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JUMO meroTRON 104/108/116

Modular one/two-channel controller with PLC function

Brief description

This controller series comprises four universally usable compact controllers with one or two control channels in various DIN formats for controlling temperature, pressure, and other process variables.

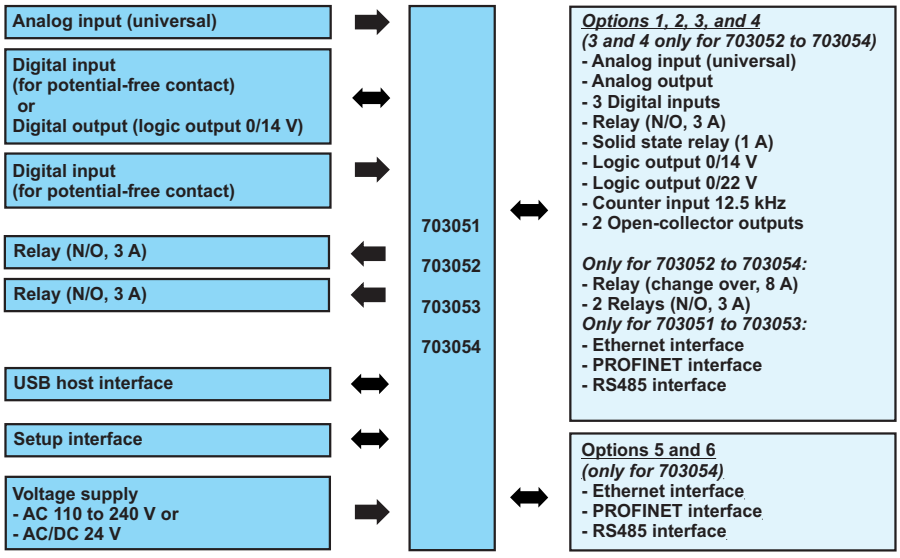
The devices are characterized by a simple, clearly structured operation that is supported with texts. Process values and parameters are shown by two 18-segment LCD displays. Types 703052, 703053, and 703054 also have a pixel matrix LCD display for displaying text. Additional display elements provide information about the switch positions of the outputs and about certain functions (e.g. ramp function/program, timer, manual mode). The devices are operated using a membrane keyboard with 4 keys and can be used under harsh environmental influences thanks to the high IP65 protection type.

Depending on the hardware design, the devices can be used as a two-state controller, three-state controller, three-step controller, position controller, or continuous controller. The basic type includes autotuning, a ramp function, a program controller, manual mode, limit value monitoring functions, digital control signals, extensive timer functions, and a service counter. Users can also upgrade the devices with a math and logic function and with a structured text code functionality for complex control tasks and process steps. The structured text code functionality also gives users flexibility in how they can operate the device, as it enables direct access to the display and operating keys. And the extra code 278 enables the use of even more functionalities, such as a boost function to clear the nozzles, or a startup ramp for hot runner technology.



meroTRON 104 / Type 703054

Block diagram



Special features

- Customizable menu structure
- Optional inputs/outputs, interfaces and functions
- Up to 5 analog inputs
- Fixed-setpoint or program controller
- Two-channel controller (option)
- 4 programs each with 24 sections
- Control loop and output level monitoring
- Data logger
- Counting inputs 12.5 kHz (options)
- Math and logic function (option)
- ST code (structured text; option)
- RS485, Ethernet and PROFINET interface (options)
- Additional analog and digital inputs via interface
- Removable terminal strips with PUSH IN technology

Approvals and approval marks (see technical data)

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Device types



Type 703051 (format 116)



Type 703052 (format 108H)



Type 703053 (format 108Q)



Type 703054 (format 104)

Description

Inputs and outputs

Each device type has a universal analog input (for RTD temperature probe, thermocouple, current, voltage, resistance transmitter, resistance/potentiometer), a digital input, a switchable digital input/output, and two relay outputs (NO contact 3 A). The digital inputs are provided to connect a potential-free contact. The digital output provides a logic signal 0/14 V.

Other optional digital and analog inputs and outputs are also available (see order details), which the customer can retrofit themselves if they wish to.

Connecting an external current transformer to an optional analog input enables users to monitor heater current (max. 50 mA).

The optional digital outputs 0/14 V (not galvanically isolated) can be used to control solid state relays, for example.

The optional digital outputs 0/22 V with galvanic isolation can also be used as a voltage supply for two-wire transmitters.

Certain inputs and outputs cannot be used simultaneously (see notes in the connection diagram).

Customer-specific linearization

Sensor signals with special characteristic line properties can also be used through customer-specific linearization. The corresponding programming can be carried out in the setup program on the basis of a value table with up to 40 value pairs or using a formula (4th order polynomial).

The device can support 2 customer-specific linearizations.

Counting inputs

Customers can opt to have the device equipped with up to 4 counting inputs. The maximum counting frequency is 12.5 kHz. Each counting input can be controlled by a digital signal 0/24 V or via a potential-free contact.

The counters can be used for the following functions (user configurable): counting pulses, calculating frequency, rotational speed, velocity, and totalized flow rate (volume per time unit). Users can also use math functions or ST code to program the device to carry out customized functions, such as calculating total flow (volume).

Signal allocation via selectors

The input signals and all of the internal signals are provided in the "selectors" (analog selector, digital selector) so that they are available for further use in the device. The control signals for the outputs are also assigned via selectors, which enables signals and functions to be assigned flexibly.

USB interfaces

The device comes with a USB-device interface (socket type Micro-B on the rear side) for connecting the device to a PC and is intended exclusively for using the setup program.

There is also a USB-host interface (socket type A). On the device formats 108 and 104 this is located on the rear side. On the small device format 116 it is located on the side. This interface is designed for connecting a USB flash drive to the device (for firmware updates, extracting the data logger, and transferring the device configuration).

RS485 interface

The optional RS485 interface supports the Modbus RTU protocol and can be used in master or slave mode.

Ethernet interface

The optional Ethernet interface (Modbus TCP) provides the communication with 2 × masters or 2 × slaves in parallel and is intended for connection to an internal company network, for transferring process values, and for communicating with the setup program.

PROFINET interface

The device can also be optionally equipped with a PROFINET interface and integrated into a PROFINET network as an IO device. A GSD file (GSDML) is available for the programming system of the IO controller, which describes the features of the device.

The PROFINET interface does not support the use of Ethernet standard services.

If the device is equipped with the PROFINET interface, Ethernet or RS485 interface cannot be equipped.

Voltage supply

The device comes in two voltage supply variants: AC 110 to 240 V or AC/DC 24 V (see technical data).

Electrical connection

Removable spring-cage terminals (PUSH IN technology) are used for the electrical connection process, which saves users valuable time.

Controller types and structures

The device supports one or two control channels, which can be configured as a two-state controller, three-state controller, three-step

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controller, position controller, or continuous controller if the device is equipped with the right hardware. Depending on the controller type, different controller structures can be specified (P, I, PD, PI, PID) using adjustable controller parameters. The controller supports two switchable parameter blocks per control channel.

The signal sources of the controller can be freely selected, and it is possible to toggle between 4 setpoint values using digital signals.

The fast switching time (10 ms) of the outputs for two-state and three-state controllers enables a more stable control response to be achieved, particularly for fast-response ceramic heating elements. Only the logic outputs should be used for this.

Autotuning

Autotuning (oscillation method or step response method) also makes it possible for the controller to be matched to the control process by users who are not control technology experts. The way the control process reacts to changes in the actuating variable is evaluated in the process and certain controller parameters are calculated.

Ramp function

The ramp function is used for a constant change of the setpoint value up to the ramp end value (specified setpoint value). A rising or a falling edge arises depending on the actual value at the time of the ramp start. The slope is defined via two adjustable gradients (upward, downward). The ramp function is controlled via binary signals (start, brake, stop).

Control loop and output level monitoring

Control loop monitoring monitors changes to the actual value at maximum output level (for example when starting up a plant or if there is a setpoint value step). The actual value must leave the monitoring band within a definable timeframe. Control loop monitoring is used to detect incorrectly placed sensors, for example.

