Automation

SMARTRONIC MA

R1310

Type Series Booklet

Legal information/Copyright

Type Series Booklet SMARTRONIC MA

Contents

Automation

Digital Positioners

SMARTRONIC 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 MA is a digital electro-pneumatic positioner powered via the 4 - 20 mA circuit.
- For automation of:
  - Pneumatic quarter-turn actuators of the ACTAIR NG and DYNACTAIR NG type series
  - Quarter-turn actuators with standardised VDI/VDE 3845 interface
  - Linear actuators to NAMUR
- Position indicator under sight glass for remote indication
- SMARTRONIC MA features a LEXAN housing (polycarbonate 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 compressed air supply is connected via the base:
  - Direct (without piping) for the ACTAIR NG and DYNACTAIR NG type series
  - Via external piping for quarter-turn actuators with standardised VDI/VDE 3845 interface and for linear actuators to NAMUR
- Open / closed position signalling via limit switches or proximity sensors
- The actuating times for open/close operations are set via the easily accessible air flow reducer.
- 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 pushbutton
- Consumes very little control air while idle, regardless of position.
- Mounted directly on pneumatic actuators without installation kits and with direct compressed air supply (without piping)
- SMARTRONIC MA is HART-compatible.

Related documents

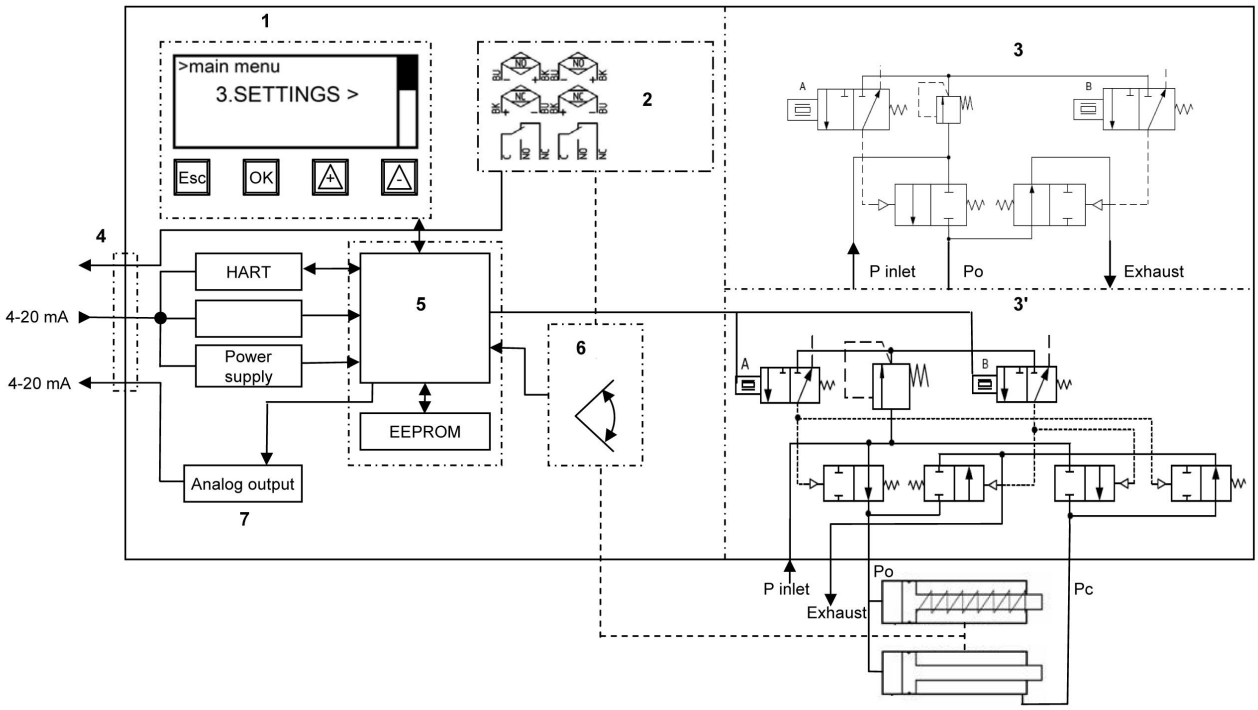
Table 2: Information/documents

Document	Reference number
SMARTRONIC MA operating manual	8520.8041

8520.803/02-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 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 directional control valve which controls the actuator is a poppet valve with 3 switching positions.

