Pumps type MP

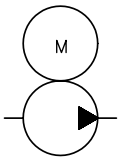
Motor pump combination for mounting into tanks for on/off service

For hydraulic power packs with tank suited for direct mounting of the valves, see D 7200 H

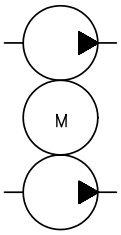
Pressure p_{max} 700 bar (radial piston pump)
200 bar (gear pump)

Delivery flow Q_{max} 4.5 lpm (radial piston pump)
31 lpm (gear pump)

Single circuit pump



Dual circuit pump (double pump)



1. General information

The pumps type MP are intended to be installed in tanks. Special feature is the arangement of pump and motor being oil immersed. This arrangement yields a number of advantages when compared with power packs of conventional style:

- Higher permissible exploitation of the motor output due to the intensive cooling effect of the surrounding oil
- Lower operating noise by the absence of dire ctly emitted operation noise from fan and motor as well as by the muffling effect of the hydraulic fluid
- Low space requirements due to compact design: Pump and motor are mounted on and into one another.

The pumps should be used preferable for short time and on/off service S2 and S3. No-load operation S6 is possible, de-pending on pump size and load.
The operating modes (VDE 0530):

- S 2 = Short time operation
  S 3 = Intermittent service (on/off service) ┐ Main operating modes for the use of these pumps
  S 6 = Permanent operation with intermittent load (no-load operation). Permissible only at sufficiently large tank. Hydraulic power packs type HK acc. to D 7600-2 (-3, -4) or pumps type R acc. to D 6010, type Z acc. to D 6820 or type RZ acc. to D 6910 should be utilized for such cases.
- The load duration per operating cycle shouldn‘t exceed 2 min., see section 5.5
- The relative duty cycle varies depending on operating mode and size of the tank, see section 5.5.
  The nom. voltage must be specified with your order, see section 3.3.

Single circuit pumps

Radial piston pumps for high pressure systems up to 700 bar

Type MP ... - H ...

Gear pumps for mid-pressure systems up to 200 bar

Type MP ... - Z ...

Dual circuit pumps (double pumps)

Radial piston pump + gear pump

Type MP ... - H ... - Z ...

Gear pump + gear pump

Type MP ... - Z ... - Z ...

2. Available versions, main data

2.1 Single circuit pumps (radial piston pumps) For gear pumps, see section 2.2

intended for 3-phase mains and for 1-phase mains

Order example: **MP 24 A - H 0,81** 3 ~ 230/400V 50Hz

Specification of motor voltage

Pump				Basic type and size										
				Nom. speed 1450 rpm						Nom. speed 2850 rpm				
					Version for 3-phase mains		Version for 1-phase mains [2]				Version for 3-phase mains		Version for 1-phase mains [2]	
Coding	Piston diameter (mm)	Piston number [1]	V_g Geometric displacement (cm^3/rev)	Delivery flow Q_{max} (lpm)	**MP 14 A**	**MP 24 A**	**MPW 14**	**MPW 24**		Delivery flow Q_{max} (lpm)	**MP 12 A**	**MP 22 A**	**MPW 12**	**MPW 22**
							Operation condenser C_B (µF) approx. 400V DB						Operation condenser C_B (µF)	
							8	16					12	16
					Pressure p_{max} (reference value) p_{cold} (bar) / p_{warm} (bar) [3]						Pressure p_{max} (reference value) p_{cold} (bar) / p_{warm} (bar) [3]			
H 0,18	4	2	0.125	0.18		700/700		700/700				700/700		700/700
H 0,27		3	0.19	0.27	700/700	700/700	530/450	700/700		0.53	700/700	700/700	450/380	700/670
H 0,46		5	0.31	0.46		700/700		700/610		0.88		700/700		480/400
H 0,28	5	2	0.197	0.28		700/700		700/700				700/700		700/650
H 0,42		3	0.29	0.42	540/460	700/700	340/290	700/650		0.82	650/550	700/700	290/245	510/430
H 0,7		5	0.49	0.7		700/660		460/390		1.37		650/550		300/260
H 0,43	6	2	0.28	0.39		700/700		700/680				700/700		530/450
H 0,64		3	0.42	0.64	380/320	700/700	240/200	530/450		1.18	450/380	700/640	200/170	350/300
H 1,08		5	0.71	1.0		540/460		320/270		1.94		450/380		210/180
H 0,56	7	2	0.38	0.53		570/570		570/500				570/570		390/330
H 0,81		3	0.58	0.82	280/230	570/560	170/150	390/330		1.61	330/280	550/470	150/120	260/220
H 1,39		5	0.96	1.37		400/300		230/200		2.69		330/280		150/130
H 0,73	8	2	0.50	0.68		430/430		430/380				430/430		300/250
H 1,1		3	0.75	1.07	210/180	430/430	130/110	300/250		2.1	250/210	420/360	110/90	200/170
H 1,77		5	1.26	1.73		300/250		180/150		3.51		250/220		120/100
H 0,92	9	2	0.64	0.87		340/340		340/300				340/340		230/200
H 1,35		3	0.95	1.32	170/140	340/340	100/90	230/200		2.71	200/170	330/280	90/70	150/130
H 2,27		5	1.59	2.21		240/200		140/120		4.5		200/170		90/80

[1]) Indications for versions with two pistons:
Significant pulsation will occur due to the low number of pistons.
Their principal utilization is with gear pumps as dual stage pump (for possible combinations, see section 2.3.1) where a high pressure stage is needed only briefly to achieve a certain pressure level (e.g. at press controls). For complete two stage units (pump, tank, two stage valve, accessories and valve controls), see D 7200 H.

[2]) The motors of the version for 1-phase mains have main and help winding (condenser motors). **The condenser is not scope of delivery and has to be customer furnished.**
Attention: The versions for 1-phase (AC) may only start against a very low pressure. Therefore the control must enable a pressureless start e.g. by means of an idle circulation solenoid valve, which is held open during start for a period of approx. 0.5 to 1s (e.g. by means of a delay relays).

[3]) Upper value p_{cold} = Permissible pressure for cold motor and short time operation S 2

Lower value p_{warm} = Permissible pressure for operation warm motor (max. fluid temperature 80°C) on/off service S 3 and no-load operation S 6

2.2 Single circuit pump (gear pump) Versions for 3-phase and 1-phase mains

Order example: **MP 24 A - Z 3,5** 3 ~ 230/400V 50Hz

Basic type and size — Pump coding — Specification of motor voltage

Note:
Suction parts are available to the completion of the pump acc. to section 6!

