bürkert
FLUID CONTROL SYSTEMS

Type 8681

Control Head

Designs: 24 V DC, 120 V AC, AS-i, DeviceNet, IO-Link, büS/CANopen

Operating Instructions

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Operating Instructions 2022-02/08_EN_00806150 / Original DE

Control Head Type 8681

Contents

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

1 OPERATING INSTRUCTIONS

The operating instructions describe the entire life cycle of the device. Keep these instructions in a location which is easily accessible to every user, and make these instructions available to every new owner of the device.

WARNING!

The operating instructions contain important safety information!

- Carefully read these instructions.
- Observe in particular the safety instructions, intended use and operating conditions.
- Persons, who work on the device, must read and understand these instructions.

1.1 Symbols

DANGER!

Warns of an immediate danger!

- Failure to observe the warning will result in a fatal or serious injury.

WARNING!

Warns of a potentially dangerous situation!

- Failure to observe the warning may result in serious injuries or death.

CAUTION!

Warns of a possible danger!

- Failure to observe this warning may result in a moderate or minor injury.

NOTE!

Warns of damage to property!

- Failure to observe the warning may result in damage to the device or the equipment.

Indicates important additional information, tips and recommendations.

- Designates an instruction for risk prevention.

→ Designates a procedure which you must carry out.

1.2 Definition of terms: “device” and “büS”

The term “device” used in this manual generally denotes the Control head Type 8681 in its several designs and variants.

The term “büS” (Bürkert system bus) used in this manual stands for the communication bus developed by Bürkert, based on the CANopen protocol.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

2 AUTHORISED USE

Incorrect use of the control head Type 8681 may be dangerous to people, nearby equipment and the environment.

The control head is designed for use as a control unit for pneumatically actuated process valves and / or for recording their switching statuses.

- Use the device for its intended purpose only! Non-intended use of the device may be dangerous to people, nearby equipment and the environment.
- Use the device according to the authorised data, operating conditions and conditions of use specified in the contract documents and operating instructions. These are described in chapter “6 Technical Data”.
- In view of the large number of application options, check and, if necessary, test prior to installation whether the control head is suitable for the specific application case:
  Should you have any questions, please contact your Bürkert Service Center.
- Do not use pulsating DC voltage (rectified AC voltage without smoothing) as the operating voltage.
- Use the device only in conjunction with third-party devices and components recommended and authorised by Bürkert.
- Any unauthorised reconstructions and changes to the control head are prohibited for safety reasons.
- Correct transportation, correct storage and installation as well as careful operation and maintenance are essential for reliable and problem-free operation.
- For connecting the control head, use line installations that do not cause any mechanical stresses.
- In hazardous areas (potentially explosive atmosphere), only use devices that are approved for this area. These devices are identified by a separate „Ex“ type label. For use, observe the information on the separate „Ex“ type label and the additional instructions (ATEX) – to download from the Bürkert website – see „4.3 Information and instructions on the Internet“ on page 14.
- Devices without a separate Ex type label must not be used in the potentially explosive atmosphere..

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

3 BASIC SAFETY INSTRUCTIONS

These safety instructions do not consider any contingencies or incidents which occur during installation, operation and maintenance.
The operator is responsible for observing the location-specific safety regulations, also with reference to the personnel.

DANGER!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- Opening the hood or the housing in a potentially explosive atmosphere is only allowed in a not energised state!
- Secure the housing with a lead seal to prevent it from being opened without a tool!
- Activating the DIP switches on the PCB, using the service interface and the Teach buttons, is **not** permitted in a potentially explosive atmosphere!
- Layers of dust on the housing may not exceed 5 mm! Lint, conductive and non-conductive dust particles are allowed. The inside of the housing must not be dirty!
- When wiping the control head, use a damp or anti-static cloth in the potentially explosive atmosphere to prevent electrostatic charges!
- Use only cables and cable glands which have been approved for the respective application area and which have been screwed into place according to the respective installation instructions!
- Close all unnecessary openings with locking screws/sealing plugs approved for explosions area!

WARNING!

Danger – high pressure in the plant / at the device!

- Before loosening lines and valves, turn off the pressure and vent the lines.

Risk of electric shock!

- Before reaching into the system (except for the Teach procedure in a non-explosive atmosphere) switch off the power supply and secure it to prevent restarting!
- Observe applicable accident prevention and safety regulations for electrical equipment!

General hazardous situations.

To prevent injuries:

- Operate the device only in perfect status and in consideration of the operating instructions.
- Observe the general rules of technology.
- Install the device according to the regulations applicable in the respective country.
- Only trained technicians may perform installation and maintenance work.
- Perform installation and maintenance with suitable tools only.
- Do not make any unauthorised internal or external changes to the device!
- Ensure that the system cannot be activated unintentionally.
- After the process is interrupted, restart in a controlled manner. Observe sequence: first connect electrical or pneumatic power supply, than charge the device with medium.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

NOTE!

Electrostatic sensitive components/modules!

- The device contains electronic components which react sensitively to electrostatic discharge (ESD). Contact with electrostatically charged persons or objects may be hazardous to these components. In the worst case scenario, they will be destroyed immediately or will fail after start-up.
- Observe the requirements in accordance with EN 61340-5-1 to minimise or avoid the possibility of damage caused by sudden electrostatic discharge!
- Also ensure that you do not touch electronic components when the operating voltage is on!

NOTE!

Risk of damage to property!

- Do not connect any mechanically rigid connection parts, in particular those with long lever arms, as such connections could generate torques that might damage the control head.
- Do not supply the medium connections of the system with liquids or aggressive or flammable media!
- Do not subject the housing to mechanical loads (e.g. by placing objects on it or standing on it).
- Do not make any external changes to the housings of the device. Do not paint housing parts or screws.
- Only use compatible cleaning agents for cleaning the securely closed control head and always rinse thoroughly with clean water.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

4 GENERAL INFORMATION

4.1 Contact address

Bürkert Fluid Control Systems
Sales Center
Christian-Bürkert-Straße 13-17
D-74653 Ingelfingen, Germany

Phone: +49 7940 10 91 111
Fax: +49 7940 10 91 448

Email: info@buerkert.com
Website: www.burkert.com

4.2 Warranty

The warranty is only valid if the control head is used as intended in accordance with the specified application conditions.

4.3 Information and instructions on the Internet

The operating instructions, data sheets, software manuals and additional instructions for control head Type 8681 in its several designs and variants can be found on the Internet.

Software can also be downloaded for the respective variants.
The EDS files for DeviceNet and büS/CANopen as well as the IODD file for IO-Link are saved in the ZIP container "Initiation Files". Customer-specific software is only accessible via the customer login (e.g. data for the preconfigured ME43 gateway).

→ Access **website:** www.burkert.com

→ **In the search field:** enter the type number or the identification/article number of the respective device**.**

→ Download the required files under **"Downloads" or "Downloads" / "Software"** , e.g.:
Type 8681 | Software manual | PC service program for control head Type 8681

Additional documents for the configuration of the variants "IO-Link" and "büS/CANopen" can also be found on the website either under Type 8681 or the respective type number, e. g.:

- Type 8920 | Software manual | Bürkert Communicator
- Type ME43 | Operating instructions | Fieldbus gateway büS to Industrial Ethernet
- Type ME43 | Software manual | Central configuration management

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

5 SYSTEM DESCRIPTION

5.1 Intended application area

The control head Type 8681 has been designed for use as an actuator for pneumatically operated process valves and / or for recording the switching status of these.

5.2 General description

The control head Type 8681 is used for actuating pneumatically operated process valves.

For process valve actuation, the control head can be equipped with up to three solenoid valves.

For the recording and feedback of the process valve switching positions to a higher-level control, the control head has been equipped with a contact-free position measuring system which operates with 3 discrete, adjustable feedback signals (Teach functions).

The control head and the process valve are interconnected by an adapter. This produces an integrated, compact and decentralised system of feedback, actuation and valve function. The following advantages over centralised solutions working with valve clusters are achieved:

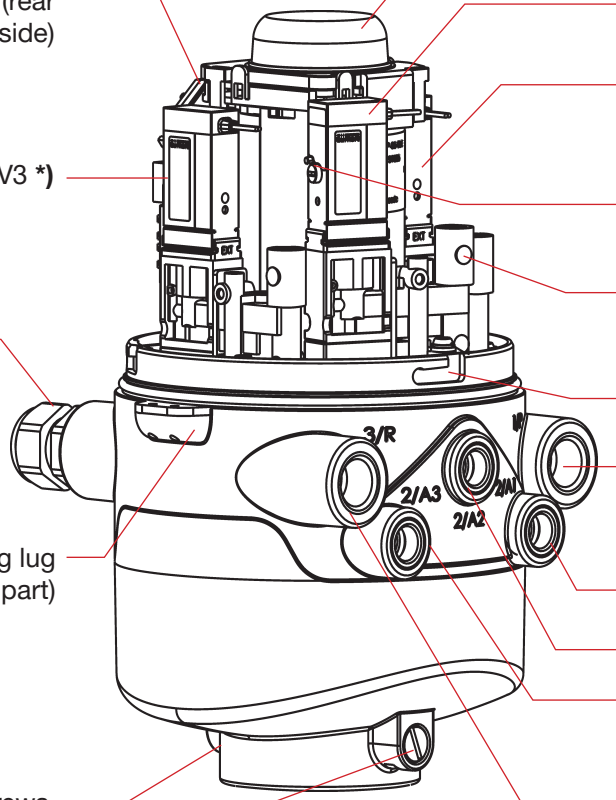
- low installation expenditure
- easy start-up
- higher application-specific flexibility
- shorter switching times and less air consumption due to shorter distances between the pilot valves and the process valve. Up to 3 solenoid valves in the control head serve as pilot valves.

Various pneumatic and electrical connection or communication variants are available, and described in detail below.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

5.3 Functions / options / variants

5.3.1 Structure of the control head



Electronic module with connection terminals, service interface and Teach buttons (rear side)

Solenoid valve V3 *)

Cable glands (rear)

Sealing lug (on lower housing part)

2 locking screws (shoulder screws M5).

No sealing function, merely as protection against pulling off from the hub flange

Position measuring system with LED (device status LED/Top LED)

Solenoid valve V2 *)

Solenoid valve V1 *)

Mechanical manual override (red lever)

Flow restriction screw(s) for P and R (2 per solenoid valve)

Locking groove (3x)

Supply pressure connection(1/P)

Solenoid valve 1 (2/A1)

Solenoid valve 2 (2/A2)

Solenoid valve 3 (2/A3)

Working connections (2/A1...3)

Exhaust air connection (3/R)

Silencer in the exhaust air connection (3/R), not shown

Fig. 1: Structure of control head Type 8681 (with 3 solenoid valves)

*) If the solenoid valve is not present, the connection is sealed tightly with a cover plate.
Control head versions without solenoid valves (i.e. “feedback top”) do not have any pneumatic connections at the housing, see also chapter “5.3.3 Number of solenoid valves” and “Fig. 5”.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

5.3.2 Fluid diagrams Type 8681 – examples

The following fluid diagrams show the internal pneumatic circuitry of the solenoid valves of the control head to the process valve being controlled.

Variant with 3 solenoid valves – e.g. for double-seated (process) valves:

with restriction capability for each solenoid valve (Type 6524, see “Fig. 6” on page 27)

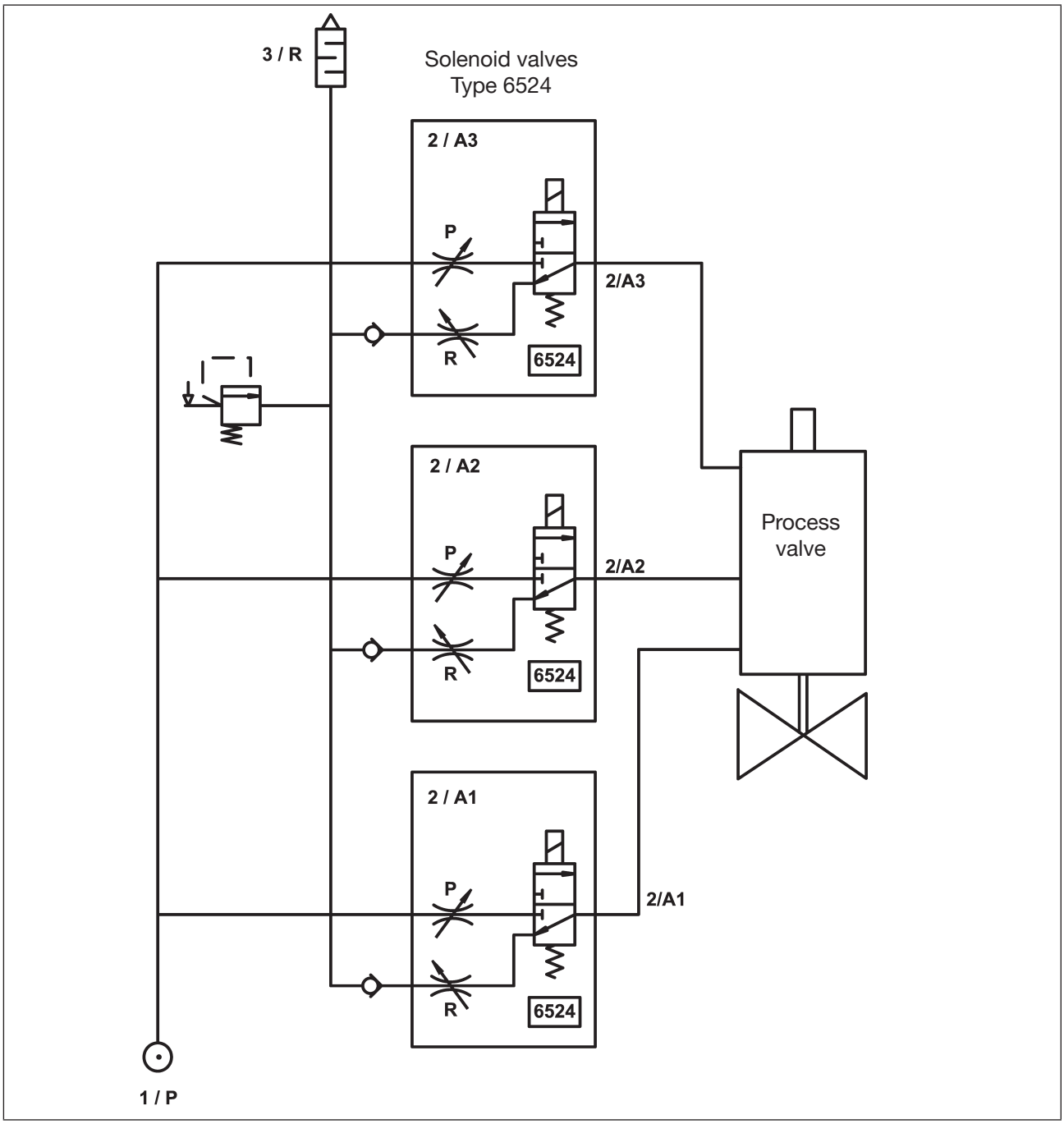


Fig. 2: Fluid diagram (model: 3 solenoid valves Type 6524)

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Variant with 2 solenoid valves – e.g. for double-acting actuators:

- with restriction capability for each solenoid valve (Type 6524, see “Fig. 6” on page 27)
- for safety position: solenoid valve V1 as NC valve, solenoid valve V2 as NO valve
- see also chapter “19 Special designs” on page 128

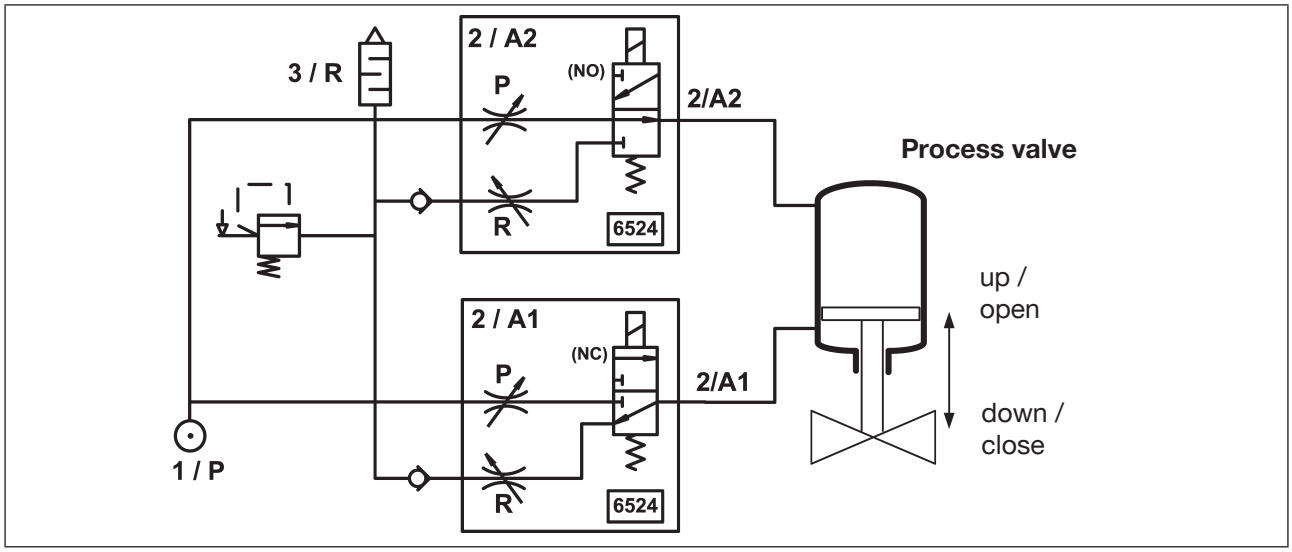


Fig. 3: Fluid diagram (design for double-acting actuators: 2 solenoid valves, NC + NO**)*

5.3.3 Number of solenoid valves

Depending on the number of solenoid valves in the control head, the control head can control various process valves (single-acting and double-acting actuators as well as double-seated and multi-position valves) or act as a mere feedback top without solenoid valves:

Type of use	Number of solenoid valves
Feedback top	0
Control head for single-acting actuators	1 (NC*)
Control head for double-acting actuators (both drive chambers not energised and deaerated)	2 (2 x NC*)
Control head for double-seated valves with integrated aeration of both valve seats	3 (3 x NC*)
Control head for double-acting actuators (with safety position) – for details see chapter “19 Special designs”	2 (1 x NC* + 1 x NO**)

* *NC = 3/2-way valve; closed in rest position, output A relieved*
** *NO = 3/2-way valve; opened in rest position, output A pressurised*

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

5.3.4 Pneumatic interfaces

- Intake & exhaust air connections (1/P, 3/R): G 1 / 4
  Working connections (2/A1 ... A3): G 1/8
- Integrated non-return valves in the solenoid valves' exhaust air duct
- Actuation of Connection 2/A1 (Solenoid Valve 1; normally the main stroke of the process valve) using the magnetic manual override that is externally accessible *via magnetic manual override tool*. (both solenoid valves are actuated simultaneously *via magnetic manual override tool* for the design for double-acting actuators)
- Special silencers with a high flow-rate capacity to connection 3/R have already been mounted.
- The interior of the housing is protected against excessive overpressure, for example due to leakages, by a pressure-relief valve with output into the joint exhaust air connection 3/R.

5.3.5 Magnetic and mechanical manual override

The control head provides the following as standard:

- *Magnetic manual override for solenoid valve V1 (via magnetic manual override tool):*:
  easily accessible from the outside, on the basis of encoded magnetic fields for Solenoid Valve V1 (Connection 2/A1) as well as
- *Mechanical manual override:*
  on each equipped solenoid valve, accessible when the hood is open (see “Fig. 6” on page 27)

The magnetic manual override (for 2/A1 or V1) has the following advantages:

- the control head does not need to be opened
- simple actuation tool for opening/closing solenoid valve V1 (main stroke) -
  helpful for service/maintenance work on the process valve (V2 and V3 are switched off at the same time; both solenoid valves are actuated simultaneously *with the magnetic manual override tool* for the design for double-acting actuators)
- LED display for the "activated (magnetic) manual override" status = service mode
  (see chapters “21 LED Colour Assignments” and “22 Service Mode / Manual override”)

Magnetic manual override is **only applicable in automatic mode;** in manual mode, V1 cannot be switched using the magnetic manual override tool.

For a detailed description of the manual override, see chapter “22 Service Mode / Manual override”.

5.3.6 Position measuring system

The switching positions of the process valves are reported to the actuator by feedback signals from the inductive position measuring system.

The connection to the control head is done by means of a simple adaptation to the process valve's piston (valve spindle). Details are described in chapters “6.8 Position measuring system data” on page 28 and “20 Position Measuring System” on page 130.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

5.3.7 Other features

- **Central optical position indicator** (device status LED /Top LED) for showing the process valve switching positions:
  Positions and status information are generally indicated by 3 signal colours of the device status LED (Top LED), additional colours and display modes (e.g. NAMUR) are available for the büS/CANopen and the IO-Link design.
  The assignment of the signal colours and the “flashing patterns” indicating the status or type of error are described in detail in chapter “21 LED Colour Assignments”.
- **Simple adaptation of the control head** (position measuring system) to the process valve piston rod / valve spindle
- **Simple adjustment of the position measuring system** by means of 3 Teach buttons on the electronic module – either manual or automatic adjustment (manual Teach function or automatic Teach function (Autotune)) - see chapter “20.2” on page 132
- **The capability of restricting the pilot valves (solenoid valves)** for the individual setting of the expansion and retraction rates of the process valve and the individual setting of the flow-rate of the working connections (see “Fig. 6” on page 27)
- **Energy efficient solenoid valve actuation** by lowering the holding current during long-term operation
- **Various electrical connection and communication options** (24 V DC, 120 V AC, AS-Interface, DeviceNet, IO-Link, büS/CANopen - see the respective chapter)

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

6 TECHNICAL DATA

6.1 Operating conditions

DANGER!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- In the potentially explosive atmosphere, only use devices that are approved for this purpose. These devices are identified by a separate Ex type label. Before use, note the information on the separate Ex type label and in the Ex additional instructions.
- Observe the instructions on operating the device in a potentially explosive atmosphere in chapter „3 Basic Safety Instructions“ on page 12

WARNING!

Risk of injury from overheating of the control head.

Heating above the permitted temperature range can endanger people, the device and the environment.

- Do not expose the device to any mechanical or thermal loads that will exceed the limits described in the operating instructions.

Ambient temperature:

Standard version: -10 ... +55 °C
in a potentially explosive atmosphere (zone 2): +5 ... +55 °C

Degree of protection:

Standard version:
IP65 / IP67 according to EN 60529
(only if cables, plugs and sockets have been connected correctly, the hood has been sealed correctly and the adaptation to the process valve was done correctly)

IP69K according to IEC 40050-9
(Housing seal with connected exhaust air line instead of silencer and ideally closed cable glands confirmed through IP69K Standard testing)

Version for use in a potentially explosive atmosphere (Zone 2):
IP64 according to EN 60529 and requirements EN 60079-0: 2009
(only if cables, plugs and sockets have been connected correctly, the hood has been sealed correctly and the adaptation to the process valve was done correctly)

6.2 Conformity / standards

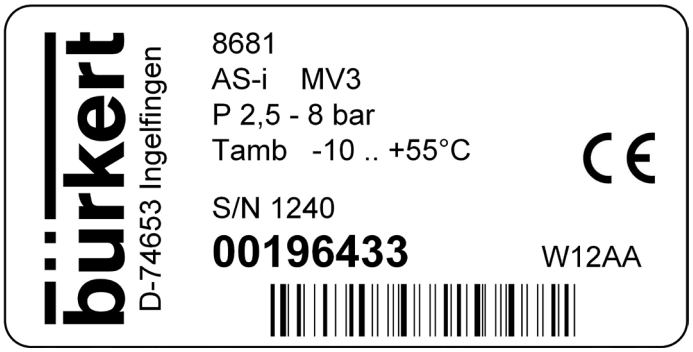
The control head conforms to the EU Directives according to the EU Declaration of Conformity.

The applied standards, which are used to demonstrate compliance with the EU Directives, are listed in the EC Declaration of Conformity and/or the EC type test certificate. These are available from Bürkert.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

6.3 Type label

The specifications on the type label indicate the technical data and approvals applicable to the respective control head. The symbols on the type label (example) mean:

Type label	
Line 1 Line 2 Line 3 Line 4 Line 5 **Line 6** Line 7	
Line 1	Device type
Line 2	Device design: Type of communication (24 V DC, 120 V AC, AS-i, DevNet, IO-Link, büS/CANopen); (possibly supply voltage); Number of solenoid valves (“MV”): MV0 = no solenoid valve, MV1 = 1 solenoid valve, single-action, MV2 = 2 solenoid valves, not double-acting, MV3 = 3 solenoid valves, MVD = 2 solenoid valves, double-acting)
Line 3	Permitted pressure range
Line 4	Permitted ambient temperature range (Tamb) (further device specific information possible)
Line 5	Serial number S/N
Line 6	**ID number** / date of manufacture (coded)
Line 7	Bar code (with ID and serial number)
	Further symbols and information on the type label indicate special approvals or relevant approval information for this device

Further possible symbols on the type label:	
CE	Device complies with European standards according to EU Declaration of Conformity
Ex	Approval according to (potentially explosive atmospheres) “ATEX” Directive
FM APPROVED	FM approval for explosion-proof equipment
c UL us LISTED	UL approval for USA and Canada

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

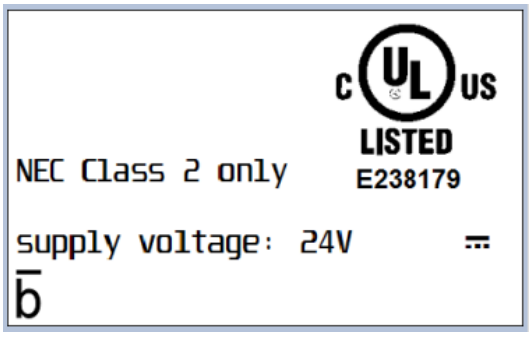
Details of the Directives:

ATEX Directive 2014/34/EU		
Ignition protection type:	Gas ATEX category	II 3G Ex ec IIC T4 Gc X
	Dust ATEX category	II 3D Ex tc IIIC T135°C Dc X
FM - Factory Mutual		
NI/I/2/ABCD/T5; +5°C < Ta < 55°C IP64 (cables and cable glands are not part of the FM approval of the device and are therefore not fitted at the factory.)		
c UL us - Underwriters Laboratories (Canada and USA)		
UL 61010-1 AND CSA C22.2 NO. 61010-1		
Restrictions:	Application area: 0 to +55°C, Indoor use, power supply with class-2 power supply unit	

6.4 Additional warning signs

Additional signs indicate additional approvals and special operating conditions.

Warning sign for use of the device in potentially explosive atmosphere	
Line 1 Line 2 Line 3 Line 4	II 3 G Ex ec IIC T4 Gc X Tamb +55°C II 3 D Ex tc IIIC T135°C Dc X **WARNING – POTENTIAL ELECTROSTATIC CHARGING** **HAZARD – SEE INSTRUCTIONS**
Line 1	Specifications according to ATEX directive (gas) / ambient temperature
Line 2	Specifications according to ATEX directive (dust) / degree of protection specification
Line 3	WARNING – POTENTIAL ELECTROSTATIC CHARGING
Line 4	HAZARD – SEE INSTRUCTIONS

Additional plate for devices with UL approval	
UL label with UL file no. Note on use of power supply unit according to NEC Class 2 Permissible supply voltage (24 V DC)	

The permissible values for voltage and maximum current consumption for devices with UL approval are listed in the following chapter.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

6.5 Specifications for devices with UL approval

Design	Voltage range	Power consumption
24 V DC	12 - 28 V	300 mA
AS interface	21 - 31.6 V	200 mA
DeviceNet	11 - 25 V	200 mA
büS/CANopen	11 - 25 V	200 mA
IO-Link	18 - 30 V	200 mA

Table 1: Permissible values for voltage and max. current consumption

Protection class:

The **protection class** of the devices (see chapter „6.1 Operating conditions“) with UL approval is evaluated **for IP65.**
IP67 and IP69K have not been evaluated by UL.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

6.6 Mechanical data

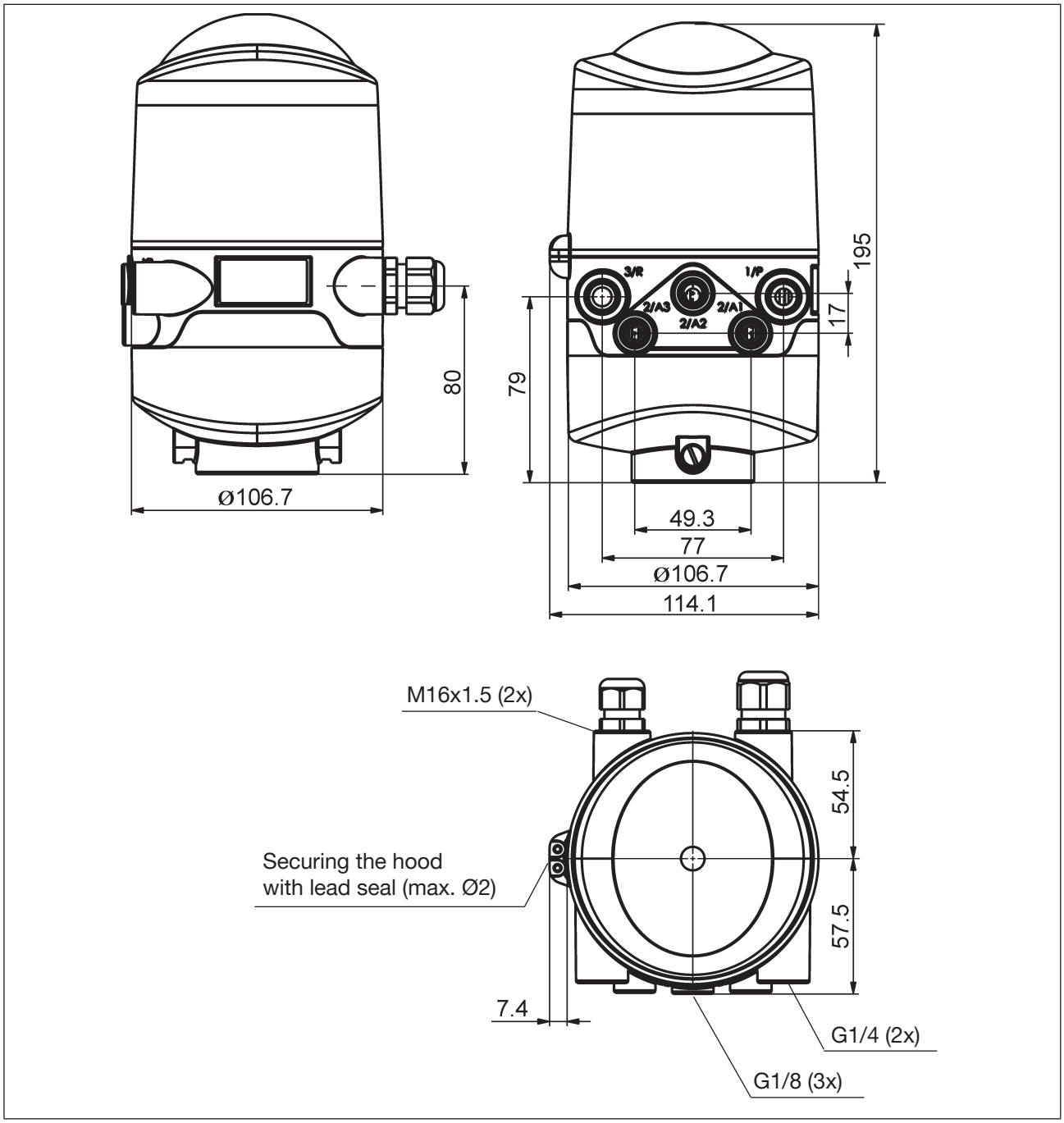


Fig. 4: Dimensional drawing (for models with 1 to 3 solenoid valves)

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

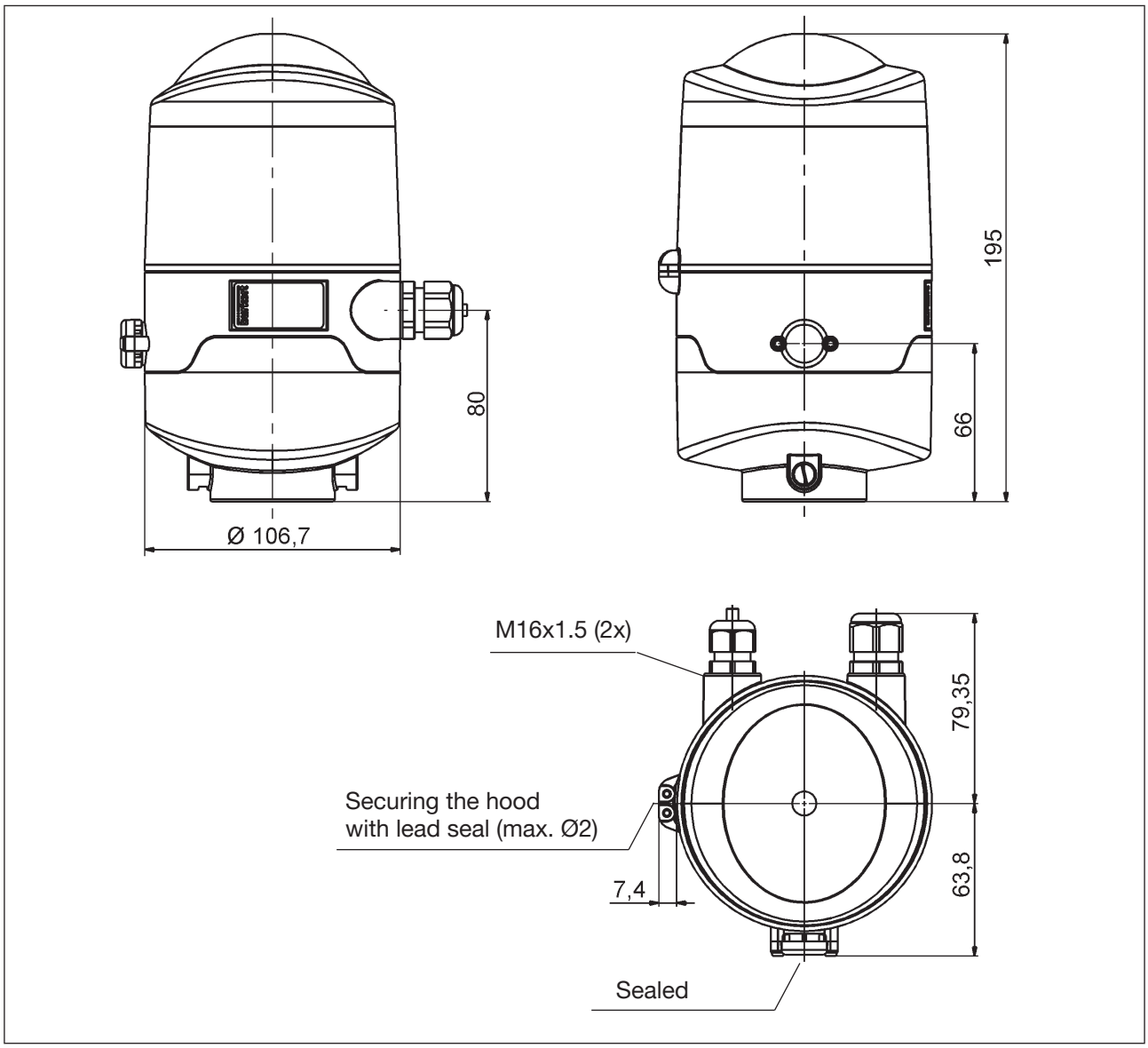


Fig. 5: Dimensional drawing (for models without solenoid valves = feedback top)

Weight:	Approx. 0.8 kg	
Housing material:	exterior:	PA, PC, PPO, VA
	inside:	ABS, PA, PMMA
Sealing material:	exterior:	CR, EPDM
	inside:	EPDM, FKM, NBR

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

6.7 Pneumatic data

Control medium: Air, neutral gases
Quality classes in accordance with ISO 8573-1
(5 µm filter recommended)

Dust content	Quality class 7:	max. particle size 40 µm, max. particle density 10 mg/m3
Water content	Quality class 3:	max. pressure dew point -20 °C or min. 10 °C below the lowest operating temperature
Oil content	Quality class X:	max. 25 mg/m3

Temperature range of compressed air: -10 ... +50 °C

Pressure range: 2.5 ... 8 bar

Air rate solenoid valve: QNn = 110 IN/min (for ventilation and deaeration, aeration)
(110 IN/min - supplied state
200 IN/min - maximum typical flow rate)
(QNn value according to definition when pressure drops from 7 to 6 bar absolute at +20 °C)

Connections: Intake and exhaust air connection (1/P, 3/R): G1/4
Working connections (2/A1...3): G1/8

Setting the intake and exhaust air at the solenoid valve using flow restriction screws

The intake and exhaust air can be set separately for each solenoid valve using flow restriction screws, in order to be able to affect the expansion and retraction rates of the process valve (see figure below).
For details see „9.3 Flow restriction function of the solenoid valves“ on page 39.

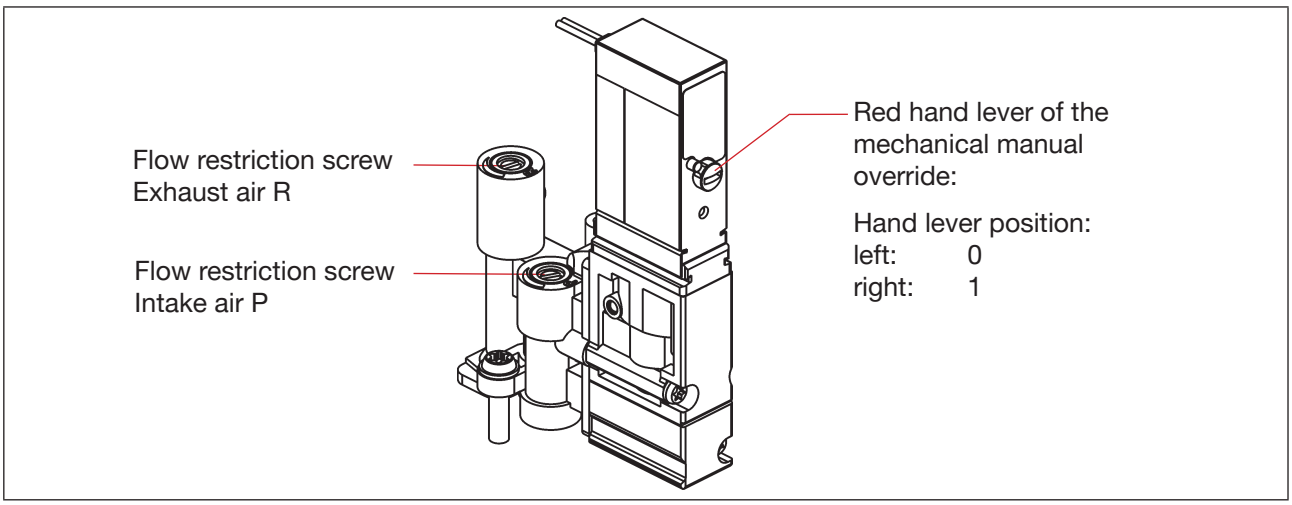


Fig. 6: Flow restriction screws and mechanical manual override of the solenoid valves

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

6.8 Position measuring system data

Stroke range (measuring range):	0 ... 80 mm
Resolution:	≤ 0.1 mm
Total error:	± 0.5 mm - when using a target (in accordance with the dimensional drawing) and a piston rod (Ø 22 mm) (fault refers to the reproducibility of a taught position)
Target material:	ferromagnetic material (stainless steel 1.4021)
Piston rod material:	not ferromagnetic material (see note **(*)** below)

"Fig. 7" shows the dimensional relationships between the control head and the piston with target.

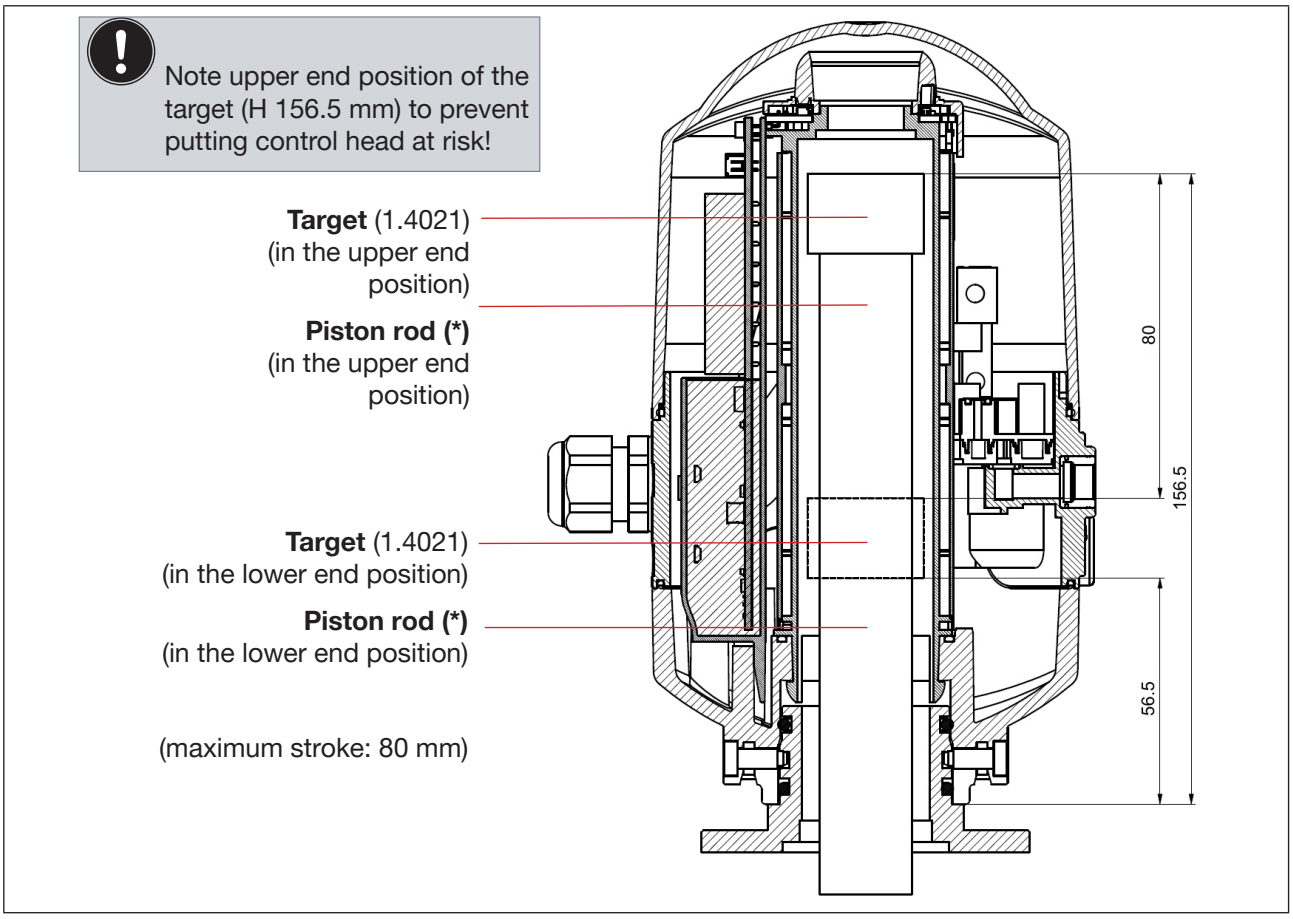


Fig. 7: Sectional view of control head and piston with target (in upper and lower end position)

(*) *The fastening materials* for target and piston rod, as well as *the piston rod itself,* may not be made of material with very good electrical conductivity (e.g. copper, aluminum) or of ferromagnetic material. Stainless steel without ferromagnetic properties is suitable (if necessary, check after machining).

The details for the assembly of the control head to the process valve are described in chapter „7.2 Assembly of the control head".

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

6.9 Factory settings in the firmware

The control head is supplied with the firmware factory settings as listed below.

Changes to the factory settings for the **classic variants** of Type 8681 **(24 V DC, 120 V AC, AS-i, DeviceNet)** are possible via the PC service program (see software manual: "Software manual Type 8681 | PC service program").
To do so, the control head is connected to the PC via the service interface on the electronic module – see „Fig. 9". This involves removing the plastic cover (see chapter „8").

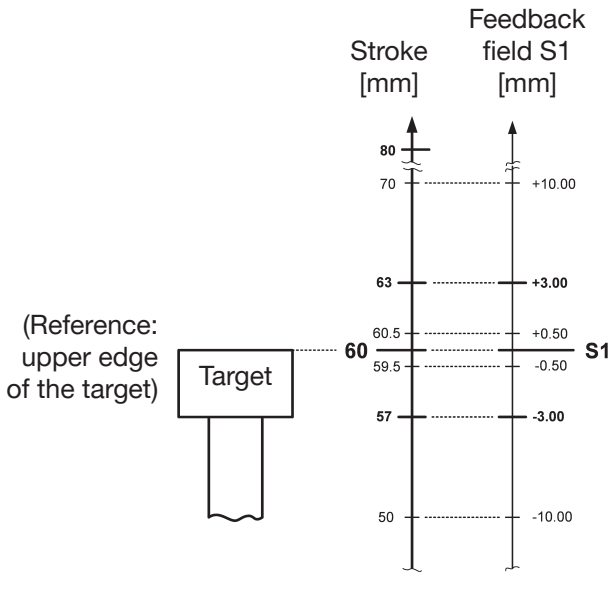
The service interface may only be used in non-explosive atmosphere, because the plastic hood should be removed (see chapter "8 Opening and Closing the Housing").

Changes to the factory settings for the **variants DeviceNet, büS/CANopen and IO-Link** are usually possible via the bus-specific communication interface. With büS/CANopen and IO-Link, changes can also be carried out via the Bürkert Communicator (Type 8920).

6.9.1 Feedback fields (position measuring system)

A feedback field is the area within which a valve position (e.g. S1) is reported back.

Signal of the valve position	Feedback field at top / positive		Feedback field at bottom / negative	
	Factory setting [mm]	Adjustment range [mm]	Factory setting [mm]	Adjustment range [mm]
S1	+ 3.00	+ 10.00 ... + 0.50	- 3.00	- 0.50 ... - 10.00
S2	+ 3.00	+ 10.00 ... + 0.50	- 3.00	- 0.50 ... - 10.00
S3	+ 1.00	+ 10.00 ... + 0.50	- 1.00	- 0.50 ... - 10.00



Ensure that the teach points including their feedback fields are within the measuring range.

Fig. 8: Schematic diagram (not to scale) of the feedback fields, using the example of valve position S1

Overlaps of S1/S2/S3 are possible (see chapter "21.3 Signal priorities").

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

6.9.2 Service / maintenance notification (maintenance request)

Factory setting for the "Service/maintenance notification" function: **not active.**

When Service/maintenance notification is activated, this is indicated by a special flashing pattern - see Chap. “21.2 Flashing pattern & fault signalling” on page 144, for the büS/CANopen design, see the „Additional Instructions for Type 8681 büS/CANopen“.

The Service/maintenance notification is used to observe predefined maintenance intervals which should occur either after an adjustable number of switching cycles or when a certain time has elapsed. The PC service program or the Bürkert Communicator is used – depending on the control head design – to adjust the service/maintenance interval (number of days or switching cycles) as well as activation/deactivation of the "Service/maintenance notification" function.

Connection to the PC is either via the service interface – see „Fig. 9“ – or communication takes place via the Bürkert Communicator (only for büS/CANopen and IO-Link variants). Details about the “Service” menu option are described in the software manual: “Software manual Type 8681 | PC service program” or can be found in the Bürkert Communicator.

A feedback, indicating that a service / maintenance is required (Service/maintenance notification), occurs when a Service/maintenance notification is activated after the following counter readings:

Counter readings (service interval)	Factory setting	Adjustment range	Adjustment range (IO-Link design only)
Switching cycle counter V1	10 000	(1 ... 255) x 1000	1 ... 4294967295
Switching cycle counter V2	50 000	(1 ... 255) x 1000	1 ... 4294967295
Switching cycle counter V3	50 000	(1 ... 255) x 1000	1 ... 4294967295
Operating duration	365 days	1 ... 65 535 days	

The resettable operating hour and switching cycle counters are reset to "0" when a Device Reset occurs.

