

Internal gear pump,
fixed displacement

RE 10227/2018-08 1/24
Replaces: 12.10

Type PGH

Frame size 4 and 5
Component series: 3X
Maximum operating pressure 350 bar
Maximum displacement volume 250 cm³



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Features

- Fixed displacement
- Low operating noise
- Little flow pulsation
- High efficiency also at low speed and viscosity due to sealing gap compensation
- Suitable for broad viscosity and speed ranges
- All frame sizes and sizes can be combined with each other in any form
- Can be combined with internal gear pumps, vane pumps and axial piston pumps
- Suitable for operation with HFC fluid (seal design "W")
- Use:
For fatigue-resistant drives with high power and high pressures with very large load cycle numbers, e.g. plastics processing machines, automated presses, foundry machines and other applications with accumulator charging operation.

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code: Single pumps

PG		H	-3X/							*		
Series											Further details in the plain text	
High pressure pump		= H									Type of connection	
Frame size											U2 = SAE 2-hole mounting flange	
BG4		= 4									E4 = ¹⁾ ISO 4-hole mounting flange according to ISO 3019-2 and VDMA 24560	
BG5		= 5									Seal material	
Component series: Component series 30 to 39 = 3X (30 to 39: Unchanged installation and connection dimensions)											V = FKM seals	
Size											W = ²⁾ Shaft seal ring made of NBR (remaining seals made of FKM)	
											Line connection ³⁾	
											07 = SAE flange standard pressure series	
											11 = SAE flange high-pressure series	
											Shaft design	
											E = Cylindrical	
											R = SAE involute gear	
											Direction of rotation (looking at the shaft end)	
											R = Clockwise	
											L = Counterclockwise (on request)	

¹⁾ Only in connection with cylindrical shaft (according

Not all variants are possible according to the type key!
Please select the desired pump using the selection tables (pages 6 to 11) or after consultation with Bosch Rexroth.

¹⁾ Only in connection with cylindrical shaft (according to VDMA), only with clockwise rotation

²⁾ In case of operation with HFC fluid

³⁾ For each size, one type of connection **07** or **11** has been determined:

07: PGH5-3X/200/250...

11: PGH4-3X/020/025/032/040/050...

PGH5-3X/063/080/100/125/160...

The suction ports have all been designed in standard pressure series (dimensions see page 12).

Standard types PGH4-3X	
Type	Material no.
PGH4-3X/020RE11VU2	R901147100
PGH4-3X/025RE11VU2	R901147101
PGH4-3X/032RE11VU2	R901147102
PGH4-3X/040RE11VU2	R901147103
PGH4-3X/050RE11VU2	R901147104

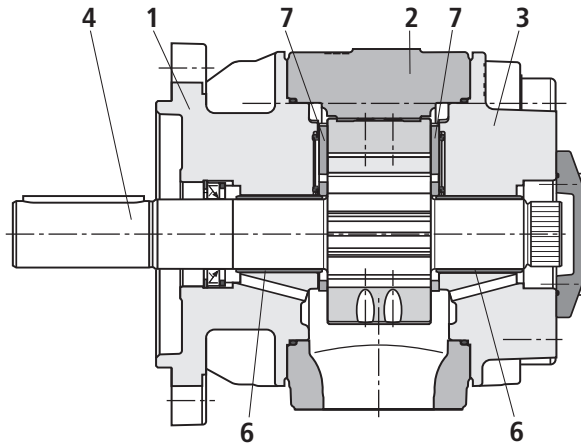
Standard types PGH5-3X	
Type	Material no.
PGH5-3X/063RE11VU2	R901147115
PGH5-3X/080RE11VU2	R901147116
PGH5-3X/100RE11VU2	R901147117
PGH5-3X/125RE11VU2	R901147118
PGH5-3X/160RE11VU2	R901147119
PGH5-3X/200RE07VU2	R901147120
PGH5-3X/250RE07VU2	R901147121

Function, section, symbol

Structure

Hydraulic pumps of type PGH.-3X are gap-compensated internal gear pumps with fixed displacement.

They mainly consist of: Mounting flange (1), housing (2),



Suction and displacement procedure

The hydro-dynamically mounted pinion shaft (4) drives the toothed internal gear (5) in the direction of rotation shown.

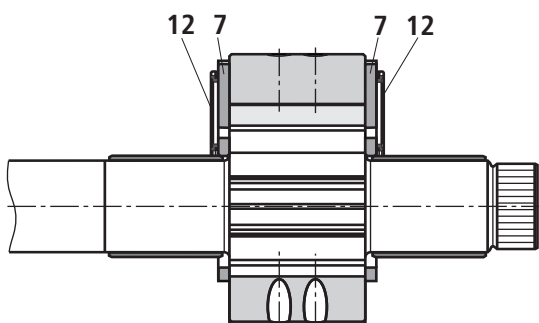
The tooth clearances opening in the suction area prime the fluid. The fluid is transported into the tooth clearances of pinion and internal gear, from the suction area (S) into the pressure area (P).

There, the fluid is displaced from the closing tooth clearances and delivered into the pressure port (P).

Suction and discharge area are separated by the radial compensation elements (9 to 11) and the tooth engagement between internal gear and pinion shaft.

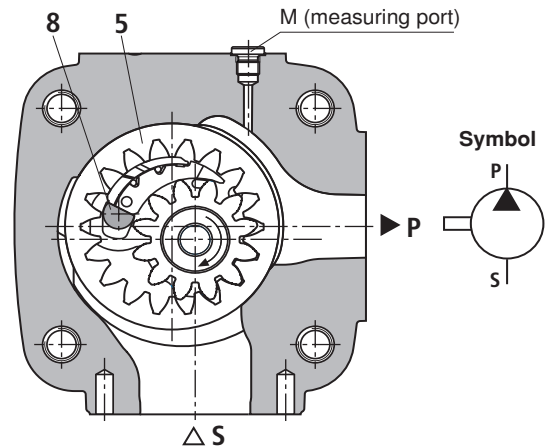
Axial compensation

The displacement chamber in the pressure area is axially sealed by axial washers (7).



The sides of the axial washers facing away from the displacement area are backed by a pressure field (12). These fields balance the axial washers vis-à-vis the displacement area, which results in a perfect sealing with low mechanical losses.

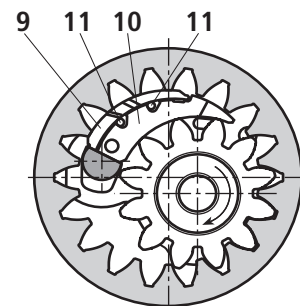
cover with through-drive (3), pinion shaft (4), internal gear (5), sliding bearings (6), axial washers (7) and stop pin (8) as well as the radial compensation consisting of segment (9), segment support (10) and the seal rolls (11).



Radial compensation

The radial compensation elements consist of segment (9), segment support (10) and seal rolls (11).

Segment (9) and segment support (10) are arranged in the pressure field so that the resulting compressive force is basically accepted by the stop pin.



A small compressive force component presses segment and segment support onto the tooth tips of pinion shaft and internal gear and in this way provides for the separation of the pressure area from the suction area with automatic clearance adjustment.

This is the prerequisite for constantly high volumetric efficiency during the entire operating time.

The clearance adjustment of segment and segment support is made possible by the seal rolls located inbetween.

Hydro-dynamic and hydrostatic mounting

The pinion shaft (4) is accepted by hydro-dynamically lubricated radial sliding bearings (6).

The internal gear (5) is mounted hydrostatically in the housing.

Gearing

The gearing with involute edges has a large meshing length for little flow and pressure pulsation and thus guarantees low-noise running.

Technical Data (For applications outside these parameters, please consult us!)

general

Design	Internal gear pump, gap-compensated
Type of connection	SAE 2-hole flange according to ISO 3019-1 or 4-hole flange according to VDMA 24560 and ISO 3019-2
Line connection	Flange port
Shaft load	Radial and axial forces (e.g. belt pulley) only after coordination
Direction of rotation (looking at the shaft end)	Clockwise or counterclockwise (on request) – not bidirectional!

hydraulic

Hydraulic fluid	HLP – mineral oil according to DIN 51524 part 2 HFC – water polymer solutions according to DIN EN ISO 12922 ^{1) 2)} ; Seal design W HEES – fluids according to DIN ISO 15380 ¹⁾ HFD-U – fluids according to VDMA 24317 ¹⁾ , DIN EN ISO 12922 ¹⁾ Please observe our specifications according to data sheet RE 90220 Other fluids on request!		
Hydraulic fluid	HLP fluid	°C	–10 to +80; for other temperatures please consult us!
temperature range	Special fluid	°C	–10 to +50; for other temperatures please consult us!
Ambient temperature range		°C	–20 to +60
Viscosity range		mm ² /s	10 to 300 (to n = 1800 min ^{–1}) 10 to 100 (to n = 3000 min ^{–1}) 2000 admissible start viscosity (400 to 1800 min ^{–1})
Max. admissible level of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)			Class 20/18/15 ³⁾

1) Attention!

