

CU4 Direct Connect Control Unit

SAFETY AGAINST EXPLOSION - FOR ATEX ZONE 2 GAS APPLICATIONS



FORM NO.: H345315 REVISION: GB-0

READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING OR SERVICING THIS PRODUCT.



EU Declaration of Conformity

SPXFLOW[®]

Product

Nomenclature : **Control Unit**
Model / Type : CU4, CU4plus
Variants : AS-interface, Direct Connect

Manufacturer

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Applicable EU Harmonisation Legislation

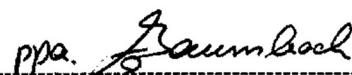
EU Declaration of Conformity in accordance with

ATEX Directive 2014/34/EU

- Essential Health and Safety Requirements have been met by complying with the harmonised standard/s - EN 60079-0:2018, EN 60079-7:2015+A1:2018 and EN 60079-18:2015+A1:2017.
- Equipment Marking: **II 3 G Ex ec mc IIC T4 Gc**
0 °C ≤ Ta ≤ +55 °C

This declaration of conformity is issued under the sole responsibility of the manufacturer and design center. It will lose its validity if the product is modified without the written permission from the manufacturer and/or if the safety instructions specified in the instruction manual are not being followed.

Authorised Signatory:

Signature: -----

Date: 14.09.2021

Frank Baumbach, Regional Engineering Manager - F&B Components.
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NOTE:

In addition to D4 and D4 SL double seat valves and different other process valve ranges, also other SPX FLOW process valves are in preparation for ATEX Zone 2 application requirements.

0. ATEX Specific Instructions

0.1. General Information

These ATEX Specific Safety Instructions apply for CU4 / CU4 plus ATEX Control Units used in Potentially Explosive Atmospheres according to **Zone 2 ATEX, GAS** applications (according to Directive 2014/34/EU), **ONLY**.

These instructions shall be read carefully by the competent operating and maintenance personnel.

We point out that we will not accept any liability for damage or malfunctions resulting from the non-compliance with these instructions.

0.2. ATEX Specific Symbol



DANGER! WARNING! CAUTION!

This symbol draws your attention to important directions which have to be observed for the operation in explosive areas.

Failure to observe the warning may result in fatal or serious injury as well as damage to property!

0.3. Authorized Use

The CU4 / CU4plus ATEX Control Unit is designed to be mounted to pneumatic actuators of process valves for the control of media as used in the food and beverage industries as well as in pharmaceutical and chemical applications.

The control unit is installed on a pneumatic actuator of a process valve. The process valve and the actuator must have at least the ATEX approval of the control unit.

SPX FLOW will be held responsible only for the control units supplied and selected according to the operating conditions indicated by the customer or end user and as stated in the order confirmation. If in doubt, contact your local supplier.

Observe the admissible data, operating conditions and conditions of use as specified in the contract documents, instruction manuals and on the type label.

The control unit must only be used with SPX FLOW valves and components recommended and authorized by SPX FLOW.

Adequate transport, storage and installation, careful handling and maintenance are essential for a faultless and reliable function of the control unit.

Observe the intended use of the control unit.

0. ATEX Specific Instructions

0.4. Specific Safety Instructions



Removing the electric plug

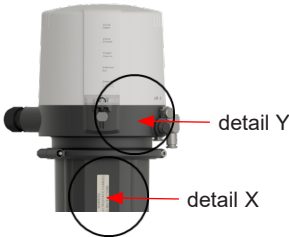
- Remove the electric circular plug or disconnect terminal connections only after the power supply has been separated.

lead seal



Opening the device

- Do not open the control unit in the presence of explosive atmosphere.
- Do not install and set the proximity switches in the presence of explosive atmosphere.
- Before startup, secure the cover with the enclosed lead seal. Opening the cover without tools must be prevented.



Electrostatic discharge

- In case of sudden discharge from electrostatically charged devices or individuals, risk of explosion in the explosive area exists.
- Prevent the occurrence of electrostatic discharges by suitable measures.
- Clean the control unit surface by gently wiping it with a damp or antistatic cloth, only.

electrostatic risk



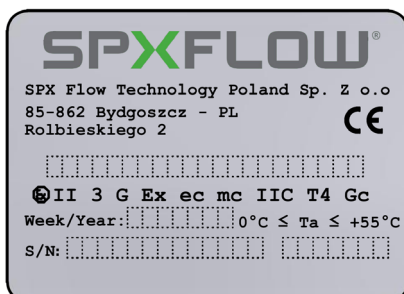
In order to prevent the emergence of explosion risks observe the safety instructions of the instruction manual and adhere to the following:

- Observe information on temperature classes, ambient temperatures, degree of protection and voltage on the approval ID label.
- Do not use control units in areas subject to gas with lower ignition temperatures than indicated on the approval ID label.
- Installation, operation and maintenance may only be performed by qualified personnel.
- Observe the applicable international and national safety regulations as well as the general rules of technology for construction and operation.
- Do not repair the control unit yourself. Replace it by an equivalent device.
- Repairs may only be performed by the manufacturer.
- Do not expose the control unit to mechanical and/or thermal loads which may exceed the limits described in the instruction manual.
- Only use cable and/or line entry points approved for the respective application area and which are screwed in place according to the respective installation instructions.
- The cable glands may be used for fixed installations, only.
- Close all unnecessary cable glands with locking screws approved for the explosive area.
- The required degree of protection (IP67) is guaranteed only in connection with suitable adaption sets. All pneumatic and electrical connections must be equipped with suitable connectors.

detail X: electrostatic risk label
CU4 ATEX 3G



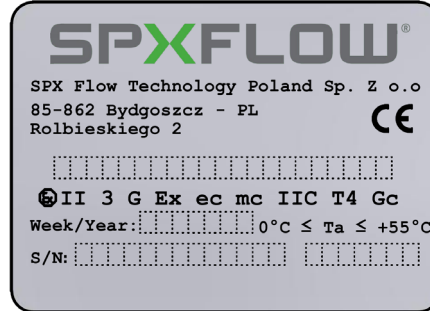
detail Y: type label
CU4 ATEX 3G



0. ATEX Specific Instructions

0.5. Identification of CU4 / CU4plus control units for use in ATEX environment

ATEX - identification:



Equipment group II

Explosion subcategory / Equipment marking
II 3 G Ex ec mc IIC T4 Gc

Ambient temperature
 $0\text{ }^{\circ}\text{C} \leq T_{\text{amb}} \leq +55\text{ }^{\circ}\text{C}$

0.6. Responsibilities



It is within the operator`s responsibility to ensure that the specified product temperatures are not exceeded and that regular inspections and maintenance are carried out to provide for proper function of the control unit and valve.

The following pages show the operating instructions for the standard control unit for non-ATEX applications.

1. Abbreviations and Definitions

A	Exhaust air
AWG	American Wire Gauge
CE	Communauté Européenne
CU	Control Unit
DI	Digital Input
DO	Digital Output
EMV	Electromagnetic Compatibility
EU	European Union
GND	Ground/mass potential
IP	International Protection
LED	Luminous diode
N	Pneumatic Air Connection NOT element
NEMA	National Electrical Manufacturers Association
P	Supply Air Connection
PWM	Pulse-width modulation
Y	Pneumatic Air Connection

2. Safety Instructions

2.1. Sentinels

Meaning:



Danger!

Direct danger which can lead to severe bodily harm or to death!



Caution!

Dangerous situation which can lead to bodily harm and/or material damage.



Attention!

Risk as a result of electric current.



Note!

Important technical information or recommendation.

These special safety instructions point directly to the respective handling instructions. They are accentuated by the corresponding symbol. Carefully read the instructions to which the sentinels refer. Continue handling the control unit only after having read these instructions.

2. Safety Instructions

2.2. Intended Use

The CU4 control unit is only intended for use as described in chapter 3.1. Use beyond that described in chapter 3.1. does not comply with the regulations and SPX FLOW shall not be responsible for any damage resulting from this non-observance. The operator bears the full risk. Prerequisites for proper and safe operation of the control unit are the appropriate transport and storing as well as the professional assembly. Intended use also means the observance of operating, service and maintenance conditions.

2.3. General Regulations for Careful Handling

To ensure a faultless function of the unit and a long service life, the information given in this instruction manual as well as the operating conditions and permissible data specified in the data sheets of the control unit for process valves should be strictly adhered to.

- The operator is committed to operating the control unit in faultless condition, only.
- Observe the general technical rules while using and operating the unit.
- Observe the relevant accident prevention regulations, the national rules of the user country as well as your company-internal operating and safety regulations during operation and maintenance of the unit.
- Switch off the electric power supply before carrying out any work on the system!
- Note that piping or valves that are under pressure must not be removed from a system!
- Take suitable measures to prevent unintentional operation or impermissible impairment.
- Following an interruption of the electric or pneumatic supply, ensure a defined and controlled re-start of the process!
- If these instructions are not observed, SPX FLOW will not accept any liability. Warranties on units, devices and accessories will expire!

2. Safety Instructions



2.4. Welding instructions

It is generally recommended to avoid welding work in process installations in which control units are installed and connected. If welding is nonetheless required, earthing of the electric devices in the welding area is a necessity.



2.5. Persons

- Installation and maintenance work may only be carried out by qualified personnel and by means of appropriate tools.
- The qualified personnel must get a special training with regard to possible risks and must know and observe the safety instructions indicated in the instruction manual.
- Work at the electrical installation may only be carried out by personnel skilled in electrics!

2.6. Warranty

This document does not contain any warranty acceptance. We refer to our general terms of sale and delivery. Prerequisite for a guarantee is the correct use of the unit in compliance with the specified conditions of application.



Note!

This warranty only applies to the Control Unit. No liability will be accepted for consequential damage of any kind arising from failure or malfunction of the device.

3. General Terms

3.1. Purpose of use

The CU4 Direct Connect Control Unit is designed for the control of process valves used in the food and related industries.

The CU4 control unit operates as interface between process control and process valve and controls the electric and pneumatic signals.

The pneumatic control of valves is undertaken via the solenoid valves. The control unit controls the valve positions, **open** and **closed**, via integrated and external sensors. The electronic module undertakes the task to process the switching signal from the control and to control the corresponding solenoid valves. The electronic module also provides for potential-free contacts. The corresponding light signals in the control unit provide for an external indication of the valve positions.

3.2. Design of CU4 Direct Connect (fig. 3.2.)

The CU4 Direct Connect Control Unit mainly consists of the following components:

1. The Control Unit base with integrated air channels and electric and pneumatic connections as well as viewing windows with type label.
2. 1 or 3 solenoid valves for the control of the valve actuators and for the seat lifting of double seat valves.
- 1 solenoid valve with 1 logic NOT element for the control of the valve actuators.
3. Sensor module with 2 integrated Hall sensors or 2 external proximity switches to detect the valve position.
4. Electronic module for the electric supply, communication with the control, evaluation of feedback signals and control of solenoid valves as well as the valve position indication through LED.
5. Clamp ring to fasten the CU4 on the adapter.
6. Cover with LED optics.

The cable/s by means of which the solenoid valves are connected with the electronic module must be guided through the cable guide at the rear side of the electronic module. **(fig. 3.2.1)**

fig. 3.2.

