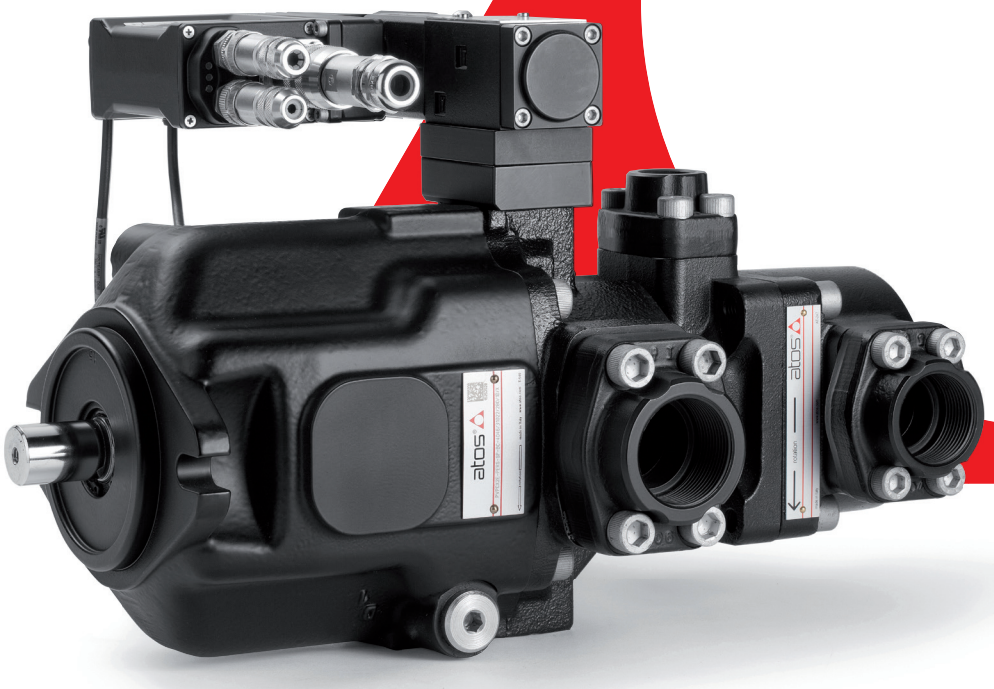
Насосы гидравлические ATOS

Технические характеристики



Алматы (7273)495-231
Ангарск (3955)60-70-56
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Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
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Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
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Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Курган (3522)50-90-47
Липецк (4742)52-20-81
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Ноябрьск (3496)41-32-12
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Саранск (8342)22-96-24
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сыктывкар (8212)25-95-17
Тамбов (4752)50-40-97
Сургут (3462)77-98-35
Тверь (4822)63-31-35
Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Улан-Удэ (3012)59-97-51
Уфа (347)229-48-12
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Чебоксары (8352)28-53-07
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Череповец (8202)49-02-64
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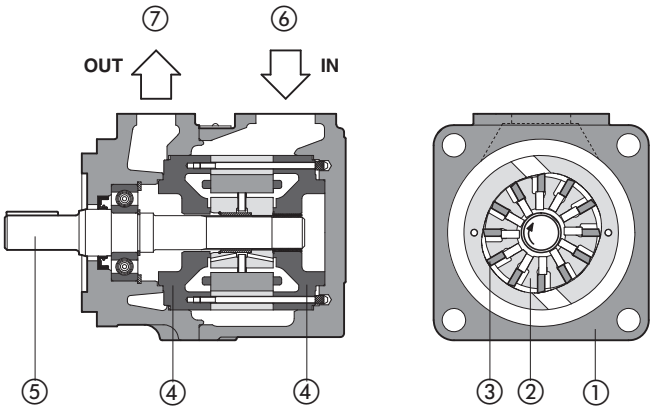
INDEX

PUMPS

Vane pumps type PFE-31, PFE-41, PFE-51

fixed displacement - cartridge design



① body
②③ rotor with vanes
④ balanced plates
⑤ shaft
⑥ inlet port
⑦ outlet port

PFE-41

PFE-*1 are fixed displacement-twelve-vane pumps, ② ③ cartridge design with integral hydraulic balancing ④ for high pressure operation, long service life and low noise level.

They are available in three different sizes with max displacements up to 44, 85 and 150 cm³/rev and single, multiple or with through-shaft configurations.

Mounting flange according to SAE J744 standard.

Inlet and outlet ports can be oriented in four different positions to match any installation requirement.

Simplified maintenance as the pumping cartridge can be easily replaced.

Max pressure 210 bar.

1 MODEL CODE

PFE	X2	-	31	036	/	31028	/	1	D	T	*	/	*

Fixed displacement vane pump

Additional suffix for multiple pumps:
X2 = double pump composed of single vane pumps
X3 = triple pump composed of single vane pumps

Eventual suffix for pumps with through shaft:
XA = for coupling one PFE-31
XB = for coupling one PFE-41 (only for PFE-41 and PFE-51)
XC = for coupling one PFE-51 (only for PFE-51)
XO = with through shaft, without rear flange
Note: mulitple pumps are assembled in decreasing order of size. See also tab. A190.

Size, see section 2:
31, 41, 51

Displacement [cm³/rev], see section 2
for PFE 31: **010, 016, 022, 028, 036, 044**
for PFE 41: **029, 037, 045, 056, 070, 085**
for PFE 51: **090, 110, 129, 150**

Only for multiple pumps PFEX*: type of second (and third) pump

Drive shaft, see section 6 and 7:

cylindrical, keyed for single and multiple pump (only first position)
1 = standard
2 = long version (only for PFE-41 and PFE-51)
3 = for high torque applications

splined
5 = for single and multiple pumps (any position)
6 = for single and multiple pumps (only first position)
7 = for second and third position in multiple pumps
} only for PFE-31 and PFE-41

Direction of rotation (viewed from the shaft end):
D = clockwise (supplied standard if not otherwise specified)
S = counterclockwise
Note: PFE are not reversible

Port orientation, see section 5:
T = standard
U, V, W = on request

Series number

Seals material:
omit for NBR (mineral oil & water glycol)
PE = FPM

2 OPERATING CHARACTERISTICS at 1450 rpm (based on mineral oil ISO VG 46 at 50°C)

Model	Displacement cm³/rev	Max pressure (1)	Speed range rpm (2)	7 bar (3) l/min	kW	70 bar (3) l/min	kW	140 bar (3) l/min	kW	210 bar (3) l/min	kW
PFE-31010	10,5	160	800-2400	15	0,2	13,5	2	12	5	-	-
PFE-31016	16,5	210 bar	800-2800	23	0,5	21	3	19	5	16	8,3
PFE-31022	21,6			30	0,6	28	4	26	7	23	10,8
PFE-31028	28,1			40	0,8	38	5,5	36	10	33	14
PFE-31036	35,6			51	1	49	7	46	12,5	43	17,8
PFE-31044	43,7		800-2500	63	1,3	61	8	58	15,5	55	22
PFE-41029	29,3			41	0,8	39	5,5	37	10	34	14,7
PFE-41037	36,6			52	1	50	7	48	12,5	45	18,3
PFE-41045	45,0			64	1,3	62	8,5	60	16	57	22,6
PFE-41056	55,8			80	1,6	78	11	75	21	72	28
PFE-41070	69,9			101	2	98	13,5	95	26	91	35
PFE-41085	85,3		800-2000	124	2,4	121	16	118	32	114	43
PFE-51090	90,0		800-2200	128	2,7	124	17	119	33	114	45
PFE-51110	109,6			157	3,2	152	21	147	40	141	55
PFE-51129	129,2			186	3,7	180	25	174	47	168	65
PFE-51150	150,2		800-1800	215	4,2	211	29	204	55	197	75

(1) Max pressure is 160 bar for /PE version and water glycol fluid
(2) Max speed is 1800 rpm for /PE versions; 1500 rpm for water glycol fluid
(3) Flow rate and power consumption are proportional to the rotation speed, see section 4

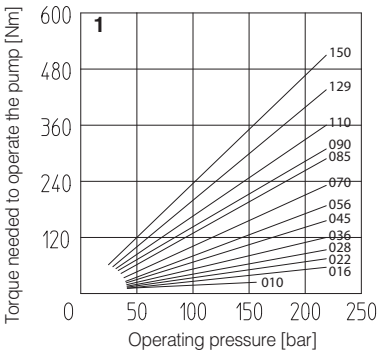
3 MAIN CHARACTERISTICS OF VANE PUMPS TYPE PFE-*1

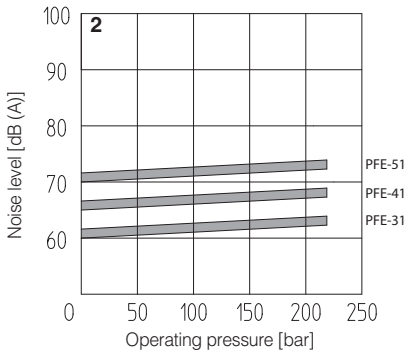
Installation position		Any position	
Loads on the shaft		Axial and radial loads are not allowed on the shaft. The coupling should be sized to absorb the power peak.	
Ambient temperature		**Standard** = -25°C ÷ +80°C **/PE** option -15°C ÷ +80°C	
Fluid		Hydraulic oil as per DIN 51524...535; for other fluids see section 1	
Recommended viscosity		max at cold start: 800 mm²/s; max at full power 100 mm²/s; during operation 24 mm²/s; min at full power 10 mm²/s	
Max fluid contamination level	normal operation	ISO4406 class 21/19/16 NAS1638 class 10	see also filter section at KTF catalog
	longer life	ISO4406 class 18/16/13 NAS1638 class 8	
Fluid temperature		-20°C +60°C -20°C +50°C (water glycol) -20°C +80°C (/PE seals)	
Recommended pressure on inlet port		from -0,15 to 1,5 bar for speed up to 1800 rpm; from 0 to +1,5 bar for speed over 1800 rpm	
Compliance		RoHS Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006	

4 DIAGRAMS (based on mineral oil ISO VG 46 at 50°C)

1 = Torque versus pressure diagram

2 = Ambient noise levels measured in compliance with ISO 4412-1 oleohydraulics -Test procedure to define the ambient noise level - Pumps
Shaft speed: 1450 rpm.

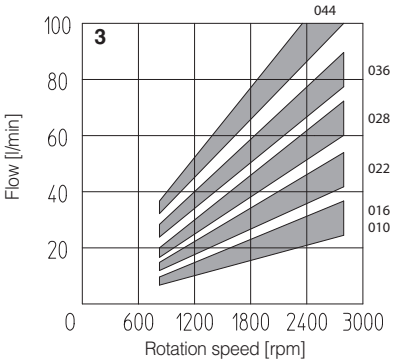


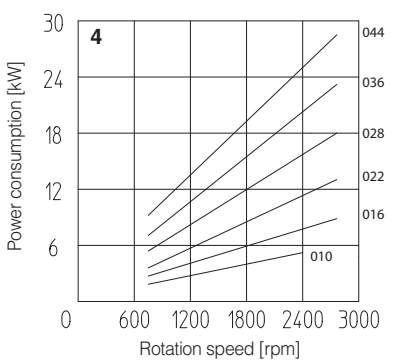


PFE-31:

3 = Flow versus speed diagram with pressure variation from 7 bar to 210 bar.

4 = Power consumption versus speed diagram at 140 bar. Power consumption is proportional to operating pressure.

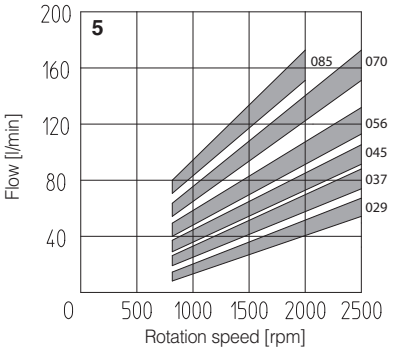


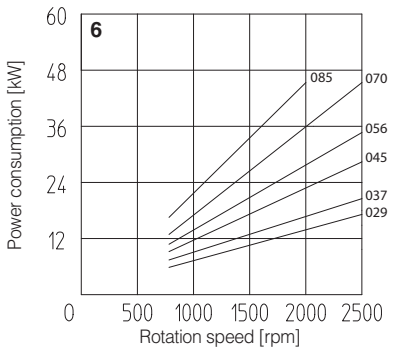


PFE-41:

5 = Flow versus speed diagram with pressure variation from 7 bar to 210 bar.

6 = Power consumption versus speed diagram at 140 bar. Power consumption is proportional to operating pressure.

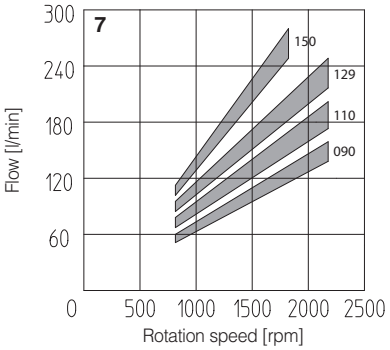


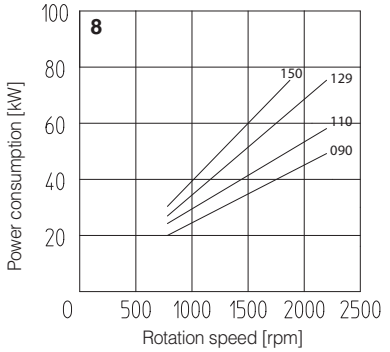


PFE-51:

7 = Flow versus speed diagram with pressure variation from 7 bar to 210 bar.

8 = Power consumption versus speed diagram at 140 bar. Power consumption is proportional to operating pressure.



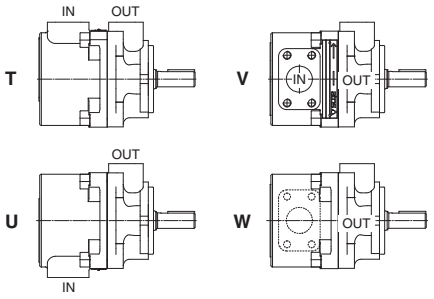


5 PORT ORIENTATION

Single pumps can be supplied with oil ports oriented in different configuration in relation to the drive shaft, as follows (wiewed from the shaft end);

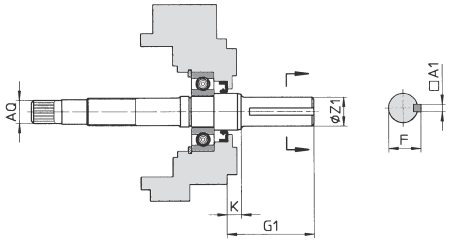
T = inlet and outlet ports on the same axis (standard)
U = outlet orientated 180° with respect to the inlet
V = outlet oriented 90° with respect to the inlet
W = outlet oriented 270° with respect to the inlet

In multiple pumps inlet ports and outlet ports are in line.
Ports orientation can be easily changed by rotating the pump body that carries inlet port.



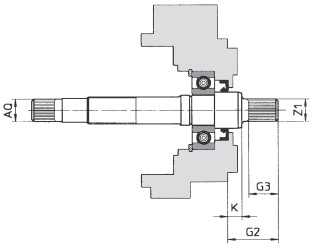
6 DRIVE SHAFT

CYLINDRICAL SHAFT KEYED
1 = for single and multiple pumps (only first position) supplied as standard if not specified in the model code
2 = for single and multiple pumps (only first position) long version (only for PFE-41 and PFE-51)
3 = for single and multiple pumps (only first position) for high torque applications



Model	Keyed shaft type 1 (standard)						Keyed shaft type 2						Keyed shaft type 3					
	A1	F	G1	K	ØZ1	Only for through shaft execution Ø AQ	A1	F	G1	K	ØZ1	Only for through shaft execution Ø AQ	A1	F	G1	K	ØZ1	Only for through shaft execution Ø AQ
PFE-31	4,78	21,11	56,00	8,00	19,05	SAE 16/32-9T	–	–	–	–	–	–	4,78	24,54	56,00	8,00	22,22	SAE 16/32-9T
	4,75	20,94			19,00								4,75	24,41			22,20	
PFE-41	4,78	24,54	59,00	11,40	22,22	SAE 32/64-24T	6,36	25,03	71,00	8,00	22,22	SAE 32/64-24T	6,38	28,30	78,00	11,40	25,38	SAE 32/64-24T
	4,75	24,41			22,20		6,35	24,77			22,20		6,35	28,10			25,36	
PFE-51	7,97	35,33	73,00	14	31,75	SAE 16/32-13T	7,95	35,33	84,00	8,10	31,75	SAE 16/32-13T	7,97	38,58	84,00	14	34,90	SAE 16/32-13T
	7,94	35,07			31,70		7,94	35,07			31,70		7,94	38,46			34,88	

SPLINED SHAFT
5 = for single and multiple pumps (any position)
for PFE-31 according to SAE A 16/32 DP, 9 teeth;
for PFE-41 according to SAE B 16/32 DP, 13 teeth;
for PFE-51 according to SAE C 12/24 DP, 14 teeth;
6 = for single and multiple pumps (only first position)
for PFE-31 and PFEX*-31 according to SAE B 16/32 DP, 13 teeth;
for PFE-41 and PFEX*-41 according to SAE C 12/24 DP, 14 teeth;
7 = for second and third position pump in multiple configuration:
for PFEX*-31 according to SAE B 16/32 DP, 13 teeth;
for PFEX*-41 according to SAE C 12/24 DP, 14 teeth;



Model	Splined shaft type 5					Splined shaft type 6					Splined shaft type 7				
	G2	G3	K	Z1	Only for through shaft execution Ø AQ	G2	G3	K	Z1	Only for through shaft execution Ø AQ	G2	G3	K	Z1	Only for through shaft execution Ø AQ
PFE-31	32,00	19,50	6,50	SAE 16/32-9T	SAE 16/32-9T	41,00	28	8,00	SAE 16/32-13T	SAE 16/32-9T	32,00	19	8,00	SAE 16/32-13T	SAE 16/32-9T
PFE-41	41,25	28	8,00	SAE 16/32-13T	SAE 32/64-24T	55,60	42	8,00	SAE 12/24-14T	SAE 32/64-24T	41,60	28	8,00	SAE 12/24-14T	SAE 32/64-24T
PFE-51	56,00	42	8,10	SAE 12/24-14T	SAE 16/32-13T	–	–	–	–	–	–	–	–	–	–

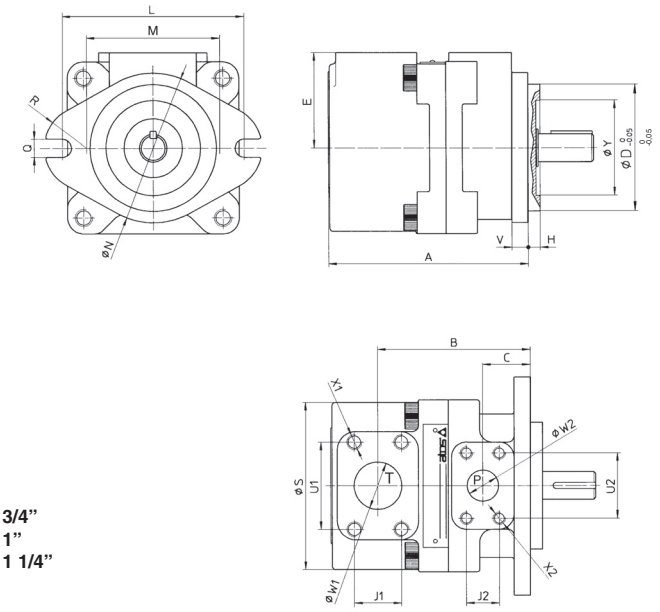
7 LIMITS OF SHAFT TORQUE

Pump model	Maximum driving torque [Nm]						Maximum torque available at the end of the through shaft [Nm]
	Shaft type 1	Shaft type 2	Shaft type 3	Shaft type 5	Shaft type 6	Shaft type 7	Any type of shaft
PFE-31	160	–	240	110	240	240	130
PFE-41	250	250	400	200	400	400	250
PFE-51	500	500	850	450	–	–	400

The values of torque required to operate the pumps are shown for each type on the “torque versus pressure” diagram at section 4.
In multiple pumps the total torque applied to the shaft of the first element (drive shaft) is the sum of the single torque needed for operating each single pump and it is necessary to verify that this total torque applied to the drive shaft is not higher than the values indicated in the table.

8 DIMENSIONS OF SINGLE PUMPS [mm]

T = inlet port
P = outlet port



SAE FLANGES
PFE-31: port **T = 1 1/4"**; port **P = 3/4"**
PFE-41: port **T = 1 1/2"**; port **P = 1"**
PFE-51: port **T = 2**; port **P = 1 1/4"**

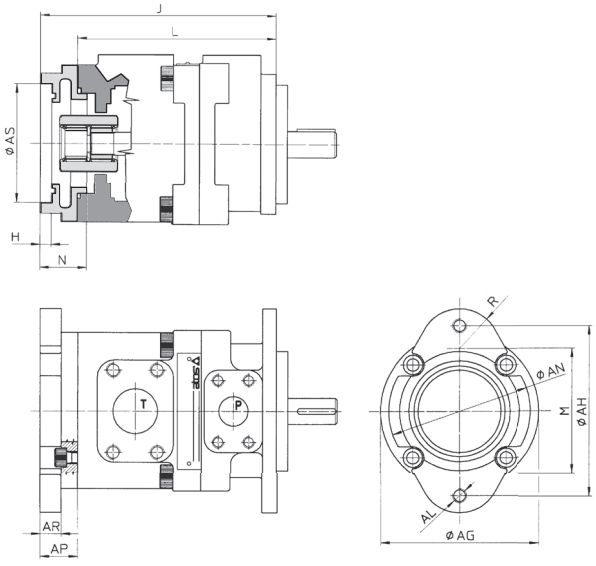
Mass:
PFE-31 = 9 kg
PFE-41 = 14 kg
PFE-51 = 25,5 kg

SAE flanges can be supplied with the pump

Model	A	B	C	ØD	E	H	L	M	ØN	Q	R
PFE-31	136	100	28	82,55	70	6,4	106	73	95	11,1	28,5
PFE-41	160	120	38	101,6	76,2	9,7	146	107	120	14,3	34
PFE-51	186,5	125	38	127	82,6	12,7	181	143,5	148	17,5	35
Model	**ØS**	**U1**	**U2**	**V**	**ØW1**	**ØW2**	**J1**	**J2**	**X1**	**X2**	**ØY**
PFE-31	114	58,7	47,6	10	32	19	30,2	22,2	M10X20	M10X17	47
PFE-41	134	70	52,4	13	38	25	35,7	26,2	M12X20	M10X17	76
PFE-51	160	77,8	58	15	51	32	42,9	30,2	M12X20	M10X20	76

9 DIMENSIONS OF PUMPS WITH THROUGH-SHAFT (FOR MULTIPLE PUMPS) [mm]

T = inlet port
P = outlet port



SAE FLANGES
PFEX-31: port **T = 1 1/4"**; port **P = 3/4"**
PFEX-41: port **T = 1 1/2"**; port **P = 1"**
PFEX-51: port **T = 2**; port **P = 1 1/4"**

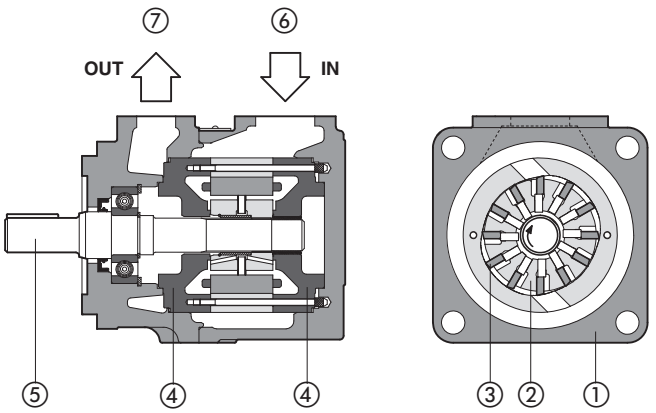
For other dimensions, see section 8

Model	Ø AG	Ø AH	AL	Tightening torque (Nm)(1)	Ø AN	AP	AR	Ø AS	H	J	L	M	N	R
PFEXA-31	114	106	M10X17	70	95	33	25	82,57 82,63	6,42 6,47	165,5	132,5	79	32	28,5
PFEXA-41	134	106	M10X17	70	95	23	11	82,57 82,63	6,42 6,47	194	171	73	32	28,5
PFEXB-41	134	146	M12	125	120	32	18	101,62 101,68	9,73 9,78	203	171	107	41	34
PFEXA-51	134	106	M10X17	70	95	22,7	11	82,57 82,63	6,42 6,47	206,2	183,5	73	32	28,5
PFEXB-51	134	146	M12	125	120	32	18	101,62 101,68	9,73 9,78	215,5	183,5	107	41	34
PFEXC-51	134	181	M16	300	148	46,5	30,7	127,02 127,02	12,73 12,78	230	183,5	143,5	56	35

(1) Tightening torque for screw class 12.9

Vane pumps type PFE-32, PFE-42, PFE-52

fixed displacement - cartridge design - high pressure and low noise level execution



① body
②③ rotor with vanes
④ balanced plates
⑤ shaft
⑥ inlet port
⑦ outlet port

PFE-42

New PFE-*2 are fixed displacement -twelve-vanes pumps ②③, cartridge design with integral hydraulic balancing ④ for high pressure operation and long service life with further reduction of noise level compared with PFE-*1.

These pumps are available as single, multiple or with through-shaft configuration.
Mounting flange according to SAE J744 standard.
Easy installation as inlet and outlet ports can be assembled in any of four relative positions.
Easy maintenance as the pumping cartridge can be replaced in a few minutes.

Three different sizes with max displacements up to 36, 85 and 150 cm³/rev.
Max pressures up to 300 bar.

1 MODEL CODE

PFE	X2	-	42	045	/	31028	/	3	D	T	*	/	*

PFE: Fixed displacement vane pump

X2: Additional suffix for multiple pumps:
X2 = double pump composed of single vane pumps
X3 = triple pump composed of single vane pumps
Additional suffix for pumps with through shaft:
XA = for coupling one PFE-31
XB = for coupling one PFE-41 (only for PFE-42 and PFE-52)
XC = for coupling one PFE-51 (only for PFE-52)
XO = with through shaft, without rear flange
Note: mulitple pumps are assembled in decreasing order of size. See also tab. A190.

42: Size, see section 2:
32, 42, 52

045: Displacement [cm³/rev], see section 2
for PFE 32: **016, 022, 028, 036**
for PFE 42: **045, 056, 070, 085**
for PFE 52: **090, 110, 129, 150**

31028: Only for multiple pumps PFEX*: type of second (and third) pump

3: Drive shaft, see section 6 and 7:
cylindrical, keyed for single and multiple pump (only first position)
3 = for high torque applications
splined
5 = for single and multiple pumps (any position)
6 = for single and multiple pumps (only first position)
7 = for second and third position in multiple pumps
} only for PFE-32 and PFE-42

D: Direction of rotation (viewed from the shaft end):
D = clockwise (supplied standard if not otherwise specified)
S = counterclockwise
Note: PFE are not reversible and it is therefore necessary to specify the desired direction of rotation

T: Port orientation, see section 5:
T = standard
U, V, W = on request

*****: Series number

*****: Seals material:
omit for NBR (mineral oil & water glycol)
PE = FPM

2 OPERATING CHARACTERISTICS at 1450 rpm (based on mineral oil ISO VG 46 at 50°C)

Model	Displacement cm³/rev	Max pressure (1)	Speed range rpm (2)	7 bar (3)		140 bar (3)		at max. pressure (3)	
				l/min	kW	l/min	kW	l/min	kW
PFE-32016	16,5	210 bar	1000-2500	23	0,35	20	6	16	10
PFE-32022	21,6	300 bar	1200-2500	30	0,6	26	7	20	16
PFE-32028	28,1			40	0,8	36	10	30	20
PFE-32036	35,6			51	1	46	12,5	40	26
PFE-42045	45	280 bar	1000-2200	64	1,3	60	16	56	31
PFE-42056	55,8			80	1,6	75	21	70	40
PFE-42070	69,9	250 bar		101	2	95	26	90	42
PFE-42085	85,3	210 bar	800-2000	124	2,4	118	32	114	43
PFE-52090	90	250 bar	1000-2000	128	2,7	119	33	111	54
PFE-52110	109,6			157	3,2	147	40	138	66
PFE-52129	129,2			186	3,7	174	47	163	78
PFE-52150	150,2	210 bar	800-1800	215	4,2	204	55	197	80

(1) Max pressure is 160 bar for /PE version and water glycol fluid
(2) Max speed is 1800 rpm for /PE versions; 1500 rpm for water glycol fluid
(3) Flow rate and power consumption are proportional to the rotation speed

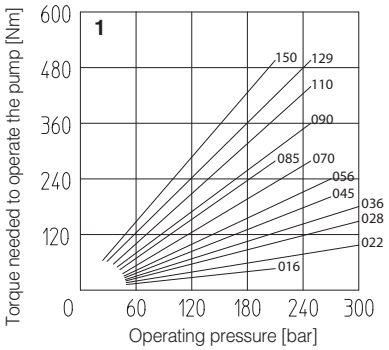
3 MAIN CHARACTERISTICS OF VANE PUMPS TYPE PFE-*2

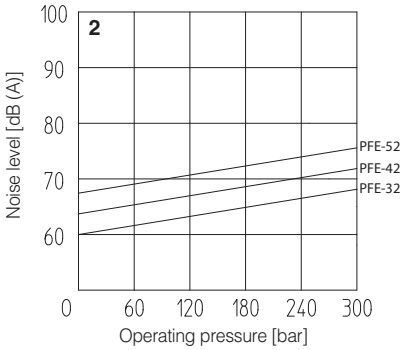
Installation position		Any position	
Loads on the shaft		Axial and radial loads are not allowed on the shaft. The coupling should be sized to absorb the power peak.	
Ambient temperature		**Standard** = -25°C ÷ +80°C **/PE** option -15°C ÷ +80°C	
Fluid		Hydraulic oil as per DIN 51524...535; for other fluids see section 1	
Recommended viscosity		max at cold start: 800 mm²/s; max at full power 100 mm²/s; during operation 24 mm²/s; min at full power 10 mm²/s	
Max fluid contamination level	normal operation	ISO4406 class 21/19/16 NAS1638 class 10	see also filter section at KTF catalog
	longer life	ISO4406 class 18/16/13 NAS1638 class 8	
Fluid temperature		-20°C +60°C -20°C +50°C (water glycol) -20°C +80°C (/PE seals)	
Recommended pressure on inlet port		from -0,15 to 1,5 bar for speed up to 1800 rpm; from 0 to +1,5 bar for speed over 1800 rpm	
Compliance		RoHS Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006	

4 DIAGRAMS (based on mineral oil ISO VG 46 at 50°C)

1 = Torque versus pressure diagram

2 = Ambient noise levels measured in compliance with ISO 4412-1 oleohydraulics -Test procedure to define the ambient noise level - Pumps
Shaft speed: 1450 rpm.

