

Single-line Systems for Commercial Vehicles

1-9420-US

For grease up to NLGI grades 000, 00 or 0



- Cut wear and tear
- Reduce downtimes
- Lower maintenance costs with automatic lubrication

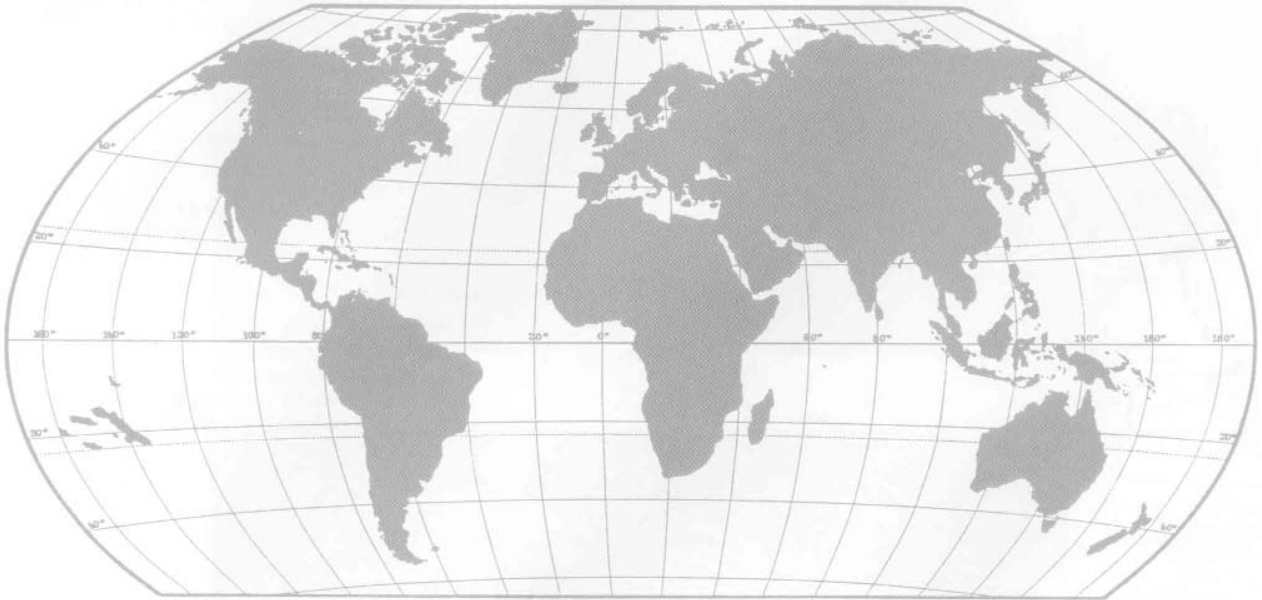


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Notice

All products from Willy Vogel AG may be used only for their intended purpose. If operating instructions are supplied together with the products, the provisions and information therein of specific relevance to the equipment must be observed as well.



In particular, we call your attention to the fact that hazardous materials of any kind, especially the materials classified as hazardous by EC Directive 67/548/EEC, Article 2, Par. 2, may only be filled into VOGEL centralized lubrication systems and components and delivered and/or distributed with the same after consultation with and written approval from Willy Vogel AG.

All products manufactured by VOGEL are not approved for use in conjunction with gases, liquefied gases, pressurized gases in solution and fluids with a vapor pressure exceeding normal atmospheric pressure (1013 mbars) by more than 0.5 bar at their maximum permissible temperature.

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Systems overview

Lubricant: Grease up to NLGI grades 000, 00 or 0 *			
Selection criteria	Max. connected load (ccm) or max. number of lube points	80 ccm	
	Pump suitable for	Truck tractor Truck tractor with extra equipment Interconnected system/semitrailer KFU units also for GGVS vehicles ¹⁾ (with cable harness 997-000-374)	
	Type of drive	electric	
Type designation	Pump	Gear pump unit KFU2-40 KFUS2-64  page 12	KFU6-20 
Technical data	Operating pressure	38 bars	
	Reservoir capacity	2.7 liters	6 liters
Auxiliary equipment	Lubricant distribution	VKSO piston distributors	
	Control system	Electronic control unit IG502-E with or without monitoring function KFUS with integrated control unit IG490	
	Main line connection: pump - distributor	Mainly plastic tubing 10 x 1.5 diam., but also steel tubing 10 x 0.7 diam. hose SLH10-...	
	Secondary line connection: distributor - lube point	Mainly plastic tubing 4 x 0.85 diam.; in case of large movement between lubrication point and chassis: hose 734 ...	

¹⁾ GGVS – Hazardous Goods Road Ordinance

* NLGI grade 0 at temperatures above –10 °C

36 ccm	36 ccm	approx. 20 lubrication points
Truck tractor Truck tractor with small extra equipment also for GGVS vehicles ¹⁾ (with solenoid valve DVS3206-E-F-S1)	Trailer / semitrailer also for GGVS vehicles ¹⁾	Truck tractor with small number of lubrication points Truck tractor with extra equipment also for GGVS vehicles ¹⁾
pneumatic	pneumatic	electric
Piston pump PEF-90  page 15	Piston pump PEF-90-S14 / PEF-90-S15 PEF-90-S19 <small>for GGVS-vehicles ¹⁾</small>  page 18	Compact unit KFB(S)1  page 20
22 to 50 bars	22 to 50 bars	30 bars
3 liters	3 liters	1.4 liters
VKSO piston distributors		VKSO piston distributors
Electronic control unit IG502-E with or without monitoring function	with built-in electronic control unit IG476-2 <small>for PEF-90-S14</small> IG476-3 <small>for PEF-90-S19</small> mech. pulse counter <small>PEF-90-S15</small>	Electronic control unit IG502 with or without monitoring function
		plastic tubing ø 10x1.5
		plastic tubing ø 4x0.85 diam.

Lubricants

The installed centralized lubrication system must only be operated with grease of NLGI grades 000, 00 within the intended temperature range of –25 °C to +80 °C.

When grease of NLGI grade 0 is used, a restricted temperature range of –10 °C to +80 °C applies.

To ensure faultless operation of your centralized lubrication system at all times we recommend use of the grease listed below and tested by us. (Sodium-soap greases must not be used on motor vehicles due to their solubility in water.)

In the interest of a well functioning system always pay attention to cleanliness when topping up lubricant. Dirt leads to malfunctions of the centralized lubrication system and to destruction at the lubrication points.

When the listed products are used it is possible to change from conventional to biodegradable grease (and vice versa.) with no inconvenience.

A suitable grease conforming to the identical specifications of WILLY VOGEL AG, Mercedes-Benz AG and MAN AG can be purchased from WILLY VOGEL AG in 1 kg and 25 kg drums.

1 kg drum, order No. FL1-000 ^{1) 4)}
25 kg drum, order No. FL25-000 ²⁾

Types of grease, NLGI grade 0 ³⁾:

Supplier	Type
ARAL AG	Fließfett AN 0
BP Oil Deutschland GmbH	BP Energ grease ZS 0
DEA Mineralöl AG	DEALITH EP 0
Zeller+Gmelin GmbH & Co	Divinol L 0

Biodegradable types of grease available from WILLY VOGEL AG can also be used in VOGEL centralized lubrication systems.

1 kg drum, order No. FL1-000BIO ¹⁾
25 kg drum, order No. FL25-000BIO ²⁾

Biodegradable types of grease, NLGI grade 0 ³⁾:

Lieferant	Sortenbezeichnung
ARAL AG	ARALUB BAB EP 0
AVIA Mineralöl AG	Syntogrease 0
BP Oil Deutschland GmbH	Biogrease EP 0
Fuchs Petrolub AG	Plantogel 0201 S
RHENUS	Norlith BZS 0
Siebert GmbH	Bio-Fließfett EP 4905

Further types of grease, NLGI grades 000, 00:

Supplier	Type
ARAL AG	Fließfett N
Autol-Werke GmbH	Autol Getriebefließfett ZSA
AVIA Mineralöl AG	AVIALITH 000 EP
Axel Christiernsson	Acinol 8300-EPSCS
BP Oil Deutschland GmbH	Energ grease ZS 00
Calypsol	SF 7-042
Castrol Ltd., England	Castrol CLS Grease
DEA	Dealit EP 00
Deutsche Shell GmbH	Shell Retinax CS
ELF	MULTI BT 000
Esso	Grease TCL 435
FINA	MARSON ZS - G 0116
Georg Oest Mineralölwerke	Oest Spezialfett LT 000 EP
Kompressol-Öl Verkaufs GmbH	Kompressol CZ 8332/N
KRAFFT	KEC-Grease
Mobil Schmierstoff GmbH	Chassis Grease LBZ
Mobil Schmierstoff GmbH	Mobilgrease EAL 003
MOL	Carrier Liton-00
ÖMV - GmbH	ÖMV-Signum EP Z
Optimol	Oliit 00
Pluto	Plutoleum SHM 000
Reiner Chemische Fabrik GmbH	Gearmaster ZSA
RHENUS	Rhenus Norlith FZS 000
Wilhelm Reiners GmbH & Co.	
Siebert GmbH	Fließfett EP 7028
Texaco	Multifak 6833 EP 00
Veedol Int. Ltd., England	Veedol GFG
Wintershall AG	Wiolub LFK 00
Zeller+Gmelin GmbH & Co	Divinol Fett Central 00

Further biodegradable types of grease, NLGI grades 000, 00:

Supplier	Type
ARAL AG	ARALUB BAB 000
ASEOL	VIVA 4-131
AVIA Mineralöl AG	AVIALITH 000 Bio
Axel Christiernsson	Acinol 7302 BD
Bechem	Bio-VE-8 00/000
BP Oil Deutschland GmbH	Biogrease EP 00/000
DEA	Dolon E EP 00
Deutsche Shell GmbH	Shell Retinax CSB 00
FINKE Mineralölwerk	AVIATICON FETT BD-ZSA
Fuchs Lubritech GmbH	Staby ECO 00
Fuchs Petrolub AG	Plantogel 0202 S
ÖMV-GmbH	ECODUR EP 00
RHENUS	Rhenus Norlith BZS 000
Wilhelm Reiners GmbH & Co.	
Willy Vogel AG	Volvo grease 00CSBD
Texaco	Multifac 264 EP 00/000
Texaco	STARFAK EP 00
Westfalen AG	Bio-Gresalit-ZSA 00
Wintershall AG	Wiolub LFB 00 Bio
Zeller+Gmelin GmbH & Co	Divinol Biofett E 00

¹⁾ Coupler for 1 kg drum, Order No. KFU2.U8

²⁾ Topping-up pumps for 25 kg drum, Order No. 169-000-082 and 169-000-084

³⁾ For units with grease pressurizer

⁴⁾ Filler bend for pumps with screw cover, order No. 169-000-037

Systems for grease up to NLGI grades 000, 00 or 0

- Electrically operated gear pump units KFU / KFUS
- Pneumatically actuated piston pump PEF-90
- Electrically operated piston pump KFB(S)1

1. Planning and installation

a) Determination of number of lubrication points.

All friction points of the chassis and any body units, with the exception of the universal joints of the cardan shaft.

b) Determination of metered quantities.

The tabular values correspond to the average lubricant needs of the bearings in a vehicle weighing more than 8 tons.

The lubrication frequency depends on the type of operation.

Truck tractors	Metered qty (ccm)	Trailers and semitrailers	Metered qty (ccm)	Buses	Metered qty (ccm)
1. steering knuckle	0.4	1. tow bar	0.4	1. stop lever	0.1
2. spring pin	0.4	2. turntable (fifth wheel)	0.4	2. dual lever	0.1
3. spring suspension	0.4	3. spring pin	0.4	3. reversing lever	0.1
4. brake shaft	0.2	4. brake shaft	0.2	4. idler arm	0.1
5. brake shaft, wheel side	0.1	5. brake shaft, wheel side	0.1	5. linkage setting device	0.2
6. linkage setting device	0.2	6. linkage setting device	0.2	6. brake shaft	0.2
7. stabilizer	0.2	7. hand brake	0.1	7. brake shaft, wheel side	0.1
8. driver's cab support	0.1	8. spare wheel	0.1	8. steering knuckle	0.4
9. longitudinal control arm	0.2	9. brake shoe pin	0.1	9. turntable	0.4
10. transverse control arm	0.2	10. steering assembly	0.4	10. drag link	0.4
11. coupling	0.1	11. support arms	0.1	11. knuckle pin bearing	0.4
12. gas control	0.1	12. wearing plate	0.4	12. axle support	0.4
13. center bearing	0.4			13. gas control	0.1
14. fifth wheel support plate	0.4				

c) Calculation of system capacity

Maximum values:

Electrically operated gear pump units

KFU / KFUS = 80 ccm

Pneumatically actuated piston pump

PEF-90 = 36 ccm

Electrically operated compact unit

KFBS Cf. diagram on page 20 for max. system capacity

Example of how to calculate the system capacity: *)

20 lubrication points, 0.4 ccm each	.....	= 8	ccm
10 lubrication points, 0.2 ccm each	.....	= 2	ccm
10 lubrication points, 0.1 ccm each	.....	= 1	ccm
		11	ccm
+25 % (safety margin)	.....	= 2.75	ccm

Compressibility and expansion losses:

1 ccm/m main-line tube	
(average value for steel and plastic tubing),	
assumed:	
12 m main-line tubing, 10 x 1	..... = 12 ccm
Total **)	<u>25.75 ccm</u>

d) Selection of distributors

Metered quantities of VKSO distributors: 0.1, 0.2 and 0.4 ccm.
Depending on tubing layout: 2-, 4- and 6-port VKSO distributors.

Two different distributors are connected to one manifold with a VKR 2.U2 connector.

e) Tubing connections

Main line connections to VKSO distributors:

M16x1.5 thread for 10 mm diam. tube, tapped for solderless tube connection.

Secondary (lubrication) line connections

to VKSO distributors: with plug-in connectors.

*) The example applies only to KFU and PEF-90 units. The safety margins for the KFB(S) units are already worked into the diagram.

**) If the calculated system capacity exceeds the capacity of the pump unit, a second pump unit must be used. A second unit is also required when the vehicle is operated for extended periods of time at temperatures below -20 °C with a main-line train of more than 17 m.

f) Installation

(Detailed installation instructions are available on request.)

This information is supposed to be a guideline and aid for the fitter. It will enable him to install the equipment on vehicles on his own, even if there are no tubing layouts available, or only incomplete ones.

For the prevalent, standard types of commercial vehicles we have prepared tubing layouts according to which the installations are to be made. If required, these layouts will be mailed free of charge.

Additional superstructures and special vehicles can be outfitted on the basis of these layouts.

The preassembled VKSO distributors for standard systems are supplied with a preset metered quantity, but they can be changed to another quantity of lubricant if necessary.

Install the VKSO distributors at suitable locations on the vehicle and connect to the tubing.

Max. length of the secondary lines

(connection: distributor - lubrication point) **6 m.**

Tighten the socket unions, but do not overtighten (maximum of 1½ turns). The tapered sleeves and tubing are slightly deformed when tightened, thus offering no resistance – as a fixing bolt would when tightened.

Attention must be paid to the following when installing the secondary lines:

- **Steering lock angle, sagging, chafing spots.**
- **Keep away from heat sources.**

Install the pump and control unit at a suitable place.

Connect hoses and make electrical connections.

Some installation hints:

- Use the existing holes drilled in the chassis and in other vehicle parts for the installation.
- Span large boreholes with body washers.
- Lay 4 x 0.85 plastic tubing (as per WVN716, flexible) between distributors and lubrication points.
- Use 734...-K hose lines to connect non-stationary lubrication points and lubrication points that are subject to heavy mechanical stress and strain.
- **The compressed air for the PEF-90 pneumatically actuated pump must be taken from a line for auxiliary loads.** The regulations of the TÜV (Technical Control Board) must be observed.

- **The pertinent Hazardous Goods Road Ordinance (GGVS) must be observed in the case of tank trucks and other vehicles carrying hazardous goods.**

The following can be used:

electrically operated gear pump units KFU2-40, KFU6-20 in conjunction with cable harness 997-000-374; compact units KFB(S) in conjunction with cable harness 997-000-630 or 007-000-650

or

pneumatically actuated piston pump PEF-90 in conjunction with solenoid valve DVS3206-E-F-S1.

Furthermore, the pressure switch line must likewise be laid in corrugated tubing.

2. Operation and maintenance

In the case of automatically controlled systems, with the exception of KFB(S) compact units, the indicator light goes on for about 3 seconds every time the ignition is switched on. (See point 3 for response to malfunctions.)

For the most part, maintenance is limited to topping up with **clean** lubricant in good time.

All tube connections should be checked for a tight fit when the vehicle is inspected.

Replace torn or worn hose lines after eliminating the cause, and trigger test lubrication. Actuate automatic systems by hand and observe the indicator light.

The main line (connection: pump - distributor) is monitored by a pressure switch that reports the build-up of pressure. Exception: KFBS and KFUS units. If the indicator light does not light up, or if it burns constantly in the case of automatic systems, this means the pressure has failed to build up.

Select a smaller metered quantity for highly overlubricated points and a higher quantity for dry points.

If the entire system is overlubricated or underlubricated, there is a malfunction: in this case proceed in accordance with 3.b) or 3.c) respectively.

3. Malfunctions and their elimination

a) Fault indication by indicator light.

The indicator light does not go out about 3 seconds after the ignition is switched on or the motor started.

Look for the fault in the following order:

Check lubricant level in the reservoir;

top up lubricant if necessary and bleed the system.

In the case of electrically operated gear pumps, loosen the screw union of the main line while the pump is running. There must be a continuous discharge of lubricant.

In the case of pneumatically operated systems:

Check the compressed-air supply.

Minimum pressure is 6 bars.

Check pump function.

The piston stroke must be heard or felt when the compressed air is applied.

Check lubricant pressure in main line.

Loosen the lubrication-point connection and check whether the distributor is delivering lubricant. If it is, the fault must be looked for in the pressure switch, electrical wiring or control unit.

Please note:

The distributor will not feed lubricant until the main line is relieved of pressure again. It is therefore called a "relubrication distributor".

Check electrical connections:

Is power available?

Are all terminals tight?

Check the indicator light, solenoid valve, pressure switch and control unit.

Main line connections,

main hose lines in particular, must be checked for leakage.

