Flow Monitors and Sensors

for intermittent and circulating centralized lubrication systems

Flow monitor

Flow sensor

Oil-streak sensor

Flow monitors/sensors have the task of monitoring the flow of lubricant from the pump or a piston distributor element to the lube point. Flow monitors with various designs are used for this job. A further task involves monitoring a continuous flow of oil from a pump through a lubrication system. These flow monitors are designed for a throughput ranging from 0,5 cm^3 to 14 000 cm^3.

Flow sensors keep an eye on the flow of lubricant from a metering point to the lube point, the metering point metering out a small amount of oil for only a short period of time.

Depending on the type, flow sensors can monitor lubricant quantities ranging from 10 mm^3 all the way to 600 mm^3 per lubricant pulse.

The oil-streak sensors monitor the continuity of the oil flow in oil+air systems.

So the following points have to be observed when selecting an appropriate monitoring device:

- intermittent or continuous operation
- kind of lubrication system
- lubricant quantity to be monitored
- eff. viscosity of the lubricant
- system pressure.

Overview flow monitors and -sensors

Please have a look at the important product usage information on the back cover of the brochure.

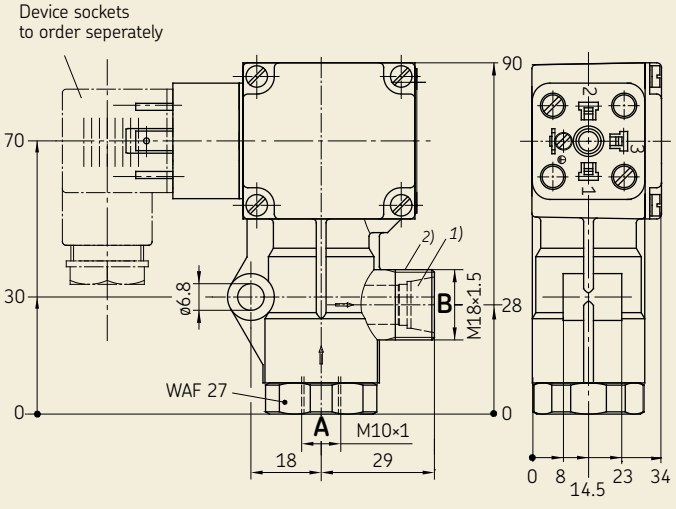
Designation	Order No.	Metered quantity flow rate	Application	Port A	Port B	Fig..	Page
Flow monitor	171-100-011	0,2 – 1,5 cm^3/pass	Intermittend totalloss lubrication systems	M10×1	M18×1,5	1	2
Flow monitor	171-210-051 171-210-052 171-210-053 171-210-054 171-210-055	50 – 100 100 – 200 200 – 500 cm^3/min 500 – 800 800 – 1800	Circulating centralized lubrication systems	M10×1	M18×1,5	2	3
Flow monitor	171-210-061 171-210-062 171-210-063 171-210-064 171-210-065	1,6 – 2,5 2,3 – 4,0 3,6 – 6,0 l/min 5,5 – 10,0 8,0 – 14,0	Circulating centralized lubrication systems	M18×1,5	M18×1,5	3	3
Flow sensor	GS300 GS304N GS304P	10 – 600 mm^3/Impuls	Intermittend centralized lubrication systems, e.g. with piston distributors, metering elements, injection oilers			4	8
Oil-streak sensor	GS4011-S20 GS6011-S20 GS4011-S50 GS6011-S50	120 – 600 120 – 600 60 – 120 60 – 120 mm^3/h	Oil+air centralized lubrication systems for assembling very close to the lube point			5	9
Oil-streak sensor	GS4011-S300 GS6011-S300	ab 2 ab 2 mm^3/Impuls	Oil+air centralized lubrication systems for assembling very close to the mixing valve			5	9

Please note: See leaflet 1-1730-EN for associated line sockets.

Flow monitors for monitoring of an intermittend flow of oil

Totalloss lubrication systems

Fig. 1



Note: See application I, page 4.

