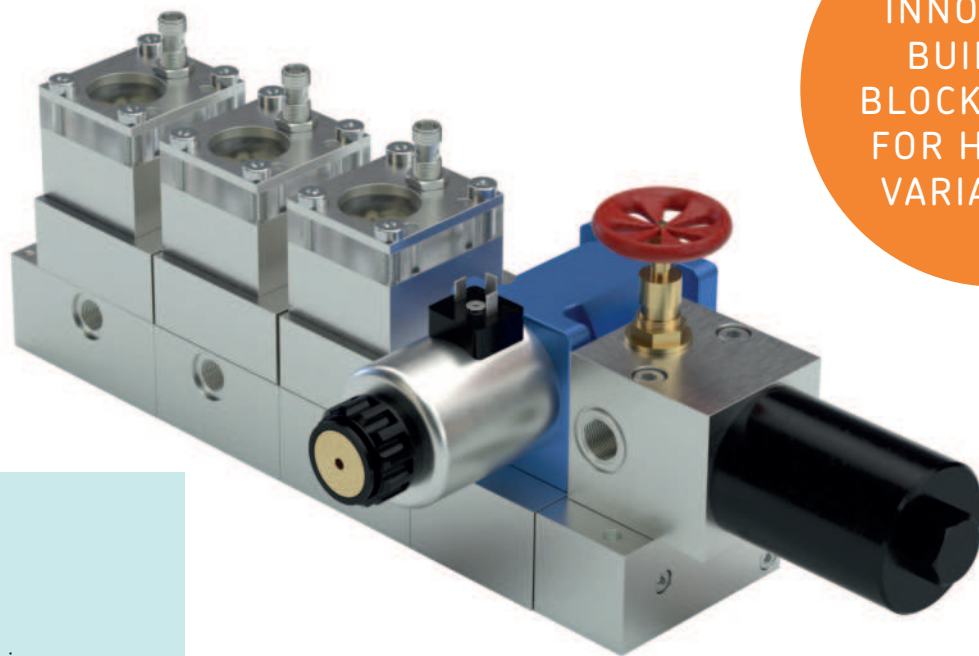


Flow limiter series SMBM

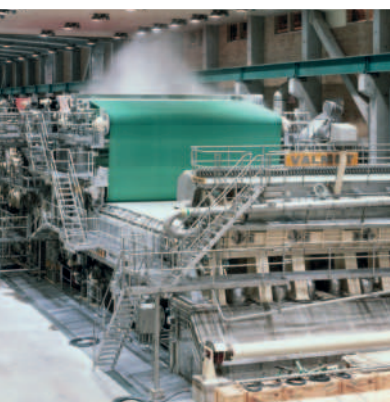
For base plate mounting, for use in oil circulation lubrication systems

INNOVATIVE
BUILDING
BLOCK DESIGN
FOR HIGHEST
VARIABILITY

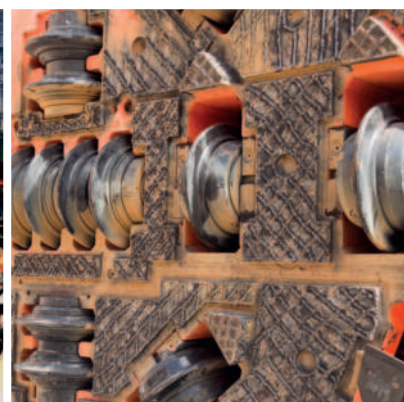


Advantages:

- Modular design
- Constant oil flow
- Self-adjusting metering
- Identical oil flows despite different back pressures
- Wide viscosity range
- Virtually independent of viscosity
- ATEX versions available



- Easy system design
- Space-saving installation
- Easy start-up, no adjustment required
- Effective monitoring of correct oil flow



Oil circulation lubrication systems with SKF flow limiters

Application

Flow limiters are used in oil circulation lubrication systems. They feed specified individual oil flows to each lubrication point of the connected system. These individual oil flows are non-sensitive to system pressure changes and virtually independent of viscosity.

That makes them an ideal solution for applications with changing oil temperatures like in steel mills or mining. Their self-adjusting working principle makes sophisticated pressure control devices obsolete.

The SMBM flow limiter series is designed for base plate mounting in modular banks of 1-6 flow limiters.

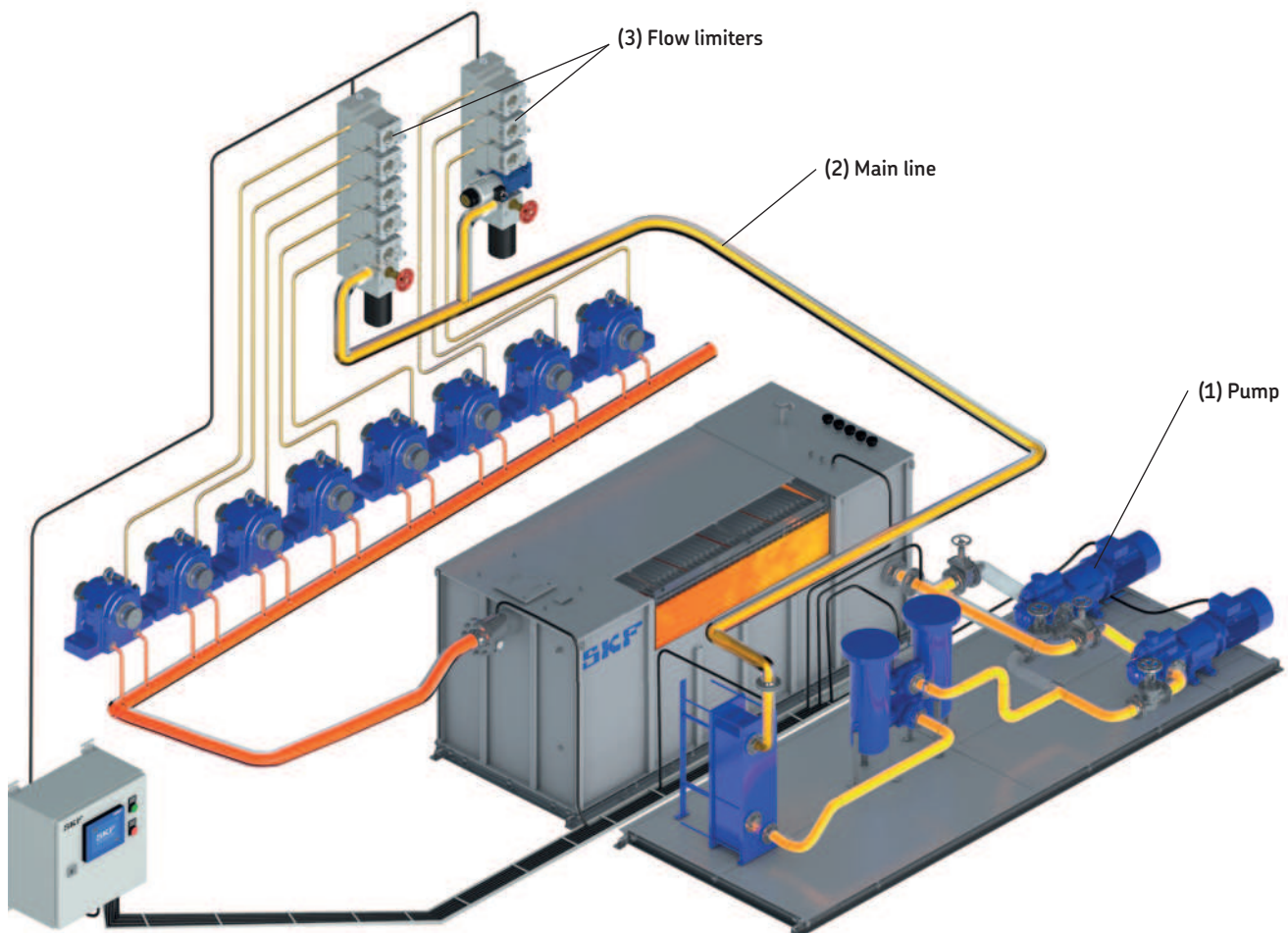
Using interchangeable plug-in nozzles, the oil flow can be set stepwise from 0.08 to 8 l/min (0.17 to 16.9 pts/min).

