Axial Piston Pump
Series PV

Design 45

Variable Displacement

Catalogue HY30-3245/UK
February 2007

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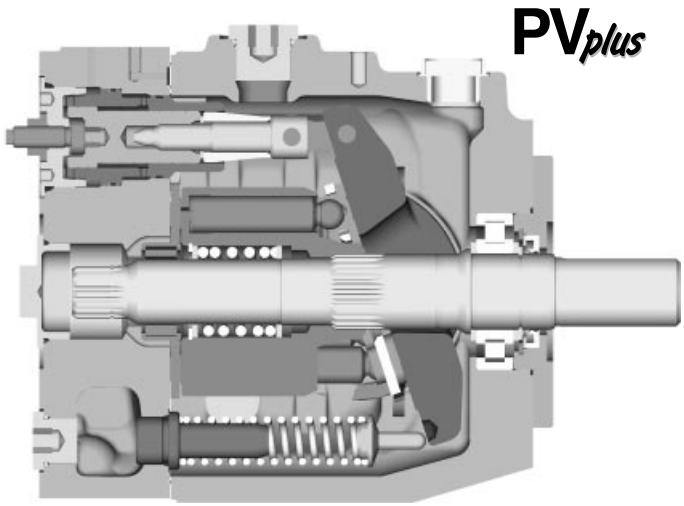
With thru drive for single and multiple pumps

Swash plate type for open circuit



Technical Features

- Low noise level
- Fast response
  (eg. PV046: upstroke <70ms, downstroke <40ms)
- Service-friendly
- High self-priming speed
- Compact design
- Thru drive for 100% nominal torque

Technical Data

Size		PV016	PV020	PV023	PV032	PV040	PV046
Max. Displacement	[cm3/rev.]	16	20	23	32	40	46
Output flow at 1500 min-1	[l/min]	24	30	34,5	48	60	69
Nominal pressure pN	[bar]	350	350	350	350	350	350
Max. pressure pmax 1)	[bar]	420	420	420	420	420	420
Max. Case drain pressure	[bar]	2	2	2	2	2	2
Min. Inlet pressure	[bar]	0,8	0,8	0,8	0,8	0,8	0,8
Max. Inlet pressure	[bar]	16	16	16	16	16	16
Input power at 1500 min-1 and 350 bar	[kW]	15,5	19,5	22,5	31	39	45
Max speed 2)	[min^{-1}]	3000	3000	3000	2800	2800	2800
Moment of inertia	[kgm^2]	0,0017	0,0017	0,0017	0,0043	0,0043	0,0043
Weight	[kg]	19	19	19	30	30	30

1) Maximum 20% of the working cycle.
2) The maximum speed ratings are shown for an inlet pressure of 1 bar (absolute) and for a fluid viscosity of ν= 30 mm^2/s

General Information

Fluid recommendations

Premium quality hydraulic mineral fluid are recommended, like HLP oils to DIN 51522, part 2.

Viscosity

The normal operating viscosity should range between 16 and 100 mm^2/s (cSt). Max. start-up viscosity is 800 mm2/s (cSt).

Seals

NBR (nitrile) seals are used for operation with hydraulic fluids based on mineral oil. For synthetic fluids, such as phosphoric acid esters, Flourocarbon seal are required.

Filtration

For maximum pump and system component functionability and life, the system should be protected from contamination by effective filtration.
Fluid cleanliness should be in accordance with ISO classification ISO 4406:1999. The quality of filter elements should be in accordance with ISO standards.
Minimum requirement for filtration rate x (mm);
General hydraulic systems for satisfactory operation:
Class 20/18/15, according to ISO 4406:1999
Hydraulic systems with maximised component life and functionability:
Class 18/16/13, according to ISO 4406:1999

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P	V				R	1		1			N							

axial piston pump variable displacement high pressure version

size and displacement

rotation

variation

mounting interface

threads code

thru drive code

coupling code

seals

compensator

design series:

pump **compensator**
not required on order

see next page →

code	displacement
016	16 cm³/rev
020	20 cm³/rev
023	23 cm³/rev
032	32 cm³/rev
040	40 cm³/rev
046	46 cm³/rev

code	material
N	NBR (nitrile)

code	thru drive coupling option
1	single pump, no coupling
H	with coupling 25 x 1,5 x 15, DIN 5480
J	with coupling 32 x 1,5 x 20, DIN 5480
Y	with SAE coupling 9T-16/32 DP
A	with SAE coupling 11T-16/32 DP
B	with SAE coupling 13T-16/32 DP
C	with SAE coupling 15T-16/32 DP
D	with SAE coupling 14T-12/24 DP

code	rotation
R	clockwise

code	variation
1	standard

code	ports[1]	threads[2]
1	BSPP	metrisch

[1] refers to drain, gage and flushing port,
[2] refers to all mounting threads

code	thru drive option
no thru drive adapter	
T	single pump, prepared for thru drive
with thru drive adapter	
Y[3]	SAE AA, Ø 50.8 mm
A	SAE A, Ø 82.55 mm
B	SAE B, Ø 101.6 mm
C[4]	SAE C, Ø 127 mm
G	metric, Ø 63 mm
H	metric, Ø 80 mm
J	metric, Ø 100 mm
K[4]	metric, Ø 125 mm

See dimensional drawing for details
[3] only for PV016 - PV023
[4] only for PV032 and larger

code	mounting interface		shaft
K	metr. ISO 3019/2	4-hole flange	cylindric, key
L		4-hole flange	splined, DIN 5480

bold letters = preferred program

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P	V																	

compensator — **design series: pump compensator** *not required on order*

code			compensator style
0	**0**	**1**	no compensator
compensator version			
M	**M**		**standard pressure compensator, no control port**
M	**R**		**remote pressure compensator, control port on compensator body side**
M	**F**		**flow (load sensing) compensator, load sensing port on compensator body side**
compensator variation			
		C	**standard variation, no topside interface for pilot valves**
		1	**topside NG6 /CETOP 3 interface for pilot valves**

code			compensator style
electro hydraulic control			
F	P	V	closed loop displacement control only, no pressure compensation
function			
U	P		closed loop proportional displacement control with pressure compensation
compensator version			
		R	remote pressure compensation, NG6 /CETOP 3 interface for pilot valves
		D	version UPR, with proportional pilot valve type PVACPPU..35 mounted
		G	version UPD, with pressure sensor for closed loop pressure and power control

displacement						code			compensator style
power control									
016 **023**	**032** **046**					**nominal power at 1.500 rev/min**			
						B			3 kW
						C			4 kW
						D			5,5 kW
						E			7,5 kW
						G			11 kW
						H			15 kW
						K			18,5 kW
						M			22 kW
						S			30 kW
function									
							L		power control
							C		power control and load sensing
compensator version									
								C	integrated, adjustable pressure compensation
								1	topside NG6 / CETOP 3 interface

