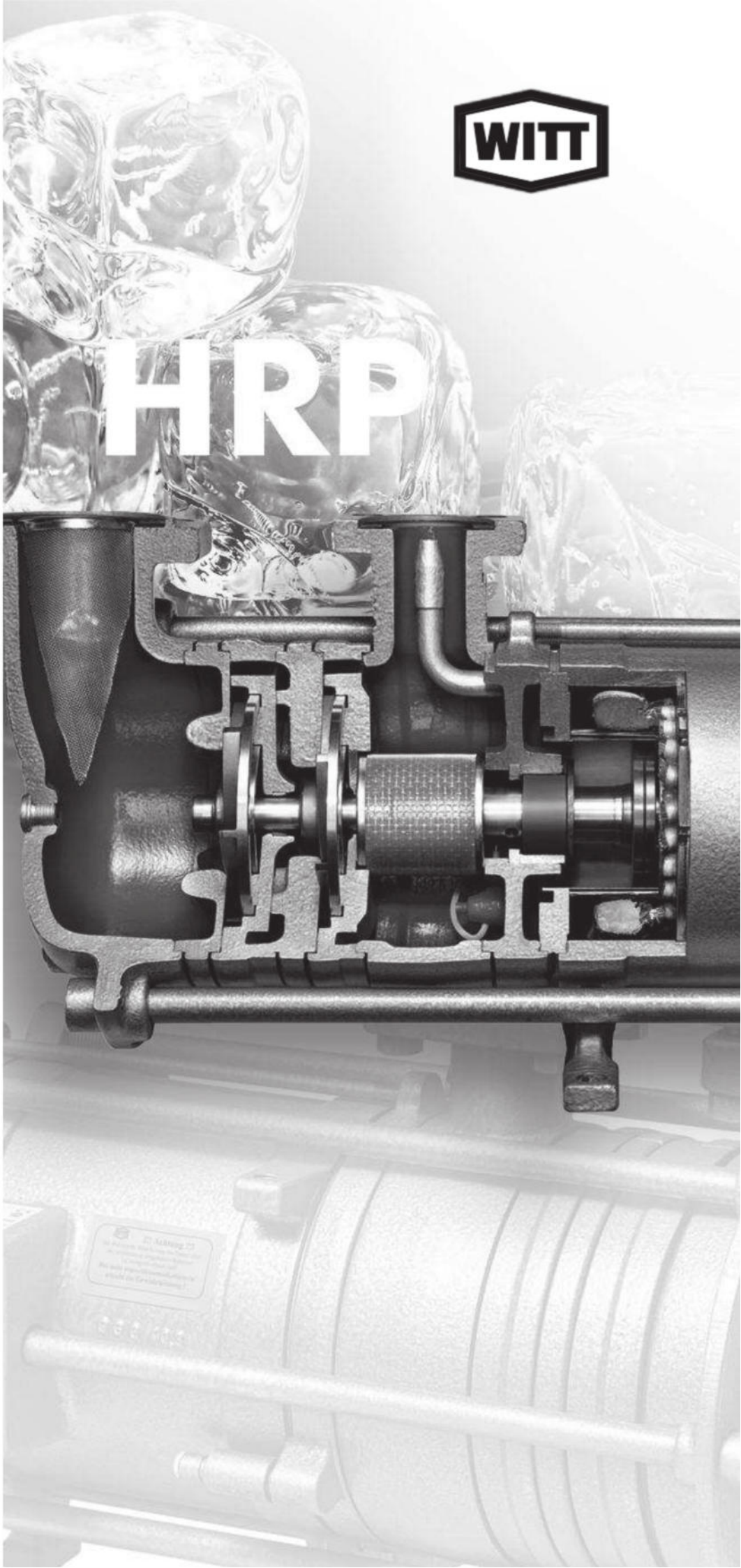
WITT

HRP

Hermetic refrigerant pumps

Installation and operating instructions

HRP 3232
HRP 5040
HRP 5050
HRP 8050
HRP 10080



4. TECHNICAL DATA

4.1 GENERAL INFORMATION

DESCRIPTION	Unit	HRP 3232	HRP 5040	HRP 5050	HRP 8050	HRP 10080
Volume refrigerant side	ltr.	1,1	2,8	5	5,5	6,35
Volume transformer oil	ltr.	0,75	1	1,5	1,5	1,6
Weight pump with counterflanges	kg	43	55	83	83 / 110**	117
Sound pressure level	dB(A)	< 70	< 70	< 70	< 70	< 70
Class of terminal box insulation	IP	54	54	54	54	54
Box cable sockets prepared to	PG	1 x M16; 1 x M20	1 x M16 1 x M20	1 x M16 1 x M20;	1 x M16 1xM20/M25 **	1 x M16 1 x M25

