SKF LubriLean – DigitalSuper

Minimal Quantity Lubrication for Dry Machining Processes

DigitalSuper 1

DigitalSuper 2

DigitalSuper 1 with lubricant reservoir

Cut costs

- No need for cooling lubricants
- No need for machine tool components like lubricant filters and conditioning systems
- No disposal costs for chips and cooling lubricants
- No need to wash workpieces

Improve productivity

- Significant reduction of production time (30–50%)
- Higher cutting efficiency
- Tool lives increased by as much as 300%
- Reliable control of production processes

Utilize a technological advantage

- Solutions for OEMs and retrofitters
- Parallel use of wet and dry machining

Function

The innovative technology of the 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 in question, even when low pressure in the air-supply network or small coolant duct diameters are involved.

The LubriLean DigitalSuper stands out not only for its performance but also for its very user-friendly handling.

A standard Profibus interface conforming to HPC specifications permits easy system integration in three steps and makes retrofits easier (fig. 1).

The LubriLean DigitalSuper comes with comfortable interfaces to support PC-based, machine-independent system diagnoses (fig. 2).

A special system of nozzles in the reservoir turns a lubricant and compressed air into a fine aerosol with an homogenous droplet size of roughly 0.5 µm (fig. 3).

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.

Modern machining centers with a large number of tools require individual control of the aerosol quantity by way of a stored program controller (SPC).

That 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.

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)

The aerosol's transport through lines as long as 20 m is no problem for the LubriLean DigitalSuper system.

A ball valve has to be installed directly upstream of the spindle or turret intake in order to assure short response times despite long transport paths. As an optional feature, it is possible to integrate a bypass system into the aerosol feed in order to realize short response times when changes occur in the amounts of aerosol to be supplied (fig. 4, page 3).

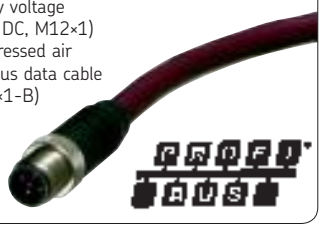
As a result, the production of aerosol is not stopped during a tool change since the newly required quantity is being produced instead. The aerosol is directed through a 3/2-way ball valve for this purpose. That makes sure the new quantity of aerosol is available right away when the process starts.

The aerosol generated during the tool change can be directed right into an exhaust or, with an optional topping-up reservoir, into a separating device.

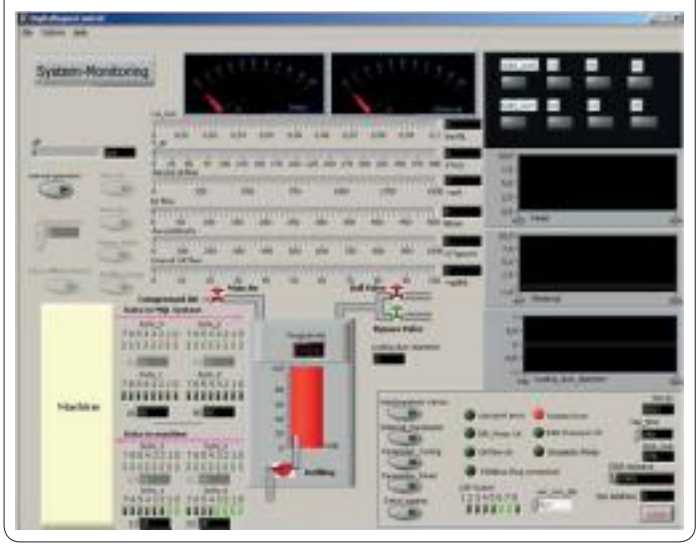
See important product usage information on the back cover.

