

# Flow limiter SP/SMB8

for mounting plates



Flow limiters are used in large oil circulation lubrication systems. The task of a flow limiter is to divide up the volumetric flow of the main line into parallel individual volumetric flow quantities and to "limit" these according to requirements, or to keep them constant. The volumetric flow generated is independent of the system pressure and nearly independent of viscosity.

The SP/SMB8 flow limiter was developed specially for mounting plates. The advantage of this design is its simple and compact construction.

Using interchangeable plug-in nozzles, the volumetric flow of the flow limiter can be set stepwise from 0.08 to 8 l/min. This also makes subsequent adjustments possible (necessary when the unit is modified, e.g.). Tedious resetting and measuring are unnecessary.

The volumetric flow can be monitored simply and safely with a signal transmitter or proximity switch (which is also subsequently attachable). A fault signal occurs when the volumetric flow drops to approx. 70% of the nominal volumetric flow.

## Advantages

- **reliable**  
continuous dispensation of individual volume flows
  - self-adjusting metering, thus identical volume flows despite different back pressures
  - wide viscosity range of temperature and viscosity, due to stable system conditions
- **easy system design**  
The demanded volume flow and flow limiter nozzle and determined during projection
- **space-saving cultivation**  
in application of a base plate with an access, up to 6 flow limiter attachable
- **easy start-up**  
Pre-adjusted volume flows enable short start up periods.
- **effective monitoring of the volume flow**  
signal transmitter or piston detector reacts to approximately 30% deviations of volume flow
- **wide range of operation, up to 200 bar**
- **optional ATEX version or integrated gear indicator for volume flow**

See important product usage information on the back cover.

## Flow limiter SP/SMB8

The SP /SMB8 flow limiter comes with two throttles installed in series ( $D_1$ ,  $D_2$ ). Throttle  $D_1$  is an interchangeable plug-in nozzle which, as a non adjustable orifice, determines the rated volumetric flow. Nonadjustable orifice  $D_1$  is available with different nozzle cross sections (see table on page 8 and 10). Throttle  $D_2$ , on the other hand, is an adjustable orifice that has a variable nozzle cross section depending on the position of control piston RK. Displacement of the control piston (RK) against the spring force (F) automatically changes the flow resistance of throttle  $D_2$  in such a way that the differential pressure at nonadjustable orifice  $D_1$  remains constant, and thus the volumetric flow as well.

$$p_1 \cdot A = p_2 \cdot A + F \text{ resp. } p_{1/2} = p_1 - p_2 = \frac{F}{A} = \text{constant}$$

The result is:

the difference in pressure upstream and downstream of the variable nozzle is held constant by adjustable orifice  $D_2$  (pressure balance).

The condition for this function is that the system pressure  $p_1$  is always greater than the sum of the pressure drops in and after each flow limiter.

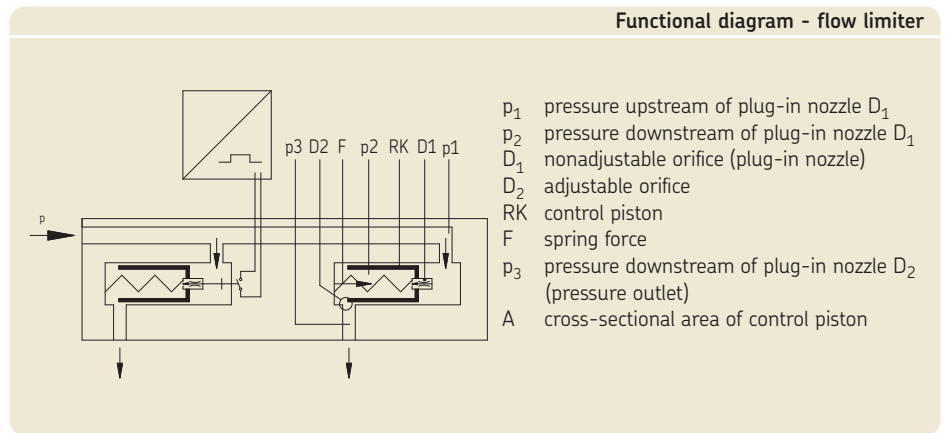
$$p_1 > p_{1/2} + p_3$$

For this reason the pump volume flow should exceed all individual flow quantities by approx. 15 %, i.e.,

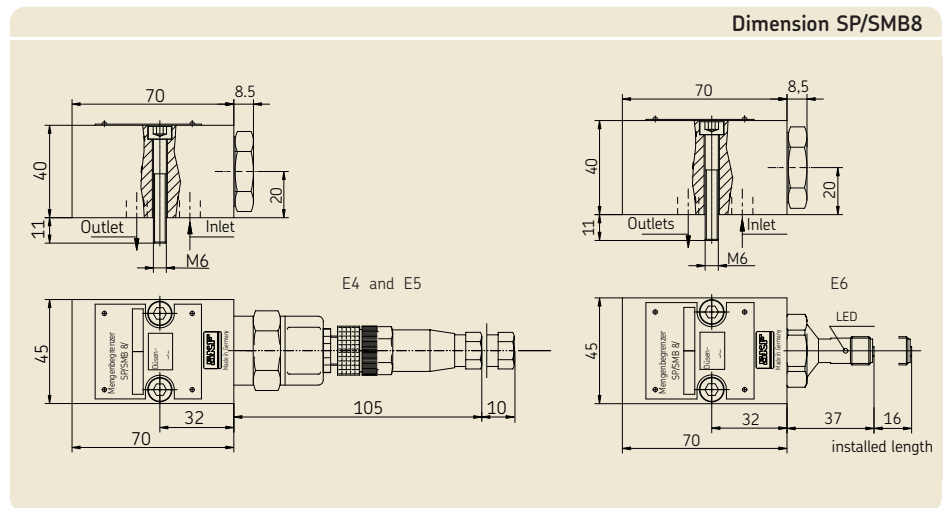
$$Q = 1.15 \cdot (\sum Q_i)$$

Due to the very short throttle length of the plug-in nozzle  $D_1$ , the control characteristic is nearly independent of viscosity and temperature, within the in the technical data specified viscosity range.