[1]) Port tapped for cutting-sleeve screw union E0-2 DIN 2353 / ISO 8434-1
[2]) DIN 2353 / ISO 8434-1. Only permissible for the use of preassembled fittings. We recommend use of a preassembled E0-2 screw union. (Example: GA21...23/GA30)

Technical data

Number of cycles . . . . . max. 2/min [3])
Operating viscosity . . . . . 20-750 mm^2/s
Actuating pressure . . . . . min. 4 bars [4]) max. 30 bars
Electr. switching. . . . . changeover 250 V AC, 0,5 A
Type of enclosure . . . . . IP 44
Mounting position . . . . . any

Materials:
Housing . . . . . die-cast zinc, polyamide
Seals . . . . . NBR (FKM version on request)

[3]) Suitable for medial operating viscosity. In case of higher viscosity decreases the number of cycles.

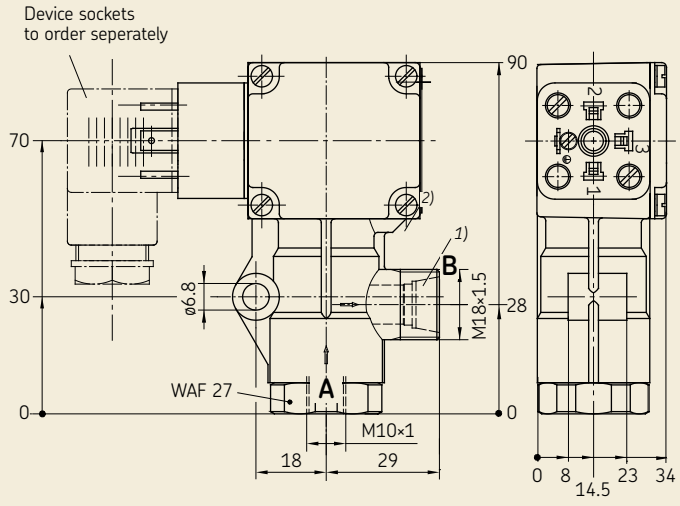
[4]) In single line centralized lubrication systems the main line needs to have before the distributors a pressure of at least 14 bars.

Order No.	Flow rate
171-100-011	0,2 – 1,5 cm^3/pass

Flow monitors for the monitoring of a continuous flow of oil

circulating lubrication systems with 50 bis 1800 cm^3/min or 1,6 bis 14 l/min

Fig. 2



Note: See application II + III on page 4 + 5.

Technical data

Operating viscosity . . . . . 20 – 1000 mm^2/s
Actuating pressure . . . . . min. 4 bars [3], max. 25 bars
Electr. switching . . . . . changeover 250 V AC, 0,5 A
Perm. operating temperature . . . . + 5 bis +80 °C
Type of enclosure . . . . . IP 65
Mounting position . . . . . any

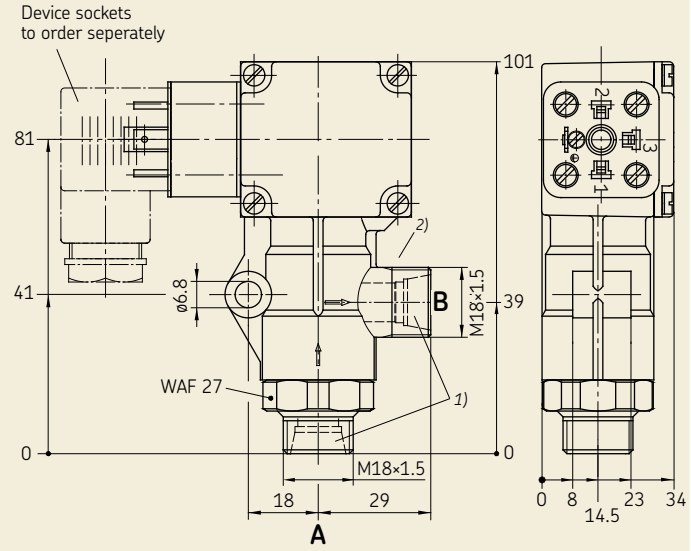
Materials:

Housing . . . . . die-cast zinc, polyamide
Seals . . . . . NBR (FKM version on request)

[3] *If the flow monitors are equipped with metering restrictors, at least 6 bars are required in the feed lin*

Order No. (Fig. 2)	Flow rate
171-210-051	50 – 100
171-210-052	100 – 200
171-210-053	200 – 500 cm^3/min
171-210-054	500 – 800
171-210-055	800 – 1800