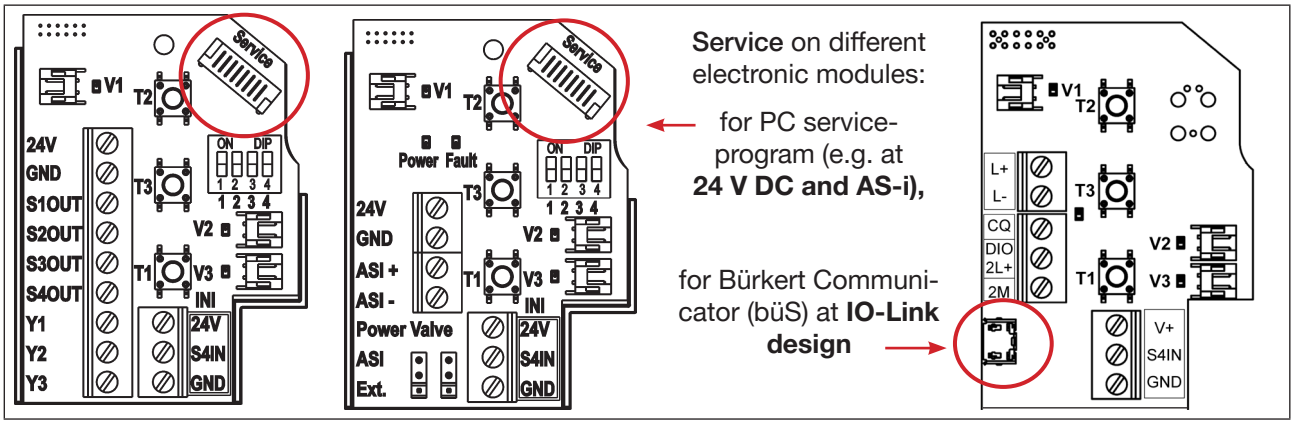


Fig. 9: Location of the Service interface on several electronic modules

6.9.3 Manual override function (magnetic)

Factory setting for the magnetic manual override function: **active**.

For details compare also chapter “22.1 Magnetic manual override” on page 152.

Deactivation is possible using the PC service program (for IO-Link and büS/CANopen design via Bürkert Communicator). Details are described in the software manual “PC service program” under the “SYSTEM/ Start-up” menu option (with the Bürkert Communicator, it is necessary to search for the corresponding object).

The connection to the PC is via the Service interface – see „Fig. 9“ (or for the IO-Link and büS/CANopen design via büS stick to the Bürkert Communicator).

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

6.10 Resetting the device (Device Reset)

A restricted reset of the device to factory settings (Device Reset) can be performed using the:

- **PC Service Program** (see: „Software manual Type 8681 | PC service program“) for “classic” designs or
- **Bürkert Communicator** (for IO-Link and büS/CANopen design only) or
- directly on the control head.

Procedure (directly at the control head):

→ Simultaneously actuate T1 + T2 + T3 (approx. 2.5 s long) to access the "Device Reset" mode – the corresponding flashing pattern depends on the design of the control head.
If the device is not reset 10 s after switching to the „Device Reset“ mode, this mode is automatically left.

→ Simultaneously actuate T1 + T2 + T3 again (approx. 2.5 s long) – this will reset the device for real. The flashing pattern which depends on the design of the control head, indicates that the device was reset – see also chapter “21.2 Flashing pattern & fault signalling” on page 144.

Device Reset resets the following values to the factory settings:

• Teach positions S1...S3	all positions "*not taught*"
• Feedback fields from S1...S3	(see chapter “6.9.1” on page 29)
• Resettable switching cycle counters V1...V3	(see chapter “6.9.2” on page 30)
• Resettable operating duration	(see chapter “6.9.2” on page 30)
• Service intervals switching cycles V1...V3	(see chapter “6.9.2” on page 30)
• Service interval operating duration	(see chapter “6.9.2” on page 30)
• Service/maintenance notification (signaling of elapsed maintenance intervals)	*inactive* (see chapter “6.9.2” on page 30)
• Magnetic manual override function	*active* (see chapter “6.9.3” on page 30)
• External initiator S4 in = NO	(see chapter “21.1.1” on page 139)
• Feedback external initiator S4 as S1	*not active* (see "PC service program" software manual)
• Configurations client (only büS/CANopen)	*automatic switching on* or *active* (see „15.14.4“)
• Service display option (only IO-Link, büS/C.)	service indication display option: *on* (see software description)

Device Reset does not reset the following values (amongst others):

• all hardware configured values (i.e. set via DIP switches)	
• Switching cycle counter Total V1...V3	
• Operating duration Total	
• AS-i address	(see chapter “12.9” on page 62)
• AS-i profile	
• DeviceNet Input Assembly	(see chapter “13.11.1” on page 71)

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

7 ASSEMBLY

7.1 Safety instructions

DANGER!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- Opening the hood or the housing in a potentially explosive atmosphere is only allowed in a not energised state!
- When used in a potentially explosive atmosphere (zone 2), the devices must be installed in a protected mounting position in accordance with IEC/EN 60079-0.

WARNING!

Risk of injury due to electric shock!

- Before reaching into the system (except for the Teach procedure in a non-explosive atmosphere) switch off the power supply and secure it to prevent restarting!
- Observe applicable accident prevention and safety regulations for electrical equipment!

Risk of injury from high pressure in the system!

- Before loosening lines and valves, turn off the pressure and vent the lines.

Risk of injury from improper assembly!

- Assembly may only be carried out by trained technicians and with the appropriate tools!

Risk of injury from unintentional activation of the system and uncontrolled restart!

- Secure system against unintentional activation; following assembly, ensure a controlled restart.

NOTE!

Risk of damage to property in case of improper installation!

Non-observance can damage the device or the plant.

- Do not improperly stress the control head.
- Do not apply any leverage effect on the head and do not climb on it.
- When sealing the flange from the outside to the inside, make sure that the inflow of cleaning agent is considered and that the actuator space of the process valve towards the control head is sealed.

7.2 Assembly of the control head

The control head can be installed in any installation position, preferably with the hood face up.

The control head should be installed such that layers of dust thicker than 5 mm cannot form; meaning that such should be ensured through correspondingly regular cleaning.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

7.2.1 Hub flange / Adapter

For the installation of the control head Type 8681 to a process valve (spindle), you will require a process valve-specific hub flange as an adapter.

The hub flange must be adapted to the design of the process valve and produce the mechanical connection between the process valve and the control head. The axial fastening is done by two locking screws (shoulder screws M5), which engage in the middle groove of the hub flange (protection against pulling off). The control head can radially slide into any position in 360° arc, seamlessly.

The hub flange and the **non-ferromagnetic piston rod** with the **ferromagnetic target,** which serves to detect the process valve position must comply with the specifications regarding material and dimensional accuracy – see chapter "6.8 Position measuring system data".

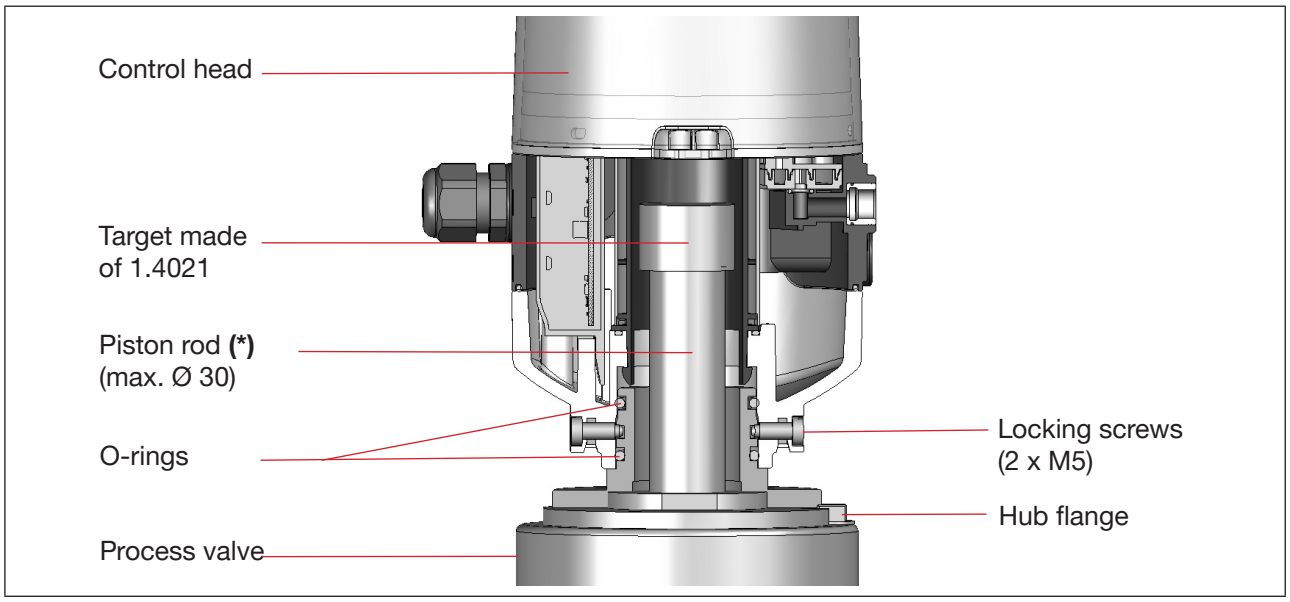


Fig. 10: Schematic diagram of the control head - process valve adaptation

(*) The fastening materials for target and piston rod as well as the piston rod itself shall not be made of material with very good electrical conductivity (e.g. copper, aluminum) or of ferromagnetic material. Stainless steel without ferromagnetic properties is suitable (if necessary, check after machining).

- To ensure the proper function of the position measuring system, the axial deviation of the adapter must be less than ± 0.1 mm to the spindle when mounted!
- Use Bürkert adaptions exclusively.
- Prior to assembling the control head onto the hub flange, lightly grease the O-rings with a silicone grease.
- The hood must be lead-sealed in the **potentially explosive atmosphere** to prevent the housing from being opened without a tool!

For dimensional relationships, see also chapter "6.8 Position measuring system data".

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

7.2.2 Assembly sequence on the example of a double-seated valve

Procedure:

→ Mount the piston rod with the target on the process valve spindle. Observe reference dimensions!

→ Fasten the hub flange on the process valve - see "Fig. 10".
During this, observe central alignment and sealing conditions!

→ Check the secure fit of the sealing rings (in the upper and lower grooves).

→ Mount the control head on the hub flange (seamlessly 360° rotatable).

→ Secure control head with the two locking screws (shoulder screws M5) in the middle groove of the hub flange to prevent it from being pulled off the hub flange – tightening torque: max. 3.2 Nm (see "Fig. 10" and "7.2.3 Realignment of the control head").

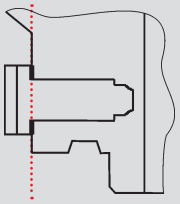
7.2.3 Realignment of the control head

If necessary, the control head can be realigned (rotated), in particular if properly accessible installation of the pneumatic supply lines is not possible due to spatial conditions. This might also be required for operational aspects (accessibility of the manual override) and because of electrical connection possibilities.

Procedure:

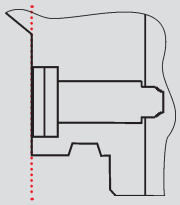
→ Loosen the locking screws (shoulder screws M5 – see "Fig. 10") slightly until the underside of the screw head is flush with the auxiliary surface of the housing.

The locking screw has been loosened sufficiently when the lower side of the screw head is flush with the auxiliary surface of the housing.



The locking screw is sufficiently tightened when the upper side of the screw head is flush with the auxiliary surface of the housing.

Tightening torque: max. 3.2 Nm



→ Rotate the control head until the desired alignment has been achieved.

→ Secure the control head with locking screws again until the upper side of the screw head is flush with the auxiliary surface of the housing. The locking screws have no sealing function. The control head is not fixed in place by the locking screws but is merely secured against being pulled off the hub flange.

7.2.4 Assembly of the pneumatic and electrical connections

Pneumatic installation

see chapter "9 Pneumatic Installation"

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Electrical installation

Electrical installation and the communication connections depend on the control head variant:

24 V DC: see chapter “10 24 V DC - Design”,

120 V AC: see chapter “11 120 V AC - Design”

AS interface: see chapter “12 AS Interface - Design”,

DeviceNet: see chapter “13 DeviceNet - Design”,

IO-Link: see chapter “14 IO-Link - Design”,

büS/CANopen: see chapter “15 büS/CAN open-Design”.

7.2.5 Recommended auxiliary materials

Silicone grease for easy lubrication of the EPDM seals.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

8 OPENING AND CLOSING THE HOUSING

8.1 Safety instructions

DANGER!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- Opening the hood or the housing in a potentially explosive atmosphere is only allowed in a not energised state!

WARNING!

Risk of injury due to electric shock!

- Before opening the hood and prior to reaching into the system (aside from a Teach procedure in a non-explosive atmosphere), switch off the power supply and secure to prevent restarting!
- Observe applicable accident prevention and safety regulations for electrical equipment!

Risk of injury from high pressure in the system!

- Before loosening lines and valves, turn off the pressure and vent the lines.

Risk of injury from improper installation!

- Installation may be carried out by trained technicians only and with the appropriate tools!

Risk of injury from unintentional activation of the system and uncontrolled restart!

- Secure system against unintentional activation.
- Following installation, ensure a controlled restart.

8.2 Opening and closing the housing

8.2.1 Opening the housing

NOTE!

Improper handling will damage the plastic hood / seal!

- Do not use excessive force (e.g. by knocks) for opening.
- Make sure that the lubricated seal is not soiled when the hood is placed down as this might reduce the IP protection!

Procedure:

→ Remove lead seal if housing is secured – see “Fig. 11” on page 37.

→ Open the plastic hood by turning counterclockwise (all the way, approx. 1.5 cm). Due to the tightness of the sealing, loosen the plastic hood by carefully tilting it laterally and lift it upwards to remove it.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

8.2.2 Closing the housing

If necessary, clean the seal contour of the seal and of the hood and lightly lubricate it using a silicone grease.

Caution:
Do not use any petroleum-based or synthetic lubricants (except for silicone grease)!

Procedure:

→ Put the plastic hood on the lower part such that the inner "lugs" are positioned over the locking grooves and the external sealing lugs are positioned almost over each other. Press the hood completely over the seal (O-ring) of the lower part – see also "Fig. 11".

→ Turn the hood by approx. 1.5 cm clockwise (meaning until the sealing lugs are positioned over each other).

→ If necessary, apply a lead seal to prevent opening without a tool.

The hood must be **lead-sealed in the potentially explosive atmosphere** to prevent the housing from being opened without a tool!

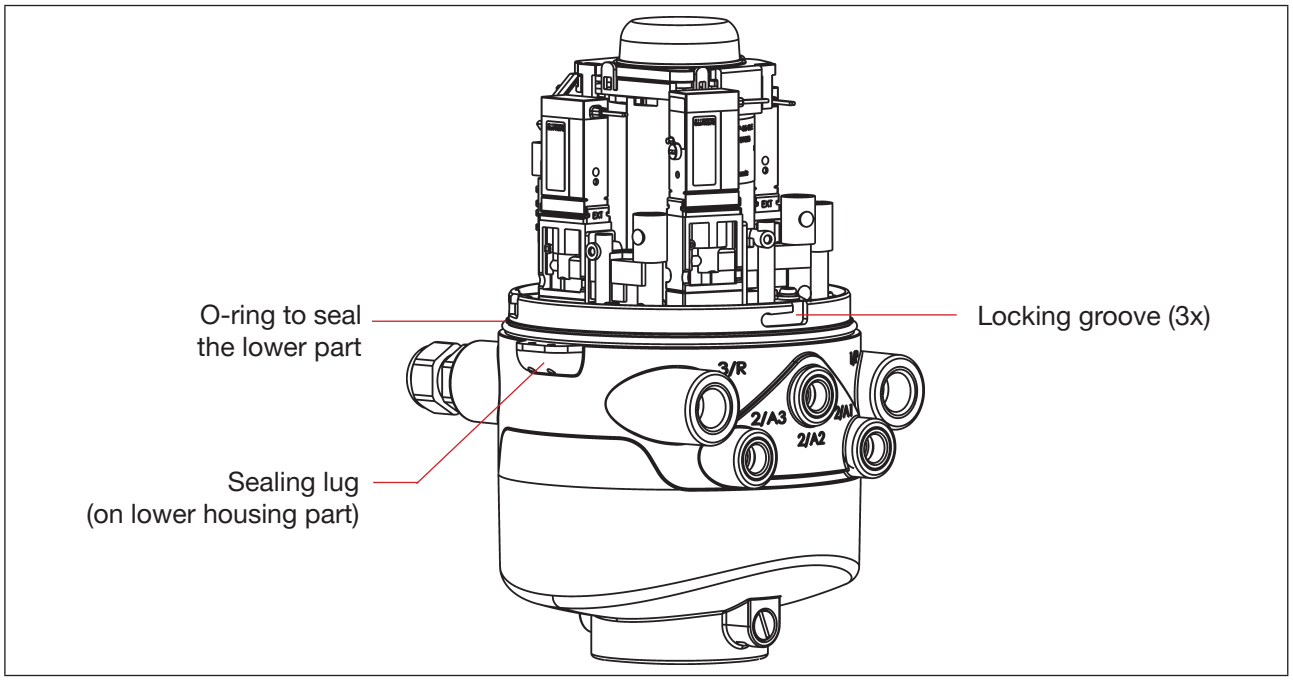


Fig. 11: Sealing lug and locking grooves

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

9 PNEUMATIC INSTALLATION

9.1 Safety instructions

WARNING!

Risk of injury from high pressure in the system!

- Before loosening lines and valves, turn off the pressure and vent the lines.

Risk of injury from improper installation!

- Installation may be carried out by trained technicians only and with the appropriate tools!

Risk of injury from unintentional activation of the system and uncontrolled restart!

- Secure system against unintentional activation.
- Following installation, ensure a controlled restart.

9.2 Pneumatic connection of the control head

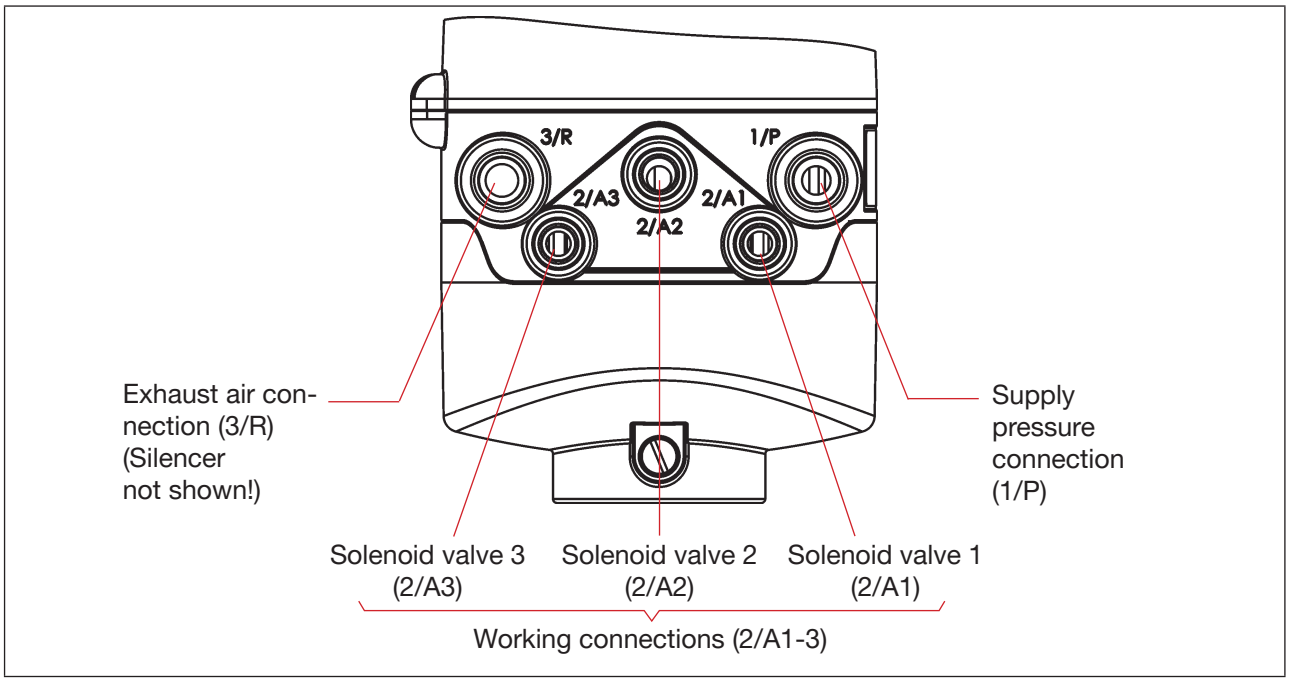


Fig. 12: Pneumatic connection

Procedure:

→ If required, realign the control head (see chapter "7.2.3 Realignment of the control head").

→ A silencer has already been mounted on the **Exhaust Air Connection (3/R)** in the supplied state. As needed, the silencer can be replaced by an exhaust air hose (e.g. after screwing in an appropriate plug-in hose connectors).

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

→ Connect the required **working connections 2/A1 to 2/A3** (according to the number of solenoid valves in the control head) with the corresponding connections on the process valve (“Fig. 12”).

→ Connect the supply line to **supply pressure connection 1/P** (observe the permissible pressure range, see chapter “6.7 Pneumatic data” on page 27).

NOTE!

Information to hose pipes!

- Only use approved hose pipes with Ø6 mm (or 1/4") or Ø8 mm (or 5/16") outer diameters (tolerance: +0.05/-0.1 mm).
- Only use suitable hose qualities (in particular for high ambient temperatures) that bear up under common stresses caused by the quick connector.
- Only use a suitable hose cutter when cutting hose pipes. This will safeguard against damage and impermissible deformation.
- Accordingly dimension hose length to prevent that the hose ends in the plug-in hose connectors generate any diagonally pulling stresses (curved outlet without eccentric stress).

Application of silencer or exhaust air hose?

- When using an exhaust air hose, accordingly dimension its length to ensure that a Q_{Nn} value >620 l/min is reached.

Note:
Dimension the hose lengths so that the control head can be removed from the process valve if required without any additional disassembly work.

9.3 Flow restriction function of the solenoid valves

Set the flow restriction screws of the solenoid valves only when needed and after completion of all necessary installations!

The flow restriction screws of the solenoid valves (see “Fig. 13”) are used for setting the air intake and exhaust for the working connections and thus also for setting the opening and closing speed of the process valve:

- Factory setting of nominal flow rate: Q_{Nn} approx. 110 l/min.
- The flow restriction screws do not serve any sealing function.
- Only tighten the flow restriction screws to the stopper, otherwise damage to device may occur.
- Only use appropriate screwdrivers (b ≤ 3 mm).

When setting the retraction and extension rates of the pneumatic actuator, ensure that there is no constant "primary pressure" during deaeration!

Keep in mind that the working conditions in the process valve area on the side of the product (flow types, pressure variations) may result in changes in the set aeration and deaeration times.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Settings of the flow-rate or the control speed with the help of the flow restriction screws:

For proper setting, it is advisable to turn the **two flow restriction screws initially into the minimum flow-rate position.** The process valve will then initially move slowly so that you have more time to find the optimum setting during a switching operation.

Minimising the flow rate:	Turn clockwise
Maximising the flow rate:	Turn counterclockwise

→ Open the housing following the instructions in chapter “8 Opening and Closing the Housing”.

→ Observing the safety guidelines, activate the respective valve location (V1, V2 or V3) to be set (either using the system control (PC service programm or Bürkert Communicator) or the respective manual overrides on the solenoid valve - “Fig. 13”).

→ Turn the flow restriction screw "P" counterclockwise to set the required flow rate and therefore the opening time for the process valve. (Tool: flat-blade screwdriver, width ≤ 3 mm).

→ Subsequently deactivate the respective valve location (V1, V2 or V3).

→ Turn the flow restriction screw "R" counterclockwise to set the required flow rate and therefore the closing time for the process valve.

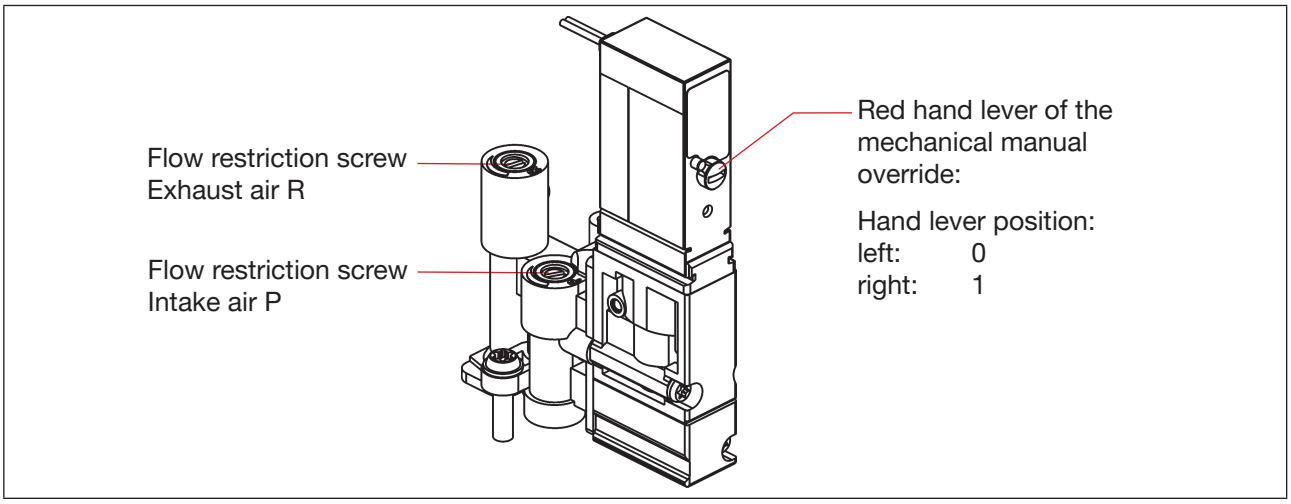


Fig. 13: Flow restriction screws and mechanical manual override of the solenoid valves

NOTE!

To avoid unintentional switching of the process valve:

- Makes sure that all manual overrides have been deactivated (hand lever all the way left, as pictured) after the setting work has been completed!

→ If no further installation work is required, close the housing following the instructions in chapter “8 Opening and Closing the Housing”.

If no system status is available during setting, readjust the system under system operation conditions if necessary.

Observe the safety guidelines during this! See chapter “3 Basic Safety Instructions” on page 12.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

10 24 V DC - DESIGN

10.1 Electrical connection options

The following connection concepts are available for the electrical connection of the control head:

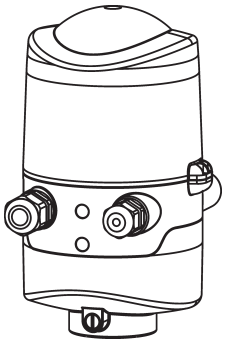
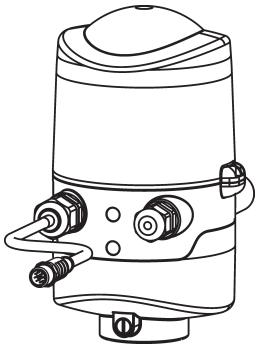
	
Cable gland	**Cable gland with multi-pole connection** (M12 plug according to IEC 61076-2-101, 12-pole)
Connection left: Voltage, signals Connection right: external initiator	Connection left: Voltage, signals Connection right: external initiator

Fig. 14: Connection concepts 24 V DC

10.2 Electrical data

Power supply: 12 ... 28 V DC, residual ripple 10%

Connections:

Cable gland variant

1 x M16 x 1.5 cable gland/size22 - for power supply and signals, (only for transportation safety device sealed with dummy plugs, remove these before use!)
for cable diameter 5 ... 10 mm,
for wire cross-sections 0.14 ... 1.5 mm^2

1 x M16 x 1.5 cable gland/size19 - connection option for external initiator (sealed with dummy plug, remove these before use)

Multi-pole connection variant

1 x M16 x 1.5 cable gland / size22 with multi-pole connection (M12 plug according to IEC 61076-2-101, 12-pole) for power supply and signals, cable length approx. 15 cm

1 x M16 x 1.5 cable gland/size19 - connection option for external initiator (sealed with dummy plug, remove these before use)

Power consumption (standby current): 30 mA at 24 V DC

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Solenoid valves:

Typ. switching capacity:	0.9 W (per solenoid valve, for 200 ms after switching on)
Typ. continuous output:	0.6 W (per solenoid valve, from 200 ms after switching on)
Power consumption per solenoid valve:	50 mA at 12 V DC
	25 mA at 24 V DC
	22 mA at 28 V DC
Operating mode:	Long-term operation (100% ED)

Central display of switching statuses: approx. 42 mA with a power supply of 24 V DC per illuminated display;
colour switching see chapter “21 LED Colour Assignments”

Outputs/binary feedback signals:	S1 out - S4 out
Design:	Normally open contact, PNP output short-circuit-proof, with self-clocking short-circuit protection
Switchable output current:	max. 100 mA per feedback signal
Output voltage - active:	≥ (operating voltage - 2 V)
Output voltage - inactive:	max. 1 V in unloaded state

Input / proximity switches (external initiator: S4 in):

Power supply:	Voltage present at the control head - 10%
Current carrying capacity sensor supply:	max. 90 mA
Short-circuit protection	
Design:	DC 2- and 3-conductor, NO or NC (factory setting NO), PNP output
Input current 1 signal:	ISensor > 6.5 mA, limited internally to 10 mA
Input voltage 1 signal:	USensor > 10 V
Input current 0 signal:	ISensor < 4 mA
Input voltage 0 signal:	USensor < 5 V

Inputs valve actuation (Y1 - Y3):

Signal level - active:	U > 10 V, max. 24 V DC + 10%
Signal level - inactive:	U < 5 V
Impedance:	> 30 kOhm

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

10.3 Design aid

Power consumption of the electronics:								
P_{EI}	=	0.7 W	or	I_{EI}	=	30 mA	at	24 V
Power consumption of a valve during activation (200 ms):								
$P_{Valve-ON}$	=	0.9 W	or	$I_{Valve-ON}$	=	38 mA	at	24 V
Power consumption of a valve after reduction:								
P_{Valve}	=	0.6 W	or	I_{Valve}	=	25 mA	at	24 V
Power consumption of an optical position report:								
P_{LED}	=	1.0 W	or	I_{LED}	=	42 mA	at	24 V

Also, if several control head valves were to be opened simultaneously, the switch signal will be sent staggered to the valves. Only **one** 0.9 W valve will ever be recorded.

Calculation examples:

Example 1:
3 valves are activated simultaneously, one position is reported (status for 200 ms):

P_{Total} =		P_{EI}	+	1 x $P_{Valve-ON}$	+	2 x P_{Valve}	+	1 x P_{LED}		
3.8 W	=	0.7 W	+	1 x 0.9 W	+	2 x 0.6 W	+	1 x 1.0 W		
or										
I_{Total}	=	I_{EI}	+	1 x $I_{Valve-ON}$	+	2 x I_{Valve}	+	1 x I_{LED}		
160 mA	=	30 mA	+	1 x 38 mA	+	2 x 25 mA	+	1 x 42 mA		

Example 2:
3 valves have been activated simultaneously, one position is reported (persistent state):

P_{Total}	=	P_{EI}	+	3 x P_{Valve}	+	1 x P_{LED}		
3.5 W	=	0.7 W	+	3 x 0.6 W	+	1 x 1.0 W		
or								
I_{Total}	=	I_{EI}	+	3 x I_{Valve}	+	1 x I_{LED}		
147 mA	=	30 mA	+	3 x 25 mA	+	1 x 42 mA		

When using an external initiator, its power requirement should be added.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

10.4 Safety instructions

DANGER!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- Opening the hood or the housing in a potentially explosive atmosphere is only allowed in a not energised state!

WARNING!

Risk of injury due to electric shock!

- Before reaching into the system (except for the Teach procedure in a non-explosive atmosphere) switch off the power supply and secure it to prevent restarting!
- Observe applicable accident prevention and safety regulations for electrical equipment!
- When setting the position measuring system (Teach procedure), do not contact any live components!

Risk of injury from improper installation!

- Installation may be carried out by trained technicians only and with the appropriate tools!

Risk of injury from unintentional activation of the system and uncontrolled restart!

- Secure system against unintentional activation.
- Following installation, ensure a controlled restart.

10.5 Electrical installation / start-up

10.5.1 Cable gland with screw terminals

Procedure:

→ Open the housing following the instructions in chapter “8 Opening and Closing the Housing”.

→ Assemble connection cables for signals and power supply as well as for the external initiator where necessary in observance of the rules of technology.

→ Insert cables through the respective cable glands into the interior of the housing.

→ Connect the wires to the connection terminals according to the connection configuration described in “Fig. 15”.

If required, secure the cable with a cable clip!

→ Close the housing following the instructions in chapter “8 Opening and Closing the Housing”.

NOTE!

Ensure IP protection!

- To ensure IP protection, the union nuts of the cable glands must be tightened in accordance with the cable sizes or dummy plugs used (approx. 1.5 Nm).
- If no external initiator is used, the right-hand connection opening must be tightly sealed using a dummy plug or using a cable gland (SW 19, Ø 3 - 6 mm) + dummy plug (Ø 5 - 6 mm)!

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

NOTE!

Use of the control head in a potentially explosive atmosphere

- Only use cables and cable glands which are approved for the respective application area and fit the cable glands according to the respective operating instructions!
- Close all unnecessary openings with lock screws/plugs approved for explosions area!

24 V DC Electronic module, terminal strip configuration:

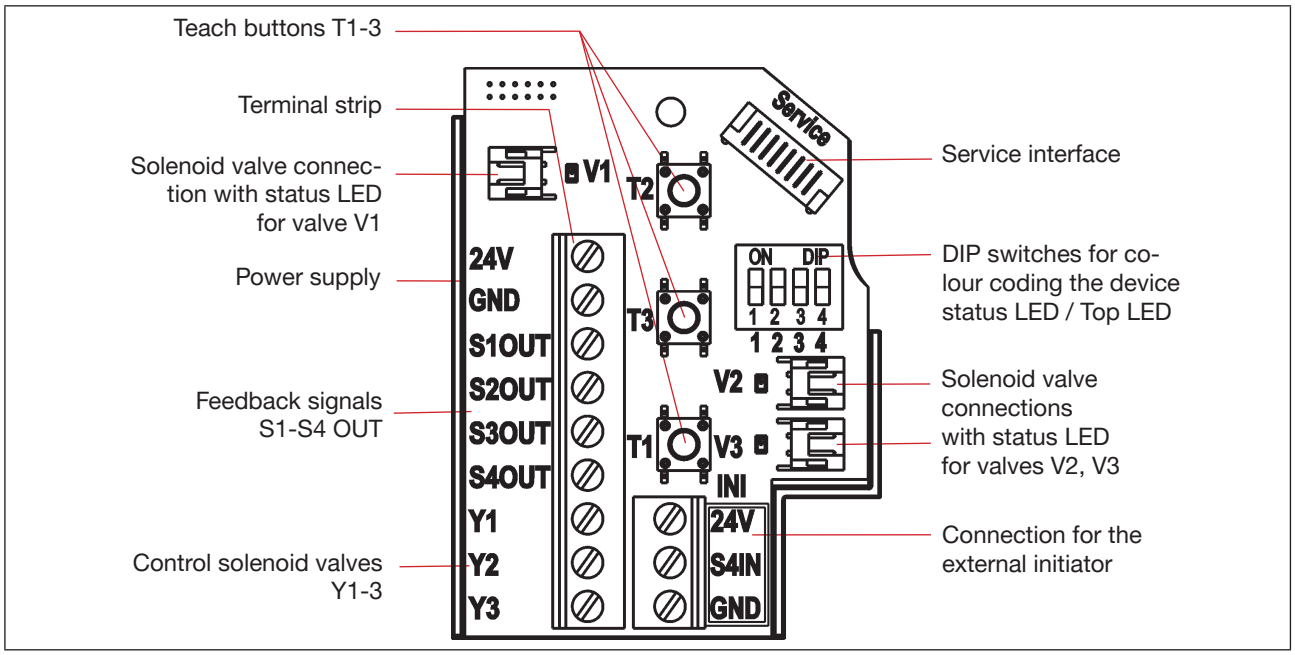


Fig. 15: 24 V DC electronic module

Designation Terminal strip	Configuration
24 V	Power supply 24 V
GND	GND
S1 OUT	Output position S1
S2 OUT	Output position S2
S3 OUT	Output position S3
S4 OUT	External initiator output S4
Y1	Solenoid valve V1 input
Y2	Solenoid valve V2 input
Y3	Solenoid valve V3 input

Designation Terminal strip	Configuration
24 V	Power supply 24 V for external initiator
S4 IN	External initiator input
GND	GND external initiator

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Circuit diagram 24 V DC:

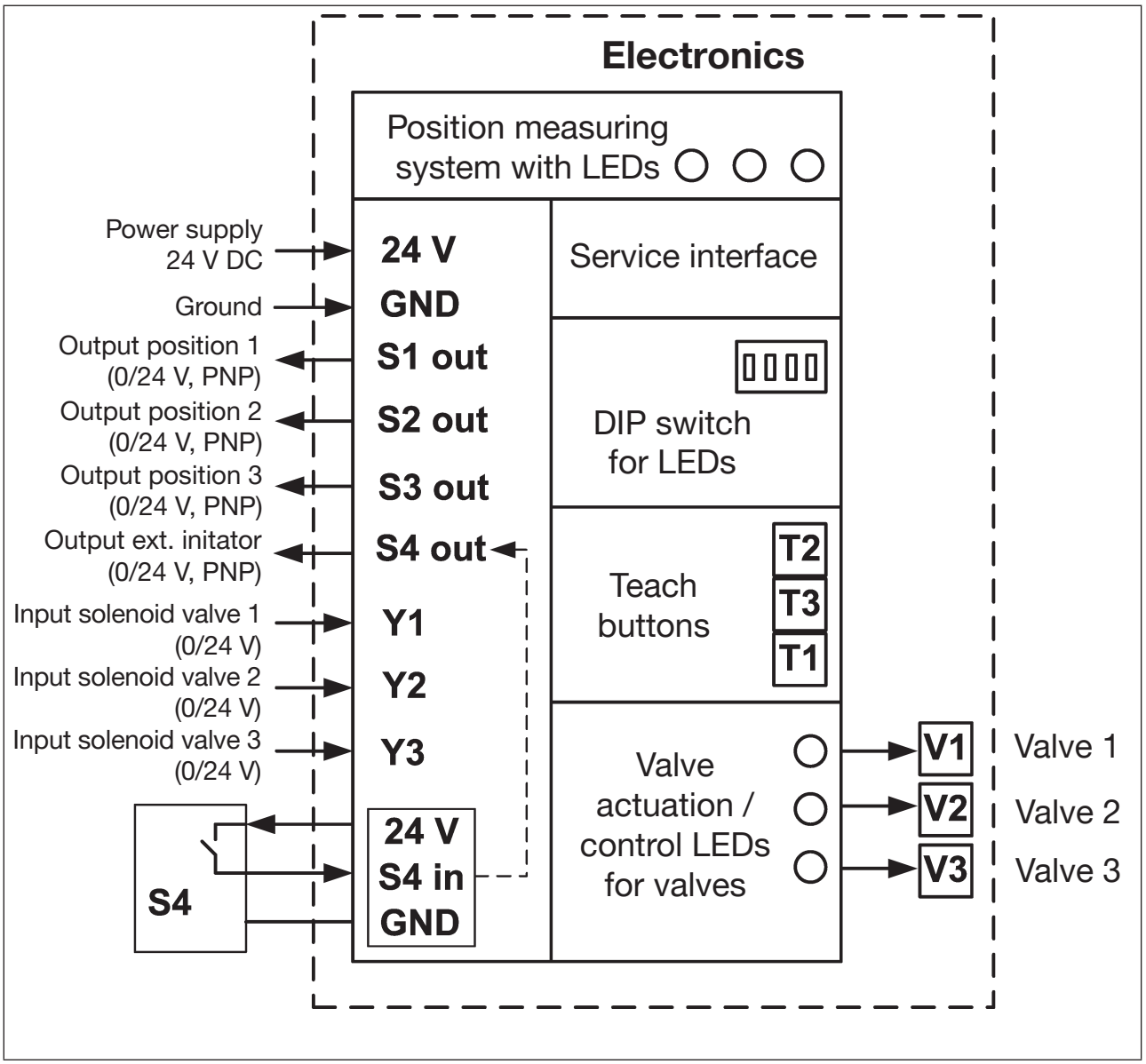


Fig. 16: Circuit diagram 24 V DC

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

10.5.2 Multi-pole connection

Internal cabling work is not required for models with multi-pole connection, which makes installation and start-up on site considerably easier and quicker, reducing the risk of leaks. However, you will require the correspondingly packaged or assembled cable sets with the following pin assignment:

Input and output signals to the higher-level control (PLC):
12-pole circular plug-in connector M12 x 1.0 - male (acc. to IEC 61076-2-101)

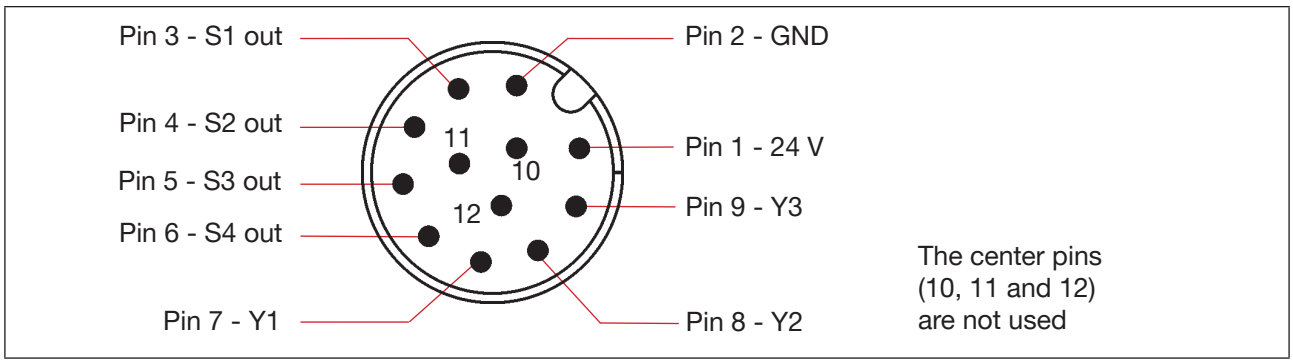


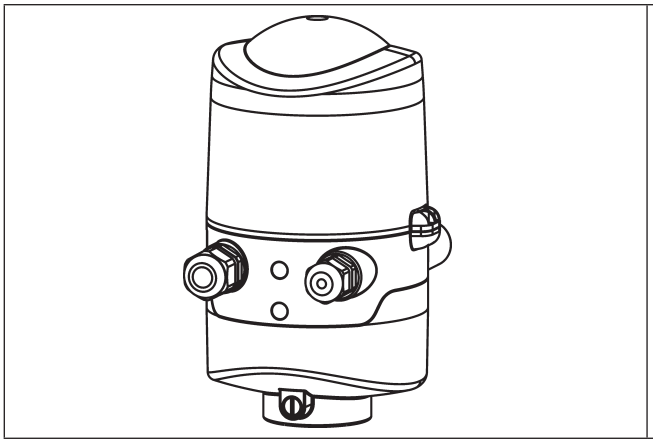
Fig. 17: 12-pole multi-pole connection (view onto the plug pins)

Pin	Designation	Configuration
1	24 V	Power supply 24 V
2	GND	GND
3	S1 out	Output position S1
4	S2 out	Output position S2
5	S3 out	Output position S3
6	S4 out	External initiator output S4
7	Y1	Solenoid valve V1 input
8	Y2	Solenoid valve V2 input
9	Y3	Solenoid valve V3 input
10		Not used
11		Not used
12		Not used

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

11 120 V AC - DESIGN

11.1 Electrical connection options



Cable gland:

Connection left: Voltage, signals

Connection right: external initiator

Fig. 18: Connection concept 120 V AC

11.2 Electrical data

Central power supply: 110 ... 130 V AC, 50/60 Hz

Connections: Cable gland

1 x M16 x 1.5 cable gland/size22 - for power supply and signals
(only for transportation safety devices sealed with dummy plugs, remove these before use!)
for cable diameter 5 ... 10 mm,
for wire cross-sections 0.5 ... 1.5 mm2 ,
including PE connection terminal
(tightening torque of the clamping screws max. 0.5 Nm)

1 x M16 x 1.5 cable gland/size19 - connection option for external initiator (sealed with dummy plug, remove these before use)

Power consumption (standby current): 10 mA at 120 V AC

Solenoid valves:

Max. switching capacity:	1.7 VA (per solenoid valve)
Typ. continuous output:	1.4 VA (per solenoid valve)
Power consumption per solenoid valve:	12 mA at 120 V AC
Operating mode:	Long-term operation (100% ED)

Central display of the switching statuses: 13 mA with a power supply of 120 V AC per illuminated display;
colour switching see chapter “21 LED Colour Assignments”

Outputs/binary feedback signals: S1out - S3out

Design:	Normally open contact, L switching, short-circuit protection via automatically resetting fuse
Switchable output current:	max. 50 mA per feedback signal
Output voltage - active:	≥ (operating voltage - 2 V)
Output voltage - inactive:	max. 1 V in unloaded state

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Feedback signal output: S4 out is directly connected to S4in

Input / proximity switches (external initiator: S4 in):

Power supply:	voltage present at control head UNominal = 120 V AC, 50/60 Hz
Design:	DC 2 and 3-wire, Normally open contact, L-switching
Input current 1-signal:	ISensor < 2 mA

Inputs valve actuation (Y1 - Y3):

Signal level - active:	U > 60 V AC
Signal level - inactive:	U < 20 V AC
Impedance:	> 40 kOhm

11.3 Design aid

Power consumption of the electronics:								
P_{EI}	=	1.2 VA	or	I_{EI}	=	10 mA	at	120 V AC
Power consumption of a valve during activation (200 ms):								
$P_{Valve-ON}$	=	1.7 VA	or	$I_{Valve-ON}$	=	14 mA	at	120 V AC
Power consumption of a valve after reduction:								
P_{Valve}	=	1.4 VA	or	I_{Valve}	=	12 mA	at	120 V AC
Power consumption of an optical position report:								
P_{LED}	=	1.6 VA	or	I_{LED}	=	13 mA	at	120 V AC

Also, if several control head valves were to be opened simultaneously, the switch signal will be sent staggered to the valves. Only **one** valve 1.7 VA will ever be recorded.

Calculation examples:

Example 1: 3 valves are activated simultaneously, one position is reported (status for 200 ms):								
P_{Total}	=	P_{EI}	+	1 x $P_{Valve-ON}$	+	2 x P_{Valve}	+	1 x P_{LED}
7.3 VA	=	1.2 VA	+	1 x 1.7 VA	+	2 x 1.4 VA	+	1 x 1.6 VA
or								
I_{Total}	=	I_{EI}	+	1 x $I_{Valve-ON}$	+	2 x I_{Valve}	+	1 x I_{LED}
61 mA	=	10 mA	+	1 x 14 mA	+	2 x 12 mA	+	1 x 13 mA

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Example 2: 3 valves have been activated simultaneously, one position is reported (persistent state):						
P_{Total}	=	P_{El}	+	3 x P_{Valve}	+	1 x P_{LED}
7.0 VA	=	1.2 VA	+	3 x 1.4 VA	+	1 x 1.6 VA
or						
I_{Total}	=	I_{El}	+	3 x I_{Valve}	+	1 x I_{LED}
59 mA	=	10 mA	+	3 x 12 mA	+	1 x 13 mA

When using an external initiator, its power requirement should be added.

11.4 Safety instructions

DANGER!

Risk of injury due to electric shock (110 ... 130 V AC)!

- Before reaching into the system (except for the Teach procedure in a non-explosive atmosphere) switch off the power supply and secure it to prevent restarting!
- Observe applicable accident prevention and safety regulations for electrical equipment!
- When setting the position measuring system (Teach procedure), do not contact any live components!

Risk of electric shock if the PE connection is not connected!

- the PE connection must be connected!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- Opening the hood or the housing in a potentially explosive atmosphere is only allowed in a not energised state!

WARNING!

Risk of injury from improper installation!

- Installation may be carried out by trained technicians only and with the appropriate tools!

Risk of injury from unintentional activation of the system and uncontrolled restart!

- Secure system against unintentional activation.
- Following installation, ensure a controlled restart.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

11.5 Electrical installation / start-up

DANGER!

Risk of injury due to electric shock (110 ... 130 V AC)!

- Before reaching into the system (except for the Teach procedure in a non-explosive atmosphere) switch off the power supply and secure it to prevent restarting!
- Observe applicable accident prevention and safety regulations for electrical equipment!
- When setting the position measuring system (Teach procedure), do not contact any live components!

Procedure:

→ Open the housing following the instructions in chapter “8 Opening and Closing the Housing”.

→ Assemble connection cables for signals and power supply as well as for the external initiator where necessary in observance of the rules of technology.

→ Insert cables through the respective cable glands into the interior of the housing.