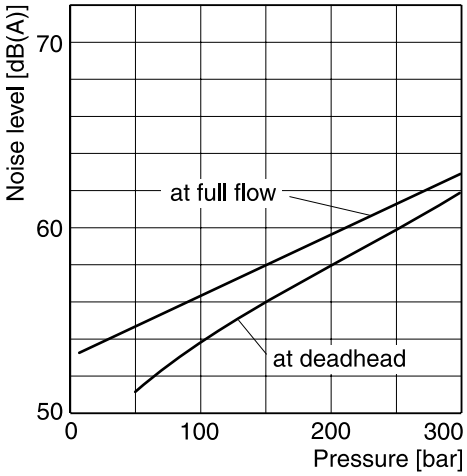
Note:

Compensator differential Δ**p** is factory pre-set to:

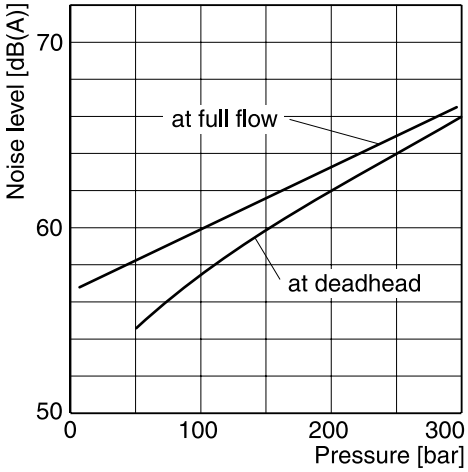
remote comepnsators, power control **15 ± 1 bar**

load sensing comp. (not power control) (codes ...MF*) **10 ± 1 bar**

PV016 - PV023



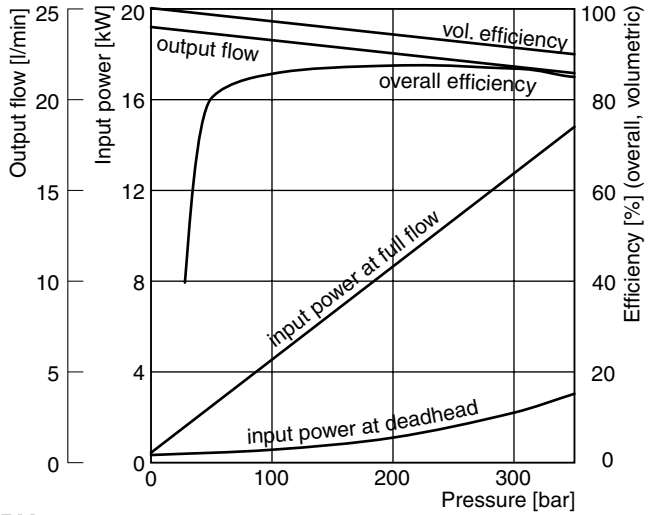
PV032 - PV046



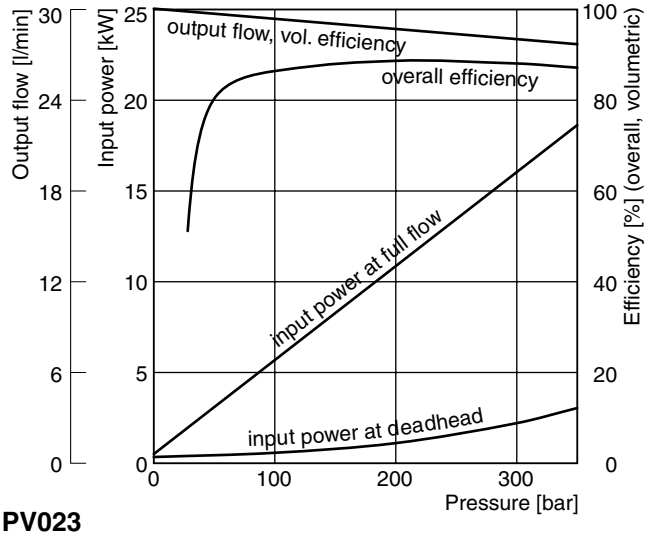
Typical sound level for single pumps, measured in unechoic chamber according to DIN 45 635, part 1 and 26. Microphone distance 1m; speed: n = 1500 min^{-1}.

All data measured with mineral oil viscosity 30 mm^2/s (cSt) at 50 °C.

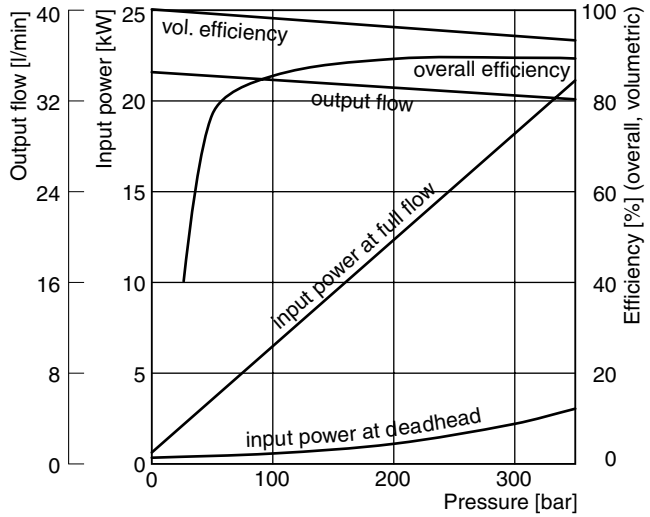
Efficiency, power consumption
PV016



PV020



PV023



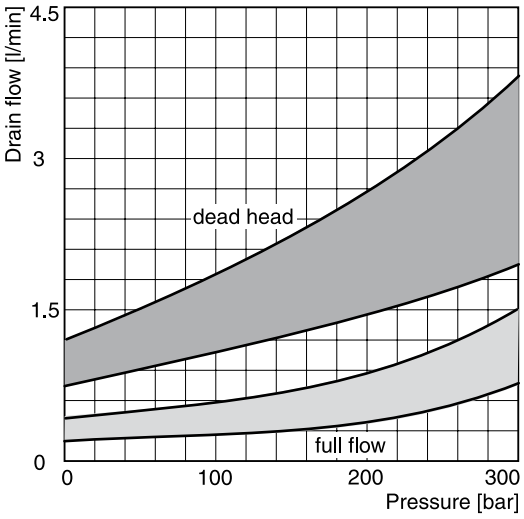
Efficiency and case drain flows PV016, PV020, PV023

The efficiency and power graphs are measured at an input speed of n = 1500 min^{-1}, a temperature of 50 °C and a fluid viscosity of 30 mm^2/s.

