FlowBoxSpeedController

Speed controller 0-10V for fans with EC motor

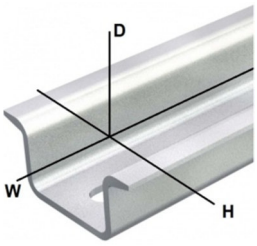
The FlowBoxSpeedController is a speed controller 0-10V for fans with EC motor. This speed controller was specially designed for the operation of flow boxes/filter fan units (FFU) of the type FFU-S-EC/MOD-12xx with 0-10V control from Exyte.
Thanks to the speed controller, it is now easily possible to establish a connection from a PLC to one or more flow boxes. How many flow boxes can be controlled by a speed controller depends on the internal resistance of each individual flow box and the voltage drop of the 0-10V signal on the network cable. The information about the internal resistance can be found under the technical data electrical and the voltage drop can be found in the diagram. The voltage drop can be calculated using the following formulas.

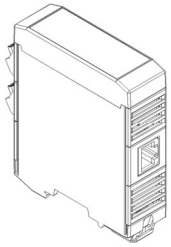
$$R_{AQ} = \frac{10V}{I_{AQ}}$$

$$l = \frac{\frac{10V \times \Delta U}{100\%}}{2 \times \rho \times I_{AQ}} \times A$$

R_{AQ} … load resistance [Ω]
I_{AQ} … output current due to the load [A]
ΔU … max voltage drop on the cable [%]
l … network cable length [m]
A … wire cross section [mm^2]
ρ … specific resistance [$\frac{\Omega \times mm^2}{m}$]

The signals from the PLC are processed by the speed controller and made available to the flow boxes. In addition, the signals from the flow boxes are processed by the speed controller to form discrete signals that can be evaluated by the PLC.



