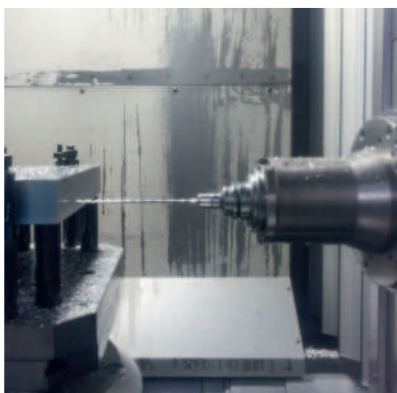
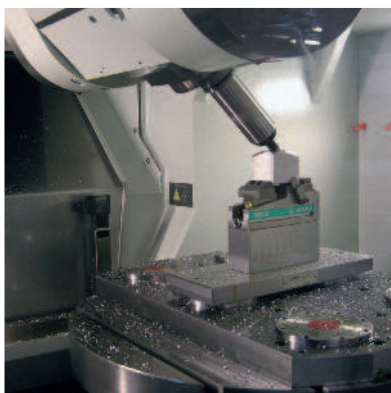
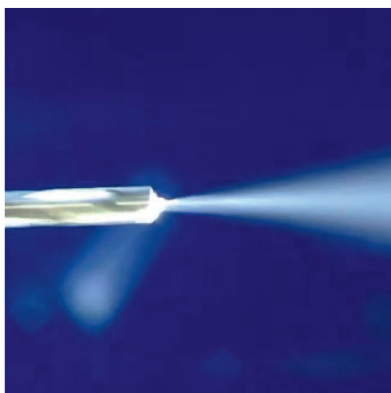


Minimal quantity lubrication (MQL) SKF LubriLean

Product series DigitalSuper

Extended product range with enhanced performance and state-of-the-art communication



Products and applications

The innovative technology of the SKF LubriLean DigitalSuper makes it possible to use minimal quantity lubrication (MQL) for a wide range of cutting applications.

The unit's innovative generation of aerosol, combined with a powerful integrated control unit, constantly provides an optimal supply of oil for the machining process, even in case of unfavourable pressure ratios caused by the application (deep-hole drilling) or by small diameter cooling ducts.

The LubriLean DigitalSuper stands out due to its performance as well as for its very user-friendly operation.

SKF LubriLean can replace the centralized cooling system in many machining processes. It assists customers in reducing costs of cooling system operation and maintenance, enables higher metal-cutting speed, increases the machining surface quality, extends the tool's service life and lowers the passive impact on the environment.

Applications:

- Machining centers
- Turning centers
- The DigitalSuper 2 is available mainly for use on machining centers with double spindles or on turning machines with two turrets.
- The DigitalSuper with Bypass-Control (BPC) is for use in advanced drilling tasks such as deep-hole drilling with small tool diameters (<5 mm).

Advantages:

- Usable in nearly all production processes (optimally defined droplet size of 0,5 µm)
- Short response times (tool changes)
- No moving parts (thus wear-free)
- Specially suitable for small tools and high cutting speeds
- Simple integration in machine tool systems (retrofits, standard)
- Aerosol transport through lines as long as 20 m
- Continuous and homogenous aerosol flow
- No energy consumption for aerosol production

Application finder DigitalSuper

Product series	Machining center Regular tools	Machining center Deep-hole drilling Ø < 5 mm	Turning center	Protocol PROFIBUS	PROFINET
UFD10-1-100000	•	•	•	•	
UFD10-1-110000				•	
UFD10-1-101000	•	•	•	•	
UFD10-1-111000				•	
UFD10-1-200000	•		•		•
UFD10-1-210000		•			•
UFD10-1-201000	•		•		•
UFD10-1-211000		•			•
UFD20-1-100000	•		•	•	
UFD20-1-101000	•		•	•	



Cutting processes



Milling and drilling processes



Two spindles

DigitalSuper devices with two aerosol generators work with machine centers with two spindles

Features

Aerosol generation

SKF LubriLean is based on the Venturi effect principle, supplying lubricant in aerosol form to the cutting point without a pump element. It provides the minimum quantity of lubricant that the metal-cutting process requires for lubrication between the tool and work-piece.

A special system of nozzles in the reservoir turns the lubricant and compressed air into a fine aerosol with a homogenous drop-let size of roughly 0,5 µm. Due to its small particle size, the aerosol passes through rotating spindles on machining centers or winding ducts in the turrets on modern turning centers all the way to the cutting site without any separation of the aerosol en route.

Reliable machining is assisted by the transportation of nearly loss-free aerosol.

A number of aerosol generators in the product can be combined flexibly to produce the required aerosol for different machining processes.

Communication interface

Modern machining centers with a large number of tools require individual control of the aerosol quantity by way of a stored program controller (SPC). This is possible with the LubriLean DigitalSuper system. The aerosol quantity and composition required for the respective tool and cutting tasks are set by the transmission of program numbers to the DigitalSuper using M or H commands from the machine's control system.

A PROFIBUS or PROFINET interface conforming to HPC specifications permits easy system integration.

The LubriLean DigitalSuper comes with comprehensive interfaces to support PC-based, machine-independent system diagnoses.

Deep-hole drilling

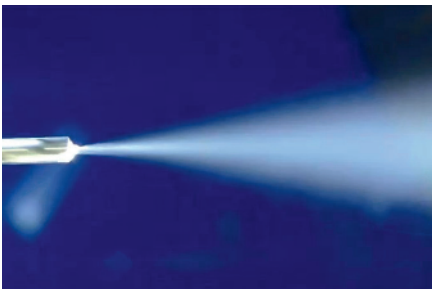
The active Bypass-Control (BPC) has been developed for advanced drilling tasks such as deep-hole drilling with small tool diameters (<5 mm).

The increasing drilling depth restrains the aerosol throughput during these machining tasks, making it more difficult to bring the required amount of lubricant to the cutting edge of the tool. Due to inappropriate internal pressure conditions, the decreasing air throughput results in decreasing aerosol generation.

The active Bypass-Control works against this physical effect. To make this happen, a Y-fitting splits the aerosol flow at the end of the aerosol line, as close as possible to the spindle (→ Fig. 3, page 4).

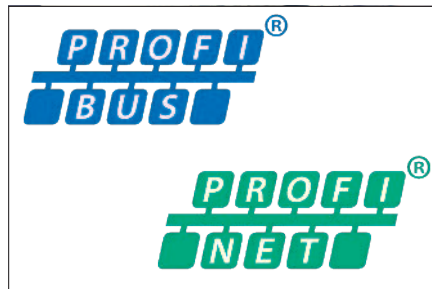
One part of the split aerosol flow is led through the spindle to the tool, and the other part is led through a bypass valve back to the refilling reservoir or into the exhaust system of the customer's machine.

During the machining process, the bypass valve is closed and opened, depending on the pressure conditions in the MQL system. This results in consistent aerosol generation and a reliable and homogenous supply to the tool during the entire drilling process.



