

INCREMENTAL AND ABSOLUTE TRANSDUCERS CAT2025



SHAPING YOUR MOVEMENT



SHAPING YOUR MOVEMENT





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PRODUCTION

For 40 years we've been focused on developing and manufacturing always more innovative encoders.

That's why we're a leading company, since 1985.

Eltra operates in the market of sensors for automated systems **since 1985**. During these 40 years the Company has constantly grown, increasing its technology offer (over 4.000 product codes and an average of 180.000 articles manufactured each year) while maintaining the **flexibility** and the capability to design and manufacture customized products according to the Customer specific needs, features that have always distinguished the brand **Eltra**.

The company offers an extensive range of catalog products (incremental and absolute rotary encoders, explosion-proof models, rope and magnetic encoders; linear and optical incremental systems working also with field-bus interfaces, several accessories etc.), as well as a service of **Project & Development** of models upon Client's requirement.

Like many other successful companies, **Eltra** began as an entrepreneurial dream started in a garage. But what initially was just a sort of an hobby, became rapidly a solid business project and in 1985 the company **Eltra** was formed and established in the current Sarego premises. Since then **Eltra** has experienced a constant growth and development, both nationwide and abroad, that lead during the 2000's decade to the establishment of two strategic branches in **Slovakia** and **China**. In 2004 **Eltra** becomes a limited company and in 2008 joins **Avago Technologies** group, now a **Broadcom Inc.** (NASDAQ:AVGO) group company, which contributes to extend its technological know-how and to consolidate its presence in the global market, without affecting although Eltra's Italian identity and the **quality** trademark typical of the **Made in Italy**.





QUALITY



The CE marking (also known as CE mark) is a mandatory conformity mark on many products placed on the single market in the European Economic Area (EEA).

ATEX gets its name from the French title of the 94/9/EC directive: Appareils destinés à être utilisés en ATmosphères EXplosibles. Employers must classify areas where hazardous explosive atmospheres may occur into zones. The classification given to a particular zone, and its size and location, depends on the likelihood of an explosive atmosphere occurring and its persistence if it does.

ISO 9000 is a family of standards for quality management systems. ISO 9000 is maintained by ISO, the International Organization for Standardization and is administered by accreditation and certification bodies. Some of the requirements in ISO 9001 (which is one of the standards in the ISO 9000 family)

REACH (Registration, Evaluation, Authorisation and restriction of CHemicals) is a new European Union Regulation, EC/2006/1907 of 18 December 2006. REACH addresses the production and use of chemical substances, and their potential impacts on both human health and the environment.

Underwriters Laboratories Inc. (UL) is a U.S. privately owned and operated, independent, third party product safety testing and certification organization.

A producer of a UL-certified product must demonstrate compliance with the appropriate safety requirements, many of which are developed by UL.



see all our certifications
www.eltra.it/download-area/certifications/







APPLICATIONS

SOLUTIONS FOR MOTION CONTROL IN INDUSTRIAL AUTOMATED SYSTEMS

Reliability, speed and endurance are common and key factors for an efficient operation of systems and robots among the broad field of the Factory Automation. These features play a central role also in the electro-mechanical components of the machines applied in the motion control technology.

Eltra has an extensive catalog of encoders with a high level of resolution and IP rating, that satisfy the needs of this macro-area of application in terms of electronics – with several interfaces and output frequencies available – and mechanics – with a large number of flanges and diameters options – in order to offer a wide spectrum of standard products.

Moreover, for all those production plants and systems that have specific requirements, Eltra offers custom-tailored solutions designed to meet the Client's needs.

MOTION CONTROL

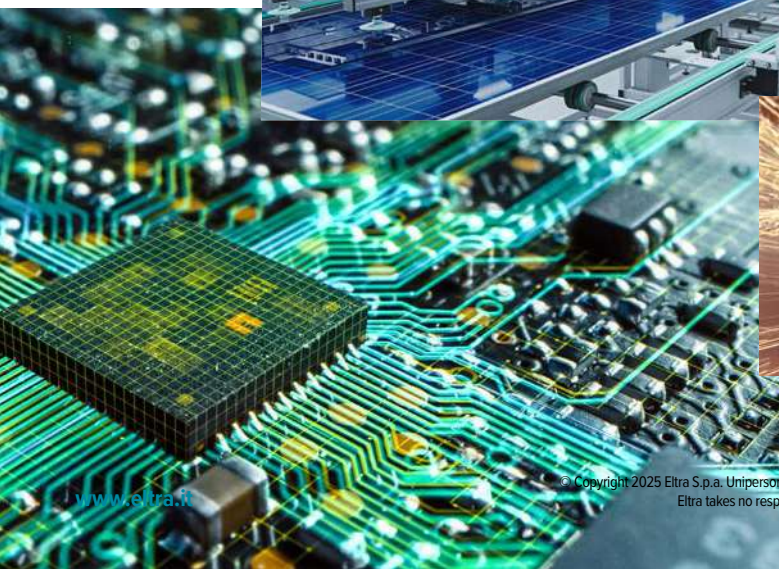
Series with a high IP sealing, extremely adaptable and easy to fix, particularly suitable for motion control application.

ROBOTICS

Encoders featuring high resolution and output frequency to ensure the maximum accuracy of automated systems and industrial robots.

SERVO-MANIPULATORS

Especially compact devices that guarantee a fully reliable position and speed control in servo-manipulators.





TECHNICAL BASICS

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TECHNICAL INDEX



What is an encoder?

The encoder is a device that converts the angular or linear motion of a shaft or axle into a series of electrical digital pulses.

These pulses are used to control the motion of the mechanical shaft that generated them. The encoder is composed by:

- Mechanical interface
- Code wheel (or magnetic actuator or linear scale)
- Optoelectronic receiver (or magnetic sensor)
- Electrical interface

Main technologies used in encoders to detect the signals are:

- Photoelectrical or optical scanning (rotary or linear)
- Magnetic field variations (rotary or linear)
- Potentiometer (rotary or linear)
- Magnetostrictive effect (linear)
- Energy Harvesting Effect (rotary)

Main applications of rotary and linear transducers are: machine-tools, material processing machinery, robots, motor feedback systems, measure and motion control devices.

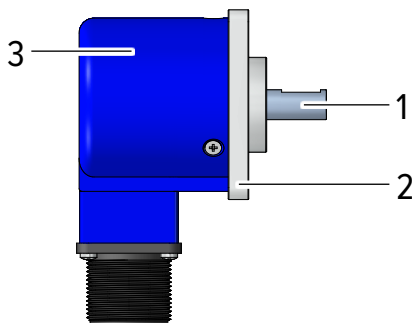
Mechanical interface

The mechanical interface consists in all those components that allow the coupling the encoder to be coupled to the machine or device of application.

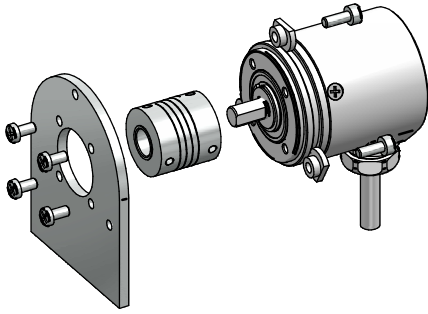
These components include:

1. An **axle**, connected to the shaft of the machine in rotation, designed in accordance to the type of fixing: **solid** or **blind/through hollow shaft**;
2. A **flange**, which fixes and adjusts the encoder to its support;
3. An **housing**, which contains and protects the disc and the electronic components.

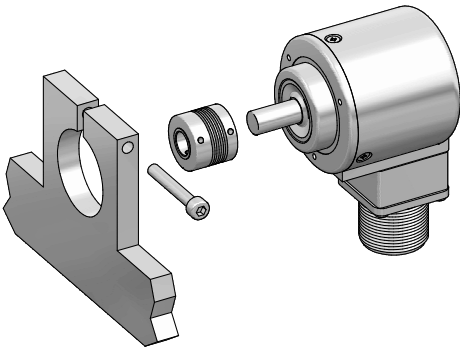
Elastic couplings can also be used to adjust the connection between the motor shaft and the encoder.



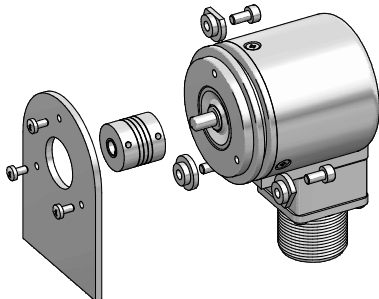
Some examples of encoders' mounting



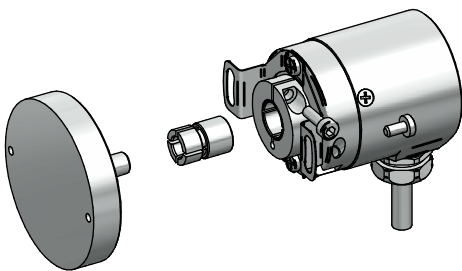
Solid shaft rotary encoder mounted by a fixing flange and the elastic coupling.



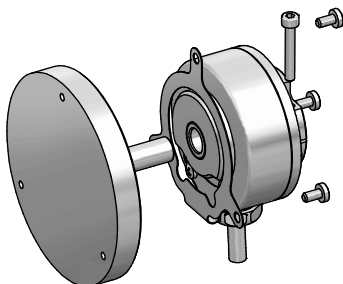
Solid shaft rotary encoder mounted by a clamping fixing.



Solid shaft rotary encoder mounted by a fixing flange (or by fixing clamps) and the elastic coupling.



Blind hollow shaft rotary encoder mounted by a stator coupling with collar clamping shaft fixing.

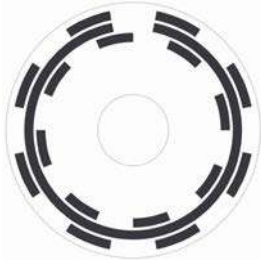


Through hollow shaft encoder with a rear collar clamping shaft fixing.

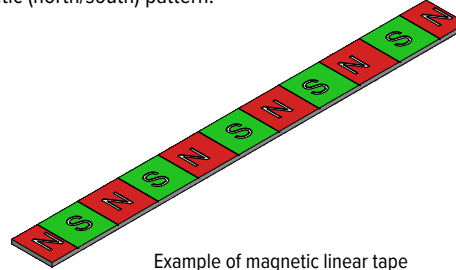
Encoder code wheel (or magnetic / linear scale)

The encoder code wheel determines the transmission code of pulses. It consists of a support made of plastic, glass or metallic material, on which a pattern of alternating clear (transparent) and opaque segments is engraved. On linear scales, this pattern is replaced by a stationary opaque strip.

Magnetic sensing replaces the codewheel or linear scale with a magnetic (north/south) pattern.



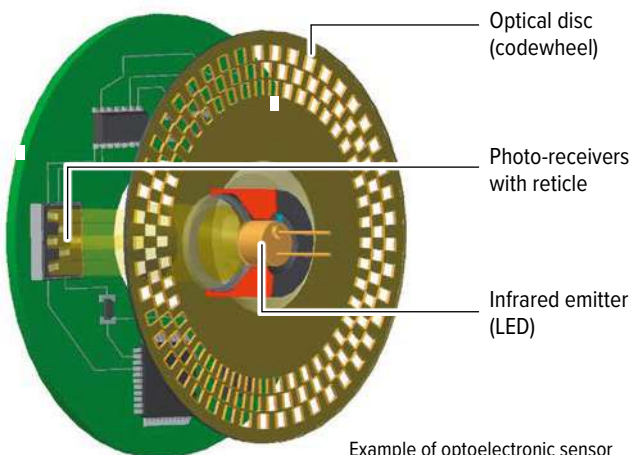
Example of a codewheel



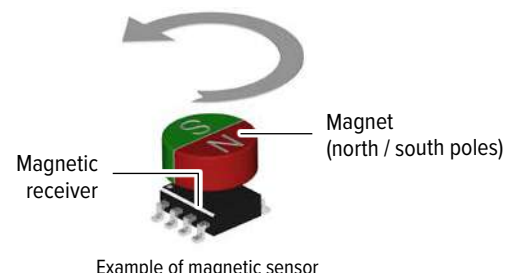
Example of magnetic linear tape

Encoder optoelectronic receiver (or magnetic sensor)

The optoelectronic receiver is made by an array of sensor (photodiodes or phototransistors) which is illuminated by an infrared light source (IR LED). Between the receiver and the LED there's the graduated codewheel. The light projects the disk image on the receiver's surface which is covered by a grating called reticle having the same disk steps. The receiver transduces the occurring light variations caused by the disk shifting and converts them into their corresponding electrical variations. In magnetic encoders system is made by a rotating actuator with a magnet and the magnetic sensor convert magnetic field variation into electrical signals.



Example of optoelectronic sensor



Example of magnetic sensor

Electrical interface

The electrical interface is how the encoder transmits data to a receiver. It uses electrical signals, which can be digital or analogue, that are sent through the encoder cable to an intelligent device, such as an interface board or PLC. The type of encoder, whether incremental or absolute, determines the electrical interface.

Interfaces on incremental encoders are:

- **NPN**
- **NPN Open collector**
- **Push pull**
- **Line driver**

Interfaces on absolute encoders are:

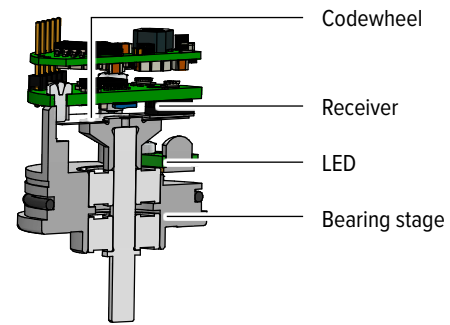
- **Analogue (voltage or current)**
- **Bit-parallel (NPN / NPN Open collector / PNP / PNP Open collector / Push pull)**
- **Serial transmission (Serial Synchronous Interface (SSI) / BiSS)**
- **Fieldbus (Canopen / Profinet / Ethercat)**

Photoelectric or optical scanning (rotary or linear)

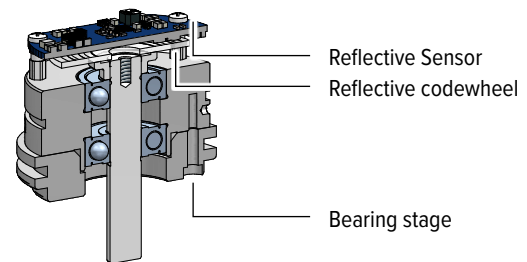
There are two ways to build an optical scanning system: transmissive or reflective. In a transmissive optical encoder, the scanning system relies on the rotation of a graduated disc or code wheel patterned with alternating opaque and clear segments. The code wheel is illuminated by an infrared light source positioned perpendicularly to the sensor.

The disc projects its image onto multiple receivers, which are masked by a grid known as a 'reticle' with the same pitch. The receivers detect changes in light that occur during the disc's rotation and convert them into corresponding electric pulses. Linear transducers operate on a similar principle, but detect motion using a linear reading system.

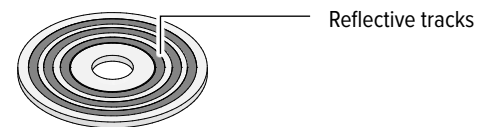
The reflective optical system is based on photoelectric scanning of a code wheel. In this technology, the light source and receiver are in the same surface mount package. The code wheel is formed by darker segments alternated with reflective ones. The light is reflected and detected by the sensor (receiver), which transforms the variations into corresponding pulses, as per the transmissive system. This type of reading allows for a reduction in device size while maintaining performance. It is an ideal solution for applications that require miniaturized encoders with high resolution.



Example of transmissive encoder



Example of reflective encoder

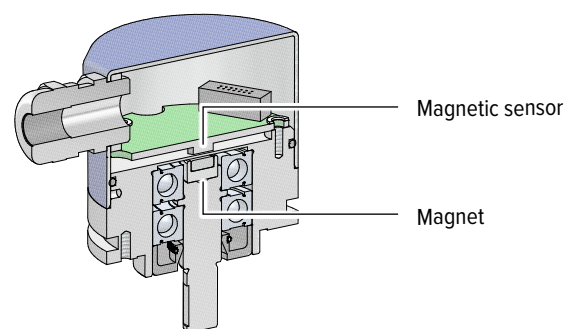


Example of multi track reflective codewheel

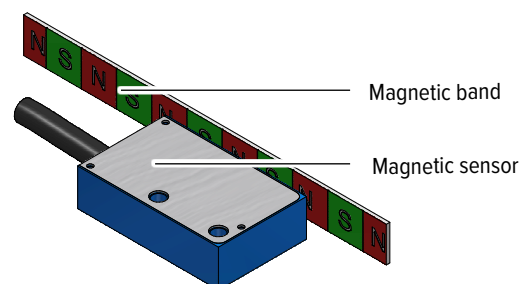
Magnetic sensing (rotary or linear)

Magnetic encoders use a signal detection system that detects changes in the magnetic flux generated by a rotating magnet (with one or more pole pairs) in front of a sensor fixed to the encoder's shaft. The sensor samples the magnetic field variation and converts it into an electric pulse, which determines the position.

There are two types of magnetic technology: on-axis and off-axis. The primary advantage of magnetic technology is its non-contact detection system, which prevents wear and makes it cost-effective due to its low maintenance and potentially infinite durability. Magnetic encoders are ideal for heavy-duty applications that require high robustness, speed, and a wide range of operating temperatures, while also ensuring excellent signal reliability.



Magnetic rotary encoder

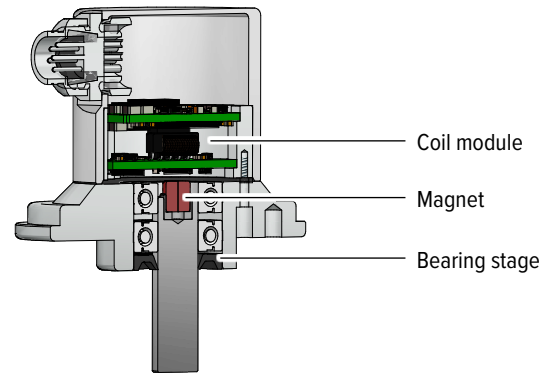


Magnetic incremental linear encoder

Energy harvesting (rotary)

Multiturn counting is enabled using energy-harvesting technology. A magnet mounted on the rotating shaft moves in tandem, and the energy-harvesting coil module cuts the moving magnet field to generate energy. This effect generates the same amount of energy independently of the rotation speed. The energy generated is sufficient to power the revolution tracking circuitry.

Therefore, miscounts are prevented even without an external power supply. This technology can replace traditional gear technology because it does not wear out (no contact technology).

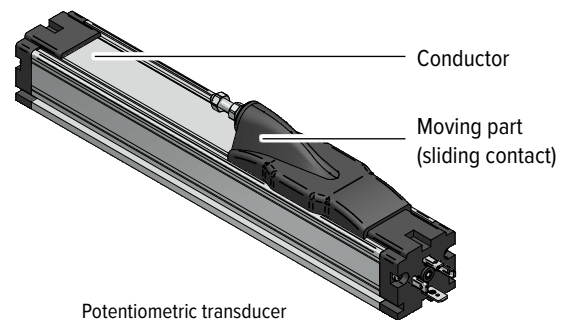


Energy Harvesting engine

Potentiometric sensing (rotary or linear)

This linear/rotary transducer consists of a wire or metal layer wound around a non-conductive support and a movable contact that shifts along the conductor. The operating principle is based on the change in resistance of an electric circuit caused by the displacement of the object whose position needs to be determined.

Potentiometers are ideal for use in machinery for processing thermo-plastics, wood, marble, iron, and steel, as well as any application that requires absolute measurement of position and motion.

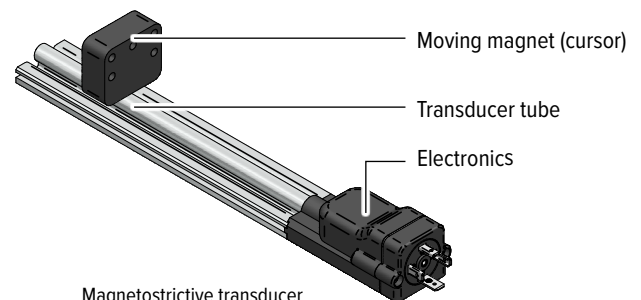


Potentiometric transducer

Magnetostrictive sensing (linear)

Magnetostrictive transducers are based on the magnetostriction principle. Certain materials expand and contract when exposed to an alternating magnetic field. The two magnetic fields are generated by the moving magnet and the current pulse inside the transducer tube. This interaction creates a strain pulse that travels inside the tube until it is detected by the electronics.

The absolute position is calculated by measuring the time of the strain pulse compared to the current pulse that generates it. This technology's key factor is the absence of any electrical contact on the slider, making the device highly resistant to wear and tear while ensuring great speed and precision.

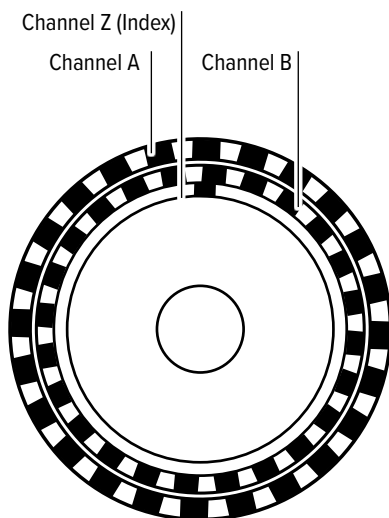


Magnetostrictive transducer

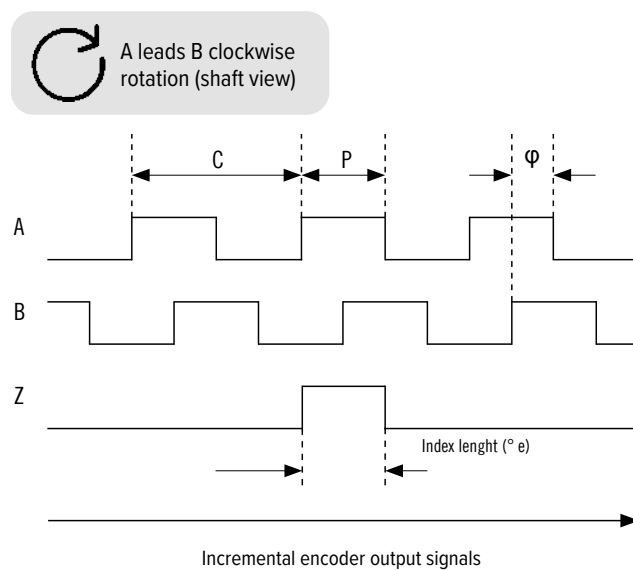
Incremental encoder

The incremental encoder is so called because it tracks changes relative to a reference point, regardless of the direction of rotation. It senses rotation, speed, and acceleration by counting output circuit pulses, but the machine's zero point must be reset at each new start. The incremental encoder typically provides two types of square waves.

Channel A provides information about the rotation speed, while channel B provides data regarding the direction of rotation based on the sequence produced by the two signals. The resolution can be increased by reading not only the rising edges but also the falling edges of A and B signals, which are out of phase by 90 degrees electrically. Using this method, an encoder with 1000 physical pulses per revolution can generate 2000 or 4000 pulses per revolution. Additionally, a Zero (Z or Index) channel is available, which provides the absolute 'zero' position of the encoder shaft and serves as a reference point.



Example of 3 channels incremental encoder codewheel



Incremental encoder output signals

One Cycle: 360 electrical degrees (°e).

Cycle Error (ΔC): an indication of cycle uniformity. The difference between an observed shaft angle which gives rise to one electrical cycle, and the nominal angular increment of 1/N of a revolution.

Pulse Width (P): the number of electrical degrees that an output is high during 1 cycle. This value is nominally 50 % (or 180°e).

Pulse Width Error (ΔP): the deviation, in electrical degrees, of the pulse width from its ideal value. Typical value is max ± 10 % on optical encoders or ± 20 % on magnetic encoders.

Phase (φ): the numbers of electrical degrees between the center of the high state of the channel A and the center of the high state of the channel B.

This value is nominally 90°e for a quadrature output.

Phase Error (Δφ): the deviation of the phase from its ideal value. Typical value is max ± 30°e on optical encoders or ± 40°e on magnetic encoders.

Index length (°e): Index is aligned on the channel A and its length can be 180°e or 90°e (called A&B)

Number of encoder pulses is determined from angular or linear resolution needed. For linear applications a calculation is required to convert linear movements into rotary.

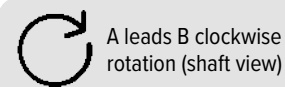
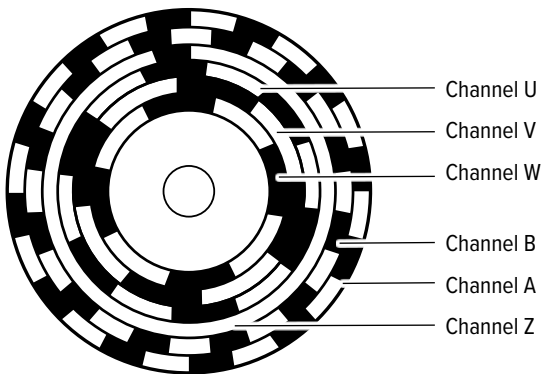
$$\text{Encoder Resolution (ppr)} = \frac{\text{Circumference}}{\text{Accuracy}}$$

Encoder max pulse frequency can be considered according to the speed and the encoder resolution.

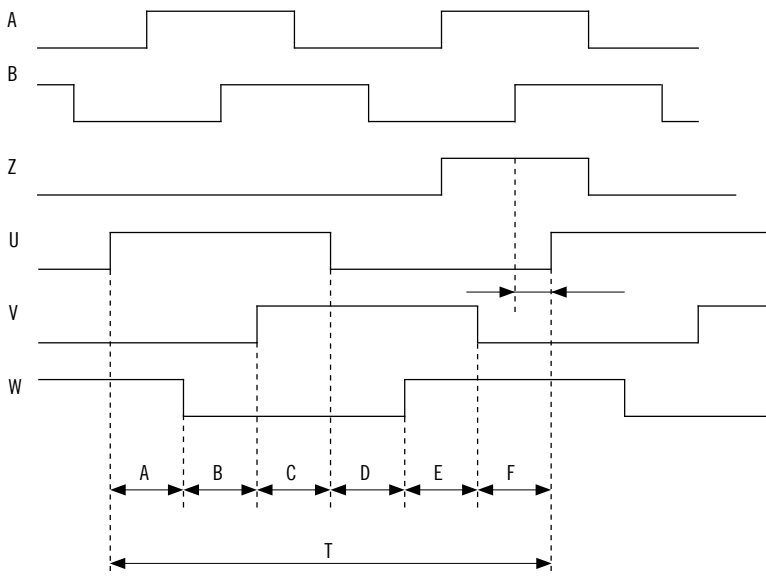
$$\text{Frequency} = \frac{\text{rpm} \times \text{resolution (ppr)}}{60}$$

There are other encoders that integrate additional electrical output signals called incremental encoders with integrated commutation signals, normally used as motor feedback. These additional signals (called U, V, W) simulate the commutation (Hall) signals, which are usually employed in brushless motors and are usually generated by integrated magnetic sensors.

In Eltra's encoders commutation signals are optically generated and are represented as 3 squared waves, shifted by 120° electrical degrees (see below table about the relation between motor poles and pulse degrees). These signals are used by the drive to generate the correct motor supply phases sequences. These commutation signals can be repeated many times within one mechanical revolution, since they depend directly on the number of poles of the motor.



Example of 6 channels commutation encoder codewheel



INCREMENTAL SIGNALS

COMMUTATION SIGNALS (HALL)

MOTOR POLES	A / B / C / D / E / F	T
4	30° ±1,5°	180°
6	20° ±1,5°	120°
8	15° ±1,5°	90°

Absolute encoder

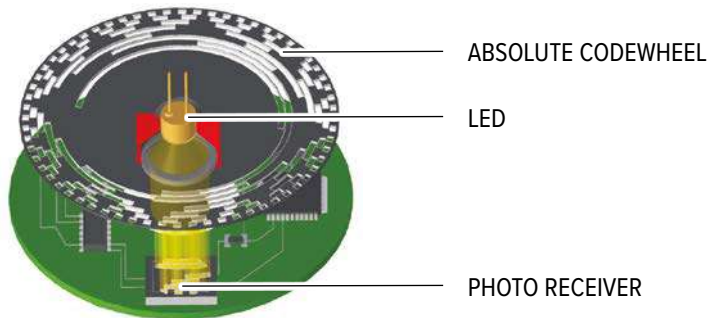
The absolute encoder provides a unique digital code for each angle position of the shaft, storing the value of the current position and, therefore, preventing the loss of the information in case of restarting the system or of a power-loss.

The absolute encoder could be of two types:

- Singleturn
- Multiturn

The singleturn absolute encoder allows a precise encoding of the angular position of the shaft, to which the encoder is coupled to, even if the power goes off. Therefore, each single degree position is converted into a specific code (Gray or binary) proportionally to the number of bit.

The multiturn absolute encoder allows a higher number of applications, representing a very interesting extension of the encoders' action field. Besides the angular tracking of the singleturn system, the multiturn stores also the counting of number of revolutions made.



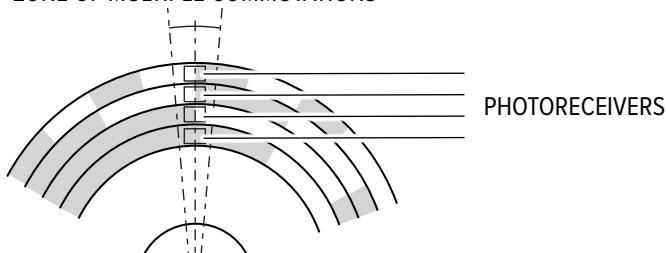
Gray or binary code

Absolute encoders maintain the absolute position value even after an interruption or loss of power. Therefore, it is essential that all position-related data is always available. Binary codes are used for this purpose. These are defined by the pattern of clear and opaque segments arranged on the disc in a transverse or longitudinal direction with respect to the direction of movement.

Binary code

The natural binary code has the disadvantage of having more binary digits change between two consecutive positions. Due to mechanical tolerances, bounces, or noise, it is possible that the commutation signals do not switch simultaneously when the state changes, resulting in intermediate situations that could cause errors in position calculation. To prevent this issue and avoid errors in the output code, an output sync signal (STROBE) is utilised.

ZONE OF MULTIPLE COMMUTATIONS



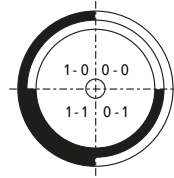
Gray code

Gray code is a binary code in which only one digit changes between consecutive steps. To avoid encoding errors caused by bit changes in contiguous positions, the code tracks are read crosswise with respect to the direction of movement.

DECIMAL	BINARY	GRAY
0	0000	0000
1	0001	0001
2	0010	0011
3	0011	0010
4	0100	0110
5	0101	0111
6	0110	0101
7	0111	0100
8	1000	1100
9	1001	1101
10	1010	1111
11	1011	1110
12	1100	1010
13	1101	1011
14	1110	1001
15	1111	1000

1-1 0-0
1-0 0-1

2 Bit optical disc with binary code



2 Bit optical disc with gray code

Gray code can be converted to binary with a simple combinatory circuit (XOR).

The gray excess code

However, if the number of defined positions is not a power of 2, even with the Gray code, more than one bit can change simultaneously between the last and the first code value. For example, in a 12 ppr absolute encoder, the code should be like the one shown in the table below. It is evident that between the positions “11” and “0”, 3 bits can simultaneously change, leading to reading errors.

The Gray excess code maintains one-bit variation specificity by aligning the 0 position with the N value.

N is a number that, when subtracted from the Gray code and converted into binary, provides the exact position value.

POSITION	GRAY
0	0000
1	0001
2	0011
3	0010
4	0110
5	0111
6	0101
7	0100
8	1100
9	1101
10	1111
11	1110
0	0000

← Error

The formula to calculate the N value is:

$$N = (2^n - IMP) / 2$$

Where : IMP is the number of PPR

2ⁿ is the power of 2 multiple immediately higher than IMP

In our example N will be:

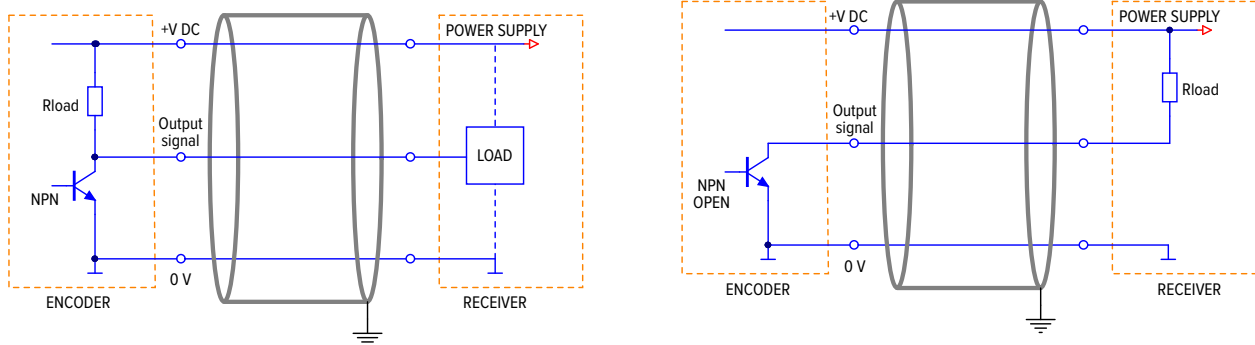
$$N = (2^4 - 12) / 2 = (16-12) / 2 = 2$$

Electrical interfaces

NPN / NPN open collector

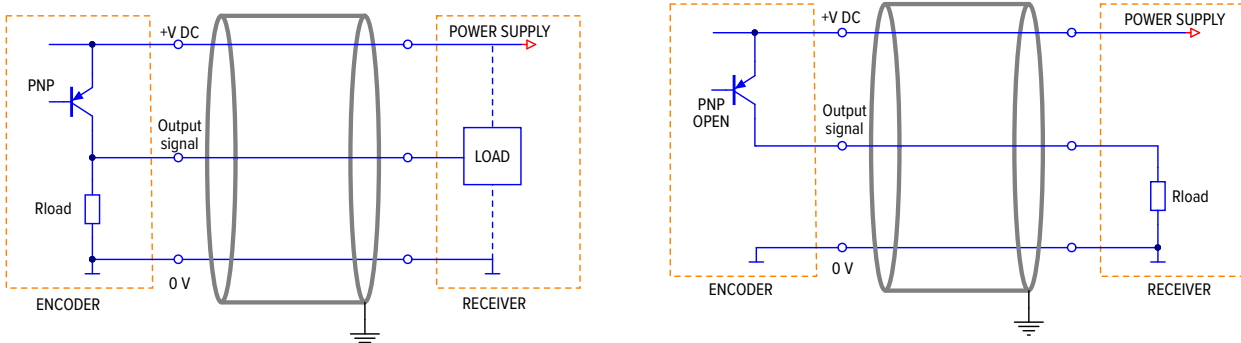
The circuit consists of an NPN transistor and a pull-up resistor, which is used to match the output voltage to the power supply when the transistor is off (also known as a 'sink output'). Output performance is limited by cable length, signal frequency, and load.

In the open collector variant, there is no pull-up resistor, allowing for signals with different voltages.



PNP / PNP open collector

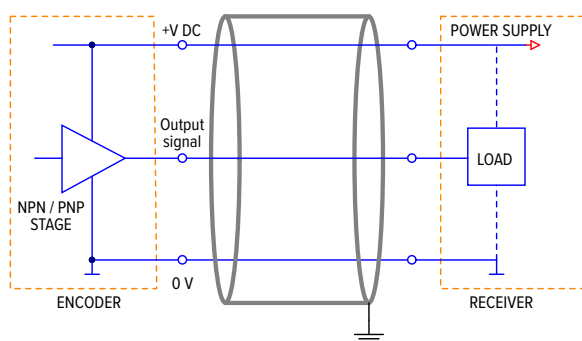
The main difference is the transistor, which is a PNP type (also known as a 'source output'). If present, the resistor is in a pull-down configuration. This configuration has the same limitations as an NPN transistor in terms of cable length, frequency, and load.



Push-Pull

In NPN or PNP electronics, frequency performance is limited by the resistor, which has a much higher impedance than a transistor. To overcome this issue, push-pull electronics use complementary transistors, reducing the impedance for commutation to positive levels and to zero.

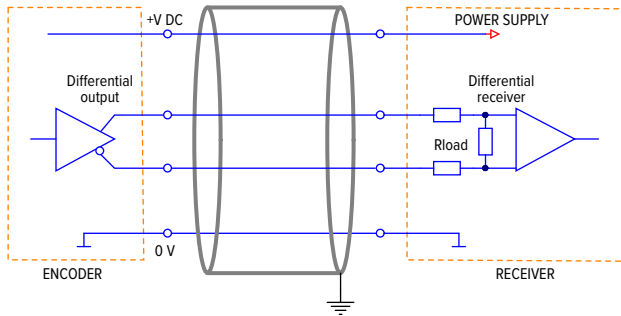
This solution increases frequency performance, allowing for longer cable connections and optimal data transmission. Saturation levels may be higher than in NPN and PNP electronics, but push-pull electronics can be used interchangeably with NPN or PNP.



Line driver

LINE DRIVER is used in environments that are particularly exposed to electrical disturbances or when the encoder is far from the receiver system. The data transmitter and receiver work on two complementary channels, limiting disturbances (cross-talk). These interferences are known as ‘common mode disturbances’ because their generation is due to a common point which is 0 V. In LINE DRIVER, transmitted and received signals are processed differentially, using the differences between complementary channels and eliminating common mode signals at the receiver.

This transmission method is available in both +5 V DC (known as RS-422) and +30 V DC models.



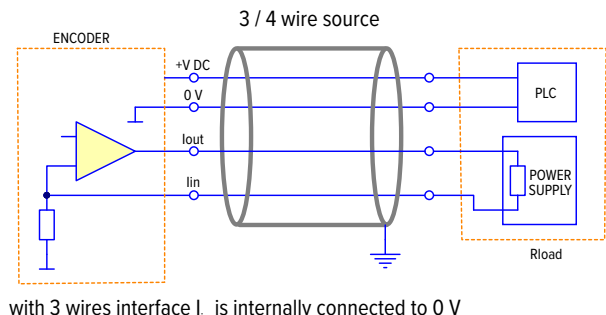
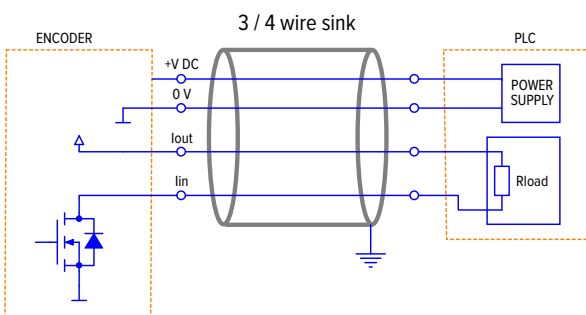
Output stage protection

An ASIC is used to protect outputs from short circuits. The solution is based on an active sensor that instantly controls the temperature of the element to be protected. It provides constant protection against repetitive and permanent short circuits, making it ideal for heavy-duty applications or harsh environments. This solution is available for LINE-DRIVER and PUSH-PULL electronics.

Analogue interface

The analogue interface provides position information through current or voltage signals and can be used as a replacement for a potentiometer. The voltage range is from 0 to 5 V or 0 to 10 V, while the current range (sink or source configuration) is from 0 to 20 mA or to 4 to 20 mA in accordance with industry-standard interfaces.

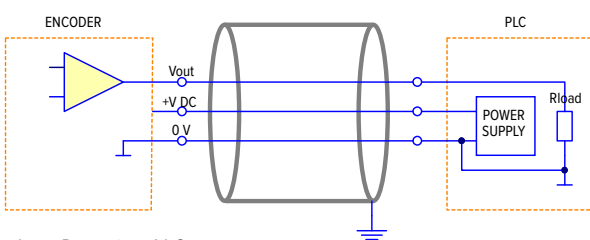
CURRENT OUTPUT



with 3 wires interface I_{out} is internally connected to +V DC
 where $R_{LOAD}^{max} = (V_{DC} - 2) / 0.02$

with 3 wires interface I_{in} is internally connected to 0 V

VOLTAGE OUTPUT



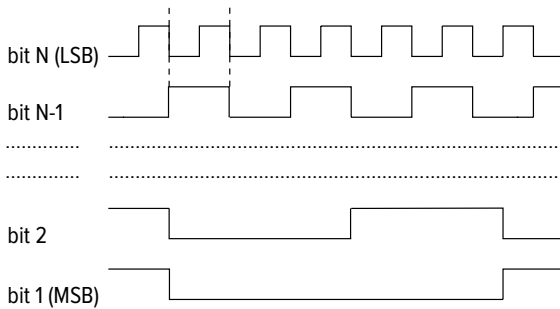
where $R_{LOAD}^{min} = 1 \text{ k}\Omega$

Bit-parallel interface

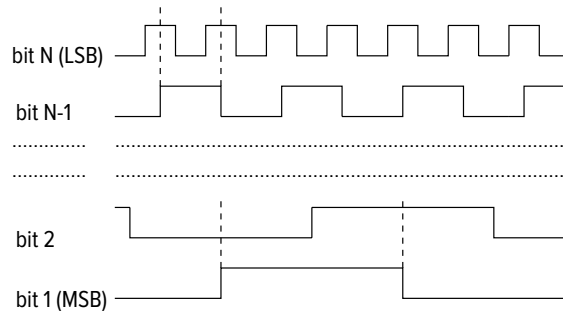
The parallel output is the standard interface for single-turn and multi-turn absolute encoders. These encoders provide position data output using a 'bit by bit' encoding, either according to Gray or binary standards, simultaneously with the device's resolution.

Parallel transmission requires a wire for each bit, resulting in increased wiring complexity for higher device resolutions.

To reduce the number of wires, other forms of data transmission such as the SSI or BiSS serial interfaces or field bus protocols like PROFIBUS, PROFINET or ETHERCAT have been implemented.



Binary bit-parallel output

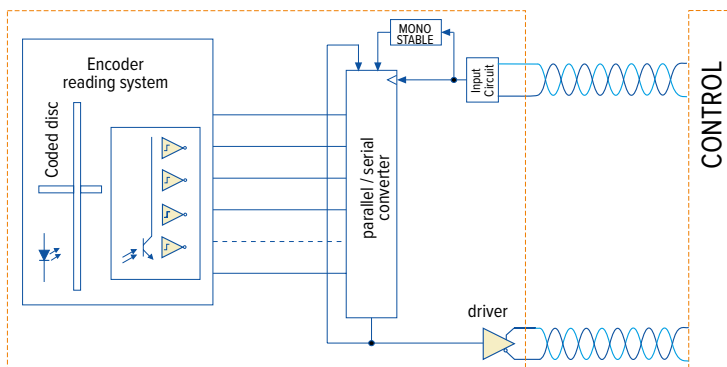


Gray bit-parallel output

SSI interface

The automation field is constantly evolving, leading to an increased demand for precision in measurement devices, including absolute encoders.

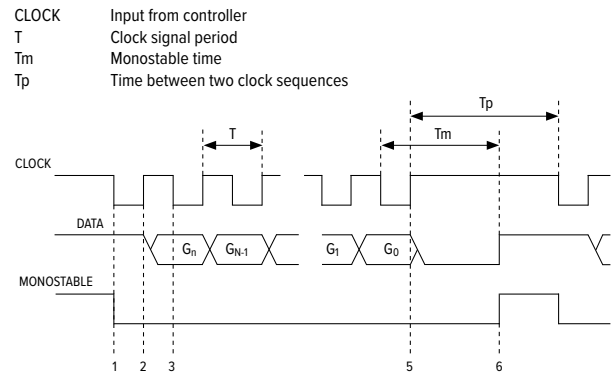
To meet this demand, absolute encoders have been designed with higher resolutions, resulting in more bits and wires. The Synchronous Serial Interface (SSI) was created to address these issues, reducing installation costs and simplifying wiring. This interface transmits digital data in serial mode using only two signals, CLOCK and DATA, regardless of the encoder's bit count.



The encoder reading system obtains the position data, which is then continuously transmitted to a parallel/serial converter. The data is stored and transmitted to the output when the mono-stable circuit is activated by a clock signal transition. The CLOCK and DATA signals are transmitted differentially (RS422) to enhance immunity from interference and allow longer transmission distances.

When quiescent, CLOCK and DATA signals have a high logical level and the monostable circuit is disabled.

- On the first CLOCK falling edge the monostable is activated and parallel value at the P/S converter input is stored into the shift register.
- On the next CLOCK rising edge Most Significant Bit (MSB) is transferred into the DATA signal output.
- On the next CLOCK falling edge (when the signal is stable) the controller acquires value from DATA signal and monostable is re-activated.
- On each further CLOCK rising edge following bit up to the least significant one are copied in the DATA signal output and then acquired by the controller on falling edge.
- At the end of the CLOCK pulse sequence, when the external control has also acquired the value of the Least Significant Bit (LSB), the CLOCK pulse sequence stops and therefore the monostable is no longer re-activated.
- Once the mono-stable time (T_m) has passed, the DATA signal returns to a high logical level and monostable disables itself.



The frame length of the transmitted data depends only on the encoder type (singleturn or multiturn) and not on the resolution. In fact, the standard frame length for a singleturn encoder is 13 bit, while for a multiturn one is 25 bit.

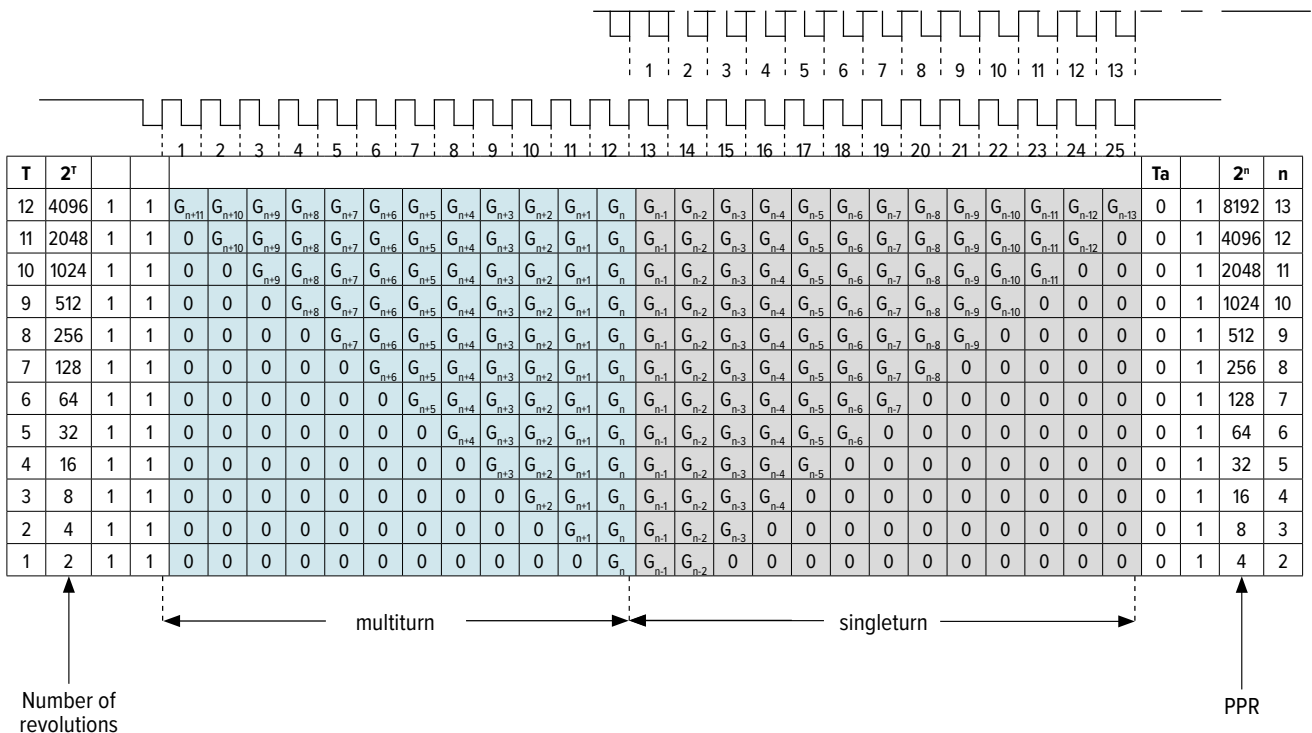
With multiturn encoder with number of revolutions > 4096 frame length is 27 bit (14 bit for revolutions + 13 bit for singleturn) and 32 bit (19 bit for revolutions + 13 bit for singleturn).

Frame alignment is on the center as shown on below table:

n = number of bit per revolution

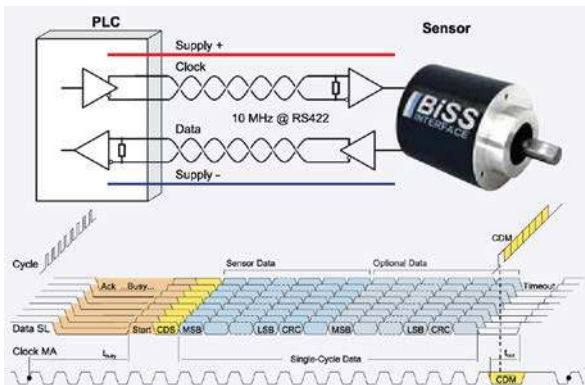
T = number of bit for revolutions **T_c** = clock period

T_a = $\frac{T_m - T_c}{2}$ **T_m** = monoflop time

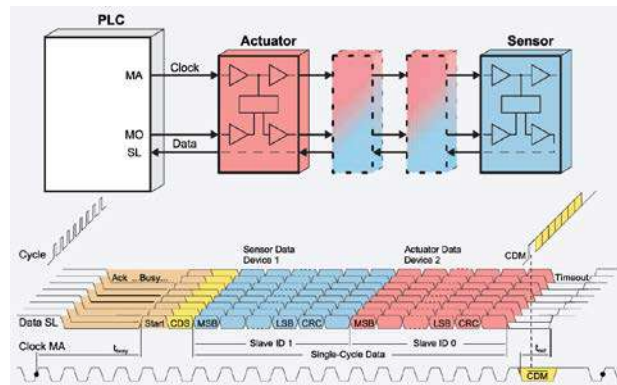


BiSS interface BISS INTERFACE

BiSS is an open source digital interface for sensors and actuators. BiSS is hardware compatible to the industrial standard SSI (Serial Synchronous Interface) but offers additional features and options like bidirectional data communication (serial synchronous, continuous data communication) and two unidirectional lines clock and data (cyclic at high speed (up to 10 MHz), line delay compensation for high speed data transfer, request processing times for data generation at slaves, safety capable (CRC, errors, warnings) and bus capability for multiple slaves and devices in a chain. The advantage of open source protocols is that the selection of components is not imposed so the end customer can choose the proper products related to the application, increasing the cost-efficiency. Further advantage for the end customer is the compatibility between different manufactures.

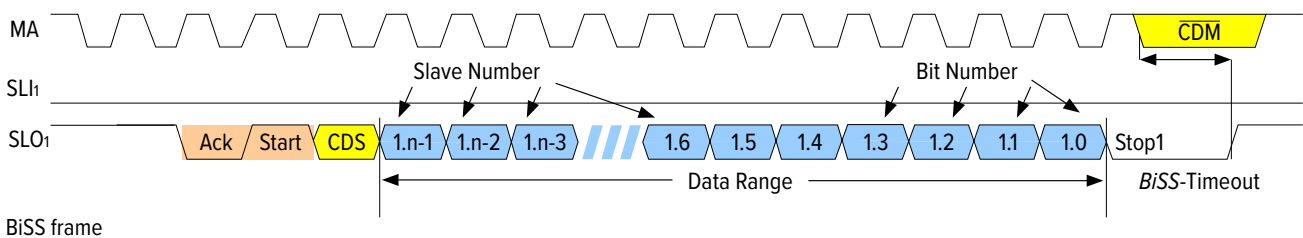


Typical BiSS encoder connection



Example of multi product BiSS connection

In point-to-point configuration, only one device with one or more slaves (sensors) is connected to the master. The master transmits the clock signal to the slave(s) via the MA line. The SL line carries the sensor data directly from the first slave back to the master. In point-to-point configuration the input SLI of the 'Last Slave' is connected to '0'. In bus configuration, all devices, which may also each include multiple slaves, are connected in a chain. Each slave therefore has two terminals (SLO and SLI) with drivers provided for high speed differential signals if applicable. The MA line supplies the clock signal from the master simultaneously to all slaves and the SLO and SLI lines connect the master and all slaves in a chain.



The BiSS frame (transmission frame) is started by the master with the clock MA, clocked and ended. Here the first rising edge at MA is used for the synchronization of all slaves. It enables the isochronous scanning of sensor data and the isochronous output of actuator data. With the 2nd rising edge from MA, all slaves set their SLO line to "0" and generate their "Ack" (Acknowledge) signal with it; it remains active (SLO = "0") until the start bit arrives at the input SLI of the respective slave. The start bit is then passed on synchronously with the clock MA from each slave delayed by one clock pulse, while the CDS bit is either passed on by the slave or is set according to the rules of the control frame. Beginning with the 2nd bit after the start bit and up to the stop bit of the BiSS frame, the data range follows, which transmits the sensor data from the slaves to the master and the actuator data from the master to the slaves. The BiSS frame ends with the BiSS timeout. In this time no further clock pulses are sent to the MA by the master. The inverse state of the MA line during the BiSS timeout is the state of the CDM (Control Data Master) bit. At the end of the data transmission, the master sets its output MO to the idle state "1". The slaves then pass on this "1" received at SLI to their output SLO as soon as they have detected the expiration of the timeout themselves. This ensures that the BiSS timeout on the line SL is only signaled to the master when all connected slaves have detected the timeout.

When the BiSS timeout expires, all slaves return to the idle state; all lines are set to the high signal level ("1") in the process.

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CANopen interface **CANopen**®

CAN is a field bus. It operates with the CSMA/CA (Carrier Sense Multiple Access / Collision Avoidance) method. It means that collisions during bus access are avoided by a so called bitwise arbitration. The bits are coded NRZ-L (Non Return to Zero - Low).

A cyclic redundancy check (CRC) and other safety mechanisms provide a secure transmission. For synchronization a mechanism called "bit stuffing" is used. CAN is a multi-master system, i.e. several equal bus nodes can be connected without a bus master supervising the communication. In principle a CAN bus can be realized with copper wire or in fibre optic cable.

The common CAN implementation with copper wire operates with differential signals, transmitted via two wires: CANHIGH, CANLOW. Therefore CAN has a good common mode rejection ratio.

Data is transmitted with bits that can either be dominant or recessive. The dominant (0) always overwrites the recessive (1).

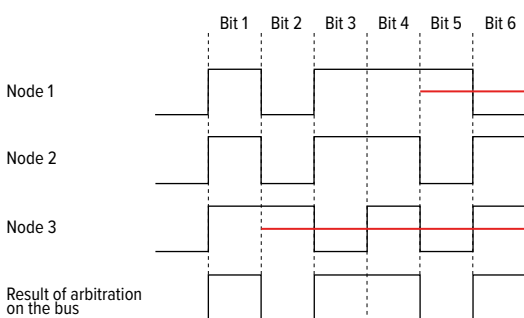
The topology of a CAN network is a line, which can be extended by stubs. The maximum length of a stub is limited to 0,5 m.

The network always has to be terminated on both ends with 120 Ohm each (between CANHIGH and CANLOW). Other locations or values are not allowed.

The arbitration mentioned before is used to control the bus access of the nodes by prioritization of the CAN-Identifier of the different messages.

Every node monitors the bus. If more than one node wants access on the bus, the node with the highest priority of the messages ID succeeds and the other nodes retreat until there is "silence" on the bus (see below example). Technically the first dominant bit of the ID send overwrites the corresponding recessive bit of the other IDs. In case that more than one node uses the same CAN-ID an error occurs only at a collision within the rest of the frame.

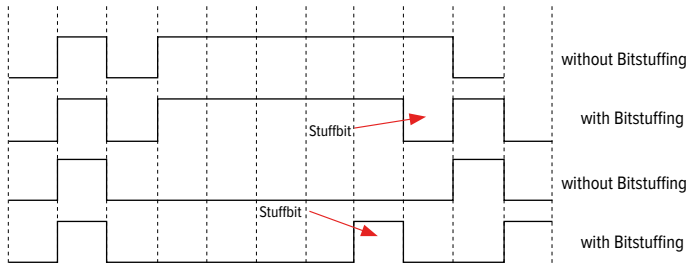
In principle a CAN-ID should only be used by a single node.



Example of arbitration

Due to the arbitration there is a ranking of the messages. The message with the lowest ID has the highest priority and therefore it has almost instant access on the bus. The exception is that an ongoing transmission will not be interrupted. So time critical messages should be assigned to the high priority CAN-IDs, but even then there is no determination in the time of transmission (non-deterministic transmission).

For the arbitration all nodes have to be synchronised. Due to the lack of a separate clock signal, the transmission of many identical bits in line would lead to the loss of synchronisation. The so called bit-stuffing is used to prevent this case. After five equal bits a complementary bit will be inserted into the transmission (the application will not notice). So the nodes can keep up resynchronising on the bit edges (see below figure).



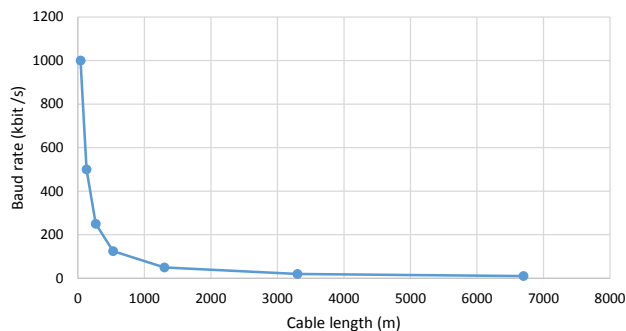
Bitstuffing

A CAN network can operate with baud rates up to 1 Mbit/s.

Due to the necessary synchronisation of the nodes, the maximum delay caused by the length of the cable has to be limited.

The limitation corresponds with the baudrate. There is a common recommendation of the maximum cable length at several baud rates:

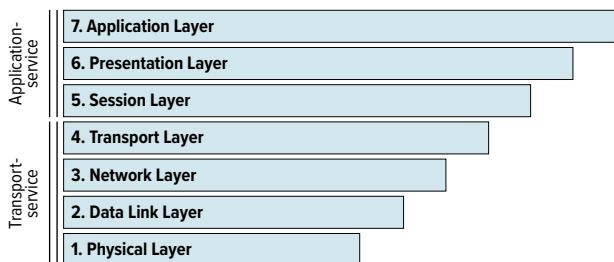
BAUD RATES (kbit /s)	CABLE LENGTH (m)
10	6700
20	3300
50	1300
125	530
250	270
500	130
1000	< 40



CAN baud rates and recommended cable length limits

CANopen

CANopen is a specified higher protocol (layer 7 protocol)



ISO-OSI model

With CANopen it is possible to transfer larger amounts of data, emergency telegrams and process data.

CANopen describes how the communication is performed. That means that parameters to configure a device are transmitted in a defined form (profile).

A CANopen profile defines objects representing the different functions of a device. These objects form a table called object dictionary.

The communication profile defines the basic services and parameters of a CANopen device (e.g. service data objects SDOs, process data objects PDOs, used CAN-IDs, etc.). The device profile defines the specific functions of a device family (e.g. encoders, i/o devices, ...).

For encoders the device profile is the encoder profile CiA 406.

PROFINET interface

The ever-shorter innovation cycles for new products makes the continuous evolution of automation technology necessary. The use of fieldbus technology has been a significant development in the past few years. It has made possible to migrate from centralized automation systems to decentralized ones. PROFIBUS, as the global market leader, has set the benchmark here for 25 years. In today's automation technology, Ethernet and information technology (IT) are increasingly calling the shots with established standards like TCP/IP and XML. Integrating information technology into automation opens up significantly better communication options among automation systems, extensive configuration and diagnostic possibilities, and network-wide service functionality.

These functions have been integral components of PROFINET from the outset. PROFINET is the innovative open standard for Industrial Ethernet.

PROFINET satisfies all requirements of automation technology; whether the application involves production automation, process automation, or drives (with or without functional safety), PROFINET is the first choice across the board. As a technology that is standard in the automotive industry, widely disseminated in machine building, and well-proven in the food and packaging and logistics industries, PROFINET has found its way into all application areas.

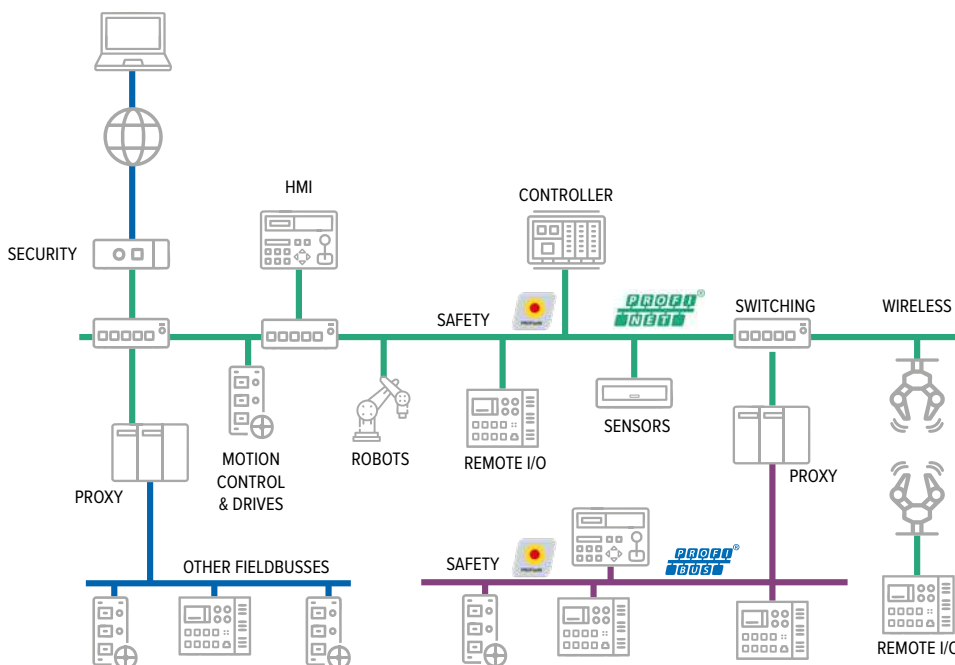
New application areas are constantly emerging, such as marine and rail applications or even day-to-day operations, for example, in a beverage shop. And now: the new PROFenergy technology profile will improve the energy balance in production processes.

PROFINET is standardized in IEC 61158 and IEC 61784.

The ongoing further development of PROFINET offers users a long-term view for the implementation of their automation tasks.

For plant and machine manufacturers, the use of PROFINET minimizes the costs for installation, engineering, and commissioning.

For plant owners, PROFINET offers ease of plant expansion and high plant availability due to autonomously running plant units and low maintenance requirements. The mandatory certification for PROFINET devices also ensures a high quality standard.



Example of plant network

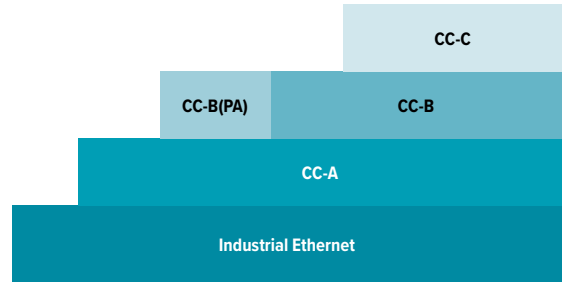
The scope of functions supported by PROFINET IO is clearly divided into conformance classes ("CC"). These provide a practical summary of the various minimum properties.

There are three conformance classes that build upon one another and are oriented to typical applications (see figure).

CC-A provides basic functions for PROFINET IO with RT communication. All IT services can be used without restriction. Typical applications are found, for example, in business automation. Wireless communication is specified for this class.

CC-B extends the concept to include network diagnostics via IT mechanisms as well as topology information. The system redundancy function important for process automation is contained in an extended version of CC-B named CC-B(PA).

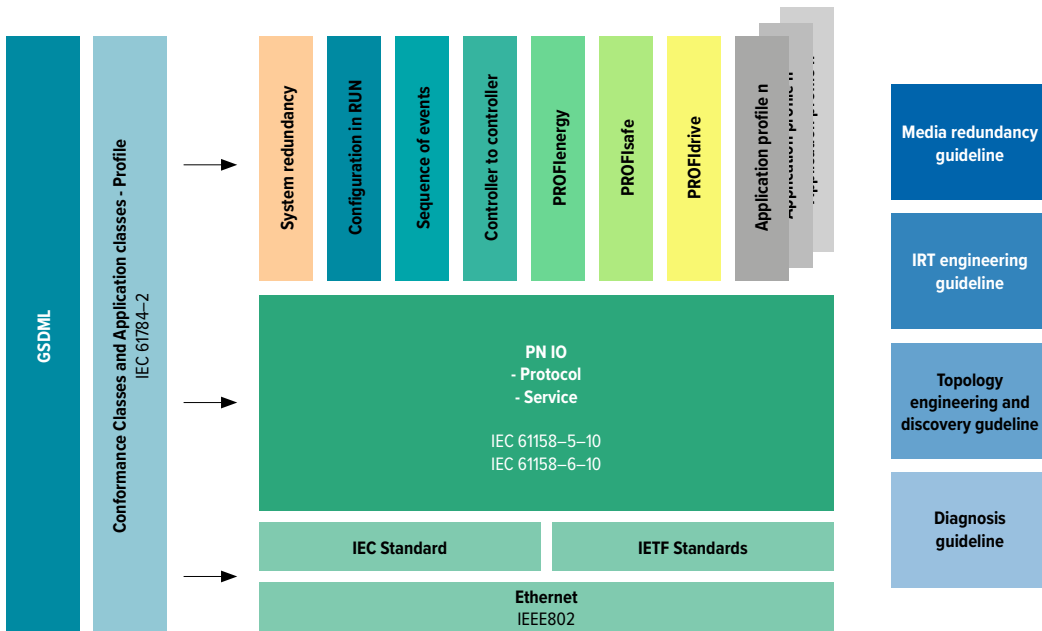
CC-C describes the basic functions for devices with hardware-supported bandwidth reservation and synchronization (IRT communication) and is thus the basis for isochronous applications.



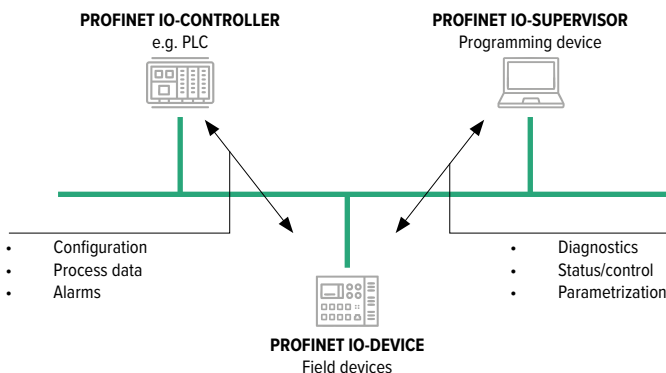
Structure of conformance classes

The conformance classes also serve as the basis for the certification and the cabling guidelines. A detailed description of the CCs can be found in the document “The PROFINET IO Conformance Classes” [7.042].

The PROFINET concept was defined in close collaboration with end users based on standard Ethernet according to IEEE 802 in IEC 61158 and IEC 61784. Figure below lists additional specifications of the functionalities in the form of different joint profiles. These form the basis for device or application-specific profiles. Instructions are created for the necessary planning, engineering, and commissioning steps. The basics for this form the guidelines for engineering PROFINET systems.



PROFINET IO follows the Provider/Consumer model for data exchange. Configuring a PROFINET IO system has the same look and feel as in PROFIBUS. The following device classes are defined for PROFINET IO (figure below):



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IO Controller: this is typically the programmable logic controller (PLC) on which the automation program runs. This is comparable to a class 1 master in PROFIBUS. The IO controller provides output data to the configured IO devices in its role as provider and is the consumer of input data of IO devices.

IO Device: an IO device is a distributed I/O field device that is connected to one or more IO controllers via PROFINET IO. It is comparable to the function of a slave in PROFIBUS. The IO device is the provider of input data and the consumer of output data.

IO Supervisor: this can be a Programming Device (PD), personal computer (PC), or human machine interface (HMI) device for commissioning or diagnostic purposes and corresponds to a class 2 master in PROFIBUS.

A plant unit contains at least one IO controller and one or more IO devices. IO supervisors are usually integrated only temporarily for commissioning or troubleshooting purposes.

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EtherCAT interface

EtherCAT is Industrial Ethernet and utilizes standard frames and the physical layer as defined in the Ethernet Standard IEEE 802.3. However, it also addresses the specific demands faced in the automation industry, where:

- there are hard real-time requirements with deterministic response times
- the system is usually made up of many nodes, each only having a small amount of cyclic process data
- hardware costs are even more important than in IT and office applications

The above requirements make using a standard Ethernet network at the field level practically impossible. If an individual Ethernet telegram is used for each node, the effective data rate sinks significantly for just a few bytes of cyclic process data: the shortest Ethernet telegram is 84 bytes long (including the Inter Frame Gap), of which 46 bytes can be used for process data. For example, if a drive sends 4 bytes of process data for the actual position and status information and receives 4 bytes of data for the target position and control information, the effective data rate for both telegrams sinks to $4/84 = 4.8\%$. Additionally, the drive usually has a reaction time that triggers the transmission of the actual values after receiving the target values. At the end, not much of the 100MBit/s transfer rate remains.

Protocol stacks, such as those used in the IT world for routing (IP) connection (TCP), require additional overhead for each node and create further delays through the stack runtimes.

EtherCAT overcomes the difficulties described in the previous section with its high performing mode of operation, in which a single frame is usually sufficient to send and receive control data to and from all nodes! The EtherCAT master sends a telegram that passes through each node. Each EtherCAT slave device reads the data addressed to it on the fly, and inserts its data in the frame as the frame is moving downstream. The frame is delayed only by hardware propagation delay times. The last node in a segment or branch detects an open port and sends the message back to the master using Ethernet technology's full duplex feature.

The telegram's maximum effective data rate increases to over 90 %, and due to the utilization of the full duplex feature, the theoretical effective data rate is even greater than 100 MBit/s.

The EtherCAT master is the only node within a segment allowed to actively send an EtherCAT frame; all other nodes merely forward frames downstream. This concept prevents unpredictable delays and guarantees real-time capabilities.

The master uses a standard Ethernet Media Access Controller (MAC) without an additional communication processor. This allows a master to be implemented on any hardware platform with an available Ethernet port, regardless of which real-time operating system or application software is used.

EtherCAT slave devices use an EtherCAT Slave Controller (ESC) to process frames on the fly and entirely in hardware, making network performance predictable and independent of the individual slave device implementation.

ETHERNET HEADER			ECAT	ETHERCAT TELEGRAM				ETHERNET	
DA	SA	Type	Frame HDR	Datagram 1	Datagram 2	...	Datagram n	Pad.	FCS
(6)	(6)	(2/4)	(2)	(10+n+2)	(10+m+2)		(10+k+2)	(0...32)	(4)

EtherType 0x88A4

EtherCAT in a standard Ethernet frame (according to IEEE 802.3)

EtherCAT embeds its payload in a standard Ethernet frame. The EtherCAT frame is identified with the Identifier (0x88A4) in the EtherType field. Since the EtherCAT protocol is optimized for short cyclic process data, the use of bulky protocol stacks, such as TCP/IP or UDP/IP, can be eliminated.

To ensure Ethernet IT communication between the nodes, TCP/IP connections can optionally be tunneled through a mailbox channel without impacting real-time data transfer.

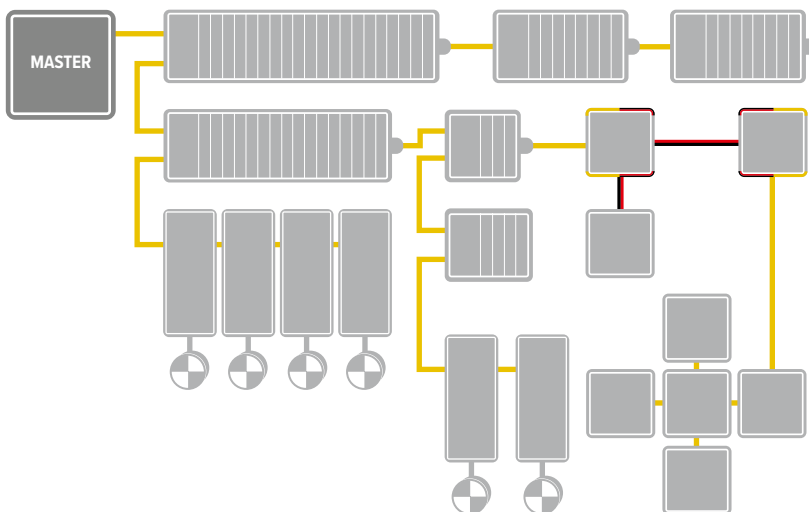
During startup, the master device configures and maps the process data on the slave devices. Different amounts of data can be exchanged with each slave, from one bit to a few bytes, or even up to kilobytes of data. The EtherCAT frame contains the frame header and one or more datagrams. The datagram header indicates what type of access the master device would like to execute:

- Read, write, or read-write
- Access to a specific slave device through direct addressing, or access to multiple slave devices through logical addressing (implicit addressing)

Logical addressing is used for the cyclical exchange of process data. Each datagram addresses a specific part of the process image in the EtherCAT segment, for which 4 GBytes of address space is available. During network startup, each slave device is assigned one or more addresses in this global address space. If multiple slave devices are assigned addresses in the same area, they can all be addressed with a single datagram. Since the datagrams completely contain all the data access related information, the master device can decide when and which data to access. For example, the master device can use short cycle times to refresh data on the drives, while using a longer cycle time to sample the I/O; a fixed process data structure is not necessary. This also relieves the master device in comparison to in conventional fieldbus systems, in which the data from each node had to be read individually, sorted with the help of the process controller, and copied into memory. With EtherCAT, the master device only needs to fill a single EtherCAT frame with new out put data, and send the frame via automatic Direct Memory Access (DMA) to the MAC controller.

When a frame with new input data is received via the MAC controller, the master device can copy the frame again via DMA into the computer's memory – all without the CPU having to actively copy any data.

Line, tree, star, or daisy-chain: EtherCAT supports almost all of topologies. EtherCAT makes a pure bus or line topology with hundreds of nodes possible without the limitations that normally arise from cascading switches or hubs.



Flexible topology: line, tree, star, or daisy-chain

When wiring the system, the combination of lines with branches or drop lines is particularly beneficial: the ports necessary to create branches are directly integrated in many I/O modules, so no additional switches or active infrastructure components are required.

The star topology, the Ethernet classic, can also naturally be utilized.

Modular machines or tool changers require network segments or individual nodes to be connected and disconnected during operation. EtherCAT Slave Controllers already include the basis for this Hot Connect feature. If a neighboring station is removed, then the port is automatically closed so the rest of the network can continue to operate without interference. Very short detection times faster than 15 microseconds guarantee a smooth changeover. EtherCAT offers a lot of flexibility regarding cable types, so each segment can use the exact type of cable that best meets its needs. Inexpensive industrial Ethernet cable can be used between two nodes up to 100m apart in 100BASE-TX mode. Furthermore, the protocol addition EtherCAT P enables the transmission of data and power via one cable.

This option enables the connection of devices such as sensors with a single line. Optical fibres (such as 100BASE-FX) can also be used, for example for a node distance greater than 100 m. The complete range of Ethernet wiring is also available for EtherCAT. Up to 65,535 devices can be connected to one EtherCAT segment, so network expansion is virtually unlimited. Because of the practically unlimited number of nodes, modular devices such as sliced I/O stations can be designed in such a way that each module is an EtherCAT node of its own. Hence, the local extension bus is eliminated; the high performance of EtherCAT reaches each module directly and without any delays, since there is no gateway in the bus coupler or head station any more.

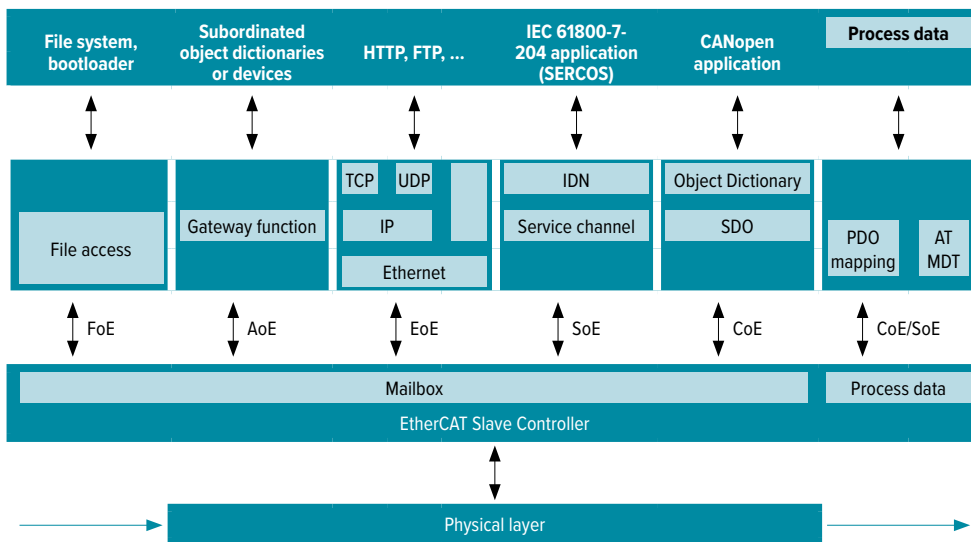
In order to configure and diagnose slave devices, it is possible to access the variables provided for the network with the help of acyclic communication. This is based on a reliable mailbox protocol with an auto-recover function for erroneous messages.

In order to support a wide variety of devices and application layers, the following EtherCAT communication profiles have been established:

- CAN application protocol over EtherCAT (CoE)
- Servo drive profile, according to IEC 61800-7-204 (SoE)
- Ethernet over EtherCAT (EoE)
- File access over EtherCAT (FoE)
- ADS over EtherCAT (AoE)

A slave device isn't required to support all communication profiles; instead, it may decide which profile is most suitable for its needs. The master device is notified which communication profiles have been implemented via the slave device description file. With the CoE protocol, EtherCAT provides the same communication mechanisms as in CANopen®-Standard EN 50325-4: Object Dictionary, Mapping of Process Data Objects (PDO) and Service Data Objects (SDO). Even the network management is similar.

This makes it possible to implement EtherCAT with minimal effort in devices that were previously outfitted with CANopen, and large portions of the CANopen Firmware are even reusable. Optionally, the legacy 8-byte PDO limitation can be waived, and it's also possible to use the enhanced bandwidth of EtherCAT to support the upload of the entire Object Dictionary. The device profiles, such as the drive profile CiA 402, can also be reused for EtherCAT.



Different communication profiles can coexist in the same system

EtherCAT®, EtherCAT P®, and Safety over EtherCAT® are registered trademarks and patented technologies, licensed by Beckhoff Automation GmbH, Germany. CANopen® is a registered trademark of the CAN in Automation e.V. Other text and pictures copyright Ethercat Technology Group.

Output signal levels

Please refer to the table below for output levels based on the specific electrical interface.

SIGNAL LEVELS							
Output circuit	NPN	NPN Open collector	PNP	PNP Open collector	Push-pull	Line driver HTL	RS422
Ordering code	N	C	R	U	P / PC	L	S / RS
Load current	20 mA	20 mA	20 mA	20 mA	20 mA	20 mA	/
Signal levels HIGH (min) LOW (max)	+V DC - 2,5 V 0,5 V	/ 0,5 V	+V DC - 2,5 V 0,5 V	/ 0,5 V	+V DC - 2,5 V 0,5 V	+V DC - 2,5 V 0,5 V	2,5 V 0,5 V
Note		Ext. power supply max +30 V DC		Ext. power supply max +30 V DC			
Reverse polarity power supply protection	see product datasheet						
Short circuit proof outputs	see product datasheet				short circuit to 0V , +V DC or between channels ¹		

¹ when power supply correctly applied

Encoder cable length

Depending on the application, the maximum cable length may be shorter, especially where there is a high level of electrical noise.

Please carefully select the power supply core diameter. The size should be sufficient to ensure that the encoder power supply does not fall below the minimum voltage specified in the product datasheet. Always use shielded cables. For further details or information, please contact our offices directly.

INCREMENTAL ENCODERS			
Power supply (+ V DC)	Electrical interface	Frequency (kHz)	Max cable length (m)
5V	RS-422	50	300
5V	RS-422	100	200
5/30V - 5/28V - 8/24V	Line driver HTL	50	80
5/30V - 5/28V - 8/24V	Line driver HTL	100	40
5/30V - 5/28V - 8/24V	Push-pull	50	60
5/30V - 5/28V - 8/24V	Push-pull	100	30
ABSOLUTE ENCODERS			
Power supply (+ V DC)	Electrical interface	Frequency (kHz)	Max cable length (m)
8/28V - 8/30V	Push pull Bit-parallel	25	100
5V - 8/28V - 8/30V	SSI	100	300
5V - 8/28V - 8/30V	SSI	200	200
5V - 8/28V - 8/30V	SSI	400	50
5V - 8/28V - 8/30V	SSI	1000	10
12/28V	Analogue (current)	-	200

System setup: ambient temperature (20°C / +68°F), load current 20 mA , Eltra AWG 24 shielded cable.

Absolute encoders auxiliary inputs / outputs

INPUTS

UP/DOWN (U/D): when connected to a logic HIGH, the encoder output will invert the counting direction. This is equivalent to rotating the encoder shaft in the opposite direction. The Up/Down setting must be configured before powering up.

LATCH: When connected to a logic state of HIGH, the output data is frozen. In this way, while the encoder shaft is turning, the output data remains stable.

RESET: when connected to a logic state of HIGH, it sets the output position to zero. The reset must be activated only when the encoder shaft is at a standstill.

OUTPUTS

STROBE: available only with the binary code. The output data is considered valid when all data has been updated and the logic state is set to HIGH.

INPUT	STATE HIGH	STATE LOW
U / D	Inverts the code	No effect
LATCH	Blocks the code	No effect
RESET	Output reset	No effect

PRECAUTIONS AGAINST ELECTROSTATIC DISCHARGES

Ensure that the metallic case of the connector is connected to the ground through a ring fixed to the connector screw, as shown in Figure 1.

Connect the cable shield to both, the ground and the connector case, as illustrated in Figure 2.

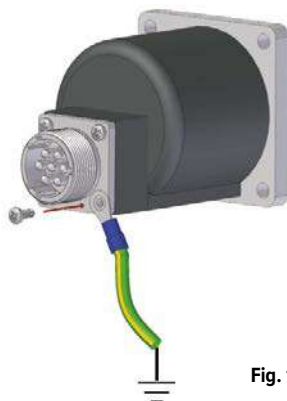


Fig. 1



Fig. 2

To enhance protection against electrostatic discharges, connect the metallic connector case to ground.

MTTFd information

Eltra-manufactured sensors are not safety devices unless explicitly stated in the product datasheet.

The MTTFd mentioned in the datasheet only pertains to the electronic and / or the electrical components of the sensor.

The MTTFd, expressed in years, is calculated using the 'Parts Count' method (as described in EN ISO 13849-1 Annex D.1). This involves adding up the failure rates of all individual components, assuming that a dangerous failure of any component (worst-case scenario) will result in a loss of sensor functionality. The individual component failure rates are based on the Siemens SN29500 (40°C ambient temperature and nominal load) standards or those provided by the component manufacturer.

Installation and precautions



The transducer must be used in accordance with its specifications. It is a precision measuring instrument and not a safety device.



Personnel responsible for mounting and commissioning the device must be qualified and carefully follow installation instructions. It is strongly recommended to avoid any mechanical or electrical modifications for safety reasons. Any modifications will void the warranty.



To ensure proper functioning, avoid subjecting the device to stress or impact.



Ensure that the mechanical coupling of the transducer is designed as specified in the technical datasheet and that the product is installed according to the instructions provided.



Additionally, check that the operating environment is free from corrosive agents (such as acids) or substances that are incompatible with the device and its IP rating.



Ensure the device is properly grounded. If necessary, provide an additional external connection.



Products with variant codes (a number or combination of numbers after ".") may have different mechanical, electrical, or connection requirements than standard products. Please refer to the additional documentation.



Installation and wiring should only be performed by trained personnel in a POWER-OFF condition.



To prevent short-circuits, insulate any unused wires at varying lengths. Do not connect unused pins on the connector.



Before switching on, verify the voltage range applicable for the device.



Place power and signal cables in a way that avoids capacitive or inductive interferences that may cause device malfunction. Also, keep the transducer cable far from power lines or any other cable with high noise levels.



The user who integrates the transducer into their appliance must comply with CE/UKCA regulations and is responsible for marking the end machine/device.



Failure to observe these usage and installation precautions may void the warranty.



Eltra disclaims any liability for damages or injuries resulting from non-compliance with these directives.



The products should be stored in their original packaging in a dust-free, dry and temperature-regulated location that is free from chemical influences or mechanical shock/vibrations.



For storage periods exceeding 12 months, rotate the encoder shaft every 12 months at low speed (e.g. by hand) to allow the bearing lubricant to distribute.

Please refer to www.eltra.it for sales conditions.



INCREMENTAL ENCODERS

Designed in order to control the position and the angular speed of moving mechanical axes

The main application fields for ELTRA brand encoders include wood-working machinery, textile machines, and CNC machinery.

The encoders offer a complete range of options with resolutions up to 24000 pulses per turn (ppr), a variety of flange choices, and various electrical interfaces. They are available in shaft, blind hollow shaft, and through hollow shaft options with diameters up to 60 mm (2.36").

OPTICAL SOLID SHAFT INCREMENTAL ENCODER		
ER 30 E / H		38
EH 38 A / B / D		40
ER 40 A / B / C / H / I / N / X		42
ER 58 B / C / H / T		45
ER 63 A / D / E		49
EX 80 A / D	explosion proof ATEX	53
EH 90 A - 115 A / R		56
ER 90 A - 115 A		59
OPTICAL HOLLOW SHAFT INCREMENTAL ENCODER		
EH 17 - 30 M	kit encoder	62
EH 17 - 30 MH	kit encoder	64
EF* 36 K		66
ER 38 F / G		68
EL 48 C / P		70
EL 49 C / P		72
EF* 49 C / P		74
EH 50 FA / FP		76
EH 53 A / B		78
EL - ER 53 A / B		80
ER 58 F - 63 F / G		83
EL 63 FB / GB / PB / PBF / PC / PCF		86
ER 72 A / B		89
EH 80 C / K / P / PG		92
EH - EL 88 P		95
EH 88 PE / PET		97
EL 120 P		99
MAGNETIC INCREMENTAL ENCODER		
EMI 30 E / H	solid shaft	102
EMI 40 A / B / C / H / I	solid shaft	104
EMI 58 B / C / H / T	solid shaft	107
EMIP 58 B / C	solid shaft programmable	110
EMI 63 A / D / E	solid shaft	113
EMI 90 A - 115 A	solid shaft	116
EMI 30 M	kit encoder	119
EMI 38 F / G	blind hollow shaft	121
EMI 55 M	kit encoder	123
EMI 58 F - 63 F / G	blind hollow shaft	125
EMIP 58 F - 63 G	blind hollow shaft programmable	128
EMI 72 A / B	blind hollow shaft	131
ETMR A / B	kit encoder	134

models marked with * are available with Hall phases
(commutation signals)

MAIN FEATURES

Miniaturised ø 30 mm encoder series for use in small devices.
Recommended when a minimum size is required while still offering excellent performance.

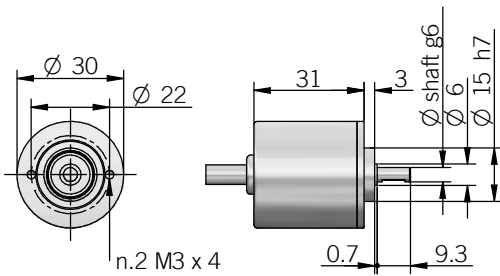
- 3 channel encoder (A / B / Z) up to 2500 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 220 kHz
- Cable output, connectors available at cable end
- Solid shaft diameter up to 6 mm
- Mounting by clamping or threaded flange



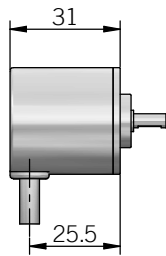
ORDERING CODE

ER	30E	500	S	5/28	C	4	X	3	P	A	.XXX
SERIES incremental encoder series ER											
MODEL clamping flange ø 15 mm 30E M18 threaded flange 30H											
RESOLUTION ppr from 100 to 2500 refer to the available pulses list											
ZERO PULSE without zero pulse S with zero pulse Z											
POWER SUPPLY (with L electrical interface) 5 V DC 5 5 ... 28 V DC 5/28											
ELECTRICAL INTERFACE NPN open collector C push-pull P line driver L power supply 5/28 V DC - output RS-422 RS											
SHAFT DIAMETER (mod. E) mm 4 mm 6											
ENCLOSURE RATING IP 54 X											
MAX ROTATION SPEED 3000 rpm 3											
OUTPUT TYPE cable (standard length 0,5 m) P preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)											
DIRECTION TYPE axial A radial R											
VARIANT custom version XXX											

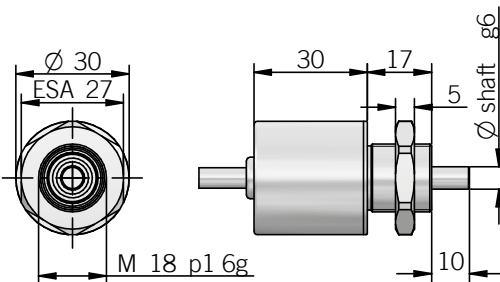
30E AXIAL CABLE OUTPUT



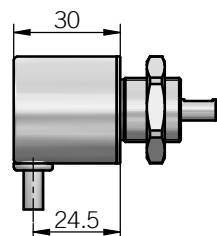
30E RADIAL CABLE OUTPUT



30H AXIAL CABLE OUTPUT



30H RADIAL CABLE OUTPUT



recommended mating shaft tolerance H7
dimensions in mm

CONNECTIONS

Function	Cable C / P	Cable L / RS
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
≡	shield	shield

ELECTRICAL SPECIFICATIONS

Resolution	from 100 to 2500 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	220 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	250 years
Mission time (T_m)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 4 / 6 mm
Enclosure rating	IP 54 (IEC 60529)
Max rotation speed	3000 rpm
Max shaft load⁴	5 N (1,12 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,05 x 10 ⁻⁶ kgm ² (1,2 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,005 Nm (0,71 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-25° ... +85°C (-13° ... +185°F)
Storage temperature⁶	-25° ... +85°C (-13° ... +185°F)
Weight	70 g (2,47 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

RESOLUTIONS

100 - 128 - 200 - 250 - 256 - 300 - 360 - 400 - 500 - 512 - 600 - 625 - 720 - 800 - 1000 - 1024 - 1200 - 1250 - 1440 - 1600 - 2000 - 2048 - 2500

please directly contact our offices for other pulses, preferred resolutions in bold

EH 38 A / B / D

SOLID SHAFT INCREMENTAL ENCODER

MAIN FEATURES

Miniaturised \varnothing 38 mm encoders designed to fit in small devices.
Recommended when minimum size is required, while still offering excellent performance.

- 3 channel encoder (A / B / Z) up to 1024 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 105 kHz
- Cable output, connectors available at cable end
- Solid shaft diameter up to 6 mm
- Mounting by clamping or centering square flange



ORDERING CODE

EH 38A 500 S 5/28 P 6 X 3 PR .XXX

SERIES
incremental encoder series EH

MODEL
clamping flange \varnothing 20 mm 38A
square flange \square 36,5 mm 38B
square flange \square 32 mm 38D

RESOLUTION
ppr from 50 to 1024
refer to the available pulses list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
5 V DC 5
5 ... 28 V DC 5/28

ELECTRICAL INTERFACE
NPN open collector C
push-pull P
line driver L
power supply 5/28 V DC - output RS-422 RS

SHAFT DIAMETER
mm 6

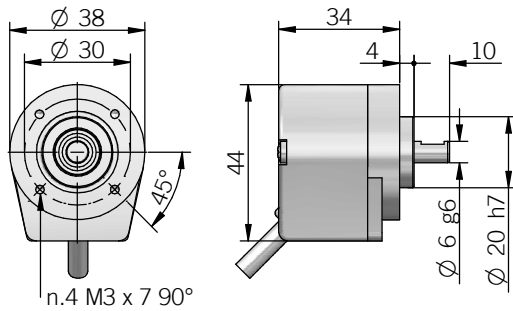
ENCLOSURE RATING
IP 54 X

MAX ROTATION SPEED
3000 rpm 3

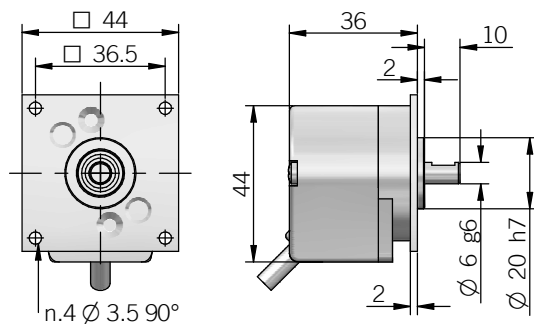
OUTPUT TYPE
radial cable (standard length 0,5 m) PR
preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)

VARIANT
custom version XXX

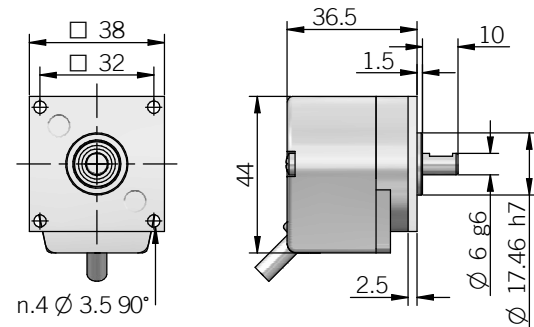
38A



38B



38D



recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 50 to 1024 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Current consumption without load	100 mA max
Max load current	C / P = 50 mA / channel L = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	105 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	90°e (gated A&B)
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	244 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 6 mm
Enclosure rating	IP 54 (IEC 60529)
Max rotation speed	3000 rpm
Max shaft load⁴	5 N (1,12 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,05 x 10 ⁻⁶ kgm ² (1,2 x 10 ⁻⁶ lbft ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum aluminium / stainless steel (mod. B)
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-20° ... +70°C (-4° ... +158°F)
Storage temperature⁶	-20° ... +70°C (-4° ... +158°F)
Weight	150 g (5,29 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

RESOLUTIONS

50* - 100 - 200 - 250 - 256 - 360 - 400 - 500 - 512 - 1000 - 1024

*available only without zero pulse

please directly contact our offices for other pulses, preferred resolutions in bold

CONNECTIONS

Function	Cable C / P	Cable L
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
⏏	shield	shield

ER 40 A / B / C / H / I / N / X

SOLID SHAFT INCREMENTAL ENCODER

MAIN FEATURES

Miniaturised ø 42 mm range of encoders for general factory automation applications.

- 3 channel encoder (A / B / Z) up to 14400 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 500 kHz
- Cable output, connectors available at cable end
- Solid shaft diameter 6 mm or 8 mm
- Mounting by clamping, threaded or synchronous flange



ORDERING CODE

ER 40A 100 S 5/28 P 6 X 6 P R .XXX

SERIES
(mod. A / B / C / H / I / N / X) incremental encoder series ER

MODEL
clamping flange ø 20 mm 40A
square flange □ 36,5 mm 40B
clamping flange ø 17,46 mm 40C
M18 threaded flange 40H
M20 threaded flange 40I
synchronous flange ø 21 mm 40N
synchronous flange ø 30 mm 40X

RESOLUTION
(mod. A / B) ppr from 100 to 14400
(mod. C / H / I / N / X) ppr from 100 to 2500
refer to the available pulses list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
(with L electrical interface) 5 V DC 5
5 ... 28 V DC 5/28

ELECTRICAL INTERFACE
NPN open collector C
push-pull P
line driver L
power supply 5/28 V DC - output RS-422 RS

SHAFT DIAMETER
(mod. A / B / C / H / I / N) mm 6
(mod. X) mm 8

ENCLOSURE RATING
IP 54 X
(mod. A / B / H) IP 66 shaft side / IP 67 cover side S

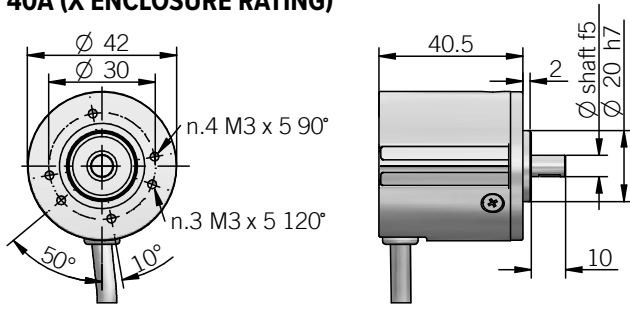
MAX ROTATION SPEED
(IP 66) 3000 rpm 3
(IP 54) 6000 rpm 6

OUTPUT TYPE
cable (standard length 0,5 m) P
preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)

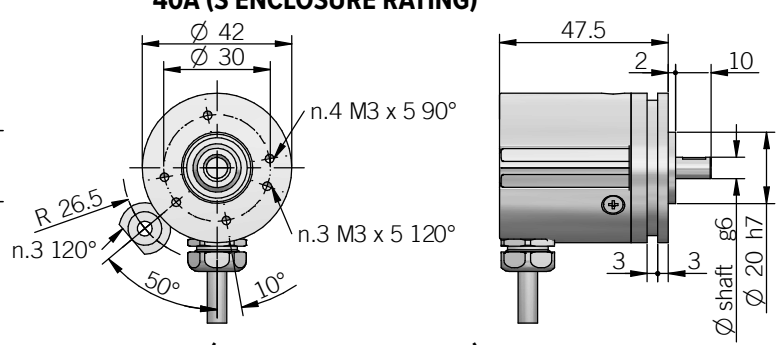
DIRECTION TYPE
(mod. A / B / C / H / I / N) axial A
radial R

VARIANT
custom version XXX

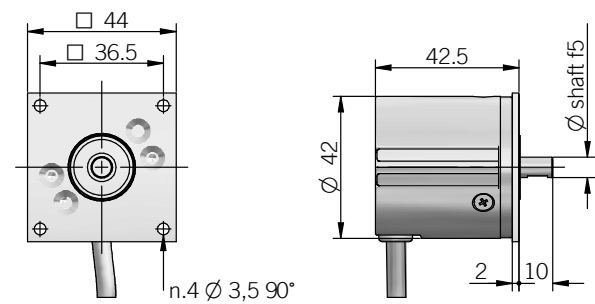
40A (X ENCLOSURE RATING)



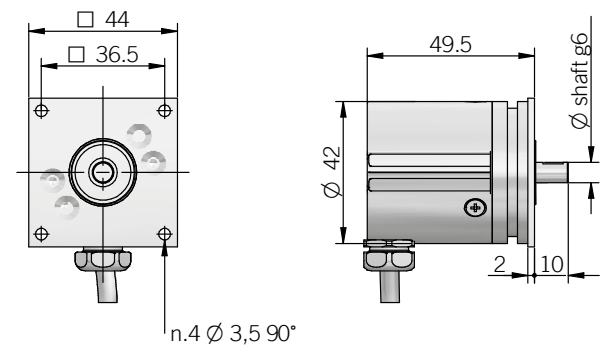
40A (S ENCLOSURE RATING)



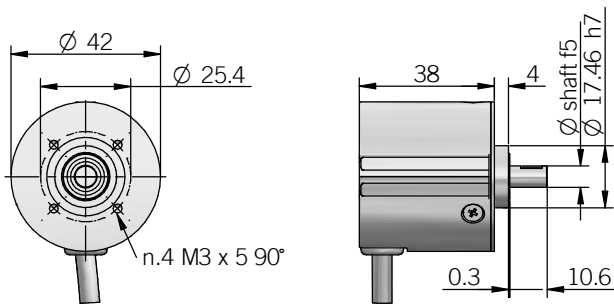
40B (X ENCLOSURE RATING)



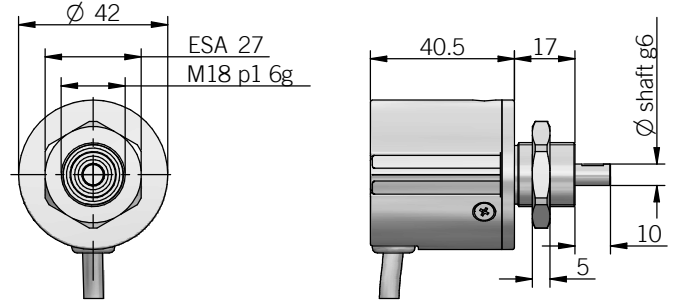
40B (S ENCLOSURE RATING)



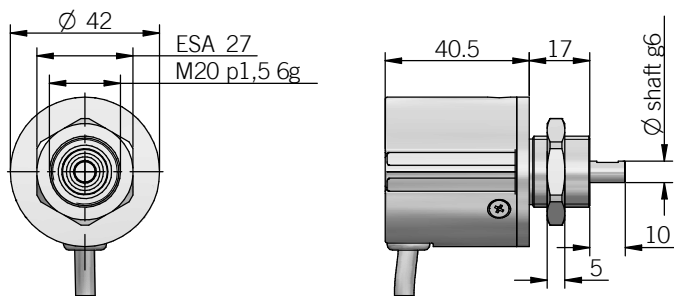
40C



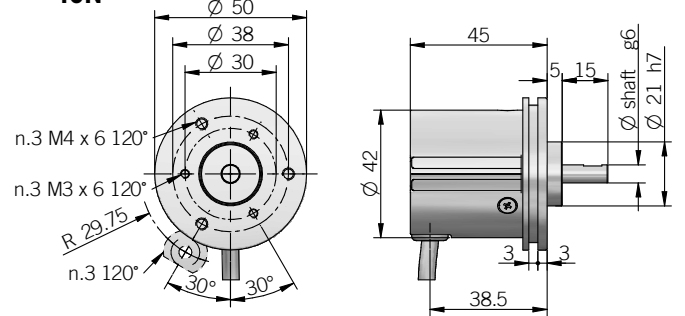
40H



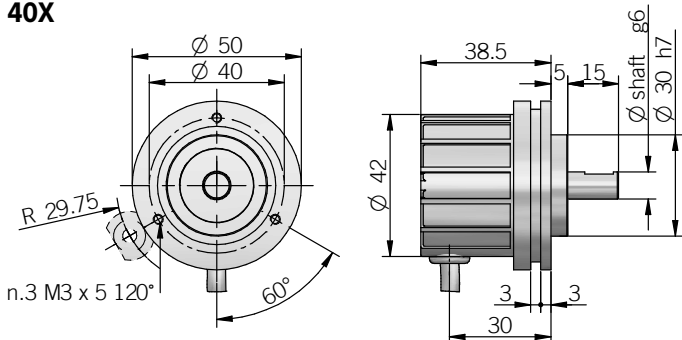
40I



40N

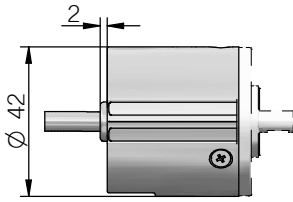


40X



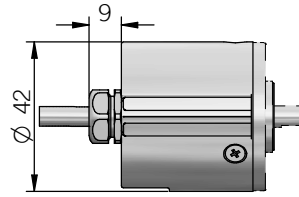
fixing clamps not included, please refer to the Accessories
recommended mating shaft tolerance H7
dimensions in mm

DIMENSIONS WITH AXIAL OUTPUT WITH X ENCLOSURE RATING



dimensions in mm

DIMENSIONS WITH AXIAL OUTPUT WITH S ENCLOSURE RATING



ELECTRICAL SPECIFICATIONS

Resolution	from 100 to 14400 ppr (mod. A / B) from 100 to 2500 ppr (mod. C / H / I / N / X)
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	250 kHz up to 3600 ppr 500 kHz from 4000 ppr
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	263 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 6 / 8 mm
Enclosure rating IEC 60529	X = IP 54 S = IP 66 shaft side / IP 67 cover side
Max rotation speed	6000 rpm with X enclosure rating 3000 rpm with S enclosure rating
Max shaft load⁴	30 N (6,74 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,1 x 10 ⁻⁶ kgm ² (2,4 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin) with X enclosure rating < 0,05 Nm (7,10 Ozin) with S enclosure rating
Bearing stage material	aluminum aluminium / stainless steel (mod. B)
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-25° ... +85°C (-13° ... +185°F)
Storage temperature⁶	-25° ... +70°C (-13° ... +158°F)
Weight	100 g (3,52 oz)

¹ as measured at the transducer without cable influences² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section³ this product is not a safety component, for further details refer to TECHNICAL BASICS section⁴ maximum load for static usage⁵ measured on the transducer flange⁶ condensation not allowed

CONNECTIONS

Function	Cable C / P	Cable L / RS
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
⊥	shield	shield

RESOLUTIONS

100 - 120 - 128 - 150 - 200 - 240 - 250 - 256 - 300 - 360 - 400 - 480 - 500 - 512 - 600 - 625 - 720 - 800 - 900 - 1000 - 1024 - 1200 - 1250 - 1440 - 1600 - 1800 - 2000 - 2048 - 2500 - 3000 - 3600 - 4000 - 4096 - 5000 - 6000 - 7200 - 8000 - 8192 - 10000 - 12000 - 14400

please directly contact our offices for other pulses, preferred resolutions in bold

ER 58 B / C / H / T

SOLID SHAFT INCREMENTAL ENCODER

MAIN FEATURES

Standard ø 58 mm encoder series for industrial applications with high mechanical resistance requirements. These encoders are designed to withstand high radial and axial shaft loads and can be mounted by flanges or fixing clamps.