→ Connect the wires to the connection terminals according to the connection configuration described in “Fig. 19: 120 V AC electronic module”. If required, secure the cable with a cable clip.

DANGER!

Risk of electric shock if the PE connection is not connected!

- the PE connection must be connected!

→ Clamp the protective conductor to the PE connection.

→ Check correct grounding.

→ Close the housing following the instructions in chapter “8 Opening and Closing the Housing”.

NOTE!

Ensure IP protection!

- To ensure IP protection, the union nuts of the cable glands must be tightened in accordance with the cable sizes or dummy plugs used (approx. 1.5 Nm).
- If no external initiator is used, the right-hand connection opening must be tightly sealed using a dummy plug or using a cable gland (SW 19, Ø 3 - 6 mm) + dummy plug (Ø 5 - 6 mm)!

NOTE!

Use of the control head in a potentially explosive atmosphere

- Only use cables and cable glands which are approved for the respective application area and fit the cable glands according to the respective operating instructions!
- Close all unnecessary openings with lock screws/plugs approved for explosions area!

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

120 V AC Electronic module, terminal strip configuration:

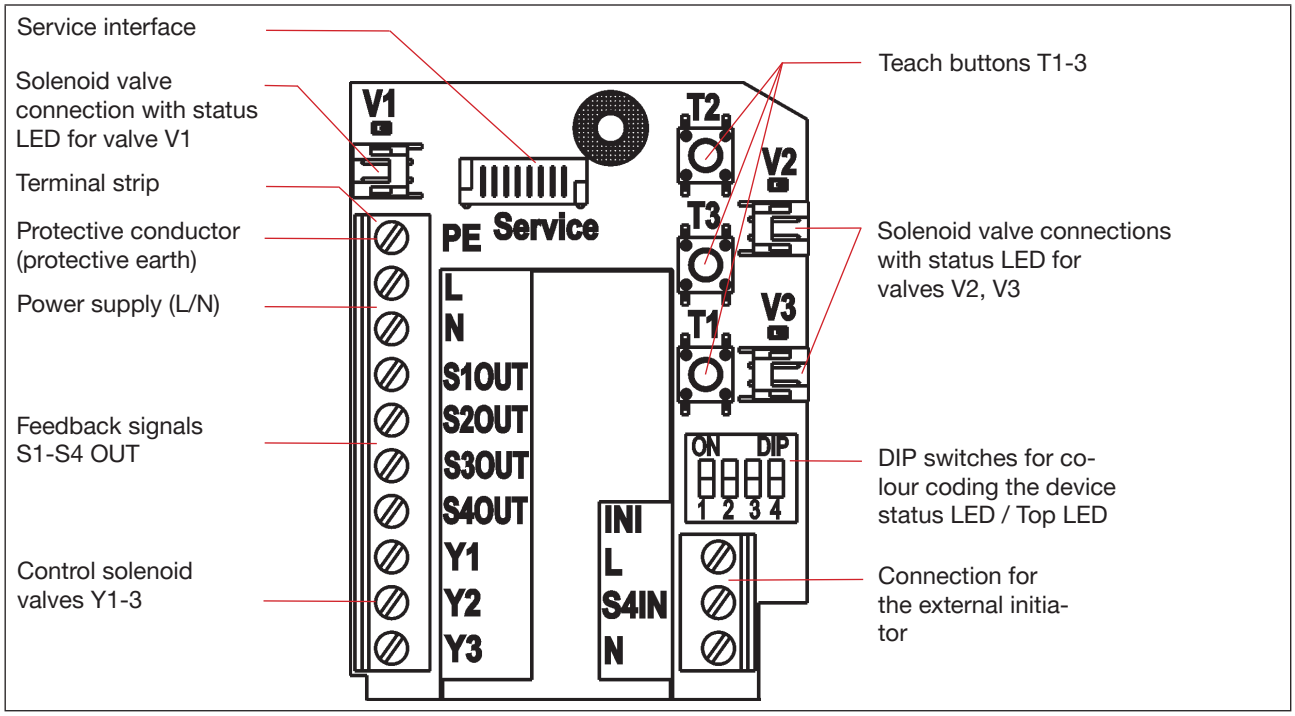


Fig. 19: 120 V AC electronic module

Designation Terminal strip	Configuration	
PE	Protective conductor - Protective Earth	
L	Conductor	Power
N	Neutral conductor	supply 120 V AC
S1 OUT	Output position S1	
S2 OUT	Output position S2	
S3 OUT	Output position S3	
S4 OUT	External initiator output S4	
Y1	Solenoid valve V1 input	
Y2	Solenoid valve V2 input	
Y3	Solenoid valve V3 input	

Designation Terminal strip	Configuration for external initiator
L	Power supply - conductor
S4 IN	External initiator input
N	Power supply - neutral conductor

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Circuit diagram 120 V AC:

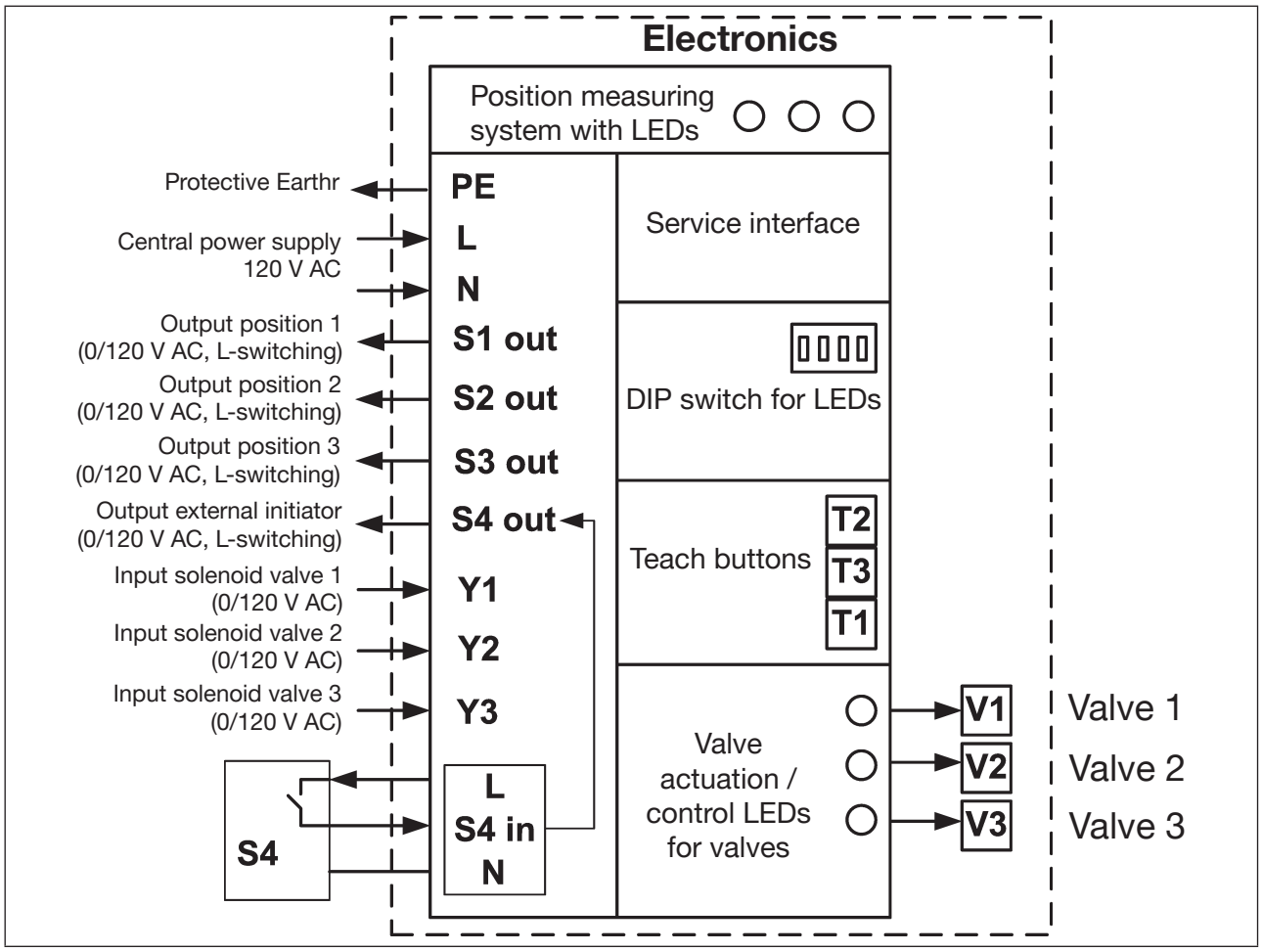


Fig. 20: Circuit diagram 120 V AC

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

12 AS INTERFACE - DESIGN

12.1 Definition

AS interface connection

AS interface (Actuator Sensor Interface) is a field bus system which is used primarily for networking binary sensors and actuators (slaves) with a higher-level control (master).

Connecting the control heads to higher bus systems is possible using commercially available gateways. Contact your distribution partner in this regard.

Bus line

Unshielded two-wire line (AS interface line as AS interface cable harness) along which both information (data) and energy (power supply for the actuators and sensors) are transmitted.

Network topology

Freely selectable within wide limits, i.e. star, tree and line networks are possible. Further details are described in the AS interface specification (A/B slave model complies with the version 3.0 specification).

Consider the maximum total length of the bus cable - see chapter “12.4” on page 55.

The control heads have been configured as AS interface version with an extended address range (A/B slaves) for 62 slaves or optionally as an AS interface version for 31 slaves. For details, see chapter “12.9 Programming data”.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

12.2 Electrical connection options for AS interface

The following connection concepts are available for the electrical connection of the control head:

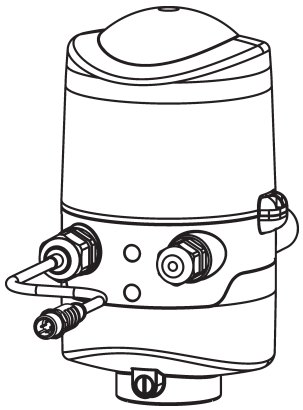
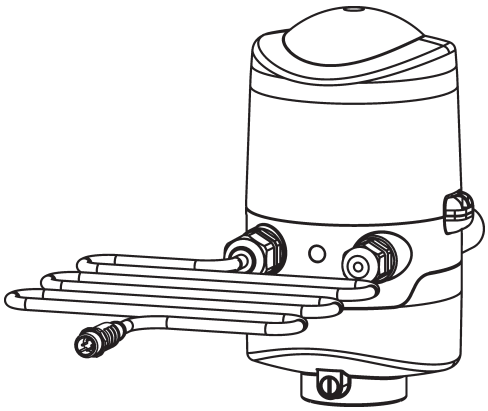
	
Cable gland **with multi-pole connection** (M12 plug according to IEC 61076-2-101, 4-pole), cable length approx. 15 cm	Cable gland **with multi-pole connection** (M12 plug according to IEC 61076-2-101, 4-pole), cable length approx. 80 cm
Connection left: AS interface Connection right: external initiator	Connection left: AS interface Connection right: external initiator

Fig. 21: AS interface connection concepts

12.3 Number of connectable control heads

The level of expansion that is actually possible depends on the total number of all individual operating currents for each control head, which are supplied via the bus at the common AS interface bus segment (see chapter “12.6 Design aid”).

Standard: AS interface/62 slaves
(AS interface version with extended addressing range (A/B slave))
In AS interface versions with extended addressing range (A/B slave), 1 master can communicate with 62 slaves.

Option: AS interface/31 slaves
(AS interface version with 31 slave addressing range)
In this case, a maximum of 31 control heads can be connected to a bus line (address range restriction).

12.4 Maximum length of the bus line

The bus cable may be a maximum of 100 m long. All AS interface lines of an AS interface string must be considered for the design, i.e. even the drop lines to the individual slaves and the cabling inside the control head.

When designing the system, the **calculated line length of the cable at the control head must be either 0.3 or 1 m** (see the following „Table 2“). This takes into account the outer and inner cable lengths (see also the following example calculation).

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Model	Calculated line length (including internal cabling)
Multi-pole, outer cable length approx. 15 cm	0.3 m
Multi-pole, outer cable length approx. 80 cm	1.0 m

Table 2: Calculated line length of the control head versions (cable length inside and outside)

Example calculation line length:

for multi-pole connection with approx. 15 cm outer cable length :
When using 62 control heads, the AS interface cable harness may still be (100 m - 62 * 0.3 m) = 81.4 m long.

If the calculated maximum line length of 100 m were to be exceeded, a commercially available AS interface repeater may be used, as needed.

Observe maximum power supply via certified AS interface power supply units ≤ 8 A!
For details see AS interface specification.

Observe the optional design "AS Interface with External Power Supply" to reduce the load on the AS interface bus segment! (see chapters “12.5” and “12.8”)

Use cables according to the AS interface specification.
If other cables are used, the maximum cable length will change.

12.5 Electrical data

Comments / notes:

Outputs (from master perspective):	0 to 3 solenoid valves
Inputs (from master perspective):	3 binary feedback signals and 1 external initiator
Watchdog:	If bus communication fails for more than 50 to 100 ms, the outputs are set to 0

Setting the solenoid valves' power supply using jumpers on the AS interface electronic module:

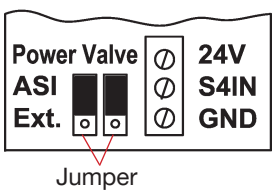
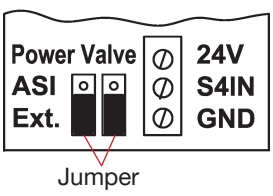
Power supply via AS interface	External power supply (connection see chapter “12.8”)
	

Fig. 22: Jumper settings for power supply via AS interface or for external power supply

The control head Type 8681 was developed according to the Complete Specification (V.3.0) and the Profile S-7.A.E and S-7.F.F of the AS International Association.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Connections:

Multi-pole connection version:	1 x M16 x 1.5 cable gland / size19 with multi-pole connection (M12 plug according to IEC 61076-2-101, 4-pole) for power supply and signals, cable length approx. 15 cm or approx. 80 cm
	1 x M16 x 1.5 cable gland/size19 - connection option for external initiator (sealed with dummy plug, remove these before use)
Power supply:	29.5 ... 31.6 V DC (according to specification) 21.0 ... 31.6 V DC (according to specification Power24)

Input / proximity switches (external initiator: S4 in):

Power supply:	AS interface voltage present at control head - 10%
Current carrying capacity, sensor power supply:	max. 30 mA
Short-circuit protection design:	DC 2- and 3-conductor, NO or NC (factory setting NO), PNP output
Input current 1 signal:	ISensor > 6.5 mA, limited internally to 10 mA
Input voltage 1 signal:	USensor > 10 V
Input current 0 signal:	ISensor < 4 mA
Input voltage 0 signal:	USensor < 5 V

Inputs (from master perspective) / binary feedback signals:
The recovery of the 3 valve positions reported back in binary format is described in chapter “20” on page 130.

Outputs (from master perspective) / solenoid valves:

Typ. switching capacity:	0.9 W (per solenoid valve, for 200 ms after switching on)
Typ. continuous output:	0.6 W (per solenoid valve, from 200 ms after switching on)
Watchdog function:	integrated
Output reduction:	via AS interface - electronics integrated
Typ. Pull-in current (per sol. valve):	30 mA or 0.9 W/200 ms (at 30.5 V AS-i voltage)
Typ. Holding current (per sol. valve):	20 mA or 0.6 W (at 30.5 V AS-i voltage)
Operating mode:	Long-term operation (100% ED)
Valve type:	Type 6524

Central display of the switching statuses:

Power consumption from AS interface at 30.5 V AS interface voltage:	approx. 33 mA or 1 W per illuminated display
Number of representable colours:	2 colours for process valve switching statuses 1 colour for signaling a fault For "universal colour switching" see chapter ”21 LED Colour Assignments”.

Power supply via AS interface bus (without external power supply):

Max. power consumption from AS-i:	<160 mA
Power consumption during normal operation from the AS-i (after current reduction):	<150 mA 3 valves activated, 1 position reported back by LED display, no external initiator
Integrated short-circuit protection	

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

NOTE!

If all 3 solenoid valves are simultaneously controlled via the AS interface, the electronics will activate the valves sequentially with a 200 ms time delay to protect the bus from overloads.

External power supply for solenoid valves:

External power supply:	19.2 V DC to 31.6 V DC The power supply unit must include a secure disconnect in accordance with IEC 60364-4-41. It must conform to the SELV standard. The ground potential must not have a ground connection.
Power consumption from external power supply for outputs (solenoid valves) - without integrated current limiting:	<110 mA at 24 V DC (for 200 ms after switching on of the 3.rd valve)
Power consumption from AS-i for inputs and display:	<150 mA (incl. external initiator, feedback and fault display)
Integrated short-circuit protection	

Please consider the following information to power requirement and to the maximum expansion stage of the AS interface network in chapter "12.3 Number of connectable control heads" and in the AS interface specifications, where applicable.

12.6 Design aid

Design aid for supply of the valves via the AS-i bus

Power consumption of the electronics:								
P_{EI}	=	1.0 W	or	I_{EI}	=	33 mA	at	30.5 V
Power consumption of a valve during activation (200 ms):								
$P_{Valve-ON}$	=	0.9 W	or	$I_{Valve-ON}$	=	30 mA	at	30.5 V
Power consumption of a valve after reduction:								
P_{Valve}	=	0.6 W	or	I_{Valve}	=	20 mA	at	30.5 V
Power consumption of an optical position report:								
P_{LED}	=	1.0 W	or	I_{LED}	=	33 mA	at	30.5 V

For the design of the **maximum line lengths** observe chapter "12.4 Maximum length of the bus line".

Even if several control head valves are switched simultaneously via the bus, the switching signal is passed on to the valves in staggered order, i.e. only **one** valve is ever taken up 0.9 W.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Calculation examples:

Example 1: 3 valves are activated “simultaneously”, one position is reported (status for 200 ms):								
P_{Slave}	=	P_{EI}	+	1 x $P_{Valve-ON}$	+	2 x P_{Valve}	+	1 x P_{LED}
4.1 W	=	1.0 W	+	1 x 0.9 W	+	2 x 0.6 W	+	1 x 1.0 W
or								
I_{Slave}	=	I_{EI}	+	1 x $I_{Valve-ON}$	+	2 x I_{Valve}	+	1 x I_{LED}
136 mA	=	33 mA	+	1 x 30 mA	+	2 x 20 mA	+	1 x 33 mA

Example 2: 3 valves have been activated “simultaneously”, one position is reported (persistent state):						
P_{Slave}	=	P_{EI}	+	3 x P_{Valve}	+	1 x P_{LED}
3.8 W	=	1.0 W	+	3 x 0.6 W	+	1 x 1.0 W
or						
I_{Slave}	=	I_{EI}	+	3 x I_{Valve}	+	1 x I_{LED}
126 mA	=	33 mA	+	3 x 20 mA	+	1 x 33 mA

When using an external initiator, its power requirement should be added.

12.7 Safety instructions

DANGER!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- Opening the hood or the housing in a potentially explosive atmosphere is only allowed in a not energised state!

WARNING!

Risk of injury due to electric shock!

- Before reaching into the system (except for the Teach procedure in a non-explosive atmosphere) switch off the power supply and secure it to prevent restarting!
- Observe applicable accident prevention and safety regulations for electrical equipment!

Risk of injury from improper installation!

- Installation may be carried out by trained technicians only and with the appropriate tools!

Risk of injury from unintentional activation of the system and uncontrolled restart!

- Secure system against unintentional activation.
- Following installation, ensure a controlled restart.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

12.8 Electrical installation of the AS interface

Internal cabling work is not required for any of the AS Interface designs with multi-pole connection, which makes installation and start-up on site considerably easier and quicker, reducing the risk of leaks.

However, you will require the correspondingly assembled cable sets with the following pin assignments. Likewise, the jumpers on the electronic module must be set correspondingly (see figures below).

NOTE!

Use of the control head in a potentially explosive atmosphere

- Only use cables and cable glands which are approved for the respective application area and fit the cable glands according to the respective operating instructions!
- Close all unnecessary openings with lock screws/plugs approved for explosions area!

Bus connection for AS interface (power supply for solenoid valves via bus or external power supply) M12 x 1 circular plug, 4-pole, male (according to IEC 61076-2-101)

(view of the M12 plug, from the front onto the pins)

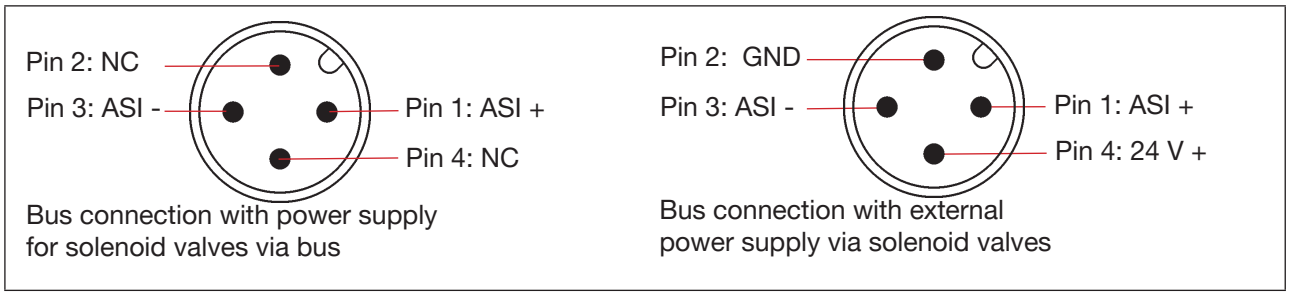


Fig. 23: AS interface bus connection (power supply for solenoid valves via bus or external power supply)

Pin	Configuration (supply via bus)	Configuration (external power supply)	Wire colour
1	AS interface - ASI+	AS interface - ASI +	brown
2	Not used	GND	white
3	AS interface - ASI –	AS interface - ASI –	blue
4	Not used	24 V +	black

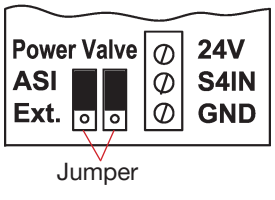
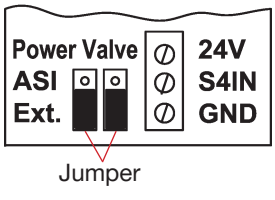
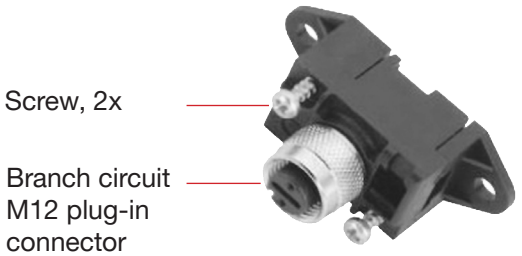
Power supply of the solenoid valves via the bus	External power supply of the solenoid valves
	

Fig. 24: Jumper setting on AS-i electronic module: Power supply to the solenoid valves via the bus or externally

The cable with multi-pole connection variant is especially suited for direct and flexible connection to the AS interface cable harness using the ribbon cable terminal (M12 branch circuit, VA branch circuit) that is optionally available.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

The optional ribbon cable terminal contacts the AS interface cable harness by means of penetration technology which allows installation by "clipping in" the AS interface cable harness without cutting and without removing insulation.



Procedure:

→ Open the ribbon cable terminal
(loosen screws and remove cover)

→ Insert cable harness

→ Close ribbon cable terminal again

→ Tighten the screws
Loosen the thread-forming screws slightly and position them on the existing threaded hole and screw in.

Fig. 25: Optional ribbon cable terminal for AS interface cable harness

AS interface electronic module - LED status displays:

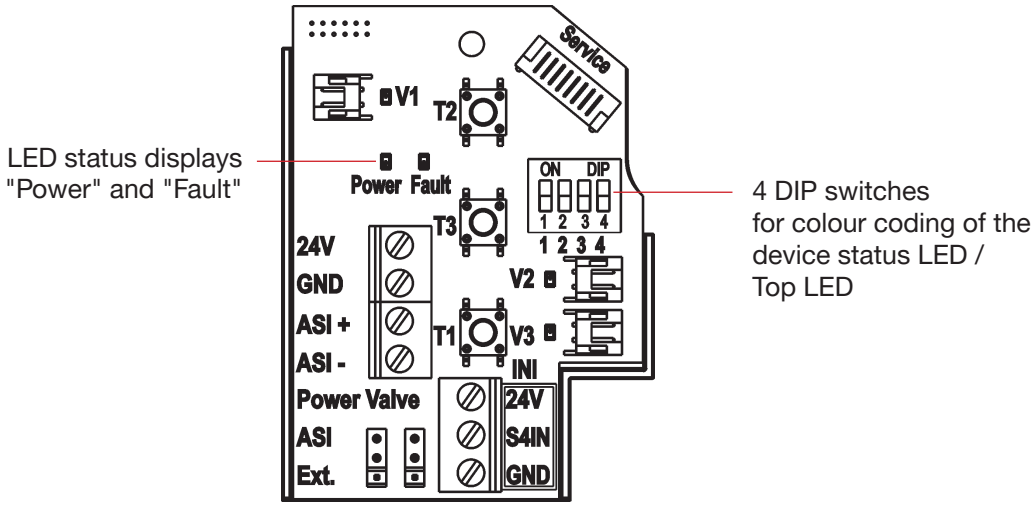


Fig. 26: LED status displays on the AS-i electronic module

LED 1 "Power" (green)	LED 2 "Fault" (red)	signalised status
off	off	Power OFF
on	off	OK
on	on	No data traffic (expired Watchdog at slave address does not equal 0)
flashing	on	Slave address = 0
flashing	flashing	Sensor supply overload / manual actuation activated / “untaught” / service/maintenance request / PC service program service mode

The central multi-colour status display (device status LED / Top LED) flashes also in the fault colour (see chapter “21.2 Flashing pattern & fault signalling” on page 144), if the status LED 2 “Fault” on the electronic module is active.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

12.9 Programming data

The control heads have been configured as AS interface version with an extended address range (A/B slaves) for 62 slaves or optionally as an AS interface version for 31 slaves.

A change between both control head configurations (for 62 slaves or 31 slaves) is only possible by exchanging the electronic PCB!

If one control head is replaced with another control head having a different configuration in the AS interface field bus system (e.g. AS interface version 62 slaves (A/B-Slave) to replace a device with AS interface version 31 slaves), a configuration error will be generated at the master due to the different ID codes!

In this case (intentional replacement!), the current configuration must be re-programmed in the AS interface master. Please read the operating instructions of the used AS interface master!

AS-i address factory setting:

AS-i address = 0

Programming data table:

	Programming data for 62 slaves AS interface - Device for A/B slave addressing (default device)	**Programming data for 31 slaves** AS interface (optional)
I/O configuration	7 hex (4 inputs / 4 outputs) see below: Bit configuration table	7 hex (4 inputs / 4 outputs) see below: Bit configuration table
ID code	A hex	F hex
Extended ID code 1	7 hex	(F hex)
Extended ID code 2	E hex	(F hex)
Profile	S-7. A.E	S-7. F.F

Bit configuration table:

Data bit	**D3**	**D2**	**D1**	**D0**
Input	External initiator S4	Position S3	Position S2	Position S1
Output	Not used	Solenoid valve V3	Solenoid valve V2	Solenoid valve V1
Parameter bit	**P3**	**P2**	**P1**	**P0**
Output	Not used	Not used	Not used	Not used

Compare also the bit configuration for the design “19.2 Control head (AS-i) with 2 external initiators” on page 129.

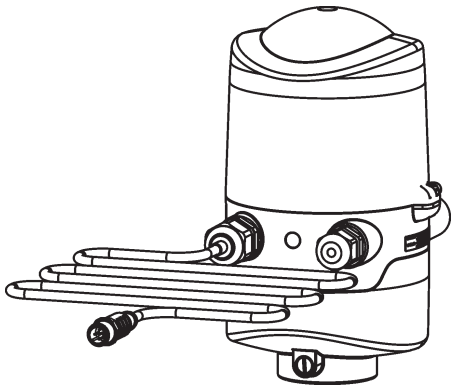
MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

13 DEVICENET - DESIGN

13.1 Definition

- The DeviceNet is a field bus system which is based on the CAN protocol (Controller Area Network). It enables actuators and sensors (slaves) to be networked with higher-level controllers (master).
- The control head in the DeviceNet is a slave device according to the Predefined Master/Slave Connection Set stipulated in the DeviceNet specification. Polled I/O, Bit Strobed I/O and Change of Status (COS) are supported as I/O connection variants.
- With DeviceNet it is necessary to differentiate between cyclical or event-driven high-priority process messages (I/O Messages) and acyclical low-priority management messages (Explicit Messages).
- The protocol process conforms to the DeviceNet specification Release April 2010.

13.2 Electrical connection option



Cable gland with multi-pole connection
(M12 plug according to IEC 61076-2-101, 5-pole), cable length approx. 80 cm

Connection left: Voltage, signals

Connection right: external initiator

Fig. 27: Connection concept DeviceNet

13.3 DeviceNet specification

EDS file:	8681.EDS
Icons:	8681.ICO
Baud rate:	125 kBit/s, 250 kBit/s, 500 kBit/s (can be adjusted using DIP switches 7, 8); factory setting: 125 kBit/s (see chapter “13.10.2 Setting the baud rate”)
Address:	0 ... 63 (via DIP switches 1 ... 6 adjustable); factory setting: 63 (see chapter “13.10.1 Settings of the DeviceNet address”)
Process data:	2 static input assemblies (Input: from control head to DeviceNet master/scanner) 1 static output assembly (Output: from DeviceNet master/scanner to control head)

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Inputs:	3 discrete feedback signals from the position measuring system (positions S1 - S3) 1 discrete feedback signal from the external initiator (S4) 1 analog position signal in mm supply via DeviceNet string (11 ... 25 V DC) Switch level high signal ≥ 5 V Switch level low signal ≤ 1.5 V
Outputs:	3 solenoid valves
Power consumption from the bus:	max. output 5 W, if all valves are switched (3 x type 6524 with 0.6 W each)

13.3.1 Total line length and maximum line length according to DeviceNet specification

The bus line is a 4-core cable with additional shielding which must conform to the DeviceNet specification. The cable transmits both information (data) and energy (power supply for low-power actuators and sensors).

The maximum total line length (sum of trunk lines and drop lines) of a network depends on the baud rate.

When designing the system, the **calculated line length of the cable at the control head must be 1 m** - this takes into account the outer and inner cable lengths.

Baud rate	Maximum total line length*		
	Thick Cable**	Mid Cable**	Thin Cable**
125 kBit/s	500 m	300 m	100 m for all baud rates
250 kBit/s	250 m	250 m	
500 kBit/s	100 m	100 m	

* *According to DeviceNet specification. If a different cable type is used, lower maximum values apply.*
** *For cable designation and details - see DeviceNet specification.*

13.3.2 Drop line length

Baud rate	Length of the drop lines	
	Maximum length	Maximum total length of all drop lines in the network
125 kBit/s	6 m for all baud rates	156 m
250 kBit/s		78 m
500 kBit/s		39 m

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

13.4 Electrical data

Connections:

"Multi-pole":	1 x M16 x 1.5 cable gland / size22 with multi-pole connection (M12 plug according to IEC 61076-2-101, 5-pole) for DeviceNet bus and power supply, cable length approx. 80 cm
	1 x M16 x 1.5 cable gland/size19 - connection option for external initiator (sealed with dummy plug, remove these before use)

Power supply: 11 … 25 V DC (according to specification)

Max. power consumption: <200 mA at 24 V DC (200 ms after switching on of the valves)

Input / proximity switches (external initiator: S4 in):

Power supply:	via DeviceNet power supply - 10%
Current carrying capacity sensor supply:	max. 30 mA
Short-circuit protection	
Design:	DC 2- and 3-wire, Normally open contact, PNP output
Input current 1 signal:	I_{Sensor} > 6.5 mA, limited internally to 10 mA
Input voltage 1 signal:	U_{Sensor} > 10 V
Input current 0 signal:	I_{Sensor} < 4 mA
Input voltage 0 signal:	U_{Sensor} < 5 V

Inputs (from master perspective) / binary or analog feedback signals:
The recovery of the 3 valve positions reported back in binary format or the analog position signal is described in chapter “20 Position Measuring System” on page 130.

Outputs (from master perspective) / solenoid valves:

Typ. switching capacity:	0.9 W (per solenoid valve, for 200 ms after switching on)
Typ. continuous output:	0.6 W (per solenoid valve, from 200 ms after switching on)
Power consumption per solenoid valve:	50 mA at 12 V DC 25 mA at 24 V DC 22 mA at 28 V DC
Operating mode:	Long-term operation (100% ED)
Valve types:	6524

Central display of the switching statuses:

Power consumption from DeviceNet at 24 V DC:	approx. 42 mA with a power supply of 24 V DC per illuminated display; colour switching see chapter “21 LED Colour Assignments” on page 137

13.5 Safety position if the bus fails

If the bus fails, the solenoid valve is switched to a programmable safety position (default: solenoid valve not energised). For configuration data see chapter “13.12.1 Configuration of the safety position of solenoid valves during a bus error”.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

13.6 Design aid

Power consumption of the electronics:								
P_{EI}	=	1.44 W	or	I_{EI}	=	60 mA	at	24 V
Power consumption of a valve during activation (200 ms):								
$P_{Valve-ON}$	=	0.9 W	or	$I_{Valve-ON}$	=	38 mA	at	24 V
Power consumption of a valve after reduction:								
P_{Valve}	=	0.6 W	or	I_{Valve}	=	25 mA	at	24 V
Power consumption of an optical position report:								
P_{LED}	=	1.0 W	or	I_{LED}	=	42 mA	at	24 V

Calculation examples:

Example 1:
3 valves are activated simultaneously, one position is reported (status for 200 ms):

P_{Total}	=	P_{EI}	+	3 x $P_{Valve-ON}$	+	1 x P_{LED}
5.14 W	=	1.44 W	+	3 x 0.9 W	+	1 x 1.0 W
or						
I_{Total}	=	I_{EI}	+	3 x $I_{Valve-ON}$	+	1 x I_{LED}
216 mA	=	60 mA	+	3 x 38 mA	+	1 x 42 mA

Example 2:
3 valves have been activated simultaneously, one position is reported (persistent state):

P_{Total}	=	P_{EI}	+	3 x P_{Valve}	+	1 x P_{LED}
4.24 W	=	1.44 W	+	3 x 0.6 W	+	1 x 1.0 W
or						
I_{Total}	=	I_{EI}	+	3 x I_{Valve}	+	1 x I_{LED}
177 mA	=	60 mA	+	3 x 25 mA	+	1 x 42 mA

When using an external initiator, its power requirement should be added.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

13.7 Safety instructions

DANGER!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- Opening the hood or the housing in a potentially explosive atmosphere is only allowed in a not energised state!

WARNING!

Risk of injury due to electric shock!

- Before reaching into the system (except for the Teach procedure in a non-explosive atmosphere) switch off the power supply and secure it to prevent restarting!
- Observe applicable accident prevention and safety regulations for electrical equipment!
- When setting the position measuring system (Teach procedure), do not contact any live components!

Risk of injury from improper installation!

- Installation may be carried out by trained technicians only and with the appropriate tools!

Risk of injury from unintentional activation of the system and uncontrolled restart!

- Secure system against unintentional activation.
- Following installation, ensure a controlled restart.

13.8 Electrical installation - DeviceNet

No internal cabling work is required for any of the DeviceNet designs (cable with multi-pole connection), which makes installation and start-up on site considerably easier and quicker, reducing the risk of leaks. However, you will require the correspondingly assembled cable sets with the pin assignments described below. The configuration conforms to the DeviceNet specification.

Multi-pole connection DeviceNet

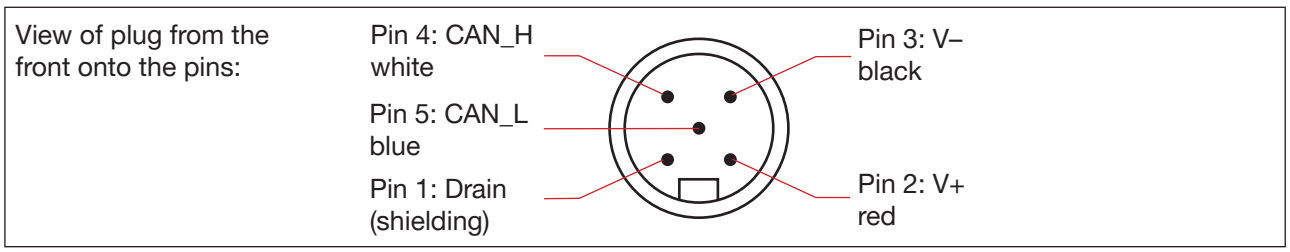


Fig. 28: Bus connection of DeviceNet with power supply

Pin	1	2	3	4	5
Signal	Shielding	V +	V –	CAN_H	CAN_L
Wire colour		red	black	white	blue

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

DeviceNet electronic module:

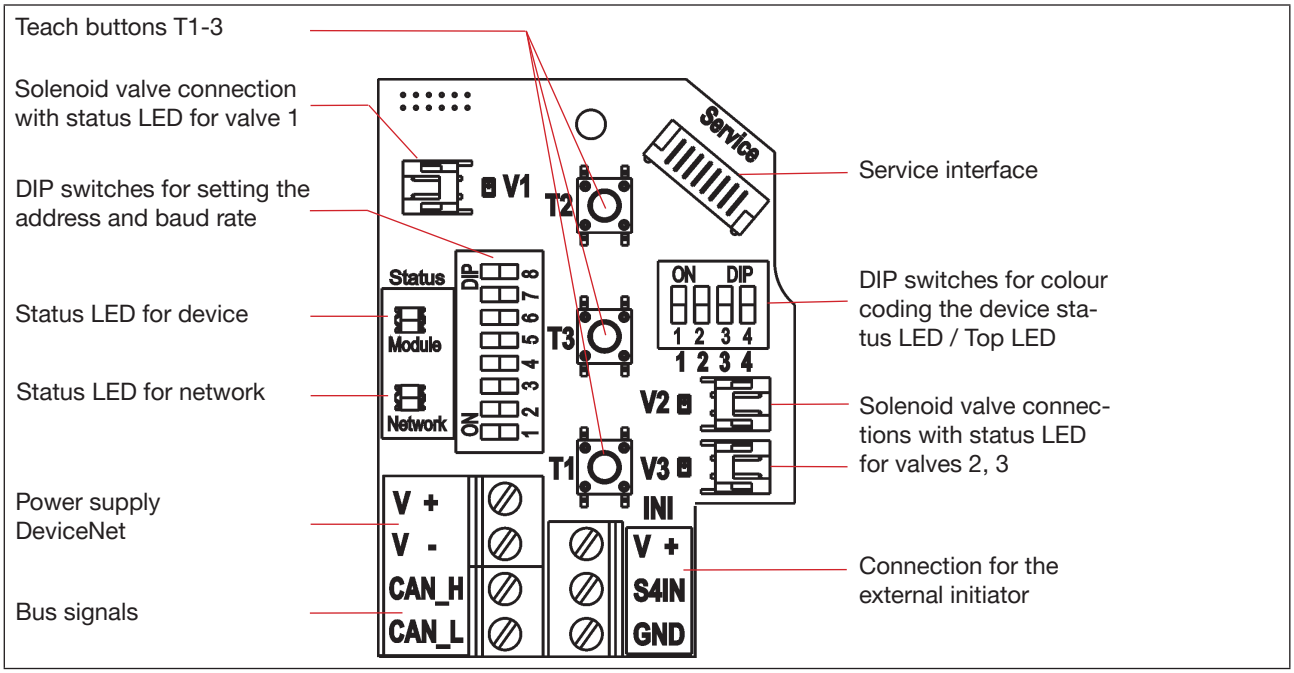


Fig. 29: DeviceNet electronic module

Terminal strip configuration:

Designation Terminal strip	Configuration
V+	Power supply DeviceNet
V-	Power supply DeviceNet
CAN_H	Bus signal CAN high
CAN_L	Bus signal CAN low

Designation Terminal strip	Configuration
V +	Power supply for external initiator
S4 IN	External initiator input
GND	GND external initiator

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

13.9 Network topology of a DeviceNet system

When installing a DeviceNet system, ensure that the terminating circuit of the data lines is correct. The circuit prevents the occurrence of interference caused by signals reflected onto the data lines.

The trunk line must be terminated at both ends with resistors of 120 Ω and 1/4 W power loss (see “Fig. 30: Network topology”).

“Fig. 30” illustrates a line with one trunk line and several drop lines. Trunk lines and drop lines consist of identical material.

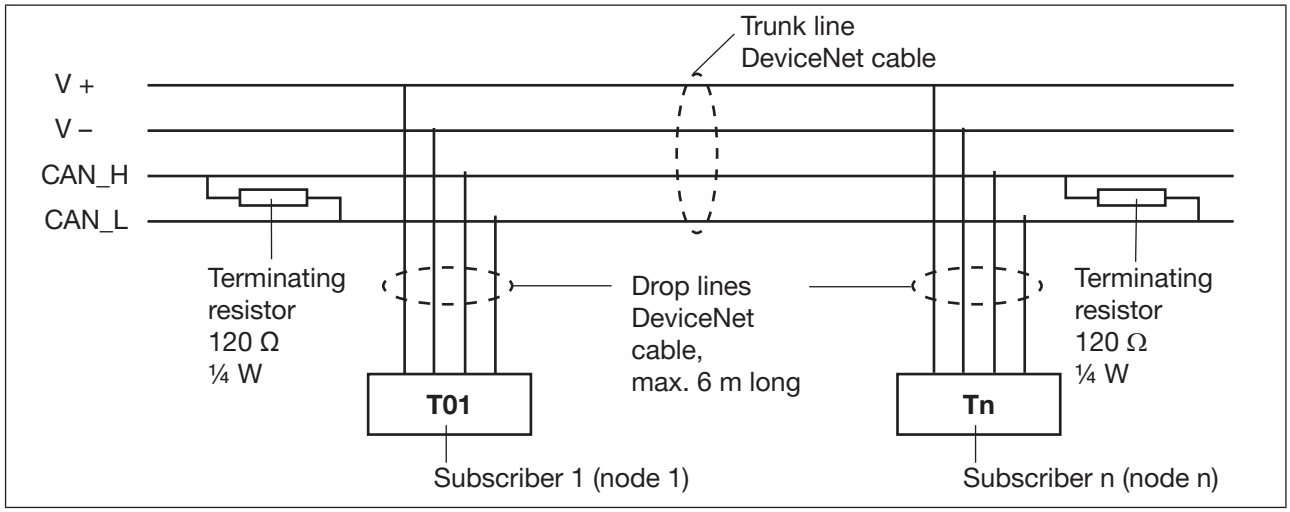


Fig. 30: Network topology

13.10 Configuring the DeviceNet address / baud rate

8 DIP switches are available for configuration:

- DIP switches 1 to 6 for the DeviceNet address
- DIP switches 7 to 8 for the baud rate

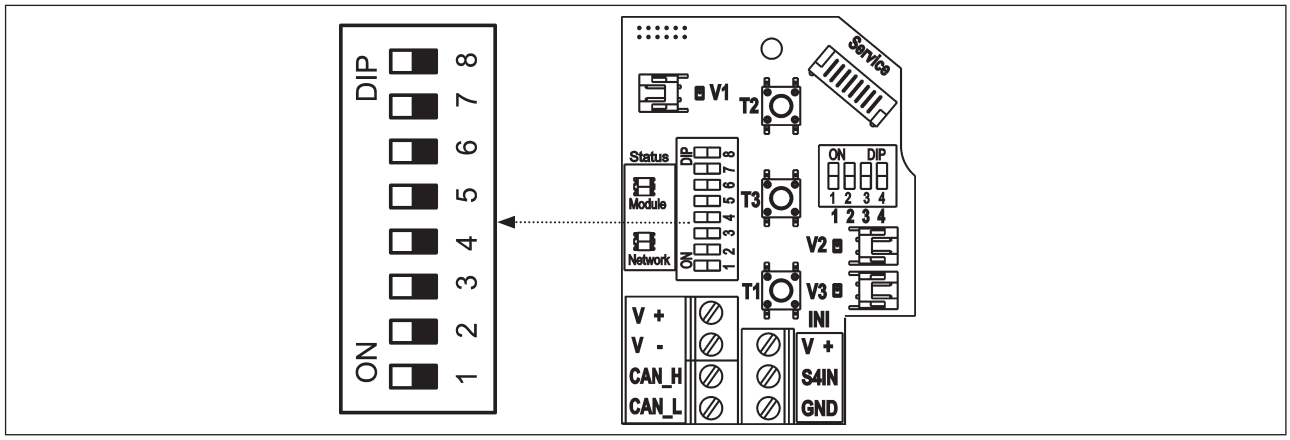


Fig. 31: Position of the DIP switches for baud rate and addressing

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

13.10.1 Settings of the DeviceNet address

MAC ID address = Medium Access Control Identifier Address

MAC ID address = [DIP 1 · 2^0 + DIP 2 · 2^1 + DIP 3 · 2^2 + DIP 4 · 2^3 + DIP 5 · 2^4 + DIP 6 · 2^5]

with DIP x = off = 0 and DIP x = on =1

Table of the settings of the DeviceNet address:

MAC ID	DIP1	DIP2	DIP3	DIP4	DIP5	DIP6
0	off	off	off	off	off	off
1	on	off	off	off	off	off
2	off	on	off	off	off	off
3	on	on	off	off	off	off
4	off	off	on	off	off	off
5	on	off	on	off	off	off
6	off	on	on	off	off	off
7	on	on	on	off	off	off
8	off	off	off	on	off	off
9	on	off	off	on	off	off
10	off	on	off	on	off	off
11	on	on	off	on	off	off
12	off	off	on	on	off	off
13	on	off	on	on	off	off
14	off	on	on	on	off	off
15	on	on	on	on	off	off
16	off	off	off	off	on	off
17	on	off	off	off	on	off
18	off	on	off	off	on	off
19	on	on	off	off	on	off
20	off	off	on	off	on	off
21	on	off	on	off	on	off
22	off	on	on	off	on	off
23	on	on	on	off	on	off
24	off	off	off	on	on	off
25	on	off	off	on	on	off
26	off	on	off	on	on	off
27	on	on	off	on	on	off
28	off	off	on	on	on	off
29	on	off	on	on	on	off
30	off	on	on	on	on	off
31	on	on	on	on	on	off

MAC ID	DIP1	DIP2	DIP3	DIP4	DIP5	DIP6
32	off	off	off	off	off	on
33	on	off	off	off	off	on
34	off	on	off	off	off	on
35	on	on	off	off	off	on
36	off	off	on	off	off	on
37	on	off	on	off	off	on
38	off	on	on	off	off	on
39	on	on	on	off	off	on
40	off	off	off	on	off	on
41	on	off	off	on	off	on
42	off	on	off	on	off	on
43	on	on	off	on	off	on
44	off	off	on	on	off	on
45	on	off	on	on	off	on
46	off	on	on	on	off	on
47	on	on	on	on	off	on
48	off	off	off	off	on	on
49	on	off	off	off	on	on
50	off	on	off	off	on	on
51	on	on	off	off	on	on
52	off	off	on	off	on	on
53	on	off	on	off	on	on
54	off	on	on	off	on	on
55	on	on	on	off	on	on
56	off	off	off	on	on	on
57	on	off	off	on	on	on
58	off	on	off	on	on	on
59	on	on	off	on	on	on
60	off	off	on	on	on	on
61	on	off	on	on	on	on
62	off	on	on	on	on	on
63	on	on	on	on	on	on

Table 3: Settings of the DeviceNet address via DIP switches

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

13.10.2 Setting the baud rate

Adjustment of the control head to the baud rate of the network.

Baud rate	DIP 7	DIP 8
125 kBit/s	off	off
250 kBit/s	on	off
500 kBit/s	off	on
not permitted:	(on)	(on)

Table 4: Setting the baud rate via DIP switches

If the settings are changed by actuating the DIP switches, this change will not take effect until the device is restarted!

For a restart

- briefly disconnect the control head from the power supply and reconnect or
- switch the power supply off/on or
- transmit an appropriate reset message.

13.11 Configuration of the process data

To **transmit process data** via an I/O connection, 2 static input and 1 static output assembly can be selected. These assemblies contain selected attributes combined into one object so that process data can be transmitted collectively via an I/O connection.

The **process data** is selected by setting the device parameters Active Input Assembly and Active Output Assembly or - if supported by the DeviceNet-Master/Scanner - by setting Produced Connection Path and Consumed Connection Path when an I/O connection is initialised according to the DeviceNet specification.

