



bielomatik



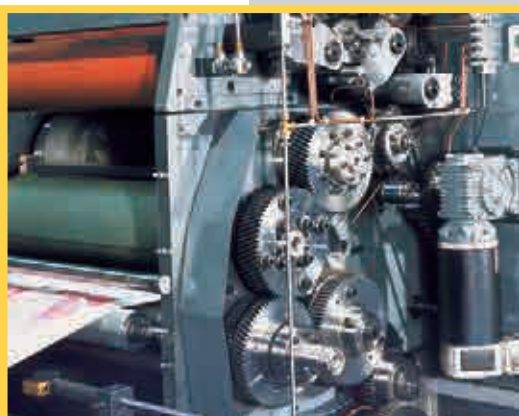
Excellence in
Central Lubrication

Product Catalogue Central Lubrication Systems





Single line lubrication system within a paper processing system



Single line lubrication system of a paper processing line

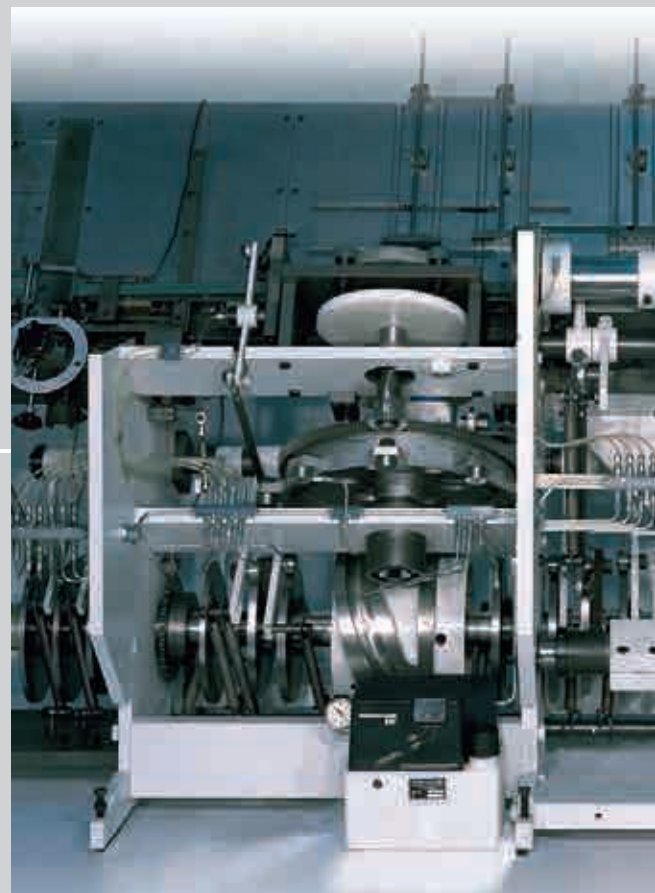
Single line lubrication system for oil within a printing machine

Our centralized lubrication technology sees to the exact dosing of lubricants. We offer application-specific solutions for plant and machinery in all industries.

As diverse as this scope of application is, our huge range of system components is

Centralized lubrication technology

- Dosing system for oil and fluid grease
- Progressive system for oil, fluid grease and grease
- Circulation system for lubrication and cooling
- Oil / Air lubrication system
- Block lubrication system
- Equipment

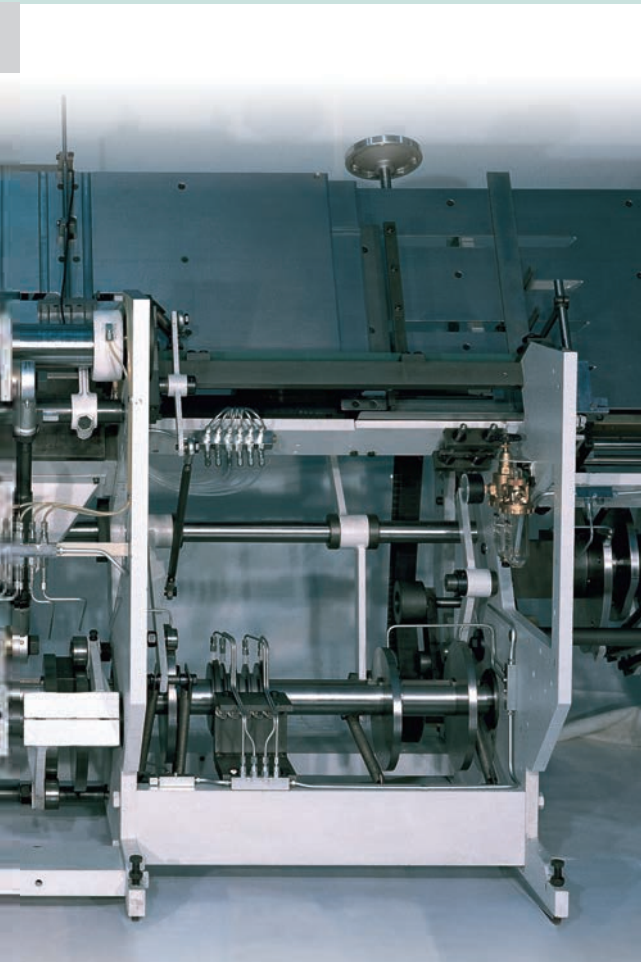


with oil and grease

just as extensive. Patented technologies and specialized technical solutions with the greatest precision offer you measurable success. Whether you want us to supply in series or solve a specific problem, your requirements are our central focus.

One drop of oil may be too little, or too much!

- Too much for small, sensitive bearings.
- Too much, when oil should be used economically.
- Too much, when it contaminates the product, questioning the quality guidelines of the production output.

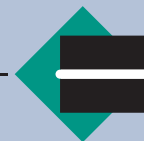


Your advantage: our lubrication experience with our own machines



bielomatik

Excellence in
Plastic Welding



Automated system for
process-reliable joining of
SCR tanks for synthetic urea



Infrared welding of an
automobile instrument panel.



Machines for laser welding
of plastics



**Minimal quantity lubrication systems
for metal cutting**



bielomatik

Excellence in
Minimal Quantity Lubrication



An economical alternative to traditional wet or dry machining in metal machining. bielomatik MQL systems help reducing production costs and decreasing health issues, as well as enhancing the environment.



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Single line lubrication system

Single piston pumps

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Units

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Distributor strips

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Single line lubrication system

For numerous lubrication points with smallest dosing quantities for delivering oil and fluid grease.

The Advantages

- Connecting numerous lubrication points
- Smallest dosing quantities
- Compact construction
- For oil or fluid grease
- Dynamic or static principle
- Cost-effective
- Easy assembly

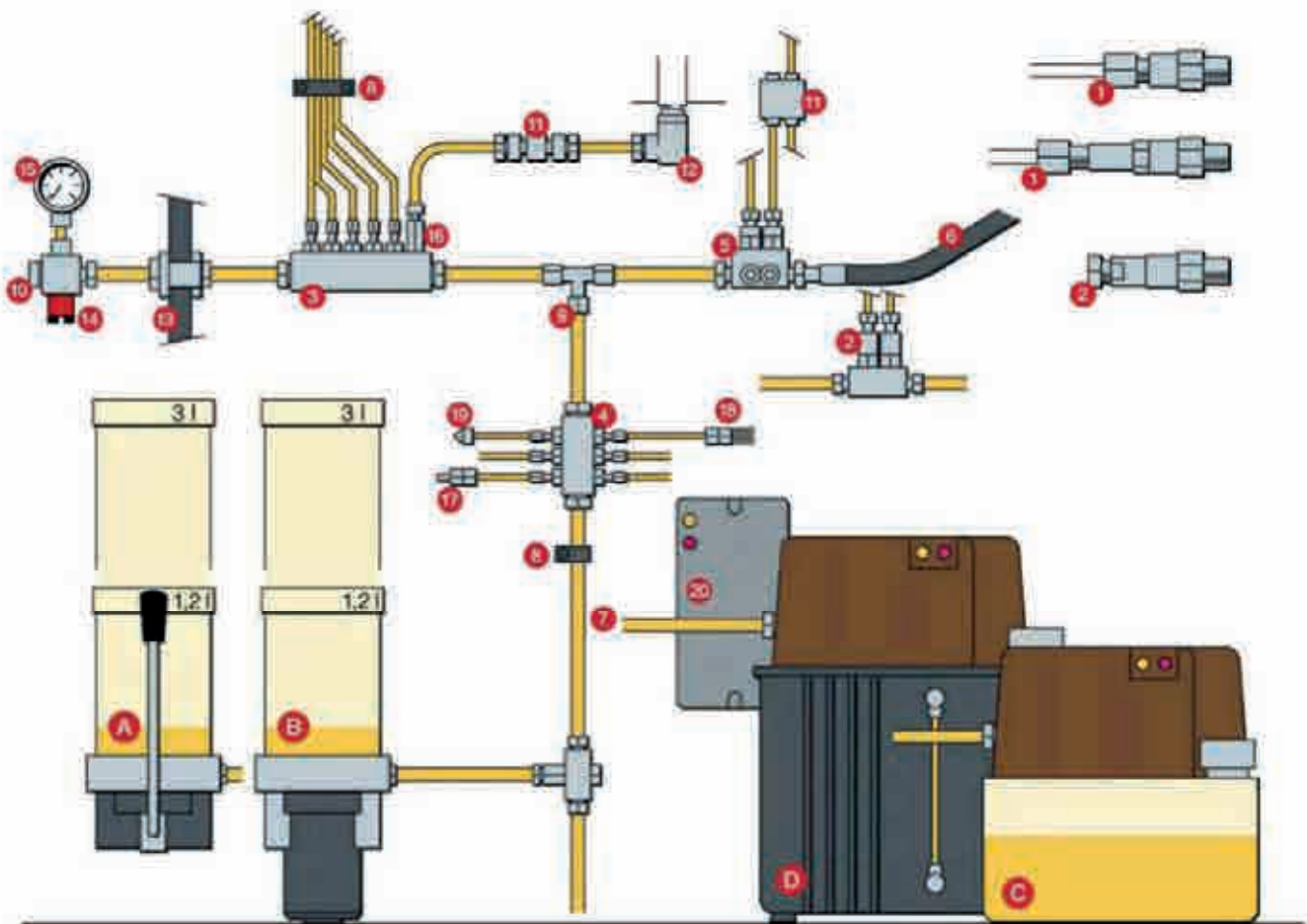
The system components

- Manual, pneumatic and electrical pumps
- Distributor strips
- Dosing valves
- Screwed fittings
- Control and check devices

The function

The dosing valves are impinged on the main line with the pump – dynamically operating metering valves with a pressure surge, static operating dosing elements with slow pressure build-up. These thus transfer the respective quantity of the lubricant to the friction point.

During the following relief phase, the lubricant is restacked in the dosing valves for the next lubrication process.



- | | |
|---|--|
| 1 Dosing element dynamic | 13 Straight fittings |
| 2 Dosing element static | 14 Check device - pressure switch |
| 3 Distributor strip, single | 15 Check device - pressure gauge |
| 4 Distributor strip, on both sides | 16 Spacer for pipe connection |
| 5 Distributor strip, angled | 17 Pipe fitting as straight, elbow or swivel fitting |
| 6 High-pressure hoses | 18 Brush for smearing oil |
| 7 Pipelines | 19 Nozzle |
| 8 Pipe clamps | 20 Control device |
| 9 Connecting and branching pieces | A Manual pump |
| 10 Vent parts | B Pneumatic pump |
| 11 Pipe couplings - plug-in or bolted connections | C Compact unit standard (3 l) |
| 12 Circulation pipe connections | D Compact unit with large container (5 or 13 l) |

General description - Single line lubrication system

1. Application:

The single line lubrication system is the most widely spread total loss lubrication system in the general engineering field. Small quantities of oil or fluid grease are fed intermittently in the desired cycle time of the lubrication point. Example 5 to 1000 mm³ dosing volume, to 25 bar pressure at lubrication point, for a pump pressure of 25 to 80 bar.

Special features:

- Supply to numerous lubrication points
- Flexible construction
- Exact dosing
- Easy expansion
- Point-target type of spraying possible, e.g. chain bolt lubrication

2. Mode of operation of the bielomatik system (Fig 1):

The pump (2) sucks the lubricant from the container (1). The lubricant reaches the main line (4), distributor strips (5) and the dosing valves (6) through the relief valve (3) (position 1). For every pressure build-up controlled by the pressure control valve (7), the dosing valves (6) deliver the lubricant to the lubrication point (9) via the lubrication line (8). The respective dosing valve determines the dosing volume.

In an automatically operated system, the pressure build-up is controlled by a max. pressure switch (10) and the electronics (11). The pump is switched-off after the pressure build-up and again switched-on after the end of the cycle time. Pressure build-up from the unit up to the farthest metering valve requires a specific time depending upon the length of the line and

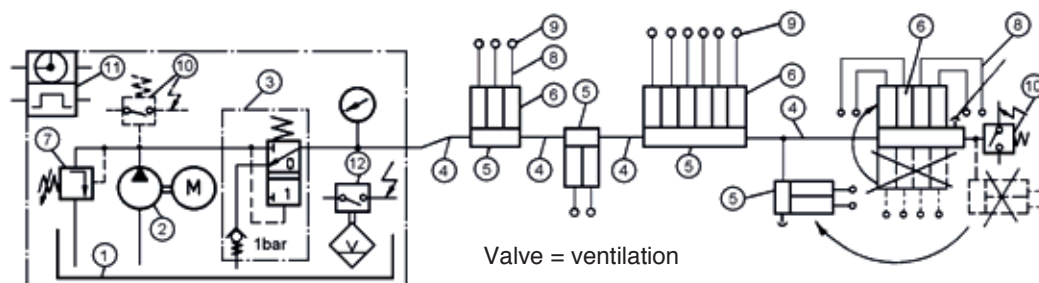
flowability of the lubricant. The afterflow period of the pump is hence prolonged for systems, for which the pressure switch is not fitted at the end of the line. The afterflow period should end approx. 2 sec after pressure build-up at the farthest end of the main line. (factory setting of the boards $t_n = 2$ sec). Units with controls without an afterflow period have an operating time of min. 5 sec.

A level control (12) monitors the constant level of the lubricant in the container. By stopping the pump, the entire system is relieved using the relief valve (3) (position 0) at ca. 1 bar. This is important for the function of the dosing valve and can be controlled via a min. pressure switch.

3. bielomatik Pumps and Lubrication Units:

Pressure relief valve (7) as well as a relief valve (3) are integrated in the bielomatik pumps. These are delivered complete with container or as ready to connect compact units including the electronics (11). Manual and pneumatically actuated single piston pumps deliver with a piston stroke of e.g. 10 cm³. This piston stroke must be selected such that the prescribed pressure build-up (e.g. 25/32 bar) is attained. (6. layout must be observed).

Electrical bielomatik pumps are basically designed as gear pumps. The measuring valves require a rate of flow approx. 1 l/min. Dosing elements can be operated from 0.1 l/min. For which mostly the three-phase or single phase alternating current motors in short-time operation are adequate. Alternately, even a pump with 100% duty cycle can be used.



Picture 1: Schematic assembly of a single line lubrication system

4. bielomatik Dosing and Metering Elements (Picture 2):

Up to 24 bielomatik dosing elements can be connected to a distributor strip. For pressure build-up, every dosing element dispenses the prescribed dosing volume (piston surface x stroke). At the end of the stroke, the piston seals from the main line to the lubrication line. Due to pressure relief, the dosing piston is brought to the starting position by the spring and is pre-filled for the next lubrication procedure. For the metering valve, the piston must be moved in the direction of the spring quickly, i.e. pressure must build-up fast. There may be overdosage due to slow movement of the piston between the end positions. This is due to a leakage in the piston annular gap.

For dosing elements, the fitted seals prevent excess lubrication at slow pressure build-up.

5. The bielomatik electronics:

The bielomatik electronics is used for time or clock-dependent control of the pump motor as well as the control valve in the pneumatic pump and for monitoring the single line system. Pressure build-up must take place within a specified monitoring time. The electronic assembly can be integrated in the lubrication unit as well as installed in an electrical switch cabinet.

6. Design:

The number of lubrication points and their lubrication requirement (volume per time x) must be determined in advance. Basically, smaller dosing volume (e.g. 10 - 160 mm³) must be preferred and the cycle time must be shortened. The duty cycle of the motor and the relief time (at 1 bar) must be observed in the main line. (relief for fluid grease under circumstances few minutes).

Dimensioning of the system should be done such that the required usable dosing volumes, under consideration of the dead volume, pipeline resistance and leakage of the system is not exceeded and pressure build-up is ensured. For single piston pumps, 1/3 of the displacement per stroke should be available as effective reserve after the pressure build-up.

Displacement > usable dosing volumes + dead volumes + influence of the pipeline resistance

- The usable dosing volume is the total of the rate of delivery of all dosing elements of a system.
- The dead volume is the volume, which is taken up by the entire system as result of pressure build-up: Compression of the trapped air and the lubricant, expansion of the main line (polyamide pipe 6x1.2:0.3 to 0.5 cm³/m), volume absorption of the pressure switch (e.g. 0.2 cm³) and the pressure gauge (to 1 cm³). The main line and the dosing valve are laid such that self-venting is possible. That means, the main lines must be laid escalating. On the main line end and higher points of the system, dosing valves must be arranged with outlets on the top (s. picture 1) (9). There must no air inclusions.
- The pipeline resistance of the system must be kept as little as possible so that pressure can build-up quickly at the end of the line. The more viscous the lubricant, the bigger should the line cross section be designed. If the pump delivers a flow rate much more than the system can take, the surplus outflows through the pressure control valve. This must be avoided in single piston pumps,



Picture 2: Metering valve (left); dosing element (right)

which can be attained by restricting the pneumatic maximum pressure at 6 bar. If the pipeline resistance in open main line ends is more than the adjustment values of max. pressure switch, the same must be set at the end of the main line.

Line dimensioning:

Main line:

e.g. Polyamide pipe 6 x 1.2 mm
e.g. Steel pipe 6 x 0.7 and 8 x 0.7 mm

Lubrication lines:

e.g. Polyamide pipe 4 x 0.75 mm
e.g. Steel pipe 4 x 0.7 mm

Generally, the lines should be kept as short as possible particularly for viscid lubricants. Moreover, individual lubrication lines must not be longer than 3 m.

Pretests on a design true to the original are required for large systems or highly viscous lubricants. Pressure build-up and relief time must be determined here.

7. Lubricant:

Generally, mineral oils with an operating viscosity of 50 - 750 mm²/s can be dispensed in bielomatik lubrication systems. However, attention should be paid that these NBR seals are not affected. The function of synthetic lubricants or mineral oils can be checked with aggressive additives, on request. When using fluid greases release list TA 308 09 001, which can be obtained on request, must be checked. Fluid greases, which are not listed in consultation with bielomatik.

Attention:

- do not possibly mix different lubricants! Ideally, the system must be cleaned.
- No way must greases be mixed with non-compatible types of soaps

8. Assembly and Commissioning:

In principle, cleanliness customary to the hydraulic system must be observed. Pipelines and drilled channels must be deburred and clean them of any foreign bodies, as non-compliance may lead to malfunctions.

Retaining screws or nuts linked to double taper or cutting ring do not have a fixed arrester when tightening.

Rule:

After laying out, tighten to one and half turns. Insert sleeves must be used in polyamide pipes. The main lines must be well ventilated when commissioning. Lubrication lines should be prefilled and connected to the lubrication point.



Designation	Single piston pump	Single piston pump	Single piston pump
Type	AB-H	AB-P	AM
Kind of drive system	manual	pneumatic	pneumatic
Filling quantity	1.2 / 3.0 litres	1.2 / 1.5 / 3.0 litres	1.5 / 3.0 litres
Pump pressure	45 bar	60 bar	60 bar
Displacement	10.5 cm ³ /stroke	10.5 cm ³ /stroke	25.0 cm ³ /stroke
More information on	Page 16	Page 17	Page 19

Overview pumps - single line lubrication system



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Lubrication unit	Lubrication unit	Compact unit	Dosing pumps
CME	MPT	AF1-OE	AG
Electrical	Electrical	Electrical	Electrical
3.0 litre	3 / 4 / 8 / 12 litres	3 / 6 / 12 litres	0.5 litre
30 bar	50 bar	45 bar	7 bar
0.2 l/min	0.2 or 0.5 l/min	1.0 l/min	25.0 mm ³ / outlet
Page 21	Page 23	Page 25	Page 26

Single piston pump AB-H

The single piston pump AB-H is a robust hand lever pump. They are suitable for daily or rare lubrications. The hand lever can be mounted in three different positions, by which a flexible assembly is possible.

Detailed information under TA 308 11 501.

General

Type	Single piston pump
Lubrication line connection	Pipe connection Ø 6 mm
Ambient temperature	0 to 80 °C
Filling	manual or filling device

Hydraulic system

Operating pressure	45 bar
Displacement	10.5 cm³/stroke
Operating medium	Mineral oil, fluid grease
Range of viscosity	50 to 750 mm²/s, NLGI 000-0*

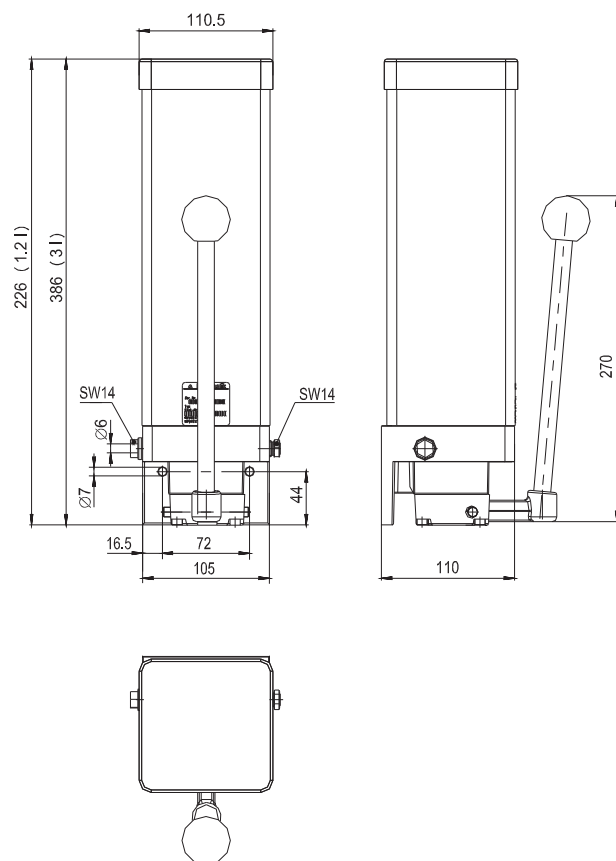
*as per fluid grease release list

Drive

Type of drive	manual
Actuating force	200 N

Order summary

Container Size [l]	Order number
1,2	300 11 522
3,0	300 11 523



Single Piston Pump AB-P

The single piston pump AB-P is a robust pneumatic pump. It is suitable for automatic lubrications, which must be done several times daily to maximum once per minute.

Detailed information under TA 308 11 502.

General

Type	Single piston pump
Lubrication line connection	Pipe connection Ø 6 mm
Ambient temperature	0 to 80 °C
Filling	manual or filling device
Protection class as per EN60529	IP67

Hydraulic system

Operating pressure	60 bar
Displacement	10.5 cm³/stroke
Operating medium	Mineral oil, fluid grease
Range of viscosity	50 to 750 mm²/s, NLGI 000-0*

*as per fluid grease release list

Drive

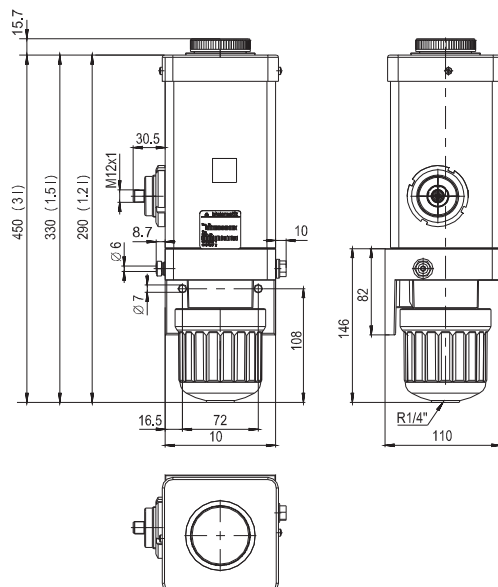
Type of drive	pneumatic
Supply pressure	4 to 6 bar
Supply fitting	R ¼ "

Sensor system

Level control	
Switching voltage	24 V AC/DC
Switching current	≤100 mA (≥5 mA)
Connection	M12 x 1

Order summary

Container Size [l]	Filling connection	Level control	Screw cap	Order number
1,2	no	no	no	300 11 540
1,2	no	Oil	no	300 11 556
1,2	no	Oil	yes	300 11 565
1,5	yes	Fluid grease	no	300 11 575
3,0	no	no	no	300 11 541
3,0	no	Oil	no	300 11 557
3,0	no	Fluid grease	yes	300 11 567



Single piston pump AB-P (capacitive level control)

The single piston pump AB-P is a robust pneumatic pump. It is suitable for automatic lubrications, which must be done several times daily to maximum once per minute.

The capacitive level control offers a reliable use of fluid greases, which are difficult to detect.

Detailed information under TA 308 11 602.

General

Type	Single piston pump
Lubrication line connection	Pipe connection Ø 6 mm
Ambient temperature	0 to 80 °C
Filling	manual or filling device
Protection class as per EN60529	IP67

Hydraulic system

Operating pressure	60 bar
Displacement	10.5 cm³/stroke
Operating medium	Mineral oil, fluid grease
Range of viscosity	50 to 750 mm²/s, NLGI 000-0*

*as per fluid grease release list

Drive

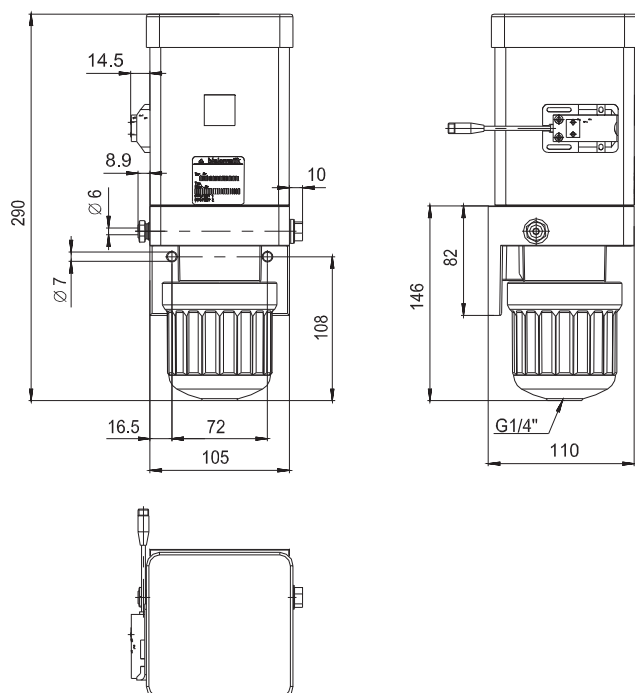
Type of drive	pneumatic
Supply pressure	4 to 6 bar
Supply fitting	G ¼ "

Sensor system

Level control	
Nominal voltage	24 V DC
Power consumption	≤ 17 mA
Switching current	≤ 100 mA
Connection	M8 x 1

Order summary

Container Size [l]	Order number
1,2	300 11 615



Single piston pump AM

The single piston pump AM is a robust pneumatic pump. It is suitable for automatic lubrications, which must be done several times daily to maximum once per minute.

Detailed information under TA 308 11 504.

General

Type	Single piston pump
Lubrication line connection	Pipe connection Ø 6 mm
Ambient temperature	0 to 80 °C
Filling	manual
Protection class as per EN60529	IP 64

Hydraulic system

Operating pressure	60 bar
Displacement	25 cm³/stroke
Operating medium	Mineral oil, fluid grease
Range of viscosity	50 to 750 mm²/s, NLGI 000-0*

*as per fluid grease release list

Drive

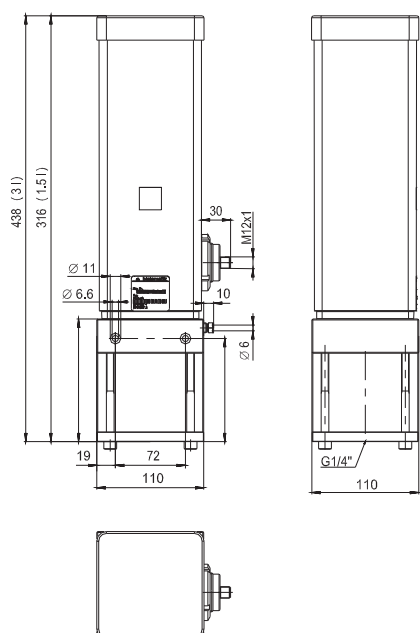
Type of drive	pneumatic
Supply pressure	4 to 6 bar
Supply fitting	G ¼ "

Sensor system

Level control	
Switching voltage	≤ 24 V AC/DC
Switching current	≤ 100 mA (≥ 5 mA)
Connection	M12 x 1

Order summary

Container Size [l]	Level control	Order number
1,5	Fluid grease/oil	300 11 586
3,0	Fluid grease/oil	300 11 587
3,0	Oil	300 11 626



Single piston pump AM (capacitive level control)

The single piston pump AM is a robust pneumatic pump. It is suitable for automatic lubrications, which must be done several times daily to maximum once per minute. The capacitive level control offers a reliable use of fluid greases, which are difficult to detect.

Detailed information under TA 308 11 603.