- 3 channel encoder (A / B / Z) up to 24000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 500 kHz
Cable or connector output
- Metal cover available for heavy duty applications
- Solid shaft diameter up to 12 mm
- Mounting by synchronous, clamping or coupling flange

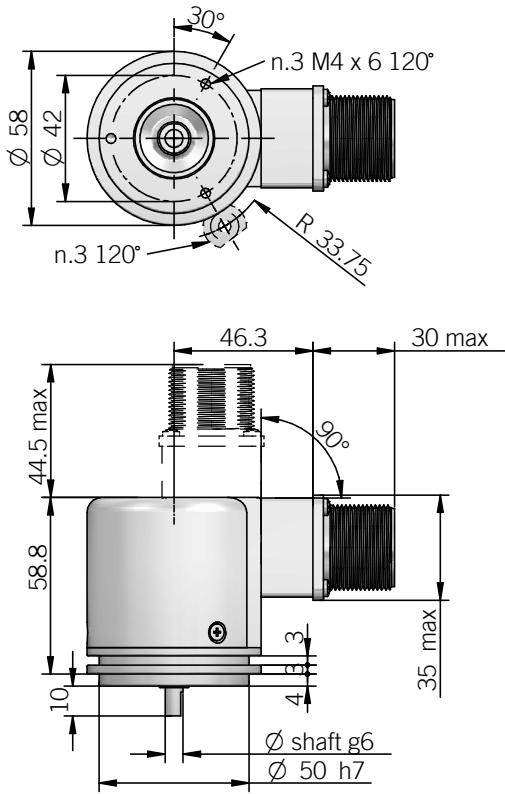


ORDERING CODE

ER	58C	M*	500	S	5/28	P	8	X	6	M	R	.162	+XXX
SERIES													
incremental encoder series ER													
MODEL													
synchronous flange ø 50 mm 58B													
clamping flange ø 36 mm 58C													
clamping flange ø 50 mm 58H													
coupling flange ø 40 mm 58T													
METAL COVER													
* add for metal cover M													
RESOLUTION													
ppr from 100 to 24000													
refer to the available pulses list													
ZERO PULSE													
without zero pulse S													
with zero pulse Z													
POWER SUPPLY													
(with L electrical interface) 5 V DC 5													
5 ... 28 V DC 5/28													
ELECTRICAL INTERFACE													
NPN open collector C													
push-pull P													
line driver L													
power supply 5/28 V DC - output RS-422 RS													
SHAFT DIAMETER													
(mod. B) mm 6													
(mod. C) mm 8													
(mod. B / C / H) (3/8") mm 9,52													
mm 10													
(mod. T) mm 12													
ENCLOSURE RATING													
IP 54 shaft side / IP67 cover side X													
(mod. B / C / T) IP 66 shaft side / IP67 cover side S													
MAX ROTATION SPEED													
(S enclosure rating) 3000 rpm 3													
(X enclosure rating) 6000 rpm 6													
OUTPUT TYPE													
cable (standard length 1,5 m) P													
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)													
MIL plug connector M													
JIS-C-5432 IP40 plug connector J													
M12 plug connector M12													
M23 plug connector H													
M16 IP40 plug connector C													
DIRECTION TYPE													
axial A													
radial R													
SOCKET													
socket not included .162													
to be reported only with connector output (eg. MR.162), for socket see Accessories													

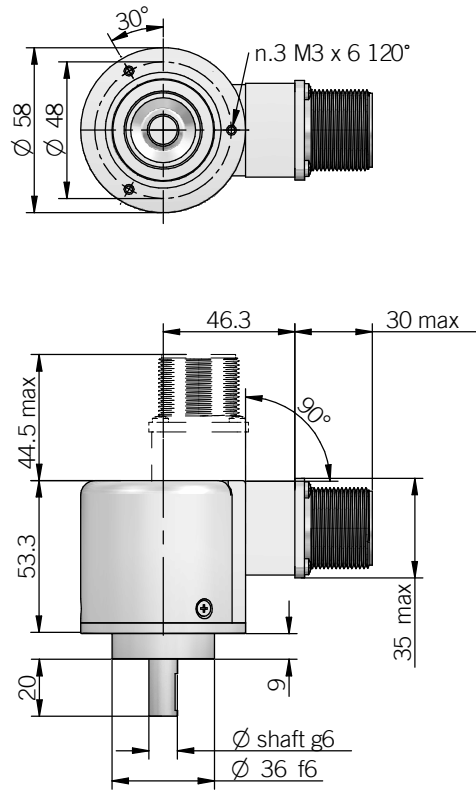
VARIANT
custom version **XXX**

58B

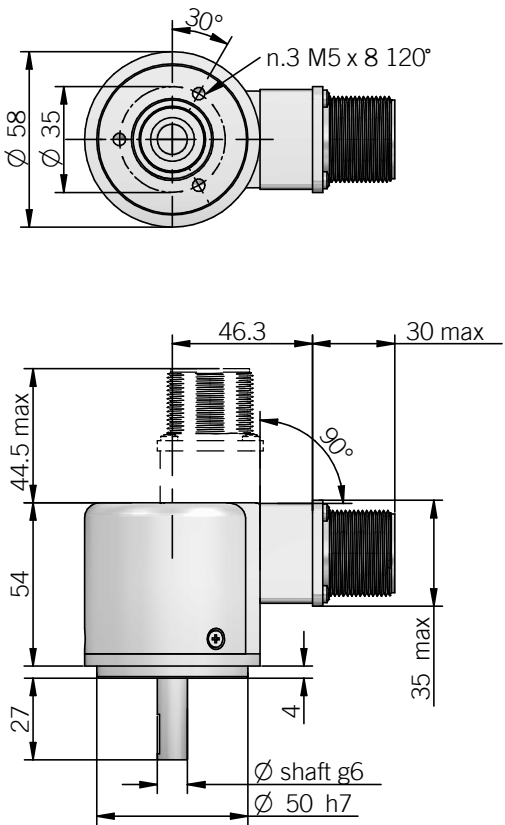


fixing clamps not included, please refer to Accessories

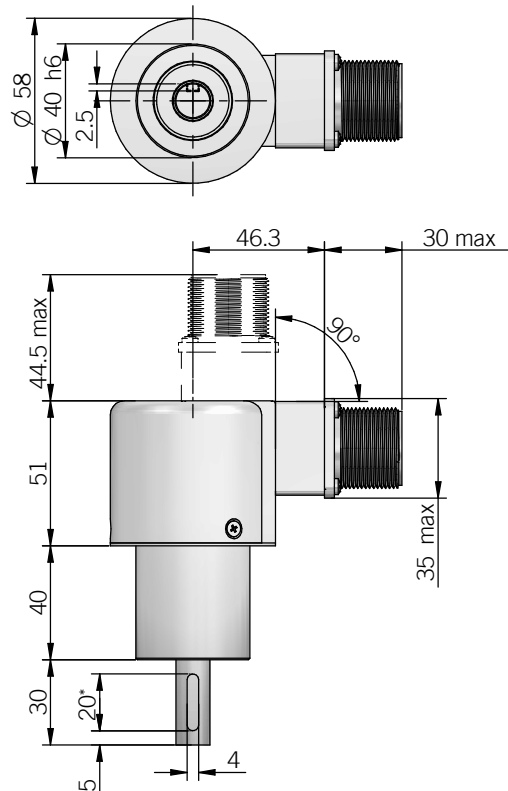
58C



58H

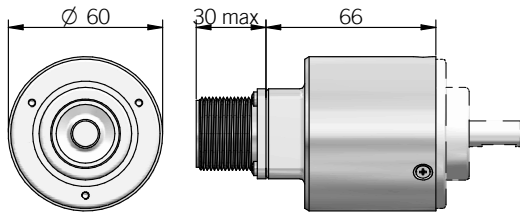


58T

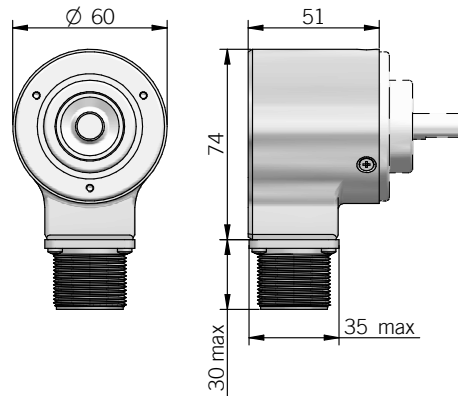


* slot only with 12mm shaft diameter

DIMENSION WITH METAL COVER AND AXIAL OUTPUT



DIMENSION WITH METAL COVER AND RADIAL OUTPUT



recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS	
Resolution	from 100 to 24000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	250 kHz up to 6000 ppr / 500 kHz from 7200 ppr
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	263 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS	
Shaft diameter	ø 6 / 8 / 9,52 (3/8") / 10 / 12 mm
Enclosure rating IEC 60529	X = IP 54 shaft side / IP 67 cover side S = IP 66 shaft side / IP 67 cover side
Max rotation speed	6000 rpm with X enclosure rating 3000 rpm / 70° C ER series with S enclosure rating 2000 rpm / 85° C ER series with S enclosure rating
Max shaft load⁴	10 N (2,25 lbs) axial with ø 6 mm shaft 20 N (4,45 lbs) radial with ø 6 mm shaft 200 N (45 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 ⁻⁶ kgm ² (36 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,83 Ozin) with X enclosure rating < 0,06 Nm (8,50 Ozin) with S enclosure rating
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced / painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-25° ... +85°C (-13° ... +185°F)
Storage temperature⁶	-25° ... +70°C (-13° ... +158°F)
Weight	350 g (12,35 oz) 450 g (15,87 oz) with metal cover

RESOLUTIONS
100 - 120 - 128 - 150 - 200 - 240 - 250 - 256 - 300 - 360 - 400 - 480 - 500 - 512 - 600 - 625 - 720 - 800 - 900 - 1000 - 1024 - 1200 - 1250 - 1440 - 1600 - 1800 - 2000 - 2048 - 2500 - 3000 - 3600 - 4000 - 4096 - 5000 - 6000 - 7200 - 8000 - 8192 - 9000 - 10000 - 10240 - 12000 - 14400 - 16000 - 16384 - 18000 - 20000 - 20480 - 24000

please directly contact our offices for other pulses, preferred resolutions in bold

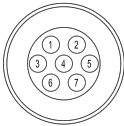
¹ as measured at the transducer without cable influences
² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section
⁴ maximum load for static usage
⁵ measured on the transducer flange
⁶ condensation not allowed

CONNECTIONS

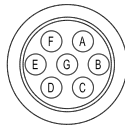
Function	Cable C / P	Cable L / RS	7 pin J C / P	7 pin J L / RS no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L / RS with Zero	10 pin M L / RS with Zero	5 pin M12 C / P	8 pin M12 L / RS	12 pin H	5 pin C C / P	8 pin C L / RS
+V DC	red	red	6	4	F	D	4 - 5	D - E	2	7	12	5	7
0 V	black	black	1	6	A	F	6	F	4	1	10	1	8
A+	green	green	3	1	C	A	1	A	3	6	5	2	1
A-	/	brown or grey	/	3	/	C	7	G	/	5	6	/	2
B+	yellow	yellow	5	2	E	B	2	B	1	4	8	4	3
B-	/	orange	/	5	/	E	8	H	/	3	1	/	4
Z+	blue	blue	4	/	D	/	3	C	5	2	3	3	5
Z-	/	white	/	/	/	/	9	I	/	8	4	/	6
⏏	shield	shield	7	7	G	G	10	J	housing ¹	housing ¹	9	housing ¹	housing ¹

¹only with metal cover

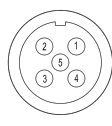
J connector (7 pin)
JIS-C-5432 IP40 Size 16
front view



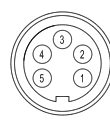
M connector (7 pin)
Amphenol MS3102-E-16-S
front view



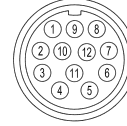
M12 connector (5 pin)
M12 A coded
front view



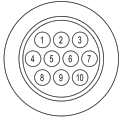
C connector (5 pin)
Amphenol C091 M16 IP40
front view



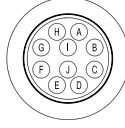
H connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



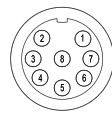
J connector (10 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (10 pin)
Amphenol MS3102-E-18-1
front view



M12 connector (8 pin)
M12 A coded
front view



C connector (8 pin)
Amphenol C091 IP40 IEC 60130-9
front view



MAIN FEATURES

Standard ø 63 mm encoder series for industrial applications with high mechanical resistance requirements. These encoders are designed to withstand high radial and axial shaft loads and can be mounted by flanges or fixing clamps.

- 3 channel encoder (A / B / Z) up to 24000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 500 kHz
- Cable or connector output
- Metal cover available for heavy duty applications
- Solid shaft diameter up to 10 mm
- Mounting by synchronous or centering 2,5" square flange



ORDERING CODE

ER 63A M* 500 S 5/28 P 8 X 6 M R .162 +XXX

SERIES
incremental encoder series **ER**

MODEL
synchronous flange ø 31,75 mm **63A**
centering square flange ø 31,75 mm **63D**
centering square flange ø 50 mm **63E**

METAL COVER
* add for metal cover **M**

RESOLUTION
ppr from 1 to **24000**
refer to the available pulses list

ZERO PULSE
without zero pulse **S**
with zero pulse **Z**

POWER SUPPLY
(with L electrical interface) 5 V DC **5**
5 ... 28 V DC **5/28**

ELECTRICAL INTERFACE
NPN open collector **C**
push-pull **P**
line driver **L**
power supply 5/28 V DC - output RS-422 **RS**

SHAFT DIAMETER
mm **8**
(3/8") mm **9,52**
mm **10**

ENCLOSURE RATING
IP 54 **X**
IP 66 **S**

MAX ROTATION SPEED
(IP 66) 3000 rpm **3**
(IP 54) 6000 rpm **6**

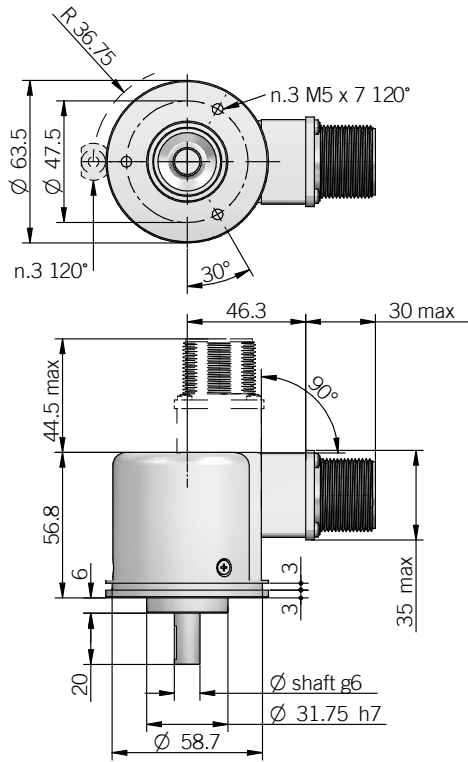
OUTPUT TYPE
cable (standard length 1,5 m) **P**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)
MIL plug connector **M**
JIS-C-5432 IP40 plug connector **J**
M12 plug connector **M12**
M23 plug connector **H**
M16 IP40 plug connector **C**

DIRECTION TYPE
axial **A**
radial **R**

SOCKET
socket not included **.162**
to be reported only with connector output (eg. MR.162), for socket see Accessories

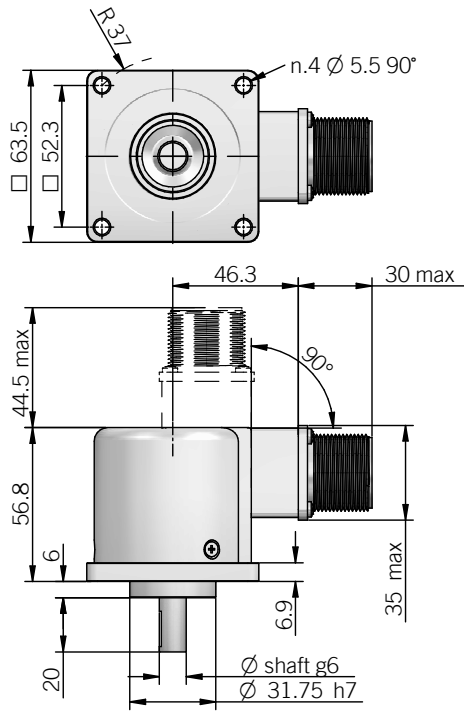
VARIANT
custom version **XXX**

63A

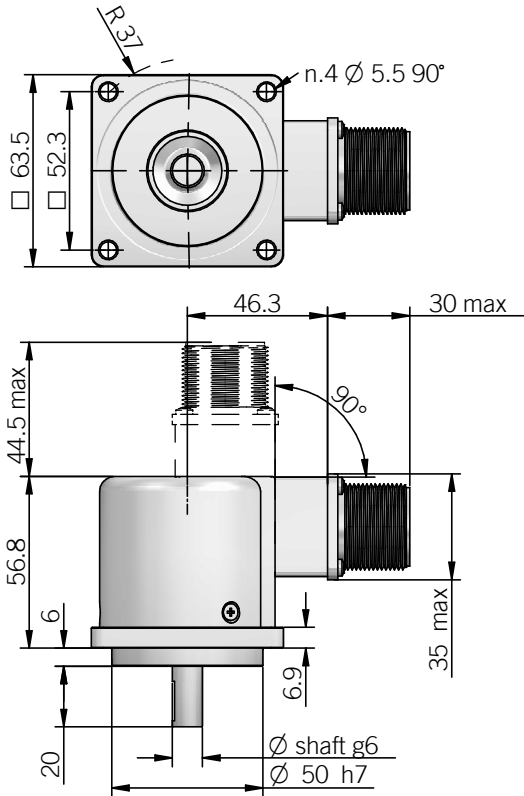


fixing clamps not included, please refer to the Accessories

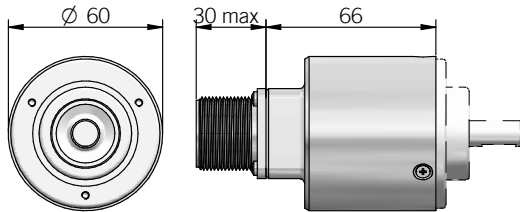
63D



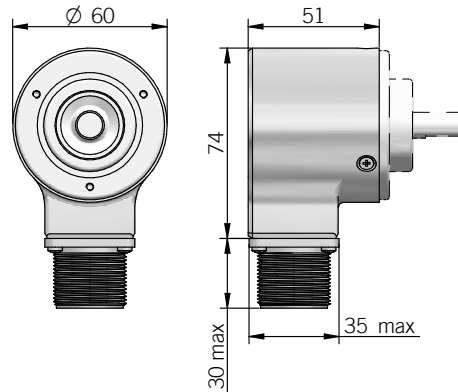
63E



DIMENSION WITH METAL COVER AND AXIAL OUTPUT



DIMENSION WITH METAL COVER AND RADIAL OUTPUT



recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS	
Resolution	from 100 to 24000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	250 kHz up to 6000 ppr / 500 kHz from 7200 ppr
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	263 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS	
Shaft diameter	ø 8 / 9,52 (3/8") / 10 mm
Enclosure rating IEC 60529	X = IP 54 S = IP 66
Max rotation speed	6000 rpm with X enclosure rating ER 3000 rpm / 70° C with S enclosure rating ER 2000 rpm / 85° C with S enclosure rating
Max shaft load⁴	200 N (45 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 ⁻⁶ kgm ² (36 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,83 Ozin) with X enclosure rating < 0,06 Nm (8,50 Ozin) with S enclosure rating
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced / painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-25° ... +85°C (-13° ... +185°F)
Storage temperature⁶	-25° ... +70°C (-13° ... +158°F)
Weight	350 g (12,35 oz) 450 g (15,87 oz) with metal cover

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

RESOLUTIONS
100 - 120 - 128 - 150 - 200 - 240 - 250 - 256 - 300 - 360 - 400 - 480 - 500 - 512 - 600 - 625 - 720 - 800 - 900 - 1000 - 1024 - 1200 - 1250 - 1440 - 1600 - 1800 - 2000 - 2048 - 2500 - 3000 - 3600 - 4000 - 4096 - 5000 - 6000 - 7200 - 8000 - 8192 - 9000 - 10000 - 10240 - 12000 - 14400 - 16000 - 16384 - 18000 - 20000 - 20480 - 24000

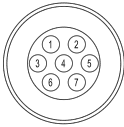
please directly contact our offices for other pulses, preferred resolutions in bold

CONNECTIONS

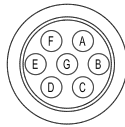
Function	Cable C / P	Cable L / RS	7 pin J C / P	7 pin J L / RS no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L / RS with Zero	10 pin M L / RS with Zero	5 pin M12 C / P	8 pin M12 L / RS	12 pin H	5 pin C C / P	8 pin C L / RS
+V DC	red	red	6	4	F	D	4 - 5	D - E	2	7	12	5	7
0 V	black	black	1	6	A	F	6	F	4	1	10	1	8
A+	green	green	3	1	C	A	1	A	3	6	5	2	1
A-	/	brown or grey	/	3	/	C	7	G	/	5	6	/	2
B+	yellow	yellow	5	2	E	B	2	B	1	4	8	4	3
B-	/	orange	/	5	/	E	8	H	/	3	1	/	4
Z+	blue	blue	4	/	D	/	3	C	5	2	3	3	5
Z-	/	white	/	/	/	/	9	I	/	8	4	/	6
⊥	shield	shield	7	7	G	G	10	J	housing ¹	housing ¹	9	housing ¹	housing ¹

¹only with metal cover

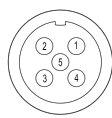
J connector (7 pin)
JIS-C-5432 IP40 Size 16
front view



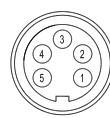
M connector (7 pin)
Amphenol MS3102-E-16-S
front view



M12 connector (5 pin)
M12 A coded
front view



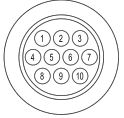
C connector (5 pin)
Amphenol C091 M16 IP40
front view



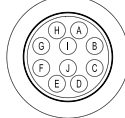
H connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



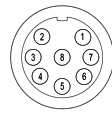
J connector (10 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (10 pin)
Amphenol MS3102-E-18-1
front view



M12 connector (8 pin)
M12 A coded
front view



C connector (8 pin)
Amphenol C091 IP40 IEC 60130-9
front view



MAIN FEATURES

Explosion proof encoders designed to operate in hazardous and explosive environments.

- 3 channel encoder (A / B / Z) up to 10000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 500 kHz
- 10 mm solid shaft diameter
- Mounting by synchronous or centering square flange

EX CLASSIFICATION

It has been assured with EC-TYPE Examination Certificate CESI 04 ATEX 082 that the EX 80 is compliant with essential health and safety requirements according to

- EN IEC 60079-0:2018
- EN 60079-1:2014
- EN 60079-31:2014

The UE declaration is available on www.eltra.it



ORDERING CODE

EX 80A 500 S 5/28 P 10 X 3 PR .XXX

SERIES
explosion proof encoder series EX

MODEL
synchronous flange ø 40 mm 80A
centering square flange ø 40 mm 80D

RESOLUTION
ppr from 100 to 10000
refer to the available pulses list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
(with L electrical interface) 5 V DC 5
5 ... 28 V DC 5/28

ELECTRICAL INTERFACE
NPN open collector C
push-pull P
line driver L
power supply 5/28 V DC - output RS-422 RS

SHAFT DIAMETER
mm 10

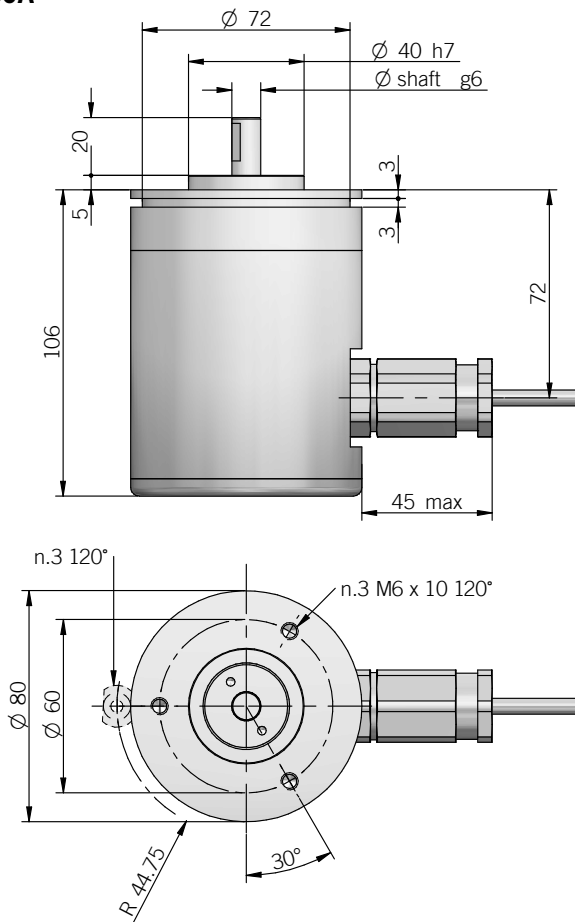
ENCLOSURE RATING
IP 65 X

MAX ROTATION SPEED
3000 rpm 3

OUTPUT TYPE
radial cable (standard length 1,5 m) PR
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)

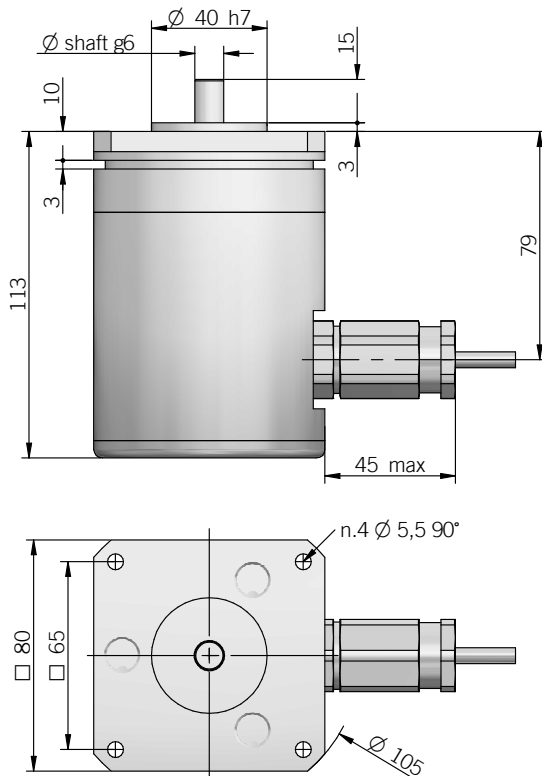
VARIANT
custom version XXX

80A



fixing clamps not included, please refer to the Accessories

80D



recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 100 to 10000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Current consumption without load	80 mA max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	250 kHz up to 6000 ppr / 500 kHz from 7200 ppr
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	263 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed or flexible installation conductors section min 0,14 mm ² / AWG 26 bending radius min 35 mm (fixed) / min 60 mm (flexible)
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Shaft diameter	Ø 10 mm
Enclosure rating	IP 65 (IEC 60529)
Max rotation speed	3000 rpm
Max shaft load⁴	200 N (45 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 ⁻⁶ kgm ² (36 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,06 Nm (8,50 Ozin)
Bearing stage material	anodized aluminum
Shaft material	stainless steel
Housing material	anodized aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-20° ... +50°C (-4° ... +122°F)
Storage temperature⁶	-20° ... +70°C (-4° ... +158°F)
Weight	1200 g (42,33 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

RESOLUTIONS

100 - 200 - 360 - 400 - 500 - 1000 - 1024 - 1440 - 2000 - 2048 - 2500 - 3000 - 3600 - 4000 - 4096 - 5000 - 6000 - 7200 - 8000 - 8192 - 9000 - 10000

please directly contact our offices for other pulses, preferred resolutions in bold

EPL MARKING



II 2GD
Ex db IIC T6 Gb
Ex tb IIIC T85°C Db
IP 65

II 2GD

II: group II: different than mines

2: category 2: high level of protection

GD: areas containing gas (G) and dust (D)

Ex db IIC T6 Gb

Ex db: flameproof enclosure for explosive atmospheres with gases, vapours and mists

IIC: group of gas IIC

T6: max surface temperature +85°C of the device for atmospheres with gas

Gb: product with a high level of protection

Ex tb IIIC T85°C Db

Ex tb: flameproof enclosure safety type

IIIC: group of dust combustibles IIIC

T85°C: max surface temperature +85°C of the device in the presence of dust

Db: product with a high level of protection

CONNECTIONS

Function	Cable C / P	Cable L / RS
+V DC	brown	brown
0 V	gray	gray
A+	green	green
A-	/	red
B+	yellow	yellow
B-	/	pink
Z+	white	blue
Z-	/	white
⊥	shield	shield

EH 90 A - EH 115 A / R

SOLID SHAFT INCREMENTAL ENCODER

MAIN FEATURES

Encoder series designed for use in harsh environments with high mechanical resistance requirements. The model 90A can be mounted by flanges or fixing clamps, while the model 115A has a tachometer generator REO-444 type compatible flange with optional centrifugal relay.

- 3 channel encoder (A / B / Z) up to 2048 ppr
- Redundancy encoder with double output and / or double resolutions
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 105 kHz
- Solid shaft diameter up to 11 mm
- Mounting by synchronous or REO-444 flange
- Model 115R available with centrifugal relay

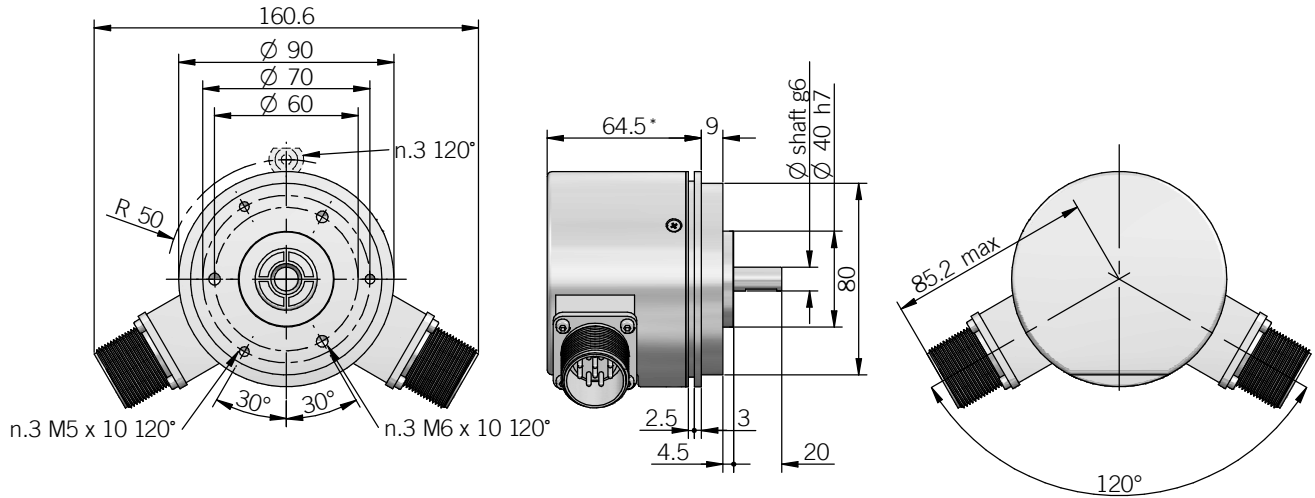


ORDERING CODE	EH	90A	500	S	5/30	P	1000	Z	5/30	P	8	X	6	M	R	.162	+XXX	+2000
SERIES																		
incremental encoder series EH																		
MODEL																		
synchronous flange ø 40 mm 90A																		
flange REO-444 115A																		
flange REO-444 with centrifugal relay 115R																		
RESOLUTION																		
ppr from 200 to 2048																		
refer to the available pulses list																		
ZERO PULSE																		
without zero pulse S																		
with zero pulse Z																		
POWER SUPPLY																		
(with L electrical interface) 5 V DC 5																		
5 ... 30 V DC 5/30																		
ELECTRICAL INTERFACE																		
NPN open collector C																		
push-pull P																		
line driver L																		
power supply 5/30 V DC - output RS-422 RS																		
RESOLUTION																		
ZERO PULSE																		
POWER SUPPLY																		
ELECTRICAL INTERFACE																		
SHAFT DIAMETER																		
(mod. 90A) mm 8																		
(mod. 90A) (3/8") mm 9,52																		
mm 10																		
(mod. 115A - 115R) mm 11																		
ENCLOSURE RATING																		
IP 54 X																		
(mod. 90) IP 66 S																		
MAX ROTATION SPEED																		
(IP 66) 3000 rpm 3																		
(IP 54) 6000 rpm 6																		
OUTPUT TYPE																		
cable (standard length 1,5 m) P																		
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)																		
MIL plug connector M																		
JIS-C-5432 IP40 plug connector J																		
DIRECTION TYPE																		
axial A																		
radial R																		
SOCKET																		
socket not included .162																		
to be reported only with connector output (eg. MR.162), for socket see Accessories																		
VARIANT																		
custom version XXX																		
RELAY INTERVENTION SPEED																		
(mod. 115R) from 600 to 4300																		
for other speeds please contact our offices directly																		

To be indicated in the models 90A - 115A for double electronics and double resolution.
 With different double resolution please add 250 as variant, see examples:

- Double different resolution and double electronics: **EH90A1024Z5L-2048Z5/30L10X250**
- Double different resolution and same electronics: **EH90A1024-2048Z5L10X250**
- Same resolution and double electronics: **EH90A1024Z5L-Z5/30L10X ...**

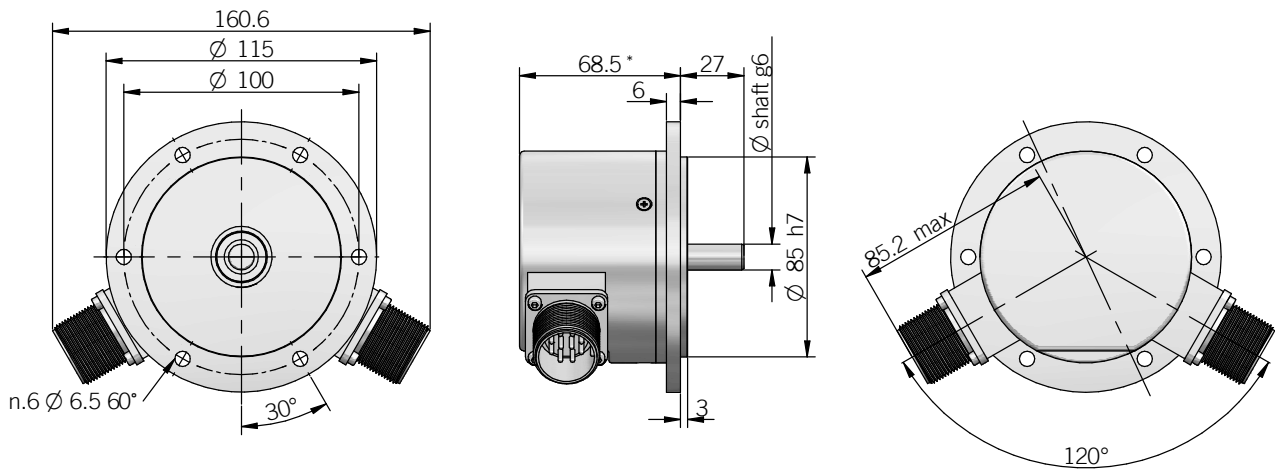
90A WITH DOUBLE OUTPUT / RESOLUTION



fixing clamps not included, please refer to the Accessories

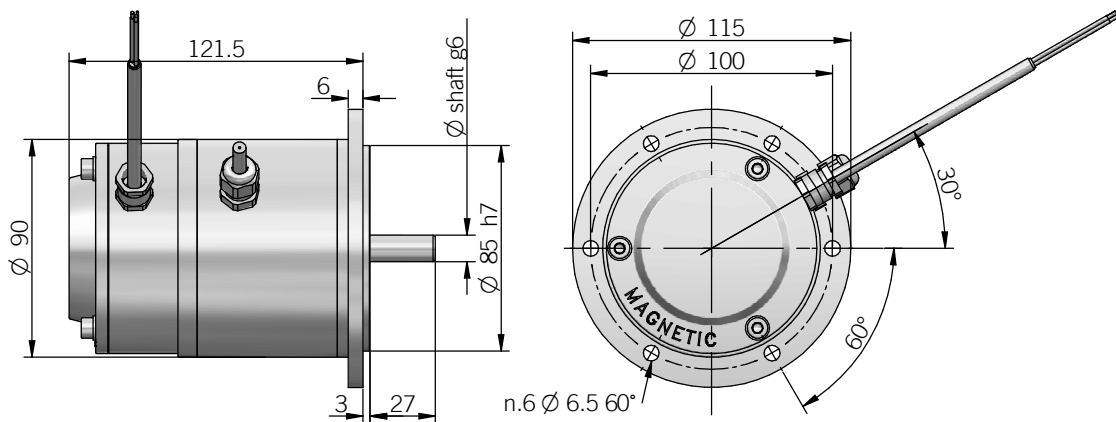
* with double resolution + 3.5mm

115A WITH DOUBLE OUTPUT / RESOLUTION



* with double resolution + 3.5mm

115R



recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS

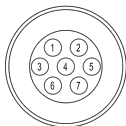
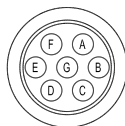
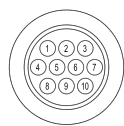
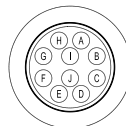
Resolution	from 200 to 2048 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/30 = 4,5 ... 30 V DC (reverse polarity protection)
Current consumption without load	100 mA max
Max load current	C / P = 50 mA / channel L = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	105 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	90°e (gated A&B)
Mean time to dangerous failure (MTTF)_d³ according to EN ISO 13849-1	244 years / encoder
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

RELAY CHARACTERISTICS

Intervention speed	from 600 to 4300 rpm
Accuracy	± 3 %
Contact capacity	2 A / 250 V AC 3,3 A / 125 V AC
Type of contact	Normally Closed (NC)

CONNECTIONS

Function	Cable C / P	Cable L	7 pin J C / P	7 pin J L no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L with Zero	10 pin M L with Zero
+V DC	red	red	6	4	F	D	4 - 5	D - E
0 V	black	black	1	6	A	F	6	F
A+	green	green	3	1	C	A	1	A
A-	/	brown or grey	/	3	/	C	7	G
B+	yellow	yellow	5	2	E	B	2	B
B-	/	orange	/	5	/	E	8	H
Z+	blue	blue	4	/	D	/	3	C
Z-	/	white	/	/	/	/	9	I
⊥	shield	shield	7	7	G	G	10	J

J connector (7 pin)
JIS-C-5432 IP40 Size 16
front viewM connector (7 pin)
Amphenol MS3102-E-16-S
front viewJ connector (10 pin)
JIS-C-5432 IP40 Size 16
front viewM connector (10 pin)
Amphenol MS3102-E-18-1
front view

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 8 / 9,52 (3/8") / 10 / 11 mm
Enclosure rating IEC 60529	X = IP 54 S = IP 66
Max rotation speed	6000 rpm with X enclosure rating 3000 rpm with S enclosure rating
Max shaft load⁴	200 N (45 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	3,5 x 10 ⁻⁶ kgm ² (83 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,8 Ozin) with X enclosure rating < 0,06 Nm (8,5 Ozin) with S enclosure rating
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-10° ... +60°C (+14° ... +140°F)
Storage temperature⁶	-25° ... +70°C (-13° ... +158°F)
Weight	750 g (26,46 oz) 1050 g (37,04 oz) with relay

¹ as measured at the transducer without cable influences² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section³ this product is not a safety component, for further details refer to TECHNICAL BASICS section⁴ maximum load for static usage⁵ measured on the transducer flange⁶ condensation not allowed

RESOLUTIONS

200 - 250 - 500 - 512 - **1000** - **1024** - **2000** - **2048**

please directly contact our offices for other pulses, preferred resolutions in bold

ER 90 A / 115 A

SOLID SHAFT INCREMENTAL ENCODER

MAIN FEATURES

Encoder series designed for use in harsh environments with high mechanical resistance requirements. The model 90A can be mounted by flanges or fixing clamps, while the model 115A has a tachometer generator REO-444 type compatible flange.

- 3 channel encoder (A / B / Z) up to 10000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 500 kHz
- Cable or connector output
- Metal cover for heavy duty applications
- Solid shaft diameter up to 11 mm
- Mounting by synchronous or REO-444 flange



ORDERING CODE ER 90A 500 S 5/28 P 8 X 6 M R .162 +XXX

SERIES
incremental encoder series ER

MODEL
synchronous flange ø 40 mm 90A
flange REO-444 115A

RESOLUTION
ppr from 100 to 10000
refer to the available pulses list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
(with L electrical interface) 5 V DC 5
5 ... 28 V DC 5/28

ELECTRICAL INTERFACE
NPN open collector C
push-pull P
line driver L
power supply 5/28 V DC - output RS-422 RS

SHAFT DIAMETER
(mod. 90A) mm 8
(mod. 90A) (3/8") mm 9,52
mm 10
(mod. 115A) mm 11

ENCLOSURE RATING
IP 54 shaft side / IP 67 cover side X
IP 66 shaft side (mod. 90A) - IP 65 shaft side (mod. 115A) / IP 67 cover side S

MAX ROTATION SPEED
(S enclosure rating) 3000 rpm 3
(X enclosure rating) 6000 rpm 6

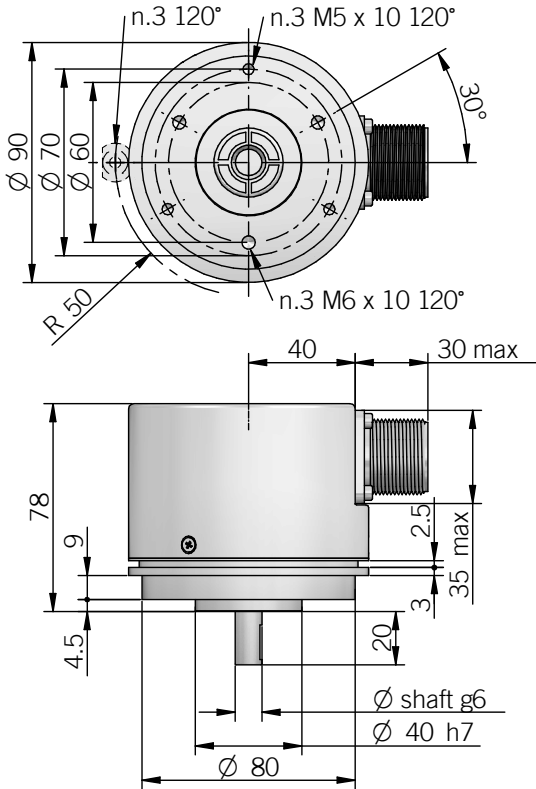
OUTPUT TYPE
cable (standard length 1.5 m) P
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)
MIL plug connector M
JIS-C-5432 IP40 plug connector J

DIRECTION TYPE
axial A
radial R

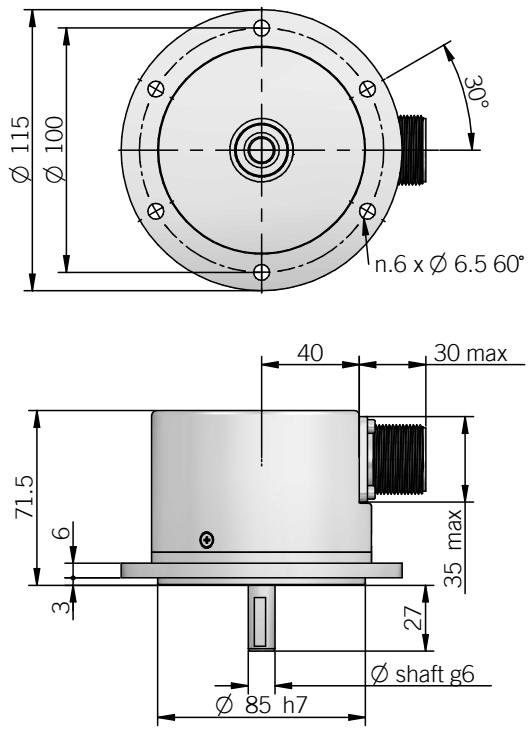
SOCKET
socket not included .162
to be reported only with connector output (eg. MR.162), for socket see Accessories

VARIANT
custom version XXX

90A

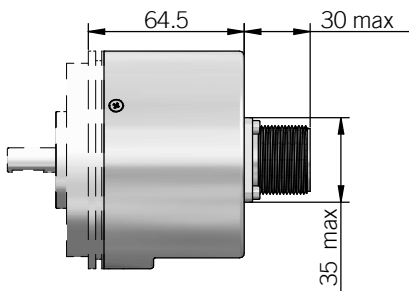


115A

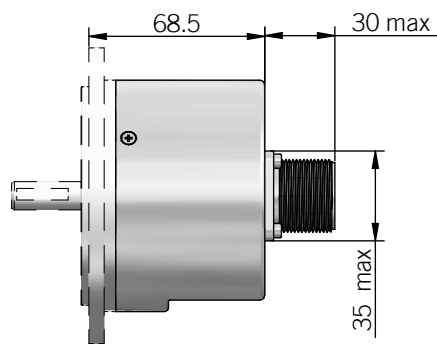


fixing clamps not included, please refer to Accessories

90A WITH AXIAL OUTPUT



115A WITH AXIAL OUTPUT



recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 100 to 10000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	250 kHz up to 6000 ppr / 500 kHz from 7200 ppr
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	263 years ER series
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

RESOLUTIONS

100 - 120 - 128 - 150 - 200 - 240 - 250 - 256 - 300 - **360** - 400 - 480 - **500** - **512** - **600** - 625 - **720** - 800 - 900 - **1000** - **1024** - 1200 - 1250 - 1440 - 1600 - 1800 - **2000** - **2048** - **2500** - 3000 - **3600** - 4000 - 4096 - **5000** - 6000 - **7200** - 8000 - 8192 - 9000 - **10000** - 10240 - 12000 - **14400** - 16000 - 16384 - 18000 - **20000** - 20480 - 24000

please directly contact our offices for other pulses, preferred resolutions in bold

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 8 / 9,52 (3/8") / 10 / 11 mm
Enclosure rating IEC 60529	X = IP 54 shaft side / IP 67 cover side S = IP 66 shaft side / IP 67 cover side (mod. 90A) S = IP 65 shaft side / IP 67 cover side (mod. 115A)
Max rotation speed	6000 rpm with X enclosure rating EL 3000 rpm / 60° C with S enclosure rating ER 3000 rpm / 70° C with S enclosure rating ER 2000 rpm / 85° C with S enclosure rating
Max shaft load⁴	200 N (45 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	3,5 x 10 ⁻⁶ kgm ² (83 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,83 Ozin) with X enclosure rating < 0,06 Nm (8,50 Ozin) with S enclosure rating
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-25° ... +85°C (-13° ... +185°F)
Storage temperature⁶	-25° ... +70°C (-13° ... +158°F)
Weight	350 g (12,35 oz) 450 g (15,87 oz) with metal cover

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

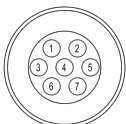
⁵ measured on the transducer flange

⁶ condensation not allowed

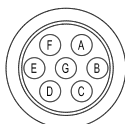
CONNECTIONS

Function	Cable C / P	Cable L / RS	7 pin J C / P	7 pin J L / RS no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L / RS with Zero	10 pin M L / RS with Zero
+V DC	red	red	6	4	F	D	4 - 5	D - E
0 V	black	black	1	6	A	F	6	F
A+	green	green	3	1	C	A	1	A
A-	/	brown or grey	/	3	/	C	7	G
B+	yellow	yellow	5	2	E	B	2	B
B-	/	orange	/	5	/	E	8	H
Z+	blue	blue	4	/	D	/	3	C
Z-	/	white	/	/	/	/	9	I
≡	shield	shield	7	7	G	G	10	J

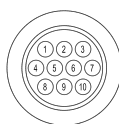
J connector (7 pin)
JIS-C-5432 IP40 Size 16
front view



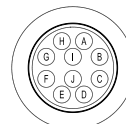
M connector (7 pin)
Amphenol MS3102-E-16-S
front view



J connector (10 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (10 pin)
Amphenol MS3102-E-18-1
front view



MAIN FEATURES

Series of miniaturised encoders for integration on small size AC/DC motors, stepper motors or for applications with limited dimensions.

- 3 channel encoder (A / B / Z) up to 1024 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 105 kHz
- No wear due to absence of bearings
- Easy mounting
- Compact size



ORDERING CODE

EH 30M 500 S 5/30 P 6 X 6 PR .XXX

SERIES
incremental encoder series **EH**

MODEL
kit encoder with flange **17M**
kit encoder **30M**

RESOLUTION
ppr from **50** to **1024**
refer to the available pulses list

ZERO PULSE
without zero pulse **S**
with zero pulse **Z**

POWER SUPPLY
5 V DC **5**
5 ... 30 V DC **5/30**

ELECTRICAL INTERFACE
NPN open collector **C**
push-pull **P**
line driver **L**
power supply 5/30 V DC - output RS-422 **RS**

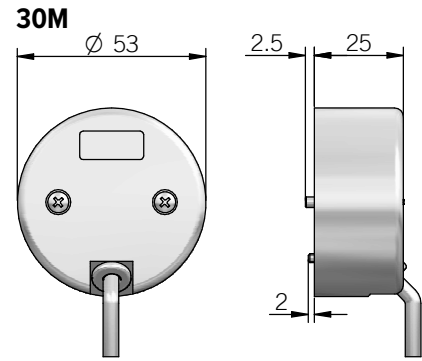
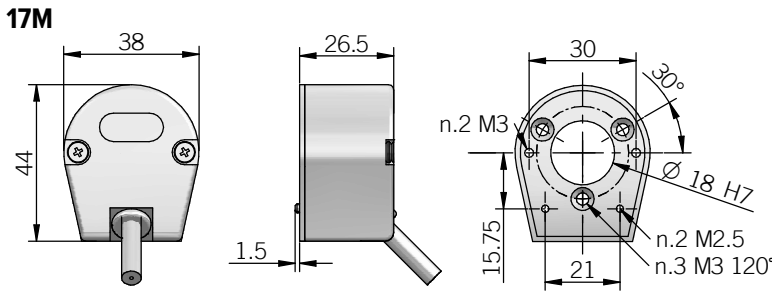
BORE DIAMETER
mm **6**
(1/4") mm **6,35**

ENCLOSURE RATING
(mod. 17M) IP40 - (mod. 30M) IP 54 **X**

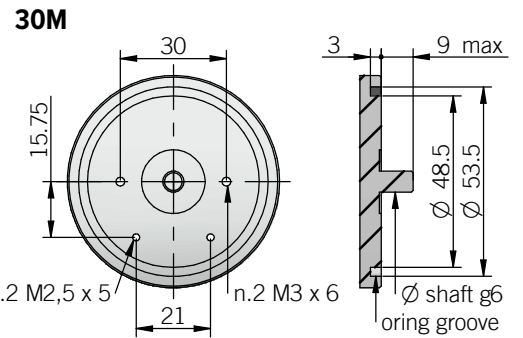
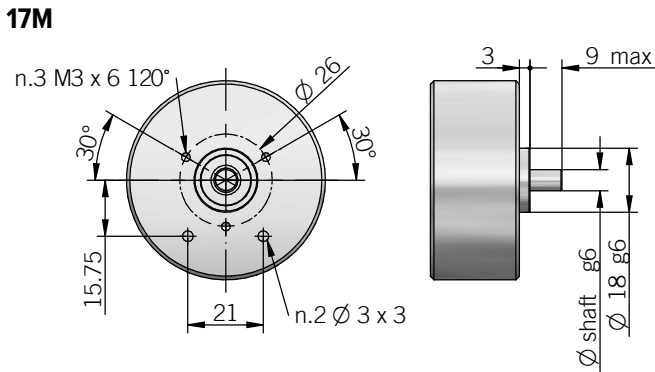
MAX ROTATION SPEED
6000 rpm **6**

OUTPUT TYPE
radial cable (standard length 0,5 m) **PR**
preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)

VARIANT
custom version **XXX**



RECOMMENDED INTERFACE FLANGE DESIGN



dimensions in mm

ELECTRICAL SPECIFICATIONS	
Resolution	from 50 to 1024 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/30 = 4,5 ... 30 V DC (reverse polarity protection)
Current consumption without load	100 mA max
Max load current	C / P = 50 mA / channel L = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	105 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	90°e (gated A&B)
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	244 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

RESOLUTIONS

50* - **100** - **200** - 250 - 256 - 360 - 400 - **500** - 512 - **1000** - 1024
 *available only without zero pulse
 please directly contact our offices for other pulses, preferred resolutions in bold

MECHANICAL SPECIFICATIONS	
Bore diameter	ø 6 / 6,35 (1/4") mm
Enclosure rating IEC 60529	mod. 17 IP 40 mod. 30 IP 40 or 54*
Max rotation speed	6000 rpm limited by output frequency
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,5 x 10 ⁻⁶ kgm ² (12 x 10 ⁻⁶ lbfm ²)
Flange material (mod. 17)	aluminium
Hub material	aluminium
Cover material	PA66 / PA6 glass fiber reinforced
Shaft radial play allowed	± 0,04 mm
Shaft axial play allowed	± 0,1 mm
Operating temperature^{4,5}	-20° ... +85°C (-4° ... +185°F)
Storage temperature⁵	-25° ... +85°C (-13° ... +185°F)
Weight	50 g (1,76 oz)

*when properly installed with oring kit (not supplied, please refer to Accessories)
¹ as measured at the transducer without cable influences
² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section
⁴ measured on the transducer flange
⁵ condensation not allowed

CONNECTIONS

Function	Cable P	Cable L / RS
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
⊖	shield	shield

MAIN FEATURES

Series of miniaturised encoders for integration on small size AC/DC motors, stepper motors or for applications with limited dimensions.

- 3 channel encoder (A / B / Z) up to 5000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 500 kHz
- No wear due to absence of bearings
- Easy mounting
- Compact size

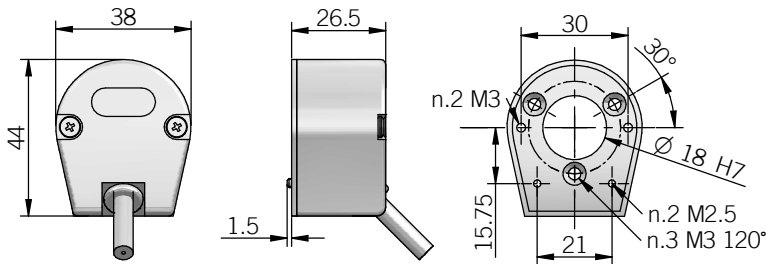


ORDERING CODE

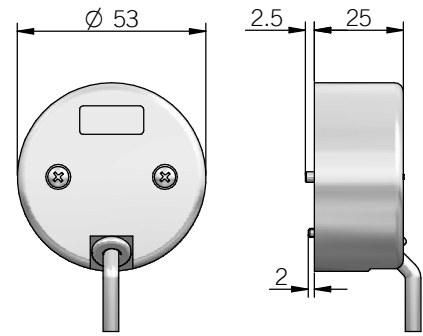
EH 30MH 2000 S 5/30 P 6 X X PR .XXX

SERIES incremental encoder series EH											
TYPE high resolution kit encoder with flange 17MH high resolution kit encoder 30MH											
RESOLUTION ppr 2000 / 2048 / 2500 / 4096 / 5000											
ZERO PULSE without zero pulse S with zero pulse Z											
POWER SUPPLY 5 ...30 V DC 5/30											
ELECTRICAL INTERFACE push-pull P line driver L power supply 5/30 V DC - output RS-422 RS											
BORE DIAMETER mm 6 (1/4") mm 6,35											
ENCLOSURE RATING (mod. 17MH) IP40 - (mod. 30MH) IP 54 X											
OPTION to be reported X											
OUTPUT TYPE radial cable (standard length 0,5 m) PR preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)											
VARIANT custom version XXX											

17MH

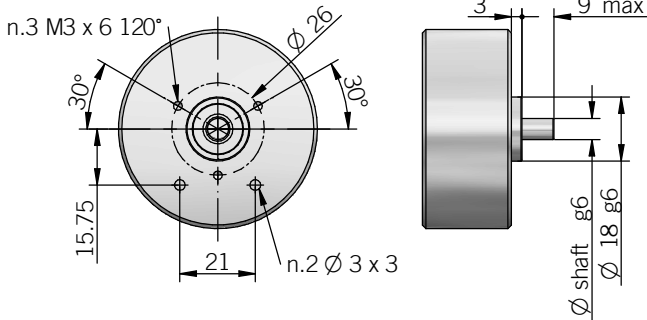


30MH

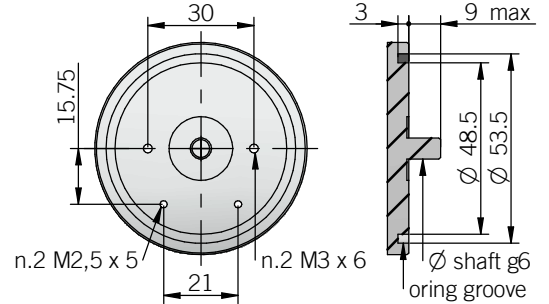


RECOMMENDED INTERFACE FLANGE DESIGN

17MH



30MH



dimensions in mm

ELECTRICAL SPECIFICATIONS	
Resolution	2000 - 2048 - 2500 - 4096 - 5000 ppr
Power supply¹	4,5 ... 30 V DC (reverse polarity protection)
Current consumption without load	60 mA max
Max load current	20 mA / channel
Electrical interface²	push-pull / line driver HTL (AEC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	500 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	90°e (gated A&B)
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	289 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

MECHANICAL SPECIFICATIONS	
Bore diameter	ø 6 / 6,35 (1/4") mm
Enclosure rating IEC 60529	mod. 17 IP 40 mod. 30 IP 40 or 54*
Max rotation speed	6000 rpm limited by output frequency
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,5 x 10 ⁻⁶ kgm ² (12 x 10 ⁻⁶ lbf ²)
Flange material (mod. 17)	aluminium
Hub material	aluminium
Cover material	PA66 / PA6 glass fiber reinforced
Shaft radial play allowed	± 0,04 mm
Shaft axial play allowed	± 0,1 mm
Operating temperature^{4,5}	-20° ... +85°C (-4° ... +185°F)
Storage temperature⁵	-25° ... +85°C (-13° ... +185°F)
Weight	50 g (1,76 oz)

*when properly installed with oring kit (not supplied, please refer to Accessories)

CONNECTIONS		
Function	Cable P	Cable L / RS
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
⊥	shield	shield

MAIN FEATURES

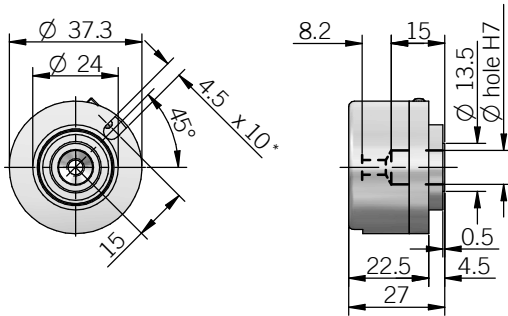
ø 36 mm series of encoders, recommended for feedback control systems on AC servomotors, interchangeable with the size 15 resolver at the rear of the motor.

- 6 channel encoder with optical generation of “Hall effect phases” (commutation signals)
- Signal transmission via bit-parallel bus
- Easy mechanical mounting
- Small dimensions
- Wide range of resolutions available
- High temperature resistance



ORDERING CODE	EF	36K	4	L	512	S	5	L	8	X	6	PR	.XXX
SERIES incremental encoder with Hall phases	EF												
MODEL blind hollow shaft with rear fixing		36K											
MOTOR POLES 4 poles (2 poles pair) 6 poles (3 poles pair) 8 poles (4 poles pair)			4 6 8										
ELECTRICAL INTERFACE FOR COMMUTATION SIGNALS NPN open collector line driver RS-422						C L							
INCREMENTAL RESOLUTION ppr from refer to the available pulses list					500 to 1024								
ZERO PULSE without zero pulse with zero pulse						S Z							
POWER SUPPLY 5 V DC							5						
ELECTRICAL INTERFACE FOR INCREMENTAL SIGNALS line driver RS-422								L					
BORE DIAMETER mm (3/8") mm mm									8 9,52 10				
ENCLOSURE RATING IP 40										X			
MAX ROTATION SPEED 6000 rpm											6		
OUTPUT TYPE radial cable (standard length 0,3 m) preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)												PR	
VARIANT custom version													XXX

36K



* ø 4 mm torque pin min 0.5mm from bottom end

for size 15 Resolver flange please refer to Accessories

recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS	
Incremental resolution	from 500 to 1024 ppr
Power supply¹	4,5 ... 5,5 V DC
Current consumption without load	150 mA max
Max load current	20 mA / channel (line driver RS-422) 30 mA / channel (NPN open collector)
Electrical interface for incremental signals²	line driver RS-422 (AELT-5000 or similar)
Electrical interface for Hall phases²	NPN open collector (pull-up max +30V DC) line driver RS-422 (AELT-5000 or similar)
Max output frequency	150 kHz
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	300 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Cable type	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

RESOLUTIONS
500 4 / 6 poles
512 4 / 6 poles
1000 6 / 8 poles
1024 4 / 6 / 8 poles

please directly contact our offices for other pulses

MECHANICAL SPECIFICATIONS	
Bore diameter	ø 8 / 9,52 (3/8") / 10 mm
Enclosure rating	IP 40 (IEC 60529)
Max rotation speed	6000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	5 G, 10 ... 500 Hz (IEC 60068-2-6)
Moment of inertia	0,5 x 10 ⁻⁶ kgm ² (12 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-10° ... +85°C (+14° ... +185°F)
Storage temperature⁵	-25° ... +85°C (-13° ... +185°F)
Weight	150 g (5,29 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

CONNECTIONS	
Function	Cable
+V DC	red
0 V	black
A+	green
B+	yellow
Z+	blue
A-	brown
B-	orange or pink
Z-	white
U+	grey
V+	violet
W+	grey-pink
U-	red-blue
V-	white-green
W-	brown-green
⊥	shield

MAIN FEATURES

Miniaturised range of encoders for general factory automation applications, small AC motors and gearmotors and geared motors.

- 3 channel encoder (A / B / Z) with resolution up to 14400 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 500 kHz
- Cable output, connectors available at cable end
- Metal cover for high IP protection
- Blind hollow shaft diameter up to 10 mm with collar clamping
- Mounting by stator coupling or torque pin

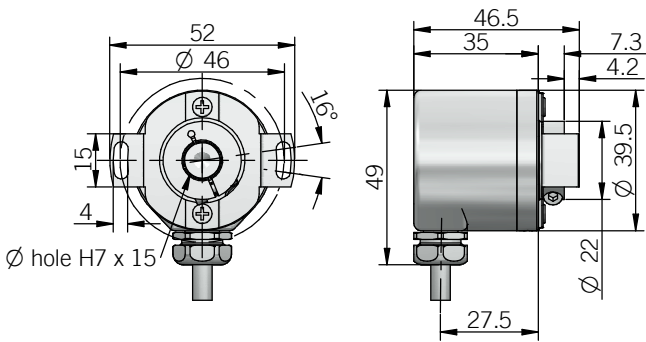


ORDERING CODE

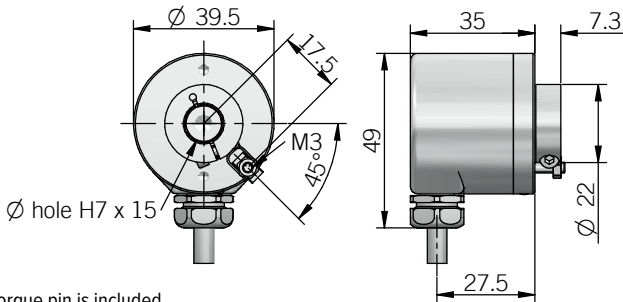
ER 38F 500 S 5/30 P 10 X X PR .XXX

SERIES incremental encoder series ER											
MODEL blind hollow shaft with stator coupling 38F blind hollow shaft with torque pin 38G											
RESOLUTION ppr from 100 to 14400 refer to the available pulses list											
ZERO PULSE without zero pulse S with zero pulse Z											
POWER SUPPLY (with L electrical interface) 5 V DC 5 5 ... 30 V DC 5/30											
ELECTRICAL INTERFACE NPN open collector C push-pull P line driver L power supply 5/30 V DC - output RS-422 RS											
BORE DIAMETER mm 4 mm 5 mm 6 (1/4") mm 6,35 mm 8 mm 10											
ENCLOSURE RATING IP 66 shaft side / IP67 cover side X											
OPTION to be reported X											
OUTPUT TYPE radial cable (standard length 0,5 m) PR preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)											
VARIANT custom version XXX											

38F



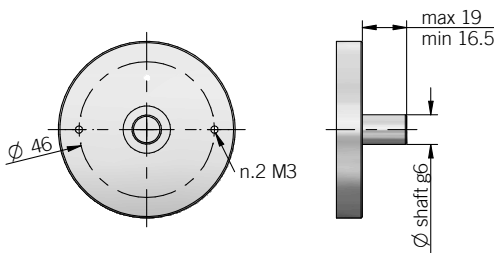
38G



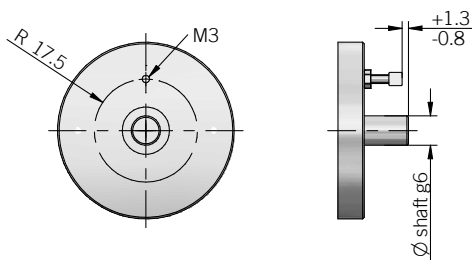
torque pin is included

RECOMMENDED INTERFACE FLANGE DESIGN

38F



38G



dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 100 to 14400 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/30 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	250 kHz up to 3600 ppr / 500 kHz from 4000 ppr
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	263 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Bore diameter	ø 4* / 5* / 6* / 6,35* (1/4") / 8* / 10 mm * with supplied shaft adapter
Enclosure rating IEC 60529	IP 66 shaft side / IP 67 cover side
Max rotation speed	6000 rpm
Max shaft load⁴	5 N (1,12 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,8 x 10 ⁻⁶ kgm ² (19 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Shaft adapter material	bronze
Housing material	painting aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5, 6}	-25° ... +85°C (-13° ... +185°F)
Storage temperature⁶	-25° ... +85°C (-13° ... +185°F)
Weight	150 g (5,29 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

RESOLUTIONS

100 - 120 - 128 - 150 - 200 - 240 - 250 - 256 - 300 - **360** - 400 - 480 - **500** - **512** - 600 - 625 - 720 - 800 - 900 - **1000** - **1024** - 1200 - 1250 - 1440 - 1600 - 1800 - **2000** - **2048** - **2500** - 3000 - **3600** - 4000 - 4096 - **5000** - 6000 - **7200** - 8000 - 8192 - 10000 - 12000 - 14400

please directly contact our offices for other pulses, preferred resolutions in bold

EL 48 C / P

THROUGH HOLLOW SHAFT INCREMENTAL ENCODER

MAIN FEATURES

Hollow shaft \varnothing 48 mm encoder series recommended for motor feedback.

- 3 channel encoder (A / B / Z) up to 2048 ppr
- Power supply up to +24 V DC with various electrical interfaces available
- Output frequency up to 150 kHz
- Cable output, connectors available at cable end
- Through hollow shaft up to 8 mm diameter
- Mounting by stator coupling



ORDERING CODE

EL 48C 500 S 5 L 8 X 6 PR .XXX

SERIES
incremental encoder series EL

MODEL
blind hollow shaft 48C
through hollow shaft 48P

RESOLUTION
ppr from 100 to 2048
refer to the available pulses list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
(with L electrical interface) 5 V DC 5
8 ... 24 V DC 8/24

ELECTRICAL INTERFACE
NPN open collector C
push-pull P
line driver L

BORE DIAMETER
mm 6
mm 8

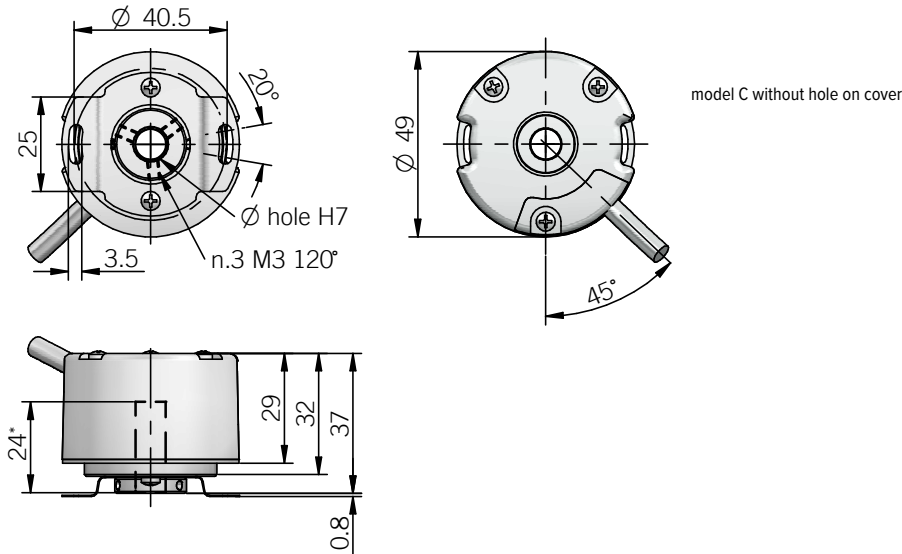
ENCLOSURE RATING
IP 30 X

MAX ROTATION SPEED
6000 rpm 6

OUTPUT TYPE
radial cable (standard length 0,3 m) PR
preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)

VARIANT
custom version XXX

48C / P



model C without hole on cover

* maximum protrusion of the customer shaft in blind hollow shaft model
recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 100 to 2048 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 8/24 = 7,6 ... 25,2 V DC
Current consumption without load	100 mA max
Max load current	C / P = 30 mA / channel L = 20 mA / channel
Electrical interface²	NPN open collector (pull-up max +30V DC) push-pull / line driver HTL (AEC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	150 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	330 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

CONNECTIONS

Function	Cable C / P	Cable L
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
— —	shield	shield

MECHANICAL SPECIFICATIONS

Bore diameter	ø 6 / 8 mm
Enclosure rating	IP 30 (IEC 60529)
Max rotation speed	6000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 500 Hz (IEC 60068-2-6)
Moment of inertia	2,5 x 10 ⁻⁶ kgm ² (59 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA 66 glass fiber reinforced
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-20° ... +85 °C (-4° ... +185°F)
Storage temperature⁵	-25° ... +85°C (-13° ... +185°F)
Weight	100 g (3,53 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

RESOLUTIONS

100 - 200 - 360 - 400 - 500 - 512 - 1000 - 1024 - 2000 - 2048

please directly contact our offices for other pulses, preferred resolutions in bold

EL 49 C / P

THROUGH HOLLOW SHAFT INCREMENTAL ENCODER

MAIN FEATURES

∅ 49 mm encoder recommended for feedback control systems on AC servomotors,

- 3 channel encoder (A / B / Z) up to 2048 ppr
- Power supply up to +24 V DC with various electrical interfaces available
- Output frequency up to 150 kHz
- Cable output, connectors available at cable end
- Through hollow shaft up to 12,7 mm (1/2") diameter
- Interchangeable with size 19 resolver



ORDERING CODE

EL 49C 500 S 5 L 8 X 6 PR .XXX

SERIES
incremental encoder EL

MODEL
blind hollow shaft 49C
through hollow shaft 49P

RESOLUTION
ppr from 100 to 2048
refer to the available pulses list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
(with L electrical interface) 5 V DC 5
8 ... 24 V DC 8/24

ELECTRICAL INTERFACE
NPN open collector C
push-pull P
line driver L

BORE DIAMETER
mm 6
mm 8
(3/8") mm 9,52
mm 10
mm 12
(1/2") mm 12,7

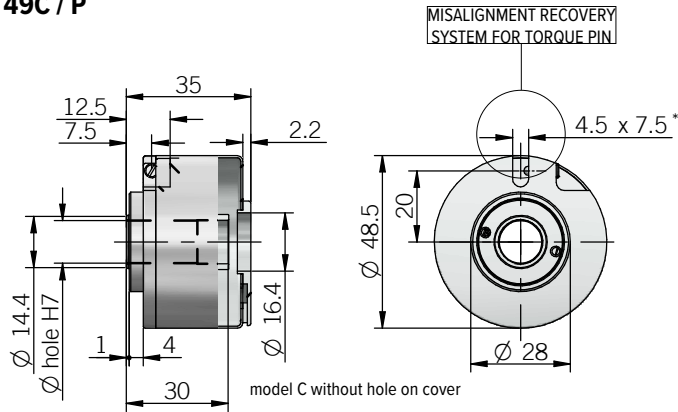
ENCLOSURE RATING
IP 40 X

MAX ROTATION SPEED
6000 rpm 6

OUTPUT TYPE
radial cable (standard length 0,3 m) PR
preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)

VARIANT
custom version XXX

49C / P



* \varnothing 4 mm torque pin min 0.5 mm from bottom end

for size 19 (version 01 or 14) resolver flange please refer to Accessories

recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 100 to 2048 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 8/24 = 7,6 ... 25,2 V DC
Current consumption without load	100 mA max
Max load current	20 mA / channel
Electrical interface²	NPN open collector (pull-up max +30V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	150 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	208 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

CONNECTIONS

Function	Cable C / P	Cable L
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
⊥	shield	shield

MECHANICAL SPECIFICATIONS

Bore diameter	\varnothing 6 / 8 / 9,52 (3/8") / 10 / 12 / 12,7 (1/2") mm
Enclosure rating	IP 40 (IEC 60529)
Max rotation speed	6000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	2×10^{-6} kgm ² (47 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	nickel plated brass
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4, 5}	-20° ... +85 °C (-4° ... +185°F) -10° ... +100°C (+14° ... +212°F) on demand
Storage temperature⁵	-25° ... +85 °C (-13° ... +185°F)
Weight	150 g (5,29 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

RESOLUTIONS

100 - 200 - 500 - 512 - 1000 - 1024 - 2000 - 2048

please directly contact our offices for other pulses

MAIN FEATURES

ø 49 mm encoder series recommended for feedback control systems on AC servomotors.
They include a traditional incremental encoder and commutation signals (Hall effect phases).

- Easy mechanical mounting
- Small dimensions
- Wide range of resolutions available
- High temperature resistance
- 6 channel encoder with optical generation of "Hall effect phases" (commutation signals)

**ORDERING CODE**

EF 49C 6 L 500 S 5 L 8 X 6 PR .XXX

SERIES
incremental encoder with Hall phases **EF**

MODEL
blind hollow shaft **49C**
through hollow shaft **49P**

MOTOR POLES
4 poles (2 poles pair) **4**
6 poles (3 poles pair) **6**
8 poles (4 poles pair) **8**

ELECTRICAL INTERFACE FOR COMMUTATION SIGNALS
NPN open collector **C**
line driver RS-422 **L**

INCREMENTAL RESOLUTION
ppr from **100** to **2048**
refer to the available pulses list

ZERO PULSE
without zero pulse **S**
with zero pulse **Z**

POWER SUPPLY
5 V DC **5**

ELECTRICAL INTERFACE FOR INCREMENTAL SIGNALS
line driver **L**

BORE DIAMETER
mm **6**
mm **8**
(3/8") mm **9,52**
mm **10**
mm **12**
(1/2") mm **12,7**

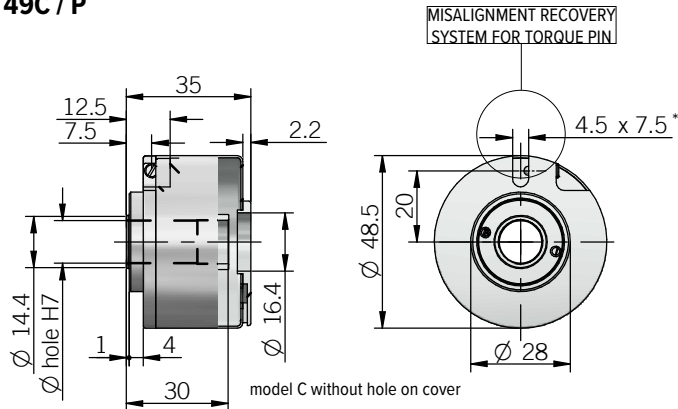
ENCLOSURE RATING
IP 40 **X**

MAX ROTATION SPEED
6000 rpm **6**

OUTPUT TYPE
radial cable (standard length 0,3 m) **PR**
preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)

VARIANT
custom version **XXX**

49C / P



* \varnothing 4 mm torque pin min 0.5 mm from bottom end
for size 19 (version 01 or 14) resolver flange please refer to Accessories

recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS

Incremental resolution	from 100 to 2048 ppr
Power supply¹	4,5 ... 5,5 V DC
Current consumption without load	150 mA max
Max load current	20 mA / channel
Electrical interface for incremental signals²	line driver RS-422 (AELT-5000 or similar)
Electrical interface for Hall phases²	NPN open collector (pull-up max +30V DC) line driver RS-422 (AELT-5000 or similar)
Max output frequency	150 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	277 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive
UL / CSA	file n. E212495

RESOLUTIONS

100 4 / 6 poles
200 4 / 6 poles
500 4 / 6 / 8 poles
512 4 / 6 / 8 poles
1000 4 / 6 / 8 poles
1024 4 / 6 / 8 poles
2000 4 / 6 / 8 poles
2048 4 / 6 / 8 poles

please directly contact our offices for other pulses

MECHANICAL SPECIFICATIONS

Bore diameter	\varnothing 6 / 8 / 9,52 (3/8") / 10 / 12 / 12,7 (1/2") mm
Enclosure rating	IP 40 (IEC 60529)
Max rotation speed	6000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	5 G, 10 ... 500 Hz (IEC 60068-2-6)
Moment of inertia	2×10^{-6} kgm ² (47×10^{-6} lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	nickel plated brass
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-20° ... +85 °C (-4° ... +185°F)
Storage temperature⁵	-25° ... +85 °C (-13° ... +185°F)
Weight	150 g (5,29 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

CONNECTIONS

Function	Cable
+V DC	red
0 V	black
A+	green
B+	yellow
Z+	blue
A-	brown
B-	orange or pink
Z-	white
U+	grey
V+	violet
W+	grey-pink
U-	red-blue
V-	white-green
W-	brown-green
⊥	shield

MAIN FEATURES

∅ 50 mm encoder recommended for motor feedback. Suitable for small size motors due to its compact dimensions.

- 3 channel encoder (A / B / Z) up to 1024 ppr
- Highly integrated optical ASIC
- Wide power supply range up to +30 V DC
- Through hollow shaft up to 10 mm diameter
- Mounting by coupling flange or stator coupling (front or rear mounting)
- IP 65 as protection grade
- Wide temperature range -40 ... + 100°C

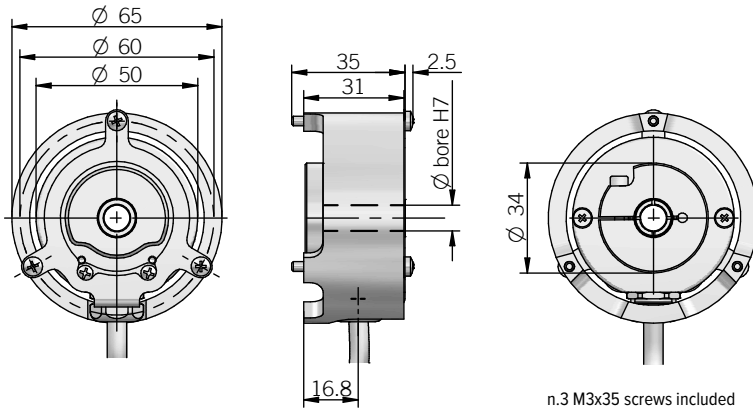


ORDERING CODE

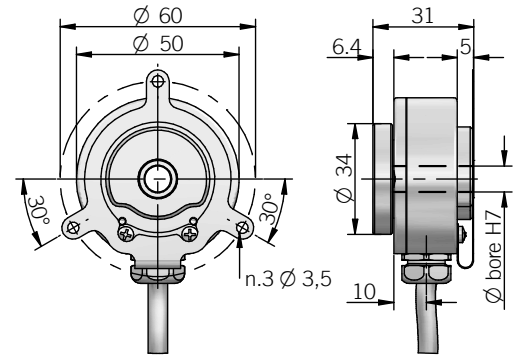
EH 50FP 1024 S 5/30 P 6 X 6 PR .XXX

SERIES incremental encoder series EH												
MODEL through hollow shaft with front fixing 50FA through hollow shaft with rear fixing 50FP												
RESOLUTION ppr from 100 to 1024 refer to the available pulses list												
ZERO PULSE without zero pulse S with zero pulse Z												
POWER SUPPLY 5 ... 30 V DC 5/30												
ELECTRICAL INTERFACE push-pull P line driver L power supply 5/30 V DC - output RS-422 RS												
BORE DIAMETER mm 8 mm 10												
ENCLOSURE RATING IP 65 X												
MAX ROTATION SPEED 6000 rpm 6												
OUTPUT TYPE radial cable (standard length 0,5 m) PR preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)												
VARIANT custom version XXX												

50FA



50FP



recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS	
Resolution	from 100 to 1024 ppr
Power supply¹	4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	20 mA / channel
Electrical interface²	push-pull / line driver HTL (AEC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	105 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	90°e (gated A&B)
Mean time to dangerous failure (MTTF)_d³ according to EN ISO 13849-1	54 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS	
Bore diameter	ø 8 / 10 mm
Enclosure rating	IP 65 (IEC 60529)
Max rotation speed	6000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,5 x 10 ⁻⁶ kgm ² (12 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Shaft material	stainless steel
Housing material	aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-40° ... +100 °C (-40° ... +212°F)
Storage temperature⁵	-40° ... +100 °C (-40° ... +212°F)
Weight	150 g (5,29 oz) mod.FP 200 g (7,05 oz) mod.FA

¹ as measured at the transducer without cable influences
² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section
⁴ measured on the transducer flange
⁵ condensation not allowed

CONNECTIONS		
Function	Cable P	Cable L / RS
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
≡	shield	shield

RESOLUTIONS
100 - 200 - 256 - 360 - 400 - 500 - 1000 - 1024
please directly contact our offices for other pulses, preferred resolutions in bold

MAIN FEATURES

Series of encoders for direct mounting on motors; integrated elastic coupling allows radial and axial shaft play.

- 3 channel encoder (A / B / Z) up to 1024 ppr
- Power supply up to +24 V DC with various electrical interfaces available
- Output frequency up to 150 kHz
- Cable output, connectors available on cable end
- Up to 10 mm bore diameter
- Integrated elastic coupling



ORDERING CODE

EH 53A 500 S 8/24 P 8 X 6 PR.N .XXX

SERIES
incremental encoder series EH

MODEL
adjustable flange model 53A
adjustable flange model 53B

RESOLUTION
ppr from 50 to 1024
refer to the available pulses list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
(with L electrical interface) 5 V DC 5
8 ... 24 V DC 8/24

ELECTRICAL INTERFACE
NPN open collector C
push-pull P
line driver L

BORE DIAMETER
mm 6
mm 8
mm 10

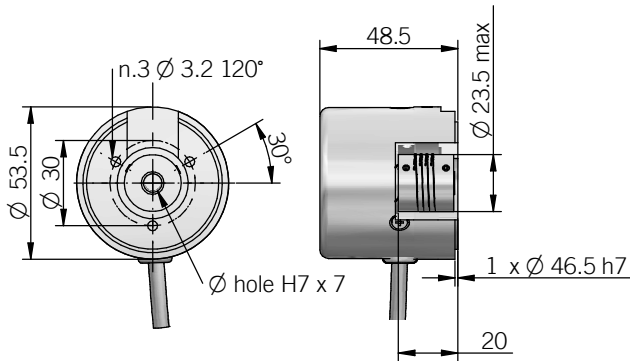
ENCLOSURE RATING
IP 54 X

MAX ROTATION SPEED
6000 rpm 6

OUTPUT TYPE
radial cable (standard length 0,5 m) PR.N
preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)

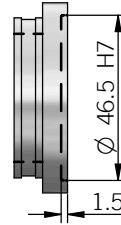
VARIANT
custom version XXX

53A



recommended mating shaft tolerance g6
dimensions in mm

53B INTERFACE



ELECTRICAL SPECIFICATIONS	
Resolution	from 100 to 1024 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 8/24 = 7,6 ... 25,2 V DC (reverse polarity protection)
Current consumption without load	100 mA max
Max load current	C / P = 50 mA / channel L = 20 mA / channel
Electrical interface²	NPN open collector (pull-up max +30V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	150 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	208 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

CONNECTIONS		
Function	Cable C / P	Cable L
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
≡	shield	shield

MECHANICAL SPECIFICATIONS	
Bore diameter	ø 6 / 8 / 10 mm
Enclosure rating	IP 54 (IEC 60529)
Max rotation speed	6000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1 x 10 ⁻⁶ kgm ² (24 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-10° ... +60°C (+14° ... +140°F)
Storage temperature⁵	-25° ... +70°C (-13° ... +158°F)
Weight	150 g (5,29 oz)

¹ as measured at the transducer without cable influences
² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section
⁴ measured on the transducer flange
⁵ condensation not allowed

RESOLUTIONS
50 - 100 - 120 - 125 - 128 - 150 - 180 - 200 - 250 - 256 - 300 - 360 - 400 - 500 - 512 - 600 - 720 - 1000 - 1024

please directly contact our offices for other pulses

EL - ER 53 A / B

BLIND HOLLOW SHAFT INCREMENTAL ENCODER

MAIN FEATURES

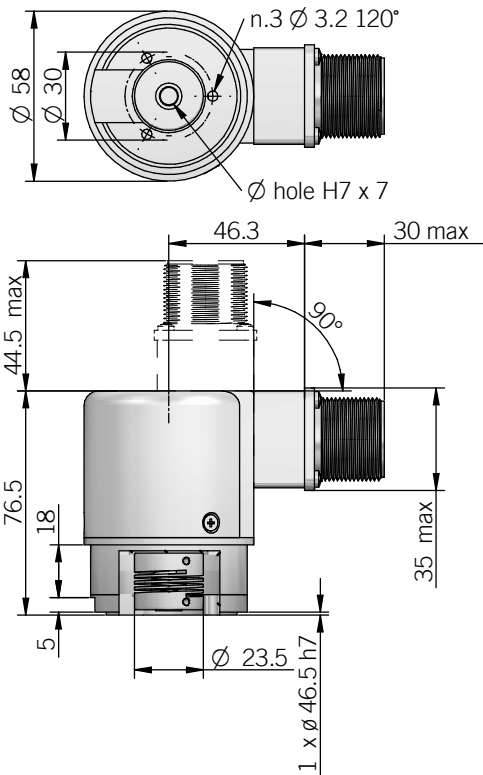
Series of encoders for direct mounting on motors; integrated elastic coupling allows radial and axial shaft play.

- 3 channel encoder (A / B / Z) up to 10000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 500 kHz
- Cable or connector output
- Metal cover available for heavy duty applications
- Integrated elastic coupling up to 10 mm bore diameter

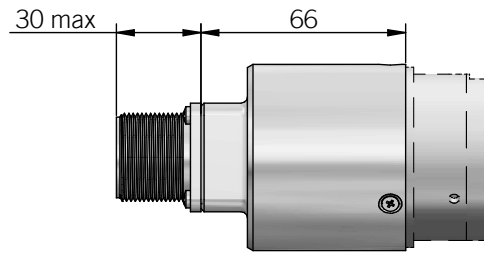


ORDERING CODE	ER	53A	M*	500	S	5/28	P	8	X	6	M	R	.162	+XXX
<p>SERIES incremental encoder series EL incremental encoder series ER</p> <p>MODEL adjustable flange model 53A adjustable flange model 53B</p> <p>METAL COVER * add for metal cover M</p> <p>RESOLUTION ppr from 1 to 10000 refer to the available pulses list</p> <p>ZERO PULSE without zero pulse S with zero pulse Z</p> <p>POWER SUPPLY (with L electrical interface) 5 V DC 5 5 ... 28 V DC 5/28</p> <p>ELECTRICAL INTERFACE NPN open collector C push-pull P line driver L power supply 5/28 V DC - output RS-422 RS</p> <p>BORE DIAMETER mm 6 mm 8 mm 10</p> <p>ENCLOSURE RATING IP 54 X IP 64 S</p> <p>MAX ROTATION SPEED (IP 64) 3000 rpm 3 (IP 54) 6000 rpm 6</p> <p>OUTPUT TYPE cable (standard length 1,5 m) P preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) MIL plug connector M JIS-C-5432 IP40 plug connector J M12 plug connector M12 M23 plug connector H M16 IP40 plug connector C</p> <p>DIRECTION TYPE axial A radial R</p> <p>SOCKET socket not included .162 to be reported only with connector output (eg. MR.162), for socket see Accessories</p> <p>VARIANT custom version XXX</p>														

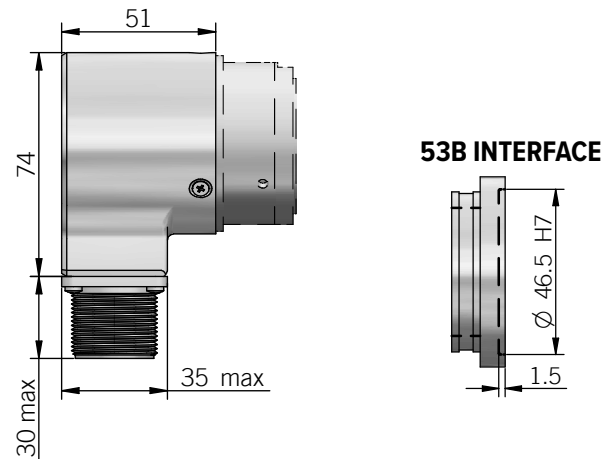
53A



DIMENSIONS WITH METAL COVER AND AXIAL OUTPUT



DIMENSIONS WITH METAL COVER AND RADIAL OUTPUT



recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS	
Resolution	from 1 to 10000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	250 kHz up to 6000 ppr / 500 kHz from 7200 ppr
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	200 years EL series 263 years ER series
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

ER SERIES RESOLUTIONS
100 - 120 - 128 - 150 - 200 - 240 - 250 - 256 - 300 - 360 - 400 - 480 - 500 - 512 - 600 - 625 - 720 - 800 - 900 - 1000 - 1024 - 1200 - 1250 - 1440 - 1600 - 1800 - 2000 - 2048 - 2500 - 3000 - 3600 - 4000 - 4096 - 5000 - 6000 - 7200 - 8000 - 8192 - 9000 - 10000

please directly contact our offices for other pulses, preferred resolutions in bold

MECHANICAL SPECIFICATIONS	
Bore diameter	ø 6 / 8 / 10 mm
Enclosure rating IEC 60529	X = IP 54 S = IP 64
Max rotation speed	6000 rpm with X enclosure rating 3000 rpm with S enclosure rating
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1 x 10 ⁻⁶ kgm ² (24 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced / painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-10° ... +60°C (+14° ... +140°F) EL series -25° ... +85°C (-13° ... +185°F) ER series
Storage temperature⁵	-25° ... +70°C (-13° ... +158°F)
Weight	350 g (12,35 oz) 450 g (15,87 oz) with metal cover

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

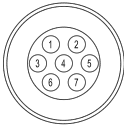
EL SERIES RESOLUTIONS
1 - 2 - 4 - 5 - 10 - 15 - 16 - 20 - 25 - 30 - 32 - 40 - 50 - 60 - 70 - 80 - 90 - 160 - 180 - 350 - 450 - 660 - 700 - 750 - 1500

CONNECTIONS

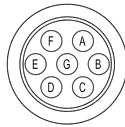
Function	Cable C / P	Cable L / RS	7 pin J C / P	7 pin J L / RS no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L / RS with Zero	10 pin M L / RS with Zero	5 pin M12 C / P	8 pin M12 L / RS	12 pin H	5 pin C C / P	8 pin C L / RS
+V DC	red	red	6	4	F	D	4 - 5	D - E	2	7	12	5	7
0 V	black	black	1	6	A	F	6	F	4	1	10	1	8
A+	green	green	3	1	C	A	1	A	3	6	5	2	1
A-	/	brown or grey	/	3	/	C	7	G	/	5	6	/	2
B+	yellow	yellow	5	2	E	B	2	B	1	4	8	4	3
B-	/	orange	/	5	/	E	8	H	/	3	1	/	4
Z+	blue	blue	4	/	D	/	3	C	5	2	3	3	5
Z-	/	white	/	/	/	/	9	I	/	8	4	/	6
⊥	shield	shield	7	7	G	G	10	J	housing ¹	housing ¹	9	housing ¹	housing ¹

¹only with metal cover

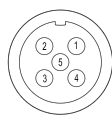
J connector (7 pin)
JIS-C-5432 IP40 Size 16
front view



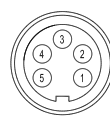
M connector (7 pin)
Amphenol MS3102-E-16-S
front view



M12 connector (5 pin)
M12 A coded
front view



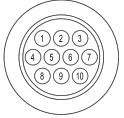
C connector (5 pin)
Amphenol C091 M16 IP40
front view



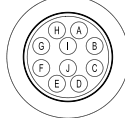
H connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



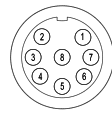
J connector (10 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (10 pin)
Amphenol MS3102-E-18-1
front view



M12 connector (8 pin)
M12 A coded
front view



C connector (8 pin)
Amphenol C091 IP40 IEC 60130-9
front view



ER 58 F - 63 F / G

BLIND HOLLOW SHAFT INCREMENTAL ENCODER

MAIN FEATURES

Hollow shaft encoder series for industrial applications with high mechanical resistance requirements. These encoders are designed to withstand high radial and axial shaft loads.

- 3 channel encoder (A / B / Z) up to 24000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 500 kHz
- Cable or connector output
- Metal cover available for heavy duty applications
- Blind hollow shaft diameter up to 15 mm
- Mounting by stator coupling, torque stop slot or torque pin

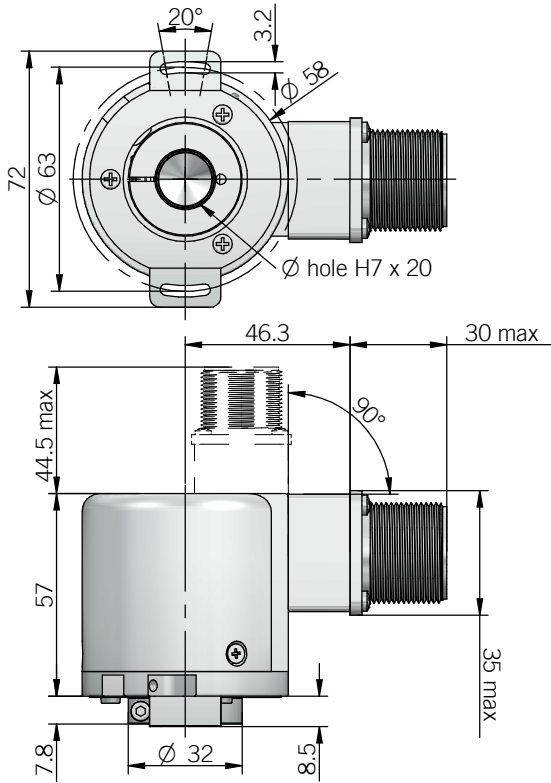


ORDERING CODE ER 58F M* 500 S 5/28 P 8 X 3 M R .162 +XXX

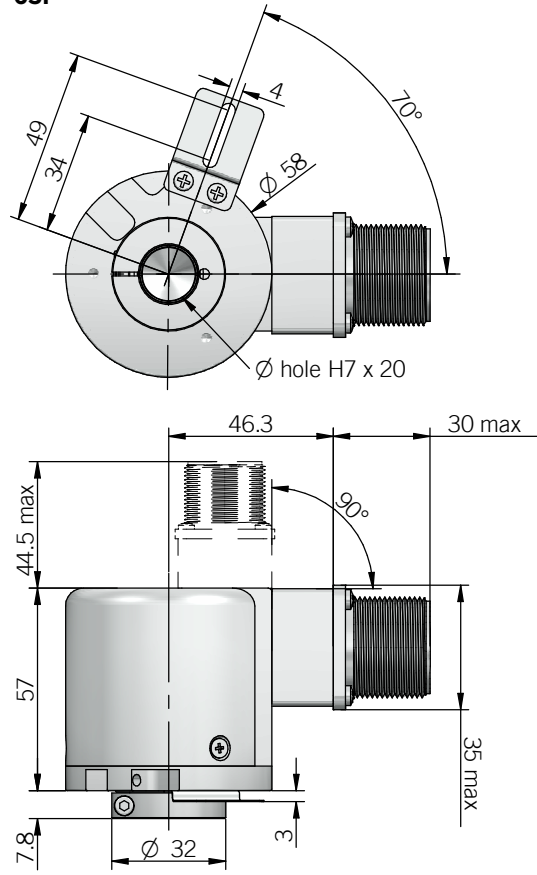
ORDERING CODE	ER	58F	M*	500	S	5/28	P	8	X	3	M	R	.162	+XXX
SERIES incremental encoder series ER														
MODEL blind hollow shaft with stator coupling 58F blind hollow shaft with torque stop slot 63F blind hollow shaft with torque pin 63G														
METAL COVER * add for metal cover M														
RESOLUTION ppr from 100 to 24000 refer to the available pulses list														
ZERO PULSE without zero pulse S with zero pulse Z														
POWER SUPPLY (with L electrical interface) 5 V DC 5 5 ... 28 V DC 5/28														
ELECTRICAL INTERFACE NPN open collector C push-pull P line driver L power supply 5/28 V DC - output RS-422 RS														
BORE DIAMETER mm 8 mm 10 mm 12 mm 14 mm 15														
ENCLOSURE RATING IP 54 X IP 66 S														
MAX ROTATION SPEED 3000 rpm 3														
OUTPUT TYPE cable (standard length 1,5 m) P preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) MIL plug connector M JIS-C-5432 IP40 plug connector J M12 plug connector M12 M23 plug connector H M16 IP40 plug connector C														
DIRECTION TYPE axial A radial R														
SOCKET socket not included .162 to be reported only with connector output (eg. MR.162), for socket see Accessories														

VARIANT
custom version **XXX**

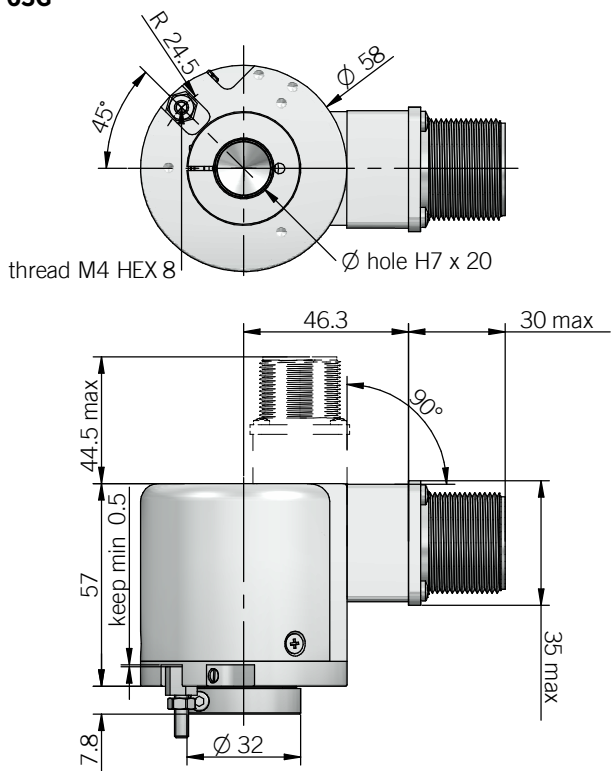
58F



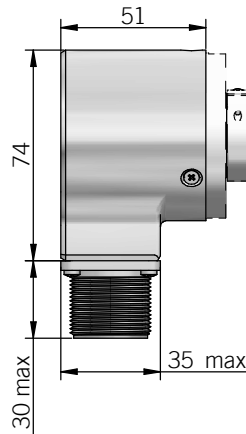
63F



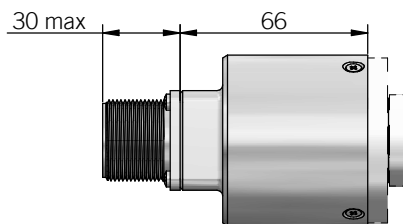
63G



DIMENSIONS WITH METAL COVER AND RADIAL OUTPUT



DIMENSIONS WITH METAL COVER AND AXIAL OUTPUT



torque pin is included in model G, for model F please refer to Accessories
 recommended mating shaft tolerance g6
 dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 100 to 24000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	250 kHz up to 6000 ppr / 500 kHz from 7200 ppr
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	263 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

RESOLUTIONS

100 - 120 - 128 - 150 - 200 - 240 - 250 - 256 - 300 - **360** - 400 - 480 - **500** - **512** - **600** - 625 - **720** - 800 - 900 - **1000** - **1024** - 1200 - 1250 - 1440 - 1600 - 1800 - **2000** - **2048** - **2500** - 3000 - **3600** - 4000 - 4096 - **5000** - 6000 - **7200** - 8000 - 8192 - 9000 - **10000** - 10240 - 12000 - **14400** - 16000 - 16384 - 18000 - **20000** - 20480 - 24000

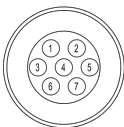
please directly contact our offices for other pulses, preferred resolutions in bold

CONNECTIONS

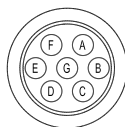
Function	Cable C / P	Cable L / RS	7 pin J C / P	7 pin J L / RS no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L / RS with Zero	10 pin M L / RS with Zero	5 pin M12 C / P	8 pin M12 L / RS	12 pin H	5 pin C C / P	8 pin C L / RS
+V DC	red	red	6	4	F	D	4 - 5	D - E	2	7	12	5	7
0 V	black	black	1	6	A	F	6	F	4	1	10	1	8
A+	green	green	3	1	C	A	1	A	3	6	5	2	1
A-	/	brown or grey	/	3	/	C	7	G	/	5	6	/	2
B+	yellow	yellow	5	2	E	B	2	B	1	4	8	4	3
B-	/	orange	/	5	/	E	8	H	/	3	1	/	4
Z+	blue	blue	4	/	D	/	3	C	5	2	3	3	5
Z-	/	white	/	/	/	/	9	I	/	8	4	/	6
⏏	shield	shield	7	7	G	G	10	J	housing ¹	housing ¹	9	housing ¹	housing ¹

¹ only with metal cover

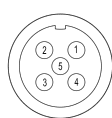
J connector (7 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (7 pin)
Amphenol MS3102-E-16-S
front view



M12 connector (5 pin)
M12 A coded
front view



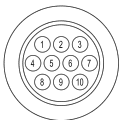
C connector (5 pin)
Amphenol C091 M16 IP40
front view



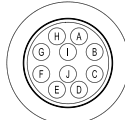
H connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



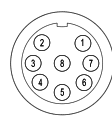
J connector (10 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (10 pin)
Amphenol MS3102-E-18-1
front view



M12 connector (8 pin)
M12 A coded
front view



C connector (8 pin)
Amphenol C091 IP40 IEC 60130-9
front view



MECHANICAL SPECIFICATIONS

Bore diameter	ø 8* / 10* / 12* / 14 / 15 mm * with supplied shaft adapter (valid for resolution ≥ 3000 ppr)
Enclosure rating IEC 60529	X = IP 54 S = IP 66
Max rotation speed	3000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	4 x 10 ⁻⁶ kgm ² (95 x 10 ⁻⁶ lbft ²)
Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,83 Ozin) with X enclosure rating < 0,06 Nm (8,50 Ozin) with S enclosure rating
Bearing stage material	aluminum
Shaft material	stainless steel
Shaft adapter material	bronze
Housing material	PA66 glass fiber reinforced / painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-20° ... +70°C (-4° ... +158°F)
Storage temperature⁵	-25° ... +70°C (-13° ... +158°F)
Weight	350 g (12,35 oz) 450 g (15,87 oz) with metal cover

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

EL 63 FB / GB / PB / PBF / PC / PCF

BLIND / THROUGH HOLLOW SHAFT INCREMENTAL ENCODER

MAIN FEATURES

Series of hollow shaft encoders for small AC motors, thanks to their compact size (only 35 mm height).

