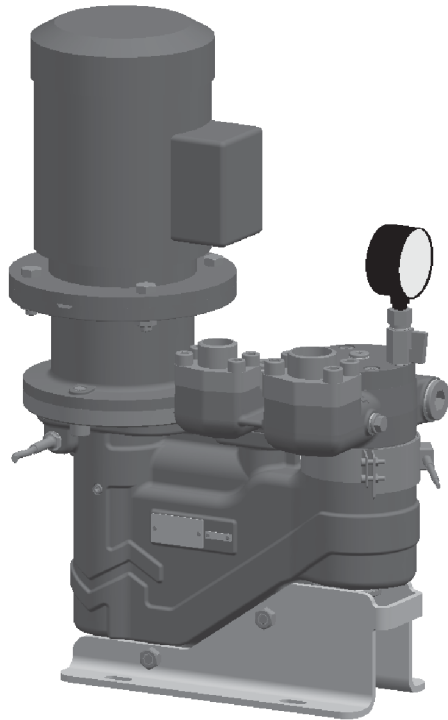


Screw pump

Series ALLFUEL® AFI-F/AFI-T



AFI-F Filter unit



Utilization

For pumping heating oils, lubrication oils, hydraulic oils, or other lubricating liquids. The pumped liquids may not contain any abrasive components nor chemically attack the pump material.

Main field of application

ALLFUEL Injection (AFI) pumps are employed as transfer, booster and burner operation pumps in oil-fired systems, as feeder and filling pumps in tank systems and as lube-oil pumps in virtually all areas of industry. They are also used to generate pressure in oil-hydraulic systems of all types.

Design

Compact single or twin units, vertical design with integrated filter.

Abbreviation

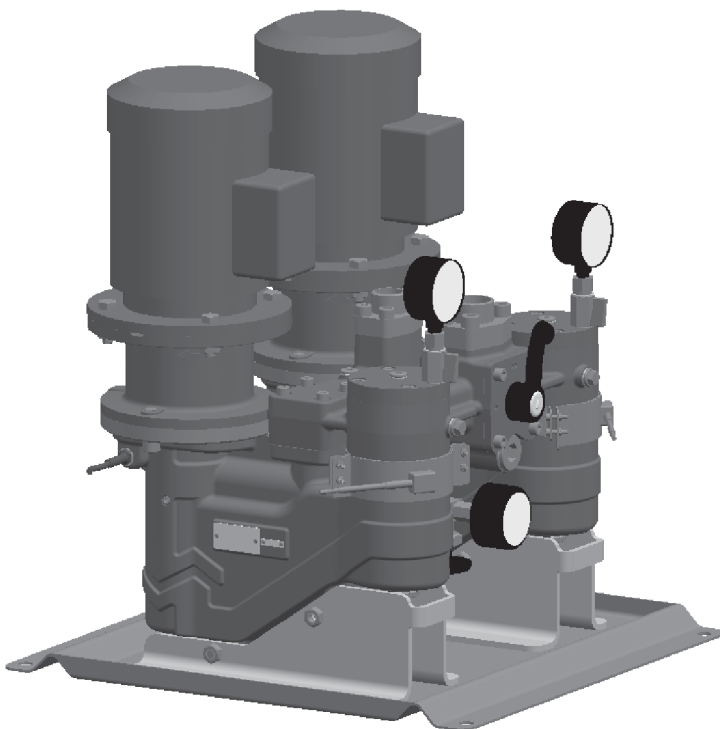
	AFI	-	T	10	R	38	G	19US	W195	E
Series (Injection)										
Version ①										
Size ②										
Spindel pitch direction (R = right)										
Spindel pitch angle (degrees)										
Bearing type ③										
Shaft seal ④										
Material code										
Heating ⑤										

- ① T = Twin unit with filter;
F = Single unit with filter
- ② Theoretical capacity Q [l/min] at 1.450 1/min and 46-degree pitch angle
- ③ G = internal plain bearing; U = antifriction bearing
- ④ Unheated, uncooled mechanical shaft seal
- ⑤ Version with electric heating of mechanical seal and filter housing available at additional charge

Structural design

Single unit AFI-F:

Internal-bearing, three-screw, self-priming screw pump. Hardened and polished spindles run in an exchangeable casing insert. The drive spindle is hydraulically balanced. A special starting screw absorbs the axial thrust of the idler screws. It is hydraulically driven. Only the torque resulting from liquid friction is transferred to the thread flanks. The thread flanks are therefore virtually free of loads and are not subject to wear. The pumped liquid lubricates all sliding parts and can be categorized as full fluid friction. In sizes 10 and 20 a balancing piston running in the bearing ring



AFI-T Twin unit with filter

provides radial and axial bearing of the drive spindle; in size 40 a groove ball bearing fulfils this role. A maintenance-free mechanical seal seals the shaft. A return bore connects the seal chamber and the suction area to each other. As a result, only suction pressure acts on the shaft seal, regardless of discharge pressure. When a complete pump/motor assembly is delivered, a pump bracket connects the pump to the drive motor.

Twin unit AFI-T:

Two AFI-F single units (as described above) are attached to a shared reversing valve housing. A ball valve, two non-return valves and the pressure relief valve are located in the reversing valve housing. This design lets the operator switch the individual pump units as desired or remove a pump without interrupting operation.

Functionality

Single unit AFI-F:

Specially-shaped thread flanks cause the three spindles to form sealed chambers; rotation of the spindles then causes the contents of the chambers to move continuously in the axial direction from the pump's suction side to its pressure side. Despite rotation of the spindles, no turbulence results. The uniform chamber volumes eliminate crushing forces.

Twin unit AFI-T:

Both pumps can be switched either manually or automatically (refer to "Operational monitoring/Switching device" for information on automatic switching). The working pressure building in the pressure area opens the non-return valve of the pump that is currently running and closes the same device on the stopped pump. This prevents the reserve pump from running backwards.