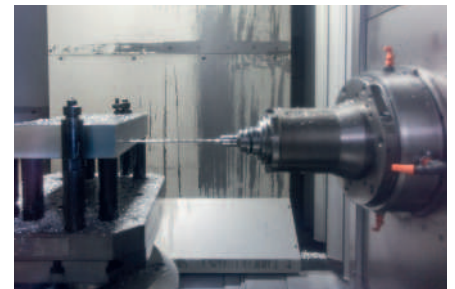
Aerosol generation

A continuous and homogenous aerosol flow is generated by DigitalSuper devices



Communication interface

Depending on your machine, SKF offers devices with PROFIBUS or PROFINET protocol

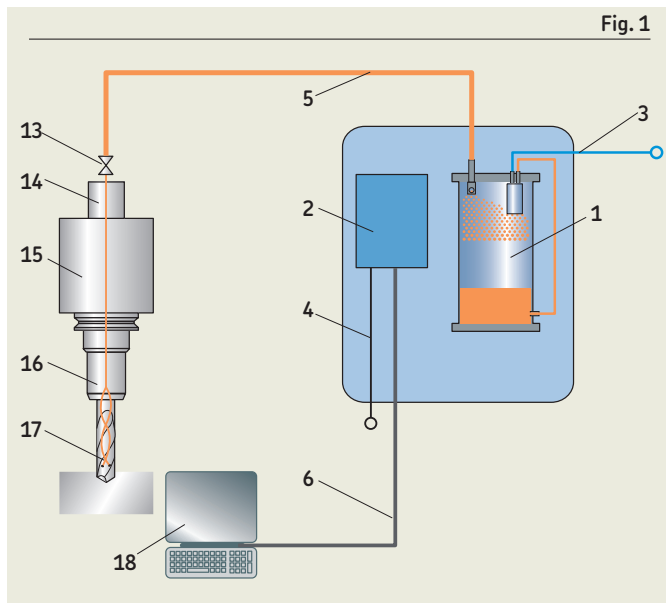


Deep-hole drilling

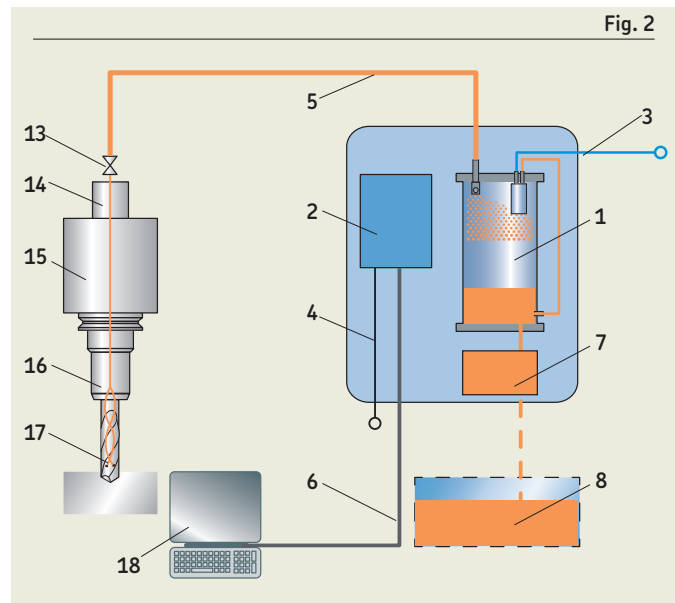
SKF DigitalSuper devices with Bypass-Control reliably support advanced machining processes with small tools

Product range

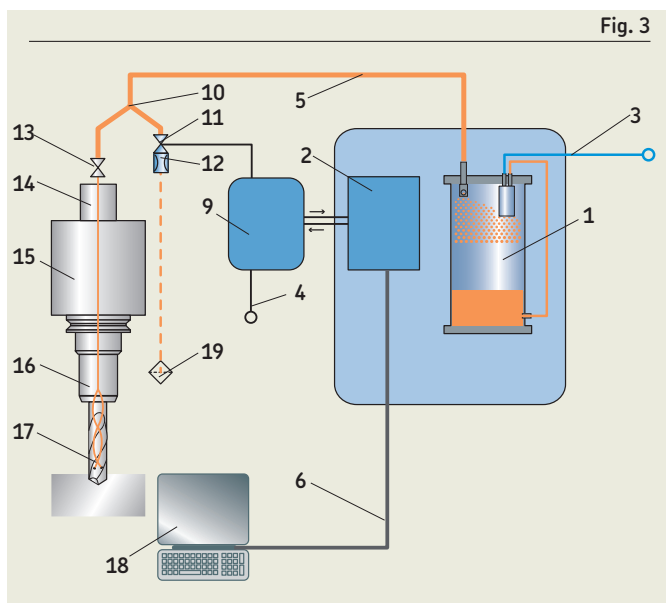
SKF offers an easy-to-configure MQL system. The UFD10 series comes with one aerosol generator and PROFIBUS or PROFINET protocol (→ Fig. 1). Additionally, you can order a filling pump system (→ Fig. 2) and a Bypass-Control (→ Fig. 3). A combination of both is possible (→ Fig. 4), depending on your application.



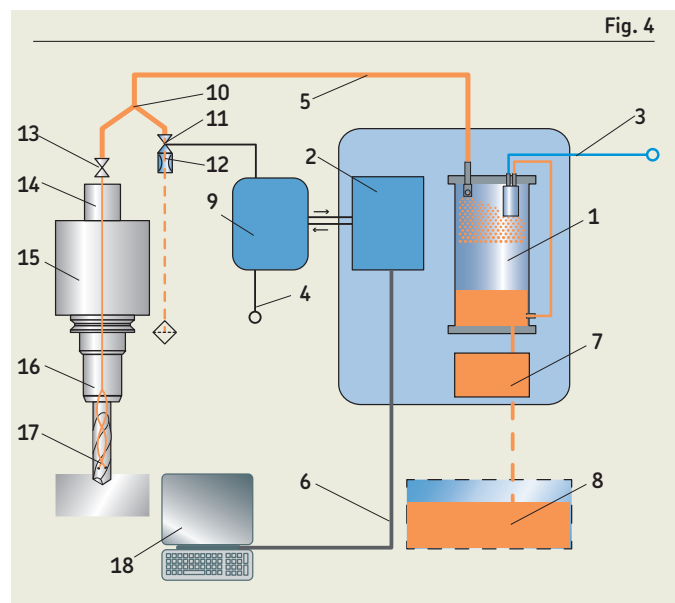
MQL System DigitalSuper with one aerosol generator
PROFIBUS UFD10-1-100000
PROFINET UFD10-1-200000



MQL System DigitalSuper with one aerosol generator, filling pump and optional refilling reservoir
PROFIBUS UFD10-1-101000
PROFINET UFD10-1-201000

