

Operating Manual

CU4 AS-interface

Control Unit



Read and understand this manual prior to operating or servicing this product.

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**IT IS ESSENTIAL TO READ THIS OPERATING MANUAL
BEFORE USE OF THE CONTROL UNIT!**

1. Abbreviations and Definitions

A	Exhaust Air
AWG	American Wire Gauge
CE	Communauté Européenne
CU	Control Unit
DI	Digital Input
DO	Digital Output
EMC	Electromagnetic Compatibility
GND	Ground
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

Symbol:

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. Conventional Use

The DELTA CU4 control unit is only intended for use as described in **chapter 3.1**. Use beyond that described in **chapter 3.1** is not according to regulations and APV shall not be responsible for any damage resulting from this non-observance. The operator bears the full risk. Conditions for a proper and safe operation of the control unit are the appropriate transport and storing as well as the professional assembly. Conventional 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 operating 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 electrical 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 electrical or pneumatic supply, ensure a defined and controlled re-start of the process!
- If these instructions are not observed, we 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 installation in which control units are installed and connected. If welding is nonetheless required, earthing of the electrical 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.
- Qualified personnel must get a special training with regard to possible risks and must know and observe the safety instructions indicated in the operating manual.
- Work at the electrical installation may only be carried out by personnel specialised 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

Attention !

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

2.7. Important Safety Instructions for AS-interface networks

- Safety Instructions for AS-interface
Always use protective modules against excess voltage in the AS-interface installation.
- Safety Instructions for AS-interface
Grounding
For the AS-interface network a potential-free operation must be guaranteed. Observe the use of isolation monitoring modules to provide for proper grounding conditions.
(Grounding of the bus cable or connected components or their charging with external voltage leads to malfunction in the bus system.)

3. General Terms

3.1. Purpose of use

The Control Unit Delta CU4 AS-interface has been developed for the control of process valves used in the food industry and related industries.

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

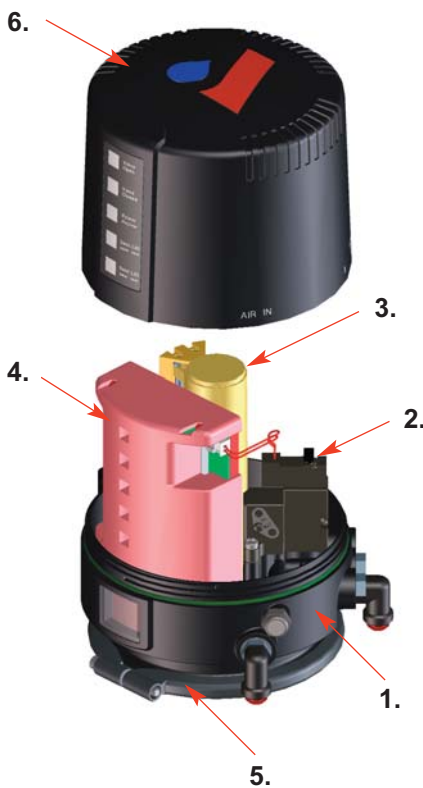
The pneumatic control of APV valves is undertaken via the solenoid valves. The control unit controls the valve positions, **open** and **closed**, via integrated and external sensors. The electronic module undertakes the task to process the switching signal from the control and to control the corresponding solenoid valves. The electronic module also provides 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 AS-interface (fig. 3.2.)

The Control Units CU4 AS-interface 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 control, evaluation of feedback signals and control of solenoid valves as well as valve position indication through LED.
5. Clamp ring to fasten the CU4 on the adapter.
6. Cover with LED optics.

fig. 3.2.



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 valves types, see **chapter 5**. Adapter. The snap connectors for supply air and pneumatic air to the individual cylinders at the valves are located at the outside of the control unit. At the 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 fulfills 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.

A feedback unit is required to detect the valve position. The CU4 AS-interface 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. As an alternative, 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 located on the front side of the electronic module. Their signals are visibly indicated to the outside by an optical window in the cover the control unit. Beside the open and closed valve position, the existence of the operating voltage as well as different diagnostic information are indicated.

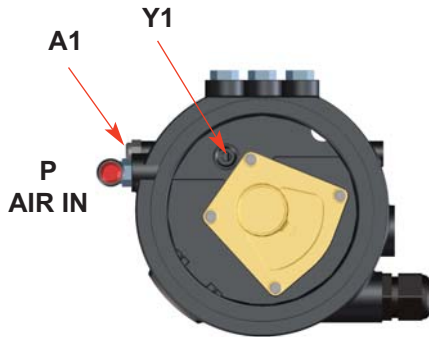
Chapter 6.6. LED indicators provide more details.

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.

(Attention: wiring needs also be changed.)

4. Mechanics and Pneumatics

4.1. Air connections for turning actuator



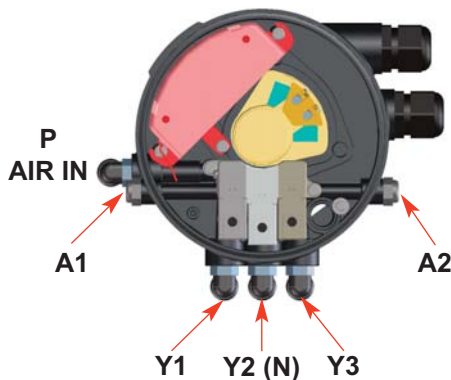
4.1.1. Function

CU41-T-AS-i

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 seat valves and double seat mixproof valves



4.2.1. Function

CU41-S-AS-i / CU41-M-AS-i

design for seat valves and double seat mixproof valves without seat lift.

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

CU41N-S-AS-i

design for seat valves with NOT element.

- P** air supply with integrated particle filter.
- Y1** pneumatic 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-M-AS-i

design for double seat mixproof valves with seat lift.

- P** air supply with integrated particle filter.
- Y1** pneumatic 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.