To these media, the limitations for special fluids apply

2) Hydraulic fluid HFC: Input speed $n_{\max} = 2000 \text{ min}^{-1}$

3) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Efficient filtration prevents failures and simultaneously increases the service life of the components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

Technical Data (For applications outside these parameters, please consult us!)

Frame size		PGH4					
Size	Size	20	25	32	40	50	
Weight	m kg	14	14.5	15	16	17	
Speed range ¹⁾	n_{min} min ⁻¹	200	200	200	200	200	
	n_{max} min ⁻¹	3000	3000	3000	3000	3000	
Displacement	V cm ³	20.1	25.3	32.7	40.1	50.7	
Flow ²⁾	q_V l/min	28.9	36.3	46.9	57.6	72.8	
Moment of inertia (around drive axis)	J kgm ²	0.00037	0.00045	0.00055	0.00066	0.00081	
Power consumption	P_{ad} kW						
Min. drive power necessary (with $p \approx 1$ bar)		1.1	1.1	1.1	1.1	1.5	
Max. admissible drive power		35	44	56	61	66	
Operating pressure, absolute – Input	p bar	0.8 to 2 (shortly, upon start 0.6 bar)					
Nominal pressure	p_N bar						
– Output, continuous	HLP fluid			315		250	
	Special fluid ³⁾			220		175	
intermittent ⁴⁾	p_{max} bar						
	HLP fluid			350		250	
	Special fluid ³⁾			245		210	

Frame size		PGH5						
Size	Size	63	80	100	125	160	200	250
Weight	m kg	42	43.5	45.5	48	52	55.5	60.5
Speed range ¹⁾	n_{min} min ⁻¹	200	200	200	200	200	200	200
	n_{max} min ⁻¹	3000	3000	3000	3000	3000	3000	3000
Displacement	V cm ³	64.7	81.4	100.2	125.3	162.8	200.4	250.5
Flow ²⁾	q_V l/min	92.8	116.9	143.8	179.8	233.7	287.7	359.6
Moment of inertia (around drive axis)	J kgm ²	0.00237	0.00289	0.00329	0.00407	0.00506	0.00623	0.00760
Power consumption	P_{ad} kW							
Min. drive power necessary (with $p \approx 1$ bar)		1.8	2.2	3	4	5.5	7.5	7.5
Max. admissible drive power		96	103	129	161	134	140	134
Operating pressure, absolute – Input	p bar	0.8 to 2 (shortly, upon start 0.6 bar)						
Nominal pressure	p_N bar							
– Output, continuous	HLP fluid		315			210	170	135
	Special fluid ³⁾		220			145	115	90
intermittent ⁴⁾	p_{max} bar							
	HLP fluid		350			260	210	170
	Special fluid ³⁾		245			180	145	115

¹⁾ Hydraulic fluid HFC: Input speed $n_{max} = 2000$ min⁻¹

²⁾ Measured with $n = 1450$ min⁻¹, $p = 10$ bar and $\dot{V} = 30$ mm²/s

³⁾ **Attention!**

To these media, the limitations for special fluids apply

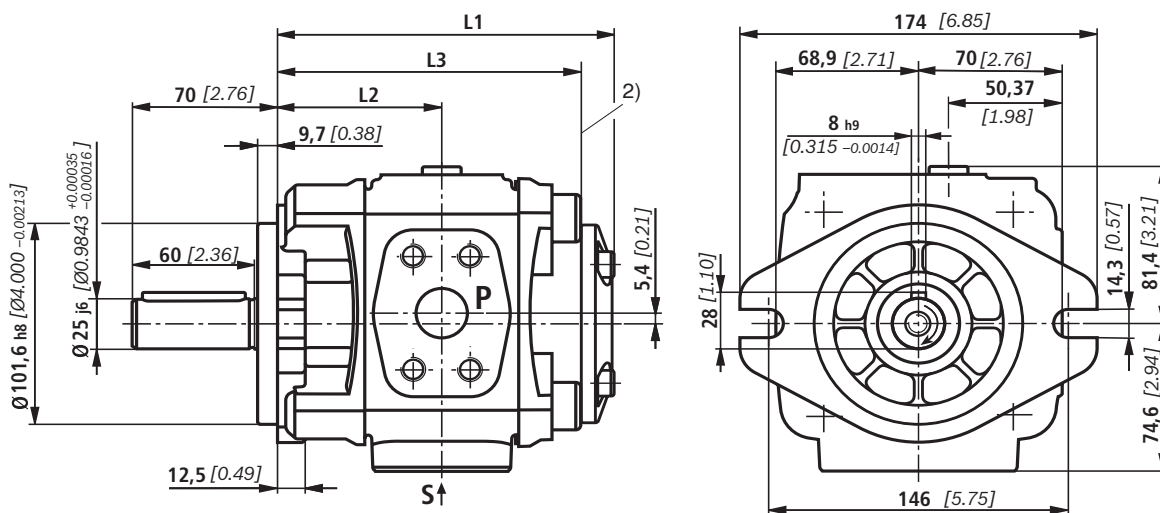
⁴⁾ Max 10 s, max. 50 % of the duty cycle

Unit dimensions of frame size 4 (dimensions in mm [inch])

PGH4-3X/...^RE...VU2
L

Drive shaft cylindrical,
SAE 2-hole mounting flange

Type	Size	Material no. "R" clockwise	"L" counter- clockwise	L1	L2	L3	S ¹⁾	P ¹⁾
PGH4-3X/020..E11VU2		R901147100	On request	145 [5.71]	70.5 [2.78]	129 [5.08]	1" S	3/4" H
PGH4-3X/025..E11VU2		R901147101	On request	150 [5.91]	73 [2.87]	134 [5.28]	1 1/4" S	3/4" H
PGH4-3X/032..E11VU2		R901147102	On request	157 [6.18]	76.5 [3.01]	141 [5.55]	1 1/2" S	1" H
PGH4-3X/040..E11VU2		R901147103	On request	164 [6.46]	80 [3.15]	148 [5.83]	1 1/2" S	1" H
PGH4-3X/050..E11VU2		R901147104	On request	174 [6.85]	85 [3.35]	158 [6.22]	2" S	1" H



¹⁾ S = Standard pressure series;

H = High-pressure series;
exact dimensions see table page 12

²⁾ For multiple pumps, the combination part starts from here

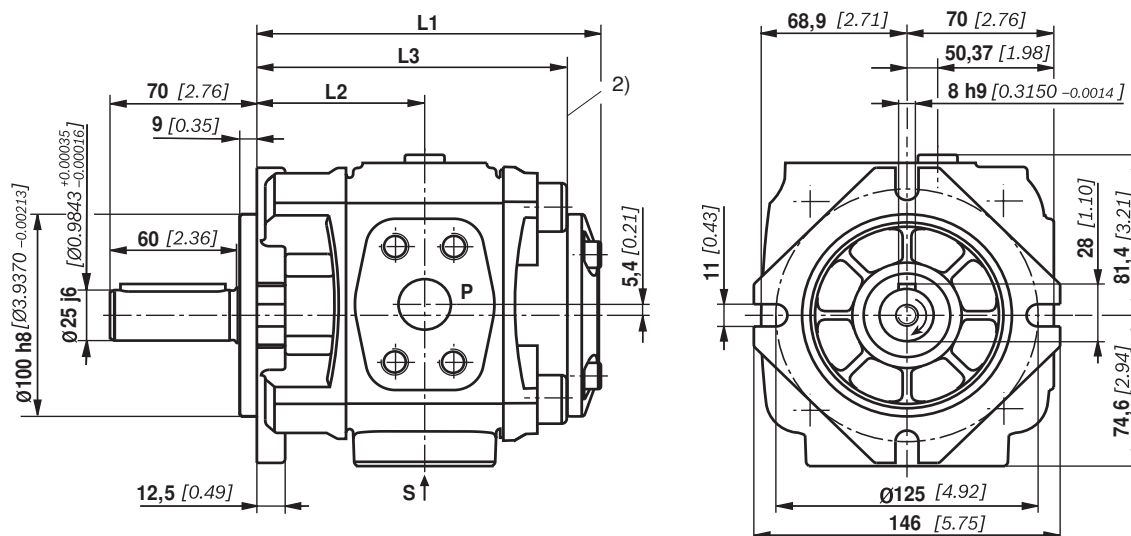
The figure shows a pump with clockwise rotation, in case of pumps with counterclockwise rotation, the pressure port is on the opposite side!