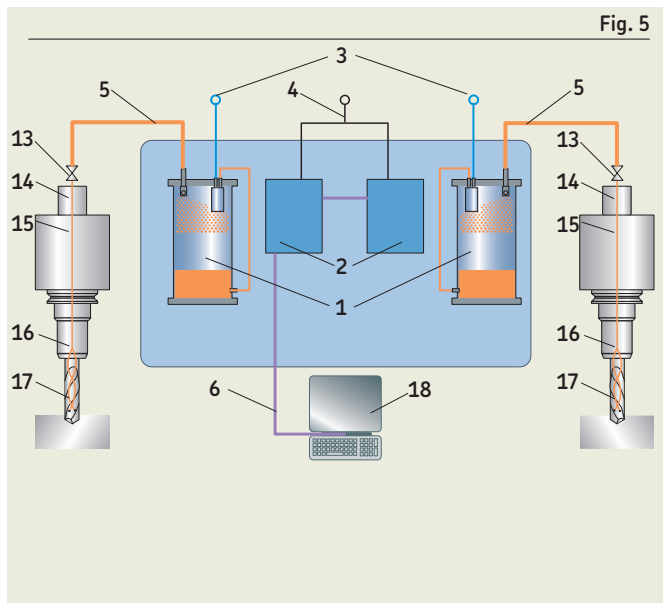


MQL System DigitalSuper with one aerosol generator and Bypass-Control
PROFIBUS UFD10-1-110000
PROFINET UFD10-1-210000

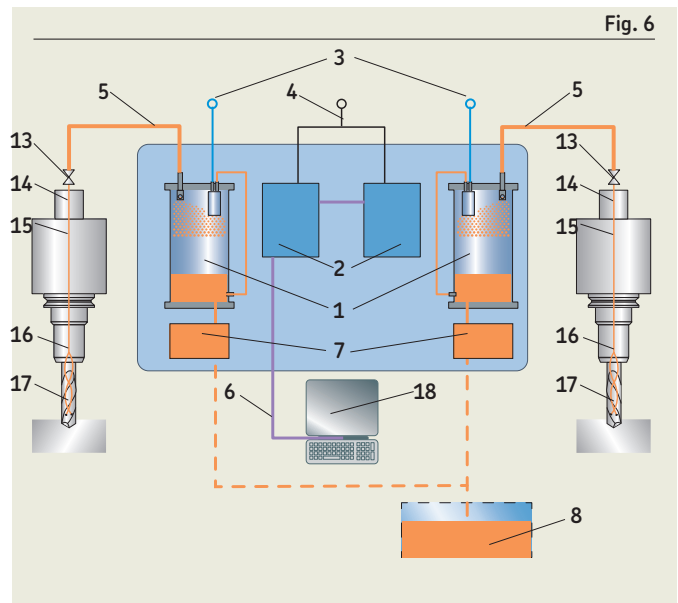


MQL System DigitalSuper with one aerosol generator, Bypass-Control, filling pump and optional refilling reservoir
PROFIBUS UFD10-1-111000
PROFINET UFD10-1-211000

The UFD20 series comes with two aerosol generators and PROFIBUS protocol (→ Fig. 5). Additionally, you can order a filling pump system (→ Fig. 6).



MQL System DigitalSuper with two aerosol generators
PROFIBUS UFD20-1-100000



MQL System DigitalSuper with two aerosol generators, filling pump and
optional refilling reservoir
PROFIBUS UFD20-1-101000

Description for figures 1–6

- 1 Aerosol generator
- 2 MQL internal control unit
- 3 Pressurized air inlet
- 4 Power
- 5 Aerosol line
- 6 Communication protocol
- 7 Filling pump
- 8 Refilling reservoir (→ accessories)
- 9 Bypass-Control unit
- 10 Y-splitter
- 11 Bypass- / wetting-out valve
- 12 Bypass throttle
- 13 Ball valve
- 14 Rotary unit
- 15 Spindle
- 16 Tool holder
- 17 Tool
- 18 Machine tool control
- 19 Separator

⚠ CAUTION

The important information on product usage located on the back cover applies to all systems described in this brochure.

Technical data

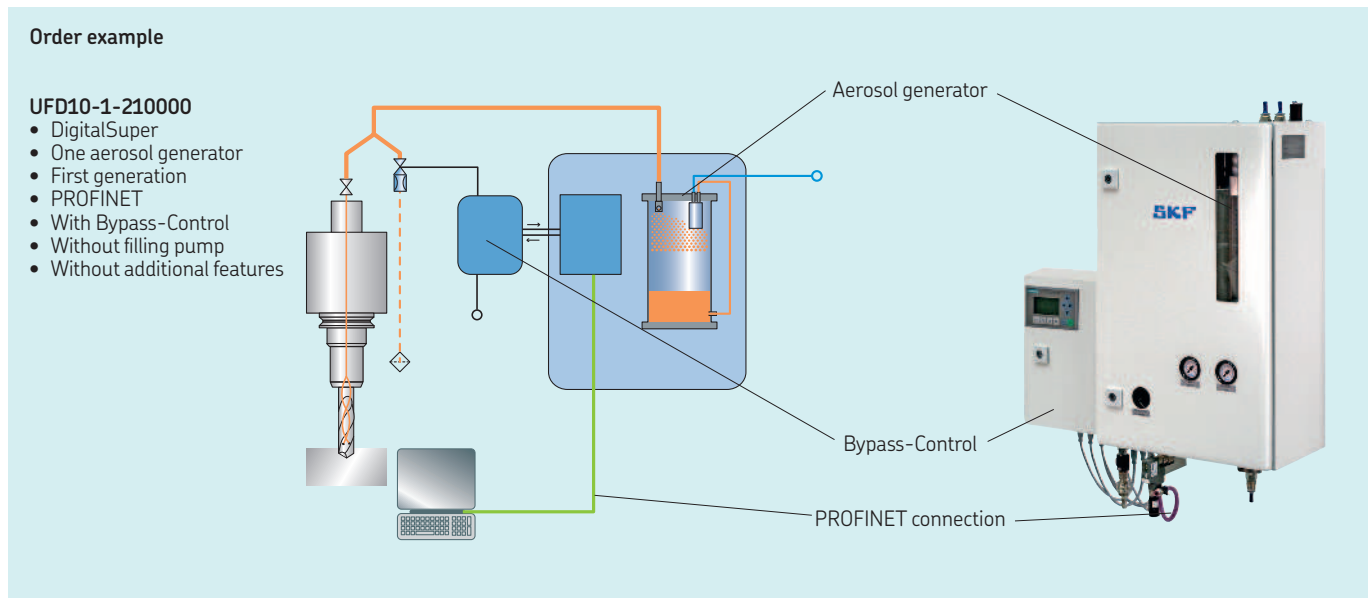
Technical data for all models

Lubricant	→ accessories, page 15
Reservoir capacity	1,2 l
Metered aerosol quantity per outlet	3–400 ml/h
Operating temperature	+10 to 40 °C (+50 to 104 °F)
Operating air pressure	4–10 bar (48–145 psi)
Air consumption per aerosol generator	10–500 NI/min
Voltage per control unit	24 V DC ±20%
Protection class acc. DIN EN 60529	IP 54
Mounting position	vertical, connections downwards
Connections for aerosol line	Plug-in connector for plastic tubes 12x1
lubricant refilling:	
suction line	Plug-in connector for plastic tubes Pa11/12 plastic tube 10x1,5
return line / reservoir draining	Plug-in connector for plastic tubes Pa11/12 plastic tube 10x1,5
bypass valve, 20 bar	G1/2"