System set-up

A pump (1) sends oil to the main line (2). Attached to the main line are the flow limiters (3) or flow dividers which divide the oil flow into constant smaller flows. Optionally, progressive metering devices can be mounted downstream of the flow limiters to further split the oil flow into smaller portions.

Signal transmitters, piston detectors or gear meters mounted on the flow limiters monitor the oil flow for each individual device.

They are connected to a monitoring unit.



How it works

The total oil flow Q_{in} entering a bank of flow limiters mounted on a base plate is divided up into individual oil flows Q_{out} .

The system pressure, being the input pressure p_1 , is the same for all flow limiters mounted on the same base plate.

Every flow limiter has a spring loaded control piston with 1 plug-in nozzle **D1** (SMBM-X) or 2 plug-in nozzles **D1/D2** (SMBM-V) which acts as a differential pressure regulator.

The non-adjustable plug-in nozzles (**D1** or **D1/D2**) on the control piston determine the rated oil flow (\rightarrow figure 1 and 2) while **D3** is a variable orifice formed by the circular edge of the control piston and a ring of outlet bores in the piston race.

The opening of this variable orifice **D3** is a result of the pressure **balance between p_1 and p_2** and the spring force on the control piston.

Given the relatively short hydraulic length of the orifice defined by the plug-in nozzles **D1** or **D1/D2**, the influence of viscosity is low. Therefore, the oil flow is only influenced by the differential pressure p_1/p_2 which is constant.

Consequently, the resulting oil flow is constant.

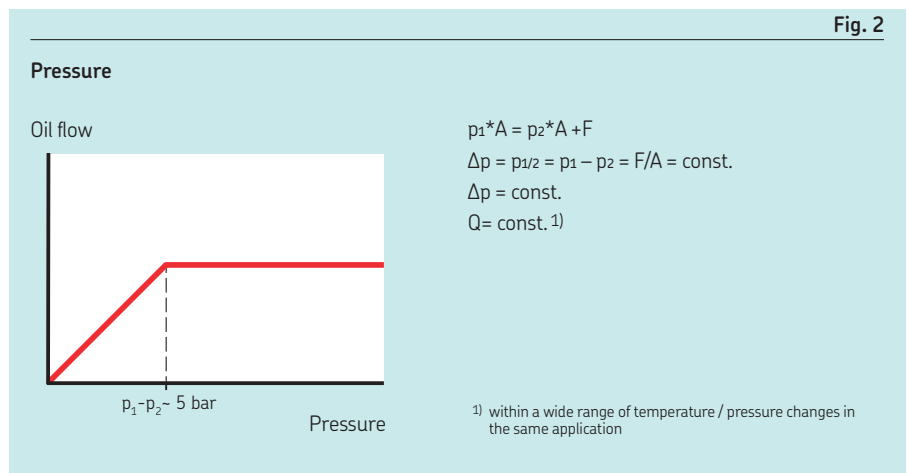
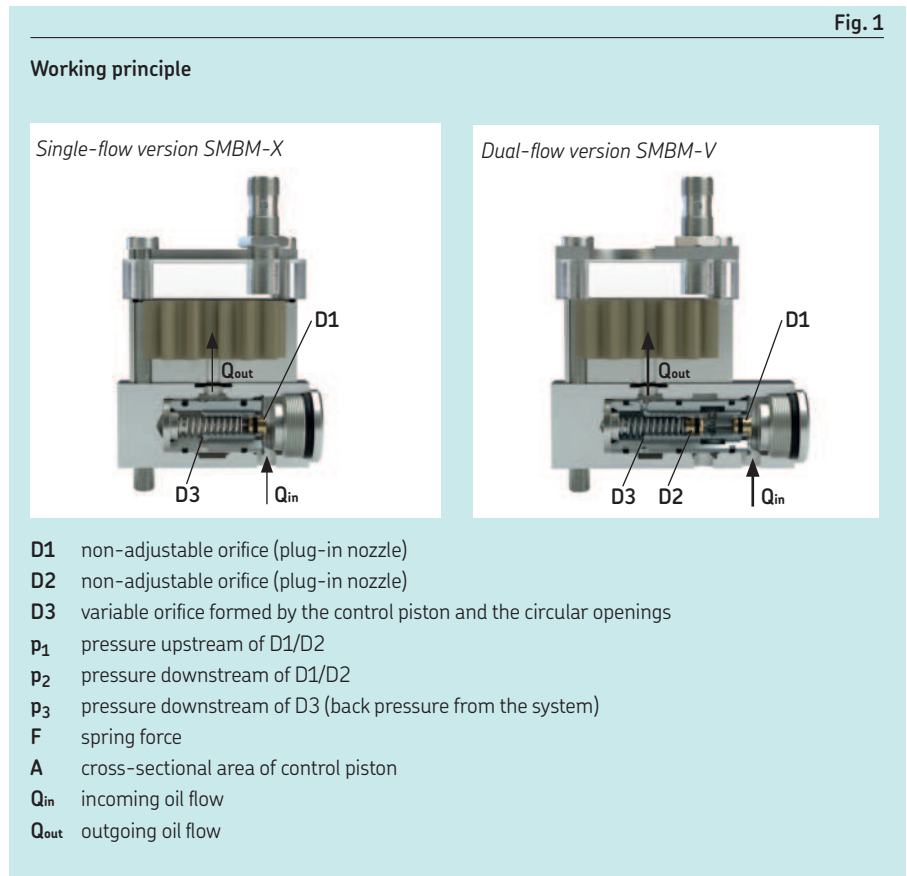
Pre-requisites

For the proper function of the flow limiter, p_1 must always be greater than the differential pressure p_1/p_2 plus the back pressure downstream of the flow limiter.

$$p_1 > p_1/p_2 + p_3$$

We recommend to choose the feeding oil pump with approx. 15% of reserve.

$$Q_{pump} \geq 1,15 * \Sigma Q_{in}$$



Flow limiter oil circulation lubrication systems involving downstream mounted progressive metering valves are usually operated at 20–25 bar (290–360 psi) system pressure. For pure flow limiter systems without progressive metering valves, we recommend 16 bar (230 psi).