Fig. 3



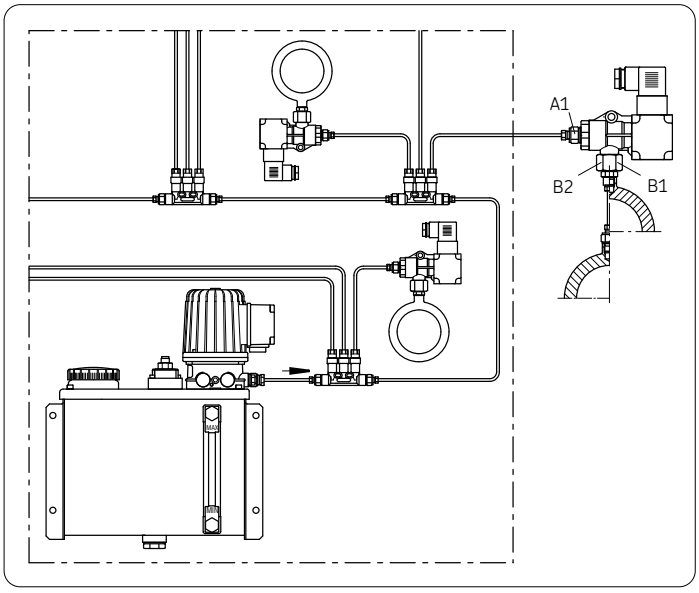
Note: See application IV, page 5.

Order No. (Fig. 3)	Flow rate
171-210-061	1,6 – 2,5
171-210-062	2,3 – 4,0
171-210-063	3,6 – 6,0 l/min
171-210-064	5,5 – 10,0
171-210-065	8,0 – 14,0

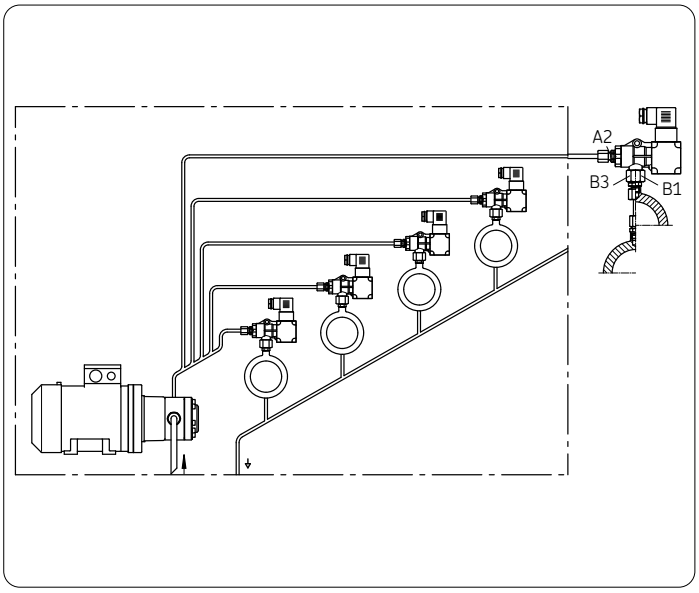
[1] *Port tapped for cutting-sleeve screw union E0-2 DIN 2353 / ISO 8434-1*
[2] *DIN 2353 / ISO 8434-1. Only permissible for the use of preassembled fittings. We recommend use of a preassembled E0-2 screw union. (Example: GA21...23/GA30)*

System examples and connection fittings

I. Singleline, totalloss lubrication system with piston distributors



II. Circulating lubrication system with multicircuit pump unit



Connection fittings I

Straight screwin connector [1])

Connection	for tubing diam.	Socket union order No.	Double tapered ring order No.	Adapter order No.	Washer order No.
A1	4	404-002	404-001	404-006	504-019

Connection fittings with screwed stud end
for direct attachment of flow monitor to the lube point

Connection	Adapter Order No.	d1
B1	GA21	M10×1
	GA22	M10×1 tap.
	GA23	R1/8 tap.
	GA24	R1/4 tap.

Connection fitting for tubing [1])

Connection	for tubing diam.	Adapter order No.	d2	Socket union order No.	Double tap. ring order No.
B2	4	GA30	M8×1	404-002	404-001

Connection fittings II

Connection piece without restrictor [2])
Straight screw-in connector

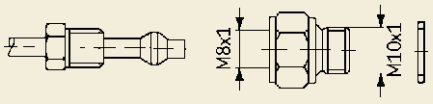
Connection	for tubing diam.	Union nut order No.	Cutting sleeve order No.	Adapter order No.	Washer order No.
	6	406-302	406-301	GD60.02	
A2	8	408-302	408-301	GD80.02	504-019
	10	410-302	410-301	GD100.02	