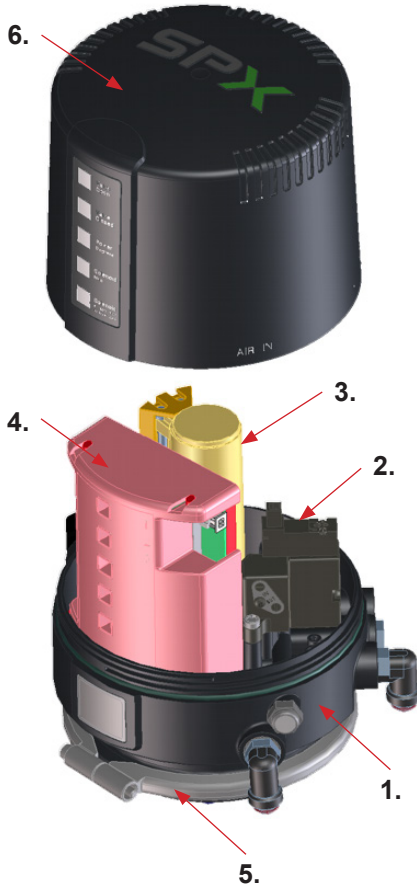
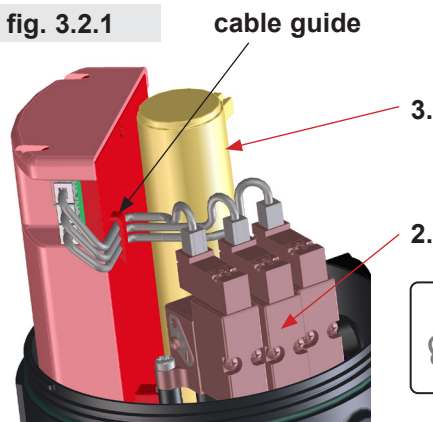


fig. 3.2.1



3. General Terms

3.3. Function of the individual components

The installation of the control unit is undertaken by special adapters which are available for the different valve types, see **chapter 5. Adapter**. The snap connectors for supply air and pneumatic air to the individual cylinders of the valves are located at the outside of the control unit. In case of control units for valves with turning actuator, the pneumatic air is transferred internally to the actuator. The air supply of the control unit is equipped with an exchangeable air filter. Observance of the required compressed air quality is imperative. Please also see **chapter 4.5**.

The number of the solenoid valves installed in the CU4 depends on the valve actuators to be controlled. Single seat and butterfly valves and double seat valves without seat lift function require 1 solenoid valve. Control units for double seat valves are equipped with 3 solenoid valves. For the manual actuation, the solenoid valves are provided with a safe handle which is easy to operate.

The electronic module installed in the control unit has the task to process the electric signals from the control, to control the solenoid valves and to evaluate the feedback signals from the feedback unit. Moreover, the signalling and indication of the valve positions as well as additional diagnostic functions are undertaken via the electronic module.

The electronic module is the interface between control actuators or sensors. Depending on the control type, different modules are available, e.g. Direct Connect, AS-interface, Profibus and DeviceNet. The CU4 Direct Connect module described herein provides for the direct parallel wiring of the control.

A feedback unit is required to detect the valve position.

The CU4 Direct Connect is equipped with 2 adjustable Hall effect sensors.

These are activated by a valve control rod installed on the operating cam. In this way, the **open** and **closed** valve position can be detected.

The 2 Hall effect sensors are continuously adjustable over an additional range. Thus, feedback messages for different valves with different stroke lengths can be adjusted properly. Alternatively, external proximity switches can be connected instead of the integrated Hall effect sensors when the valve position indication is undertaken direct at the process valve.

3. General Terms

3.3. Function of the individual components

The luminous diodes are arranged at the front side of the electronic module. Their signals are visibly indicated to the outside by an optical window in the cover of the control unit. Beside the open and closed valve position, the existence of the operating voltage as well as different diagnostic information are indicated. **Chapter 6.5.** “LED indication” contains more details.

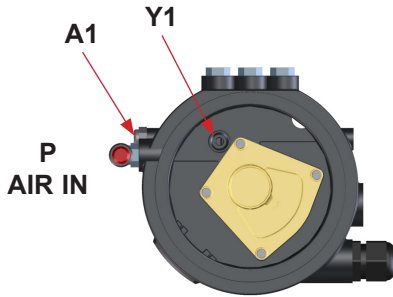
The complete control unit has been designed on the building block principle. By exchange of the electronic module, the control type can be changed, e.g. from direct control (Direct Connect) to communication with AS-interface.



Note! Wiring must also be changed.

4. Mechanics and Pneumatics

4.1. Air connection for valves with turning actuators



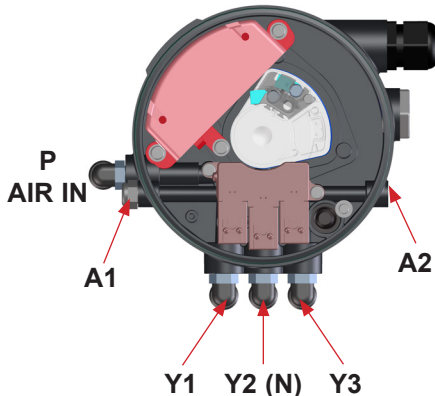
4.1.1. Function

CU41-T-DC

design for valve with turning actuator, e.g. butterfly valves

- P** air supply with integrated particle filter
- Y1** bore to transfer control air to turning actuator
- A1** exhaust air, with exhaust silencer

4.2. Air connections for seat valves and double seat mix proof valves



4.2.1. Function

CU41-S-DC / CU41-D4

design for seat valves and double seat mix proof valves without seat lift

- P** air supply with integrated particle filter
- Y1** control air connection for main actuator
- A1** exhaust air, with exhaust silencer

CU41N-S-DC

design for seat valves with NOT element

- P** air supply with integrated particle filter
- Y1** control air connection for main actuator
- N** pneumatic air connection for the spring support of the actuator by compressed air, via NOT element
- A1** exhaust air, with exhaust silencer

CU43-D4

design for double seat mixproof valves with seat lift

- P** air supply with integrated particle filter
- Y1** control air connection for main actuator
- Y2** pneumatic air connection for seat lift actuator of upper seat lifting
- Y3** pneumatic air connection for seat lift actuator of lower seat lifting
- A1/A2** exhaust air, with exhaust silencer

4. Mechanics and Pneumatics

4.3. Pressure relief valve

The base of the control unit is equipped with a pressure relief valve which prevents an inadmissible pressure build-up in the inner control unit.

If required, the pressure relief vents into the clearance between the base and the adapter of the control unit.

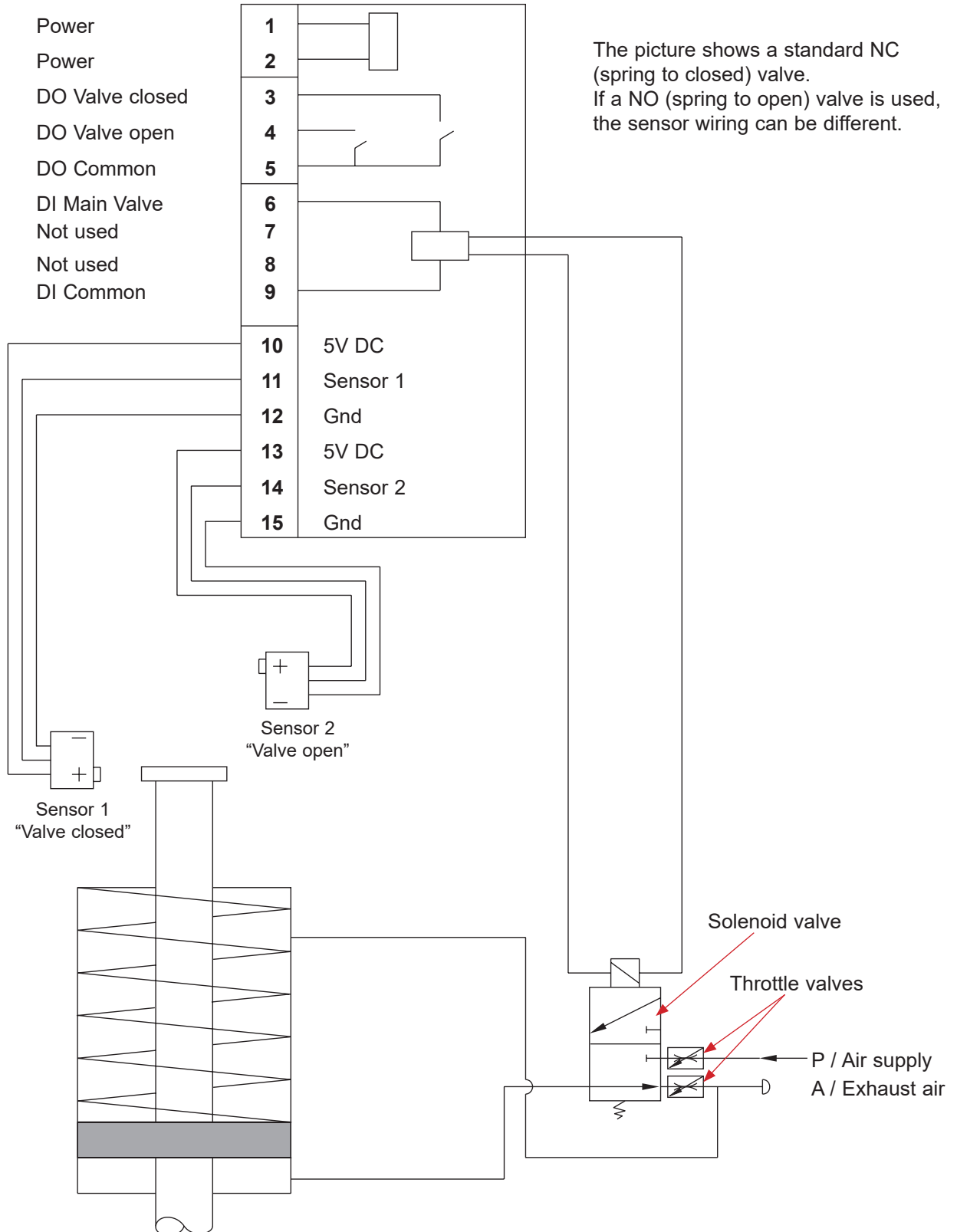


The pressure relief valve must not be mechanically blocked under any circumstances.