Unit dimensions of frame size 4 (dimensions in mm [inch])

PGH4-3X/... RE...VE4

Drive shaft cylindrical,
4-hole mounting flange according to ISO 3019-2
and VDMA 24560

Type	Size	Material no. "R" clockwise	L1	L2	L3	S ¹⁾	P ¹⁾
PGH4-3X/020RE11VE4		R901147105	145 [5.71]	70.5 [2.78]	129 [5.08]	1" S	3/4" H
PGH4-3X/025RE11VE4		R901147106	150 [5.91]	73.0 [2.87]	134 [5.28]	1 1/4" S	3/4" H
PGH4-3X/032RE11VE4		R901147107	157 [6.18]	76.5 [3.01]	141 [5.55]	1 1/2" S	1" H
PGH4-3X/040RE11VE4		R901147108	164 [6.46]	80 [3.15]	148 [5.83]	1 1/2" S	1" H
PGH4-3X/050RE11VE4		R901147109	174 [6.85]	85 [3.35]	158 [6.22]	2" S	1" H



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exact dimensions see table page 12

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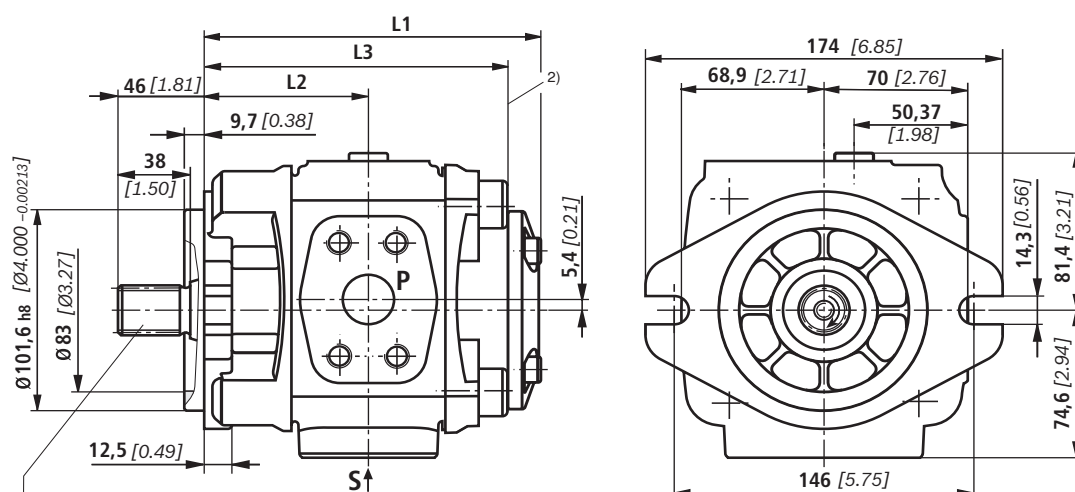
Unit dimensions of frame size 4 (dimensions in mm [inch])

PGH4-3X/...R...VU2

Drive shaft splined, SAE 2-hole mounting flange

(central and back pump in pump combinations)

Type	Size	Material no.		L1	L2	L3	S ¹⁾	P ¹⁾
		"R" clockwise	"L" counter-clockwise					
PGH4-3X/020..R11VU2		R901147110	On request	145 [5.71]	70.5 [2.78]	129 [5.08]	1" S	3/4" H
PGH4-3X/025..R11VU2		R901147111	On request	150 [5.91]	73 [2.87]	134 [5.28]	1 1/4" S	3/4" H
PGH4-3X/032..R11VU2		R901147112	On request	157 [6.18]	76.5 [3.01]	141 [5.55]	1 1/2" S	1" H
PGH4-3X/040..R11VU2		R901147113	On request	164 [6.46]	80 [3.15]	148 [5.83]	1 1/2" S	1" H
PGH4-3X/050..R11VU2		R901147114	On request	174 [6.85]	85 [3.35]	158 [6.22]	2" S	1" H



Shaft 25-4; SAE J744 JUL 88;
Involute gear
ANSI B92.1a-1976,
15T 16/32 DP 30°

¹⁾ S = Standard pressure series;

H = High-pressure series;

exact dimensions see table page 12

²⁾ For pump combinations, the combination part starts from here

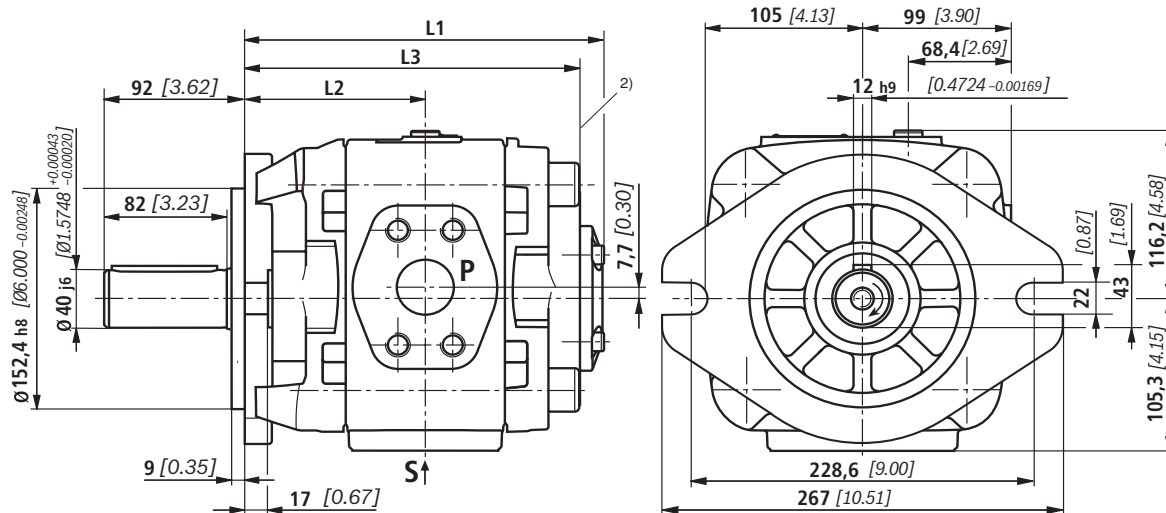
The figure shows a pump with clockwise rotation, in case of pumps with counterclockwise rotation, the pressure port is on the opposite side!

Unit dimensions of frame size 5 (dimensions in mm [inch])

PGH5-3X/... R E...VU2

Drive shaft cylindrical, SAE 2-hole mounting flange

Type	Size	Material no.		L1	L2	L3	S ¹⁾	P ¹⁾
		"R" clockwise	"L" counter-clockwise					
PGH5-3X/063..E11VU2		R901147115	On request	210 [8.27]	105.5 [4.15]	194 [7.64]	2" S	1 1/4" H
PGH5-3X/080..E11VU2		R901147116	On request	218 [8.58]	109.5 [4.31]	202 [7.95]	2" S	1 1/4" H
PGH5-3X/100..E11VU2		R901147117	On request	227 [8.94]	114 [4.49]	211 [8.31]	2 1/2" S	1 1/2" H
PGH5-3X/125..E11VU2		R901147118	On request	239 [9.41]	120 [4.72]	223 [8.78]	2 1/2" S	1 1/2" H
PGH5-3X/160..E11VU2		R901147119	On request	257 [10.12]	129 [5.08]	241 [9.49]	3" S	2" H
PGH5-3X/200..E07VU2		R901147120	On request	275 [10.83]	138 [5.43]	259 [10.20]	3 1/2" S	2" S
PGH5-3X/250..E07VU2		R901147121	On request	299 [11.77]	150 [5.91]	283 [11.14]	3 1/2" S	2 1/2" S



¹⁾ S = Standard pressure series;

H = High-pressure series;
exact dimensions see table page 12

²⁾ For pump combinations, the combination part starts from here

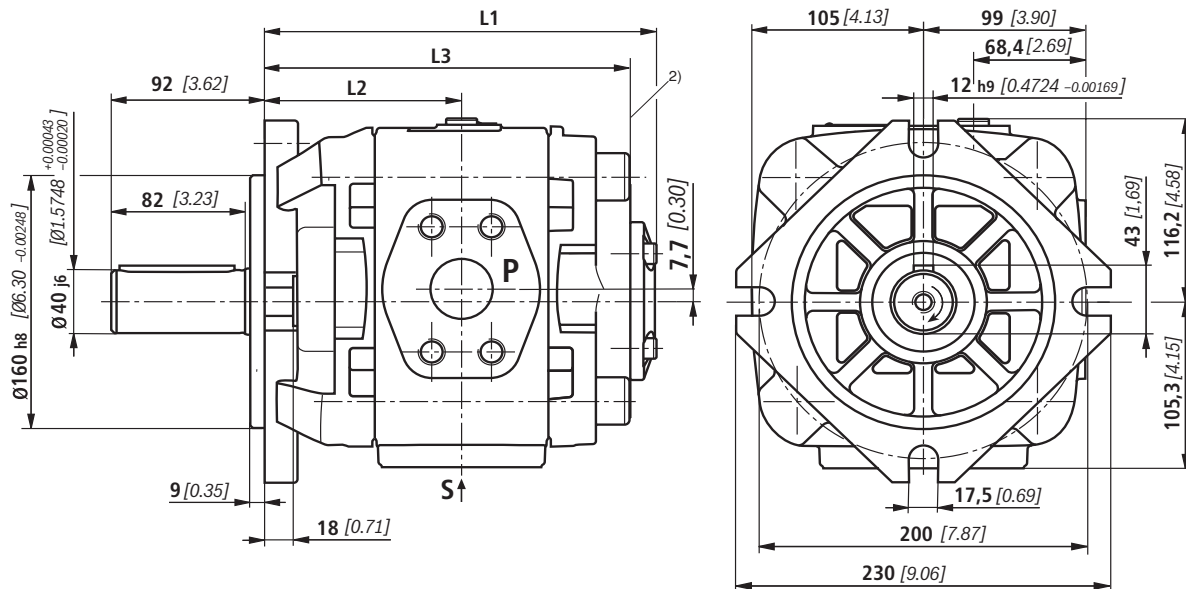
The figure shows a pump with clockwise rotation, in case of pumps with counterclockwise rotation, the pressure port is on the opposite side!

