nVent

RAYCHEM

TCONTROL-05

Panel mounted controller

Contents

1. Introduction

1.1 Safety information

General

This manual contains information that must be observed in the interest of your own safety and to avoid material damage. This information is supported by symbols which are used in this manual as indicated.

Please read this manual before starting up the device. Store this manual in a place that is accessible to all users at all times.

If difficulties occur during startup, please do not intervene in any way that could jeopardize your warranty rights!

Warning symbols

WARNING!

This symbol in connection with the signal word indicates that **personal injury** may occur if the respective precautionary measures are not carried out.

CAUTION!

This symbol in connection with the signal word indicates that **material damage or data loss** will occur if the respective precautionary measures are not taken.

CAUTION!

This symbol indicates that **components could be destroyed** by electrostatic discharge (ESD = Electro Static Discharge) if the respective cautionary measures are not taken.

Only use the ESD packages intended for this purpose to return device inserts, assembly groups, or assembly components.

READ THE DOCUMENTATION!

This symbol, which is attached to the device, indicates that the associated documentation for the device must be observed. This is necessary to identify the nature of the potential hazard, and to take measures to prevent it.

Note symbols

NOTE!

This symbol refers to an **Important information** about the product or its handling or additional use.

REFERENCE!

This symbol refers to **additional information** in other sections, chapters, or other manuals.

FURTHER INFORMATION

This symbol is used in tables and indicates that **further information** is provided after the table.

DISPOSAL!

At the end of its service life, the device and any batteries present do not belong in the trash! Please ensure that they are **disposed of** properly and in an **environmentally friendly** manner.

1.2 Intended use

The device is designed for use in an industrial environment as specified in the technical data. Other uses beyond those defined are not viewed as intended uses.

The device has been manufactured in compliance with applicable standards and directives as well as the applicable safety regulations. Nevertheless, improper use may lead to personal injury or material damage.

To avoid danger, only use the device:

- For the intended use
- When in good order and condition
- When taking the technical documentation provided into account

Risks resulting from the application may arise, e.g. as the result of missing safety provisions or wrong settings, even when the device is used properly and as intended.

1.3 Qualification of personnel

This document contains the necessary information for the intended use of the device to which it relates.

It is intended for staff with technical qualifications who have been specially trained and have the appropriate knowledge in the field of automation technology.

The appropriate level of knowledge and the technically fault-free implementation of the safety information and warnings contained in the technical documentation provided are prerequisites for risk-free mounting, installation, and startup as well as for ensuring safety when operating the described modules. Only qualified personnel have the required specialist knowledge to correctly interpret and implement the safety information and warnings contained in this document in specific situations.

1.4 Acceptance of goods, storage, and transport

1.4.1 Checking the delivery

- Ensure that the packaging and its contents are undamaged
- Check the delivery for completeness against the packing slip and order details
- Inform the supplier immediately if there is any damage
- Store damaged parts until clarification is received from the supplier

1.4.2 Important information about storage and transport

- Store the device in a dry, clean environment. Observe the admissible ambient conditions (see “Technical data”)
- Protect the device from shock during transport
- The original packaging provides optimum protection for storage and transport

1.4.3 Returning goods

In the event of repair, return the complete device in clean condition.

Use the original packaging to return goods.

Protection against electrostatic discharge (ESD)
(ESD = electrostatic discharge)

To prevent damage due to ESD, electronic modules or components must be handled, packaged, and stored in an ESD-protected environment. Measures that protect against electrostatic discharge and electric fields are described in DIN EN 61340-5-1 and DIN EN 61340-5-2 “Protection of electronic devices from electrostatic phenomena”.

This symbol in connection with the signal word indicates that material damage or data loss will occur if the respective precautionary measures are not taken.

When returning electronic modules or components, please note the following:

- Pack sensitive components only in an environment providing protection against ESD. Workspaces such as this divert electrostatic charges to ground in a controlled manner and prevent static charges due to friction.
- Use only packaging intended specifically for ESD-sensitive assemblies/components. These must consist of conductive plastics.