Performance data

Capacity ①	Q	up to	112 l/min
Suction pressure	p _s	up to	5 bar
Discharge pressure ②	p _d	up to	40 bar
Liquid temperature ③	t	up to	150 °C
Viscosity range	v	3 up to	750 mm ² /s
Discharge flange nominal diameter	DN _d	20 up to	25 mm

① At n = 2900 1/min and v = 750 mm²/s

② Refer to the individual reference curves for the achievable pump pressure in relation to viscosity and rotational speed. Pressure specifications are applicable only to nearly static pressure loads. Please inquire about dynamically alternating pressure loads.

③ Consultation required if temperatures higher

Installation

The pump/motor assemblies are of a vertical design and are delivered with mounting feet and oil sump (twin units only).

Filter

The pumps are delivered with an integrated radial screen filter for protection against contamination. The pump sucks the liquid through the filter, whereby the flow moves from inside the filter to outside. Filter mesh size 0.4 mm.

Heating

If heating is required, these pumps can be delivered with electric heating cartridges for the mechanical seal chamber and heating shells for the filter housing (subject to additional cost).

Pump size	Connection for	Heating cartridge output (pressure side)	Heating shell output (filter)
10	230 V	160 W	165 W
20	230 V	200 W	205 W
40	230 V	-	265 W

Heating capacity is dimensioned so that the heater must operate for at least 60 minutes in order to achieve an outlet temperature of 20 °C. When temperatures are lower (below 0 °C), a correspondingly longer heat-up time will be required. Heating is not designed to achieve noticeably higher liquid temperatures during operation.

Flanges and connections

Feed and pressure ports as counter flange based on SAE (SAE J518C, hole pattern 3000 PSI).

Connections at present:

- B7 Draining
- E7 Venting of pump
- E8 Venting of filter
- H7 Heating cartridge
- M1, M2, M3 Pressure gauge

Shaft seal

The shaft is sealed with a maintenance-free, unbalanced mechanical seal.

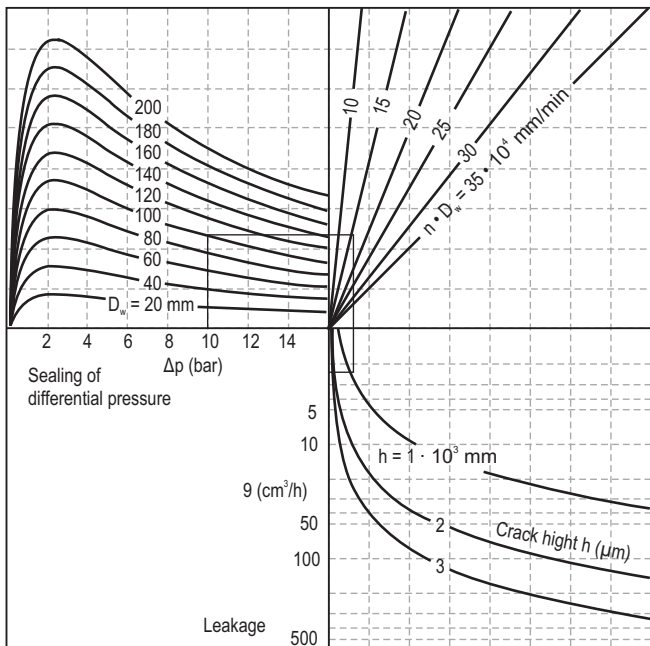
<u>Part name</u>	<u>Material design</u>
Rotating ring	silicon carbide
Counter ring	silicon carbide
Seal ring	FPM (Viton)
Spring	CrNiMo steel
Metal parts	CrNiMo steel

Noise level and pulsation

The design and operation of the screw pump enable a very low noise level and virtually pulsation-free pumping.

Leaks

Formation of a lubricating film between the sliding surfaces is the most important factor in the functionality of a mechanical seal. This film is formed by the liquid being sealed. Due to elevated pressure inside the suction chamber, a small amount of liquid/lubricant will be continuously pushed out through the sliding surfaces. This "standard leak" of a few ml/h is essential for maintaining lubrication of the sliding surfaces. Absence or inadequate formation of a lubricating film is a common cause of damage (see following diagram).




Theoretical average leak rate depending on mechanical oscillations, fluid properties, condition of the sliding surfaces, etc. (Source: Burgmann ABC der Gleitringdichtungen)

When pumping liquids with low volatility, such as HFO, the user must therefore expect increasing deposits on the atmosphere side as time passes. As a result, it is physically not possible to achieve a 100% seal with a mechanical seal. If this is not acceptable, the magnetically-coupled version of ALLFUEL will be the right choice.

Overload protection

A pressure-relief valve is integrated into each pump as a means of overload protection. Its standard trigger pressure is set to approximately 10% above the working pressure. Please make sure your order specifies if a different trigger pressure is desired.

Explosion protection

 The pump fulfills the requirements according to EU explosion-protection directive 94/9/EC (ATEX 100a) for devices in device class II, category 2 G. Classification into temperature classes according to EN 13463-1 depends on the temperature of the pumped liquid. Refer to the proposal or order documentation for the maximum permissible liquid temperature for the respective temperature classes.

Note: When operating the pump in category 2, suitable measures must be provided to prevent impermissible warming of the pump surfaces in the event of disturbance.

Drive

The following motor versions are normally provided with delivery of complete pump/motor assemblies: Surface-cooled three-phase squirrel-cage motors, IMV 1 design type, IP 55 protection class according to IEC standard, insulation class F utilized according to B,

output and main dimensions according to DIN 42 677. Motors configured for 50 Hz may also be operated in 60 Hz networks.