13.11.1 Static input assemblies

Name	Address of data attribute of the assemblies for read access. Class, instance, attributes	Format of the data attribute Value 0: OFF, Value 1: ON
S1…S4 (factory setting)	4, 1, 3	**Byte 0:** Bit 0: Position S1 Bit 1: Position S2 Bit 2: Position S3 Bit 3: Position S4
S1…S4 + POS (with POS: Actual position	4, 2, 3	**Byte 0:** Bit 0: Position S1 Bit 1: Position S2 Bit 2: Position S3 Bit 3: Position S4 Bit 4…7: not used **Byte 1:** POS in mm

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

The addresses listed in the table “Static input assemblies” can be used as path data for the Produced Connection Path attribute of an I/O connection.

Nevertheless, by using this address data, the attributes combined in the assemblies can also be accessed acyclically via Explicit Messages.

13.11.2 Static output assembly

Name	Address of data attribute of the assemblies for read access. Class, instance, attributes	Format of the data attribute Value 0: OFF, Value 1: ON
Solenoid valves V1…3	4, 21, 3	**Byte 0:** Bit 0: Solenoid valve V1 Bit 1: Solenoid valve V2 Bit 2: Solenoid valve V3 Bit 3…7: not used

The address listed in the table “Static output assembly” can be used as path data for the Produced Connection Path attribute of an I/O connection.

Nevertheless, by using this address data, the attributes combined in the assemblies can also be accessed acyclically via Explicit Messages.

13.12 Configuration of the device

13.12.1 Configuration of the safety position of solenoid valves during a bus error

The valve safety position and the safety mode attributes can be used to configure the solenoid valves in the event of a bus error.

The configuration data of the (behaviour of) solenoid valves in case of a bus error can be accessed acyclically via Explicit Messages.

- The Get_Attribute_Single service stands for a read access of the configuration data.
- The Set_Attribute_Single service stands for a write access of the configuration data.

1 data byte for safety mode:
(attribute address:
class 150, instance 1, attributes 7)

Bit	Mode	Value assignment
Bit 0	Charac-teristics in event of bus error	0 Approach safety position 1 Retain last valve position
Bits 1...7	not used	0 (always)

1 data byte for valve safety position:
(attribute address:
class 150, instance 1, attributes 6)

Bit	Solenoid valve	Value assignment
Bit 0	Y1 (solenoid valve V1)	Value 0: OFF / value 1: ON
Bit 1	Y2 (solenoid valve V2)	Value 0: OFF / value 1: ON
Bit 2	Y3 (solenoid valve V3)	Value 0: OFF / value 1: ON
Bits 3...7	not used	0 (always)

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

13.12.2 Configuration example

The example describes the principle procedure when configuring the device using the RSNetWorx software for DeviceNet (Rev. 4.21.00).

Installation of the EDS File

The EDS file is installed with the aid of the EDS Installation Wizard Tool associated with RSNetWorx.

During the installation procedure the icon can be assigned (if this does not occur automatically).

Offline parameterisation of the device

When a device has been inserted into the DeviceNet configuration of RSNetWorx, the device can be parameterised offline.

"Fig. 33" indicates how, for example, an input assembly which deviates from the factory setting (input process data can be transferred via I/O connection) can be selected. However, ensure that the length of the process data during a subsequent configuration of the DeviceNet master/scanner is adjusted accordingly.

All parameter changes implemented offline must become operative for the real device at a later date by a download process.

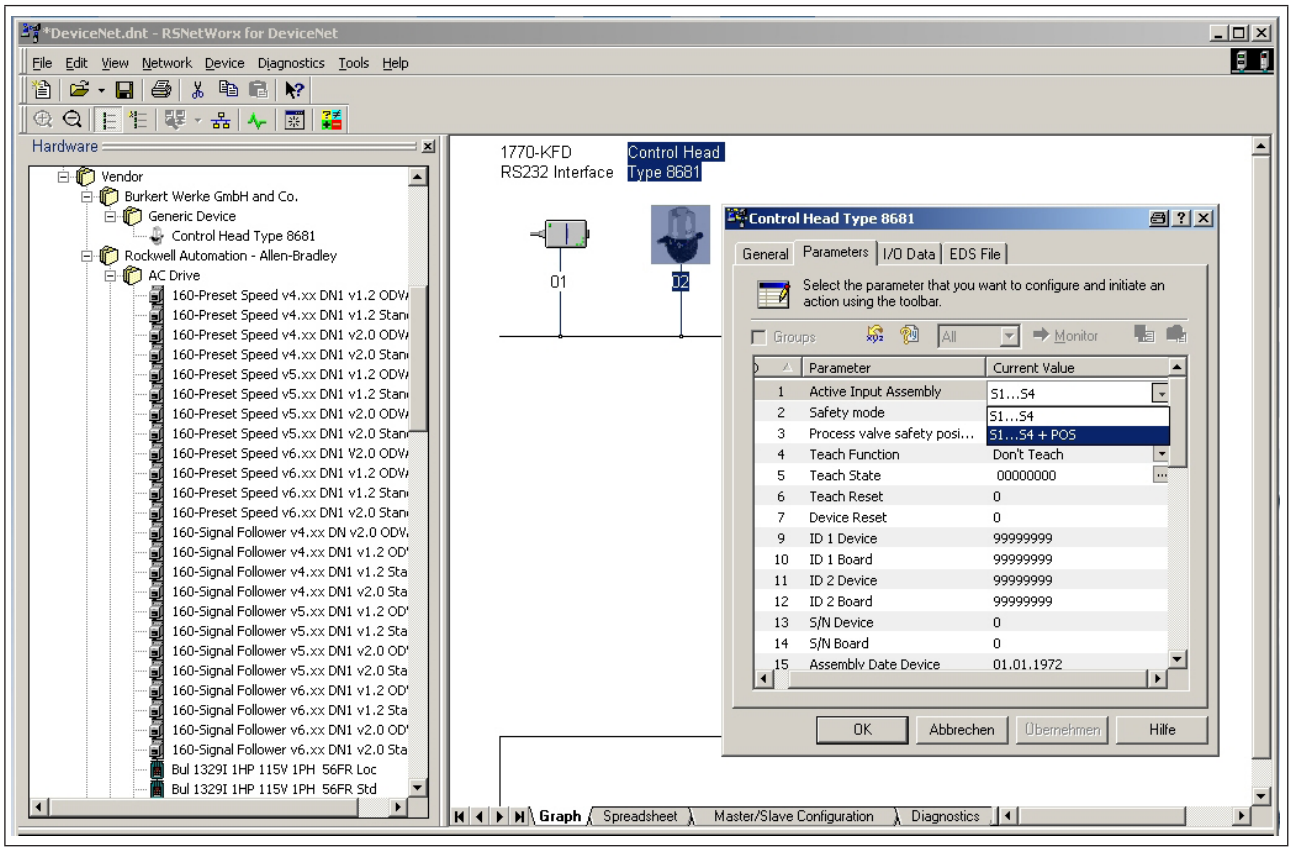


Fig. 32: Selecting the input assembly (screenshot)

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

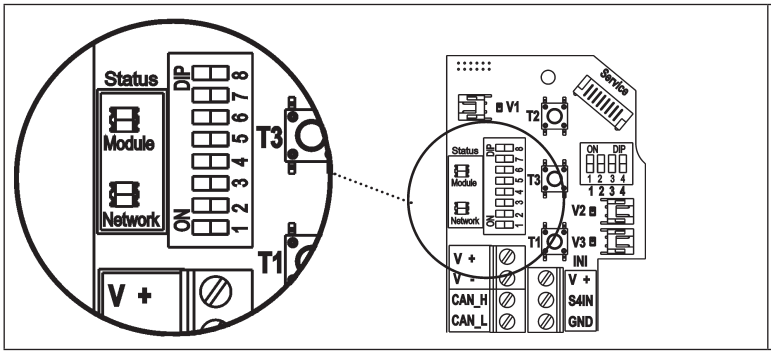
Online parameterisation of the device

Devices can also be parameterised online. In doing so, you can also select whether only individual parameters (single) or all parameters (all) of a group are read from the device (upload) or are loaded into the device (download).

It is also possible to transfer individual parameters or all parameters of a group cyclically in monitor mode. This may be helpful particularly for start-up purposes.

13.13 Display of the status LEDs in the event of a bus error

The bus errors are also indicated by the central multi-colour status display (device status LED / Top LED) - see chapter “21.2 Flashing pattern & fault signalling” on page 144.



The device status LED ("modules") and the bus status LED ("network") are located on the electronic module.

The errors displayed here on the electronic module are also signalled via the central multi-colour status display (device status LED / Top LED).

Fig. 33: Status LEDs

Function tests for both status LEDs after power has been switched on (connection of the network cable):

Status LED	Colours of the LED	Function test
"Modules"	green / red ***)**	250 ms ON (green) / 250 ms ON (red)
"Network"	green / red	250 ms ON (green) / 250 ms ON (red)

Then another function test is run during which the LEDs light up briefly.

When the test is complete, the status LEDs indicate the device statuses which are described in the following tables (“13.13.1” and “13.13.2”).

13.13.1 Status of the device status LED "Modules"

LED	Device status	Explanation
Off	No supply	Device is not supplied with voltage
Green	Device is working	Normal operating status
Flashes red ***)**		The DIP switch setting for the baud rate or the MAC ID address has been changed and does not correspond to the value read during the last device restart. The change will not be applied until the next device restart.

***)** displays “red” as of firmware version C.08.00

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

13.13.2 Status of bus status LED "Network"

LED	Device status	Explanation	Troubleshooting
Off	No voltage / not online	• Device is not supplied with voltage • Device has still not ended Duplicate MAC ID Test (test lasts approx. 2 s) • Device cannot end Duplicate MAC ID Test.	• Connect other devices, if the device is the only network subscriber, • replace device • check baud rate • check bus connection
Green	Online, connection to master exists	• Normal operating status with established connection to the master	
Flashes green	Online, without connection to master	• Normal operating status without established connection to the master	
Flashes red	Connection time-out	• One or more I/O connections are in Time-Out state	• New connection establishment by master to ensure that the I/O data is transmitted cyclically.
Red	Critical fault	• Another device with the same MAC ID address is in the circuit • No bus connection due to communication problems	• Check baud rate • Please check address as possible troubleshooting • If required, replace device

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

14 IO-LINK - DESIGN

IO-Link is a worldwide standardised IO technology (IEC 61131-9) for communicating with sensors and actuators. IO-Link is a point-to-point communication system with 3- or 5-conductor connection technology for sensors and actuators and unshielded standard sensor lines.

Control head Type 8681 (IO-Link design) is available in 2 variants:

- **Port class A:** with a shared power supply (Power 1) for supply of the system and actuators (solenoid valves) **or**
- **Port class B:** with power supply (Power 1) for the system supply and Power 2 for separate supply of the actuators (solenoid valves), which allows for a safety shutdown of the solenoid valves only.

The devices conform to the specifications as described in greater detail in chapter “14.3”.

14.1 Network principle / interfaces

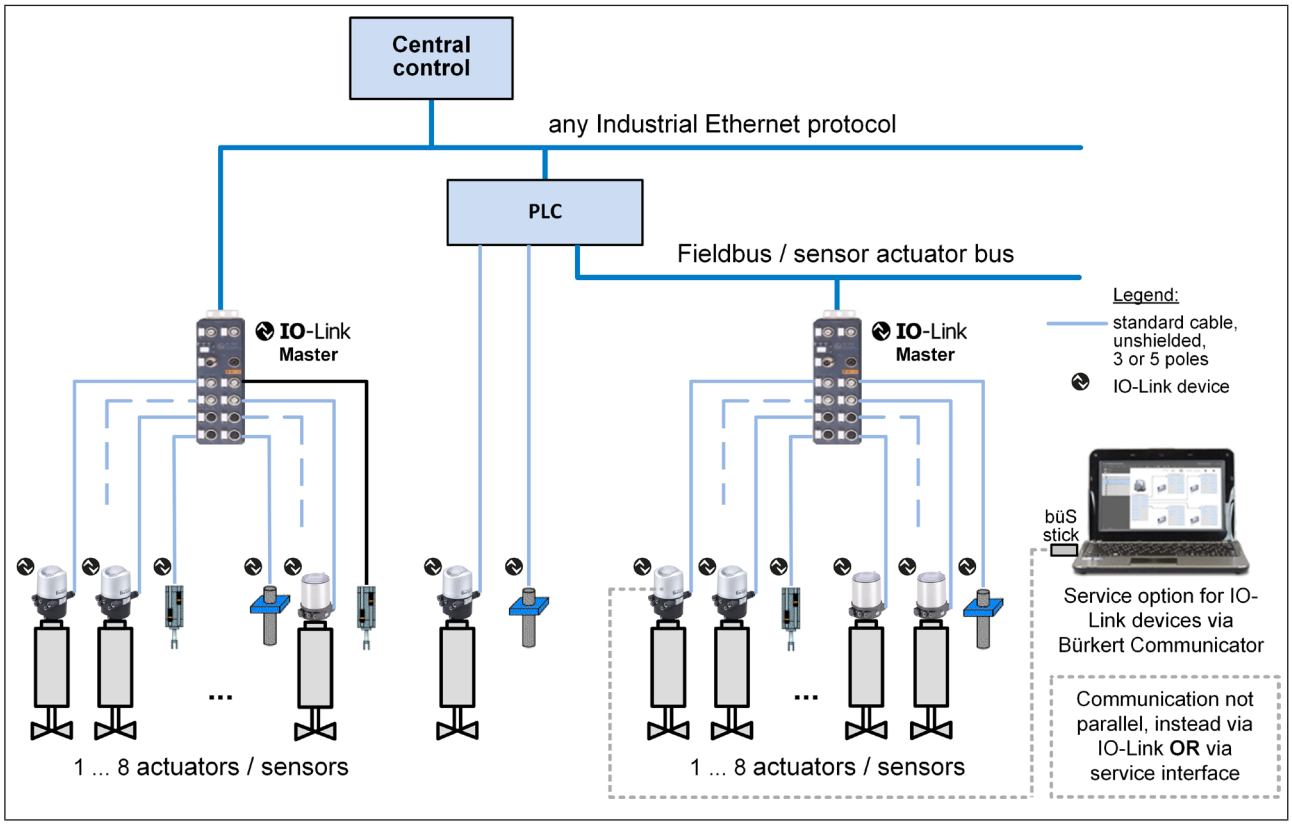


Fig. 34: Network principle of IO-Link

IO-Link control heads can also be connected individually with the Bürkert-Communicator for configuration and firmware update: via the büS stick to the Micro-USB port on the electronic module (see “Fig. 36”). Since no voltage is transferred via this interface, the control head must also be supplied with voltage, for example via the IO-Link port.

Note, however, that device parametrisation is not possible simultaneously via IO-Link and the Bürkert Communicator – see also chapter “14.4”.

The connection with the Bürkert Communicator (Type 8920) is made via the accessory listed in chapter “16” on page 121 under “Service-Tool”. At least the büS standard set and büS adapter are required.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

14.2 Quickstart for Type 8681 IO-Link

Network layout:

IO-Link devices are connected with standard commercial IO-Link masters and can easily be integrated into all commonly used fieldbus and automation systems.

The network is structured similarly to the diagram in “Fig. 34”.
3-pin or 5-pin unshielded standard cables 20 m in length between the IO-Link device and IO-Link master are sufficient for connecting IO-Link devices with IO-Link masters.

The IO-Link control heads are either equipped with M12 connectors (variant with multi-pole plug) or can be wired themselves (variant with cable gland). For details see “14.5”.

Configuration:

The network is configured by the higher-level controller.

To ensure clear communication, IO-Link devices should **not be parametrised simultaneously** by the higher-level controller (PLC) via the IO-Link master **and** with the Bürkert Communicator (via the service interface).

See details in “14.4”

Software download / firmware updates:

Download the required software files / IODD and the object description from:

www.burkert.com / search term: 8681 / Downloads / Software / “Initiation Files EDS IODD” (zip file).

See details in chapter “14.6” on page 85.

14.3 Technical data / specification

IO-Link specification:	Version 1.1.2
Port class:	**A:** shared power supply (Power 1) for supply of the system and actuators (solenoid valves) **or** **B:** Separate power supply for the system (Power 1) and for the actuators/solenoid valves (Power 2)
Power supply:	Port class **A:** via IO-Link port (M12x1, 4-pole A-coded); Port class **B:** via IO-Link port (M12x1, 5-pole, A-coded), for details see chapter “14.5.5” and “Fig. 37” on page 84)
Operation mode:	IO-Link operation mode (SIO operation mode is not supported)
IODD file:	Download from: www.burkert.com / Type 8681 / Downloads / Software (“Initiation Files” - zip file)
VendorID:	0x78, 120
DeviceID:	See relevant IODD file (port class A or B)
Transmission speed	COM3 (230.4 kbit/s)
M sequence type in Operate Mode:	TYPE_2_V
Min. cycle time:	2 ms
Data storage:	yes
Max. line length:	20 m between IO-Link master and IO-Link device

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

14.4 IO-Link master / communication / configuration

IO-Link master

IO-Link masters are used as the interface between the control heads Type 8681 (IO-Link) and the higher-level controller. All commonly used IO-Link masters in accordance with the specification (see chapter "14.3") can be used.

The "addressing" of the IO-Link devices is defined by the connection or port on the IO-Link master – This must be noted when replacing the devices or master.

Communication / configuration / parametrisation

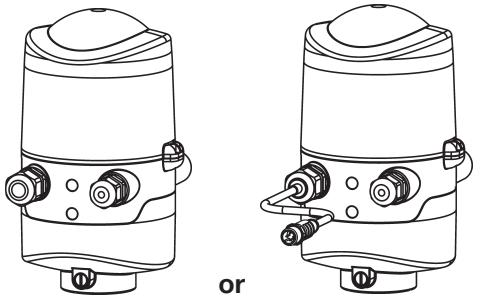
After the network has been set up (see for example "14.1 Network principle / interfaces") and the correct software has been installed in the IO-Link devices (IODD taking into consideration the port class) the network is configured using the higher-level controller.

As described in chapter "14.1", an IO-Link control head can also be connected in parallel to the IO-Link port with the Bürkert Communicator (Type 8920) via the service interface (Micro-USB) on the electronic module (see "Fig. 36" on page 83).

To ensure clear communication, IO-Link devices should **not be parametrised simultaneously** by the higher-level controller (PLC) via the IO-Link master **and** with the Bürkert Communicator (via the service interface).

14.5 Electrical data form the control head (IO-Link)

14.5.1 Electrical connection options / interface



with cable glands

or

with cable glands and multi-pole connection
(M12 connection in accordance with IEC 61076-2-101, 4-pole (port class A) or 5-pole (port class B), cable length approx. 15 cm

Connection left: voltage, signals (IO-Link port)
Connection right: external initiator

Fig. 35: Connection options

Connections:

Cable gland variant: 1 x M16 x 1.5 cable gland / size22 – for power supply and signals (IO-Link); only for transportation safety device sealed with dummy plugs, remove these before use) for cable diameter 5 ... 10 mm, for wire cross-sections 0.14 ... 1.5 mm^2

1 x M16 x 1.5 cable gland/size19 – connection option for external proximity switch (sealed with dummy plug, remove this before use)

Variant multi-pole connection: 1 x M16 x 1.5 cable gland/size22 with M12 connector in accordance with IEC 61076-2-101, 4-pole (port class A) or 5-pole (port class B) for power supply and signals (IO-Link), cable length approx. 15 cm

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

1 x M16 x 1.5 cable gland/size19 – connection option for external proximity switch (sealed with dummy plug, remove this before use)

Connection lines: IO-Link devices and IO-Link masters are connected by unshielded 3- or 5-conductor standard lines maximum 20 m in length with a cross-section of ≥0.34 mm²

IO-Link port (left cable gland): IO-Link communication and power supply (Power 1 for port class A or Power 1 and 2 for port class B)

Service interface (büS) (on electronic module): Micro-USB interface on the electronic module for software updates (see "Fig. 36" on page 83)

14.5.2 Electrical data of the control head

Protection class: 3 in accordance with DIN EN 61140 (VDE 0140-1)

Connections: Circular plug-in connector M12 x 1, 4-pole, port class A or circular plug-in connector M12 x 1, 5-pole, port class B

Operating voltage: 18...30 V DC (according to specification)

Current consumption for port class A (Supply of the system and actuators (solenoid valves) via Power 1) **and port class B** (system supply via Power 1, supply of actuators (solenoid valves) via Power 2) – compare also "Fig. 37" on page 84"14.5.3" on page 81 and chapter "14.5.3" on page 81

Max. current consumption: i.e. 2 solenoid valves active, 1 solenoid valves switches on (for 200 ms), 1 position feedback via LED display, no external proximity switch:
port class A (Power 1): <151 mA at 24 V DC
port class B (Power 1): <63 mA at 24 V DC
port class B (Power 2): <97 mA at 24 V DC

Current consumption in persistent state: i.e. 3 solenoid valves active, 1 position feedback via LED-Display, no external proximity switch:
port class A (Power 1): <138 mA at 24 V DC
port class B (Power 1): <63 mA at 24 V DC
port class B (Power 2): <84 mA at 24 V DC

Idle current: i.e. no solenoid valve active, no position feedback via LED display, no external proximity switch:
port class A (Power 1): <42 mA at 24 V DC
port class B (Power 1): <42 mA at 24 V DC
port class B (Power 2): <9 mA at 24 V DC

Input / proximity switches (external initiator: S4 in):

Power supply:	via the IO-Link power supply - 10%
current carrying capacity of sensor supply:	max. 30 mA
short-circuit protection design:	DC 2- and 3-wire, Normally open contact, PNP output
Input current for 1-signal:	I_{sensor} > 6.5 mA, limited internally to 10 mA
Input voltage for 1-signal:	U_{sensor} > 10 V
Input current for 0-signal:	I_{sensor} < 4 mA
Input voltage for 0-signal:	U_{Sensor} < 5 V

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Inputs (control head –> IO-Link master/PLC) / binary or analogue feedback signals:
The recovery of the valve positions 3 reported back in binary format or the analogue position signal is described in chapter “20 Position Measuring System” on page 130. The analogue target position signal (resolution: 0.1 mm) is available as a cyclic value/ parameter.

Outputs (IO-Link master/PLC –> Control head) / solenoid valves:

Typ. switching capacity:	0.9 W (per solenoid valve, for 200 ms after the power has been switched on)
Typ. continuous capacity:	0.6 W (per solenoid valve from 200 ms after the power has been switched on)
Reduction in output:	Integrated via the IO-Link electronics
Typ. inrush current:	38 mA or 0.9 W / 200 ms (per solenoid valve)
Typ. hold current:	25 mA or 0.6 W at 24 V DC (per solenoid valve)
Operation mode:	Continuous operation (100% duty cycle)
Valve types:	6524

Central display of the switching statuses:

Current consumption from IO-Link at 24 V DC:	Approx 21 mA for a power supply of 24 V DC for each indicator light shown; for colour switching see chapter “21 LED Colour Assignments” on page 137

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

14.5.3 Design aid

The values were determined for the design voltage of 24 V DC. The different power supply of the system and actuators (solenoid valves) for port class A and B (see “Fig. 37”) must be taken into consideration when designing the voltage sources.

Power/current consumption for port class A:

Power consumption of the electronics:							
P_{el}	=	1.0 W	or	I_{el}	=	42 mA	at 24 V
Power consumption of a valve during activation (200 ms):							
$P_{valve\ ON}$	=	0.9 W	or	$I_{valve\ ON}$	=	38 mA	at 24 V
Power consumption of a valve after reduction:							
P_{valve}	=	0.6 W	or	I_{valve}	=	25 mA	at 24 V
Power consumption of an optical position feedback:							
P_{LED}	=	0.5 W	or	I_{LED}	=	21 mA	at 24 V

Calculation examples (for port class A):

Example 1:
3 valves are activated, one position is reported (status for 200 ms): the control head switches automatically one valve after another to keep the current consumption low - i.e.: max. current consumption $I_{Total\ I,\ max.}$ = current consumption of 2 valves (already activated) + 1 valve (just switching)

P_{Total}	=	P_{el}	+	2 x P_{valve}	+	1 x $P_{valve\ ON}$	+ 1 x P_{LED}
3.6 W	=	1.0 W	+	2 x 0.6 W	+	1 x 0.9 W	+ 1 x 0.5 W
or							
I_{Total} @ 24 V	=	I_{el}	+	2 x I_{valve}	+	1 x $I_{valve\ ON}$	+ 1 x I_{LED}
151 mA	=	42 mA	+	2 x 25 mA	+	1 x 38 mA	+ 1 x 21 mA

Example 2:
3 valves have been activated, one position is reported (persistent state):

P_{Total}	=	P_{el}	+	3 x P_{valve}	+	1 x P_{LED}	
3.3 W	=	1.0 W	+	3 x 0.6 W	+	1 x 0.5 W	
or							
I_{Total} @ 24 V	=	I_{el}	+	3 x I_{valve}	+	1 x I_{LED}	
138 mA	=	42 mA	+	3 x 25 mA	+	1 x 21 mA	

When using an external proximity switch, its power requirement should be added.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Power/current consumption for port class B:

Power 1: Electronics supply (1) + display LED
Power 2: Electronics supply (2) + actuators (solenoid valves in the control head)

Power 1:	**Power consumption of the electronics (1):**						
	$P_{el\ 1}$	= 1.0 W	or	$I_{el\ 1}$	= 42 mA	at	24 V
	Power consumption of an optical position feedback:						
	P_{LED}	= 0.5 W	or	I_{LED}	= 21 mA	at	24 V

Power 2:	**Power consumption of the electronics (2):**						
	$P_{el\ 2}$	= 0.22 W	or	$I_{el\ 2}$	= 9 mA	at	24 V
	Power consumption of a valve during activation (200 ms):						
	$P_{valve\ ON}$	= 0.9 W	or	$I_{valve\ ON}$	= 38 mA	at	24 V
	Power consumption of a valve after reduction:						
	P_{valve}	= 0.6 W	or	I_{valve}	= 25 mA	at	24 V

Calculation examples (for port class B):

Example 1:
3 valves are activated, one position is reported (status for 200 ms): the control head automatically switches one valve after another to keep current consumption low, i.e for
Power 1: max. current consumption $I_{Power\ 1}$ = current consumption of electronics (1) + display LED
Power 2: max. current consumption $I_{Power\ 2}$ = current consumption of electronics (2) + of 2 valves (already turned on)
+ 1 valve (currently switching)

$P_{Power\ 1}$	=	$P_{el\ 1}$	+	1 x P_{LED}	$P_{Power\ 2}$	=	$P_{el\ 2}$	+	2 x P_{valve}	+	1 x $P_{valve\ ON}$
1.5 W	=	1.0 W	+	1 x 0.5 W	2.3 W	=	0.22 W	+	2 x 0.6 W	+	1 x 0.9 W
or											
$I_{Power\ 1}$ @ 24 V	=	$I_{el\ 1}$	+	1 x I_{LED}	$I_{Power\ 2}$ @ 24 V	=	$I_{el\ 2}$	+	2 x I_{valve}	+	1 x $I_{valve\ ON}$
63 mA	=	42 mA	+	1 x 21 mA	97 mA	=	9 mA	+	2 x 25 mA	+	1 x 38 mA

Example 2:
3 valves have been activated, one position is reported (persistent state):

$P_{Power\ 1}$	=	$P_{el\ 1}$	+	1 x P_{LED}	$P_{Power\ 2}$	=	$P_{el\ 2}$	+	3 x P_{valve}
1.5 W	=	1.0 W	+	1 x 0.5 W	2.02 W	=	0.22 W	+	3 x 0.6 W
or									
$I_{Power\ 1}$ @ 24 V	=	$I_{el\ 1}$	+	1 x I_{LED}	$I_{Power\ 2}$ @ 24 V	=	$I_{el\ 2}$	+	3 x I_{valve}
63 mA	=	42 mA	+	1 x 21 mA	84 mA	=	9 mA	+	3 x 25 mA

When using an external proximity switch, its power requirement should be added.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

14.5.4 Electrical installation – IO-Link

For the versions with cable glands:

→ Open the housing (compare chapter “8 Opening and Closing the Housing” on page 36) so that the electronic module is visible as shown below (“Fig. 36”).

→ Connect the different wires of the cable (unshielded 3- or 5-line standard lines) to the connection terminals on the left side as described in chapter “14.5.5”. The assignment conforms to the IO-Link specification.

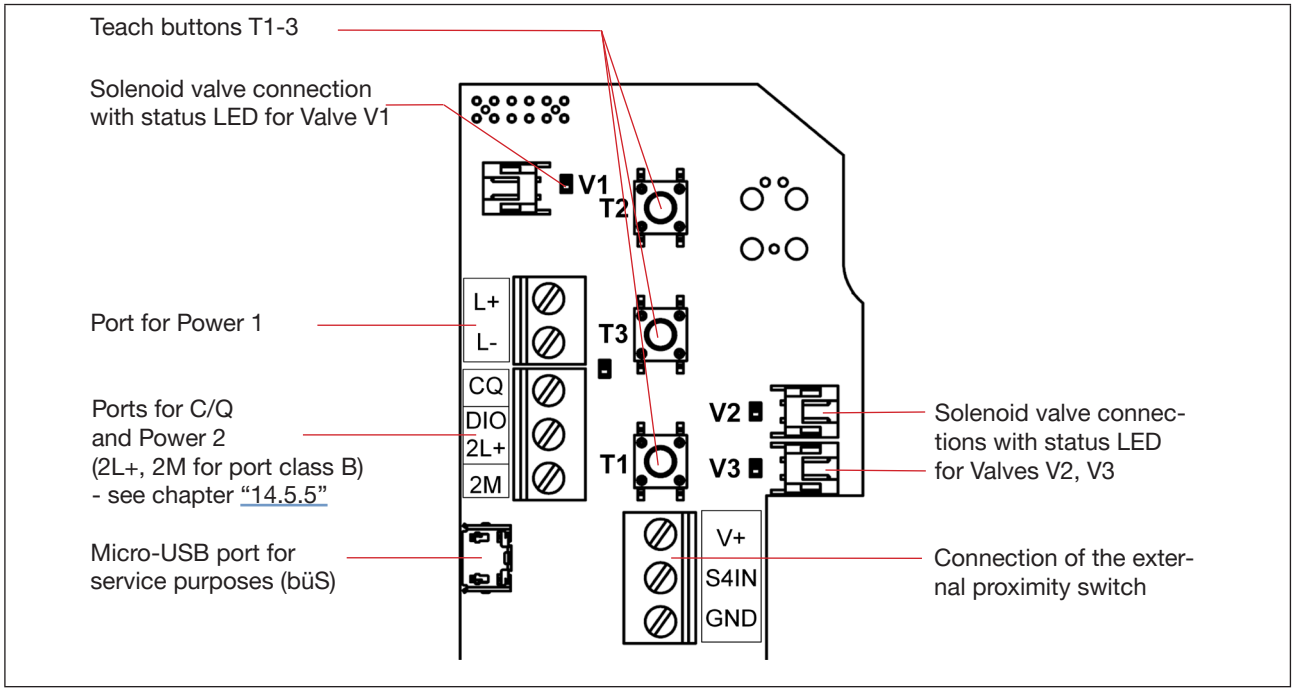


Fig. 36: Electronic module IO-Link (in the example: port class B)

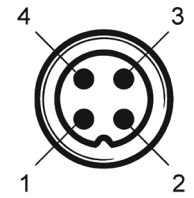
For the multi-pole connection variants:

No internal cabling work is required for any of the IO-Link versions with multi-pole connection which makes installation and start-up on site considerably easier and quicker, reducing the risk of leaks.

The control head features a multi-pole circular plug (M12 x 1-, 4- or 5-pole, male) to a cable 15 cm in length. The assignment corresponds to the IO-Link specification, or see also the next chapter “14.5.5”).

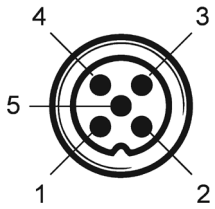
MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

14.5.5 Pin assignment (port class A or B)



Pin	Designation	Assignment (IO-Link operation mode)	Wire colour
1	L+	24 V DC	brown
2	DIO / 2L+	Not used	(white)
3	L-	0 V (GND)	blue
4	C/Q	IO-Link	black

Table 5: Pin assignment for connecting port Class A (M12 connection, 4-pole)



Pin	Designation	Assignment (IO-Link operation mode)	Wire colour
1	L+	24 V DC (Power 1)	brown
2	DIO / 2L+	24 V DC (Power 2)	white
3	L-	0 V (GND - Power 1)	blue
4	C/Q	IO-Link	black
5	2M	0 V (GND - Power 2)	grey or yellow/ green

Table 6: Pin assignment for connecting port Class B (M12 connection, 5-pole)

The diagram below illustrates the difference between port class A and B:

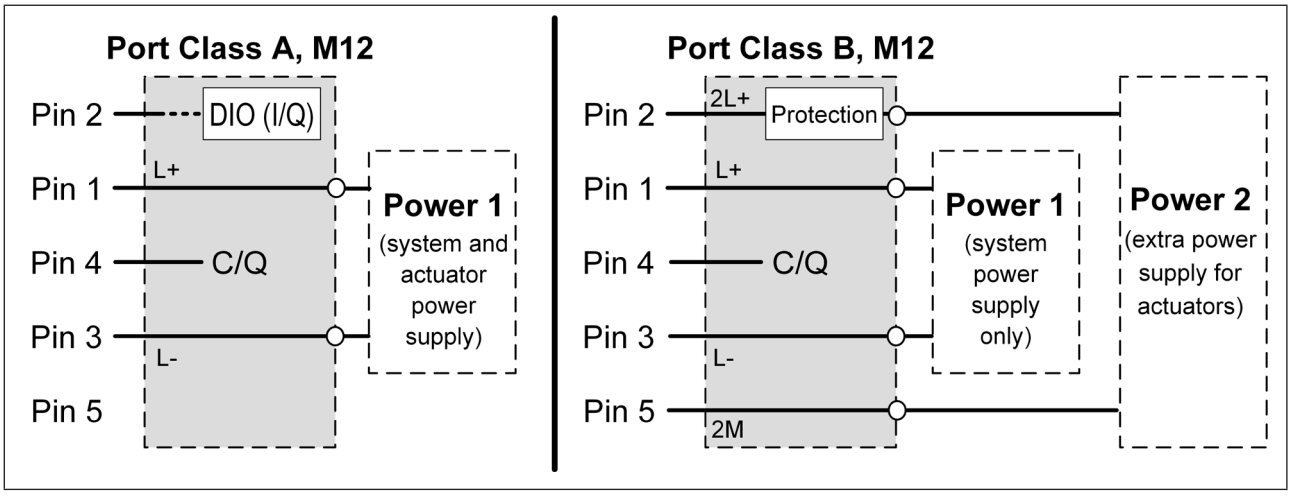


Fig. 37: Assignment principles for port class A and B

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

14.6 Software / firmware updates

14.6.1 Software

The necessary start-up files and a description of the process data and acyclic parameters are available on the Internet and can be downloaded from the Bürkert website:

www.burkert.com / search term: 8681 / Downloads / Software / “Initiation Files EDS IODD” (zip file)

for port class A: Buerkert_Werke_GmbH-ControlHead8681_ClassA-YYYYMMDD-IODDx.x.XML
for port class B: Buerkert_Werke_GmbH-ControlHead8681_ClassB-YYYYMMDD-IODDx.x.XML

The corresponding icons and image files must also be downloaded.

14.6.2 Firmware updates

Firmware updates can only be made using the büS service interface (Micro-USB) on the electronic module (see “Fig. 36” or chapter “14.5.4”). A **büS stick** and the **Bürkert Communicator** are required to do this. The Bürkert Communicator (Type 8920) can also be downloaded from the Bürkert website.

For details on connecting the control head with the Bürkert Communicator see chapter “14.1 Network principle / interfaces” on page 76.

14.7 Safety position if the bus fails

A bus failure or bus error is indicated by the central multicolour device status display (top LED). Bus errors can occur for example due to communication problems with the IO-Link master or PLC.

When a bus failure occurs, the solenoid valves are switched to a programmable safety position (default: solenoid valves de-energised).

Internal safety position

If internal errors are detected by the device, or if the power supply of the solenoid valves cannot be ensured, for example due to (massively) exceeding or falling short of the permitted power supply, the “internal safety position” of the solenoid valves is approached (i.e. all solenoid valves off) as long as the error persists.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15 BÜS/CAN OPEN-DESIGN

15.1 Definition

The “büS” (Bürkert system bus) is a fieldbus system based on the CAN protocol (Controller Area Network). It enables Bürkert devices to communicate with each other.

The Control Head Type 8681 büS/CANopen is a device which conforms to the specification (see chapter “15.4”).

15.2 Network principle / Interfaces

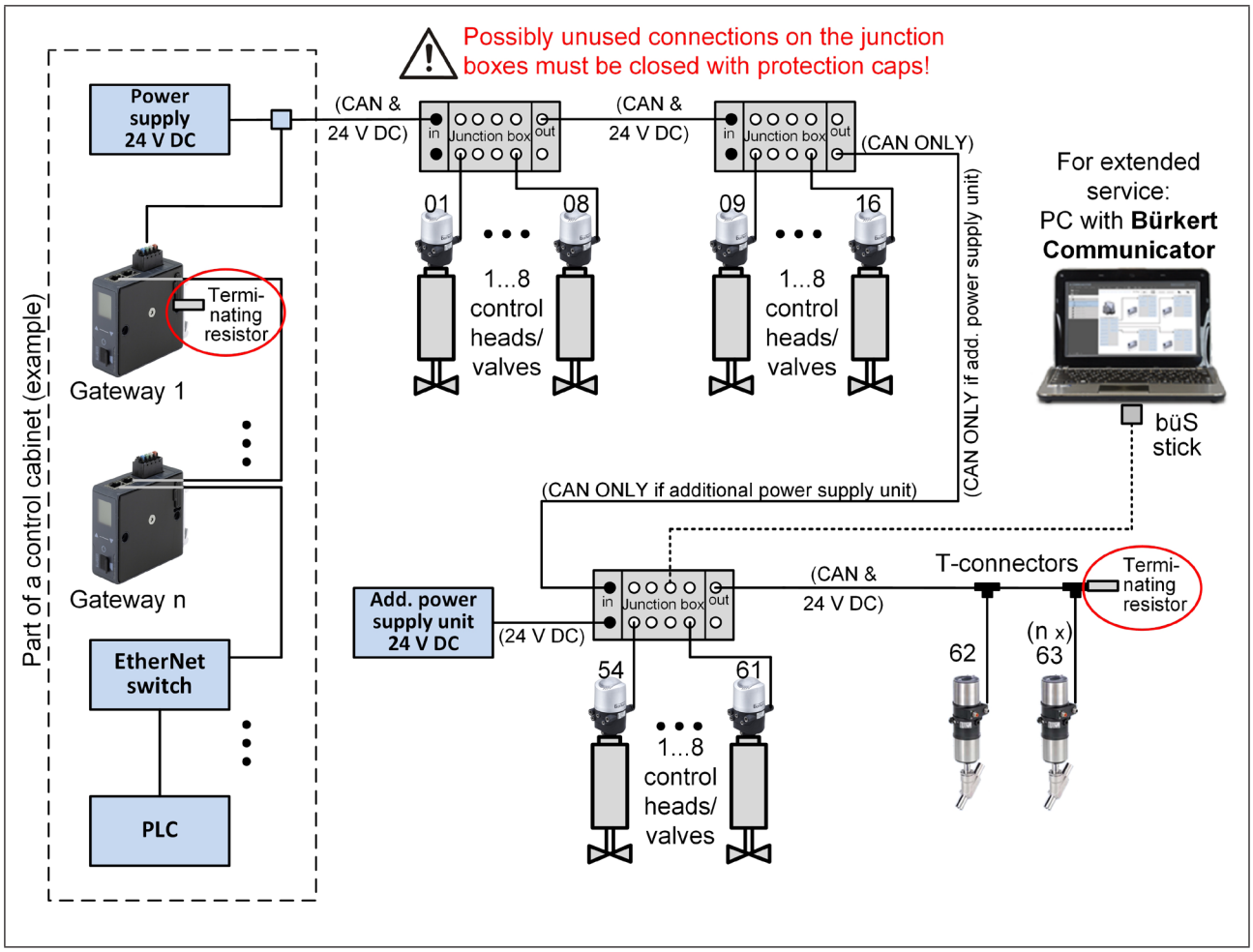


Fig. 38: Network principle

The PC with the Bürkert Communicator can be connected to each free connection in the büS network, for example to one of the distributors.

The control head can also be connected to the Bürkert-Communicator for individual configuration. This can be done (depending on the variant) via the M12 plug or via the connection terminal inside the device. In doing so, the control head must also be supplied with power.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Different connection cables and a plug-in power supply unit as well as a mains adapter are included in a small equipment case ("USB büS interface Set1" - see in the last table "Standard service equipment" in chapter "16 Accessories for büS devices" on page 121). This allows to configure also a single device.

Important notes for network building:

- **Each gateway** can control up to 63 nodes (Control Heads Type 8681 büS/CANopen) if the network topology considers the max. permitted cable length and the required power supply. **Each node** requires a **unique "Node ID",** otherwise an error occurs.
- **The max. total line length** is 200 m for 125 kbit/s, 100 m for 250 kbit/s, 40 m for 500 kbit/s.
- **The max. cable length for a single drop line** is 6 m, **the max. total length of all drop lines** in the network is 100 m for 125 kbit/s, 55 m for 250 kbit/s, 30 m for 500 kbit/s.
- If the **voltage drop i**s too large, an **additional power supply** can feed in at a CAN junction box (PWR IN connection). In this case, connect CAN ONLY to CAN IN using a CAN cable .
  This cable (which interconnects the CAN junction boxes at "CAN ONLY" and "CAN IN") cannot be used for T-connectors to branch "nodes" because no power is supplied to this cable (compare example 3 in chapter "17 Cabling examples (büS/CANopen)" on page 123).
- **Unused or open connections** must be closed with the appropriate protective caps.
- Required **tightening torque** for all plug-in connections (cables, T-pieces, ...) to ensure the required leak-tightness against moisture: **0.6 Nm + 0.1 Nm.**
- The CAN cable must be **"terminated" at both ends:** connect a terminating resistor **(120 ohms)** to the end of the CAN cable / T-connector or, if the line ends with a CAN junction box, connect the terminating resistor to the CAN OUT connection.
- **For service** work and also when reading out CAN data, a **PC with Bürkert Communicator Type 8920** can be connected to any free connection at the CAN junction box or to the CAN ONLY connection. **A büS stick** is necessary to connect the PC to the CAN network.
- **T-connectors** can be used to connect single "nodes" or a PC to read out the CAN data (via Bürkert Communicator).

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.3 Quickstart for Type 8681 büS/CANopen

“büS” (Bürkert system bus) stands for the communication bus developed by Bürkert and is based on the CANopen protocol. The following steps refer to the application of the e.g. EtherNet/IP protocol using a Bürkert gateway preconfigured for a maximum of 63 control heads.

For other gateway configurations (e.g. in conjunction with ELEMENT positioners), the specific documentation for preconfigured Bürkert gateways must be observed.

After mounting the control heads (Type 8681 büS/CANopen) in the network, the following operations must first be carried out on the control heads:

1.) Addressing of the control heads

According to “15.14.2 Setting the büS/CANopen address (Node ID)” each control head in the network must be assigned its own unique address (Node-ID).

When using a preconfigured gateway: For easy start-up, each control head should be assigned its unique node ID between 1 and 63 using the DIP switches. This allows the preconfigured communication settings between the gateway and each control head to be used. The factory setting (address “0” = softwareconfigurable address/node ID) should not be used furthermore.

When using a non-pre-configured gateway or when using the factory setting “0” (software-configurable address/node ID): A device configuration via Bürkert Communicator on site is required for start-up each control head (see also chapter “15.14.3” on page 100).

Error-free parameter access by the Logix Designer: To ensure this, the new addresses should be selected clearly arranged and in sequence (starting with “1” and without gaps in the numerical series!).

Any change of the device address requires a device restart.

2.) Setting the baud rate

Set the baud rates according to chapter “15.14.1 Setting the baud rate”. The combination of cable lengths and baud rate is very important (see chapter “15.4.2 Total line length and drop line lengths of the bus cables”).

The baud rate of all devices connected to the network (including the gateway) must be the same .

Any change of the baud rate requires a device restart.

3.) “Hiding” of non-existent devices

If less than 63 devices are assigned to the gateway, the non-existent devices must be “hidden” at the gateway, both outputs AND inputs - see chapter “15.18 Configuration of the control head network”, either using the Logix-Designer (chapter “15.18.1”) or Bürkert Communicator (chapter “15.18.2”).

After the changes have been made, a device restart is required.

4.) Careful closing of the electrical connections

Due to moisture (including steam) in the system, all electrical connections (M12 plug-in connections) must be firmly screwed on with 0.6 (+0.1) Nm. All open electrical connections must be well “sealed” with protective caps (see information box in chapter “15.2 Network principle / Interfaces” and also chapter “16 Accessories for büS devices” and chapter “17 Cabling examples (büS/CANopen)”.

Firmware updates - see chapter “15.22 Firmware updates” on page 120

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.4 büS/CANopen specification

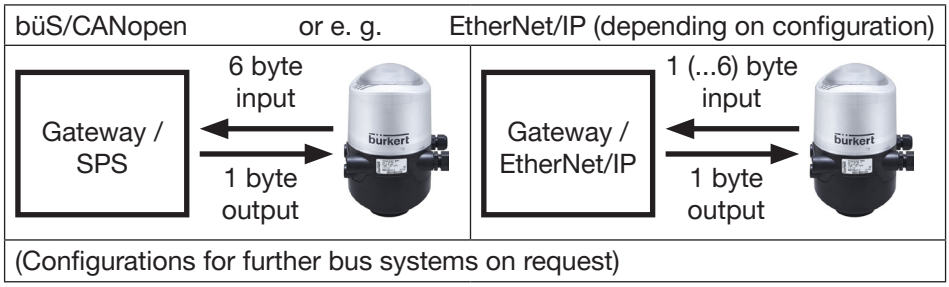
15.4.1 General data

Baud rate: configurable via DIP switches 7, 8 or via software (selectable values – see chapter “15.14.1 Setting the baud rate”)
factory setting: software configurable baud rate (**pre-selected: 500 kbit/s**)

Address: 1 ... 63 (via DIP switches 1 ... 6 adjustable);
factory settings: 0 = software configurable address / Node ID
(Node ID from 1 to 127 possible;
pre- selection: auto-addressing of the Node ID,
see chapter “15.14.2 Setting the büS/CANopen address (Node ID)”)

Bus mode: büS or CANopen (bus mode is software configurable only)
factory setting: **büS**

Process data:



Inputs:
(Control head –> gateway)
6 byte with:
4 byte position feedback in m (resolution: 1 mm)
(= feedback as cyclic position signal of the target),
1 byte NAMUR status feedback,
1 byte position feedback (3 discrete feedback signals from the position measuring system (positions S1 to S3) + 1 discrete feedback signal from the external initiator (S4);
power supply via büS/CANopen cable (11 ... 25 V DC)
(The acyclic analogue position signal of the target can be read out e.g. as parameter “8681_Current_Position_mm_DevXX” (resolution: 0.1 mm) - see chapter “15.20 Access to parameters (Read / Write)” on page 115)

Outputs:
(Gateway –> control head)
1 byte for control of the 3 solenoid valves

15.4.2 Total line length and drop line lengths of the bus cables

The bus line is a 4-core cable with additional shielding which must conform to the büS/CANopen specification. The cable transmits both data/information and energy (low-voltage power supply for actuators and sensors)

The maximum total line length (sum of trunk lines and drop lines) of a network depends on the baud rate.

Some baud rates and their corresponding maximum lengths are listed in the table below.

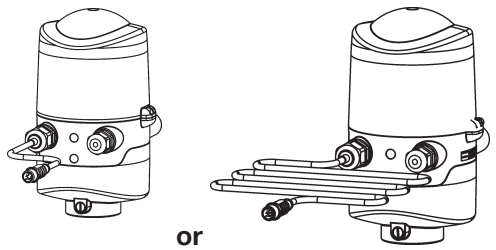
MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Baud rate	Max. total line length
125 kbit/s	200 m
250 kbit/s	100 m
500 kbit/s	40 m

Max. length of an individual drop line	Max. total length of all drop lines
6 m	100 m
6 m	55 m
6 m	30 m

Compare chapter “15.13 Network topology of a büS/CANopen system”.