No liability can be assumed for damage caused by ESD.

CAUTION!

Electrostatic charges occur in non-ESD-protected environments.

Electrostatic discharges can damage modules or components.

- For transport purposes, use only the ESD packaging provided.

1.4.4 Disposal

Disposing of the device

DISPOSAL!

Devices and/or replaced parts should not be placed in the refuse bin at the end of their service life as they consist of materials that can be recycled by specialist recycling plants.

Dispose of the device and the packaging material in a proper and environmentally friendly manner. For this purpose, observe the country-specific laws and regulations for waste treatment and disposal.

Disposing of the packaging material

The entire packaging material (cardboard packaging, inserts, plastic film, and plastic bags) is fully recyclable.

1.5 Identifying the device version

1.5.1 Nameplate

The nameplate is affixed to the housing.

Contents

The nameplate contains important information. This includes:

Description	Designation on the nameplate	Example
Device type	Type	702114/81-4356-25/214
Part no.	TN	00123456
Serial number	F-Nr.	0070033801217480006
Voltage supply	–	AC/DC 20 to 30 V, 48 to 63 Hz

Device type (Type)

Identify the supplied device version with help of the product identification table on the next page.

Part no. (TN)

The part no. uniquely identifies an article. It is important for communication between the customer and the nVent sales department.

Serial number (F-Nr.)

The serial number indicates, among other things, the date of manufacture (year/week).

Example: F-no. = 0070033801217480006

The characters in question are digits 12, 13, 14, and 15 (from the left). Thus the device was produced in calendar week 48 of 2017.

1.5.2 Product identification

	(1)	**Basic type**
702111		**Type 702111** (size: 48 x 48 mm) 1 analog input, 2 digital inputs (digital input 1, alternative to logic output), 2 relays (N/ O contact), 1 logic output 0/14 V (alternative to digital input 1) incl. timer, ramp function, and program function
	(2)	**Version**
8		Standard with default settings[a]
9		Customer-specific configuration (specifications in plain text)
	(3)	**Option 1[b]**
0		Not used
1		1 relay (N/O contact)
2		1 logic output 0/14 V
4		1 RS485 interface (Modbus-RTU)
	(4)	**Option 2[b]**
0		Not used
1		1 relay (N/O contact)
2		1 logic output 0/14 V
3		1 analog output
	(5)	**Option 3[b]**
0		Not used
	(6)	**Option 4[b]**
0		Not used
	(7)	**Voltage supply**
23		AC 110 to 240 V +10/-15 %, 48 to 63 Hz
25		AC/DC 20 to 30 V, 48 to 63 Hz

	(8)	Extra codes
000		Without extra code
214		Math and logic module
221		Structured text

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

[b] The options cannot be retrofitted! Please consider options when ordering.

[c] PhotoMOS is a registered trademark of Panasonic Corporation.

	(1)		(2)		(3)	(4)	(5)	(6)		(7)		(8)	
Order code		/											, ...[a]
3 Order example	702114	/	8	–	4	3	5	6	–	23	/	214	, ...

[a] List extra codes in sequence, separated by commas.

1.5.3 Scope of delivery

1 device in the ordered version
1 quick start guide
1 mounting frame

1.5.4 Accessories

Description
Setup program
USB cable, A connector to Micro-B connector, length 3 m
Mounting for DIN rail, for type 702111

1.6 Brief description

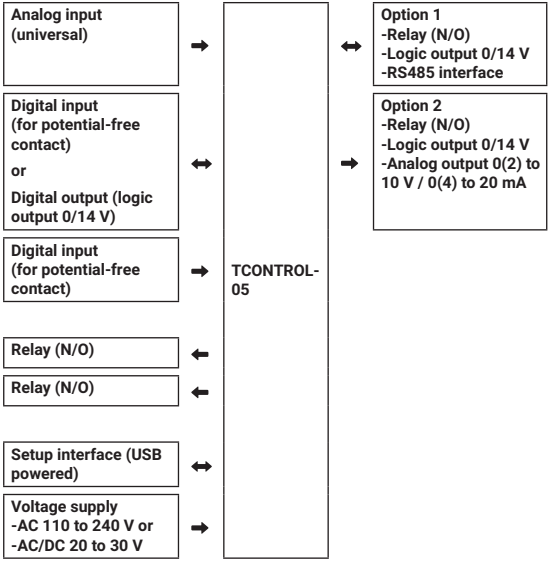
The controller series comprises five freely configurable, universally usable compact controllers in various DIN formats to control temperature, pressure, and other process variables.