Unit dimensions of frame size 5 (dimensions in mm [inch])

PGH5-3X/...RE...VE4

Drive shaft cylindrical,
4-hole mounting flange according to ISO 3019-2
and VDMA 24560

Type	Size	Material no. "R" clockwise	L1	L2	L3	S ¹⁾	P ¹⁾
PGH5-3X/063RE11VE4	R901147122	210 [8.27]	105.5 [4.15]	194 [7.64]	2" S	1 1/4" H	
PGH5-3X/080RE11VE4	R901147123	218 [8.58]	109.5 [4.31]	202 [7.95]	2" S	1 1/4" H	
PGH5-3X/100RE11VE4	R901147124	227 [8.94]	114 [4.49]	211 [8.31]	2 1/2" S	1 1/2" H	
PGH5-3X/125RE11VE4	R901147125	239 [9.41]	120 [4.72]	223 [8.78]	2 1/2" S	1 1/2" H	
PGH5-3X/160RE11VE4	R901147126	257 [10.12]	129 [5.08]	241 [9.49]	3" S	2" H	
PGH5-3X/200RE07VE4	R901147127	275 [10.83]	138 [5.43]	259 [10.20]	3 1/2" S	2" S	
PGH5-3X/250RE07VE4	R901147128	299 [11.77]	150 [5.91]	283 [11.14]	3 1/2" S	2 1/2" S	



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exact dimensions see table page 12

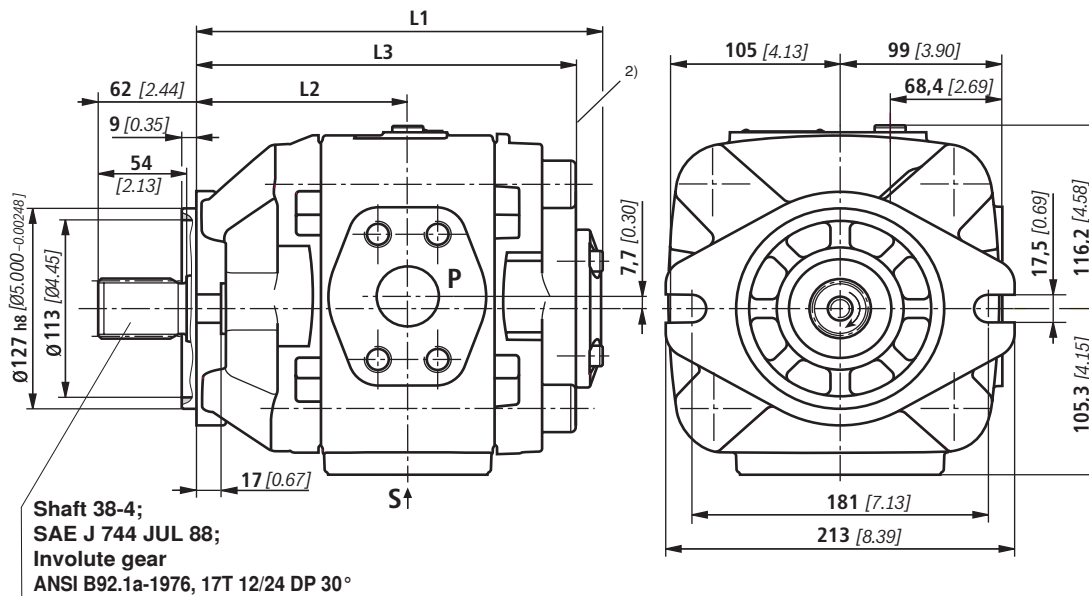
²⁾ For pump combinations, the combination part starts from here

Unit dimensions of frame size 5 (dimensions in mm [inch])

PGH5-3X/...^RR...VU2
L

Drive shaft splined, SAE 2-hole mounting flange
(central and back pump for pump combinations)

Type	Size	Material no.		L1	L2	L3	S ¹⁾	P ¹⁾
		"R" clockwise	"L" counter-clockwise					
PGH5-3X/063..R11VU2		R901147129	On request	219 [8.62]	114.5 [4.51]	203 [7.99]	2" S	1 1/4" H
PGH5-3X/080..R11VU2		R901147130	On request	227 [8.94]	118.5 [4.67]	211 [8.31]	2" S	1 1/4" H
PGH5-3X/100..R11VU2		R901147131	On request	236 [9.29]	123 [4.84]	220 [8.66]	2 1/2" S	1 1/2" H
PGH5-3X/125..R11VU2		R901147132	On request	248 [9.76]	129 [5.08]	232 [9.13]	2 1/2" S	1 1/2" H
PGH5-3X/160..R11VU2		R901147133	On request	266 [10.47]	138 [5.43]	250 [9.84]	3" S	2" H
PGH5-3X/200..R07VU2		R901147134	On request	284 [11.18]	147 [5.79]	268 [10.55]	3 1/2" S	2" S
PGH5-3X/250..R07VU2		R901147135	On request	308 [12.13]	159 [6.26]	292 [11.50]	3 1/2" S	2 1/2" S



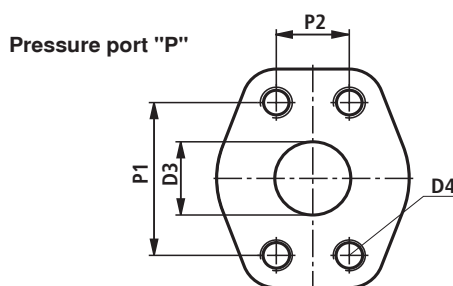
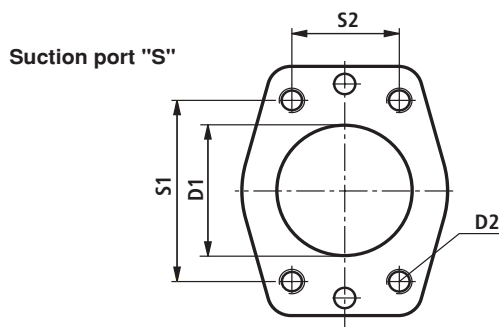
¹⁾ S = Standard pressure series;

H = High-pressure series;
exact dimensions see table page 12

²⁾ For pump combinations, the combination part starts from here

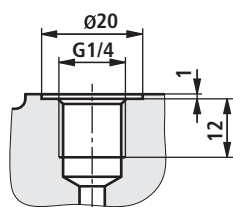
The figure shows a pump with clockwise rotation, in case of pumps with counterclockwise rotation, the pressure port is on the opposite side!

Ports (dimensions in mm [inch])