Technical data for specific models	UFD10-1-10X000	UFD10-1-20X000	UFD10-1-11X000	UFD10-1-21X000	UFD20-1-10X000
Type of protocol (FELDBUS)	PROFIBUS	PROFINET	PROFIBUS	PROFINET	PROFIBUS
Bypass-Control	-	-	•	•	-
Number of aerosol generators	1	1	1	1	2
Recommended air pressure	6 bar (87 psi)	6 bar (87 psi)	10 bar (145 psi)	10 bar (145 psi)	6 bar (87 psi)
Weight with filled aerosol generator	30 kg (66 lb)	33 kg (72 lb)	36 kg (79 lb)	36 kg (79 lb)	40 kg (88 lb)

How to configure

Order code	U	F	D		0	-	1	-				0	0	0
MQL device DigitalSuper														
Number of aerosol generators 10 = one for one spindle 20 = two for two spindles														
Generation 1 = First generation														
Type of protocol 1 = PROFIBUS 2 = PROFINET														
Machining scope 0 = without Bypass-Control (for machining with regular tools) 1 = with Bypass-Control (for full machining range including deep-hole drilling)														
Filling pump (→ For filling reservoir see accessories, pages 13–14) 0 = without 1 = with														
Features 0 = without														



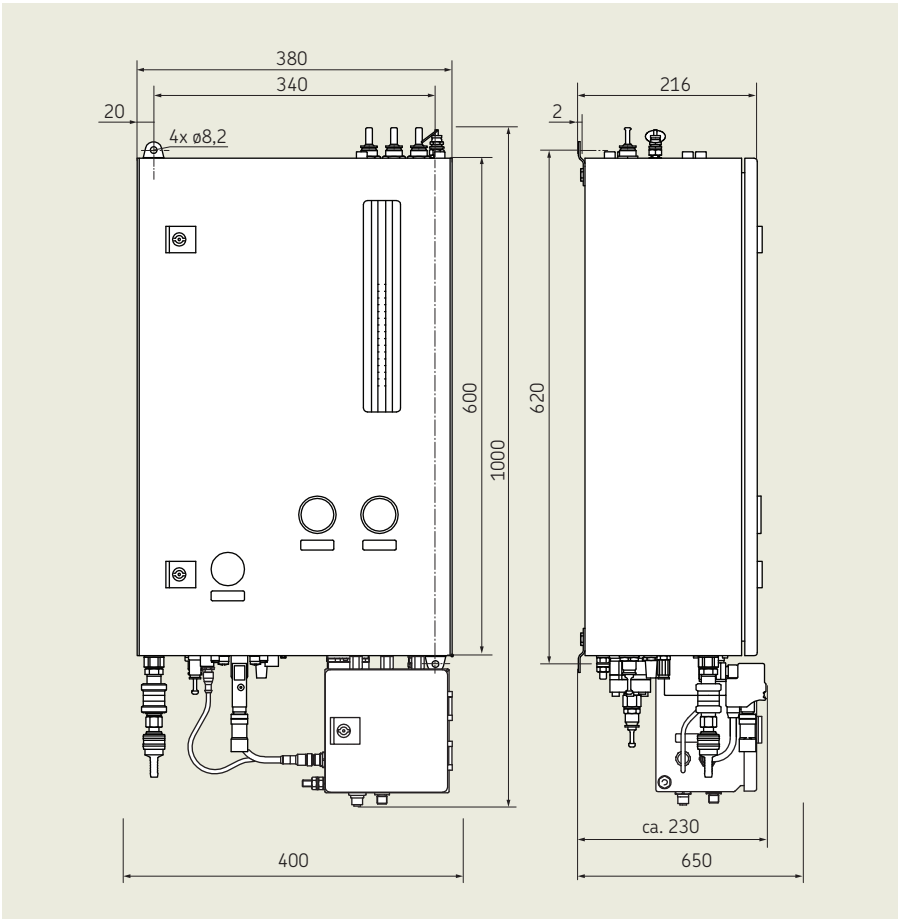
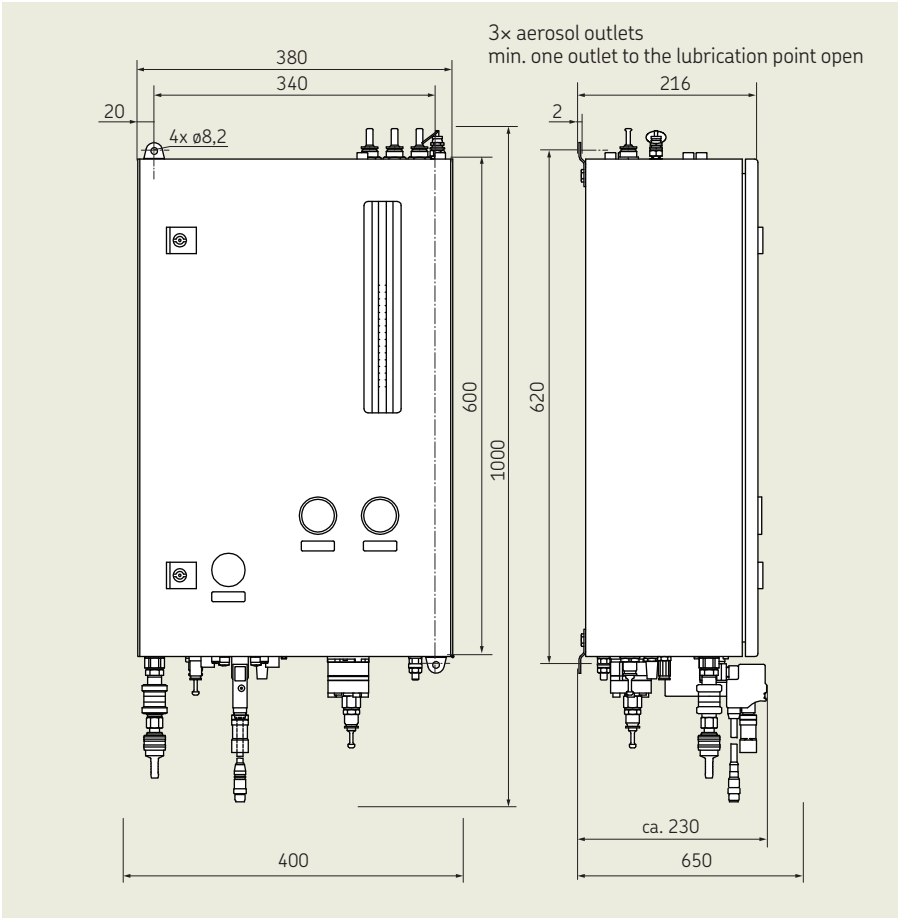
Installation drawings



