

# Circulating Lubrication Systems (Oil)

Screw-in restrictors, metering valve distributors, flow volume dividers

Screw-in restrictor



Metering valve distributor



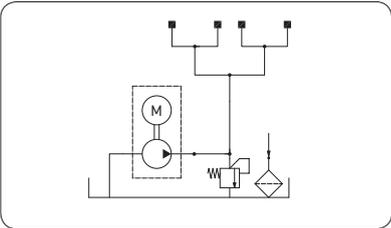
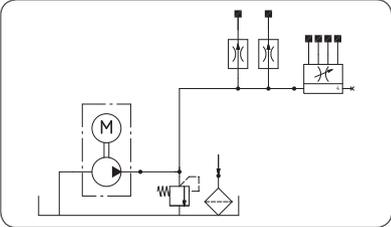
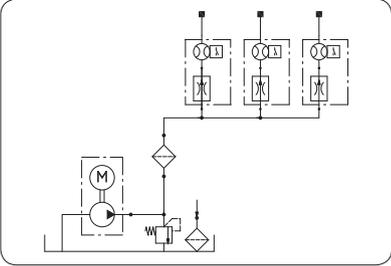
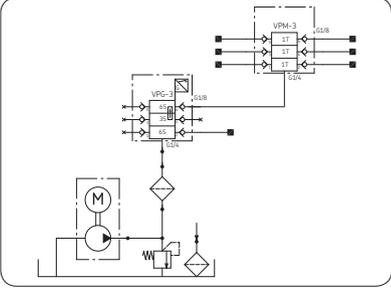
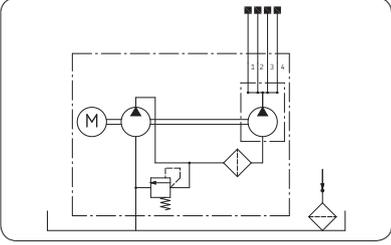
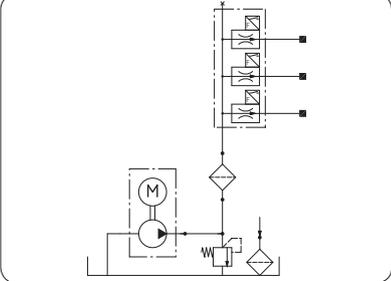
Flow volume divider SP/SMT  
(cf. leaflet 1-5017-EN)



A continuous flow of oil is often necessary for the lubrication or cooling of machines or systems requiring large amounts of oil. This flow is produced by gear, gerotor, vane and piston pumps and then distributed to meet the needs of the individual lube points.

The system is very simple if there is only one lube point to be supplied. But if the lubricant is to be delivered to a number of lube points in equal quantities or certain proportions, there are several possibilities entailing different expenses and effects.

It must be remembered that circulating lubrication systems require an oil return line from the lube points to the oil reservoir. Adequate filtering of the oil must be provided. Restrictors, especially for small amounts of oil, are sensitive to dirt.

Distribution systems	System description
<p><b>1</b></p> 	<p><b>1a</b> <i>Restrictor tubes</i></p> <p>A pump supplies a network of lines connected to all the lube points via manifolds and branch lines. The quantity is apportioned in inverse proportion to the resistance of the restrictor tubes, screw-in restrictors or metering valve distributors.</p>
	<p><b>1b</b> <i>Screw-in restrictors and adjustable metering valve distributors</i></p> <p>Screw-in restrictors can be installed on manifolds (cf. leaflet 1-0103-EN) or screwed directly into the threads of the lube points.</p>
	<p><b>1c</b> <i>Flow monitors with choke</i></p> <p>System similar to <b>1b</b>, but the interchangeable metering valve is installed upstream of a flow monitor in which an electrical contact is actuated by a piston moved by the oil flow.</p> <p>The contact returns to its neutral position when there is oil pressure without a simultaneous flow of oil.</p> <p>See leaflet 1-1704-EN</p>
<p><b>2</b></p> 	<p><i>Progressive feeders</i></p> <p>The flow from the pump is divided up by a feeder.</p> <p>The flow from this "master feeder" can be further divided for up to a total of some 100 lube points by way of downstream progressive feeders.</p> <p>See leaflets 1-3013-EN to 1-3017-EN</p>
<p><b>3</b></p> 	<p><i>Multi-circuit pumps</i></p> <p>Multi-circuit pumps (e.g. 2, 4, 5, 8, 10, 20 zones) supply the lube points directly with prespecified quantities of oil that correspond to the pumps' delivery rates. It is possible to work with or without priming pressure, depending on the operating pressures and accuracy requirements to be expected.</p> <p>Subdistribution of the individual zones is possible in accordance with systems <b>1</b> and <b>2</b> above.</p> <p>See leaflet 1-1204-2-EN</p>
<p><b>4</b></p> 	<p><i>Flow volume divider</i></p> <p>The oil is distributed via non-adjustable flow dividers. The volumetric flow in the main line is divided up into individual parallel flows.</p> <p>Secondary distribution as per systems <b>1</b> and <b>2</b> is possible.</p> <p>See leaflet 1-5017-EN</p>

