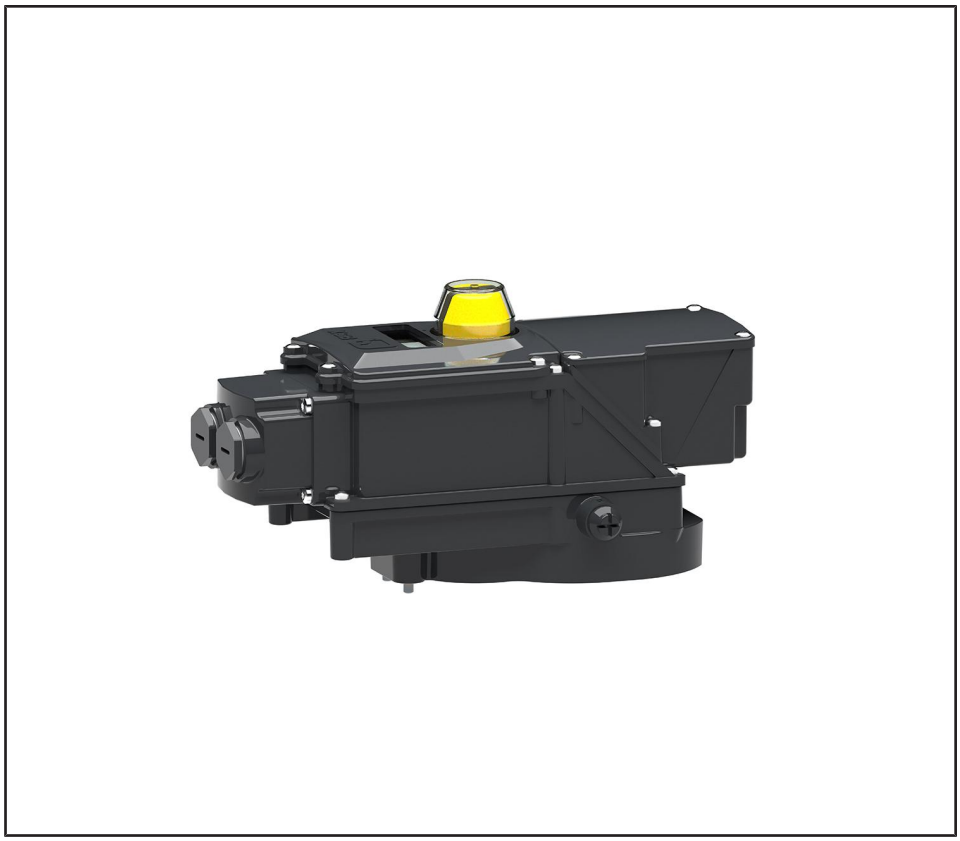
Automation

SMARTRONIC U MA

A1310

Type Series Booklet



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Type Series Booklet SMARTRONIC U MA

Contents

Automation **4**
Digital Positioners 4
SMARTRONIC U MA 4
Main applications 4
Operating data 4
Design details 4
Product benefits 4
Related documents 4
Technical data 5
Functional schematic 5
Control board 5
Pneumatic poppet valve with piezoelectric pilot valve 5
User interface 5
Technical specification 6
Control air supply 7
Base "UNLIMITED" 8
HART protocol 10
Adjusting the stroke depending on the setpoint signal 11
Safety position 11
Option: proximity sensors 11
Technical data of the mechanical limit switches 12
Technical data of the proximity sensors 12
Technical data of the ATEX-certified proximity sensors 13
Option: actual-position feedback 13
Connection to HART communicator 14
Display 14
Materials 15
SMARTRONIC U MA materials 15
Variants 18
Adaptation for mounting on linear actuators to NAMUR 18
Dimensions 19
SMARTRONIC U MA dimensions 19
Purchase order specifications 20

Automation

Digital Positioners

SMARTRONIC U MA

Main applications

- Water
- Waste water
- Energy
- Industry
- Shipbuilding
- Oil and gas

Operating data

Table 1: Operating properties

Ambient characteristics	Value
Min. permissible temperature [°C]	≥ -20
Max. permissible temperature [°C]	≤ +80
Enclosure	IP67 to EN 60529
Electromagnetic compatibility	In conformity with the European Electromagnetic Compatibility Directive 2014/30/EU
Vibrations	IEC 68-2-6 Test Fc
Compressed air purity class	ISO 8573-1 Class 4

Design details

Design

- SMARTRONIC U MA is a digital electro-pneumatic positioner. It is powered via the 4 - 20 mA circuit.
- For automation of:
  - Quarter-turn actuators of the ACTAIR EVO, DYNACTAIR EVO type series and all previous KSB actuator generations
  - Quarter-turn actuators with standardised VDI/VDE 3845 interface
  - Linear actuators to NAMUR
- Position indicator under sight glass for remote indication
- SMARTRONIC U MA features a polycarbonate housing (with 20% glass fibre) accommodating the following 3 components:
  - Electrical connection
  - Printed circuit board
  - Poppet valve with piezoelectric pilot valve for control air supply.
- The control air supply is connected via the aluminium base:
  - Directly to ACTAIR EVO, DYNACTAIR EVO and all previous KSB actuator generations
  - Via external piping for quarter-turn actuators with standardised VDI/VDE 3845 interface and for linear actuators to NAMUR
- Open/Closed position signalling
- The actuating times for open/close operations are set via the easily accessible air flow reducers.
- Communication using the HART protocol
- The autoadaptive angle sensor adjusts its travel automatically to the actuator travel.

Variants

- Actual-position feedback via 4 - 20 mA signal
- "Fail in last position" function on loss of power

Product benefits

- Quick, straightforward installation and commissioning thanks to auto-calibration
- Intuitive, user-friendly interface for local control and configuration via display and pushbuttons
- Consumes very little control air while idle, regardless of position.
- A single aluminium base allows the positioner to be mounted directly on actuators of all sizes and generations, without installation components, ensuring direct control air supply without external piping.
- SMARTRONIC U MA is HART-compatible.