4. Mechanics and Pneumatics

4.4 Functional description - block diagrams

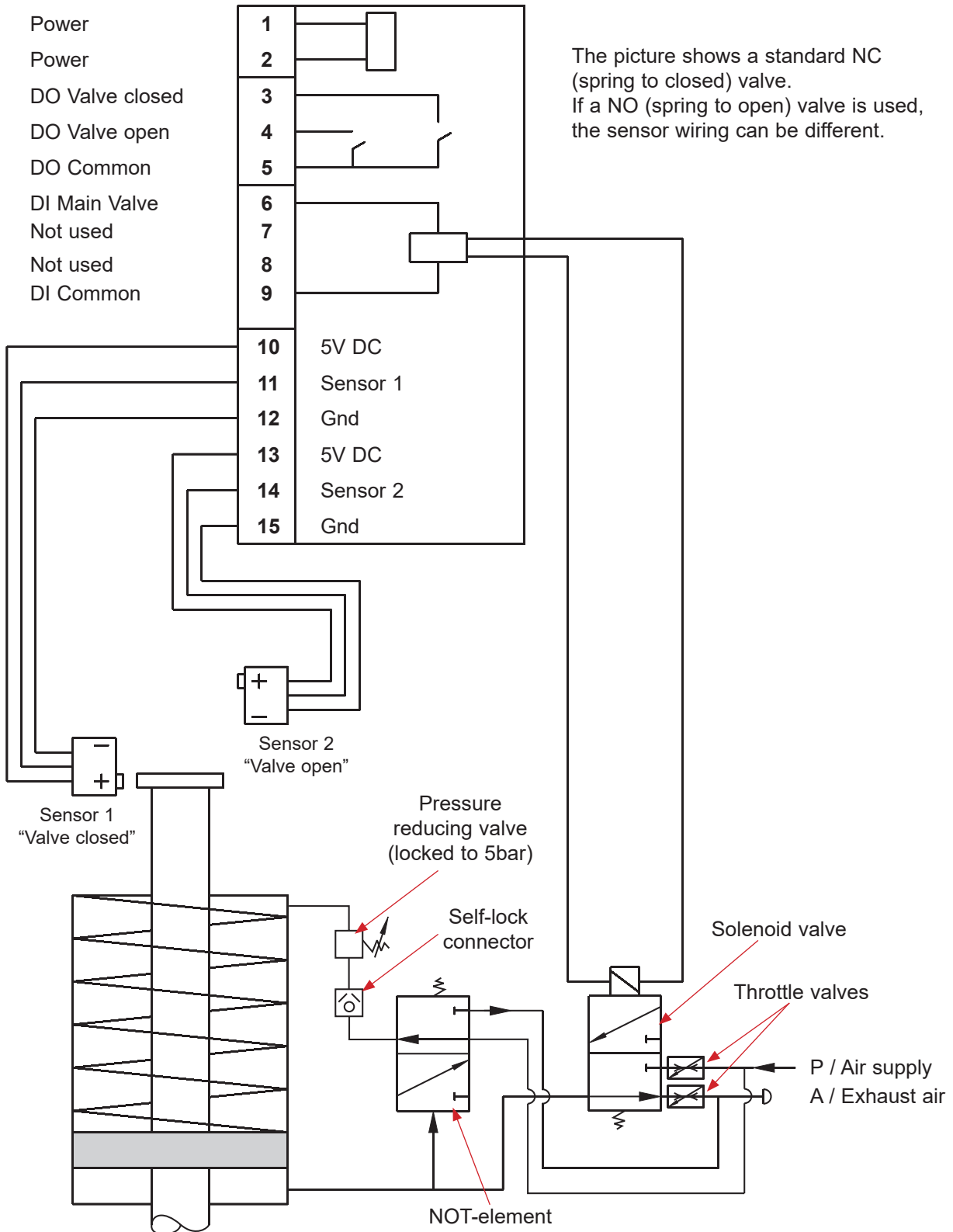
4.4.1. CU41 Direct Connect



4. Mechanics and Pneumatics

4.4.2. CU41N Direct Connect

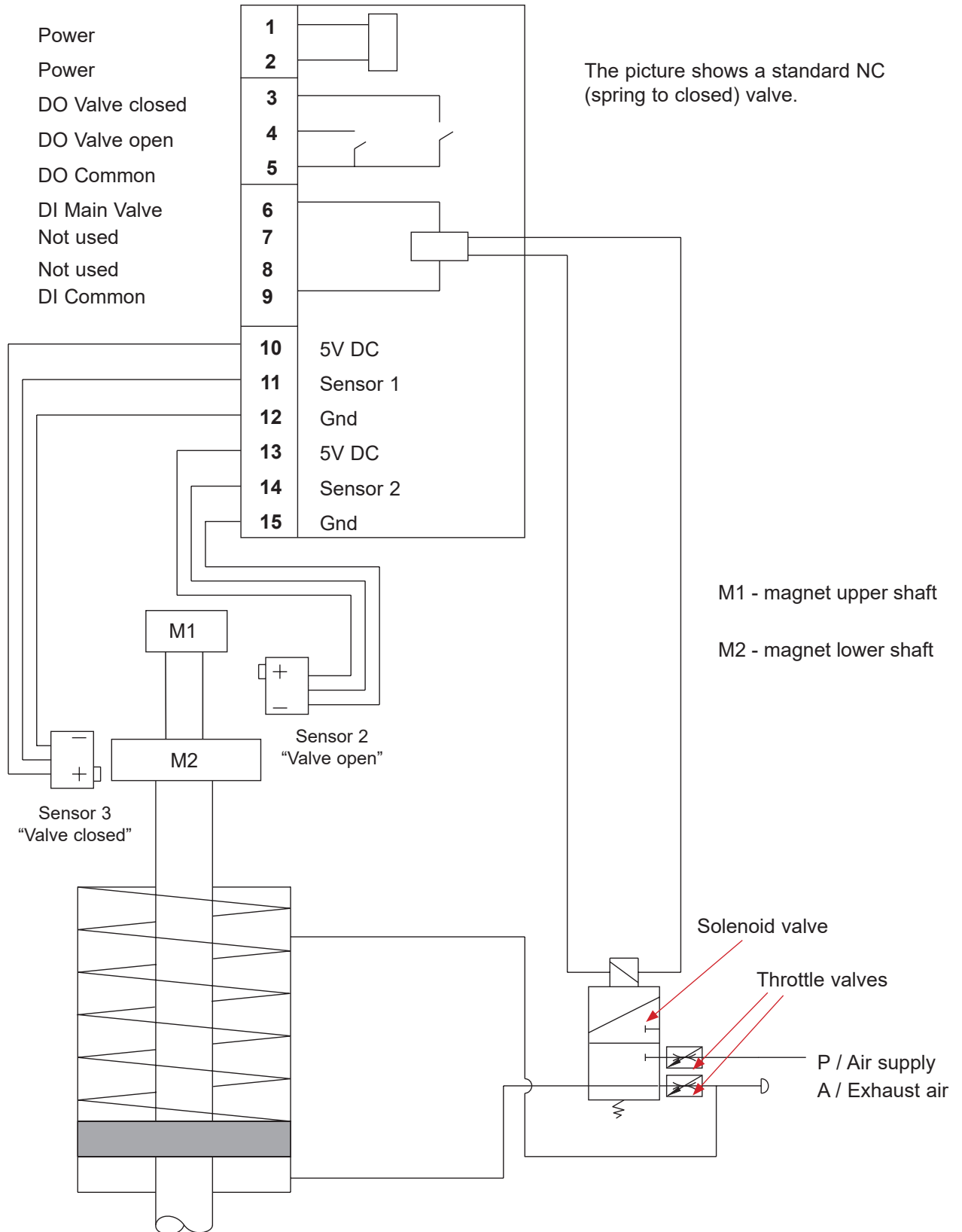
Functional description - block diagram



4. Mechanics and Pneumatics

4.4.3. CU41-D4 Direct Connect for D4 double seat mix proof valve

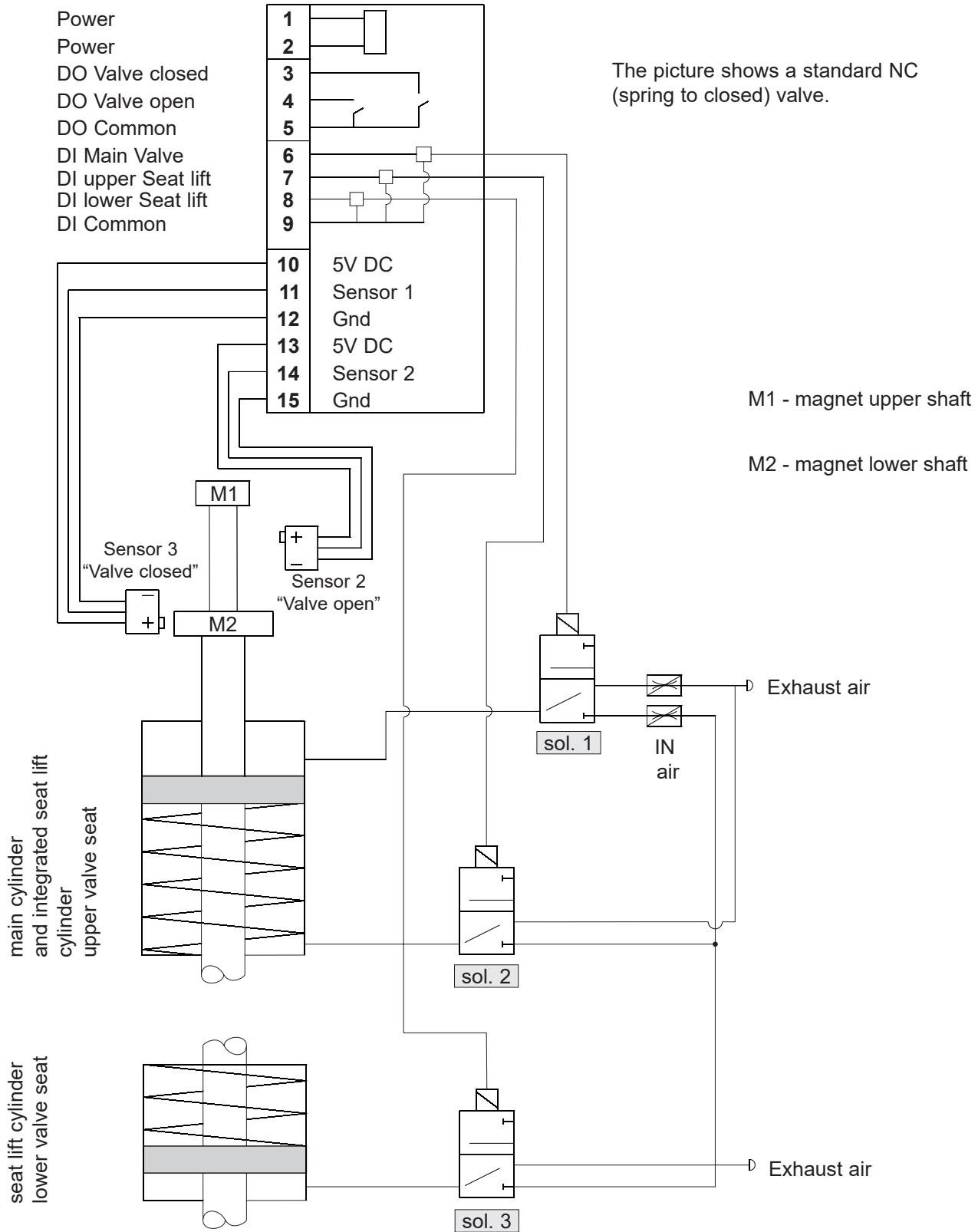
Functional description - block diagram



4. Mechanics and Pneumatics

4.4.4. CU43-D4 Direct Connect for DA4 / D4 SL double seat mix proof valves

Functional description - block diagram



4. Mechanics and Pneumatics

4.5. Technical Data / Standards

Material:	PA6.6
Ambient temperature:	0°C to +55°C (limitation due to ATEX application)
EU:	EMC 2014/30/EU (89/336/EEC)
Standards and environmental audits:	<p>protection class IP 67 EN 60529 / complies with NEMA 6 EMC interference resistance EN 61000-6-2 EMC emitted interference EN 61000-6-4</p> <p>vibration/oscillation EN 60068-2-6</p> <p>safety of machinery DIN EN ISO 13849-1</p>
Air hose:	6 mm / ¼" OD
Pressure range:	6–8 bar
Compressed air quality:	quality class acc. to DIN ISO 8573-1
content of solid particles:	<p>quality class 3, max. size of solid particles per m³ 10000 of 0,5 µm < d < 1,0 µm 500 of 1,0 µm < d < 5,0 µm</p>
content of water:	<p>quality class 3, max. dew point temperature -20°C For installations at lower temperatures or at higher altitudes, consider additional measures to reduce the pressure dew point accordingly.</p>
content of oil:	<p>quality class 1, max. 0,01 mg/m³</p>

The oil applied must be compatible with Polyurethane elastomer materials.

4. Mechanics and Pneumatics

4.6. Solenoid valves

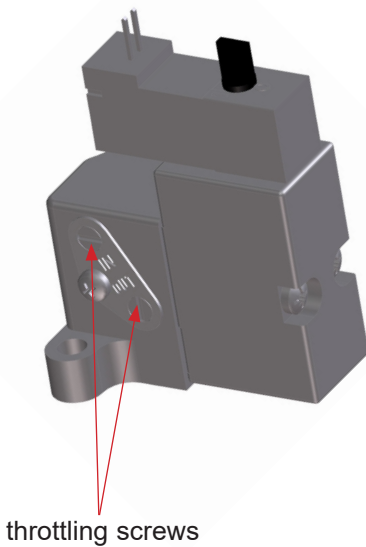
In the base of the control unit max. 3 solenoid valves are installed. The 3/2-way solenoid valves are connected with the electronic module by moulded cables and plug connectors.

control: effected by **pwm-signal**
handle: rotary switch at valve

4.7. Throttling function

The operating speed of the valve actuator can be varied or reduced. This may be necessary to slacken the actuation of the valve in order to prevent pressure hammers in the piping installation.

For this purpose, the supply and exhaust air of the **first solenoid valve** can be adjusted via the throttling screws respectively allocated in the interface of the solenoid valve. By turning the screws in anticlockwise direction, the inlet or outlet air is throttled.



4.8. NOT element

Through the installation of the logic NOT element, the closing force of the valve actuator can be increased by additional compressed air.

The NOT element conveys the compressed air via an external reducing valve (max. 5 bar) to the spring side of the valve actuator.

The pressure reducing valve is fixed to 5 bar.



Note!

The air connection of the NOT element is equipped with an integrated non-return valve.

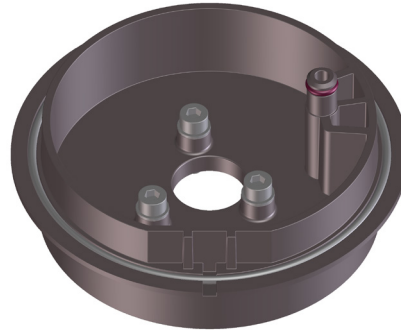
The air hose must be slid into the air connection until it stops - in order to open the non-return valve.