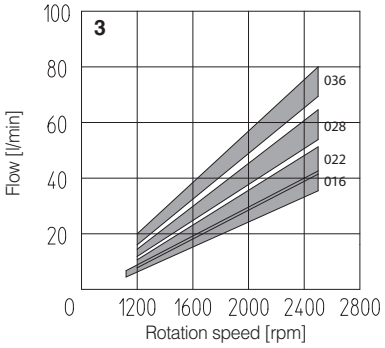


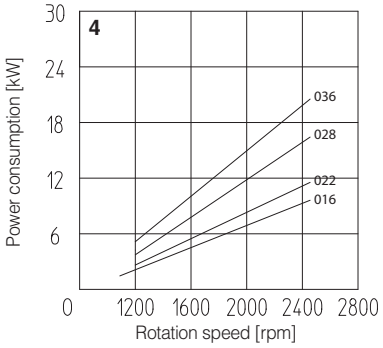


PFE-32:

3 = Flow versus speed diagram with pressure variation from 7 bar to 210 bar.

4 = Power consumption versus speed diagram at 140 bar. Power consumption is proportional to operating pressure.

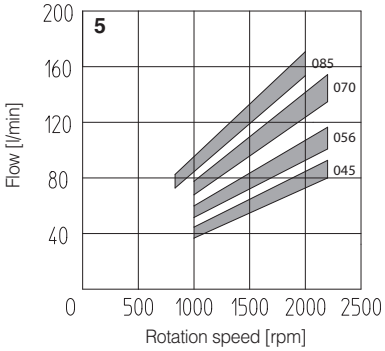


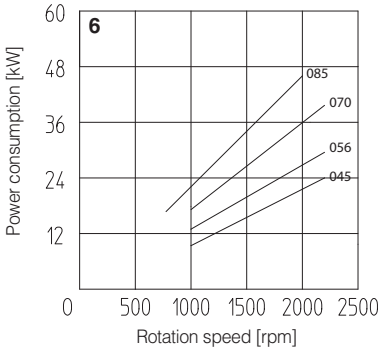


PFE-42:

5 = Flow versus speed diagram with pressure variation from 7 bar to 210 bar.

6 = Power consumption versus speed diagram at 140 bar. Power consumption is proportional to operating pressure.

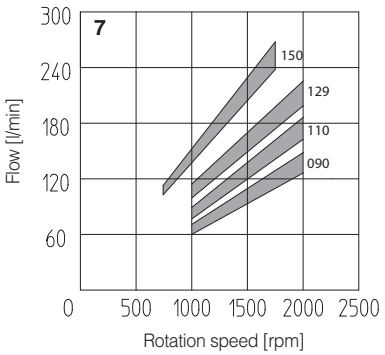


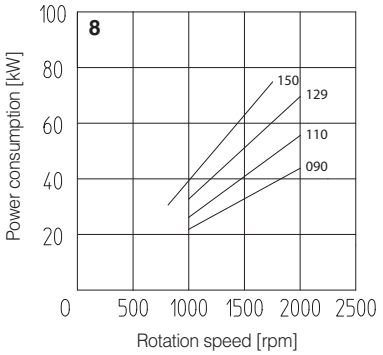


PFE-52:

7 = Flow versus speed diagram with pressure variation from 7 bar to 210 bar.

8 = Power consumption versus speed diagram at 140 bar. Power consumption is proportional to operating pressure.



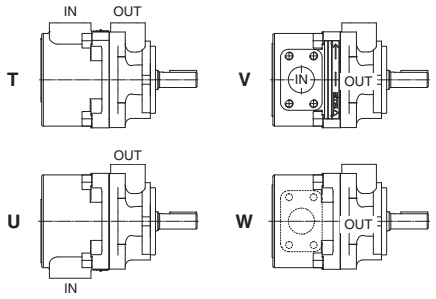


5 PORT ORIENTATION

Single pumps can be supplied with oil ports oriented in different configuration in relation to the drive shaft, as follows (wiewed from the shaft end);

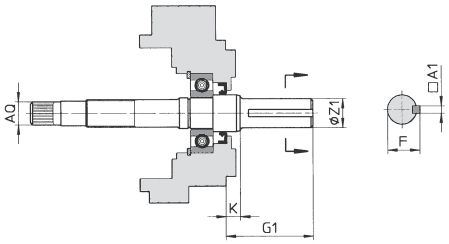
T = inlet and outlet ports on the same axis (standard)
U = outlet orientated 180° with respect to the inlet
V = outlet oriented 90° with respect to the inlet
W = outlet oriented 270° with respect to the inlet

In multiple pumps inlet ports and outlet ports are in line.
Ports orientation can be easily changed by rotating the pump body that carries inlet port.



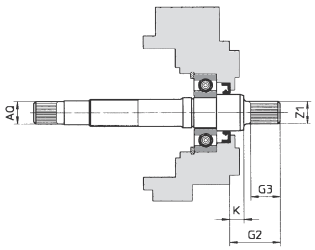
6 DRIVE SHAFT

CYLINDRICAL KEYED SHAFT
3 = for single and multiple pumps (only first position)
for high torque applications



Model	Keyed shaft type 3					
	A1	F	G1	K	ØZ1	Only for through shaft execution Ø AQ
PFE-32	4,78	24,54	56,00	8,00	22,22	SAE 16/32-9T
	4,75	24,41			22,20	
PFE-42	6,38	28,30	78,00	11,40	25,38	SAE 32/64-24T
	6,35	28,10			25,35	
PFE-52	7,97	38,58	84,00	14	34,90	SAE 16/32-13T
	7,94	38,46			34,88	

SPLINED SHAFT
5 = for single and multiple pumps (any position)
for PFE-32 according to SAE A 16/32 DP, 9 teeth;
for PFE-42 according to SAE B 16/32 DP, 13 teeth;
for PFE-52 according to SAE C 12/24 DP, 14 teeth;
6 = for single and multiple pumps (only first position)
for PFE-32 and PFEX*-32 according to SAE B 16/32 DP, 13 teeth;
for PFE-42 and PFEX*-42 according to SAE C 12/24 DP, 14 teeth;
7 = for second and third position pump in multiple configuration:
for PFEX*-32 according to SAE B 16/32 DP, 13 teeth;
for PFEX*-42 according to SAE C 12/24 DP, 14 teeth;



Model	Splined shaft type 5					Splined shaft type 6					Splined shaft type 7				
	G2	G3	K	Z1	Only for through shaft execution Ø AQ	G2	G3	K	Z1	Only for through shaft execution Ø AQ	G2	G3	K	Z1	Only for through shaft execution Ø AQ
PFE-32	32,00	19,50	6,50	SAE 16/32-9T	SAE 16/32-9T	41,00	28	8,00	SAE 16/32-13T	SAE 16/32-9T	32,00	19	8,00	SAE 16/32-13T	SAE 16/32-9T
PFE-42	41,25	28	8,00	SAE 16/32-13T	SAE 32/64-24T	55,60	42	8,00	SAE 12/24-14T	SAE 32/64-24T	41,60	28	8,00	SAE 12/24-14T	SAE 32/64-24T
PFE-52	55,60	42	8,10	SAE 12/24-14T	SAE 16/32-13T	–	–	–	–	–	–	–	–	–	–

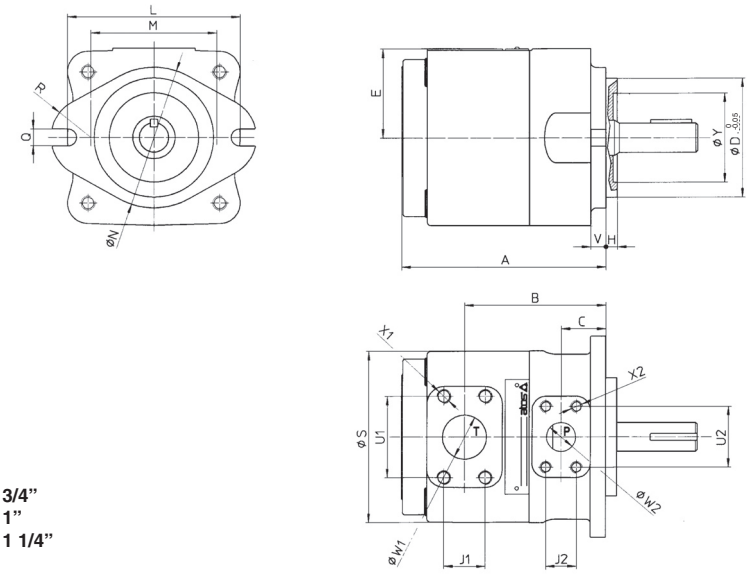
7 LIMITS OF SHAFT TORQUE

Pump model	Maximum driving torque [Nm]				Maximum torque available at the end of the through shaft [Nm]
	Shaft type 3	Shaft type 5	Shaft type 6	Shaft type 7	Any type of shaft
PFE-32	240	110	240	240	130
PFE-42	400	200	400	400	250
PFE-52	850	450	–	–	400

The values of torque required to operate the pumps are shown for each type on the “torque versus pressure diagram” at section 4.
In multiple pumps the total torque applied to the shaft of the first element (drive shaft) is the sum of the single torque needed for operating each single pump and it is necessary to verify that this total torque applied to the drive shaft is not higher than the values indicated in the table.

8 DIMENSIONS OF SINGLE PUMPS [mm]

T = inlet port
P = outlet port



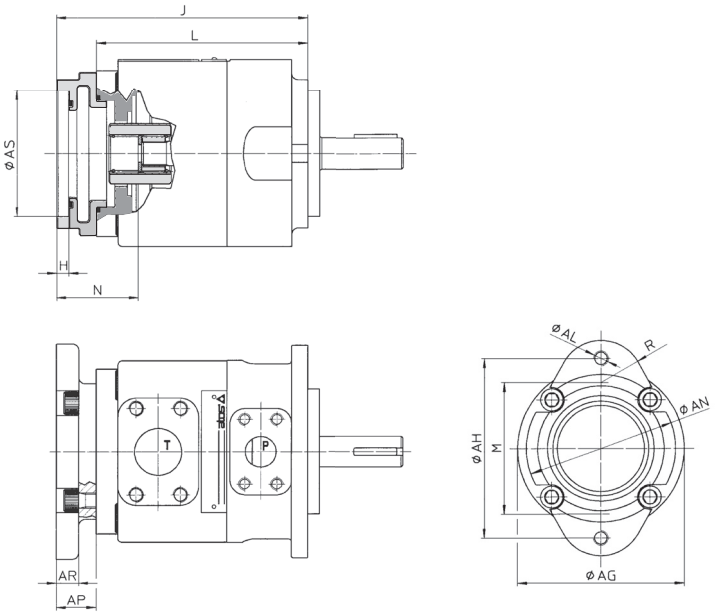
SAE FLANGES
PFE-32: port **T = 1 1/4”**; port **P = 3/4”**
PFE-42: port **T = 1 1/2”**; port **P = 1”**
PFE-52: port **T = 2**; port **P = 1 1/4”**

Mass:
PFE-32 = 9 kg
PFE-42 = 20,5 kg
PFE-52 = 32,1 kg

Model	A	B	C	ØD	E	H	L	M	ØN	Q	R
PFE-32	136	100	28	82,5	70	6,4	106	73	95	11	28,5
PFE-42	175,5	121	38	101,6	78	9,7	146	107	121	14,3	34
PFE-52	189	125	38	127	89	12,7	181	143,5	148	17,5	35
Model	**ØS**	**U1**	**U2**	**V**	**ØW1**	**ØW2**	**J1**	**J2**	**X1**	**X2**	**ØY**
PFE-32	114	58,7	47,6	10	32	19	30,2	22,2	M10X20	M10X17	47
PFE-42	148	70	52,4	13	38	25	35,7	26,2	M12X20	M10X17	76
PFE-52	174	77,8	58,7	16,3	50	50	42,9	30,2	M12X20	M10X20	76

9 DIMENSIONS OF PUMPS WITH THROUGH-SHAFT (FOR MULTIPLE PUMPS) [mm]

T = inlet port
P = outlet port



SAE FLANGES
PFEX-32: port **T = 1 1/4”**; port **P = 3/4”**
PFEX-42: port **T = 1 1/2”**; port **P = 1”**
PFEX-52: port **T = 2**; port **P = 1 1/4”**

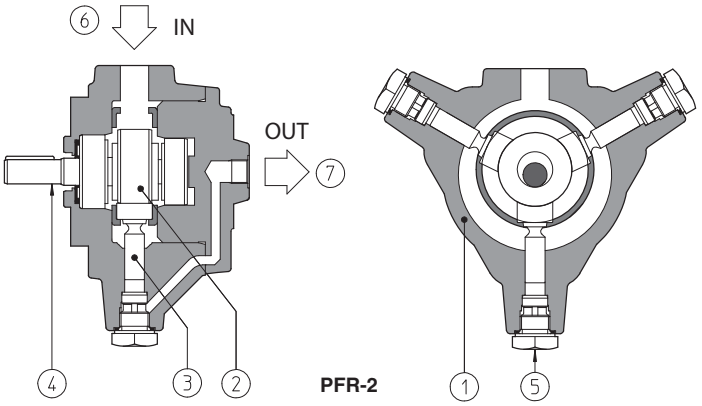
For other dimensions, see section 8

Model	Ø AG	Ø AH	AL	Tightening torque (Nm)(1)	Ø AN	AP	AR	Ø AS	H	J	L	M	N	R
PFEXA-32	114	106	M10X17	70	95	33	25	82,57 82,63	6,42 6,47	193,7	132,5	79	32	28,5
PFEXA-42	134	106	M10X17	70	95	22,7	11	82,57 82,63	6,42 6,47	194	171	73	34	28,5
PFEXB-42	134	146	M12	125	120	32	18	101,62 101,68	9,73 9,78	203	171	107	43	34
PFEXA-52	134	106	M10X17	70	95	22,7	11	82,57 82,63	6,42 6,47	206,2	183,5	73	34,5	28,5
PFEXB-52	134	146	M12	125	120	32	18	101,62 101,68	9,73 9,78	215,5	183,5	107	43,8	34
PFEXC-52	134	181	M16	300	148	46,7	30,7	127,02 127,02	12,73 12,78	230,2	183,5	143,5	58,5	35

(1) Tightening torque for screw class 12.9

Radial piston pumps type PFR

fixed displacement



① body
② central bearing and return plates
③ radial pistons
④ shaft
⑤ seat of delivery valve
⑥ inlet port
⑦ outlet port

PFR are fixed displacement radial piston pumps with positive drive construction of the pistons ③ (without return spring) for high performance and low noise level.
Suitable for hydraulic oils according to DIN 51524... 535 or synthetic fluids having similar lubricating characteristics.

These pumps are available as single or with through-shaft configuration in order to be coupled to PFE vane pumps, see table A190.

Wide range of displacements from 1,7 up to 25,4 cm³/rev.
Max pressure up to 350/500 bar.

1 MODEL CODE

PFR	XA	-	3	08	**	-	*

PFR: Fixed displacement radial piston pump

XA: Additional suffix for pumps provided to be coupled with vane pump type PFE (tab. A005), see section 9
Only for PFR-3 and PFR-5:
XA = provided (throughgoing shaft, flange and joint) to be coupled with PFE-31
XB = provided (throughgoing shaft, flange and joint) to be coupled with PFE-41
XC = provided (throughgoing shaft, flange and joint) to be coupled with PFE-51
See table A190 for codes of complete multiple pumps: PFR +PFE = PFRX*E

3: Conventional size, see section 2: **2, 3, 5**

08: Displacement [cm³/rev], see section 2
for PFR-2: **02, 03**
for PFR-3: **08, 11, 15**
for PFR-5: **18, 25**

******: Series number

*****: Seals material: omit for NBR (mineral oil & water glycol) **PE** = FPM

2 OPERATING CHARACTERISTICS at 1450 rpm (based on mineral oil ISO VG 46 at 50°C)

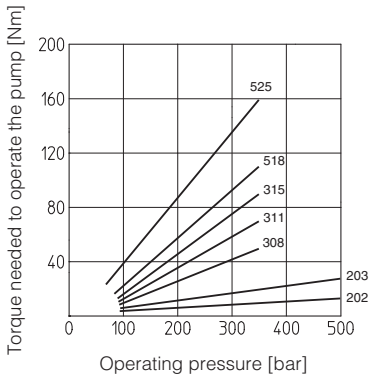
Model	Displacement cm³/rev	Max pressure bar	Speed range rpm	150 bar (3) l/min	kW	250 bar (3) l/min	kW	350 bar (3) l/min	kW	500 bar (3) l/min	kW
PFR-202	1,7	500 (1)	600-1800 (2)	2,4	0,7	2,4	1,1	2,4	1,6	2,4	2,1
PFR-203	3,5			5,0	1,4	5,0	2,2	4,9	3,0	4,9	4,2
PFR-308	8,2	350 (1)		11,8	3,2	11,5	5,6	11,5	7,5	-	-
PFR-311	11,4			16,5	4,5	16,4	7,8	16,2	10	-	-
PFR-315	14,7			21,3	6,3	21,3	10,0	20,9	12,5	-	-
PFR-518	18,1			26	7,7	25,8	12,3	25,6	15,2	-	-
PFR-525	25,4			36,5	11	36	17,3	35,5	21,6	-	-

(1) Max pressure is 250 bar for /PE versions; max pressure is 175 bar for water glycol fluid
(2) Max speed is 1000 rpm for /PE version and for water glycol fluid
(3) Flow rate and power consumption are proportional to rotation speed

3 MAIN CHARACTERISTICS OF FIXED DISPLACEMENT RADIAL PISTON PUMP TYPE PFR

Installation position		Any position. It is advisable to install on the outlet pipe a proper valve for air bleeding. The installation under oil level is recommended. The installation above oil level should be avoided. The shaft of the pump has an eccentric cam which rotates with the shaft generating the stroke of the pistons and thus generating the flow rate. For best functioning a balanced coupling should be provided between the shaft of the motor and the shaft of the pump. See section 10
Commisioning		PFR pumps can be reversed without changing the flow direction. Therefore both directions of rotation are permitted. It is recommend to start the pump by short impulses, with pump case filled and air bleed plugs unlocked. Pumps type PFR-3 and PFR-5 have 2 air bleeds, normally plugged, ports located near to the P ports. To help filling and air bleeding, it could be advisable to install a vertical pipe connected on the intake line, just before the inlet port flange.
Loads on the shaft		Axial and radial loads are not allowed on the shaft. The coupling should be sized to absorb the developed peak horsepower.
Ambient temperature		**Standard** = -25°C ÷ +80°C **/PE** option -15°C ÷ +80°C
Fluid		Hydraulic oil as per DIN 51524...535; for other fluids see section 1
Recommended viscosity		max at cold start: 800 mm²/s; max at full power 100 mm²/s; during operation 24 mm²/s; min at full power 10 mm²/s
Max fluid contamination level	normal operation	ISO4406 class 21/19/16 NAS1638 class 10 — see also filter section at KTF catalog
	longer life	ISO4406 class 18/16/13 NAS1638 class 8
Fluid temperature		-20°C +60°C -20°C +50°C (water glycol) -20°C +80°C (/PE seals)
Recommended pressure on inlet port		from -0,1 to 1,5 bar for speed up to 1800 rpm
Compliance		RoHS Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

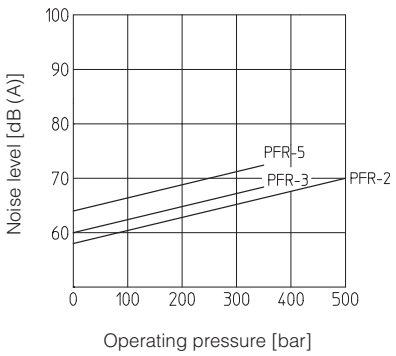
4 TORQUE VERSUS PRESSURE DIAGRAM



5 NOISE LEVEL

Ambient noise levels measured in compliance with ISO 4412-1 oleohydraulics -Test procedure to define the ambient noise level - Pumps

Shaft speed: 1450 rpm. Mineral oil ISO VG 46 at 50°C.



6 LIMIT OF SHAFT TORQUE

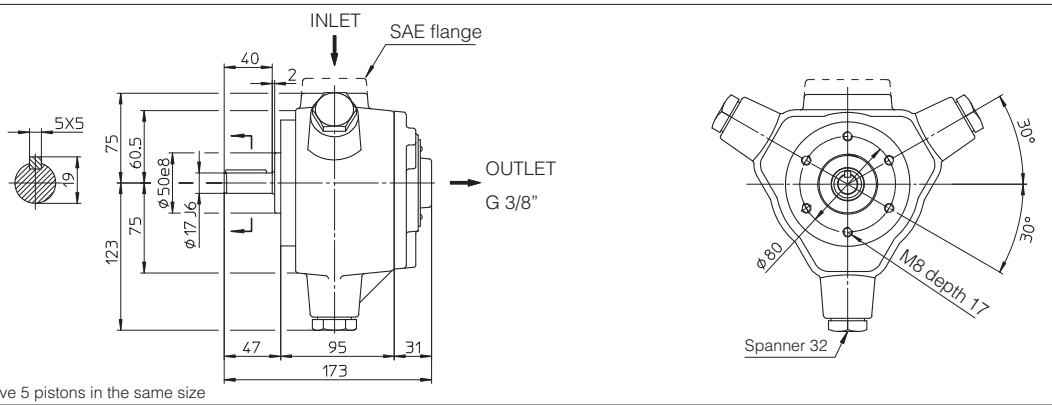
Pump model	Maximum driving torque [Nm]	Maximum torque available on the end of the through shaft [Nm]
PFR-2	200	=
PFR-3	600	320
PFR-5	800	320

The values of torque needed to operate the pumps are shown for each type on the "torque versus pressure diagram" at section 4.
In multiple pumps the total torque applied to the shaft of the first element (drive shaft) is the sum of the single torque needed for operating each single pump and it is necessary to verify that this total torque applied to the drive shaft is not higher than the values indicated in the table.

7 DIMENSIONS OF SINGLE PUMPS [mm]

PFR-2

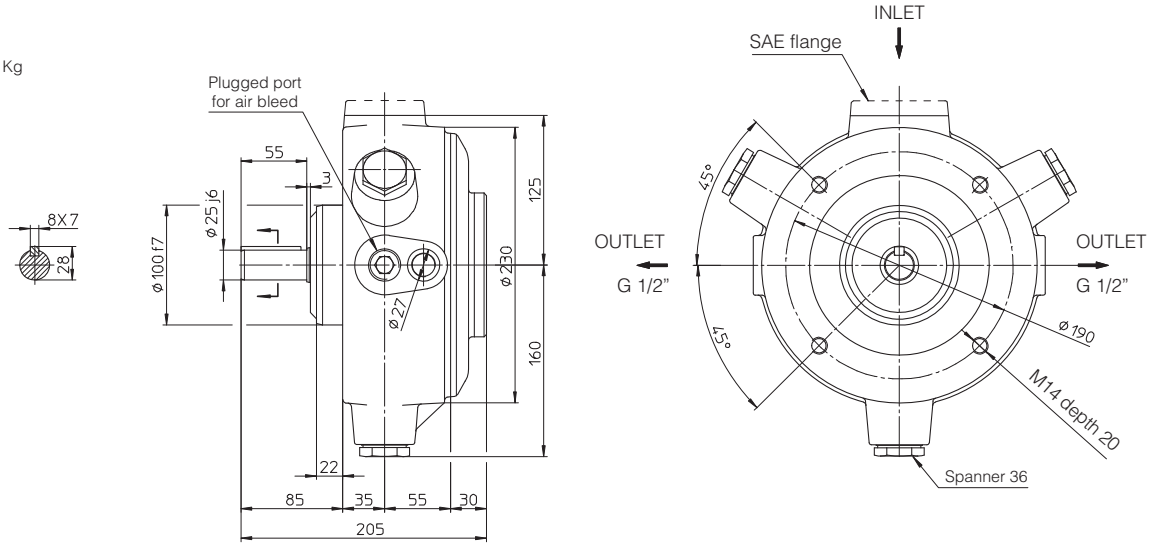
Mass: 12 Kg



Note: PFR-206 have 5 pistons in the same size

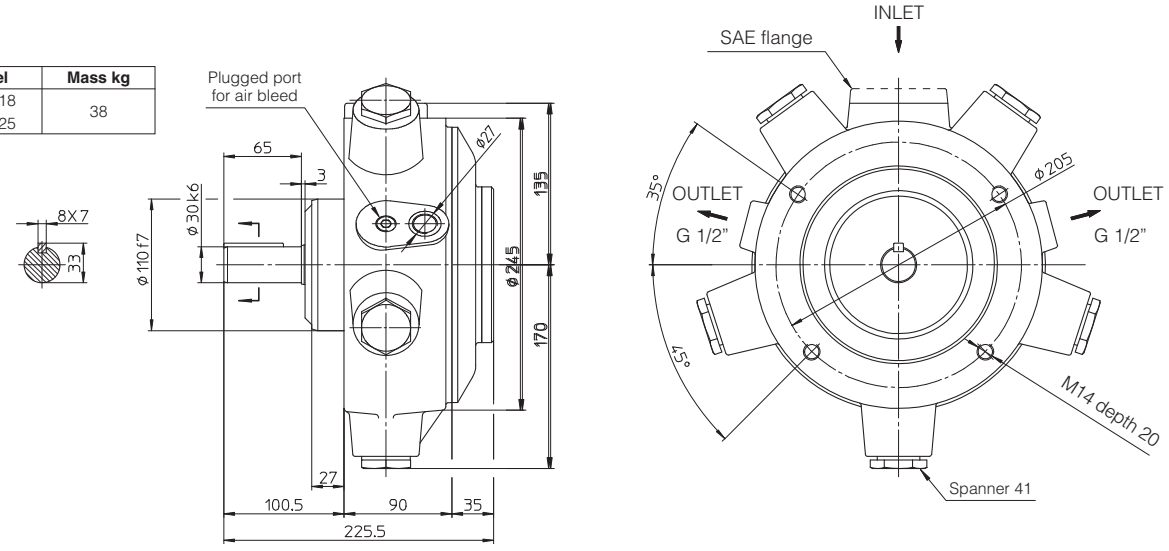
PFR-3

Mass: 31 Kg



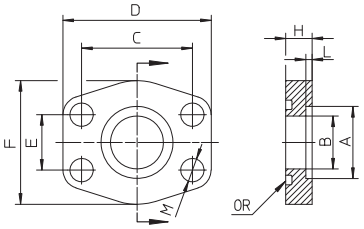
PFR-5

Model	Mass kg
PFR-518 PFR-525	38



(•) **SAE flanges are supplied with the pump**

8 SAE-3000 FLANGES supplied with the pump [mm]

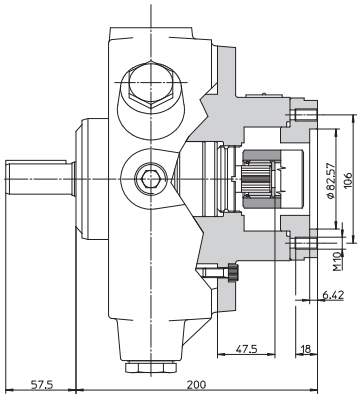


Flanges are supplied with seal and screws M10 class 12.9
Tightening torque = 70 Nm

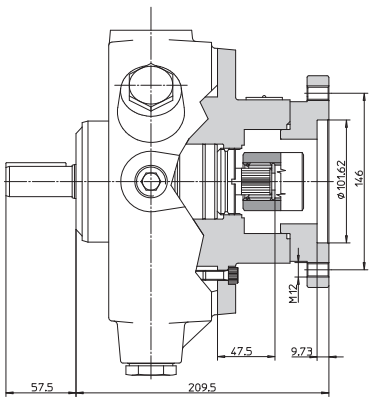
Pump model	Flange code	A	B	C	D	E	F	H	L	M	OR	Screws
PFR - 2	WFA-25	35,5	29	52,37	70	26,19	55	12	4	ø 11	4131	M10x30
PFR - 3 PFR - 5	WFA-32	42,5	34	58,72	79	30,18	68	12	4	ø 11,5	4150	M10x35

9 DIMENSIONS OF PUMPS PROVIDED TO BE COUPLED WITH VANE PUMPS [mm]

PFRXA-3



PFRXB-3



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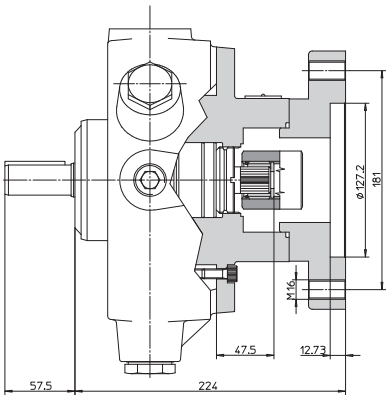

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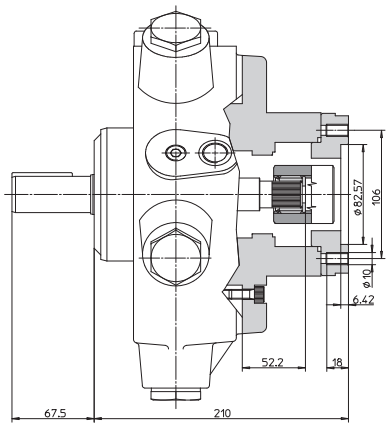

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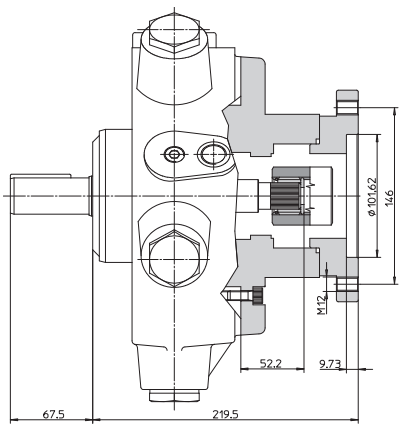

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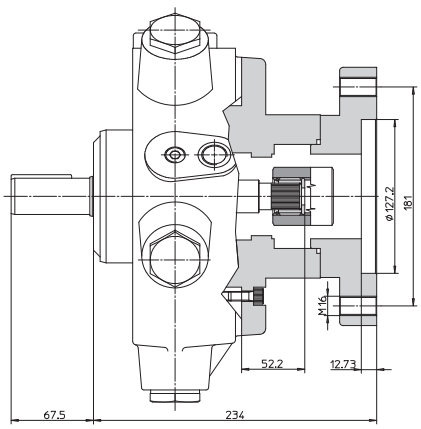


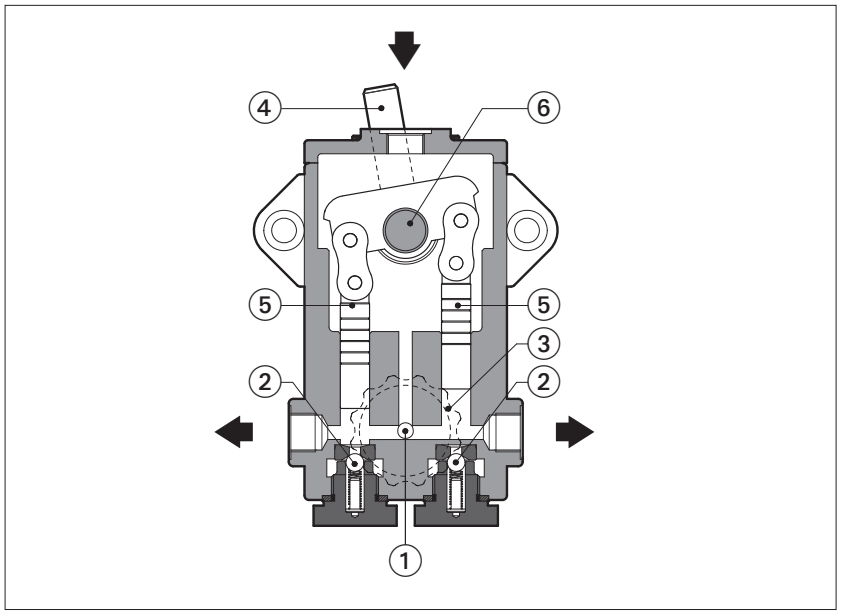
10 BALANCED COUPLING

The balanced couplings permit to minimize the vibrations caused by the unbalanced mass during the pump rotation.
The couplings listed in the table, supplied by Atos, must be used together with the relevant bell housing (supplied by Scoda). The table lists the codes of the Atos balanced couplings and the Scoda bell housing, available for the several pumps and for the standardized sizes of the electrical motors.