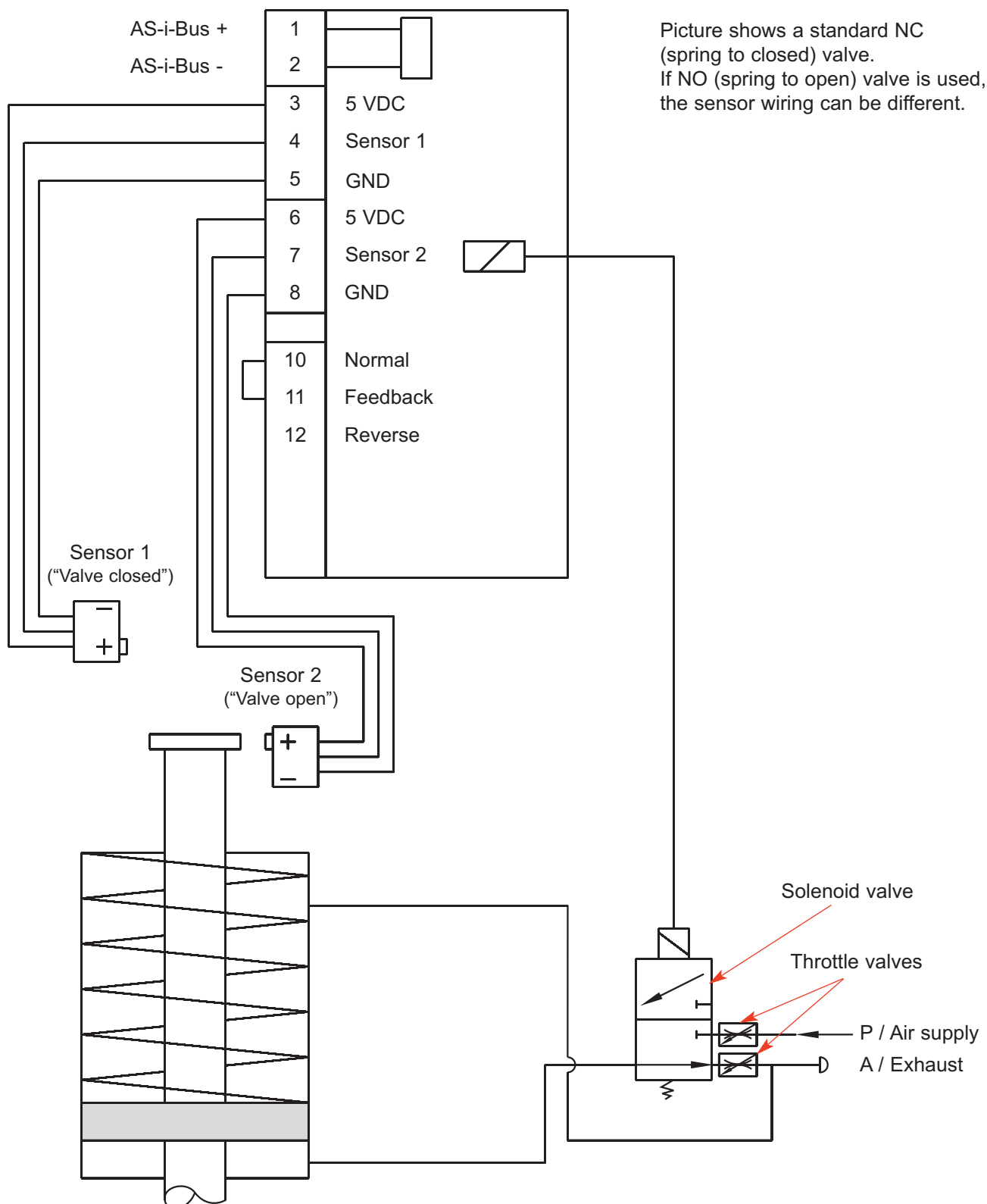


The pressure relief valve must not be mechanically blocked under any circumstances.