Version for 3-phase mains

Size	Pump coding	V_g Geom. displacement (cm³/rev)	Nom. speed 1450 rpm: Delivery flow Q_{max} (lpm)	Basic type and size: MP 14 A — Pressure p_{max} (reference value) p_{cold} (bar) / p_{warm} (bar) 1) 2)	Basic type and size: MP 24 A — Pressure p_{max} (reference value) p_{cold} (bar) / p_{warm} (bar) 1) 2)	Nom. speed 2850 rpm: Delivery flow Q_{max} (lpm)	Basic type and size: MP 12 A — Pressure p_{max} (reference value) p_{cold} (bar) / p_{warm} (bar) 1) 2)	Basic type and size: MP 22 A — Pressure p_{max} (reference value) p_{cold} (bar) / p_{warm} (bar) 1) 2)
0	**Z 0,5**	0.36	0.5	150/150	150/150	1.0	150/150	150/150
	Z 1,0	0.72	1.0	150/150	150/150	2.0	150/150	150/150
	Z 1,8	1.3	1.85	100/85	150/150	3.7	120/100	150/150
1	**Z 2,0**	1.4	2.0	90/75	180/180	4	110/90	180/155
	Z 2,7	1.9	2.7	70/55	160/140	5.4	80/70	130/110
	Z 3,5	2.41	3.5	50/45	130/110	6.9	65/55	100/90
	Z 4,5	3.1	4.5	40/35	100/85	9	50/40	80/70
	Z 5,2	3.59	5.2	35/30	85/70	10.2	40/35	70/60
	Z 6,9	4.76	6.9	25/20	65/55	13.5	30/25	50/45
	Z 8,8	6.1	8.8	20/15	50/45	17.5	20/15	40/35
	Z 9,8	7.0	9.8	15/10	40/35	19.2	20/15	35/30
	Z 11,3	7.9	11.1	10/10	35/30	21.8	15/10	30/25
2	**Z 9,0**	6.0	9		50/40	17.1		40/35
	Z 12,3	8.5	12.3		35/30	24.2		30/25
	Z 16	11.0	16		25/20	31.3		25/20

Version for 1-phase mains For necessary operation condensers, see tables in sect. 2.1

Size	Pump coding	V_g Geom. displacement (cm³/rev)	Nom. speed 1450 rpm: Delivery flow Q_{max} (lpm)	Basic type and size: MPW 14 — Pressure p_{max} (reference value) p_{cold} (bar) / p_{warm} (bar) 1) 2)	Basic type and size: MPW 24 — Pressure p_{max} (reference value) p_{cold} (bar) / p_{warm} (bar) 1) 2)	Nom. speed 2850 rpm: Delivery flow Q_{max} (lpm)	Basic type and size: MPW 12 — Pressure p_{max} (reference value) p_{cold} (bar) / p_{warm} (bar) 1) 2)	Basic type and size: MPW 22 — Pressure p_{max} (reference value) p_{cold} (bar) / p_{warm} (bar) 1) 2)
0	**Z 0,5**	0.36	0.5	150/150	150/150	1.0	100/85	150/150
	Z 1,0	0.72	1.0	110/95	150/150	2.0	95/80	150/140
	Z 1,8	1.3	1.85	60/50	140/120	3.7	50/45	90/75
1	**Z 2,0**	1.4	2.0	55/50	130/110	4	50/45	85/70
	Z 2,7	1.9	2.7	40/35	95/80	5.4	35/30	60/50
	Z 3,5	2.41	3.5	35/30	75/65	6.9	30/25	50/40
	Z 4,5	3.1	4.5	25/20	60/50	9	20/20	40/30
	Z 5,2	3.59	5.2	20/20	50/40	10.2	20/15	30/25
	Z 6,9	4.76	6.9	15/15	35/30	13.5	15/10	25/20
	Z 8,8	6.1	8.8	15/10	30/25	17.5	10/10	20/15
	Z 9,8	7.0	9.8	10/8	25/20	19.0		15/10
	Z 11,3	7.9	11.1		20/15	21.0		15/10
2	**Z 9,0**	6.0	9		30/25	17.1		20/15
	Z 12,3	8.5	12.3		20/15	24.2		15/10
	Z 16	11.0	16		15/10	31.3		

1) Upper value p_{cold}
Permissible pressure for cold motor and short time operation S 2

Lower value p_{warm}
Permissible pressure for operation warm motor (max. fluid temperature 80°C) on/off service S 3 and no-load operation S 6

2) The middled pressure of subsequent load cycles
(e.g. at accumulator charging operation) should not exceed 50 ... 60% of p_{cold} for applications above 160 bar to ensure an economic service life of the bearings.

2.3 Dual circuit pumps (double pumps)

The main data for all indiv. pumps are listed in the tables of sections 2.1 and 2.2. The pressure figures supplied there must be reduced depending on load, see notes in section 5.3.

2.3.1 Combination radial piston pump - gear pump

Order example: **MP 24 A - H 0,81 - Z 9** Motor voltage 3 ~ 230/400V 50Hz

Note: In principle, the coding for the H... -pump section is named first within the basic type coding of MP...!

Basic type and size	Radial piston pump (high pressure pump) Piston number 1	2	3	5	7	Gear pump Z 0,5 Z 1,0 Z 1,8	Z 2,0; Z 5,2; Z 9,8 Z 2,7; Z 6,9; Z 11,3 Z 3,5; Z 8,8	Z 9 Z 12,3 Z 16
MP 14 A MP 12 A MPW 14 MPW 12			H 0,27 H 0,42 H 0,64 H 0,81 H 1,1 H 1,35				•	
MP 24 A MP 22 A MPW 24 MPW 22		H 0,18 H 0,28 H 0,43 H 0,56 H 0,73 H 0,92	H 0,27 H 0,42 H 0,64 H 0,81 H 1,1 H 1,35	H 0,46 H 0,7 H 1,08 H 1,39 H 1,77 H 2,27		•	•	•

Attention: Observe the load limits of the individual pumps as well as the complete system, see sect. 2.1, 2.2 and 5.3