Connected in three steps **Fig. 1**

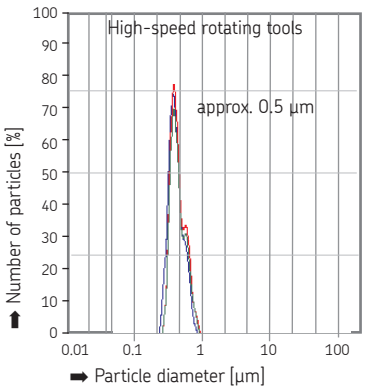
Step ❶ supply voltage (24 V DC, M12×1)
Step ❷ compressed air
Step ❸ Profibus data cable (M12×1-B)



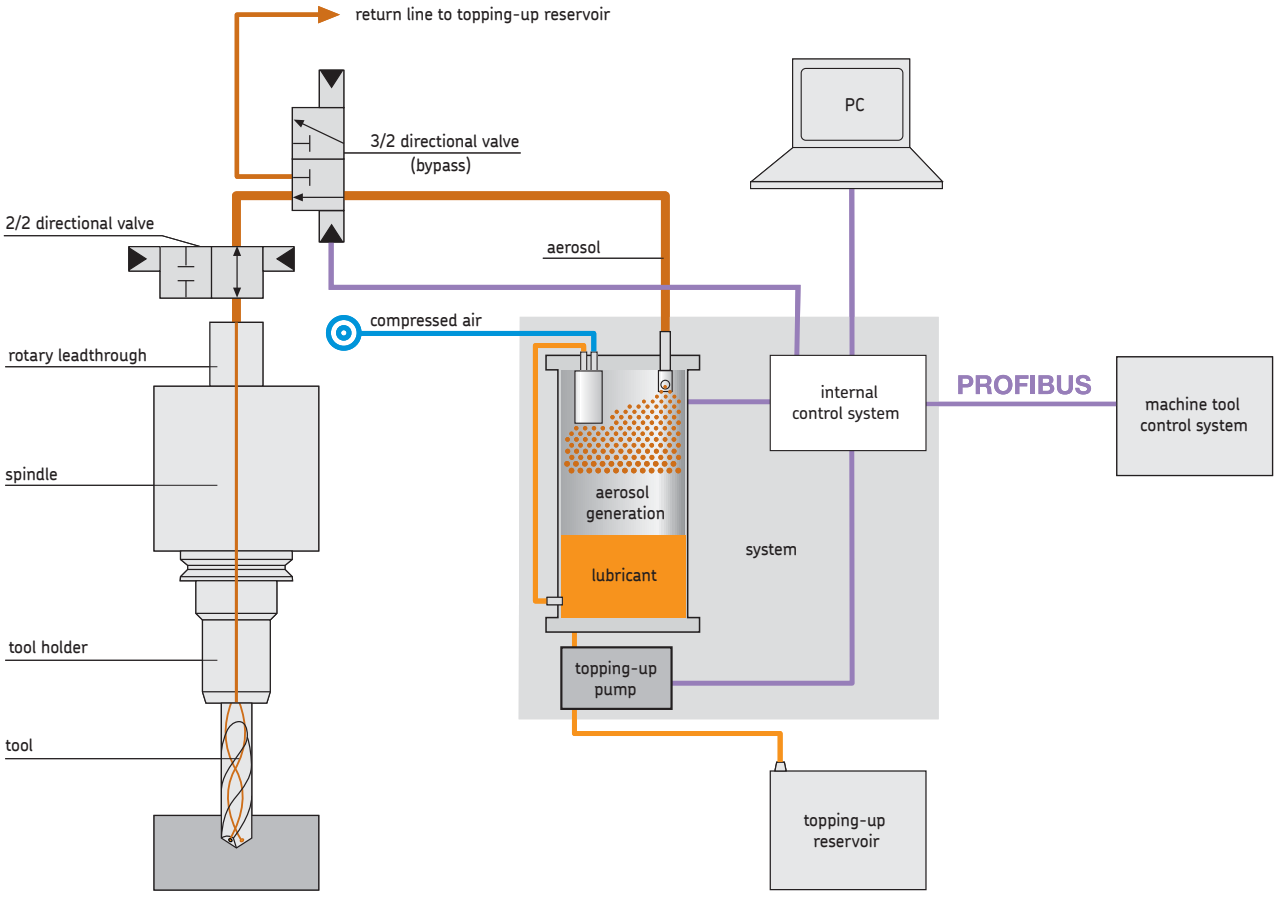
System diagnosis **Fig. 2**



Particle size distribution **Fig. 3**



Overall MQL system **Fig. 4**



Technical data

Standard:	• Metal housing • Internal lubrication • External lubrication • 4-point lubricant level monitoring • Visual lubricant level indicator • Flow sensor • Pressure monitoring
Capacity	1.8 l
Compressed air port	min. 4 bars max. 10 bars
Actuation	24 V DC (standard)
Number of outlet ports	1 to 3
Air consumption	15–300 Nl/min *)
Outlet	
Oil quantity	1–150 ml/h *)
Mounting position	vertical
Weight empty	28 kg
Schnittstellen	Profibus M8×1 for ball valve RS 232 / M12×1 for monitoring tool

*) *depending on choice of tool coolant duct diameter*

Applications

DigitalSuper

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.