PUMP MODEL	ELECTRICAL MOTOR	BALANCED COUPLING	BELL HOUSING
PFR-202	UNEL-MEC 100-112	Y-GB-82/02	Y-LS4P2
	UNEL-MEC 132	Y-GB-122/02	Y-LS6P2
PFR-203	UNEL-MEC 100-112	Y-GB-82/03	Y-LS4P2
	UNEL-MEC 132	Y-GB-122/03	Y-LS6P2
PFR-308	UNEL-MEC 100-112	Y-GB-83/08	Y-LS4P3
	UNEL-MEC 132	Y-GB-123/08	Y-LS6P3
	UNEL-MEC 160	Y-GB-303/08	Y-LS7P3
PFR-311	UNEL-MEC 100-112	Y-GB-83/11	Y-LS4P3
	UNEL-MEC 132	Y-GB-123/11	Y-LS6P3
	UNEL-MEC 160	Y-GB-303/11	Y-LS7P3
PFR-315	UNEL-MEC 100-112	Y-GB-83/15	Y-LS4P3
	UNEL-MEC 132	Y-GB-123/15	Y-LS6P3
	UNEL-MEC 160	Y-GB-303/15	Y-LS7P3
PFR-518	UNEL-MEC 132	Y-GB-125/18	Y-LS6P5
	UNEL-MEC 160	Y-GB-305/18	Y-LS7P5
	UNEL-MEC 180	Y-GB-605/18	
PFR-525	UNEL-MEC 132	Y-GB-125/25	Y-LS6P5
	UNEL-MEC 160	Y-GB-305/25	Y-LS7P5
	UNEL-MEC 180	Y-GB-605/25	

Hand pumps type PM

2-plunger

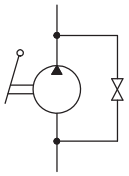


PM are double alternate-acting hand pumps with simple and rugged construction for minimum service and long operating life.
They are provided with one by-pass valve ① which connects directly the delivery ports with the inlet port through the delivery valves ②. The by-pass valve is operated by a handwheel ③.
Pumping operation is made by alternative movement of the lever ④ and consequently movement of plungers ⑤, after having locked the by-pass valve by means of the handwheel.
The splined shaft attachment ⑥ permits to turn the lever shaft in the best position.
On the pump body are available two outlet ports (one supplied plugged).
Suitable for hydraulic oils according to DIN 51524...535 or synthetic fluids having similar lubricating characteristics.
Displacements: from 12 to 20 cm³ for double stroke.
Max pressure 250 bar

1 MODEL CODE

PM	-	112	*	/	*
2-plunger hand pump		Displacement, see section 2 **112**= 12 cm³/double stroke **120**= 20 cm³/double stroke	Series number		Seals material: omit for NBR (mineral oil & water glycol) **PE** = FPM

2 OPERATING CHARACTERISTICS with hydraulic fluid having a viscosity of 24 mm²/s and 40°C

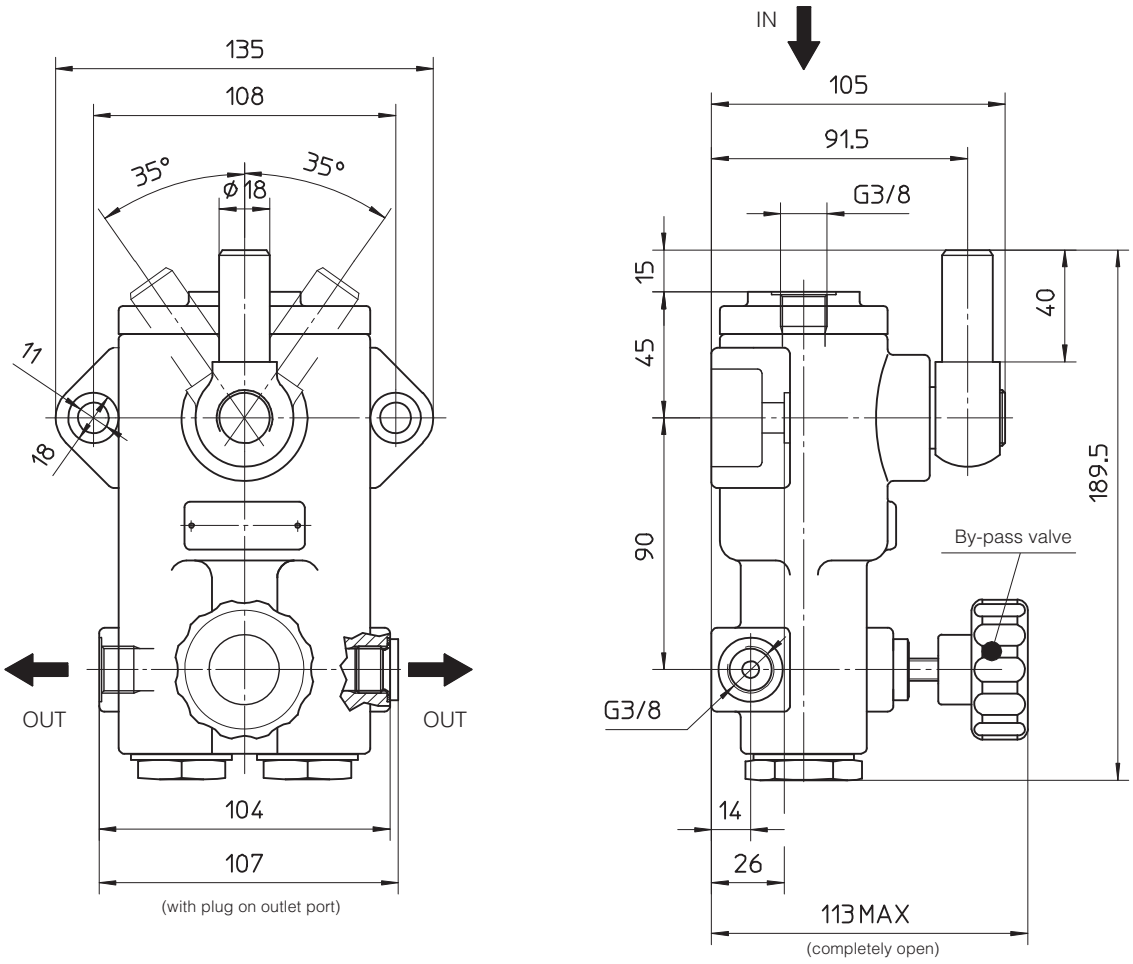


Model	Displacement for double stroke [cm³]	Max pressure [bar]	Shaft rotation angle [degree]	Maximum torque required [Nm]
PM-112	12	250	± 35°	133
PM-120	20	120	± 35°	116

3 MAIN CHARACTERISTICS OF HAND PUMP TYPE PM

Installation position		Vertical position, with inlet port facing upward to ensure complete case filling	
Commissioning		Pumping operation is made by alternative movement of the lever after closing by-pass valve. **Note:** the by-pass valve connects the delivery ports with inlet port and when locked it could allow some leakage from outlet ports. Two opposite outlet ports are available for pump delivery: one of these is supplied plugged. The pumps are supplied without lever harm that could made by a simple tube with Ø 18 mm inside diameter. Usually a lenght of 500 to 600 mm is appropriate. Lever position can be selected by proper assembling of lever on splined shaft.	
Ambient temperature		**Standard** = -25°C ÷ +80°C **/PE** option -15°C ÷ +80°C	
Fluid		Hydraulic oil as per DIN 51524...535; for other fluids see section 1	
Recommended viscosity		10 ÷ 100 mm²/sec at 40°C (ISO VG 15 - 100)	
Max fluid contamination level	normal operation	ISO4406 class 21/19/16 NAS1638 class 10	see also filter section at KTF catalog
	longer life	ISO4406 class 18/16/13 NAS1638 class 8	
Fluid temperature		-20°C +60°C -20°C +50°C (water glycol) -20°C +80°C (/PE seals)	
Compliance		RoHS Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006	

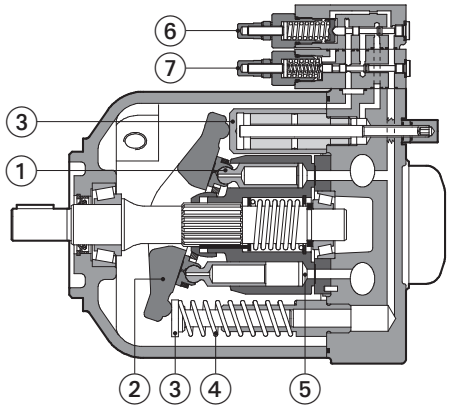
4 DIMENSIONS [mm]



Mass: 4,6 Kg

Axial piston pumps

variable displacement, mechanical controls



① Pistons
② Swash plate
③ Servo piston
④ Spring
⑤ Rotating barrel
⑥ Max pressure compensator
⑦ Load sensing compensator
⑧ Remote pressure transducer

PVPC-L-4046

PVPC

Variable displacement axial piston pumps with swash plate design suited for high pressure open circuits.
They are characterized by low noise emission, short response time and flexible operation thanks to the wilde range of mechanical controls, see section 11.

For PVPC pumps with electrohydraulic proportional controls, see tech table AS170.

SAE J744 mounting flange and shaft.

Max displacement (cm³/rev)	Max pressure working (bar)	Max pressure peak (bar)
29, 46, 73, 140	280	350
88	250	315

1 MODEL CODE

PVPC	X2E	-	C	-	4046	/	1	D	-	X	24DC	*	/	*

PVPC
Variable displacement axial piston pump

X2E
Option for pumps with through shaft (1):
XA = intermediate flange SAE A
XB = intermediate flange SAE B
XC = intermediate flange SAE C (only for size 5073 and 90)
Additional suffix for double pumps:
X2E = with a fixed displacement pump type PFE (see tech table A005)

C
Type of control, see section 11:
C = manual pressure compensator
CH = manual pressure compensator, with venting
R = remote pressure compensator
L = load sensing (pressure & flow)
LW = constant power (combined pressure & flow)
For electrohydraulic proportional controls, see tech table AS170

4046
Size and max displacement (2):
3029 = size 3 - displacement 029 cm³/rev
4046 = size 4 - displacement 046 cm³/rev
5073 = size 5 - displacement 073 cm³/rev
5090 = size 5 - displacement 090 cm³/rev
6140 = size 6 - displacement 140 cm³/rev

1
Shaft, SAE Standard **(3)**:
1 = keyed
5 = splined

D
Direction of rotation, viewed at the shaft end:
D = clockwise
S = counterclockwise

X
X = without connector (only for CH version)
See section 4 for available connectors, to be ordered separately

24DC
Coil voltage, see section 4
(only for CH version)

*****
Series number

*****
Seals material, see section 5 :
- = NBR
PE = FKM

(1) Not available for PVPC-*-6140
(2) Optional intermediate displacements 35 and 53 cm³/rev are available on request
(3) Pumps with ISO 3019/2 mounting flange and shaft (option /M) are available on request

2 GENERAL CHARACTERISTICS

Assembly position - see section 6	Any position. The drain port must be on the top of the pump. Drain line must be separated and unrestricted to the reservoir and extended below the oil level as far from the inlet as possible. Suggested maximum line lenght is 3 m.
Ambient temperature range	**Standard** = -25°C ÷ +80°C **/PE** option -15°C ÷ +80°C
Storage temperature	**Standard** = -40°C ÷ +50°C **/PE** option -20°C ÷ +50°C
Surface protection (pump body)	Black painting RAL9005

3 HYDRAULIC CHARACTERISTICS - based on mineral oil ISO VG 46 at 50 °C

PVPC size		**3029**		**4046**		**5073**		**5090**		**6140**	
Max displacement	(cm^3/rev)	29		46		73		88		140	
Theoretical max flow at 1450 rpm	(l/min)	42		66,7		105,8		127,6		203	
Max working pressure / Peak	(bar)	280/350		280/350		280/350		250/315		280/350 **(1)**	
Min/Max inlet pressure	(bar abs.)	0,8 / 25		0,8 / 25		0,8 / 25		0,8 / 25		0,8 / 25	
Max pressure on drain port	(bar abs.)	1,5		1,5		1,5		1,5		1,5	
Power consumption at 1450 rpm and at max pressure and displacement	(Kw)	19,9		31,6		50,1		54,1		122	
Max torque on the shaft	(shaft type)	Type 1	Type 5	Type 1	Type 5	Type 1	Type 5	Type 1	Type 5	Type 1	Type 5
	(Nm)	210	270	350	440	670	810	670	810	1000	2340
Max torque at max working pressure	(Nm)	128		203		328		350		780	
Speed rating	(rpm)	500 ÷ 3000		500 ÷ 2600		500 ÷ 2600		500 ÷ 2200		500 ÷ 2200	
Body volume	(l)	0,7		0,9		1,5		1,5		2,8	

(1) The maximum pressure can be increased to 350 bar (working) and 420 (peak) after detailed analysis of the application and of the pump working cycle

4 ELECTRICAL CHARACTERISTICS - for PVPC-CH

Insulation class	H
Connector protection degree	IP 65
Relative duty factor	100%
Supply voltage tolerance	± 10%

4.1 COIL VOLTAGE - only for CH version

Average values based ambient/coil temperature of 20°C.

External supply nominal voltage ±10%		**Voltage code**	Power consumption	Nominal courrent	Coil characteristics
DIRECT CURRENT	12 DC 24 DC	**12DC** **24DC**	19,2 W	1,61 A 0,80 A	Insulation Class: **H**
ALTERNATE CURRENT	24 / 50 / 60 AC 110 / 50 / 60 AC 220 / 50 / 60 AC	**24/50/60AC** **110/50/60AC** **220/50/60AC**	19,0 W	0,89 A 0,19 A 0,09 A	Protection degree: **IP65**

4.2 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 - to be ordered separately

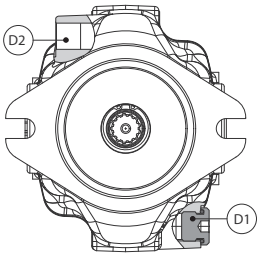
Code of connector	Function
SP-666	Connector IP-65
SP-667	Connector IP-65 but with built-in signal led

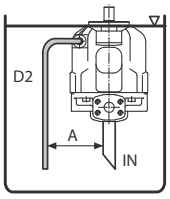
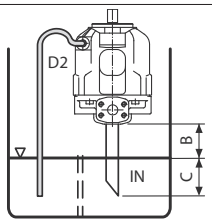
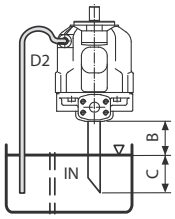
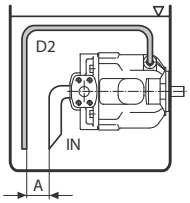
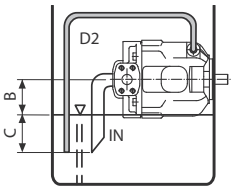
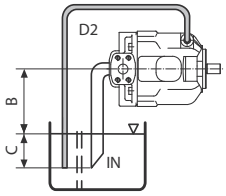
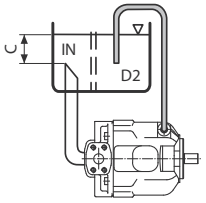
5 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

Seals, recommended fluid temperature		NBR seals (standard) = -25°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity		15÷35 mm^2/s - max allowed range: min 10 cSt (at 80°C) - max 1500 cSt at cold startup (-25°C)		
Max fluid contamination level	normal operation	ISO4406 class 20/18/13 NAS1638 class 9		see also filter section at KTF catalog
	longer life	ISO4406 class 18/16/11 NAS1638 class 7		
Hydraulic fluid		**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils		NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water		FKM	HFDU, HFDR **(1)**	ISO 12922
Flame resistant with water		NBR, HNBR	HFC **(1)**	

(1) Max working pressure must be reduced to: 180 bar (working) / 210 bar (peak) for HFC fluid
200 bar (working) / 240 bar (peak) for HFDU and HFDR fluid

6 INSTALLATION POSITION

<table>
<tr><td rowspan="2"> 

The pump is supplyed whit drain D2 open, and D1 plugged. Before installation fill the pump with hydraulic oil for at least 3/4 of its volume, keeping it in horizontal position. With exception of pump mounted below the oil level, we recomend to interpose a baffle plate between inlet and drain line.</td><td colspan="3">VERTICAL INSTALLATION</td></tr>
<tr><td> 
</td><td> 
</td><td> 
</td></tr>
<tr><td></td><td>INSIDE THE TANK
Minimum oil level equal or above the pump mounting surface.
A ≥ 200mm</td><td>INSIDE THE TANK
Minimum oil level below the pump mounting surface.
Minimum inlet pressure = 0,8 bar absolute
B ≤ 800mm, C= 200mm</td><td>OUTSIDE THE TANK, above oil level
Minimum inlet pressure = 0,8 bar absolute
B ≤ 800mm, C= 200mm</td></tr>
<tr><td colspan="4">HORIZONTAL INSTALLATION</td></tr>
<tr><td> 
</td><td> 
</td><td> 
</td><td> 
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Minimum oil level below the pump mounting surface.
Minimum inlet pressure = 0,8 bar (absolute)
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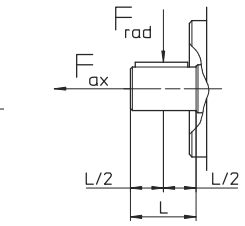
Minimum inlet pressure = 0,8 bar (absolute)
B ≤ 800mm, C= 200mm</td><td>OUTSIDE THE TANK, below oil level
C= 200mm</td></tr>
</table>

IN: inlet line - **D1:** drain line - **A:** minimum distance between inlet and drain line - **B+C:** permissible suction height - **C:** inlet line immersion dept

7 MAX PERMESSIBLE LOAD ON DRIVE SHAFT

PVPC size			**3029**	**4046**	**5073**	**5090**	**6140**
F_{ax} = axial load		N	1000	1500	2000	2000	2000
F_{rad} = radial load		N	1500	1500	3000	3000	3000

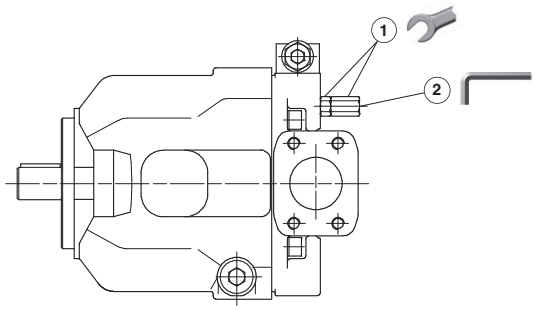
Notes: For speeds over 1800 rpm the inlet port must be under oil level with adequate pipes.
Maximum pressure for all models with water glycol fluid is 160 bar, with option /PE is 190 bar.
Max speed with options /PE and for water glycol fluid is 2000/1900/1600/1500 rpm respectively for the four sizes.

8 VARIATION OF MAX SPEED VS INLET PRESSURE

Inlet pressure	**Displacement %**					
bar abs.	65	70	80	90	100	
0,8	120	115	105	97	90	**% variation of the max. speed**
0,9	120	120	110	103	95	
1,0	120	120	115	107	100	
1,2	120	120	120	113	106	
1,4	120	120	120	120	112	
1,6	120	120	120	120	117	
2,0	120	120	120	120	120	

Example
Displacement: 80% - Inlet pressure: 1,0 bar - Speed: 115%

9 MAX DISPLACEMENT SETTING



1 Locking displacement limiter screw

2 Displacement setting

PVPC size		**3029**	**4046**	**5073**	**5090**	**6140**
Max displacement setting range	from ÷ to	20,1 ÷ 28,7	31,8 ÷ 45,4	36,8 ÷ 73,6	44,0 ÷ 87,9	70 ÷ 140
One turn of screw changes pump displacement by approximately	cm^3/rev	1,5	2,2	3,2	3,2	6,0
For locking displacement limiter screw	mm	14	14	17	17	19
For displacement setting	mm	4	4	5	5	6
Tightening torque	Nm	15 ± 1	15 ± 1	15 ± 1	15 ± 1	20 ± 1

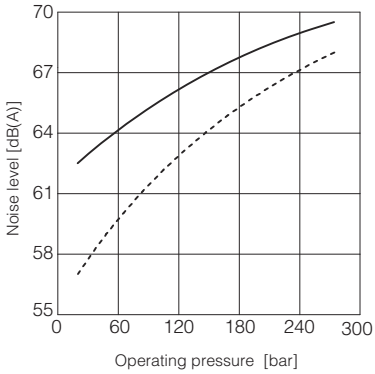
10 DIAGRAMS at 1450 rpm (based on mineral oil ISO VG 46 at 50°C)

10.1 Noise level curves

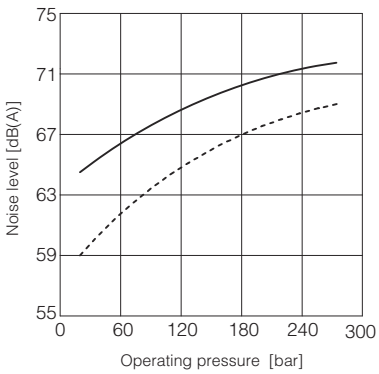
Ambient noise levels measured in compliance with ISO 4412-1 oleohydraulics -Test procedure to define the ambient noise level - Pumps Shaft speed: 1450 rpm.

—— = Qmax ---- = Qmin

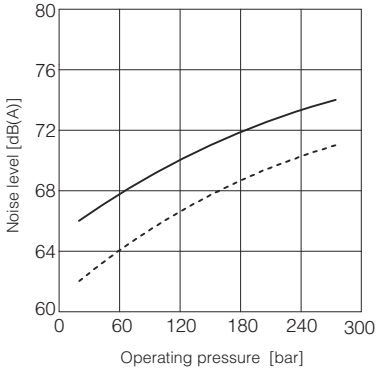
PVPC-*-3029



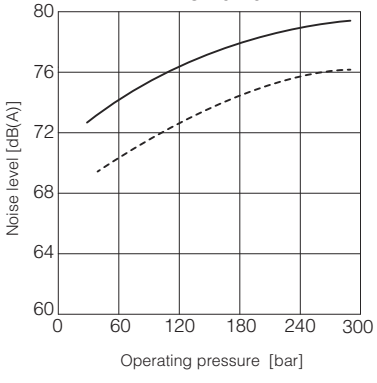
PVPC-*-4046



PVPC-*-5073 and PVPC-*-5090



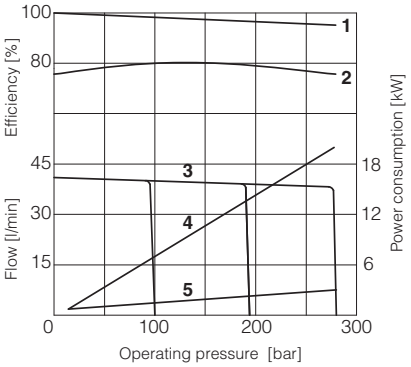
PVPC-*-6140



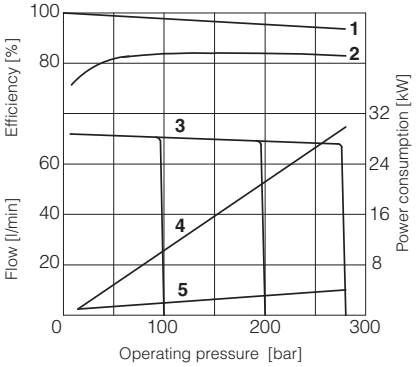
10.2 Operating limits

1 = Volumetric efficiency
2 = Overall efficiency
3 = Flow versus pressure curve
4 = Power consumption with full flow
5 = Power consumption at null flow

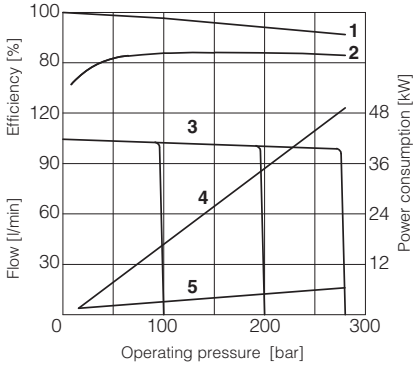
PVPC-*-3029



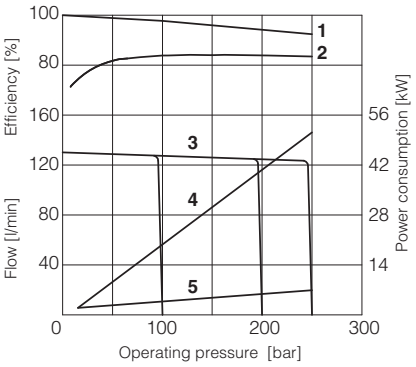
PVPC-*-4046



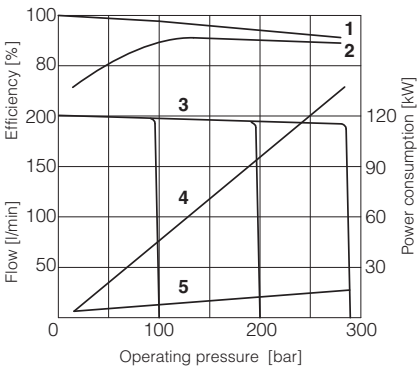
PVPC-*-5073



PVPC-*-5090



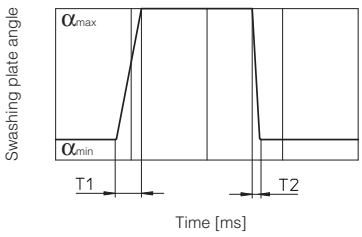
PVPC-*-6140

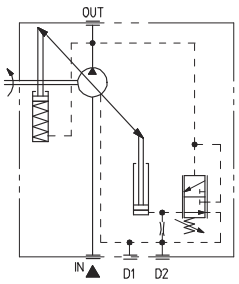


10.3 Response times

Response times and pressure peack due to variation 0% to 100% and 100% to 0% of the pump displacement, obtained with an istantaneously opening and shut-off of the delivery line.

Pump type	**T1** (ms)	**T2** (ms)
PVPC-*-3029	140	36
PVPC-*-4046	140	42
PVPC-*-5073	160	44
PVPC-*-5090	160	44
PVPC-*-6140	220	150





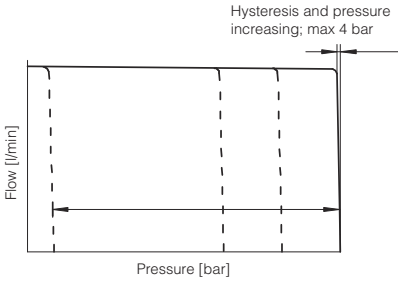
C

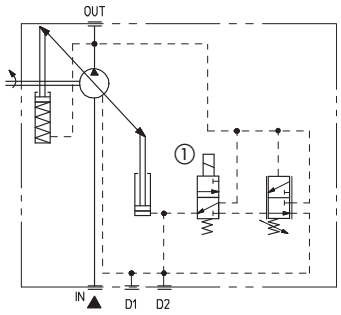
Manual pressure compensator

The pump displacement is zeroed when the line pressure approaches the setting pressure of the compensator.

Compensator setting range:
20 ÷ 280 bar for 3029, 4046, 5073, 6140
20 ÷ 250 bar for 5090

Compensator standard setting:
280 bar for 3029, 4046, 5073, 6140
250 bar for 5090





① solenoid venting valve

CH

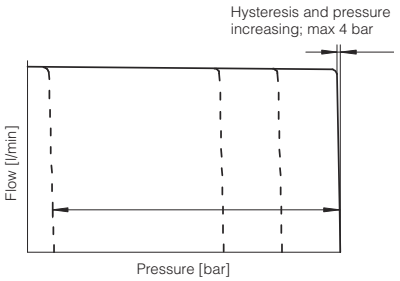
Manual pressure compensator with venting

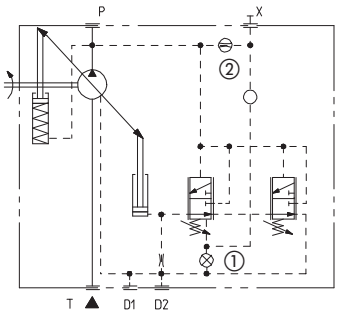
As C plus venting function, when a long unloading time is required and heat generation and noise have to be kept at lowest level.

Venting valve solenoid voltage, see section 4
Venting valve OFF = null displacement
Venting valve ON = max displacement

Compensator setting range:
20 ÷ 280 bar for 3029, 4046, 5073
20 ÷ 250 bar for 5090, 6140

Compensator standard setting:
280 bar for 3029, 4046, 5073
250 bar for 5090, 6140





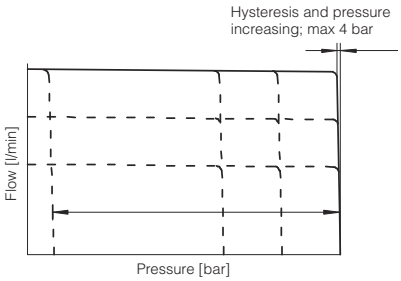
R

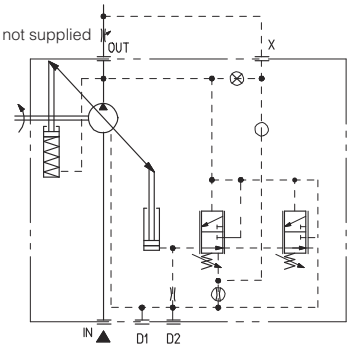
Remote pressure compensator

As C, but predisposed with X piloting port for connection of a remote pilot relief valve.