Flow limiter series SMBM

Overview

Dual-flow version SMBM-V

Requires use of a
change-over valve

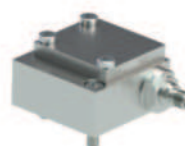
Single-flow version SMBM-X



SMBM-X 11/12/13



SMBM-V 11/12/13



SMBM-X 31



SMBM-V 31

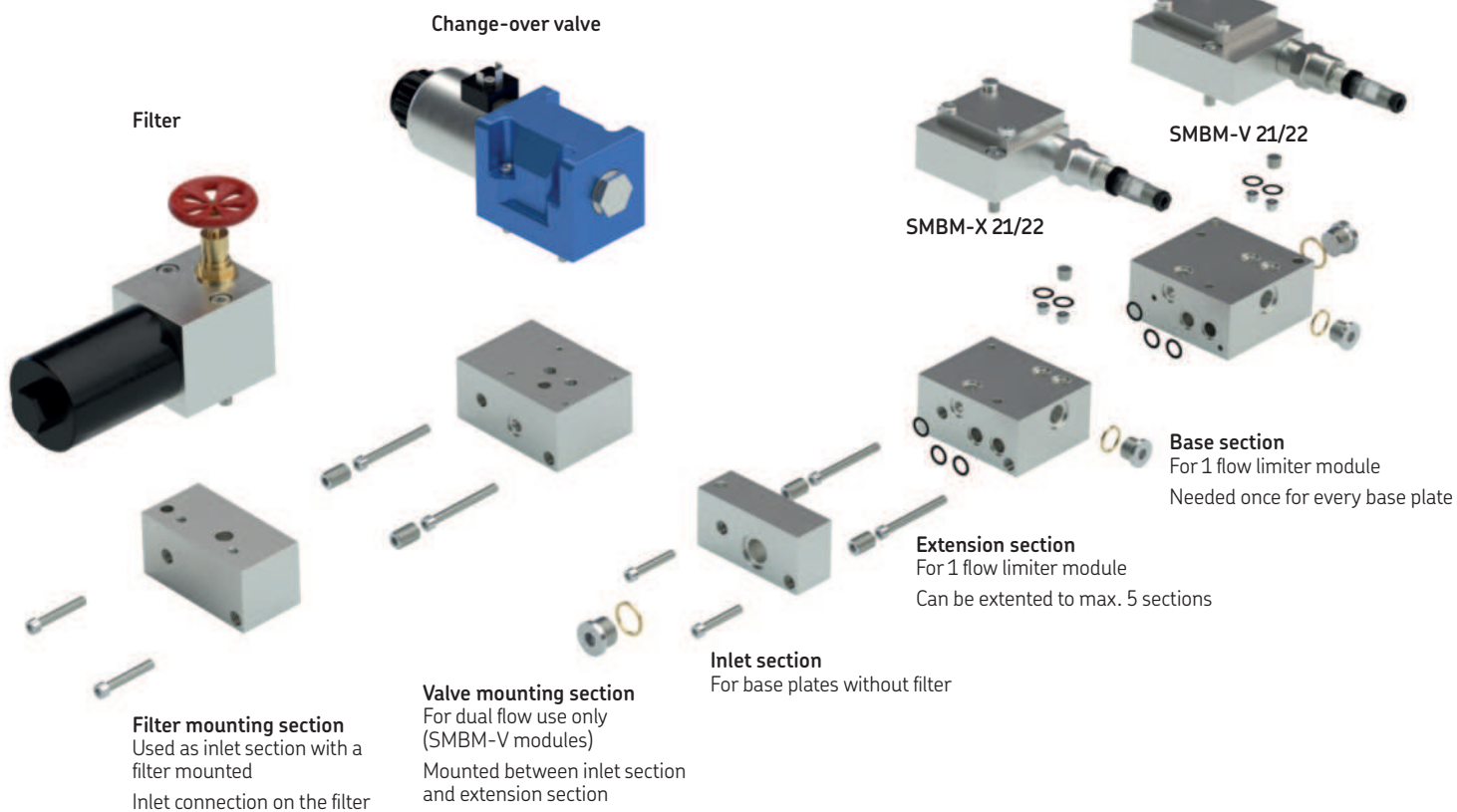


SMBM-X 21/22



SMBM-V 21/22

Attachments



Flow limiter series SMBM

Single-flow with position monitoring – SMBM-X 21/22/31

Flow regulating valve with fixed output based on pressure balance

Functional description →page 3

SMBM-X 21/22

Monitoring by signal transmitter



SMBM-X 31

Monitoring by piston detector



Order codes

SMBM-X →page 14
 Base plate mounting →page 9
 Output oil flow →pages 10/11

Technical data

Type/principle of operation	2-way flow control valve with a fixed set-point
Type of monitoring	Signal transmitter or piston detector (go/no-go signal)
Mounting position	Any (w/o filter); Vertical (with filter)
Ambient temperature	0–70 °C (32–158 °F)
Lubricant temperature	0–70 °C (32–158 °F)
Material	EN AW-6061-T651, anodized
Weight SMBM-X 21/22	0.87 kg (1.92 lbs)
SMBM-X 31	0.81 kg (1.79 lbs)
Dimensions w/o monitoring (LxWxH)	79x79x45 mm (3.11x3.11x1.77 in)
Nominal flow	0.08–8 l/min (0.17–16.9 pts/min)
Working pressure p ₁	
Without electrical monitoring	5–200 bar (72.5–2 900 psi)
SMBM-X 21/22	5–100 bar (72.5–1 450 psi)
SMBM-X 31	5–85 bar (72.5–1 230 psi)
Required differential pressure (p ₃ -p ₁)	≥ 5 bar (72.5 psi)
Lubricant	Mineral oils, synthetic oils
Operating viscosity	20–600 mm ² /s

Single-flow with gear meter – SMBM-X 11/12/13

Flow regulating valve with fixed output based on pressure balance

Functional description →page 3

SMBM-X 11/12/13

Monitoring by gear meter with screwed-in pulse sensor



Order codes

SMBM-X →page 14
 Base plate mounting →page 9
 Output oil flow →pages 10/11

Technical data

Type/principle of operation	2-way flow control valve with a fixed set-point
Type of monitoring	Gear meter with pulse sensor
Mounting position	Any (w/o filter); Vertical (with filter)
Ambient temperature	0–70 °C (32–158 °F)
Lubricant temperature	0–70 °C (32–158 °F)
Material	EN AW-6061-T651, anodized
Weight	1.17 kg (2.58 lbs)
Dimensions (LxWxH)	79x79x90 mm (3.11x3.11x3.54 in)
Nominal flow	0.08–8 l/min (0.17–16.9 pts/min)
Working pressure p ₁	5–50 bar (72.5–725 psi)
Required differential pressure (p ₃ -p ₁)	≥ 6 bar (87 psi)
Lubricant	Mineral oils, synthetic oils
Operating viscosity	20–600 mm ² /s

Flow limiter series SMBM

Dual-flow with position monitoring – SMBM-V 21/22/31

Flow control valve with fixed output based on pressure balance, used with change-over valve

Functional description →page 3

SMBM-V 21/22
Monitoring by signal transmitter



SMBM-V 31
Monitoring by piston detector



Order codes

SMBM-V →page 14
Base plate mounting →page 9
Output oil flow →pages 10/11

Technical data

Type/principle of operation	2-way flow control valve with 2 separate fixed set-points
Type of monitoring	Signal transmitter or piston detector (go/no-go signal)
Mounting position	Any (w/o filter); Vertical (with filter)
Ambient temperature	0–70 °C (32–158 °F)
Lubricant temperature	0–70 °C (32–158 °F)
Material	EN AW-6061-T651, anodized
Weight SMBM-V 21/22	1.03 kg (2.27 lbs)
SMBM-V 31	0.97 kg (2.14 lbs)
Dimensions w/o monitoring (LxWxH)	100x79x45 mm (3.94x3.11x1.77 in)
Nominal flow	0.08–8 l/min (0.17–16.9 pts/min)
Working pressure p_1	
Without electrical monitoring	5–200 bar (72.5–2 900 psi)
SMBM-V 21/22	5–100 bar (72.5–1 450 psi)
SMBM-V 31	5–85 bar (72.5–1 230 psi)
Required differential pressure (p_3-p_1)	≥ 5 bar (72.5 psi)
Lubricant	Mineral oils, synthetic oils
Operating viscosity	20–600 mm ² /s

Dual-flow with gear meter – SMBM-V 11/12/13

Flow control valve with fixed output based on pressure balance, use with change-over valve

Functional description →page 3

SMBM-V 11/12/13
Monitoring by gear meter with screwed-in pulse sensor



Order codes

SMBM-V →page 14
Base plate mounting →page 9
Output oil flow →pages 10/11

Technical data

Type/principle of operation	2-way flow control valve with 2 separate fixed set-points
Type of monitoring	Gear meter with pulse sensor
Mounting position	Any (w/o filter); Vertical (with filter)
Ambient temperature	0–70 °C (32–158 °F)
Lubricant temperature	0–70 °C (32–158 °F)
Material	EN AW-6061-T651, anodized
Weight	1.34 kg (2.95 lbs)
Dimensions (LxWxH)	100x79x90 mm (3.94x3.11x3.54 in)
Nominal flow	0.08–8 l/min (0.17–16.9 pts/min)
Working pressure p_1	5–50 bar (72.5–725 psi)
Required differential pressure (p_3-p_1)	≥ 6 bar (87 psi)
Lubricant	Mineral oils, synthetic oils
Operating viscosity	20–600 mm ² /s