SMARTRONIC MA is powered exclusively via the 4-20 mA setpoint 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 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	LEXAN (PC with 20 % glass fibre)
Position indicator	Visual position indicator on the cover
Electrical connection	2 M20 ports for cable gland For flexible conductors with wire end sleeve with a cross-section of 0.25 mm^2 to 0,5 mm^2
Angle of rotation	-5° to 95°
Weight	1.7 kg

Control air supply	
Control air supply port	Port "P", 1/4" gas port, filter fitted in the base
Exhaust port	Port "E", 1/4" gas port, with silencer or for connection to an exhaust system
Operating pressure	2 to 8 bar
Filtration level	ISO 8573-1 Class 4 (< 15 µm)
Dew point	ISO 8573-1 Class 4 (pressure dew point temperature < 3 °C, and in all cases a dew point temperature which 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
Control air consumption in normal position	< 0.4 Nl/min at 25 °C

Electronic system	
Power supply	Via 4-20 mA control signal
Power consumption	From 40 mW at 4 mA to 200 mW at 20 mA
Control signal	4-20 mA
Minimum operating 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
Limit of static destruction	40 mA

Positioner	
Hysteresis and 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 Bit
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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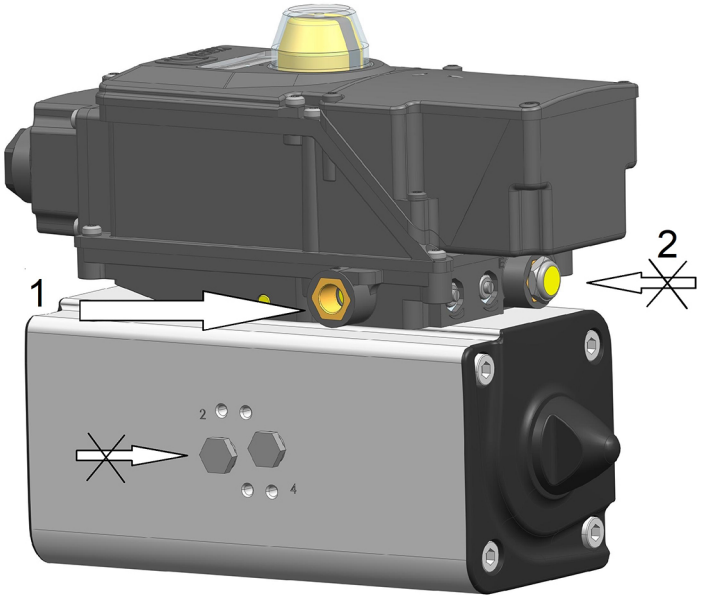
Compressed air supply

The compressed air is connected to the SMARTRONIC 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.



Illustration

1 - Control air supply

2 - Exhaust

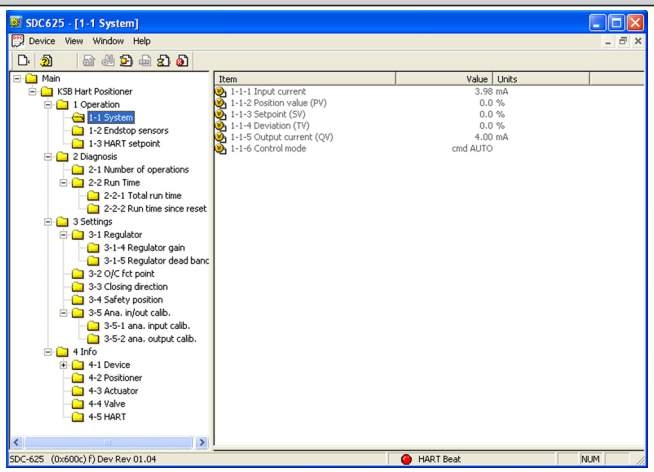
Control air supply: Port "P", 1/4" gas port