General

Type	Single piston pump
Lubrication line connection	M10 x 1
Ambient temperature	0 to 80 °C
Filling	manual
Protection class as per EN60529	IP67

Hydraulic system

Operating pressure	60 bar
Displacement	25 cm ³ /stroke
Operating medium	Mineral oil, fluid grease
Range of viscosity	50 to 750 mm ² /s, NLGI 000-0*

*as per fluid grease release list

Drive

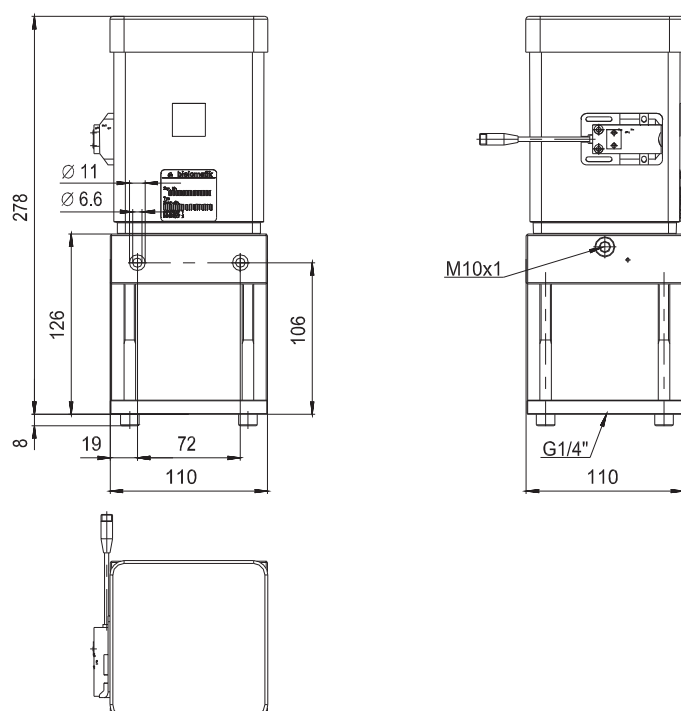
Type of drive	pneumatic
Supply pressure	4 to 6 bar
Supply fitting	G 1/4 "

Sensor system

Level control	
Nominal voltage	24 V DC
Power consumption	≤ 17 mA
Switching current	≤ 100 mA
Connection	M8 x 1

Order summary

Container Size [l]	Order number
1,2	300 11 634



Lubrication unit CME 3

The CME lubrication unit is a gear pump unit, which is available with and without integrated control. It is suitable for automated lubrication, which must be done several times daily to maximum once per minute.

Detailed information under TA 308 16 904.

General

Type	Lubrication unit
Lubrication line connection	Pipe connection Ø 6 mm
Ambient temperature	0 to 40 °C
Filling	manual
Protection class as per EN60529	IP33

Hydraulic system

Operating pressure	30 bar
Displacement	0.2 l/min
Operating medium	Mineral oil
Range of viscosity	50 to 750 mm²/s

Drive

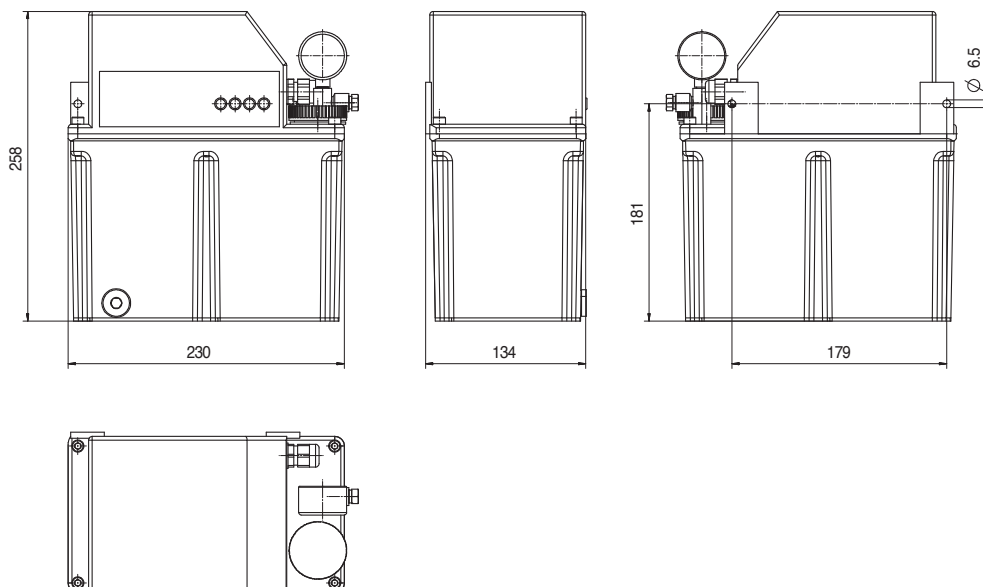
Type of drive	Electrical
Supply voltage	230 V
Supply current	0.75 A
Frequency	50 Hz
Power consumption	110 W

Sensor system

	Level control	Pressure monitoring
Switching voltage	≤ 24 V AC/DC	≤ 24 V AC/DC
Switching current	≤ 100 mA	≤ 2.0 A
Connection	Terminal strip	Terminal strip

Order summary

Container Size [l]	Pressure gauge	Electric control	Order number
3,0	no	yes	300 16 932
3,0	no	no	300 16 934
3,0	yes	no	300 16 936
3,0	yes	yes	300 16 939



Lubrication unit CME 3 (24 V)

The CME lubrication unit is a gear pump unit, which is available with and without integrated control. It is suitable for automated lubrication, which must be done several times daily to maximum once per minute.

Detailed information under TA 308 16 911.

General

Type	Lubrication unit
Lubrication line connection	Pipe connection Ø 6 mm
Ambient temperature	0 to 40 °C
Filling	manual
Protection class as per EN60529	IP 30

Hydraulic system

Operating pressure	30 bar
Displacement	0.2 l/min
Operating medium	Mineral oil
Range of viscosity	50 to 750 mm²/s

*as per fluid grease release list

Drive

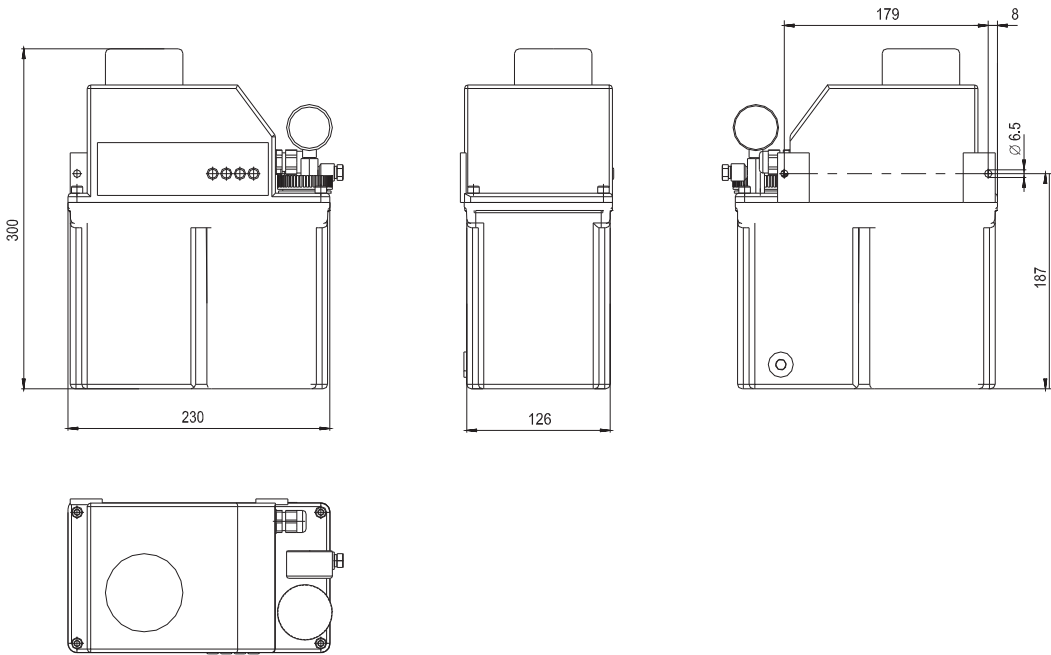
Type of drive	Electrical
Supply voltage	24 V DC
Supply current	4.5 A
Power consumption	110 W

Sensor system

	Level control	Pressure monitoring
Switching voltage	≤ 24 V AC/DC	≤ 24 V AC/DC
Switching current	≤ 100 mA	≤ 2.0 A
Connection	Terminal strip	Terminal strip

Order summary

Container Size [l]	Pressure gauge	Electric control	Order number
3,0	yes	no	300 16 943
3,0	yes	yes	300 16 945



Lubrication unit MPT 3

The MPT lubrication unit is a powerful gear pump unit for quick pressure build-up. It is suitable for automated and extensive lubrication, which must be done several times daily to maximum once per minute.

Detailed information under TA 308 16 906.

General

Type	Lubrication unit
Lubrication line connection	Pipe connection Ø 6 mm
Ambient temperature	0 to 40 °C
Filling	manual
Protection class as per EN60529	IP53

Hydraulic system

Operating pressure	50 bar
Displacement	0.5 l/min
Operating medium	Mineral oil, fluid grease
Range of viscosity	50 to 750 mm²/s, NLGI 000-0*

*as per fluid grease release list

Drive

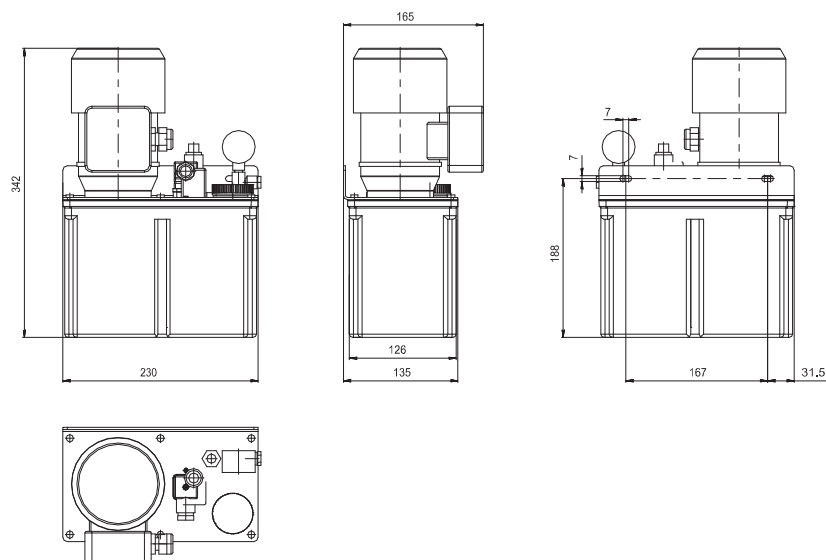
Type of drive	Electrical
Supply voltage	420 V
Supply current	0.35 A
Frequency	50 Hz
Power consumption	90 W

Sensor system

	Level control	Pressure monitoring
Switching voltage	≤ 24 V AC/DC	≤ 24 V AC/DC
Switching current	≤ 100 mA	≤ 2.0 A
Connection	Terminal strip	Terminal strip

Order summary

Container Size [l]	Level control	Pressure gauge	Pressure monitoring	Order number
3,0	Oil: closed	no	yes	300 16 960
3,0	Fluid grease: open	no	yes	300 16 961
3,0	Oil: open	no	no	300 16 970
3,0	Oil: open	yes	no	300 16 978
3,0	Fluid grease: open	yes	no	300 16 988



Lubrication unit MPT 4 / 8 / 12

The MPT lubrication unit is a powerful gear pump unit. It is suitable for automated and extensive lubrication, which must be done several times daily to maximum once per minute.

Detailed information under TA 308 16 905 / TA 308 16 909 / TA 308 16 903.

General

Type	Lubrication unit
Lubrication line connection	Pipe connection Ø 6 / 8 mm, M12 x 1
Ambient temperature	0 to 40 °C
Filling	manual
Protection class as per EN60529	IP54

Hydraulic system

Operating pressure	50 bar
Displacement	0.2 - 0.5 l/min
Operating medium	Mineral oil
Range of viscosity	50 to 750 mm²/s, NLGI 000-0*

*as per fluid grease release list

Drive

Type of drive	Electrical
Supply voltage	420 V
Supply current	0.35A
Frequency	50 Hz
Power consumption	90 W

Sensor system

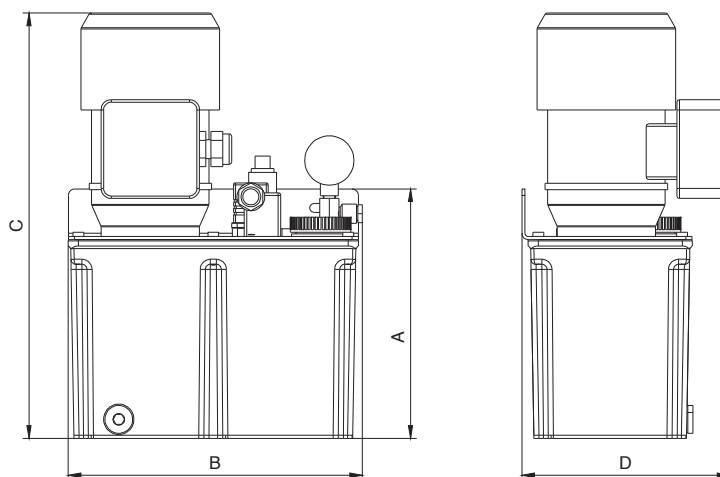
Level control	
Switching voltage	≤ 24 V AC/DC
Switching current	≤ 100 mA (≥ 5 mA)
Connection	M12 x 1

Order summary

Type	Container Size [l]	Connection	Displacement [l/min]	Order number
MPT 4	4,0	Pipe connection ø 8 mm	0,5	300 16 920
MPT 8	8,0	M 12 x 1	0,5	300 16 921
MPT 8	8,0	Pipe connection ø 6 mm	0,2	300 16 980
MPT 12	12,0	Pipe connection ø 6 mm	0,5	300 16 990



Unit	Dimensions [mm]			
	A	B	C	D
MPT 4	175	236	345	152
MPT 8	250	330	430	163
MPT 12	230	355	420	213



Compact unit AF1 – OE (3 / 6 / 12 litres)

The AF1 - OE compact unit is a powerful and highly dynamic gear pump unit. It is suitable for automated and extensive lubrication, which must be done several times hourly to once per second.

Detailed information under TA 308 16 303 / TA 308 16 402 / TA 308 16 513.

General

Type	Compact unit
Lubrication line connection	Pipe connection Ø 6 / 8 mm
Ambient temperature	0 to 40 °C
Filling	manual
Protection class as per EN60529	IP53

Hydraulic system

Operating pressure	45 bar
Displacement	1 l/min
Operating medium	Mineral oil, fluid grease
Range of viscosity	50 to 750 mm²/s, NLGI 000-0*

*as per fluid grease release list

Drive

Type of drive	Electrical
Supply voltage	230 V
Supply current	1.5 A
Frequency	50 Hz
Power consumption	285 W

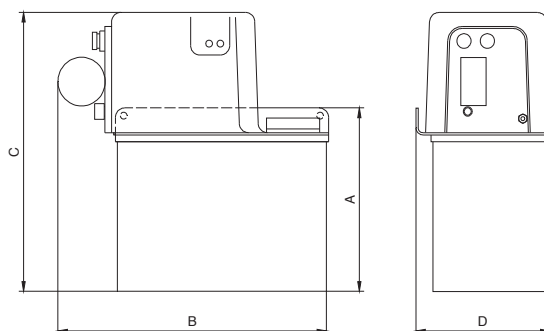
Sensor system

	Level control	Pressure monitoring
Switching voltage	≤ 24 V AC/DC	≤ 24 V AC/DC
Switching current	≤ 100 mA	≤ 2.0 A
Connection	Terminal strip	Terminal strip

Order summary

Container Size [l]	Pipe connection ø [mm]	Pressure gauge	Pressure switch	Electric control	Order number
3,0	6	no	yes	yes	300 16 350
3,0	6	yes	yes	yes	300 16 352
3,0	6	yes	no	no	300 16 354
3,0	6	no	yes	no	300 16 362
6,0	8	yes	yes	yes	300 16 427
6,0	6	no	yes	no	300 16 428
12,0	8	yes	yes	no	300 16 513
12,0	8	yes	yes	yes	300 16 514

Unit	Dimensions [mm]			
	A	B	C	D
AF1-OE 3	228	290	290	166
AF1-OE 6	232	590	379	146
AF1-OE 12	310	345	350	250



Dosing pump AG

Dosing pump AG is a compact lubrication system with a 24 V magnet pump. It is suitable for supplying one to four lubrication points directly with lubricant, which must be done several times daily to maximum once per minute. They have stroke monitoring, through which a lubrication process can be monitored. You may also get different container sizes on request.

Detailed information under TA 308 13 091.

General

Type	Dosing pumps
Lubrication line connection	Pipe connection Ø 6 mm
Ambient temperature	0 to 60 °C
Filling	manual
Protection class as per EN60529	IP 65

Hydraulic system

Max. counter pressure	7 bar
Displacement	25 mm³/stroke
Operating medium	Mineral oil
Range of viscosity	10 to 750 mm²/s

Drive

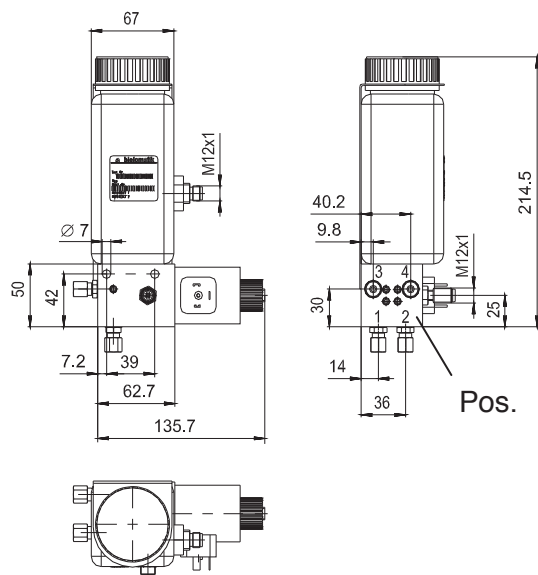
Type of drive	Electrical
Supply voltage	24 V DC
Supply current	1.2 A
Power consumption	30 W
Connection	Angled plug connector DIN43650A

Sensor system

Level control		Stroke monitoring	
Switching voltage	≤ 24 V	Nominal voltage	≤ 24 V
Switching current	≤ 0.5 A	Switching current	≤ 300 mA
-	-	Power consumption	≤ 15 mA
Connection	M12 x 1	Connection	M12 x 1

Order summary

Container Size [l]	Number of outlets	Order number
0,5	1 (pos.4)	300 13 091
0,5	2 (pos. 3 and 4)	300 13 092
0,5	3 (pos. 2, 3 and 4)	300 13 093
0,5	4 (pos. 1, 2, 3 and 4)	300 13 094



Summary dosing valves - single line lubrication system

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Designation	Metering valve	Dosing element
Version	dynamic	Static
Dosing volume	5 to 1,000 mm ³	10 to 600 mm ³
Sealing material	NBR	NBR
Pipe connection	Bolted or plug connection Ø 4 mm	Bolted or plug connection Ø 4 mm
More information on	Page 30	Page 32

General description - metering valve

Metering valves are simple and inexpensive dynamic dosing valves. Lubrication quantity between 5 mm³ and 1000 mm³ per stroke can be dispensed with these metering valves.

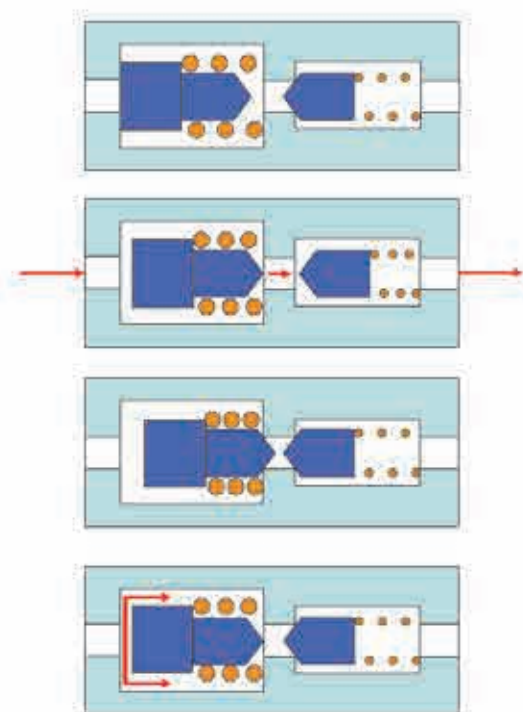
Structure and mode of action

A pressure pulse is required for actuation. As a result of this pulse, the dosing piston is moved with great speed towards the return valve (position 2). With this stroke movement, a specific lubricant volume (dosing volume) is dispensed through the return valve. After completion of the stroke, the dosing valve closes the connecting bore. The dosing process is closed (position 3),

the return valve closes. After completing the lubrication cycle and subsequent relieving of the main line, the dosing valve is pressed with a spring in its starting position (position 1). The lubricant is thus restacked via the play between the dosing valve and the body of the dosing element (position 4).

The metering valve must be operated only with the pumps **AB-H**, **AB-P**, **AM** and **AF1-OE**.

Detailed information under TA 308 20 001.



Position 1:

Initial position

The main line is relieved, dosing valve in the initial position return valve closed.

Position 2:

Dosing through pulse initiated,

Dosing valve in the pressure stroke position, return valve opened.

Position 3:

Dosing completed,

Dosing valve in the closed position, return valve closed.

Position 4:

Relief of main line initiated,

Dosing valve in the restacking position, return valve closed.

Order number - metering valve

Order overview

Version	Dosing volume	Order number
Plug-in connection	10 mm ³	300 20 000
Plug-in connection	20 mm ³	300 20 001
Plug-in connection	30 mm ³	300 20 002
Plug-in connection	50 mm ³	300 20 003
Plug-in connection	100 mm ³	300 20 004
Plug-in connection	200mm ³	300 20 005
Bolted connection	10 mm ³	300 20 400
Bolted connection	20 mm ³	300 20 401
Bolted connection	30 mm ³	300 20 402
Bolted connection	50 mm ³	300 20 403
Bolted connection	100 mm ³	300 20 404
Bolted connection	200 mm ³	300 20 405



The dosing volumes

5 mm ³	300 20 030
250 mm ³	300 20 017
500 mm ³	300 20 018
1000 mm ³	300 20 019

can be delivered only with bolted connection. Versions with plug-in connection can be requested separately.

General description - dosing element

Dosing elements are reliable and efficient static dosing valves. Lubrication quantity between 10 mm³ and 600 mm³ per stroke can be metered out with these dosing elements.

Structure and mode of action

Metering procedure:

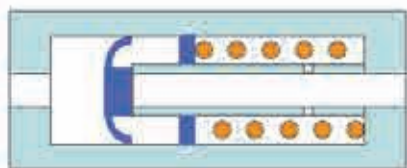
If pressure is built-up at the entrance of the body, then the lubricant flows to the lower surface of the seal via return valve. The seal with the piston moves against the force of the spring up to the end stop on the dosing nozzle. Metering is done, whereby, the displaced lubricant flows through a transverse and longitudinal bore to the centre of the outlet.

Relieving procedure:

If pressure at the entrance falls below the relief pressure, the return valve lifts as a result of the tensioned spring and releases its longitudinal bore. The lubricant flows through the longitudinal and transverse bore at the centre from the lower to the upper side of the piston, which moves up to its lower end stop. The valve is then in the initial position and is ready for the next metering.

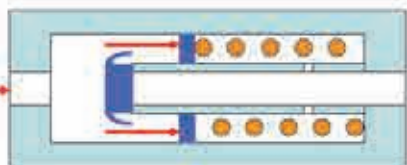
The dosing element can be used with all pumps of the single line system.

Detailed information under TA 308 20 801.



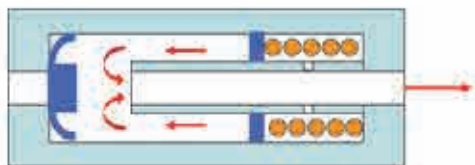
Position 1:

Initial position.
Main line is ventilated. Return valve in the initial position.



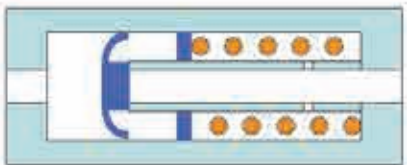
Position 2:

Dosing through pulse initiated.
Return valve in the restacking position.
Fill lubricant.



Position 3:

Dosing.
Return valve encircles the main line.
Spring force of the seal doses the lubricant.



Position 4:

Back to the initial position

Order number - dosing element

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Order overview : dosing elements with bolted connection

Version	Dosing volume	Order number
Bolted connection	10 mm ³	300 20 800
Bolted connection	20 mm ³	300 20 801
Bolted connection	30 mm ³	300 20 802
Bolted connection	50 mm ³	300 20 803
Bolted connection	100 mm ³	300 20 804
Bolted connection	160mm ³	300 20 805
Bolted connection	200 mm ³	300 20 896
Bolted connection	400 mm ³	300 20 897
Bolted connection	600 mm ³	300 20 898



Order overview : dosing elements with plug-in connection

Version	Dosing volume	Order number
Plug-in connection	10 mm ³	300 20 820
Plug-in connection	20 mm ³	300 20 821
Plug-in connection	30 mm ³	300 20 822
Plug-in connection	50 mm ³	300 20 823
Plug-in connection	100 mm ³	300 20 824
Plug-in connection	160mm ³	300 20 725



Distributor strips

Distributor strips for usage with metering valves and dosing elements for the single line lubrication system.

General

Version	Steel, surface galvanised
Application	for installing dosing elements, metering valves, compressor nozzles and as branching-off conductor
Operating pressure	100 bar
Fixing	Tapping screw

Order summary (duplicate)

Number of outlets	Fig.	Packaging unit [no.]	Dimensions [mm]			Order number
			a	L1	L2	
2x1	1	30	-	45	20	300 48 001
2x2	2	20	-	57	32	300 48 002
2x3	3	20	18	75	50	300 48 003
2x4	3	20	36	93	68	300 48 004
2x5	3	20	54	111	86	300 48 005
2x6	3	10	72	129	104	300 48 006
2x7	3	10	90	147	122	300 48 007
2x8	3	10	108	165	140	300 48 008
2x9	3	10	126	183	158	300 48 009
2x10	3	10	144	201	176	300 48 010
2x11	3	10	162	219	194	300 48 011
2x12	3	10	180	237	212	300 48 012

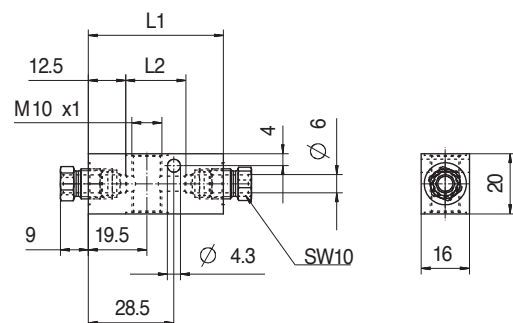


Fig. 1

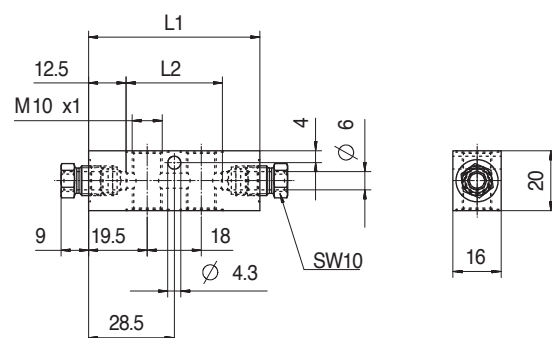


Fig. 2

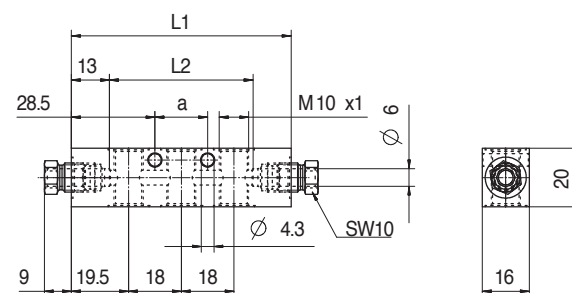


Fig. 3

Distributor strips

Order summary (simple)

Number of outlets	Fig.	Packaging unit	Dimensions [mm]			Order number
			a	L1	L2	
1	4	30	-	45	20	300 48 201
2	5	20	-	57	32	300 48 202
3	6	20	18	75	50	300 48 203
4	6	20	36	93	68	300 48 204
5	6	20	54	111	86	300 48 205
6	6	10	72	129	104	300 48 206
7	6	10	90	147	122	300 48 207
8	6	10	108	165	140	300 48 208
9	6	10	126	183	158	300 48 209
10	6	10	144	201	176	300 48 210
11	6	10	162	219	194	300 48 211
12	6	10	180	237	212	300 48 212

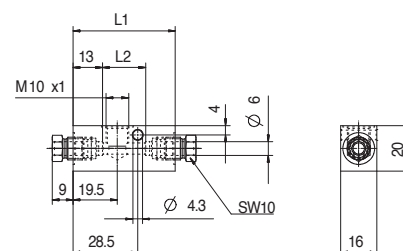


Fig. 4

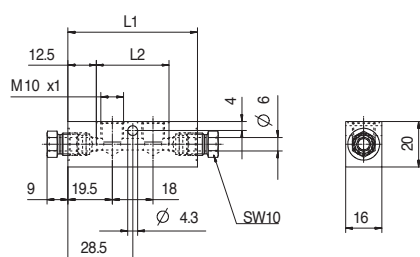


Fig. 5

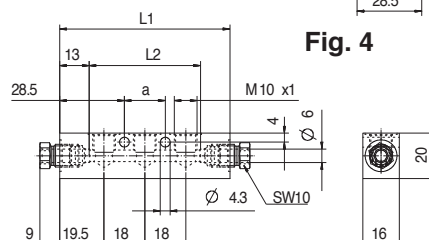


Fig. 6

Order summary (angled)

Number of outlets	Fig.	Packaging unit	Dimensions [mm]			Order number
			a	L1	L2	
2x1	7	15	-	40	15	300 48 401
2x2	8	10	-	58	33	300 48 402
2x3	9	10	18	76	51	300 48 403
2x4	9	10	36	94	69	300 48 404
2x5	9	10	54	112	87	300 48 405
2x6	9	5	72	130	105	300 48 406

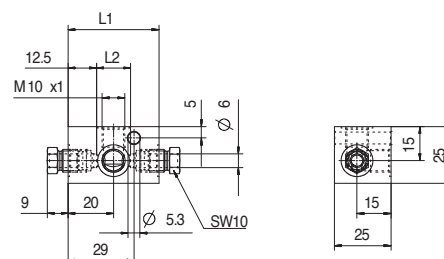


Fig. 7

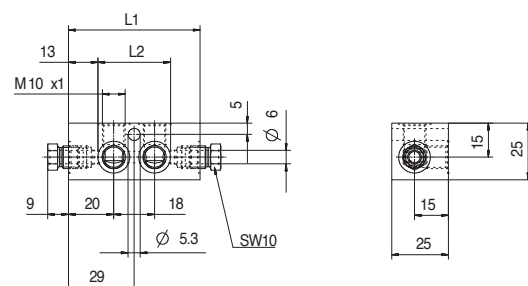


Fig. 8

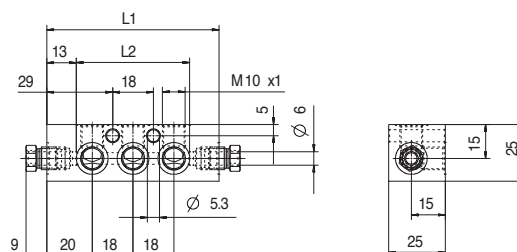


Fig. 9

Accessories

Designation	Thread	Order number
Tapping screw	M4 x 25	300 47 703
	M4 x 35	300 47 705

Prefabrication - single line lubrication system

As a special service bielomatik offers system-wide prefabrication of the components. This service covers all imaginable assembly operations, which are possible before the delivery of the system.

