

Automatic filters

Accessories

Differential pressure switches, measuring and display units, valves, electric control units, secondary processing

1. Features

The greatest possible potential offered by MAHLE automatic filters is only achieved by combining them with the right accessories. These include the following attachment parts:

- Differential pressure switches, measuring and display units
- Valves
- Electric control units
- Secondary processing



2. Differential pressure switches, measuring and display units

The efficiency of an automatic filter is only evident when it is working optimally. This encompasses both the filtration as well as automatic cleaning. In practice, this is usually controlled by

either differential pressure or time. In order to be able to offer you the optimum solution, MAHLE has various measuring instruments available for a wide range of different process tasks..

2.1 Differential pressure switches

Analogue differential pressure switches are a low-cost option for monitoring processes. Changes in pressure are recorded within this differential pressure switch by changes in a piston path. When the switching point is reached, the red indicator button pops out of the optical display and the electrical contact switches. If the differential pressure falls again, the indicator button remains out, the electrical contact reverts. The indicator button must be reset in its original position manually (manual acknowledgement). The switching function can be changed by turning the switching part through 180° and reconnecting it (normally closed or normally open). When delivered, it is in the normally closed state.

The electrical maintenance indicators, which are mentioned in the MAHLE list of released products, are simple electrical devices according to DIN EN 60079-11, without own supply voltage. The electrical components consists of reed-contacts, bimetal switches, plug connections and terminal clamps.

For equipment group II, category 2 G (zone 1) and category 2 D (zone 21), these simple electrical components can be used acc. EN 60079-14 and EN241-11 in intrinsically safe circuits [EEX ib] without making and certification.

The EN 60079-12 (gas) and EN 61241-14 (dust) Installation regulations have to be observed as well as the national security terms and accident prevention regulations.

- Low-cost monitoring unit
- Optical and electrical display with check function
- Normally open/normally closed combination
- Worldwide distribution

Please contact us for detailed technical information about use of differential pressure switches in ATEX areas.

2.1.1 Technical data						
	PiS 3076	PiS 3077	PiS 3079	PiS 3192	5.01	5.02
Switching point/ Differential pressure	PiS 3076/0.3*	PiS 3077/0.3	-	-	-	-
	PiS 3076/0.7	PiS 3077/0.7	PiS 3079/0.7	-	5.01/0.7	5.02/0.7
	PiS 3076/1.2	PiS 3077/1.2	PiS 3079/1.2	-	-	-
	PiS 3076/2.2	PiS 3077/2.2	PiS 3079/2.2	PiS 3192/2.2	-	-
Max. stat. operating pressure	63 bar	63 bar	63 bar	450 bar	100 bar	100 bar
Perm. operating temperature	10 bis+120 °C					
Max. perm. viscosity	1000 mm ² /s					
Type of contact		without			5.01 C0 without	5.02 C0 without
	1 contact NO/NC	-	1 contact NO/NC	1 contact t NO/NC	5.01 C1 1 contact NO/NC	5.02 C1 1 contact NO/NC
	-	-	-	-	5.01 C2 2 contacts 75+100% NO+NO/NC	5.02 C2 2 contact 75+100% NO+NO/NC
Electr. connection	Wiring box DIN EN 175301-803	-	M12x1 (4-pole)	Wiring box DIN EN 175301- 803	Terminal strip	Terminal strip
Process connection	2x G ¹ / ₈ direct	2x G ¹ / ₈ direct	2x G ¹ / ₈ direct	2x G ¹ / ₈ via mounting block	2x R ¹ / ₄ connected to pipes	2x R ¹ / ₄ connected to pipes
Material Upper part/lower part/membrane	PA6/Al/FKM**	PA6/Al/FKM**	PA6/Al/FKM**	PA6/stainless steel /FKM**	5.01/... AlSi12/ALhc/FKM* *	5.02/... AlSi12/VA/FKM**
	PiS 3076 V2A PA6/VA/FKM**	PiS 3077 V2A PA6/VA/FKM**	PiS 3079 V2A PA6/VA/FKM	-	-	-
Switching voltage	250 VAC/200 VDC	-	250 VAC/200 VDC	250 VAC/200 VDC	250 VAC/200 VDC	250 VAC/200 VDC
Max. Switching current	1 A	-	1 A	1 A	1,5 A	1,5 A
Protection class DIN 40050	IP 65	-	IP 65	IP 65	IP 65	IP 65

