

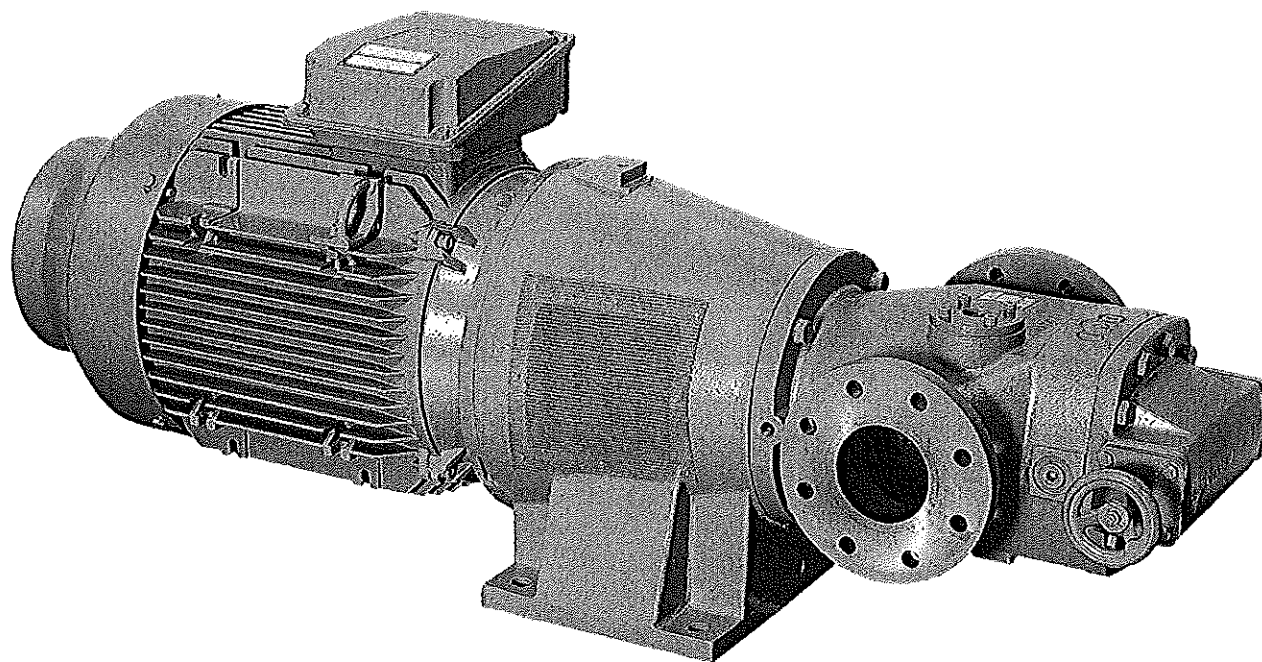


A Member of the
COLFAX PUMP GROUP

ACF4

Screw pump series

Product description



Flow volume: 300-3 000 l/min
Max differential pressure: 16 bar
Applications: Lubrication, circulation and transfer

Applications

The ACF pumps are used for a number of different fluids:

Lubrication oil, fuel oil, vegetable oil, hydraulic oil and other hydraulic fluids, glycols, polymers, emulsions, and any non-aggressive fluid with some lubricating properties.

Typical applications are:

- Lubrication of diesel engines, gears, gas and steam turbines, hydro turbines, paper machines. Main and prelube pump for diesel engines.
- Circulation for cooling and filtration in large machineries and hydraulic systems, pumping transformer oil for insulation in transformers.
- Transfer onboard ships, in oil factories, refineries, tank farms etc.
- Filling of pressure chambers in hydraulic presses.

Technical data

Discharge pressure

Maximum discharge pressure is 16 bar

Differential pressure

Maximum differential pressure is 16 bar but is reduced at low viscosities as shown in the table below.

Viscosity, mm ² /s (cSt)	2	7	12	20	30	37
Max. diff. pressure (bar)	5	8	10	12	15	16

Inlet pressure

Max. inlet pressure is 5 bar.

Min. inlet pressure (suction capability) is dependent on fluid viscosity and axial velocity of the fluid. I.e. suction capability increases with decreased viscosity and rotation speed.

Min. inlet pressure is shown in the selection guide.

Information about min. inlet pressure for each individual pump case can be obtained from IMO AB.

Displacement cm³/r

Size and lead

080K	080N	090K	090N	100K	100N
380	458	555	653	769	895
110L	110N	125L	125N		
1053	1191	1399	1748		

Pressure relief valve

The pump is equipped with an integral pressure relief valve with internal return, limiting the differential pressure across the pump and protecting the pump should the discharge line be blocked. The valve is

adjustable for different opening pressures: up to 10 bar for springs with model code "O" and up to 16 bar for springs with model code "P".

The value of the pressure limit can be set at the factory and should be adjusted at installation (see Installation & Start-up instruction for low pressure pumps).

The maximum pressure accumulation varies with pump size, speed and viscosity, but will normally not exceed 5 bar. The characteristic of the valve allows the valve to be used as pressure regulating valve when not too high demands on pressure modulation are required.

Drive

The ACF -pump is designed primarily for direct drive through a flexible shaft coupling. Under certain conditions other types of drive can be permitted, e.g. gear or pulley drives, which create radial loads onto the shaft end. Permissible radial force varies with pressure, speed and inlet conditions.

For radial load requirements, please contact IMO AB.

