

Automation

# SMARTRONIC PC

Intelligent Positioner  
SMARTRONIC PC R1312

## Type Series Booklet



## **Legal information/Copyright**

Type Series Booklet SMARTRONIC PC  
Original operating manual

KSB Aktiengesellschaft

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## Automation

### Intelligent Positioner

## SMARTRONIC PC



### Main applications

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

### Operating data

Operating data overview

Characteristic	Value
Enclosure	IP 67 to EN 60529
Electromagnetic compatibility	In conformity with the European EMC Directive 2004/108/EC and NF EN 61000-6-2/NF EN 61000-6-4
Wi-Fi version	In conformity with the European 1999/56/EC Directive (R and TTE)
Operating temperature	<b>-20 °C to +80 °C</b>
Vibrations	To IEC 68-2-6 Test Fc
Compressed air purity class	ISO 8573-1 Class 5

### Design details

- SMARTRONIC PC is an intelligent positioner.
- Used for the control of:
  - Quarter-turn actuators from the ACTAIR and DYNACTAIR type series
  - Quarter-turn actuators with standardised VDI/VDE 3845 interface
  - Linear actuators to NAMUR

- All SMARTRONIC PC versions feature the following functions:
  - Compressed air supply
  - Position signalling
  - Intelligent valve control
  - Monitoring the valve/actuator unit via an integrated printed circuit board with programmable microprocessor
- The compressed air supply is connected via the base:
  - Direct connection to ACTAIR and DYNACTAIR
  - Connection via external piping for quarter-turn actuators with standardised VDI/VDE 3845 interface and for linear actuators to NAMUR
- Position signalling via limit switches or proximity sensors along the entire valve travel.
- The actuating times for open/close operations are set via the easily accessible air flow reducer.
- Its design is based on a programmable microcontroller whose control and monitoring algorithms have been developed by KSB-AMRI.
- It is connected to the actuator in two ways: mechanically to the actuator itself and pneumatically to the inside of the actuator.

### Variants

- Programmable curves for valve opening and closing
- Intelligent positioning
- Monitoring via external signal source
- Control function
- Filter tank level control
- Communication via RS232
- Communication via Ethernet
- Communication via Wi-Fi
- Field bus Profibus DP
- Actual-position feedback

### Product benefits

- **Simplified and optimised automatic procedures**  
SMARTRONIC PC allows the valve/actuator unit to perform comprehensive control functions:
  - Intelligent positioning
  - Control of process variables
  - Pressure surge control

This simplifies central automatic processes, both in terms of software (no valve-specific control algorithms) and hardware (fewer digital inputs and outputs).
- **Process safety and monitoring**
  - SMARTRONIC PC can process and display process-related alarms. To prevent any hazards, it is able to give the command that the valve should move into the fail-safe position.
- Position indicator under sight glass for remote indication
- **User-friendly**  
KSB AMRI has developed a user-friendly interface which helps to save time during commissioning and maintenance work. The user is able to perform the following operations at any time, either locally or remotely; from a PC:
  - Visualise valve operation in real time

- Launch automatic auto-calibration
- Set the proportional, integral and derivative parameters (PID) to optimise system response
- Display SMARTRONIC PC's load cycles from commissioning
- Program the characteristic curves for opening and closing.
- **Reduced investment costs**
  - SMARTRONIC PC can optionally be connected to a Profibus DP field bus which ensures that the costs for planning and installing (cabling) the valve/actuator unit can be reduced.
- **Reduced operating costs**
  - If the actuator is inactive, the pneumatic directional control valve does not require any compressed air.
  - Compared with other positioners on the market, the SMARTRONIC PC allows substantial energy savings to be achieved.