Output level monitoring monitors the output level in the corrected state. The output level must be within a definable range around a mean output level. Output level monitoring can be used to detect when heating elements fail, for example.

When the control loop monitoring function or output level monitoring function is activated, an alarm signal is triggered.

Program controller

The controller can also be operated as a program controller. Using a program editor, the user can create and manage up to 4 programs. Each program supports 2 setpoint values, 8 operating contacts, and 24 program sections.

The user can configure various details, such as conditions for program start, lead time, program repeat, tolerance band, and the type of setpoint value change (step or ramp). The programs are controlled using binary signals, and they can be configured to start at specific times (date and time).

Limit value monitoring functions

The device is equipped with 8 limit value monitoring functions, each with 8 configurable alarm functions. Any analog signal from a selector is selected as the value to be monitored. The limit value is formed of an absolute value or a value that depends on a further analog signal. Special functions such as switch-on/switch-off delay, pulse function, alarm suppression in the switch-on phase or in case of a parameter change, alarm latch, and lock with acknowledgment are available. With the limit value monitoring function, extensive alarm and limit value functions can be implemented.

Digital control signals

This function can be used to configure up to 8 digital control signals. Each control signal is either formed by an AND/OR/XOR operation of up to three selectable binary signals,

or a single binary signal serves as the input signal and is output as a pulse-like signal, as a delayed signal, as a pulse signal (wiper signal), or as a signal triggered by an edge. In the latter case the rising or falling edge of the binary signal is detected, and the output signal is activated for the duration of the sampling interval.

The output signal can be inverted in all specified cases.

Timer

The device is equipped with 2 timers.

The timers can be started via freely selectable digital signals or on the basis of integrated tolerance band monitoring. There is also a lead time and after-run time functionality, as well as a self-locking function with acknowledgement. This allows users to easily take advantage of a wide range of functions, such as time-based controlling or setpoint changeover.

Service counter

The service counter is used either to count the switching frequency of a binary signal or to determine its switch-on duration. When the set limit value is reached, a binary signal is activated that needs to be acknowledged.

In addition, an operating hours counter is available that determines the device's operation time.

Math and logic function

The optional math and logic function (extra code) can be used to link analog or binary values. Up to four user configurable math or logic formulae can be created using the setup program. The results are available in the analog or digital selector for further use.

Structured text

The user has the option to create his/her own application using the "structured text" option (extra code).

The application is created with the ST editor, which is part of the setup program, in the PLC programming language "structured text". The finished application is transmitted to the device and continuously processed there. There are online-debugger functions available in the ST editor for testing and troubleshooting.

The user can also use the setup program to create up to 100 customized texts and then use a suitable application to make them appear on the device display. These texts can be entered in four different languages, so that if the device language is changed, the text will display in the relevant language.

Functions for applications in the plastics industry

Special functions that are designed for use in the plastics industry are available as an additional option (extra code). This includes the boost function to clear the nozzles during the production process, and the startup ramp for hot runner technology, which is used for low-wear operation of the ceramic cartridge heaters, for example.

Data logger

The data logger can be used to record 4 analog and 4 binary values. The recording interval can be configured to last between 1 minute and 1 hour. The recording process is based on the ring buffer principle. At a recording interval of 10 minutes, the data can be recorded for 2 years before the oldest data starts to be overwritten.

The data can be extracted by means of a USB flash drive (CSV file).

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Real-time clock

The real-time clock provides the current date and time (program start in real time, time stamp for data logger and ST code).

Retain memory

The integrated retain memory ensures that certain data is always retained – even in the event of a power failure. This includes the service data, the counter and timer data, the program generator status and the retain data of the ST code.

Customizable operating levels

The user can configure the device menu however they wish, to make it as easy as possible to use and integrate into the plant. There are four menu levels with sub-menus. The menu items and parameters can be indicated in four different languages (language can be changed). The user can also choose to lock some or all of the menu levels in order to prevent any unauthorized operation.

Setup program

The setup program is required to be able to start up the device and is available to download for free. As well as providing the option to customize the operating levels (the parameters for which can be subsequently edited on the device), the setup program gives the user an easy and convenient way of configuring the device via PC. The user can use it to create and edit data records, transfer them to the device, and extract them from it. The data can be stored and printed. In addition, the user can easily create and print out a connection diagram that shows the current terminal assignment of the device.

Startup: the startup function is for recording process variables during startup (max. 24 hours). The recorded diagrams are available on the PC and can, for example, be used for system documentation.

Online data: the device's current process variables are shown in a separate window.

Program editor: in addition to the device's program editor, the user can also use the setup program to create setpoint value programs.

Firmware update

Firmware updates to the device can be carried out conveniently using a USB flash drive. The firmware file is provided by the manufacturer if required.

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Controller parameters

The following table shows the parameters in a parameter block. Depending on the controller type configured, certain parameters may be omitted or ineffective. The transmission behavior is specified by the selection of the controller structure and determined by the configuration of the parameters for the proportional band (P component), derivative time (D component), and reset time (I component). Parameters that appear in pairs such as proportional band Pb1 and Pb2 refer to the first and second controller outputs.

The same parameters are also available for the second parameter block.

Parameter	Value range	Default setting	Unit	Meaning
Controller structure 1	P, I, PD, PI, PID	PID		Transmission behavior of the first controller output
Controller structure 2	P, I, PD, PI, PID	PID		Transmission behavior of the second controller output with a three-state controller
Proportional band Pb1	0 to 99999	0	Physical unit of the controller size	Size of the proportional band The controller structure is not effective with 0 (behavior as with limit value monitoring function)! Pb1/2 must be > 0 for a continuous controller.
Proportional band Pb2	0 to 99999	0	Physical unit of the controller size	
Derivative time Tv1	0 to 99999	80	s	Influences the differential component of the controller output signal.
Derivative time Tv2	0 to 99999	80	s	
Reset time Tn1	0 to 99999	350	s	Influences the integral component of the controller output signal.
Reset time Tn2	0 to 99999	350	s	
Cycle time Cy1	0 to 99999	20	s	When using a switching output, the cycle time should be chosen so that the energy supply to the process is almost continuous, and the switching elements are not overloaded.
Cycle time Cy2	0 to 99999	20	s	
Contact spacing Xsh	0 to 999	0	Physical unit of the controller size	Spacing between the two control contacts for a three-state controller, three-step controller, and continuous controller with integrated position controller
Switching differential Xd1	0 to 999	1	Physical unit of the controller size	Hysteresis for a switching controller with proportional band Pb = 0
Switching differential Xd2	0 to 999	1	Physical unit of the controller size	
Actuator time TT	5 to 3000	60	s	Control valve runtime range used for a three-step controller and continuous controller with integrated position controller
Working point Y0	-100 to +100	0	s	The output level for P and PD controllers (if x = w then y = Y0)
Output value limit Y1	0 to 100	100	%	Maximum output value limit (only effective if Pb > 0)
Output value limit Y2	-100 to +100	-100	%	Minimum output value limit (only effective if Pb > 0)
Minimum relay switch-on duration Tk1	0 to 60	0.25	s	Limits the switching frequency for switching outputs (digital outputs) Recommended setting if a relay is used as a controller output: ≥ 0.15 s
Minimum relay switch-on duration Tk2	0 to 60	0.25	s	

