Operating Instructions

Process pressure transmitter with ceramic measuring cell

VEGABAR 14 according to MB 3517

Document ID: 35931

Contents

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Supplementary documentation

Information:
Supplementary documents appropriate to the ordered version come with the delivery. You can find them listed in chapter "*Product description*".

Editing status: 2019-08-07

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1 About this document

1.1 Function

This operating instructions provides all the information you need for mounting, connection and setup as well as important instructions for maintenance, fault rectification, the exchange of parts and the safety of the user. Please read this information before putting the instrument into operation and keep this manual accessible in the immediate vicinity of the device.

1.2 Target group

This operating instructions manual is directed to trained personnel. The contents of this manual must be made available to the qualified personnel and implemented.

1.3 Symbols used

Document ID
This symbol on the front page of this instruction refers to the Document ID. By entering the Document ID on www.vega.com you will reach the document download.

Information, tip, note
This symbol indicates helpful additional information.

Caution: If this warning is ignored, faults or malfunctions can result.

Warning: If this warning is ignored, injury to persons and/or serious damage to the instrument can result.

Danger: If this warning is ignored, serious injury to persons and/or destruction of the instrument can result.

Ex applications
This symbol indicates special instructions for Ex applications.

SIL applications
This symbol indicates instructions for functional safety which must be taken into account particularly for safety-relevant applications.

- **List**
  The dot set in front indicates a list with no implied sequence.

→ **Action**
This arrow indicates a single action.

1 **Sequence of actions**
Numbers set in front indicate successive steps in a procedure.

Battery disposal
This symbol indicates special information about the disposal of batteries and accumulators.

2 For your safety

2.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

2.2 Appropriate use

VEGABAR 14 is a pressure transmitter for measurement of gauge pressure, absolute pressure and vacuum.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden.

2.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

2.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety

reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

2.5 Safety label on the instrument

The safety approval markings and safety tips on the device must be observed.

2.6 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

The EU conformity declaration can be found on our homepage.

2.7 Measuring range - permissible process pressure

Due to the application, a measuring cell with a measuring range higher than the permissible pressure range of the process fitting may have been integrated. The permissible process pressure is stated with "Process pressure" on the type label, see chapter 3.1 "*Configuration*". For safety reasons, this range must not be exceeded.

2.8 Fulfillment of NAMUR recommendations

With respect to interference resistance and emitted interference, the NAMUR recommendation NE 21 is fulfilled.

2.9 Installation and operation in the USA and Canada

This information is only valid for USA and Canada. Hence the following text is only available in the English language.

Installations in the US shall comply with the relevant requirements of the National Electrical Code (ANSI/NFPA 70).

Installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code.

2.10 Safety instructions for Ex areas

For Ex applications, only devices with corresponding Ex approval may be used. Observe the Ex-specific safety instructions. These are an integral part of the operating instructions and are enclosed with every device with Ex approval.

2.11 Environmental instructions

Protection of the environment is one of our most important duties. That is why we have introduced an environment management system with the goal of continuously improving company environmental pro-

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tection. The environment management system is certified according to DIN EN ISO 14001.

Please help us fulfil this obligation by observing the environmental instructions in this manual:

- Chapter "*Packaging, transport and storage*"
- Chapter "*Disposal*"

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- Process pressure transmitter VEGABAR 14 with plug connector M12 x 1
- Documentation
  - This operating instructions manual
  - If necessary, certificates

Configuration

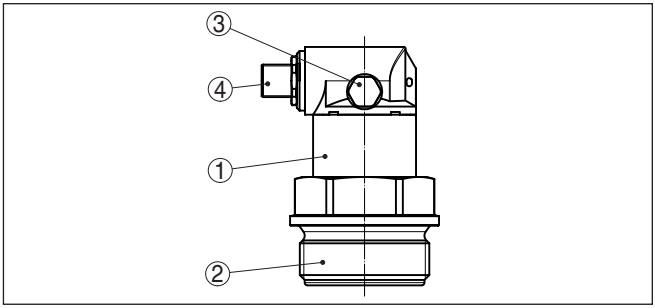

Fig. 1: VEGABAR 14 with plug connector M12 x 1

1 Housing with electronics
2 Process fitting
3 Pressure compensation
4 Plug connector

Type label

The type label contains the most important data for identification and use of the instrument:

- Article number
- Serial number
- Technical data
- Article numbers, documentation

With the serial number, you can access the delivery data of the instrument via "www.vega.com", "*VEGA Tools*" and "*Instrument search*". You can find the serial number on the inside of the instrument as well as on the type label on the outside.