The NOT element is also used for air/air actuators.

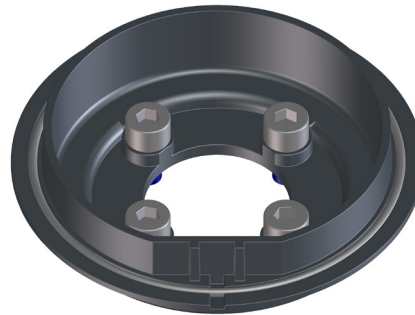
5. Adapter

Adapter for different process valves

5.1. Valves with turning actuator, e.g. butterfly valves



5.2. Single seat valves



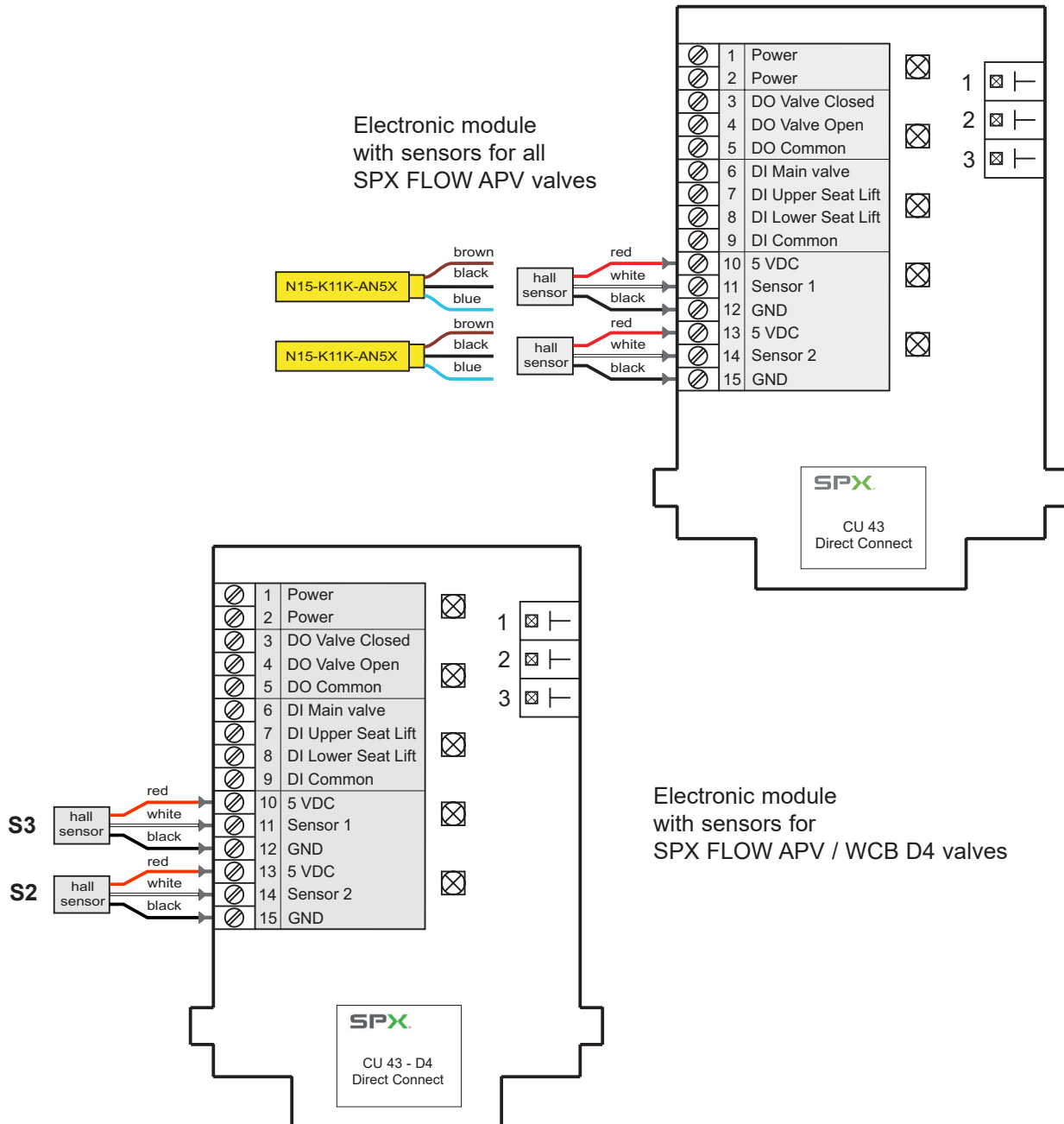
5.3. Double seat mix proof valves D4, D4 SL, DA4



6. Electronic module

6.1 Function / Block diagram

The electronic module CU4 Direct Connect operates as interface between superordinated control (PLC) and is connected direct by parallel wiring, i.e. every individual signal is on a separate line. The large input voltage range from 15 to 48VDC provides for versatile connections. All operating ranges within the electronic module such as the control of the solenoid valves, position feedback and LED indication are separated galvanically and can, thus, be operated with different voltages. Control of the solenoid valves is effected in energy-saving manner via pwm-signals.



6. Electronic module

6.2. Functional description of connections

Terminal	CU41 M12-5-pol. plug pin	CU43 M12-8-pol. plug pin	Designation	Functional description for all valve types	Functional description for D4, D4 SL and DA4 valve types
1	1 brown	2 brown	Power	Operating voltage	Operating voltage
2	3 blue	7 blue	Power	Operating voltage	Operating voltage
3	2 white	3 green	DO Closed Valve	Digital potential-free output for closed valve position	Digital potential-free output for closed valve position
4	5 grey	1 white	DO Open Valve	Digital potential-free output for open valve position	Digital potential-free output for open valve position
5	Bridge to Terminal 1	Bridge to Terminal 1	DO Common	Common potential for digital output to valve position indication	Common potential for digital output to valve position indication
6	4 black	6 pink	DI Main Valve	Digital input to control 1st solenoid valve (valve open)	Digital input to control 1st solenoid valve (valve open)
7		4 yellow	DI Upper Seat Lift	Digital input to control 2nd solenoid valve (seat lifting of upper valve seat)	Digital input to control 2nd solenoid valve (seat lifting of upper valve seat)
8		8 red	DI Lower Seat Lift	Digital input to control 3rd solenoid valve (seat lifting of lower valve seat)	Digital input to control 3rd solenoid valve (seat lifting of lower valve seat)
9	Bridge to Terminal 2	5 grey	DI Common	Common potential for digital inputs to control valve	Common potential for digital inputs to control valve
10			5 VDC	Voltage supply for valve sensor	Voltage supply for valve sensor
11			Sensor 1	Sensor signal 1 (closed valve position)	Connection Hall sensor 3 (closed valve position)
12			GND	Mass potential for sensor supply	Mass potential for sensor supply
13			5 VDC	Voltage supply for valve sensor	Voltage supply for valve sensor
14			Sensor 2	Sensor signal 2 (open valve position)	Connection Hall sensor 2 (open valve position)
15			GND	Mass potential for sensor supply	Mass potential for sensor supply

6. Electronic module

6.3. Technical data for electronic module

CU4 Direct Connect

Operating voltage:	15 – 24VDC
Supply of solenoid valve:	pwm-signal from electronic module
Dig. input (DI):	15 – 48VDC Imax. 1mA/24VDC
Dig. output (DO):	Umax. 48VDC Imax. 150mA RI 5,6Ohm / 100mA
Voltage supply of sensors:	5VDC (+/-5%)

Power consumption

Minimum (Power ON, 2 LED, no solenoid valve)	about 20mA, at 24VDC
Typically (Power ON, 2 LED, 1 solenoid valve)	about 35mA, at 24VDC
Maximum (Power ON, 3 LED, 2 solenoid valves)	about 55 mA, at 24VDC

Connecting terminals:	conductor cross section 0,5-1,5 mm ² (with conductor sleeve) complying with AWG 20-16
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Note! Observe that only one cable should be installed. If more than one cable is required, follow the max. cross section limitations!

Torque for screw terminal:	0,8 Nm +/- 0,1
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6. Electronic module

6.4. Connections









Sensors to detect the valve positions:

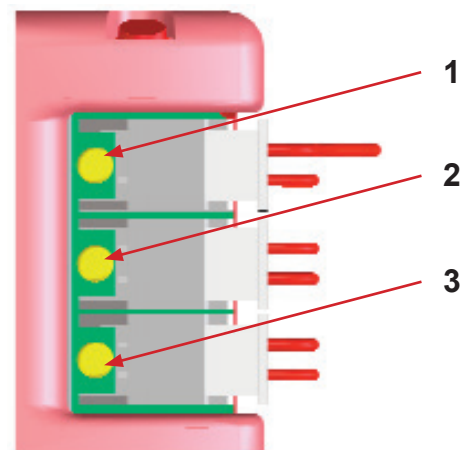
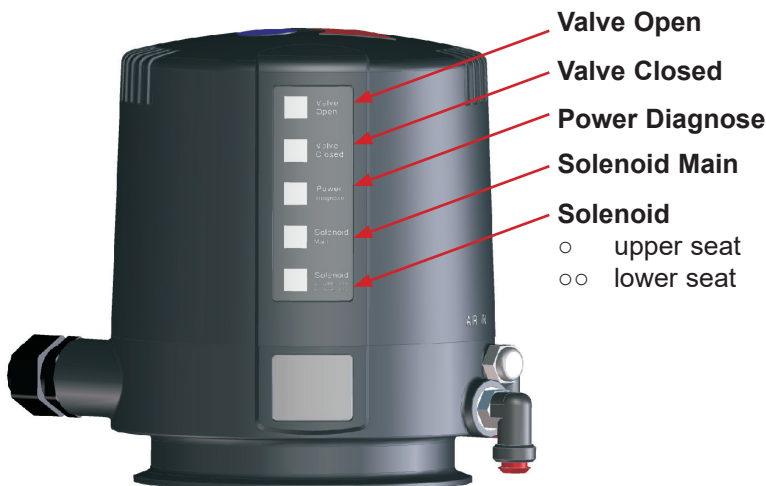
Internal sensors: Hall effect sensors
(APV valves): H320385
(APV / WCB D4 valves): H337014
UB 4,75-5,25 VDC
operating distance according to
SPX FLOW specification

External sensors: Inductive proximity switches: H208844
UB 4,75-5,25 VDC
operating distance according to
SPX FLOW specification

6. Electronic module

6.5. LED indication

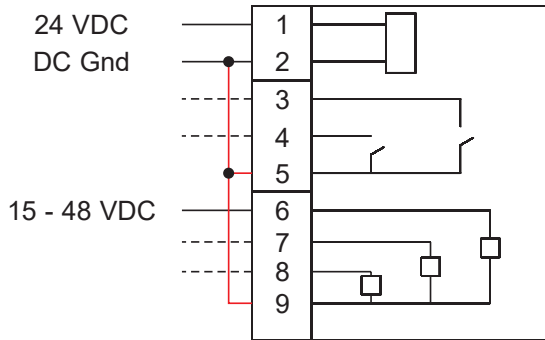
External luminous displays				
Valve Open	colour green, permanent light			valve in open position
Valve Closed	colour orange, permanent light			valve in closed position
Power Diagnose	colour green, permanent light			operating voltage at module - faultless
	colour green, flashing			failure solenoid valve (wire fracture)
Solenoid Main	colour blue, permanent light			main solenoid valve (1) controlled
Solenoid Main ○ upper seat ○○ lower seat	colour blue, 1 blink			solenoid valve (2) for upper seat lift controlled
	colour blue, 2 blinks			solenoid valve (3) for lower seat lift controlled
	colour blue, permanent blink			solenoid valves (2) + (3) for diagnosis, only
Internal luminous displays				
Luminous diode	1			1st solenoid valve (1) controlled
Luminous diode	2			2nd solenoid valve (2) controlled
Luminous diode	3			3rd solenoid valve (3) controlled