** Model HRP8050-2, Model HRP 5050-90 and 8050-90

4.2 ELECTRICAL DATA

(applies to all pressure stages)

50 Hz 3 x 400 V							
DESCRIPTION	Unit		HRP 3232	HRP 5040	HRP 5050	HRP 8050	HRP 10080
Speed	n	[min^{-1}]	2900	2900	2900	2900	2900
max. power consumption							
with NH_3	I_{max}	[A]	1,5	4,7	5,5	7,0	13,0
with CO_2	I_{max}	[A]	2,1	-	7,0	10,0	16,0
With HFC, HFO, e.g. R134a	I_{max}	[A]	2,2	5,2	8,5	16,0**	20,0
Motor power factor							
with NH_3	Cos φ	[-]	0,61	0,63	0,68	0,80	0,79
with CO_2	Cos φ	[-]	0,83	-	0,80	0,88	0,85
With HFC, HFO, e.g. R134a	Cos φ	[-]	0,84	0,63	0,85	0,85**	0,89
Effective motor power	N	[kW]	$N_{wirk} = \sqrt{3} \times (U \times I_{wirk} \times \cos \varphi)$ (values at operating point – see selection tool)				

FURTHER MOTORS

50 Hz 3 x 380 V							
DESCRIPTION	Unit		HRP 3232	HRP 5040	HRP 5050	HRP 8050	HRP 10080
Speed	n	[min^{-1}]	2900	2900	2900	2900	2900
max. power consumption							
with NH_3	I_{max}	[A]	1,7	5,2	5,8	8,5	14,0
with CO_2	I_{max}	[A]	2,3	-	7,6	12,6	18,0
With HFC, HFO, e.g. R134a	I_{max}	[A]	2,6	7,2	9,0	16,9**	21,0
Motor power factor							
with NH_3	Cos φ	[-]	0,84	0,63	0,85	0,85	0,89
with CO_2	Cos φ	[-]	0,84	-	0,85	0,85	0,89
With HFC, HFO, e.g. R134a	Cos φ	[-]	0,84	0,63	0,85	0,89**	0,89
Effective motor power	N	[kW]	$N_{wirk} = \sqrt{3} \times (U \times I_{wirk} \times \cos \varphi)$ (values at operating point – see selection tool)				

60 Hz 3 x 380 V							
DESCRIPTION	Unit		HRP 3232	HRP 5040	HRP 5050	HRP 8050	HRP 10080
Speed	n	[min^{-1}]	3500	3500	3500	3500	3500
max. power consumption							
with NH_3	I_{max}	[A]	2,5	7,5	8,5	12,0	20,0
with CO_2	I_{max}	[A]	3,3	-	12,0	18,5	30,0
With HFC, HFO, e.g. R134a	I_{max}	[A]	3,5	10	13,5	24,5**	33,0
Motor power factor							
with NH_3	Cos φ	[-]	0,93	0,86	0,91	0,91	0,93
with CO_2	Cos φ	[-]	0,93	-	0,91	0,91	0,93
With HFC, HFO, e.g. R134a	Cos φ	[-]	0,93	0,86	0,91	0,93**	0,93
Effective motor power	N	[kW]	$N_{wirk} = \sqrt{3} \times (U \times I_{wirk} \times \cos \varphi)$ (values at operating point – see selection tool)				

The following table gives an overview of available standard and special pump types. Futher pump types are under development.