4. Mechanics and Pneumatics

4.4. CU41 AS-interface

Functional description - block diagram



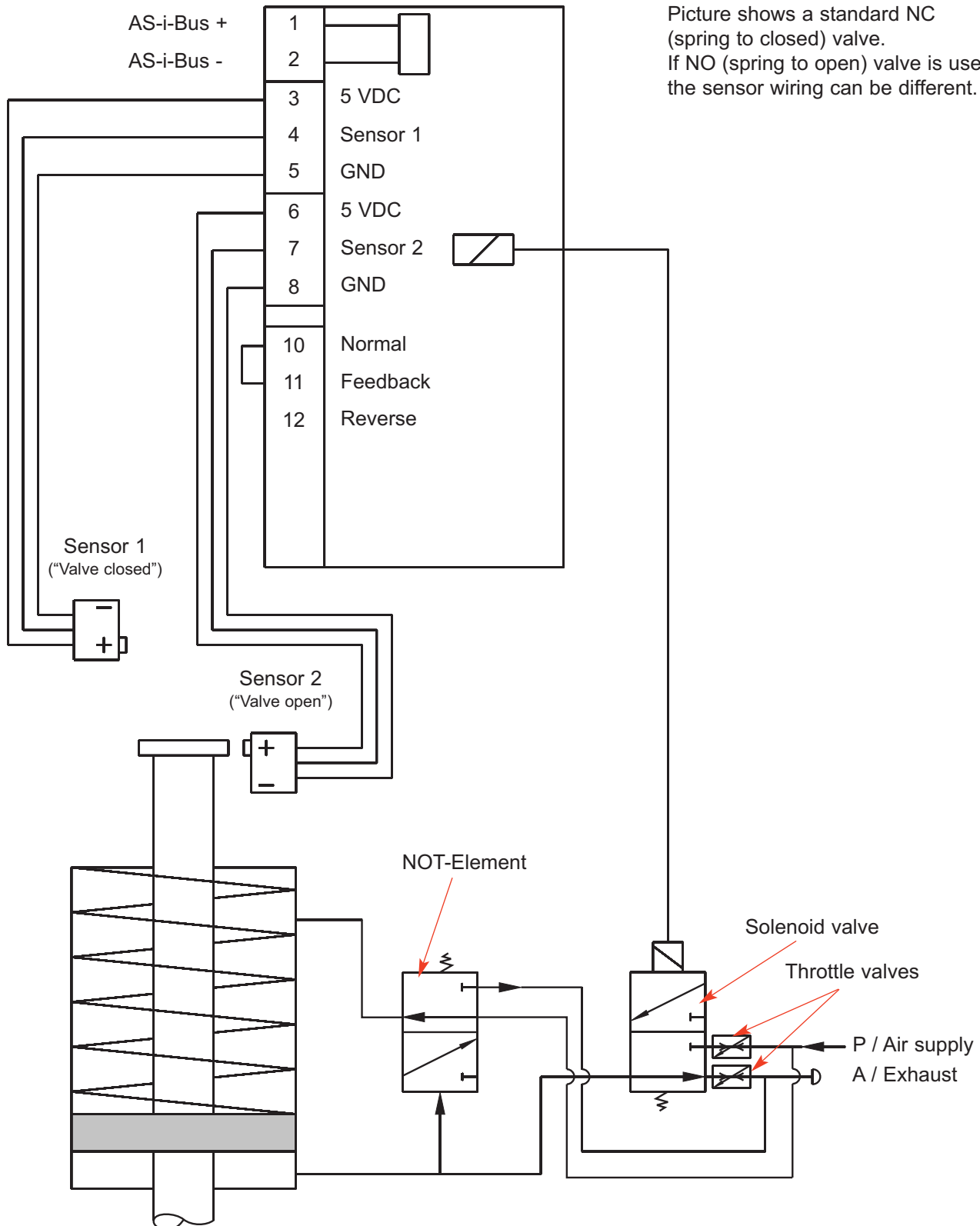
4. Mechanics and Pneumatics

4.4.1. CU41N - AS-interface

Functional description - block diagram



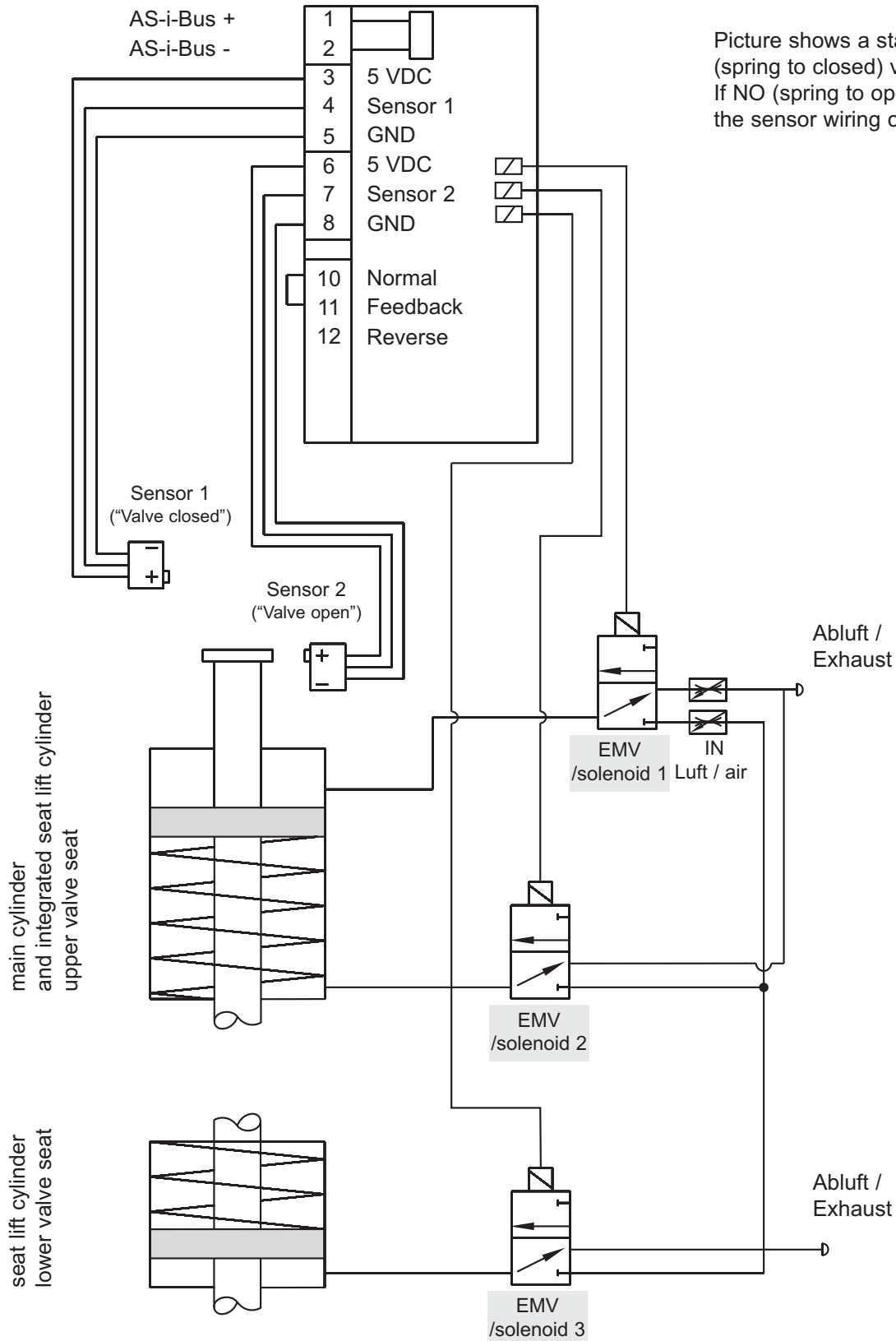
Picture shows a standard NC (spring to closed) valve.
If NO (spring to open) valve is used, the sensor wiring can be different.



4. Mechanics and Pneumatics

4.4.2. CU43 AS-interface for double seat valve DA3

Functional description - block diagram



4. Mechanics and Pneumatics

4.5. Technical Data / Standards

Material: PA6.6

Ambient temperature: -20°C bis +70°C

CE: EMC 89/336/EEC

Standards and environmental audits: protection class IP 67 EN60529 /
complies with NEMA 6
EMV interference resistance
EN61000-6-2
EMV emitted interference
EN61000-6-4

vibration/oscillation EN60068-2-6

safety of machinery
DIN EN ISO 13849-1

air hose: 6 mm / ¼" OD

pressure range: 6-8 bar

compressed air quality: quality class according to
DIN/ISO 8573-1

- **content of solid particles:** quality class 3,
max. size of solid particles per m³
10000 of 0,5µm <d<1,0µm
500 of 1,0µm <d<5,0µm
- **content of water:** quality class 4,
max. dew point temperature + 3°C
For installations at lower temperatures
or at higher altitudes, additional
measures must be considered to reduce
the pressure dew point accordingly.
- **content of oil:** quality class 1,
max. 0,01mg/m³

(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

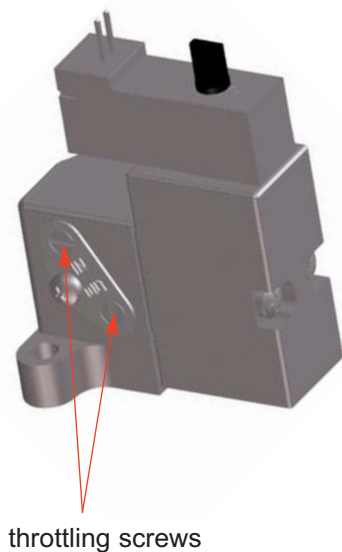
4.7. Throttling function

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.

4.8. NOT element

The closing force of the valve actuator can be increased by additional compressed air. Through the installation of the logic NOT element, compressed air is guided via a pressure reducing valve on the spring side of the valve actuator.

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



throttling screws

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 valves



6. Electronic module

6.1. Function / Block diagram

The Control Unit DELTA CU4 AS-interface is a slave for the fieldbus system AS-Interface.