- Filling the pump with the lubrication desired by the customer
- Filling the pipes and lines with the lubrication desired by the customer
- Lubrication system for complete installation in connection with a customer interface
- Customer-specific configuration of pumps (air or lubrication side with specific screw joints)
- Customer-specific modifications to standard elements
- Customer-specific packaging of fabricated systems
- Combinations of several systems

The advantage is that a complete system can be pre-fabricated ex-factory as per the customer's requirements thus significantly reducing the assembly time. Even placing the order is very simple as individual parts from all systems must not be ordered separately. You can get the delivery of a completely pre-fabricated lubrication system under one order number.

The following examples show only a small extract from the various options of pre-fabrication from bielomatik Leuze GmbH & Co. KG.

Example 1:

This assembly group is pre-fabricated based on a 10-port distributor port, 10 different dosing elements and outgoing lines and thus delivered in compliance with the customer requirements.



Example 2:

Comprising a double-sided distributor strip with 2x6 outlets with 11 different dosing elements and a straight pipe fitting 6 mm as supply or transfer line, this assembly is specially delivered pre-fabricated as per the customer's requirements.



Example 3:

Consisting of a double-sided distributor strip with 2x5 outlets, 8 metering valves with four nozzles each, two brushes for smearing oil and two pre-fabricated pipelines, example 3 shows the flexibility of the customer-specific pre-fabrication.

An additional pressure switch is assembled for monitoring the lubrication. The supply line comprises a swivelling fitting with 6 mm diameter.



For queries related to customer-specific pre-fabrication call us on +49 (0) 7025 / 12-519.



Progressive lubrication

Grease pumps

Page 44

Progressive distributor

Page 52

Pre-fabrication

Page 62



Progressive lubrication system

For oil, fluid grease and grease. Dispensing with optimum function monitoring.

The Advantages

- Compact, flexible kit
- Monitored function
- Channels flow through completely
- 8 different dosing volumes
- Integrated return valve
- System also sequentially controlled

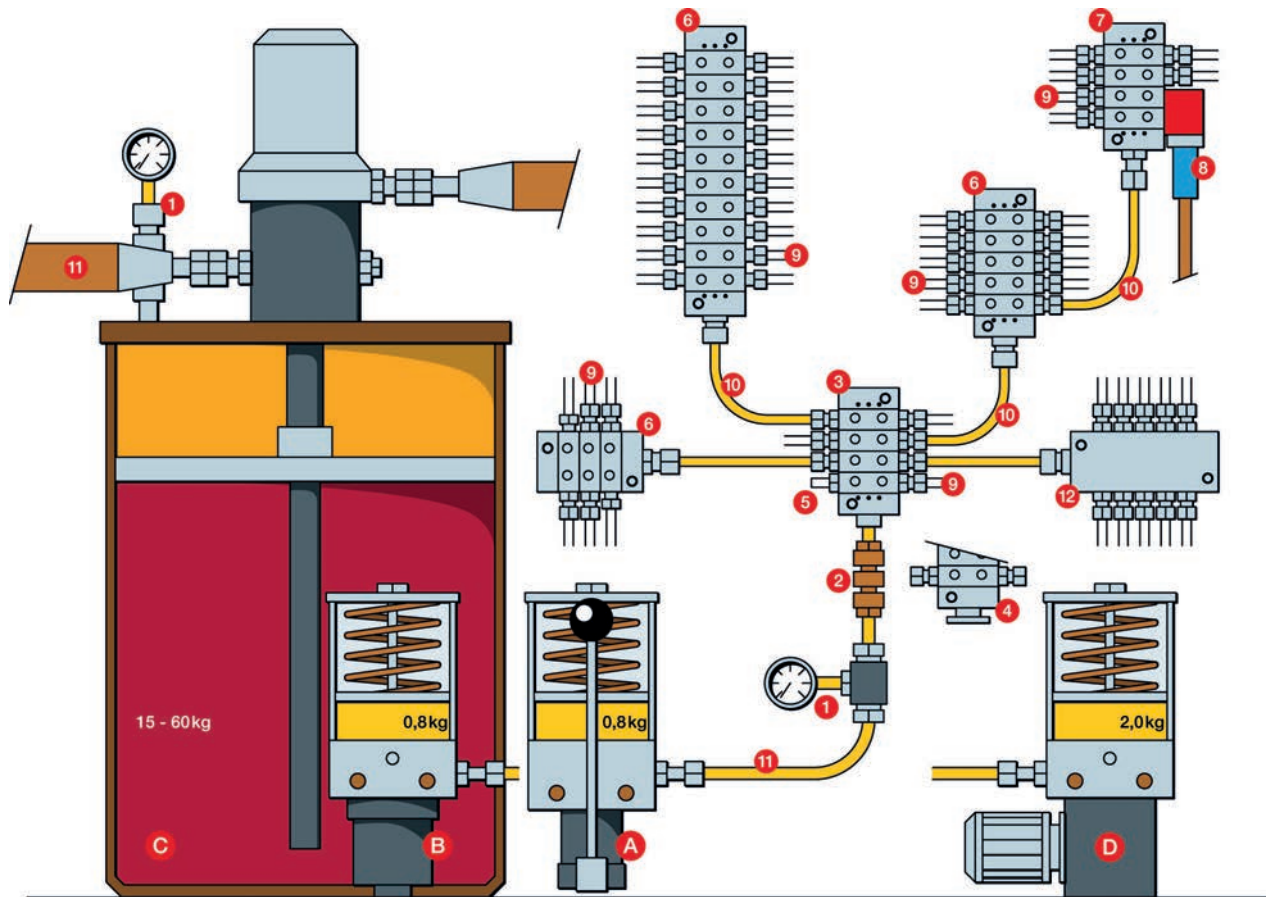
The system components

- Manual, pneumatic and electrical pumps
- Main lines
- Progressive distributor
- Line to the lubrication point
- Screwed fittings
- Control and monitoring devices

The function

The lubricant is pumped through the main lines to the progressive distributor with the pump. The lubricant is delivered consequently "progressively" to the friction point.

The circulation of a progressive distributor is monitored optically or electrically.



- | | | | |
|---|--|----|--|
| 1 | Pressure check/ ventilation | 9 | Line to the lubrication point |
| 2 | Coupling/ plug-in and screw coupling | 10 | Pipes and hoses |
| 3 | Progressive distributor (1 generation), detachable, up to 50 connections | 11 | Main line |
| 4 | Connection for sliding clutch for mobile supply | 12 | Progressive block distributor (2 generation) |
| 5 | Control pin for the function of the distributor | A | Hand pump for grease |
| 6 | Progressive distributor (2 generation) | B | Pneumatic pump for grease |
| 7 | Progressive distributor (3 generation) | C | Barrel pump for thread of 15 – 60 kg |
| 8 | Function control | D | Electrical grease pump |

General description - progressive lubrication system

1. Construction and design:

The bielomatik progressive lubrication system comprises a feed pump and progressive distributors, whereby, the distributor is equipped with a circulation control (U of Fig. 1). In addition there are the necessary pipelines, threaded pipe fittings and fastening components. Pressure indicator (D of Fig. 1) in the inlet of the respective progressive distributor, are additionally helpful for function control.

The layout of a system depends upon the number of lubrication points and the respective grease requirement. If several lubrication points are available than those that can be supplied by a progressive distributor, a main distributor must be used, from which downstream distributors can be supplied. Max. 3 generations are possible in a row (Fig. 1).

The lubrication pump should be assembled on an easily accessible position of the machine, so that uncomplicated refilling of the container is possible. The progressive distributor should be assembled as close to the lubrication points as possible. The line system must be designed such that it can take maximum pump pressure. Preferably steel pipes are laid. If mobile lubrication points are to be lubricated, high pressure hoses of appropriate dimension must be used. The length of the high pressure hoses should be kept as short as possible, as these expand under pressure and can intake appropriate lubricant quantity. Timely secure feeding of the lubricant is thus no longer guaranteed. Moreover, like for air inclusions, a quick pressure suppression, which may affect the lubricant adversely, is prevented. Only lubrication lines, i.e. lines directly leading from the distributor to the lubrication point, can be laid in polyamide pipe, if it is ensured

that the permissible operating pressure of the pipe shall not be exceeded. The required pipe fittings and fastening components are yielded by the cross-sections of the pipes and the available connection thread. Fittings with tapered thread must not be used in the progressive distributors at all.

It is recommended to select the cross-sections of the pipeline according to the length of the pipes so that only little operating pressure (less than 80 bar) is required. Slow action pumps are beneficial. Higher pressure changes the lubricants adversely. Hence, possibly low operating pressure must be selected in the pneumatic pumps. The pumping pressure can also be reduced through a throttle in the air line.

2. Mode of action:

The lubricant is pumped into the main line by actuating the pump and fed to the connected progressive distributor. The lubricant is distributed over the number of outlets of the distributor and then delivered to the lubrication points or fed to another downstream progressive distributor, divided there and dispensed to the connected lubrication points. Dosing is done as per the selection of the dosing elements with different flow rates. A circulation control detects every circulation of the system. If a progressive distributor cannot deliver its lubricant or if a piston is blocked e.g. due to contamination, the system reports fault i.e. the circulation control has not reported within the monitoring time.

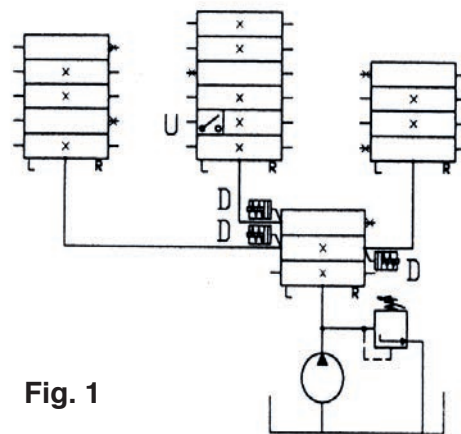


Fig. 1

3. Start-up:

Before start-up, the pump must be filled with clean grease without any air bubbles. It is important that the pump is filled using a filling or barrel pump. The barrel pumps must be equipped with follow-up piston. Clean and air-bubble-free filling can thus be ensured. A cartridge pump with pre-filled cartridges may also be used for small consumption quantities. Then the pump and subsequently the progressive distributor must be ventilated. Pumping follows till bubble-free lubricant appears first on the pump and then on all the outlets of the main distributor and subsequently on the downstream progressive distributors.

Particularly for large systems, which are operated with grease, it is essential to start the system step-wise from the lubrication point to the pump i.e. lubrication points, lines and progressive distributor must be pre-filled individually. The pressure requirement of individual segments of the system can thus be checked directly. Pay attention that the lubricant is refilled on time, for preventing air bubbles in the system. Else the complete system must be re-ventilated.

4. Assembly:

The fastening surface of the progressive distributor must be plane, so that the housing is not braced while screwing. If required, washers may be required for alignment.

Outlet bore of the progressive distributor must be closed. Cleanliness must be observed. Pumps, progressive distributor and particularly the pipelines and fittings must be cleaned thoroughly prior to the assembly.

5. Lubricant:

Generally, grease can be dispensed based on mineral oil that shows a walk penetration more than 265 (1/10 mm), NLGI-Klasse 000 - 2 in the bielomatik progressive lubrication system.

Greases must not be mixed. In exceptional case, if tolerated, saponification may be mixed.

Attention:

- do not possibly mix different lubricants! Ideally, the system must be cleaned.
- No way must greases be mixed with non-compatible types of soaps.

6. Maintenance:

Impermeability of the system and the container fill level must be checked at regular intervals. A fault

occurs if the circulation control has not responded within the monitoring time.

Reasons:

- a) Container or barrel empty.
- b) Pump not ventilated or defective.
- c) System blocks at high pump pressure.

Reasons:

- Lubrication line closed
- Lubrication point or its channel closed
- Outlet on the progressive distributor closed unauthorised
- Piston in the progressive distributor fits tightly (bracing, contamination)
- Channel within the progressive distributor closed due to contamination.
- All pistons of a progressive distributor are at centre position.

In case the system is blocked, fault may occur at any location in the system. There is overpressure at the blocked location, which is signalled to the relevant pressure indicator by a protruding pin. Source of fault can thus be localised on a secondary distributor.



Designation

Single piston pump

Single piston pump

Type

AI-H

AI-P

Drive method

manual

pneumatic

Filling quantity

0.8 kg

0.8 kg

Pump pressure

145 bar

145 bar

Displacement

3 cm³/stroke

3 cm³/stroke

More information on

Page 46

Page 47

Summary of grease pumps progressive lubrication system



45

Electrical grease pump	Mounting press	Grease filling machine
PEG 2 / PEG 5	-	-
Electrical	manual	manual
2 / 5 kg	0.5 kg	15, 25, 50 kg
250 bar	400 bar	8 bar
2.4 / 4.5 cm ³ per min.	1.4 cm ³ /stroke	30.0 cm ³ /stroke
Page 48	Page 50	Page 51

Single piston pump AI-H

The single piston pump AI-H is a robust hand lever pump. They are suitable for different lubrication, which must be done daily or rarely.

Detailed information under TA 308 11 306.

General

Type	Single piston pump
Lubrication line connection	Pipe connection Ø 8 mm
Ambient temperature	0 to 40 °C
Filling	Filling device

Hydraulic system

Operating pressure	145 bar
Displacement	3 cm³/stroke
Operating medium	Fluid grease, grease
Range of viscosity	NLGI 000-2*

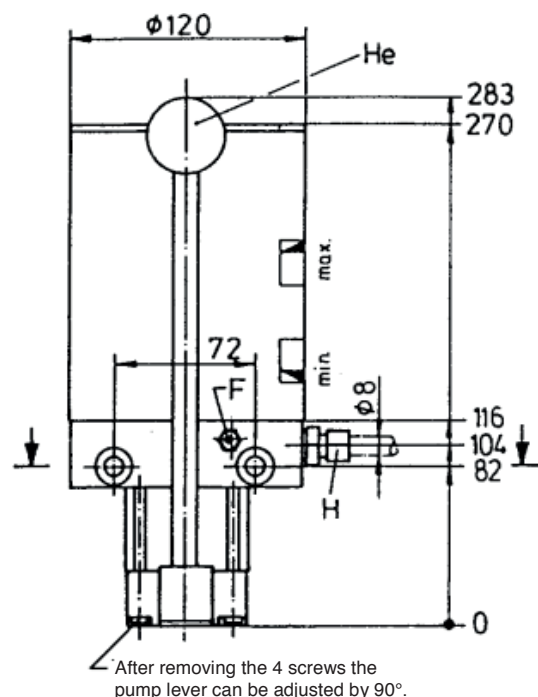
*as per fluid grease release list

Drive

Type of drive	manual
Actuating force	200 N

Order summary

Fill quantity [kg]	Order number
0,8	300 11 301



Single piston pump AI-P

The single piston pump AB-P is a robust pneumatic pump. It is suitable for automated and different lubrication, which must be done several times daily to once per minute.

Detailed information under TA 308 11 305.

General

Type	Single piston pump
Lubrication line connection	Pipe connection Ø 8 mm
Ambient temperature	0 to 40 °C
Filling	Filling device
Protection class as per EN60529	IP 54

Hydraulic system

Operating pressure	145 bar
Displacement	3 cm³/stroke
Operating medium	Fluid grease, grease
Range of viscosity	NLGI 000 – 2*

*as per fluid grease release list

Drive

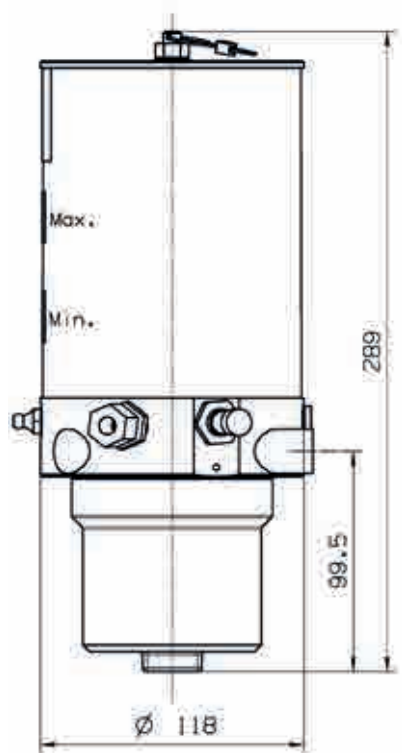
Type of drive	pneumatic
Supply pressure	6 bar
Supply fitting	G 1/4"

Sensor system

Level control	
Nominal voltage	24 V DC
Power consumption	≤ 20 mA
Switching current	≤ 200 mA
Connection	M12 x 1

Order summary

Fill quantity [kg]	Order number
0,8	300 11 406



Electrical grease pump PEG 2

The electrical grease pump PEG 2 is robust and efficient stirring pump. It is suitable for automated lubrication. It is connected directly or to the progressive distributors and can be retrofitted with up to three pump elements.

Detailed information under TA 308 11 725.

General

Type	Stirring pump
Lubrication line connection	G 1/4 "
Ambient temperature	0 to 60 °C
Filling	Filling device
Protection class as per EN60529	IP 54

Hydraulic system

Operating pressure	145 bar
Displacement	2.4 cm³/min
Operating medium	Fluid grease, grease
Range of viscosity	NLGI 000-2*

*as per fluid grease release list

Drive

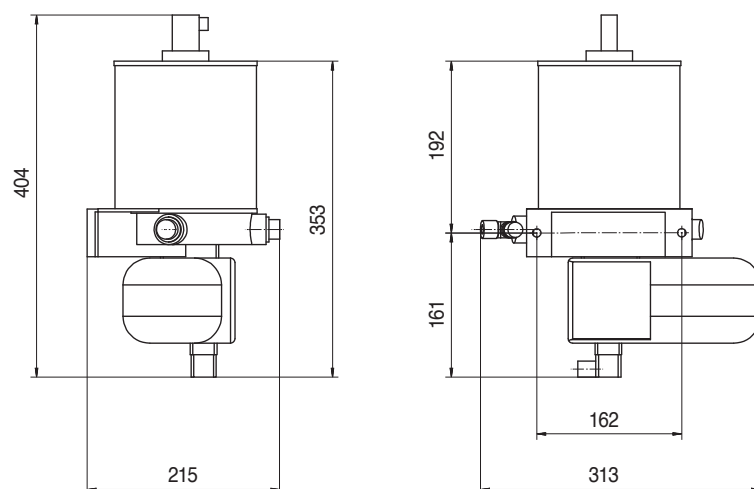
Type of drive	Electrical
Supply voltage	24 V DC
Supply current	1.5 A
Power consumption	30 W
Connection	Angled plug connector DIN 43650A

Sensor system

Level control	
Nominal voltage	24 V
Switching current	≤ 0.2 A
Connection	Angled plug connector DIN 43650A

Order summary

Fill quantity [kg]	Order number
2,0	300 11 726



Electrical grease pump PEG 5

The electrical grease pump PEG5 is robust and efficient stirring pump. It is suitable for automated lubrication. It is connected directly or to the progressive distributors and can be retrofitted with up to three pump elements.

Detailed information under TA 308 11 750.

General

Type	Stirring pump
Lubrication line connection	G 1/4"
Ambient temperature	0 to 80 °C
Filling	Filling device
Protection class as per EN60529	IP 54

Hydraulic system

Operating pressure	250 bar
Displacement	4.5 cm³/min
Operating medium	Fluid grease, grease
Range of viscosity	NLGI 000-2*

*as per fluid grease release list

Drive

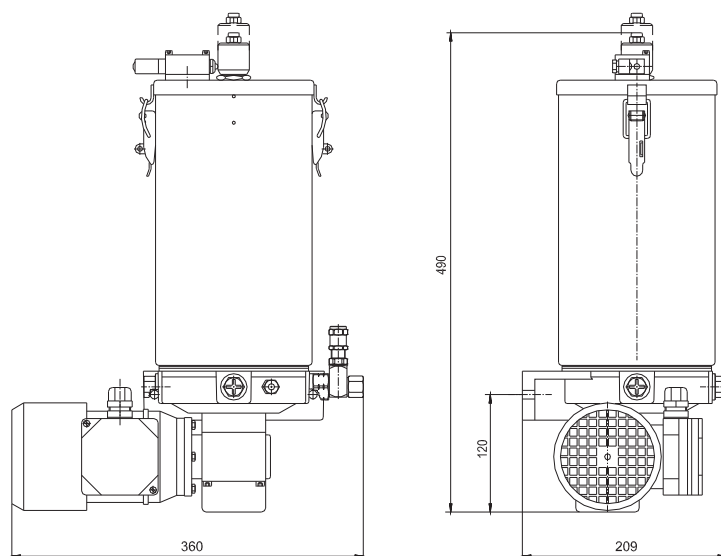
Type of drive	Electrical
Supply voltage	3 x 400 V / 3 x 460 V
Supply current	≤ 0.46 A
Frequency	50 / 60 Hz
Power consumption	90 W
Connection	Terminal board

Sensor system

Level control	
Switching voltage	≤ 24 V DC
Switching current	≤ 2 A DC
Connection	Angled plug connector DIN 43650A

Order summary

Fill quantity [kg]	Order number
5,0	300 11 750



Mounting press

The mounting press is a robust and cost-effective cartridge grease gun. It is suitable for simple lubrication tasks.

Detailed information under TA 308 15 102.

General

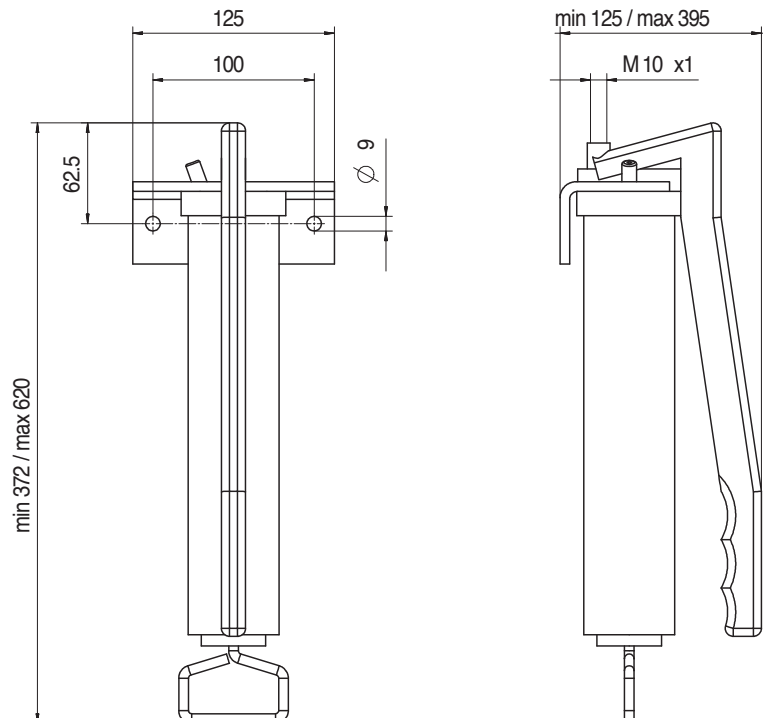
Filling	a.) via fill nipple
	b.) with cartridge 500ccm
	c.) external (suction)

Hydraulic system

Max. pumping pressure	400 bar
Displacement	1.4 cm³/stroke

Order summary

Mounting press	Order number
for grease nipple DIN 1282	300 15 111
for ball joint grease nipple DIN 71412	300 15 112
for grease nipple DIN 1282 incl. retaining clip	300 15 113



Grease filling machine

Grease filling device for filling grease pumps with filling nipple from commercially available threads. The filling device ensures a quick, closed and air free filling of the grease pumps. Disadvantages of manual filling, like contamination of the lubricant at open threads and pumps on-site and contaminated auxiliary means, are eliminated by an economical refilling.

Detailed information under TA 308 15 302.

General

- Clean handling
- efficient when dealing with grease
- safe and quick filling from the grease container
- Automatic throttling valve (hence no grease spill)

Order overview

Manually operated filling device as portable version (without transport carriage)

Grease container [kg]	Container interior- □ [mm]	Container interior- height max. [mm]	Order number
15	250 - 267	362	300 58 032
25	311 - 330	400	300 58 034

Filling machine with pneumatic pump and transport carriage

Grease container [kg]	Container interior- □ [mm]	Container interior- height max. [mm]	Order number
15	250 - 267	362	300 15 332
25	311 - 330	400	300 15 334
50	365 - 385	590	300 15 335

Filling machine complete

Grease filling machine complete with lid, follow-up piston, dolly, 3.5 m hose and mouthpiece for	
conical grease nipple	Flat grease nipple
DIN 71412	DIN 3404 A



Designation

Version

Number of outlets

Dosing volume per outlet

Monitoring

More information on

Progressive distributors



53

Progressive distributor VD

Block distributor

2 or 4

230 mm³

Without

Page 54

Progressive distributor VF

Block distributor

3 to 18

100 / 200 mm³

Optical / electrical

Page 56

Progressive distributor VE

Disc distributor

3 to 50

80 to 420 mm³

Optical / electrical

Page 58

Progressive distributor VD

Progressive distributor in block design available with 2 or 4 lubrication outlets.
The progressive distributor VD is suitable for lubrication with fluid grease or grease.

Detailed information under TA 308 20 203.

General

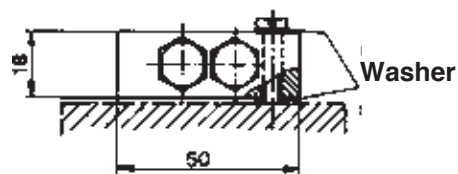
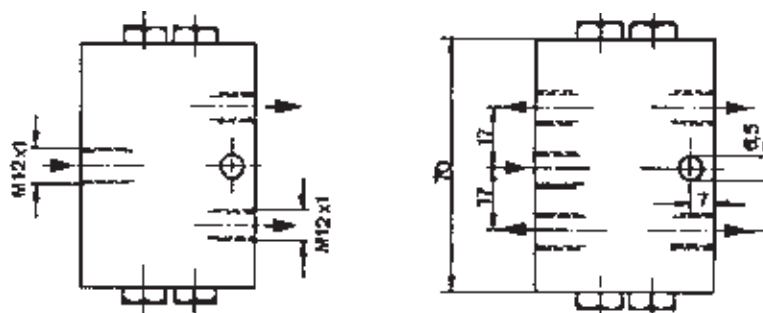
Type	Block distributor
Lubrication line connection	M12 x 1
Ambient temperature	0 to 100 °C

Hydraulic system

Operating pressure	100 bar
max. displacement	0.1 l/min
Operating medium	Fluid grease, grease
Range of viscosity	NLGI 000-2
Dosing volume	230mm ³ / outlet

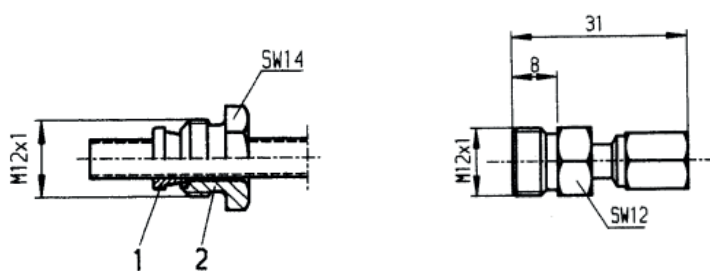
Order summary

Number of outlets	Order number
2	300 20 265
4	300 20 266



Order overview for accessories

Accessories	Connection	Order number
Sealing cone	Ø 4 mm	302 25 002
	Ø 6 mm	302 25 001
Male fitting	Ø 4 mm M12 x 1	302 56 608
	Ø 6 mm M12 x 1	302 56 609
Straight pipe fitting	Ø 8 mm M12 x 1	300 44 150
	Ø 10 mm M12 x 1	300 44 233
Retaining screw	M6 x 30	620 06 052
Washer	A 6.4	620 44 003



Progressive distributor VF

Progressive distributor in block design available with up to 18 lubrication outlets.
The progressive distributor VF is suitable for distribution of central lubrication with fluid grease or grease.

Detailed information under TA 308 21 502.

General

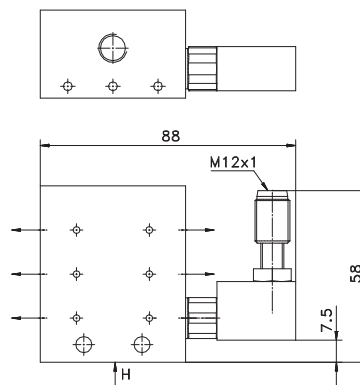
Type	Block distributor
Lubrication line connection	M10x1
Ambient temperature	0 to 100 °C
Protection class as per EN60529	IP 67

Hydraulic system

Operating pressure	20 to 250 bar
Operating medium	Fluid grease, grease
Range of viscosity	NLGI 000- 2

Sensor system

Circulation control	
Switching voltage	24 V DC
Switching current	≤ 300 mA
Power consumption	≤ 15 mA
Connection	M12 x 1



Design:

Block design i.e. 1 piston for each outlet in a housing. The inflow through the main line H is on the front side of the housing. Outlets L and R are on the left and right of the housing, which are offset against the effective piston (see directions of arrow Fig. 1). Opposite outlets can be connected. Due to which the opposite outlets demand double the quantity. The dosing volume for every outlet is specified in figures on the type plate. For details see order samples. Electrical circulation controls are available.