Speed

The maximum speed is 1800 rpm. Max. operating speed may be reduced depending on inlet conditions. Please consult the selection guide to find a corresponding speed limit in order to avoid cavitation problems.

for CCW operation can be delivered on special request.

For shorter periods of time, a few minutes for emptying a discharge line, the pump may be operated in reverse direction, provided the back pressure is limited to 3 bar.

Rotation

The ACF pump is designed to operate in one rotational direction only, as standard clockwise when facing the shaft end. Pumps

Fluid viscosity

2-1500 mm²/s. Viscosity up to 5000 mm²/s with approval from IMO AB.

Material and design

	IXXX	NVXX
Pump body	Grey cast iron	(Option: Nodular cast iron)
Power rotor	Nitrocarburated carbon steel	
Idler rotors	Surface-treated carbon steel	
Shaft seal	Mechanical seal with rotating sealing ring and stationary seat in perlitic cast iron (surface treated).	

For handling of fluids which may be aggressive to above materials consult IMO AB.

Sound level	Size	080	090	100	110	125
Typical pump sound pressure levels referred to free field conditions at a distance of 1 m. from the pump.	Sound pressure level, dB (A)	73	74	75	76	77
Noise of driver excluded in the quoted figures. the pressure levels are measured at a discharge pressure of 7 bar, speed 1450 rpm, viscosity 37 mm ² /s.						

Pumping temperature

Type Ixxx: -20°C to 90°C.
Type NVxx: -20°C to 130°C.

Units

The following units are frequently used for specification of pumps:

	SI-unit	IMO units	USA units	conversion
Pressure	Pa (MPa)	bar	psi	1 bar = 14.5 psi = 0.1 MPa
Speed	r/s	rpm	rpm	1 rpm = 0.016667 r/s
Viscosity	mm ² /s	cSt	SSU	see table
Temperature	°C	°C	°F	°C = (°F-32)/1.8
Length	m	mm	inch	1 mm = 0.0394 inch
Flow rate	m ³ /s	lit/min	GPM	1 lit/min = 0.264 GPM

Viscosity table

cSt	2	4	8	20	37	75	200	400	800	1500
SSU	32.6	39.2	52.2	99.4	174	346	927	1850	3700	6940

Selection guide 50 Hz

Size & Lead	Visc. (cSt)	Speed: 960 rpm							Speed: 1450 rpm						
		Q _{eff} (lit/min)			P _e (kW)			Min. inlet (bar)*	Q _{eff} (lit/min)			P _e (kW)			Min. inlet (bar)*
		Diff. pressure (bar)			Diff. pressure (bar)				Diff. pressure (bar)			Diff. pressure (bar)			
		4	8	12	4	8	12	4	8	12	4	8	12		
080K	20	310	288	270	2.9	5.4	7.8	-0.85	497	474	457	4.6	8.3	11.9	-0.85
	37	325	308	295	3.1	5.5	8.0	-0.85	512	495	482	4.9	8.6	12.3	-0.85
	75	337	325	316	3.4	5.8	8.2	-0.85	524	512	503	5.4	9.1	12.8	-0.85
	400	353	348	344	4.6	7.0	9.5	-0.82	540	535	531	7.7	11.4	15.0	-0.68
080N	20	377	350	330	3.5	6.4	9.4	-0.85	601	575	555	5.5	9.9	14.4	-0.81
	37	393	374	359	3.7	6.7	9.6	-0.85	618	598	584	5.9	10.3	14.7	-0.80
	75	407	394	383	4.1	7.0	9.9	-0.85	632	618	608	6.5	10.9	15.4	-0.78
	400	426	420	415	5.5	8.5	11.4	-0.77	650	644	640	9.2	13.7	18.1	-0.58
090K	20	468	442	421	4.3	7.8	11.4	-0.85	740	714	693	6.7	12.0	17.4	-0.82
	37	486	466	451	4.5	8.1	11.6	-0.85	758	738	723	7.1	12.5	17.9	-0.82
	75	500	486	475	4.9	8.5	12.0	-0.85	772	758	747	7.9	13.3	18.6	-0.80
	400	519	513	508	6.7	10.2	13.8	-0.80	791	785	780	11.2	16.6	21.9	-0.64
090N	20	546	513	488	5.0	9.2	13.4	-0.85	866	833	808	7.8	14.2	20.5	-0.75
	37	568	543	524	5.3	9.5	13.7	-0.85	888	863	844	8.4	14.7	21.0	-0.74
	75	585	568	555	5.8	10.0	14.1	-0.85	905	888	875	9.3	15.6	21.9	-0.72
	400	609	601	596	7.9	12.1	16.2	-0.75	929	921	916	13.2	19.5	25.8	-0.53
100K	20	655	620	593	5.9	10.8	15.8	-0.85	1032	997	971	9.2	16.7	24.1	-0.77
	37	677	652	632	6.2	11.2	16.1	-0.85	1054	1029	1009	9.9	17.3	24.8	-0.76
	75	696	678	664	6.8	11.7	16.7	-0.85	1073	1055	1041	10.9	18.4	25.8	-0.74
	400	720	712	706	9.3	14.2	19.1	-0.76	1097	1090	1084	15.5	23.0	30.4	-0.56
100N	20	759	718	686	6.9	12.6	18.3	-0.85	1198	1156	1124	10.8	19.4	28.1	-0.69
	37	786	755	732	7.3	13.0	18.7	-0.85	1224	1194	1170	11.5	20.2	28.8	-0.67
	75	808	786	770	7.9	13.7	19.4	-0.84	1246	1225	1208	12.7	21.4	30.0	-0.65
	400	837	828	820	10.8	16.5	22.2	-0.70	1275	1266	1259	18.0	26.7	35.3	-0.44
110L	20	888	837	798	8.1	14.8	21.6	-0.85	1404	1353	1314	12.7	22.8	33.0	-0.68
	37	920	883	854	8.5	15.3	22.0	-0.85	1436	1399	1370	13.5	23.7	33.9	-0.66
	75	947	921	901	9.3	16.1	22.8	-0.84	1463	1437	1417	15.0	25.1	35.3	-0.64
	400	983	972	963	12.7	19.4	26.2	-0.70	1499	1488	1479	21.2	31.4	41.6	-0.44
110N	20	1014	960	919	9.1	16.8	24.4	-0.82	1597	1543	1502	14.3	25.8	37.3	-0.58
	37	1048	1008	978	9.7	17.3	24.9	-0.81	1632	1592	1562	15.3	26.8	38.3	-0.57
	75	1076	1049	1027	10.5	18.2	25.8	-0.80	1660	1632	1611	16.9	28.4	40.0	-0.54
	400	1114	1102	1093	14.4	22.0	29.6	-0.64	1698	1686	1677	24.0	35.5	47.0	-0.31
125L	20	1199	1139	1093	10.7	19.7	28.6	-0.85	1884	1825	1779	16.8	30.3	43.9	-0.70
	37	1237	1193	1159	11.4	20.3	29.3	-0.85	1922	1879	1845	18.0	31.5	45.0	-0.68
	75	1269	1238	1214	12.4	21.3	30.3	-0.84	1954	1923	1900	19.9	33.4	46.9	-0.66
	400	1311	1297	1287	16.86	25.81	34.77	-0.68	1996	1983	1973	28.2	41.72	55.25	-0.40
125N	20	1505	1433	1378	13.4	24.6	35.8	-0.80	2362	2290	2235	21.0	37.9	54.8	-0.53
	37	1551	1498	1458	14.2	25.4	36.6	-0.78	2407	2355	2314	22.5	39.4	56.3	-0.51
	75	1589	1552	1523	15.5	26.7	37.8	-0.76	2445	2408	2380	24.8	41.7	58.6	-0.47
	400	1639	1623	1611	21.1	32.3	43.4	-0.55	2496	2480	2468	35.2	52.1	69.0	-0.16