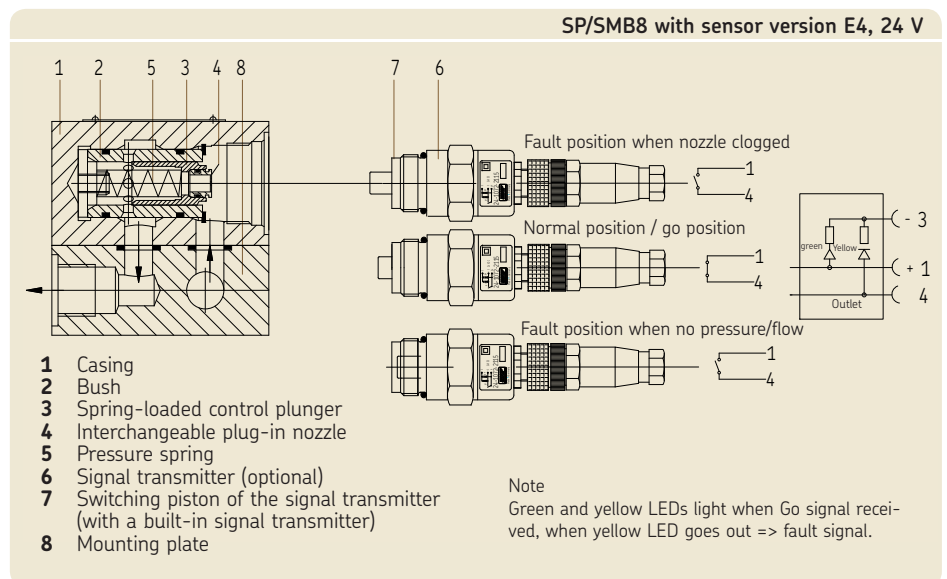
Selection of nozzle, cf. page 7.



## Flow limiter SP/SMB8



## Design flow limiter SP/SMB8 with signal transmitter version E4

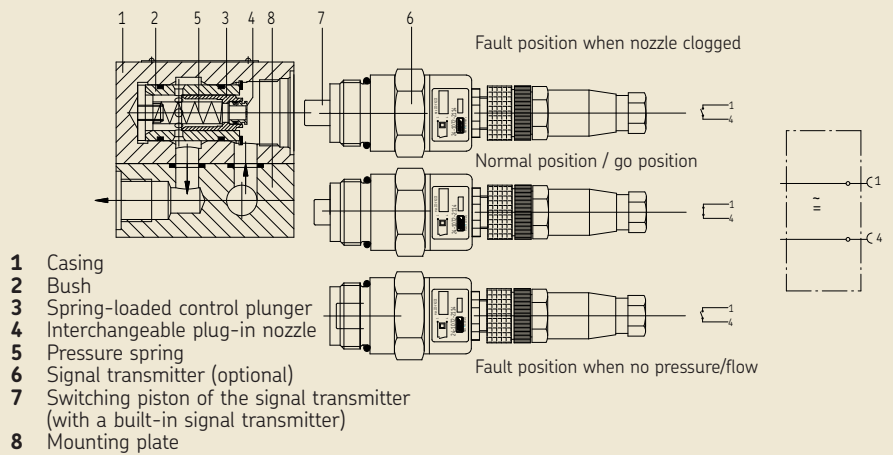


## Design Flow limiter SP/SMB8

with signal transmitter version E5



SP/SMB8 with sensor version E5, 24-230 V

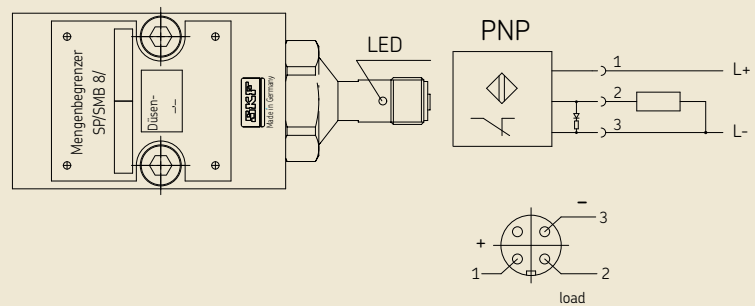


## Design Flow limiter SP/SMB3

with proximity switch E6



SP/SMB8 with proximity switch E6, 24 V

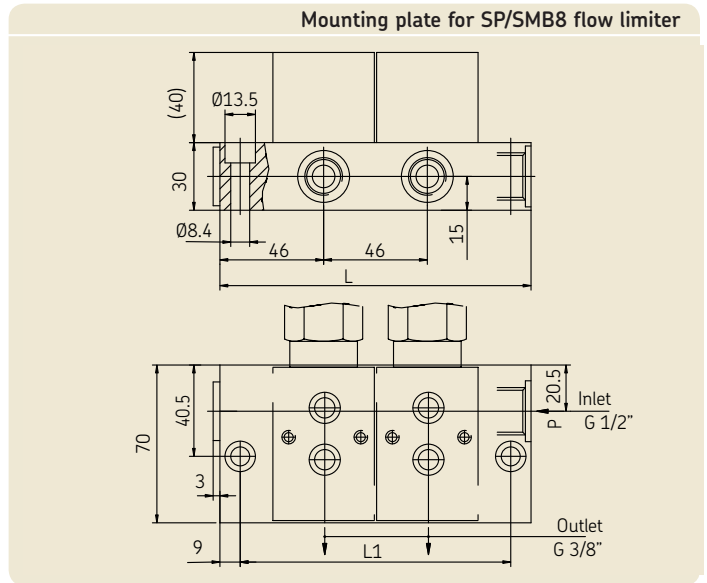


Fault position with no flow = pin 2 open  
 Normal position / go position = pin 2 closed