Related documents

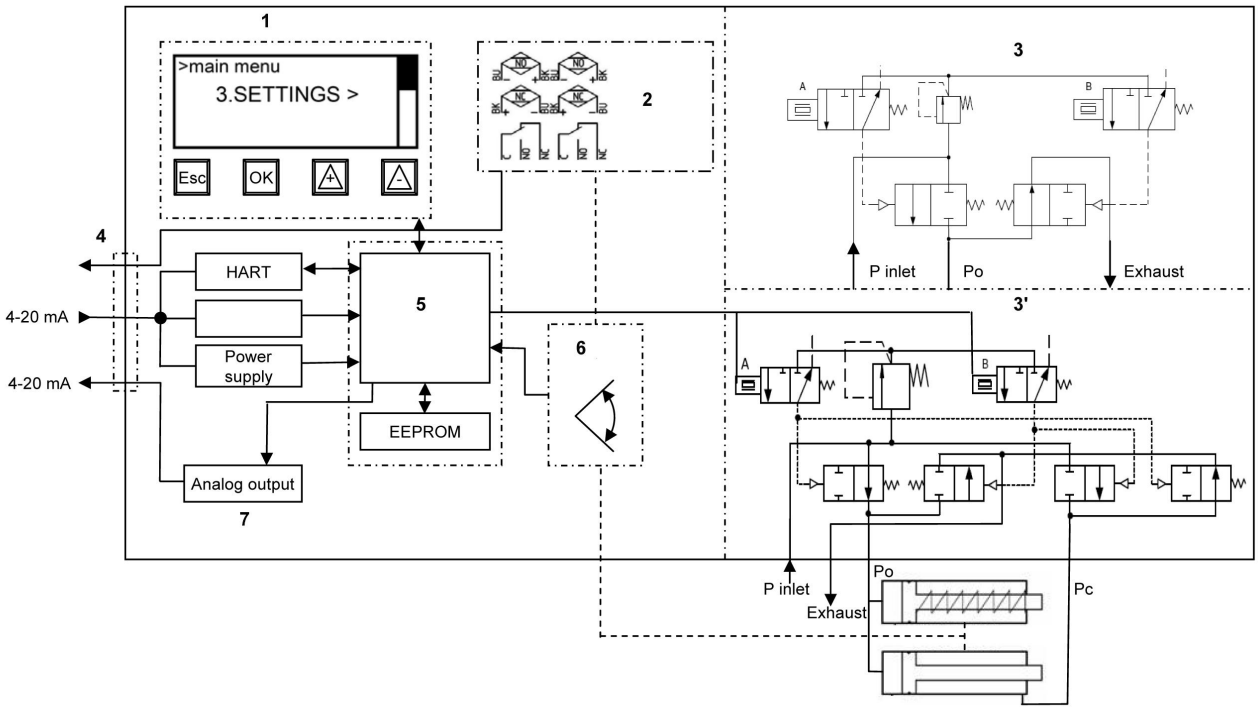
Table 2: Information/documents

Document	Reference number
SMARTRONIC U MA A1310 operating manual	8520.8044

8520.807/01-EN

Technical data

Functional schematic



Schematic

Key:

1 - User interface

2 - Contacts or limit switches

3 - Electro-pneumatic functional schematic for single-acting actuators

3' - Electro-pneumatic functional schematic for double-acting actuators

4 - Terminal strip

5 - Microcontroller and printed circuit board

6 - Angle sensor

7 - Actual-position feedback via 4-20 mA signal

SMARTRONIC U MA moves the valve into the required position in accordance with an analog 4-20 mA setpoint signal.

Control board

This digital positioner is of the sequential type.

The poppet valve which controls the actuator is an on/off valve with 3 switching positions.

SMARTRONIC U MA is powered exclusively via the 4-20 mA signal (2-wire system).

When power is lost or removed, the valve moves into the fail-safe position which is configured when ordering the SMARTRONIC U MA positioner.

Pneumatic poppet valve with piezoelectric pilot valve

The piezoelectric pilot valves are controlled via the printed circuit board, which responds as soon as a difference between the actual position and the setpoint is detected (signal from angle sensor).

The piezoelectric pilot valves convert this command into a pneumatic signal and ensure the position is adopted quickly and reliably.

This technology ensures an extremely long service life.

The linear or rotary movement of the actuator is detected by an angle sensor.

User interface

The user interface features a graphical display with a user-friendly, intuitive drop-down menu and 4 buttons.

It allows the following functions:

- Switching to automatic or manual mode
- Adjusting the valve position along the entire valve travel (manual mode)
- Launching auto-calibration
- Manually adjusting the dead band and gain

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- Configuring the split range mode
- Configuring the closing direction of the valve
- Reading diagnostic information
- Continuously reading the valve position
- Displaying the HART data

Technical specification

Housing	
Material	Polycarbonate with 20 % glass fibre + aluminium alloy
Position indicator	Visual position indicator on the cover
Electrical connection	2 M20 ports for cable gland For flexible conductors with wire end sleeve and with insulating input sleeve, with a cross-section of 0.25 mm^2 to 0.5 mm^2
Angle of rotation	-5° to 95°
Weight	2.4 kg

Control air supply	
Control air supply port	Port "P", 1/4" threaded gas port, filter fitted in the base
Exhaust port	Port "E", 1/4" threaded gas port, with silencer or for connection to an exhaust system
Operating pressure	2 to 8 bar
Filtration	ISO 8573-1 Class 4 (< 15 µm)
Dew point	ISO 8573-1 Class 4 (pressure dew point temperature < 3 °C, and in all cases where the dew point temperature is 5 °C below the ambient temperature)
Lubrication	ISO 8573-1 Class 5 (< 30 mg/m^3)
Max. flow rate	260 Nl/min at 25 °C
Consumption while idle	< 0.4 Nl/min at 25 °C

