

DATA SHEET

# DC523

## Digital Input/Output module



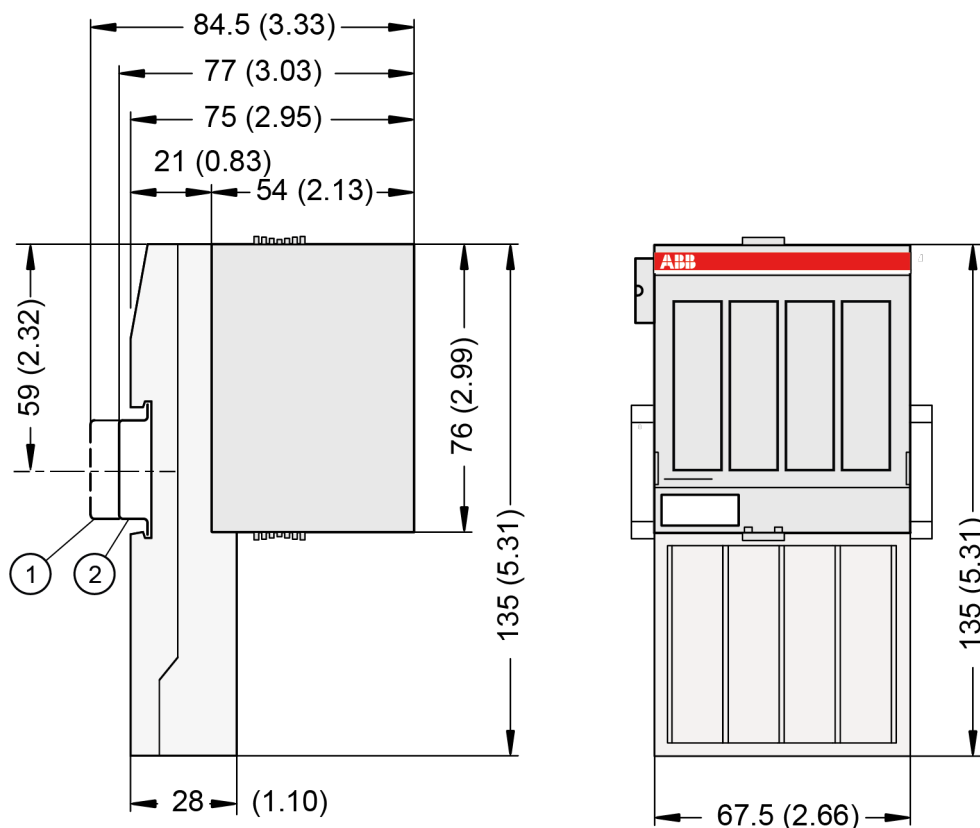
### 1 Ordering data

Part no.	Description	Product life cycle phase *)
1SAP 240 500 R0001	DC523, digital input/output module, 24 DC, 24 V DC / 0.5 A, 1-wire	Active
1SAP 440 500 R0001	DC523-XC, digital input/output module, 24 DC, 24 V DC / 0.5 A, 1-wire, XC version	Active



\*) Modules in lifecycle Classic are available from stock but not recommended for planning and commissioning of new installations.

## 2 Dimensions



- 1 Din rail 15 mm
- 2 Din rail 7.5 mm



*The dimensions are in mm and in brackets in inch.*

## 3 Technical data

The system data of AC500 and S500 ↗ *Chapter 4 “System data AC500” on page 6* are applicable to the standard version.

The system data of AC500-XC ↗ *Chapter 5 “System data AC500-XC” on page 11* are applicable to the XC version.

Only additional details are therefore documented below.

The technical data are also applicable to the XC version.

Parameter	Value
Process supply voltage UP	
Connections	Terminals 1.8, 2.8, 3.8 and 4.8 for +24 V (UP) as well as 1.9, 2.9, 3.9 and 4.9 for 0 V (ZP)
Rated value	24 V DC
Max. ripple	5 %
Protection against reversed voltage	Yes

Parameter	Value
Rated protection fuse on UP	10 A fast
Galvanic isolation	Yes, per module
Current consumption	
From 24 V DC power supply at the terminals UP/L+ and ZP/M of the CPU/communication interface module	Ca. 2 mA
From UP at normal operation / with outputs	0.1 A + max. 0.5 A per output
Inrush current from UP (at power up)	0.008 A <sup>2</sup> s
Max. power dissipation within the module	6 W (outputs unloaded)
Sensor power supply	
Connections	Terminals 1.0...1.3 = +24 V, 1.4...1.7 = 0 V
Voltage	24 V DC with short circuit and overload protection
Loadability	Terminals 1.0...1.3, in total max. 0.5 A
Weight (without terminal unit)	Ca. 125 g
Mounting position	Horizontal Or vertical with derating (output load reduced to 50 % at 40 °C per group)
Cooling	The natural convection cooling must not be hindered by cable ducts or other parts in the switch-gear cabinet.