Mode of operation:

Every piston in the progressive distributor is displaced once consecutively per circulation in the two end positions. The lubricant thus displaced flows towards the respective outlet. Before the end position of the currently mobile piston, the piston initiates the inflow and the outflow of the lubricant to the next piston through its control edge. Progressive distributor can pause in every position and restart. If an outlet is blocked, the progressive distributor stands still. This is a pre-requisite for simple monitoring of individual progressive distributor or those connected in series. There must be a circulation control in the system for monitoring, which, for the purpose of controlling, must respond in a predetermined monitoring time.

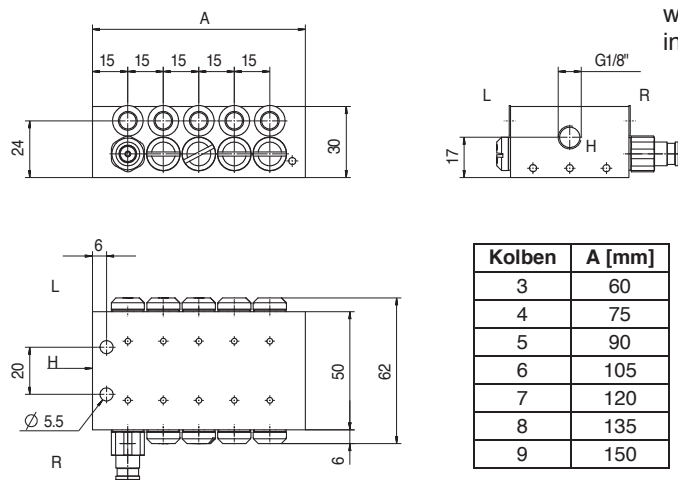


Fig. 1



Order number - configurator

Order number:	300 21	X X	X	VF	X X	X	-	...
----------------------	---------------	------------	----------	-----------	------------	----------	----------	------------

Version:	
without monitoring	57
optical monitoring	58
electrical monitoring*	49

Number of outlets:	
6 outlets	3
8 outlets	4
10 outlets	5
12 outlets	6
14 outlets	7
16 outlets	8
18 outlets	9

Dosing volume:	
100 mm ³ /outlet	10
200 mm ³ /outlet	20

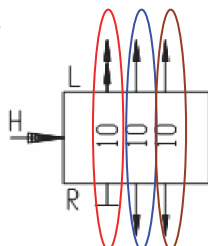
Page:	
Left	L
Right	R

*incl. inductive proximity switch
with cable M12 x 1, length 3m

The dosing volume of the outlets must be enumerated starting from input H. This must be specified through the figure 10 for 100 mm³ or 20 for 200 mm³. If the dosing volume is combined by removing the ball and the plug screw on an opposite side, the same must be mentioned. The side to be kept open should be specified through addition R or L as per the code. (R = Right; L = Left)

Order sample:

Progressive distributor 300 21 573
VF 10L-10-10
10 for 100 mm³



Order overview

Version		Order number
Without Monitoring	6 Outlets	300 21 57 3
Without Monitoring	8 Outlets	300 21 57 4
Without Monitoring	10 Outlets	300 21 57 5
Without Monitoring	12 Outlets	300 21 57 6
Without Monitoring	14 Outlets	300 21 57 7
Without Monitoring	16 Outlets	300 21 57 8
Without Monitoring	18 Outlets	300 21 57 9
Optical Monitoring	6 Outlets	300 21 58 3
Optical Monitoring	8 Outlets	300 21 58 4
Optical Monitoring	10 Outlets	300 21 58 5
Optical Monitoring	12 Outlets	300 21 58 6
Optical Monitoring	14 Outlets	300 21 58 7
Optical Monitoring	16 Outlets	300 21 58 8
Optical Monitoring	18 Outlets	300 21 58 9
Electrical Monitoring	6 Outlets	300 21 49 3
Electrical Monitoring	8 Outlets	300 21 49 4
Electrical Monitoring	10 Outlets	300 21 49 5
Electrical Monitoring	12 Outlets	300 21 49 6
Electrical Monitoring	14 Outlets	300 21 49 7
Electrical Monitoring	16 Outlets	300 21 49 8
Electrical Monitoring	18 Outlets	300 21 49 9

Progressive distributor VE

Progressive distributor in disks, which is available with up to 25 lubrication outlets, each having a different dosing volume. The progressive distributor VE is suitable for distribution of challenging lubrication tasks with fluid grease or grease.

Detailed information under TA 308 21 601.

General

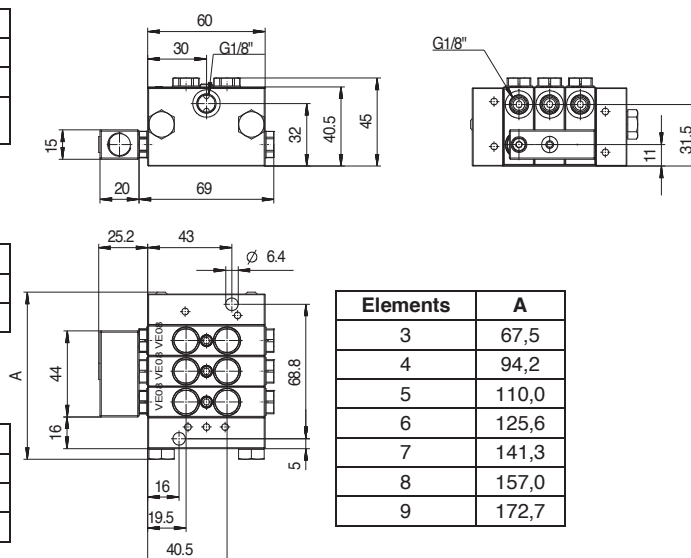
Type	Disc distributor
Lubrication line connection	M10 x 1
Ambient temperature	0 to 110 °C
Protection class as per EN60529	IP 67

Hydraulic system

Operating pressure	20 to 250 bar
Operating medium	Fluid grease, grease
Range of viscosity	NLGI 000-2

Sensor system

Circulation control	
Switching voltage	24 V DC
Switching current	≤ 300 mA
Connection	M12 x 1



Design:

Disk-type construction, with starter and end plate and optionally with 3 to 10 elements with 7 different dosing volumes. The disks are held together with 2 through screws. Inflow through main line connection H in the starter plate. Through a dosing piston assembled in the lower part of the element, every element delivers 2 element-based dosed volumes, which can optionally be delivered laterally (L, R) or to the upper outlets (1, 2). The upper outlets are closed in the delivered condition. Opposite outlets can be connected. Due to which the opposite outlets yield double the quantity. Adjacent outlets, outlets on the top or lateral outlets can be connected in pairs with bridges. All dosing quantities can be realised with the addition of individual dosing quantities. A return valve is integrated in the progressive distributor per outlet. Backflow of grease is thus avoided. Electrical and optical circulation controls as well as pressure indicators are included in the kit.

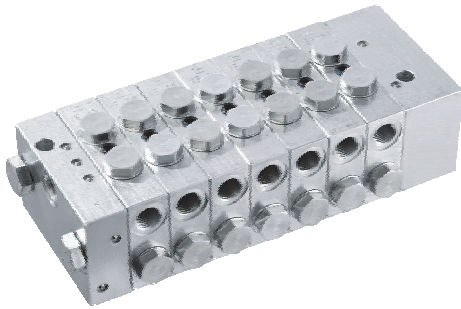
Mode of operation:

During pressurisation, pistons in the elements are again moved back consequently before and afterwards. The lubricant thus displaced flows towards the respective outlet. Shortly before the end position of the currently mobile piston, the piston initiates the inflow and the outflow of the lubricant to the next piston via its control edge. Progressive distributor can pause in every position and restart. If an outlet is blocked, the progressive distributor stands still. This is a pre-requisite for simple monitoring of individual progressive distributor or those connected in series. There must be a circulation control in the system for monitoring that detects the monitoring time.

Features:

All channels flow through completely with lubricant.

- No settling of the bled grease solids in the channels, which lead to blocking.
- Mandatory self-venting



Order number - configurator

Order number:	300 216	X	X	VE	XX	X	-	...
----------------------	---------	---	---	----	----	---	---	-----

Version:	
without monitoring	0
optical monitoring	1
electrical monitoring*	2

Number of elements**:	
3 elements	3
4 elements	4
5 elements	5
6 elements	6
7 elements	7
8 elements	8
9 elements	9

Dosing volume:	
80 mm ³ /outlet	08
120 mm ³ /outlet	12
180 mm ³ /outlet	18
240 mm ³ /outlet	24
300 mm ³ /outlet	30
360 mm ³ /outlet	36
420 mm ³ /outlet	42

Page:	
Left	L
Right	R

* In progressive distributor with electrical circulation control the inductive proximity switch 676 62 047 must be ordered.

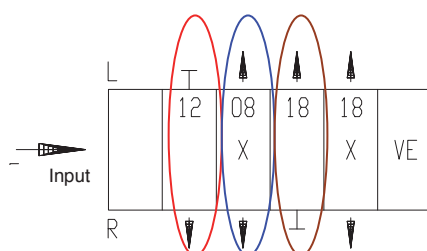
** Up to 25 elements are available on request.

The dosing volume of the outlets must be enumerated starting from input H. The progressive distributor may contain only one size. These must be specified with the code 08 for 80 mm³ or 42 for 420 mm³.

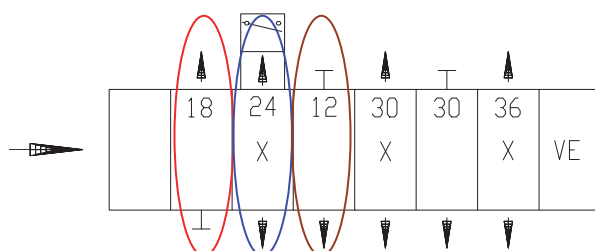
If the dosing volume is combined by removing the ball and the plug screw on an opposite side, the same must be mentioned. The side to be kept open should be specified through addition R or L as per the code. (R = Right; L = Left)

Sample orders:

1. Progressive distributor with 4 elements and 6 outlets.
Progressive distributor
300 21 604 VE **12R-08-18L-18**



2. Progressive distributor with 6 elements and 9 outlets and electrical circulation control.
Progressive control with electrical circulation control
300 21 626 VE **18L-24-12R-30-30R-36**



Order overview

Version		Order number
Without Monitoring	3 Elements	300216 0 3
Without Monitoring	4 Elements	300216 0 4
Without Monitoring	5 Elements	300216 0 5
Without Monitoring	6 Elements	300216 0 6
Without Monitoring	7 Elements	300216 0 7
Without Monitoring	8 Elements	300216 0 8
Without Monitoring	9 Elements	300216 0 9
Optical Monitoring	3 Elements	300216 1 3
Optical Monitoring	4 Elements	300216 1 4
Optical Monitoring	5 Elements	300216 1 5
Optical Monitoring	6 Elements	300216 1 6
Optical Monitoring	7 Elements	300216 1 7
Optical Monitoring	8 Elements	300216 1 8
Optical Monitoring	9 Elements	300216 1 9
Electrical Monitoring	3 Elements	300216 2 3
Electrical Monitoring	4 Elements	300216 2 4
Electrical Monitoring	5 Elements	300216 2 5
Electrical Monitoring	6 Elements	300216 2 6
Electrical Monitoring	7 Elements	300216 2 7
Electrical Monitoring	8 Elements	300216 2 8
Electrical Monitoring	9 Elements	300216 2 9

Accessories: For main line connection H, outlets L, R, 1, 2 (see Fig.)

Designation	Dimensions [mm]					Drawing	Possible assembly	Order number
	d	1	S2	L	L1			
Straight pipe fitting	4	1	12	21	-	E4	L, R, 1, 2, H	300 44 152
Straight pipe fitting	6	11	12	21	-	E6	L, R, 1, 2, H	300 44 147
Straight pipe fitting	8	14	14	22	-	E8	L, R, 1, 2, H *	300 43 905
Straight pipe fitting	10	17	19	29	-	E10	H	638 12 802
Straight pipe fitting	12	19	22	49	-	E12	H	300 44 141
Straight pipe fitting with return valve	6	17	14	41	-	R6	H	300 22 143
Straight pipe fitting with return valve	8	17	17	39	-	R8	H	300 22 144
Straight pipe fitting with return valve	10	17	17	41	-	R10	H	300 22 145
Swivelling fitting	4	14	8	20	26	S4	L, R, 1, 2, H	300 45 523
Swivelling fitting	6	14	10	20	29	S6	L, R, 1, 2, H	300 45 527
Swivelling fitting	8	14	14	21	23	S8	H *	300 45 401
Bridge	-	12	-	14	-	B	L, R, 1, 2	300 45 809
Bridge with outlet	-	12	-	14	25	A	L, R, 1, 2	300 45 804
Pressure indicator 100 bar	-	12	-	27	-	DZ 100	L, R, 1, 2, 3, 4	300 27 101
Pressure indicator 50 bar	-	12	-	27	-	DZ 100	L, R, 1, 2, 3, 4	300 27 100
Male fitting	6	0	-	5	-	D6	L, R	302 56 616
Double taper ring	for Ø 6 mm pipe						L, R, 1, 2, H	302 15 201

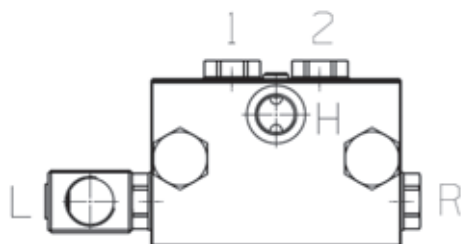
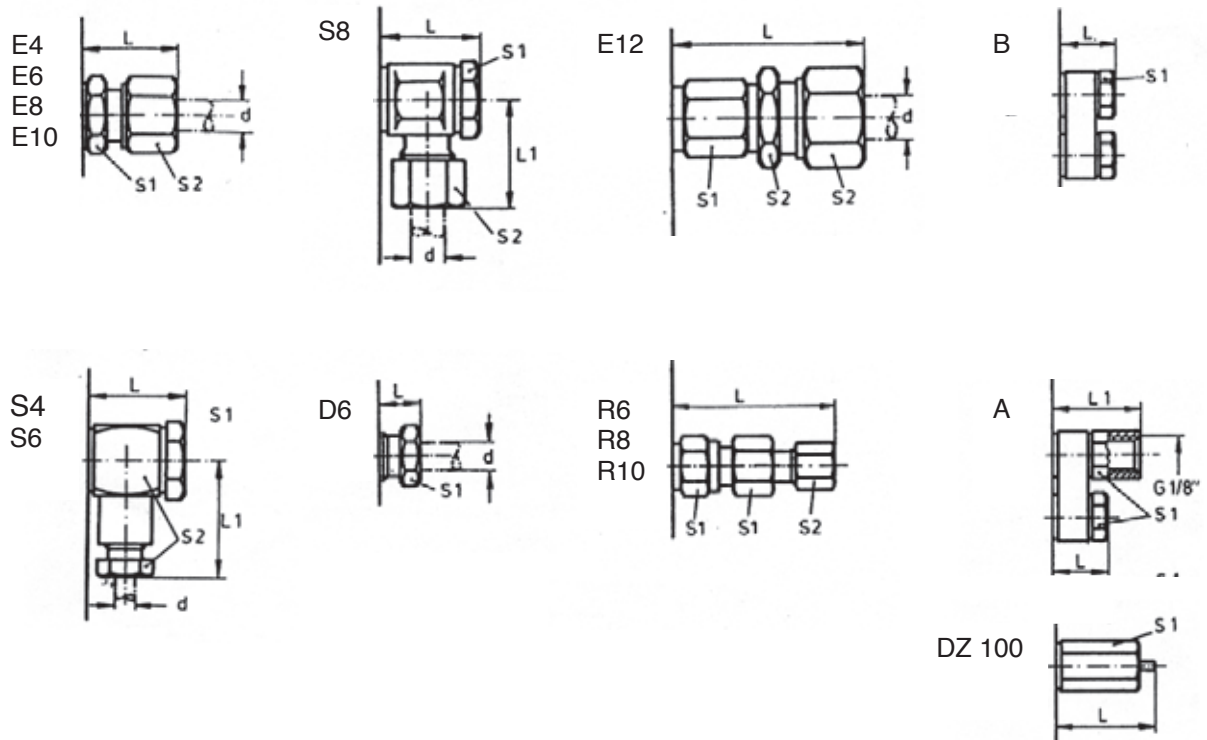


Fig.: Overview connections



Prefabrication - progressive lubrication system

As a special service bielomatik offers system-wide prefabrication of the components. This service covers all imaginable assembly operations, which are possible before the delivery of the system.

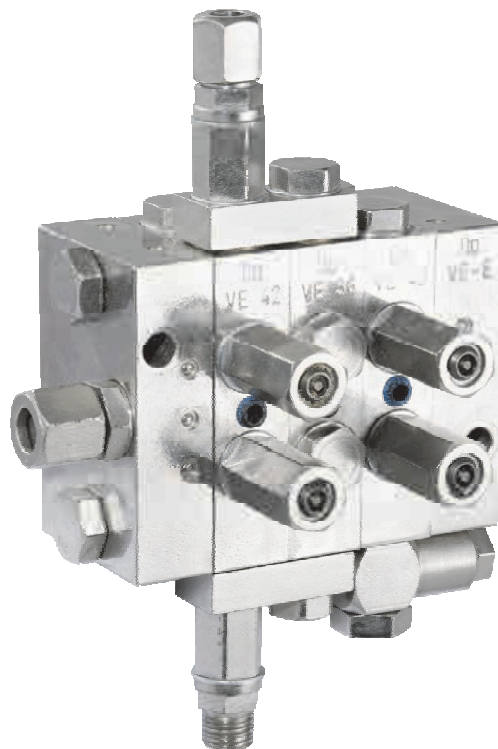
- Filling the pump with the lubrication desired by the customer
- Filling the pipes and lines with the lubrication desired by the customer
- Lubrication system for complete installation in connection with a customer interface
- Customer-specific configuration of pumps (air or lubrication side with specific screw joints)
- Customer-specific modifications to standard elements
- Customer-specific packaging of fabricated systems
- Combinations of several systems

The advantage is that a complete system can be pre-fabricated ex-factory as per the customer's requirements thus significantly reducing the assembly time. Even placing the order is very simple as individual parts from all systems must not be ordered separately. You can get the delivery of a completely pre-fabricated lubrication system under one order number.

The following examples show only a small extract from the various options of pre-fabrication from bielomatik Leuze GmbH & Co. KG.

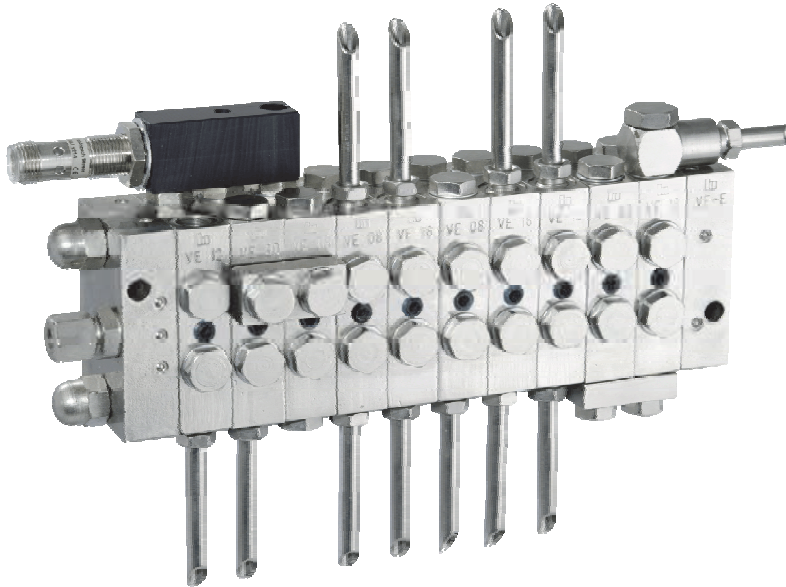
Example 1:

The figure shows a 3 times magnified progressive distributor VE with the assembly **VE 42-36-42**. The distributor is provided with customer-specific various screw joints and equipped with additional pressure indicators.



Example 2:

The figure shows a 8 times magnified progressive distributor VE with the assembly **VE 12-30-08-08-18-12-08-18**. The distributor is provided with customer-specific various screw joints and has an additional electronic circulation control.



Example 3:

The figure shows a customer-specific lubrication cabinet with electronic control for automated lubrication of up to 8 lubrication circuits. The lubrication cabinet comprises a pump for 50 kg thread, level and function monitoring and an outlet stop.



For queries related to customer-specific pre-fabrication call us on +49 (0) 7025 / 12-519.



Circulation lubrication system

Gear pump unit

Page 68

Flow regulators

Page 74



Circulation lubrication system

For lubricating and cooling supports and gearboxes.

The advantages

- Economical through closed circuit
- Environment friendly
- Function monitoring

The system components

- Customer-specific circulation units with gear and screw spindle pumps
- Main line
- Flow regulators with electronic monitoring
- Lines to the lubrication points
- Fittings
- Control and check devices

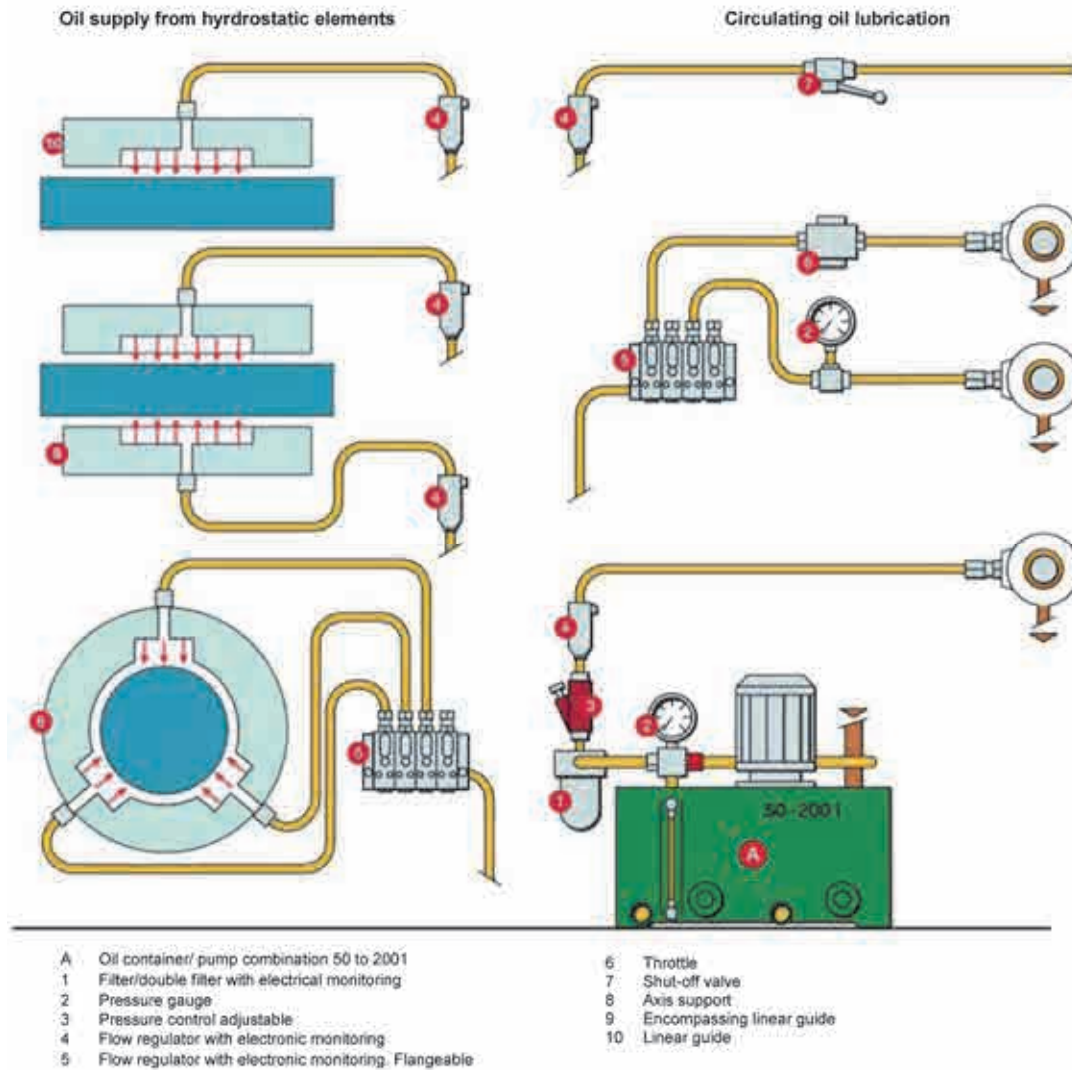
Circulation lubrication system for the supply to lubrication points

The bielomatik circulation lubrication system is preferably used, if an additional cooling and cleaning of the lubrication point is requested. In this lubrication system, after the supply to the lubrication point, oil is led back to the lubrication unit and reused. Due to this impurities are removed and very high temperatures are avoided.

The closed oil circuit supports such an environment friendly and economical lubrication system.

A screw spindle or gear pump dispenses the oil from the tank via pressure filter to the distributors. The desired oil quantity can be fed to the lubrication points via flow regulators or throttles.

Pressure switch, flow regulators with electrical monitoring, temperature sensors and circulation controls are used for monitoring.



Circulation lubrication system in the hydrostatic

Hydrostatic sliding guides are often used in machines with high precision and lifting capacity requirements. Advantage of hydrostatic sliding guides is that the contact surfaces are separated by a permanent oil film. The oil supply creates the required pressure in the oil gap. Sliding surfaces are thus separated. The load is carried by the hydrostatic oil film. This prevents wearing and startup friction. This produces an improved damping and a stick-slip can be eliminated.

Several support cavities are required for mounting for being able to accept excentric loads. As the oil pressures in the respective support cavities vary according to the load, independent oil supply must be provided. bielomatik offers flow regulators for regulating this oil supply. Function of these flow regulators is to keep the volume flow constant, independent of temperature and load pressure.

The bielomatik flow regulator regulates the volume flow so that the same remains constant. Constant volume flow produces pocket pressure dependent upon the height (h), so that change in height (Δh) decreases with bigger loads. This means that change in height (Δh) is less at larger load, as compared to a pressure control. This yields an excellent stiffness ratio and good damping characteristics of the guide.

By using bielomatik flow regulator and an unregulated pump, it is possible to supply a guide with several support cavities. They are flow regulators for pipeline installation and available flangeable as valve terminal. The work area of the flow regulators is between 0.16 l/min and 31 l/min with a size grouping according to preferred number of rows.

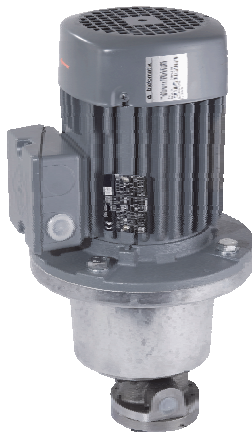
Version

Displacement

Pump pressure

More information on

Summary gear pump unit circulation lubrication system



Gear pump unit 1

Base mount

< 3 litre

35 bar

Page 70

Gear pump unit 2

Sub-base mount

< 3 litre

35 bar

Page 71

Gear pump unit 3

Base mount

> 3 litre

35 bar

Page 72

Gear pump unit 1

Gear pumps up to 3 litres displacement and a maximum pumping pressure of 35 bar. This pump is designed for base mount.

Detailed information under TA 308 14 302.

General

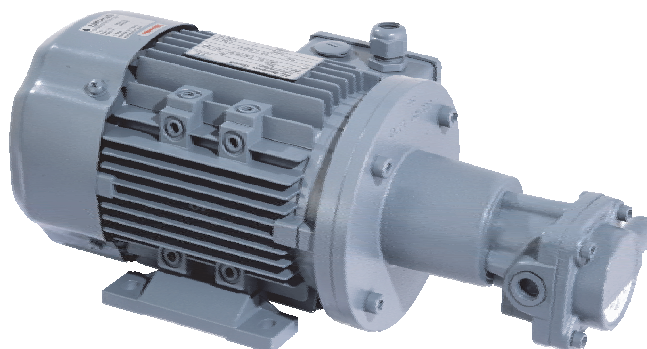
Type	Base mount
Ambient temperature	0 to 80 °C
Protection class as per EN60529	IP 44

Hydraulic system

Operating pressure	35 bar
Displacement	< 3 l/min
Operating medium	Mineral oil
Range of viscosity	20 to 750 mm²/s

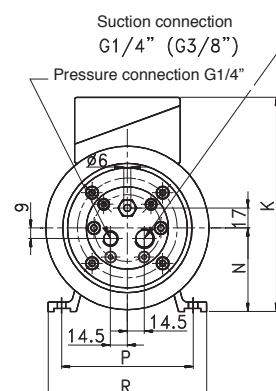
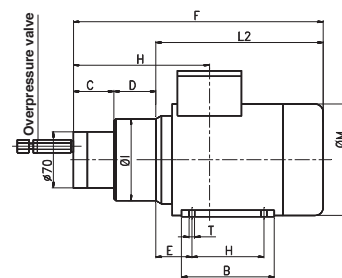
Drive

Type of drive	Electrical
Supply voltage	3x 400 V AC
Frequency	50 Hz
Connection	Terminal board



Gear pump unit to 3 l/min displacement

Flow rate [l/min]	Engine output [KW]	Dimensions [mm]									Order number
						C	D	F	L2	M	
		B	E	N	P	R	T	H	I	K	
0,06	0,21					37	42,5	236	156	109	300 14 154
		100	40	63	100	128	8	80	90	161	
0,18	0,21					37	42,5	236	156	109	300 14 155
		100	40	63	100	128	8	80	90	161	
0,25	0,21					37	42,5	236	156	109	300 14 139
		100	40	63	100	128	8	80	90	161	
0,375	0,21					38,5	42,5	237	156	109	300 14 156
		100	40	63	100	128	8	80	90	161	
0,5	0,21					40	42,5	239	156	109	300 14 153
		100	40	63	100	128	8	80	90	161	
0,75	0,30					45	52,5	274	176	124	300 14 158
		116	45	71	112	138	8	90	102	175	
1	0,30					45	52,5	274	176	124	300 14 159
		116	45	71	112	138	8	90	102	175	
1,2	0,44					47	52,5	276	176	124	300 14 323
		116	45	71	112	138	8	90	102	175	
1,5	0,44					47	52,5	276	176	124	300 14 327
		116	45	71	112	138	8	90	102	175	
2	0,44					47	52,5	276	176	124	300 14 330
		116	45	71	112	135	7	90	102	182	
3	0,66					50,5	52,5	312	209	139	300 14 427
		116	45	71	112	135	7	90	102	182	



Gear pump unit 2

Gear pumps up to 3 litres displacement and also a maximum pumping pressure of 35 bar. This pump is designed for sub-base mount

Detailed information under TA 308 14 302.