<table>
<tr><th colspan="8">Nenndruck und verfügbare Pumpen / Design pressure and available pumps</th></tr>
<tr><th>Frequency</th><th>Design Press.</th><th>Refrigerant</th><th colspan="5" rowspan="2">pump type</th></tr>
<tr><th>[Hz]</th><th>[bar]</th><th></th></tr>
<tr><td>50 / 60</td><td>25</td><td>NH_3, CO_2</td><td>HRP3232</td><td>HRP5040</td><td>HRP5050</td><td>HRP8050</td><td>HRP10080</td></tr>
<tr><td rowspan="6">50 / 60</td><td rowspan="2">25
40</td><td>Other HFC, HFO</td><td rowspan="4">Standard</td><td rowspan="2">Standard</td><td rowspan="3">Standard</td><td>Standard</td><td rowspan="3">Standard</td></tr>
<tr><td>NH_3, CO_2</td><td>Special</td></tr>
<tr><td rowspan="2">40</td><td rowspan="2">Other HFC, HFO</td><td rowspan="3">Not available</td><td>Standard</td></tr>
<tr><td>Special</td></tr>
<tr><td>65</td><td>All refrigerants</td><td>Not available</td><td>Not available</td><td>Not available</td></tr>
<tr><td>90</td><td>Only CO_2</td><td>Not available</td><td>Standard</td><td>Standard</td></tr>
</table>

	HRP			
	5040	5050	8050	10080
L	540	520	555	725
B	260	310	310	355
H	283	349	351	362
a1	150	180	180	180
a2	228	234	255	302
a3	196	170	170	290
b1	105	133	133	133
b2	154	174	174	222
c	53	53	66	70
d1	60,3	60,3	88,9	114,3
d2	48,3	60,3	60,3	88,9
l1	155	155	178	212
m1	115	145	145	145
m2	168	204	206	217
m3	130	190	190	190

	HRP			
	5040	5050	8050	10080
f1	343	343	470	466
f2	346	343	343	---
f3	376	373	373	472
h1	138	138	179	179
h2	141	138	138	179