**NOTICE!**

**Attention:**

All I/O channels (digital and analog) are protected against reverse polarity, reverse supply, short circuit and continuous overvoltage up to 30 V DC.



**Multiple overloads**

No effects of multiple overloads on isolated multi-channel modules occur, as every channel is protected individually by an internal smart high-side switch.

### 3.1 Technical data of the configurable digital inputs/outputs

Each of the configurable I/O channels is defined as input or output by the user program. This is done by interrogating or allocating the corresponding channel.

Parameter	Value
Number of channels per module	24 inputs/outputs (with transistors)
Distribution of the channels into groups	1 group of 24 channels
If the channels are used as inputs	
Channels C0...C7	Terminals 2.0...2.7
Channels C8...C15	Terminals 3.0...3.7

Parameter	Value
Channels C16...C23	Terminals 4.0...4.7
If the channels are used as outputs	
Channels C0...C7	Terminals 2.0...2.7
Channels C8 C15	Terminals 3.0...3.7
Channels C16...C23	Terminals 4.0...4.7
Indication of the input/output signals	1 yellow LED per channel, the LED is ON when the input/output signal is high (signal 1)
Monitoring point of input/output indicator	LED is part of the input circuitry
Galvanic isolation	From the rest of the module

### 3.1.1 Technical data of the digital inputs/outputs if used as inputs

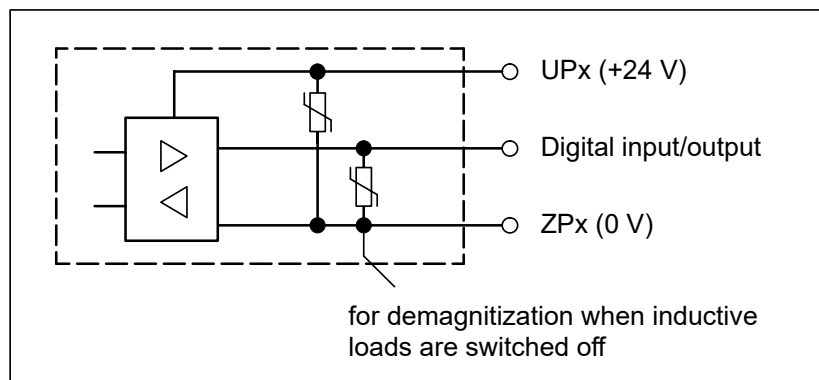
Parameter	Value
Number of channels per module	Max. 24 digital inputs
Reference potential for all inputs	Terminals 1.9, 2.9, 3.9 and 4.9 (negative pole of the process supply voltage, signal name ZP)
Galvanic isolation	From the rest of the module
Indication of the input signals	1 yellow LED per channel, the LED is ON when the input signal is high (signal 1)
Monitoring point of input/output indicator	LED is part of the input circuitry
Input type acc. to EN 61131-2	Type 1
Input delay (0->1 or 1->0)	Typ. 8 ms, configurable from 0.1 to 32 ms
Input signal voltage	24 V DC
Signal 0	-3 V...+5 V *)
Undefined signal	> +5 V...< +15 V
Signal 1	+15 V...+30 V
Ripple with signal 0	Within -3 V...+5 V *)
Ripple with signal 1	Within +15 V...+30 V
Input current per channel	
Input voltage +24 V	Typ. 5 mA
Input voltage +5 V	> 1 mA
Input voltage +15 V	> 5 mA
Input voltage +30 V	< 8 mA
Max. cable length	
Shielded	1000 m
Unshielded	600 m

\*) Due to the direct connection to the output, the demagnetizing varistor is also effective at the input (see figure) above. This is why the difference between UPx and the input signal must not exceed the clamp voltage of the varistor. The varistor limits the clamp voltage to approx. 36 V. Consequently, the input voltage must range from -12 V to +30 V when UPx = 24 V and from -6 V to +30 V when UPx = 30 V.