Versions for use in explosive environments

Single-flow with gear meter (ATEX version) – SMBM-X...-EEX

Special version of the SMBM-X 11/12/13 flow limiter

including gear meter with ATEX approved pulse sensor and a full metal cover with sight glass



Order codes

SMBM-X →page 14
Base plate mounting →page 9
Output oil flow →pages 10/11

Technical data

Type/principle of operation	2-way flow control valve with one fixed set-point
Type of monitoring	Gear meter with pulse sensor
Mounting position	Any (w/o filter) Vertical (with filter)
Ambient temperature	0–57 °C (32–134 °F)
Lubricant temperature	0–57 °C (32–134 °F)
Material	EN AW-6061-T651, anodized
Weight	1.17 kg (2.58 lbs)
Dimensions (LxWxH)	79x79x90 mm (3.11x3.11x3.54 in)
Nominal flow	0.08–8 l/min (0.17–16.9 pts/min)
Working pressure p ₁	5–50 bar (72.5–725 psi)
Required differential pressure (p ₃ -p ₁)	≥ 6 bar (87 psi)
Lubricant	Mineral oils, synthetic oils
Operating viscosity	20–600 mm ² /s

Dual-flow with gear meter (ATEX version) – SMBM-V...-EEX

Special version of the SMBM-V 1 flow limiter

including gear meter with ATEX approved pulse sensor and a full metal cover with sight glass



Order codes

SMBM-V →page 14
Base plate mounting →page 9
Output oil flow →pages 10/11

Technical data

Type/principle of operation	2-way flow control valve with one fixed set-point
Type of monitoring	Gear meter with pulse sensor
Mounting position	Any (w/o filter) Vertical (with filter)
Ambient temperature	0–57 °C (32–134 °F)
Lubricant temperature	0–57 °C (32–134 °F)
Material	EN AW-6061-T651, anodized
Weight	1.34 kg (2.95 lbs)
Dimensions (LxWxH)	100x79x90 mm (3.94x3.11x3.54 in)
Nominal flow	0.08–8 l/min (0.17–16.9 pts/min)
Working pressure p ₁	5–50 bar (72.5–725 psi)
Required differential pressure (p ₃ -p ₁)	≥ 6 bar (87 psi)
Lubricant	Mineral oils, synthetic oils
Operating viscosity	20–600 mm ² /s

Signal transmitters (standard and ATEX versions)

For SMBM-X21/22 and SMBM-V21/22 versions




	Standard versions 24-1072-2115 →page 14	24-1072-2114	ATEX version* 24-1072-2123 →page 14
Order number			
Connectors			
Electrical data			
Switching state indication	LED, yellow	None	None
Switching voltage	24 V DC		30 V DC
Switching current	max. 2 A		max. 100 mA
Switching capacity	max. 40 W		
Contacts	NC (normally closed)		
Type of protection	IP 65		IP 65
Explosion protection	n.a.		n.a.
Recommended cable size	2x0.75 mm ²		
Connector	M12x1, PG 7		M12x1, PG 7
Weight	0,2 kg (0.44 lbs)	0,12 kg (0.26 lbs)	0,2 kg (0.44 lbs)
Dimensions			
Length incl. standard connector	128 mm (5.04 in)		128 mm (5.04 in)
Length signal transmitter only	82.2 mm (3.25 in)		82.2 mm (3.25 in)
Thread	M26x1.5		M26x1.5
Technical data			
Type/principle of operation	Magnetic switch (Reed contact)		
Mounting position	Any		
Ambient temperature	0–70 °C (32–158 °F)		* This signal transmitter is rated "simple electrical equipment" in accordance with EN 50020:2002 and must only be operated in intrinsically safe electrical circuits (see manual). max. Ui=30V, Ii=100mA, Pi=1W
Lubricant temperature	0–70 °C (32–158 °F)		
Max. Working pressure	85 bar (1 233 psi)		
Material			
Housing	EN AW-6061-T651, anodized		
Connector	Polyamide		

Pulse sensors for gear meters (standard and ATEX versions)

For SMBM-X/MV 11/12/13..-EEX versions



	Standard version 2340-0000030 →page 14	ATEX version* 2340-0000091 →page 14	
Order number			
Connectors			
Technical data			
Type/principle of operation	Inductive proximity sensor	Inductive proximity sensor	
	PNP	2-wire, NAMUR	
Mounting position	Any	Any	
Ambient temperature	-40 to +70 °C (-40 to +158 °F)	0 to +57 °C (32 to +134 °F)	
Lubricant temperature	-40 to +70 °C (-40 to +158 °F)	0 to +57 °C (32 to +134 °F)	
Material housing	Brass, nickel plated	Stainless steel	
Active area	PBT	PBT	
Electrical data			
Switching state indication	LED, yellow	LED, yellow	
Switching voltage	10–30 V DC		
Nominal voltage		8.2 V DC	
Switching current	0–150 mA		
Power consumption		attenuated ≤ 1 mA unattenuated ≥ 2.2 mA	
Contacts	NO (normally open)	NC (normally closed)	
Type of protection	IP 67	IP 67	
Explosion protection	n.a.	II 1G Ex ia IIC T6 Ga II 1D Ex ia IIIC T135°C Da	
Weight	0.02 kg (0.04 lbs)	0.02 kg (0.04 lbs)	
Dimensions (∅xL)	M12x45 mm (M12x1.77 in)	M12x55 mm (M12x2.17 in)	
			* This pulse sensor must only be operated in intrinsically safe electrical circuits (see manual). Ui=16V, Ii=25mA, Pi=34mW

Piston detector

For SMBM-X31 and SMBM-V31 versions



Order number

24-1884-2785

Technical data

Type/principle of operation	Inductive PNP
Mounting position	Any
Ambient temperature	0–80 °C (32–176 °F)
Lubricant temperature	0–80 °C (32–176 °F)
Max. Working pressure	100 bar (1 450 psi)
Material	
Housing	Stainless steel
Active surface	Stainless steel
Weight	0.05 kg (0.11 lbs)
Length	53 mm (2.09 in)
Thread	M26x1,5

Electrical data

Operating voltage	10–30 V DC
Rated current	max. 100 mA
Short circuit protection	included
Contacts	NC (normally closed)
Type of protection	IP 67
Recommended cable size	3x0.75 mm ²
Connector	M12x1
Switching state indication	LED yellow

Oil filter with shut-off valve

For all versions



Order number*

24-0651-3041

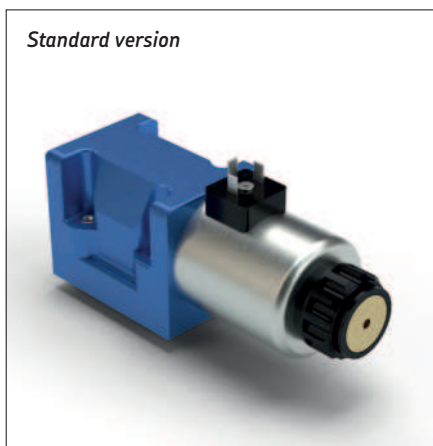
Technical data

Type	Metal mesh filter
Mounting position	Vertical, with filter cartridge downwards
Ambient temperature	0–70 °C (32–158 °F)
Lubricant temperature	0–70 °C (32–158 °F)
Material	
Filter flange	ENAW-6061-T651, anodized
Filter body	Cast iron
Filter element	Stainless steel
Shut-off valve	Brass
Connection port	G1/2 BSPP
Filter mesh size	0.1 mm (100 micron)
Weight	2.2 kg (4.9 lbs)
Dimensions (LxWxH)	178x69x130 mm (7.01x2.72x5.12 in)