## Mounting plate for 1 to 6 flow limiters

Material .....AlCuPb F38, neutrally anodized

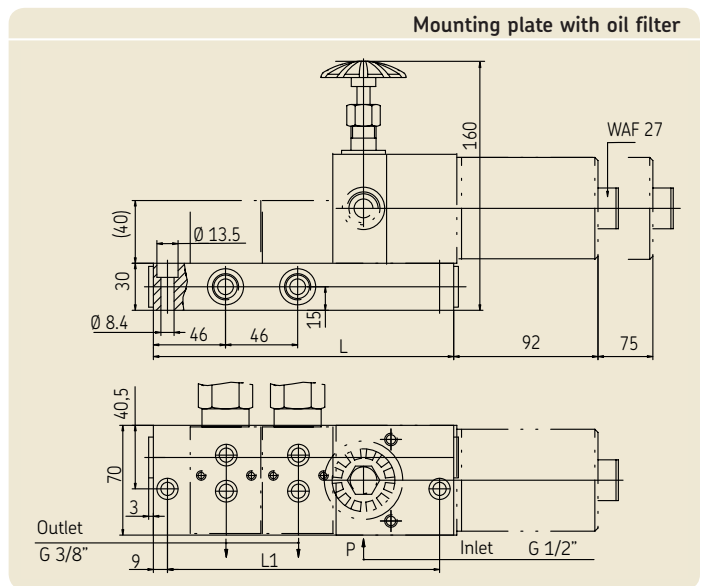
Mounting plate				
Qty-Flow-limiter [n]	Dim. L [mm]	Dim. L <sub>1</sub> [mm]	Weight [kg/St.]	Order no.
1	92	74	0.55	24-0714-3477
2	138	120	0.75	24-0714-3478
3	184	166	0.95	24-0714-3479
4	230	212	1.15	24-0714-3480
5	276	258	1.35	24-0714-3481
6	322	304	1.55	24-0714-3482



## Mounting plate for 1 to 6 flow limiters and oil filter

Material ..... AlCuPb F38, neutrally anodized

Mounting plate with oil filter				
Qty-Flow-limiter [n]	Dim. L [mm]	Dim. L <sub>1</sub> [mm]	Weight [kg/St.]	Order no.
1	145.5	127.5	0.85	24-0714-3471
2	191.5	173.5	1.05	24-0714-3472
3	237.5	219.5	1.25	24-0714-3473
4	283.5	265.5	1.45	24-0714-3474
5	329.5	311.5	1.65	24-0714-3475
6	375.5	357.5	1.85	24-0714-3476

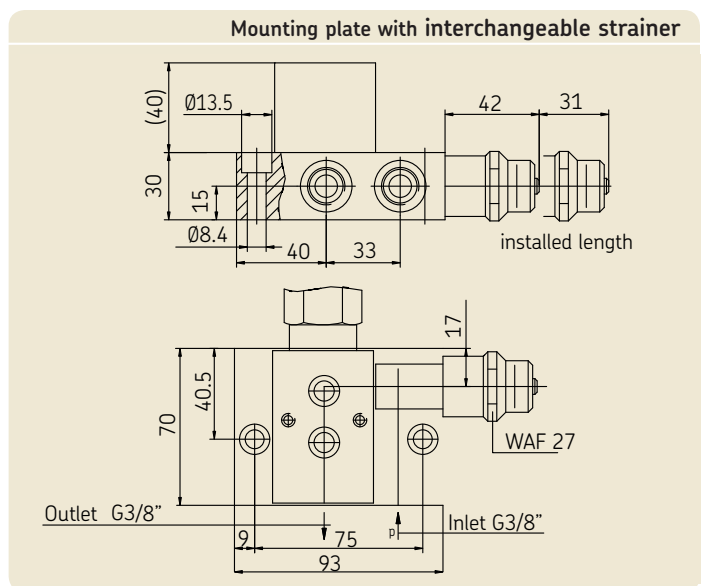


## Mounting plate for a flow limiter with interchangeable strainer

Material ..... AlCuPb F38, neutrally anodized  
 Mesh spacing interchangeable strainer ... 0.3 mm  
 Weight ..... 0.57 kg

Replacement parts	
<b>Designation</b>	<b>Order no.</b>
mesh spacing 300 µm	24-1874-2106
Gasket set for interchangeable strainer	24-0404-2117

Plate with interchangeable strainer	
<b>Designation</b>	<b>Order no.</b>
Mounting plate with interchangeable strainer	24-0714-3470



## Oil filter with shut-off valve

Material ..... AlCuPb F38,  
neutrally anodized  
Mesh spacing ..... 0.1 mm  
Weight ..... 2.3 kg

### Replacement parts

#### Designation

Valve insert with hand wheel  
Filter insert, filter fineness 100 µm  
Gasket set for filter

#### Order no.

24-2104-2009  
24-0651-2200  
24-0404-2293

### Oil filter with shut-off valve

#### Designation

Oil filter with shut-off valve for mounting basic plate

#### Order no.

24-0651-3041

## Dummy element to blank off unused mounting

Material ..... AlCuPb F38,  
neutrally anodized  
Design ..... with mounting screws  
M6 x 45 and sealing  
Weight ..... 0.25 kg/St.