Case drain flow and compensator control flow leave via the drain port of the pump. To the values shown are to be added 1 to 1.2 l/min , if at pilot operated compensators the control flow of the pressure pilot valve also goes through the pump.

Please note: The values shown below are only valid for static operation. Under dynamic conditions and at rapid compensation of the pump the volume displaced by the servo piston also leaves the case drain port. This dynamic control flow can reach up to 40 l/min! Therefore the case drain line is to lead to the reservoir at full size and without restrictions as short and direct as possible.

Case drain flows PV016-023



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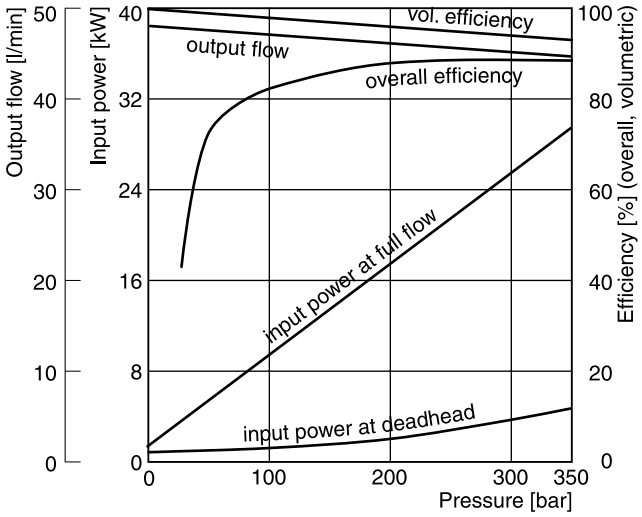
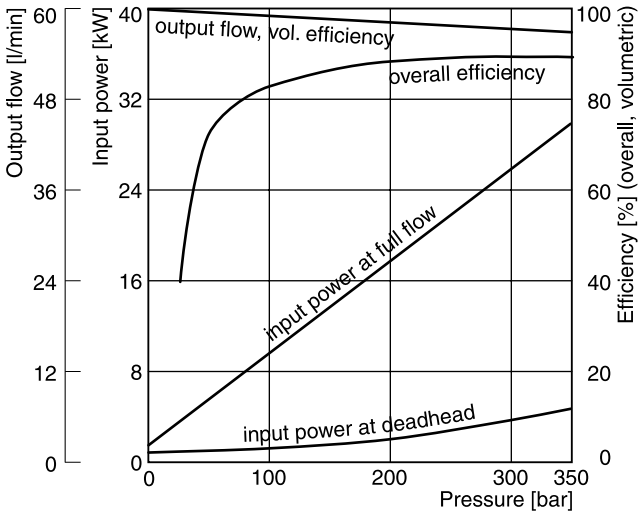
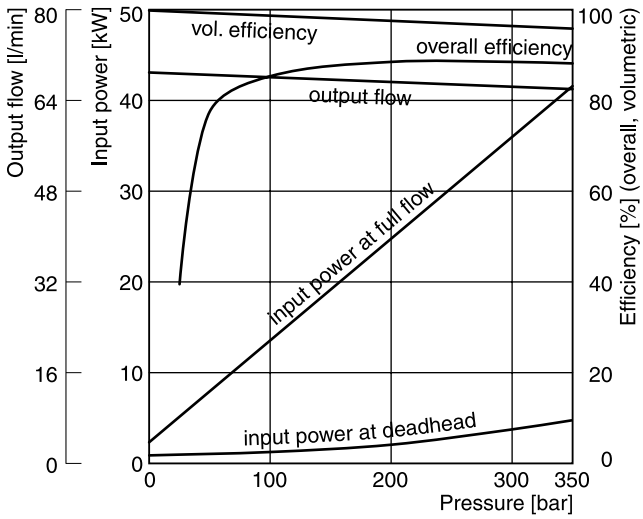
Efficiency, power consumption
PV032



PV040



PV046



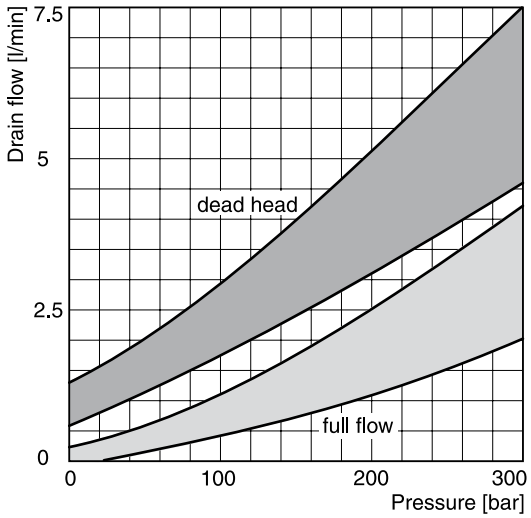
Efficiency and case drain flows PV032 to PV046

The efficiency and power graphs are measured at an input speed of n = 1500 min^{-1}, a temperature of 50 °C and a fluid viscosity of 30 mm^2/s.

Case drain flow and compensator control flow leave via the drain port of the pump. To the values shown are to be added 1 to 1.2 l/min , if at pilot operated compensators the control flow of the pressure pilot valve also goes through the pump.

Please note: The values shown below are only valid for static operation. Under dynamic conditions and at rapid compensation of the pump the volume displaced by the servo piston also leaves the case drain port. This dynamic control flow can reach up to 60 l/min! Therefore the case drain line is to lead to the reservoir at full size and without restrictions as short and direct as possible.