15.5 Electrical connection options



With cable glands
or
with cable glands and multi-pole connection
(M12 plug according to IEC 61076-2-101, 5-pole)

Connection left: voltage, signals
Connection right: external initiator

Fig. 39: Connection options

15.6 Electrical data of the control head

Connections:

Cable gland variant: 1 x M16 x 1.5 cable gland / size22 – for power supply and signals, (only for transportation safety device sealed with dummy plugs, remove these before use!)
for cable diameter 5 ... 10 mm, for wire cross-sections 0.14 ... 1.5 mm²

1 x M16 x 1.5 cable gland/size19 - connection option for external initiator (sealed with dummy plug, remove this before use)

Multi-pole connection variant: 1 x M16 x 1.5 cable gland/size22 with M12 plug according to IEC 61076-2-101, 5-pole for büS/CANopen and power supply, cable length approx. 80 cm

1 x M16 x 1.5 cable gland/size19 - connection option for external initiator (sealed with dummy plug, remove this before use)

Power supply: 11 … 25 V DC

Power consumption (standby current): <60 mA at 24 V DC

Max. power consumption: <180 mA at 24 V DC (see chapter “15.8 Design aid”)

Power consumption (persistent state): <165 mA at 24 V DC (3 solenoid valves active, 1 position feedback with LED display, no external initiator)

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Input / proximity switches (external initiator: S4 in):

Power supply:	via the büS/CANopen power supply - 10%
Current carrying capacity sensor supply:	max. 30 mA
Short-circuit protection	
Design:	DC 2- and 3-wire, Normally open contact, PNP output
Input current 1 signal:	I_{Sensor} > 6.5 mA, limited internally to 10 mA
Input voltage 1 signal:	U_{Sensor} > 10 V
Input current 0 signal:	I_{Sensor} < 4 mA
Input voltage 0 signal:	U_{Sensor} < 5 V

Inputs (from master perspective) / binary or analogue feedback signals:
The recovery of the 3 valve positions reported back in binary format or the analogue position signal is described in chapter “20 Position Measuring System” on page 130.
The analogue target position signal (resolution: 0.1 mm) is available in the büS/CANopen network as an acyclic value / parameter.

Outputs (from master perspective) / solenoid valves:

Typ. switching capacity:	0.9 W (per solenoid valve, for 200 ms after the power has been switched on)
typ. continuous output:	0.6 W (per solenoid valve, from 200 ms after the power has been switched on)
Output reduction:	via the büS/CANopen interface - electronics integrated
Typ. pull-in current:	38 mA or 0.9 W / 200 ms (per solenoid valve)
Typ. holding current:	25 mA or 0.6 W at 24 V DC (per solenoid valve)
Operating mode:	Continuous operation (100% duty cycle)
Valve types:	6524

Central display of the switching statuses:

Current consumption from büS/CANopen at 24 V DC:	approx. 30 mA with a power supply of 24 V DC per illuminated display; colour switching see chapter “21 LED Colour Assignments” on page 137.

15.7 Safety position if the bus fails

If the bus fails, the solenoid valves are switched to a programmable safety position (default: solenoid valve de-energised).

For configuration data / parameter see chapter “15.20 Access to parameters (Read / Write)” on page 115.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.8 Design aid

Power consumption of the electronics:							
P_{EI}	=	1.3 W	or	I_{EI}	=	54 mA	at 24 V
Power consumption of a valve during activation (200 ms):							
$P_{Valve-ON}$	=	0.9 W	or	$I_{Valve-ON}$	=	38 mA	at 24 V
Power consumption of a valve after reduction:							
P_{Valve}	=	0.6 W	or	I_{Valve}	=	25 mA	at 24 V
Power consumption of an optical position feedback:							
P_{LED}	=	0.7 W	or	I_{LED}	=	30 mA	at 24 V

Calculation examples:

Example 1:
3 valves are activated, one position is reported (status for 200 ms): the control head switches automatically one valve after another to keep the current consumption low - i.e.: max. current consumption $I_{Total\ I,\ max.}$ = current consumption of 2 valves (already activated) + 1 valve (just switching)

P_{Total}	= P_{EI}	+ 2 x P_{Valve}	+ 1 x $P_{Valve-ON}$	+ 1 x P_{LED}
4.1 W	= 1.3 W	+ 2 x 0.6 W	+ 1 x 0.9 W	+ 1 x 0.7 W
or				
I_{Total} @ 24 V	= I_{EI}	+ 2 x I_{Valve}	+ 1 x $I_{Valve-ON}$	+ 1 x I_{LED}
172 mA	= 54 mA	+ 2 x 25 mA	+ 1 x 38 mA	+ 1 x 30 mA

Example 2:
3 valves have been activated, one position is reported (persistent state):

P_{Total}	= P_{EI}	+ 3 x P_{Valve}	+ 1 x P_{LED}	
3.8 W	= 1.3 W	+ 3 x 0.6 W	+ 1 x 0.7 W	
or				
I_{Total} @ 24 V	= I_{EI}	+ 3 x I_{Valve}	+ 1 x I_{LED}	
159 mA	= 54 mA	+ 3 x 25 mA	+ 1 x 30 mA	

When using an external initiator, its power requirement should be added.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.9 Installation – Safety instructions

WARNING!

Risk of injury due to electric shock!

- Before reaching into the system (apart from the Teach procedure in a non-explosive atmosphere), switch off the voltage and secure to prevent it from being switched on again!
- Observe the applicable accident prevention and safety regulations for electrical equipment!
- When setting the position measuring system (Teach procedure), do not touch any live components!

Risk of injury due to improper installation!

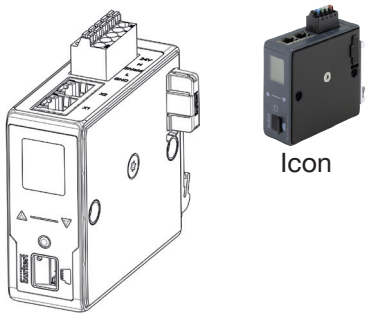
- Installation may be carried out by authorised technicians only and with the appropriate tools!

Risk of injury due to unintentional activation of the system and uncontrolled restart!

- Secure system against unintentional activation!
- Following installation, ensure a controlled restart.

The **mechanical and pneumatic installation** of the control heads is described in detail in chapter “7 Assembly” on page 32 and “9 Pneumatic Installation” on page 38.

15.10 Gateway



The gateway Type ME43 is used as the fieldbus interface between “büS”-capable devices (control heads Type 86xx or other Bürkert büS devices) and the PLC (e.g. EtherNet/IP; Profinet, etc. on request).

The number of devices with which the gateway can communicate depends on the inputs and outputs per büS device and the respective fieldbus protocol (see the ME43 operating instructions under “Maximum number of data values”).
For example, the gateway can process the inputs/outputs of 63 Type 8681 control heads.

EDS file for EtherNet/IP: Gateway_EIP_8681_vxx_yymmdd_63Dev.eds

Icon: icon_me43.ico

Fig. 40: Gateway ME43 with connection terminals

15.11 Gateway installation

→ Mount the gateway(s) on a top hat rail in the control cabinet

→ Connect the gateway(s) – see therefor chapter “15.2 Network principle / Interfaces” on page 86 and “17 Cabling examples (büS/CANopen)” on page 123 especially chapter as well as the details in the following chapters.

→ Connect gateway(s) to the master controller (PLC) via for example EtherNet/IP

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.12 Electrical installation - büS/CANopen

For the multi-pole connection variants:

No internal cabling work is required for any of the “büS” variants (with multi-pole connection) which makes installation and start-up on site considerably easier and quicker, reducing the risk of leaks.

The control head features a multi-pole circular plug (M12 x 1, 5-pole, male) to an 80 cm long cable. The assignment conforms to the büS/CANopen specification.

However, you will require the correspondingly assembled cable sets with the pin assignments described in the figure below:

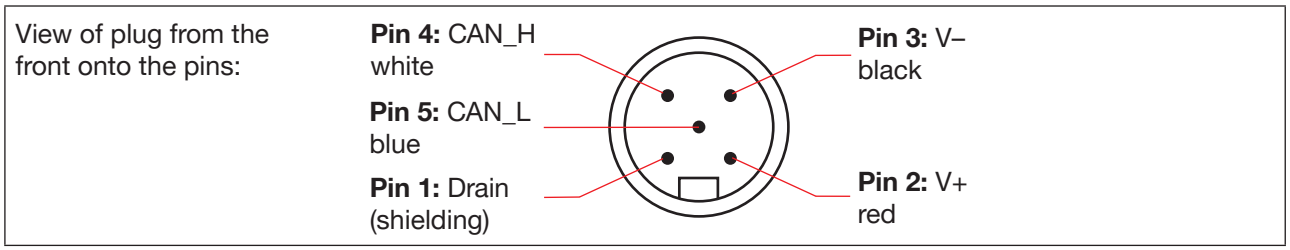


Fig. 41: Bus connection büS/CANopen with power supply

For the versions with cable glands:

→ Open the housing (compare chapter “8 Opening and Closing the Housing” on page 36) so that this electronic module is visible as shown below (“Fig. 42”).

→ Connect the different wires of the CAN cable to the screw terminals for the bus signal as specified in the table “Terminal strip configuration”. The configuration conforms to the büS/CANopen specification.

→ The order numbers of the required CAN cables are listed in chapter “16 Accessories for büS devices”.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.12.1 Electronic module büS/CANopen:

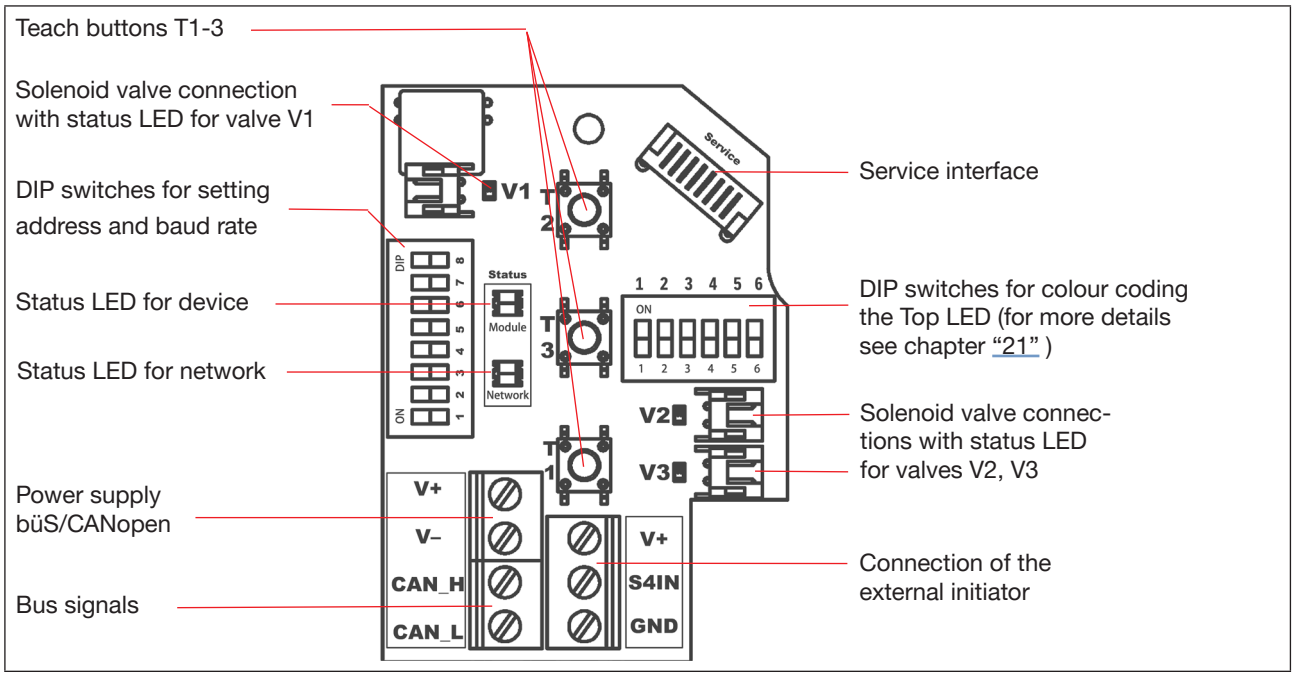


Fig. 42: Electronic module büS/CANopen

15.12.2 Terminal strip configuration:

Designation Terminal strip	Wire colour	Assignment
V+	red	Power supply büS/CANopen
V-	black	Power supply büS/CANopen
CAN_H	white	Bus signal CAN high
CAN_L	blue	Bus signal CAN low

Designation Terminal strip	Assignment
V +	Power supply for external initiator
S4 IN	External initiator input
GND	GND external initiator

For connecting the external initiator - compare chapter "18 Connection of an External Initiator" on page 126.

15.12.3 Details on the DIP switches for colour coding:

The (classic) colour combinations can be set via DIP 1 to 4 as described in chapter "21.1.1 Device specific LED mode "8681 Classic Mode"" on page 139. But on this occasion DIP 5 and DIP 6 have to be set to "OFF" to display the correct colours.

As of firmware B.02.00.00 there are software configurable display modes for the device status LED (Top LED) – details are specified in chapter "21.1 Display modi – overview" on page 137.

Other parameters or configurations require the use of the CANopen object list or parameter list - see chapter "15.20.4 Access to further parameters (cyclic and acyclic)" on page 118.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.13 Network topology of a büS/CANopen system

When installing a büS/CANopen system, ensure that the terminating circuit of the data lines is correct. The circuit prevents the occurrence of interference caused by signal reflection in the data lines.

The trunk line must be terminated at both ends with 120 Ω resistors and 1/4 W power loss - see "Fig. 43: Network topology - büS/CANopen".

"Fig. 43" illustrates a line with one trunk line and several drop lines. Trunk lines and drop lines consist of identical material.

A unique Node ID (büS/CANopen address) can be allocated to each control head via DIP switches - see chapter "15.14 Configuring the Node ID / baud rate").

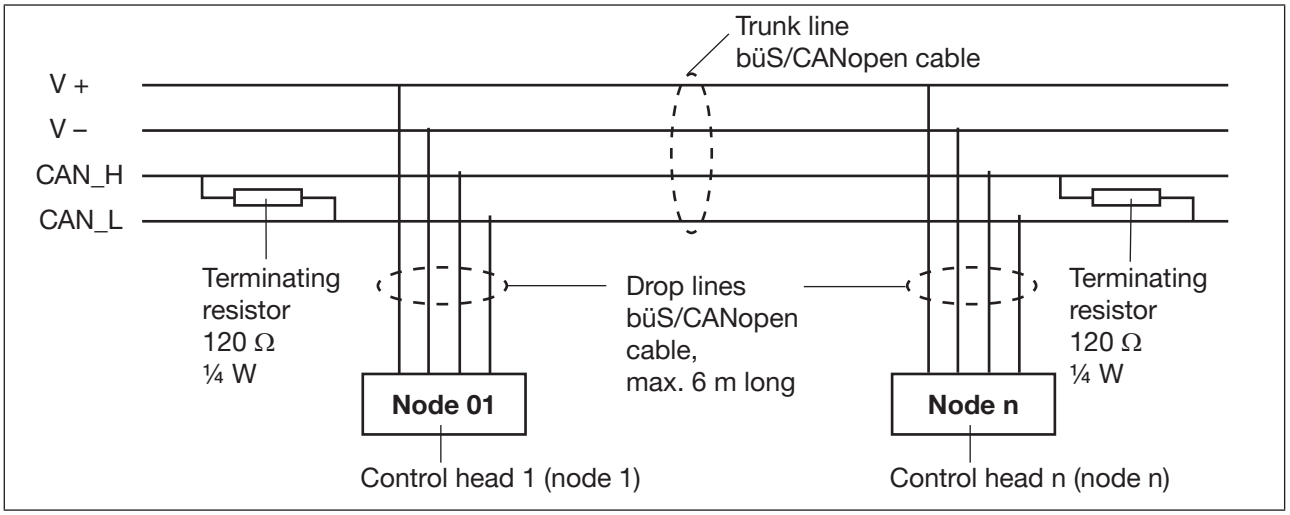
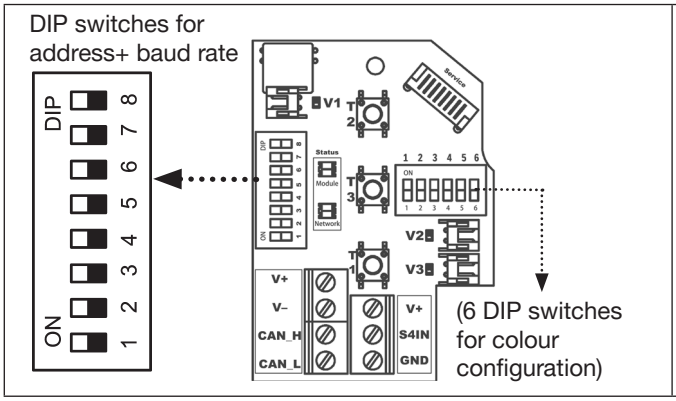


Fig. 43: Network topology - büS/CANopen

15.14 Configuring the Node ID / baud rate



8 DIP switches are available for configuration of the node ID and baud rate:

- DIP switches 1 to 6 for the Node ID (büS/CANopen address)
- DIP switches 7 to 8 for the baud rate

Please note:
Values fixed by DIP switches invalidate software-configured values!

Fig. 44: Position of the DIP switches

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.14.1 Setting the baud rate

Baud rate	DIP 7	DIP 8
125 kbit/s	off	off
250 kbit/s	on	off
500 kbit/s	off	on
Factory settings: software configurable baud rate***)** with pre-setting: 500 kbit/s	**on**	**on**

***)** Via software (Bürkert Communicator) configurable baud rates: 50, 125, 250, 500, 1000 kbit/s; via software (CANopen/SPS) *additionally* configurable baud rates: 10, 20, 100 kbit/s (see chapter "15.20.4 Access to further parameters (cyclic and acyclic)" on page 118).

Please note: The baud rate of all network participants (control heads, gateway, possibly other products) must correspond to each other!

To apply any changes to settings, restart the device!

If the settings are changed by actuating the DIP switches, these changes will not take effect until the device is restarted! For a restart:

- trigger a restart command via Bürkert Communicator or
- briefly disconnect the control head from the power supply and reconnect or
- switch the power supply off/on or
- transmit an appropriate reset message.

Special characteristics for configuration of the "software configurable baud rate":

- Hardware configured values (via DIP switch) have priority over software configured values!
- If the DIP switches were set to "software configurable baud rate", the current baud rate is still valid - until a new baud rate is selected via software. Then restart the device!

  Example: *Resetting the factory setting without using the software:*
  Set DIP7+8 to 500 kbit/s. Restart device.
  Then set DIP7+8 to "software configurable". Restart device.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.14.2 Setting the büS/CANopen address (Node ID)

Node ID = [DIP 1 · 2^0 + DIP 2 · 2^1 + DIP 3 · 2^2 + DIP 4 · 2^3 + DIP 5 · 2^4 + DIP 6 · 2^5]
with DIP x = off = 0 and DIP x = on =1

Table of settings of the büS/CANopen address:

Node ID	DIP1	DIP2	DIP3	DIP4	DIP5	DIP6
0 *)	**off**	**off**	**off**	**off**	**off**	**off**
1	on	off	off	off	off	off
2	off	on	off	off	off	off
3	on	on	off	off	off	off
4	off	off	on	off	off	off
5	on	off	on	off	off	off
6	off	on	on	off	off	off
7	on	on	on	off	off	off
8	off	off	off	on	off	off
9	on	off	off	on	off	off
10	off	on	off	on	off	off
11	on	on	off	on	off	off
12	off	off	on	on	off	off
13	on	off	on	on	off	off
14	off	on	on	on	off	off
15	on	on	on	on	off	off
16	off	off	off	off	on	off
17	on	off	off	off	on	off
18	off	on	off	off	on	off
19	on	on	off	off	on	off
20	off	off	on	off	on	off
21	on	off	on	off	on	off
22	off	on	on	off	on	off
23	on	on	on	off	on	off
24	off	off	off	on	on	off
25	on	off	off	on	on	off
26	off	on	off	on	on	off
27	on	on	off	on	on	off
28	off	off	on	on	on	off
29	on	off	on	on	on	off
30	off	on	on	on	on	off
31	on	on	on	on	on	off

Node ID	DIP1	DIP2	DIP3	DIP4	DIP5	DIP6
32	off	off	off	off	off	on
33	on	off	off	off	off	on
34	off	on	off	off	off	on
35	on	on	off	off	off	on
36	off	off	on	off	off	on
37	on	off	on	off	off	on
38	off	on	on	off	off	on
39	on	on	on	off	off	on
40	off	off	off	on	off	on
41	on	off	off	on	off	on
42	off	on	off	on	off	on
43	on	on	off	on	off	on
44	off	off	on	on	off	on
45	on	off	on	on	off	on
46	off	on	on	on	off	on
47	on	on	on	on	off	on
48	off	off	off	off	on	on
49	on	off	off	off	on	on
50	off	on	off	off	on	on
51	on	on	off	off	on	on
52	off	off	on	off	on	on
53	on	off	on	off	on	on
54	off	on	on	off	on	on
55	on	on	on	off	on	on
56	off	off	off	on	on	on
57	on	off	off	on	on	on
58	off	on	off	on	on	on
59	on	on	off	on	on	on
60	off	off	on	on	on	on
61	on	off	on	on	on	on
62	off	on	on	on	on	on
63	on	on	on	on	on	on

To apply any changes to settings, restart the device!
(See **NOTE box 1** for restarting on next page)

***) This is the factory setting.** (For explanations see **NOTE box 2** on next page)

For easy start-up when **using a preconfigured gateway,** a node ID between 1 and 63 should be set on the device using the DIP switches. Otherwise, a device configuration on site via Bürkert Communicator is required for start-up.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

NOTE 1: How to restart the device

If the settings are changed by actuating the DIP switches, these changes will not take effect until the device is restarted! For a restart:

- trigger a restart command via Bürkert Communicator or
- briefly disconnect the control head from the power supply and reconnect or
- switch the power supply off/on or
- transmit an appropriate reset message.

NOTE 2: Special characteristics for the DIP switch setting DIP1 to DIP6 "000000"

- This setting is the **factory setting,** i.e. **software configurable address/Node ID.** The further behaviour in the network depends on the "Static Node-ID", see for this the following explanations.

- **Bus mode büS (bueS) or CANopen:** The behaviour with this DIP switch setting depends on the bus mode (büS (bueS) or CANopen). The **factory setting is büS** (bueS). The bus mode can be changed by software only - see chapter "15.20.4 Access to further parameters (cyclic and acyclic)" on page 118.

- **Device addressing using software in the:**

büS/bueS mode: For the DIP switch position (DIP1 to DIP6 = 000000) the parameter **"Fixed CANopen address" ("Static Node ID")** has a **factory setting of "0" = "Auto addressing"** of the device address (CANopen address, Node ID). On this occasion, the Node ID will be automatically configured (device addresses from 1 to 127 are possible).

If the device is to receive a fixed device address, the **"Fixed CANopen address" ("Static Node ID")** must be set to the appropriate value using the Bürkert Communicator. To accept this value, the device must be restarted. If the device does not receive the "target" device address set as parameter "Fixed CANopen address" , the solenoid valves remain in the configured safety position and an error status is displayed.

If the "Fixed CANopen address" ("Static Node ID") is reset to "0" (= "Auto addressing"), the auto addressing starts after a restart with the last used device address (Node ID).

When changing the configuration of the device address from "via DIP switch" to "software configured", the "Fixed CANopen address" ("Static Node-ID") is reset once to "0" (= "Auto addressing") at the required restart. Auto addressing starts a usual after a restart with the last used device address (Node ID) .

In the **case of auto addressing,** the **interfaces** of the individual devices have to be checked and possibly reassigned, e.g. via Bürkert Communicator – see software manual for Type 8920 (search therein for "büS network configuration"/"büS map"), see chapter "4.3".

CANopen mode: Software configurable device address / Node ID (from 1 to 127 is possible): Consider for CANopen bus mode that a software configured Node ID of "0" results in a device Node ID of "1"! But if two devices had the same address, bus problems would result!

Please note: Hardware-configured values (that means: set via DIP switches) overwrite software-configured values!

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

NOTE 3: Special characteristics for the DIP switch setting different to DIP1 to DIP6 "000000", i.e. hardware configured Node ID

- **Bus mode büS (bueS) or CANopen:**
  The behaviour with this DIP switch setting depends on the bus mode (büS (bueS) or CANopen). The **factory setting is büS (bueS).** The bus mode can be changed by software only - see chapter "15.20.4 Access to further parameters (cyclic and acyclic)" on page 118.

- **Device addressing using DIP switches in the:**

  büS (bueS) mode: The parameter "Fixed CANopen address" ("Static Node ID") is automatically updated to the address value currently set via DIP switches when a restart occurs.

  The parameter "Fixed CANopen address" ("Static Node-ID") is automatically updated to the address value currently set via DIP switches after a restart. In this mode, the device is prepared at the factory for the use with a preconfigured gateway, i.e. the input connection for controlling the solenoid valves has already been configured.
  Details are clarified in chapter "15.14.3" below.

  CANopen mode: **The device address (Node ID) is used which is set via DIP switches.**

15.14.3 Factory settings of the control head regarding the gateway configuration

Factory settings:

Bus mode: "büS",
Addressing: software configurable Node ID
(i.e. **DIP1 to DIP6 = 000000**) - see details in NOTE box 2 above.

If DIP1 to DIP6 differ from the factory setting:

This means: **if DIP1 to DIP6 > 000000** (device address fixed by DIP switches - see NOTE box 3) **and** the DIP switch position was changed after the last device restart, the control heads will be configured according to a presetting rule at the next device restart. This automatically configures the setpoint producer for the control of the solenoid valves. The **factory default setting** is defined: **"Presetting Rule" = "1" for systems with a preconfigured gateway** ("Gateway_8681"). This results in an automatic adaptation according to the node ID (>0, set via the DIP switches) of the respective control head.

From firmware version B.02.00 onwards, it is possible to change the (preconfigured) setpoint producer via "büS-Map" with the Bürkert Communicator for e.g. a standard büS system (without preconfigured gateway).

Changing the DIP switches to a value > 000000 and then restarting the device will overwrite any changes made via the Bürkert Communicator with values according to the preset "presetting rule". This presetting rule is defined by the parameter *"presetting rule" ("Use Special Sensor Index")* which can be found in the Bürkert Communicator under: Control Head / General Settings / Parameters / büS mapping.

When returning to the factory default setting (with fixed device address), after changing the presetting:

- ensure that the parameter *"presetting rule"* is set to "1"
- note the previous DIP switches position
- set DIP1 to DIP6 to factory default setting 000000, then restart the device
- set DIP1 to DIP6 to the noted DIP switches position, then restart the device again.

Details on the büS network configuration ("büS map") are described in the software manual for the Bürkert Communicator (Type 8920) - see chapter "4.3".

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.14.4 Central configuration management (Configuration client)

As of firmware B.01.00.00 the central configuration management (e.g. with gateway ME43, as of firmware A.03.02) is supported. This means that defective Bürkert devices can be exchanged easily, almost without configuration effort. To do this, the configuration management for the configuration provider (gateway) in the Bürkert Communicator must be set to "Active" **and** the *"Configuration client"* parameter for the configuration device (control head) must be set to mode "Automatically switch on" (= factory setting) or "Active" (Bürkert Communicator: Control Head / General settings / Parameters / Configuration client / Mode).

Via a memory card in the ME43 gateway, the last stored device parameters and configurations are retained and can be transferred to the new Bürkert device.

When replacing a defective control head, however, the **hardware settings (all DIP switches)** must be set on the new device **before** connecting to the network, as they have been set on the device which is to be replaced. In this way, all relevant software parameters (during the communication process lasting several minutes to integrate the new control head into the network) can be transferred automatically. The new device must then be "taught".

Details and operating conditions are described in the software manual "Central configuration management of Bürkert devices" (see chapter "4.3" on page 14).

For this configuration the Bürkert Communicator version 4.x or higher is required.

(During a device reset / factory reset of the configuration device (control head, as of firmware B.01.00.00), the *"configuration client"* parameter mode is reset to the factory setting "Automatically switch on".)

15.15 Changing the gateway IP address

Each gateway requires a unique IP address to distinguish several gateways from each other.

If required, the gateway IP address can be changed directly at the gateway itself using its menu and arrow keys or in four other ways:
using **web server** ("15.15.1") or **Bürkert Communicator** ("15.15.2") or **Logix Designer** ("15.15.3"), please use the LogixDesigner manual for this) or **RS Linx** ("15.15.4").
After changing the gateway IP address, register ("15.16") and install the gateway using Logix Designer (see "15.17").

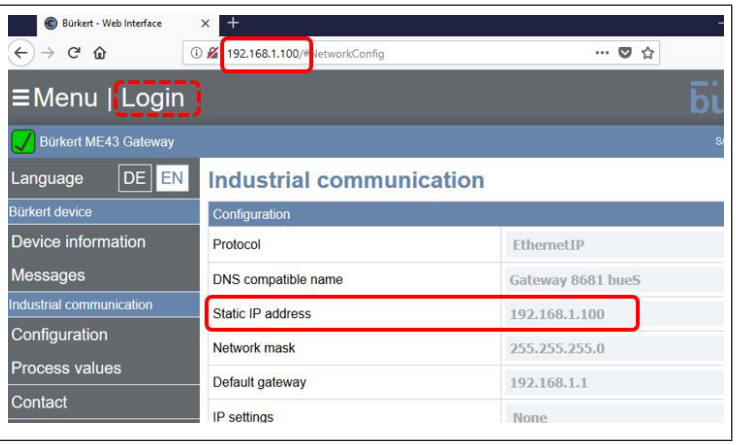
The gateway must always be connected to the same network as the PC!

15.15.1 Changing the gateway IP address using web server

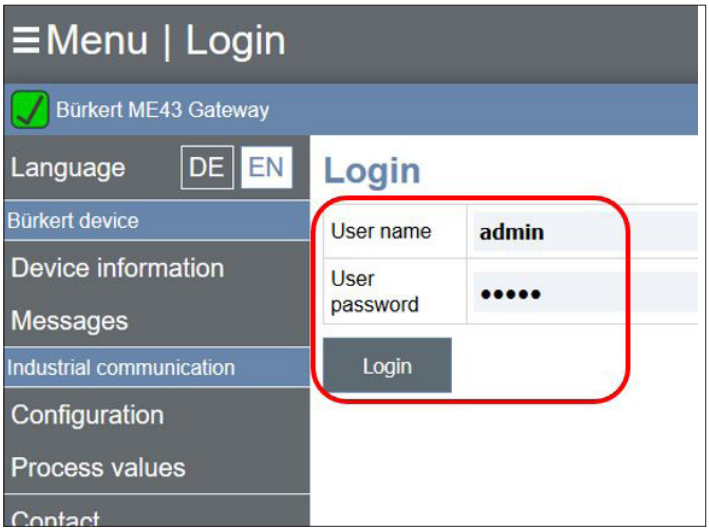
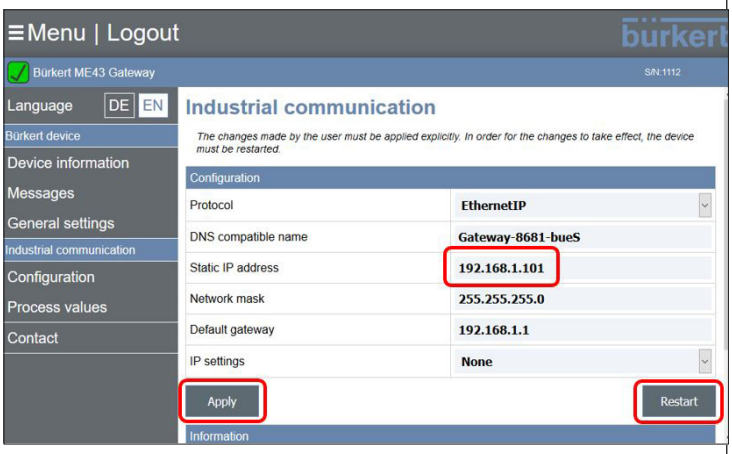
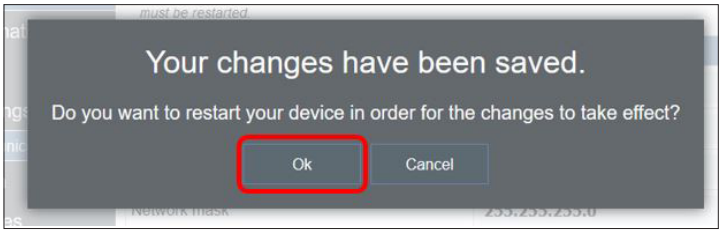
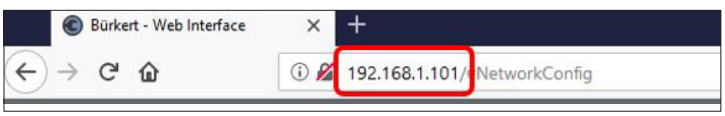
→ Call the gateway's web server with a browser (enter only the current IP address number: **"http://192.168.1.100")**

(the window which opens for this IP address shows the default "Static IP address" of all gateways ME43 (factory setting): **192.168.1.100)**

→ Then click "Login"



MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

→ Complete the “User name” and “User password” (factory setting for both: “admin”) → Click the “Login” button	
→ Change/overwrite the “Static IP address”, e.g. with “192.168.1.101” or another address, to distinguish the gateways from each other → Confirm by clicking the “Apply” button (If the button “Restart” is clicked, the new “Static IP address” is not saved, only the device will be restarted.)	
→ Click the “OK” button to take over the new “Static IP address” by restarting the device (if “Cancel” is selected, the old “Static IP address” remains active and is only taken over at the next restart)	
→ The following message appears	
→ To connect the gateway to its new IP address: enter the **new** IP address (shown in the figure above) into the browser address bar and press “Enter”	

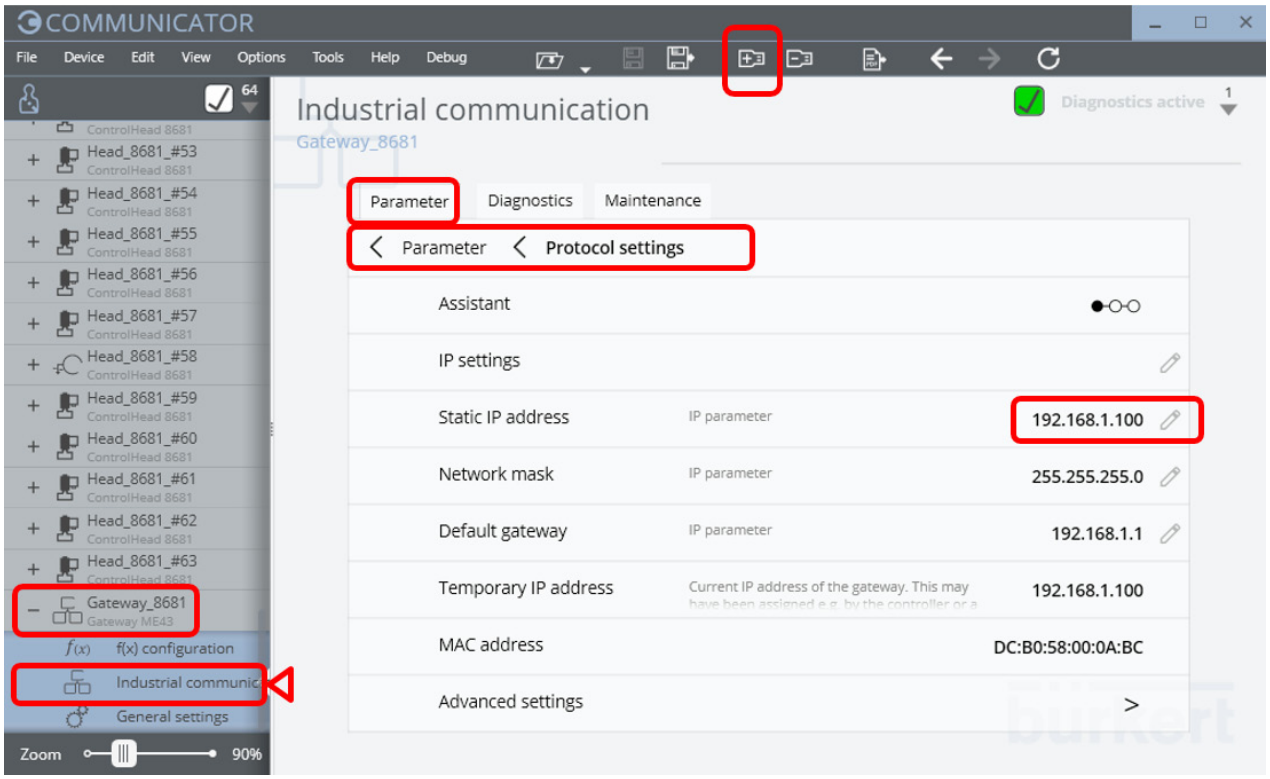
15.15.2 Changing the gateway IP address using “Bürkert Communicator”

→ Connect the PC (with Bürkert Communicator Type 8920) via “büS stick” to the büS/CANopen data line (e.g. to a free connection of a CAN junction box in the network - as shown in “Fig. 38: Network principle” on page 86)

→ Start the Bürkert Communicator Type 8920

→ Click on the icon to add a “büS connection” (e.g. “büS COM8”)

→ Open the desired gateway (e.g. “Gateway_8681”) and select **“Industrial communication”** and then the **“Parameter”** tab, then select **“Protocol settings”**



→ The standard address “Static IP address” is displayed (“192.168.1.100”)

→ Click the pencil to change the IP address

→ Confirm the new “Static IP address” by clicking on the “Apply” button

→ Restart the device / gateway: Right click on “Gateway_8681”, then select the “Restart” option

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.15.3 Changing the gateway IP address via Logix Designer

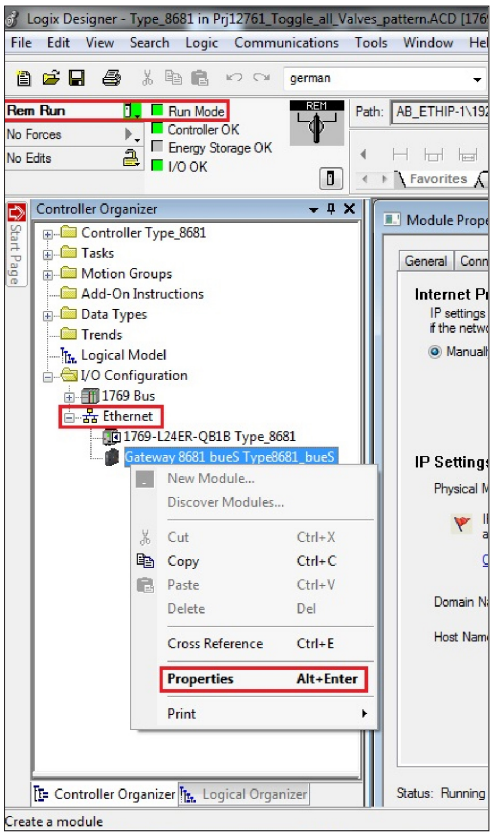
→ Start the “Logix Designer”

→ First, select “Go Online” (“Rem Run” = Remote Run)

→ Right click on “Ethernet”

→ Select “Gateway 8681 bues ...”

→ Right click and select “Properties”



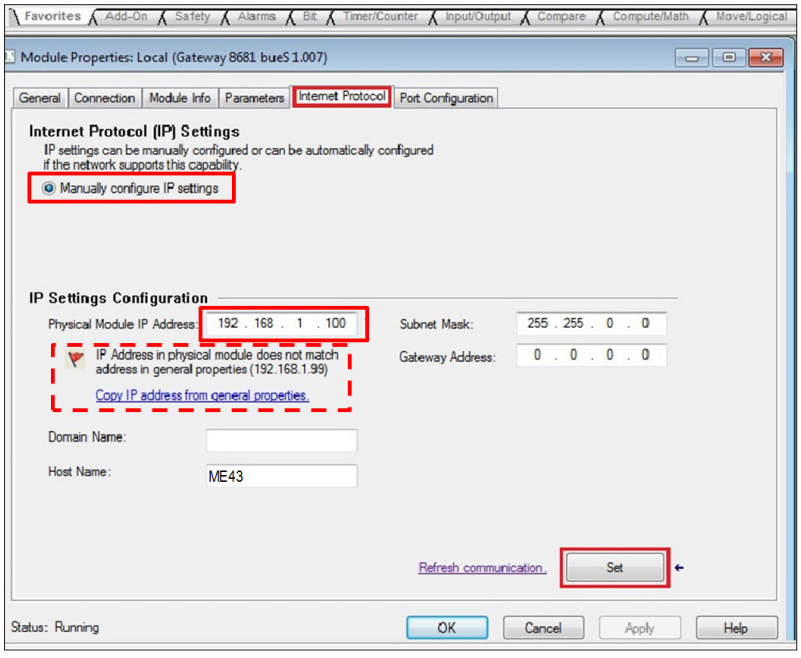
→ A new window opens, go to the “Internet Protocol” tab

→ Mark “Manually configure IP settings” (in the area “Internet Protocol Settings”)

→ In the area “IP Settings Configuration”, overwrite the current “Physical Module IP Address” and - if required - also “Subnet Mask” and “Gateway Address”

→ Click the “Set” button.
A warning then appears:
“IP Address in physical module does not match address in general properties (...)”

→ Click the “OK” button



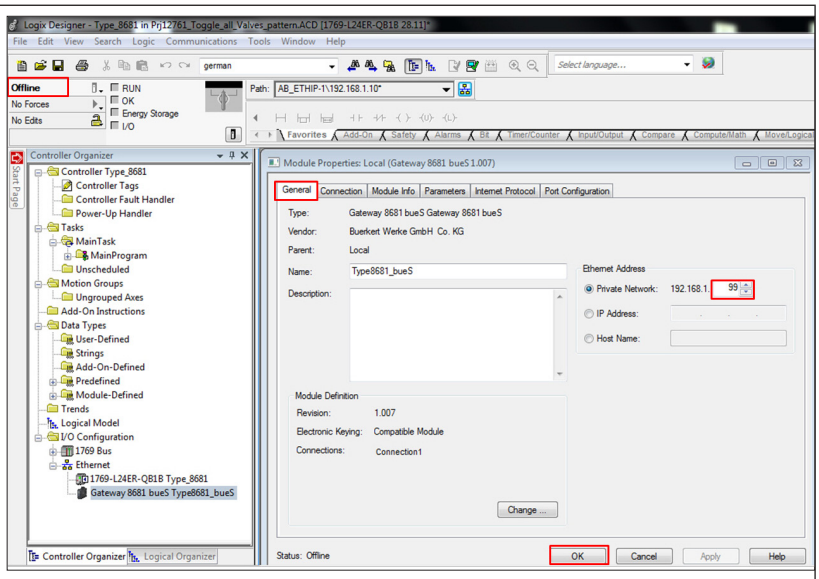
MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

→ Then select “Go Offline”

→ Go to the “General” tab

→ Overwrite the “Ethernet Address”/ “Private Network” with the new address

→ Click the “OK” button

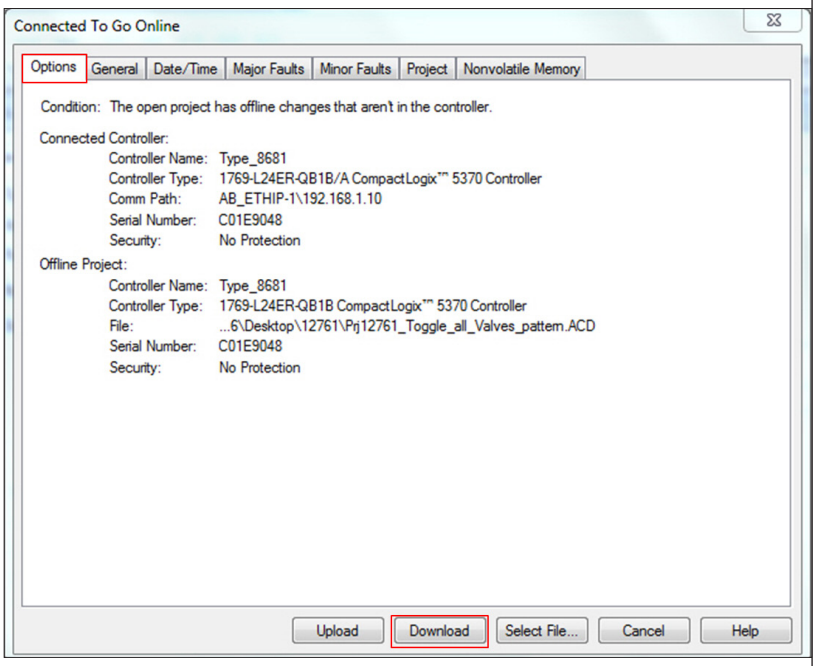


→ Select “Go Online” again

→ A new window opens

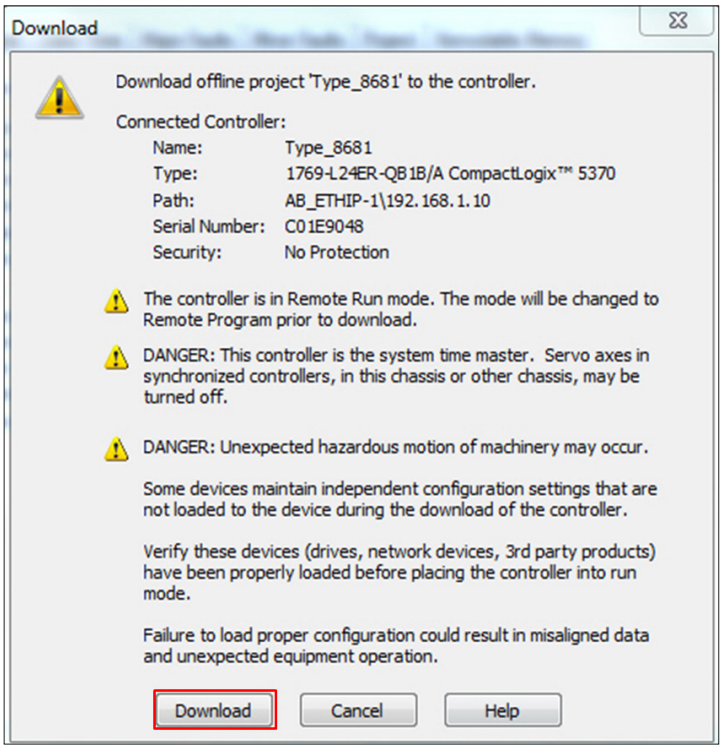
→ Go to the “Options” tab

→ Click the “Download” button to load the offline changes of the project into the controller / PLC



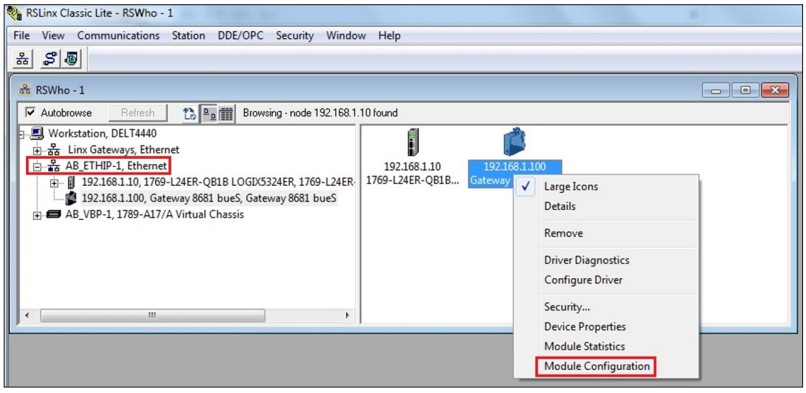
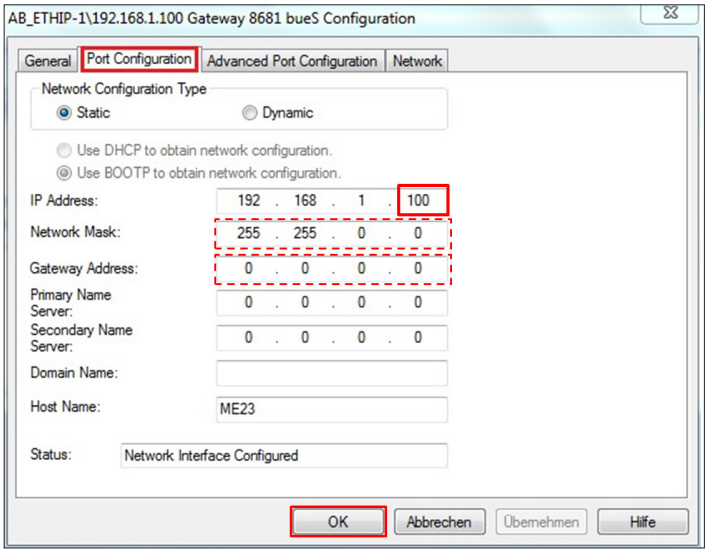
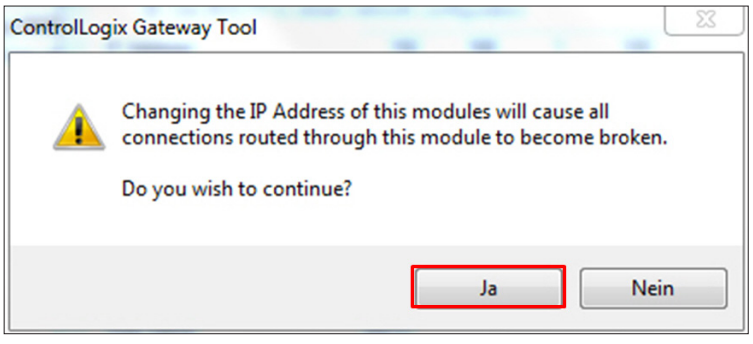
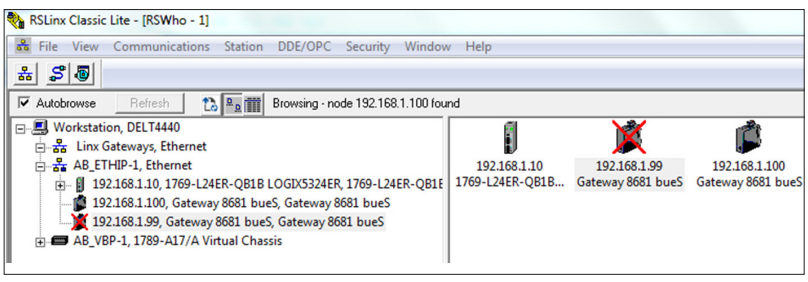
(continued on next page)

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

→ A new window with several warnings opens → Click the “Download” button to continue the download process	

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

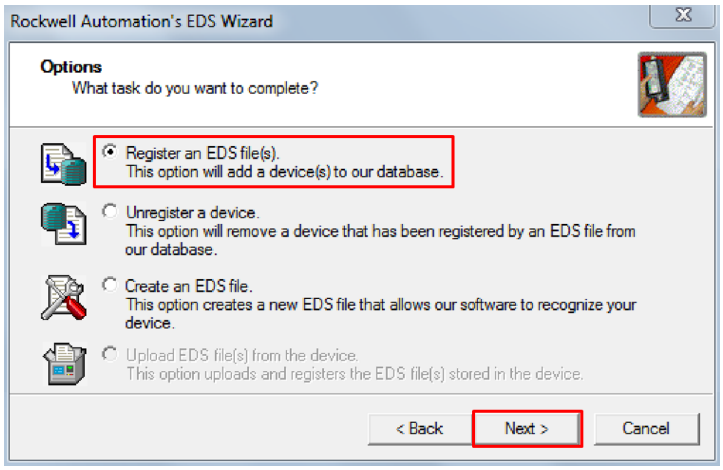
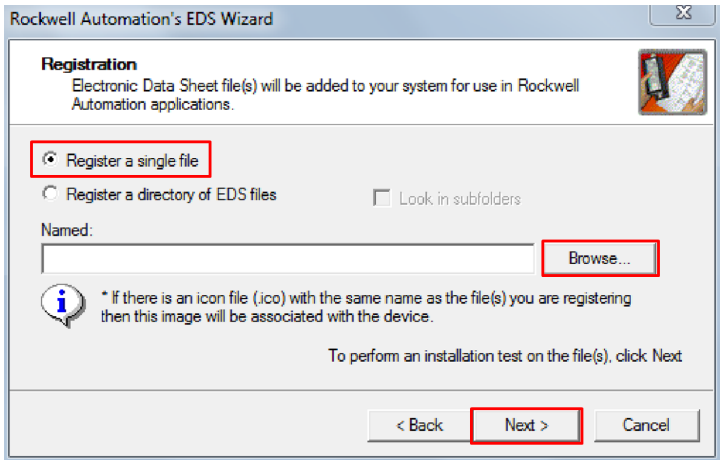
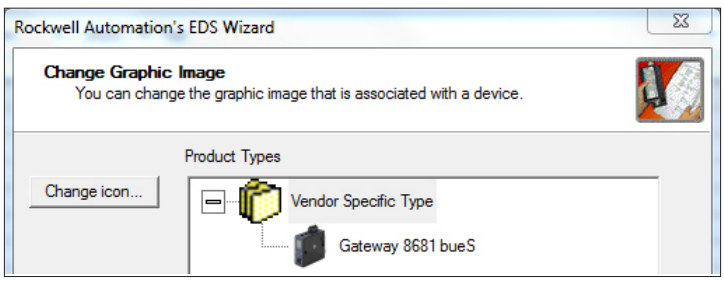
15.15.4 Changing the gateway IP address using RS Linx

→ Start “RS Linx” → Select “Autobrowse” → Right click on “AB_ETHIP-1, Ethernet” → Select “XXX, Gateway 8681 bueS ...” → Right click on “XXX, Gateway 8681 bueS ...” and select “Module Configuration”	
→ A new window opens, go to the “Port Configuration” tab → In the area “Network Configuration Type”, mark the “Static” option → Enter the new “IP Address” and - if required - also the “Subnet Mask” and “Gateway Address” → Confirm the configuration with “OK”	
→ A warning window opens → Click “Ja” (Yes) button to continue the changing process	
Inaccessible IP addresses are crossed out	

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.16 Registration of a gateway via Logix Designer

The gateway ME43 must be registered in the Logix Designer database:

→ Ensure that the EDS file and the ICO file are in the same folder **(Do not change the name of the ICO file** as it is referenced in the EDS file with this name!)	
→ Start the “Logix Designer” → Go to the “Tools” tab → Select “EDS Hardware Installation Tool” → A new window opens as shown in the figure on the right → Select “Register an EDS file(s)” option and click the “Next” button	
→ A new window opens as shown in the figure on the right → Select “Register a single file” option → Browse your computer for the appropriate EDS file: “Gateway_EIP_8681_vXX_YYMMDD_63Dev.eds” → Click the “Next” button (twice)	
→ A new window opens: “Change Graphic Image” → If you want to change the icon graphic, click the “Change icon ...” button and select a graphic → Click the “Next” button (twice) → Then click the “Finish” button	
The gateway ME43 is now registered in the Logix Designer database.	