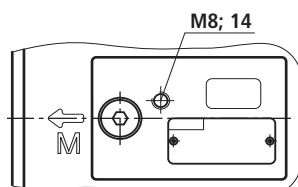


Frame size	Size	Porting pattern/ suction port S	D1	D2	S1	S2	Porting pattern/ pressure port P	D3	D4	P1	P2
4	020	1" 5000 PSI	Ø25 [Ø0.984]	M10; 18	52.4 [2.063]	26.2 [1.032]	3/4" 6000 PSI	Ø19 [Ø0.748]	M10; 18	50.8 [2.000]	23.8 [0.937]
	025	1 1/4" 4000 PSI	Ø32 [Ø1.260]	M10; 18	58.7 [2.311]	30.2 [1.189]	3/4" 6000 PSI	Ø19 [Ø0.748]	M10; 18	50.8 [2.000]	23.8 [0.937]
	032	1 1/2" 3000 PSI	Ø38 [Ø1.496]	M12; 21	69.9 [2.752]	35.7 [1.406]	1" 6000 PSI	Ø25.4 [Ø1.000]	M12; 23	57.2 [2.252]	27.8 [1.094]
	040	1 1/2" 3000 PSI	Ø38 [Ø1.496]	M12; 21	69.9 [2.752]	35.7 [1.406]	1" 6000 PSI	Ø25.4 [Ø1.000]	M12; 23	57.2 [2.252]	27.8 [1.094]
	050	2" 3000 PSI	Ø51 [Ø2.008]	M12; 21	77.8 [3.063]	42.9 [1.689]	1" 6000 PSI	Ø25.4 [Ø1.000]	M12; 23	57.2 [2.252]	27.8 [1.094]
5	063	2" 3000 PSI	Ø51 [Ø2.008]	M12; 21	77.8 [3.063]	42.9 [1.689]	1 1/4" 6000 PSI	Ø32 [Ø1.260]	M12; 21	66.6 [2.622]	31.8 [1.252]
	080	2" 3000 PSI	Ø51 [Ø2.008]	M12; 21	77.8 [3.063]	42.9 [1.689]	1 1/4" 6000 PSI	Ø32 [Ø1.260]	M12; 21	66.6 [2.622]	31.8 [1.252]
	100	2 1/2" 2500 PSI	Ø64 [2.520]	M12; 23	88.9 [3.500]	50.8 [2.000]	1 1/2" 6000 PSI	Ø38 [Ø1.496]	M16; 30	79.3 [3.122]	36.5 [1.437]
	125	2 1/2" 2500 PSI	Ø64 [2.520]	M12; 23	88.9 [3.500]	50.8 [2.000]	1 1/2" 6000 PSI	Ø38 [Ø1.496]	M16; 30	79.3 [3.122]	36.5 [1.437]
	160	3" 2000 PSI	Ø76 [Ø2.992]	M16; 30	106.4 [4.189]	61.9 [2.437]	2" 6000 PSI	Ø51 [Ø2.008]	M20; 35	96.8 [3.811]	44.5 [1.752]
	200	3 1/2" 500 PSI	Ø89 [Ø3.504]	M16; 30	120.7 [4.752]	69.9 [2.752]	2" 3000 PSI	Ø51 [Ø2.008]	M12; 23	77.8 [3.063]	42.9 [1.689]
	250	3 1/2" 500 PSI	Ø89 [Ø3.504]	M16; 30	120.7 [4.752]	69.9 [2.752]	2 1/2" 2500 PSI	Ø64 [Ø2.520]	M12; 23	88.9 [3.500]	50.8 [2.000]

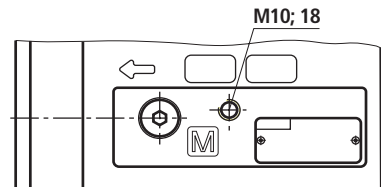
Measuring port
PGH4-3X/... and PGH5-3X/...



Transport thread PGH4-3X/...



Transport thread PGH5-3X/...



Pump combinations

All internal gear pumps of type PGH-3X can be combined; each pump has an output shaft gearing. The combination options and the material numbers of the necessary combination parts are shown in the following figure.

Please observe the project planning information for pump combinations on page 21.

Back pump	Front pump	Material no.	
		PGH4-3X	PGH5-3X
PGH2-2X/...R...U2	(RE10223)	R901155288	R901155283
PGH3-2X/...R...U2	(RE10223)	R901155288	R901155283
PGH4-3X/...R...U2		R901155289	R901155284
PGH5-3X/...R...U2		–	R901155285
PGF2-2X/...J...U2	(RE10213)	R901155288	R901155283
PGP2-2X/...J...U2	(RE10231)	R901155288	R901155283
PGF3-3X/...J...U2	(RE10213)	R901155287	R901155282
PGP3-3X/...J...U2	(RE10231)	R901155287	R901155282
PVV/Q1-1X/...J...B	(RE10335)	R901155287	R901155282
PVV/Q2-1X/...J...B	(RE10335)	R901155287	R901155282
PVV/Q4-1X/...J...C	(RE10335)	–	R901155286
PVV/Q5-1X/...J...C	(RE10335)	–	R901155286
AZPF-1X/...RR...B	(RE10089)	R901155288	R901155283

Ordering code

Ordering code		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">-3X/</div> <div style="border: 1px solid black; padding: 2px 10px;">+</div> <div style="border: 1px solid black; padding: 2px 10px;">-</div> <div style="border: 1px solid black; padding: 2px 10px;">/</div> <div style="border: 1px solid black; padding: 2px 10px;">+</div> <div style="border: 1px solid black; padding: 2px 10px;">-</div> <div style="border: 1px solid black; padding: 2px 10px;">/</div> <div style="border: 1px solid black; padding: 2px 10px;"></div> <div style="border: 1px solid black; padding: 2px 10px;"></div> <div style="border: 1px solid black; padding: 2px 10px;"></div> <div style="border: 1px solid black; padding: 2px 10px;"></div> </div>									
2-fold	= P2	<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p>Series of the 1st pump ¹⁾</p> <p>Component series of the 1st pump ¹⁾</p> <p>Size of the 1st pump ¹⁾</p> <p>Series of the 2nd pump ¹⁾</p> <p>Component series of the 2nd pump ¹⁾</p> <p>Size of the 2nd pump ¹⁾</p> <p>Series of the 3rd pump ¹⁾</p> <p>Component series of the 3rd pump ¹⁾</p> <p>Size of the 3rd pump ¹⁾</p> </div> <div style="width: 35%; padding-left: 10px;"> <p>Type of connection of the 1st pump</p> <p>U2 = ²⁾ SAE 2-hole mounting flange</p> <p>E4 = ³⁾ ISO 4-hole mounting flange according to ISO 3019-2 and VDMA 24560</p> <p>Seal material</p> <p>V = FKM seals</p> <p>W = Shaft seal NBR (remaining seals FKM)</p> <p>Shaft design of the 1st pump</p> <p>E = Cylindrical</p> <p>R = SAE involute gear</p> <p>Direction of rotation (looking at the shaft end)</p> <p>R = Clockwise</p> <p>L = Counterclockwise (on request)</p> </div> </div>									
3-fold	= P3										

Order example:

P3GH5-3X/160+GH5-3X/100+GH4-3X/050REVE4

¹⁾ For detailed information refer to the ordering code page 2

2) In connection with cylindrical and splined shaft

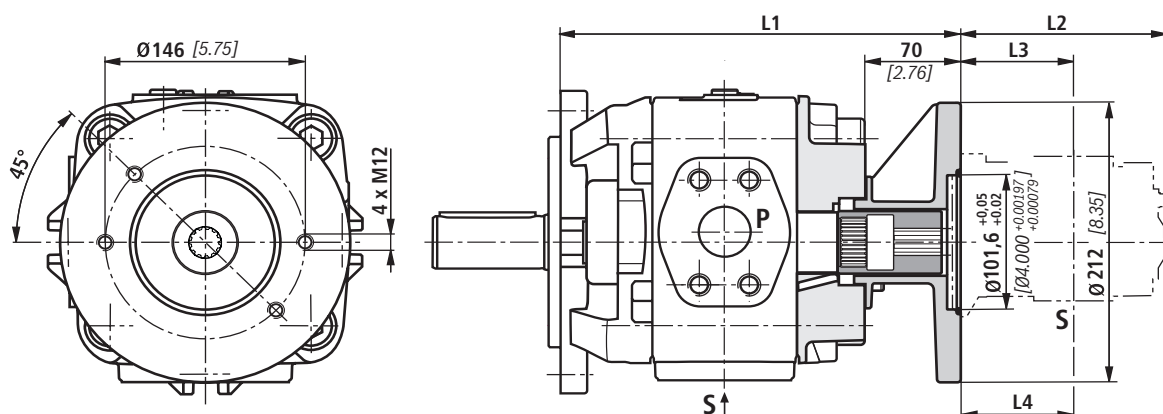
³⁾ Only in connection with cylindrical shaft (according to VDMA); only with clockwise rotation

Unit dimensions pump combinations (dimensions in mm [inch])

The dimensional drawings show the front pump and the combination part.

Combination part PGH5-3X+GF3-3X/VV1-1X/VV2-1X/K02

Material no.: R901155282



PGH5-3X.. Size	PGH5-3X/..RE..U2 PGH5-3X/..RE..E4 L1	PGH5-3X/..RR..U2 L1
63	264 [10.39]	273 [10.75]
80	272 [10.71]	281 [11.06]
100	281 [11.06]	290 [11.42]
125	293 [11.54]	302 [11.89]
160	311 [12.24]	320 [12.60]
200	329 [12.95]	338 [13.31]
250	353 [13.90]	362 [14.25]

PGF3/PGP2 Size	L2	L3
20	144.5 [5.69]	79.5 [3.13]
22	146.5 [5.77]	80.5 [3.17]
25	150.5 [5.93]	82.5 [3.25]
32	159.5 [6.28]	87 [3.43]
40	169.5 [6.67]	92 [3.62]

