Compact hydraulic power pack type HK 4

Product documentation

Operating pressure p_{max}:	700 bar
Geometric displacement V_{max}:	17.0 cm^3/U
Usable volume V_{use}:	11.1 l

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Contents

1 Overview of compact hydraulic power pack type HK 4 and HKF 4

Compact hydraulic power packs are a type of hydraulic power pack. They are characterised by a highly compact design, since the motor shaft of the electric motor also acts as the pump shaft.
The ready-for-connection compact hydraulic power pack type HK and HKF includes an electric motor that runs in oil. The stator is securely attached to the housing (tank). The compact hydraulic power pack is suitable for hydraulic systems with operating mode S2, S3 or S6. A fan, which effectively dissipates the heat from the hydraulic system, is mounted on the housing. In the case of type HKF, the fan is powered by a separate motor independently of the pump motor. In the case of type HK, the fan is securely attached to the motor shaft. An external cooler is not generally required. Type HK and HKF includes a 3-phase motor and has a vertical housing. Single-circuit, dual-circuit or triple-circuit systems can be selected. A radial piston pump, external gear pump or internal gear pump can be used as a hydraulic pump.The compact hydraulic power pack type HK and HKF is suitable for use as a highly compact control system, since connection blocks and valve banks can be directly mounted.

Compact hydraulic power pack type HK 4 and HKF 4

Features and benefits:

- Environmentally friendly thanks to low oil filling volume; low cost of disposal and low hydraulic fluid costs

Intended applications:

- Endurance test bench construction

2 Available versions, main data

2.1 Motor and container

Order coding example:

HK 43 **HKF 44**	**9**	**D** **DT**	**/1** **/1**	**P1**	**M**	**H 0,7** **Z 11,3**	- A1/380 - C6	**- 3x400/230 V 50 Hz** **- 3x400/230 V 50 Hz**	**- G 1/4 x 300**

Oil drain hose Table 1f Oil drain hose

Motor voltage Table 10 Motor voltage

Pump version Pump version, see Chapter 2.2, "Pump"

Additional options Table 1d Additional options

Electrical connection Table 1e Electrical connection

Terminal box position Table 1c Terminal box position

Additional options Table 1d Additional options

Tank size Table 1b Tank size

Basic type and motor power Table 1a Basic type and motor power

Table 1a Basic type and motor power

Basic type	Comment	Nominal power (kW)	Rated speed (rpm)
HK 43 **HK 43 V**	with integrated fan Basic type HK 4.V is a version with cast stator (see notes Chapter 6.1, "Planning information" "Selection of a compact hydraulic power pack")	1.5 1.8	1395 (50 Hz) 1674 (60 Hz)
HK 44 **HK 44 V**		2.2 2.6	1405 (50 Hz) 1700 (60 Hz)
HK 48 **HK 48 V**		3.0 3.6	1420 (50 Hz) 1704 (60 Hz)
HKF 43 **HKF 43 V**	with separately drive fan for temperature-critical applications with approximately 25% higher cooling (see Chapter 6.1, "Planning information" "Identifying excess temperature") Basic typeHK 4.V is a version with a cast stator (see notes Chapter 6.1, "Planning information" "Selection of a compact hydraulic power pack")	1.5 1.8	1395 (50 Hz) 1674 (60 Hz)
HKF 44 **HKF 44 V**		2.2 2.6	1405 (50 Hz) 1700 (60 Hz)
HKF 48 **HKF 48 V**		3.0 3.6	1420 (50 Hz) 1704 (60 Hz)
HKF 43...U **HKF 44...U** **HKF 48...U**	Version with frequency converter, see D 7600-4FU	1.5 2.2 3.0	1395 1405 1420

NOTE
The actual power consumption depends on the load and can be up to 1.8 x nominal power.

Table 1b Tank size

Coding	Note	Fill volume V_{fill} (l)	Usable volume V_{usable} (l)	Basic type	
				HK	HKF
5	Second value for basic type HK 48 and HKF 48	6.8/6.6	2.5/1.8	●	●
9		10.0/9.0	5.7/5.5	●	●
2	Only available in combination with basic type HKF 48	15.4	11.1	--	●

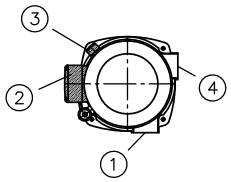
Table 1c Terminal box position

Coding	Comment	
/1	Series	
/2	90°	offset in anticlockwise direction
/3	180°	
/4	270°	

Alternative assignment for type HKF with terminal box:

/5	Series	
/6	90°	offset in anticlockwise direction
/7	180°	
/8	270°	

/1
/5



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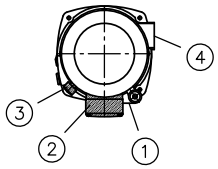

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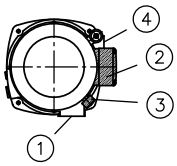

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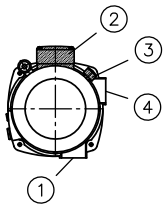


1 Main connection base
2 Terminal box
3 Air filter
4 Second connection base

NOTE

- The 4 terminal box positions cover the entire finned tube top, including the oil level gauge, air filter, etc. (see also dimension diagram Chapter 4.2, "Basic pump ").
- For version with HARTING connector (Table 1e) and alternative assignment (coding /5.../8), the pump motor and fan motor are connected separately (see Chapter 4.3, "Electric and hydraulic connections"). Use for example in standby mode with continuous fan for additional cooling during motor shutdown.

Table 1d Additional options

Coding	Comment
without designation	Without additional equipment
S	Level switch (N/O contact), usable volume, see Table 1b
D	Level switch (N/C contact), usable volume, see Table 1b
D-D	Level switch (N/C contact), two switching points, usable volume see Table 1b ▪ 1. Switching point 2 litres lower than usable volume as per Table 1b only for type HK 4.9, HKF 4.9 and HKF 482.
A	Level switch (N/C contact), separate electric connection, see Chapter 3.3, "Electrical" and Chapter 4.2, "Basic pump ", only in combination with alternative terminal box assignment according to Table 1c coding /5 ... /8
T	Temperature switch (switching point 80°C)
T60, T55, T65	Temperature switch (switching point 55°C, 60°C, 65°C)
T55T65	Temperature switch, two switching points (55°C, 65°C)
W **W60**	Temperature switch (switching point 80°C or 60°C), separate electric connection (also available in the combination AW, AW 60, WW 60, AWW 60), only in combination with alternative terminal box assignment according to Table 1d coding /5 ... /8
L	additional drain port at the second connection base G 3/4, see Chapter 4.3, "Electric and hydraulic connections" and Chapter 6.1.1, "Selection advice" ("Additional drain return port") ▪ Only single- and dual-circuit pumps, coding H, Z, HH, HZ, ZZ according to Chapter 2.2, "Pump".
R	Fan cover for additional protection against coarse dirt
M	with G 1 1/4 (BSPP) filling reduction
MA	Like M, additional drain plug G 1/4 (BSPP) in pump base, only for pump combination H, HH, HH-H, Z (size 1 to Z 11.3)
MW	with filling coupling MD-012-2-WR021-19-1

Table 1e Electrical connection

Coding	Comment
No designation	Series (terminal box)
P1, P2	HARTING plug, different connection positions, see Chapter 4.2, "Basic pump " (not for type HKF 45)
E, P1E, P2E	electrical connection with additional suppressor at the terminal box or HARTING connector, see Chapter 3.3, "Electrical"

NOTE

- For version with HARTING connector (Table 1e) and alternative assignment (coding /5 and /8), the pump motor and fan motor are connected separately (see Chapter 4.3, "Electric and hydraulic connections"). Use for example in standby mode with continuous fan for additional cooling during motor shutdown.

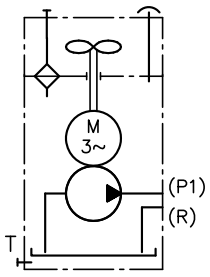
Table 1f Oil drain hose

Coding	Description
No designation	Tapped plug G 1/4 (BSPP), in addition: Drain G 3/4 (BSPP), see Chapter 4.2, "Basic pump "
G 1/4 x 300	Oil drain hose approximately 300 mm with ball valve
G 1/4 x 500	Oil drain hose approximately 500 mm with ball valve
G 1/4 W x 300	Oil drain hose approximately 300 mm with bracket and ball valve
G 1/4 W x 500	Oil drain hose approximately 500 mm with bracket and ball valve

2.2 Pump

2.2.1 Single-circuit pumps

Circuit symbol:



Order coding example:

HKF 482 DT/1	**- Z 24**	- A1/150	- 3x400/230 V 50 Hz
HK 44/1	**- H 7,2**	- C5	- 3x400/230 V 50 Hz

Single-circuit pump with a 3-phase motor Table 2 Single-circuit pump with a 3-phase motor

Table 2 Single-circuit pump (radial piston pump) with a 3-phase motor

NOTE

- The delivery flow Q_{max} relates to the rated speed and varies depending on the load (see diagrams Chapter 3.3, "Electrical").
- Notes on the pressures p_{max}(see Chapter 3.3, "Electrical", Table 10).
- For pump version with gear pumps **Z** the max. hydraulic work value $(pV_g)_{max}$ is 10% lower.
- **The permissible pressures p_{max} relate to a version with a 3x400/230 V 50 Hz or 3x460 V 60 Hz motor.**
- Be aware of different motor power ratings and resulting permissible maximum pressures $p_{max} = (pV_g)_{max}/V_g$. at other nominal voltages and power frequencies, $(pV_g)_{max}$ (see Chapter 3.3, "Electrical", Table 10)“

Radial piston pump H

	Delivery flow coding			H 0.9	H 1.25	H1.4	H1.5	H1.8	H 2.08
	Displacement volume V_g (cm³/rev)			0.64	0.88	1.07	1.15	1.29	1.46
	Piston diameter (mm)			6	7	6	8	6	7
	Number of pump elements			3	3	5	3	6	5
HK 43	Permissible pressure p_{max}	(bar)		700	700	700	700	700	620
HKF 43	Continuous operation S1 p_1	(bar)		680	500	410	390	340	300
	Delivery flow Q_{max}	(lpm)	50 Hz	0.90	1.22	1.50	1.60	1.80	2.04
			60 Hz	1.08	1.47	1.79	1.91	2.15	2.44
HK 44	Permissible pressure p_{max}	(bar)		700	700	700	700	700	700
HKF 44	Continuous operation S1 p_1	(bar)		700	700	700	700	690	610
	Delivery flow Q_{max}	(lpm)	50 Hz	0.89	1.21	1.48	1.58	1.77	2.01
			60 Hz	1.06	1.45	1.77	1.89	2.13	2.41
HK 48	Permissible pressure p_{max}	(bar)		700	700	700	700	700	700
HKF 48	Continuous operation S1 p_1	(bar)		700	700	700	700	700	700
	Delivery flow Q_{max}	(lpm)	50 Hz	0.92	1.25	1.53	1.63	1.83	2.08
			60 Hz	1.10	1.50	1.83	1.95	2.20	2.49

Radial piston pump H

	Delivery flow coding			H 2.45	H 2.5	H 2.6	H 3.2	H3.6	H 4.2
	Displacement volume V_g (cm³/rev)			1.75	1.79	1.91	2.29	2.58	2.981
	Piston diameter (mm)			7	10	8	8	12	10
	Number of pump elements			6	3	5	6	3	5
HK 43	Permissible pressure p_{max}	(bar)		510	500	470	390	350	300
HKF 43	Continuous operation S1 p_1	(bar)		250	250	230	190	170	150
	Delivery flow Q_{max}	(lpm)	50 Hz	2.45	2.50	2.66	3.20	3.60	1.16
			60 Hz	2.93	2.99	3.19	3.83	4.31	4.98
HK 44	Permissible pressure p_{max}	(bar)		700	560	650	550	390	420
HKF 44	Continuous operation S1 p_1	(bar)		510	500	470	390	350	300
	Delivery flow Q_{max}	(lpm)	50 Hz	5.41	2.46	2.63	3.15	3.55	4.10
			60 Hz	2.90	2.95	3.15	3.78	4.25	4.92
HK 48	Permissible pressure p_{max}	(bar)		700	560	700	700	390	560
HKF 48	Continuous operation S1 p_1	(bar)		670	560	620	520	390	400
	Delivery flow Q_{max}	(lpm)	50 Hz	2.49	2.54	2.71	3.25	3.66	4.24
			60 Hz	2.99	3.05	3.25	3.91	4.39	5.09