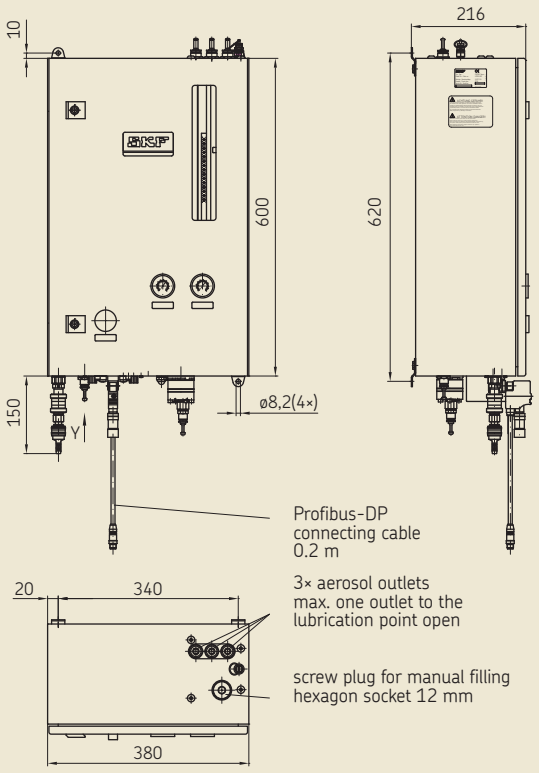




DigitalSuper 1

Order No. UFD10-020

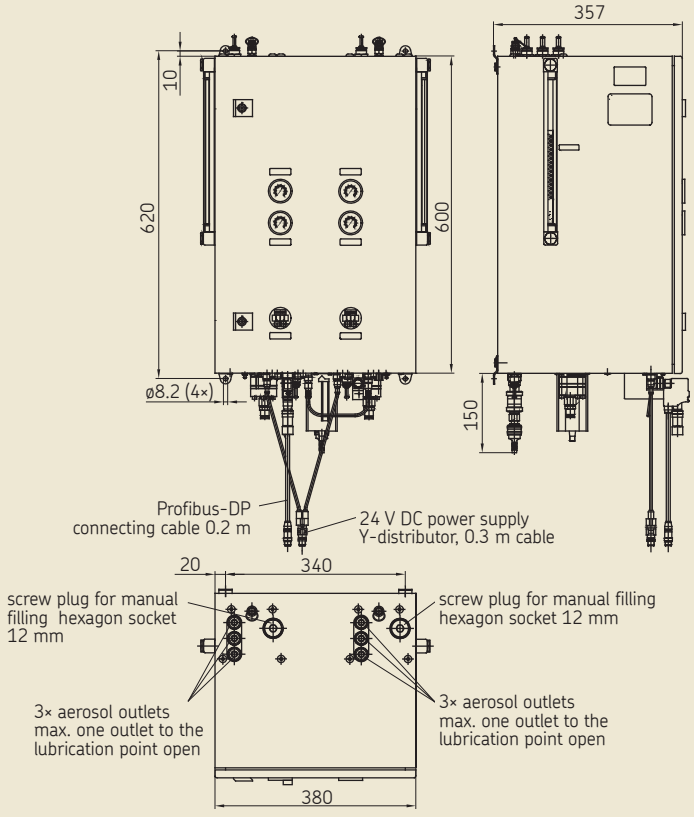
DigitalSuper 1



DigitalSuper 2

Order No. UFD20-020

DigitalSuper 2



Accessories

Aerosol monitor AM1000

LubriLean products form a system that can be used not only to generate the required quantities of high quality aerosols but also to monitor their supply.

The heart of the monitoring system is the AM1000 aerosol monitor. It is 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 (fig. 5). 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 DigitalSuper minimal quantity lubrication system via a CAN-bus interface.