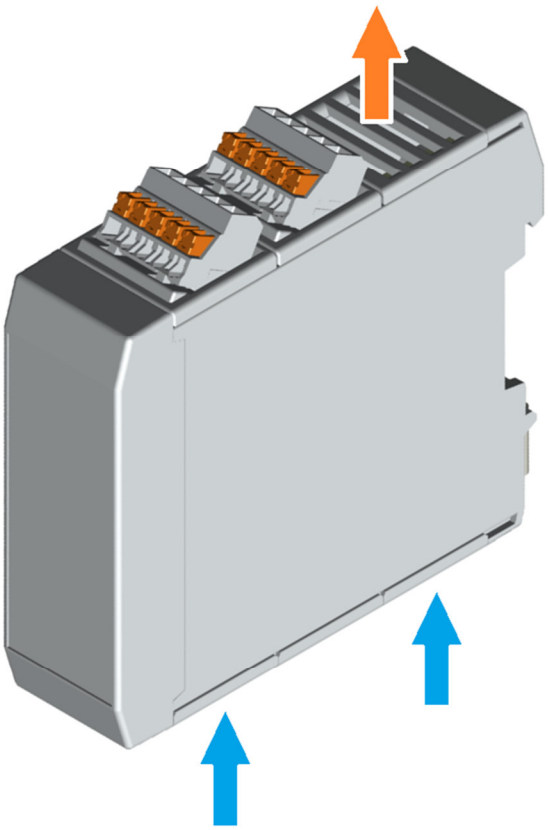


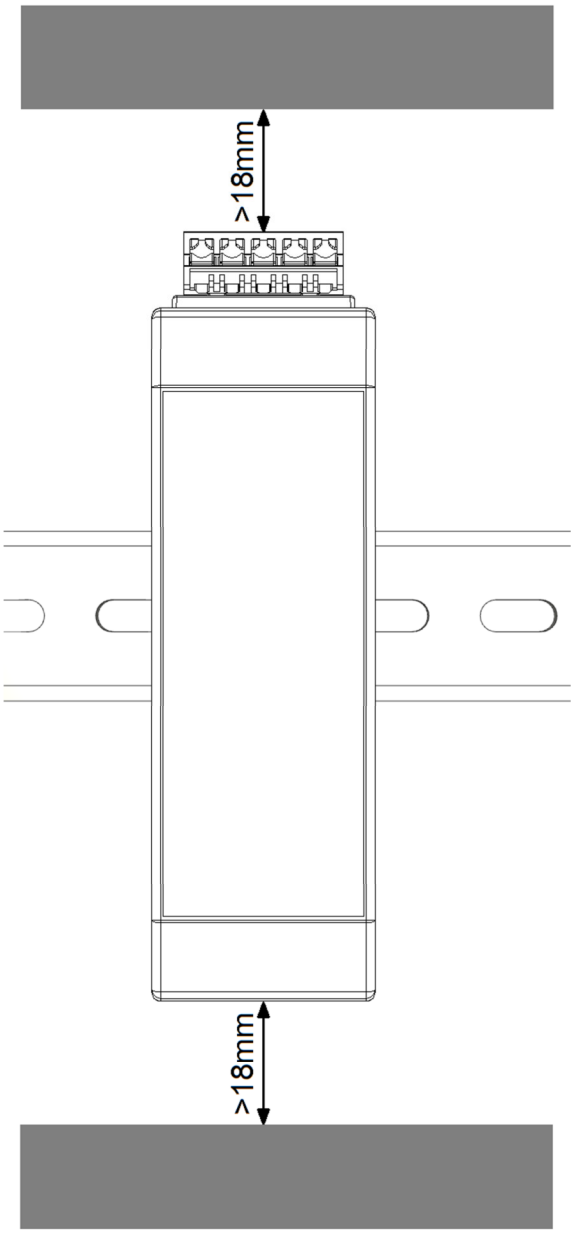
Key commercial data

Packing unit	1 pc
Weight per piece (excluding packing)	80g
Weight per piece (including packing)	95g
Weight short circuit plug (excluding packing)	5g
Country of origin	Germany

Technical data mechanically

Width (W)	25mm
Height (H)	87mm
Depth (D)	95mm
Short circuit plug (B×H×T)	15×15×44mm
Ambient temperature (operation)	0°C … 50°C
Ambient temperature (storage/transport)	-20°C … 70°C
Relative humidity	90% without condensation
Mounting position	horizontal





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Technical data electric

Nominal voltage U_N – Input side	24V DC (± 15%)
Nominal current I_N – Input side	max 100mA
Nominal power P_N – Input side	max 2,4W
Protection class	IP20
Output current I_{DQ} (conditionally short-circuit proof)	max 20mA
Internal resistance R_{AI} 0…10V	approximately 12kΩ
Internal resistance R_{AI} 0/4…20mA	100Ω
Load R_{AQ} 0…10V (conditionally short-circuit proof)	≥ 2,5kΩ
Output current I_{AQ}	max 25mA
Connection data connectors X1/X2	
Connection type	Push-in spring connection
Conductor cross section solid	0,25mm^2 … 1,5mm^2
Conductor cross section flexible	0,25mm^2 … 1,5mm^2
Conductor cross section with ferrule, without plastic sleeve	0,25mm^2 … 1mm^2
Conductor cross section with ferrule, with plastic sleeve	0,25mm^2 … 0,75mm^2
Stripping length	10mm
Connection data connectors X3	
Connection type	RJ45 connector

Standards and Regulations

Standards/regulations	EN IEC 61000-6-2: 2019
	EN 61000-6-3: 2007 +A1:2011 +AC:2012
	EN 50178: 10/97

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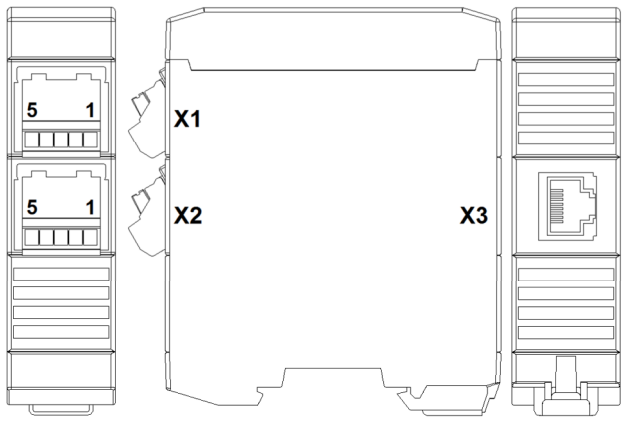
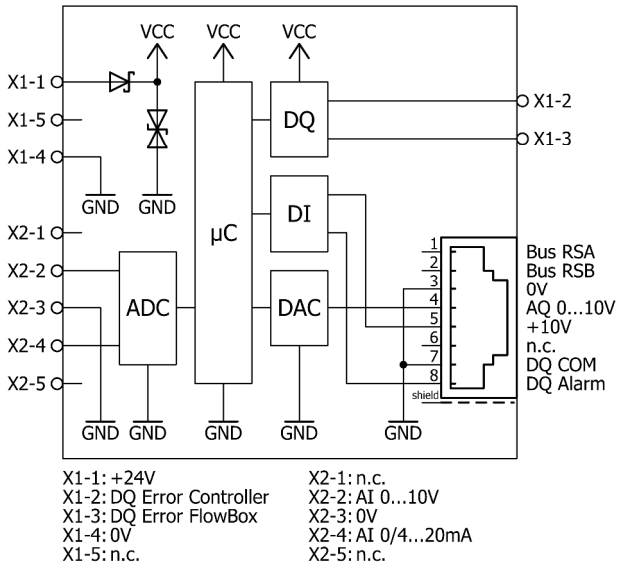
PIN assignment





X1-1: +24V
X1-2: DQ Error Controller
X1-3: DQ Error FlowBox
X1-4: 0V
X1-5: n.c.

X2-1: n.c.
X2-2: AI 0...10V
X2-3: 0V
X2-4: AI 0/4...20mA
X2-5: n.c.

Functionality of the device

Power supply	Status LED green	Error LED red	Contact DQ X1-2	Contact DQ X1-3	Function
≤ 3,8V	●	●	0V	-	Normal
> 3,8V	●	☀	0V	-	Error
> 3,8V	☀	●	VCC	-	Normal

Power supply	Analogue output AQ 0…10V	Function
< 15V	The value at the output is not between 0…10V (with/without offset) and the load R_{AQ} is ≥ 2,5kΩ.	Normal
≥ 15V	The value at the output is not between 0…10V (with/without offset) and the load R_{AQ} is ≥ 2,5kΩ.	Error
≥ 15V	The value at the output is between 0…10V (with/without offset).	Normal

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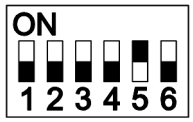
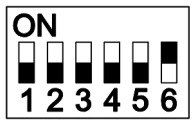
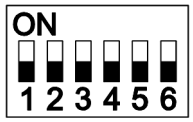
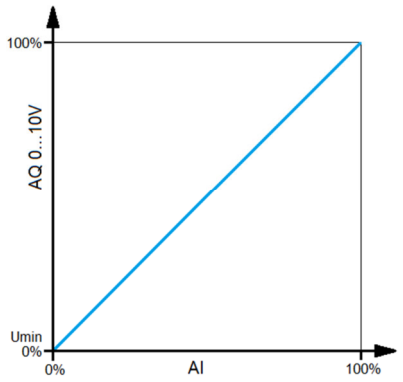
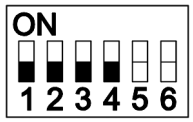
Error condition	Status LED green	Error LED red	Contact DQ X1-2	Contact DQ X1-3	Function
In the operating mode 4…20mA, the value of the analog input is below 4mA.	☀	☀ 100ms	VCC	0V	Normal
One of the connected flow boxes is switched off, has an error or the short circuit plug was not plugged in.	☀	☀	VCC	0V	Normal
There is no flow box connected to the speed controller itself.	☀	☀	VCC	0V	Normal
There is no error.	☀	●	VCC	VCC	Normal

Function Normal:
The function of the device lies in its specified parameters.

Function Error:
The device is defective and should be replaced.

● LED does not light
☀ LED lights up green
☀ LED lights up red
☀ LED flashes

If the device has an error, a reset by pressing it with a ballpoint pen or similar may help. If the device error persists after a reset and turning off the power, the device should be replaced.

<table>
<tr><td rowspan="3"> 
</td><td>Operating mode 0…10V
DIP switch 05 in switch position „ON“</td><td> 
</td></tr>
<tr><td>Operating mode 0…20mA
DIP switch 05 in switch position „OFF“
DIP switch 06 in switch position „ON“</td><td> 
</td></tr>
<tr><td>Operating mode 4…20mA
DIP switch 05 in switch position „OFF“
DIP switch 06 in switch position „OFF“</td><td> 
</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="3"> 
</td><td>If the DIP switches 01 to 04 are in the “OFF” switch position, then no offset/minimum output voltage is effective on the analog output AQ. The analog output behaves as shown in the diagram on the left.</td><td> 
</td><td> 
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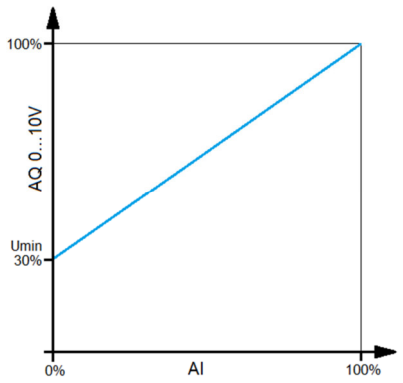
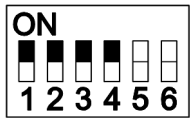
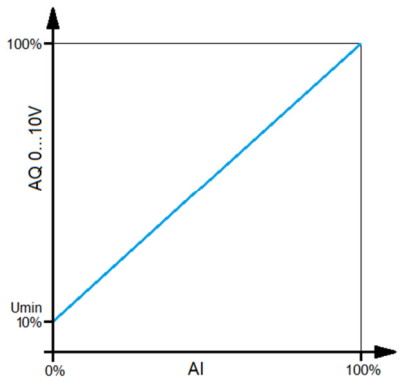
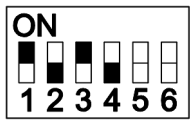
<tr><td>If the DIP switches 01 to 04 are in the switch position “ON”, then an offset/minimum output voltage of 30% is effective on the analog output AQ. The analog output behaves as shown in the diagram on the left.</td><td> 
</td><td> 
</td></tr>
<tr><td>If the DIP switches 01/03 are in the switch position “ON” and the DIP switches 02/04 are in “OFF”, then an offset/minimum output voltage of 10% is effective on the analog output AQ. The analog output behaves as shown in the diagram on the left.
An offset of 0 to 30% with an increment of 2% can be set via the DIP switches.</td><td> 
</td><td> 
</td></tr>
<tr><td colspan="3">DIP switch 01 in switch position “ON” offset+2%; DIP switch 02 in switch position “ON” offset+4%
DIP switch 03 in switch position “ON” offset+8%; DIP switch 04 in switch position “ON” offset+16%</td></tr>
</table>

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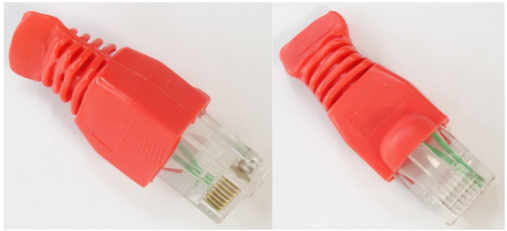
Safety regulations and installation notes

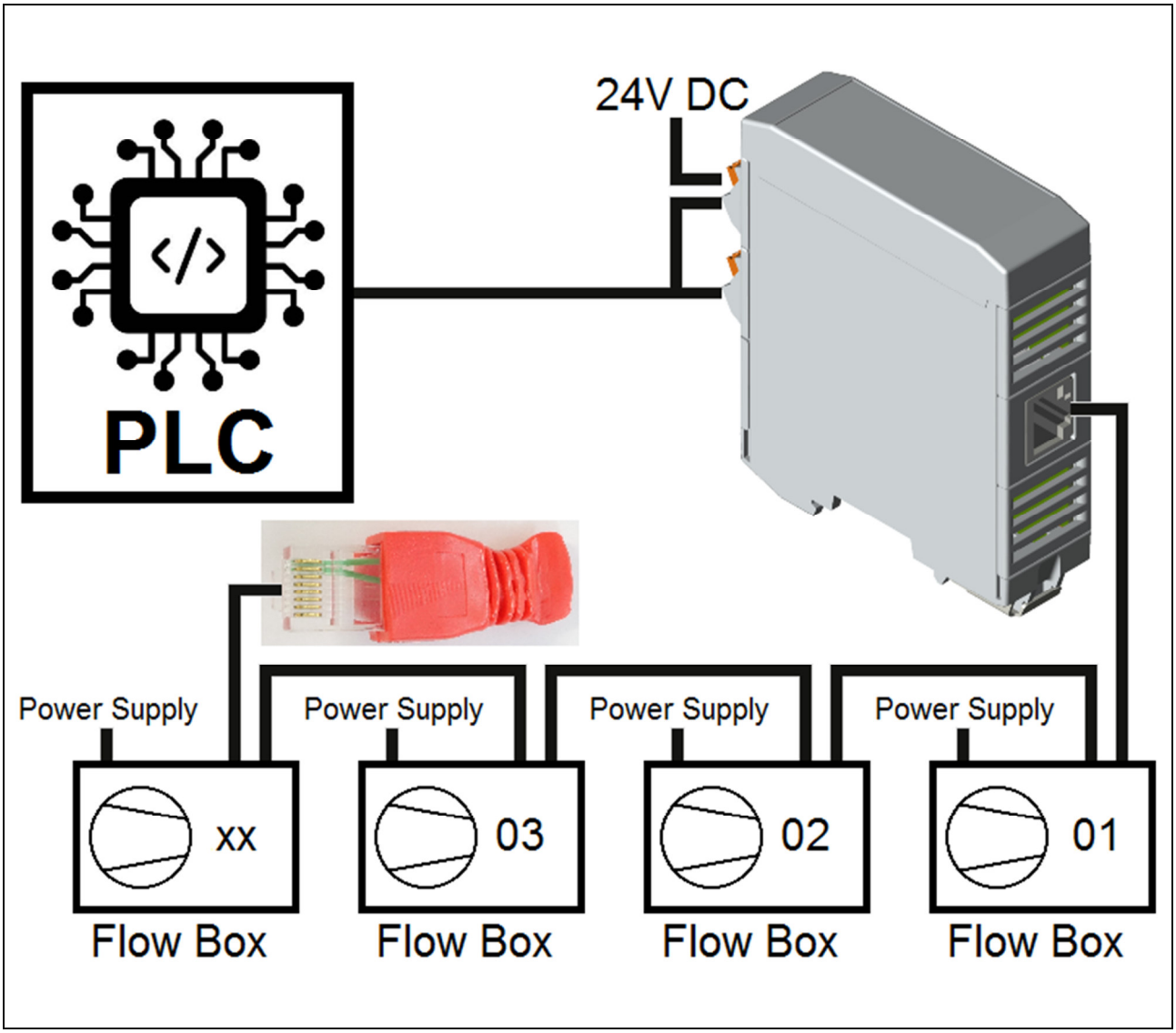
	Before startup please ensure: • Only skilled persons may install, start up and operate the device. • Observe the national safety and accident prevention regulations.
	WARNING: Danger to life by electric shock! • Never carry out work when voltage is present. • Establish mains connection correctly and ensure protection against electric shock. • The device must be switched off outside the power supply in accordance with the regulations of EN 60950-1 (e.g. by means of line protection on the primary side). • Cover termination area after installation in order to avoid accidental contact with live parts (e.g. installation in control cabinet). • Protect the device against foreign bodies penetrating it.
	NOTE: Danger if used improperly! • The device is a built-in device. • The IP20 degree of protection (IEC 60529/EN 60529) of the device is intended for use in a clean and dry environment. Do not subject the device to any load that exceeds the described limits. • Observe mechanical and thermal limits. • Ensure that the primary-side wiring and secondary-side wiring are the correct size and have sufficient fuse protection.
	• It is not permissible to open or modify the device. Do not repair the device yourself but replace it with an equivalent device. Repairs may only be carried out by the manufacturer. The manufacturer is not liable for damage resulting from violation. • The device may only be used for its intended use.

Pictures

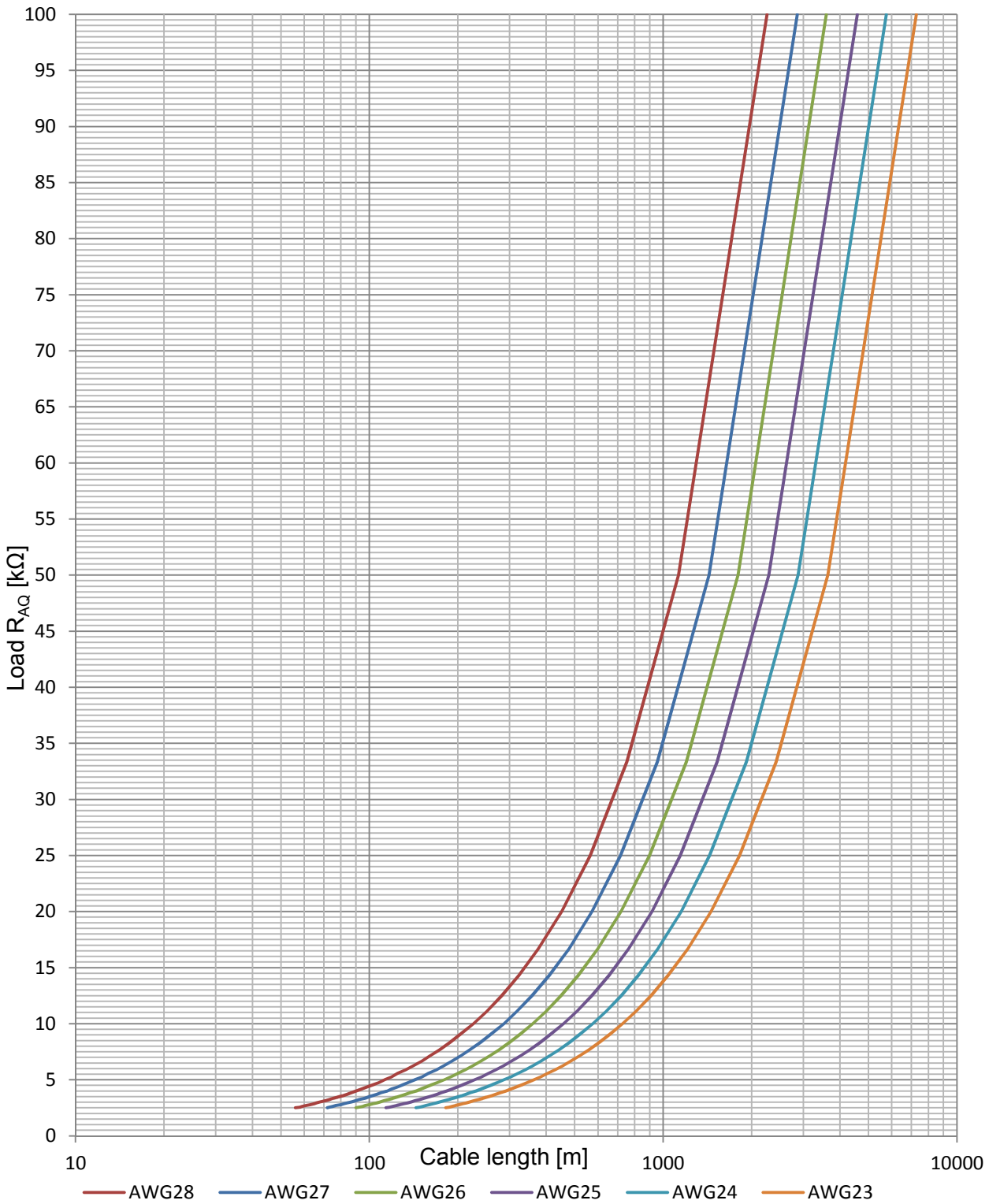


short circuit plug
(included in delivery)

Connecting principle



Diagram



The maximum network cable length for the cross section AWG28 to AWG23 can be found in the diagram. Characteristic curves are based on the load resistance and were calculated with a voltage drop ≤ 1%.