General

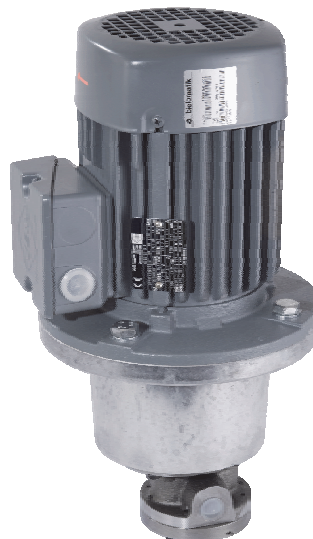
Type	Sub-base mount
Ambient temperature	0 to 80 °C
Protection class as per EN60529	IP 44

Hydraulic system

Operating pressure	35 bar
Displacement	< 3 l/min
Operating medium	Mineral oil
Range of viscosity	20 to 750 mm²/s

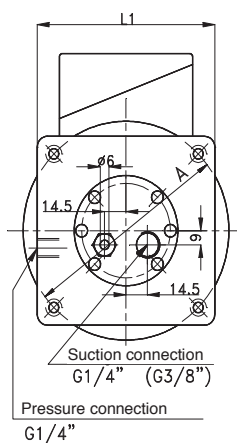
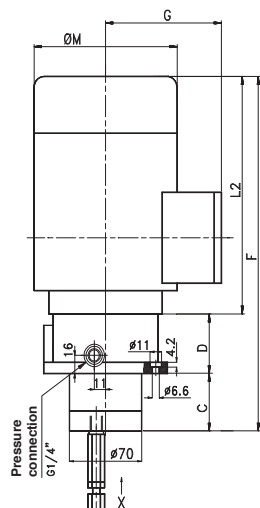
Drive

Type of drive	Electrical
Supply voltage	3x 400VAC
Frequency	50 Hz
Connection	Terminal board



Gear pump unit to 3 l/min displacement

Flow rate [l/min]	Engine output [KW]	Dimensions [mm]								Order number
		A	C	D	F	Thread	L1	L2	M	
0,06	0,21	110	37	42,5	236	107	100	156	109	300 14 150
0,18	0,21	110	37	42,5	236	107	100	156	109	300 14 151
0,25	0,21	110	37	42,5	236	107	100	156	109	300 14 124
0,375	0,21	110	38,5	42,5	237	107	100	156	109	300 14 152
0,5	0,21	110	40	42,5	239	107	100	156	109	300 14 157
0,75	0,30	138	45	52,5	274	113	120	176	124	300 14 160
1,0	0,30	138	45	52,5	274	113	120	176	124	300 14 147
1,2	0,44	138	47	52,5	276	113	120	176	124	300 14 325
1,5	0,44	110	47	52,5	276	113	110	176	124	300 14 326
2,0	0,44	110	47	52,5	276	113	100	176	124	300 14 332
3,0	0,66	138	50,5	52,5	312	113	120	209	139	300 14 535



Gear pump unit 3

Gear pumps for displacement of 3 litres and also a maximum pumping pressure of 35 bar. This pump is designed for base mount.

Detailed information under TA 308 14 302.

General

Type	Base mount
Ambient temperature	0 to 80 °C
Protection class as per EN60529	IP 44

Hydraulic system

Operating pressure	35 bar
Displacement	> 3 l/min
Operating medium	Mineral oil
Range of viscosity	20 to 750 mm²/s

Drive

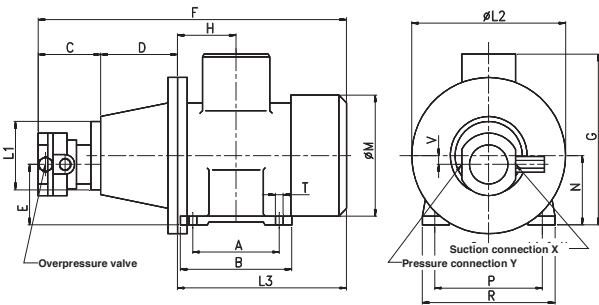
Type of drive	Electrical
Supply voltage	3x 400 V AC
Frequency	50 Hz
Connection	Terminal board

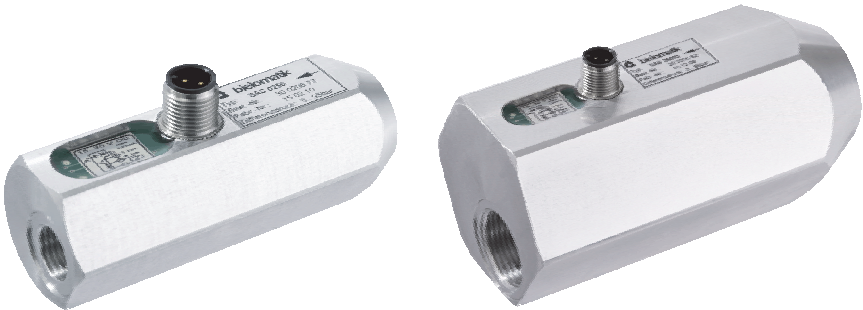


Gear pump unit greater than 3 l/min displacement

Flow rate [l/min]	Engine output [KW]	Dimensions [mm]										Order number
		A	B	C	D	E	F	Thread	H	L1	L2	
		L3	M	N	P	R	T	V	X	Y		
3	0,44	90	116	65	80	62	321	175	61	70	160	300 14 514
		176	124	71	112	138	8	9	¼"	¼"		
6	0,66	100	125	85	100	67	394	192	67	100	200	300 14 762
		209	139	80	125	168	10	13	3/8"	3/8"		
9	0,90	100	125	85	100	67	394	192	67	100	200	300 14 763
		209	139	80	125	168	10	13	3/8"	3/8"		300 14 768*
13	1,32	100	130	100	100	75	426	210	70	120	200	300 14 764
		226	157	90	140	178	10	15	1/2"	1/2"		
17	1,80	125	155	100	100	75	448	210	70	120	200	300 14 765
		248	157	90	140	178	10	15	1/2"	1/2"		
22	1,80	125	155	120	124	71	492	210	70	140	200	300 14 766
		248	157	90	140	178	10	19	3/4"	3/4"		
27	2,64	140	175	120	135	81	527	227	75	140	250	300 14 767
		272	177	100	160	192	12	19	3/4"	3/4"		

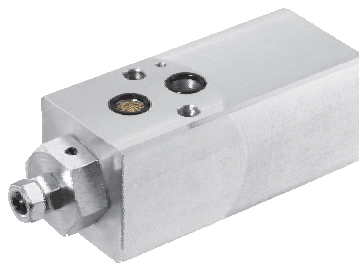
*without overpressure valve





Designation	SAS size 1	SAS size 2
Version	Pipe fitting	Pipe fitting
Volume	0.16 to 6.3 l/min fixed setting	7.1 to 31.5 l/min fixed setting
Pipe connection	G 1/4 "	G 3/4 "
More information on	Page 76	Page 77

Summary flow regulators oil circulation lubrication system



SCS

Connection panel

0,16 to 3,6 l/min
fixed setting

G 1/2 " On; G 3/8 " Off

Page 78

SFE

Connection panel

0,1 to 5,8 l/min
adjustable setting

G 1/2 "On; G 3/8 "Off

Page 80

SKE

Screw-in hole

0,1 to 5,8 l/min
adjustable setting

See drawing

Page 81

Flow regulator SAS (size 1)

The flow regulator SAS is a pressure independent and monitored volume flow regulator. It is available from 0.16 l/min to 6.3 l/min and designed for pipe fitting.

Mode of operation:

A measuring orifice fixed in the flow regulator determines the volume flow. A control piston ensures constant pressure difference at the measuring orifice, regardless of the pressure difference of inflow P and outflow A. The volume flow is mostly pressure and temperature independent. The function is ensured if the pressure difference from P to A is min. 5 bar and the available volume flow is more than 10% than the relevant actual volume flow at the operating viscosity of the oil. The integrated signal generator reports if the volume flow is lower than max. 20% of the actual volume flow. If the green LED on the valve glows, volume flow is ok. The red LED reports no or a very low volume flow. A protective diode for the cut-off discharge of inductive loads is integrated.

Detailed information under TA 308 20 602.

General

Type	Pipe fitting
Lubrication line connection	G 1/4"
Ambient temperature	0 to 80 °C
Protection class as per EN60529	IP 67

Hydraulic system

Operating pressure	100 bar
Displacement	0.16 to 6.3 l/min
Operating medium	Mineral and synthetic oils
Range of viscosity	10 to 750 mm²/s

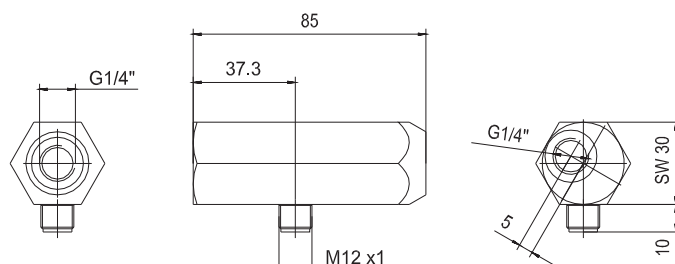
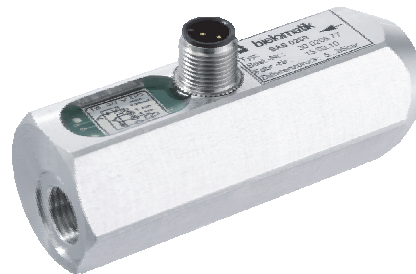
Sensor system

Function monitoring	
Nominal voltage	24 V DC
Switching current	≤130 mA
Connection	M12 x 1; 4-pole

Order summary

Discharge rate [l/min]	Single device type	Order number
0,16	SAS 0160	300 20 675*
0,25	SAS 0250	300 20 677*
0,40	SAS 0400	300 20 679*
0,50	SAS 0500	300 20 680*
0,63	SAS 0630	300 20 681*
1,00	SAS 1000	300 20 683
1,25	SAS 1250	300 20 684
1,60	SAS 1600	300 20 685
2,00	SAS 2000	300 20 686
2,50	SAS 2500	300 20 687
3,15	SAS 3150	300 20 688
4,00	SAS 4000	300 20 689
5,00	SAS 5000	300 20 690
6,30	SAS 6300	300 20 691

* with stainless steel filter



Flow regulator SAS (size 2)

The flow regulator SAS is a pressure independent and monitored volume flow regulator. It is available from 7.1 l/min to 31.5 l/min and designed for pipe fitting.

Mode of operation:

A measuring orifice fixed in the flow regulator determines the volume flow. A control piston ensures constant pressure difference at the measuring orifice, regardless of the pressure difference of inflow P and outflow A. The volume flow is mostly pressure and temperature independent. The function is ensured if the pressure difference from P to A is min. 5.2 bar and the available volume flow is more than 10% than the relevant actual volume flow at the operating viscosity of the oil. The integrated signal generator reports if the volume flow is lower than max. 20 % of the actual volume flow. If the green LED on the valve glows, volume flow is ok. The red LED reports no or a very low volume flow. A protective diode for the cut-off discharge of inductive loads is integrated

Detailed information under TA 308 20 602.

General

Type	Pipe fitting
Lubrication line connection	G 3/4"
Ambient temperature	0 to 80 °C
Protection class as per EN60529	IP 67

Hydraulic system

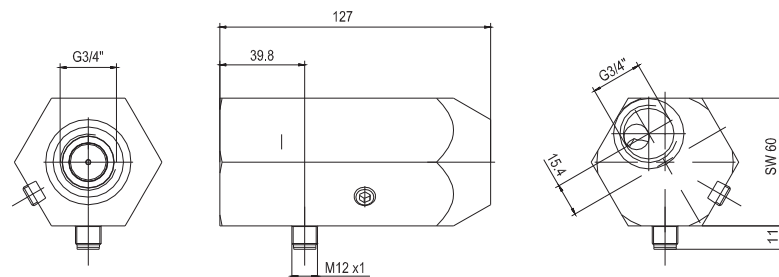
Operating pressure	100 bar
Displacement	7.1 to 31.5 l/min
Operating medium	Mineral and synthetic oils
Range of viscosity	10 to 750 mm²/s

Sensor system

Function monitoring	
Nominal voltage	24 V DC
Switching current	≤130 mA
Connection	M12 x 1; 4-pole

Order summary

Discharge rate [l/min]	Single device type	Order number
7,10	SAS 07100	300 20 651
8,00	SAS 08000	300 20 652
10,00	SAS 10000	300 20 654
12,50	SAS 12500	300 20 656
14,00	SAS 14000	300 20 657
16,00	SAS 16000	300 20 658
18,00	SAS 18000	300 20 659
20,00	SAS 20000	300 20 660
25,00	SAS 25000	300 20 662
31,50	SAS 31500	300 20 664



Flow regulator SCS (flanshable)

The flow regulator SCS is a pressure independent and monitored volume flow regulator. It is available from 0.16 l/min to 6.3 l/min. The flow regulator is available on a flange plate, which makes space-saving installation easy.

Mode of operation:

A measuring orifice fixed in the flow regulator determines the volume flow. A control piston ensures constant pressure difference at the measuring orifice, regardless of the pressure difference of inflow P and outflow A. The volume flow is mostly pressure and temperature independent. The function is ensured if the pressure difference from P to A is min. 5 bar and the available volume flow is more than 10% than the relevant actual volume flow at the operating viscosity of the oil. The integrated signal generator reports if the volume flow is lower than max. 20% of the actual volume flow. If the green LED on the valve glows, volume flow is ok. The red LED reports no or a very low volume flow. A protective diode for the cut-off discharge of inductive loads is integrated

Detailed information under TA 308 20 901.

General

Type	Flange construction
Lubrication line connection	On G $\frac{1}{2}$ ", Off G $\frac{3}{8}$ "
Ambient temperature	0 to 80 °C
Protection class as per EN60529	IP 67

Hydraulic system

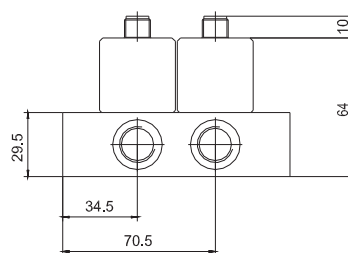
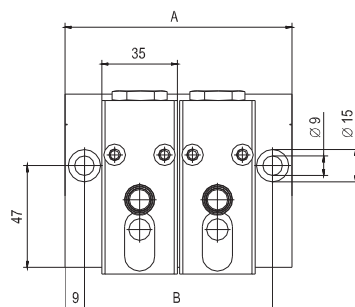
Operating pressure	100 bar
Displacement	0.16 to 6.3 l/min
Operating medium	Mineral and synthetic oils
Range of viscosity	10 to 750 mm ² /s

Sensor system

Function monitoring	
Nominal voltage	24 V DC
Switching current	≤130 mA
Connection	M12 x 1; 4-pole

Dimensions flow regulator terminal

Number of flow regulators	A [mm]	B [mm]
1 times	69	51
2 times	105	87
3 times	141	123
4 times	177	159
5 times	213	195
6 times	249	231
7 times	285	267
8 times	321	303



Order number - configurator

Order number:

300 20 99

X

SCS

X X

-

...

Number of flow regulators:

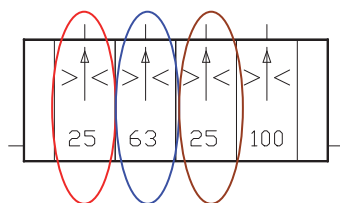
1 Valve	1
2 Valves	2
3 Valves	3
4 Valves	4
5 Valves	5
6 Valves	6
7 Valves	7
8 Valves	8

Discharge rate:

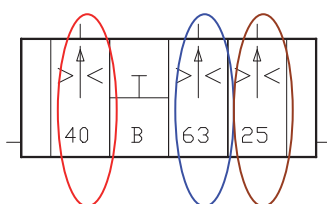
0.16 l/min	16
0.25 l/min	25
0.40 l/min	40
0.50 l/min	50
0.63 l/min	63
0.80 l/min	80
1.00 l/min	100
1.25 l/min	125
1.60 l/min	160
2.00 l/min	200
2.50 l/min	250
3.15 l/min	315
4.00 l/min	400
5.00 l/min	500
6.30 l/min	630

Sample orders:

1. Flow regulator with 4 valves.
Flow regulator valve terminal 300 20 994
SCS 25-63-25-100



2. Mit 3 Ventilen und einer Blindplatte.
Stromregelventilinsel 300 20 994 SCS 40-B-63-25



Order overview

Version	Order number
1 Valve	300 20 99 1
2 Valves	300 20 99 2
3 Valves	300 20 99 3
4 Valves	300 20 99 4
5 Valves	300 20 99 5
6 Valves	300 20 99 6
7 Valves	300 20 99 7
8 Valves	300 20 99 8

All flow regulators and the associated connection plates are also available individually.

Flow regulator SFE (adjustable)

The adjustable flow regulator with a flange structure ensures a load-independent and even flow rate for supplying hydraulic consumers. An adjusting piston, which regulates the oil flow rate, is used for the adjustment.

Mode of operation:

A measuring orifice fixed in the flow regulator determines the volume flow. A control piston ensures constant pressure difference at the measuring orifice, regardless of the pressure difference of inflow P and outflow A. The volume flow is pressure and temperature independent. The function is ensured if the pressure difference from P to A is min. 5 bar and the available volume flow is more than 10% than the relevant actual volume flow at the operating viscosity of the oil.

Detailed information in datasheet.

General

Type	Flange construction
Lubrication line connection	On G 1/2"; Off G 3/8"
Ambient temperature	20 to 80 °C
Protection class as per EN60529	IP 67

Hydraulic system

Operating pressure	max. 100 bar
Displacement	See order summary
Operating medium	Mineral and synthetic oils
Range of viscosity	10 to 750 mm²/s

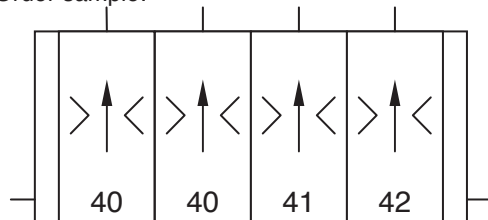
Order summary

Number of flow regulators	Dimensions		Order number
	L1 (mm)	L2 (mm)	
1 times	69	51	300 21 331
2 times	105	87	300 21 332
3 times	141	123	300 21 333
4 times	177	159	300 21 334
5 times	213	195	300 21 335
6 times	249	231	300 21 336
7 times	285	267	300 21 337
8 times	321	303	300 21 338

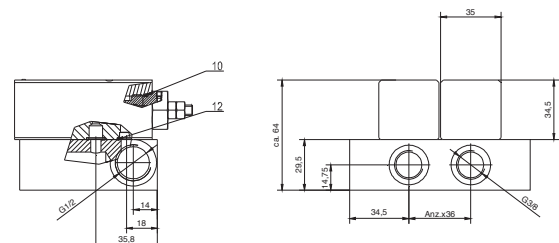
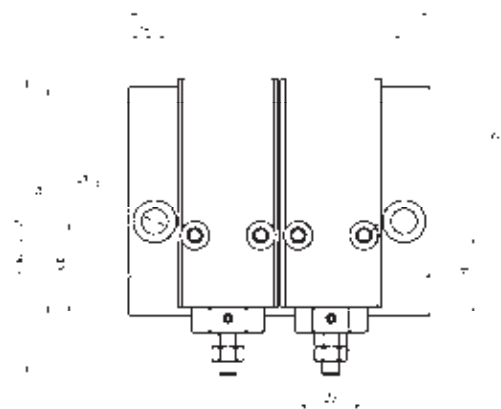
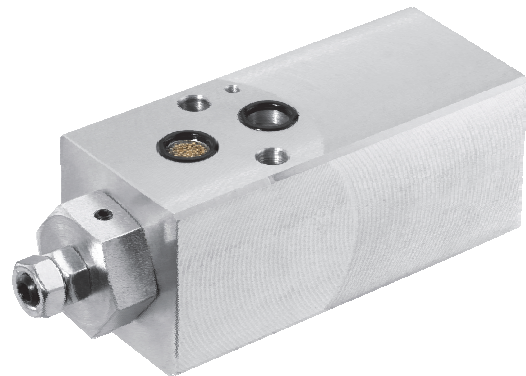
Overview figures for the individual valves

Component	Flow rate	Default setting ex works	Reference number
Flow regulator	0.1-0.5 l/min	0.3 l/min	39
Flow regulator	0.4-1.0 l/min	0.7 l/min	40
Flow regulator	0.9-2.5 l/min	1.7 l/min	41
Flow regulator	2.4-5.8 l/min	4.5 l/min	42
Blanking plate			B

Order sample:



Flow regulator terminal SFE 40 – 40 – 41 - 42



Flow regulator SKE (adjustable)

The adjustable flow regulator ensures a load-independent and even flow rate for supplying hydraulic consumers. An adjusting piston, which regulates the oil flow rate, is used for the adjustment. The flow regulator has a cartridge-type structure and can therefore be used in screw-in holes according to illustration.

Mode of operation:

A measuring orifice fixed in the flow regulator determines the volume flow. A control piston ensures constant pressure difference at the measuring orifice, regardless of the pressure difference of inflow P and outflow A. The volume flow is pressure and temperature independent. The function is ensured if the pressure difference from P to A is min. 5 bar and the available volume flow is more than 10% than the relevant actual volume flow at the operating viscosity of the oil.

Detailed information in datasheet.

General

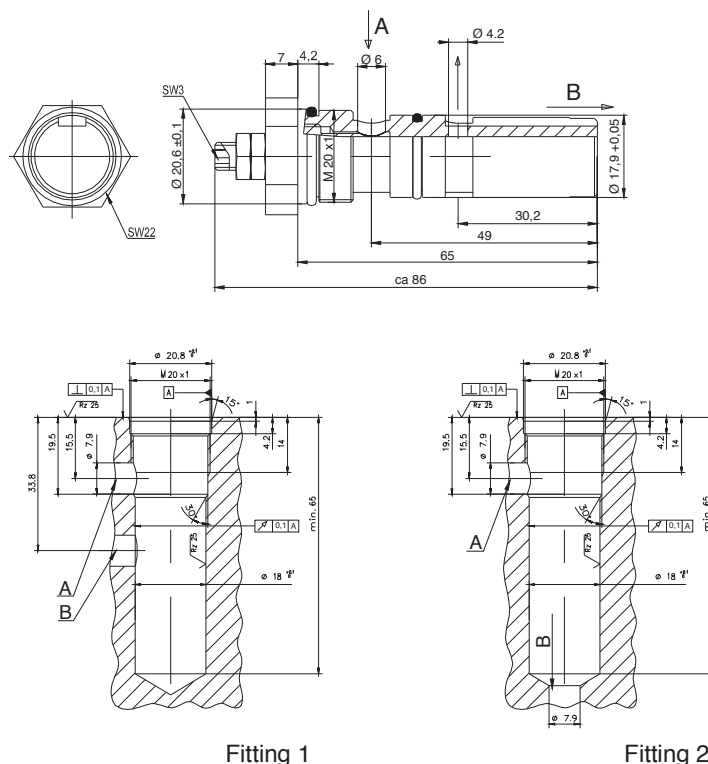
Type	Flange construction
Lubrication line connection	Screw-in hole
Ambient temperature	20 to 80 °C
Protection class as per EN60529	IP 67

Hydraulic system

Operating pressure	max. 100 bar
Displacement	See order summary
Operating medium	Mineral and synthetic oils
Range of viscosity	10 to 750 mm²/s

Order summary

Flow rate	Default setting ex works	Order number
0.1-0.5 l/min	0.3 l/min	300 21 349
0.4-1.0 l/min	0.7 l/min	300 21 350
0.9-2.5 l/min	1.7 l/min	300 21 351
2.4-5.8 l/min	4.5 l/min	300 21 352







Oil/air lubrication system

Dosing unit

Page 85

Compressor nozzles

Page 86

Mixing blocks

Page 87

Pre-fabrication

Page 88

Oil/air lubrication system

Lubrication of open support, friction surfaces, spindles or chains with smallest dosing quantities.

The Advantages

- Minimum quantity lubrication for high speeds (10 000 – 45 000 U/min.)
- Surface lubrication
- Lubrication of open supports, friction points, spindles and chains

The system components

- Manual, pneumatic and electrical pumps
- Main line
- Distributor strips
- Dosing units
- Mixing heads
- Lines to the lubrication points
- Screwed fittings
- Control and check devices

The function

Pneumatic control is used simultaneously with every lubrication pulse in order to spray the measured out lubricant according to the mixing head with pressure on the lubrication point.

Dosing unit

Dosing units are available with a different number of outlets. Several lubrication points with defined dosing quantities are fed.

Detailed information under TA 308 21302.

General

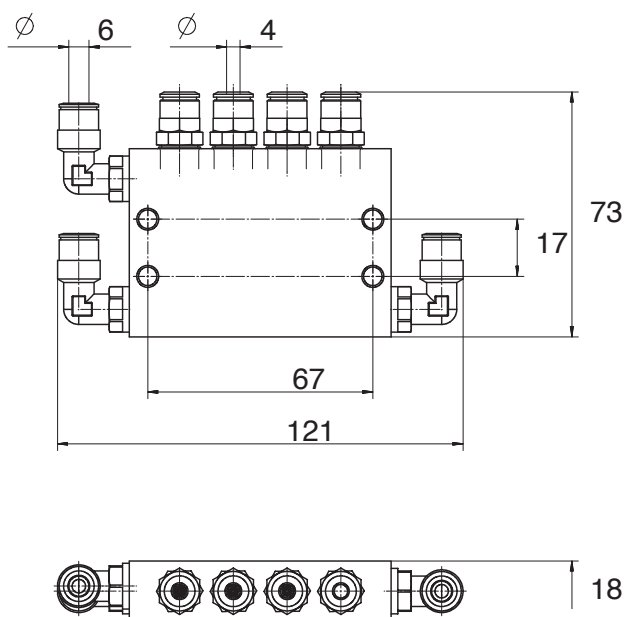
Type	Oil/air dosing unit
Installation position	Outlets on the top
Lubrication line connection	Plug connector Ø 4 mm
Ambient temperature	0 to 60 °C

Hydraulic system

Displacement	20 mm ³ /stroke
Operating medium	Mineral oil
Range of viscosity	50 to 150 mm ² /s

Order summary

Number of outlets	Order number
2	300 21 302
4	300 21 304
6	300 21 306
8	300 21 308



Compressor nozzle

Compressor nozzles are used for spraying oil or an oil-air mixture. The different external geometries enable attachment of hoses, pipes or fittings. Fluid velocity can be specified through the diameter of the nozzle, by which the impact speed or the range can be determined. Main applications are the chain lubrication and the support lubrication.

Moreover, nozzles for fitting in the pipelines, which function as pressure reducer, are available.

Detailed information under TA 308 20 501.

General

Type	Nozzle for pipe fitting
Installation position	Any
Operating pressure	max.2 bar
Air flow	see Diagram



Order summary

Bore Ø [mm]	Label (see diagram)	Order number				
		Fig.1	Fig.2	Fig.3	Fig.4	Fig.5
0,5	1	300 20 540	-	303 23 008	303 23 018	-
0,7	2	-	-	303 23 009	303 23 019	300 20 509
0,9	3	-	300 20 552	303 23 010	-	-
1,2	4	300 20 543	-	303 23 011	-	-

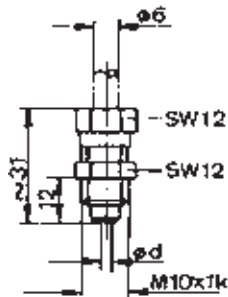


Fig. 1

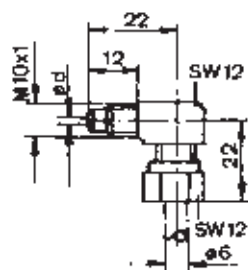


Fig. 2

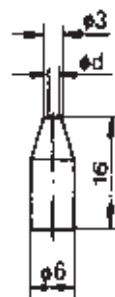


Fig. 3

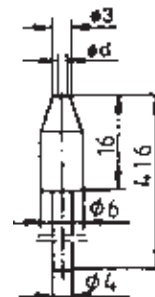


Fig. 4

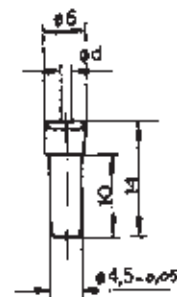


Fig. 5

Mixing block

Mixing blocks for mixing oil/air for spraying on accessible lubrication points and for continuous feeding on closed lubrication points.

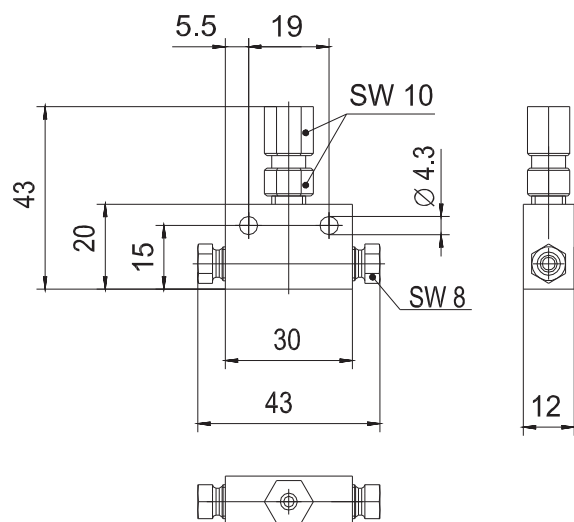
Detailed information under TA 308 46 803.

General

Type	Steel mixing block
Installation position	Any
Operating pressure	100 bar
Pipe connection	Pipe connection Ø 4 mm
Fixing	Tapping screw

Order summary

Pipe connection	Order number
Ø 4 mm	300 48 219



Pre-fabrication - Oil/air lubrication system

As a special service bielomatik offers system-wide prefabrication of the components. This service covers all imaginable assembly operations, which are possible before the delivery of the system.