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Technical data

Analog input

Thermocouples

Designation	Type	Standard	ITS	Measuring range	Accuracy[a]
Fe-CuNi	"L"	DIN 43710 (1985)	IPTS-68	-200 to +900 °C	≤ 0.25 %
Fe-CuNi	"J"	DIN EN 60584-1:2014 IEC 60584-1:2013	ITS-90	-210 to +1200 °C	≤ 0.25 % from -100 °C
Cu-CuNi	"U"	DIN 43710 (1985)	IPTS-68	-200 to +600 °C	≤ 0.25 % from -100 °C
Cu-CuNi	"T"	DIN EN 60584-1:2014 IEC 60584-1:2013	ITS-90	-270 to +400 °C	≤ 0.25 % from -150 °C
NiCr-Ni	"K"	DIN EN 60584-1:2014 IEC 60584-1:2013	ITS-90	-270 to +1372 °C	≤ 0.25 % from -80 °C
NiCr-CuNi	"E"	DIN EN 60584-1:2014 IEC 60584-1:2013	ITS-90	-270 to +950 °C	≤ 0.25 % from -80 °C
NiCrSi-NiSi	"N"	DIN EN 60584-1:2014 IEC 60584-1:2013	ITS-90	-270 to +1300 °C	≤ 0.25 % from -80 °C
Pt10Rh-Pt	"S"	DIN EN 60584-1:2014 IEC 60584-1:2013	ITS-90	-50 to +1768 °C	≤ 0.25 % from 20 °C
Pt13Rh-Pt	"R"	DIN EN 60584-1:2014 IEC 60584-1:2013	ITS-90	-50 to +1768 °C	≤ 0.25 % from 50 °C
Pt30Rh-Pt6Rh	"B"	DIN EN 60584-1:2014 IEC 60584-1:2013	ITS-90	0 to 1820 °C	≤ 0.25 % from 400 °C
W5Re-W26Re	"C"	DIN EN 60584-1:2014 IEC 60584-1:2013	ITS-90	0 to 2315 °C	≤ 0.25 % from 500 °C
W3Re-W25Re	"D"	ASTM E1751M-15	ITS-90	0 to 2315 °C	≤ 0.25 % from 500 °C
W5Re-W20Re	"A1"	GOST R 8.585-2001	ITS-90	0 to 2500 °C	≤ 0.25 % from 500 °C
Chromel®-Copel	"L"	GOST R 8.585-2001	ITS-90	-200 to +800 °C	≤ 0.25 % from -80 °C
Chromel®-Alumel®	"K"	GOST R 8.585-2001	ITS-90	-270 to +1372 °C	≤ 0.25 % from -80 °C

[a] Accuracy refers to the measuring range.

Ambient temperature influence	≤ 100 ppm/K
Cold junction	Internal or external (constant)
Cold junction temperature (external)	-30 to +85 °C (adjustable)
Sampling rate	Min. 50 ms (configurable)
Input filter	Digital filter, 2nd order; filter constant can be set from 0 to 100.0 s

RTD temperature probe

Designation	Standard	ITS	Connection type	Measuring range	Accuracy[a]	Measuring current
Pt100	DIN EN 60751:2009 IEC 60751:2008	ITS-90	Two-wire	-200 to +850 °C	≤ 0.2 %	500 µA
			Three-wire	-200 to +850 °C	≤ 0.1 %	500 µA
Pt1000	DIN EN 60751:2009 IEC 60751:2008	ITS-90	Two/three-wire	-200 to +850 °C	≤ 0.1 %	50 µA
Pt100	GOST 6651-2009 A.2	ITS-90	Two-wire	-200 to +850 °C	≤ 0.2 %	500 µA
			Three-wire	-200 to +850 °C	≤ 0.1 %	500 µA

[a] Accuracy refers to the measuring range.

Ambient temperature influence	≤ 50 ppm/K
Sensor line resistance	Max. 30 Ω per line
Sampling rate	Min. 50 ms (configurable)
Input filter	Digital filter, 2nd order; filter constant can be set from 0 to 100.0 s

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Resistance transmitter and resistance/potentiometer

Designation	Measuring range	Accuracy[a]	Measuring current
Resistance transmitter	0 to 4000 Ω	≤ 0.1 % at 4000 Ω	50 µA
Resistance/potentiometer	0 to 400 Ω	≤ 0.1 %	500 µA
	0 to 4000 Ω	≤ 0.1 %	50 µA

[a] Accuracy refers to the maximum measuring range. Small measuring spans lead to reduced linearization accuracy.

Ambient temperature influence	≤ 100 ppm/K
Connection type	
Resistance transmitter	Three-wire circuit
Resistance/potentiometer	Two-wire/three-wire circuit
Sensor line resistance	Max. 30 Ω per line
Sampling rate	Min. 50 ms (configurable)
Input filter	Digital filter, 2nd order; filter constant can be set from 0 to 100.0 s

Voltage, current (standard signals); heater current

Designation	Measuring range	Accuracy[a]	Input resistance or compliance voltage
Voltage	0 to 10 V	≤ 0.1 %	> 500 kΩ
	0 to 1 V	≤ 0.1 %	> 500 kΩ
Current	4 to 20 mA	≤ 0.1 %	< 2.5 V
	0 to 20 mA	≤ 0.1 %	< 2.5 V
Heater current	AC 0 to 50 mA, 50 Hz	≤ 20 %	< 2.5 V
	DC 0 to 20 mA	≤ 1 %	< 2.5 V

[a] Accuracy refers to the maximum measuring range. Small measuring spans lead to reduced linearization accuracy.

Ambient temperature influence	≤ 100 ppm/K
Deviation below/above the measuring range	According to NAMUR recommendation NE 43 (only current input 4 to 20 mA)
Sampling rate	Min. 50 ms (configurable)
Input filter	Digital filter, 2nd order; filter constant can be set from 0 to 100.0 s

Measuring circuit monitoring

The device behavior in the event of a malfunction is configurable.

Measuring probe	Underrange	Overrange	Short-circuit (probe/line)	Break (probe/line)	Reverse polarity
RTD temperature probe	++	++	++	++	---
Resistance/potentiometer	---	++	---	++	---
Resistance transmitter	---	++	---	(+)[a]	---
Thermocouple	++	++	---	++	(+)[b]
Current 0 to 20 mA	---	++	---	---	---
Current 4 to 20 mA	++	++	++	++	++
Voltage 0 to 10 V	++	++	---	---	++
Voltage 0 to 1 V	---	++	---	---	++
Heater current	---	++	---	---	---
++ = is detected		--- = is not detected		(+) = is detected in certain conditions	

[a] Break in measuring current path is not detected.

[b] Is dependent on the set characteristic line.

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Digital inputs

Input for potential-free contact	
Function	Contact closed: input is active (R_{ON} < 1 kΩ) Contact open: input is inactive (R_{OFF} > 50 kΩ)
Sampling rate	Min. 50 ms (configurable)
Counting input	
Voltage	0/24 V (logic level 0: < 3.5 V; logic level 1: > 10 V)
Counting frequency	Max. 12.5 kHz, min. 0.5 Hz

Analog output

Voltage	
Output signal	DC 0 to 10 V
Load resistance	> 500 Ω
Current	
Output signal	DC 0(4) to 20 mA
Load resistance	< 450 Ω
Accuracy	≤ 0.5 %
Ambient temperature influence	≤ 150 ppm/K

Digital outputs

Relay (NO contact)	
Switching capacity	Max. 3 A at AC 230 V or DC 24 V, resistive load
Contact life	150,000 operations at rated load 350,000 operations at 1 A
Relay (changeover contact)	
Switching capacity	Max. 8 A at AC 230 V or DC 24 V, resistive load
Contact life	50,000 operations at rated load 100,000 operations at 3 A 250,000 operations at 1 A
Logic output 14 V	
Output signal	DC 0/14 V ±15 %
Current	Max. 20 mA per output (at nominal voltage 14 V); short-circuit proof
Switching time as controller output	Min. 10 ms
Logic output 22 V	(Voltage supply for transmitter)
Output signal	DC 0/22 V ±15 %
Current	Max. 30 mA per output (at nominal voltage 22 V); short-circuit proof
Switching time as controller output	Min. 10 ms
Solid state relay	
Switching capacity	Max. 1 A at AC 230 V, resistive load
Internal protective circuit	Varistor
Open-collector output	
Switching capacity	Max 1.3 A at DC 24 V