Case drain flows PV032-046



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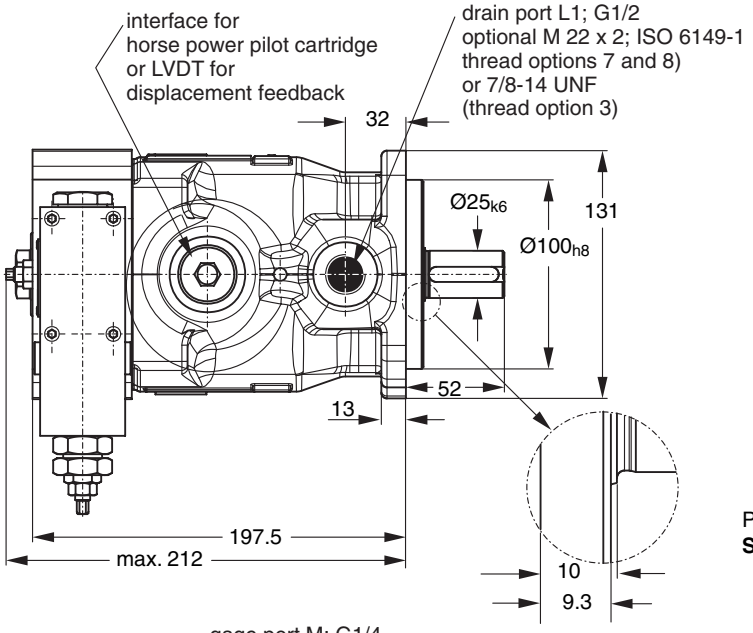
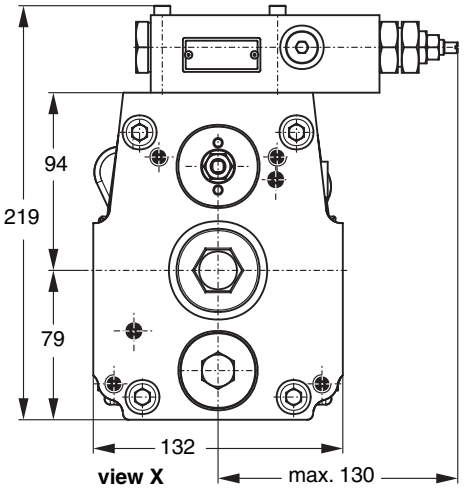
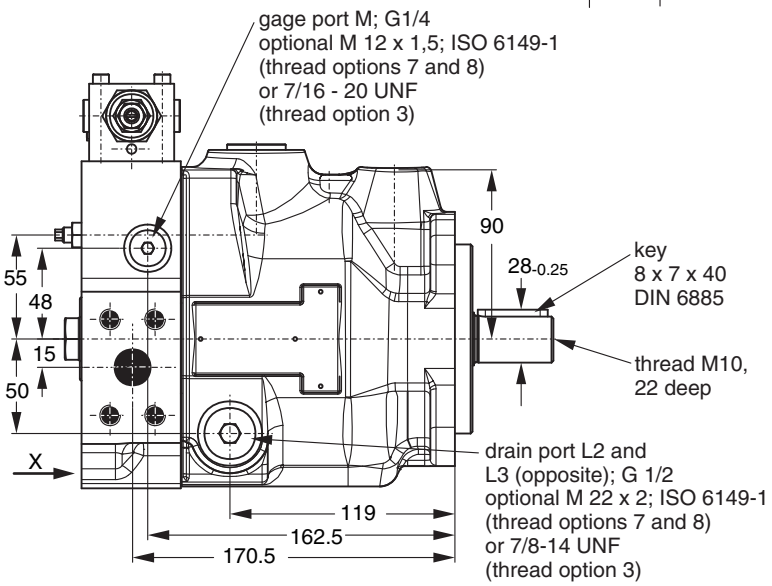
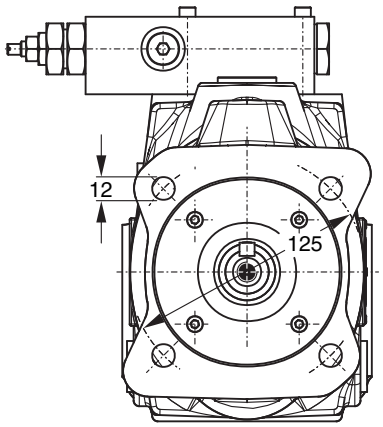
PV016 - 023, metric version



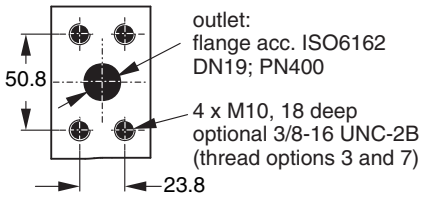


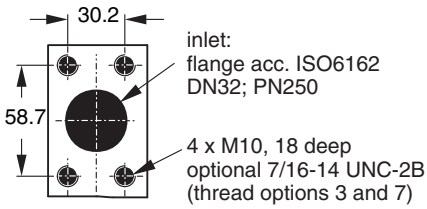
Pump shown with
Standard pressure compensator, code ...MMC

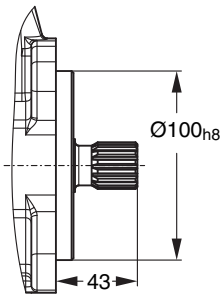




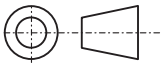
The pump shown above has mounting option **K**
and **thru drive option T**
(prepared for thru drive)







Mounting option L
splined shaft W25x1.5x15x8f
DIN 5480



Shown is a clockwise rotating pump. Counter clockwise rotating pumps have inlet, outlet and gauge ports reversed.