- Voltage/connection:

Frequency [Hz]	Voltage [V]	Areas of usage
50	220-240/380-420	Europe
50	380-420/660-720	Europe
50	500	Europe
60	254-277/440-480	USA
60	440-480	USA
60	318-346/550-600	Canada
60	220-240/380-420	Asia, S.-Am.

Power is transferred over an elastic coupling. Additional radial forces may not act on the drive spindle.

Operational monitoring

Suction side: Pressure-vacuum gauge
 Pressure side: Pressure gauge (included with delivery as required)

The pressure-vacuum gauges display the pressure downstream of the filters. This enables measurement of pressure loss in the filter and detection of impermissible contamination. In addition, connections M1 and M3 permit precise detection of differential pressure.

A switching device is available at extra cost. It provides operational monitoring and is designed to automatically switch on the reserve pump if the operational pump fails. Signal lamps indicate current operational statuses.

Switching device **U1** for motors up to 3 kW (400 V operational voltage) for switching on pump directly, consisting of:

- 1 steel casing, IP55 protection class, dimensions: width 320 mm, height 320 mm, depth 160 mm
- 2 three-phase air-gap relays with overload relay
- 1 selector switch (pump 1, pump 2 and OFF)
- 2 green signal lamps "Normal operation"
- 1 red signal lamp "Disturbance"
- control fuse, connection terminals for all incoming and outgoing lines
- 2 control-line terminals for connection of any additional command units

Switching device **U3** for motors with 4.0 and 5.5 kW output power (400 V operational voltage), suitable for star-delta switching, consisting of:

- 1 steel casing, IP55 protection class, dimensions: width 520 mm, height 520 mm, depth 210 mm
- 1 selector switch (pump 1, pump 2 and OFF)
- 2 green signal lamps "Normal operation"
- 1 red signal lamp "Disturbance"
- 2 electric circuit fuses
- 1 control fuse, connection terminals like U1

Materials

Denomination	Material design			
	W195	W196	W197	W198 ③
Pump casing	EN-GJL-250	EN-GJS-400-15	EN-GJL-250	EN-GJS-400-15
Casing insert	AlMgSi1	AlMgSi1	EN-GJL-250 tenifer.	EN-GJL-250 tenifer.
Pump cover, drive side	EN-GJL-250	EN-GJS-400-15	EN-GJL-250	EN-GJS-400-15
Bush	AlMgSi1	AlMgSi1	EN-GJL-250	EN-GJL-250
Drive screw	16MnCrS5	16MnCrS5	16MnCrS5	16MnCrS5 tenifer.
Idler screw				
Reversing valve housing ①	EN-GJL-250	EN-GJS-400-15	EN-GJL-250	EN-GJS-400-15
Valve casing ②				