Auxiliary equipment for systems **1a** and **1b** is specified in this leaflet.

## Circulating Lubrication Systems (Oil)

Volumetric flow per lube point	Perm. operating pressure [bar]	Max. number of lubrication points	Monitoring	General remarks and criteria
a few cm <sup>3</sup> to several l/min	2–20	Unlimited in practice.  Tubing cross sections and pump have to be adapted.	No monitoring of individual points, pressure can only be monitored in the main line.	<p><b>1a</b> For an even distribution of oil, provide for the most symmetric layout possible. Lay tubing with the largest possible cross sections from the pump to the junctions. When individual points require different amounts of oil, change the lengths or cross sections of the restrictor tubes to obtain the respectively needed quantity. Inexpensive, reliable, insensitive to dirt. Planning is complicated when extensive, asymmetric systems with different oil needs are involved.</p> <p><b>1b 1c</b> Restrictors can clog up when unfiltered oil is used. Therefore, install anecessary to install a microfilter upstream in the system, preferably with a dirt indicator. Planning and quantity regulation are easy. The pressure losses in the tubing have to be taken into account when the system is designed.</p> <p><b>1a 1b 1c</b> Metering is imprecise with fluctuating and varying back pressures. Often of no importance in circulating lubrication systems not used for cooling purposes at the same time. The systems do not depend on the viscosity.</p>
Screw-in restrictors: 0.2–230 cm <sup>3</sup> /min	2–20			
Metering valve 0–2000 cm <sup>3</sup> /min	0–10			
0.05–14 l/min	5–25		Oil flow is monitored. An alarm is triggered if the flow drops below the bottom limit of the range for the flow monitor selected.	
a few cm <sup>3</sup> to 1 l/min	5–200  Pressure should not exceed 100 bars in circulating lubrication systems.	2 to roughly 100	Central monitoring of functions of all distributors easy since system-related.	<p>Pulsating oil current. Very exact apportioning of quantities, even with back pressures.</p> <p>Planning complicated, especially changes at a later date.</p> <p>The systems depend on the viscosity.</p>
0.015–1.2 l/min per outlet	20 or 80 depending on pump	2, 4, 5, 8, 10, 20 zones per pump	Monitoring of one or more strings of lines with flow monitors or the like possible.	<p>Easy to plan.</p> <p>A monitored string of lines already shows the pump is operating and “lubricant is available”.</p> <p>The lower the pressure difference between the priming pump and distributing pump, the more even the delivery rates are in relation to each other.</p>
0,09–100 l/min per outlet port	Max. 200 depending on flow divider	Limited in practice.	Monitoring of one or more strings possible due to system.	<p>The incoming volumetric flow is divided up into individual parallel flows. The volumetric flow produced does not depend on the system pressure and is nearly independent of the viscosity.</p> <p>The individual volumetric flow rate can be altered by an exchange of plug-in nozzles.</p>

# Screw-in restrictors

Screw-in restrictors are used to deliver relatively small amounts of oil to the lube points. The sizes are identified by code numbers.

The diagrams show the flow rates of the individual sizes as a function of the pressure and as measured with an operating viscosity of oil amounting to 140 mm<sup>2</sup>/s. The flow rate varies with the viscosity.

The restrictors are marked with a direction arrow. The types A and D can either be combined and fitted to manifolds (cf. leaflet 1-0103-EN) or types B and C directly screwed into the ports of the individual lube points.

Special attention must be paid to the use of clean oil and the recommended filter size being 10 µm.

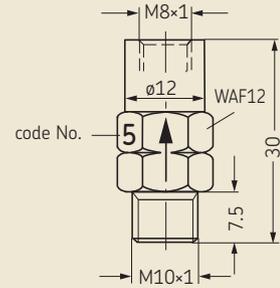
See important product usage information on the back cover.