6. Electronic module

6.6. Wiring examples

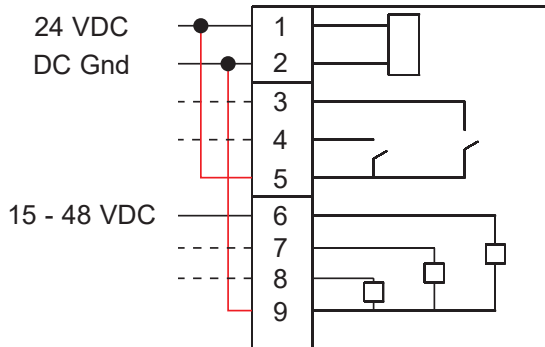
Example 1



Power
Power
DO Valve closed
DO Valve open
DO Common
DI Main Valve
DI upper seat lift
DI lower seat lift
DI Common

5/7 cable required
DC supply
DC valve signal
2 feedback to SPS
common DC mass

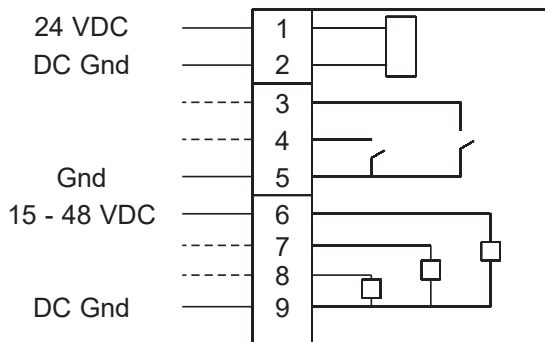
Example 2



Power
Power
DO Valve closed
DO Valve open
DO Common
DI Main Valve
DI upper seat lift
DI lower seat lift
DI Common

5/7 cable required
DC supply
DC valve signal
2 feedback to SPS
common DC mass

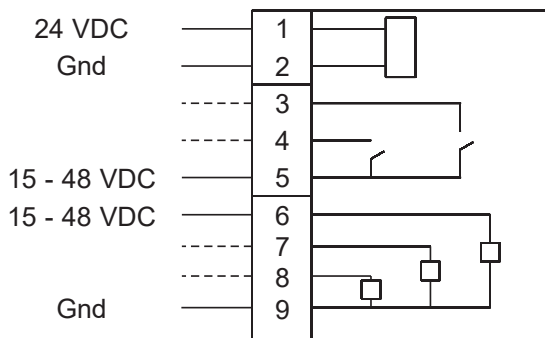
Example 3



Power
Power
DO Valve closed
DO Valve open
DO Common
DI Main Valve
DI upper seat lift
DI lower seat lift
DI Common

7/9 cable required
DC supply
DC valve signal
2 feedback to SPS
separated DC mass, functional units
galvanically isolated

Example 4

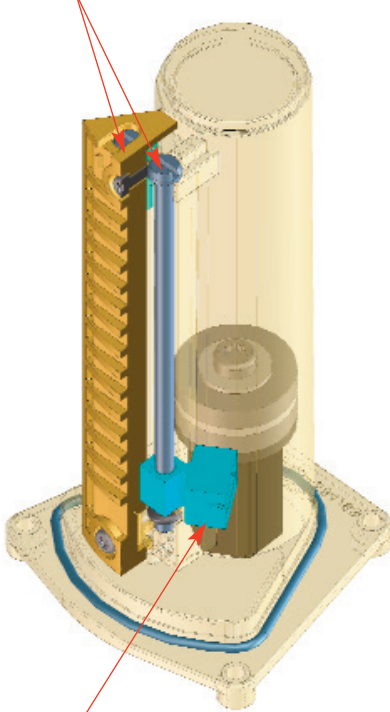


Power
Power
DO Valve closed
DO Valve open
DO Common
DI Main Valve
DI upper seat lift
DI lower seat lift
DI Common

7/9 cable required
DC supply
DC valve signal
2 feedback to SPS
separated DC mass, functional units
galvanically isolated

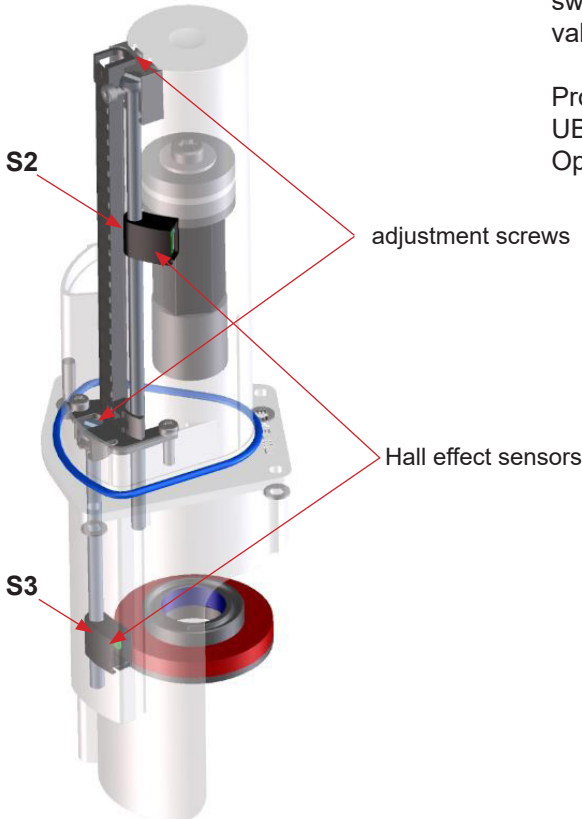
7. Feedback unit

Feedback unit for
SPX FLOW APV valves
adjustment screws



Hall effect sensor

Feedback unit for
SPX FLOW APV / WCB D4 valves



7.1. General terms

For the internal registration of the valve position indication, the feedback unit with 2 Hall effect sensors is applied. It is used when single seat and butterfly valves are installed. The control of these sensors is effected by magnets assembled on the valve shaft rod. The Hall effect sensors are installed on a movable threaded rod. By means of this assembly, the sensors can be adjusted via a large range, in accordance with the valve stroke.

7.2. Sensors

Hall effect sensors (APV valves): H320385
Hall effect sesonrs (APV / WCB D4 valves): H337014
UB 4,75-5,25 VDC
operating distance according to SPX FLOW specification

7.3. Adjustment of valve position feedback

By turning of the adjustment screws on which the Hall effect sensors are installed, the sensors can be moved into the respectively required position to detect the valve position. The o-rings on the adjusting screws prevent accidental displacement of these positions. After the installation of the control unit, check the correct adjustment of the position of the Hall sensor.

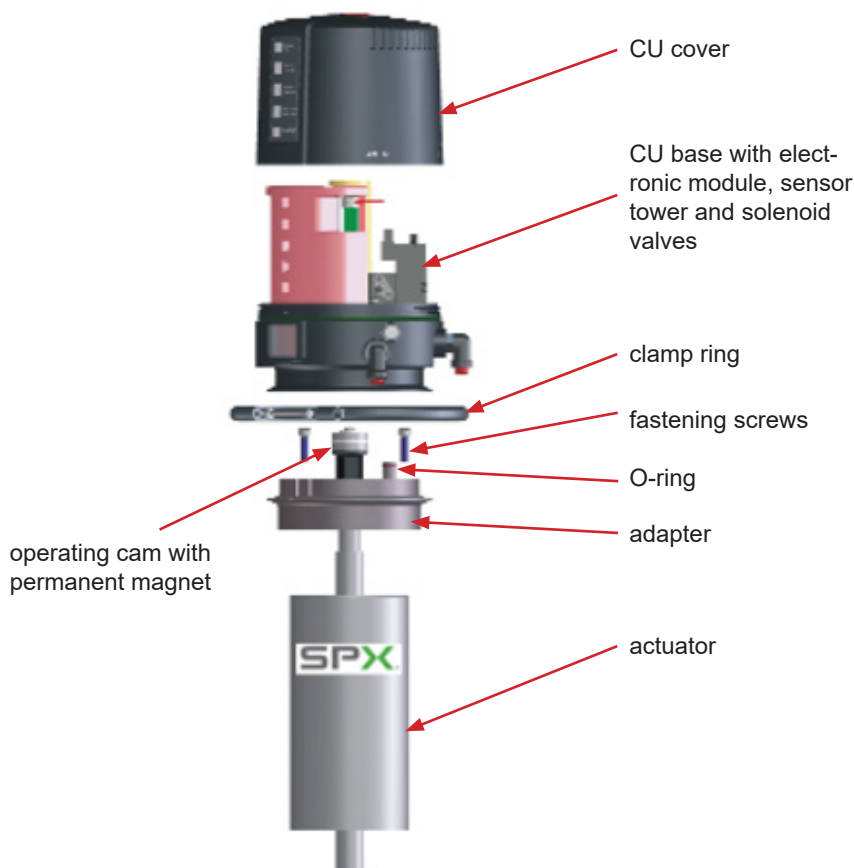
7.4. Use of external sensor

Instead of the internal Hall effect sensors, also 2 external proximity switches can be connected to the CU4 DC, e.g. for the valve position indication at double seat valves.

Proximity switch: H208844
UB 4,75-5,25 VDC
Operating distance according to SPX FLOW specification

8. CU Assembly and Startup

8.1. Valves with turning actuator, e.g. butterfly valves



Caution!

The permanent magnet is made of fragile material and must be protected against mechanical load . – Risk of fracture!
The magnetic fields can damage or delete data carrier or influence electronic and mechanic components.

Assembly of the Control Unit on the valve

1. Assembly of the adapter on the turning actuator.
Fasten with 3 screws.
See to the right positioning of the O-rings on the lower side of the adapter and in the groove of the air transfer stud.
2. Install operating cam with shaft rod prolongation.
Secure with Loctite semi-solid and fasten it.
3. Place the control unit via the operating cam onto the adapter.
Observe alignment!
4. Attach the clamp rings and fasten them with the screws.

8. CU Assembly and Startup

8.1.1. Pneumatic connection

Supply air:



Caution!

Shut off the compressed air supply before connecting the air hose! Make sure that the air hose is professionally cut to length. Use a hose cutter for this purpose.

Pneumatic air for valve actuator:

For the assembly of the control unit on the turning actuator with integrated air transfer, air hosing between the control unit and the actuator is not required.

Exhaust air:

As a standard, the exhaust air connection is equipped with a silencer. If required, the silencer can be removed and the exhaust air can be hosed separately when it must be led off to the exterior, for example.

8.1.2. Electric connection



Attention!

Electric connections shall only be carried out by qualified personnel!

Make sure that the operating voltage is correct!

After determining the connecting variant according to chapter 6.6. Wiring Examples, select the corresponding cable.

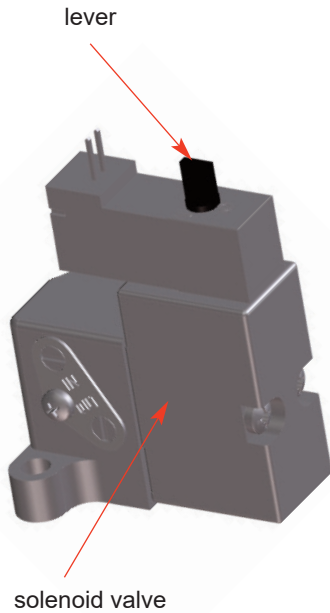
Guide the cable through the cable gland and connect it according to the Wiring Diagram. Preferably use wire terminations!

Tighten the cable gland in order to ensure the corresponding protective class.

8. CU Assembly and Startup

8.1.3 Startup

After proper assembly and installation of the control unit, start-up can be undertaken as described below:



1. Switch on the air supply.
2. Switch on the voltage supply.
3. Check the solenoid valves by turning the handle on the upper side of the valve by 90°.
4. Check the valve position indicator and adjust feedbacks for **open** and **closed** valve position as described below.

For valves in normally closed (air-to-raise, spring-to-lower) /normally open (air-to-lower, spring-to-raise) design with turning actuator, the following allocation applies:

Closed valve position feedback – sensor 1 controlled

For the adjustment, Hall sensor 1 with non-controlled (controlled) solenoid valve 1 is moved into the required position by turning the adjustment screw 1. The **LED Valve Closed** lights up.