Electronic system	
Power supply	Via 4-20 mA signal
Power consumption	From 40 mW at 4 mA to 200 mW at 20 mA
Control signal	4-20 mA
Minimum current	3.8 mA
Required voltage	10 V DC
Reverse polarity protection	Yes, up to 20 V DC
Overvoltage protection	Yes
Load	500 to 515 Ohm at 20 mA
Static destruction limit	40 mA

Positioner	
Hysteresis and control dead band	< ± 1 % < ± 1 %
Linearity	Yes
Repeatability	< ± 0.5%
Law of variation	Linear
Offset adjustment (zero) and full scale adjustment	Manually adjustable via user interface (display + buttons)
Direct (standard) or indirect direction of action – dead band and gain are automatically adjusted – auto-calibration via buttons	

Position transmitter (optional)	
Output	4-20 mA, 2-wire system with galvanic/electronic isolation
Retrieval period	0.4 seconds
Resolution	CAN 16 bits
Linearity	< ± 0.01%
Temperature effect, from Tmin to Tmax	< ± 0.05 % -10 °C

Position sensors (optional)
Adjustment via cams along the entire travel
Inductive proximity sensors or mechanical limit switches

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Control air supply

The control air is connected to the SMARTRONIC U MA.

The pneumatic directional control valve requires filtered control air to ISO 8573-1, Class 4.

A sintered bronze filter is fitted in the housing's inlet port for safety reasons to prevent clogging and damage to the pneumatic directional control valve.

The operating pressure ranges from 2 to 8 bar.

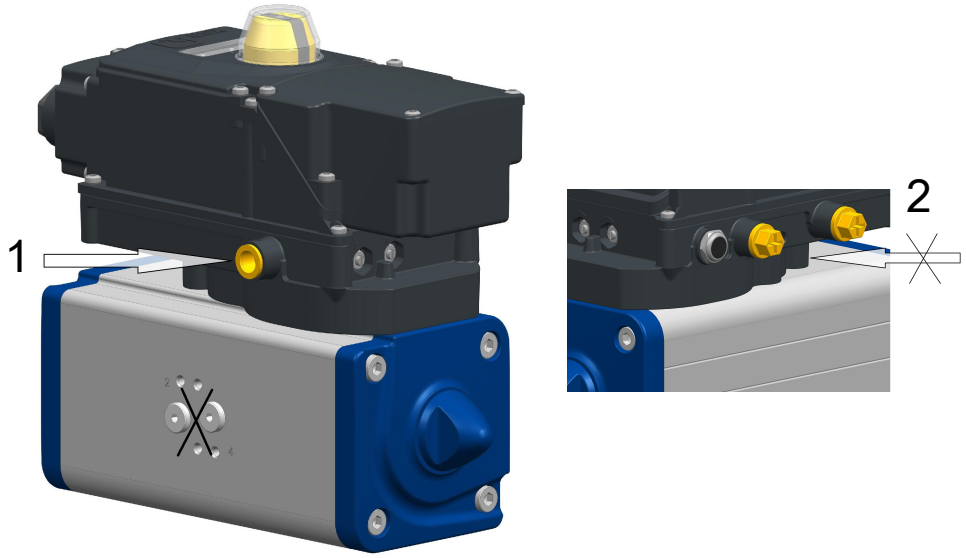

Fig. 1: View of control air connection

1 - Control air supply

2 - Exhaust

Control air supply: Port "P", 1/4" threaded gas port

Exhaust port: Port "E", 1/4" threaded gas port, with silencer or for connection to an exhaust system

To prevent any premature wear of mechanical components, especially actuator components, the use of lubricated air (max. 10 mg/m^3) is recommended.

Base “UNLIMITED“

The base type UNLIMITED has a rotatable distribution plate with 4 positions, allowing direct connection without installation components and is suitable for ACTAIR/DYNACTAIR (previous generation), ACTAIR/DYNACTAIR NG(V) and ACTAIR/DYNACTAIR EVO(E).

This new robust base type UNLIMITED and its actuating shaft are made from die-cast aluminium. The captive screws facilitate installation and maintenance.

This unique base provides ports for either direct control air or external control air connection.

Direct control air connection

The base type UNLIMITED can be fitted to ACTAIR and DYNACTAIR actuators (all generations) without the need for a bracket and external piping

This mounting method is compatible with the following products:
- ACTAIR EVO 2 to 160
- DYNACTAIR EVO 1 to 80
- ACTAIR NG 2 to 160
- DYNACTAIR NG 1 to 80
- ACTAIR 3 to 200
- DYNACTAIR 1.5 to 100

A VDI/VDE 3845 interface eliminates the need for external piping and saves space.

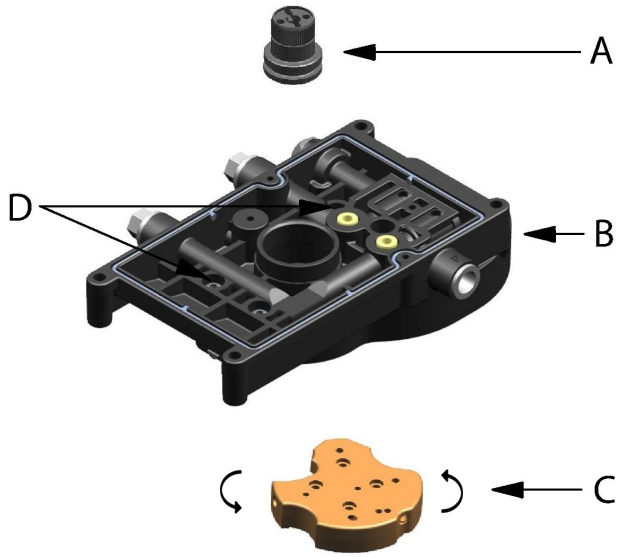

Fig. 2: Base UNLIMITED

A: Actuating shaft made of aluminium
B: Base made of aluminium
C: Rotatable distribution plate with 4 positions + 4 sealing elements
D: Mounting via VDI/VDE 3845 interface