DigitalSuper with one aerosol generator
 PROFIBUS UFD10-1-101000



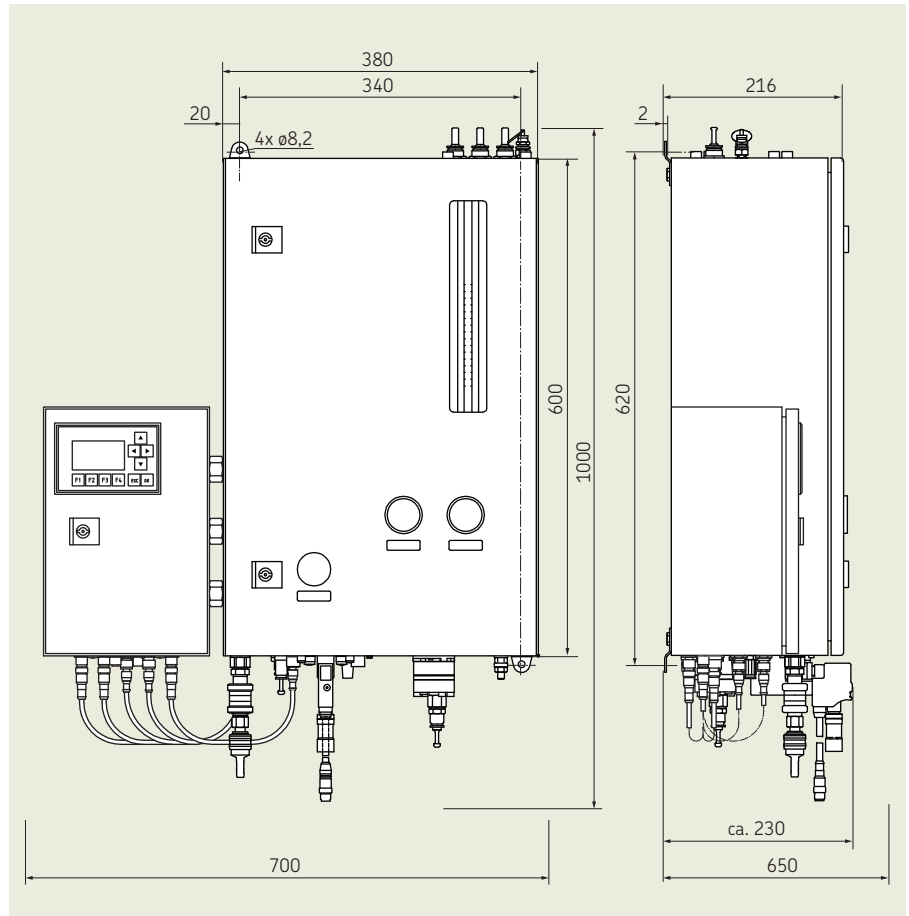
DigitalSuper with one aerosol generator
 PROFINET UFD10-1-201000



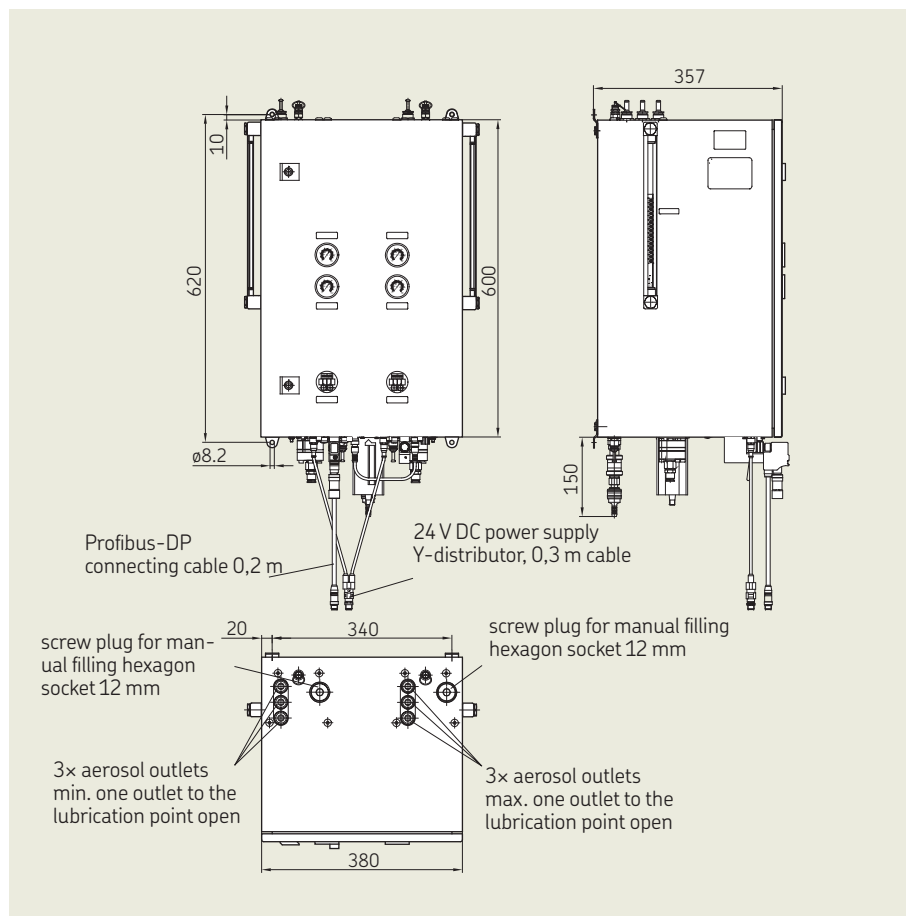


*MQL System DigitalSuper with one aerosol generator and Bypass-Control
PROFIBUS UFD10-1-111000*

Included in delivery:
Coaxial valve – UFZ.0434 (→ page 12)
Y-fitting – UFZ.0421 (→ page 15)
Bypass throttle – UFZ.0423 (→ page 15)



*DigitalSuper with two aerosol generators
PROFIBUS UFD20-1-101000*



Accessories

Aerosol monitor AM1000



The aerosol monitor AM1000 monitors the supply of the aerosol in a LubriLean system. Preferably located in the aerosol's path just upstream of the machining site.