Connection fitting for tubing [2])

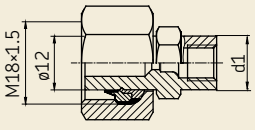
Connection	for tubing diam.	Adapter order No.
	6	473-806-391
B3	8	473-808-392
	10	473-810-391

Connection

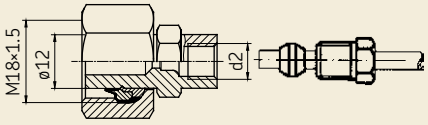
A1



B1

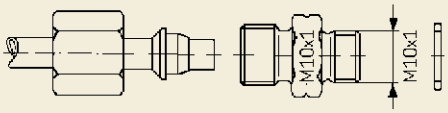


B2

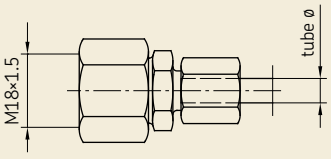


Connection

A2

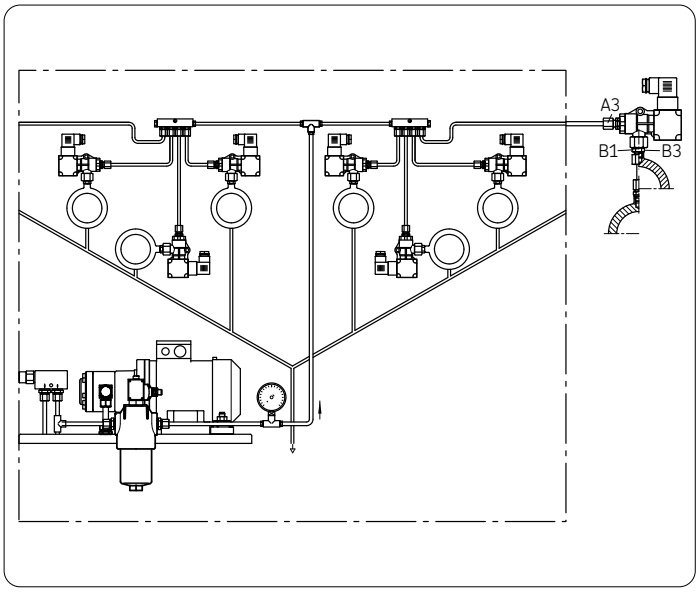


B3

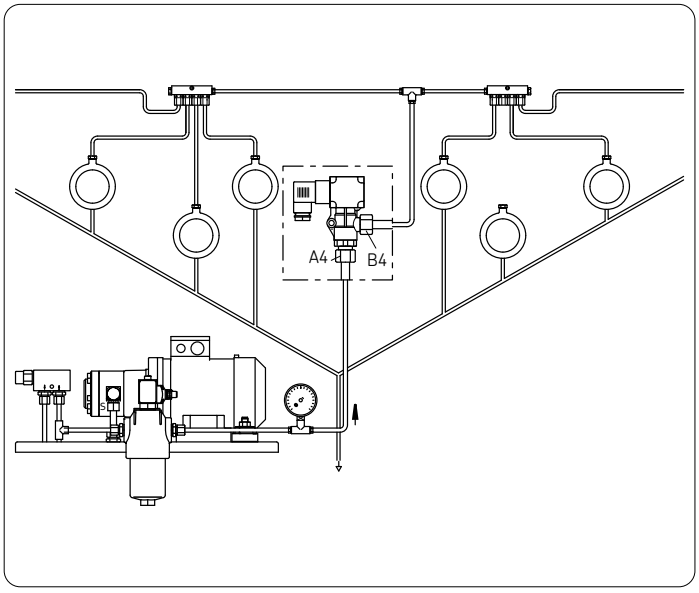


System examples and connection fittings

III. Circulating lubrication system with restrictors



IV. Circulating lubrication system with restrictor tubes



Connection fittings III

Connection piece with restrictor [2])
Straight screw-in connector

Connection	for tubing diam.	Union nut order No.	Cutting sleeve order No.	Adapter with restrictor (compl. with washer) order No.	code No.
A3	6	406-302	406-301	GD60	60
				GD61	61
				GD62	62
				GD63	63
				GD64	64
				GD65	65
	8	408-302	408-301	GD80	80
				GD81	81
				GD82	82
				GD83	83
				GD84	84
				GD85	85
				GD86	86
				GD87	87
				GD88	88
				GD89	89