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

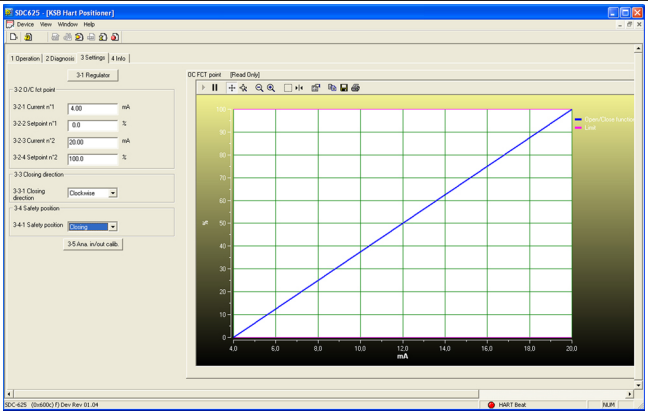
To prevent any premature mechanical component wear, especially of actuator components, the use of oil-lubricated control air (max. 10 mg/m3) is recommended.

HART protocol

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

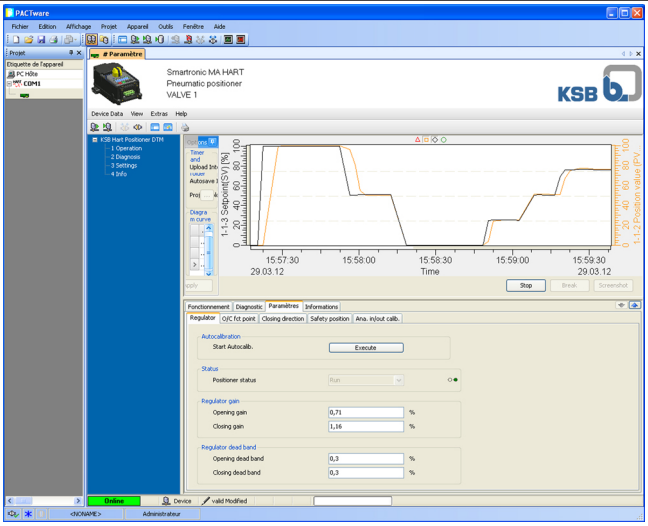


HART Screen No. 1



HART Screen No. 2

DTM-compatible



HART Screen No. 3

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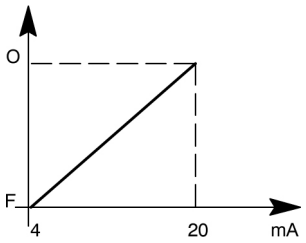
Adjusting the stroke depending on the setpoint signal

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.

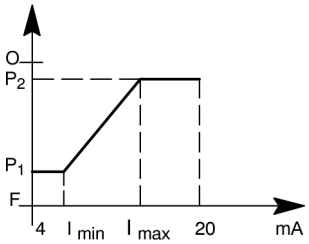
The positioner describes a linear movement between these two points.

Position



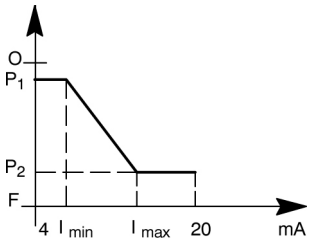
Default setting

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 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 Close or Fail Last (hold last position).

Option: proximity sensors

The printed circuit board of the SMARTRONIC 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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Mechanical limit switches: technical data

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

Proximity sensors: technical data

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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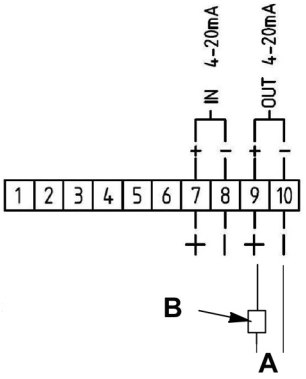
Option: actual-position feedback

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



Schematic of optional actual-position feedback

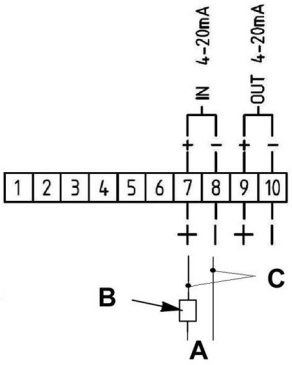
A - Power supply 15 to 24 V DC

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 dead band	< ± 0.1 % of full scale
Linearity	< ± 0.1 % of full scale
Temperature effect, from Tmin. to Tmax. in °C	< ± 0.1 % of full scale

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.



