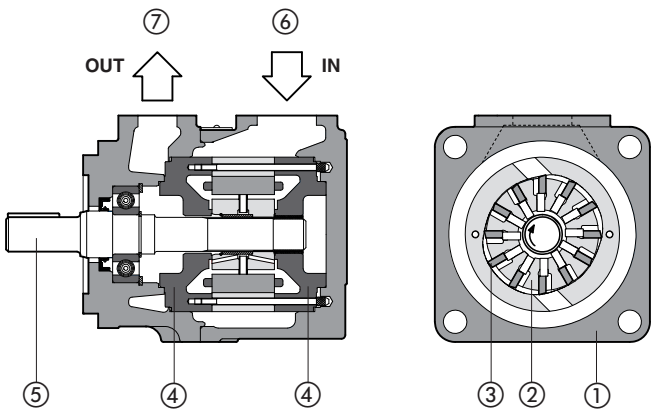
Vane pumps type PFE-31, PFE-41, PFE-51

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

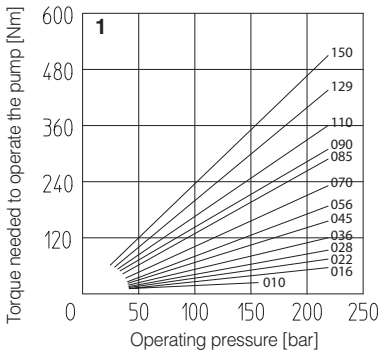
3 MAIN CHARACTERISTICS OF VANE PUMPS TYPE PFE-*1

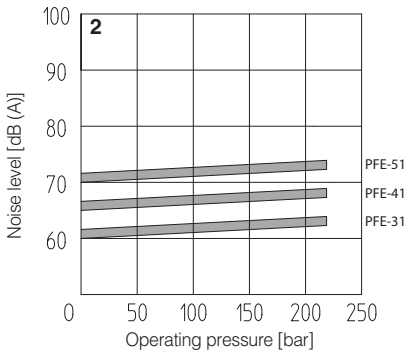
Installation position	Any position
Loads on the shaft	Axial and radial loads are not allowed on the shaft. The coupling should be sized to absorb the power peak.
Ambient temperature	from -20°C to +70°C
Fluid	Hydraulic oil as per DIN 51524...535; for other fluids see section 1
Recommended viscosity max at cold start max at full power during operation min at full power	 800 mm²/s 100 mm²/s 24 mm²/s 10 mm²/s
Fluid contamination class	ISO 4401 class 21/19/16 NAS 1638 class 10 (filters at 25 μm value with $\beta_{25} \geq 75$ recommended)
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

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.

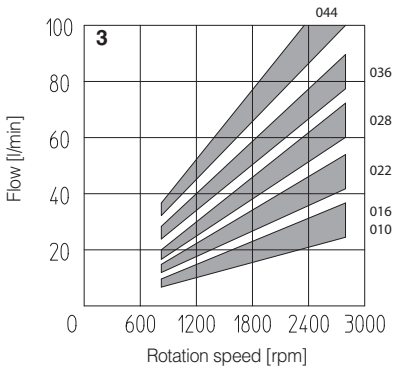


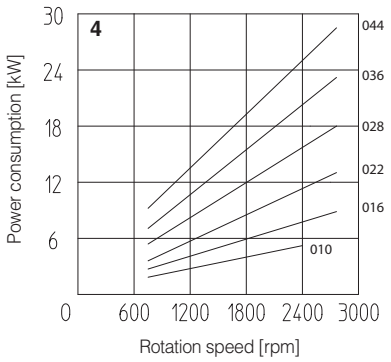


PFE-31:

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.

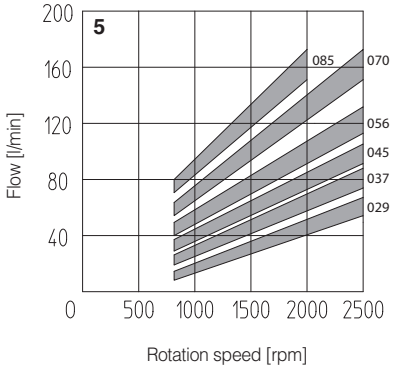


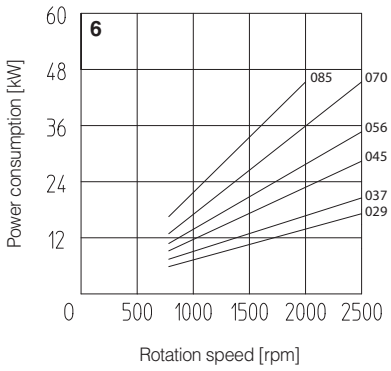


PFE-41:

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.

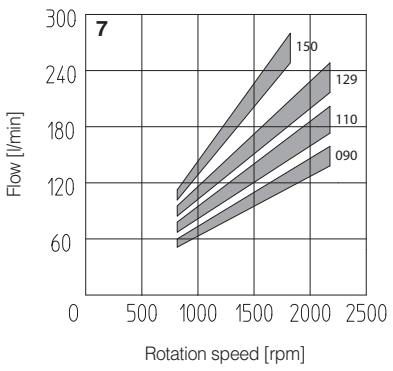


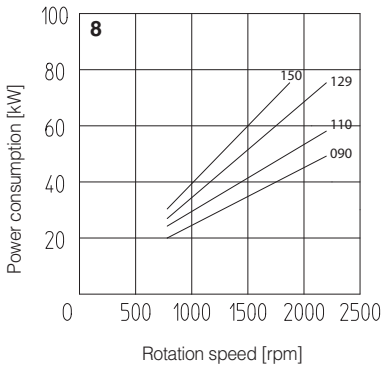


PFE-51:

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.



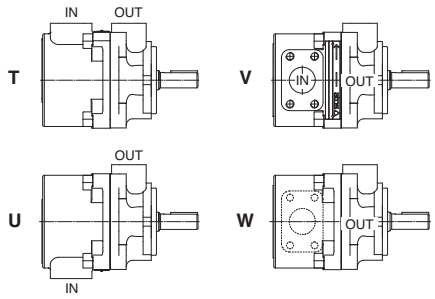


5 PORT ORIENTATION

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);

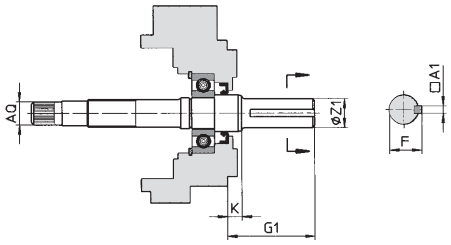
T = inlet and outlet ports on the same axis (standard)
U = outlet orientated 180° with respect to the inlet
V = outlet oriented 90° with respect to the inlet
W = outlet oriented 270° with respect to the inlet

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.



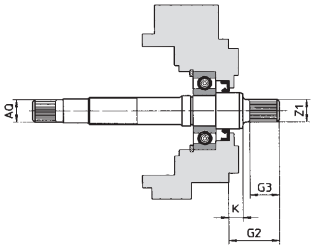
6 DRIVE SHAFT

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	–	–	–	–	–	–	–	–	–	–

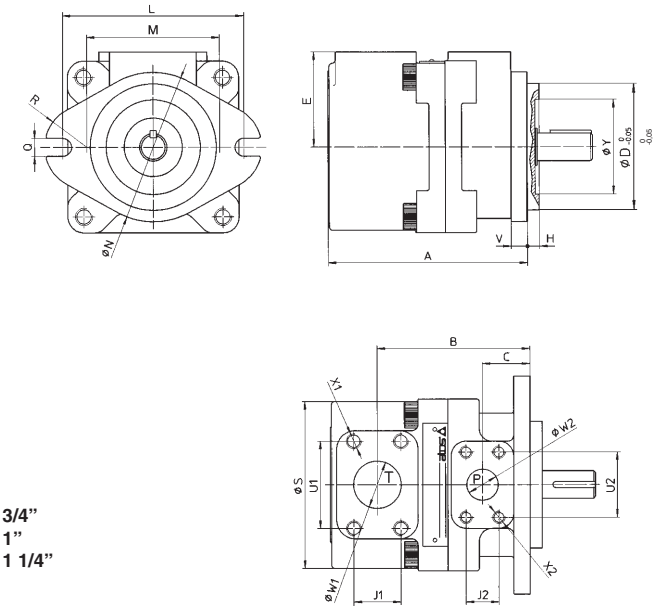
7 LIMITS OF SHAFT TORQUE

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"**

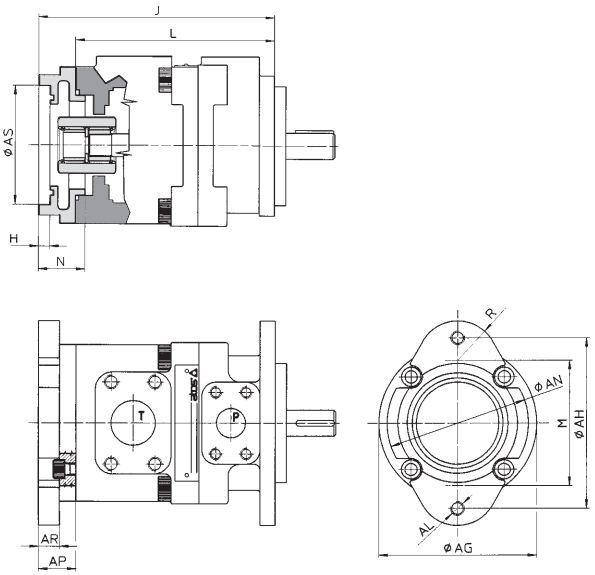
Mass:
PFE-31 = 9 kg
PFE-41 = 14 kg
PFE-51 = 25,5 kg

SAE flanges can be supplied with the pump, see www.scoda.it, tab. SK155

Model	A	B	C	ØD	E	H	L	M	ØN	Q	R
PFE-31	136	100	28	82,5	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"**

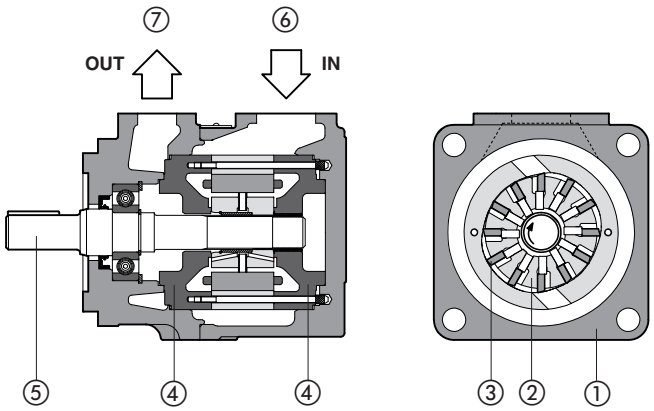
For other dimensions, see section 8

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) } only for PFE-32 and PFE-42
7 = for second and third position in multiple pumps

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

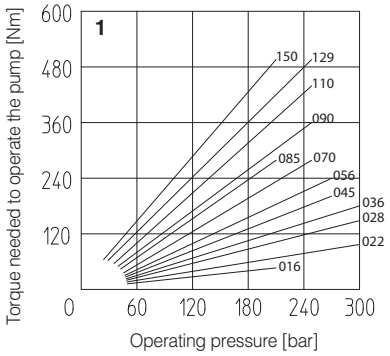
3 MAIN CHARACTERISTICS OF VANE PUMPS TYPE PFE-*2

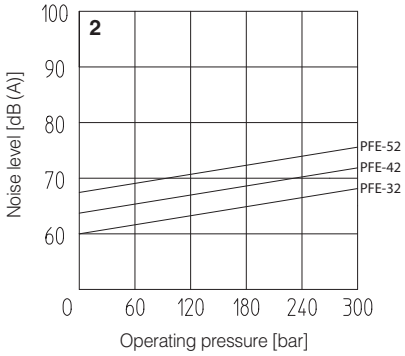
Installation position	Any position.
Loads on the shaft	Axial and radial loads are not allowed on the shaft. The coupling should be sized to absorb the power peaks.
Ambient temperature	from -20°C to +70°C
Fluid	Hydraulic oil as per DIN 51524...535; for other fluids see section 1
Recommended viscosity max at cold start max at full power during operation min at full power	 800 mm²/s 100 mm²/s 24 mm²/s 10 mm²/s
Fluid contamination class	ISO 4401 class 21/19/16 NAS 1638 class 10 (filters at 25 μm value with $\beta_{25} \geq 75$ recommended)
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 to 1,5 bar

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.

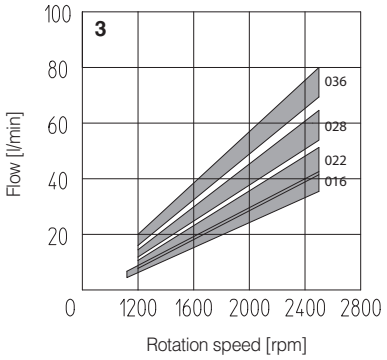


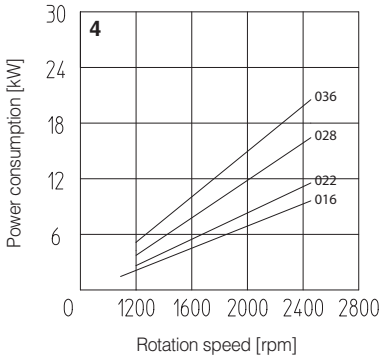


PFE-32:

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.

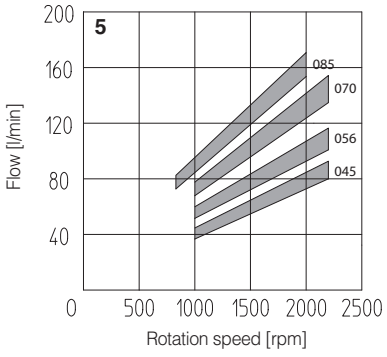


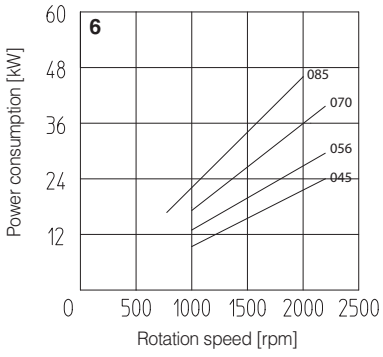


PFE-42:

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.

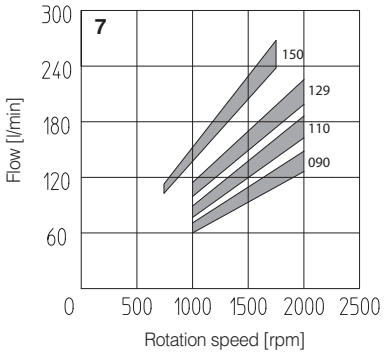


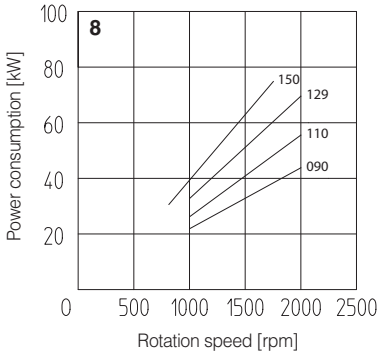


PFE-52:

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.



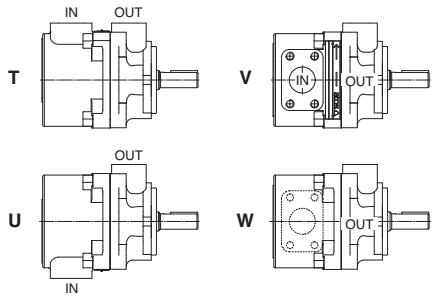


5 PORT ORIENTATION

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);

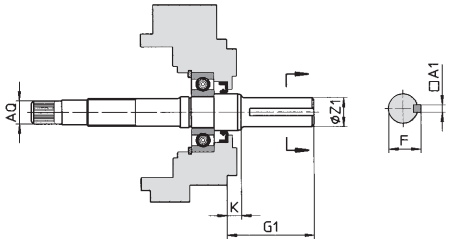
T = inlet and outlet ports on the same axis (standard)
U = outlet orientated 180° with respect to the inlet
V = outlet oriented 90° with respect to the inlet
W = outlet oriented 270° with respect to the inlet

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.



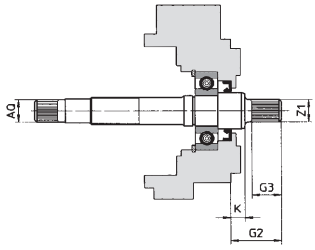
6 DRIVE SHAFT

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			25,36	
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	41,50	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	56,00	42	8,10	SAE 12/24-14T	SAE 16/32-13T	–	–	–	–	–	–	–	–	–	–

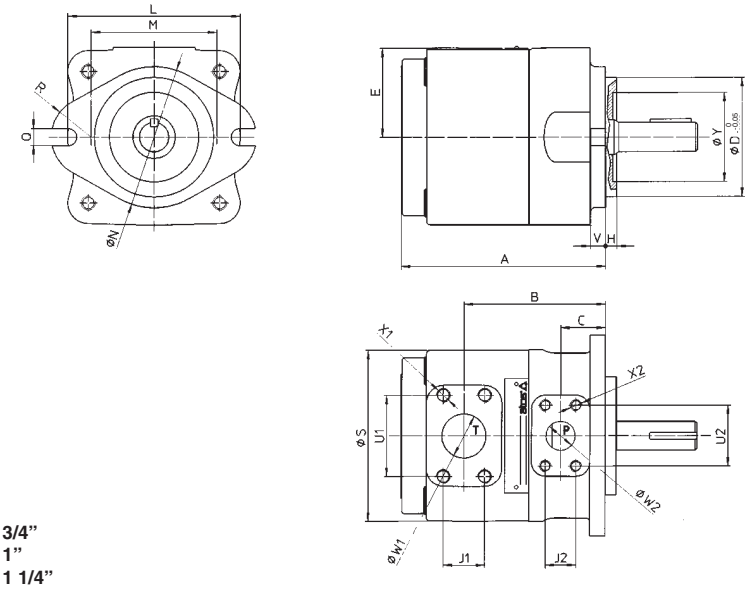
7 LIMITS OF SHAFT TORQUE

Pump model	Maximum driving torque [Nm]				Maximum torque available at the end of the through shaft [Nm]
	Shaft type 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"**

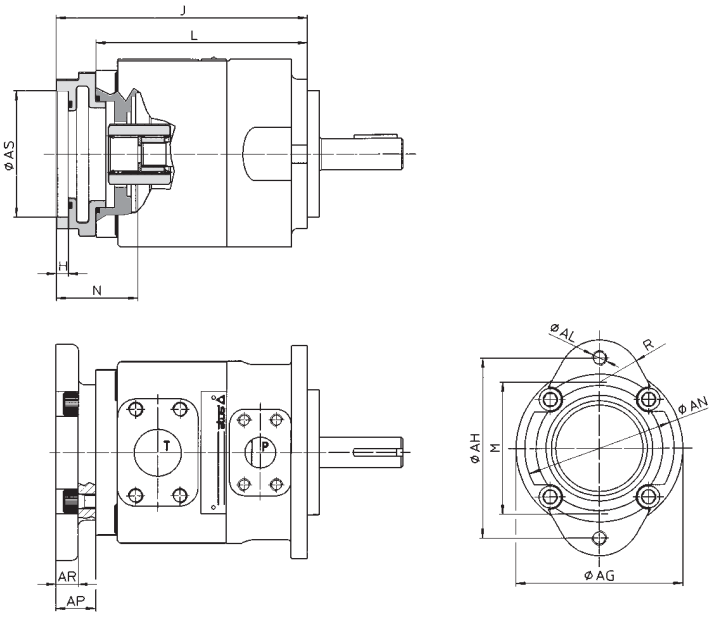
Mass:
PFE-32 = 9 kg
PFE-42 = 20,5 kg
PFE-52 = 32,1 kg