* Includes mounting screws and seals
Spare parts → page 14

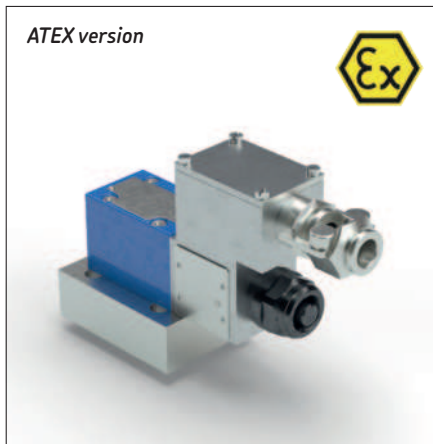
Change-over valve (standard and ATEX versions)

For SMBM-V and SMBM-V...-EEX



Technical data

Type/principle of operation	3/2-way solenoid valve with manual override	
Mounting position	Any	
Max. Working pressure	Standard version 210 bar (3 045 psi)	ATEX version 350 bar (5 075 psi)
Oil temperature range	-20 to +70 °C (-4 to +156 °F)	-20 to +70 °C (-4 to +156 °F)
Max. Ambient temperature	+50 °C (+122 °F)	+135 °C (275 °F)
Viscosity range	2.8–500 mm ² /s	
Power consumption	40 W	
Protection class with mounted connector	IP 65	IP 66
Isolation class	F	
Explosion protection valve	-	Ex e mb IIC T4 Gb
Explosion protection category cable gland	-	II 2G Ex e IIC Gb
Material	Cast iron	Cast iron
Weight	3.9 kg (8.6 lbs)	2.6 kg (5.7 lbs)
Dimensions (LxWxH)	201.4x70x117 mm (7.93x2.76x4.61 in)	191x70x131 mm (7.52x2.76x5.16 in)



Order number

Change-over valve 24 V DC	24-1254-2486
Mounting block	24-1882-2167
Includes connector 24 V DC	

24-1254-3437
24-1503-2552

Base plates

For all flow limiter versions

Flow limiter base plates can be adjusted to the need. Their modular design allows for the use with different combinations.

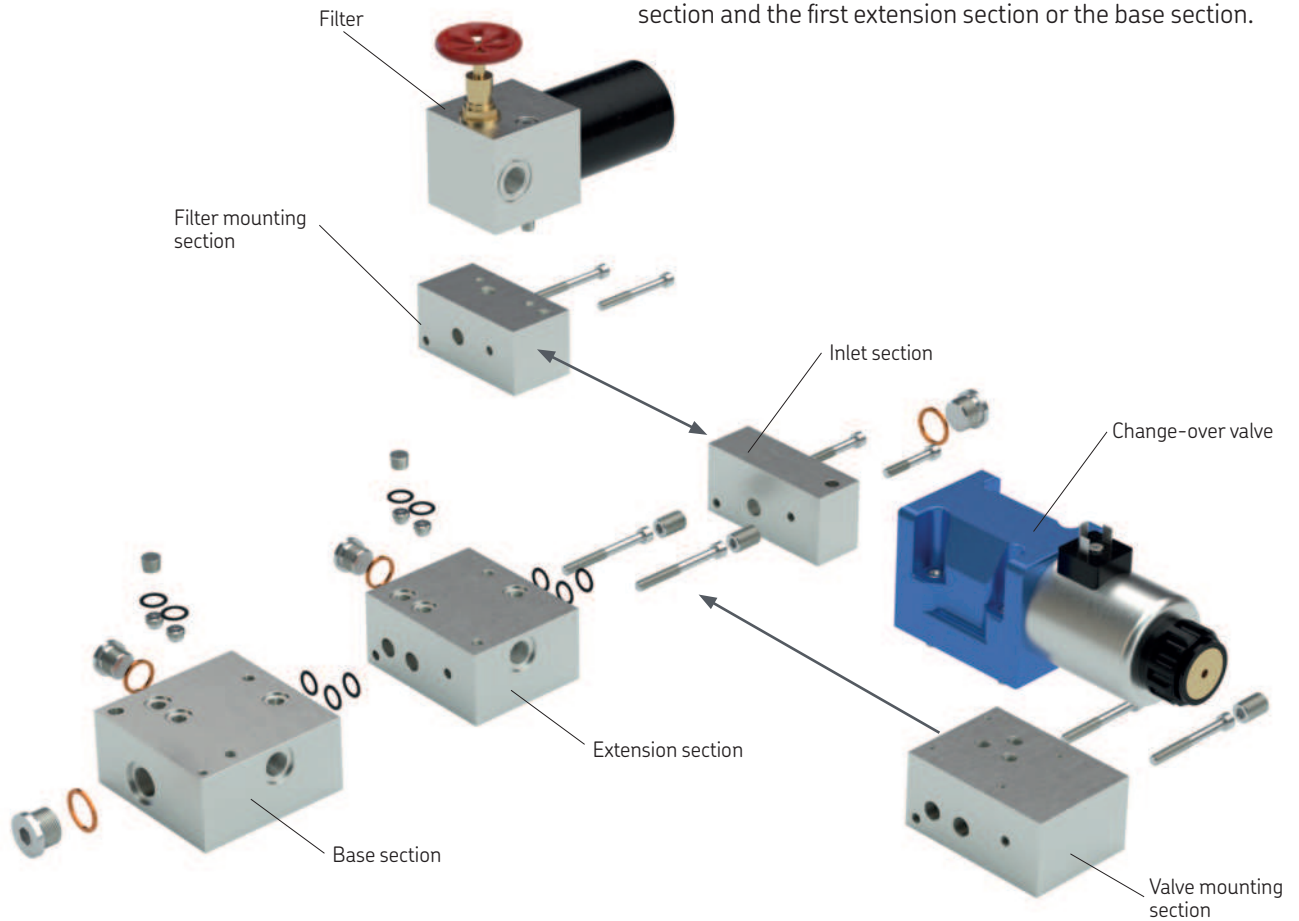
At least two modules are needed to build a complete base plate:

- Inlet section
- Extension section

This combination can be used to mount one flow limiter module of the SMBM-X series. The filter mounting section can be used instead of the simple inlet section if a filter is required.

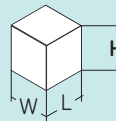
For more than one flow limiter module, extension sections need to be inserted between the inlet section or the filter mounting section and the base section.

For the SMBM-V series, an additional valve mounting section is required between the inlet section or the filter mounting section and the first extension section or the base section.



Technical data

Material EN AW-6061-T651 anodized
 Lubricant inlet G¹/₂
 Lubricant outlets G³/₈



Dimensions	Length		Width		Height		Weight		Order numbers
	mm	in	mm	in	mm	in	kg	lbs	
Base section	98.5	3.88	100	3.94	48	1.89	1.10	2.43	24-0714-3483
Extension section	81.0	3.19	100	3.94	48	1.89	1.00	2.21	24-0714-3484
Inlet section	35.0	1.38	100	3.94	48	1.89	0.47	1.04	24-0714-3485
Valve mounting section	72.0	2.83	100	3.94	48	1.89	0.91	2.01	24-0714-3486
Filter mounting section	50.0	1.97	100	3.94	48	1.89	0.64	1.41	24-0714-3487

* Size details for complete flow limiter configurations can be found in the manual (→operation manual 951-170-238 on skf.com).