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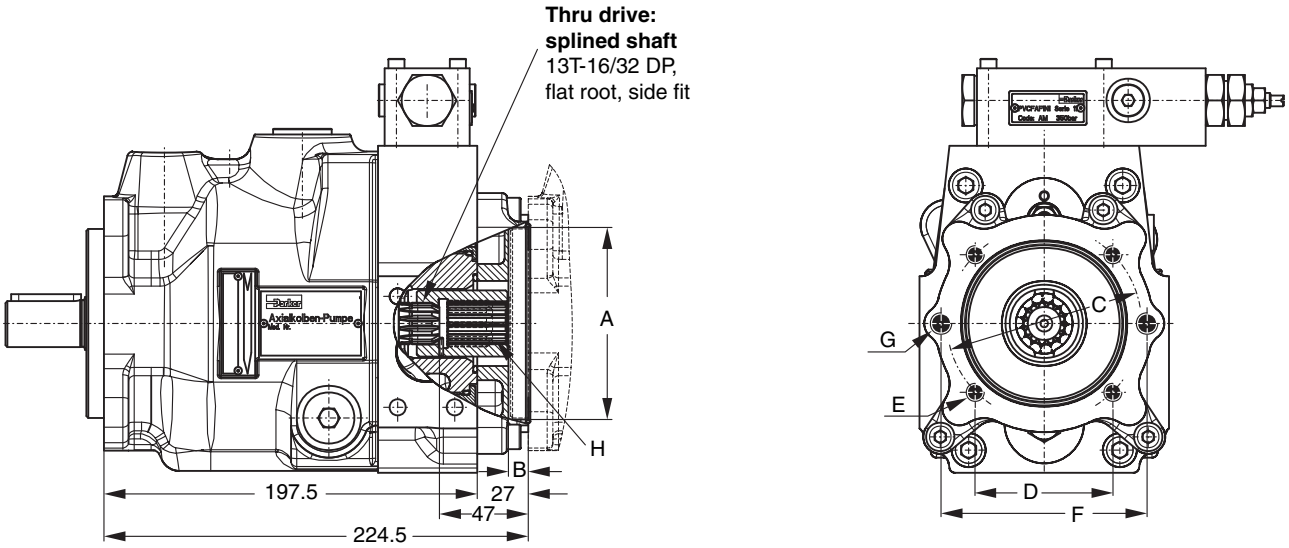
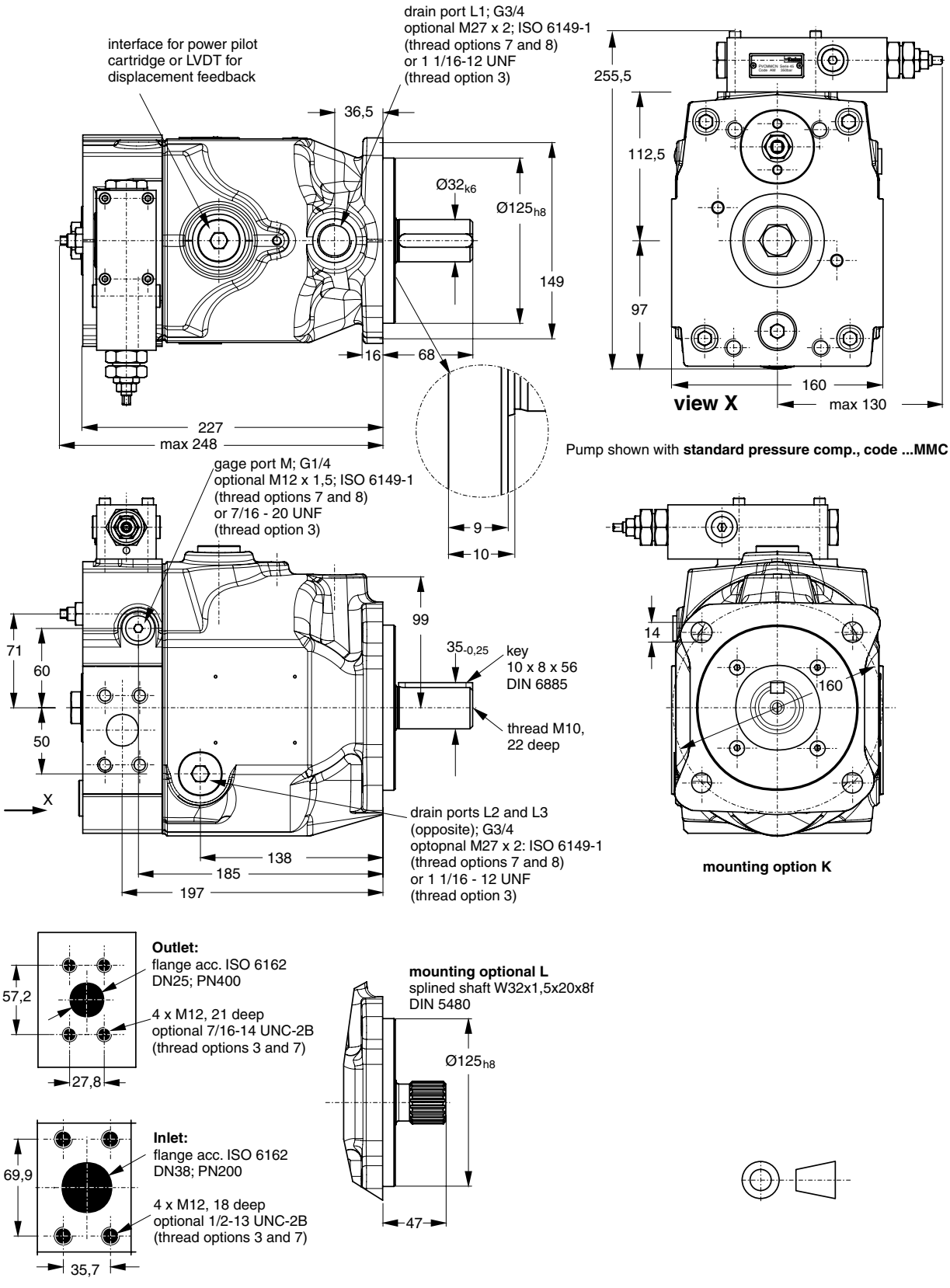
Variation with thru drive



Thru drive adaptors are available with the following dimensions								
Drawing Dimension / Thru drive option	A	B	C	D	E	F	G	Remark
Y	50,8	8	-	-	-	82	M8	SAE AA 2-Bolt
A	82,55	10	-	-	-	106	M10	SAE A 2-Bolt
B	101,6	10,5	127	89,8	M12	-	-	SAE B 4-Bolt
G	63	8,5	85	60,1	M8	100	M8	2/4-Bolt
H	80	8,5	103	72,8	M8	109	M10	2/4-Bolt
J	100	10,5	125	88,4	M10	-	-	4-Bolt

PV032 - 046, metric version



Shown is a clockwise rotating pump. Counter clockwise rotating pumps have inlet, outlet and gauge ports reversed.

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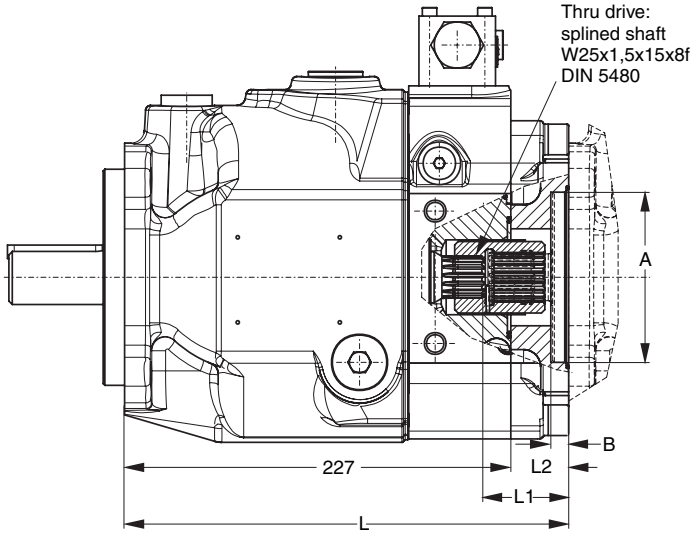
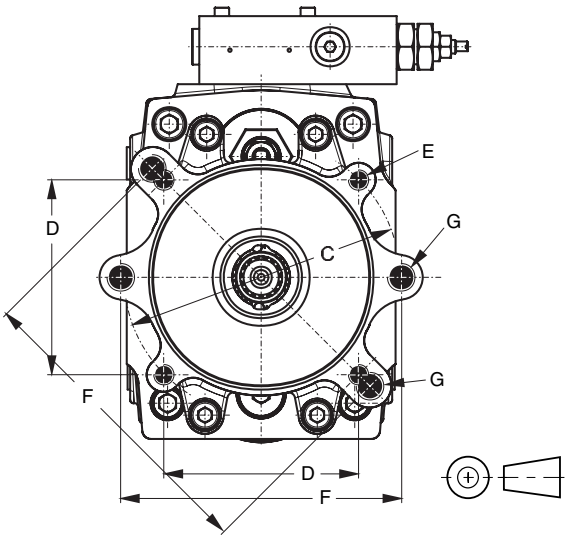
Variation with thru drive





Dimension H and available couplings see page 12.
At threads options 3 and 7 the dimensions E and G are UNC - 2B threads.