* Valid for liquids free from unresolved air or gas.

Selection guide 60 Hz

Size & Lead	Visc. (cSt)	Speed: 1600 rpm							Speed: 1750 rpm						
		Q _{eff} (lit/min)			P _e (kW)			Min. inlet (bar)*	Q _{eff} (lit/min)			P _e (kW)			Min. inlet (bar)*
		Diff. pressure (bar)			Diff. pressure (bar)				Diff. pressure (bar)			Diff. pressure (bar)			
		4	8	12	4	8	12	4	8	12	4	8	12		
080K	20	387	364	346	3.6	6.5	9.5	-0.85	611	588	571	5.6	10.1	14.5	-0.81
	37	401	384	371	3.8	6.8	9.7	-0.85	626	609	596	6.1	10.5	14.9	-0.80
	75	413	401	392	4.2	7.1	10.1	-0.85	638	626	617	6.7	11.2	15.6	-0.78
	400	429	424	420	5.8	8.7	11.7	-0.77	654	649	645	9.7	14.2	18.6	-0.58
080N	20	468	442	422	4.3	7.9	11.4	-0.85	738	712	692	6.8	12.1	17.5	-0.73
	37	485	466	451	4.6	8.1	11.7	-0.85	755	736	721	7.3	12.6	18.0	-0.71
	75	499	485	475	5.0	8.6	12.1	-0.85	769	755	745	8.1	13.5	18.8	-0.68
	400	517	511	507	7.0	10.5	14.1	-0.70	787	782	777	11.7	17.1	22.4	-0.44
090K	20	579	553	532	5.2	9.5	13.8	-0.85	907	880	860	8.2	14.7	21.2	-0.74
	37	597	577	562	5.6	9.9	14.2	-0.85	924	904	889	8.8	15.3	21.8	-0.73
	75	611	597	586	6.1	10.4	14.7	-0.85	938	924	914	9.8	16.3	22.8	-0.71
	400	630	624	619	8.5	12.8	17.1	-0.74	957	951	946	14.2	20.7	27.2	-0.51
090N	20	677	644	618.2	6.1	11.2	16.3	-0.84	1062	1029	1003	9.6	17.3	24.9	-0.64
	37	698	674	655	6.5	11.6	16.6	-0.84	1084	1059	1040	10.4	18.0	25.6	-0.62
	75	716	699	686	7.2	12.2	17.3	-0.82	1101	1084	1071	11.6	19.2	26.8	-0.60
	400	740	732	726	10.0	15.0	20.1	-0.67	1125	1117	1112	16.7	24.3	31.9	-0.37
100K	20	809	774	747	7.2	13.2	19.2	-0.85	1263	1228	1201	11.4	20.4	29.3	-0.66
	37	831	806	786	7.7	13.7	19.6	-0.85	1285	1260	1240	12.2	21.2	30.2	-0.65
	75	850	832	818	8.5	14.4	20.4	-0.83	1304	1286	1272	13.6	22.6	31.6	-0.62