- Filling the pump with the lubrication desired by the customer
- Filling the pipes and lines with the lubrication desired by the customer
- Lubrication system for complete installation in connection with a customer interface
- Customer-specific configuration of pumps (air or lubrication side with specific screw joints)
- Customer-specific modifications to standard elements
- Customer-specific packaging of fabricated systems
- Combinations of several systems

The advantage is that a complete system can be pre-fabricated ex-factory as per the customer's requirements thus significantly reducing the assembly time. Even placing the order is very easy, as not individual parts from all systems must be ordered separately. It is available under one order number the complete lubrication system is delivered pre-fabricated.

The following examples show only a small extract from the various options of pre-fabrication of bielomatik Leuze GmbH & Co. KG.

Components predominantly from the field of single line systems can be combined with the screw joint program - connected to an easy and cost-effective oil/air system. Here two distributor strips are screwed together, whereby, one functions as the air side and the other as oil side.

Both the sides are joined with a Y-piece.

There is a metering valve on the oil side through the dimensioning of which oil droplets can be defined, which should be added to the air flow per lubrication pulse.

Oil from the air flow is fed as smear to the lubrication point. The oil quantity can thus be defined through the cycle time of the lubrication pulse.



Example 1:

Comprises a 12 times distributor strip, assembly with 12 metering valves, is used as distributor block for the oil/air lubrication. The oil and air-side supply line with Ø 6 mm is fixed with a pluggable screw joint.

**Example 2:**

The single piston pump AM is used for supplying to the assembly presented in example 1. Customer-specific, this pump is provided with two pluggable connections for lines with Ø 6 mm and a pressure gauge for pressure monitoring.



For queries related to customer-specific pre-fabrication call us on +49 (0) 7025 / 12-519.





Central strips

Page 93

Grease nipple

Page 94

Identification rings

Page 95

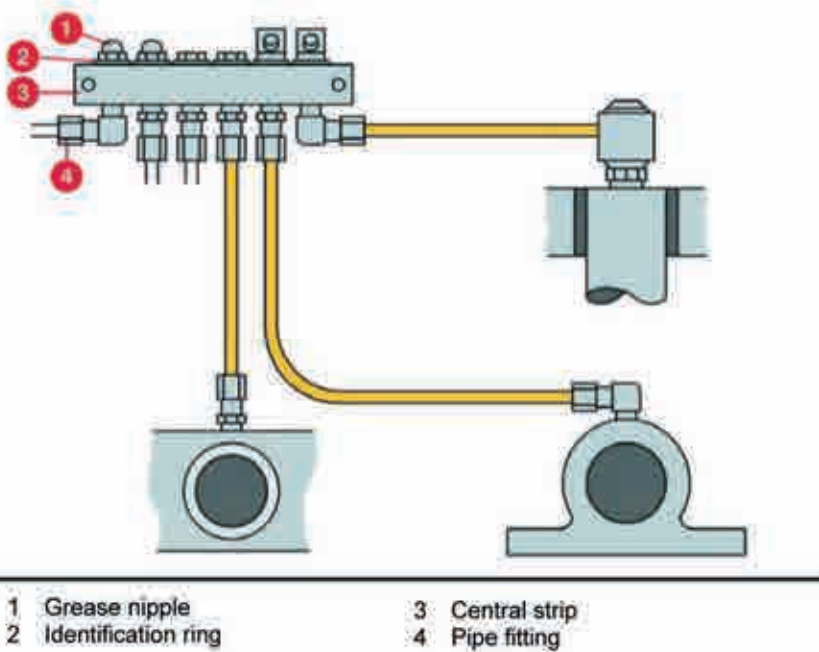
Block lubrication system

Block lubrication system

Easy and cost-effective.

The block lubrication system

is an easy and cost-effective solution for providing grease or fluid grease to inaccessible lubrication points manually from a central location.



Central strips

The central strips have 1 to 8 through threaded holes of different thread types. Lubrication lines of different lubrication points are connected to the central strips and assigned to the lubrication nipples.

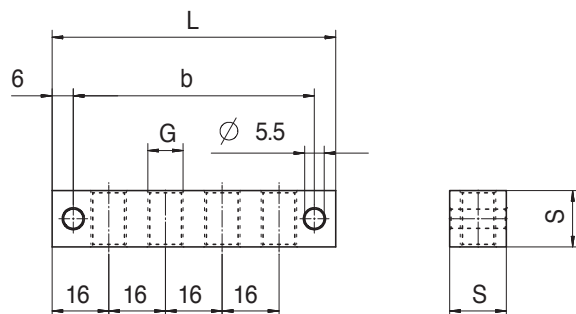
Detailed information under TA 308 43 701.

Number of Connections	Dimensions					Order number
	Thread	S	a [mm]	b [mm]	l [mm]	
1	M10 x 1	16	-	20	32	304 48 671
2	M10 x 1	16	20	40	52	304 48 672
3	M10 x 1	16	16	52	64	304 48 673
4	M10 x 1	16	16	68	80	304 48 674
5	M10 x 1	16	16	84	96	304 48 675
6	M10 x 1	16	16	100	112	304 48 676
7	M10 x 1	16	16	116	128	304 48 677
8	M10 x 1	16	16	132	144	304 48 678

1	M8 x 1	16	-	20	32	304 48 622
2	M8 x 1	16	20	40	52	304 48 623
3	M8 x 1	16	16	52	64	304 48 624
4	M8 x 1	16	16	68	80	304 48 625
5	M8 x 1	16	16	84	96	304 48 626
6	M8 x 1	16	16	100	112	304 48 627
7	M8 x 1	16	16	116	128	304 48 628
8	M8 x 1	16	16	132	144	304 48 629

1	M6	12	-	20	32	304 48 651
2	M6	12	16	36	48	304 48 652
3	M6	12	16	52	64	304 48 653
4	M6	12	16	68	80	304 48 654
5	M6	12	16	84	96	304 48 655
6	M6	12	16	100	112	304 48 656
7	M6	12	16	116	128	304 48 657
8	M6	12	16	132	144	304 48 658

1	G 1/8"	16	-	20	32	304 48 601
2	G 1/8"	16	20	40	52	304 48 602
3	G 1/8"	16	16	52	64	304 48 603
4	G 1/8"	16	16	68	80	304 48 604
5	G 1/8"	16	16	84	96	304 48 605
6	G 1/8"	16	16	100	112	304 48 606
7	G 1/8"	16	16	116	128	304 48 607
8	G 1/8"	16	16	132	144	304 48 608



Grease nipple

Different lubrication nipples for the block lubrication system.

Detailed information under TA 308 51 002.

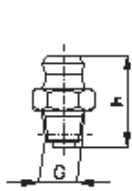


Fig. 1

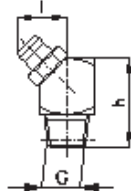


Fig. 2

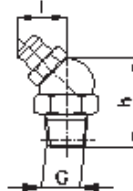


Fig. 3

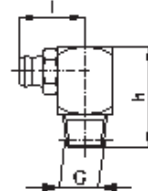


Fig. 4

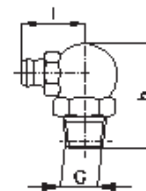


Fig. 5

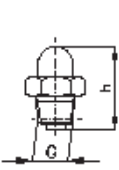


Fig. 6

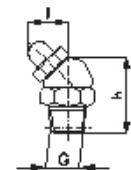


Fig. 7

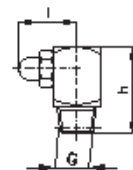


Fig. 8

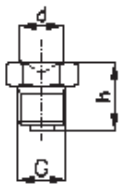


Fig. 9

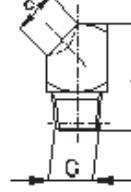


Fig. 10

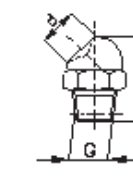


Fig. 11

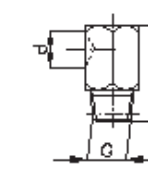


Fig. 12

Thread	Packaging unit [no.]	Dimensions						Order number					
		d	h	l	Wrench opening		Fig.	Conical grease nipple DIN71412	Fig.	Conical grease nipple DIN3402	Fig.	Funnel type lubrication nipple DIN3405	
					Square	Hexa.							
M6 x 1	100	6	9,5	-	-	7	-	-	-	-	9	300 51 201	
M8 x 1	100	8	9,5	-	-	9	-	-	-	-	9	300 51 202	
M10 x 1	100	10	9,5	-	-	11	-	-	-	-	9	300 51 204	
M6k	100	-	15	-	-	7	1	300 51 001	6	300 51 101	-	-	
M8 x 1k	100	-	15	-	-	9	1	300 51 002	6	300 51 102	-	-	
M8 x 1.25k	100	-	15	-	-	9	1	300 51 003	-	-	-	-	
M10 x 1k	100	-	15	-	-	11	1	300 51 004	-	-	-	-	
G½	100	-	15	-	-	11	1	300 51 005	6	300 51 105	-	-	
M12 x 1k	100	-	18	-	-	14	1	300 51 008	-	-	-	-	
M6 x 1	100	-	13	-	-	7	1	300 51 009	-	-	-	-	
M6k	50	6	15	10	9	-	2	300 51 021	-	-	-	-	
M8 x 1k	50	6	15	10	9	-	2	300 51 022	-	-	10	300 51 222	
M8 x 1.25k	50	-	15	-	9	-	2	300 51 023	-	-	-	-	
M10 x 1k	50	6	15	11	11	-	3	300 51 024	7	300 51 124	11	300 51 224	
G½	50	6	20	11	-	11	3	300 51 025	-	-	11	300 51 225	
M6k	50	6	18	14	9	-	4	300 51 041	8	300 51 141	-	-	
M8 x 1k	50	6	18	14	9	-	4	300 51 042	8	300 51 142	-	-	
M8 x 1.25k	50	-	18	14	9	-	4	300 51 043	-	-	-	-	
M10 x 1k	50	6	18	15	11	11	4	300 51 044	-	-	12	300 51 244	
G½	50	6	19	15	-	11	5	300 51 045	-	-	-	-	

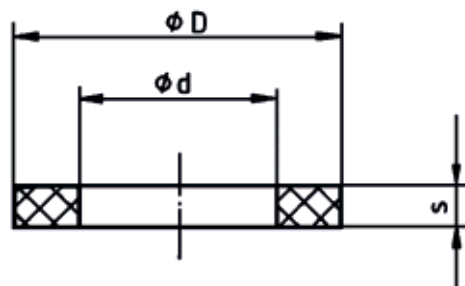
Identification rings

Rings for labelling lubrication points, for determining the lubrication frequency or the kind of lubricant.

Detailed information under TA 308 51 401.

General

Version	from PMMA Colours: red, yellow, green, white and blue
Installation	in connection with grease nipples
Packaging unit	250 pieces



Order summary

D [mm]	d [mm]	s [mm]	Thread	Order number				
				red	yellow	green	white	blue
10	6,2	1,0	M6	300 51 410	300 51 411	300 51 412	300 51 413	300 51 414
14	6,2	1,0	M6	300 51 420	300 51 421	300 51 422	300 51 423	300 51 424
15	8,2	1,0	M8	300 51 430	300 51 431	300 51 432	300 51 433	300 51 434
15	10,2	1,0	M10	300 51 440	300 51 441	300 51 442	300 51 443	300 51 444





Solenoid valves

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Pressure gauge

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Pressure switch

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Controls

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Fittings

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Accessories

2/2 control valve

Electrical 2/2 solenoid valve for mineral oil and fluid grease in static and dynamic single line systems with a nominal width of 5 mm.

Detailed information under TA 308 23 800.

General

Type	2/2 solenoid valve
Lubrication line connection	G 1/4"
Ambient temperature	0 to 80 °C
Protection class as per EN60529	IP 65

Hydraulic system

Operating pressure	0 - 50 bar
Operating medium	Mineral oil, fluid grease
Range of viscosity	20 to 750 mm²/s, NLGI 000-0*

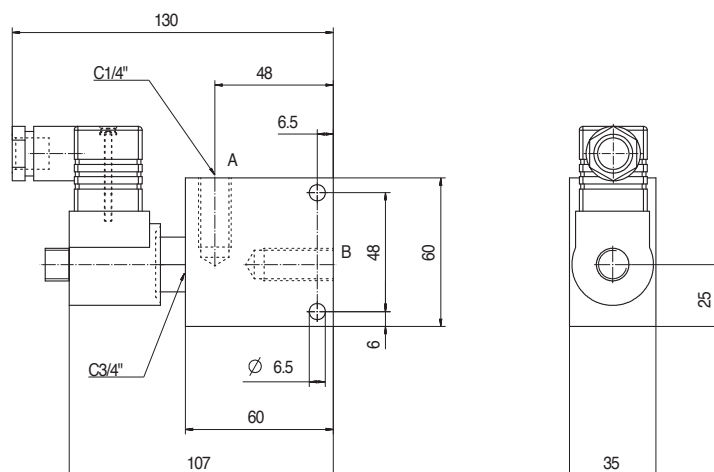
*as per fluid grease release list

Sensor system

Drive	Electrical
Supply voltage	24 V DC
Supply current	0.52 A
Power consumption	12.5 W
Drive	Right-angle connector

Order summary

Duty cycle	function	Order number
100 %	NO (normal open)	300 23 810
100 %	NC (normal close)	300 23 811
50 % (15 min.)	NO (normal open)	300 23 816



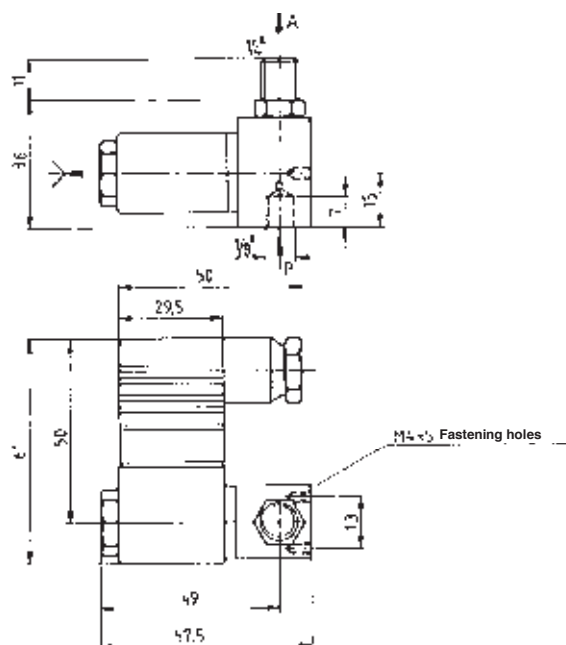
Detailed information under TA 308 23 401.

Type	3/2 solenoid valve
Lubrication line connection	G1/4"; G1/8"
Ambient temperature	0 to 60 °C
Protection class as per EN60529	IP 54

Operating pressure	6 bar
--------------------	-------

Type of drive	Electrical	Electrical
Supply voltage	230 V AC	24 V DC
Power consumption	5 W	3 W
Connection	Right-angle connector	Right-angle connector

Voltage	Order number
24V DC	300 23 403
230 V AC, 50 Hz	300 23 404



4/2 control valve

Electrical solenoid control valve for oil with a nominal width of 6 mm.

Detailed information under TA 308 23 703.

General

Type	4/2 solenoid valve
Ambient temperature	-20 to 50 °C
Protection class as per EN60529	IP 54

Hydraulic system

Operating pressure	200 or 315 bar
Operating medium	Mineral oil, fluid grease
Range of viscosity	20 – 750 mm ² /s

*as per fluid grease release list

Drive

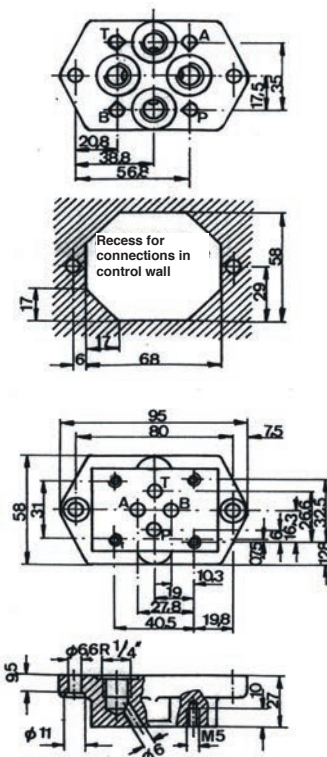
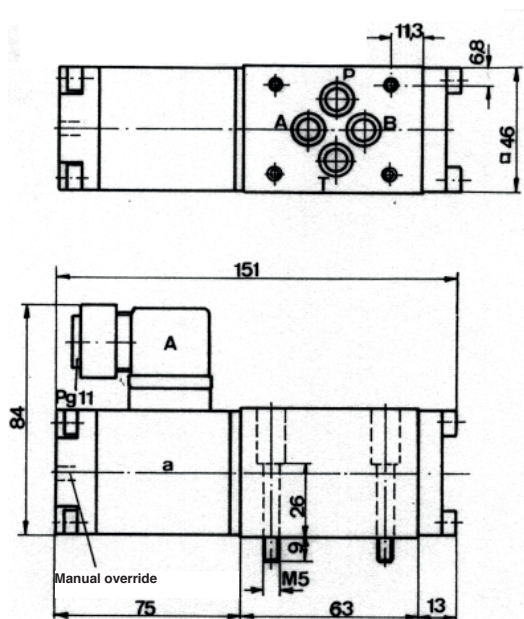
Type of drive	Electrical	
Supply voltage	220 V AC	24 V DC
Frequency	50 Hz	-
Power consumption	50 W	32 W
Operating pressure	200 bar	315 bar

Order summary

Supply voltage	Order number
220 V AC	300 23 772
24 V	300 23 713

Order summary accessories

Accessories	Order number
Connection panel	638 40 004
Fixing bracket	304 20 457
Straight pipe fitting ø 10	300 44 056



2/2 control valve

Electrical 2/2 control - solenoid valve with a nominal width of 3 mm. High quality valve for viscous fluids.

Detailed information under TA 308 23 707.

General

Type	2/2 solenoid valve
Lubrication line connection	G 3/8"
Ambient temperature	0 to 80 °C
Protection class as per EN60529	IP 65

Hydraulic system

Operating pressure	250 bar
Operating medium	Fluid grease, grease
Range of viscosity	NLGI 000-2*

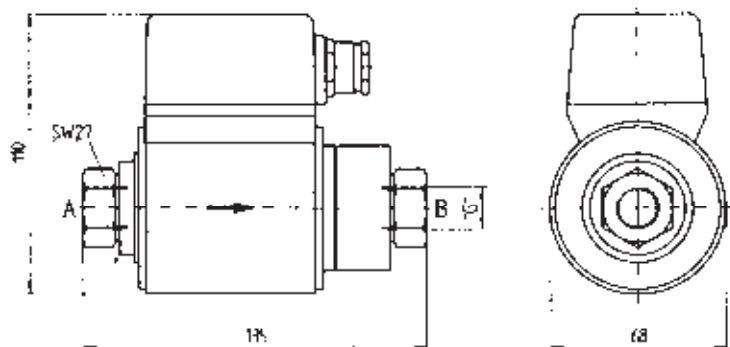
*as per fluid grease release list

Drive

Voltage	24 V DC
Supply current	1.6 A
Power consumption	40 W
Connection	Terminal strip

Order summary

Voltage	Order number
24 V DC	300 23 798

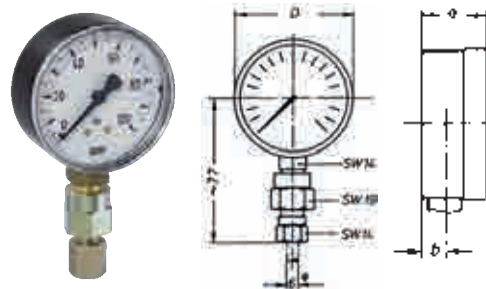


Pressure gauge

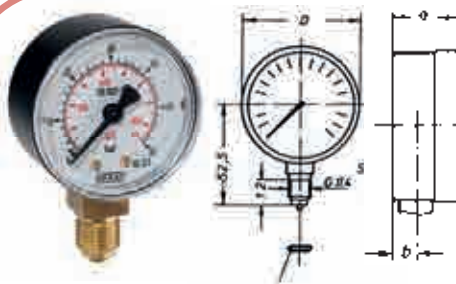
General:

Application	For pressure measurement of media, which do not corrode copper alloys
Installation	Different kinds of connections, when using polyamide pipes, strictly use insert sleeves.

Detailed information under TA 308 27,001.



Version: Standard
 Pressure range: 0 to 100 bar
 Dimension: D = 63 mm
 a = 27 mm
 b = 9.5 mm
Order number: 300 27 005



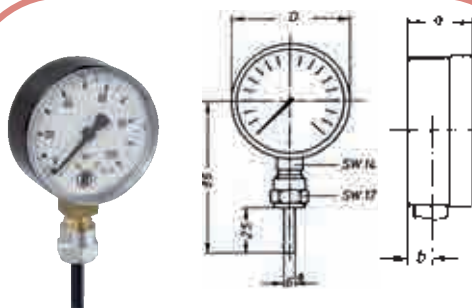
Sealing ring 30049314 to be ordered extra

Version: Glycerine
 Pressure range: 0 to 60 bar
 Dimension: D = 63 mm
 a = 36 mm
 b = 11.5 mm
Order number: 300 27 098

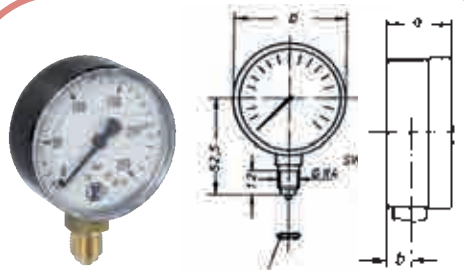


Sealing ring 30049314 to be ordered extra

Version: Standard
 Pressure range: 0 to 60 bar
 Dimension: D = 50 mm
 a = 27 mm
 b = 9.5 mm
Order number: 642 04 032



Version: Standard
 Pressure range: 0 to 100 bar
 Dimension: D = 63 mm
 a = 27 mm
 b = 9.5 mm
Order number: 300 27 006



Sealing ring 30049314 to be ordered extra

Version: Standard
 Pressure range: 0 to 250 bar
 Dimension: D = 63 mm
 a = 27 mm
 b = 9.5 mm
Order number: 300 27 014

Pressure switch

Pressure switch for monitoring the lubrication in line lubrication systems. Available as normally closed or normally open for different pressures.

Detailed information on data sheet 308 62 403.

General

Type	Pressure switch
Lubrication line connection	M10 x 1
Ambient temperature	0 to 80°C
Protection class as per EN60529	IP 65

Hydraulic system

Operating pressure	60 bar
Operating medium	Mineral oil, fluid grease, air
Range of viscosity	20 – 750 mm²/s, NLGI 000-2

Sensor system

Switching voltage	≤ 42 V DC
Switching current	≤ 1.5 A

Order summary

Normally closed contact			Normally open contact			Adjusted switching pressure [bar]
Fig.1 Screw terminal	Fig.2 Flat plug	Fig.3 M12 x 1	Fig.1 Screw terminal	Fig.2 Tab connector	Fig.3 M12 x 1	
300 62 403	300 62 423	301 62 317	300 62 503	300 62 523	301 62 321	0,5
300 62 410	-	301 62 315	300 62 510	300 62 512	301 62 313	0,8
300 62 405	300 62 424	301 62 316	300 62 505	300 62 524	301 62 312	1
300 62 407	-	301 62 324	300 62 507	-	-	1,5
300 62 408	300 62 426	301 62 325	300 62 508	300 62 526	301 62 320	2
300 62 409	300 62 427	301 62 326	300 62 509	300 62 527	301 62 318	3
300 62 411	300 62 428	301 62 329	300 62 511	300 62 528	301 62 319	5
300 62 450	300 62 437	-	300 62 550	-	301 62 323	8
300 62 413	300 62 429	-	300 62 513	-	-	10
300 62 415	300 62 430	-	300 62 515	300 62 530	301 62 331	12
-	-	301 62 338	300 62 517	300 62 531	301 62 332	15
300 62 418	300 62 432	301 62 335	300 62 518	300 62 532	301 62 337	20
300 62 419	300 62 433	301 62 342	300 62 519	300 62 533	301 62 340	25
300 62 400	300 62 402	301 62 341	300 62 500	300 62 502	301 62 343	32
300 62 421	-	-	300 62 521	300 62 535	-	50

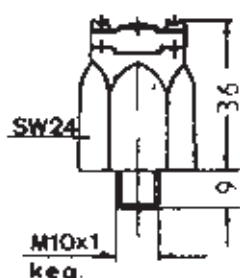


Fig. 1
Accessories for pressure switch

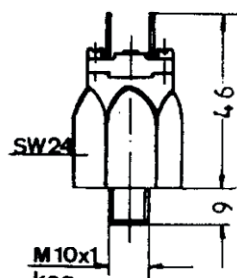


Fig. 2

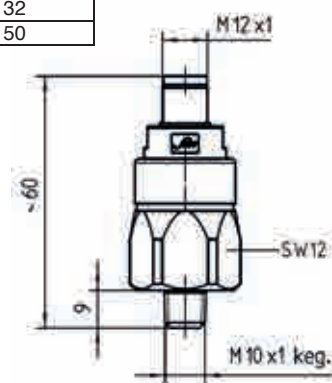
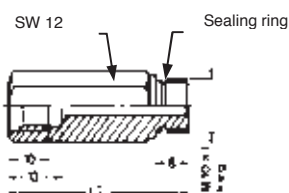


Fig. 3



Designation	Connecting piece	Protective rubber cap
Order number	300 45 847	300 69 000

Control for single line lubrication system

For control and monitoring single line lubrication systems with metering valves and dosing elements.

Detailed information under TA 308 64,401.

General

Nominal voltage	230 V AC; 24 V DC
Output pump drive	230 V – 3A AC; 24 V - 3 A DC
Error messages	≤ 60 V - 0.8 A DC (floating) ≤ 250 V - 2 A AC
Cycle time (time dependent)	1 sec to 99days (factory setting $t_z=3$ h)
Monitoring time	1 to 99 sec (factory setting $t_0=15$ sec)
Run-on time	0 to 15 sec (factory setting $t_n=2$ sec)
Cycle time (clock dependent)	1 - 9.9×10^4 cycles

Order summary

Fig.	Voltage	Protection class	Relays for pump drive	Order number
1	230 V AC	IP 00	no	300 64 400
2	230 V AC	IP 65	no	300 64 402
2	24 V	IP 65	yes	300 64 442

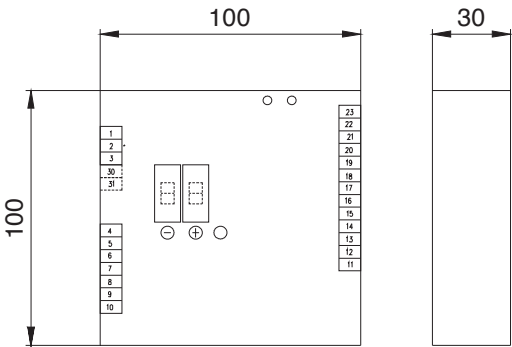


Abb. 1 Platine

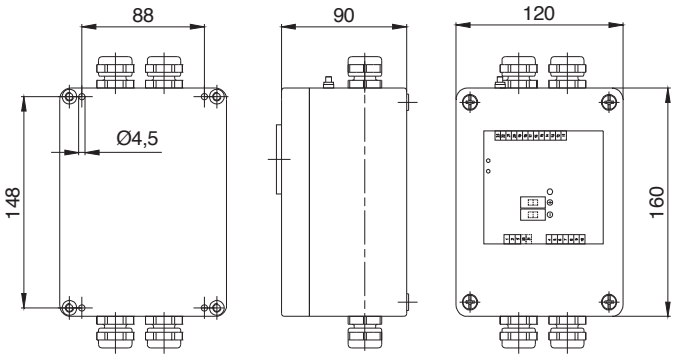


Abb. 2 Kunststoffgehäuse

Control for progressive lubrication system

For controlling and monitoring progressive lubrication systems with progressive distributor

Detailed information under TA 308 64,402.

General

Nominal voltage	230 V AC; 24 V DC
Output pump drive	230 V – 3A AC; 24 V - 3 A DC
Error messages	≤ 60 V - 0.8 A DC (floating) ≤ 250 V - 2 A AC
Cycle time (time dependent)	1 sec to 99days (factory setting $t_z=3$ h)
Monitoring time	1 to 9 min (factory setting $t_u=15$ sec)
Cycle time (clock dependent)	1 - 9.9×10^4 cycles

Order summary

Fig.	Voltage	Protection class	Static output for electric grease pump	Dynamic output for single piston pump	Order number
1	24 V	IP65	Yes	no	300 64 447
1	230 V AC	IP65	no	yes	300 64 407
2	24 V	IP54	no	yes	300 64 449

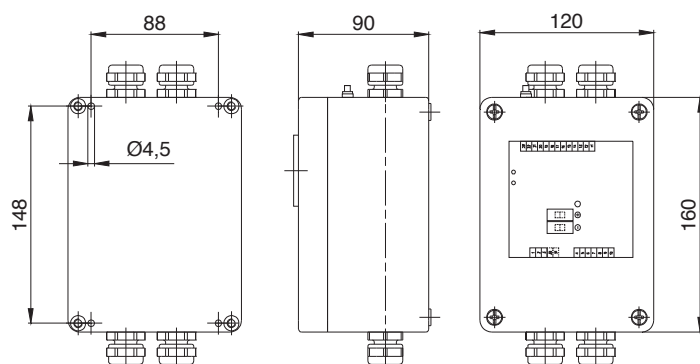


Fig. 1 Plastic housing

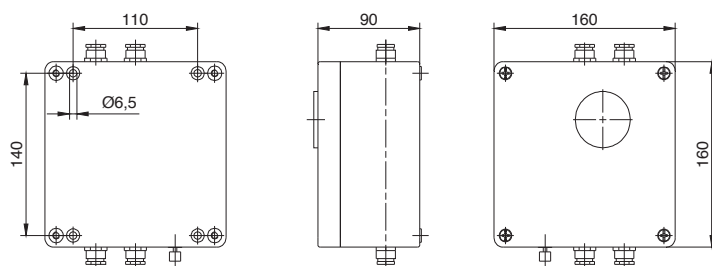


Fig. 2 Alu housing

Shut-off valve

For shutting off pipelines for lubricants, water, air and gas.