*Switching point in bar – for example 0.3 bar






** Fluororubber

NO = normally open contact, NO/NC = changeover contact

2.2 Analogue manometers and digital differential pressure measuring and switching units

Alongside low-cost pressure switches, MAHLE also offers you digital differential pressure manometers for process monitoring and control. The differential pressure manometers allow you to adapt the switching point for cleaning optimally to your process. The differential pressure can be read off conveniently at any time on the LED display. As an option, you can tap an analogue

signal, which allows your process to be monitored from a measuring station, 0 to 10V or 4 to 20mA. MAHLE offers different measuring units and connections for the respective task, depending on the process. You will also find suitable solutions for potentially explosive areas here..

2.2.1 Technical data					
	Gauge	PiS 3340	PiS 3170	PiS 3175	PiS 3180 Ex
					
	Analogue display	No display	Digital display		
Basic measuring range differential pressure	0 to 16 bar	0 to 4 bar	0 to 40 bar	0 to 6/0 to 40 bar	-1.3 to 16 bar
Max. operating pressure (overpressure-resistant)	25 bar	16 (20) bar	40 (80) bar	16 (32)/40 (80) bar	16 (40) bar
Perm. temperature	< 70 °C	-20 to +80 °C	-10 to +70 °C	< 80 °C (optional max. 200 °C version available)	-25 to +85/+150
Protection class DIN 40050	IP 54	IP 65	IP 65	IP 65	IP 65
Nominal voltage	-	24	24	24	24
Perm. operating voltage	-	19 to 28 VDC	12 to 32 VDC	12 to 32 VDC	13.5 to 45 VDC
Output signal	-	4 to 20 mA	4 to 20 mA/ 0 to 10 V	4 to 20 mA/0 to 10 V	4 to 20 mA + Hart 5.1
Switching contacts	-	-	2 relay contacts NO/NC programmable	2 relay contacts NO/NC programmable	-
Measured value display	analogue	-	3.5-line LED	3.5-line LED	5-line LED
ATEX	No ATEX marking necessary	-	-	(optionally available in Ex 3G)	Ex II 2G Exd IIC T5
Electr. connection	-	M12x1	M12x1 for supply and 2 switching contacts + M8x1 analogue output signal	M12x1 für Versorgung u. 2 switching contacts + M8x1 analogue output signal	M20x1,5 wiring through terminals
Process connection	G1/4 (inside)	G1/8 (inside)	2x G1/8, mechanical joint suitable for direct fitting to MAHLE filters	Pressure transmitter connection: 2x G1 optionally with flange 2x DN 25 PN40	2x remote seal DN 25 PN40 with capillary tube
Housing material	Stainless steel	CuZn	Polyamide PA	Polyamide PA	Stainless steel/Al
Material which comes into contact with media	CuZn (inside)	CuZn, ceramic	Stainless steel, FKM*, CuZn, ceramic	Stainless steel, FKM*	Stainless steel
Certificate	-	-	-	-	ATEX, GOST

* Fluororubber

3. Valves

One important component of MAHLE automatic filters are the valves, through which automated processes are possible in the first place. The built-in valves on the automatic filter control the

different volume flows from the filter. MAHLE offers suitable valves for every filtration process. Special versions can also be provided on request.

3.1 Check valves

In the automatic filter segment, check valves are mainly used on draining or emptying connections with nominal widths greater than or equal to DN 50.