	400	874	866	860	11.7	17.7	23.6	-0.69	1328	1320	1314	19.7	28.7	37.7	-0.41
100N	20	938	897	865	8.4	15.3	22.3	-0.80	1466	1425	1393	13.2	23.7	34.1	-0.54
	37	965	934	911	9.0	15.9	22.8	-0.79	1493	1462	1439	14.2	24.7	35.1	-0.53
	75	987	965	949	9.8	16.8	23.7	-0.77	1515	1493	1477	15.8	26.3	36.7	-0.50
	400	1016	1007	999	13.6	20.6	27.5	-0.61	1544	1535	1527	22.9	33.3	43.8	-0.24
110L	20	1098	1047	1008	9.9	18.1	26.2	-0.79	1720	1669	1630	15.6	27.9	40.1	-0.52
	37	1131	1094	1065	10.6	18.7	26.8	-0.79	1752	1715	1686	16.7	29.0	41.3	-0.51
	75	1158	1132	1111	11.6	19.7	27.9	-0.77	1779	1753	1733	18.6	30.9	43.2	-0.48
	400	1194	1183	1174	16.1	24.2	32.3	-0.60	1815	1804	1795	26.9	39.2	51.5	-0.24
110N	20	1252	1198	1157	11.2	20.2	29.6	-0.74	1954	1901	1859	17.6	31.5	45.4	-0.39
	37	1286	1247	1216	11.9	21.1	30.4	-0.73	1989	1949	1919	18.9	32.8	46.7	-0.37
	75	1315	1287	1265	13.1	22.3	31.5	-0.70	2017	1989	1968	21.1	35.0	48.9	-0.34
	400	1353	1341	1331	18.2	27.4	36.6	-0.52	-	-	-	-	-	-	-
125L	20	1479	1419	1373	13.2	24.0	34.8	-0.81	2304	2244	2198	20.7	37.0	53.3	-0.56
	37	1517	1473	1439	14.0	24.8	35.7	-0.80	2342	2298	2265	22.2	38.6	54.9	-0.54
	75	1548	1517	1494	15.4	26.2	37.0	-0.77	2374	2343	2319	24.8	41.1	57.4	-0.51
	400	1591	1577	1567	21.3	32.1	43.0	-0.57	2416	2403	2392	35.8	52.1	68.4	-0.20
125N	20	1855	1783	1728	16.5	30.0	43.5	-0.70	2886	2814	2759	25.8	46.2	66.6	-0.31
	37	1900	1848	1807	17.5	31.0	44.5	-0.68	2932	2879	2839	27.8	48.2	68.6	-0.29
	75	1938	1901	1873	19.2	32.7	46.2	-0.66	2970	2933	2904	30.9	51.3	71.7	-0.24
	400	1989	1973	1961	26.6	40.2	53.7	-0.40	-	-	-	-	-	-	-

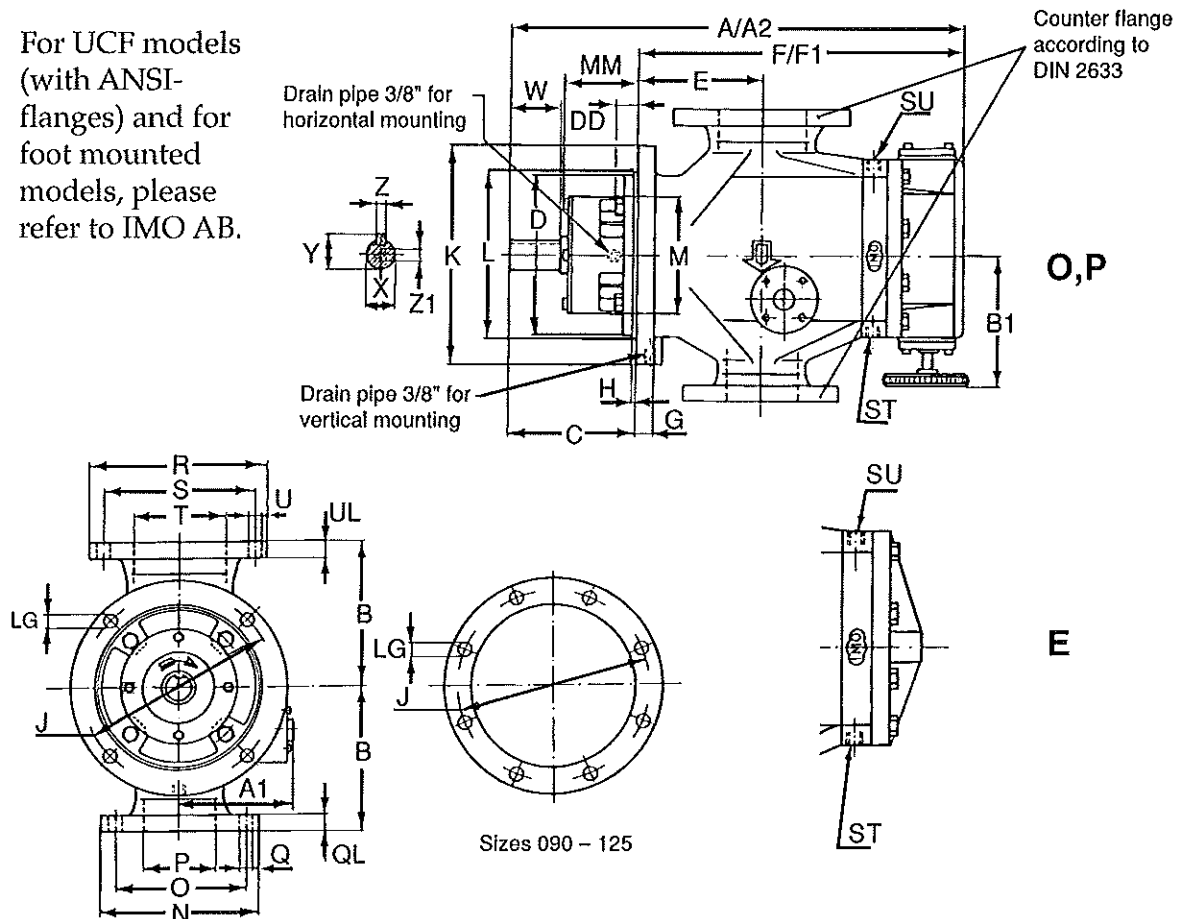
* Valid for liquids free from unresolved air or gas.