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.17 Installation of a gateway via Logix Designer

Gateway(s) must be added to the Ethernet (I/O Configuration):

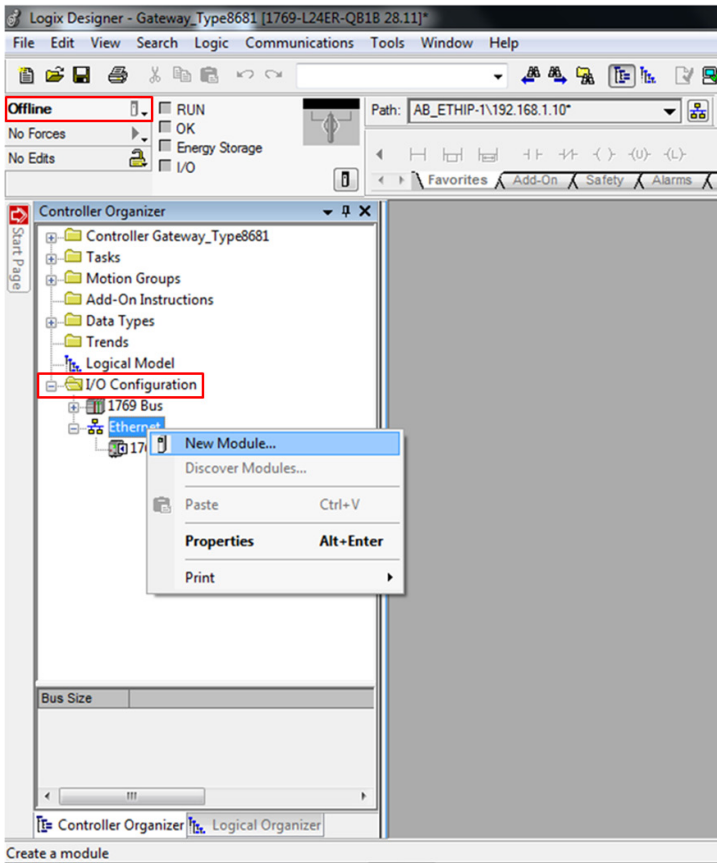
→ Start the “Logix Designer”

→ First, go “Offline”

→ Search for “I/O Configuration” and “Ethernet”

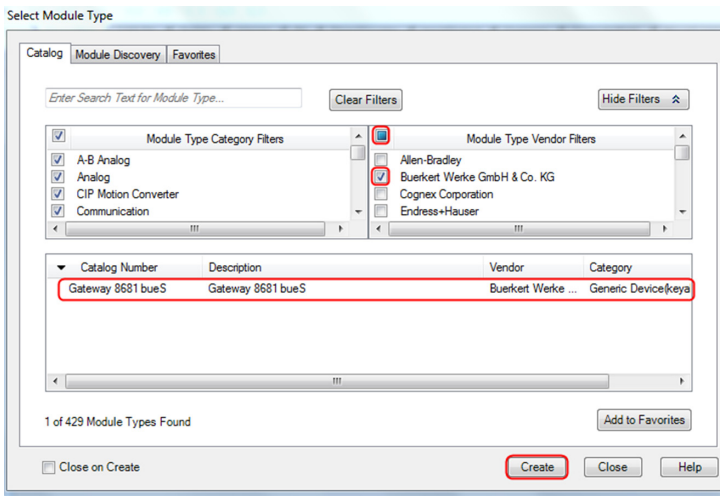
→ Right click on “Ethernet”

→ Select “New Module”



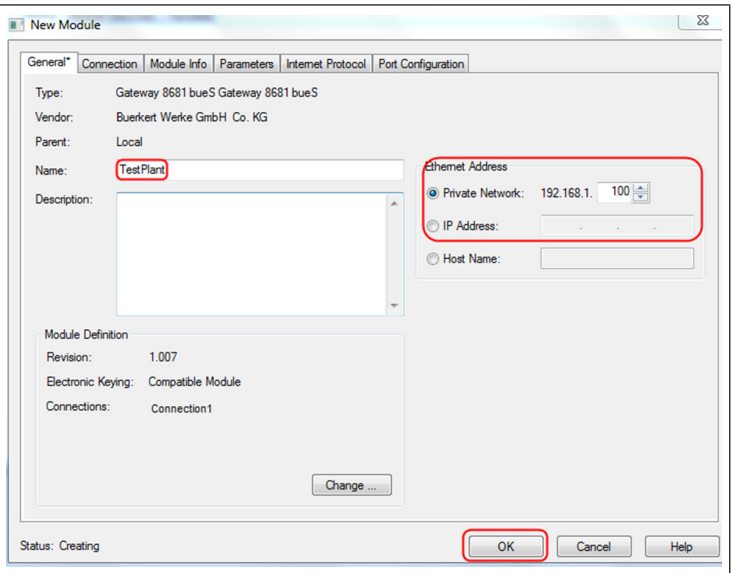
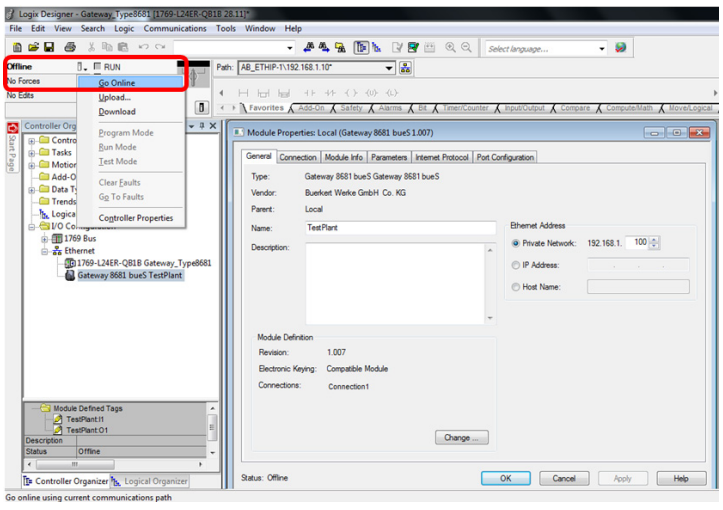
→ In the new window “Select Module Type”, select the appropriate device from the “Catalogue”:
(use the filter function for a faster search: vendor “Buerkert Werke ...”)

→ After selecting the “Gateway 8681 bueS”, click on the “Create” button



(continued on next page)

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

→ In the new window “New Module”, enter a new significant name in the name field and select the appropriate “Private Network” number for the “Ethernet Address” → Click on “OK” button	
→ Close the (old) window “Select Module Type” → in the new window DOWNLOAD the corresponding files (see chapter “15.10 Gateway” on page 93) onto the PLC	
→ Then “Go Online” to connect the gateway and the master controller / PLC (EtherNet/IP) to each other	

15.18 Configuration of the control head network

The gateway Type ME43 is used as a fieldbus interface between the control heads (Type 8681 büS/CANopen) and the master controller (EtherNet/IP). Each gateway can communicate with up to 63 control heads of Type 8681 büS/CANopen.

To set up a network, it is necessary to **assign a unique device address to each control head** (to do so, use the respective DIP switches - see chapter "15.14.2" on page 98).

If there are less than 63 control heads connected to a gateway, it is necessary to "hide" the non-existing control heads, namely both the **inputs and the outputs.**

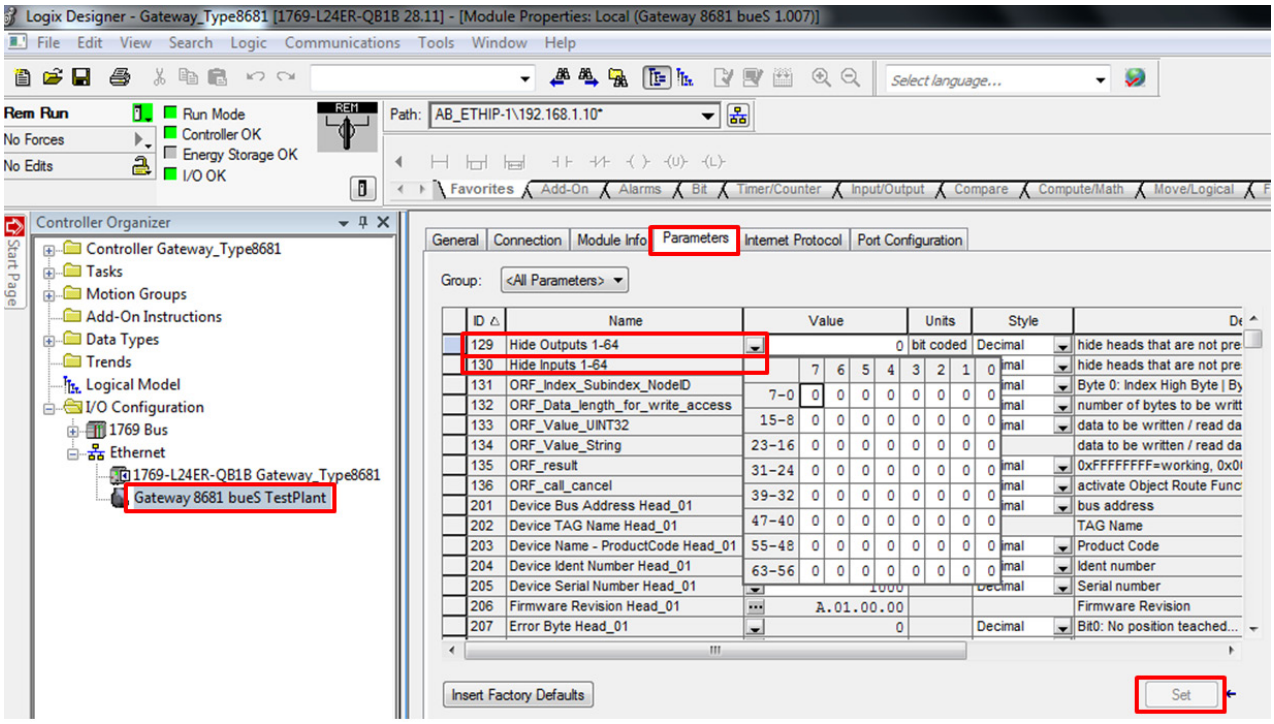
There are 2 options to "hide" the inputs and outputs:
via software "Logix Designer" ("15.18.1") or via the "Bürkert Communicator" Type 8920 ("15.18.2").

15.18.1 "Hide function" via software "Logix Designer"

→ Start the "Logix Designer"

→ Open the project (e.g. "Logix Designer - Gateway_Type8681")

→ Open the desired gateway and select the "Parameters" tab



→ Now select the line "Hide Outputs 1-64" and "hide" each non-existent control head by setting a "1" (one) in each field for the outputs.

→ Now select the line "Hide Inputs 1-64" and "hide" each non-existent control head by setting a "1" (one) in each field for the inputs.

→ Click on the "Set" button to save it and to transfer it to the gateway

→ After doing these steps, **restart the whole system:** it is recommended to switch off and switch on the corresponding power supply unit! The network configuration has then been completed.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

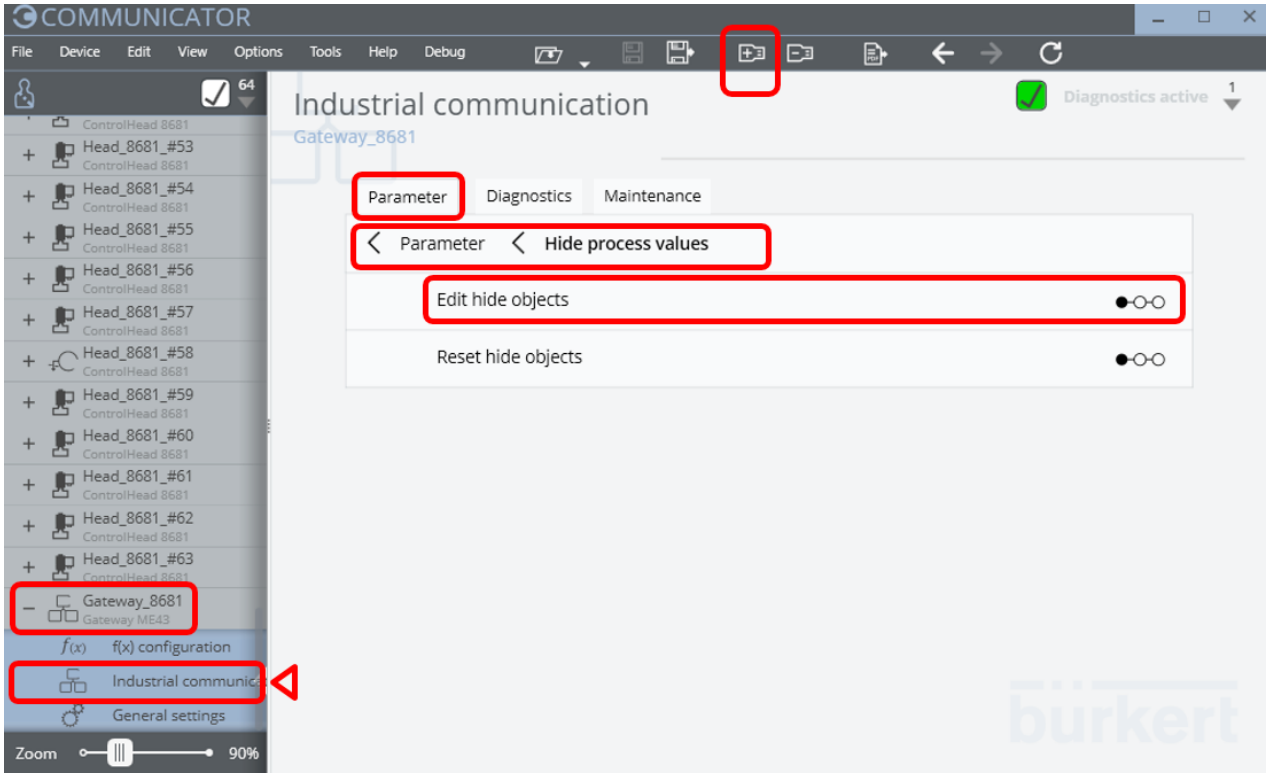
15.18.2 "Hide function" via "Bürkert Communicator"

→ Connect the PC (with Bürkert Communicator Type 8920) via "büS stick" to the büS/CANopen data line (e.g. to a free connection of a CAN junction box in the same network - as shown in "Fig. 38: Network principle" on page 86)

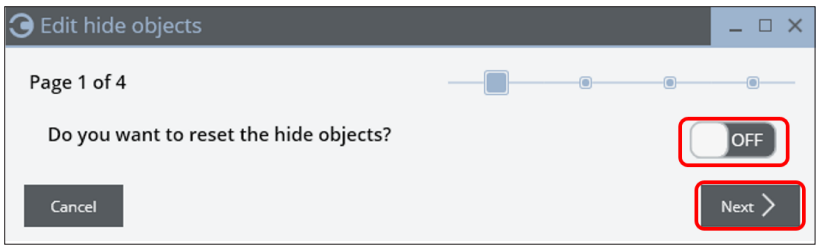
→ Start the Bürkert Communicator Type 8920

→ Click on the icon to add an interface (e.g. "büS COM8")

→ Open the desired gateway (e.g. "Gateway_8681") and select **"Industrial communication"** and then the **"Parameter"** tab, search for **"Hide process values"**, then select **"Edit hide objects"** and start the step sequence with a click



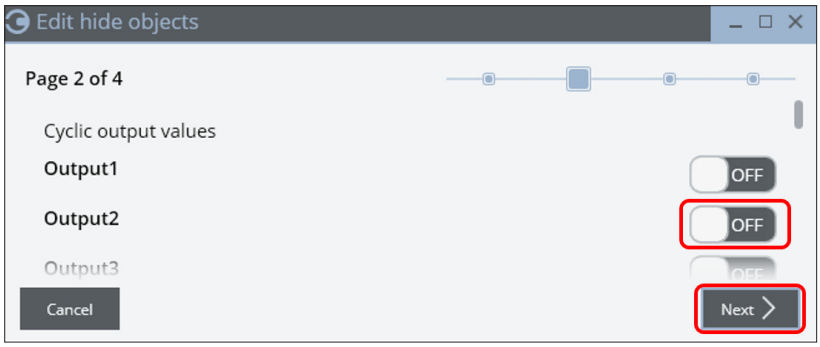
→ **"Page 1":** Start the "hiding function":
set the switch to ON (ON) in order to reset already hidden values – or
set the switch to OFF (OFF) in order to NOT reset already hidden values.



→ Click on **"Next"** (or cancel the "hiding process" via button "Cancel").

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

→ **"Page 2":** Hiding of the outputs:
set the switch to ON (ON) in order to activate the hiding, i.e. these outputs are hidden then – or
set the switch to OFF (OFF) in order NOT to activate the hiding, i.e. these outputs are NOT hidden:



→ Click on **"Next"** (or cancel the "hiding process" via button "Cancel").

→ **"Page 3":** Hiding of the inputs:
set the switch to ON (ON) in order to activate the hiding, i.e. these inputs are hidden then – or
set the switch to OFF (OFF) in order NOT to activate the hiding, i.e. these inputs are NOT hidden: :

→ Click on **"Next"** (or cancel the "hiding process" via button "Cancel").

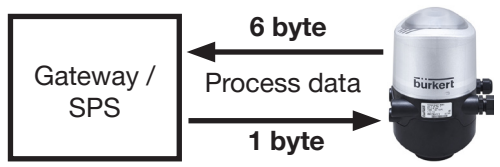
→ **"Page 4":** Finish the "hiding function":
set the switch to ON (ON):
newly hidden values will be confirmed and with **"Finish" the device will be restarted immediately** – or

set the switch to OFF (OFF):
newly hidden values will be confirmed, but with **"Finish" the device is NOT restarted immediately** (the newly set values are accepted after the next restart) – or

cancel the execution of the "hiding function" with button **"Cancel"** (so the new settings will be discarded).

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.19 Description of the (cyclical) I/O data



Depending on the configuration, the gateway processes 1 ... 6 byte of the process data emanating from the control head for the position feedback of the position measuring system.

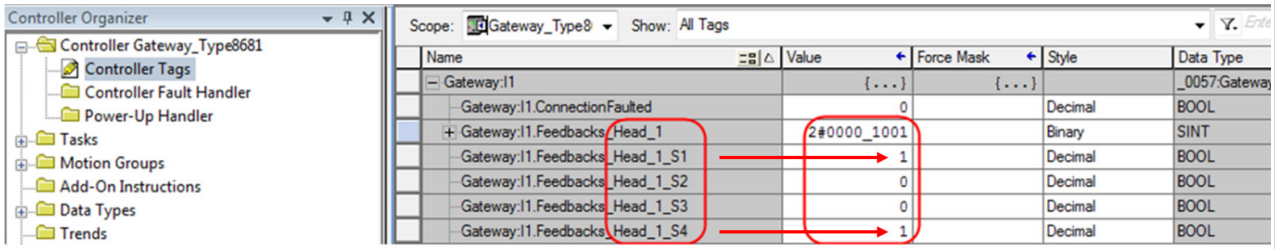
1 byte process data regarding the solenoid valve switching statuses are processed by the control head.

For process data, see also chapter “15.4.1” on page 89

The relevant process data are transfered via Logix Designer as “Controller Tags”:
the (position) feedback from S1 ... S4 (bit-coded, see example 1 below) and the current position feedback (“analog”) as well as the solenoid valve switching statuses V1 ... V3 (bit-coded, see example 2 below)

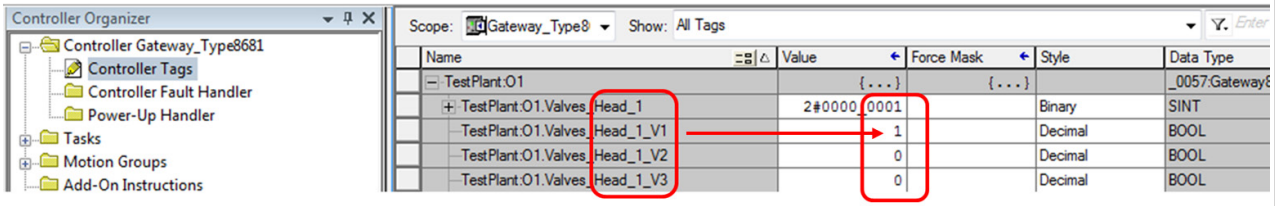
Example 1 (process data from control head to gateway/PLC):

“Position 1” and “External Initiator” are active:



Example 2 (process data from PLC/gateway to the control head):

“Valve 1” is active:



See also chapter “15.20.4 Access to further parameters (cyclic and acyclic)” on page 118.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.20 Access to parameters (Read / Write)

Some relevant acyclic parameters have been defined for preconfigured gateways which can be read directly with the **Logix Designer** and partially overwritten - described below in chapters “15.20.1 Parameter – reading via Logix Designer” and “15.20.2 Parameters – writing via Logix Designer”.

The **Bürkert Communicator (Type 8920)** also makes it easy to read out the parameters and change the values (see “15.20.3 Access to parameters via Bürkert Communicator” or in the software manual for the Bürkert Communicator - see chapter “4.3 Information and instructions on the Internet” on page 14).

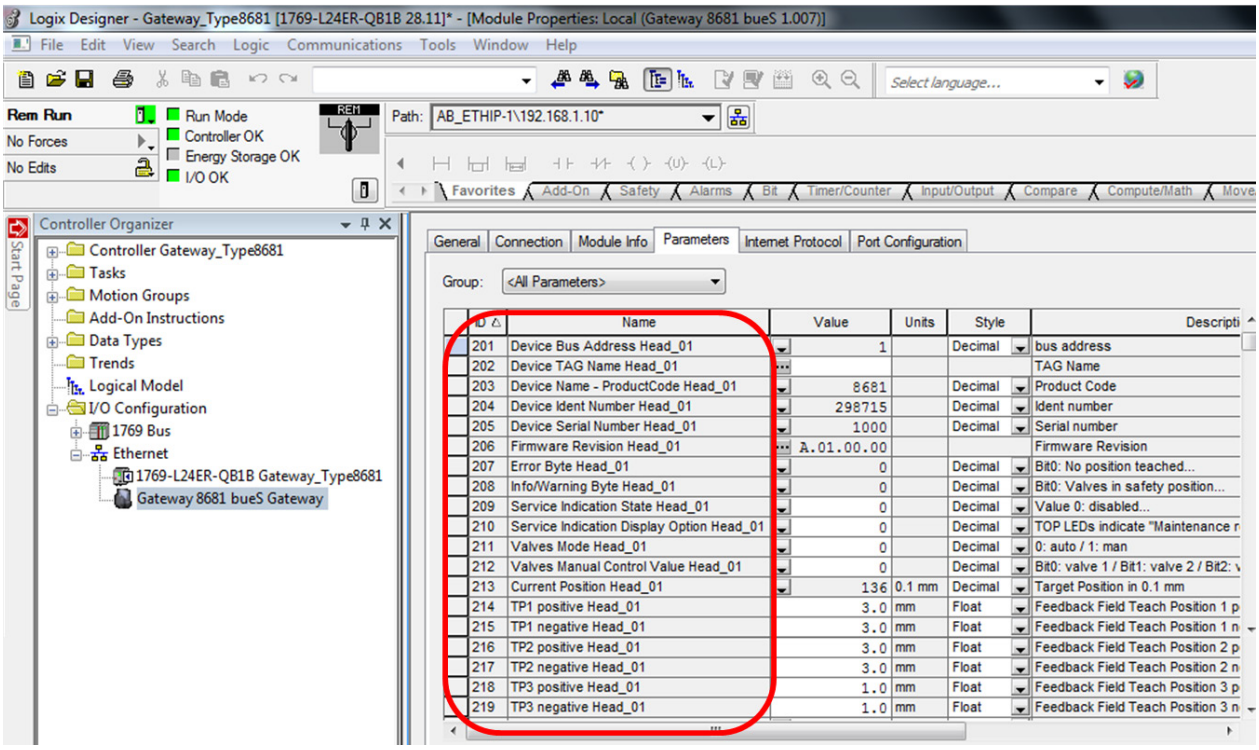
In addition to these relevant acyclic parameters, further values and statuses for acyclic parameters of the büS devices connected to the gateway can be read out and partially written/overwritten - see “15.20.4 Access to further parameters (cyclic and acyclic)” on page 118.

15.20.1 Parameter – reading via Logix Designer

→ Open the project (e.g. “Logix Designer - Gateway_Type8681”)

→ According to the path (I/O Configuration / Ethernet / Gateway ...), open the desired gateway and select the “Parameters” tab. In “Group” select <All Parameters>, all relevant predefined parameters are displayed for each control head (scroll down to see the data of the other control heads).

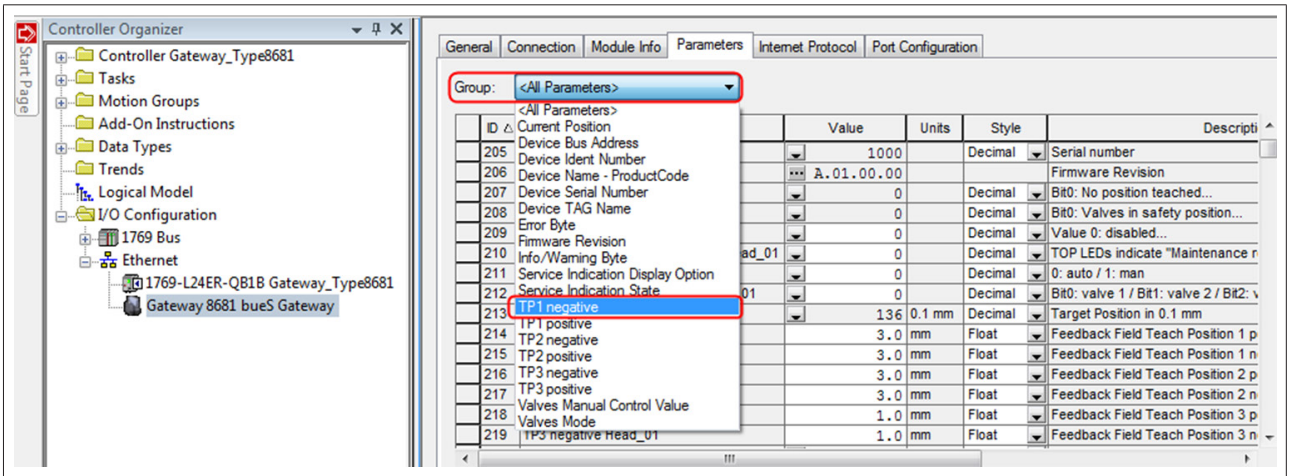
NOTE! EDS with other predefined parameters available on request.



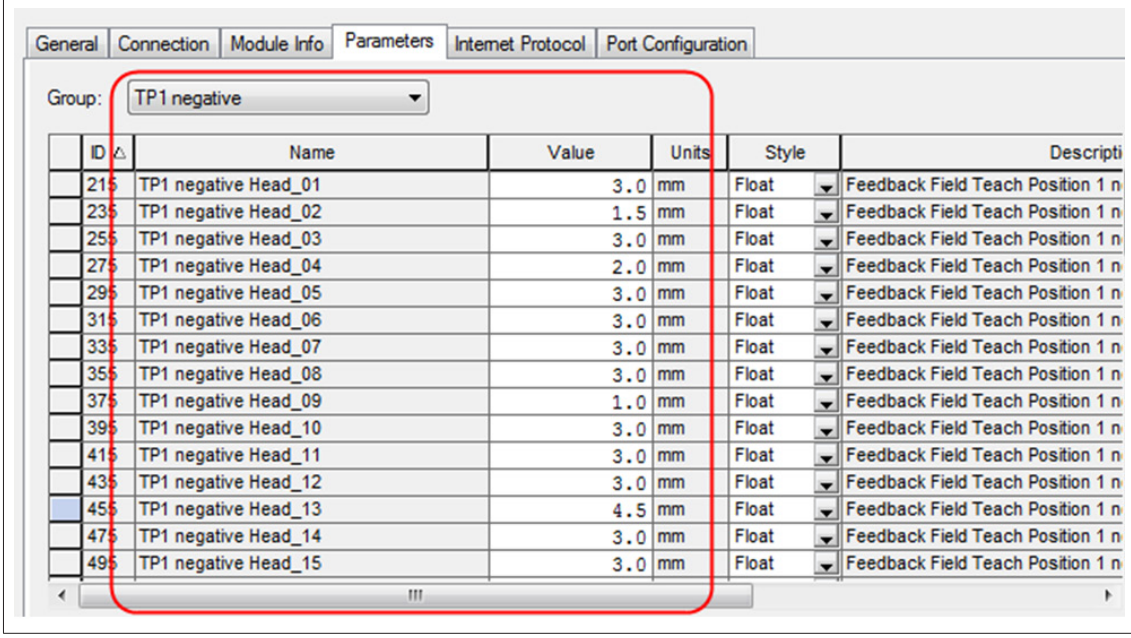
But **o n e parameter** for all control heads can also be displayed using the “Group” function:

→ E.g. select the (Parameter) “Group” / “TP1 negative” (= Feedback Field Teach Position 1 negative):

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022



T h i s parameter is displayed for all devices:

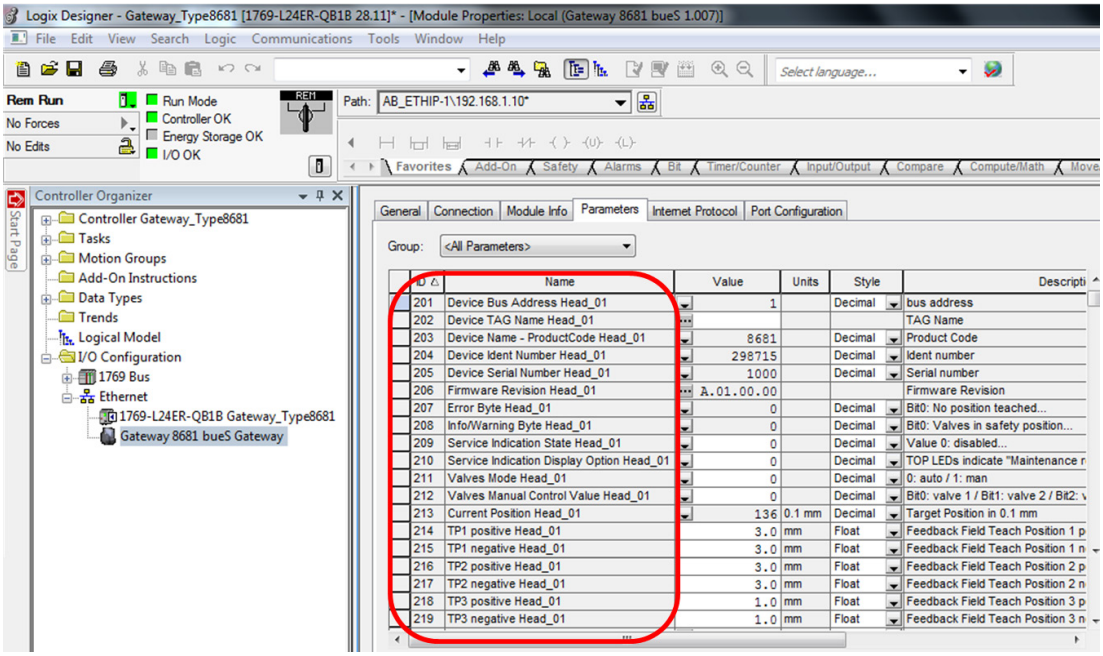


MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.20.2 Parameters – writing via Logix Designer

Parameters in **white fields (rw)** can be overwritten (parameters in grey fields (ro) can only be read out):

→ Open the desired gateway as for the reading function and in the “Parameters” tab select e.g. Group: “All Parameters”



In order to type in or change a value in a white field:

→ Type in a value in the white “Value” field, considering the data type as specified under “Style” (if no style is specified, it is a string value, in that case click the symbol ... to type in).

→ Press the button “OK or “Enter” to accept the value

15.20.3 Access to parameters via Bürkert Communicator

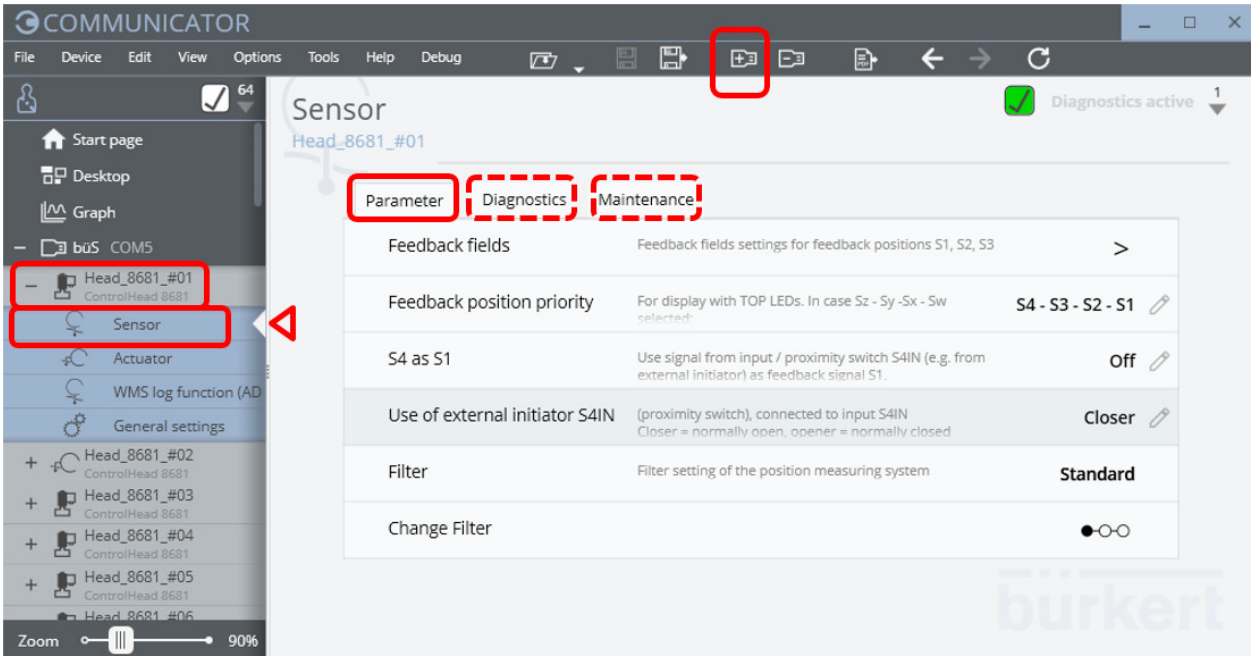
The Bürkert Communicator (Type 8920) makes it easy to read and change parameters. For a detailed description of the Bürkert Communicator - see the relevant manual (see chapter “4.3 Information and instructions on the Internet” on page 14).

→ Connect the PC (with Bürkert Communicator Type 8920) to the büS/CANopen data line using the “büS stick”; start Bürkert Communicator Type 8920

→ Click on the icon to add an interface (e.g. “büS COM8”)

→ Select the desired device in the navigation bar (left), open the **“Parameter” tab** (for special values also “Diagnostics” or “Maintenance”), search for the desired value/parameter and read it out or change:

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022



→ Current parameter values can be read out directly at the right margin;
Parameters with a pen symbol can be overwritten with the appropriate authorisation or step sequences can be started.

→ A **restart** is required after a factory reset and in order to activate changes of bus/communication settings.

15.20.4 Access to further parameters (cyclic and acyclic)

In addition to the predefined relevant parameters, further values can be read out and partially overwritten. Access is via “Bürkert Communicator” or e.g. via Logix Designer.

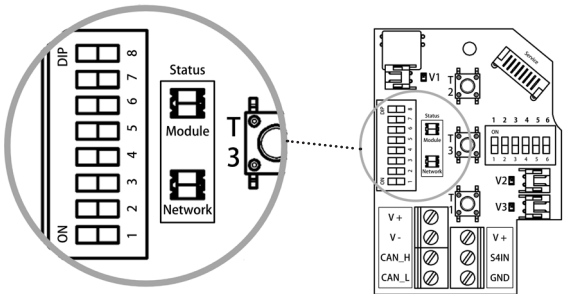
The required fieldbus addresses (as well as indices / sub-indices) are shown in a **Parameter list** that corresponds to the **respective gateway configuration.** This parameter list and other files can be found on the Bürkert website - enter the respective ID number of the preconfigured gateway as search term and download the required files from the ZIP container under “Downloads” / “Software”.

An **Object list for CANopen** and other required files for the Type 8681 büS/CANopen can be found on the Bürkert website – enter the type “8681” or the ID number of the device as search term and download the corresponding files after opening the ZIP container with the “Initiation Files”, found under “Downloads” / “Software”.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

15.21 Display of the status LEDs for bus error

Bus errors are also indicated by the central multi-coloured status display (device status LED / Top LED)- see chapter “21.2 Flashing pattern & fault signalling” and “21.3 Signal priorities”.

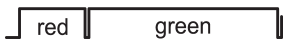


Bus errors are indicated by the status LEDs on the electronic module as well as by the Top LED.

The device status LED (“Module”) and the bus status LED (“Network”) are located on the electronic module of the control head - see figure beside.

Fig. 45: Status-LEDs

Function tests for both status LEDs after the power has been switched on (connection of the network cable):

Status LED	Colour of the LED	Function test	Flashing pattern
“Module”	red / green	250 ms ON (red) 750 ms ON (green)	
“Network”	green / red	250 ms ON (red) 250 ms ON (green) 500 ms OFF	

If the function test has been completed successfully, the status LEDs indicate the device status as described in the following tables:

Status of the device status LED “Module”

LED	Device status	Explanation
OFF	No power supply	• Device is not powered
Green	Device is working	• normal operation

Status of bus status LED “Network”

LED	Device status	possible errors	Remedy
OFF		• No fault detected or • Device start-up phase	
Green ***)**		• No fault detected ***)**	
Red/green ***)** flashing (500 ms/ 500ms	only in bus mode = “büs” ***)**	• No setpoint connection configured for controlling the solenoid valves ***)**	Configure a setpoint connection for controlling the solenoid valves (see chapter “15.14.3” on page 100
(continued on next page)			

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

LED	Device status	possible errors	Remedy
Red	Error **- it is critical if the LED is still lit 2 minutes after the last device restart**	• Another device with the same Node ID is in the same network • No bus connection (Gateway / PLC) due to communication problems or gateway restart	• Check baud rate • Check the Node ID address (if required, correct it so that each address is only available once) • Check the status of the gateway connected to the system • If required, replace the device

***)** Display/visualisation only from firmware version B.02

15.22 Firmware updates

Firmware updates of the control heads, gateways (and possibly other devices) can only be carried out using the Bürkert Communicator with the aid of a büS stick. This requires the “installer level”.

The integration of the Bürkert Communicator into the network can be seen, for example, in “Fig. 38: Network principle” on page 86

The firmware is stored in the Bürkert Communicator and is kept up to date via updates.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

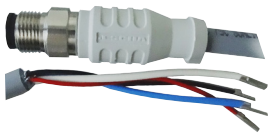
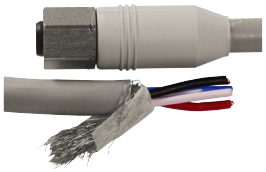
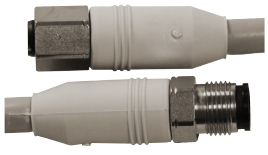
16 ACCESSORIES FOR BÜS DEVICES

CAUTION!

Risk of injury and/or damage due to the use of unsuitable parts

Incorrect accessories and unsuitable spare parts may cause injuries and damage the device and the surrounding area.

- Use only original accessories and original spare parts from Bürkert.

Accessories	Figure	Order / ID no.
Switching power supply Type 1573 to power the CAN sub-system **(Note:** only ID no. 772898 conforms to NEC Class 2 (all ID no. of Type 1573 conform to the EU standards 2014/35/EU - LVD and 2014/30/EU - EMC)		
3.8 A nominal output current **(conforms to "NEC Class 2")**		772898
1 A nominal output current		772361
2 A nominal output current		772362
10 A nominal output current		772698
Gateway ME43 (also an **SD card** for the gateway) (connection between büS/CANopen (Bürkert) and Ethernet/IP (Rockwell Automation)); preconfigured and designed for the connection/control of up to 63 Control Heads Type 8681 (büS) Other pre-configurations e.g. in conjunction with Control Heads Type 8691, Positioners Type 8692 or Process Controllers Type 8693 on request.		316696 (gateway) 774087 (SD card)
Cables and connections (büS/CANopen) **developed for application in environments with "hygienic requirements"** (degree of protection: IP65/67 | materials: Metal parts - stainless steel, cable sheath - PVC | U = 24 V DC, I = max. 4 A; **required tightening torque** for the required leak-tightness against moisture: **0.6 Nm + 0.1 Nm)**		
Connection cable with flying leads and M12 plug***)**, length 1 m (for the connection of büS control heads with cable glands)		218187
Connection cable with flying leads and M12 socket***),** length 1 m		773482
Connection cable with flying leads and M12 socket***),** length 3 m		773483
Extension cable, M12 plug + M12 socket***),** length 0.5 m		773484
Extension cable, M12 plug + M12 socket***),** length 1 m		773485
Extension cable, M12 plug + M12 socket***),** length 3 m		773486
Extension cable, M12 plug + M12 socket***),** length 5 m		773487
Extension cable, M12 plug + M12 socket***),** length 10 m		773488
Extension cable, M12 plug + M12 socket***),** length 20 m		773489

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Accessories	Figure	Order / ID no.
CAN terminating resistor, M12 plug***),** 120 Ω		773490
CAN terminating resistor, M12 socket***),** 120 Ω		773491
CAN Y-connector, M12***)**		773492
CAN T-connector, M12***)**		773493
Mounting plate for CAN T-connector (M12)		773494
Protective cap for M12 socket for closing unnecessary (open) connections (10 protective caps per pack)		308778
Protective cap for M12 plug including O-ring 8 x 2 N-NBR 70 (10 caps and 10 O-rings per pack) for closing unnecessary (open) connections		308785
CAN junction box, M12 ***)** for connection up to 8 devices to the bus (6 connections have already been closed with appropriate protective caps)		338398

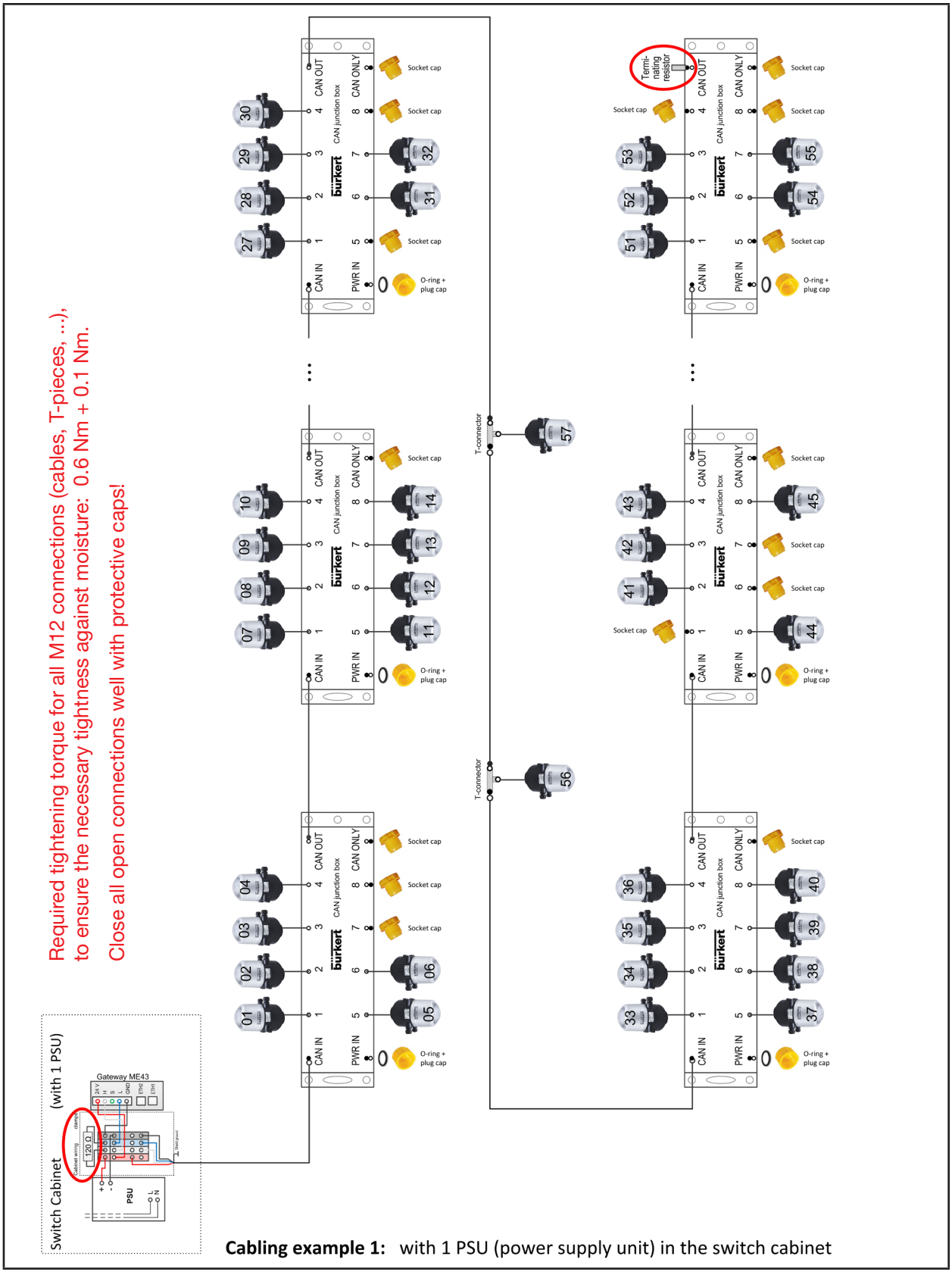
***) Required tightening torque** for all plug-in connections (cables, T-pieces, ...) to ensure the required leak-tightness against moisture: **0.6 Nm + 0.1 Nm.**

Alternatively, DeviceNet cabling components (e.g. from Rockwell Automation) can also be used. **However, they must comply with the necessary requirements when used in the "Hygenic area",** because not all of these parts have the required quality such as stainless steel or PP or PPE or PVC.