Advantages:

- Low-cost variant from DN 80 onwards
- Selection of manually actuated, electric/pneumatic (EL/PN) or purely electric versions (EL)
- Different material compositions allow ideal adaptation for every process
- Electrical standard connection device socket DIN 43650, also as M12x1 if required

Special versions:

- High-temperature versions
- Brands according to customer requirement
- Special materials
- ATEX version
- ISO 1
- Metal-to-metal sealing



Example illustration

3.1.1 Technical data

Nominal width	Max. operating pressure [bar]	Temp. of the medium [°C]	Ambient temperature [°C]	Actuation/ mode of operation	Nominal voltage [V]	Material			Ex protection
						Housing	Flap	Seal	ATEX 2014/34/EC
DN 80 - DN 1000	PN6 - PN16	-10 to +80	-20 to +80	Manual or EL or EL/PN/ double operation	24 VDC (EL/PN), 24 VDC (EL), 230 VAC (EL)	CuZn, GGG*, stainless steel	stainless steel	FKM**, PTFE	Optionally in Ex II 2G T3

*Nodular cast iron

**Fluororubber

Special versions on request.

3.2 Ball valves

Advantages:

- Virtually pocket-free design
- Small dimensions
- High air-tightness
- Full passage
- Different material compositions allow ideal adaptation for every process
- Electrical standard connection DIN 43650, optionally M12x1

Special versions:

- High-temperature versions
- High-pressure versions
- Brands according to customer requirement
- Special materials
- ATEX version
- Heating jacket



Example illustration

3.2.1 Technical data									
Nominal width	Max. operating pressure [bar]	Temp. of the medium [°C]	Ambient temperature [°C]	Actuation/ mode of operation	Nominal voltage [V]	Material			Ex protection
						Housing	Flap	Seal	
G½ - G2½, DN25- DN100	PN40	-10 to +120	-20 to +80	Manual or EL or EL/PN/ double operation	24 VDC (EL/PN), 24 VDC (EL), 230 VAC (EL)	CuZn nickel plated, C-steel, stainless steel	CuZn hard chrome plated, stainless steel	FKM*, PTFE	ATEX 2014/34/EC Optionally in Ex II 2G T3

* Fluororubber
Special versions on request.

4. Electric control units for automatic filters

A control workflow adapted to the functions of MAHLE automatic filters is important for smooth operation, optimum adaptation to the filtration task and the right reaction to operating conditions. Where electrical actuation cannot be taken over by the whole system incorporating an automatic filter, a decentral MAHLE control box for automatic filters can be used.

Adaptation of the existing control cabinets and software is very complex in retrofit situations as well, which means a separate control for the automatic filter is an economic solution in such situations too. MAHLE automatic filter control units have respective exchange contacts for meaningful communication options.

4.1 Electric control unit MFS-AF

Universal control unit for all MAHLE automatic filter types. the optimum control functions and control parameters can be set using software parameters. The filter cleaning workflow can be triggered via the control contact of a differential pressure measuring unit or switch. In addition, it can be combined with a time function or be controlled exclusively by the time function. Time and counting functions are optionally available for drain valve control. Controlled by a release contact, triggering of filter cleaning is only carried out when there is an external release. A fault message contact reports faults to higher-order control points.

- Prepared for all automatic filter series
Adaptation through software configuration
- Micro-PLC made by Siemens of the type LOGO! with display
- Service-friendly operation
- Sturdy style
- Compact design
- Versions for different supply voltages
- Versions with different motor protection relays to match the nominal current of the automatic filter drive motor
- Versions with switch amplifier for actuating filters in potentially explosive areas (control box outside the potentially explosive area)
- Versions for parallel-operation installation for two automatic filters
- Input for external release for filter cleaning
- Collective fault message
- Cable markings
- Operating equipment markings included in the scope of supply