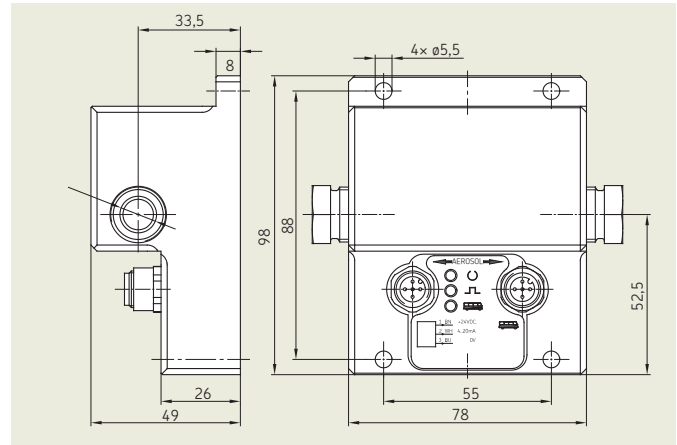
An optical measuring process is used to provide a yardstick for the number of oil droplets per respective volume. This analog value can be transmitted for evaluation via a customary 4 to 20 mA interface, e.g. to the machine's control system.

Alternatively, the aerosol monitor can be connected to the minimal quantity lubrication system via a CAN-BUS interface. All relevant analog variables like air throughput, aerosol density, inlet and internal reservoir pressure are detected and passed on to the machine tool via the optimal PROFIBUS interface.

After an MQL machining process has been run, the representative analog value measured during the process can be stored in the machine tool's control system. Deviations from this value indicate changes in the overall MQL system and can be investigated before production quality deteriorates.

This helps to increase process reliability and to avoid poor surface qualities or even broken tools.

Another important control feature, the sensor transmits an additional calculated variable – the equivalent internal coolant-duct diameter of the tool in use. The characterization of a tool's flow resistance by way of its internal coolant-duct diameter has proved to be practicable since the program numbers to be set were determined as a function of the internal coolant duct.



Technical data

Order number	AM1000
Medium	Aerosol for MQL applications
Typical droplet Ø	0,5–5 µm
Max. permissible pressure	10 bar <i>145 psi</i>
Max. throughput	800 l/min
Operating temperature	0 to +60 °C <i>+32 to 140 °F</i>
Protection class per DIN EN 60529 (housing)	IP 65
Operating voltage	24 V DC ±25%
Power consumption at rest	max. 60 mA
Power consumption under load	max. 80 mA
Mounting position	upright, as illustrated

Accessories for AM1000

Teach adapter	UFZ.U00-137
BUS cable, 10 m	UFZ.0370
BUS cable, 6 m	UFZ.0369
BUS cable, 4 m	UFZ.0375
BUS cable, 2 m	UFZ.0368
BUS cable, 1 m	UFZ.0374
T-connector M12×1*	UFZ.0373
Cordset, 5 m	
single-ended M12×1 female connector and molded cable	179-990-600
single-ended M12×1 female, right-angle connector and molded cable	179-990-601