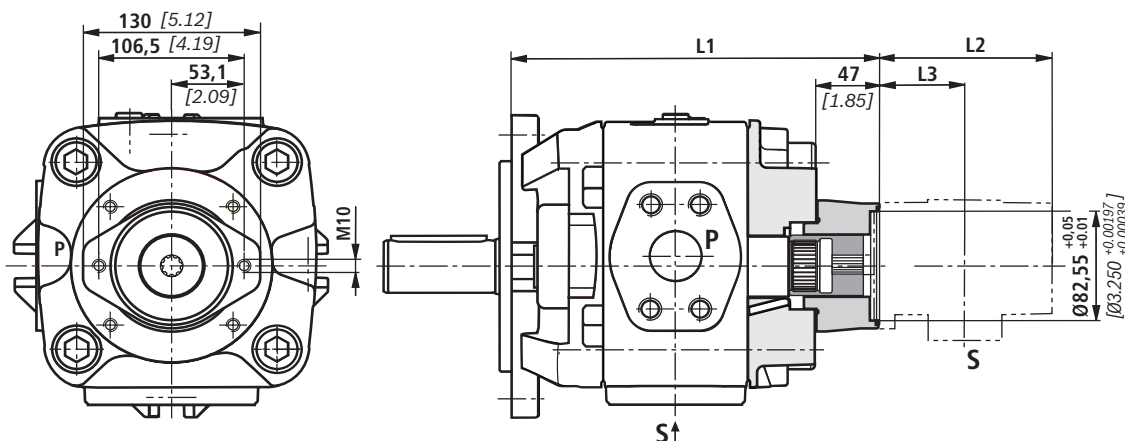
PVV..UMB Frame size	L2	L3 (P)	L4 (S)
1	156 [6.14]	133 [5.24]	63.5 [2.50]
2	163 [6.42]	38 [1.50]	120.5 [4.75]

Unit dimensions pump combinations (dimensions in mm [inch])

The dimensional drawings show the front pump and the combination part.

Combination part PGH5-3X+GH2/3-2X/GF2-2X/AZPF-1X/K01

Material no.: R901155283



PGH5-3X.. Size	PGH5-3X/..RE..U2 PGH5-3X/..RE..E4 L1	PGH5-3X/..RR..U2 L1
63	241 [9.49]	250 [9.84]
80	249 [9.80]	258 [10.16]
100	258 [10.16]	267 [10.51]
125	270 [10.63]	279 [10.98]
160	288 [11.34]	297 [11.69]
200	306 [12.05]	315 [12.40]
250	330 [12.99]	339 [13.35]

PGH2 Size	L2	L3
005	110 [4.33]	54 [2.13]
006	112.5 [4.43]	55.5 [2.19]
008	116 [4.57]	57 [2.24]

PGH3 Size	L2	L3
011	121.5 [4.78]	60 [2.36]
013	126.5 [4.98]	62.5 [2.46]
016	131.5 [5.18]	65 [2.56]

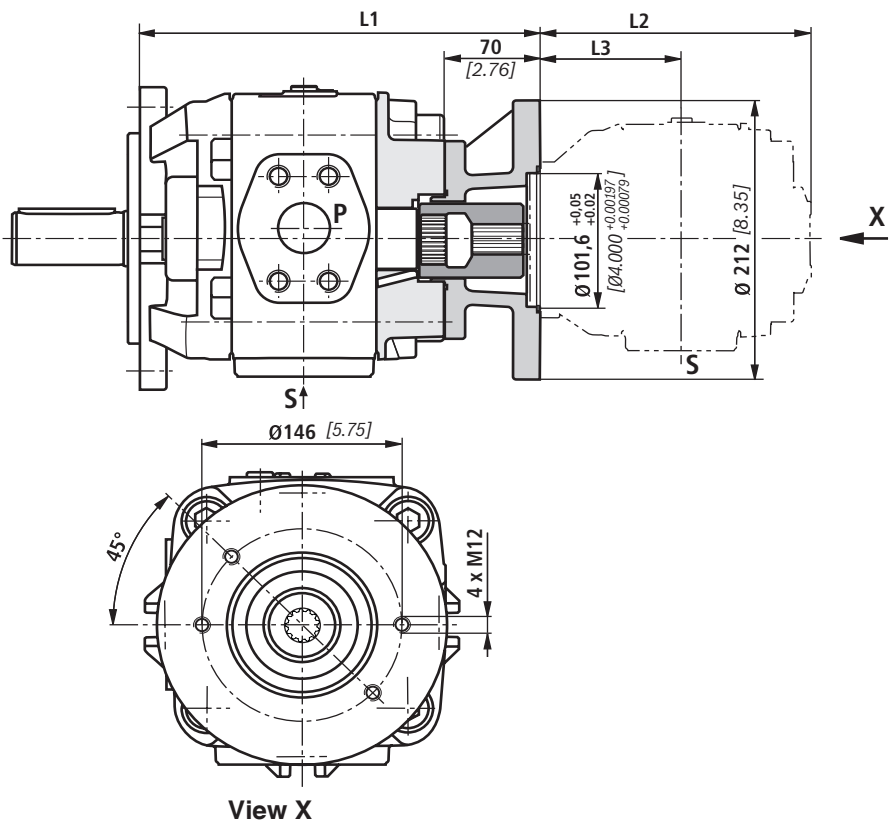
PGF2/PGP2 Size	L2	L3
006	116 [4.567]	65 [2.559]
008	119.5 [4.705]	67 [2.638]
011	125 [4.921]	69.5 [2.736]
013	130 [5.118]	72 [2.835]
016	135 [5.315]	74.5 [2.933]
019	141 [5.551]	77.5 [3.051]
022	147 [5.787]	80.5 [3.169]

AZPF Size	L2	L3
004	85 [3.346]	40 [1.575]
005	87.5 [3.445]	41 [1.614]
008	91.5 [3.602]	43 [1.692]
011	96.5 [3.799]	47 [1.850]
014	101.5 [3.996]	47.5 [1.870]
016	105 [4.134]	47.5 [1.870]
019	110 [4.331]	47.5 [1.870]
022	115.5 [4.547]	55 [2.165]

Unit dimensions pump combinations (dimensions in mm [inch])

The dimensional drawings show the front pump and the combination part.

Combination part PGH5-3X+GH4-3X..R
Material no.: R901155284



PGH5-3X.. Size	PGH5-3X/..RE..U2 PGH5-3X/..RE..E4	PGH5-3X/..RR..U2
	L1	L1
63	264 [10.39]	273 [10.75]
80	272 [10.71]	281 [11.06]
100	281 [11.06]	290 [11.42]
125	293 [11.54]	302 [11.89]
160	311 [12.24]	320 [12.60]
200	329 [12.95]	338 [13.31]
250	353 [13.90]	362 [14.25]

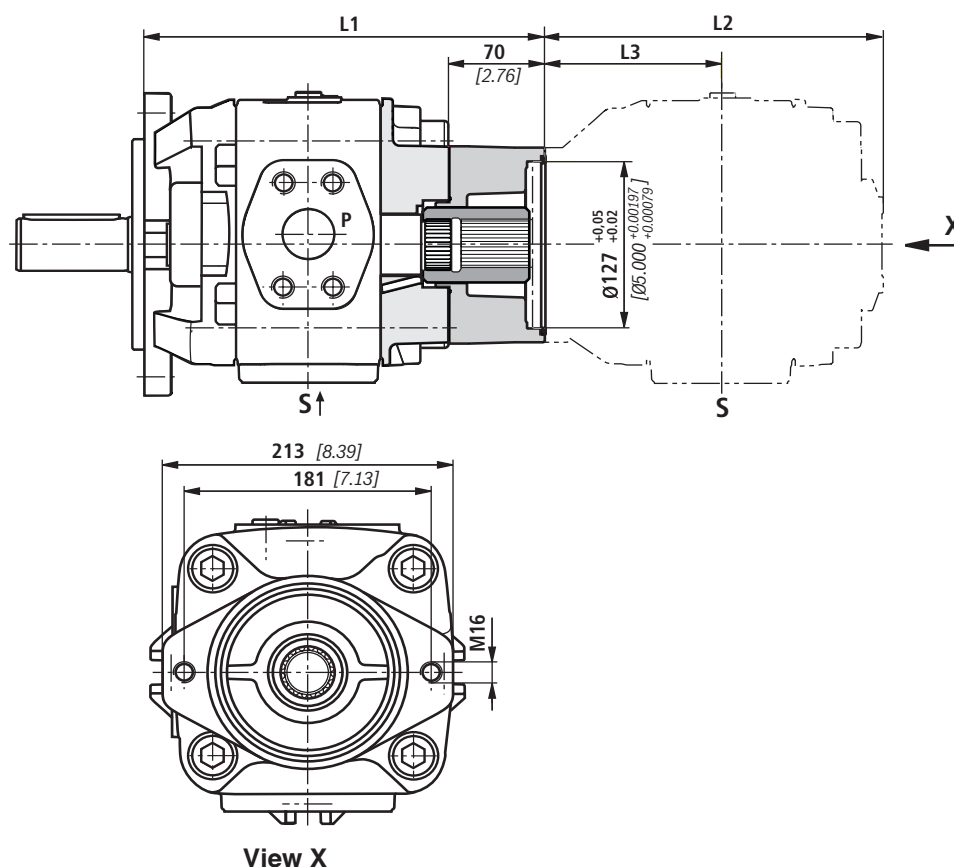
PGH4-3X...R..U2 Size	L2	L3
20	145 [5.71]	70.5 [2.78]
25	150 [5.91]	73 [2.87]
32	157 [6.18]	76.5 [3.01]
40	164 [6.46]	80 [3.15]
50	174 [6.85]	85 [3.35]

Unit dimensions pump combinations (dimensions in mm [inch])

The dimensional drawings show the front pump and the combination part.