① AFI-T only

② AFI-F only

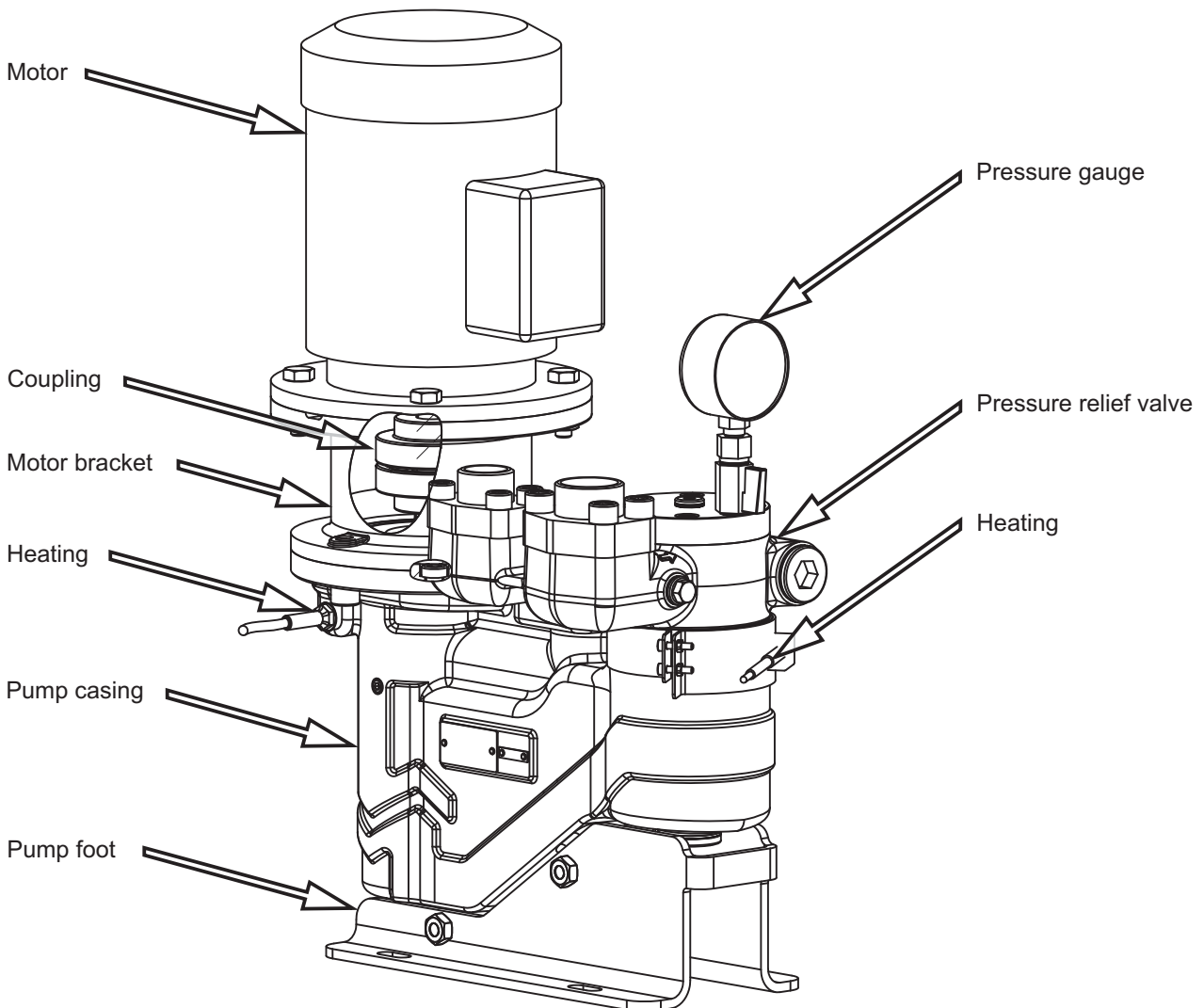
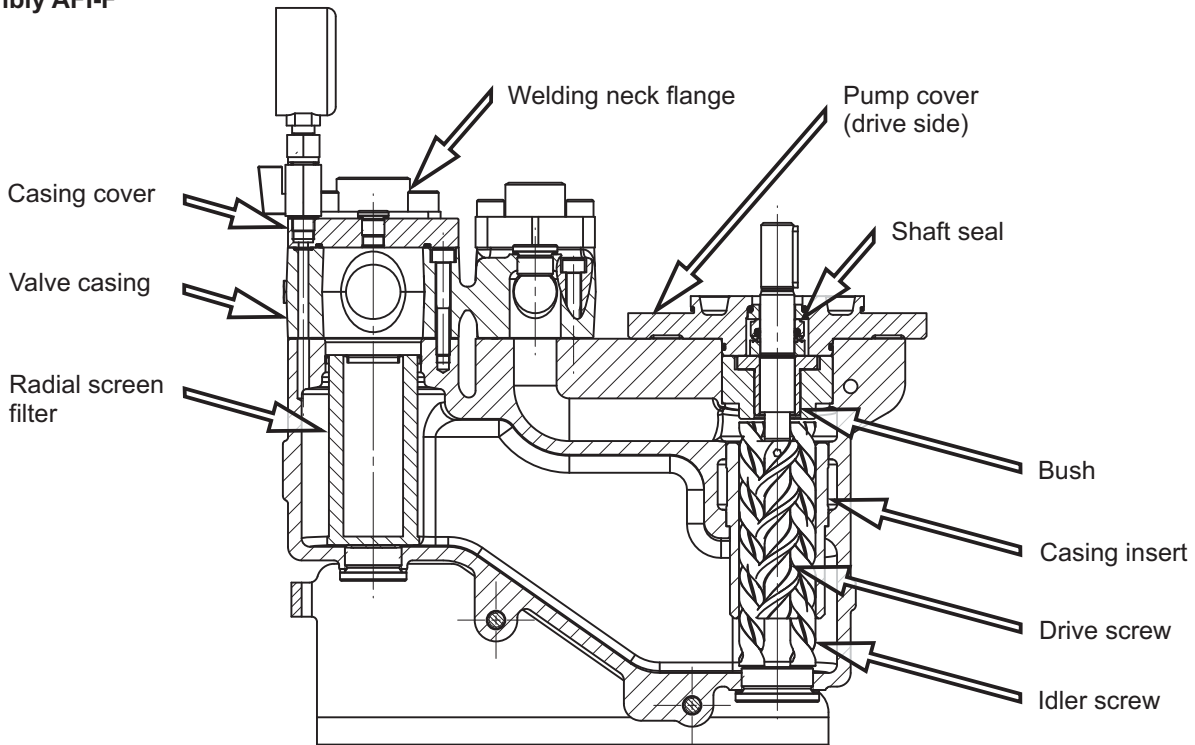
③ Recommended material for critical liquids

NPSH [m]