Plug-in nozzles

Table 1

SMBM-X

Correction factor for nozzle indices 050-145 → diagram 1

Nominal oil flow ¹⁾		Nozzle index	Order number	Nominal oil flow ¹⁾		Nozzle index	Order number
l/min	pts/min			[l/min]	[pts/min]		
0.08	0.17	050	24-0455-2574	2.67	5.64	185	24-0455-2601
0.12	0.25	055	24-0455-2575	2.8	5.92	190	24-0455-2602
0.15	0.32	060	24-0455-2576	2.98	6.3	195	24-0455-2603
0.2	0.42	065	24-0455-2577	3.16	6.68	200	24-0455-2604
0.25	0.53	070	24-0455-2578	3.3	6.97	205	24-0455-2605
0.29	0.61	075	24-0455-2579	3.43	7.25	210	24-0455-2606
0.35	0.74	080	24-0455-2580	3.58	7.57	215	24-0455-2607
0.41	0.87	085	24-0455-2581	3.79	8.01	220	24-0455-2608
0.47	0.99	090	24-0455-2582	3.98	8.22	225	24-0455-2609
0.56	1.18	095	24-0455-2583	4.18	8.83	230	24-0455-2610
0.65	1.37	100	24-0455-2584	4.37	9.24	235	24-0455-2611
0.73	1.54	105	24-0455-2585	4.57	9.66	240	24-0455-2612
0.79	1.67	110	24-0455-2586	4.8	10.14	245	24-0455-2613
0.88	1.86	115	24-0455-2587	5	10.57	250	24-0455-2614
0.98	2.07	120	24-0455-2588	5.19	10.97	255	24-0455-2615
1.09	2.3	125	24-0455-2589	5.37	11.35	260	24-0455-2616
1.18	2.49	130	24-0455-2590	5.55	11.73	265	24-0455-2617
1.3	2.75	135	24-0455-2591	5.77	12.19	270	24-0455-2618
1.43	3.02	140	24-0455-2592	5.99	12.66	275	24-0455-2619
1.56	3.3	145	24-0455-2593	6.22	13.15	280	24-0455-2620
				6.49	13.72	285	24-0455-2621
1.67	3.53	150	24-0455-2594	6.74	14.24	290	24-0455-2622
1.79	3.87	155	24-0455-2595	6.95	14.69	295	24-0455-2623
1.92	4.06	160	24-0455-2596	7.17	15.15	300	24-0455-2624 ²⁾
2.07	4.37	165	24-0455-2597	7.31	15.45	305	24-0455-2625 ²⁾
2.21	4.67	170	24-0455-2598	7.48	15.81	310	24-0455-2626 ²⁾
2.36	4.99	175	24-0455-2599	7.72	16.32	315	24-0455-2627 ²⁾
2.52	5.33	180	24-0455-2600	7.98	16.86	320	24-0455-2628 ²⁾

Table 2

SMBM-V

Start-up oil flow reduction to 25%

Nominal oil flow ¹⁾		Nozzle index	Order number	Order number	
l/min	pts/min			Nozzle D1	Nozzle D2
0.08 : 0.65	0.17 : 1.37	003	24-0455-2574	24-0455-2584	
0.12 : 0.79	0.25 : 1.67	004	24-0455-2575	24-0455-2586	
0.15 : 0.98	0.32 : 2.07	005	24-0455-2576	24-0455-2588	
0.20 : 1.18	0.42 : 2.49	006	24-0455-2577	24-0455-2590	
0.25 : 1.43	0.53 : 3.02	007	24-0455-2578	24-0455-2592	
0.29 : 1.67	0.61 : 3.53	008	24-0455-2579	24-0455-2594	
0.35 : 1.92	0.74 : 4.06	009	24-0455-2580	24-0455-2596	
0.41 : 2.21	0.87 : 4.67	010	24-0455-2581	24-0455-2598	
0.47 : 2.52	0.99 : 5.33	011	24-0455-2582	24-0455-2600	
0.56 : 2.80	1.18 : 5.92	012	24-0455-2583	24-0455-2602	
0.65 : 3.16	1.37 : 6.68	013	24-0455-2584	24-0455-2604	
0.73 : 3.43	1.54 : 7.25	014	24-0455-2585	24-0455-2606	
0.79 : 3.79	1.67 : 8.01	015	24-0455-2586	24-0455-2608	
0.88 : 4.37	1.86 : 9.24	016	24-0455-2587	24-0455-2610	
0.98 : 4.57	2.07 : 9.66	017	24-0455-2588	24-0455-2612	
1.09 : 5.00	2.30 : 10.57	018	24-0455-2589	24-0455-2614	
1.18 : 5.37	2.49 : 11.35	019	24-0455-2590	24-0455-2616	
1.30 : 5.77	2.75 : 12.19	020	24-0455-2591	24-0455-2618	
1.43 : 6.22	3.02 : 13.15	021	24-0455-2592	24-0455-2620	
1.56 : 6.74	3.30 : 14.24	022	24-0455-2593	24-0455-2622	
1.67 : 7.17	3.53 : 15.15	023	24-0455-2594	24-0455-2624 ³⁾	
1.79 : 7.48	3.87 : 15.81	024	24-0455-2595	24-0455-2626 ³⁾	
1.92 : 7.98	4.06 : 16.86	025	24-0455-2596	24-0455-2628 ³⁾	

¹⁾ All oil flow rates related to the indicated nozzle sizes were determined for a service viscosity of 300 mm²/s at a temperature of 20 °C (68 °F). They are approximate values and may need to be adapted to different viscosities → page 13.

²⁾ Not applicable for SMBM-X 11

³⁾ Not applicable for SMBM-V 11

The oil flow values referring to the nozzle indices given in table x are based on laboratory test results at a service viscosity of 300 mm²/s at a temperature of 20 °C. They may vary within limits with different oil types and conditions. Especially for low flow rates under 1.60 l/min, the influence of nozzle diameter, viscosity and pressure is quite high. To find a correction factor to compensate for these influences → Page 13.

How to select the right nozzle index

Diagram 1

Determination of nozzle indices 050 to 145 at a differential pressure of 250 bar

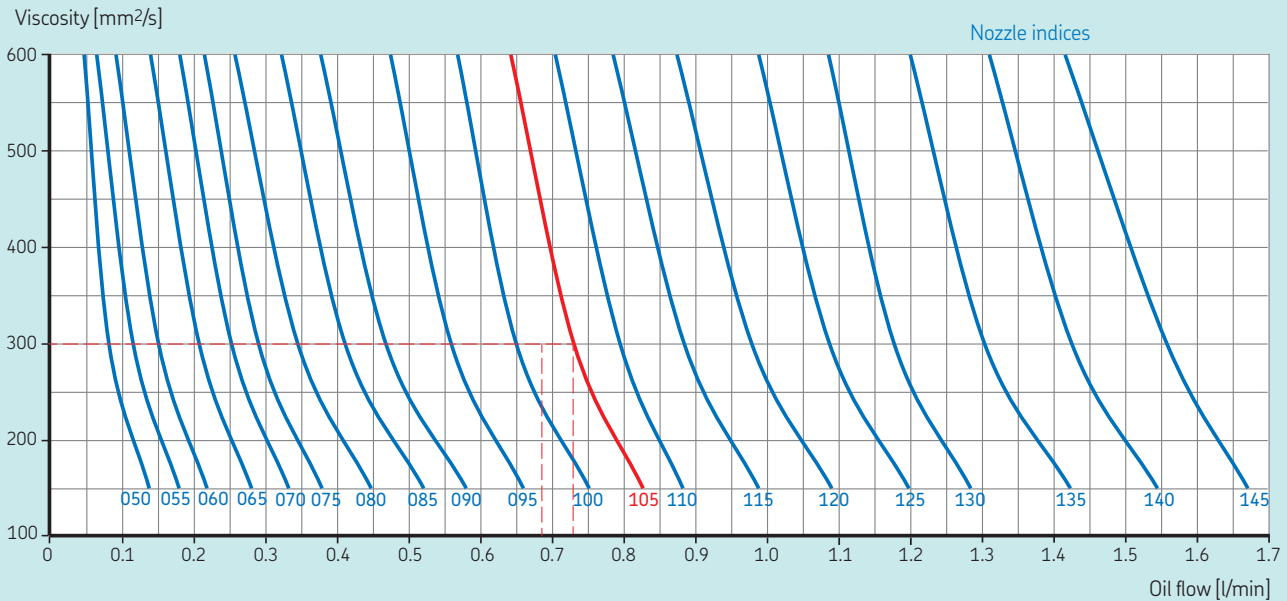
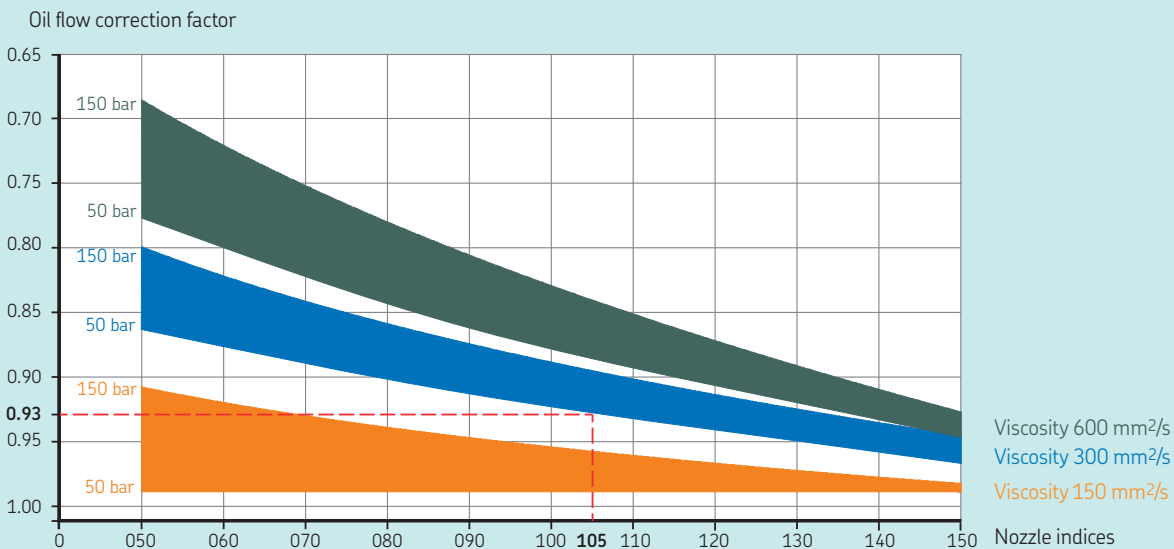