All the relevant analog state variables like the air throughput, aerosol density, inlet and internal reservoir pressure are not only detected but also passed on to the machine tool via the optimal Profibus interface.

After an MQL machining process has been run in, 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. They can now be investigated before production quality deteriorates.

This is real progress, considering the fact that in the past deviations of relevance used to attract attention only at a very late date in the form of 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.

Fig. 5

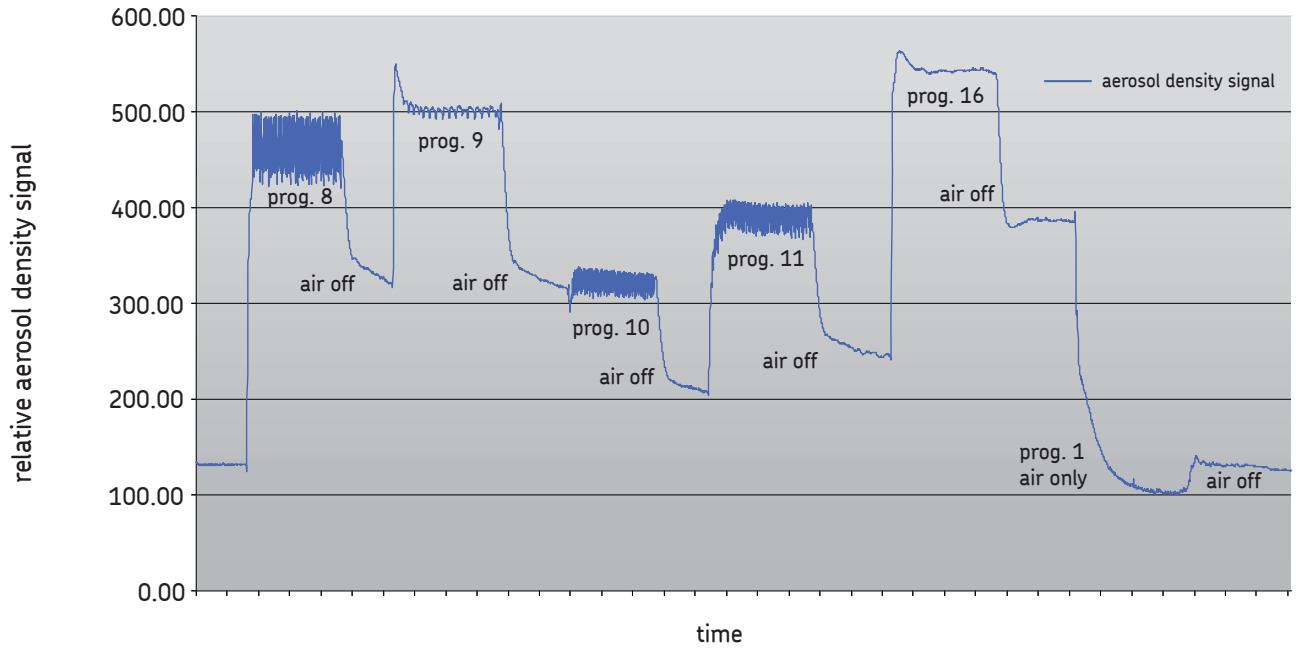


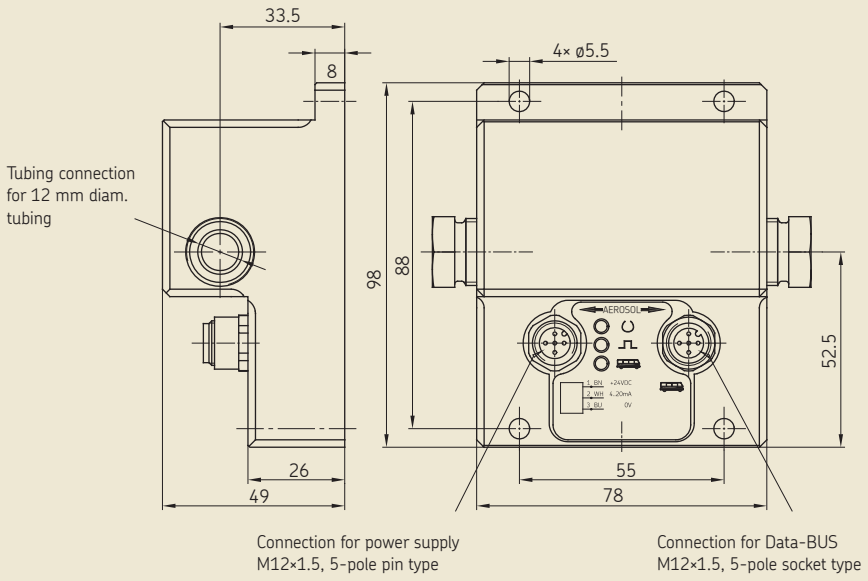
Fig. 5
AM1000 aerosol density signal
measured with 2 mm tool with different aerosol settings on the DigitalSuper