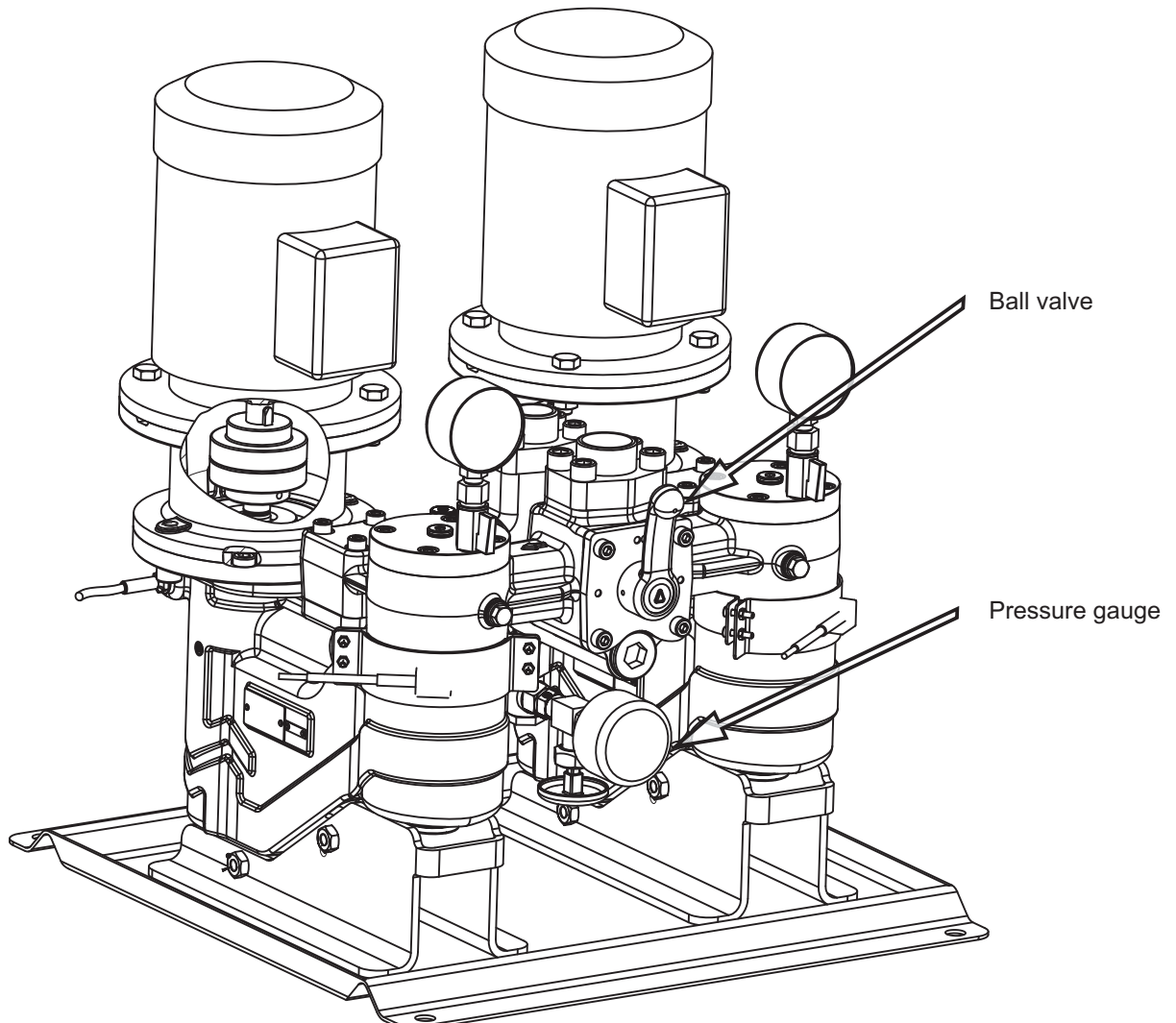
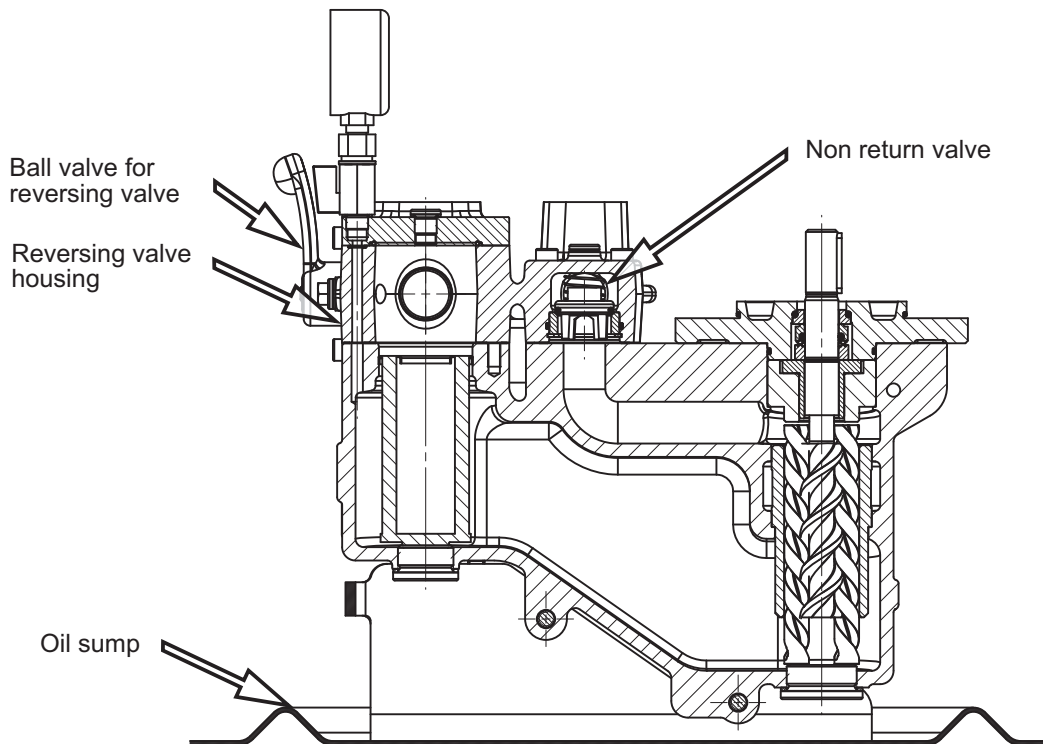
NPSH req. for the pump with filter

AFI-T / AFI-F	Speed 1/min											
	950 / 1.140			1.450 / 1.750			2.900			3.400		
	Kinematic viscosity mm ² /s											
	3-40	150	750	3-40	150	750	3-40	150	750	3-40	150	750
10-28	2,5	2,8	3,3	2,5	3,0	3,6	2,6	3,2	4,3	2,6	3,3	4,6
10-38	2,5	2,9	3,7	2,6	3,2	4,2	2,7	3,6	5,3	2,7	3,8	6,0
10-46	2,6	3,1	4,0	2,6	3,4	4,9	2,9	4,1	6,6	3,0	4,4	7,5
10-56	2,6	3,3	4,9	2,7	3,8	6,2	3,3	5,1	9,2	3,6	5,7	10,7
20-38	2,5	3,1	3,9	2,6	3,2	4,6	2,7	3,9	6,3	2,9	4,3	7,1
20-46	2,6	3,2	4,4	2,7	3,7	5,4	3,1	4,6	8,0	3,4	5,2	9,2
20-56	2,7	3,6	5,5	2,8	4,3	7,2	3,9	6,0	11,2	4,3	6,8	13,3
40-38	2,5	3,0	3,9	2,6	3,4	4,5	2,9	4,0	6,0	3,0	4,4	6,7
40-46	2,6	3,2	4,3	2,7	3,7	5,4	3,3	4,9	7,7	3,7	5,4	9,0
40-54	2,6	3,6	5,1	2,9	4,3	6,7	4,1	6,1	10,3	4,7	7,0	12,2