3.2 Principle of operation

Application area

VEGABAR 14 is a pressure transmitter for measurement of gauge pressure, absolute pressure or vacuum. Measured products are gases, vapours and liquids.

Functional principle

The sensor element is the CERTEC® measuring cell with rugged ceramic diaphragm. The process pressure causes a capacitance change in the measuring cell via the ceramic diaphragm. This change is converted into an appropriate output signal and output as measured value.

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Voltage supply

4 … 20 mA two-wire electronics for voltage supply and measured value transmission on the same cable.

3.3 Adjustment

The instrument offers no adjustment options.

3.4 Packaging, transport and storage

Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test based on ISO 4180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

Transport

Transport must be carried out in due consideration of the notes on the transport packaging. Nonobservance of these instructions can cause damage to the device.

Transport inspection

The delivery must be checked for completeness and possible transit damage immediately at receipt. Ascertained transit damage or concealed defects must be appropriately dealt with.

Storage

Up to the time of installation, the packages must be left closed and stored according to the orientation and storage markings on the outside.

Unless otherwise indicated, the packages must be stored only under the following conditions:

- Not in the open
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration

Storage and transport temperature

- Storage and transport temperature see chapter "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 … 85 %

Lifting and carrying

With instrument weights of more than 18 kg (39.68 lbs) suitable and approved equipment must be used for lifting and carrying.

4 Mounting

4.1 General instructions

Ambient conditions

The instrument is suitable for standard and extended ambient conditions acc. to DIN/EN/IEC/ANSI/ISA/UL/CSA 61010-1. It can be used indoors as well as outdoors.

Process conditions

Note:
For safety reasons, the instrument must only be operated within the permissible process conditions. You can find detailed information on the process conditions in chapter "*Technical data*" of the operating instructions or on the type label.

Make sure before mounting that all parts of the instrument exposed to the process are suitable for the existing process conditions.

These are mainly:

- Active measuring component
- Process fitting
- Process seal

Process conditions in particular are:

- Process pressure
- Process temperature
- Chemical properties of the medium
- Abrasion and mechanical influences

4.2 Installation procedure

Welding the socket

For mounting VEGABAR 14, a welded socket is required. You can find these components in the supplementary instructions manual "*Welded socket and threaded adapter*".

Screwing in

On devices with a threaded fitting, the hexagon on the process fitting must be tightened with a suitable wrench.

See chapter "*Dimensions*" for wrench size.

Warning:
The housing or the electrical connection may not be used for screwing in! Depending on the device version, tightening can cause damage, e. g. to the rotation mechanism of the housing.

5 Connecting to power supply

5.1 Preparing the connection

Safety instructions

Always keep in mind the following safety instructions:

Warning:
Connect only in the complete absence of line voltage.

- The electrical connection must only be carried out by trained, qualified personnel authorised by the plant operator.
- If overvoltage surges are expected, overvoltage arresters should be installed.

Voltage supply

Power supply and current signal are carried on the same two-wire cable. The operating voltage can differ depending on the instrument version.

The data for power supply are specified in chapter "*Technical data*".

Provide a reliable separation between the supply circuit and the mains circuits according to DIN EN 61140 VDE 0140-1.

Keep in mind the following additional factors that influence the operating voltage:

- Lower output voltage of the power supply unit under nominal load (e.g. with a sensor current of 20.5 mA or 22 mA in case of fault)
- Influence of additional instruments in the circuit (see load values in chapter "*Technical data*")

Select connection cable

The instrument is connected with standard two-wire cable without screening. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Make sure that the cable used has the required temperature resistance and fire safety for max. occurring ambient temperature

Use cable with round cross section. A suitable outer cable diameter of (see chapter "*Technical data*") ensures the seal effect of the cable gland.