Radial piston pump H

	Delivery flow coding			H 4.3	H 5.0	H 5.1	H 5.6	H 6.5	H 6.0
	Displacement volume V_g (cm³/rev)			3.03	3.58	3.51	4.03	4.58	4.30
	Piston diameter (mm) Number of pump elements			13 3	10 6	14 3	15 3	16 3	12 5
HK 43	Permissible pressure p_{max}	(bar)		300	250	260	220	200	210
HKF 43	Continuous operation S1 p_1	(bar)		150	120	130	110	100	100
	Delivery flow Q_{max}	(lpm)	50 Hz	4.22	5.00	4.90	5.62	6.39	6.00
			60 Hz	5.05	5.98	5.86	6.73	7.66	7.18
HK 44	Permissible pressure p_{max}	(bar)		330	350	290	250	220	290
HKF 44	Continuous operation S1 p_1	(bar)		300	250	260	220	200	210
	Delivery flow Q_{max}	(lpm)	50 Hz	4.16	4.92	4.83	5.54	6.30	5.91
			60 Hz	4.99	5.91	5.79	6.65	7.56	7.09
HK 48	Permissible pressure p_{max}	(bar)		330	560	290	250	220	390
HKF 48	Continuous operation S1 p_1	(bar)		330	330	290	250	220	280
	Delivery flow Q_{max}	(lpm)	50 Hz	4.30	5.09	4.98	5.27	6.51	6.10
			60 Hz	5.16	6.10	5.98	6.87	7.81	7.32

Radial piston pump H

	Delivery flow coding			H 7.0	H 7.2	H8.3	H 8.6	H 9.5	H 9.9
	Displacement volume V_g (cm³/rev)			5.04	5.16	5.8	6.0	6.7	7.0
	Piston diameter (mm) Number of pump elements			13 5	12 6	14 5	13 6	15 5	14 6
HK 43	Permissible pressure p_{max}	(bar)		180	170	150	150	130	130
HKF 43	Continuous operation S1 p_1	(bar)		90	90	80	70	70	60
	Delivery flow Q_{max}	(lpm)	50 Hz	7.04	7.19	8.16	8.44	9.37	9.79
			60 Hz	8.42	8.61	9.77	10.11	11.21	11.72
HK 44	Permissible pressure p_{max}	(bar)		250	240	210	210	190	180
HKF 44	Continuous operation S1 p_1	(bar)		180	170	150	150	130	130
	Delivery flow Q_{max}	(lpm)	50 Hz	6.94	7.09	8.04	8.32	9.23	9.65
			60 Hz	8.32	8.51	9.65	9.99	11.08	11.58
HK 48	Permissible pressure p_{max}	(bar)		330	390	290	330	250	290
HKF 48	Continuous operation S1 p_1	(bar)		230	230	200	200	180	170
	Delivery flow Q_{max}	(lpm)	50 Hz	7.16	7.32	8.31	8.59	9.54	9.97
			60 Hz	8.59	8.79	9.97	10.31	11.44	11.96

Radial piston pump H

	Delivery flow coding			H 10.9	H 11.5	H13.1
	Displacement volume V_g (cm^3/rev)			7.64	8.06	9.17
	Piston diameter (mm) Number of pump elements			16 5	15 6	16 6
HK 43	Permissible pressure p_{max}	(bar)		120	110	100
HKF 43	Continuous operation S1 p_1	(bar)		60	50	50
	Delivery flow Q_{max}	(lpm)	50 Hz	10.66	11.24	12.79
			60 Hz	12.76	13.46	15.31
HK 44	Permissible pressure p_{max}	(bar)		160	160	140
HKF 44	Continuous operation S1 p_1	(bar)		120	110	100
	Delivery flow Q_{max}	(lpm)	50 Hz	10.51	11.08	12.61
			60 Hz	12.61	13.30	15.13
HK 48	Permissible pressure p_{max}	(bar)		220	250	220
HKF 48	Continuous operation S1 p_1	(bar)		150	150	130
	Delivery flow Q_{max}	(lpm)	50 Hz	10.85	11.44	13.02
			60 Hz	13.02	13.73	15.62

to Table 2 Single-circuit pump (gear pump) with a 3-phase motor

NOTE

For this pump version, the max. hydraulic work value $(pV_g)_{max}$ is 10% lower.

Gear pump Z

	Delivery flow coding			Z 2	Z 2.7	Z 3.5	Z4.5	Z 5.2	Z 6.5
	Displacement volume V_g (cm^3/rev)			1.6	2.15	2.65	3.35	4.25	4.5
	Size			1	1	1	1	1	2
HK 43	Permissible pressure p_{max}	(bar)		170	170	170	170	170	170
HKF 43	Continuous operation S1 p_1	(bar)		170	170	170	140	110	100
	Delivery flow Q_{max}	(lpm)	50 Hz	2.2	3.0	3.7	4.7	5.9	6.3
			60 Hz	2.7	3.6	4.4	5.6	7.1	7.5
HK 44	Permissible pressure p_{max}	(bar)		170	170	170	170	170	170
HKF 44	Continuous operation S1 p_1	(bar)		170	170	170	170	170	170
	Delivery flow Q_{max}	(lpm)	50 Hz	2.2	3.0	3.7	4.7	6.0	6.3
			60 Hz	2.7	3.7	4.5	5.7	7.2	7.7
HK 48	Permissible pressure p_{max}	(bar)		170	170	170	170	170	170
HKF 48	Continuous operation S1 p_1	(bar)		170	170	170	170	170	170
	Delivery flow Q_{max}	(lpm)	50 Hz	2.3	3.1	3.8	4.8	6.0	6.4
			60 Hz	2.7	3.7	4.5	5.7	7.2	7.7

Gear pump Z

	Delivery flow coding			Z6.9	Z 8.8	Z 9	Z 9.8	Z 11.3	Z 12.3
	Displacement volume V_g (cm³/rev)			5.35	6.65	6.0	7.1	8.5	8.5
	Size			1	1	2	1	1	2
HK 43	Permissible pressure p_{max}	(bar)		170	150	150	140	110	110
HKF 43	Continuous operation S1 p_1	(bar)		90	70	70	70	60	50
	Delivery flow Q_{max}	(lpm)	50 Hz	7.5	9.3	8.4	9.9	11.9	11.9
			60 Hz	9.0	11.1	10.0	11.9	14.2	14.2
HK 44	Permissible pressure p_{max}	(bar)		170	170	170	170	160	150
HKF 44	Continuous operation S1 p_1	(bar)		170	140	150	140	110	110
	Delivery flow Q_{max}	(lpm)	50 Hz	7.5	9.3	2.7	2.7	11.9	11.9
			60 Hz	9.1	11.3	2.7	2.7	14.5	14.5
HK 48	Permissible pressure p_{max}	(bar)		170	170	170	170	170	170
HKF 48	Continuous operation S1 p_1	(bar)		170	170	170	170	150	140
	Delivery flow Q_{max}	(lpm)	50 Hz	7.6	9.4	2.7	2.7	12.1	12.1
			60 Hz	9.1	11.3	2.7	2.7	14.5	14.5

Gear pump Z

	Delivery flow coding			Z 14.4	Z 16	Z 21	Z 24
	Displacement volume V_g (cm³/rev)			10.65	11.0	14.5	17.0
	Size			1	2	2	2
HK 43	Permissible pressure p_{max}	(bar)		90	80	60	50
HKF 43	Continuous operation S1 p_1	(bar)		40	40	30	30
	Delivery flow Q_{max}	(lpm)	50 Hz	14.9	15.3	20.2	23.7
			60 Hz	17.8	18.4	24.3	28.5
HK 44	Permissible pressure p_{max}	(bar)		130	110	90	70
HKF 44	Continuous operation S1 p_1	(bar)		90	80	60	50
	Delivery flow Q_{max}	(lpm)	50 Hz	15.0	15.5	20.4	23.9
			60 Hz	18.1	18.7	24.7	28.9
HK 48	Permissible pressure p_{max}	(bar)		170	170	170	150
HKF 48	Continuous operation S1 p_1	(bar)		120	110	80	70
	Delivery flow Q_{max}	(lpm)	50 Hz	15.1	15.6	20.6	24.1
			60 Hz	18.1	18.7	24.7	29.0

to Table 2 Single-circuit pump (internal gear pump) with 3-phase motor (only type HKF)

NOTE

For this pump version, the max. hydraulic work value $(pV_g)_{max}$ is 10% lower.

Internal gear pump IZ

	Delivery flow coding			IZ 7.5	IZ 9.1	IZ 11.9	IZ 16.2	IZ 19.2	IZ 22.9
	Displacement volume V_g (cm^3/rev)			5.4	6.4	7.9	10.9	13.3	15.8
	Size			2	2	2	2	2	2
HK 44	Permissible pressure p_{max}	(bar)		230	200	160	110	90	80
HKF 44	Continuous operation S1 p_1	(bar)		170	140	110	80	70	60
	Delivery flow Q_{max}	(lpm)	50 Hz	7.4	8.8	10.9	15.0	18.3	21.7
			60 Hz	8.9	10.6	13.0	18.0	21.9	26.1
HK 48	Permissible pressure p_{max}	(bar)		250	250	250	240	200	160
HKF 48	Continuous operation S1 p_1	(bar)		220	180	150	110	90	70
	Delivery flow Q_{max}	(lpm)	50 Hz	7.7	9.1	11.2	15.5	18.9	22.4
			60 Hz	9.2	10.9	13.5	18.6	22.7	26.9

2.2.2 Dual-circuit pump with shared pedestal

a) Radial piston pump version - radial piston pump HH and radial piston pump - gear pump HZ

Order coding example:

HK	44	ST/1	**- H**	**H**	**3,6**	**/ 6,5**	- SS - A1/250	- 3x400/230 V 50 Hz
HK	449	DT/1 P	**- H**	**Z**	**1,5**	**/ 8,8**	- AN21F2C50 - C315	- 3x400/230 V 50 Hz

Pressure connection P3 Table 4 Pressure connection P3

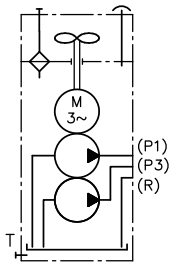
Pressure connection P1 Table 3 Pressure connection P1

Pressure connection P3 Table 4 Pressure connection P3: Radial piston pump **H** or gear pump **Z**

Pressure connection P1 Table 3 Pressure connection P1: Radial piston pump **H**

Combination options

Coding	P1	P3	Examples
HH	3 pump elements	3 pump elements	HH 0.9/0.9
HZ	3 pump elements	Gear pump size 1	HZ 1.25/11.3
	3 pump elements	Gear pump size 2	HZ 0.9/16
	5 pump elements	Gear pump size 1	HZ 2.08/9.8
	5 pump elements	Gear pump size 2	HZ 1.4/8.8
	6 pump elements	Gear pump size 1	HZ 1.8/6.9
	6 pump elements	Gear pump size 2	HZ 5.0/21



NOTE

For this pump version, the max. hydraulic work value $(pV_g)_{max}$ is 10% lower.

Table 3 Pressure connection P1

NOTE

- The delivery flow Q_{max} relates to the rated speed and varies depending on the load (see diagrams Chapter 3.3, "Electrical").
- Notes on the pressures p_{max}(see Chapter 3.3, "Electrical", Table 10).
- For this pump version, the max. hydraulic work value $(pVg)_{max}$ is 10% lower.