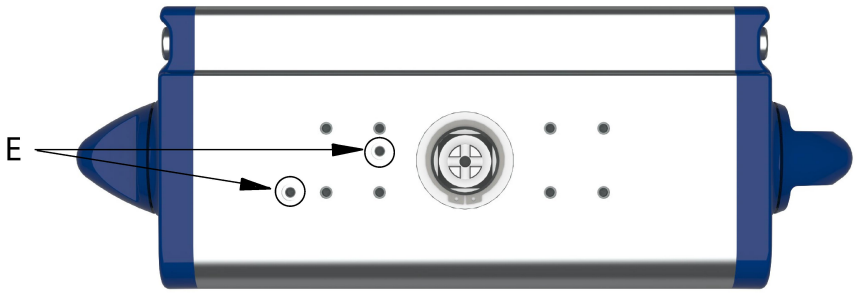

Fig. 3: Top view of ACTAIR EVO

E: Ports for direct control air supply (KSB system)

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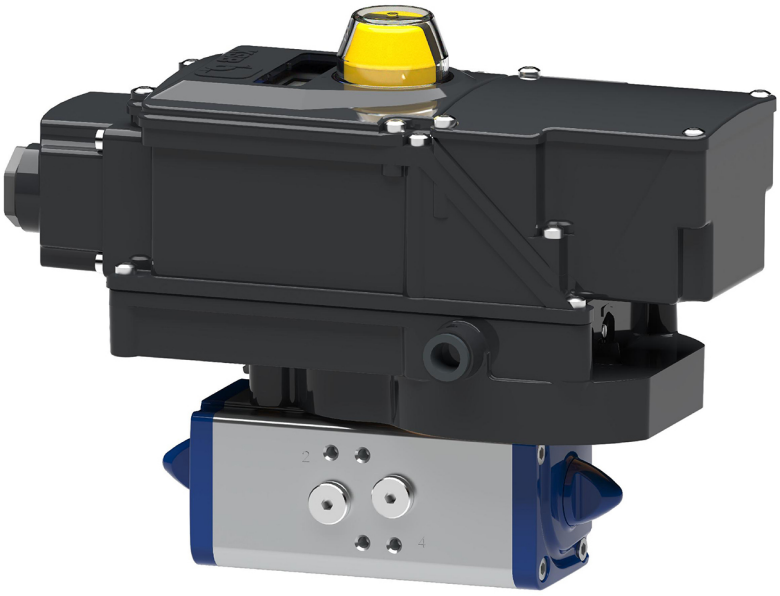

Fig. 4: SMARTRONIC U MA mounted on ACTAIR EVO

Control air connection with piping

The base type UNLIMITED allows positioners to be mounted on ACTAIR/DYNACTAIR actuators (all generations) with piping. This mounting option is used for actuators which do not have control air connections compatible with the VDI/VDE 3845 interface.

This mounting method is compatible with the following products:
- ACTAIR EVO 240 to 700
- DYNACTAIR EVO 120 to 350
- ACTAIR 400 to 1600
- DYNACTAIR 200 to 800
- ACTAIR NG 240 to 700
- DYNACTAIR NG 120 to 350