Screw-in restrictors of types C and D additionally contain one check valve each that can help to prevent leaks.

The scope of delivery also covers union nuts and tapered rings when types C or D are ordered.

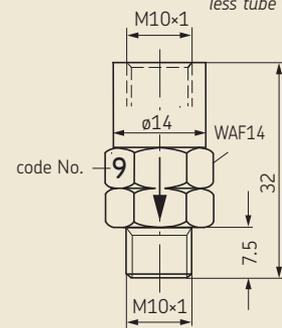
## Type A

Port tapped for solderless tube connection.

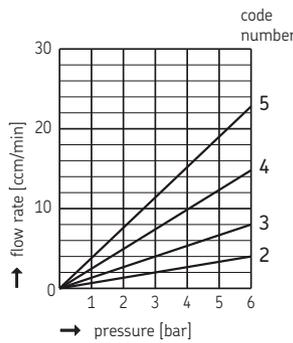


## Type B

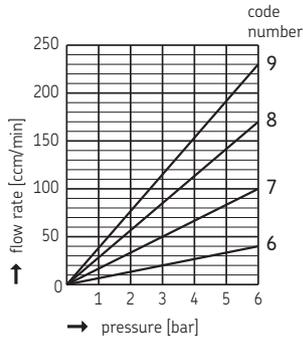
Port tapped for solderless tube connection.



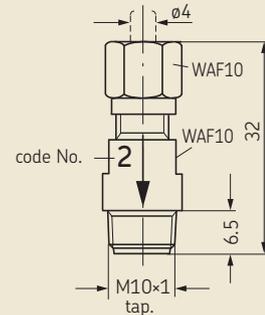
## Diagram (types A and B)



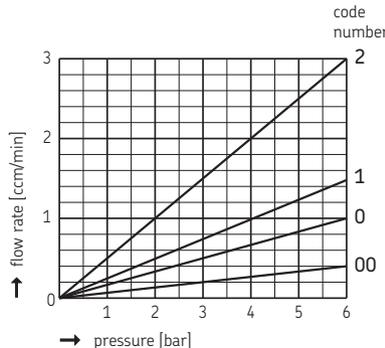
## Diagram (types A and B)



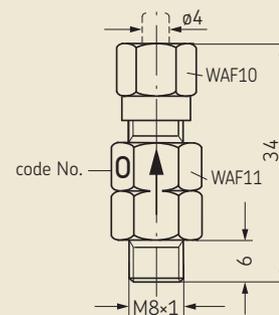
## Type C



## Diagram (types C and D)



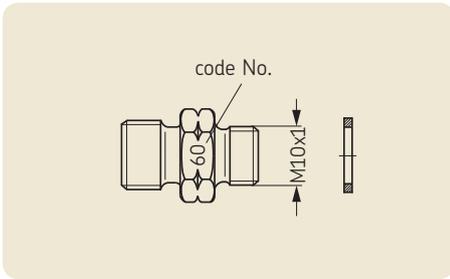
## Type D



Order No.	f. tube diam.	Code No.	Type
VD1-102		2	
VD1-103		3	
VD1-104		4	
VD1-105	4	5	A
VD1-106		6	
VD1-107		7	
VD1-108		8	
VD1-109		9	
Washer, order No. 504-019			
VD2-102		2	
VD2-103		3	
VD2-104	6	4	B
VD2-105		5	
VD2-109		9	
Washer, order No. 504-019			
Order No.	f. tube diam. <sup>1)</sup>	Code No.	Type
VD3-099		00	
VD3-100		0	
VD3-101	4	1	C
VD3-102		2	
Tube connection acc. to DIN 2353			
Order No.	f. tube diam. <sup>1)</sup>	Code No.	Type
VD4-099		00	
VD4-100	4	0	D
Washer, order No. DIN 7603-A8x11.5-CU			

<sup>1)</sup> Tighten the union nut finger-tight. Then tighten the union nut by a max. of 3/4 to 1 revolution using an appropriate tool.