### Dummy element

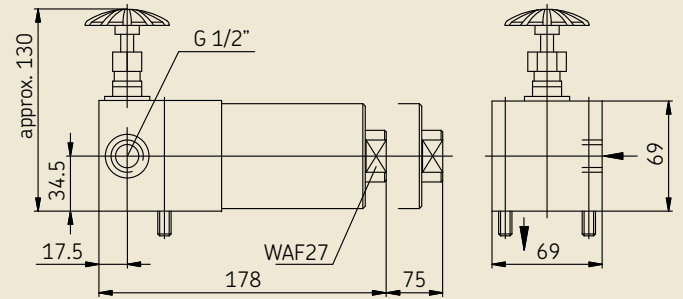
#### Designation

Dummy element

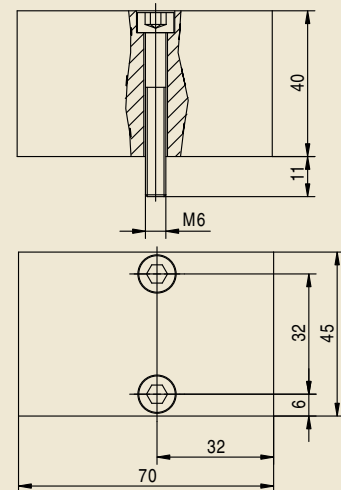
#### Order no.

24-0711-2403

### Oil filter with shut-off valve



### Dummy element to blank off unused mounting



## Technical Data

### General information

Design ..... 2-way flow limiter valve  
 Mounting position ... optional (filter always in upright position!)

Ambient temperature and Lubricant temperature range ..... 0 to + 100 °C  
 Material ..... AlCuPb F38, neutrally anodized  
 Weight ..... 0.5 kg

### Hydraulic

Nominal volumetric flow ..... stepwise from 0.08 to 8 l/min  
 (also see related tables on page 7)

working pressure  $p_1$  without adaptations ..... 5 to 200 bars

E4/E5 with signal transmitter ..... 5 to 85 bars  
 E6 with proximity switch ... 5 to 200 bars

Required differential pressure between input pressure  $p_1$  and output pressure  $p_3 \geq 5$  bar

Lubricant ..... mineral oils, synthetic oils and ecological oils

Operating viscosity ..... 20 to 600 mm<sup>2</sup>/s <sup>4)</sup>

### Signal transmitter E4 / E5

Type ..... magnetic switch  
 Switching element/contact type ..... magnetic/reed contact  
 Ambient and lubricant temperature range .... 0 bis + 90 °C  
 Material/Casing ..... AlCuMgPb F38, neutrally anodized, Connector polyamide  
 Weight ..... 0.2 kg

#### Normal version

#### ATEX Version <sup>1)</sup>

Switching voltage ..... 24 V bis 230 V AC/DC <sup>2)</sup>

30 V DC

Switched current ..... max. 2A <sup>3)</sup>


max. 100 mA

Switching capacity ..... max. 40 W

Function ..... NC (normally closed)

NC (normally closed)

Type of protection .... IP 65

 II 3 cII CT6

#### Connection

E4 plug straight, 4 pol, 24 V DC, with a green and yellow LED, M12x1  
 E5 plug straight, 24-230 V AC/DC without LED, M12x1

E5 plug straight, 4 pol, without LED, M12x1

Connection lines .....screwed

screwed

Cross section for connection

E4 max. 3x0.75 mm<sup>2</sup>  
 E5 max. 2x0.75 mm<sup>2</sup>

E5 max. 2x0.75 mm<sup>2</sup>

### Proximity switch E6

Type ..... inductive PNP (normally closed)

Operating voltage ..... 12 to 36 V DC

Current rating ..... 100 mA

Operating temperature .... 0 °C to 80 °C

Short circuit protection ... included

Type of enclosure (DIN 40 050) ... IP 67 <sup>5)</sup>

## Accessories/ Replacement parts

Designation	Order number
<b>Flow limiter SP/SMB8</b>	
without nozzle, without signal transmitter	24-1883-3005
Gasket	24-0404-2339
<b>Signal transmitter, Version E4</b>	
signal transmitter without coupler socket	24-1072-2113
signal transmitter with coupler socket with LED`s (24 V DC)	24-1072-2115
coupler socket with LED`s (24 V DC)	24-1882-2151
<b>Signal transmitter, Version E5</b>	
signal transmitter without coupler socket	24-1072-2113
signal transmitter with coupler socket without LED`s (230 V AC/DC)	24-1072-2114
coupler socket without LED`s	24-1882-2121
<b>Proximity switch E6</b>	
Proximity switch	24-1884-2282
Sockets straight, 4-poles, M 12x1	179-990-371
Sockets angled, 4-poles, M 12x1	179-990-372
Sockets straight, 4-poles, M 12x1 with orange cable 5 m	179-990-600
Sockets angled, 4-poles, M 12x1 with orange cable 5 m	179-990-601
<b>Monitoring unit</b>	
Group monitoring unit	84-8011-0369

1) The ATEX signal transmitter is identical to the basic version E5. The electric connection values of the ATEX signal transmitter have to be considered. The signal transmitter must only be used in combination with the disconnecter unit.

2) Sufficient spark protection required.

3) Pay attention to maximum switching capacity.