Actuator with VDI/VDE 3845 interface

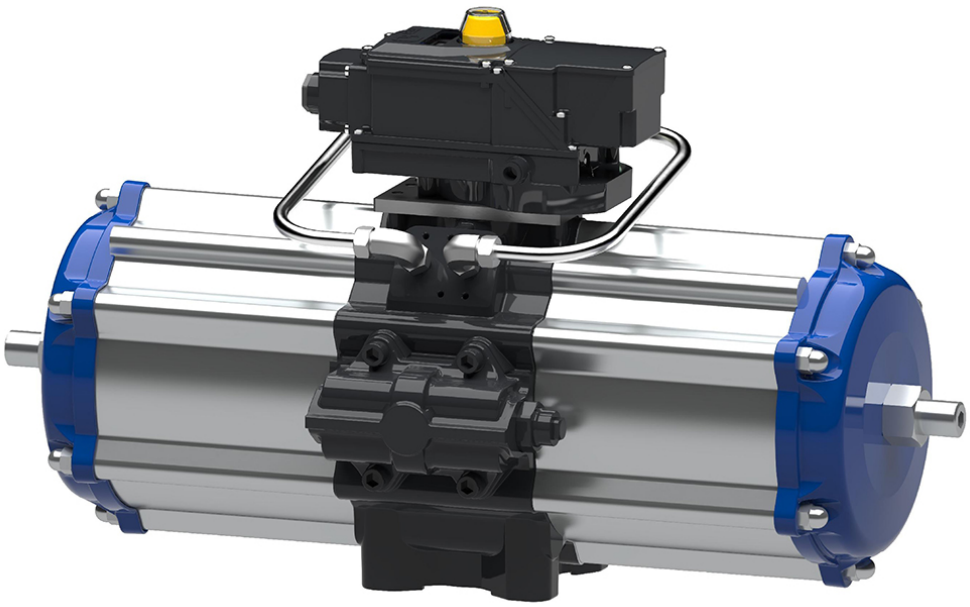

Fig. 5: SMARTRONIC U MA mounted on ACTAIR EVO 340

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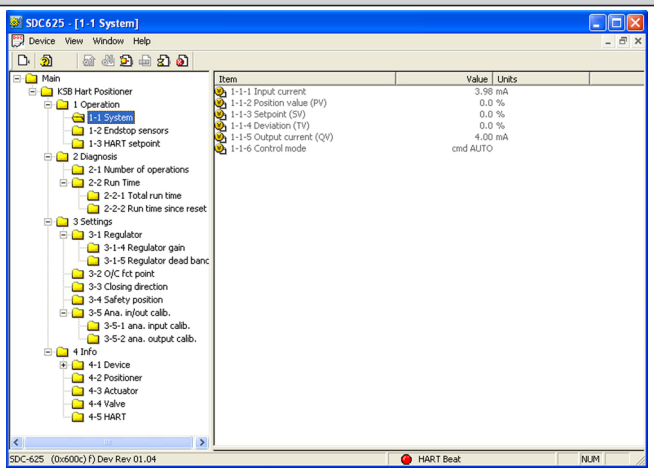
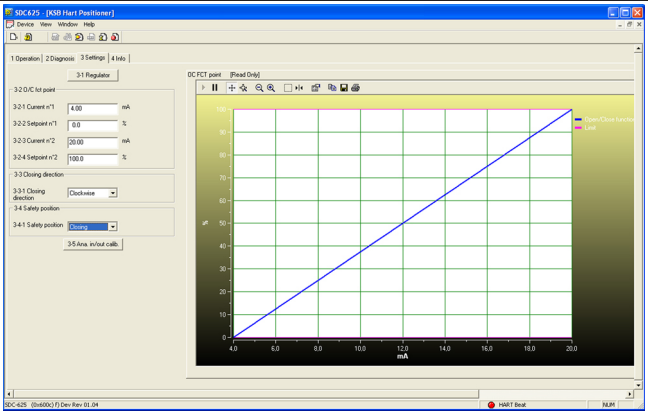
HART protocol

DD-compatible / EDD-compatible
(.fm6, .fm8, .imf, .imp, .sym)

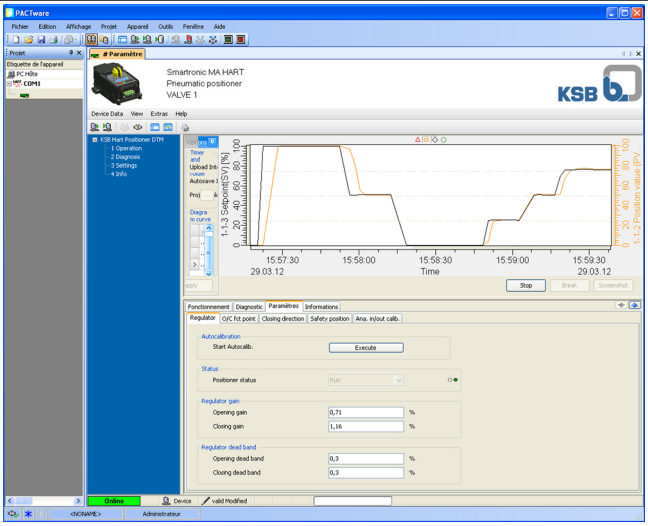


HART Screen No. 1



HART Screen No. 2

DTM-compatible



HART Screen No. 3

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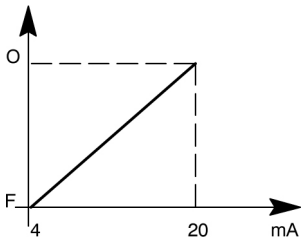
Adjusting the stroke depending on the setpoint signal

The operating staff can define two values for the setpoint current signal: Imin (mA) and Imax (mA); the values are assigned position setpoints P1 and P2 respectively.

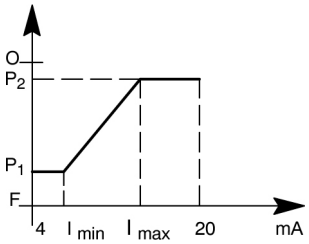
The positioner describes a linear movement between these two points.

Position



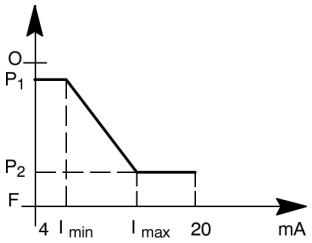
Default setting

Position



Manual setting - Direct direction of action

Position



Manual setting - Indirect direction of action

O: Open

F: Closed

This allows the definition of the positioner's direct and indirect direction of action and operation in the split range mode.

Safety position

The SMARTRONIC U MA is configured for the valve to move into a fail-safe position if the 4-20 mA signal fails or if the current signal falls below 3.6 mA. Possible fail-safe positions: Fail Open, Fail Closed or Fail Last (hold last position).

Option: proximity sensors

The printed circuit board of the SMARTRONIC U MA positioner is fitted with:

- 2 mechanical limit switches (standard)
- 2 inductive proximity sensors (optional)

The positions of the limit switches or proximity sensors can be adjusted via the cams for the entire stroke.

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Technical data of the mechanical limit switches

Mechanical limit switches, Crouzet			
Supplier:	Crouzet		
Material:	Housing	Glass-fibre reinforced thermoplastic polyester	
	Button	Glass-fibre reinforced polyamide UL 94 VO	
	Switching contact	Silver nickel	
Switching capacity:	Current (Ohmic resistance): 6 A		
	Breaking capacity to IEC 947.5.1		
Life expectancy:	Electrical	At I = 5 A	10^5 operating cycles
		At I = 1 A	10^6 operating cycles
		At I = 0.2 A	10^7 operating cycles
	Mechanical	3 x 10^7 operating cycles	

Max. permissible current in A	Alternating current			
	220 V	127 V	48 V	24 V
Control of resistive loads and solid state loads with isolation by optocouplers	5	5	5	5
Control of static loads with transformer isolation	2.5	3	4	4
Control of electromagnetic loads	2.5	3	4	4