## Connecting piece with restrictor (compl. with washer)



Order No.	for tube diam.	Connection thread <sup>1)</sup>	Code No.
GD60	6	M12x1.5	60
GD61			61
GD62			62
GD63			63
GD64			64
GD65	65		
GD80	8	M14x1.5	80
GD81			81
GD82			82
GD83			83
GD84			84
GD85			85
GD86			86
GD87			87
GD88			88
GD89	89		

<sup>1)</sup> Ports tapped for solderless tube connection to DIN 2353 (cutting sleeve)

### Determining the restrictor size

1. Draw a straight line along the index lines through point Q eff.
2. Determine the point at which p intersects with this line, resulting in D.
3. Select the restrictor closest to point D. D must be inside the white field, i.e. small amounts cannot be "apportioned and monitored" with the unit.

#### Example 1

required:  $Q = 36 \text{ cm}^3/\text{min}$ ,

given:  $v_{\text{eff}} = 280 \text{ mm}^2/\text{s}$ ,

$p = 7 \text{ bar}$

Result: restrictor size No. 60 (borderline case)

#### Example 2

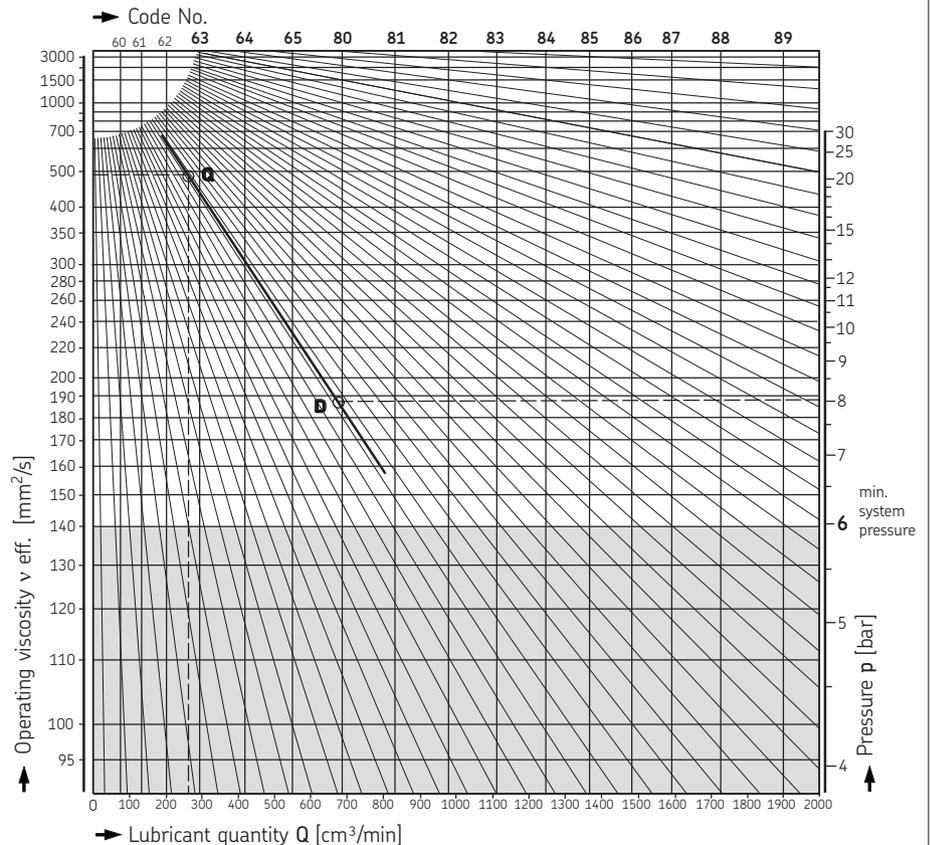
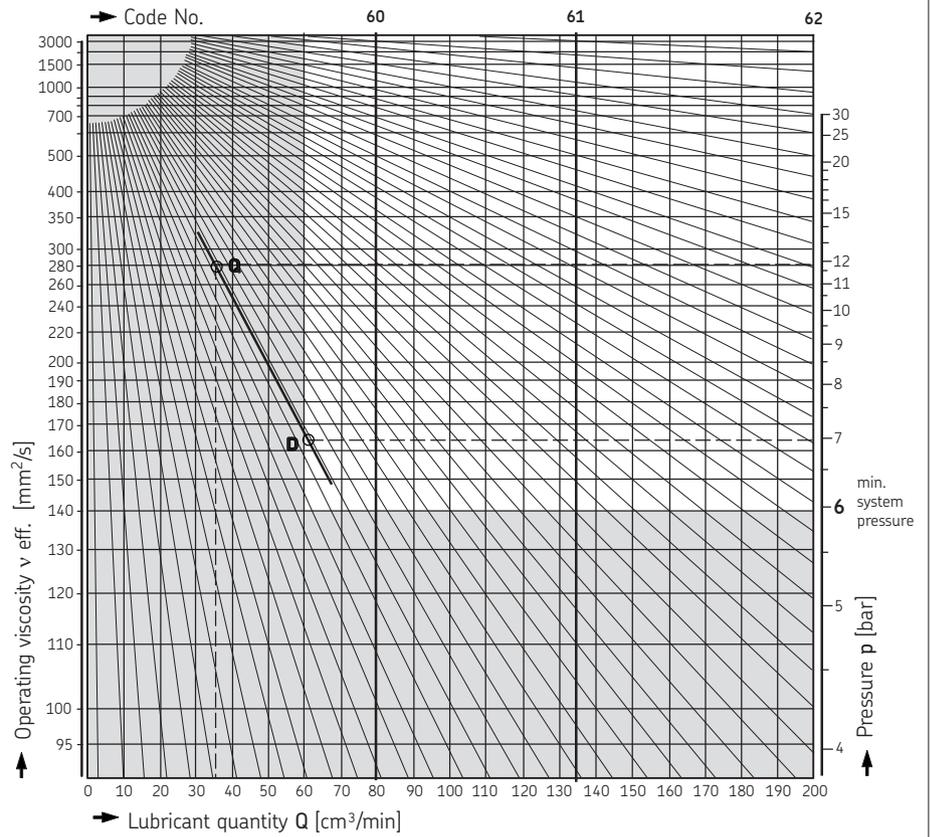
required:  $Q = 260 \text{ cm}^3/\text{min}$ ,