The graph shows very clearly how sensitive the aerosol monitor is as it reacts to small changes in the aerosol density when operated on a LubriLean DigitalSuper.

Accessories

Aerosol monitor AM1000

Aerosolmonitor AM1000



Technical data

Order No.	**AM1000**
Medium	aerosol for MQL
Typical droplet ø	0.5 to 5 µm
Max. permissible pressure	10 bars
Max. throughput	800 Nl/min
Ambient temperature	0 to +60 °C
Mounting position	upright, as illustrated
Type of enclosure (housing)	IP 54 (DIN EN 60529)
Operating voltage	24 V DC ±25 %
Power consumption at rest	max. 60 mA
Power consumption under load	max. 80 mA

Accessories for AM1000 aerosol monitor

Teach Adapter	UFZ.U00-137
Bus cable	
10 m	UFZ.0370
6 m	UFZ.0369
4 m	UFZ.0375
2 m	UFZ.0368
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

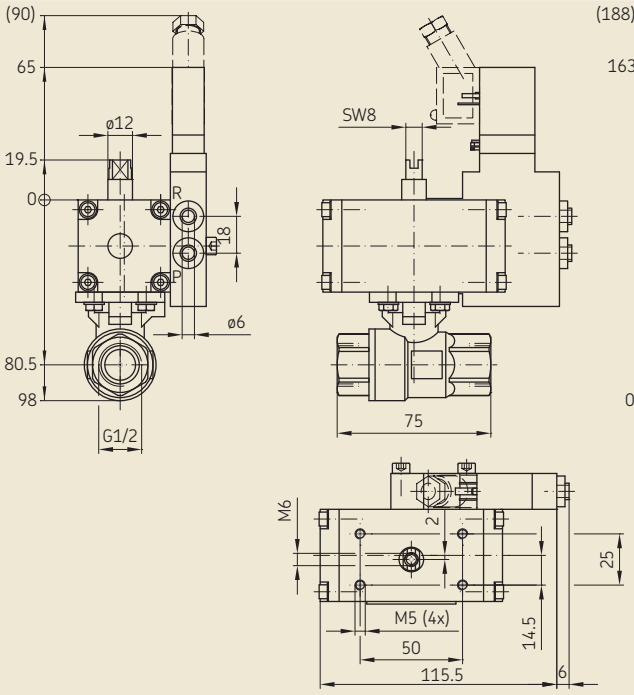
**) for continuation of Data-BUS line for use with two AM1000 at UFD20-02x*