- 3 channel encoder (A / B / Z) up to 2500 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 300 kHz
- Cable output, connectors available on cable end
- Through or blind hollow shaft up to 15 mm diameter
- Shaft fixing by collar clamping

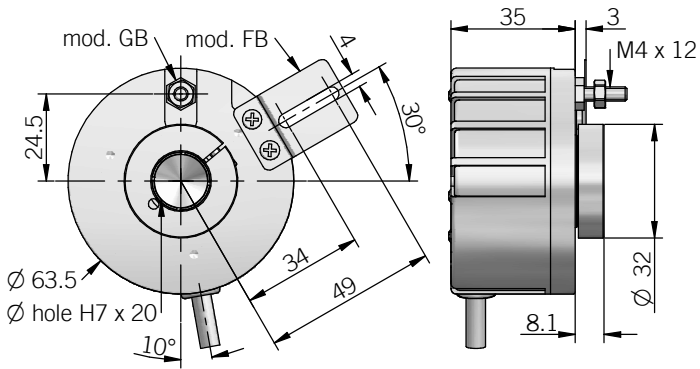


ORDERING CODE

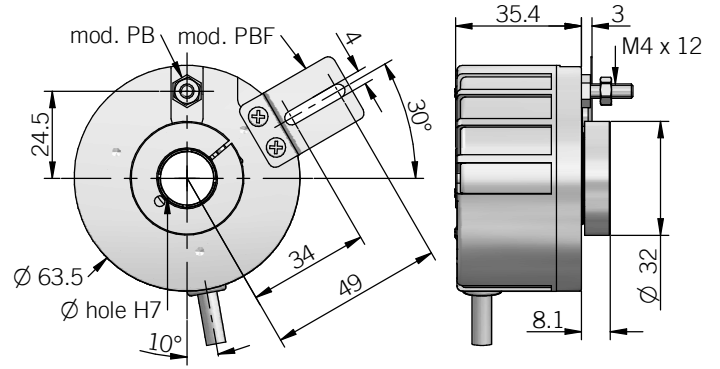
EL 63GB 500 S 5/28 P 8 X 3 PR .XXX

SERIES incremental encoder EL											
MODEL blind hollow shaft with torque stop slot 63FB blind hollow shaft with torque pin 63GB through hollow shaft with torque pin 63PB through hollow shaft with torque stop slot 63PBF rear fixing shaft with torque pin 63PC rear fixing shaft with torque stop slot 63PCF											
RESOLUTION ppr from 1 to 2500 refer to the available pulses list											
ZERO PULSE without zero pulse S with zero pulse Z											
POWER SUPPLY (with L electrical interface) 5 V DC 5 5 ... 28 V DC 5/28											
ELECTRICAL INTERFACE NPN open collector C push-pull P line driver L power supply 5/28 V DC - output RS-422 RS											
BORE DIAMETER mm 8 mm 10 mm 12 mm 14 mm 15											
ENCLOSURE RATING IP 54 X											
MAX ROTATION SPEED 3600 rpm 3											
OUTPUT TYPE radial cable (standard length 1,5 m) PR preferred cable lengths 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)											
VARIANT custom version XXX											

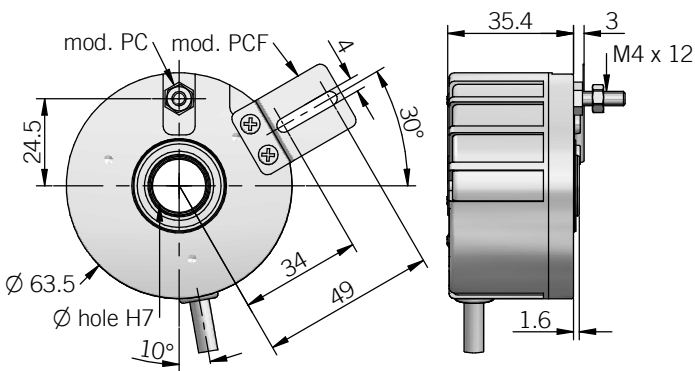
63FB / GB



63PB / PBF



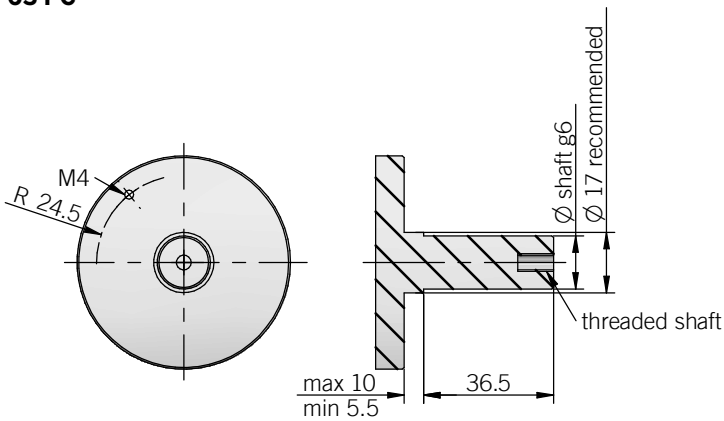
63PC / PCF



torque pin is included in model GB / PB / PC, for model FB / PBF / PCF please refer to Accessories

recommended mating shaft tolerance g6

**RECOMMENDED INTERFACE FLANGE DESIGN
63 PC**



dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 1 to 2500 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	300 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	200 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

RESOLUTIONS

1 - 2 - 5 - **20** - 25 - **32** - 50 - 60 - 100 - 128 - **200** - 250 - 256 - **360** - 400 - 500 - 512 - 600 - 720 - 1000 - **1024** - 1440 - 1800 - **2000** - 2048 - 2500

please directly contact our offices for other pulses, preferred resolutions in bold

MECHANICAL SPECIFICATIONS

Bore diameter	ø 8 / 10 / 12 / 14 / 15 mm
Enclosure rating	IP 54 (IEC 60529)
Max rotation speed	3600 rpm continuous / 4000 rpm peak
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	4 x 10 ⁻⁶ kgm ² (95 x 10 ⁻⁶ lbft ²)
Starting torque (at +20°C / +68°F)	< 0,04 Nm (5,66 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA 66 glass fiber reinforced
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4, 5}	-10° ... +60 °C (+14° ... +140°F)
Storage temperature⁵	-25° ... +70 °C (-13° ... +158°F)
Weight	350 g (12,35 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

CONNECTIONS

Function	Cable C / P	Cable L / RS
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
⊖	shield	shield

ER 72 A / B

BLIND HOLLOW SHAFT INCREMENTAL ENCODER

MAIN FEATURES

Standard encoder series for industrial environments with high mechanical resistance requirements. Specially designed for direct mounting on motors or tachometric dynamos thanks to integrated elastic coupling that allows radial and / or axial play on the motor shafty.

- 3 channel encoder (A / B / Z) up to 24000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 500 kHz
- Cable or connector output
- Metal cover available for heavy duty applications
- Integrated elastic coupling up to 10 mm bore diameter



ORDERING CODE **ER** **721** **A** **M*** **500** **S** **5/28** **P** **8** **X** **6** **M** **R** **.162** **+XXX**

SERIES
incremental encoder series ER

MODEL
fixing holes ø 63,5 mm **721**
fixing holes ø 65 mm **722**
fixing holes ø 57 mm **723**
fixing holes ø 60 mm **724**

FLANGE TYPE
flange type **A**
flange type **B**

METAL COVER
* add for metal cover **M**

RESOLUTION
ppr from **100** to **24000**
refer to the available pulses list

ZERO PULSE
without zero pulse **S**
with zero pulse **Z**

POWER SUPPLY
(with L electrical interface) 5 V DC **5**
5 ... 28 V DC **5/28**

ELECTRICAL INTERFACE
NPN open collector **C**
push-pull **P**
line driver **L**
power supply 5/28 V DC - output RS-422 **RS**

BORE DIAMETER
mm **6**
mm **8**
mm **10**

ENCLOSURE RATING
IP 54 **X**
(mod. 721 / 722 max 2500 ppr) IP 66 **S**

MAX ROTATION SPEED
(IP 66) 3000 rpm **3**
(IP 54) 6000 rpm **6**

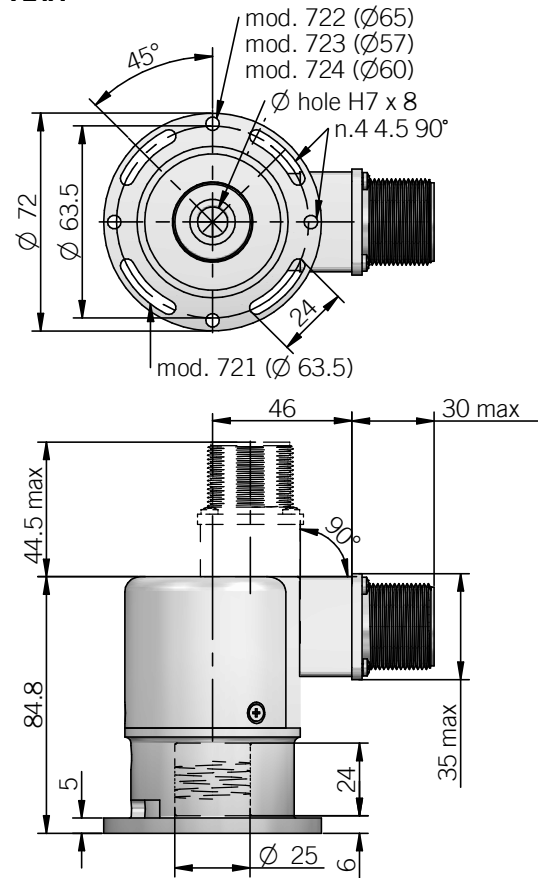
OUTPUT TYPE
cable (standard length 1,5 m) **P**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)
MIL plug connector **M**
JIS-C-5432 IP40 plug connector **J**
M12 plug connector **M12**
M23 plug connector **H**
M16 IP40 plug connector **C**

DIRECTION TYPE
axial **A**
radial **R**

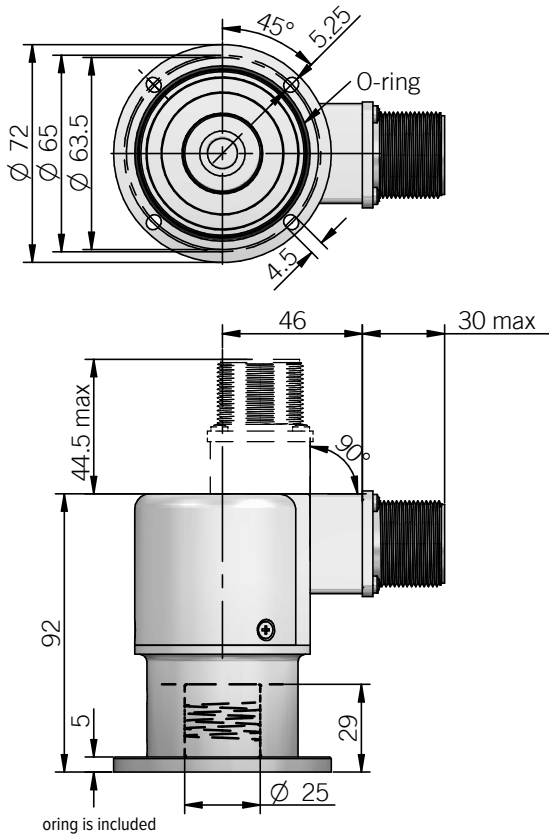
SOCKET
socket not included **.162**
to be reported only with connector output (eg. MR.162), for socket see Accessories

VARIANT
custom version **XXX**

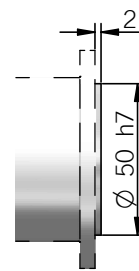
721A



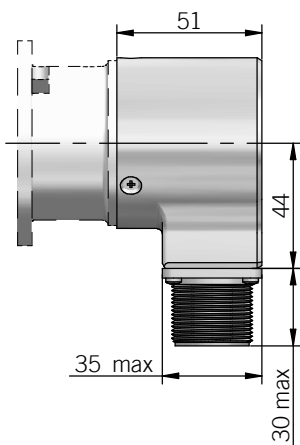
721A (S ENCLOSURE RATING)



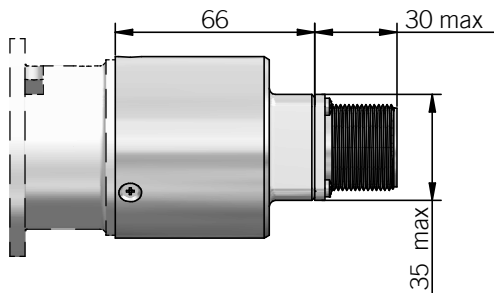
72B FLANGE



DIMENSIONS WITH METAL COVER AND RADIAL OUTPUT



DIMENSIONS WITH METAL COVER AND AXIAL OUTPUT



recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 100 to 24000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	250 kHz up to 6000 ppr / 500 kHz from 7200 ppr
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	263 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

MECHANICAL SPECIFICATIONS

Bore diameter	ø 6 / 8 / 10 mm
Enclosure rating IEC 60529	X = IP 54 S = IP 66
Max rotation speed	6000 rpm with X enclosure rating 3000 rpm / 70° C with S enclosure rating 2000 rpm / 85° C with S enclosure rating
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	3,5 x 10 ⁻⁶ kgm ² (83 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,83 Ozin) with X enclosure rating < 0,04 Nm (5,66 Ozin) with S enclosure rating
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced / painted aluminum
Elastic coupling material	aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-25° ... +85°C (-13° ... +185°F)
Storage temperature⁵	-25° ... +70°C (-13° ... +158°F)
Weight	400 g (14,11 oz) 500 g (17,64 oz) with metal cover

RESOLUTIONS

100 - 120 - 128 - 150 - 200 - 240 - 250 - 256 - 300 - **360** - 400 - 480 - **500** - **512** - **600** - 625 - **720** - 800 - 900 - **1000** - **1024** - 1200 - 1250 - 1440 - 1600 - 1800 - **2000** - **2048** - **2500** - 3000 - **3600** - 4000 - 4096 - **5000** - 6000 - **7200** - 8000 - 8192 - 9000 - **10000** - 10240 - 12000 - **14400** - 16000 - 16384 - 18000 - **20000** - 20480 - 24000

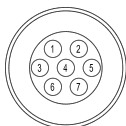
please directly contact our offices for other pulses, preferred resolutions in bold

CONNECTIONS

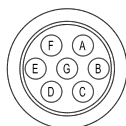
Function	Cable C / P	Cable L / RS	7 pin J C / P	7 pin J L / RS no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L / RS with Zero	10 pin M L / RS with Zero	5 pin M12 C / P	8 pin M12 L / RS	12 pin H	5 pin C C / P	8 pin C L / RS
+V DC	red	red	6	4	F	D	4 - 5	D - E	2	7	12	5	7
0 V	black	black	1	6	A	F	6	F	4	1	10	1	8
A+	green	green	3	1	C	A	1	A	3	6	5	2	1
A-	/	brown or grey	/	3	/	C	7	G	/	5	6	/	2
B+	yellow	yellow	5	2	E	B	2	B	1	4	8	4	3
B-	/	orange	/	5	/	E	8	H	/	3	1	/	4
Z+	blue	blue	4	/	D	/	3	C	5	2	3	3	5
Z-	/	white	/	/	/	/	9	I	/	8	4	/	6
⊥	shield	shield	7	7	G	G	10	J	housing ¹	housing ¹	9	housing ¹	housing ¹

¹ only with metal cover

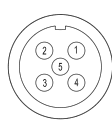
J connector (7 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (7 pin)
Amphenol MS3102-E-16-S
front view



M12 connector (5 pin)
M12 A coded
front view



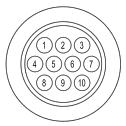
C connector (5 pin)
Amphenol C091 M16 IP40
front view



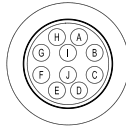
H connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



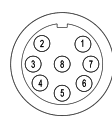
J connector (10 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (10 pin)
Amphenol MS3102-E-18-1
front view



M12 connector (8 pin)
M12 A coded
front view



C connector (8 pin)
Amphenol C091 IP40 IEC 60130-9
front view



EH 80 C / K / P / PG

BLIND / THROUGH HOLLOW SHAFT INCREMENTAL ENCODER

MAIN FEATURES

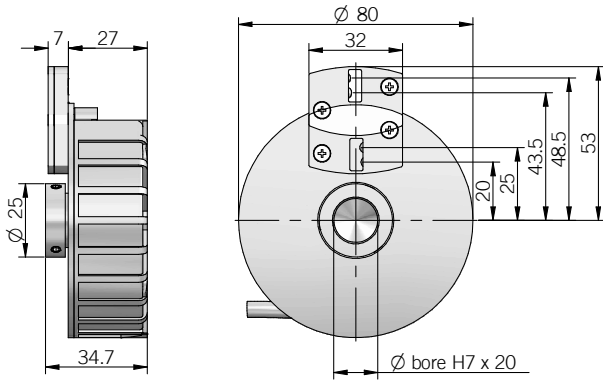
Series of encoders ø 80 mm with very high resistance to shock and vibration recommended for feedback control systems on AC servomotors.

- 3 channel encoder (A / B / Z) up to 2048 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 105 kHz
- Cable output, connectors available at cable end
- Through or blind hollow shaft diameter up to 15 mm
- Shaft mounting by grub screws or collar clamping

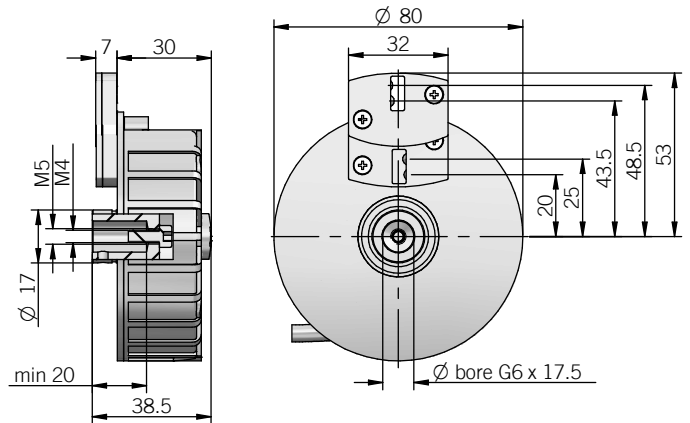


ORDERING CODE	EH	80C	500	S	5	L	8	X	6	PR	.XXX
SERIES incremental encoder EH											
MODEL blind hollow shaft 80C blind hollow shaft with rear fixing 80K through hollow shaft 80P through hollow shaft with collar clamping 80PG											
RESOLUTION ppr from 100 to 2048 refer to the available pulses list											
ZERO PULSE without zero pulse S with zero pulse Z											
POWER SUPPLY (with L electrical interface) 5 V DC 5 5 ... 28 V DC 5/28											
ELECTRICAL INTERFACE NPN open collector C push-pull P line driver L power supply 5/28 V DC - output RS-422 RS											
BORE DIAMETER (mod. C - P) mm 8 mm 10 (mod. C - P) mm 12 (mod. C - P - PG) mm 14 (mod. C - P - PG) mm 15											
ENCLOSURE RATING (mod. C - P - PG) IP 64 shaft side / IP 65 cover side X (mod. K) IP 64											
MAX ROTATION SPEED (mod. P - PG) 3500 rpm 3 (mod. C - K) 6000 rpm 6											
OUTPUT TYPE radial (standard length 0,3 m) PR preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)											
VARIANT custom version XXX											

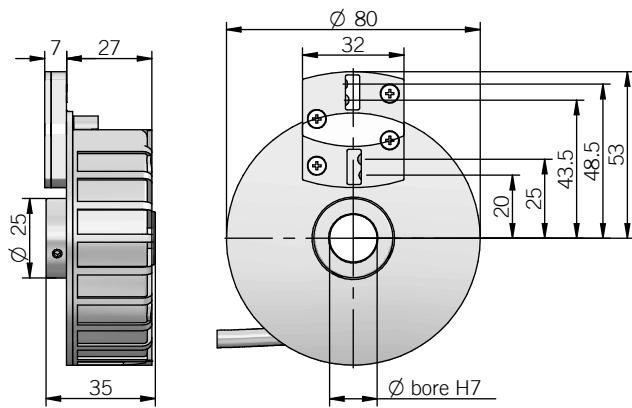
80C



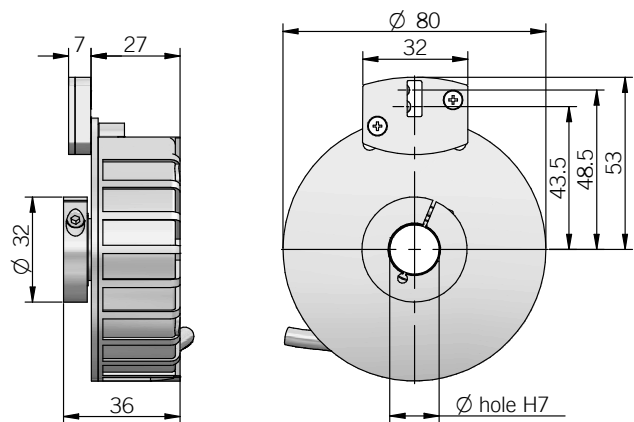
80K



80P



80PG



recommended mating shaft tolerance g6, model 80K mating shaft tolerance h7
for torque pin please refer to Accessories
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 100 to 2048 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	105 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	90°e (gated A&B)
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	207 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Bore diameter	ø 8 / 10 / 12 / 14 / 15 mm
Enclosure rating IEC 60529	IP 64 shaft side / IP 65 cover side (mod.C / P / PG) IP 64 (mod.K)
Max rotation speed	3500 rpm (mod.P / PG) 6000 rpm (mod.C / K)
Shock	70 G, 11 ms (IEC 60068-2-27)
Vibration	30 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	4 x 10 ⁻⁶ kgm ² (95 x 10 ⁻⁶ lbfm ²)
Starting torque (at +20°C / +68°F)	< 0,04 Nm (5,66 Ozin)
Bearing stage material	PA66 or PPS glass fiber reinforced
Shaft material	aluminum (mod. C / K) stainless steel (mod.P / PG)
Housing material	PA66 or PPS glass fiber reinforced
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-20° ... +85 °C (-4° ... +185°F) -20° ... +100°C (-4° ... +212°F) on demand
Storage temperature⁵	-25° ... +85 °C (-13° ... +185°F)
Weight	250 g (8,82 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

CONNECTIONS

Function	Cable C / P	Cable L / RS
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
\perp	shield	shield

RESOLUTIONS

100* - **200** - 250 - 256 - 360 - 400 - **500** - 512 - 600 - **1000** - **1024** - **2000** - **2048**

*available without zero pulse, please directly contact our offices for other pulses, preferred resolutions in bold

EH - EL 88 P

THROUGH HOLLOW SHAFT INCREMENTAL ENCODER

MAIN FEATURES

∅ 88 mm through hollow shaft encoder designed for medium size asynchronous motors.

- 3 channel encoder (A / B / Z) up to 2500 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 105 kHz
- Cable output, connectors available on cable end
- Sturdy mechanic
- 25 or 30 mm bore diameter, others on request
- Shaft fixing by grub screws

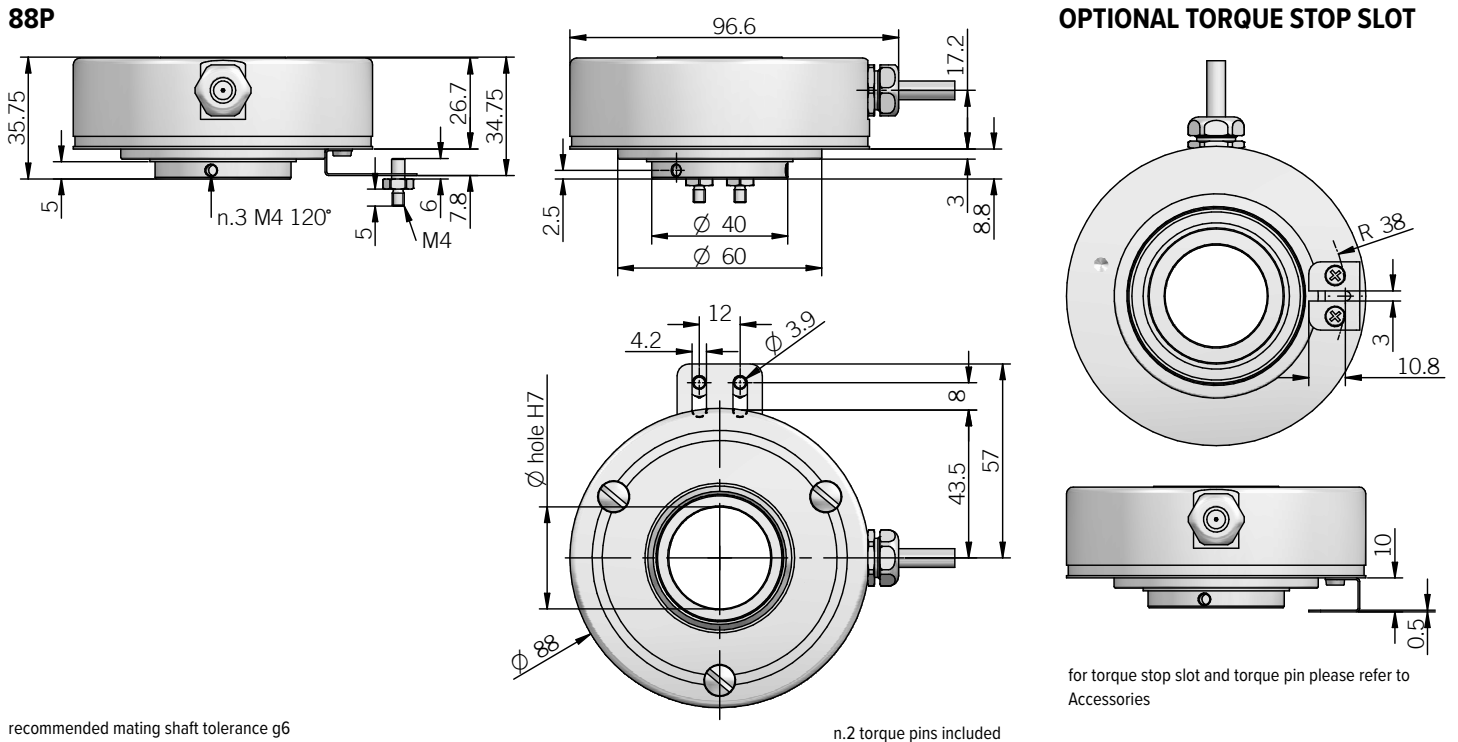


ORDERING CODE

EH 88P 1024 S 5/28 P 30 S 3 PR .XXX

ORDERING CODE	EH	88P	1024	S	5/28	P	30	S	3	PR	.XXX
SERIES incremental encoder series EH incremental encoder series EL											
MODEL through hollow shaft with torque stop slot 88P											
RESOLUTION (mod. EH) max ppr 2500 (mod. EL) max ppr 2048 refer to the available pulses list											
ZERO PULSE without zero pulse S with zero pulse Z											
POWER SUPPLY (with L electrical interface) 5 V DC 5 5 ... 28 V DC 5/28											
ELECTRICAL INTERFACE NPN open collector C push-pull P line driver L power supply 5/28 V DC - output RS-422 RS											
SHAFT DIAMETER mm 25 mm 30 please directly contact our offices for other diameters											
ENCLOSURE RATING IP 65 S											
MAX ROTATION SPEED 3000 rpm 3											
OUTPUT TYPE radial cable (standard length 0,5 m) PR preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)											
VARIANT custom version XXX											

88P



recommended mating shaft tolerance g6
dimensions in mm

n.2 torque pins included

for torque stop slot and torque pin please refer to Accessories

ELECTRICAL SPECIFICATIONS	
Resolution	from 250 to 2500 ppr EH series from 2 to 2048 ppr EL series
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Current consumption without load	100 mA max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	105 kHz
Index signal	90°e (gated A&B) EH series 180°e (gated A) EL series
Counting direction	A leads B clockwise (shaft view)
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	220 years EH series 331 years EL series
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS	
Shaft diameter	ø 25 / 30 mm
Enclosure rating	IP 65 (IEC 60529)
Max rotation speed	3000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27) EL series 70 G, 11 ms (IEC 60068-2-27) EH series
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6) EL series 30 G, 10 ... 2000 Hz (IEC 60068-2-6) EH series
Moment of inertia	45 x 10 ⁻⁶ kgm ² (10,68 x 10 ⁻⁴ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,1 Nm (14,16 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-10° ... +70°C (+14° ... +158°F)
Storage temperature⁵	-25° ... +85°C (-13° ... +185°F)
Weight	350 g (12,35 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

CONNECTIONS		
Function	Cable C / P	Cable L / RS
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
⊖	shield	shield

EH SERIES RESOLUTIONS
250 - 256 - 500 - 512 - 700 - 720 - 1000 - 1024 - 1440 - 2500

EL SERIES RESOLUTIONS
2 - 5 - 100 - 200 - 360 - 400 - 2000 - 2048

please directly contact our offices for other pulses, preferred resolutions in bold

EH 88 PE / PET

THROUGH HOLLOW SHAFT INCREMENTAL ENCODER

MAIN FEATURES

Cost effective encoder for asynchronous motors, suitable for elevators and stage machinery.

- 3 channel encoder (A / B / Z) up to 2500 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 105 kHz
- Cable output, connectors available on cable end
- Sturdy mechanic
- Up to 40 mm bore diameter
- Shaft fixing by collar clamping

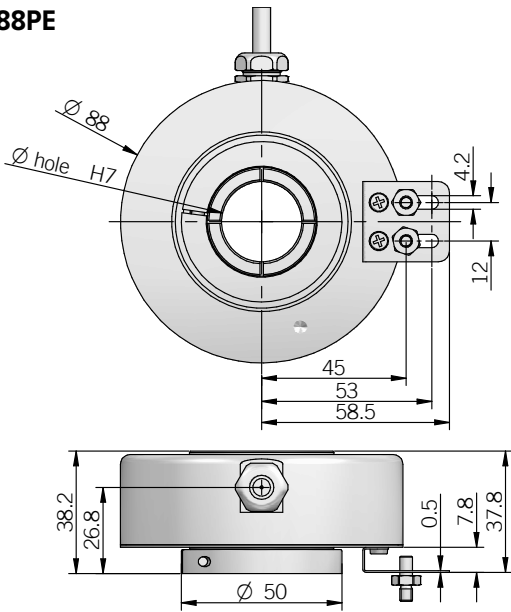


ORDERING CODE

EH 88PE 1024 S 5/28 P 30 X 3 PR .XXX

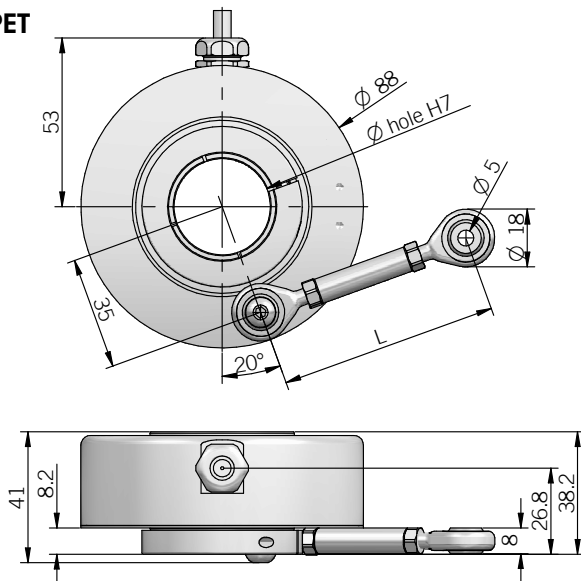
SERIES incremental encoder series EH												
MODEL through hollow shaft with torque stop slot 88PE through hollow shaft for torque arm fixing 88PET please refer to Accessories for torque arm												
RESOLUTION ppr from 500 to 2500 refer to the available pulses list												
ZERO PULSE without zero pulse S with zero pulse Z												
POWER SUPPLY (with L electrical interface) 5 V DC 5 5 ... 28 V DC 5/28												
ELECTRICAL INTERFACE push-pull P line driver L power supply 5/28 V DC - output RS-422 RS												
BORE DIAMETER mm 25 mm 30 (mod. PE) mm 35 (mod. PE) mm 38 (mod. PE) mm 40												
ENCLOSURE RATING IP 54 X												
MAX ROTATION SPEED 3000 rpm 3												
OUTPUT TYPE radial cable (standard length 0,5 m) PR preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)												
VARIANT custom version XXX												

88PE



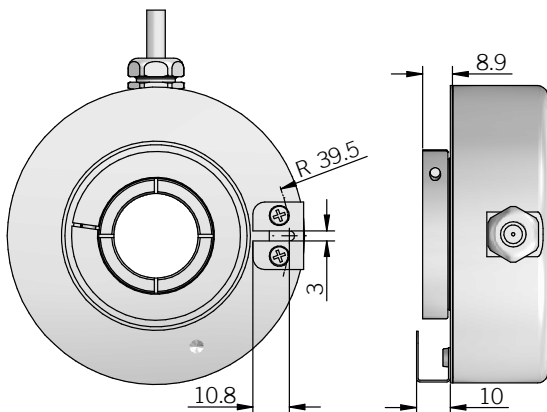
for torque pin please refer to Accessories

88PET



torque arm not included, please refer to Accessories

OPTIONAL TORQUE STOP SLOT



for torque stop slot and torque pin please refer to Accessories
recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 500 to 2500 ppr
Power supply ¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	20 mA / channel
Electrical interface ²	push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	105 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	90°e (gated A&B)
Mean time to dangerous failure (MTTF)_d ³ according to EN ISO 13849-1	220 years
Mission time (Tm) ³	20 years
Diagnostic coverage (DC) ³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Bore diameter	ø 25 / 30 / 35 / 38 / 40 mm
Enclosure rating	IP 54 (IEC 60529)
Max rotation speed	3000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	45 x 10 ⁻⁶ kgm ² (10,68 x 10 ⁻⁴ lbfm ²)
Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,83 Ozin)
Bearing stage material	aluminum
Shaft material	up to ø 38 mm aluminum ø 40 mm stainless steel
Housing material	aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature ^{4,5}	-30° ... +85°C (-22° ... +185°F)
Storage temperature ⁵	-30° ... +85°C (-22° ... +185°F)
Weight	350 g (12,35 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

CONNECTIONS

Function	Cable P	Cable L / RS
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
—	shield	shield

RESOLUTIONS

500 - 512 - 720 - **1000** - **1024** - 1440 - 2500

please directly contact our offices for other pulses, preferred resolutions in bold

MAIN FEATURES

∅ 120 mm through hollow shaft encoder designed for medium / large size motors.

- 3 channel encoder (A / B / Z) up to 2048 ppr
- Power supply up to +28 V DC with various electrical interfaces available
- Output frequency up to 105 kHz
- Cable output, connectors available at cable end
- Through hollow shaft up to 60 mm diameter
- Shaft fixing by grub screws



ORDERING CODE

EL 120P 1024 S 5/28 P 50 X 3 PR .XXX

SERIES
incremental encoder series EL

MODEL
through hollow shaft with spring 120P

RESOLUTION
ppr from 400 to 2048
refer to the available pulses list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
(with L electrical interface) 5 V DC 5
(with L electrical interface) 8 ... 24 V DC 8/24
5 ... 28 V DC 5/28

ELECTRICAL INTERFACE
push-pull P
line driver L

BORE DIAMETER
mm 40
mm 50
mm 60

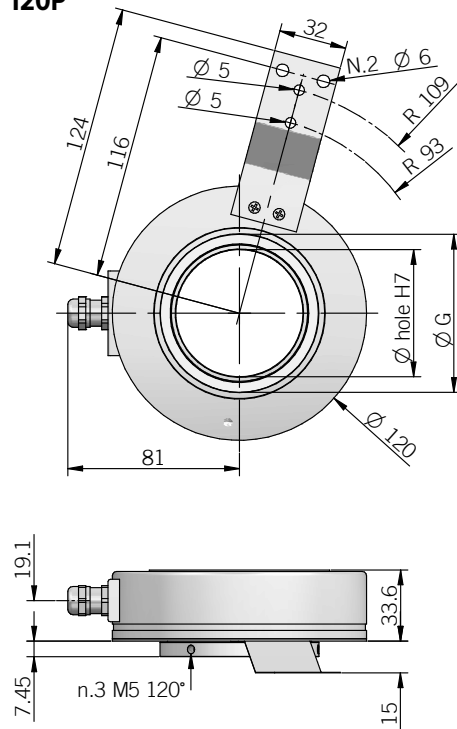
ENCLOSURE RATING
IP 54 X

MAX ROTATION SPEED
3000 rpm 3

OUTPUT TYPE
radial cable (standard length 0,5 m) PR
preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)

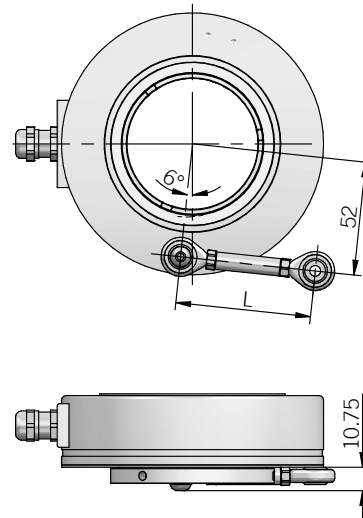
VARIANT
custom version XXX

120P



recommended mating shaft tolerance g6
dimensions in mm

INSTALLATION WITH TORQUE ARM



for torque arm please refer to Accessories

SHAFT DIAMETER	G
ø 40	ø 65
ø 50	ø 65
ø 60	ø 75

ELECTRICAL SPECIFICATIONS

Resolution	from 400 to 2048 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,75 ... 29,4 V DC 8/24 = 7,6 ... 25,2 V DC (reverse polarity protection)
Current consumption without load	100 mA max
Max load current	C / P = 50 mA / channel L = 20 mA / channel
Electrical interface²	push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	105 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	90°e (gated A&B)
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	429 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive
UL / CSA	file n. E212495

RESOLUTIONS

400 - 800 - 1000 - **1024** - 1440 - 1600 - 2000 - **2048**

please directly contact our offices for other pulses, preferred resolutions in bold

MECHANICAL SPECIFICATIONS

Bore diameter	ø 40 / 50 / 60 mm
Enclosure rating	IP 54 (IEC 60529)
Max rotation speed	3000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	approx 215 x 10 ⁻⁶ kgm ² (51 x 10 ⁻⁴ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,05 Nm (7 Ozin)
Bearing stage material	aluminum
Shaft material	aluminum
Housing material	aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	0° ... +60 °C (+32° ... +140°F)
Storage temperature⁵	-25° ... +70 °C (-13° ... +158°F)
Weight	750 g (26,46 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

CONNECTIONS

Function	Cable C / P	Cable L
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
⊖	shield	shield



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EMI 30 E / H

SOLID SHAFT MAGNETIC INCREMENTAL ENCODER

MAIN FEATURES

Miniaturised \varnothing 30 mm encoder series for use in small devices.
Recommended when a minimum size is required while still offering excellent performance.

- Innovative proprietary magnetic ASIC
- 3 channel encoder (A / B / Z) up to 20000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 800 kHz
- Cable output, connectors available at cable end
- Solid shaft diameter up to 6 mm
- Mounting by clamping or threaded flange



ORDERING CODE

EMI 30E 100 S 5/30 C 4 X X P A .XXX

SERIES
incremental encoder series EMI

MODEL
clamping flange \varnothing 15 mm 30E
M18 threaded flange 30H

RESOLUTION
ppr from 1 to 20000
please refer to the preferred resolutions list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
(with L electrical interface) 5 V DC 5
5 ... 30 V DC 5/30

ELECTRICAL INTERFACE
NPN open collector C
push-pull P
line driver L
power supply 5/28 V DC - output RS-422 RS

SHAFT DIAMETER
(mod. E) mm 4
mm 6

ENCLOSURE RATING
IP 54 X

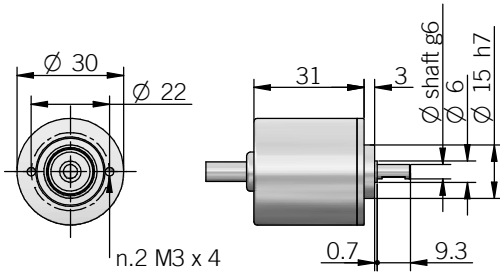
OPTION
to be reported X

OUTPUT TYPE
cable (standard length 0,5 m) P
preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)

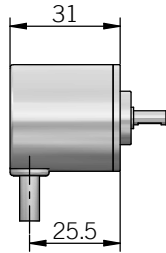
DIRECTION TYPE
axial A
radial R

VARIANT
custom version XXX

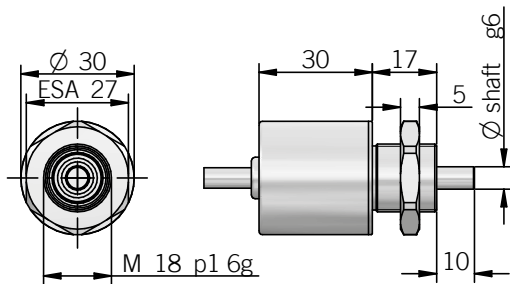
30E AXIAL CABLE OUTPUT



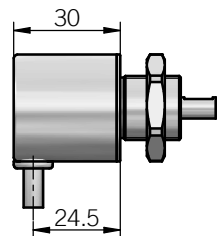
30E RADIAL CABLE OUTPUT



30H AXIAL CABLE OUTPUT



30H RADIAL CABLE OUTPUT



recommended mating shaft tolerance H7
dimensions in mm

CONNECTIONS

Function	Cable C / P	Cable L / RS
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
⊥	shield	shield

ELECTRICAL SPECIFICATIONS

Resolution	from 1 to 20000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/30 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	800 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Startup time typical	20 ms
Accuracy	± 0,1° at +20°C (+68°F) ± 0,5° in the operating temperature range
Hysteresis	0,70° up to 256 ppr 0,35° from 257 ppr to 20000 ppr
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	385 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 4 / 6 mm
Enclosure rating	IP 54 (IEC 60529)
Max rotation speed	3000 rpm
Max shaft load⁴	5 N (1,12 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,05 x 10 ⁻⁶ kgm ² (1,2 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,005 Nm (0,71 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-25° ... +85°C (-13° ... +185°F)
Storage temperature⁶	-25° ... +85°C (-13° ... +185°F)
Weight	70 g (2,47 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

PREFERRED RESOLUTIONS

1 - 2 - 4 - 5 - 6 - 8 - 10 - 12 - 16 - 20 - 30 - 40 - 50 - 60 - 80 - 90 - 100 - 125 - 128 - 200 - 250 - 256 - 360 - 400 - 500 - 512 - 720 - 1000 - 1024 - 1440 - 2000 - 2048 - 3600 - 4096 - 5000 - 7200 - 10000 - 14400 - 20000

please directly contact our offices for other pulses

EMI 40 A / B / C / H / I

SOLID SHAFT MAGNETIC INCREMENTAL ENCODER

MAIN FEATURES

Miniaturised ø 42 mm encoder series for general factory automation applications.

- Innovative proprietary magnetic ASIC
- 3 channel encoder (A / B / Z) up to 10000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Cable output, connectors available at cable end
- Solid shaft 6 mm diameter
- Mounting by clamping, square or threaded flange



ORDERING CODE

EMI 40A 100 S 5/30 P 6 X X P R .XXX

SERIES
magnetic incremental encoder series EMI

MODEL
clamping flange ø 20 mm 40A
square flange □ 36,5 mm 40B
clamping flange ø 17,46 mm 40C
M18 threaded flange 40H
M20 threaded flange 40I

RESOLUTION
ppr from 1 to 10000
please refer to the preferred resolutions list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
(with L electrical interface) 5 V DC 5
5 ... 30 V DC 5/30

ELECTRICAL INTERFACE
NPN open collector C
push-pull P
line driver L
power supply 5/30 V DC - output RS-422 RS

SHAFT DIAMETER
mm 6

ENCLOSURE RATING
IP 54 X
(mod. A / B) IP 66 S

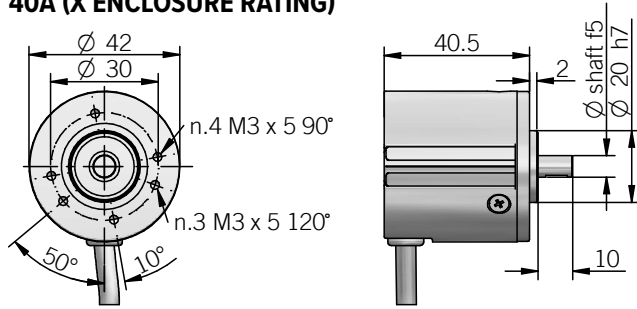
OPTION
to be reported X

OUTPUT TYPE
cable (standard length 0,5 m) P
preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)

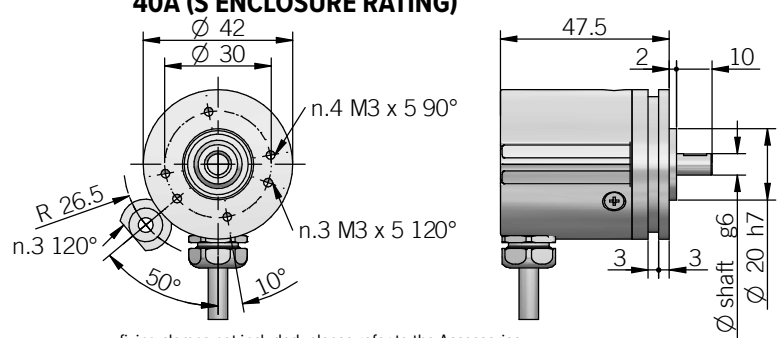
DIRECTION TYPE
(mod. A / B / C / H / I) axial A
radial R

VARIANT
custom version XXX

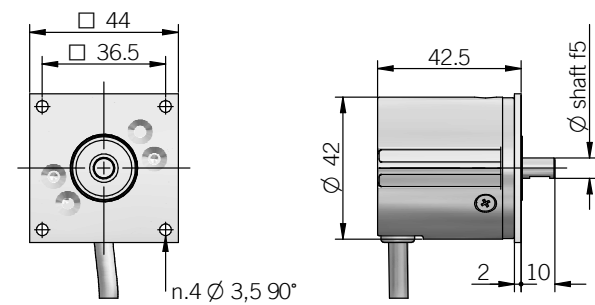
40A (X ENCLOSURE RATING)



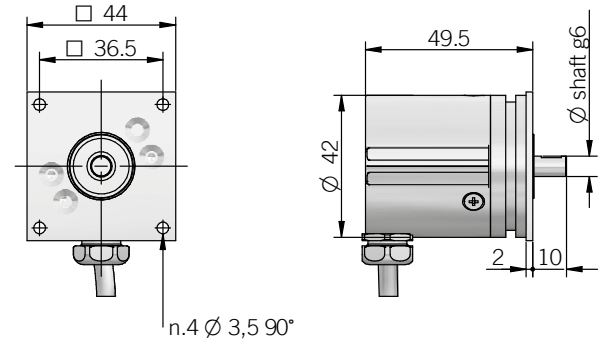
40A (S ENCLOSURE RATING)



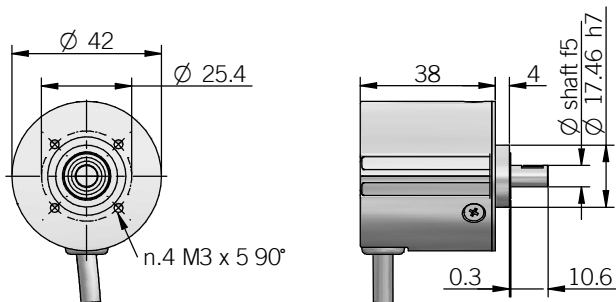
40B (X ENCLOSURE RATING)



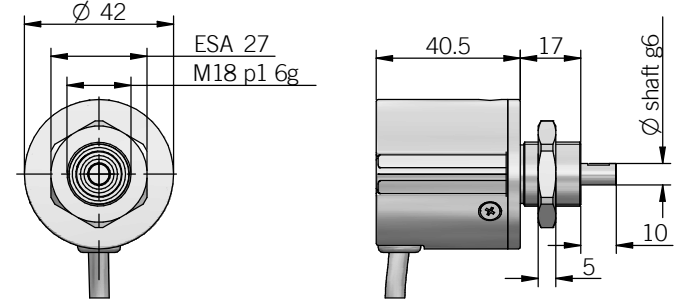
40B (S ENCLOSURE RATING)



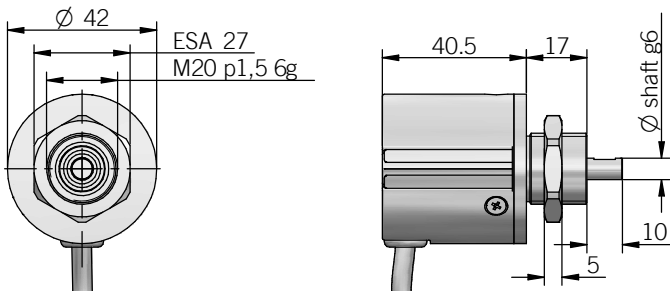
40C



40H

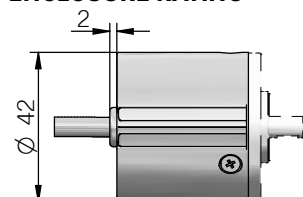


40I

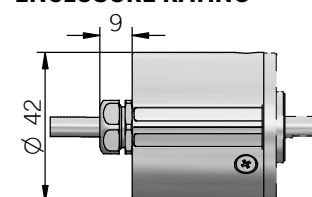


recommended mating shaft tolerance H7

DIMENSIONS WITH AXIAL OUTPUT WITH X ENCLOSURE RATING



DIMENSIONS WITH AXIAL OUTPUT WITH S ENCLOSURE RATING



dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 1 to 10000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/30 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	800 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Startup time typical	20 ms
Accuracy	< 0,2° at +20°C (+68°F) ± 0,5° in the operating temperature range
Hysteresis	0,70° up to 256 ppr 0,35° from 257 ppr to 10000 ppr
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	275 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

CONNECTIONS

Function	Cable C / P	Cable L / RS
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
≡	shield	shield

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 6 mm
Enclosure rating IEC 60529	X = IP 54 S = IP 66
Max rotation speed	6000 rpm with X enclosure rating 4000 rpm with S enclosure rating
Max shaft load⁴	30 N (6,74 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,1 x 10 ⁻⁶ kgm ² (2,4 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin) with X enclosure rating < 0,05 Nm (7,10 Ozin) with S enclosure rating
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5, 6}	-25° ... +100°C (-13° ... +212°F)
Storage temperature⁶	-25° ... +70°C (-13° ... +158°F)
Weight	100 g (3,52 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

PREFERRED RESOLUTIONS

2 - 4 - 5 - 6 - 8 - 10 - 12 - 16 - 20 - 30 - 40 - 50 - 60 - 80 - 90 - 100 - 125 - 128 -
200 - 250 - 256 - 360 - 400 - 500 - 512 - 720 - 1000 - 1024 - 1440 - 2000 - 2048 -
3600 - 4096 - 5000 - 7200 - 10000

please directly contact our offices for other pulses

EMI 58 B / C / H / T

SOLID SHAFT MAGNETIC INCREMENTAL ENCODER

MAIN FEATURES

Standard \varnothing 58 mm encoder series for industrial applications with high mechanical resistance requirements. Based on a proprietary magnetic sensor these encoders are designed to withstand high radial and axial shaft loads and can be mounted by flanges or fixing clamps.

- 3 channel encoder (A / B / Z) up to 10000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 800 kHz
Cable or connector output
- Metal cover available for heavy duty applications
- Solid shaft diameter up to 12 mm
- Mounting by synchronous, clamping or coupling flange



ORDERING CODE **EMI 58C M* 500 S 5/30 P 8 X X M R .162 +XXX**

SERIES
magnetic incremental encoder series **EMI**

MODEL
synchronous flange \varnothing 50 mm **58B**
clamping flange \varnothing 36 mm **58C**
clamping flange \varnothing 50 mm **58H**
coupling flange \varnothing 40 mm **58T**

METAL COVER
* add for metal cover **M**

RESOLUTION
ppr from **1** to **10000**
please refer to the preferred resolutions list

ZERO PULSE
without zero pulse **S**
with zero pulse **Z**

POWER SUPPLY
(with L electrical interface) 5 V DC **5**
5 ... 30 V DC **5/30**

ELECTRICAL INTERFACE
NPN open collector **C**
push-pull **P**
line driver **L**
power supply 5/30 V DC - output RS-422 **RS**

SHAFT DIAMETER
(mod. B) mm **6**
(mod. C) mm **8**
(mod. B / C / H) (3/8") mm **9,52**
mm **10**
(mod. T) mm **12**

ENCLOSURE RATING
IP 54 **X**
(mod. B / C / T) IP 66 **S**

OPTION
to be reported **X**

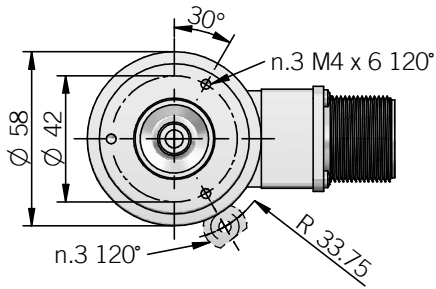
OUTPUT TYPE
cable (standard length 1,5 m) **P**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)
MIL plug connector **M**
JIS-C-5432 IP40 plug connector **J**
M12 plug connector **M12**
M23 plug connector **H**
M16 IP40 plug connector **C**

DIRECTION TYPE
axial **A**
radial **R**

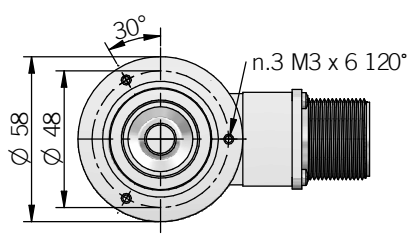
SOCKET
socket not included **.162**
to be reported only with connector output (eg. MR.162), for socket see Accessories

VARIANT
custom version **XXX**

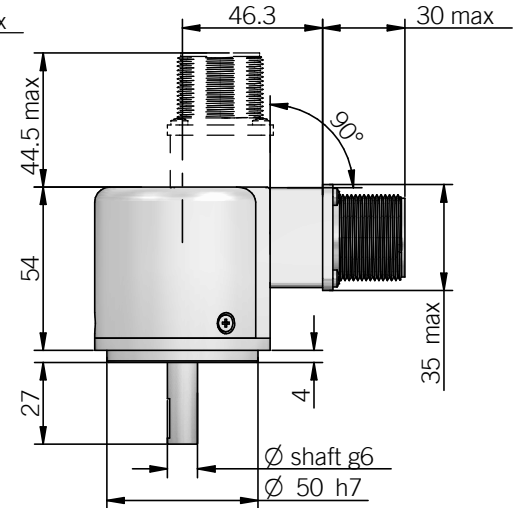
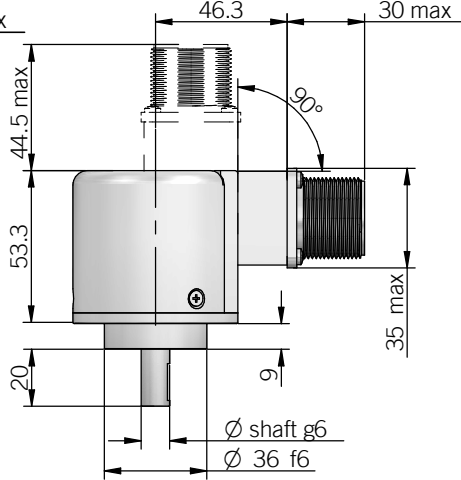
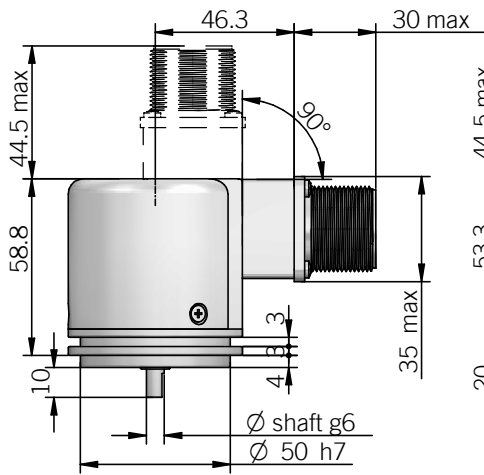
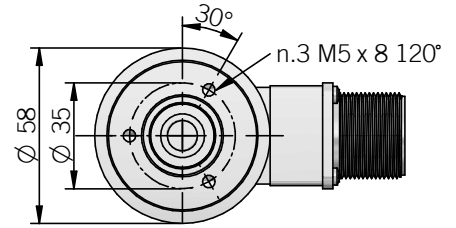
58B



58C

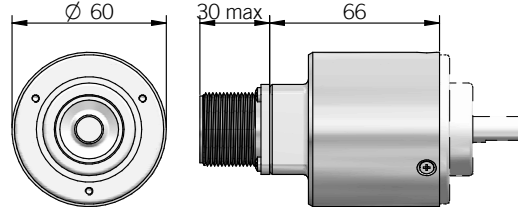


58H

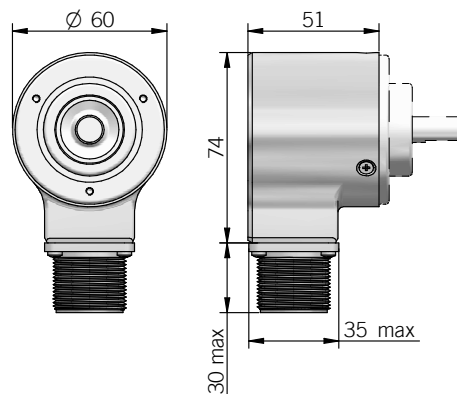


fixing clamps not included, please refer to Accessories

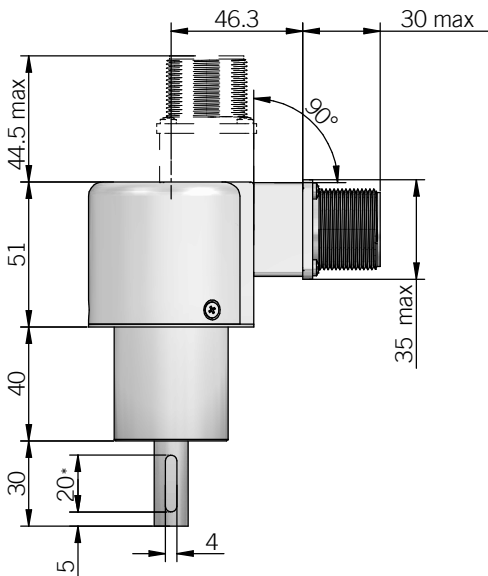
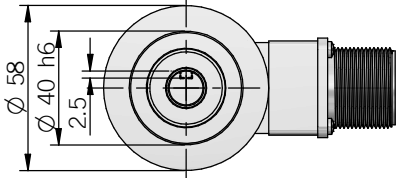
DIMENSION WITH METAL COVER AND AXIAL OUTPUT



DIMENSION WITH METAL COVER AND RADIAL OUTPUT



58T



* slot only with 12 mm shaft diameter
recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 1 to 10000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/30 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	800 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Startup time typical	20 ms
Accuracy	< 0,2° at +20°C (+68°F) ± 0,5° in the operating temperature range
Hysteresys	0,70° up to 256 ppr 0,35° from 257 ppr to 10000 ppr
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	275 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 6 / 8 / 9,52 (3/8") / 10 / 12 mm
Enclosure rating IEC 60529	X = IP 54 S = IP 66
Max rotation speed	6000 rpm
Max shaft load⁴	10 N (2,25 lbs) axial with ø 6 mm shaft 20 N (4,45 lbs) radial with ø 6 mm shaft 200 N (45 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 ⁻⁶ kgm ² (36 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,83 Ozin) with X enclosure rating < 0,06 Nm (8,50 Ozin) with S enclosure rating
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced / painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-25° ... +100°C (-13° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁶	-25° ... +70°C (-13° ... +158°F)
Weight	350 g (12,35 oz) 450 g (15,87 oz) with metal cover

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

PREFERRED RESOLUTIONS

2 - 4 - 5 - 6 - 8 - 10 - 12 - 16 - 20 - 30 - 40 - 50 - 60 - 80 - 90 - 100 - 125 - 128 - 200 - 250 - 256 - 360 - 400 - 500 - 512 - 720 - 1000 - 1024 - 1440 - 2000 - 2048 - 3600 - 4096 - 5000 - 7200 - 10000

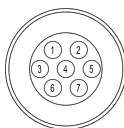
please directly contact our offices for other pulses

CONNECTIONS

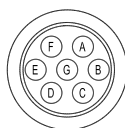
Function	Cable C / P	Cable L / RS	7 pin J C / P	7 pin J L / RS no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L / RS with Zero	10 pin M L / RS with Zero	5 pin M12 C / P	8 pin M12 L / RS	12 pin H	5 pin C C / P	8 pin C L / RS
+V DC	red	red	6	4	F	D	4 - 5	D - E	2	7	12	5	7
0 V	black	black	1	6	A	F	6	F	4	1	10	1	8
A+	green	green	3	1	C	A	1	A	3	6	5	2	1
A-	/	brown or grey	/	3	/	C	7	G	/	5	6	/	2
B+	yellow	yellow	5	2	E	B	2	B	1	4	8	4	3
B-	/	orange	/	5	/	E	8	H	/	3	1	/	4
Z+	blue	blue	4	/	D	/	3	C	5	2	3	3	5
Z-	/	white	/	/	/	/	9	I	/	8	4	/	6
⏏	shield	shield	7	7	G	G	10	J	housing ¹	housing ¹	9	housing ¹	housing ¹

¹ only with metal cover

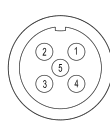
J connector (7 pin)
JIS-C-5432 IP40 Size 16
front view



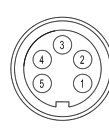
M connector (7 pin)
Amphenol MS3102-E-16-S
front view



M12 connector (5 pin)
M12 A coded
front view



C connector (5 pin)
Amphenol C091 M16 IP40
front view



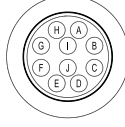
H connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



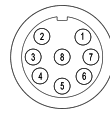
J connector (10 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (10 pin)
Amphenol MS3102-E-18-1
front view



M12 connector (8 pin)
M12 A coded
front view



C connector (8 pin)
Amphenol C091 IP40 IEC 60130-9
front view



MAIN FEATURES

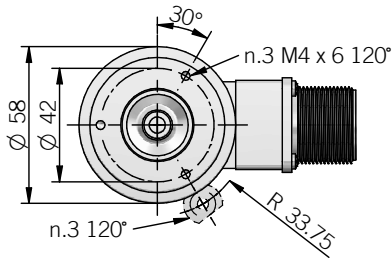
Solid shaft encoder series for industrial applications with high mechanical resistance requirements. The proprietary state of the art magnetic sensor offers a wide range of options (resolution, electrical output, index width, index length) programmable by the end user

- 3 channel encoder (A / B / Z) up to 20000 ppr
- Power supply up to +30 V DC with differential (TTL or HTL) as electrical interface
- Output frequency up to 800 kHz
- Cable or connector output, available with metal cover for heavy duty applications
- Solid shaft diameter up to 10 mm
- Mounting by synchronous or clamping flange

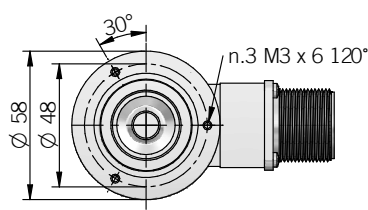


ORDERING CODE	EMI	P	58C	M* 20000	Z	5/30	L	15	X	X	M	R	.162	+XXX
SERIES magnetic incremental encoder EMI														
FEATURE user programmable P														
MODEL synchronous flange ø 50 mm 58B clamping flange ø 36 mm 58C														
METAL COVER * add for metal cover M														
RESOLUTION ppr 20000 user programmable from 1 to 20000 ppr														
ZERO PULSE with zero pulse Z														
POWER SUPPLY 5 ... 30 V DC 5/30														
ELECTRICAL INTERFACE line driver L TTL / HTL user programmable														
SHAFT DIAMETER (mod. B) mm 6 (mod. C) mm 8 (3/8") mm 9,52 mm 10														
ENCLOSURE RATING IP 54 X IP 66 S														
OPTION to be reported X														
OUTPUT TYPE cable (standard length 1,5 m) P preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) MIL plug connector M M12 plug connector M12 M23 plug connector H														
DIRECTION TYPE axial A radial R														
SOCKET socket not included .162 to be reported only with connector output (eg. MR.162), for socket see Accessories														
VARIANT custom version XXX														

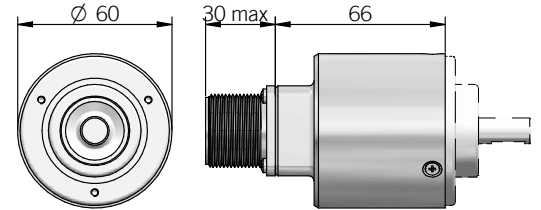
58 B



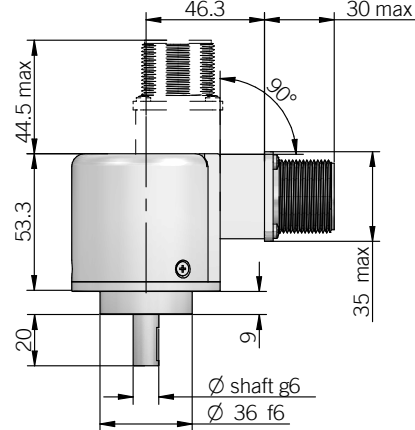
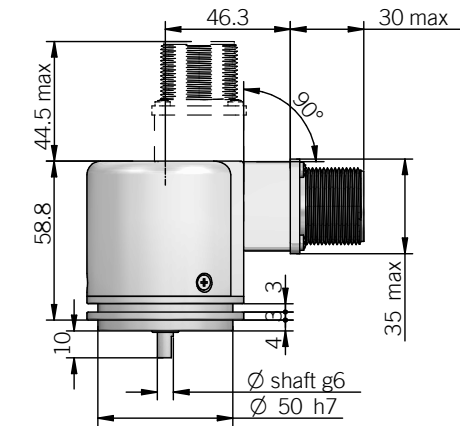
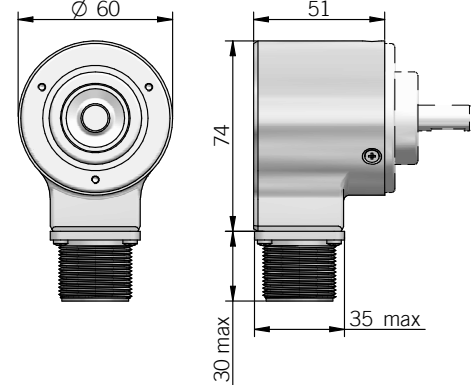
58 C



DIMENSION WITH METAL COVER AND AXIAL OUTPUT



DIMENSION WITH METAL COVER AND RADIAL OUTPUT



recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS		MECHANICAL SPECIFICATIONS	
Resolution	user programmable from 1 to 20000 ppr default 1024 ppr	Shaft diameter	ø 6 / 8 / 9,52 (3/8") / 10 mm
Power supply¹	4,5 ... 30 V DC (reverse polarity protection)	Enclosure rating IEC 60529	X = IP 54 S = IP 66
Power draw without load	0,8 W max	Max rotation speed	6000 rpm
Max load current	20 mA / channel	Max shaft load⁴	10 N (2,25 lbs) axial with ø 6 mm shaft 20 N (4,45 lbs) radial with ø 6 mm shaft 200 N (45 lbs) axial / radial
Electrical interface²	line driver TTL / HTL (AEIC-7272 or similar) user programmable / default TTL	Shock	50 G, 11 ms (IEC 60068-2-27)
Max output frequency	800 kHz	Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Counting direction	user programmable default A leads B clockwise (shaft view)	Moment of inertia	1,5 x 10 ⁻⁶ kgm ² (36 x 10 ⁻⁶ lbf ²)
Index length	user programmable default 180°e (gated A)	Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,83 Ozin) with X enclosure rating < 0,06 Nm (8,50 Ozin) with S enclosure rating
Accuracy	± 0,10°	Bearing stage material	aluminum
Hysteresis	user programmable from 0° to 0,70° default 0,17°	Shaft material	stainless steel
Start-up time	500 ms	Housing material	PA66 glass fiber reinforced / painted aluminum
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	173 years	Bearings	n.2 ball bearings
Mission time (Tm)³	20 years	Bearings life	10 ⁹ revolutions
Diagnostic coverage (DC)³	0%	Operating temperature^{5,6}	-25° ... +100°C (-13° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm	Storage temperature⁶	-25° ... +70°C (-13° ... +158°F)
Electromagnetic compatibility	according to 2014/30/EU directive	Weight	350 g (12,35 oz) 450 g (15,87 oz) with metal cover
RoHS	according to 2011/65/EU directive		
UL / CSA	file n. E212495		

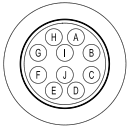
¹ as measured at the transducer without cable influences
² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section
⁴ maximum load for static usage
⁵ measured on the transducer flange
⁶ condensation not allowed

CONNECTIONS

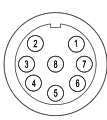
Function	Cable	10 pin M	8 pin M12	12 pin H
+V DC	red	D - E	7	12
0 V	black	F	1	10
A+	green	A	6	5
A-	brown or grey	G	5	6
B+	yellow	B	4	8
B-	orange	H	3	1
Z+	blue	C	2	3
Z-	white	I	8	4
⏏	shield	J	housing ¹	9

¹ only with metal cover

M connector (10 pin)
Amphenol MS3102-E-18-1
front view



M12 connector (8 pin)
M12 A coded
front view



H connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



EMI 63 A / D / E

SOLID SHAFT MAGNETIC INCREMENTAL ENCODER

MAIN FEATURES

Standard ø 63 mm encoder series for industrial applications with high mechanical resistance requirements. Based on a proprietary magnetic sensor these encoders are designed to withstand high radial and axial shaft loads and can be mounted by flanges or fixing clamps.

- 3 channel encoder (A / B / Z) up to 10000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 800 kHz
- Cable or connector output
- Metal cover available for heavy duty applications
- Solid shaft diameter up to 10 mm
- Mounting by synchronous or centering 2,5" square flange



ORDERING CODE

EMI 63A M* 500 S 5/30 P 8 X X M R .162 +XXX

SERIES
magnetic incremental encoder series **EMI**

MODEL
synchronous flange ø 31,75 mm **63A**
centering square flange ø 31,75 mm **63D**
centering square flange ø 50 mm **63E**

METAL COVER
* add for metal cover **M**

RESOLUTION
ppr from **1** to **10000**
please refer to the preferred resolutions list

ZERO PULSE
without zero pulse **S**
with zero pulse **Z**

POWER SUPPLY
(with L electrical interface) 5 V DC **5**
5 ... 30 V DC **5/30**

ELECTRICAL INTERFACE
NPN open collector **C**
push-pull **P**
line driver **L**
power supply 5/30 V DC - output RS-422 **RS**

SHAFT DIAMETER
mm **8**
(3/8") mm **9,52**
mm **10**

ENCLOSURE RATING
IP 54 **X**
IP 66 **S**

OPTION
to be reported **X**

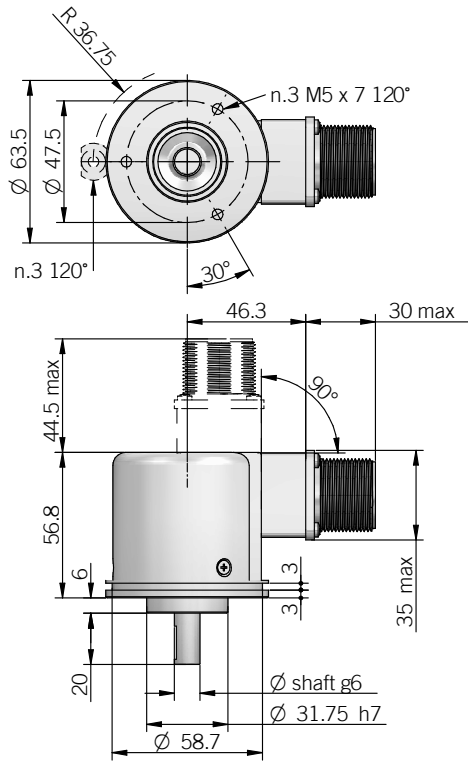
OUTPUT TYPE
cable (standard length 1,5 m) **P**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)
MIL plug connector **M**
JIS-C-5432 IP40 plug connector **J**
M12 plug connector **M12**
M23 plug connector **H**
M16 IP40 plug connector **C**

DIRECTION TYPE
axial **A**
radial **R**

SOCKET
socket not included **.162**
to be reported only with connector output (eg. MR.162), for socket see Accessories

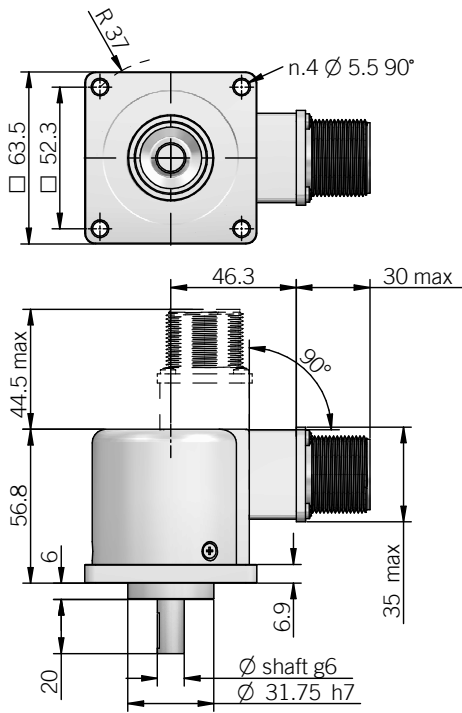
VARIANT
custom version **XXX**

63A

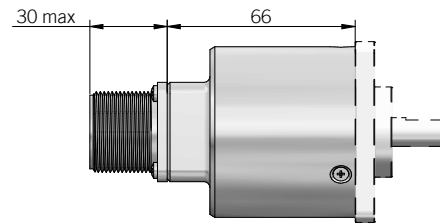


fixing clamps not included, please refer to the Accessories

63D

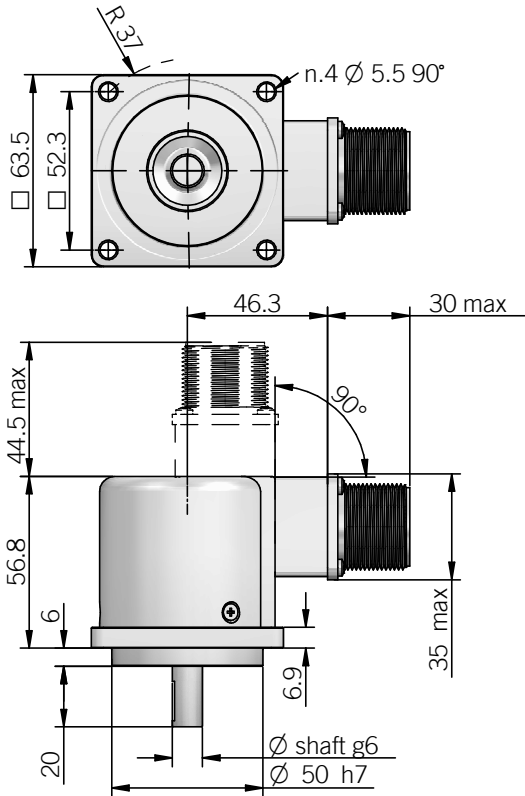


DIMENSION WITH METAL COVER AND AXIAL OUTPUT

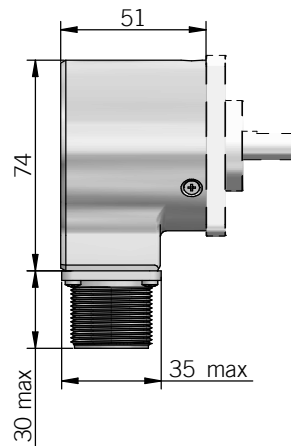


DIMENSION WITH METAL COVER AND RADIAL OUTPUT

63 E



recommended mating shaft tolerance H7
dimensions in mm



ELECTRICAL SPECIFICATIONS

Resolution	from 1 to 10000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/30 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	800 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Startup time typical	20 ms
Accuracy	< 0,2° at +20°C (+68°F) ± 0,5° in the operating temperature range
Hysteresys	0,70° up to 256 ppr 0,35° from 257 ppr to 10000 ppr
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	275 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 8 / 9,52 (3/8") / 10 mm
Enclosure rating IEC 60529	X = IP 54 S = IP 66
Max rotation speed	6000 rpm
Max shaft load⁴	200 N (45 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 ⁻⁶ kgm ² (36 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,83 Ozin) with X enclosure rating < 0,06 Nm (8,50 Ozin) with S enclosure rating
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced / painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-25° ... +100°C (-13° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁶	-25° ... +70°C (-13° ... +158°F)
Weight	350 g (12,35 oz) 450 g (15,87 oz) with metal cover

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

PREFERRED RESOLUTIONS

2 - 4 - 5 - 6 - 8 - 10 - 12 - 16 - 20 - 30 - 40 - 50 - 60 - 80 - 90 - 100 - 125 - 128 - 200 - 250 - 256 - 360 - 400 - 500 - 512 - 720 - 1000 - 1024 - 1440 - 2000 - 2048 - 3600 - 4096 - 5000 - 5000 - 7200 - 10000

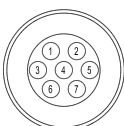
please directly contact our offices for other pulses

CONNECTIONS

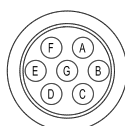
Function	Cable C / P	Cable L / RS	7 pin J C / P	7 pin J L / RS no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L / RS with Zero	10 pin M L / RS with Zero	5 pin M12 C / P	8 pin M12 L / RS	12 pin H	5 pin C C / P	8 pin C L / RS
+V DC	red	red	6	4	F	D	4 - 5	D - E	2	7	12	5	7
0 V	black	black	1	6	A	F	6	F	4	1	10	1	8
A+	green	green	3	1	C	A	1	A	3	6	5	2	1
A-	/	brown or grey	/	3	/	C	7	G	/	5	6	/	2
B+	yellow	yellow	5	2	E	B	2	B	1	4	8	4	3
B-	/	orange	/	5	/	E	8	H	/	3	1	/	4
Z+	blue	blue	4	/	D	/	3	C	5	2	3	3	5
Z-	/	white	/	/	/	/	9	I	/	8	4	/	6
⏏	shield	shield	7	7	G	G	10	J	housing ¹	housing ¹	9	housing ¹	housing ¹

¹ only with metal cover

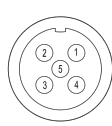
J connector (7 pin)
JIS-C-5432 IP40 Size 16
front view



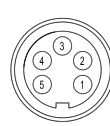
M connector (7 pin)
Amphenol MS3102-E-16-S
front view



M12 connector (5 pin)
M12 A coded
front view



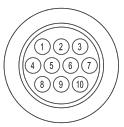
C connector (5 pin)
Amphenol C091 M16 IP40
front view



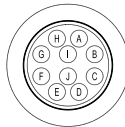
H connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



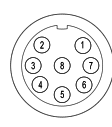
J connector (10 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (10 pin)
Amphenol MS3102-E-18-1
front view



M12 connector (8 pin)
M12 A coded
front view



C connector (8 pin)
Amphenol C091 IP40 IEC 60130-9
front view



EMI 90 A - 115 A

SOLID SHAFT MAGNETIC INCREMENTAL ENCODER

MAIN FEATURES

Encoder series designed for use in harsh environments with high mechanical resistance requirements. The model 90A can be mounted synchronous flange and fixing clamps while the model 115A has a tachometer generator REO-444 type compatible flange.

- 3 channel encoder (A / B / Z) up to 10000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 800 kHz
- Cable or connector output
- Metal cover for heavy duty applications
- Solid shaft diameter up to 11 mm
- Mounting by synchronous or REO-444 flange



ORDERING CODE

EMI 90A 500 S 5/30 P 8 X X M R .162 +XXX

SERIES
magnetic incremental encoder series EMI

MODEL
synchronous flange ø 40 mm 90A
flange REO-444 115A

RESOLUTION
ppr from 1 to 10000
refer to the available pulses list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
(with L electrical interface) 5 V DC 5
5 ... 30 V DC 5/30

ELECTRICAL INTERFACE
NPN open collector C
push-pull P
line driver L
power supply 5/30 V DC - output RS-422 RS

SHAFT DIAMETER
(mod. 90A) mm 8
(mod. 90A) (3/8") mm 9,52
mm 10
(mod. 115A) mm 11

ENCLOSURE RATING
IP 54 shaft side / IP 67 cover side X
IP 66 shaft side (mod. 90A) - IP 65 shaft side (mod. 115A) / IP 67 cover side S

OPTION
to be reported X

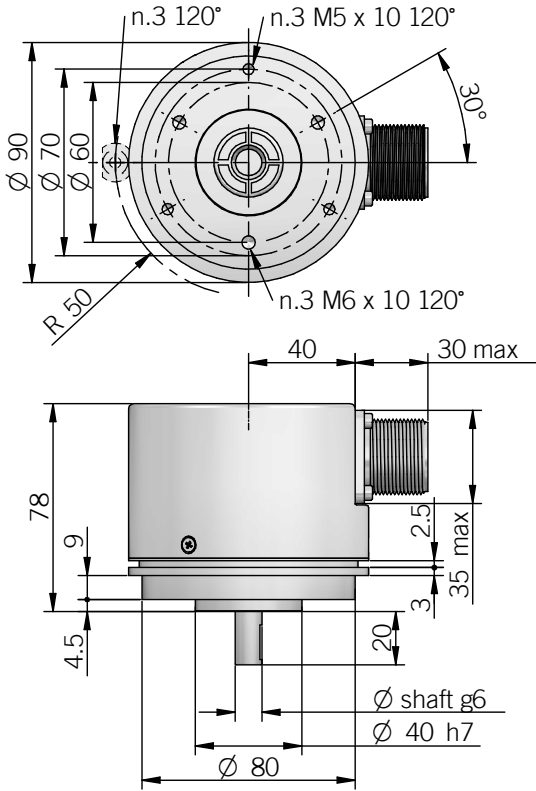
OUTPUT TYPE
cable (standard length 1.5 m) P
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)
MIL plug connector M
JIS-C-5432 IP40 plug connector J

DIRECTION TYPE
axial A
radial R

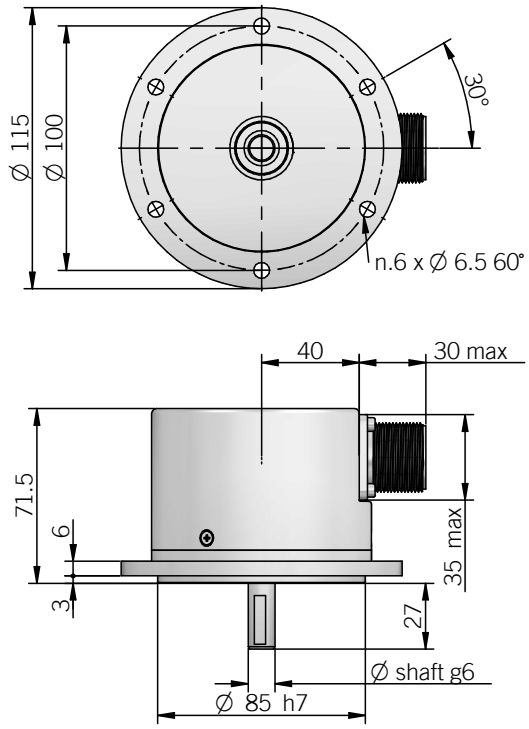
SOCKET
socket not included .162
to be reported only with connector output (eg. MR.162), for socket see Accessories

VARIANT
custom version XXX

90A

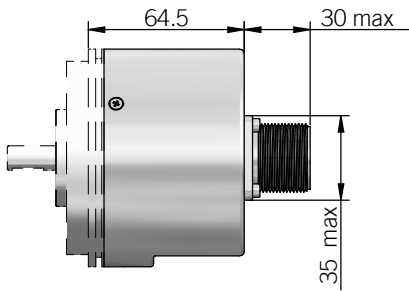


115A

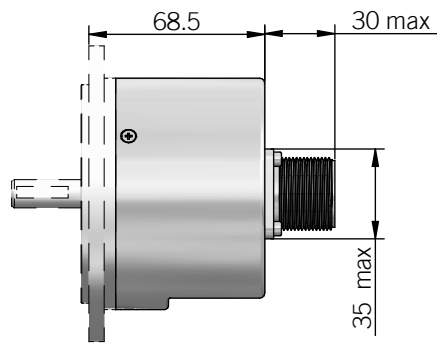


fixing clamps not included, please refer to Accessories

90A WITH AXIAL OUTPUT



115A WITH AXIAL OUTPUT



recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 1 to 10000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/30 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	800 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Startup time typical	20 ms
Accuracy	< 0,2° at +20°C (+68°F) ± 0,5° in the operating temperature range
Hysteresis	0,70° up to 256 ppr 0,35° from 257 ppr to 10000 ppr
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	275 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 8 / 9,52 (3/8") / 10 / 11 mm
Enclosure rating IEC 60529	X = IP 54 shaft side / IP 67 cover side S = IP 66 shaft side / IP 67 cover side (mod. 90A) S = IP 65 shaft side / IP 67 cover side (mod. 115A)
Max rotation speed	6000 rpm
Max shaft load⁴	200 N (45 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	3,5 x 10 ⁻⁶ kgm ² (83 x 10 ⁻⁶ lbfm ²)
Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,83 Ozin) with X enclosure rating < 0,06 Nm (8,50 Ozin) with S enclosure rating
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-25° ... +85°C (-13° ... +185°F)
Storage temperature⁶	-25° ... +70°C (-13° ... +158°F)
Weight	350 g (12,35 oz) 450 g (15,87 oz) with metal cover

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

PREFERRED RESOLUTIONS

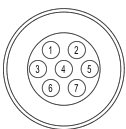
2 - 4 - 5 - 6 - 8 - 10 - 12 - 16 - 20 - 30 - 40 - 50 - 60 - 80 - 90 - 100 - 125 - 128 -
200 - 250 - 256 - 360 - 400 - 500 - 512 - 720 - 1000 - 1024 - 1440 - 2000 - 2048 -
3600 - 4096 - 5000 - 7200 - 10000

please directly contact our offices for other pulses

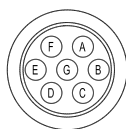
CONNECTIONS

Function	Cable C / P	Cable L / RS	7 pin J C / P	7 pin J L / RS no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L / RS with Zero	10 pin M L / RS with Zero
+V DC	red	red	6	4	F	D	4 - 5	D - E
0 V	black	black	1	6	A	F	6	F
A+	green	green	3	1	C	A	1	A
A-	/	brown or grey	/	3	/	C	7	G
B+	yellow	yellow	5	2	E	B	2	B
B-	/	orange	/	5	/	E	8	H
Z+	blue	blue	4	/	D	/	3	C
Z-	/	white	/	/	/	/	9	I
⏏	shield	shield	7	7	G	G	10	J

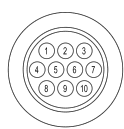
J connector (7 pin)
JIS-C-5432 IP40 Size 16
front view



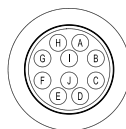
M connector (7 pin)
Amphenol MS3102-E-16-S
front view



J connector (10 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (10 pin)
Amphenol MS3102-E-18-1
front view



MAIN FEATURES

Series of miniaturised encoders with innovative proprietary magnetic sensor for integration on small size AC/DC motors, stepper motors or for applications of limited size.

- 3 channel encoder (A / B / Z) with resolution up to 10000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Cable output, connectors available at cable end
- Compact size (height < 25 mm)
- No wear due to non-contact magnetic technology
- Bore shaft diameter up to 10 mm
- Wide operating temperature range -20° ... +100°C (-4° ... +212°F)
- OEM version available without cover for easy integration



ORDERING CODE

EMI 30M *S 50 Z 5/30 P 6 X X PR .XXX

SERIES
magnetic incremental encoder series EMI

MODEL
kit encoder 30M

COVER
* add if without cover S

RESOLUTION
ppr from 1 to 10000
please refer to the preferred resolutions list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
5 V DC 5
5 ... 30 V DC 5/30

ELECTRICAL INTERFACE
NPN open collector C
push-pull P
line driver L
power supply 5/30 V DC - output RS-422 RS

BORE DIAMETER
mm 6
(1/4") mm 6,35
mm 8
mm 10

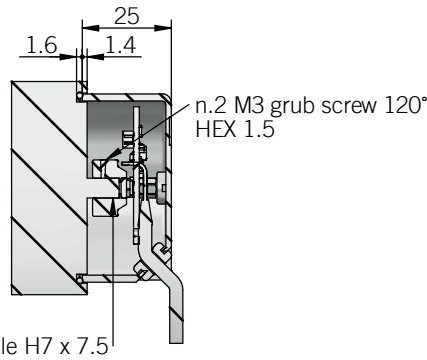
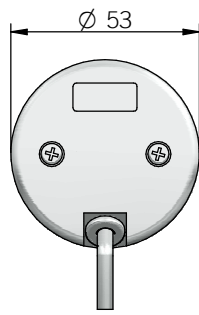
ENCLOSURE RATING
IP 54 X

OPTION
to be reported X

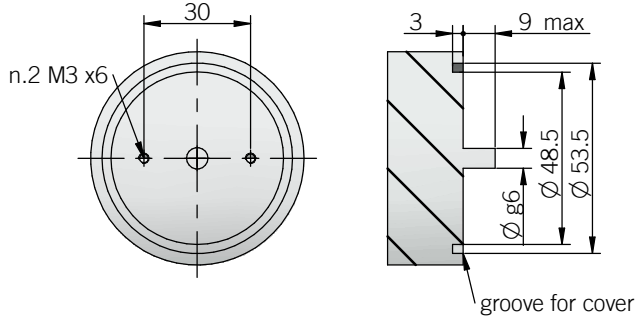
OUTPUT TYPE
radial cable (standard length 0,5 m) PR
preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)

VARIANT
custom version XXX

30M

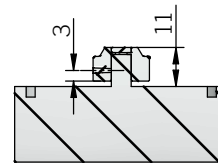


RECOMMENDED INTERFACE FLANGE DESIGN



dimensions in mm

MAGNET-ACTUATOR INSTALLATION



ELECTRICAL SPECIFICATIONS	
Resolution	from 1 to 10000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/30 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	800 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Startup time typical	20 ms
Accuracy	< 0,2° at +20°C (+68°F) ± 0,5° in the operating temperature range
Hysteresis	0,70° up to 256 ppr 0,35° from 257 ppr to 10000 ppr
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	253 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive
UL / CSA	file n. E212495

PREFERRED RESOLUTIONS
2 - 4 - 5 - 6 - 8 - 10 - 12 - 16 - 20 - 30 - 40 - 50 - 60 - 80 - 90 - 100 - 125 - 128 - 200 - 250 - 256 - 360 - 400 - 500 - 512 - 720 - 1000 - 1024 - 1440 - 2000 - 2048 - 3600 - 4096 - 5000 - 7200 - 10000

please directly contact our offices for other pulses

MECHANICAL SPECIFICATIONS	
Bore diameter	ø 6 / 6,35 (1/4") / 8 / 10 mm
Enclosure rating	IP 54 (IEC 60529) when properly installed with supplied oring kit
Max rotation speed	limited only by output frequency
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,1 x 10 ⁻⁶ kgm ² (2,4 x 10 ⁻⁶ lbf ²)
Magnet-actuator material	aluminium
Cover material	PA66 glass fiber reinforced
Shaft radial play allowed	± 0,25 mm
Shaft axial play allowed	± 0,5 mm
Operating temperature^{4,5}	-20° ... +100°C (-4° ... +212°F)
Storage temperature⁵	-20° ... +100°C (-4° ... +212°F)
Weight	100 g approx (3,5 oz)

¹ as measured at the transducer without cable influences
² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section
⁴ measured on the transducer flange
⁵ condensation not allowed

CONNECTIONS		
Function	Cable C / P	Cable L / RS
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
⊖	shield	shield

MAIN FEATURES

Thanks to its magnetic technology, the EMI 38 series is suitable for applications in harsh environment such as marble and glass processing machines, washing machines and industrial automation in general.

- Innovative proprietary magnetic ASIC
- 3 channel encoder (A / B / Z) with resolution up to 10000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Cable output, connectors available at cable end
- Blind hollow shaft up to 10 mm diameter with shaft fixing by collar clamping
- Wide operating temperature range -25° ... +100°C (-13° ... +212°F)

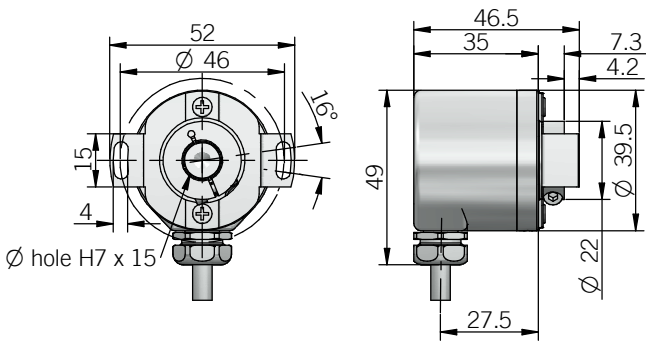


ORDERING CODE

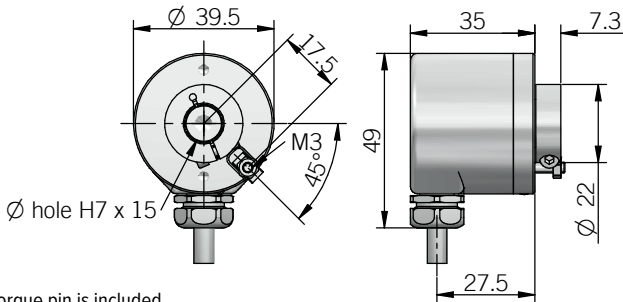
EMI 38F 500 S 5/30 P 10 X X PR .XXX

SERIES magnetic incremental encoder series EMI											
MODEL blind hollow shaft with stator coupling 38F blind hollow shaft with torque pin 38G											
RESOLUTION ppr from 1 to 10000 please refer to the preferred resolutions list											
ZERO PULSE without zero pulse S with zero pulse Z											
POWER SUPPLY (with L electrical interface) 5 V DC 5 5 ... 30 V DC 5/30											
ELECTRICAL INTERFACE NPN open-collector C push-pull P line driver L power supply 5/30 V DC - output RS-422 RS											
SHAFT DIAMETER mm 4 mm 5 mm 6 (1/4") mm 6,35 mm 8 mm 10											
ENCLOSURE RATING IP 66 shaft side / IP67 cover side X											
OPTION to be reported X											
OUTPUT TYPE radial cable (standard length 0,5 m) PR preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)											
VARIANT custom version XXX											

38F



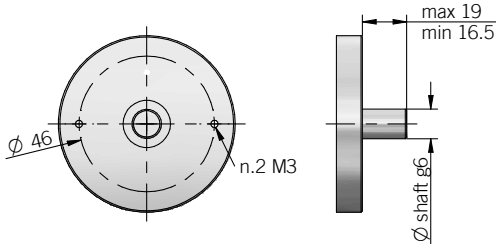
38G



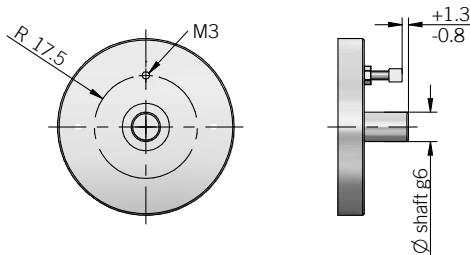
torque pin is included

RECOMMENDED INTERFACE FLANGE DESIGN

38F



38G



dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 1 to 10000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/30 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	800 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Startup time typical	20 ms
Accuracy	< 0,2° at +20°C (+68°F) ± 0,5° in the operating temperature range
Hysteresis	0,70° up to 256 ppr 0,35° from 257 ppr to 10000 ppr
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	275 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 4* / 5* / 6* / 6,35* (1/4") / 8* / 10 mm * with supplied shaft adapter
Enclosure rating IEC 60529	IP 66 shaft side / IP 67 cover side
Max rotation speed	6000 rpm
Max shaft load⁴	5 N (1,12 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,8 x 10 ⁻⁶ kgm ² (19 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Shaft adapter material	bronze
Housing material	painted aluminum
Bearings	n.2 ball bearings
Bearing lifetime	10 ⁹ revolutions
Operating temperature^{5, 6}	-25° ... +100°C (-13° ... +212°F)
Storage temperature⁶	-25° ... +85°C (-13° ... +185°F)
Weight	150 g (5,29 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

PREFERRED RESOLUTIONS

2 - 4 - 5 - 6 - 8 - 10 - 12 - 16 - 20 - 30 - 40 - 50 - 60 - 80 - 90 - 100 - 125 - 128 - 200 - 250 - 256 - 360 - 400 - 500 - 512 - 720 - 1000 - 1024 - 1440 - 2000 - 2048 - 3600 - 4096 - 5000 - 7200 - 10000

please directly contact our offices for other pulses

MAIN FEATURES

EMI series encoders are suitable for a wide range of applications such as electric motors, marine industry, iron and steel industry, textile machines, wood, paper, glass and marble working machines and more generally for automation and process control.

- 3 channel encoder (A / B / Z) with resolution up to 10000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Cable or M12 connector output, other connectors available on cable end
- Compact dimensions
- No wear due to non-contact magnetic technology
- Bore shaft diameter up to 10 mm
- IP 67 enclosure rating
- Wide operating temperature range -40° ... +100°C (-40° ... +212°F)



ORDERING CODE

EMI 55M 512 Z 5/30 P 10 X X M12 R .162 +XXX

SERIES
magnetic incremental encoder series EMI

MODEL
kit encoder ø 55 mm 55M

RESOLUTION
ppr from 1 to 10000
please refer to the preferred resolutions list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
(with L electrical interface) 5 V DC 5
5 ... 30 V DC 5/30

ELECTRICAL INTERFACE
NPN open-collector C
push-pull P
line driver L
power supply 5/30 V DC - output RS-422 RS

MAGNET ACTUATOR BORE DIAMETER
mm 6
mm 8
(3/8") mm 9,52
mm 10

ENCLOSURE RATING
IP 67 X

OPTION
to be reported X

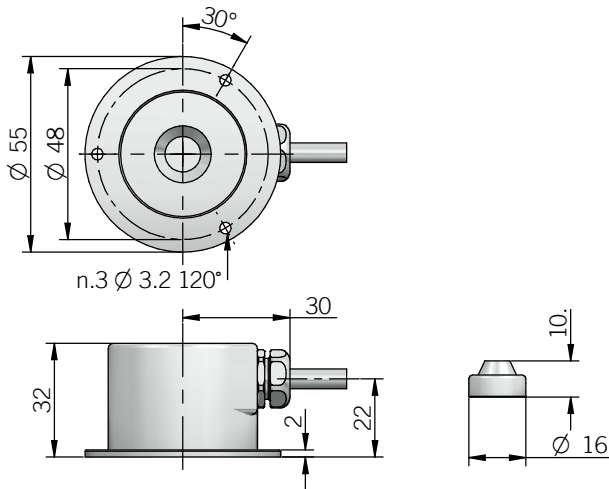
OUTPUT TYPE
cable (standard length 0,5 m) P
preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)
M12 plug connector M12

DIRECTION TYPE
radial R

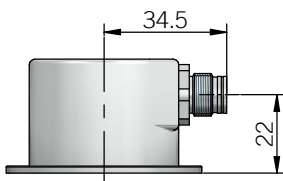
SOCKET
socket not included .162
to be reported only with connector output (eg. M12.162), for socket see Accessories

VARIANT
custom version XXX

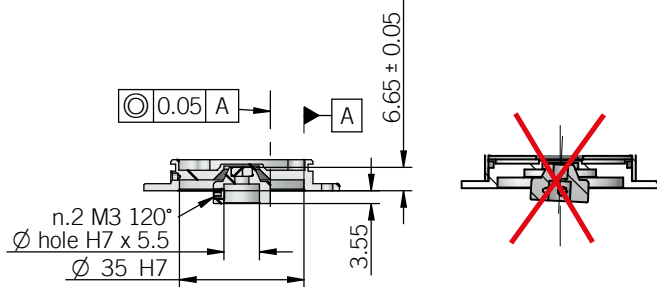
EMI55 M WITH CABLE OUTPUT



DIMENSIONS WITH M12 CONNECTOR



MAGNET ACTUATOR INSTALLATION



recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 1 to 10000 ppr
Power supply ¹	5 = 4,5 ... 5,5 V DC 5/30 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface ²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	800 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Startup time typical	20 ms
Accuracy	< 0,2° at +20°C (+68°F) ± 0,5° in the operating temperature range
Hysteresis	0,70° up to 256 ppr 0,35° from 257 ppr to 10000 ppr
Mean time to dangerous failure (MTTF) ³ according to EN ISO 13849-1	275 years
Mission time (Tm) ³	20 years
Diagnostic coverage (DC) ³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Bore diameter (magnet-actuator)	ø 6 / 8 / 9,52 (3/8") / 10 mm
Enclosure rating	IP 67 (IEC 60529)
Max rotation speed	10000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia (magnet actuator)	0,1 x 10 ⁻⁶ kgm ² (2,4 x 10 ⁻⁶ lbf ²)
Flange material	aluminum
Housing material	painted aluminum
Magnet-actuator material	aluminum
Magnet actuator allowable play	± 0,2 mm (axial) ± 0,1 mm (radial)
Operating temperature ^{4,5}	-40° ... +100°C (-40° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature ⁵	-25° ... +85°C (-13° ... +185°F)
Weight	150 g (5,29 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

PREFERRED RESOLUTIONS

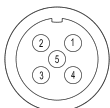
2 - 4 - 5 - 6 - 8 - 10 - 12 - 16 - 20 - 30 - 40 - 50 - 60 - 80 - 90 - 100 - 125 - 128 -
200 - 250 - 256 - 360 - 400 - 500 - 512 - 720 - 1000 - 1024 - 1440 - 2000 - 2048 -
3600 - 4096 - 5000 - 7200 - 10000

please directly contact our offices for other pulses

CONNECTIONS

Function	Cable C / P	Cable L / RS	5 pin M12 C / P	8 pin M12 L / RS
+V DC	red	red	2	7
0 V	black	black	4	1
A+	green	green	3	6
A-	/	brown or grey	/	5
B+	yellow	yellow	1	4
B-	/	orange	/	3
Z+	blue	blue	5	2
Z-	/	white	/	8
⏏	shield	shield	housing	housing

M12 connector (5 pin)
M12 A coded
front view



M12 connector (8 pin)
M12 A coded
front view



EMI 58 F - 63 F / G

BLIND HOLLOW SHAFT MAGNETIC INCREMENTAL ENCODER

MAIN FEATURES

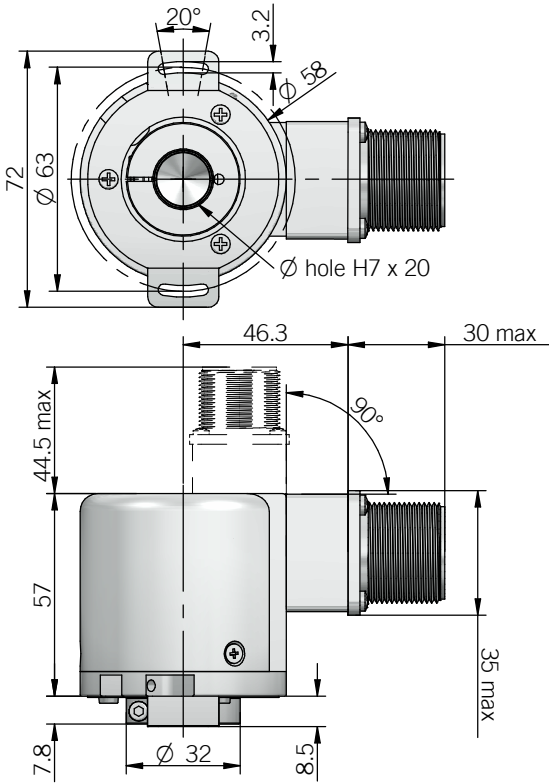
Hollow shaft encoder series for industrial applications with high mechanical resistance requirements. Based on a proprietary magnetic sensor with these encoders are designed to withstand high radial and axial shaft loads.