Radial piston pump H

Delivery flow coding	H 0.9	H 1.25	H 1.4	H 1.5	H 1.8	H 2.08
Displacement volume V_g (cm³/rev)	0.64	0.88	1.07	1.15	1.29	1.46
Piston diameter (mm) Number of pump elements	6 3	7 3	6 5	8 3	6 6	7 5
Delivery flow coding	**H 2.45**	**H 2.5**	**H 2.6**	**H 3.2**	**H 3.6**	**H 4.2**
Displacement volume V_g (cm³/rev)	1.75	1.79	1.91	2.29	2.58	2.98
Piston diameter (mm) Number of pump elements	7 6	10 3	8 5	8 6	12 3	10 5
Delivery flow coding	**H 4.3**	**H 5.0**	**H 5.1**	**H 5.6**	**H 6.5**	**6.0**
Displacement volume V_g (cm³/rev)	3.03	3.58	3.51	4.03	4.58	4.30
Piston diameter (mm) Number of pump elements	13 3	10 6	14 3	15 3	16 3	12 5
Delivery flow coding	**H 7.0**	**H 7.2**	**H 8.3**	**H 8.6**	**H 9.5**	**H 9.9**
Displacement volume V_g (cm³/rev)	5.04	5.16	5.85	6.05	6.72	7.02
Piston diameter (mm) Number of pump elements	13 5	12 6	14 5	13 6	15 5	14 6
Delivery flow coding	**H 10.9**	**H 11.5**	**H 13.1**			
Displacement volume V_g (cm³/rev)	7.64	8.06	9.17			
Piston diameter (mm) Number of pump elements	16 5	15 6	16 6			

Table 4 Pressure connection P3

NOTE

- The delivery flow Q_{max} relates to the rated speed and varies depending on the load (see diagrams Chapter 3.3, "Electrical").
- Notes on the pressures p_{max}(see Chapter 3.3, "Electrical", Table 10).
- For this pump version, the max. hydraulic work value $(pVg)_{max}$ is 10% lower.

Radial piston pump H

Delivery flow coding	H 0.9	H 1.25	H 1.5	H 2.5	H 3.6	H 4.3
Displacement volume V_g (cm³/rev)	0.64	0.88	1.15	1.79	2.58	3.03
Piston diameter (mm) Number of pump elements	6 3	7 3	8 3	10 3	12 3	13 3
Delivery flow coding	**H 5.1**	**H 5.6**	**H 6.5**			
Displacement volume V_g (cm³/rev)	3.51	4.03	4.58			
Piston diameter (mm) Number of pump elements	14 3	15 3	16 3			

Gear pump Z

Delivery flow coding	Z 2	Z 2.7	Z 3.5	Z 4.5	Z 5.2	Z 6.5
Displacement volume V_g (cm³/rev)	1.6	2.15	2.65	3.35	4.25	4.5
Size	1	1	1	1	1	2
Delivery flow coding	**Z 6.9**	**Z 8.8**	**Z 9**	**Z 9.8**	**Z 11.3**	**Z 12.3**
Displacement volume V_g (cm³/rev)	5.35	6.65	6.0	7.1	8.5	8.5
Size	1	1	2	1	1	2
Delivery flow coding	**Z 14.4**	**Z 16**	**Z 21**			
Displacement volume V_g (cm³/rev)	10.65	11.0	14.5			
Size	1	2	2			

b) Version of gear pump – gear pump ZZ

Order coding example:

HK	489	DT/1 M	- Z	Z	2,7	/ 9,8	- SS - A1F3/120	- 3x400/230 V 50 Hz

Pressure connection P3 Table 5 Pressure connection P3

Pressure connection P1 Table 5 Pressure connection P1

Pressure connection P3 Table 5 Pressure connection P3: Gear pump **Z**

Pressure connection P1 Table 5 Pressure connection P1: Gear pump **Z**

Available combinations:

ZZ 2.7/5.2	**ZZ 3.5/5.2**	**ZZ 5.2/11.3**
ZZ 2.7/8.8	**ZZ 4.5/4.5**	**ZZ 6.9/11.3**
ZZ 2.7/9.8	**ZZ 4.5/9.8**	**ZZ 8.8/8.8**
ZZ 2.7/11.3	**ZZ 4.5/11.3**	**ZZ 11.3/11.3**

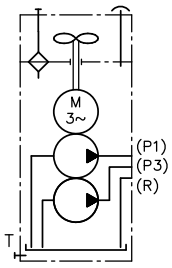


Table 5 Pressure connection P1 and P3

NOTE

- The delivery flow Q_{max} relates to the rated speed and varies depending on the load (see diagrams Chapter 3.3, "Electrical").
- Notes on the pressures p_{max}(see Chapter 3.3, "Electrical", Table 10).
- For pump version with gear pumps **Z** the max. hydraulic work value $(pV_g)_{max}$ is 10% lower.
- **The permissible pressures p_{max} relate to a version with a 3x400/230 V 50 Hz or 3x460 V 60 Hz motor.**
- Be aware of different motor power ratings and resulting permissible maximum pressures $p_{max} = (pV_g)_{max}/V_g$. at other nominal voltages and power frequencies, $(pV_g)_{max}$ (see Chapter 3.3, "Electrical", Table 10)“

Gear pump Z

Delivery flow coding	Z 2.7	Z 3.5	Z 4.5	Z 5.2	Z 6.9	Z 8.8
Displacement volume V_g (cm³/rev)	2.15	2.65	3.35	4.25	5.35	6.65
Size	1	1	1	1	1	1
Delivery flow coding	**Z 9.8**	**Z 11.3**				
Displacement volume V_g (cm³/rev)	7.1	8.5				
Size	1	1				

2.2.3 Dual-circuit pumps with separate connection pedestals

Order coding example:

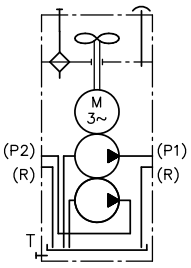
HKF	449	DT/1	**- Z 4,5**	**- Z 4,5**	- AL 21 D 10 - E/70/90 - AL 21 D 10 - E/90/100	- 3x400/230 V 50 Hz
HK	43	DT/1M	**- H 0,9**	**- H 1,5**	- A1/150 - AS1 F1/260	- 3x400/230 V 50 Hz
HKF	449	DT	**- H 0,9**	**- Z 16**	- A1/160 - AL 21 F3 VM - E/85/100 - 7/70	- 3x400/230 V 50 Hz

Pressure connection P2 Table 7 Pressure connection P2: Radial piston pump **H** or gear pump **Z**

Pressure connection P1 Table 6 Pressure connection P1: Radial piston pump **H** or gear pump **Z**

Combination options

Coding	P1	P2	Examples
H - H	3 pump elements	3 pump elements	H 0.9 - H 0.9
H - Z	3 pump elements 3 pump elements 5 pump elements 5 pump elements 6 pump elements 6 pump elements	Gear pump size 1 Gear pump size 2 Gear pump size 1 Gear pump size 2 Gear pump size 1 Gear pump size 2	H 1.25 - Z 11.3 H 0.9 - Z 16 H 2.08 - Z 9.8 H 1.4 - Z 8.8 H 1.8 - Z 6.9 H 3.2 - Z 21
Z - Z	Gear pump size 1	Gear pump size 1	Z 4.5 - Z 4.5



For pump version **H - H, H - Z or Z - Z:**

NOTE
For this pump version, the max. hydraulic work value $(pV_g)_{max}$ is 10% lower.

Table 6 Pressure connection P1

NOTE

- The delivery flow Q_{max} relates to the rated speed and varies depending on the load (see diagrams Chapter 3.3, "Electrical").
- Notes on the pressures p_{max}(see Chapter 3.3, "Electrical", Table 10).
- For pump version with gear pumps **Z** the max. hydraulic work value $(pV_g)_{max}$ is 10% lower.
- **The permissible pressures p_{max} relate to a version with a 3x400/230 V 50 Hz or 3x460 V 60 Hz motor.**
- Be aware of different motor power ratings and resulting permissible maximum pressures $p_{max} = (pV_g)_{max}/V_g$. at other nominal voltages and power frequencies, $(pV_g)_{max}$ (see Chapter 3.3, "Electrical", Table 10)"

Radial piston pump H

Delivery flow coding	H 0.9	H 1.25	H 1.4	H 1.5	H 1.8	H 2.08
Displacement volume V_g (cm³/rev)	0.64	0.88	1.07	1.15	1.29	1.46
Piston diameter (mm) Number of pump elements	6 3	7 3	6 5	8 3	6 6	7 5
Delivery flow coding	**H 2.45**	**H 2.5**	**H 2.6**	**H 3.2**	**H 3.6**	**H 4.2**
Displacement volume V_g (cm³/rev)	1.75	1.79	1.91	2.29	2.58	2.98
Piston diameter (mm) Number of pump elements	7 6	10 3	8 5	8 6	12 3	10 5
Delivery flow coding	**H 4.3**	**H 5.0**	**H 5.1**	**H 5.6**	**H 6.5**	**6.0**
Displacement volume V_g (cm³/rev)	3.03	3.58	3.51	4.03	4.58	4.30
Piston diameter (mm) Number of pump elements	13 3	10 6	14 3	15 3	16 3	12 5
Delivery flow coding	**H 7.0**	**H 7.2**	**H 8.3**	**H 8.6**	**H 9.5**	**H 9.9**
Displacement volume V_g (cm³/rev)	5.04	5.16	5.85	6.05	6.72	7.02
Piston diameter (mm) Number of pump elements	13 5	12 6	14 5	13 6	15 5	14 6
Delivery flow coding	**H 10.9**	**H 11.5**	**H 13.1**			
Displacement volume V_g (cm³/rev)	7.64	8.06	9.17			
Piston diameter (mm) Number of pump elements	16 5	15 6	16 6			

Gear pump Z

Delivery flow coding	Z 2.7	Z 4.5	Z 5.2	Z 8.8	Z 11.3
Displacement volume V_g (cm³/rev)	2.15	3.35	4.25	6.65	8.5
Size	1	1	1	1	1

Available combinations:

Z 2.7 - Z 5.2	**Z 4.5 - Z 4.5**	**Z 8.8 - Z 8.8**	**Z 11.3 - Z 11.3**

Table 7 Pressure connection P2

NOTE

- The delivery flow Q_{max} relates to the rated speed and varies depending on the load (see diagrams Chapter 3.3, "Electrical").
- Notes on the pressures p_{max}(see Chapter 3.3, "Electrical", Table 10).
- For pump version with gear pumps **Z** the max. hydraulic work value $(pV_g)_{max}$ is 10% lower.
- **The permissible pressures p_{max} relate to a version with a 3x400/230 V 50 Hz or 3x460 V 60 Hz motor.**
- Be aware of different motor power ratings and resulting permissible maximum pressures $p_{max} = (pV_g)_{max}/V_g$. at other nominal voltages and power frequencies, $(pV_g)_{max}$ (see Chapter 3.3, "Electrical", Table 10)“

Radial piston pump H

Delivery flow coding	**H 0.9**	**H 1.25**	**H 1.5**	**H 2.5**	**H 3.6**	**H 4.3**
Displacement volume V_g (cm³/rev)	0.64	0.88	1.15	1.79	2.58	3.03
Piston diameter (mm) Number of pump elements	6 3	7 3	8 3	10 3	12 3	13 3
Delivery flow coding	**H 5.1**	**H 6.5**				
Displacement volume V_g (cm³/rev)	3.51	4.58				
Piston diameter (mm) Number of pump elements	14 3	16 3				

Gear pump Z

Delivery flow coding	**Z 2**	**Z 2.7**	**Z 3.5**	**Z 4.5**	**Z 5.2**	**Z 6.5**
Displacement volume V_g (cm³/rev)	1.6	2.15	2.65	3.35	4.25	4.5
Size	1	1	1	1	1	2
Delivery flow coding	**Z 6.9**	**Z 8.8**	**Z 9**	**Z 9.8**	**Z 11.3**	**Z 12.3**
Displacement volume V_g (cm³/rev)	5.35	6.65	6.0	7.1	8.5	8.5
Size	1	1	2	1	1	2
Delivery flow coding	**Z 14.4**	**Z 16**	**Z 21**	**Z 24**		
Displacement volume V_g (cm³/rev)	10.65	11.0	14.5	17.0		
Size	1	2	2	2		

2.2.4 Three-circuit pumps

Order coding example:

HK	43	ST/1	**- H**	**H**	**1,6**	**/1,6**	**- H 1,6**	- C30 - A1 F1/450 - A1 F1/450	- 3x400/230 V 50 Hz
HK	449	DT/1	**- H**	**H**	**3,3**	**/0,83**	**- Z 9,8**	- SS A1/150 - G24 - A1 F2/100	- 3x400/230 V 50 Hz
HKF	489	DT/1	**- H**	**H**	**0,9**	**/0,9**	**- Z 8,8**	- U4 - AP1 F3-P4-42/290 - G24 - AL 21 R F3 D/160/180 - 23	- 3x400/230 V 50 Hz

Pressure connection P2 Table 9 Pressure connection P2: Radial piston pump H or gear pump Z

Pressure connection P3 Table 8 Pressure connection P3

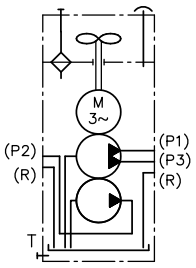
Pressure connection P1 Table 8 Pressure connection P1

Pressure connection P3 Table 8 Pressure connection P3: Radial piston pump H

Pressure connection P1 Table 8 Pressure connection P1: Radial piston pump H

Combination options

Coding	P1	P3	P2	Examples
HH - H	2 pump elements	2 pump elements	2 pump elements	HH 1.6/1.6 - H 2.8
HH - Z	2 pump elements 3 pump elements 3 pump elements	2 pump elements 3 pump elements 3 pump elements	Gear pump size 1 Gear pump size 1 Gear pump size 2	HH 1.6/1.6 - Z 8.8 HH 4.3/4.3 - Z 11.3 HH 6.5/3.6 - Z 16



NOTE

For this pump version, the max. hydraulic work value $(pV_g)_{max}$ is 10% lower.