* for continuation of Data-BUS line for use with two AM1000 at UFD20-X

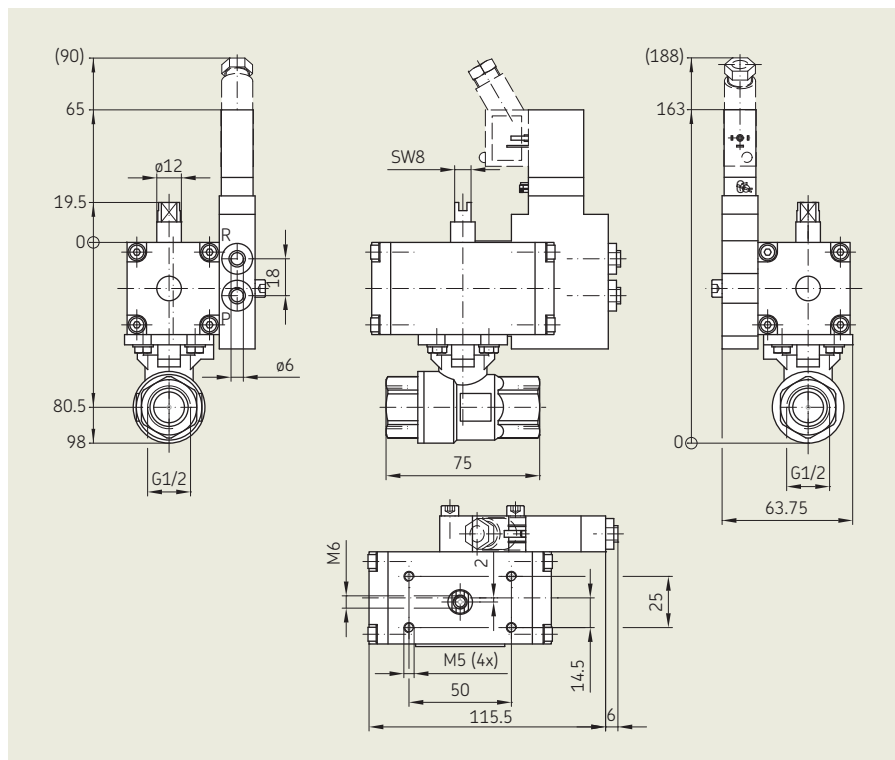
Accessories

Ball valves



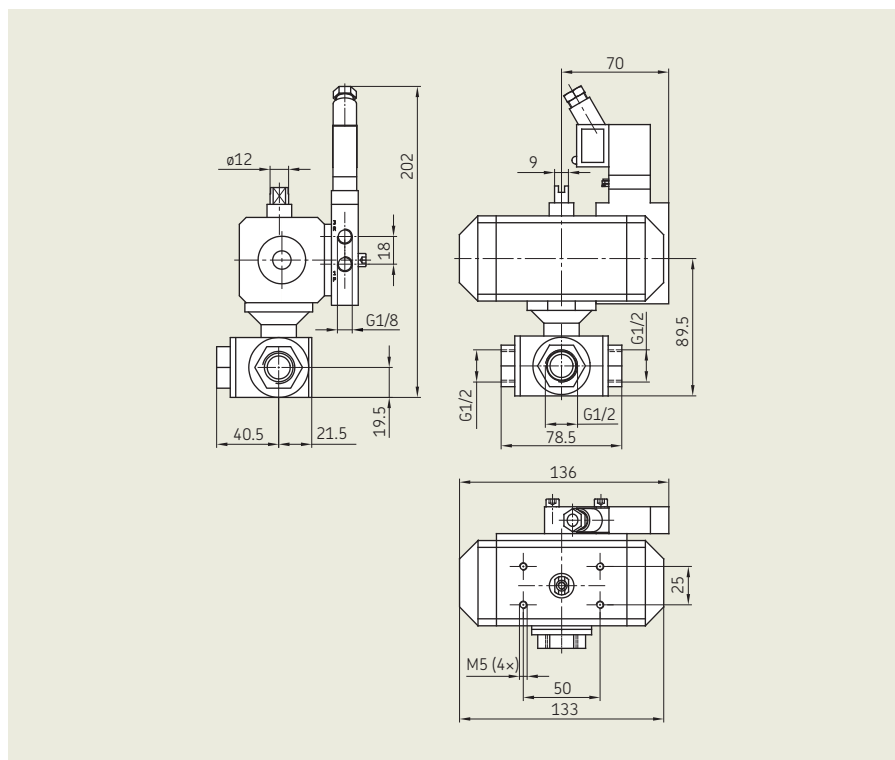
Ball valve 2/2-way

Order number **UFZ.U00-128**
 Max. operating pressure 100 bar 1 450 psi



Ball valve 3/2-way

Order number **UFZ.U00-041**
 Max. operating pressure 100 bar 1 450 psi



Accessories

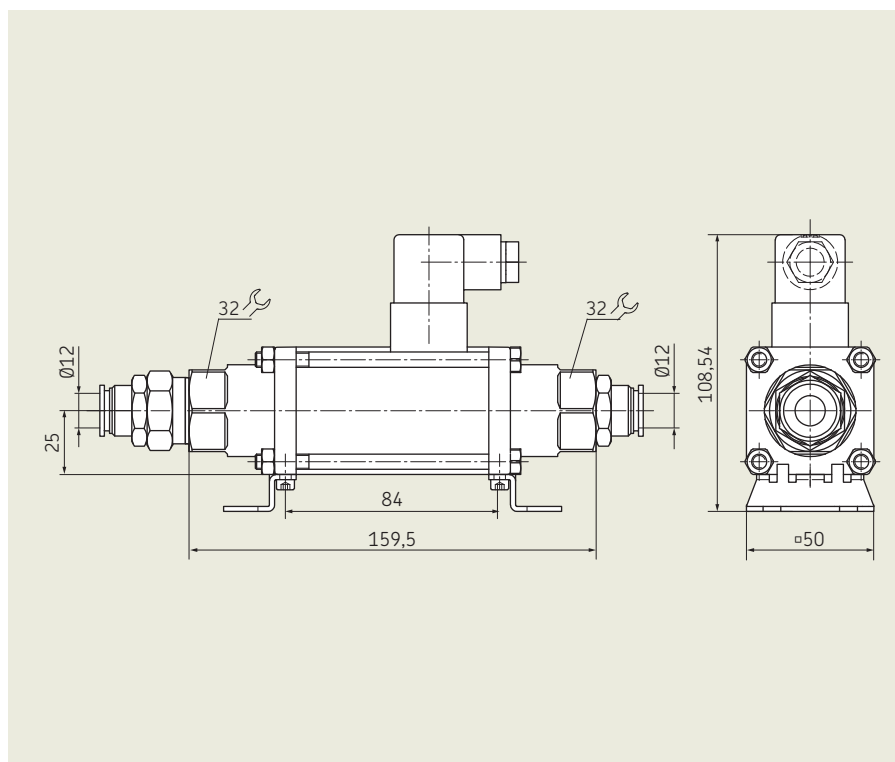
Valves



2/2 way coaxial valve

Order number **UFZ.U00-161**

Max. operating pressure 0–20 bar 0–290 psi

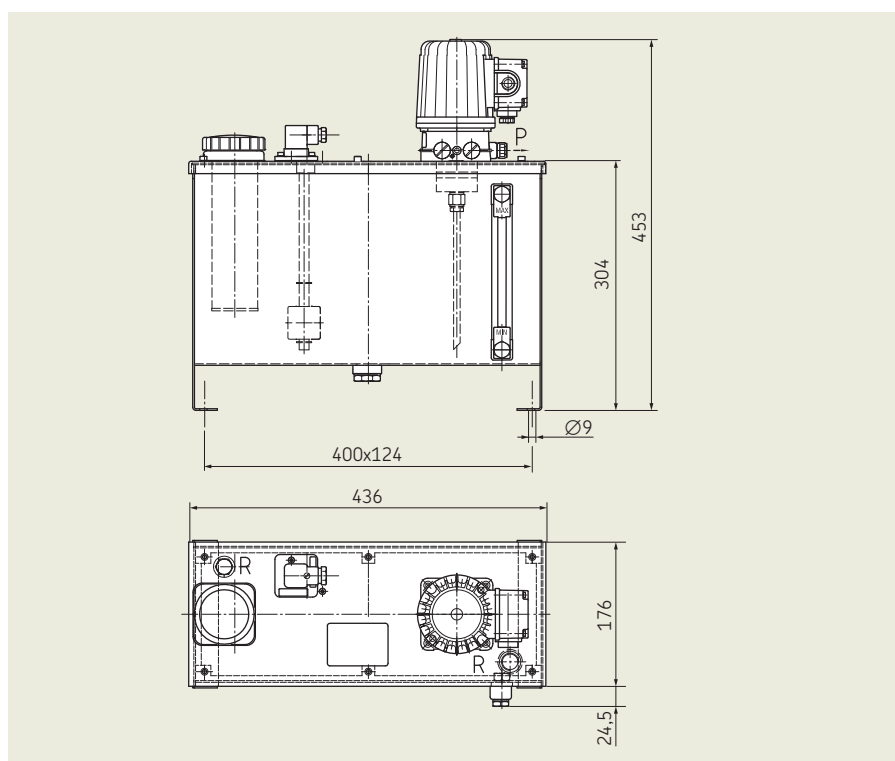


Lubricant refilling station

Refilling station
with pump unit and reservoir, 15 liters
for UFD10-X and UFD20-X models

Order number **MF5-BW16-S8+299**
360–440V, 50HZ
430–530V, 60HZ
FPM sealing

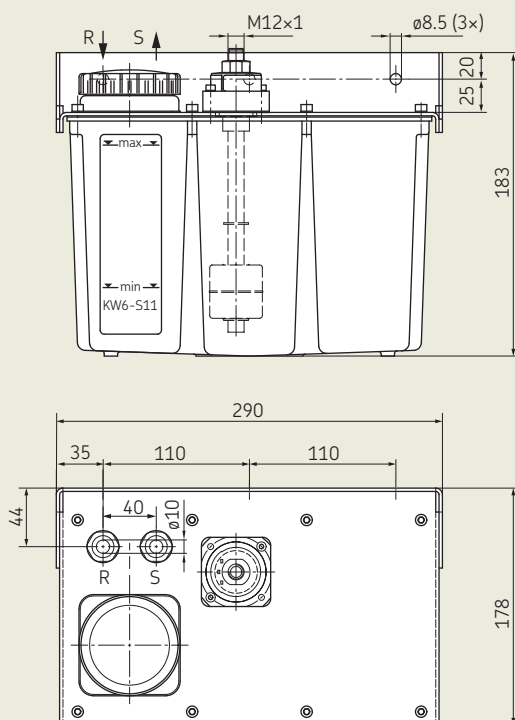
Order number **UFZ.U00-157**
tubing, connection
parts