- 3 channel encoder (A / B / Z) up to 10000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 800 kHz
- Cable or connector output
- Metal cover available for heavy duty applications
- Blind hollow shaft diameter up to 15 mm
- Mounting by stator coupling, torque stop slot or torque pin

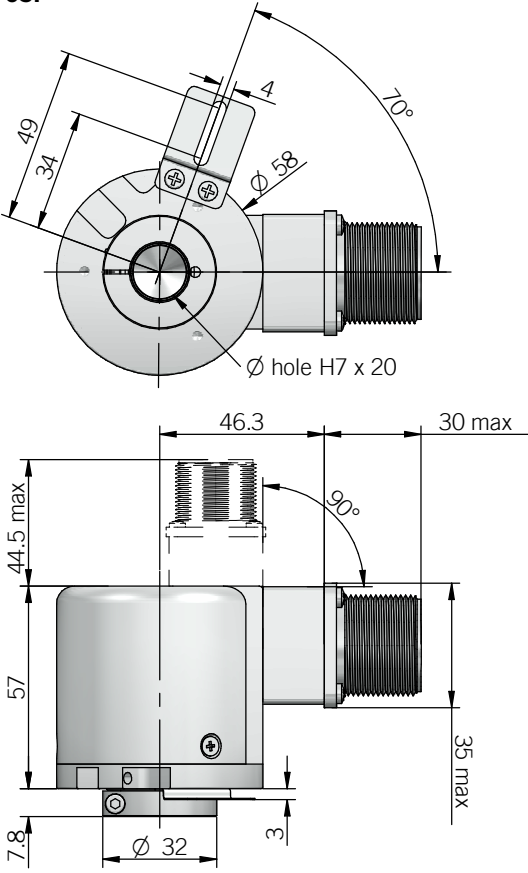


ORDERING CODE	EMI	58F	M*	500	S	5/30	P	8	X	X	M	R	.162	+XXX
SERIES magnetic incremental encoder series EMI														
MODEL blind hollow shaft with stator coupling 58F blind hollow shaft with torque stop slot 63F blind hollow shaft with torque pin 63G														
METAL COVER * add for metal cover M														
RESOLUTION ppr from 1 to 10000 please refer to the preferred resolutions list														
ZERO PULSE without zero pulse S with zero pulse Z														
POWER SUPPLY (with L electrical interface) 5 V DC 5 5 ... 30 V DC 5/30														
ELECTRICAL INTERFACE NPN open collector C push-pull P line driver L power supply 5/30 V DC - output RS-422 RS														
BORE DIAMETER mm 8 mm 10 mm 12 mm 14 mm 15														
ENCLOSURE RATING IP 54 X IP 66 S														
OPTION to be reported X														
OUTPUT TYPE cable (standard length 1,5 m) P preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) MIL plug connector M JIS-C-5432 IP40 plug connector J M12 plug connector M12 M23 plug connector H M16 IP40 plug connector C														
DIRECTION TYPE axial A radial R														
SOCKET socket not included .162 to be reported only with connector output (eg. MR.162), for socket see Accessories														
VARIANT custom version XXX														

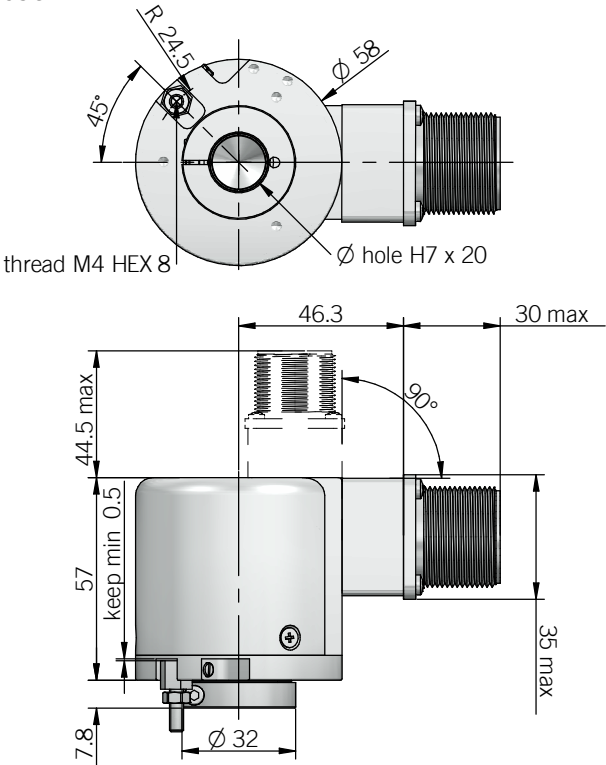
58F



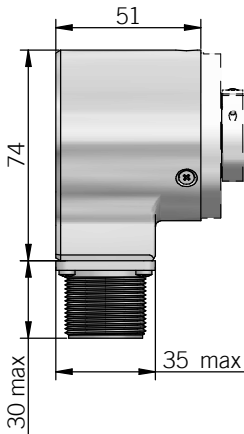
63F



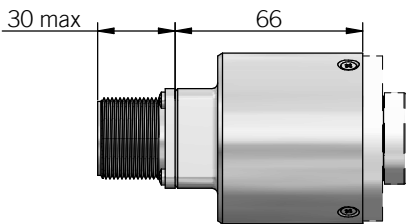
63G



DIMENSIONS WITH METAL COVER AND RADIAL OUTPUT



DIMENSIONS WITH METAL COVER AND AXIAL OUTPUT



torque pin is included in model G, for model F please refer to Accessories
 recommended mating shaft tolerance g6
 dimensions in mm

ELECTRICAL SPECIFICATIONS **MECHANICAL SPECIFICATIONS**

Resolution	from 1 to 10000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/30 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	800 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Startup time typical	20 ms
Accuracy	< 0,2° at +20°C (+68°F) ± 0,5° in the operating temperature range
Hysteresys	0,70° up to 256 ppr 0,35° from 257 ppr to 10000 ppr
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	275 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive
UL / CSA	file n. E212495

Bore diameter	ø 8 / 10 / 12 / 14 / 15 mm
Enclosure rating IEC 60529	X = IP 54 S = IP 66
Max rotation speed	6000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	4 x 10 ⁻⁶ kgm ² (95 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,83 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced / painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-25° ... +100°C (-13° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁵	-25° ... +70°C (-13° ... +158°F)
Weight	350 g (12,35 oz) 450 g (15,87 oz) with metal cover

¹ as measured at the transducer without cable influences
² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section
⁴ measured on the transducer flange
⁵ condensation not allowed

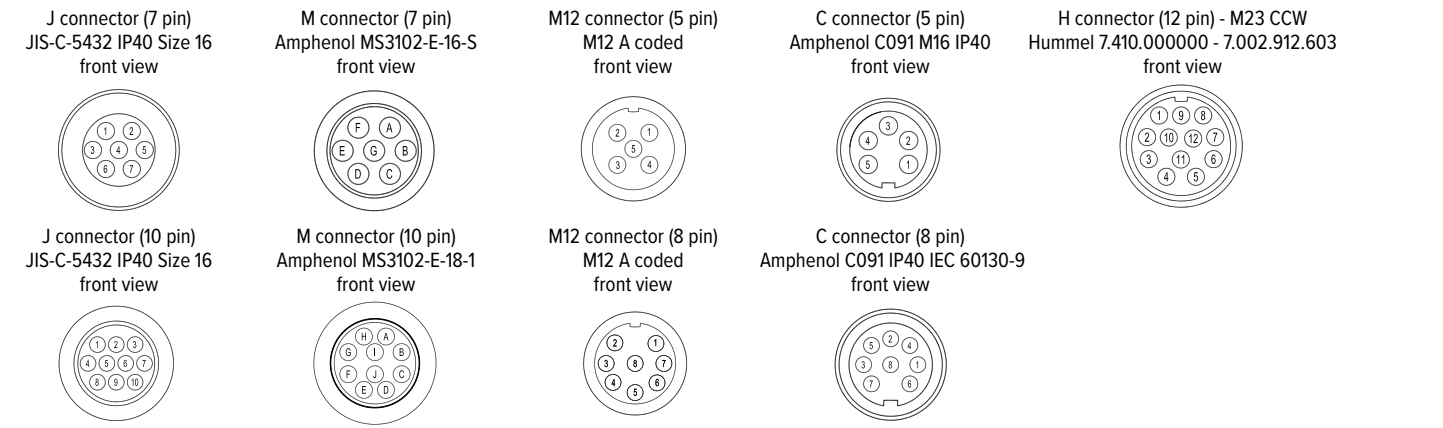
PREFERRED RESOLUTIONS

2 - 4 - 5 - 6 - 8 - 10 - 12 - 16 - 20 - 30 - 40 - 50 - 60 - 80 - 90 - 100 - 125 - 128 - 200 - 250 - 256 - 360 - 400 - 500 - 512 - 720 - 1000 - 1024 - 1440 - 2000 - 2048 - 3600 - 4096 - 5000 - 7200 - 10000
 please directly contact our offices for other pulses

CONNECTIONS

Function	Cable C / P	Cable L / RS	7 pin J C / P	7 pin J L / RS no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L / RS with Zero	10 pin M L / RS with Zero	5 pin M12 C / P	8 pin M12 L / RS	12 pin H	5 pin C C / P	8 pin C L / RS
+V DC	red	red	6	4	F	D	4 - 5	D - E	2	7	12	5	7
0 V	black	black	1	6	A	F	6	F	4	1	10	1	8
A+	green	green	3	1	C	A	1	A	3	6	5	2	1
A-	/	brown or grey	/	3	/	C	7	G	/	5	6	/	2
B+	yellow	yellow	5	2	E	B	2	B	1	4	8	4	3
B-	/	orange	/	5	/	E	8	H	/	3	1	/	4
Z+	blue	blue	4	/	D	/	3	C	5	2	3	3	5
Z-	/	white	/	/	/	/	9	I	/	8	4	/	6
⏏	shield	shield	7	7	G	G	10	J	housing ¹	housing ¹	9	housing ¹	housing ¹

¹ only with metal cover



MAIN FEATURES

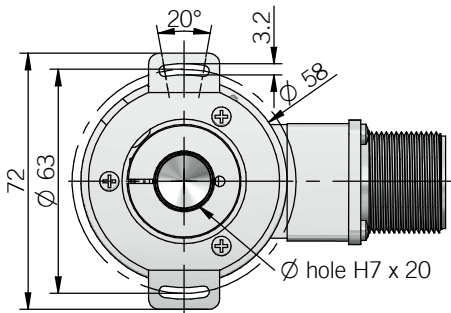
Hollow shaft encoder series for industrial applications with high mechanical resistance requirements. The proprietary state of the art magnetic sensor provides wide options (resolution, electrical output, index width) programmable by the end user.

- 3 channel encoder (A / B / Z) up to 20000 ppr
- Power supply up to +30 V DC with RS-422 or HTL as electrical interface
- Up to 800 kHz output frequency
- Cable or connector output, available with metal cover for heavy duty applications
- Blind hollow shaft diameter up to 15 mm
- Mounting by stator coupling or with torque pin

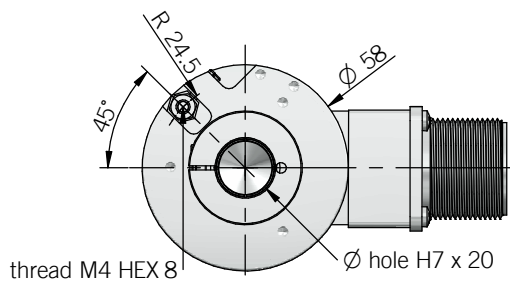


ORDERING CODE	EMI	P	58F	M* 20000	Z	5/30	L	15	X	X	M	R	.162	+XXX
SERIES magnetic incremental encoder EMI														
FEATURE user programmable P														
MODEL blind hollow shaft with stator coupling 58F blind hollow shaft with torque pin 63G														
METAL COVER * add for metal cover M														
RESOLUTION ppr 20000 user programmable from 1 to 20000 ppr														
ZERO PULSE with zero pulse Z														
POWER SUPPLY 5 ... 30 V DC 5/30														
ELECTRICAL INTERFACE line driver L RS-422 / HTL user programmable														
BORE DIAMETER mm 15 other diameters with optional shaft adapter, see Accessories														
ENCLOSURE RATING IP 54 X IP 66 S														
OPTION to be reported X														
OUTPUT TYPE cable (standard length 1,5 m) P preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) MIL plug connector M M12 plug connector M12 M23 plug connector H														
DIRECTION TYPE axial A radial R														
SOCKET socket not included .162 to be reported only with connector output (eg. MR.162), for socket see Accessories														
VARIANT custom version XXX														

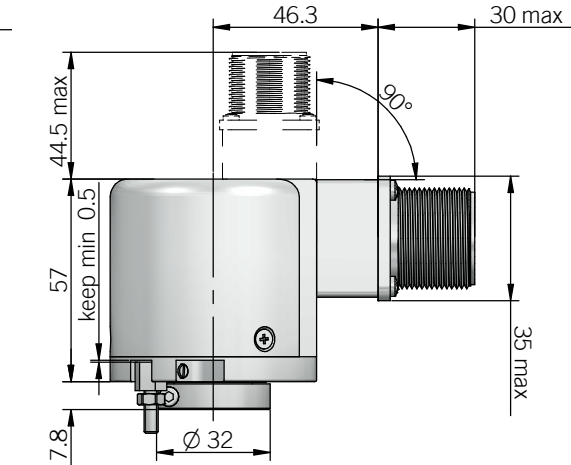
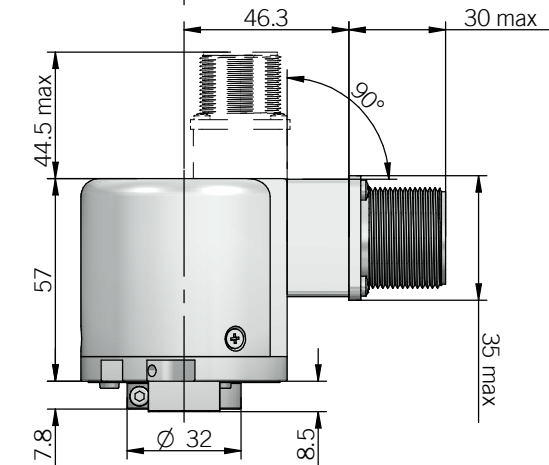
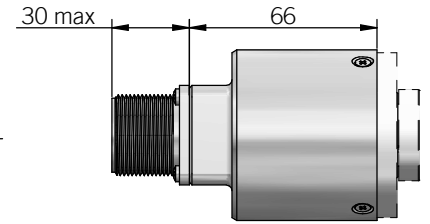
58 F



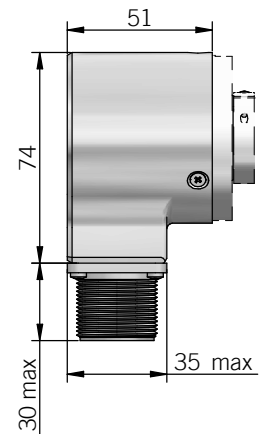
63 G



DIMENSIONS WITH METAL COVER AND AXIAL OUTPUT



DIMENSIONS WITH METAL COVER AND RADIAL OUTPUT



recommended mating shaft tolerance g6
dimensions in mm

torque pin is included in model G

ELECTRICAL SPECIFICATIONS

Resolution	user programmable from 1 to 20000 ppr default 1024 ppr
Power supply¹	4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	20 mA / channel
Electrical interface²	line driver RS-422 / HTL (AEIC-7272 or similar) user programmable / default RS-422
Max output frequency	800 kHz
Counting direction	user programmable default A leads B clockwise (shaft view)
Index length	user programmable default 180°e (gated A)
Accuracy	± 0,10°
Hysteresis	user programmable from 0° to 0,70° default 0,17°
Start-up time	500 ms
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	173 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Bore diameter	ø 15 mm ø 6* / 8* / 9,52 (3/8")* / 10* / 11* / 12* * with optional shaft adapter, please refer to Accessories
Enclosure rating IEC 60529	X = IP 54 S = IP 66
Max rotation speed	6000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	4 x 10 ⁻⁶ kgm ² (95 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,83 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced / painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{3,4}	-25° ... +100°C (-13° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁴	-25° ... +70°C (-13° ... +158°F)
Weight	350 g (12,35 oz) 450 g (15,87 oz) with metal cover

¹ as measured at the transducer without cable influences


² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

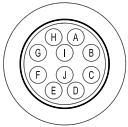
⁵ condensation not allowed

CONNECTIONS

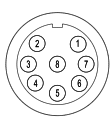
Function	Cable	10 pin M	8 pin M12	12 pin H
+V DC	red	D - E	7	12
0 V	black	F	1	10
A+	green	A	6	5
A-	brown or grey	G	5	6
B+	yellow	B	4	8
B-	orange	H	3	1
Z+	blue	C	2	3
Z-	white	I	8	4
	shield	J	housing ¹	9

¹only with metal cover

M connector (10 pin)
Amphenol MS3102-E-18-1
front view



M12 connector (8 pin)
M12 A coded
front view



H connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



MAIN FEATURES

Standard encoder series for industrial environments with high mechanical resistance requirements. Specially designed for direct mounting on motors or tachometric dynamos thanks to integrated elastic coupling that allows radial and / or axial play on the motor shafty.

- 3 channel encoder (A / B / Z) up to 10000 ppr
- Power supply up to +30 V DC with RS-422 or HTL as electrical interface
- Up to 800 kHz output frequency
- Cable or connector output
- Metal cover available for heavy duty applications
- Integrated elastic coupling up to 10 mm bore diameter



ORDERING CODE **EMI** **721** **A** **M*** **500** **S** **5/30** **P** **8** **X** **X** **M** **R** **.162** **+XXX**

SERIES
incremental encoder series ER

MODEL
fixing holes ø 63,5 mm **721**
fixing holes ø 65 mm **722**
fixing holes ø 57 mm **723**
fixing holes ø 60 mm **724**

FLANGE TYPE
flange type **A**
flange type **B**

METAL COVER
* add for metal cover **M**

RESOLUTION
ppr from 1 to **10000**
refer to the available pulses list

ZERO PULSE
without zero pulse **S**
with zero pulse **Z**

POWER SUPPLY
(with L electrical interface) 5 V DC **5**
5 ... 30 V DC **5/30**

ELECTRICAL INTERFACE
NPN open collector **C**
push-pull **P**
line driver **L**
power supply 5/30 V DC - output RS-422 **RS**

BORE DIAMETER
mm **6**
mm **8**
mm **10**

ENCLOSURE RATING
IP 54 **X**
(mod. 721 / 722 max 2500 ppr) IP 66 **S**

OPTION
to be reported **X**

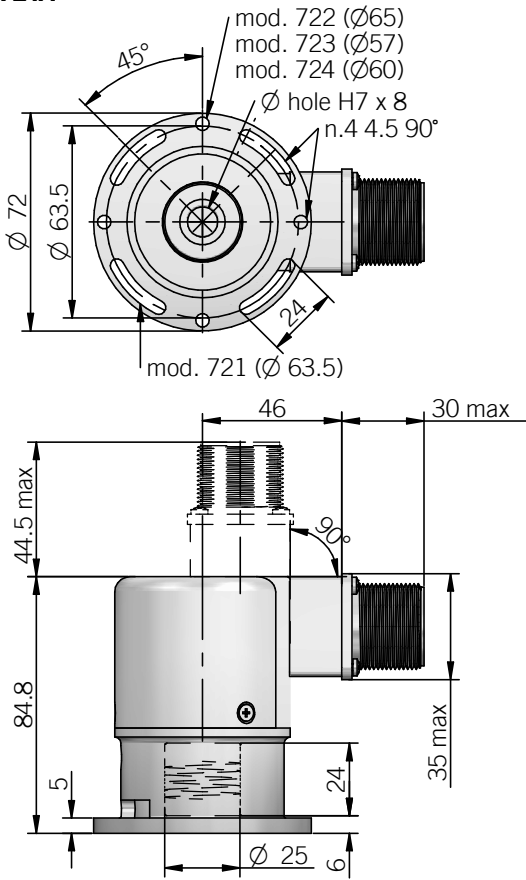
OUTPUT TYPE
cable (standard length 1,5 m) **P**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)
MIL plug connector **M**
JIS-C-5432 IP40 plug connector **J**
M12 plug connector **M12**
M23 plug connector **H**
M16 IP40 plug connector **C**

DIRECTION TYPE
axial **A**
radial **R**

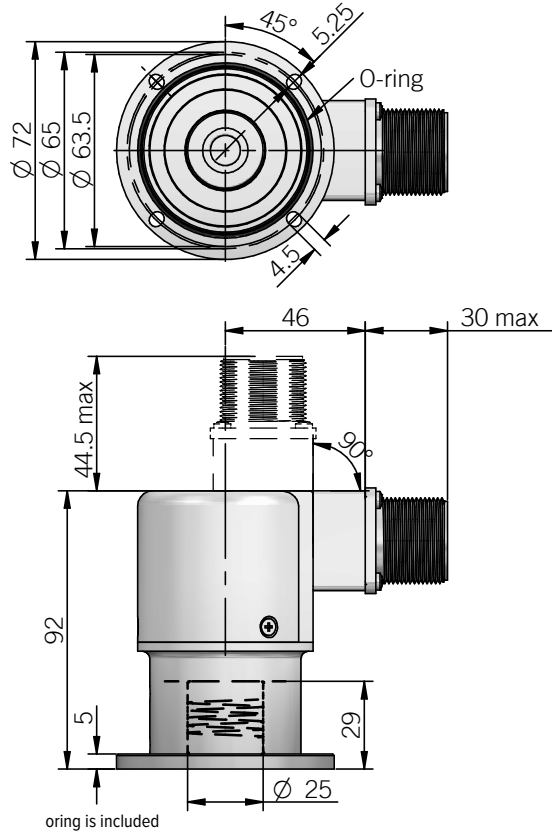
SOCKET
socket not included **.162**
to be reported only with connector output (eg. MR.162), for socket see Accessories

VARIANT
custom version **XXX**

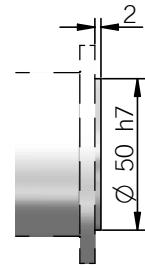
721A



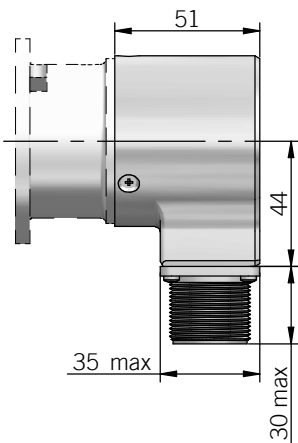
721A (S ENCLOSURE RATING)



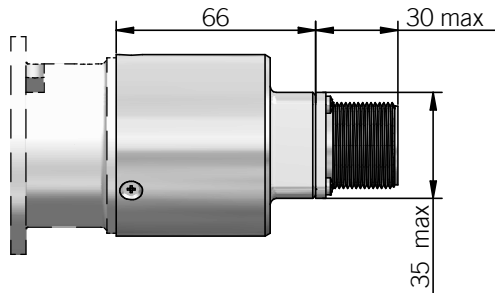
72B FLANGE



DIMENSIONS WITH METAL COVER AND RADIAL OUTPUT



DIMENSIONS WITH METAL COVER AND AXIAL OUTPUT



recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 1 to 10000 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/30 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	800 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Startup time typical	20 ms
Accuracy	< 0,2° at +20°C (+68°F) ± 0,5° in the operating temperature range
Hysteresis	0,70° up to 256 ppr 0,35° from 257 ppr to 10000 ppr
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	275 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Bore diameter	ø 6 / 8 / 10 mm
Enclosure rating IEC 60529	X = IP 54 S = IP 66
Max rotation speed	6000 rpm with X enclosure rating 3000 rpm / 70° C with S enclosure rating 2000 rpm / 85° C with S enclosure rating
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	3,5 x 10 ⁻⁶ kgm ² (83 x 10 ⁻⁶ lbfm ²)
Starting torque (at +20°C / +68°F)	< 0,02 Nm (2,83 Ozin) with X enclosure rating < 0,04 Nm (5,66 Ozin) with S enclosure rating
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA66 glass fiber reinforced / painted aluminum
Elastic coupling material	aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-25° ... +85°C (-13° ... +185°F)
Storage temperature⁵	-25° ... +70°C (-13° ... +158°F)
Weight	400 g (14,11 oz) 500 g (17,64 oz) with metal cover

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

PREFERRED RESOLUTIONS

2 - 4 - 5 - 6 - 8 - 10 - 12 - 16 - 20 - 30 - 40 - 50 - 60 - 80 - 90 - 100 - 125 - 128 - 200 - 250 - 256 - 360 - 400 - 500 - 512 - 720 - 1000 - 1024 - 1440 - 2000 - 2048 - 3600 - 4096 - 5000 - 7200 - 10000

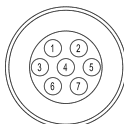
please directly contact our offices for other pulses

CONNECTIONS

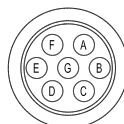
Function	Cable C / P	Cable L / RS	7 pin J C / P	7 pin J L / RS no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L / RS with Zero	10 pin M L / RS with Zero	5 pin M12 C / P	8 pin M12 L / RS	12 pin H	5 pin C C / P	8 pin C L / RS
+V DC	red	red	6	4	F	D	4 - 5	D - E	2	7	12	5	7
0 V	black	black	1	6	A	F	6	F	4	1	10	1	8
A+	green	green	3	1	C	A	1	A	3	6	5	2	1
A-	/	brown or grey	/	3	/	C	7	G	/	5	6	/	2
B+	yellow	yellow	5	2	E	B	2	B	1	4	8	4	3
B-	/	orange	/	5	/	E	8	H	/	3	1	/	4
Z+	blue	blue	4	/	D	/	3	C	5	2	3	3	5
Z-	/	white	/	/	/	/	9	I	/	8	4	/	6
⏏	shield	shield	7	7	G	G	10	J	housing ¹	housing ¹	9	housing ¹	housing ¹

¹ only with metal cover

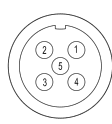
J connector (7 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (7 pin)
Amphenol MS3102-E-16-S
front view



M12 connector (5 pin)
M12 A coded
front view



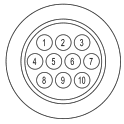
C connector (5 pin)
Amphenol C091 M16 IP40
front view



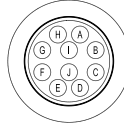
H connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



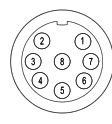
J connector (10 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (10 pin)
Amphenol MS3102-E-18-1
front view



M12 connector (8 pin)
M12 A coded
front view



C connector (8 pin)
Amphenol C091 IP40 IEC 60130-9
front view



MAIN FEATURES

Contactless encoder with through hollow shaft up to 28 mm. The compact size (only 11 mm thick), high IP rating and vibration resistance make this product an excellent solution for heavy duty applications.

- 2 channel encoder (A / B) up to 4096 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 350 kHz
- Cable output, connectors available at cable end
- Through hollow shaft up to 28 mm diameter
- Tolerance ring for shaft mounting
- Wide operating temperature range -20° ... +85°C (-4° ... +185°F)

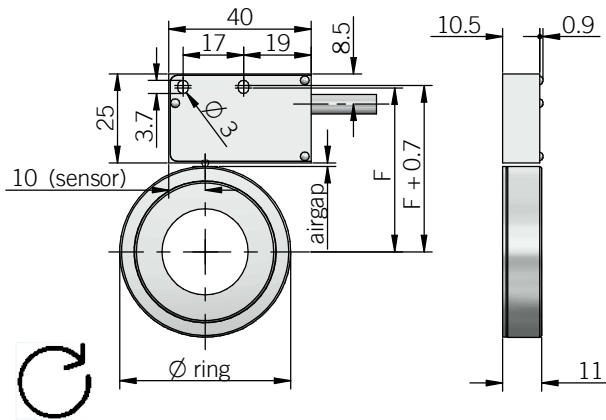


ORDERING CODE

ETMR A 4096 S 5 L 9 S 8 PR .XXX

SERIES incremental encoder with magnetic ring ETMR																			
MODEL bore diameter from 9 ... 19 mm A bore diameter 24 / 28 mm B																			
RESOLUTION ppr from 64 to 4096 refer to the available pulses list																			
ZERO PULSE without zero pulse S																			
POWER SUPPLY (with L electrical interface) 5 V DC 5 5 ... 28 V DC 5/28																			
ELECTRICAL INTERFACE push-pull P line driver L power supply 5/28 V DC - output RS-422 RS																			
BORE DIAMETER mm 9 (3/8") mm 9,52 mm 10 mm 11 mm 14 mm 19 mm 24 mm 28																			
ENCLOSURE RATING IP 67 S																			
MAX ROTATION SPEED 8000 rpm 8																			
OUTPUT TYPE cable (standard length 1,5 m) PR preferred cable lengths 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)																			
VARIANT custom version XXX																			

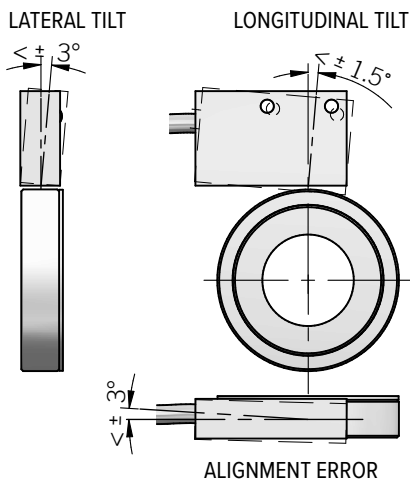
ETMRA / B



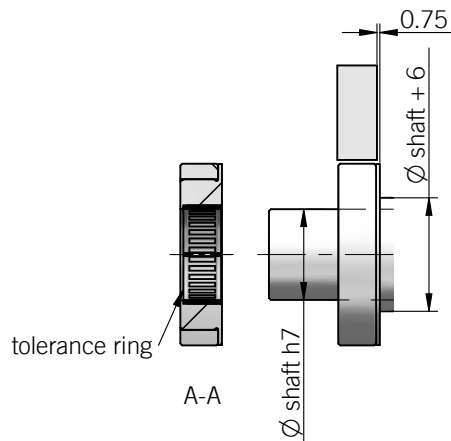
Model	A	B
ø ring	41,2	48
Fixing (F)	41,9	46
Airgap	0,3 ± 0,1	1 ± 0,1

tolerance ring is included
for mounting instruction please refer to product installation notes

MOUNTING TOLERANCES



RECOMMENDED INTERFACE DESIGN



dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 64 to 4096 ppr (powers of 2)
Pole pitch	model A = 2 mm model B = 5 mm
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	20 mA / channel
Electrical interface²	push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	350 kHz
Counting direction	A leads B clockwise (front view)
Accuracy	± 0,35° typical / ± 0,50° max
Mean time to dangerous failure (MTTF)_d³ according to EN ISO 13849-1	318 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 min bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Bore diameter	ø 9 / 9,52 (3/8") / 10 / 11 / 14 / 19 / 24 / 28 mm
Enclosure rating	IP 67 (IEC 60529)
Max rotation speed	8000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	115 x 10 ⁻⁶ kgm ² (27,29 x 10 ⁻⁴ lbf ²)
Sensor body material	anodized aluminum
Magnet-actuator material	stainless steel
Operating temperature^{4, 5}	-20° ... +85°C (-4° ... +185°F)
Storage temperature⁵	-20° ... +85°C (-4° ... +185°F)
Weight	100 g (3,53 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation allowed

CONNECTIONS

Function	Cable P	Cable L / RS
+V DC	red or brown	red
0 V	black or grey	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
⊕	shield	shield

RESOLUTIONS

64* - 128 - 256 - 512 - 1024 - 2048 - 4096

* available with mod.B; please directly contact our offices for other pulses



ABSOLUTE ENCODERS

No need to be reset

Absolute encoders can provide accurate data even after a power-down event without requiring a reset to the zero point. Due to these specifications and the ability to transfer data over a field bus, absolute encoders are now commonly used in various applications.

Max singleturn resolution: 25 bit (33'554'432 ppr)

Max number of turns: 40 bit (1'099'511'627'776 turns)

Supported output interfaces are: Bit-parallel, Analogue, Modbus RTU, SSI, BiSS, Canopen, Profinet and Ethercat.

OPTICAL SINGLETURN ABSOLUTE ENCODER		
EAR 58 B / C - 63 A / D / E	solid shaft SSI - PAR	138
EAR 58 F - 63 F / G	blind hollow shaft SSI - PAR	144
EAR 90 A - 115 A	solid shaft SSI - PAR	150
EAL 58 B / C - 63 A / D / E	solid shaft ANALOGUE	155
EAL 58 F - 63 F / G	blind hollow shaft ANALOGUE	158
EAL 90 A - 115 A	solid shaft ANALOGUE	161
EAX 80 A / D	explosion proof ATEX SSI	164
MAGNETIC SINGLETURN ABSOLUTE ENCODER		
EMA 36 B	solid shaft SSI	167
EMA 36 F / G	blind hollow shaft SSI	169
EMA 50 A / B	solid shaft SSI - PAR	171
EMA 50 F / G	blind hollow shaft SSI - PAR	174
EML 50 A / B	solid shaft ANALOGUE	177
EML 50 F / G	blind hollow shaft ANALOGUE	180
OPTICAL MULTITURN ABSOLUTE ENCODER		
AAM 38 F	blind hollow shaft BiSS	183
EAMR 58 B / C - 63 A / D / E	solid shaft SSI - PAR	186
EAMR 58 F - 63 F / G	blind hollow shaft SSI - PAR	192
EAMR 90 A - 115 A	solid shaft SSI - PAR	198
EAML 58 B / C - 63 A / D / E	solid shaft ANALOGUE	203
EAML 58 F - 63 F / G	blind hollow shaft ANALOGUE	206
EAML 90 A - 115 A	solid shaft ANALOGUE	209
AAM 58 B / C	solid shaft PROFINET	212
AAM 58 F	blind hollow shaft PROFINET	215
AAM 58 B / C	solid shaft ETHERCAT	217
AAM 58 F	blind hollow shaft ETHERCAT	220
EAMX 80 A / D	explosion proof ATEX SSI	222
MAGNETIC MULTITURN ABSOLUTE ENCODER		
EAM 36 B	solid shaft SSI	225
EAM 36 F / G	blind hollow shaft SSI	227
AAM 36 B	solid shaft CANOPEN	229
AAM 36 F	blind hollow shaft CANOPEN	231
EAM 110 M	blind hollow shaft MODBUS	233

EAR 58 B / C - 63 A / D / E BIT-PARALLEL - SSI SOLID SHAFT SINGLETURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard singleturn absolute encoders for factory automation applications.

- Optical sensing technology (proprietary OptoASIC)
- Resolution up to 25 bit
- Power supply up to +30 VDC with bit-parallel or SSI as electrical interface
- Cable or connector output
- Solid shaft diameter up to 10 mm
- Mounting by synchronous, clamping or centering 2,5" square flange



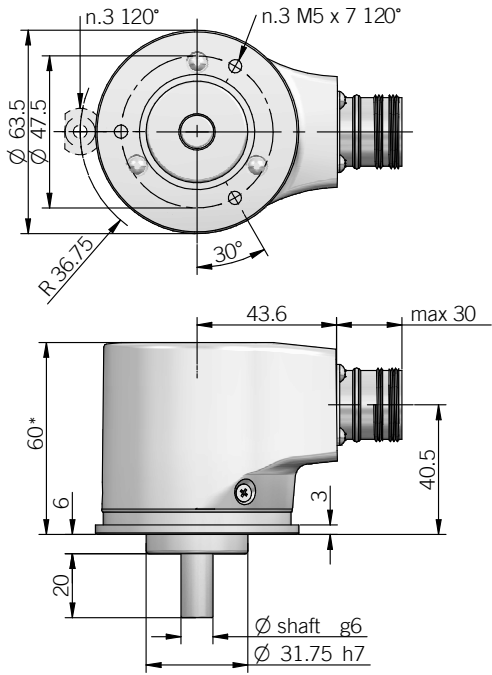
ORDERING CODE BIT PARALLEL

EAR	63A	12	G	8/30	P	P	X	10	X	MA	R	.162	+XXX
SERIES singleturn absolute encoder EAR													
MODEL synchronous flange ø 31.75 mm 63A synchronous flange ø 50 mm 58B clamping flange ø 36 mm 58C centering square flange ø 31.75 mm 63D centering square flange ø 50 mm 63E													
RESOLUTION bit from 1 to 13 (multiples and submultiples of 360) ppr from 90 to 3600													
CODE TYPE binary B gray G (no powers of 2) binary offset code (0-XXX) BC (no powers of 2) gray offset code (0-XXX) GC													
POWER SUPPLY 8 ... 30 V DC 8/30													
ELECTRICAL INTERFACE push-pull P													
LOGIC negative N positive P													
OPTIONS to be reported if not used X latch with external input L (with binary code) strobe S reset with external input ZE latch / reset with external inputs LZE (with binary code) strobe / reset with external input SZE													
SHAFT DIAMETER (mod. 58 B) mm 6 (mod. 63 A / D) 3/8"- mm 9,52 (mod. 58 C - 63 A / D / E) mm 10													
ENCLOSURE RATING IP 65 shaft side / IP67 cover side X IP 67 S													
OUTPUT TYPE (without options) cable (standard length 1,5 m) PD cable (standard length 1,5 m) PE preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PDR5) (without reset option) 19 pin MIL plug connector MA													
DIRECTION TYPE radial R													
SOCKET socket not included .162 to be reported only with connector output (eg. MAR.162), for socket see Accessories													
VARIANT custom version XXX													

ORDERING CODE SSI	EAR	63A	13	G	8/30	S	X	2048	RS	10	X	HA	R	.162	+XXX
SERIES singleturn absolute encoder EAR															
MODEL synchronous flange ø 31.75 mm 63A synchronous flange ø 50 mm 58B clamping flange ø 36 mm 58C centering square flange ø 31.75 mm 63D centering square flange ø 50 mm 63E															
RESOLUTION bit 13 / 16 / 17 / 18 / 21 / 25 ppr 360 / 720 / 1440 / 2880 / 3600															
CODE TYPE binary B gray G (no powers of 2) binary offset code (0-XXX) BC (no powers of 2) gray offset code (0-XXX) GC															
POWER SUPPLY 8 ... 30 V DC 8/30															
ELECTRICAL INTERFACE Serial Synchronous Interface - SSI S															
OPTION to be reported if not used X reset with external input ZE reset on cover or with external input ZP															
INCREMENTAL RESOLUTION (powers of 2) ppr from 128 to 8192															
INCREMENTAL ELECTRICAL INTERFACE available with PD or HA output type line driver HTL L push pull P line driver RS-422 RS															
SHAFT DIAMETER (mod. 58 B) mm 6 (mod. 63 A / D) 3/8" - mm 9,52 (mod. 58 C - 63 A / D / E) mm 10															
ENCLOSURE RATING IP 65 shaft side / IP67 cover side X IP 67 S															
OUTPUT TYPE cable (standard length 1,5 m) PC preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) cable (standard length 1,5 m) PD preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) (without reset option) 7 pin MIL plug connector MC (with reset option) 10 pin MIL plug connector MD 12 pin M23 plug connector HA 8 pin M12 plug connector M12															
DIRECTION TYPE radial R															
SOCKET socket not included .162 to be reported only with connector output (eg. HAR.162), for socket see Accessories															
VARIANT custom version XXX															

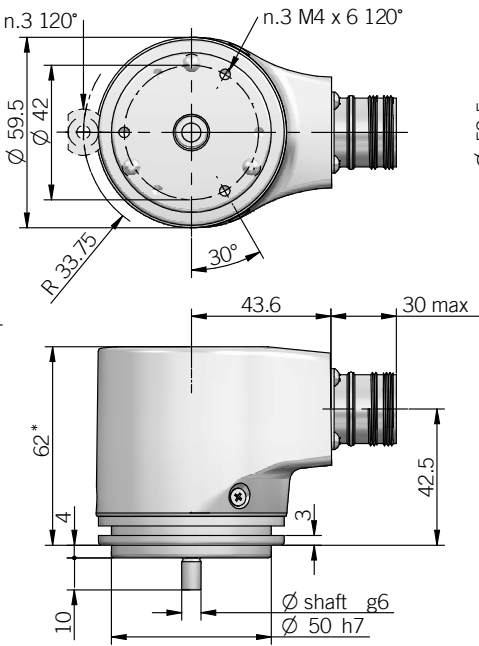
to be added with incremental output

63A



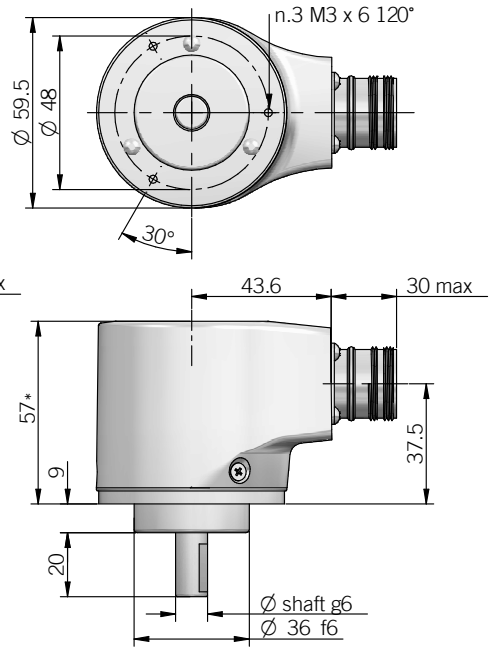
fixing clamps not included, please refer to Accessories

58B

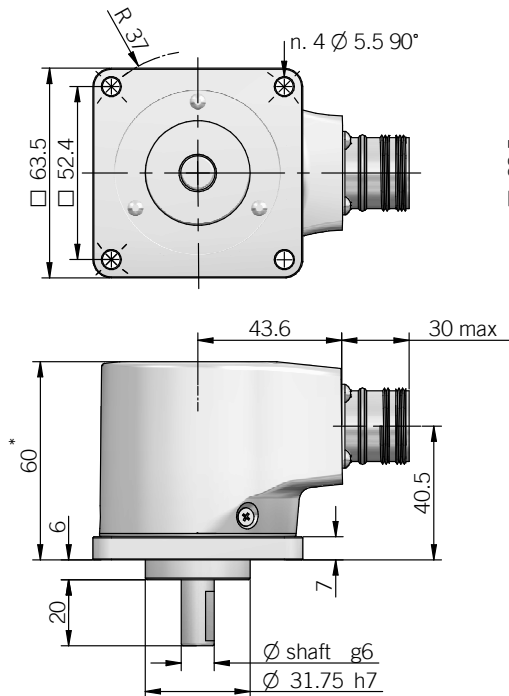


fixing clamps not included, please refer to Accessories

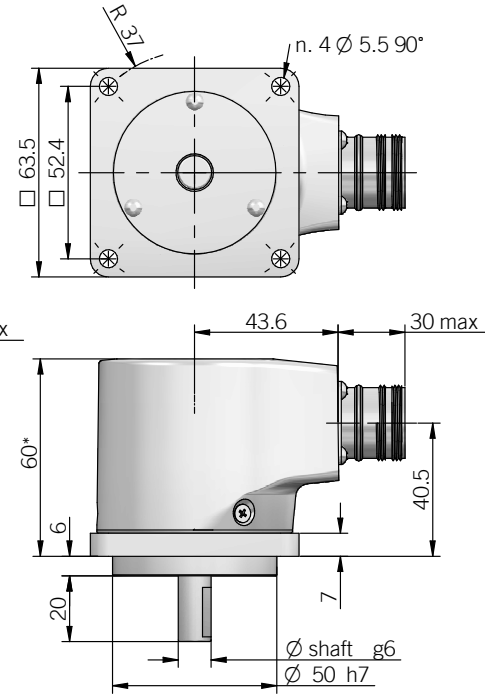
58C



63D



63E



* with option ZP +1,5 mm
recommended mating shaft tolerance H7
dimensions in mm

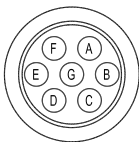
BIT-PARALLEL CONNECTIONS

Function	Binary / Gray	Cable PD	Cable PE	19 pin MA
bit 1 (LSB)	B ⁰ / G ⁰	green	green	A
bit 2	B ¹ / G ¹	yellow	yellow	B
bit 3	B ² / G ²	blue	blue	C
bit 4	B ³ / G ³	brown	brown	D
bit 5	B ⁴ / G ⁴	orange or pink	orange or pink	E
bit 6	B ⁵ / G ⁵	white	white	F
bit 7	B ⁶ / G ⁶	grey	grey	G
bit 8	B ⁷ / G ⁷	purple	purple	H
bit 9	B ⁸ / G ⁸	grey / pink	grey / pink	J
bit 10	B ⁹ / G ⁹	white / green	white / green	K
bit 11	B ¹⁰ / G ¹⁰	brown / green	brown / green	L
bit 12	B ¹¹ / G ¹¹	white / yellow	white / yellow	M
bit 13	B ¹² / G ¹²	yellow / brown	yellow / brown	N
STROBE	/	/	green / blue	P
LATCH	/	/	yellow / grey	R
0 V	/	black	black	T
U / D	/	red / blue	red / blue	U
RESET	/	/	pink / green	/
+ V DC	/	red	red	V
⏏	/	shield	shield	S

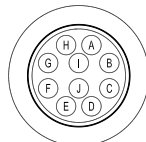
SSI CONNECTIONS

Function	Cable PC	Cable PD	7 pin MC	10 pin MD	12 pin HA	12 pin HA	8 pin M12
+ V DC	red	red	G	G	8	8	8
0 V	black	black	F	F	1	1	5
DATA +	green	green	C	C	2	2	3
DATA -	brown	brown	D	D	10	10	2
CLOCK +	yellow	yellow	A	A	3	3	4
CLOCK -	orange or pink	orange or pink	B	B	11	11	6
A+	/	grey	/	/	/	6	/
A-	/	blue	/	/	/	7	/
B+	/	purple	/	/	/	9	/
B-	/	white / green	/	/	/	12	/
U / D	red / blue	red / blue	E	E	5	5	7
RESET	white	white	/	H	4	4	1
⏏	shield	shield	housing	housing	9	housing	housing

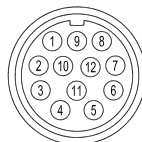
MC connector (7 pin)
Amphenol MS3102-E-16-S
front view



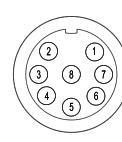
MD connector (10 pin)
Amphenol MS3102-E-18-1P
front view



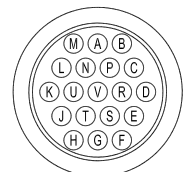
HA connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



M12 connector (8 pin)
M12 A coded
front view



MA connector (19 pin)
Amphenol 62IN 12E 14-19 P
front view



ELECTRICAL SPECIFICATIONS

Resolution	P = from 90 ppr to 13 bit S = from 360 ppr to 25 bit
Power supply¹	7,6 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Max load current	20 mA / channel
Absolute electrical interface²	P = push pull (iC-DL) S = RS-422 (THVD1451 or similar)
Incremental electrical interface²	L = HTL differential (AEIC-7272 or similar) P = Push-Pull (AEIC-7272 or similar) RS = RS-422 (AELT-5000 or similar)
Max incremental output frequency	128 kHz
Auxiliary inputs (U/D - RESET - LATCH)	active high (+V DC) connect to 0 V if not used / RESET - LATCH t_{min} 150 ms
Max frequency	25 kHz LSB (Bit-parallel) clock input 100 kHz ... 1 MHz (SSI)
Code type	binary or gray
Logic	SSI = positive Bit-parallel = positive or negative
SSI monostable time (T_m)	20 μ s
SSI pause time (T_p)	> 35 μ s
SSI frame	left aligned format MSB ... LSB up to 13 bit = length 13 bit from 14 to 21 bit = length 21 bit from 22 to 25 bit = length 25 bit
SSI status and parity bit	on request
Counting direction	SSI output = decreasing clockwise (shaft view) incremental output = A leads B clockwise (shaft view)
Start-up time	700 ms
Accuracy	$\pm 0,069^\circ$
Mean time to dangerous failure (MTTF)_d³ according to EN ISO 13849-1	173 years with BIT-PARALLEL output 214 years with SSI/INCREMENTAL output
Mission time (T_m)³	20 years
Diagnostic coverage (DC)³	0%
Cable type PC	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Cable type PD	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Cable type PE	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

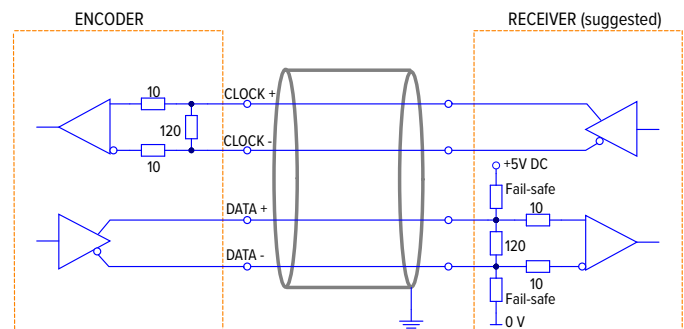
Shaft diameter	$\varnothing 6 / 9,52 (3/8") / 10$ mm
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load⁴	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	$1,5 \times 10^{-6}$ kgm ² (36×10^{-6} lbf ²)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminium
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature Bit-parallel^{5, 6}	-20° ... +85°C (-4 ... +185°F)
Operating temperature SSI^{5, 6}	-40° ... +100°C (-40° ... +212°F) -20° ... +100°C (-4° ... +212°F) with PC cable output -20° ... +85°C (-4° ... +185°F) with PD cable output -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁶	-20° ... +85°C (-4° ... +185°F)
Weight	approx 300 g (10,58 oz)

¹ as measured at the transducer without cable influences² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section³ this product is not a safety component, for further details refer to TECHNICAL BASICS section⁴ maximum load for static usage⁵ measured on the transducer flange⁶ condensation not allowed

ROTATION SPEED DERATING TABLE

Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000
+85 ... +100 (+185 ... +212)	5000	3000

SSI ELECTRICAL INTERFACE





WWW.ELTRA.IT

EAR 58 F - 63 F / G BIT-PARALLEL - SSI

BLIND HOLLOW SHAFT SINGLETURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard singleturn absolute encoders for factory automation applications.

- Optical sensing technology (proprietary OptoASIC)
- Resolution up to 25 bit
- Power supply up to +30 VDC with Bit-parallel or SSI as electrical interface
- Cable or connector output
- Blind hollow shaft up to 15 mm
- Mounting by stator coupling, torque stop slot or torque pin

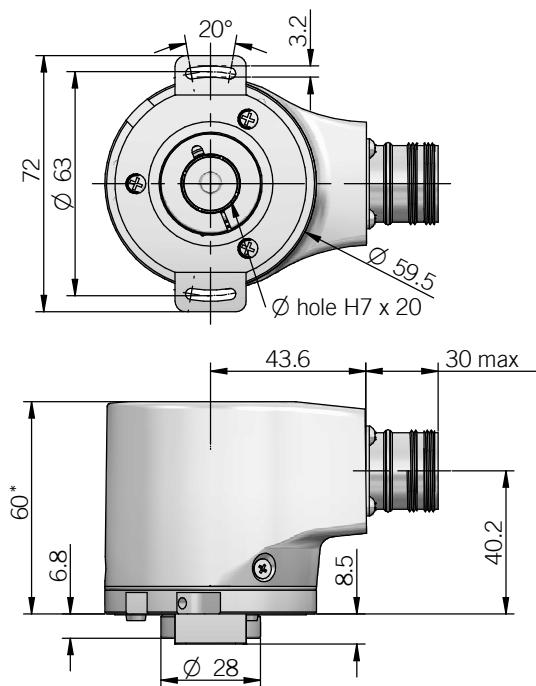


ORDERING CODE BIT PARALLEL	EAR	58F	12	G	8/30	P	P	X	15	X	MA	R	.162	+XXX
SERIES singleturn absolute encoder	EAR													
MODEL blind hollow shaft with stator coupling blind hollow shaft with torque stop slot blind hollow shaft with torque pin	58F	63F	63G											
RESOLUTION bit from (multiples and submultiples of 360) ppr from	1 to 13													
CODE TYPE binary gray (no powers of 2) binary offset code (no powers of 2) gray offset code	B	G	BC	GC										
POWER SUPPLY 8 ... 30 V DC	8/30													
ELECTRICAL INTERFACE push-pull	P													
LOGIC negative positive	N	P												
OPTIONS to be reported if not used latch with external input (with binary code) strobe reset with external input latch / reset with external inputs (with binary code) strobe / reset with external input	X	L	S	ZE	LZE	SZE								
BORE DIAMETER mm mm diameters	14	15	6 / 8 / 9,52 (3/8") / 10 / 11 / 12 mm with optional shaft adapter, see Accessories											
ENCLOSURE RATING IP 65 shaft side / IP67 cover side IP 67	X	S												
OUTPUT TYPE (without options) cable (standard length 1,5 m) cable (standard length 1,5 m) preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PDR5) (without reset option) 19 pin MIL plug connector	PD	PE	MA											
DIRECTION TYPE radial	R													
SOCKET socket not included to be reported only with connector output (eg. MAR.162), for socket see Accessories	.162													
VARIANT custom version	XXX													

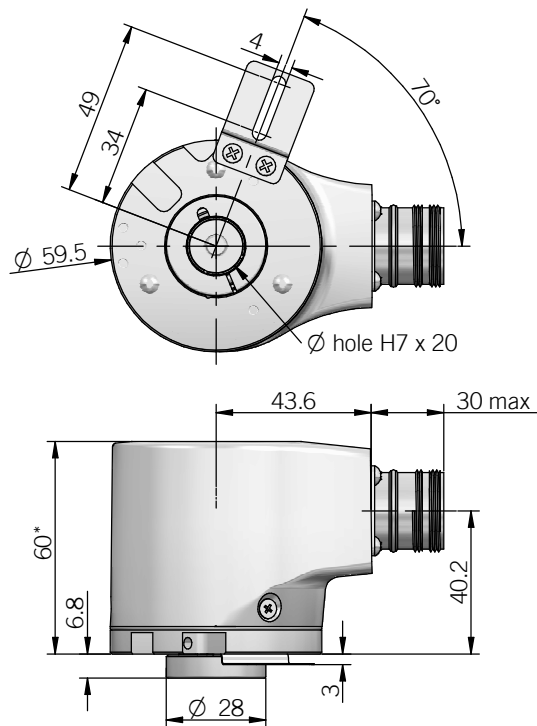
ORDERING CODE SSI	EAR	58F	13	G	8/30	S	X	2048	RS	15	X	HA	R	.162	+XXX
SERIES singleturn absolute encoder EAR															
MODEL blind hollow shaft with stator coupling 58F blind hollow shaft with torque stop slot 63F blind hollow shaft with torque pin 63G															
RESOLUTION bit 13 / 16 / 17 / 18 / 21 / 25 ppr 360 / 720 / 1440 / 2880 / 3600															
CODE TYPE binary B gray G (no powers of 2) binary offset code (0-XXX) BC (no powers of 2) gray offset code (0-XXX) GC															
POWER SUPPLY 8 ... 30 V DC 8/30															
ELECTRICAL INTERFACE Serial Synchronous Interface - SSI S															
OPTION to be reported if not used X reset with external input ZE reset on cover or with external input ZP															
INCREMENTAL RESOLUTION (powers of 2) ppr from 128 to 8192															
INCREMENTAL ELECTRICAL INTERFACE available with PD or HA output type line driver HTL L push pull P line driver RS-422 RS															
BORE DIAMETER mm 14 mm 15 diameters 6 / 8 / 9,52 (3/8") / 10 / 11 / 12 mm with optional shaft adapter, see Accessories															
ENCLOSURE RATING IP 65 shaft side / IP67 cover side X IP 67 S															
OUTPUT TYPE cable (standard length 1,5 m) PC preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) cable (standard length 1,5 m) PD preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) (without reset option) 7 pin MIL plug connector MC (with reset option) 10 pin MIL plug connector MD 12 pin M23 plug connector HA 8 pin M12 plug connector M12															
DIRECTION TYPE radial R															
SOCKET socket not included .162 to be reported only with connector output (eg. HAR.162), for socket see Accessories															
VARIANT custom version XXX															

to be added with incremental output

58F

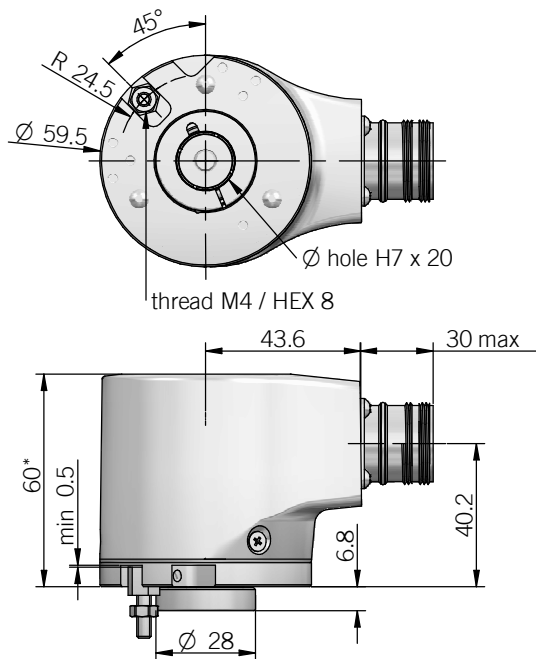


63F



for torque pin please refer to Accessories

63G



torque pin is included

* with option ZP +1,5 mm
recommended mating shaft tolerance g6
dimensions in mm

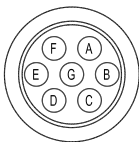
BIT-PARALLEL CONNECTIONS

Function	Binary / Gray	Cable PD	Cable PE	19 pin MA
bit 1 (LSB)	B ⁰ / G ⁰	green	green	A
bit 2	B ¹ / G ¹	yellow	yellow	B
bit 3	B ² / G ²	blue	blue	C
bit 4	B ³ / G ³	brown	brown	D
bit 5	B ⁴ / G ⁴	orange or pink	orange or pink	E
bit 6	B ⁵ / G ⁵	white	white	F
bit 7	B ⁶ / G ⁶	grey	grey	G
bit 8	B ⁷ / G ⁷	purple	purple	H
bit 9	B ⁸ / G ⁸	grey / pink	grey / pink	J
bit 10	B ⁹ / G ⁹	white / green	white / green	K
bit 11	B ¹⁰ / G ¹⁰	brown / green	brown / green	L
bit 12	B ¹¹ / G ¹¹	white / yellow	white / yellow	M
bit 13	B ¹² / G ¹²	yellow / brown	yellow / brown	N
STROBE	/	/	green / blue	P
LATCH	/	/	yellow / grey	R
0 V	/	black	black	T
U / D	/	red / blue	red / blue	U
RESET	/	/	pink / green	/
+ V DC	/	red	red	V
⏏	/	shield	shield	S

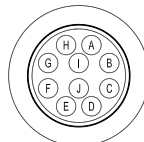
SSI CONNECTIONS

Function	Cable PC	Cable PD	7 pin MC	10 pin MD	12 pin HA	12 pin HA	8 pin M12
+ V DC	red	red	G	G	8	8	8
0 V	black	black	F	F	1	1	5
DATA +	green	green	C	C	2	2	3
DATA -	brown	brown	D	D	10	10	2
CLOCK +	yellow	yellow	A	A	3	3	4
CLOCK -	orange or pink	orange or pink	B	B	11	11	6
A+	/	grey	/	/	/	6	/
A-	/	blue	/	/	/	7	/
B+	/	purple	/	/	/	9	/
B-	/	white / green	/	/	/	12	/
U / D	red / blue	red / blue	E	E	5	5	7
RESET	white	white	/	H	4	4	1
⏏	shield	shield	housing	housing	9	housing	housing

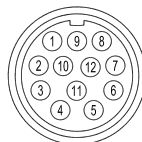
MC connector (7 pin)
Amphenol MS3102-E-16-S
front view



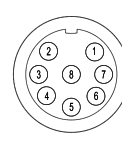
MD connector (10 pin)
Amphenol MS3102-E-18-1P
front view



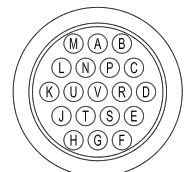
HA connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



M12 connector (8 pin)
M12 A coded
front view



MA connector (19 pin)
Amphenol 62IN 12E 14-19 P
front view



ELECTRICAL SPECIFICATIONS

Resolution	P = from 90 ppr to 13 bit S = from 360 ppr to 25 bit
Power supply¹	7,6 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Max load current	20 mA / channel
Absolute electrical interface²	P = push pull (IC-DL) S = RS-422 (THVD1451 or similar)
Incremental electrical interface²	L = HTL differential (AEIC-7272 or similar) P = Push-Pull (AEIC-7272 or similar) RS = RS-422 (AELT-5000 or similar)
Max incremental output frequency	128 kHz
Auxiliary inputs (U/D - RESET - LATCH)	active high (+V DC) connect to 0 V if not used / RESET - LATCH t_{min} 150 ms
Max frequency	25 kHz LSB (Bit-parallel) clock input 100 kHz ... 1 MHz (SSI)
Code type	binary or gray
Logic	SSI = positive Bit-parallel = positive or negative
SSI monostable time (Tm)	20 μ s
SSI pause time (Tp)	> 35 μ s
SSI frame	left aligned format MSB ... LSB up to 13 bit = length 13 bit from 14 to 21 bit = length 21 bit from 22 to 25 bit = length 25 bit
SSI status and parity bit	on request
Counting direction	SSI output = decreasing clockwise (shaft view) incremental output = A leads B clockwise (shaft view)
Start-up time	700 ms
Accuracy	$\pm 0,069^\circ$
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	173 years with BIT-PARALLEL output 214 years with SSI/INCREMENTAL output
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type PC	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Cable type PD	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Cable type PE	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

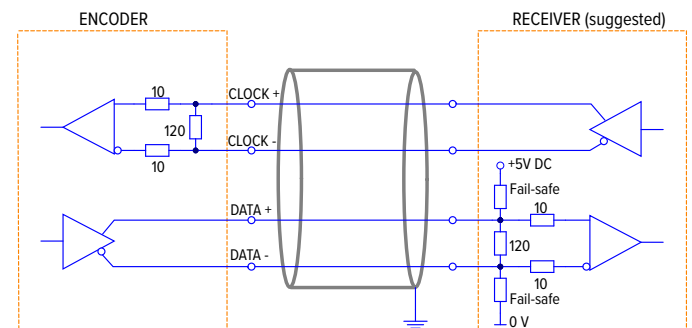
Bore diameter	\varnothing 14 / 15 mm \varnothing 6* / 8* / 9,52 (3/8")* / 10* / 11* / 12* * with optional shaft adapter, please refer to Accessories
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load⁴	200 N (45 lbs) axial / 60 N (13,49 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	5×10^{-6} kgm ² (119×10^{-6} lbft ²)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature Bit-parallel^{5, 6}	-20° ... +85°C (-4 ... +185°F)
Operating temperature SSI^{5, 6}	-40° ... +85°C (-40° ... +185°F) -20° ... +85°C (-4° ... +185°F) with cable output -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁶	-20° ... +85°C (-4° ... +185°F)
Weight	approx 300 g (10,58 oz)

¹ as measured at the transducer without cable influences² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section³ this product is not a safety component, for further details refer to TECHNICAL BASICS section⁴ maximum load for static usage⁵ measured on the transducer flange⁶ condensation not allowed

ROTATION SPEED DERATING TABLE

	Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
IP65	up to +70 (+158)	9000	6000
	+70 ... 85 (+158 ... +185)	6000	3000
IP67	up to +70 (+158)	8000	6000
	+70 ... 85 (+158 ... +185)	4000	2000

SSI ELECTRICAL INTERFACE





WWW.ELTRA.IT

EAR 90 - 115 A BIT-PARALLEL - SSI SOLID SHAFT SINGLETURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard singleturn absolute encoders for factory automation applications.

- Optical sensing technology (proprietary OptoASIC)
- Resolution up to 25 bit
- Power supply up to +30 VDC with Bit-parallel or SSI as electrical interface
- Cable or connector output
- Solid shaft diameter up to 10 mm
- Mounting by synchronous or REO-444 flange

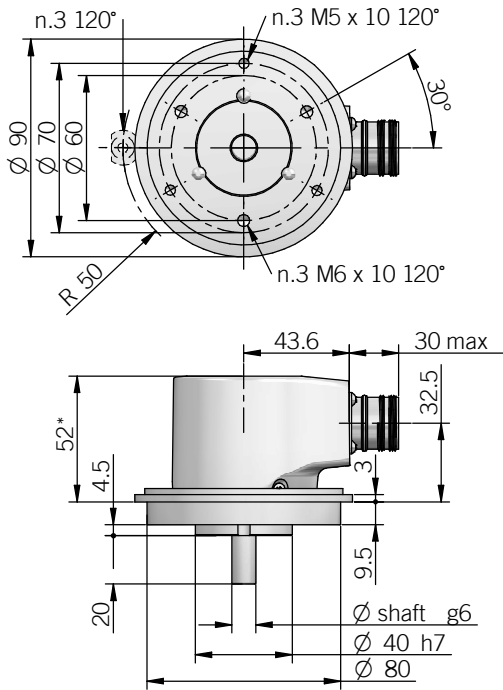


ORDERING CODE BIT PARALLEL	EAR	90A	12	G	8/30	P	P	X	10	X	MA	R	.162	+XXX
SERIES singleturn absolute encoder	EAR													
MODEL synchronous flange ø 40 mm REO-444 flange		90A 115A												
RESOLUTION bit from (multiples and submultiples of 360) ppr from			1 to 13 90 to 3600											
CODE TYPE binary gray (no powers of 2) binary offset code (no powers of 2) gray offset code				B G BC GC										
POWER SUPPLY 8 ... 30 V DC					8/30									
ELECTRICAL INTERFACE push-pull						P								
LOGIC negative positive							N P							
OPTIONS to be reported if not used latch with external input (with binary code) strobe reset with external input latch / reset with external inputs (with binary code) strobe / reset with external input								X L S ZE LZE SZE						
SHAFT DIAMETER (mod. 90) 3/8"- mm mm									9,52 10					
ENCLOSURE RATING IP 65 shaft side / IP67 cover side IP 67										X S				
OUTPUT TYPE (without options) cable (standard length 1,5 m) cable (standard length 1,5 m) preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PDR5) (without reset option) 19 pin MIL plug connector													PD PE MA	
DIRECTION TYPE radial													R	
SOCKET socket not included to be reported only with connector output (eg. MAR.162), for socket see Accessories													.162	
VARIANT custom version														XXX

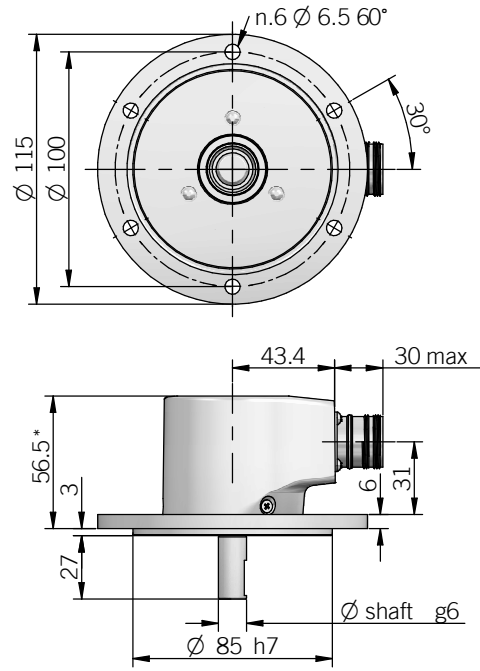
ORDERING CODE SSI	EAR	90A	13	G	8/30	S	X	2048	RS	10	X	HA	R	.162	+XXX
SERIES singleturn absolute encoder EAR															
MODEL synchronous flange ø 40 mm 90A REO-444 flange 115A															
RESOLUTION bit 13 / 16 / 17 / 18 / 21 / 25 ppr 360 / 720 / 1440 / 2880 / 3600															
CODE TYPE binary B gray G (no powers of 2) binary offset code (0-XXX) BC (no powers of 2) gray offset code (0-XXX) GC															
POWER SUPPLY 8 ... 30 V DC 8/30															
ELECTRICAL INTERFACE Serial Synchronous Interface - SSI S															
OPTION to be reported if not used X reset with external input ZE reset on cover or with external input ZP															
INCREMENTAL RESOLUTION (powers of 2) ppr from 128 to 8192															
INCREMENTAL ELECTRICAL INTERFACE available with PD or HA output type line driver HTL L push pull P line driver RS-422 RS															
SHAFT DIAMETER (mod. 90) 3/8" - mm 9,52 mm 10															
ENCLOSURE RATING IP 65 shaft side / IP67 cover side X IP 67 S															
OUTPUT TYPE cable (standard length 1,5 m) PC preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) cable (standard length 1,5 m) PD preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) (without reset option) 7 pin MIL plug connector MC (with reset option) 10 pin MIL plug connector MD 12 pin M23 plug connector HA 8 pin M12 plug connector M12															
DIRECTION TYPE radial R															
SOCKET socket not included .162 to be reported only with connector output (eg. HAR.162), for socket see Accessories															
VARIANT custom version XXX															

to be added with incremental output

90A



115A



for fixing clamps please refer to Accessories
 * with option ZP +1,5 mm
 recommended mating shaft tolerance H7
 dimensions in mm

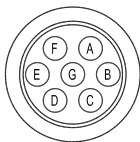
BIT-PARALLEL CONNECTIONS

Function	Binary / Gray	Cable PD	Cable PE	19 pin MA
bit 1 (LSB)	B ⁰ / G ⁰	green	green	A
bit 2	B ¹ / G ¹	yellow	yellow	B
bit 3	B ² / G ²	blue	blue	C
bit 4	B ³ / G ³	brown	brown	D
bit 5	B ⁴ / G ⁴	orange or pink	orange or pink	E
bit 6	B ⁵ / G ⁵	white	white	F
bit 7	B ⁶ / G ⁶	grey	grey	G
bit 8	B ⁷ / G ⁷	purple	purple	H
bit 9	B ⁸ / G ⁸	grey / pink	grey / pink	J
bit 10	B ⁹ / G ⁹	white / green	white / green	K
bit 11	B ¹⁰ / G ¹⁰	brown / green	brown / green	L
bit 12	B ¹¹ / G ¹¹	white / yellow	white / yellow	M
bit 13	B ¹² / G ¹²	yellow / brown	yellow / brown	N
STROBE	/	/	green / blue	P
LATCH	/	/	yellow / grey	R
0 V	/	black	black	T
U / D	/	red / blue	red / blue	U
RESET	/	/	pink / green	/
+ V DC	/	red	red	V
⏏	/	shield	shield	S

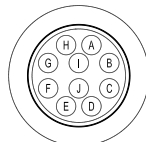
SSI CONNECTIONS

Function	Cable PC	Cable PD	7 pin MC	10 pin MD	12 pin HA	12 pin HA	8 pin M12
+ V DC	red	red	G	G	8	8	8
0 V	black	black	F	F	1	1	5
DATA +	green	green	C	C	2	2	3
DATA -	brown	brown	D	D	10	10	2
CLOCK +	yellow	yellow	A	A	3	3	4
CLOCK -	orange or pink	orange or pink	B	B	11	11	6
A+	/	grey	/	/	/	6	/
A-	/	blue	/	/	/	7	/
B+	/	purple	/	/	/	9	/
B-	/	white / green	/	/	/	12	/
U / D	red / blue	red / blue	E	E	5	5	7
RESET	white	white	/	H	4	4	1
⏏	shield	shield	housing	housing	9	housing	housing

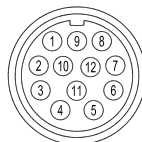
MC connector (7 pin)
Amphenol MS3102-E-16-S
front view



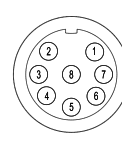
MD connector (10 pin)
Amphenol MS3102-E-18-1P
front view



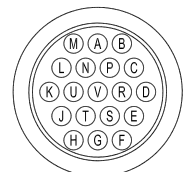
HA connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



M12 connector (8 pin)
M12 A coded
front view



MA connector (19 pin)
Amphenol 62IN 12E 14-19 P
front view



ELECTRICAL SPECIFICATIONS

Resolution	P = from 90 ppr to 13 bit S = from 360 ppr to 25 bit
Power supply¹	7,6 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Max load current	20 mA / channel
Absolute electrical interface²	P = push pull (iC-DL) S = RS-422 (THVD1451 or similar)
Incremental electrical interface²	L = HTL differential (AEIC-7272 or similar) P = Push-Pull (AEIC-7272 or similar) RS = RS-422 (AELT-5000 or similar)
Max incremental output frequency	128 kHz
Auxiliary inputs (U/D - RESET - LATCH)	active high (+V DC) connect to 0 V if not used / RESET - LATCH t_{min} 150 ms
Max frequency	25 kHz LSB (Bit-parallel) clock input 100 kHz ... 1 MHz (SSI)
Code type	binary or gray
Logic	SSI = positive Bit-parallel = positive or negative
SSI monostable time (T_m)	20 μ s
SSI pause time (T_p)	> 35 μ s
SSI frame	left aligned format MSB ... LSB up to 13 bit = length 13 bit from 14 to 21 bit = length 21 bit from 22 to 25 bit = length 25 bit
SSI status and parity bit	on request
Counting direction	SSI output = decreasing clockwise (shaft view) incremental output = A leads B clockwise (shaft view)
Start-up time	700 ms
Accuracy	$\pm 0,069^\circ$
Mean time to dangerous failure (MTTF)_d³ according to EN ISO 13849-1	173 years with BIT-PARALLEL output 214 years with SSI/INCREMENTAL output
Mission time (T_m)³	20 years
Diagnostic coverage (DC)³	0%
Cable type PC	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Cable type PD	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Cable type PE	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

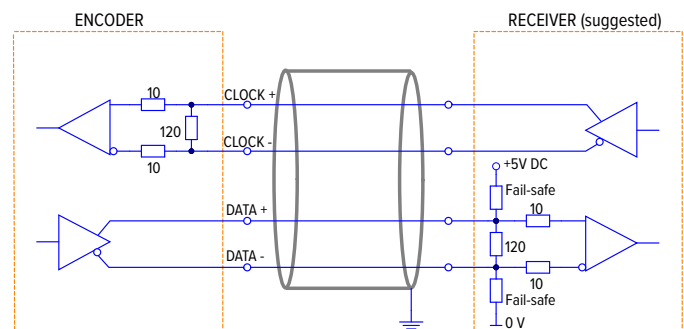
Shaft diameter	\varnothing 9,52 (3/8") / 10 mm
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load⁴	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 ⁻⁶ kgm ² (36 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature Bit-parallel^{5, 6}	-20° ... +85°C (-4 ... +185°F)
Operating temperature SSI^{5, 6}	-40° ... +100°C (-40° ... +212°F) -20° ... +100°C (-4° ... +212°F) with PC cable output -20° ... +85°C (-4° ... +185°F) with PD cable output -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁶	-20° ... +85°C (-4° ... +185°F)
Weight	approx 300 g (10,58 oz)

¹ as measured at the transducer without cable influences² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section³ this product is not a safety component, for further details refer to TECHNICAL BASICS section⁴ maximum load for static usage⁵ measured on the transducer flange⁶ condensation not allowed

ROTATION SPEED DERATING TABLE

Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000
+85 ... +100 (+185 ... +212)	5000	3000

SSI ELECTRICAL INTERFACE



EAL 58 B / C - 63 A / D / E ANALOGUE

SOLID SHAFT SINGLETURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard singleturn absolute encoders for factory automation applications.

- Optical sensing technology (OptoASIC)
- Programmable measuring range via teach-in function (external inputs or cover button)
- Power supply up to +30 VDC with analogue (voltage or current) electrical interface
- Cable or M12 connector output
- Solid shaft diameter up to 10 mm
- Mounting by synchronous, clamping or centering 2,5" square flange



ORDERING CODE EAL 63A 16B 12/30 V 05 X 10 X M12 R .162 +XXX

SERIES
analogue singleturn absolute encoder **EAL**

MODEL
synchronous flange ø 31.75 mm **63A**
synchronous flange ø 50 mm **58B**
clamping flange ø 36 mm **58C**
centering square flange ø 31.75 mm **63D**
centering square flange ø 50 mm **63E**

OUTPUT DAC RESOLUTION
16 bit **16B**

POWER SUPPLY
12 ... 30 V DC **12/30**

ELECTRICAL INTERFACE
voltage **V**
current **I**

OUTPUT RANGE
0 ... 5 V **05**
0 ... 10 V **010**
0 ... 20 mA **020**
4 ... 20 mA **420**

OPTIONS
to be reported with voltage output / 3 wires current output **X**
4 wires current output **Q**

SHAFT DIAMETER
(mod. 58 B) mm **6**
(mod. 63 A / D) 3/8"- mm **9,52**
(mod. 58 C - 63 A / D / E) mm **10**

ENCLOSURE RATING
IP 65 shaft side / IP67 cover side **X**
IP 67 **S**

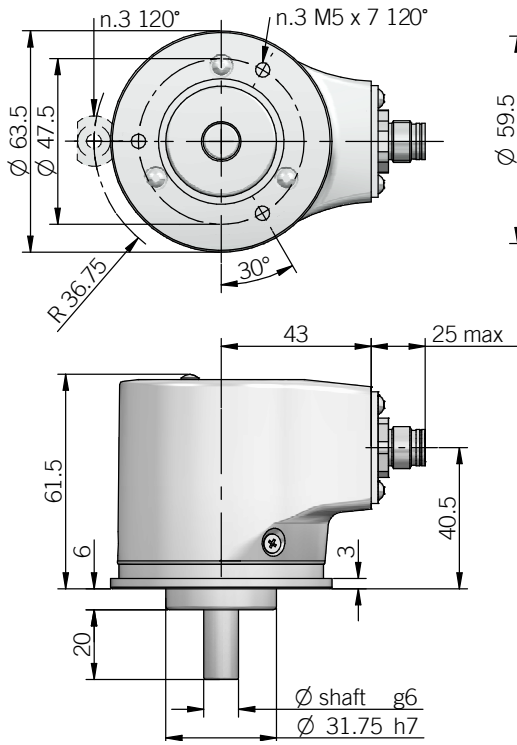
OUTPUT TYPE
cable (standard length 1,5 m) **P**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after **DIRECTION TYPE** (eg. PR5)
M12 plug connector **M12**

DIRECTION TYPE
radial **R**

SOCKET
socket not included **.162**
to be reported only with connector output (eg. M12R.162), for socket see Accessories

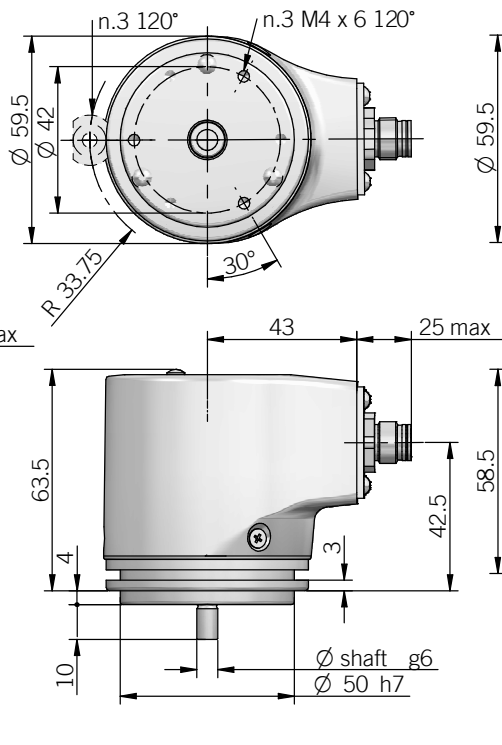
VARIANT
custom version **XXX**

63A



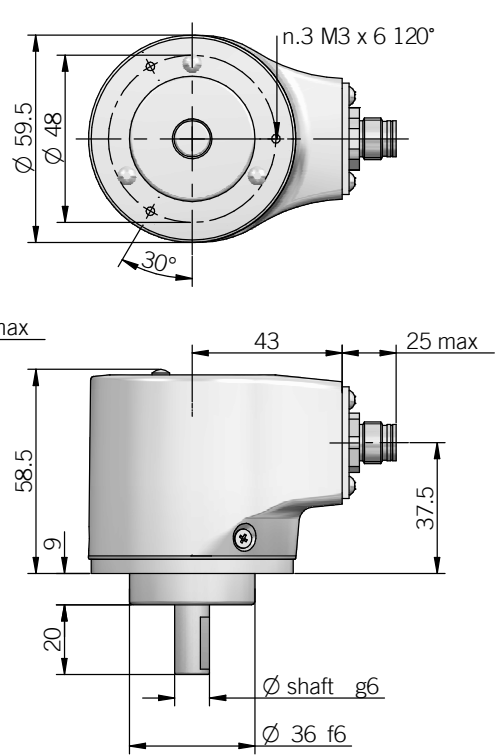
for fixing clamps please refer to Accessories

58B

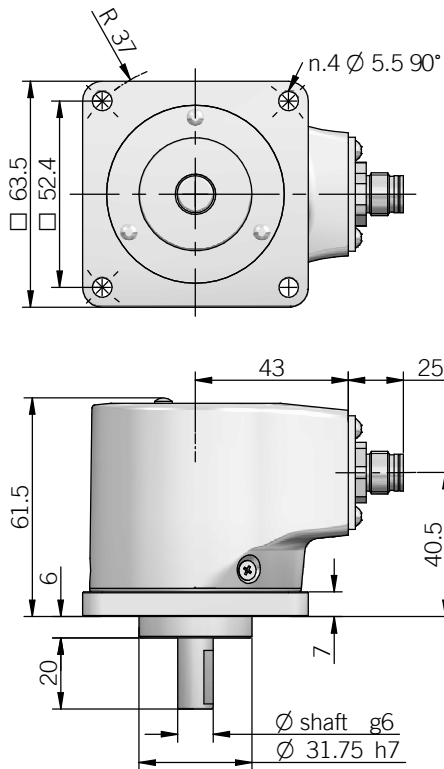


for fixing clamps please refer to Accessories

58C

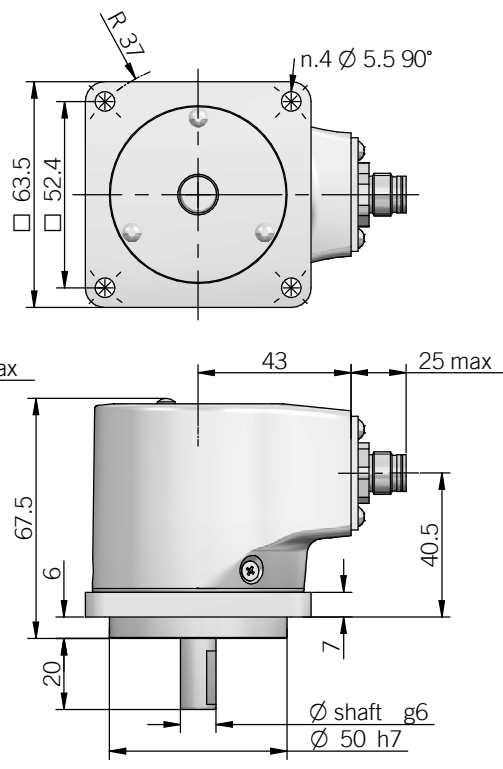


63D



recommended mating shaft tolerance H7
dimensions in mm

63E



ELECTRICAL SPECIFICATIONS

Resolution	16 bit
Output DAC resolution	16 bit
Minimum angle	22,5°
Power supply¹	11,4 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Electrical interface²	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
Auxiliary inputs (BEGIN - END)	active high (+V DC) connect to 0 V if not used / t_{min} 150 ms
Load	Rmin= 1 kΩ (voltage output) Rmax= (V DC - 2) / 0,02 (current output)
Output update frequency	16 kHz
Signal pattern	auto teaching according to commissioning
Start-up time	700 ms
Linearity error	± 0,069°
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	215 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Shaft diameter	∅ 6 / 9,52 (3/8") / 10 mm
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load⁴	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 ⁻⁶ kgm ² (36 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-20° ... +85°C (-4° ... +185°F)
Storage temperature⁶	-20° ... +85°C (-4° ... +185°F)
Weight	approx 350 g (12,35 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

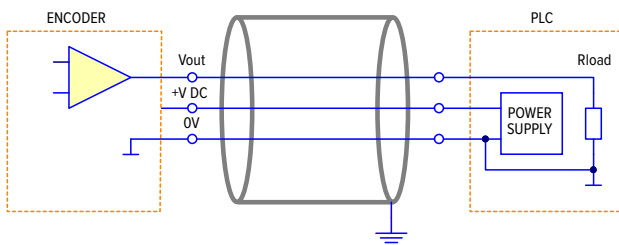
⁴ maximum load for static usage

⁵ measured on the transducer flange

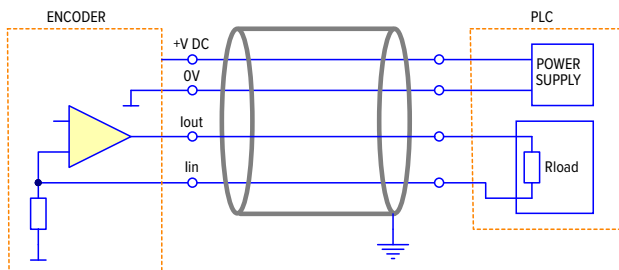
⁶ condensation not allowed

ELECTRICAL INTERFACE

VOLTAGE OUTPUT



CURRENT OUTPUT



3 / 4 wire source
with 3 wires interface lin is internally connected to 0V

ROTATION SPEED / TEMPERATURE TABLE

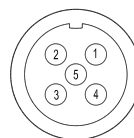
Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000

CONNECTIONS

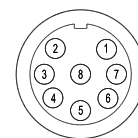
Function	Cable	5 pin M12	8 pin M12*
+ V DC	red	2	2
0 V	black	3	3
Vout / lout	green	1	1
lin	yellow	/	6
BEGIN	white	4	4
END	brown or grey	5	5
⏏	shield	housing	housing

* with Q current output

M12 connector (5 pin)
M12 A coded
front view



M12 connector (8 pin)
M12 A coded
front view



EAL 58 F - 63 F / G ANALOGUE

BLIND HOLLOW SHAFT SINGLETURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard singleturn absolute encoders for factory automation applications.

- Optical sensing technology (OptoASIC)
- Programmable measuring range via teach-in function (external inputs or cover button)
- Power supply up to +30 VDC with analogue (voltage or current) electrical interface
- Cable or M12 connector output
- Blind hollow shaft up to 15 mm
- Mounting by stator coupling, torque stop slot or torque pin



ORDERING CODE

EAL 58F 16B 12/30 V 05 X 15 X M12 R .162 +XXX

SERIES
analogue singleturn absolute encoder **EAL**

MODEL
blind hollow shaft with stator coupling **58F**
blind hollow shaft with torque stop slot **63F**
blind hollow shaft with torque pin **63G**

OUTPUT DAC RESOLUTION
16 bit **16B**

POWER SUPPLY
12 ... 30 V DC **12/30**

ELECTRICAL INTERFACE
voltage **V**
current **I**

OUTPUT RANGE
0 ... 5 V **05**
0 ... 10 V **010**
0 ... 20 mA **020**
4 ... 20 mA **420**

OPTIONS
to be reported with voltage output / 3 wires current output **X**
4 wires current output **Q**

BORE DIAMETER
mm **14**
mm **15**
diameters 6 / 8 / 9,52 (3/8") / 10 / 11 / 12 mm with optional shaft adapter, see Accessories

ENCLOSURE RATING
IP 65 shaft side / IP67 cover side **X**
IP 67 **S**

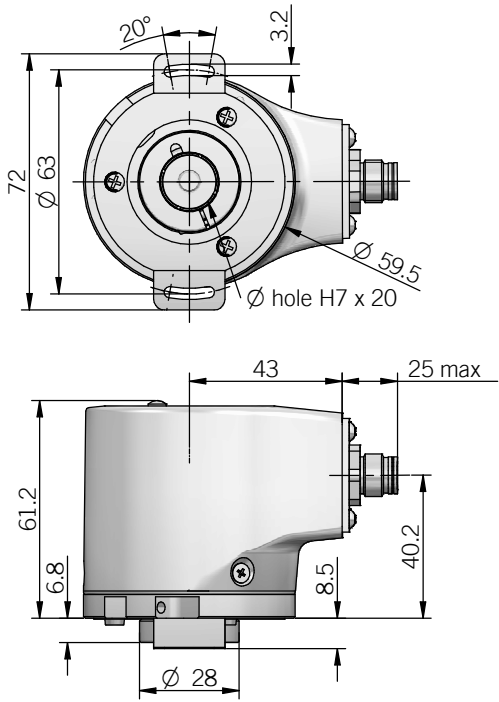
OUTPUT TYPE
cable (standard length 1,5 m) **P**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)
M12 plug connector **M12**

DIRECTION TYPE
radial **R**

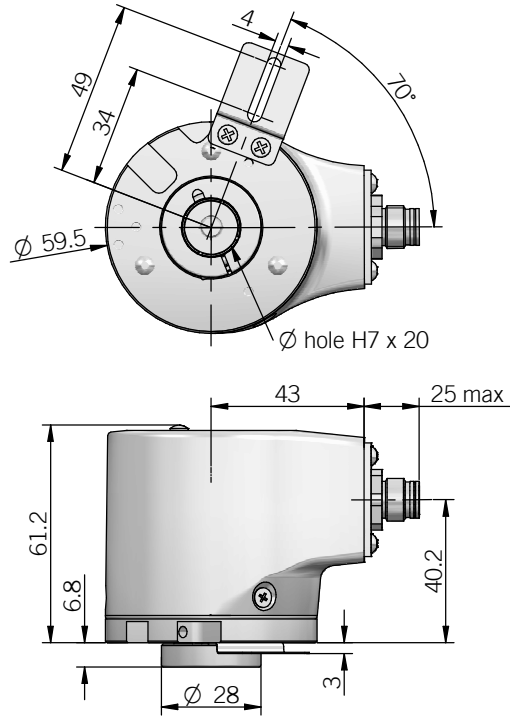
SOCKET
socket not included **.162**
to be reported only with connector output (eg. M12R.162), for socket see Accessories

VARIANT
custom version **XXX**

58F

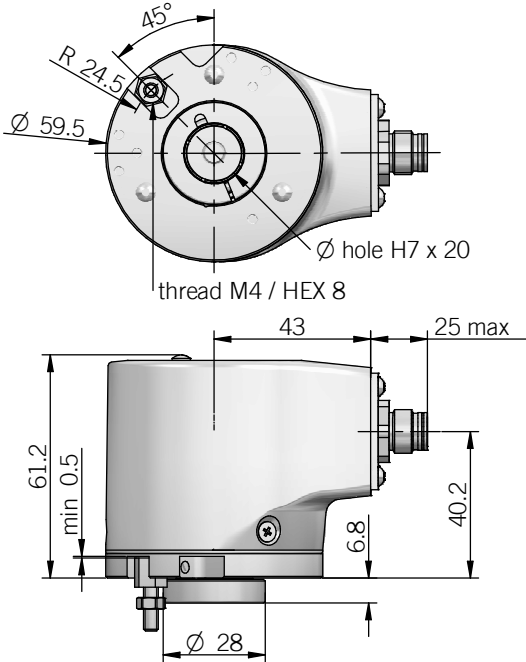


63F



for torque pin please refer to Accessories

63G



torque pin is included
recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	16 bit
Output DAC resolution	16 bit
Minimum angle	22,5°
Power supply¹	11,4 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Electrical interface²	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
Auxiliary inputs (BEGIN - END)	active high (+V DC) connect to 0 V if not used / t_{min} 150 ms
Load	Rmin= 1 k Ω (voltage output) Rmax= (V DC - 2) / 0,02 (current output)
Output update frequency	16 kHz
Signal pattern	auto teaching according to commissioning
Start-up time	700 ms
Linearity error	\pm 0,069°
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	215 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Bore diameter	ϕ 14 / 15 mm ϕ 6* / 8* / 9,52 (3/8")* / 10* / 11* / 12* mm * with optional shaft adapter, please refer to Accessories
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load⁴	200 N (45 lbs) axial / 60 N (13,49 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	5 x 10 ⁻⁶ kgm ² (119 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-20° ... +85°C (-4° ... +185°F)
Storage temperature⁶	-20° ... +85°C (-4° ... +185°F)
Weight	approx 350 g (12,35 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

ROTATION SPEED / TEMPERATURE TABLE

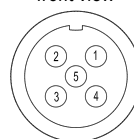
	Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
IP65	up to +70 (+158)	9000	6000
	+70 ... +85 (+158 ... +185)	6000	3000
IP67	up to +70 (+158)	8000	4000
	+70 ... +85 (+158 ... +185)	4000	2000

CONNECTIONS

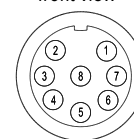
Function	Cable	5 pin M12	8 pin M12*
+ V DC	red	2	2
0 V	black	3	3
Vout / Iout	green	1	1
lin	yellow	/	6
BEGIN	white	4	4
END	brown or grey	5	5
GND	shield	housing	housing

* with Q current output

M12 connector (5 pin)
M12 A coded front view

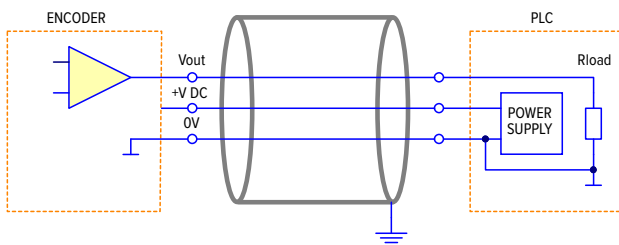


M12 connector (8 pin)
M12 A coded front view

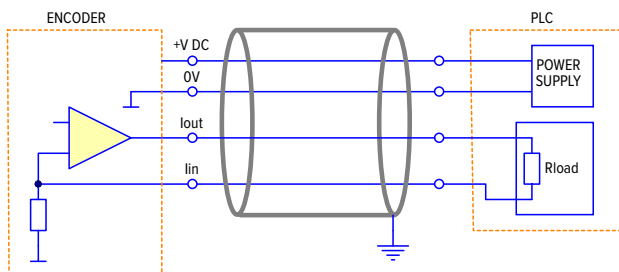


ELECTRICAL INTERFACE

VOLTAGE OUTPUT



CURRENT OUTPUT



3 / 4 wire source
with 3 wires interface lin is internally connected to 0V

EAL 90 - 115 A ANALOGUE

SOLID SHAFT SINGLETURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard singleturn absolute encoders for factory automation applications.

- Optical sensing technology (OptoASIC)
- Programmable measuring range via teach-in function (external inputs or cover button)
- Power supply up to +30 VDC with analogue (voltage or current) electrical interface
- Cable or M12 connector output
- Solid shaft diameter up to 10 mm
- Mounting by synchronous or REO-444 flange



ORDERING CODE

EAL 90A 16B 12/30 V 05 X 10 X M12 R .162 +XXX

SERIES
analogue singleturn absolute encoder **EAL**

MODEL
synchronous flange ø 40 mm **90A**
REO-444 flange **115A**

OUTPUT DAC RESOLUTION
16 bit **16B**

POWER SUPPLY
12 ... 30 V DC **12/30**

ELECTRICAL INTERFACE
voltage **V**
current **I**

OUTPUT RANGE
0 ... 5 V **05**
0 ... 10 V **010**
0 ... 20 mA **020**
4 ... 20 mA **420**

OPTIONS
to be reported with voltage output / 3 wires current output **X**
4 wires current output **Q**

SHAFT DIAMETER
(mod. 90) 3/8" - mm **9,52**
mm **10**

ENCLOSURE RATING
IP 65 shaft side / IP67 cover side **X**
IP 67 **S**

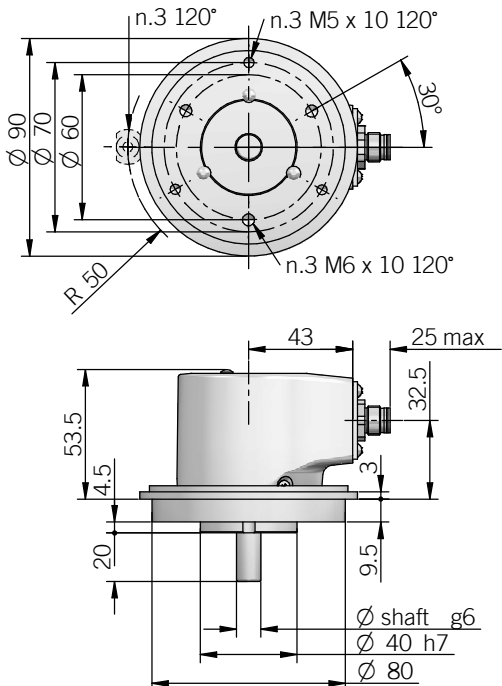
OUTPUT TYPE
cable (standard length 1,5 m) **P**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)
M12 plug connector **M12**
socket connector included, without socket please add 162 as variant code

DIRECTION TYPE
radial **R**

SOCKET
socket not included **.162**
to be reported only with connector output (eg. M12R.162), for socket see Accessories

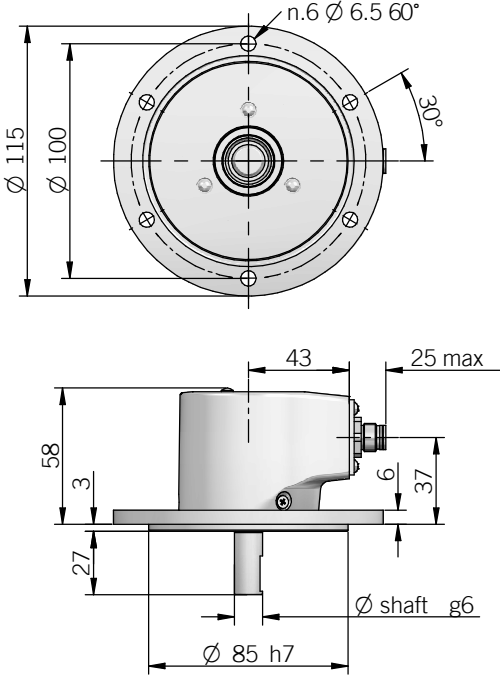
VARIANT
custom version **XXX**

90A



for fixing clamps please refer to Accessories
recommended mating shaft tolerance H7
dimensions in mm

115A

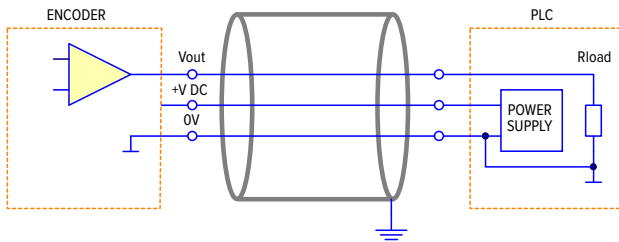


ELECTRICAL SPECIFICATIONS

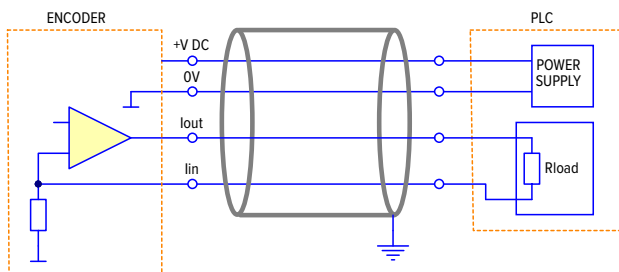
Resolution	16 bit
Output DAC resolution	16 bit
Minimum angle	22,5°
Power supply¹	11,4 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Electrical interface²	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
Auxiliary inputs (BEGIN - END)	active high (+V DC) connect to 0 V if not used / t_{min} 150 ms
Load	Rmin= 1 k Ω (voltage output) Rmax= (V DC - 2) / 0,02 (current output)
Output update frequency	16 kHz
Signal pattern	auto teaching according to commissioning
Start-up time	700 ms
Linearity error	$\pm 0,069^\circ$
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	215 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

ELECTRICAL INTERFACE

VOLTAGE OUTPUT



CURRENT OUTPUT



3 / 4 wire source
with 3 wires interface lin is internally connected to 0V

MECHANICAL SPECIFICATIONS

Shaft diameter	\varnothing 9,52 (3/8") / 10 mm
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load⁴	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 ⁻⁶ kgm ² (36 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-20° ... +85°C (-4° ... +185°F)
Storage temperature⁶	-20° ... +85°C (-4° ... +185°F)
Weight	approx 350 g (12,35 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

ROTATION SPEED / TEMPERATURE TABLE

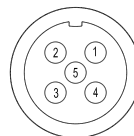
Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000

CONNECTIONS

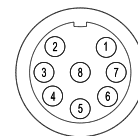
Function	Cable	5 pin M12	8 pin M12*
+ V DC	red	2	2
0 V	black	3	3
Vout / Iout	green	1	1
lin	yellow	/	6
BEGIN	white	4	4
END	brown or grey	5	5
⊥	shield	housing	housing

* with Q current output

M12 connector (5 pin)
M12 A coded
front view



M12 connector (8 pin)
M12 A coded
front view



EAX 80 A / D SSI

EXPLOSION PROOF ATEX SINGLETURN ABSOLUTE ENCODER

MAIN FEATURES

Explosion proof encoders designed to operate in hazardous and explosive environments.

- Optical sensing technology (proprietary OptoASIC)
- Resolution up to 25 bit
- Power supply up to +30 VDC with SSI as electrical interface
- Code reset for easy setup
- 10 mm solid shaft diameter
- Cable output
- Mounting by synchronous or centering square flange

EX CLASSIFICATION

It has been assured with EC-TYPE Examination Certificate CESI 04 ATEX 082 that the EAX 80 is compliant with essential health and safety requirements according to

- EN IEC 60079-0:2018
- EN 60079-1:2014
- EN 60079-31:2014

The UE declaration is available on www.eltra.it



ORDERING CODE

EAX 80A 13 G 8/30 S X 10 X PR .XXX

SERIES
singleturn absolute flameproof encoder **EAX**

MODEL
synchronous flange ø 40 mm **80A**
centering square flange ø 40 mm **80D**

RESOLUTION
bit **13 / 16 / 17 / 18 / 21 / 25**
ppr **360 / 720 / 1440 / 2880 / 3600**

CODE TYPE
binary **B**
gray **G**
(no powers of 2) binary offset code (0-XXX) **BC**
(no powers of 2) gray offset code (0-XXX) **GC**

POWER SUPPLY
8 ... 30 V DC **8/30**

ELECTRICAL INTERFACE
Serial Synchronous Interface - SSI **S**

OPTIONS
to be reported if not used **X**
reset with external input **ZE**

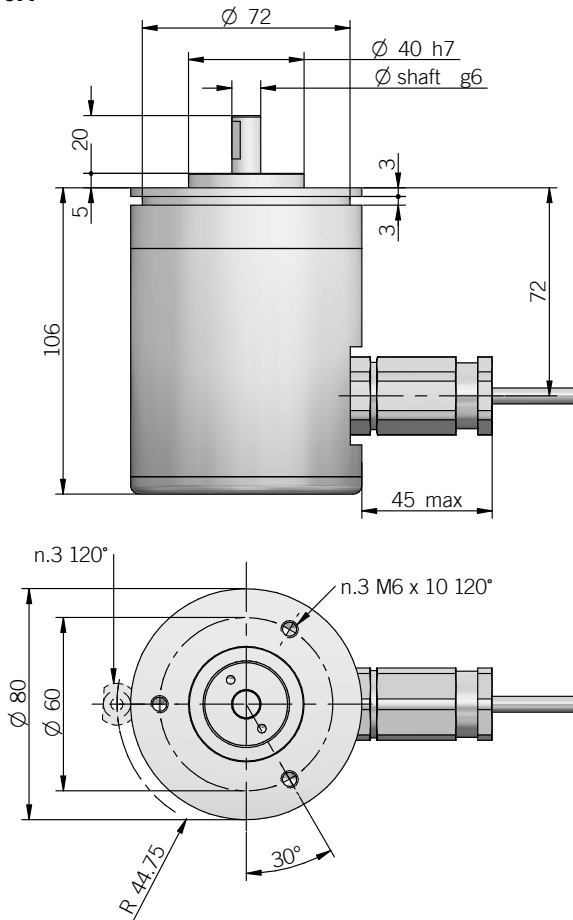
SHAFT DIAMETER
mm **10**

ENCLOSURE RATING
IP 65 **X**

OUTPUT TYPE
radial cable (standard length 1,5 m) **PR**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PDR5)

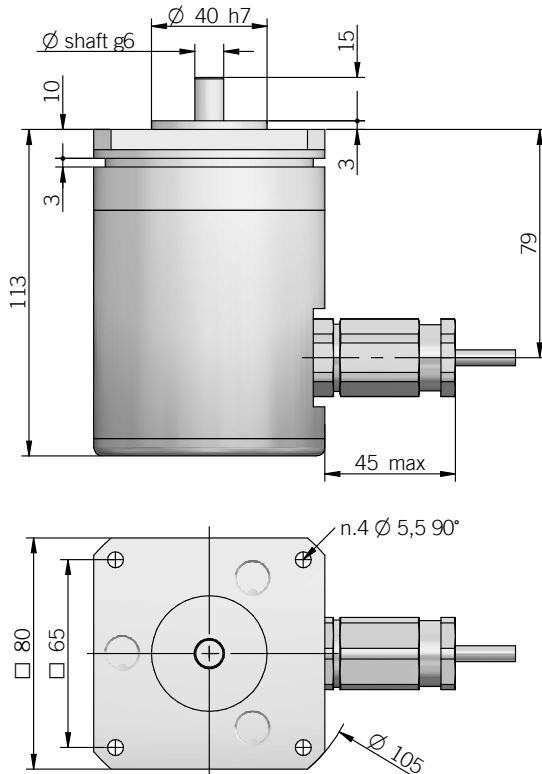
VARIANT
custom version **XXX**

80A



fixing clamps not included, please refer to the Accessories

80D



recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 360 ppr to 25 bit
Power supply¹	7,6 ... 30 V DC (reverse polarity protection)
Current consumption without load	100 mA max
Absolute electrical interface²	RS-422 (THVD1451 or similar)
Auxiliary inputs (U/D - RESET)	active high (+V DC) connect to 0 V if not used / RESET t_{min} 150 ms
Max frequency	clock input 100 kHz ... 1 MHz
Code type	binary or gray
Logic	positive
SSI monostable time (Tm)	20 μ s
SSI pause time (Tp)	> 35 μ s
SSI frame	left aligned format MSB ... LSB up to 13 bit = length 13 bit from 14 to 21 bit = length 21 bit from 22 to 25 bit = length 25 bit
SSI status and parity bit	on request
Counting direction	decreasing clockwise (shaft view)
Start-up time	700 ms
Accuracy	$\pm 0,069^\circ$
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	214 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed or flexible installation conductors section min 0,14 mm ² / AWG 26 bending radius min 35 mm (fixed) / min 60 mm (flexible)
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Shaft diameter	ϕ 10 mm
Enclosure rating	IP 65 (IEC 60529)
Max rotation speed	3000 rpm
Max shaft load⁴	200 N (45 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	$1,5 \times 10^{-6}$ kgm ² (36×10^{-6} lbf ²)
Starting torque (at +20°C / +68°F)	< 0,06 Nm (8,50 Ozin)
Bearing stage material	anodized aluminum
Shaft material	stainless steel
Housing material	anodized aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	0° ... +50°C (+32° ... +122°F)
Storage temperature⁶	-15° ... +70°C (+5° ... +158°F)
Weight	1200 g (42,33 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

EPL MARKING



II 2GD
Ex db IIC T6 Gb
Ex tb IIIC T85°C Db
IP 65

II 2GD

II: group II: different than mines
 2: category 2: high level of protection
 GD: areas containing gas (G) and dust (D)

Ex db IIC T6 Gb

Ex db: flameproof enclosure for explosive atmospheres with gases, vapours and mists

IIC: group of gas IIC

T6: max surface temperature +85°C of the device for atmospheres with gas

Gb: product with a high level of protection

Ex tb IIIC T85°C Db

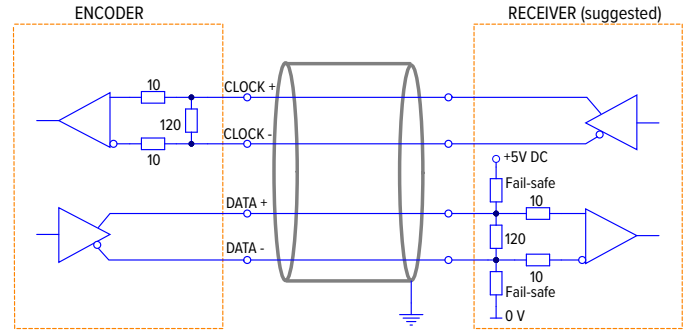
Ex tb: flameproof enclosure safety type

IIIC: group of dust combustibles IIIC

T85°C: max surface temperature +85°C of the device in the presence of dust

Db: product with a high level of protection

SSI ELECTRICAL INTERFACE



CONNECTIONS

Function	Cable
+ V DC	red
0 V	grey
DATA +	green
DATA -	brown
CLOCK +	yellow
CLOCK -	pink
U / D	blue
RESET	white
⊥	shield

MAIN FEATURES

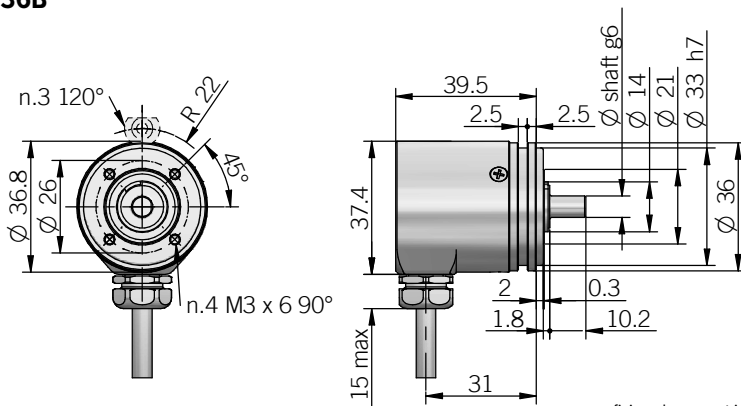
Miniaturised singleturn absolute encoder for applications with limited space.