Compensator setting range:
20 ÷ 280 bar for 3029, 4046, 5073
20 ÷ 250 bar for 5090, 6140

Compensator standard setting:
280 bar for 3029, 4046, 5073
250 bar for 5090, 6140





L

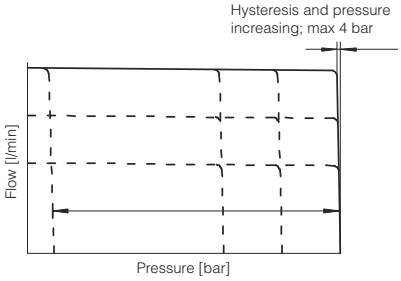
Load sensing

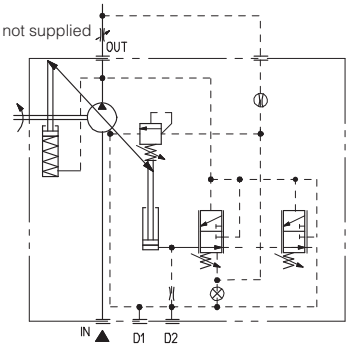
The pump displacement is automatically adjusted to maintain a constant (load indipendent) pressure drop across an external throttle. Changing the throttle regulation, the pump flow is consequently adjusted.
Load sensing control always incorporates an hydraulic compensator to limit the maximum pressure.

Compensator setting range:
20 ÷ 280 bar for 3029, 4046, 5073
20 ÷ 250 bar for 5090, 6140

Compensator standard setting:
280 bar for 3029, 4046, 5073
250 bar for 5090, 6140

Differential pressure setting range: 10 ÷ 40 bar
Differential pressure standard setting: 14 bar

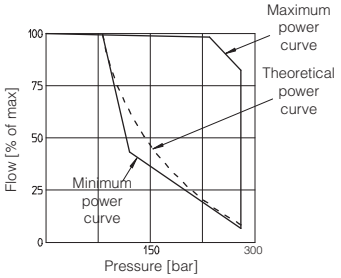




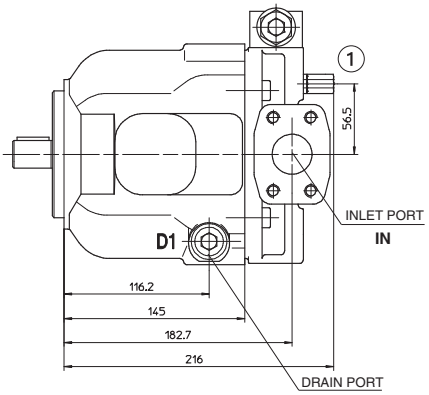
LW

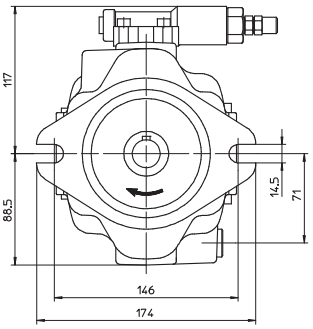
Constant power

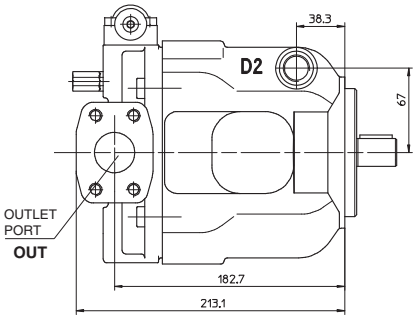
In order to achieve a constant drive torque with varying operating pressure. The swashing angle and therefore the outlet flow is varied so that the product of flow and pressure remains constant.
For the best regulation, minimum working pressure is 80 bar.
While selecting LW control, the required value of power must be communicated with the order (ex. 10 kW at 1450 rpm).



12 INSTALLATION DIMENSIONS OF PVPC-*-3029: BASIC VERSION “C” CONTROL







PORTS DIMENSION

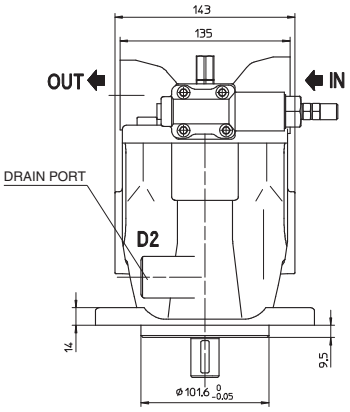
IN = Flange SAE 3000 1 1/4”

OUT = Flange SAE 6000 3/4”

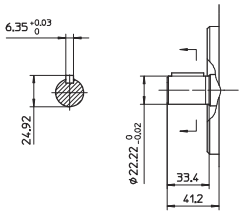
D1, D2 = 1/2” BSPP

① = Screw for max displacement setting.
In case of double pumps, the screw is not available for version XB

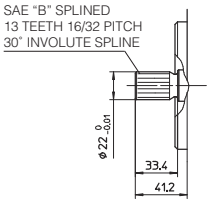
Mass [kg]	
PVPC-*-3029	18



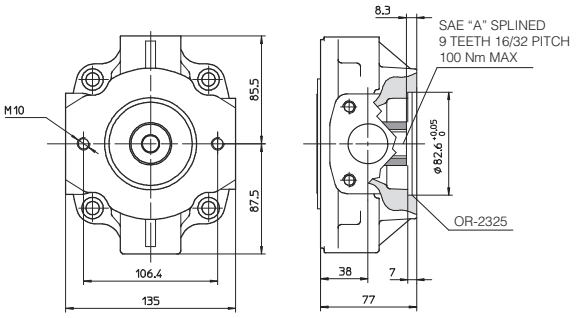
SHAFT TYPE “1”



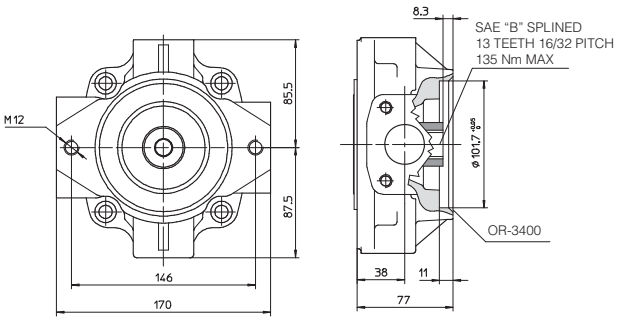
SHAFT TYPE “5”



CODE XA - INTERMEDIATE FLANGE SAE “A” FOR PFE-31

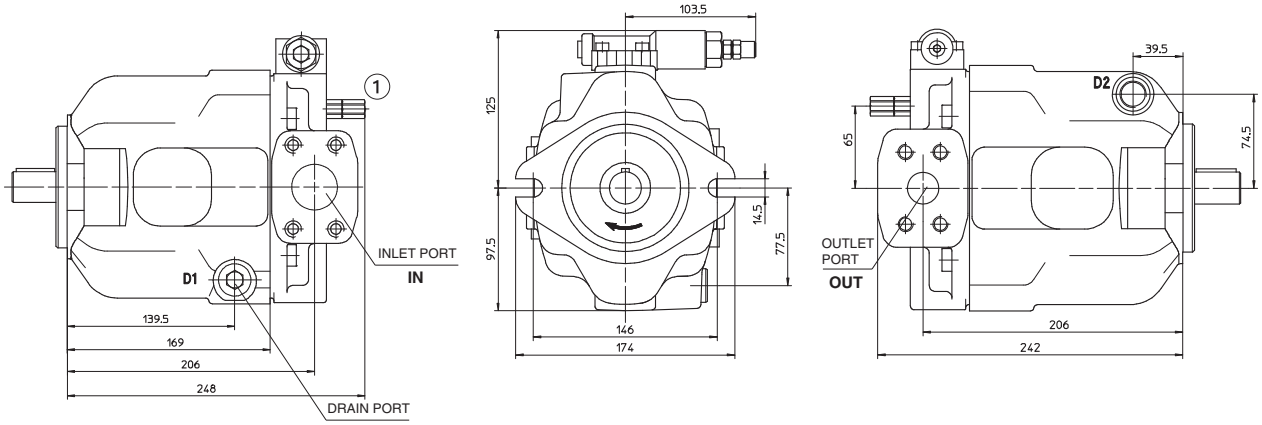


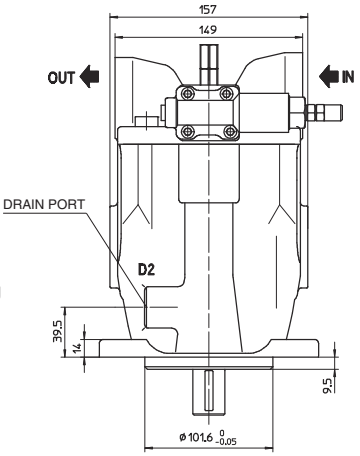
CODE XB - INTERMEDIATE FLANGE SAE “B” FOR PFE-41
screw for max displacement setting not available



Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted

13 INSTALLATION DIMENSIONS OF PVPC-*-4046: BASIC VERSION “C” CONTROL



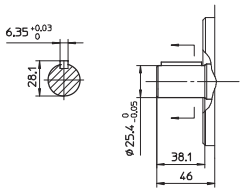


PORTS DIMENSION

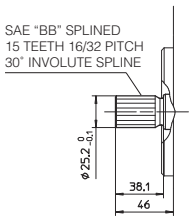
IN = Flange SAE 3000 1 1/2”
OUT = Flange SAE 6000 1”
D1, D2 = 1/2” BSPP
① = Screw for max displacement setting

Mass [kg]	
PVPC-*-4046	24

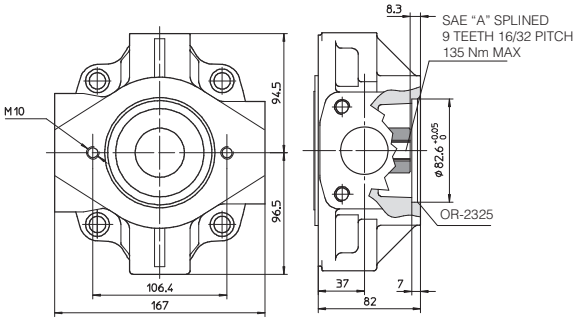
SHAFT TYPE “1”



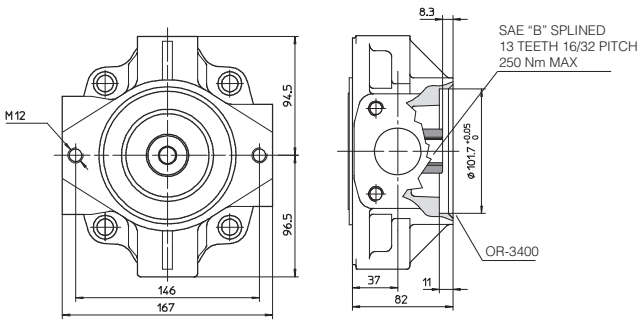
SHAFT TYPE “5”



CODE XA - INTERMEDIATE FLANGE SAE “A” FOR PFE-31

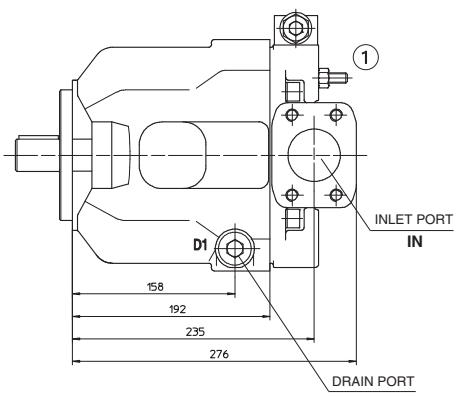


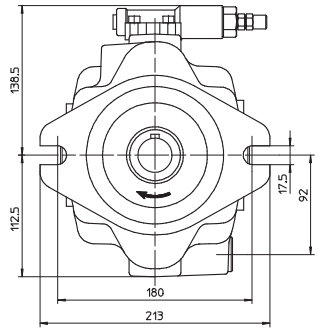
CODE XB - INTERMEDIATE FLANGE SAE “B” FOR PFE-41

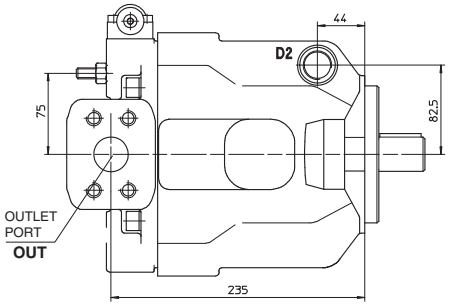


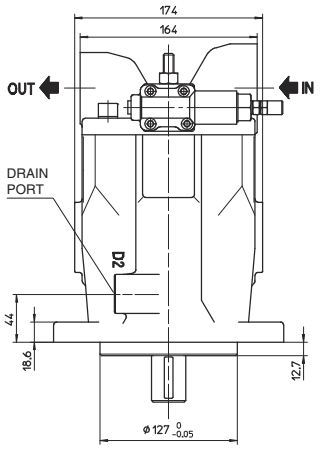
Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted

14 INSTALLATION DIMENSIONS OF PVPC-*-5073 and PVPC-*-5090: BASIC VERSION "C" CONTROL







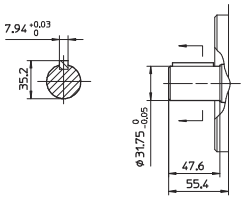


PORTS DIMENSION

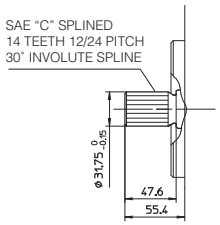
IN = Flange SAE 3000 2"
OUT = Flange SAE 6000 1 1/4"
D1, D2 = 3/4" BSPP
① = Screw for max displacement setting.
In case of double pump the screw is not available for version XC

Mass [kg]	
PVPC-*-5073	33
PVPC-*-5090	

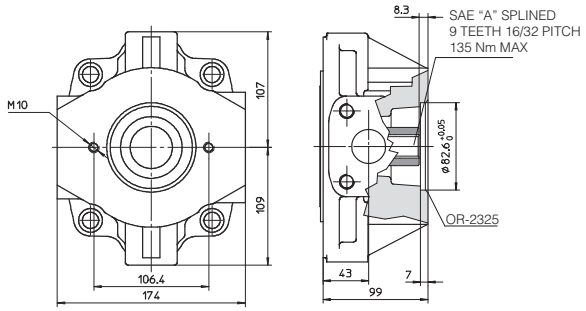
SHAFT TYPE "1"



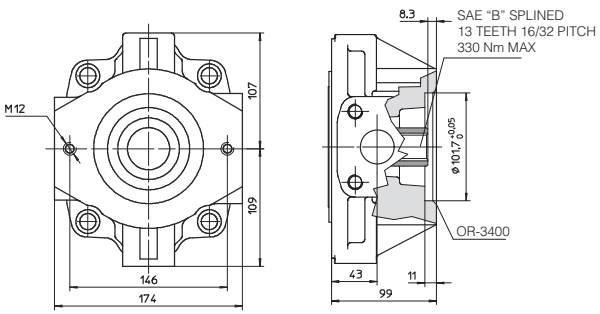
SHAFT TYPE "5"



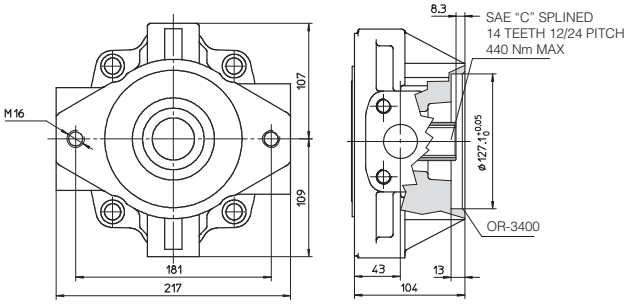
CODE XA - INTERMEDIATE FLANGE SAE "A" FOR PFE-31



CODE XB - INTERMEDIATE FLANGE SAE "B" FOR PFE-41

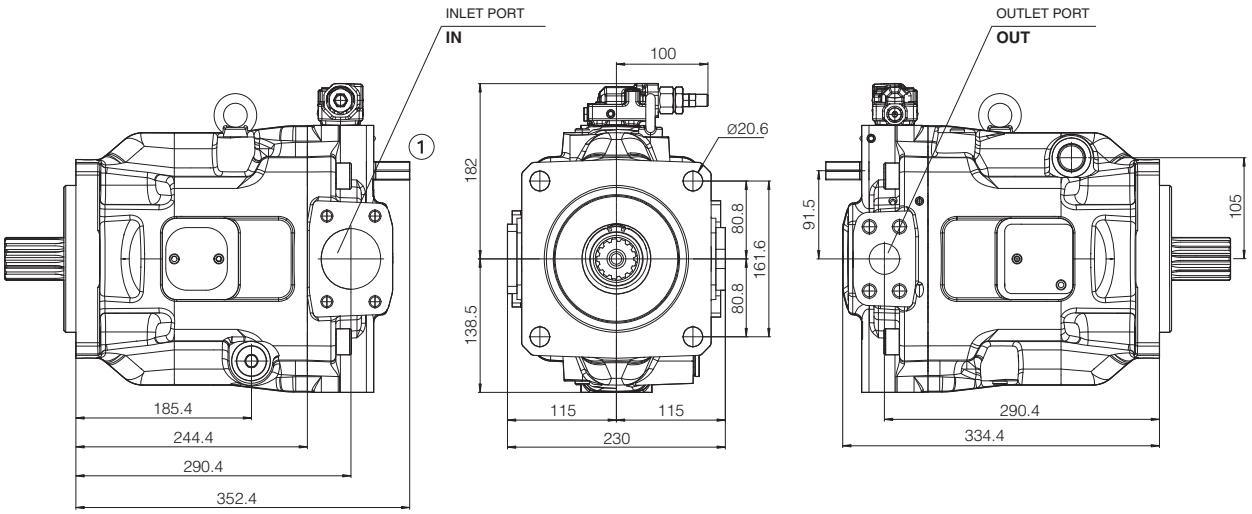


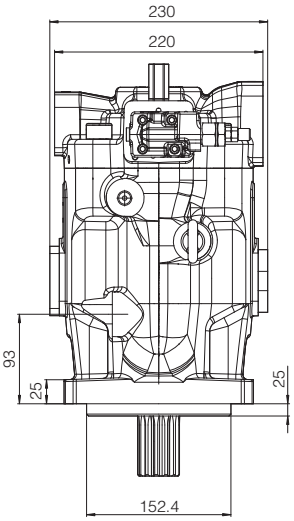
CODE XC - INTERMEDIATE FLANGE SAE "C" FOR PFE-51



Drawing show pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted

15 INSTALLATION DIMENSIONS OF PVPC-*-6140: BASIC VERSION “C” CONTROL



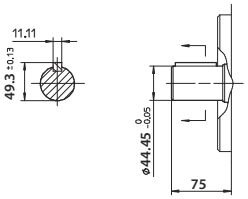


PORTS DIMENSION

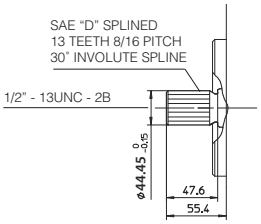
IN = Flange SAE 3000 2 1/2”
OUT = Flange SAE 6000 1 1/4”
D1, D2= 3/4” BSPP
① = Regulation screw for max displacement setting.

Mass [kg]	
PVPC-*-6140	69

SHAFT TYPE “1”



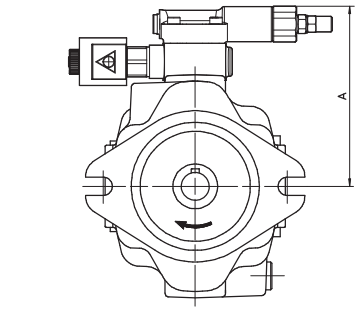
SHAFT TYPE “5”



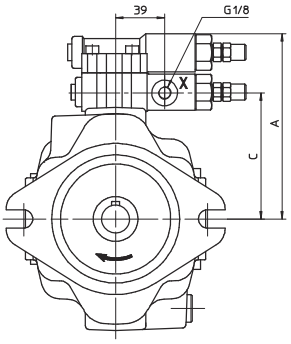
16 INSTALLATION DIMENSIONS OF OTHER CONTROLS

16.1 PVPC size 3, 4 and 5

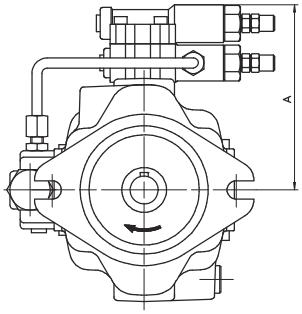
VERSION CH

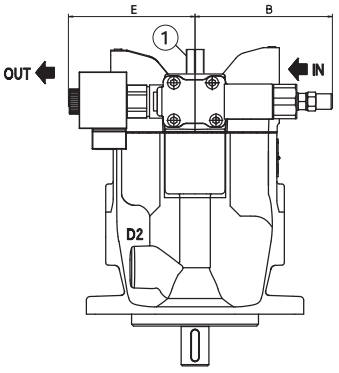


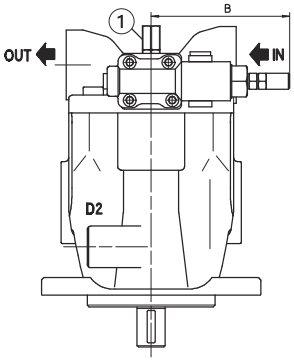
VERSIONS L, R

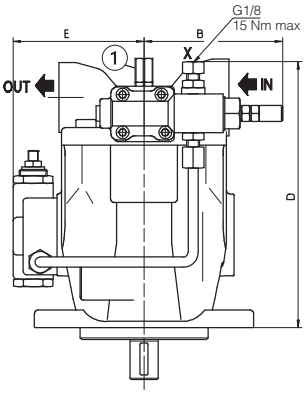


VERSION LW









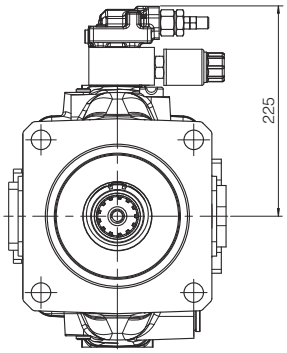
① = Regulation screw for max displacement. Adjustable range 50% to 100% of max displacement).
In case of double pump the regulation screw is not always available, please contact our technical office.

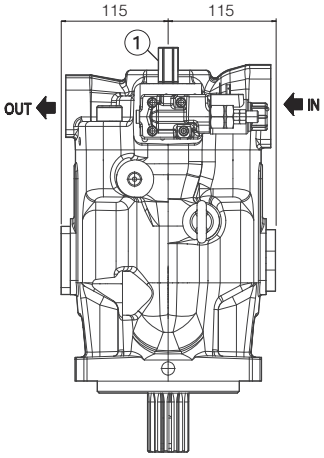
Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted and also the consequently position of the control groups

Pump type	Version	A	B	C	D	E	Mass (kg)
PVPC-*-3029	**CH**	144	111	-	-	102	22
	L -R	144	111	100	-	-	19,2
	LW	144	111	-	211	104	20
PVPC-*-4046	**CH**	153	111	-	-	102	28
	L -R	153	111	109	-	-	25,2
	LW	153	111	-	235	111	26
PVPC-*-5073 PVPC-*-5090	**CH**	166	111	-	-	102	36,9
	L -R	166	111	122	-	-	34,2
	LW	166	111	-	258	120	35

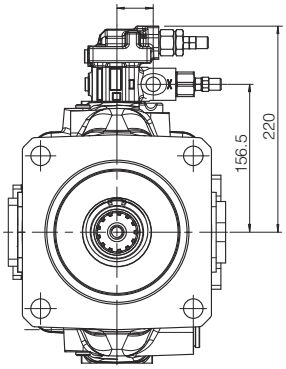
16.2 PVPC size 6

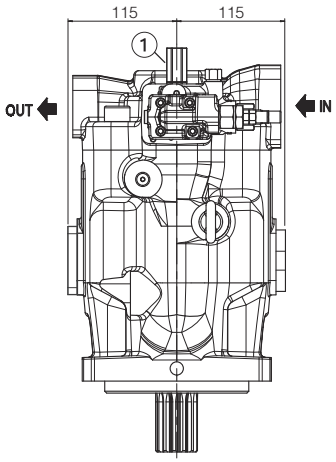
VERSION CH



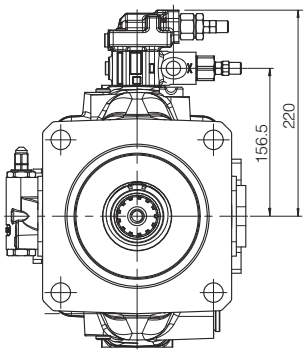


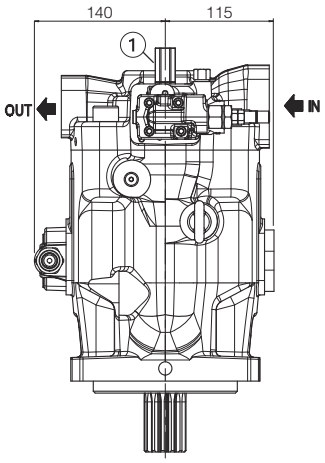
VERSIONS L, R





VERSION LW





① = Regulation screw for max displacement. Adjustable range 50% to 100% of max displacement).
In case of double pump the regulation screw is not always available, please contact our technical office.

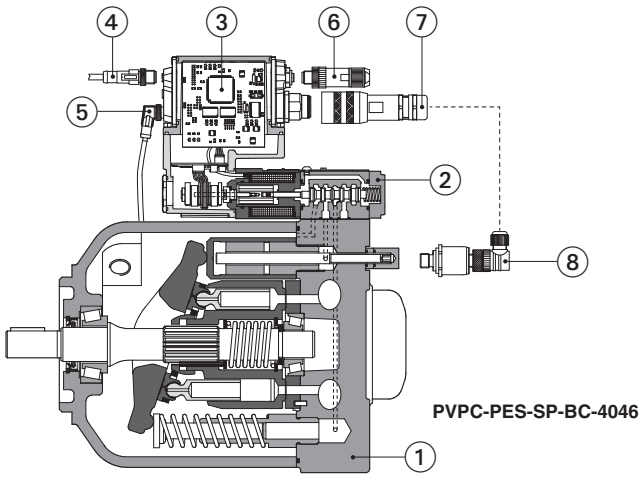
Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted and also the consequently position of the control groups

17 RELATED DOCUMENTATION

A900	Operating and maintenance information for pumps
K800	Electric and electronic connectors

Proportional controls for axial piston pumps

pressure, flow or P/Q controls



PVPC-PES-SP-BC-4046

① Pump body
② Proportional valve
③ On-board driver with P/Q control
④ USB connector
⑤ Swash plates transducer connection
⑥ Fieldbus connector
⑦ Main connector
⑧ Remote pressure transducer

PVPC

Variable displacement axial piston pumps with swash plate design suited for high pressure open circuits, they are provided with advanced electrohydraulic proportional controls:

- **CZ** open loop pressure control
- **LQZ** open loop flow control (load sensing)
- **PES** closed loop P/Q control

PES performs alternate closed loop controls of pressure, flow and max power limitation. It is also available with optional sequence module (PERS versions) that allows to reduce close to zero the pressure to the delivery line.

SAE J744 mounting flange and shaft.

Max displacement (cm³/rev)	Max pressure working (bar)	Max pressure peak (bar)
29, 46, 73, 140	280	350
88	250	315

For technical characteristics and features, see tech table A160.

1 **MODEL CODE**

PVPC	X2E	-	PERS-SP	-	BC	-	4046	/	*	/	1	D	/	*	*	/	*

PVPC
Variable displacement axial piston pump

Option for pumps with through shaft (1):
XA = intermediate flange SAE A
XB = intermediate flange SAE B
XC = intermediate flange SAE C (only for size 5073 and 5090)

Additional suffix for double pumps:
X2E = with a fixed displacement pump type PFE (see tech table A005)

Type of control, see section 10 and 11:
CZ = proportional pressure control **(1)**
LQZ = proportional flow control (load sensing) **(1)**
PES-SP = closed loop integral digital P/Q driver
PERS-SP = as PES plus sequence module

Fieldbus interfaces, USB port always present **(2)**:
NP = Not present
BC = CANopen
BP = PROFIBUS DP
EH = EtherCAT
EW = POWERLINK
EI = EtherNet/IP
EP = PROFINET RT/IRT

Size and max displacement (3):
3029 = size 3 - displacement 029 cm³/rev
4046 = size 4 - displacement 046 cm³/rev
5073 = size 5 - displacement 073 cm³/rev
5090 = size 5 - displacement 090 cm³/rev
6140 = size 6 - displacement 140 cm³/rev

Pressure setting, only for PERS: **200** = 200 bar **250** = 250 bar **280** = 280 bar

Shaft, SAE Standard **(5)**:
1 = keyed **5** = splined

Direction of rotation, viewed at the shaft end:
D = clockwise **S** = counterclockwise

Electronics options, for PES and PERS **(4):**
C = current feedback for pressure transducer 4÷20 mA (omit for std voltage ±10VDC)
I = current reference input and monitor 4÷20 mA (omit for std voltage ±10VDC)
X = on-board pressure transducer with pre-configured pressure settings (only for PERS)
S = with 2 on-off inputs for multiple pressure PID selection for NP execution or double power supply for fieldbus execution, plus dedicated connector for remote pressure transducer

Coil voltage, for CZ, LQZ - see section 15:
18 = optional coil for low current drivers

Series number

Seals material, see section 9:
- = NBR
PE = FKM

(1) Not available for PVPC-*-6140
(2) Only for PES and PERS
(3) Optional intermediate displacements 35 and 53 cm³/rev are available on request
(4) For possible combined options, see section 14
(5) Pumps with ISO 3019/2 mounting flange and shaft (option /M) are available on request

2 OFF-BOARD ELECTRONIC DRIVERS - only for **CZ**, **LQZ**

Drivers model	E-MI-AC-01F		E-MI-AS-IR		E-BM-AS-PS		E-BM-AES
Type	Analog		Digital				
Voltage supply (VDC)	12	24	12	24	12	24	24
Valve coil option	/6	std	/6	std	/6	std	std
Format	plug-in to solenoid				DIN-rail panel		
Data sheet	G010		G020		G030		GS050

3 GENERAL NOTES

Atos digital proportionals pumps are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive).
Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **FS900** and in the user manuals included in the E-SW-* programming software.

4 PUMP SETTINGS AND PROGRAMMING TOOLS

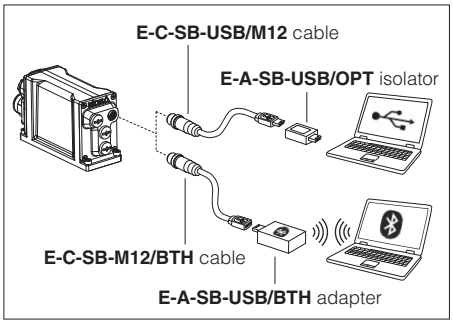
Pump's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **FS900**).
For fieldbus versions, the software permits pump's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

The software is available in different versions according to the driver's options (see table **GS500**):

E-SW-BASIC	support:	NP (USB)	PS (Serial)	IR (Infrared)
E-SW-FIELDBUS	support:	BC (CANopen)	BP (PROFIBUS DP)	EH (EtherCAT)
		EW (POWERLINK)	EI (EtherNet/IP)	EP (PROFINET)
E-SW-*/PQ	support:	valves with SP, SF, SL alternated control (e.g. E-SW-BASIC/PQ)		

WARNING: drivers USB port is not isolated! For E-C-SB-USB/M12 cable, the use of isolator adapter is highly recommended for PC protection

USB or Bluetooth connection



WARNING: see tech table **GS500** for the list of countries where the Bluetooth adapter has been approved

5 FIELDBUS - see tech. table **GS510**

Fieldbus allows valve direct communication with machine control unit for digital reference, valve diagnostics and settings. These execution allow to operate the valves through fieldbus or analog signals available on the main connector.