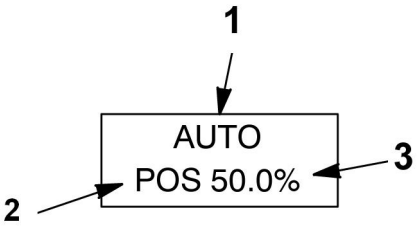
Schematic of a HART communicator

A - Power supply 4-20 mA

B - Load 250 Ohm

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

Display



Display schematic

1	2	3
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	Parameter: **POS:** Valve position (%) **SSR:** Absolute angle sensor value (if NO CALIB)	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 MA materials

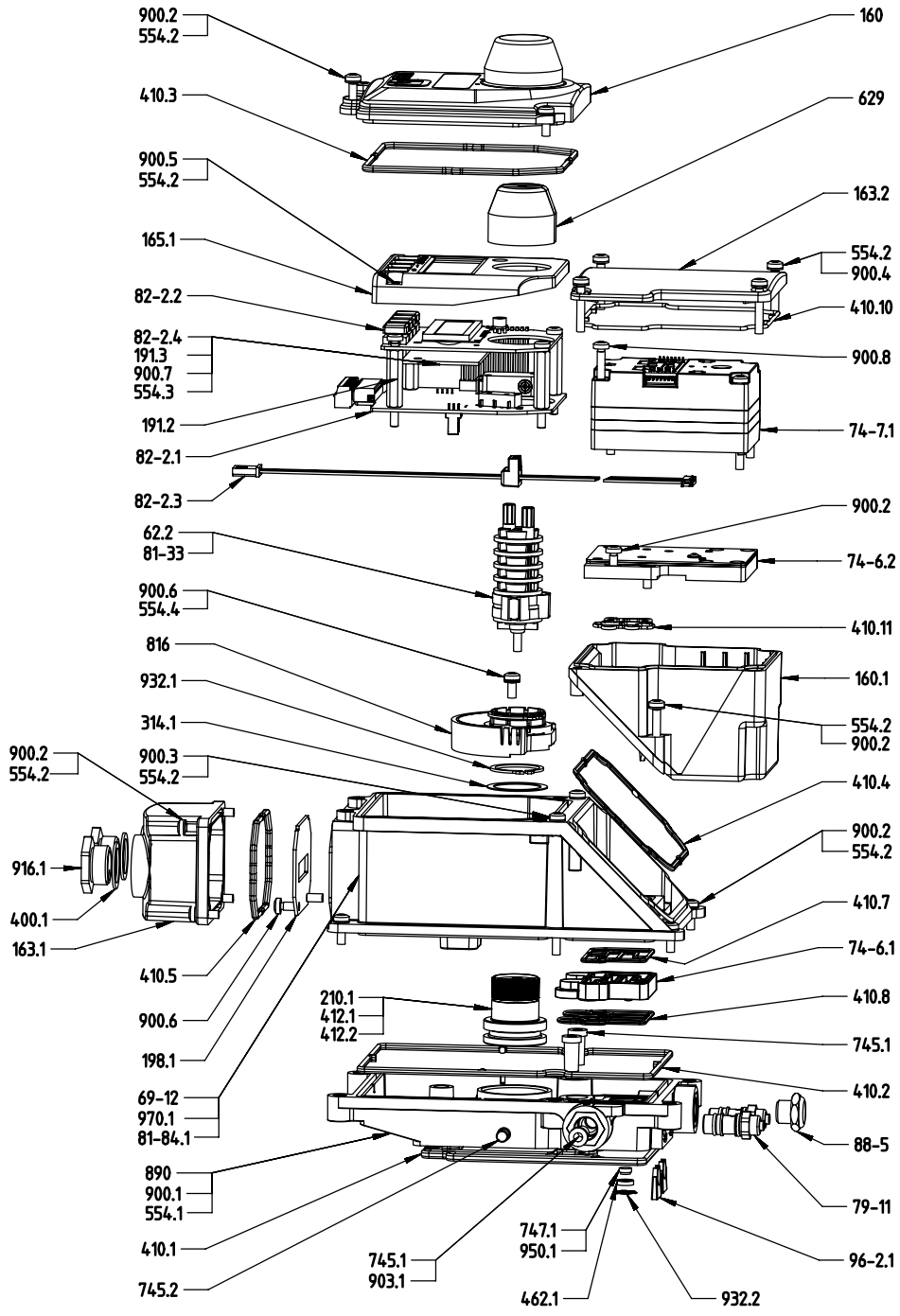

Fig. 1: Exploded view R1310

Table 3: List of components

Part No.	Description	Materials
69-12	Housing	LEXAN (polycarbonate with 20% glass fibre)
160	Cover	LEXAN (polycarbonate with 20% glass fibre)
160.1	Cover (directional control valve)	LEXAN (polycarbonate with 20% glass fibre)
163.1	Housing (directional control valve)	LEXAN (polycarbonate with 20% glass fibre)
163.2	Cover	Polycarbonate
165.1	Cover	
191.2	PCB support	Nickel-plated brass
191.3	Spacer	
198.1	Connection plate	
210.1	Shaft	Polycarbonate SM60/0
314.1	Anti-friction disc	Stainless steel, type 304L
400.1	Gasket	Neoprene
410.1	Profile seal	NBR70
410.2	Profile seal	NBR70
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
410.9	Profile seal	NBR70
410.10	Profile seal	NBR70
410.11	Profile seal	NBR70