Table 8 Pressure connection P1 and P3

NOTE

- The delivery flow Q_{max} relates to the rated speed and varies depending on the load (see diagrams Chapter 3.3, "Electrical").
- Notes on the pressures p_{max}(see Chapter 3.3, "Electrical", Table 10).
- For pump version with gear pumps **Z** the max. hydraulic work value $(pV_g)_{max}$ is 10% lower.
- **The permissible pressures p_{max} relate to a version with a 3x400/230 V 50 Hz or 3x460 V 60 Hz motor.**
- Be aware of different motor power ratings and resulting permissible maximum pressures $p_{max} = (pV_g)_{max}/V_g$. at other nominal voltages and power frequencies, $(pV_g)_{max}$ (see Chapter 3.3, "Electrical", Table 10)“

Radial piston pump H

Delivery flow coding	**H 0.6**	**H 0.83**	**H 0.9**	**H 1.0**	**H 1.25**	**H 1.5**
Displacement volume V_g (cm³/rev)	0.43	0.58	0.64	0.76	0.88	1.15
Piston diameter (mm) Number of pump elements	6 2	7 2	6 3	8 2	7 3	8 3
Delivery flow coding	**H 1.6**	**H 2.4**	**H 2.5**	**H 2.8**	**H 3.3**	**H 3.6**
Displacement volume V_g (cm³/rev)	1.19	1.72	1.79	2.02	2.34	2.58
Piston diameter (mm) Number of pump elements	10 2	12 2	10 3	13 2	14 2	12 3
Delivery flow coding	**H 3.8**	**H 4.3**	**H 5.0**	**H 5.1**	**H 5.6**	**H 6.5**
Displacement volume V_g (cm³/rev)	2.69	3.03	3.06	3.51	4.03	4.58
Piston diameter (mm) Number of pump elements	15 2	13 3	16 2	14 3	15 3	16 3

Table 9 Pressure connection P2

NOTE

- The delivery flow Q_{max} relates to the rated speed and varies depending on the load (see diagrams Chapter 3.3, "Electrical").
- Notes on the pressures p_{max}(see Chapter 3.3, "Electrical", Table 10).
- For pump version with gear pumps **Z** the max. hydraulic work value $(pV_g)_{max}$ is 10% lower.
- **The permissible pressures p_{max} relate to a version with a 3x400/230 V 50 Hz or 3x460 V 60 Hz motor.**
- Be aware of different motor power ratings and resulting permissible maximum pressures $p_{max} = (pV_g)_{max}/V_g$. at other nominal voltages and power frequencies, $(pV_g)_{max}$ (see Chapter 3.3, "Electrical", Table 10)“

Radial piston pump H

Delivery flow coding	**H 0.9**	**H 1.25**	**H 1.5**	**H 2.5**	**H 3.6**	**H 4.3**
Displacement volume V_g (cm³/rev)	0.64	0.88	1.15	1.79	2.58	3.03
Piston diameter (mm) Number of pump elements	6 3	7 3	8 3	10 3	12 3	13 3
Delivery flow coding	**H 5.1**	**H 5.6**	**H 6.5**			
Displacement volume V_g (cm³/rev)	3.51	4.03	4.58			
Piston diameter (mm) Number of pump elements	14 3	15 3	16 3			

Gear pump Z

Delivery flow coding	**Z 2**	**Z 2.7**	**Z 3.5**	**Z 4.5**	**Z 5.2**	**Z 6.9**
Displacement volume V_g (cm³/rev)	1.6	2.15	2.65	3.35	4.25	5.35
Size	1	1	1	1	1	1
Delivery flow coding	**Z 8.8**	**Z 9.8**	**Z 11.3**	**Z 12.3**	**Z 14.4**	**Z 16**
Displacement volume V_g (cm³/rev)	6.65	7.1	8.5	8.5	10.65	11.0
Size	1	1	1	2	1	2

3 Parameters

3.1 General

General information

Conformity	▪ Declaration of incorporation according to Machinery Directive 2006/42/EC ▪ Declaration of conformity according to Low-Voltage Directive 2006/95/EC ▪ UL conformity of the stators - UL reference E 216350 ▪ UL conformity of the external fans - UL reference E 93656
Designation	Hydraulic power pack
Design	Valve-controlled radial piston pump, gear pump or internal gear pump
Model	Compact hydraulic power pack (closed unit with a pump, electric drive and tank)
Material	Steel; nitrided valve housing, electrogalvanised sealing nuts and connection block, hardened and ground functional inner parts Housing: Aluminium
Installation position	Vertical
rotation direction	Radial piston pump – any Gear pump – anticlockwise Internal gear pump – anticlockwise Type HKF- anticlockwise (If there is no delivery flow in the 3-phase version, replace two of the three main conductors.)
Speed range	Radial piston pump H: 200 ... 3500 rpm Gear pump Z 1.1 ... Z 6.9: 650 ... 3500 rpm Z 8.8, Z 9.8, Z 11.3, Z 14.4: 650 ... 3000 rpm Z 6.5, Z 9, Z 12.3 ... Z 24: 650 ... 3500 rpm Internal gear pump IZ 7.5 ... IZ 22.9: 200 ... 3600 rpm
Line connection	only via the screwed-on connection blocks, see selection table in Chapter 6.1, "Planning information" ("Selection of the connection blocks") Basic pump: Connection drilling pattern, see Chapter 4.3, "Electric and hydraulic connections"
Ambient temperature	-40 ... +60°C

Weight

(without oil filling)

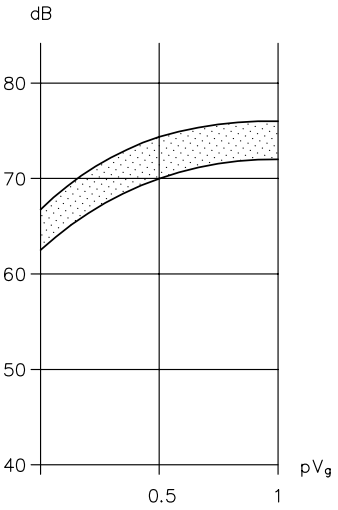
Type	H HH H - H HH - H	Z IZ	H - Z HH - Z	ZZ Z - Z
HK 4.5, HKF 4.5	29.8 kg	26.3 kg	27.6 kg	29.3 kg
HK 4.9, HKF 4.9	34.4 kg	30.9 kg	33.9 kg	32.2 kg
HK 482, HKF 482	39.2 kg	36.1 kg	40.1 kg	37.3 kg

For weights of the required connection blocks and valve banks, see corresponding publications, see Chapter 6.1, "Planning information" ("Selection of the connection blocks") and ("Selection of the directional valve banks")

Characteristics

Running noises

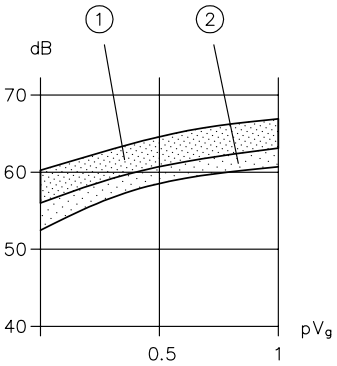
Radial piston pump



dB noise level (A);
pV_g hydraulic work value (bar cm³)

$\frac{p_B}{p_{max}}$ *Pressure ratio*

Gear pump



dB noise level (A);
pV_g hydraulic work value (bar cm³)

1 Gear pump
2 Internal gear pump

Measurement conditions:

Workroom, noise level approx. 50 dB(A); measuring point attached 1m above ground; 1m in the object distance, pump with 4 damping elements ∅40x30 (65 Shore model, model damping element no. 20291/V).

Viscosity during measurements approx. 60 mm²/s

Measuring devices:

Precision noise level meter IEC 651 class I

NOTE
Pumps with smaller delivery flows usually tend toward the lower limit, pumps with larger delivery flows tend toward the upper limit. The noise level of dual-circuit pumps, based on the total flow rate, is approximately in the same range as that of a radial piston single-circuit pump of the same size.

3.2 Hydraulic

Pressure	Pressure side (connection P): depending on version and delivery flow, see Chapter 2.2, "Pump" Suction side (container interior): ambient air pressure. Not suitable for charging.
Start against pressure	The version with 3-phase motor can start against the pressure p_{Max}.
Hydraulic fluid	Hydraulic oil: according to DIN 51 524 Part 1 to 3; ISO VG 10 to 68 according to DIN 51 519 Viscosity range: min. approx. 4; max. approx. 800 mm ²/s Optimal operating range: approx. 10 ... 500 mm²/s Also suitable for biologically degradable pressure fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C.
Cleanliness level	**ISO 4406** 21/18/15...19/17/13
Temperatures	Ambient: approx. -40 to +60°C, oil: -25 to +80°C, pay attention to the viscosity range! Start temperature: down to -40°C is permissible (observe start-viscosity!), as long as the steady-state temperature is at least 20K higher for subsequent operation. Biologically degradable pressure fluids: note manufacturer specifications. With consideration for the seal compatibility, not above +70°C.
Fill volume and usable volume	Tank size, see Chapter 2.1, "Motor and container", Table 1b

3.3 Electrical

Data applies to radial piston and gear pumps
The drive motor forms a closed, inseparable unit with the pump, see description Chapter 1, "Overview of compact hydraulic power pack type HK 4 and HKF 4".