SAE flanges can be supplied with the pump, see www.scoda.it, tab. SK155

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	11,1	28,5
PFE-42	175,5	120	38	101,6	78	9,7	146	107	120	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	134	70	52,4	13	38	25	35,7	26,2	M12X20	M10X17	76
PFE-52	158	77,8	58,7	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-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"**

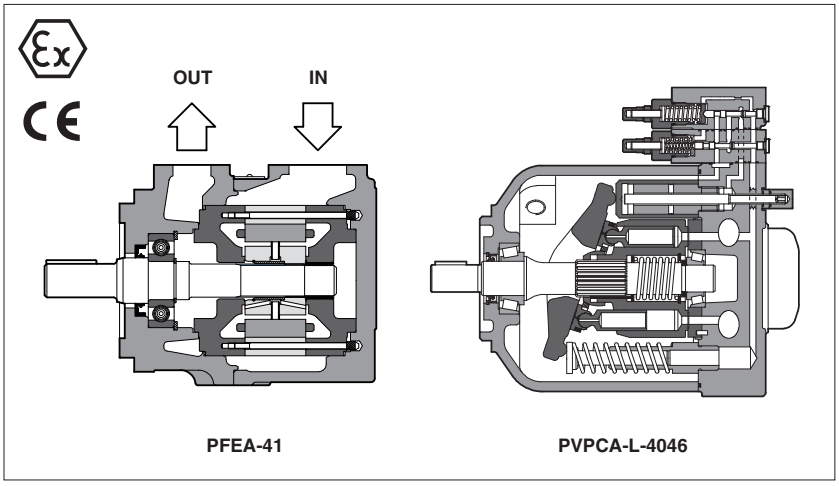
For other dimensions, see section 8

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	165,5	132,5	79	32	28,5
PFEXA-42	134	106	M10X17	70	95	23	11	82,57 82,63	6,42 6,47	194	171	73	32	28,5
PFEXB-42	134	146	M12	125	120	32	18	101,62 101,68	9,73 9,78	203	171	107	41	34
PFEXA-52	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-52	134	146	M12	125	120	32	18	101,62 101,68	9,73 9,78	215,5	183,5	107	41	34
PFEXC-52	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

PFEA vane and PVPCA piston pumps - for potentially explosive atmospheres

according to 94/9/CE Atex directive



PFEA vane and PVPCA piston pumps are certified for application in potentially explosive atmospheres according to ATEX 94/9/CE, protection mode Ex II 2/2 GD cbk IIC T6/T5/T4 (group II for surface plants with gas, vapours and dust environment, category 2, zone 1, 2, 21 and 22).
The external surface temperature of the pump is in accordance with the certified class, to avoid the self ignition of the explosive mixture present in the environment.

- **PFEA** are fixed displacement-twelve-vane pumps available in three different body sizes and with following executions:
  PFEA-*1 max pressure 210 bar
  PFEA-*2 max pressure 300 bar
  Displacements up to 150 cm³/rev.
  SAE J744 mounting flange and shaft.
  Optional through output shaft execution.

- **PVPCA** are variable displacement axial piston pumps for high pressure operation, and low noise level, available in a wide range of hydraulic and proportional controls.
  PVPCA max working pressure 280 bar
  max peak pressure 350 bar
  Displacement: 29-46-73-88 cm³/rev.
  SAE J744 mounting flange and shaft.
  Optional through output shaft execution.

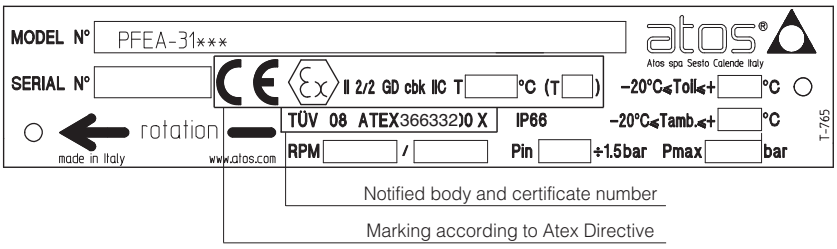
1 EXPLOSION PROOF CERTIFICATION MAIN DATA

ATEX certification	**Ex II 2/2 GD cbk IIC Tx**					
Reference Norm	**UNI EN 13463**					
PUMP TYPE	**PFEA***			**PVPCA***		
	(**std** and **/PE**)	**water glycol**	**/7 /PE**	(**std** and **/PE**)	**water glycol**	**/7 /PE**
Temperature class	**T6**	**T6**	**T5**	**T5**	**T5**	**T4**
Surface temperature	≤ 85 °C	≤ 85 °C	≤ 100 °C	≤ 100 °C	≤ 100 °C	≤ 135 °C
Ambient temperature	-20 ÷ +60 °C	-20 ÷ +60 °C	-20 ÷ +70 °C	-20 ÷ +60 °C	-20 ÷ +60 °C	-20 ÷ +70 °C
Max inlet fluid temperature	+60 °C	+50 °C	+80 °C	+60 °C	+50 °C	+80 °C
Protection degree	IP 66					

2 CERTIFICATION

2.1 EXAMPLE OF PFEA NAMEPLATE MARKING

At side are resumed the pumps marking according to Atex certification



2.2 GROUP II, Atex

Ex = Equipment for explosive atmospheres
II = Group II for surfaces plants
2/2 = Pump category
GD = For gas, vapours and dust
c = Protection by constructional safety
b = Protection by control of ignition source
k = Protection by liquid immersion
IIC = Gas group (acetylene, hydrogen)
T6/T5/T4 = Temperature class
Zone 1 (gas) **and 21** (dust) = Possibility of explosive atmosphere during normal functioning
Zone 2 (gas) **and 22** (dust) = Low probability of explosive atmosphere

3 TECHNICAL CHARACTERISTICS and OVERALL DIMENSIONS

PFEA-*1, see tab. A005
PFEA-*2, see tab. A007
PVPCA (with hydraulic controls), see tab. A160
PVPCA (with proportional controls), see tab. A170

4 INSTALLATION NOTES

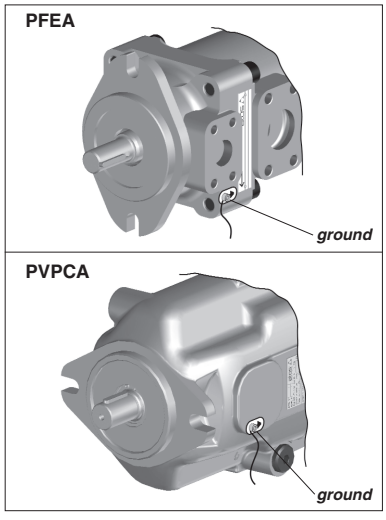
Before installation and start-up please consult tab. A600

- According to EN 1127-1:2008, the maximum surface temperature indicated in the nameplate must be lower than the following Tmax values:

  Gas - Tmax= max value (80% of gas ignition temperature)
  Dust - Tmax = dust ignition tempeature - 75K

- The fluid ignition temperature must be 50K greater than the maximum surface temperature indicated in the nameplate
- The maximum operating pressure and minimum inlet pressure are indicated on pump's nameplate.
- The pump must be connected to ground using the ground facility (threaded hole M3x7) provided on the pump body and evidenced with special nameplate. The pump's body and the electric motor, or other devices used to driving the pump, must be connected at the same electric potential.

⚠ **WARNING:** The pumps must not be operated in dry conditions or with oil ports blocked



5 MODEL CODE of VANE PUMPS type PFEA

PFEA XA – 31 036 / 1 D T / 7 ** /*

Fixed displacement vane pump with Ex-proof certification

Additional suffix for pumps with through shaft:
XA = for coupling with PFEA-31
XB = for coupling with PFEA-41 (only for PFEA-4* and PFEA-5*)
XC = for coupling with PFEA-51 (only for PFEA-5*)
XO = with through shaft, without rear flange

Size:
31, 41, 51 (standard)
32, 42, 52 (high pressure and low noise)

Displacement of **PFEA-*1** [cm³/rev]
for PFEA-31: **016, 022, 028, 036, 044**
for PFEA-41: **029, 037, 045, 056, 070, 085**
for PFEA-51: **090, 110, 129, 150**

Displacement of **PFEA-*2** [cm³/rev]
for PFEA-32: **022, 028, 036**
for PFEA-42: **045, 056, 070, 085**
for PFEA-52: **090, 110, 129, 150**

Drive shaft:
cylindrical, keyed (not for PFEA rear pumps to be coupled with PFEAX*)
1 = standard (only for PFEA*-*1)
2 = long version (only for PFEA*-41 and PFEA*-51)
3 = for high torque applications
splined
5 = standard (1)
6 = for high torque application (only for PFEA*-3* and PFEA*-4*, single and first pumps) with through output shaft

Direction of rotation (viewed from the shaft end):
D = clockwise
S = counterclockwise
Note: PFEA* are not reversible

Port orientation, see table A005 section [5]:
T = standard
U, V, W = on request

Option (only for /PE version):
/ 7 = for ambient temperature up to 70°C

Series number

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

1) Shaft type 5 has to be selected for PFEA rear pumps to be coupled with PFEAX* first pumps

6 MODEL CODE of PISTON PUMPS type PVPCA (with hydraulic controls)

PVPCA XA - C - 4 046 / 31044 / 1 D /PA -GK /7 24DC 10 /*

Variable displacement vane pump with Ex-proof certification

Additional suffix for pumps with through shaft:
XA = for coupling with PFEA-3* (only for PVPCA*-3*)
XB = for coupling with PFEA-4* (only for PVPCA*-4*)
XC = for coupling with PFEA-5* (only for PVPCA*-5*)

Type of control (2):
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 proportional controls see note (2)

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

Type of PVPCA (for double pumps), see tab. A160

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

Cable gland:
- = without cable gland
PA = with threaded cable gland arleady installed

Solenoid threaded connection (only for PA cable gland):
GK = GK-1/2" ISO/UNI-6125 (tapered)
NPT = 1/2" NPT ANSI B2.1 (tapered)
M = M20x1,5 UNI-4535 (6H/6g)

Option:
/ 7 = for ambient temperature up to 70°C (only for /PE)
/ O = horizontal cable entrance
/ WP = prolongued manual override protected by metallic cap

Voltage code (see table E120)

Series number

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

1) Pumps with ISO 3019/2 mounting flange and shaft (option /M) are available on request

2) Pumps with proportional controls type: CZ, LQZ, LZQZ, LZQZR, PES and PERS are available on request.
For the technical characteristics of PVPCA pumps with proportional controls, see table A170 and F600

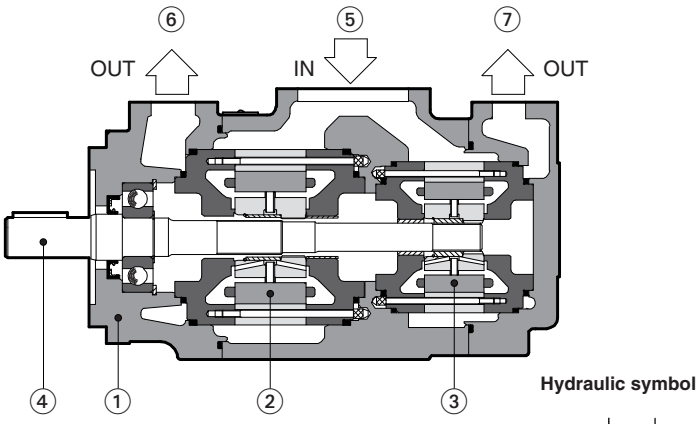
7 OPERATING AND MAINTENANCE

Specific Operating and maintenance instructions are always enclosed with the delivered pumps together with the CE conformity declaration and the relevant catalogue technical tables.

For the operating and maintenance instructions, refer to the following documentations:
-PFEA and -PVPCA see table A600

Double vane pumps type PFED

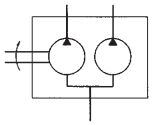
fixed displacement



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

Hydraulic symbol



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	-	43	045	/	022	/	1	D	TA	**	/ *

PFED — Fixed displacement double vane pump

43 — 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 section 3

022 — Displacement of second element [cm³/rev], see section 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	from -20°C to +70°C
Fluid	Hydraulic oil as per DIN 51524...535; for other fluids see section 1
Recommended viscosity max at cold start max at full power during operation min at full power	 800 mm²/s 100 mm²/s 24 mm²/s 10 mm²/s
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

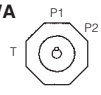
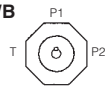
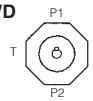
3 OPERATING CHARACTERISTICS at 1450 rpm with hydraulic oil having viscosity of 24 mm²/sec and 40°C

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	
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	800→2500
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	
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	800→2000
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	
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	700→2200
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	700→2000
PFED-54 110/029	157	3,2	41	0,8	152	21	39	5,5	147	40	37	10	141	58	34	14	
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	700→2200
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	700→2000
PFED-54 129/029	186	3,7	41	0,8	180	25	39	5,5	174	47	37	10	168	69	34	14	
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	700→2200
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	700→2000
PFED-54 150/029	215	4,2	41	0,8	211	29	39	5,5	204	55	37	10	197	80	34	14	
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	700→1800
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)

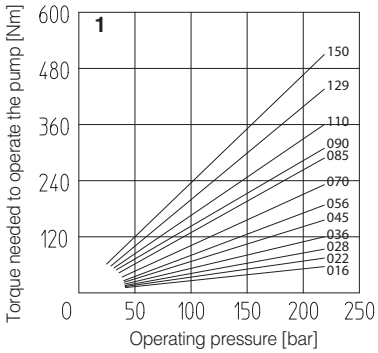
Pumps can be supplied with the oil ports oriented in different configuration in relation to the drive shaft. Port orientation of the first element is designated as follows (as wiewed at the shaft end);
T = inlet and outlet ports on the same axis (standard)
U = outlet orientated 180° with respect to the 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 	**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; T = inlet port

5 DIAGRAMS

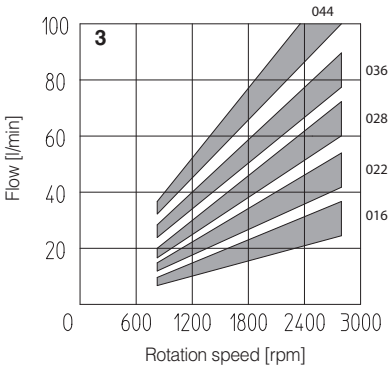
1 = Torque versus pressure diagram

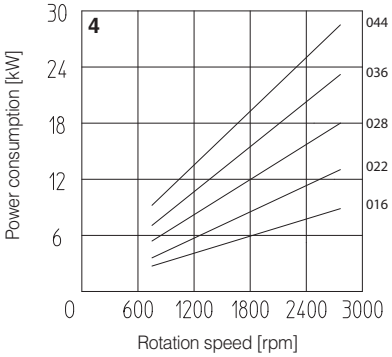


PFED-43: Second element (cartridge SC-PFED-31)**

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.

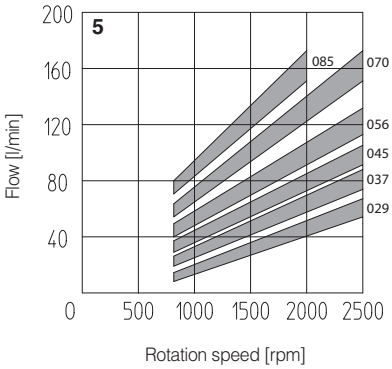


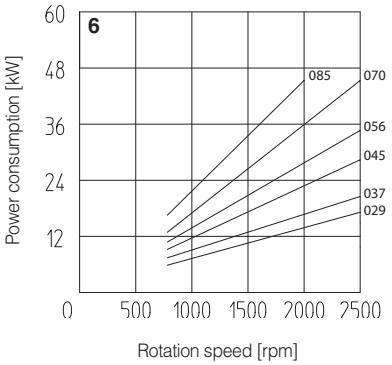


PFED-43: First element (cartridge SC-PFE-41)**
PFED-54: Second element (cartridge SC-PFED-41)**

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.

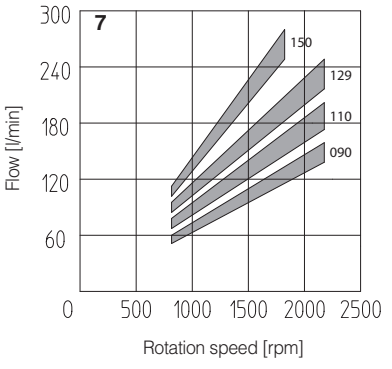


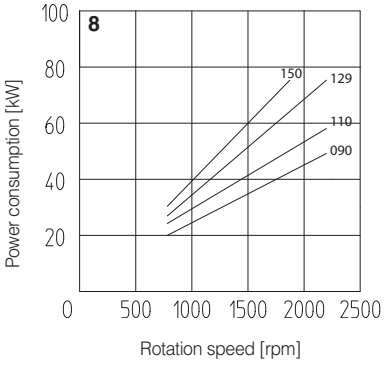


PFED-54: First element (cartridge SC-PFE-51)**

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

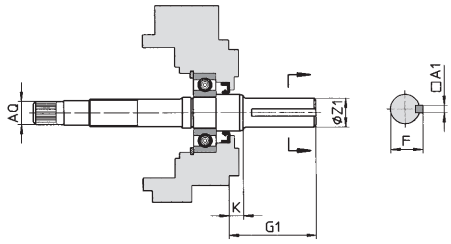
Pump model	Maximum driving torque [Nm]					
	Shaft type 1	Shaft type 2	Shaft type 3	Shaft type 5	Shaft type 6	Shaft type 7
PFED-43	250	250	400	200	400	400
PFED-54	500	500	850	450	–	–

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

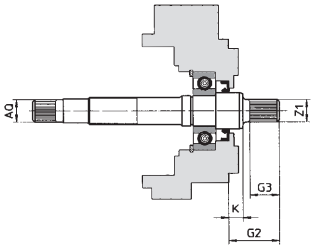
1 = supplied as standard if not specified in the model code
2 = according to ISO/DIN 3019 standards
3 = for high torque applications



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	73,1	14	31,75	7,97	35,33	84,1	8,1	31,75	7,97	38,58	84,1	14	34,90
	7,94	35,07			31,70	7,94	35,07			31,70	7,94	38,46			34,88

SPLINED SHAFT

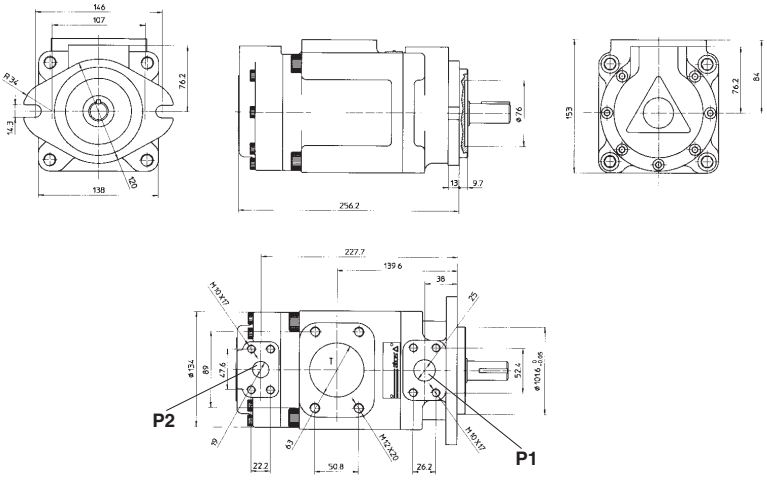
5 = for PFED-43 according to SAE B 16/32 DP, 13 teeth;
for PFED-54 according to SAE C 12/24 DP, 14 teeth;
6 = (only for PFED-43) according to SAE C 12/24 DP, 14 teeth;
7 = only for PFED-43 when used as the last element of a multiple pump: similar to shaft type 6.