Pump dimensions

Pump ACF

Dimensions in mm (The counter flanges are accessories)

For UCF models (with ANSI-flanges) and for foot mounted models, please refer to IMO AB.



Pump size	Main dim.													Flange dim.						
	A ^(O,P)	A ^(E)	A1	B	B1	C	D	DD	E	F ^(O,P)	F ^(E)	M	MM	G	H	J	K	L1	LG ³	LG ⁴
080	639	588	154	200	195	180	222	36	172	458	408	150	106	24	5	265	300	230	4	18
090	669	619	157	225	195	180	243	36	188	489	439	162	105	24	5	300	350	250	8	18
100	769	701	198	250	220	220	290	36	209	549	481	210	129	30	5	350	400	300	8	18
110	816	748	198	260	220	220	290	36	240	596	528	210	129	30	5	350	400	300	8	18
125	921	818	198	265	260	220	290	36	270	701	598	210	129	35	5	350	400	300	8	18

Pump size	Outlet						Inlet						Shaft					Weight			
	N	O	P	Q ³	Q ⁴	QL	R	S	T	U ³	U ⁴	UL	W	X ²	Y	Z	Z1 ⁵	ST ⁶	SU ⁷	lbs	kg
080	229	180	100	8	18	20	254	210	125	8	18	22	70	40	43,5	12	5/8"	1/2"	3/8"	220	100
090	254	210	125	8	18	22	285	240	150	8	22	22	70	45	49	14	5/8"	1/2"	3/8"	285	130
100	254	210	125	8	18	22	285	240	150	8	22	22	80	50	54	14	5/8"	1/2"	3/8"	365	165
110	285	240	150	8	22	22	343	295	200	12	22	24	85	55	60	16	5/8"	1/2"	3/8"	450	205
125	285	240	150	8	22	23	343	295	200	12	22	27	90	60	65	18	5/8"	1/2"	3/8"	605	275

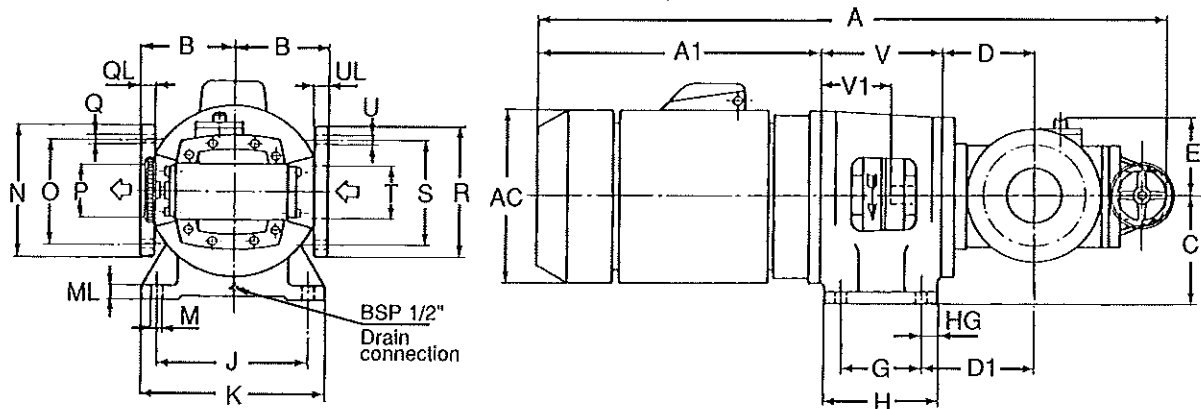
1) Tolerances ISO h7 2) Tolerances ISO j6
3) Pcs 4) Diameter 5) UNC 6) Discharge, BSP 7) Suction, BSP

Fig. 9

Pump dimensions

Pump unit ACF

Dimensions in mm (With standard electric motor)