Then check whether the **pump valves** are dirty.

b) Entire system insufficiently lubricated.

Install a pressure gauge in the main line and check the pressure build-up and relief. Min. pressure build-up is 30 bars. A maximum residual pressure of 1 bar may remain after the pressure is relieved (measured at pump's outlet port).

c) Entire system is overlubricated.

Check setting of control unit and increase interval time if necessary.

d) Individual lubrication points are overlubricated or underlubricated.

Change metered quantity.

e) Distributor faults.

Replace distributors.

Please note!

Absolute cleanliness must be maintained when doing any work on the system, especially when replacing metering nipples on distributors. Dirt in the system causes malfunctions.

Never use trichloroethylene, perchloroethylene or similar liquids aggressive to Perbunan when cleaning centralized lubrication systems.

Suitable cleaning agents are petroleum ether or kerosene.

Pressure curve in main line in the case of systems with VKSO relubrication distributors

Pneumatically actuated piston pumps and electrically operated gear pump units have the same pressure characteristic, but the time required for the pressure build-up will generally be shorter with pneumatically actuated piston pumps.

The maximum pressure reached in the main line depends on the actuating pressure of the piston pumps or on the pressure intensity of the safety valve in the case of gear pump units.

Pneumatically operated piston pumps: 22-50 bars

Electrically operated KFU.. gear pump units: ≈ 38 bars

Electrically operated KFBS compact units: ≈ 30 bars
(length of main line limited to 10 m)

Functional sequence

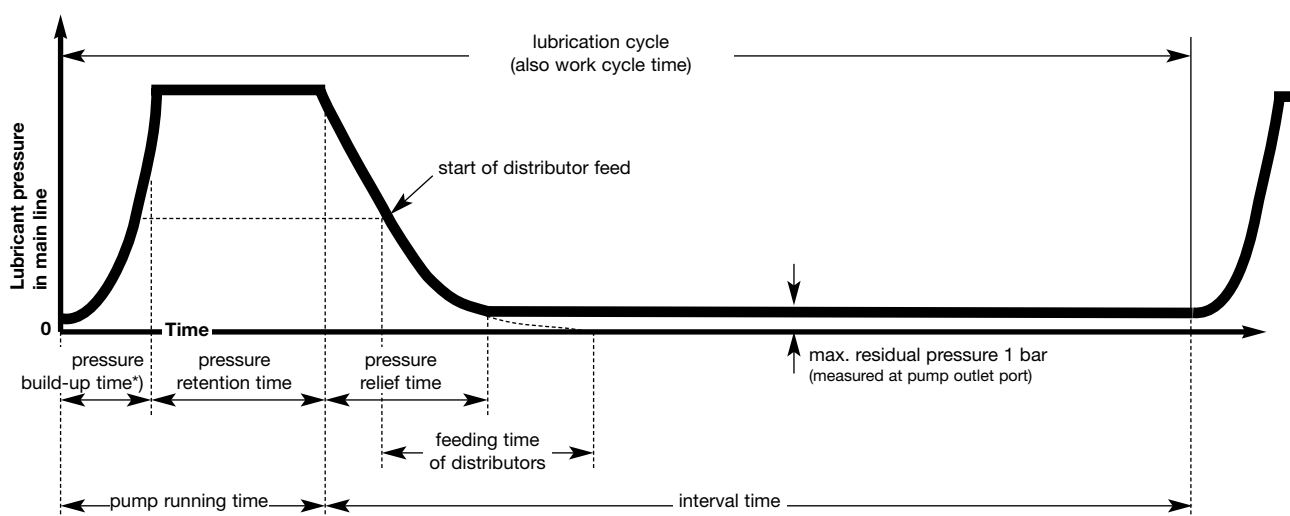
At the end of the preset interval time, the pump motor is switched on and the pressure required by the system built up. This is reported to the control unit by the actuation of the pressure switch. At the end of the pump running time the pump motor is switched off and a new interval time begins.

If there is no signal from the pressure switch while the pump is in operation, the control unit reports a fault at the end of the pump running time. This is signaled by the constant burning of the indicator light.

The metering chambers of the distributors are filled with lubricant during the pressure build-up in the main line.

The relief of pressure in the main line via the pressure relief valve starts when the pump is switched off. The lubricant from the metering chambers is delivered to the lubrication points by the spring-loaded distributor pistons at the same time as the pressure is relieved.

The KFB(S) compact units have the same functional sequence, but the pressure build-up is not monitored in this case.



*) depending on size of system and pump

Gear pump units KFU2-40, KFU6-20, KFUS2-64 with reservoir, electrically operated

The gear pump unit consists mainly of a gear pump with relief valve, safety valve, DC motor, transparent lubricant reservoir, filler socket and angle bracket. The DC motor and filler socket are covered by a hood to protect them from dirt. The hood snaps into place on both sides of the reservoir lid.

Function

The gear pump continuously supplies lubricant to the relubrication distributors via the main line network when the pump is in operation. As soon as the metering chambers of the distributors are full the excess lubricant flows back into the reservoir via the safety valve.

At the end of the pump running time (start of the interval time), the pressure relief valve opens so that the pressure in the main line can drop to a residual pressure of 0.2 to 1.0 bar. The spring-loaded pistons of the distributors can now deliver lubricant from the metering chambers to the lubrication points.

Nearly every size of system on commercial vehicles, including superstructures, can be supplied by one single pump when a KFU2-40 or KFU6-20 pump unit is used.

Furthermore, the semitrailer or trailer can be connected in the form of an **interconnected system**, but this is only advisable when the motor vehicle and semitrailer/trailer are rarely or never disconnected from each other.

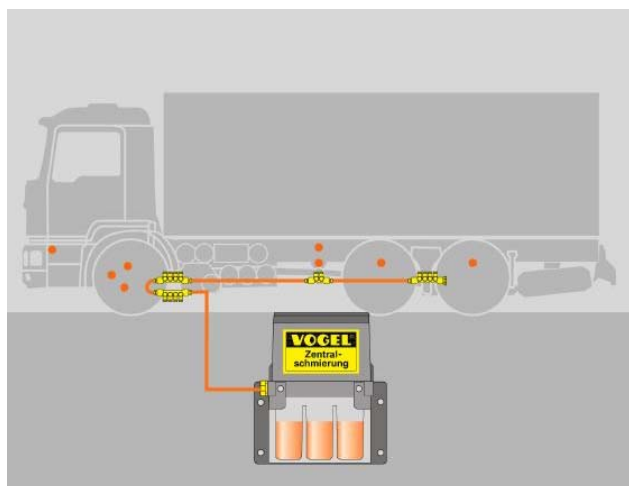
The KFU units must be used with cable harness 997-000-374 on vehicles approved for the transport of hazardous goods by road (GGVS).

Associated cable harness for KFU, order No. 997-000-373; cable harness for KFUS2-64, order No. 997-000-750.

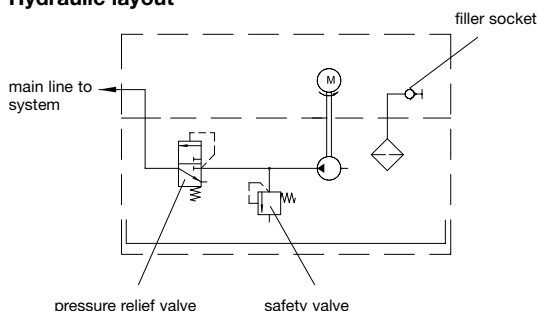
Technical data

Order No.	KFU2-40	KFU6-20
Order No.	KFUS2-64	
reservoir capacity	2.7 l	6 l
Weight (without lubricant)	ca. 5.5 kg	ca. 7.3 kg
operating voltage	12 or 24 V DC	
	Please quote required voltage when ordering.	
12 V fuse for KFU	7,5 A	
24 V fuse for KFU	7,5 A	
12 V fuse for KFUS	16 A	
24 V fuse for KFUS	8 A	
flow rate	140 ccm/min	
	at back pressure p = 38 bars and temperature t = 25 °C	
system capacity for single-line systems	max. 80 ccm	
units with relief valve and safety valve		
max. operating pressure	38 ⁺² ₋₃ bars	
	(corresponds to actual value of built-in safety valve)	
permissible operating temperature	-25 °C to +75 °C	
type of enclosure	IP 59 k	
lubricant	grease up to NLGI grades 000, 00 or 0	
	NLGI grade 0 at operating temperatures above -10 °C.	

**Associated control unit for KFU: IG502-E,
KFUS unit with integrated control unit: IG490.**



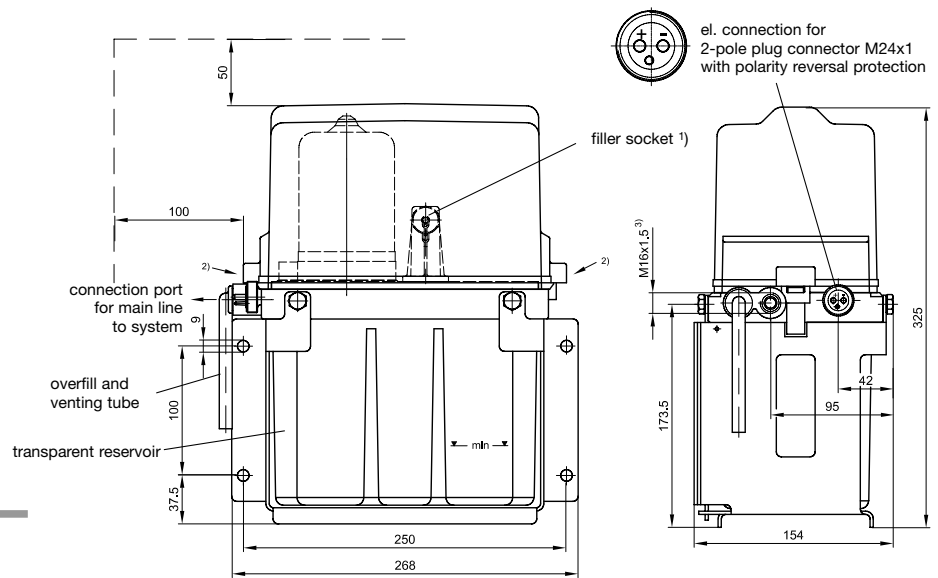
Hydraulic layout



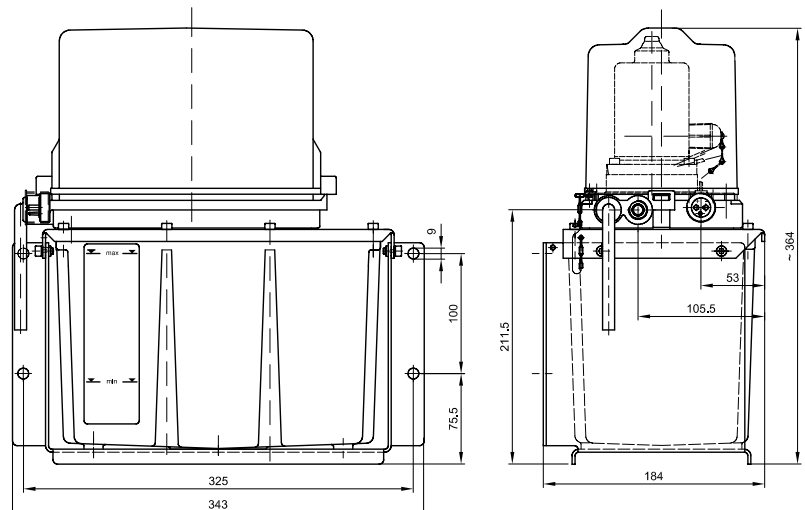
Gear pump units KFU2-40, KFU6-20, KFUS2-64 with reservoir, electrically operated



KFU2-40 with 2.7 l reservoir



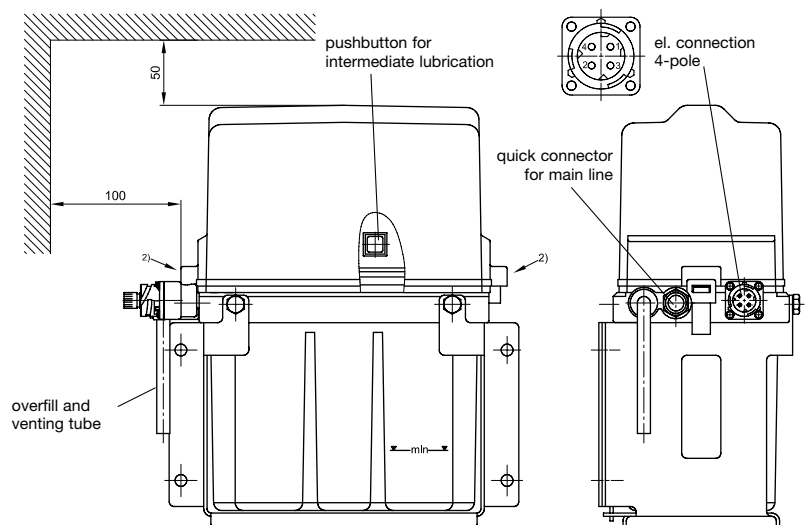
KFU6-20 with 6 l reservoir



This unit should only be used for systems with a minimum lubricant consumption of 6 l /year.



KFUS2-64 with 2.7 l reservoir



- 1) Coupling bush for filler socket, order No. 995-001-500 (please order separately).
- 2) The cover must be removed for filling. Press in cover with both hands at the positions marked and lift.
- 3) Ports tapped for solderless tube connection.

Interconnected system with KFU2-40, KFU6-20, KFUS2-64 gear pump units, electrically operated, for truck tractors with trailer or semitrailer without frequent change of vehicles

The unit is installed on the truck tractor, and the main line of the following vehicle is connected to the centralized lubrication system of the truck tractor via a plug and socket coupling.

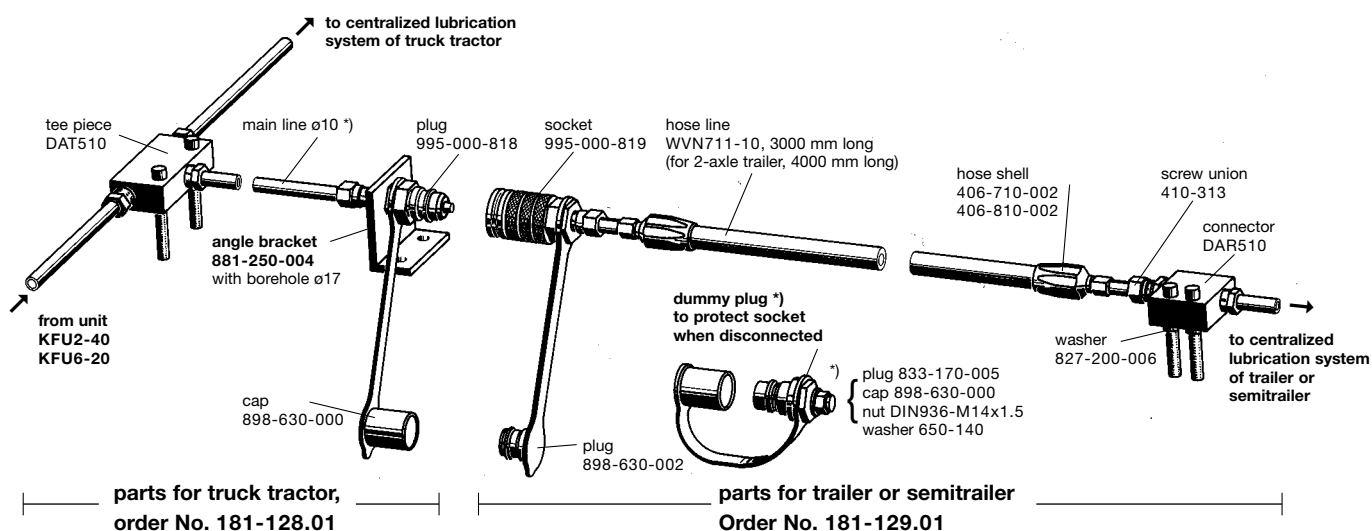
The feed capacity is dimensioned so that all standard interconnected vehicles can be supplied.

The units must be used with cable harness 997-000-374 on vehicles approved for the transport of hazardous goods by road (GGVS).

Associated control unit: IG502-E



Coupling parts for interconnected system



*) Please order separately if required

Coupling parts
for interconnected system

Order No. 181-123.01

Complete,
but with spiral tubing ¹⁾

Order No. 181-122.01

Parts for trailer or semitrailer
with spiral tubing ¹⁾

Order No. 181-140.01

¹⁾ Spiral tubing , order No. 167-003-501

Piston pump PEF-90, pneumatically actuated

The unit consists mainly of

- a lubricant pump in the form of a pneumatically actuated piston pump with spring reset,
- suction valve,
- combination pressure and relief valve,
- lubricant reservoir in the form of a bellows, including protective holder,
- filler socket for topping up the lubricant reservoir..

Function

The delivery piston is moved in the direction of the outlet after pressurization with compressed air. As a result, the lubricant that flowed into the pump chamber through the suction valve is delivered to the system via the combination pressure and relief valve.

After the compressed air is switched off the delivery piston is returned to its initial position by the reset spring. Due to the resulting underpressure the combination pressure and relief valves also returns to its initial position, thereby opening the pressure relief bore; the pressure in the main line is relieved as a result.

Due to the pressure relief the paths from the metering chambers to the friction point are opened in the distributors so that the spring-loaded metering pistons can now deliver lubricant to the friction point.

The inlet valve is opened by the underpressure resulting from the return motion of the piston, and new lubricant flows into the pump chamber.

This ends the work cycle.

Please note

When filling for the first time, overfill the pump unit in order to keep air from becoming trapped in the bellows and to assure faultless operation.



Technical data

Order No.	PEF-90
delivery rate per stroke	48 ccm
operating pressure (depending on air pressure)	22 to 50 bars
max. perm. P1 air pressure for the pump	10 bars
permissible operating temperature	-25 °C to +80 °C
reservoir capacity	3 l
lubricant	grease of NLGI grades 000, 00 or 0
	NLGI grade 0 at operating temperatures above -10 °C.

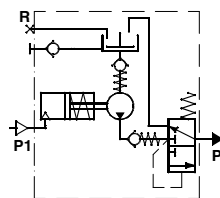
materials:

cylinder/piston	.Al Mg Si 0.5
valves	steel, Cu Zn 40 Pb 2
seals, lubricant reservoir	NBR
mounting position	as shown
Weight (without lubricant)	approx. 4.7 kg

Make sure the pump is installed without distortion!