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Interfaces

USB device	
Connector type	Micro-B (socket)
Standard	Low-Speed, Full-Speed, High-Speed
Line length	Max. 3 m
USB host	
Connector type	A (socket)
Standard	Low-Speed, Full-Speed
Usage	Exclusively for connecting a USB flash drive (FAT16/FAT32; see accessories)
Load current	Max. 100 mA
RS485	
Baud rate	9600, 19200, 38400, 115200
Data format	8-1-no parity, 8-1-even parity, 8-1-odd parity, 8-2-no parity
Protocol	Modbus RTU (master/slave)
Ethernet	
Connector type	RJ45 (socket)
Transfer rate	10 Mbit/s, 100 Mbit/s
Protocol	TCP/IP, DHCP, DNS; Modbus TCP (master/slave)
Connecting cable	Network cable, at least CAT5 (S/FTP)
Line length	Max. 100 m
PROFINET IO Device	
Connector type	2 x RJ45 (socket), integrated switch
Transfer rate	100 Mbit/s
Conformity class	C (CC-C)
Netload class	III (Netload Class III)
Protocol	DCP, LLDP, VLAN Priority, PTCP, MRP
Connecting cable	Network cable, at least CAT5 (S/FTP)
Line length	Max. 100 m

Display

18-segment LCD displays	Upper display	Lower display
Digit height		
Type 703051 (format 116)	12.3 mm	5.9 mm
Type 703052 (format 108H)	11.5 mm	8.5 mm
Type 703053 (format 108Q)	16.5 mm	9 mm
Type 703054 (format 104)	24.8 mm	12 mm
Color	White	Green
Places, including decimal places	4	4 (8 for type 703051)
Decimal places	0, 1, 2, 3, or automatic (configurable)	

Pixel matrix LCD display (only for types 703052, 703053, and 703054)	
Pixel fields	
Type 703052 (format 108H)	2 rows each with 9 pixel fields
Type 703053 (format 108Q)	2 rows each with 8 pixel fields
Type 703054 (format 104)	2 rows each with 11 pixel fields
Number of pixels per field	8 × 5
Color	White

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Electrical data

Voltage supply	(see nameplate)	
Variant 1	AC 110 to 240 V +10/-15 %, 48 to 63 Hz	
Variant 2	AC/DC 24 V +10/-15 %, AC 48 to 63 Hz	
Electrical safety	According to DIN EN 61010:2020, part 1; overvoltage category II up to 300 V mains voltage, pollution degree 2	
Power consumption	For AC 110 to 240 V	For AC/DC 24 V
Type 703051 (format 116)	Max. 4.3 W	Max. 4.5 W
Types 703052, 703053 (formats 108H, 108Q)	Max. 4.9 W	Max. 6.0 W
Type 703054 (format 104)	Max. 6.8 W	Max. 8.9 W
Electrical connection	On the back via spring-cage terminals (PUSH IN technology)	
Conductor cross section for voltage supply (connection element 1)		
Wire or stranded wire (without ferrule)	Min. 0.2 mm^2, max. 2.5 mm^2	
Stranded wire with ferrule	Without/with plastic collar: min. 0.25 mm^2, max. 2.5 mm^2	
Stripping length	10 mm	
Conductor cross sections for standard relays (connection elements 2 and 3), optional relays and solid state relays		
Wire (without ferrule)	Min. 0.2 mm^2, max. 1.5 mm^2	
Stranded wire (without ferrule)	Min. 0.2 mm^2, max. 2.5 mm^2	
Stranded wire with ferrule	Without/with plastic collar: min. 0.25 mm^2, max. 1.5 mm^2	
Stripping length	10 mm	
Conductor cross sections for standard inputs and outputs (connection element 4), optional inputs and outputs (except for relays and solid state relays), RS485 interface		
Wire or stranded wire (without ferrule)	Min. 0.2 mm^2, max. 1.5 mm^2	
Stranded wire with ferrule	Without plastic collar: min. 0.25 mm^2, max. 1.5 mm^2 With plastic collar: min. 0.25 mm^2, max. 0.75 mm^2	
Stripping length	10 mm	

Environmental influences

Ambient temperature range	
Storage	-30 to +70 °C
Operation	-10 to +55 °C
Site altitude	Max. 2000 m above sea level
Climatic environmental influences	According to DIN EN 60721-3 with extended temperature range
Resistance to climatic conditions	≤ 90 % rel. humidity without condensation
Storage	According to class 1K2
Operation	According to class 3K3
Vibration	According to DIN EN 60068-2-6, table C.2
Amplitude	0.15 mm from 10 to 58.1 Hz
Acceleration	20 m/s^2 from 58.1 to 150 Hz
Shock	According to DIN EN 60068-2-27, table A.1
Peak acceleration	150 m/s^2
Shock duration	11 ms

Electromagnetic compatibility (EMC)	According to DIN EN 61326-1:2013
Interference emission	Class B[a, b]
Interference immunity	Industrial requirements

[a] The product is suitable for industrial use as well as for households and small businesses.

[b] With Ethernet interface: Class A – only for industrial use –

Case

Case type	Plastic case for panel mounting according to DIN IEC 61554 (indoor use)
Case front	Made of plastic with membrane keyboard
Panel thickness	1 to 10 mm
Case mounting	In panel using the supplied mounting frame or both mounting elements
Operating position	Any[a]
Protection type	According to DIN EN 60529, IP65 on the front, IP20 on the back
Weight	
Type 703051 (format 116)	Max. 170 g
Type 703052 (format 108H)	Max. 271 g
Type 703053 (format 108Q)	Max. 271 g
Type 703054 (format 104)	Max. 417 g

[a] The maximum admissible ambient temperature only applies for the installation with the display in a vertical position.

Approvals and approval marks

The device is approved if the relevant approval mark is pictured on the device.

c UL us	
Test facility	Underwriters Laboratories
Certificate/test no.	E201387
Inspection basis	UL 61010-1 (3rd ed.), CAN/CSA-22.2 No. 61010-1 (3rd ed.)
Valid for	All types

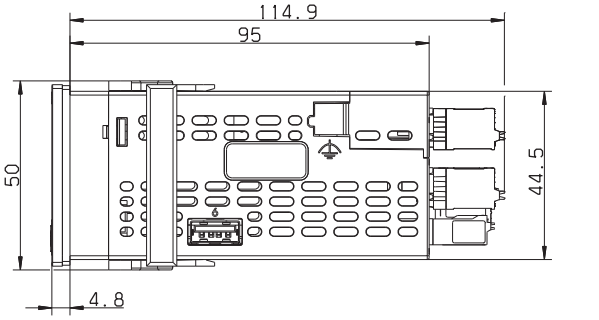
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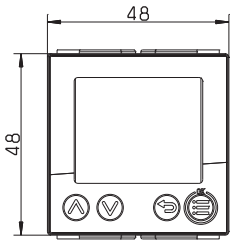
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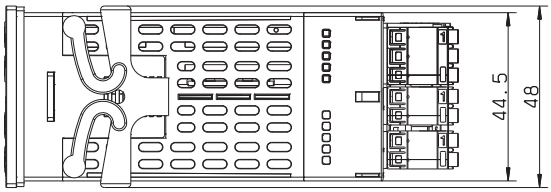
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Dimensions

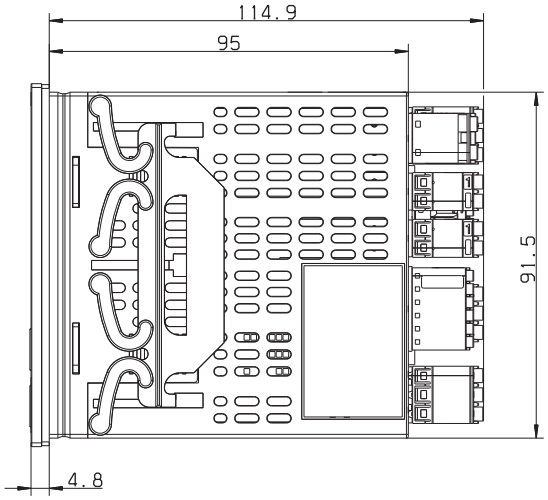
Format 116 (48 mm × 48 mm)