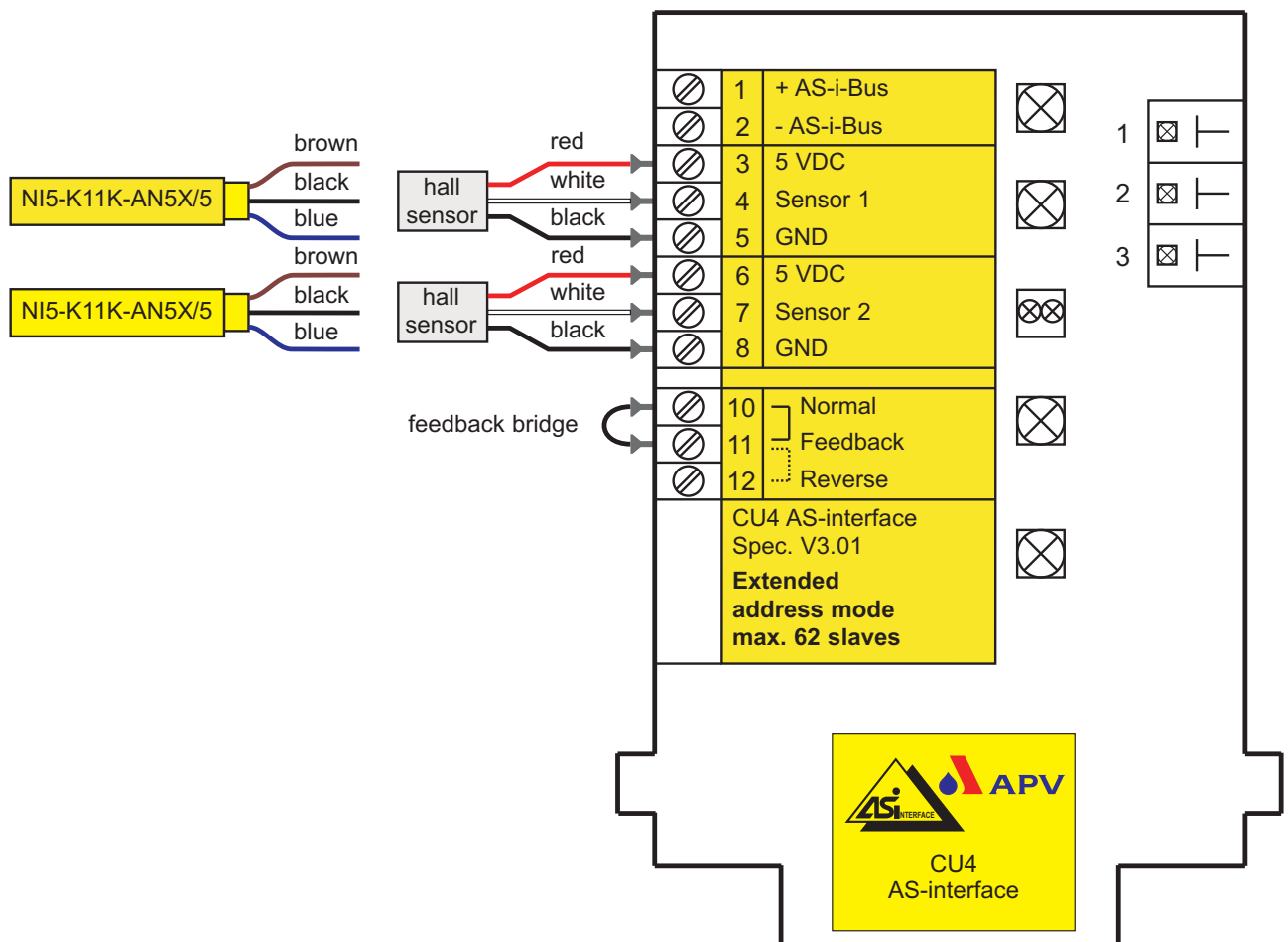
It complies with the specification V3.0. The profile is S-7.A.*.E (3 outputs and 2 inputs).

By means of a connecting terminal, the inputs can either be connected with internal APV Hall effect sensors or with external inductive proximity switches (compare 6.5.).

The AS-Interface DELTA CU4 is designed for the extended address range. With these devices in the extended address range up to 62 slaves (formerly known as 2.1) can be connected with one AS-Interface cable (**Attention:** Consider cumulative power input and simultaneity factor!)

For reasons of compatibility with older versions, a version with the profile S-7.F.F.F (formerly known as 2.0) is alternatively available.

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

6.1.1. Switchover of feedback signals

The signals to the control can be switched over via the bridge between the terminals 10, 11 and 12.

If a bridge is located between the terminals 10 and 11 (normal), the signal is transferred from sensor 1 (**closed valve position**) to input DI0 of the control. The signal of sensor 2 (**open valve position**) is sent to input DI1.

In case of a bridge between terminals 11 and 12 (reverse), the signal of sensor 1 (**closed valve position**) is sent to input DI1 of the control. At input DO0, the signal of sensor 2 (**open valve position**) switched.

If there is no bridge between the terminals 10, 11 and 12, this will lead to an error message. The two LEDs '**valve open**' and '**valve closed**' will flash in this case.

6.2. Functional description of connections

Terminal	Designation	Functional description
1	AS-i +	AS-i network connection
2	AS-i -	AS-i network connection
3	5 VDC	voltage supply for valve sensor
4	Sensor 1	sensor signal 1 (closed valve position)
5	GND	ground for sensor supply
6	5 VDC	voltage supply for valve sensor
7	Sensor 2	sensor signal 2 (open valve position)
8	GND	ground for sensor supply
10	Normal	normal allocation of feedback signals
11	Feedback	tie point for cable bridge
12	Reverse	reverse allocation of feedback signals

6. Electronic module

6.3. Use of data bits

Communication data

The use of the data bits shall be drawn from the following table:

Data bit	Info	Connection	Level
DO0	0	main valve	Low (no electr. current)
(Output)	1		High (current)
DO1	0	lower seat lifting (option)	Low (no electr. current)
(Output)	1		High (current)
DO2	0	upper seat lifting (option	Low (no electr. current)
(Output)	1		High (current)
DO3		free	
(Output)			
		Feedback bridge	
Data bit		normal (10 11 12) └─┘	reverse (10 11 12) └─┘
DI0		valve position, Sensor 1 (closed valve position)	valve position, Sensor 2 (open valve position)
(Input)			
DI1		valve position, Sensor 2 (open valve position)	valve position, Sensor 1 (closed valve position)
(Input)			
DI2		Permanent "1"	Permanent "1"
(Input)			
DI3		Permanent "1"	Permanent "1"
(Input)			

6. Electronic module

6.4. Technical Data

AS-Interface profile:	S-7.A.*.E (S-7.F.F.F as option)
Extended address range:	is supported
Serial communication mode:	no
Inverse-polarity protection:	exists
Indication "Power":	LED3 (green)
Indication "Fault":	LED3 (red)
AS-Interface Voltage range:	26,5...31,6 V
Max. power input:	<= 150 mA
Input delay time:	< 1 s
AS-Interface specification:	V3.0
Supply of solenoid valves:	pwm-signals from electronic module
Short-circuit protection:	yes
Excess voltage protection:	100mA
Induction protection:	yes
Status indication of outputs:	LED on board
Response time of watchdog:	--- (watchdog not activated)

Short-circuit or excess voltage of actuator supply or cable break at valves is signalled to the master via the peripheral failure bit (profile Profil S-7.A.*.Eonly). Simultaneously LED3 flashes according to AS-Interface specification alternately red/green.