given:  $v_{\text{eff}} = 480 \text{ mm}^2/\text{s}$ ,

$p = 8 \text{ bar}$

Result: restrictor size No. 80

Nomograph for determination of restrictor size

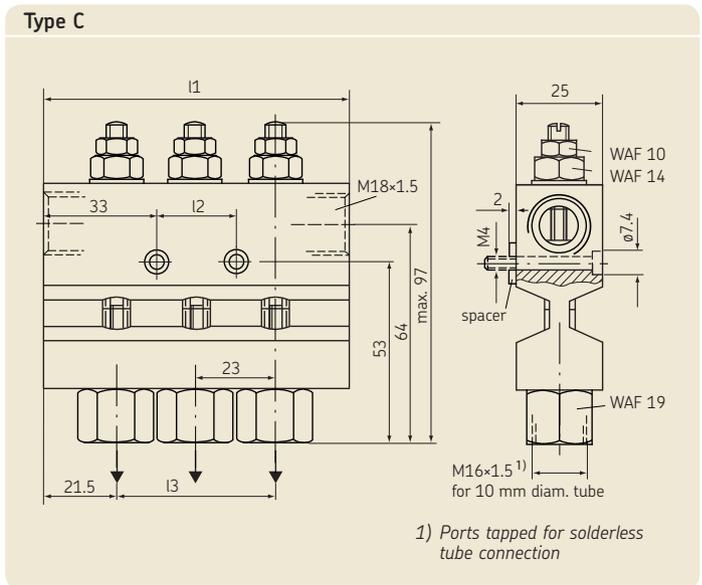
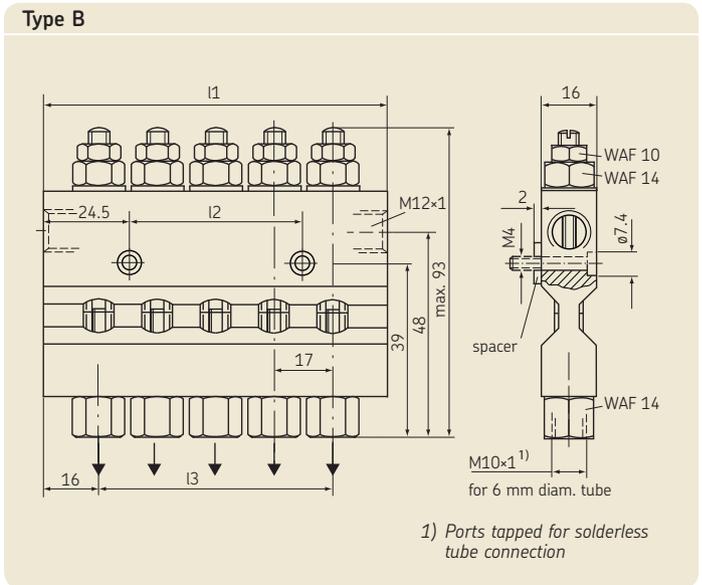
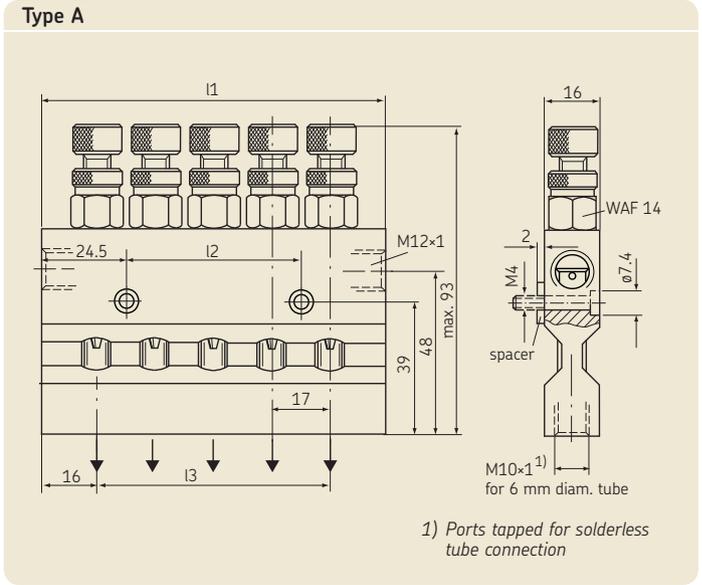