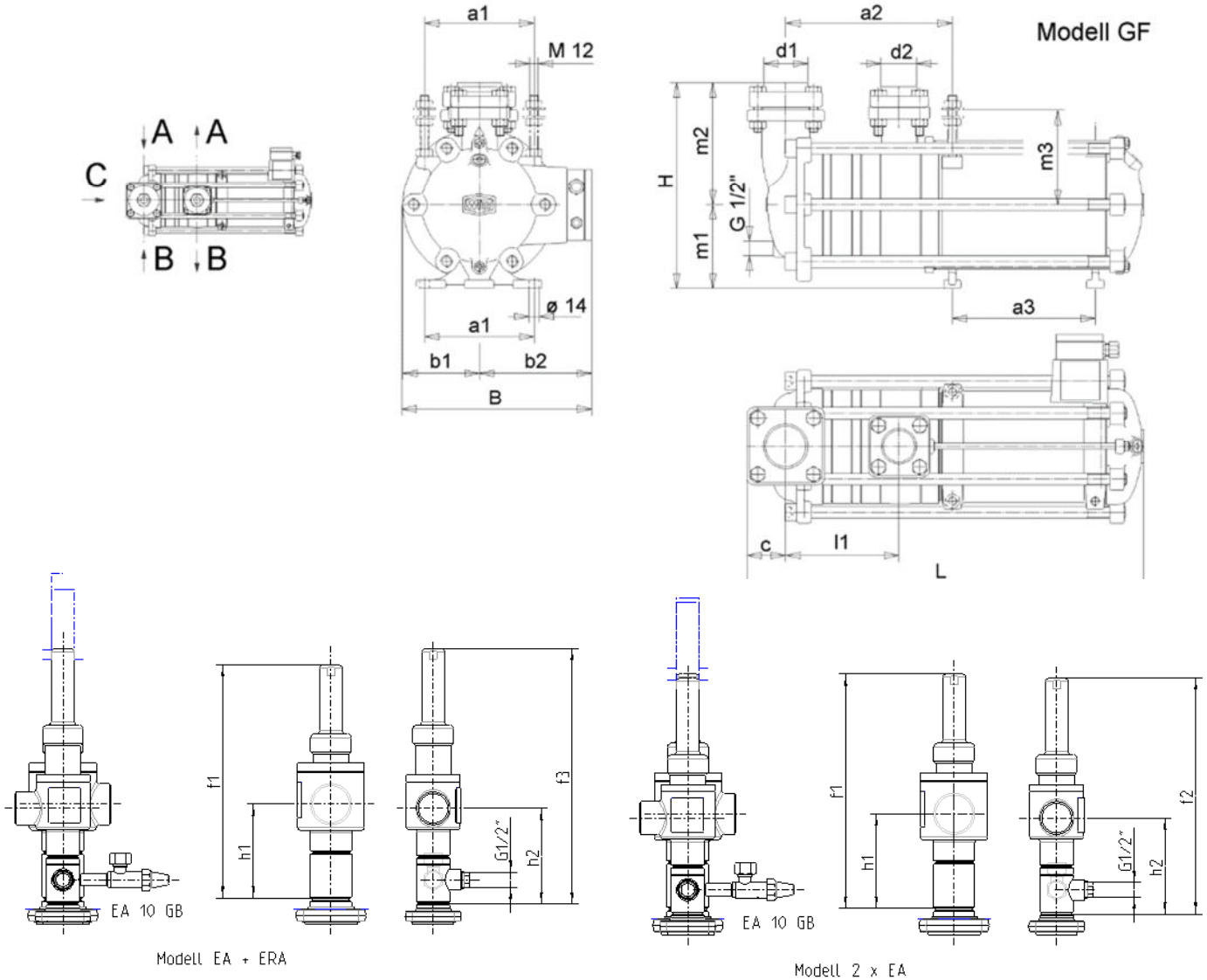


Fig. 2a HRP 5040/5050/8050/10080

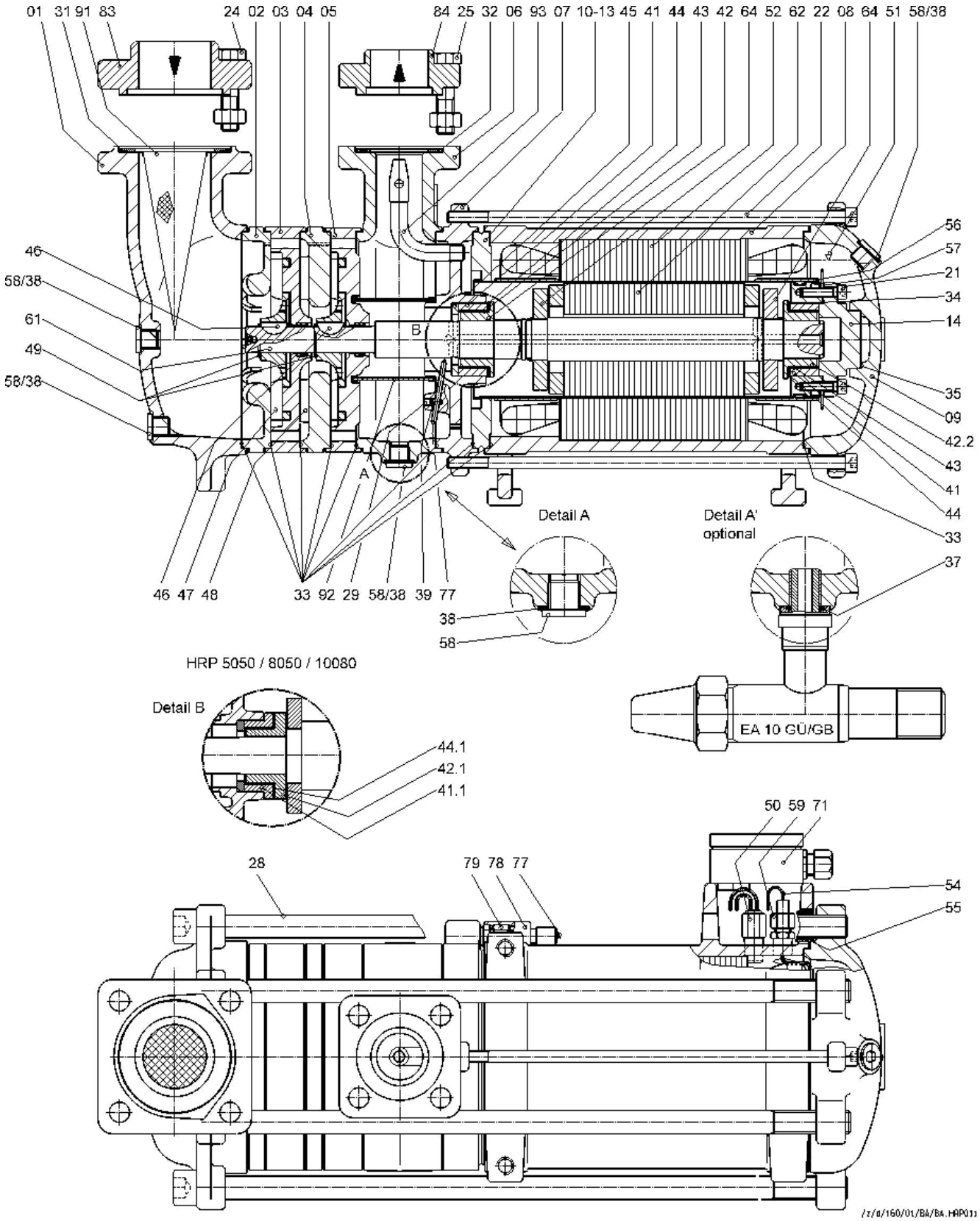


Fig. 3b HRP5040/HRP 5050/HRP 8050/HRP 10080

4.7 DESCRIPTION OF OPERATION

From the surge drum refrigerant liquid flows into the suction chamber of the pump. In the suction connection a conical screen is placed. A special design of the suction chamber reduces the inlet friction. The pressure is increased in two stages through impellers and intermediate pieces. A built in ejector is designed to provide adequate cooling of bearings and motor.

By the differential pressure in the pump some of the liquid refrigerant is bled to the back bearings through the hollow shaft. On top of each intermediate piece there is a small bypass hole connecting the suction and discharge side. When gas has collected in the discharge chamber it can vent through these holes to the suction chamber and from there returning to the surge drum. It is important that the downleg must be designed in such a way that the pump venting can take place (see chapter 6).

For the HRP 3232, 5050-90 and 8050-90 the design of a vertical motor shaft allows the free flow of any gas bubbles that may form.

Pumps with horizontal motor shaft (HRP 5040, HRP 5050, HRP 8050 and HRP 10080) are equipped with a sensor behind the bearing filter to detect wear of the bearings. While the pump is at stand still at connection (position 77) on the out-side of the pump you can measure the electrical resistance through the shaft. If there is a short circuit, i.e. down to earth, the bearings are worn and the pump should be sent in for repair.