Associated control unit: IG502-E

Hydraulic layout

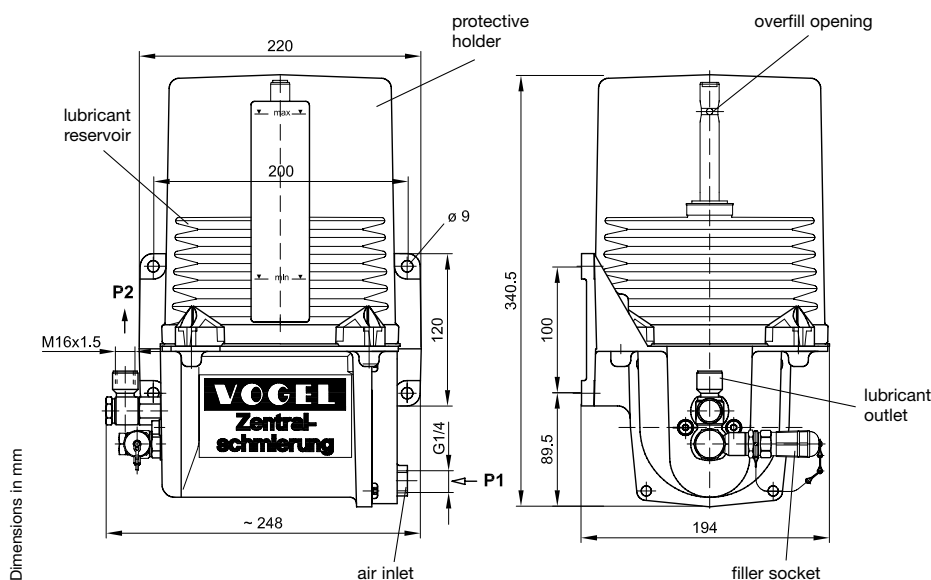


P1 = air line from compressed air network
P2 = main line of system

P1 = when connected to tubing:
adapter 406-054 for 6 mm diam. tubing,
order washer 508-108 separately
can be connected to 3/2-way
solenoid valve DVS3206-E-F

P2 = ports tapped for solderless tube
connection for tube ø10

See page 41 for grease topping-up pumps.



Dimensions in mm

Electronic control unit IG502-E

for systems with KFU2-40, KFU6-20 gear pump units or PEF-90 piston pumps

Operating and display elements

The IG502 control units come with an operating and display panel that can be used to check, monitor and, if necessary, readjust the parameters as well as programmed functions.

Modes of operation

PAUSE (pump OFF) with timer function

- programmable from **0.1 to 99.9 h**
- digital display after invoking: **tPA** (**t** = timer, **PA** = PAUSE)

The PAUSE (the interval between two lube cycles) is determined by a clock cycle (timer) generated by the control system and by the value (in hours) programmed for PAUSE (tPA).

PAUSE (pump OFF) with counter function

- programmable from **1 to 999 pulses**
- digital display after invoking: **cPA** (**c** = counter, **PA** = PAUSE)

The PAUSE (the interval between two lube cycles) is determined by the interval between the times signals arrive at the counter input and by the value programmed for PAUSE (cPA).

CONTACT (pump ON) with timer function

- programmable from **1 bis 99.9 minutes**
- digital display after invoking: **tCO** (**t** = timer, **CO** = CONTACT)

The pump running time (CONTACT) is determined by a clock cycle (timer) generated by the control system and by the value (in minutes) programmed for CONTACT (tCO).

Monitoring functions

PS (Pressure Switch)

This monitoring function is intended for centralized grease lubrication systems designed for NLGI grades 000, 00,0 in which the pressure in the main line is monitored. Once the monitoring parameter **PS** has been programmed, the pressure switch installed in the main line is monitored for respective signals while the pump is in operation.

CS (Cycle Switch)

This monitoring function is intended for centralized grease lubrication systems with progressive feeders in which a piston's motion is monitored with a cycle switch.

Once the monitoring parameter **CS** has been set, the cycle switch installed on the progressive feeder is monitored for the respective signal while the pump is in operation.

The respective monitoring parameter selected (**PS** or **CS**) is displayed by the lighting of the corresponding LED in the PAUSE (interval) mode.

Without monitoring (OFF)

The monitoring can also be switched off (OFF).

The control system then works without direct monitoring of the pressure build-up in the main line or without monitoring of the feeder's operation. The **PS** or **CS** LEDs do not light up.

Fault displays

The red FAULT LED shows a group fault signal when it constantly burns. The cause of the fault signal is additionally shown on the digital display to help with troubleshooting.

The following messages are provided for:

- FPS** – pressure build-up fault when monitoring is effected with a pressure switch.
- FCS** – cycle-switch fault when a progressive feeder is not working or is blocked (line break).

Special functions

Control units comprising the IG502 group have two electronic counters in which times are permanently stored; they cannot be changed by the user.

These counters are used to check the operation of the centralized lubrication system and are read out via the LED display.

Fault-hours counter

The amount of time a farm or construction machine has been run with a non-functioning centralized lubrication system (e.g. with no lubricant in the reservoir) is added up by the fault-hours counter.

The counter's contents are automatically updated and cannot be cleared. The current state of the counter can be displayed by invoking function parameter **Fh** on the display and operating panel. The current value is displayed in hours.

The counter has a resolution of 0.1 hour, i.e. the smallest displayable interval amounts to 6 minutes.

Elapsed-hours counter

The electronic elapsed-hours counter adds up the time in which power is applied to the control unit.

The counter's contents are automatically updated and cannot be cleared. The current state of the counter can be displayed by invoking function parameter **Oh** on the display and operating panel. The current value is displayed in hours.

The counter has a resolution of 0.1 hour, i.e. the smallest displayable interval amounts to 6 minutes.

The units comply with the legal requirements of EC Directives

- 72/245/EEC, version 95/54 EC
- 89/336/EEC

Application

The IG502-E universal control unit is used to control and monitor centralized lubrication systems on commercial vehicles. The control unit's functions can be programmed. Its housing dimensions, electrical connection and functions are compatible with those of VOGEL control units in use to date.

The operating elements are protected by a foil against moisture and dirt. The unit has a voltage-independent data memory. This is where the configuration data and parameters are stored. As a result, the control unit is not dependent on a constant supply of voltage.

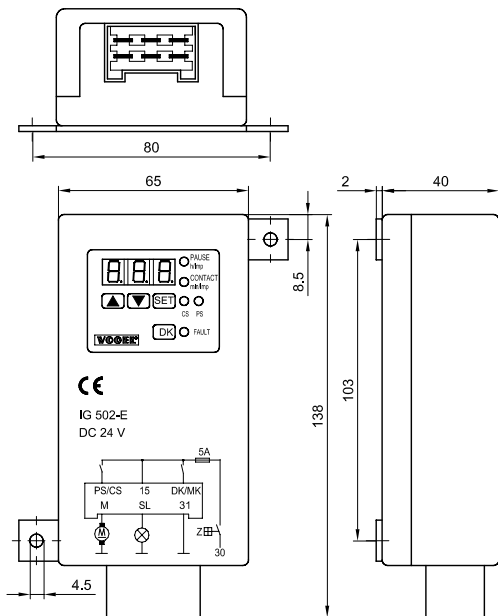
If an external indicator light SL has been installed in the driver's cab, it will light up for 3 seconds after the unit is switched on.

Installation

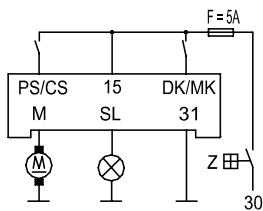
The unit has to be installed in a closed compartment on the vehicle where it is protected from ambient influences. It is fastened in place with straps.

The IG502-E is accommodated in an IP 20 type of enclosure. The plug conforms to safety class IP 00.

If the control unit is installed in a hard-to-reach place, it is advisable to additionally install an illuminated pushbutton on the dashboard to serve as a fault display and function check.



Wiring diagram



Dimensions in mm

Technical data

Order No. IG502-E

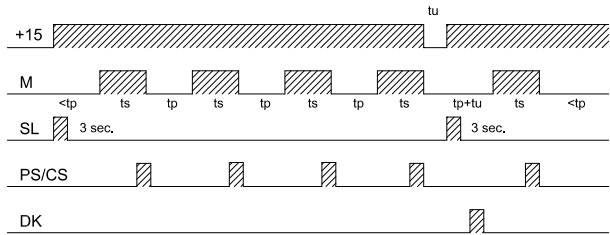
Associated cable harness

- for KFU2-40, KFU6-20 order No. 997-000-373
- for KFU2-40, KFU6-20
- for vehicles with hazardous goods .. order No. 997-000-374
- for PEF-90 order No. 997-000-189

- control voltage 1) 12 or 24 V DC
- max. contact load, terminal M 5 A
- SL-output 4 W
- type of enclosure 2) IP 20, DIN 40050
- temperature range -25 to +75 °C
- max. fusing. 5 A
- programmable interval times 0.1 to 99.9 h
- programmable pump running time 0.1 to 99.9 min
- programmable pulses 1 to 999
- elapsed-time, fault hours memory 0 to 99999.9 h

1) Please quote control voltage when ordering.
2) Warranted for vertical (plug-in connector pointing downward) and horizontal installation.

Normal functional sequence



(time axis not to scale)

- tu = ignition interruption
- ts = contact time
- tp = interval time
- 30 = battery + / vehicle network
- 15 = operating voltage + / after ignition "ON"
- 31 = operating voltage -
- DK/MK = pushbutton / intermediate lubrication or pulse-counter input
- PS/CS = pressure switch / cycle switch
- M = pump motor
- SL = indicator light
- Z = ignition lock
- F = 5 A fuse

LED PAUSE

lights in intervals.

LED CONTACT

lights when pump running.

LED CS

lights for monitoring with cycle switch function.

LED PS

lights for monitoring with pressure switch function.

LED FAULT

lights for fault monitoring (cycle or pressure switch).

Trailer and semitrailer lubrication

with PEF-90-S14 pneumatically actuated piston pump including IG476-2 electronic control unit

with PEF-90-S19 pneumatically actuated piston pump including IG476-3 electronic control unit

for use on vehicles carrying hazardous goods

with PEF-90-S15 pneumatically actuated piston pump including DSWM21-2-S1 mechanical pulse counter



PEF-90-S14



Rear view of PEF-90-S14

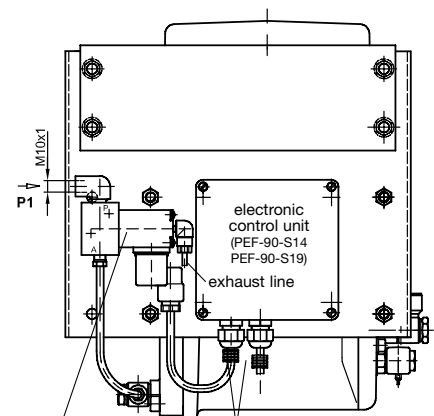
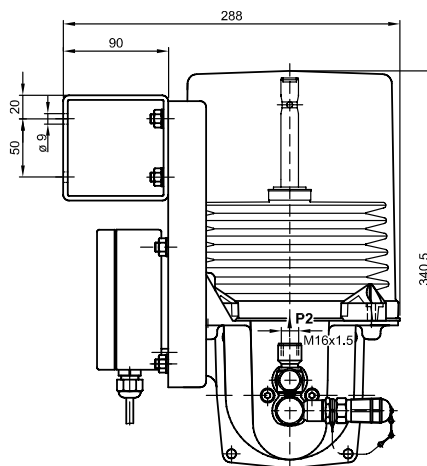
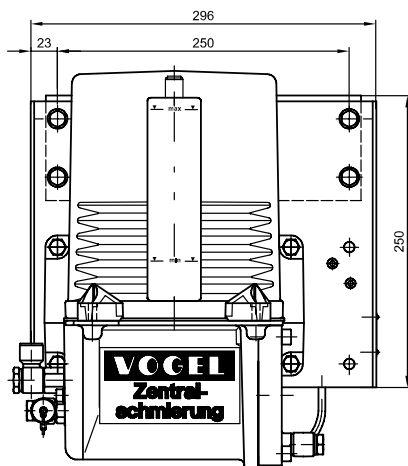
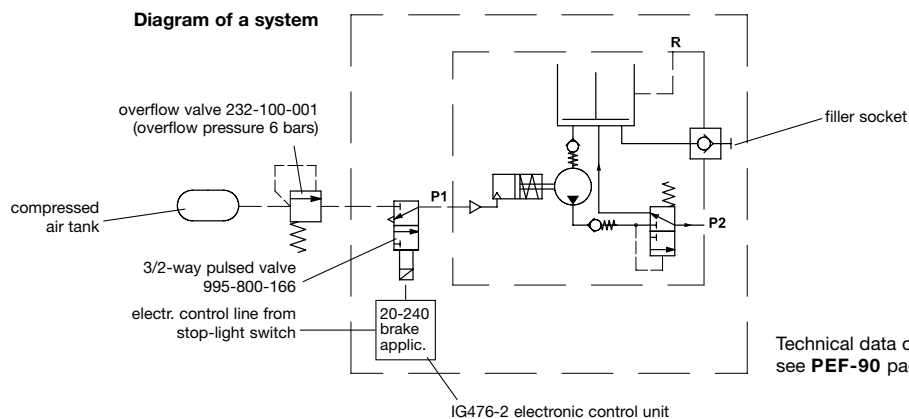


Rear view of PEF-90-S19



Rear view of PEF-90-S15

Diagram of a system



P1 = compressed air connection port
P2 = pressure port to system

pulsed valve compl.
order No. 995-800-166

PEF-90-S15
with 3/2-way solenoid valve
order No. DVS3206-E-F

for PEF-90-S19
with corrugated tube
(used on vehicles carrying
hazardous goods)

weight (without lubricant): approx 11.4 kg

Trailer and semitrailer lubrication

with PEF-90-S14 pneumatically actuated piston pump including IG476-2 electronic control unit

with PEF-90-S19 pneumatically actuated piston pump including IG476-3 electronic control unit

for use on vehicles carrying hazardous goods

with PEF-90-S15 pneumatically actuated piston pump including DSWM21-2-S1 mechanical pulse counter

Functional sequence

PEF-90-S14, PEF-90-S19 with electronic control unit IG476

The switching pulses for the stop light are registered and added in the electronic control unit at an interval of at least one second. As soon as the preset number of brake applications is reached, the pulse-controlled 3/2-way solenoid valve is energized for a lubricating time of at least 40 seconds, thereby pressurizing the compressed air cylinder of the piston pump. The delivery piston of the pump executes one working stroke, the lubricant distributors are filled (relubrication distributors).

Application of the brakes during the lubricating time is ignored.

The first application of the brakes at the conclusion of the lubricating time reverses the valve. As a result, the compressed air cylinder of the piston pump is relieved of pressure, and the delivery piston returns to its initial position. At the same time, this relieves the pressure in the main line so that the distributors can now deliver the lubricant.

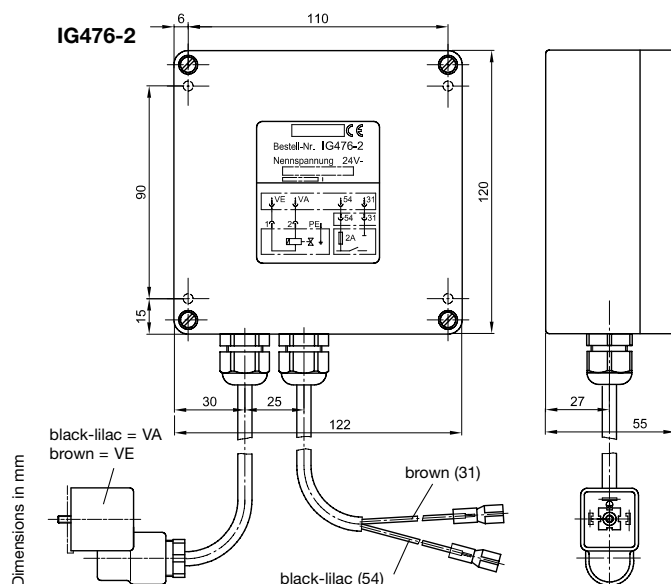
Further applications of the brakes are now registered and added again.

The control unit is equipped with an EEPROM memory that stores the counter states, even when no power is applied between applications of the brakes.

The number of times the brakes have to be applied before lubrication takes place depends on the conditions in which the vehicle is operated. It is possible to set the number of times (20, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, 240) after which lubrication is initiated. After changing the setting it is advisable to trigger manual lubrication so that the counter begins at 0 again.

The unit is set at the factory for 100 applications of the brakes.

A pushbutton is built in for **function tests** when the brakes are applied. The function test can only be performed when there is adequate air pressure (more than 6 bars) in the air tank and power is available!



Functional sequence

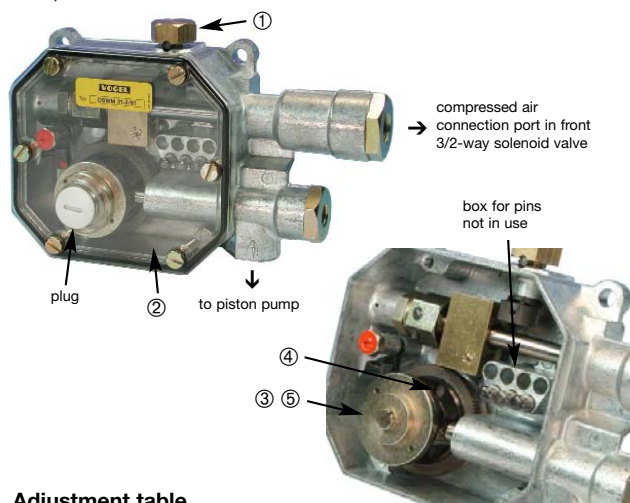
PEF-90-S15 with DSWM21-2-S1 mechanical pulse counter

Every time the stop light switch is actuated, the 3/2-way-solenoid valve is energized and compressed air delivered to the counting mechanism of the pulse counter. When the specified number of brake applications set with the pulse counter is reached (cf. adjustment table), the compressed air is switched to the cylinder of the piston pump. The delivery piston of the pump executes one working stroke, the lubricant distributors are filled (relubrication distributors).

