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.

PLEASE NOTE:
Product groups SMB 8, 9 and 10 have been replaced by the new flow limiter series SMB M, featuring innovative building block design for highest variability.
Refer to brochure 18872 EN for more information.
Flow limiter SP/SMB8

The SP/SMB8 flow limiter comes with two throttles installed in series (D₁, D₂). Throttle D₁ is an interchangeable plug-in nozzle which, as a non adjustable orifice, determines the rated volumetric flow. Nonadjustable orifice D₁ is available with different nozzle cross sections (see table on page 8 and 10). Throttle D₂, 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 D₂ in such a way that the differential pressure at nonadjustable orifice D₁ 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 D₂ (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.,

\[ Q = 1.15 \cdot (\sum Q) \]

Due to the very short throttle length of the plug-in nozzle D₁, 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.

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Flow limiter SP/SMB8

Design Flow limiter SP/SMB8
with signal transmitter version E5

Design Flow limiter SP/SMB3
with proximity switch E6

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

SP/SMB8 with proximity switch E6, 24 V

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Flow limiter SP/SMB8

 PLEASE NOTE: Product groups SMB 8, 9 and 10 have been replaced by the new flow limiter series SMB M, featuring innovative building block design for highest variability. Refer to brochure 18872 EN for more information.

Mounting plate for 1 to 6 flow limiters

Material .......................... AlCuPb F38, neutrally anodized

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>92</td>
<td>74</td>
<td>0.55</td>
<td>24-0714-3477</td>
</tr>
<tr>
<td>2</td>
<td>138</td>
<td>120</td>
<td>0.75</td>
<td>24-0714-3478</td>
</tr>
<tr>
<td>3</td>
<td>184</td>
<td>166</td>
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<td>24-0714-3479</td>
</tr>
<tr>
<td>4</td>
<td>230</td>
<td>212</td>
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<td>24-0714-3480</td>
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<tr>
<td>5</td>
<td>276</td>
<td>258</td>
<td>1.35</td>
<td>24-0714-3481</td>
</tr>
<tr>
<td>6</td>
<td>322</td>
<td>304</td>
<td>1.55</td>
<td>24-0714-3482</td>
</tr>
</tbody>
</table>

Mounting plate for 1 to 6 flow limiters with extension for oil filter mounting

Material .......................... AlCuPb F38, neutrally anodized

<table>
<thead>
<tr>
<th>Qty-Flow-limiter [n]</th>
<th>Dim. L [mm]</th>
<th>Dim. L₁ [mm]</th>
<th>Weight [kg/St.]</th>
<th>Order no. 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>145.5</td>
<td>127.5</td>
<td>0.85</td>
<td>24-0714-3471</td>
</tr>
<tr>
<td>2</td>
<td>191.5</td>
<td>173.5</td>
<td>1.05</td>
<td>24-0714-3472</td>
</tr>
<tr>
<td>3</td>
<td>237.5</td>
<td>219.5</td>
<td>1.25</td>
<td>24-0714-3473</td>
</tr>
<tr>
<td>4</td>
<td>283.5</td>
<td>265.5</td>
<td>1.45</td>
<td>24-0714-3474</td>
</tr>
<tr>
<td>5</td>
<td>329.5</td>
<td>311.5</td>
<td>1.65</td>
<td>24-0714-3475</td>
</tr>
<tr>
<td>6</td>
<td>375.5</td>
<td>357.5</td>
<td>1.85</td>
<td>24-0714-3476</td>
</tr>
</tbody>
</table>

1) Without oil filter, must ordered separately.

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

<table>
<thead>
<tr>
<th>Designation</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>mesh spacing 300 µm</td>
<td>24-1874-2106</td>
</tr>
<tr>
<td>Gasket set for interchangeable strainer</td>
<td>24-0404-2117</td>
</tr>
</tbody>
</table>

Replacement parts

<table>
<thead>
<tr>
<th>Designation</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate with interchangeable strainer</td>
<td>24-0714-3470</td>
</tr>
</tbody>
</table>

PLEASE NOTE:

The mounting plates and strainers are designed with standardization in mind. The mounting plates can be combined with interchangeable strainers and oil filters. Please refer to the technical specifications for the dimensions and order numbers.