### 3.1.2 Technical data of the digital inputs/outputs if used as outputs

Parameter	Value
Number of channels per module	Max. 24 transistor outputs
Reference potential for all outputs	Terminals 1.9, 2.9, 3.9 and 4.9 (negative pole of the process supply voltage, signal name ZP)
Common power supply voltage	For all outputs: terminals 1.8, 2.8, 3.8 and 4.8 (positive pole of the process supply voltage, signal name UP)
Output voltage for signal 1	UP (-0.8 V)
Output delay (0->1 or 1->0)	On request
Output current	
Rated value, per channel	500 mA at UP = 24 V
Maximum value (all channels together)	8 A
Leakage current with signal 0	< 0.5 mA
Rated protection fuse on UP	10 A fast
Demagnetization when inductive loads are switched off	With varistors integrated in the module (see figure below)
Switching frequency	
With resistive load	On request
With inductive loads	Max. 0.5 Hz
With lamp loads	Max. 11 Hz with max. 5 W
Short-circuit-proof / overload-proof	Yes
Overload message ( $I > 0.7 \text{ A}$ )	Yes, after ca. 100 ms
Output current limitation	Yes, automatic reactivation after short circuit/overload
Resistance to feedback against 24 V signals	Yes
Max. cable length	
Shielded	1000 m
Unshielded	600 m

The following drawing shows the circuitry of a digital input/output with the varistors for demagnetization when inductive loads are switched off.



## 3.2 Technical data of the fast counter



The fast counter of the module does not work if the module is connected to a

- FBP interface module
- CS31 bus module
- CANopen communication interface module

Parameter	Value
Used inputs	C16 / C17
Used outputs	C18
Counting frequency	Max. 50 kHz

## 4 System data AC500

### 4.1 Environmental conditions

Table 1: Process and supply voltages

Parameter	Value
24 V DC	
Voltage	24 V (-15 %, +20 %)
Protection against reverse polarity	Yes
120 V AC	
Voltage	120 V (-15 %, +10 %)
Frequency	50/60 Hz (-6 %, +4 %)
230 V AC	
Voltage	230 V AC (-15 %, +10 %)
Frequency	50/60 Hz (-6 %, +4 %)
120 V AC...240 V AC wide-range supply	
Voltage	120 V...240 V (-15 %, +10 %)
Frequency	50/60 Hz (-6 %, +4 %)
Allowed interruptions of power supply, according to EN 61131-2	
DC supply	Interruption < 10 ms, time between 2 interruptions > 1 s, PS2
AC supply	Interruption < 0.5 periods, time between 2 interruptions > 1 s



#### NOTICE!

Exceeding the maximum power supply voltage for process or supply voltages could lead to unrecoverable damage of the system. The system might be destroyed.

**NOTICE!**

Improper voltage level or frequency range which cause damage of AC inputs:

- AC voltage above 264 V
- Frequency below 47 Hz or above 62.4 Hz

**NOTICE!**

Improper connection leads cause overtemperature on terminals.

PLC modules may be destroyed by using wrong cable type, wire size and cable temperature classification.

Parameter	Value
Temperature	
Operating	0 °C...+60 °C: Horizontal mounting of modules. 0 °C...+40 °C: Vertical mounting of modules. Output load reduced to 50 % per group.
Storage	-40 °C...+70 °C
Transport	-40 °C...+70 °C
Humidity	Max. 95 %, without condensation
Air pressure	
Operating	> 800 hPa / < 2000 m
Storage	> 660 hPa / < 3500 m
Ingress protection	IP20

## 4.2 Creepage distances and clearances

The creepage distances and clearances meet the requirements of the overvoltage category II, pollution degree 2.