Diagram 2

Viscosity and pressure correction



Example

Given values:

Desired flow rate $Q = 0.69 \text{ l/min}$
(1.46 pts/min)

Operating viscosity $\nu = 300 \text{ mm}^2/\text{s}$

Differential pressure $\Delta p = 50 \text{ bar}$

1 Pre-selection of nozzle index

Locate the intersection point of the desired flow rate (0.69 l/min) and the operating viscosity (300 mm²/s) → **diagram 1**

Use the curve next to the intersection point to determine the nozzle index (**105**). The nominal oil flow for this nozzle at nominal pressure drop ($\Delta p = 20 \text{ bar}$) can be found at the intersection point of the nozzle index curve and the operating viscosity line (300 mm²/s). The result is **0,73 l/min** (1.54 pts/min)

2 Determination of the correction factor and calculation of the actual flow rate

The correction factors for a viscosity of 300 mm²/s can be found in the blue band → **diagram 2**

Locate the vertical intersection point of the nozzle index 105 and the lower limit of the blue band representing a differential pressure of 50 bar. The correction factor can be found at the horizontal intersection with the vertical axis. The result is **0,93**.

3 Calculation of the resulting oil flow rate

Multiply the result found under 1 by the correction factor found under 2.
 $> 0.73 \text{ l/min} \times 0.93 = 0.68 \text{ l/min}$
(1.44 pts/min)

How to order

Flow limiter module without base plate

Order code **SMB M** – [] [] [] [] – []

Flow limiter SMB

Mounting
M = Baseplate

Change-over option
V = Dual-flow
X = Single-flow

Type of monitoring
 00 = without gear meter, no electric monitoring
 01 = with gear meter (333 ppl.), no sensor ¹⁾
 02 = with gear meter (167 ppl.), no sensor
 03 = with gear meter (83 ppl.), no sensor
 11 = with gear meter (333 ppl.), and standard sensor ^{1) 2)}
 12 = with gear meter (167 ppl.), and standard sensor ²⁾
 13 = with gear meter (83 ppl.), and standard sensor ²⁾
 21 = with signal transmitter 24 V DC (incl. LED)
 22 = with signal transmitter 24 V DC (w/o LED) ²⁾
 31 = with piston detector
 41 = with gear meter (333 ppl.), and signal transmitter 24 V DC (incl. LED) ¹⁾
 42 = with gear meter (167 ppl.), and signal transmitter 24 V DC (incl. LED) ²⁾
 43 = with gear meter (83 ppl.), and signal transmitter 24 V DC (incl. LED) ²⁾
 51 = with gear meter (333 ppl.), and signal transmitter 24 V DC (w/o LED) ^{1) 2)}
 52 = with gear meter (167 ppl.), and signal transmitter 24 V DC (w/o LED) ²⁾
 53 = with gear meter (83 ppl.), and signal transmitter 24 V DC (w/o LED) ²⁾
 61 = with gear meter (333 ppl.), and piston detector ¹⁾
 62 = with gear meter (167 ppl.), and piston detector
 63 = with gear meter (83 ppl.), and piston detector

Type of connection
 XX = without connection cable ³⁾
 CS = connection cable with straight connector
 CA = connection cable with angled connector ³⁾
 XS = straight connector, no cable
 XA = angled connector, no cable ³⁾

Nozzle index
→ table 1 and 2 (page 12)

Version code
 w/o Suffix = Standard version
 EEX = Explosion proof version

¹⁾ Max. admissible nozzle indices
295 (for SMBM-X) and **022** (for SMBM-V)
²⁾ EEX versions possible
³⁾ Not for EEX versions

Order examples

SMBM-V11 CS 022

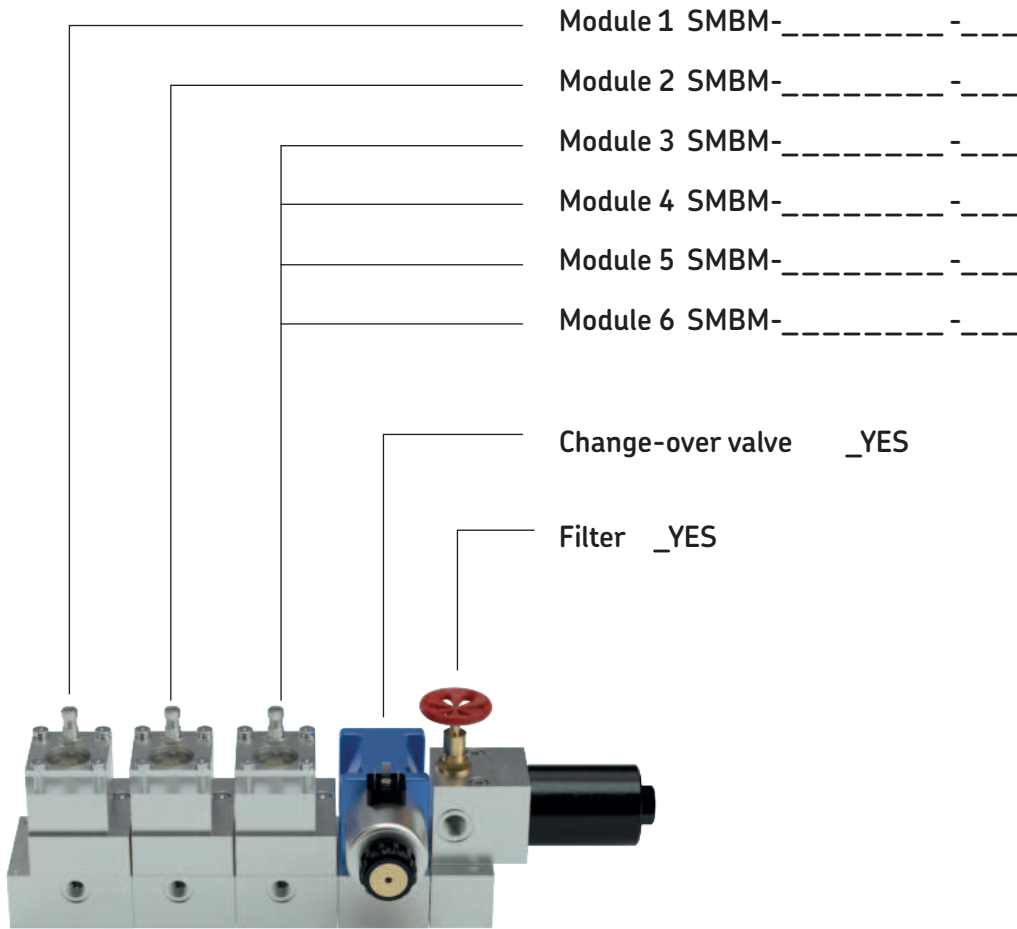
- Flow limiter
- Base plate mounting
- Dual-flow
- With gear meter and standard resolution (333 pulses per liter)
- Incl. connection cable with straight connector
- For a flow of 6.74 l/min (100%) and 1.56 l/min (25%)
- Standard version