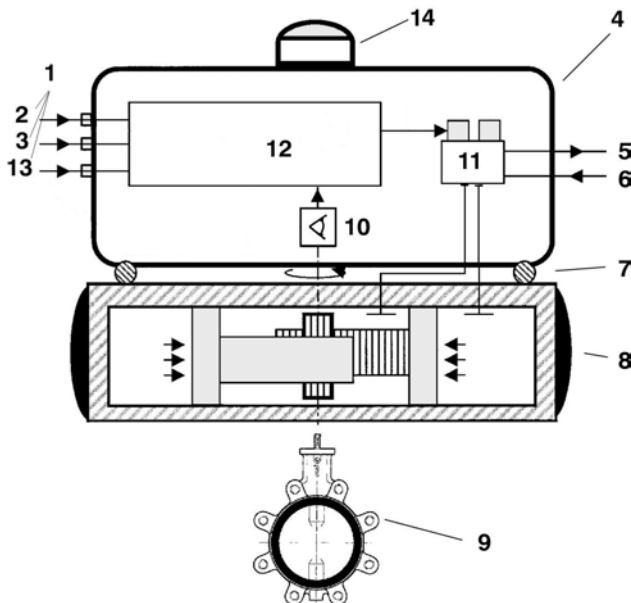
### Related documents

Other applicable documents

Document	Reference No.
Operating manual	8520.8051
	42 812 734

**Technical data**

**Functional schematic**



The integrated microprocessor processes all data and runs the specific open- and closed-loop control algorithms for each SMARTRONIC PC version. It handles communication between the user interface (MMI), the process control system or the field bus (Profibus DP).

- 13. External signal source  
An analog external signal source can be connected to the SMARTRONIC PC which processes the measured values directly. The measured values are used for control or process monitoring.
- 14. Visual position indicator

1. Connections

2. User interface

Both the configuration of SMARTRONIC PC and real-time display of process data are performed via a serial interface, Ethernet or Wi-Fi using a PC.

3. Process control system

The open- and closed-loop control information from SMARTRONIC PC can be transmitted to the PLC and the monitoring PC via cable or field bus (Profibus DP).

4. SMARTRONIC PC

5. Exhaust

6. Compressed air supply

7. VDI/VDE interface

8. Pneumatic actuator

9. Valve

10. Position monitoring

The valve position is recorded by the angle sensor which is mounted on the actuator's stem. This information is transmitted to the microprocessor and the PLC for processing. The angle sensor is fitted with a stop mechanism which also ensures that the angle sensor is automatically adjusted to the actuator's stroke.

A 4-20 mA signal allows actual-position feedback to the process control system.

11. Integrated pneumatic control

The pneumatic directional control valve is fitted into the SMARTRONIC PC. The compressed air is supplied via the VDI/VDE interface, external connections are not required (up to ACTAIR 200 and DYNACTAIR 100). The pneumatic directional control valve is a 4/3 directional control valve. It is controlled via two pilot valves. The "fail-safe (Fail Open or Fail Close) position in the event of a power supply failure is specified for each unit in the purchase order.

12. Integrated microprocessor

**Technical specification**

<b>Housing</b>	
Material	PBT, 30% glass fibre reinforced
Position indicator	Visual position indicator on the cover
Compressed air connection	<b>2 x 1/4" gas ports</b>
Electrical connection	<ul style="list-style-type: none"> <li>- To the user interface (RS232 and Ethernet): 5-pin M12 female connector</li> <li>- To the user interface (Wi-Fi): Wi-Fi aerial</li> <li>- To the PLC and the external signal source: 2 cable glands for cable diameter 6 to 12 mm</li> </ul>
Internal connectors	<ul style="list-style-type: none"> <li>- Spring-type connection</li> <li>- Cable length to be stripped: 8 mm</li> <li>- For rigid or flexible conductors, with a cross-section of 0.14 mm<sup>2</sup> (26 AWG) to 0.5 mm<sup>2</sup> (20 AWG)</li> <li>- For flexible conductors with wire end sleeve and without insulating input sleeve, with a cross-section of 0.25 mm<sup>2</sup> (23 AWG) to 0.5 mm<sup>2</sup> (20 AWG)</li> </ul>
Weight	1.7 kg

<b>Compressed air supply</b>	
Compressed air supply	Port "P" with filter fitted in the base
Exhaust	1/4" gas port, marked "E", with silencer or exhaust system connection
Operating pressure	<b>2 to 8 bar (30 to 115 psi)</b>
Filtration	ISO 8573-1 Class 5 (< 40 µm)
Dew point	ISO 8573-1 Class 5 (< 7 °C and in all cases < 5 °C below the ambient temperature)
Lubrication	ISO 8573-1 Class 5 (< 25 mg/m <sup>3</sup> )
Max. flow rate	400 Nl/min
Consumption in "at rest" position	Zero

<b>Power supply</b>	
Max. voltage	30 V DC
Min. voltage	20 V DC
Power consumption	6.3 W max.

### Compressed air supply

The compressed air is connected to the SMARTRONIC PC.