Pump size	Frame size	Main dim.										Foot dim.						
		A	A1	AC	B	C	D	Di	E	V	V1	G	H	HG	J	K	M	ML
080	F265	1114	389	249	200	250	172	214	154	273	93	190	260	35	340	400	22	25
080	F300	1340	585	351	200	250	172	214	154	303	123	220	290	35	340	400	22	25
080	F350	1367	612	392	200	250	172	214	154	303	123	220	290	35	340	400	22	25
090	F300	1372	585	351	225	250	188	234	157	303	123	220	288	35	340	400	22	25
090	F350	1399	612	392	225	250	188	234	157	303	123	220	288	35	340	400	22	25
090	F400	1449	642	442	225	250	188	234	157	323	143	230	300	35	340	400	22	25
100	F300	1472	585	351	250	300	209	248	198	343	123	265	335	35	380	450	25	25
100	F350	1499	612	392	250	300	209	248	198	343	123	265	335	35	380	450	25	25
100	F400	1549	642	442	250	300	209	248	198	363	143	285	355	35	430	500	25	35
100	F500	1966	1039	555	250	300	209	248	198	383	163	285	375	35	430	500	25	35
110	F300	1519	585	351	260	300	240	279	198	343	123	265	335	35	380	450	25	25
110	F350	1546	612	392	260	300	240	279	198	343	123	265	335	35	380	450	25	25
110	F400	1596	642	442	260	300	240	279	198	363	143	285	355	35	430	500	25	35
110	F500	2013	1039	555	260	300	240	279	198	383	163	285	375	35	430	500	25	35
125	F300	1623	585	351	265	300	270	309	198	343	123	265	335	35	380	450	25	25
125	F350	1650	612	392	265	300	270	309	198	343	123	265	335	35	380	450	25	25
125	F400	1700	642	442	265	300	270	309	198	363	143	285	355	35	430	500	25	35
125	F500	2117	1039	555	265	300	270	309	198	383	163	285	375	35	430	500	25	35

Pump size	Outlet					Inlet					Weight Approx.	
	N	O	P	Q	QL	R	S	T	U	UL	Lbs	kg
080	229	180	100	18x8	20	254	210	125	18x8	22	363	165
080	229	180	100	18x8	20	254	210	125	18x8	22	446	270
080	229	180	100	18x8	20	254	210	125	18x8	22	512	310
090	254	210	125	18x8	22	285	240	150	22x8	22	495	300
090	254	210	125	18x8	22	285	240	150	22x8	22	561	340
090	254	210	125	18x8	22	285	240	150	22x8	22	652	395
100	254	210	125	18x8	22	285	240	150	22x8	22	569	345
100	254	210	125	18x8	22	285	240	150	22x8	22	635	385
100	254	210	125	18x8	22	285	240	150	22x8	22	726	440
100	254	210	125	18x8	22	285	240	150	22x8	22	817	495
110	285	240	150	22x8	22	343	295	200	22x12	24	635	385
110	285	240	150	22x8	22	343	295	200	22x12	24	701	424
110	285	240	150	22x8	22	343	295	200	22x12	24	792	480
110	285	240	150	22x8	22	343	295	200	22x12	24	883	535
125	285	240	150	22x8	23	343	295	200	22x12	27	751	455
125	285	240	150	22x8	23	343	295	200	22x12	27	817	495
125	285	240	150	22x8	23	343	295	200	22x12	27	908	550
125	285	240	150	22x8	23	343	295	200	22x12	27	998	605

Fig. 10

IMO Tuning®

The tuning® valves, which are standard on the ACF series, make it possible to pump oil containing free air, with a minimum of disturbing vibration noise.

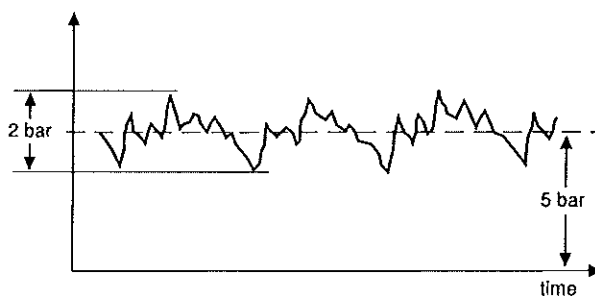
Low volume lube oil systems and additives that prolong deaeration time are the main reasons for having an excessive amount of free air in the oil. Free air is the main source of vibration and noise in pump systems as the

air entrained oil is compressible and air bubbles expands and decreases in size very rapidly.

By throttling the tuning® valve, the correct amount of fluid, depending on air content and pressure, is fed from the pressure side into the rotor bores.

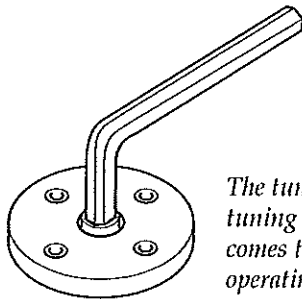
The effect this has on the air bubbles is that they will gradually decrease in size rather than collapse when exposed to the full pressure on the discharge side.

Effect of tuning® Pressure fluctuations

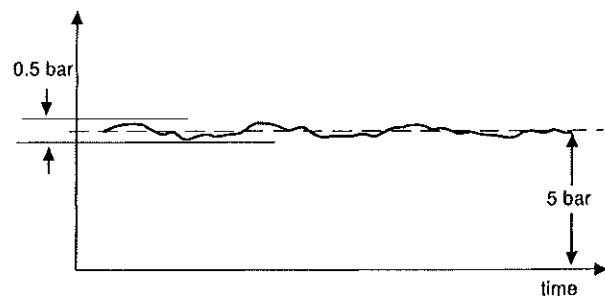


Without tuning®

Pressure fluctuations are rapid and cover a wide band which produces a loud rattling noise.