4) With cold-start-conditions with a operating-viscosity > 600 mm<sup>2</sup>/s occurs a diminution of the debit-volume-stream

5) Please order coupler socket separately, see accessories

## Plug-in nozzles

				<i>Plug-in nozzles SP/SMB8</i>			
<i>Nominal volumetric <sup>1)</sup></i> <i>[l/min]</i>	<i>index nozzle</i>	<i>nozzle</i> <i>[Ø mm]</i>	<i>Spare Part</i> <i>complete Plug in</i> <i>nozzle D<sub>1</sub></i>	<i>Nominal volumetric</i> <i>[l/min]</i>	<i>index nozzle</i>	<i>nozzle</i> <i>[Ø mm]</i>	<i>Spare Part</i> <i>complete Plug in</i> <i>nozzle D<sub>1</sub></i>
0.081	050	0,50	24-0455-2574	1.67	150	1,50	24-0455-2594
0.115	055	0,55	24-0455-2575	1.79	155	1,55	24-0455-2595
0.150	060	0,60	24-0455-2576	1.92	160	1,60	24-0455-2596
0.207	065	0,65	24-0455-2577	2.07	165	1,65	24-0455-2597
0.252	070	0,70	24-0455-2578	2.21	170	1,70	24-0455-2598
0.290	075	0,75	24-0455-2579	2.36	175	1,75	24-0455-2599
0.345	080	0,80	24-0455-2580	2.52	180	1,80	24-0455-2600
0.411	085	0,85	24-0455-2581	2.67	185	1,85	24-0455-2601
0.468	090	0,90	24-0455-2582	2.80	190	1,90	24-0455-2602
0.559	095	0,95	24-0455-2583	2.98	195	1,95	24-0455-2603
0.650	100	1,00	24-0455-2584	3.16	200	2,00	24-0455-2604
0.730	105	1,05	24-0455-2585	3.30	205	2,05	24-0455-2605
0.794	110	1,10	24-0455-2586	3.43	210	2,10	24-0455-2606
0.884	115	1,15	24-0455-2587	3.58	215	2,15	24-0455-2607
0.978	120	1,20	24-0455-2588	3.79	220	2,20	24-0455-2608
1.087	125	1,25	24-0455-2589	3.98	225	2,25	24-0455-2609
1.177	130	1,30	24-0455-2590	4.18	230	2,30	24-0455-2610
1.303	135	1,35	24-0455-2591	4.37	235	2,35	24-0455-2611
1.425	140	1,40	24-0455-2592	4.57	240	2,40	24-0455-2612
1.558	145	1,45	24-0455-2593	4.80	245	2,45	24-0455-2613
				5.00	250	2,50	24-0455-2614
				5.19	255	2,55	24-0455-2615
				5.37	260	2,60	24-0455-2616
				5.55	265	2,65	24-0455-2617
				5.77	270	2,70	24-0455-2618
				5.99	275	2,75	24-0455-2619
				6.22	280	2,80	24-0455-2620
				6.49	285	2,85	24-0455-2621
				6.74	290	2,90	24-0455-2622
				6.95	295	2,95	24-0455-2623
				7.15	300	3,00	24-0455-2624
				7.31	305	3,05	24-0455-2625
				7.48	310	3,10	24-0455-2626
				7.72	315	3,15	24-0455-2627
				7.98	320	3,20	24-0455-2628

*1) at a service viscosity of 300 mm<sup>2</sup>/s and 20 bar differential pressure*

### Note!

The table values given above up to a nozzle diameter of 1.45 are based on a differential pressure of 20 bar and viscosity of 300 mm<sup>2</sup>/s. Other differential pressures or viscosities result in slightly different delivery rates. These can be determined precisely using the charts for delivery rates and correction factors for the pressure (see usage example).

The table values given above for nozzle diameters of 1.5 and above are valid without correction over the entire viscosity range from 150 to 600 mm<sup>2</sup>/s and differential pressures of 20 to 150 bar.

## Selection of nozzle sizes of 0.50 to 1.45 mm at differential pressures of 20 to 150 bar and viscosities of 150 to 600 mm<sup>2</sup>/s