Transformer oil is used in the stator housing between the motor can and the outside casing. This oil is useful to prevent moisture entering the stator, conducts the motor heat away to the outside casing.

A thermistor is integrated in the stator windings to sense any abnormal rise in temperature and interrupt the motor supply.

4.8 PERFORMANCE CHARACTERISTIC TABLE

50 Hz, 3 x 400V													
	Druckdifferenz Δp [bar]								Volumenstrom V[m³/h]				
	Pressure difference Δp [bar]								Volume flow V[m³/h]				
	R717		R22, R134a		R507		CO_2		HRP 3232	HRP 5040	HRP 5050	HRP 8050	HRP 10080
Delivery head	at evaporation temperature t_0												
H [m]	0°C	-40°C	0°C	-40°C	0°C	-40°C	0°C	-40°C					
2	0,13	0,14	0,25	0,28	0,23	0,25	0,18	0,22	5,6	13,2	15	30,0	55,0
4	0,25	0,27	0,50	0,55	0,45	0,51	0,36	0,44	5,0	13,0	14,6	29,9	53,7
6	0,38	0,41	0,75	0,83	0,68	0,76	0,55	0,66	4,7	12,6	14,4	29,4	53,0
8	0,50	0,54	1,00	1,10	0,91	1,02	0,73	0,88	4,4	12,0	14,2	28,7	52,5
10	0,63	0,68	1,26	1,38	1,14	1,27	0,91	1,09	4,2	10,5	13,9	28,0	52,1
15	0,94	1,02	1,88	2,07	1,70	1,91	1,37	1,64	3,6	9,0	13,2	26,1	50,3
20	1,25	1,35	2,51	2,76	2,27	2,54	1,82	2,19	3,0	8,0	12,3	24,2	46,8
25	1,57	1,69	3,14	3,45	2,84	3,18	2,28	2,74	2,3	5,2	11,5	22,4	42,6
30	1,88	2,03	3,77	4,14	3,41	3,82	2,73	3,28	-	1,5	10,4	20,1	37,9
35	2,19	2,37	4,40	4,83	3,97	4,45	3,19	3,83	-	-	9,1	18,2	32,7
40	2,51	2,71	5,02	5,52	4,54	5,09	3,64	4,38	-	-	7,5	15,0	26,6
45	2,82	3,05	5,65	6,21	5,11	5,72	4,10	4,93	-	-	5,2	12,5	20,4
50	3,13	3,39	6,28	6,90	5,68	6,36	4,55	5,47	-	-	2,0	9,1	10,9
55	3,45	3,72	6,91	7,59	6,24	7,00	5,01	6,02	-	-	-	-	-
60	3,76	4,06	7,53	8,28	6,81	7,63	5,46	6,57	-	-	-	-	-
65	4,07	4,40	8,16	8,97	7,38	8,27	5,92	7,11	-	-	-	-	-
70	4,39	4,74	8,79	9,66	7,95	8,90	6,37	7,66	-	-	-	-	-
75	4,70	5,08	9,42	10,35	8,52	9,54	6,83	8,21	-	-	-	-	-