The devices are characterized by a simple, clearly structured supported with texts. Process values and parameters are represented by two 18-segment LCD displays. In addition, all devices have individual display elements for the switch positions of the outputs as well as for manual mode, ramp function, and timer. The devices are operated using a membrane keyboard with four buttons 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 two-state controllers, three-state controllers, three-step controllers, or continuous controllers. 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. A math and logic function is also available as an option. Furthermore, the user has the option to create his/her own application using structured text (ST code).

The devices can be conveniently configured using a PC with the help of the setup program (incl. program editor and ST editor). No separate voltage supply is required when configuring via the USB interface (USB-powered).

1.7 Block diagram



1.8 Device types

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1.9 Available technical documentation

In addition to this quick start guide, the following documents are available as PDF files and can be requested:

- Operating manual
- Interface description (Modbus)

2. Mounting

2.1 Installation site and ambient conditions

WARNING!

The device is not designed for use in potentially explosive areas.

Explosion hazard.

- Only deploy the device outside of potentially explosive areas.

Mounting site

The device is designed for installation in a panel cut-out within a closed switch cabinet. The front of the device and housing have different protection types (see technical data).

Climatic conditions

The ambient temperature and the relative humidity at the mounting site must correspond to the technical data. Aggressive gases and vapors have a negative effect on the operating life of the device. The mounting site must be free from dust, powder, and other suspended solids.

Installation position

The device can be installed in any position.

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

Technical data

➥ chapter 5 “Technical data”, Page 24

2.2 Cleaning

The front of the device (front foil) can be cleaned with standard detergents, rinsing and cleaning agents.

CAUTION!

The front of the device is not resistant to aggressive acids and lyes, scouring agents, and cleaning with a pressure cleaner.

Use of these media can cause damage.

- Only clean the front of the device with suitable agents.

2.3 Dimensions

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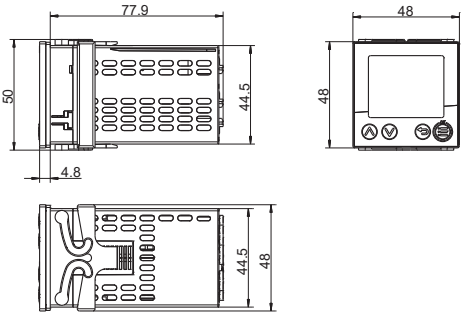

Panel cut-out according to DIN IEC 61554

TCONTROL-05 dimensions	Panel cut-out (width x height)	Minimum spacing of panel cut- outs (for tightly packed installations)	
		Horizontal	Vertical
48 mm × 48 mm	$45^{+0.6}$ mm × $45^{+0.6}$ mm	15 mm	30 mm

2.4 DIN rail installation

Special mounting elements for mounting on a DIN rail (35 mm, according to DIN EN 60715) are available as accessories. This involves a base plate attached to the DIN rail and a device holder (see depictions in the section “Dimensions”).

Process:

1. Mount the base plate on the DIN rail from above and press down until it engages.
2. Insert the mounting frame (included in the scope of delivery of the device, see Panel mounting) into the device holder from above (front).
3. Insert the device (without panel seal) into the device holder from the front and secure using the mounting frame. In doing so, ensure sufficient attachment (see Panel mounting).
4. Carry out electrical connection.
   To facilitate the connection, the device holder can be mounted in the base plate from above with its underside positioned vertically (top connection terminals).