Standard service equipment (not suitable for "hygienic requirements")	Order/ID No.
Magnetic manual override (see „22.1“) for switching solenoid valve 1 (2/A1)	796131
USB büS interface set 1 – case with "USB-büS interface set 2" as well as power supply unit, adapter cable with M12 plug / wires, adapter M12 plug to M12 plug, Y-piece M12 plug to 2x M12 socket, CD-ROM Bürkert Communicator), etc. (for devices with büS or service büS (8681 büS/CANopen, 8681 IO-Link))	772426
USB büS interface set 2 – contains: büS stick, programming cable M12 socket to mini USB plug and 24 V DC socket, büS adapter M12 plug to micro USB plug (for devices with service büS (8681 IO-Link))	772551
Extension cable, M12 plug and socket, length 1 m | 3 m	772404 | 772405
Extension cable, M12 plug and socket, length 5 m | 10 m	772406 | 772407

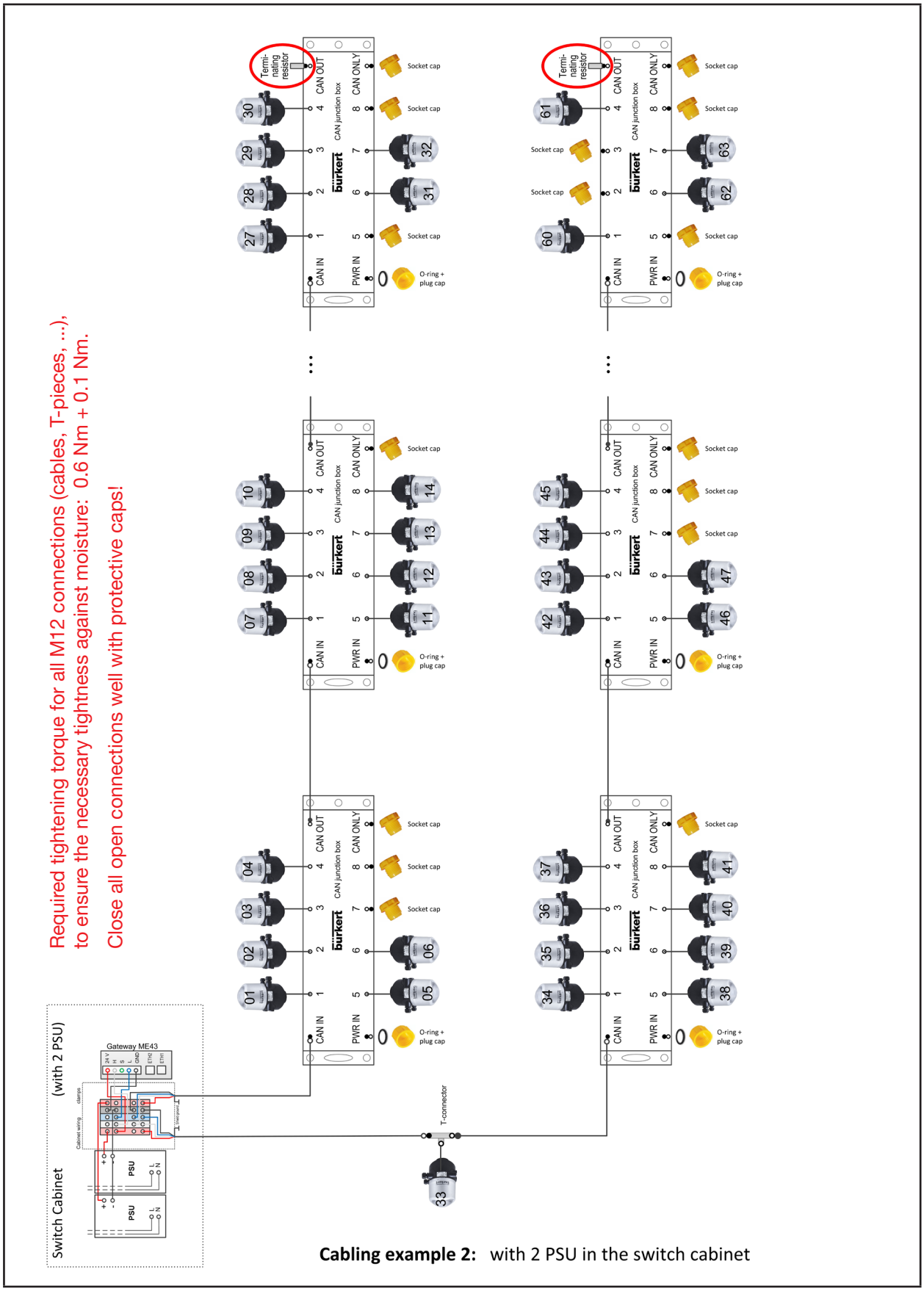
MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

17 CABLING EXAMPLES (BÜS/CANOPEN)



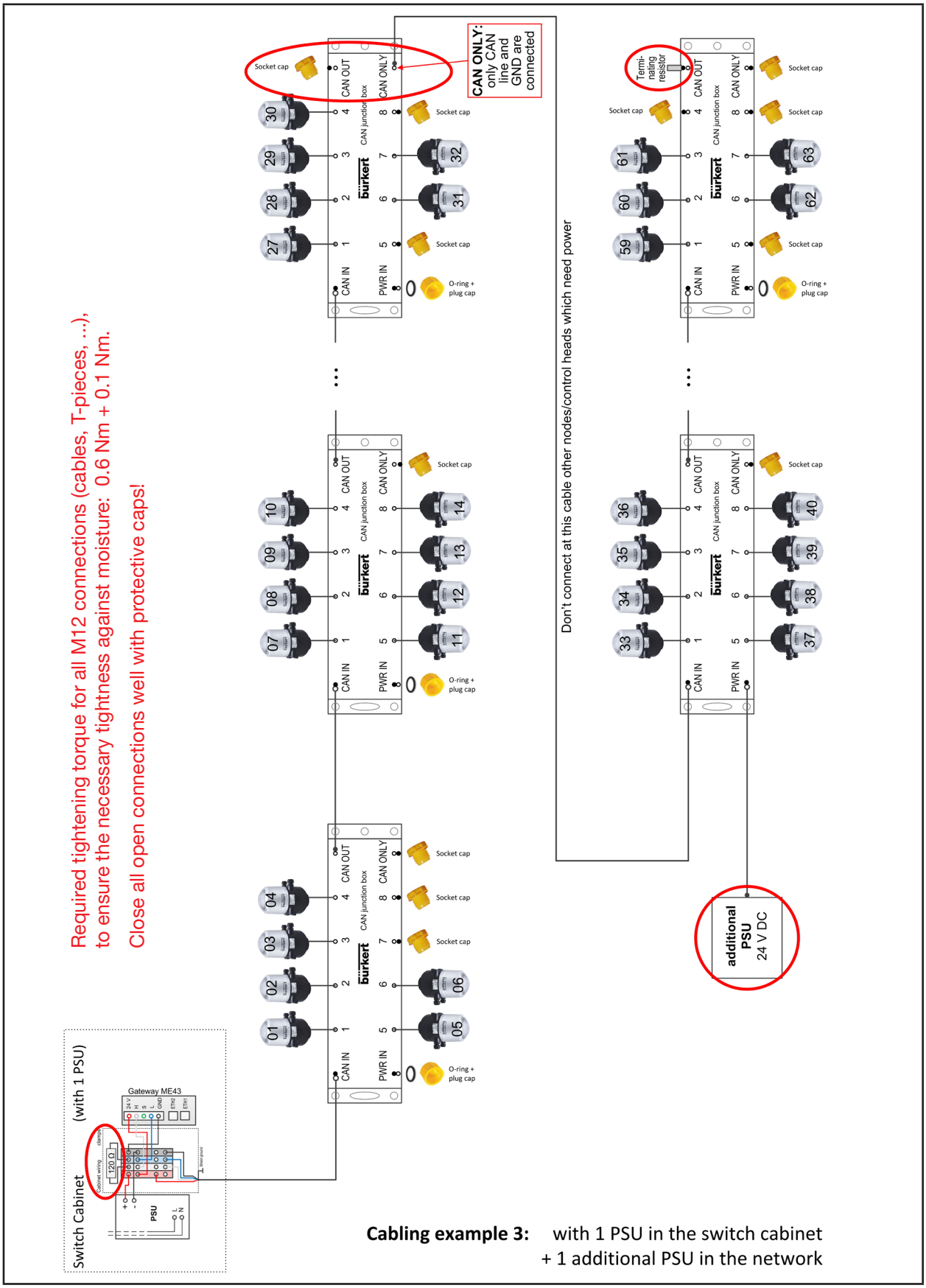
Cabling example 1: with 1 PSU (power supply unit) in the switch cabinet

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022



Cabling example 2: with 2 PSU in the switch cabinet

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022



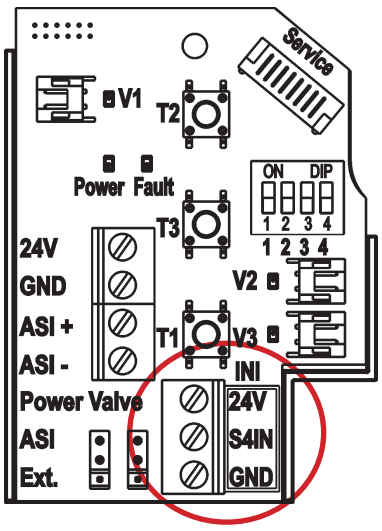
Cabling example 3: with 1 PSU in the switch cabinet
+ 1 additional PSU in the network

18 CONNECTION OF AN EXTERNAL INITIATOR

DANGER!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- Opening the hood or the housing in a potentially explosive atmosphere is only allowed in a not energised state!



An external initiator can be connected via the 3-fold screw terminal - at bottom right on the respective electronic module (in the example: AS-i).

Due to the size of the screw terminals, the wire cross-sections of the external initiator have the following values for the different designs:

0.14 ... 1.5 mm² for designs: 24 V DC, AS-i, DeviceNet; IO-Link, büS/CANopen

0.5 ... 1.5 mm² for design: 120 V AC

Fig. 46: Screw terminal for external initiator

Designation of the screw terminals on the different electronic modules:

Designation - according to design			Configuration
24 V DC, AS-i	DevNet, IO-Link, büS/CANopen	120 V AC	
24 V	V+	L	Power supply - according to design!
S4 IN	S4 IN	S4 IN	External initiator input
GND	GND	N	GND external initiator (24 V DC, AS-i, DevNet) or power supply (120 V AC design)

Electrical requirements of the external initiator for different designs:

The electrical requirements of the external initiator can be found in the respective subchapters "Electrical data" under the headword "Input / proximity switch (external initiator: S4 in)":

Design 24 V DC: see Page 41,
120 V AC design: see Page 48
AS-i design: see Page 56,
DeviceNet design: see Page 65,
IO-Link design: see Page 76,
büS/CANopen: see Page 86.

Procedure when connecting the external initiator:

→ Open the housing following the instructions in chapter “8 Opening and Closing the Housing”.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

→ Assemble the connection cables according to the general rules of technology.

→ Insert cables through the cable gland (connection on right) into the interior of the housing.

→ Connect the wires to the connection terminals according to the pin assignment.

→ Close the housing following the instructions in chapter "8 Opening and Closing the Housing".

NOTE!

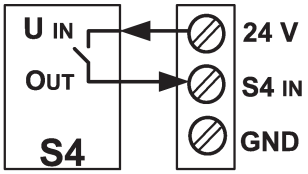
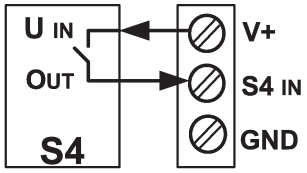
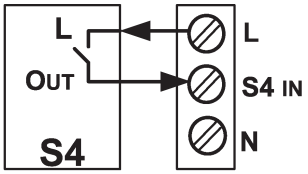
Ensure IP protection!

- To ensure IP protection, the union nuts of the cable glands must be tightened in accordance with the cable sizes or dummy plugs used (approx. 1.5 Nm).
- If no external initiator is used, the right-hand connection opening must be tightly sealed using a dummy plug or using a cable gland (SW 19, Ø 3 - 6 mm) + dummy plug (Ø 5 - 6 mm)!

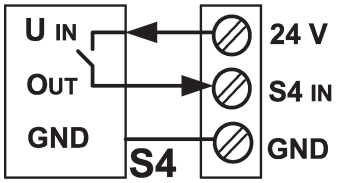
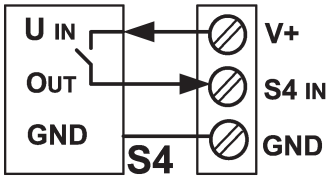
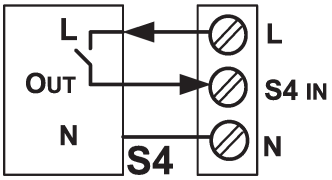
Use of the control head in a potentially explosive atmosphere

- Only use cables and cable glands which are approved for the respective application area and fit the cable glands according to the respective operating instructions!
- Close all unnecessary openings with lock screws/plugs approved for explosions area!

Connecting a 2-wire initiator:

24 V DC, AS-i	DeviceNet, IO-Link, büS/CANopen	120 V AC
		

Connecting a 3-wire initiator:

24 V DC, AS-i	DeviceNet, IO-Link, büS/CANopen	120 V AC
		

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

19 SPECIAL DESIGNS

19.1 Control head for double-acting actuators

This design is configured for double-acting actuators. Of the two internal solenoid valves, one is designed for NC mode of operation and the other for NO mode of operation.

19.1.1 Anomalies

This variant can be configured for all electrical designs.

This control head differs from control head Type 8681 (standard) in the following points:

- Solenoid valve 1: NC / Normally Closed;
  Solenoid valve 2: NO / Normally Open (as a result safety position)
- The flow rate from P to A2 may be restricted to 50 l/min only, otherwise a reliable switchover (from A2 to R) cannot be guaranteed!
- only automatic Teach function (Autotune) 1 and 2 possible

19.1.2 Fluid diagram

See “Fig. 3: Fluid diagram (design for double-acting actuators: 2 solenoid valves, NC* + NO**)” on page 18.

19.1.3 Activation of a double-acting actuator

To open or close the process valve, both solenoid valves (V1 and V2) must be activated simultaneously:

Process valve	24 V / 120 V		AS interface		DeviceNet	
Solenoid valve (V)	V1	V2	V1	V2	V1	V2
Open	Y1 = ON	Y2 = ON	D0 = 1	D1 = 1	Bit0 = 1	Bit1 = 1
Close	Y1 = OFF	Y2 = OFF	D0 = 0	D1 = 0	Bit0 = 0	Bit1 = 0

For further information on the electrical installation and programming, see the relevant chapters for the individual standard designs:

24 V - design: “10 24 V DC - Design” on page 41,
120 V - design: “11 120 V AC - Design” on page 48,
AS-i - design: “12 AS Interface - Design” on page 54,
DVN - design: “13 DeviceNet - Design” on page 63.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

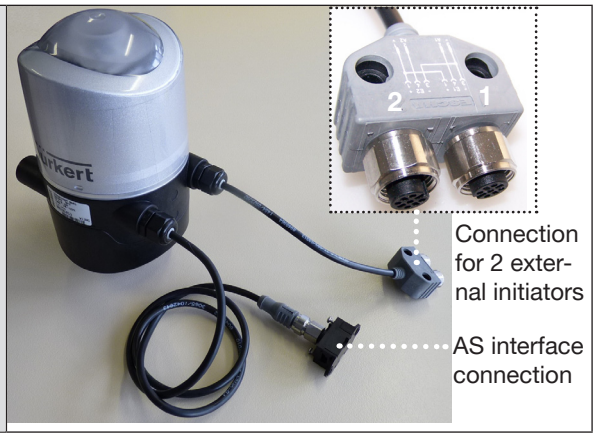
19.2 Control head (AS-i) with 2 external initiators

19.2.1 Anomalies

This variant was configured for the AS interface design.

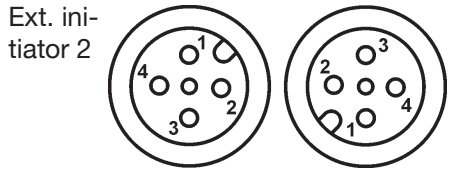
This control head differs from control head Type 8681 (standard, AS-i) in the following points:

- Connections for 2 external initiators, which behave like S1 and S2 (Top LED display)
- No internal positions can be taught
- No automatic Teach function (Autotune) can be used



19.2.2 Electrical installation and programming data

Compare also chapter "12.8 Electrical installation of the AS interface" on page 60 for the standard designs:



(View of the two M12 female connectors for the two external initiators)

Pin	External initiator 2	Wire colour	Pin	External initiator 1	Wire colour
1	24 V +	brown	1	24 V +	brown
2	Not used	-	2	Not used	-
3	GND	blue	3	GND	blue
4	S5 IN	white	4	S4 IN	black

Compare also chapter "12.9 Programming data" on page 62 for the standard designs:

Bit configuration table:

Data bit	D3	D2	D1	D0
Input	Not used	Not used	External initiator 2 (S5 IN)	External initiator 1 (S4 IN)
Output	Not used	Not used	Solenoid valve **V3**	Solenoid valve **V2**	Solenoid valve **V1**

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

20 POSITION MEASURING SYSTEM

Operating principle of the position measuring system

The position measurement is based on recording the change in position of the ferromagnetic target inside the system. The geometry and the material of the target to be used are synchronized with the sensitivity of the system.

The measurement precision is determined by the ferromagnetic properties of the target and all other parts in the system. While the targets must be ferromagnetic, the other components are ideally made of materials that do not have ferromagnetic properties – see therefor chapter “6.8 Position measuring system data” on page 28.

The switching positions of the process valves are reported to the actuator by feedback signals from the solderless position measuring system. Connection to the control head is done by means of a simple adaptation to the process valve's piston (valve spindle).

Stroke range / Feedback / Teach functions

The recordable stroke range is between 0 ... 80 mm.

3 discrete feedback are evaluated:

- Position 1 (discrete S1OUT signal)
- Position 2 (discrete S2OUT signal)
- Position 3 (discrete S3OUT signal)

A discrete, external feedback signal (standard proximity switch / external initiator) can also be processed (S4IN, S4OUT).

The valve positions S1 to S3 are reported within a certain tolerance range, this feedback range can be adapted - see chapter “6.9.1 Feedback fields (position measuring system)” on page 29.

These Teach buttons or the PC service program (for the 24 V DC, 120 V AC, AS-i, DeviceNet variants) can be used to define the switch positions of the position sensor (Teach procedure: manual or automatic Teach functions).
The control head is connected to the PC via the service interface on the electronic module. For the IO-Link and büS/CANopen variants, the Bürkert Communicator (Type 8920) can be used. This requires a büS stick in addition to the Bürkert Communicator – see chapter „16 Accessories for büS devices“ on page 121.

If an explosive atmosphere is present the housing **may not be opened** when voltage is present.

For a detailed description of the **electrical installation** - see

chapter “10 24 V DC - Design” on page 41 or
chapter “11 120 V AC - Design” on page 48 or
chapter “12 AS Interface - Design” on page 54 or
chapter “13 DeviceNet - Design” on page 63 or
chapter “14 IO-Link - Design” on page 76 or
chapter “15 büS/CAN open-Design” on page 86 or
chapter “18 Connection of an External Initiator” on page 126 or
chapter “19.2 Control head (AS-i) with 2 external initiators” on page 129.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

20.1 Setting the position measuring system (Teach procedure)

DANGER!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- Opening the hood or the housing in a potentially explosive atmosphere is only allowed in a not energised state!

Example for the manual Teach procedure (manual Teach function) for 3 valve positions:

→ Open the housing following the instructions in chapter “8 Opening and Closing the Housing”.

→ Supply electrical power so that the position measuring system and the LED display can function.

→ Position the process valve at the lower switching position.

→ Depress the lower Teach button (T1) for approx. 1.5 seconds:
The LED (colour) corresponding to this position will flash quickly 3 times during the Teach procedure. When this position has been saved, the corresponding LED will remain continuously lit until the position of the target is changed.

→ Afterwards, position the process valve at the upper switching position to be recorded.

→ Depress the upper Teach button (T2) for approx. 1.5 seconds:
The LED (colour) corresponding to this position will flash quickly 3 times during the Teach procedure. When this position has been saved, the corresponding LED will remain continuously lit until the position of the target is changed.

→ The process valve can now be moved into a third, defined position.

→ Depress the middle Teach button (T3) for approx. 1.5 seconds:
The LED (colour) corresponding to this position will flash quickly 3 times during the Teach procedure. When this position has been saved, the corresponding LED will flash continuously until the position of the target is changed.

→ If required, return control head and system to normal status (switching position, power supply).

→ Close the housing following the instructions in chapter “8 Opening and Closing the Housing”.

If the piston rod or the target are located outside the measuring area during the Teach procedure, the Top LED will flash 3 times in the defined fault colour.

If the piston rod or target are outside of the measuring area, no positions signals are transmitted, i.e. the Top LED will not be lit.

The Teach buttons can be assigned to any of the positions of the piston rod or target, i.e. T1 does not have to correspond to the lower target position, etc.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

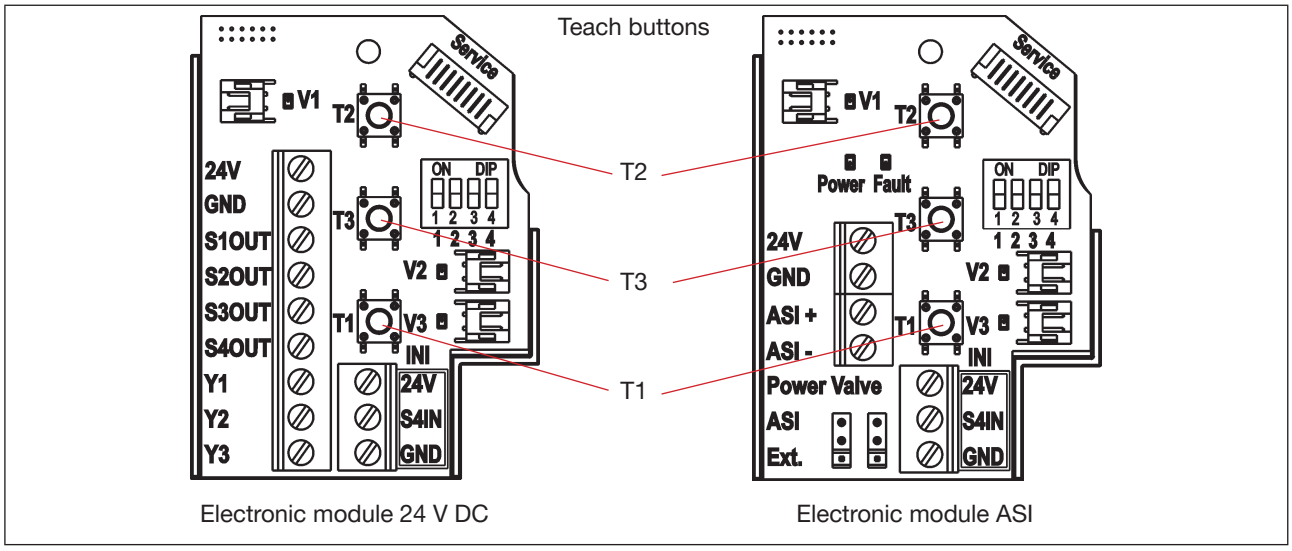


Fig. 47: Teach buttons on the electronic modules (in the example of the electronic modules for 24 V DC and AS-i)

20.2 Teach buttons / Teach functions

20.2.1 Teach functions and Teach reset

The individual valve positions/positions S1 to S3 can be taught manually via the Teach buttons (see chapter „20.1“) and these valve positions can be reset (Teach reset).

Teach button	Function	Activation duration	Optical feedback
T1	manual Teach function S1	1.5 s	Top-LED flashes quickly three times, then continuously in the encoded colour for position S1
T2	manual Teach function S2	1.5 s	Top-LED flashes quickly three times, then continuously in the encoded colour for position S2
T3	manual Teach function S3	1.5 s	Top-LED flashes quickly three times, then flashes slowly in the encoded colour for position S3
T1 + T2	**Teach reset** of all valve positions (S1, S2, and S3)	2.5 s	Flashes in the fault colour - see chapter “21.2”

Furthermore, the Teach procedure can also be automated – the **automatic Teach functions (Autotune functions)** programmed for this purpose are described in detail in the following chapters.

The 5 different automatic Teach functions (Autotune) are pre-programmed for various process valve types (e.g. single-acting or double-acting actuators, double-seat valves, etc.) and for various starting positions of the process valves (open, closed) - the automatic Teach function (Autotune) being used must be selected according to the process valve type and application.

The **colour coding/colour assignment** for the individual valve positions/positions are described in chapter “21.1.1 Device specific LED mode “8681 Classic Mode””.

The valve positions/positions (S1 to S4) as well as various errors and warnings are distinguished by various **“flashing patterns”** – see chapter “21.2 Flashing pattern & fault signalling”.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

20.2.2 Automatic Teach functions (Autotune)

The automatic Teach procedure of the valve positions S1 to S3 can be implemented using the automatic Teach functions (Autotune).

The optical feedback of the classic variants (24 V DC, 120 V AC, AS-i, DeviceNet) differ slightly from those of the newer IO-Link and büS/CANopen variants.
This is due to the modified design of the top LED, which has been optimised for the display according to “NAMUR” (NE 107, edition 2006-06-12).

The classic variants have 3 LEDs that can simultaneously display 3 colours (green, yellow, red).

The IO-Link and büS/CANopen variants have LEDs that can change their colour spectrum and are, therefore, capable of display functions according to “NAMUR”.

Change to Autotune mode (mode to start the automatic Teach functions):

Teach button	Mode	Activation duration	Optical feedback (classic designs)	Optical feedback (IO-Link, büS/CANopen)
T2 + T3	Autotune-Modus	2.5 s	green + yellow + red all LEDs permanently ON	red + yellow + green flashing in succession (500 ms per colour)

Then one of the 6 automatic Teach functions (Autotune) can be selected according to the following table:

Teach button	Mode	Activation duration	Optical feedback (classic designs)	Optical feedback (IO-Link, büS/CANopen)
T1	Autotune 1	each 0.5 s	green + yellow + red “running light” (i.e. alternating display)	red + yellow + green flashing in succession (200 ms per colour***)**)
T2	Autotune 2			
T3	Autotune 3			
T1 + T2	Autotune 4			
T1 + T3	Autotune 5			
T2 + T3	Autotune 6			

The following applies to IO-Link and büS/CANopen devices:

***)** This optical feedback for **“automatic Teach function (Autotune) active”** is only valid for the display mode **“Device-specific LED mode” (“8681 Classic 0 ... 15”)** - see chapter „21.1.1“.

With the other display modes of the device status LED (top LED) – see chapter „21.1“ – there are differences in the colour and flashing pattern display for **“automatic Teach function (Autotune) active”.** See also:
- **NAMUR mode** (chapter „21.1.2“) - display orange as a “function check”
- **Valve mode** (chapter „21.1.3“) - no display
- **Valve mode + error** (chapter „21.1.4“) - no display
- **Valve mode + error + warnings** (chapter „21.1.5“) - display orange as a “function check”

The following also applies to IO-Link-devices:

Following the procedure described above, a reference run is carried out during which the Teach positions taught in the respective automatic Teach function (Autotune) are approached again one after the other. The travel times are determined and stored as reference values in the Teach function.

Irregularities with the automatic Teach functions (Autotune)?

Refer to the notes below:

If no automatic Teach function (Autotune) has been started 10 s after switching to Autotune mode, the automatic Teach function (Autotune) is exited automatically.

If an automatic Teach function (Autotune) does not run properly or is aborted (if e.g. no compressed air is connected), the positions already taught are deleted again, the corresponding automatic Teach function (Autotune function) is left and switched to normal operation.
The Teach positions are set to "not taught", i.e. the Top LED flashes in the fault colour.

In the case of the design for **double-acting actuators** (solenoid valves NC+NO) only automatic Teach functions (Autotune) 1 and 2 are possible (compare chapter "19.1" on page 128).

20.2.3 Sequence of the automtic Teach functions (Autotune)

Automatic Teach function / Autotune 1:

Control	Effect on the process valve	Internal program		Error
T2 + T3	**Autotune mode started**			
T1	Autotune 1 starts			
	Closed position	Teach	T1	
	Open valve	Activate	V1	
		Wait period	10s	
	Open position	Teach	T2	
	Valve closing	Deactivate	V1	
	Valve closes	Wait on position S1	S1	Timeout 15 s
	Autotune mode completed			

Example illustration of the Autotune sequence 1:

1. Check in what position the process valve must be at the beginning of the Autotune procedure (here: closed position). Close it if necessary!
2. Press the teach buttons T2 and T3 at the same time (for 2.5 s) to select the Autotune mode.
   This mode will be indicated by continuous illumination of the Top LED (central device status LED).
3. Press teach button T1 (for 0.5 s) to start the Autotune 1 mode. This will be indicated by illumination of the Top LED in a "chaser mode". The programmed sequence for "Auto-Teach sequence" 1 will now run fully automatically:
   - The position in that the process valve is adjusted will be taught first as position S1. The position of the process valve must therefore be checked first!
   - After that, valve V1 is activated. It initiates opening of the process valve.
   - After maximum 10 s, the process valve has reached position S2 (open position).
   - Then position S2 is taught.
   - After that, valve V1 is deactivated. It initiates closing of the process valve.
   - Once the process valve is closed (after 15 s maximum), position S1 is displayed by the Top LED.
4. Autotune sequence 1 is complete: Positions S1 and S2 are taught.

In the event that a **timeout** occurs (after 15 seconds wait period), the corresponding automatic Teach function (Autotune function) will be exited and switched to normal operation.
Furthermore, the Teach positions are set to "not taught", i.e. the Top LED flashes in the fault colour.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Automatic Teach function / Autotune 2:

Control	Effect on the process valve	Internal program		Error
T2 + T3	**Autotune mode started**			
T2	Autotune 2 starts			
	Open position	Teach	T2	
	Valve closing	Activate	V1	
		Wait period	10s	
	Closed position	Teach	T1	
	Open valve	Deactivate	V1	
	Valve opens	Wait on position S2	S2	Timeout 15 s
	Autotune mode completed			

Automatic Teach function / Autotune 3:

Control	Effect on the process valve	Internal program		Error
T2 + T3	**Autotune mode started**			
T3	Autotune 3 starts			
	Closed position	Teach	T1	
	Open valve	Activate	V1	
		Wait period	10s	
	Open position	Teach	T2	
	Valve closing	Deactivate	V1	
	Valve closes	Wait on position S1	S1	Timeout 15 s
	Open clock valve plate	Activate	V2	
		Wait period	10s	
	Clock valve plate	Teach	T3	
	Valve closing	Deactivate	V2	
	Valve closes	Wait on position S1	S1	Timeout 15 s
	Autotune mode completed			

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Automatic Teach function / Autotune 4:

Control	Effect on the process valve	Internal program		Error
T2 + T3	**Autotune mode started**			
T1 + T2	Autotune 4 starts			
	Valve closing	Activate	V2	
		Wait period	10s	
	Closed position	Teach	T1	
	Open valve	Deactivate	V2	
		Activate	V1	
		Wait period	10s	
	Open position	Teach	T2	
	Valve closing	Deactivate	V1	
		Activate	V2	
	Valve closes	Wait on position S1	S1	Timeout 15 s
	Neutral position	Deactivate	V2	
	Autotune mode completed			

Automatic Teach function / Autotune 5:

Control	Effect on the process valve	Internal program		Error
T2 + T3	**Autotune mode started**			
T1 + T3	Autotune 5 starts			
	Closed position	Teach	T1	
	Open valve	Activate	V1	
		Wait period	10s	
	Open position	Teach	T2	
	Valve closing	Deactivate	V1	
	Valve closes	Wait on position S1	S1	Timeout 15 s
	Intermediate position opens	Activate	V2	
		Wait period	10s	
	Intermediate position	Teach	T3	
	Valve closing	Deactivate	V2	
	Valve closes	Wait on position S1	S1	Timeout 15 s
	Autotune mode completed			

Automatic Teach function / Autotune 6:

Spare function

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

21 LED COLOUR ASSIGNMENTS

The switching statuses of the process valves as well as the device statuses are signalled to the outside via the central multi-colour status display (device status LED / Top LED), so that quick visual control is possible also for large systems.

Colours and flashing patterns have been assigned to the signals of the process valve positions and device statuses – see chapter "21.1.1 Device specific LED mode "8681 Classic Mode"" and "21.2 Flashing pattern & fault signalling". When several signals are overlapped, a priority list applies ("21.3 Signal priorities").

In order to be able to react to various process valve designs or customer signalling philosophies in the systems, the colour assignments can be changed on site using the **DIP switches for colour coding** (see chapter "21.1.1 Device specific LED mode "8681 Classic Mode"" – except for the IO-Link version, which does not have DIP switches).

For the büS/CANopen and IO-Link variants, the colours can alternatively be assigned using the Bürkert Communicator. **With the DeviceNet, büS/CANopen and IO-Link variants,** changes to settings can also be carried out via the actual bus-specific communication interface; in this case, no settings on the electronic module are required and, as such, the cover can remain closed.

Factory setting DIP 1 - 4: 0000 – i.e. DIP1 to 4 in position 0 = OFF
(relates to variants 24 V DC, 120 V AC, AS-i, DeviceNet)

Factory setting DIP 1 - 5: 111110 – i.e. DIP1 to 5 in position 1 = ON, **DIP 6** = Pos. 0 = OFF
(relates to variant büS/CANopen - see following chapter "21.1")

When using the control head in a potentially explosive atmosphere, the housing may only be opened in a not energised state.

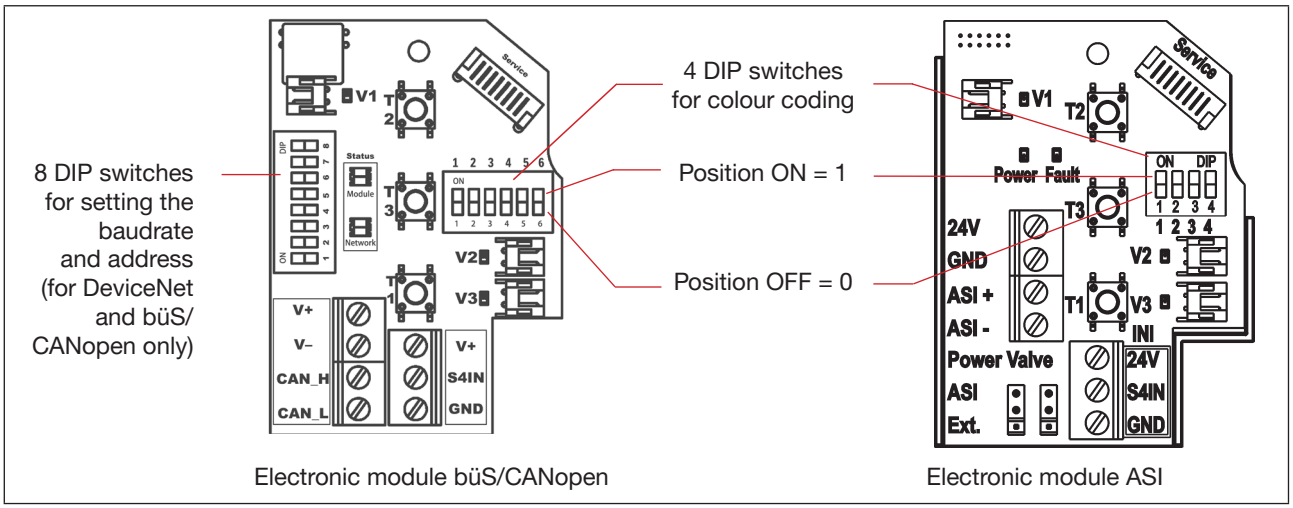


Fig. 48: DIP switches for setting the colour coding (in the example of the electronic modules büS/CANopen and AS-i)

21.1 Display modi – overview

The switching status and position feedback (S1, S2, S3, S4IN) of the process valve described above as well as error and warning messages are displayed differently in the various variants due to the varying design of the top LED.

With Type 8681 büS/CANopen and IO-Link, further display modes and colour combinations can be selected, which may differ from the classic variants (24 V DC, 120 V AC, AS-i, DeviceNet) - see "Table 7".

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Display modes for the büS/CANopen variant:

Display modes and colour coding can be switched to the colour coding on the electronic module (see „Fig. 42“ on page 95) using the 6 DIP switches.
Therefore, the following „Table 7“ applies to firmware version B.02.00.00 and higher.

DIP1	DIP2	DIP3	DIP4	DIP5	DIP6	Description of the display modes of the device status LED (Top LED)
X	X	X	X	0	0	**8681 “Classic Mode”:** the colour combinations for the position and error feedback are set using DIP switches 1 to 4 as described in the Basic Operating Instructions, chapter “Setting colour combinations” – see also chapter “21.1.1 Device specific LED mode “8681 Classic Mode””
1	1	1	1	1	0	**Factory settings: software-configurable display mode:** display mode of the device status LED can be selected by firmware: - Device specific LED mode (8681 Classic 0 ... 15) – see chapter “21.1.1” - NAMUR mode – see chapter “21.1.2” - Valve mode – see chapter “21.1.3” - Valve mode + errors – see chapter “21.1.4” - **Valve mode + errors + warnings (factory setting)** – see chapter “21.1.5” - Fixed colour – see chapter “21.1.6” - (Top) LED off (there is no feedback via Top LED) (In the Bürkert Communicator the display modes can be found under: General settings -> Parameters -> Status LED -> Mode) **PLEASE NOTE:** Hardware-configured values (that means: set via DIP switches) overwrite the software-configured display mode!
0	0	1	1	1	0	**NAMUR mode:** The device status is displayed according to NAMUR NE 107 – see chapter “21.1.2”
0	1	1	1	1	0	**Valve mode:** Display of the position feedback – see chapter “21.1.3”
1	0	1	1	1	0	**Valve mode + errors:** Display of the position and error feedback – see chapter “21.1.4”
1	1	0	1	1	0	**Valve mode + errors + warnings:** Display of the position and error feedback as well as warnings – see chapter “21.1.5”
X	X	X	X	X	X	all other combinations: (Top) LED off

Table 7: Colour combinations / colour coding / display modes for Type 8681 IO-Link and büS/CANopen (DIP switch settings available for büS/CANopen variant only)

Display modes for the IO-Link variant:

The display modes and colour coding listed in „Table 7“ can only be set by configuration/parameterisation of the devices, as no DIP switches are available –- see IODD object description (can be downloaded from the Bürkert website, see chapter „4.3 Information and instructions on the Internet“.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

21.1.1 Device specific LED mode “8681 Classic Mode”

This display mode **“Device-specific LED mode” “8681 Classic Mode”** of the device status LED for position feedback (S1, S2, S3, S4IN) of the process valve corresponds to the optical feedback of the standard or “classic” control heads (variants 24 V DC, 120 V AC, AS-i, DeviceNet).

With büS/CANopen devices, **the colour combination is set using DIP1 to 4** - i.e. in the same way as with the classic variants.
The assignment of the DIP switch position to the respective colour combination / LED mode (8681 Classic X) is listed in “Table 8”:

S1	S2	S3	S4	Fault	DIP1	DIP2	DIP3	DIP4	Designation of the device specific LED mode
green	yellow	green		red	0	0	0	0	8681 Classic 0
yellow	green	yellow		red	1	0	0	0	8681 Classic 1
green	red	green		yellow	0	1	0	0	8681 Classic 2
red	green	red		yellow	1	1	0	0	8681 Classic 3
green	yellow	yellow		red	0	0	1	0	8681 Classic 4
yellow	green	green		red	1	0	1	0	8681 Classic 5
green	red	red		yellow	0	1	1	0	8681 Classic 6
red	green	green		yellow	1	1	1	0	8681 Classic 7
green	yellow	green	green	red	0	0	0	1	8681 Classic 8
yellow	green	yellow	yellow	red	1	0	0	1	8681 Classic 9
green	red	green	green	yellow	0	1	0	1	8681 Classic 10
red	green	red	red	yellow	1	1	0	1	8681 Classic 11
green	yellow	yellow	yellow	red	0	0	1	1	8681 Classic 12
yellow	green	green	green	red	1	0	1	1	8681 Classic 13
green	red	red	red	yellow	0	1	1	1	8681 Classic 14
red	green	green	green	yellow	1	1	1	1	8681 Classic 15

Table 8: Colour combinations / Colour coding of the classic variants and designation of the corresponding device-specific LED mode “8681 Classic X“

eters / Status LED) or via the network (e.g. via Logix Designer for büs/CANopen devices) – it is possible under *“Device-specific LED mode”* to select the parameter *“8681 Classic X”*.

With IO-Link devices:

The display mode *“8681 Classic”* is activated by setting the LED mode (0x2120) to *“Device Specific”*. The colour coding is then set via the *“Device Specific LED Mode”* (0x2C11 – for details, see IODD object description).

General notes on S4 (using an external initiator):

S4IN reacts like a “normally open contact” (NO) or a “normally closed contact” (NC) – the **factory setting is: Normally open contact (NO).**

External initiator S4/S4IN as:	Position feedback “0”	Position feedback “1”
“Closer“ (Normally Open)	“S4 active”	“S4 not active”
“Opener“ (Normally Closed)	“S4 not active”	“S4 active”

Table 9: Position feedback of the external initiator (S4/S4IN) depends on the mode of operating

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

The mode of operating of the external initiator (S4/S4IN) can be set **for the classic variants** by means of a PC service program – to do so, connect the control head to the PC via the service interface and proceed as described in the software manual: "Software manual Type 8681 | PC service program" in chapter *"Sub-menu Start-up (general)"*.

For the IO-Link and büS/CANopen variants, the Bürkert Communicator is recommended for setting the mode of operating of the external initiator (S4/S4IN) (connection to the PC via a büS stick - see chapter "16" on page 121. The parameter concerned is described in the respective device description file IODD or EDS (*"Service Parameters"* 0x2C04 / 0xA).

21.1.2 NAMUR mode

The device status LED (Top LED) indicates the device status only and changes colour according to NAMUR NE 107 (edition 2006-06-12). There is no feedback on the process valve positions (S1, S2, S3, S4IN).

For IO-Link devices:

The information required for configuration can be found in the IODD object description under object "LED modi" (0x2120).

For büS/CANopen devices:

This display mode can be configured by software (DIP 1 to 6: 111110 for "software configurable") or can be fixed as of firmware revision B.02.00.00 using DIP switches (DIP 1 to 6: 001110) – compare "Table 7" on page 138.

If several device statuses exist simultaneously, the device status with the highest priority is displayed. The priority is determined by the severity of the deviation from normal operation (red LED = failure = highest priority) – see following "Table 10".

Colour*)	Prio-rity	Description	Meaning
red	1	Failure, error, malfunction	Controlled operation is not possible due to a malfunction in the device or its peripheral devices.
orange	2	Function check	Work is being carried out on the device; controlled operation is therefore not currently possible (this includes "automatic Teach function (Autotune) active").
yellow	3	Out of specification	The ambient conditions or process conditions for the device are outside the specified area (this includes "manual Teach function or automatic Teach function (Autotune) required").
blue	4	Maintenance required	The device is in controlled operation, but a function is presently restricted. → Service the device!
green	5	Diagnostics active (controlled operation)	Device is operating faultlessly (controlled). Status changes are indicated in different colours. Messages are transmitted via a fieldbus if connected.

Table 10: Description of the colours in display mode "NAMUR"

***)** If a control head is connected to the Bürkert Communicator, this control head "flashes" (single flash) in the particular colour of the device status – see also the chapter "21.2.3 Localisation function" on page 148

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

21.1.3 Valve mode

The device status LED (Top LED) display the position feedback (S1, S2, S3) of the process valve and the feedback S4IN from the external initiator. There is no display of error and warning messages in this mode.

The position feedback is displayed as shown below in “Table 11”.

Position	Process valve position, e.g.:	Colour	Flashing pattern of the position feedback
S1	closed	green ***)**	continuously lit
S2	open	yellow ***)**	continuously lit
S3	cycle stroke	green ***)**	continuously flashing slowly ****)** (250 ms ON, 250 ms OFF) 
S4IN	ext. Initiator, active	green ***)**	continuously flashing quickly ****)** (125 ms ON,125 ms OFF) 
If there is no position feedback (S1 to S4IN), i.e. the process valve is in intermediate positions of the defined teach points, the Top LED is off ***) ***).**			

Table 11: Description of the colours and flashing patterns in “valve mode” display mode

***)** Factory settings (other selectable colours for S1 to S4IN and also for the intermediate positions: white, green, blue, yellow, orange, red, (Top) LED off)

****)** Factory settings (other selectable flashing patterns: [continuously lit], [125 ms ON + 125 ms OFF], [250 ms ON + 250 ms OFF])

*****)** Flashing pattern for the selected colour for the intermediate positions: continuously lit

For IO-Link devices:

The information required for configuration can be found in the IODD object description under object “LED modi” (0x2120).

For büS/CANopen devices:

This display mode can be configured by software as of firmware revision B.02.00.00 (DIP 1 to 6: 111110) or can be fixed using DIP switches (DIP 1 to 6: 011110) – see “Table 7” on page 138.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

21.1.4 Valve mode + Errors

The device status LED (Top LED) display the position feedback (S1, S2, S3) of the process valve and the feedback S4IN from the external initiator as well as error messages. The position feedback is displayed as shown below in “Table 12”.

If an **error** (i.e. internal error, bus error, error with manual or automatic Teach function, positions measuring system signal error) occurs, this is also displayed alternately according to the scheme:
1 second position feedback / 1 second error display.