# Metering valve distributors

These metering valve distributors are used if an infinitely variable adjustment of the flow rate per lube point is required – even at a later date.

In the case of **type A** – for flow rates within the drop-feed range – knurled lock nuts and knurled screws are provided for adjustment purposes. It is necessary to provide for a sufficiently large drain-off in order to maintain a free fall of drops in the sight-glass.

In the case of **types B and C**, the continuous flow rate is adjusted after the upper hexagonal lock nut is loosened. Spring-loaded metal pins in sight glasses indicate that oil is flowing when they move away from the mark.



**Technical data**

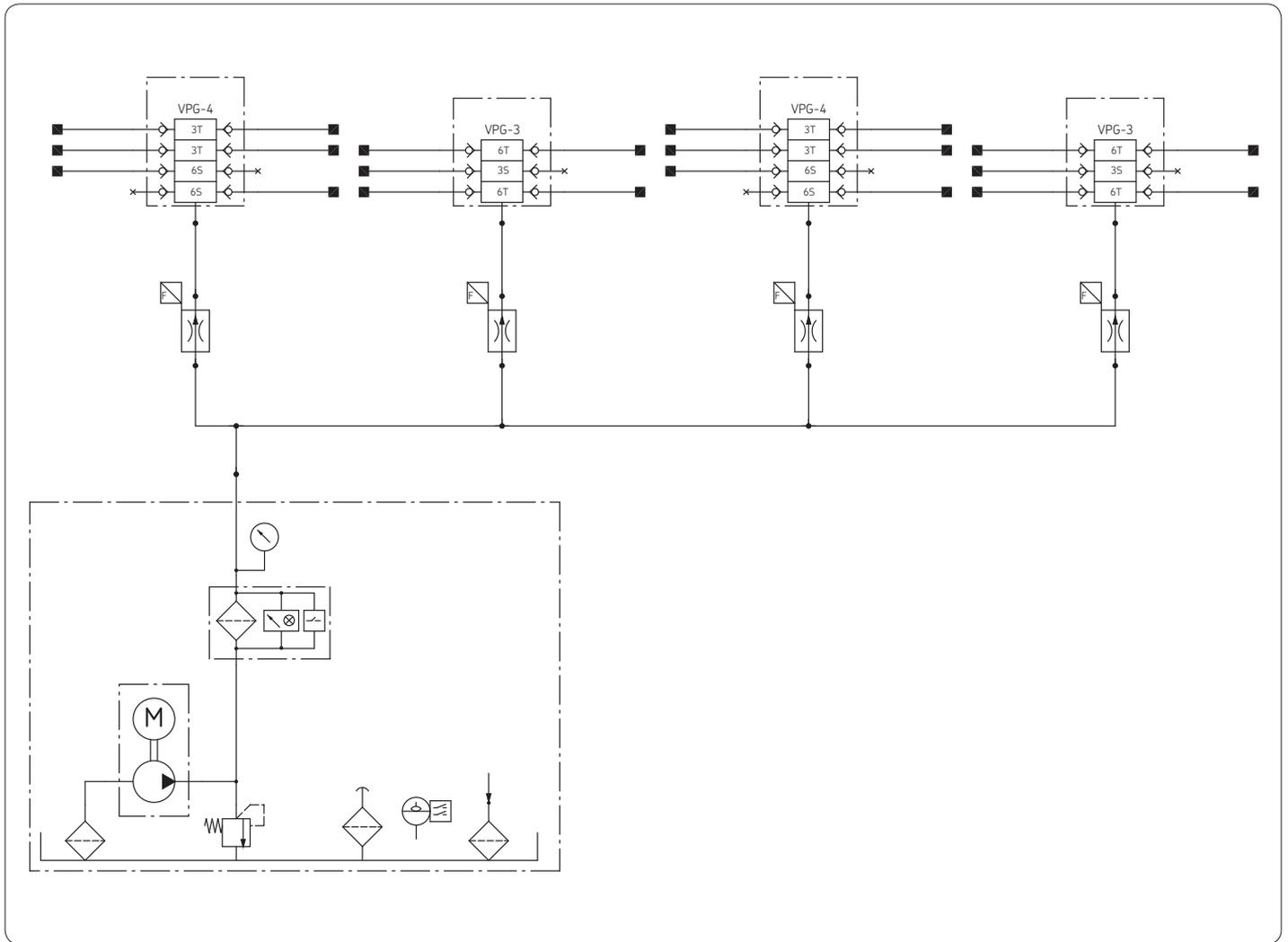
Operating pressure . . . . . 10 bars  
 Viscosity range . . . . . 10 to 1000 mm<sup>2</sup>/s  
 Temperature range . . . . . 0 to +60 °C  
 Mounting position . . . . . as shown