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]

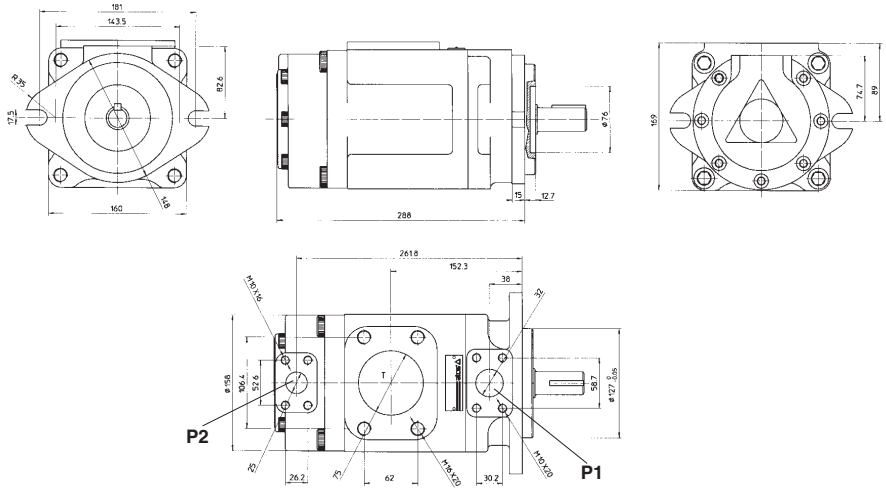
PFED-43



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

Weight: 24,5 kg

PFED-54

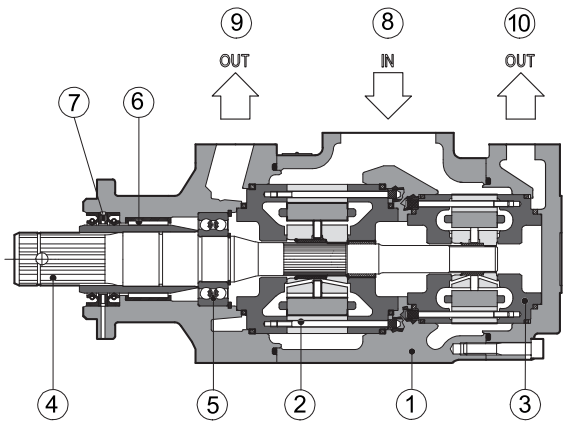


SAE FLANGES:
port P1 = 1 ¼";
port P2 = 1";
port T = 3"

Weight: 36 kg

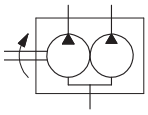
Vane pumps for PTO drives type PFEO-41 and PFEDO-43

fixed displacement, DIN ISO 6162-1, square flange



PFEDO-43045/022/5D

Hydraulic symbol



① body
② first cartridge: stator, rotor, vanes, balanced plates
③ second cartridge: as above
④ renforced shaft
⑤ double ball bearing
⑥ roll bearing
⑦ double shaft seal
⑧ inlet port
⑨ first outlet port
⑩ second outlet port

Fixed displacement vane pumps specially designed for direct installation on PTO drives of mobile vehicles and derived from PFE standard versions but with:

- 4 holes, square mounting flange according to DIN ISO 6162-1 for direct connection to PTO;
- DIN 5462 reinforced splined shaft, specially supported by a double ball bearing and a roll bearing for high radial loads;
- double shaft seal to prevent contamination between the PTO gearbox fluid and the pump fluid.

They are available in single cartridge execution (PFEO) or with double cartridge in a single body (PFEDO).

Easy installation due to the possibility of inlet/outlet ports orientation and semplified maintenance due to the quick cartridge replacement.

Wide displacement range: from 29 to 85 cm³/rev for PFEO, from 29+16 to 85+44 for PFEDO.

Max pressure up to 210 bar.

1 MODEL CODE

PFEDO	-	43	045	/	022	/	5	D	TA	**	/*

PFEO = fixed displacement vane pump
PFEDO = fixed displacement double vane pump

Models:
41 = for PFEO, see section 3
43 = for PFEDO, see section 4

Displacement [cm³/rev] PFEO, see section 3.
Displacement of first element [cm³/rev] PFEDO, see section 4.

Displacement of second element [cm³/rev], PFEDO, see section 4.

Ports orientation, see section 5

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

Note: PFEO and PFEDO are not reversible

Drive shaft, splined type DIN 5462.

Series number

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

Note: model type PFEO-42* with max pressure up to 280 bar with displacement 045, 056, 070 and 085, available on request.

2 MAIN CHARACTERISTICS

Installation position	Any position.
Loads on the shaft	Axial loads are not allowed. For max allowed radial load see diagram 7 in section 6
Ambient temperature	from -20°C to +70°C
Fluid	Hydraulic oil as per DIN 51524...535; for other fluids see section 1
Recommended viscosity max at cold start max at full power during operation min at full power	 1000 mm²/s (low speed 400 rpm and low pressure recommended) 100 mm²/s 24 mm²/s 10 mm²/s
Fluid contamination class	ISO 4401 class 21/19/16 NAS 1638 class 10 (filters at 25 µm value with $\beta_{25} \geq 75$ 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

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

Model	Displacement cm³/rev	Max pressure (1)	Speed range rpm (2)(3)	7 bar (4) l/min	kW	140 bar (4) l/min	kW	max pressure (4) l/min	kW
PFEO-41029	29,3	210 bar	400-2500	41	0,8	37	10	34	14,7
PFEO-41037	36,6			52	1	48	12,5	45	18,3
PFEO-41045	45,0			64	1,3	60	16	57	22,6
PFEO-41056	55,8			80	1,6	75	21	72	28
PFEO-41070	69,9			101	2	95	26	91	35
PFEO-41085	85,3		400-2000	124	2,4	118	32	114	43

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

PFEDO-43 are composed of one cartridge PFE-41 and one cartridge PFED-31.

Model	Displacement [cm³/rev]		Max pressure (1)	Speed range min/max (2) rpm (3)	7 bar (4) 1°flow		2°flow		140 bar (4) 1°flow		2°flow		210 bar (4) 1°flow		2°flow	
PFEDO-43	1°cartridge	2°cartridge			l/min	Kw	l/min	Kw	l/min	Kw	l/min	Kw	l/min	Kw	l/min	Kw
PFEDO-43 029/016	29,3	16,5	210 bar	400-2500	41	0,8	23	0,5	37	10	19	5	34	14	16	6,5
PFEDO-43 029/022		21,6			41	0,8	30	0,6	37	10	26	7	34	14	23	10
PFEDO-43 029/028		28,1			41	0,8	40	0,8	37	10	36	10	34	14	33	14
PFEDO-43 037/016	36,6	16,5			52	1	23	0,5	48	12,5	19	5	45	18	16	6,5
PFEDO-43 037/022		21,6			52	1	30	0,6	48	12,5	26	7	45	18	23	10
PFEDO-43 037/028		28,1			52	1	40	0,8	48	12,5	36	10	45	18	33	14
PFEDO-43 037/036		35,6			52	1	51	1	48	12,5	46	12,5	45	18	43	18
PFEDO-43 045/016	45	16,5			64	1,3	23	0,5	60	24	19	5	57	24	16	6,5
PFEDO-43 045/022		21,6			64	1,3	30	0,6	60	16	26	7	57	24	23	10
PFEDO-43 045/028		28,1			64	1,3	40	0,8	60	16	36	10	57	24	33	14
PFEDO-43 045/036		35,6			64	1,3	51	1	60	16	46	12,5	57	24	43	18
PFEDO-43 045/044		43,7			64	1,3	63	1,3	60	16	58	15,5	57	24	55	23
PFEDO-43 056/016	55,8	16,5			80	1,6	23	0,5	75	21	19	5	72	30	16	6,5
PFEDO-43 056/022		21,6			80	1,6	30	0,6	75	21	26	7	72	30	23	10
PFEDO-43 056/028		28,1			80	1,6	40	0,8	75	21	36	10	72	30	33	14
PFEDO-43 056/036		35,6			80	1,6	51	1	75	21	46	12,5	72	30	43	18
PFEDO-43 056/044		43,7			80	1,7	63	1,3	75	21	58	15,5	72	30	55	23
PFEDO-43 070/016	69,8	16,5			101	2	23	0,5	95	26	19	5	91	37	16	6,5
PFEDO-43 070/022		21,6			101	2	30	0,6	95	26	26	7	91	37	25	10
PFEDO-43 070/028		28,1			101	2	40	0,8	95	26	36	10	91	37	33	14
PFEDO-43 070/036		35,6			101	2	51	1	95	26	46	12,5	91	37	43	18
PFEDO-43 070/044		43,7			101	2	63	1,3	95	26	58	18,5	91	37	55	23
PFEDO-43 085/016	85,3	16,5		400-2000	124	2,4	23	0,5	118	32	19	5	114	46	16	6,5
PFEDO-43 085/022		21,6			124	2,4	30	1,6	118	32	26	7	114	46	23	10
PFEDO-43 085/028		28,1			124	2,4	40	0,8	118	32	36	10	114	46	33	14
PFEDO-43 085/036		35,6			124	2,4	51	1	118	32	46	12,5	114	46	43	18
PFEDO-43 085/044		43,7			124	2,4	63	1,3	118	32	58	15,5	114	46	55	23

(1) Max pressure is 160 bar for /PE version and water glycol fluid
(2) Max speed is 1800 rpm for /PE version; 1500 rpm for water glycol fluid
(3) Max speed for venting = 2700 rpm
(4) Flow rate and power consumption are proportional to the rotation speed

5 PORT ORIENTATION (pumps viewed from the shaft end)

Pumps can be supplied with oil ports oriented in different configurations in relation to the drive shaft. Port orientation of PFEO (the first element for PFEDO) is 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
Outlet port (P2) of second element for PFEDO can be orientated, relative to the inlet port (T1), 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.

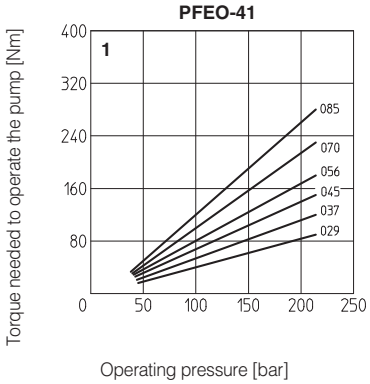
PFEO	PFEDO							
T P-T	**TO** P1-T-P2	**TA** P1-T P2	**TB** P1-T P2	**TC** P1-T P2	**TD** P1-T P2	**TE** P1-T P2	**TF** P1-T P2	**TG** P1-T P2
W P T	**WO** P1-P2 T	**WA** P1 P2 T	**WB** P1 T P2	**WC** P1 T P2	**WD** P1 T P2	**WE** P1 T P2	**WF** P1 P2-T	**WG** P1 P2 T
U P T	**UO** P1-P2 T	**UA** P1 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
V P 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	**VG** P1 P2 T

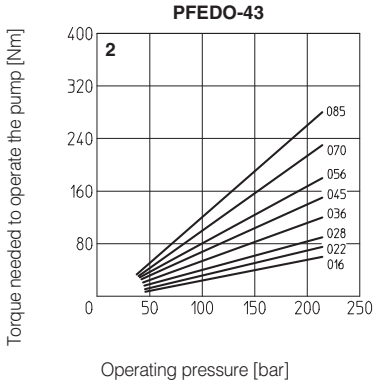
P1 = outlet port of first element; P2 = outlet port of second element; T = inlet port

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

1 = Torque versus pressure diagram PFEO-41

2 = Torque versus pressure diagram PFEDO-43 (the total shaft torque is the sum of the first cartridge + the second one).

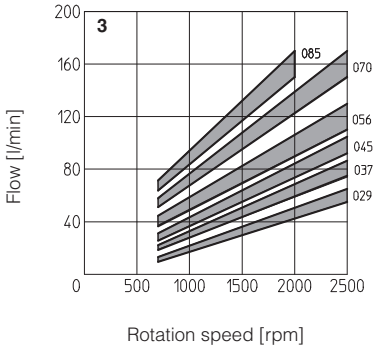


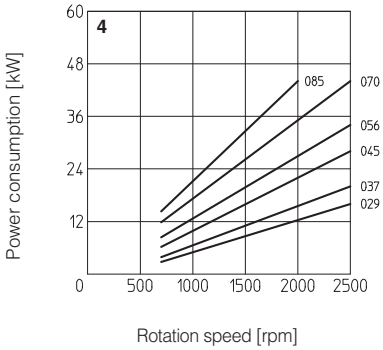


PFEO-41
PFEDO-43: First element (cartridge SC-PFE-41)**

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.

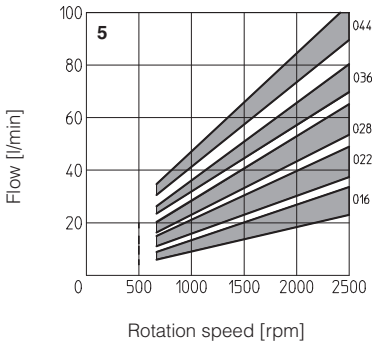


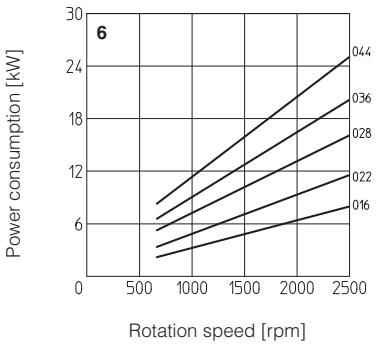


PFEDO-43: Second element (cartridge SC-PFED-31)**

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

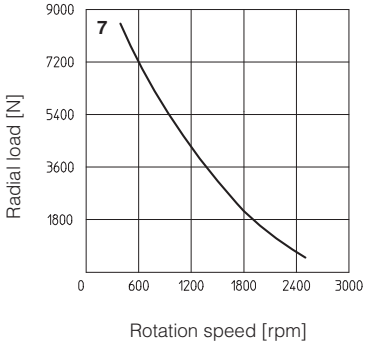
6 = Power consumption versus speed diagram at 140 bar. Power consumption is proportional to operating pressure.





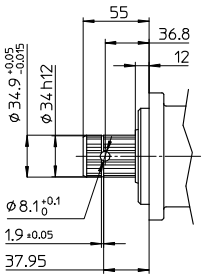
PFEO and PFEDO

7 = max allowed radial load versus speed diagram



7 DRIVE SHAFT

Spline shaft DIN 5462

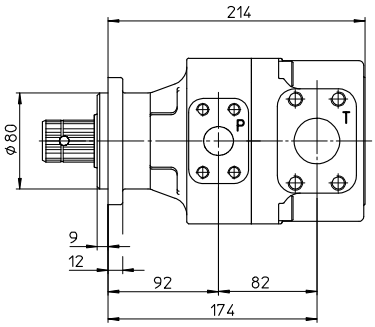


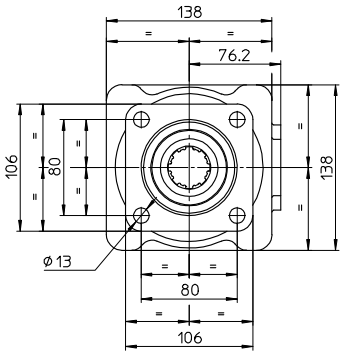
Max Torque 750 Nm

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 max allowed.
The values of torque needed to operate each single cartridge are shown on the "torque versus pressure diagram" at section 6.

8 DIMENSIONS [mm]

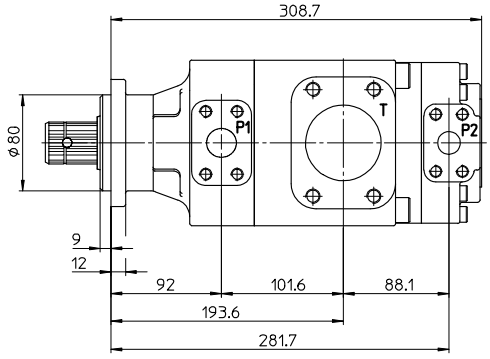
PFEO-41*
Mounting flange
DIN ISO 6162-1; SAE J518 “C”
SAE flanges
port **P = 1”**
port **T = 1 1/2”**

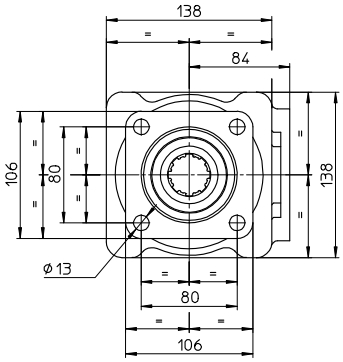




Mass: 18 kg

PFEDO-43*
Mounting flange
DIN ISO 6162-1; SAE J518 “C”
SAE flanges
port **P1 = 1”**
port **P2 = 3/4”**
port **T = 2 1/2”**





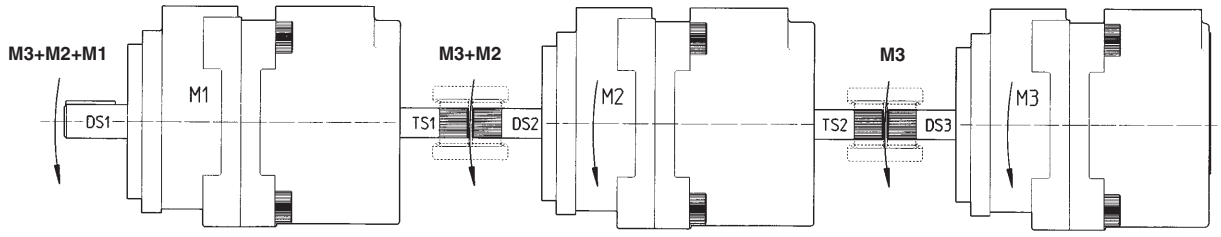
Mass: 25 kg

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.

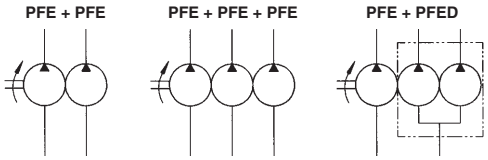
The values of torque needed to operate each single pump and the allowed limit torque values for drive shafts and through shafts are shown on technical tables of individual basic pumps.

For multiple pumps, the following verifications must be executed:

a) $M3 \leq L_{TS2}$
b) $M3 + M2 \leq L_{DS2}$
c) $M3 + M2 \leq L_{TS1}$
d) $M3 + M2 + M1 \leq L_{DS1}$

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: 016, 022, 028, 036, 044
for PFE 41: 029, 037, 045, 056, 070,085
for PFE 51: 090, 110, 129, 150
for PFE 32: 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

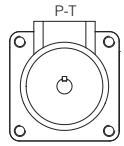
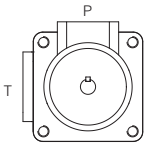
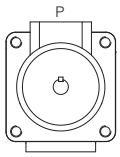
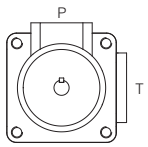
Note:
multiple pumps are supplied with inlet and outlet ports in line. Ports orientation can be easily changed by rotating the pump body that carries inlet port.