Position	Process valve position, e.g.:	Colour	Flashing pattern of the position feedback	Fault indication
S1	closed	green ***)**	continuously lit	is lit red alternating with colour from S1
S2	open	yellow ***)**	continuously lit	is lit red alternating with colour from S2
S3	cycle stroke	green ***)**	continuously flashing slowly ****)** (250 ms ON, 250 ms OFF) 	is lit red alternating with colour from S3
S4IN	ext. Initiator, active	green ***)**	continuously flashing quickly ****)** (125 ms ON,125 ms OFF) 	is lit red alternating with colour from S4IN
If there is no position feedback (S1 to S4IN), i.e. the process valve is in intermediate positions of the defined teach points, the Top LED is off ***) ***)**.				

Table 12: Description of the colours and flashing patterns in “valve mode + errors” display mode

***)** Factory settings (other selectable colours for S1 to S4IN and also for the intermediate positions: white, green, blue, yellow, orange, red, (Top) LED off)

****)** Factory settings (other selectable flashing patterns are: [continuously lit], [125 ms ON + 125 ms OFF], [250 ms ON + 250 ms OFF])

*****)** Flashing pattern for the selected colour for the intermediate positions: continuously lit (alternating with possible error messages)

For IO-Link devices:

The information required for configuration can be found in the IODD object description under object “LED modi” (0x2120).

For büS/CANopen devices:

This display mode can be configured by software as of firmware revision B.02.00.00 (DIP 1 to 6: 111110) or can be fixed using DIP switches (DIP 1 to 6: 101110) – see “Table 7” on page 138.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

21.1.5 Valve mode + Errors + Warnings

The device status LED (Top LED) display the position feedback (S1, S2, S3) of the process valve and the feedback S4IN from the external initiator as well as error and warning messages. The position feedback is displayed as shown in “Table 13” below.

If an **error or a warning** occurs (see colour assignment below following “Table 13”, this is also displayed alternately:
1 second position feedback / 1 second error or warning display.

Position	Process valve position, e.g.:	Colour	Flashing pattern of the position feedback	Fault indication	Warning display
S1	closed	green ***)**	continuously lit	is lit red (= **error colour ***)**) alternating with colour and any flashing pattern of the position (S1 or S2 or S3 or S4IN)	is lit in the **warning colour ****)** alternating with colour and any flashing pattern of the position (S1 or S2 or S3 or S4IN)
S2	open	yellow ***)**	continuously lit		
S3	cycle stroke	green ***)**	continuously flashing slowly ****)** (250 ms ON, 250 ms OFF) 		
S4IN	ext. Initiator, active	green ***)**	continuously flashing quickly ****)** (125 ms ON,125 ms OFF) 		
If there is no position feedback (S1 to S4IN), i.e. the process valve is in intermediate positions of the defined teach points, the Top LED is off ***)**. (Flashing pattern for the intermediate positions with selected colour (different from the factory setting “(Top) LED off”): continuously lit, alternating with possible warning or error messages)					

Table 13: Description of the colours and flashing patterns in “valve mode + errors + warnings” display mode

***)** Factory settings (other selectable colours for S1 to S4IN and also for the intermediate positions: white, green, blue, yellow, orange, red, (Top) LED off)

****)** Factory settings (other selectable flashing patterns: [continuously lit], [125 ms ON + 125 ms OFF], [250 ms ON + 250 ms OFF])

*****) Error colour:** **red** (internal error, bus error, error with manual or automatic Teach function, positions measuring system signal error)

******) Warning colours:** (firmly specified):
Orange: **Function check** (service mode/manual override active, automatic Teach function (Autotune) active)
Yellow: **Out of specification** (storage error of the operating hour/cycle counter, manual or automatic Teach function required (no position “taught”))
Blue: **Maintenance required** (Service/maintenance notification)

For IO-Link devices:

The information required for configuration can be found in the IODD object description under object “LED modi” (0x2120).

For büS/CANopen devices:

This display mode can be configured by software as of firmware revision B.02.00.00 (DIP 1 to 6: 111110) or can be fixed using DIP switches (DIP 1 to 6: 110110) – see “Table 7” on page 138.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

21.1.6 Display mode “Fixed colour”

For IO-Link devices:

The information required for configuration can be found in the IODD object description under object “LED modi” (0x2120).

For büS/CANopen devices:

In this operation mode there is no feedback on process valve positions or error/warning displays.

A fixed colour can be assigned to the device. However, this is possible only in software configurable display mode (for büS/CANopen devices: DIP1 to 6: 111110) – compare “Table 7” on page 138.

Configuration/parametrisation (for example via Bürkert Communicator) can be used to select the following colours: white, green, blue, yellow, orange, red, teal, pink **(factory settings: (top) LED off)**.

21.2 Flashing pattern & fault signalling

The device status LED (Top LED) display the position feedback (positions) S1, S2, S3 of the process valve, the feedback S4IN from the external initiator as well as error and warning messages, partly using special “flashing patterns”.

How these are displayed, depends on the selected display mode of the device status LED - see chapter “21.1 Display modi – overview” on page 137.

21.2.1 Position feedback in normal operation

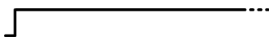
No.	Flashing pattern	ON	OFF	Note
1		ON		**continuously lit** in the respective **position colour:** Signal from S1 and S2 (factory settings)
2		250 ms	250 ms	**continuously flashing** in the respective **position colour:** Signal from position S3 (factory settings)
3		125 ms	125 ms	**continuously flashing** in the respective **position colour:** Signal from the external initiator S4 (factory settings)

Table 14: Position feedback in normal operation

For IO-Link and büS/CANopen devices:

Software can be used in some cases to assign other colours and flashing patterns at some display modes – for büS/CANopen devices this is also possible with DIP switches – details see in chapter “21.1 Display modi – overview” on page 137 and the following.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

21.2.2 Feedback in case of errors / warnings

If the position feedback in normal operation and error/warning displays occur **at the same time,** these are not displayed at all for some display modes or **alternately** for other display modes – as shown in the following "Table 15" .

Display mode	Position feedback	Errors (E)+ warnings (W)	Special characteristics
"Device specific" ("8681 Classic")	yes	yes	**Simultaneous display** for the classic designs (24 V DC, 120 V AC, AS-i, DeviceNet) **Alternating display** for IO-Link and büS/ CANopen: 2 seconds position feedback (see "21.3.2") / 2 seconds error/warning display (see "21.3.1")
NAMUR	no	yes	only device status displays - see chapter "21.1.2"
Valve mode	yes	no	see chapter "21.1.3" and "21.3.2"
Valve mode + errors	yes	yes (**E**rrors)	alternately: 1 second position feedback (see "21.3.2") / 1 second error display – see chapter "21.3.1"
Valve mode + errors + warnings	yes	yes (**E**rrors + **W**arnings)	alternately: 1 second position feedback (see "21.3.2") / 1 second error/warning display – see "21.3.1"
"Fixed colour"	no	no	Selected colour displayed permanently – see chapter "21.1.6"
"LED off"	no	no	no displays

Table 15: Display behaviour of the different display modes with regard to position, error, warning

In addition to the position feedback (see chapter "21.2.1 Position feedback in normal operation" on page 144), the errors and the device status in the various display modes are also indicated by means of different flashing patterns - see the following "Table 16".

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Display of device status / errors / warnings

No.	Flashing pattern / colour (for reasons of space the "colour of the valve position" is designated as **position colour**)	ON	OFF	Note	Classic *)	NAMUR *)	VM *)	VM+E *)	VM+E+W *)
1	 in position colour	100 ms	100 ms	**3 x flashing:** Teach confirmation	x	x	x	x	x
				(**after** successful teaching: colour for position S1 and S2 continuously ON)			x	x	x
2	 in error colour	100 ms	100 ms	**3 x flashing:** - if target could not be located in the measuring area during teaching or - if teach position is too close (±0.5 mm) to a previously defined teach position or - if magnetic manual override is used, even though manual override function was disabled by software	x	x	x	x	x
3	 in position colour	125 ms	125 ms	**Continuous flashing:** Signal from the external initiator S4 (factory settings – comp. line 3 in "Table 14")	x		x	x	x
4	 in position colour	250 ms	250 ms	**Continuous flashing:** Signal from position S3 (factory settings – comp. line 2 in "Table 14")	x		x	x	x
5	 in error colour	250 ms	250 ms	**Continuous flashing:** - Teaching does not occur or - Automatic Teach function (Autotune) error or - Teach Reset implemented or - Bus error or - Position measuring system signal error (from firmware B.02.00.00) or - Device Reset implemented	x				
6	 in error colour	50 ms	450 ms	**Continuous flashing:** Device in service mode / manual override active	x				
7	 in error colour	450 ms	50 ms	**Continuous flashing:** Internal error	x				

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

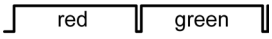
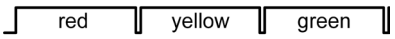
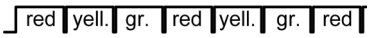
No.	Flashing pattern / colour (for reasons of space the "colour of the valve position" is designated as **position colour**)	ON	OFF	Note	Classic *)	NAMUR *)	VM *)	VM+E *)	VM+E+W *)
8	 in **error** or **blue** colour (position feedback during OFF phase)	1 **sec.**	3 **sec.**	**Continuous flashing:** Service/maintenance notification (maintenance / service required) (in **error colour** for the classic designs (24 V, 120 V, AS-i, DeviceNet), in **blue colour** for büS/CANopen and IO-Link designs) (Position feedback occurs during OFF phase)	x				
9	 alternately red / green (500 ms per colour)			**Continuous flashing:** Device Reset mode active (for Device Reset press again within 10 s)	x	x	x	x	x
10	 alternately red / yellow / green (500 ms per colour)			**Continuous flashing:** Autotune (selection) mode active (see "20.2.2") (for automatic Teach function (Autotune) press appropriate keys within 10 s)	x	x	x	x	x
11	 alternately red / yellow / green (200 ms per colour)			**Continuous flashing:** automatic Teach function active, i.e. Autotune function active (see "20.2.2")	x				

Table 16: Display behaviour of the different display modes with regard to, error, warning, status

***)** These abbreviations mean: Classic – device specific LED mode (8681 Classic Mode X),
NAMUR – NAMUR mode (NAMUR NE 107),
"VM" – Valve Mode,
"VM+E" – Valve Mode with Error messages,
"VM+E+W" – Valve Mode with Error and Warning messages

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

21.2.3 Localisation function

For IO-Link and büS/CANopen devices only:

This function can be used to locate a device in the system via the controller or via the Bürkert Communicator. However, the localisation function must be activated – see the respective device description file IODD (*"Process output data"*) or EDS (*"Locating Function"* 0x2101).

The device status LED (top LED) then starts to "flash" according to signal priority (see chapter "21.3") according to the following logic: see "Table 17".

In **NAMUR mode,** the device status "single flashing" is displayed.

With **display modes "VM+F" and "VM+F+W",** any error or warning messages that may occur are displayed in the corresponding colour "single flashing" alternating with the corresponding position feedback (S1, S2, S3 or S4) – see "Table 17":

No.	Flashing pattern	Note	Classic *)	NAMUR *)	VM *)	VM+E *)	VM+E+W *)
1	 every second: 1 x 25 ms ON	**single flashing:** in white: no (taught) position active in colour from S1 or S2: S1 or S2 active	x		x	x	x
		in colour of the device status **or in the error colour / warning colour** alternating with the position feedback (S1, S2, S3, S4), if an error or warning message is present		x		x	x
2	 every second: 2 x 25 ms ON	**double flashing:** in colour from S3: S3 active	x		x	x	x
3	 every second: 3 x 25 ms ON	**triple flashing:** in colour from S4: S4 active	x		x	x	x

Table 17: Display behaviour during active localisation function

***)** These abbreviations mean: Classic – device specific LED mode (8681 Classic Mode X),
NAMUR – NAMUR mode (NAMUR NE 107),
"VM" – Valve Mode,
"VM+E" – Valve Mode with Error messages,
"VM+E+W" – Valve Mode with Error and Warning messages

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

21.3 Signal priorities

21.3.1 When several statuses overlap for one valve

For the classic variants (24 V DC, 120 V AC, AS-i, DeviceNet) **and the "Device-specific display mode 8681 Classic X"** of the IO-Link and büS/CANopen variants, the the following priority list applies:

1. I**nternal error**
2. **Manual operating mode** is active, e.g. by magnetic manual override - see chapter "22 Service Mode / Manual override" on page 152
3. **Other faults,** e.g. position measuring system (WMS) not taught, WMS signal error, bus error or other (see chapter "21.2.2 Feedback in case of errors / warnings" on page 145)
4. **Service / maintenance request**

For the other display modes of IO-Link and büS/CANopen design:

(see chapter "21.1" on page 137) the display logic is described in detail in the respective subchapters:

- "NAMUR" – see chapter "21.1.2" on page 140
- "Valve mode" – see chapter "21.1.3" on page 141
- "Valve mode + errors" – see chapter "21.1.4" on page 142
- "Valve mode + errors + warnings" – see chapter "21.1.5" on page 143

21.3.2 When position feedback overlaps

The following logic is the **factory setting** for all display modes which report the position:

S1	S2	S3	S4	Error	Priority	Note / flashing patterns
active	active	active	**active**		S4	Flashing in S4 flashing pattern (if S4 activated by DIP***)**) as S3/S4 has priority over S1 and S2
		active	**active**		S4	Flashing in S4 flashing pattern if S4 activated by DIP***)**
active	active	**active**			S3	Flashing in S3 flashing pattern as S3/S4 has priority over S1 and S2
active	**active**				S2	Position feedback of S2 has priority

Table 18: Display priorities when position feedback overlaps (factory settings = „PRIO 24")

***)** The activation of S4 via DIP switches is possible only with the classical designs and with the büS/CANopen design.
The IO-Link design has no DIP switches, S4 (external initiator signal) can be activated/deactivated only via configuration/parametrisation.

Factory settings: S4 has the highest priority, descending to S1 (i.e. S4 - S3 - S2 - S1) - this corresponds to the "PRIO 24" in the following "Table 19".

If the factory setting described above in "Table 18" (= "PRIO 24") is to be changed, this can be done **for IO-Link and büS/CANopen designs** via software using the sensor parameter "PRIO (priority feedback positions)" (0x2C05 / 0x8).

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

With the classic variants (24 V DC, 120 V AC, AS-i, DeviceNet), the setting can be changed by a service technician, if necessary.

The parameter values and the assigned display priority are listed in “Table 19”.

Parameter “PRIO”	(highest) priority 1	Priority 2	Priority 3	(lowest) priority 4
1	S1	S2	S3	S4
2	S1	S2	S4	S3
3	S1	S3	S2	S4
4	S1	S3	S4	S2
5	S1	S4	S2	S3
6	S1	S4	S3	S2
7	S2	S1	S3	S4
8	S2	S1	S4	S3
9	S2	S3	S1	S4
10	S2	S3	S4	S1
11	S2	S4	S1	S3
12	S2	S4	S3	S1
13	S3	S1	S2	S4
14	S3	S1	S4	S2
15	S3	S2	S1	S4
16	S3	S2	S4	S1
17	S3	S4	S1	S2
18	S3	S4	S2	S1
19	S4	S1	S2	S3
20	S4	S1	S3	S2
21	S4	S2	S1	S3
22	S4	S2	S3	S1
23	S4	S3	S1	S2
24 *)	**S4**	**S3**	**S2**	**S1**
25	particular logic, see “Table 20”			

Table 19: Display priorities when position feedback overlaps - can be selected using parameter “PRIO”

***)** Factory settings: “PRIO 24”

When the position feedback is from S4 (external initiator), note whether the external initiator acts as an “Opener” (NC contact) or as a “Closer” (NO contact) – see “Table 9: Position feedback of the external initiator (S4/S4IN) depends on the mode of operating” on page 139

If the **factory setting of S4IN** (normally open contact = NO) is to be changed, this can be done for IO-Link and büS/CANopen variants via software using the *sensor parameter “Circuit Function External Initiator*

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

S4IN" (0x2C04 / 0xA).
With the classic variants (24 V DC, 120 V AC, AS-i, DeviceNet), this setting can be changed using the PC service program.

For further details about S4 - see section "General notes on S4 (using an external initiator)" in chapter "21.1.1" on page 139

Special case: "PRIO 25"

Optical feedback: Display of the Top LED	Position feedback			
	S4	S3	S2	S1
S1	1	0	0	1
S2	0	0	1	0
S3	1	1	0	0
S4	0	0	0	1
no display	all other combinations			

Table 20: Special case: Display priorities when position feedback overlaps (parameter "PRIO" = "25")

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

22 SERVICE MODE / MANUAL OVERRIDE

By default, the control head provides the following (e.g. for service purposes):

- a **magnetic manual override** which is easily accessible from the outside for solenoid valve 1 (2/A1)*) as well as
- a **mechanical manual override** accessible when the hood is open on each equipped solenoid valve – see chapter “22.2 Mechanical manual override”.

22.1 Magnetic manual override

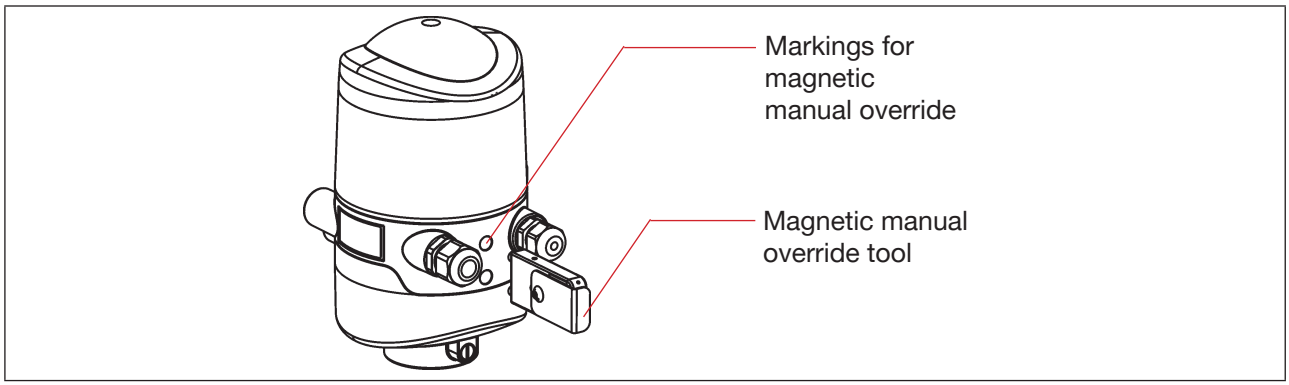


Fig. 49: Magnetic manual override / magnetic manual override tool on the basis of encoded magnetic fields

Irrespective of the signal of the higher-level control, the magnetic manual override sets in the **Automatic mode** the output of the solenoid valve V1*) electrically to an ON signal and, if control pressure is present, switches the 2/A1 output*), **in manual operating status,** the manual override **cannot** be used.

However, if the output of solenoid valve 1*) is activated by the control (ON signal from the higher-level control), this switching status cannot be set to an OFF signal with the manual override!

Activation/deactivation of this function is possible using the PC service program. **The factory setting** is “magnetic manual override function active”, i.e. the function can be used, it is not disabled.

The connection to the PC is made via the service interface. Details are described in the “PC Service Program Type 8681” software manual under the “SYSTEM/Start-up” menu option (for the IO-Link and büS/ CANopen design, the changeover can be carried out via the Bürkert Communicator).

Caution!

When the magnetic manual override (solenoid valve 1*)) will be actuated:

- the peripheral fault bit is set on the AS interface design.
- the mode is switched to "Manual override active" for the DeviceNet design and can be read out.
- the feedback signals (valve positions S1-3, external initiator) function as per normal operation.

Always observe the safety guidelines and the system statuses!

*) both solenoid valves are actuated simultaneously for the design for double-acting actuators (see chapter “19 Special designs” on page 128)

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

The **activation of the manual override** or errors when using the manual override are signaled by device status LED / Top LED in the fault colour - see chapter “21.2 Flashing pattern & fault signalling” on page 144 or “Table 16” on page 147

Procedure for activating & deactivating the manual override for valve location 2/A1:

→ Observe safety guidelines for the system prior to using the manual override!

→ Activating the magnetic manual override (only possible in Automatic mode):
Hold the magnetic manual override tool on the identification points between the cable glands for three seconds (see “Fig. 49”), feedback for activation by device status LED / Top LED (“Table 16”)

→ Once the measure has been completed, deactivate the magnetic manual override:
Hold the manual override tool on the identification points between the cable glands for another three seconds (see “Fig. 49”).

After a power failure, the magnetic manual override is reset and the control head restarts in normal operating mode, i.e. the signal from the higher-level control is accepted.

22.2 Mechanical manual override

If additional manual overrides are required for additional service purposes or in the event of a failure of the electrical energy, it is possible for all voltage and communication designs to switch the connected process valve using the mechanical manual override of the respective solenoid valves V1 to V3 after opening the housing.

DANGER!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- Opening the hood or the housing in a potentially explosive atmosphere is only allowed in a not energised state!

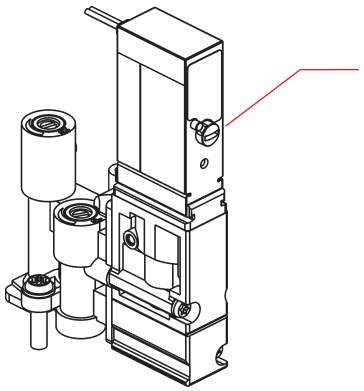


Fig. 50: Mechanical manual override of the solenoid valves

When the service measures have been completed, reset all manual overrides to "0" for controlled operation of the system!

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

23 MAINTENANCE, TROUBLESHOOTING

23.1 Safety instructions

DANGER!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- Opening the hood or the housing in a potentially explosive atmosphere is only allowed in a not energised state!

WARNING!

Risk of injury due to electric shock!

- Before reaching into the system (except for the Teach procedure in a non-explosive atmosphere) switch off the power supply and secure it to prevent restarting!
- Observe applicable accident prevention and safety regulations for electrical equipment!

Risk of injury from high pressure in the system!

- Before loosening lines and valves, turn off the pressure and vent the lines.

Risk of injury from improper maintenance!

- Maintenance may only be carried out by trained technicians and with the appropriate tools!

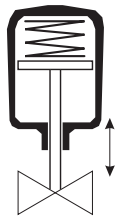
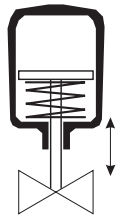
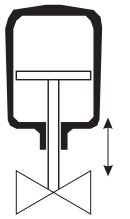
Risk of injury from unintentional activation of the system and uncontrolled restart!

- Secure system against unintentional activation.
- Following maintenance, ensure a controlled restart.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

23.2 Safety positions

Safety positions of the solenoid valves after failure of the electrical or pneumatic auxiliary power:

Operating mode	Process valve design	Safety positions after failure of the auxiliary power	
		electrical	**pneumatic**
 up down	single-acting Control function A • air opening • • spring closing	down	down
 up down	single-acting Control function B • • air closing • • spring opening	up	up
 up down	double-acting Control function I • air opening • air closing	**not defined** for both solenoid valves NC*, but **defined** for Solenoid valve1 NC* + Solenoid valve2 NO**	not defined

By default the control head is equipped with solenoid valves which operate in NC* mode, the design for double-acting actuators is equipped with 1 solenoid valve NC* and 1 solenoid valve NO**.

If process valves with several switching positions (e.g. double-seated valves) are connected, the safety positions of the individual actuators can be viewed according to the same logic as for a classical single-seated valve.

Safety positions of the solenoid valves after failure of the bus communication:

AS interface:	If the Watchdog is activated (default), behaviour is the same as a failure of the auxiliary electrical power, i.e. all solenoid valve outputs are set to „0“.
DeviceNet:	See chapter “13.12.1 Configuration of the safety position of solenoid valves during a bus error” on page 72
IO-Link:	See chapter “14.7 Safety position if the bus fails” on page 85
büS/CANopen:	See chapter „15.7 Safety position if the bus fails“ on page 91

* *NC: 3/2-way valve; closed in rest position, output A unloaded,*
** *NO: 3/2-way valve; opened in rest position, output A pressurised.*

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

23.3 Maintenance / service

When used properly, the control head Type 8681 operates maintenance and trouble-free.

For service work, contact the Bürkert Sales Center (chapter “4.1” on page 14).

If the service/maintenance notification function is active (see chapter “6.9 Factory settings in the firmware”), a maintenance prompt is issued - the corresponding "flashing pattern" depends on the design of the control head Type 8681 - see chapter “21.2 Flashing pattern & fault signalling” on page 144.

23.4 Cleaning

NOTE!

Aggressive cleaning agents may damage the material!

- In the potentially explosive atmosphere, only wipe the control head with a damp or anti-static cloth to avoid electro-static charges.
- The customary cleaning agents and foam cleaners can be used to clean the outside. We recommend checking that the cleaning agents are compatible with the housing materials and seals before using the cleaning agent.

→ Clean the control head and rinse it thoroughly with clean water to safeguard against the formation of deposits in grooves and recesses.

If cleaning agent is not rinsed off properly, its concentration may considerably exceed the concentration for use when the water has evaporated. The chemical effect will thus be several times stronger!

Observe the specifications of the manufacturer and the recommendations for use of the cleaning agent manufacturer!

23.5 Malfunctions

In the event of any malfunctions in spite of a correct installation, proceed according to the fault analysis described in the table below:

Fault description	Possible cause of the fault	Troubleshooting
No feedback signal	Position of the position measuring system (Teach) not appropriate for the spindle position (“7.2.1”, “7.2.2”)	Perform / repeat the Teach procedure (see chapter “20.1 Setting the position measuring system (Teach procedure)”)
	Setting of the external initiators incorrect	Set the external initiator according to the respective operating instructions.
	No or faulty associated feedback signals or external initiator	Set the connections according to the pin and plug configurations described in these operating instructions (for the respective voltage and communication variant).
	Target is not mounted on the process valve's spindle or target faulty	Check the target for correct mounting and condition (see chapter “6.8 Position measuring system data”.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Fault description	Possible cause of the fault	Troubleshooting
Feedback signal is "lost" in system operation	Position in the limit range of the feedback field "6.9.1 Feedback fields (position measuring system)" on page 29	Repeat the Teach procedure (see chapter "20.1 Setting the position measuring system (Teach procedure)")
		Check the process valve end positions during operation against the end positions in non-operative status of the system.
		Check the pressure supply.
Valve output 2/A1 cannot be switched off with the control	Magnetic manual override is still activated	Deactivate the manual override - compare chapter "22.1 Magnetic manual override"
Valve outputs cannot be switched off by the control	Mechanical manual override at the solenoid valve is still activated	Deactivate the mechanical manual overrides on the solenoid valves - compare chapter "22.2 Mechanical manual override"
Faults are signaled by means of device status LED / Top LED	Possible causes may vary depending on the version	Please read the corresponding descriptions of the respective communication variant in these operating instructions (see chapter "21.2 Flashing pattern & fault signalling")
No or faulty function of the process valves	No electrical power supply or communication for the control head	Check the power supply and the communication settings (also refer to detailed descriptions of the respective versions in these operating instructions)
	No or insufficient pneumatic supply of the control head	Check the pressure supply and ensure that supply is sufficient
Incorrect function of the process valves	Confused pneumatic connection lines	Check the correct pneumatic connection of the control head to the process valve (for fluid diagrams see chapter "5.3.2 Fluid diagrams Type 8681 – examples" and the operating instructions of the corresponding process valves)
	Valves not correctly connected on electronic module	Check the correct electrical connection of the solenoid valves - compare e.g. "Fig. 15: 24 V DC electronic module"

In the event of any undefined faults, be sure to contact the service department of Bürkert. (see chapter "4.1 Contact address")

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

24 REPLACEMENT OF COMPONENTS AND MODULES

If components or modules need to be replaced for maintenance or service reasons, please observe the following notes and descriptions.

Devices that are used in the potentially explosive atmosphere may only be repaired by the manufacturer!

24.1 Safety instructions

DANGER!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- Opening the hood or the housing in a potentially explosive atmosphere is only allowed in a not energised state!

WARNING!

Risk of injury due to electric shock!

- Before reaching into the system (except for the Teach procedure in a non-explosive atmosphere) switch off the power supply and secure it to prevent restarting!
- Observe applicable accident prevention and safety regulations for electrical equipment!

Risk of injury from high pressure!

- Before loosening lines and valves, turn off the pressure and vent the lines.

Risk of injury due to improper maintenance work!

- Maintenance work may be carried out by trained technicians only and with the appropriate tools!

Risk of injury from unintentional activation of the system and uncontrolled restart!

- Secure system against unintentional activation.
- Following maintenance, ensure a controlled restart.

NOTE!

IP65 / IP67 protection

During all work steps, make sure that IP65 / IP67 protection is once again ensured for the control head when used as intended!

Opening and closing the control head

During all work which requires opening and closing of the control head, also observe the notes and comments in chapter “8 Opening and Closing the Housing”!

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

24.2 Changing the electronic module

NOTE!

Electrostatic sensitive components/modules!

- The device contains electronic components which react sensitively to electrostatic discharge (ESD). Contact with electrostatically charged persons or objects may be hazardous to these components. In the worst case scenario, they will be destroyed immediately or will fail after start-up.
- Observe the requirements in accordance with DIN EN 61340-5-1 to minimise or avoid the possibility of damage caused by sudden electrostatic discharge!
- Also ensure that you do not touch electronic components when the operating voltage is on!

Removal procedure:

→ Open the housing following the instructions in chapter "8 Opening and Closing the Housing".

→ If necessary, mark the electrical connections to ensure correct assignment during reinstallation!

→ If necessary, note the position of the 4 DIP switches for the set colour code and on the DeviceNet electronic module the DIP switches (8-switch block) for Baud rate and address. On the AS-i electronic module, note the AS interface address and the jumper positions (power supply to AS interface).

→ If required, read out and note special settings by the PC service program.

→ Loosen all electrical connections on the electronic module (plug-type connections, screw-type terminal connections).

→ Loosen the screw-type connection (Torx T10 screw) of the electronic module and store the screw in a safe place.

→ Carefully press the electronic module forwards so that the contact pins on the position measuring system are exposed.

→ Carefully lift the electronic module upwards.

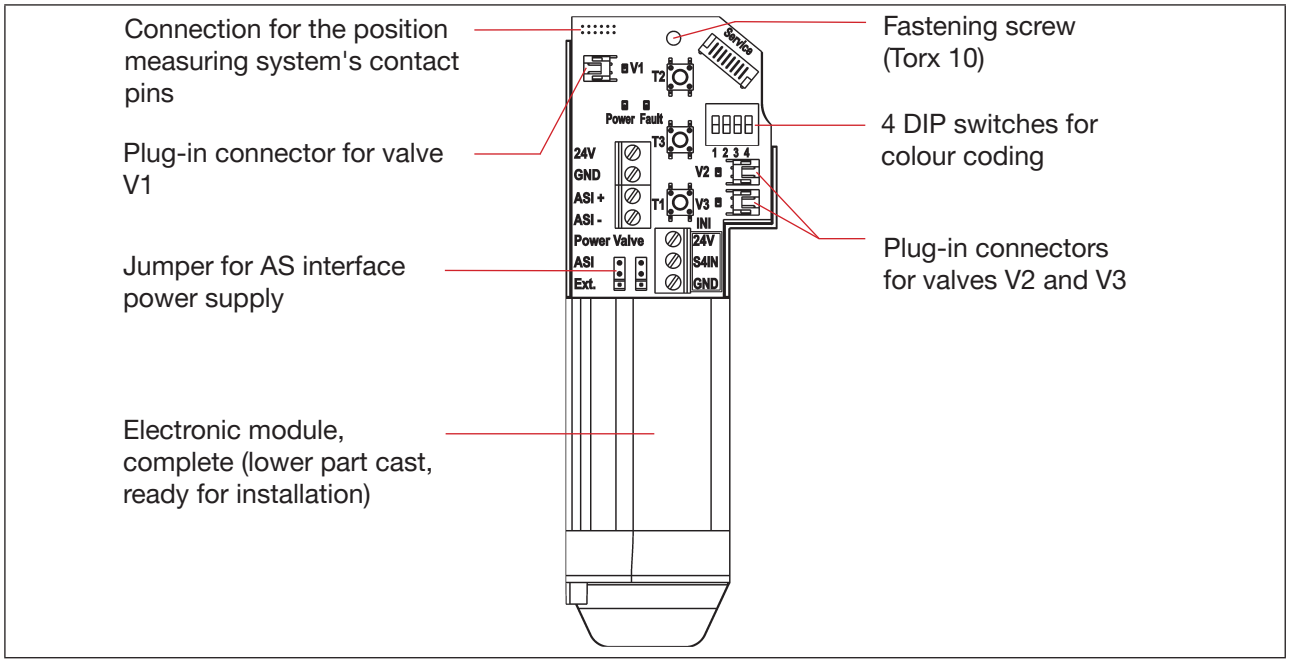


Fig. 51: Electronic module (here example of AS interface)

Installation procedure:

→ Carefully insert the entire electronic module into the recess in the lower housing part.

→ Plug the electronic module carefully onto the contact pins for the position measuring system.

→ Refasten the electronic module with the Torx T10 screw (torque 0.4 Nm).

→ Reattach the electrical connections.

→ Check DIP switch positions (4-switch block for colour coding, 8-switch block on DeviceNet electronic module for address and Baud rate) and set the previously noted switch settings, if necessary.

→ If necessary, set AS interface address and jumper positions.

→ If required, make settings again, read out by the PC service program, using the PC service program.

→ Perform Teach procedure (see chapter "20.1 Setting the position measuring system (Teach procedure)" on page 131).

Be sure to work carefully and cautiously, so that the electronics are not damaged.

→ Close the housing following the instructions in chapter "8 Opening and Closing the Housing".

24.3 Changing the valves

According to the design, 0 to 3 solenoid valves (V1 ... V3) have been installed in the control head. The solenoid valves have been designed with the flow restriction equipment for intake and exhaust air and must be installed as a valve module.

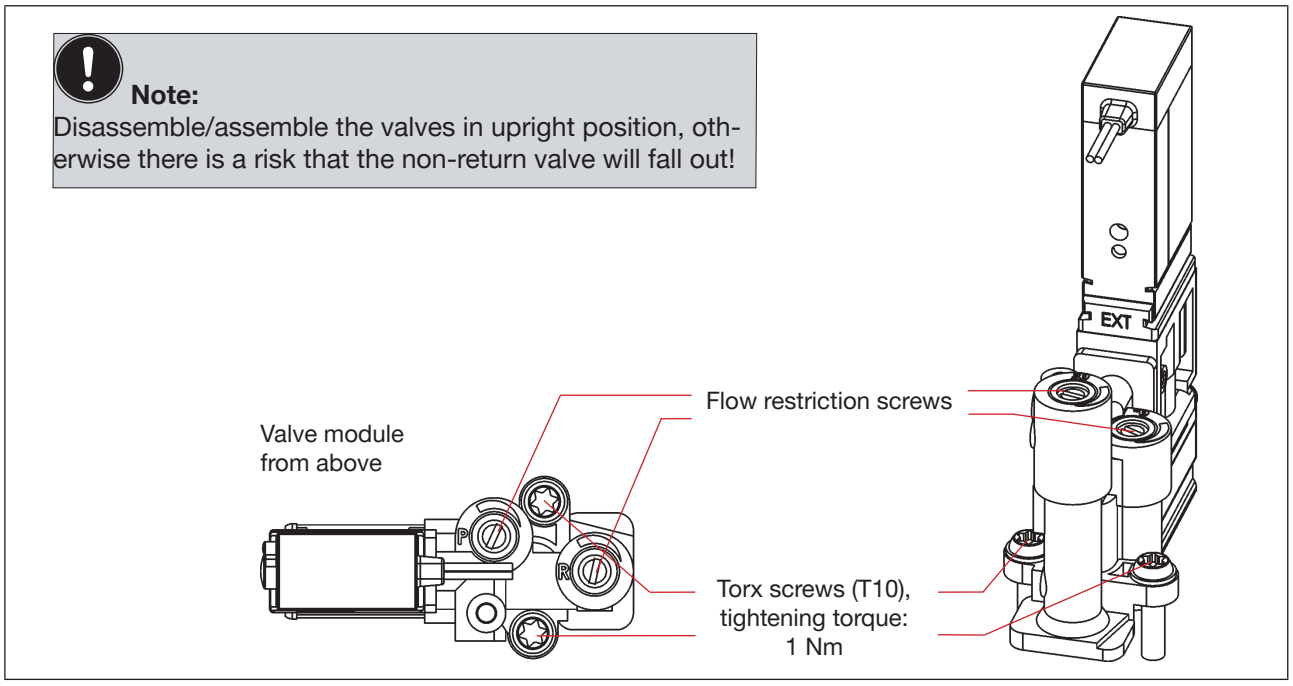


Fig. 52: Valve module

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

Procedure:

→ Open the housing following the instructions in chapter “8 Opening and Closing the Housing”.

→ If necessary, mark the electrical connections to ensure correct assignment during reinstallation.

→ Loosen the electrical connections.

→ Loosen the connecting screws (Torx T10) for the corresponding valve module.

→ Take out the valve module and replace it with the spare part set.

→ When inserting the valve module, make sure that the form seal fits correctly and fully on the lower side of the respective valve flange!

→ Fix the valve module: to do this, insert the screws (Torx T10) into the existing threading by turning them backwards and tighten them to a torque of 1.2 Nm.

→ Reattach the electrical connections.
(If other connections, apart from the solenoid valve connections, have been removed, read the corresponding chapters on the electrical installation of the respective voltage / bus / connection variant)

→ Close the housing following the instructions in chapter “8 Opening and Closing the Housing”.

24.4 Changing the position measuring system

The position measuring system consists of a housing, with a PCB mounted above with LEDs and light conductor. There are 4 snap-fit hooks, which secure the position measuring system in the lower housing part, by snapping them into place.

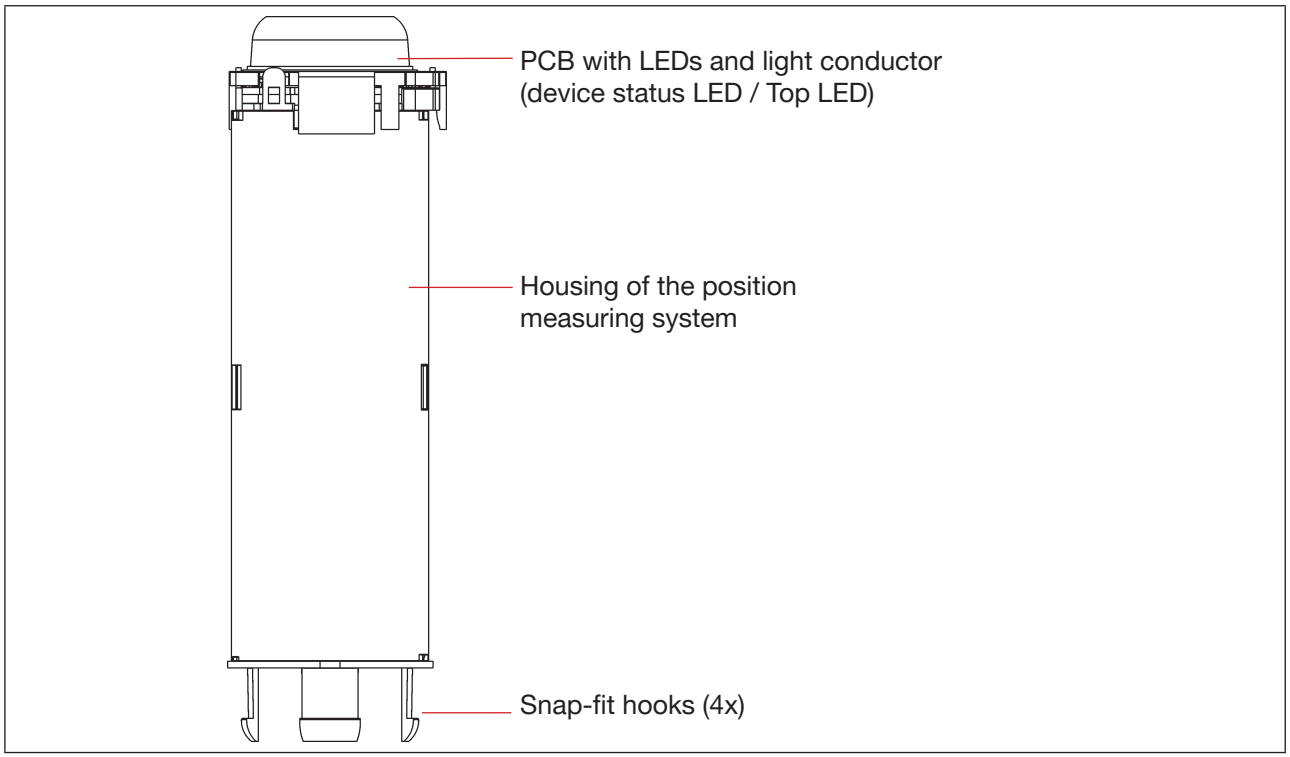


Fig. 53: Position measuring system

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

WARNING!

Risk of injury from high pressure!

▸ Before loosening lines and valves, turn off the pressure and vent the lines.

NOTE!

Electrostatic sensitive components/modules!

- Before changing the position measuring system, switch the electrical power for the control head off so that destruction of the PCB and electronic module is avoided.
- The device contains electronic components which react sensitively to electrostatic discharge (ESD). Contact with electrostatically charged persons or objects may be hazardous to these components. In the worst case scenario, they will be destroyed immediately or will fail after start-up.
- Observe the requirements in accordance with DIN EN 61340-5-1 to minimise or avoid the possibility of damage caused by sudden electrostatic discharge!
- Also ensure that you do not touch electronic components when the operating voltage is on!

Deinstallation procedure:

→ Switch the electrical power to the control head off!

→ Loosen the control head from the process valve.

→ Open the housing following the instructions in chapter “8 Opening and Closing the Housing”.

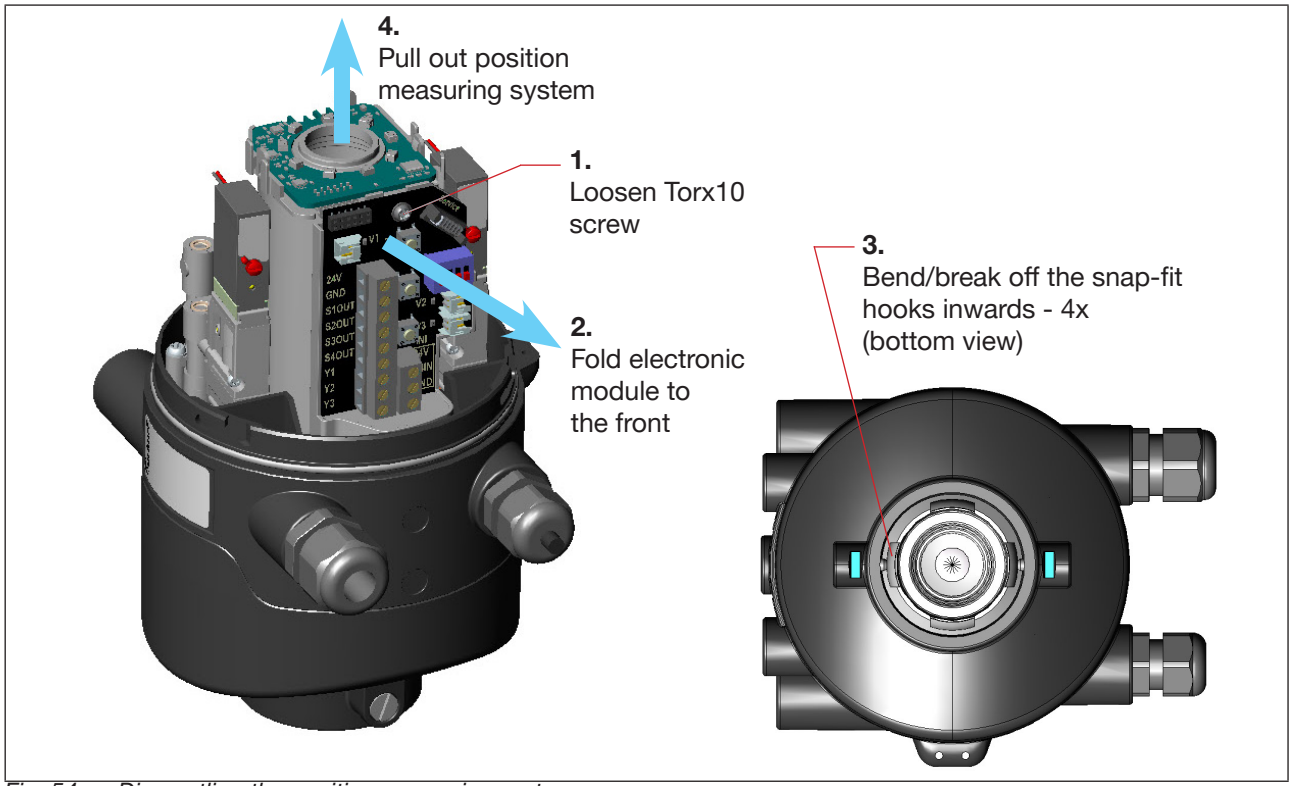


Fig. 54: Dismantling the position measuring system

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

→ Loosen the fastening screw (Torx 10) of the electronic module (see chapter “24.2”).

→ Tilt the electronics forwards to loosen the position measuring system's contact pins from the electronic module.

→ Bend the snap-fit hooks on the bottom end of the position measuring system inwards. In some cases, break them off.

→ Pull the position measuring system upwards out of the guide.

Installation procedure:

→ Insert the new position measuring system from above so that the contact pins are located on the side of the electronic module.

→ Carefully push the housing of the position measuring system downwards until the snap-fit hooks snap into place.

→ Slide the electronic module carefully onto the contacts pins and fasten the electronic module using the Torx screw.

→ Remount the control head on the process valve as described in chapter “7 Assembly”.

→ Adjust position measuring system to the process valve by teaching-in (see chapter “20.1 Setting the position measuring system (Teach procedure)”)

→ Close the housing following the instructions in chapter “8 Opening and Closing the Housing”.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

25 SHUTDOWN

25.1 Safety instructions

DANGER!

Danger of explosion in a potentially explosive atmosphere (only in the event of a fault as zone 2)!

- Opening the hood or the housing in a potentially explosive atmosphere is only allowed in a not energised state!

WARNING!

Risk of injury due to electric shock!

- Before reaching into the system (except for the Teach procedure) switch off the power supply and secure it to prevent reactivation!
- Observe applicable accident prevention and safety regulations for electrical equipment!

Risk of injury from high pressure!

- Before loosening lines and valves, turn off the pressure and vent the lines.

Risk of injury due to improper disassembly!

- Disassembly work may be carried out by trained technicians only and with the appropriate tools!

25.2 Dismantling the control head Type 8681

Prior to starting with the work, check the system status!

Procedure for variants with cable gland:

→ Open the housing following the instructions in chapter “8 Opening and Closing the Housing”.

→ Uninstall the electrical connections at the terminal strip.

→ Close the housing following the instructions in chapter “8 Opening and Closing the Housing”.

→ Loosen the pneumatic connections (for a detailed description, see chapter “9 Pneumatic Installation”).

→ Loosen the locking screws (shoulder screws M5).

→ Pull control head upwards and off the adaptation.

Procedure for variants with multi-pole connection:

→ Remove the multi-pole plugs.

→ Loosen the pneumatic connections (for a detailed description, see chapter “9 Pneumatic Installation”).

→ Loosen the locking screws (shoulder screws M5).

→ Pull control head upwards and off the adaptation.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

26 PACKAGING AND TRANSPORT

NOTE!

Transport damage!

Inadequately protected devices may be damaged during transportation.

- During transportation protect the device against moisture and dirt in shock-resistant packaging.
- Avoid the effects of heat and cold which could result in temperatures above or below the permitted storage temperature.

Approved non-return and reusable transport containers are used for the transport ex factory and storage of the control head. Preferably use this packaging.

If the control head is stored for further pre-assembly of a system, for example as part of a process valve module, kindly make sure:

- that the control head has been secured sufficiently!
- that the electrical and pneumatic lines cannot be accidentally damaged and / or cannot indirectly damage the control head!
- that the control head is not used as support during packaging and transport!
- that the control head is not exposed to any mechanical stress!

27 STORAGE

NOTE!

Incorrect storage may damage the device.

- Store the device in a dry and dust-free location!
- Storage temperature: -20 ... +65 °C.

Kindly make sure that the devices, following storage at low temperatures, are heated slowly to room temperature before you carry out any assembly work on the devices or start operation of the devices!

28 DISPOSAL

→ Dispose of the device and packaging in an environmentally friendly manner.

NOTE!

Damage to the environment caused by device components contaminated with media.

- Observe the relevant disposal and environmental protection regulations.

Note:

Observe the national waste disposal regulations.

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

bürkert
FLUID CONTROL SYSTEMS

MAN 1000138479 EN Version: J Status: RL (released | freigegeben) printed: 18.03.2022

www.burkert.com