After further application of the brakes (max. of 6 times with ratchet drive set to one tooth), the compressed air is switched off again and the delivery piston of the pump returns to its initial position. At the same time, the centralized lubrication system is relieved of pressure so that the distributors can now supply lubricant to the friction points.

The number of times the brakes have to be applied before lubrication takes place depends on the conditions in which the vehicle is operated.

To perform a function test, unscrew the screw plug (Pg9) in the cover and turn the pin wheel to the left with a screwdriver – until tripped. Then screw the plug in again. The function test can only be performed when there is adequate air pressure (more than 6 bars) in the air tank.



Adjustment table

number of pins inserted	operating strokes required until valve is actuated with ratchet drive	
	1 tooth	3 teeth
1	96	32
2	48	16
4	24	8

Changing the setting

1. Set hexagonal nut for adjustment of ratchet drive to desired drive – the embossed number indicates the number of teeth per drive; possible: 1 tooth or 3 teeth per drive.
2. Unscrew cover.
3. Remove disk from pin wheel.
4. Insert required number of pins (max. 4).
5. Place disk on pin wheel and screw on cover, check function.

KFB/KFBS compact unit, electrically operated

The KFB/KFBS compact unit consists mainly of a gear pump with DC gear motor, relief and safety valve, control unit, pushbutton for manual triggering and lubricant reservoir.

The lubricant reservoir comes with an overfill release valve and vent. The filling level can be seen in the reservoir made of transparent material. The reservoir is filled via a filler socket.

The lubricant supplied by the pump is distributed to the individual lubrication points via VKSO piston distributors.

Piston pump order No.	Reservoir capacity [liters]	Grease filling
KFB1		
KFBS1 (incl. control system)	1.4	via filler socket
with filling-level monitoring function		
KFB1-W		
KFBS1-W (incl. control system)	1.0	via filler socket
with preinstalled 4-port piston distributor		
KFB1-4-S...		
KFBS1-4-S... (incl. control system)	1.4	via filler socket
with preinstalled 6-port piston distributor		
KFB1-6-S...		
KFBS1-6-S... (incl. control system)	1.4	via filler socket

Order examples see page 21.

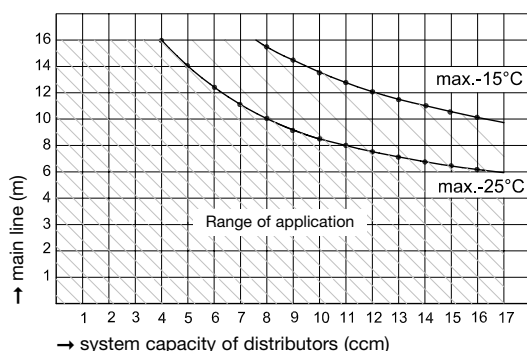
The **KFBS** pump unit is controlled by the integrated IG502-I control and monitoring unit. This can be done on a time or (pulse) load-dependent basis, with or without monitoring of the system's pressure build-up. A pressure switch¹⁾ has to be installed in the system for this purpose.

Technical Data

Unit

operating voltage	12 VDC / 24 VDC (please indicate when ordering)
Mode/ON time	S3/4% – 60 min. Pay attention to interval and contact time when setting! Max. runtime 2.5 min., min. interval time 1 h
operating pressure	38 bar
permissible operating temperature	–25 °C to +75 °C
DIN 40050 enclosure	IP 6K9K
number of outlets	1
weight (filled with grease)	approx. 3.8 kg
lubricant	grease up to NLGI grade 000, 00, 0
system capacity	cf. diagram
main line	10x1.5 diam.; max. 16 m cf. diagram

Diagram: max. system capacity / max. length of main line for NLGI grades 000, 00



KFBS1

Function

The automatic cycle consisting of the interval time and pump running time is started after the KFB/KFBS unit has been connected to the vehicle's electrical system and the ignition turned on.

When the ignition is on, the pump motor is switched on at the end of the interval time and the pump running time started. During the pump running time the gear pump delivers lubricant from the reservoir to the metering chambers of the relubrication distributors. As soon as the metering chambers of the distributors are full the surplus lubricant flows back into the reservoir via the safety valve.

Forced pressure relief is initiated at the end of the pump running time (beginning of the interval time), the pressure in the distributor feed (main line) drops to a residual pressure of 0.2 to 1 bar via the open relief valve. The spring-loaded pistons of the distributors can now deliver lubricant from the metering chambers to the lubrication points.

A new interval time sequence is started when the pump motor is switched off.

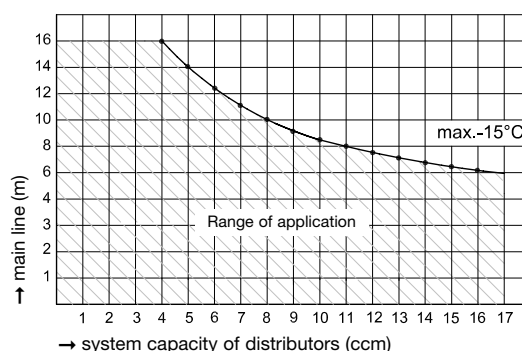
The interval time stops running down every time the ignition is switched off. The interval time continues to run down when the ignition is turned on again.

All further lubrication operations are repeated on a cyclic basis in the order described.

¹⁾ Pressure switch for 20-bar switching pressure, **order No. DS-E20-S1** (when installed at end of main line); for 25-bar switching pressure, **order No. DS-E25-S1** (not possible when installed at end of main line).

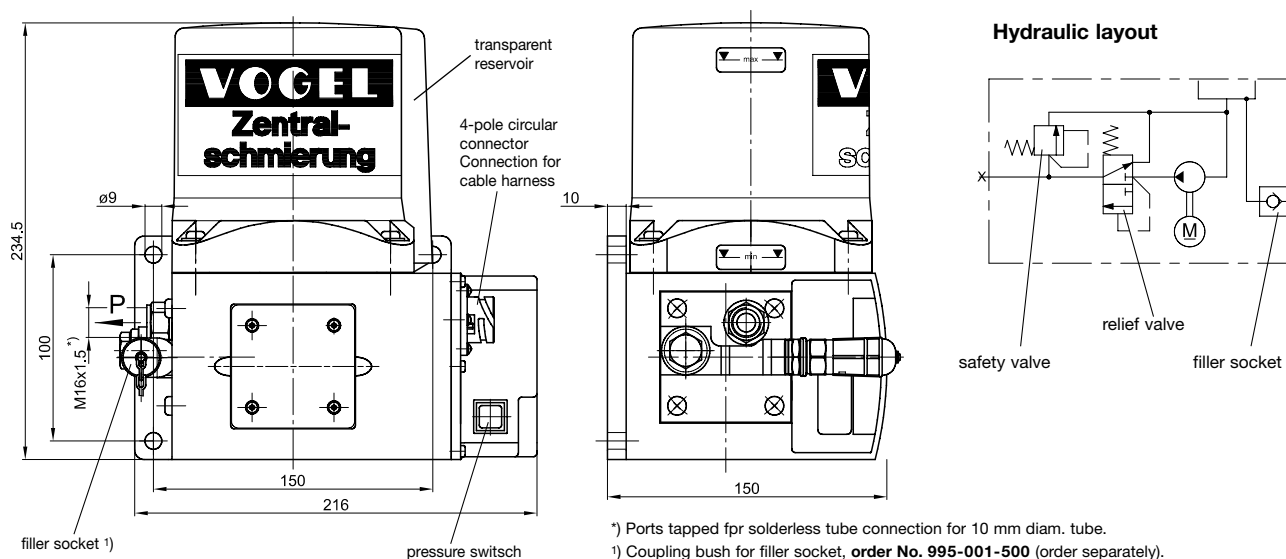
Associated cable harness for pressure switch, **order No. 997-000-379**.

Diagram: max. system capacity / max. length of main line for NLGI grade 0



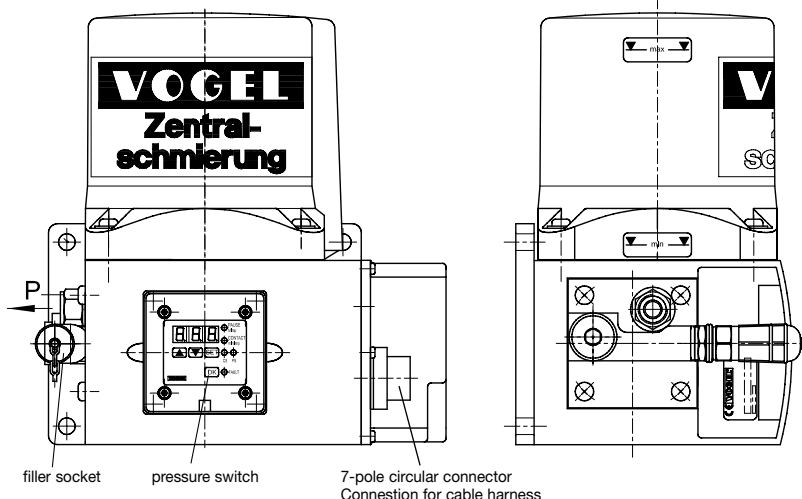
KFB/KFBS compact unit, electrically operated

KFB1 without control unit



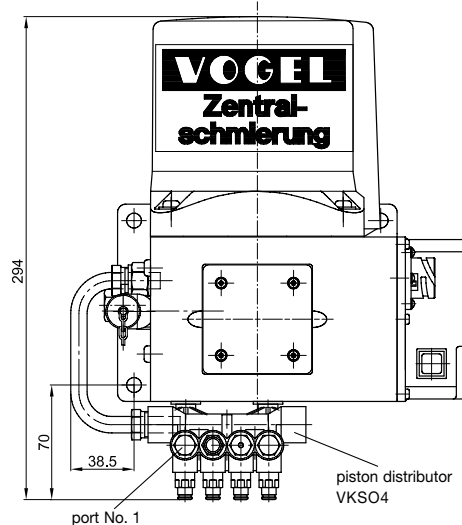
KFBS1 with control system

See above for missing dimensions and data.



KFB1-4-S...

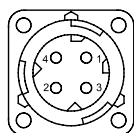
with preinstalled piston distributor



Pin allocation KFB1

Cable harness 997-000-706 (not included in delivery)

Pin No.	Function	Core color
1	15 plus potential	red/black
2	31 minus potential	brown



Pin allocation KFB1-W / KFBS1(-W)

Cable harness 997-000-904 (not included in delivery)
(for GGVS design 2): 997-000-630 or 997-000-650)

Pin No.	Function	Core color
1	31 minus potential	brown
2	15 plus potential	red/black
3	DK manual lubrication	blue
4	SL2 indicator light, ext.	pink
5	ZDS+ pressure switch, +output	black
6	ZDS pressure switch, input	black
7	SL1 status display light	purple/green

2) GGVS = Hazardous Goods Road Ordinance

The voltage key has to be added to the order No: **12 VDC**: order key **912**
24 VDC: order key **924**

Order example for compact unit without distributors: KFB1 in 24 VDC, **order No. KFB1+924**

Order example for compact unit with 4-port piston distributor: KFB1 in 24 VDC with VKSO4, metered with 0.2; 0.2; 0.2; 0.2 ccm (as of port 1) **order No. KFB1-4-S1+924** (specified with same metering of 0.2 ccm)

Order example for compact unit with 6-port piston distributor: KFB1 in 12 VDC with VKSO6, metered with 0.1; 0.4; 0.2; 0.2; 0.4; 0.1 ccm **order No. KFB1-6-S...+912** (specified after receipt of order)

Piston distributors, group VKSO (relubrication distributors)

The distributors meter and distribute the lubricant from the pump to the individual lubrication points. They do so independent of each other.

Interchangeable metering nipples make it possible to adapt the quantity to the amount of lubricant required by the friction point.

The cycle number, i.e. the number of pump strokes per time unit of the lubrication system, also permits further coordination of the lubricant quantity with the friction point and entire system.

Lubricant is only delivered under spring pressure **after** the end of pump operation, i.e. after the pressure is relieved.

A collar (changeover valve) in the distributor closes the outlet to the lubrication point during the delivery stroke, thus storing the lubricant beneath the piston. The changeover valve opens the outlet as soon as the pressure drops in the main line, i.e. when the pressure relief valve of the pump opens.

When installing a system, arrange the lines and distributors in such a way that any air entrained in the system can escape by itself via the lubrication points. For this purpose, distributors with horizontal outlet ports or with outlet ports pointing upward must be installed at a position suitable for bleeding of the entire system.

Assign **only one** lubrication point to each distributor outlet port. Connect the secondary line (connection: distributor - lubrication point) to the lubrication points only after bubble-free lubricant emerges from the tubing after the pump is repeatedly actuated. Fill long secondary lines beforehand if necessary.

The metered quantity can be seen from the shape of the metering nipple and code number.



VKSO2

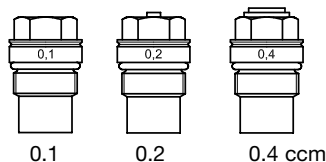


VKSO4



VKSO6

Metering nipples

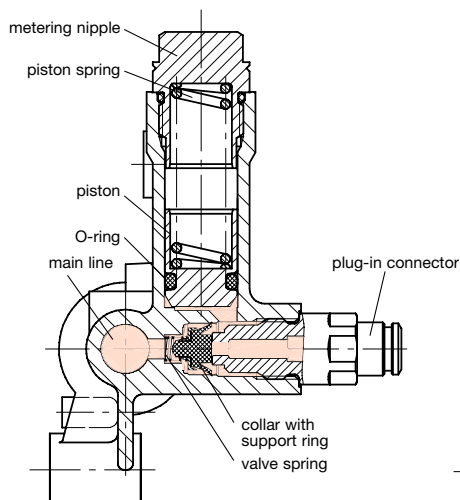


0.1

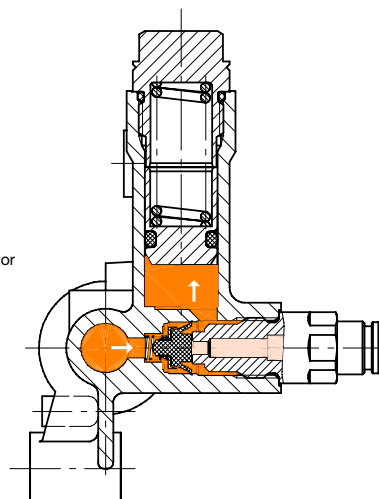
0.2

0.4 ccm

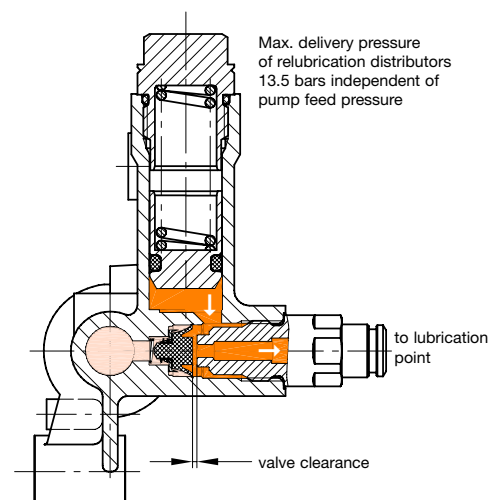
Design and function



Distributor in initial position
system is non-pressurized



Distributor pressurized
main line pressurized by pump



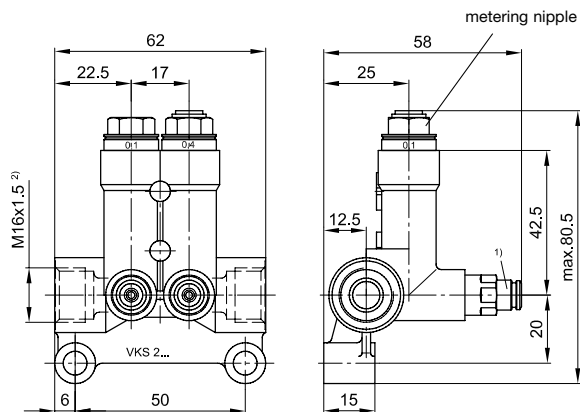
Distributor feeding
main line relieved of pressure

Max. delivery pressure
of relubrication distributors
13.5 bars independent of
pump feed pressure

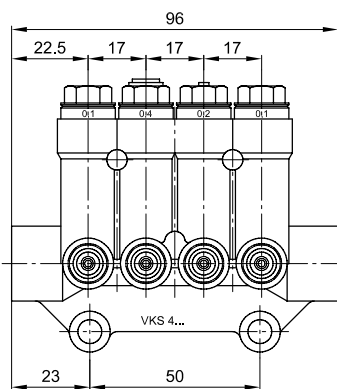
to lubrication
point

valve clearance

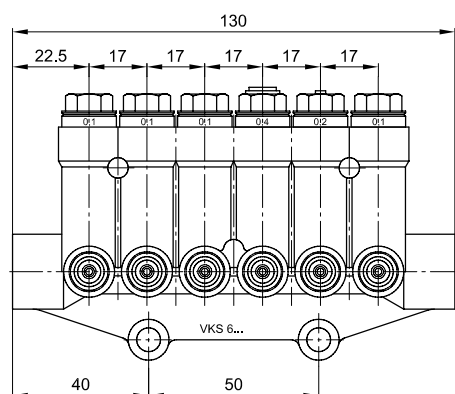
Piston distributors, group VKSO (relubrication distributors)



VKSO2 ... 2-port distributor



VKSO4 ... 4-port distributor



VKSO6 ... 6-port distributor

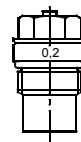
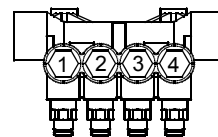
- 1) Quick connector connection for $\varnothing 4$ plastic tubing.
 2) Ports tapped for solderless tube connection.
 M16x1,5 for 10 mm diam. tube, M8x1 for 4 mm diam. tube.

Piston distributors are only supplied with metering nipples fitted.

Plug-in connectors permit timesaving installation of secondary lines without the use of tools (cf. page 26).