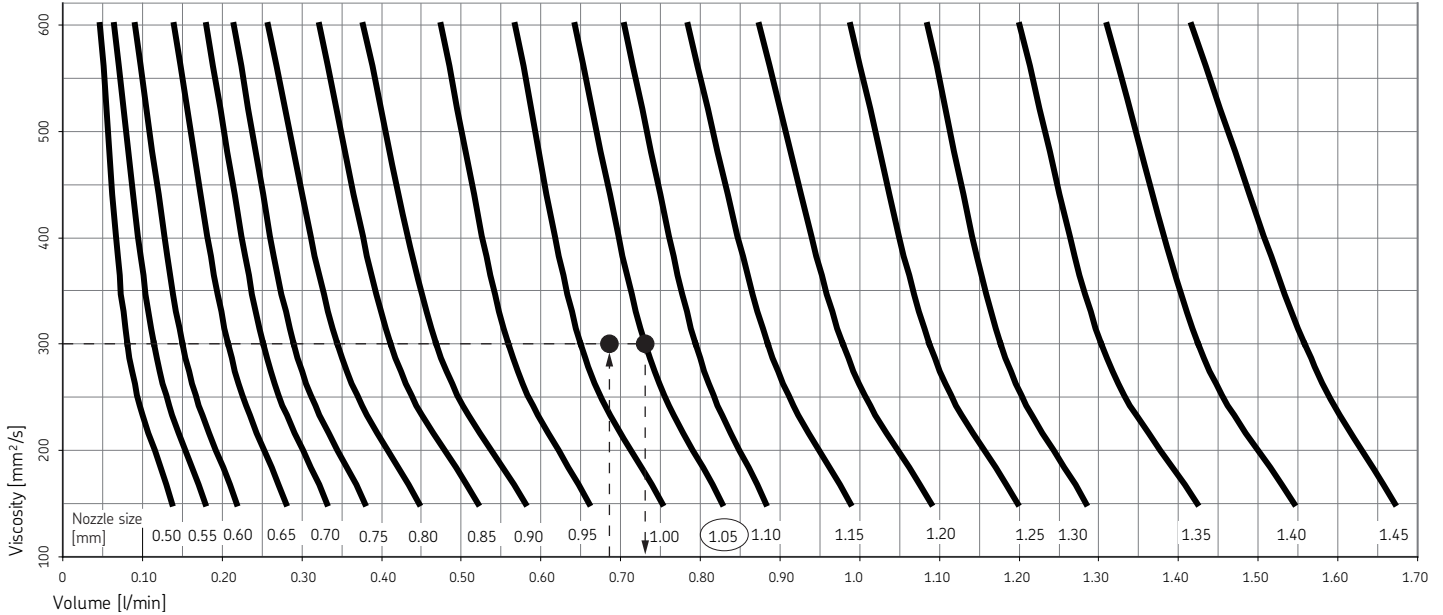
### Example for how to choose a nozzle

Given conditions: desired flow rate 0,690 l/min  
 operating viscosity 300mm<sup>2</sup>/s  
 differential pressure 50bar  
 (e.g. system pressure 90 bar,  
 back pressure 40 bar)

### 1) Preselection of nozzle diameter

- Locate the intersection point of the desired flow rate (0.690 l/min) and the operating viscosity (300 mm<sup>2</sup>/s).
- The curve next to the intersection point gives the nozzle diameter (1.05 mm).
- The nominal volume of the selected nozzle at

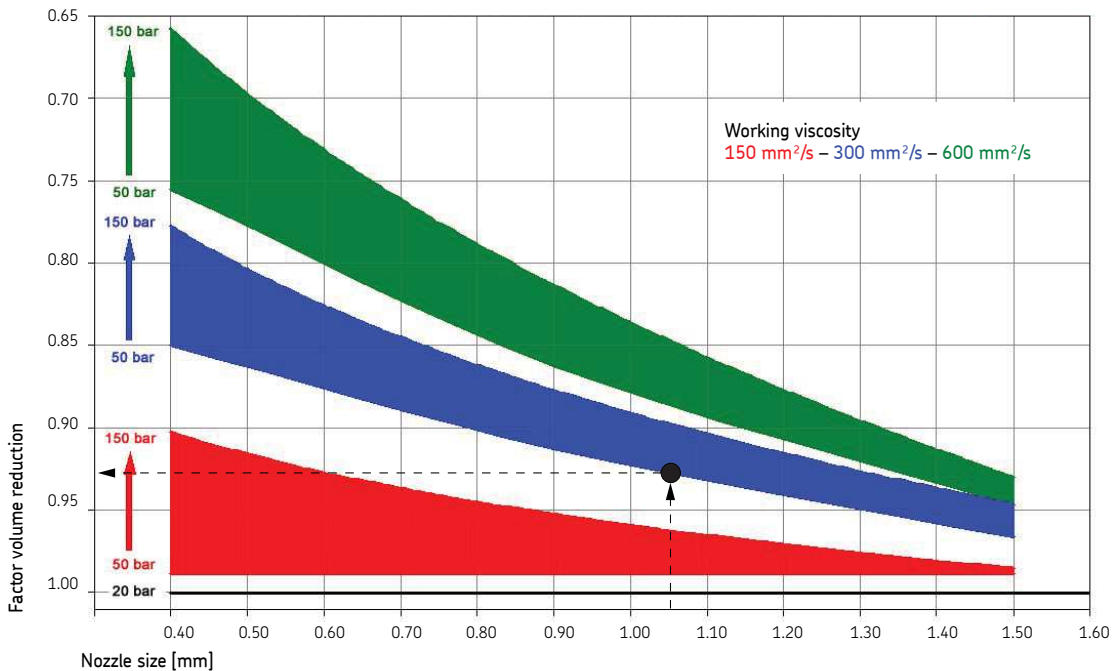
20 bar can be found at the intersection point between nozzle curve (1.05 mm) and the operating viscosity (300 mm<sup>2</sup>/s). In this example it is 0,735 l/min.



### 2) Define the correction factor and calculate the actual flow rate

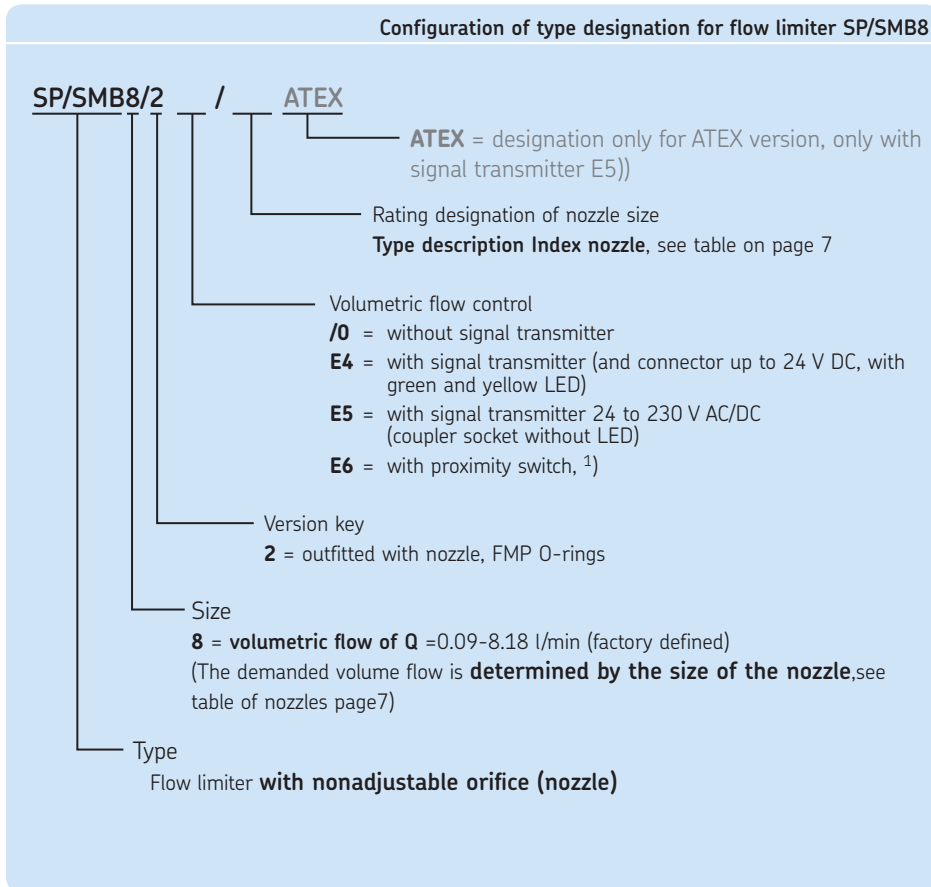
The diagram for the selection of the nozzle sizes is valid for a differential pressure of 20 bar. Higher differential pressures will reduce the flow rate. The reduced flow rate can be calculated using a correction factor.