412.1	O-ring	NBR70
412.2	O-ring	NBR70
462.1	Bearing disc	
554.1	Washer	Stainless steel
554.2	Washer	Stainless steel
554.3	Washer, flat	Steel
554.4	Serrated lock washer	Steel
629	Position indicator assembly	
62-2	Adjustable cams assembly	
745.1	Sintered filter	
745.2	Sintered filter	Bronze
74-6.1	Distribution plate	
74-6.2	Distribution plate	
74-7.1	Directional control valve	
747.1	Profile seal, valve	
79-11	Flow limiter	
816	Angle sensor assembly	
817.1	Cable gland	
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	
88-5	Silencer	Bronze
890	Base	LEXAN (polycarbonate with 20% glass fibre)
900.1	Screw	A2-70
900.2	Screw	A2-70
900.3	Screw	A2-70
900.4	Screw	A2-70
900.5	Screw	A2-70
900.6	Self-tapping screw	A2-80
900.7	Hexagon socket head cap screw	A2-80
900.8	Screw	A2-70
900.9	Screw	A2-70
903.1	Plug	
916.1	Screw plug	

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Part No.	Description	Materials
916.2	Protecting plug	Rubber
920.2	Hexagon nut	A2-70
932.1	Circlip	Steel
932.2	Reinforced circlip	Steel
950.1	Spring	
96-2.1	Locking plate	Polycarbonate SM60/0
970.1	Sticker	Adhesive polyester

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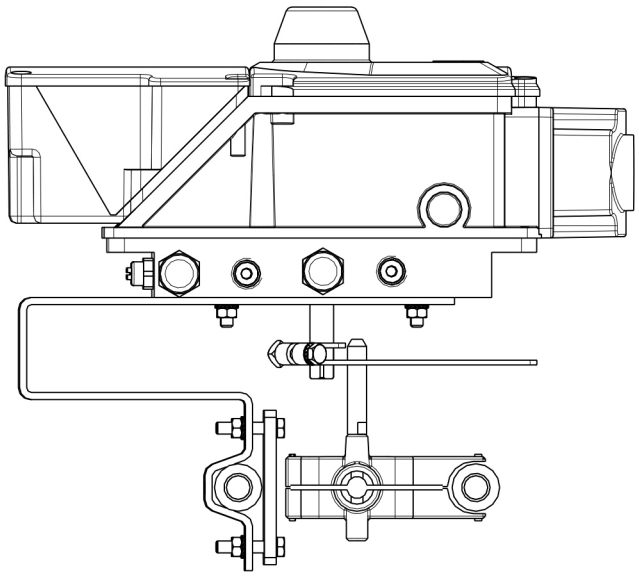
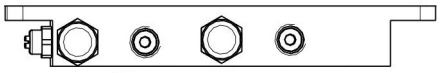
Variants