Combination part PGH5-3X+GH5-3X..R

Material no.: R901155285



PGH5-3X.. Size	PGH5-3X/..RE..U2 PGH5-3X/..RE..E4 L1	PGH5-3X/..RR..U2 L1
63	264 [10.39]	273 [10.75]
80	272 [10.71]	281 [11.06]
100	281 [11.06]	290 [11.42]
125	293 [11.54]	302 [11.89]
160	311 [12.24]	320 [12.60]
200	329 [12.95]	338 [13.31]
250	353 [13.90]	362 [14.25]

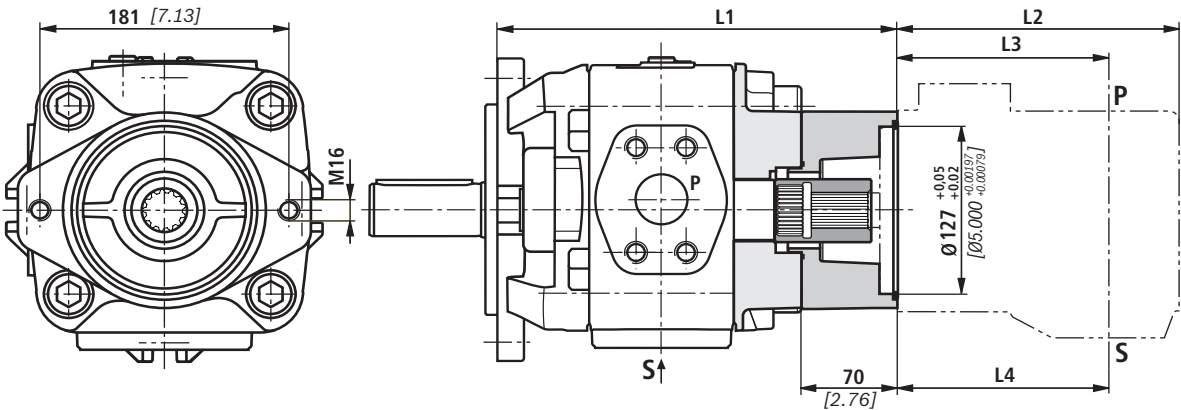
PGH5-3X...R..U2 Size	L2	L3
63	219 [8.62]	114.5 [4.51]
80	227 [8.94]	118.5 [4.67]
100	236 [9.29]	123 [4.84]
125	248 [9.76]	129 [5.08]
160	266 [10.47]	138 [5.43]
200	284 [11.18]	147 [5.79]
250	308 [12.13]	159 [6.26]

Unit dimensions pump combinations (dimensions in mm [inch])

The dimensional drawings show the front pump and the combination part.

Combination part: PGH5-3X+VV4/5-1X..J

Material no. R901155286



PGH5-3X.. Size	PGH5-3X/..RE..U2 PGH5-3X/..RE..E4 L1	PGH5-3X/..RR..U2 L1
63	264 [10.39]	273 [10.75]
80	272 [10.71]	281 [11.06]
100	281 [11.06]	290 [11.42]
125	293 [11.54]	302 [11.89]
160	311 [12.24]	320 [12.60]
200	329 [12.95]	338 [13.31]
250	353 [13.90]	362 [14.25]

PVV..UMB Frame size	L2	L3 (P)	L4 (S)
4	186 [7.32]	38 [1.50]	126 [4.96]
5	216 [8.50]	43 [1.69]	153 [6.02]

Project planning information

1. General notes

This project planning information refers to the specific properties of the Rexroth PGH.-3X internal gear pump.

Comprehensive general information and suggestions are contained in the hydraulics trainer, edition 3 "Project planning information and design of hydraulic systems", RE 00281.

1.1 Intended use

Rexroth internal gear pumps are intended for the setup of hydraulic drive systems in the fields of machine and plant construction. During project planning, the basic principles of the EU Machinery Directive or comparable national regulations outside the EU have to be observed.

The pumps must not be used in explosive environments in accordance with directive 94/9/EC (ATEX).

1.2 Technical data

The system or machine manufacturer has to ensure compliance with the admissible technical data and operating conditions. The pump itself does not contain a device to prevent operation outside the admissible data.

All mentioned technical features are average values and are applicable for the specified boundary conditions. In case of modifications to the boundary conditions (e.g. viscosity), the technical data may change as well. Tolerances corresponding to the relevant state-of-the-art are possible.

Operating the pump outside of the admissible technical data (pages 4, 5) is possible to a certain extent, however, this requires the explicit written approval by Bosch Rexroth.

2.2 Suction line

The line cross-sections have to be dimensioned for the designed flows in a manner that an ideal suction speed of 0.6 to 1.2 m/s is achieved on average. The suction speed must not exceed a maximum value of 2 m/s.

The suction cross-sections at the pump itself are dimensioned for the maximum flow and thus are a reference only. In case of continuous operation with speeds lower than the admissible maximum speed, the suction tube diameter is to be dimensioned smaller than the suction port of the pump in accordance with the actual suction speed.

All in all, the suction line has to be designed in a way that the admissible inlet operating pressure is complied with (0.8 to 2 bar absolute)! Bends and a combination of the suction tubes of several pumps must be avoided. If suction filters have to be used, it has to be ensured on the system side that the lowest admissible inlet operating pressure is not exceeded even when the filter is contaminated.

Please ensure air tightness of the transitions and dimensional stability of the suction hose as regards to the external air pressure.

The suction tube immersion depth should be selected as large as possible. Depending on the internal reservoir pressure, the viscosity of the operating medium, and the flow ratios within the reservoir, no vortex must be formed even during maximum flow. Otherwise there is the risk of sucking in air.

We recommend selecting suction tubes according to AB 23-03.

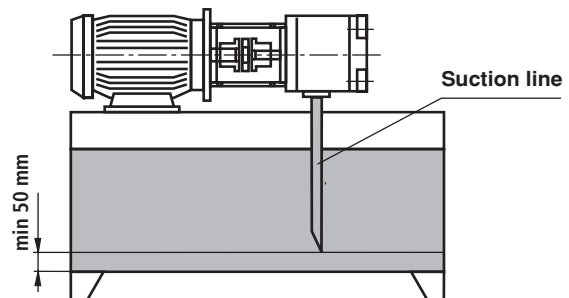
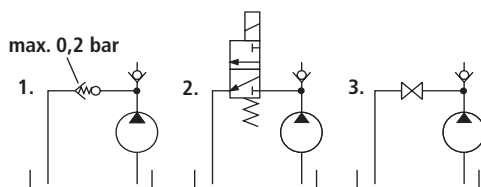
2. Hydraulic project planning

2.1 Bleeding option for commissioning

For Rexroth internal gear pumps PGH.-3X a manual, switchable or automatic bleeding option is to be provided for the initial commissioning or re-commissioning after maintenance and repair works. As bleeding point, the measurement port (M) available at the pump can be used. Otherwise, the bleeding point has to be put into the pressure line in front of the first valve or check valve. Bleeding may be effected with a maximum counter-pressure of 0.2 bar.

Examples of bleedings circuits:

1. Automatic bleeding via automatic bleeding valve
2. Switchable bleeding
3. Manually operated bleeding



Project planning information

2.3 Pressure line

With pressure lines, sufficient bursting resistance of the tubes, hoses and connection elements has to be ensured. The cross-sections should be based on the maximum flow in order to avoid additional excessive load of the pump due to backpressure. In this connection, you must also consider the pipe losses across the entire pressure line length and other line resistances (e.g. bends, pressure filters).

2.4 Pressure limitation

The internal gear pump PGH is not equipped with devices for compliance with the maximum operating pressure. Setting and limiting the admissible operating pressure has to be ensured on the system side.

The pressure relief valves necessary for that purpose are to be designed considering the maximum flow and the existing pressure increase speed so that the admissible intermittent operating pressure is not exceeded.

2.5 Pressure holding function

In the variable-speed drive, the pump can temporarily also be operated below the specified minimum speed, in the pressure holding function. The holding time and the related necessary speed result from the operating viscosity and the pressure level. For the design, please contact Bosch Rexroth's Technical Sales.

In the deactivated condition (speed = 0), a leakage flow flows through the pump back into the reservoir, depending on the load pressure. If this is to be securely prevented, a check valve has to be used.

When using a check valve, please observe the information on bleeding in chapter 2.1.

3. Mechanical project planning

3.1 Installation and disassembly option

For installing and disassembling the pump on or from the drive, accessibility has to be provided for on the system side by means of suitable lifting gear. Please consider especially the own weight of frame size PGH 5 (see "Technical Data", page 5).

Screws of the property class 8.8 or 10.9 have to be provided for mounting purposes.