Max. permissible current in A	Direct current		
	115 V	48 V	24 V
Control of resistive loads and solid state loads with isolation by optocouplers	0.6	2	5
Control of static loads with transformer isolation	0.3	1	3
Control of electromagnetic loads	0.04	0.15	0.6

Technical data of the proximity sensors

Proximity sensors IFM XC0035	
Manufacturer:	IFM
Housing material:	Polybutylene therephtalate
Power supply:	5 to 36 V DC
Max. output current:	
- Peak:	200 mA
- Continuous:	200 mA
Min. output current:	4 mA
Max. voltage drop:	<= 4.6 V
Leakage current:	<= 0.8 mA
Max. switching frequency:	2 kHz
Operating status indication:	LED

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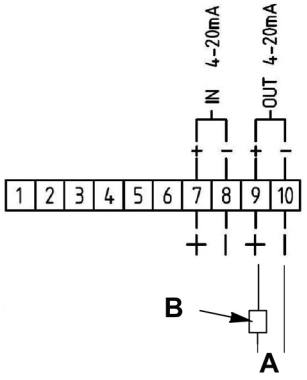
Technical data of the ATEX-certified proximity sensors

Manufacturer	IFM
Housing material	Polybutylene terephthalate
Technical design	Connection to certified intrinsically safe circuits with max. values V = 15 V / I = 50 mA / P = 120 mW
Output	NC
Nominal voltage [V]	8.2 DC (1 kΩ)
Supply voltage for use outside potentially explosive atmospheres [V]	7.5 to 30 V DC
Output current for use outside potentially explosive atmospheres [mA]	< 30
Current input [mA]	< 1 in break condition, > 2.1 mA in make condition
Self-capacitance [nF]	< 80
Self-inductance [µH]	< 110
Real switching distance [mm]	2 ±10 %
Switching point drift [% of Sr]	-10 to 10
Hysteresis [% of Sr]	1 to 15
Switching frequency [Hz]	800
Correction factors	Steel = 1 / stainless steel approx. 0.7 / brass approx. 0.5 / aluminium approx. 0.4 / copper approx. 0.3
Ambient temperature [°C]	-20 °C to +70 °C
Enclosure	IP67
Impact/vibration resistance	30g (11 ms) / 10-55 Hz (1 mm)
EMC	EN 60947-5-6
Approval	PTB 01 ATEX 2191 BVS 04 ATEX E153 IECEx BVS 06.0003
Equipment marking	II 2G EEx ia IIC T6 Ta: -20 to 70 °C II 1D Ex iaD 20 T 90 °C Ta: -20 to 70 °C Ex ia IIC T6 Ta: -20 to 70 °C
Connection	Electric cable made of PVC: 2 x 0.14 mm2

Option: actual-position feedback

The SMARTRONIC U MA positioner can optionally be equipped with a printed circuit board for actual-position feedback via a 4-20 mA signal.



Optional actual-position feedback

A - Power supply 15 to 24 V DC

B - Max. resistance 1000 Ohm

Power supply	15 to 24 V DC
Output	4-20 mA, 2-wire system with galvanic/electronic isolation
Load	0 - 1000 Ohm
Hysteresis and control dead band	< ± 0.1 % of full scale
Linearity	< ± 0.1 % of full scale
Temperature effect, from Tmin. to Tmax. in °C	< ± 0.05 % of full scale

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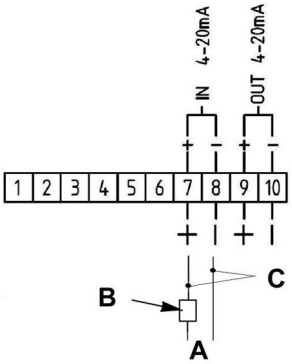
Connection to HART communicator

The positioner's printed circuit board can communicate with a HART communicator.For this purpose, it is sufficient to connect the HART modem or the input of the field communicator 375 or 475 in parallel to the 4-20 mA input of the positioner.



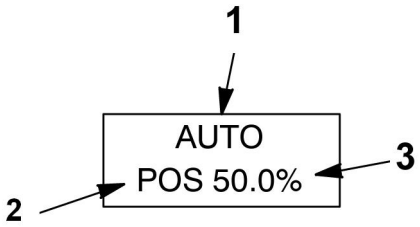
Schematic of a HART communicator

A - Power supply 4-20 mA

B - Load 250 Ohm

C - HART communicator (modem, field communicator 375 ...)

Display



Display schematic

1

Operating mode:

AUTO: Automatic positioning (4-20 mA setpoint)

MANU: Manual positioning (local control)

HART: Positioning via HART protocol (HART setpoint)

NO CALIB: Instrument is not calibrated

2

Parameter:

POS: Valve position (%)

SSR: Absolute angle sensor value (if NO CALIB)

3

Parameter value:

The display provides information about the operating mode and the valve position.

If the instrument has never been calibrated, the angle sensor value is displayed (SSR).

Text display may be adjusted according to the positioner's installation position.