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Flow limiter SP/SMB8

Oil filter with shut-off valve

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

<table>
<thead>
<tr>
<th>Designation</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve insert with hand wheel</td>
<td>24-2104-2009</td>
</tr>
<tr>
<td>Filter insert, filter fineness 100 µm</td>
<td>24-0651-2200</td>
</tr>
<tr>
<td>Gasket set for filter</td>
<td>24-0404-2293</td>
</tr>
</tbody>
</table>

**PLEASE NOTE:**
Product groups SMB 8, 9 and 10 have been replaced by the new flow limiter series SMB M, featuring innovative building block design for highest variability. Refer to brochure 18872 EN for more information.

Dummy element to blank off unused mounting

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

<table>
<thead>
<tr>
<th>Designation</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dummy element</td>
<td>24-0711-2403</td>
</tr>
</tbody>
</table>
Flow limiter SP/SMB8

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 \( p_3 \) ≥ 5 bar

Lubricant mineral oils, synthetic oils and ecological oils
Operating viscosity 20 to 600 mm\(^2\)/s

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

Switching voltage 24 V bis 230 V AC/DC
Switching current max. 2A
Switching capacity max. 40 W
Function NC (normaly closed)
Type of protection IP 65

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

Connection lines screwed

Cross section for connection
E4 max. 3x0.75 mm
E5 max. 2x0.75 mm

ATEX Version

Switching voltage 30 V DC
Switching current max. 100 mA
Function NC (normaly closed)
Type of protection EX II 3 c II CT6

Connection

E5 plug straight, 4 pol, without LED, M12x1

Connection lines screwed

Cross section for connection
E5 max. 2x0.75 mm

Proximity switch E6

Type inductive PNP (normaly 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

Accessories/Replacement parts

Designation Order number

Flow limiter SP/SMB8 without nozzle, without signal transmitter 24-1881-3005
Gasket 24-0404-2339

Signal transmitter, Version E4 signal transmitter without coupler socket 24-1072-2113
signal transmitter with coupler socket with LED`s (24 V DC) 24-1072-2115
without LED, M12x1 24-1882-2151

Signal transmitter, Version E5 signal transmitter without coupler socket 24-1072-2113
signal transmitter with coupler socket without LED`s (230 V AC/DC) 24-1072-2114
cooler socket with LED`s 24-1882-2121

Proximity switch E6 Proximity switch 24-1884-2282
Sockets straight, 4-poles, M 12x1 179-999-371
Sockets angled, 4-poles, M 12x1 179-999-372
Sockets straight, 4-poles, M 12x1 with orange cable 5 m 179-999-600
Sockets angled, 4-poles, M 12x1 with orange cable 5 m 179-999-601

Monitoring unit Group monitoring unit 84-8011-0369

PLEASE NOTE:
Product groups SMB 8, 9 and 10 have been replaced by the new flow limiter series SMB M, featuring innovative building block design for highest variability. Refer to brochure 18872 EN for more information.

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 disconnector unit.
2) Sufficient spark protection required.
3) Pay attention to maximum switching capacity.
4) With cold-start-conditions with a operating-viscosity > 600 mm\(^2\)/s occurs a diminution of the debit-volume-stream
5) Please order coupler socket separately, see accessories
# Flow limiter SP/SMB8