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.

To prevent any premature mechanical component wear, especially of actuator components, the use of lubricated air (between 5 and max. 25 mg/m<sup>3</sup>) is recommended.

1 - Compressed air supply

2 - Exhaust

Compressed air supply: port "P"

Exhaust: port "E", with silencer or exhaust system connection

### Programmable curves for opening/closing

- Actuation is triggered by a volt-free On/Off contact (PLC).
- The user can program the valve's actuation time, i.e. time-dependent actuation curves for opening and closing can be stored.
- These two curves can be parameterised on the basis of 20 points. The microcontroller continuously compares the valve position with the programmed curve.
- This avoids pressures surges.

### Intelligent positioning

- The valve position is controlled via an external 4-20 mA setpoint signal.
- The user defines the setpoint signal which triggers the complete closing or opening of the valve: this option is used for valves operated in split-range mode.
- The user can also configure the actuation curve of a butterfly valve disc according to the external signal.

This means valve actuation can be linear or in accordance with a user-defined curve which only applies to a specific application (butterfly valve employed as a linear control element).

### Process monitoring

- Valve opening and closing is programmed.
- An external signal source directly connected to the SMARTRONIC PC allows the implementation of monitoring and safety functions.
- The user can define two limits for this external signal source (4-20 mA signal) and determine a fail-safe position.

### Control

- A PID control algorithm allows the control of a physical quantity transmitted by an external signal source which is connected directly to the SMARTRONIC PC.
- This external signal source (4-20 mA) can be supplied with 24 V voltage by the control unit.
- An Open/Close control allows the selection of SMARTRONIC PC's operating mode: automatic or manual.

▪ If the controller is in

- **automatic mode**, it will control a physical quantity transmitted by the signal source.

The external setpoint input corresponds to a control setpoint.

- Example: 400 m<sup>3</sup>/h, if the flow rate is measured via the external signal source input

- **manual mode**, it is used as a positioner.

The external setpoint input (4-20 mA signal or Profibus) corresponds to a position setpoint.

- Example: Valve opening angle is 45°

- The emergency shutdown command ensures the valve is closed automatically.

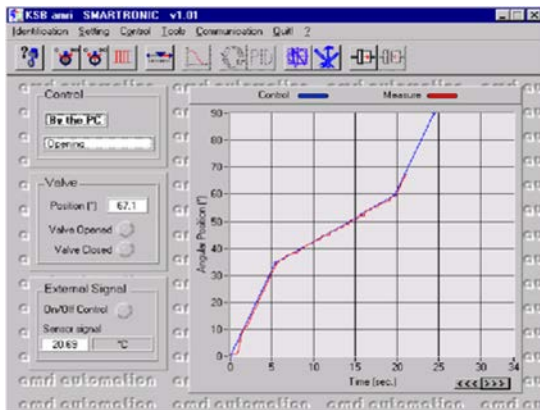
### Filter tank level control

- The control task is to keep the water level in a filter tank constant; the water in the tank is filtered through anti-bacterial sand or charcoal filters.
- SMARTRONIC PC is installed at the tank's outlet ensuring that gradual filter clogging and fluctuations in the water volume entering the filter tank are compensated.
- Alongside classic control functions, SMARTRONIC PC features specific control algorithms which allow the water level in filter tanks to be controlled.

### User interface

- The user interface is available via a PC or a PDA.
- It ensures straightforward commissioning, parameterisation and display of SMARTRONIC PC operating data, both locally and remotely.
- A programming set is available which helps install the software on the PC and connect the PC to the instrument's programming port.

The following example shows a time-dependent actuation curve (programmable opening/closing curves function).