It is also possible to mount the device holder with its front positioned horizontally so that the connection terminals can be accessed from the front. After connection, the device holder must be removed from this position!

5. Insert the device holder into the side recesses of the base plate with its rear detent lugs and press down until it engages.

2.5 Panel mounting

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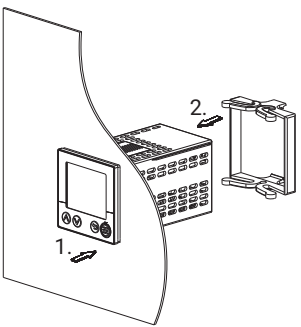


1. Insert the device from the front into the panel cut-out and ensure that the seal is correctly positioned.
2. Push the mounting frame from the panel rear onto the device body and press the springs against the panel rear until the detent lugs engage in their slots and the frame is sufficiently fastened.

CAUTION!

The front of the device and housing have different protection types!

The protection type IP65 (front-side) is only guaranteed if the seal is flush and even.

- Use the mounting frame or both mounting elements as shown in the figure and ensure an even attachment!

3. Electrical connection

3.1 Installation notes

Requirements for personnel

- Work on the device must only be carried out to the extent described and, like the electrical connection, only by qualified personnel.
- Before plugging and unplugging connecting cables, it must be ensured that the acting person is electrostatically discharged (by touching grounded metallic parts, for example).

Cables, shielding, and grounding

- When selecting the electrical wiring material as well as when installing and connecting the device electrically, comply with the requirements of DIN VDE 0100 “Low-voltage electrical installations” and the applicable country-specific regulations (for example, based on IEC 60364).
- It may be necessary to adhere to special notes relating to the heat resistance of cables (see connection diagram).
- Route input, output, and supply lines separately and not parallel to one another.
- Only use shielded and twisted probe and interface cables. Do not route the lines close to current- carrying components or cables.
- For temperature probes, ground the shielding on one side in the control cabinet.
- Do not perform loopthroughs on the grounding cables, but instead route the cables individually to a shared grounding point in the control cabinet; in doing so, ensure that the cables are as short as possible.
- Ensure that the potential equalization is correct.

Electrical safety

- The device is intended to be installed in control cabinets or plants. Ensure that the customer’s fuse protection does not exceed 20 A. Disconnect the device from the mains voltage on all poles prior to starting service or repair work.
- The relay’s load circuit can be operated with a hazardous electrical voltage (e.g. 230 V). De-energize the load circuit during mounting/dismounting and electrical connection.
- To prevent the relay contacts being destroyed in the case of an external short-circuit in the load circuit, the latter must be

fuse-protected as per the maximum admissible relay current (see technical data).

- The device is not suitable for installation in potentially explosive areas.
- In addition to a faulty installation, incorrectly set values on the device can also impair the correct function of thedownstream process. Therefore, ensure that safety devices independent of the device, e.g., overpressure valves or temperature limiters/monitors, are present and that it is only possible for qualified personnel to define settings. Please observe the corresponding safety regulations in this context.

References to other information

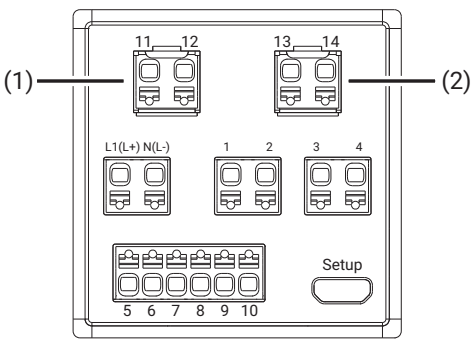
- The electromagnetic compatibility conforms to the standards and regulations cited in the technical data.
- In general, please observe the specifications regarding electrical isolation.

Setup interface

- The setup interface (USB) is not intended for a permanent connection. Always disconnect the USB cable from the device as soon as you have finished working with the setup program.