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Materials

SMARTRONIC U MA materials

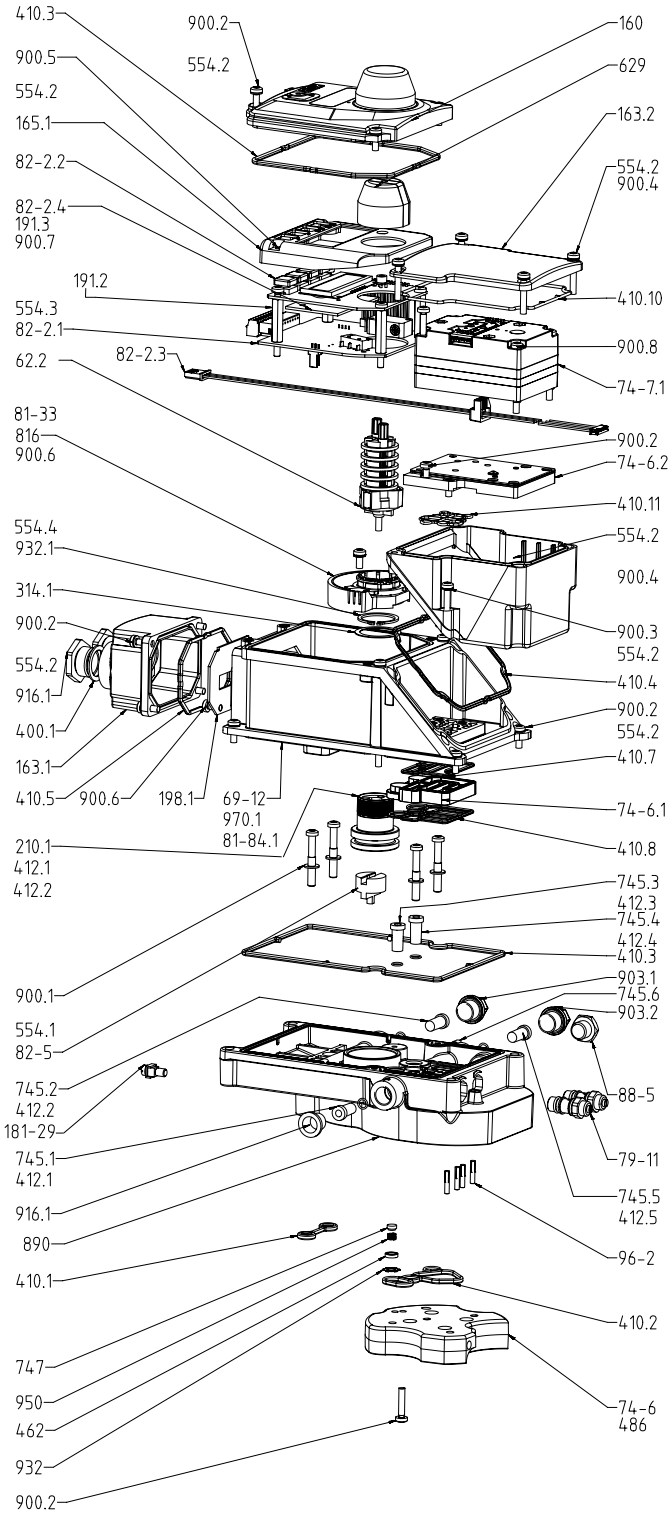

Fig. 6: Exploded view of A1310

Table 3: List of components

Part No.	Description	Materials
69-12	Housing	Polycarbonate with 20 % glass fibre
160	Cover	Polycarbonate with 20 % glass fibre
163.1	Housing (directional control valve)	Polycarbonate with 20 % glass fibre
163.2	Cover	Polycarbonate with 20 % glass fibre
165.1	Bonnet	Polycarbonate with 20 % glass fibre
181-29	Earth terminal	Steel
191.2	Spacer, PCB	Nickel-plated brass
191.3	Spacer ring	Polyamide
198.1	Connection plate	Polyamide
210.1	Actuating shaft	Aluminium alloy
314.1	Anti-friction disc	Stainless steel, type 304L
400.1	Gasket	Neoprene
410.1	Profile seal	NBR80
410.2	Profile seal	NBR80
410.3	Profile seal	NBR70
410.4	Profile seal	NBR70
410.5	Profile seal	NBR70
410.7	Profile seal	NBR70
410.8	Profile seal	NBR70
410.10	Profile seal	NBR70
410.11	Profile seal	NBR70
412.1	O-ring	NBR70
412.2	O-ring	NBR70
412.3	O-ring	NBR70
412.4	O-ring	NBR70
412.5	O-ring	NBR70
462	Bearing disc	Polyamide
486	Ball	Steel
554.1	Washer	Stainless steel
554.2	Washer	Stainless steel
554.3	Washer	Steel
554.4	Serrated lock washer	Steel
629	Position indicator assembly	
62-2	Adjustable cam assembly	
745.1	Sintered filter	Bronze
745.2	Sintered filter	Bronze
745.3	Sintered filter	Bronze
745.4	Sintered filter	Bronze
745.5	Sintered filter	Bronze
745.6	Sintered filter	Bronze
74.6	Distribution plate	
74-6.1	Distribution plate A/B	
74-6.2	Distribution plate	
74-7.1	Directional control valve	
747	Profile seal	
79-11	Flow reducer	
816	Angle sensor assembly	
81-33	Detection plate	Steel
81-84.1	Circuit diagram	
82-2.1	Printed circuit board	
82-2.2	Printed circuit board	
82-2.3	Actual-position feedback	
82-2.4	Printed circuit board	
82-5	Adapter, shaft	Thermoplastic
88-5	Silencer	Bronze
890	Base	Aluminium alloy
900.1	Bolt/screw	A2-70
900.2	Hexagon socket head cap screw	A2-70

8520.807/01-EN

Part No.	Description	Materials
900.3	Hexagon socket head cap screw	A2-70
900.4	Hexagon socket head cap screw	A2-70
900.5	Hexagon socket head cap screw	A2-70
900.6	Self-tapping screw	A2-80
900.7	Hexagon socket head cap screw	A2-80
900.8	Hexagon socket head cap screw	A2-70
903.1	Plug	Polyamide
903.2	Plug	Polyamide
916.1	Screw plug	Polyamide
932	Reinforced circlip	Steel
932.1	Circlip	Steel
950	Spring, valve disc	Stainless steel
96-2	Locking plate	Polycarbonate with 20 % glass fibre
970.1	Sticker	Adhesive polyester