Order No.	number of lubrication points
VKSO2 ...	2
VKSO4 ...	4
VKSO6 ...	6

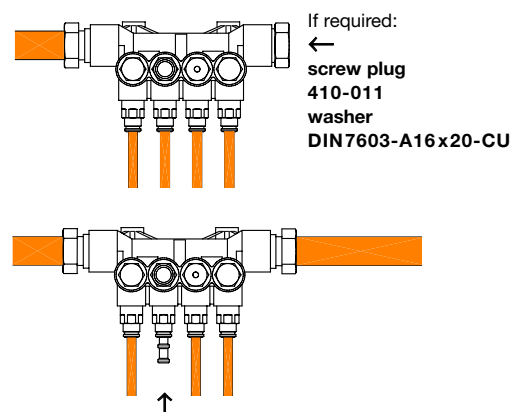
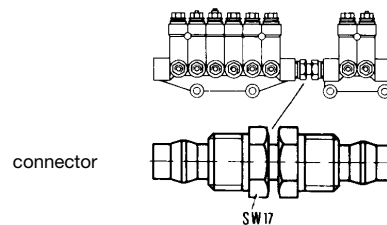
When ordering distributors, please quote the desired metered quantities (0.1; 0.2; 0.4 ccm) in the respective order.



**Metering nipples, with O-ring
for metered quantity**

	Order No.
0.1 cm³	VKU010-K
0.2 cm³	VKU020-K
0.4 cm³	VKU040-K

Distributors are connected to manifolds with a connector, order No. VKR2.U2

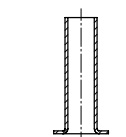


Individual distributor outlet ports can be closed with **plug pin 450-204-002** and thus shut down. Other metered quantities will not be affected by this step.

Fittings and auxiliary equipment

Screw unions for steel and plastic tubing

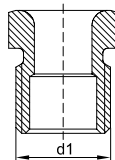
(use reinforcing socket for plastic tubing)



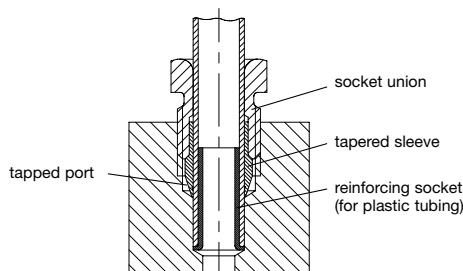
Reinforcing socket
for plastic tubing



Tapered sleeves



Socket unions



for outer tube diam.	Order No.	Order No.	Order No.	d1
4x0.85	404-603	404-611	404-612-MS	M8x1
6x1.25	406-613	406-611	406-612-MS	M10x1
8x1.25	408-603	408-611	408-612-MS	M14x1.5
10x2 *)	410-613	410-611	410-612-MS	M16x1.5

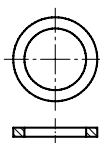
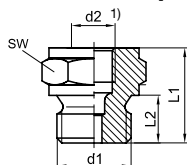
Material: brass

*) Mercedes Benz version

Assembly

Slide socket union and tapered sleeve onto end of the tube. In the case of plastic tubing, **first** insert the reinforcing socket. Insert end of tube into tapped port up to the stop. First tighten the socket union finger-tight and then turn it another 1 1/2 turns.

Adapters with respective washers



for outer tube diam.	Adapter Order No.	d1	d2	L1	L2	sw	Washer Order No.
4	404-044 *)	M8x1	M8x1	46	6	11	DIN7603-A8x11.5-CU
4	404-063	M8	M8x1	22	8	11	DIN7603-A8x11.5-CU
4	404-006	M10x1	M8x1	18	7.5	14	504-019
4	404-007	M10x1	M8x1	24	6	11	504-019
4	404-164	M14x1.5	M8x1	18	9	17	DIN7603-A14x18-CU
6	406-004	M10x1	M10x1	18	7.5	14	504-019
6	406-166	M16x1.5	M10x1	19	9	19	DIN7603-A16x20-CU
6	406-054	G 1/4 A	M10x1	20	10	17	508-108
8	408-004	M10x1	M14x1.5	28	7.5	17	504-019
8	408-005	M16x1.5	M14x1.5	22	9	19	DIN7603-A16x20-CU
8	301-020	G 1/4 A	M14x1.5	23	10	17	508-108

Material

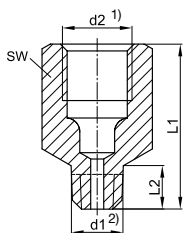
Adapters:
steel, galvanized surface
Washers: copper

Please note!
Order washers separately!

1) Ports tapped for solderless tube connection

*) extra long

Adapters with tapered thread for screwing into lubrication ports without sealing face



for outer tube diam.	Order No.	d1	d2	L1	L2	sw
4	404-662K	M6 tap.	M8x1 ¹⁾	19	5	11
4	404-663K	M6 tap.	M8x1 ¹⁾	20	6	11
4	404-673K	M6x0.75 tap.	M8x1 ¹⁾	20	6	11
4	404-047K	M7 tap.	M8x1 ¹⁾	20	6	11
4	404-003K	M8x1 tap.	M8x1 ¹⁾	17	7.4	11
4	404-045	M8x1 tap.	M8x1 ¹⁾	62.5	7.4	11
4	404-006K	M10x1 tap.	M8x1 ¹⁾	16	7.4	11
4	401-004-512	M10x1 tap.	M8x1	25	7.4	11
4	404-050	*)	M8x1 ¹⁾	18	5.2	11
4	853-460-000	*)	M8x1 ¹⁾	46	5.2	11
4	404-040K	R 1/8 tap.	M8x1 ¹⁾	16	6	11
4	404-040K-US	1/8 NPTF	M8x1 ¹⁾	20	6.7	11
4	404-054K	R 1/4 tap.	M8x1 ¹⁾	14	9	14
4	404-072	1/4-28 UNF	M8x1 ¹⁾	20	5.6	11
4	401-004-903	1/4 BSF	M8x1 ¹⁾	20	5	11
4	401-004-904	3/16 BSF	M8x1 ¹⁾	18	5	11
4.5	406-004K-S1	M10x1	M10x1 ¹⁾	23	7.4	13
4.5	406-004K-S2	M10x1 tap.	M10x1	18	7	13
4.5	456-004K-S2	R 1/8 tap.	M10x1	18	6	13
4.5	401-019-691	R 1/8 tap.	G 1/8	23	7.5	14
6	406-004K	M10x1 tap.	M10x1 ¹⁾	23	7.4	14
6	406-035K	M10x1 tap.	M10x1	40	8	14

Adapters with tapered threads are used without washers, since tapered threads are self-sealing. Therefore, the ports do not have to be provided with sealing faces.

Material:
steel, galvanized surface

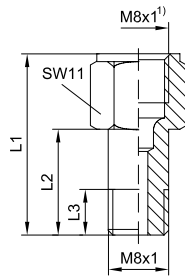
1) Ports tapped for solderless tube connection

2) Tapered thread according to DIN 158, tapered, short, or as per DIN 2999

*) Self-forming thread for 7.6 mm diam. borehole

Fittings and auxiliary equipment

Adapters



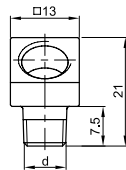
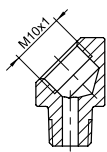
for outer tube diam.	Order No.	L1	L2	L3
4	404-004	24	14	6
4	404-005	32	22	5

Material: steel, galvanized surface

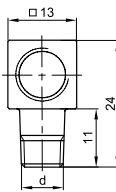
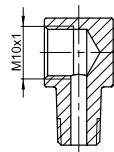
¹⁾ Ports tapped for solderless tube connection

Elbow

A



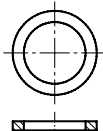
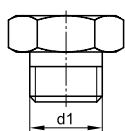
B



Order No.	d	Type
406-145K	M8x1 tap.	A
406-045K	M10x1 tap.	A
406-089K	M8x1 tap.	B
406-090K	M10x1 tap.	B

Material: steel, galvanized surface

Screw plugs and respective flat washers

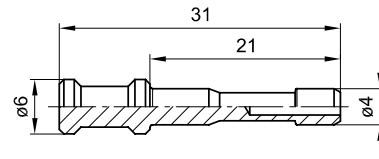


Screw plug Order No.	d1	Flat washers Order No.
404-011	M8x1	DIN7603-A8x11.5-CU
408-011	M14x1.5	DIN7603-A14x18-CU
410-011	M16x1.5	DIN7603-A16x20-CU

Material: steel, galvanized surface

Material: copper
Please note!
Order flat washers separately!

Pin plug for plug-in connector, tube diam. 4



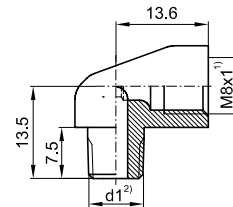
Order No. **450-204-002**

Material: brass

Elbows with tapered thread

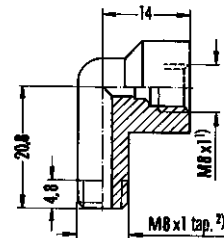
for screwing into lubrication ports without sealing face.

Elbows with tapered threads are used without washers, since tapered threads are self-sealing. Therefore, the ports do not have to be provided with sealing faces.



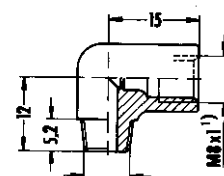
for outer tube diam.	Order No.	d1
4	504-200K	M6 tap.
4	504-201K	M8x1 tap.
4	504-202K	M10x1 tap.
4	514-018K-S1	R 1/8 tap.

Material: brass



for outer tube diam.	Order No.
4	504-211K

Material: brass



Self-forming thread for 7.6 mm diam. borehole

for outer tube diam.	Order No.
4	504-050

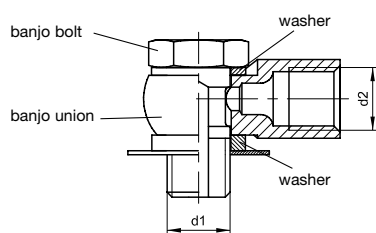
Material: steel, galvanized surface

¹⁾ Ports tapped for solderless lube connection.

²⁾ Tapered thread according to DIN 158, tapered, short, or as per DIN 2999.

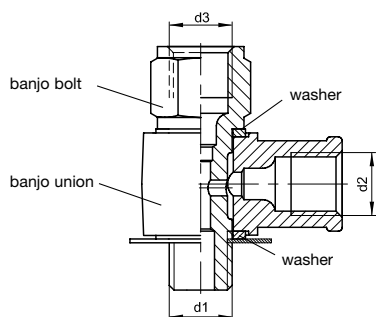
Fittings and auxiliary equipment

Banjo fittings



Elbow type

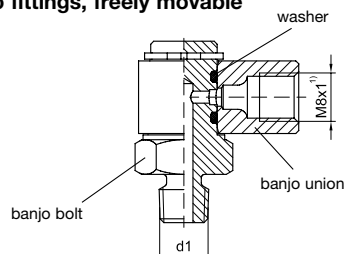
for outer tube diam.	Order No.	d1	d2 1)
4	504-401	M8x1	M8x1
6	506-140	M10x1	M10x1
6	506-214	G 1/4 A	M10x1
6	506-145	M16x1.5	M10x1
8	508-145	M16x1.5	M14x1.5
10	510-024	G 1/4 A	M16x1.5
10	510-145	M16x1.5	M16x1.5



L-type

for outer tube diam.	Order No.	d1	d2 1)	d3 1)
4	504-114	M8x1	M8x1	M8x1
6	506-114	M10x1	M10x1	M10x1
6 and 10	506-346	M16x1.5	M10x1	M16x1.5
10 and 8	508-346	M16x1.5	M14x1.5	M16x1.5
10	510-343	G 1/4 A	M16x1.5	M16x1.5
10	510-344	M16x1.5	M16x1.5	M16x1.5
10 and 6	510-346	M16x1.5	M16x1.5	M10x1

Banjo fittings, freely movable



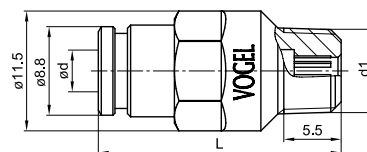
for outer tube diam.	Order No.	d1
4	405-549-049	M8x1 tap.
4	405-551-049	M10x1 tap.

Swing angle: 360°

Frequency: approx. 1 movement/min. at max. swing angle

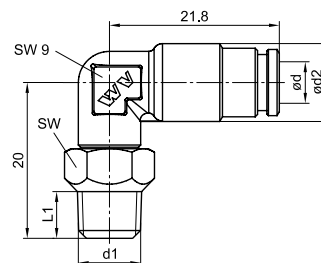
1) Ports tapped for solderless tube connection

Plug-in connectors, detachable



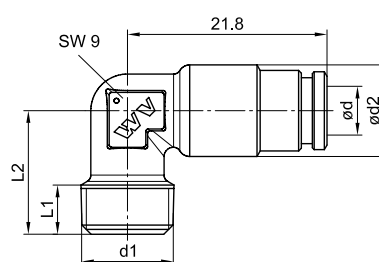
Adapters

Order No.	tube diam. d	d1	L
451-004-462-VS	4	M6 tap.	25.8
451-004-498-VS	4	M8x1 tap.	23.3
451-004-518-VS	4	M10x1 tap.	22.8



Banjo fittings

Order No.	tube diam. d	d1	ø d2	L1	sw
455-546-048-VS	4	M6 tap.	10	6	10
455-529-048-VS	4	M8x1 tap.	10	6	10
455-531-048-VS	4	M10x1 tap.	10	6	12



Elbows

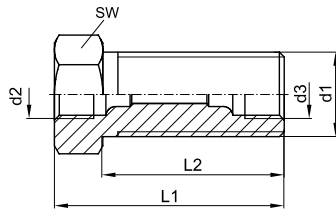
Order No.	tube diam. d	d1	ø d2	L1	L2
453-004-471-VS	4	M6 tap.	10	6	14
504-201-VS	4	M8x1 tap.	10	6	13.5
504-202-VS	4	M10x1 tap.	10	6	13.5
514-018-VS	4	R1/8 tap.	10	7.5	15

Protective cap for quick connectors, 4 mm diam. tubing,
order No. 898-110-077.

Pipe cutter with formation of claw groove for quick connectors,
order No. 169-000-336.

Fittings and auxiliary equipment

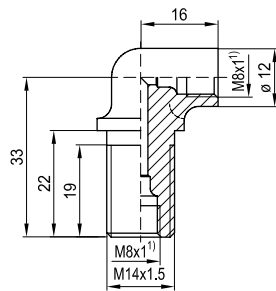
Connector, tube to tube



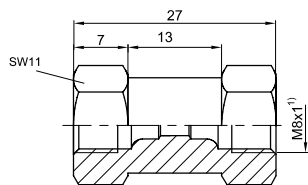
for outer tube diam.	Order No.	d1	d2 1)	d3 1)	L1	L2	sw
4	404-008	M14x1.5	M8x1	M8x1	27	19	17
4	404-009 *	M14x1.5	M8x1	M8x1	38	30	17
6	406-008	M14x1.5	M10x1	M10x1	30	20	17
8	408-008	M20x1.5	M14x1.5	M14x1.5	40	28	24
10	410-008	M20x1.5	M16x1.5	M16x1.5	42	27	24

Material: steel, galvanized surface

* specially long version for double frame.

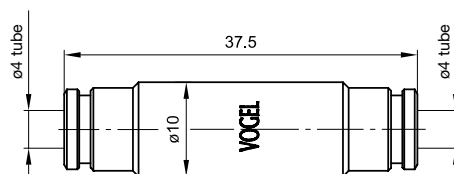
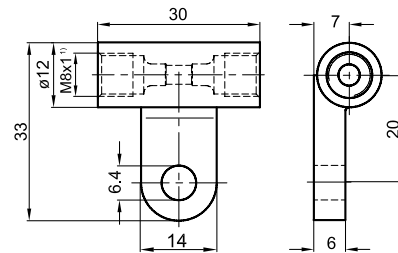
for outer
tube diam. **Order No.**4 **504-103**

Material: brass

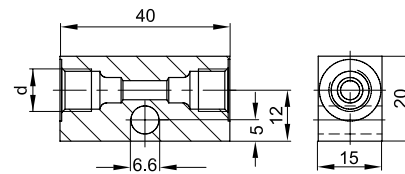
for outer
tube diam. **Order No.**4 **404-010**

Material: steel, galvanized surface

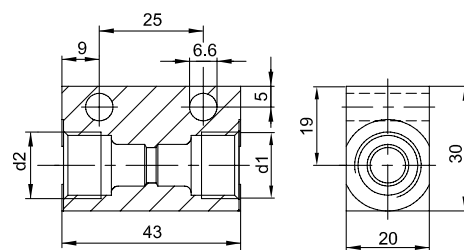
for quick connectors

for outer
tube diam. **Order No.**4 **454-504-041-VS**for outer
tube diam. **Order No.**4 **504-004** 1 fastening hole
4 **504-040** 2 fastening holes

Material: die-cast zinc

for outer
tube diam. **Order No.** d 1)6 **DAR506** M10x1
8 **DAR508** M14x1.5

Material: aluminum alloy

for outer
tube diam. **Order No.** d1 1) d2 1)10 **DAR510** M16x1.5 M16x1.5
8 and 10 **DAR510-S1** M14x1.5 M16x1.5

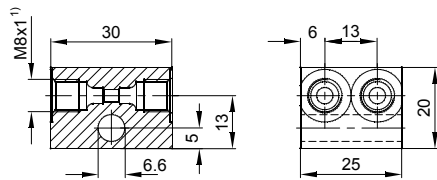
Material: steel, galvanized surface

1) Ports tapped for solderless tube connection

Fittings and auxiliary equipment

Connectors, tube to tube

Double connector

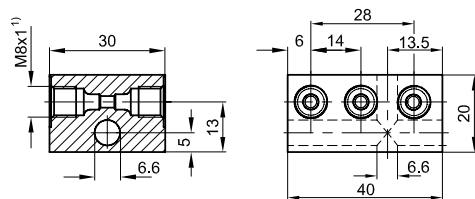


for outer
tube diam. **Order No.**

4 **DAR524**

Material: steel, galvanized surface

Triple connector

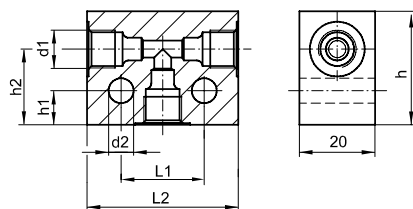


for outer
tube diam. **Order No.**

4 **DAR534**

Material: steel, galvanized surface

Tee

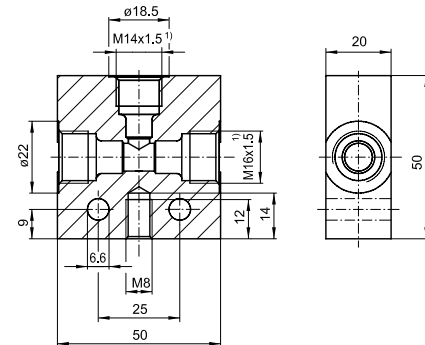


for outer tube diam.	Order No.	d1 1)	d2	L1	L2	h	h1	h2
6	DAT506 *	M10x1	6.6	22	40	30	9	20
8	DAT508 *	M14x1.5	6.6	32	50	40	9	29
10	DAT510 **	M16x1.5	7	25	52	40	15	29