3. Further data

Valid for all pump versions

3.1 General and hydraulic

Nomination	Constant delivery pump
Pipe connection	ISO 228/1 (BSPP), suited for pipe fittings with tapped journal shape B DIN 3862 Bl.2. For port sizes, see dimensional drawings in section 4 ++
Direction of rotation	MP...-H... any MP...-Z... MP...-H..-Z.. ┐ anti-clockwise **Attention:** Observe “Direction of rotation“ in section 5.2!
Fastening	See dimensional drawings in section 4 ++
Installed position	Any, but the H pump section must be completely fluid immersed always. For details, see section 5.1.
Pressure fluid	Hydraulic oil conforming DIN 51524 part 1 to 3: ISO VG 10 to 68 conform. DIN 51519. Viscosity range: Viscosity during start min. approx. 4; max. approx. 1500 mm^2/s opt. service: approx. 10 ... 500 mm^2/s Also suitable are biologically degradable pressure fluids type HEES (Synth. Ester) at service temperatures up to approx. +70°C. Electrically hazardous: Any fluid types containing water must not be used (short-cut). Opt. operation viscosity: MP...-H... approx. 10 ... 500 mm^2/s MP...-Z... approx. 16 ... 500 mm^2/s Start viscosity: MP...-H... min. approx. 4 mm^2/s max. approx. 500 ... 800 mm^2/s to MP 1. A and MP 2. A MP...-Z... min. approx. 12 mm^2/s max. approx. 800 ... 1000 mm^2/s
Temperature	Ambient: approx. -40 ... +60°C. This is the main parameter for the expectant operation temperature, see also sect. 5.5! Fluid: -25 ... +80°C, note the viscosity range! **Attention:** The expectant operation temperature may be estimated via curves in section 5.5!

3.2 Mass (weight) approx. in kg

Motor

	MP 14A	MP 24A
Type	MPW 14	MPW 24
Mass (kg)	3.8	6.1

Pump section

Radial piston pump fitting								
	H 0,18; 0,28 H 0,43; 0,56 H 0,73; 0,92	H 0,27; 0,42 H 0,64; 0,81 H 1,1; 1,35	H 0,46; 0,7 H 1,08; 1,39 H 1,77; 2,27	H 0,3; 0,41; 0,5 H 0,8; 1,2; 1,45 H 1,7; 1,9; 2,2	H 0,6; 0,83; 1,0 H 1,6; 2,4; 2,8 H 3,3; 3,8; 4,4	H 0,9; 1,5 H 2,5; 3,6 H 4,3; 5,1 H 5,6; 6,5	H 1,4; 2,6 H 4,2; 6,0 H 7,0; 8,3 H 9,5; 10,9	H 2,1; 3,7 H 5,8; 8,4 H 9,8; 11,8 H 13,3;15,3
MP 1 ...		1.5						
MP 2 ...	2.6	2.8	3.0					

Gear pump fitting	Z 0,5 to Z 1,8	Z 2,0 to Z 11,3	Z 9 to Z 16
MP 1 ...	0.7	1.2	
MP 2 ...	0.9	1.6	

3.3 Elektric data

Coding		Version with 3-phase motor MP 14 A	MP 12 A	MP 24 A	MP 22 A
Nominal power	P_N (kW)	0.25	0.37	0.55	0.75
Nominal speed	n_N (min^{-1})	1320	2810	1390	2830
Nom. voltage 1)		3 ~ 230/400V △Y 50 Hz (3 ~ 265/460V △Y 60 Hz) for MP 1. A to MP 5. A 3 ~ Y 500V 50 Hz 2)			
Permissible voltage ranges 3)		Mains 50 Hz: ±10% U_N (conforming IEC 38) Mains 60 Hz: ±5% U_N			
Nom. current 4)	I_N (A) 400V	0.89	1.0	1.6	2.0
	230V	1.55	1.73	2.8	3.5
	500V 5)	0.65	0.80	1.22	1.48
Start current ratio	I_A/I_N	2.8	5.7	4.0	5.0
Power factor	cos. φ	0.70	0.80	0.78	0.82

Coding		Version with AC-motor 1 ~ 230V 50 Hz 1) MPW 14	MPW 24
Nominal power	P_N (kW)	0.18	0.37
Nominal speed	n_N (min^{-1})	1390	1380
Nom. current 4)	I_N (A)	1.85	3.0
Operation condenser	C_B (µF)	8	16
Power factor	cos. φ	0.86	0.95
Start current ratio	I_A/I_N	2.6	2.5

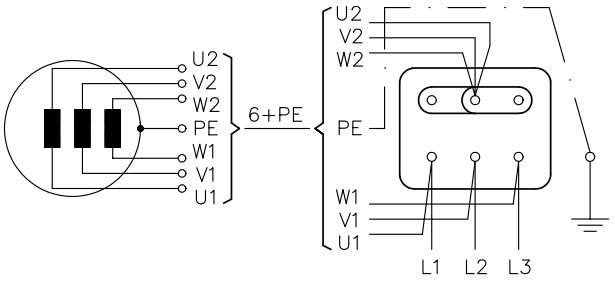
Connection cable 2 m 1.5 mm²	7-leeds (optional 7 m, specify in uncoded text)
Isolation class	F (winding), IEC (VDE 0301 T1)
Comparison protection class	Pump complete with motor IP 00; IP 54 (Hydraulic power pack D 7200 H) DIN VDE 0470 / EN 60529 / IEC 529

Attention: Do not connect radial piston pumps with 2-pole motors (MP 12 A - H.., MP 22 A - H..) to mains 60 Hz. The resulting high speed (approx. 3400 rpm) may cause increased running noise in general and uneven delivery flow at small piston diameters.

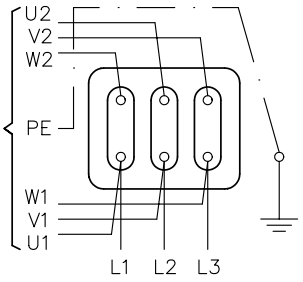
Circuitries and cable connection

3-phase motor

3 ~ 400V Y 50 Hz

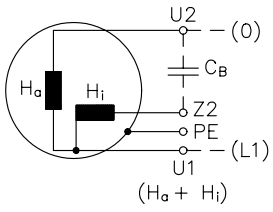


3 ~ 230V △ 50 Hz
3 ~ 500V 50 Hz 5)



AC-motor

1 ~ 230V 50 Hz



1) Motors for other mains voltages and/or mains frequency 60 Hz on enquiry

2) Max. permanent load 500V +15%, acc. to the supplier of the wire leads.

3) The motors may be connected to mains voltage below these limits but reduced voltage will cause a performance drop (& reduced $p_{max.}$).