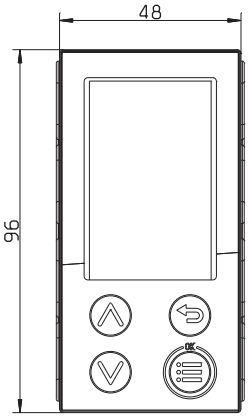


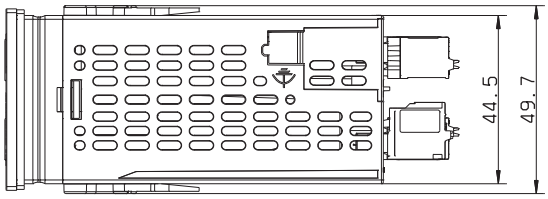




Format 108H (48 mm × 96 mm)





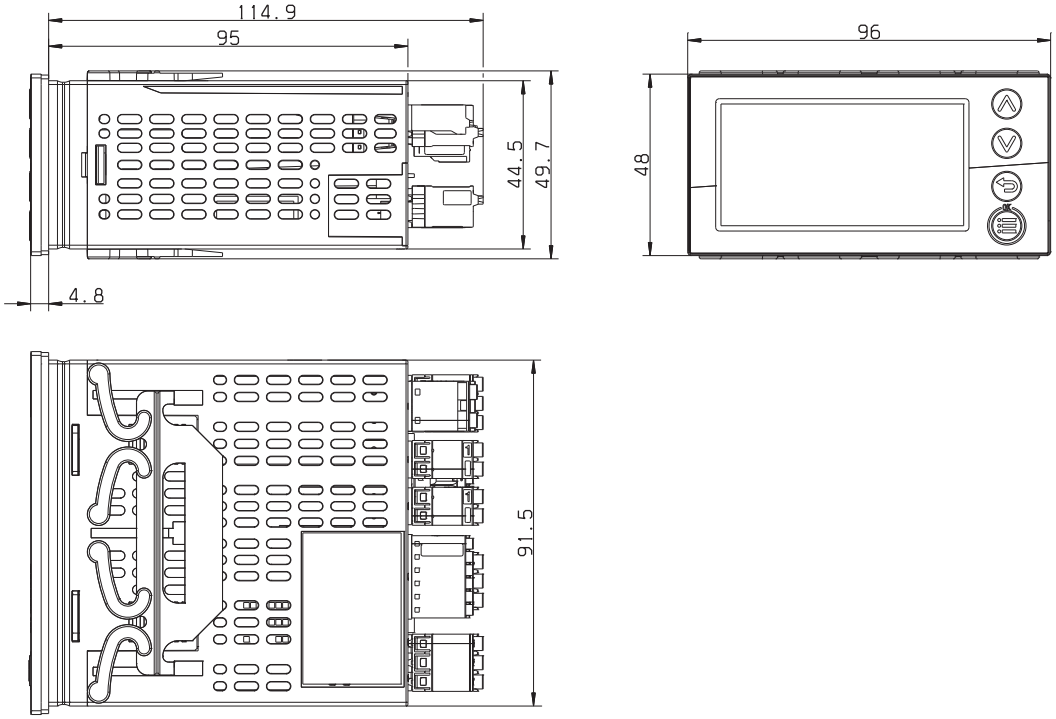


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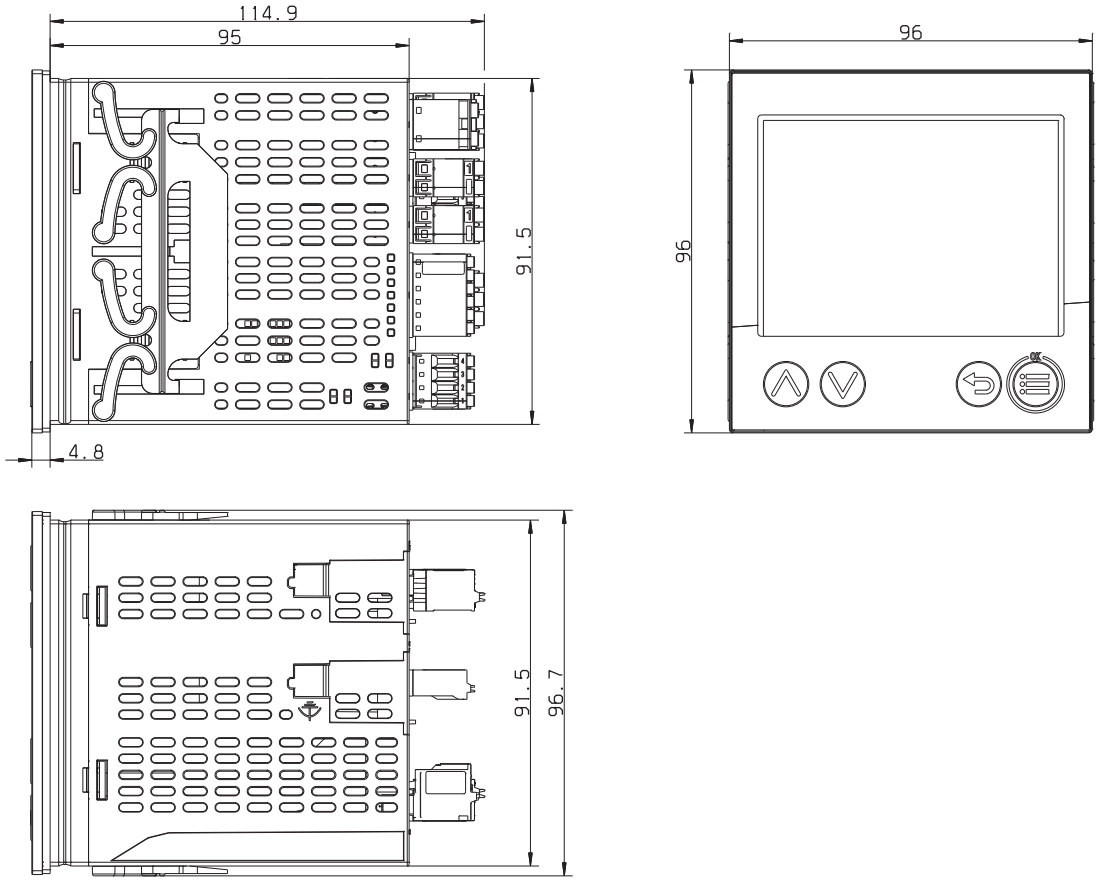
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Format 108Q (96 mm × 48 mm)



Format 104 (96 mm × 96 mm)



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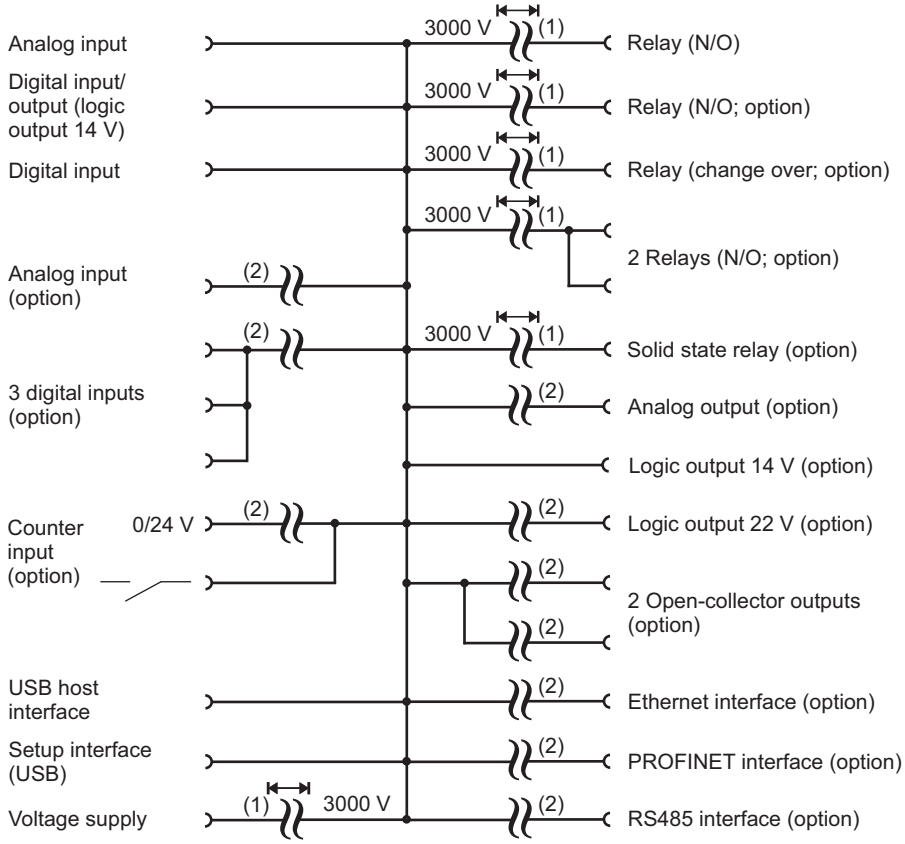
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Panel cut-outs according to DIN IEC 61554