## 4.3 Insulation test voltages, routine test

According to EN 61131-2

Parameter	Value	
230 V circuits against other circuitry	2500 V	1.2/50 µs
120 V circuits against other circuitry	1500 V	1.2/50 µs
120 V...240 V circuits against other circuitry	2500 V	1.2/50 µs
24 V circuits (supply, 24 V inputs/outputs, analog inputs/outputs), if they are galvanically isolated against other circuitry	500 V	1.2/50 µs

Parameter	Value	
COM interfaces, galvanically isolated	500 V	1.2/50 $\mu$ s
COM interfaces, electrically not isolated	Not applicable	Not applicable
FBP interface	500 V	1.2/50 $\mu$ s
Ethernet	500 V	1.2/50 $\mu$ s
ARCNET	500 V	1.2/50 $\mu$ s
230 V circuits against other circuitry	1350 V	AC 2 s
120 V circuits against other circuitry	820 V	AC 2 s
120 V...240 V circuits against other circuitry	1350 V	AC 2 s
24 V circuits (supply, 24 V inputs/outputs, analog inputs/outputs), if they are galvanically isolated against other circuitry	350 V	AC 2 s
COM interfaces, galvanically isolated	350 V	AC 2 s
COM interfaces, electrically not isolated	Not applicable	Not applicable
FBP interface	350 V	AC 2 s
Ethernet	350 V	AC 2 s
ARCNET	350 V	AC 2 s

#### 4.4 Power supply units


For the supply of the modules, power supply units according to SELV or PELV specifications must be used.



##### **Safety Extra Low Voltage (SELV) and Protective Extra Low Voltage (PELV)**

*To ensure electrical safety of AC500/AC500-eCo extra low voltage circuits, 24 V DC supply, communication interfaces, I/O circuits, and all connected devices must be powered from sources meeting requirements of SELV, PELV, class 2, limited voltage or limited power according to applicable standards.*



	<p><b>WARNING!</b></p> <p><b>Improper installation can lead to death by touching hazardous voltages!</b></p>
	<p>To avoid personal injury, safe separation, double or reinforced insulation and separation of the primary and secondary circuit must be observed and implemented during installation.</p> <ul style="list-style-type: none"> <li>– Only use power converters for safety extra-low voltages (SELV) with safe galvanic separation of the primary and secondary circuit.</li> <li>– Safe separation means that the primary circuit of mains transformers must be separated from the secondary circuit by double or reinforced insulation. The protective extra-low voltage (PELV) offers protection against electric shock.</li> </ul>

## 4.5 Electromagnetic compatibility

Table 2: Range of use

Parameter	Value
Industrial applications	Yes
Domestic applications	No

Table 3: Immunity against electrostatic discharge (ESD), according to IEC 61000-4-2, zone B, criterion B

Parameter	Value
Electrostatic voltage in case of air discharge	8 kV
Electrostatic voltage in case of contact discharge	4 kV, in a closed switchgear cabinet 6 kV <sup>1)</sup>
ESD with communication connectors	In order to prevent operating malfunctions, it is recommended, that the operating personnel discharge themselves prior to touching communication connectors or perform other suitable measures to reduce effects of electrostatic discharges.
ESD with connectors of terminal bases	The connectors between the Terminal Bases and processor modules or Communication Modules must not be touched during operation. The same is valid for the I/O bus with all modules involved.

<sup>1)</sup> High requirement for shipping classes are achieved with additional specific measures (see specific documentation).

Table 4: Immunity against the influence of radiated (CW radiated), according to IEC 61000-4-3, zone B, criterion A

Parameter	Value
Test field strength	10 V/m

Table 5: Immunity against fast transient interference voltages (burst), according to IEC 61000-4-4, zone B, criterion B

Parameter	Value
Supply voltage units (DC)	2 kV
Supply voltage units (AC)	2 kV
Digital inputs/outputs (24 V DC)	1 kV

Parameter	Value
Digital inputs/outputs (120 V AC...240 V AC)	2 kV
Analog inputs/outputs	1 kV
CS31 bus	1 kV
Serial RS-485 interfaces (COM)	1 kV
Serial RS-232 interfaces (COM, not for PM55x and PM56x)	1 kV
ARCNET	1 kV
FBP	1 kV
Ethernet	1 kV
I/O supply (DC-out)	1 kV

Table 6: Immunity against the influence of line-conducted interferences (CW conducted), according to IEC 61000-4-6, zone B, criterion A

Parameter	Value
Test voltage	3V zone B, 10 V is also met.
High energy surges	According to IEC 61000-4-5, zone B, criterion B
Power supply DC	1 kV CM / 0.5 kV DM <sup>2)</sup>
DC I/O supply	0.5 kV CM / 0.5 kV DM <sup>2)</sup>
Communication Lines, shielded	1 kV CM <sup>2)</sup>
AC I/O unshielded <sup>3)</sup>	2 kV CM / 1 kV DM <sup>2)</sup>
I/O analog, I/O DC unshielded <sup>3)</sup>	1 kV CM / 0.5 kV DM <sup>2)</sup>
Radiation (radio disturbance)	According to IEC 55011, group 1, class A

<sup>2)</sup> CM = Common Mode, DM = Differential Mode

<sup>3)</sup> When DC I/O inputs are used with AC voltage, external filters limiting high energy surges to 1 kV CM / 0.5 DM are required to meet requirements according IEC 61131-2.