4) For actual current consumption, see section 5.4

5) 4-wire cable (W1, V1, U1, PE) is used for 500 V internal circuitry: Y

$$p_{max} \approx \frac{U_{tats}}{1.1\ U_N} \cdot p_k\ (p_w)$$

Example: Motor nom. voltage 230/400V 50 Hz (265/460V 60 Hz)

Actual mains voltage 400V 60 Hz

Selected pump MP 24 A - H 0,81 p_{max} = 570 bar

$$p_{max} \approx \frac{400V}{1.1 \cdot 460V} \cdot 570\ bar$$

$$p_{max} \approx 450\ bar$$

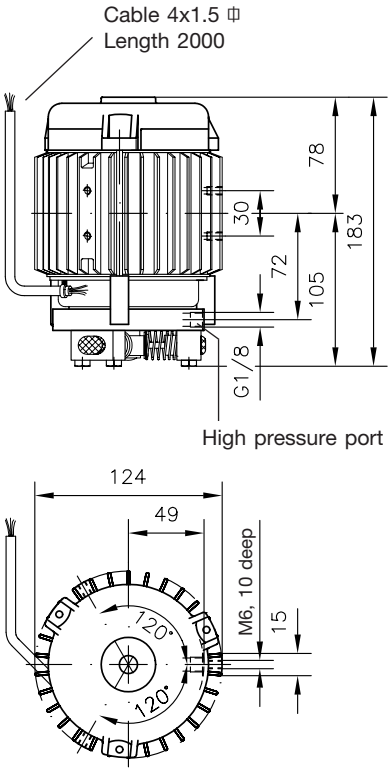
4. Unit dimensions

All dimensions in mm, subject to change without notice!

4.1 Pumps

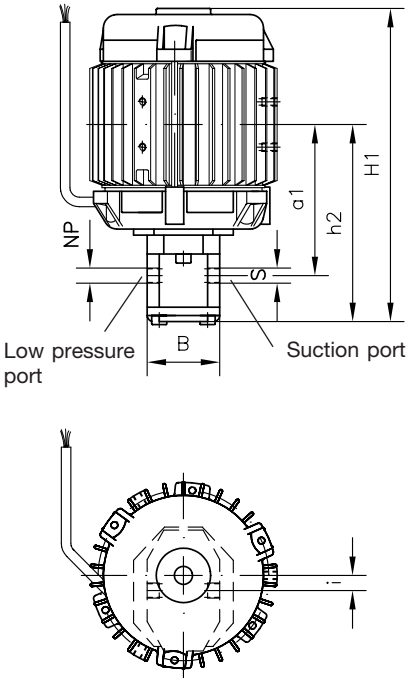
Single circuit pump (radial piston pump)

Type MP(W) 1..-H..



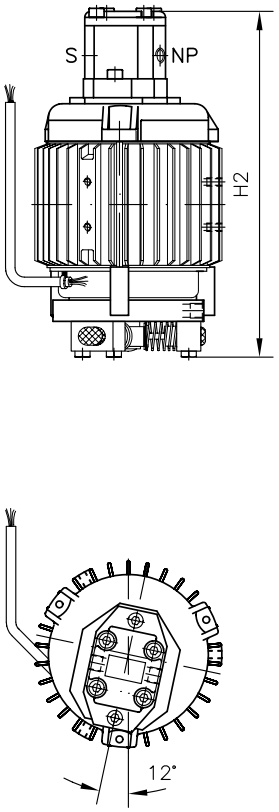
Single circuit pump (gear pump)

Type MP(W) 1..-Z..



Dual circuit pump

Type MP(W) 1..-H..-Z..

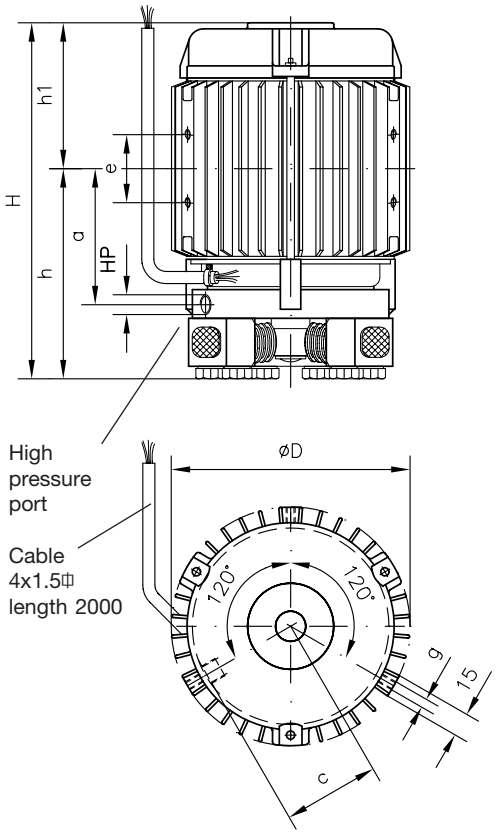


Type		NP and S	H_1	H_2	B	a_1	h_2	i
MP(W) 1..-Z.. MP(W) 1..-H..-Z..	Z 0,5		215	234	48	101	137	7.7
	Z 1,0	M 10x1	215	234	48	101	137	7.7
	Z 1,8	M 10x1	218	236	48	103	140	7.7
	Z 2,0 to Z 4,5	M 10x1 G 3/8	221	242	68	109	143	11
	Z 5,2		228	249	68	112	150	11
	Z 6,9	G 3/8	228	249	68	112	150	11
	Z 8,8 to Z11,3	G 3/8 G 3/8	237	258	68	121	159	11

For missing dimensions, see MP(W) 1..-H..

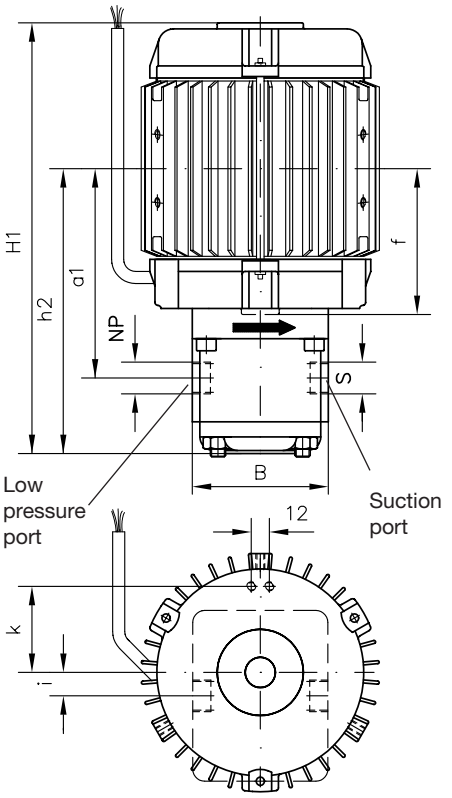
Single circuit pump (radial piston pump)

Type MP(W) 2..-H..