Connection fittings IV

Only for a range of 1.6 to 14 l/min
(flow monitor as per Fig. 2, page 3)

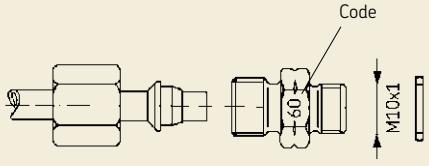
Tube union [2])
for direct connection to the flow monitor

Connection	for tubing diam.	Function nut order No.
A4	12	460-212-001

[1]) *Port tapped for solderless tube connection*
[2]) *Port tapped for solderless cutting-sleeve screw union to DIN 2353*

Connection

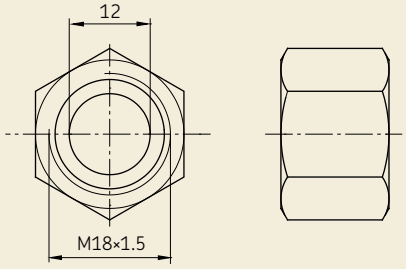
A3



The required restrictor sizes are determined with the nomograph on page 6

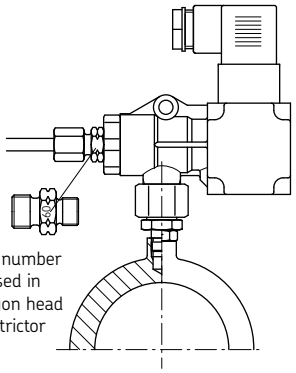
Connection

A4



Nomograph for determination of restrictor sizes

(connection A3, system example III)