Supply of sensors:	5 VDC (+/-5%)
Note:	The sensor inputs and the peripheral supply must not be connected with installation-GND.
Connecting terminals:	conductor cross section 0,5-1,5 mm ² (with conductor sleeve) complying with AWG 20-16

6. Electronic module

6.5. Connections











Sensors to detect the valve positions:

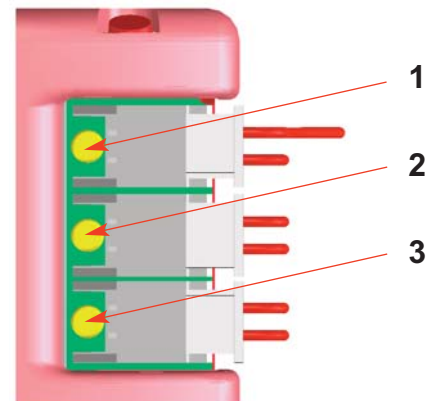
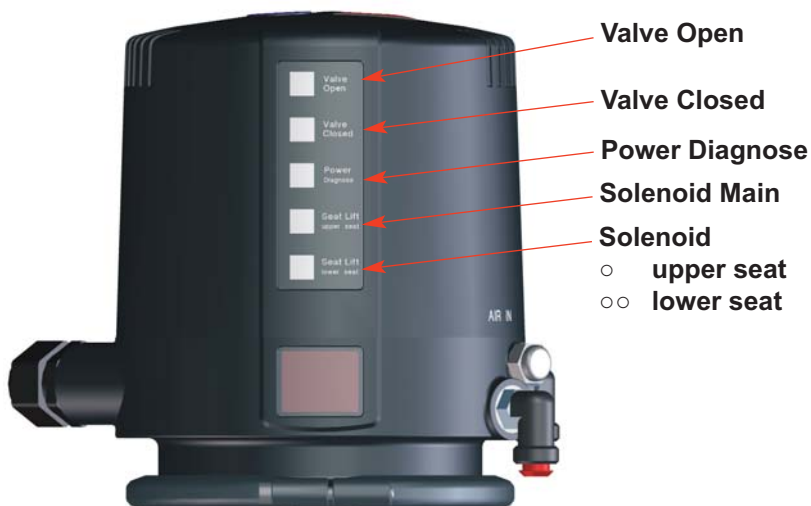
Internal sensors: Hall effect sensors,
APV type H 320385
UB 4,75-5,25 VDC
operating distance according to
APV specification

External sensors: Inductive proximity switches,
APV type H 208844
UB 4,75-5,25 VDC
operating distance according to
APV specification

6. Electronic module

6.6. LED indicators

External luminous displays				
Valve <i>Open</i>		colour: green, permanent light		valve in open position
Valve <i>Closed</i>		colour: orange, permanent light		valve in closed position
Valve <i>Open</i>		colour: green, flashing		Bridge missing at terminals 10, 11, 12
Valve <i>Closed</i>		colour: orange, flashing		
Power <i>Diagnose</i>		colour: green, permanent light		operating voltage at module - faultless
		colour: red /green		AS-i status + peripheral failure, e.g. short-circuit, excess voltage, cable break (profile S-7.A.*.E only)
<i>Soleniod Main</i>		colour: blue, permanent light		1st solenoid valve (1) controlled
<i>Soleniod Main</i> ○ <i>upper seat</i> ○ <i>lower seat</i>		colour: blue, 1 blink		2nd solenoid valve (2) controlled
		colour: blue, 2 blink		3rd solenoid valve (3) controlled
		colour: blue, 1 blink		solenoid valve 2nd and 3rd (2) + (3) controlled
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



7. Feedback unit

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 type H 320385
UB 4,75-5,25 VDC
operating distance according to APV specification

7.3. Adjustment of valve position feedback

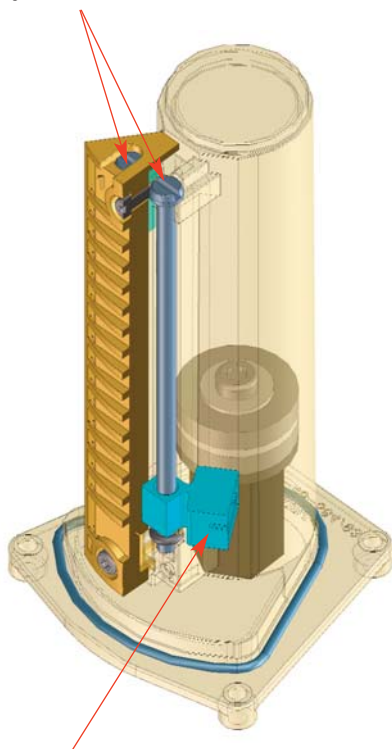
By turning of the adjustment screws on which the Hall effect sensors are installed, the sensors can be moved into the respectively required position to detect the valve position. The o-rings on the adjusting screws prevent unintended accidental displacement of these positions. After the installation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

7.4. Use of external sensors

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 APV Type H208844
UB 4,75-5,25 VDC
Operating distance according to APV specification

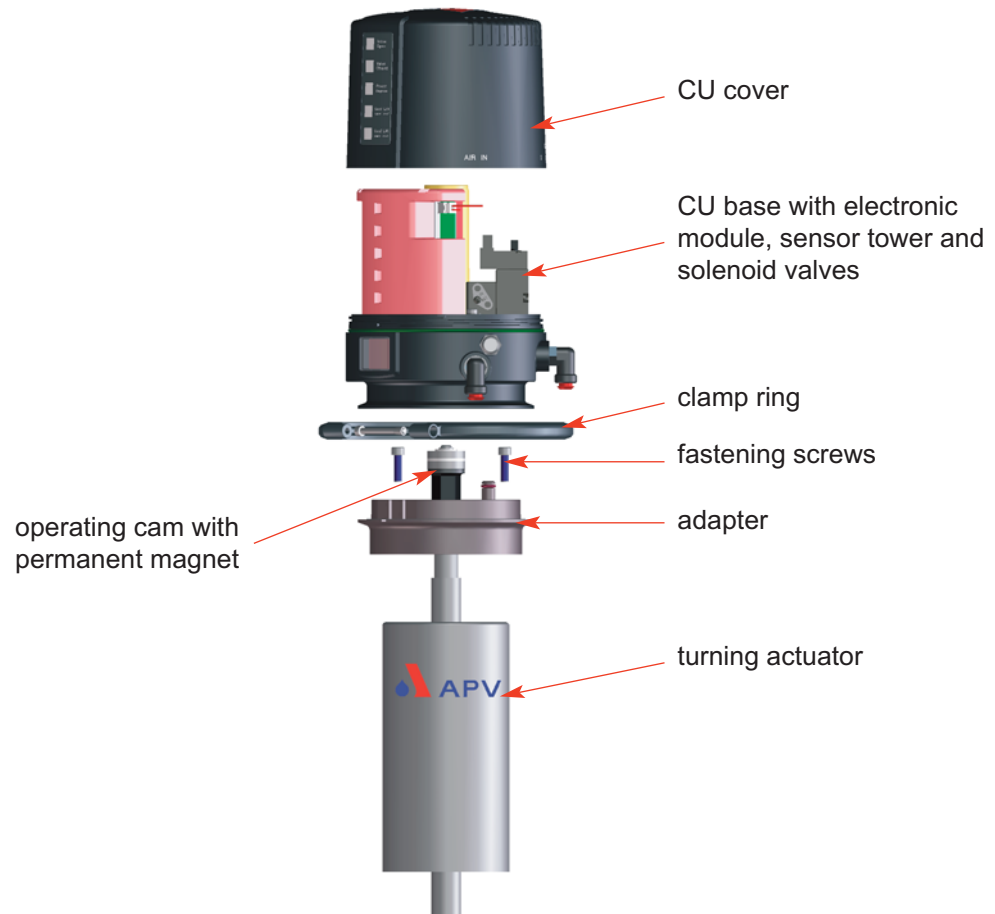
adjustment screws



Hall effect sensor

8. CU Assembly and Start-up

8.1. Turning actuator, e.g. for 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 Start-up

8.1.1. Pneumatic connection



Supply air:

CAUTION

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

See 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 necessary.