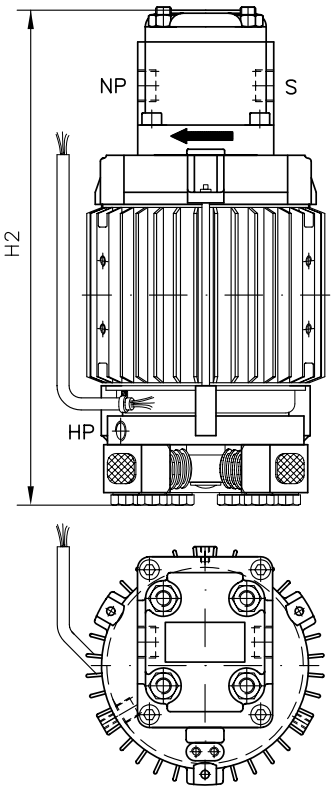
Single circuit pump (gear pump)

Type MP(W) 2..-Z..



Dual circuit pump

Type MP(W) 2..-H..-Z..



Type	HP	D	H	a	c	e	g	h	h_1
MP(W) 2..-H..	G 1/8	140	195	75	56.5	35	M6, 11 deep	108	87

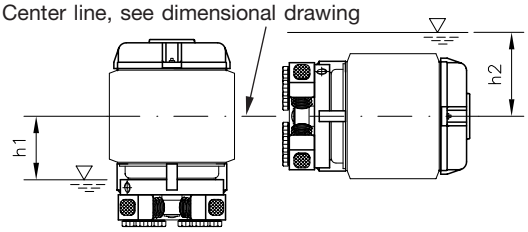
Type		NP	S	H_1	H_2	B	a_1	f	h_2	i	k
MP(W) 2..-Z..	Z 0,5	M10x1	M10x1	232	253	48	111	83	145	7.7	50
MP(W) 2..-H..-Z..	Z 1,0	M10x1	M10x1	232	253	48	111	83	145	7.7	50
	Z 1,8	M10x1	M10x1	234	255	48	113	83	147	7.7	50
	Z 2,0 to 4,5	G 3/8	G 3/8	240	261	68	116	83	153	11	50
	Z 5,2 and 6,9	G 3/8	G 3/8	247	268	68	119	83	160	11	50
	Z 8,8 to 11,3	G 3/8	G 3/8	256	277	68	128	83	169	11	50
	Z 9 and 12,3	G 1/2	G 1/2	266	281	90	129	83	179	15.5	50
	Z 16	G 1/2	G 3/4	266	281	90	129	83	179	15.5	50

5. Notes for general lay-out and initial operation

5.1 Installation in customer furnished tanks

The dimensions of a customer furnished tank should be selected in such a way that it is ensured that the motor is always oil immersed, even when the max. required fluid volume is removed. This way the performance rating of the power pack can be completely utilized. The perm. performance is reduced if the motor contour is partially or completely above the fluid level. When more than 1/4 of the motor is above the fluid level a no-load operation is no longer permissible but on/off service can be still provided. The thermal balance of the motor has to be checked (via resistance measurement acc. to VDE 0530) if the fluid level drops even further. This temperature (resistance) check has to be undertaken several times until no more temperature rise can be detected; always after a load sequence when the pump has performed some operation cycles. The perm. fluid temperature is approx. 80°C, the perm. winding temperature is approx. 130°C (isolation class B).
See also D 7200 sect. 5.5.

Center line, see dimensional drawing

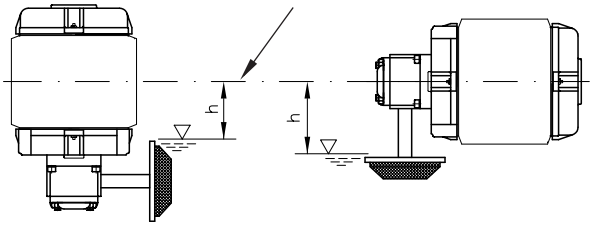


Type MP...-H...

The installed position of the pump is arbitrary, as long as the pump is immersed below the fluid level by h_1, h_2.

Type	h_1	h_2
MP 1..	65	80
MP 2..	70	90

Center line, see dimensional drawing



Type MP...-Z...

The installed position of the pump is arbitrary, as long as all suction parts are immersed below the fluid level by h.
h = dependent on size, gear pump and chosen suction part (see dimensional drawings in sect. 4 and 6)

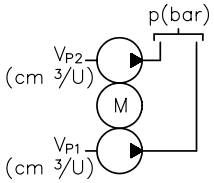
5.2 Direction of rotation

It is not necessary to observe the direction of rotation with type MP...-H..., whereas a certain direction of rotation is absolutely required for types MP...-H...-Z and MP...-Z. The rotation direction can't be detected in installed state (hydraulic power packs), but via checking the delivery flow. Procedure: Direct the flow from port P via a translucent hose back into the tank; Switch on/off the pump several times. When a flow is visible the direction is o.k. otherwise it has to be reversed by interchanging the connection of two of the three main wires of the motor. The pumps type MP...-Z...-Z... rotate anti-clockwise (facing the drive shaft) in delivery state. See also dimensional drawings in sect. 4++ where arrows indicate the rotation direction.

5.3 Motor load with dual circuit pumps

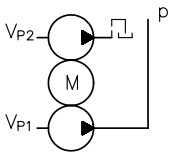
It should be recalculated, that the product $(pV)_{calc.}$ of intended pressure p_1, p_2 and all three possible load conditions is lower than $(pV)_{calc.\ max}$. The pressure limits p_{cold} and p_{warm} acc. to sect. 2.1 and 2.2 must be observed.