Thru drive adaptors are available with the following dimensions								
Drawing Dimension / Thru drive option	A	B	C	D	E	F	G	Remark
A	82,55	8	-	-	-	106	M10	SAE A 2-Bolt
B	101,6	11	127	89,8	M12	146	M12	SAE B 2/4-Bolt
C	127	13,5	161,9	114,5	M12	-	-	SAE C 4-Bolt
G	63	8,5	85	60,1	M8	100	M8	2/4-Bolt
H	80	8,5	103	72,8	M8	109	M10	2/4-Bolt
J	100	10,5	125	88,4	M10	140	M12	2/4-Bolt
K	125	10,5	160	113,1	M12	-	-	4-Bolt

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Mounting kits for multiple pumps, for second pump option

MK – PV | BG | ☐ | ☐ | ☐ | ☐ | ☐

- **MK – PV**: Mounting kit; Axial piston pump series PV
- **BG**: fixed
- **☐ Size**
- **☐ Second pump**
- **☐ Thread**
- **☐ Seals**
- **☐ Design series** (see name plate)

Code	Pump size
1	Pump size 1: PV016 - PV028
2	Pump size 2: PV032 - PV046, PV076
3	Pump size 3: PV063, PV080 - PV100
4	Pump size 4: PV140 - PV180
5	Pump size 5: PV270

Code	Second pump, SAE
T	Prepared for thru drive option (plugged)
Y	SAE AA, diameter 50.8 mm
A	SAE A, diameter 82.55 mm
B	SAE B, diameter 101.6 mm
C	SAE C, diameter 127 mm
D	SAE D, diameter 152.4 mm
E	SAE E, diameter 165.1 mm
	Second pump, metric
G	Diameter 63 mm
H	Diameter 80 mm
J	Diameter 100 mm
K	Diameter 125 mm
L	Diameter 160 mm
M	Diameter 200 mm

Code	Seals
N	NBR
V	FPM
E	EPR

Code	Thread
M	Metric
S	SAE

Kit contains positions 30, 69, 84, 85 and 87, see drawing below.

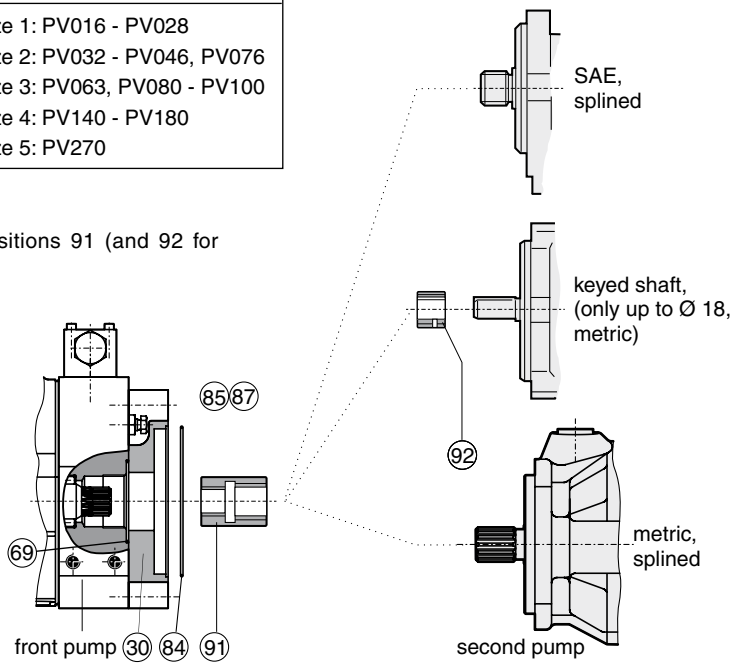
Mounting kits for multiple pumps, couplings

MK – PV | BG | ☐ | K | ☐ | ☐

- **MK – PV**: Mounting kit; Axial piston pump series PV
- **BG**: fixed
- **☐ Size**
- **K**: fixed
- **☐ Coupling**
- **☐ Design series** (see name plate)

Code	Pump size
1	Pump size 1: PV016 - PV028
2	Pump size 2: PV032 - PV046, PV076
3	Pump size 3: PV063, PV080 - PV100
4	Pump size 4: PV140 - PV180
5	Pump size 5: PV270

Kit contains positions 91 (and 92 for keyed shaft).



Code	Coupling for metric, splined shaft DIN 5480
01	N25 x 1.5 x 15
02	N32 x 1.5 x 20
03	N40 x 1.5 x 25
04	N50 x 2 x 24
05	N60 x 2 x 28
	Coupling for SAE splined shaft flat root, side fit
11	9T 16/32
12	11T 16/32
13	13T 16/32
14	15T 16/32
15	14T 12/24
16	17T 12/24
17	13T 8/16
18	15T 8/16
	Coupling + adaptor for keyed shaft
20	Diameter 12 mm
21	Diameter 16 mm
22	Diameter 18 mm

Max. transferable torque in [Nm] for different shafts options

Shaft code	PV016-023	PV032-046
D	300	550
E	300	610
K	300	570
L	405	675
Max. torque transmission cap. for rear mounted pump	140	275

Important notice

The max. allowable torque of the individual shaft must not be exceeded. For 2-pump combinations there is no problem because PV series offers 100% thru torque. For 3-pump combinations (and more) the limit torque could be reached or exceeded.

Therefore it is necessary to calculate the torque factor and compare it with the allowed torque limit factor in the table.

Required: calculated torque factor
< torque limit factor

To make the necessary calculations easier and more user friendly it is not required to calculate actual torque requirements in Nm and compare them with the shaft limitations. The table on the right shows limit factors that include material specification, safety factors and conversion factors.