6 GENERAL CHARACTERISTICS

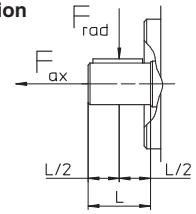
Assembly position	Any position. The drain port must be on the top of the pump. Drain line must be separated and unrestricted to the reservoir and extended below the oil level as far from the inlet as possible. Suggested maximum line lenght is 3 m.
Subplate surface finishing to ISO 4401	Acceptable roughness index: Ra ≤ 0,8, recommended Ra 0,4 – Flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	150 years, see technical table P007
Ambient temperature range	**CZ,LQZ:** **Standard** = -25°C ÷ +60°C **/PE** option = -15°C ÷ +80°C **PES, PERS:** **Standard** = -20°C ÷ +60°C **/PE** option = -20°C ÷ +60°C
Storage temperature range	**CZ,LQZ:** **Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C **PES, PERS:** **Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Surface protection (pump body)	Black painting RAL 9005
Surface protection (pilot valve)	Zinc coating with black passivation, galvanic treatment (driver housing for AEB and AES)
Corrosion resistance (pilot valve)	Salt spray test (EN ISO 9227) > 200 h
Compliance (proportional pilot valve)	CE according to EMC directive 2014/30/EU (Immunity: EN 61000-6-2; Emission: EN 61000-6-3) RoHS Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

7 HYDRAULIC CHARACTERISTICS - based on mineral oil ISO VG 46 at 50 °C

PVPC size		**3029**		**4046**		**5073**		**5090**		**6140**	
Max displacement	(cm^3/rev)	29		46		73		88		140	
Theoretical max flow at 1450 rpm	(l/min)	42		66,7		105,8		127,6		203	
Max working pressure / Peak	(bar)	280/350		280/350		280/350		250/315		280/350 **(1)**	
Min/Max inlet pressure	(bar abs.)	0,8 / 25		0,8 / 25		0,8 / 25		0,8 / 25		0,8 / 25	
Max pressure on drain port	(bar abs.)	1,5		1,5		1,5		1,5		1,5	
Power consumption at 1450 rpm and at max pressure and displacement	(Kw)	19,9		31,6		50,1		54,1		122	
Max torque on the first shaft	(Nm)	Type 1 210	Type 5 270	Type 1 350	Type 5 440	Type 1 670	Type 5 810	Type 1 670	Type 5 810	Type 1 1000	Type 5 2340
Max torque at max working pressure	(Nm)	128		203		328		350		780	
Speed rating	(rpm)	500 ÷ 3000		500 ÷ 2600		500 ÷ 2600		500 ÷ 2200		500 ÷ 2200	
Body volume	(l)	0,7		0,9		1,5		1,5		2,8	

(1) The maximum pressure can be increased to 350 bar (working) and 420 (peak) after detailed analysis of the application and of the pump working cycle

External load position



F_{ax} = axial load
F_{rad} = radial load

Notes:
For speeds over 1800 rpm the inlet port must be under oil level with adequate pipes.
Maximum pressure for all models with water glycol fluid is 160 bar, with /PE options is 190 bar.
Max speed with /PE options and water glycol fluid is 2000/1900/1600/1500 rpm respectively for the four sizes.

8 ELECTRICAL CHARACTERISTICS

Power supplies	Nominal : +24 VDC Rectified and filtered : VRMS = 20 ÷ 32 VMAX (ripple max 10 % VPP)			
Max power consumption	**CZ**, **LQZ** = 35 Watt; **PES**, **PERS** = 50 Watt			
Max. solenoid current	2,6 A for standard **12 VDC** coil; 1,5 A for standard **18 VDC** coil (only for CZ, LQZ)			
Coil resistance R at 20°C	**Size 3**: 3 ÷ 3,3 Ω for standard **12 VDC** coil; 13 ÷ 13,4 Ω for **18 VDC** coil (only for version CZ, LQZ)			
	Size 4, 5: 3,8 ÷ 4,1 Ω for standard **12 VDC** coil; 12 ÷ 12,5 Ω for **18 VDC** coil (only for version CZ, LQZ)			
Analog input signals	Voltage: range ±10 VDC (24 VMAX tollerant) Input impedance: Ri > 50 kΩ Current: range ±20 mA Input impedance: Ri = 500 Ω			
Monitor outputs	Output range: voltage ±10 VDC @ max 5 mA current ±20 mA @ max 500 Ω load resistance			
Enable input	Range: 0 ÷ 5 VDC (OFF state), 9 ÷ 24 VDC (ON state), 5 ÷ 9 VDC (not accepted); Input impedance: Ri > 10 kΩ			
Fault output	Output range: 0 ÷ 24 VDC (ON state > [power supply - 2 V] ; OFF state < 1 V) @ max 50 mA; external negative voltage not allowed (e.g. due to inductive loads)			
Pressure transducer power supply	+24VDC @ max 100 mA (E-ATR-8 see tech table **GS465**)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions, alarms history storage function			
Insulation class	H (180°) Due to the occuring surface temperatures of the solenoid coils, the European standards ISO 13732-1 and EN982 must be taken into account			
Protection degree to DIN EN60529	**CZ, LQZ** = IP65; **PES, PERS** = IP66/67 with mating connector			
Duty factor	Continuous rating (ED=100%)			
Tropicalization	Tropical coating on electronics PCB			
Additional characteristics	Short circuit protection of solenoid's current supply; 3 leds for diagnostic; spool position control by P.I.D. with rapid solenoid switching; protection against reverse polarity of power supply			
Communication interface	USB Atos ASCII coding	CANopen EN50325-4 + DS408	PROFIBUS DP EN50170-2/IEC61158	EtherCAT, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT EC 61158
Communication physical layer	not insulated USB 2.0 + USB OTG	optical insulated CAN ISO11898	optical insulated RS485	Fast Ethernet, insulated 100 Base TX
Recommended wiring cable	LiYCY shielded cables, see section 20			

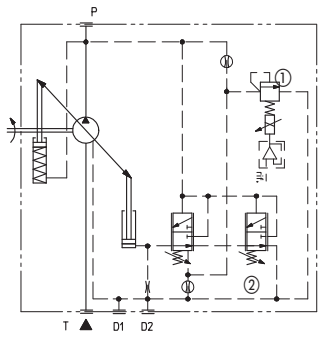
Note: a maximum time of 800 ms (depending on communication type) have be considered between the driver energizing with the 24 VDC power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

9 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

Seals, recommended fluid temperature		NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity		20÷100 mm²/s - max allowed range 15 ÷ 380 mm²/s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7		see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5		
Hydraulic fluid		**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils		NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water		FKM	HFDU, HFDR **(1)**	ISO 12922
Flame resistant with water		NBR, HNBR	HFC **(1)**	

(1) Max working pressure must be reduced to: 180 bar (working) / 210 bar (peak) for HFC fluid
200 bar (working) / 240 bar (peak) for HFDU and HFDR fluid

10 OPEN LOOP ELECTROHYDRAULIC CONTROLS

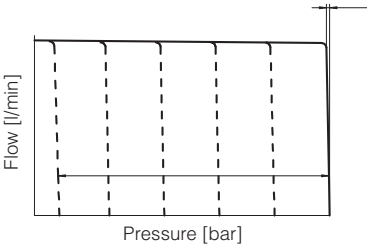


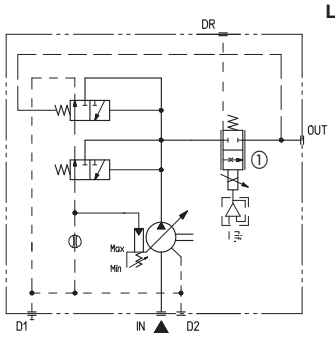
CZ

Proportional pressure control

Open loop control of the pump max pressure
The pumps displacement, and thus the flow, remains constant as far the pressure in the circuit reaches the value set on the proportional pilot valve ①, then the flow is reduced to maintain the circuit pressure to the value set by the electronic reference signal to the proportional valve. In this conditions the pressure in the circuit can be continuosly modulated by means of the reference signal.
Proportional pressure setting range: see below pressure control diagram.
Compensator setting range ②: 20÷350 bar (315 bar for 090)
Compensator factory setting ②: 280 bar (250 bar for 090)

Hysteresis and pressure increase: max 4 bar

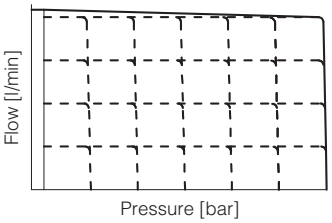




LQZ

Proportional flow (load-sensing)

Open loop control of the pump flow independent to the cyrcuit load. The pump displacement is self adjusted to maintain a costant pressure drop across the proportional flow control valve ①.
The pump flow can be continuosly regulated by modulating the proportional valve ①.

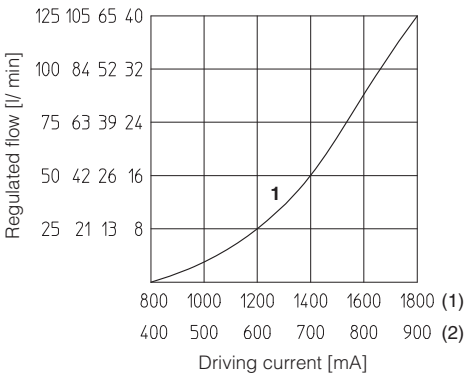


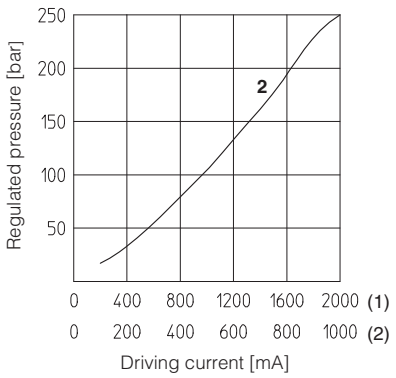
Diagrams for CZ, LQZ

Regulation diagrams
1 = Flow control
2 = Pressure control

(1) for standard 12 VDC coil
(2) for 18 VDC coil

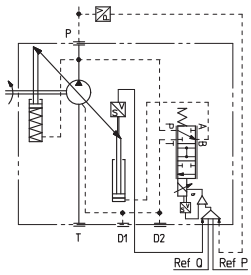
Pump size
88 73 46 29 cm³/rev





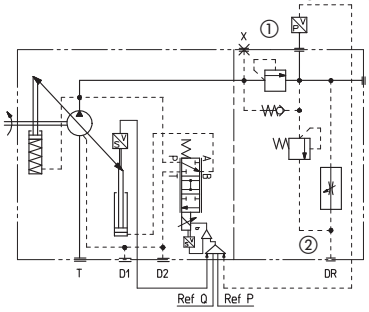
11 P/Q CONTROL

Pressure transducer not included



PES

Pressure transducer included only for PERS/X



PERS
PERS/X

P/Q control integrates the alternate pressure and flow regulation with the electronic max power limitation.
A remote pressure transducer must be installed on the system and its feedback has to be interfaced to the pump on-board digital driver.
Flow control is active when the actual system pressure is lower than the pressure reference input signal: the pump flow is regulated according to the flow reference input.
Pressure control is activated when the actual pressure grows up to the pressure reference input signal: the pump flow is then reduced in order to regulate and limit the max system pressure (if the pressure tends to decrease under its command value, the flow control returns active). This option allows to realize accurate dynamic pressure profiles.
Following fieldbus interfaces are available:
- BC - CANopen interface
- BP - PROFIBUS DP interface
- EH - EtherCAT interface
- EW - POWRELINK interface
- EI - EtherNet/IP interface
- EP - PROFINET RT/IRT interface

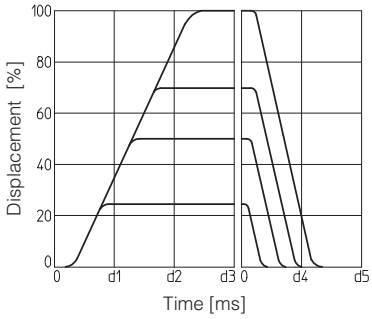
The pumps with BC, BP, EH, EW, EI and EP interfaces can be integrated into a fieldbus communication network and thus digitally operated by the machine control unit.
The digital control ensures high performances as flow and pressure linearity (see diagram 1), better flow knee (see diagram 2), internal leakage compensation (controlled flow independent to the load variations).

PVPC-PES basic version, without sequence module and without pressure transducer, which has to be installed on the main line and wired to the 12 poles connector of the pump on-board digital driver.

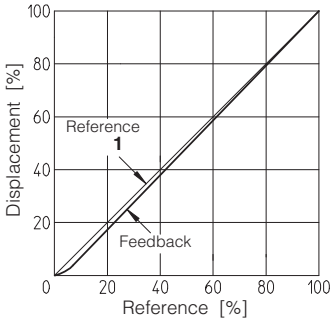
PVPC-PERS version with sequence module RESC ② which grant a minimum piloting pressure (18 bar) when the actual pressure falls below that value. Without pressure transducer.

PVPC-PERS/X as PERS version plus integral pressure transducer, with output signal 4÷20 mA, factory wired to the pump on-board digital driver through a cable gland.

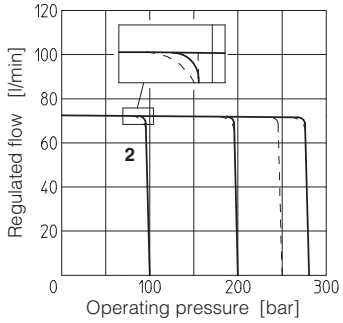
Response time



Regulated flow



P/Q control



Type pump	d1	d2	d3	d4	d5
	[ms]				
PVPC-PE(R)S-3029	30	60	90	30	60
PVPC-PE(R)S-4046	40	80	120	40	80
PVPC-PE(R)S-5073	50	100	150	50	100
PVPC-PE(R)S-5090	60	120	170	60	120
PVPC-PE(R)S-6140	90	180	200	90	180

Response time of displacement variation for a step change of the electronic reference signal.

12 PRESSURE TRANSDUCER SELECTION

The pressure transducer type E-ATR-8 must be ordered separately (see tech table **GS465**)
For /X option the pressure transducer with output signal 4 ÷ 20 mA is on-board to the pump.

Pump code:	Pressure transducer code:
PVPC-PE(R)S-*/200	E-ATR-8/250
PVPC-PE(R)S-*/250	E-ATR-8/400
PVPC-PE(R)S-*/280	E-ATR-8/400
PVPC-PE(R)S-*/200/*/C	E-ATR-8/250/I
PVPC-PE(R)S-*/250/*/C	E-ATR-8/400/I
PVPC-PE(R)S-*/280/*/C	E-ATR-8/400/I

13 ELECTRONICS OPTIONS - only for **PES** and **PERS**

I = This option provides 4 ÷ 20 mA current reference and monitor signals, instead of the standard ±10 VDC.
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ±20 mA.
It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

C = This option is available to connect pressure transducers with 4 ÷ 20 mA current output signal, instead of the standard ±10 VDC.
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ±20 mA.

X = This option providing the presence of the pressure transducer, with output signal 4÷20 mA, integral to the pump and factory wired to the PES electronics through a cable gland (see 16.10).

S = Two on-off input signals are available on the main connector to select one of the four pressure PID parameters setting, stored into the driver (see 16.11).

14 POSSIBLE COMBINED OPTIONS

for **PES**:	for **PERS**:
/CI, /CS, /IS, /CIS	/CI, /CS, /IS, /IX, /SX, /CIS, /ISX

15 COIL VOLTAGE OPTION - only for **CZ** and **LQZ**

18 = Optional coil to be used with electronic drivers not supplied by Atos, with power supply 24 VDC and with max current limited to 1A.

16 POWER SUPPLY AND SIGNALS SPECIFICATIONS - only for **PES** and **PERS**

Generic electrical output signals of the pump (e.g. fault or monitor signals) must not be directly used to activate safety functions, like to switch-ON/OFF the machine's safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, ISO 4413).

16.1 Power supply (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: apply at least a 10000 µF/40 V capacitance to single phase rectifiers or a 4700 µF/40 V capacitance to three phase rectifiers. In case of separate power supply see 16.2.

⚠ A safety fuse is required in series to each power supply: 2,5 A time lag fuse.

16.2 Power supply for driver's logic and communication (VL+ and VL0) - only for **/S** and **/SX** options for fieldbus executions

The power supply for driver's logic and communication must be appropriately stabilized or rectified and filtered: apply at least a 10000 µF/40 V capacitance to single phase rectifiers or a 4700 µF/40 V capacitance to three phase rectifiers.
The separate power supply for driver's logic on pin 9 and 10, allow to remove solenoid power supply from pin 1 and 2 maintaining active the diagnostics, USB and fieldbus communications.

⚠ A safety fuse is required in series to each driver's logic and communication power supply: 500 mA fast fuse.

16.3 Flow reference input signal (Q_INPUT+)

Functionality of Q_INPUT+ signal, is used as reference for the pump's flow.
Reference input signal is factory preset according to selected valve code, defaults are ±10 VDC for standard and 4 ÷ 20 mA for /I option.
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ± 20 mA.
Drivers with fieldbus interface can be software set to receive reference signal directly from the machine control unit (fieldbus reference). Analog reference input signal can be used as on-off commands with input range 0 ÷ 24VDC.

16.4 Pressure reference input signal (P_INPUT+)

Functionality of P_INPUT+ signal, is used as reference for the driver pressure closed loop.
Reference input signal is factory preset according to selected valve code, defaults are ±10 VDC for standard and 4 ÷ 20 mA for /I option.
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ± 20 mA.
Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).
Analog reference input signal can be used as on-off commands with input range 0 ÷ 24VDC.

16.5 Flow monitor output signal (Q_MONITOR)

The driver generates an analog output signal proportional to the actual pump swashplate position; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, fieldbus reference, pilot spool position).
Monitor output signal is factory preset according to selected pump code, defaults are ±10 VDC for standard and 4 ÷ 20 mA for /I option.
Output signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ± 20 mA.

16.6 Pressure monitor output signal (P_MONITOR)

The driver generates an analog output signal proportional to alternated pressure/force control; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, force reference).
Monitor output signal is factory preset according to selected pump code, defaults are ±10 VDC for standard and 4 ÷ 20 mA for /I option.
Output signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ± 20 mA.

16.7 Enable input signal (ENABLE) - only for **/S** and **/SX** options

To enable the driver, supply a 24 VDC on pin 3 (pin C): Enable input signal allows to enable/disable the current supply to the solenoid, without removing the electrical power supply to the driver; it is used to active the communication and the other driver functions when the valve must be disabled for safety reasons. This condition **does not comply** with norms IEC 61508 and ISO 13849.
Enable input signal can be used as generic digital input by software selection.

16.8 Fault output signal (FAULT)

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for 4 ÷ 20 mA input, spool position transducer cable broken, etc.). Fault presence corresponds to 0 VDC, normal working corresponds to 24 VDC.
Fault status is not affected by the Enable input signal. Fault output signal can be used as digital output by software selection.

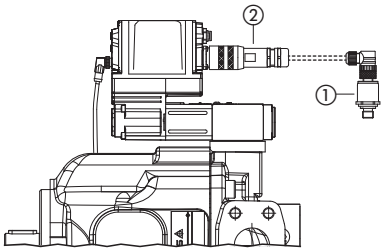
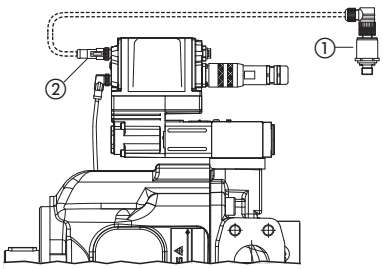
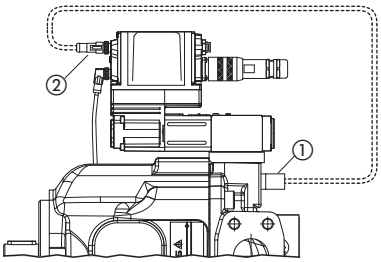
16.9 Pressure transducer input signal

Analog pressure transducers can be directly connected to the driver.
Analog input signal is factory preset according to selected pump code, defaults are ±10 VDC for standard and 4 ÷ 20 mA for /C option.
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ± 20 mA.
Refer to the pump technical table to transducer characteristics to select the transducer's maximum pressure.

Standard:
Remote pressure transducer can be directly connected to the main connector on the driver (see 17.1)

/S option
Remote pressure transducer can be directly connected to a dedicated M12 connector (see 17.4)

/X and /SX options
Integral-to-pump transducer is directly connected with a dedicated M12 connector and no remote transducer is required;
current input signal (4 ÷ 20 mA) of the integral transducer allows cable break detection functionality

Standard	/S option	/X and /SX options
		
① = **remote transducer** ② = **main connector** Note: ① and ② to be ordered separately	① = **remote transducer** ② = **M12 connector** Note: ① and ② to be ordered separately	① = **integral transducer** ② = **M12 connector** Note: ① and ② included

16.10 Logic Input Signal (D_IN) - only for **standard** and **standard** with **/X** option

D_IN on-off input signal can be software set to perform one of the following functions:
- enable and disable the driver functioning; apply 0 VDC to disable and 24 VDC to enable the driver - see 16.7
- switch between two pressure PID settings; apply 0 VDC to select SET1 pressure PID and 24 VDC to select SET2 - see 16.11
- enable and disable the power limitation function; default setting, apply 0V to disable and 24VDC to enable the power limitation - see 16.13

16.11 Multiple PID selection (D_IN0 and D_IN1) - only for **/S** and **/SX** options in **NP** execution

Two on-off input signals are available on the main connector to select one of the four pressure PID parameters setting, stored into the driver.
Switching the active setting of pressure PID during the machine cycle allows to optimize the system dynamic response in different hydraulic working conditions (volume, flow, etc.).
Supply a 24 VDC or a 0 VDC on pin 9 and/or pin 10, to select one of the PID settings as indicated by binary code table at side. Gray code can be selected by software.

	PID SET SELECTION			
PIN	**SET 1**	**SET 2**	**SET 3**	**SET 4**
9	0	24 VDC	0	24 VDC
10	0	0	24 VDC	24 VDC

16.12 Multiple pressure PID (1)

Four sets for pressure PID parameters are stored into the driver: switching in real-time the active pressure PID parameters during machine cycle allows to optimize the system dynamic response in different hydraulic working conditions (volume, flow, etc.).
The available commands to switch these PID pressure sets depend on the driver execution:

Fieldbus	Driver	Commands
NP	Standard and Standard with /X option	1 on-off input on main connector allow to switch the 2 PID parameters (SET1 and SET2, see 4.10)
	/S and /SX options	2 on-off inputs allow to switch the 4 PID parameters set (SET1.. SET4 - see 4.11)
BC, BP, EH, EW, EI, EP	All versions	real-time fieldbus communication can switch between the 4 PID parameters set (SET1 - SET4 - see driver manuals)

16.13 Hydraulic Power Limitation (1)

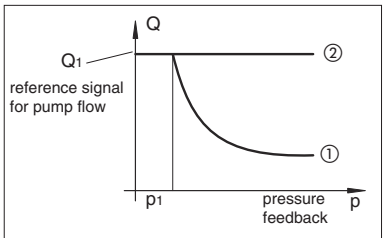
A limit to the maximum pump's hydraulic power can be software set into the driver thus limiting the electric power consumption of the motor coupled to the pump: when the actual requested hydraulic power **p**x**Q** (pressure transducer feeback x flow reference value) reaches the max power limit (p1xQ1), the driver automatically reduces the flow pump regulation.

The higher is the pressure feedback the lower is the pumps's regulated flow:

$$\text{Flow regulation} = \text{Min}\left(\frac{\text{PowerLimit [kW]}}{\text{Pressure Feedback [bar]}} \times \frac{1}{\text{Flow Full Scale [l/min]}} ; \text{Flow Reference}\right)$$

The hydraulic power limitation, disabled as default, can be enabled using the Atos pc software or the fieldbus communication (fieldbus executions).
Standard and standard with /X option allow also to enable and disable this function during the machine cycle, using the D_IN on-off input available on the main connector (see 16.11).

16.12 - Hydraulic Power Limitation



regulation curve ① with and ② without power limitation.
p1 x Q1 = max power limit

(1) The sections 16.12 and 16.13 are a brief description of the settings and features of digital drivers with alternated P/Q control. For a detailed descriptions of available settings, wirings and installation procedures, please refer to the user manual included in the E-SW programming software:
E-MAN-RI-PES - user manual for **PES-S** digital drivers

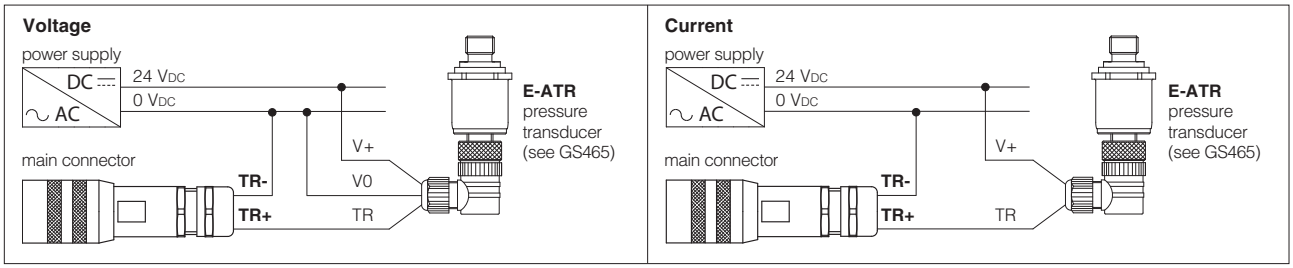
17 ELECTRONIC CONNECTIONS

17.1 Main connector signals - 12 pin (A) **Standard** and **Standard** with **/X** option - for **PES** and **PERS**

PIN	Standard	/X	TECHNICAL SPECIFICATIONS	NOTES
1	**V+**		Power supply 24 VDC	Input - power supply
2	**V0**		Power supply 0 VDC	Gnd - power supply
3	**FAULT**		Fault (0 VDC) or normal working (24 VDC), referred to V0	Output - on/off signal
4	**INPUT-**		Negative reference input signal for Q_INPUT+ and P_INPUT+	Gnd - analog signal
5	**Q_INPUT+**		Flow reference input signal: ±10 VDC / ±20 mA maximum range Defaults are 0÷+10 VDC for standard and 4 ÷ 20 mA for /I option	Input - analog signal **Software selectable**
6	**Q_MONITOR**		Flow monitor output signal: ±10 VDC / ±20 mA maximum range Defaults are 0÷+10 VDC for standard and 4 ÷ 20 mA for /I option. Referred to V0	Output - analog signal **Software selectable**
7	**P_INPUT+**		Pressure reference input signal: ±10 VDC / ±20 mA maximum range Defaults are 0÷+10 VDC for standard and 4 ÷ 20 mA for /I option	Input - analog signal **Software selectable**
8	**P_MONITOR**		Pressure monitor output signal: ±10 VDC / ±20 mA maximum range Defaults are 0÷+10 VDC for standard and 4 ÷ 20 mA for /I option. Referred to V0	Output - analog signal **Software selectable**
9	**D_IN**		Function software selectable between: power limitation enable (default), multiple pressure PID selection or pump enable (24 VDC) / disable (0 VDC). Referred to V0	Input - on/off signal
10	**TR+**		Remote pressure transducer input signal: ±10 VDC / ±20 mA maximum range Defaults are 0÷+10 VDC for standard and 4 ÷ 20 mA for /C option	Input - analog signal **Software selectable**
		NC	Do not connect	
11	**TR-**		Negative pressure transducer input signal for TR+	Input - analog signal
		NC	Do not connect	
PE	**EARTH**		Internally connected to driver housing	

Note: these connections are the same of Rexroth A10VSO axial piston pumps, model SYDFEE and SYDFEC

Remote pressure transducer connections - only for **Standard**



17.2 Main connector signals - 12 pin (A) **/S** and **/SX** option - for **PES** and **PERS**

PIN	/S and /SX		TECHNICAL SPECIFICATIONS	NOTES
	NP	Fieldbus		
1	**V+**		Power supply 24 VDC	Input - power supply
2	**V0**		Power supply 0 VDC	Gnd - power supply
3	**ENABLE** referred to: V0	VL0	Enable (24 VDC) or disable (0 VDC) the pump	Input - on/off signal
4	**Q_INPUT+**		Flow reference input signal: ±10 VDC / ±20 mA maximum range Defaults are 0÷+10 VDC for standard and 4 ÷ 20 mA for /I option	Input - analog signal **Software selectable**
5	**INPUT-**		Negative reference input signal for Q_INPUT+ and P_INPUT+	Input - analog signal
6	**Q_MONITOR** referred to: V0	VL0	Flow monitor output signal: ±10 VDC / ±20 mA maximum range Defaults are 0÷+10 VDC for standard and 4 ÷ 20 mA for /I option	Output - analog signal **Software selectable**
7	**P_INPUT+**		Pressure reference input signal: ±10 VDC / ±20 mA maximum range Defaults are 0÷+10 VDC for standard and 4 ÷ 20 mA for /I option	Input - analog signal **Software selectable**
8	**P_MONITOR** referred to: V0	VL0	Pressure monitor output signal: ±10 VDC / ±20 mA maximum range Defaults are 0÷+10 VDC for standard and 4 ÷ 20 mA for /I option	Output - analog signal **Software selectable**
9	**D_IN0**		Function software selectable between: multiple pressure PID 0 selection (default) or power limitation enable. Referred to V0	Input - on/off signal
		VL+	Power supply 24 VDC for driver's logic and communication	Input - power supply
10	**D_IN1**		Function software selectable between: multiple pressure PID 1 selection (default) or power limitation enable. Referred to V0	Input - on/off supply
		VL0	Power supply 0 VDC for driver's logic and communication	Gnd - power supply
11	**FAULT** referred to: V0	VL0	Fault (0 VDC) or normal working (24 VDC)	Output - on/off signal
PE	**EARTH**		Internally connected to driver housing	

Notes: these connections are the same of Moog radial piston pumps, model RKP-D;
do not disconnect VL0 before VL+ when the driver is connected to PC USB port

17.3 Communications connectors - for **PES** and **PERS** (B) - (C)

(B) **USB connector - M12 - 5 pin** always present		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION** (1)
1	**+5V_USB**	Power supply
2	**ID**	Identification
3	**GND_USB**	Signal zero data line
4	**D-**	Data line -
5	**D+**	Data line +