Load condition 1



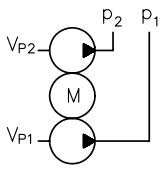
Both pumps work against one common pressure,
$p_1 = p_2 = p$
$(pV)_{calc.} = p(V_{P1} + V_{P2})$

Load condition 2



Only one pump works (V_{P1} against pressure, V_{P2} idles,
$p_1 = p$
$(pV)_{calc.} = pV_{P1} + 3\ V_{P2}$ [1])

Load condition 3



Both pumps work against different pressure simultaneously
$(pV)_{calc.} = p_1\ V_{P1} + p_2\ V_{P2}$

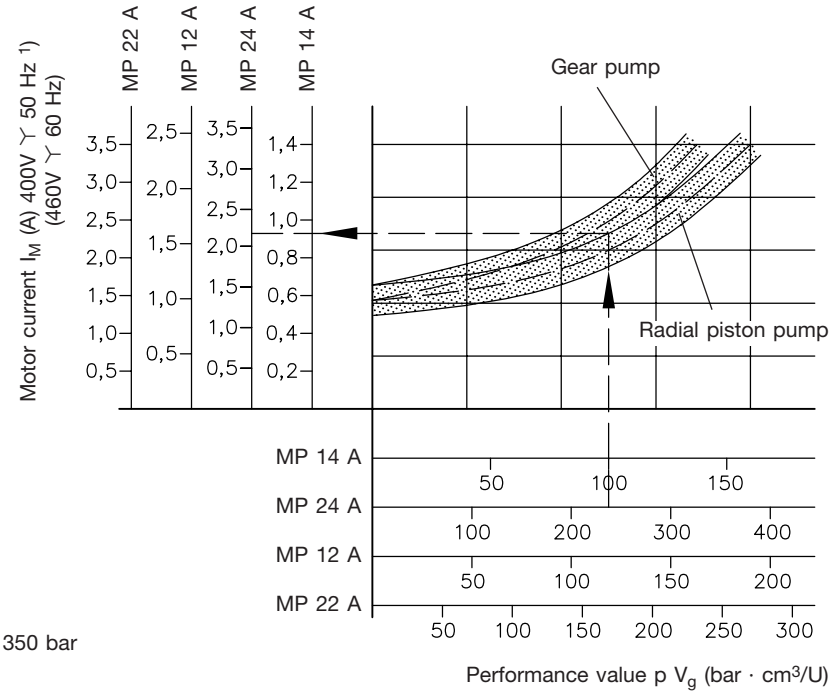
Type	$(pV)_{calc.\ max}$
MP 14 A (MPW 14)	145 (90)
MP 12 A (MPW 12)	170 (75)
MP 24 A (MPW 24)	340 (200)
MP 22 A (MPW 22)	290 (135)

[1]) A back pressure of approx. 3 bar was considered for an idling pump.

5.4 Current consumption

The following characteristics are reference values. You serve the inquiry of current consumption and expected heat built-up (see sect. 5.5) as well as for setting the protective motor switch (overload protection).

Version for 3-phase mains



Example:

Chosen pump MP 24 A - H 1,1

Operation pressure of the system p_{oper} = 350 bar

V_g = 0.75 cm³/rev

$p \cdot V_g$ = 262 bar cm³

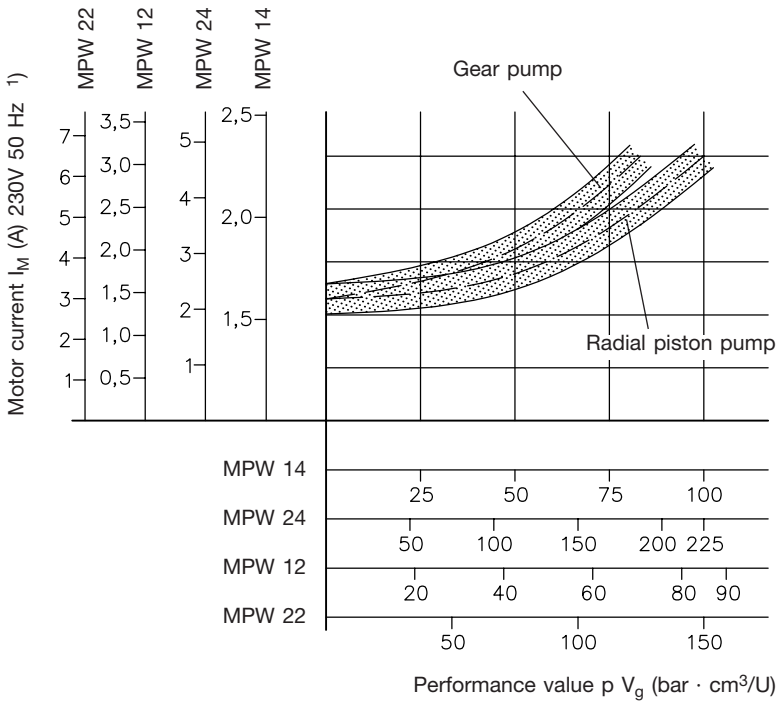
Resulting in a motor current of approx. 2.1 A

1) The reference values for the motor current have to be determined by conversion at other nom. voltages, e.g.:

Main 230V 50 Hz : $I_{230V} \approx I_{400V} \cdot \frac{400V}{230V}$

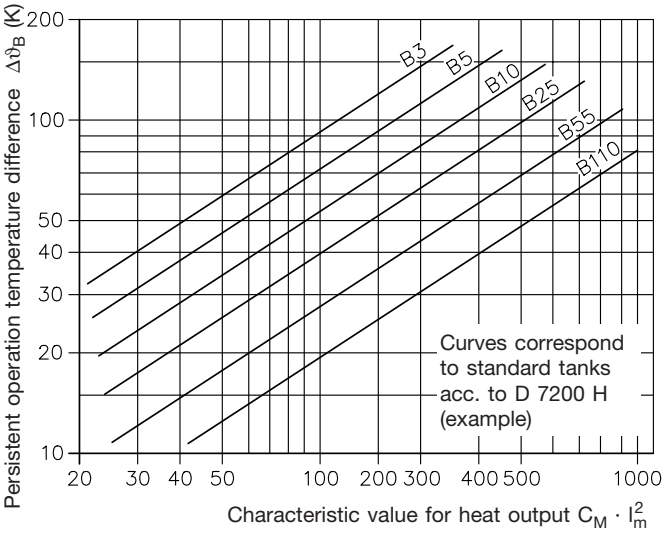
Main 500V 50 Hz : $I_{500V} \approx I_{400V} \cdot \frac{400V}{500V}$