Pump	Shaft	Torque limit factor
PV016-023	D	17700
	E	17700
	K	17700
	L	20130
PV032-046	D	32680
	E	36380
	K	33810
	L	40250

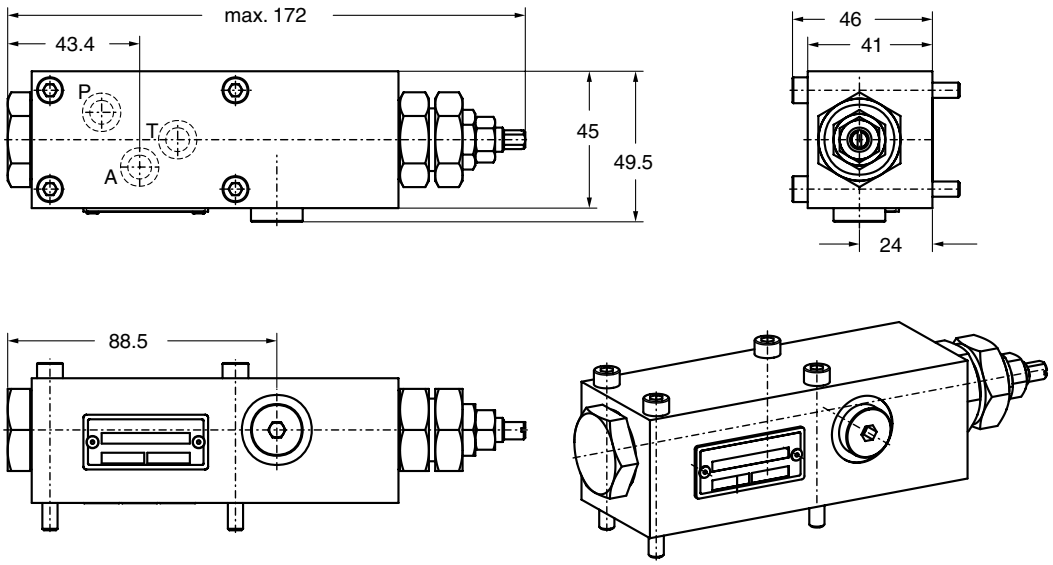
The **total torque factor** is represented by the sum of the individual torque factors of all pumps in the complete pump combination.

Total torque factor of the combination
= sum of individual torque factors of all pumps

The **torque factor of each individual pump** is calculated by multiplying the max. operating pressure p of the pump (in bar) with the max. displacement Vg of the pump (in cm^3/rev).

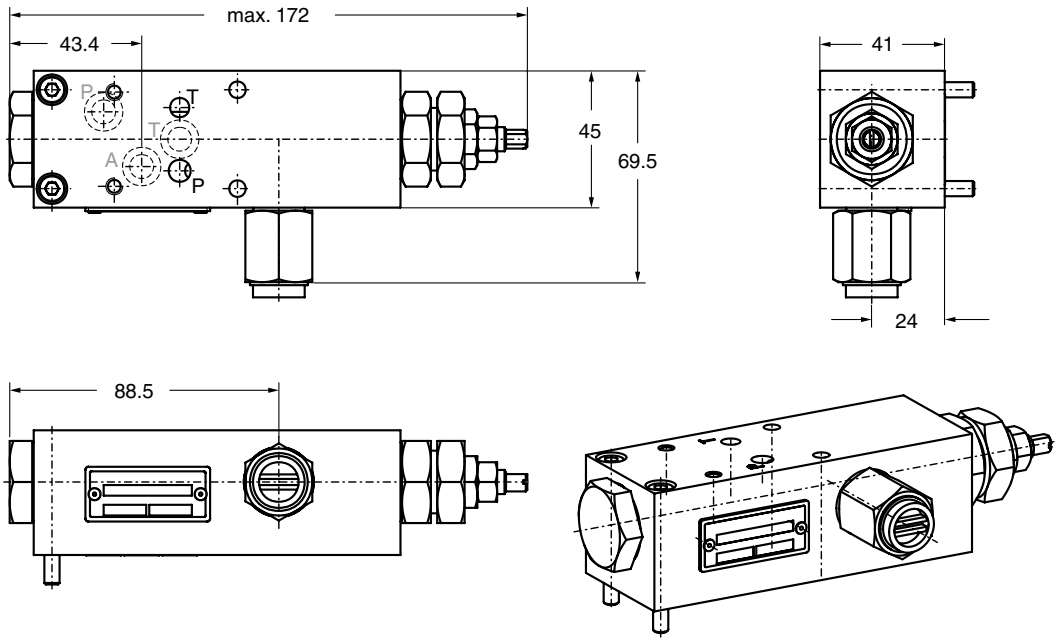
Torque factor of any pump
= p x Vg

Dimensions standard pressure compensator, code MMC



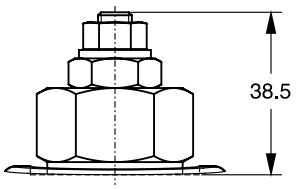
Code “MM1“ has NG06/CETOP 3 interface topside as shown below.

Dimensions remote pressure and load sensing compensator, code MR1 and MF1



Codes “MRC“ and “MFC“ have same dimensions, but no valve interface on top.

Dimensions power pilot cartridge

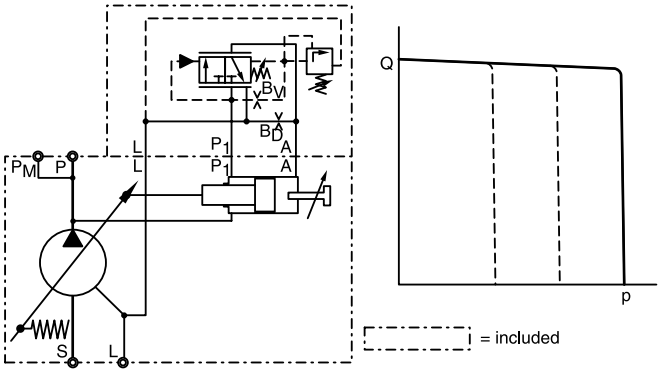


Standard pressure compensator, code MMC

The standard pressure compensator adjusts the pump displacement according to the actual need of the system in order to keep the pressure constant.

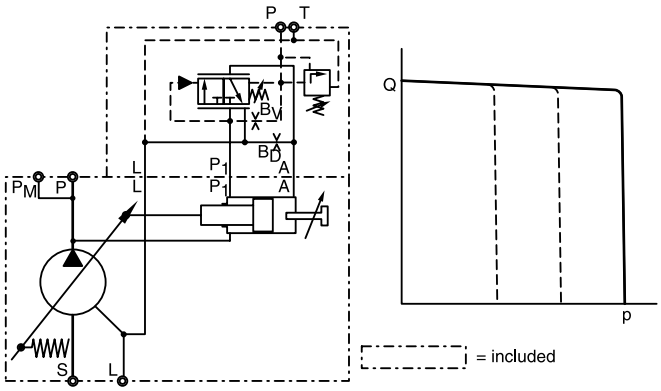
As long as the system pressure at outlet port P is lower than the set pressure (set as spring preload of the integrated pilot valve) the working port A of the compensator valve is connected to the case drain and the piston area is unloaded. Bias spring and system pressure on the annulus area keep the pump at full displacement.

