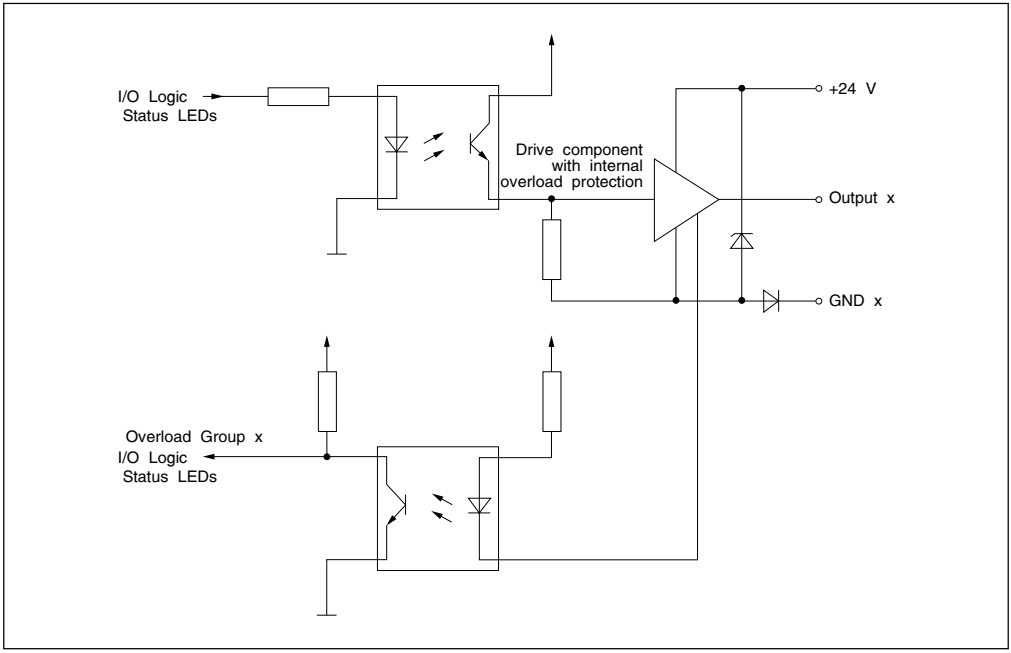
8.2 DO428

8.2.1 Technical Data

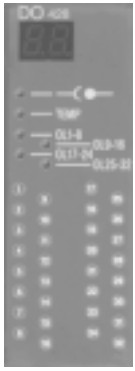
Module ID	DO428
Model Number	2DO428.6
Description	2010 Digital Output Module, 32 transistor outputs 24 VDC, 0.5 A, 4 electrically isolated output groups, Order terminal blocks separately!
C-UL-US Listed	Yes
B&R ID Code	$1D
Base Plate Module	BP200, BP201, BP210
Number of Outputs Total in 4 Groups of	 32 8
Type Transistor	
Electrical Isolation Output - PCC Group - Group Output - Output	 Yes Yes No
Switching Voltage Minimum Nominal Maximum	 18 VDC 24 VDC 30 VDC
Continuous Current per Output per Group Module	 Max. 0.5 A Max. 4 A Max. 16 A
Leakage Current when Switched Off	0.3 mA

Module ID	DO428
Switching Delay log. 0 - log. 1 log. 1 - log. 0	 Typ. 5 µsec / max. 110 µsec Typ. 60 µsec / max. 100 µsec
Switching Frequency (resistive load)	Max. 500 Hz
Overload Protection	Yes
Start after Overload Cutoff	Automatic after approx. 5 sec
Short Circuit Current	0.75 to 1.5 A
Protective Circuit Internal External	 Against peak over voltage to 55 V (VDE 160) Against reverse polarity of the 24 V supply on the module only if required (Surge)
Reverse Voltage for Turning Off Inductive Loads	45 to 55 V
Power Consumption Internal Terminal Side at 24 V	 Max. 5 W Max. 2 W per group
Dimensions (H, W, D) [mm]	285, 40, 185

8.2.2 Output Circuit



8.2.3 Status LEDs



—≺ ●— Indicates the status of the terminal block, i.e. if this LED is lit the terminal block is either not connected to the module or is not connected properly.