Open valve position feedback – sensor 2 controlled

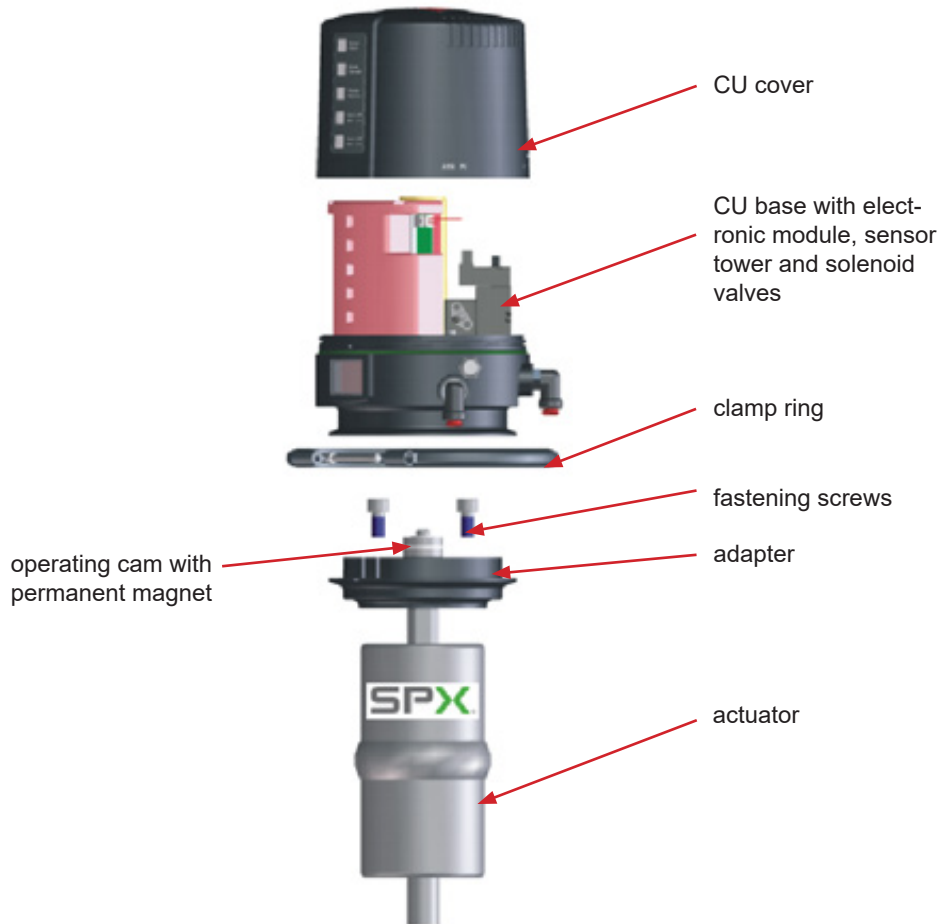
For the adjustment of Hall sensor 2, at first, the (non-controlled) solenoid valve 1 is controlled. This can optionally be made manually or electrically. The open valve position and the corresponding feedback can be adjusted. This is undertaken by turning the adjustment screw 2 until the required position is reached and the **LED Valve Open** lights up.



Observe the switching hysteresis of the Hall effect sensors! Therefore, adjust the switch-point of the sensors with overlap in order to permit small variations and, thus, to prevent failures!

8. CU Assembly and Startup

8.2. Single seat valves



CAUTION!

The permanent magnet is made of fragile material and must be protected against mechanical load . – Risk of fracture!
The magnetic fields can damage or delete data carrier or influence electronic and mechanic components.

Assembly of the Control Unit on the valve

1. Assembly of the adapter on the single seat valve.
Fasten with 4 screws.
2. Secure operating cam with Loctite semi-solid and fasten it.
3. Place the control unit via the operating cam onto the adapter.
Observe alignment.
4. Attach the clamp rings and fasten them with the screws.

8. CU Assembly and Startup

8.2.1. Pneumatic connection



Supply air:

Caution!

Shut off the compressed air supply before connecting the air hose!

Make sure that the air hose is professionally cut to length. Use a hose cutter for this purpose.

Pneumatic air for valve actuator:

Connect the pneumatic air connection Y1 with the valve actuator.

- For the CU41N (**with logic NOT element**), the pneumatic air connection **N** must be connected with the spring side of the actuator.

Take note of the spring side of the actuator during the assembly of the pressure-reducing valve.

Exhaust air:

As a standard, the exhaust air connection is equipped with a silencer. If required, the silencer can be removed and the exhaust air can be hosed separately when it must be led off to the exterior, for example.

8.2.2. Electric connection



Attention!

Electric connections shall only be carried out by qualified personnel.

Make sure that the operating voltage is correct!

After determining the connecting variant according to chapter 6.6 Wiring Examples, select the corresponding cable.

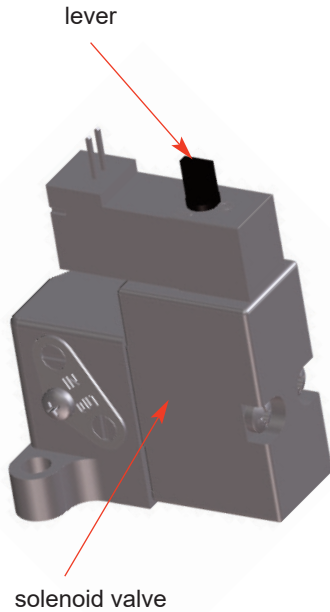
Guide the cable through the cable gland and connect it according to the Wiring Diagram. Preferably use wire terminations! Tighten the cable gland in order to ensure the corresponding protective class.

8. CU Assembly and Startup

8.2.3. Startup

After proper assembly and installation of the control unit, start-up can be undertaken as described below:

1. Switch on the air supply
2. Switch on the voltage supply.
3. Check the solenoid valves by turning the handle on the upper side of the valve by 90°.
4. Check the valve position indicator and adjust feedbacks for **open** and **closed** valve position as described below.



For single seat valves in normally closed (normally open) the following allocation applies:

Closed valve position feedback – sensor 1 controlled

For the adjustment, Hall sensor 1 with non-controlled (controlled) solenoid valve 1 is moved into the required position by turning the adjustment screw 1. The **LED Valve Closed** lights up.

Open valve position feedback – sensor 2 controlled

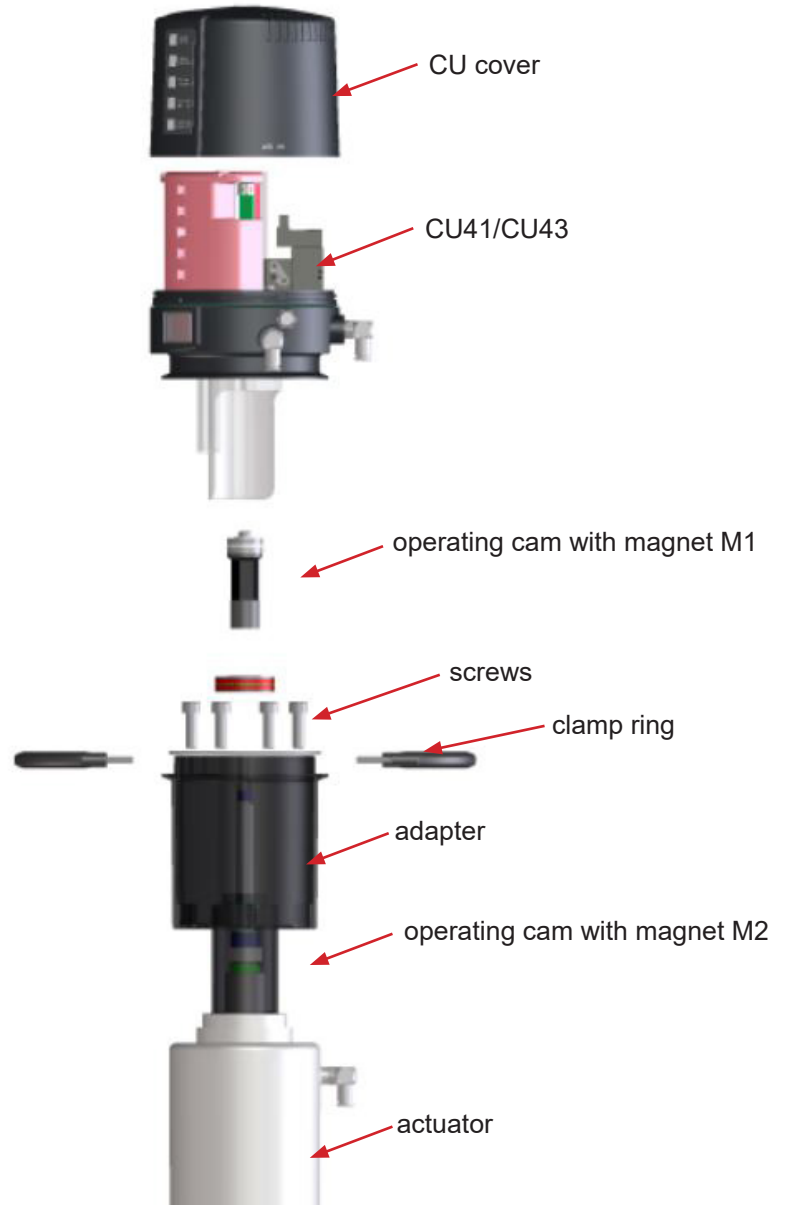
For the adjustment of Hall sensor 2, at first, the (non-controlled) solenoid valve 1 is controlled. This can optionally be made manually or electrically. The open valve position and the corresponding feedback can be adjusted. This is undertaken by turning the adjustment screw 2 until the required position is reached and the **LED Valve Open** lights up.



Observe the switching hysteresis of the Hall effect sensors! Therefore, adjust the switch-point of the sensors with overlap in order to permit small variations and, thus, to prevent failures!

8. CU Assembly and Startup

8.3. Double seat mix proof valves D4, D4 SL, DA4



Assembly of the Control Unit on the valve

1. Assemble the magnet M2 on the upper shaft under the stop screw.
2. Assemble the adapter with the 4 screws on the double seat valve.
3. Assemble the operating cam M1 with guide rod extension on the guide rod.
4. Place the control unit onto the adapter. Observe alignment!
5. Attach the clamp rings and fasten them with the 2 screws.
6. Align air connections of the control unit to the valve actuator.

8. CU Assembly and Startup

8.3.1 Pneumatic connection

Supply air:



Caution!

Shut off the compressed air supply before connecting the air hose!

Make sure that the air hose is professionally cut to length. Use a hose cutter for this purpose.

Pneumatic air to valve actuator:

Connect pneumatic air connection **Y1** with the valve actuator. Main actuator



Connect pneumatic air connection **Y2** with the valve actuator. (seat lifting - upper valve seat)



Connect pneumatic air connection **Y3** with the valve actuator. (seat lifting – lower valve seat)



Exhaust air:

As a standard, the exhaust air connections **A1** and **A2** are equipped with a silencer. If required, the silencer can be removed and the exhaust air can be hoses separately when it must be led off to the exterior, for example.

8.3.2 Electric connection



Attention!

Electric connections shall only be carried out by qualified personnel!

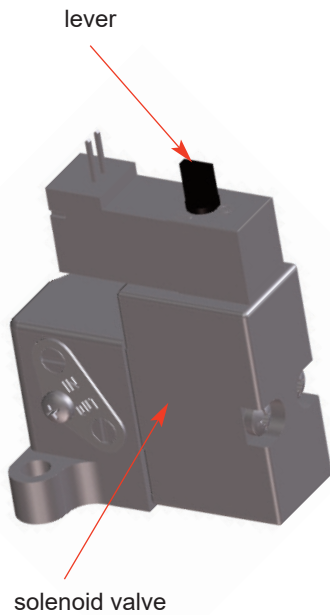
Make sure that the operating voltage is correct!

After determining the connecting variant according to chapter 6.6. Wiring Examples, select the corresponding cable.

Guide the cable through the cable gland and connect it according to the Wiring Diagram. Preferably use wire terminations!

Tighten the cable gland in order to ensure the corresponding protective class.

8. CU Assembly and Startup



8.3.3 Connection of external proximity switches

The electric connection of the proximity switches specified by SPX FLOW is undertaken according to the terminal layout described in chapter 6.1.

The mechanic assembly of the proximity switches is carried out at the actuator of the corresponding double seat valves. Observance of the instruction manual for double seat valves is essential!

8.3.4 Startup

After proper assembly and installation of the control unit, start-up can be undertaken as described below

1. Switch on the air supply
2. Switch on the voltage supply.
3. Check the solenoid valves by turning the handle on the upper side of the valve by 90°.
4. Check the valve position indicator.
The proximity switches are installed at the double seat valves with a mechanical stop.
Adjustment is not required!