Material: * aluminum alloy; ** steel, galvanized surface

¹⁾ Ports tapped for solderless tube connection

Tee

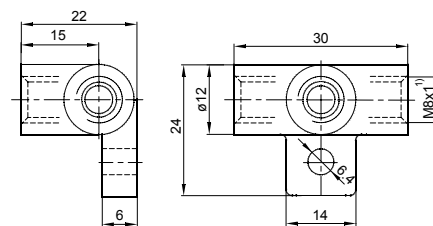


for outer
tube diam. **Order No.**

10 (2x) and 8 (1x) **DAT510-S1**

Material: steel, galvanized surface

Tee

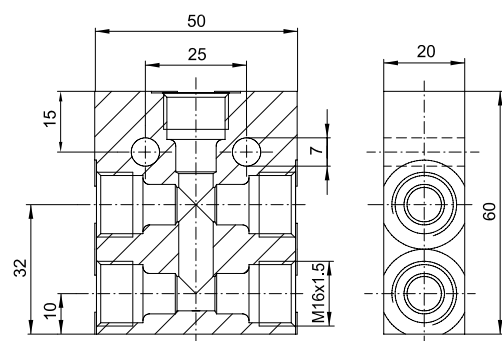


for outer
tube diam. **Order No.**

4 **504-045**

Material: die-cast zinc

Cross joint



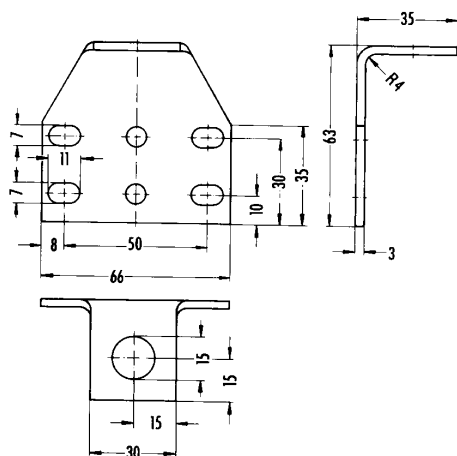
for outer
tube diam. **Order No.**

10 **DAK510-S1**

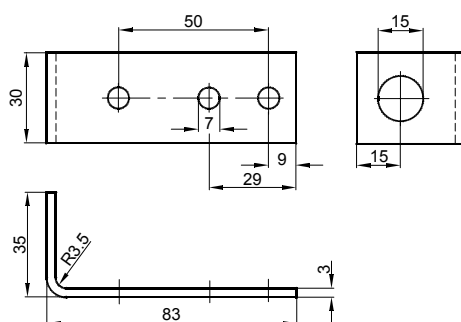
Material: steel, galvanized surface

Fittings and auxiliary equipment

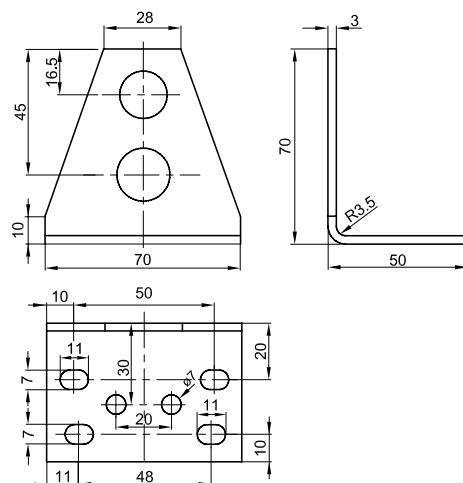
Fixing brackets for mounting of distributors

**Order No. 881-260-020**

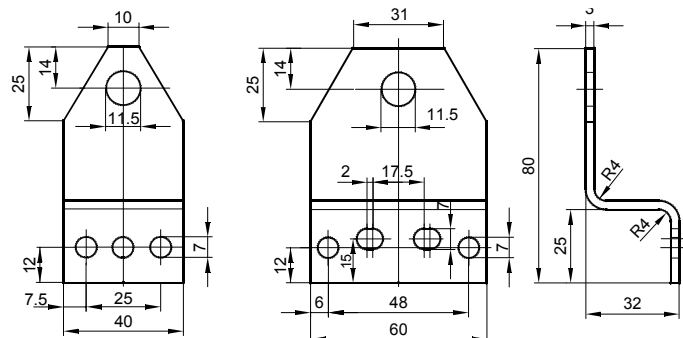
Material: steel, galvanized surface

**Order No. 881-280-006**

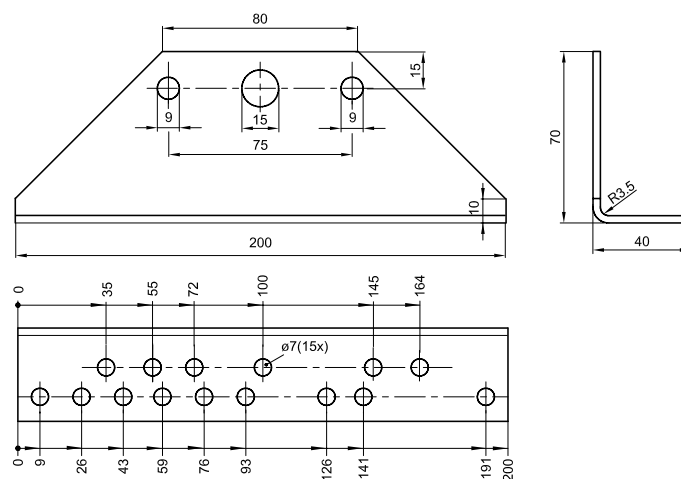
Material: steel, galvanized surface

**Order No. 881-280-007**

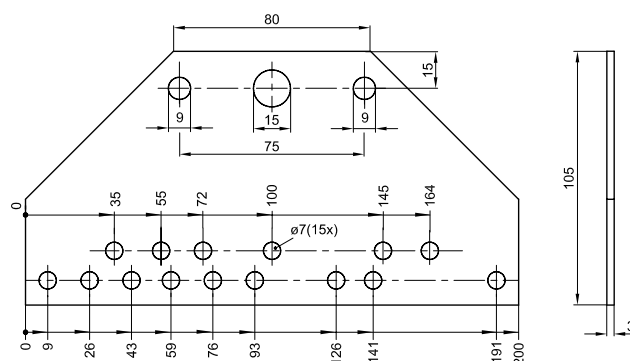
Material: steel, galvanized surface

**Order No. 881-280-008****Order No. 881-280-009**

Material: steel, galvanized surface

**Order No. 881-290-110**

Material: steel, galvanized surface

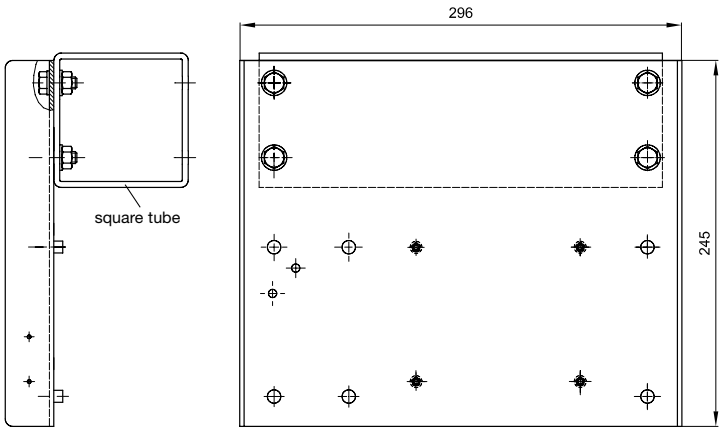
**Order No. 881-290-111**

Material: steel, galvanized surface

Fittings and auxiliary equipment

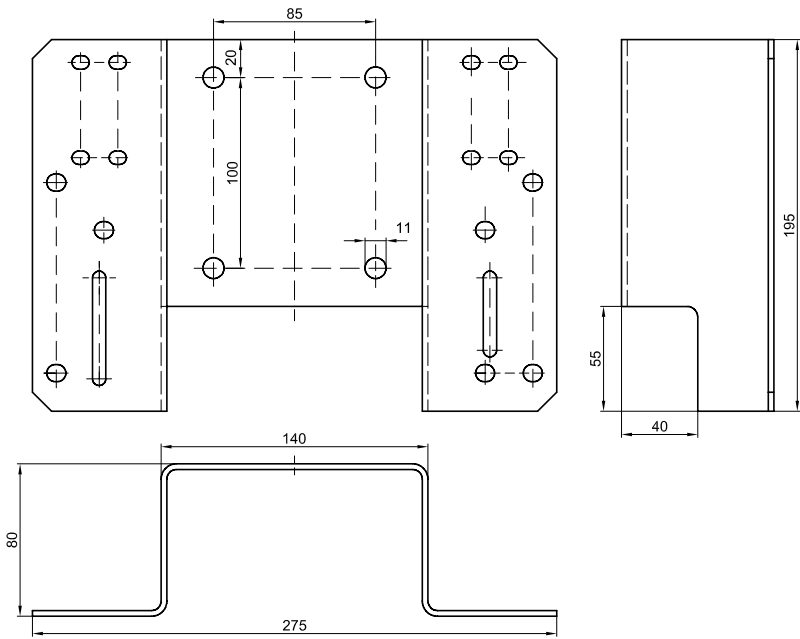
Pump fastening plate for systems with KFU gear pump units and PEF piston pumps

Order No. 995-002-140



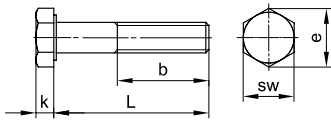
Bracket for systems with KFU gear pump units

Order No. 881-290-450



Fittings and auxiliary equipment

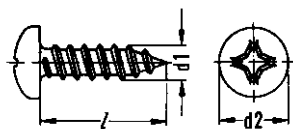
Fixing bolts



Hexagonal head bolts

Order No.	L	b	k	sw	e
DIN933-M6x20-8.8	20	20	4	10	11.1
DIN933-M6x25-8.8	25	25	4	10	11.1
DIN931-M6x30-8.8	30	18	4	10	11.1
DIN933-M6x35-8.8	35	35	4	10	11.1
DIN931-M6x40-8.8	40	18	4	10	11.1
DIN933-M6x45-8.8	45	45	4	10	11.1
DIN931-M6x55-8.8	55	18	4	10	11.1
DIN933-M8x25-8.8	25	25	5.5	13	14.4
DIN933-M8x35-8.8	35	35	5.5	13	14.4

Material: steel, galvanized surface

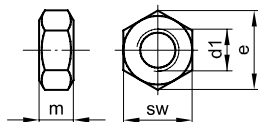


Self-tapping screws

Order No.	l	d1	d2
DIN7981-B4.2x9.5	9.5	4.2	8.2
DIN7981-BZ4.8x9.5	9.5	4.8	9.5
DIN7981-BZ4.8x13	13	4.8	9.5

Material: steel, galvanized surface

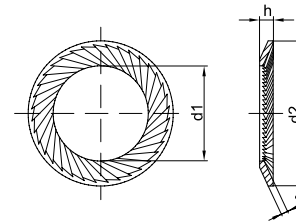
Nuts



Order No.	d1	m	sw	e
DIN934-M6-8	M6	5	10	11.5
DIN934-M8-8	M8	6.5	13	14.4
DIN936-M14x1.5-5	M14x1.5	8	22	25.4
DIN936-M16x1.5-5	M16x1.5	8	24	27.7
DIN936-M20x1.5-5	M20x1.5	9	30	34.6

Material: steel, galvanized surface

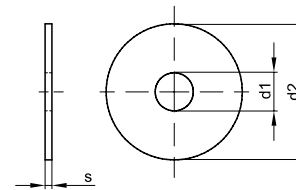
Lock washers



Order No.	for bolt	d1	d2	s	h
650-050	BZ 4.8	5.3	9	0.6	0.9
650-060	M6	6.4	10	0.7	0.9
650-080	M8	8.4	13	0.8	1.2
650-140	M14	15	22	1.2	1.8
650-160	M16	17	24	1.3	1.9
650-200	M20	21	30	1.5	2.2

Material: spring steel

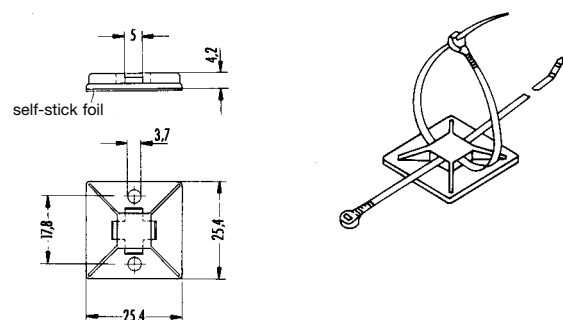
Body washers



Order No.	d1	d2	s
821-400-006	6.6	28	2
821-400-010	8.4	30	1.5

Material: steel, galvanized surface

Mounting base

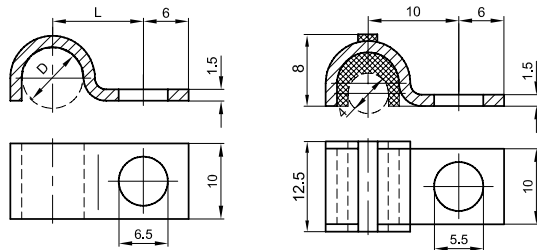


Order No. 179-990-186

Fittings and auxiliary equipment

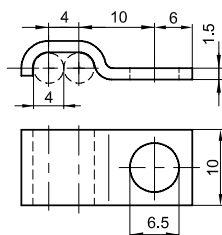
Mounting clips

Clip with cushion



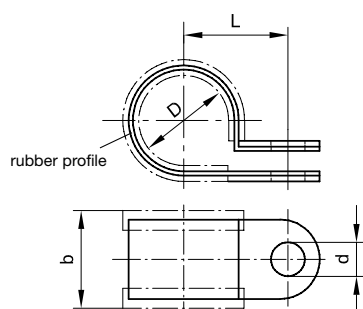
for outer tube diam. D	Order No.	L	for outer tube diam.	Order No.
4	604-001-A	9	4	604-111
6	606-010-A	10		
8	608-001-A	12		
10	610-001-A	13		

Material: mild steel, galvanized surface



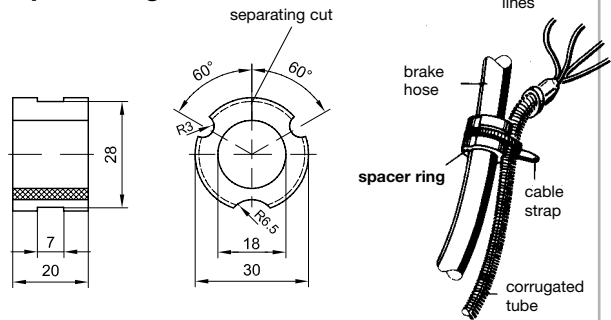
for outer tube diam.	Order No.	Number of tubes
4	604-002-A	2

Material: mild steel, galvanized surface



for outer tube diam. D	Order No.	d	b	L
6	941-206-104	5.2	15	11
6	941-206-108	6.4	18.5	14.2
8	941-208-104	6.4	18.5	15.2
9	941-209-104	5.2	15	12.5
12	941-212-104	6.4	18.5	17.2
13	941-213-104	6.4	18.5	17.7
15	941-215-104	6.4	18.5	18.7
17	941-217-104	5.2	15	16.5
20	941-220-104	6.4	18.5	21.2
22	941-222-100	6.4	18.5	22.2
27	941-227-104	10.2	31	31

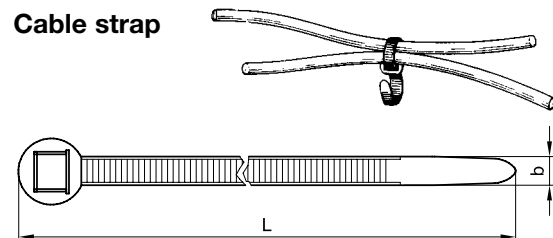
Spacer ring



Order No. 898-210-061

Material: CR (chloroprene rubber)

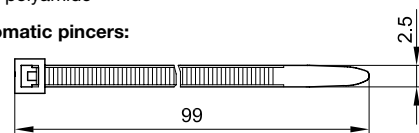
Cable strap



Order No.	L	b
898-610-000	197	4.9
898-710-000	302	4.9
898-710-001	360	7.5

Material: polyamide

For automatic pincers:

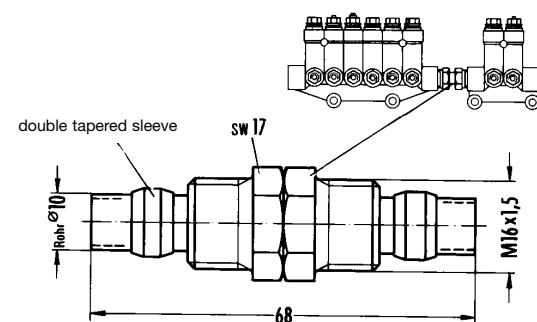


single part

Order No. 898-510-002 898-510-000

Material: polyamide

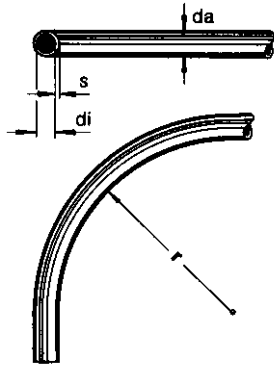
Connector for VKSO distributors



Order No. VKR2.U2

Fittings and auxiliary equipment

Tubing



Use screw unions with reinforcing sockets for plastic tubing

Steel tubing, galvanized

Order No.	da	s	di	minimum bending radius r	
				bent with mandrel	bent with grooved disk
WV-RO4x0.7VERZI	4	0.7	2.6	6	–
WV-RO6x0.7VERZI	6	0.7	4.6	22	16
WV-RO8x0.7VERZI	8	0.7	6.6	42	22
WV-RO10x0.7VERZI	10	0.7	8.6	71	27
Diesel injection pipe					
DIN73000A2-6ST30AL	6	2.0	2.0	22	16

Plastic tubing WVN715, unplasticized/semi-rigid as per DIN 73 378

Order No.	da	s	di	minimum bending radius r	perm. operating pressure	rupture pressure
					(bars)	(bars)
WVN715-RO10x1.5+A89	10	1.5	7	89	40	120

Color: black

Plastic tubing WVN716, flexible as per DIN 73 378

Order No.	da	s	di	minimum bending radius r	perm. operating pressure	rupture pressure
					(bars)	(bars)
* WVN716-RO4x0.85	4	0.85	2.3	38	36	109
WVN716-RO6x1.25	6	1.25	3.5	63	35	106

* The WVN716-RO4x0.85 plastic tubing can be supplied in various colors and also filled with grease NLGI grades 000, 00 or 0.