Accessories

Ball valve 2/2-way

Order No. UFZ.U00-128
Operating pressure max. 100 bars

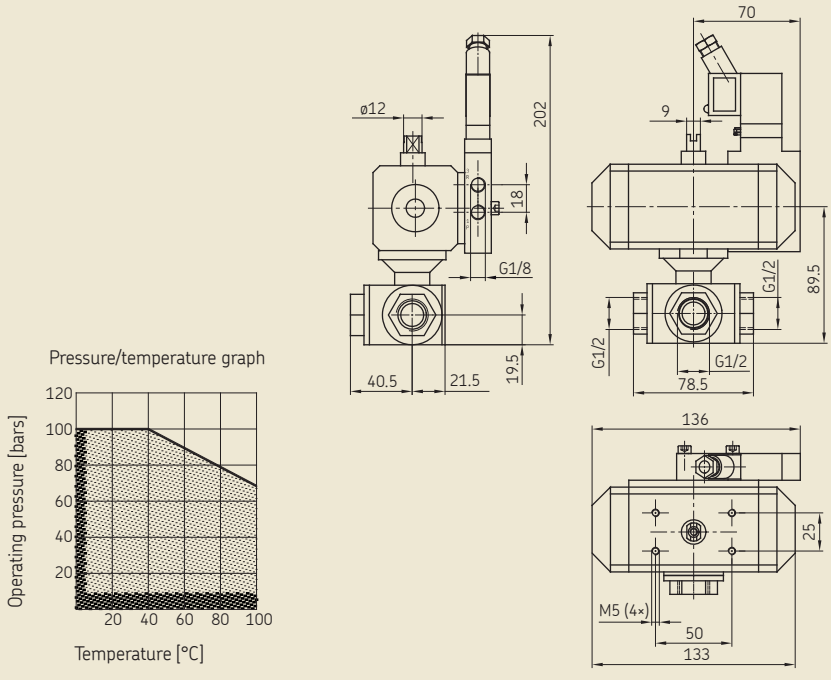
2/2-way ball valve



Ball valve 3/2-way

Order No. UFZ.U00-041
Max. operating pressure 100 bars
(see pressure/temperature graph)

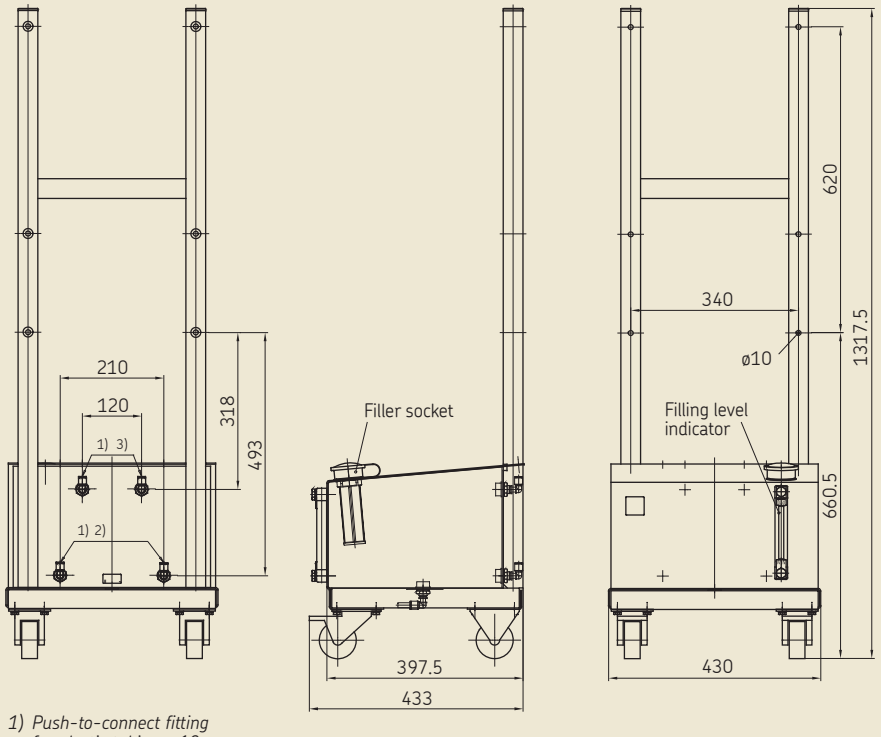
3/2-way ball valve



Accessories

Lubricant reservoir
(Illus. compl. with DigitalSuper)
Order No. UFD.70.000
Reservoir capacity 30 liters

Schmierstoffbehälter UFD.70.000



1) Push-to-connect fitting for plastic tubing, ø10
2) Suction port
3) Return flow port

MQL Lubricants

				DIN 51757	Test to DIN 51562	DIN ISO 2592
Type of lubricant	**Order No.**	Can size [liter]	Base	Density at +20 °C [g/cm³]	Viscosity at +40 °C [mm²/s]	Flash point [°C]
LubriOil	OEL...-LUBRIOIL *)	2.5; 5; 10	fatty acid ester	0.92	47	265
LubriFluid F100	OEL...-LUBRI-F100 *)	2.5; 5; 10	higher alcohol	0.84	25	184