Cable screening and grounding

If screened cable is required, connect the cable screen on both ends to ground potential.

In electroplating plants as well as plants for cathodic corrosion protection it must be taken into account that significant potential differences exist. This can lead to unacceptably high currents in the cable screen if it is grounded at both ends.

Information:
The metallic parts of the instrument (process fitting, housing, etc.) are conductively connected to the ground terminal.

5.2 Wiring plan

Round plug connector M12 x 1

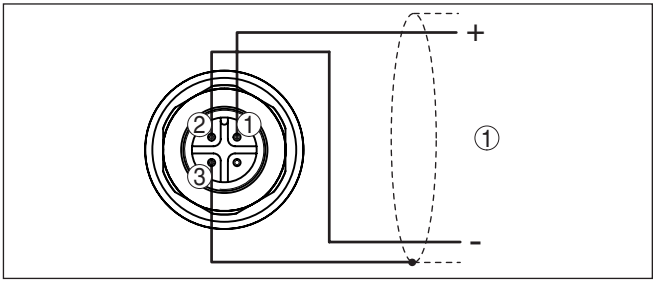

Fig. 2: Wiring plan round plug connector M12 x 1, view to the connection on the instrument side

1 Voltage supply and signal output

5.3 Switch-on phase

After connecting VEGABAR 14 to power supply or after a voltage recurrence, the instrument carries out a self-check:

- Internal check of the electronics
- 4 … 20 mA output jumps to the fault signal 22 mA

Then VEGABAR 14 delivers a current of 4 … 20 mA to the cable. The value corresponds to the actual level as well as to settings already carried out, e.g. the factory setting.

6 Setup

6.1 Setup steps

After mounting and electrical connection, VEGABAR 14 is ready for operation.

VEGABAR 14 delivers a current of 4 … 20 mA corresponding to the actual process pressure.

Further settings are not necessary.

7 Maintenance and fault rectification

7.1 Maintenance

Maintenance

If the device is used properly, no special maintenance is required in normal operation.

Cleaning

The cleaning helps that the type label and markings on the instrument are visible.

Take note of the following:

- Use only cleaning agents which do not corrode the housings, type label and seals
- Use only cleaning methods corresponding to the housing protection rating

7.2 Rectify faults

Reaction when malfunction occurs

The operator of the system is responsible for taking suitable measures to rectify faults.

Causes of malfunction

The device offers maximum reliability. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Voltage supply
- Signal processing

Fault rectification

The first measure to take is to check the output signal. In many cases, the causes can be determined this way and the faults quickly rectified.

24 hour service hotline

Should these measures not be successful, please call in urgent cases the VEGA service hotline under the phone no. **+49 1805 858550**.

The hotline is manned 7 days a week round-the-clock. Since we offer this service worldwide, the support is only available in the English language. The service is free, only standard call charges are incurred.

Check the 4 … 20 mA signal

Error code	Cause	Rectification
4 … 20 mA signal not stable	No atmospheric pressure compensation	Check the pressure compensation in the plug or via the capillaries
No 4 … 20 mA signal	Connection to voltage supply wrong	Check connection according to chapter "*Connection steps*" and if necessary, correct according to chapter "*Wiring plan*"
	No operating voltage	Check cables for breaks; repair if necessary
	Operating voltage too low or load resistance too high	Check, adapt if necessary

Error code	Cause	Rectification
Current signal 22 mA	Electronics module or measuring cell defective	Exchange the instrument or send it in for repair

In Ex applications, the regulations for the wiring of intrinsically safe circuits must be observed.

Reaction after fault rectification

Depending on the reason for the fault and the measures taken, the steps described in chapter "*Set up*" may have to be carried out again.

7.3 How to proceed if a repair is necessary

You can find an instrument return form as well as detailed information about the procedure in the download area of our homepage: www.vega.com.

By doing this you help us carry out the repair quickly and without having to call back for needed information.