- Contactless magnetic sensing technology (magnetic ASIC)
- Up to 18 bit as singleturn resolution
- Power supply up to +30 V DC with SSI as electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available at cable end
- 6 mm diameter solid shaft
- Mounting by synchronous flange



ORDERING CODE	EMA	36B	13	G	8/30	S	P	X	6	X	8	M12R	.162	+XXX
SERIES magnetic singleturn absolute encoder EMA														
MODEL synchronous flange ø 33 mm 36B														
RESOLUTION from 1 to 18 bit please directly contact our offices for other pulses														
CODE TYPE binary B gray G														
POWER SUPPLY 5 V DC 5 8 ... 30 V DC 8/30														
ELECTRICAL INTERFACE Serial Synchronous Interface - SSI S														
LOGIC positive P														
OPTIONS to be reported if not used X reset with external input ZE														
SHAFT DIAMETER mm 6														
ENCLOSURE RATING IP 67 cover side / IP 65 shaft side X														
MAX ROTATION SPEED 8000 rpm 8														
OUTPUT TYPE radial cable (standard length 0,5 m) PR preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5) 8 pin M12 radial plug connector M12R														
SOCKET socket not included .162 to be reported only with connector output (eg. M12R.162), for socket see Accessories														
VARIANT custom version XXX														

36B



fixing clamps not included, please refer to Accessories

recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS	
Resolution	from 1 to 18 bit
Power supply¹	5 = 4,75 ... 5,25 V DC 8/30 = 7,6 ... 30 V DC (reverse polarity protection)
Power draw without load	< 0,4 W
Electrical interface²	RS-422 (THVD1451 or similar)
Auxiliary inputs (U/D - RESET)	active high (+V DC) connect to 0 V if not used / RESET t_{min} 150 ms
Clock frequency	100 kHz ... 1 MHz
Code type	binary or gray
SSI monostable time (Tm)	20 μ s
SSI pause time (Tp)	> 35 μ s
SSI frame	left aligned format MSB ... LSB up to 13 bit = length 13 bit 14 to 18 bit = length 18 bit
SSI status and parity bit	on request
Counting direction	decreasing clockwise (shaft view)
Start-up time	150 ms
Accuracy (at +20°C / +68°F)	\pm 0,20°
Mean time to dangerous failure (MTTF)_d³ according to EN ISO 13849-1	230 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

CONNECTIONS

Function	Cable	8 pin M12
+ V DC	red	8
0 V	black	5
DATA +	green	3
DATA -	brown or grey	2
CLOCK +	yellow	4
CLOCK -	orange	6
U / D	red / blue	7
RESET	white	1
⏏	shield	housing

MECHANICAL SPECIFICATIONS	
Shaft diameter	\varnothing 6 mm
Enclosure rating	IP 67 cover side / IP 65 shaft side (IEC 60529)
Rotation speed	8000 rpm continuous / 10000 rpm max
Max shaft load⁴	20 N (4,5 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,001 x 10 ⁻⁶ kgm ² (0,02 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	chrome plated steel
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5, 6}	-30° ... +100°C (-22° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁶	-25° ... +85°C (-13° ... +185°F)
Weight	150 g (5,29 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

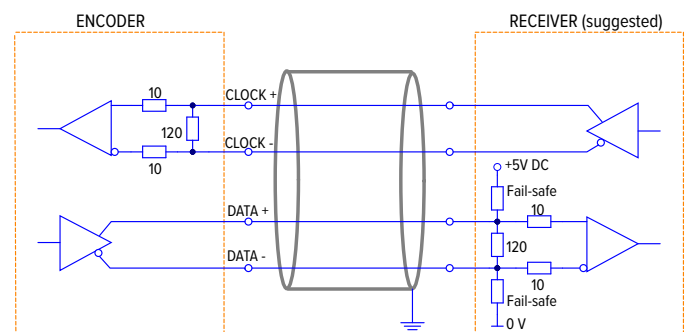
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

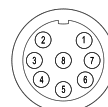
⁵ measured on the transducer flange

⁶ condensation not allowed

SSI ELECTRICAL INTERFACE



M12 connector (8 pin)
M12 A coded
front view



MAIN FEATURES

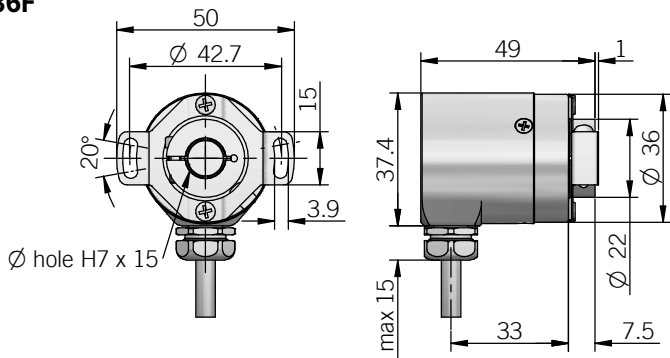
Miniaturised singleturn absolute encoders for applications with limited space.

- Contactless magnetic sensing technology (magnetic ASIC)
- Up to 18 bit as singleturn resolution
- Power supply up to +30 V DC with SSI as electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available at cable end
- Blind hollow shaft up to 10 mm diameter
- Mounting by stator coupling or torque pin



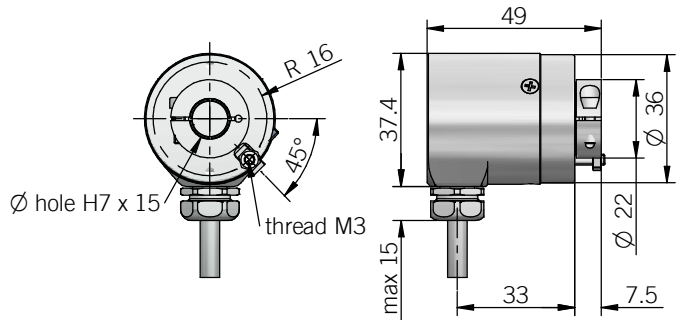
ORDERING CODE	EMA	36F	13	G	8/30	S	P	X	10	X	8	M12R	.162	+XXX
SERIES magnetic singleturn absolute encoder	EMA													
MODEL blind hollow shaft with stator coupling blind hollow shaft with torque pin		36F 36G												
RESOLUTION from 1 to 18 bit please directly contact our offices for other pulses			13											
CODE TYPE binary gray				G										
POWER SUPPLY 5 V DC 8 ... 30 V DC					8/30									
ELECTRICAL INTERFACE Serial Synchronous Interface - SSI						S								
LOGIC positive							P							
OPTIONS to be reported if not used reset with external input								X ZE						
BORE DIAMETER (3/8") mm mm									9,52 10					
diameters 4 / 5 / 6 / 6,35 (1/4") / 8 mm with optional shaft adapter, see Accessories														
ENCLOSURE RATING IP 67 cover side / IP 66 shaft side										X				
MAX ROTATION SPEED 8000 rpm											8			
OUTPUT TYPE radial cable (standard length 0,5 m) preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PDR5) 8 pin M12 radial plug connector												PR M12R		
SOCKET socket not included to be reported only with connector output (eg. M12R.162), for socket see Accessories													.162	
VARIANT custom version														XXX

36F



recommended mating shaft tolerance g6
dimensions in mm

36G



torque pin is included, for mounting instruction please refer to product installation notes

ELECTRICAL SPECIFICATIONS

Resolution	from 1 to 18 bit
Power supply¹	5 = 4,75 ... 5,25 V DC 8/30 = 7,6 ... 30 V DC (reverse polarity protection)
Power draw without load	< 0,4 W
Electrical interface²	RS-422 (THVD1451 or similar)
Auxiliary inputs (U/D - RESET)	active high (+V DC) connect to 0 V if not used / RESET t _{min} 150 ms
Clock frequency	100 kHz ... 1 MHz
Code type	binary or gray
SSI monostable time (Tm)	20 µs
SSI pause time (Tp)	> 35 µs
SSI frame	left aligned format MSB ... LSB up to 13 bit = length 13 bit 14 to 18 bit = length 18 bit
SSI status and parity bit	on request
Counting direction	decreasing clockwise (shaft view)
Start-up time	150 ms
Accuracy (at +20°C / +68°F)	± 0,20°
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	230 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

CONNECTIONS

Function	Cable	8 pin M12
+ V DC	red	8
0 V	black	5
DATA +	green	3
DATA -	brown or grey	2
CLOCK +	yellow	4
CLOCK -	orange	6
U / D	red / blue	7
RESET	white	1
⏏	shield	housing

MECHANICAL SPECIFICATIONS

Bore diameter	ø 9,52 (3/8") / 10 mm ø 4" / 5" / 6" / 6,35 (1/4")* / 8" mm * with optional shaft adapter, please refer to Accessories
Enclosure rating	IP 67 cover side / IP 66 shaft side (IEC 60529)
Rotation speed	8000 rpm continuous / 10000 rpm max
Max shaft load⁴	20 N (4,5 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,001 x 10 ⁻⁶ kgm ² (0,02 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	chrome plated steel
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5, 6}	-30° ... +100°C (-22° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁶	-25° ... +85°C (-13° ... +185°F)
Weight	150 g (5,29 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

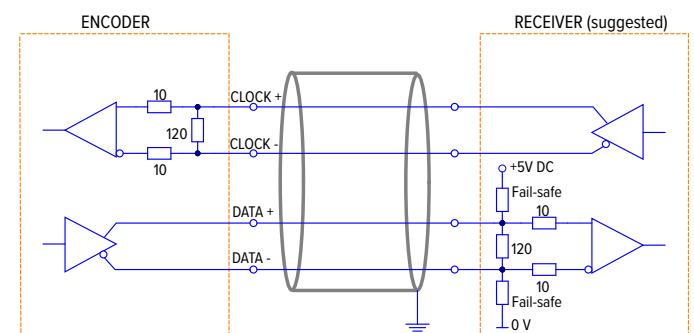
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

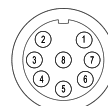
⁵ measured on the transducer flange

⁶ condensation not allowed

SSI ELECTRICAL INTERFACE



M12 connector (8 pin)
M12 A coded
front view



EMA 50 A / B BIT-PARALLEL - SSI

SOLID SHAFT MAGNETIC SINGLETURN ABSOLUTE ENCODER

MAIN FEATURES

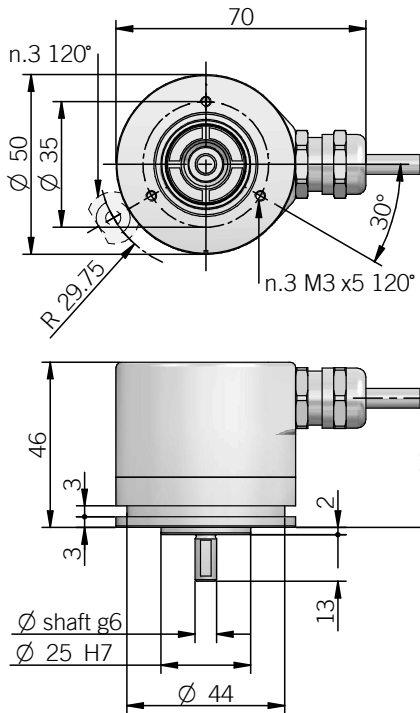
Singleturn absolute magnetic encoders with solid shaft, 50 mm size

- Resolution up to 13 bit (8192 ppr)
- Power supply up to +30 V DC with SSI or Bit-parallel as electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available at cable end
- Robust construction
- Solid shaft diameter up to 10 mm
- IP 67 enclosure rating
- Mounting by synchronous flange



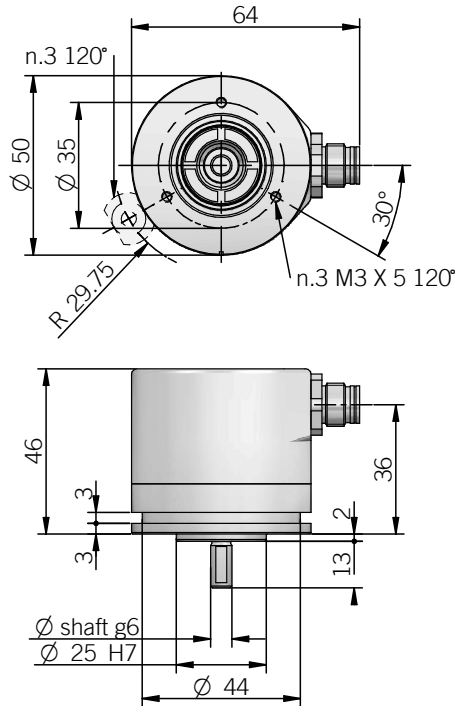
ORDERING CODE	EMA	50B	1024	G	8/30	N	N	X	6	X	3	M12	R	.162	+XXX
<p>SERIES magnetic singleturn absolute encoder EMA</p> <p>MODEL synchronous flange ø 25 mm 50A synchronous flange ø 30 mm 50B for anodized version please directly contact our offices</p> <p>RESOLUTION (N / C / R / U / P interface) ppr from 2 to 4096 (S interface) ppr from 2 to 8192</p> <p>CODE TYPE binary B gray G (no powers of 2) binary offset code (0-XXX) BC (no powers of 2) gray offset code (0-XXX) GC</p> <p>POWER SUPPLY 5 V DC 5 8 ... 30 V DC 8/30</p> <p>ELECTRICAL INTERFACE NPN N NPN open collector C PNP R PNP open collector U push pull P Serial Synchronous Interface - SSI S</p> <p>LOGIC negative N positive P</p> <p>OPTIONS to be reported if not used X reset with external input ZE (with binary code) strobe S (with binary code) strobe and reset with external input SZE</p> <p>SHAFT DIAMETER (mod. 50A) mm 6 (mod. 50B) mm 8 (mod. 50B) mm 10</p> <p>ENCLOSURE RATING IP 65 X IP 67 S</p> <p>MAX ROTATION SPEED 3000 rpm 3</p> <p>OUTPUT TYPE cable (standard length 0,5 m) P preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) (S interface) M12 plug connector M12</p> <p>DIRECTION TYPE axial A radial R</p> <p>SOCKET socket not included .162 to be reported only with connector output (eg. M12R.162), for socket see Accessories</p> <p>VARIANT custom version XXX</p>															

50A WITH RADIAL CABLE OUTPUT



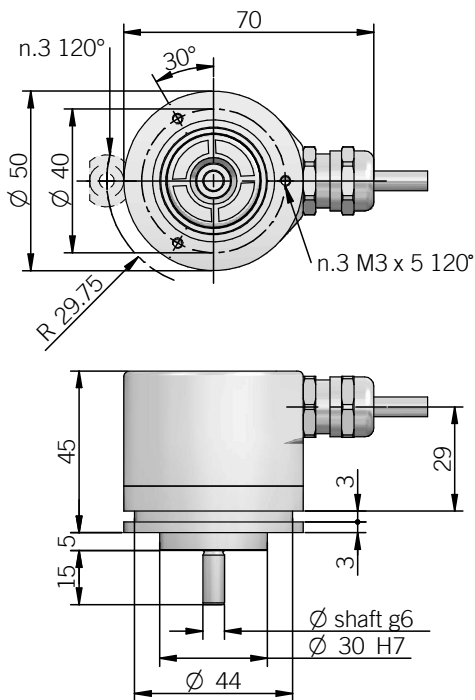
fixing clamps not included, please refer to Accessories

50A WITH RADIAL M12 OUTPUT



fixing clamps not included, please refer to Accessories

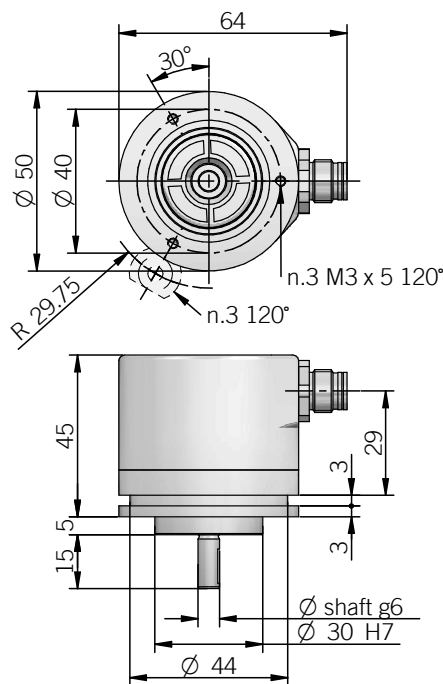
50B WITH RADIAL CABLE OUTPUT



fixing clamps not included, please refer to Accessories

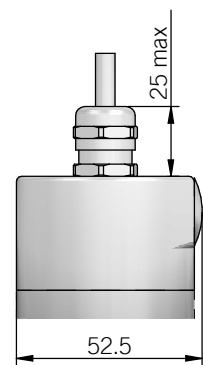
recommended mating shaft tolerance H7
dimensions in mm

50B WITH RADIAL M12 OUTPUT



fixing clamps not included, please refer to Accessories

DIMENSIONS WITH AXIAL OUTPUT



ELECTRICAL SPECIFICATIONS

Resolution	from 2 to 4096 ppr (N / C / P / R / U interface) from 2 to 8192 ppr (S interface)
Power supply¹	5 = 4,5 ... 5,5 V DC 8/30 = 7,6 ... 31,5 V DC (reverse polarity protection)
Current consumption without load	< 100 mA
Max load current	P = 20 mA / channel N / C / R / U = 40 mA / channel
Electrical interface²	NPN / NPN open collector (ULN2003A) PNP / PNP open collector (TD62783) push pull (iC-DL) RS-422 (LTC1690 or similar)
Auxiliary inputs (U/D - RESET)	active high (+V DC) connect to 0 V if not used / RESET tmin 150 ms
Max frequency	25 kHz LSB (Bit-parallel) clock input 100 kHz ... 1 MHz (SSI)
Code type	binary or gray
SSI monostable time (Tm)	20 μs
SSI pause time (Tp)	> 35 μs
Strobe time	20 μs
SSI frame	MSB ... LSB 13 bit data length
Counting direction	decreasing clockwise (shaft view)
Start-up time	150 ms
Accuracy	± 0,35° typical
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	149 years with BIT-PARALLEL output 160 years with SSI output
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type SSI	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Cable type Bit Parallel	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

BIT-PARALLEL CONNECTIONS

Function	Gray / Binary	Cable
bit 1 (LSB)	G ⁰ / B ⁰	green
bit 2	G ¹ / B ¹	yellow
bit 3	G ² / B ²	blue
bit 4	G ³ / B ³	brown
bit 5	G ⁴ / B ⁴	orange or pink
bit 6	G ⁵ / B ⁵	white
bit 7	G ⁶ / B ⁶	grey
bit 8	G ⁷ / B ⁷	violet
bit 9	G ⁸ / B ⁸	grey / pink
bit 10	G ⁹ / B ⁹	white / green
bit 11	G ¹⁰ / B ¹⁰	brown / green
bit 12	G ¹¹ / B ¹¹	white / yellow
0 V	/	black
+ V DC	/	red
U / D	/	red / blue
RESET	/	yellow / brown
STROBE	/	white / grey
⏏	/	shield

MECHANICAL SPECIFICATIONS

Shaft diameter	∅ 6 / 8 / 10 mm
Enclosure rating IEC 60529	X = IP 65 S = IP 67
Max rotation speed	3000 rpm continuous / 5000 rpm instantaneous
Max shaft load⁴	30 N (6,74 lbs) axial / 50 N (11,24 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,5 x 10 ⁻⁶ kgm ² (12 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-25° ... +85°C (-13° ... +185°F)
Storage temperature⁶	-25° ... +85°C (-13° ... +185°F)
Weight	200 g (7,05 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

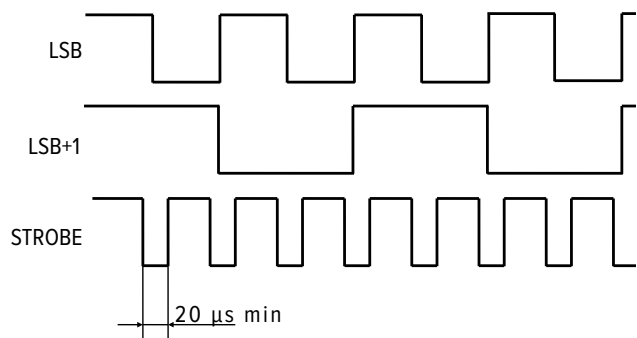
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

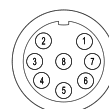
STROBE TIMING



SSI CONNECTIONS

Function	Cable	8 pin M12
+ V DC	red	8
0 V	black	5
DATA +	green	3
DATA -	brown or grey	2
CLOCK +	yellow	4
CLOCK -	orange or pink	6
U / D	red / blue	7
RESET	white	1
⏏	shield	housing

M12 connector (8 pin)
M12 A coded
front view



EMA 50 F / G BIT-PARALLEL - SSI

BLIND HOLLOW SHAFT MAGNETIC SINGLETURN ABSOLUTE ENCODER

MAIN FEATURES

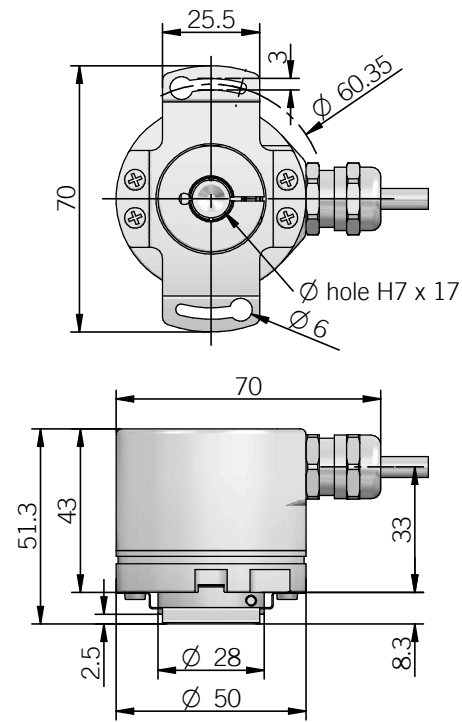
Singleturn absolute magnetic encoders with blind hollow shaft, 50 mm size

- Resolution up to 13 bit (8192 ppr)
- Power supply up to +30 V DC with SSI or Bit-parallel as electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available at cable end
- Robust construction
- Blind hollow shaft diameter up to 15 mm
- IP 67 enclosure rating
- Mounting by stator coupling or torque pin

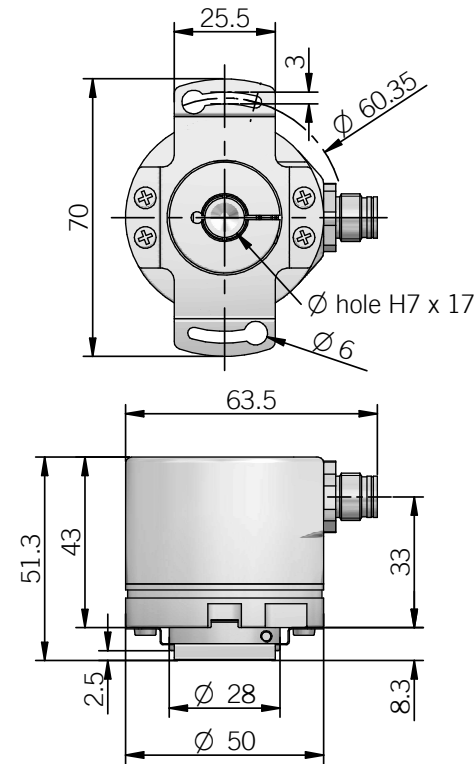


ORDERING CODE	EMA	50F	1024	G	8/30	N	N	X	15	X	3	M12	R	.162	+XXX
SERIES magnetic singleturn absolute encoder	EMA														
MODEL blind hollow shaft with stator coupling blind hollow shaft with torque pin		50F 50G													
RESOLUTION (N / C / R / U / P interface) ppr from 2 to (S interface) ppr from 2 to			4096 8192												
CODE TYPE binary gray (no powers of 2) binary offset code (0-XXX) (no powers of 2) gray offset code (0-XXX)				B G BC GC											
POWER SUPPLY 5 V DC 8 ... 30 V DC				5 8/30											
ELECTRICAL INTERFACE NPN NPN open collector PNP PNP open collector push pull Serial Synchronous Interface - SSI				N C R U P S											
LOGIC negative positive				N P											
OPTIONS to be reported if not used reset with external input (with binary code) strobe (with binary code) strobe and reset with external input				X ZE S SZE											
BORE DIAMETER mm mm diameters 5 / 6 / 8 / 10 / 12 mm with optional shaft adapter, see Accessories				14 15											
ENCLOSURE RATING IP 65 IP 67				X S											
MAX ROTATION SPEED 3000 rpm				3											
OUTPUT TYPE cable (standard length 0,5 m) preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) (S interface) M12 plug connector				P M12											
DIRECTION TYPE axial radial				A R											
SOCKET socket not included to be reported only with connector output (eg. M12R.162), for socket see Accessories				.162											
VARIANT custom version				XXX											

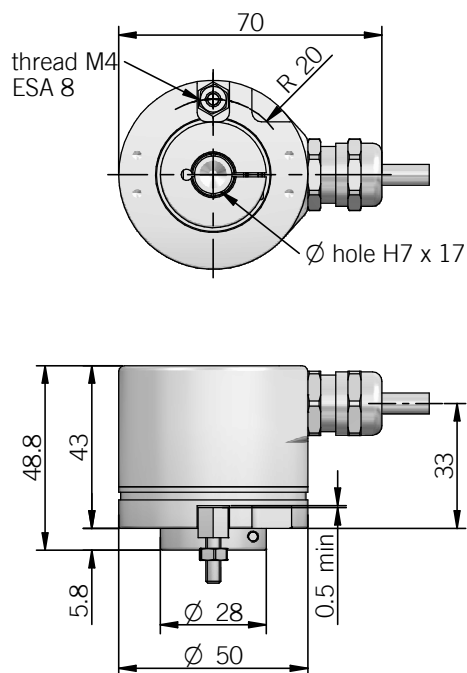
50F WITH RADIAL CABLE OUTPUT



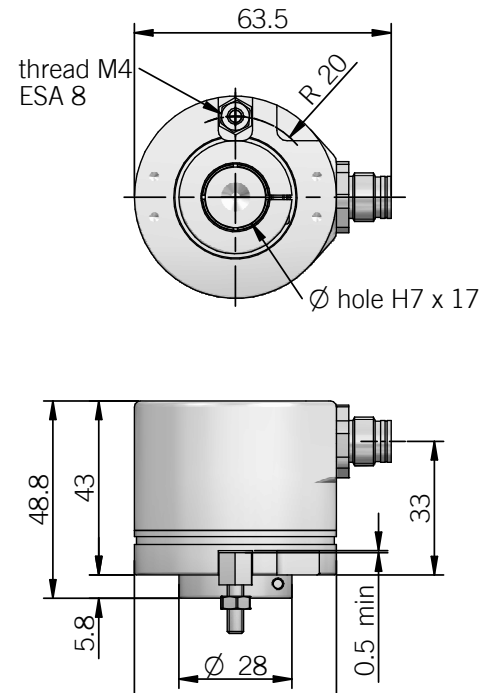
50F WITH RADIAL M12 OUTPUT



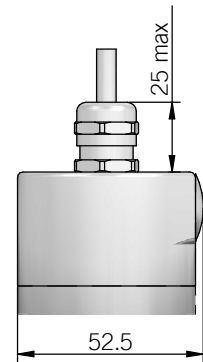
50G WITH RADIAL CABLE OUTPUT



50G WITH RADIAL M12 OUTPUT



DIMENSIONS WITH AXIAL OUTPUT



torque pin is included in model G, for mounting instruction please refer to product installation notes

recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 2 to 4096 ppr (N / C / P / R / U interface) from 2 to 8192 ppr (S interface)
Power supply¹	5 = 4,5 ... 5,5 V DC 8/30 = 7,6 ... 31,5 V DC (reverse polarity protection)
Current consumption without load	< 100 mA
Max load current	P = 20 mA / channel N / C / R / U = 40 mA / channel
Electrical interface²	NPN / NPN open collector (ULN2003A) PNP / PNP open collector (TD62783) push pull (iC-DL) RS-422 (LTC1690 or similar)
Auxiliary inputs (U/D - RESET)	active high (+V DC) connect to 0 V if not used / RESET t _{min} 150 ms
Max frequency	25 kHz LSB (Bit-parallel) clock input 100 kHz ... 1 MHz (SSI)
Code type	binary or gray
SSI monostable time (T_m)	20 μs
SSI pause time (T_p)	> 35 μs
Strobe time	20 μs
SSI frame	MSB ... LSB 13 bit data length
Counting direction	decreasing clockwise (shaft view)
Start-up time	150 ms
Accuracy	± 0,35° typical
Mean time to dangerous failure (MTTF)_d³ according to EN ISO 13849-1	149 years with BIT-PARALLEL output 160 years with SSI output
Mission time (T_m)³	20 years
Diagnostic coverage (DC)³	0%
Cable type SSI	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Cable type Bit Parallel	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

BIT-PARALLEL CONNECTIONS

Function	Gray / Binary	Cable
bit 1 (LSB)	G ⁰ / B ⁰	green
bit 2	G ¹ / B ¹	yellow
bit 3	G ² / B ²	blue
bit 4	G ³ / B ³	brown
bit 5	G ⁴ / B ⁴	orange or pink
bit 6	G ⁵ / B ⁵	white
bit 7	G ⁶ / B ⁶	grey
bit 8	G ⁷ / B ⁷	violet
bit 9	G ⁸ / B ⁸	grey / pink
bit 10	G ⁹ / B ⁹	white / green
bit 11	G ¹⁰ / B ¹⁰	brown / green
bit 12	G ¹¹ / B ¹¹	white / yellow
0 V	/	black
+ V DC	/	red
U / D	/	red / blue
RESET	/	yellow / brown
STROBE	/	white / grey
⏏	/	shield

MECHANICAL SPECIFICATIONS

Bore diameter	ø 14 / 15 mm ø 5 / 6* / 8* / 10* / 12* mm * with optional shaft adapter, please refer to Accessories
Enclosure rating IEC 60529	X = IP 65 S = IP 67
Max rotation speed	3000 rpm continuous
Max shaft load⁴	30 N (6,74 lbs) axial / 50 N (11,24 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	4 x 10 ⁻⁶ kgm ² (95 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-25° ... +85°C (-13° ... +185°F)
Storage temperature⁶	-25° ... +85°C (-13° ... +185°F)
Weight	200 g (7,05 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

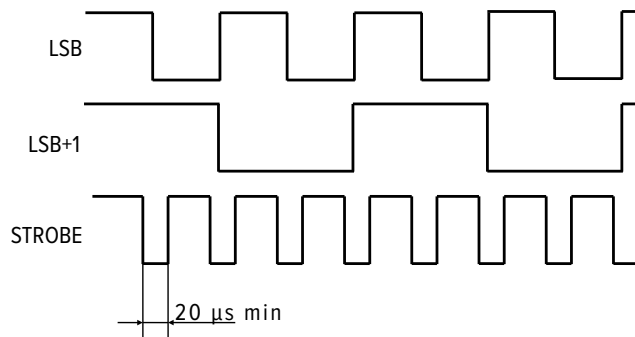
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

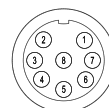
STROBE TIMING



SSI CONNECTIONS

Function	Cable	8 pin M12
+ V DC	red	8
0 V	black	5
DATA +	green	3
DATA -	brown or grey	2
CLOCK +	yellow	4
CLOCK -	orange or pink	6
U / D	red / blue	7
RESET	white	1
⏏	shield	housing

M12 connector (8 pin)
M12 A coded
front view



EML 50 A / B ANALOGUE

SOLID SHAFT MAGNETIC SINGLETURN ABSOLUTE ENCODER

MAIN FEATURES

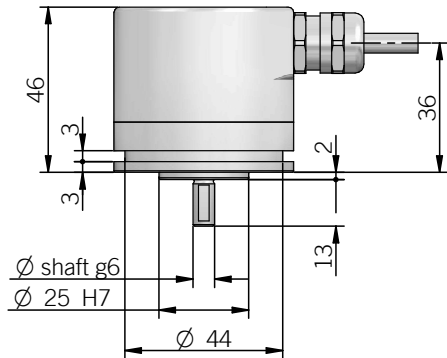
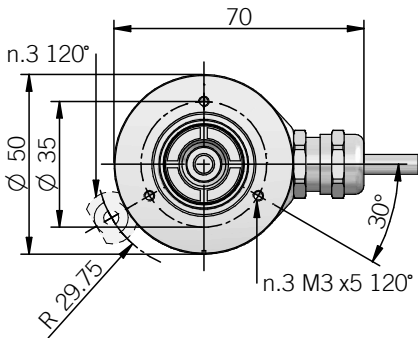
Singleturn absolute magnetic encoders with solid shaft, 50 mm size

- Resolution 12 bit
- Power supply up to +28 V DC with analogue (voltage or current) electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available at cable end
- Robust construction
- Solid shaft diameter up to 10 mm
- IP 67 enclosure rating
- Mounting by synchronous flange



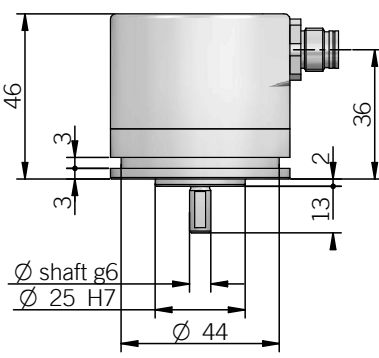
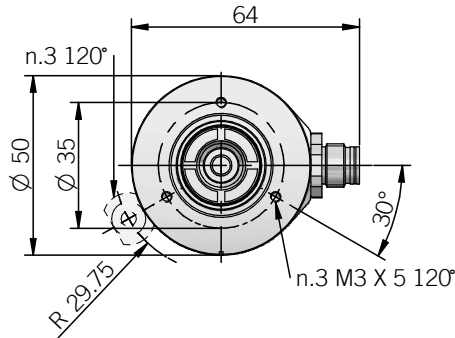
ORDERING CODE	EML	50A	360	X	12/28	V	05	X	6	X	3	M12	R	.162	+XXX
<p>SERIES magnetic singleturn absolute encoder EML</p> <p>MODEL synchronous flange ø 25 mm 50A synchronous flange ø 30 mm 50B for anodized version please directly contact our offices</p> <p>ACTIVE ANGLE degrees 360 degrees 270 degrees 180 degrees 90</p> <p>OPTION to be reported if not used X reset with external input ZE</p> <p>POWER SUPPLY 12 ... 28 V DC 12/28</p> <p>ELECTRICAL INTERFACE voltage V current I</p> <p>OUTPUT RANGE 0 ... 5 V 05 0 ... 10 V 010 0 ... 20 mA 020 4 ... 20 mA 420</p> <p>OPTIONS to be reported with voltage output / 3 wires current output X 4 wires current output Q</p> <p>SHAFT DIAMETER (mod. 50A) mm 6 (mod. 50B) mm 8 (mod. 50B) mm 10</p> <p>ENCLOSURE RATING IP 65 X IP 67 S</p> <p>MAX ROTATION SPEED 3000 rpm 3</p> <p>OUTPUT TYPE cable (standard length 0,5 m) P preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) M12 plug connector M12</p> <p>DIRECTION TYPE axial A radial R</p> <p>SOCKET socket not included .162 to be reported only with connector output (eg. M12R.162), for socket see Accessories</p> <p>VARIANT custom version XXX</p>															

50A WITH RADIAL CABLE OUTPUT



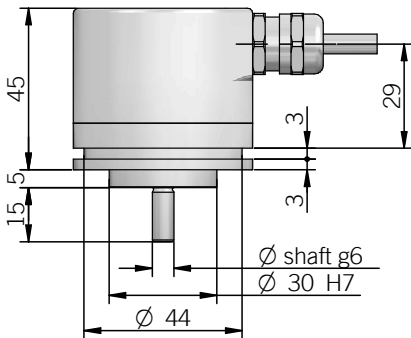
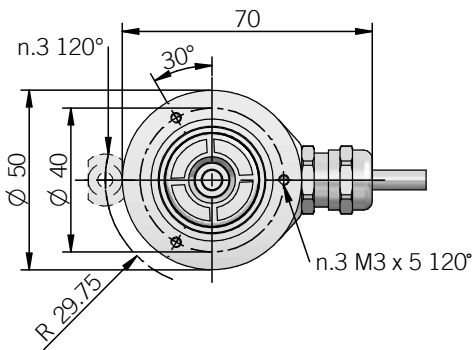
fixing clamps not included, please refer to Accessories

50A WITH RADIAL M12 OUTPUT



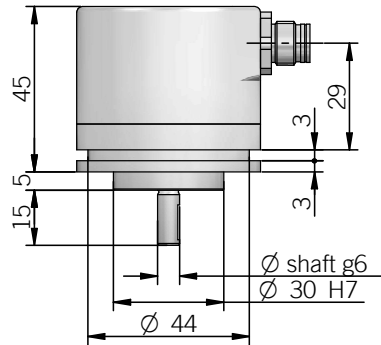
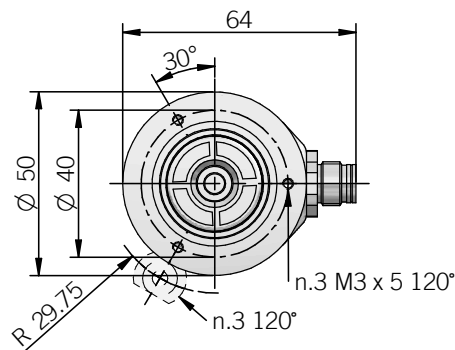
fixing clamps not included, please refer to Accessories

50B WITH RADIAL CABLE OUTPUT



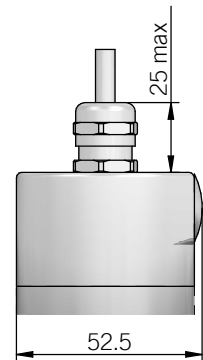
fixing clamps not included, please refer to Accessories

50B WITH RADIAL M12 OUTPUT



fixing clamps not included, please refer to Accessories

DIMENSIONS WITH AXIAL OUTPUT



recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	12 bit
Output DAC resolution	12 bit
Active angle	90 ... 360 mechanical degrees
Power supply¹	11,4 ... 29,4 V DC (reverse polarity protection)
Current consumption without load	40 mA max
Electrical interface²	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
Auxiliary inputs (U/D - RESET)	active high (+V DC) connect to 0 V if not used / RESET tmin 150 ms
Load	$R_{min} = 1 \text{ k}\Omega$ (voltage output) $R_{max} = (V_{DC} - 2) / 0,02$ (current output)
Output update frequency	100 kHz
Signal pattern	decreasing clockwise (shaft view)
Start-up time	150 ms
Linearity error	< 1 %
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	153 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 6 / 8 / 10 mm
Enclosure rating IEC 60529	X = IP 65 S = IP 67
Max rotation speed	3000 rpm continuous / 5000 rpm instantaneous
Max shaft load⁴	30 N (6,74 lbs) axial / 50 N (11,24 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,5 x 10 ⁻⁶ kgm ² (12 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-25° ... +85°C (-13° ... +185°F)
Storage temperature⁶	-25° ... +85°C (-13° ... +185°F)
Weight	200 g (7,05 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

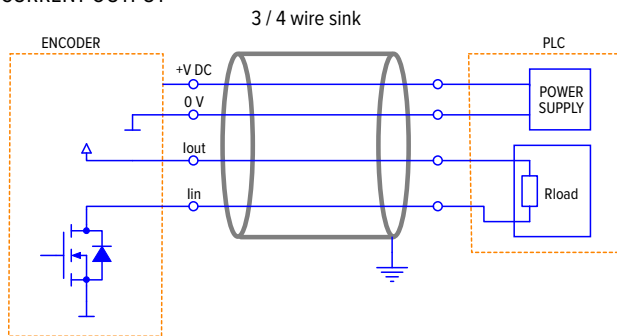
⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

ELECTRICAL INTERFACE

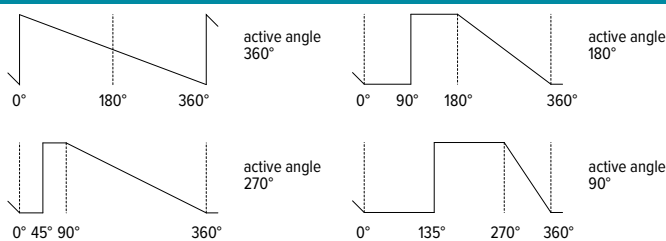
CURRENT OUTPUT



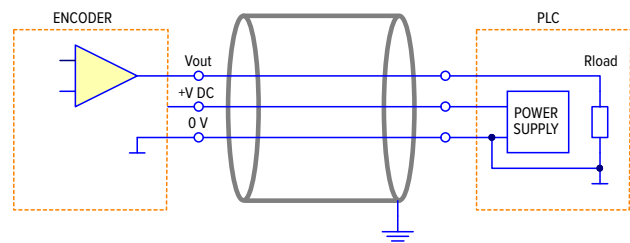
with 3 wires interface I_{out} is internally connected to +V DC

where $R_{LOAD,max} = (V_{DC} - 2) / 0,02$

SIGNAL PATTERN (decreasing CW)



VOLTAGE OUTPUT



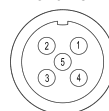
where $R_{LOAD,min} = 1 \text{ k}\Omega$

CONNECTIONS

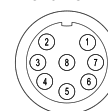
Function	Cable (voltage)	Cable (current)	5 pin M12	8 pin M12*
+ V DC	red	red	2	8
0 V	black	black	4	5
V _{out}	green	/	3	/
I _{in}	/	yellow	3	3
I _{out}	/	green	/	2
U / D	blue	blue	5	7
RESET	white	white	1	1
⊕	shield	shield	housing	housing

* with Q current output

M12 connector (5 pin)
M12 A coded
front view



M12 connector (8 pin)
M12 A coded
front view



EML 50 F / G ANALOGUE

BLIND HOLLOW SHAFT MAGNETIC SINGLETURN ABSOLUTE ENCODER

MAIN FEATURES

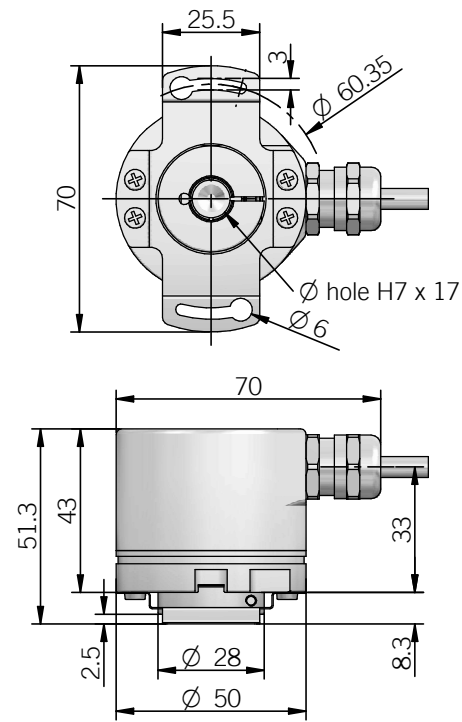
Singleturn absolute magnetic encoders with blind hollow shaft, 50 mm size

- Resolution 12 bit
- Power supply up to +28 V DC with analogue (voltage or current) electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available at cable end
- Robust construction
- Blind hollow shaft diameter up to 15 mm
- IP 67 enclosure rating
- Mounting by stator coupling or torque pin

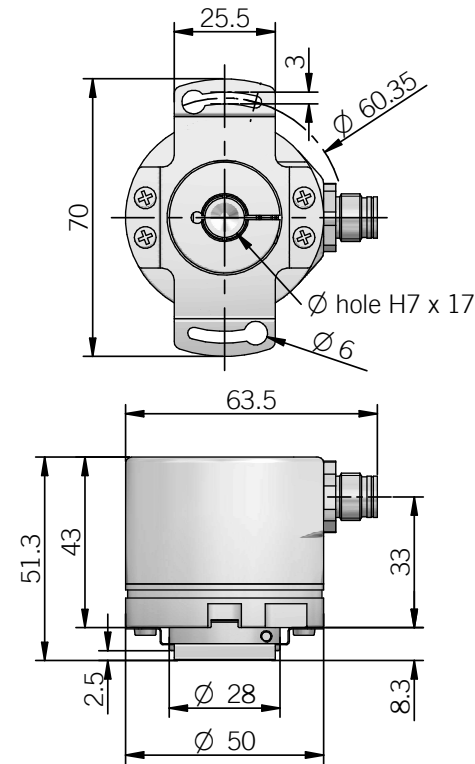


ORDERING CODE	EML	50F	360	X	12/28	V	05	X	15	X	3	M12	R	.162	+XXX
SERIES magnetic singleturn absolute encoder EML															
MODEL blind hollow shaft with stator coupling 50F blind hollow shaft with torque pin 50G															
ACTIVE ANGLE degrees 360 degrees 270 degrees 180 degrees 90															
OPTION to be reported if not used X reset with external input ZE															
POWER SUPPLY 12 ... 28 V DC 12/28															
ELECTRICAL INTERFACE voltage V current I															
OUTPUT RANGE 0 ... 5 V 05 0 ... 10 V 010 0 ... 20 mA 020 4 ... 20 mA 420															
OPTIONS to be reported with voltage output / 3 wires current output X 4 wires current output Q															
BORE DIAMETER mm 14 mm 15 diameters 5 / 6 / 8 / 10 / 12 mm with optional shaft adapter, see Accessories															
ENCLOSURE RATING IP 65 X IP 67 S															
MAX ROTATION SPEED 3000 rpm 3															
OUTPUT TYPE cable (standard length 0,5 m) P preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) M12 plug connector M12															
DIRECTION TYPE axial A radial R															
SOCKET socket not included .162 to be reported only with connector output (eg. M12R.162), for socket see Accessories															
VARIANT custom version XXX															

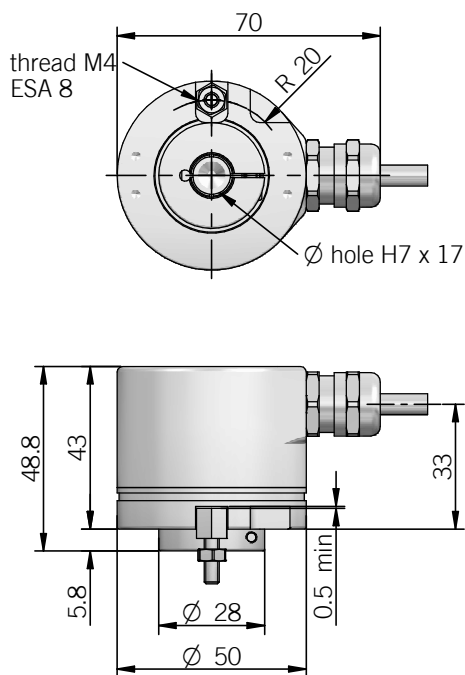
50F WITH RADIAL CABLE OUTPUT



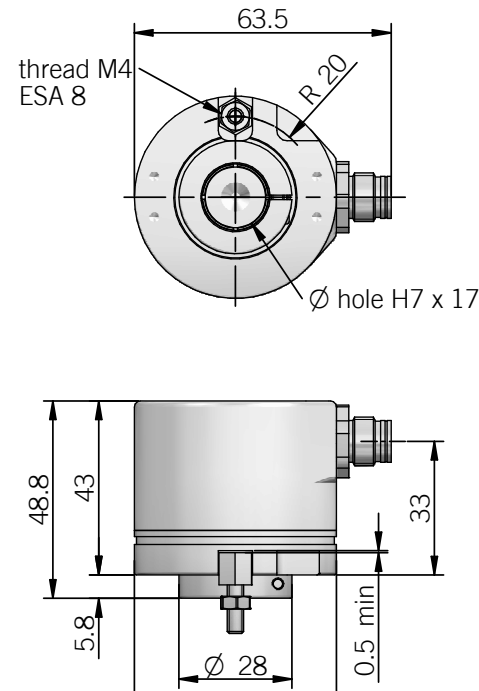
50F WITH RADIAL M12 OUTPUT



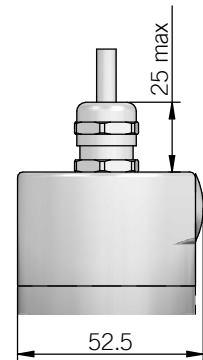
50G WITH RADIAL CABLE OUTPUT



50G WITH RADIAL M12 OUTPUT



DIMENSIONS WITH AXIAL OUTPUT



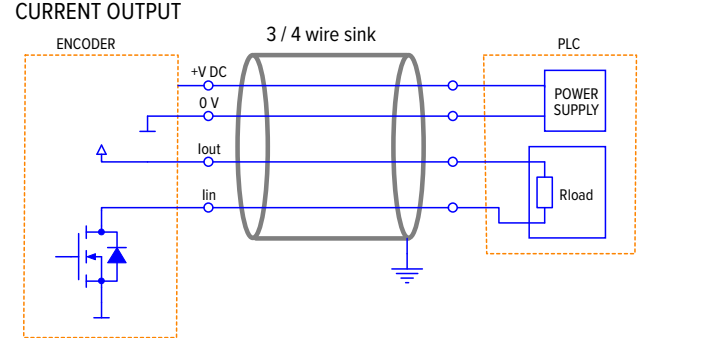
torque pin is included in model G, for mounting instruction please refer to product installation notes

recommended mating shaft tolerance g6
dimensions in mm

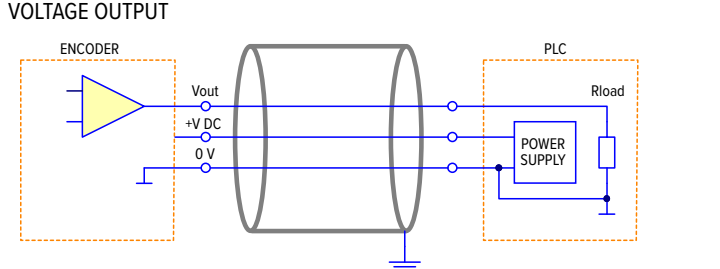
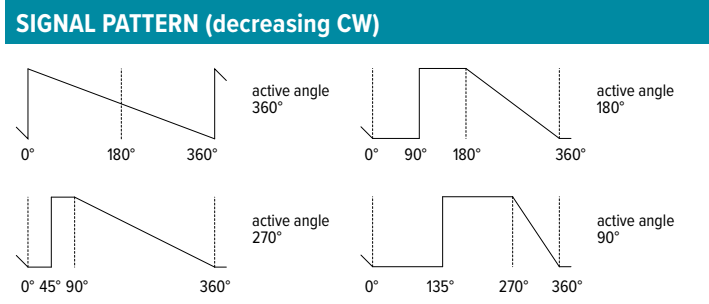
ELECTRICAL SPECIFICATIONS		MECHANICAL SPECIFICATIONS	
Resolution	12 bit	Bore diameter	ø 14 / 15 mm ø 5 / 6* / 8* / 10* / 12* mm * with optional shaft adapter, please refer to Accessories
Output DAC resolution	12 bit	Enclosure rating IEC 60529	X = IP 65 S = IP 67
Active angle	90 ... 360 mechanical degrees	Max rotation speed	3000 rpm continuous
Power supply¹	11,4 ... 29,4 V DC (reverse polarity protection)	Max shaft load⁴	30 N (6,74 lbs) axial / 50 N (11,24 lbs) radial
Current consumption without load	40 mA max	Shock	50 G, 11 ms (IEC 60068-2-27)
Electrical interface²	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)	Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Auxiliary inputs (U/D - RESET)	active high (+V DC) connect to 0 V if not used / RESET tmin 150 ms	Moment of inertia	4 x 10 ⁻⁶ kgm ² (95 x 10 ⁻⁶ lbft ²)
Load	R _{min} = 1 kΩ (voltage output) R _{max} = (V _{DC} - 2) / 0,02 (current output)	Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Output update frequency	100 kHz	Bearing stage material	aluminum
Signal pattern	decreasing clockwise (shaft view)	Shaft material	stainless steel
Start-up time	150 ms	Housing material	painted aluminum
Linearity error	< 1 %	Bearings	n.2 ball bearings
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	153 years	Bearings life	10 ⁹ revolutions
Mission time (Tm)³	20 years	Operating temperature^{5,6}	-25° ... +85°C (-13° ... +185°F)
Diagnostic coverage (DC)³	0%	Storage temperature⁶	-25° ... +85°C (-13° ... +185°F)
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm	Weight	200 g (7,05 oz)
Electromagnetic compatibility	according to 2014/30/EU directive		
RoHS	according to 2011/65/EU directive		
UL / CSA	file n. E212495		

¹ as measured at the transducer without cable influences
² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section
⁴ maximum load for static usage
⁵ measured on the transducer flange
⁶ condensation not allowed

ELECTRICAL INTERFACE



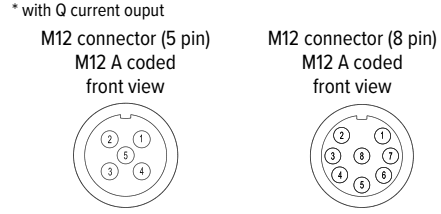
with 3 wires interface I_{out} is internally connected to +V DC
 where R_{LOAD} max = (V_{DC} - 2) / 0,02



where R_{LOAD} min = 1 kΩ

CONNECTIONS

Function	Cable (voltage)	Cable (current)	5 pin M12	8 pin M12*
+ V DC	red	red	2	8
0 V	black	black	4	5
V _{out}	green	/	3	/
I _{in}	/	yellow	3	3
I _{out}	/	green	/	2
U / D	blue	blue	5	7
RESET	white	white	1	1
⊥	shield	shield	housing	housing



AAM 38 F BISS

BLIND HOLLOW SHAFT MULTITURN ABSOLUTE ENCODER

MAIN FEATURES

Miniaturised optical multiturn absolute encoder for high-end applications. Thanks to BiSS-C interface and high resolution it can be used in robotics, motor feedback and CNC machines.

- Optical/magnetic (optoASIC + energy harvesting) sensor technology
- 39 bit total resolution (23 bit singleturn + 16 bit multiturn)
- Power supply +5 VDC with BiSS-C as electrical interface
- Cable output
- Blind hollow shaft diameter up to 8 mm
- Mounting by stator coupling
- Operating temperature -20° ... +105°C (-4° ... +221°F)

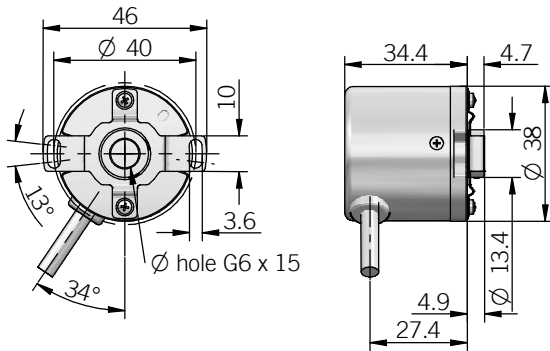


ORDERING CODE

AAM 38F 16 / 23 B 5 B 8 X X PR .XXX

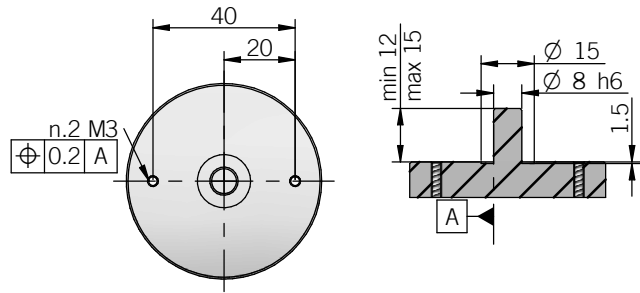
SERIES absolute multiturn encoder AAM													
MODEL blind hollow shaft with stator coupling 38F													
MULTITURN RESOLUTION bit 16													
SINGLETURN RESOLUTION bit 23													
CODE TYPE binary B													
POWER SUPPLY 5 V DC 5													
ELECTRICAL INTERFACE BiSS-C B													
BORE DIAMETER mm 6 (1/4") mm 6,35 mm 8													
ENCLOSURE RATING IP 50 X													
OPTIONS to be reported X													
OUTPUT TYPE radial cable (standard length 0,2m) PR													
VARIANT custom version XXX													

AAM 38F



dimensions in mm

RECOMMENDED INTERFACE FLANGE DESIGN



ELECTRICAL SPECIFICATIONS		MECHANICAL SPECIFICATIONS	
Multiturn resolution	16 bit	Shaft diameter	ø 6 / 6,35 (1/4") / 8 mm
Singleturn resolution	23 bit	Enclosure rating	IP 50 (IEC 60529)
Fault status	8 bit	Max rotation speed	6000 rpm continuous
CRC	8 bit	Shock	200 G, 6 ms (IEC 60068-2-27)
Power supply¹	4,75 ... 5,25 V DC	Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Current consumption without load	< 120 mA	Shaft material	brass
Output type²	BiSS-C (SN65LBC179Q or similar)	Housing material	steel
Code type	binary	Bearing stage material	aluminum
Clock frequency (MA)	80 kHz ... 10 MHz	Bearings	n.2 ball bearings
Position calculation Time	Refer to BiSS-C T _{busy time}	Bearings life	10 ⁹ revolutions
Counting direction	decreasing clockwise (shaft view)	Operating temperature^{4,5}	-20° ... +105°C (-4° ... +221°F)
Start-up time	500 ms	Storage temperature⁵	-20° ... +105°C (-4° ... +221°F)
Accuracy	± 0,02°	Shaft radial play allowed	± 0,05 mm
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	481 years	Shaft axial play allowed	± 0,1 mm
Mission time (Tm)³	20 years	Fixing torque for shaft grains	1 Nm (142 Ozin) recommended
Diagnostic coverage (DC)³	0%	Fixing torque for spring screws	0,35 Nm (49,5 Ozin) recommended for M3 screws (not provided)
Electromagnetic compatibility	according to 2014/30/EU directive	Weight	150 g (5,29 oz)
RoHS	according to 2011/65/EU directive		

CONNECTIONS

Function	Cable
+ V DC	red
GROUND	black
SERIAL DATA (SLO) +	orange
SERIAL DATA (SLO) -	blue
SERIAL CLOCK (MA)+	brown
SERIAL CLOCK (MA) -	white

¹ as measured at the transducer without cable influences
² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section
⁴ measured on the transducer flange
⁵ condensation not allowed



WWW.ELTRA.IT

EAMR 58 B / C - 63 A / D / E BIT-PARALLEL - SSI SOLID SHAFT MULTITURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard multiturn absolute encoders for factory automation applications.

- Optical/magnetic (proprietary optoASIC + energy harvesting) sensor technology
- Resolution up to 65 bit (25 bit singleturn + 40 bit multiturn)
- Power supply up to +30 VDC with Bit-parallel or SSI as electrical interface
- Cable or connector output
- Solid shaft diameter up to 10 mm
- Mounting by synchronous, clamping or centering 2,5" square flange



ORDERING CODE BIT PARALLEL

EAMR 63A 12 / 12 G 8/30 P P X 10 X MA R .162 +XXX

SERIES
multiturn absolute encoder **EAMR**

MODEL
synchronous flange ø 31.75 mm **63A**
synchronous flange ø 50 mm **58B**
clamping flange ø 36 mm **58C**
centering square flange ø 31.75 mm **63D**
centering square flange ø 50 mm **63E**

MULTITURN RESOLUTION
bit from 1 to 12

SINGLETURN RESOLUTION
bit from 1 to 13

CODE TYPE
binary **B**
gray **G**

POWER SUPPLY
8 ... 30 V DC **8/30**

ELECTRICAL INTERFACE
push-pull **P**

LOGIC
negative **N**
positive **P**

OPTIONS
to be reported if not used **X**
latch **L**
reset with external input **ZE**
latch / reset with external inputs **LZE**

SHAFT DIAMETER
(mod. 58 B) mm **6**
(mod. 63 A / D) 3/8"- mm **9,52**
(mod. 58 C - 63 A / D / E) mm **10**

ENCLOSURE RATING
IP 65 shaft side / IP67 cover side **X**
IP 67 **S**

OUTPUT TYPE
(up to 13 bit as total resolution, without reset option) 16 cores cable (standard length 1,5 m) **PD**
(from 14 to 25 bit as total resolution or options) 32 cores cable (standard length 1,5 m) **PE**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PDR5)
(up to 13 bit as total resolution, without reset option) 19 pin MIL plug connector **MA**
(from 14 to 25 bit as total resolution) 32 pin MIL plug connector **ME**

DIRECTION TYPE
radial **R**

SOCKET
socket not included **.162**
to be reported only with connector output (eg. MAR.162), for socket see Accessories

VARIANT
custom version **XXX**

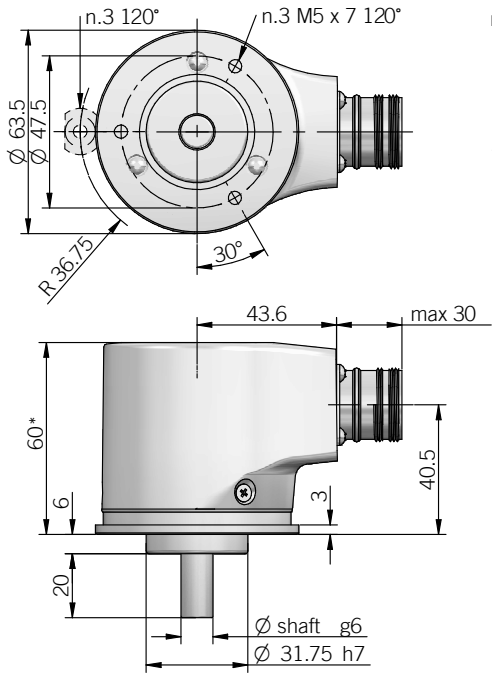
TABLE OF CONTENTS

ABSOLUTE INDEX

OPTICAL MULTITURN ABSOLUTE ENCODERS | EAMR 58 B / C - 63 A / D / E PAR - SSI

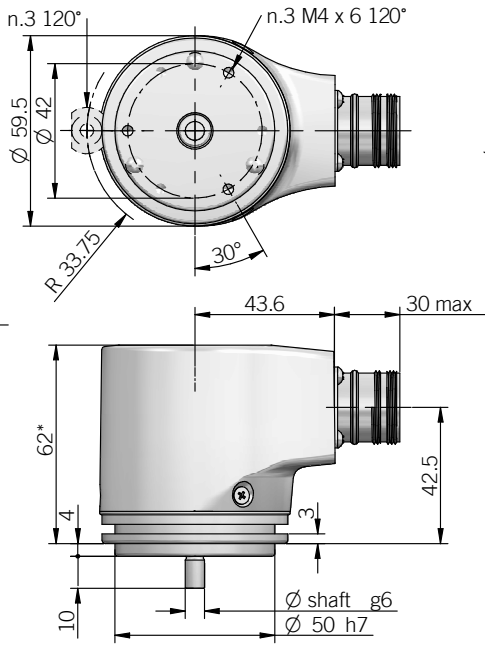
ORDERING CODE SSI	EAMR	63A	12 / 13	G	8/30	S	X	2048	RS	10	X	HA	R	.162	+XXX
<p>SERIES multiturn absolute encoder EAMR</p> <p>MODEL synchronous flange ø 31.75 mm 63A synchronous flange ø 50 mm 58B clamping flange ø 36 mm 58C centering square flange ø 31.75 mm 63D centering square flange ø 50 mm 63E</p> <p>MULTITURN RESOLUTION bit 12 / 14 / 15 see table for preferred combinations</p> <p>SINGLETURN RESOLUTION bit 13 / 18 / 25 see table for preferred combinations</p> <p>CODE TYPE binary B gray G</p> <p>POWER SUPPLY 8 ... 30 V DC 8/30</p> <p>ELECTRICAL INTERFACE Serial Synchronous Interface - SSI S</p> <p>OPTION to be reported if not used X reset with external input ZE reset on cover or with external input ZP</p> <p>INCREMENTAL RESOLUTION (powers of 2) ppr from 128 to 8192</p> <p>INCREMENTAL ELECTRICAL INTERFACE available with PD or HA output type line driver HTL L push pull P line driver RS-422 RS</p> <p>SHAFT DIAMETER (mod. 58 B) mm 6 (mod. 63 A / D) 3/8"- mm 9,52 (mod. 58 C - 63 A / D / E) mm 10</p> <p>ENCLOSURE RATING IP 65 shaft side / IP67 cover side X IP 67 S</p> <p>OUTPUT TYPE cable (standard length 1,5 m) PC preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) cable (standard length 1,5 m) PD preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) (without reset option) 7 pin MIL plug connector MC (with reset option) 10 pin MIL plug connector MD 12 pin M23 plug connector HA 8 pin M12 plug connector M12</p> <p>DIRECTION TYPE radial R</p> <p>SOCKET socket not included .162</p> <p>VARIANT custom version XXX</p>															
<p>only with additional incremental output</p> <p>to be reported only with connector output (eg. HAR.162), for socket see Accessories</p>															

63A



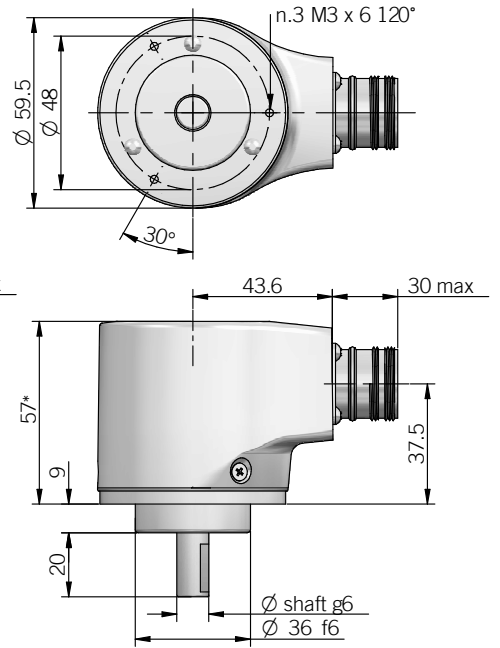
for fixing clamps please refer to Accessories

58B

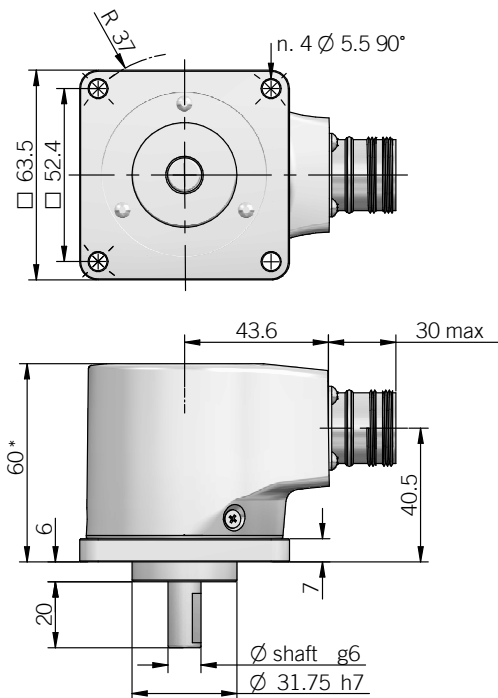


for fixing clamps please refer to Accessories

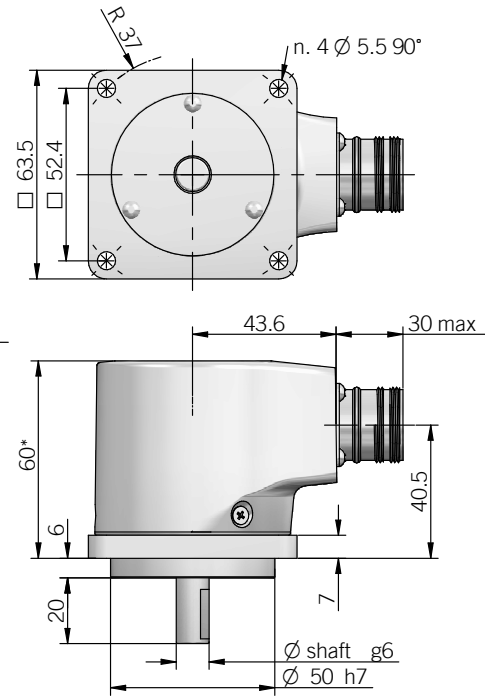
58C



63D



63E



* with option ZP +1,5 mm
recommended mating shaft tolerance H7
dimensions in mm

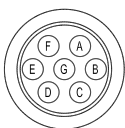
BIT-PARALLEL CONNECTIONS

Function	Binary / Gray	Cable PD	Cable PE	19 pin MA	32 pin ME
bit 1 (LSB)	B ⁰ / G ⁰	green	green	A	A
bit 2	B ¹ / G ¹	yellow	yellow	B	B
bit 3	B ² / G ²	blue	blue	C	C
bit 4	B ³ / G ³	brown	brown	D	D
bit 5	B ⁴ / G ⁴	orange or pink	orange or pink	E	E
bit 6	B ⁵ / G ⁵	white	white	F	F
bit 7	B ⁶ / G ⁶	grey	grey	G	G
bit 8	B ⁷ / G ⁷	purple	purple	H	H
bit 9	B ⁸ / G ⁸	grey / pink	grey / pink	J	J
bit 10	B ⁹ / G ⁹	white / green	white / green	K	K
bit 11	B ¹⁰ / G ¹⁰	brown / green	brown / green	L	L
bit 12	B ¹¹ / G ¹¹	white / yellow	white / yellow	M	M
bit 13	B ¹² / G ¹²	yellow / brown	yellow / brown	N	N
bit 14	B ¹³ / G ¹³	/	white / grey	/	P
bit 15	B ¹⁴ / G ¹⁴	/	grey / brown	/	R
bit 16	B ¹⁵ / G ¹⁵	/	white / pink	/	S
bit 17	B ¹⁶ / G ¹⁶	/	pink / brown	/	T
bit 18	B ¹⁷ / G ¹⁷	/	white / blue	/	U
bit 19	B ¹⁸ / G ¹⁸	/	brown / blue	/	V
bit 20	B ¹⁹ / G ¹⁹	/	white / red	/	W
bit 21	B ²⁰ / G ²⁰	/	brown / red	/	X
bit 22	B ²¹ / G ²¹	/	white / black	/	Y
bit 23	B ²² / G ²²	/	brown / black	/	Z
bit 24	B ²³ / G ²³	/	grey / green	/	a
bit 25	B ²⁴ / G ²⁴	/	yellow / pink	/	b
LATCH	/	/	yellow / grey	R	e
0 V	/	black	black	T	j
U / D	/	red / blue	red / blue	U	g
RESET	/	/	pink / green	/	f
+ V DC	/	red	red	V	h
⏏	/	shield	shield	S	housing

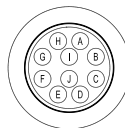
SSI CONNECTIONS

Function	Cable PC	Cable PD	7 pin MC	10 pin MD	12 pin HA	12 pin HA	8 pin M12
+ V DC	red	red	G	G	8	8	8
0 V	black	black	F	F	1	1	5
DATA +	green	green	C	C	2	2	3
DATA -	brown	brown	D	D	10	10	2
CLOCK +	yellow	yellow	A	A	3	3	4
CLOCK -	orange or pink	orange or pink	B	B	11	11	6
A+	/	grey	/	/	/	6	/
A-	/	blue	/	/	/	7	/
B+	/	purple	/	/	/	9	/
B-	/	white / green	/	/	/	12	/
U / D	red / blue	red / blue	E	E	5	5	7
RESET	white	white	/	H	4	4	1
⏏	shield	shield	housing	housing	9	housing	housing

MC connector (7 pin)
Amphenol MS3102-E-16-S
front view



MD connector (10 pin)
Amphenol MS3102-E-18-1P
front view



HA connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



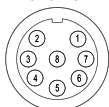
MA connector (19 pin)
Amphenol 62IN 12E 14-19 P
front view



ME connector (32 pin)
Glenair IPT 02 A 18-32 P F6
front view



M12 connector (8 pin)
M12 A coded
front view



ELECTRICAL SPECIFICATIONS

Multiturn resolution	12 / 14 / 15 bit please directly contact our offices for other pulses
Singleturn resolution	P = from 1 to 13 bit S = preferred combinations 12 multiturn / 13 singleturn 14 multiturn / 18 singleturn 15 multiturn / 25 singleturn please directly contact our offices for other pulses
Power supply¹	7,6 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Max load current	20 mA / channel
Absolute electrical interface²	P = push pull (IC-DL) S = RS-422 (THVD1451 or similar)
Incremental electrical interface²	L = HTL differential (AEIC-7272 or similar) P = Push-Pull (AEIC-7272 or similar) RS = RS-422 (AELT-5000 or similar)
Max incremental output frequency	128 kHz
Auxiliary inputs (U/D - RESET - LATCH)	active high (+V DC) connect to 0 V if not used / RESET - LATCH t_{min} 150 ms
Max frequency	25 kHz LSB (Bit-parallel) clock input 100 kHz ... 1 MHz (SSI)
Code type	binary or gray
Logic	SSI = positive Bit-parallel = positive or negative
SSI monostable time (T_m)	20 μ s
SSI pause time (T_p)	> 35 μ s
SSI frame	tree format MSB ... LSB up to 12 bit multiturn = length 25 bit (12MT + 13ST) 14 bit multiturn = length 32 bit (14MT + 18ST) 15 bit multiturn = length 40 bit (15MT + 25ST)
SSI status and parity bit	on request
Counting direction	SSI output = decreasing clockwise (shaft view) incremental output = A leads B clockwise (shaft view)
Start-up time	700 ms
Accuracy	$\pm 0,069^\circ$
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	156 years with BIT-PARALLEL output 186 years with SSI/INCREMENTAL output
Mission time (T_m)³	20 years
Diagnostic coverage (DC)³	0%
Cable type PC	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Cable type PD	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Cable type PE	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

ROTATION SPEED DERATING TABLE

Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000
+85 ... +100 (+185 ... 212)	5000	3000

MECHANICAL SPECIFICATIONS

Shaft diameter	$\varnothing 6 / 9,52 (3/8") / 10$ mm
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load⁴	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	$1,5 \times 10^{-6}$ kgm ² (36×10^{-6} lbf ²)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminium
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature Bit-parallel^{5, 6}	-20° ... +85°C (-4 ... +185°F)
Operating temperature SSI^{5, 6}	-40° ... +100°C (-40° ... +212°F) -20° ... +100°C (-4° ... +212°F) with PC cable output -20° ... +85°C (-4° ... +185°F) with PD cable output -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁶	-20° ... +85°C (-4° ... +185°F)
Weight	approx 300 g (10,58 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

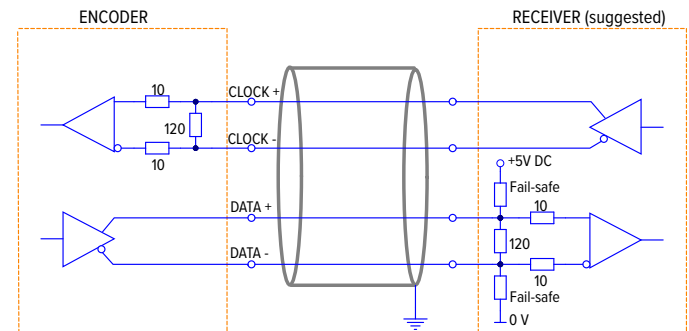
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

SSI ELECTRICAL INTERFACE



BIT-PARALLEL CONNECTOR OR CABLE CHOICE

Depending on the resolution and the number of turns selected, it is possible to calculate the connections required by the connector or cable.

See below examples:

EXAMPLE 1

Singleturn = 8 bit = 8 connections
Multiturn = 5 bit = 5 connections
Total connections 13

EXAMPLE 2

Singleturn = 12 bit = 12 connections
Multiturn = 12 bit = 12 connections
Total connections 24

From 1 to 13 connections a 16 cores cable (PD) or a 19 pin connector (MA) is required.
From 14 to 25 connections a 32 cores cable (PE) or a 32 pin connector (ME) is required.

With LATCH option a 32 cores cable (PE) or a 19 pin connector (MA) or a 32 pin connector (ME) is required.

With RESET option a 32 cores cable (PE) or a 32 pin connector (ME) is required.



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EAMR 58 F - 63 F / G BIT-PARALLEL - SSI

BLIND HOLLOW SHAFT MULTITURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard multiturn absolute encoders for factory automation applications.

- Optical/magnetic (proprietary optoASIC + energy harvesting) sensor technology
- Resolution up to 65 bit (25 bit singleturn + 40 bit multiturn)
- Power supply up to +30 VDC with Bit-parallel or SSI as electrical interface
- Cable or connector output
- Blind hollow shaft up to 15 mm
- Mounting by stator coupling, torque stop slot or torque pin

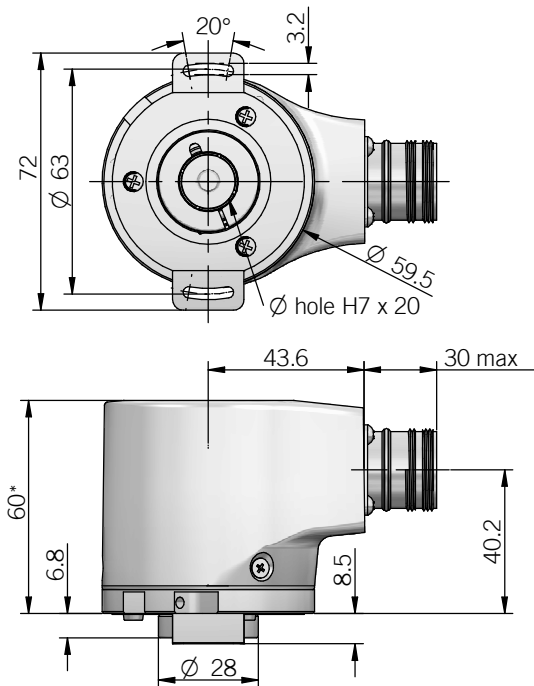


ORDERING CODE	EAMR	58F	12 / 12	G	8/30	P	P	X	15	X	MA	R	.162	+XXX
SERIES multiturn absolute encoder	EAMR													
MODEL blind hollow shaft with stator coupling blind hollow shaft with torque stop slot blind hollow shaft with torque pin		58F 63F 63G												
MULTITURN RESOLUTION bit from			1 to 12											
SINGLETURN RESOLUTION bit from				1 to 13										
CODE TYPE binary gray				B G										
POWER SUPPLY 8 ... 30 V DC					8/30									
ELECTRICAL INTERFACE push-pull						P								
LOGIC negative positive							N P							
OPTIONS to be reported if not used latch with external input reset with external input latch / reset with external inputs								X L ZE LZE						
BORE DIAMETER mm mm									14 15					
diameters (6 / 8 / 9,52 (3/8") / 10 / 11 / 12 mm) with optional shaft adapter, see Accessories														
ENCLOSURE RATING IP 65 shaft side / IP67 cover side IP 67									X S					
OUTPUT TYPE (up to 13 bit as total resolution, without reset option) 16 cores cable (standard length 1,5 m) (from 14 to 25 bit as total resolution or options) 32 cores cable (standard length 1,5 m) preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PDR5) (up to 13 bit as total resolution, without reset option) 19 pin MIL plug connector (from 14 to 25 bit as total resolution) 32 pin MIL plug connector											PD PE MA ME			
DIRECTION TYPE radial												R		
SOCKET socket not included to be reported only with connector output (eg. MAR.162), for socket see Accessories													.162	
VARIANT custom version														XXX

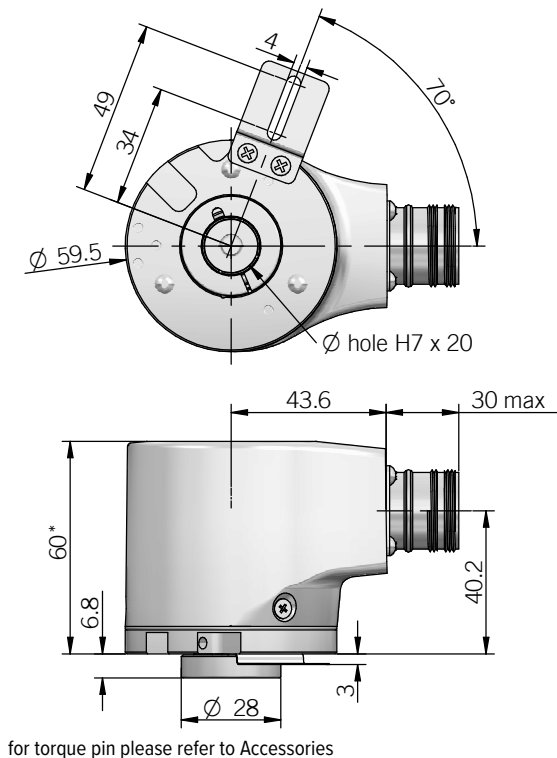
ORDERING CODE SSI	EAMR	58F	12 / 12	G	8/30	S	X	2048	RS	15	X	HA	R	.162	+XXX
<p>SERIES multiturn absolute encoder EAMR</p> <p>MODEL blind hollow shaft with stator coupling 58F blind hollow shaft with torque stop slot 63F blind hollow shaft with torque pin 63G</p> <p>MULTITURN RESOLUTION bit 12 / 14 / 15 see table for preferred combinations</p> <p>SINGLETURN RESOLUTION bit 13 / 18 / 25 see table for preferred combinations</p> <p>CODE TYPE binary B gray G</p> <p>POWER SUPPLY 8 ... 30 V DC 8/30</p> <p>ELECTRICAL INTERFACE Serial Synchronous Interface - SSI S</p> <p>OPTION to be reported if not used X reset with external input ZE reset on cover or with external input ZP</p> <p>INCREMENTAL RESOLUTION (powers of 2) ppr from 128 to 8192</p> <p>INCREMENTAL ELECTRICAL INTERFACE available with PD or HA output type line driver HTL L push pull P line driver RS-422 RS</p> <p>BORE DIAMETER mm 14 mm 15 diameters 6 / 8 / 9,52 (3/8") / 10 / 11 / 12 mm with optional shaft adapter, see Accessories</p> <p>ENCLOSURE RATING IP 65 shaft side / IP67 cover side X IP 67 S</p> <p>OUTPUT TYPE cable (standard length 1,5 m) PC preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) cable (standard length 1,5 m) PD preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) (without reset option) 7 pin MIL plug connector MC (with reset option) 10 pin MIL plug connector MD 12 pin M23 plug connector HA 8 pin M12 plug connector M12</p> <p>DIRECTION TYPE radial R</p> <p>SOCKET socket not included .162 to be reported only with connector output (eg. HAR.162), for socket see Accessories</p> <p>VARIANT custom version XXX</p>															

to be added with incremental output

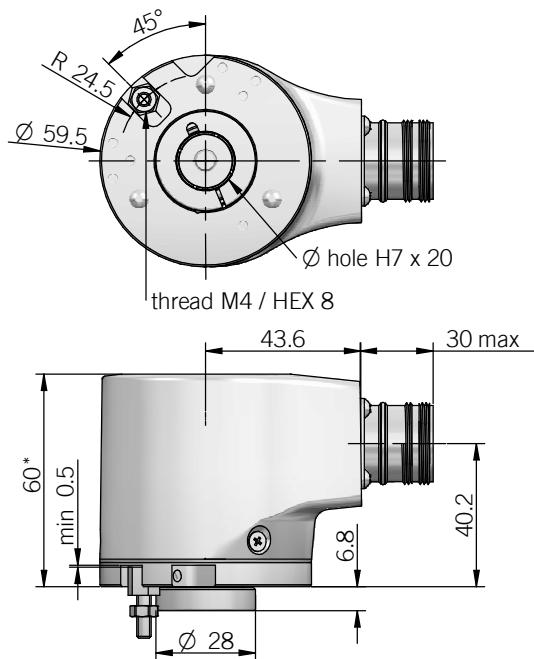
58F



63F



63G



torque pin is included

* with option ZP +1,5 mm
recommended mating shaft tolerance g6
dimensions in mm

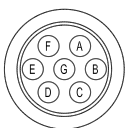
BIT-PARALLEL CONNECTIONS

Function	Binary / Gray	Cable PD	Cable PE	19 pin MA	32 pin ME
bit 1 (LSB)	B ⁰ / G ⁰	green	green	A	A
bit 2	B ¹ / G ¹	yellow	yellow	B	B
bit 3	B ² / G ²	blue	blue	C	C
bit 4	B ³ / G ³	brown	brown	D	D
bit 5	B ⁴ / G ⁴	orange or pink	orange or pink	E	E
bit 6	B ⁵ / G ⁵	white	white	F	F
bit 7	B ⁶ / G ⁶	grey	grey	G	G
bit 8	B ⁷ / G ⁷	purple	purple	H	H
bit 9	B ⁸ / G ⁸	grey / pink	grey / pink	J	J
bit 10	B ⁹ / G ⁹	white / green	white / green	K	K
bit 11	B ¹⁰ / G ¹⁰	brown / green	brown / green	L	L
bit 12	B ¹¹ / G ¹¹	white / yellow	white / yellow	M	M
bit 13	B ¹² / G ¹²	yellow / brown	yellow / brown	N	N
bit 14	B ¹³ / G ¹³	/	white / grey	/	P
bit 15	B ¹⁴ / G ¹⁴	/	grey / brown	/	R
bit 16	B ¹⁵ / G ¹⁵	/	white / pink	/	S
bit 17	B ¹⁶ / G ¹⁶	/	pink / brown	/	T
bit 18	B ¹⁷ / G ¹⁷	/	white / blue	/	U
bit 19	B ¹⁸ / G ¹⁸	/	brown / blue	/	V
bit 20	B ¹⁹ / G ¹⁹	/	white / red	/	W
bit 21	B ²⁰ / G ²⁰	/	brown / red	/	X
bit 22	B ²¹ / G ²¹	/	white / black	/	Y
bit 23	B ²² / G ²²	/	brown / black	/	Z
bit 24	B ²³ / G ²³	/	grey / green	/	a
bit 25	B ²⁴ / G ²⁴	/	yellow / pink	/	b
LATCH	/	/	yellow / grey	R	e
0 V	/	black	black	T	j
U / D	/	red / blue	red / blue	U	g
RESET	/	/	pink / green	/	f
+ V DC	/	red	red	V	h
⏏	/	shield	shield	S	housing

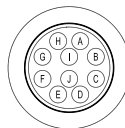
SSI CONNECTIONS

Function	Cable PC	Cable PD	7 pin MC	10 pin MD	12 pin HA	12 pin HA	8 pin M12
+ V DC	red	red	G	G	8	8	8
0 V	black	black	F	F	1	1	5
DATA +	green	green	C	C	2	2	3
DATA -	brown	brown	D	D	10	10	2
CLOCK +	yellow	yellow	A	A	3	3	4
CLOCK -	orange or pink	orange or pink	B	B	11	11	6
A+	/	grey	/	/	/	6	/
A-	/	blue	/	/	/	7	/
B+	/	purple	/	/	/	9	/
B-	/	white / green	/	/	/	12	/
U / D	red / blue	red / blue	E	E	5	5	7
RESET	white	white	/	H	4	4	1
⏏	shield	shield	housing	housing	9	housing	housing

MC connector (7 pin)
Amphenol MS3102-E-16-S
front view



MD connector (10 pin)
Amphenol MS3102-E-18-1P
front view



HA connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



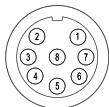
MA connector (19 pin)
Amphenol 62IN 12E 14-19 P
front view



ME connector (32 pin)
Glenair IPT 02 A 18-32 P F6
front view



M12 connector (8 pin)
M12 A coded
front view



ELECTRICAL SPECIFICATIONS

Multiturn resolution	12 / 14 / 15 bit please directly contact our offices for other pulses
Singleturn resolution	P = from 1 to 13 bit S = preferred combinations 12 multiturn / 13 singleturn 14 multiturn / 18 singleturn 15 multiturn / 25 singleturn please directly contact our offices for other pulses
Power supply¹	7,6 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Max load current	20 mA / channel
Absolute electrical interface²	P = push pull (IC-DL) S = RS-422 (THVD1451 or similar)
Incremental electrical interface²	L = HTL differential (AEIC-7272 or similar) P = Push-Pull (AEIC-7272 or similar) RS = RS-422 (AELT-5000 or similar)
Max incremental output frequency	128 kHz
Auxiliary inputs (U/D - RESET - LATCH)	active high (+V DC) connect to 0 V if not used / RESET - LATCH t_{min} 150 ms
Max frequency	25 kHz LSB (Bit-parallel) clock input 100 kHz ... 1 MHz (SSI)
Code type	binary or gray
Logic	SSI = positive Bit-parallel = positive or negative
SSI monostable time (Tm)	20 μ s
SSI pause time (Tp)	> 35 μ s
SSI frame	tree format MSB ... LSB up to 12 bit multiturn = length 25 bit (12MT + 13ST) 14 bit multiturn = length 32 bit (14MT + 18ST) 15 bit multiturn = length 40 bit (15MT + 25ST)
SSI status and parity bit	on request
Counting direction	SSI output = decreasing clockwise (shaft view) incremental output = A leads B clockwise (shaft view)
Start-up time	700 ms
Accuracy	$\pm 0,069^\circ$
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	156 years with BIT-PARALLEL output 186 years with SSI/INCREMENTAL output
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type PC	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Cable type PD	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Cable type PE	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

ROTATION SPEED DERATING TABLE

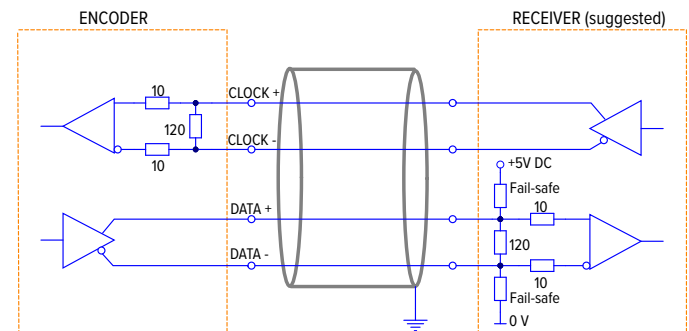
	Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
IP65	up to +70 (+158)	9000	6000
	+70 ... 85 (+158 ... +185)	6000	3000
IP67	up to +70 (+158)	8000	6000
	+70 ... +85 (+158 ... +185)	4000	2000

MECHANICAL SPECIFICATIONS

Bore diameter	\varnothing 14 / 15 mm \varnothing 6 / 8* / 9,52 (3/8")* / 10* / 11* / 12* mm * with optional shaft adapter, please refer to Accessories
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load⁴	200 N (45 lbs) axial / 60 N (13,49 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	5×10^{-6} kgm ² (119 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature Bit-parallel^{5,6}	-20° ... +85°C (-4° ... +185°F)
Operating temperature SSI^{5,6}	-40° ... +85°C (-40° ... +185°F) -20° ... +85°C (-4° ... +185°F) with cable output -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁶	-20° ... +85°C (-4° ... +185°F)
Weight	approx 350 g (12,35 oz)

¹ as measured at the transducer without cable influences² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section³ this product is not a safety component, for further details refer to TECHNICAL BASICS section⁴ maximum load for static usage⁵ measured on the transducer flange⁶ condensation not allowed

SSI ELECTRICAL INTERFACE



BIT-PARALLEL CONNECTOR OR CABLE CHOICE

Depending on the resolution and the number of turns selected, it is possible to calculate the connections required by the connector or cable.
See below examples:

EXAMPLE 1

Singleturn = 8 bit = 8 connections
Multiturn = 5 bit = 5 connections
Total connections 13

EXAMPLE 2

Singleturn = 12 bit = 12 connections
Multiturn = 12 bit = 12 connections
Total connections 24

From 1 to 13 connections a 16 cores cable (PD) or a 19 pin connector (MA) is required.
From 14 to 25 connections a 32 cores cable (PE) or a 32 pin connector (ME) is required.

With LATCH option a 32 cores cable (PE) or a 19 pin connector (MA) or a 32 pin connector (ME) is required.

With RESET option a 32 cores cable (PE) or a 32 pin connector (ME) is required.



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EAMR 90 - 115 A BIT-PARALLEL - SSI SOLID SHAFT MULTITURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard multiturn absolute encoders for factory automation applications.

- Optical/magnetic (proprietary optoASIC + energy harvesting) sensor technology
- Resolution up to 65 bit (25 bit singleturn + 40 bit multiturn)
- Power supply up to +30 VDC with Bit-parallel or SSI as electrical interface
- Cable or connector output
- Solid shaft diameter up to 10 mm
- Mounting by synchronous or REO-444 flange



ORDERING CODE BIT PARALLEL

EAMR 90A 12 / 12 G 8/30 P P X 10 X MA R .162 +XXX

SERIES
multiturn absolute encoder **EAMR**

MODEL
synchronous flange ø 40 mm **90A**
REO-444 flange **115A**

MULTITURN RESOLUTION
bit from **1** to **12**

SINGLETURN RESOLUTION
bit from **1** to **13**

CODE TYPE
binary **B**
gray **G**

POWER SUPPLY
8 ... 30 V DC **8/30**

ELECTRICAL INTERFACE
push-pull **P**

LOGIC
negative **N**
positive **P**

OPTIONS
to be reported if not used **X**
latch with external input **L**
reset with external input **ZE**
latch / reset with external inputs **LZE**

SHAFT DIAMETER
(mod. 90) 3/8" - mm **9,52**
mm **10**

ENCLOSURE RATING
IP 65 shaft side / IP67 cover side **X**
IP 67 **S**

OUTPUT TYPE
(up to 13 bit as total resolution, without reset option) 16 cores cable (standard length 1,5 m) **PD**
(from 14 to 25 bit as total resolution or options) 32 cores cable (standard length 1,5 m) **PE**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PDR5)
(up to 13 bit as total resolution, without reset option) 19 pin MIL plug connector **MA**
(from 14 to 25 bit as total resolution) 32 pin MIL plug connector **ME**

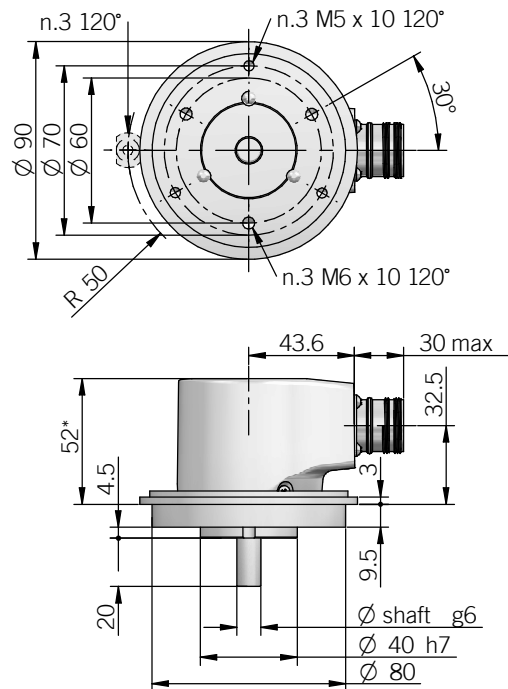
DIRECTION TYPE
radial **R**

SOCKET
socket not included **.162**
to be reported only with connector output (eg. MAR.162), for socket see Accessories

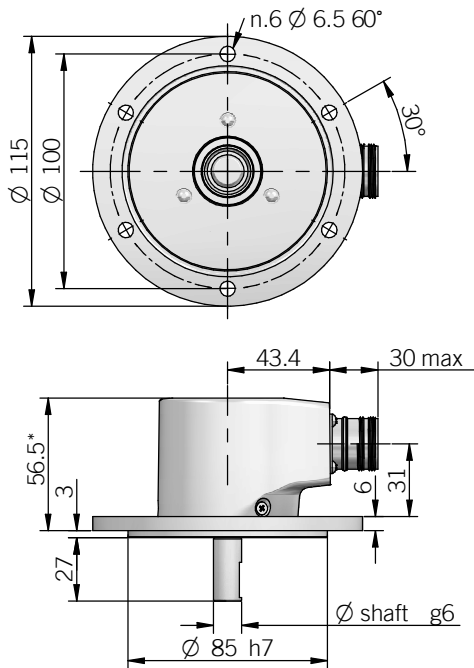
VARIANT
custom version **XXX**

ORDERING CODE	EAMR	90A	12 / 13	G	8/30	S	X	2048	RS	10	X	HA	R	.162	+XXX
SSI															
SERIES multiturn absolute encoder	EAMR														
MODEL synchronous flange ø 40 mm REO-444 flange	90A 115A														
MULTITURN RESOLUTION bit see table for preferred combinations	12 / 14 / 15														
SINGLETURN RESOLUTION bit see table for preferred combinations	13 / 18 / 25														
CODE TYPE binary gray	B G														
POWER SUPPLY 8 ... 30 V DC	8/30														
ELECTRICAL INTERFACE Serial Synchronous Interface - SSI	S														
OPTION to be reported if not used reset with external input reset on cover or with external input	X ZE ZP														
INCREMENTAL RESOLUTION (powers of 2) ppr from	128 to 8192														
INCREMENTAL ELECTRICAL INTERFACE available with PD or HA output type line driver HTL push pull line driver RS-422	L P RS														
SHAFT DIAMETER (mod. 90) 3/8" - mm mm	9,52 10														
ENCLOSURE RATING IP 65 shaft side / IP67 cover side IP 67	X S														
OUTPUT TYPE cable (standard length 1,5 m) preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) cable (standard length 1,5 m) preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) (without reset option) 7 pin MIL plug connector (with reset option) 10 pin MIL plug connector 12 pin M23 plug connector 8 pin M12 plug connector	PC PD MC MD HA M12														
DIRECTION TYPE radial	R														
SOCKET socket not included	.162														
to be added with incremental output															
to be reported only with connector output (eg. HAR.162), for socket see Accessories															
VARIANT custom version	XXX														

90A



115A



for fixing clamps please refer to Accessories
 * with option ZP +1,5 mm
 recommended mating shaft tolerance H7
 dimensions in mm

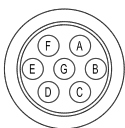
BIT-PARALLEL CONNECTIONS

Function	Binary / Gray	Cable PD	Cable PE	19 pin MA	32 pin ME
bit 1 (LSB)	B ⁰ / G ⁰	green	green	A	A
bit 2	B ¹ / G ¹	yellow	yellow	B	B
bit 3	B ² / G ²	blue	blue	C	C
bit 4	B ³ / G ³	brown	brown	D	D
bit 5	B ⁴ / G ⁴	orange or pink	orange or pink	E	E
bit 6	B ⁵ / G ⁵	white	white	F	F
bit 7	B ⁶ / G ⁶	grey	grey	G	G
bit 8	B ⁷ / G ⁷	purple	purple	H	H
bit 9	B ⁸ / G ⁸	grey / pink	grey / pink	J	J
bit 10	B ⁹ / G ⁹	white / green	white / green	K	K
bit 11	B ¹⁰ / G ¹⁰	brown / green	brown / green	L	L
bit 12	B ¹¹ / G ¹¹	white / yellow	white / yellow	M	M
bit 13	B ¹² / G ¹²	yellow / brown	yellow / brown	N	N
bit 14	B ¹³ / G ¹³	/	white / grey	/	P
bit 15	B ¹⁴ / G ¹⁴	/	grey / brown	/	R
bit 16	B ¹⁵ / G ¹⁵	/	white / pink	/	S
bit 17	B ¹⁶ / G ¹⁶	/	pink / brown	/	T
bit 18	B ¹⁷ / G ¹⁷	/	white / blue	/	U
bit 19	B ¹⁸ / G ¹⁸	/	brown / blue	/	V
bit 20	B ¹⁹ / G ¹⁹	/	white / red	/	W
bit 21	B ²⁰ / G ²⁰	/	brown / red	/	X
bit 22	B ²¹ / G ²¹	/	white / black	/	Y
bit 23	B ²² / G ²²	/	brown / black	/	Z
bit 24	B ²³ / G ²³	/	grey / green	/	a
bit 25	B ²⁴ / G ²⁴	/	yellow / pink	/	b
LATCH	/	/	yellow / grey	R	e
0 V	/	black	black	T	j
U / D	/	red / blue	red / blue	U	g
RESET	/	/	pink / green	/	f
+ V DC	/	red	red	V	h
⏏	/	shield	shield	S	housing

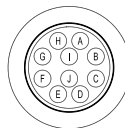
SSI CONNECTIONS

Function	Cable PC	Cable PD	7 pin MC	10 pin MD	12 pin HA	12 pin MA	8 pin M12
+ V DC	red	red	G	G	8	8	8
0 V	black	black	F	F	1	1	5
DATA +	green	green	C	C	2	2	3
DATA -	brown	brown	D	D	10	10	2
CLOCK +	yellow	yellow	A	A	3	3	4
CLOCK -	orange or pink	orange or pink	B	B	11	11	6
A+	/	grey	/	/	/	6	/
A-	/	blue	/	/	/	7	/
B+	/	purple	/	/	/	9	/
B-	/	white / green	/	/	/	12	/
U / D	red / blue	red / blue	E	E	5	5	7
RESET	white	white	/	H	4	4	1
⏏	shield	shield	housing	housing	9	housing	housing

MC connector (7 pin)
Amphenol MS3102-E-16-S
front view



MD connector (10 pin)
Amphenol MS3102-E-18-1P
front view



HA connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



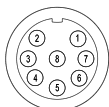
MA connector (19 pin)
Amphenol 62IN 12E 14-19 P
front view



ME connector (32 pin)
Glennair IPT 02 A 18-32 P F6
front view



M12 connector (8 pin)
M12 A coded
front view



ELECTRICAL SPECIFICATIONS

Multiturn resolution	12 / 14 / 15 bit please directly contact our offices for other pulses
Singleturn resolution	P = from 1 to 13 bit S = preferred combinations 12 multiturn / 13 singleturn 14 multiturn / 18 singleturn 15 multiturn / 25 singleturn please directly contact our offices for other pulses
Power supply¹	7,6 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Max load current	20 mA / channel
Absolute electrical interface²	P = push pull (IC-DL) S = RS-422 (THVD1451 or similar)
Incremental electrical interface²	L = HTL differential (AEIC-7272 or similar) P = Push-Pull (AEIC-7272 or similar) RS = RS-422 (AELT-5000 or similar)
Max incremental output frequency	128 kHz
Auxiliary inputs (U/D - RESET - LATCH)	active high (+V DC) connect to 0 V if not used / RESET - LATCH t_{min} 150 ms
Max frequency	25 kHz LSB (Bit-parallel) clock input 100 kHz ... 1 MHz (SSI)
Code type	binary or gray
Logic	SSI = positive Bit-parallel = positive or negative
SSI monostable time (Tm)	20 μ s
SSI pause time (Tp)	> 35 μ s
SSI frame	tree format MSB ... LSB up to 12 bit multiturn = length 25 bit (12MT + 13ST) 14 bit multiturn = length 32 bit (14MT + 18ST) 15 bit multiturn = length 40 bit (15MT + 25ST)
SSI status and parity bit	on request
Counting direction	SSI output = decreasing clockwise (shaft view) incremental output = A leads B clockwise (shaft view)
Start-up time	700 ms
Accuracy	$\pm 0,069^\circ$
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	156 years with BIT-PARALLEL output 186 years with SSI/INCREMENTAL output
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type PC	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Cable type PD	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Cable type PE	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 50 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

ROTATION SPEED DERATING TABLE

Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000
+85 ... +100 (+185 ... 212)	5000	3000

MECHANICAL SPECIFICATIONS

Shaft diameter	\varnothing 9,52 (3/8") / 10 / 11 mm
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load⁴	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 ⁻⁶ kgm ² (36 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature Bit-parallel^{5, 6}	-20° ... +85°C (-4 ... +185°F)
Operating temperature SSI^{5, 6}	-40° ... +100°C (-40° ... +212°F) -20° ... +100°C (-4° ... +212°F) with PC cable output -20° ... +85°C (-4° ... +185°F) with PD cable output -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁶	-20° ... +85°C (-4° ... +185°F)
Weight	approx 350 g (12,35 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

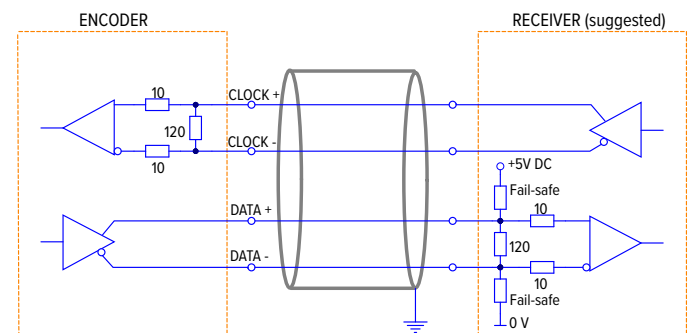
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

SSI ELECTRICAL INTERFACE



BIT-PARALLEL CONNECTOR OR CABLE CHOICE

Depending on the resolution and the number of turns selected, it is possible to calculate the connections required by the connector or cable.

See below examples:

EXAMPLE 1

Singleturn = 8 bit = 8 connections
Multiturn = 5 bit = 5 connections
Total connections 13

EXAMPLE 2

Singleturn = 12 bit = 12 connections
Multiturn = 12 bit = 12 connections
Total connections 24

From 1 to 13 connections a 16 cores cable (PD) or a 19 pin connector (MA) is required.
From 14 to 25 connections a 32 cores cable (PE) or a 32 pin connector (ME) is required.

With LATCH option a 32 cores cable (PE) or a 19 pin connector (MA) or a 32 pin connector (ME) is required.

With RESET option a 32 cores cable (PE) or a 32 pin connector (ME) is required.

EAML 58 B / C - 63 A / D / E ANALOGUE SOLID SHAFT MULTITURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard multiturn absolute encoders for factory automation applications.