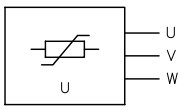
Port	• For version with HARTING connector, housing with female insert HARTING HAN 1 CE or equivalent, cable cross section 1.5 mm² • For version with terminal box, the cable fitting M20 x 1.5 must be provided by the user
Protection class	IP 65 according to IEC 60529 **NOTE** The breather filter must be safeguarded against moisture penetration.
Protection class	VDE 0100 Protection class 1
Insulation	designed in accordance with EN 60 664-1 • For 4-wire AC voltage systems L1-L2-L3-PE (3-phase systems) **with** an earthed neutral point up to 500 V AC nominal phase voltage phase-phase • For 3-wire AC voltage systems L1-L2-L3 (3-phase systems) **without** an earthed neutral point up to a nominal phase voltage of 300 V AC phase-phase • for a single-phase and earthed 2-wire alternating current system L-N (mains) up to a nominal voltage of 300 V AC.
Suppressor **Coding E, PE**	Type RC 3 R Operating voltage 3x 575 V AC Frequency 10 ... 400 Hz max. motor power 4.0 kW 

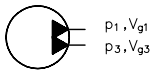
Table 10 Motor data

Type	Nominal voltage and power frequency U_N (V), f (Hz)	Nominal power P_N (kW)	Rated speed n_N (rpm)	Nominal current I_N (A)	Starting current ratio I_A / I_N	Power factor cos φ	max. hydraulic work vlue $(pV_g)_{max}$ (bar cm³)
HK 43 HKF 43	3x400/230 V 50 Hz	1.5	1395	3.1/5.4	4.2	0.91	900
	3x460/265 V 60 Hz	1.8	1674	2.8/5.2	4	0.9	900
	3x500 V 50 Hz	1.5	1395	2.5	3.8	0.91	900
	3x600 V 60 Hz	1.8	1670	2.5	3.8	0.91	900
HK 44 HKF 44	3x400/230 V 50 Hz	2.2	1405	4.8/8.3	5.4	0.85	1250
	3x460/265 V 60 Hz	2.6	1700	4.8/8.3	5	0.85	1250
	3x500 V 50 Hz	2.2	1405	3.9	4.8	0.85	1250
	3x600 V 60 Hz	2.6	1686	3.9	4.8	0.85	1250
	3x380 V 60 Hz	2.6	1710	4.9	5	0.84	1250
	3x200 V 50 Hz	2.2	1420	10.7	5.4	0.78	990
	3x220 V 60 Hz	2.6	1705	9.4	5.4	0.85	990
HK 48 HKF 48	3x400/230 V 50 Hz	3	1420	6.3/11.0	6.3	0.83	2600
	3x460/265 V 60 Hz	3.6	1704	6.3/11.0	6.3	0.83	2600
	3x500 V 50 Hz	3	1420	5	6	0.83	2600
	3x600 V 60 Hz	3.6	1704	5	6	0.83	2600
	3x200 V 50 Hz	3	1420	12	6.5	0.83	2000
	3x220 V 60 Hz	3.6	1700	12.5	6.5	0.89	2000

NOTE

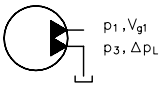
- The current consumption of the motor is dependent on the load. The nominal values only apply for one operating point. In modes S2 and S3 the motor may be used at up to about 1.8 times its nominal power. The heat development which is increased here is cooled in the no-load phases or during stoppage times.
- The current and pump delivery flow can be estimated on the basis of the medium and maximum hydraulic work values $(pV_g)_m$ and $(pV_g)_{max}$.
- The relevant load case is responsible for current consumption in dual-circuit pumps. The hydraulic work of the individual circuits is to be determined and added.

All connections pressurised:



Dual-circuit pumps $(pV_g)_{calc.} = p_1 V_{g1} + p_3 V_{g3}$

One connection pressurised, the other one delivering in circulation mode:

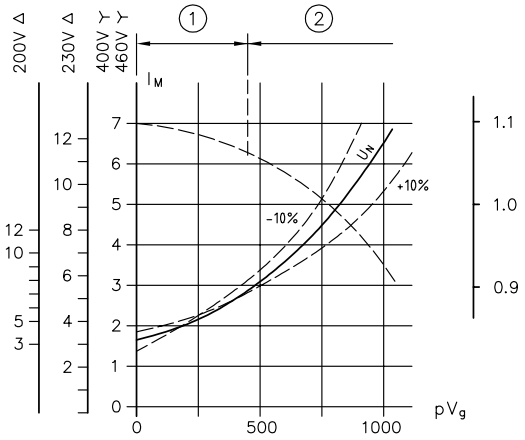


Dual-circuit pumps $(pV_g)_{calc.} = p_1 V_{g1} + \Delta p_L V_{g3}$

- Voltage tolerances: ± 10% (IEC 38), at 3x460/265 V 60 Hz ± 5%
  It can be operated at undervoltage; take note of information about performance restrictions in Chapter 6.1, "Planning information" ("Selection of a compact hydraulic power pack")!
- For pump version **Z**, **HH**, **HZ**, **H - H**, **H - Z**, **HH - Z**, **ZZ** bzw. **Z - Z** the max. hydraulic work value $(pV_g)_{max}$ is 10% lower .

Current consumption

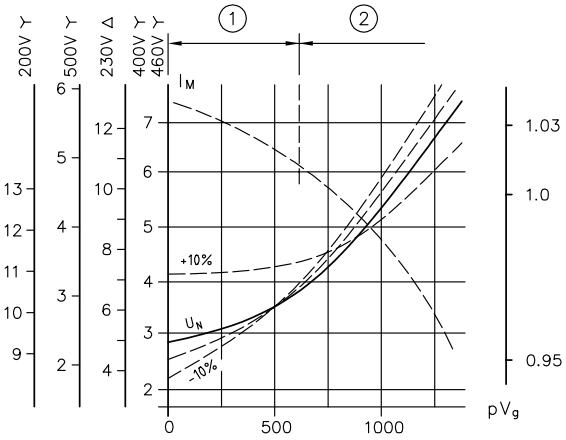
HK 43
HKF 43



I_M motor current (A); pV_g hydraulic work value (bar cm³); Q_{Pu} delivery flow curve (tendency) 1.0

1 Area S1
2 Area S6

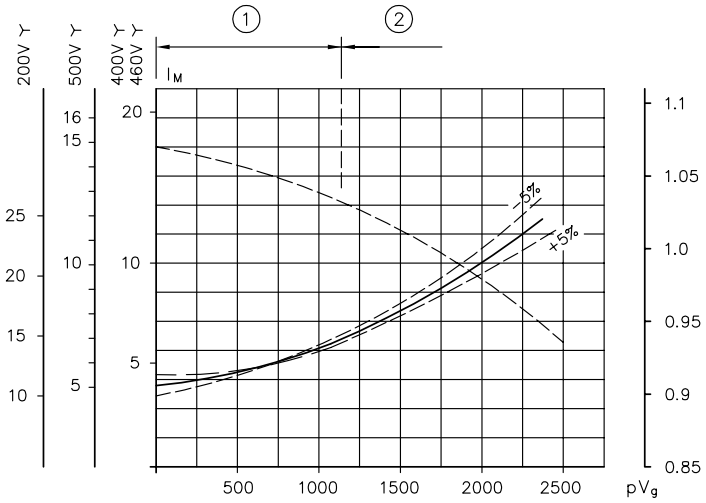
HK 44
HKF 44



I_M motor current (A); pV_g hydraulic work value (bar cm³); Q_{Pu} delivery flow curve (tendency) 1.0

1 Area S1
2 Area S6

HK 48
HKF 48



I_M motor current (A); pV_g hydraulic work value (bar cm³); Q_{Pu} delivery flow curve (tendency) 1.0

1 Area S1
2 Area S6

Temperature switch

Technical data:
Bimetallic-element switch

Coding **T, 60, T55T65**

W, W60, WW60

Signal indication	80°C ± 5K (coding T, W) 60°C ± 5K (coding T60, W60) 55°C or 65°C (coding T55, T65)
Max. voltage	AC: 250 V 50/60 Hz 2.5 A DC: 42 V 1.2 A
Nominal current (cos φ ~ 0.95 / 0.6)	2.5 A / 1.6 A
Max. current at 24 V (cos φ = 1)	1.5 A
Electrical connection	See Chapter 4.3, "Electric and hydraulic connections"
Switching hysteresis	30 K ± 15 K

Level switch
Coding **D, S, A**

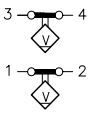
Technical data:

		D, A	**S**
Max. DC/AC switching capacity	30 VA	(N/C contact)	(N/O contact)
Max. DC/AC current	0.5 A (cos φ = 0.95)		
Max. voltage	230 V AC/DC		

Electrical connection: See Chapter 4.3, "Electric and hydraulic connections"

Coding **D -D**

Max. DC/AC switching capacity	3 VA
Max. DC/AC current	0.25 A
Max. voltage	42 V AC/DC
Electrical connection	See Chapter 4.3, "Electric and hydraulic connections"



A protective circuit is to be implemented in the case of an inductive load!

External fan
Coding **HKF**

Motor data

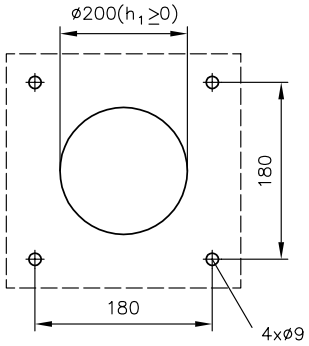
U_N	P_N(W)	Rotation speed (rpm)	Protection class
3x400/230 V 50 Hz Y△	110	2680	IP 44
3x460/265 V 60 Hz Y△	160	2950	IP 44

Temperature range	-10°C ... +50°C
Electrical connection	in the terminal box or HARTING plug (see Chapter 4.3, "Electric and hydraulic connections")

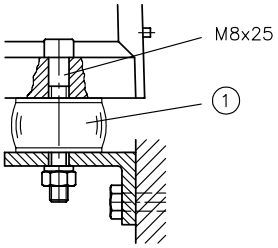
4 Dimensions

All dimensions in mm, subject to change.

4.1 Mounting hole pattern

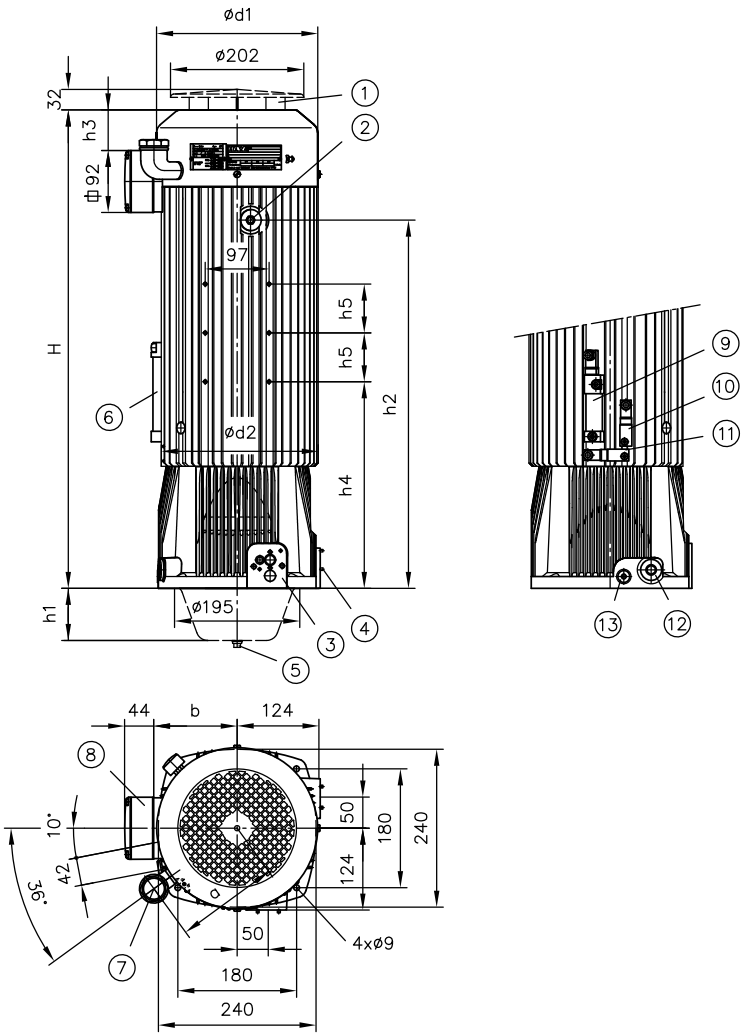


Recommended attachment



1 Damping element ∅40x30/M8 (65 Shore)

4.2 Basic pump



1 Fan cover, coding R
2 Drain port G 3/4, as standard
3 Main connection base
4 Second connection base
5 Drain screw G 1/8
6 Level switch, coding D, D-D, S
7 Oil filler G 1 1/4 series
8 Terminal box
9 Level switch, coding A
10 Temperature switch, coding W 60
11 Temperature switch, coding W
12 Connection for auxiliary tank G 3/4
13 Oil drain G 1/4