TEMP Indicates that all outputs have been switched off because of excessive temperature in the inside of the module. This function protects the module from thermal damage. After the module has cooled for approx. 10 sec, normal operation continues.

OL x-y Overload: These LEDs indicate that the overload or the short circuit protection circuit has been activated for the respective LED group. If for example the LED OL 1-8 is lit, one of the outputs 1 to 8 has been switched off (for more information refer to section “Overload Protection”).

1 ... **32** LEDs 1 to 32 indicate the logical status of the respective output.

8.2.4 Loads Free Switching

By removing the terminal block, the terminal block contact of the output module is turned off. This prevents any wear on the contacts because the terminal block is always inserted or removed without power. The logical state is retained when the terminal block is removed, i.e. immediately after re-inserting the terminal block, the outputs can continue from where they left off.

8.2.5 Overload Protection

Overload protection is activated in the following cases:

- ❍ The junction temperature for the transistors exceeds the limit (typ. 150 °C, min. 135 °C, max. 175 °C). Causes: short circuit, overload or excessive environmental temperature.
- ❍ The 24 V supply voltage (terminal side) is less than typ. 13 V (min. 10 V, max. 14.5 V)

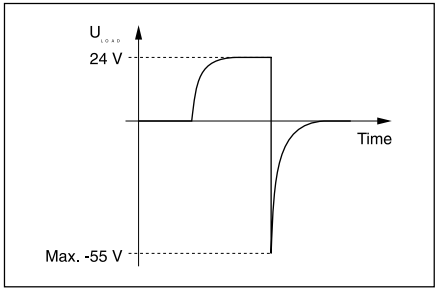
The affected output is switched off until ...

- ... the junction temperature is again within the allowed limits (Hysteresis typ. 20 °C). The time before it is switched on again is normally within seconds.
- ... the supply voltage is in the valid range (typ. > 14.5 V).
- ... the terminal block is connected properly.

8.2.6 Switching Inductive Loads

The transistor enables the fast and safe switching of inductive loads. It is not necessary to use an inverse diode on the inductive load. Note however that the maximum switching frequency is inductively limited by the fixed reverse voltage of 45 to 55 V.

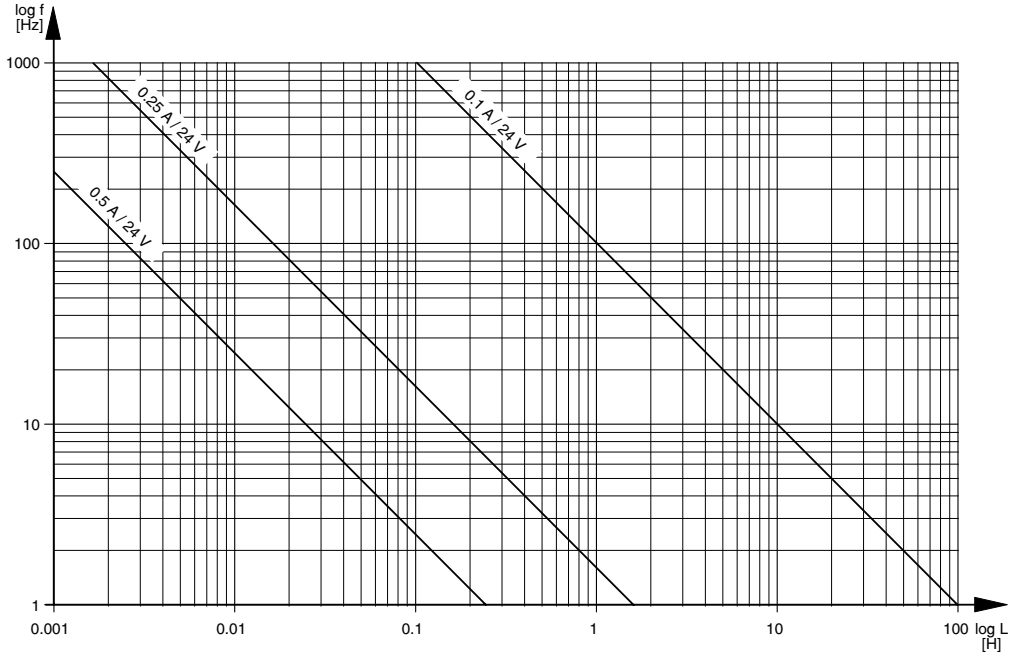
Reverse voltage: The reverse voltage is a negative voltage on the switching element (e.g. valve). If the switching element does not allow operation with a negative voltage, an inverse diode must be installed externally in order to limit the voltage to approximately -0.6 V.