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



CAUTION

Electric connections shall only be carried out by qualified personnel.

See to a professional execution and installation of the AS-interface network.

Observe the Safety Instructions specified in chapter 2.

8. CU Assembly and Start-up

8.1.3. Start-up

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:

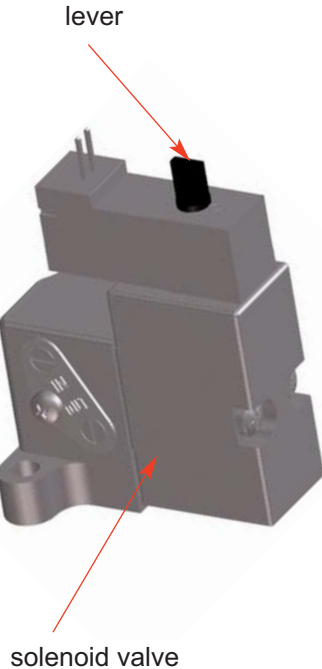
Closed valve position feedback – sensor 1 controlled

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

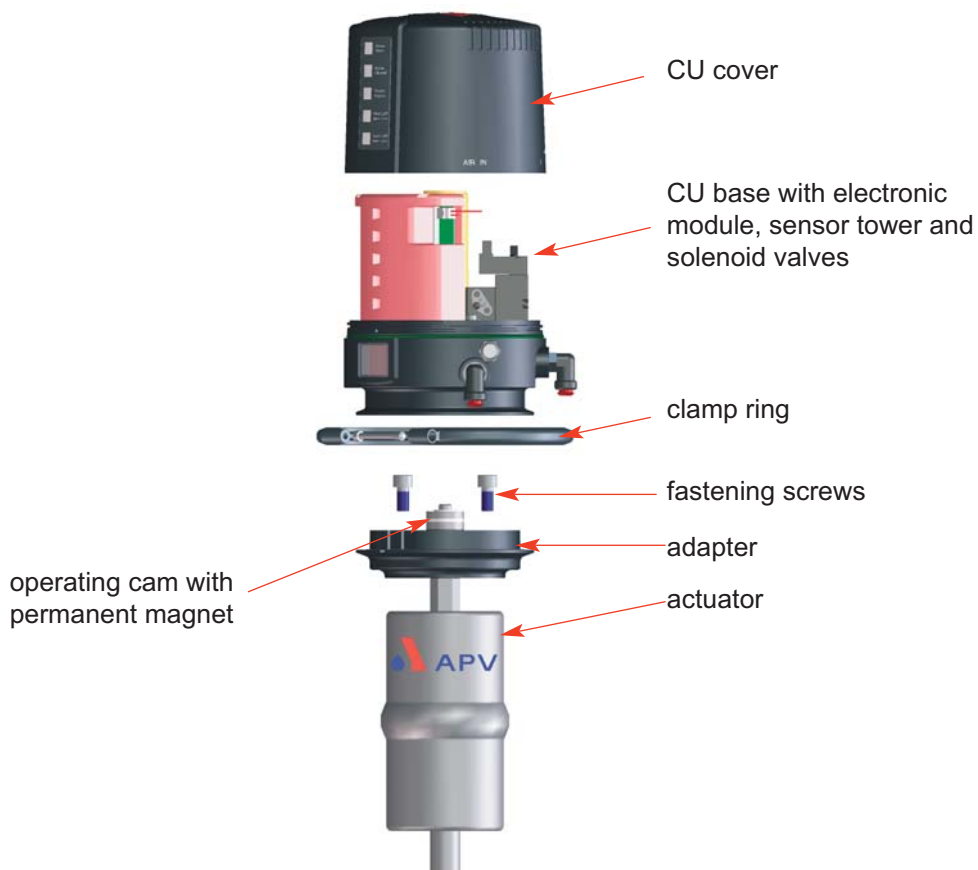
For the adjustment of Hall sensor 2, at first, the (*non-controlled*) solenoid valve 1 is controlled. This can optionally be made manually or electrically. The open valve position and the corresponding feedback can be adjusted. This is undertaken by turning the adjustment screw 2 until the required position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

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 Start-up

8.2.1. Pneumatic connection



Supply air:

CAUTION

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

See 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.
See to 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



CAUTION

Electric connections shall only be carried out by qualified personnel.

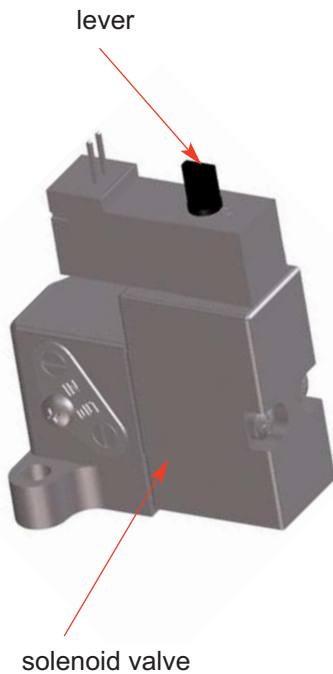
See to a professional execution and installation of the AS-interface network.
Observe the Safety Instructions specified in chapter 2.

8. CU Assembly and Start-up

8.2.3. Start-up

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

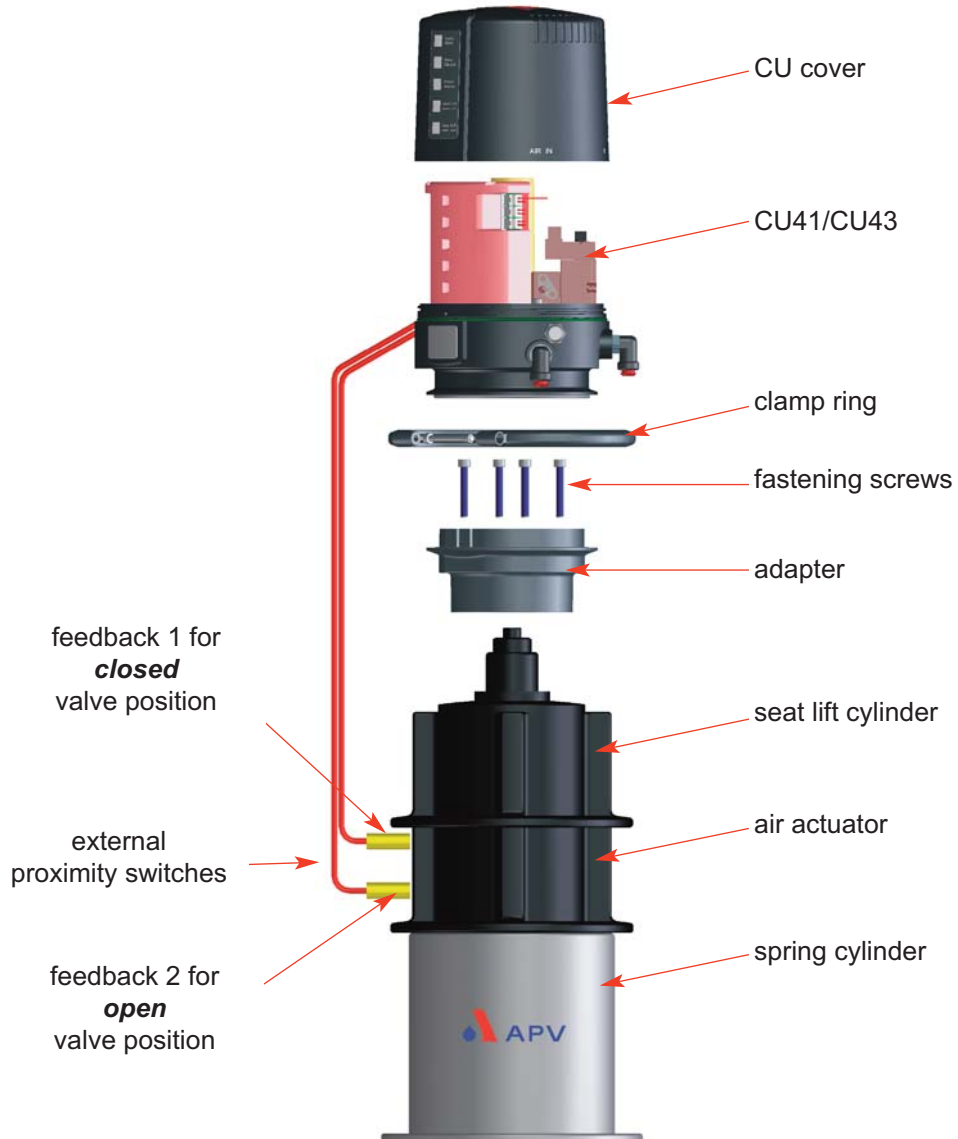
For the adjustment of Hall sensor 2, at first, the (non-controlled) solenoid valve 1 is controlled. This can optionally be made manually or electrically. The open valve position and the corresponding feedback can be adjusted. This is undertaken by turning the adjustment screw 2 until the required position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