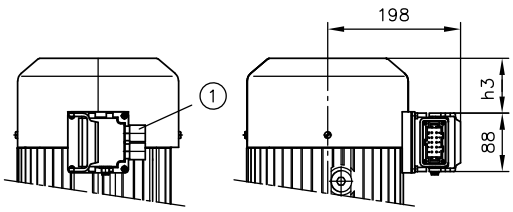
Pump version	h_1
H, H-H, HH-H, Z (Bg 1: Z 2... Z 11.3)	--
Z (Z 14.4 / Bg 2: 6.5 ... Z 16), IZ, ZZ, Z-Z, HZ (Z 2.0-11.3)	79
Z (Z 21, Z 24), HZ (Z 6.5-Z 24) H-Z, HH-Z	103

Basic type	H	h_2	h_3	h_4	h_5	d_1	d_2	a	b
HK 4	460	--	50	--	--	219	174	135	114
HK 4.8	580	--	50	--	--	219	174	135	114
HK 4.5	483	328	50	--	--	245	198	148	123
HK 4.9	603	448	50	337	74	245	198	148	123
HKF 4.5	513	328	80	--	--	245	198	148	123
HKF 4.9	633	448	80	337	74	245	198	148	123
HKF 4.2	833	648	80	337	74	245	198	148	123

Additional option

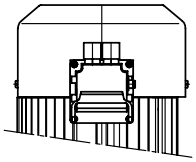
HARTING plug

Coding **P1**

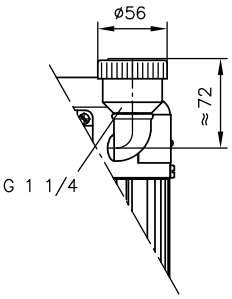


1 Suppressor coding **P1E**

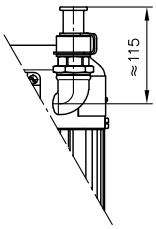
Coding **P2**



Filler reduction port **M**

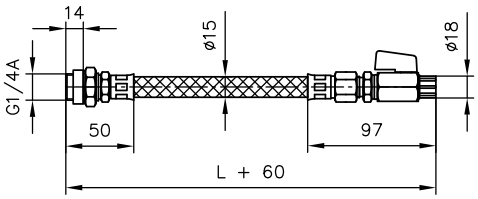


Filling coupling **MW**

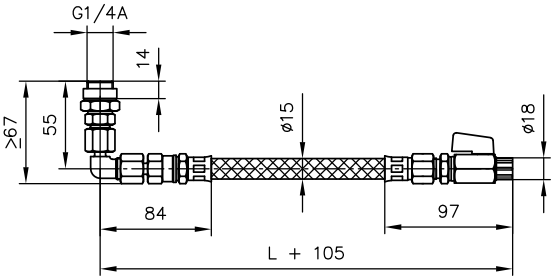


Oil drain hose

Coding **G 1/4 x 300**
G 1/4 x 500



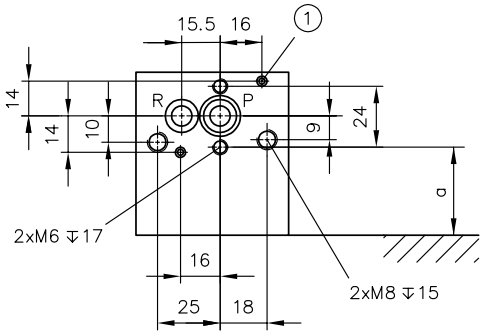
Coding **G 1/4 W x 300**
G 1/4 W x 500



4.3 Electric and hydraulic connections

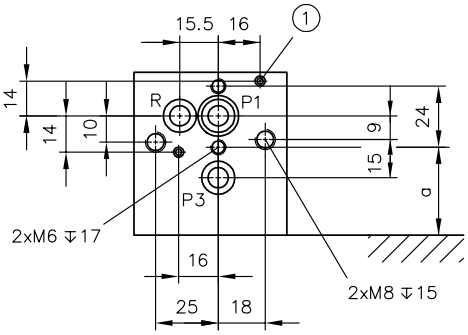
Hydraulic

Single-circuit pump (main connection pedestal)
Dual-circuit pump with separate connection pedestal (main and second connection pedestal)
Three-circuit pump (second connection pedestal)



1 Centring pin

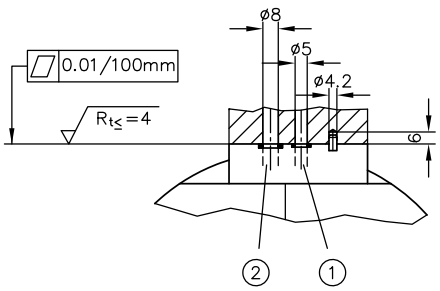
Dual-circuit pump with shared connection pedestal (main connection pedestal)
Three-circuit pump (main connection pedestal)



1 Centring pin

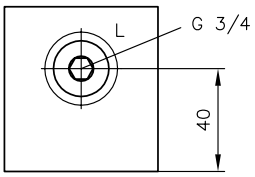
	a
HK 4, HKF 4 main connection pedestal	31
HK 4, HKF 4 second connection pedestal	25

Hole for self-made connection block



1 Sealing of connections:
P and P1 = edge seal 6.07x1.68 NBR 90 Sh
2 Sealing of connections:
P3 and R = 8x2 NBR 90 Sh

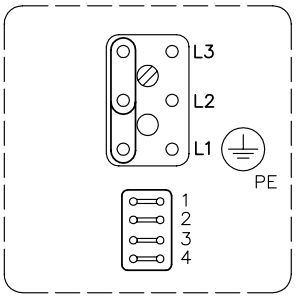
Drain port (second connection pedestal), coding **L**



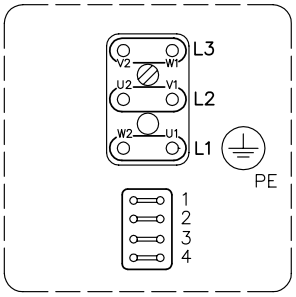
Terminal box

Type HK

3-phase motor star pattern ⅄

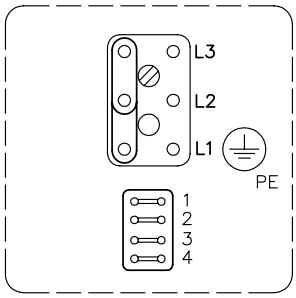


3-phase motor delta circuit △

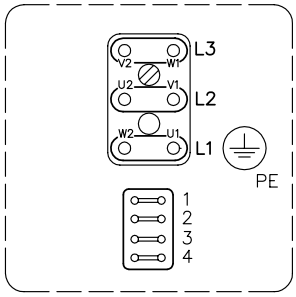


Type HKF

3-phase motor star pattern ⅄
Terminal box position /1, /2, /3, /4
(see Table 1c)

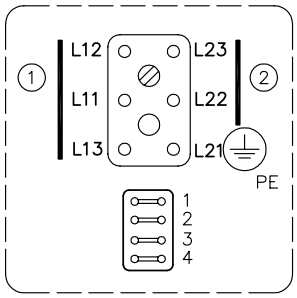


3-phase motor delta circuit △



Type HKF

Star or delta circuit factory-set
Terminal box position /5, /6, /7, /8
(see Table 1c)

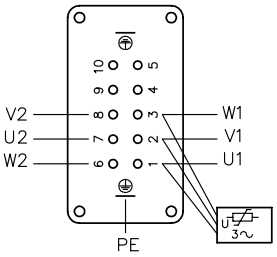


1 Fan
2 Pump

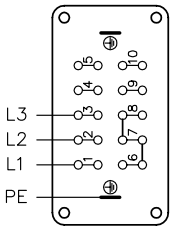
HARTING connector HAN 10 E
Coding **P1, P2**

Type HK

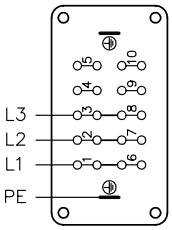
Base (on the pump side)



Socket (on the customer side)
Star pattern ⅄
Bridges are to be installed by the customer

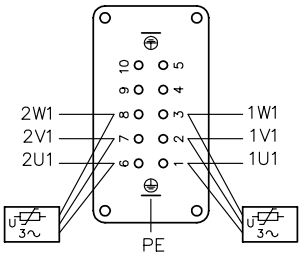


Socket (on the customer side)
Delta circuit △
Bridges are to be installed by the customer

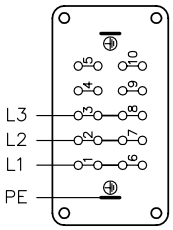


Type HKF

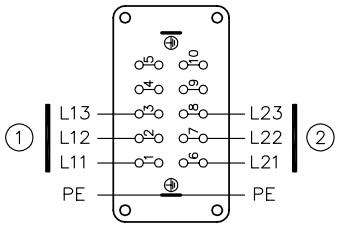
Base (on the pump side)



Socket (on the customer side)
Star or delta circuit factory-set
Terminal box position /1, /2, /3, /4 (see Table 1c)
Motor and fan together



Socket (on the customer side)
Star or delta circuit factory-set
Terminal box position /1, /2, /3, /4 (see Table 1c)
Motor and fan separately

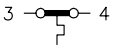


1 Pump
2 Fan

Terminal connections for version with terminal box

Temperature switch

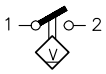
Coding **T, T60**



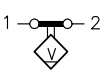
Level switch

Coding **S, D**

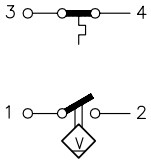
S (N/O contact)



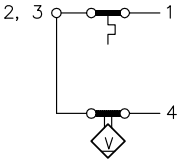
D (N/C contact)



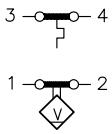
Coding **S-T**



Coding **DT**

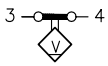


Coding **D-T**

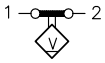


Coding **D-D**

1. Switching point

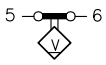


2. Switching point

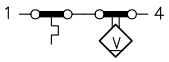


Coding **D-DT**

1. Switching point



2. Switching point



Terminal connections for version with HARTING connector

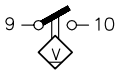
Temperature switch

Coding **T, T60**

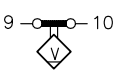
Level switch

Coding **S, D**

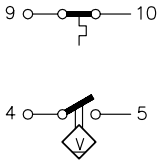
S (N/O contact)



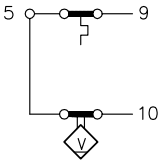
D (N/C contact)



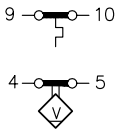
Coding **S-T**



Coding **DT**

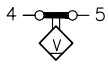


Coding **D-T**

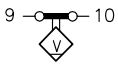


Coding **D-D**

1. Switching point

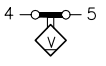


2. Switching point

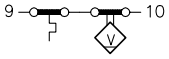


Coding **D-DT**

1. Switching point



2. Switching point

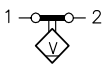


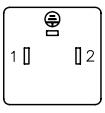
Temperature switch
(separate connection)

Coding **W, W60**

Level switch
(separate connection)

Coding **A**





Male connector
DIN EN 175 301-803 C
(8 mm)

5 Assembly, operation and maintenance recommendations

5.1 Intended use

These hydraulic components is intended exclusively for hydraulic applications (fluid technology).

The user must observe the safety measures and warnings in this documentation.

Essential requirements for the product to function correctly and safely:

- All information in this documentation must be observed. This applies in particular to all safety measures and warnings.
- The product must only be assembled and put into operation by qualified personnel.
- The product must only be operated within the specified technical parameters. The technical parameters are described in detail in this documentation.
- All components must be suitable for the operating conditions in the event of application in an assembly.
- The operating and maintenance manual of the components, assemblies and the specific complete system must also always be observed.

If the product can no longer be operated safely:

1. Remove the product from operation and mark it accordingly.

✓ It is then not permitted to continue using or operating the product.

5.2 Assembly information

The product must only be installed in the complete system with standard and compliant connection components (screw fittings, hoses, pipes, fixtures etc.).

The product must be shut down correctly prior to dismounting (in particular in combination with hydraulic accumulators).

DANGER

Risk to life caused by sudden movement of the hydraulic drives when dismantled incorrectly!