- Optical/magnetic (proprietary optoASIC + energy harvesting) sensor technology
- Programmable measuring range via teach-in function (external inputs or cover button)
- Power supply up to +30 VDC with analogue (voltage or current) electrical interface
- Cable or M12 connector output
- Solid shaft diameter up to 10 mm
- Mounting by synchronous, clamping or centering 2,5" square flange



ORDERING CODE **EAML** **63A** **16B 12/30** **V** **05** **X** **10** **X** **M12** **R** **.162** **+XXX**

SERIES
analogue multiturn absolute encoder **EAML**

MODEL
synchronous flange ø 31.75 mm **63A**
synchronous flange ø 50 mm **58B**
clamping flange ø 36 mm **58C**
centering square flange ø 31.75 mm **63D**
centering square flange ø 50 mm **63E**

OUTPUT DAC RESOLUTION
16 bit **16B**

POWER SUPPLY
12 ... 30 V DC **12/30**

ELECTRICAL INTERFACE
voltage **V**
current **I**

OUTPUT RANGE
0 ... 5 V **05**
0 ... 10 V **010**
0 ... 20 mA **020**
4 ... 20 mA **420**

OPTIONS
to be reported with voltage output / 3 wires current output **X**
4 wires current output **Q**

SHAFT DIAMETER
(mod. 58 B) mm **6**
(mod. 63 A / D) 3/8" - mm **9,52**
(mod. 58 C - 63 A / D / E) mm **10**

ENCLOSURE RATING
IP 65 shaft side / IP67 cover side **X**
IP 67 **S**

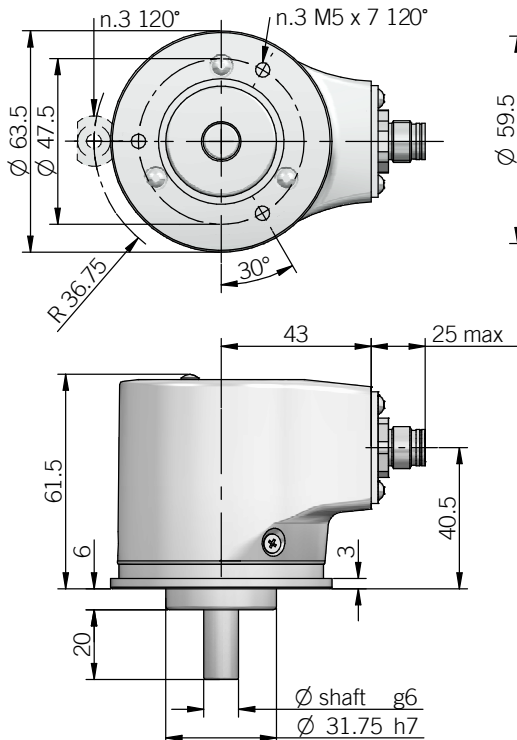
OUTPUT TYPE
cable (standard length 1,5 m) **P**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after **DIRECTION TYPE** (eg. PR5)
M12 plug connector **M12**

DIRECTION TYPE
radial **R**

SOCKET
socket not included **.162**
to be reported only with connector output (eg. M12R.162), for socket see Accessories

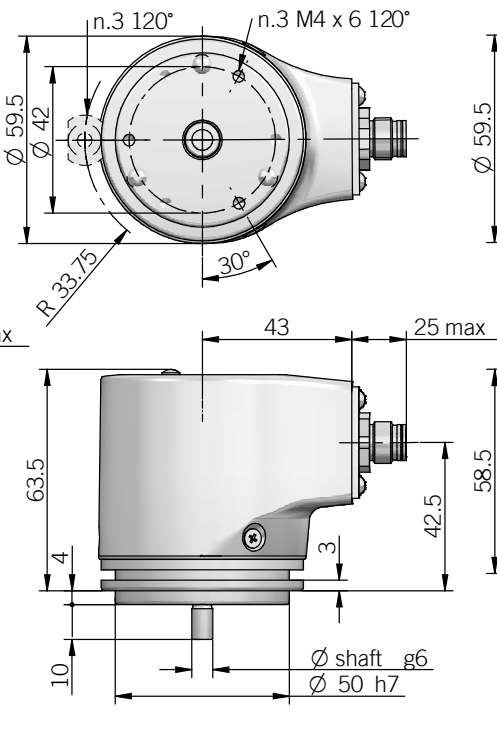
VARIANT
custom version **XXX**

63A



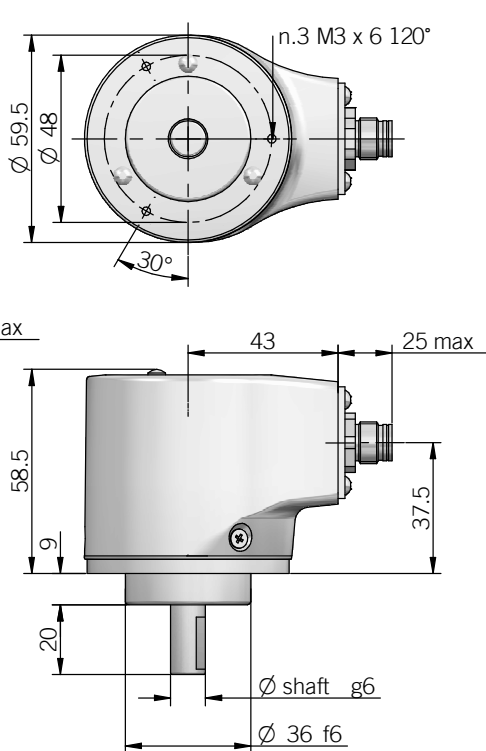
for fixing clamps please refer to Accessories

58B

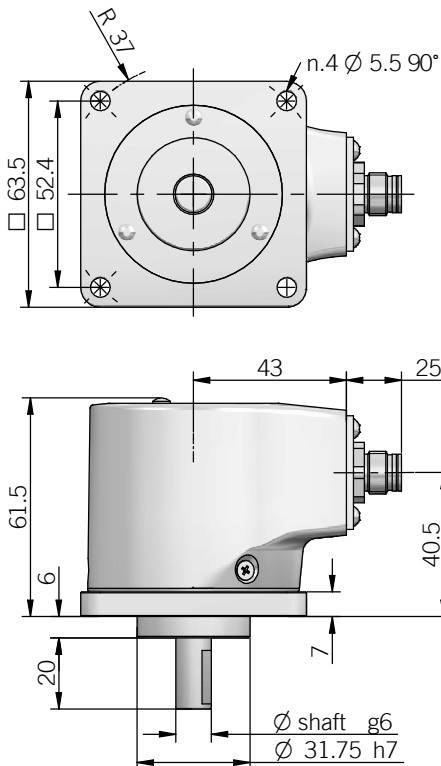


for fixing clamps please refer to Accessories

58C

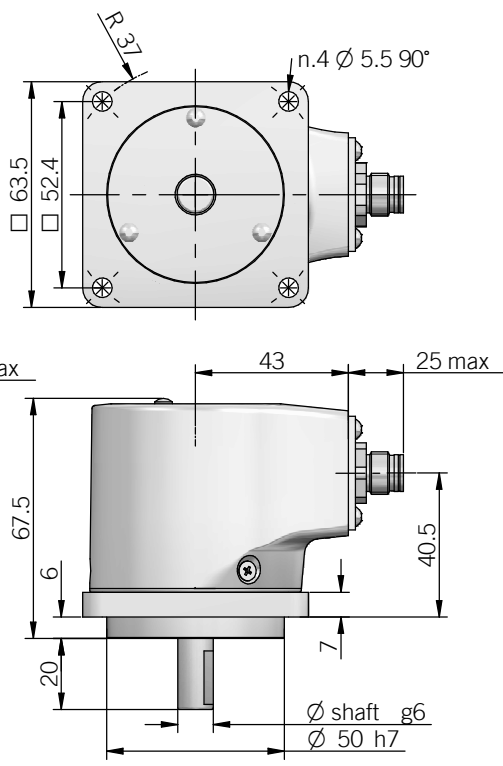


63D



recommended mating shaft tolerance H7
dimensions in mm

63E

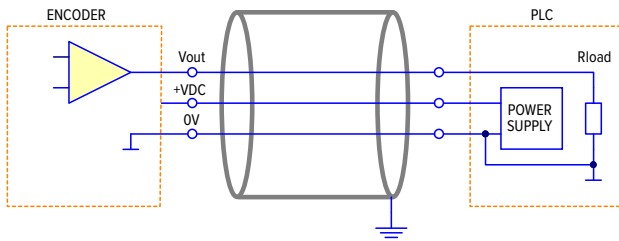


ELECTRICAL SPECIFICATIONS

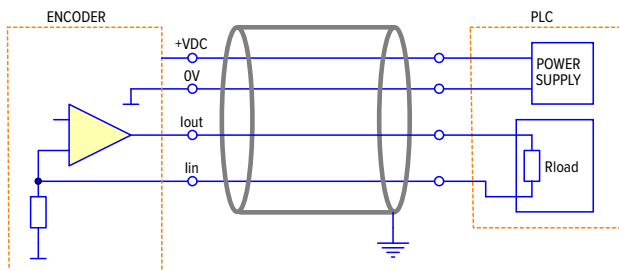
Multiturn resolution	16 bit max
Singleturn resolution	16 bit max
Output DAC resolution	16 bit
Minimum angle	22,5°
Power supply¹	11,4 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Electrical interface²	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
Auxiliary inputs (BEGIN - END)	active high (+V DC) connect to 0 V if not used / t_{min} 150 ms
Load	$R_{min} = 1\text{ k}\Omega$ (voltage output) $R_{max} = (V_{DC} - 2) / 0,02$ (current output)
Output update frequency	16 kHz
Signal pattern	auto teaching according to commissioning
Start-up time	700 ms
Linearity error	$\pm 0,069^\circ$
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	186 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

ELECTRICAL INTERFACE

VOLTAGE OUTPUT



CURRENT OUTPUT



3 / 4 wire source
with 3 wires interface lin is internally connected to 0V

MECHANICAL SPECIFICATIONS

Shaft diameter	$\varnothing 6 / 9,52 (3/8") / 10\text{ mm}$
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load⁴	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	$1,5 \times 10^{-6}\text{ kgm}^2 (36 \times 10^{-6}\text{ lbf}^2)$
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10^9 revolutions
Operating temperature^{5,6}	-20° ... +85°C (-4 ... +185°F)
Storage temperature⁶	-20° ... +85°C (-4 ... +185°F)
Weight	approx 350 g (12,35 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

ROTATION SPEED / TEMPERATURE TABLE

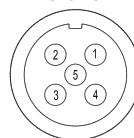
Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000

CONNECTIONS

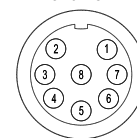
Function	Cable	5 pin M12	8 pin M12*
+ V DC	red	2	2
0 V	black	3	3
V_{out} / I_{out}	green	1	1
I_{in}	yellow	/	6
BEGIN	white	4	4
END	brown or grey	5	5
⊥	shield	housing	housing

* with Q current output

M12 connector (5 pin)
M12 A coded front view



M12 connector (8 pin)
M12 A coded front view



EAML 58 F - 63 F / G ANALOGUE

BLIND HOLLOW SHAFT MULTITURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard multiturn absolute encoders for factory automation applications.

- Optical/magnetic (proprietary optoASIC + energy harvesting) sensor technology
- Programmable measuring range via teach-in function (external inputs or cover button)
- Power supply up to +30 VDC with analogue (voltage or current) electrical interface
- Cable or M12 connector output
- Blind hollow shaft up to 15 mm
- Mounting by stator coupling, torque stop slot or torque pin



ORDERING CODE **EAML 58F 16B 12/30 V 05 X 15 X M12 R .162 +XXX**

SERIES
analogue multiturn absolute encoder **EAML**

MODEL
blind hollow shaft with stator coupling **58F**
blind hollow shaft with torque stop slot **63F**
blind hollow shaft with torque pin **63G**

OUTPUT DAC RESOLUTION
16 bit **16B**

POWER SUPPLY
12 ... 30 V DC **12/30**

ELECTRICAL INTERFACE
voltage **V**
current **I**

OUTPUT RANGE
0 ... 5 V **05**
0 ... 10 V **010**
0 ... 20 mA **020**
4 ... 20 mA **420**

OPTIONS
to be reported with voltage output / 3 wires current output **X**
4 wires current output **Q**

BORE DIAMETER
mm **14**
mm **15**
diameters 6 / 8 / 9,52 (3/8") / 10 / 11 / 12 mm with optional shaft adapter, see Accessories

ENCLOSURE RATING
IP 65 shaft side / IP67 cover side **X**
IP 67 **S**

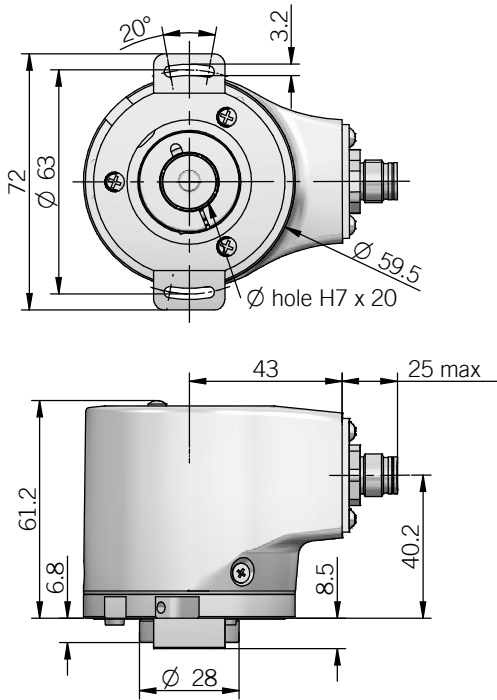
OUTPUT TYPE
cable (standard length 1,5 m) **P**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)
M12 plug connector **M12**

DIRECTION TYPE
radial **R**

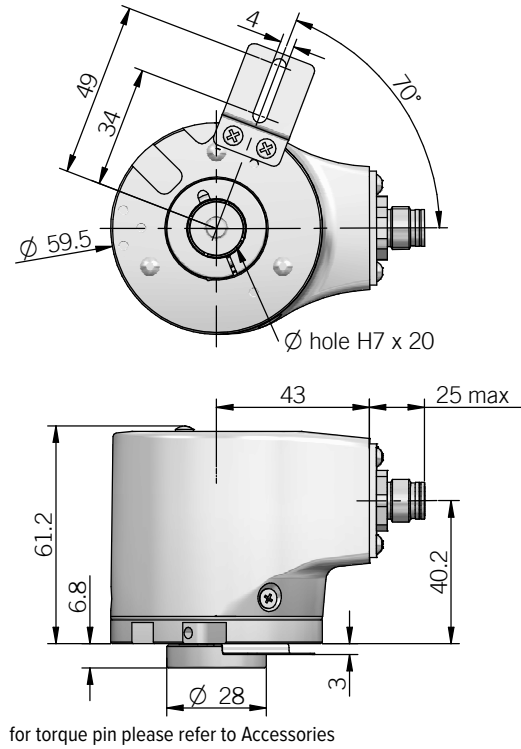
SOCKET
socket not included **.162**
to be reported only with connector output (eg. M12R.162), for socket see Accessories

VARIANT
custom version **XXX**

58F

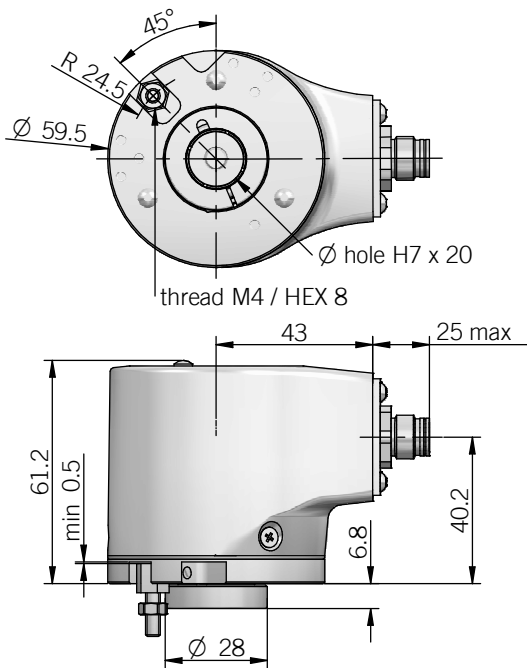


63F



for torque pin please refer to Accessories

63G



torque pin is included
recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS

Multiturn resolution	16 bit max
Singleturn resolution	16 bit max
Output DAC resolution	16 bit
Minimum angle	22,5°
Power supply¹	11,4 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Electrical interface²	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
Auxiliary inputs (BEGIN - END)	active high (+V DC) connect to 0 V if not used / t_{min} 150 ms
Load	$R_{min} = 1\text{ k}\Omega$ (voltage output) $R_{max} = (V\text{ DC} - 2) / 0,02$ (current output)
Output update frequency	16 kHz
Signal pattern	auto teaching according to commissioning
Start-up time	700 ms
Linearity error	$\pm 0,069^\circ$
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	186 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Bore diameter	$\varnothing 14 / 15\text{ mm}$ $\varnothing 6 / 8^* / 9,52 (3/8)^* / 10^* / 11^* / 12^*\text{ mm}$ * with optional shaft adapter, please refer to Accessories
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load⁴	200 N (45 lbs) axial / 60 N (13,49 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	$5 \times 10^{-6}\text{ kgm}^2$ ($119 \times 10^{-6}\text{ lbf}^2$)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10^9 revolutions
Operating temperature^{5,6}	-20° ... +85°C (-4° ... +185°F)
Storage temperature⁶	-20° ... +85°C (-4° ... +185°F)
Weight	approx 350 g (12,35 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

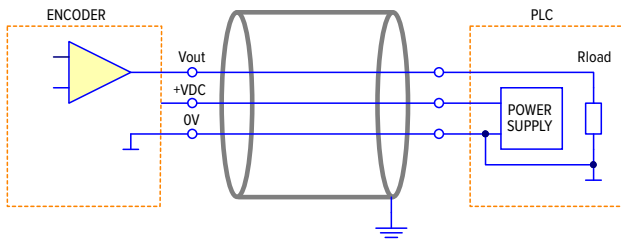
⁴ maximum load for static usage

⁵ measured on the transducer flange

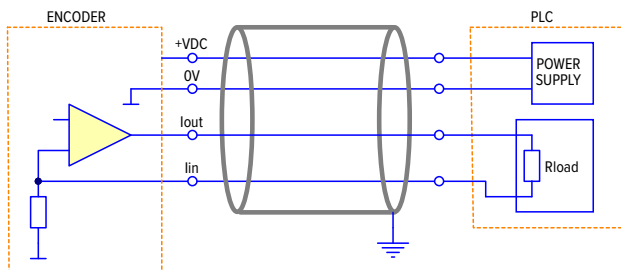
⁶ condensation not allowed

ELECTRICAL INTERFACE

VOLTAGE OUTPUT



CURRENT OUTPUT



3 / 4 wire source
with 3 wires interface Iin is internally connected to 0V

ROTATION SPEED / TEMPERATURE TABLE

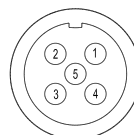
Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000

CONNECTIONS

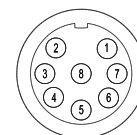
Function	Cable	5 pin M12	8 pin M12*
+ V DC	red	2	2
0 V	black	3	3
V_{out} / I_{out}	green	1	1
I_{in}	yellow	/	6
BEGIN	white	4	4
END	brown or grey	5	5
⊥	shield	housing	housing

* with Q current output

M12 connector (5 pin)
M12 A coded
front view



M12 connector (8 pin)
M12 A coded
front view



EAML 90 - 115 A ANALOGUE SOLID SHAFT MULTITURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard multiturn absolute encoders for factory automation applications.

- Optical/magnetic (proprietary optoASIC + energy harvesting) sensor technology
- Programmable measuring range via teach-in function (external inputs or cover button)
- Power supply up to +30 VDC with analogue (voltage or current) electrical interface
- Cable or M12 connector output
- Solid shaft diameter up to 11 mm
- Mounting by synchronous or REO-444 flange



ORDERING CODE **EAML** **90A** **16B** **12/30** **V** **05** **X** **10** **X** **M12** **R** **.162** **+XXX**

SERIES
analogue multiturn absolute encoder **EAML**

MODEL
synchronous flange ø 40 mm **90A**
REO-444 flange **115A**

OUTPUT DAC RESOLUTION
16 bit **16B**

POWER SUPPLY
12 ... 30 V DC **12/30**

ELECTRICAL INTERFACE
voltage **V**
current **I**

OUTPUT RANGE
0 ... 5 V **05**
0 ... 10 V **010**
0 ... 20 mA **020**
4 ... 20 mA **420**

OPTIONS
to be reported with voltage output / 3 wires current output **X**
4 wires current output **Q**

SHAFT DIAMETER
(mod. 90) 3/8" - mm **9,52**
mm **10**
(mod. 115) mm **11**

ENCLOSURE RATING
IP 65 shaft side / IP67 cover side **X**
IP 67 **S**

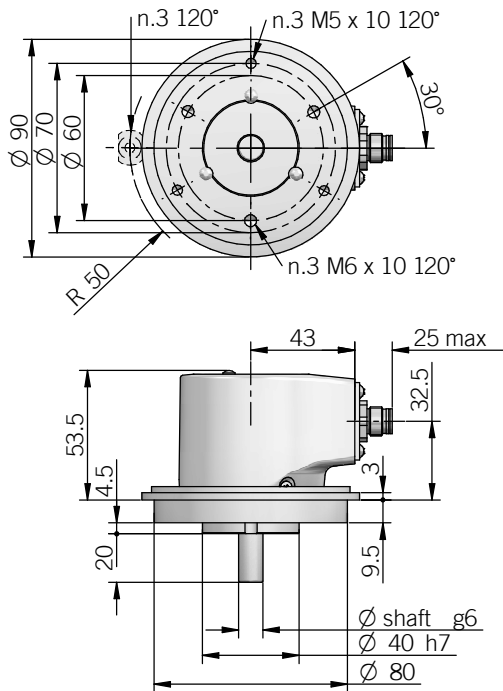
OUTPUT TYPE
cable (standard length 1,5 m) **P**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after **DIRECTION TYPE** (eg. PR5)
M12 plug connector **M12**

DIRECTION TYPE
radial **R**

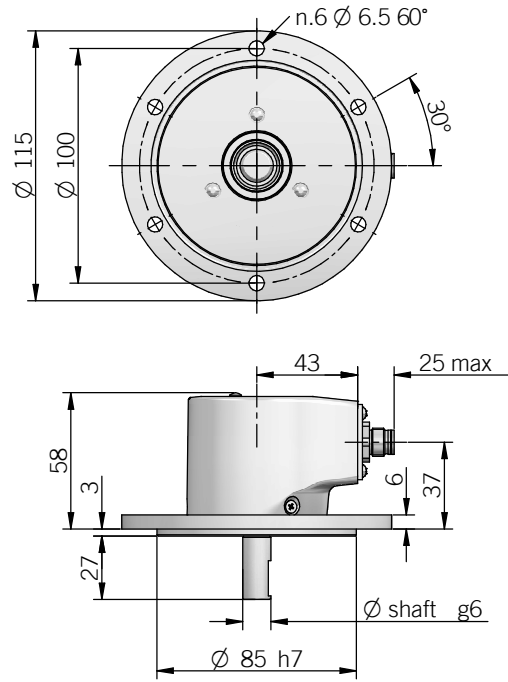
SOCKET
socket not included **.162**
to be reported only with connector output (eg. M12R.162), for socket see Accessories

VARIANT
custom version **XXX**

90A



115A



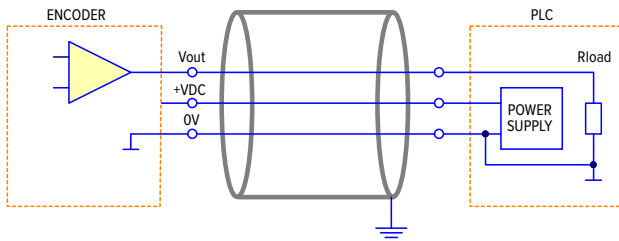
for fixing clamps please refer to Accessories
 recommended mating shaft tolerance H7
 dimensions in mm

ELECTRICAL SPECIFICATIONS

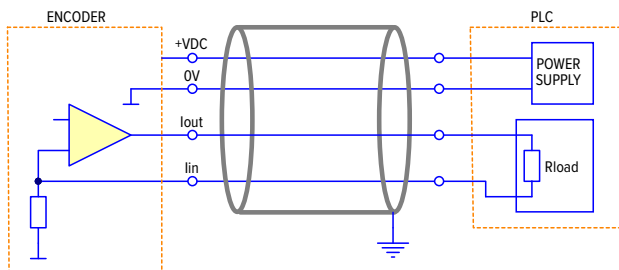
Multiturn resolution	16 bit max
Singleturn resolution	16 bit max
Output DAC resolution	16 bit
Minimum angle	22,5°
Power supply¹	11,4 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Electrical interface²	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
Auxiliary inputs (BEGIN - END)	active high (+V DC) connect to 0 V if not used / t_{min} 150 ms
Load	$R_{min} = 1\text{ k}\Omega$ (voltage output) $R_{max} = (V_{DC} - 2) / 0,02$ (current output)
Output update frequency	16 kHz
Signal pattern	auto teaching according to commissioning
Start-up time	700 ms
Linearity error	$\pm 0,069^\circ$
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	186 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

ELECTRICAL INTERFACE

VOLTAGE OUTPUT



CURRENT OUTPUT



3 / 4 wire source
with 3 wires interface Iin is internally connected to 0V

MECHANICAL SPECIFICATIONS

Shaft diameter	$\varnothing 9,52$ (3/8") / 10 / 11 mm
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load⁴	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	$1,5 \times 10^{-6}$ kgm ² (36×10^{-6} lbf ²)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-20° ... +85°C (-4 ... +185°F)
Storage temperature⁶	-20° ... +85°C (-4 ... +185°F)
Weight	approx 350 g (12,35 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

ROTATION SPEED / TEMPERATURE TABLE

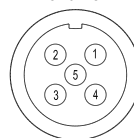
Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000

CONNECTIONS

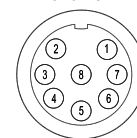
Function	Cable	5 pin M12	8 pin M12*
+ V DC	red	2	2
0 V	black	3	3
V _{out} / I _{out}	green	1	1
I _{in}	yellow	/	6
BEGIN	white	4	4
END	brown or grey	5	5
⏏	shield	housing	housing

* with Q current output

M12 connector (5 pin)
M12 A coded front view



M12 connector (8 pin)
M12 A coded front view



AAM 58 B / C PROFINET

SOLID SHAFT MULTITURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard multiturn absolute encoders for factory automation applications.

- Optical sensing technology (OptoASIC + gears)
- 25 bit total resolution (13 bit singleturn + 12 bit multiturn)
- Power supply up to +30 V DC with Profinet IO as electrical interface
- Intelligent status leds
- M12 connector for quick setup
- Solid shaft diameter up to 10 mm
- Mounting by synchronous or clamping flange
- Operating temperature -40° ... +80°C (-40° ... +176°F)



ORDERING CODE

AAM 58B R 12 / 13 B 10/30 PFN 6 X X M12R .162

SERIES
absolute multiturn encoder **AAM**

MODEL
synchronous flange ø 50 mm **58B**
clamping flange ø 36 mm **58C**

REVISION
to be reported **R**

MULTITURN RESOLUTION
bit **12**

SINGLETURN RESOLUTION
bit **13**

CODE TYPE
binary **B**

POWER SUPPLY
10 ... 30 V DC **10/30**

ELECTRICAL INTERFACE
PROFINET IO **PFN**

SHAFT DIAMETER
(mod. 58B) mm **6**
(mod. 58C) mm **10**

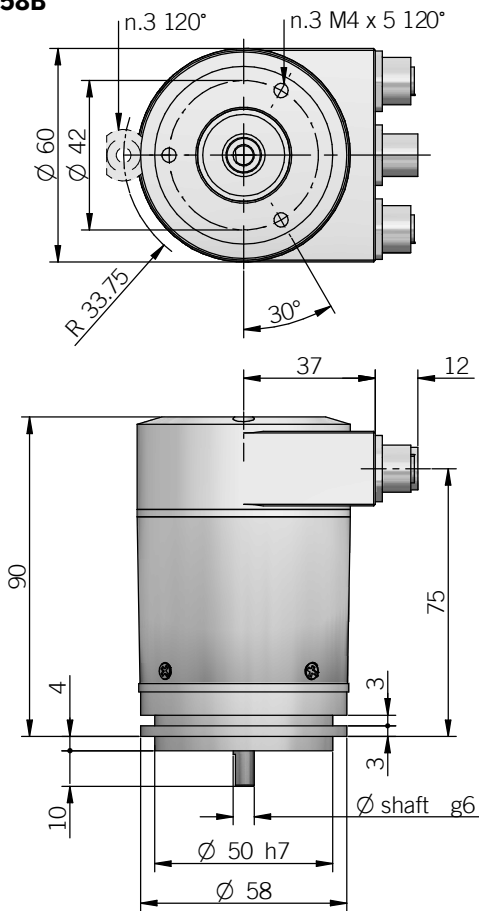
ENCLOSURE RATING
IP 65 **X**

OPTIONS
to be reported **X**

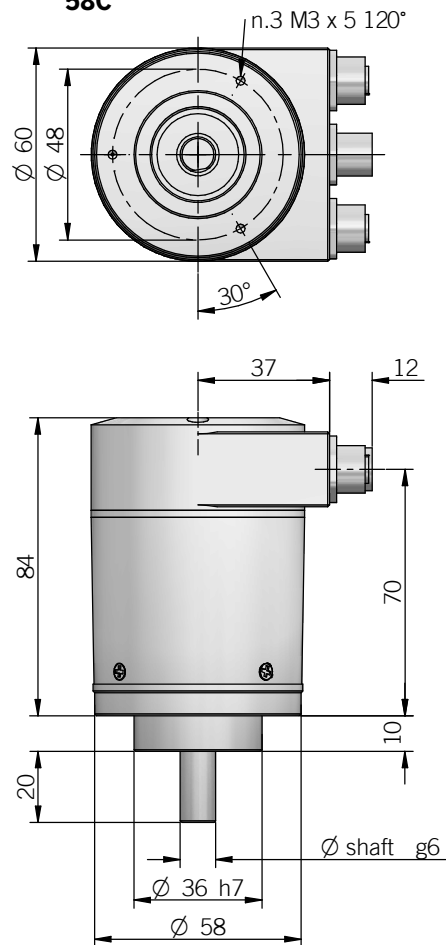
OUTPUT TYPE
radial M12 connectors **M12R**

SOCKETS
sockets not included **.162**
for sockets see Accessories

58B



58C



fixing clamps not included, please refer to Accessories
recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS

Multiturn resolution	1 ... 12 bit programmabile during commissioning
Singleturn resolution	1 ... 13 bit programmabile during commissioning
Power supply¹	10 ... 30 V DC (reverse polarity protection)
Current consumption without load	< 200 mA
Electrical interface²	PROFINET IO RT Class 1 / Conformance Class B
Hardware features	Ertec 200P auto-negotiation auto-polarity auto-crossover diagnostic LEDs
Code type	binary
Max bus frequency	100 Mbit/s
Cycle time	≤ 1 ms
Accuracy	± 0,04°
Start-up time	500 ms
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	121 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 6 mm (mod. 58B) ø 10 mm (mod. 58C)
Enclosure rating	IP 65 (IEC 60529)
Max rotation speed	6000 rpm
Max shaft load³	80 N (17,98 lbs) radial / 40 N (9 lbs) axial
Starting torque (at +20°C / +68°F)	< 0,05 Nm (7 Ozin)
Moment of inertia	approx 1,8 x 10 ⁻⁶ kgm ²
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibrations	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Bearings life	10 ⁹ revolutions
Bearings	n.2 ball bearings
Shaft material	stainless steel
Bearing stage / cover material	aluminium
Housing material	painted aluminium
Operating temperature^{4,5}	-40° ... +80°C (-40° ... +176°F)
Storage temperature⁵	-40° ... +85°C (-40° ... +185°F)
Weight	600 g (21 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ maximum load for static usage

⁴ measured on the transducer flange

⁵ condensation not allowed

CONNECTIONS

	Pin	Function
PORT 1 Connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-
POWER connector	1	+V DC
	2	/
	3	0 V
	4	/
PORT 2 Connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-

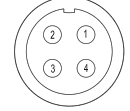
socket connectors not included, please refer to Accessories



PORT 1 / 2 connector (4 pin)
M12 D coded
front view



POWER connector (4 pin)
M12 A coded
front view



AAM 58 F PROFINET

BLIND HOLLOW SHAFT MULTITURN ABSOLUTE ENCODER

MAIN FEATURES

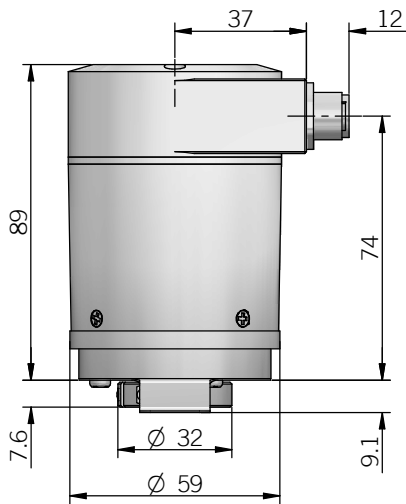
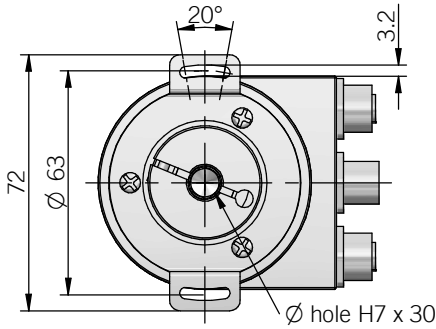
Industry standard multiturn absolute encoder for factory automation applications.

- Optical sensing technology (OptoASIC + gears)
- 25 bit total resolution (13 bit singleturn + 12 bit multiturn)
- Power supply up to +30 V DC with Profinet IO as electrical interface
- Intelligent status leds
- M12 connector for quick setup
- Blind hollow shaft diameter up to 15 mm
- Mounting by stator coupling
- Operating temperature -40° ... +80°C (-40° ... +176°F)



ORDERING CODE	AAM	58F	R	12	/	13	B	10/30	PFN	15	X	X	M12R	.162
SERIES absolute multiurn encoder AAM														
MODEL blind hollow shaft with stator coupling 58F														
REVISION to be reported R														
MULTITURN RESOLUTION bit 12														
SINGLETURN RESOLUTION bit 13														
CODE TYPE binary B														
POWER SUPPLY 10 ... 30 V DC 10/30														
ELECTRICAL INTERFACE PROFINET IO PFN														
BORE DIAMETER mm 15 diameters 10 / 12 mm with optional shaft adapter, see Accessories														
ENCLOSURE RATING IP 65 X														
OPTIONS to be reported X														
OUTPUT TYPE radial M12 connectors M12R														
SOCKETS sockets not included .162 for sockets see Accessories														

58F



recommended mating shaft tolerance g6
dimensions in mm

CONNECTIONS

	Pin	Function
PORT 1 Connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-
POWER connector	1	+V DC
	2	/
	3	0 V
	4	/
PORT 2 Connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-

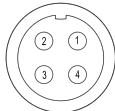
socket connectors not included, please refer to Accessories



PORT 1 / 2 connector (4 pin)
M12 D coded
front view



POWER connector (4 pin)
M12 A coded
front view



ELECTRICAL SPECIFICATIONS

Multiturn resolution	1 ... 12 bit programmable during commissioning
Singleturn resolution	1 ... 13 bit programmable during commissioning
Power supply ¹	10 ... 30 V DC (reverse polarity protection)
Current consumption without load	< 200 mA
Electrical interface ²	PROFINET IO RT Class 1 / Conformance Class B
Hardware features	Ertec 200P auto-negotiation auto-polarity auto-crossover diagnostic LEDs
Code type	binary
Max bus frequency	100 Mbit/s
Cycle time	≤ 1 ms
Accuracy	± 0,04°
Start-up time	500 ms
Mean time to dangerous failure (MTTF) ³ according to EN ISO 13849-1	121 years
Mission time (Tm) ³	20 years
Diagnostic coverage (DC) ³	0%
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive

MECHANICAL SPECIFICATIONS

Bore diameter	ø 15 mm ø 12* / 10* mm * with optional shaft adapter, please refer to Accessories
Enclosure rating	IP 65 (IEC 60529)
Max rotation speed	6000 rpm
Max shaft load ³	80 N (17,98 lbs) radial / 40 N (9 lbs) axial
Starting torque (at +20°C / +68°F)	< 0,05 Nm (7 Ozin)
Moment of inertia	approx 1,8 x 10 ⁻⁶ kgm ²
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibrations	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Bearings life	10 ⁹ revolutions
Bearings	n.2 ball bearings
Shaft material	stainless steel
Bearing stage / cover material	aluminium
Housing material	painted aluminium
Operating temperature ^{4, 5}	-40° ... +80°C (-40° ... +176°F)
Storage temperature ⁵	-40° ... +85°C (-40° ... +185°F)
Weight	600 g (21 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ maximum load for static usage

⁴ measured on the transducer flange

⁵ condensation not allowed

AAM 58 B / C ETHERCAT

SOLID SHAFT MULTITURN ABSOLUTE ENCODER

EtherCAT
Conformance tested



MAIN FEATURES

Industry standard multiturn absolute encoders for factory automation applications.

- Optical sensing technology (OptoASIC + gears)
- 25 bit total resolution (13 bit singleturn + 12 bit multiturn)
- Power supply up to +30 V DC with EtherCAT as electrical interface
- Intelligent status leds
- M12 connector for quick setup
- Solid shaft diameter up to 10 mm
- Mounting by synchronous or clamping flange
- Operating temperature -40° ... +80°C (-40° ... +176°F)



ORDERING CODE **AAM** **58B** **R** **12** / **13** **B** **10/30** **ETC** **6** **X** **X** **M12R** **.162**

SERIES
absolute multiturn encoder **AAM**

MODEL
synchronous flange ø 50 mm **58B**
clamping flange ø 36 mm **58C**

REVISION
to be reported **R**

MULTITURN RESOLUTION
bit **12**

SINGLETURN RESOLUTION
bit **13**

CODE TYPE
binary **B**

POWER SUPPLY
10 ... 30 V DC **10/30**

ELECTRICAL INTERFACE
ETHERCAT **ETC**

SHAFT DIAMETER
(mod. 58B) mm **6**
(mod. 58C) mm **10**

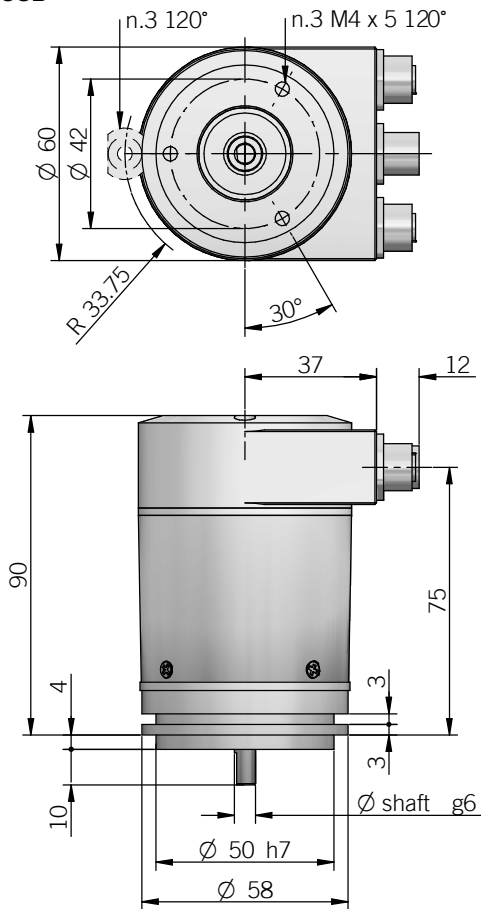
ENCLOSURE RATING
IP 65 **X**

OPTIONS
to be reported **X**

OUTPUT TYPE
radial M12 connectors **M12R**

SOCKETS
sockets not included **.162**
for sockets see Accessories

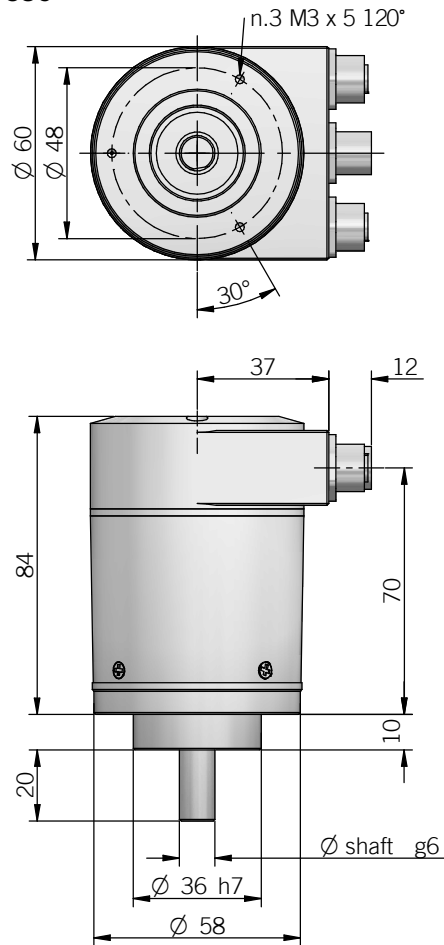
58B



for fixing clamps please refer to Accessories

recommended mating shaft tolerance H7
dimensions in mm

58C



ELECTRICAL SPECIFICATIONS

Multiturn resolution	1 ... 12 bit programmabile during commissioning
Singleturn resolution	1 ... 13 bit programmabile during commissioning
Power supply¹	10 ... 30 V DC (reverse polarity protection)
Current consumption without load	< 200 mA
Electrical interface²	Ethercat
Profile	CoE (CANopen over EtherCAT, DS-301+DS-406)
Programming functions	Resolution Preset Counting direction
Code type	binary
Max bus frequency	100 Mbit/s
Cycle time	≥ 62,5 μs
Accuracy	± 0,044°
Start-up time	500 ms
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	121 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 6 mm (mod. 58B) ø 10 mm (mod. 58C)
Enclosure rating	IP 65 (IEC 60529)
Max rotation speed	6000 rpm
Max shaft load³	80 N (17,98 lbs) radial / 40 N (9 lbs) axial
Starting torque (at +20°C / +68°F)	< 0,05 Nm (7 Ozin)
Moment of inertia	approx 1,8 x 10 ⁻⁶ kgm ²
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibrations	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Bearings life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel
Bearing stage / cover material	aluminium
Housing material	aluminium
Operating temperature^{4,5}	-40° ... +80°C (-40° ... +176°F)
Storage temperature⁵	-40° ... +85°C (-40° ... +185°F)
Weight	600 g (21 oz)

¹ as measured at the encoder without cable influences

² for further details refer to TECHNICAL BASICS section

³ maximum load for static usage

⁴ measured on encoder flange

⁵ condensation not allowed

CONNECTIONS

	Pin	Function
ECAT IN connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-
POWER connector	1	+V DC
	2	/
	3	0 V
	4	/
ECAT OUT connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-

socket connectors not included, please refer to Accessories

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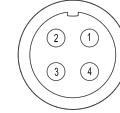


ECAT IN POWER ECAT OUT

ECAT IN / OUT connector (4 pin)
M12 D coded
front view



POWER connector (4 pin)
M12 A coded
front view



AAM 58 F ETHERCAT

BLIND HOLLOW SHAFT MULTITURN ABSOLUTE ENCODER

EtherCAT
Conformance tested



MAIN FEATURES

Industry standard multiturn absolute encoder for factory automation applications.

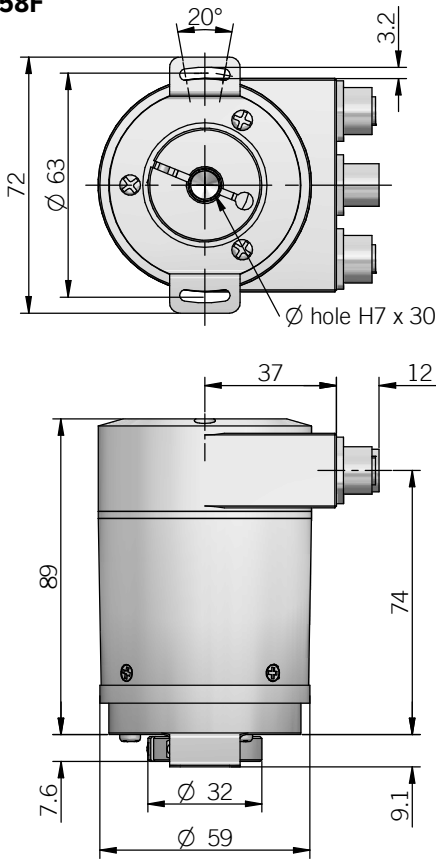
- Optical sensing technology (OptoASIC + gears)
- 25 bit total resolution (13 bit singleturn + 12 bit multiturn)
- Power supply up to +30 V DC with EtherCAT as electrical interface
- Intelligent status leds
- M12 connector for quick setup
- Blind hollow shaft diameter up to 15 mm
- Mounting by stator coupling
- Operating temperature -40° ... +80°C (-40° ... +176°F)



ORDERING CODE

ORDERING CODE	AAM	58F	R	12	/	13	B	10/30	ETC	15	X	X	M12R	.162
SERIES absolute multiurn encoder	AAM													
MODEL blind hollow shaft with stator coupling		58F												
REVISION to be reported			R											
MULTITURN RESOLUTION bit				12										
SINGLETURN RESOLUTION bit						13								
CODE TYPE binary							B							
POWER SUPPLY 10 ... 30 V DC								10/30						
ELECTRICAL INTERFACE ETHERCAT									ETC					
BORE DIAMETER mm										15				
diameters 10 / 12 mm with optional shaft adapter, see Accessories														
ENCLOSURE RATING IP 65											X			
OPTIONS to be reported												X		
OUTPUT TYPE radial M12 connectors													M12R	
SOCKETS sockets not included for sockets see Accessories														.162

58F



recommended mating shaft tolerance g6
dimensions in mm

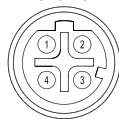
CONNECTIONS

	Pin	Function
ECAT IN connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-
POWER connector	1	+V DC
	2	/
	3	0 V
	4	/
ECAT OUT connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-

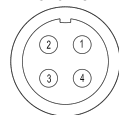
socket connectors not included, please refer to Accessories



ECAT IN / OUT connector (4 pin)
M12 D coded
front view



POWER connector (4 pin)
M12 A coded
front view



ELECTRICAL SPECIFICATIONS

Multiturn resolution	1 ... 12 bit programmable during commissioning
Singleturn resolution	1 ... 13 bit programmable during commissioning
Power supply¹	10 ... 30 V DC (reverse polarity protection)
Current consumption without load	< 200 mA
Electrical interface²	Ethercat
Profile	CoE (CANopen over EtherCAT, DS-301+DS-406)
Programming functions	Resolution Preset Counting direction
Code type	binary
Max bus frequency	100 Mbit/s
Cycle time	≥ 62,5 μs
Accuracy	± 0,044°
Start-up time	500 ms
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	121 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive

MECHANICAL SPECIFICATIONS

Bore diameter	ø 15 mm ø 12* / 10* mm * with optional shaft adapter, please refer to Accessories
Enclosure rating	IP 65 (IEC 60529)
Max rotation speed	6000 rpm
Max shaft load³	80 N (17,98 lbs) radial / 40 N (9 lbs) axial
Starting torque (at +20°C / +68°F)	< 0,05 Nm (7 Ozin)
Moment of inertia	approx 1,8 x 10 ⁻⁶ kgm ²
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibrations	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Bearings life	10 ⁹ revolutions
Bearings	n° 2 ball bearings
Shaft material	stainless steel
Bearing stage / cover material	aluminium
Housing material	aluminium
Operating temperature^{4,5}	-40° ... +80°C (-40° ... +176°F)
Storage temperature⁵	-40° ... +85°C (-40° ... +185°F)
Fixing torque for collar clamping	1,5 Nm (212 Ozin) recommended
Weight	600 g (21 oz)

¹ as measured at the encoder without cable influences

² for further details refer to TECHNICAL BASICS section

³ maximum load for static usage

⁴ measured on encoder flange

⁵ condensation not allowed

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

EAMX 80 A / D SSI

EXPLOSION PROOF ATEX MULTITURN ABSOLUTE ENCODER

MAIN FEATURES

Explosion proof encoders designed to operate in hazardous and explosive environments.

- Optical/magnetic (proprietary optoASIC + energy harvesting) sensor technology
- Resolution up to 65 bit (25 bit singleturn + 40 bit multiturn)
- Power supply up to +30 VDC with SSI as electrical interface
- Cable output
- Solid shaft diameter up to 10 mm
- Mounting with synchronous or centering square flange

EX CLASSIFICATION

It has been assured with EC-TYPE Examination Certificate CESI 04 ATEX 082 that the EAMX 80 is compliant with essential health and safety requirements according to

- EN IEC 60079-0:2018
- EN 60079-1:2014
- EN 60079-31:2014

The UE declaration is available on www.eltra.it



ORDERING CODE

EAMX 80A 12 / 13 G 8/30 S X 10 X PR .XXX

SERIES
multiturn absolute explosion proof encoder
EAMX

MODEL
synchronous flange ø 40 mm 80A
centering square flange ø 40 mm 80D

MULTITURN RESOLUTION
bit 12 / 14 / 15
see table for preferred combinations

SINGLETURN RESOLUTION
bit 13 / 18 / 25
see table for preferred combinations

CODE TYPE
binary B
gray G

POWER SUPPLY
8 ... 30 V DC 8/30

ELECTRICAL INTERFACE
Serial Synchronous Interface - SSI S

OPTION
to be reported if not used X
reset with external input ZE

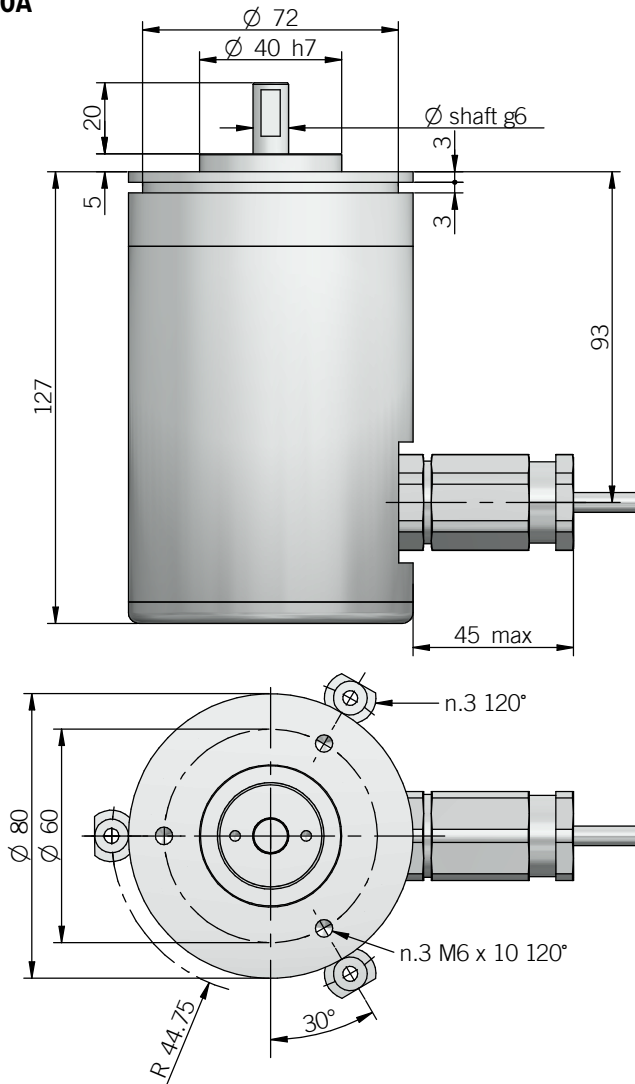
SHAFT DIAMETER
mm 10

ENCLOSURE RATING
IP 65 X

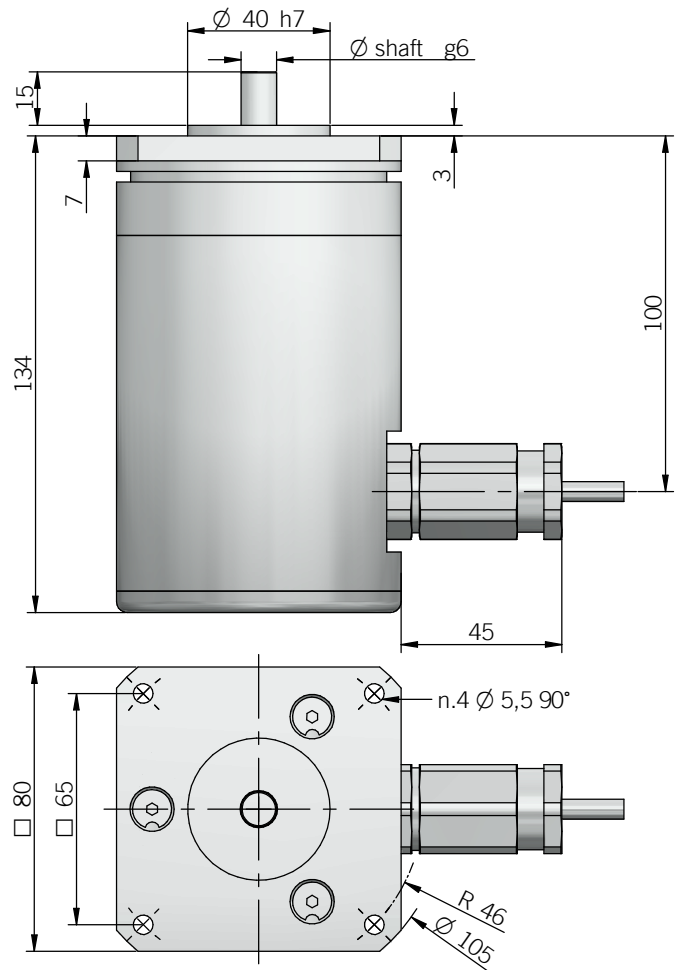
OUTPUT TYPE
radial cable (standard length 1,5 m) PR
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)

VARIANT
custom version XXX

80A



80D



fixing clamps not included, please refer to Accessories
recommended mating shaft tolerance G6
dimensions in mm

EPL MARKING

II 2GD
Ex db IIC T6 Gb
Ex tb IIIC T85°C Db
IP 65

II 2GD

II: group II: different than mines
2: category 2: high level of protection
GD: areas containing gas (G) and dust (D)

Ex db IIC T6 Gb

Ex db: flameproof enclosure for explosive atmospheres with gases, vapours and mists

IIC: group of gas IIC

T6: max surface temperature +85°C of the device for atmospheres with gas

Gb: product with a high level of protection

Ex tb IIIC T85°C Db

Ex tb: flameproof enclosure safety type

IIIC: group of dust combustibles IIIC

T85°C: max surface temperature +85°C of the device in the presence of dust

Db: product with a high level of protection

ELECTRICAL SPECIFICATIONS

Multiturn resolution	12 / 14 / 15 bit please directly contact our offices for other pulses
Singleturn resolution	preferred combinations 12 multiturn / 13 singleturn 14 multiturn / 18 singleturn 15 multiturn / 25 singleturn please directly contact our offices for other pulses
Power supply¹	7,6 ... 30 V DC (reverse polarity protection)
Current consumption without load	100 mA max
Electrical interface²	RS-422 (THVD1451 or similar)
Auxiliary inputs (U/D - RESET)	active high (+V DC) connect to 0 V if not used / RESET t_{min} 150 ms
Max frequency	clock input 100 kHz ... 1 MHz
Code type	binary or gray
Logic	positive
SSI monostable time (Tm)	20 μ s
SSI pause time (Tp)	> 35 μ s
SSI frame	tree format MSB ... LSB up to 12 bit multiturn = length 25 bit (12MT + 13ST) 14 bit multiturn = length 32 bit (14MT + 18ST) 15 bit multiturn = length 40 bit (15MT + 25ST)
SSI status and parity bit	on request
Counting direction	decreasing clockwise (shaft view)
Start-up time	700 ms
Accuracy	$\pm 0,069^\circ$
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	186 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed or flexible installation conductors section min 0,14 mm ² / AWG 26 bending radius min 35 mm (fixed) / min 60 mm (flexible)
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Shaft diameter	\varnothing 10 mm
Enclosure rating	IP 65 (IEC 60529)
Max rotation speed	3000 rpm
Max shaft load⁴	200 N (45 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 ⁻⁶ kgm ² (36 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,06 Nm (8,50 Ozin)
Bearing stage material	anodized aluminum
Shaft material	stainless steel
Housing material	anodized aluminum
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5, 6}	0° ... +50°C (+32° ... +122°F)
Storage temperature⁶	-15° ... +70°C (+5° ... +158°F)
Weight	1200 g (42,33 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

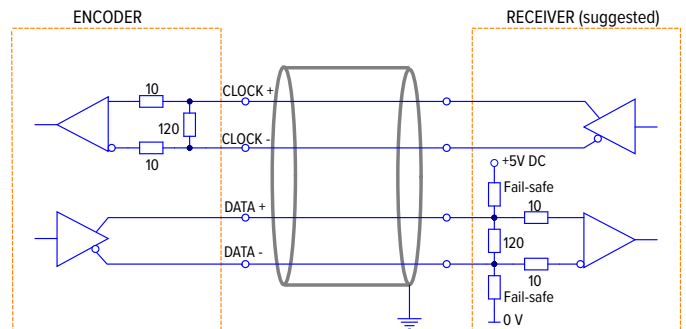
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

⁵ measured on the transducer flange

⁶ condensation not allowed

SSI ELECTRICAL INTERFACE



CONNECTIONS

Function	Cable
+ V DC	red
0 V	grey
DATA +	green
DATA -	brown
CLOCK +	yellow
CLOCK -	pink
U / D	blue
RESET	white
---	shield

MAIN FEATURES

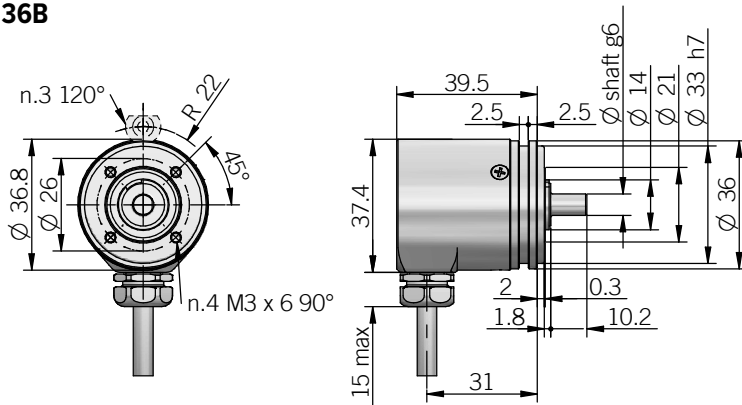
Miniaturised multiturn absolute encoder for applications with limited space.

- Non-contact proprietary magnetic sensing technology (ASIC + energy harvesting)
- Up to 58 bit as total resolution (18 bit singleturn + 40 bit multiturn)
- Power supply up to +30 V DC with SSI as electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available at cable end
- 6 mm diameter solid shaft
- Mounting by synchronous flange



ORDERING CODE	EAM	36B	12 / 13	G	8/30	S	P	X	6	X	8	M12R	.162	+XXX
SERIES magnetic multiturn absolute encoder	EAM													
MODEL synchronous flange ø 33 mm		36B												
MULTITURN RESOLUTION turns from 1 to 17 bit														
SINGLETURN RESOLUTION from 1 to 18 bit														
CODE TYPE binary gray														
POWER SUPPLY 5 V DC 8 ... 30 V DC														
ELECTRICAL INTERFACE Serial Synchronous Interface - SSI														
LOGIC positive														
OPTIONS to be reported if not used reset with external input														
SHAFT DIAMETER mm														
ENCLOSURE RATING IP 67 cover side / IP 65 shaft side														
MAX ROTATION SPEED 8000 rpm														
OUTPUT TYPE radial cable (standard length 0,5 m) preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE 8 pin M12 radial plug connector														
SOCKET socket not included to be reported only with connector output (eg. M12R.162), for socket see Accessories														
VARIANT custom version														

36B



recommended mating shaft tolerance H7
dimensions in mm

fixing clamps not included, please refer to Accessories

ELECTRICAL SPECIFICATIONS	
Multiturn resolution	1 to 17 bit for multiturn resolution > 17 bit please contact our offices
Singleturn resolution	1 to 18 bit
Power supply¹	5 = 4,75 ... 5,25 V DC 8/30 = 7,6 ... 30 V DC (reverse polarity protection)
Power draw without load	< 0,4 W
Electrical interface²	RS-422 (THVD1451 or similar)
Auxiliary inputs (U/D - RESET)	active high (+V DC) connect to 0 V if not used / RESET t_{min} 150 ms
Clock frequency	100 kHz ... 1 MHz
Code type	binary or gray
SSI monostable time (Tm)	20 μ s
SSI pause time (Tp)	> 35 μ s
SSI frame	tree format MSB ... LSB up to 12 bit multiturn = length 25 bit (12MT + 13ST) 14 bit multiturn = length 32 bit (14MT + 18ST) 15 to 17 bit multiturn = length 32 bit (17MT + 15ST)
SSI status and parity bit	on request
Counting direction	decreasing clockwise (shaft view)
Start-up time	150 ms
Accuracy (at +20°C / +68°F)	$\pm 0,20^\circ$
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	183 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS	
Shaft diameter	\varnothing 6 mm
Enclosure rating	IP 67 cover side / IP 65 shaft side (IEC 60529)
Rotation speed	8000 rpm continuous / 10000 rpm max
Max shaft load⁴	20 N (4,5 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,001 x 10 ⁻⁶ kgm ² (0,02 x 10 ⁻⁶ lbfm ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	chrome plated steel
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-30° ... +100°C (-22° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁶	-25° ... +85°C (-13° ... +185°F)
Weight	150 g (5,29 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

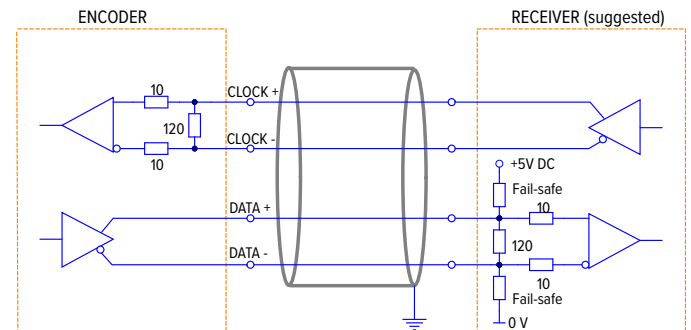
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

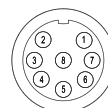
⁵ measured on the transducer flange

⁶ condensation not allowed

SSI ELECTRICAL INTERFACE



M12 connector (8 pin)
M12 A coded
front view



CONNECTIONS

Function	Cable	8 pin M12
+ V DC	red	8
0 V	black	5
DATA +	green	3
DATA -	brown or grey	2
CLOCK +	yellow	4
CLOCK -	orange	6
U / D	red / blue	7
RESET	white	1
Shield	shield	housing

MAIN FEATURES

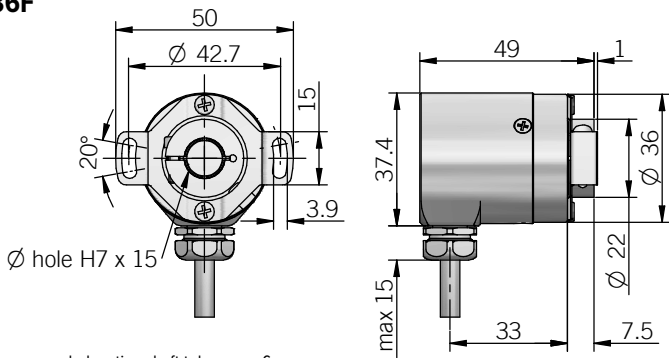
Miniaturised multiturn absolute encoders for applications with limited space.

- Non-contact proprietary magnetic sensing technology (ASIC + energy harvesting)
- Up to 58 bit as total resolution (18 bit singleturn + 40 bit multiturn)
- Power supply up to +30 V DC with SSI as electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available on cable end
- Blind hollow shaft up to 10 mm diameter
- Mounting by stator coupling or torque pin



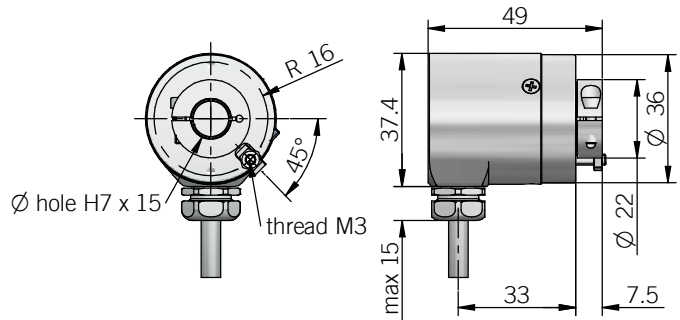
ORDERING CODE	EAM	36F	12 / 13	G	8/30	S	P	X	10	X	8	M12R	.162	+XXX
SERIES magnetic multiturn absolute encoder	EAM													
MODEL blind hollow shaft with stator coupling blind hollow shaft with torque pin	36F													
MULTITURN RESOLUTION turns from 1 to 18 bit														
SINGLETURN RESOLUTION from 1 to 18 bit														
CODE TYPE binary gray				G										
POWER SUPPLY 5 V DC 8 ... 30 V DC					8/30									
ELECTRICAL INTERFACE Serial Synchronous Interface - SSI						S								
LOGIC positive							P							
OPTIONS to be reported if not used reset with external input								X						
BORE DIAMETER (3/8") mm mm									10					
diameters 4 / 5 / 6 / 6,35 (1/4") / 8 mm with optional shaft adapter, see Accessories														
ENCLOSURE RATING IP 67 cover side / IP 66 shaft side										X				
MAX ROTATION SPEED 8000 rpm											8			
OUTPUT TYPE radial cable (standard length 0,5 m) preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PCR5) 8 pin M12 radial plug connector												PR		
SOCKET socket not included													.162	
to be reported only with connector output (eg. M12R.162), for socket see Accessories														
VARIANT custom version														XXX

36F



recommended mating shaft tolerance g6
dimensions in mm

36G



torque pin is included, for mounting instruction please refer to product installation notes

ELECTRICAL SPECIFICATIONS

Multiturn resolution	1 to 17 bit for multiturn resolution > 17 bit please contact our offices
Singleturn resolution	1 to 18 bit
Power supply¹	5 = 4,75 ... 5,25 V DC 8/30 = 7,6 ... 30 V DC (reverse polarity protection)
Power draw without load	< 0,4 W
Electrical interface²	RS-422 (THVD1451 or similar)
Auxiliary inputs (U/D - RESET)	active high (+V DC) connect to 0 V if not used / RESET t _{min} 150 ms
Clock frequency	100 kHz ... 1 MHz
Code type	binary or gray
SSI monostable time (Tm)	20 µs
SSI pause time (Tp)	> 35 µs
SSI frame	tree format MSB ... LSB up to 12 bit multiturn = length 25 bit (12MT + 13ST) 14 bit multiturn = length 32 bit (14MT + 18ST) 15 to 17 bit multiturn = length 32 bit (17MT + 15ST)
SSI status and parity bit	on request
Counting direction	decreasing clockwise (shaft view)
Start-up time	150 ms
Accuracy (at +20°C / +68°F)	± 0,20°
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	183 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,14 mm ² / AWG 26 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

CONNECTIONS

Function	Cable	8 pin M12
+ V DC	red	8
0 V	black	5
DATA +	green	3
DATA -	brown or grey	2
CLOCK +	yellow	4
CLOCK -	orange	6
U / D	red / blue	7
RESET	white	1
⏏	shield	housing

MECHANICAL SPECIFICATIONS

Bore diameter	ø 9,52 (3/8") / 10 mm ø 4* / 5* / 6* / 6,35 (1/4")* / 8* mm * with optional shaft adapter, please refer to Accessories
Enclosure rating	IP 67 cover side / IP 66 shaft side (IEC 60529)
Rotation speed	8000 rpm continuous / 10000 rpm max
Max shaft load⁴	20 N (4,5 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,001 x 10 ⁻⁶ kgm ² (0,02 x 10 ⁻⁶ lbf ²)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	chrome plated steel
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-30° ... +100°C (-22° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
Storage temperature⁶	-25° ... +85°C (-13° ... +185°F)
Weight	150 g (5,29 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

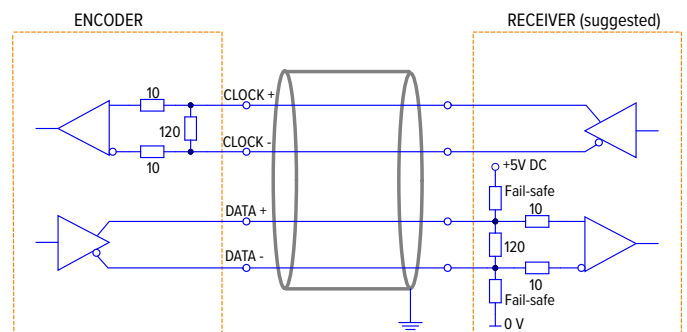
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

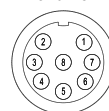
⁵ measured on the transducer flange

⁶ condensation not allowed

SSI ELECTRICAL INTERFACE



M12 connector (8 pin)
M12 A coded
front view



AAM 36 B CANOPEN

SOLID SHAFT MAGNETIC MULTITURN ABSOLUTE ENCODER

MAIN FEATURES

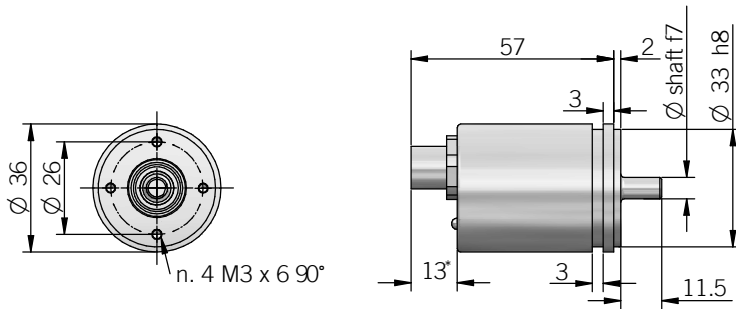
Industry standard multiturn absolute encoder for factory automation applications.

- Non-contact magnetic sensing technology (magnetic ASIC + energy harvesting)
- Sturdy construction thanks to separated chambers
- Power supply up to +32 VDC with CANopen interface
- Cable or M12 connector axial output
- 6 mm diameter solid shaft
- Mounting by synchronous flange



ORDERING CODE	AAM	36B	24 / 14	B	10/30	CNP	6	X	X	M12A	.162	+XXX
SERIES magnetic multiturn absolute encoder series AAM												
MODEL synchronous flange ø 33 mm 36B												
MULTITURN RESOLUTION bit 24												
SINGLETURN RESOLUTION bit 14												
CODE TYPE binary B												
POWER SUPPLY 10 ... 30 V DC 10/30												
ELECTRICAL INTERFACE CANopen CNP												
SHAFT DIAMETER mm 6												
ENCLOSURE RATING IP67 cover side / IP 65 shaft side X												
OPTIONS to be reported X												
OUTPUT TYPE axial cable (standard length 2 m) PA2 5 pin M12 axial plug connector M12A												
SOCKET socket not included .162 to be reported only with connector output (eg. M12A.162), for socket see Accessories												
VARIANT custom version XXX												

36B



* with cable output + 7mm

recommended mating shaft tolerance H7
dimensions in mm

ELECTRICAL SPECIFICATIONS


Multiturn resolution	24 bit programmable during commissioning
Singleturn resolution	14 bit programmable during commissioning
Power supply¹	10 ... 32 V DC (reverse polarity protection)
Power draw without load	0,5 W
Electrical interface²	CAN
Protocol	CANopen Communication profile CiA 301 Encoder profile CiA 406 V3.2 class C2
Node number	1 ... 127 (default 127) programmable during commissioning
Baud rate	10 kBaud ... 1 Mbaud with automatic bit rate detection
LSS protocol	according to CiA 305
CAN transmission modes	programmable (Synchronous and Asynchronous)
LED error messages	according to CiA 303-3
Code type	binary
Position update rate	≤ 600 μs
Start-up time	< 1,5 s
Accuracy	± 0,35°
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	1000 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed or flexible installation conductors section 0,25 mm ² / AWG 24 bending radius min 35 mm (fixed installation) bending radius min 95 mm (flexible installation)
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive

¹ as measured at the transducer without cable influences² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section³ this product is not a safety component, for further details refer to TECHNICAL BASICS section⁴ maximum load for static usage⁵ measured on the transducer flange⁶ condensation not allowed

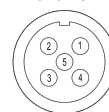
MECHANICAL SPECIFICATION

Shaft diameter	ø 6 mm
Enclosure rating IEC 60529	IP 67 cover side / IP65 shaft side
Max rotation speed	12000 rpm
Max shaft load³	80 N (17,98 lbs) radial / 50 N (11,24 lbs) axial
Shock	100 G, 6 ms (IEC 60068-2-27)
Vibrations	30 G, 10 ... 2000 Hz (IEC 60068-2-6)
Starting torque (at +20°C / +68°F)	< 0,002 Nm (0,28 Ozin)
Bearing stage material	aluminium
Shaft material	stainless steel
Housing material	chromium plated steel
Bearings	2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-40° ... +85°C (-40° ... +185°F)
Storage temperature⁵	-40° ... +100°C (-40° ... +212°F)
Weight	110 g (3,88 oz) approx

CONNECTIONS

Function	5 pin M12
+ V DC	2
0 V	3
CAN_H	4
CAN_L	5
CAN_GND (shield)	1
	shield connected to encoder housing

M12 connector (5 pin)

M12 A coded
front view

AAM 36 F CANOPEN

BLIND HOLLOW SHAFT MAGNETIC MULTITURN ABSOLUTE ENCODER

MAIN FEATURES

Industry standard multiturn absolute encoder for factory automation applications.

- Non-contact magnetic sensing technology (magnetic ASIC + energy harvesting)
- Sturdy construction thanks to separated chambers
- Power supply up to +32 VDC with CANopen interface
- Cable or M12 connector axial output
- 8 or 10 mm blind hollow shaft
- Mounting by stator coupling



ORDERING CODE **AAM** **36F** **24 / 14** **B 10/30** **CNP** **10** **X** **X M12A .162 +XXX**

SERIES
magnetic multiturn absolute encoder series
AAM

MODEL
blind hollow shaft with stator coupling 36F

MULTITURN RESOLUTION
bit 24

SINGLETURN RESOLUTION
bit 14

CODE TYPE
binary B

POWER SUPPLY
10 ... 30 V DC 10/30

ELECTRICAL INTERFACE
CANopen CNP

BORE DIAMETER
mm 8
mm 10

ENCLOSURE RATING
IP67 cover side / IP 65 shaft side X

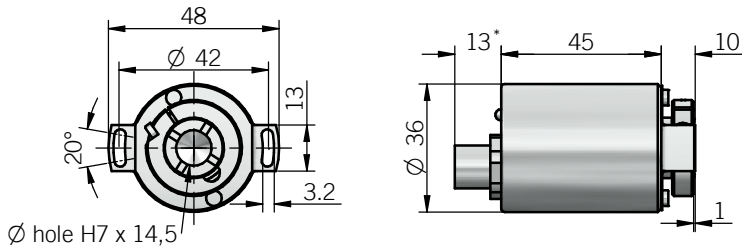
OPTIONS
to be reported X

OUTPUT TYPE
axial cable (standard length 2 m) PA2
5 pin M12 axial plug connector M12A

SOCKET
socket not included .162
to be reported only with connector output (eg. M12A.162), for socket see Accessories

VARIANT
custom version XXX

AAM 36F



* with cable output + 7mm

recommended mating shaft tolerance g6
dimensions in mm

ELECTRICAL SPECIFICATIONS

Multiturn resolution	24 bit programmable during commissioning
Singleturn resolution	14 bit programmable during commissioning
Power supply¹	10 ... 32 V DC (reverse polarity protection)
Power draw without load	0,5 W
Electrical interface²	CAN
Protocol	CANopen Communication profile CiA 301 Encoder profile CiA 406 V3.2 class C2
Node number	1 ... 127 (default 127) programmable during commissioning
Baud rate	10 kBaud ... 1 Mbaud with automatic bit rate detection
LSS protocol	according to CiA 305
CAN transmission modes	programmable (Synchronous and Asynchronous)
LED error messages	according to CiA 303-3
Code type	binary
Position update rate	≤ 600 μs
Start-up time	< 1,5 s
Accuracy	± 0,35°
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	1000 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed or flexible installation conductors section 0,25 mm ² / AWG 24 bending radius min 35 mm (fixed installation) bending radius min 95 mm (flexible installation)
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive

¹ as measured at the transducer without cable influences² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section³ this product is not a safety component, for further details refer to TECHNICAL BASICS section⁴ maximum load for static usage⁵ measured on the transducer flange⁶ condensation not allowed

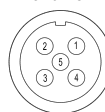
MECHANICAL SPECIFICATION

Bore diameter	ø 8 / 10 mm
Enclosure rating IEC 60529	IP 67 cover side / IP65 shaft side
Max rotation speed	6000 rpm
Max shaft load³	80 N (17,98 lbs) radial / 50 N (11,24 lbs) axial
Shock	100 G, 6 ms (IEC 60068-2-27)
Vibrations	30 G, 10 ... 2000 Hz (IEC 60068-2-6)
Starting torque (at +20°C / +68°F)	< 0,002 Nm (0,28 Ozin)
Bearing stage material	aluminium
Shaft material	stainless steel
Housing material	chromium plated steel
Bearings	2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{4,5}	-40° ... +85°C (-40° ... +185°F)
Storage temperature⁵	-40° ... +100°C (-40° ... +212°F)
Weight	110 g (3,88 oz) approx

CONNECTIONS

Function	5 pin M12
+ V DC	2
0 V	3
CAN_H	4
CAN_L	5
CAN_GND (shield)	1
≡	shield connected to encoder housing

M12 connector (5 pin)

M12 A coded
front view

EAM 110M

BLIND HOLLOW SHAFT MAGNETIC MULTITURN ABSOLUTE ENCODER

MAIN FEATURES

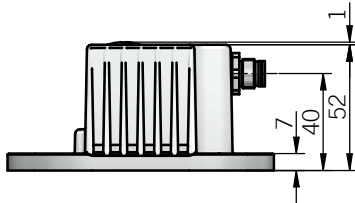
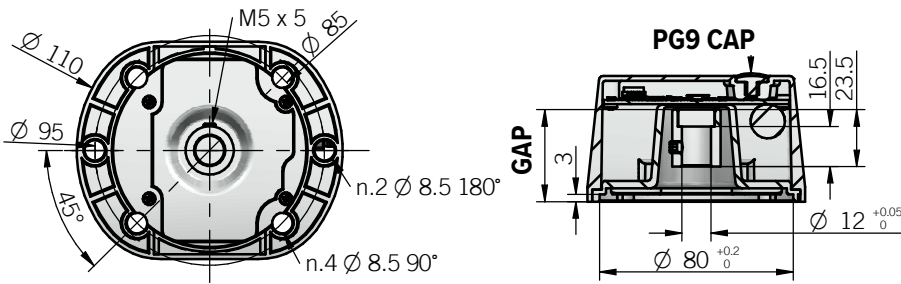
Magnetic multiturn absolute encoder with a buffer battery and Modbus RTU communication. It is design for installation, for example, on 050/063 series gearmotors.

- Total resolution 25 bit (9 bit singleturn + 16bit multiturn)
- Power supply up to +30 VDC, battery life up to 10 years
- Radial cable or metallic M12 connector output
- IP65 enclosure rating
- Mounting in kit without bearings, hub for 12 mm diameter shaft
- Battery activation via dip-switch



ORDERING CODE	EAM	110M	16	9	B	10/30	RS485	12	T	X	M12R	.162	+XXX
SERIES magnetic multiturn absolute encoder series EAM													
MODEL 050/063 flange 110M													
MULTITURN RESOLUTION bit 16													
SINGLETURN RESOLUTION bit 9													
CODE TYPE binary B													
POWER SUPPLY 10 ... 30 V DC 10/30													
ELECTRICAL INTERFACE RS-485 RS485													
BORE DIAMETER mm 12													
LINE TERMINATION with termination resistor T without termination resistor X													
ENCLOSURE RATING IP 65 X													
OUTPUT TYPE radial cable (standard length 0,5 m) PR preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) M12 radial connector M12R													
SOCKET socket not included .162 to be reported only with connector output (eg. M12R.162), for socket see Accessories													
VARIANT custom version XXX													

110M



dimensions in mm

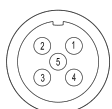
ELECTRICAL SPECIFICATIONS

Sensing principle	Magnetic asic
Singleturn resolution	9 bit
Multiturn resolution	16 bit (battery buffered)
Power supply¹	+10 ... 30 V DC (reverse polarity protection)
Current consumption without load	30 mA
Battery life (at +20°C / +68°F)	10 years (depending on the usage)
Electrical interface	RS-485
Code type	binary
Communication protocol	Modbus RTU
Maximum permissible electrical acceleration	100 rad/s ²
Counting direction	decreasing clockwise (shaft view)
Start-up time	150 ms with main power
Accuracy	± 0,75°
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive

CONNECTIONS

Function	Cable	M12 5 pin
+V DC	red	1
0 V	black	3
A	green	2
B	yellow	4
NC	/	5
Shield	shield	/

M12 connector (5 pin)
M12 A coded
front view



MECHANICAL SPECIFICATION

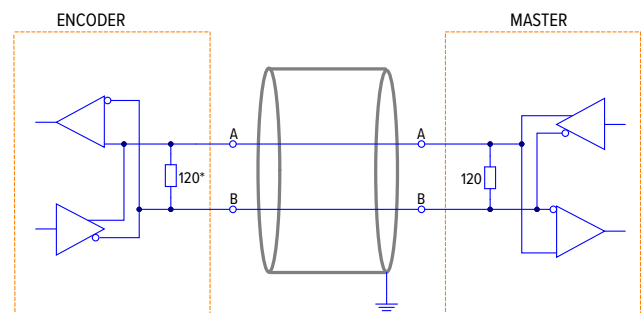
Bore diameter	ø 12 mm
Magnet positioning (GAP)	31,5 ... 38 mm
Enclosure rating	IP 65 (IEC 60529) when properly installed
Max rotation speed	6000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibrations	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	0,1 x 10 ⁻⁶ kgm ² (2,4 x 10 ⁻⁶ lbf ²)
Magnet hub material	PA66 glass fiber reinforced
Housing material	PA66 glass fiber reinforced
Operating temperature^{2,3}	-20° ... +70°C (-4° ... +158°F)
Storage temperature^{2,3}	-20° ... +70°C (-4° ... +158°F)
Weight	160 g (5,64 oz)

¹ as measured at the transducer without cable influences

² measured on the transducer flange

³ condensation not allowed

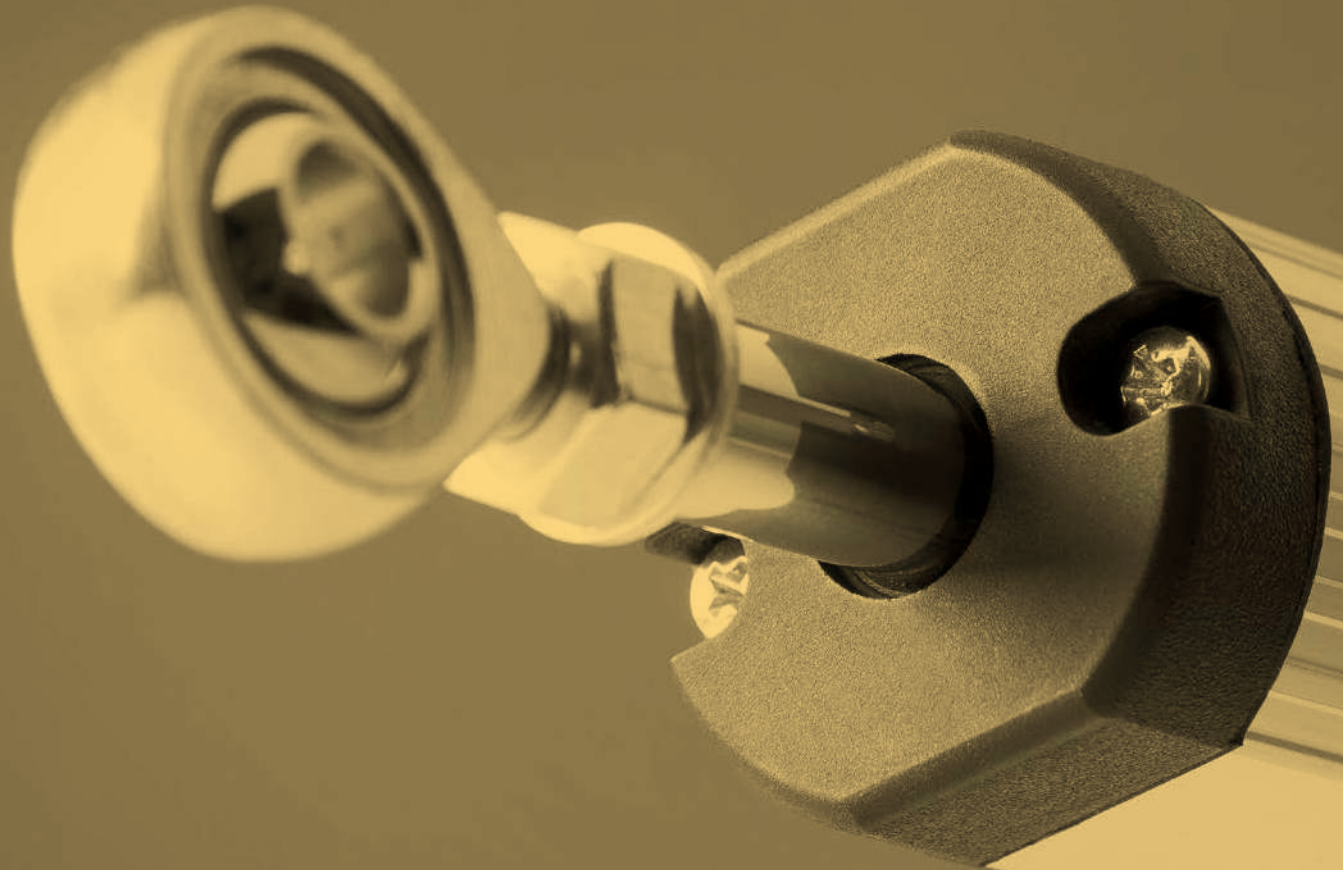
RS-485 ELECTRICAL INTERFACE



* with line termination (T ordering code)



WWW.ELTRA.IT



LINEAR TRANSDUCERS

High reliability even in the heavy environments

The potentiometers are an ideal solution for commonly used machines in material production, such as injection presses for plastics and rubber, thanks to the presence of a groove in the housing that makes them easy to install. ELTRA's linear transducers are engineered for high accuracy, high cycle-life and easy installation with standard strokes ranging from 10 mm (4/10") to 1250 mm (4 ft). They provide accurate sensing in a wide range of configurations.

ELTRA offers linear sensors with a rod style for fitting into hydraulic cylinders or profile housings for convenient mounting. These sensors provide absolute positioning, greater reliability, easy control, noise reduction, robustness, increased productivity, reduced shock and stress on mechanical parts, and high precision for optimal performance. Our cost-effective solutions ensure that you get the best value for your investment.



ER A / B / C / D / E / F	incremental linear	238
ETMA 1 / 2 / 4 / 5 / 6	magnetic incremental linear	240
EBMA	magnetic tape for ETMA	242
TMAA	magnetic absolute linear	244
BMAA	magnetic tape for BMAA	246
FE	rope encoder	248
FES	rope encoder	250
EPLA	linear potentiometer	252
EPLB	cylindrical linear potentiometer	254
EPLC	rodless linear potentiometer	256
EPLT	linear potentiometer with ball tip	258
EMSPA	magnetostrictive ANALOGUE	260
EMSPB	magnetostrictive ANALOGUE	263
EMSPS	magnetostrictive SSI	265
EMSSA	magnetostrictive ANALOGUE	268
EMSSS	magnetostrictive SSI	271

MAIN FEATURES

Incremental linear system based on optical or magnetic principle.
Easy mounting with two joint heads.

- 0,01 mm max resolution (after quad evaluation)
- Available with or without zero mark on left, right or central position
- Up to 1 m/s travel speed
- Working stroke up to 500 mm
- Cable output, connectors available at cable end
- Mounting by joint heads

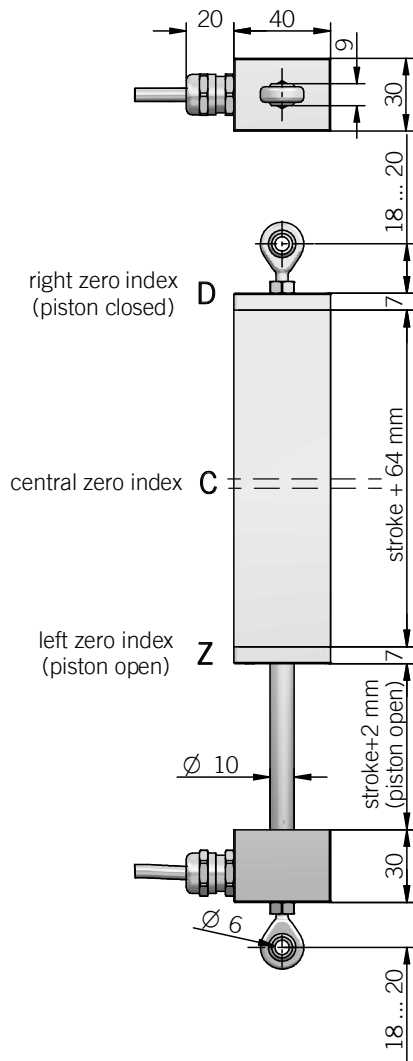


ORDERING CODE

ER A 100 S 8/24 P 6 P .XXX

SERIES incremental linear encoder ER									
RESOLUTION 0,2 mm A 0,1 mm B 0,04 mm C 1 mm D 0,5 mm E 0,2 mm F									
WORKING STROKE working stroke (mm) from 100 to 500									
ZERO PULSE without zero pulse S (mod. A) central zero index C (mod. A) right zero index (closed position) D (mod. A) left zero index (open position) Z									
POWER SUPPLY 5 V DC 5 8 ... 24 V DC 8/24									
ELECTRICAL INTERFACE (mod. A) NPN open collector C push-pull P line driver L									
BALL JOINTS FIXING HOLE DIAMETER mm 6									
OUTPUT TYPE radial cable (standard length 1,5 m) P preferred cable lengths 2 / 3 / 5 / 10 m, to be added after output type									
VARIANT custom version XXX									

A/B/C/D/E/F

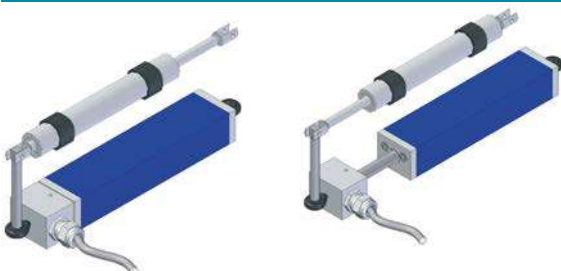


dimensions in mm

CONNECTIONS

Function	Cable C/P	Cable L
+V DC	red or brown	red
0 V	black or grey	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue or white	blue
Z-	/	white
⏏	shield	shield

APPLICATION EXAMPLE



ELECTRICAL SPECIFICATIONS

Technology	optical mod. A magnetic mod. B / C / D / E / F
Resolution	A / F = 0,2 mm (0,05 mm after quad eval) B = 0,1 mm (0,025 mm after quad eval) C = 0,04 mm (0,01 mm after quad eval) D = 1 mm (0,25 mm after quad eval) E = 0,5 mm (0,125 mm after quad eval)
Linearity error	± 1/4 pulse
Power supply¹	5 = 4,5 ... 5,5 V DC 8/24 = 7,6 ... 25,2 V DC mod. A 8/24 = 4,5 ... 30 V DC (reverse polarity protection) mod. B / C / D / E / F
Current consumption without load	< 100 mA max
Max load current	50 mA / channel (NPN open) 20 mA / channel (push pull / line driver)
Electrical interface²	NPN open collector (pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar)
Max output frequency	100 kHz
Mean time to dangerous failure (MTTF)³ according to EN ISO 13849-1	431 years mod. A 318 years mod. B / C / D / E / F
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Counting direction	A leads B (piston opening) mod. A B leads A (piston opening) mod. B / C / D / E / F
Cable type	shielded - fixed or flexible installation conductors section 0,14 mm ² / AWG 26 min bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Working stroke	100 - 150 - 200 - 250 - 300 - 350* - 400* - 500* mm * vertical mounting only (mod.A)
Enclosure rating	IP 64 (IEC 60529)
Travel speed	1 m/s max
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Rod material	stainless steel
Housing material	painting aluminum
Fixing	n.2 ball joints with ø 6 mm hole
Operating temperature^{3,4}	-10° ... +60°C (+14° ... +140°F)
Storage temperature⁴	-25° ... +70°C (-13° ... +158°F)
Weight	400 ... 1000 g (14,11 ... 35,27 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ measured on transducer housing

⁴ condensation not allowed

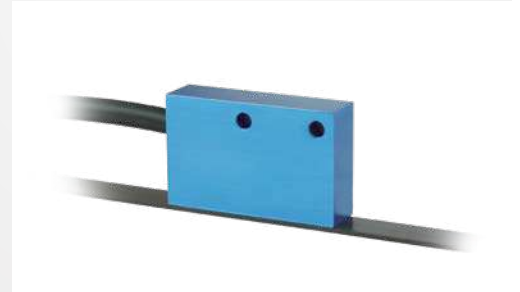
ETMA 1/2/4/5/6

MAGNETIC INCREMENTAL LINEAR SENSOR

MAIN FEATURES

Incremental linear system based on the magnetic principle with no wear thanks to non-contact technology. Thanks to its high IP rating, ETMA is suitable for applications in harsh environments such as marble and glass processing machines, washing machines.

- Resolution up to 0,01 mm
- Power supply up to +30 V DC with various electrical interfaces available
- Up to 4 m/s travel speed
- IP 67 as protection grade
- Cable output, connectors available at cable end

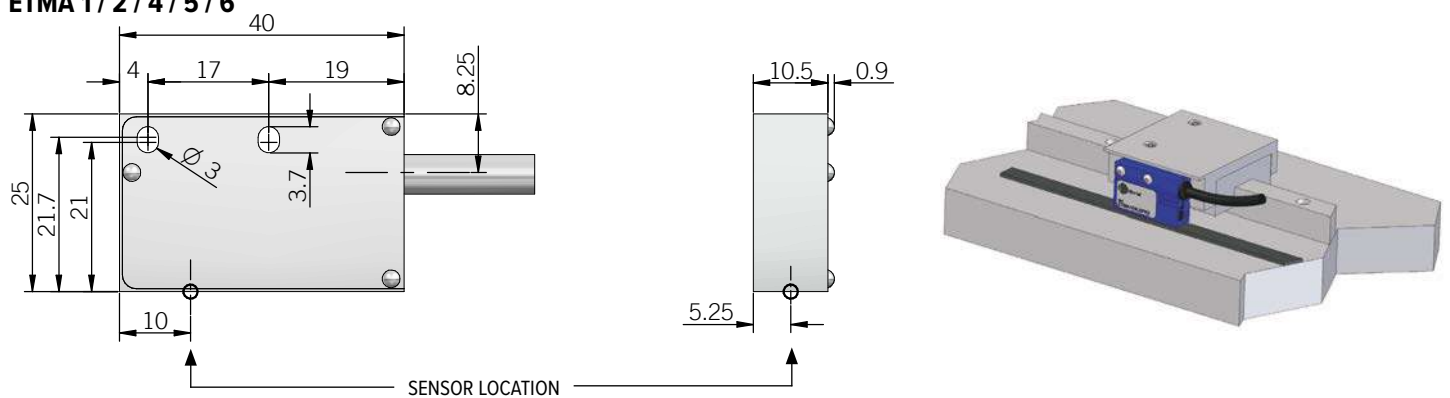


ORDERING CODE

ETMA 1 Z 5 L S PR3 .XXX

DESCRIPTION	ETMA	1	Z	5	L	S	PR3	.XXX
SERIES magnetic incremental linear sensor	ETMA							
RESOLUTION 0,1 mm 0,04 mm 0,2 mm 0,5 mm 1 mm		1 2 4 5 6						
ZERO PULSE without zero pulse with zero pulse			S Z					
POWER SUPPLY (with L electrical interface) 5 V DC 5 ... 28 V DC				5 5/28				
ELECTRICAL INTERFACE push-pull line driver power supply 5/28 V DC - output RS-422					P L RS			
ENCLOSURE RATING IP 67						S		
OUTPUT TYPE cable length 3m preferred cable lengths 6 / 10 / 20 m, to be added after output type							PR3	
VARIANT custom version								XXX

ETMA 1 / 2 / 4 / 5 / 6



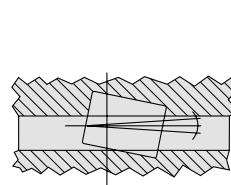
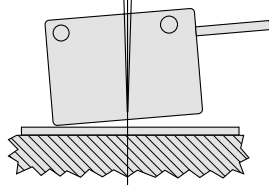
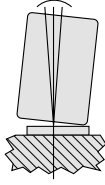
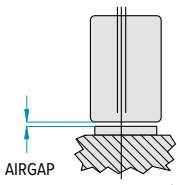
MECHANICAL TOLERANCES

LATERAL OFFSET
 ± 1 mm

LATERAL TILT
 $< \pm 5^\circ$

LONGITUDINAL TILT
 $< \pm 5^\circ$

ALIGNMENT ERROR
 $< \pm 1,5^\circ$



(WITHOUT PROTECTIVE STEEL TAPE)
dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	1 = 0,1 mm (0,025 mm after quad eval) 2 = 0,04 mm (0,01 mm after quad eval) 4 = 0,2 mm (0,05 mm after quad eval) 5 = 0,5 mm (0,125 mm after quad eval) 6 = 1 mm (0,25 mm after quad eval)
Zero pulse	ETMA 1 / 4 / 5 = every 5 mm ETMA 2 / 6 = every 2 mm
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Current consumption without load	30 mA max
Max load current	20 mA / channel
Electrical interface²	push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Accuracy (at +20°C / +68°F)	$\pm 1/4$ pulse with recommended airgap
Travel speed	4 m/s
Cable type	shielded - fixed or flexible installation conductors section 0,14 mm ² / AWG 26 min bending radius min 60 mm
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	318 years
Mission time (Tm)³	20 years
Diagnostic coverage (DC)³	0%
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

¹ as measured at the transducer without cable influences
² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section
³ this product is not a safety component, for further details refer to TECHNICAL BASICS section
⁴ measured on the transducer flange
⁵ condensation allowed

MECHANICAL SPECIFICATIONS

Enclosure rating	IP 67 (IEC 60529)
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Housing material	anodized aluminium
Fixing	n.2 holes $\varnothing 3$ mm
Operating temperature^{4,5}	-20° ... +85°C (-4° ... +185°F)
Storage temperature⁵	-25° ... +70°C (-13° ... +158°F)
Air gap	ETMA 1 / 4 / 5 1 ... 2 mm (1,5 mm recommended) ETMA 2 / 6 0,1 ... 1 mm (0,3 mm recommended)
Weight	150 g (5,29 oz)

CONNECTIONS

Function	Cable P	Cable L / RS
+V DC	red or brown	red
0 V	black or grey	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue or white	blue
Z-	/	white
⏏	shield	shield

MAIN FEATURES

- Magnetic tape for use with ETMA
- Easy to install with premounted double-sided adhesive
- 2 mm or 5 mm pole pitch
- High pole accuracy
- Available in rolls up to 50 m



ORDERING CODE

EBM A 1 - 10 . XXX

SERIES
magnetic tape **EBM**

TAPE TYPE
10 mm width magnetic tape **A**

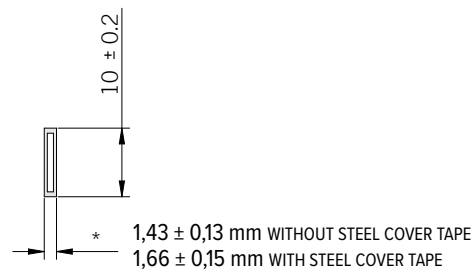
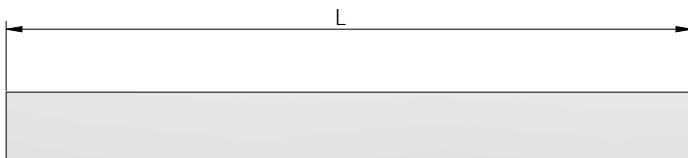
PITCH
5mm pitch for ETMA 1 / 4 / 5 **1**
2mm pitch for ETMA 2 / 6 **2**

separate the code with a dash -

TAPE LENGTH
from 0,5 m to 50 m **10**

VARIANT
custom version **XXX**

EBMA



dimensions in mm

for fixing clips please refer to Accessories

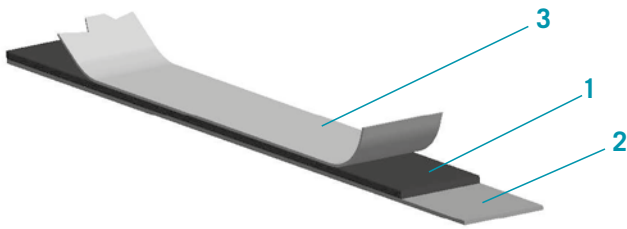
GENERAL SPECIFICATIONS

Operating temperature	-20° ... +100°C (-4° ... +212°F)
Accuracy	± 40 µm/m
Linear expansion coefficient	17 x 10 ⁻⁶ m/K
Bending radius	> 65 mm without steel cover tape > 100 mm with steel cover tape

CONSTRUCTION

As shown in the figure below, Eltra magnetic tape is made up of three layers:

- 1** - a flexible elastomer magnetic tape filled with ferrite
- 2** - a stainless steel tape used to create a shield against any external magnetic flux and other external agents. It's also glued to the top layer to give the magnetic tape the mechanical rigidity. The stainless steel tape is supplied with a double-sided acrylic adhesive (thickness 0.13 mm), not shown in the illustration.
- 3** - a steel tape, magnetically transparent, with the function of mechanically protecting the magnetic layer; it is the most rigid part and is therefore supplied separately for transport and application purposes. It must be stuck on the magnetic tape by the user. The steel tape is supplied with a double-sided acrylic adhesive (thickness 0.13 mm) not shown in the illustration.



To prevent damage from possible internal stresses in the magnetic tape, the tape should be wound with the magnetic layer facing outwards, with a minimum internal diameter of 200 mm and a minimum of 5 mm between layers. If supplied in single strips, leave at least 10 mm between strips.

TIPS FOR APPLYING THE MAGNETIC TAPE

Fixing pressure

Magnetic tape is adhesive. It is therefore important that there is optimum contact between the surfaces for correct use. Good pressure must be applied evenly to ensure a perfect result.

Applying temperature

To ensure optimum adhesion, a surface temperature between +20°C and +37°C (+68°F to +98.6°F) is recommended. Maximum adhesion is achieved after 72 hours at a temperature of +21°C (+69.8°F). Do not apply magnetic tape if the surface temperature is below +10°C (+50°F).

Application materials

Magnetic tape must be applied to dry, smooth and clean surfaces. The surfaces must be cleaned with an aqueous solution (such as water and 50% alcohol or heptane). Metallic surfaces such as brass, copper, etc. must be protected to prevent possible oxidation.

CHEMICAL AGENTS AND MAGNETIC TAPE BEHAVIOUR

Null effect	Medium effect	Strong effect
motor oil	JP-4 fuel	aromatic hydrocarbons (benzene, toluene, xylene, trichloroethylene, freon 10)
transmission oil	gasoline	ketones (acetone)
ATF (automatic transmission fluid)	heptane	mineral acids (hydrochloric, sulphuric, nitric, phosphoric, boric)
hydraulic oil	alcohols	
kerosene		
antifreeze		
detergents, disinfectants (Clorox®)		
turpentine		
water		
salt spray		

MAIN FEATURES

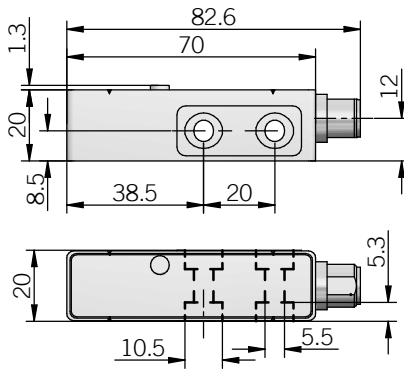
Absolute linear system based on the magnetic principle with no wear thanks to non-contact technology. Thanks to its high IP rating, TMAA is suitable for applications in harsh environments such as marble and glass processing machines or washing machines.