Assembly AFI-F

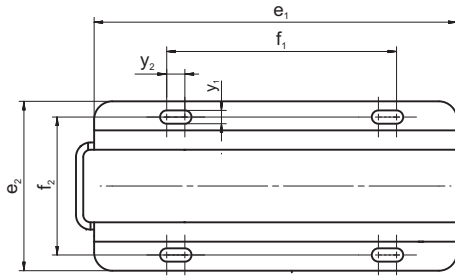


Assembly AFI-T

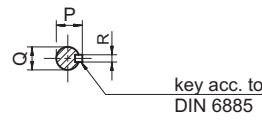


Main dimensions AFI-F

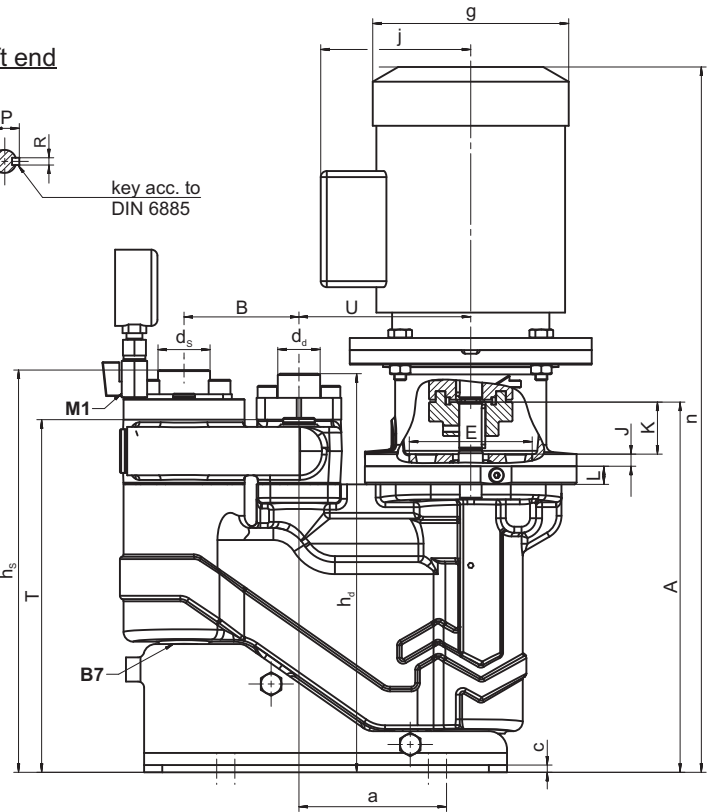
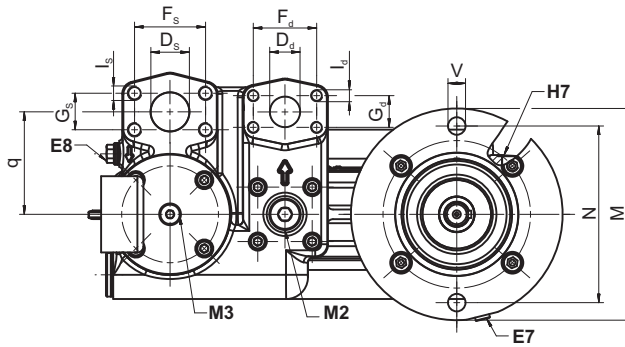
Pump foot



Shaft end



Top view without motor/bracket



AFI-F size	Pump dimensions													
	A	B	E	J	K	L	M	N	P	Q	R	T	U	V
10	264	95	82,55 _{-0,05}	8	33	13	130	106	16	14 _{j6}	5	264	117	11
20	306		101,6 _{-0,05}	10	43	15	175	146	21,5	19 _{j6}	6	292	142	14
40	358								14 _{j6}			342	160	

AFI-F size	Motor size	Unit dimensions											
		a	c	e ₁	e ₂	f ₁	f ₂	g ②	j ②	n ②	q	y ₁	y ₂
10	80	97	6	280	140	190	114	162	209	619	85	11	15
	90S							181	218	632			
	90L							181	218	656			
20	90S	122	6	300	140	190	114	181	218	658	85	11	15
	90L							181	218	726			
	100L							202	223	739			
	112M							227	238	746			
40	90L	128	6	330	140	190	114	181	218	778	85	11	15
	100L							202	223	791			
	112M							227	238	798			
	132S							266	278	910			
	132M							266	278	910			

Connections

Draining	Venting		Heating cartridge	Pressure gauge	
B7	E7	E8	H7	M1/M2	M3
G 1	M8x1	G ¼	M12x1	G ¼	G ½

Dimensions in mm,
Direction of rotation:
Clockwise as seen from the
drive side

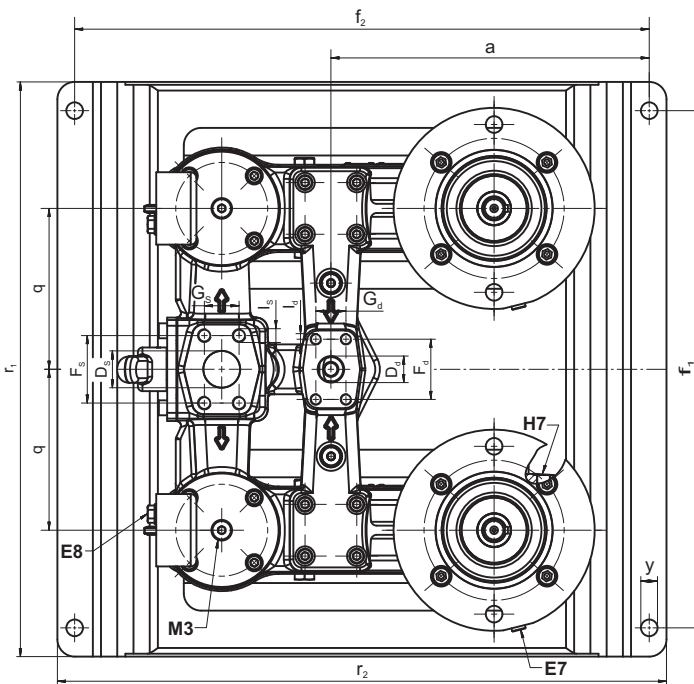
AFI-F size	Connection dimensions													
	SAE suction flange ①							SAE pressure flange ①						
	Inch.	D _s	F _s	G _s	l _s	d _s	h _s	Inch.	D _d	F _d	G _d	l _d	d _d	h _d
10	1 ¼	32	58,72	30,18	4 x M12	43	305	1	25	52,37	26,19	4 x M10	35	302
20							333							330
40							383							380