Output range  
 type A . . . . . 0 to 10 cm<sup>3</sup>/min  
 type B . . . . . 10 to 1000 cm<sup>3</sup>/min  
 type C . . . . . 10 to 2000 cm<sup>3</sup>/min

Indicating range B and C at 110 mm<sup>2</sup>/s  
 commencement of indication . . . . . at 10 cm<sup>3</sup>/min  
 end of indication . . . . . at 1000 or 2000 cm<sup>3</sup>/min

Order No.	Number of lube points	Dimensions [mm]			Type
		l1	l2	l3	
242-016.00	1	32	-	-	A
242-026.00	2	49	-	17	A
242-056.00	5	100	51	68	A
242-146.00	14	253	204	221	A
<hr/>					
242-024.00	2	49	-	17	B
242-034.00	3	66	17	34	B
242-044.00	4	83	34	51	B
242-054.00	5	100	51	68	B
242-064.00	6	117	68	85	B
242-104.00	10	185	136	153	B
242-124.00	12	219	170	187	B
<hr/>					
242-025.00	2	66	-	23	C
242-035.00	3	89	23	46	C
242-045.00	4	112	46	69	C
242-055.00	5	135	69	92	C
242-065.00	6	158	92	115	C
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	<b>Types A and B</b>	<b>Type C</b>			
Adapter for main tube	406-162 for 6 mm diam. 408-162 for 8 mm diam. 410-162 for 10 mm diam.	410-018 for 10 mm diam. 412-004 for 12 mm diam.			
Screw plug	408-211	412-011			
Washer	508-215-CU	DIN7603-A18x22-CU			

# Layout of a circulating lubrication system (printing machine) with progressive feeders



**Order No. 1-5006-EN**

Subject to change without notice! (11/2015)



CAD models for products shown in this brochure can be downloaded at: [skf-lubrication.partcommunity.com](http://skf-lubrication.partcommunity.com)

**! Important information on product usage**

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 (1 013 mbar) 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.

**Further brochures**

1-9201-EN Transport of Lubricants in Centralized Lubrication Systems

**SKF Lubrication Systems Germany GmbH**

Motzener Strasse 35/37 · 12277 Berlin · Germany  
PF 970444 · 12704 Berlin · Germany  
Tel. +49 (0)30 72002-0 · Fax +49 (0)30 72002-111  
[www.skf.com/lubrication](http://www.skf.com/lubrication)

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