- 5 µm max absolute resolution / 1 µm incremental resolution
- Power supply up to +30 V DC with SSI electrical interface
- Up to 5 m/s travel speed
- IP 67 as protection grade
- M12 radial connector
- For use with BMAA magnetic tape



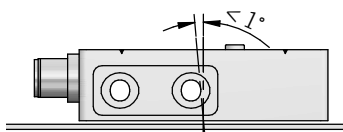
ORDERING CODE	TMAA	5	G	5/30	S	1	L	G	S	M12R	.162
SERIES magnetic absolute linear sensor	TMAA										
ABSOLUTE RESOLUTION 5 µm 10 µm	5 10										
CODE TYPE gray	G										
POWER SUPPLY 5 ... 30V DC	5/30										
ELECTRICAL ABSOLUTE INTERFACE Serial Synchronous Interface - SSI	S										
INCREMENTAL RESOLUTION without incremental signals 1 µm 5 µm 10 µm	X 1 5 10										
ELECTRICAL INCREMENTAL INTERFACE to be reported if not used RS-422	X L										
MAX INCREMENTAL SIGNALS FREQUENCY to be reported if not used 1250 kHz 100 kHz 15 kHz refer to the table for travel speed limits	X A D G										
ENCLOSURE RATING IP 67	S										
OUTPUT TYPE 12 pin M12 radial plug connector	M12R										
SOCKET socket not included for socket see Accessories	.162										

TMAA

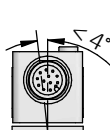


MOUNTING TOLERANCES

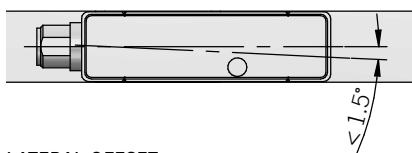
LONGITUDINAL TILT



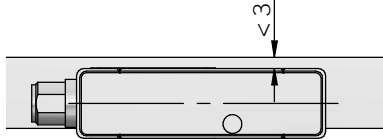
LATERAL TILT



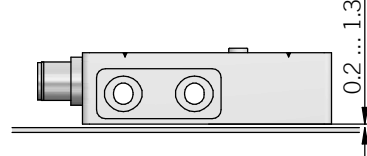
ALIGNMENT ERROR



LATERAL OFFSET



AIRGAP



dimensions in mm
for connector please refer to Accessories

CONNECTIONS

Function	M12 connector 12 pin
+ V DC	5
0 V	12
A+	7
A-	6
B+	9
B-	8
DATA +	2
DATA -	3
CLOCK +	11
CLOCK -	4
PROG	10



M12 connector (12 pin)
M12 A coded
front view

ELECTRICAL SPECIFICATIONS

Absolute resolution	5 - 10 μ m
Incremental resolution	1 - 5 μ m
Stroke	≤ 10240 mm
Power supply ¹	4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1,5 W
Electrical interface for absolute signals ²	RS-422
Electrical interface for incremental signals ²	RS-422
Clock frequency	50 ... 750 kHz
Pause time (Tc)	> 25 μ s
SSI frame	MSB ... LSB 27 bit data length 24 bit data + 3 bit status
Code type	gray
Accuracy (sensor+tape)	$\pm (0,02 + 0,03 \times \text{length})$ mm length in meter
Repeatability	$\pm 5 \mu$ m, ± 1 increment
Max travel speed	≤ 5 m/s for absolute output refer to the table for incremental output
Mean time to dangerous failure (MTTF) ³ according to EN ISO 13849-1	106 years
Mission time (Tm) ³	20 years
Diagnostic coverage (DC) ³	0%
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive

MECHANICAL SPECIFICATIONS

Enclosure rating	IP 67 (IEC 60529)
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Housing material	zinc die-cast
Operating temperature ^{3,4}	-30° ... +85°C (-22° ... +185°F)
Storage temperature ⁴	-40° ... +85°C (-40° ... +185°F)
Working distance from magnetic tape without steel cover tape	0,2 ... 1,3 mm
Weight	80 g (2,82 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

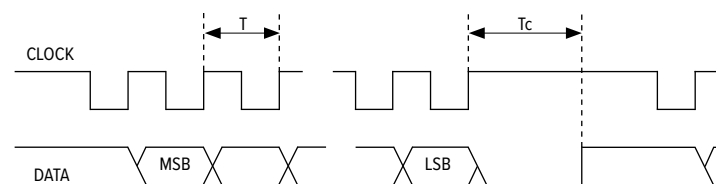
⁴ measured on the transducer flange

⁵ condensation allowed

INCREMENTAL FREQUENCY - TRAVEL SPEED

Resolution (μ m)	Travel speed (m/s)		
	1	4	0,32
5	20	1,60	0,25
10	25	3,20	0,50
Max frequency (Khz)	1250	100	15,63

SSI INTERFACE



CLOCK Input from controller
T Clock signal period
Tc Pause time

MAIN FEATURES

- Magnetic tape for use with TMAA
- Easy to install with premounted double-sided adhesive
- High pole accuracy
- Available in rolls up to 75 m

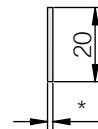


ORDERING CODE

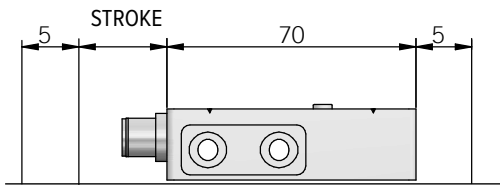
BMA A 50 - 1 . XXX

SERIES magnetic tape BMA					
TAPE TYPE 20 mm width magnetic tape A					
ACCURACY CLASS ± 50 µm 50					
separate the code with a dash -					
				TAPE LENGTH 0,2 ... 75 m 1 in intervals of 0,1 m	
					VARIANT custom version XXX

BMAA



1,4 mm without steel cover tape
1,58 mm with steel cover tape



Minimum tape length (mm) = 70 + 10 + STROKE

dimensions in mm

for fixing clips please refer to Accessories

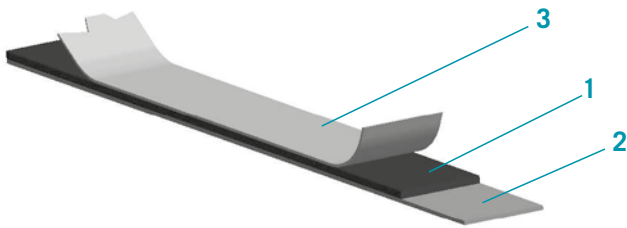
SPECIFICATIONS

Operating temperature	-20° ... +70°C (-4° ... +158°F)
Storage temperature	-40° ... +70°C (-40° ... +158°F)
Relative humidity	100%
Accuracy	± 50 µm
Linear expansion coefficient	(11 ± 1) x 10 ⁻⁶ m/K
Bending radius	> 350 mm

CONSTRUCTION

As shown in the figure below, Eltra magnetic tape is made up of three layers:

- 1** - a flexible elastomer magnetic tape filled with ferrite
- 2** - a stainless steel tape used to create a shield against any external magnetic flux and other external agents. It's also glued to the top layer to give the magnetic tape the mechanical rigidity. The stainless steel tape is supplied with a double-sided acrylic adhesive (thickness 0.13 mm), not shown in the illustration.
- 3** - a steel tape, magnetically transparent, with the function of mechanically protecting the magnetic layer; it is the most rigid part and is therefore supplied separately for transport and application purposes. It must be stuck on the magnetic tape by the user. The steel tape is supplied with a double-sided acrylic adhesive (thickness 0.13 mm) not shown in the illustration.



To prevent damage from possible internal stresses in the magnetic tape, the tape should be wound with the magnetic layer facing outwards, with a minimum internal diameter of 200 mm and a minimum of 5 mm between layers. If supplied in single strips, leave at least 10 mm between strips.

TIPS FOR APPLYING THE MAGNETIC TAPE

Fixing pressure

Magnetic tape is adhesive. It is therefore important that there is optimum contact between the surfaces for correct use. Good pressure must be applied evenly to ensure a perfect result.

Applying temperature

To ensure optimum adhesion, a surface temperature between +20°C and +37°C (+68°F to +98.6°F) is recommended. Maximum adhesion is achieved after 72 hours at a temperature of +21°C (+69.8°F). Do not apply magnetic tape if the surface temperature is below +10°C (+50°F).

Application materials

Magnetic tape must be applied to dry, smooth and clean surfaces. The surfaces must be cleaned with an aqueous solution (such as water and 50% alcohol or heptane). Metallic surfaces such as brass, copper, etc. must be protected to prevent possible oxidation.

CHEMICAL AGENTS AND MAGNETIC TAPE BEHAVIOUR		
Null effect	Medium effect	Strong effect
motor oil	JP-4 fuel	aromatic hydrocarbons (benzene, toluene, xylene, trichloroethylene, freon 10)
transmission oil	gasoline	ketones (acetone)
ATF (automatic transmission fluid)	heptane	mineral acids (hydrochloric, sulphuric, nitric, phosphoric, boric)
hydraulic oil	alcohols	
kerosene		
antifreeze		
detergents, disinfectants (Clorox®)		
turpentine		
water		
salt spray		

MAIN FEATURES

Rope encoder series with Dyneema rope available for lengths up to 4 m.
The applied encoder can be incremental or absolute. Perfectly suitable for harsh environments thanks to its high mechanical resistance. It can be used in a wide range of applications such as: vertical warehouses, presses, extruders, etc.



ORDERING CODE

FE 1500 A - EH30

SERIES rope encoder for linear measures FE			
WORKING STROKE 1,5 m 1500 4 m 4000			
TYPE OF ROPE END eyelet A			
ENCODER FLANGE MODEL EAM53 EL/ER53 EH/EMI30M			

The encoder used with the FE model must be ordered separately. The letter F must be placed in front of the ordering code.

Example:

- 1) encoder model EH 30 M ordering code: FEH30M300S5/28P6X6PR
- 2) encoder model EL 53 B ordering code: FEL53B1100S5/28P6X3MR
- 3) encoder model EAMR 53 B ordering code: FEAMR53B12/13G8/30SX6XM12R
- 4) encoder model EAML 53 B ordering code: FEAML53B16B12/30V010X6M12R

Complete ordering code example:

FE1500A-EH30
FEH30M1024S5/28P6X6PR

SPECIFICATIONS

Model	FE 1500	FE 4000
Linearity error	± 0,75 mm	± 2 mm
Drum circumference	120 mm	220 mm
Max speed	0,85 m/s	
Pull-out force required	≥ 9 N (2,02 lbs)	
Enclosure rating	depends on encoder IP	
Shock	50 G, 11 ms (IEC 60068-2-27)	
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)	
Housing material	painted aluminum	
Rope material	Dyneema®	
Operating temperature	-10° ... +60°C (+14° ... +140°F)	
Storage temperature	-25° ... +70°C (-13° ... +158°F)	
Weight	500 g (17,64 oz) mod. 1500 1100 g (38,80 oz) mod. 4000	
Electromagnetic compatibility	see encoder	
RoHS	see encoder	

For encoder specifications, refer to single product datasheet :

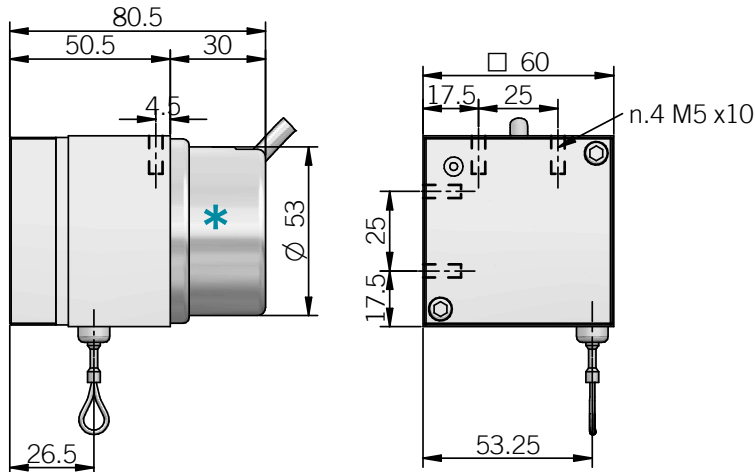
- FEH 30 M see EH 30 M - EH 30 MH encoder
- FEL 53 B see EL - ER 53 encoder
- FEAMR 53 B see EAMR 58 - 63 solid shaft encoder
- FEAML 53 B see EAML 58 - 63 solid shaft encoder

FE installation notes

A 5 mm wire extension is recommended before the measurement start point. This will prevent the wire from snapping back to the stop on when rewinding. The wire should be pulled straight out in line with the wire outlet; the wire must not spring back loosely, it must be loaded by spring force in all situations and movements. Do not twist or bend the wire seat or the wire. Do not open the spring housing of the rope encoder. Do not extend the wire beyond the specified maximum extension length.

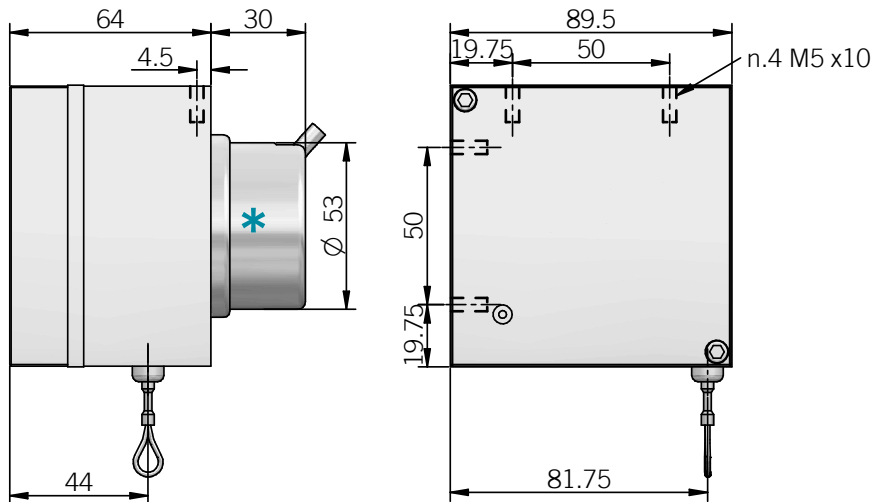
Mechanical resolution [mm] = Drum circumference [mm] / Encoder pulses [ppr o singleturn resolution]

FE 1500



* dimensions with EH30M encoder

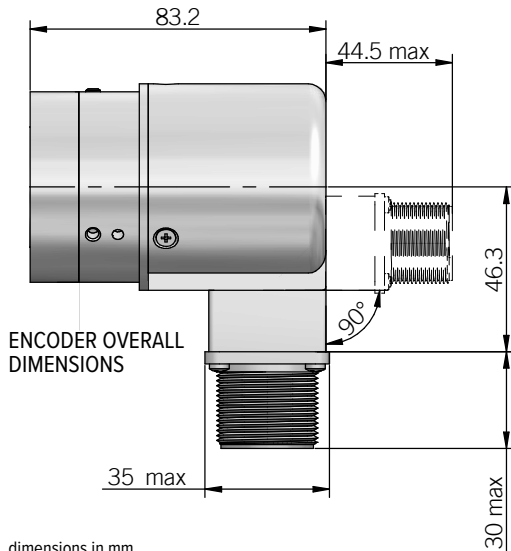
FE 4000



* dimensions with EH30M encoder

FEL 53 B

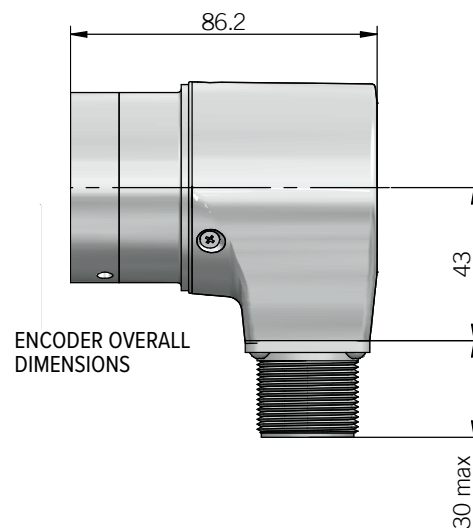
* INCREMENTAL ENCODER APPLICATION



dimensions in mm

FEAMR 53 B

* MULTITURN ABSOLUTE ENCODER APPLICATION



MAIN FEATURES

Rope encoder series with steel rope available for lengths up to 15 m.
 The attached encoder can be incremental or absolute.
 Perfectly suitable also for harsh environments, thanks to its excellent mechanical resistance.
 It can be used in wide range of applications such as: vertical warehouses, presses, extruders, etc.



ORDERING CODE

FES 3000 A -58B
SERIES
 rope encoder for linear measures **FES**
WORKING STROKE
 3 m **3000**
 6 m **6000**
 15 m **15000**
OUTPUT TYPE
 horizontal output **A**
ENCODER FLANGE MODEL
58B

Incremental or absolute (model 58B) must be ordered together.
 Please add the letter F in front of the standard encoder ordering code.
 Example:

- 1) with incremental encoder ordering code will be : FER58B ...
- 2) with absolute multiturn encoder ordering code will be : FEAMR58B ...
- 3) with absolute Profinet multiturn encoder ordering code will be : FAAM58BR ...

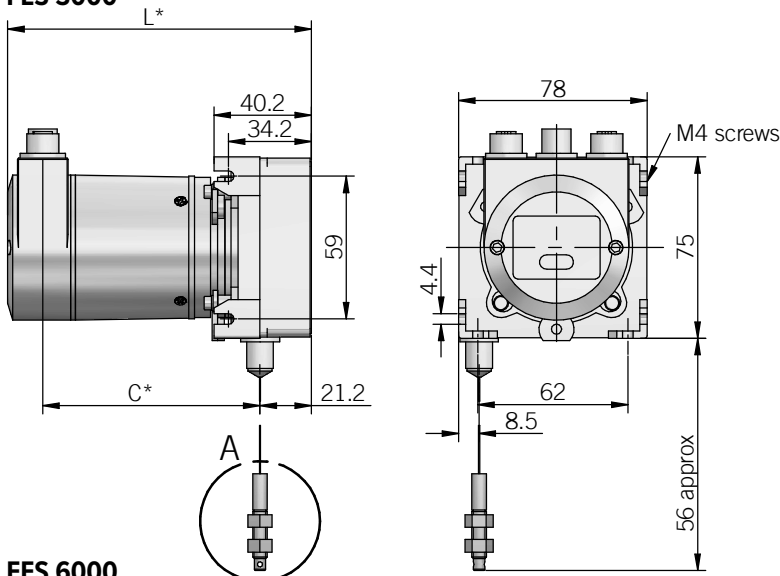
Complete ordering code example:

FES3000A-58B
FER58B1024Z5/28L6X3PR

SPECIFICATIONS

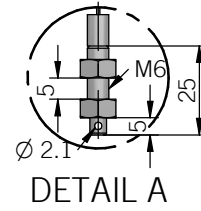
Model	FES 3000	FES 6000	FES 15000
Max length measurement	3 m	6 m	15 m
Drum circumference	200 mm	200 mm	500 mm
Wire diameter	0,87 mm	0,6 mm	0,87 mm
System accuracy	/	± 0,1%	± 0,1%
Repeat accuracy	± 0,15 mm	± 0,15 mm	± 0,2 mm
Max speed	0,8 m/s	3 m/s	≤ 2,4 m/s
Max acceleration	/	≤ 23,5 m/s ²	/
Pull-out force required	≥ 3 N (0,67 lbs)	≥ 8 N (1,8 lbs)	≥ 15,5 N (3,48 lbs)
Housing material	aluminum / plastic		aluminium die casting
Rope material	steel		steel rope, synthetically coated
Enclosure rating	depends on encoder IP		
Shock (IEC 60068-2-27)	/	50 G, 11 ms	/
Vibrations (IEC 60068-2-6)	/	10 G, 5 ... 150 Hz	/
Operating temperature	-40° ... +80°C (-40° ... +176°F)	-20° ... +80°C (-4° ... +176°F)	-40° ... +80°C (-40° ... +176°F)
Weight	350 g (12,35 oz) + encoder	600 g (24,69 oz) + encoder	2500 g (88,18 oz) + encoder
(EMI-EMIP-ER 58B) L*	95 mm	120 mm	112 mm
(EAMR 58B) L*	98 mm	123 mm	115 mm
(AAM 58BR PROFINET/ETHERCAT) L*	125,5 mm	151 mm	143 mm
(EMI-EMIP-ER 58B) C*	57 mm	51 mm	41 mm
(EAMR 58B) C*	57 mm	51 mm	41 mm
(AAM 58BR PROFINET/ETHERCAT) C*	90 mm	83,5 mm	73,5 mm
Electromagnetic compatibility	see encoder		
RoHS	see encoder		

FES 3000

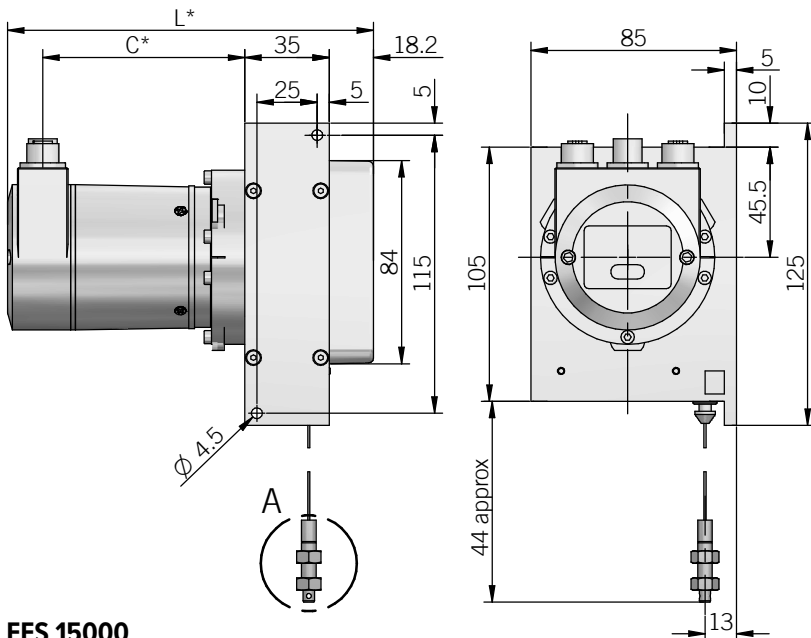


FES installation notes

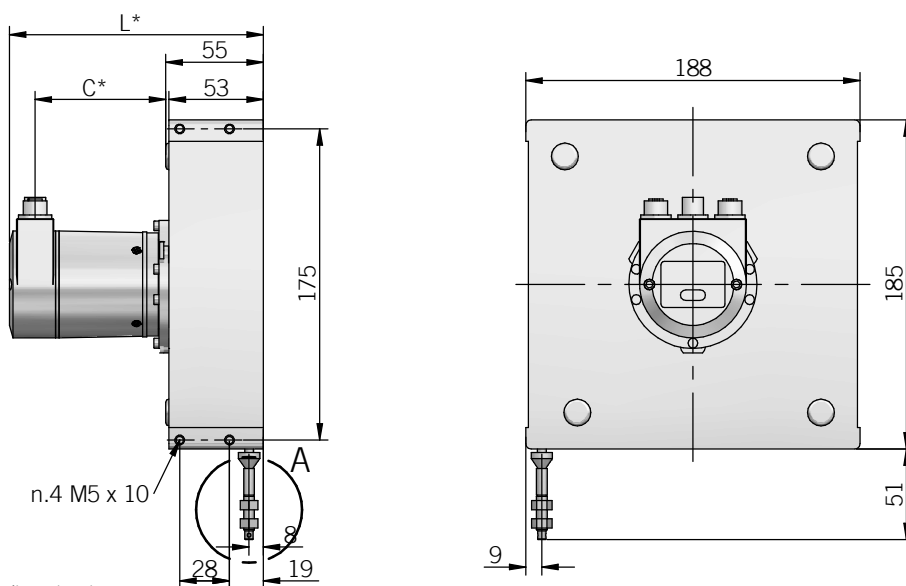
A 5 mm wire extension is recommended before the measurement start point. This will prevent the wire from snapping back to the stop on when rewinding.
 The wire should be pulled straight out in line with the wire outlet; the wire must not spring back loosely, it must be loaded by spring force in all situations and movements.
 Do not twist or bend the wire seat or the wire.
 Do not open the spring housing of the rope encoder.
 Do not extend the wire beyond the specified maximum extension length



FES 6000



FES 15000



dimensions in mm

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LINEAR INDEX

EPLA
LINEAR POTENTIOMETER

MAIN FEATURES

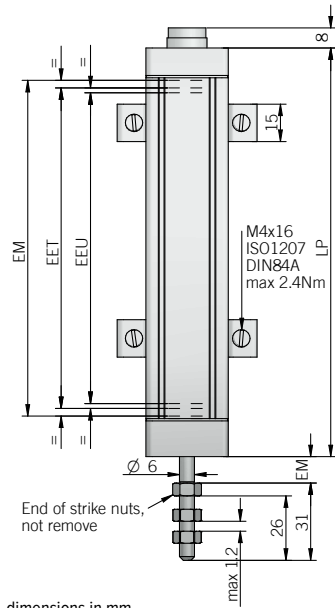
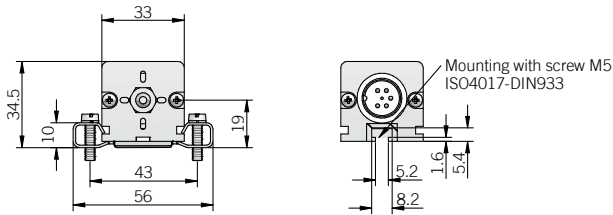
EPLA is an absolute linear potentiometer that guarantees high reliability even in harsh applications with strong vibrations and shocks. The groove on the housing of the transducer is an excellent alternative to the usual system of mounting with brackets. Installation is also simplified by the absence of variations in the electrical output signal outside the theoretical electrical stroke. EPLA is the right solution for material processing machines such as injection presses for plastics, rubber, etc.



ORDERING CODE **EPLA 200 X 10 C5 A**

SERIES linear potentiometer model EPLA					
STROKE mm from 50 to 900 see table for stroke availability					
ENCLOSURE RATING IP 60 X IP 65 S					
TRAVEL SPEED max 10 m/s 10					
OUTPUT TYPE cable (standard length 1 m) P 3 pin connector C3 EN 175301-803 form A (DIN 43650-A) 4 pin connector C4 DIN 43322 5 pin connector C5					
OUTPUT DIRECTION axial A					

EPLA



dimensions in mm

CONNECTIONS

Function	Cable	3 pin C3	4 pin C4	5 pin C5
+	blue	3	3	3
-	brown	1	1	1
OUTPUT	yellow	2	2	2
NC	/	/	4	4
NC	/	/	/	5

C3 connector (3 pin)

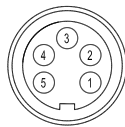
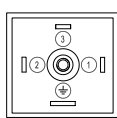
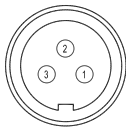
C4 connector (4 pin)
EN 175301-803 form A

C5 connector (5 pin)
DIN 45322

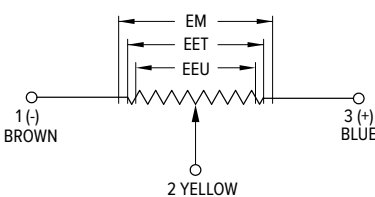
front view

front view

front view



- fixing kit (brackets, screws) included
- socket connector not included, please refer to Accessories



ELECTRICAL SPECIFICATIONS

Resolution	virtually infinite
Independent linearity	± 0,05 %
Repeatability	0,01 mm
Resistance tolerance	± 20 %
Recommended cursor current	< 0,1 µA
Resistance thermal coefficient	-200 ... 200 ppm / °C typical
Output voltage temperature coefficient	≤ 5 ppm / °C
Power dissipation	3 W at 40 °C / 0 W at 120 °C
Max cursor current	10 mA
Applicable voltage	60 V DC max
Electrical insulation	> 100 MΩ, 500 V DC, 1 bar, 2 s
Dielectric strenght	< 100 µA, 500 V AC, 50 Hz, 1 bar, 2 s
Cable type	shielded - fixed installation conductors section 0,20 mm ² / AWG 24 bending radius min 40 mm
RoHS	according to 2011/65/EU directive

Important: data are valid if the transducer is used as a ratiometric device with a maximum applicable current ≤ 0,1 µA

MECHANICAL SPECIFICATIONS

Stroke	50 - 100 - 150 - 200 - 300 - 350 - 400 - 450 - 500 - 600 - 750 - 900 mm
Useful electric stroke (EEU) (+ 3 / - 0 mm)	see stroke (mm)
Theoretical electric stroke (EET) (±1 mm)	EEU + 3 mm (50 ... 150), EEU + 4 mm (200 ... 300), 355 mm (350), 406 mm (400), 457 mm (450), 508 mm (500), 609 mm (600), 762 mm (750), 914 mm (900)
Mechanical stroke (EM)	EEU + 9 mm (50 ... 150), EEU + 10 mm (200 ... 300), 361 mm (350), 412 mm (400), 463 mm (450), 518 mm (500), 619 mm (600), 772 mm (750), 924 mm (900)
Resistance (on the EET)	5 kΩ (50 ... 600) 10 kΩ (750 ... 900)
Case length (LP)	EEU + 63 mm (50 ... 150), EEU + 64 mm (200 ... 300), 415 mm (350), 466 mm (400), 517 mm (450), 572 mm (500), 673 mm (600), 826 mm (750), 978 mm (900)
Travel speed	10 m/s max
Acceleration	200 m/s ² max
Enclosure rating	X = IP 60 (IEC 60529) S = IP 65 (IEC 60529)
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 5 ... 2000 Hz (IEC 60068-2-6)
Displacement force typical	3,5 N (0,79 lbs) with X enclosure rating 15 N (3,37 lbs) with S enclosure rating
Housing material	anodized aluminium / Nylon 66 G
Pull shaft material	stainless steel
Mounting	brackets with variable center-to-center distance or M5 ISO4017 - DIN933 screw
Life	> 25 x 10 ⁶ m strokes or > 100 x 10 ⁶ manoeuvres
Operating temperature^{1,2}	-30° ... +100°C (-22° ... +212°F)
Storage temperature²	-50° ... +120°C (-58° ... +248°F)

¹ measured on transducer

² condensation not allowed

Installation warnings:

- connect the transducer according to the specified connections
- DO NOT use it as a variable resistor
- the transducer must be calibrated by adjusting the stroke so that the output signal is between 1% and 99% of the voltage level

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LINEAR INDEX

EPLB CYLINDRICAL LINEAR POTENTIOMETER

MAIN FEATURES

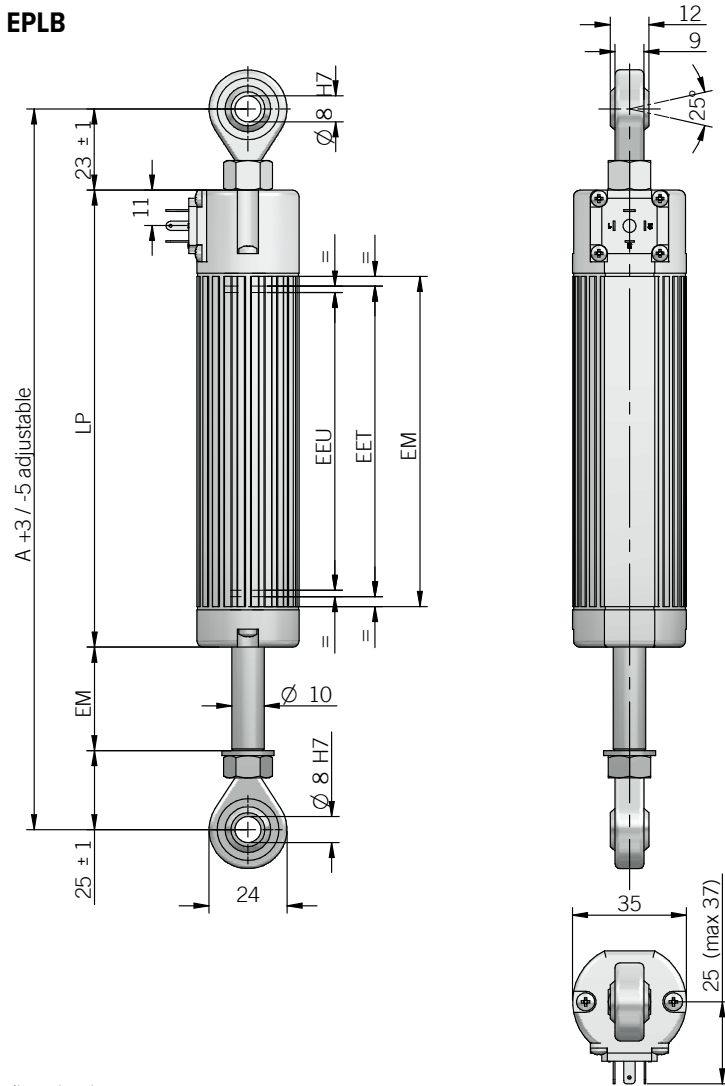
EPLB is an absolute linear potentiometer transducer. Mechanical mounting is facilitated by the presence of spherical joints on both sides and by the cylindrical shape of the housing. The main feature is the absence of variations in the electrical output signal outside the theoretical electrical travel. Thanks to its robustness and precision, the EPLB is an excellent solution for most mechanical automation applications.



ORDERING CODE

	EPLB	300	S	5	P	R
SERIES	cylindrical linear potentiometer model EPLB					
STROKE	mm from 50 to 750 see table for stroke availability					
ENCLOSURE RATING	IP 65 S					
TRAVEL SPEED	max 5 m/s 5					
OUTPUT TYPE	cable (standard length 1 m) P 3 pin connector C3 EN 175301-803 form C (DIN 43650-C) 4 pin connector C4 M16 IP40 DIN 43322 5 pin connector C5					
OUTPUT DIRECTION	radial R					

EPLB



dimensions in mm

CONNECTIONS

Function	Cable	3 pin C3	4 pin C4	5 pin C5
+	blue	3	3	3
-	brown	1	1	1
OUTPUT	yellow	2	2	2
NC	/	/	4	4
NC	/	/	/	5

C3 connector (3 pin)

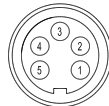
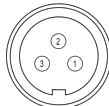
C4 connector (4 pin)
EN 175301-803 form C

C5 connector (5 pin)
DIN 43322

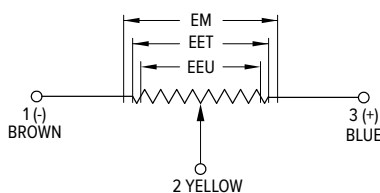
front view

front view

front view



· socket connector not included, please refer to Accessories



ELECTRICAL SPECIFICATIONS

Resolution	virtually infinite
Independent linearity	± 0,05 %
Repeatability	0,01 mm
Resistance tolerance	± 20 %
Recommended cursor current	< 0,1 µA
Output voltage temperature coefficient	≤ 1,5 ppm / °C
Power dissipation	3 W at 40 °C / 0 W at 120 °C
Max cursor current	10 mA
Applicable voltage	60 V max
Electrical insulation	> 100 MΩ, 500 V DC, 1 bar, 2 s
Dielectric strenght	< 100 µA, 500 V AC, 50 Hz, 1 bar, 2 s
Cable type	shielded - fixed installation conductors section 0,20 mm ² / AWG 24 bending radius min 40 mm
RoHS	according to 2011/65/EU directive

Important: data are valid if the transducer is used as a ratiometric device with a maximum applicable current ≤ 0,1 µA

MECHANICAL SPECIFICATIONS

Stroke	50 - 100 - 150 - 200 - 300 - 400 - 450 - 500 - 600 - 750 mm
Useful electric stroke (EEU) (+3/-0 mm)	see stroke (mm)
Theoretical electric stroke (EET) (±1 mm)	EEU + 3 mm (50 ... 150), EEU + 4 mm (200 ... 300), 406 mm (400), 457 mm (450), 508 mm (500), 609 mm (600), 762 mm (750)
Mechanical stroke (EM)	EEU + 9 mm (50 ... 150), EEU + 10 mm (200 ... 300), 412 mm (400), 463 mm (450), 518 mm (500), 619 mm (600), 772 mm (750)
Resistance (on the EET)	5 kΩ (50 ... 600) 10 kΩ (750)
Case length (LP)	EEU + 130,5 mm (50 ... 150), EEU + 131,5 mm (200 ... 300), 539,5 mm (400), 590,5 mm (450), 665,5 mm (500), 766,5 mm (600), 919,5 mm (750)
Minimum interaxis length (A)	EEU + 177 mm (50 ... 150), EEU + 178 mm (200 ... 300), 586 mm (400), 637 mm (450), 712 mm (500), 813 mm (600), 966 mm (750)
Travel speed	5 m/s max
Enclosure rating	IP 65 (IEC 60529)
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 5 ... 2000 Hz (IEC 60068-2-6)
Displacement force	≤ 15 N (3,37 lbs)
Moving angle	± 25° max
Housing material	anodized aluminium / Nylon 66 G
Rod material	stainless steel
Mounting	2 selfloading and selfaligning ball-joints
Life	> 25 x 10 ⁶ m strokes or > 100 x 10 ⁶ manoeuvres
Operating temperature ^{1,2}	-30° ... +100°C (-22° ... +212°F)
Storage temperature ²	-50° ... +120°C (-58° ... +248°F)

¹ measured on transducer

² condensation not allowed

Installation warnings:

- connect the transducer according to the specified connections
- DO NOT use it as a variable resistor
- the transducer must be calibrated by adjusting the stroke so that the output signal is between 1% and 99% of the voltage level

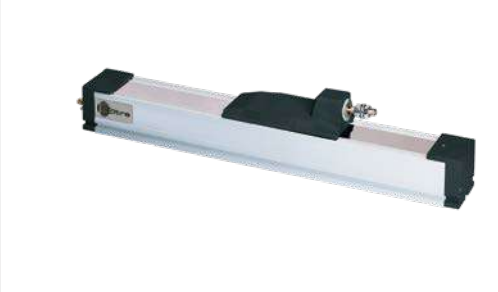
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LINEAR INDEX

EPLC
RODLESS LINEAR POTENTIOMETER

MAIN CHARACTERISTICS

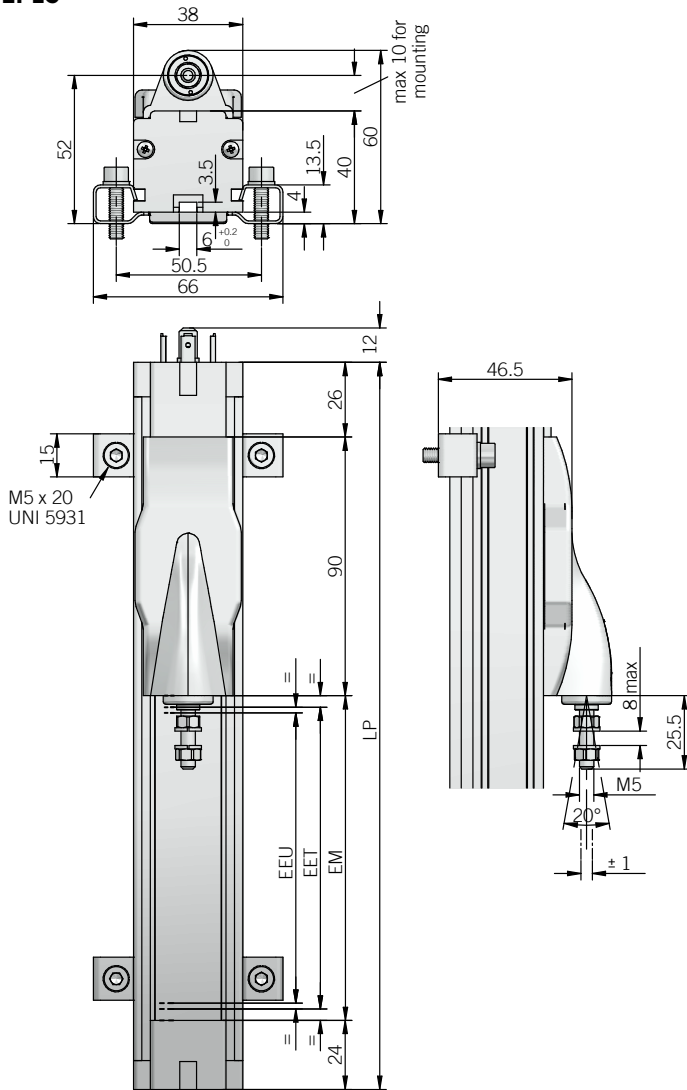
EPLC is an absolute linear potentiometer transducer without an internal rod. This transducer is characterised by a cursor with integrated coupling that slides along the axis. The main characteristic is the absence of variations in the electrical output signal outside the theoretical electrical travel.



ORDERING CODE **EPLC 500 X 4 C4 A**

SERIES rodless linear potentiometer model EPLC					
STROKE mm from 100 to 1500 see table for stroke availability					
ENCLOSURE RATING IP 40 X					
TRAVEL SPEED max 4 m/s 4 max 10 m/s 10					
OUTPUT TYPE EN 175301-803 form A (DIN 43650-A) 4 pin connector C4 M16 IP40 DIN 43322 5 pin connector C5					
OUTPUT DIRECTION axial A					

EPLC

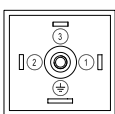


dimensions in mm

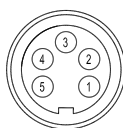
CONNECTIONS

Function	4 pin C4	5 pin C5
+	3	3
-	1	1
OUTPUT	2	2
NC	4	4
NC	/	5

C4 connector (4 pin)
EN 175301-803 form A
front view



C5 connector (5 pin)
DIN 45322
front view



- fixing kit (brackets, screws, grower) included
- socket connector not included, please refer to Accessories

ELECTRICAL SPECIFICATIONS

Resolution	virtually infinite
Independent linearity	± 0,05 %
Repeatability	0,01 mm
Resistance tolerance	± 20 %
Recommended cursor current	< 0,1 µA
Resistance temperature coefficient	-200 ... 200 ppm / °C typical
Output voltage temperature coefficient	≤ 5 ppm / °C typical
Power dissipation	3 W at 40 °C / 0 W at 120 °C
Max cursor current	10 mA max
Applicable voltage	60 V max
Electrical insulation	> 100 MΩ, 500 V DC, 1 bar, 2 s
Dielectric strenght	< 100 µA, 500 V AC, 50 Hz, 1bar, 2 s
RoHS	according to 2011/65/EU directive

Important: data are valid if the transducer is used as a ratiometric device with a maximum applicable current ≤ 0,1 µA

MECHANICAL SPECIFICATIONS

Stroke	100 - 150 - 200 - 300 - 400 - 500 - 600 - 700 - 850 - 900 - 1000 - 1250 - 1500 mm
Useful electric stroke (EEU) (+3/-0 mm)	see stroke (mm)
Theoretical electric stroke (EET) (±1 mm)	103 mm (100), 153 mm (150), 204 mm (200), 305 mm (300), 406 mm (400), 509 mm (500), 611 mm (600), 713 mm (700), 865 mm (850), 915 mm (900), 1017 mm (1000), 1271 mm (1250), 1521 mm (1500)
Mechanical stroke (EM)	EET + 10mm (100 ... 1500)
Resistance (on the EET)	5 kΩ (100 ... 300) 10 kΩ (400 ... 1000) 20 kΩ (1250 ... 1500)
Case length (LP)	EET + 150mm (100 ... 1500)
Travel speed	4 = 4 m/s max 10 = 10 m/s max
Acceleration	200 m/s ² max
Enclosure rating	IP 40 (IEC 60529)
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 5 ... 2000 Hz (IEC 60068-2-6)
Displacement force	≤ 1,2 N (0,27 lbs) max
Housing material	anodized aluminium / Nylon 66 G 25
Mounting	brackets with variable center-to-center distance with M6 screw ISO4017 - DIN933
Operating temperature^{1,2}	-30° ... +100°C (-22° ... +212°F)
Storage temperature²	-50° ... +120°C (-58° ... +248°F)

¹ measured on transducer
² condensation not allowed

Installation warnings:

- connect the transducer according to the specified connections
- DO NOT use it as a variable resistor
- the transducer must be calibrated by adjusting the stroke so that the output signal is between 1% and 99% of the voltage level

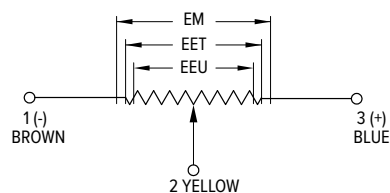


TABLE OF CONTENTS

LINEAR INDEX

EPLT

LINEAR POTENTIOMETER WITH BALL TIP

MAIN CHARACTERISTICS

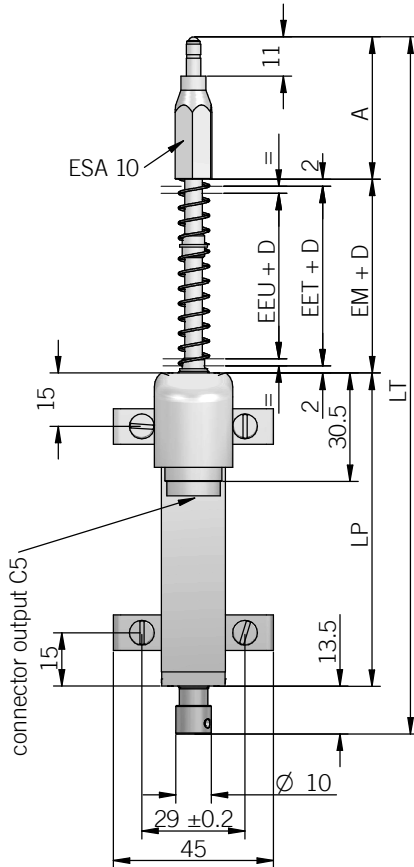
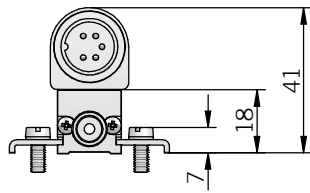
EPLT is an absolute linear potentiometer transducer. This model is characterised by the absence of a cursor and the presence of a sensing system consisting of a moving stainless steel ball rod mounted on a threaded tip with a spring. This transducer is suitable for applications where short strokes are required. The presence of the spring ensures automatic positioning of the head, making it suitable for use in precision applications on cams or for checking products coming from automatic production lines. EPLT is also characterised by the absence of variations in the electrical output signal outside the theoretical electrical stroke.



ORDERING CODE

	EPLT	100	X	10	P	A
SERIES	linear potentiometer with ball tip EPLT					
STROKE	10 / 25 / 50 / 75 / 100 please contact our offices for other strokes					
ENCLOSURE RATING	IP 40 X					
TRAVEL SPEED	max 10 m/s 10					
OUTPUT TYPE	cable (standard length 1 m) P M16 IP40 DIN 43322 5 pin connector C5					
OUTPUT DIRECTION	axial A					

EPLT

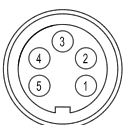


dimensions in mm

CONNECTIONS

Function	Cable P	5 pin C5
+	blue	3
-	brown	1
OUTPUT	yellow	2
NC	/	4
NC	/	5

C5 connector (5 pin)
DIN 45322
front view



- fixing kit (brackets, M4x10 screws, washer) and tip with ball included
- socket connector not included, please refer to Accessories

ELECTRICAL SPECIFICATIONS

Resolution	virtually infinite					
Stroke	mm	10	25	50	75	100
Independent linearity	%	± 0,3	± 0,2	± 0,1	± 0,1	± 0,1
Resistance tolerance	± 20 %					
Recommended cursor current	< 0,1 µA					
Output voltage temperature coefficient	< 1,5 ppm / °C					
Power dissipation at 40 °C (0 W at +120 °C)	W	0,2	0,6	1,2	1,8	2,4
Max cursor current	10 mA max					
Max applicable voltage	V	14	25	60	60	60
Electrical insulation	> 100 MΩ, 500 V DC, 1 bar, 2 s					
Dielectric strenght	< 100 µA, 500 V AC, 50 Hz, 1bar, 2 s					
Cable type	shielded - fixed installation conductors section 0,20 mm ² / AWG 24 bending radius min 40 mm					
RoHS	according to 2011/65/EU directive					

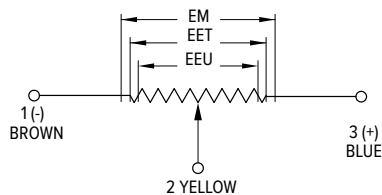
Important: data are valid if the transducer is used as a ratiometric device with a maximum applicable current ≤ 0,1 µA

MECHANICAL SPECIFICATIONS

Stroke	mm	10	25	50	75	100
Useful electric stroke (EEU) (+1/-0 mm)	mm	10	25	50	76	101
Theoretical electric stroke (EET) (±1 mm)	mm	11	26	51	76	101
Mechanical stroke (EM)	mm	15	30	55	81	106
Resistance (on EET)	kΩ	1	1	5	5	5
Case length (LP)	mm	48	63	88	114	139
Sensing probe length	mm	32	32	40	40	40
Additional length (D)	mm	-	-	-	5	11
Total length (LT)	mm	108	138	196	251	307
Travel speed	10 m/s max					
Enclosure rating	IP 40 (IEC 60529)					
Shock	50 G, 11 ms (IEC 60068-2-27)					
Vibration	20 G, 5 ... 2000 Hz (IEC 60068-2-6)					
Displacement force	≤ 4 N (0,9 lbs)					
Housing material	anodized aluminium / Nylon 66 G 25					
Rod material	stainless steel					
Mounting	brackets with variable center-to-center distance					
Life	> 25 x 10 ⁶ m strokes or > 100 x 10 ⁶ operations					
Operating temperature^{1,2}	-30° ... +100°C (-22° ... +212°F)					
Storage temperature²	-50° ... +120°C (-58° ... +248°F)					

¹ measured on transducer

² condensation not allowed



Installation warnings:

- connect the transducer according to the specified connections
- DO NOT use it as a variable resistor
- the transducer must be calibrated by adjusting the stroke so that the output signal is between 1% and 99% of the voltage level

MAIN CHARACTERISTICS

EMSPA is an absolute linear magnetostrictive transducer with analogue interface. Thanks to the absence of electrical contact on the housing, there is no problem of wear and deterioration during its working life. Magnetostrictive technology guarantees high performance in terms of speed and accuracy. The compact size and robust housing ensure high reliability and ease of installation, even in applications with mechanical stresses, vibrations or high levels of contamination.



ORDERING CODE

EMSPA 500 S 20D 10 P A

linear magnetostrictive transducer with analogue output **EMSPA**

SERIES

STROKE

mm from **50** to **1500**
see table for stroke availability

ENCLOSURE RATING

IP 67 **S**

OUTPUT SIGNAL

0 ... 10 V DC / 1 cursor (standard) **10S**
0 ... 10 V DC / 1 cursor position/speed **10P**
0 ... 10 V DC / 2 cursors (min. stroke 400 mm) **10D**
4 ... 20 mA / 1 cursor **20S**
4 ... 20 mA / 1 cursor position/speed **20P**
4 ... 20 mA / 2 cursors (min. stroke 400 mm) **20D**

TRAVEL SPEED

max 10 m/s **10**

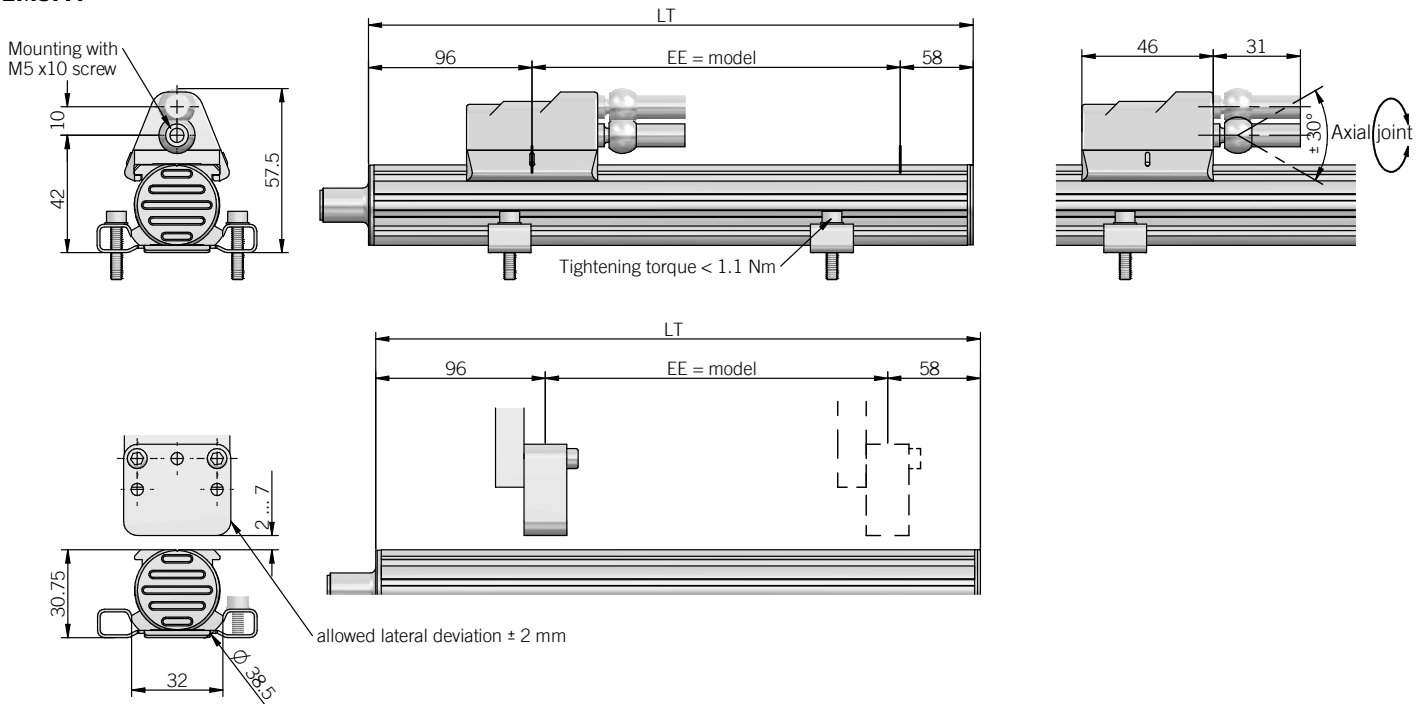
OUTPUT TYPE

cable (standard length 1 m) **P**
M12 5 pin connector **S5**
M12 8 pin connector **S8**
M16 IP40 DIN 45322 6 pin connector **C6**
M16 IP40 DIN 45326 8 pin connector **C8**

OUTPUT DIRECTION

axial **A**

EMSPA



dimensions in mm

· brackets, cursors and socket connector not included, please refer to Accessories

ELECTRICAL SPECIFICATIONS		MECHANICAL SPECIFICATIONS	
Resolution	16 bit (max electrical noise 5 mVpp)	Stroke	50 - 100 - 150 - 200 - 250 - 300 - 350 - 400 - 450 - 500 - 600 - 700 - 800 - 900 - 1000 - 1100 - 1200 - 1300 - 1400 - 1500 mm
Output signal	0 ... 10 V DC	Electric stroke (EE)	see stroke (mm)
Output alarm value	10,5 V DC	Overall dimension (LT)	EE + 154 mm
Output max value	12 V DC	Enclosure rating	IP 67 (IEC 60529)
Power supply¹	19,2 ... 28,8 V DC	Detected measurement	displacement / speed
Power ripple	1 Vpp max	Travel speed	10 m/s max
Current consumption	70 mA max	Acceleration	100 m/s ² max
Output load	5 kΩ	Speed measurement range	0 ... 10 m/s
Output ripple	< 5 mVpp	Speed accuracy	< 2 %
Independent linearity	≤ ± 0,01 % FS (min ± 0,060 mm) typical with sliding cursor ≤ ± 0,02 % FS with floating cursor (working distance 2 ... 5 mm) ≤ ± 0,04 % FS with floating cursor (working distance 5 ... 7 mm)	Shock	100 G, 11 ms, single shock (IEC 60068-2-27)
Repeatability	< 0,01 mm	Vibration	12 G, 10 ... 2000 Hz (IEC 680068-2-6)
Hysteresis	< 0,01 mm	Housing material	anodized aluminium / Nylon 66 G 25
Sampling time	0,5 ms (50 ... 300) 1 ms (350 ... 1100) 1,5 ms (1200 ... 1500)	Cursor type	sliding or floating cursor
Protection against overvoltage	yes	Temperature coefficient	0,005 % FS / °C
Protection against polarity inversion	yes	Operating temperature^{2,3}	-30° ... +75°C (-22° ... +167°F)
Protection against power supply on output	yes	Storage temperature³	-40° ... +100°C (-40° ... +212°F)
Electrical insulation	500 V DC		
Cable type	shielded - fixed installation conductors section 0,25 mm ² / AWG 24 bending radius min 40 mm		
Electromagnetic compatibility	according to 2014/30/EU directive		
RoHS	according to 2011/65/EU directive		

¹ as measured at the transducer without cable influences

² measured on transducer

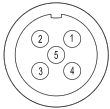
³ condensation not allowed

CONNECTIONS

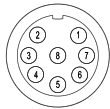
Function	Cable P	5 pin M12 S5	8 pin M12 S8	6 pin M16 IP40 C6	8 pin M16 IP40 C8
+ V DC	brown	5	7	5	7
0 V	white	4	6	6	8
Output cursor 1 0 ... 10 V 4 ... 20 mA	grey	1	5	1	5 (1*)
0V cursor 1	pink	2	1	2	2
Inverse output cursor 1 Output cursor 2 Output speed 10 ... 0 V 20 ... 4 mA	yellow	3	3	3	3
0 V Output cursor 1 Output cursor 2 Output speed	pink	2	2	4	6
NC	/	/	4	/	4
NC	/	/	8	/	/

* only with 4 ... 20 mA output

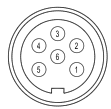
S5 connector (5 pin)
M12 A coded
front view



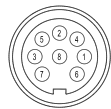
S8 connector (8 pin)
M12 A coded
front view



C6 connector (6 pin)
DIN 45322
front view



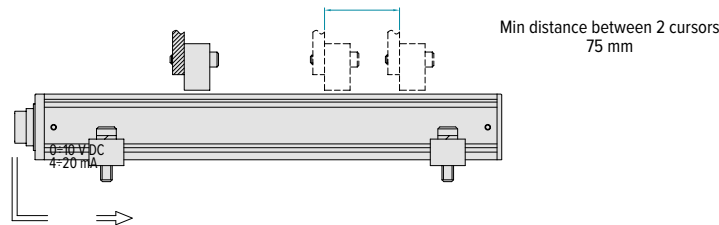
C8 connector (8 pin)
DIN 45326
front view



The transducer housing must only be earthed on the control system side through the cable shield.

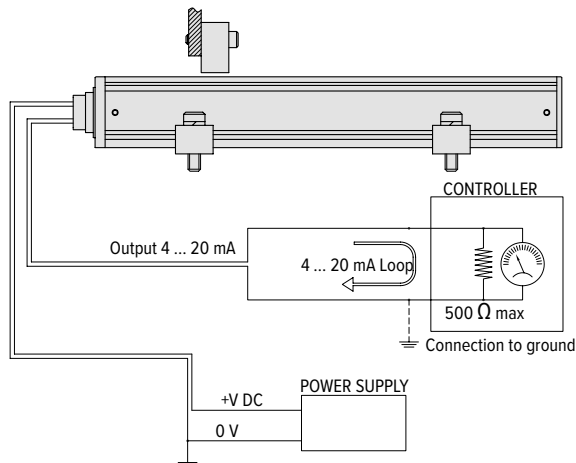
To ensure correct electrical insulation of the transducer from the machine, always fit the brackets using the plastic washers supplied.

INSTALLATION EXAMPLE



For a multi-cursor model, the cursors must operate under the same conditions of distance and temperature. The cursors must be mounted on a non-magnetic material support (such as brass, aluminium or AISI316 stainless steel). The kit includes two screws, two nuts and two washers (all brass). The cursor must be installed with maximum attention to horizontal alignment with the transducer axis (maximum tolerance ± 2 mm), the distance from the transducer surface must be within the range of 2 to 7 mm.

APPLICATION EXAMPLE (CURRENT OUTPUT)



MAIN CHARACTERISTICS

The EMSPB is an absolute linear magnetostrictive transducer with analogue interface. Thanks to the absence of electrical contact on the housing, there is no problem of wear and deterioration during its working life. Magnetostrictive technology guarantees high performance in terms of speed and accuracy. The compact size and robust housing ensure high reliability and ease of installation, even in applications with mechanical stresses, shocks or high levels of contamination.



ORDERING CODE

EMSPB 1000 S 10S 10 C4 A

linear magnetostrictive transducer with analogue output **EMSPB**

SERIES

STROKE

mm from **50** to **1500**
see table for stroke availability

ENCLOSURE RATING

IP 65 **S**

OUTPUT SIGNAL

0,1 ... 10,1 V DC / 1 cursor (standard) **10S**
4 ... 20 mA / 1 cursor **20S**

TRAVEL SPEED

max 10 m/s **10**

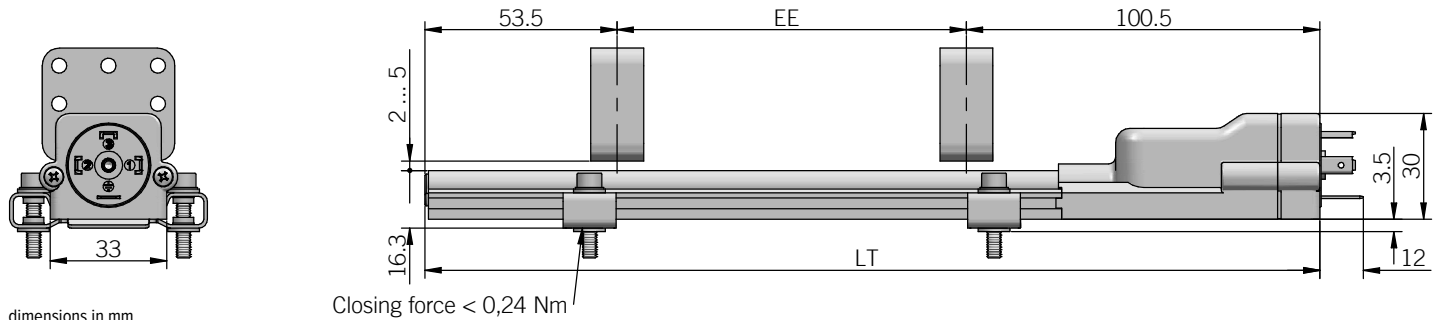
OUTPUT TYPE

EN 175301-803 form A (DIN 43650-A) 4 pin connector **C4**
M12 5 pin connector **S5**

OUTPUT DIRECTION

axial **A**

EMSPB



dimensions in mm

Closing force $< 0,24 \text{ Nm}$

· brackets, cursors and socket connector not included, please refer to Accessories

ELECTRICAL SPECIFICATIONS	
Resolution	virtually infinite limited only by electrical noise 5 mVpp
Output signal	0,1 ... 10,1 V DC 4 ... 20 mA
Output alarm value in absence of cursor	10,5 V DC 21 mA
Output value max	12 V DC 30 mA
Power supply¹	19,2 ... 28,8 V DC
Power ripple	1 Vpp max
Current consumption	35 mA max 60 mA max
Output load	$\geq 10 \text{ k}\Omega$ 50 ... 500 Ω
Independent linearity	$\pm 0,04 \%$ FS max (min $\pm 0,09 \text{ mm}$)
Repeatability	$\leq 0,01 \text{ mm}$ (typical)
Hysteresis	$\leq 0,02 \text{ mm}$ (typical)
Sampling time	1 ms (50 ... 600) 1,5 ms (650 ... 900) 2 ms (1000 ... 1300) 3 ms (1400 ... 1500)
Protection against overvoltage	yes
Protection against polarity inversion	yes
Protection against power supply on output	yes
Electrical insulation	500 V DC
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive

¹ as measured at the transducer without cable influences

^{2,3} measured on transducer

³ condensation not allowed

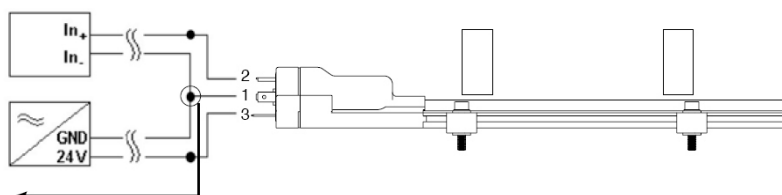
INSTALLATION NOTES

For a multi-cursor model, the cursors must operate under the same conditions of distance and temperature. The cursors must be mounted on a non-magnetic material support (such as brass, aluminium or AISI316 stainless steel).

The kit includes two screws, two nuts and two washers (all brass).

The cursor must be installed with maximum attention to horizontal alignment with the transducer axis (maximum tolerance $\pm 2 \text{ mm}$), the distance from the transducer surface must be within the range of 2 to 5 mm.

APPLICATION EXAMPLE (CURRENT OUTPUT)



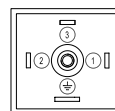
Note: connect as close as possible to the transducer

MECHANICAL SPECIFICATIONS	
Stroke	50 - 100 - 150 - 200 - 225 - 300 - 350 - 400 - 450 - 500 - 600 - 700 - 800 - 900 - 1000 - 1100 - 1200 - 1300 - 1400 - 1500 mm
Electric stroke (EE)	see stroke (mm)
Overall dimension (LT)	EE + 154 mm
Enclosure rating	IP 67 (IEC 60529)
Detected measurement	displacement
Travel speed	10 m/s max
Acceleration	100 m/s ² max
Shock	100 G, 11 ms, single shot (IEC 68000-2-27)
Vibration	12 G, 10 ... 2000 Hz (IEC 68000-2-6)
Housing material	anodized aluminium / Nylon 66 G 25
Cursor type	floating cursor
Temperature coefficient	$\leq 0,01 \%$ FS / °C (min. 0,015 mm / °C)
Operating temperature^{2,3}	-20° ... +75°C (-4° ... +167°F)
Storage temperature³	-40° ... +100°C (-40° ... +212°F)

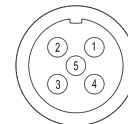
CONNECTIONS

Function	4 pin C4	M12 5 pin S5
+V DC	3	5
0 V	1	4
OUTPUT	2	1
0 V output	/	2
NC	/	3
⊕	4	housing

C4 connector (4 pin)
EN 175301-803 form A
front view



M12 connector (5 pin)
M12 A coded
front view



MAIN CHARACTERISTICS

EMSPS is an absolute linear magnetostrictive transducer with SSI output. The main characteristic of magnetostrictive transducers is the absence of electrical contact on the housing, there is no problem of wear and deterioration during the working life, guaranteeing high displacement speed and precision. High reliability and ease of installation, even in applications with mechanical stresses, shocks or high levels of contamination, are ensured by the compact size and robust housing.



ORDERING CODE

EMSPS 500 S 25 G 10 R5 P A

SERIES
linear magnetostrictive transducer with SSI output **EMSPS**

STROKE
mm from **50** to **1500**
see table for stroke availability

ENCLOSURE RATING
IP 67 **S**

DATA LENGTH
(FM357) 21+1 bit **21**
24 bit **24**
25 bit **25**

CODE TYPE
binary **B**
gray **G**

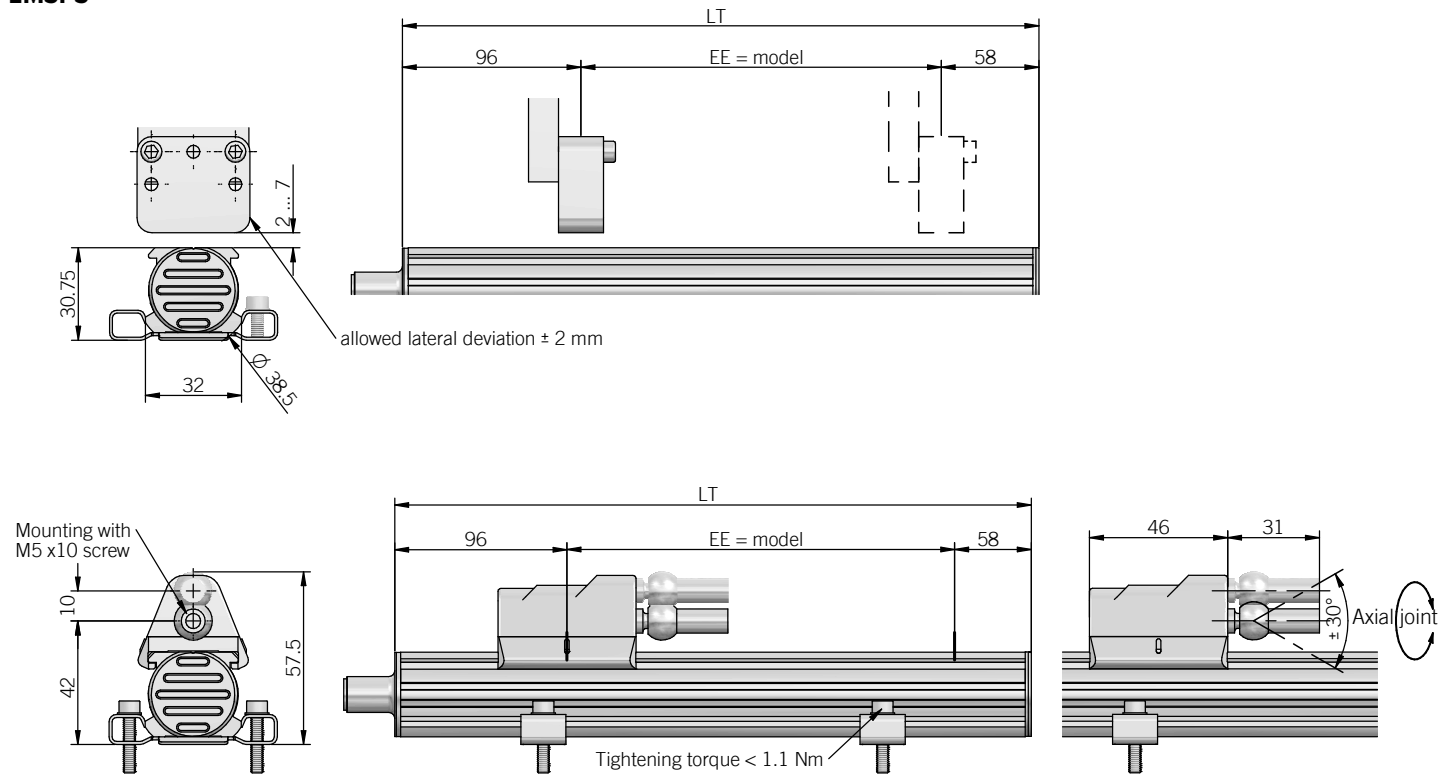
TRAVEL SPEED
max 10 m/s **10**

RESOLUTION
0,002 mm **R2**
0,005 mm **R5**
0,010 mm **R10**
0,020 mm **R20**
0,040 mm **R40**

OUTPUT TYPE
cable (standard length 1 m) **P**
DIN 45322 M16 IP40 6 pin connector **C6**
DIN 45326 M16 IP40 8 pin connector **C8**
M12 8 pin connector **S8**

OUTPUT DIRECTION
axial **A**

EMSPS



dimensions in mm

· brackets, cursors and socket connector not included, please refer to Accessories

ELECTRICAL SPECIFICATIONS

Resolution	2 - 5 - 10 - 20 - 40 μ m
Independent linearity	$\leq \pm 0,01$ % FS (min $\pm 0,060$ mm) typical with sliding cursor $\leq \pm 0,02$ % FS typical with floating cursor
Repeatability	< 0,01 mm
Hysteresis	$\leq \pm 0,005$ % FS (min 0,010 mm)
Power supply¹	10 ... 32 V DC
Power ripple	1 Vpp max
Max load current	50 mA max
Electrical interface	RS-422
SSI output code	binary or gray
Clock frequency	50 kHz ... 1 MHz
SSI monostable time (Tm)	16 μ s
SSI frame	21 / 24 / 25 bit data length
Counting direction	increase
Protection against overvoltage	yes
Protection against polarity inversion	yes
Self-resetting internal fuse	yes
Electrical insulation	500 V DC (+V DC / earth)
Cable type	twisted pair shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 75 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive

MECHANICAL SPECIFICATIONS

Stroke	50 - 100 - 150 - 200 - 250 - 300 - 350 - 400 - 450 - 500 - 600 - 700 - 800 - 900 - 1000 - 1100 - 1200 - 1300 - 1400 - 1500 mm
Electric stroke (EE)	see stroke (mm)
Overall dimensions (LT)	EE + 154 mm
Enclosure rating	IP 67 (IEC 60529)
Detected measurement	displacement
Scale orientation	increasing
Travel speed	10 m/s max
Acceleration	100 m/s ² max
Shock	100 G, 11 ms, single shot (IEC 68000-2-27)
Vibration	12 G, 10 ... 2000 Hz (IEC 68000-2-6)
Housing material	anodized aluminium / Nylon 66 G 25
Cursor type	sliding or floating cursor
Temperature coefficient	20 ppm FS / °C
Operating temperature^{2,3}	-30° ... +90°C (-22° ... +194°F)
Storage temperature³	-40° ... +100°C (-40° ... +212°F)

¹ as measured at the transducer without cable influences

² measured on transducer

³ condensation not allowed

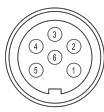
CONNECTIONS

Function	Cable P	8 pin M12 S8	6 pin M16 IP40 C6	8 pin M16 IP40 C8
+ V DC	blue / white	7	5	7
0 V	blue	6	6	6
DATA +	orange / white	2	2	2
DATA -	orange	5	1	5
CLOCK +	green / white	3	3	1
CLOCK -	green	1	4	3
NC	/	4	/	4
NC	/	8	/	8

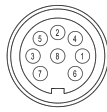
S8 connector (8 pin)
M12 A coded
front view



C6 connector (6 pin)
DIN 45322
front view

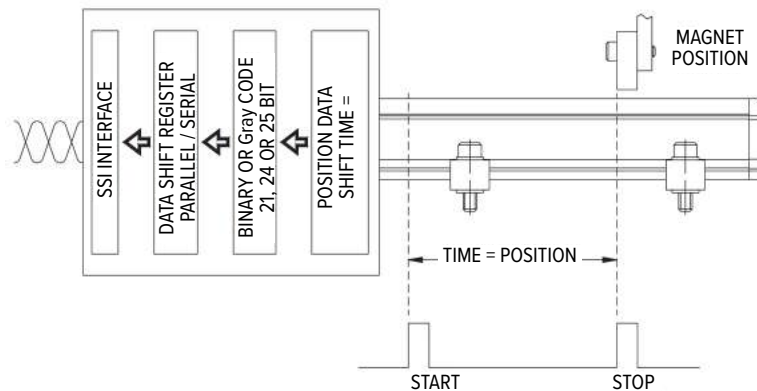


C8 connector (8 pin)
DIN 45326
front view



The transducer enclosure and cable shield have to be connected to ground on both sides.

SSI BLOCK DIAGRAM

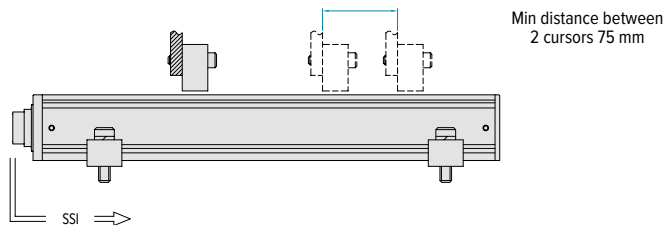


SSI output goes to 0 if the echo is absent (magnet out of measurement range or internal device error)

SSI CABLE LENGTH

Cable length	< 3 m	< 50 m	< 100 m	< 200 m	< 400 m
Baud rate	1 Mbaud	400 kbaud	300 kbaud	200 kbaud	100 kbaud

INSTALLATION EXAMPLE



For a multi-cursor model, the cursors must operate under the same conditions of distance and temperature. The cursors must be mounted on a non-magnetic material support (such as brass, aluminium or AISI316 stainless steel). The kit includes two screws, two nuts and two washers (all brass). The cursor must be installed with maximum attention to horizontal alignment with the transducer axis (maximum tolerance ± 2 mm), the distance from the transducer surface must be within the range of 2 to 7 mm.

MAIN CHARACTERISTICS

EMSSA is an absolute linear magnetostrictive transducer with analogue output. The main characteristic of magnetostrictive transducers is the absence of electrical contact on the housing, there is no problem of wear and deterioration during working life, guaranteeing high displacement speed and precision. High reliability and ease of installation, even in applications with mechanical stresses, shocks or high levels of contamination, are ensured by the compact size and robust housing. This series is designed for internal mounting in high pressure applications (350 bar, 500 bar peak) such as hydraulic or pneumatic cylinders.

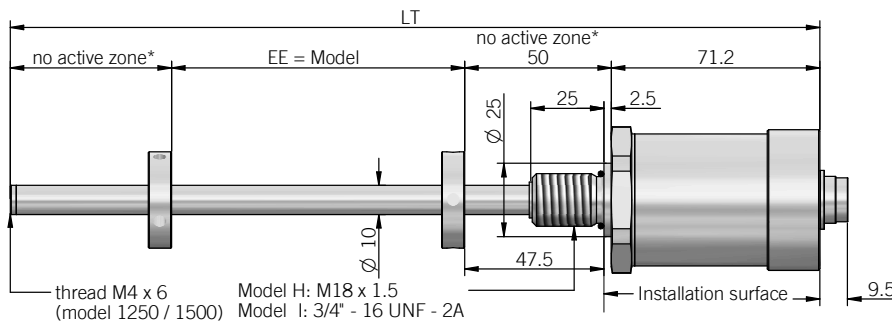


ORDERING CODE

EMSSA 500 S 10 H 10 P A

SERIES linear magnetostrictive transducer with analogue output EMSSA							
STROKE mm from 50 to 1500 see table for stroke availability							
ENCLOSURE RATING IP 67 S							
OUTPUT SIGNAL 0 ... 10 V DC 10 4 ... 20 mA 20							
THREAD TYPE M18 x 1,5 H 3/4" - 16 UNF I							
DISPLACEMENT SPEED max 10 m/s 10							
OUTPUT TYPE cable (standard length 1 m) P DIN 45322 M16 IP40 6 pin connector C6							
OUTPUT DIRECTION axial A							

EMSSA



* = 55 mm up to stroke 1000 mm, from 1250 mm consider 60 mm due to M4 threaded hole

dimensions in mm

- OR 15,4 x 2,1 (mod.H) / OR 16,36 x 2,21 (mod.I) included
- Cursors and socket connector not included, please refer to Accessories

ELECTRICAL SPECIFICATIONS	
Resolution	16 bit (max electrical noise 5 mVpp)
Output signal	0 ... 10 V DC 4 ... 20 mA
Output alarm value	10,5 V DC 21 mA
Output value max	12 V DC 30 mA
Power supply¹	19,2 ... 28,8 V DC
Power ripple	1 Vpp max
Current consumption	70 mA max 90 mA max
Output load	5 kΩ < 500 Ω
Output ripple	< 5 mVpp
Independent linearity	± 0,02 % FS (min ± 0,060 mm)
Repeatability	< 0,01 mm
Hysteresis	< 0,01 mm
Sampling time	0,5 ms (mod. 50 ... 200) 1 ms (mod. 400 ... 1000) 1,5 ms (mod. 1250 ... 1500)
Protection against overvoltage	yes
Protection against polarity inversion	yes
Protection against power supply on output	yes
Electrical insulation	500 V DC
Cable type	shielded - fixed installation conductors section 0,25 mm ² / AWG 24 bending radius min 40 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive

MECHANICAL SPECIFICATIONS	
Stroke	50 - 100 - 150 - 200 - 250 - 300 - 350 - 400 - 450 - 500 - 600 - 700 - 800 - 900 - 1000 - 1250 - 1500 mm
Electric stroke (EE)	see stroke (mm)
Overall dimensions (LT)	EE + 176,2 mm (mod. 50 ... 900) EE + 181,2 mm (mod. 1000 ... 1500)
Enclosure rating	IP 67 (IEC 60529)
Detected measurement	displacement
Travel speed	10 m/s max
Acceleration	100 m/s ² max
Speed measurement range	0 ... 10 m/s
Speed accuracy	< 2 %
Shock	100 G, 11 ms, single shock (IEC 60068-2-27)
Vibration	12 G, 10 ... 2000 Hz (IEC 680068-2-6)
Rod / housing material	1.4401 / AISI 316 stainless steel
Operative pressure	350 bar (500 bar peak)
Cursor type	floating cursor
Temperature coefficient	± 0,01 % FS / °C
Operating temperature^{2,3}	-30° ... +75°C (-22° ... +167°F)
Storage temperature³	-40° ... +100°C (-40° ... +212°F)

¹ as measured at the transducer without cable influences

² measured on transducer

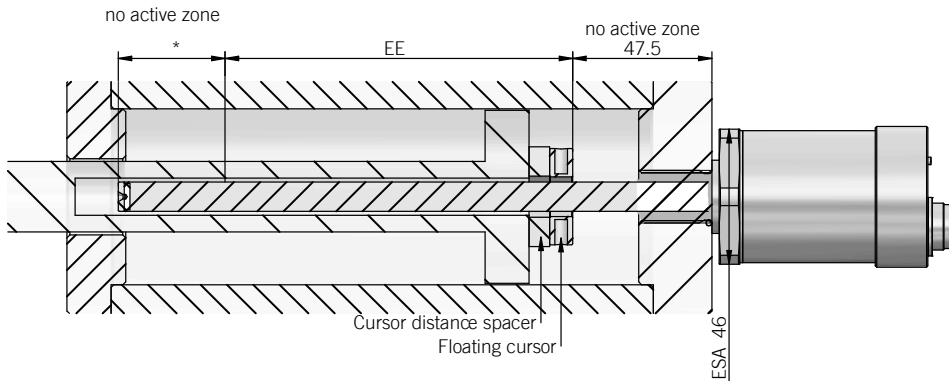
³ condensation not allowed

CONNECTIONS		
Function	Cable P	6 pin M16 IP40 C6
+ V DC	brown	5
0 V	white	6
Output cursor 1 0 ... 10 V 4 ... 20 mA	grey	1
0 V cursor 1	pink	2
Inverse output cursor 1 10 ... 0 V 20 ... 4 mA	yellow	3
0 V inverse output cursor 1	pink	4

C6 connector (6 pin)
DIN 45322
front view



INSTALLATION EXAMPLE



* = 55 mm up to stroke 1000 mm, from 1250 mm consider 60 mm due to M4 threaded hole

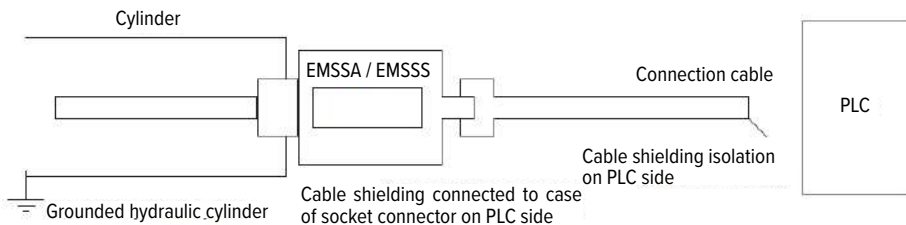
For correct installation of rod-type magnetostrictive transducers in hydraulic cylinders, remember that the cylinder head must be made of non-magnetic material where the threaded hole will be drilled to install the transducer. If not, the residual magnetisation caused by drilling the threaded hole must be less than 4 Gauss. The sealing surface must be free of longitudinal or helical scratches.

Ro 1,6 μm for sealing with non pulsating pressure
Ro 0,8 μm for seals with pulsating pressure

Suggested o-ring (model H)
Parker 6-349 15,4 x 2,1
Material: Viton 90° Shore A
Mixes: Parker N552-90

Suggested o-ring (model I)
Parker 3-908 16,36 x 2,21
Material: Viton 90° Shore A
Mixes: Parker N552-90

ELECTRICAL CONNECTION EXAMPLE



The transducer must be installed away from sources of magnetic fields, both static and 50 Hz (electric motors, solenoids, etc.).

- in the case of a floating cursor, the support must be made of non-magnetic material.
- the transducer connection cable must be wired separately from power cables and/or solenoid controls, drives, or remote switches
- power must be supplied from a dedicated power supply and connected directly to power terminals as close as possible
- as the transducer cursor is a magnet, make sure there are no iron filings or small fragments of magnetic metal near the transducer. This could produce an accumulation of material on the cursor, resulting in sliding problems
- if the transducer is installed in a cylinder that is isolated from the ground, the cable shield on PLC side must be grounded
- with multiple cursors (two or more), the cursors distance must be at least minimum 75 mm each

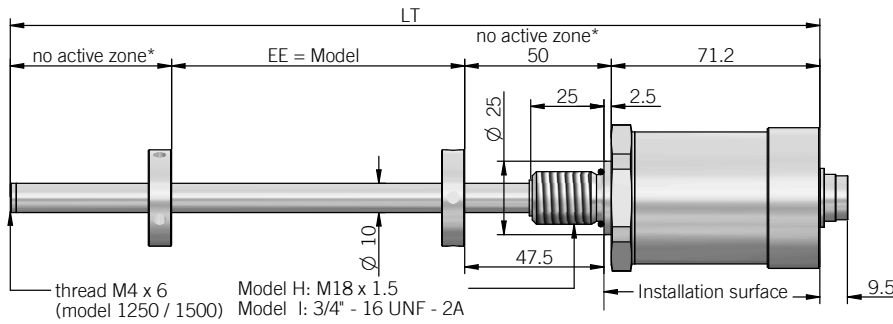
MAIN CHARACTERISTICS

EMSSA is an absolute linear magnetostrictive transducer with SSI output. The main characteristic of magnetostrictive transducers is the absence of electrical contact on the housing, there is no problem of wear and deterioration during working life, guaranteeing high displacement speed and precision. High reliability and ease of installation, even in applications with mechanical stresses, shocks or high levels of contamination, are ensured by the compact size and robust housing. This series is designed for internal mounting in high pressure applications (350 bar, 500 bar peak) such as hydraulic or pneumatic cylinders.



ORDERING CODE	EMSSS	500	S	24	G	H	10	R5	P	A
linear magnetostrictive transducer with SSI output	SERIES EMSSS									
	STROKE mm from 100 to 1500 see table for stroke availability									
	ENCLOSURE RATING IP 67	S								
	DATA LENGTH (FM357)			21 bit	24 bit	25 bit				
	CODE TYPE binary gray				B	G				
	THREAD TYPE M18 x 1,5 3/4" - 16 UNF					H	I			
	DISPLACEMENT SPEED max speed						10			
	RESOLUTION 0,005 mm 0,010 mm 0,020 mm 0,040 mm							R5 R10 R20 R40		
	OUTPUT TYPE cable (standard length 1 m) DIN 45322 M16 IP40 6 pin connector								P C6	
	OUTPUT DIRECTION axial									A

EMSSS



* = 55 mm up to stroke 1000 mm, from 1250 mm consider 60 mm due to M4 threaded hole

dimensions in mm

- OR 15,4 x 2,1 (mod.H) / OR 16,36 x 2,21 (mod.I) included
- Cursors and socket connector not included, please refer to Accessories

ELECTRICAL SPECIFICATIONS	
Resolution	5 - 10 - 20 - 40 μ m
Independent linearity	$\leq \pm 0,02$ % FS (min $\pm 0,060$ mm)
Repeatability	< 0,01 mm
Hysteresis	$\leq \pm 0,005$ % FS (min 0,010 mm)
Sampling time	1 ms (mod. 100 ... 1000) 2 ms (mod. 1250 ... 1500)
Power supply¹	10 ... 32 V DC
Power ripple	1 Vpp max
Max load current	50 mA max
Electrical interface	RS-422
SSI output code	binary or gray
Clock frequency	50 kHz ... 1 MHz
SSI monostable time (Tm)	16 μ s
SSI frame	21 / 24 / 25 bit data length
Counting direction	increase
Protection against overvoltage	yes
Protection against polarity inversion	yes
Self-resetting internal fuse	yes
Electrical insulation	500 V DC (+V DC / earth)
Cable type	twisted pair shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 75 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive

MECHANICAL SPECIFICATIONS	
Stroke	100 - 150 - 200 - 300 - 400 - 450 - 500 - 600 - 700 - 800 - 900 - 1000 - 1250 - 1500 mm
Electric stroke (EE)	see model (mm)
Overall dimensions (LT)	EE + 176,2 mm (mod. 100 ... 1000) EE + 181,2 mm (mod. 1250 ... 1500)
Enclosure rating	IP 67 (IEC 60529)
Detected measurement	displacement
Travel speed	10 m/s max
Acceleration	100 m/s ² max
Speed measurement range	min 0 ... 0,1 m/s max 0 ... 10 m/s
Speed accuracy	< 2 %
Shock	100 G, 11 ms, single shock (IEC 60068-2-27)
Vibration	12 G, 10 ... 2000 Hz (IEC 680068-2-6)
Rod / housing material	1.4401 / AISI 316 stainless steel
Operative pressure	500 bar
Cursor type	floating cursor
Temperature coefficient	20 ppm FS / °C
Operating temperature^{2,3}	-30° ... +90°C (-22° ... +194°F)
Storage temperature³	-40° ... +100°C (-40° ... +212°F)

¹ as measured at the transducer without cable influences

³ measured on transducer

⁴ condensation not allowed

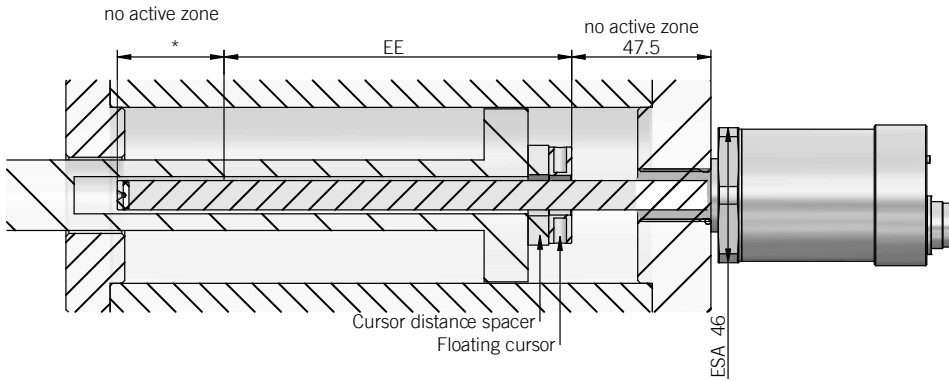
CONNECTIONS

Function	Cable P	6 pin M16 IP40 C6
+ V DC	blue / white	5
0 V	blue	6
DATA +	brown / white	2
DATA -	orange	1
CLOCK +	green / white	3
CLOCK -	green	4

C6 connector (6 pin)
DIN 45322
front view



INSTALLATION EXAMPLE



* = 55 mm up to stroke 1000 mm, from 1250 mm consider 60 mm due to M4 threaded hole

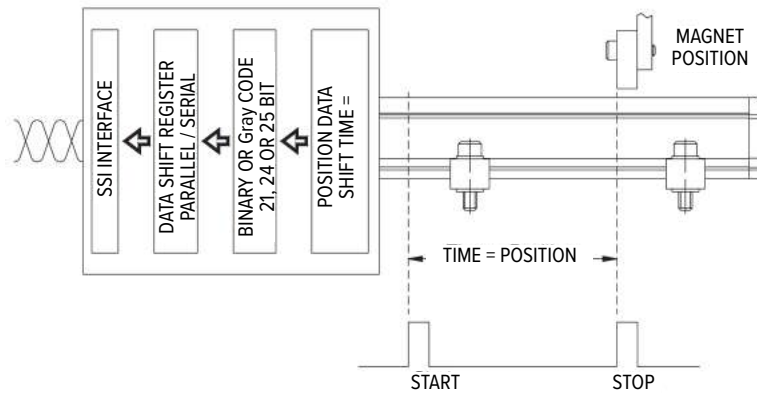
For correct installation of rod-type magnetostrictive transducers in hydraulic cylinders, remember that the cylinder head must be made of non-magnetic material where the threaded hole will be drilled to install the transducer. If not, the residual magnetisation caused by drilling the threaded hole must be less than 4 Gauss. The sealing surface must be free of longitudinal or helical scratches.

Ro 1,6 µm for sealing with non pulsating pressure
 Ro 0,8 µm for seals with pulsating pressure

Suggested o-ring (model H)
 Parker 6-349 15,4 x 2,1
 Material: Viton 90° Shore A
 Mixes: Parker N552-90

Suggested o-ring (model I)
 Parker 3-908 16,36 x 2,21
 Material: Viton 90° Shore A
 Mixes: Parker N552-90

SSI BLOCK DIAGRAM



SSI output goes to 0 if the echo is absent (magnet out of measurement range or internal device error)

SSI CABLE LENGTH

Cable length	< 3 m	< 50 m	< 100 m	< 200 m	< 400 m
Baud rate	1 Mbaud	400 kbaud	300 kbaud	200 kbaud	100 kbaud

INSTALLATION NOTES

The transducer must be installed away from sources of magnetic fields, both static and 50 Hz (electric motors, solenoids, etc.).

- in the case of a floating cursor, the support must be made of non-magnetic material.
- the transducer connection cable must be wired separately from power cables and/or solenoid controls, drives, or remote switches
- power must be supplied from a dedicated power supply and connected directly to power terminals as close as possible
- as the transducer cursor is a magnet, make sure there are no iron filings or small fragments of magnetic metal near the transducer. This could produce an accumulation of material on the cursor, resulting in sliding problems
- if the transducer is installed in a cylinder that is isolated from the ground, the cable shield on PLC side must be grounded
- with multiple cursors (two or more), the cursors distance must be at least minimum 75 mm each



OTHER PRODUCTS

Special products for different application's needs.

In addition to the wide variety of incremental, absolute, and linear transducers, Eltra also provides tailored products and adaptation boards to meet the specific requirements of factory automation applications.



EC 34	incremental encoder for rack	276
RH 200 A / B / C	measuring wheel	279
RL - RM 500 A / B / C	measuring wheel	281
EP A	rotary potentiometer	284
EMB / EMBO	signal splitter	286

MAIN FEATURES

Rack and pinion encoder with automatic slack recovery. Compared to an incremental linear system, this type of encoder greatly simplifies linear measurements and overcomes measurement problems over long distances.

The encoder is inside a solid aluminium body and incorporate a preload system that allows automatic slack recovery between the rack and pinion.

- 3 channel encoder (A / B / Z) up to 2500 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 220 kHz
- Cable or connector output



ORDERING CODE

EC 34A 500 S 5/28 P 10 M .162 +XXX

SERIES
encoder for rack **EC**

MODEL
flange **34A**

RESOLUTION
ppr **100 ... 2500**
refer to the available pulses list

ZERO PULSE
without zero pulse **S**
with zero pulse **Z**

POWER SUPPLY
(with L electrical interface) 5 V DC **5**
5 ... 28 V DC **5/28**

ELECTRICAL INTERFACE
NPN open collector **C**
push-pull **P**
line driver **L**
power supply 5/28 V DC - output RS-422 **RS**

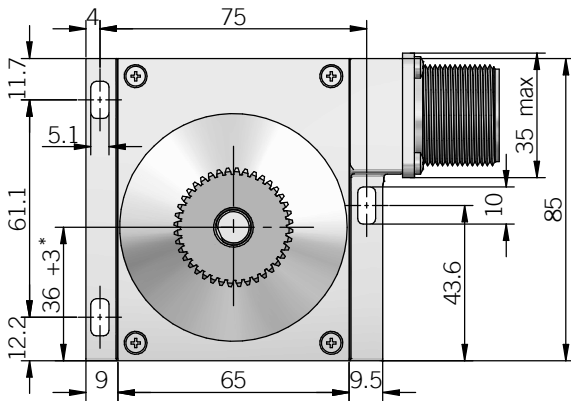
SHAFT DIAMETER
mm **10**

OUTPUT TYPE
cable (standard length 1,5 m) **P**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after output type
MIL plug connector **M**
JIS-C-5432 IP40 plug connector **J**

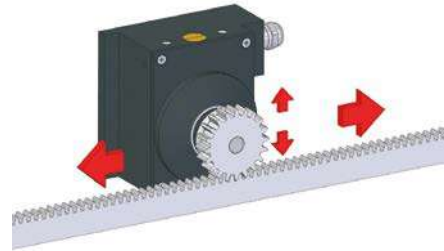
SOCKET
socket not included **.162**
to be reported only with connector output (eg. M.162), for socket see Accessories

VARIANT
custom version **XXX**

34A



* can be adjusted to 37.5 ± 1.5 mm



for cogged wheel please refer to Accessories
dimensions in mm

ELECTRICAL SPECIFICATIONS	
Resolution	from 100 to 2500 ppr
Power supply¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	220 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF_d)³ according to EN ISO 13849-1	263 years
Mission time (T_m)³	20 years
Diagnostic coverage (DC)³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

RESOLUTIONS

100 - **200** - 300 - 360 - 400 - **500** - 512 - 600 - 720 - **1000** - 1024 - 1200 - 1440 - **2000** - 2048 - 2500

please directly contact our offices for other pulses, preferred resolutions in bold

MECHANICAL SPECIFICATIONS	
Shaft diameter	ø 10 mm
Enclosure rating	IP 64 (IEC 60529)
Max rotation speed	3000 rpm
Max shaft load⁴	200 N (45 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Starting torque (at +20°C / +68°F)	< 0,06 Nm (8,50 Ozin)
Housing material	painted aluminum
Shaft material	stainless steel
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature^{5,6}	-20° ... +70°C (-4° ... +158°F)
Storage temperature⁶	-25° ... +70°C (-4° ... +158°F)
Weight	700 g (24,69 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ maximum load for static usage

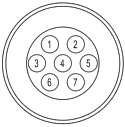
⁵ measured on the transducer flange

⁶ condensation not allowed

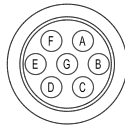
CONNECTIONS

Function	Cable C / P	Cable L / RS	7 pin J C / P	7 pin J L / RS no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L / RS with Zero	10 pin M L / RS with Zero
+V DC	red	red	6	4	F	D	4 - 5	D - E
0 V	black	black	1	6	A	F	6	F
A+	green	green	3	1	C	A	1	A
A-	/	brown or grey	/	3	/	C	7	G
B+	yellow	yellow	5	2	E	B	2	B
B-	/	orange	/	5	/	E	8	H
Z+	blue	blue	4	/	D	/	3	C
Z-	/	white	/	/	/	/	9	I
⏏	shield	shield	7	7	G	G	10	J

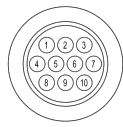
J connector (7 pin)
JIS-C-5432 IP40 Size 16
front view



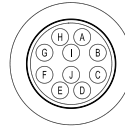
M connector (7 pin)
Amphenol MS3102-E-16-S
front view



J connector (10 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (10 pin)
Amphenol MS3102-E-18-1
front view



MAIN FEATURES

Series of measuring wheels designed for specific industrial applications where it is necessary to measure a linear movement (i.e. continuous sheet cutting machines for wood, textiles, glass, etc.). The body is made entirely of aluminium and is mounted by means of an oscillating arm pivoted on the shaft. The weight of the metric wheel maintains a stable contact with the material, allowing accurate measurement of both length and speed. The wheel surface can be in cross-knurled aluminium, special anti-oil or anti-slip rubber.

- 3 channel encoder (A / B / Z) up to 1024 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 105 kHz
- Compact size
- Cable output, connectors available at cable end



ORDERING CODE

RH200 A 500 S 5/28 P 8 X 3 PR .XXX

MODEL
200 mm measuring wheel RH200

WHEEL SURFACE
smooth A
knurled B
rubberized C
without wheel /

RESOLUTION
ppr from 50 to 1024
refer to the available pulses list

ZERO PULSE
without zero pulse S
with zero pulse Z

POWER SUPPLY
(with L electrical interface) 5 V DC 5
5 ... 28 V DC 5/28

ELECTRICAL INTERFACE
NPN open collector C
push-pull P
line driver L
power supply 5/28 V DC - output RS-422 RS

SHAFT DIAMETER
mm 8

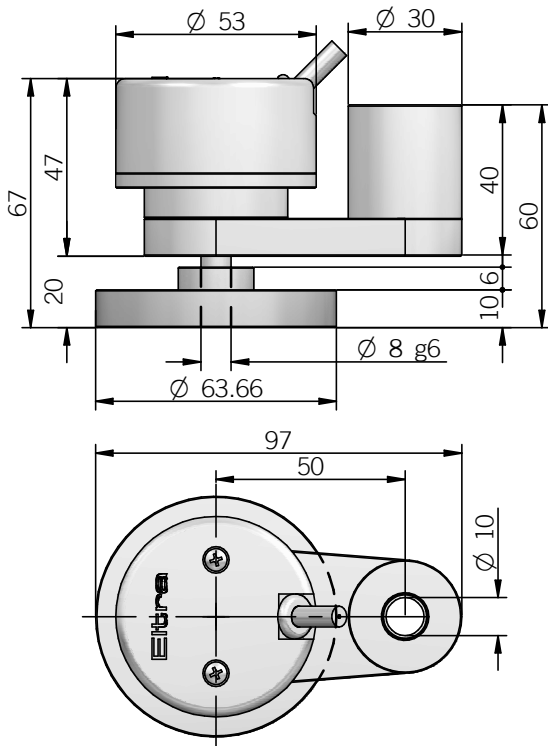
ENCLOSURE RATING
IP 54 X

MAX ROTATION SPEED
3000 rpm 3

OUTPUT TYPE
cable (standard length 0,5 m) PR
preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)

VARIANT
custom version XXX

RH200



dimensions in mm

ELECTRICAL SPECIFICATIONS

Resolution	from 50 to 1024 ppr
Power supply ¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Current consumption without load	100 mA max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface ²	NPN open collector (AEC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	105 kHz
Counting direction	A leads B clockwise (shaft view)
Index signal	90°e (gated A&B)
Mean time to dangerous failure (MTTF)_d ³ according to EN ISO 13849-1	244 years
Mission time (T_m) ³	20 years
Diagnostic coverage (DC) ³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

CONNECTIONS

Function	Cable C / P	Cable L / RS
+V DC	red	red
0 V	black	black
A+	green	green
A-	/	brown or grey
B+	yellow	yellow
B-	/	orange
Z+	blue	blue
Z-	/	white
⏏	shield	shield

RESOLUTIONS

50* - **100** - 200 - 250 - 400 - **500** - 512 - **1000** - **1024**

*available without zero pulse

please directly contact our offices for other pulses, preferred resolutions in bold

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 8 mm
Enclosure rating	IP 54 (IEC 60529)
Max rotation speed	3000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Starting torque (at +20°C / +68°F)	< 0,01 Nm (1,42 Ozin)
Bearing stage material	aluminum
Housing material	PA66 glass fiber reinforced
Shaft material	stainless steel
Support material	aluminum
Wheel material	aluminum
Surface material	Smooth / Knurled = aluminium Rubberized = Nitrile NBR 80 ± 5 Shore A
Bearings	n.2 ball bearings
Bearings life	10 ⁹ revolutions
Operating temperature ^{4, 5}	-10° ... +70°C (+14° ... +158°F)
Storage temperature ⁵	-25° ... +70°C (-13° ... +158°F)
Encoder + support weight	250 g (8,82 oz)
Wheel weight	90 g (3,17 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

⁴ measured on the transducer flange

⁵ condensation not allowed

MAIN FEATURES

Series of measuring wheels designed for specific industrial applications where it is necessary to measure a linear movement (i.e. continuous sheet cutting machines for wood, textiles, glass, etc.). The body is made entirely of aluminium and is mounted by means of an oscillating arm pivoted on the shaft. The weight of the metric wheel maintains a stable contact with the material, allowing accurate measurement of both length and speed. The wheel surface can be in cross-knurled aluminium, special anti-oil or anti-slip rubber.