The tuning® valve on a ACF-pump is easily adjusted (by turning the tuning spindle with an Allen key to a position where the noise level comes to a minimum) while the pump is working under normal operating conditions.



With tuning®

Pressure fluctuations are highly reduced in speed and magnitude leading to low noise level.

Diagrams refer to tests at 1800 rpm, delivery pressure 5 bar, inlet pressure -0,5 bar, viscosity 75 cSt and 6% free air.

Installation

The ACF-pump is designed to be flange-mounted horizontally to its electric motor via a connecting frame and a flexible shaft coupling or vertically on a tripod stand.

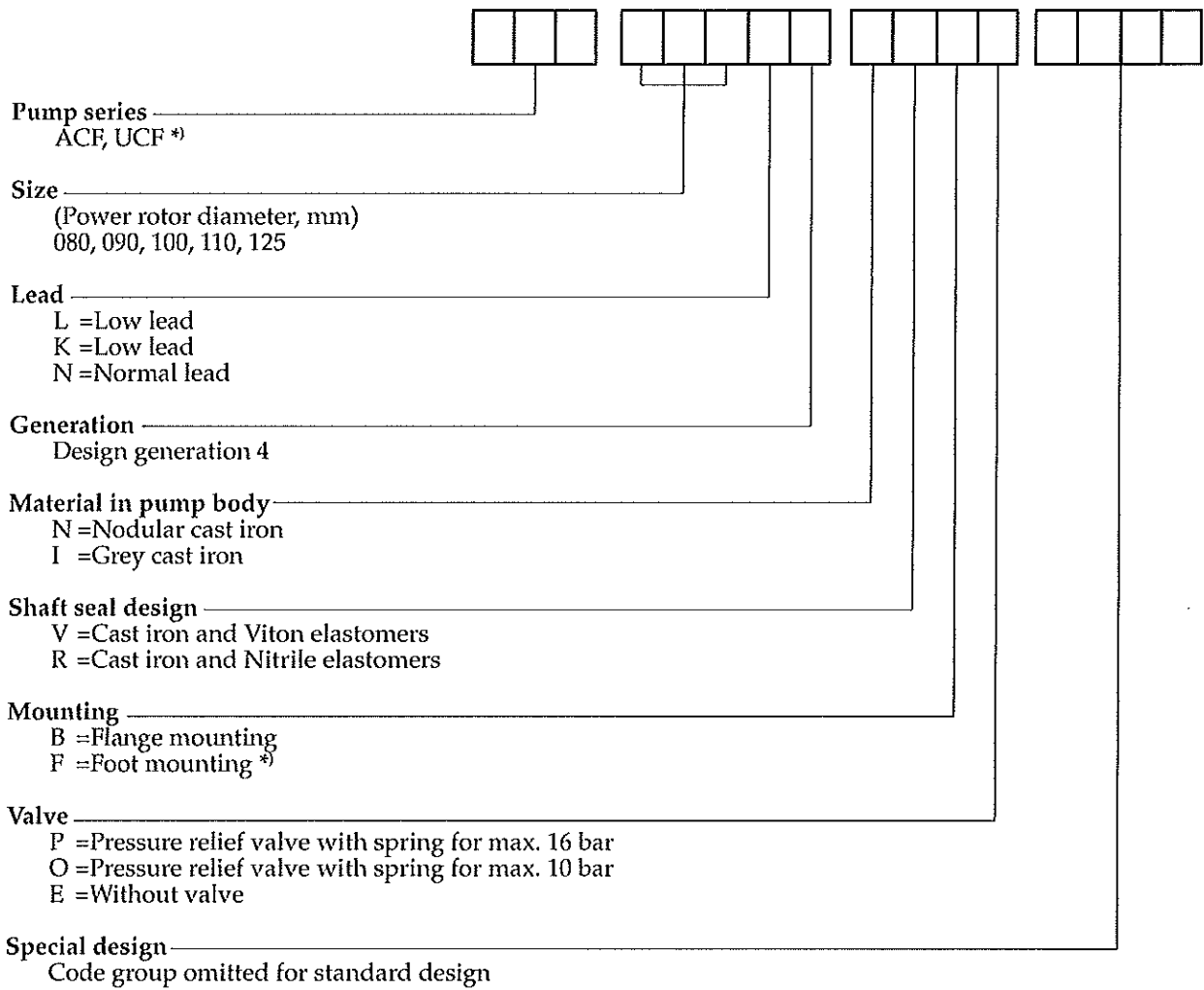
For more information about installation read the Installation and Start-up instruction for low pressure pumps.

Maintenance and Service

Spare parts for these pumps are easily available from stock. For detailed information and know-how about service read the

maintenance and service instruction for ACF-pumps or contact IMO AB.

Pump model code



*) For UCF and foot-mounted models, please contact IMO AB

Accessories

A bare shaft pump (Fig. 1) can be ordered with the accessories in fig. 2-8.