3.2 Connection elements

Dimension: 48 mm × 48 mm



Terminals	Connection
1, 2	Output 1 (relay)
3, 4	Output 2 (relay)
5-8	Analog input
8, 10	Input 2 (for potential-free contact)
9, 10	Input 1 (for potential-free contact) or output 3 (logic output)
11, 12	(1) = option 1: output 4 (relay, logic output) or RS485 interface
13, 14	(2) = option 2: output 5 (relay, logic or analog output)
L1(L+), N(L-)	Voltage supply
Setup (USB)	PC (setup program)

3.3 Connection diagram

CAUTION!

In unfavorable conditions, the temperature may exceed 60°C at the terminals. and to take measures to prevent it.

As a result, the insulation of the cables connected at the terminals may be damaged.

- The affected cables must be heat-resistant up to at least 80°C.

NOTE!

There is an individual connection diagram on the housing that corresponds to the ordered device version.

3.3.1 Analog input

The analog input version is identical for all types.

Measuring probe/ standard signal	Symbol and terminal designation
Thermocouple	
RTD temperature probe two-wire circuit	
RTD temperature probe three-wire circuit	
Voltage DC 0(2) ... 10 V (useable as alternative to digital input 2)	
Current DC 0(4) ... 20 mA	
Resistance/potentiometer two-wire circuit	
Resistance/potentiometer three-wire circuit	
Resistance transmitter A = Start E = End S = Slider	

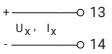
3.3.2 Digital input

The digital input version is identical for all types.

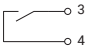
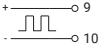
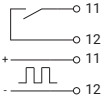
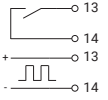
Input	Version	Symbol and terminal designation
1	Digital input for potential-free contact (useable as alternative to digital output 3)	
2	Digital input for potential-free contact (only usable if the analog input is not configured as DC 0(2) ... 10 V)	

3.3.3 Analog output

The digital input version is identical for all types.

Version for types 702111 to 702114		
Output		**Symbol and terminal designation**
5	Option 2 (alternative to digital output 5): DC 0/2 ... 10 V or DC 0/4 ... 20 mA (configurable)	

3.3.4 Digital output

Output	Version	Symbol and terminal designation
1	Relay (N/O contact)	
2	Relay (N/O contact), (for type 702110 as option 2, see below)	
3	Logic output 0/14 V (usable as alternative to digital input 1)	
4	Option 1 (alternative to RS485 interface Relay (N/O contact), or logic output 0/14 V	
5	Option 2 (alternative to analog output): Relay (N/O contact) or logic output 0/14 V	

3.3.5 RS485 interface

Input	Symbol and terminal designation
Option 1 (alternative to digital output 4): RS485 interface	RxD/TxD+ 11 RxD/TxD- 12

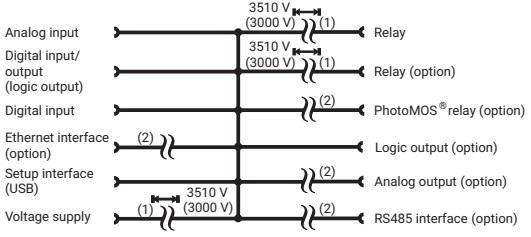
3.3.6 Voltage supply

Version (see nameplate)	Symbol and terminal designation
AC 110 to 240 V	L1 ——o L1/L+ N ——o N/L-
AC/DC 20 to 30 V	L+ ——o L1/L+ L- ——o N/L-

NOTE

No separate voltage supply is required for configuring using the setup program as the device is supplied via the USB interface (USB-powered). For a device in format 108H, 108Q, or 104, in this case the standard digital outputs are activated and the digital outputs of the options are deactivated.

3.4 Galvanic isolation



1. The voltage specifications correspond to the test voltages (alternating voltage, rms values) according to EN 61010-1:2011-07 for the type test. Type 702110 (format 132): 3000 V instead of 3510 V.
2. Functional galvanic isolation for the connection of SELV or PELV circuits.

CAUTION!

The measuring input and the USB interface are not electrically isolated.