- 3 channel encoder (A / B / Z) up to 10000 ppr
- Power supply up to +30 V DC with various electrical interfaces available
- Output frequency up to 500 kHz
- Model RM with internal coupling
- Cable or connector output



ORDERING CODE

RL500 A 500 S 5/28 P 10 X 3 M R .162 +XXX

MODEL
500 mm measuring wheel - RL series **RL500**
500 mm measuring wheel - RM series **RM500**

WHEEL SURFACE
smooth **A**
knurled **B**
rubberized **C**
without wheel /

RESOLUTION
(mod. RL) ppr from 10 to 2500
(mod. RM) ppr from 1 to 10000
refer to the available pulses list

ZERO PULSE
without zero pulse **S**
with zero pulse **Z**

POWER SUPPLY
(with L electrical interface) 5 V DC **5**
5 ... 28 V DC **5/28**

ELECTRICAL INTERFACE
NPN open collector **C**
push-pull **P**
line driver **L**
power supply 5/28 V DC - output RS-422 **RS**

SHAFT DIAMETER
mm **10**

ENCLOSURE RATING
IP 64 **X**
IP 66 **S**

MAX ROTATION SPEED
3000 rpm **3**

OUTPUT TYPE
cable (standard length 1,5 m) **P**
preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)
MIL plug connector **M**
JIS-C-5432 IP40 plug connector **J**
M12 plug connector **M12**
M23 plug connector **H**
M16 IP40 plug connector **C**

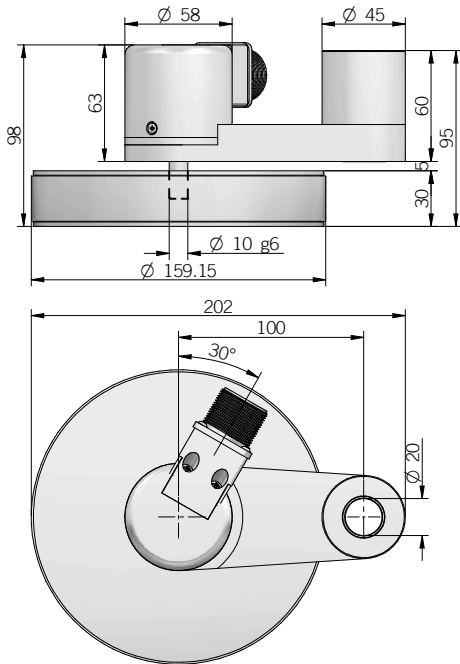
DIRECTION TYPE
axial **A**
radial **R**

SOCKET
socket not included **.162**

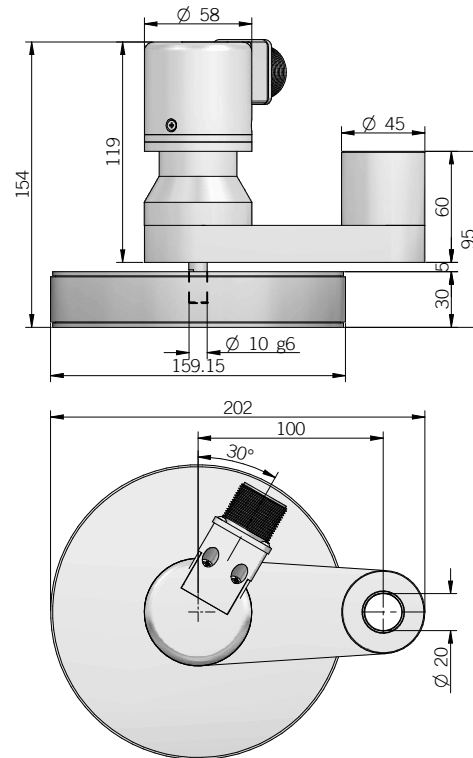
to be reported only with connector output (eg. M12R.162), for socket see Accessories

VARIANT
custom version **XXX**

RL500



RM500



dimensions in mm

ELECTRICAL SPECIFICATIONS	
Resolution	from 1 to 10000 ppr
Power supply ¹	5 = 4,5 ... 5,5 V DC 5/28 = 4,5 ... 30 V DC (reverse polarity protection)
Power draw without load	0,8 W max
Max load current	C / P = 50 mA / channel L / RS = 20 mA / channel
Electrical interface ²	NPN open collector (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) line driver RS-422 (AELT-5000 or similar)
Max output frequency	250 kHz up to 6000 ppr / 500 kHz from 7200 ppr
Counting direction	A leads B clockwise (shaft view)
Index signal	180°e (gated A)
Mean time to dangerous failure (MTTF) ³ according to EN ISO 13849-1	200 years
Mission time (Tm) ³	20 years
Diagnostic coverage (DC) ³	0%
Cable type	shielded - fixed installation conductors section 0,22 mm ² / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

RL SERIES RESOLUTIONS
10 - 20 - 50 - 100 - 150 - 200 - 250 - 300 - 360 - 400 - 500 - 512 - 600 - 720 - 1000 - 1024 - 1200 - 1440 - 2000 - 2048 - 2500

RM SERIES RESOLUTIONS
1 - 2 - 4 - 5 - 10 - 15 - 16 - 20 - 25 - 30 - 32 - 40 - 50 - 60 - 70 - 80 - 90 - 100 - 120 - 128 - 150 - 200 - 240 - 250 - 256 - 300 - 360 - 400 - 480 - 500 - 512 - 600 - 625 - 720 - 750 - 800 - 900 - 1000 - 1024 - 1200 - 1250 - 1440 - 1500 - 1600 - 1800 - 2000 - 2048 - 2500 - 3000 - 3600 - 4000 - 4096 - 5000 - 6000 - 7200 - 8000 - 8192 - 9000 - 10000

please directly contact our offices for other pulses, preferred resolutions in bold

MECHANICAL SPECIFICATIONS	
Shaft diameter	ø 10 mm
Enclosure rating IEC 60529	X = IP 64 S = IP 66
Max rotation speed	3000 rpm
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin) with X enclosure rating < 0,06 Nm (8,50 Ozin) with S enclosure rating
Bearing stage material	aluminum
Housing material	PA66 glass fiber reinforced
Shaft material	stainless steel
Support material	aluminum
Wheel material	aluminum
Surface material	Smooth / Knurled = aluminium Rubberized = PUR 50 ± 7 Shore A
Bearings	n.2 ball bearings n.2 ball bearings on support (mod. RM)
Bearings life	10 ⁹ revolutions
Operating temperature ^{4, 5}	-10° ... +70°C (+14° ... +158°F)
Storage temperature ⁵	-25° ... +70°C (-13° ... +158°F)
Encoder + support weight	1000 g (35,27 oz)
Wheel weight	mod. A/B 900 g (31,75 oz) mod. C with rubber belt 850g (30 oz)

¹ as measured at the transducer without cable influences

² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

³ this product is not a safety component, for further details refer to TECHNICAL BASICS section

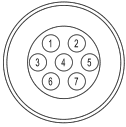
⁴ measured on the transducer flange

⁵ condensation not allowed

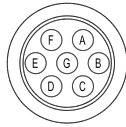
CONNECTIONS

Function	Cable C / P	Cable L / RS	7 pin J C / P	7 pin J L / RS no Zero	7 pin M C / P	7 pin M L / RS no Zero	10 pin J L / RS with Zero	10 pin M L / RS with Zero	5 pin M12 C / P	8 pin M12 L / RS	12 pin H	5 pin C C / P	8 pin C L / RS
+V DC	red	red	6	4	F	D	4 - 5	D - E	2	7	12	5	7
0 V	black	black	1	6	A	F	6	F	4	1	10	1	8
A+	green	green	3	1	C	A	1	A	3	6	5	2	1
A-	/	brown or grey	/	3	/	C	7	G	/	5	6	/	2
B+	yellow	yellow	5	2	E	B	2	B	1	4	8	4	3
B-	/	orange	/	5	/	E	8	H	/	3	1	/	4
Z+	blue	blue	4	/	D	/	3	C	5	2	3	3	5
Z-	/	white	/	/	/	/	9	I	/	8	4	/	6
⏏	shield	shield	7	7	G	G	10	J	/	/	9	/	/

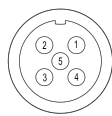
J connector (7 pin)
JIS-C-5432 IP40 Size 16
front view



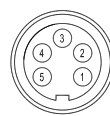
M connector (7 pin)
Amphenol MS3102-E-16-S
front view



M12 connector (5 pin)
M12 A coded
front view



C connector (5 pin)
Amphenol C091 M16 IP40
front view



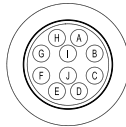
H connector (12 pin) - M23 CCW
Hummel 7.410.000000 - 7.002.912.603
front view



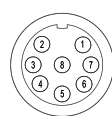
J connector (10 pin)
JIS-C-5432 IP40 Size 16
front view



M connector (10 pin)
Amphenol MS3102-E-18-1
front view



M12 connector (8 pin)
M12 A coded
front view



C connector (8 pin)
Amphenol C091 IP40 IEC 60130-9
front view



MAIN FEATURES

Encoder with potentiometric output signal.
The rotary potentiometer is mounted in a robust housing and is supported by two ball bearings.
This ensures excellent life, speed and accuracy.

- Singleturn or multiturn models available
- Cable output, connectors available at cable end
- Mounting by flange

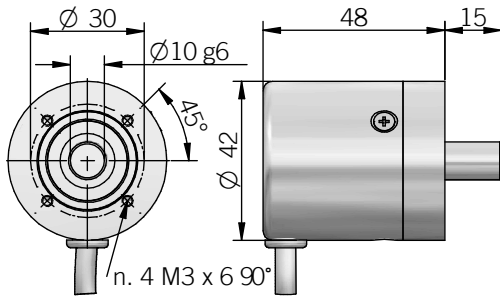


ORDERING CODE

EP A 103/10 P R .XXX

SERIES rotary potentiometer EP					
MODEL fixing flange screw holes ø 30 mm A					
RESISTIVE VALUE 1k ohm / 1 turn 102/1 5k ohm / 1 turn 502/1 10k ohm / 1 turn 103/1 5k ohm / 3 turns 502/3 10k ohm / 3 turns 103/3 1k ohm / 10 turns 102/10 5k ohm / 10 turns 502/10 10k ohm / 10 turns 103/10					
OUTPUT TYPE cable (standard length 1,5 m) P preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5)					
DIRECTION TYPE axial A radial R					
VARIANT custom version XXX					

A



recommended mating shaft tolerance H7
dimensions in mm

GENERAL SPECIFICATION

Model	Resistive value (Ohm)	Mechanical rotation	Electrical rotation	Element technology	Tolerance	Linearity	Minimum resistance (Ohm)	Power rating (70 °C)	Life (shaft revolutions)	Vibration
102/1	1 k	320 ± 5°	same as mech	conductive plastic	10 %	±1%	0,2 %	1 W	10'000'000	15 G, 10 ... 150 Hz
102/10	1 k	3600 +10° -0°	same as mech	wirewound	5 %	±0,25 %	1	2 W	1'000'000	15 G, 10 ... 2000 Hz
502/1	5 k	320 ± 5°	same as mech	conductive plastic	10 %	±1%	0,2 %	1 W	10'000'000	15 G, 10 ... 150 Hz
502/3	5 k	1080 +10° -0°	same as mech	wirewound	5 %	±0,25 %	1	1 W	300'000	15 G, 10 ... 2000 Hz
502/10	5 k	3600 +10° -0°	same as mech	wirewound	5 %	±0,25 %	1	2 W	1'000'000	15 G, 10 ... 2000 Hz
103/1	10 k	300 ± 5°	270 ± 10°	cermet	10 %	±5 %	4	1 W	50'000	10 G, 10 ... 150 Hz
103/3	10 k	1080 +10° -0°	same as mech	wirewound	5 %	±0,25 %	1	1 W	300'000	15 G, 10 ... 2000 Hz
103/10	10 k	3600 +10° -0°	same as mech	wirewound	5 %	±0,25 %	1	2 W	1'000'000	15 G, 10 ... 2000 Hz

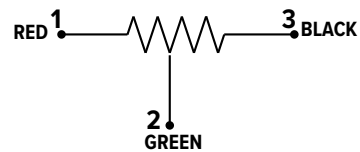
MECHANICAL SPECIFICATIONS

Shaft diameter	ø 10 mm
Enclosure rating	IP 54 (IEC 60529)
Shock	50 G, 11 ms
Vibration	see table
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	PA 66 glass fiber reinforced
Bearings	n.2 ball bearings
Limit stop	automatic clutch (no stop)
Cable type	shielded - fixed installation conductors section 0,22 mm ² /AWG 24 bending radius min 60 mm
Operating temperature ^{1,2}	0° ... +80°C (+32° ... +176°F)
Storage temperature ²	-25° ... +85°C (-13° ... +185°F)
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

¹ measured on the transducer flange

² condensation not allowed

ELECTRICAL CONNECTIONS



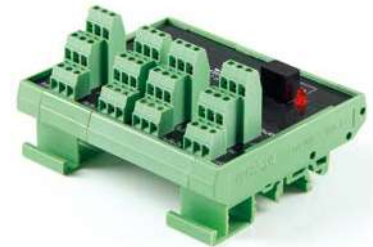
MAIN FEATURES

This board is used when it is necessary to adapt the electronic characteristics of the encoder to those of the control. **The main functions of the EMB / EMBO are to split the output signal and to adapt the output stages.** For example, with the EMB an encoder with a 5 V DC output can be connected to a control that only accepts 24 V DC inputs. Or an encoder can be connected to a control with the same power supply but different electronics. It can solve a wide range of problems: check the ordering code for more information.

The board can support up to two different voltages and must be supplied through connector X4, using the higher voltage. It is also possible to obtain up to 8 outputs from the same input by mounting several boards on a single support, in order to drastically reduce the wiring.

In this case, the ordering code includes information about all the outputs.

For example, a board with one 5 V DC NPN input and eight 5 V DC line driver outputs has the following ordering code **EMB5N5L5L5L5L5L5L5L**.



ORDERING CODE	EMB	*O	5	L	8/24	P	8/24	P	.2V	.XXX
SERIES signal splitter EMB										
INPUT OPTION * add for optically isolated input O										
INPUT VOLTAGE X1 CONNECTOR 5 V DC 5 (mod. EMB) 8 ... 24 V DC 8/24 (mod. EMBO) 24 V DC 24										
INPUT ELECTRONICS X1 CONNECTOR (mod. EMB) NPN N (mod. EMB) NPN open collector C push-pull P line driver L (mod. EMB) PNP R										
OUTPUT VOLTAGE (OUT1) X2 CONNECTOR 5 V DC 5 (mod. EMB) 8 ... 24 V DC 8/24 (mod. EMBO) 24 V DC 24										
OUTPUT ELECTRONICS (OUT1) X2 CONNECTOR (mod. EMB) NPN N (mod. EMB) NPN open collector C push-pull P line driver L										
OUTPUT VOLTAGE (OUT2) X3 CONNECTOR 5 V DC 5 (mod. EMB) 8 ... 24 V DC 8/24 (mod. EMBO) 24 V DC 24										
OUTPUT ELECTRONICS (OUT2) X3 CONNECTOR (mod. EMB) NPN N (mod. EMB) NPN open collector C push-pull P line driver L										
VERSION version 2. .2V										
VARIANT custom version .XXX										

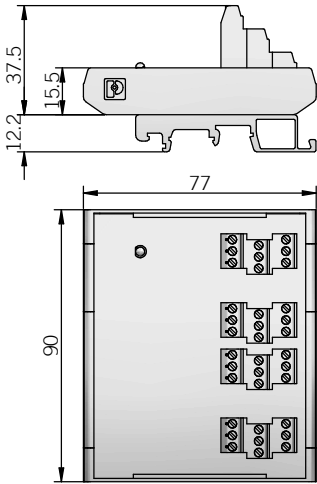
The following example may better illustrate a typical EMB application: an encoder with a 5 V DC RS-422 output must be connected to both a 24 V DC push-pull input and an instrument with a 5 V DC RS-422 input. Ordering code will be: **EMB5L8/24P5L** where

- EMB5L indicates 5 V DC line driver input on X1 connector
- EMB5L8/24P indicates 24 V DC push-pull output on X2 connector
- EMB5L8/24P5L indicates 5 V DC line driver output on X3 connector

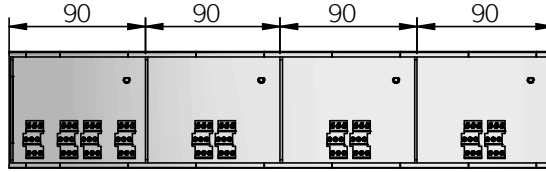
Power supply of this board is 24 V DC, because it is the highest used value, and it will be supplied through X4 connector.

EMB

Single implementation


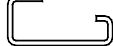


**Multiple implementation
(4 modules / 8 outputs max)**



dimensions in mm

ELECTRICAL SPECIFICATIONS	
Power supply¹	5 = 4,5 ... 5,5 V DC 8/24 = 7,6 ... 30 V DC (reverse polarity protection) 24 = 22,8 ... 25,2 V DC (reverse polarity protection)
Current consumption without load on X4	70 mA max
Supply current on X1 (for sensor power supply)	100 mA max
Max current consumption	$I_{max} = 280 + 960 + 100 = 1340$ mA considering: 4 x EMB = $70 \times 4 = 280$ mA 3 x 8 outputs (40mA each) = 960 mA 1 x input sensor supply current = 100 mA
Electrical interface² (input)	N / C / P / 8/24L / R = window comparator with hysteresis 5L = RS-422 (26LS32 or similar)
Electrical interface² (output)	NPN / NPN open coll. (AEIC-7273, pull-up max +30 V DC) push-pull / line driver HTL (AEIC-7272 or similar) 5L = line driver RS-422 (AELT-5000 or similar)
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

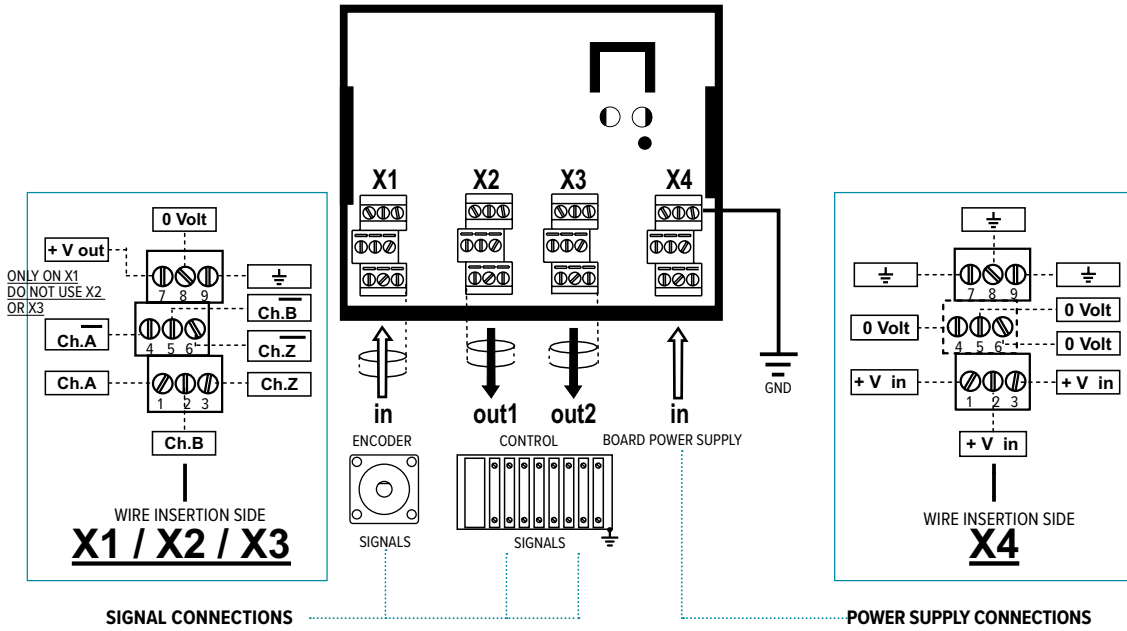
MECHANICAL SPECIFICATIONS	
Enclosure rating	IP00
Operating temperature^{3,4}	-20° ... +85°C (-4° ... +185°F)
Storage temperature⁴	-20° ... +85°C (-4° ... +185°F)
Mounting type	  DIN 46277-3 rail (Omega) DIN 46277-2 rail (Omega)
Weight	150 g (5,29 oz) (1 module)

¹ as measured at the terminal board without cable influences
² for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section
³ measured on rack
⁴ condensation not allowed

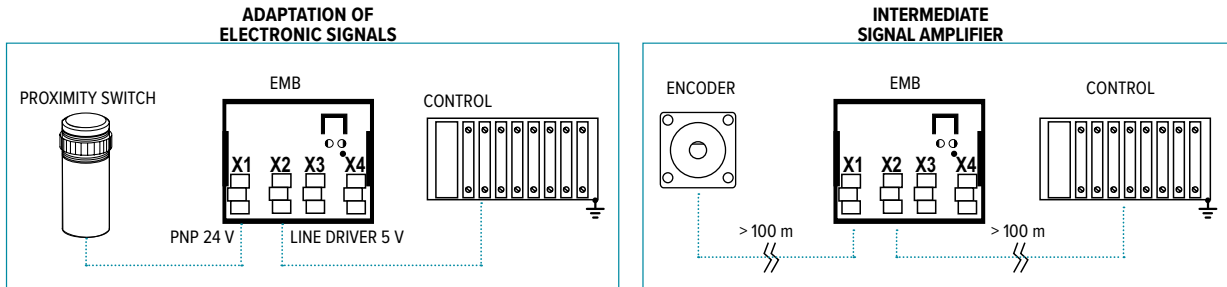
X1 INPUT ELECTRONIC SPECIFICATIONS		
Input type	Max load current (mA per channel)	Max input frequency (kHz)*
5P (TTL compatible)	15	100
5L (RS-422 compatible)	40	200
8/24P (push pull)	20	100
8/24L (line driver HTL)	20	100
8/24N (NPN)	20	10
8/24C (NPN open)	20	10
8/24R (PNP)	20	10

* depending on length and cable specs

TERMINAL BOARD CONNECTIONS



APPLICATION EXAMPLES





WWW.ELTRA.IT



ACCESSORIES

Accessories for different application's needs

From connectors to couplings, Eltra offers a comprehensive range of accessories to satisfy generic and specific application requirements.

Perfectly matching the corresponding transducers, these accessories provide the basis for a cost-effective integration within your system.



COUPLINGS	292
FOR ROTARY TRANSDUCERS	296
FOR LINEAR TRANSDUCERS	308
CABLES & PIGTAILS	312

STANDARD ELASTIC COUPLINGS

Eltra elastic couplings are essential components for the transmission of motion to the encoder shaft. The couplings are made of aluminium alloy and consist of a cylindrical body with a helical groove that provides:

- torsional rigidity
- the ability to compensate for slight shaft misalignment
- the ability to absorb axial shaft play

Elastic couplings can be supplied with different coupling diameters.

ORDERING CODE**G 25 A 6 / 8**

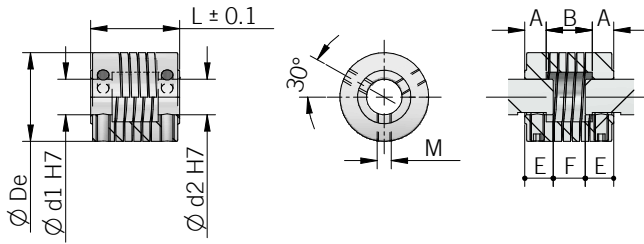
SERIES
precision elastic coupling **G**

MODEL
20 / 23 / 25 / 30
refer to the table for available P/N

SHAFT FIXING TYPE
shaft fixing with grub screw **A**

HOLE DIAMETER d1
4 ... 10 mm **6**
(DO NOT ADD IF d2 = d1) HOLE DIAMETER d2
6 ... 14 mm **8**

MECHANICAL DIMENSIONS



For proper installation it is recommended to insert shafts in the coupling observing "E" dimensions

dimensions in mm

STANDARD COUPLINGS

	P / N	Material	De	L	d1	d2	A	B	M	E	F	Torque (Nm) (Ozin)
G20A4/6	94070087	aluminium	20	20	4	6	6	8	M3	7	6	0,25 (35,40)
G20A6	94070006	aluminium	20	20	6	6	6	8	M3	7	6	0,25 (35,40)
G23A6/8	94070092	aluminium	23,5	20	6	8	6	8	M4	7	6	0,3 (42,48)
G23A6/10	94070093	aluminium	23,5	20	6	10	6	8	M4	7	6	0,3 (42,48)
G23A8/11	94070212	aluminium	23,5	20	8	11	6	8	M4	7	6	0,3 (42,48)
G23A10	94070095	aluminium	23,5	20	10	10	6	8	M4	7	6	0,3 (42,48)
G25A6	94070042	aluminium	25	25	6	6	7	11	M4	8	9	0,4 (56,64)
G25A6/8	94070024	aluminium	25	25	6	8	7	11	M4	8	9	0,4 (56,64)
G25A6/10	94070023	aluminium	25	25	6	10	7	11	M4	8	9	0,4 (56,64)
G25A8	94070026	aluminium	25	25	8	8	7	11	M4	8	9	0,4 (56,64)
G25A8/10	94070027	aluminium	25	25	8	10	7	11	M4	8	9	0,4 (56,64)
G25A8/11	94070104	aluminium	25	25	8	11	7	11	M4	8	9	0,4 (56,64)
G25A9,52	94070030	aluminium	25	25	9,52 (3/8")	9,52 (3/8")	7	11	M4	8	9	0,4 (56,64)
G25A9(H7)	94070150	aluminium	25	25	9	9	7	11	M4	8	9	0,4 (56,64)
G 25 A 10	94070012	aluminium	25	25	10	10	7	11	M4	8	9	0,4 (56,64)
G25A10/12	94070014	aluminium	25	25	10	12	7	11	M4	8	9	0,4 (56,64)
G25A11	94070067	aluminium	25	25	11	11	7	11	M4	8	9	0,4 (56,64)
G30A6	94070113	aluminium	25	30	6	6	8	14	M4	9	12	0,4 (56,64)
G30A6/8	94070037	aluminium	25	30	6	8	8	14	M4	9	12	0,4 (56,64)
G30A6/10	94070034	aluminium	25	30	6	10	8	14	M4	9	12	0,4 (56,64)
G30A6,35/14	94070197	aluminium	25	30	6,35 (1/4")	14	8	14	M4	9	12	0,4 (56,64)
G30A8	94070036	aluminium	25	30	8	8	8	14	M4	9	12	0,4 (56,64)
G30A10	94070051	aluminium	25	30	10	10	8	14	M4	9	12	0,4 (56,64)

please directly contact our offices for other holes diameter, preferred P/N in bold

SPECIAL APPLICATION COUPLINGS

Special application couplings are designed to meet extreme coupling conditions such as high torque or large axial or radial backlash. Please refer to the individual product description to identify the correct elastic coupling for your application.

GS-DA SERIES

The GS-DA series is a plastic double-loop coupling with medium torsional stiffness, low restoring forces and shock and vibration damping properties.

It provides smooth running, maintenance free operation and reliable compensation for radial, lateral and angular misalignment.

It is also thermally and electrically insulated.

GS-EA SERIES

The GS-EA series is a heavy-duty, multi-purpose helix coupling for backlash-free and angularly aligned transmission of rotary motion with high torsional rigidity and medium restoring forces. It provides vibration damping and optimum misalignment compensation.

It is machined from a single piece and has clamping hubs for shaft connections without causing surface defects.

GS-EP SERIES

The GS-EP series are low cost, injection moulded shaft couplings with medium torsional stiffness, low restoring forces and vibration damping. Metal inserts in the hubs provide a reliable shaft connection and the free slot area allows the shafts to project into the coupling.

It is also electrically insulated.

GS-M SERIES

GS-M series are multi-purpose couplings used for backlash-free transmission of rotary motions with high vibration-damping effect, good compensation of misalignments and low torsional stiffness and low restoring forces.

It has no moving parts, very robust design.

GS-O SERIES

The GS-O series are elastic couplings in which rotation is transmitted by a central disc which slides over the pins on the hubs under controlled preload conditions to eliminate backlash.

These couplings offer generous radial compensation and easy maintenance.

GS-S SERIES

GS-S series are bellows couplings for backlash-free and angularly aligned transmission with high vibration damping effect, optimum misalignment compensation with very high torsional stiffness and low restoring forces.

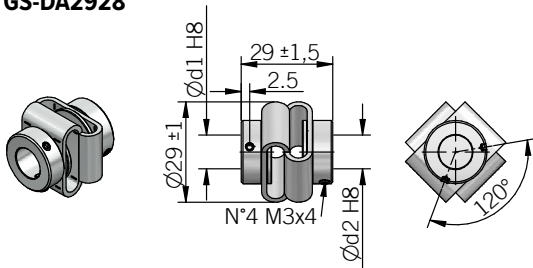
The design is very robust due to the stainless steel bellows and also has clamping hubs for shaft connections without causing surface defects.

SPECIAL APPLICATION ELASTIC COUPLINGS ORDERING CODE

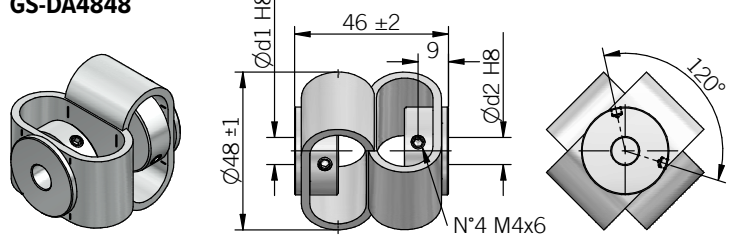
	P / N	Description
GS-DA2928-6 (former GS32A6)	94070188	Double loop plastic coupling 29 x 28 mm (ø 6 / 6 mm hole)
GS-DA2928-8 (former GS01A8)	94070050	Double loop plastic coupling 29 x 28 mm (ø 8 / 8 mm hole)
GS-DA2928-10 (former GS11A10)	94070091	Double loop plastic coupling 29 x 28 mm (ø 10 / 10 mm hole)
GS-DA4848-10 (former GS15A10)	94070112	Double loop plastic coupling 48 x 48 mm (ø 10 / 10 mm hole)
GS-EA1323-4 (former G13A4)	94070219	Aluminium coupling 13 x 23 mm (ø 4 / 4 mm hole)
GS-EP1520-6 (former GS21A6)	94070143	Plastic coupling with helical groove 15 x 20 mm (ø 6 / 6 mm hole)
GS-EP1520-4 (former GS22A4)	94070149	Plastic coupling with helical groove 15 x 20 mm (ø 4 / 4 mm hole)
GS-M1635-8 (former GS13A8)	94070115	Spring coupling 16 x 35 mm (ø 8 / 8 mm hole)
GS-M1635-10 (former GS30A10)	94070184	Spring coupling 16 x 35 mm (ø 10 / 10 mm hole)
GS-O1922-6 (former GS02A6)	94070061	Decomposable coupling Oldham 19 x 22 mm (ø 6 / 6 mm hole)
GS-O1922-10 (former GS16A10)	94070117	Decomposable coupling Oldham 19 x 22 mm (ø 10 / 10 mm hole)
GS-O1922-10/12 (former GS41A10/12)	94070218	Decomposable coupling Oldham 19 x 22 mm (ø 10 / 12 mm hole)
GS-S2530-10 (former GS25A10)	94070171	High pulses bellows coupling 25 x 30 mm (ø 10 / 10 mm hole)

please directly contact our offices for other models

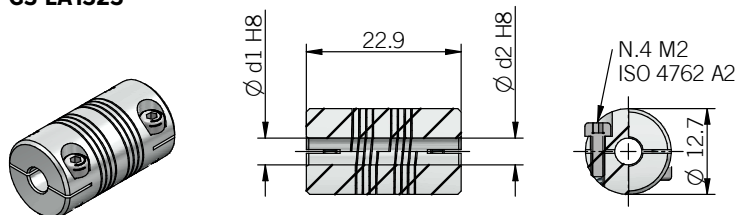
GS-DA2928



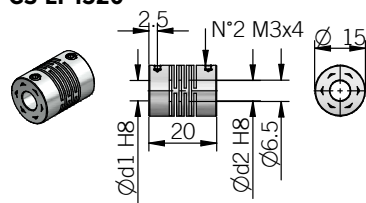
GS-DA4848



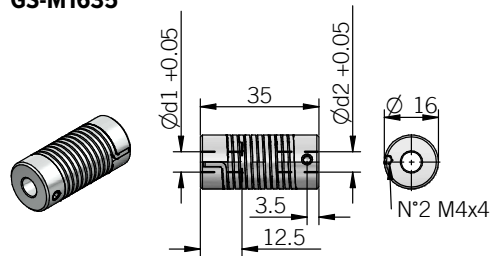
GS-EA1323



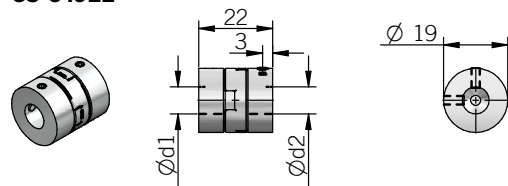
GS-EP1520



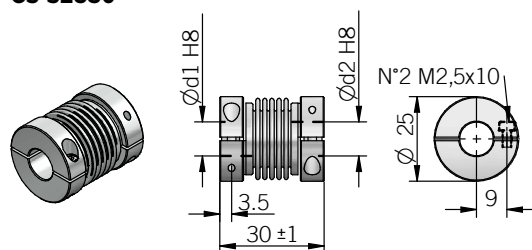
GS-M1635



GS-O1922



GS-S2530

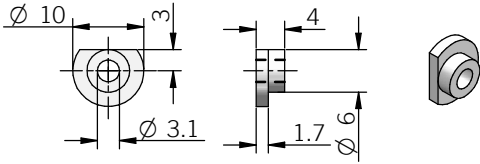


dimensions in mm

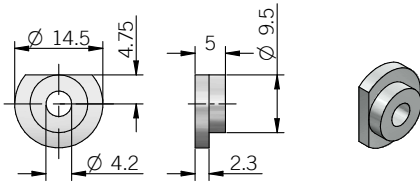
TECHNICAL DATA

	DA2928	DA4848	EA1323	EP1520	M1635	O1922	S2530
Max speed (rpm)	3000	3000	5000	12000	3000	3000	10000
Max torque (Nm) (Ozin)	0,5 (70,80)	2 (283,22)	2 (283,22)	0,3 (42,48)	0,5 (70,80)	1,7 (240,74)	2 (283,22)
Max offset radial (mm)	± 2	± 3	± 0,17	± 0,3	± 1	± 0,2	± 0,3
Max offset axial (mm)	± 2	± 4	± 0,25	± 0,2	± 1	± 0,1	± 0,4
Max offset angular (°)	± 10	± 12	± 5	± 2,5	± 5	± 0,5	± 4
Moment of inertia (gcm²)	41	106	1,2	2	10	6,7	29,8
Max clamping torque (Nm) (Ozin)	1 (141,61)	1 (141,61)	0,3 (42,48)	0,7 (99,12)	1,5 (212,41)	0,94 (133,11)	1 (141,61)
Temperature range (°C) (°F)	-30° ... +80 (-22° ... +176)	-30° ... +80 (-22° ... +176)	-40° ... +140 (-40° ... +284)	-10° ... +80 (14° ... +176)	-30° ... +120 (-22° ... +248)	-20° ... +60 (-4° ... +140)	-30° ... +120 (-22° ... +248)
Weight (g) (oz)	33 (1,16)	85 (3,00)	5 (0,18)	6 (0,21)	28 (0,99)	12 (0,42)	20 (0,71)
Flange material	steel galvanized	steel galvanized	aluminium	PA 66 glass fiber reinforced	zinc die casting	aluminium	aluminium
Insert material	poliurethan	poliurethan	aluminium	aluminium	spring steel	acetal	stainless steel

FIXING CLAMPS



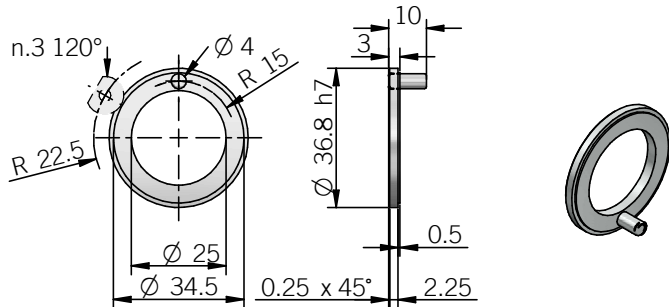
Description	P/N	Material	Scope of delivery	Applicable to model
kit n.3 fixing clamps	94080011	aluminum	n.3 fixing clamps	36B - 36K



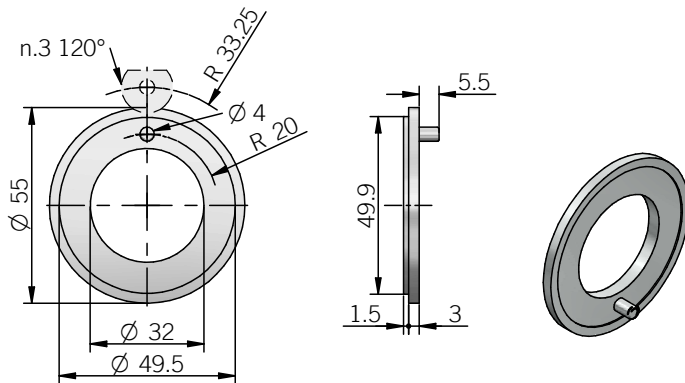
Description	P/N	Material	Scope of delivery	Applicable to model
kit n.3 fixing clamps	94080001	aluminum	n.3 fixing clamps	40A IP66 - 40N - 40X - 49C/P - 50A/B - 58B - 63A - 80A - 90A

dimensions in mm

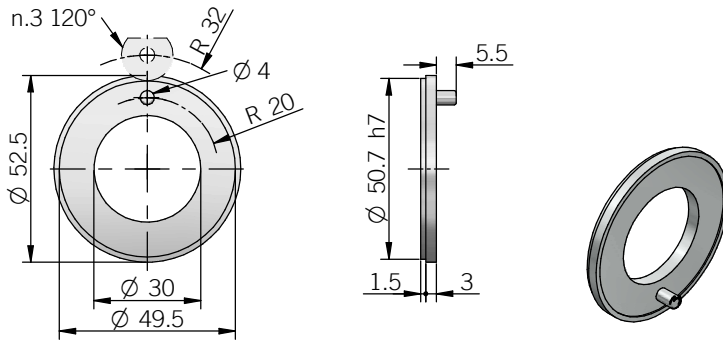
MECHANICAL FLANGES



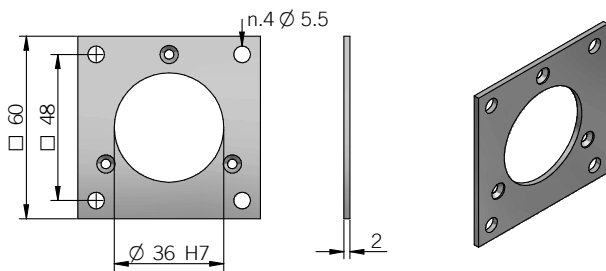
Description	P/N	Material	Scope of delivery	Applicable to model
FLG004 - resolver flange size 15	94010076	aluminum	n.1 flange	36K



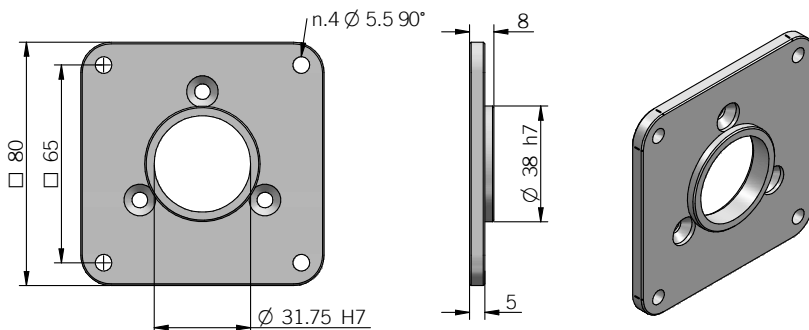
Description	P/N	Material	Scope of delivery	Applicable to model
FLG000 - resolver flange size 19 (01 version)	94010087	aluminum	n.1 flange	49C/P



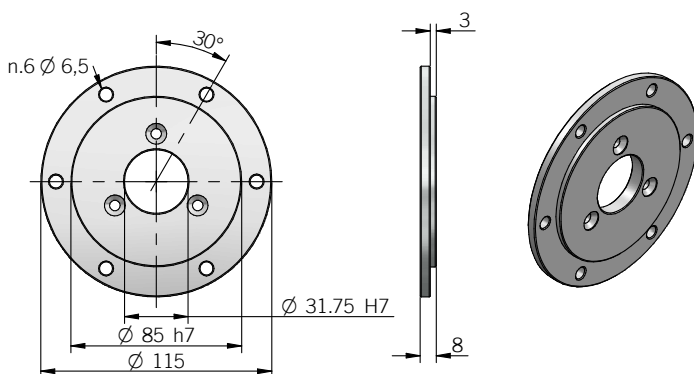
Description	P/N	Material	Scope of delivery	Applicable to model
FLG001 - resolver flange size 19 (14 version)	94010065	aluminum	n.1 flange	49C/P



Description	P/N	Material	Scope of delivery	Applicable to model
58C square flange	94990048	aluminum	n.1 58C square flange n.3 M3x6 screws	58C



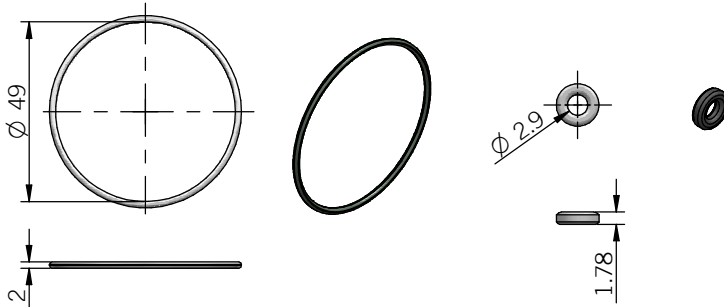
Description	P/N	Material	Scope of delivery	Applicable to model
63A square flange	94990049	aluminum	n.1 63A square flange n.3 M5x10 screws	63A



Description	P/N	Material	Scope of delivery	Applicable to model
63A REO-444 flange	94990050	aluminum	n.1 63A REO-444 flange n.3 M5x10 screws	63A

dimensions in mm

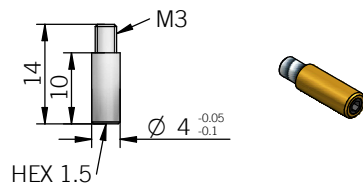
ORING KIT



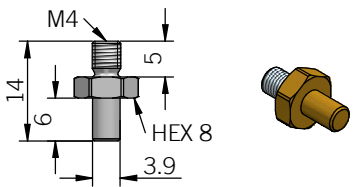
dimensions in mm

Description	P/N	Material	Scope of delivery	Applicable to model
EH30 IP54 kit	94990053	NBR	n.1 OR 49x2 n.2 OR 2012	30M - 30MH

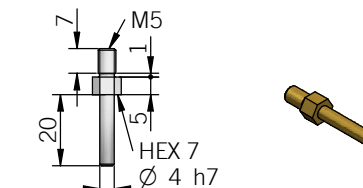
TORQUE PINS



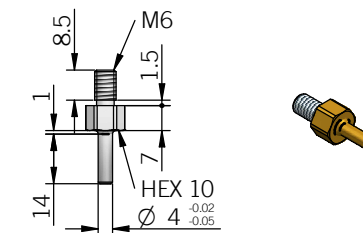
Description	P/N	Material	Scope of delivery	Applicable to model
M3 4 mm torque pin	94990067	Brass	n.1 torque pin	63F - 63FB - 63PBF - 63PCF



Description	P/N	Material	Scope of delivery	Applicable to model
M4 3.9 mm torque pin	94990079	Brass	n.2 torque pins	88PE

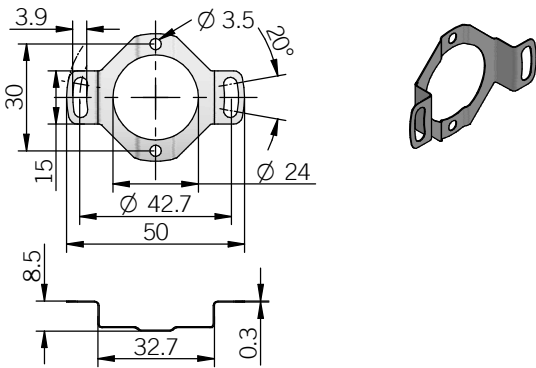


Description	P/N	Material	Scope of delivery	Applicable to model
M5 4mm torque pin	94990068	Brass	n.1 torque pin	80C - 80K - 80P - 80PG



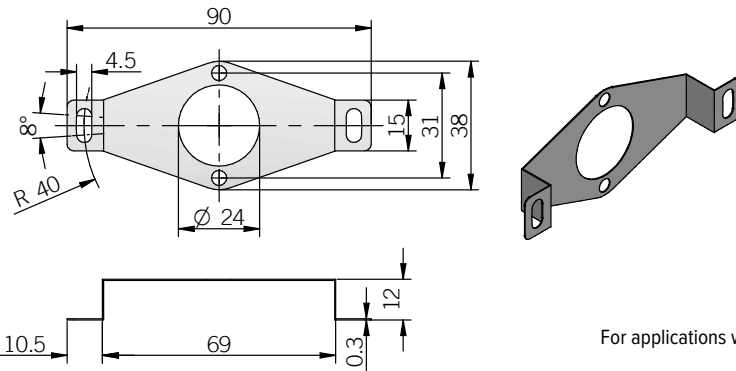
Description	P/N	Material	Scope of delivery	Applicable to model
M6 4mm torque pin	94990069	Brass	n.1 torque pin	63F - 63FB - 63PBF - 63PCF

TORQUE SUPPORT KIT



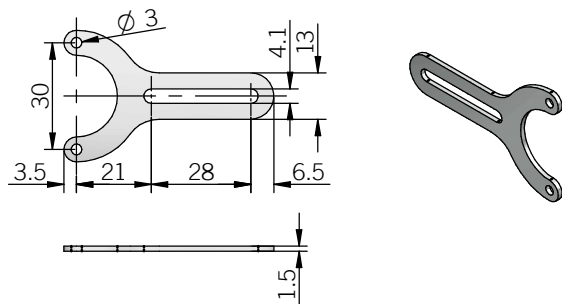
For applications with high dynamics and moderate axial play and low radial play

Description	P/N	Material	Scope of delivery	Applicable to model
ø 42,7 mm elastic spring	94990046	1.4310 AISI 301	n.1 encoder spring n.2 M3x4 screws	38F



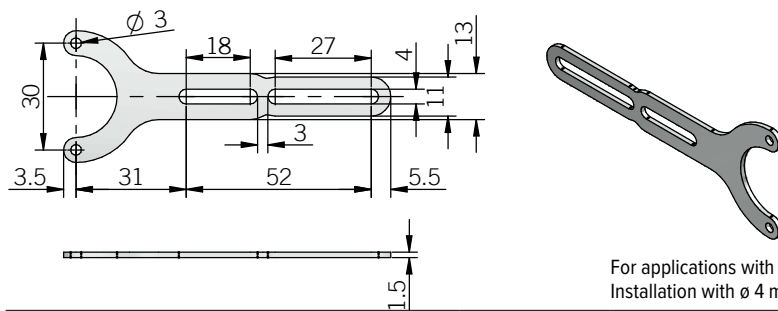
For applications with high dynamics and moderate axial play and low radial play

Description	P/N	Material	Scope of delivery	Applicable to model
ø 80 mm elastic spring	94990047	1.4310 AISI 301	n.1 encoder spring n.2 M3x4 screws	36F - 38F



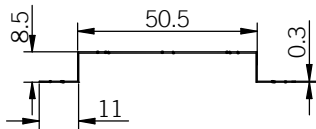
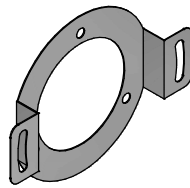
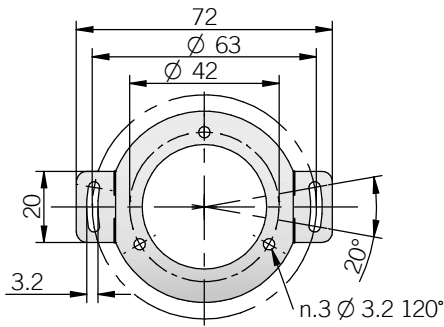
For applications with low dynamics and high axial play and low radial play.
Installation with ø 4 mm cylindrical pin. Do not install with rigid fixing (e.g. screw)

Description	P/N	Material	Scope of delivery	Applicable to model
38F bracket kit 21 ... 49 mm	94990054	Stainless steel	n.1 bracket n.2 M3x6 screws	36F - 38F



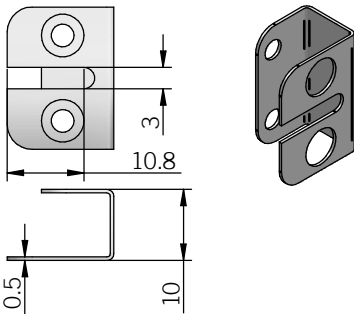
For applications with low dynamics and high axial play and low radial play.
Installation with ø 4 mm cylindrical pin. Do not install with rigid fixing (e.g. screw)

Description	P/N	Material	Scope of delivery	Applicable to model
38F bracket kit 31 ... 83 mm	94990045	Stainless steel	n.1 bracket n.2 M3x6 screws	36F - 38F



For applications with high dynamics and moderate axial play and low radial play

Description	P/N	Material	Scope of delivery	Applicable to model
Ø 63 mm elastic spring	94990022	1.4310 / AISI 301	n.1 encoder spring n.3 M3x4 screws	63FB - 63GB - 63PB - 63PBF - 63PC - 63PCF

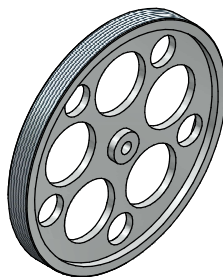
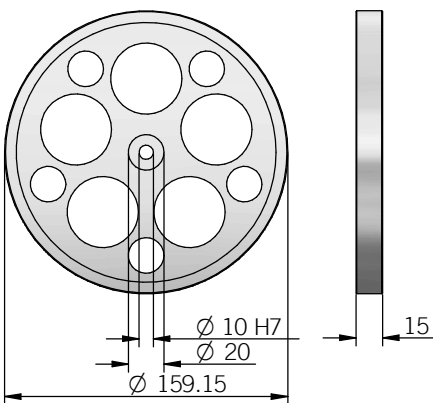


For applications with low dynamics and high axial play and low radial play.
Installation with Ø 3 mm cylindrical pin. Do not install with rigid fixing.

Description	P/N	Material	Scope of delivery	Applicable to model
88P-88PE torque stop kit	94990051	1.4310 / AISI 301	n.1 torque stop n.2 M3x4 screws	88P - 88PE

dimensions in mm

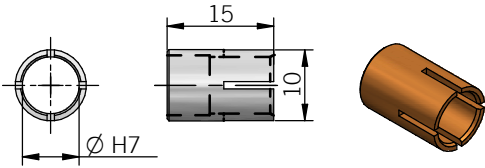
MEASURING WHEELS



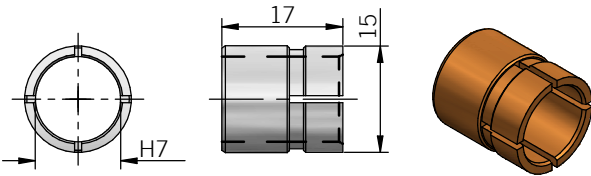
dimensions in mm

Description	P/N	Material	Scope of delivery	Applicable to model
Measuring wheel weight 260 g (9,17 oz)	94990070	aluminum	n.1 measuring wheel n.1 M5x16 screw	RL - RM 500

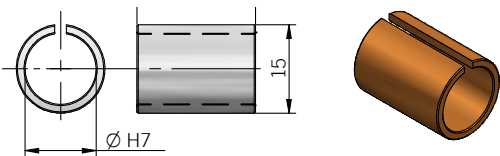
SHAFT ADAPTERS



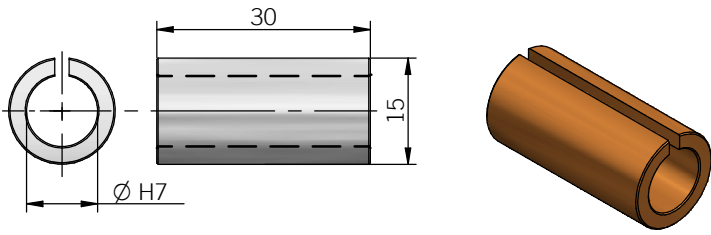
Description	P/N	Material	Scope of delivery	Applicable to model
Shaft adapter 10/8 mm	94990082	Bronze	n.1 shaft adapter	36F - 36G
Shaft adapter 10/6,35 mm (1/4")	94990083			
Shaft adapter 10/6 mm	94990084			
Shaft adapter 10/5 mm	94990085			
Shaft adapter 10/4 mm	94990086			



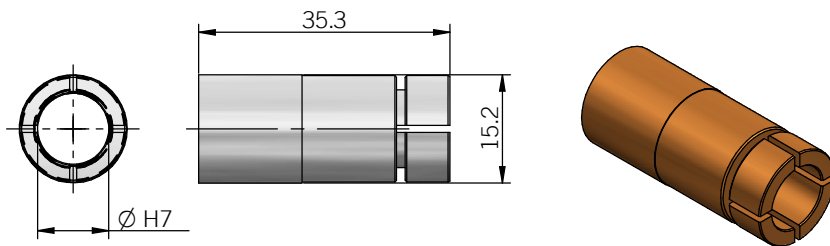
Description	P/N	Material	Scope of delivery	Applicable to model
Shaft adapter 15/12 mm	94990087	Bronze	n.1 shaft adapter	50F - 50G
Shaft adapter 15/10 mm	94990088			
Shaft adapter 15/8 mm	94990089			
Shaft adapter 15/6 mm	94990090			
Shaft adapter 15/5 mm	94990091			



Description	P/N	Material	Scope of delivery	Applicable to model
Shaft adapter 15/12 mm	94990071	Bronze	n.1 shaft adapter	EAL 58F - 63F - 63G EAR 58F - 63F - 63G EAML 58F - 63F - 63G EAMR 58F - 63F - 63G EMIP 58F - 63G
Shaft adapter 15/11 mm	94990072			
Shaft adapter 15/10 mm	94990073			
Shaft adapter 15/9,52 mm (3/8")	94990074			
Shaft adapter 15/8 mm	94990075			
Shaft adapter 15/6 mm	94990076			



Description	P/N	Material	Scope of delivery	Applicable to model
Shaft adapter 15/12 mm	94990077	Bronze	n.1 shaft adapter	AAM 58FR
Shaft adapter 15/10 mm	94990078			

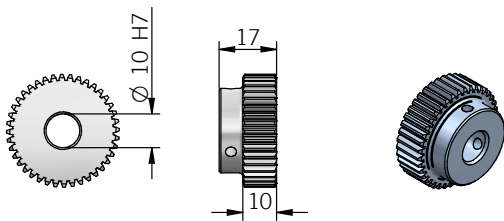


Description	P/N	Material	Scope of delivery	Applicable to model
Shaft adapter 15/12 mm	94990066	Bronze	n.1 shaft adapter	80PG
Shaft adapter 15/10 mm	94990065			

dimensions in mm, for further shaft adapter diameters please directly contact our offices

EC34 ACCESSORY

Rack and cogged wheel p = 2,5 z = 40 m = 0,796

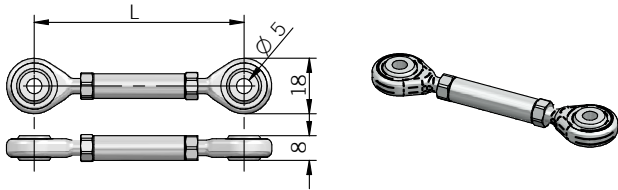


FORMULAS
 modulus $m = Dp/z$
 step $p = m \times \uparrow$
 primitive diameter $Dp = m \times z$
 cog number $z = Dp/m$

dimensions in mm

Description	P/N	Material	Scope of delivery	Applicable to model
Cogged wheel M = 0,796 / P = 2,5 / Z = 40	94080003	C45 steel	n.1 cogged wheel	EC 34A

TORQUE ARMS

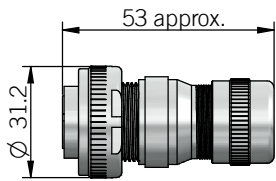


For applications with low axial and radial play

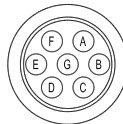
dimensions in mm

Description	P/N	Material	Scope of delivery	Applicable to model
Torque arm L = 80 MM	94010061	Steel	n. 1 torque arm n. 2 M5 x 12 UNI ISO 7380	88PET - 120P
Torque arm L = 110 MM	94010070			
Torque arm L = 140 MM	94010071			

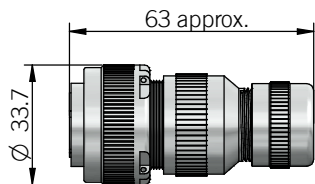
CONNECTORS



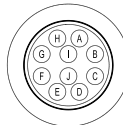
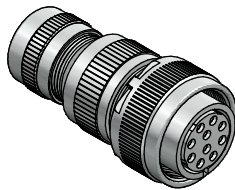
PINOUT SOLDER SIDE VIEW



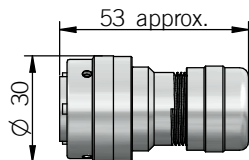
Description	P/N	Material	Specifications	Scope of delivery	Mating with
CONN. M07FV Field-attachable MIL straight 7 pin - socket IP67	94990121	Metal	Solder max 1,3 mm ² / AWG 16 Cable gland range ø 5 ... 10 mm -40° ... +125°C (-40° ... +257°F)	n.1 connector	M connector (7 pin)



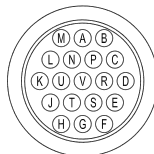
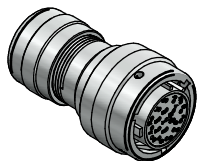
PINOUT SOLDER SIDE VIEW



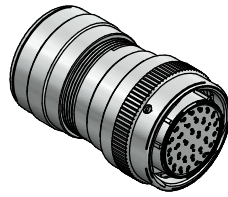
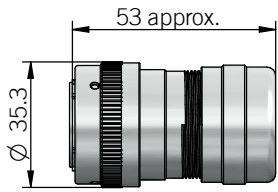
Description	P/N	Material	Specifications	Scope of delivery	Mating with
CONN. M10FV Field-attachable MIL straight 10 pin - socket IP67	94990119	Metal	Solder max 1,3 mm ² / AWG 16 Cable gland range ø 5 ... 10 mm -40° ... +100°C (-40° ... +212°F)	n.1 connector	M connector (10 pin)



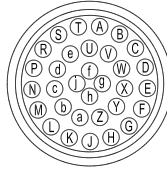
PINOUT SOLDER SIDE VIEW



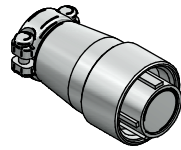
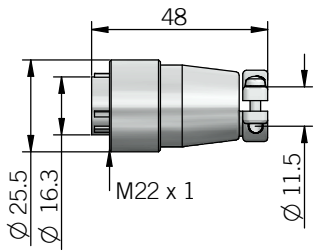
Description	P/N	Material	Specifications	Scope of delivery	Mating with
CONN. M19FV Field-attachable MIL straight 19 pin - socket IP67	94990123	Metal	Solder max 0,5 mm ² / AWG 20 Cable gland range ø 5 ... 10 mm -40° ... +125°C (-40° ... +257°F)	n.1 connector	M connector (19 pin)



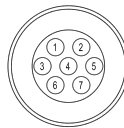
PINOUT SOLDER SIDE VIEW



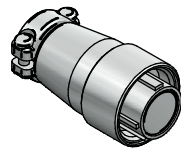
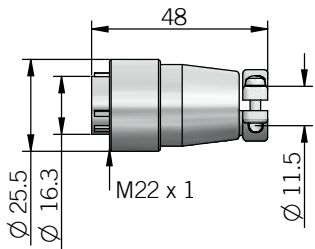
Description	P/N	Material	Specifications	Scope of delivery	Mating with
CONN. M32FV Field-attachable MIL straight 32 pin - socket IP67	94990128	Metal	Screw max 0,5 mm ² / AWG 20 Cable gland range ø 9 ... 15 mm -40° ... +125°C (-40° ... +257°F)	n.1 connector	M connector (32 pin)



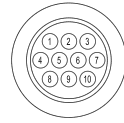
PINOUT SOLDER SIDE VIEW



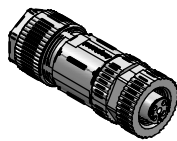
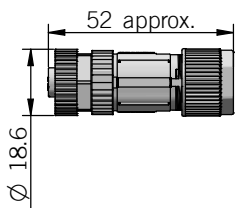
Description	P/N	Material	Specifications	Scope of delivery	Mating with
CONN. J07FV Field-attachable J07 straight 7 pin JIS-C-5432 - socket IP40	94990131	Metal / Plastic	Solder max ø 1,5 mm -25° ... +85°C (-13° ... +185°F)	n.1 connector	J connector (7 pin)



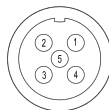
PINOUT SOLDER SIDE VIEW



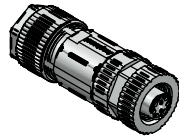
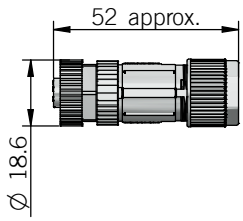
Description	P/N	Material	Specifications	Scope of delivery	Mating with
CONN. J10FV Field-attachable J10 straight 10 pin JIS-C-5432 - socket IP40	94990133	Metal / Plastic	Solder max ø 1 mm -25° ... +85°C (-13° ... +185°F)	n.1 connector	J connector (10 pin)



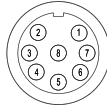
PINOUT SOLDER SIDE VIEW



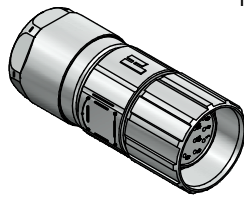
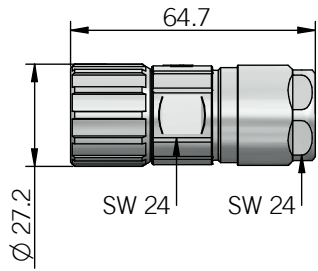
Description	P/N	Material	Specifications	Scope of delivery	Mating with
CONN. M12FV 5P Field-attachable M12 straight 5 pin A-coded socket IP67	94990117	Metal	Screw max 0,75 mm ² / AWG 18 Cable gland range ø 4 ... 7 mm -40° ... +85°C (-40° ... +185°F)	n.1 connector	M12 connector (5 pin) - A coded



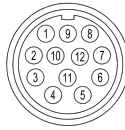
PINOUT SOLDER SIDE VIEW



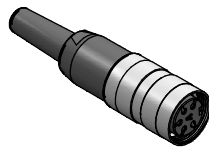
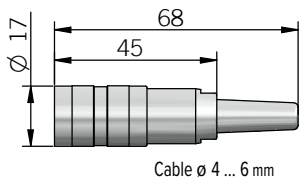
Description	P/N	Material	Specifications	Scope of delivery	Mating with
CONN. M12FV 8P Field-attachable M12 straight 8 pin A-coded socket IP67	94990118	Metal	Screw max 0,75 mm ² / AWG 18 Cable gland range ø 4 ... 7 mm -40° ... +85°C (-40° ... +185°F)	n.1 connector	M12 connector (8 pin) - A coded



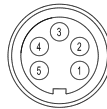
PINOUT SOLDER SIDE VIEW



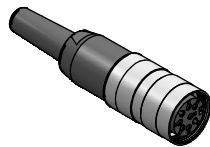
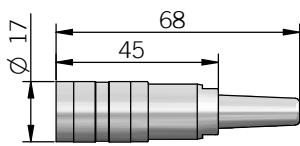
Description	P/N	Material	Specifications	Scope of delivery	Mating with
CONN. H12FV CCW Field-attachable M23 straight 12 pin socket IP67	94990137	Metal	Solder max ø 1 mm Cable gland range ø 3 ... 7 mm -40° ... +125°C (-40° ... +257°F)	n.1 connector	H connector (12 pin) - M23 CCW



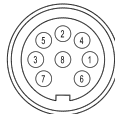
PINOUT SOLDER SIDE VIEW



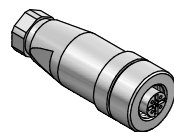
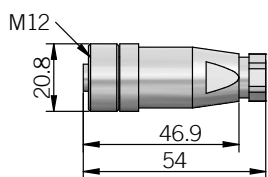
Description	P/N	Material	Specifications	Scope of delivery	Mating with
CONN. C05FV Field-attachable C091 M16 straight 5 pin - socket IP40	94990135	Metal / Plastic	Screw max 0,5 mm ² / AWG 20 Cable range ø 4 ... 6 mm -40° ... +100°C (-40° ... +212°F)	n.1 connector	C connector (5 pin)



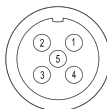
PINOUT SOLDER SIDE VIEW



Description	P/N	Material	Specifications	Scope of delivery	Mating with
CONN. C08FV Field-attachable C091 M16 straight 8 pin IEC 60130-9 - socket IP40	94990142	Metal / Plastic	Screw max 0,5 mm ² / AWG 20 Cable range ø 4 ... 6 mm -40° ... +100°C (-40° ... +212°F)	n.1 connector	C connector (8 pin)

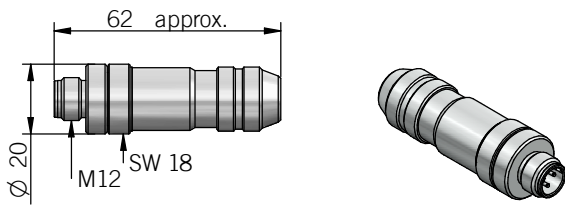


PINOUT SOLDER SIDE VIEW



Description	P/N	Material	Specifications	Scope of delivery	Applicable to model
CONN. M12FV 5P PLASTIC Field-attachable M12 straight 5 pin A-coded socket - IP67	94990114	Plastic	Screw max 0,75 mm ² / AWG 18 Cable gland range ø 3,5 ... 6 mm -40° ... +90°C (-40° ... +194°F)	n.1 connector	PFN - ETC POWER connector





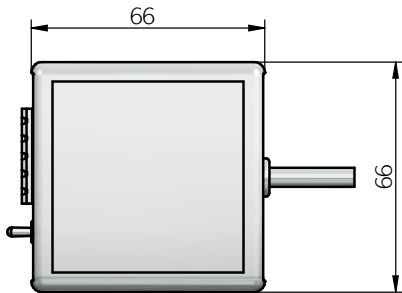
PINOUT SOLDER SIDE VIEW



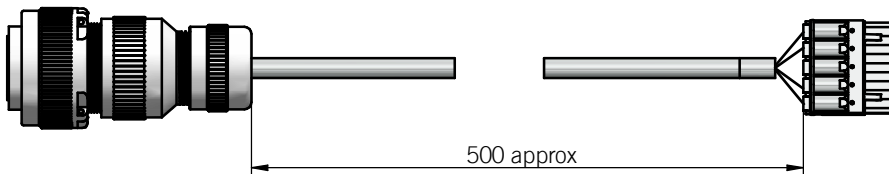
Description	P/N	Material	Specifications	Scope of delivery	Applicable to model
CONN. M12MV ETHERNET Field-attachable M12 straight 4 pin D-coded plug - IP67	94990115	Metal	Screw max 0,75 mm ² / AWG 18 Cable gland range ø 6 ... 8 mm -40° ... +85°C (-40° ... +185°F)	n.1 connector	PFN - ETC I/O connector

IP rating when plugged with proper cable, dimensions in mm

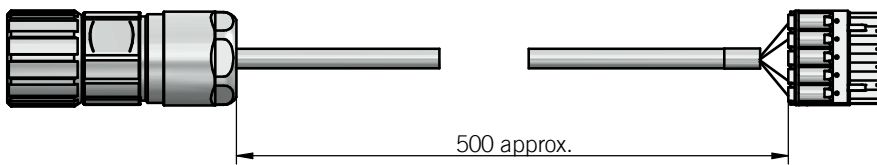
EMIP ACCESSORIES



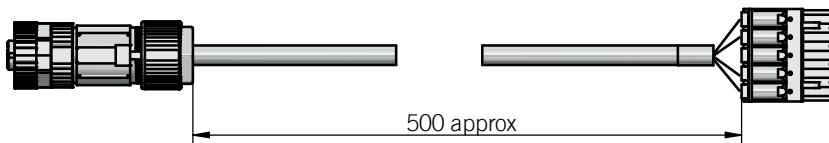
Description	P/N	Material	Scope of delivery	Applicable to model
UPT-001 USB tool for PC programming	94990170	Plastic	Programmer box with USB cable (length 1,8m) n.2 push-in connectors	EMIP



Description	P/N	Material	Scope of delivery	Applicable to model
UPT-001 M10 cable adapter	94030308	Metal	n.1 M10 socket with cable and push-in connector	EMIP



Description	P/N	Material	Scope of delivery	Applicable to model
UPT-001 H12 (M23) cable adapter	94030307	Metal	n.1 H12 socket with cable and push-in connector	EMIP



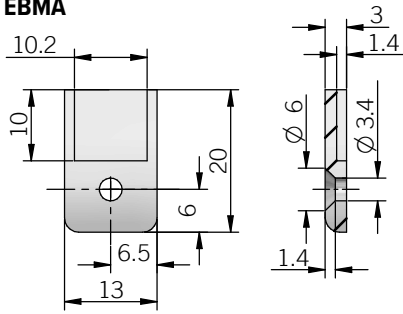
Description	P/N	Material	Scope of delivery	Applicable to model
UPT-001 M12 cable adapter	94030310	Metal	n.1 M12 socket with cable and push-in connector	EMIP



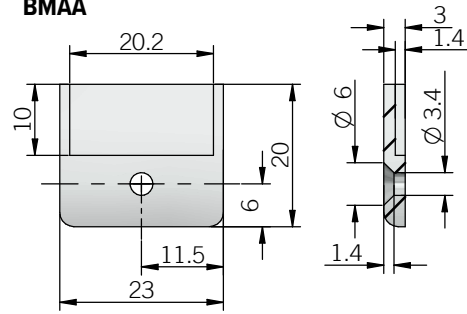
WWW.ELTRA.IT

CLIPS FOR MAGNETIC TAPE

EBMA



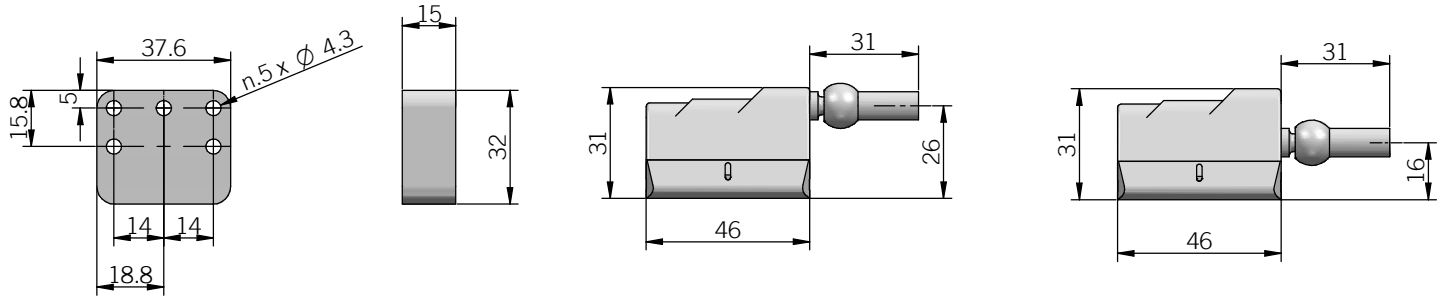
BMAA



dimensions in mm

Description	P/N	Material	Scope of delivery	Applicable to model
EBMA fixing clips	94990055	Polyamide	n.10 clips	EBMA
BMAA fixing clips	94990056	Polyamide	n.10 clips	BMAA

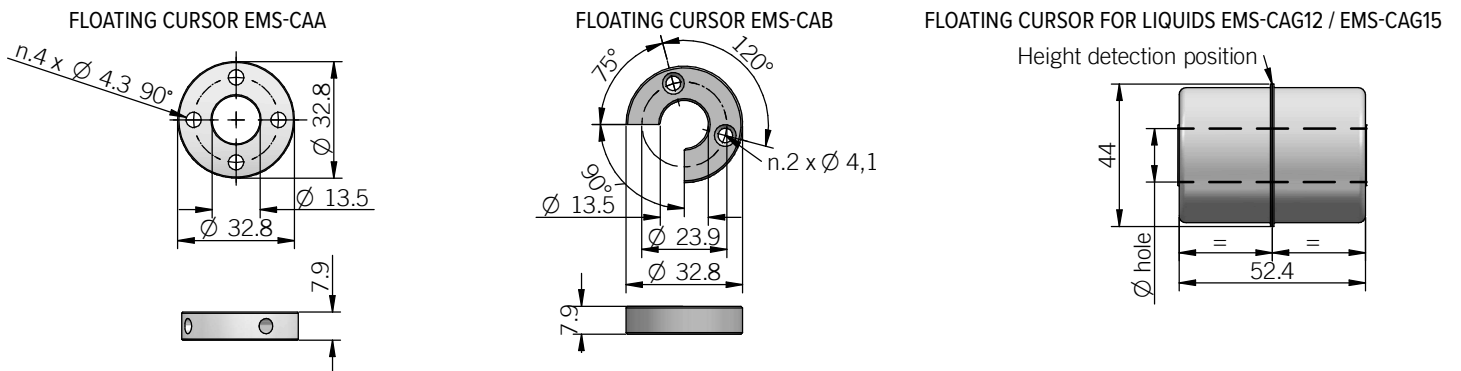
CURSORS FOR EMSPA - EMSPB - EMSPS



dimensions in mm

Function	Description	P/N	Function	Description	P/N	Function	Description	P/N
Floating cursor	EMS-CSF.2V EMS-CSF ¹	95490027 95490012	Sliding cursor axial joint high	EMS-CSA.2V EMS-CSA ¹	95490028 95490000	Sliding cursor axial joint low	EMS-CSB.2V EMS-CSB ¹	95490029 95490001

FLOATING CURSORS FOR EMSSA - EMSSS



FLOATING CURSOR EMS-CAA

FLOATING CURSOR EMS-CAB

FLOATING CURSOR FOR LIQUIDS EMS-CAG12 / EMS-CAG15

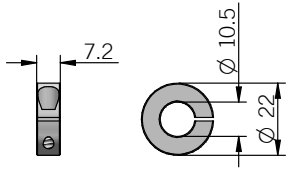
FLOATING CURSOR EMS-CAC

Description	P/N	Material	Scope of delivery
EMS-CAA.2V EMS-CAA ¹	95590016 95590000	aluminum	n.4 M4 brass nuts n.8 D4 brass washers n.4 M4x25 brass screws
EMS-CAB.2V EMS-CAB ¹	95590017 95590001	aluminum	n.4 M4 brass nuts n.4 D4 brass washers n.2 M4x25 brass screws
EMS-CAC.2V EMS-CAC ¹	95590018 95590011	aluminum	/
EMS-CAG12.2V EMS-CAG12 ¹	95590019 95590012	AISI 316 stainless steel	12 mm hole
EMS-CAG15 ¹	95590013	AISI 316 stainless steel	15 mm hole

dimensions in mm

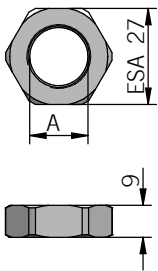
¹only for spare parts for magnetostrictive transducers sold before February 2020, please contact our offices for availability

COLLAR CLAMPING FOR EMS-CAG12 / EMS-CAG15



Description	P/N	Material	Scope of delivery
EMS-FG01	95590014	AISI 316 stainless steel	n.1 D3 AISI 316 washer n.1 M3x8 AISI 316 screw

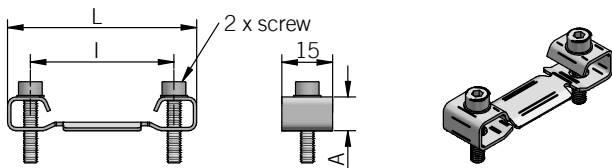
HEX NUT



Description	P/N	Material	A	Applicable to model
EMS-CD01	95590010	AISI 316 stainless steel	M18 x 1,5	EMSSA - EMSSS
EMS-CD02	95590015	AISI 316 stainless steel	3/4" - 16UNF	EMSSA - EMSSS

dimensions in mm

BRACKETS

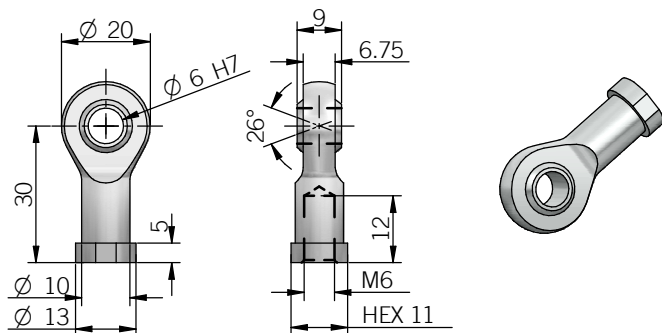


Scope of delivery
n.2 brackets

dimensions in mm

Description	P/N	Center-to-center (l)	Overall dimension (L)	Height (A)	Screw (M)	Applicable to model
EMSPA-EMSPS-ST42	95490011	42,5	56	12,4	M4	EMSPA - EMSPS
EMSPA-EMSPS-ST50	95490010	50	63,5	12,4	M5	EMSPA - EMSPS
EMSPB-ST42	95490022	42,5	56	10	M4	EMSPB
EMSPB-ST50	95490026	50	63,5	10	M5	EMSPB

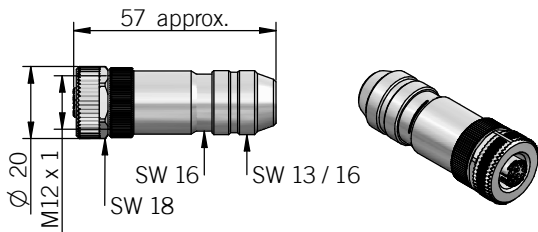
EPLA BALL JOINT



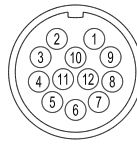
dimensions in mm

Description	P/N	Material	Scope of delivery	Applicable to model
EPLA-SN01	95390003	Steel	n.1 ø 6 mm ball joint	EPLA

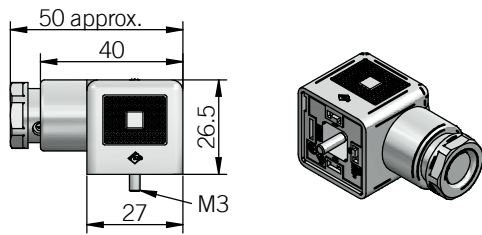
CONNECTORS



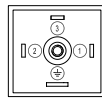
PINOUT SOLDER SIDE VIEW



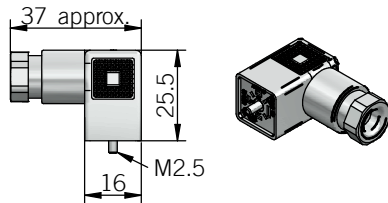
Description	P/N	Material	Specifications	Scope of delivery	Applicable to model
CONN. M12FV 12P Field-attachable M12 straight 12 pin A-coded socket IP67	94990116	Metal	Solder max 0,25 mm ² / AWG 24 Cable gland range ø 6 ... 8 mm -40° ... +85°C (-40° ... +185°F)	n.1 connector	TMAA



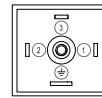
PINOUT SOLDER SIDE VIEW



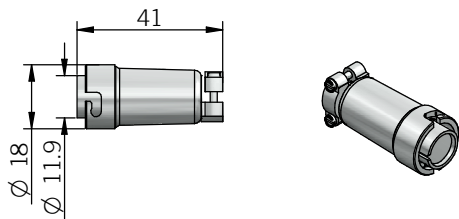
Description	P/N	Material	Specifications	Scope of delivery	Applicable to model
EPLA/C-EMSPB C04FV 90° IP 65 Field-attachable 90 degrees 4 pin EN 175301-803 form C (DIN 43650-A) socket	95390004	Plastic	Screw max 1,50 mm ² / AWG 16 Cable gland range ø 6 ... 8 mm -30° ... +125°C (-22° ... +257°F)	n.1 connector	EPLA - EPLC - EMSPB



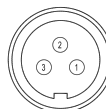
PINOUT SOLDER SIDE VIEW



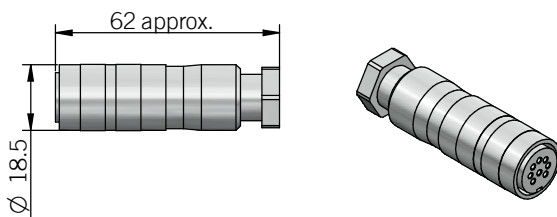
Description	P/N	Material	Specifications	Scope of delivery	Applicable to model
EPLB-C04FV 90° IP 65 Field-attachable 90 degrees 4 pin EN 175301-803 form C (DIN 43650-C) socket	95390001	Plastic	Screw max 0,75 mm ² / AWG 18 Cable gland range ø 4 ... 6 mm -40° ... +90°C (-40° ... +194°F)	n.1 connector	EPLB



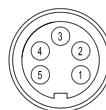
PINOUT SOLDER SIDE VIEW



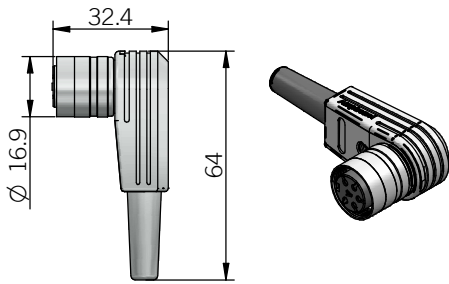
Description	P/N	Material	Specifications	Scope of delivery	Applicable to model
EPL-C03FV Field-attachable straight 3 pin socket IP40	95390002	Metal	Solder max ø 1,1 mm Cable gland range ø 5 ... 8 mm -25° ... +85°C (-13° ... +185°F)	n.1 connector	EPLA - EPLB



PINOUT SOLDER SIDE VIEW



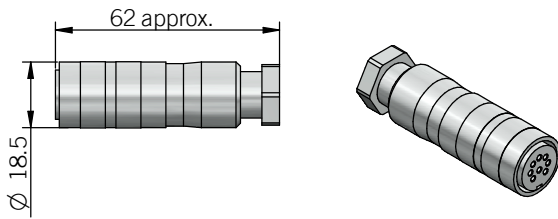
Description	P/N	Material	Specifications	Scope of delivery	Applicable to model
EPL-C05FV IP 67 Field-attachable straight 5 pin DIN 45322 socket	95390005	Metal / Plastic	Screw max 0,75 mm ² / AWG 18 Cable gland range ø 6 ... 8 mm -30° ... +95°C (-22° ... +203°F)	n.1 connector	EPLA - EPLB - EPLC - EPLT



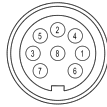
PINOUT SOLDER SIDE VIEW



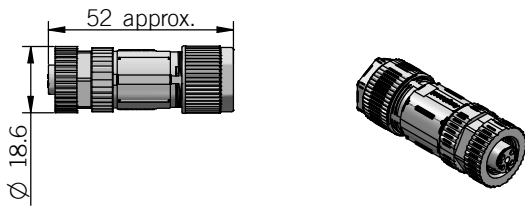
Description	P/N	Material	Specifications	Scope of delivery	Applicable to model
EPL-C05FV 90° IP 40 Field-attachable 90 degrees 5 pin DIN 45322 socket	95390007	Metal / Plastic	Solder max 0,5 mm ² / AWG 20 Cable range ø 4 ... 6 mm -40° ... +100°C (-40° ... +212°F)	n.1 connector	EPLA - EPLB - EPLC - EPLT



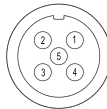
PINOUT SOLDER SIDE VIEW



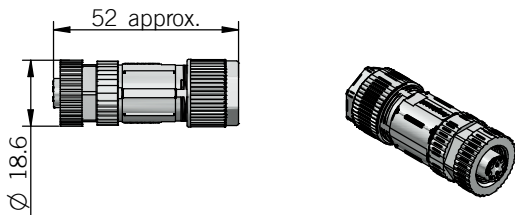
Description	P/N	Material	Specifications	Scope of delivery	Applicable to model
EMS-C08FV IP 67 Field-attachable M16 IP40 straight 8 pin DIN 45326 socket	95490025	Metal / Plastic	Screw max 0,75 mm ² / AWG 18 Cable gland range ø 6 ... 8 mm -30° ... +95°C (-22° ... +203°F)	n.1 connector	EMSPA - EMSPS



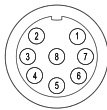
PINOUT SOLDER SIDE VIEW



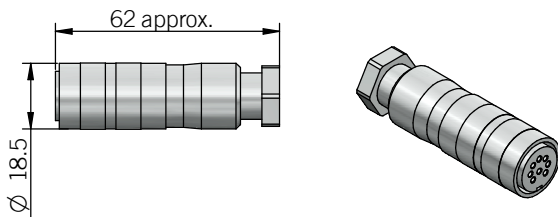
Description	P/N	Material	Specifications	Scope of delivery	Applicable to model
EMS-S05FV IP67 Field-attachable M12 straight 5 pin A-coded socket	95490002	Metal	Screw max 0,75 mm ² / AWG 18 Cable gland range ø 4 ... 7 mm -30° ... +85°C (-22° ... +185°F)	n.1 connector	EMSPA - EMSPB



PINOUT SOLDER SIDE VIEW



Description	P/N	Material	Specifications	Scope of delivery	Applicable to model
EMS-S08FV IP67 Field-attachable M12 straight 8 pin A-coded socket IP67	95490002	Metal	Screw max 0,75 mm ² / AWG 18 Cable gland range ø 4 ... 7 mm -30° ... +85°C (-22° ... +185°F)	n.1 connector	EMSPA - EMSPB



PINOUT SOLDER SIDE VIEW



Description	P/N	Material	Specifications	Scope of delivery	Applicable to model
EMS-C06FV IP 67 Field-attachable M16 IP40 straight 6 pin DIN 45322 socket	95490015	Metal / Plastic	Screw max 0,75 mm ² / AWG 18 Cable gland range ø 6 ... 8 mm -30° ... +95°C (-22° ... +203°F)	n.1 connector	EMSPA - EMSPS - EMSSA - EMSSS

IP rating when plugged with proper cable, dimensions in mm

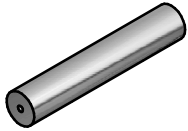
CABLES

Eltra cables are high quality shielded cables for reliable transmission between the sensor and the subsequent electronics.

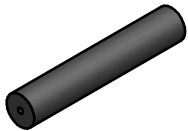
Thanks to the different cable materials (PVC or PUR, for fixed or flexible installation) and the robust and compact design they can be used in harsh operating conditions.

Eltra supplies unassembled, partially or fully assembled cables as accessories with preferred cable lengths are 1,5 / 2 / 3 / 5 / 10 m.

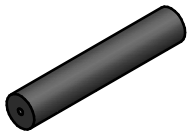
The cables are not suitable for outdoor use (no direct UV and/or moisture exposure), for assistance please contact our office directly.



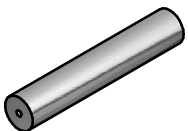
Description	Technical data	Operating temperature	Conductor colours
SPZ.CAVO 5 POLI xx M / 5 CORES CABLE xx M 5 cores PVC flame retardant shielded cable	Outer sheat material PVC - silver grey diameter $5,2 \pm 0,15$ mm Conductors sheat material PVC Conductors cross section AWG 24 / 0,22 mm ² Shield AL/PET foil + drain wire	Fixed installation -25° ... +85°C (-13°... +185°F) Bending radius min 60 mm Minimum temperature installation -5°C (+23°F)	red black green yellow blue



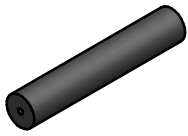
Description	Technical data	Operating temperature	Conductor colours
SPZ.CAVO 5 POLI HT xx M / 5 CORES HT CABLE xx M 5 cores PVC flame retardant high temperature shielded cable	Outer sheat material PVC - black Outer diameter $5,2 \pm 0,15$ mm Conductors sheat material PVC Conductors cross section AWG 24 / 0,22 mm ² Shield AL/PET foil + drain wire	Fixed installation -40° ... +105°C (-40°... +221°F) Bending radius min 60 mm Minimum temperature installation -5°C (+23°F)	red black green yellow blue



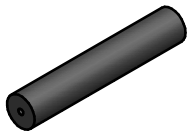
Description	Technical data	Operating temperature	Conductor colours
SPZ.CAVO 5 POLI CAT. xx M / 5 CORES FLEX CABLE xx M 5 cores PUR drag chain shielded cable	Outer sheat material PUR - black diameter $5,2 \pm 0,15$ mm Conductors sheat material PVC Conductors cross section AWG 24 / 0,22 mm ² Braid tinned copper 90% coverage	Flexible installation -20° ... +80°C (-4°... +185°F) Bending radius min 60 mm Travel speed 100 m/min max Acceleration 5 m/s ² max Minimum temperature installation -5°C (+23°F)	red black green yellow blue



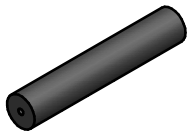
Description	Technical data	Operating temperature	Conductor colours
SPZ.CAVO 8 POLI xx M / 8 CORES CABLE xx M 8 cores PVC flame retardant shielded cable	Outer sheat material PVC - silver grey diameter $5,7 \pm 0,15$ mm Conductors sheat material PVC Conductors cross section AWG 24 / 0,22 mm ² Shield AL/PET foil + drain wire	Fixed installation -25° ... +85°C (-13°... +185°F) Bending radius min 60 mm Minimum temperature installation -5°C (+23°F)	red black green yellow blue brown or grey orange white



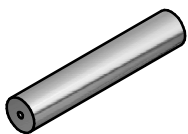
Description	Technical data	Operating temperature	Conductor colours
SPZ.CAVO 8 POLI HT xx M / 8 CORES HT CABLE xx M 8 cores PVC flame retardant high temperature shielded cable	Outer sheat material PVC - black Outer diameter 5,6 ± 0,1 mm Conductors sheat material PVC Conductors cross section AWG 24 / 0,22 mm ² Shield AL/PET foil + drain wire	Fixed installation -40° ... +105°C (-40°... +221°F) Bending radius min 60 mm Minimum temperature installation -5°C (+23°F)	red black green yellow blue grey orange white



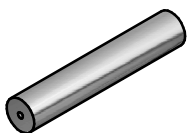
Description	Technical data	Operating temperature	Conductor colours
SPZ.CAVO 8 POLI TP xx M / 8 CORES TP CABLE xx M 8 cores twisted pairs PVC flame retardant shielded cable	Outer sheat material PVC - black Outer diameter 5,6 ± 0,1 mm Conductors sheat material PVC Conductors cross section 4 x 2 x AWG 26 / 0,14 mm ² Braid tinned copper > 82% coverage	Fixed installation -30° ... +105°C (-22°... +221°F) Bending radius min 60 mm Minimum temperature installation -5°C (+23°F)	red black yellow orange green brown white red/blue



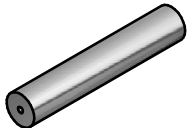
Description	Technical data	Operating temperature	Conductor colours
SPZ.CAVO 8 POLI CAT. xx M / 8 CORES FLEX CABLE xx M 8 cores PUR drag chain shielded cable	Outer sheat material PUR - black diameter 5,7 +0 / -0,15 mm Conductors sheat material PVC Conductors cross section AWG 26 / 0,14 mm ² Braid tinned copper 90% coverage	Flexible installation -20° ... +85°C (-4°... +185°F) Bending radius min 60 mm Travel speed 100 m/min max Acceleration 5 m/s ² max Minimum temperature installation -5°C (+23°F)	red black green yellow blue brown orange white



Description	Technical data	Operating temperature	Conductor colours
SPZ.CAVO 12 POLI xx M / 12 CORES CABLE xx M 12 cores PVC flame retardant shielded cable	Outer sheat material PVC - silver grey Outer diameter 6,5 ± 0,1 mm Conductors sheat material PVC Conductors cross section AWG 24 / 0,22 mm ² Shield AL/PET foil + drain wire	Fixed installation -20° ... +85°C (-4° ... +185°F) Bending radius min 60 mm Minimum temperature installation -5°C (+23°F)	red black green yellow blue brown orange white grey violet grey/pink red/blue



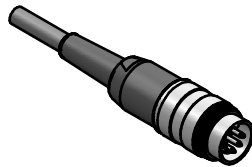
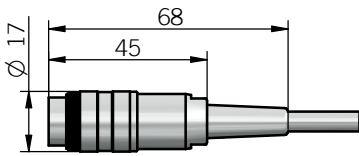
Description	Technical data	Operating temperature	Conductor colours
SPZ.CAVO 16 POLI xx M / 16 CORES CABLE xx M 16 cores PVC flame retardant shielded cable	Outer sheat material PVC - grey Outer diameter 7 mm approx Conductors sheat material PVC Conductors cross section AWG 26 / 0,14 mm ² Braid tinned copper 85% coverage	Fixed installation -40° ... +85°C (-40°... +185°F) Bending radius min 50 mm Minimum temperature installation -5°C (+23°F)	red black green yellow blue brown orange white grey violet grey/pink red/blue white/green brown/ green/ white/ yellow/ yellow/ brown



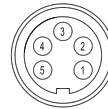
Description	Technical data	Operating temperature	Conductor colours
SPZ.CAVO 32 POLI xx M / 32 CORES CABLE xx M 32 cores PVC flame retardant shielded cable	Outer sheat material PVC - grey Outer diameter 10 mm approx Conductors sheat material PVC Conductors cross section AWG 26 / 0,14 mm ² Braid tinned copper 85% coverage	Fixed installation -40° ... +85°C (-40°... +185°F) Bending radius min 50 mm Minimum temperature installation -5°C (+23°F)	red black green yellow blue brown pink white grey violet grey/pink red/blue white/green brown/ green white/ yellow yellow/ brown white/grey brown/grey white/pink brown/pink white/blue brown/blue white/red brown/red white/black brown/black grey/green yellow/grey pink/green yellow/pink green/blue yellow/blue

note: xx in meters

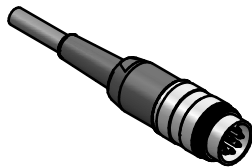
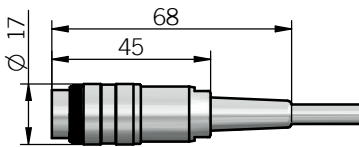
PIGTAILS WITH PLUG



PINOUT FRONT VIEW



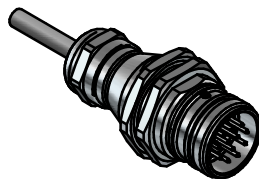
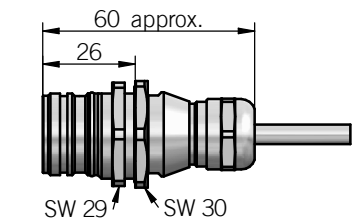
Description	Ordering code example	Electrical interfaces supported	Mating with
PR+C Pigtail with metal/plastic 5 pin C091 M16 IP40 plug connector	ER30E500Z5/28P4X3PR+C.162	NPN open collector (with or without zero) push-pull (with or without zero)	CONN.C05FV (P/N 94990135)



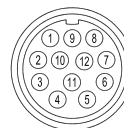
PINOUT FRONT VIEW



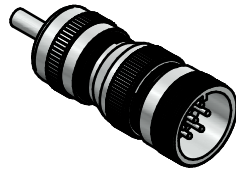
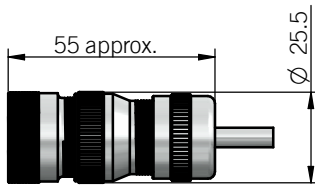
Description	Ordering code example	Electrical interfaces supported	Mating with
PR+C Pigtail with metal/plastic 8 pin C091 M16 IEC 60130-9 IP40 plug connector	EH30M1000Z5L6X6PR+C.162	line driver (with or without zero) RS-422 (with or without zero)	CONN.C08FV (P/N 94990142)



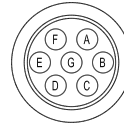
PINOUT FRONT VIEW



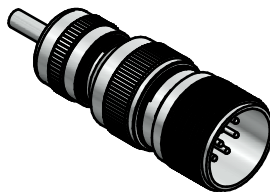
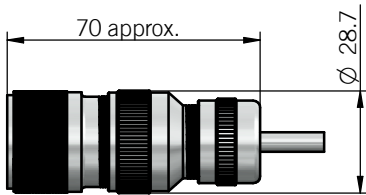
Description	Ordering code example	Electrical interfaces supported	Mating with
PR+H (incremental) / PR+HA (absolute) Pigtail with metal 12 pin M23 CCW plug connector	ER58B1000Z5L6S3PR+H.162 EMA36B12G8/30SPZE6X8PR+HA.162	NPN open collector (with or without zero) push-pull (with or without zero) line driver (with or without zero) RS-422 (with or without zero) SSI (with or without reset)	CONN.H12FV CCW (P/N 94990137)



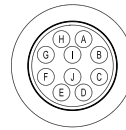
PINOUT FRONT VIEW



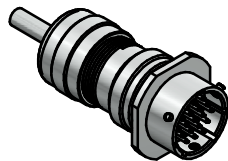
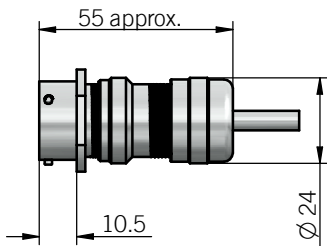
Description	Ordering code example	Electrical interfaces supported	Mating with
PR+M (incremental) / PR+MC (absolute) Pigtail with metal 7 pin MIL plug connector	ER38F500S5L10XPR+M.162 EMA50F1024G8/30SPX15X3PR+MC.162	NPN open collector (with or without zero) push-pull (with or without zero) line driver (without zero) RS-422 (without zero) SSI (without reset)	CONN.M07FV (P/N 94990121)



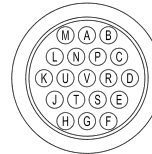
PINOUT FRONT VIEW



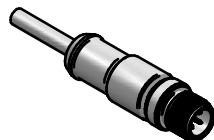
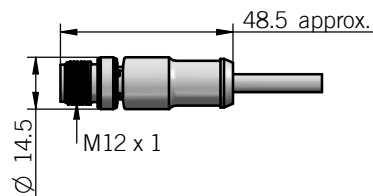
Description	Ordering code example	Electrical interfaces supported	Mating with
PR+M (incremental) / PR+MD (absolute) Pigtail with metal 10 pin MIL plug connector	EH80C1024Z5/28L10X6PR+M.162 EAMR63D12/13B8/30SZE10XPR+MD.162	line driver (with zero) RS-422 (with zero) SSI (with reset)	CONN.M10FV (P/N 94990119)



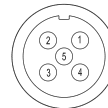
PINOUT FRONT VIEW



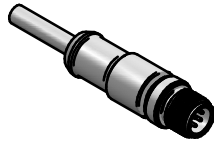
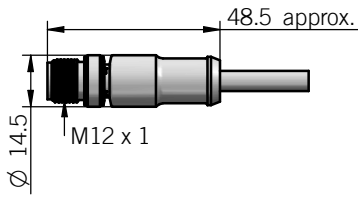
Description	Ordering code example	Electrical interfaces supported	Mating with
PR+M (incremental) / PR+MA (absolute) Pigtail with metal 19 pin MIL plug connector	EF36K6L1000Z5L10X6PR+M.162 EMA50F1024G8/30UPX12X3PR+MA.162	NPN open collector (EF series, with or without zero) push-pull (EF series, with or without zero) RS-422 (EF series, with or without zero) Bit-parallel (singleturn models)	CONN.M19FV (P/N 94990123)



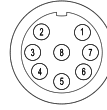
PINOUT FRONT VIEW



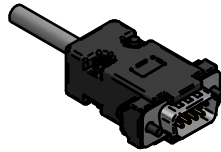
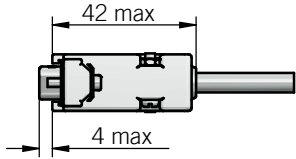
Description	Ordering code example	Electrical interfaces supported	Mating with
PR+M12 Pigtail with M12 5 pin M12 A-coded plug connector	ER40A150S5/28P6X6PR+M12.162 EAL58C16B12/30V010X10XPR+M12.162	NPN open collector (with or without zero) push-pull (with or without zero) Analogue (voltage or current 3 wires)	CONN.M12FV 5P (P/N 94990117)



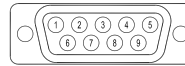
PINOUT FRONT VIEW



Description	Ordering code example	Electrical interfaces supported	Mating with
PR+M12 Pigtail with 8 pin M12 A-coded plug connector	EMI38F10Z5/30RS6XXPR+M12.162 EMA50A4096B8/30SP-ZE6X3PR+M12.162	line driver (with or without zero) RS-422 (with or without zero) SSI (with or without reset) Analogue (current 4 wires)	CONN.M12FV 8P (P/N 94990118)

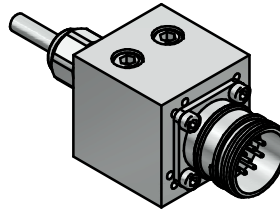
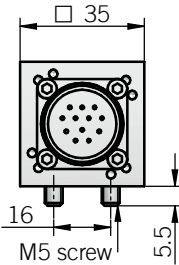
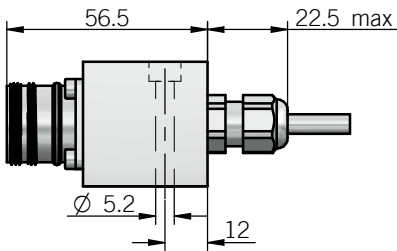


PINOUT FRONT VIEW



Description	Ordering code example	Electrical interfaces supported	Mating with
PR+V Pigtail with plastic 9 pin SUB-DE plug connector	ER63A250Z5/28P10X6PR+V.162	NPN open collector (with or without zero) push-pull (with or without zero) line driver (with or without zero) RS-422 (with or without zero)	CONN.V09FV (P/N 94990059)

PIGTAIL WITH CONNECTOR BLOCK & PLUG

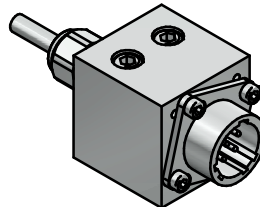
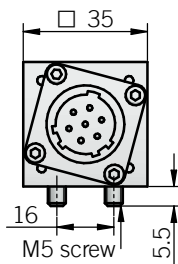
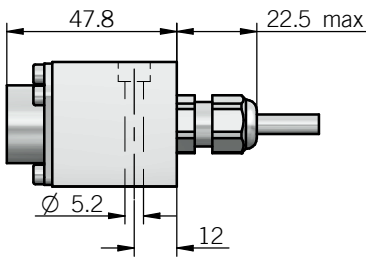


FRONT VIEW

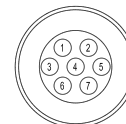


n.2 M5x40 screws included

Description	Ordering code example	Electrical interfaces supported	Mating with
HR.445 Pigtail with black anodized aluminium connector block & 12 pin M23 CCW IP67 plug	EH80P2048Z5L14X3HR.162+445	NPN open collector (with or without zero) push-pull (with or without zero) line driver (with or without zero) RS-422 (with or without zero)	CONN.H12FV CCW (P/N 94990137)

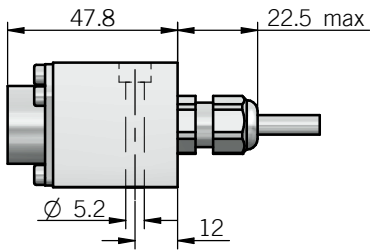


FRONT VIEW

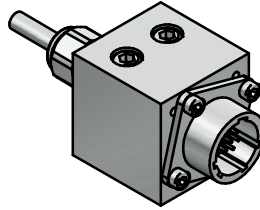
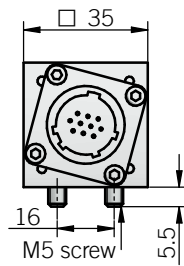


n.2 M5x40 screws included

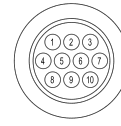
Description	Ordering code example	Electrical interfaces supported	Mating with
JR.445 Pigtail with black anodized aluminium connector block & 7 pin JIS-C-5432 IP40 plug	EH30M1024S5L6X3JR.162+445	NPN open collector (with or without zero) push-pull (with or without zero) line driver (without zero) RS-422 (without zero)	CONN.J07FV (P/N 94990131)



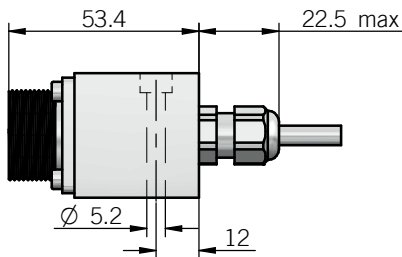
n.2 M5x40 screws included



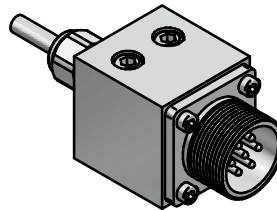
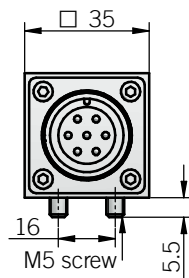
FRONT VIEW



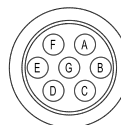
Description	Ordering code example	Electrical interfaces supported	Mating with
JR.445 Pigtail with black anodized aluminium connector block & 10 pin JIS-C-5432 IP40 plug	ER40A2000Z5/28L6X6 JR.162+445	line driver (with zero) RS-422 (with zero)	CONN.J10FV (P/N 94990133)



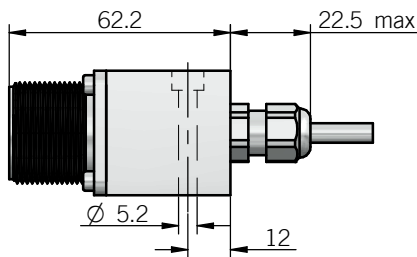
n.2 M5x40 screws included



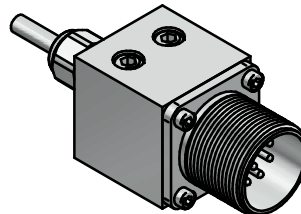
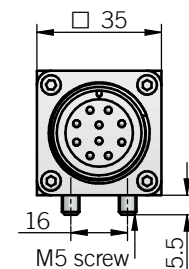
FRONT VIEW



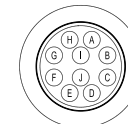
Description	Ordering code example	Electrical interfaces supported	Mating with
MR.445 Pigtail with black anodized aluminium connector block & 7 pin IP67 MIL plug	EL63GB100Z5/28P15X3 MR.162+445	NPN open collector (with or without zero) push-pull (with or without zero) line driver (without zero) RS-422 (without zero)	CONN.M07FV (P/N 94990121)



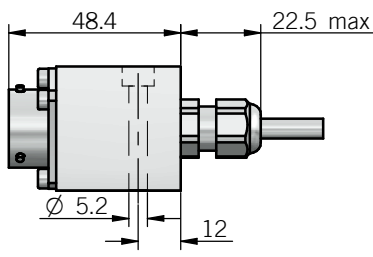
n.2 M5x40 screws included



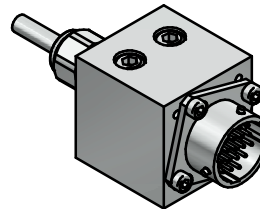
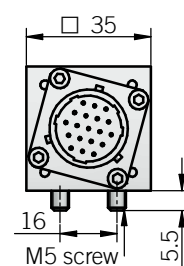
FRONT VIEW



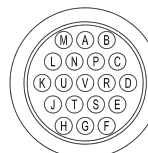
Description	Ordering code example	Electrical interfaces supported	Mating with
MR.445 Pigtail with black anodized aluminium connector block & 10 pin IP67 MIL plug	ER38F1000Z5/30L10XX MR.162+445	line driver (with zero) RS-422 (with zero)	CONN.M10FV (P/N 94990119)



n.2 M5x40 screws included



FRONT VIEW



Description	Ordering code example	Electrical interfaces supported	Mating with
MR.445 Pigtail with black anodized aluminium connector block & 19 pin IP67 MIL plug	EF36K6L1000Z5L10X6 MR.162+445	NPN open collector (EF series, with or without zero) push-pull (EF series, with or without zero) RS-422 (EF series, with or without zero)	CONN.M19FV (P/N 94990123)

dimensions in mm



ELTRA WORLD

CHINA



ITALY

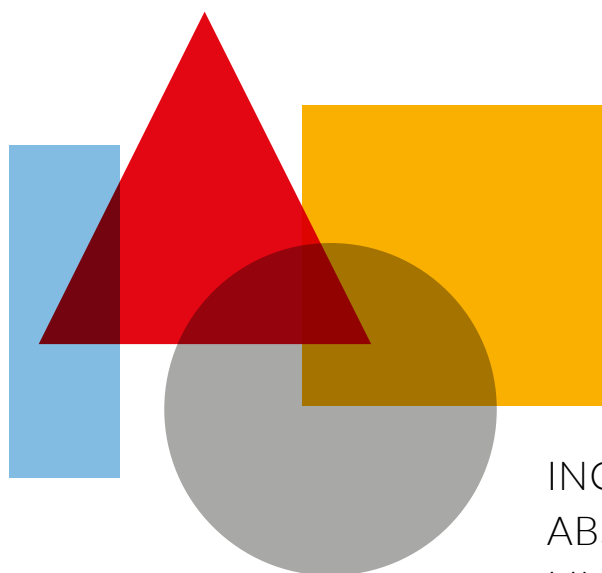
SLOVAKIA

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