① SAE J518C, hole pattern
3.000 PSI

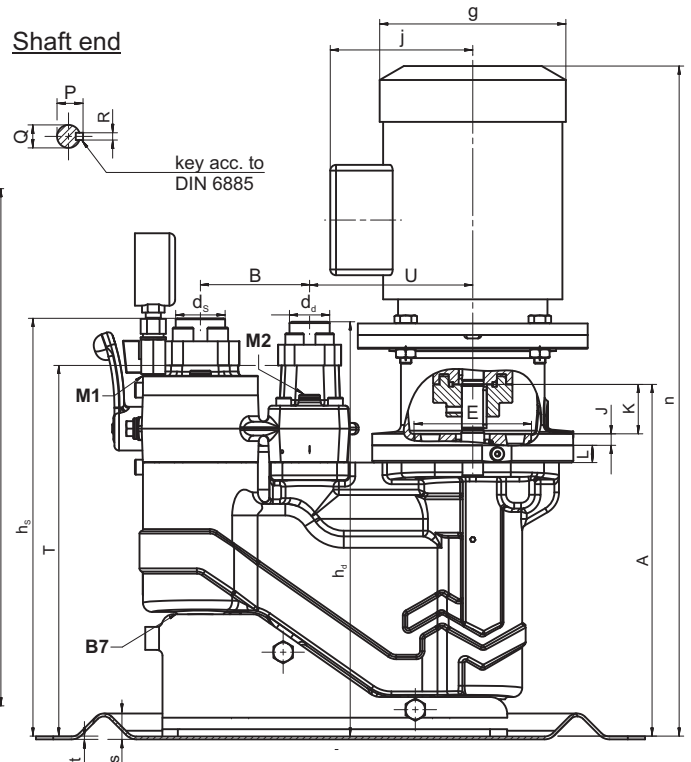
② Dimensions are reference
only and may deviate depend-
ing on motor manufacturer

Main dimensions AFI-T

Top view without motor/bracket



Shaft end



AFI-T size	Pump dimensions													
	A	B	E	J	K	L	M	N	P	Q	R	T	U	V
10	264	95	82,55 _{-0,05}	9	33	12	130	106	16	14 _{js}	5	295	117	11
20	306		101,6 _{-0,05}	10	43	15	175	146	21,5	19 _{js}	6	323	142	14
40	358									14 _{js}		373	160	

AFI-T size	Motor size	Unit dimensions											
		a	f ₁	f ₂	g ②	j ②	n ②	q ②	r ₁	r ₂	s	t	y
10	80	252	450	500	162	209	618		500	530	23	3	14,5
	90S				181	218	631	115					
	90L				181	218	655						
20	90S	277			181	218	658	115					
	90L				181	218	726	115					
	100L				202	223	739	140					
40	112M	298			227	238	746	140					
	90L				181	218	778	115					
	100L				202	223	791	140					
	112M				227	238	798	140					
	132S				266	278	910	190					
	132M	266			278	910	190	530					

Connections

Draining	Venting		Heating cartridge	Pressure gauge
B7	E7	E8	H7	M1/M2/M3
G 1	M8x1	G ¼	M12x1	G ¼

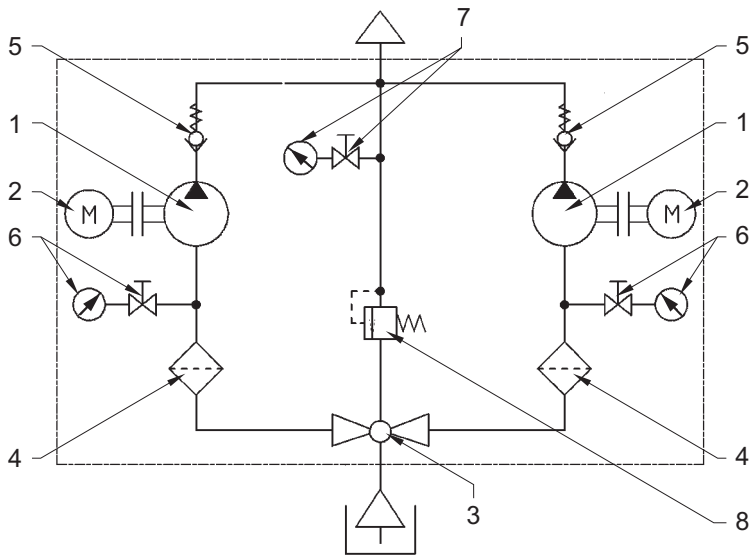
Dimensions in mm,
Direction of rotation:
Clockwise as seen from the
drive side

AFI-T size	Connection dimensions													
	SAE suction flange ①							SAE pressure flange ①						
	Inch.	D _s	F _s	G _s	l _s	d _s	h _s	Inch.	D _d	F _d	G _d	l _d	d _d	h _d
10	1 ¼	32	58,72	30,18	4 x M12	43	336	1	23	52,37	26,19	4 x M10	35	333
20							364							361
40							414							411

① SAE J518C, hole pattern
3.000 PSI

② Dimensions are reference
only and may deviate depend-
ing on motor manufacturer

Connection diagram AFI-T



AFI-T connection diagram	
Part No.	Description
1	Operation and reserve pump
2	Three-phase motor
3	Ball valve
4	Radial screen filter
5	Non return valve
6	Pressure gauge with ball valve
7	Pressure gauge with ball valve
8	Pressure relief valve

Benefits

► **Impressive service life**
Hydrodynamic axial thrust compensation minimizes loads on the screws and extends service life.