(C1) (C2) **BP fieldbus execution, connector - M12 - 5 pin**		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION** (1)
1	**+5V**	Termination supply signal
2	**LINE-A**	Bus line (high)
3	**DGND**	Data line and termination signal zero
4	**LINE-B**	Bus line (low)
5	**SHIELD**	

(1) Shield connection on connector's housing is recommended

(C1) (C2) **BC fieldbus execution, connector - M12 - 5 pin**		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION** (1)
1	**CAN_SHLD**	Shield
2	**not used**	(C1) - (C2) pass-through connection (2)
3	**CAN_GND**	Signal zero data line
4	**CAN_H**	Bus line (high)
5	**CAN_L**	Bus line (low)

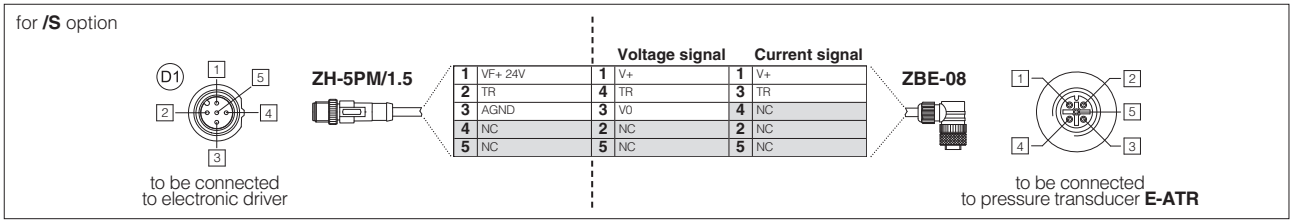
(C1) (C2) **EH, EW, EI, EP fieldbus execution, connector - M12 - 4 pin**		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION** (1)
1	**TX+**	Transmitter
2	**RX+**	Receiver
3	**TX-**	Transmitter
4	**RX-**	Receiver
Housing	**SHIELD**	

(2) Pin 2 can be fed with external +5V supply of CAN interface

17.4 Remote pressure/force transducer connector - M12 - 5 pin - for **PES** and **PERS** with for **/S, /X, /SX** options (D1) - (D2)

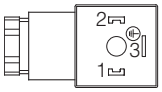
PIN	SIGNAL	TECHNICAL SPECIFICATION	NOTES	Voltage	Current
1	**VF +24V**	Power supply +24VDC	Output - power supply	Connect	Connect
2	**TR1**	Signal transducer: ±10 VDC / ±20 mA maximum range	Input - analog signal **Software selectable**	Connect	Connect
3	**AGND**	Common gnd for transducer power and signals	Common gnd	Connect	/
4	**NC**	Not connect		/	/
5	**NC**	Not connect		/	/

Remote pressure transducer connection - example



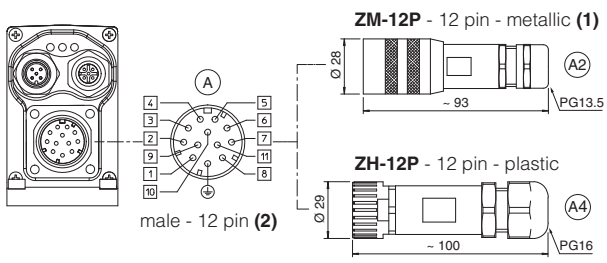
Note: connectors front view

17.5 Solenoid connection - for **CZ** and **LQZ**

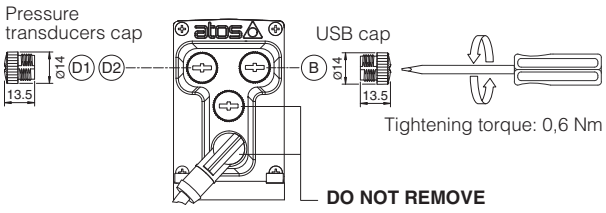
PIN	SIGNAL	TECHNICAL SPECIFICATION	Connector code 666
1	**COIL**	Power supply	
2	**COIL**	Power supply	
3	**GND**	Ground	

17.6 PES and PERS connections layout

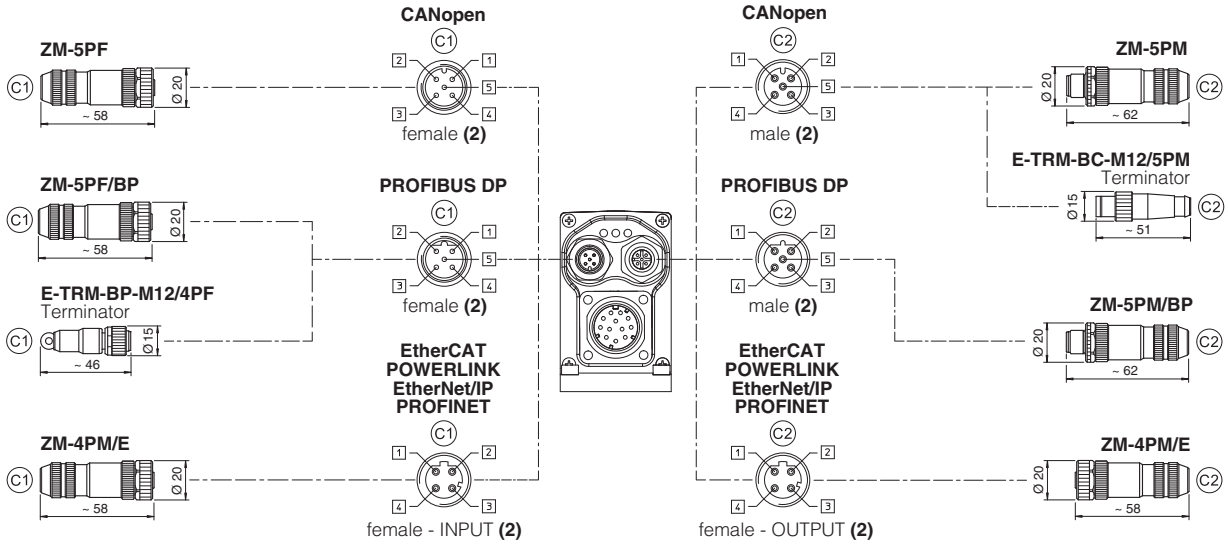
MAIN CONNECTORS



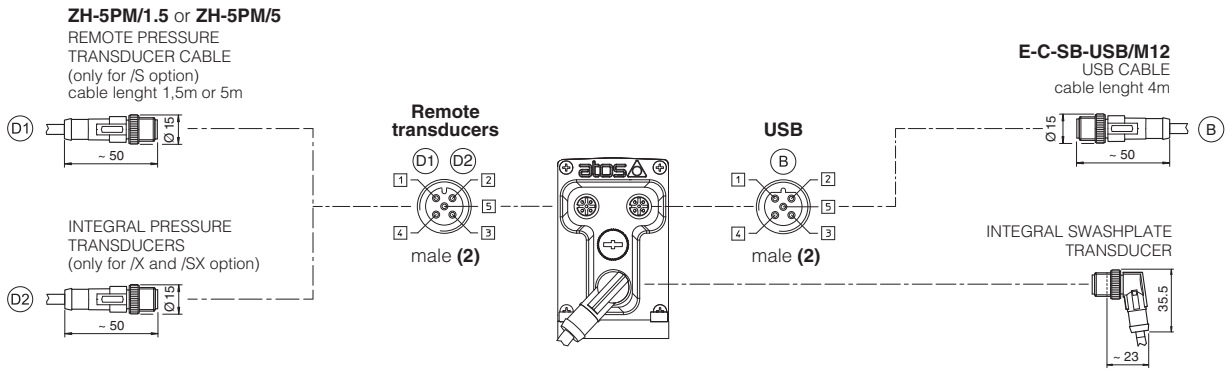
PLASTIC PROTECTION CAPS - supplied with the valves



FIELDBUS CONNECTORS



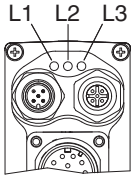
TRANSDUCERS AND USB CONNECTORS



(1) Use of metallic connectors is strongly recommended in order to fulfill EMC requirements **(2)** Pin layout always referred to driver's view

17.7 Diagnostic LEDs (L)

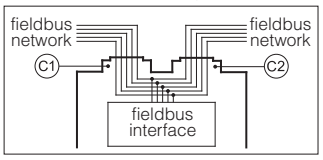
Three leds show driver operative conditions for immediate basic diagnostics. Please refer to the driver user manual for detailed information.

FIELDBUS / LEDS	NP Not Present	BC CANopen	BP PROFIBUS DP	EH EtherCAT	EW POWERLINK	EI EtherNet/IP	EP PROFINET	L1 L2 L3
L1	VALVE STATUS			LINK/ACT				
L2	NETWORK STATUS			NETWORK STATUS				
L3	SOLENOID STATUS			LINK/ACT				

18 IN / OUT FIELDBUS COMMUNICATION CONNECTORS

Two fieldbus communication connectors are always available for digital driver executions BC, BP, EH, EW, EI, EP. This features allows considerable technical advantages in terms of installation simplicity, wirings reduction and also avoid the usage expensive T-connectors.
For BC and BP executions the fieldbus connectors have an internal pass-through connection and can be used like end point of the fieldbus network, using an external terminator (see tech table **GS500**).
For EH, EW, EI and EP execution the external terminators are not required: each connector is internally terminated.

BC and BP pass-through connection



19 CONNECTORS CHARACTERISTICS - to be ordered separately

19.1 Main connectors

CONNECTOR TYPE	POWER SUPPLY	POWER SUPPLY
CODE	(A1) ZM-12P	(A2) ZH-12P
Type	12pin female straight circular	12pin female straight circular
Standard	DIN 43651	DIN 43651
Material	Metallic	Plastic reinforced with fiber glass
Cable gland	PG13,5	PG16
Recommended cable	LiYCY 12 x 0,75 mm² max 20 m (logic and power supply)	LiYCY 10 x 0,14mm² max 40 m (logic) LiYY 3 x 1mm² max 40 m (power supply)
Conductor size	0,5 mm² to 1,5 mm² - available for 12 wires	0,14 mm² to 0,5 mm² - available for 9 wires 0,5 mm² to 1,5 mm² - available for 3 wires
Connection type	to crimp	to crimp
Protection (EN 60529)	IP 67	IP 67

19.2 Fieldbus communication connectors

CONNECTOR TYPE	BC CANopen (1)		BP PROFIBUS DP (1)		EH EtherCAT, EW POWERLINK, EI EtherNet/IP, EP PROFINET (2)
CODE	(C1) ZM-5PF	(C2) ZM-5PM	(C1) ZM-5PF/BP	(C2) ZM-5PM/BP	(C1) (C2) ZM-4PM/E
Type	5 pin female straight circular	5 pin male straight circular	5 pin female straight circular	5 pin male straight circular	4 pin male straight circular
Standard	M12 coding A – IEC 61076-2-101		M12 coding B – IEC 61076-2-101		M12 coding D – IEC 61076-2-101
Material	Metallic		Metallic		Metallic
Cable gland	Pressure nut - cable diameter 6÷8 mm		Pressure nut - cable diameter 6÷8 mm		Pressure nut - cable diameter 4÷8 mm
Cable	CANbus Standard (DR 303-1)		PROFIBUS DP Standard		Ethernet standard CAT-5
Connection type	screw terminal		screw terminal		terminal block
Protection (EN 60529)	IP67		IP 67		IP 67

(1) E-TRM-** terminators can be ordered separately, see tech table **GS500** **(2)** Internally terminated

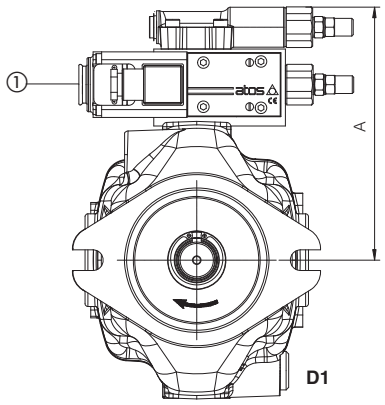
19.3 Remote pressure transducer connectors

CONNECTOR TYPE	PRESSURE TRANSDUCER		SF - Double transducers
CODE	(D1) (D2) ZH-5PM/1.5	(D1) (D2) ZH-5PM/5	(D2) ZH-5PM-2/2
Type	5 pin male straight circular		4 pin male straight circular
Standard	M12 coding A – IEC 61076-2-101		M12 coding A – IEC 61076-2-101
Material	Plastic		Plastic
Cable gland	Connector moulded on cables 1,5 m lenght	5 m lenght	Connector moulded on cables 2 m lenght
Cable	5 x 0,25 mm²		3 x 0,25 mm² (both cables)
Connection type	molded cable		splitting cable
Protection (EN 60529)	IP 67		IP 67

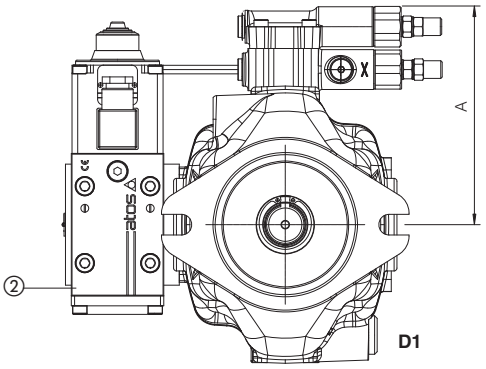
20 INSTALLATION DIMENSION [mm]

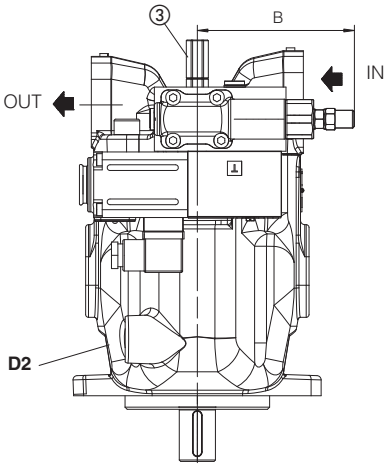
DIMENSIONS OF PVPC size 3, 4 and 5

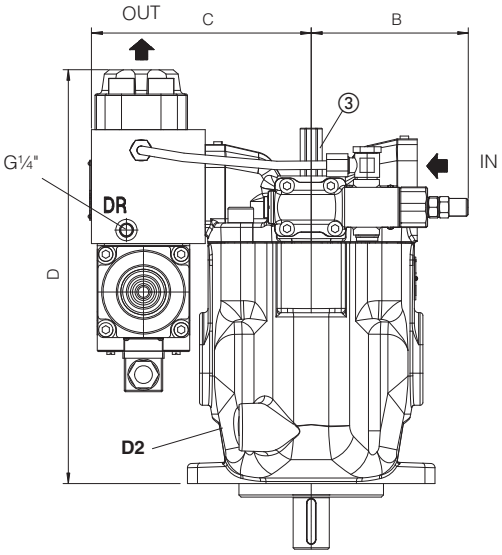
PVPC-CZ



PVPC-LQZ







① = Proportional pressure control valve

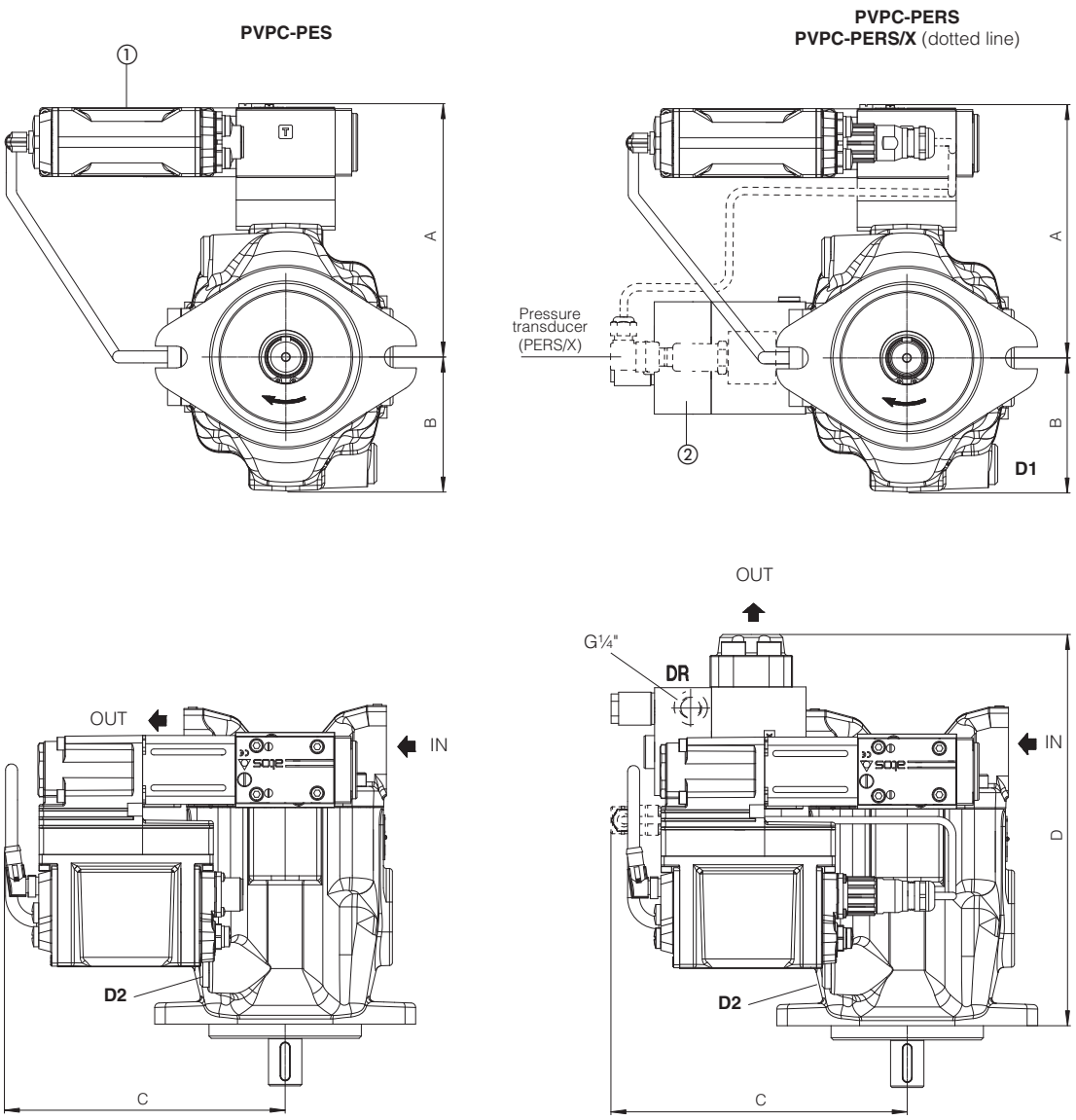
② = Proportional flow control valve

③ = Regulation screw for max displacement. Adjustable range 50% to 100% of max displacement (not available for versions PES, PERS and PERS/X). In case of double pump the regulation screw is not always available, please contact our technical office.

Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted and consequently also the position of the control devices.

Pump type	Version	A	B	C	D	IN	OUT	D1, D2	Mass (kg)
PVPC-*-3029	**CZ**	168	111	-	-	Flange SAE 3000 1 1/4”	Flange SAE 6000 3/4”	1/2” BSPP	22
	LQZ	144	111	132	257				24
PVPC-*-4046	**CZ**	177	111	-	-	Flange SAE 3000 1 1/2”	Flange SAE 6000 1”	1/2” BSPP	28
	LQZ	153	111	156	293				33,6
PVPC-*-5073 PVPC-*-5090	**CZ**	190	111	-	-	Flange SAE 3000 2”	Flange SAE 6000 1 1/4”	3/4” BSPP	36,9
	LQZ	166	111	163	328				44

DIMENSIONS OF PVPC size 3, 4 and 5



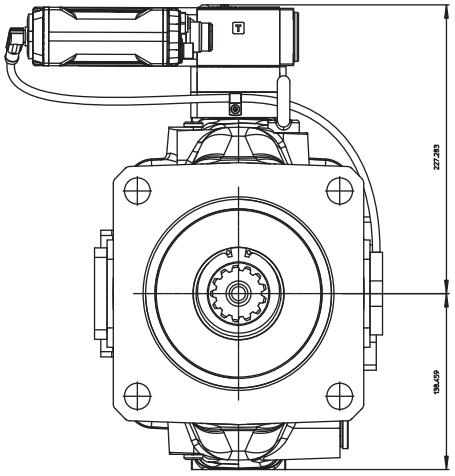
① = Proportional valve with on-board driver with P/Q control
② = Sequence module

Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted and consequently also the position of the control devices.

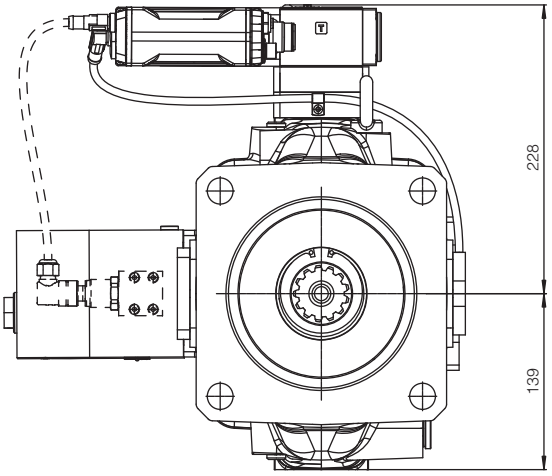
Pump type	Version	A	B	C	D	IN	OUT	D1, D2	Mass (kg)
PVPC-*-3029	**PES**	170	103,5	190	-	Flange SAE 3000 1 1/4”	Flange SAE 6000 3/4”	1/2” BSPP	21,6
	PERS	170	103,5	200	262,5				26
	PERS/X	190	103,5	200	262,5				26,4
PVPC-*-4046	**PES**	178	103,5	190	-	Flange SAE 3000 1 1/2”	Flange SAE 6000 1”	1/2” BSPP	27,6
	PERS	178	103,5	220	299				33,7
	PERS/X	178	103,5	220	299				34,1
PVPC-*-5073 PVPC-*-5090	**PES**	190	103,5	190	-	Flange SAE 3000 2”	Flange SAE 6000 1 1/4”	3/4” BSPP	36,6
	PERS	190	103,5	230	337				46,7
	PERS/X	190	103,5	230	337				47,1

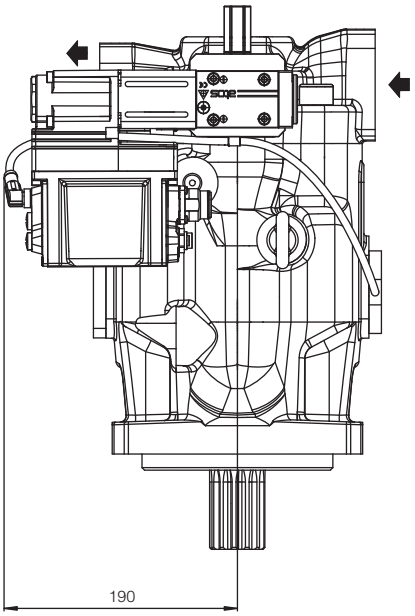
DIMENSIONS OF PVPC size 6

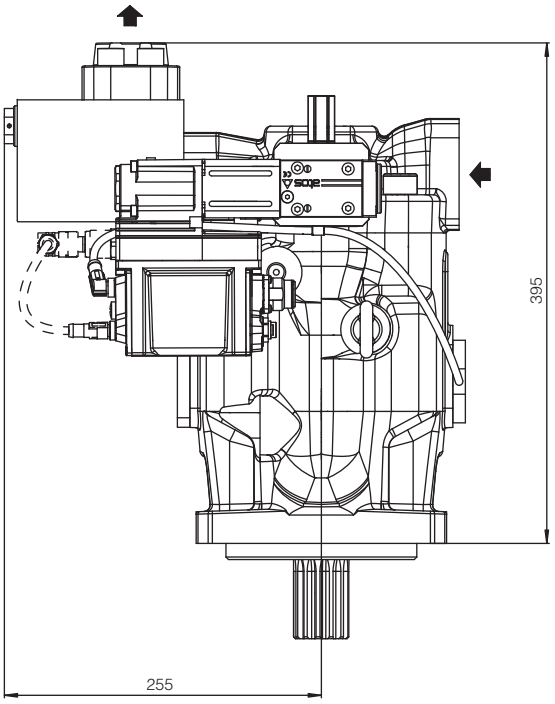
PVPC-PES



PVPC-PERS
PVPC-PERS/X (dotted line)







① = Proportional valve with on-board driver with P/Q control
② = Sequence module

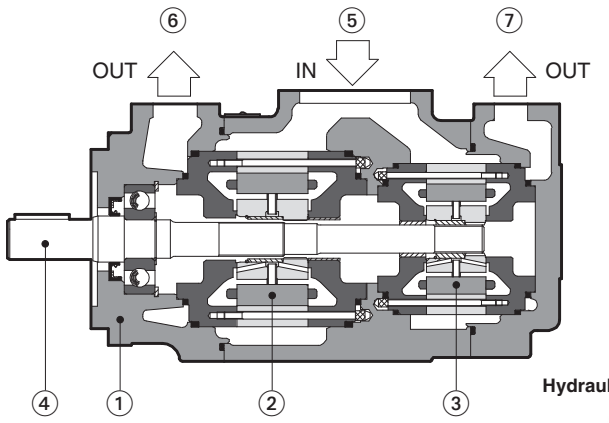
Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted and consequently also the position of the control devices.

21 RELATED DOCUMENTATION

A900	Operating and maintenance information for pumps	**G030**	E-BM-AS digital driver
FS001	Basics for digital electrohydraulics	**GS050**	E-BM-AES digital driver
FS500	Digital proportional valves with P/Q control	**GS500**	Programming tools
FS900	Operating and maintenance information for proportional valves	**GS510**	Fieldbus
G010	E-MI-AC analog driver	**K800**	Electric and electronic connectors
G020	E-MI-AS-IR digital driver	**P005**	Mounting surfaces for electrohydraulic valves

Double vane pumps type PFED

fixed displacement



① body
② first cartridge: stator, rotor, vanes, balanced plates
③ second cartridge: as above
④ shaft
⑤ inlet port
⑥ first outlet port
⑦ second outlet port

PFED-43

PFED are fixed displacement double vane pumps ②③ composed by two cartridges of pumps type PFE (see tab. A005) assembled in a main body having one inlet port ⑤ and two outlet ports ⑥⑦.

PFED-43 are composed by one cartridge of PFE-41 and one cartridge of PFE-31.
PFED-54 are composed by one cartridge of PFE-51 and one cartridge of PFE-41.

Suitable for hydraulic oils according to DIN 51524...535 or synthetic fluids having similar lubricating characteristics.

These pumps can be assembled, as second element, with PFE-4 and PFE-5 to obtain triple pumps, see tab A190.

Mounting according to SAE J744.
Easy installation as inlet and outlet ports can be assembled in any of four relative positions.
Easy maintenance as pumping cartridge can be replaced in a few minutes.

Wide variety of displacements: from 29+16 up to 150+85 cm³/rev.
Max pressure up to 210 bar.