Risk of serious injury or death.

- Depressurise the hydraulic system.
- Perform safety measures in preparation for maintenance.

NOTE

The pump unit may only be installed and connected by a qualified specialist who is familiar with and adheres to general engineering principles and relevant applicable regulations and standards.

NOTE

Within the meaning of the European Machinery Directive 2006/42/EC, Annex II, section 1 B: The incomplete machine is manufactured in accordance with the harmonised standards EN 982 and DIN 24 346. Commissioning is prohibited until it has been determined that the machine in which the incomplete machine is to be installed complies with the provisions of the EC directives.

The electrical connection is to be carried out by a qualified specialist who has received appropriate training.

The following directives and standards must be observed:

- VDI 3027 Commissioning and maintenance of oil-hydraulic systems
- DIN 24346 Hydraulic systems
- ISO 4413 Hydraulic fluid power – general rules for application
- D 5488/1 Oil recommendations
- B 5488 General operating and maintenance manual

5.2.1 Identification

See type plate or option table

5.2.2 Setting up and attaching

- Set-up

DANGER

Risk of injury due to hot compact hydraulic power pack and hot directional valve solenoids during operation.

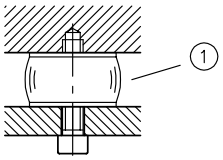
Danger of burning.

- Do not touch the compact hydraulic power pack or directional valve solenoids during operation.
- Allow the compact hydraulic power pack and directional valve solenoids to cool down before any work.
- Wear protective gloves.

NOTE

Ensure that fresh air can be drawn in and that warm air can escape. No changes of any kind (mechanical, welding or soldering work) may be made.

- Installation position – vertical
- For dimensions, see Chapter 4.2, "Basic pump "
- For mounting hole pattern, see Chapter 4.1, "Mounting hole pattern"
- Recommended attachment



1 Damping element ∅40x30/M8 (65 Shore)

- Weight (for the basic power pack, without valve mounting and oil filling)
  For mass (weight) of connection blocks and valve banks, see the corresponding publications

Type	H HH H-H HH-H	Z IZ	H-Z	ZZ Z-Z
HK 4.5, HKF 4.5	29.8 kg	26.3 kg	27.6 kg	29.3 kg
HK 4.9, HKF4.9	34.4 kg	30.9 kg	33.9 kg	32.2 kg
HK 48, HKF 482	39.2 kg	36.1 kg	40.0 kg	37.3 kg

5.2.3 Electrical connection and selection of the motor protection circuit-breaker

- Connecting the electric drive (see Chapter 5.2.3, "Electrical connection and selection of the motor protection circuit-breaker")
- Connecting the float and level gauge (see Chapter 5.2.3, "Electrical connection and selection of the motor protection circuit-breaker")

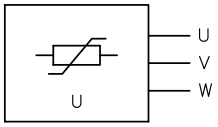
> **NOTE**
> The temperature switch responds at a oil temperature of approx. 95°C or 60°C.

> **NOTE**
> If the amount of oil removed during each operating cycle causes the oil level to fall below the monitoring level of the level switch, then suitable electrical measures are to be taken in order to ignore the signal until the oil level rises above the monitoring level once again as a result of the oil flowing back in at the end of the operating cycle.

- Setting the motor protection circuit breaker
  - S1 operation (for pressures <= p_1)
    The motor protection circuit breaker is set to the max. current, but not higher than the nominal current I_N of the motor. The motor protection only extends to a possible mechanical motor blockage.
  - S 6 operation (for pressures <= p_{max})
    The motor protection circuit breaker is set to approx. (0.85 to 0.9) I_N (see motor current Chapter 5.2.3, "Electrical connection and selection of the motor protection circuit-breaker"). This ensures that the motor protection circuit breaker is not triggered prematurely during normal operation, but that the response of the pressure-limiting valve before switch-off is not so long that the max. permissible oil temperature is exceeded.
  - The settings of the motor protection circuit breaker must be checked during the test run. Temperature switches, level switches and pressure switches are further safety measures against malfunctions.

5.2.4 Information on ensuring EMC (electromagnetic compatibility)

If compact hydraulic power packs (induction machine in accordance with EN 60034-1 Section 12.1.2.1) are connected to a system (for example, power supply in accordance with EN 60034-1 Section 6), they do not generate any impermissible fault signals (EN 60034-1 Section 19). Tests of immunity to interference to verify compliance with the standards EN 60034-1 Section 12.1.2.1 and VDE 0530-1 are not required. Any brief and potentially disruptive electromagnetic fields generated when switching the motor on and off can be weakened, for example, using suppressor type 23140, 3x400 V AC 4 kW 50-60 Hz, made by Murr-Elektronik, D-71570 Oppenweiler, Germany.
A suppressor can be integrated as an option directly on the terminal box or HARTING plug (coding E, P1E or P2E, see Table 1e)



5.3 Operating instructions

Note product configuration and pressure / flow rate

The statements and technical parameters in this documentation must be strictly observed.
The instructions for the complete technical system must also always be followed.

NOTE

- Read the documentation carefully before usage.
- The documentation must be accessible to the operating and maintenance staff at all times.
- Keep documentation up to date after every addition or update.

CAUTION

Risk of injury on overloading components due to incorrect pressure settings!
Risk of minor injury.

- Always monitor the pressure gauge when setting and changing the pressure.

Purity and filtering of the hydraulic fluid

Fine contamination can significantly impair the function of the hydraulic component. Contamination can cause irreparable damage.

Examples of fine contamination include:

- Metal chips
- Rubber particles from hoses and seals
- Dirt due to assembly and maintenance
- Mechanical debris
- Chemical ageing of the hydraulic fluid

NOTE

Fresh hydraulic fluid from the drum does not always have the necessary degree of purity.
When pouring in hydraulic fluid, filter it.

Pay attention to the cleanliness level of the hydraulic fluid to maintain faultless operation.
(See also cleanliness level in Chapter 3, "Parameters")

Additionally applicable document: D 5488/1 Oil recommendations

Always fill the hydraulic fluid via the system filter or a mobile filter station.

Check for correct connection

- Electrical: power supply, control
- Hydraulic: piping, hoses, cylinders, motors
- Mechanical: attachment to the machine, the frame and the base

Motor protection

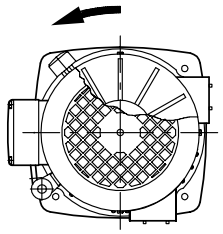
- The electric drive must be protected with a motor protection circuit.
  For the current setting, see Chapter 5.2.3, "Electrical connection and selection of the motor protection circuit-breaker"

Fill volume and usable volume

Coding	Fill volume V_{fill} (l)	Usable volume V_{usable} (l)	Basic type	
			HK	HKF
5	6.8/6.6	2.5/1.8	●	●
9	10.0/9.0	5.7/5.5	●	●
2	15.4	11.1	--	●

rotation direction

- Radial piston pump – any
- Gear pump – anticlockwise
- Internal gear pump – anticlockwise
- HKF-type – anticlockwise
  (Rotation direction is only marked by arrow on the fan housing. If there is no delivery flow in the 3-phase version, replace two of the three main conductors.)



Start and bleeding

☑ Directional valve is in switching position in which the depressurised circulation of the pump is possible.

1. Switch the pump on and off several times so that the pump cylinders bleed automatically.

☑ If the controller is not designed for this,

2. a pipe screw connection with a short pipe bracket and a transparent plastic tube can be attached to connection P.
3. Insert the other end into the opening for the oil filler (unscrew the air filter).

✓ When the oil flow is free of bubbles, the pump has been bled.

4. Then move the consumer(s) back and forth several times until the air is largely removed there too and the movement is smooth.
5. If the consumers have bleed points, loosen the locking elements and only tighten them once bubble-free oil emerges.

Directional valves

– Any solenoid valves must be connected to the controller in accordance with the hydraulic schematic and function diagram.

Accumulator systems

– Accumulators should be filled using designated equipment in accordance with the pressure specifications of the hydraulic schematic. The relevant operating and maintenance manuals must be followed.

⚠ **CAUTION**

Risk of injury due to incorrect transportation.

Risk of minor injury.

- Comply with the regulations on transportation and safety.
- Wear protective equipment.

5.4 Maintenance information

Conduct a visual inspection at regular intervals, but at least once per year, to check if the hydraulic connections are damaged. If external leakages are found, shut down and repair the system.

Clean the device surface of dust deposits and dirt at regular intervals, but at least once per year.

The compact hydraulic power packs together with the attached directional valves require minimal maintenance. It must be ensured that the oil level is regularly monitored.

An oil change must be performed once a year; any pressure filters and return line filters must be replaced.

NOTE
Before starting maintenance or repair work:

- Depressurise the system on the fluid side. This applies in particular for systems with hydraulic accumulators.
- Switch off or interrupt the power supply.

Repairs and spare parts

– Repairs (replacement of wearing parts) can be carried out by trained specialists themselves. A spare parts list is available on request. The electric drive cannot be replaced.

6 Other information

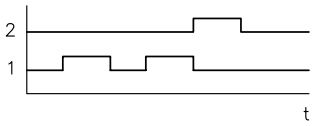
6.1 Planning information

6.1.1 Selection advice

The procedure for the selection and design of compact hydraulic power packs with a valve attachment is described below. In order to find the ideal solution, several iterative steps generally have to be carried out.

a) Setting up a function diagram

The required or desired (hydraulically activated) functions form the basis for the function diagram.



b) Definition of pressures and flow rates

- Dimensioning and selection of actuators on the basis of the reaction forces arising
- Calculation of the individual flow rates on the basis of the required velocity profiles

> **NOTE**
> Take note of the reset times for spring-loaded clamping cylinders.

In the case of time-linked clamping devices, the release of spring-loaded clamping cylinders may often have a greater influence over the time interval than clamping. The return stroke times are determined exclusively by the forces of the reset springs. They drive the cylinder pistons ahead, against the flow resistance from directional valves and pipelines. This must be noted in the dimensions of pipelines or hose lines, as well as valves.

- Calculation of the individual operation pressures required
- Determination of the maximum (pump) delivery flow required – Q (lpm)
- Determination of the (system) operating pressure – p_{max} (bar)

Q - flow rate

p - pressure

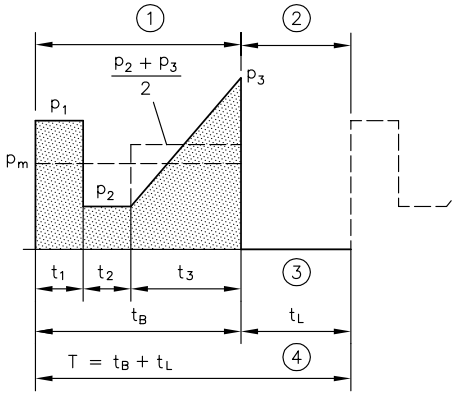
A - Area

v - Velocity

F - Force

$$Q\left(l/\min\right) = 0.06 \cdot A\left(mm^2\right) \cdot v\left(\frac{m}{s}\right)$$

$$p\left(bar\right) = \frac{10 \cdot F(N)}{A(mm^2)}$$



1 Load time

2 No-load time

3 No load

4 One working cycle

c) Preparation of the hydraulic schematic

- Criteria:
  - single circuit system
  - Accumulator charging mode
  - Dual-circuit systems with two separately operating hydraulics circuits
  - Dual-circuit systems with a shared hydraulics circuit (for instance, in presses or hydraulic tools as high-pressure systems / low-pressure systems, in handling systems with velocity controlrapid feed/creep)
  - Use of an accumulator for the short-term support of the pump delivery flow

d) Setting up a time/load diagram on the basis of a function diagram

- Deriving the mode for the compact hydraulic power pack
  - Calculation of the relative ON-time %ED
  - S1 – continuous operation (not suitable for compact hydraulic power packs only suitable with restrictions)
  - S2 – short period operation
  - S3 – standby mode
  - S6 – continuous run with intermittent load

e) Selection of a compact hydraulic power pack

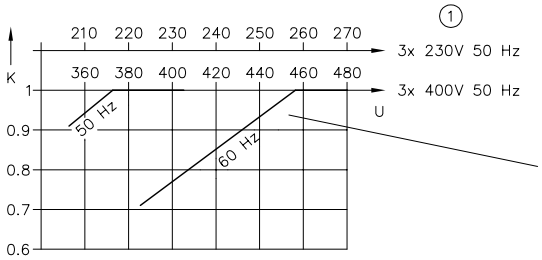
- Definition of the basic type on the basis of the power supply
  - Three-phase current
- Motor selection
  - Voltage tolerances: ± 10% (IEC 38), at 3x460/265 V 60 Hz ± 5%
  - A 3-phase motor 400 V 50 Hz can be used without restrictions in 460 V 60 Hz supply networks.
  - It can be operated at undervoltage. Bear in mind that this will involve performance restrictions.