The following color key information to be added to the order No. applies in this case:

Color key	Color key tubing filled with grease
A 87 = green	AF 1 = natural color
A 88 = red	AF 4 = brown
A 89 = black	AF 6 = black
A 90 = brown	AF 7 = red
without color key: natural color	AF 8 = green

Order examples

Plastic tubing WVN716-RO4x0.85, color **black**, 5 m long:

Order No. WVN716-RO4x0.85+A89, 5 m

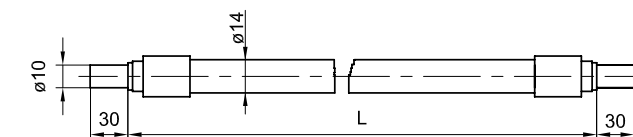
Plastic tubing WVN716-RO4x0.85, color **green**, filled with grease, NLGI-Klasse 000, 00 or 0, 8 m long:

Order No. WVN716-RO4x0.85+AF8, 8 m

Fittings and auxiliary equipment

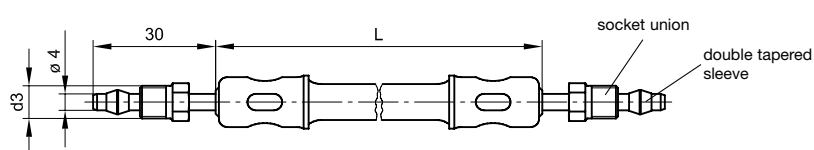
Hoses for main lines

(connection: pump - distributor)



L + 5	Order No.	External tube diam.	Hose diam.	Socket union thread
580	SLH10-580	10	14	M16x1.5
650	SLH10-650			
1600	SLH10-1600			

Material inner liner: PA 11/12 oder PE-E
 reinforcement: 1 layer of braided, highly tear-resistant synthetic fiber
 outer cover: PA 11/12
 Please order tapered sleeves 410-611 and socket unions 410-612-MS separately.



Hoses for secondary lines

(connection: distributor - lubrication point)

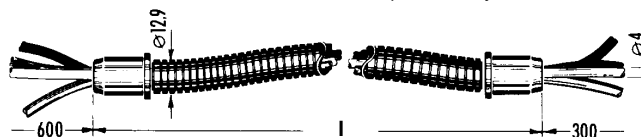
Please note!

These hoses line must not be used as main hose lines

L + 5	Order No.	External tube diam.	Hose diam.	d3
220	734-220-K	4	8.8	M8x1
260	734-260-K			
300	734-300-K			
340	734-340-K			

Complete with socket unions and double tapered sleeves

Material hose: oil-proof rubber inside and outside with braided rayon carcass.
 tube ends: steel tube, tube ends permanently bonded to the hose.



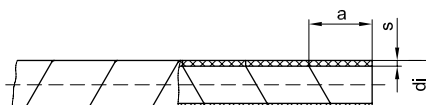
Multiple-line hoses

(connection: distributor - lubrication point)

L + 5	Order No.	Hose diam.
580	774-580	12.9
960	774-960	

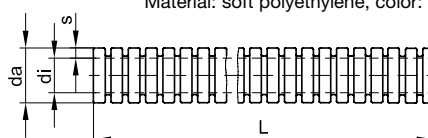
Material protective hose: polyamide PA 6
 plastic tubes: polyamide PA 11 or PA 12, flexible
 4 colors: green, black, red, brown

Protective helix



Order No.	d _i	s	a	
982-760-061	4	1	10	Please indicate length (up to 25 m) when ordering
982-760-121	8.5	1.5	10	

Material: soft polyethylene, color: black



Protective hose

Order No.	rated width	d x s	d _i	L *)
982-760-070	4	7 x 1,25	4	up to max. 100 m *)
982-760-120	8	11.7 x 1.6	8.4	up to max. 50 m *)
982-760-130	10	12.9 x 1.5	10	
982-760-160	12	15.7 x 1.7	12.3	

Material: polyamide 6; color: black

*) please quote when ordering

Hose sleeves
 for protective hose 982-760-130
 (rated width 10)



Order No.
 2-hole:
 898-210-047



3-hole:
 898-210-075

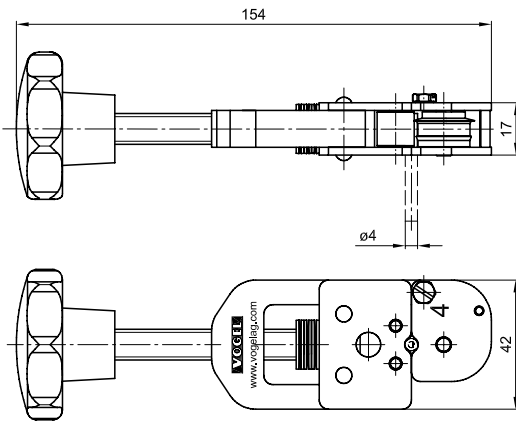


4-hole
 898-210-063

Fittings and auxiliary equipment

Tube cutter

with formation of claw groove for 4 mm diam.
quick tube connectors

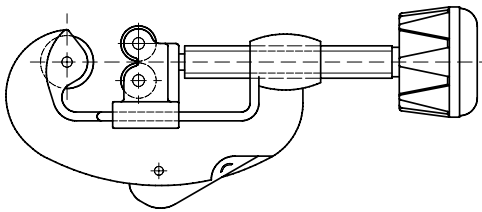


Order No. 169-000-336

Cutting wheel

Order No. 844-330-006

Tube cutter



Order No. 169-000-301

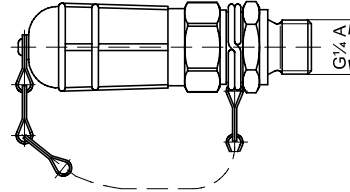
Spare cutting wheel

Order No. 844-300-001

Shears for plastic tubing

Order No. 169-000-090

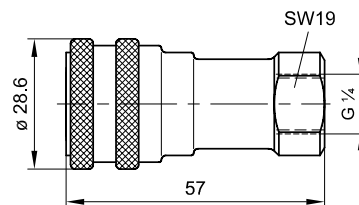
Filler socket



Order No. 995-000-705

Respective coupling socket order No. 995-001-500

Coupling socket for topping-up port

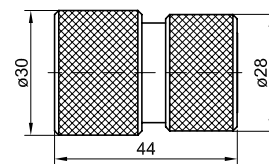


Order No. 995-001-500

Respective plug order No.. 833-370-001

Connection piece with hose socket, ND 16
order No. 857-870-002

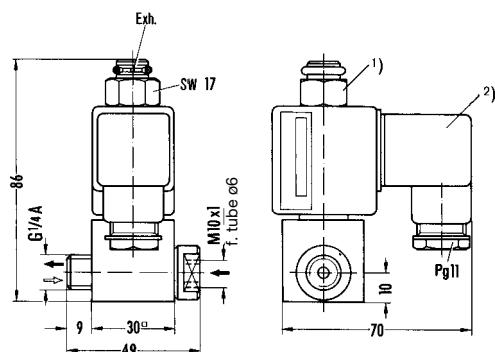
Coupler for grease drum FL1-000



Order No. KFU2.U8

Fittings and auxiliary equipment

3/2-way solenoid valves



for mounting on the pump: order No. DVS3206-E-F

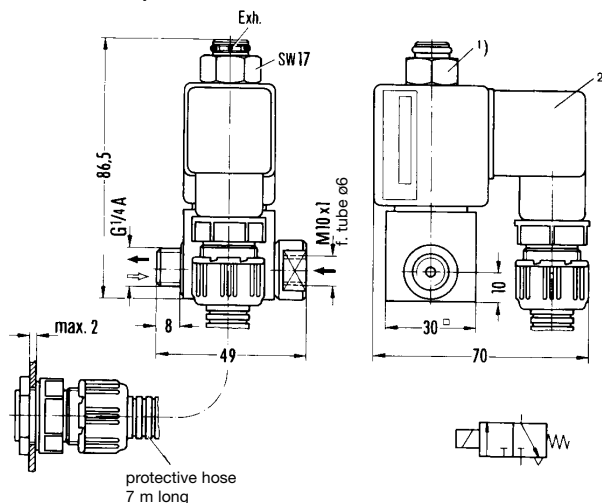
Type of enclosure IP 56 a

Associated coupler socket, order No. 179-990-091

Technical data of valves

passage at valve seat	2 mm diam.
air-flow rate at 6 bars	200 l/min
max. air pressure	10 bars
switching frequency	ca. 250/min
voltage	12 / 24 V DC
	(please quote when ordering)
power consumption	ca. 12 W
mounting position	as shown

complete with protective hose and screw union for GGVS *) vehicles



Order No. DVS3206-E-F-S1

Type of enclosure IP 56 a

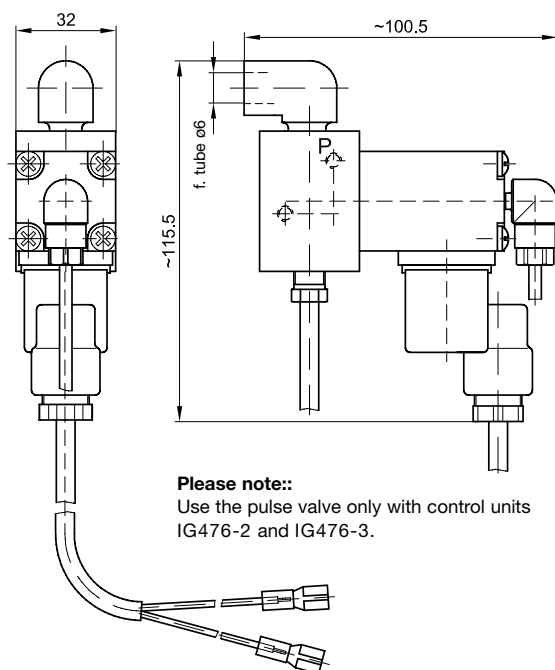
Associated coupler socket, order No. 179-990-296

*) vehicles carrying hazardous material

1) The magnet can be turned to any position after nut is loosened.

2) Coupler socket with interference suppression circuit.

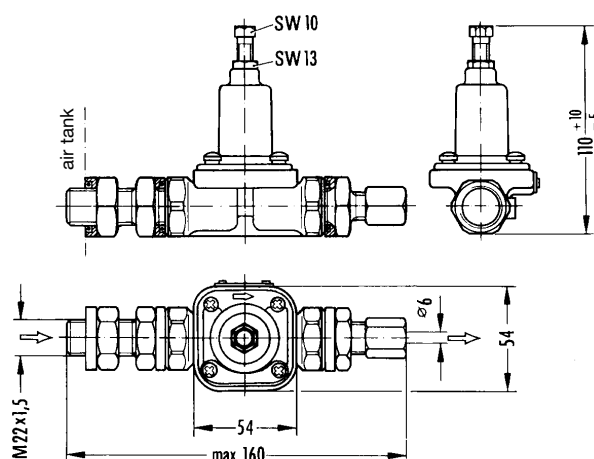
Pulse valve



Please note::
Use the pulse valve only with control units IG476-2 and IG476-3.

Order No. 995-800-166

Overflow valve without return flow



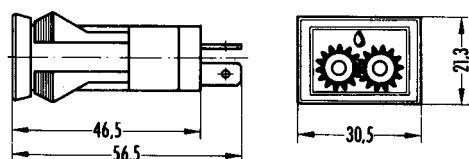
Order No. 232-100-001

operating pressure	max. 10 bars
permissible medium	air
temperature range	-40 °C to +80 °C
rated width	8 mm
overflow pressure 1)	6 bars

1) The secondary units are not supplied until a pressure of more than 6 bars reached in the main tank.

Fittings and auxiliary equipment

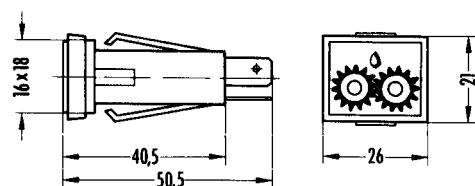
Indicator lights



for MAN vehicles and Mercedes-Benz buses

Order No. 179-100-028

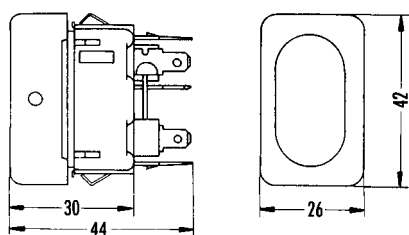
Indicator light fitted with filament lamp (order No. 179-100-026).
Spare filament lamp, order No. 179-100-054.



for Mercedes-Benz trucks

Order No. 179-100-025

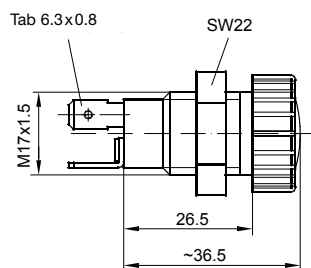
Indicator light fitted with filament lamp (order No. P-66.62).
Please indicate 12 V or 24 V voltage when reordering.



for Scania trucks

Order No. 179-100-070

This includes: base, order No. 179-990-330
2 receptacles, order No. 179-990-331



for general needs

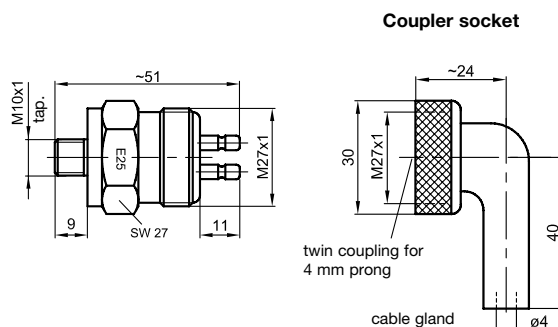
Order No.	Face	Voltage	Power
P-66.60GRUEN	green		
P-66.60ROT	red	12 or 24 V	2 W
P-66.60GELB	yellow		

Spare filament lamp

Order No.	Voltage	Power
P-66.62	12 or 24 V	2 W

Please indicate 12 V or 24 V voltage when ordering.

Pressure switch



Order No. switching pressure (bars)

DS-E20-S1	20 ± 2,5
DS-E25-S1	25 ± 2,5

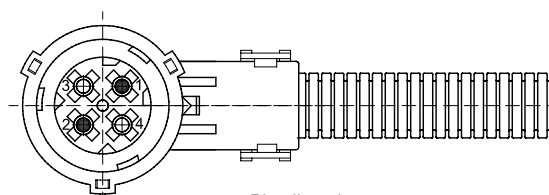
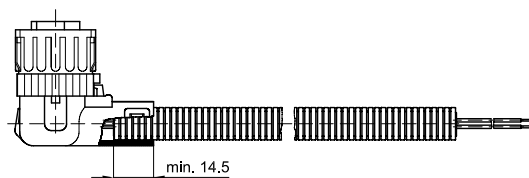
connection for 4 mm prongs
contact rating 130 W at 24 V
temperature stability -25 °C to +80 °C
type of enclosure IP 56 a
type of contact NO contact

The diaphragm is resistant to mineral oils.