- For the viscosity of 300 mm<sup>2</sup>/s required in this example select the blue band. This blue band covers in ascending order the pressure range from 50 bar to 150 bar.
- Locate the vertical intersection point for the nozzle size 1.05 mm and 50 bar within the blue band.
- The correction factor can be found at the horizontal intersection with the vertical axis (factor volume reduction), in this case 0.925.
- The actual flow rate is the nominal flow rate at 20bar multiplied by the correction factor: 0,735 l/min x 0,925 = 0,680 l/min





## Key to order codes



1) Please order line socket separately, see accessories on page 6

## Order example

Flow limiter design SP/SMB and size 8 (SP/SMB8) equipped with nozzle (2), with 2 point signal transmitter, version 24-230 V AC/DC (E5) and a nozzle diameter of 0.5 mm with a volume flow of 0.08 l/min (050) gives the following:

Type designation: **SP/SMB8/2E5/050**  
 as well as  
 Order no.: **24-2708-8 050**

### Note

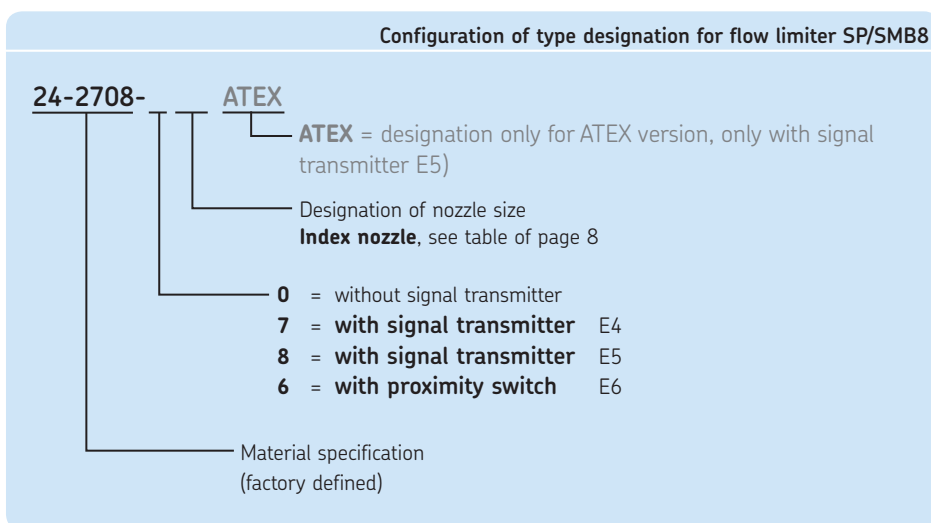
The flow limiter type SP/SMB8 is optionally available in ATEX designs:

Zone 1

Zone 21

with following characteristics:

- Body design with grounding clamp
  - Type plate extended
  - Operation only while using a disconnecter unit
  - Available inclusive ATEX certificate
- Further ATEX versions available on demand after consultation with SKF Lubrication Systems AG.



Type designation:

**SP/SMB8/2 .. / ...**

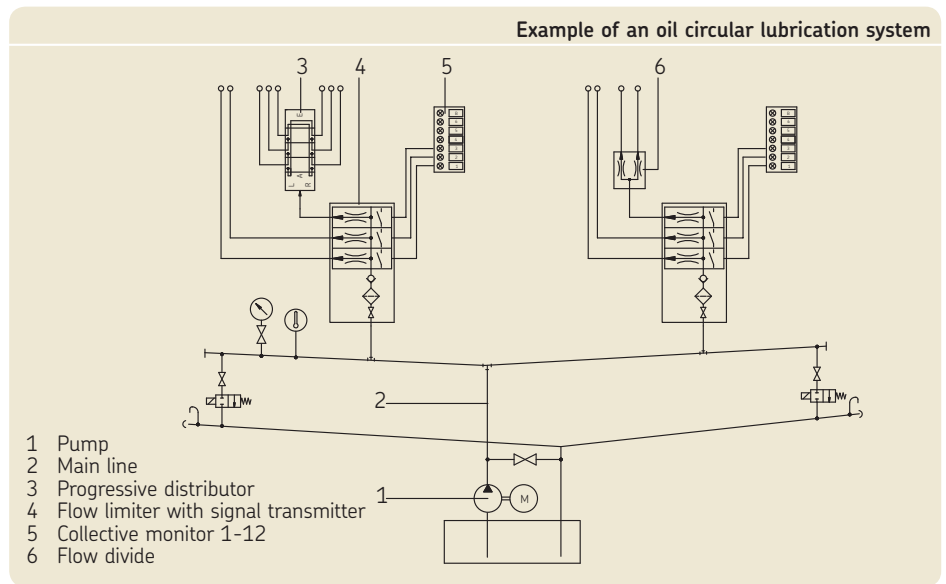
Order number:

**24-2708- .....**

## Example of an oil circular lubrication system

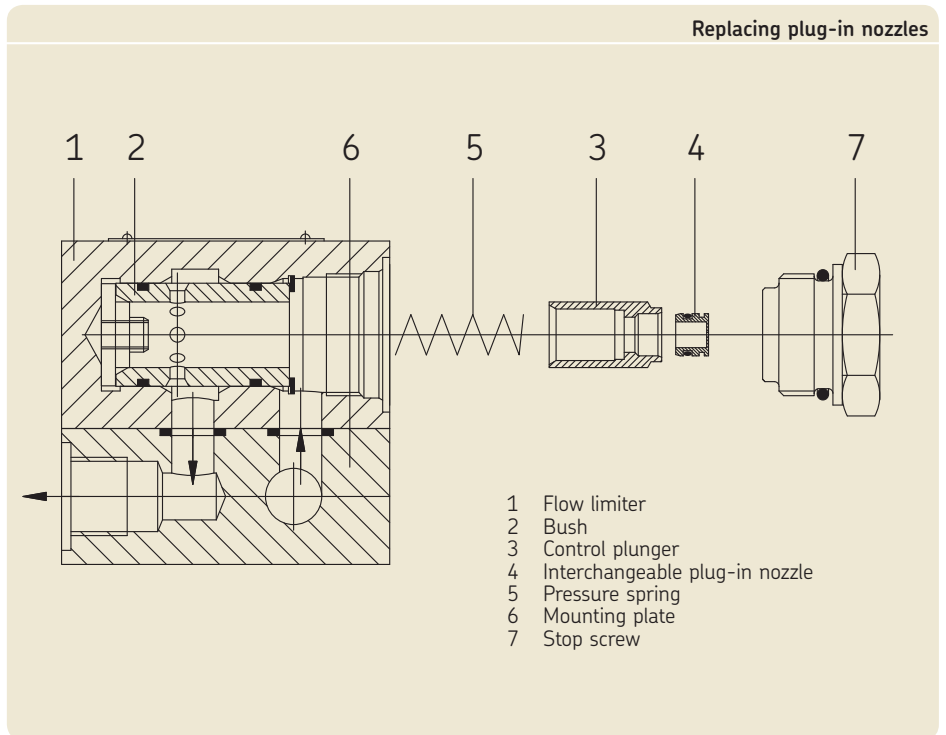
The pump (1) delivers the lubricant to the main line (2). From here, the lubricant then reaches the lubricating point directly via the flow limiter (4), or via the progressive distributor (3) or flow divider (6) which are connected to it.

The signal transmitters or proximity switches which are screwed into the flow limiters (4) monitor the volumetric flow. Collective monitors (5) evaluate the entering signals.



## Replacing plug-in nozzles

- Interrupt oil feed to flow limiter above shut-off valve (at oil filter, if required).
- ☞ control plunger held under spring pressure!
- **Slowly** remove stop screw (hexagonal 30 mm) or signal transmitter or proximity switches with sealing ring
- ☞ **Caution:** Oil may be hot.
- Remove control plunger, plug-in nozzle with sealing ring and pressure spring.
- Remove plug-in nozzle from control plunger. Use a rod approx.  $\varnothing 7$  in diameter, if necessary. Never use a pointed instrument such as a needle.
- Insert new plug-in nozzle with sealing ring into the control plunger as far as it will go.
- Insert pressure spring (without crossing the thread) into the bore hole.
- Insert control plunger with new plug-in nozzle on top of the pressure spring into the bore hole without crossing the thread.
- Check control plunger for smooth action by pressing against the pressure spring. Crossing the thread causes malfunctions.
- Screw in stop screw or signal transmitter with sealing ring.
- Open shut-off valve.



### Note

With altered nozzle-cross-section, the nozzle-statements are to be altered accordingly on the Type plate sign.



**Order No. 1-3028-EN**

Subject to change without notice! (02/2016)

**Important product usage information**

All products from SKF may be used only for their intended purpose as described in this brochure and in any instructions. If operating instructions are supplied with the products, they must be read and followed.

Not all lubricants are suitable for use in centralized lubrication systems. SKF does offer an inspection service to test customer supplied lubricant to determine if it can be used in a centralized system. SKF lubrication systems or their components are not approved for use with gases, liquefied gases, pressurized gases in solution and fluids with a vapor pressure exceeding normal atmospheric pressure (1013 mbars) by more than 0.5 bar at their maximum permissible temperature.

Hazardous materials of any kind, especially the materials classified as hazardous by European Community Directive EC 67/548/EEC, Article 2, Par. 2, may only be used to fill SKF centralized lubrication systems and components and delivered and/or distributed with the same after consulting with and receiving written approval from SKF.

**Brochure note**

1-3027-EN	Overview brochure - Flow limiter		
1-3001-EN	Flow limiter SP/SMB3	6 to 38 l/min	Sensor and piston detector
1-3001-EN	Flow limiter SP/SMB6	25 to 132 l/min	Sensor and piston detector
1-3002-EN	Flow limiter SP/SMB9	0.08 to 8 l/min	Gear wheel-type flow indicator
1-3003-EN	Flow limiter SP/SMB10	0.21 to 8.15 l/min	Gear wheel-type flow indicator
1-3004-EN	Flow limiter SP/SMB13	6 to 38 l/min	Gear wheel-type flow indicator
1-3005-EN	Flow limiter SP/SMB14	25 to 132 l/min	Gear wheel-type flow indicator
1-1730-EN	Electrical plug-in connections		

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