Example illustration

4.1.1 Technical data		
Housing	Material	Steel plate coated in RAL 7035
	Housing protection class DIN 40050	IP 65
	Dimensions	400x500x210
Electrical data	Supply voltage	standard 3~ 230/400 - 500 V/PE/50 Hz + 60 Hz, others on request
	Pre-fuse/power supply cable (recommended)	10 A/5x2.5 mm²
	Control voltage	24 VDC
	Motor feeder/motor protection switch	3~ 400 V, standard 0.6 to 1.0 A, optional: 0.4 to 0.6 A, 1.0 to 1.6 A
	Switching outputs 24 VDC	Switching outputs for valves, each with up to 5 A load
	Contact exchange	Release (external potential-free), fault message: Changeover contact NO/NC potential-free
	ATEX	Version MFS-AF EX with switch amplifier for actuating filters in potentially explosive areas (control box outside the potentially explosive area)
	Electrical connections	Terminal strip

4.2 Digital differential pressure measuring unit with control function PiS 3170 MFC

The MAHLE automatic filter variants with pneumatic drive are particularly interesting for retrofit purposes, since the drive energy comes from the compressed air network while the 24 V control voltage of a system is used for the control functions. This means a 400 V power pack does not have to be retrofitted and intervention in the system software is not necessary.

The control functions are realised by the correspondingly extended MFC variant of the tried-and-trusted digital differential pressure measuring unit PiS 3170.

Automatic filters with pneumatic drive and PiS 3170 MFC work independently and fully automatically (if required: cleaning only following external release). Communication with higher-order system control via contact exchange for release, start of filter cleaning and fault message.



- For automatic filters with pneumatic rotary drive
- Kompakt
- Low cost
- Two pressure sensors measure the input and output pressure at the filter, the display and control unit uses these values to determine the differential pressure.
The differential pressure display unit PiS 3170 MFC can display all three pressure values.
- Differential pressure is an indicator for filter blockage and is used to control automatic filter cleaning.
- The first differential pressure switching point triggers filter cleaning, the second differential switching point triggers a fault message output
- Measuring range 0 to 16 bar for input, output and differential pressure
- Resistant to overpressure up to 32 bar
- Power supply: 24 VDC
- 4 switching outputs for valves, each with up to 0.5 A load
1 output for rotary drive, up to 1.0 A load
- Outputs protected against short-circuit and overload, free-wheeling diode prevents faults with inductive loads
- Input for external release for filter cleaning
- Input for external start of filter cleaning
- Fault message output
- No 400 V power pack, no intervention in electrical system control units necessary

Example illustration

4.2.1 Technical data		
Operating data	Basic measuring range	0 to 16 bar
	Max. stat. operating pressure	32 bar
	Perm. media temperature	-10 to +70°C
	Housing protection class DIN 40050	IP 54
Electrical data	Supply/control voltage	24 VDC
	Switching outputs 24 VDC	4 switching outputs for valves, each with up to 0.5 A load 1 output for rotary drive, up to 1.0 A load
	Measured value display	3 digits + sign
	ATEX	Not available at the moment
	Electrical connections	Terminal strip, cable glands
Connections	Process connection	Inner thread G ¹ / ₈ , suitable for direct fitting to MAHLE filters
Materials	Sensor in contact with media	Stainless steel, FKM (fluororubber), NBR
	Housing	Polyamide PA

5. Secondary processing

5.1 Sedimentation tank

The MAHLE sedimentation tank is a convenient secondary processing stage to trap the backflush and sludge volume from the MAHLE automatic filter and collect particles which can be sedimented in a sediment strainer tank.

- Can be used for MAHLE automatic filters of the types VARIO series 2 and 3
- Coarse dirt is trapped in the strainer and can then be easily disposed of or further processed
- Low maintenance effort
- Mounting concept adapted to MAHLE automatic filters
- Available in two different sizes

5.1.1 MAHLE sedimentation tank type 1

- 2 strainers
- Separate draining area for the second strainer
- Attachment bracket for automatic filter

Width x depth:	530x700 mm
Tank height:	580 mm
Height with filter bracket:	1395 mm

5.1.2 MAHLE sedimentation tank type 2

- 1 strainer
- Draining area for strainer on the opened cover
- Attachment bracket for automatic filter

Width x depth:	530x700 mm
Tank height:	580 mm
Height with filter bracket:	1395 mm

5.2 MAHLE fine dirt discharger MFA 500

Particle concentrate from MAHLE automatic filters is processed by sedimentation by the MAHLE MFA 500. MFA 500 is an automatic particle discharge system. Sedimented particles are discharged from the tank sump via a scraper conveyor.