Coupler socket, Order No. 179-990-098

Coupler socket for corrugated tube

Order No. 997-000-376

Cable harness 12 m – 2-core type
for system with KFUS2-64 gear pump unit

Pin allocation

Pin No.	Function	Core color
1	- 31	brown
2	+ 15	red/black

Order No. 997-000-750

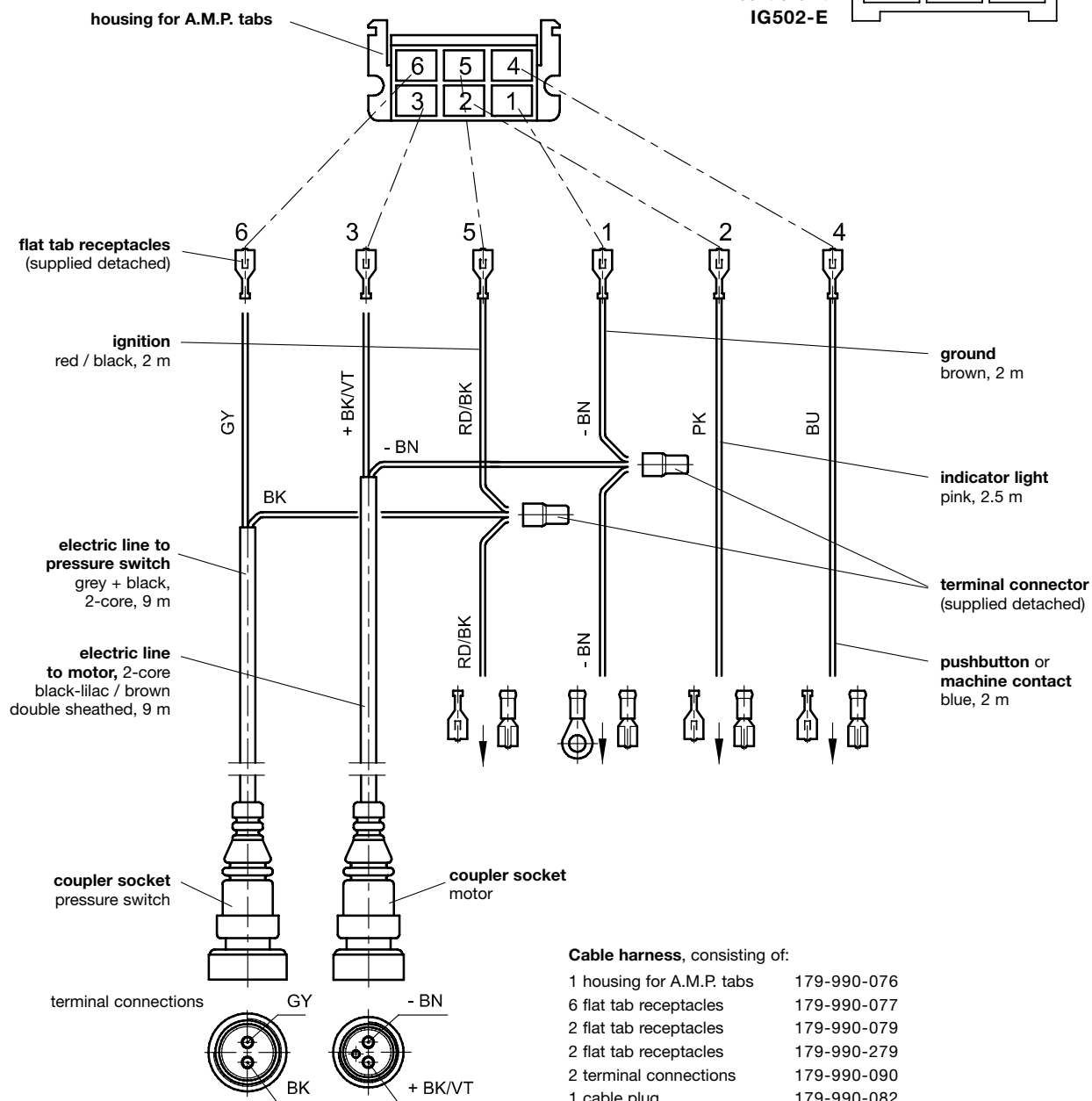
Fittings and auxiliary equipment

Cable harness for systems with KFU2-40, KFU6-20 gear pump units

Order No. 997-000-373

Connection
terminals for the
control unit
IG502-E

PS/CS	15	DK/MK
M	SL	31



Cable harness, consisting of:

1 housing for A.M.P. tabs	179-990-076
6 flat tab receptacles	179-990-077
2 flat tab receptacles	179-990-079
2 flat tab receptacles	179-990-279
2 terminal connections	179-990-090
1 cable plug	179-990-082
1 coupler socket (DS)	179-990-098
1 connector shell	179-990-272
2 plug sockets	179-990-264
1 plug cap	898-320-023
1 socket union	847-420-006
1 washer	824-400-004

} Motor connection

Cable 1.5 mm²

single-sheathed	981-900-008
double-sheathed, 2-core	981-900-018 for pressure switch
double-sheathed, 2-core	981-900-031 for motor

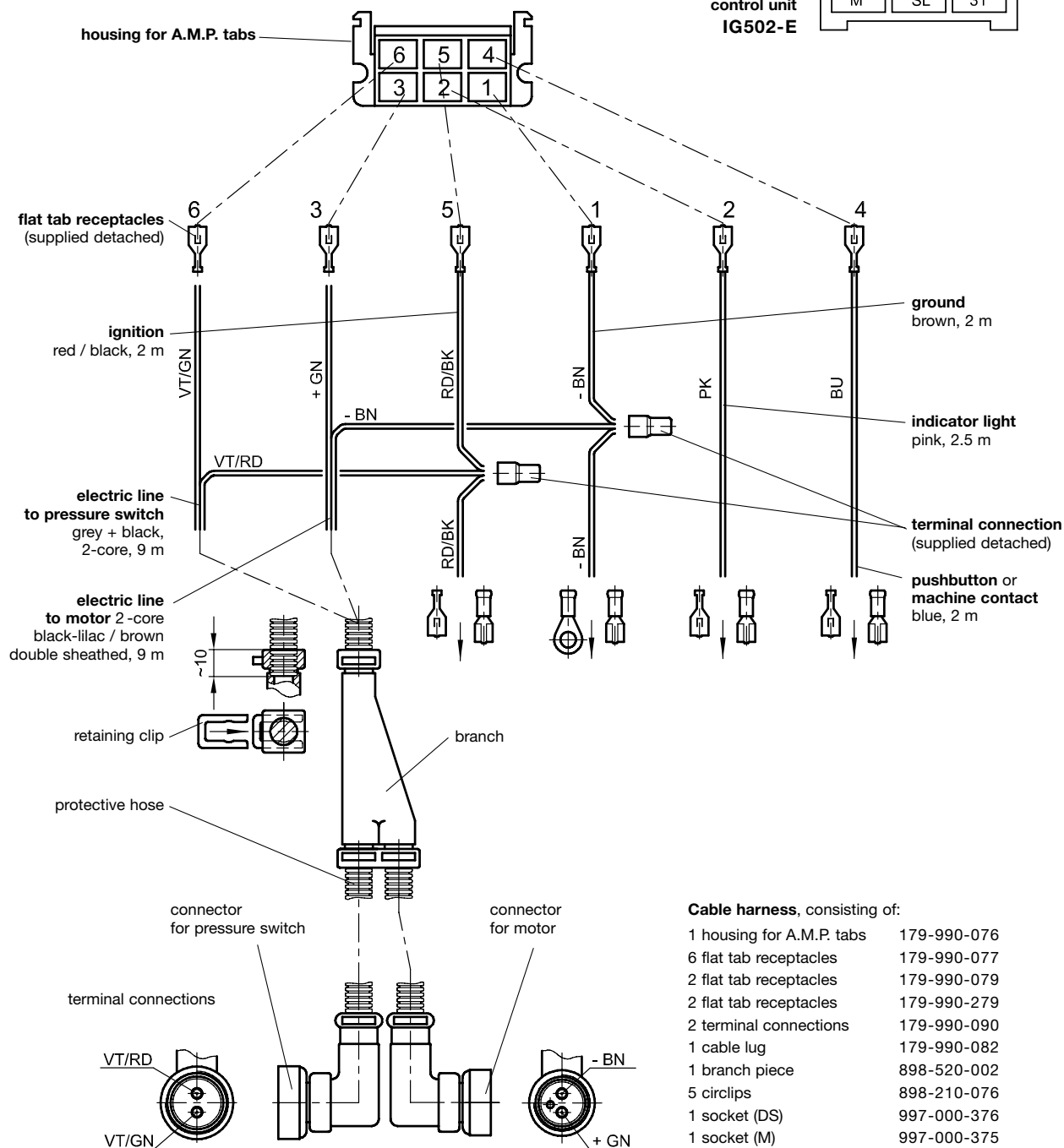
Fittings and auxiliary equipment

Cable harness for systems with KFU2-40, KFU6-20 gear pump units used on vehicles carrying hazardous goods

Order No. 997-000-374

Connection
terminals for the
control unit
IG502-E

PS/CS	15	DK/MK
M	SL	31



Cable harness, consisting of:

1 housing for A.M.P. tabs	179-990-076
6 flat tab receptacles	179-990-077
2 flat tab receptacles	179-990-079
2 flat tab receptacles	179-990-279
2 terminal connections	179-990-090
1 cable lug	179-990-082
1 branch piece	898-520-002
5 circlips	898-210-076
1 socket (DS)	997-000-376
1 socket (M)	997-000-375
4 cable straps	898-610-004
1 corrugated tube 11 m	982-760-120

Cable 1.5 mm², insulated 981-900-047

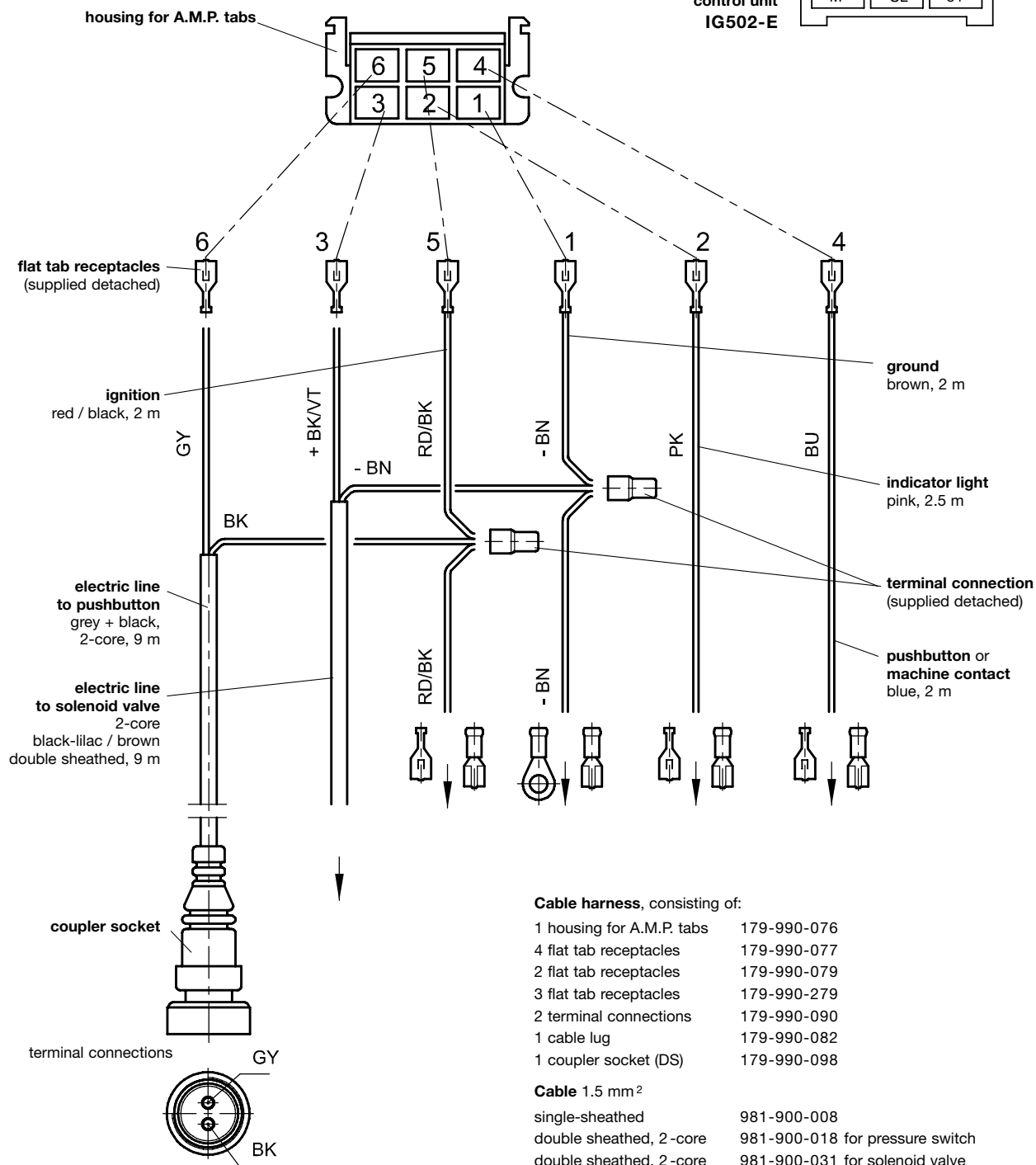
Fittings and auxiliary equipment

Cable harness for systems with PEF-90 piston pump

Order No. 997-000-189

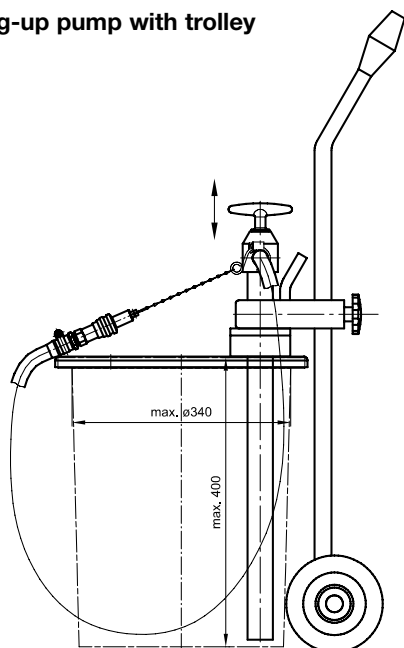
Connection
terminals for the
control unit
IG502-E

PS/CS	15	DK/MK
M	SL	31



Fittings and auxiliary equipment

Topping-up pump with trolley



Order No. 169-000-082

Can be used for grease drum **FL25-000**
FL25-000-BIO

max. internal diameter 340 mm
max. height 400 mm
capacity 25 kg
pump output 0.1 l / stroke $\pm 10\%$

Operating instructions

Open the grease drum and place the cover of the topping-up pump on the drum.

Insert the suction tube in the opening in the cover, push down to the bottom of the grease drum and secure with the lock screw.

Use a clean cloth to thoroughly clean the filler socket of the vehicle pump and filler coupling of the grease pump after removing the protective caps.

Now connect the coupling of the topping-up pump to the filler socket of the vehicle pump. The hose coupling must snap into place when connected.

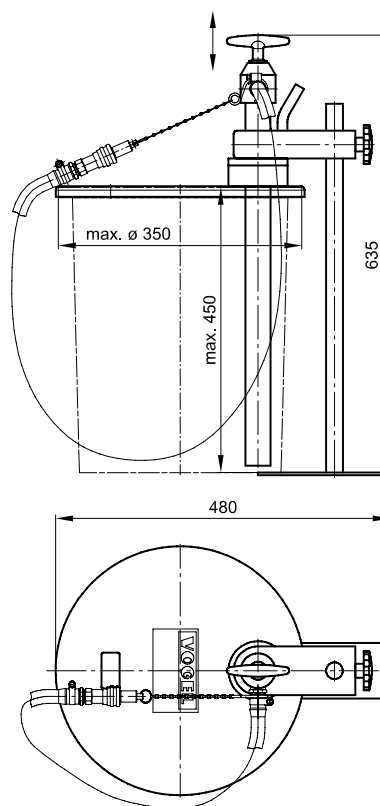
Actuate the lever of the topping-up pump until the reservoir of the vehicle pump is filled to within **approx. 1 cm of the top edge** (max. marking on reservoir).

When the reservoir is full remove the coupling from the pump and put the protective cap back on the filler socket.

Slip the coupling half of the topping-up pump onto the respective holder.

Coupling bush for topping-up connection
order No. 995-001-500

Topping-up pump without trolley



Order No. 169-000-084

Can be used for grease drum **FL25-000**
FL25-000-BIO

max. internal diameter 340 mm
max. height 450 mm
capacity 25 kg
pump output 0.25 l / double stroke

Connection of compressed-air supply line to the compressed air system of a vehicle for a pneumatically operated centralized lubrication system

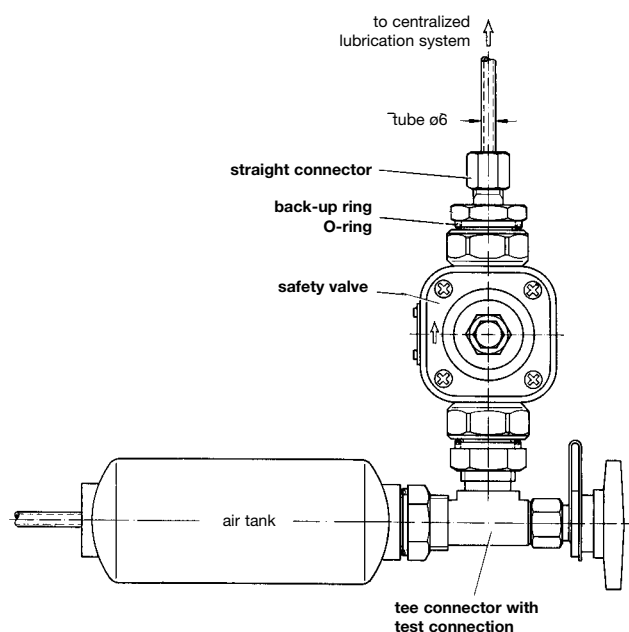
- Observe the regulations of the Technical Control Board (Technischer Überwachungsverein) when connecting the air supply for the centralized lubrication system.
- The air supply line may only be connected to an air tank or to a line for secondary loads.
- The compressed air for the centralized lubrication system must be clean and dry.

The following check should be made to ascertain whether the air supply line has been connected at a place conforming to the safety regulations:

- Open the air line to the centralized lubrication system so that the air can escape. The air pressure indicated on the pressure gauge in the driver's cab must not drop below 5.5 bars; the air brake pressure is thus maintained as prescribed.

For trailers with laminated leaf springs:

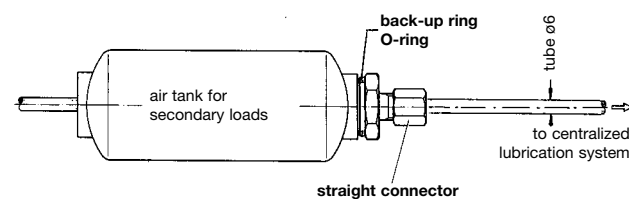
Air connection at the air tank with safety valve
(without return flow).



	Order No.
Safety valve	232-100-000
Tee connector with test connection	491-900-001
Straight connector	441-006-432
Back-up ring	847-400-004
O-ring	971-020-250

For trailers with air suspension:

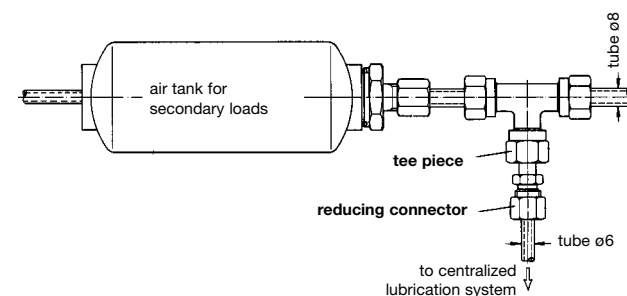
Air connection at the air tank for secondary line loads with straight connector.



	Order No.
Straight connector	441-006-432
Back-up ring	847-400-004
O-ring	971-020-250

For trailers with air suspension:

Air connection at air tank for secondary loads branch of air connection with tee piece.



	Order No.
Tee piece	408-407
Reducing connector	408-406



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