Adaptation for mounting on linear actuators to NAMUR

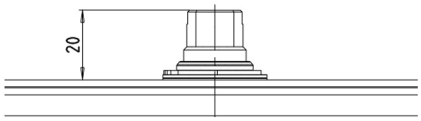


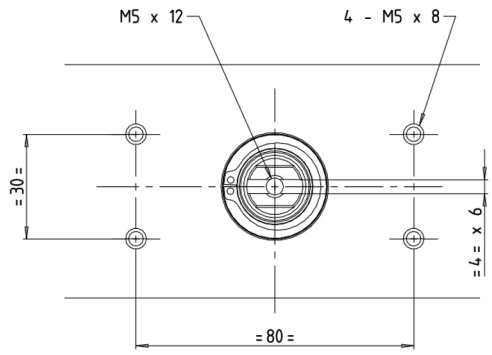
Front view

Mounting flange for actuators with VDI/VDE 3845 interface, not applicable to ACTAIR and DYNACTAIR



Front view





Dimensions to VDI/VDE 3845

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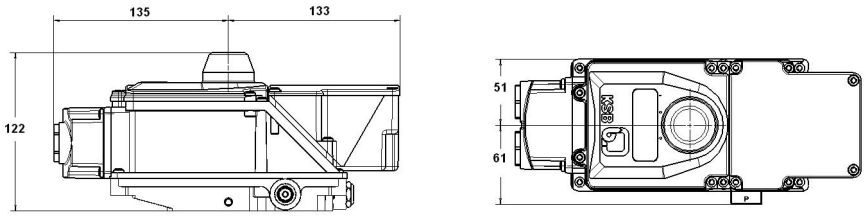
Dimensions

SMARTRONIC MA dimensions



Type R1310

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Purchase order data

SMARTRONIC MA coding

Table 4: Coding overview

SMARTRONIC MA	R001310	.	0	0	0	1	.	.	.	B	.	.	2	.	0	6	0	0
Position detection																		
Limit switch on printed circuit board		1	0	0	0													
Sensor on printed circuit board		2	0	0	0													
Position indicator																		
1/Open and 1/Closed						1												
Actual-position feedback																		
No 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										
Solenoid valve																		
4/3 double, centre closed									S									
3/3 single, centre closed									T									
Voltage, solenoid valve																		
24 V DC (Piezo)										B								
Actuator																		
ACTAIR 3 to 200 with closed-position travel stop									S		2							
ACTAIR 3 to 200, with open-position travel stop									S		3							
ACTAIR 400 to 1600									S		4							
DYNACTAIR 1.5 to 25 normally closed									T		6							
DYNACTAIR 1.5 to 25 normally open									T		7							
DYNACTAIR 50 to 100 normally closed									T		8							
DYNACTAIR 50 to 100 normally open									T		9							
DYNACTAIR 200 to 800 normally closed									T		J							
DYNACTAIR 200 to 800 normally open									T		K							
ACTAIR NG 2 to 700 DYNACTAIR NG 1 to 350 normally closed									T		L							
									T		M							
DYNACTAIR NG 1 to 350 normally open									T		N							
Pneumatic quarter-turn actuator, double-acting									S		W							
Pneumatic quarter-turn actuator, single-acting									T		X							
Pneumatic linear actuator, double-acting									S		Y							
Pneumatic linear actuator, single-acting									T		Z							
Fail-safe position																		
Fail Close in the event of power failure												A						
Fail Open in the event of power failure												B						
Fail Last in the event of power failure												C						
SMARTRONIC function																		
Intelligent positioner													2					
Field bus																		
HART														D				
Heating resistor																		
None															0			
Indicator																		
3D sight glass																6		
Configuration																		
None																	0	
Diagnosis																		
None																		0

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