## Profibus DP

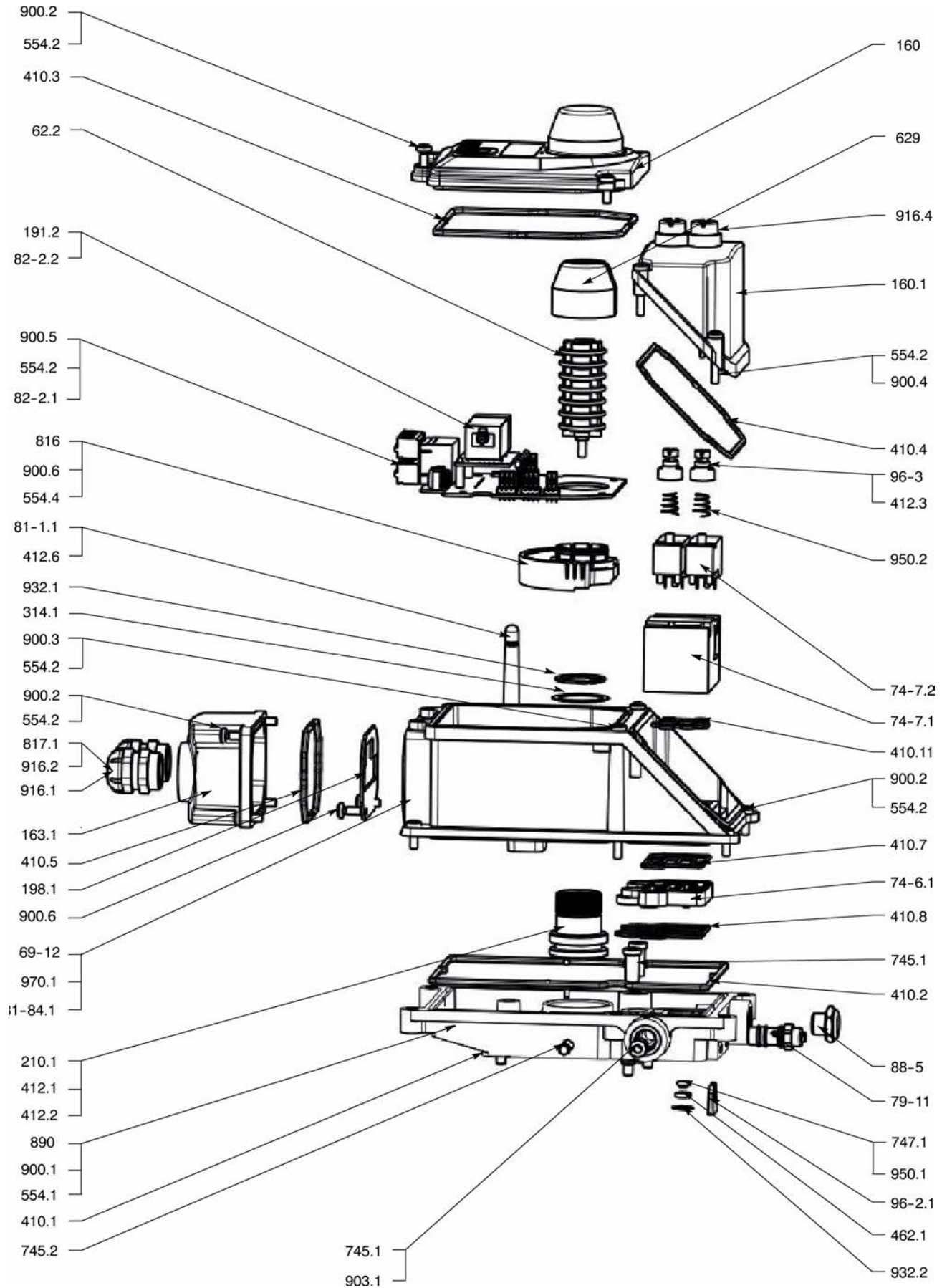
Overview of operating data

SMARTRONIC PC Profibus DP meets the requirements of the EN 50170 and DIN 19245 Profibus standards.			
Actuator selection	SMARTRONIC PC Profibus DP is suitable for use with all pneumatic actuators from the ACTAIR and DYNACTAIR type series.		
Topology	Bus, tree with repeaters		
Medium	Twisted-pair cables, RS 485 interface		
Network speed and length	Speed Baud (kbits/s)	Length (without repeater)	Length (with repeater)
Profile/Version	9.6	1200 m	10 km
	19.2	1200 m	10 km
	45.45	1200 m	10 km
	93.75	1200 m	10 km
	187.5	1000 m	6 km
	500	400 m	1 km
	1500	200 m	600 m
Max. number of stations	32, up to 126 with repeaters		
Bus access	Polling of the master to the slave components (design with one or more masters)		
Addressing	Via 2 decimal encoders on the SMARTRONIC PC's printed circuit board		
Control bus variables	6 input bytes 6 output bytes		
Bus terminal resistor	A terminal resistor is integrated in each slave component of SMARTRONIC PC Profibus DP which can be activated via a switch on the printed circuit board.		
Supported operations	Cyclic data exchange, Sync mode, Freeze mode		