## Plug-in nozzles

<table>
<thead>
<tr>
<th>Nominal volumetric [l/min]</th>
<th>index nozzle</th>
<th>nozzle [Ø mm]</th>
<th>Spare Part complete Plug in nozzle D₁</th>
<th>Nominal volumetric [l/min]</th>
<th>index nozzle</th>
<th>nozzle [Ø mm]</th>
<th>Spare Part complete Plug in nozzle D₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.081</td>
<td>050</td>
<td>0.50</td>
<td>24-0455-2574</td>
<td>1.67</td>
<td>150</td>
<td>1.50</td>
<td>24-0455-2594</td>
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<tr>
<td>0.115</td>
<td>055</td>
<td>0.55</td>
<td>24-0455-2575</td>
<td>1.79</td>
<td>155</td>
<td>1.55</td>
<td>24-0455-2595</td>
</tr>
<tr>
<td>0.150</td>
<td>060</td>
<td>0.60</td>
<td>24-0455-2576</td>
<td>1.92</td>
<td>160</td>
<td>1.60</td>
<td>24-0455-2596</td>
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<tr>
<td>0.207</td>
<td>065</td>
<td>0.65</td>
<td>24-0455-2577</td>
<td>2.07</td>
<td>165</td>
<td>1.65</td>
<td>24-0455-2597</td>
</tr>
<tr>
<td>0.252</td>
<td>070</td>
<td>0.70</td>
<td>24-0455-2578</td>
<td>2.21</td>
<td>170</td>
<td>1.70</td>
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<tr>
<td>0.290</td>
<td>075</td>
<td>0.75</td>
<td>24-0455-2579</td>
<td>2.36</td>
<td>175</td>
<td>1.75</td>
<td>24-0455-2599</td>
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<tr>
<td>0.345</td>
<td>080</td>
<td>0.80</td>
<td>24-0455-2580</td>
<td>2.52</td>
<td>180</td>
<td>1.80</td>
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<tr>
<td>0.411</td>
<td>085</td>
<td>0.85</td>
<td>24-0455-2581</td>
<td>2.67</td>
<td>185</td>
<td>1.85</td>
<td>24-0455-2601</td>
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<tr>
<td>0.468</td>
<td>090</td>
<td>0.90</td>
<td>24-0455-2582</td>
<td>2.80</td>
<td>190</td>
<td>1.90</td>
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<tr>
<td>0.559</td>
<td>095</td>
<td>0.95</td>
<td>24-0455-2583</td>
<td>2.98</td>
<td>195</td>
<td>1.95</td>
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<td>0.650</td>
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<td>3.98</td>
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<td>1.45</td>
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<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**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 mm²/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).
Flow limiter SP/SMB8

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 mm²/s

Example for how to choose a nozzle

Given conditions: desired flow rate 0.690 l/min, operating viscosity 300 mm²/s, differential pressure 50 bar (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 mm²/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 mm²/s). In this example it is 0.735 l/min.

2) Define the correction factor and calculate the actual flow rate
- For the viscosity of 300 mm²/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 20 bar multiplied by the correction factor: 0.735 l/min x 0.925 = 0.680 l/min

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Flow limiter SP/SMB8

Key to order codes

Configuration of type designation for flow limiter SP/SMB8

SP/SMB8/2 / ATEX

ATEX = designation only for ATEX version, only with signal transmitter E5)

Rating designation of nozzle size
Type description Index nozzle, see table on page 7

Volumetric flow control
/0 = without signal transmitter
E4 = with signal transmitter (and connector up to 24 V DC, with green and yellow LED)
E5 = with signal transmitter 24 to 230 V AC/DC (coupler socket without LED)
E6 = with proximity switch, ¹)

Version key
2 = equipped with nozzle, FMP O-rings

Size
8 = volumetric flow of 0 = 0.09 - 8.18 l/min (factory defined)
(The demanded volume flow is determined by the size of the nozzle, see table of nozzles page 7)

Type
Flow limiter with nonadjustable orifice (nozzle)

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:

• Body design with grounding clamp
• Type plate extended
• Operation only while using a disconnector unit
• Available inclusive ATEX certificate

Further ATEX versions available on demand after consultation with SKF Lubrication Systems AG.

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Refer to brochure 18872 EN for more information.
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. ø 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.

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PLEASE NOTE:
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Refer to brochure 18872 EN for more information.
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

PLEASE NOTE:

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