Detailed information under TA 308 22,503.

General

Version	Housing: Steel Handle: Fig.1 Plastic, Fig.2 Aluminium.
Ambient temperature	0 to 80 °C
Installation	Pipe connection. When using polyamide pipes strictly use insert sleeves.
Direction of passage	Any
Control travel	90°



Order summary

Fig.	Pipe Ø [mm]	Operating pressure [bar]	Dimensions [mm]								Order number
			R	L1	L2	B	H	h	m	S	
1	6	500	108	86	53	26	55	13	M12 x 1.5	14	300 22 567
2	10	250	100	94	59	30	54	14,5	M16 x 1.5	19	300 22 512

Fig. 1

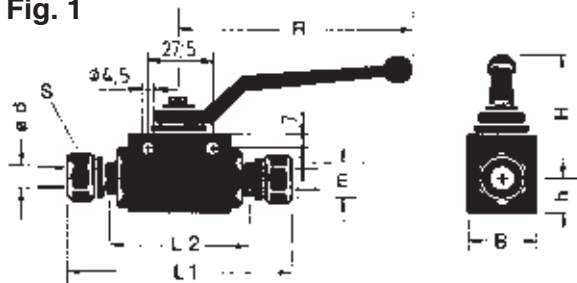
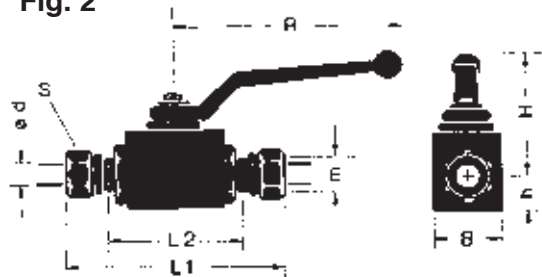


Fig. 2



Polyamide pipe

PA pipes for flexible laying of lubrication lines. Preferred for single line lubrication system.

Technological characteristics:

Ageing resistant. Water consumption for permanent storage in water max. 0.5 to 1%. The smooth external and internal surfaces enable high rate of flow, abrasion-proof. Hardly inflammable

Chemical characteristics:

Resistant and insensitive to oils, grease, lubricant, all forces, chlorine-free detergents and solvents. For decision on specific cases on resistance of polyamide pipe against chemicals, we request you for specific details about used chemicals, temperatures, pressures etc.

Detailed information under TA 308 40,301.

General

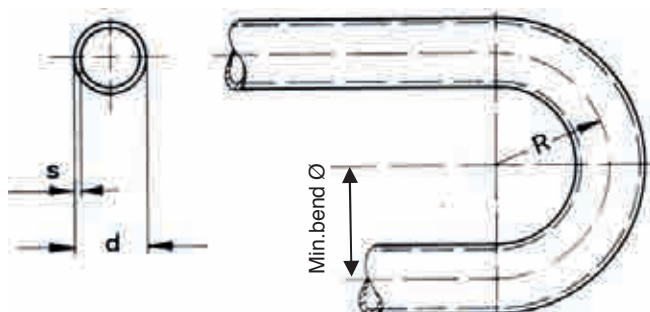
Application	Normal or flexible version
Ambient temperature	-40 to +80 °C
Material	PA transparent

Order summary standard version

External Ø [mm]	Wall thickness [mm]	Standard version		
		Operating pressure [bar]	Min. bend Ø [mm]	Order number
4	0,75	52	15 x Ø	300 40 302
4	1	76	15 x Ø	300 40 303
6	1	45	15 x Ø	300 40 305
6	1,2	50	15 x Ø	300 40 350
8	1	32	15 x Ø	300 40 307

Order summary flexible version

External Ø [mm]	Wall thickness [mm]	Flexible version		
		Operating pressure [bar]	Min. bend Ø [mm]	Order number
4	0,75	31	10 x Ø	300 40 322
4	1	44	10 x Ø	300 40 323
6	1	27	10 x Ø	300 40 325



High pressure hose line

Detailed information under TA 308 40,703.

General

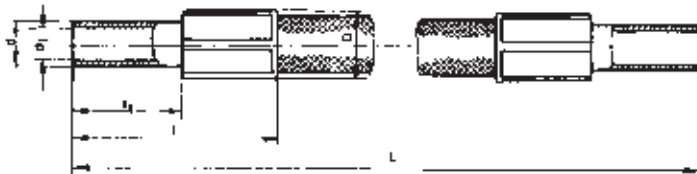
Application	Flexible pipe connection
Version	Polyamide 11 with synthetic fibre outer layer
Ambient temperature	-60 to 100 °C
Resistant	Mineral oil, synthetic oil, fluid grease
Increase in volume	0.1 cm³/m (at 50 bar operating pressure)
Information	When using in connection with safety components special guidelines must be observed

Dimensions

Pipe- external- ø d [mm]	Clear width di [mm]	Clamping sleeves ø D [mm]	l1 [mm]	L [mm]	min. bending radius [mm]	max. pressure at 20 °C [bar]
6	3	approx. 10	25	32	40	200
8	4,8	approx. 13	22	44	63	190

Order summary

Hose length L [mm]	Order number	
	d= ø 6 mm	d= ø 8 mm
200	300 40 801	300 40 846
300	300 40 802	-
400	300 40 803	300 40 848
500	300 40 804	-
600	300 40 805	300 40 850
700	300 40 806	300 40 851
800	300 40 807	300 40 852
900	300 40 808	300 40 853
1000	300 40 809	300 40 854
1250	300 40 810	300 40 855
1500	300 40 811	300 40 856
2000	300 40 812	300 40 857
2500	300 40 813	-



Steel pipe

Steel pipes for motionless installation of lubrications. These are preferably used in progressive system, as they can withstand high pressure.

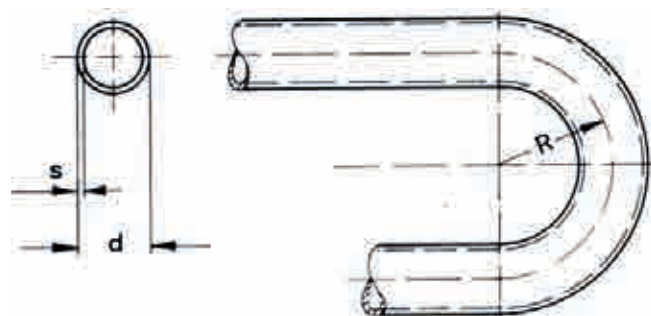
Detailed information under TA 308 40,003.

General

Versions:	Version 1: Steel tape wound, internal and external coppered. Version 2: Steel tape wound, internal and external galvanised. Version 3: Seamless precision steel pipe DIN2391 St 35.4 grade C.
Installation	Connection via pipe fittings

Order summary

External Ø ±0.05 mm [mm]	Wall thickness [mm]	Smallest bending radius as per DIN 5508 [mm]	Version			Order number
			1	2	3	
4	0,7	7	X	-	-	300 40 001
4	1,0	7	-	-	X	300 40 004
6	0,7	12	X	-	-	300 40 002
6	0,7	12	-	X	-	300 40 032
8	0,7	20	X	-	-	300 40 005
8	0,7	20	-	X	-	300 40 035
10	0,7	25	X	-	-	300 40 007
10	0,7	25	-	X	-	300 40 037



Straight fitting

Straight fittings of different sizes and types for executing pipelines through machines or container walls.

Detailed information under TA 308 42,502.

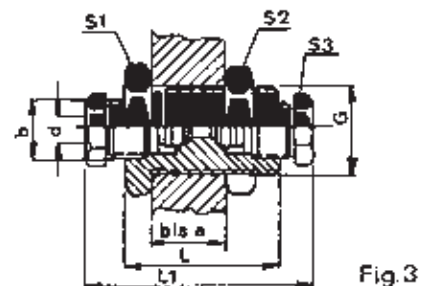
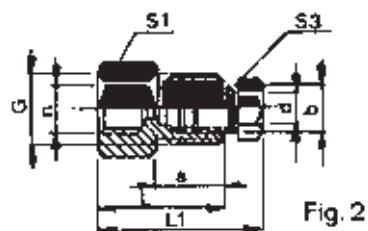
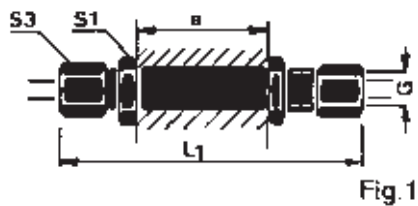
General

Version	Steel, galvanised surface, with double taper ring and male fitting
Operating pressure	40 bar
Installation	Installation instructions see TA 308 09 101. When using polyamide pipes strictly use insert sleeves.



Order summary

Pipe Ø [mm]	Fig.	Dimensions [mm]									Packaging unit [no.]	Order number
		L	L1	a	Thread	b	n	S1	S2	S3		
4	1	-	52	17	M8 x 1	M8 x 1	-	14	-	10	10	300 42 400
4	2	22	30	12	M12	M10 x 1	M8 x 1	14	-	8	100	300 42 501
6	3	33	50	20	M16 x 1.5	-	-	24	24	10	25	300 42 502



Pipe connections

Pipe connections for connecting pipelines made of metal and polyamide.

Detailed information under TA 308 41,002.

General

Version	Steel
Surface	galvanised
Installation	Installation instructions see TA 308 09 101. When using polyamide pipes strictly use insert sleeves.

Straight fittings (Fig. 1)

Pressure [bar]	Pipe Ø [mm]	Dimensions [mm]					Packaging unit [no.]	Order number
		m	L ₁	L ₂	S ₁	S ₂		
40	4	M8 x 1	32	8	10	10	100	300 41 000
	6	M10 x 1	34	6	12	12	100	300 41 001
	8	M12 x 1	35	5	14	14	100	300 41 002
100	6	M12 x 1.5	40	13	14	14	50	300 41 003
	8	M14 x 1.5	43	10	17	17	50	300 41 004
	10	M16 x 1.5	43	9	17	19	25	300 41 005
	12	M18 x 1.5	45	8	19	22	25	300 41 006

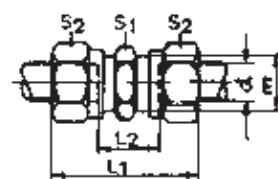


Fig. 1

Elbow fittings (Fig. 2)

Pressure [bar]	Pipe Ø [mm]	Dimensions [mm]					Packaging unit [no.]	Order number
		m	L ₁	L ₂	S ₁	S ₂		
40	4	M8 x 1	21	9	10	10	50	300 41 300
	6	M10 x 1	21	9	12	12	50	300 41 301
	8	M12 x 1	24	13	12	14	50	300 41 308
100	6	M12 x 1.5	25,5	14	11	14	50	300 41 307
	8	M14 x 1.5	26,5	16	12	17	25	300 41 309
	10	M16 x 1.5	29,5	16,5	14	19	25	300 41 310
	12	M18 x 1.5	34	19	17	22	25	300 41 311

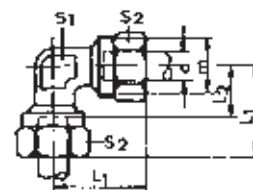


Fig. 2

T-fittings (Fig. 3)

Pressure [bar]	Pipe Ø [mm]	Dimensions [mm]					Packaging unit [no.]	Order number
		m	L ₁	L ₂	S ₁	S ₂		
40	4	M8 x 1	21	11	7	10	50	300 41 607
	6	M10 x 1	23	11	9	12	50	300 41 608
	8	M12 x 1	24	13	12	14	25	300 41 610
100	6	M12 x 1.5	25,5	14	11	14	25	300 41 609
	8	M14 x 1.5	28,5	16	12	17	25	300 41 611
	10	M16 x 1.5	29,5	16,5	14	19	25	300 41 612
	12	M18 x 1.5	34	19	17	22	25	300 41 613
160	18	M26 x 1.5	80	40	24	32	25	300 41 615

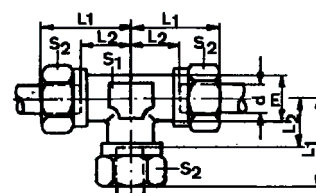


Fig. 3

Cross fittings (Fig. 4)

Pressure [bar]	Pipe Ø [mm]	Dimensions [mm]					Packaging unit [no.]	Order number
		m	L ₁	L ₂	S ₁	S ₂		
40	4	M8 x 1	42	11	7	10	25	300 42 000
	6	M10 x 1	46	11	9	12	25	300 42 001
	8	M12 x 1	50	14	11	14	10	300 42 007
100	6	M12 x 1.5	51	14	11	14	25	300 42 002
	8	M14 x 1.5	57	16	12	17	10	300 42 008

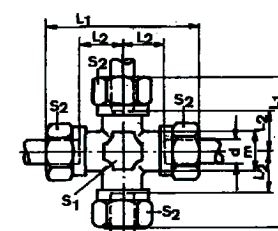


Fig. 4

Pipe joint

Pipe joint for quickly detachable connections of the pipelines.

Mode of action:

By introducing valved nipples in the locking coupling, a plug-like connection is established. When uncoupling, valves of both the connection times close simultaneously.

Engaging and disengaging also possible under pressure.

Detailed information under TA 308 42,903.

General

Version	Material brass, seal Perbunan
Ambient temperature	-20 to 80 °C
Type	Sealing on both sides
Installation position	Any
Flow direction	Any
Throughpassage	NW 4

Order summary

Designation	Fig.	Order number
Locking coupling	1	300 42 926
Locking coupling	2	300 42 927
Locking coupling	3	300 42 960
Valved nipples	4	300 42 928
Valved nipples	5	300 42 929
Valved nipples	6	300 42 961

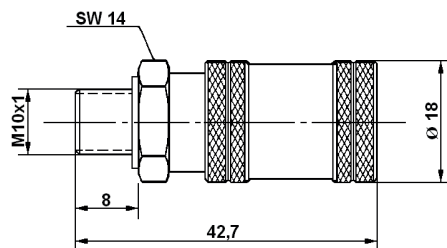


Fig. 1

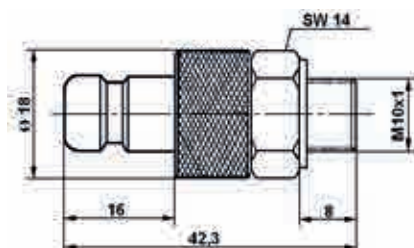


Fig. 4

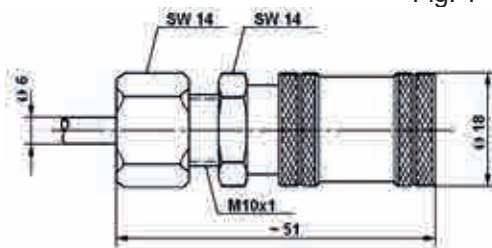


Fig. 2

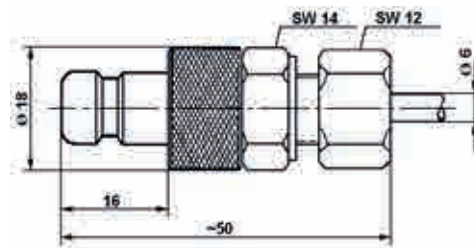


Fig. 5

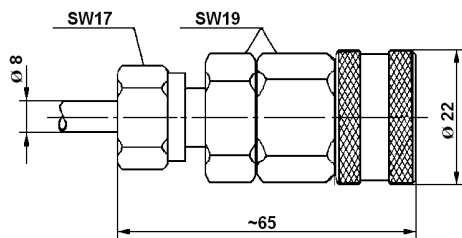


Fig. 3

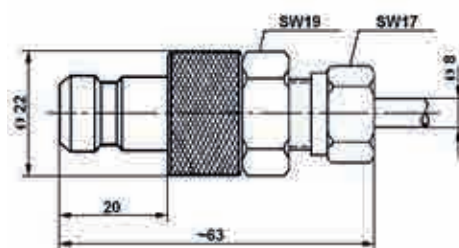


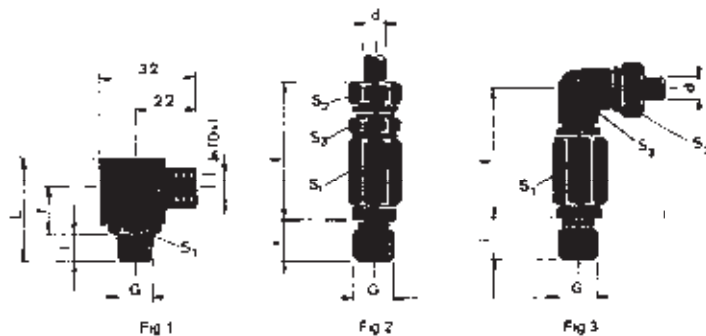
Fig. 6

General

Application	Rotating shafts
Version	Fig. 1: Aluminium and steel Fig. 2 and 3: galvanised
Ambient temperature	-20 to 80 °C
Installation position	Any
Rotational direction	Any

Operating medium	Mineral oil
Range of viscosity	50 to 750 mm ² /s

Pipe ø [mm]	Fig.	Pressure [bar]	Speed [U/min]	Dimensions [mm]							Order number
				Thread	f	i	L	S ₁	S ₂	S ₃	
-	1	5	1500	M10 x 1k	21,5	8	42	12	-	-	300 46 932
-	1	5	1500	M8 x 1k	21,5	8	42	12	-	-	300 46 934
-	1	5	1500	G ½"	21,5	8	42	12	-	-	300 46 935
6	2	25	1500	G¼"	-	12	57	22	17	17	300 46 907
6	3	100	400	G¼"	39,5	12	-	22	17	17	300 46 908
8	3	160	200	G¼"	39,5	12	-	22	19	17	300 46 911



Pipe fittings

Pipe fittings for connecting pipelines made of metal and polyamide.

Detailed information under TA 308 44,003.

General

Version	Steel, surface treatment galvanized, if not noted otherwise, with cutting rings DIN3861 or double conical rings DIN3862
Installation	Installation instructions see TA 30809101. When using polyamide pipes strictly use insert sleeves.

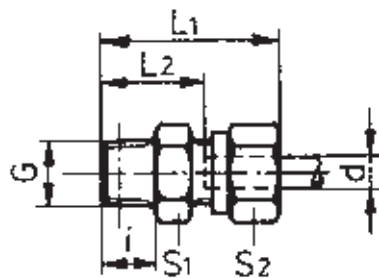


Fig.: Straight pipe fitting with tapered male thread socket

Operating pressure [bar]	Pipe Ø [mm]	Dimensions [mm]							Order number
		Thread	L ₁	L ₂	i	S ₁	S ₂	*	
40	2,5	M6 keg	20	11	6	8	8	2)	300 44 014
40	2,5	M8 x 1 keg	26	16	8	10	10	3)	300 44 131
40	2,5	M10 x 1 keg	26	16	8	12	10	3)	300 44 124
40	4	M6 x 0.75 keg	24	11	5	10	10	1)	300 44 027
100	4	¼K-26 BSF	26	13	6	10	10	1)	300 44 102
100	4	M6 keg	24	12	6	10	10	1)	300 44 017
100	4	M8 keg	26	14	8	10	10	1)	300 44 018
100	4	M10 x 1 keg	26	14	8	12	10	1)	300 44 109
100	4	M8 x 1 keg	26	14	8	10	10	1)	300 44 000
100	6	M8 x 1 keg	29	14	7	11	12	1)	300 44 103
100	6	M10 x 1 keg	27	13	8	12	12	1)	300 44 001
100	8	M10 x 1 keg	28	16,5	8	12	14	-	300 44 002
250	6	M12 x 1.5 keg	34	20	12	14	14	-	300 44 025
250	8	M12 x 1.5 keg	35	20	12	14	17	-	300 44 004
250	8	M14 x 1.5 keg	35	20	12	17	17	-	300 44 019
250	10	M14 x 1.5 keg	36	21	12	17	19	-	300 44 024
250	10	M16 x 1.5 keg	36	21	12	17	19	-	300 44 020
250	12	M16 x 1.5 keg	-	22	12	19	22	-	300 44 006
100	4	G ⅛"	26	14	8	10	10	1)	300 44 007
100	6	G ⅛"	27	13	8	12	12	1)	300 44 008
100	8	G ⅛"	28	13	8	12	14	-	300 44 009
100	8	G ¼"	36	19,5	12	17	17	1)	300 44 133
100	10	G ¼"	36	19	12	17	19	1)	300 44 134
160	18	G ½"	35	26,5	14	27	32	-	300 44 034
250	6	G ¼"	35	21	12	14	14	-	300 44 022
250	8	G ¼"	36	19,5	12	17	17	-	300 44 011
250	10	G ¼"	36	21	12	17	19	-	300 44 012
250	10	G ⅝"	36	22	12	19	19	-	300 44 023
250	12	G ⅝"	38	22	12	19	22	-	300 44 013

- 1.) Fitting with double taper ring
- 2.) Fitting with clamping ring
- 3.) Fitting with reduced tapered ring
- 4.) Stud threads form A, DIN 3852, sealing with sealing ring

Pipe fittings

Pipe fittings for connecting pipelines made of metal and polyamide

Detailed information under TA 308 44,003.

General

Version	Steel, surface treatment galvanized, if not noted otherwise, with cutting rings DIN3861 or double conical rings DIN 3862
Installation	Installation instructions see TA 308 09 101. When using polyamide pipes strictly use insert sleeves.

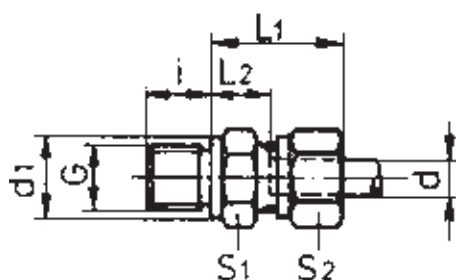
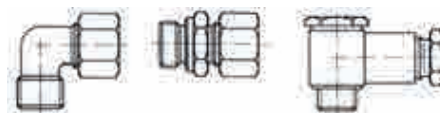


Fig.: Straight pipe fitting with cylindrical thread. Stud threads form B, DIN 3852, Sealing with sealing edge or sealing ring.

Operating pressure[bar]	Pipe Ø [mm]	Dimensions [mm]								Order number
		Thread	L ₁	L ₂	i	d ₁	S ₁	S ₂	*	
100	4	M8 x 1	19	9,5	8	12	12	10	-	300 44 036
100	4	M10 x 1	18	7	8	14	14	10	1)	300 44 142
100	6	M10 x 1	21	7	8	14	14	12	1)	300 44 050
100	8	M10 x 1	21	9	8	14	14	14		300 44 059
100	10	M18 x 1.5	27	10,5	12	23	24	19	1)	300 44 135
250	6	M12 x 1.5	25	10	12	17	17	14	-	300 44 058
250	8	M12 x 1.5	25	10	12	17	17	17	-	300 44 051
250	10	M14 x 1.5	26	11	12	19	19	19	-	300 44 052
250	10	M18 x 1.5	28	12,5	12	23	24	19	4)	300 44 032
250	12	M18 x 1.5	27	12,5	12	23	24	22	-	300 44 061
640	10	M16 x 1.5	31	15	12	21	22	22	-	300 44 060
100	4	G 1/8"	21	7	8,5	14	11	12	1)4)	300 44 152
100	6	G 1/8"	21	7	8	14	14	12	1)	300 44 054
100	6	G 1/8"	23	8	8	13	11	12	1)4)	300 44 147
100	8	G 1/8"	21	9	8	14	14	14	-	300 44 063
160	18	G 1/2"	31	14,5	14	26	27	32	-	300 44 073
160	18	G 1/4"	31	14,5	16	32	32	32	-	300 44 074
250	6	G 1/8"	23	8,5	8	14	14	14	-	300 44 069
250	6	G 1/4"	25	10	12	18	19	14	-	300 44 062
250	8	G 1/4"	25	10	12	18	19	17	-	300 44 055
250	10	G 1/8"	28	10	10	14	17	19	4)	638 12 802
250	10	G 1/4"	26	11	12	18	19	19	-	300 44 056
250	10	G 3/8"	27	12,5	12	22	22	19	-	300 44 064
250	12	G 1/4"	26	11	12	18	22	22	-	300 44 141
250	12	G 3/8"	27	12,5	12	22	22	22	-	300 44 057
250	10	G 1/2"	28	13	14	26	27	19	-	300 44 105
250	12	G 1/2"	28	13	14	26	27	22	-	300 44 115
250	15	G 1/2"	29	14	14	26	27	27	-	300 44 065

- 1.) Fitting with double taper ring
- 2.) Fitting with clamping ring
- 3.) Fitting with reduced tapered ring
- 4.) Stud threads form A, DIN 3852, sealing with sealing ring

Pipe fittings

Pipe fittings for connecting pipelines made of metal and polyamide.

Detailed information under TA 308 44,003.

General

Version	Steel, surface treatment galvanized, if not noted otherwise, with cutting rings DIN3861 or double conical rings DIN3862
Installation	Installation instructions see TA 308 09 101. When using polyamide pipes strictly use insert sleeves.

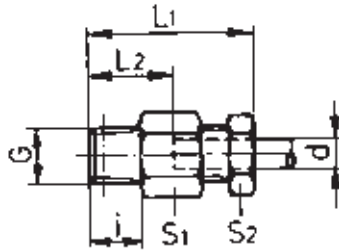


Fig.: Straight pipe fitting
with thread inserts with tapering thread

Operating pressure[bar]	Pipe Ø [mm]	Dimensions [mm]							Order number
		Thread	L ₁	L ₂	i	S ₁	S ₂	*	
100	4	M6 keg	23	7	5	10	8	1)	300 44 200
100	4	M8 keg	23	7	8	10	8	1)	300 44 202
100	4	M8 x 1 keg	23	7	8	10	8	1)	300 44 203
100	6	M10 x 1	33	10	8	12	10	1)	300 44 208
100	6	M10 x 1 keg	30	8	8	12	10	1)	300 44 209
100	4	G 1/4"	24	8	9	14	8	1)	300 44 207
100	6	G 1/2"	29	9	8	12	10	1)	300 44 215

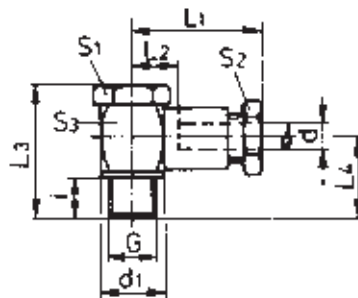


Fig.: Swivelling fitting; banjo screw
on the head with the sealing edge

Operating pressure[bar]	Pipe Ø [mm]	Dimensions [mm]											Order number
		Thread	L ₁	L ₂	L ₃	L ₄	i	d ₁	S ₁	S ₂	S ₃	*	
100	4	M6	25	6	23	13	6	12	12	8	12	1)	300 45 615
100	4	M8 x 1	25	6	23	13	6	12	12	8	12	1)	300 45 520
100	4	M8	25	6	23	13	6	12	12	8	12	1)	300 45 521
100	4	M10 x 1	26	7	28	16	8	14	14	8	14	1)	300 45 522
100	6	M10 x 1	29	7	28	16	8	14	14	10	14	1)	300 45 526
100	4	G 1/8"	26	7	28	16	8	14	14	8	14	1)	300 45 523
100	6	G 1/2"	29	7	28	16	8	14	14	10	14	1)	300 45 527
100	6	G 1/4"	31	9	33,5	19,5	9	18	19	10	18	1)	300 45 529

- 1.) Fitting with double taper ring
- 2.) Fitting with clamping ring
- 3.) Fitting with reduced tapered ring
- 4.) Stud threads form A, DIN 3852, sealing with sealing ring

Pipe fittings

Pipe fittings for connecting pipelines made of metal and polyamide.

Detail information under TA 308 44 003.

General

Version	Steel, surface treatment galvanized, if not noted otherwise, with cutting rings DIN3861 or double conical rings DIN3862
Installation	Installation instructions see TA 308 09 101. When using polyamide pipes strictly use insert sleeves.

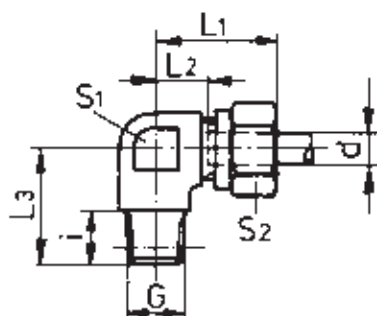
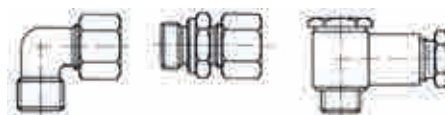


Fig.: Elbow pipe fitting with taper thread

Operating pressure [bar]	Pipe Ø [mm]	Dimensions [mm]								Order number
		Thread	L ₁	L ₂	L ₃	i	S ₁	S ₂		
40	2,5	M6 keg	16	5,5	10,5	6,5	7	8	2)	300 44 314
40	2,5	M8 keg	21	11	15	8	10	10	3)	300 44 415
100	4	¼"26 BSF	22	9	15	8	10	10	1)	300 44 401
100	4	M6 keg	21	9	15	8	10	10	1)	300 44 317
100	4	M8 keg	21	9	15	8	10	10	1)	300 44 318
100	4	M8 x 1 keg	21	9	15	8	10	10	1)	300 44 300
100	4	M10 x 1 keg	22	10	16	8	12	10	1)	300 44 403
100	6	M8 x 1 keg	22	9	16,5	8	11	12	1)	300 44 404
100	6	M10 x 1 keg	22	9	18	8	12	12	1)	300 44 301
100	8	M10 x 1 keg	24	9,5	18,5	8	13	14	1)	300 44 320
100	8	M10 x 1 keg	23	11,5	20	8	12	14	-	300 44 337
100	10	M14 x 1.5keg	31	13	27	12	17	19	1)	300 44 413
250	8	M12 x 1.5keg	29	14	26	12	12	17	-	300 44 321
250	10	M14 x 1.5keg	30	15	27	12	17	19	-	300 44 323
250	12	M16 x 1.5keg	32	17,5	28	12	17	22	-	300 44 325
640	6	M12 x 1.5keg	31	16	26	12	12	17	-	300 44 319
640	8	M14 x 1.5keg	32	17	27	12	14	19	-	300 44 322
640	10	M16 x 1.5keg	34	17,5	28	12	17	22	-	300 44 324
100	4	G ⅜"	21	10	16	8	11	10	1)	300 44 307
100	6	G ½"	22	9	16	8	11	12	1)	300 44 308
100	8	G ¾"	23	11,5	20	8	12	14	-	300 44 338
160	18	G ½"	40	29,5	36	14	24	32	-	300 44 339
250	6	G ¼"	26	14	26	12	14	14	-	300 44 327
250	8	G ¼"	29	14	26	12	12	17	-	300 44 329
250	10	G ¼"	30	15	27	12	14	19	-	300 44 330
250	10	G ⅜"	30	15	27	12	17	19	-	300 44 331
250	12	G ¼"	32	17	28	12	19	22	-	300 44 340
250	12	G ⅜"	32	17	28	12	17	22	-	300 44 332

- 1.) Fitting with double taper ring
- 2.) Fitting with clamping ring
- 3.) Fitting with reduced tapered ring
- 4.) Stud threads form A, DIN 3852, sealing with sealing ring

Pipe clamp

Pipe clamp for fixing pipelines made of steel and polyamide and from plastic tubes.
Available for 1 to 12 lines.