Format (front frame dimensions)	Panel cut-out (width x height)	Minimum spacing of panel cut-outs (for close mounting)	
		Horizontal	Vertical
116 (48 mm × 48 mm)	$45^{+0.6}$ mm × $45^{+0.6}$ mm	45 mm[a]	30 mm
108H (48 mm × 96 mm)	$45^{+0.6}$ mm × $92^{+0.8}$ mm	35 mm	45 mm
108Q (96 mm × 48 mm)	$92^{+0.8}$ mm × $45^{+0.6}$ mm	45 mm	35 mm
104 (96 mm × 96 mm)	$92^{+0.8}$ mm × $92^{+0.8}$ mm	35 mm	45 mm

[a] When connecting a USB flash drive to the device, allow for sufficient distance if necessary.

Galvanic isolation



1 The voltage information corresponds to the alternating test voltages (effective values) according to DIN EN 61010-1 (VDE 0411-1):2020-03 for type testing.

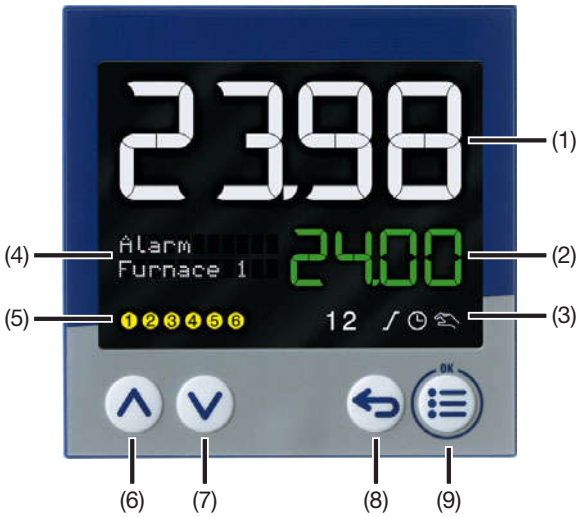
2 Functional galvanic isolation for connection of SELV or PELV electrical circuits.

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Display and control elements



1 18-segment LCD display (e.g. actual value), four-digit, white;
on type 703051 (116) it is also for displaying menu items, parameters, and text

2 18-segment LCD display (e.g. setpoint value), four-digit (on 703051 (116): eight-digit), green;
on type 703051 (116) it is also for displaying menu items, parameters, and text;
"OK" will display upon leaving editing mode (if changes were made)

3 Basic display (basic status) 1 or 2, ramp function/program, timer, manual mode

4 On types 703052 (108H), 703053 (108Q), and 703054 (104): pixel matrix LCD display for displaying menu items, parameters, values, and customer-specific texts

5 Switch position of the digital outputs (yellow = active)

6 Up (in the menu: increase value, select previous menu item or parameter; in basic display: increase setpoint value)

7 Down (in menu: reduce value, select next menu item or parameter; in basic display: reduce setpoint value)

8 Back (in menu: back to previous menu level, exit editing mode without change; in basic display: configurable function)

9 Menu/OK (long press: switch between basic displays 1 and 2; short press: call up main menu, switch to submenu/level, switch to editing mode, exit editing mode with change)

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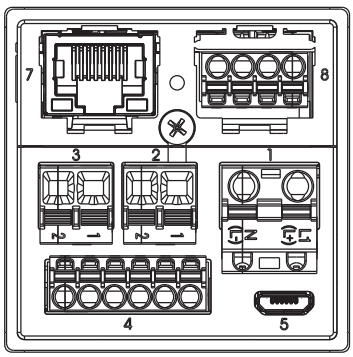
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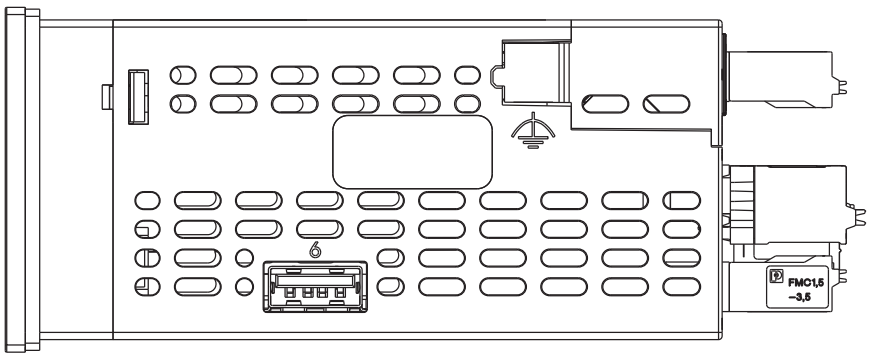
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Connection elements

Type 703051

Format 116





Element	Connection
1	Voltage supply L1(L+), N(L-)
2	Digital output 1 (relay)
3	Digital output 2 (relay)
4	Terminals 1 to 4: Analog input 1

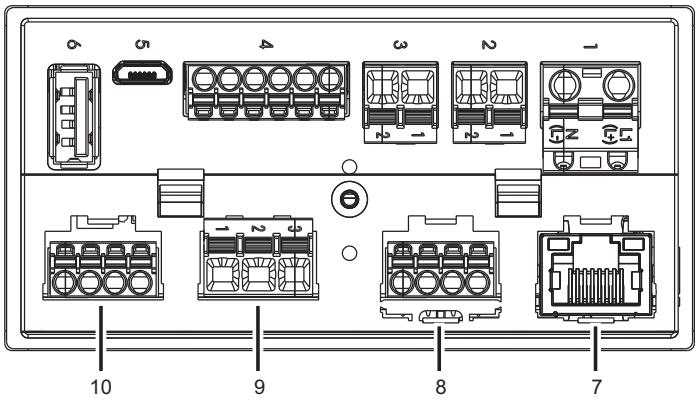
Element	Connection
4	Terminals 4 and 6: Digital input 2 (potential-free contact)
4	Terminals 5 and 6: Digital input 1 (potential-free contact) or digital output 3 (logic 0/14 V)
5	USB device interface
6	USB host interface

Element	Connection
7	Option 1[a] (with PROFINET: port 1)
8	Option 2[a] (with PROFINET: port 2)

[a] The connection element depends on the option (see order details).