8.3. Double seat valves



Assembly of the Control Unit on the valve

1. Assembly of the adapter on the double seat valve.
Fasten with 4 screws.
2. Align air connections of the control unit to the valve actuator.
3. Place the control unit onto the adapter.
Observe alignment!
4. Attach the clamp rings and fasten them with the screws.
5. Assemble the external proximity switches at the actuator.

8. CU Assembly and Start-up

8.3.1. Pneumatic connection



Supply air:

CAUTION

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

See 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



CAUTION

Electric connections shall only be carried out by qualified personnel.

See to a professional execution and installation of the AS-interface network.

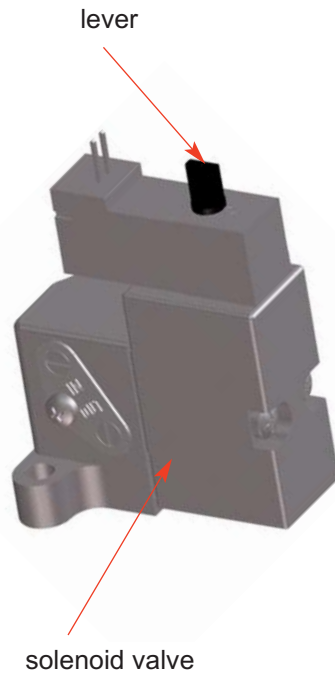
Observe the Safety Instructions specified in chapter 2.

8. CU Assembly and Start-up

8.3.3. Connection of external proximity switches

The electric connection of the proximity switches specified by APV 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 operating manual for double seat valves is essential!



8.3.4. Start-up

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 1 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 4mm

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. Disassembly

10.1. *Dismantling*

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 de-energised!

- + 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 1-15.
- + 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 de-energised!

- + 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.

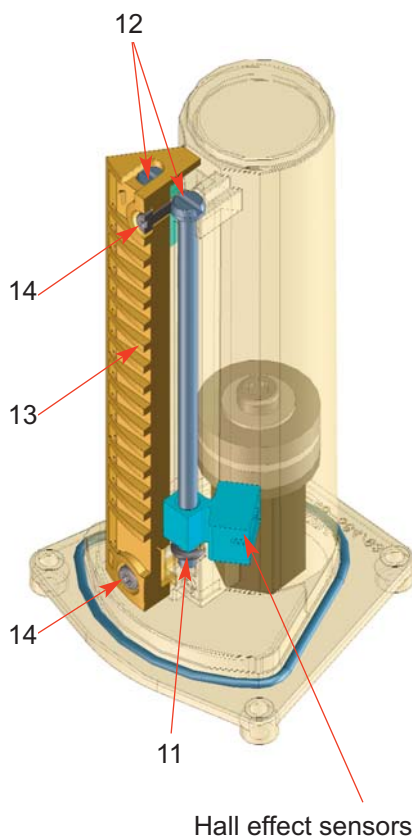
Hall effect sensors

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-rings **(11)**.
- + Dismantle the sensors by turning of 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.



Hall effect sensors

11. Trouble Shooting

Failure	Remedy
<i>Valve position is not indicated.</i>	Re-adjust Hall sensors.
	Check fastening of magnetic operating cam.
	Check cabling of the Hall sensors to the electronic module.
<i>Feedback via proximity switches is missing</i>	Check positioning of proximity switches.
	Check operating voltage.
	Check cabling to the electronic module.
<i>LED indication is missing</i>	Check operating voltage.
	Check cabling to the electronic module.
<i>LEDs 'valve open' and 'valve closed' are flashing</i>	No bridge between the terminals 10, 11 and 12. Install the corresponding bridge.
Control Unit CU41 installed on Butterfly valves	
<i>Movement of valve flap is missing with actuated solenoid valve.</i>	Check if right control unit is installed. Check label in type window of control unit: CU41-T-AS-interface (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.
<i>Air leakage at lower side of adapter.</i>	Check o-rings of adapter.

11. Trouble Shooting

<i>Failure</i>	<i>Remedy</i>
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-AS-interface (1 EMV/solenoid valve)
	Check valve movement with manual at solenoid valve.
	Check cabling between electronic module and solenoid valve.
	Check compressed air (min. 6bar).
	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-M-AS-interface (3 EMV/solenoid valves)
	Check valve movement with manual at solenoid valve.
	Check cabling between electronic module and solenoid valve.
	Check compressed air (min. 6bar).
	Check control air connection between the CU43 and the DA3 valve 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.

CU4 AS-interface **RN 01.044.5**
CU4 adapter **RN 01.044.3**

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.



Your local contact:



APV, An SPX Brand
Zechenstraße 49
D-59425 Unna
Phone: +49(0) 23 03 / 108-0 Fax: +49(0) 23 03 / 108-210

For more information about our worldwide locations, approvals, certifications, and local representatives, please visit www.spxft.com.

The information contained in this document, including any specifications and other product details, are subject to change without notice. While we have taken care to ensure the information is accurate at the time of going to press, we assume no responsibility for errors or omissions nor for any damages resulting from the use of the information contained herein.