3.2 Mounting

On the machine side, the screws have to be accessible in a way that the required tightening torque can be applied. The tightening torque is based on the operating conditions and involved elements of the screw connection and has to be specified by the manufacturer in the power unit, machine or system project planning.

3.3 Reservoir

In the reservoir construction or the selection of suitable standard reservoirs, the following requirements are to be observed:

- Selection of the largest reservoir volume possible, depending on the continuous or average flow, in order to allow for the separation of air bubbles by means of enough dwell time of the medium in the reservoir. In this connection, the air separation capability of the fluid used is also important.
- Provision of settling zones for the fluid in the reservoir in order to allow for air separation.
- Provision of guiding plates in order to allowing for the deposit of contamination at the reservoir bottom outside the pump suction area.
- Large dimensioning of the reservoir surfaces depending on the heat output to be dissipated via the reservoir walls.

3.4 Required power unit functions

Hydraulic power units should at least be equipped with the following features:

- Reservoirs, the internal pressure of which corresponds to the ambient pressure in accordance with the design, have to be equipped with ventilation filters for pressure compensation purposes.
- The fluid should be filled by means of filling connections only excluding filling with unfiltered fluid.
- Pollution or humidity must be prevented from getting into the system. When using the pump in a highly polluted environment, the reservoir is to be pre-tensioned by means of air pressure for this. If cleansing of the external reservoir side is intended or to be expected during the period of use, reservoir fittings for tubes, lines, or hoses have to be selected, which ensure safe seal against external pressurization with water jet.

3.5 Place of installation and ambient conditions

With places of installation from a geodetic height of more than 1000 m, the pump is to be arranged in or below the reservoir or the reservoir is to be pre-tensioned by means of compressed air in order to comply with the admissible minimum inlet pressure. The suction line is to be selected short and with a large cross-section, bends should not be used.

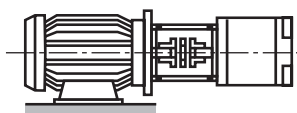
When installing the pump more than 10 m below the reservoir, the reduction of the inlet pressure to the maximum admissible value has to be ensured by means of additional measures.

When operating the pump in salt-containing or corrosive environments or when pressurization with strongly abrasive substances is possible, it has to be ensured on the system side that the shaft seal ring and the sealing area of the shaft do not make direct contact with the environment.

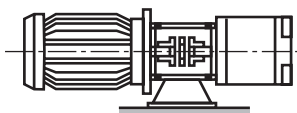
Project planning information

3.6 Installation positions

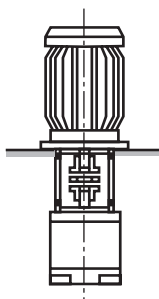
IM B3



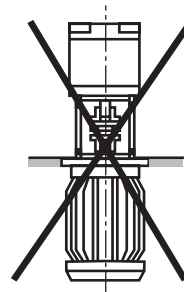
IM B5



IM V1



IM V2



⚠ Attention!

Installation position motor at bottom and pump at top (e.g. IM V2) is not admissible!

4. Pump combinations

- It has to be ensured with pump combinations that the operating data admissible for the relevant pump type is complied with in every stage.
- The combined pumps must all have the same direction of rotation.
- The pump with the largest torque, variable displacement pumps or pumps with intermittent load are to be provided as first stage in the pump combination.
- The maximum through-drive torque must be checked by the project planner for every application. This also applies to already existing (encoded) pump combinations.

- A pump stage drive torque is calculated as follows:

$$T = \frac{\Delta p \cdot V \cdot 0.0159}{\eta_{\text{hydr.-mech.}}}$$

- T : Torque in Nm
- Δp : Operating pressure in bar
- V : Displacement in cm³
- η : Hydraulic-mechanical efficiency

Maximum admissible torques in Nm:

Type	Drive torque		Output torque
	Cylindrical shaft ..E	Splined shaft ..R	
PGH4	450	450	280
PGH5	1100	1400	700

- The total of the torques in a pump combination must not exceed the max. drive torque.
- Joint aspiration is not possible.
- For reasons of stability, we recommend the ISO 4-hole mounting flange according to VDMA "E4" for combinations of three and more pumps
- Before operating pump combinations with different mediums, please consult Bosch Rexroth.
- Central and back pumps must have the shaft design "R" (splined).

Project planning information

5. Maintenance schedule and operational safety

For safe operation and a long service life of the pump, a maintenance schedule has to be developed for the power unit, the machine, or the system. The maintenance schedule has to ensure that the intended or admissible operating conditions of the pump are complied with during the period of use.

In particular, compliance with the following operating parameters has to be ensured:

- The required oil cleanliness
- The operating temperature range
- The level of the operating medium

Furthermore, the pump and the system have to be checked for modifications of the following parameters on a regular basis:

- Vibrations
- Noise
- Temperature difference pump – fluid in the reservoir
- Foam formation in the reservoir
- Leak-proofness

Modifications of these parameters indicate wear of components (e.g. drive motor, coupling, pump, etc.). The cause has to be determined and remedied immediately.

In order to achieve high operational safety of the pump in the machine or system, we recommend checking the parameters mentioned above continuously and automatically and shutting the system down automatically in case of modifications exceeding the usual fluctuations in the intended operating range.

Plastic components of drive couplings should be replaced regularly, however, after 5 years at the latest. The corresponding information of the manufacturer is to be observed.

For preventive maintenance of the pump, we recommend having the seals replaced after a maximum operating period of 5 years by an authorized Bosch Rexroth service company.

6. Accessories

6.1 SAE connection flanges

We recommend selecting the SAE flanges for suction and pressure port according to AB 22-15 (with welded connection) or AB 22-13 (with threaded connection).

6.2 Pump safety block

For limiting the operating pressure and for the pump circulation at zero pressure, we recommend our pump safety blocks type DBA... according to RE 25890.

Automatic bleeding upon commissioning is, however, not possible via DBA blocks. In this connection, we recommend a separate manual or automatic bleeding, e.g. via the pump's measurement port (see page 19)!

6.3 Other accessories

To install the Rexroth PGH.-3X internal gear pump on electric motors, we recommend selecting the pump mounting brackets according to AB 41-20 and torsionally flexible couplings according to AB 33-22.

Commissioning notes

Preparation

- Check whether the system has been installed carefully and cleanly.
- Only fill in hydraulic fluid in through a filter with the required minimum retention rate.
- Via suction or pressure pipe, fill the pump completely with the hydraulic fluid.
- Check the direction of rotation for compliance with the direction of rotation according to the pump type.

Bleeding

- Open the bleed port at the system or switch to circulation at zero pressure, according to the system operating instructions. During bleeding, discharge of enclosed air at zero pressure must be guaranteed.
- For bleeding the pump, switch the pump on and immediately off again (jog mode). This process is to be repeated until complete bleeding of the pump is ensured.
- Close the manually opened bleed ports again.

Commissioning

- If complete bleeding of the pump has been ensured, switch on the motor. Let the pump run at zero pressure until the system is completely bled. For the bleeding of the system, the system operating instructions are to be observed.
- Commission the system according to the system operating instructions and load the pump.
- After some operating time, check the hydraulic fluid in the reservoir for bubble or foam formation at the surface.

Operation

- Pay attention to changes in the noise characteristic during operation. Due to heating of the operating medium, minor noise increases are normal. Considerable increase in the noise or random short-term changes in the noise may be an indication of the aspiration of air. If the suction tubes are too short or the operating medium filling levels are too low, air can also be sucked in via a vortex.
- Changes in operating speeds, temperatures, noise increase or power consumption are an indication of wear or damage at the system or the pump.

Re-commissioning

- Check the pump and the system for leakage. Leaks are an indication of leakage below the hydraulic fluid level. An increased hydraulic fluid level in the reservoir is an indication of leakage above the hydraulic fluid level.
- If the pump is arranged above the hydraulic fluid level, the pump may run empty due to leakage, e.g. a worn shaft seal. In this case, the system must be bled once again during re-commissioning. Provide for repair.
- After repair and maintenance works, you must bleed the system once again.
- If the system is intact, switch on the motor.

General

- The pumps supplied by us have been tested for function and performance. Modifications of any type at the pump are not permitted since this would result in the invalidation of warranty claims!
- Repairs may only be carried out by the manufacturer or their authorized dealers and agencies. Repairs carried out by the customer are not covered by a warranty.

Important notes

- The pump may only be installed, maintained and repaired by authorized, trained and instructed personnel!
- The pump may only be operated within the admissible data (see page 4 and 5)!
- The pump may only be operated if it is in an unobjectionable condition!
- When carrying out any work on the pump, depressurize the system!
- Unauthorized conversions or modifications, which affect safety and function are not permitted!
- Protective devices (e.g. coupling protection) are to be attached and/or existing protective devices must not be removed!
- Make sure that all mounting screws are always properly tightened! (Observe the prescribed tightening torque!)
- The generally valid safety and accident prevention regulations must imperatively be complied with!