If a repair is necessary, please proceed as follows:

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and, if need be, also a safety data sheet outside on the packaging
- Please contact the agency serving you to get the address for the return shipment. You can find the agency on our home page www.vega.com.

8 Dismount

8.1 Dismounting steps

Warning:
Before dismounting, be aware of dangerous process conditions such as e.g. pressure in the vessel or pipeline, high temperatures, corrosive or toxic products etc.

Take note of chapters "*Mounting*" and "*Connecting to voltage supply*" and carry out the listed steps in reverse order.

8.2 Disposal

The instrument consists of materials which can be recycled by specialised recycling companies. We use recyclable materials and have designed the electronics to be easily separable.

WEEE directive
The instrument does not fall in the scope of the EU WEEE directive. Article 2 of this Directive exempts electrical and electronic equipment from this requirement if it is part of another instrument that does not fall in the scope of the Directive. These include stationary industrial plants.

Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points.

If you have no way to dispose of the old instrument properly, please contact us concerning return and disposal.

9 Supplement

9.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Materials and weights	
Materials, wetted parts	
– Process fitting	316L, Duplex steel (1.4462)
– Diaphragm	Sapphire ceramic® (99.9 % oxide ceramic)
– Measuring cell seal	FKM (VP2/A), EPDM (A+P 75.5/KW75F), FFKM (G75B, G75S)
Seal for process fitting (in the scope of delivery)	
– Thread G1½ (DIN 3852-A)	Klingersil C-4400
Materials, non-wetted parts	
– Electronics housing	Brass, nickel-plated
Materials, non-wetted parts, version with plug connector M12 x 1	
– Contact support	PA
– Contacts	CuZn, nickel layer and 0.8 µm gold-plated
– Plug seal	FKM
Conductive connection	Between ground terminal, housing and process fitting
Weight approx.	0.25 kg (0.55 lbs)

Torque	
Torque for process fitting max.	
– G1½ (DIN3852-A)	200 Nm (147.5 lbf ft)

Output variable	
Output signal	4 … 20 mA
Range	3.8 … 20.5 mA
Fault signal	22 mA
Signal resolution	5 µA
Max. output current	22 mA
Run-up time	approx. 2 s
Dead time	≤ 10 ms
Step response time	≤ 20 ms (0 … 63 %)

Input variable

The specifications concerning overload capacity are only an overview and refer to the measuring cell. Limitations due to the material and form of the process fitting are possible. The specifications on the type label always apply.