The combination of MAHLE automatic filter with MFA 500 and electric control box MFS-AF results in a complete, ready-to-operate and fully automatic filter station (see illustration).

- Tank with attachment bracket for automatic filter
- For automatic filters of the VARIO series 2 and 3
- Calmed inlet zone to prevent turbulence
- Scraper conveyor chain with clearing strips, driven by gear motor
- Mechanical safety switch to prevent operation with the cover open
- Maintenance-friendly

5.2.1 Technical data

Width x depth:	500x700 mm
Tank height:	500 mm
Height with filter bracket:	1315 mm
Discharge tank:	485x200x100 mm
Drive via angled gear motor:	230/400 VAC/50 Hz 0.09 kW
Return flow connection:	Rp 1½"
Drain screw:	Rp ¾"



Example illustration



Example illustration

5.3 MAHLE dry separator MTS 10

The MTS 10 combines the properties of the MFA and the MAHLE sedimentation tank. Thanks to its large capacity, it can cope with the drain volume flows from several automatic backflush filters.

The MTS 10 combines the following processes:

- Sedimentation
- Fluid extraction
- Filtration
- Dry retentate discharge

5.3.1 Technical data

Electrical power requirement:	230/400 VAC
Power consumption:	2,2 kW
Drive via angled gear motor:	230/400 VAC 50 Hz 0,18 kW
Max. operating temperature:	80 °C
Noise emission (briefly):	< 70 dB(A)
Overall empty weight (without valves):	approx. 650 kg
Width x depth:	1350x1144 mm
Tank height:	1906 mm
Height MTS 10:	2047 mm
Max. volume capacity:	930 l

Functional description:

The backflush retentate is discharged at intervals from the automatic filter into the buffer tank of the MAHLE dry separator. This serves as a sedimentation tank at the same time. There is a MAHLE automatic filter of the smaller VARIO series (AF 73) integrated in this tank.

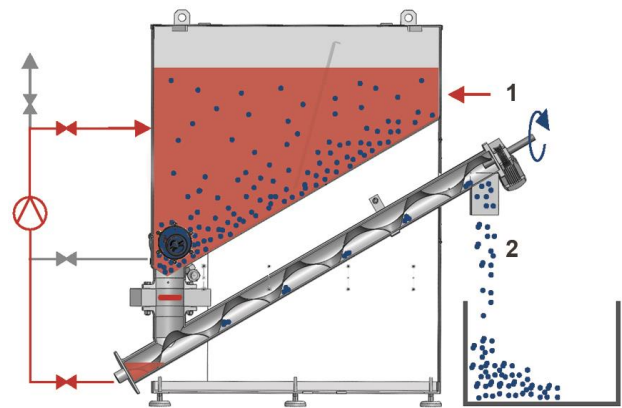
The fluid phase is extracted through the automatic filter via a sturdy suction pump mounted in the housing. The filter fineness should correspond to that of the main volume flow filtration. The automatic filter leaves the solids in the tank. Filtration and sedimentation results in a solid concentrate. In the next step, this is drained in seconds through a large-sized gate valve into the inclined pipe screw conveyor located underneath.

Due to the special tank design, all the sedimented solids are picked up. The inclined screw conveyor is operated at a low rotating speed and intermittently, and transports the solids slowly upwards and out of the fluid. The solids are dried off well through movement through the long conveyor. The dry solid is ejected directly into a waste container. After the gate valve has closed the buffer tank can be filled again with retentate from the next backflush process. The residual fluid in the inclined screw conveyor is extracted by the suction pump and pumped back into the retentate tank. The retentate processing cycle then begins again.

Technical data is subject to change without notice.



Example illustration



1 = back flush material
2 = dry solid

Example illustration

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