1 MODEL CODE

PFED	-	42	045	/	022	/	1	D	TA	*	/	*

PFED: Fixed displacement double vane pump

42: Size of cartridges:
43 = composed by: one cartridge of PFE-41 + one cartridge of PFE-31
54 = composed by: one cartridge of PFE-51 + one cartridge of PFE-41

045: Displacement of first element [cm³/rev], see sec. 3

022: Displacement of second element [cm³/rev], see sec. 3

1: Drive shaft, see section 6 and 7:
cylindrical, keyed
1 = supplied standard if not otherwise specified
2 = according to ISO/DIN 3019
3 = for high torque applications
splined
5 = for PFED-43: according to SAE B 13T 16/32 DP (13 teeth)
for PFED-54: according to SAE C 14T 12/24 DP (14 teeth)
6 = (only for PFED-43) = according to SAE C 14T 12/24 DP (14 teeth)
7 = (only for PFED-43) = similar to shaft type 6. It is used when PFED-43 is the last element of a multiple pump

D: Direction of rotation (as viewed at the shaft end):
D = clockwise (supplied standard if not otherwise specified)
S = counterclockwise
Note: PFED are not reversible

TA: Ports orientation, see section 4

*****: Series number

*****: Seals material:
omit for NBR (mineral oil & water glycol)
PE = FPM

2 MAIN CHARACTERISTICS OF DOUBLE VANE PUMPS TYPE PFED

Installation position		Any position.	
Loads on the shaft		Axial and radial loads are not allowed on the shaft. The coupling should be sized to absorb the peak horsepower developed.	
Ambient temperature		**Standard** = -25°C ÷ +80°C **/PE** option -15°C ÷ +80°C	
Fluid		Hydraulic oil as per DIN 51524...535; for other fluids see section 1	
Recommended viscosity		max at cold start: 800 mm²/s; max at full power 100 mm²/s; during operation 24 mm²/s; min at full power 10 mm²/s	
Max fluid contamination level	normal operation	ISO4406 class 21/19/16 NAS1638 class 10	see also filter section at KTF catalog
	longer life	ISO4406 class 18/16/13 NAS1638 class 8	
Fluid contamination class		ISO 4401 class 21/19/16 NAS 1638 class 10 (filters at 25 µm value with ß25 ≥ 75 recommended)	
Fluid temperature		-20°C +60°C -20°C +50°C (water glycol) -20°C +80°C (/PE seals)	
Recommended suction line pressure		from -0,5 to 1,5 bar for speed up to 1800 rpm; from 0 to +1,5 bar for speed over 1800 rpm	
Compliance		RoHS Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006	

3 OPERATING CHARACTERISTICS at 1450 rpm with hydraulic oil having viscosity of 24 mm²/sec and 40°C

Model	7 bar				70 bar				140 bar				210 bar				Speed range min/max rpm
	1°flow		2°flow		1°flow		2°flow		1°flow		2°flow		1°flow		2°flow		
PFED-43	l/min	Kw	l/min	Kw	l/min	Kw	l/min	Kw	l/min	Kw	l/min	Kw	l/min	Kw	l/min	Kw	
PFED-43 029/016	41	0,8	23	0,5	39	5,5	21	3	37	10	19	5	34	14	16	6,5	800Ø2500
PFED-43 029/022	41	0,8	30	0,6	39	5,5	28	4	37	10	26	7	34	14	23	10	
PFED-43 029/028	41	0,8	40	0,8	39	5,5	38	5,5	37	10	36	10	34	14	33	14	
PFED-43 037/016	52	1	23	0,5	50	7	21	3	48	12,5	19	5	45	18	16	6,5	
PFED-43 037/022	52	1	30	0,6	50	7	28	4	48	12,5	26	7	45	18	23	10	
PFED-43 037/028	52	1	40	0,8	50	7	38	5,5	48	12,5	36	10	45	18	33	14	
PFED-43 037/036	52	1	51	1	50	7	49	7	48	12,5	46	12,5	45	18	43	18	
PFED-43 045/016	64	1,3	23	0,5	62	8,5	21	3	60	16	19	5	57	24	16	6,5	
PFED-43 045/022	64	1,3	30	0,6	62	8,5	28	4	60	16	26	7	57	24	23	10	
PFED-43 045/028	64	1,3	40	0,8	62	8,5	38	5,5	60	16	36	10	57	24	33	14	
PFED-43 045/036	64	1,3	51	1	62	8,5	49	7	60	16	46	12,5	57	24	43	18	
PFED-43 045/044	64	1,3	63	1,3	62	8,5	61	8	60	16	58	15,5	57	24	55	23	
PFED-43 056/016	80	1,6	23	0,5	78	11	21	3	75	21	19	5	72	30	16	6,5	
PFED-43 056/022	80	1,6	30	0,6	78	11	28	4	75	21	26	7	72	30	23	10	
PFED-43 056/028	80	1,6	40	0,8	78	11	38	5,5	75	21	36	10	72	30	33	14	
PFED-43 056/036	80	1,6	51	1	78	11	49	7	75	21	46	12,5	72	30	43	18	
PFED-43 056/044	80	1,7	63	1,3	78	11	61	8	75	21	58	15,5	72	30	55	23	
PFED-43 070/016	101	2	23	0,5	98	13,5	21	3	95	26	19	5	91	37	16	6,5	
PFED-43 070/022	101	2	30	0,6	98	13,5	28	4	95	26	26	7	91	37	25	10	
PFED-43 070/028	101	2	40	0,8	98	13,5	38	5,5	95	26	36	10	91	37	33	14	
PFED-43 070/036	101	2	51	1	98	13,5	49	7	95	26	46	12,5	91	37	43	18	
PFED-43 070/044	101	2	63	1,3	98	13,5	61	8	95	26	58	15,5	91	37	55	23	
PFED-43 085/016	124	2,4	23	0,5	121	16	21	3	118	32	19	5	114	46	16	6,5	800Ø2000
PFED-43 085/022	124	2,4	30	1,6	121	16	28	4	118	32	26	7	114	46	23	10	
PFED-43 085/028	124	2,4	40	0,8	121	16	38	5,5	118	32	36	10	114	46	33	14	
PFED-43 085/036	124	2,4	51	1	121	16	49	7	118	32	46	12,5	114	46	43	18	
PFED-43 085/044	124	2,4	63	1,3	121	16	61	8	118	32	58	15,5	114	46	55	23	
PFED-54																	
PFED-54 090/029	128	2,7	41	0,8	124	17	39	5,5	119	33	37	10	114	48	34	14	700Ø2200
PFED-54 090/037	128	2,7	52	1	124	17	50	7	119	33	48	12,5	114	48	45	18	
PFED-54 090/045	128	2,7	64	1,3	124	17	62	8,5	119	33	60	16	114	48	57	24	
PFED-54 090/056	128	2,7	80	1,6	124	17	78	11	119	33	75	21	114	48	72	30	
PFED-54 090/070	128	2,7	101	2	124	17	98	13,5	119	33	95	26	114	48	91	37	
PFED-54 090/085	128	2,7	124	2,4	124	17	121	16	119	33	118	32	114	48	114	46	700Ø2000
PFED-54 110/029	157	3,2	41	0,8	152	21	39	5,5	147	40	37	10	141	58	34	14	700Ø2200
PFED-54 110/037	157	3,2	52	1	152	21	50	7	147	40	48	12,5	141	58	45	18	
PFED-54 110/045	157	3,2	64	1,3	152	21	62	8,5	147	40	60	16	141	58	57	24	
PFED-54 110/056	157	3,2	80	1,6	152	21	78	11	147	40	75	21	141	58	72	30	
PFED-54 110/070	157	3,2	101	2	152	21	98	13,5	147	40	95	26	141	58	91	37	
PFED-54 110/085	157	3,2	124	2,4	152	21	121	16	147	40	118	32	141	58	114	46	700Ø2000
PFED-54 129/029	186	3,7	41	0,8	180	25	39	5,5	174	47	37	10	168	69	34	14	700Ø2200
PFED-54 129/037	186	3,7	52	1	180	25	50	7	174	47	48	12,5	168	69	45	18	
PFED-54 129/045	186	3,7	64	1,3	180	25	62	8,5	174	47	60	16	168	69	57	24	
PFED-54 129/056	186	3,7	80	1,6	180	25	78	11	174	47	75	21	168	69	72	30	
PFED-54 129/070	186	3,7	101	2	180	25	98	13,5	174	47	95	26	168	69	91	37	
PFED-54 129/085	186	3,7	124	2,4	180	25	121	16	174	47	118	32	168	69	114	46	700Ø2000
PFED-54 150/029	215	4,2	41	0,8	211	29	39	5,5	204	55	37	10	197	80	34	14	700Ø1800
PFED-54 150/037	215	4,2	52	1	211	29	50	7	204	55	48	12,5	197	80	45	18	
PFED-54 150/045	215	4,2	64	1,3	211	29	62	8,5	204	55	60	16	197	80	57	24	
PFED-54 150/056	215	4,2	80	1,6	211	29	78	11	204	55	75	21	197	80	72	30	
PFED-54 150/070	215	4,2	101	2	211	29	98	13,5	204	55	95	26	197	80	91	37	
PFED-54 150/085	215	4,2	124	2,4	211	29	121	16	204	55	118	32	197	80	114	46	

(1) Max pressure is 160 bar for /PE and /WG versions (2) Max speed is 1800 rpm for /PE versions; 1500 rpm for /WG versions

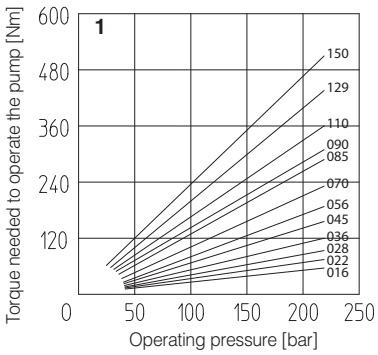
4 PORT ORIENTATION (pumps viewed from the shaf end)

Pumps can be supplied with the oil ports oriented in different configuration in relation to the drive shaft. Port orientation of the first element is designated as follows (as wiewed at the shaft end);
T = inlet and outlet ports on the same axis (standard)
U = outlet orientated 180° with respect to the inlet
V = outlet oriented 90° with respect to the inlet
W = outlet oriented 270° with respect to the inlet
Outlet port of second element can be orientated, relative to the inlet port, in 8 positions at 45° **(O, A, B, C, D, E, F, G)**
Ports orientation can be easily changed by rotating the pump body that carries inlet port.

TO P1-T-P2	**TA** P1-T P2	**TB** P1-T P2	**TC** P1-T P2	**TD** P1-T P2	**TE** P1-T P2	**TF** P1-T P2	**TG** P1-T P2
WO P1-P2 T	**WA** P1 P2 T	**WB** P1 T P2	**WC** P1 T P2	**WD** P1 T P2	**WE** P1 T P2	**WF** P1 P2-T	**WG** P1 P2 T
UO P1-P2 T	**UA** P1 P2 T	**UB** P1 T P2	**UC** P1 T P2	**UD** P1 P2-T	**UE** P1 P2 T	**UF** P1 P2 T	**UG** P1 P2 T
VO P1-P2 T	**VA** P1 P2 T	**VB** P1 P2-T	**VC** P1 T P2	**VD** P1 T P2	**VE** P1 P2 T	**VF** P1 P2 T	**VG** P1 P2 T

5 DIAGRAMS

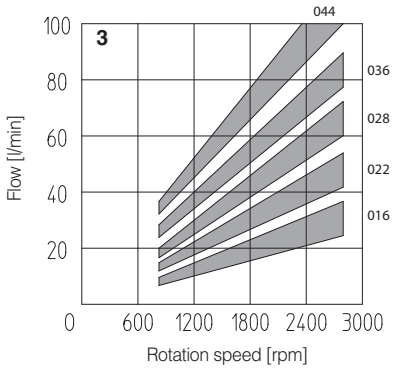
1 = Torque versus pressure diagram

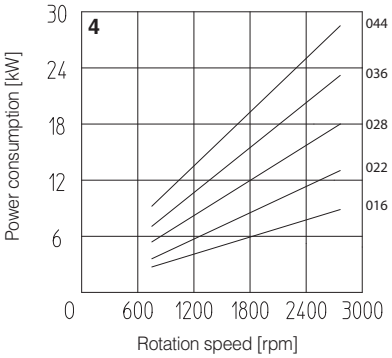


PFED-43: Second element (cartridge SC-PFED-31)**

2 = Flow versus speed diagram with pressure variation from 7 bar to 210 bar.

3 = Power consumption versus speed diagram at 140 bar. Power consumption is proportional to operating pressure.

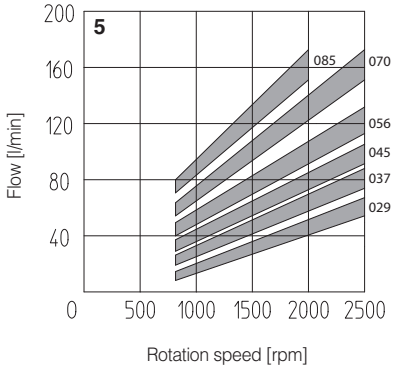


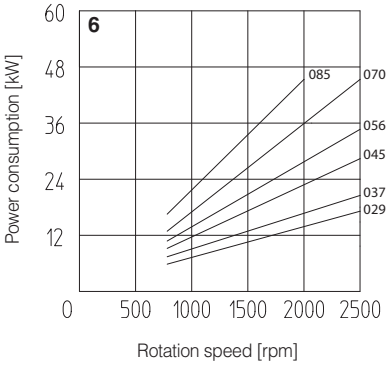


PFED-43: First element (cartridge SC-PFE-41)**
PFED-54: Second element (cartridge SC-PFED-41)**

4 = Flow versus speed diagram with pressure variation from 7 bar to 210 bar.

5 = Power consumption versus speed diagram at 140 bar. Power consumption is proportional to operating pressure.

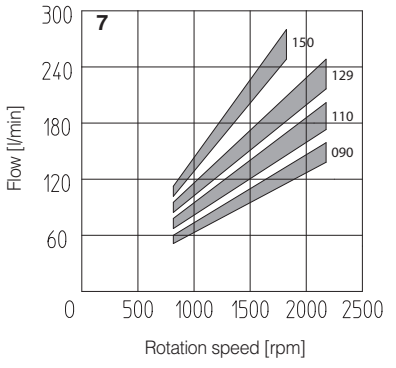


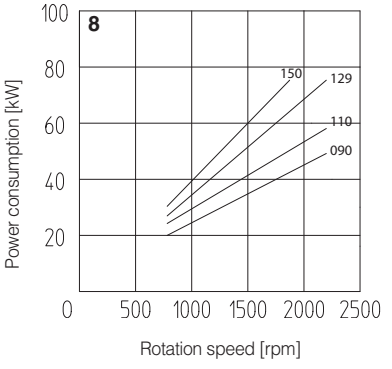


PFED-54: First element (cartridge SC-PFE-51)**

6 = Flow versus speed diagram with pressure variation from 7 bar to 210 bar.

7 = Power consumption versus speed diagram at 140 bar. Power consumption is proportional to operating pressure.





6 LIMITS OF SHAFT TORQUE

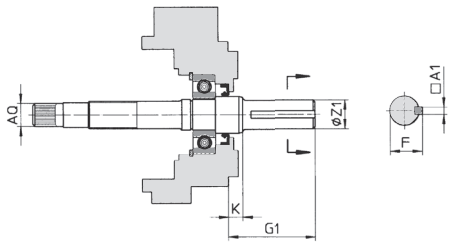
Pump model	Maximum driving torque [Nm]					
	Shaft type 1	Shaft type 2	Shaft type 3	Shaft type 5	Shaft type 6	Shaft type 7
PFED-43	250	250	400	200	400	400
PFED-54	500	500	850	450	–	–

The values of torque needed to operate each single cartridge are shown on the "torque versus pressure diagram" at section 5.
The total torque applied to the shaft of the pump is the sum of the single torque needed for operating each single cartridge and it is necessary to verify that this total torque applied to the drive shaft is not higher than the values indicated in the table.

7 DRIVE SHAFT

CYLINDRICAL SHAFT KEYED

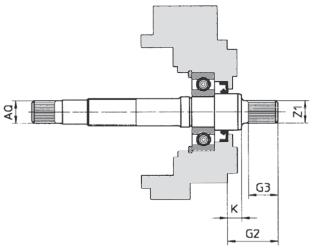
1 = supplied as standard if not specified in the model code
2 = according to ISO/DIN 3019 standards
3 = for high torque applications



Model	Keyed shaft type 1 (standard)					Keyed shaft type 2					Keyed shaft type 3				
	A1	F	G1	K	ØZ1	A1	F	G1	K	ØZ1	A1	F	G1	K	ØZ1
PFED-43	4,78	24,54	59,00	11,40	22,22	6,38	25,03	71,00	8,00	22,22	6,38	28,30	78,00	11,40	25,38
	4,75	24,41			22,20	6,35	24,77			22,20	6,35	28,10			25,35
PFED-54	7,97	35,33	74,25	14	31,75	7,97	35,33	84,25	8,1	31,75	7,97	38,58	84,25	14	34,90
	7,94	35,07			31,70	7,94	35,07			31,70	7,94	38,46			34,88

SPLINED SHAFT

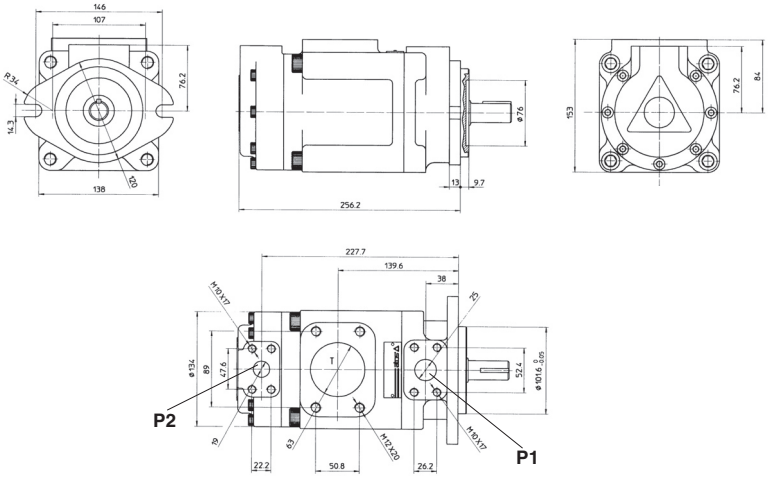
5 = for PFED-43 according to SAE B 16/32 DP, 13 teeth;
for PFED-54 according to SAE C 12/24 DP, 14 teeth;
6 = (only for PFED-43) according to SAE C 12/24 DP, 14 teeth;
7 = only for PFED-43 when used as the last element of a multiple pump: similar to shaft type 6.



Model	Splined shaft type 5				Splined shaft type 6				Splined shaft type 7			
	G2	G3	K	Z2	G2	G3	K	Z2	G2	G3	K	Z2
PFED-43	41,25	28	8,00	SAE 16/32-13T	55,60	42	8,00	SAE 12/24-14T	41,60	28	8,00	SAE 12/24-14T
PFED-54	55,7	42	8,1	SAE 12/24-14T	—	—	—	—	—	—	—	—

8 DIMENSIONS [mm]

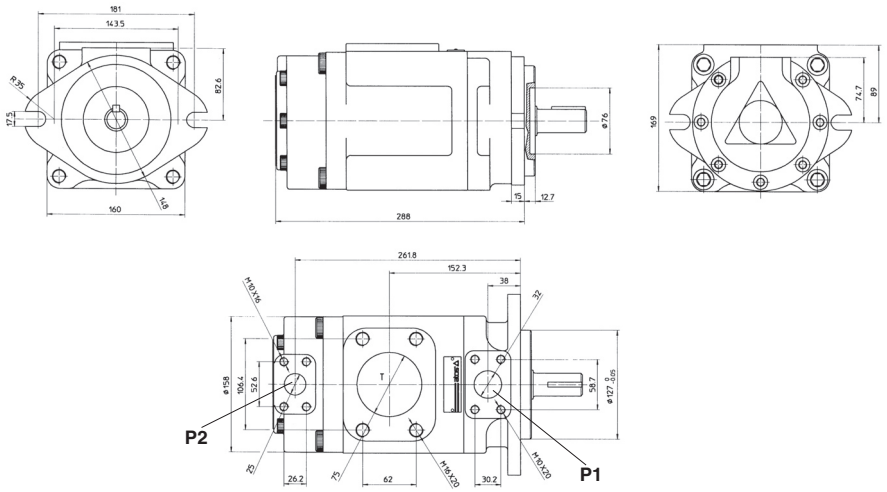
PFED-43



SAE FLANGES:
port P1 = 1";
port P2 = 3/4";
port T = 2 ½"

Weight: 24,5 kg

PFED-54



SAE FLANGES:
port P1 = 1 ¼";
port P2 = 1";
port T = 3"

Weight: 36 kg

Multiple pumps type PFEX, PFRX, PVPCX2E

vane, piston, fixed or variable displacement

Multiple pumps are composed by various vane, radial piston or axial piston pumps modularly assembled:
PFEX, see section 1, are composed by vane pumps PFE (table A005 and A007) or PFED (table A180);
PFRX, see section 2, are composed by radial piston pumps PFR (table A045) and vane pumps PFE (table A005 and A007)
PVPCX2E, see section 3, are composed by axial piston pumps PVPC (table A160) and vane pumps PFE (table A005 and A007)

For multiple pumps must be verified that the max torques applied on each single drive shaft and on each single through shaft are not higher than the max allowed limits. In particular, must be considered that the total torque applied to the drive shaft of the first element is the sum of the single torque needed for operating each single pump.

In the figure are shown:

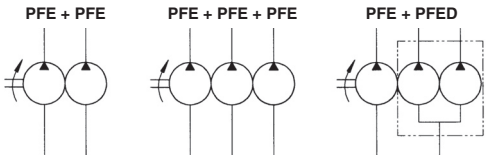
M1, M2, M3, = torque needed to operate each single pump (obtainable from “torque versus pressure diagram” of each single pump).
L_{DS1}, L_{DS2}, L_{DS3} = limits of torque for drive shafts;
L_{TS1}, L_{TS2} = limits of torque at the end of through shafts.

The values of torque needed to operate each single pump and the allowed limit torque values for drive shafts and through shafts are shown on technical tables of individual basic pumps.

For multiple pumps, the following verifications must be executed:
a) $M3 \le L_{TS2}$
b) $M3 + M2 \le L_{DS2}$
c) $M3 + M2 \le L_{TS1}$
d) $M3 + M2 + M1 \le L_{DS1}$

1 PFEX2, PFEX3, PFEXD MULTIPLE VANE PUMPS

PFEX* are fixed displacement multiple vane pumps. They can be double (composed by two pumps type PFE) or triple pumps (composed by three PFE or by one PFE and one PFED).



For technical characteristics of PFE-*1 pumps, see tab. A005; for technical characteristics of PFE-*2 see tab. A007; for technical characteristics of PFED pumps, see tab. A180.

1.1 MODEL CODE FOR PFEX*

PFEX	2	-	42	045	/	31028	/	3	D	T	*	/	*

Fixed displacement multiple vane pump

2 = double pump composed of two pumps type PFE
3 = triple pump composed of three pumps type PFE
D = triple pump composed of one pump type PFE and one pump type PFED
Pumps are assembled in decreasing order of size

Size of first pump:
31, **41**, **51**, **32**, **42**, **52**

Displacement of first pump [cm³/rev]
for PFE 31: 010, 016, 022, 028, 036, 044
for PFE 41: 029, 037, 045, 056, 070,085
for PFE 51: 090, 110, 129, 150
for PFE 32: 016, 022, 028, 036,
for PFE 42: 045, 056, 070, 085
for PFE 52: 090, 110, 129, 150

Size and displacement [cm³/rev] of second (and third) pump

Drive shaft
cylindrical keyed:
1 = (only for PFE-31, 41, 51) standard
2 = (only for PFE-41 and PFE-51) according to ISO/DIN 3019
3 = for high torque applications

splined
5 = standard
6 = for high torque applications
for PFEX*-3 according to SAE B 16/32 DP, 13 teeth;
for PFEX*-4 according to SAE C 12/24 DP, 14 teeth;

Direction of rotation (as viewed at the shaft end):
D = clockwise (supplied standard if not otherwise specified)
S = counterclockwise
Note: PFE are not reversible

Port orientation, see section 1.2

Series number

Seals material:
omit for NBR (mineral oil & water glycol)
PE = FPM

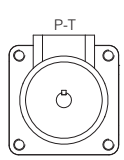
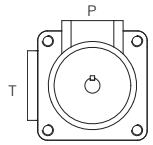
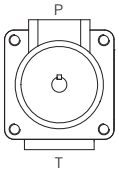
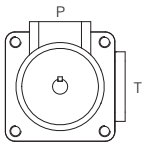
Note:
multiple pumps are supplied with inlet and outlet ports in line. Ports orientation can be easily changed by rotating the pump body that carries inlet port.

1.2 PORT ORIENTATION

-PFEX2, PFEX3

Pumps can be supplied with oil ports oriented in different configurations viewed from shaft end, as below indicated.
In PFEX2 and PFEX3 multiple pumps, the port orientation is the same for first, second (third) pumps.

Model code example: PFEX2-42045/41037/5D**T**

T  orientation of all pumps	**V**  orientation of all pumps	**U**  orientation of all pumps	**W**  orientation of all pumps

P1 outlet port ; **T1** inlet port

-PFEXD

Pumps can be supplied with oil ports oriented in different configurations viewed from shaft end, as below indicated..
In PFEXD, the ports orientation of second / third pump (PFED), can be selected according following table.
The ports orientation of first pump depends to the selected orientation of second / third pumps.

Model code example: PFEXD-42045/43037/016/5D**TO**

1st PUMP PFEX*	**2nd / 3th PUMP PFED***							
	**TO** 	**TA** 	**TB** 	**TC** 	**TD** 	**TE** 	**TF** 	**TG** 
	**WO** 	**WA** 	**WB** 	**WC** 	**WD** 	**WE** 	**WF** 	**WG** 
	**UO** 	**UA** 	**UB** 	**UC** 	**UD** 	**UE** 	**UF** 	**UG** 
	**VO** 	**VA** 	**VB** 	**VC** 	**VD** 	**VE** 	**VF** 	**VG** 

P1 outlet port of first element; **P2** outlet port of second element; **P3** outlet port of third element; **T1** inlet port of first element; **T2** inlet port of second element

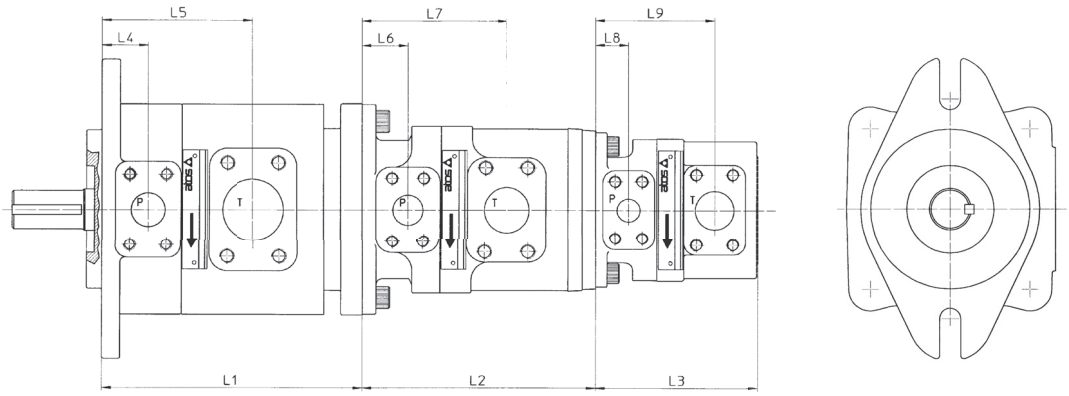
1.3 DIMENSIONS OF MULTIPLE PUMPS TYPE PFEX2, PFEX3, PFEXD [mm]

PFEX2

For missing details see tab. A005 and A007

Composed pump	First element	Second element	L1	L2	L3	L4	L5	L6
PFEX2-32***/31***/*	PFEXA-32***/*	PFE-31***/5	164	134,5	27,5	98,5	27,5	98,5
PFEX2-42***/31***/*	PFEXA7-42***/*	PFE-31***/7	194	134,5	38	120	27,5	98,5
PFEX2-42***/41***/*	PFEXB7-42***/*	PFE-41***/7	203	160	38	120	38	120
PFEX2-52***/31***/*	PFEXA7-52***/*	PFE-31***/7	206	134,5	38	125	27,5	98,5
PFEX2-52***/41***/*	PFEXB7-52***/*	PFE-41***/7	215,5	160	38	125	38	120
PFEX2-52***/51***/*	PFEXC-52***/*	PFE-51***/5	230	186,5	38	125	38	125

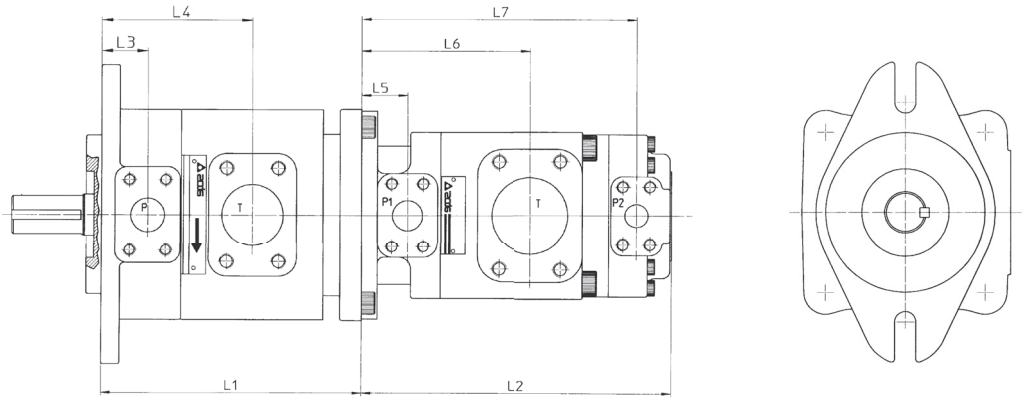
PFEX3



For missing details see tab. A005 and A007

Composed pump	First elem.	Second elem.	Third elem.	L1	L2	L3	L4	L5	L6	L7	L8	L9
PFEX3-32***/31***/31***/*	PFEXA-32***/*	PFEXA-31***/5	PFE-31***/5	164	164	134,5	27,4	98,5	27,4	98,5	24,7	98,5
PFEX3-42***/31***/31***/*	PFEXA7-42***/*	PFEXA-31***/7	PFE-31***/5	203	164	134,5	38	120	27,4	98,5	24,7	98,5
PFEX3-42***/41***/31***/*	PFEXB7-42***/*	PFEXA7-41***/7	PFE-31***/7	203	194	134,5	38	120	38	120	24,7	98,5
PFEX3-42***/41***/41***/*	PFEXB7-42***/*	PFEXB7-41***/7	PFE-41***/7	203	203	160	38	120	38	120	38	120
PFEX3-52***/31***/31***/*	PFEXA7-52***/*	PFEXA-31***/7	PFE-31***/5	206	164	134,5	38	125	24,7	98,5	24,7	98,5
PFEX3-52***/41***/31***/*	PFEXB7-52***/*	PFEXA7-41***/7	PFE-31***/7	215,5	194	134,5	38	125	38	120	24,7	98,5
PFEX3-52***/41***/41***/*	PFEXB7-52***/*	PFEXB7-41***/7	PFE-41***/7	215,5	203	160	38	125	38	120	38	120
PFEX3-52***/51***/31***/*	PFEXC-52***/*	PFEXA7-51***/5	PFE-31***/7	230	206	134,5	38	125	38	125	24,7	98,5
PFEX3-52***/51***/41***/*	PFEXC-52***/*	PFEXB7-51***/5	PFE-41***/7	230	206	160	38	125	38	125	38	120
PFEX3-52***/51***/51***/*	PFEXC-52***/*	PFEXC-51***/5	PFE-51***/5	230	230	186,5	38	125	38	125	38	125

PFEXD

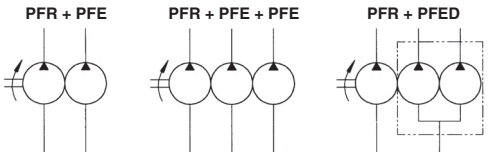


For missing details see tab. A005 and A007, A180

Composed pump	First element	Second element	L1	L2	L3	L4	L5	L6	L7
PFEXD-42***/43***/0**	PFEXB7-42***	PFED-43***/0**/7	203	256	38	120	38	139,6	227,7
PFEXD-52***/43***/0**	PFEXB7-52***	PFED-43***/0**/7	215,5	256	38	125	38	199,6	227,7
PFEXD-52***/54***/0**	PFEXC-52***	PFED-54***/0**/5	230	288	38	125	38	152,3	261,8

2 PFRX2E, PFRX3E, PFRXDE MULTIPLE RADIAL PISTON/VANE PUMPS

PFRX*E are fixed displacement multiple piston/vane pumps. They can be double (composed by one pump type PFR and one pump type PFE) or triple pumps (composed by one pump type PFR and one pump type PFEX2 or by one PFR and one PFED).



For technical characteristics of PFR pumps see tab. A045, for technical characteristics of PFE-1* pumps see tab. A005; for technical characteristics of PFE-*2 see tab. A007, for technical characteristics of PFED pumps, see tab. A180.

2.1 MODEL CODE FOR PFRX*E

PFRX	2E	-	5	25	/	31044	/	D	*	*	/	*

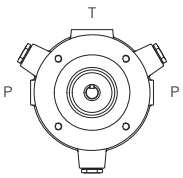
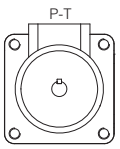
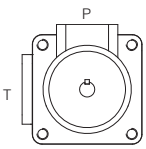
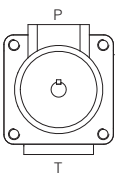
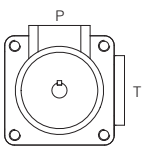
- **PFRX**: Multiple fixed displacement piston/vane pump
- **2E**: Composition: **2E** = double: PFR + PFE; **3E** = triple: PFR + PFEX2; **DE** = triple: PFR + PFED. The pumps are assembled in decreasing order of size.
- **5**: Size of first pump type PFR: **3**, **5**
- **25**: Displacement of first pump type PFR [cm³/rev] for PFR-3: **08**, **11**, **15**; for PFR-5: **18**, **25**
- **31044**: Size and displacement [cm³/rev] of PFE second (and third) pump; for PFE 31: 010, 016, 022, 028, 036, 044; for PFE 41: 029, 037, 045, 056, 070,085; for PFE 51: 090, 110, 129, 150; for PFE 32: 016, 022, 028, 036; for PFE 42: 045, 056, 070, 085; for PFE 52: 090, 110, 129, 150
- **D**: Direction of rotation (as viewed at the shaft end): **D** = clockwise (supplied standard if not otherwise specified); **S** = counter clockwise. Note: PFRX*E are not reversible
- *****: Port orientation, see section 2.2
- *****: Series number
- *****: Seals material: omit for NBR (mineral oil & water glycol); **PE** = FPM

2.2 PORT ORIENTATION

-PFRX2E, PFRX3E

Pumps can be supplied with oil ports oriented in different configurations viewed from shaft end, as below indicated.
Referred to the first element (PFRX*), in second / third pumps the ports can be oriented as indicated in the picture. The third element is always oriented as the second element.