- Do not connect the USB with a grounded sensor, even if the ground of the PC is grounded (e.g. a desktop PC).

The device is configured, parametrized, and operated using the four buttons on the front. A setup program is also available for convenient configuration of the device using a PC. Some functions can only be configured with the setup program.

The individual parameters for device setting are organized in different levels that can be inhibited. The level inhibit helps to prevent accidental or unauthorized operation.

4. Operation

4.1 Display and control elements

1. 18-segment LCD display (e.g. actual value), 4-digit, white; also for displaying menu items, parameters and text)
2. 18-segment LCD display (e.g. setpoint value), green; also for displaying menu items, parameters, values and text); display “OK” when exiting editing mode (with change)
3. Activity display for ramp function/program, timer, manual mode
4. Switching of the digital outputs (yellow = active)
5. Up (in the menu: increase value, select previous menu item or parameter; in basic status: increase setpoint value)
6. Down (in menu: reduce value, select next menu item or parameter; in basic status: reduce setpoint value)
7. Back (in menu: back to previous menu level, exit editing mode without change; in basic status: configurable function)
8. Menu/OK (call up main menu, switch to submenu/level, switch to editing mode, exit editing mode with change)

Symbols (activity displays)

Symbol	Off	Lights up	Flashes
Ramp function/ program 	Ramp function or program controller is not active and also not configured	Ramp function or program controller is configured but not active	Ramp function or program controller is active
Timer 	Timer is not active and also not configured	Timer is configured but not active	Timer is active (running)
Manual mode 	Manual mode is not active (= automatic mode)	Manual mode is active The outputs can be manually controlled using the "Up" and "Down"buttons: Increase/de-crease output level (or three-step controller: Open/close actuator).	---

Button functions

Button or button combination (permanent)	Function		
	In basic status	When navigating	When editing
Up 	Increase setpoint value. In manual mode: Increase output level (or open actuator in the case of the three-step controller)	Select previous menu item or parameter	Increase value or go up in picklist
Down 	Decrease setpoint value. In manual mode: Decrease output level (or close actuator in the case of the three-step controller)	Select next menu item or parameter	Decrease value or go down in picklist

Button or button combination (permanent)	Function		
	In basic status	When navigating	When editing
Back short (< 2 s) 	Function configurable (default setting: without function)	Move to menu level above	Leave editing mode without changes
Back long (> 2 s) 	Function configurable (default setting: switch to manual mode / end manual mode)	---	---
Menu/OK short (< 2 s) 	Call up main menu	Call up sub-menu or switch to editing mode	Leave editing mode with changes
Up + Down long (> 2 s) 	Start/stop autotuning	---	---
Down + Menu/OK very long (> 5 s) 	Call up menu for level inhibit	---	---

4.2 Language selection

After switching on the device for the first time, the user can either confirm the flashing displayed language with “OK” or select another language using the “Up”/”Down” buttons and then confirm this with “OK”.

If, at a later point, another user is to also have the option of selecting a language, the configuration parameter “Language selection active” must be set to “Yes” (Configuration > System data). After applying the language, this parameter is automatically set to “No”, so that language selection is not necessary the next time the device is switched on.

The language of the device texts can be changed at any time in the configuration settings (regardless of language selection after switch-on).

4.3 Error messages

Display	Possible cause[a]	Measures
<<<<	Measuring range underflow Short-circuit (probe/line) Break (probe/line) Polarity	Check sensor and line (break, short- circuit, polarity) Check connection terminals Check configuration (signal type, linearization, resistance measuring range, scaling)
>>>>	Measuring range overflow	
----	Break (probe/line) Polarity	

[a] Depends on the signal type (measuring probe); see chapter “Technical data”. In the event of an error, the controller switches to manual mode.

4.4 Further information

For further information regarding the operation and configuration of the device, see the operating manual, as well as the interface description (Modbus) and the ST editor manual, if necessary.

➡ chapter 1.9 “Available technical documentation”, Page 10

Ethernet interface (option)

The settings of the Ethernet interface must be made with the Lantronix CPR Manager PC software from the manufacturer Lantronix, Inc. Configuration on the device or with the setup program is not necessary.

Further information can be found in the interface description (Modbus).

5. Technical data

5.1 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 EN 60584-1:2014 IEC 60584-1:2013	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 +1300°C	≤ 0.25 % from -80°C
NiCr-CuNi	"E"	DIN EN 60584-1:2014 IEC 60584-1:2013	ITS-90	−270 to +1000°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	−50 to +1820°C	≤ 0.25 % from 400°C

Designation	Type	Standard	ITS	Measuring range	Accuracy[a]
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 +1300°C	≤ 0.25 % from –80°C

[a] The accuracy value refers to the measuring range.

Ambient temperature influence	≤ 100 ppm/K
Cold junction	Internal or external (constant)
Reference point temperature (external)	0 to 100°C (adjustable)
Sampling rate	150 ms
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/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/three-wire	–200 to +850 °C	≤ 0.1 %	500 µA
KTY			Two-wire	–53 to +153 °C	≤ 2.0 %	50 µA

[a] The accuracy value refers to the measuring range.

Ambient temperature influence	≤ 50 ppm/K
Sensor line resistance	Max. 30 ∧ per line
Sampling rate	150 ms
Input filter	Digital filter, 2nd order; filter constant can be set from 0 to 100.0 s

Resistance transmitter and resistor/potentiometer

Designation	Measuring range	ITS	Connection type
Resistance transmitter	0 to 4000 ∧	≤ 0.1 %	Two/three- wire
Resistance/ potentiometer	0 to 400 ∧ 0 to 4000 ∧	≤ 0.1 % ≤ 0.1 %	500 µA 50 µA

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

Ambient temperature influence	≤ 100 ppm/K
Connection type Resistance transmitter Resistance/potentiometer	 Three-wire circuit Two-wire/three-wire circuit
Sensor line resistance	Max. 30 ∧ per line
Sampling rate	150 ms
Input filter	Digital filter, 2nd order; filter constant can be set from 0 to 100.0 s

Voltage, current (standard signals)

Designation	Measuring range	Accuracy[a]	Input resistance or burden voltage
Voltage	0 to 10 V	≤ 0.1 %	> 500 k ∧
	2 to 10 V	≤ 0.1 %	> 500 k ∧
Current	4 to 20 mA	≤ 0.1 %	> 2.5 V
	0 to 20 mA	≤ 0.1 %	> 2.5 V

[a] The accuracy value 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	150 ms
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 fault is configurable.

Measuring probe	Measuring range underflow	Measuring range overflow	Short-circuit (probe/line)	Break (probe/line)	Polarity
RTD temperature probe	++	++	++	++	---
Resistance/ potentiometer	---	++	---	++	---
Resistance transmitter	---	++	(+)[a]	(+)[b]	---
Thermocouple	++	++	---	++	(+)[c]
Current 0 to 20 mA	---	++	---	---	---
Current 4 to 20 mA	++	++	++	++	++
Voltage 0 to 10 V	---	++	---	---	++
Voltage 2 to 10 V	++	++	++	++	++
++ = is detected		--- = is not detected		(+) = is detected in certain conditions	

[a] Is not detected in all combinations

[b] Break in measuring current path is not detected

[c] Dependent on the set characteristic line

5.2 Digital inputs

Input for potential-free contact	
Function	Contact closed: input is active (RON < 1 kΩ) Contact open: input is inactive (ROFF > 50 kΩ)
Sampling rate	150 ms

5.3 Analog outputs

Voltage Output signal Load resistance	 DC 0(2) to 10 V > 500 Ω
Current Output signal Load resistance	 DC 0(4) to 20 mA < 450 Ω
Accuracy	≤ 0.5 %
Ambient temperature influence	≤ 150 ppm/K

5.4 Digital outputs

Relay (N/O contact) Switching capacity Contact life	 Max. 3 A at AC 230 V or DC 30 V, resistive load 150,000 operations at rated load 350,000 operations at 1 A
Relay (N/O contact) with longer contact life Switching capacity Contact life	 Max. 3 A at AC 230 V, resistive load 300,000 operations at rated load 1,500,000 operations at 1 A
Logic output Output signal Current Switching time when used as a controller output	 DC 0/14 V ± 15% Max. 20 mA per output (at nominal voltage 14 V) Min. 10 ms
PhotoMOS® relay[a] Switching capacity	 Max. 200 mA at AC 30 V or DC 45 V; not short-circuit proof

[a] PhotoMOS is a registered trademark of Panasonic Corporation.