## 4.6 Mechanical data

Parameter	Value
Mounting	Horizontal
Degree of protection	IP 20
Housing	Classification V-2 according to UL 94
Vibration resistance acc. to EN 61131-2	all three axes 2 Hz...8.4 Hz, continuous 3.5 mm 8.4 Hz...150 Hz, continuous 1 g (higher values on request)
Shock test	All three axes 15 g, 11 ms, half-sinusoidal
<b>Mounting of the modules:</b>	
DIN rail according to DIN EN 50022	35 mm, depth 7.5 mm or 15 mm

Parameter	Value
Mounting with screws	Screws with a diameter of 4 mm
Fastening torque	1.2 Nm

## 4.7 Approvals and certifications

Information on approvals and certificates can be found in the corresponding chapter of the *Main catalog, PLC Automation*.

## 5 System data AC500-XC



Assembly, construction and connection of devices of the variant AC500-XC is identical to AC500 (standard). The following description provides information on general technical data of AC500-XC system.

### 5.1 Environmental conditions

Table 7: Process and supply voltages

Parameter	Value
24 V DC	
Voltage	24 V (-15 %, +20 %)
Protection against reverse polarity	Yes
120 V AC...240 V AC wide-range supply	
Voltage	120...240 V (-15 %, +10 %)
Frequency	50/60 Hz (-6 %, +4 %)
Allowed interruptions of power supply	
DC supply	Interruption < 10 ms, time between 2 interruptions > 1 s, PS2



#### NOTICE!

Exceeding the maximum power supply voltage for process or supply voltages could lead to unrecoverable damage of the system. The system might be destroyed.



#### NOTICE!

For the supply of the modules, power supply units according to PELV or SELV specifications must be used.



The creepage distances and clearances meet the requirements of the overvoltage category II, pollution degree 2.

Parameter	Value
Temperature	
Operating	<p>-40 °C...+70 °C</p> <p>-40 °C...-30 °C: Proper start-up of system; technical data not guaranteed</p> <p>-40 °C...0 °C: Due to the LCD technology, the display might respond very slowly.</p> <p>-40 °C...+40 °C: Vertical mounting of modules possible, output load limited to 50 % per group</p> <p>+60 °C...+70 °C with the following deratings:</p> <ul style="list-style-type: none"> <li>• System is limited to max. 2 communication modules per terminal base</li> <li>• Applications certified for cULus up to +60 °C</li> <li>• Digital inputs: maximum number of simultaneously switched on input channels limited to 75 % per group (e.g. 8 channels =&gt; 6 channels)</li> <li>• Digital outputs: output current maximum value (all channels together) limited to 75 % per group (e.g. 8 A =&gt; 6 A)</li> <li>• Analog outputs only if configured as voltage output: maximum total output current per group is limited to 75 % (e.g. 40 mA =&gt; 30 mA)</li> <li>• Analog outputs only if configured as current output: maximum number of simultaneously used output channels limited to 75 % per group (e.g. 4 channels =&gt; 3 channels)</li> </ul>
Storage / Transport	-40 °C...+85 °C
Humidity	Operating / Storage: 100 % r. H. with condensation
Air pressure	<p>Operating:</p> <p>-1000 m...4000 m (1080 hPa...620 hPa)</p> <p>&gt; 2000 m (&lt; 795 hPa):</p> <ul style="list-style-type: none"> <li>• max. operating temperature must be reduced by 10 K (e.g. 70 °C to 60°C)</li> <li>• I/O module relay contacts must be operated with 24 V nominal only</li> </ul>
Immunity to corrosive gases	<p>Operating: Yes, according to:</p> <p>ISA S71.04.1985 Harsh group A, G3/GX</p> <p>IEC 60721-3-3 3C2 / 3C3</p>
Immunity to salt mist	<p>Operating: Yes, horizontal mounting only, according to IEC 60068-2-52 severity level: 1</p>

**NOTICE!****Risk of corrosion!**

Unused connectors and slots may corrode if XC devices are used in salt-mist environments.