Model code example: PFRX2E-525/31044/D**T**

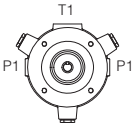
1st PUMP PFRX*	2nd / 3th PUMP PFE			
	**T** 	**V** 	**U** 	**W** 

P1 outlet port ; **T1** inlet port

-PFRXDE

Pumps can be supplied with oil ports oriented in different configurations viewed from shaft end, as below indicated.
In PFRXDE, can be select the orientation of second / third pump (PFED)

Model code example: PFRXDE-525/43045/022/D**TO**

1st PUMP PFRX*	2nd / 3th PUMP PFED*							
	**TO** P2-T2-P3	**TA** P2-T2 P3	**TB** P2-T2 P3	**TC** P2-T2 P3	**TD** P2-T2 P3	**TE** P2-T2 P3	**TF** P2-T2 P3	**TG** P2-T2 P3
	WO P2-P3 T2	**WA** P2 P3 T2	**WB** P2 P3 T2	**WC** P2 P3 T2	**WD** P2 P3 T2	**WE** P2 P3 T2	**WF** P2 P3-T2	**WG** P2 P3 T2
	UO P2-P3 T2	**UA** P2 P3 T2	**UB** P2 P3 T2	**UC** P2 P3 T2	**UD** P2 P3-T2	**UE** P2 P3 T2	**UF** P2 P3 T2	**UG** P2 P3 T2
	VO P2-P3 T2	**VA** P2 P3 T2	**VB** P2 P3-T2	**VC** P2 T2 P3	**VD** P2 T2 P3	**VE** P2 T2 P3	**VF** P2 P3 T2	**VG** P2 P3 T2

P1 outlet port of first element; **P2** outlet port of second element; **P3** outlet port of third element; **T1** inlet port of first element; **T2** inlet port of second element

2.3 OPERATING CHARACTERISTICS OF STANDARD DOUBLE PUMPS TYPE PFRX2E

(at 1450 rpm and based on mineral oil ISO VG46 at 50° C)

Standard model (1)	Speed range [rpm] (2)	RADIAL PISTON PUMP			VANE PUMP			
		Displacement [cm³/rev]	Flow [l/min] (3)	Max pressure [bar] (4)	Displacement [cm³/rev]	Flow [l/min] (3)	Max pressure [bar] (5)	Total flow [l/min]
PFRX2E-308/31010	600-1800	8	12,6	350	10,5	15	160	27,6
PFRX2E-308/31016					16,5	23	210	35,6
PFRX2E-308/31022					21,6	30		42,6
PFRX2E-308/31028					28,1	40		52,6
PFRX2E-308/31036					36,5	51		63,6
PFRX2E-308/31044					43,7	63		75,6
PFRX2E-308/41029					29,3	41		53,6
PFRX2E-308/41037					36,6	52		64,6
PFRX2E-308/41045					45	64		76,6
PFRX2E-308/41056					55,8	80		92,6
PFRX2E-308/41070					69,9	101		113,6
PFRX2E-308/41085					85,3	124		136,6
PFRX2E-308/51090					90	128		140,6
PFRX2E-308/51110					109,6	157		169,6
PFRX2E-308/51129					129,2	186		198,6
PFRX2E-311/31044		11,4	16,5	350	43,7	63		79,5
PFRX2E-311/41070					69,9	101		117,5
PFRX2E-311/41085					85,3	124		140,5
PFRX2E-311/51110					109,6	157		173,5
PFRX2E-311/51129					129,2	186		202,5
PFRX2E-315/41056		14,7	21,5	350	55,8	80		101,5
PFRX2E-315/41070					69,9	101		122,5
PFRX2E-315/51110					109,6	157		178,5
PFRX2E-315/51129					129,2	186		207,5
PFRX2E-518/31044		18,1	26	350	43,7	63		89
PFRX2E-518/41070					69,9	101		127
PFRX2E-518/41085					85,3	124		150
PFRX2E-518/51110					109,6	157		183
PFRX2E-518/51129					129,2	186		212
PFRX2E-525/41070		25,4	37	350	69,9	101		138
PFRX2E-525/51110					109,6	157		194
PFRX2E-525/51129					129,2	186		233

(1) Further composition of PFR and PFE double pumps are available on request. Other composition of PFRX2E must subject to verification of max torque limits allowed by the drive shafts of PFR and PFE and by the through shaft of PFR (320 Nm).
(2) Max speed is 1800 rpm for /PE versions; 1000 rpm for water glycol fluid
(3) Flow rate and power consumption are proportional to revolution speed
(4) Max pressure is 250 bar for /PE versions, 175 bar for water glycol fluid
(5) Max pressure is 160 bar for /PE and water glycol fluid.

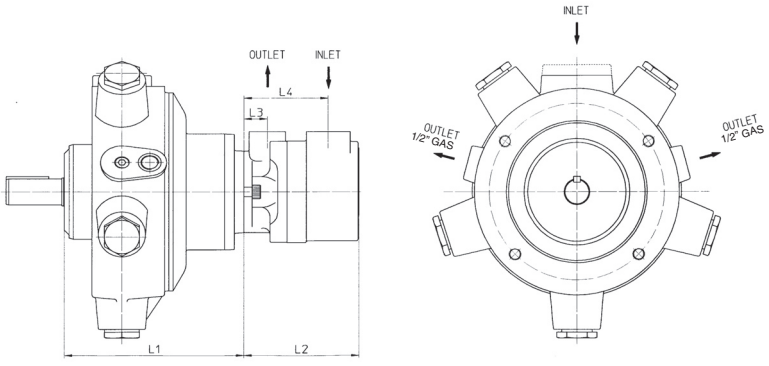
The shaft of the PFR pump has an eccentric cam which rotates with the shaft generating the stroke of the pistons and thus generating the flow rate.
For best functioning a balanced coupling should be provided between the shaft of the motor and the shaft of the pump.
See tab. A045

2.4 TRIPLE PUMPS TYPE PFRX3E AND PFRXDE

Many triple pump compositions PFRX3E = PFR + PFEX2 or PFRXDE = PFR + PFED can be realized but they must be subject to verification of max torque-limits allowed by drive shaft and through shaft of each individual basic pump according to description of first page.

2.5 DIMENSIONS OF MULTIPLE PUMPS TYPE PFRX2, PFRX3, PFRXD [mm]

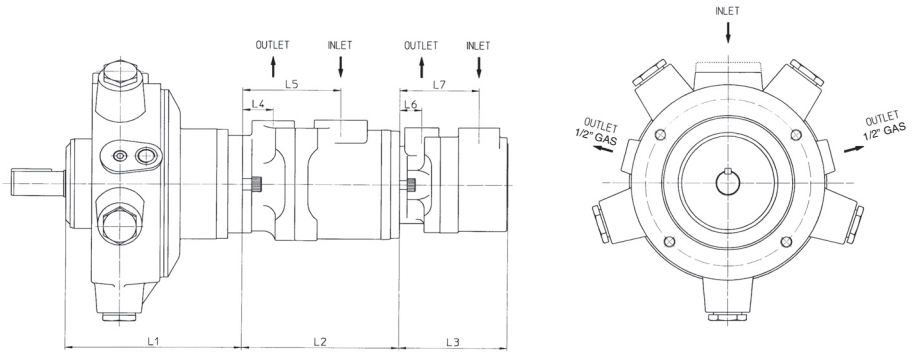
PFRX2E



For missing details see tab. A045, A005 and A007

Composed pump	First element - piston pump -	Second element - vane pump -	L1	L2	L3	L4
PFRX2E-3**/31***	PFRXA-3**	PFE-31***	200	134,5	27,5	98,5
PFRX2E-3**/41***	PFRXB-3**	PFE-41***	209	160	38	120
PFRX2E-3**/51***	PFRXC-3**	PFE-51***	224	186,5	38	125
PFRX2E-5**/31***	PFRXA-5**	PFE-31***	210	134,5	27,5	98,5
PFRX2E-5**/41***	PFRXB-5**	PFE-41***	219,5	160	38	120
PFRX2E-5**/51***	PFRXC-5**	PFE-51***	234	134,5	38	125

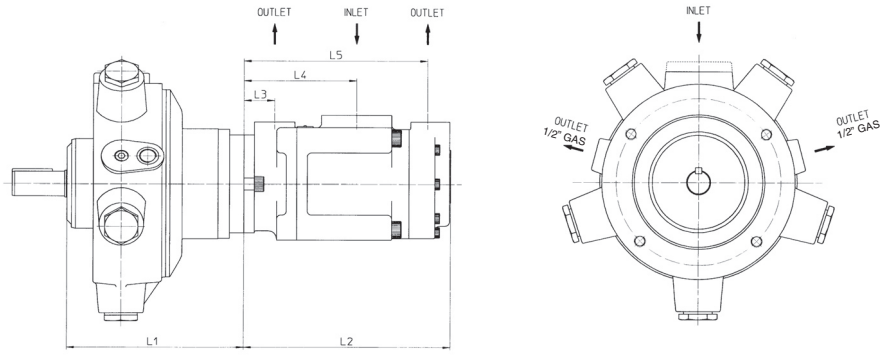
PFRX3E



For missing details see tab. A045, A005 and A007

Composed pump	First element - piston pump -	Second element - vane pump -	Third element - vane pump -	L1	L2	L3	L4	L5	L6	L7
PFRX3E-3**/31**/31***	PFRXA-3**	PFEXA-31***	PFE-31***	200	164	134,5	27,5	98,5	27,5	98,5
PFRX3E-3**/41***/31***	PFRXB-3**	PFEXA-41***	PFE-31***	209	194	134,5	38	120	27,5	98,5
PFRX3E-3**/41***/41***	PFRXB-3**	PFEXB-41***	PFE-41***	209	203	160	38	120	38	120
PFRX3E-3**/51***/31***	PFRXC-3**	PFEXA-51***	PFE-31***	224	206	134,5	38	125	27,5	98,5
PFRX3E-3**/51***/41***	PFRXC-3**	PFEXB-51***	PFE-41***	224	215,5	160	38	125	38	120
PFRX3E-3**/51***/51***	PFRXC-3**	PFEXC-51***	PFE-51***	224	230	186,5	38	125	38	125
PFRX3E-5**/31***/31***	PFRXA-5**	PFEXA-31***	PFE-31***	210	164	134,5	27,5	98,5	27,5	98,5
PFRX3E-5**/41***/31***	PFRXB-5**	PFEXA-41***	PFE-31***	219,5	194	134,5	38	120	27,5	98,5
PFRX3E-5**/41***/41***	PFRXB-5**	PFEXB-41***	PFE-41***	219,5	203	160	38	120	38	120
PFRX3E-5**/51***/31***	PFRXC-5**	PFEXA-51***	PFE-31***	234	206	134,5	38	125	27,5	98,5
PFRX3E-5**/51***/41***	PFRXC-5**	PFEXB-51***	PFE-41***	234	215,5	160	38	125	38	120
PFRX3E-5**/51***/51***	PFRXC-5**	PFEXC-51***	PFE-51***	234	230	186,5	38	125	38	125

PFRXDE



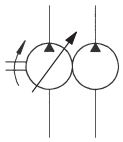
For missing details see tab. A045 and A180

Composed pump	First element - piston pump -	Second element - vane pump -	L1	L2	L3	L4	L5
PFRXDE-3**/43***/0**	PFRXB-3**	PFED-43***/0**	209	256,5	38	139,6	227,7
PFRXDE-3**/54***/0**	PFRXC-3**	PFED-54***/0**	224	288	38	152,3	261,8
PFRXDE-5**/43***/0**	PFRXB-5**	PFED-43***/0**	219,5	256,5	38	139,6	227,7
PFRXDE-5**/54***/0**	PFRXC-5**	PFED-54***/0**	234	288	38	152,3	261,8

PFRX*E pumps are supplied with WFA-32 inlet flange for PFR, and set of inlet, outlet flanges for PFE or PFED;

3 PVPCX2E MULTIPLE AXIAL PISTON/VANE PUMPS

PVPCX2E are double pumps composed by one variable displacement axial piston pump type PVPC and one vane pump type PFE.
They have two separated inlet ports and two separated outlet ports.



For technical characteristics of PVPC pumps, see tab. A160; for technical characteristics of PFE pumps see tab. A005 and A007.

3.1 MODEL CODE FOR PVPCX2E with standard hydraulic controls

PVPC | **X2E** - **C** - **4** | **046** / **31044** / **1** | **D** | **X** | **24DC** | **10** / | *****

Variable displacement axial piston pump

X2E = coupled with a fixed displacement pump type PFE (see tab. A005)

Type of control:
C = manual pressure compensator
CH = manual pressure compensator, with venting
R = remote pressure compensator
L = load sensing (pressure & flow)
LW = constant power (combined pressure & flow)

Size: **3** = for displacement 029
4 = for displacement 046
5 = for displacement 073 and 090

Max displacement of axial piston pump:
029 = 29 cm³/rev **073** = 73 cm³/rev
046 = 46 cm³/rev **090** = 88 cm³/rev

Size and displacement [cm³/rev] of PFE second (and third) pump
for **PFE 31**: 010, 016, 022, 028, 036, 044 for **PFE 32**: 016, 022, 028, 036
for **PFE 41**: 029, 037, 045, 056, 070, 085 for **PFE 42**: 045, 056, 070, 085
for **PFE 51**: 090, 110, 129, 150 for **PFE 52**: 090, 110, 129, 150

Shaft (SAE Standard):
1 = keyed (7/8" for 029 - 1" for 046 - 1 1/4" for 073 and 090)
5 = splined (13 teeth for 029 - 15 for 046 - 14 for 073 and 090)

Direction of rotation (viewed at the shaft end)
D = clockwise
S = counterclockwise

X = without connector

Supply voltage:
12 DC 24/50 AC
24 DC 110/50 AC
220/50 AC

Series number

Seals material:
– = NBR
PE = FKM
See notes under sect. 2

3.2 MODEL CODE FOR PVPCX2E with electrohydraulic proportional controls

PVPC | **X2E** - **PERS - SP** - **BC** - **4** | **046** / **31044** / ***** / **1** | **D** / **18** | **10** / | *****

Variable displacement axial piston pump

X2E = coupled with a fixed displacement pump type PFE (see tab. A005)

Type of control (see section 5, 6 and 7):
CZ = proportional pressure compensator
LQZ = proportional flow control (load sensing)
LZQZ = proportional pressure & flow control (load sensing)
LZQZR = as LZQZ plus sequence module
PES-SP = closed loop integral digital P/Q driver
PERS-SP = as PES plus sequence module

Fieldbus interfaces for PES and PERS:
USB interface always present
NP = Not present **BP** = PROFIBUS DP
BC = CANopen **EH** = EtherCAT

Size:
3 = for displacement 029 **4** = for displacement 046
5 = for displacement 073 and 090

Max displacement of axial piston pump:
029 = 29 cm³/rev **046** = 46 cm³/rev **073** = 73 cm³/rev **090** = 88 cm³/rev

Size and displacement [cm³/rev] of PFE second (and third) pump
for **PFE 31**: 010, 016, 022, 028, 036, 044 for **PFE 32**: 016, 022, 028, 036
for **PFE 41**: 029, 037, 045, 056, 070, 085 for **PFE 42**: 045, 056, 070, 085
for **PFE 51**: 090, 110, 129, 150 for **PFE 52**: 090, 110, 129, 150

Pressure setting (only for PERS): **200** = 200 bar **250** = 250 bar
280 = 280 bar (not available for 090)

Shaft (SAE Standard):
1 = keyed (7/8" for 029 - 1" for 046 - 1 1/4" for 073 and 090)
5 = splined (13 teeth for 029 - 15 for 046 - 14 for 073 and 090)

Direction of rotation
(viewed at the shaft end)
D = clockwise **S** = counterclockwise

Options, see sections 4 and 7:
18 = with 18 VDC coil instead of standard 12 VDC coil (only for CZ, LQZ, LZQZ)
for versions PES and PERS:
C = current feedback for pressure transducer 4÷20 mA
I = current reference input and monitor 4÷20 mA (omit for standard voltage reference input and monitor ±10 V)
X = with integral pressure transducer (only for PERS)
S = with two on-off inputs for multiple pressure PID selection (NP execution) or double power supply (BC, BP and EH execution).

Series number

Seals material:
– = NBR
PE = FKM
See notes under sect. 2

3.3 OPERATING CHARACTERISTICS OF STANDARD DOUBLE PUMPS TYPE PVPCX2E (with PFE-31, 41 and 51)

(at 1450 rpm and based on mineral oil ISO VG46 at 40° C)

Standard model	Speed range [rpm] (1)	AXIAL PISTON PUMP			VANE PUMP			
		Displacement [cm³/rev]	Flow [l/min] (2)	Max pressure [bar] (3)	Displacement [cm³/rev]	Flow [l/min] (2)	Max pressure [bar] (4)	Total flow [l/min]
PVPCX2E-*-3029/31010	800-2400	29	42	280/350	10,5	15	160	57
PVPCX2E-*-3029/31016	800-2800				16,5	23	210	65
PVPCX2E-*-3029/31022					21,6	30		72
PVPCX2E-*-3029/31028					28,1	40		82
PVPCX2E-*-3029/31036					35,6	51		93
PVPCX2E-*-3029/31044	800-2500				43,7	63		105
PVPCX2E-*-3029/41029					29,3	41		83
PVPCX2E-*-3029/41037					36,6	52		94
PVPCX2E-*-3029/41045					45,0	64		106
PVPCX2E-*-3029/41056					55,8	80		122
PVPCX2E-*-3029/41070					69,9	101		143
PVPCX2E-*-3029/41085	800-2000				85,3	124		166
PVPCX2E-*-4046/31010	800-2400	46	66,7	280/350	10,5	15	160	81,7
PVPCX2E-*-4046/31016	800-2600				16,5	23	210	89,7
PVPCX2E-*-4046/31022					21,6	30		92,7
PVPCX2E-*-4046/31028					28,1	40		102,7
PVPCX2E-*-4046/31036					35,6	51		113,7
PVPCX2E-*-4046/31044	800-2500				43,7	63		129,7
PVPCX2E-*-4046/41029					29,3	41		107,7
PVPCX2E-*-4046/41037					36,6	52		118,7
PVPCX2E-*-4046/41045					45,0	64		130,7
PVPCX2E-*-4046/41056					55,8	80		146.7
PVPCX2E-*-4046/41070					69.9	101		167,7
PVPCX2E-*-4046/41085	800-2000				85,3	124		190,7
PVPCX2E-*-5073/31010	800-2400	73	105,8	280/350	10,5	15	160	120,8
PVPCX2E-*-5073/31016	800-2200				16,5	23	210	128,8
PVPCX2E-*-5073/31022					21,6	30		135,8
PVPCX2E-*-5073/31028					28,1	40		145,8
PVPCX2E-*-5073/31036					35,6	51		156,8
PVPCX2E-*-5073/31044					43,7	63		168,8
PVPCX2E-*-5073/41029					29,3	41		146,8
PVPCX2E-*-5073/41037					36,6	52		157,8
PVPCX2E-*-5073/41045					45,0	64		169,8
PVPCX2E-*-5073/41056					55,8	80		185,8
PVPCX2E-*-5073/41070					69,9	101		206,8
PVPCX2E-*-5073/41085	800-2000				85,3	124		229,8
PVPCX2E-*-5073/51090	800-2200				90,0	128		233,8
PVPCX2E-*-5073/51110					109,6	157		262,8
PVPCX2E-*-5073/51129					129,2	186		291,8
PVPCX2E-*-5073/51150	800-1800				150,2	215		320,8
PVPCX2E-*-5090/31010	800-2400	88	127,6	250/315	10,5	15	160	142,6
PVPCX2E-*-5090/31016	800-2200				16,5	23	210	150,6
PVPCX2E-*-5090/31022					21,6	30		157,6
PVPCX2E-*-5090/31028					28,1	40		167,6
PVPCX2E-*-5090/31036					35,6	51		178,6
PVPCX2E-*-5090/31044					43,7	63		190,6
PVPCX2E-*-5090/41029					29,3	41		168,6
PVPCX2E-*-5090/41037					36,6	52		179,6
PVPCX2E-*-5090/41045					45,0	64		191,6
PVPCX2E-*-5090/41056					55,8	80		207,6
PVPCX2E-*-5090/41070					69,9	101		228,6
PVPCX2E-*-5090/41085	800-2000				85,3	124		251,6
PVPCX2E-*-5090/51090	800-2200				90,0	128		255,6
PVPCX2E-*-5090/51110					109,6	157		284,6
PVPCX2E-*-5090/51129					129,2	186		313,6
PVPCX2E-*-5090/51150	800-1800				150,2	215		342,6

(1) Max speed is 1800 rpm for /PE versions; 1000 rpm for water glycol fluid
(2) Flow rate and power consumption are proportional to revolution speed
(3) Max pressure is 190 bar for /PE versions, 160 bar for water glycol fluid
(4) Max pressure is 160 bar for /PE and water glycol fluid

3.4 OPERATING CHARACTERISTICS OF STANDARD DOUBLE PUMPS TYPE PVPCX2E (with PFE-32, 42 and 52)

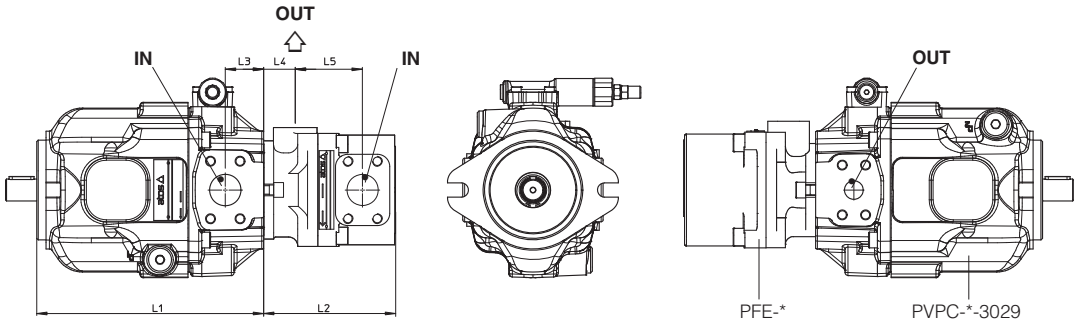
(at 1450 rpm and based on mineral oil ISO VG46 at 40° C)

Standard model	Speed range [rpm] (1)	AXIAL PISTON PUMP			VANE PUMP			
		Displacement [cm³/rev]	Flow [l/min] (2)	Max pressure [bar] (3)	Displacement [cm³/rev]	Flow [l/min] (2)	Max pressure [bar] (4)	Total flow [l/min]
PVPCX2E-*-3029/32016	1200-2500	29	42	280/350	16,5	23	210	65
PVPCX2E-*-3029/32022					21,6	30	300	72
PVPCX2E-*-3029/32028					28,1	40		82
PVPCX2E-*-3029/32036					35,6	51		93
PVPCX2E-*-3029/42045	1000-2200				45,0	64	280	106
PVPCX2E-*-3029/42056					55,8	80		122
PVPCX2E-*-3029/42070					69,9	101		143
PVPCX2E-*-3029/42085	800-2000				85,3	124		166
PVPCX2E-*-4046/32016	1200-2500	46	66,7	280/350	16,5	23	210	89,7
PVPCX2E-*-4046/32022					21,6	30	300	92,7
PVPCX2E-*-4046/32028					28,1	40		102,7
PVPCX2E-*-4046/32036					35,6	51		113,7
PVPCX2E-*-4046/42045	1000-2200				45,0	64	280	130,7
PVPCX2E-*-4046/42056					55,8	80		146,7
PVPCX2E-*-4046/42070					69,9	101		167,7
PVPCX2E-*-4046/42085	800-2000				85,3	124		190,7
PVPCX2E-*-5073/32016	1200-2500	73	105,8	280/350	16,5	23	210	128,8
PVPCX2E-*-5073/32022					21,6	30	300	135,8
PVPCX2E-*-5073/32028					28,1	40		145,8
PVPCX2E-*-5073/32036					35,6	51		156,8
PVPCX2E-*-5073/42045	1000-2200				45,0	64	280	169,8
PVPCX2E-*-5073/42056					55,8	80		185,8
PVPCX2E-*-5073/42070					69,9	101		206,8
PVPCX2E-*-5073/42085	800-2000				85,3	124		229,8
PVPCX2E-*-5073/52090	800-2000				90,0	128	250	233,8
PVPCX2E-*-5073/52110					109,6	157		262,8
PVPCX2E-*-5073/52129					129,2	186		291,8
PVPCX2E-*-5073/52150	800-1800				150,2	215	210	320,8
PVPCX2E-*-5090/32016	1200-1850	88	127,6	280/350	16,5	23	210	150,6
PVPCX2E-*-5090/32022					21,6	30	300	157,6
PVPCX2E-*-5090/32028					28,1	40		167,6
PVPCX2E-*-5090/32036					35,6	51		178,6
PVPCX2E-*-5090/42045	1000-1850				45,0	64	280	191,6
PVPCX2E-*-5090/42056					55,8	80		207,6
PVPCX2E-*-5090/42070					69,9	101		228,6
PVPCX2E-*-5090/42085	800-1850				85,3	124		251,6
PVPCX2E-*-5090/52090	1000-1850				90,0	128	250	255,6
PVPCX2E-*-5090/52110					109,6	157		284,6
PVPCX2E-*-5090/52129					129,2	186		313,6
PVPCX2E-*-5090/52150	800-1800				150,2	215	210	342,6

(1) Max speed is 1800 rpm for /PE versions; 1500 rpm for water glycol fluid
(2) Flow rate and power consumption are proportional to revolution speed
(3) Max pressure is 190 bar for /PE versions, 160 bar for water glycol fluid
(4) Max pressure is 160 bar for /PE and water glycol fluid.

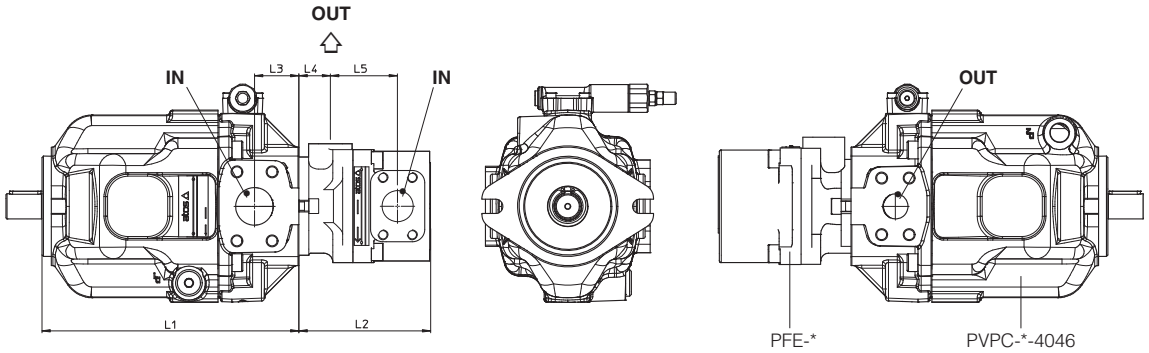
3.5 DIMENSIONS OF MULTIPLE PUMPS TYPE PVPCX2E [mm]

PVPCX2E-*-3029



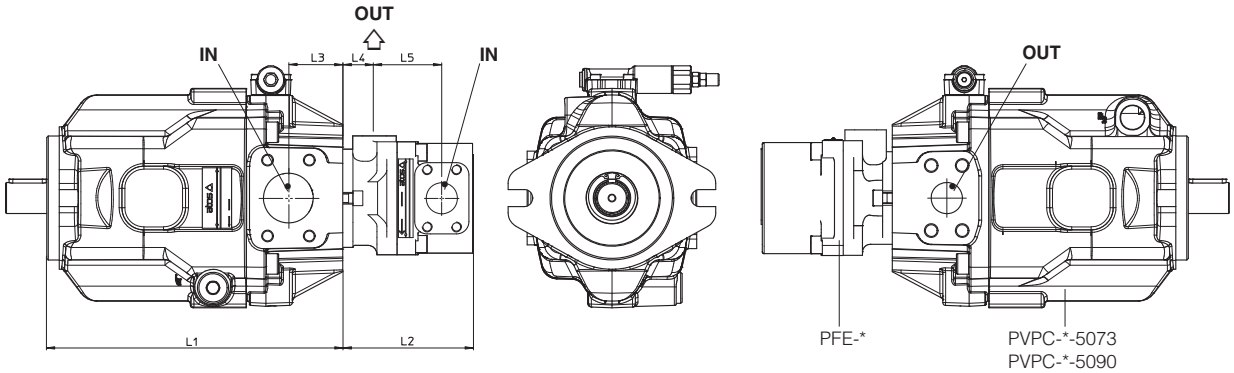
Composed pump	First element - piston pump -	Second element - vane pump -	L1	L2	L3	L4	L5
PVPCX2E-*-3029/3****	PVPCXA-*-3029	PFE-3****	231,2	134,5	39	27,5	71
PVPCX2E-*-3029/4****	PVPCXB-*-3029	PFE-4****	231,2	160	39	38	82

PVPCX2E-*-4046



Composed pump	First element - piston pump -	Second element - vane pump -	L1	L2	L3	L4	L5
PVPCX2E-*-4046/3****	PVPCXA-*-4046	PFE-3****	259	134,5	45	27,5	71
PVPCX2E-*-4046/4****	PVPCXB-*-4046	PFE-4****	259	160	45	38	82

PVPCX2E-*-5073
PVPCX2E-*-5090



Composed pump	First element - piston pump -	Second element - vane pump -	L1	L2	L3	L4	L5
PVPCX2E-*-5073/3****	PVPCXA-*-5073	PFE-3****	303,6	134,5	55,7	27,5	71
PVPCX2E-*-5073/4****	PVPCXB-*-5073	PFE-4****	303,6	160	55,7	38	82
PVPCX2E-*-5073/5****	PVPCXC-*-5073	PFE-5****	303,6	186,5	55,7	38	87
PVPCX2E-*-5090/3****	PVPCXA-*-5090	PFE-3****	303,6	134,5	55,7	27,5	71
PVPCX2E-*-5090/4****	PVPCXB-*-5090	PFE-4****	303,6	160	55,7	38	82
PVPCX2E-*-5090/5****	PVPCXC-*-5090	PFE-5****	303,6	186,5	55,7	38	87

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Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
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Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
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Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сыктывкар (8212)25-95-17
Тамбов (4752)50-40-97
Сургут (3462)77-98-35
Тверь (4822)63-31-35
Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Улан-Удэ (3012)59-97-51
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
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