This diagram illustrates the exploded view of a water purifier assembly. The components are numbered as follows:

- 1**: Main cylindrical housing with "AIR OUT" and "1 2 3" markings.
- 2**: Control panel with a digital display and buttons.
- 3**: Top cap with a handle.
- 4**: Water inlet filter.
- 5**: First stage of the filtration system.
- 6**: Second stage of the filtration system.
- 7**: Base support structure.
- 8**: Mounting feet for the base.
- 9**: Water inlet connection.
- 10**: Water outlet connection.
- 11**: Water inlet filter housing.
- 12**: Water outlet filter housing.
- 13**: Water inlet filter housing cap.
- 14**: Water outlet filter housing cap.
- 15.1**: Water inlet filter housing cap.
- 15.2**: Water outlet filter housing cap.
- 16**: Water inlet filter housing cap.
- 17.1**: Water inlet filter housing cap.
- 17.2**: Water outlet filter housing cap.
- 17.3**: Water inlet filter housing cap.
- 18**: Water inlet filter housing cap.
- 19.1**: Water inlet filter housing cap.
- 19.2**: Water outlet filter housing cap.
- 20**: Water inlet filter housing cap.
- 21**: Water outlet filter housing cap.
- 22**: Water inlet filter housing cap.
- 23**: Water outlet filter housing cap.
- 24**: Water inlet filter housing cap.
- 25**: Water outlet filter housing cap.
- 26**: Water inlet filter housing cap.
- 27**: Water inlet filter housing cap.
- 28**: Water outlet filter housing cap.

Ersatzteilliste: spare parts list

Ersatzteilliste: spare parts list

CU4 AS - Interface

Ersatzteilliste: spare parts list															<div><div></div><div>APV®</div><div>AN SPX BRAND</div></div> <div>APV Realisa GmbH, D-59425 Umma Germany</div>							
															Datum:	05/10						
															Name:	D.Schulz						
															Geprüft:							
															Datum:							
															Name:							
															Geprüft:							
															Blatt 2 von 4				RN 01.044.5			

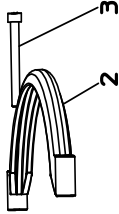
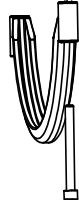
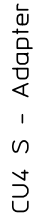
Ersatzteilliste: spare parts list

CU4 AS - Interface

Ersatzteilliste: spare parts list												<div><div></div><div>APV[®]</div><div>AN SPX BRAND</div></div> <div>APV Realisa GmbH, D-59425 Umma Germany</div>					
												Datum:	05/10				
												Name:	D.Schulz				
												Geprüft:					
												Datum:					
												Name:					
												Geprüft:					
												Blatt 3 von 4					
												RN 01.044.5					
pos.	item	Menge quantity	Beschreibung description	Material	CU41-S	CU41-T	CU41-M	CU41N-S	CU41N-T	CU43-M	CU43-S						
				material	WS-Nr. ref.-no.	WS-Nr. ref.-no.	WS-Nr. ref.-no.	WS-Nr. ref.-no.	WS-Nr. ref.-no.	WS-Nr. ref.-no.	WS-Nr. ref.-no.						
11	2	O-Ring 3x2 O-ring 3x2		NBR	58-06-043/83 H208644		----- -----	58-06-043/83 H208644		----- -----	58-06-043/83 H208644						
12	2	Zyl.-Schraube M4x100 cyl. Screw M4x100		A2-50	65-03-290/13 H320361		----- -----	65-03-290/13 H320361		----- -----	65-03-290/13 H320361						
13	1	CU4 Towerabdeckung CU4 towercover		PA12	08-46-565/93 H319869		----- -----	08-46-565/93 H319869		----- -----	08-46-565/93 H319869						
14		Ejot Delta PT Schraube WN5452 30x10 Ejot Delta PT screw WN5452 30x10		A2	65-17-110/13 4 x H320363												
15.1	1	Blindstopfen G1/8" plug G1/8"		Ms / vern.	----- -----	08-60-051/99 H320482	----- -----		08-60-051/99 H320482	----- -----							
15.2	1	Blindstopfen G1/8" plug G1/8"		Ms / vern.	08-60-051/99 H320482												
16	1	Verschraubung selbstabsperrend connector self locked		Ms / vern.	08-63-241/99 H320551												
17	1	W-Verschraubung G1/8" 6x1 Elbow connector G1/8" 6x1		1.4301 / PA	08-60-750/93 H208825												
		W-Verschraubung G1/8" 1/4" OD Elbow connector G1/8" 1/4" OD		1.4301 / PA	08-60-811/93 H312732												
17.1	1	W-Verschraubung G1/8" 6x1 Elbow connector G1/8" 1/4" OD		1.4301 / PA	08-60-750/93 H208825	----- -----		08-60-750/93 H208825	----- -----		08-60-750/93 H208825						
		W-Verschraubung G1/8" 1/4" OD Elbow connector G1/8" 1/4" OD		1.4301 / PA	08-60-811/93 H312732	----- -----		08-60-811/93 H312732	----- -----		08-60-811/93 H312732						
17.2	1	W-Verschraubung G1/8" 6x1 Elbow connector G1/8" 6x1		1.4301 / PA	----- -----												
		W-Verschraubung G1/8" 1/4" OD Elbow connector G1/8" 1/4" OD		1.4301 / PA	----- -----												
17.3	1	W-Verschraubung G1/8" 6x1 Elbow connector G1/8" 6x1		1.4301 / PA	----- -----												
		W-Verschraubung G1/8" 1/4" OD Elbow connector G1/8" 1/4" OD		1.4301 / PA	----- -----												
18	1	CU4 Luftfilter CU4 air filter		PE-porös	08-10-005/93 H320223												

Datum:						
Blatt	4	von	4	APV Rosisia GmbH, D-59425 Unna Germany		

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Ersatzteilliste: spare parts list									
<div>CU4 Adapter</div>									
						Datum:	11/08	01/09	03/09
						Name:	Peters	Peters	Trytko
						Geprüft:	Splithoff	Splithoff	Peters
						Datum:			
						Name:			
						Geprüft:			
						Blatt 2 von 3			
						RN 01.044.3			
pos.	Menge quantity	Beschreibung description	Material	CU4 - S	CU4 - Smini	CU4 - Smax	CU4 - T	CU4 - Tmax	CU4 - M
			material	WS-Nr. ref.-no.	WS-Nr. ref.-no.	WS-Nr. ref.-no.	WS-Nr. ref.-no.	WS-Nr. ref.-no.	WS-Nr. ref.-no.
		CU4 Adapter kpl. CU4 adapter cpl.		08-48-600/93 H320474	08-48-613/93 H321989	08-48-610/93 H321988	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	----- -----	----- -----	----- -----	----- -----	----- -----	08-46-572/93 H319876
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	----- -----	----- -----	----- -----
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
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
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
5	1	CU4 Magnetschaltnocke kpl. CU4 actuator screw 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	----- -----
6	4	Zyl.schraube M8x16 Cyl. Screw M8x16	A2-70	65-05-120/13 H79012	65-05-120/13 H79012	65-05-120/13 H79012	----- -----	----- -----	----- -----
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	CU3 Adapter SWmini4 CU3 adapter SWmini4	PA6	----- -----	08-48-355/93 H207570	----- -----	----- -----	----- -----	----- -----
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	----- -----	----- -----	----- -----	----- -----	58-06-039/83 H208632	----- -----

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