SMBM-X22 XS 150 – EEX

- Flow limiter
- Base plate mounting
- Single-flow
- With signal transmitter (24 V DC)
- Without connection cable
- For a flow of 1.67 LPM
- Explosion proof version

How to order

Pre-mounted flow limiter banks



To order a pre-mounted flow limiter, please fill in the boxes matching the ordering code (→page 11) for each module.

Modules are numbered to fit the mounting direction

For blinded mounting positions, fill the boxes with “NNNNNNNNN-NNNN”

A change-over valve will be added if one or more of the chosen modules require the use of it.

Maximum six modules are possible.

Order example

- Module 1 **SMBM-V11XS003**
- Module 2 **SMBM-V11XS010**
- Module 3 **SMBM-V11XS003**
- Change-over valve **x (Yes)**
- Filter **x (Yes)**

Table 3

Factory-mounted base plates

Flow limiters per base plate	For SMBM-X without filter	For SMBM-V * without filter	For SMBM-X * with filter option	For SMBM-V * with filter option
1	24-0714-3501	24-0714-3511	24-0714-3541	24-0714-3551
2	24-0714-3502	24-0714-3512	24-0714-3542	24-0714-3552
3	24-0714-3504	24-0714-3513	24-0714-3543	24-0714-3553
4	24-0714-3505	24-0714-3514	24-0714-3544	24-0714-3554
5	24-0714-3506	24-0714-3515	24-0714-3545	24-0714-3555
6	24-0714-3507	24-0714-3516	24-0714-3546	24-0714-3556

* Change-over-valves 24-1254-2486 or 24-1254-3437 (EEX) and oil filter 24-0651-3041 need to be ordered separately.

Accessories and spare parts

Table 4

Product group	Description	Order number
Flow limiter housing	SMBM-X without plug-in nozzles	24-0711-2800
	SMBM-V without plug-in nozzles	24-0711-2801
Signal transmitter (standard version)	Incl. connector, straight (24 V DC), M12x1, LED type	24-1072-2115
	Incl. connector, straight (24 V DC), M12x1	24-1072-2114
	Without connector	24-1072-2123
	Connector, straight (24 V DC), M12x1, LED type	24-1882-2151
	Connector, straight (24 V DC), M12x1	24-1882-2121
	Connector, straight (24 V DC), M12x1, LED type, with cable 5 m	179-990-604
Signal transmitter (ATEX version) ¹⁾	Incl. connector, straight (30 V), ATEX version, M12x1	24-1072-2116
	Incl. connector, straight, 2 poles, M12x1, with cable 5 m	24-1882-5005
	Incl. Connector, angled, 2 poles, M12x1, with cable 15 m	24-1882-5016
	Without connector	24-1884-2785
Piston detector	Connector, straight, 3 poles, M12x1, with cable 5 m	179-990-381
	Connector, angled, 3 poles, M12x1, with cable 5 m	179-990-382
	Connector, straight, 4 poles, M12x1	179-990-371
	Connector, angled, 4 poles, M12x1	179-990-372
	Without connector	24-1884-2785
Gear meter (standard version)	For SMBM-X/MV 11 (333 ppl)	24-0711-2816
	For SMBM-X/MV 12 (167 ppl)	24-0711-2811
	For SMBM-X/MV 13 (83 ppl)	24-0711-2812
	Standard pulse sensor M12x1	2340-00000030
	Connector, straight, 3 poles, M12x1, with cable 2 m	2370-00000053
	Connector, straight, 3 poles, M12x1, with cable 5 m	179-990-381
	Connector, angled, 3 poles, M12x1, with cable 5 m	179-990-382
	Connector, straight, 4 poles, M12x1	179-990-371
	Connector, angled, 4 poles, M12x1	179-990-372
Gear meter (ATEX version)	For SMBM-X/MV 11 (333 ppl) EEX	24-0711-2813
	For SMBM-X/MV 12 (167 ppl) EEX	24-0711-2814
	For SMBM-X/MV 13 (83 ppl) EEX	24-0711-2815
	Standard EEX pulse sensor M12x1	2340-00000091
	Connector, straight, 2 poles, M12x1, with cable 5 m	24-1882-5005
	Connector, angled, 2 poles, M12x1, with cable 15 m	24-1882-5016
Monitoring units	Group monitoring unit (SMBM-X/MV signal transmitter and piston detector versions)	84-8011-0369
	Pulse monitoring unit IPM-12 (SMBM-X/MV gear meter versions)	84-8011-0380
	Pulse monitoring unit IPM-12 (84-8011-0380) with M12 connector	84-8011-0390

¹ This signal transmitter is rated "simple electrical equipment" in accordance with EN 50020:2002 and must only be operated in intrinsically safe electrical circuits (see manual).

Table 5

Product group	Description	Order number
Change-over valves (standard version)	Electric change-over valve 24 V DC	24-1254-2486
	Connector 24 V DC as a spare part, with built-in rectifier	24-1882-2029
Change-over valves (EEX version)	Electric change-over valve 24 V DC	24-1254-3437
	Adapter block (to be ordered with the valve)	24-1503-2552
Filter	Oil filter with shut-off valve	24-0651-3041
	Valve bonnet with hand wheel	24-2104-2009
	Filter element 100 micron	24-0651-2200
Seal kits	Seal kit for gear meter	24-0404-2644
	Seal kit for base section	24-0404-2645
	Seal kit for extension section	24-0404-2646
	Seal kit for valve mounting section	24-0404-2647
	Seal kit for filter	24-0404-2293
	Seal kit for top access connection module	24-0404-2648
	Seal kit for change-over valve (ATEX version)	24-0404-2639
Base plates	Base section	24-0714-3483
	Extension section	24-0714-3484
	Inlet section	24-0714-3485
	Valve mounting section (change-over valve to be ordered separately)	24-0714-3486
	Filter mounting section (filter valve to be ordered separately)	24-0714-3487
	Top access connection module	24-0714-3440
	Dummy element for blinded flow limiter positions	24-0711-2406
	Inlet plug G1/2	95-0012-0908
	Washer, copper, for inlet plug G1/2	DIN7603-A21X26-CU
	Outlet plug G3/8	95-0038-0908
	Washer, copper, for outlet plug G3/8	DIN7603-A17X21-CU
	O-ring 12x2, for base, extension and filter sections, for SMBM-X and SMBM-V modules	WVN532-12X2
	Check valve, needed 2x per base and extension sections with SMBM-V, only	24-2104-2049
	Mounting tool for check valve 24-2104-2049	2350-00000078
	Plug R 1/8, needed 1x per base and extension sections with SMBM-X, only	2030-00000002
	Connection screw for base plate mounting (spare part)	44-1821-2588
	Mounting screw for base plate mounting, inlet section (spare part)	DIN912-M6X40-8.8
	Mounting screw for base plate mounting, extension section (spare part)	DIN912-M6X65-8.8
	Mounting screw for base plate mounting, valve and filter mounting section (spare part)	DIN912-M6X60-8.8
	Nozzles	For plug-in nozzles please refer to → page 12



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