Types 703052, 703053, 703054

Format 108Q

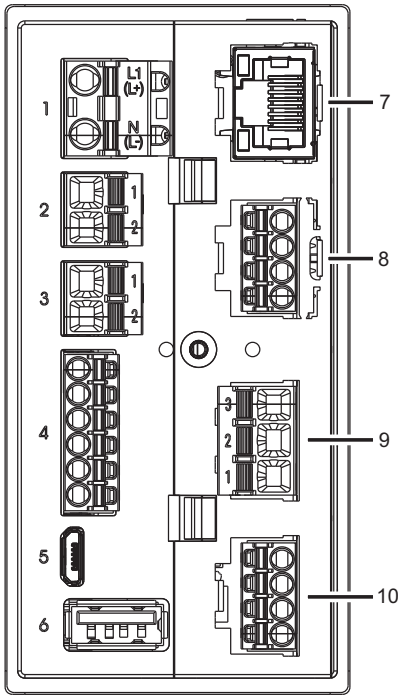


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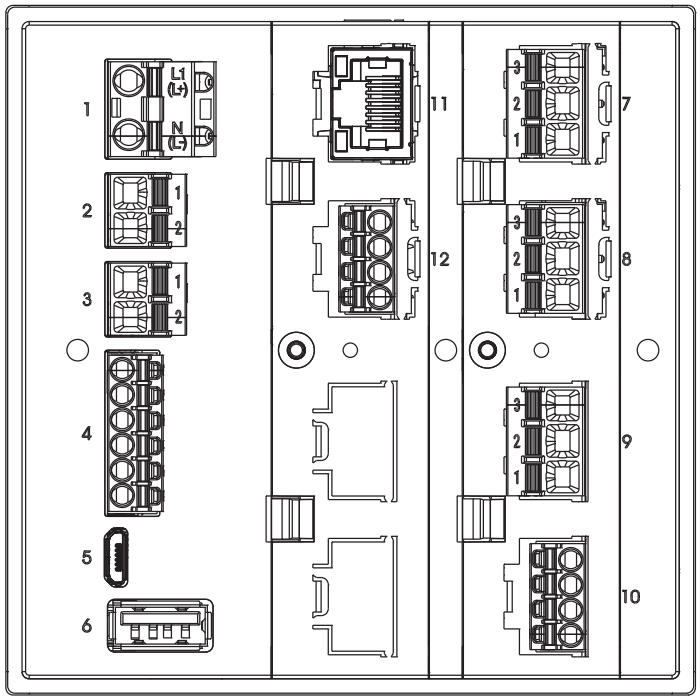
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Format 108H



Format 104



Element	Connection
1	Voltage supply L1(L+), N(L-)
2	Digital output 1 (relay)
3	Digital output 2 (relay)
4	Terminals 1 to 4: Analog input 1
4	Terminals 4 and 6: Digital input 2 (potential-free contact)

Element	Connection
4	Terminals 5 and 6: Digital input 1 (potential-free contact) or digital output 3 (logic 0/14 V)
5	USB device interface
6	USB host interface
7	Option 1[a] (with PROFINET: port 1)
8	Option 2[a] (with PROFINET: port 2)

Element	Connection
9	Option 3[a]
10	Option 4[a]
11	Option 5 (with PROFINET: port 1)
12	Option 6[a] (with PROFINET: port 2)

[a] The connection element depends on the option (see order details).

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Connection diagram

The connection diagram in the data sheet provides information on product selection.

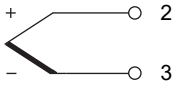
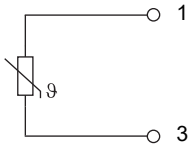
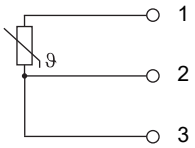
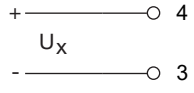
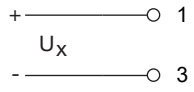
For the electrical connection, only use the installation instructions or the operating manual.

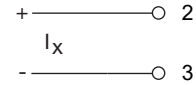
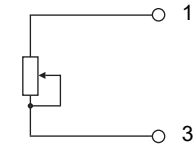
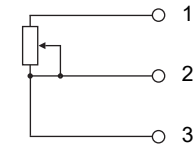
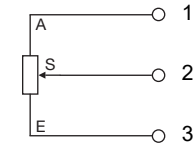
Analog inputs

Analog input 1: standard feature

Analog inputs 2 to 5: optional (options 1 to 4, see order details)

Only an optional analog input can be used as a heater current input.

Measuring probe/ standard signal	Symbol and terminal designation
Thermocouple	
RTD temperature probe two-wire circuit	
RTD temperature probe three-wire circuit	
Voltage DC 0 to 10 V (for analog input 1: only usable if digital input 2 is not used)	
Voltage DC 0 to 1 V	

Measuring probe/ standard signal	Symbol and terminal designation
Current DC 0(4) to 20 mA Heater current AC/DC (only for option)	
Resistance/potentiometer two-wire circuit	
Resistance/potentiometer three-wire circuit	
Resistance transmitter A = Start E = End S = Slider	

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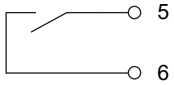
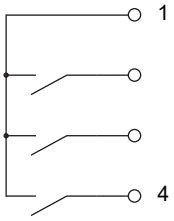
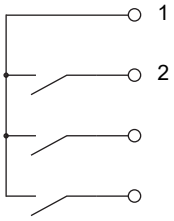
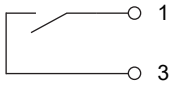
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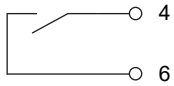
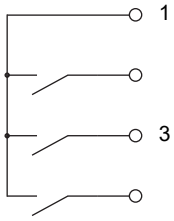
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Digital inputs

Digital inputs 1 and 2: standard feature

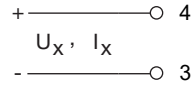
Digital inputs 3 to 14: optional (options 1 to 4, see order details)

Input	Version	Symbol and terminal designation
1	Digital input for potential-free contact (only usable if digital output 3 is not used)	
	Inputs 3, 4, 5 for option 1 Inputs 6, 7, 8 for option 2 Inputs 9, 10, 11 for option 3 Inputs 12, 13, 14 for option 4	
3 6 9 12	3 digital inputs for potential-free contact: Input for contact 1	
5 8 11 14	3 digital inputs for potential-free contact: Input for contact 3	
3 6 9 12	Counting input (12.5 kHz): Input for potential-free contact (instead of input DC 0/24 V)	

Input	Version	Symbol and terminal designation
2	Digital input for potential-free contact (can only be used if analog input 1 is not used as input DC 0 to 10 V)	
4 7 10 13	3 digital inputs for potential-free contact: Input for contact 2	
3 6 9 12	Counting input (12.5 kHz): Input DC 0/24 V (instead of input for potential-free contact)	

Analog outputs

Analog outputs 1 to 4: optional (options 1 to 4, see order details)

Output	Version	Symbol and terminal designation
1 2 3 4	DC 0 to 10 V or DC 0/4 to 20 mA (configurable)	

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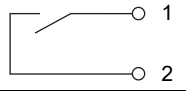
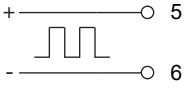
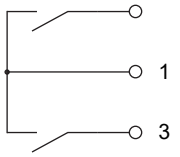
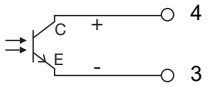
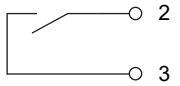
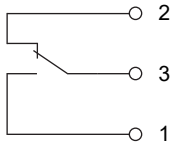
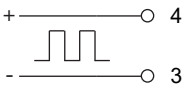
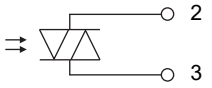
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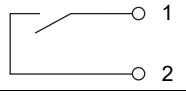
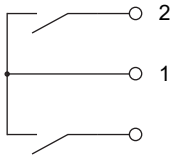
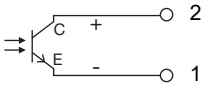
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Digital outputs

Digital outputs 1 to 3: standard feature

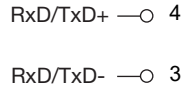
Digital outputs 4 to 11: optional (options 1 to 4, see order details)

Output	Version	Symbol and terminal designation
1	Relay (NO contact)	
3	Logic output 0/14 V (only usable if digital input 1 is not used)	
	Output 4 for option 1 Output 6 for option 2 Output 8 for option 3 Output 10 for option 4	
4 6 8 10	2 relays (NO contact): Relay 1	
	2 open-collector outputs: OC 1	
	Relay (NO contact)	
	Relay (changeover contact)	
	Logic output 0/14 V Logic output 0/22 V	
	Solid state relay	