*) *Please add the desired can size to the order No.*
Order example: OEL5-LUBRIOIL

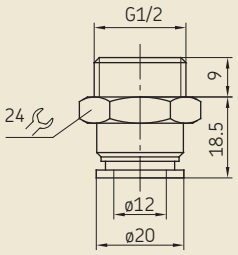
Accessories

Screw union

for connection of aerosol hose – ball valve

Order No. UFZ.0081

Operating pressure . . . max. 20 bars
Plug-in connection . . . releasable



Aerosol hose 12×1

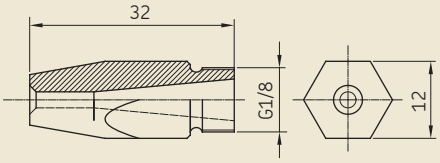
Order No. UFZ.0027

Please indicate length in running meters when ordering.

Special nozzle G1/8

Order No. UFZ.0026

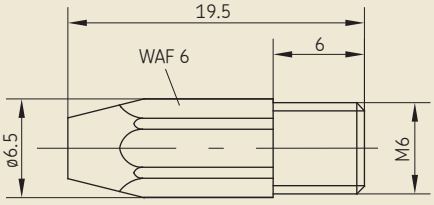
Application:
External lubrication for machining centers



Special nozzle M6

Order No. UFZ.0113

Application:
External lubrication for turning centers



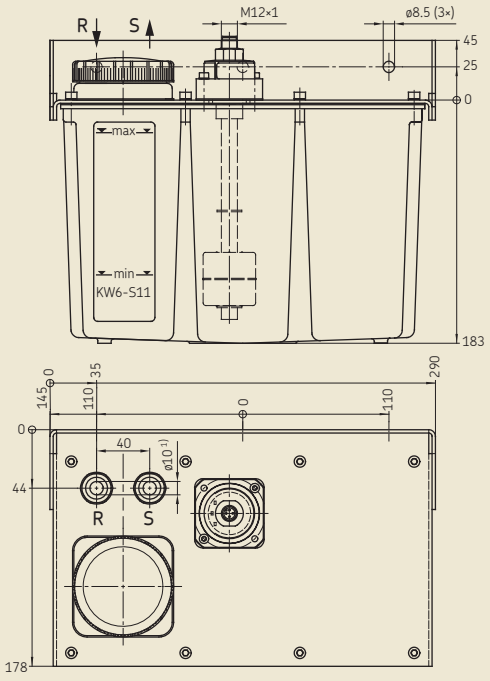
Reservoir, 6 liters

For DigitalSuper 1:
Order No. KW6-S11

Medium
Oil on a petroleum basis or synthetic basis
compatible with . . . . . plastics,
NBR elastomers,
copper and
copper alloys
Operating viscosity . . . . . 5 – 2000 mm^2/s
Operating temperature. . . 10 to +40 °C

Float switch for monitoring of critical lubricant level with advance warning

KW6-S11



1) S = suction port
R = return oil line
with push-to-connect fitting
for ø10 tubing

Reservoir, 15 liters

For DigitalSuper 1:
Order No. BW16-S16
Suction port (S): 1 and 3
with aerosol return line

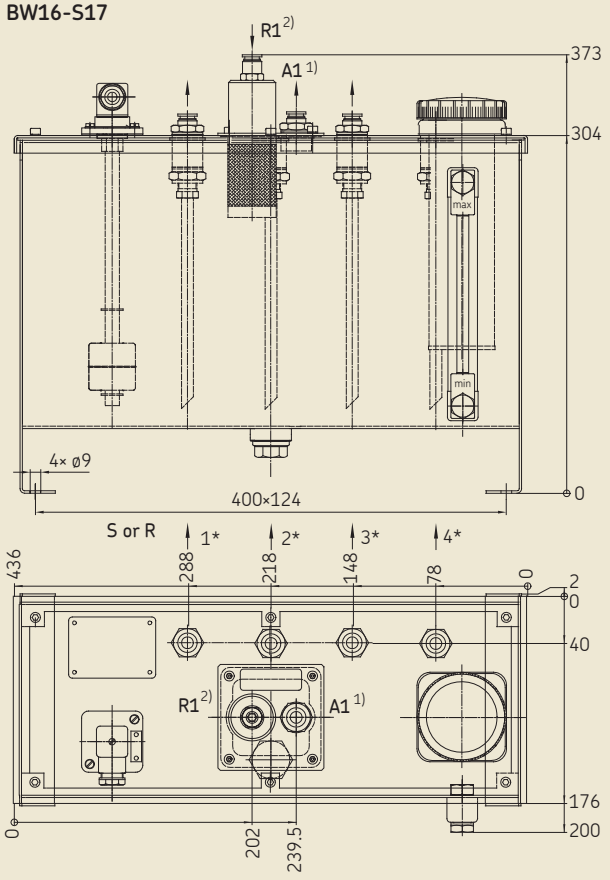
Für DigitalSuper 2:
Order No. BW16-S17
Suction port (S): 1 to 4
with aerosol return line