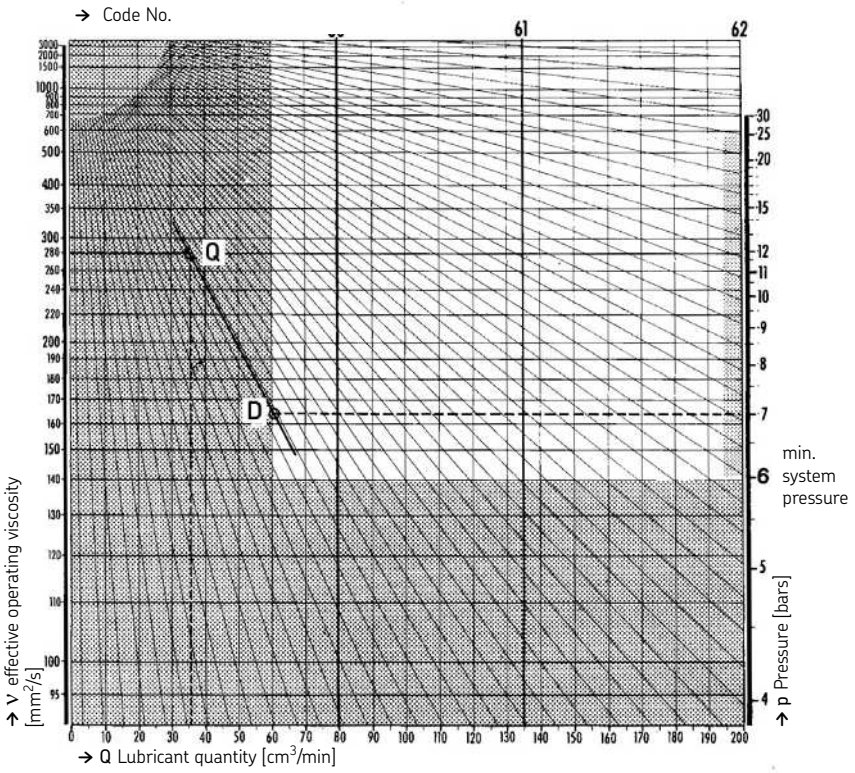


Determining the restrictor size

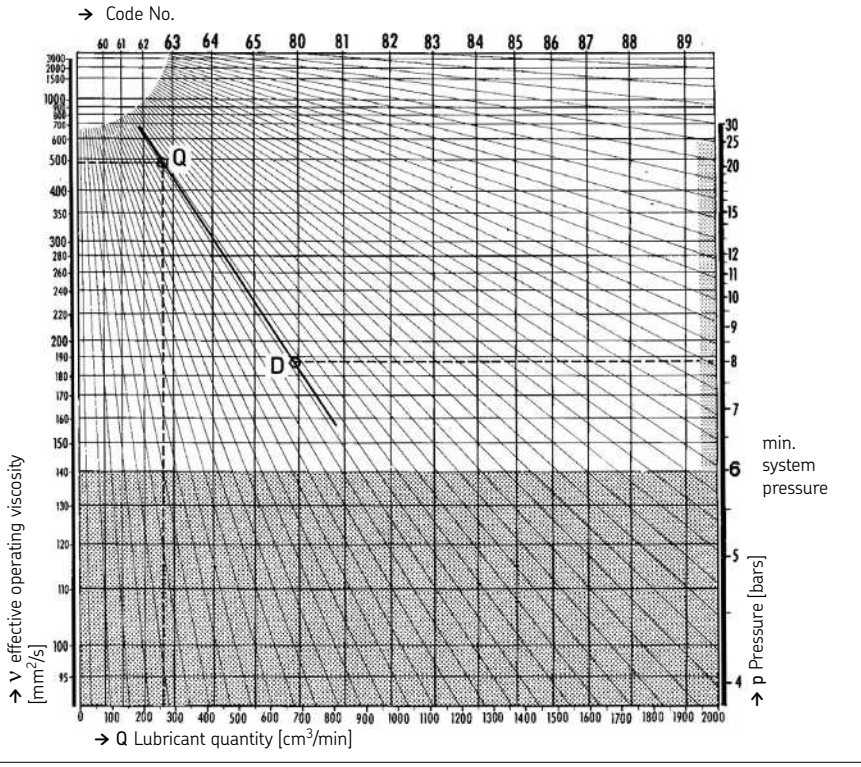
1. Draw a straight line along the index lines through point **Q** ν effective.
2. Determine the point at which **p** intersects with this line, resulting in **D**.
3. Select the restrictor **closest** to point **D.**

D must be inside the white field, that means small amounts cannot be "apportioned and monitored" with the unit.

Example 1



Example 2



Example 1:

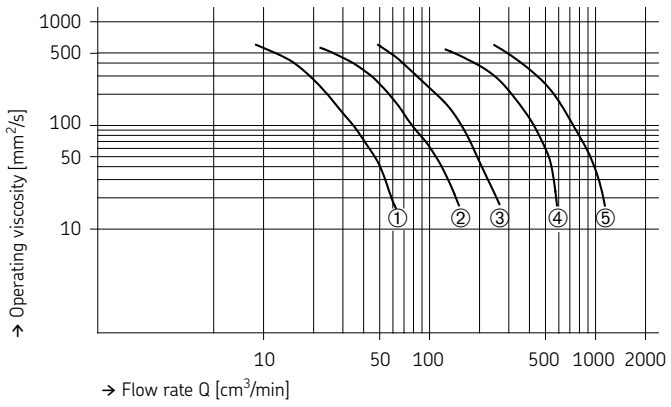
required: Q = 36 cm^3/min,
given: ν eff. = 280 mm^2/s
p = 7 bars
Result: restrictor size No. 60
(borderline case)

Example 2:

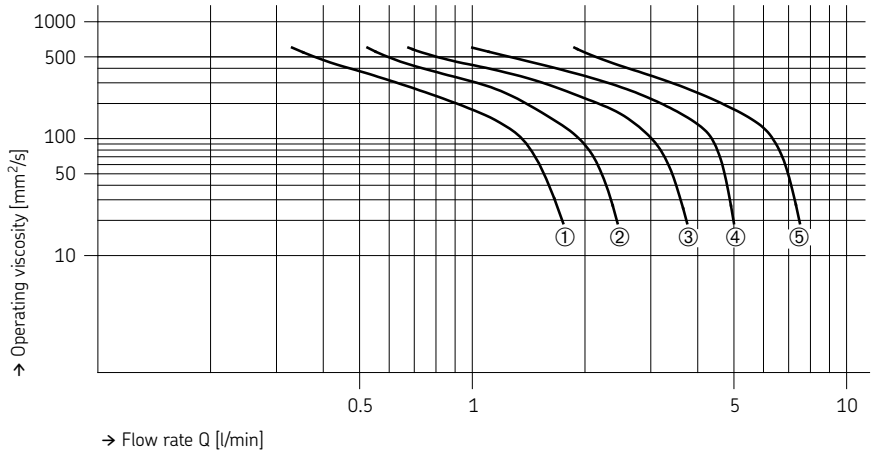
required: Q = 260 cm^3/min,
given: ν eff. = 480 mm^2/s
p = 8 bars
Result: restrictor size No. 80