Nominal range	Overload capacity, max. pressure	Overload capacity, min. pressure
Gauge pressure		
0 … 0.05 bar/0 … 5 kPa	15 bar/1500 kPa	-0.2 bar/-20 kPa
0 … 0.1 bar/0 … 10 kPa	15 bar/1500 kPa	-0.2 bar/-20 kPa
0 … 0.25 bar/0 … 25 kPa	30 bar/3000 kPa	-0.8 bar/-80 kPa
0 … 0.4 bar/0 … 40 kPa	30 bar/3000 kPa	-0.8 bar/-80 kPa
0 … 0.6 bar/0 … 60 kPa	35 bar/3500 kPa	-1 bar/-100 kPa
0 … 1 bar/0 … 100 kPa	35 bar/3500 kPa	-1 bar/-100 kPa
0 … 1.6 bar/0 … 160 kPa	50 bar/5000 kPa	-1 bar/-100 kPa
0 … 2.5 bar/0 … 250 kPa	50 bar/5000 kPa	-1 bar/-100 kPa
0 … 4 bar/0 … 40 kPa	65 bar/6500 kPa	-1 bar/-100 kPa
0 … 6 bar/0 … 600 kPa	90 bar/9000 kPa	-1 bar/-100 kPa
0 … 10 bar/0 … 1000 kPa	90 bar/9000 kPa	-1 bar/-100 kPa
0 … 16 bar/0 … 1.6 MPa	130 bar/13 MPa	-1 bar/-100 kPa
0 … 25 bar/0 … 2.5 MPa	130 bar/13 MPa	-1 bar/-100 kPa
0 … 40 bar/0 … 4 MPa	200 bar/20 MPa	-1 bar/-100 kPa
0 … 60 bar/0 … 6 MPa	200 bar/20 MPa	-1 bar/-100 kPa
-0.1 … 0.1 bar/-10 … 10 kPa	20 bar/2000 kPa	-0.4 bar/-40 kPa
-0.2 … 0.2 bar/-20 … 20 kPa	30 bar/3000 kPa	-0.8 bar/-80 kPa
-0.5 … 0.5 bar/-50 … 50 kPa	35 bar/3500 kPa	-1 bar/-100 kPa
-1 … 0.6 bar/-100 … 60 kPa	50 bar/5000 kPa	-1 bar/-100 kPa
-1 … 1 bar/-100 … 100 kPa	50 bar/5000 kPa	-1 bar/-100 kPa
-1 … 1.5 bar/-100 … 150 kPa	50 bar/5000 kPa	-1 bar/-100 kPa
-1 … 3 bar/-100 … 300 kPa	65 bar/6500 kPa	-1 bar/-100 kPa
-1 … 5 bar/-100 … 500 kPa	90 bar/9000 kPa	-1 bar/-100 kPa
-1 … 9 bar/-100 … 900 kPa	90 bar/9000 kPa	-1 bar/-100 kPa
-1 … 15 bar/-100 … 1500 kPa	130 bar/13000 kPa	-1 bar/-100 kPa
-1 … 25 bar/-1 … 2.5 MPa	130 bar/13 MPa	-1 bar/-100 kPa
-1 … 40 bar/-1 … 4 MPa	200 bar/20 MPa	-1 bar/-100 kPa
-1 … 60 bar/-1 … 6 MPa	200 bar/20 MPa	-1 bar/-100 kPa
Absolute pressure		
0 … 1 bar/0 … 100 kPa	35 bar/3500 kPa	0 bar abs
0 … 1.6 bar/0 … 160 kPa	50 bar/5000 kPa	0 bar abs
0 … 2.5 bar/0 … 250 kPa	50 bar/5000 kPa	0 bar abs
0 … 4 bar/0 … 400 kPa	65 bar/6500 kPa	0 bar abs
0 … 6 bar/0 … 600 kPa	90 bar/9000 kPa	0 bar abs
0 … 10 bar/0 … 1 MPa	90 bar/9 MPa	0 bar abs
0 … 16 bar/0 … 1.6 MPa	130 bar/13 MPa	0 bar abs

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Nominal range	Overload capacity, max. pressure	Overload capacity, min. pressure
0 … 25 bar/0 … 2.5 MPa	200 bar/20 MPa	0 bar abs
0 … 40 bar/0 … 4 MPa	200 bar/20 MPa	0 bar abs
0 … 60 bar/0 … 6 MPa	200 bar/20 MPa	0 bar abs

Reference conditions and influencing variables (according to DIN EN 60770-1)

Reference conditions according to DIN EN 61298-1

– Temperature	+15 … +25 °C (+59 … +77 °F)
– Relative humidity	45 … 75 %
– Air pressure	860 … 1060 mbar/86 … 106 kPa (12.5 … 15.4 psig)
Determination of characteristics	Limit point adjustment according to IEC 61298-2
Characteristic curve	Linear
Reference installation position	upright, diaphragm points downward
Influence of the installation position	< 0.2 mbar/20 Pa (0.003 psig)

Deviation determined according to the limit point method according to IEC 60770[1)]

Deviation	< 0.3 %

Influence of the ambient temperature[2)]

Average temperature coefficient of the zero signal[3)]	< 0.15 %/10 K

Long-term stability (according to DIN 16086, DINV 19259-1 and IEC 60770-1)

Long-term drift of the zero signal[4)]	< 0.1 %/2 years

Ambient conditions

Ambient temperature	
– Version with plug connector	-20 … +85 °C (-4 … +185 °F)
Storage and transport temperature	
– Version with plug connector	-40 … +100 °C (-40 … +212 °F)

Process conditions

The specifications of the pressure stage and product temperature are used as an overview. The specifications on the type label are applicable.