If the valve is installed in the gas part of the vent line, immediately in front of the connection point to the CO_2 vessel a smaller valve is sufficient, e.g. DN10 (0.4”). The stop valve must be locked in an open position and marked “do not close during normal operation”.

> ⚠ In application with a non-return valve or solenoid valve liquid may be trapped. When this liquid is warmed up, the pressure increases rapidly to an unacceptable value and the piping may fracture.

Adequate precautions must be taken by the installer to prevent any liquid from becoming trapped.

PIPING FROM THE CONDENSER IN CO_2 SYSTEMS

From experience it has proven good practice to enter with the line from the condenser into the surge drum below the liquid level and as such minimize the surface available for condensation in the vessel.

6.5 PROTECTION OF THE PUMP

6.5.1 REQUIRED MINIMUM FLOW

To provide the pumps with sufficient liquid refrigerant for lubrication and cooling it is important to maintain a minimum flow per following table through the pump at all times. This can be achieved when the design or the control system ensures there is always sufficient flow to the evaporators.

When the control system allows that a major part or all evaporators can be closed, a by-pass line is required to protect the pump against too high pressure (see chap. 6.5.2) and ensure a minimum flow.

Required minimum flow				
	V @ 50 Hz		V @60 Hz	
	m³/h	gal/min	m³/h	gal/min
HRP3232	0,6	2.6	0,7	3.1
HRP5040	1,2	5.3	1,5	6.6
HRP5050	3,0	13,2	3,5	15,4
HRP8050	5,0	22	5,5	24
HRP10080	8,0	35	9,6	42

6.5.3 SAFEGUARDING AGAINST TOO HIGH PRESSURE

> ⚠ Operating refrigerant pumps against too high pressure (e.g. against partially or fully closed throttled condition) is not allowed and will damage the refrigerant pump!

A **by-pass valve** (adjustable) has proven good practice to safeguard the pump against too high pressure, with the exception of CO_2 systems.

To set the by-pass valve select the pressure difference across the pump according table 1 for the following de-livery head. (take into account the pressure losses in the pipework to the by-pass valve)

	40Hz	45Hz	50Hz	55Hz	60Hz
HRP 10080	30 m	38 m	45 m	52 m	60 m
HRP 8050	30 m	38 m	45 m	52 m	60 m
HRP 5050	28 m	36 m	45 m	52 m	60 m
HRP 5040	16 m	22 m	30 m	36 m	45 m
HRP 3232	13 m	18 m	25 m	31 m	37 m

The following tables give the settings of a differential pressure operated overflow valve (e.g. A4AL or CVP-PP) for several refrigerants at evaporation temperatures of 0°C (32°F), -10°C (14°F) and -40°C (-40°F) and 50Hz respective 60 Hz.

The settings are also mentioned in our selection program.

50 Hz, 3 x 400V								
Set point Δp	Evap. Temp.		NH3		R404A/R507A		R134a	
	°C	°F	[bar]	[psi]	[bar]	[psi]	[bar]	[psi]
HRP3232	0	32	1,5	22	2,8	41	3,1	22
	-10	14	1,6	23	2,9	42	3,2	47
	-40	-40	1,7	24	3,1	45	3,4	50
HRP5040	0	32	1,8	27	3,4	49	3,8	55
	-10	14	1,9	28	3,4	51	3,9	56
	-40	-40	2,0	29	3,7	54	4,1	60
HRP5050	0	32	2,8	41	5,1	73	5,7	82
HRP8050	-10	14	2,8	42	5,2	76	5,8	85
HRP10080	-40	-40	3,0	44	5,6	82	6,2	90

TH.WITT
Kältemaschinenfabrik
GmbH

Lukasstraße 32, 52070 Aachen, Germany
Tel. +49 241 18208-0
sales@th-witt.com

www.th-witt.com