Flow rate at activation point as a factor of the viscosity

Flow monitors to monitor a flow of oil (circulating lubrication system)



Order No.	Flow rate activation point [cm³/min]	Actuation curve as per diagram
171-210-051	35	①
171-210-052	75	②
171-210-053	150	③
171-210-054	400	④
171-210-055	700	⑤

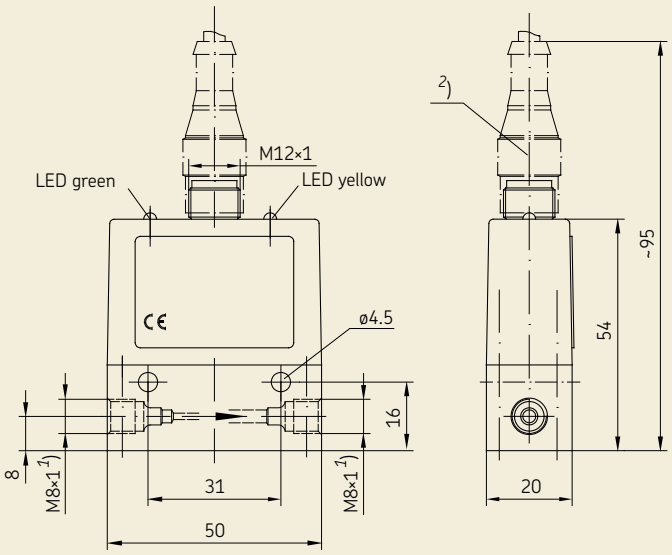


Order No.	Flow rate activation point [l/min]	Actuation curve as per diagram
171-210-061	1.3	①
171-210-062	1.9	②
171-210-063	3.0	③
171-210-064	4.5	④
171-210-065	6.5	⑤

GS300, GS304N, GS304P

Flow sensors for monitoring of lubricant feedright at the lube point

Fig. 4



1) *Port tapped for solderless 4 mm diam. tube connection*

2) ***Accessories***
GS300: 5 m connection cable, ***order No. GS200.U4***
GS304P / GS304N: 5 m onnection cable with straight line socket, 4-pole type, ***order No. 179-990-600***

Technical data

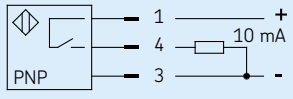
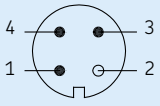
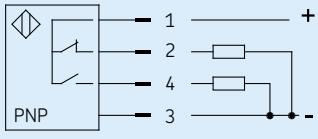
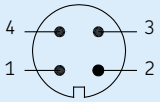
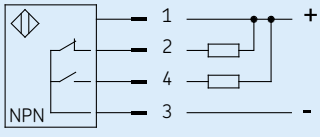
Measuring principle	calorimetrical
Suitable metered quantities	from 0.01 to 0.6 cm^3/pulse
Clock frequency[3])	max. 4 pulse/min
Lubricant[4])	oil and grease, NLGI grades 000, 00
Max. operating pressure	40 bars
Operating temperature	+10 °C to +50 °C
Installation	directly upstream of lube point
Vibration resistance	20 g (DIN/IEC 68-2-27, 10-2000 Hz)
Impact resistance	50 g (DIN/IEC 68-2-27, 11 ms)

3) *Sensor needs 30 sec. of warmup time.*

4) *The use of lubricants containing corrosive and/or abrasive additives may impair sensor function and possibly damage the sensor.*