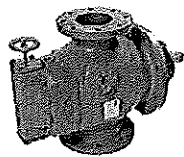


Fig. 1 Bare shaft pump



Fig. 2 Set of counter flanges

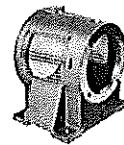


Fig. 3 Connecting frame

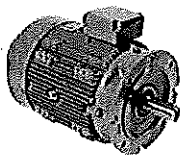


Fig. 4 Electric motor



Fig. 5 Shaft coupling



Fig. 6 Tripod



Fig. 7 Extended, flexible valve shaft

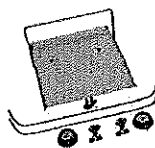


Fig. 8 Gauge panel

Sectional view

ACF/UCF

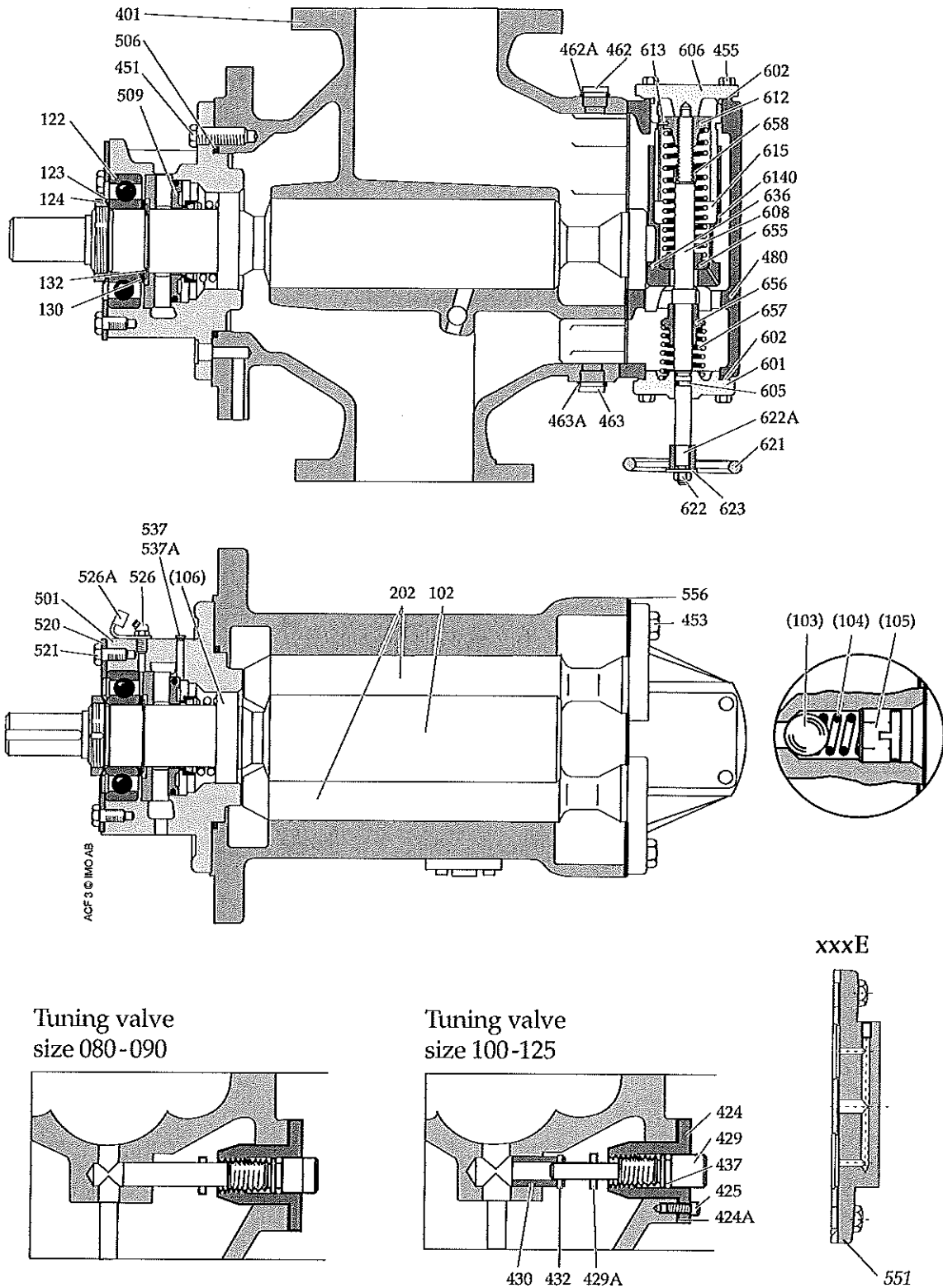


Fig. 1

List of components

Pos No	Denomination	Pos No	Denomination	Pos No	Denomination
102 (101)	Power rotor	455	Screw	605	O-ring
113	Key	462	Plug	606	Bottom cover
122	Ball bearing	462A	Sealing washer	608	Valve spindle
123	Locking washer	463	Plug	612	Regulating nut
124	Bearing nut	463A	Sealing washer	613	Pin
130	Support ring	480	Valve housing	6140	Valve piston
132	Retaining ring	501	Front cover	615	Spring
202 (201)	Idler rotor	506	O-ring	621	Wheel
401	Pump body	509	Shaft seal	622	Nut
424	Sleeve	520	Bearing disc	622A	Key
424A	Gasket	521	Screw	623	Valve plate
425	Screw	526	Grease nipple	636	Shock valve
429	Spindle	526A	Protective cap	655	Washer
429A	Pin	537	Deaeration plug	656	Sleeve
430	Piston	537A	Washer	657	Spring
432	Pin	551	Rear cover	658	Distance sleeve
437	O-ring	556	Gasket		
451	Screw	601	Top cover		
453	Screw	602	Gasket		



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