Materials

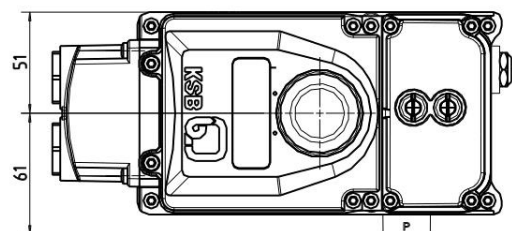
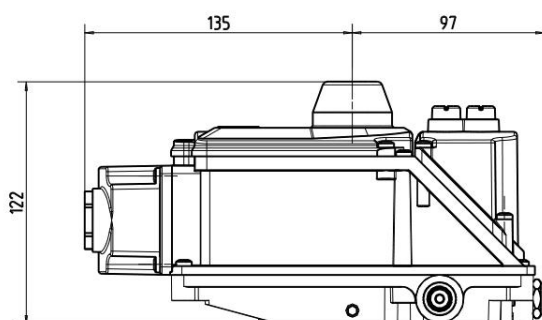
Exploded view



**List of components**

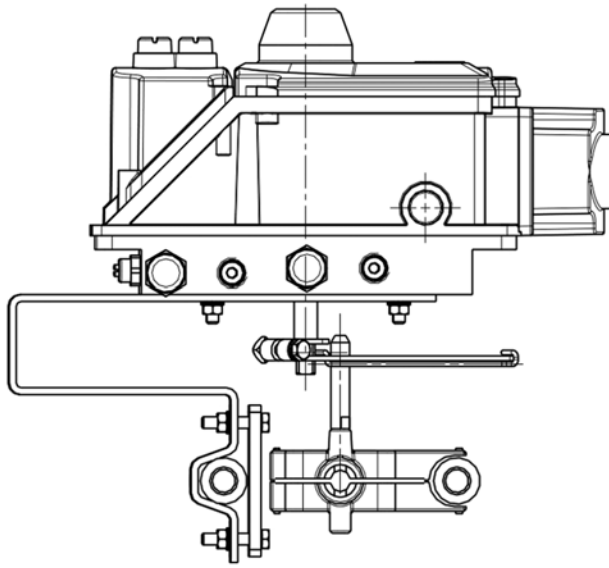
Part No.	Description	Material
160	Cover	Polycarbonate SM60/0
160.1	Cover (directional control valve)	Polycarbonate SM60/0
163.1	Housing (directional control valve)	Polycarbonate SM60/0
191.2	Support	PA 6.6
198.1	Connection plate	
210.1	Actuating stem	Polycarbonate SM60/0
314.1	Stop disc	Stainless steel 304L
410.1	Profile joint	NBR70
410.2	Profile joint	NBR70
410.3	Profile joint	NBR70
410.4	Profile joint	NBR70
410.5	Profile joint	NBR70
410.7	Profile joint	NBR70
410.8	Profile joint	NBR70
410.11	Profile joint	NBR70
412.1	O-ring	NBR70
412.2	O-ring	NBR70
412.3	O-ring	NBR70
412.6	O-ring	NBR70
462.1	Spring washer	
554.1	Washer	Stainless steel
554.2	Washer	Stainless steel
554.4	Serrated washer	Steel
629	Visual indicator assembly	
62-2	Adjustable cams assembly	
69-12	Housing	Polycarbonate SM60/0
745.1	Filter	
745.2	Filter	Bronze
74-6.1	Distribution plate	

Part No.	Description	Material
74-7.1	Directional control valve	
74-7.2	Pilot valve	
747.1	Profile joint (valve)	
79-11	Flow reducer RP 1/8"	
81-1.1	Plug connector/aerial assembly	
81-84.1	Circuit diagram	
816	Angle sensor assembly	
817.1	Plug	
82-2.1	Printed circuit board	
82-2.2	COM printed circuit board assembly	
88-5	1/4" BSP silencer	Bronze
890	Base	Polycarbonate SM60/0
96-2.1	Locking plate	Polycarbonate SM60/0
96-3	Manual override	Polycarbonate SM60/0
900.1	Screw	A2-70
900.2	Socket head cap screw	A2-70
900.3	Socket head cap screw	A2-70
900.4	Socket head cap screw	A2-70
900.5	Socket head cap screw	A2-70
900.6	Sheet metal screw	A2-80
903.1	Plug	
916.1	Screw plug	
916.2	Protective cap	Rubber
916.4	Elastomer string	NBR HT 70
932.1	Circlip	Steel
932.2	Reinforced circlip	Steel
950.1	Closing spring	
950.2	Manual override spring, lockable	Stainless steel
970.1	Plate	Adhesive polyester