► **Extraordinary flexibility**
A wide range of available materials makes it possible to adapt to special operating conditions and various liquids.

► **Continuous operation (*)**
The non-return valve makes it possible to maintain and remove a pump while the reserve pump ensures that the process continues without interruption.
(*) For AFI-T only

► **Optimized control**
The pressure-vacuum gauge monitors the cleanliness of the radial screen filter to ensure continuous flow.

► **Rapid exchanges**
Vertical filter installation lets the operator exchange the filter without draining the oil.

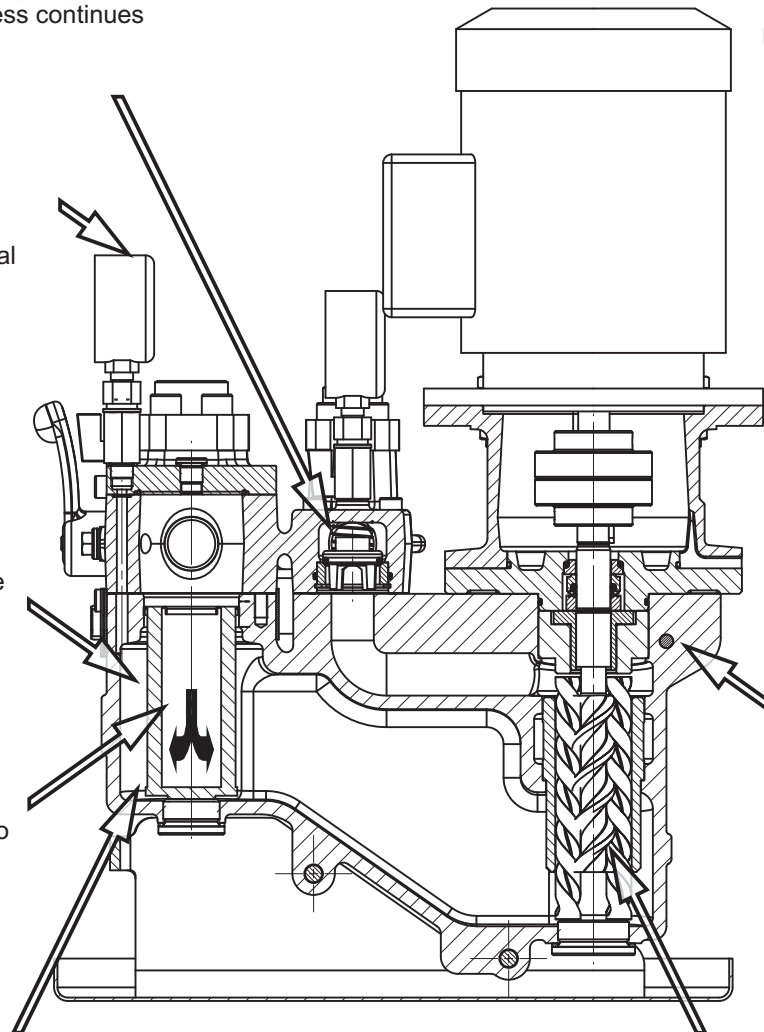
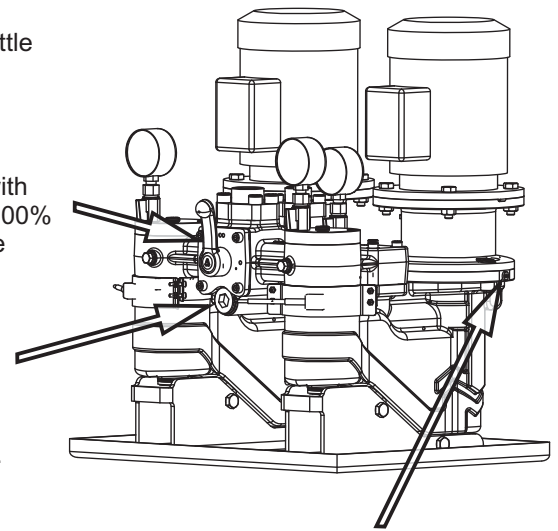
► **A clean solution**
The inside-out flow keeps particles of dirt inside the filter. An integrated magnet also keeps metal chips on the floor of the filter.

► **Reliable suction behavior**
Large filter surfaces promote excellent suction behavior and extend maintenance intervals.

► **Economical use of space**
The installed pump requires little space.

► **Save operation (*)**
The advanced valve casing with only one ball valve provides 100% security when switching to the reserve pump.
(*) For AFI-T only

► **Outstanding reliability**
The conical valve provides permanent protection against impermissibly high pressures.



► **Flawless start-up**
The vent screw ensures the best possible venting of the mechanical seal chamber each time the pump is started, even when installed vertically.

► **Flawless pump starting**
Optional heating of the filter and mechanical seal ensure that the pump starts without issue even when the ambient temperature is low.

► **Reliable process stability**
Specially-shaped thread flanks produce virtually pulsation-free, low-noise pumping action.

Subject to alterations.

ALLWEILER AG
Postfach 11 40
78301 Radolfzell • Germany
Tel. +49 (0)7732 86-0
Fax +49 (0)7732 86-436
E-mail: service@allweiler.de
Internet: <http://www.allweiler.com>

ALLWEILER 
A Colfax Business Unit