The following allocation applies for double seat valves:

Closed valve position feedback – sensor 3 controlled

Open valve position feedback – sensor 2 controlled



Check the proper fit of the proximity switches to provide for the accurate transfer of the signals for the corresponding valve position.

9. Accessories and Tools

Assembly/disassembly - adapter on valve actuator:

- hexagon socket wrench 6 mm
- screwdriver 4 mm

Assembly/disassembly – CU on adapter:

- hexagon socket wrench 3 mm

Assembly/disassembly – electronic module:

- torx wrench TX20
- screwdriver 3.5 mm

Assembly/disassembly – feedback unit:

- torx wrench TX15

Assembly/disassembly – electronic modules:

- torx wrench TX20

Assembly/disassembly – air connections:

- jaw wrench M13

Assembly/disassembly – pressure relief valve:

- torx wrench TX10

Loctite semi-solid

jaw wrench



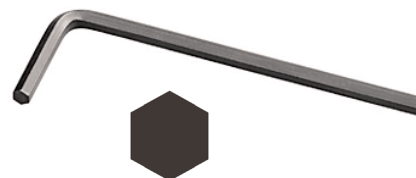
torx wrench



screwdriver

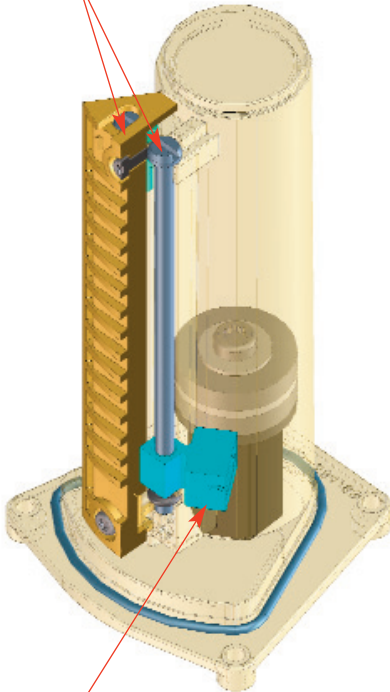


hexagon socket wrench



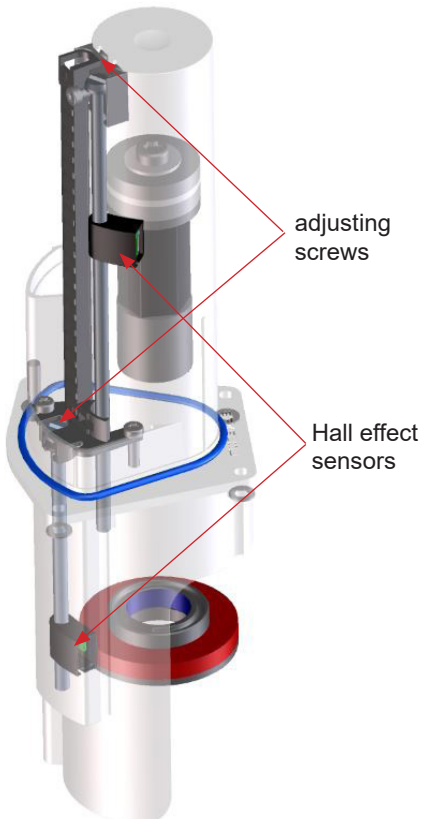
10. Service

Feedback unit for
SPX FLOW APV valves
adjusting screws



Hall effect sensor

Feedback unit for
SPX FLOW APV / WCB D4 valves



adjusting
screws

Hall effect
sensors

10.1. Disassembly

Before disassembly, verify the following items:

- The valve must be in safety position and must not be controlled!
- Shut off air supply!
- Cut off current to control unit, i.e. interrupt the supply voltage

Solenoid valve (4, 5, 6)

- + Open the CU cover by turning in anticlockwise direction.
- + Release the plug connection at the electronic module for the corresponding solenoid valve.
- + Release and remove the 2 screws (20) TX20.
- + Replace the solenoid valve.
- + Assembly in reverse order.
- See to a proper fit of the flat seal!

Electronic module (2)

Before releasing the cable connections make sure that all lines are switched off!

- + Open the CU cover by turning in anticlockwise direction.
- + Release the plug connection of the solenoid valves.
- + Release the cable from the terminal strip, all terminals 1-8.
- + Release and remove the 3 screws (20) TX20.
- + Replace the electronic module.
- + Assembly in reverse order.

Feedback unit

Before releasing the cable connections make sure that all lines are switched off!

- + Open the cover.
- + Release the cable for the Hall effect sensors from the terminal strip, terminals 3-8.
- + Release the clamp ring and lift the CU4 from the adapter.
- + Remove the 4 screws (9) TX15 at the lower side of the CU base (1).
- + Take out the feedback unit to the bottom.

Hall effect sensors

The Hall effect sensors can only be replaced at the dismantled feedback unit.

- + Remove the 3 screws (14) TX10.
- + Remove the tower lid (13).
- + Remove the O-ring (11)
- + Dismantle the sensors by turning the adjusting screw (12).

To simplify adjustment of feedbacks:

- + Mark the position of the sensor on the adjusting screw!
- + Assembly in reverse order.
- + Check the correct position of the Hall effect sensors and their functions as described in **chapter 8** „CU assembly and start-up“.

11. Trouble Shooting

General Failures	Remedy
Valve position is not indicated.	Re-adjust Hall sensors.
	Check fastening of magnetic operating cam.
	Check cabling of the Hall sensors to the electronic module.
Feedback via proximity switches is missing	Check positioning of proximity switches.
	Check operating voltage.
	Check cabling to the electronic module.
LED indication is missing	Check operating voltage.
	Check cabling to the electronic module.
Failure	Remedy
Control Unit CU41 installed on Butterfly valves	
Movement of valve flap is missing with actuated solenoid valve.	Check if right control unit is installed. Check label in type window of control unit: CU41-T-Direct Connect (1 EMV/solenoid valve)
	Check valve movement with manual at solenoid valve.
	Check cabling between electronic module and solenoid valve.
	Check compressed air (min. 6 bar).
	Bore for transfer of control air to turning actuator must be open.
Air leakage at lower side of adapter.	Check o-rings of adapter.

11. Trouble Shooting

Failure	Remedy
Control Unit CU41 installed on Single seat and Double seat valves	
Valve position movement is missing with actuated solenoid valve.	Check if right control unit is installed. Check label in type window of control unit: CU41-S-Direct Connect (1 EMV/solenoid valve) CU41-D4-Direct Connect
	Check valve movement with manual lever at solenoid valve.
	Check cabling between electronic module and solenoid valve.
	Check compressed air (min. 6 bar).
	Check control air connection between the CU41 and the valve actuator.
Control Unit CU43 installed on Double seat valves	
Valve position movement is missing with actuated solenoid valve.	Check if right control unit is installed. Check label in type window of control unit: CU43-D4-Direct Connect
	Check valve movement with manual lever at solenoid valve.
	Check cabling between electronic module and solenoid valve.
	Check compressed air (min. 6 bar).
	Check control air connection between the CU43 and the DA4 / D4 SL actuator.

12. Spare Parts Lists

The reference numbers of spare parts for the different control unit designs and adapters are included in the attached spare parts drawings with corresponding lists.

When you place an order for spare parts, please indicate the following data:

- number of parts required
- reference number
- parts designation

Data are subject to change.

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Spare Parts list

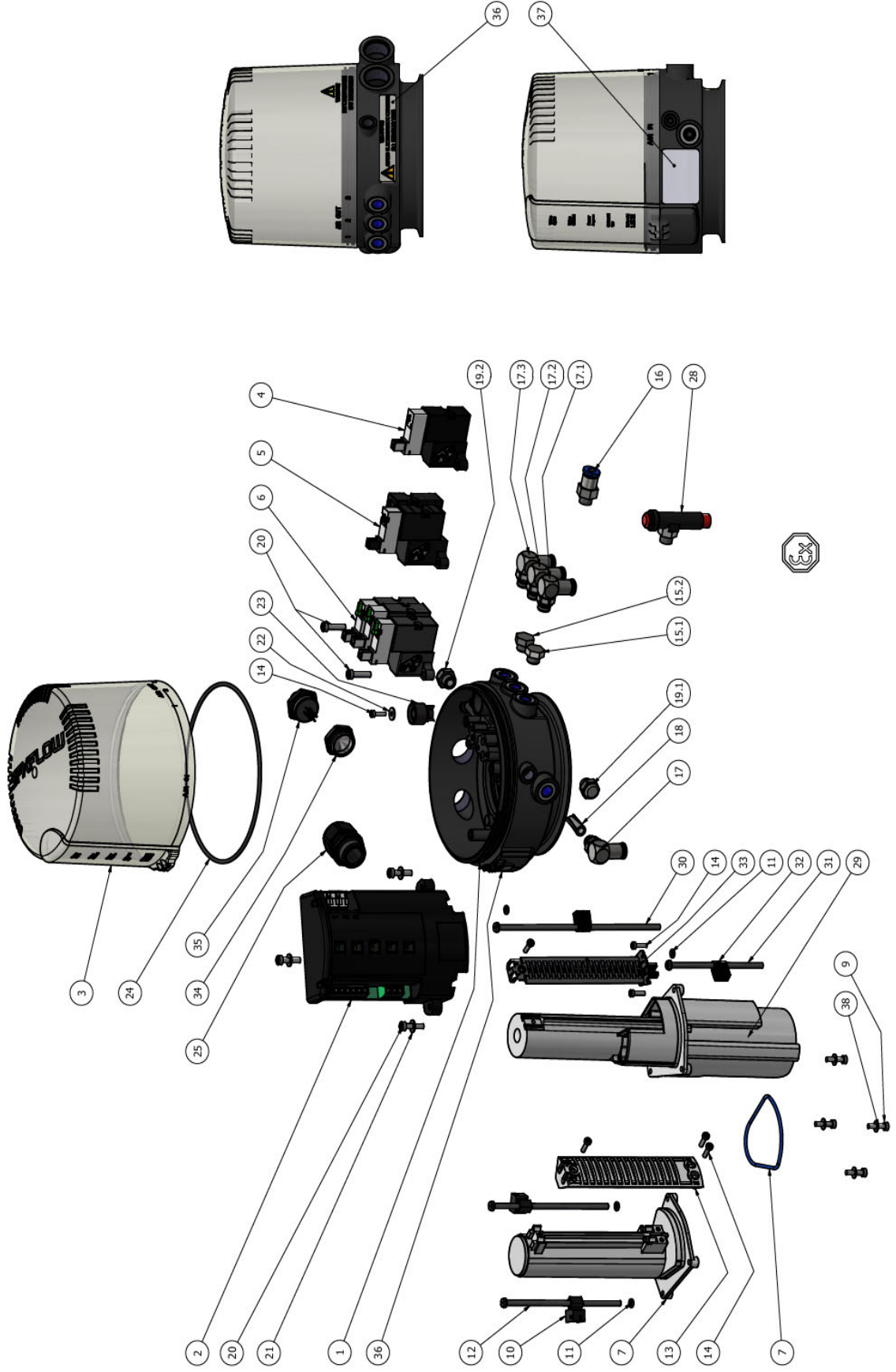
**CU4 Direct Connect
II 3 G Ex ec mc IIC T4 Gc
ATEX 3G - Zone 2**

Date: 13.09.21
Name: C. Keil
Reviewed: C. Keil

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SPX FLOW

RN ATEX 01.044-4



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Spare parts list

CU4 D4 Direct Connect
II 3 G Ex ec mc IIC T4 Gc
Zone 2



Date:	13.09.21
Name:	C. Keil
Reviewed:	C. Keil
Date:	
Name:	
Reviewed:	