Protect unused connectors and slots with TA535 protective caps for XC devices.

Table 8: Electromagnetic compatibility

Parameter	Value
Device suitable for:	
Industrial applications	Yes
Domestic applications	No
Radiated emission (radio disturbances)	Yes, according to: CISPR 16-2-3
Conducted emission (radio disturbances)	Yes, according to: CISPR 16-2-1, CISPR 16-1-2
Electrostatic discharge (ESD)	Yes, according to: IEC 61000-4-2, zone B, cri- terion B
Fast transient interference voltages (burst)	Yes, according to: IEC 61000-4-4, zone B, cri- terion B
High energy transient interference voltages (surge)	Yes, according to: IEC 61000-4-5, zone B, cri- terion B
Influence of radiated disturbances	Yes, according to: IEC 61000-4-3, zone B, cri- terion A
Influence of line-conducted interferences	Yes, according to: IEC 61000-4-6, zone B, cri- terion A
Influence of power frequency magnetic fields	Yes, according to: IEC 61000-4-8, zone B, cri- terion A



*In order to prevent malfunctions, it is recommended, that the operating personnel discharge themselves prior to touching communication connectors or perform other suitable measures to reduce effects of electrostatic discharges.*



**NOTICE!**  
**Risk of malfunctions!**

Unused slots for communication modules are not protected against accidental physical contact.

- Unused slots for communication modules must be covered with dummy communication modules to achieve IP20 rating.
- I/O bus connectors must not be touched during operation.

## 5.2 Mechanical data

Parameter	Value
Wiring method	Spring terminals
Degree of protection	IP 20
Vibration resistance	Yes, according to: IEC 61131-2 IEC 60068-2-6 IEC 60068-2-64
Shock resistance	Yes, according to: IEC 60068-2-27
Assembly position	Horizontal Vertical (no application in salt mist environment)
Assembly on DIN rail	
DIN rail type	According to IEC 60715 35 mm, depth 7.5 mm or 15 mm
Assembly with screws	
Screw diameter	4 mm
Fastening torque	1.2 Nm

## 5.3 Environmental tests

Parameter	Value
Storage	IEC 60068-2-1 Test Ab: cold withstand test -40 °C / 16 h IEC 60068-2-2 Test Bb: dry heat withstand test +85 °C / 16 h
Humidity	IEC 60068-2-30 Test Db: Cyclic (12 h / 12 h) damp-heat test 55 °C, 93 % r. H. / 25 °C, 95 % r. H., 6 cycles IEC 60068-2-78, stationary humidity test: 40 °C, 93 % r. H., 240 h
Insulation Test	IEC 61131-2
Vibration resistance	IEC 61131-2 / IEC 60068-26: 5 Hz...500 Hz, 2 g (with memory card inserted) IEC 60068-2-64: 5 Hz...500 Hz, 4 g rms
Shock resistance	IEC 60068-2-27: all 3 axes 15 g, 11 ms, half-sinusoidal

Table 9: EMC immunity

Parameter	Value
Electrostatic discharge (ESD)	Electrostatic voltage in case of air discharge: 8 kV Electrostatic voltage in case of contact discharge: 6 kV
Fast transient interference voltages (burst)	Supply voltage units (DC): 4 kV Digital inputs/outputs (24 V DC): 2 kV Analog inputs/outputs: 2 kV Communication lines shielded: 2 kV I/O supply (DC-out): 2 kV

Parameter	Value
High energy transient interference voltages (surge)	Supply voltage units (DC): 1 kV CM *) / 0.5 kV DM *) Digital inputs/outputs (24 V DC): 1 kV CM *) / 0.5 kV DM *) Digital inputs/outputs (AC): 4 kV Analog inputs/outputs: 1 kV CM *) / 0.5 kV DM *) Communication lines shielded: 1 kV CM *) I/O supply (DC-out): 0,5 kV CM *) / 0.5 kV DM *)
Influence of radiated disturbances	Test field strength: 10 V/m
Influence of line-conducted interferences	Test voltage: 10 V
Power frequency magnetic fields	30 A/m 50 Hz 30 A/m 60 Hz

\*) CM = Common Mode, \* DM = Differential Mode