Version for 1-phase mains



5.5 Operation temperature

The built-up of heat of the hydraulic power pack depends on different factors: Pump size, tank size, pressure (current consumption), operating mode (S2, S3, S6 acc. to VDE 0530), etc. A formula that can be applied to all sizes, combinations and application cases can be achieved only by extreme simplification. The result should be regarded as a guideline only. These pumps are frequently operated only in a second range with subsequent stand-still periods for several minutes or even longer. A recalculation is unnecessary for all applications with such load cycles. Its use is limited to application at increased ambient temperatures, strong exploitation in the pressure limit range, prolonged load within an operation cycle etc. where knowledge about the persistent service temperature to be expected is essential. Main target is to find out whether the persistent service temperature will be below approx. 80°C. This recalculation only applies to hydraulic power packs fulfilling the following parameters: Tank completely filled up, fluid level won't drop below motor outline during operation, all fluid returns at the end of each cycle. The curve below illustrates the persistent operation temperature $\Delta\vartheta_B$ acc. to tests with stand alone hydraulic power packs featuring HAWE tanks (see D 7200 H), it may be applied also to similar customer furnished tanks.



Tank	B3	B5	B10	B25	B55	B110
Filling volume V_F (l)	4.3	7.5 to 8.2	15.5 to 17.5	33 to 35	72 to 74	120 to 122

$\Delta\vartheta_B + \vartheta_U \leqq 80°C$ Together, temperature gain plus ambient temperature (e.g. 20°C) should be below 80°C (sect. 3.1 Fluid temperature)

Persistent operation temperature difference

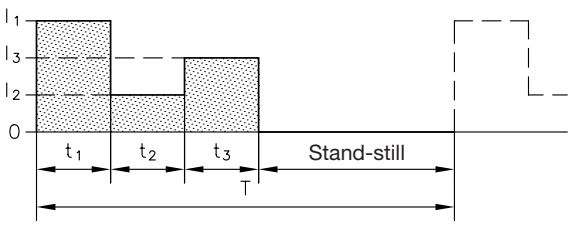
C_M (Ω) Motor constants (characteristc resistancevalues, calculated values only)

Type		MP 14	MP 24	MP 12	MP 22
U_N	400V	111	51	63	30
	230V	37	17	21	10
	500V	190	92	109	52

I_m (A) Quadratic averaged current figure (during one operation cycle with duration T). The currents I_1, I_2, I_3 ... prevailing during periods t_1, t_2, t_3 ... are to be determined on the basis of the given pressure p_1, p_2, p_3 ... and the working volume VP (see sect. 2.1), i.e. via the product p_1 V_{gP1}, p_2 V_{gP2}, p_3 V_{gP3} ... from the current curves (see sect. 5.4). In the case of dual stage pumps, the periods t_1, t_2 ... are in most cases to be set for the subsequent load sequences (sect. 5.3) within the operation cycle. The corresponding currents I_1, I_2 ... are to be read off in sect. 5.4 via the value $(pV_g)_{calc}$. To be calculated in each case.

Operating mode S3 (On/off service)

$$I_m = \sqrt{\frac{1}{T}\left(I_1^2 t_1 + I_2^2 t_2 + I_3^2 t_3 + ...\right)}$$



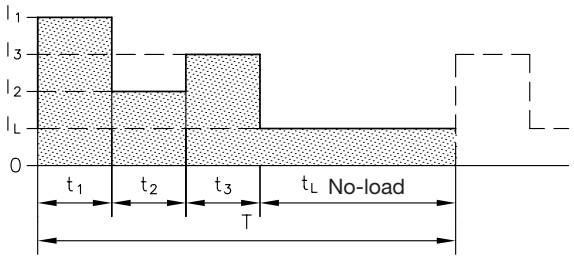
Operating mode S2

This can be regarded as a borderline case of S3, but the temperature recalculation must, however, made on base of other criteria. What is of interest is the period of time, where the pump may be switched on without exceeding the limit temperature, and how long the subsequent standstill period must be in order to allow the pump to cool down to its initial temperature. This recalculation is not necessary for cases where the pump is only operated for a few minutes with subsequent standstill periods for more than 1/2 hour.

Operating mode S6 (No-load operation)

$$I_m = \sqrt{\frac{1}{T}\left(I_1^2 t_1 + I_2^2 t_2 + I_3^2 t_3 + I_L^2 t_L\right)}$$

Not applicable for most small size tanks. The idle current I_L can be taken from sect. 5.4 für $pV_g = 0$.