SPX FLOW

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RN ATEX 01.044-4

pos. item	Quantity	Description	required in version	Material	Part no.	pos. item	Quantity	Description	required in version	Material	Part no.
		CU41 D4 DC ATEX 3G		PA6.6 GF30	H345120	20	5	Ejot Delta PT screw WN5452 40x16	CU41+43	A2	H320365
		CU41 D4 DC ATEX 3G M12		PA6.6 GF30	H345121	21	3	Washer ø4,3 DIN125	CU41+43	A2	H79576
		CU43 D4 DC ATEX 3G		PA6.6 GF30	H345116	22	1	Washer A 3,2 DIN9021	CU41+43	A2	H320404
		CU43 D4 DC ATEX 3G M12		PA6.6 GF30	H345117	23	1	CU4 pressure relief valve	CU41+43	PPS	H320352
						24	1	O-ring 120,32 x 2,62	CU41+43	NBR	H320402
		CU41 Ex Base M cpl.	CU41	PA6.6 GF30 +PA12	H344231	25	1	Screwed cable gl. M20x1.5 cable ø6-12	CU41+43	PA black	H344599
		CU43 Ex Base M cpl.	CU43	PA6.6 GF30 +PA12	H344232						
		CU41 E-module Direct Connect	CU41	Zyrel 70G33L black	H327194						
		CU43 E-module Direct Connect	CU43	Zyrel 70G33L black	H327195						
		CU4 cover translucent	CU41+43	Lexan 945AU	H337948	29	1	D4 sensor tower cmpl.	CU41+43	Grilamid TR55	H338146
		Solenoid valve 1 sol.	CU41	PPS	H319950	30	1	Cylinder head screw ISO 1207 M4x140	CU41+43	A2	H337011
						31	1	Cylinder head screw ISO 1207 M4x80	CU41+43	A2	H336896
		Solenoid valve 3 sol.	CU43	PPS	H319952	32	2	CU4 Hall sensor D4	CU41+43	Grilamid TR55	H337014
						33	2	CU4 Hall sensor bracket D4	CU41+43	Grilamid TR90	H336041
		O-ring 45,6 x 2,4	CU41+43	NBR	H320401	34	1	Blind plug V-inox FPM ex. M20x1.5	CU41+43	PA	H337788
		Ejot Delta PT screw WN5452 35x14	CU41+43	A2	H320364	35	1	Female Flange M12x1.5 - 5 Pin	CU41-M12	Ms / nickel-plated	H341353
						35	1	Female Flange M12x1.5 - 8 Pin	CU43-M12	Ms / nickel-plated	H341354
		O-ring 3x2	CU41+43	NBR	H208644	36	1	ATEX CU label - Electrostatic risk	all versions	Tevus	H345151
						37	1	ATEX CU4 type label	all versions	Tevus	H345150
						38	4	Washer A=3,7	CU41+43	A2	H323771
14	4	Ejot Delta PT screw WN5452 30x10	CU41+43	A2	H320363						
15.1	1	Blind plug G1/8"	CU41	Ms / nickel-plated	H320482						
15.2	1	Blind plug G1/8"	CU43	Ms / nickel-plated	H320482						
17	1	Elbow connector G1/8" 6x1	CU41+43	1.4301 / PA	H208825						
17.1	1	Elbow connector G1/8" 6x1	CU41+43	1.4301 / PA	H208825						
17.2	1	Elbow connector G1/8" 6x1	CU43	1.4301 / PA	H208825						
17.3	1	Elbow connector G1/8" 6x1	CU43	1.4301 / PA	H208825						
18	1	CU4 air filter	CU41+43	PE-porous	H320223						
19.1	1	Sound reducer	CU41+43	Ms / nickel-plated	H208826						
19.2	1	Sound reducer	CU43	Ms / nickel-plated	H208826						
CU4 Adapter											
	1	CU4 D4 adapter cpl.	all versions		H337098						
Adapter spareparts information to be found in document: RN 01.044.3											

Weitergabe sowie Vervielfältigung dieser Unterlage, Verwertung und Mitteilung ihres Inhalts nicht gestattet, soweit nicht schriftlich zugestanden. Verstoß verpflichtet zum Schadensersatz und kann strafrechtliche Folgen haben (Paragraph 18 UWG, Paragraph 106 UrhG). Eigentum und alle Rechte, auch für Patenterteilung und Gebrauchsmustereintragung, vorbehalten. SPX.FLOW, Germany

Ersatzteilliste: spare parts list

CU4 Adapter

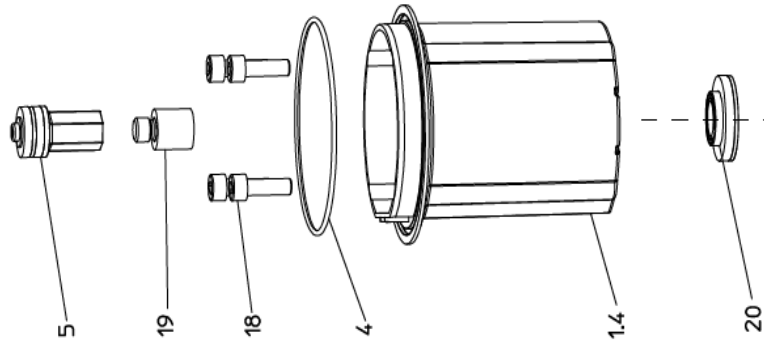
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Name:	Peters	Peters	Trytko	Schulz
Geprüft:	Spliehoff	Spliehoff	Peters	Spliehoff

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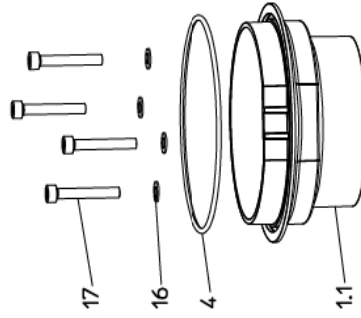
Blatt 1 von 5

RN 01.044.3

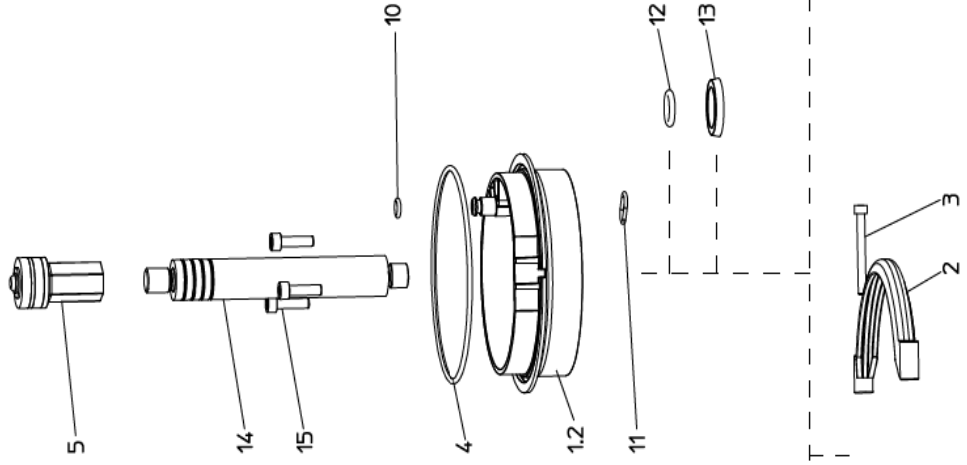
CU4 D4 - Adapter



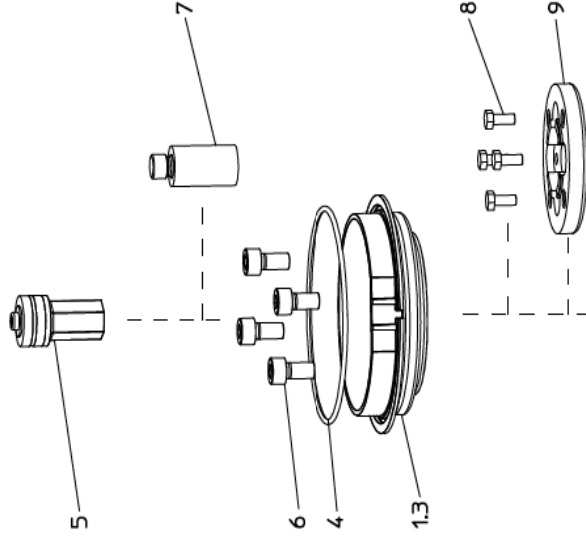
CU4 M - Adapter



CU4 T - Adapter



CU4 S - Adapter



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Ersatzteilliste: spare parts list

CU4 Adapter

SPX FLOW

pos. item	Menge quantity	Beschreibung description	Material	CU4 - S WS-Nr. ref.-no.	CU4 - S Langhub ø165 WS-Nr. ref.-no.	CU4 - Smini WS-Nr. ref.-no.	CU4 - Smax			CU4 - T			CU4 - Tmax			CU4 - M			
							CU4 - Smax WS-Nr. ref.-no.	CU4 - T WS-Nr. ref.-no.	CU4 - Tmax WS-Nr. ref.-no.	CU4 - Smax WS-Nr. ref.-no.	CU4 - T WS-Nr. ref.-no.	CU4 - Tmax WS-Nr. ref.-no.	CU4 - Smax WS-Nr. ref.-no.	CU4 - T WS-Nr. ref.-no.	CU4 - Tmax WS-Nr. ref.-no.				
		CU4 Adapter kpl. CU4 adapter cpl.		08-48-600/93 H320474	08-48-633/93 H330897	08-48-613/93 H321989	08-48-610/93 H321988	08-48-601/93 H320475	08-48-601/93 H320475	08-48-611/93 H321987	08-48-602/93 H320476								
1.1	1	CU4 Adapter M CU4 adapter M	PA6.6 GF30																
1.2	1	CU4 Adapter T CU4 adapter T	PA6.6 GF30						08-46-571/93 H319875					08-46-571/93 H319875					
1.3	1	CU4 Adapter S CU4 adapter S	PA6.6 GF30	08-46-570/93 H319874	08-46-570/93 H319874	08-46-570/93 H319874	08-46-570/93 H319874	08-46-570/93 H319874											
1.4	0	CU4 Adapter D4 CU4 adapter D4	PA6.6 GF30																
2	2	CU4 Clamphalbschale kpl. CU4 clamp cpl.	Grivory GH-5H1	08-46-569/93 H319873	08-46-569/93 H319873	08-46-569/93 H319873	08-46-569/93 H319873	08-46-569/93 H319873	08-46-569/93 H319873	08-46-569/93 H319873	08-46-569/93 H319873								
3	2	Zylinderschraube M4x40 Cyl. screw M4x40	A2-70	65-05-040/13 H320360	65-05-040/13 H320360	65-05-040/13 H320360	65-05-040/13 H320360	65-05-040/13 H320360	65-05-040/13 H320360	65-05-040/13 H320360	65-05-040/13 H320360								
4	1	O-Ring 101,27x2,62 O-ring 101,27x2,62	NBR	58-06-493/83 H148389	58-06-493/83 H148389	58-06-493/83 H148389	58-06-493/83 H148389	58-06-493/83 H148389	58-06-493/83 H148389	58-06-493/83 H148389	58-06-493/83 H148389								
5	1	CU4 Magnetschaltnocke kpl. CU4 magnet operating cam cpl.	Zytel HTN	08-60-900/93 H320479	08-60-900/93 H320479	08-60-900/93 H320479	08-60-900/93 H320479	08-60-900/93 H320479	08-60-900/93 H320479	08-60-900/93 H320479	08-60-900/93 H320479								
6	4	Zyl. Schraube Cyl. screw	A2-70	65-05-120/13 H79012	65-05-122/13 H79014	65-05-120/13 H79012	65-05-129/13 H315760												
7	1	Zugstangenverlängerung Guide rod extension	PA6			15-26-070/93 H208096	15-26-057/93 H204747												
8	4	Skt. Schraube M5x12 Hex. screw M5x12	A2-70			65-01-033/15 H78737													
9	1	CU Adapter SW4 CU adapter SW4	PA6		08-48-359/93 H330879	08-48-355/93 H207570	08-48-361/93 H327150												
10	1	O-Ring 6x2 O-ring 6x2	NBR							58-06-059/83 H320505	58-06-059/83 H320505								
11	1	O-Ring 11x2 O-ring 11x2	NBR							58-06-034/83 H321897	58-06-034/83 H321897								
12	1	O-Ring 11x3 O-ring 11x3	NBR																

Datum: 11/08 01/09 03/09 11/10
Name: Peters Trytko Schulz
Geprüft: Spliehoff Peters Spliehoff

Datum: 03/13 11/14 05/18
Name: Trytko Trytko C.Keil
Geprüft: Schulz C.Keil

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RN 01.044.3



CU4 Direct Connect

Control Unit



FOR ATEX ZONE 2 GAS APPLICATIONS

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