Detailed information under TA 308 47 202.

General

Version	Made of steel, surface galvanised
Fixing	Tapping screw (see page)

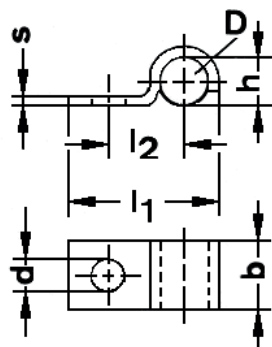


Fig. 1

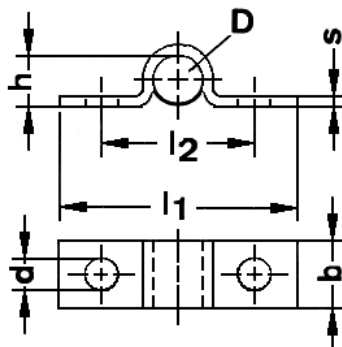


Fig. 2

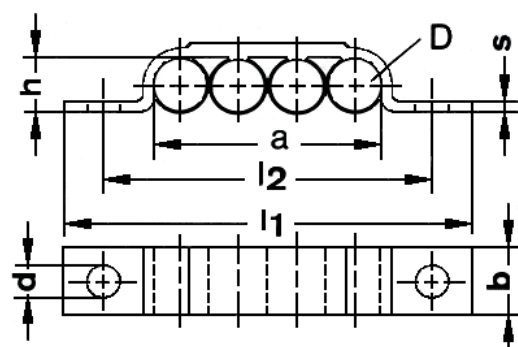


Fig. 3

Order summary

Pipelines		Fig.	Dimensions [mm]							Packagingunit [no.]	Order number
Ø [mm]	Number		d	b	h	l ₁	l ₂	s	a+1		
2,5	1	1	4,8	10	2,4	17	8	1	-	100	300 47 200
2,5	2	3	4,8	10	2,4	28	18	1	-	100	300 47 201
2,5	3	3	4,8	10	2,4	31	21	1	-	100	300 47 202
2,5	4	3	4,8	10	2,4	34	24	1	-	100	300 47 203
2,5	5	3	4,8	10	2,4	36	26	1	-	100	300 47 204
2,5	6	3	4,8	10	2,4	39	29	1	-	100	300 47 205
4	1	1	4,8	10	3,5	18	9	1	-	100	300 47 206
4	1	1	5,5	10	3,5	18	9	1	-	100	300 47 261
4	1	1	6,5	10	3,5	18	9	1	-	100	300 47 260
4	1	2	4,8	10	3,5	29	17	1	-	100	300 47 218
4	2	3	4,8	10	3,5	33	21	1	8,5	100	300 47 207
4	3	3	4,8	10	3,5	39	27	1	12,5	100	300 47 208
4	4	3	4,8	10	3,5	44	32	1	17	100	300 47 209
4	5	3	4,8	10	3,5	48	36	1	21	100	300 47 210
4	6	3	4,8	10	3,5	52	40	1	25	100	300 47 211
4	7	3	4,8	10	3,5	56	44	1	29,5	100	300 47 212
4	8	3	4,8	10	3,5	60	48	1	33,5	100	300 47 213
4	9	3	4,8	10	3,5	64	52	1	37,5	100	300 47 214
4	10	3	4,8	10	3,5	68	56	1	42	100	300 47 215
4	11	3	4,8	10	3,5	72	60	1	46	100	300 47 216
4	12	3	4,8	10	3,5	77	65	1	50	100	300 47 217
6	1	1	4,8	10	5,5	20	10	1	-	100	300 47 219
6	1	2	4,8	10	5,5	32	20	1	-	100	300 47 231
6	2	3	4,8	10	5,5	38	26	1	12,5	100	300 47 220
6	3	3	4,8	10	5,5	45	33	1	18,5	100	300 47 221
6	4	3	4,8	10	5,5	51	39	1	25	100	300 47 222
6	5	3	4,8	10	5,5	57	45	1	31	100	300 47 223
6	6	3	4,8	10	5,5	64	52	1	37	100	300 47 224
6	7	3	4,8	10	5,5	72	60	1	43,5	100	300 47 225
6	8	3	4,8	10	5,5	76	64	1	49,5	100	300 47 226
6	9	3	4,8	10	5,5	82	70	1	55,5	100	300 47 227
6	10	3	4,8	10	5,5	90	78	1	62	100	300 47 228
6	11	3	4,8	10	5,5	96	84	1	68	100	300 47 229
8	1	1	4,8	10	7,5	22	11	1	-	100	300 47 232
8	1	2	4,8	10	7,5	34	22	1	-	100	300 47 244
8	2	3	4,8	10	7,5	42	30	1	16,5	100	300 47 233
8	3	3	4,8	10	7,5	51	39	1	24,5	100	300 47 234
8	4	3	4,8	10	7,5	59	47	1	33	100	300 47 235
8	5	3	4,8	10	7,5	68	56	1	41	100	300 47 236
8	6	3	4,8	10	7,5	76	64	1	49	100	300 47 237
8	7	3	4,8	10	7,5	86	74	1	57,5	100	300 47 238
8	8	3	4,8	10	7,5	94	82	1	65,5	100	300 47 239
8	10	3	4,8	10	7,5	111	99	1	82	100	300 47 241
8	11	3	4,8	10	7,5	119	107	1	90	100	300 47 242
8	12	3	4,8	10	7,5	127	115	1	98	100	300 47 243
10	1	1	4,8	10	9,5	23	11	1	-	100	300 47 245
10	1	2	4,8	10	9,5	34	22	1	-	100	300 47 257
10	2	3	4,8	10	9,5	44	32	1	20,5	100	300 47 246
10	3	3	4,8	10	9,5	55	43	1	30,5	100	300 47 247
10	4	3	4,8	10	9,5	67	55	1	41	100	300 47 248
10	5	3	4,8	10	9,5	77	65	1	51	100	300 47 249
10	8	3	4,8	10	9,5	110	98	1	81,5	100	300 47 252
10	10	3	4,8	10	9,5	131	119	1	102	100	300 47 254
10	11	3	4,8	10	9,5	141	129	1	112	100	300 47 255
12	1	1	5,8	12	11,3	30,5	16	1,5	-	100	300 47 258
12	1	2	5,8	12	11,3	46	32	1,5	-	100	300 47 259
15	1	1	5,8	12	14,3	34	18	1,5	-	100	300 47 270
15	1	2	5,8	12	14,3	50	-	1,5	-	100	300 47 271
18	1	1	7	12	17,3	35,5	18	1,5	-	100	300 47 272
18	1	2	7	12	17,3	50	36	1,5	-	100	300 47 273

Tapping screw

Tapping screw for fixing pipe clamps, distribution part and branch pieces.

Detailed information under TA 308 47,701.

General

Version	as per DIN 7513 (galvanised)
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Order summary

Dimensions [mm]				Packaging unit [no.]	Order number
Thread	L	i Minimum dimension	Bore d H11		
M4	8	8	3,6	100	300 47 701
M4	25	8	3,6	100	300 47 703
M5	10	10	10	100	300 47 706



Sealing ring

Detailed information under TA 308 49,302.

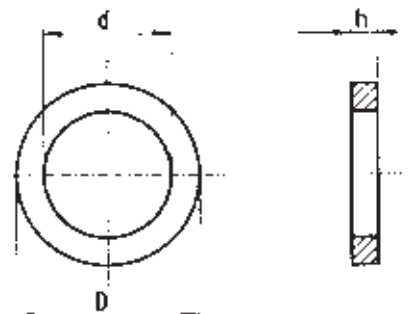
General

Version	Copper
Packaging unit	100 pieces

Order summary

Dimensions [mm]				Thread	Order number
Nominal dimension	d ^{+0.3}	D ^{-0.2}	h ^{+0.2}		
6 x 10	6,2	9,9	1	-	300 49 300
8 x 12	8,2	11,9	1	-	300 49 301
10 x 14	10,2	13,9	1	G 1/8"	300 49 302
10 x 14*	10,2	13,9	1	G 1/8"	300 49 331
12 x 16	12,2	15,9	1,5	-	300 49 303
14 x 18	14,2	17,9	1,5	G 1/4"	300 49 304
16 x 20	16,2	19,9	1,5	-	300 49 305
17 x 21	17,2	20,9	1,5	G 3/8"	300 49 306
18 x 22	18,2	21,9	1,5	G 3/8"	300 49 307
20 x 24	20,2	23,9	1,5	-	300 49 308
22 x 27	22,2	26,9	1,5	G 1/2"	300 49 309
22 x 29	22,2	28,9	1,5	G 1/2"	300 49 310

*Soft iron as per DIN 7603 form A.



Insert sleeve

Insert sleeves for reinforcing pipe ends made of polyamide pipes, which are assembled in double taper ring, clamping ring or cutting ring connections. The insert sleeves prevent constricting of the polyamide pipes during assembly and ensure a tight fitting of the connection.

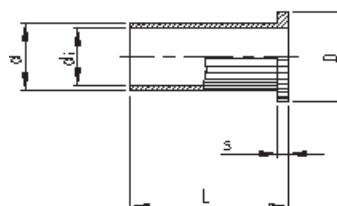
Detailed information under TA 308 49,401.

General

Version	made of brass
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Order summary

Suitable for pipe	Dimensions [mm]					Packaging unit [no.]	Order number
	d	D _{0.2}	L	di	S		
2.5 x 0.5	1,5	2,5	10	1,1	0,20	100	300 49 400
4 x 0.75	2,5	4,0	14	1,9	0,30	100	300 49 427
4 x 1.0	2,0	3,2	14	1,4	0,30	100	300 49 425
4 x 0.75	2,5	4,0	12	1,9	0,30	100	300 49 401
4.5 x 0.75	3,0	4,5	15	2,6	0,20	100	300 49 412
6 x 1.0	4,0	6,0	15	3,2	0,40	100	300 49 403
6 x 1.2	3,4	5,8	15	3,0	0,25	100	300 49 409
8 x 1.0	6,0	8,0	17	5,0	0,50	100	300 49 426
8 x 1.5	5,0	8,0	17	4,2	0,40	100	300 49 422
10 x 1.0	8,0	10,0	20	7,0	0,50	100	300 49 423
10 x 1.5	7,0	10,0	18	6,0	0,50	100	300 49 417
12 x 1.0	10,0	12,0	18	9,0	0,50	100	300 49 408
12 x 1.5	9,0	12,0	18	8,0	0,50	100	300 49 413
15 x 1.5	12,0	15,0	15	11,0	0,50	100	300 49 424
18 x 2.0	14,0	18,0	18	13,0	0,50	100	300 49 416



Screw plug

Detailed information under TA 308 49,501.

General

Version	Fig. 1 and 2 steel, galvanised. With metric thread as per 7604. With inch thread as per DIN 910.
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Order summary

Fig.	Dimensions [mm]					Order number
	Thread	d	i	l	S	
1	M8 x 1	12	8	13,0	12	300 49 500
1	M10 x 1	14	8	12,5	14	300 49 501
1	M12 x 1.5	17	9	16,5	17	300 49 502
1	M14 x 1.5	19	9	16,5	19	300 49 503
1	M16 x 1.5	21	9	16,5	22	300 49 504
2	M18 x 1.5	23	9	17	17	300 49 505
2	G 1/8"	14	8	17	10	300 49 506
2	G 1/4"	18	12	21	13	300 49 507
2	G 3/8"	22	12	21	17	300 49 508
2	G 1/2"	26	14	26	19	300 49 509
1	M10 x 1	12,5	7,5	13,5	12	303 57 101

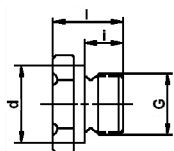


Fig. 1

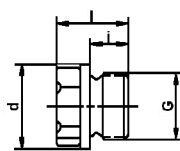


Fig. 2



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Special tools for lubrication system assembly

Detailed information under TA 308 54,001.

Pipe cutter and deburrer

for pipes up to 10 mm outer diameter

Order summary

Length	Order number
120 mm	300 54 006

Order summary spare parts

Spare part	Order number
Cutter wheel	300 54 034

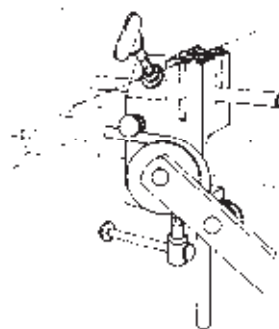


Pipe bending and sawing machines

for pipes from 6 to 12 mm outer diameter

Order summary

Rolls for pipe outer diameter	Rolls for bending radius	Order number
6+8 / 10 / 12 mm	20 / 25 / 26 mm	300 54 004



Cutting tool for plastic pipes

Pipe cutter for all plastic pipes and hoses up to 15 mm outer diameter

Order summary

Version	Order number
Plastic	300 54 016

Order summary spare parts

Spare part	Order number
Knife	300 54 021

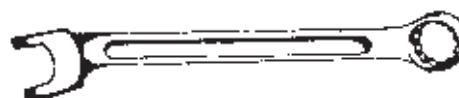


Metering valve key

for tightening the metering valves in the distribution parts and the lubrication lines

Order summary

Version	Order number
Chrome-vanadium steel, chrome-plated	300 54 120







General sales and delivery term (status 05/2007)

1. General

1.1 Our deliveries and services are exclusively subject to our below mentioned sales and delivery conditions. The validity of any terms used by the customer is itself excluded if we do not expressly object to such terms and execute the delivery. Deviations and additions by the customer is effective only with our express written confirmation. They are applicable only for the transaction, for which they were made.

1.2 Following terms are also applicable for all future transactions with the purchaser.

2. Conclusion of a contract

2.1 Information provided in context of order processing prior to placing the order particularly for performance, consumption or other individual data is binding only if it is confirmed by us with the order confirmation or subsequently in writing. Information included in the prospectus and advertisements do not present any guarantee of characteristics. Individually made verbal agreements remain effective.

2.2 Our offers are subject to confirmation. After placing the order, the contract materialises with our written order confirmation or if an order confirmation has not been issued, with our delivery.

2.3 We reserve our right on the ownership and copyright on the cost estimates, drawings and other documents; they must not be made accessible to a third party. The customer does not have the exclusive right on the standard software for usage with the agreed performance features in the unchanged form on the agreed devices. The purchaser may take two backup copies without express agreement.

2.4 Our travelling employees and representatives have no authority to give guarantee of characteristics or guarantee of quality or durability or other guarantees or make agreements deviating from the terms and conditions. Any such agreements require our written confirmation.

3. Prices

3.1 Delivery prices are, unless otherwise agreed, ex works, excluding packaging (unpaid duty for international deliveries).

3.2 The value added tax will be invoiced separately at the rate applicable on the day of delivery.

3.3 If there are unforeseen increases in material prices, labour costs, transport costs, taxes or charges between contract conclusion and delivery or performance, we are thus entitled to make a price adjustment in accordance with one of these factors, if there is delivery within four months from the conclusion of the contract. If the purchaser makes changes after conclusion of the contract, we can adjust the prices as per the additional costs accrued due to the changes.

3.4 In the event that the intended delivery is postponed by more than 3 months due to reasons beyond our control, we reserve the right for a change in price as per the changes in the labour and material costs in the period between order confirmation and actual delivery.

4. Packaging, labelling

4.1 Transport packaging must be sent back to our factory free of cost.

4.2 We take back packages from the distributors only in the factory.

4.3 If the purchaser places additional labels on our product or connects it to other products, he is then obliged to exempt us from all obligations for a claim by state authorities arising due to violation of European rules on labelling.

5. Partial deliveries, deadlines, delay

5.1 Partial deliveries and partial services are permissible provided these are reasonable for the purchaser.

5.2 Dates and deadlines stated by us are not binding on us, unless otherwise agreed in writing. The date or the deadline is deemed adhered, if the consignment is dispatched on the date or within the deadline, readiness to dispatch has been conveyed or fetched by the purchaser. We are obliged only for execution and delivery, if the purchaser has rendered all agreed payments. If payments particularly agreed down payments or obligation to co-operate of the purchaser are rendered late or are not fulfilled on time, all delivery deadlines are extended accordingly.

5.3 We may not be held responsible even for binding agreed dates and deadlines for delivery, service delays due to force majeure and due to unforeseen circumstances, which impede or make the delivery impossible. They entitle us to postpone the delivery or service by the duration of the impediment plus a reasonable restart period. This is also applicable for unforeseen events that affect the operation of a sub-contractor and for which neither the purchaser nor we are responsible.

5.4 If the dates or deadlines, which are mandatory under Section 5.2, are not complied by us, the customer is entitled to terminate the contract on the grounds of late delivery or to claim damages if a reasonable grace period set by the purchaser with threat of repudiation has expired in vain.

5.5 If a penalty for breach of contract is agreed, the right to reserve the said penalty is to be declared on acceptance.

5.6 The buyer is obliged to explain to our request within a reasonable period whether he is terminating the contract due to the delayed delivery of the contract and / or compensation instead of performance.

or insists on the delivery.

5.7 Both claims for compensation of the purchaser due to delay in delivery or even claims for compensations instead of services are in any case delayed deliveries, even after the expiry of a date set by us for delivery, are excluded. Notwithstanding the claims of the purchaser in cases of intent, gross negligence or the culpable injury to life, limb or health or in cases where we have given a guarantee for the delivery time or other reasons, as specified under the Product Liability Act or the General Equal Treatment Act, are cogently liable. A change in the burden of proof to the detriment of the customer is not related.

6. Transfer of risk, formal acceptance

6.1 For deliveries the risk is passed on to the purchaser as soon as the consignment has been sent to the transporter or has left our warehouse for dispatching. If the consignment is delayed on request by the purchaser or reasons attributable to us, risk is transferred to the purchaser with the notification of readiness.

6.2 For other services, the risk is transferred to the purchaser as soon as we have notified the completion to him. A formal acceptance takes place only if the same has been agreed or we expressly request the same.

6.3 In case of purchasing contracts with an additional service involving a contract to manufacture, the transfer of risk will comply with clause 6.1 in case of delivered parts and clause 6.2 in case of the service.

6.2. Provision of § 644 II BGB remains unaffected.

7. Defects and warranty

7.1 The purchaser must inspect goods received immediately after arrival for defects and agreed quality. Obvious defects in the delivery must be informed to us immediately, not later than seven days of receipt of the goods, hidden defects must be reported in writing within seven days after discovery. Else the delivery is deemed accepted.

7.2 The Purchaser shall give us the opportunity to investigate the complaint, particularly by making the damaged goods and their packaging available for inspection. If he refuses to do so, we are exempted from liability for defects. Only in cases where there is a risk to work safety or to avoid disproportionately large damage, shall the purchaser have the right to remedy the defect himself or have it remedied by third parties, and to demand reimbursement of the necessary expenses from us. The same is applicable if we are in default with rectification of the fault. In any case the purchaser must inform us immediately.

7.3 If the purchaser demands supplementary performance due to a defect either to rectify the fault ourselves or deliver fault-free goods as replacement. Replaced goods must be returned to us. If repairs or a replacement consignment is not possible, is refused or is not carried out by us or comes to nothing for other reasons attributable to us, within a reasonable period of grace determined by the purchaser, he may choose whether to withdraw from the contract or to reduce the purchase price.

7.4 We shall bear the costs accruing due to repairs or replacement delivery - provided the complaint is justified - the cost of the replacement part including the dispatch and the appropriate costs for removal and installation. Other possible costs incurred by the purchaser are borne by the purchaser himself, this is also applicable for higher expenses that are incurred because the goods were later taken to a place other than the premises of the customer, unless the transfer is in accordance with its intended use. Any installation and travel expenses incurred in connection with unauthorised defects are to be paid by the purchaser.

7.5 We are not liable for any damages or defects in the goods caused by incorrect operation, negligent maintenance, beyond normal wear and tear, the processing of parts not complying with drawings or bad parts, the dimensions of the specified tolerances, and similar concerns, if they are not caused by us.

7.6 Further claims of the customer, especially for damages instead of performance and for compensation of any other direct or indirect losses - including incidental or consequential damages - regardless of the legal grounds, are excluded. This does not affect the claims of the purchaser, if

a) we have concealed a legal or material defect maliciously or have undertaken a guarantee for the durability or quality of the goods;

b) the damage is intentional or is due to our gross negligence, our legal representatives or agents, or at least negligent breach of contract by these persons, with a contractual obligation always exists when the exemption from a liability relates to an obligation, the achievement of the proper implementation of the contract in the first place and assure that the purchaser regularly complies with the contract.

c) a culpable breach of duty by us or our legal representatives or agents lead to physical injury or harm to the health damage, or

d) we are cogently liable for reasons e.g. in accordance with the Product Liability Act or the General Equal Treatment Act.

In the case of negligence, our liability to pay damages is restricted to the amount of the typical, foreseeable damage.

7.7 The provisions of section 7.6 shall apply to direct claims of the purchaser against our legal representatives or agents.

7.8 All warranty claims by the purchaser, including the claims for compensation in section 7.6 and 7.7 expire one year after its delivery to the purchaser. For replacements and repairs, the limitation period is 12 months. It exists at least until the expiration of the original limitation period for the delivery item. The deadline for the liability for defect for the delivery item is extended by the duration of the interruption of the operations caused by the repair work. The provisions of this section shall apply, if the act in accordance with §§ 438 section 1 no 1 (buildings and things used for a building) and 634 a) sect. 1 no. 2 (defects of a building) German Civil Code (BGB) where longer periods are prescribed by law.

7.9 As far as we provide a test or a sample, if only the quality of the tests or the sample is not guaranteed by the contract.

7.10 Compliance of all types of safety provisions (VDE, TÜV, trade associations etc.) is the sole responsibility of the purchaser.

8. Retention of title

8.1 All goods delivered by us remain our property until all claims arising from our business contacts have been settled between us and the purchaser (if the purchaser is a businessman) or from the contractual relationship (if the purchaser is not a businessman).

8.2 The purchaser is entitled to resell and/or combine the reserved goods in the ordinary course of business, if not indicated otherwise subsequently.

8.3 The customer already now assigns all claims arising from the sale of the goods equal to the amount of the agreed purchase price as security to us, we accept the assignment. With a resale, we shall only agree if, under the above declaration of assignment an effective subrogation can take place. If the reserved goods are resold with other goods regardless whether without or after combining, the pre-assignment shall apply only to the amount of the invoice value of the reserved goods resold together with the other goods. For contracts for service or manufacturing services, with the compliance of which our retention of title ceases to exist, the wage claim of the purchaser to the amount of the invoice value of the processed reserved goods is already assigned to us now, we accept this assignment.

8.4 Until this is rescinded by us, the purchaser shall be authorised to collect the debts previously assigned to us on our account and in our own name. The collection authorization also expires without our express revocation, if the purchaser does not fulfil his obligations towards us, the conditions of the subsequent section 8.7 arise or are to be provided if the collected amounts cannot be paid to us. For the instalment on wage claims partially assigned to us the purchaser is committed to first settle the instalment of the partial claim not assigned to us. Between us and the purchaser, the part amount not assigned to us shall always be deemed to have been paid off out of the down payments collected by the purchaser. The purchaser is obliged to furnish information on the whereabouts of the goods subject to retention of title in writing on request. He shall have to nominate other parties as well as debtors for the debt assigned to us and collect necessary information on the assigned claims, provide the necessary documents and notify the debtor about the assignment on our request. The purchase shall provide the notification of assignment to us anytime. He is obliged to inform us immediately about any impairment of our retention of title rights or other securities, particularly distraints.

8.5 When combining the reserved goods with others, not belonging to us (installation), we are entitled to the resulting co-ownership share of the new item in proportion to the order value of the reserved property to the value of the other items at the time of combination. If the purchaser acquires sole title to the new goods, the contracting parties hereby agree that the purchaser shall grant us co-ownership of the new goods in proportion of the order value of the (combined) reserved goods relative to the value of the other goods. The purchaser is obliged to disclose to us any time, on request, documents required for determining our co-ownership share. It is hereby agreed that the purchaser will undertake the safekeeping of the goods in our co-ownership for us free of charge.

8.6 When paying by check or exchange procedures our retention of title and security interests remain unaffected and shall continue till our liability on exchange or cheque has ended.

8.7 With behaviour of the contracting partner contrary to the terms of the agreement, especially with delay of payment as well as if the contracting partner comes into a financial collapse, stops his payments or if a judicial insolvency proceeding is pursued or requests an out-of-court settlement and without prejudice to their other rights excellence can require the immediate claim of their property or if required demand for an assignment of the claim for return of goods. Taking back the goods does not constitute withdrawal from the contract, unless §§ 358, 359 BGB are applicable and we do not offer the purchaser to pay the usual sales value of the item at the time of removal.

8.8 The withdrawal of the goods or the enforcement of the retention of title does not require that we withdraw from the contract.

8.9 We commit ourselves to release the securities on the purchaser's request, than the value of our securities exceeds the claims to be secured by more than 10%, the choice of the securities to be released is incumbent upon us.

9. Invoices and payment terms

9.1 Invoicing is done along with consignment. If the prepared goods falling in the risk area of the purchaser cannot be dispatched due to certain reasons, the invoice is prepared and payable.

9.2 Our invoices are payable within the scope of an agreed credit arrangement latest within 30 days without any deductions. Discounts are allowed only by express agreement. Even in this case they are only allowed if the purchaser has paid all our outstanding invoice amounts or pays at the same.

9.3 If invoices are not paid within 30 days of receipt of invoice or not later than 40 days after delivery, the purchaser falls into arrears of payment and we can make interest and for any further default damages enforceable.

9.4 Bills of exchange are taken by us only by special arrangement. The acceptance of bills of exchange or cheques will only ever take place by way of fulfilment.

9.5 The purchaser may pay only undisputed or legally established claims; the same applies for a withholding under § 273 (German Civil Code) BGB for claims that are not based on the same contract.

10. Design changes

We expressly reserve the right at any time make changes in design, but are not obligated to make such changes to products already delivered.

11. Other compensation claims

11.1 Other claims for damages and expenses that are not addressed in the contract, including these conditions (the "claims"), for whatever legal reason, including breaches of duties from the contractual relationship and from tort, are excluded.

11.2 Notwithstanding the claims of the purchaser for which we have mandatory liability, e.g. under the Product Liability Act or the General Equal Treatment Act, in cases of willful misconduct, gross negligence, injury of life, limb or health or for culpable violation of essential contractual obligations. Fundamental contract obligations are obligations which when implemented generally enable the appropriate execution of the contract and assure that the purchaser regularly complies with the contract. The claim for damages for the breach of fundamental contractual obligations is limited to typical, foreseeable damage if there is malicious intent or there is liability for culpable injury to life, limb or health. A change in the burden of proof to the detriment of the customer is not related.

12. Applicable law, jurisdiction, partial effectiveness

12.1 Only the law of the Federal Republic of Germany shall apply under exclusion of CISG.

12.2 Performance for all liabilities and jurisdiction is Neuffen if the customer is a registered trader, a person of public law or a public special fund. For foreign purchasers, the international jurisdiction is agreed upon by German courts. We are also entitled to take action at the place of business. The court agreement applies also to cheque and exchange processes.

Excellence in Lubrication Technology

Lubrication Technology

- 1-channel and 2-channel minimal quantity lubrication systems for metal cutting.
- Dosing and metering systems for oil and fluid grease.
- Progressive systems for oil, fluid grease and grease.
- Circulation systems for lubrication and cooling.
- Oil/air mixing systems.

Schmiertechnik

- 1- und 2-Kanal-Minimalmengen-Schmiersysteme für die spanabhebende Metall-Bearbeitung.
- Einleitungssysteme für Öl und Fließfett.
- Progressivsysteme für Öl, Fließfett und Fett.
- Umlaufsysteme für Schmierung und Kühlung.
- Öl-Luft-Mischsysteme.

Excellence in Plastic Welding

Plastic Welding

- Hotplate welding machines with contact heating and non-contact heating by means of infrared and gas-convection.
- Linear vibration welding and spin welding machines. For both infrared pre-heating can be integrated.
- Laser welding machines working with the quasi-simultaneous and contour welding techniques.
- Ultrasonic welding machines for special applications.
- Thermal contact welding machines.
- High frequency welding machines.
- Complete automated welding lines including parts management by feeding systems, handling solutions. Machine concepts in all variations, e.g. rotary table or linear transfer design. Robots can be integrated depending on application.
- Equipment for machining, milling, assembling and testing of plastic components integrated in complete automated lines.

Kunststoff-Schweißtechnik

- Heizelement-Schweißmaschinen mit Kontakt-Erwärmung sowie kontaktlos-Erwärmung über Infrarot oder Gas-Konvektion.
- Reib-Schweißmaschinen über lineare Vibration oder Rotation mit oder ohne kontaktlos-Vorwärmung durch Infrarot.
- Laser-Schweißmaschinen mit Quasi-Simultan- oder Kontur-Prinzip.
- Ultraschall-Schweißmaschinen als Sonderanlagen.
- Wärmekontakt-Impuls-Schweißmaschinen.
- Hochfrequenz-Schweißmaschinen.
- Komplette automatisierte Fertigungslinien und -zellen mit Teile-Zuführung und -Entnahme durch Portal- oder Knickarm-Roboter, Rundteller-Konzepte, Transferlinien.
- Ausrüstungen zum Bearbeiten, Fräsen, Montieren und Prüfen, integriert in komplette Fertigungsanlagen.



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