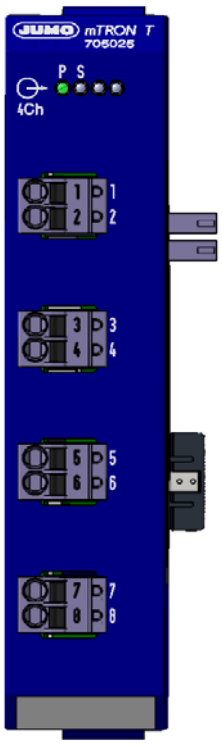
JUMO mTRON T

Measuring, control, and automation system
Analog output module 4-channel



Operating Manual

JUMO

70502500T90Z001K000

V4.00/EN/00609030

Contents

Contents

1.1 Available technical documentation

The documents specified below are available for the measuring, control, and automation system (previous document number in parentheses).

1.1.1 General information

Product	Type of documentation	No.	Printed	PDF file
Measuring, control, and automation system	Data sheet	70500000T10...	-	X
	System manual[1]	70500000T90... (B 705000.0)	X	-
	Setup program manual	70500000T96... (B 705000.6)	-	X
	System description[2]	70500000T98... (B 705000.8)	-	X

[1] Accessory subject to charge

[2] Includes an overview of the purpose and content of all documents

1.1.2 Base units

Product	Type of documentation	No.	Printed	PDF file
Central processing unit	Data sheet	70500100T10...	-	X
	Operating manual	70500100T90... (B 705001.0)	-	X
	Modbus interface description	70500100T92... (B 705001.2.0)	-	X
	PROFIBUS-DP interface description	70500103T92... (B 705001.2.3)	-	X
	digiLine interface description	70500106T92...	-	X
	Installation instructions	70500100T94... (B 705001.4)	X	X
	CODESYS OPC server operating manual	70500151T90... (B 705001.5.1)	-	X
	Process engineering application operating manual	70500152T90...	-	X
	Operating manual Thyristor power controller (type 70906x; integration in the measuring, control, and automation system)	70500153T90...	-	X

1.1.3 Input/output modules

Product	Type of documentation	No.	Printed	PDF file
Multichannel controller module	Data sheet	70501000T10...	-	X
	Operating manual	70501000T90... (B 705010.0)	-	X
	Installation instructions	70501000T94... (B 705010.4)	X	X
Relay module 4-channel	Data sheet	70501500T10...	-	X
	Operating manual	70501500T90... (B 705015.0)	-	X
	Installation instructions	70501500T94... (B 705015.4)	X	X
Analog input module 4-channel	Data sheet	70502000T10...	-	X
	Operating manual	70502000T90... (B 705020.0)	-	X
	Installation instructions	70502000T94... (B 705020.4)	X	X
Analog input module 8-channel	Data sheet	70502100T10...	-	X
	Operating manual	70502100T90... (B 705021.0)	-	X
	Installation instructions	70502100T94... (B 705021.4)	X	X
Analog output module 4-channel	Data sheet	70502500T10...	-	X
	Operating manual	70502500T90...	-	X
	Installation instructions	70502500T94...	X	X
Digital input/ output module 12-channel	Data sheet	70503000T10...	-	X
	Operating manual	70503000T90... (B 705030.0)	-	X
	Installation instructions	70503000T94... (B 705030.4)	X	X

1.1.4 Special modules

Product	Type of documentation	No.	Printed	PDF file
Router module	Data sheet	70504000T10...	-	X
	Installation instructions	70504000T94... (B 705040.4)	X	X

1.1.5 Operating, visualization, recording

Product	Type of documentation	No.	Printed	PDF file
Multifunction panel 840	Data sheet	70506000T10...	-	X
	Operating manual	70506000T90... (B 705060.0)	-	X
	Modbus interface description	70506000T92... (B 705060.2.0)	-	X
	Installation instructions	70506000T94... (B 705060.4)	X	X
Operating panels	Data sheet	70506500T10...	-	X
	Operating manual	70506500T90...	-	X

1.1.6 Power supply units

Product	Type of documentation	No.	Printed	PDF file
24 V power supply units	Data sheet	70509000T10...	-	X
	Operating instructions QS5.241		X	-
	Operating instructions QS10.241		X	-

1 Introduction

1.2 Safety information

1.2.1 Warning symbols

DANGER!
This symbol indicates that **personal injury caused by electrical shock** may occur if the respective precautionary measures are not carried out.

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 **damage to assets 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 DOCUMENTATION!
This symbol – placed on the device – indicates that the associated **device documentation has to be observed**. This is necessary to recognize the kind of the potential hazards as well as the measures to avoid them.

1.2.2 Note signs

NOTE!
This symbol refers to **important information** about the product, its handling, or additional use.

REFERENCE!
This symbol refers to **further information** in other sections, chapters, or manuals.

FURTHER INFORMATION!
This symbol is used in the tables and refers to **further information** in connection with the table.

DISPOSAL!
This device and the batteries (if installed) must not be disposed in the garbage can after use! Please ensure that they are disposed properly and in an **environmentally friendly manner**.

1.2.3 Intended use

The modules described are intended for measuring, control, and automation tasks in an industrial environment, as described in the technical data. Other uses or uses beyond those defined are not viewed as intended uses.

The modules are built according to the relevant standards and directives as well as the applicable safety regulations. Nevertheless, incorrect use may lead to bodily injury or property damage.

To avoid danger, the modules may only be used:

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

Even if a module is used correctly and according to the intended use, it may still cause application-related dangers (e.g. due to missing safety devices or incorrect settings).

1.2.4 Qualification of personnel

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

It is intended for technically qualified personnel who have received special training and have the appropriate knowledge in the field of automation technology (measuring, process, and control 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.

1.3 Acceptance of goods, storage, and transport

1.3.1 Checking the delivery

- Ensure that the packaging and contents are not damaged
- Check that the delivery is complete using the delivery papers and the order details
- Inform the supplier immediately if there is any damage
- Store damaged parts until clarification is received from the supplier

1.3.2 Notes on storage and transport

- Store the module in a dry and clean environment. Observe the admissible ambient conditions (see "Technical data")
- The transport of the module is to be shockproof
- The original packaging provides optimum protection for storage and transport

1.3.3 Returning goods

In the event of repair, please return the module in a clean and complete state.

Use the original packaging to return goods.

Accompanying letter for repair

Please include the completed accompanying letter for repair when returning goods.
Do not forget to state the following:

- Description of the application and
- Description of the error that has occurred

The accompanying letter for repair can be downloaded online from the manufacturer's website (use the search function if necessary).

Protection against electrostatic discharge (ESD)

(ESD = electrostatic discharge)
To prevent damage from ESD, electronic modules or components must be handled, packaged, and stored in an ESD-protected environment. Measures against electrostatic discharge and electrical fields are described in DIN EN 61340-5-1 and DIN EN 61340-5-2 "Protection of electronic devices from electrostatic phenomena".

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

- Sensitive components must only be packaged in an ESD-protected environment. Workspaces such as this divert electrostatic charges to ground in a controlled manner and prevent static charges due to friction capacities.
- Only use packaging for ESD-sensitive modules/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.

1.3.4 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.

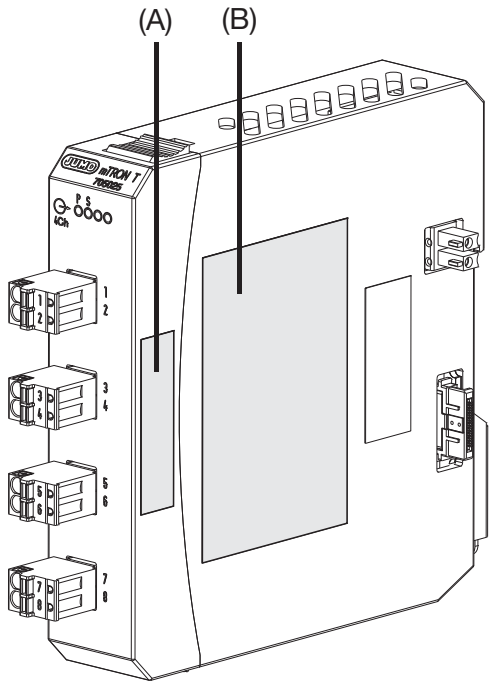
1.4 Identifying the device version

1.4.1 Nameplates

Position

The nameplate (B) is affixed to the module case.

An additional nameplate with reduced information is located on the module insert (A). This duplicate identification is important when replacing a module insert or retrofitting optional modules.



Contents

It contains important information. This includes:

Description	Designation on the nameplate	Example
Device type (A + B)	Typ	705025/36
Part no. (B)	TN	00XXXXXX
Fabrication number (A + B)	F-Nr	0070033801211010006
Voltage supply (B)	-	DC 24 V +25/-20 %

Device type

Compare the specifications on the nameplate with the order.

Identify the supplied device version using the order details of the respective module.

Part no. (TN)

The part no. clearly identifies an article in the catalog. It is important for communication between the customer and the sales department.

Fabrication no. (F-Nr)

Among other things, the fabrication number contains the date of production (year/week).
Example: F-Nr = 0070033801211010006
The figures concerned are in positions 12, 13, 14, and 15 (from the left).
The device was therefore produced in the 1st calendar week of 2011.

1.4.2 Order details

	(1)	Basic type
705025		Analog output module 4-channel
	(2)	**Voltage supply**
36		DC 24 V +25/-20 %
	(3)	**DNV GL approval**
000		Without approval
062		With DNV GL approval[1]

[1] The power supply unit used must also have a DNV GL or GL type approval (e.g. type 705090).

	(1)		(2)		(3)
Order code		/		/	
Order example	705025	/	36	/	000

1.4.3 Scope of delivery

1 analog output module 4-channel
1 installation instructions

1.4.4 General accessories

Description	Part no.
JUMO mTRON T system manual, English	00575577
Setup program with program editor JUMO mTRON T (on MiniDVD), incl. USB cable (A-plug to mini-B-plug, 3 m)	00569494
Program editor JUMO mTRON T (on MiniDVD), incl. USB cable (A-plug to mini-B-plug, 3 m)	00622333
PCA3000/PCC JUMO software package	00431884
PC Evaluation Software PCA3000	00431882
Release automatic print for PC Evaluation Software PCA3000	00505548
PCA Communication Software PCC	00431879
Plant Visualization Software JUMO SVS3000: See data sheet 700755	-
USB cable A-plug mini-B-plug 3 m	00506252

Content of the Mini-DVD:

- Setup program with program editor JUMO mTRON T in case of part no. 00569494
- Program editor JUMO mTRON T in case of part no. 00622333
- CODESYS programming software (free version)
- CODESYS Repository Package - Operating panels (free version)
- GSD file JUMO mTRON T - CPU (free version)
- PC Evaluation Software PCA3000 (30-day trial version)
- PCA Communication Software PCC (30-day trial version)
- Documentation in PDF format

1.5 System version

The system version of the measuring, control, and automation system is determined using the compatibility index of the base unit.

Example composition of a version number for the central processing unit: 248.**xx**.yy

248 = basic version, **xx = compatibility index (system version)**, yy = current version

NOTE!
The analog output module 4-channel (705025) is supported as of system version 03.

1 Introduction

2.1 Brief description

The analog output module 4-channel is equipped with four outputs. The output signal, 0(2) to 10 V or 0(4) to 20 mA, can be configured individually for each channel.

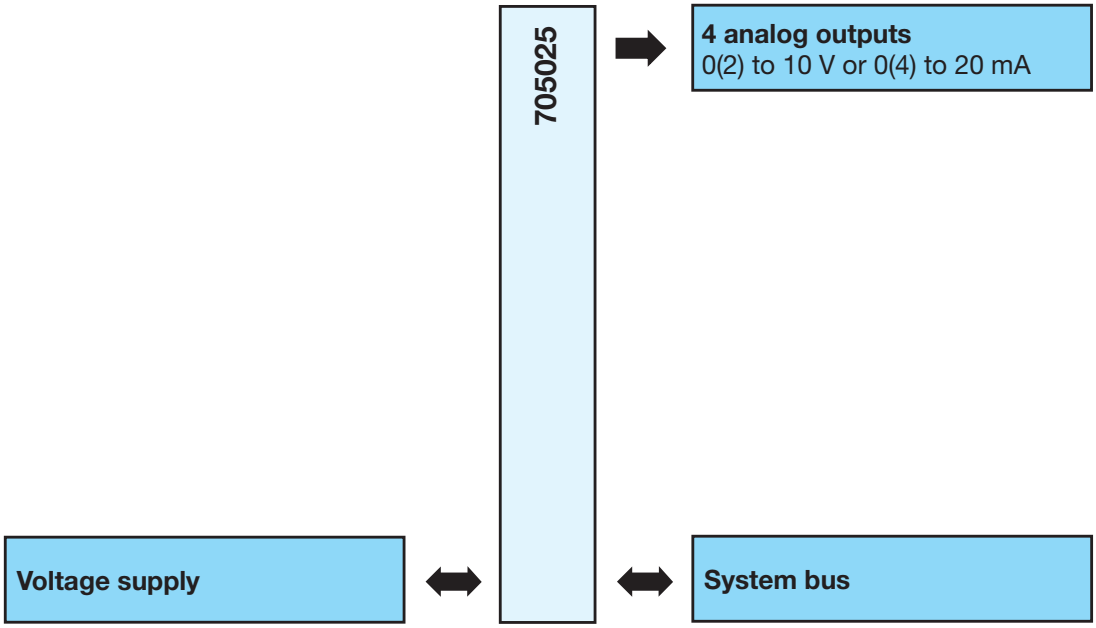
The analog outputs are controlled via the system bus.

LEDs are used to indicate applied voltage supply and the module operating status.

For retrofitting or service work, the module insert can be easily pulled out of the case to the front. The case, including the bus PCB, remains installed on the DIN rail.

The user can use a setup program or the multifunction panel 840 for straight-forward configuration of the analog output module 4-channel.

2.2 Block diagram



2 Description

3.1 General information on installation/dismounting

DANGER!
With multichannel controller module 705010 and relay module 705015, the load circuits from relay or solid state relay outputs can be operated with a dangerous electrical voltage (e.g. 230 V).
There is a risk of electric shock.
Prior to the installation/dismounting of these modules or the removal of the module insert, the load circuits are to be disconnected from the voltage and the terminal strips are to be removed from the module. This work must only be performed by qualified personnel.

WARNING!
The modules must never be installed in areas with an explosion hazard.
There is the risk of an explosion.
The entire system must only be used outside of areas with an explosion hazard.

Mounting site

All modules have protection type IP20 and are only intended for use in fireproof control cabinets or switch boxes. The mounting site should be virtually vibration-free. Electromagnetic fields caused by equipment such as motors or transformers should be avoided.

Multifunction panel 840 has protection type IP67 at the front and is intended for installation in a panel cut-out. The rear has protection type IP20.

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 modules. The mounting site must be free from dust, powder, and other suspended matter so that the cooling slots do not become blocked.

DIN rail

All modules are mounted on a DIN rail according to DIN EN 60715 (35 mm × 7.5 mm × 1 mm). For reasons of stability, the spacing of the fastening screws for the DIN rail should not exceed 200 mm. The minimum distances for the modules that are specified in the module-specific installation or operating instructions must be observed.

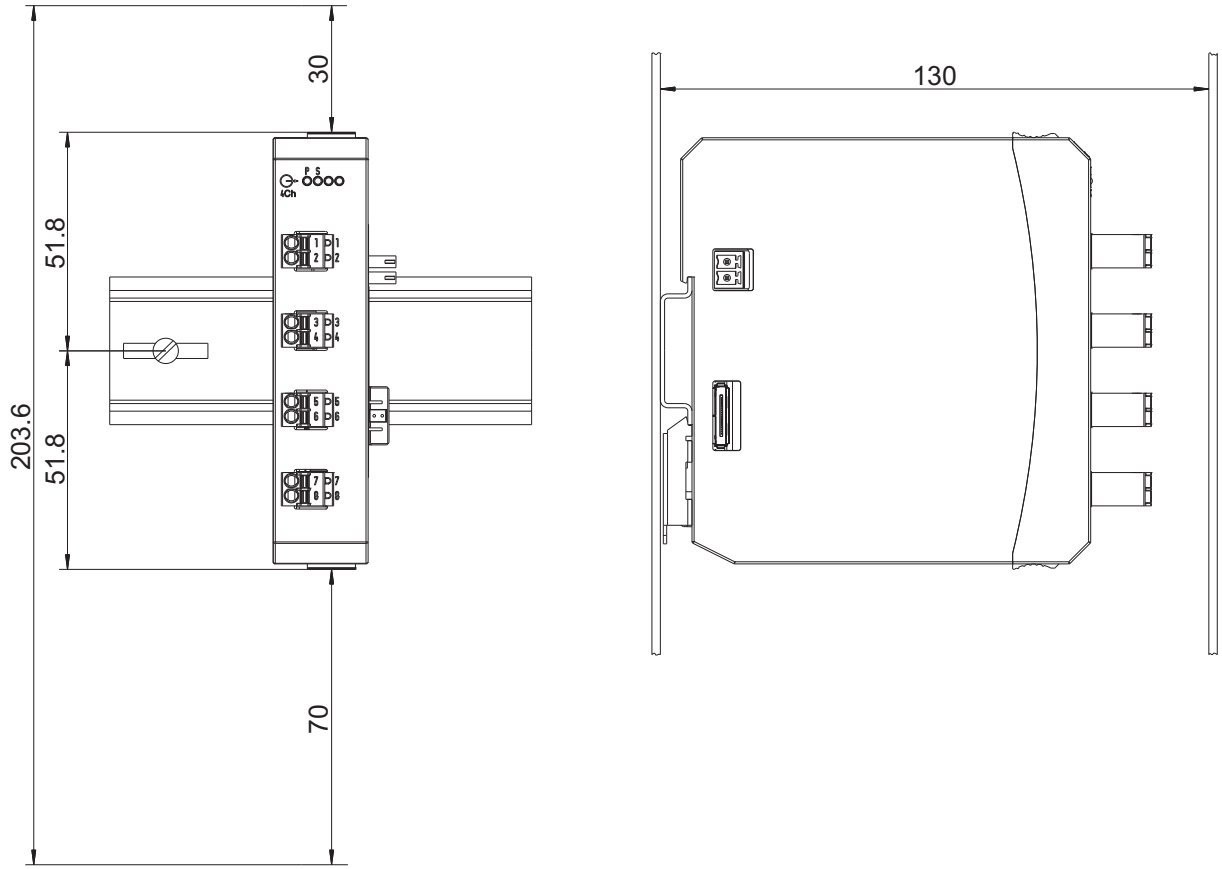
Installation position

The DIN rail should be mounted horizontally so that all modules are arranged vertically. Otherwise the admissible ambient temperature range will be restricted.

Space requirement

The modules require the minimum distances shown in the following figure for the purpose of installation/dismounting and for future maintenance or replacement. In the event of shorter distances the minimum bending radius of the cables, the performance of the electrical installation, and the clear arrangement of the plant are no longer guaranteed.

Minimum distances



3.2 Installation/dismounting on DIN rail

All modules in the system are intended for installation on a DIN rail according to DIN EN 60715 (35 mm × 7.5 mm × 1 mm).

The following must always be installed on the left, at the start of the DIN rail:

- A central processing unit *or*
- A router module

These modules connect the input/output modules to the voltage supply and the system bus.

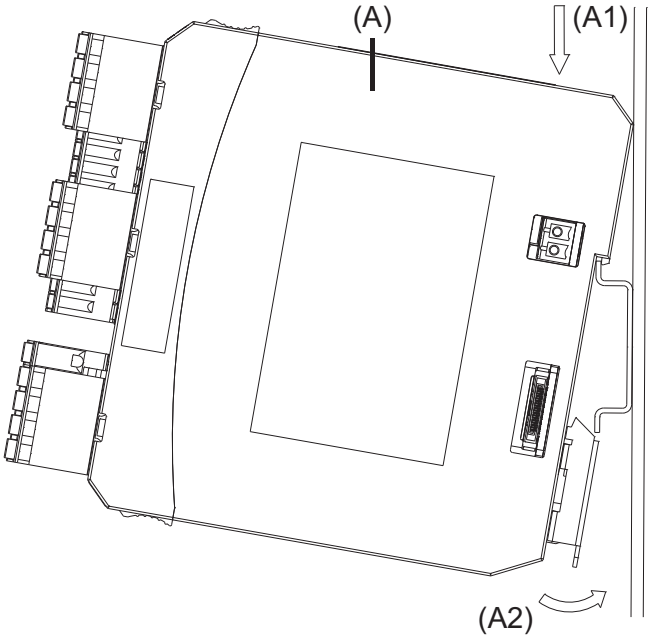
NOTE!
To determine the required minimum width of the DIN rail, the widths of the individual modules are to be added (see technical data of the modules in the respective data sheet or the module-specific installation instructions).
The widths of the cover (17.5 mm) and both end brackets (each 9.5 mm) should also be taken into consideration: 17.5 mm + 2 × 9.5 mm = 36.5 mm.

NOTE!
Modules with a recent production date have two fixing knobs on the right side of the case and on the left two round holes (for greater torsional strength of the entire module assembly). If a module with fixing knobs is to be inserted into an existing module assembly and the adjacent module does not have the corresponding holes, the fixing knobs must be completely removed to ensure electrical contact between the modules. For example, a cutter knife and a file can be used for removal.

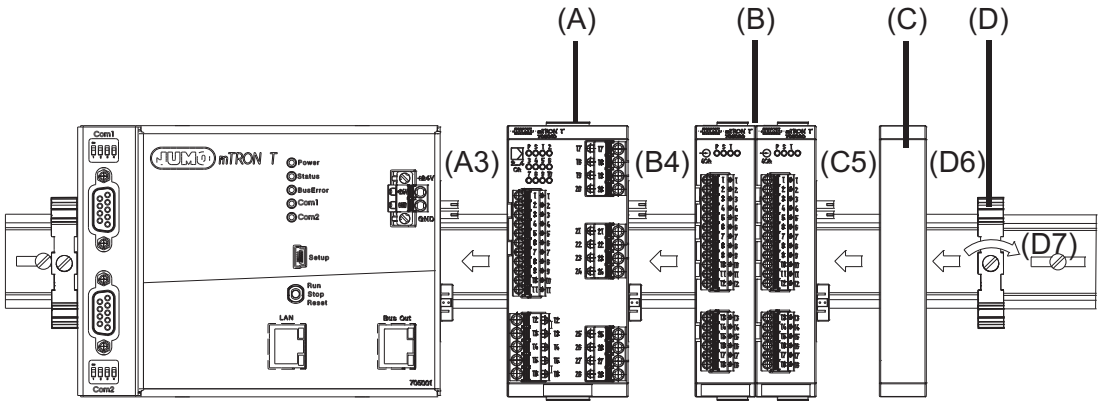
3.2.1 Input/output modules

In a sequence at the user's discretion, input/output modules can be arranged to the right next to a base unit or a router module.

Installation, using the example of a multichannel controller module 705010



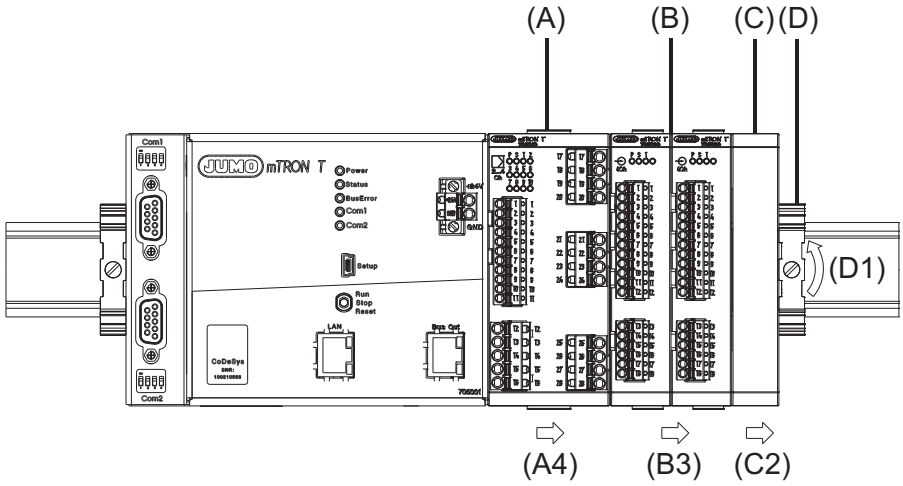
Example installation



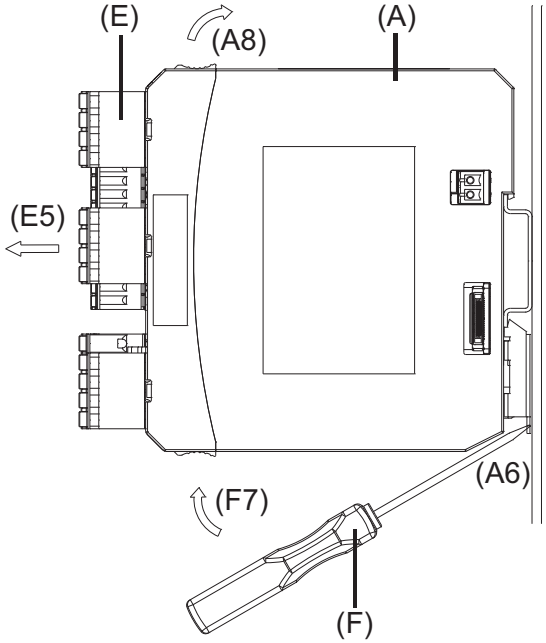
Procedure:

Step	Activity
1	Mount the multichannel controller module (A) in the DIN rail from above (A1).
2	Pivot the multichannel controller module (A) downward until it snaps into place (A2).
3	Move the multichannel controller module (A) to the left against the previous module (A3) until the plug connections for the voltage supply and the system bus are connected.
4	Position additional modules (B) and move to the left against the previous module (B4).
5	After the final module, position the cover (C) on the DIN rail and move to the left against the module (C5).
6	After attaching the cover, position the end bracket (D) on the DIN rail and move to the left against the cover (D6).
7	Fasten the end bracket (D) using a screwdriver (D7). For this purpose, ensure that the end bracket and the cover are positioned flush against the final module.

Dismounting, using the example of a multichannel controller module 705010



Removing the multichannel controller module from the DIN rail



Procedure:

Step	Activity
1	Fully release the end bracket (D) using a screwdriver (D1), press upward from below, pivot toward the front, and remove from the DIN rail. Note: The end bracket does not need to be removed from the DIN rail if there is sufficient space to the side to move it at least 20 mm to the right.
2	Move the cover (C) to the right (C2) until the side contacts of the neighboring module are exposed. Then release the cover at the bottom using a screwdriver, press upward, and remove from the DIN rail. Note: The cover does not need to be removed from the DIN rail if there is sufficient space to the side to move it at least 20 mm to the right.
3	Move the modules (B) on the right next to the multichannel controller module that is to be replaced (A) a minimum of 20 mm to the right (B3). ➥ These modules are isolated from the voltage supply and the system bus.
4	Move the multichannel controller module (A) to the right (A4) until the side contacts of the neighboring module (here: central processing unit) – on the left, next to the multichannel controller module that is to be replaced – are exposed. ➥ The multichannel controller module is isolated from the voltage supply and the system bus. This is a prerequisite for the dismounting of the multichannel controller module.
5	If required, pull off the wired terminals (E) of the multichannel controller module (A) toward the front (E5).
6	Insert a suitable screwdriver (F) into the unlocking slot of the multichannel controller module (A6) and press upward (F7).
7	Pivot the multichannel controller module (A) upward off the DIN rail (A8) and remove it.

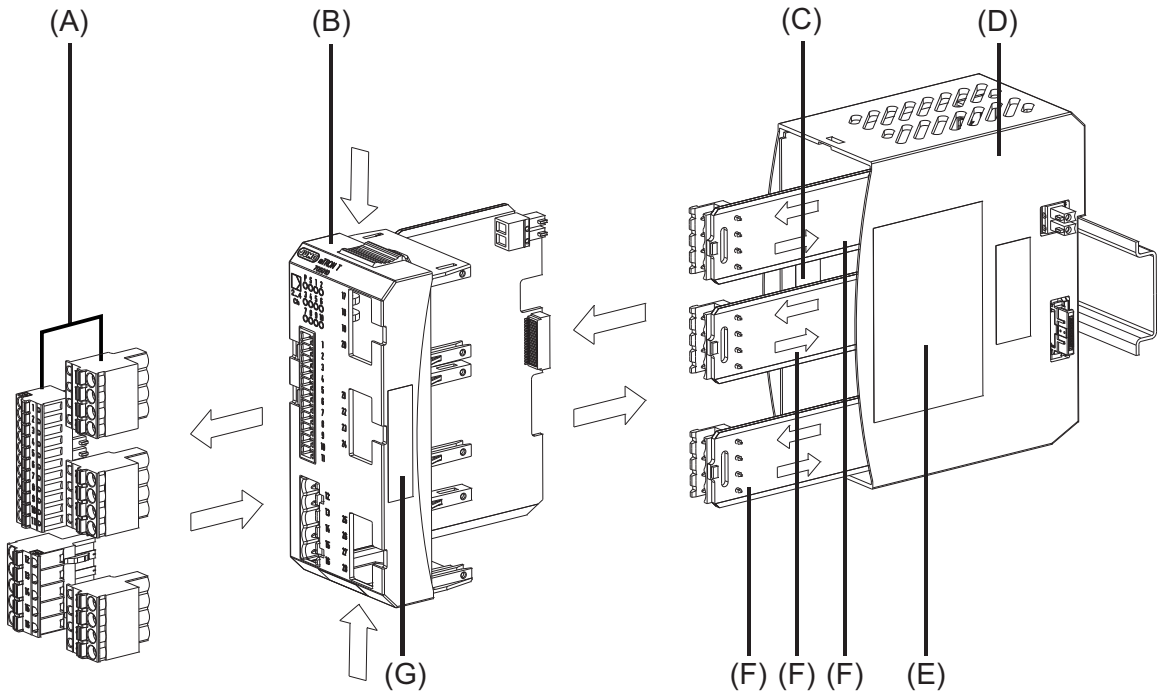
3 Mounting

3.3 Replacing module inserts

3.3.1 Input/output modules

DANGER!
With multichannel controller module 705010 and relay module 705015, the load circuits from relay or solid state relay outputs can be operated with a dangerous electrical voltage (e.g. 230 V).
There is a risk of electric shock.
The load circuits are to be disconnected from the voltage supply prior to removing the wired terminal strips. This work must only be performed by qualified personnel.

Replacement of a module insert, using the example of a multichannel controller module 705010



For service purposes (or when retrofitting options for the multichannel controller module), the case (D) can remain in the system; only the module insert (B) is replaced. For this purpose, the system does not need to be isolated from the voltage supply (hot swapping). If it is an optional module, the operation of the rest of the system (mandatory modules) is not interrupted. In the case of a mandatory module, the whole system goes into "Stop" system state (see setup program manual).

The system will detect a module insert of the same type that has been replaced and will automatically reconfigure it. Retrofitted functions for the multichannel controller module (expansion slots) must be configured using the setup program or the multifunction panel.

The new module insert also has a new nameplate (G), which will differ from the old one at least with regard to the fabrication number, and is no longer identical to nameplates (E) and (C) on the case (D).

Therefore, in the event of replacement, the module insert will be supplied along with a new nameplate that will be affixed to the case (D) in place of the old nameplate (C). This means that the specifications of nameplates (G) and (C) once again correspond to one another.

CAUTION!
Only module inserts of the same type may be used for the replacement.
Otherwise, the function of the system may be affected.
The module inserts can be clearly identified using the nameplate.

CAUTION!
With the multichannel controller module 705010, a new module insert may contain retrofitted inputs or outputs that have not yet been configured.
This can lead to unintended behavior, particularly at the outputs and the actuators connected to them.
Prior to using the retrofitted inputs or outputs, ensure that these have been configured correctly.

Removing the module insert

Step	Activity
1	Disconnect load circuits from the relay or solid state relay outputs.
2	Pull off the wired terminal strips (A) toward the front.
3	Press the old module insert (B) together on the grooved surfaces at the top and bottom and remove from the case (D).
4	For the multichannel controller module, also remove the modules (F) of the expansion slots from the case (D) toward the front, if required.

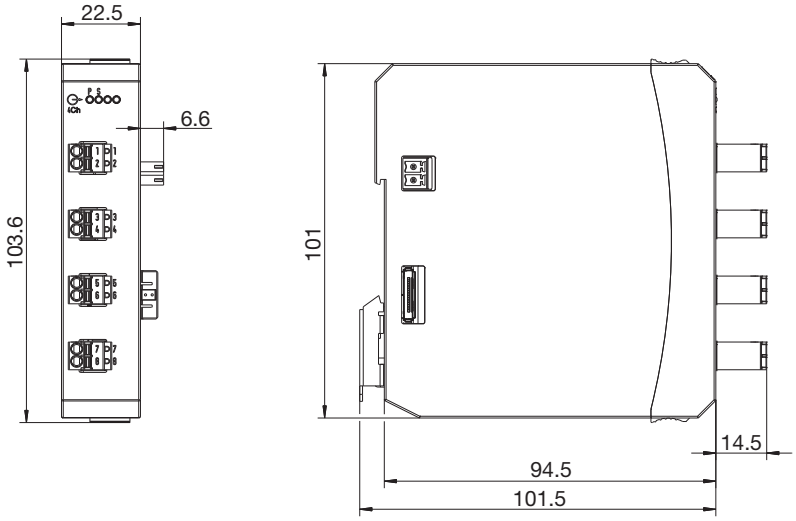
Mounting the module insert

Step	Activity
1	Affix the new nameplate in place of the old nameplate (C) in the case.
2	For the multichannel controller module, also insert the modules (F) of the expansion slots into the case (D), if required.
3	Hold the new module insert (B) at the grooved surfaces on the top and bottom and insert them into the case (D). For this purpose, ensure that the board of the module insert slides into the guide rails of the case. For the multichannel controller module, also ensure that the modules (F) of the expansion slots slide in the guide rails of the module insert.
4	Reattach the wired terminal strips (A).

NOTE!
When mounting the module insert, ensure that the snap holders (under the grooved surfaces) audibly snap into place.

NOTE!
The availability of the system can be increased through the storage of module inserts and modules for expansion slots.

3.4 Dimensions



4.1 Installation notes

NOTE!
These installation notes apply for the entire measuring, control, and automation system and, on some occasions, are only applicable for a specific module.
The respective connection diagram shows the context.

Requirements for the personnel

- Work on the modules must only be carried out to the extent described and, like the electrical connection, only by qualified personnel.
- Before plugging and unplugging connection cables ensure that the person performing the work is electrostatically discharged (e.g. by touching grounded metallic parts).

Cables, shielding, and grounding

- When selecting the cable material, when installing, and when performing the electrical connection of the module, the regulations of DIN VDE 0100 "Erection of power installations with rated voltages up to 1000 V" and the respective national regulations (e.g. on the basis of IEC 60364) are to be observed.
- Certain cables must be heat resistant up to at least 80 °C at maximum load. The relevant instructions in the connection diagram of the affected modules must be observed.
- Route input, output, and supply cables 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 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 equipotential bonding is correct.

Electrical safety

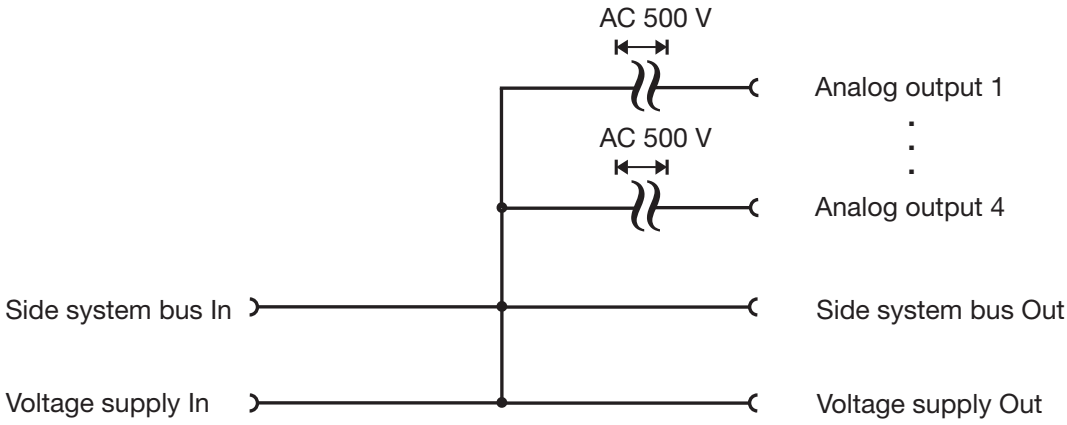
- Isolate power supply units from the voltage supply on the primary side if there is a risk of touching parts with dangerous electrical voltage (e.g. 230 V) in the course of work.
- The fuse rating of the power supply units on the primary side should not exceed a value of 10 A (inert).
- With modules with relay or solid state relay outputs, the load circuits can be operated with a dangerous electrical voltage (e.g. 230 V). Disconnect load circuits from the voltage supply during installation/dismounting and electrical connection.
- In order to prevent the destruction of the relay or solid state relay outputs in the event of an external short circuit in the load circuit, the load circuit should be fused to the maximum admissible output current.
- The modules are not suitable for installation in areas with an explosion hazard.
- In addition to a faulty installation, incorrectly set values on the module could also impair the correct function of the following process. Therefore, ensure that safety devices independent of the module (e.g. overpressure valves or temperature limiters/monitors) are available and that it is only possible for qualified personnel to define settings. Please observe the corresponding safety regulations in this context.

4 Electrical connection

References to other information

- The electromagnetic compatibility meets the standards and regulations cited in the technical data.
- The USB device interface and voltage supply in the central processing unit 705001 are **not** electrically isolated. In general, please observe the specifications regarding electrical isolation.

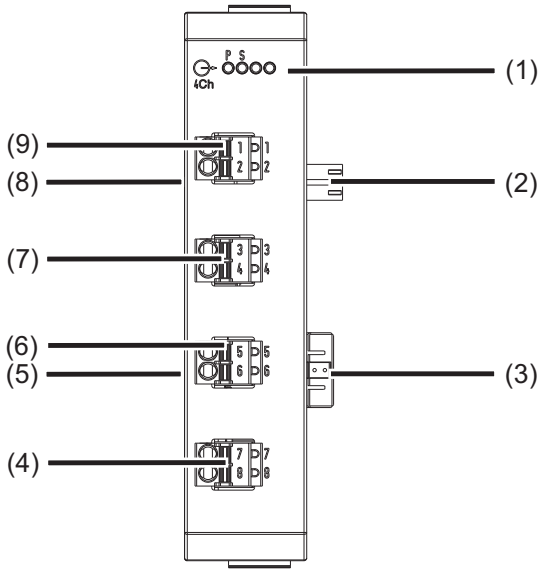
4.2 Electrical isolation



4.3 Connection diagram

CAUTION!
At maximum load, the temperature may exceed 60 °C at the terminals.
As a result the insulation of the cable may be damaged.
The cable must be heat resistant up to at least 80 °C.

4.3.1 Display and connection elements



(1) Status displays (LED):
P = Voltage supply
S = Status
(2) Voltage supply Out, DC 24 V
(3) Side system bus Out
(4) Analog output 4
(5) Side system bus In
(6) Analog output 3
(7) Analog output 2
(8) Voltage supply In, DC 24 V
(9) Analog output 1

4.3.2 Analog outputs

Connection	Output	Terminals	Symbol and terminal designation
Analog output DC 0(2) to 10 V or DC 0(4) to 20 mA (configurable)	1 2 3 4	1 and 2 3 and 4 5 and 6 7 and 8	+ ——— 1, 3, 5, 7 U_X, I_X - ——— 2, 4, 6, 8

4.4 Functional test

The **voltage supply** must be tested on completion of the electrical connection:

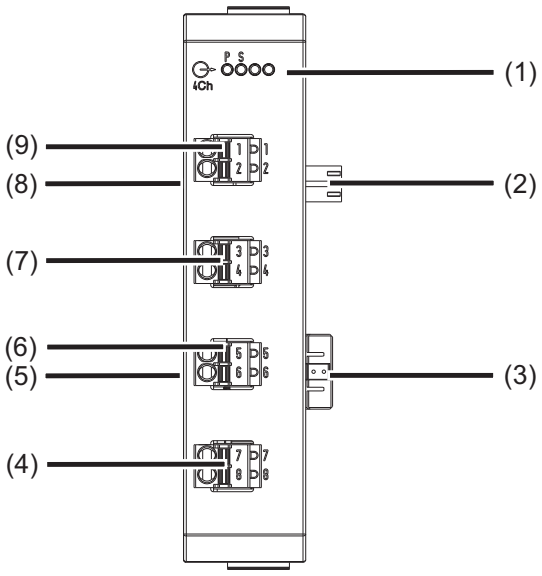
Signal	Meaning
LED "P" (Power, green) **is lit**	The module is being supplied with voltage through the side contacts.
LED "P" (Power, green) **is not lit**	The module is not supplied with voltage or there is a problem with the electrical function of the LED. Remedy: • Check the voltage supply to the side contacts of the preceding module (top contact +24 V, bottom contact GND). • Check voltage supply at the "+24 V" and "GND" terminals of the base unit or router module. • Check power supply unit and connection between the power supply unit and the base unit or router module. If the "Power" LED does not light up despite a voltage supply being present, the module insert or – if the bus board inside the case is faulty – the entire module must be replaced.

Startup

The check described above completes the process of installation and electrical connection. For startup, use the additional documentation (operating manual or system manual).

The "Introduction" section of this document contains an overview of all documentation for the measuring, control, and automation system.

5.1 Display and connection elements



(1) Status displays (LED):
P = Voltage supply
S = Status
(2) Voltage supply Out, DC 24 V
(3) Side system bus Out
(4) Analog output 4
(5) Side system bus In
(6) Analog output 3
(7) Analog output 2
(8) Voltage supply In, DC 24 V
(9) Analog output 1

5 Operation

5.2 LED displays

"P" LED (Power)

The LED is permanently lit in green if the module is being supplied with voltage.

"S" LED (Status)

This LED indicates the status of the module. Diagnostics requires the setup program or a Web browser as appropriate.

5.2.1 Display modes

The following table lists all possible states of the "S" LED (Status).

Display mode	Description	Green symbol	Red symbol
---	LED state not relevant	---	---
Off	LED off	○	○
On	LED on (permanently lit)	■	●
Flickering	LED flickers (50 ms on, 50 ms off)	■■■■	●●●●
Single flickering	LED flashes briefly (50 ms on, 200 ms off)	■□□□□	●○○○○
Blinking	LED flashes (200 ms on, 200 ms off)	■□■□■	●○●○●
Single flash	LED flashes once (200 ms on, 1000 ms off)	■□□	●○○
Double flash	LED flashes twice (on/off/on for 200 ms each time, 1000 ms off)	■■□□	●●○○
Triple flash	LED flashes three times (on/off/on/off/on for 200 ms each time, 1000 ms off)	■■■□□	●●●○○
Quadruple flash	LED flashes four times (on/off/on/off/on/off/on for 200 ms each time, 1000 ms off)	■■■■□□	●●●●○○
Blinking red/green	LED flashes red and green (200 ms red, 200 ms green)	■●	
On green/ Single flickering red	LED lights up green, flashes red (50 ms red)	■●	

5.2.2 System states and errors

The following table lists all the system states and errors that are indicated by the "S" LED (Status). In most cases, further diagnostics must be performed with the setup program.

Category	"S" LED (Status)	Meaning	Diagnostics with	Recommended action
Start error		Module error (hardware does not start up)	LED	Replace module
Start error		Internal error (bootloader) Various errors during startup (e.g. no memory, initialization error)	LED	Replace module
Start error		No firmware	LED	Replace module
Bus status		No connection to central processing unit	LED	Check whether the central processing unit is running; check cabling and topology
Bus status		System in "Stop" (INIT) state – no error, only in start phase	LED	
Bus status		System in "Stop" (PREOP) state – no error, only in start phase	LED	
Operation	 (Priority 1)	Module not calibrated (LED flashes red-green) or module in calibration mode (calibrate/test; LED flickers red-green)	LED/setup program	
Operation	 (Priority 3)	System in "Stop" (SAFEOP) state – no error	LED	
Operation	 (Priority 3)	System in "Run" (OP) state – no error	LED	

5 Operation

NOTE!
The parameters described in this section can be configured either with the setup program or on the multifunction panel.

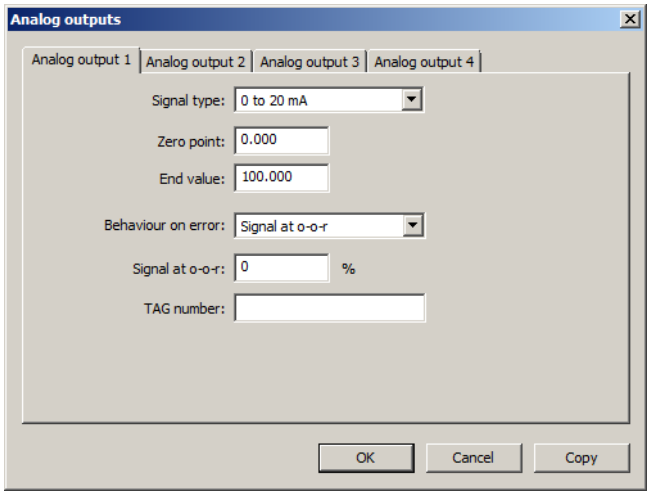
6.1 Analog outputs

The four analog outputs can be configured as current or voltage outputs (standard signal) and are freely scalable.

The analog outputs are exclusively driven by external inputs (NV_AO01 to NV_AO04).

⇨ Chapter 6.2 "NV connecting list", page 36

Setup dialog



Parameters

Parameters	Selection/settings	Description
Signal type	Physical output signal	
	0 to 10 V	Standard signal for voltage
	2 to 10 V	Standard signal for voltage
	0 to 20 mA	Standard signal for current
	4 to 20 mA	Standard signal for current
Zero point 🕮	-1999 to **0** to +9999	Scaling start
End value 🕮	-1999 to **100** to +9999	Scaling end

Parameters	Selection/settings	Description
Behavior on error 🕮	Value of the output signal after deviation above or below the measuring range (out of range = o-o-r) The options "NAMUR Low" and "NAMUR High" are only available for signal types 2 to 10 V and 4 to 20 mA.	
	NAMUR Low	Value for deviation below measured value/short-circuit according to NAMUR recommendation
	NAMUR High	Value for deviation above measured value/probe break according to NAMUR recommendation
	Signal at o-o-r	Adjustable value (see "Signal at o-o-r" parameter)
	Last value	The last value is retained.
Signal at o-o-r	**0** to 100 %	Value of the output signal in the event of deviation above or below the measuring range (in relation to the value range of the signal type)
TAG number	7 characters (as of system version 05: 42 characters)	Identification marking (documentation in PLC)

Zero point and end value

A value range is assigned to the physical output signal by specifying the zero point and end value (scaling). The default setting corresponds to a value range of 0 to 100 (for example, an output level of 0 % to 100 %).

If, for example, a temperature with a value range from 150 °C to 500 °C is issued via an analog output with signal type 0 to 20 mA, the zero point is set to 150 (corresponds to 0 mA) and the end value is set to 500 (corresponds to 20 mA).

The output signal can be inverted by swapping the zero point value and the end value (zero point > end value). As a result, an increasing input signal leads to a decreasing output signal.

If the values of zero point and end value are identical, the default setting is activated.

Behavior on error

The behavior in the event of deviation above or below the measuring range (out of range) can be configured. The settings made there also apply for probe/conductor breaks or probe/conductor short-circuits. This results in a safe state for operation in the event of an error.

As long as the system is in "Run" state, the output signal delivers the following values in case of an error (input signal returns an error value), depending on the configuration:

Signal type	**Output value at**			
	NAMUR Low	**NAMUR High**	**Signal at o-o-r, 0 % to 100 %**	**Signal at o-o-r, 0 % to 100 %; inverted**[1]
0 to 20 mA	---	---	0 mA to 20 mA	20 mA to 0 mA
4 to 20 mA	1 mA	22 mA	4 mA to 20 mA	20 mA to 4 mA
0 to 10 V	---	---	0 V to 10 V	10 V to 0 V
2 to 10 V	0.5 V	11 V	2 V to 10 V	10 V to 2 V

[1] Inverted output signal (zero point and end value are swapped)

With the setting "Last value", the last valid value is delivered in any case.

If the connection to the base unit is interrupted or if the system is in "Stop" state, the following values are output, depending on the configuration:

Signal type	**Output value at**			
	NAMUR Low	**NAMUR High**	**Signal at o-o-r**	**Last value**
0 to 20 mA	---	---	0 mA	0 mA
4 to 20 mA	1 mA	22 mA	0 mA	0 mA
0 to 10 V	---	---	0 V	0 V
2 to 10 V	0.5 V	11 V	0 V	0 V

Limits according to NAMUR recommendation NE 43 (for information only):

	Signal type 2 to 10 V	**Signal type 4 to 20 mA**
Measurement information M	1.9 to 10.25 V	3.8 to 20.5 mA
Failure information A for deviation below measured value/short-circuit ("NAMUR Low")	≤ 1.8 V	≤ 3.6 mA
Failure information A for deviation above measured value/probe break ("NAMUR High")	≥ 10.5 V	≥ 21 mA

Status after change of configuration

Modified parameters are incorporated immediately.

Behavior after power on

During the initialization phase of the module, the output signal adopts a value of 0 V or 0 mA.

After a few seconds, as soon as the module configuration was read, the output signal corresponds to the value in "Stop" system state (depending on the configuration, see table).

The current value of the input signal is applied to the output only after complete initialization of the system.

6 Configuration

6.2 NV connecting list

The NV connecting list is used to link external inputs (NV_...) of the analog output module 4-channel to signals from other modules via the system bus.

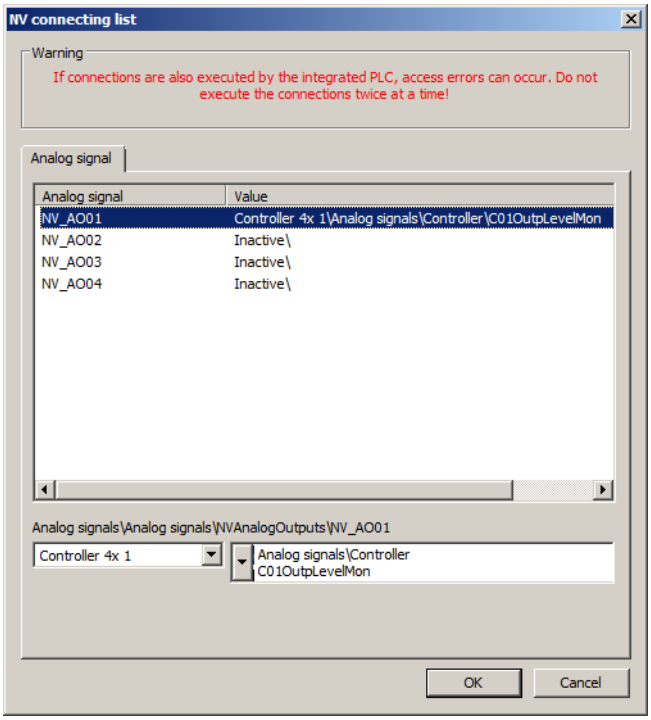
A comprehensive list with the module signals is included in the following chapter:

⇨ Chapter 6.2.1 "Analog signals", page 37

Further information about the signals can be found in the operating manual for the relevant module.

NOTE!
There is no NV connecting list in the input/output module configuration menu on the multi-function panel. Instead, a central NV connecting list is available in the configuration menu of the base unit (CPU).

Setup dialog



Parameters

Parameters	Selection/settings	Description
Analog signal / Value	Select input to be connected.	List of external inputs of the module If a connection has already been configured, the module and its signal are displayed in the "Value" column.
...\NV_AO01 (Example)	This is the previously selected external input.	
	Select the module and – in the selector next to it on the right – the signal to connect to the external input.	List of modules in the system and the relevant signals

Status after change of configuration

The connections are available immediately.

Behavior after power on

The connections are available immediately after system initialization.

6.2.1 Analog signals

The following table contains all signals that are available in the NV connecting list for connection to the external inputs (NV_...) of the analog output module 4-channel.

Category	Signal	Description
Inactive		No signal selected
Central processing unit		
Analog variables	Analog variable 1 to 64	Analog variable 1 to 64 (via interface)
Program generator 1 to Program generator 9	Channel 1 SP1 to Channel 3 SP1	Setpoint value 1 of program channel 1 to 3
	Channel 1 SP2 to Channel 3 SP2	Setpoint value 2 of program channel 1 to 3
	Channel 1 SP2 to Channel 3 SP2	Setpoint value 3 of program channel 1 to 3
	Channel 1 SP4 to Channel 3 SP4	Setpoint value 4 of program channel 1 to 3
	PLC Analog output 13 to 16	Signal of PLC analog output 13 to 16
Analog PLC output block 10 to block 18	PLC Analog output 1 to 16	Signal of PLC analog output 1 to 16
Multichannel controller module		
Controller	C01ActualValue to C04ActualValue	Actual value of controller channel 1 to 4
	C01Setpoint to C04Setpoint	Setpoint value of controller channel 1 to 4
	C01OutpLevelMon to C04OutpLevelMon	Output level (display value) of controller module 1 to 4
Analog inputs	AI01 to AI04	Measured value of analog input 1 to 4
Mathematics	Math01 to Math04	Result of math function 1 to 4

Category	Signal	Description
HW counter	HWCounter	Counter reading of hardware counter
Setpoint value	SP01RampValue to SP04RampValue	Ramp end value of ramp function 1 to 4 (if ramp function switched on) or Active setpoint value (external setpoint value + setpoint value) of setpoint function 1 to 4 (if ramp function switched off)
Analog input module 4-channel		
Analog inputs	AI01 to AI04	Measured value of analog input 1 to 4
Analog input module 8-channel		
Analog inputs	AI01 to AI08	Measured value of analog input 1 to 4
Multifunction panel 840		
System bus analog inputs	Counter/Int 1 to Counter/Int 27	Current value of counter or integrator
	Counter/Int clo 1 to Counter/Int clo 27	Value of counter or integrator in most recent closed measuring period
Process image	Current process image	Number of current process image on the display of the multifunction panel 0 = process image 1, 1 = process image 2 etc. (-1 = no active process image)
Thyristor power controller, type 70906x		
Measured values master	Individual analog signals of the power controller: See operating manual 70500153T90... (or following table)	Measured values of the power controller in single-phase operation or of the master in case of three-phase economy circuit or three-phase circuit
Measured values slave/slave1		Measured values of the slave in case of three-phase economy circuit or of slave 1 in case of three-phase circuit
Measured values slave2		Measured values of slave 2 in case of three-phase circuit

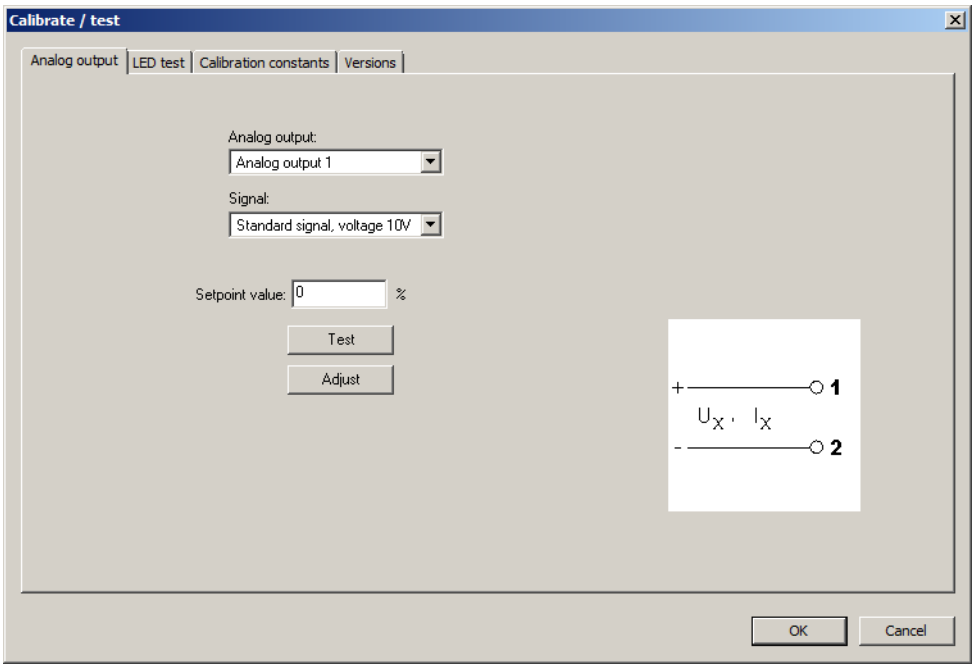
NOTE!
An active connection between the setup program and the central processing unit is required to configure the parameters described in this section.

7.1 Calibrate / test

CAUTION!
Incorrect settings may result in inadmissible changes to values or statuses.
This can have negative effects on the system function.
Individual functions must be changed only by (or under the instruction of) a service technician of the device manufacturer.

7.1.1 Analog output

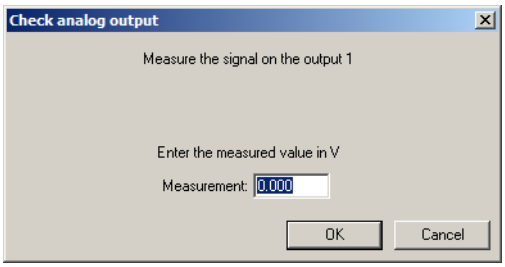
Setup dialog



Parameters

Parameters	Selection/settings	Description
Analog output	Select output (drop-down list).	Output on which the calibration or test is to be performed.
Signal	Select signal type (drop-down list).	Signal type that is issued at the relevant output.
Setpoint value	**0** to 100	Value to be issued.
Testing 🕮	Click the "Test" button.	An additional window opens with instructions for testing (see below).

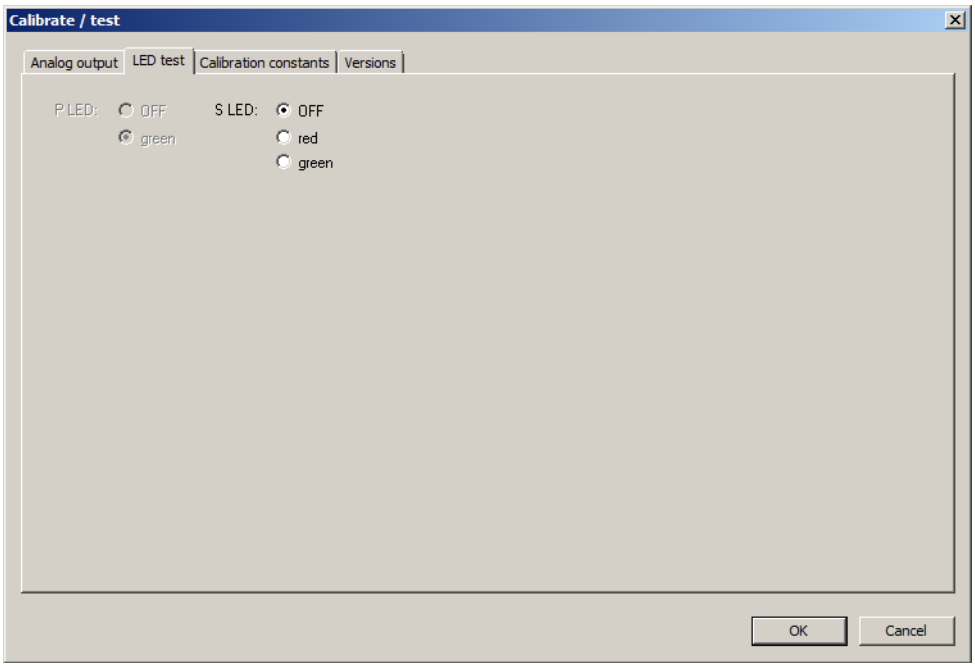
Testing



After entering of the measured value (in V or mA), the procentual deviation from setpoint value is indicated.