Output	Version	Symbol and terminal designation
2	Relay (NO contact)	
	Output 5 for option 1 Output 7 for option 2 Output 9 for option 3 Output 11 for option 4	
5 7 9 11	2 relays (NO contact): Relay 2	
	2 open-collector outputs: OC 2	

RS485 interface

Optional (option 2 or 6, see order details)

Interface	Symbol and terminal designation
RS485	

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Voltage supply

Version (see nameplate)	Symbol and terminal designation
AC 110 to 240 V	L1 ——○ L1/L+ N ——○ N/L-
AC/DC 24 V	L+ ——○ L1/L+ L- ——○ N/L-

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Order details

	(1)	**Basic type**
703051		**Type 703051** (format 116: 48 x 48 mm) 1 analog input (universal), 1 digital input, 1 digital input/output (switchable), 2 relays (NO contact) incl. 2 timers, ramp and program functions (4 programs), setup program (download)
703052		**Type 703052** (format 108H: 48 x 96 mm) 1 analog input (universal), 1 digital input, 1 digital input/output (switchable), 2 relays (NO contact) incl. 2 timers, ramp and program functions (4 programs), setup program (download)
703053		**Type 703053** (format 108Q: 96 x 48 mm) 1 analog input (universal), 1 digital input, 1 digital input/output (switchable), 2 relays (NO contact) incl. 2 timers, ramp and program functions (4 programs), setup program (download)
703054		**Type 703054** (format 104: 96 x 96 mm) 1 analog input (universal), 1 digital input, 1 digital input/output (switchable), 2 relays (NO contact) incl. 2 timers, ramp and program functions (4 programs), setup program (download)
	(2)	**Version**
8		Standard with default settings[a]
9		Customer-specific configuration (specifications in plain text)
	(3)	**Option 1**
00		Not used
01		1 analog input (universal)
02		1 counting input 12.5 kHz
03		3 digital inputs
04		1 relay (changeover contact 8 A; only for types 703052, 703053, 703054)
05		1 relay (NO contact 3 A)
06		2 relays (NO contact 3 A; only for types 703052, 703053, 703054)
07		1 solid state relay 1 A
08		1 digital output (logic 0/14 V)
09		1 analog output
10		1 digital output (logic 0/22 V, galvanically isolated)
12		1 Ethernet interface (Modbus TCP, setup program; only for types 703051, 703052, 703053)
13		1 PROFINET IO Device interface (2 × RJ45; only for types 703051, 703052, 703053); **option 2 not applicable**
14		2 open-collector outputs
	(4)	**Option 2**
00		Not used
01		1 analog input (universal)
02		1 counting input 12.5 kHz
03		3 digital inputs
04		1 relay (changeover contact 8 A; only for types 703052, 703053, 703054)
05		1 relay (NO contact 3 A)
06		2 relays (NO contact 3 A; only for types 703052, 703053, 703054)
07		1 solid state relay 1 A
08		1 digital output (logic 0/14 V)
09		1 analog output
10		1 digital output (logic 0/22 V, galvanically isolated)
11		1 RS485 interface (Modbus RTU; only for types 703051, 703052, 703053)
14		2 open-collector outputs

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	(5)	**Option 3** (only for types 703052, 703053, 703054)
00		Not used
01		1 analog input (universal)
02		1 counting input 12.5 kHz
03		3 digital inputs
04		1 relay (changeover contact 8 A);
05		1 relay (NO contact 3 A)
06		2 relays (NO contact 3 A)
07		1 solid state relay 1 A
08		1 digital output (logic 0/14 V)
09		1 analog output
10		1 digital output (logic 0/22 V, galvanically isolated)
14		2 open-collector outputs
	(6)	**Option 4** (only for types 703052, 703053, 703054)
00		Not used
01		1 analog input (universal)
02		1 counting input 12.5 kHz
03		3 digital inputs
04		1 relay (changeover contact 8 A);
05		1 relay (NO contact 3 A)
06		2 relays (NO contact 3 A)
07		1 solid state relay 1 A
08		1 digital output (logic 0/14 V)
09		1 analog output
10		1 digital output (logic 0/22 V, galvanically isolated)
14		2 open-collector outputs
	(7)	**Option 5** (only for type 703054)
00		Not used
12		1 Ethernet interface (Modbus TCP, setup program)
13		1 PROFINET IO Device interface (2 × RJ45); **option 6 not applicable**
	(8)	**Option 6** (only for type 703054)
00		Not used
11		1 RS485 interface (Modbus RTU)
	(9)	**Voltage supply**
23		AC 110 to 240 V +10/-15 %, 48 to 63 Hz
42		AC/DC 24 V +10/-15 %, AC 48 to 63 Hz
	(10)	**Extra codes**
000		Without extra code
214		Math and logic module
221		Structured text
234		Second control channel
278		Functions for plastics technology ("plast")
879		AMS2750/CQI-9[b]

[a] The language of the device texts can be adjusted (German, English, French, Spanish).

[b] The thermocouple type and the required measuring points (calibration points) must be defined for the calibration certificate. The device must be used as a permanently installed field device. Use as a mobile field testing device for SAT and TUS tests is not admissible. – Only in conjunction with customer-specific configuration.

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)		(10)		
Order code		/		-		-		-		-		-		-		-		/		,	...[a]
Order example	703054	/	8	-	01	-	03	-	09	-	09	-	12	-	11	-	23	/	214	,	...

[a] List extra codes in sequence and separate using commas.

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Stock versions

Order code	Part no.
703051/8-00-00-00-00-00-00-23/000	00761870
703051/8-00-00-00-00-00-00-42/000	00761871
703051/8-09-00-00-00-00-00-23/000	00761872
703052/8-00-00-00-00-00-00-23/000	00761873
703052/8-00-00-00-00-00-00-42/000	00761874
703052/8-09-00-00-00-00-00-23/000	00761875
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703053/8-09-00-00-00-00-00-23/000	00761878
703054/8-00-00-00-00-00-00-23/000	00761879
703054/8-00-00-00-00-00-00-42/000	00761880
703054/8-09-00-00-00-00-00-42/000	00761881
703054/8-01-00-00-00-00-00-23/000	00761882

Scope of delivery

1 device in the ordered version
1 quick start guide
1 mounting frame (only for type 703051)
2 mounting elements (only for types 703052, 703053, and 703054)

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Accessories

Description	Part no.
1 USB cable, A connector to Micro-B connector, 3 m	00616250
1 USB flash drive, 2 GB[a]	00505592
Activation for math/logic module	00759820
Activation for structured text	00759922
Activation for second control channel	00759951
Retaining bracket for DIN rail, for type 703051 (48 mm × 48 mm)[b]	00375745
Retaining bracket for DIN rail, for type 703053 (96 mm × 48 mm)[b]	00375749
Retaining bracket for DIN rail, for type 703054 (96 mm × 96 mm)[b]	00754309
Stainless steel case for type 703054 (96 mm × 96 mm)[b]	00628452
Surface-mounted housing for type 703053 (96 mm × 48 mm)[b]	00361257
Surface-mounted housing for type 703054 (96 mm × 96 mm), with lid[b]	00750965
Intermediate frame for housing extension (suitable for part no. 00750965)[b]	00728860
Optional modules for retrofitting (depends on device, see order details):	
1 analog input (universal)	00760068
1 counting input 12.5 kHz	00760076
3 digital inputs	00760077
1 relay (changeover contact 8 A)	00760078
1 relay (NO contact 3 A)	00760090
2 relays (NO contact 3 A)	00760092
1 solid state relay 1 A	00760093
1 digital output (logic 0/14 V)	00760094
1 analog output	00760095
1 digital output (logic 0/22 V, galvanically isolated)	00760096
1 RS485 interface (Modbus RTU)	00760048
1 Ethernet interface (Modbus TCP, setup program)	00760045
1 PROFINET IO Device interface (2 × RJ45)	00773311
2 open-collector outputs	00760014

[a] The indicated USB flash drive has been tested and is designed for industrial applications. Other brands with a larger memory capacity can also be used. However, no liability is assumed for these other brands.

[b] Without UL approval.