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**

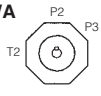
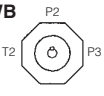
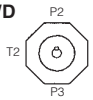
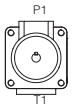
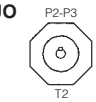
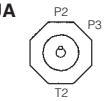
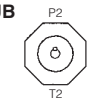
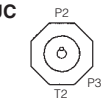
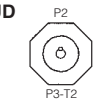
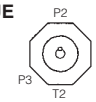
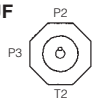
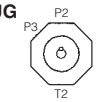
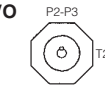
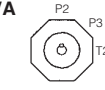
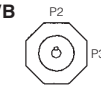
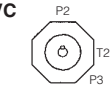
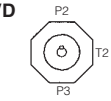
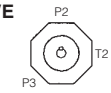
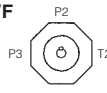
T	**V**	**U**	**W**
			
orientation of all pumps	orientation of all pumps	orientation of all pumps	orientation of all pumps

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.

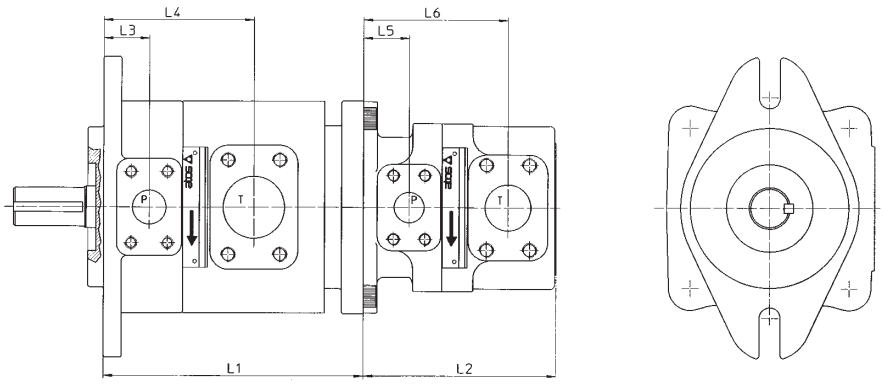
Model code example: PFEXD-42045/43037/016/5D**TO**

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]

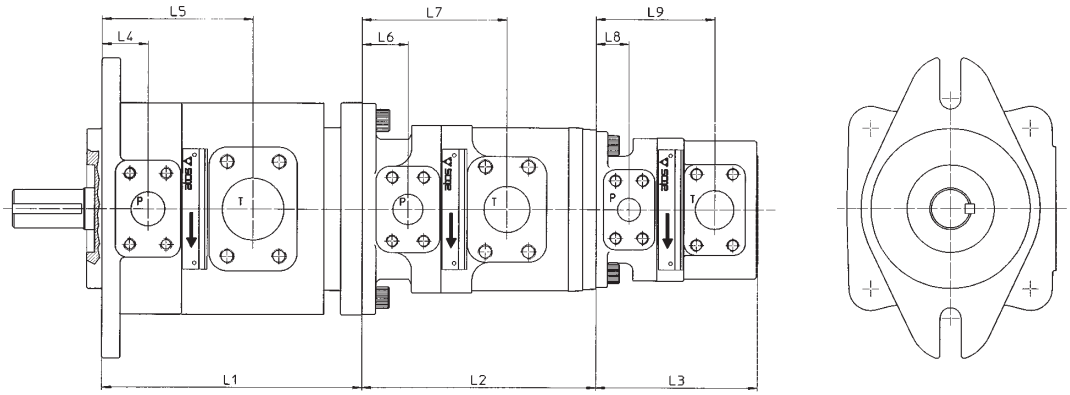
PFEX2



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

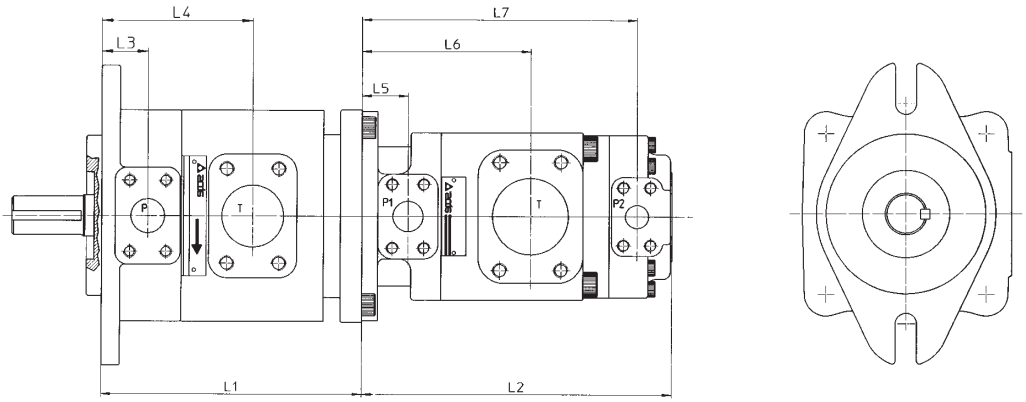
PFEX3



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

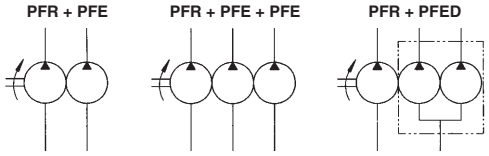


For missing details see tab. A005 and A007, A180

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 22 / 31044 / D * / ** /*

Multiple fixed displacement piston/vane pump

Composition:
2E = double: PFR + PFE
3E = triple: PFR + PFEX2
DE = triple: PFR + PFED
The pumps are assembled in decreasing order of size.

Size of first pump type PFR:
3, **5**

Displacement of first pump type PFR [cm³/rev]
for **PFR-3** = 08, 11, 15
for **PFR-5** = 18, 22, 25

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

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 2.3

Series number

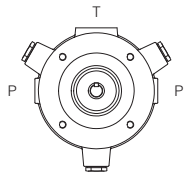
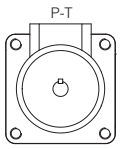
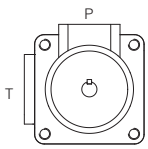
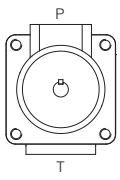
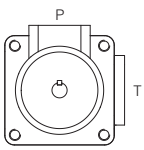
Seals material:
omit for NBR (mineral oil & water glycol)
PE = FPM

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-522/31044/D**T**

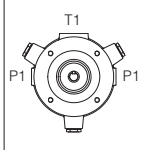
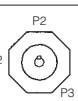
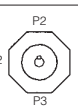
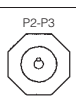
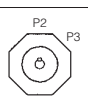
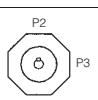
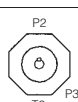
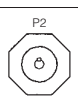
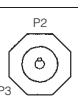
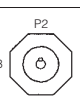
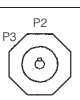
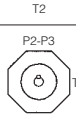
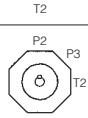
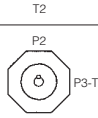
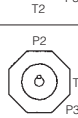
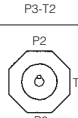
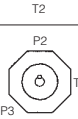
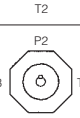
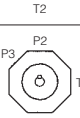
1st PUMP PFRX*	2nd / 3th PUMP PFE			
	**T** 	**V** 	**U** 	**W** 

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-522/43045/022/D**TO**

1st PUMP PFRX*	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

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-308/31036	600-1800	8	12,6	350	36,5	51	210	63,6
PFRX2E-308/31044					43,7	63	210	75,6
PFRX2E-308/41070					69,9	101	180	113,6
PFRX2E-308/41085					85,3	124	150	136,6
PFRX2E-308/51110					109,6	157	180	169,6
PFRX2E-308/51129					129,2	186	150	198,6
PFRX2E-311/31044		11,4	16,5	350	43,7	63	210	79,5
PFRX2E-311/41070					69,9	101	180	117,5
PFRX2E-311/41085					85,3	124	150	140,5
PFRX2E-311/51110					109,6	157	180	173,5
PFRX2E-311/51129					129,2	186	150	202,5
PFRX2E-315/41056		14,7	21,5	350	55,8	80	210	101,5
PFRX2E-315/41070					69,9	101	180	122,5
PFRX2E-315/51110					109,6	157	180	178,5
PFRX2E-315/51129					129,2	186	150	207,5
PFRX2E-518/31044		18,1	26	350	43,7	63	210	89
PFRX2E-518/41070					69,9	101	180	127
PFRX2E-518/41085					85,3	124	150	150
PFRX2E-518/51110					109,6	157	180	183
PFRX2E-518/51129					129,2	186	150	212
PFRX2E-522/41056		21,8	31,5	350	55,8	80	210	111,5
PFRX2E-522/41070					69,9	101	180	132,5
PFRX2E-522/51110					109,6	157	180	188,5
PFRX2E-522/51129					129,2	186	150	217,5
PFRX2E-525/41070		25,4	37	350	69,9	101	180	138
PFRX2E-525/51110					109,6	157	180	194
PFRX2E-525/51129					129,2	186	150	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.

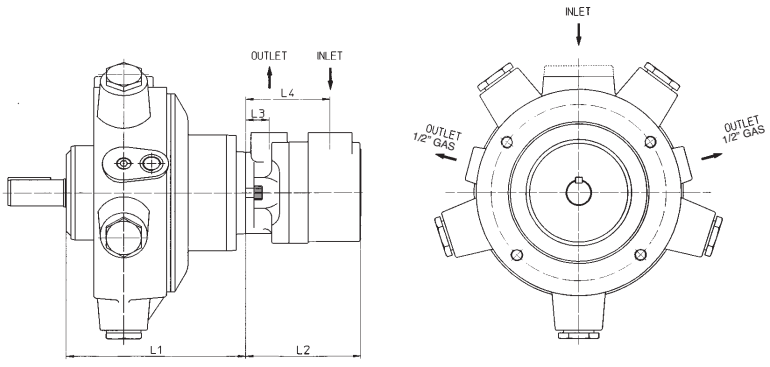
The shaft of the PFR pump has an eccentric cam which rotates with the shaft generating the stroke of the pistons and thus generating the flow rate. For best functioning a balanced coupling should be provided between the shaft of the motor and the shaft of the pump.
See tab. A045

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]

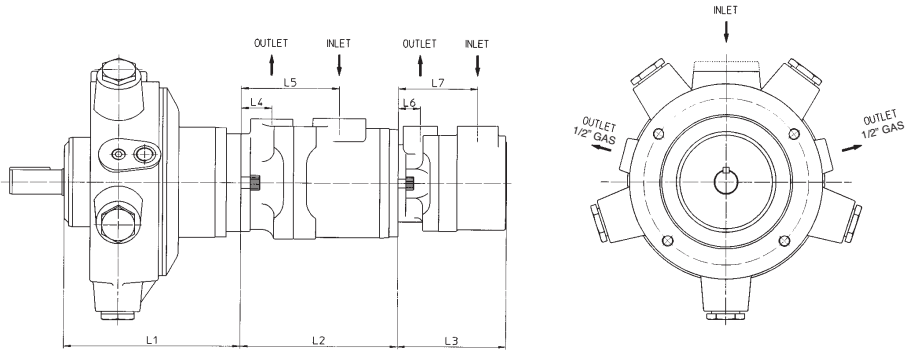
PFRX2E



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

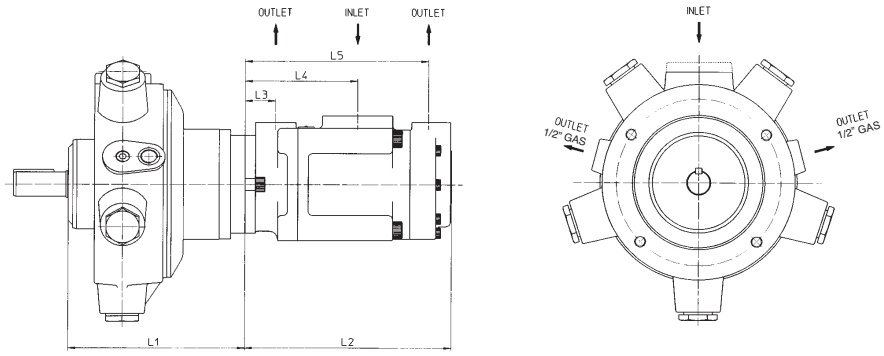
PFRX3E



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



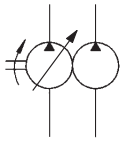
For missing details see tab. A045 and A180

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

PVPCX 2E – C – 4 046 / 31044 / 1 D X 24DC 10 /*

Variable displacement axial piston pump

2E = 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
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: 016, 022, 028, 036, 044
for PFE 41: 029, 037, 045, 056, 070,085
for PFE 51: 090, 110, 129, 150
for PFE 32: 022, 028, 036,
for PFE 42: 045, 056, 070, 085
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 DC
24/50 AC
110/50 AC
220/50 AC

Series number

Seals material:
omit for NBR (mineral oil & water glycol)
PE = FPM
See notes under section 2

1) pumps with ISO 3019/2 mounting flange and shaft (option /M) are available on request

3.2 MODEL CODE FOR PVPCX2E with electrohydraulic proportional controls

PVPCX 2E - PERS - BC - 4 046 /31044 / * /1 D / 18 10 /*

Variable displacement axial piston pump

2E = 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 = closed loop integral digital P/Q controller
PERS = as PES plus sequence module

Communication interface, only for PES and PERS versions
PS = RS232 serial **BP** = PROFIBUS-DP **BC** = CAN-Bus

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: 016, 022, 028, 036, 044
for PFE 41: 029, 037, 045, 056, 070,085
for PFE 51: 090, 110, 129, 150
for PFE 32: 022, 028, 036,
for PFE 42: 045, 056, 070, 085
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 PE(R)S:
C = predisposed to receive 4 ÷ 20 mA feedback signal from the remote pressure transducer
X = with integral pressure transducer (only for PERS)
S = additional closed loop pressure control with multiple PID parameters set - **only for -PS**
Z = as S but with double power supply, enable and fault - **only for -BC and -BP**

Series number

Seals material:
omit for NBR (mineral oil & water glycol)
PE = FPM
See notes under section 2

1) pumps with ISO 3019/2 mounting flange and shaft (option /M) are available on request

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-*-3029/31016	800-2800	29	42	280/350	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-*-4046/31016	800-2600	46	66,7	280/350	16,5	23		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-*-5073/31016	800-2200	73	105,8	280/350	16,5	23		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-*-5090/31016	800-2200	88	127,6	280/350	16,5	23		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)

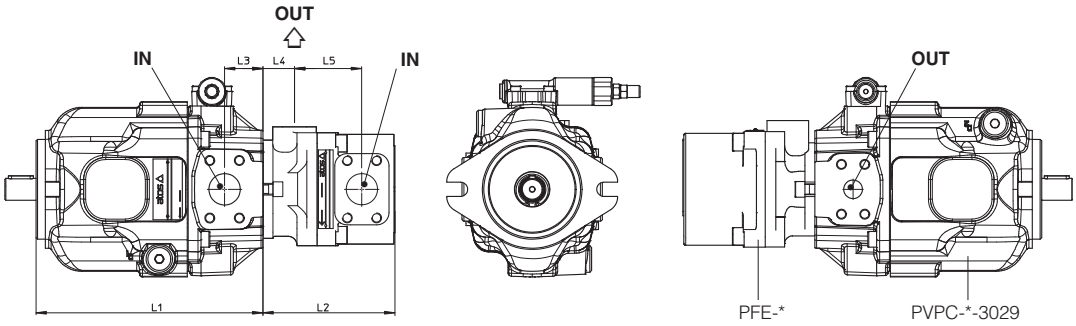
(at 1450 rpm and based on mineral oil ISO VG46 at 40° C)

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-*-3029/32022	1200-2500	29	42	280/350	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-*-4046/32022	1200-2500	46	66,7	280/350	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-*-5073/32022	1200-2500	73	105,8	280/350	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-*-5090/32022	1200-2500	88	127,6	280/350	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	1000-2000				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	800-2000				85,3	124		251,6
PVPCX2E-*-5090/52090	1000-2000				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	800-1500				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.

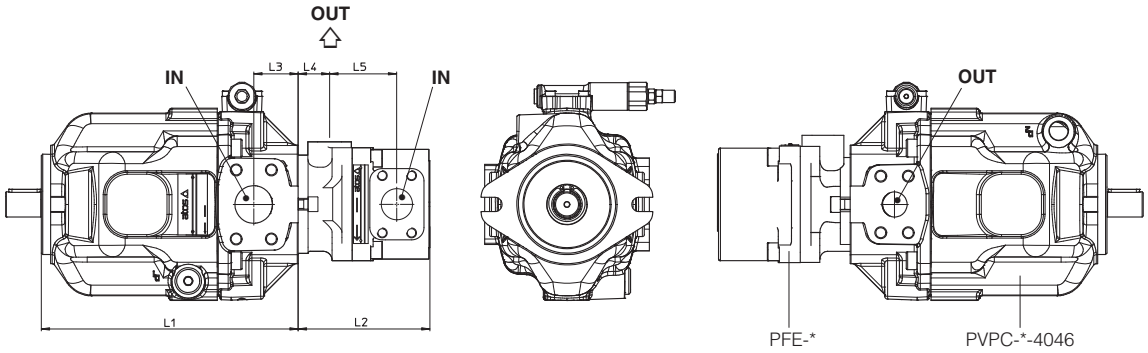
3.5 DIMENSIONS OF MULTIPLE PUMPS TYPE PVPCX2E [mm]

PVPCX2E-*-3029



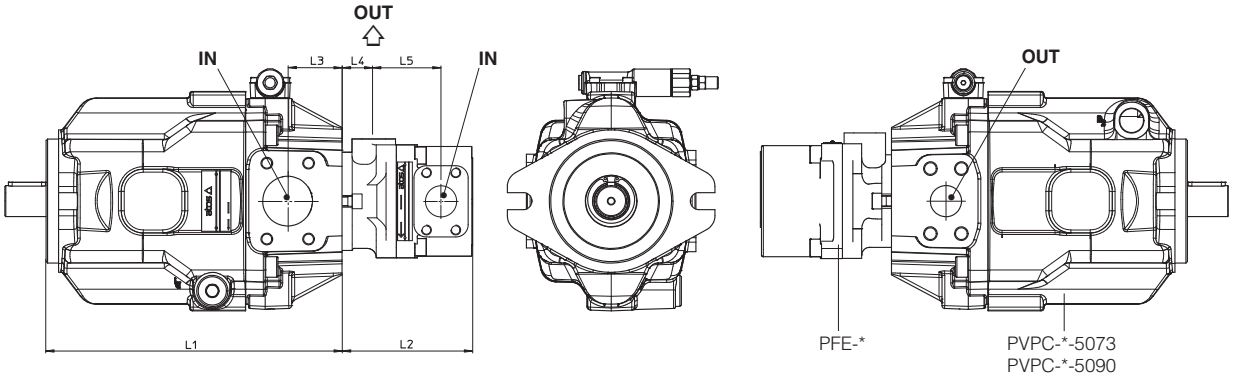
Composed pump	First element - piston pump -	Second element - vane pump -	L1	L2	L3	L4	L5
PVPCX2E-*-3029/3****	PVPCXA-*-3029	PFE-3****	231,2	134,5	39	27,5	71
PVPCX2E-*-3029/3****	PVPCXB-*-3029	PFE-4****	231,2	160	39	38	82

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

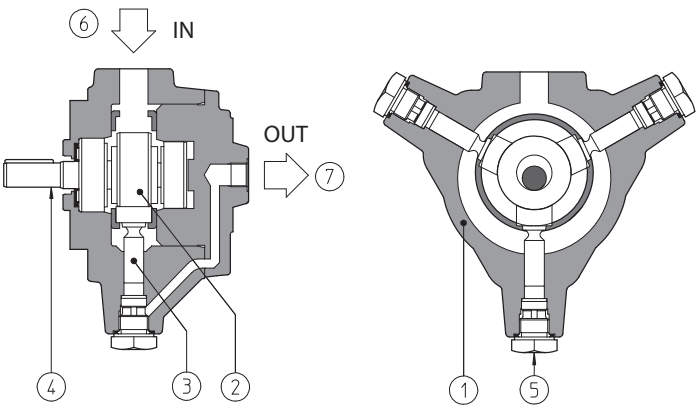
PVPCX2E-*-5073
PVPCX2E-*-5090



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

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-2

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, 06**
for PFR-3: **08, 11, 15**
for PFR-5: **18, 22, 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)

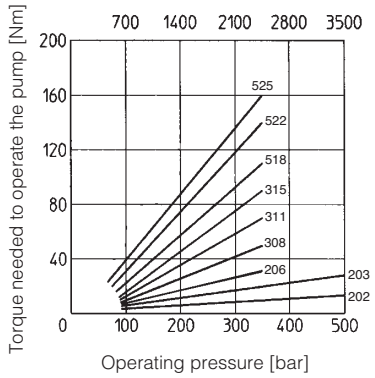
Model	Displacement cm³/rev	Max pressure bar	Speed range rpm	150 bar (3) l/min	kW	250 bar (3) l/min	kW	350 bar (3) l/min	kW	500 bar (3) l/min	kW
PFR-202	1,7	500 (1)	600-1800 (2)	2,4	0,7	2,4	1,1	2,4	1,6	2,4	2,1
PFR-203	3,5			5,0	1,4	5,0	2,2	4,9	3,0	4,9	4,2
PFR 206	5,8	350 (1)		8,3	2,4	8,3	3,7	8,2	4,9	-	-
PFR-308	8,2			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-522	21,8			31,5	9,5	31,2	14,9	31	18,4	-	-
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

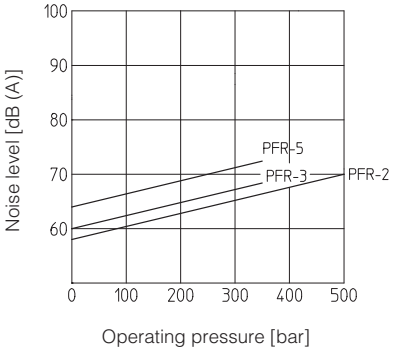
Installation position		Any position. If the pump is installed in vertical position, it is advisable to install on the outlet pipe a proper valve for air bleeding (consult our technical dept.). They are not self-priming therefore their installation under oil level is recommended. Installation above oil level requires foot valve on inlet line and pump central point located no more than 150 mm above minimum oil level. 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		from -20°C to +70°C
Fluid		Hydraulic oil as per DIN 51524...535; for other fluids see section 1
Recommended viscosity		
	max at cold start	800 mm^2/s
	max at full power	100 mm^2/s
	during operation	24 mm^2/s
	min at full power	10 mm^2/s
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 pressure on inlet port		from -0,1 to 1,5 bar for speed up to 1800 rpm

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.



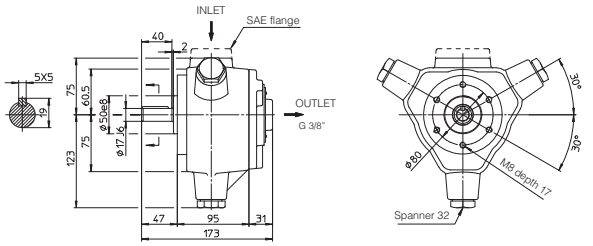
6 LIMIT OF SHAFT TORQUE

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]

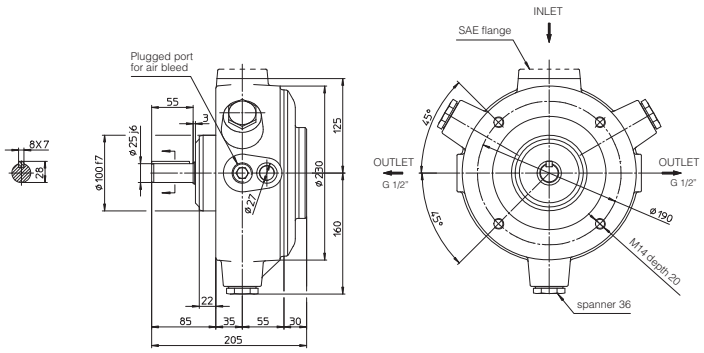
PFR-2



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

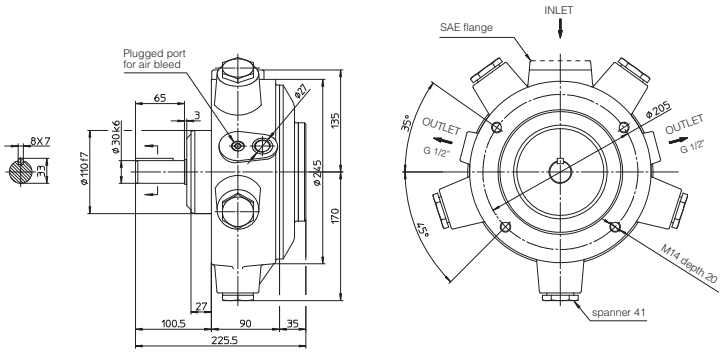
Mass: 12 Kg

PFR-3



Mass: 31 Kg

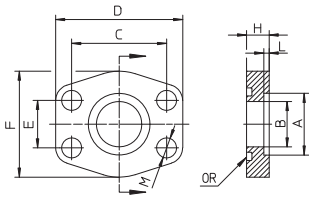
PFR-5



Model	Mass kg
PFR-518	38
PFR-522	
PFR-525	

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

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

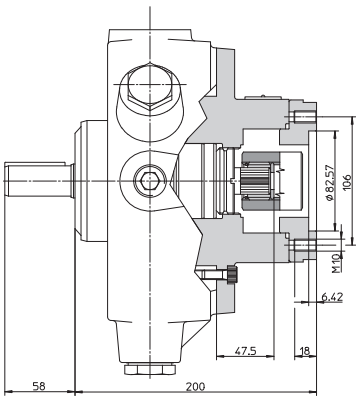


Flanges are supplied with seal and screws M10 class 12.9
Tightening torque = 70 Nm

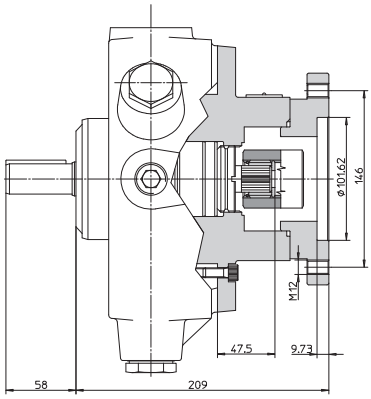
Pump model	Flange code	A	B	C	D	E	F	H	L	M	OR	Screws
PFR - 2	WFA-25	35,5	29	52,37	70	26,19	55	12	4	ø 11	4131	M10x30
PFR - 3	WFA-32	42,5	34	58,72	79	30,18	68	12	4	ø 11,5	4150	M10x35
PFR - 5												

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

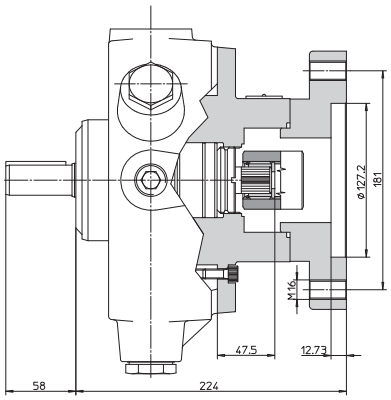
PFRXA-3



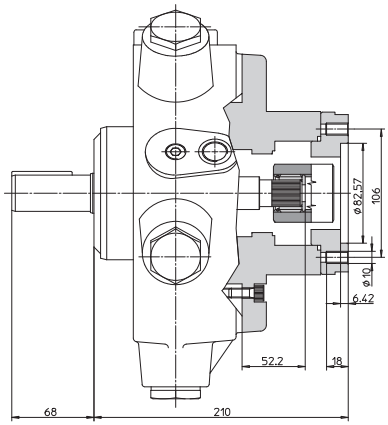
PFRXB-3



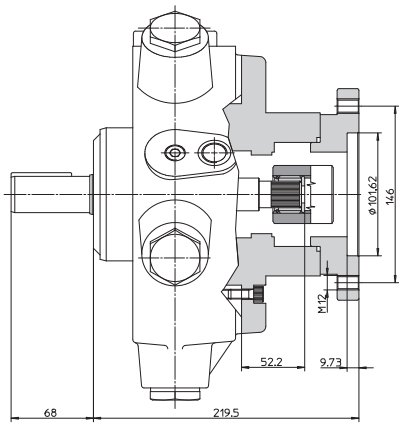
PFRXC-3



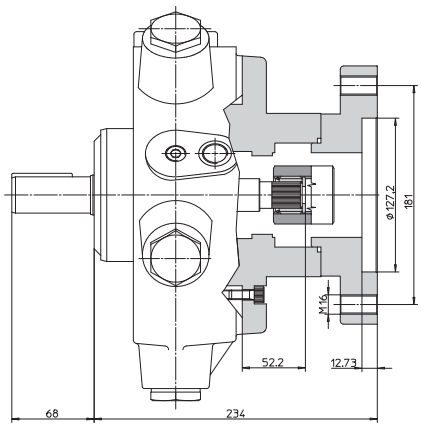
PFRXA-5



PFRXB-5



PFRXC-5



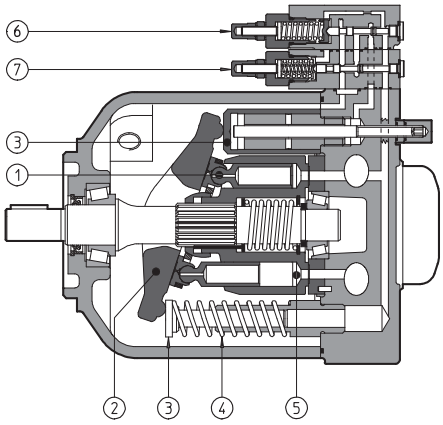
10 BALANCED COUPLING

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 e PFR-206	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-522	UNEL-MEC 132	Y-GB-125/22	Y-LS6P5
	UNEL-MEC 160	Y-GB-305/22	Y-LS7P5
	UNEL-MEC 180	Y-GB-605/22	
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	

Axial piston pumps type PVPC

variable displacement, by a full line of mechanical controls



PVPC-L-4046

PVPC are variable displacement axial piston pumps for high pressure operation, with low noise level, suitable for hydraulic oils or synthetic fluids having symilar lubricating characteristics.
The actual displacement is dependent on the lenght of stroke of the pumping pistons ①. This lenght of stroke is determined by the position of the swashing plate ② that is achieved by two servo pistons ③ with differential areas, against a spring ④.
The rotating barrel ⑤ forces the pistons in a circular path in and out of the barrel and fluid displacement takes place.
Typical section on side shows version L with manual pressure compensator ⑥ and flow regulation ⑦.
The available hydraulic controls are shown in sections [8]. The wide range of electrohydraulic proportional controls is shown in tab. A170.
SAE J744 mounting flange and shaft (see note 1).
Max displacement: 29-46-73-88 cm³/rev.
Max pressure: 280 bar working
350 bar peak.

1 MODEL CODE

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

Variable displacement axial piston pump

Eventual suffix for double pumps
X2E = with a fixed displacement pump type PFE (see tab. A005)

Type of control (see section [8]):
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 table A170

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

Type of PFE (for double pumps), see tab. A005

Shaft (SAE Standard) (1):
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 (only for CH version)
See section [4] for available connectors, to be ordered separately

Supply voltage, see section [5]
(only for CH version)

Series number

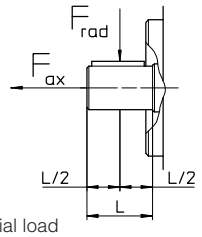
Seals material:
omit for NBR (mineral oil & water glycol)
PE = FPM
See notes in section [2]

1) pumps with ISO 3019/2 mounting flange and shaft (option /M) are available on request

2 OPERATING CHARACTERISTICS

Pump model		PVPC-*-3029	PVPC-*-4046	PVPC-*-5073	PVPC-*-5090
Displacement	[cm³/rev]	29	46	73	88
Theoretical max flow at 1450 rpm	[l/min]	42	66,7	105,8	127,6
Max working pressure / Peak pressure	[bar]	280/350	280/350	280/350	250/315
Min/Max inlet pressure	[bar abs.]	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
Power consumption at 1450 rpm and at maximum pressure and displacement	[kW]	19,9	31,6	50,1	54,1
Max torque on the first shaft	[Nm]	Type 1 200 / Type 5 190	Type 1 230 / Type 5 330	Type 1 490 / Type 5 620	Type 1 490 / Type 5 620
Max permissible load on drive shaft	[N] Fax	1000	1500	2000	2000
	Frad	1500	1500	3000	3000
Speed rating	[rpm]	600 ÷ 3000	600 ÷ 2600	600 ÷ 2200	600 ÷ 1850

External load position



Fax = axial load
Frad = 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 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.

3 MAIN CHARACTERISTICS OF VARIABLE DISPLACEMENT AXIAL PISTON PUMP TYPE PVPC

Installation 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.
Ambient temperature	from -20°C to +70°C
Fluid	Hydraulic oil as per DIN 51524...535; for other fluids see section 1
Recommended viscosity	15÷100 mm²/sec at 40°C (ISO VG 15÷100). Maximum start-up viscosity: 1000 mm²/sec
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 (seals /PE)

3.1 Coils characteristics (for version CH)

Insulation class	H
Connector protection degree	IP 65
Relative duty factor	100%
Supply voltage and frequency	See electric feature 5
Supply voltage tolerance	± 10%

4 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 FOR VERSION CH

The connectors must be ordered separately

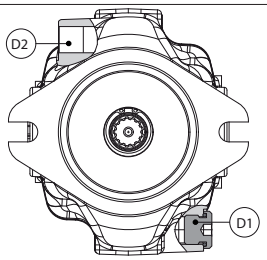
Code of connector	Function
SP-666	Connector IP-65, suitable for direct connection to electric supply source
SP-667	As SP-666 connector IP-65 but with built-in signal led, suitable for direct connection to electric supply source

5 ELECTRIC FEATURES FOR VERSION CH

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

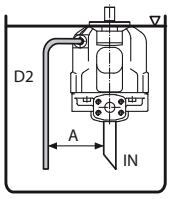
Average values based ambient/coil temperature of 20°C.

6 INSTALLATION POSITION



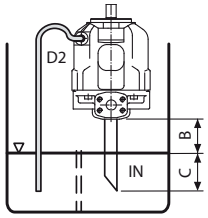
The pump is supplyed whit drain D2 open, and D1 plugged. Before installation fill the pump with hydraulic oil for at least 3/4 of its volume, keeping it in horizontal position. With exception of pump mounted below the oil level, we recomend to interpose a baffle plate between inlet and drain line.

VERTICAL INSTALLATION



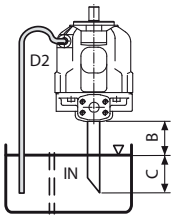
INSIDE THE TANK

Minimum oil level equal or above the pump mounting surface.
A ≥ 200mm



INSIDE THE TANK

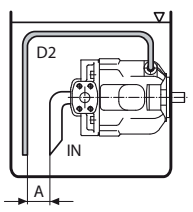
Minimum oil level below the pump mounting surface.
Minimum inlet pressure = 0,8 bar absolute
B ≤ 800mm, C= 200mm



OUTSIDE THE TANK, above oil level

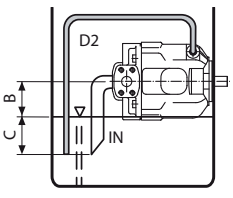
Minimum inlet pressure = 0,8 bar absolute
B ≤ 800mm, C= 200mm

HORIZONTAL INSTALLATION



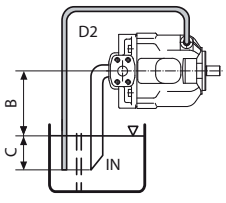
INSIDE THE TANK

Minimum oil level equal or above the pump mounting surface.
A ≥ 200mm



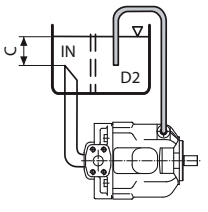
INSIDE THE TANK

Minimum oil level below the pump mounting surface.
Minimum inlet pressure = 0,8 bar (absolute)
B ≤ 800mm, C= 200mm



OUTSIDE THE TANK, above oil level

Minimum inlet pressure = 0,8 bar (absolute)
B ≤ 800mm, C= 200mm



OUTSIDE THE TANK, below oil level

C= 200mm

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

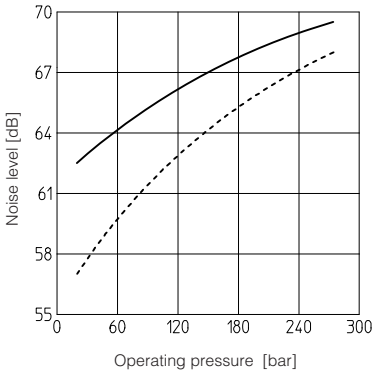
7 DIAGRAMS at 1450 rpm (based on mineral oil ISO VG 46 at 50°C)

7.1 Noise level curves

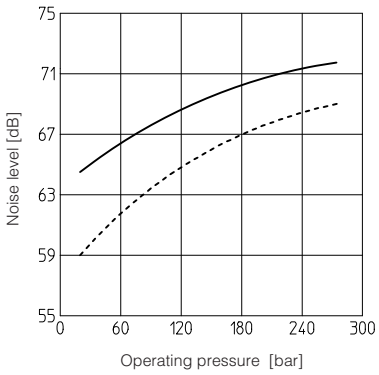
Ambient noise levels measured in compliance with ISO 4412-1 oleohydraulics -Test procedure to define the ambient noise level - Pumps
Shaft speed: 1450 rpm.

—— = Qmax ------ = Qmin

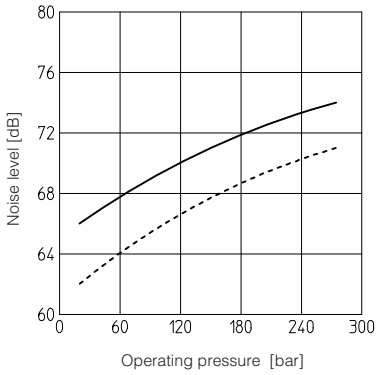
PVPC-*-3029



PVPC-*-4046



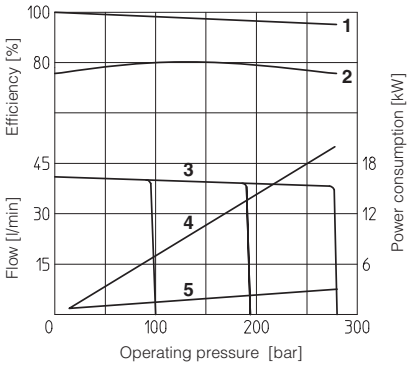
PVPC-*-5073 and PVPC-*-5090



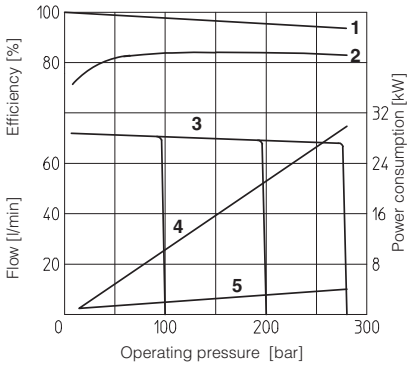
7.2 Operating limits

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

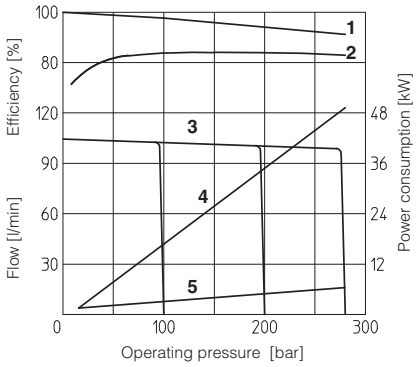
PVPC-*-3029



PVPC-*-4046



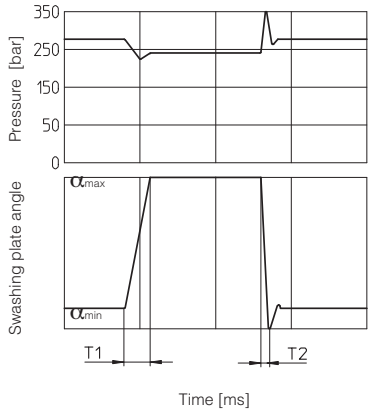
PVPC-*-5073



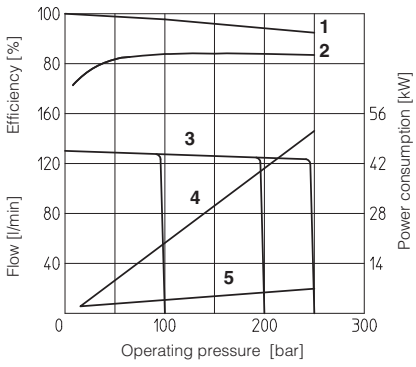
7.3 Response times

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

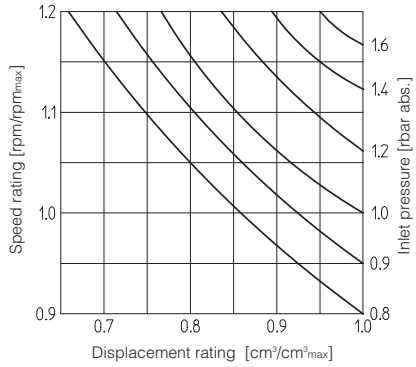
Pump type	**T1** (ms)	**T2** (ms)
PVPC-*-3029	31	19
PVPC-*-4046	44	20
PVPC-*-5073	50	25
PVPC-*-5090	53	28

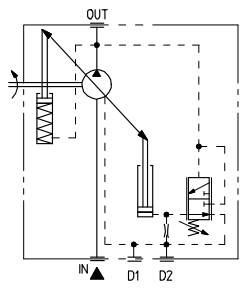


PVPC-*-5090



7.3.2 Variation of inlet pressure and reduction of displacement with increasing speed rating

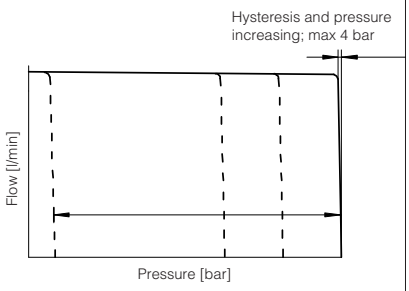


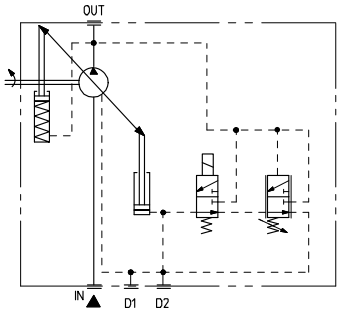


C

Manual pressure compensator

The pump displacement decreases when the line pressure approaches the setting pressure of the compensator. The pump supplies only the fluid required by the system. Pressure may be steplessly adjusted at the pilot valve.
Compensator setting range: 20 ÷ 350 bar (315 bar for 090)
Compensator standard setting: 280 bar (250 bar for 090)

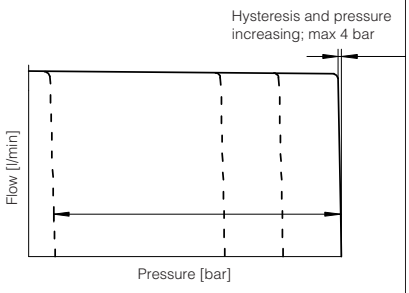


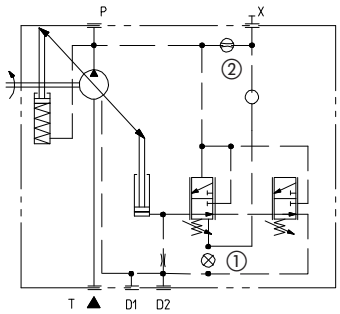


CH

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.
Compensator setting range: 20 ÷ 350 bar (315 bar for 090)
Compensator standard setting: 280 bar (250 bar for 090)

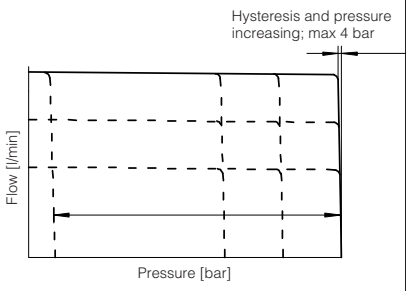


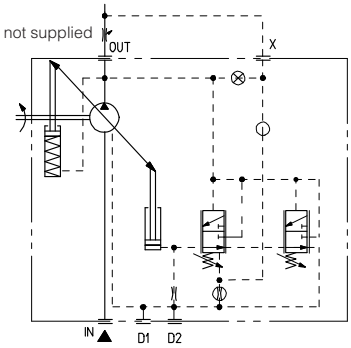


R

Remote pressure compensator

As C, but with remote setting of the compensator by means of a pressure relief valve on the piloting line X.
This version can be obtained from version L using a blind plug UNI 5923 M4x12 in pos. ① and a restrictor M4 drilled ø 0,75 mm in pos. ②.
Compensator setting range: 20 ÷ 350 bar (315 bar for 090)
Compensator standard setting: 280 bar (250 bar for 090)

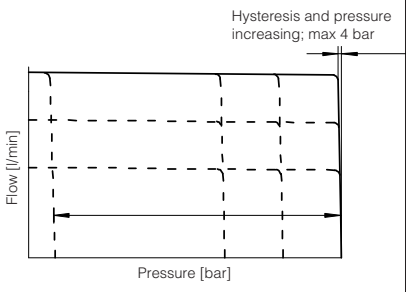


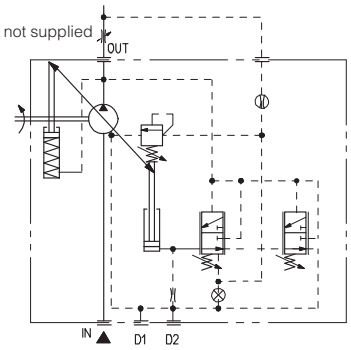


L

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 ÷ 350 bar (315 bar for 090)
Compensator standard setting: 280 bar (250 bar for 090)
Differential pressure setting range: 10 ÷ 40 bar
Differential pressure standard setting: 14 bar

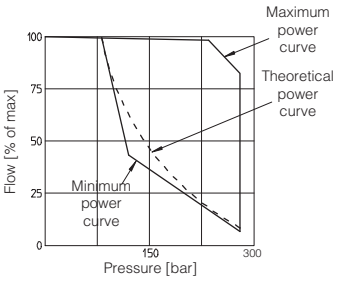




LW

Constant power

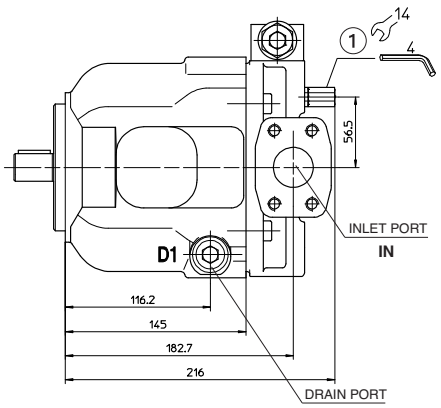
In order to achieve a constant drive torque with varying operating pressure. The swashing angle and therefore the outlet flow is varied so that the product of flow and pressure remains constant.
For the best regulation, minimum working pressure is 80 bar.
While selecting LW control, the required value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

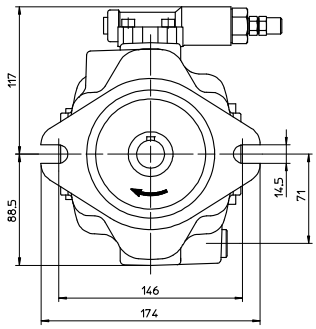


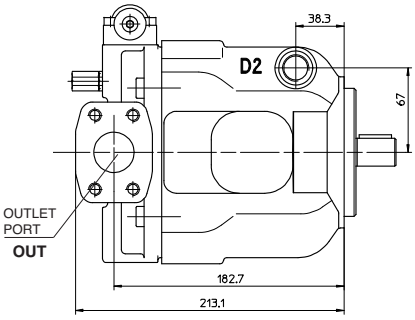
9 DIMENSIONS OF PVPC-*-3029: BASIC VERSION “C” CONTROL

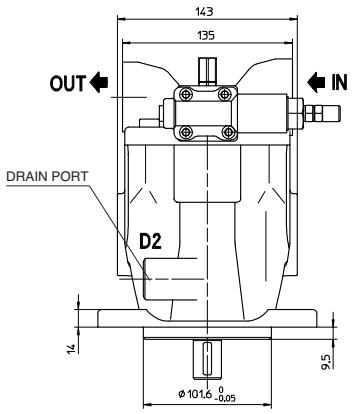
PORTS DIMENSION

IN = Flange SAE 3000 1 1/4”
OUT = Flange SAE 6000 3/4”
D1, D2 = 1/2” BSPP
① = Regulation screw for max displacement 1,5 cm³/rev per turn. 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.



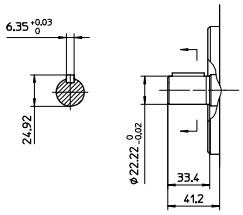




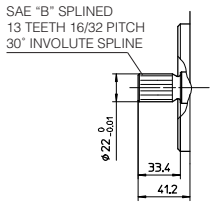


Mass: 18 kg

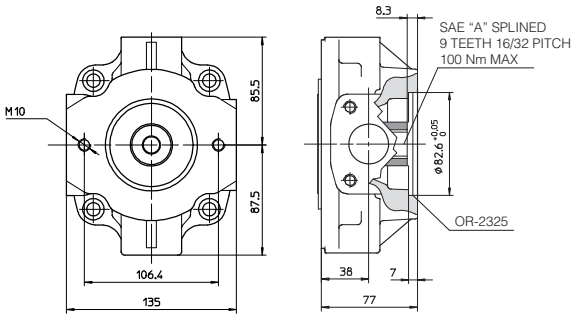
SHAFT TYPE “1”



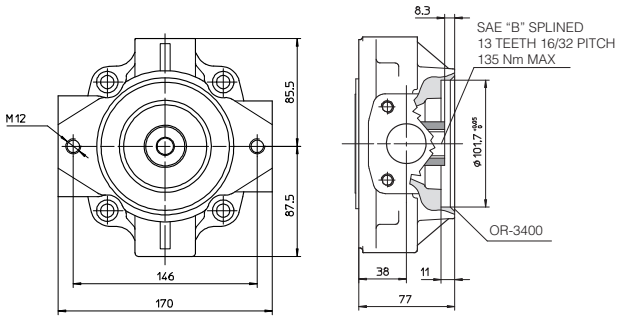
SHAFT TYPE “5”



INTERMEDIATE FLANGE SAE “A” FOR PFE-31



INTERMEDIATE FLANGE SAE “B” FOR PFE-41

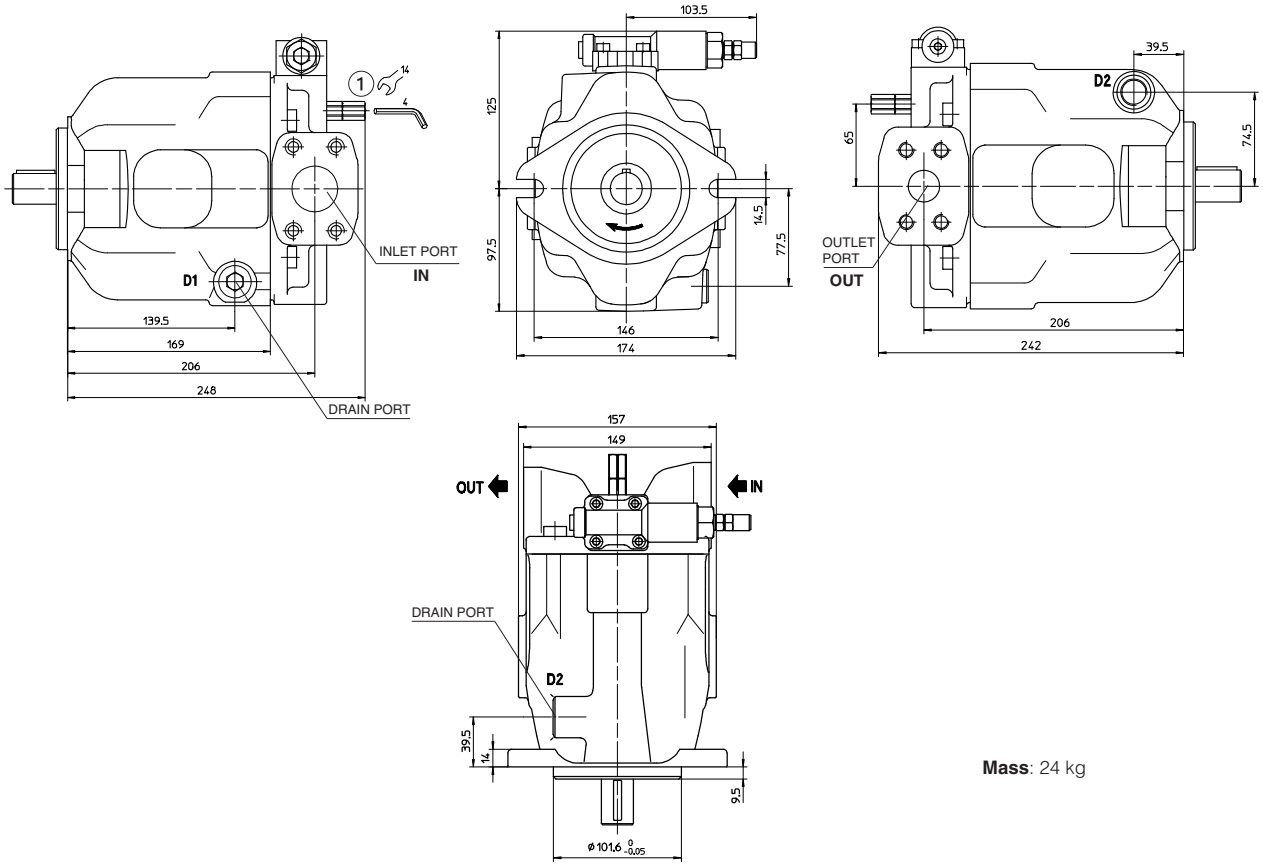


Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted

10 DIMENSIONS OF PVPC-*-4046: BASIC VERSION "C" CONTROL

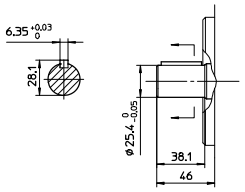
PORTS DIMENSION

IN = Flange SAE 3000 1 1/2"
OUT = Flange SAE 6000 1"
D1, D2 = 1/2" BSPP
① = Regulation screw for max displacement 2,2 cm³/rev per turn. 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.

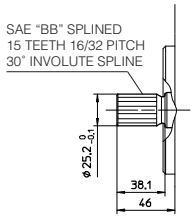


Mass: 24 kg

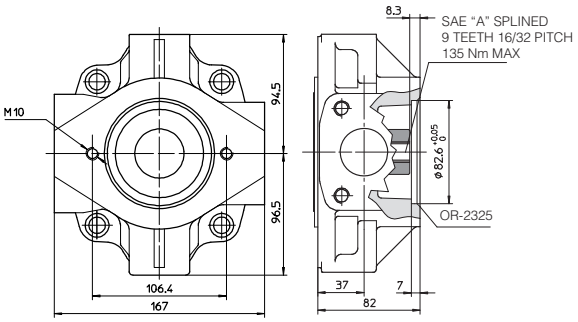
SHAFT TYPE "1"



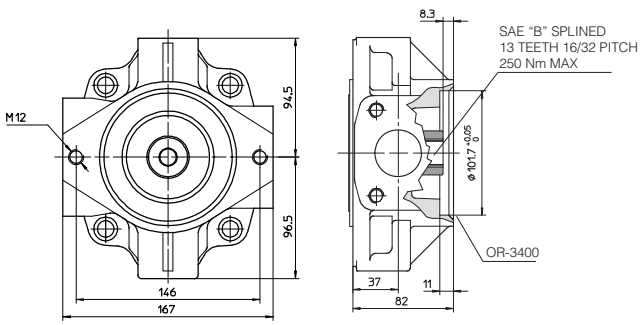
SHAFT TYPE "5"



INTERMEDIATE FLANGE SAE "A" FOR PFE-31

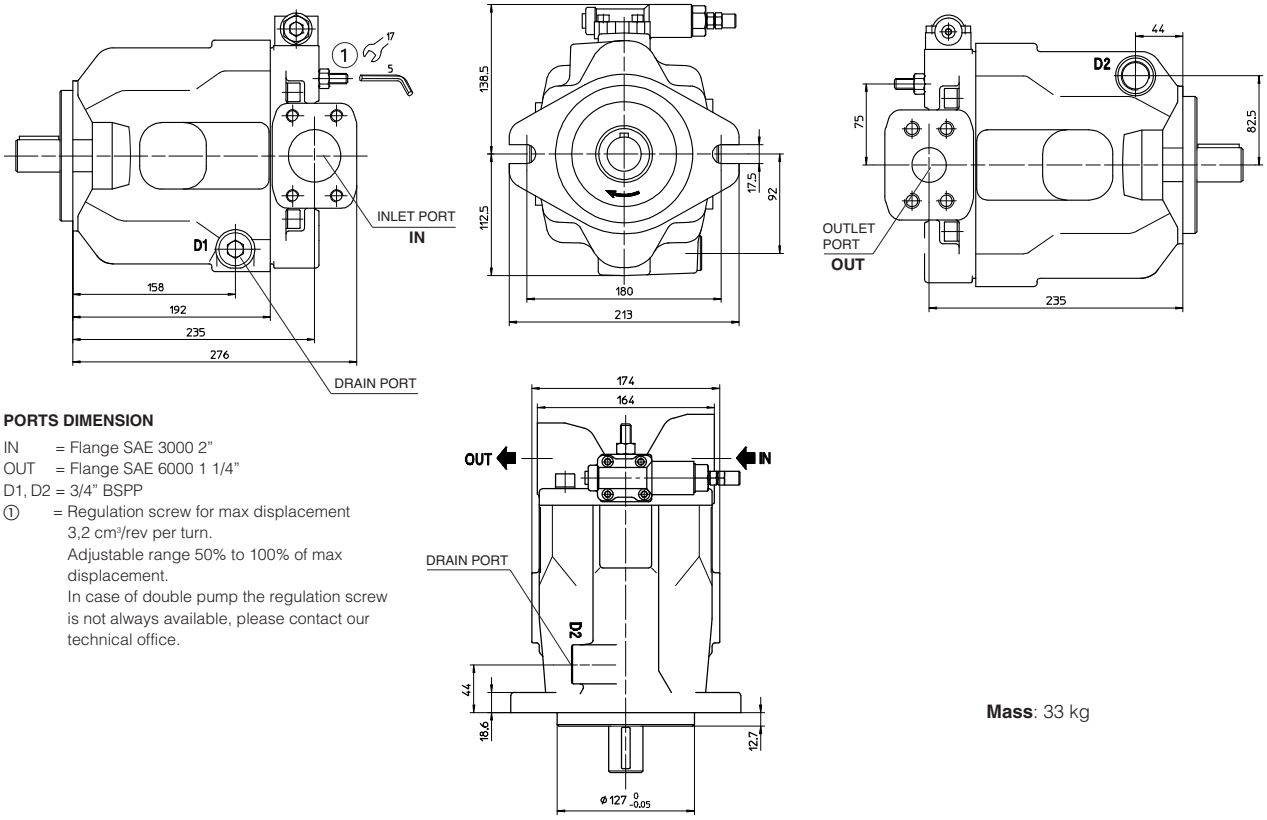


INTERMEDIATE FLANGE SAE "B" FOR PFE-41



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

11 DIMENSIONS OF PVPC-*-5073 and PVPC-*-5090: BASIC VERSION “C” CONTROL

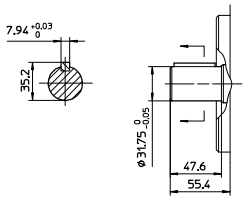


PORTS DIMENSION

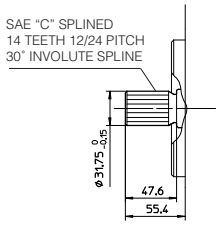
IN = Flange SAE 3000 2”
OUT = Flange SAE 6000 1 1/4”
D1, D2 = 3/4” BSPP
① = Regulation screw for max displacement 3,2 cm³/rev per turn. Adjustable range 50% to 100% of max displacement. In case of double pump the regulation screw is not always available, please contact our technical office.

Mass: 33 kg

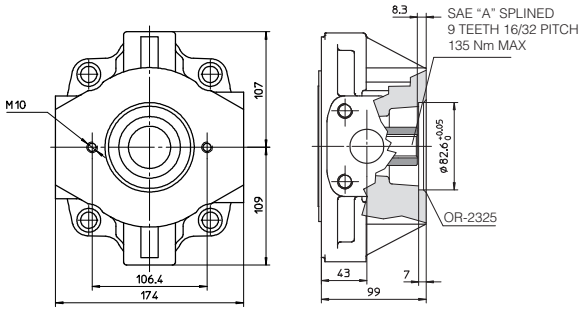
SHAFT TYPE “1”



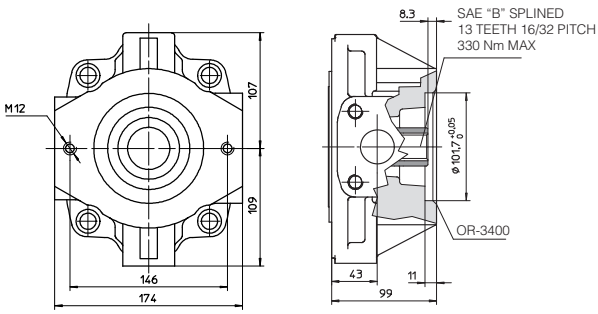
SHAFT TYPE “5”



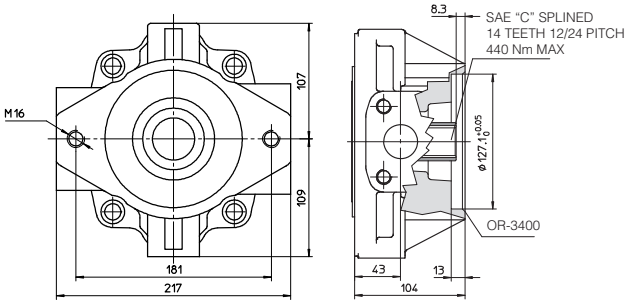
INTERMEDIATE FLANGE SAE “A” FOR PFE-31



INTERMEDIATE FLANGE SAE “B” FOR PFE-41



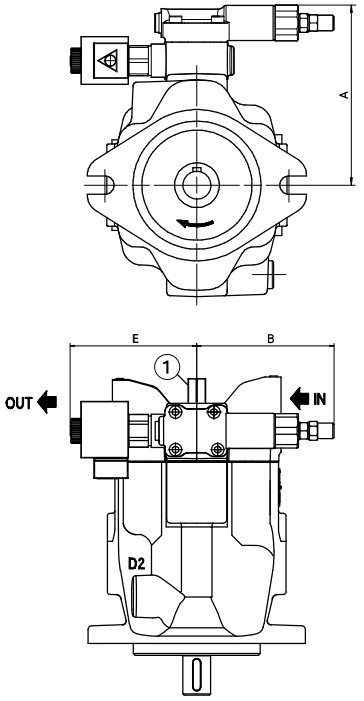
INTERMEDIATE FLANGE SAE “C” FOR PFE-51



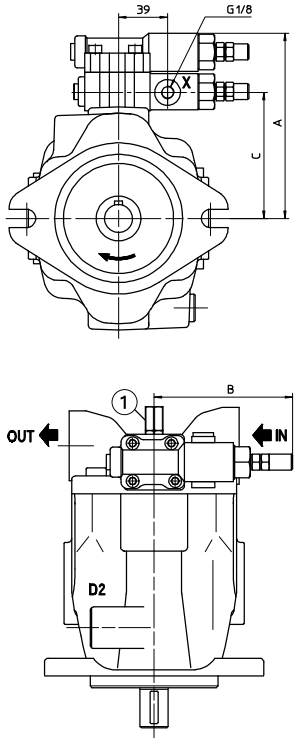
Drawing show pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted

12 DIMENSIONS OF PVPC: OTHER CONTROLS

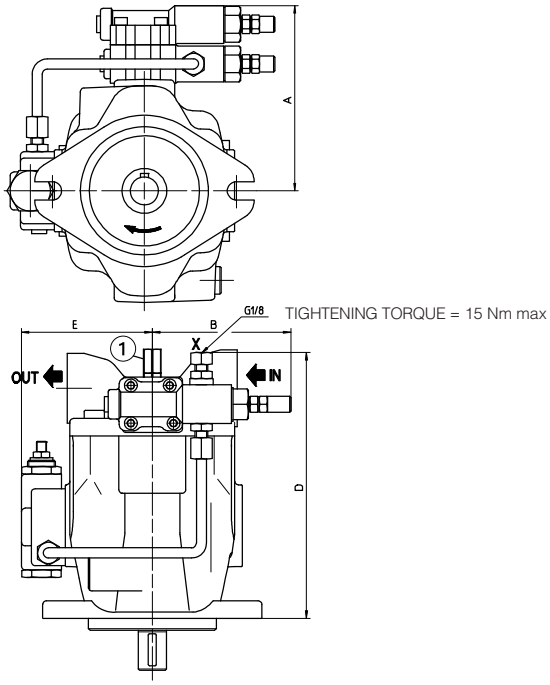
VERSION CH



VERSIONS L, R



VERSION LW



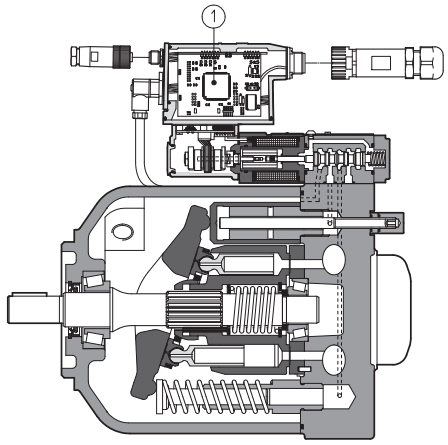
① = Regulation screw for max displacement. Adjustable range 50% to 100% of max displacement).
In case of double pump the regulation screw is not always available, please contact our technical office.

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

Proportional electrohydraulic controls for PVPC pumps

pressure-flow alternate P/Q controls, analog or digital



PVPC-PES-PS-4046

The variable displacement axial piston pumps type PVPC, can be supplied with advanced electrohydraulic proportional controls:

- open loop pressure control;
- load sensing flow control;
- Open and closed loop P/Q controls;

They allow to perform high dynamics and fine regulations, directly commanded from PLC or from the machine controller. They are available with separated driver or with integral electronics ①.

New PES digital controllers, integrated to the pump, realize alternate closed loop controls of pressure, flow and max power limitation. The P/Q controls are also available with optional sequence module (LZQZR or PERS versions) that allow to operate the pump with minimum pressure in the circuit close to zero. Following communication interfaces are available for the digital PE(R)S execution, see section [9]:

- **-PS**: Serial
- **-BC**: CANopen
- **-BP**: PROFIBUS DP

For technical characteristics and features of the PVPC pumps, see table A160.

1 MODEL CODE

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

Variable displacement axial piston pump

Additional suffix for double pumps
X2E = with a fixed displacement pump type PFE (see tab. A005)

Type of control (see section [7] and [8]):
CZ = proportional pressure compensator
LQZ = proportional flow control (load sensing)
LZQZ = proportional pressure & flow control (load sensing)
LZQZR = as LZQZ plus sequence module
PES = closed loop integral digital P/Q controller
PERS = as PES plus sequence module

Communication interface, only for PES and PERS versions
PS = Serial **BP** = PROFIBUS DP **BC** = CANopen

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

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

Type of PFE (for double pumps), see tab. A005

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

Seals material:
omit for NBR (mineral oil & water glycol)
PE = FPM
See notes in section [2]

Series number

Options, for CZ, LQZ, LZQZ, LZQZR see sections [3]:
18 = optional coil for low current drivers
Electronics options for PES and PE(R)S see sections [4] and [7]:
I = current reference input and monitor output signals (4 ÷ 20 mA)
C = current feedback input signal (4÷20 mA) for remote pressure transducer
X = with integral pressure transducer (only for PERS)
S = with two on-off inputs for multiple pressure PID selection (PS execution) or double power supply (BC and BP execution)

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

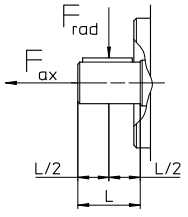
Shaft (SAE Standard):
1 = keyed (7/8" for 029 - 1" for 046 - 1 1/4" for 073 and 090)
5 = splined (13 teeth for 029 - 15 for 046 - 14 for 073 and 090)

1) pumps with ISO 3019/2 mounting flange and shaft (option /M) are available on request

2 OPERATING CHARACTERISTICS

Pump model		PVPC-*-3029	PVPC-*-4046	PVPC-*-5073	PVPC-*-5090
Displacement	[cm³/rev]	29	46	73	88
Theorical max flow at 1450 rpm	[l/min]	42	66,7	105,8	127,6
Max working pressure / Peak pressure	[bar]	280/350	280/350	280/350	250/315
Min/Max inlet pressure	[bar abs.]	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
Power consumption at 1450 rpm and at maximum pressure and displacement	[kW]	19,9	31,6	50,1	54,1
Max torque on the first shaft	[Nm]	Type 1 200 / Type 5 190	Type 1 230 / Type 5 330	Type 1 490 / Type 5 620	Type 1 490 / Type 5 620
Max permissible load on drive shaft	[N] F_{ax}	1000	1500	2000	2000
	[N] F_{rad}	1500	1500	3000	3000
Speed rating	[rpm]	600 ÷ 3000	600 ÷ 2600	600 ÷ 2200	600 ÷ 1850

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 option /PE is 190 bar.
Max speed with options /PE and water glycol fluid is 2000/1900/1600/1500 rpm respectively for the four sizes.

3 MAIN CHARACTERISTICS OF VARIABLE DISPLACEMENT AXIAL PISTON PUMP TYPE PVPC

Installation 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.
Ambient temperature	from -20°C to +70°C for versions with separated electronics / from -20°C to + 60°C for versions PES/PERS
Fluid	Hydraulic oil as per DIN 51524...535; for other fluids see section 1
Recommended viscosity	15÷100 mm²/sec at 40°C (ISO VG 15÷100). Maximum start-up viscosity: 1000 mm²/sec
Fluid contamination class	ISO 4401 class 20/18/15 NAS 1638 class 9 (filters at 10 µm value with $\beta_{10} \geq 75$ recommended)
Fluid temperature	-20°C +70°C -20°C +50°C (water glycol) -20°C +80°C (seals /PE)
Power supply for pressure transducer (PES, PERS)	24 VDC

3.1 Coils characteristics - only for CZ, LQZ, LZQZ(R) executions

Coil resistance R at 20°C	Pump size 3	**3 ÷ 3,3** Ω for standard **12 VDC** coil; **13 ÷ 13,4** Ω for **18 VDC** coil (only for version CZ, LQZ, LZQZ*)
	Pump sizes 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, LZQZ*)
Max solenoid current		**2,6 A** for standard **12** VDC coil; **1,5 A** for **18** VDC coil (available only for version CZ, LQZ, LZQZ*)
Max power		35 Watt
Protection degree (CEI EN-60529)		IP65 for -CZ, LQZ and LZQZ; IP65÷67 for versions with integral electronics (see section 17)
Duty factor		Continuous rating (ED = 100%)

4 ELECTRONIC DRIVERS

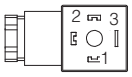
Pump model	CZ, LQZ, LZQZ(R)						PES, PERS
Drivers model	E-MI-AC-01F	E-MI-AS-IR	E-BM-AC	E-BM-AS-PS	E-ME-AC	E-RP-AC	E-RI-PES
Data sheet	G010	G020	G025	G030	G035	G100	G215

Note: for power supply and communication connector see section 11

5 GENERAL NOTES

Atos proportional pumps are CE marked according to the applicable directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive).
Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in table F003 and in the user manuals included in the E-SW programming software.
The electrical signals of the pump (e.g. 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, EN-892)

6 CONNECTIONS FOR CZ, LQZ, AND LZQZ(R)

SOLENOID POWER SUPPLY CONNECTOR		
PIN	Signal description	
1	SUPPLY	
2	SUPPLY	
3	GND	

7 PRESSURE TRANSDUCER SELECTION (excluded option /X)

The pressure transducer type E-ATR-7 must be ordered separately (see table G465)
For option X the pressure transducer is integral to the pump.

Pump code:	Pressure transducer code:
PVPC-PER(S)-*/200	E-ATR-7/250
PVPC-PER(S)-*/250	E-ATR-7/400
PVPC-PER(S)-*/280	E-ATR-7/400
PVPC-PER(S)-*/200/*/C	E-ATR-7/250/I
PVPC-PER(S)-*/250/*/C	E-ATR-7/400/I
PVPC-PER(S)-*/280/*/C	E-ATR-7/400/I

8 ELECTRONICS OPTIONS FOR PES AND PERS

Standard execution provides on the 12 pin main connector:

Power supply -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.
A safety fuse is required in series to each driver power supply: 2,5 A fuse

Reference input signals -The driver controls in closed loop both the pump flow and pressure proportionally to the external reference input signals.
The driver is designed to receive two analog reference input signals both referred to the common mode signal zero (AGND).
The inputs range and polarity are software selectable within the ±10 VDC maximum range; default settings are 0 ÷ +10 VDC.
Driver with fieldbus interface (-BC or -BP) can be software set to receive reference values directly by the machine control unit (fieldbus master); in this case the analog reference input signals can be used for start-up and maintenance operations.

Monitor output signals -The driver generates an analog output signals proportional to the actual pump swashplate position and to the actual pressure on the pump outlet line; the monitor output signals can be software set to show other signals available in the driver (e.g. analog reference, fieldbus reference, pilot spool position).
The output polarity is software selectable within ±10 VDC maximum range; default settings are 0 ÷ +10 VDC.

Fault Output Signal -Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for 4 ÷ 20mA input, pressure/swashplate/pilot transducer cable broken, etc.). Fault presence corresponds to 0 VDC, normal working corresponds to 24 VDC (pin 11 referred to pin2). Fault status is not affected by the status of the Enable input signal

Enable Input Signal (only for /S and /SX options) -To enable the driver, supply a +24VDC on pin 3 referred to pin 2: when the Enable signal is set to zero the pump functioning is disabled but the driver current output stage is still active. This condition does not comply with European Norms EN954-1.

For other functions, see table G215.

Following options are available to standard execution to special application requirements.

8.1 Option /I
It provides 4÷20 mA current reference and monitor signals instead of the standard 0÷+10 VDC.
It is normally used in case of long distance between the machine control unit and the pump or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

8.2 Option /C
The pump electronics is set to receive 4÷20 mA feedback signal from the remote pressure transducer, instead of the standard 0÷10 V.

8.3 Option /X (only for -PERS)
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.

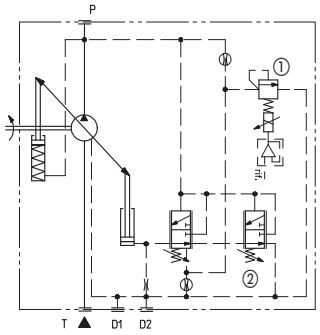
8.4 Option /S
Multiple pressure PID selection (only for /S and /SX options in -PS execution)
Two on-off input signals are available on the main connector to switch the active pressure PID parameters among one of the four setting stored into the driver.
Supply a 24V or a 0V on pin 9 and/or 10, to select one of the PID settings as indicated in the table beside.

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

Logic power supply (only for /S and /SX options in -BC or /BP execution)
Separate power supply for the solenoid (pin 1,2) and for the digital electronic circuits (pin 9,10).
Cutting solenoid power supply allows to interrupt the valve functioning but keeping energized the digital electronics thus avoiding fault conditions of the machine fieldbus controller (e.g. for emergency, as provided by the European Norms EN954-1 for components with safety class 2).
Note: pin 2 and 10 (zero Volt) are connected together inside the electronics;

8.5 Possible combined options: /CS, /SX, /IC, /IS, /IX, /ICS and /ISX.

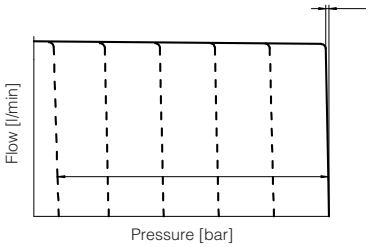
CZ



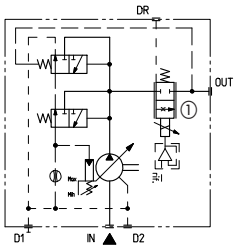
Proportional pressure compensator

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

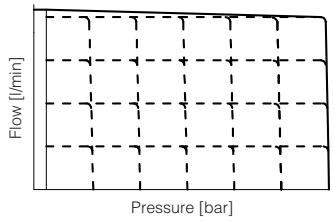


LQZ

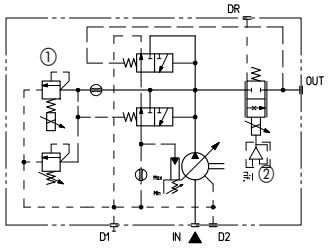


Proportional flow (load-sensing)

Open loop control of the flow rate via an reference signal to the electronic driver of the pilot proportional valve.
This energy saving control regulates the outlet pressure up to the minimum level required to operate the flow set by the reference signal to the proportional valve ①.

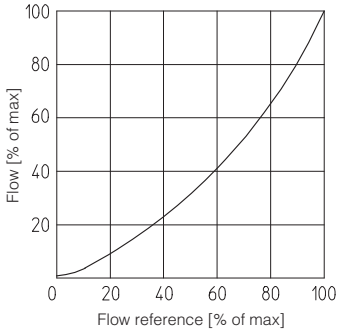


LZQZ

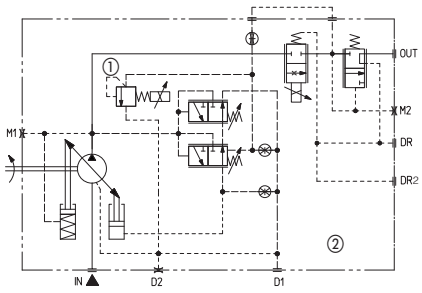


Proportional pressure & flow (load sensing)

Open loop control of pressure ① and flow ② via two reference signals to the electronic drivers of the two pilot proportional valves.
This energy saving control regulates the outlet pressure up to the minimum level required to operate the flow set by the reference signal.
In addition the proportional pressure control reduces the outlet flow, as per CZ control once max pressure is reached.
Minimum regulated pressure: 15 bar
For lower minimum regulated pressure, consult our technical office.
Maximum allowed pressure: 250 bar



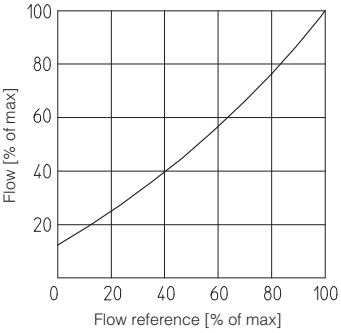
LZQZR



Flow and pressure proportional control with sequence module.

Same construction concept of LZQZ control, in addition it is equipped with RES ② sequence module which ensures the minimum pump piloting pressure in case the system pressure drops below the minimum value (18 bar).

Note: DR2 is available only for size 50.

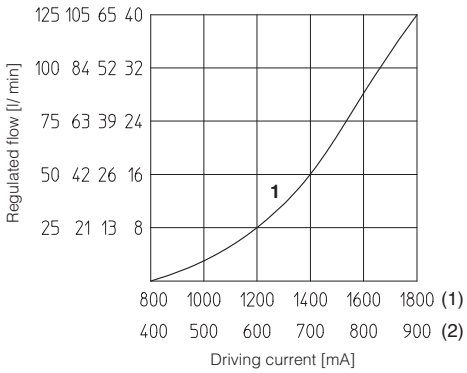


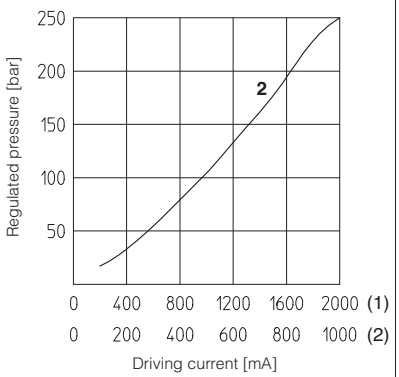
Diagrams for CZ, LQZ, LZQZ, LZQZR

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

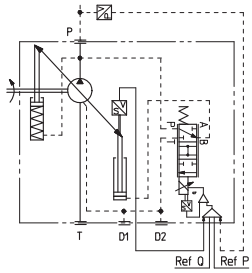




10 P/Q DIGITAL CONTROLLER

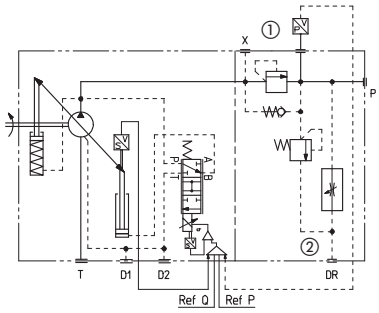
Pressure transducer not included

PES



Pressure transducer included only for PERS/X

PERS
PERS/X



Digital P/Q controller 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 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 communication interfaces are available:

- -PS, Serial communication interface. The pump reference signals are provided with analog commands via the 12 pins connector
- -BC, CANopen interface
- -BP, PROFIBUS DP interface

The pumps with -BC or -BP interfaces can be integrated into a fieldbus communication network and thus digitally operated by the machine control unit.

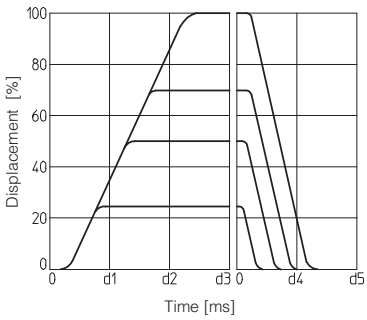
The digital control ensures high performances as flow and pressure linearity (see diagram 1), better flow knee (see diagram 2), internal leakage compensation (controlled flow independent to the load variations).

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 integral digital electronics.

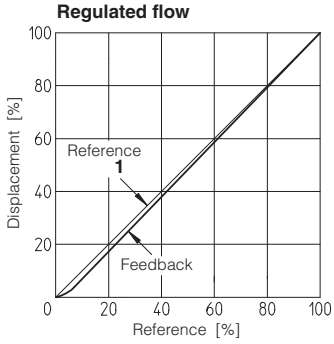
PVPC-PERS version with sequence module RES ② which grant a minimum piloting pressure (18 bar) when the actual pressure falls below that value. Without pressure transducer.

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

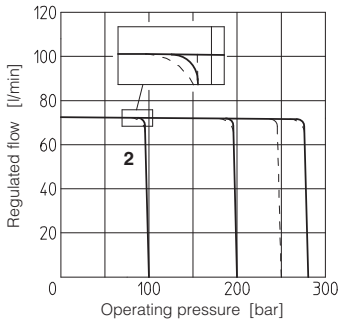
Response time



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

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

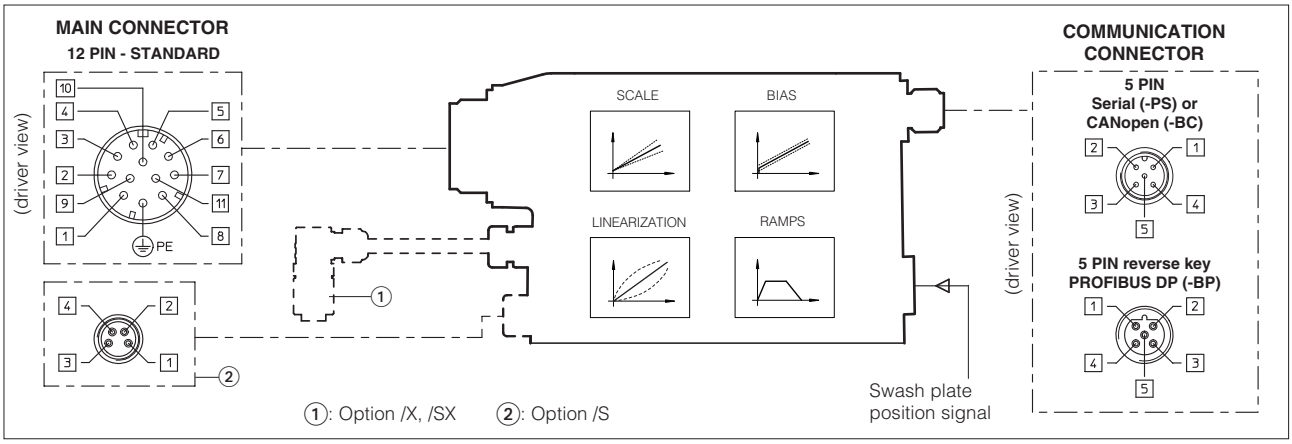
11 SOFTWARE TOOLS

The functional parameters of the digital valves, as the bias, scale, ramp and linearization of the regulation characteristic, can be easily set and optimized with graphic interface by using the Atos **E-SW/S** software and the relevant USB adapters, cable and terminators, **see tab. G500.**

Valves with fieldbus communication interface (-BC and -BP) can be completely managed by the machine control unit; it is required to implement in the machine control the standard communication as described in the user manuals supplied with the relevant programming software.

For detailed description of availabile fieldbus features, **see tab. G510**

12 DIGITAL INTEGRAL DRIVERS -PE(R)S MAIN FUNCTION AND ELECTRONICS CONNECTIONS



13 **ELECTRONIC CONNECTIONS - Standard, Standard with /X and /C options**

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
1	V+	Power supply 24 VDC for pilot valve's solenoid power stage	Input - power supply
2	V0	Power supply 0 VDC for pilot valve's solenoid power stage	Gnd - power supply
3	FAULT	Driver status: Fault (0VDC) or normal working (24 VDC)	Output - on/off signal
4	AGND	Ground: signal zero for MONITOR signals (pin 6,8) and INPUT+ signals (pin 5,7)	Gnd - analog signal
5	Q_INPUT+	Flow reference: ±10 VDC maximum range (4 ÷ 20 mA for /I option)	Input - analog signal
6	Q_MONITOR	Flow monitor: ±10 VDC maximum range (4 ÷ 20 mA for /I option)	Output - analog signal
7	P_INPUT+	Pressure reference: ±10 VDC maximum range (4 ÷ 20 mA for /I option)	Input - analog signal
8	P_MONITOR	Pressure monitor: ±10 VDC maximum range (4 ÷ 20 mA for /I option)	Output - analog signal
9	D_IN	Power limitation enable, multiple pressure PID selection or driver enable (software selectable)	Input - on/off signal
PE	EARTH	Internally connected to driver housing	
Standard with /X option			
10	NC	Do not connect for pumps with integral pressure transducer	
11	NC		
Standard and /C option			
10	TR+	Remote pressure transducer feedback: 0 ÷ 10 VDC maximum range (4 ÷ 20 mA) Input differential TR+ and TR-	Input - analog signal
11	TR-		

Note: A minimum time of 270 to 590 ms have be considered between the driver energizing with the 24 VDC power supply and when the pump is ready to operate; during this time the current to the valve coils is switched to zero.
These connections are the same of Rexroth A10VSO axial piston pumps, model SYDFEE and SYDFEC.

14 **ELECTRONIC CONNECTIONS - /S, /SX and /CS options**

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
1	V+	Power supply 24 VDC for pilot valve's solenoid power stage	Input - power supply
2	V0	Power supply 0 VDC for pilot valve's solenoid power stage	Gnd - power supply
3	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver	Input - on/off signal
4	Q_INPUT+	Flow reference: ±10 VDC maximum range (4 ÷ 20 mA for /I option)	Input - analog signal
5	AGND	Ground: signal zero for MONITOR signals (pin 6,8) and INPUT+ signals (pin 5,7)	Gnd - analog signal
6	Q_MONITOR	Flow monitor: ±10 VDC maximum range (4 ÷ 20 mA for /I option)	Output - analog signal
7	P_INPUT+	Pressure reference: ±10 VDC maximum range (4 ÷ 20 mA for /I option)	Input - analog signal
8	P_MONITOR	Pressure monitor: ±10 VDC maximum range (4 ÷ 20 mA for /I option)	Output - analog signal
11	FAULT	Driver status: Fault (0VDC) or normal working (24 VDC)	Output - on/off signal
PE	EARTH	Internally connected to driver housing	
PS execution			
9	D_IN0	Multiple pressure PID selection	Input - on/off signal
10	D_IN1	Multiple pressure PID selection	Input - on/off signal
BC and BP execution			
9	VL+	Power supply 24 VDC for driver's logic	Input - power supply
10	VL0	Power supply 0 VDC for driver's logic	Gnd - power supply

Note: A minimum time of 270 to 590 ms have be considered between the driver energizing with the 24 VDC power supply and when the pump is ready to operate; during this time the current to the valve coils is switched to zero. These connections are the same of Moog radial piston pumps, model RKP-D.

15 **ELECTRONIC CONNECTIONS - 4 PIN REMOTE PRESSURE TRANSDUCER M8 CONNECTOR (only for /S and /CS options)**

PIN	/S option		/CS option (Ri = 316 Ω) /SX option (factory wired)	
1	TR	remote pressure trasducer feedback input (0÷+10 VDC)	TR	remote pressure trasducer feeback (4÷20 mA)
2	AGND	signal zero for remote transducer power supply and feedback	NC	reserved (do not connect)
3	VT	remote transducer power supply +24 VDC	VT	remote transducer power supply +24 VDC
4	NC	reserved (do not connect)	NC	reserved (do not connect)

See tab. G465 for the pressure transducer characteristics and connections.

16 **ELECTRONIC CONNECTIONS - 5 PIN COMMUNICATION M12 CONNECTOR**

	-PS Serial		-BC CANopen		-BP PROFIBUS DP	
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION**	**SIGNAL**	**TECHNICAL SPECIFICATION**	**SIGNAL**	**TECHNICAL SPECIFICATION**
1	NC	do not connect	CAN_SHLD	Shield	+5V	for termination
2	NC	do not connect	NC	do not connect	LINE-A	Bus line (high)
3	RS_GND	Signal zero data line	CAN_GND	Signal zero data line	DGND	data line and termination Signal zero
4	RS_RX	Valves receiving data line	CAN_H	Bus line (high)	LINE-B	Bus line (low)
5	RS_TX	Valves transmitting data line	CAN_L	Bus line (low)	SHIELD	

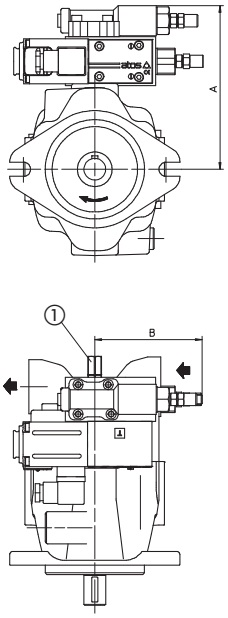
17 **MODEL CODE OF POWER SUPPLY AND COMMUNICATION CONNECTORS**

PUMP VERSION	CZ, LQZ, LZQZ	PES, PERS	-Serial (-PS) or CANopen (-BC) *only for PES and PERS*	PROFIBUS DP (-BP) *only for PES and PERS*	PRESSURE TRANSDUCER *only for /S*
CONNECTOR CODE	**666**	**ZH-12P** (1)	**ZH-5P** (1)	**ZH-5P/BP** (1)	**ZH-4P-M8 /5** (1)(2)
PROTECTION DEGREE	**IP65**	**IP65**	**IP67**	**IP67**	**IP67**

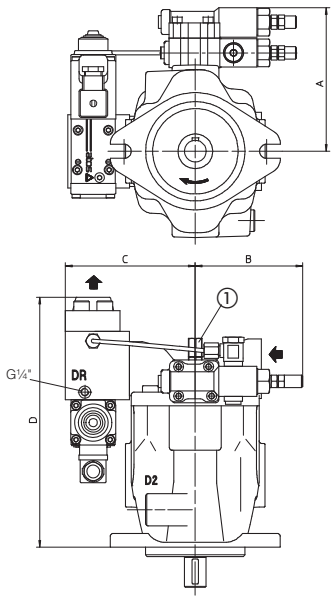
(1) to be ordered separately (2) M8 connector moulded on cable 5 mt lenght

18 DIMENSIONS OF PVPC PUMPS

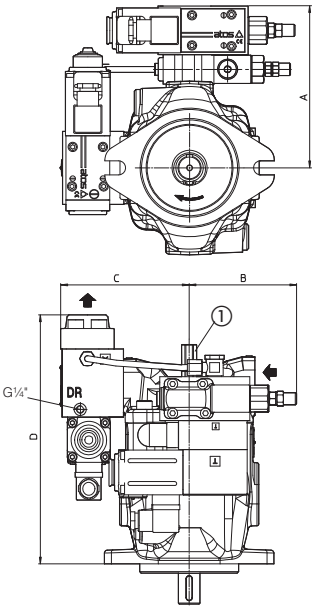
VERSION CZ



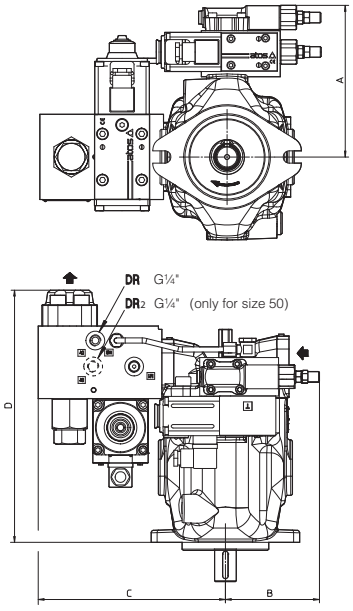
VERSION LQZ



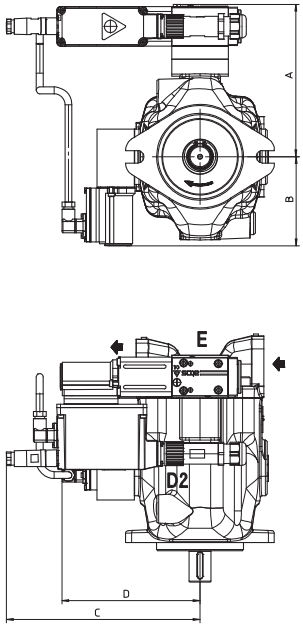
VERSION LZQZ



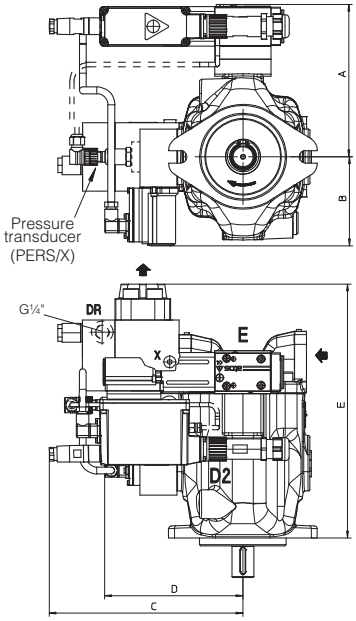
VERSION LZQZR



VERSION PES



VERSION PERS
VERSION PERS/X (dotted line)



① = 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	E	Mass (kg)
PVPC-*-3029	**CZ**	168	111	-	-		22
	LQZ	144	111	132	257		24
	LZQZ	168	111	132	257		27,5
	LZQZR	168	111	185	185		29
PVPC-*-4046	**CZ**	177	111	-	-		28
	LQZ	153	111	156	293		33,6
	LZQZ	178	111	156	293		37,4
	LZQZR	178	111	220	296		39,5
PVPC-*-5073 PVPC-*-5090	**CZ**	190	111	-	-		36,9
	LQZ	166	111	163	328		44
	LZQZ	190	111	163	328		47,6
	LZQZR	190	111	226	328		49,6
PVPC-*-3029	**PES**	170	103,5	246	155	-	21,6
	PERS	170	103,5	246	155	262,5	26
	PERS/X	190	103,5	246	226	262,5	26,4
PVPC-*-4046	**PES**	178	103,5	246	162	-	27,6
	PERS	178	103,5	246	162	299	33,7
	PERS/X	178	103,5	246	162	299	34,1
PVPC-*-5073 PVPC-*-5090	**PES**	190	103,5	246	171	-	36,6
	PERS	190	103,5	246	171	337	46,7
	PERS/X	190	103,5	246	171	337	47,1