Pressure stage, process fitting	
– Thread 316L	PN 60
– Thread PVDF	PN 10

1) Relating to the nominal measuring range, incl. non-linearity, hysteresis and non-reproducibility.
2) Relating to the nominal measuring range.
3) In the compensated temperature range of 0 … +80 °C (+32 … +176 °F), reference temperature 20 °C (68 °F).
4) Relating to the nominal measuring range.

Product temperature depending on the measuring cell seal	
– FKM (VP2/A)	-20 … +100 °C (-4 … +212 °F)
– EPDM (A+P 75.5/KW75F)	-40 … +100 °C (-40 … +212 °F)
– FFKM (G75B, G75S)	-15 … +100 °C (+5 … +212 °F)
Vibration resistance	mechanical vibrations with 4 g and 5 … 100 Hz[5)]

Electromechanical data

Round plug connector	4-pin with screw connection M12 x 1

Voltage supply

Operating voltage U_B	8 … 30 V DC
Permissible residual ripple	U_{ss} < 1 V
Load resistor	
– Calculation	$(U_B - U_{min})/0.022$ A
– Example - with U_B = 24 V DC	(24 V - 8 V)/0.022 A = 727 Ω

Electrical protective measures

Protection rating[6)]	
– With plug M12 x 1	IP 65
Protection class	III
Overvoltage category	III

Approvals

Instruments with approvals can have different technical specifications depending on the version.

For that reason the associated approval documents of these instruments have to be carefully noted. They are part of the delivery or can be downloaded by entering the serial number of your instrument into the search field under www.vega.com as well as in the general download area.

5) Tested according to the guidelines of German Lloyd, GL directive 2.
6) According to EN 60529/IEC 529.

9.2 Dimensions

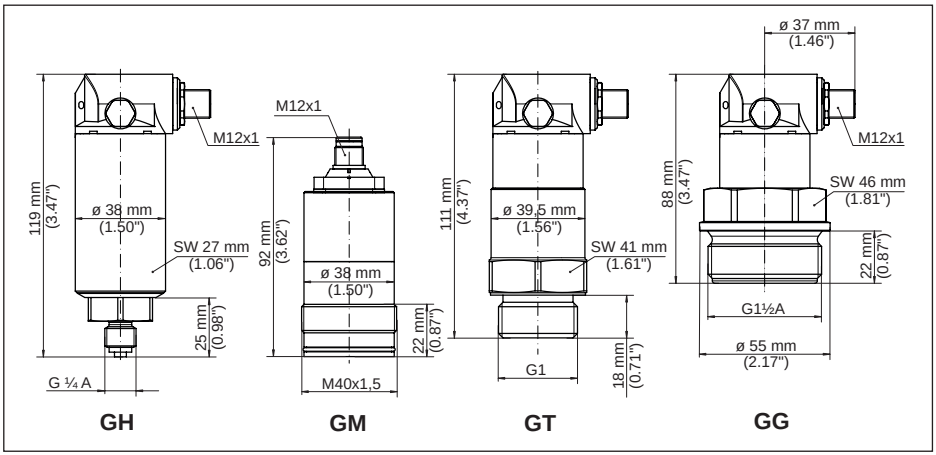

Fig. 3: VEGABAR 14 according to MB 3517

GH G1/4 (EN 837)
GM M40 x 1.5
GT G1 (ISO 228)
GT G1 1/2 (DIN 3852-A)

9.3 Industrial property rights

VEGA product lines are global protected by industrial property rights. Further information see www.vega.com.

Only in U.S.A.: Further information see patent label at the sensor housing.

VEGA Produktfamilien sind weltweit geschützt durch gewerbliche Schutzrechte.

Nähere Informationen unter www.vega.com.

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9.4 Trademark

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Printing date:

35931-EN-190813

VEGA Grieshaber KG
Am Hohenstein 113
77761 Schiltach
Germany

Phone +49 7836 50-0
Fax +49 7836 50-201
E-mail: info.de@vega.com
www.vega.com