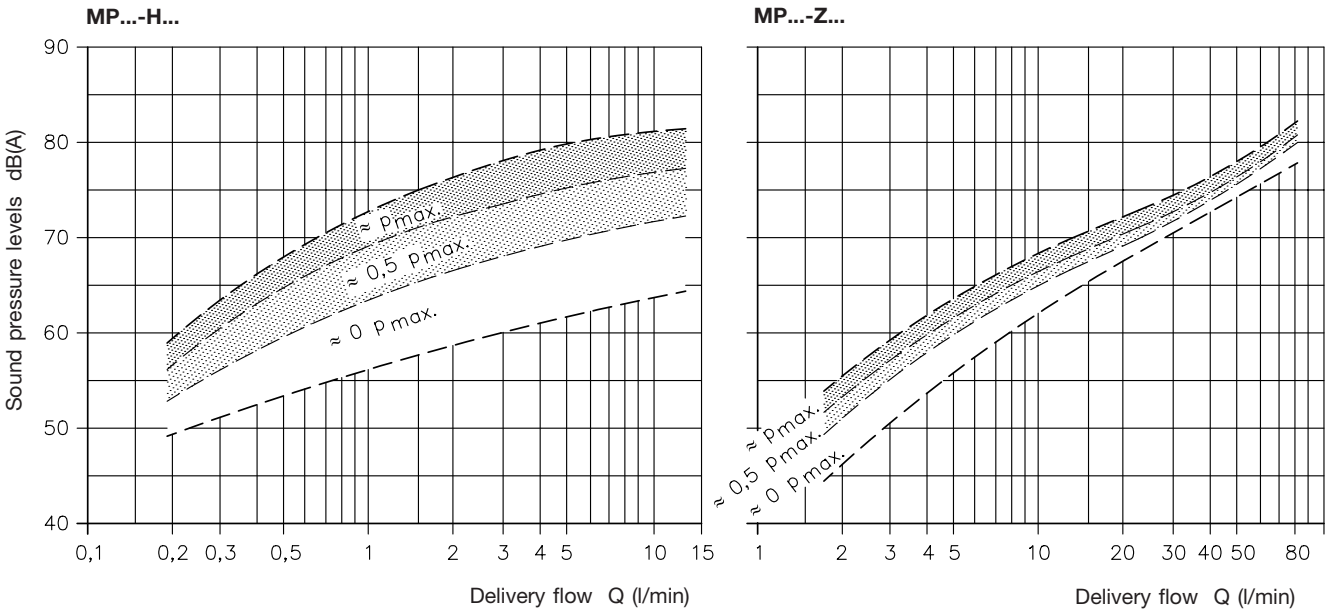


5.6 Motor safeguarding against over heating (protective motor switch)

The protective motor switch has to be adjusted in such a manner, that too early triggering is avoided during undisturbed operation and operation cycles permanently succeeding one another. Whereas it should safeguard the motor against over heating in case of stand-still due to a pressure limiting valve being adjusted to high, malfunction of a pressure switch which should trigger a stop signal etc. Guideline for proper setting of the protective switch: I_E should be 0.7 I_M in general, 0.65 I_M for operation in the range of p_{max} and 0.8 I_M for low loads. The motor current I_M can be read for various pressure settings of the pressure limiting valve in sect. 5.4.

Note: For temperature supervision of hydraulic power packs, see D 7200 H!

5.7 Running noise



Note:

The sound pressure level ranges shall serve to estimate the running noise to be expected. They approximately delimit the spreads recognizable during measuring. Pumps with smaller delivery flows tend as a rule to the lower, whereas larger ones tend to the upper limit. The noise level of dual circuit pumps is rather similar to the one of the bigger of the two pumps.
The hydraulic power pack should be mounted on „silent blocks“ to prevent or minimize the conduction of body sound onto other sound radiating machinery parts. Pipes to the consumers should be connected via short hoses to the hydraulic power unit. Rigid mounting on a surface capable of resonance (e.g. welded or thin-wall machine stands) may significantly amplify or conduct the operation noise level. We recommend to mount the hydraulic power pack via silentblocs. Further details may be found in the technical information of the respective manufacturer.

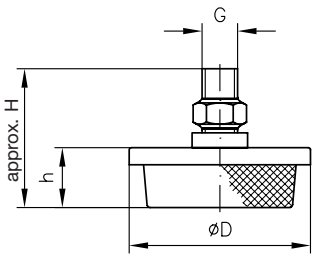
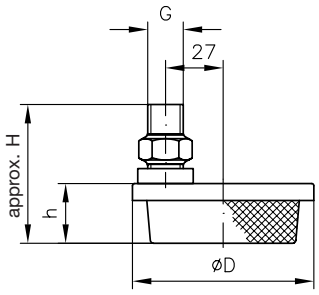
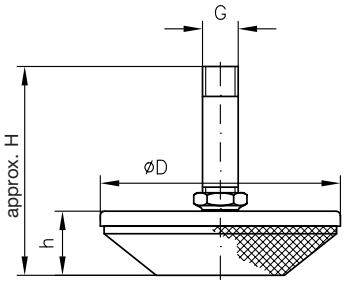
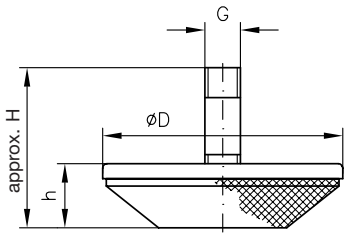
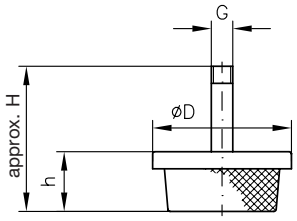
Measuring conditions:	Work room, interference level approx. 32 dB(A); measuring point 1 m above the floor; 1 m object clearance, pump standing on a sound deadening panel (height 50 mm).
Object:	Hydraulic power pack featuring a standard HAWE tank acc. to D 7200 H. (complete power pack)
Measuring device:	Precision sound pressure level measuring instrument DIN IEC 651 Kl. I
Fluid viscosity during tests:	Pumps type MP..-H = 50 mm^2/s Pumps type MP..-Z = 100 mm^2/s

5.8 Notes to ensure EMC (Electromagnetic compatibility)

Non permissible spikes are emitted (EN 60034-1 Abs. 19) when hydraulic power packs (inductive motor acc. to EN 60034-1 sect. 12.1.2.1) are connected to a system (e.g. power supply acc. to EN 60034-1 sect. 6).
Tests regarding the conformity with EN 60034-1 sect. 12.1.2.1 and/or VDE 0530-1 ( ) are not required.
Electro-magnetic fields may be generated during switching the motor On/Off. This effect can be minimzed by means of a filter e.g. type 23140, 3 · 400V AC 4kW 50-60Hz (Co. Murr-Elekronik, D-71570 Oppenweiler)

6. Suction parts for MP..-Z.. required for installation in customer furnished tanks

These suction parts enable lowering of the fluid level below the pump outline thereby exceeding the usable volume.
The sucking parts are delivered as unassembled component parts. The thread connections have to be sealed very carefully to avoid migration of air. Best apply common PTFE seal tape starting after the 2. or 3. pitches of the fittings' conical thread therby preventing sheard-off parts of the tape intruding the hydraulic circuit.
The heat built-up of the motor winding must be checked via resistance tests for pumps with little flow/higher pressure if the fluid drops below the motor outline during operation.

Coding	Main dimensions (mm)					Component part			
	Illustration	G	D	H	h	Suction screen (HAWE-No.)	Fitting	Straight fitting DIN 2982	Mass (weight) g
S 201		G 3/8 A	85	65	28	7200 015	G+F No. 245 1/2"-3/8" DIN 2950 N8 red		170
S 202		G 3/8 A	85	65	28	6020 500 a	G+F No. 245 1/2"-3/8" DIN 2950 N8 red		170
S 203		G 3/8 A	85	75	28	7200 015	G+F No. 241 1/2"-3/8" DIN 2950 N4	3/8"x40	170
S 204		G 3/8 A	113	109	30	6020 500		3/8"x80	260
S 205		G 3/8 A	113	89	30	6020 500		3/8"x60	240
S 206		G 1/2 A	113	95	30	6020 500		1/2"x80	260
S 207		G 1/2 A	113	75	30	6020 500		1/2"x60	230
S 210		M 10 x 1	65	68	28	7200 020	Complete part, can't be dismantled!		100