    $p_{max\ red} = p_{max} * k$

    p_{max} (bar) – max. operating pressure in accordance with the selection tables

    $p_{max\ red}$ (bar) – reduced max. available operating pressure

    * k – correction factor from the diagram



U supply voltage (V); K correction factor

1 Motor design

NOTE
Pump delivery flow 1.2 x greater than at 50 Hz operation!

- Version with an encased stator
  To be used in hydraulic installations in which a water content in the oil of up to 0.3 % is expected.
- Electrical connection
  - Terminal box
  - HARTING plug
- Selection of the pump type (radial piston pump, gear pump, internal gear pump pump combination)
- Selection of the key figure for the pump delivery flow with due regard for the maximum permissible pressure and definition of the basic type with the motor size
- Estimation of the noise level from the diagrams in Chapter 3, "Parameters"

f) Calculation of the hydraulic work value

- Calculation of the average pressure
- Calculation of the average hydraulic work value (average pressure x output volume)
- Calculation of the maximum hydraulic work value (maximum operating pressure x output volume)

p_m (bar) = calculated average pressure per cycle during the load time

$$t_B = t_1 + t_2 + t_3 + \ldots$$

$$p_m = \frac{1}{t_B}\left(p_1 \cdot t_1 + p_2 \cdot t_2 + \frac{p_2 + p_3}{2} \cdot t_3 + \ldots\right)$$

p_mV_g = average hydraulic work value

V_g = geometric displacement volume in accordance with the tables Chapter 2.2, "Pump"

$pV_{g\,max}$ (bar cm³) = p_{max} * V_g

g) Determination of excess temperature

CAUTION
Take note of the max. permissible oil temperature of 80°C!

The steady-state temperature is reached after an operating time of about half an hour.

Influencing variables:

- Pressure run during the load phase (average pressure)
- Time share of the no-load phase
- Additional throttle losses over and above normal flow resistances (approx. 30%) from valves and lines are only to be taken into account if they take effect over a longer share of time within a working cycle (load phase). For instance, this includes work against the pressure-limiting valve (loss = 100%)

In order to conduct an approximate check on the steady-state temperature of the oil fill, you generally only require the two most important items of data, i.e. average hydraulic work of the pump (p_mV_g) and relative load duration per working cycle (%ED).

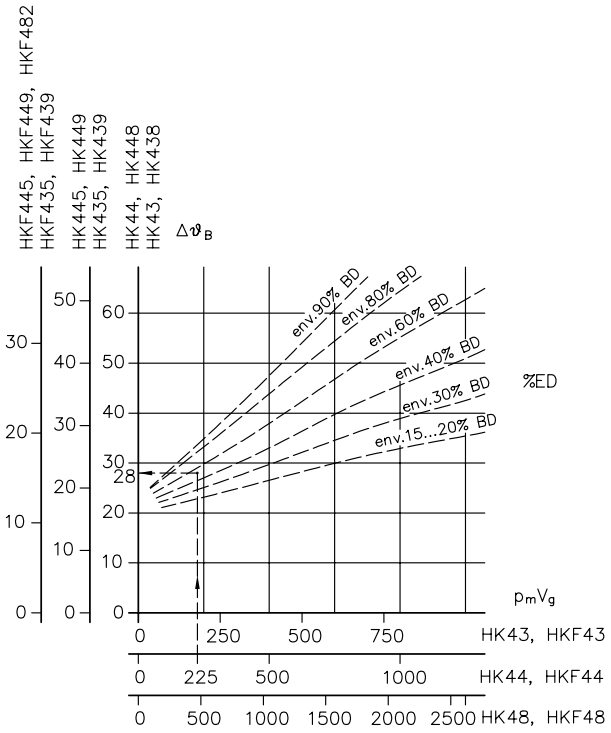
- In the case of a tank size with coding the steady-state temperature is approximately 15% lower.

$\vartheta_{Oil\,B} = \triangle\vartheta_B + \vartheta_U$

$\triangle\vartheta_B$ (K) - Steady-state temperature, assessment from the diagrams opposite

ϑ_U (K) - Ambient temperature at the place of installation

$\vartheta_{Oil\,B}$ (°C) - Steady-state temperature of the oil fill



p_mV_g average hydraulic work value (bar cm³); $\triangle\vartheta_B$ expected steady-state temperatures (K); %ED relative ON-time

$$\text{Relative duty cycle } \%ED = \frac{t_B}{t_B + t_L} \cdot 100$$

h) Determination of the max. current consumption

See diagrams Chapter 3.3, "Electrical"
zur for the settings of the motor protection circuit breaker, see Chapter 5.2.3, "Electrical connection and selection of the motor protection circuit-breaker"

i) Additional drain return port

For larger, hot operating leakage oil return flows, for example chucks on lathes. The leakage oil return flow is guided so that its entrained heat loss is dissipated by the fan cooling.

j) After-run

If the compact hydraulic power pack is wired directly to the hydraulic cylinder, e.g. in the circuit for clamping devices (B-type connection blocks), and if a pressure switch causes it to cut out once the set pressure has been reached, a certain increase in pressure still takes place as a result of the after-run action of the pump motor. The level of this additional rise in pressure is dependent on the pressure setting, on the consumer volume and on the pump delivery flow. If you wish to prevent these pressure rises, the setting for the pressure-limiting valve has to be adjusted in line with the switch-off point on the pressure switch. As a result, the subsequent delivery from the pump is discharged via the pressure-limiting valve.

The adjustment is to be carried out as follows:

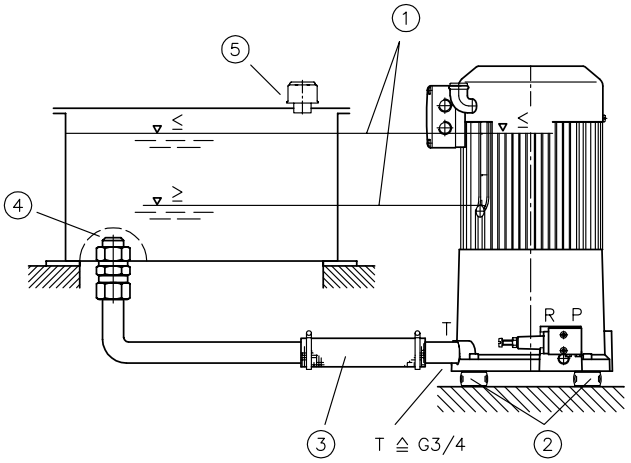
1 Open the pressure-limiting valve fully.
2 Set the pressure switch to the highest value (by turning the setting screw clockwise as far as it will go).
3 Switch on the pump (with a consumer and pressure gauge connected) and turn up the pressure-limiting valve until the pressure gauge shows the required end operating pressure.
4 Turn the pressure switch in the opposite direction until the pump is switched off at the pressure setting (see Chapter 3, "Parameters").
5 Locking the pressure-limiting valve and the pressure switch.

The rise in pressure due to the after-run can also be avoided by using an accumulator or additional volume in the consumer line.
If the compact hydraulic power pack is used to full capacity, i.e. the pressure setting is close to the maximum permissible pressure according to the selection tables in Chapter 2.1, "Motor and container" and Chapter 2.2, "Pump", practically no after-run occurs because the pump comes to a stop almost as soon as it is switched off.

k) Additional container

If necessary, an additional reservoir can be connected to port T to increase the usable volume. This container is must be supplied. It is only used to compensate for volume changes. The return line from the consumer circuit must always be fed into connection R of the HK pump!
The connection line must be dimensioned sufficiently. Connection, for example, with pipe screw connections light series for pipe 22x1.5 with hose piece for noise and vibration decoupling or with bare hose line.

NOTE
Only suitable for pump delivery flows of approx. 12 l/min.



1 Same max. filling and removal height
2 Rubber-metal attachment
3 Hose connector
4 Strainer
5 Air filter

l) Connection block and valve mounting

A connection block is necessary to make a compact hydraulic power pack ready for a hydraulic connection.

Type	Description	Publication
A, AL, AM, AK, AS, AV, AP	For single-circuit pumps with a pressure-limiting valve and the possibility of direct mounting of directional valve banks **Optional:** – Pressure filter or return line filter – Idle circulation valve – Accumulator charging valve – Proportional pressure-limiting valve	D 6905 A/1
AN, AL, NA, C30, SS, VV	For dual-circuit pumps with a pressure-limiting valve and the partial possibility of direct mounting of directional valve banks **Optional:** – Pressure filter or return line filter – Accumulator charging valve – Two-stage valve – Idle circulation valve	D 6905 A/1
AX	For single-circuit pumps with a pressure-limiting valve with unit approval and the possibility of direct mounting of directional valve banks (for use in accumulator systems) **Optional:** – Pressure filter or return line filter – Idle circulation valve	D 6905 TÜV
B	For single-circuit pumps for the activation of single-acting cylinders with a pressure-limiting valve and drain valve **Optional:** – Throttle valve	D 6905 B
C	For single-circuit pumps with connections P and R for direct piping	D 6905 C

NOTE
When setting the pressure-limiting valve on the connection block, take note of the maximum permissible pressure of the pump!

The direct mounting of valve banks with directional valves on A-type connection blocks enables a compact hydraulic unit to be assembled without the need for additional piping.

Type	Description	p_{max} (bar)	Publication
VB	Valve bank (directional seated valve)	700	D 7302
BWN, BWH	Valve bank (directional seated valve)	450	D 7470 B/1
SWR, SWS	Valve bank (directional spool valve)	315	D 7451, D 7951
BA	Valve bank for the combination of different directional valves with connection pattern NG 6 in accordance with DIN 24 340-A6	400	D 7788
BVH	Valve bank (directional seated valve)	400	D 7788 BV
NBVP	Directional seated valve	400	D 7765 N
NSWP	Directional spool valve	315	D 7451 N
NSMD	Clamping module (Directional spool valve with a pressure reducing valve and acknowledge function)	315	D 7787
NZP	Intermediate plates with connection pattern NG 6 in accordance with DIN 24 340-A6	400	D 7788 Z

Further information

Additional versions

- Compact hydraulic power pack type HKF 4 with frequency converter: D 7600-4 FU
- Compact hydraulic power pack type HK 3: D 7600-3
- Compact hydraulic power pack type HKL and HKLW: D 7600-3L
- Compact hydraulic power pack type KA and KAW size 2: D 8010
- Compact hydraulic power pack type KA and KAW size 4: D 8010-4
- Compact hydraulic power pack type HC and HCW: D 7900
- Compact hydraulic power pack type MPN and MPNW: D 7207
- Direct current compact hydraulic power pack type NPC: D 7940
- Connection blocks type A for hydraulic power packs: D 6905 A/1
- Connection block type AX, with unit approval: D 6905 TUV
- Connection blocks type B for hydraulic power packs: D 6905 B
- Connection block type C 5 and C 6: D 6905 C
- Valve bank (directional seated valve) type VB: D 7302
- Valve bank (directional seated valve) type BWN and BWH: D 7470 B/1
- Valve bank (nominal size 6) type BA: D 7788
- Valve bank (directional seated valve) type BVH: D 7788 BV
- Directional seated valve type NBVP 16: D 7765 N
- Directional spool valve type NSWP 2: D 7451 N
- Clamping module type NSMD: D 7787
- Intermediate plate type NZP: D 7788 Z
- Fitting type X 84: D 7077
- Diaphragm accumulator type AC: D 7969
- Miniature hydraulic accumulators, type AC: D 7571

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