Electrical data

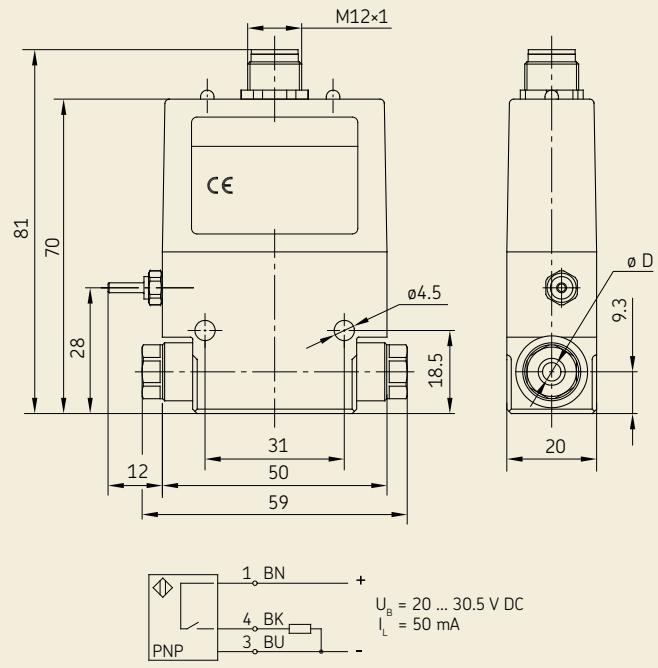
Rated voltage U_N		24 V DC
Residual ripple		10 %
Working range U_A		18 to 30 V DC
Max. power consumption I_E		25 mA
Pulse output		3 s
Load current I_A	for GS300	max. 10 mA
	for GS304	max. 500 mA per output
Output protection		short-circuit protection
Built-in plug		circular connector with M12×1 screw plug

Order No.		Switching function		Electrical connection
GS300		**Pin 1** (BN - brown):	+ 24 V	
		Pin 3 (BU - blue):	0 V	
		Pin 4 (BK - black):	PNP/NO – closes in event of flow	
GS304P		**Pin 1** (BN - brown):	+ 24 V	PNP/NC – opens in event of flow
		Pin 2 (WH	- white):	
		Pin 3 (BU - blue):	0 V	
		Pin 4 (BK - black):	PNP/NO – closes in event of flow	
GS304N		**Pin 1** (BN - brown):	+ 24 V	NPN/NC – opens in event of flow
		Pin 2 (WH	- white):	
		Pin 3 (BU - blue):	0 V	
		Pin 4 (BK - black):	NPN/NO – closes in event of flow	

GS4011-S.., GS6011-S..

The oil-streak sensors monitor the continuity of the oil flow in oil+air lubrication systems

Fig. 5



So-called oil+air centralized lubrication systems are used to supply high-speed rolling bearings in tool spindles. The bearings are supposed to be supplied with extremely small quantities of lubricant (minimal-quantity lubrication) in the case of these applications.
To achieve such small quantities of oil per unit of time, what was originally a relatively large drop of oil is torn apart by a current of air on its way from the metering point to the bearing. The oil to be delivered is fed in the line to the bearing as a thin flow of lubricant along the wall.

Monitoring:
So far, only the metered quantity of oil from the metering element has been checked upstream of the oil and air mixing point. The oil-streak sensor makes it possible to monitor the transport of a fine current of oil along the secondary line's wall downstream of the oil and air mixing point. The closer the sensor is located to the lube point, the more reliable the system monitoring.

Technical data

Measuring principle. . . . . optical
Fluid . . . . . oil + air
Max. operating pressure . . . . . 10 bars
Operating temperature . . . . . 0 to +60 °C
Mounting position . . . . . horizontal, no swivel drive
(GS4011-S300 and GS6011-S300 also vertical)

Electrical data

Rated voltage U_N . . . . . 24 V DC [1])
Operating range U_B . . . . . 20 to 30.5 V DC
Max. power consumption I_E . . . . . 40 mA
Type of enclosure IP54
Outputs . . . . . pnp type
closes when oil streaks detected, opens when there are none

Color coding with standard sensor cables:
brown (BN) . . . . . +24 V
blue (BU) . . . . . GND
black (BK) . . . . . make contact
white (WH) . . . . . break contact

[1]) *Protective measure to be taken for operation in conformity with "Functional Extra-Low Voltage with Safety Separation" (PELV = Protective Extra-Low Voltage)*

Accessories:
Connection cable with straight cable socket, 4-pole type, length 5 m,
order No. 179-990-600
Socket, 90° angled,
order No. 179-990-372

Order No.	Plastic tubing ø D	Flow rate
GS4011-S20	4	120 – 600 mm³/h
GS4011-S50	4	60 – 120 mm³/h
GS6011-S20	6	120 – 600 mm³/h
GS6011-S50	6	60 – 120 mm³/h
GS4011-S300	4	from 2 mm³/pulse
GS6011-S300	6	from 2 mm³/pulse

Notes

Order No. 1-1704-EN
Subject to change without notice! (03/2021)

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.

Further brochures:
1-0103-EN Fittings and Accessories
1-1730-EN Electric Plug-and-Socket Connectors
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

This brochure was presented by: