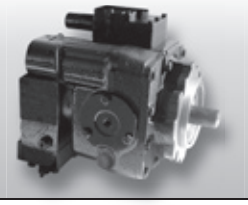


GENERAL DESCRIPTION

Description of Design and Application

PVK units are axial piston pumps of slipper design. Rotor of this pump is driven by shaft, which is supported by 2 roller bearings. Inside of the rotor, there are moving 9, hydrostatically balanced, pistons parallel with an axis of rotation. They are slipping on the inclined thrust plate which is placed inside of the swash plate and this way, the pistons are moving with a straight-line motion. They create 1 suction and 1 pressure stroke per revolution. Fluid direction is performed by frontal rotational distribution. Single cylinders are joined either with a suction channel or a pressure one of the end cap during a motion of the distributor. Swash plate angle is possible to regulate continuously with various ways of control and automatic regulations (mentioned in 5, 5.1 and 9.1) which are part of axial piston pump.These units are designed for conversion of mechanical energy into pressure one. They can be used in closed circuits of various machines (e.g. road, construction, grading, agricultural, forest, mining, ect.) where is demanded a continuous change of input parameters. The circuit has to be designed such way that pump parameters, which are determined by technical conditions and project of the specific application, must not be exceeded during an operation.

Ambient Temperature Range: -40° through +55° C

Climate Type EWD-r/CT in temperature range: -40° through +55° C according to STN 038900 part 2-1

In other macroclimate areas the units can work only after performing of special adaptation which has to be approved by the producer in advance and specified with a special production number in model code.

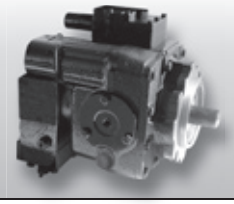
Operation Conditions

Degree of Separation (Cleaning ability 10 μm)	$\beta_{10} = 1,5 + 2$ $\beta_{25} > 75$
Fluid Filtration	18/13 following STN 656206 (ISO 4406) See attachment GTN N-082
Range of Operation Viscosity:	$(12 \div 60).mm^2s^{-1}$
Minimal Viscosity:	$7.mm^2s^{-1}$
Viscosity at Cold Starting:	$1000.mm^2s^{-1}$
Fluid Operating Temperature Range:	-40° through +80°C

Reliability Features

Following parameters are set down for evaluation of reliability of the pumps:

- Average period between 2 breakdowns	t = 1500 Mh
- Average technical life-time up to overhaul repair	tžGO = 5000 Mh
- Average operative time of repair	t00 = 0,002 hod.Mh-1
- Average operative time of maintenance	tpuo = 0,0147 hod.Mh-1
- Average value of coefficient of preparedness	kp = 0,998



SPECIFIC DATA

	Symbols		Dimensions	Frame Size		
				PVK-20	PVK-22	PVK-23
Displacement	max.	Vg	cm^3	33,3	69,8	89
Speed	max.	n_{max}	min^{-1}	3800	3200	2900
	min.	n_{min}	min^{-1}	500	500	500
Rate of flow	max.	Q_{max}	$dm^3.min^{-1}$	126,5	223,4	258,1
Pressure	nom.	p_n	MPa	35		
	max.	p_{max}	MPa	42		
Output	max.	P_{max}	kW	44,7	73,3	93,5
Torque moment	max.	M_{max}	Nm	227,7	446,8	595,2
Swash plate angle		α_{Gmax}	(°)	±18		
Direction of shaft rotation				clockwise (CW) or counterclockwise (CCW)		
Case pressure			MPa	0,25-continuous 0,5 peak intermittent		
Control pressure			MPa	1,3 till 3,5		
Weight		m	kg	49	64	85
Torque for auxiliary output	continuous SAE A		Nm	75		
	continuous SAE B			175		
	continuous SAE B-B			225		
	maximal SAE A			107		
	maximal SAE B			250		
	maximal SAE B-B			320		
Torque for 2nd section of tandem pump	continuous		Nm	225		
	maximal			320		

Rate of Flow: $Q = V_g \times n \times \eta_v / 1000$ ($dm^3.min^{-1}$)

Torque Moment: $M = V_g \times \Delta p / 2\pi \times \eta_{mh}$ (N.m)

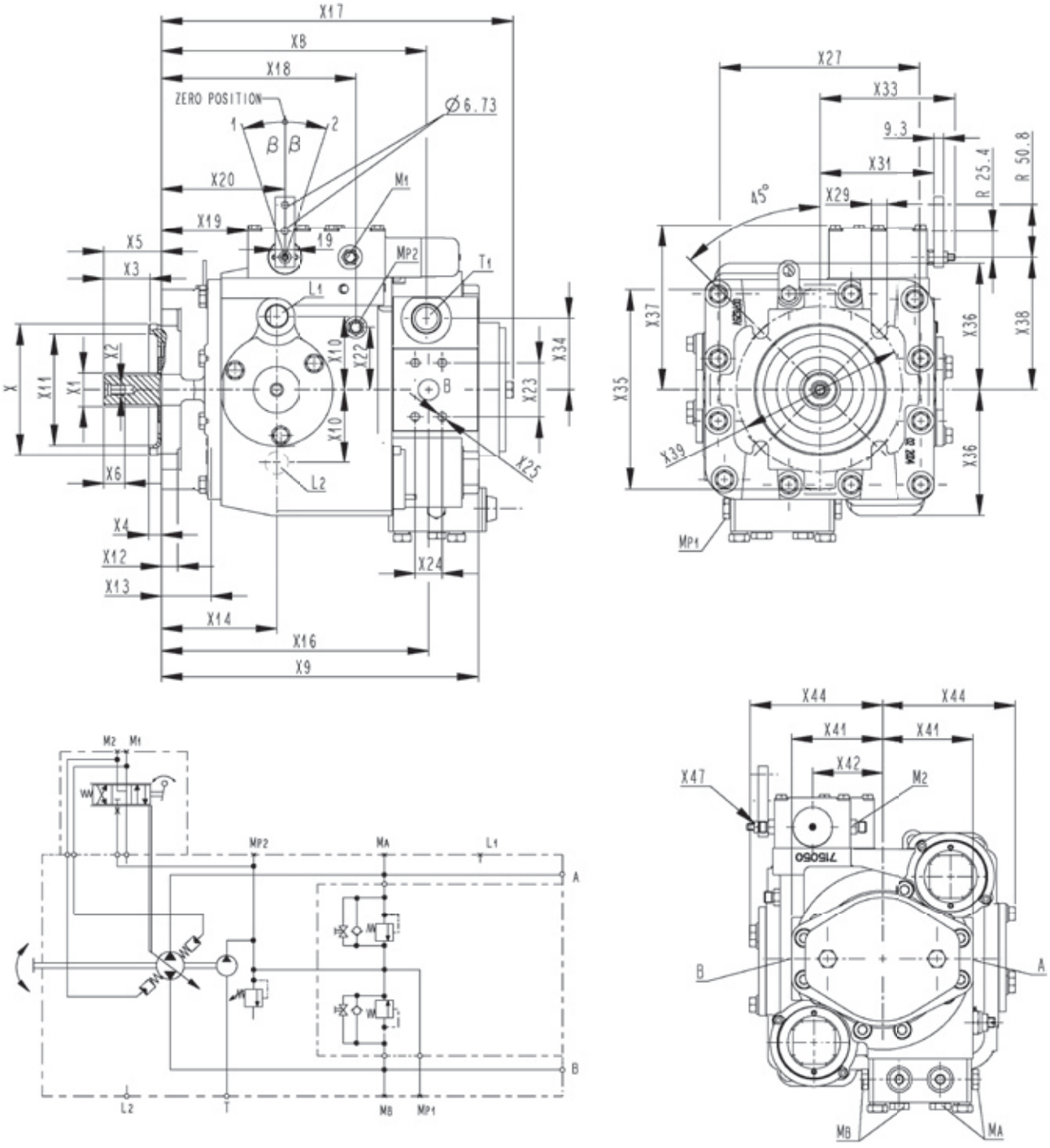
Output: $P = 2\pi \times M \times n / 60\,000 = Q \times \Delta p / 60 \times \eta_c$ (kW)

η_v - volumetric efficiency

η_{mh} - mechanical - hydraulic efficiency

η_c - overall efficiency

AXIAL PISTON PUMP WITH VARIABLE DISPLACEMENT OF PVK SERIES WITHOUT CIRCUIT FLUSHING

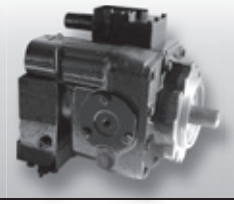


Dimensional data see table in catalog sheet GTN K-0281

Shifting of Regulation Lever in Direction:

1 -high pressure is in channel „A“ in case of CW pump
-high pressure is in channel „B“ in case of CCW pump

2 -high pressure is in channel „B“ in case of CW pump
-high pressure is in channel „A“ in case of CCW pump



DIMENSIONS

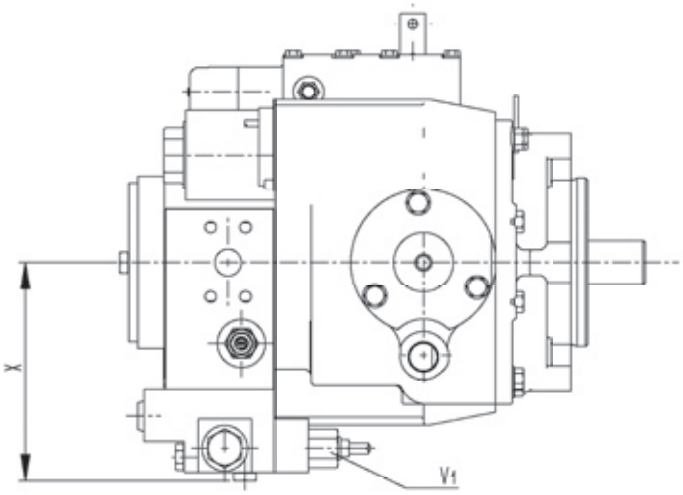
Dimension	Frame Size		
	PVK-20	PVK-22	PVK-23
X -0,05	127		
X1	34,5 -0,17		37,68 -0,16
X2	M10		
X3	48 max. engaging of coupling		
X4 -0,50	12,7		
X5	56		
X6 min.	20		
X7	not used		
X8	222	256	268
X9	265	305	317
X10	62	71,4	77,7
X11	108		
X12	12	15,7	17
X13	32	47,7	49
X14	100	112	118
X15	not used		
X16	225	259	271
X17	300	340	352
X18	162	188	195
X19	58	84	91
X20	94	120	125
X21	not used		
X22	51	60,5	65
X23	connection A,C - 57,2 B - 52,4		
X24	connection A,C - 27,8 B - 26,2		
X25	connection A-7/16"-14UNC-2B depth 22		
X25	connection B - 3/8"-16UNC-2B depth 22		
X25	connection C - M12-6H depth 22		
X26	not used		
X27	190	194	194
X28	not used		
X29	14,7 ÷ 15,8		
X30	not used		

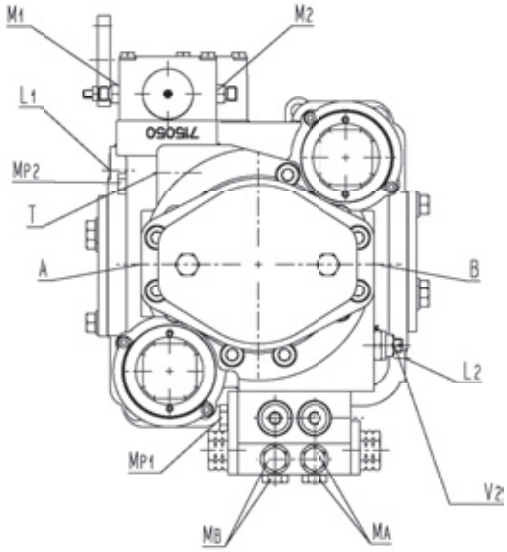
Dimension	Frame Size		
	PVK-20	PVK-22	PVK-23
X31	100	113	123,8
X32	not used		
X33	122	135	146
X34	69		
X35	146	194	194
X36	113	123	134
X37	148	160	172
X38	115,9	128,6	139,6
X39	162		
X40	not used		
X41	81	88	95,2
X42	55,6	68,3	77,8
X43	not used		
X44	108	130	148
X45	not used		
X46	not used		
X47	¼" - 20UNC-2A		
X48	not used		
X49	not used		
X50	286	326	338
X51	352	326	338
X52	not used		
X53	517	564,1	614,5
X54	392	420	464,5
X55	514	567,1	617,5
X56	578	635	683,5

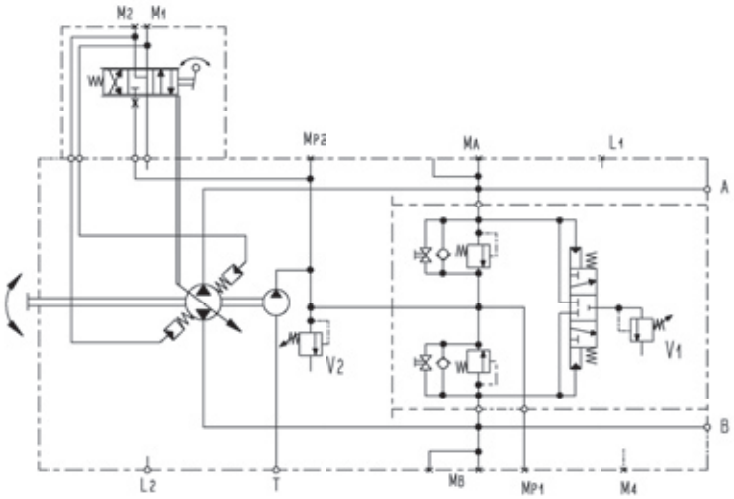
Connection A, B, M_A, M_B, M_P, L_1, L_2, M_1, M_2, T

Typ		
	A	1" - 6000psi according to SAE J518c
	B	1" - 5000psi according to SAE J518c
	C	DN 25 40 MPa ISO 6162
M_A, M_B, M_{P1}		M12x1,5 - 6H
L_1, L_2		7/8" - 14UNF-2B according to SAE J514
M_1, M_2, M_{P2}		7/16" - 20UNF-2B according to SAE J514
T		1 1/16" - 12UN-2B according to SAE J514

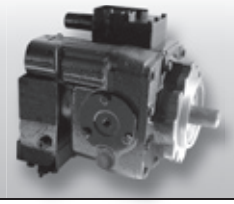
DIMENSIONS



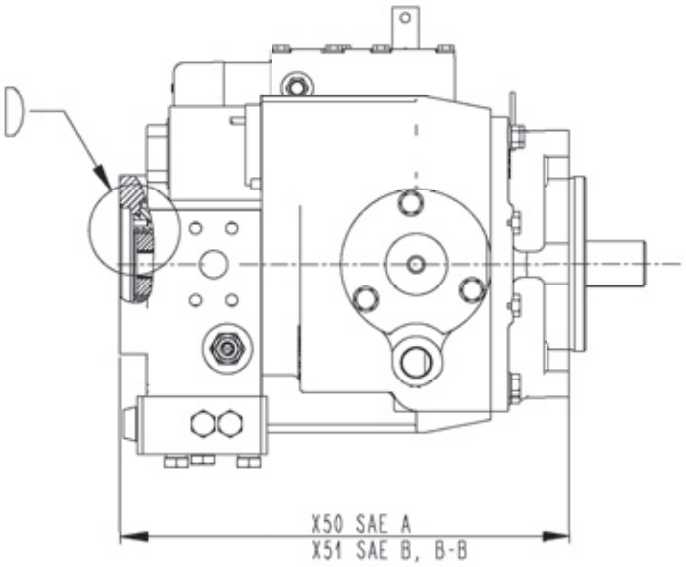


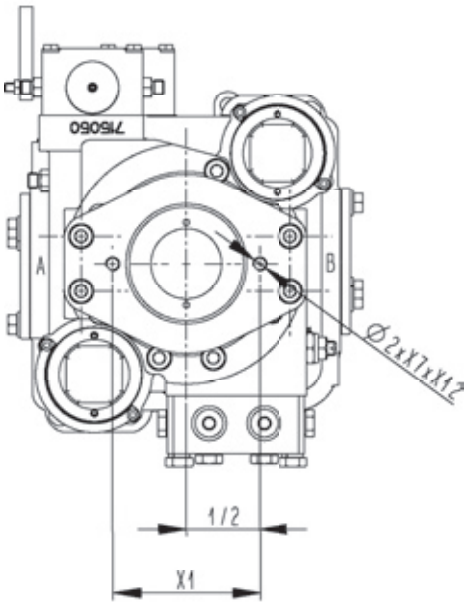


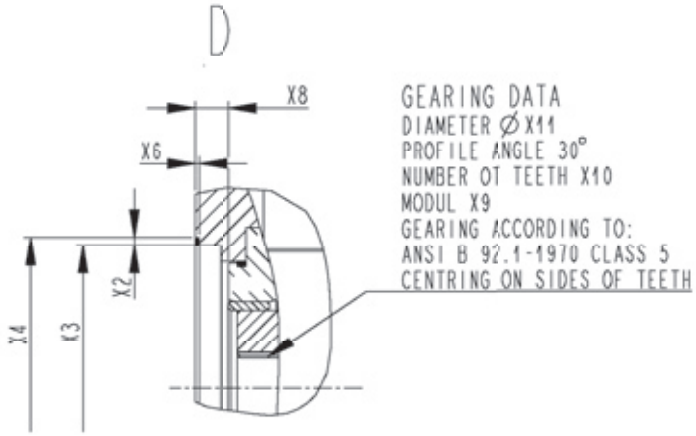
Frame Size	Dimensions X
PVK-20	148,5
PVK-22	164,5
PVK-23	173,5



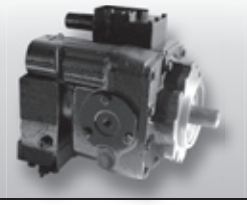
CONNECTION FOR AUXILIARY OUTPUT







	TYPE	X1	X2	X3	X4	X6	X7	X8	X9	X10	X11	X12
SAE A	F	106,4	2,27	$82,55^{+0,05}$	$87,12^{+-0,13}$	$1,2^{-0,1}$	1) 7/8“-16UNC	7,7	16/32	9	14,2875	18
	A						2) M10	6,9				
SAE B	G	146	2,27	$101,6^{+0,05}$	$106,17^{+-0,13}$	$1,2^{-0,1}$	1) 1/2"-13UNC	10,5	16/32	13	20,6375	22
	B						2) M10	10,2				
SAE B-B	H	146	2,27	$101,6^{+0,05}$	$106,17^{+-0,13}$	$1,2^{-0,1}$	1) 1/2"-13UNC	10,5	16/32	15	23,8125	22
	C						2) M12	10,2				



MODEL CODE OF PVK

1	2	3	4	5	6	7	8	9	10	11	12	13	14
PVK	XXX	XXX	X	X	X	X	XX	X	XX	XX	XX	XX	XXX

1.

PVK
Axial piston pump with variable displacement

2.

Displacement		
20	22	23

3.

XXX	Controls and regulations, see point 5.

4.

R	CW	rotation of shaft
L	CCW	

5.

Input shaft		20	22	23
A	14 teeth, 12/24 PITCH,ϕ 31.20	○	○	○
B	19 teeth, 16/32 PITCH,ϕ 31.75	○	○	○
C	21 teeth, 16/32 PITCH,ϕ 34.50	●	●	○
D	23 teeth, 16/32 PITCH,ϕ 37.68	-	-	●
E	27 teeth, 16/32 PITCH,ϕ 44.03	-	-	○
G	13 teeth, 8/16 PITCH,ϕ 43.71	-	-	○
I	20 teeth, 16/32 PITCH,ϕ 32.91	○	○	○
J	conical 1:8 SAE J 501,ϕ 41.27	-	-	○
K	conical 1:8 SAE J 501,ϕ 31.75	○	○	○
L	cylindrical ϕ 34.925, keyed	○	○	-
M	cylindrical ϕ 44.45, keyed	-	-	○
P	15 teeth, 16/32 PITCH,ϕ 25.40	○+	○+	○+
R	13 teeth, 16/32 PITCH,ϕ 21.80	○	-	-
T	2nd section (for tandem pump)	○	○	○

+ load of shaft depends on torque
see Technical Conditions GTN T-034

6.

Dimensions of high - pressure ports		20	22	23
A	SAE J518c ,code 62 size 1", 6000 PSI thread: 7/16-14 UNC-2B	○	○	○
B	SAE J518c ,code 61 size 1", 5000 PSI thread: 3/8-16 UNC-2B	●	●	●
C	ISO 6162, DN 25 type II, 40 MPa thread: M 12	○	○	○

7.

Charge pump	Vg	20	22	23
A	8.2 cm^3	○	-	-
B	11 cm^3	●	-	-
C	17 cm^3	○	●	●
N	without charge pump	○	○	○
H	11+5 cm^3	○	-	-
K	17+5 cm^3	-	○	○
L				

9.

Connection for auxiliary output						
		Pad	Input hole for shaft	20	22	23
A	SAE A J744c	2 x M10	9 teeth, 16/32 PITCH	○	○	○
B	SAE B J744c	2 x M12	13 teeth, 16/32 PITCH	○	○	○
C	SAE B-B J744c	2 x M12	15 teeth, 16/32 PITCH	○	○	○
F	SAE A J744c	2x3/8"-16UNC-2B	9 teeth, 16/32 PITCH	○	○	○
G	SAE B J744c	2x1/2"-13UNC-2B	13 teeth, 16/32 PITCH	○	○	○
H	SAE B-B J744c	2x1/2"-13UNC-2B	15 teeth, 16/32 PITCH	○	○	○
N	without connection			●	●	●
T	tandeming	4 x M12	15 teeth, 16/32 PITCH	○	○	○

14.

000
Special production number

13.

Orifice		
A	ϕ 0.76 mm	○
B	ϕ 0.91 mm	○
C	ϕ 1.05 mm	●
D	ϕ 1.36 mm	○
E	ϕ 1.60 mm	○
N	without orifice	○
X	special requirement	
1	orifice in channel P	●
2	orifice in channel A, B	○
3	orifice in channel P,A,B	○
4	orifice in channel A	○
5	orifice in channel B	○
6	orifice in channel P, A	○
7	orifice in channel P, B	○
0	without orifice	○

12.

Pressure setting of flushing		
11	1.1 MPa at 3.8 dm3.min-1	●
13	1.3 MPa at 3.8 dm3.min-1	○
16	1.6 MPa at 3.8 dm3.min-1	○
00	without flushing	○

11.

Pressure setting in channel B		
21	21 MPa	○
28	28 MPa	○
35	35 MPa	●
40	40 MPa	○
42	42 MPa	○
00	without pressure valves	○

10.

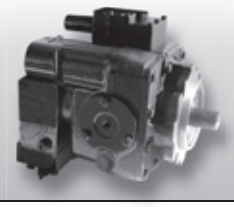
Pressure setting in channe A		
21	21 MPa	○
28	28 MPa	○
35	35 MPa	●
40	40 MPa	○
42	42 MPa	○
00	without pressure valves	○

8.

Pressenting of charge pressure		
13	1.3 MPa at 3.8 dm3.min-1	●
15	1.5 MPa at 3.8 dm3.min-1	○
18	1.8 MPa at 3.8 dm3.min-1	○
00	without charge pump	○

Other values upon consultation.

● - standard
○ - available



TYPES OF CONTROLS

WITHOUT CONTROL DEVICE

AAA	- without the mechanical-hydraulic servo valve, with top cover only
BBB	- without the mechanical-hydraulic servo valve, with joining piece and cover

MECHANICAL - HYDRAULIC

MHx	- mechanical-hydraulic servo valve
0	- standard
1	- with detent of zero position
MBx	- mechanical-hydraulic servo valve with a zero-position switch
0	- empty
1	- electric control; voltage 12 V DC
2	- electric control; voltage 24 V DC
MCx	- mechanical-hydraulic servo valve with a short-circuit valve
0	- empty
1	- electric control; voltage 12 V DC
2	- electric control; voltage 24 V DC
5	- hydraulic automatic control
MDx	- MB + MC
0	- empty
1	- electric control; voltage 12 V DC
2	- electric control; voltage 24 V DC
3	- empty
5	- MB1 + MC5

ELECTRICAL- HYDRAULIC

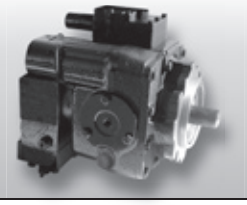
EVx	- three-positional distributor + pressure reducing valve (prcportional)
0	- empty
1	- electric control; voltage 12 V DC
2	- electric control; voltage 24 V DC
ERx	- three-positional distributor (jump control)
0	- empty
1	- electric control; voltage 12 V DC , D_n 6 mm
2	- electric control; voltage 24 V DC , D_n 6 mm
3	
4	
5	
6	
7	
8	- electric control; voltage 12 V DC , D_n 4 mm
9	- electric control; voltage 24 V DC , D_n 4 mm
ESx	- two pressure reducing valves (proportional)
0	- empty
1	- reducing valves POWER HYDRAULICS
2	
3	
4	
5	
ELx	- electric-hydraulic proportional directional valve
0	- empty
1	- directional valve with sensor of position of swash plate 12 V DC; D_n 6 mm
2	- directional valve with sensor of position of swash plate 24 V DC; D_n 6 mm
3	
4	

HYDRAULIC

PHx	- hydraulic
0	- direct

AUTOMATIC

PRx		- automatic direct regulation - constant power
H		- hydraulic control
1		- electric control; voltage 12 V DC , D_n 6 mm
2		- electric control; voltage 24 V DC , D_n 6 mm
3		- electric control; voltage 220 V AC , D_n 6 mm
4		
5		
6		
7		
8		- electric control; voltage 12 V DC , D_n 4 mm
9		- electric control; voltage 24 V DC , D_n 4 mm
V		- pneumatic control
Values of output, pressure and speed are stated on next pages		
Q x	x	- automatic control - constant rate of flow with mechanical - hydraulic servo valve
M		- mechanical control regulator
H		- hydraulic control regulator
0		- empty
1		- electric control regulator; voltage 12 V DC , D_n 6 mm
2		- electric control regulator; voltage 24 V DC , D_n 6 mm
3		
4		
5		
6		
7		
8		- electric control regulator; voltage 12 V DC, D_n 4 mm
9		- electric control regulator; voltage 24 V DC, D_n 4 mm
	1	- rate of flow up to 40 l . min^{-1}
	2	- rate of flow up to 50 l . min^{-1}
	3	- rate of flow up to 70 l . min^{-1}
	4	- rate of flow up to 90 l . min^{-1}
	5	- rate of flow up to 120 l . min^{-1}
	6	- rate of flow up to 150 l . min^{-1}
	7	- rate of flow up to 180 l . min^{-1}
	8	- rate of flow up to 220 l . min^{-1}
	9	- rate of flow up to 260 l . min^{-1}
	0	- acc. to special requirements
Way of the designation of the regulated pressure channel is stated on next pages		
Rx	x	- control - constant pressure
M		- mechanical-hydraulic servo valve
H		- hydraulic control
S		- reducing valves (proportional)
0		- empty
1		- electric control; voltage 12 V DC , D_n 6 mm
2		- electric control; voltage 24 V DC , D_n 6 mm
3		
4		
5		
6		
7		
8		- electric control; voltage 12 V DC , D_n 4 mm
9		- electric control; voltage 24 V DC , D_n 4 mm
	1	- pressure value 5 MPa
	2	- pressure value 10 MPa
	3	- pressure value 15 MPa
	4	- pressure value 20 MPa
	5	- pressure value 25 MPa
	6	- pressure value 30 MPa
	7	- pressure value 35 MPa
	8	- pressure value 40 MPa
	9	- pressure value 32 MPa
	0	- on request

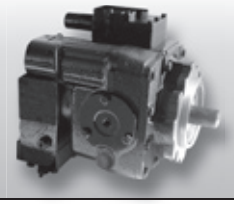


SPECIAL CODE FOR CONTROL PRX

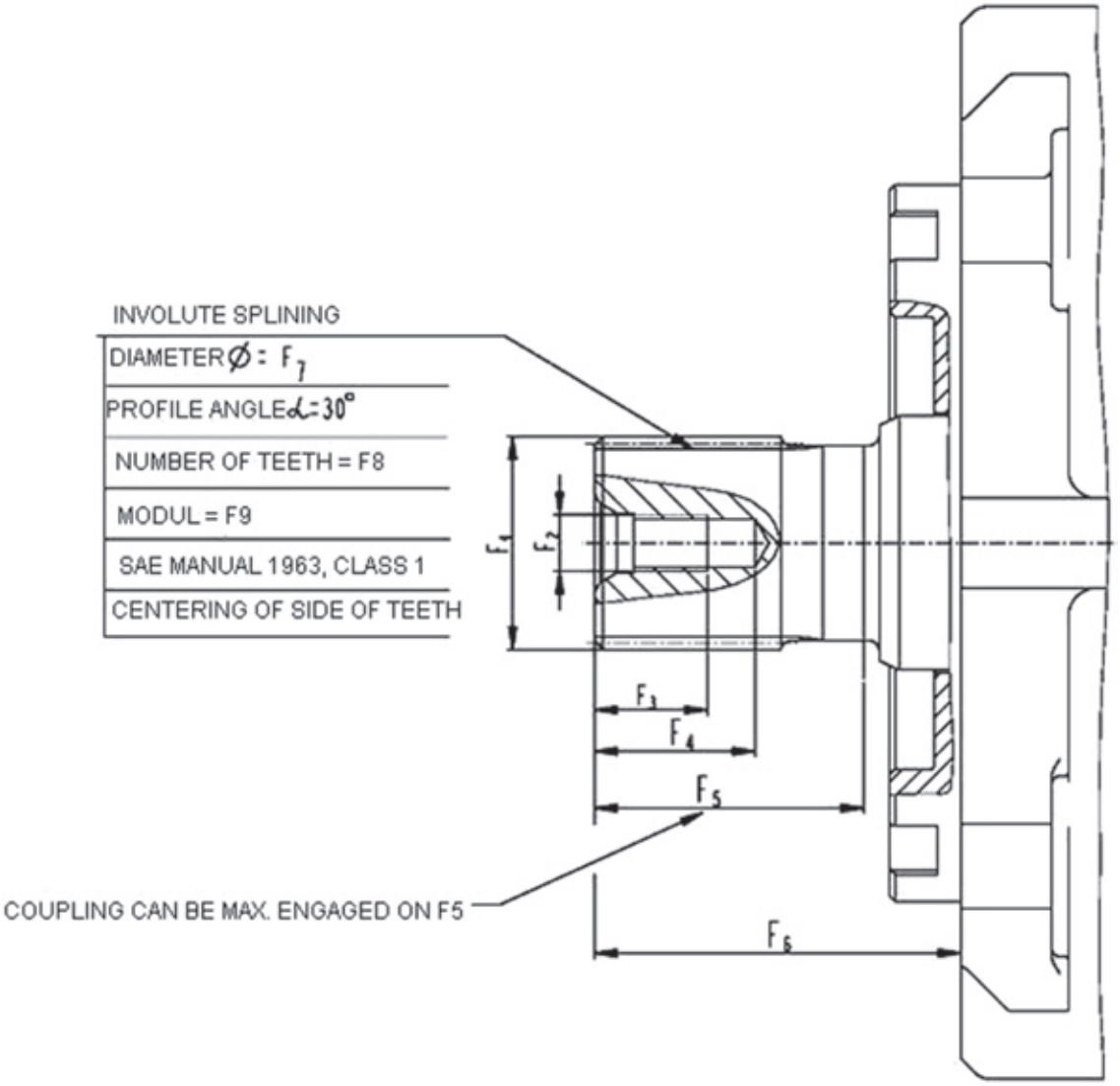
	Output P[kW]		Speed n [RPM]		Control Pressure Δpr [MPa]
A	15,0	A	1500	A	1,5
B	20,0	B	1600	B	1,6
C	25,0	C	1700	C	1,7
D	30,0	D	1800	D	1,8
E	35,0	E	1900	E	1,9
F	40,0	F	2000	F	2,0
G	45,0	G	2100	G	2,1
H	50,0	H	2200	H	2,2
K	60,0	K	2300	K	2,3
L	70,0	L	2400	L	2,4
M	80,0	M	2500	M	2,5
N	90,0	N	2600	N	2,6
O	100,0	O	2700	O	2,7
P	110,0	P	2800	P	2,8
R	125,0	R	2900	R	3,0
S	140,0	S	3000	S	3,2
T	155,0	T	3200	T	3,4
U	170,0	U	3500	U	3,6
V		V	3800	V	3,8
Z		Z		Z	4,0
X	not used undetermined	X	not used undetermined	X	not used undetermined

SPECIAL CODE FOR CONTROL QXX

A00	Regulation in pressure channel „A“
B00	Regulation in pressure channel „B“
AB0	Regulation in both pressure channels „A“ & „B“

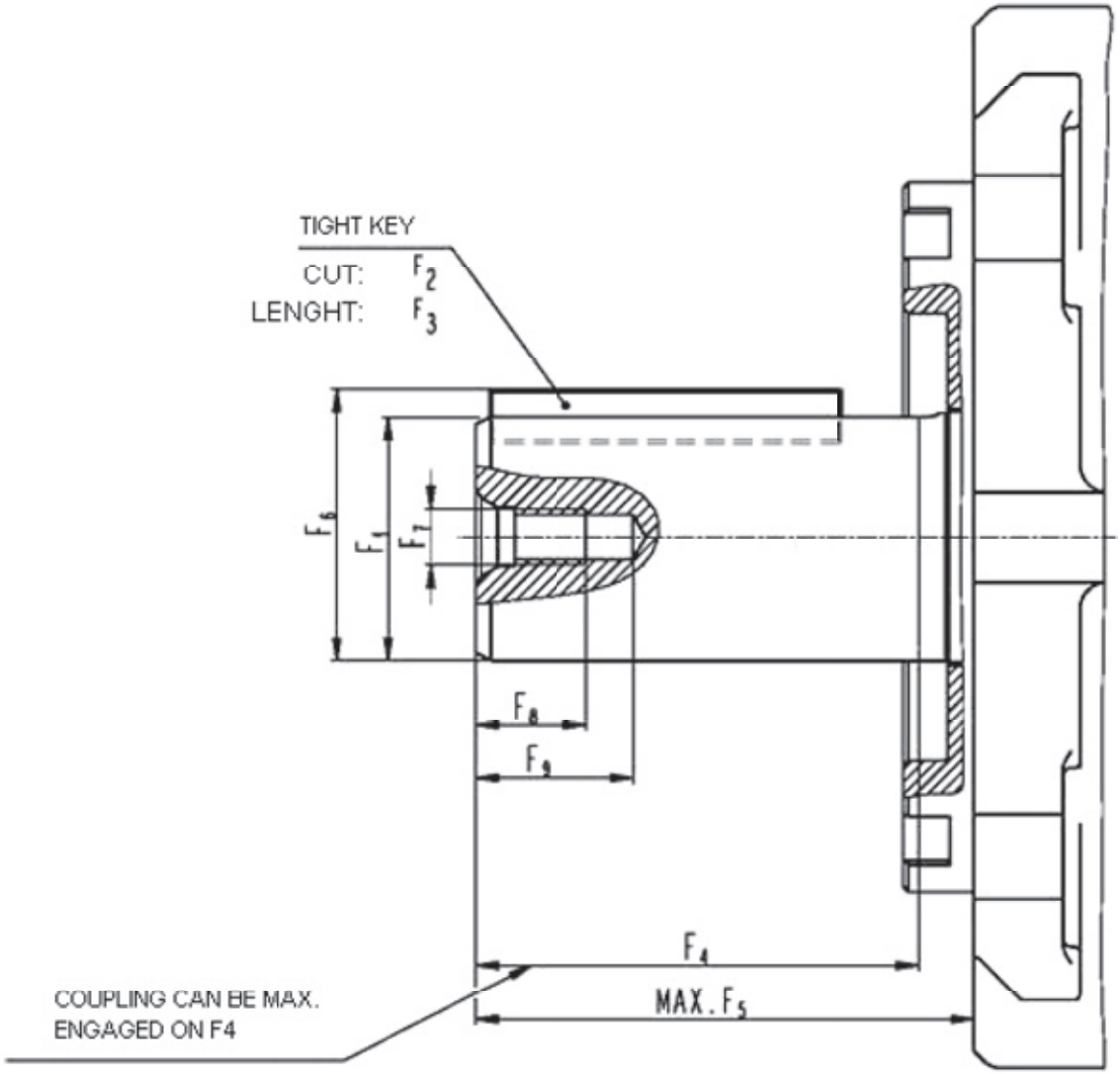


INPUT SHAFT WITH AN INVOLUTE SPLINING

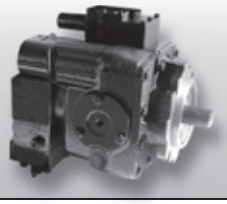


TYPE	FRAME SIZE	DIMENSION								
		F1	F2	F3	F4	F5	F6	F7	F8	F9
A	20,22,23	$31,22_{-0,17}$	M10	20	28,5	48	56	29,634	14	12/24
B	20,22,23	$31,75_{-0,17}$	M10	20	28,5	48	56	30,163	19	16/32
C	20,22,23	$34,5_{-0,18}$	M10	20	28,5	48	56	33,338	21	16/32
D	23	$37,68_{-0,18}$	M10	20	28,5	48	56	36,512	23	16/32
E	23	$44,03_{-0,18}$	M10	20	28,5	48	56	42,863	27	16/32
G	23	$43,71_{-0,17}$	M10	20	28,5	48	56	41,275	13	8/16
I	20,22,23	$32,91_{-0,17}$	M10	20	28,5	48	56	31,75	20	16/32
P	20,22,23	$25,4_{-0,12}$	M6	12	18	48	56	23,812	15	16/32
R	20	$21,8_{-0,12}$	M6	12	18	48	56	20,627	13	16/32

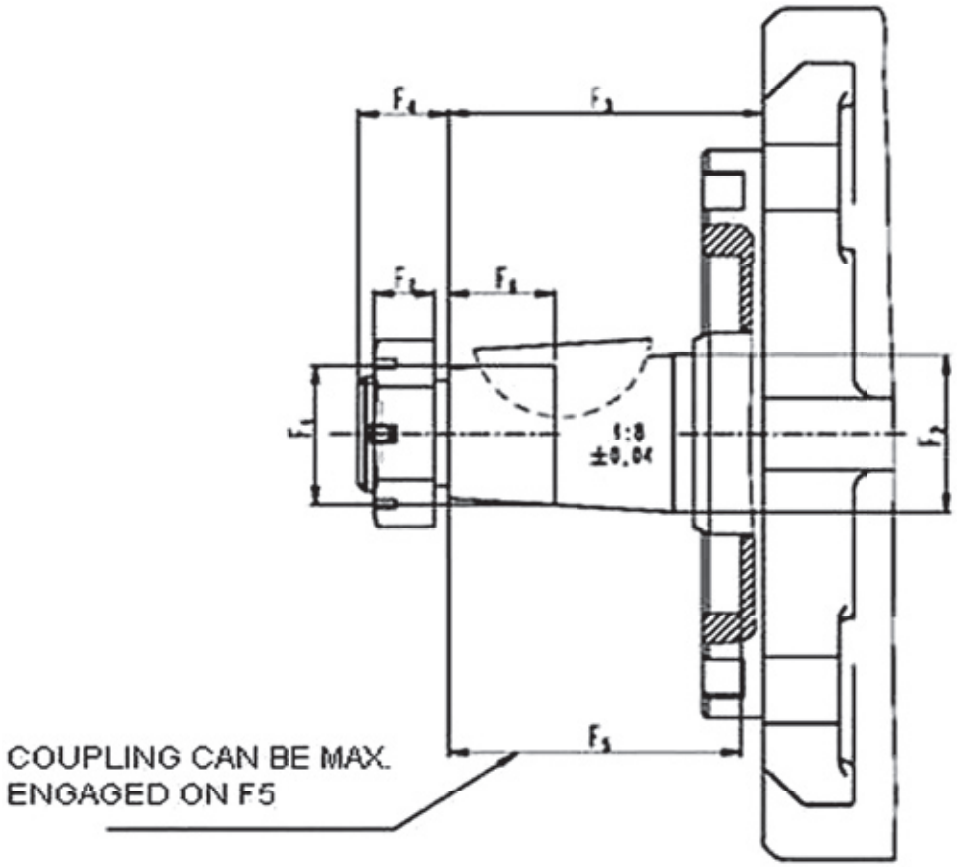
INPUT SHAFT WITH A TIGHT KEY



TYPE	FRAME SIZE	DIMENSION								
		ϕF1 $_{-0,012}$	F2$_{-0,05}$	F3	F4	F5 max.	F6	F7	F8	F9
L	20,22	34,925	7,938x7,938	63,5	67,5	77,7	38,438	M10	20	28,5
M	23	44,45	9,525x9,525	63,5	76,7	89,7	48,685	M14	30	40



CONICAL INPUT SHAFT WITH A DISK KEY

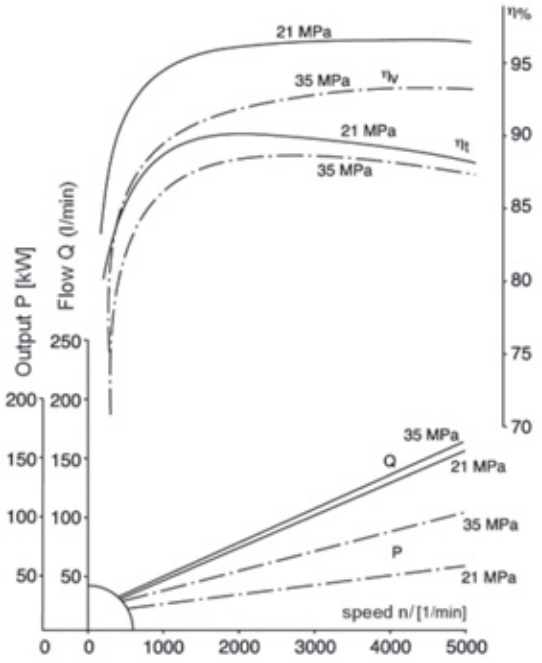


TYPE	FRAME SIZE	DIMEMSION						
		ϕ F1	ϕ F2	F3	F4	F5	F6	F7
K	20,22,23	31,75	34,94	57,3	19,1	47,8	22,4	12,7
J	23	41,275	44,45	66,5	22,1	53,8	28,45	15,7

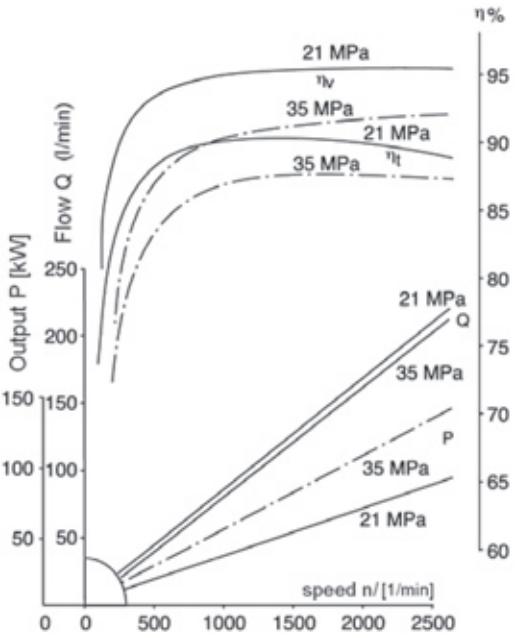
TYPE	DISK KEY	NUT
K	$9{,}475^{+0{,}024}$ x 38,1	1" – 20 UNF Gap of Spanner s=36 mm Tighting Moment: 190-230 Nm
J	$11{,}11^{+0{,}024}$ x 50,8	1 1/4" – 18 UNF Gap of Spanner s=46 mm Tighting Moment: 370-430 Nm

DEPENDENCE OF FLOW AND OUTPUT EFFICIENCY ON SPEED

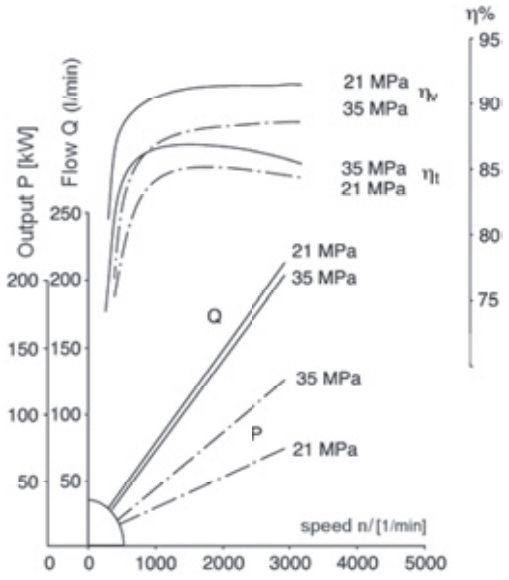
For frame size PVK-20



For frame size PVK-22



For frame size PVK-23



ηv - volumetric efficiency
ηt - total efficiency