5.5 Interfaces

USB device	
Connector type	Micro-B (socket)
Standard	Low-Speed, Full-Speed
Max. cable length	5 m
RS485	
Baud rate	9600, 19200, 38400, 115200
Data format	8/1n, 8/1e, 8/1o, 8/2n
Protocol	Modbus-RTU as slave
Ethernet	
Connector type	RJ45 (socket)
Transfer rate	10 Mbit/s, 100 Mbit/s
Protocol	TCP/IP, DHCP; Modbus-TCP, Modbus-RTU/ ASCII via TCP, as slave

5.6 Display

18-segment LCD displays		
Digit height TCONTROL-05	Upper display: 12.3 mm	Lower display: 5.9 mm
Color	Upper display: white; lower display: green	
Places, including decimal places	Upper display: 4; lower display: 8	
Decimal places	0, 1, 2, 3 or automatic (configurable)	

5.7 Electrical data

Voltage supply	AC 110 to 240 V +10/-15 %, 48 to 63 Hz AC/DC 20 to 30V, 48 to 63Hz	
Voltage supply	According to EN 61010, part 1; overvoltage category II to 300 V mains voltage, pollution degree 2	
Protection rating	I with internal isolation from SELV	
Power consumption Types 702112, 702113	For AC 110 to 240 V: Max. 4.1 W	For AC/DC 20 to 30 V: Max. 3.7 W
Electrical connection	On the back via spring-cage terminals (Push-In technology)	
Conductor cross section		
Wire or stranded wire (without ferrule)	Min. 0.2 mm^2, max. 1.5 mm^2	
Stranded wire with ferrule	Without plastic collar: min. 0.2 mm^2, max. 1.5 mm^2 With plastic collar: min. 0.2 mm^2, max. 0.75 mm^2	
Stripping length	8 mm	

5.8 Environmental influences

Ambient temperature range Storage Operation	 –30 to +70°C –10 to +55°C
Site altitude	Max. 2000 m above sea level
Climatic environmental influences Resistance to climatic conditions Storage Operation	According to DIN EN 60721-3 with extended temperature range ≤ 90 % rel. humidity without condensation According to class 1K2 According to class 3K3
Mechanical environmental influences Storage Transport Operation	According to DIN EN 60721-3 According to class 1M2 According to class 2M2 According to class 3M3
Electromagnetic compatibility (EMC) Interference emission Interference immunity	According to DIN EN 61326-1 Class A – only for industrial use – Industrial requirements

5.9 Case

Case type	Plastic housing 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 fastening	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	Max. 120 g

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

6 China RoHS

						
产品组别 Product group: 702110, 702111, 702112, 702113, 702114 部件名称 Component Name	产品中有害物质的名称及含量 China EEP Hazardous Substances Information					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
外壳 Housing (Gehause)	0	0	0	0	0	0
过程连接 Process connection (Prozessanschluss)	0	0	0	0	0	0
螺母 Nuts (Mutter)	0	0	0	0	0	0
螺栓 Screw (Schraube)	0	0	0	0	0	0

本表格依据SJ/T 11364的规定编制。
This table is prepared in accordance with the provisions SJ/T 11364.

o: 表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。
Indicate the hazardous substances in all homogeneous materials' for the part is below the limit of the
GB/T 26572.

X : 表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。
Indicate the hazardous substances in at least one homogeneous materials' of the part is exceeded the
limit of the GB/T 26572.

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