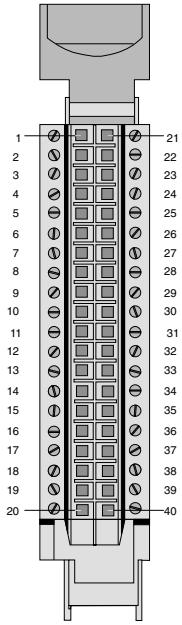
Schematic Diagram of Reverse Voltage

The maximum switching frequency is reduced with increasing inductance. An inductance of 0.5 H can be switched without any problems with 0.5 Hz at 24 V / 0.5 A and 60 °C environmental temperature.

The maximum switching frequency for a given value for inductance can be calculated from the following graph:



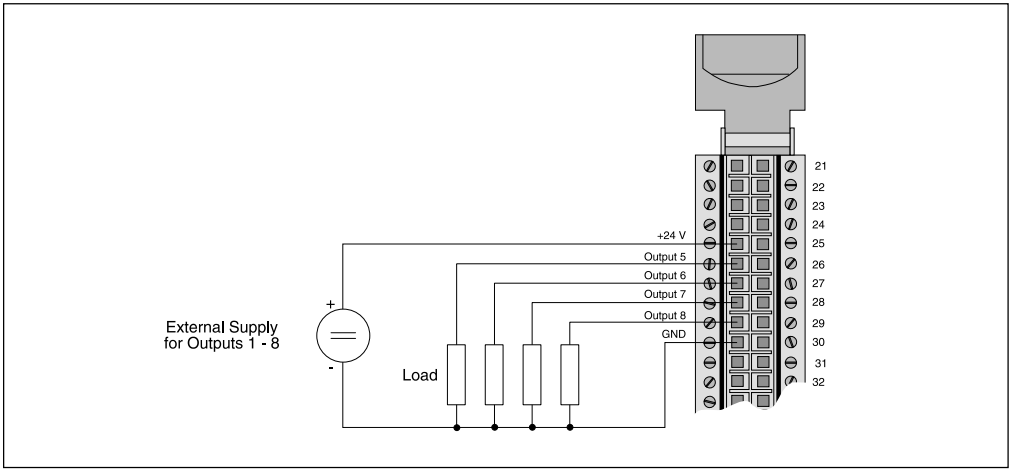
8.2.7 Terminal Assignments



TB140

Terminal	Description		Terminal	Description	
1	Output 1	Group 1	21	Output 17	Group 3
2	Output 2		22	Output 18	
3	Output 3		23	Output 19	
4	Output 4		24	Output 20	
5	+24 V (1-8)		25	+24 V (17-24)	
6	Output 5		26	Output 21	
7	Output 6		27	Output 22	
8	Output 7		28	Output 23	
9	Output 8		29	Output 24	
10	GND (1-8)		30	GND (17-24)	
11	Output 9	Group 2	31	Output 25	Group 4
12	Output 10		32	Output 26	
13	Output 11		33	Output 27	
14	Output 12		34	Output 28	
15	+24 V (9-16)		35	+24 V (25-32)	
16	Output 13		36	Output 29	
17	Output 14		37	Output 30	
18	Output 15		38	Output 31	
19	Output 16		39	Output 32	
20	GND (9-16)		40	GND (25-32)	

Connection Example



8.2.8 Variable Declaration

Function	Variable Declaration				
	Scope	Data Type	Length	Module Type	Channel
Single Digital Output (Channel x)	tc_global	BIT	1	Digital Out	1 ... 32
Read Status Register	tc_global	BYTE	1	Status In	0

STATUS REGISTER	Bit	Description	0	1
	7	Overload channel 25 to 32	no	yes
	6	Overload channel 17 to 24	no	yes
	5	Overload channel 9 to 16	no	yes
	4	Overload channel 1 to 8	no	yes
	3	0		
	2	Max. temperature exceeded	no	yes
	1	1		
	0	Terminal status: Terminal block inserted in module	yes	no