7.1.2 LED test

Setup dialog



Parameters

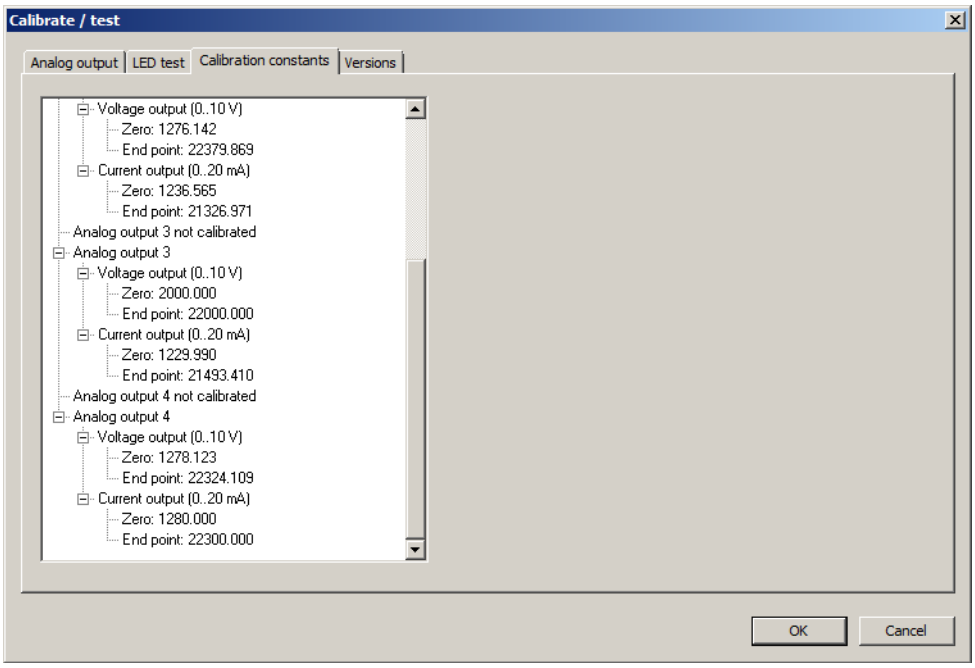
Parameters	Selection/settings	Description
P LED	This LED cannot be set manually.	The "P" LED (Power) is permanently lit in green if the module is being supplied with voltage.
S LED	To test the LED, click the required status to select it (OFF, red, or green). After selection, the LED enters the chosen status immediately.	This function is used to test the electrical function of the "S" LED (Status).

NOTE!
An LED maintains the set status until a new status is set or until the "LED test" dialog window is closed.

7 Online parameters

7.1.3 Calibration constants

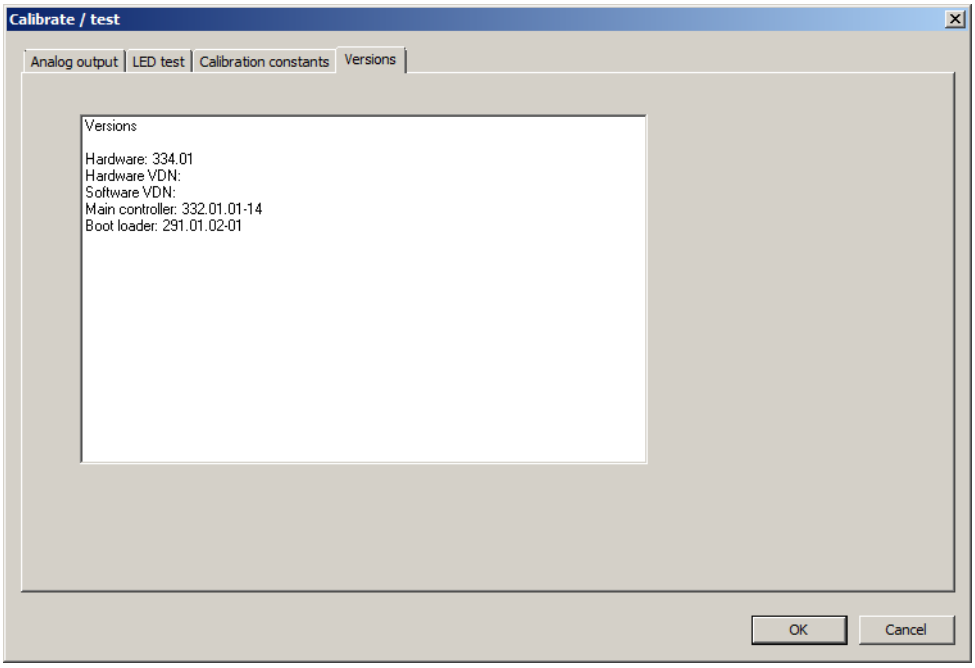
Setup dialog



This dialog displays the calibration status and the calibration constants of the analog outputs.

7.1.4 Versions

Setup dialog



This dialog displays the module versions.

8.1 Technical data

8.1.1 Analog outputs

4 analog outputs (configurable)	Load resistance R_{load}	Accuracy	Ambient temperature influence
Voltage DC 0(2) to 10 V	≥ 500 Ω	< 0.1 %	± 150 ppm/K
Current DC 0(4) to 20 mA	≤ 500 Ω	< 0.1 %	± 150 ppm/K

Selectable output behavior in case of an error acc. to NAMUR recommendation NE 43 (for signal type 2 to 10 V and 4 to 20 mA).

8.1.2 Electrical data

Voltage supply	
Connection	Lateral (feed via base unit or router module)
Voltage	DC 24 V +25/-20 %
Residual ripple	5 %
Current consumption	240 mA (at DC 19.2 V)
Power consumption	4.8 W
Outputs (terminals 1 to 8)	
Connection	At the front (removable terminal strips with Push-In technology)
Conductor cross section on terminals 1 to 8	
Wire or strand without ferrule	Min. 0.14 mm^2, max. 1.5 mm^2
Strand with ferrule	Without plastic collar: min. 0.25 mm^2, max. 1.5 mm^2 With plastic collar: min. 0.25 mm^2, max. 0.5 mm^2
Stripping length on terminals 1 to 8	9 mm
Electrical safety	According to DIN EN 61010-1 Overvoltage category III, pollution degree 2
Electromagnetic compatibility	Acc. to DIN EN 61326-1
Interference emission	Class A - only for industrial use -
Interference immunity	Industrial requirement

8 Appendix

8.1.3 Case and ambient conditions

Case type	Plastic case for DIN rail mounting in the control cabinet (indoor use); DIN rail acc. to DIN EN 60715, 35 mm x 7.5 mm x 1 mm
Dimensions (W × H × D)	22.5 mm × 103.6 mm × 101.5 mm (without connection elements)
Weight	Approx. 140 g
Protection type	IP 20, according to DIN EN 60529
Ambient temperature range	-20 to +55 °C
Storage temperature range	-40 to +70 °C
Resistance to climatic conditions	Relative humidity ≤ 90 % annual average without condensation (climatic class 3K3 acc. to DIN EN 60721-3-3 with extended temperature and humidity range)
Site altitude	Up to 2000 m above sea level
Mechanical ambient conditions[1]	Classification acc. to DIN EN 60721-3-3, table 6, class 3M2

[1] Test conditions are listed in the System Description B 705000.8.

8.1.4 Approval/approval marks

Approval mark	**Testing agency**	**Certificate/certification number**	**Inspection basis**	**Valid for**
c UL us	Underwriters Laboratories	E201387	UL 61010-1 (3. Ed.), CAN/CSA-22.2 No. 61010-1 (3. Ed.)	all types
DNV GL	DNV GL	TAA000016N	Class Guideline DNVGL-CG-0339	all types; a power supply unit with DNV GL or GL type approval is required (e.g. type 705090)

8.2 China RoHS

产品组别 Product group: 705025 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 (Gehäuse)	○	○	○	○	○	○
过程连接 Process connection (Prozessanschluss)	○	○	○	○	○	○
螺母 Nuts (Mutter)	○	○	○	○	○	○
螺栓 Screw (Schraube)	○	○	○	○	○	○

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.
○：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.

×：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.

8 Appendix

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