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Variants

Adaptation for mounting on linear actuators to NAMUR

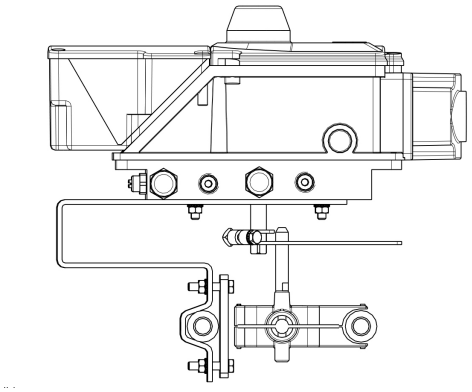

Fig. 7: Front view

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Dimensions

SMARTRONIC U MA dimensions

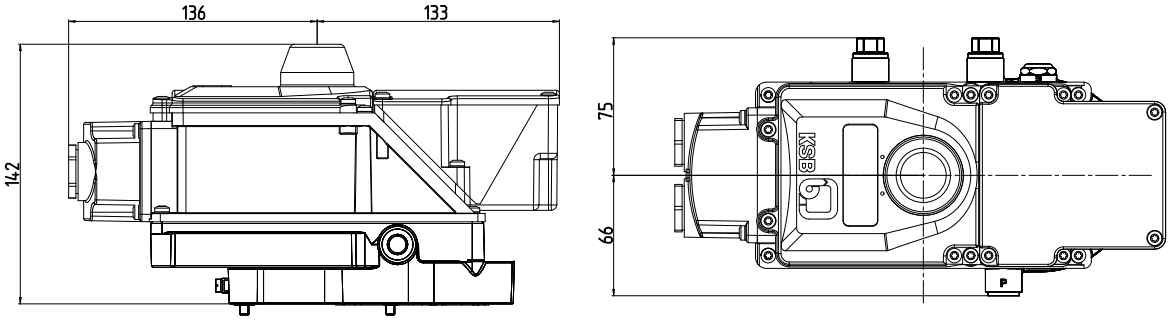

Fig. 8: SMARTRONIC U MA / type A1310 dimensions

Purchase order specifications

Table 4: Type code for SMARTRONIC U MA A1310

SMARTRONIC U MA	A001310	.	0	0	0	1	.	.	.	B	.	.	2	.	0	6	0	0	.
Sensors																			
Switch on printed circuit board		**1**	**0**	**0**	**0**														
Sensor on printed circuit board		**2**	**0**	**0**	**0**														
Position detection																			
1/Open and 1/Closed						**1**													
Actual-position feedback																			
Without actual-position feedback							**0**												
Actual-position feedback via passive 4-20 mA signal (2-wire system)							**4**												
Electrical output																			
None								**0**											
2 cable glands, plastic, M20, IP67 (diameter: 6 to 12)								**1**											
2 cable glands, metal, M20, IP67 (diameter: 6 to 12)								**2**											
Directional control valve																			
4/3 double, centre closed									**S**										
3/3 single, centre closed									**T**										
Voltage, directional control valve																			
24 V DC (Piezo)										**B**									

8520.807/01-EN

SMARTRONIC U MA	A001310	.	0	0	0	1	.	.	.	B	.	.	2	.	0	6	0	0	.
Actuator																			
ACTAIR 3 to 200, with closed-position travel stop									S		2								
ACTAIR 3 to 200, with open-position travel stop									S		3								
ACTELEC 400 to 1600									S		4								
DYNACTAIR 1.5 to 25, Fail Closed in the event of control air failure									T		6								
									T		7								
DYNACTAIR 1.5 to 25, Fail Open in the event of control air failure									T		8								
									T		9								
DYNACTAIR 50 to 100, Fail Closed in the event of control air failure									T		J								
									T		K								
DYNACTAIR 50 to 100, Fail Open in the event of control air failure									S		A								
									S		B								
DYNACTAIR 200 to 800, Fail Closed in the event of control air failure									S		C								
									S		D								
DYNACTAIR 200 to 800, Fail Open in the event of control air failure									T		E								
									T		F								
ACTAIR NG / EVO 2									T		G								
ACTAIR NG / EVO 5 - 20									T		H								
ACTAIR NG / EVO 30 - 160									T		P								
ACTAIR NG / EVO 240 - 700									T		Q								
DYNACTAIR EVO 1, Fail Closed in the event of control air failure									T		R								
									T		S								
DYNACTAIR EVO 2 - 8, Fail Closed in the event of control air failure									S		T								
									S		W								
DYNACTAIR EVO 12 - 80, Fail Closed in the event of control air failure									T		X								
									S		Y								
DYNACTAIR EVO 120 - 350, Fail Closed in the event of control air failure									T		Z								
DYNACTAIR EVO 1, Fail Open in the event of control air failure																			
DYNACTAIR EVO 2 - 8, Fail Open in the event of control air failure																			
DYNACTAIR EVO 12 - 80, Fail Open in the event of control air failure																			
DYNACTAIR EVO 120 - 350, Fail Open in the event of control air failure																			
ACTAIR / DYNACTAIR (all sizes and generations) + external connection																			
Double-acting pneumatic quarter-turn actuator																			
Single-acting pneumatic quarter-turn actuator																			
Pneumatic linear actuator, double-acting																			
Pneumatic linear actuator, single-acting																			
Fail-safe position																			
Fail Closed in the event of power failure												A							
Fail Open in the event of power failure												B							
Fail-in-last-position in the event of power failure												C							
SMARTRONIC function U																			
Intelligent positioner													2						
Field bus																			
HART														D					
Heating resistor																			
None															0				
Display																			
3D sight glass																6			

SMARTRONIC U MA	A001310	.	0	0	0	1	.	.	.	B	.	.	2	.	0	6	0	0	.
Configuration																			
None																	**0**		
Diagnosis																			
None																		**0**	
Protection against accumulation of water																			
None																			**0**
Yes																			**1**

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8520.807/01-EN

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