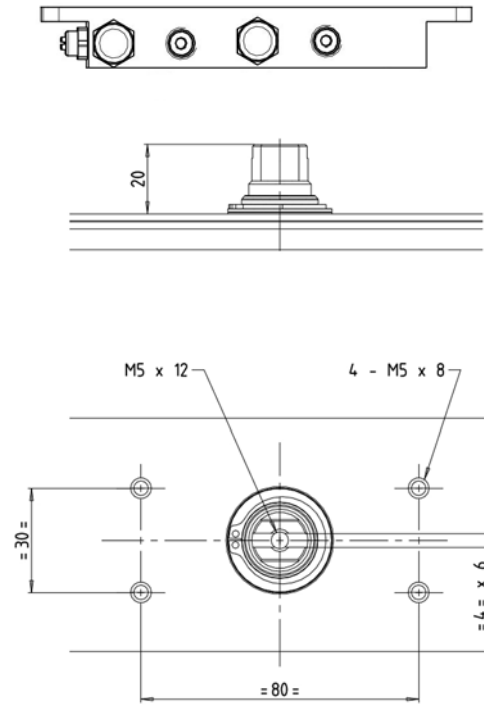
**Dimensions**


Variants

Mounting to linear actuator NAMUR



Base for actuators with VDI/VE 3845 interface, not applicable to ACTAIR and DYNACTAIR



**Purchase order data**

<b>SMARTRONIC PC</b>	R001312	0	0	0	0	0	4	.	R	7	.	.	.	.	0	6	.	.
<b>Sensors</b>																		
Auto-calibrating		0	0	0	0	0												
<b>Actual-position feedback</b>																		
Actual-position feedback via passive 4-20 mA signal (2 wires)							4											
<b>Electrical output</b>																		
2 cable glands, metal, M20 IP67 (diameter: 6 to 12)								2										
<b>Directional control valve</b>																		
4/3 closed in centre position - Position (POS)									R									
<b>Power supply, directional control valve</b>																		
24 V DC										7								
<b>Actuator</b>																		
ACTAIR 3 to 200, stop position: Closed											2							
ACTAIR 3 to 200, stop position: Open											3							
ACTAIR 400 to 1600											4							
DYNACTAIR 1.5 to 25, Fail Close in the event of air supply failure											6							
DYNACTAIR 1.5 to 25, Fail Open in the event of air supply failure											7							
DYNACTAIR 50 to 100, Fail Close in the event of air supply failure											8							
DYNACTAIR 50 to 100, Fail Open in the event of air supply failure											9							
DYNACTAIR 200 to 800, Fail Close in the event of air supply failure											J							
DYNACTAIR 200 to 800, Fail Open in the event of air supply failure											K							
Pneumatic quarter-turn actuator, double-acting											W							
Pneumatic quarter-turn actuator, single-acting											X							
Pneumatic linear actuator, double-acting											Y							
Pneumatic linear actuator, single-acting											Z							
<b>Fail-safe position</b>																		
Fail Close in the event of power supply failure												A						
Fail Open in the event of power supply failure												B						
Fail-in-last in the event of power supply failure												C						
<b>SMARTRONIC</b>																		
Programmable curves for opening/closing													1					
Intelligent positioning													2					
Monitoring via external signal													3					
Control													4					
Filter tank level control													5					
<b>Field bus</b>																		
None															0			
Profibus DP															2			
<b>Heating resistor</b>																		
None																0		

SMARTRONIC PC	R001312	0	0	0	0	0	4	.	R	7	.	.	.	.	0	6	.	.
<b>Position indicator</b>																		
3D sight glass																6		
<b>Configuration</b>																		
RS232 (plug connector M12x1.5)																	1	
Ethernet (plug connector M12x1.5)																	2	
Wi-Fi 802.11																	3	
<b>Diagnosis</b>																		
Without																		0
With																		1