Lubricant reservoirs

[illegible]

Float switch for monitoring of critical lubricant level with advance warning



S = Suction port
R = Return oil line
with push-to-connect fitting for
Ø10 tubing

Accessories

Lubricant reservoirs

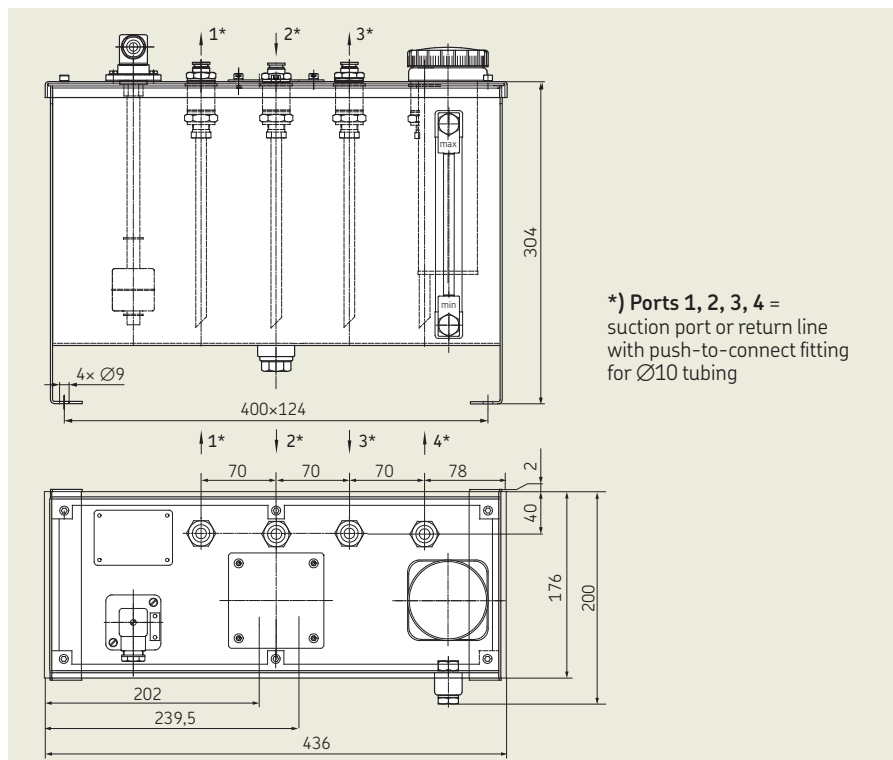
Reservoir, 15 liters for UFD10-X models

Order number **BW16-S22**
Suction port (S) 1 and 3

Reservoir, 15 liters for UFD20-X models

Order number **BW16-S23**
Suction port (S) 1 and 4
Return line (R) 2 and 3

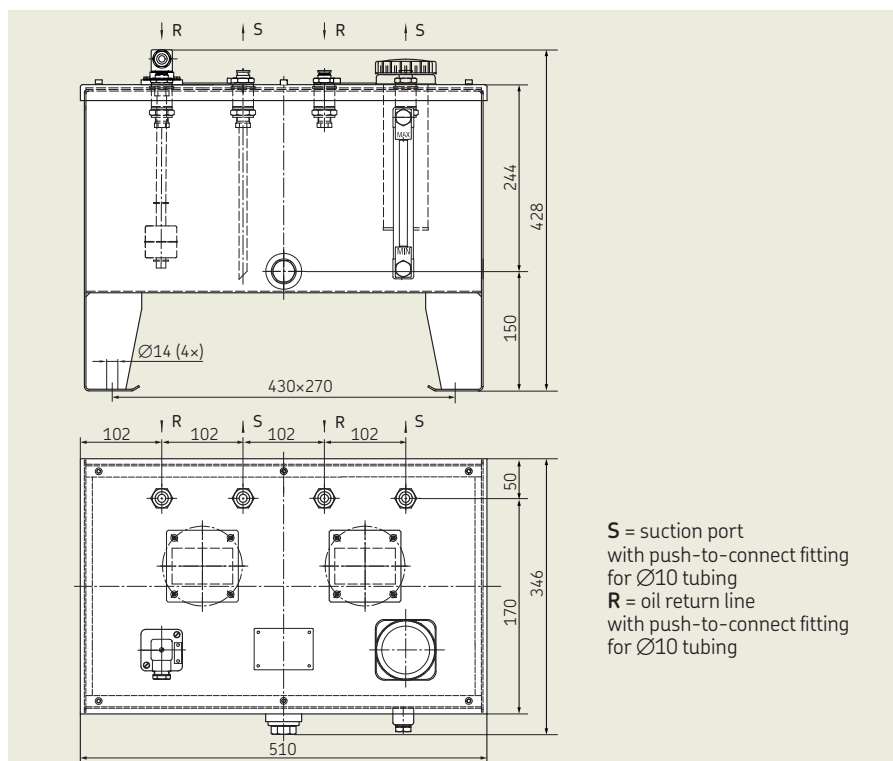
Float switch for monitoring of critical
lubricant level with advance warning



Reservoir, 30 liters for UFD20-X models

Order number **BW30-S17**

Float switch for monitoring of critical
lubricant level with advance warning



Accessories

Hoses and fittings

Designation	Order number	Details
Aerosol hose 12x1*	UFZ.0027	
Screw union to connect aerosol hose – ball valve	UFZ.0081	Max. operating pressure = 20 bar (290 psi) Plug-in connection releasable
Y-fitting 12/12/12	UFZ.0421	
Bypass throttle for recirculation reservoir	UFZ.0435 UFZ.0427 UFZ.0436	Ø d = 1 mm Ø d = 1,5 mm Ø d = 2 mm
Bypass throttle for active BPC	UFZ.0424 UFZ.0423 UFZ.0422	Ø d = 1 mm Ø d = 1,5 mm Ø d = 2 mm

* Please indicate length in running meters when ordering.

Lubricants

Lubricant	Order number	Can size	Base	DIN 51757 Density at +20 °C	Test to DIN 51562 Viscosity at +40 °C	DIN ISO 2592 Flash point	
		Liter		g/cm ³	mm ² /s	°C	°F
LubriOil	OEL...-LUBRIOIL*	2,5; 5; 10	fatty acid ester	0,92	47	265	509
LubriFluid F100	OEL...-LUBRI-F100*	2,5; 5; 10	higher alcohol	0,84	25	184	363,2

* Please add the desired can size to the order number. Example: **OEL5-LUBRIOIL**

**Important information on product usage**

SKF and Lincoln lubrication systems or their components are not approved for use with gases, liquefied gases, pressurized gases in solution and fluids with a vapor pressure exceeding normal atmospheric pressure (1 013 mbar) by more than 0,5 bar at their maximum permissible temperature.