For DigitalSuper 1:
Order No. BW16-S22
Suction port (S): 3;
Return line (R): 1

For DigitalSuper 2:
Order No. 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

BW16-S17



1) *A1 = exhaust air port with push-to-connect fitting for ø10 tubing*
2) *R1 = aerosol return line with push-to-connect fitting for ø10 tubing*

A1 and R1 with BW16-S16/S17 only

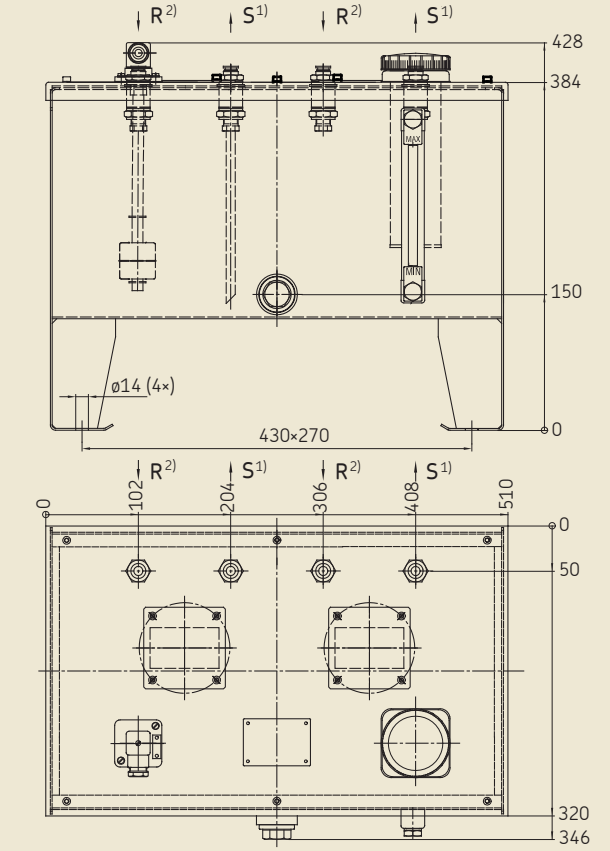
*) *Ports 1, 2, 3, 4 = suction port or return line with push-to-connect fitting for ø10 tubing*

Reseervoir, 30 liters

For DigitalSuper 2:
Order No. BW30-S17

Float switch for monitoring of critical lubricant level with advance warning

BW30-S17



1) *S = suction port with push-to-connect fitting for ø10 tubing*
2) *R = oil return line with push-to-connect fitting for ø10 tubing*

Order No. 1-5109-EN
Subject to change without notice! (07/2014)

Important product usage information
All products from SKF may be used only for their intended purpose as described in this brochure and in any instructions. If operating instructions are supplied with the products, they must be read and followed.
Not all lubricants are suitable for use in centralized lubrication systems. SKF does offer an inspection service to test customer supplied lubricant to determine if it can be used in a centralized system. SKF lubrication systems or their components are not approved for use with gases, liquefied gases, pressurized gases in solution and fluids with a vapor pressure exceeding normal atmospheric pressure (1013 mbars) by more than 0.5 bar at their maximum permissible temperature.
Hazardous materials of any kind, especially the materials classified as hazardous by European Community Directive EC 67/548/EEC, Article 2, Par. 2, may only be used to fill SKF centralized lubrication systems and components and delivered and/or distributed with the same after consulting with and receiving written approval from SKF.

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

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