When the system pressure reaches the set pressure of the pilot valve, pilot flow is built up and a differential pressure will occur at pilot orifice B_V. When this differential pressure reaches the factory setting of the compensator, the control spool connects port P_1 to A and builds up a pressure at the servo piston resulting in a down stroking of the pump. The displacement of the pump is controlled in order to match the flow requirement of the system.



Standard pressure compensator with NG6 interface, code MM1

With code …MM1 the standard pressure compensator has on its top side a valve interface size NG 6 DIN 24 340 (CETOP 03 acc. RP35H, NFPA D03). This interface allows the mounting of accessories like multiple pressure selectors without the need of external piping and valve mounting.

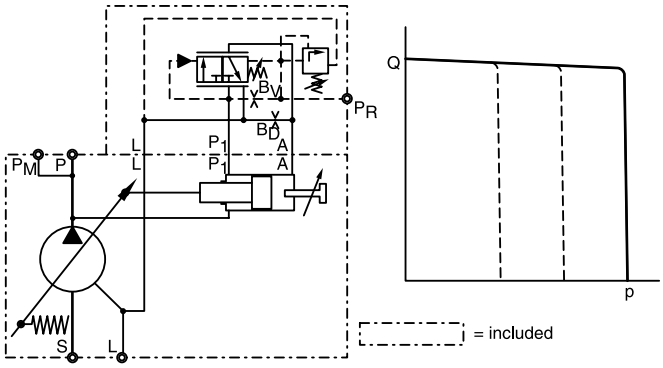


Remote pressure compensator, code MRC

The basic function of the remote pressure compensator code …MRC is equal to the function of the standard pressure compensator. The remote compensator offers an additional remote control port on the side of the compensator body. With a remote installed pilot valve, the setting of the pump compensating pressure can be adjusted from a location up to 15 meter apart from the pump.

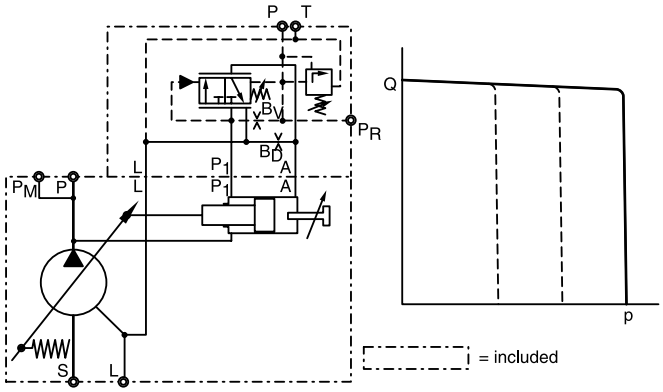
The thread of this remote port is defined in the thread option of the PV pump ordering code.

For long distances between pump and remote control valve please consider temperature and response time influences.



Remote pressure compensator with NG6 interface, code MR1

With code …MR1 the remote pressure compensator has on its top side a valve interface size NG 6 DIN 24 340 (CETOP 03 acc. RP35H, NFPA D03). This interface allows the mounting of accessories like multiple pressure selectors without the need of external piping and valve mounting.

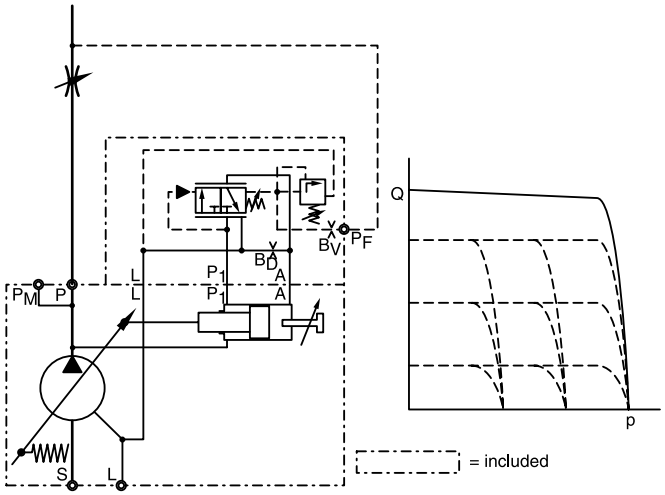


Load sensing compensator code MFC

The pilot pressure of the load sensing compensator is taken from a load sensing port in the hydraulic system. This port is located downstream of a throttle valve (manually or electronically operated). The pump compensator differential pressure is factory set to 10 bar.

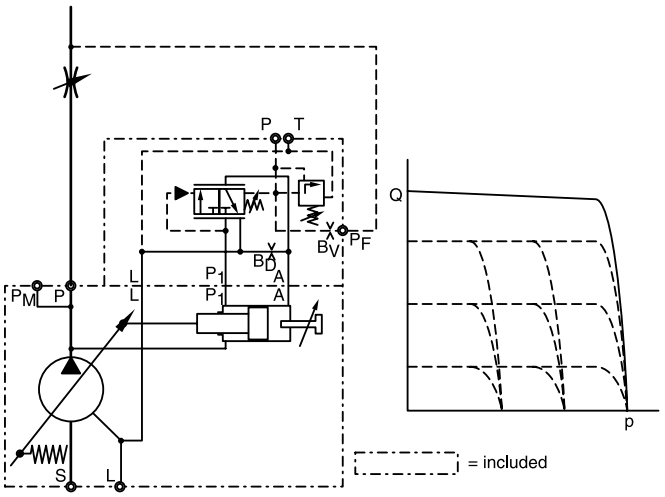
When the main stream throttle valve is set to a position, that creates the 10 bar pressure drop at a lower flow, than the pump nominal flow, the load sensing compensator will reduce the pump displacement accordingly to avoid power losses in the circuit. When the main stream throttle valve is closed, the pump will be compensated to stand-by operation at a pump outlet pressure of 10 bar.

If the system pressure exceeds the setting of the integrated pilot valve, the pilot valve will create an additional pressure drop at the pilot orifice BV. This will lead to a pressure compensation of the pump in order not to exceed the set pressure.



Load sensing compensator NG6 interface, code MF1

With code …MF1 the load sensing compensator has on its top side a valve interface size NG 6 DIN 24 340 (CETOP 03 acc. RP35H, NFPA D03). This interface allows the mounting of accessories like multiple pressure selectors without the need of external piping and valve mounting.



Hydraulic-mechanical power compensator

The hydraulic-mechanical power compensator consists of a modified remote pressure compensator (Code *L*) or of a modified load-sensing compensator (Code *C*) and a pilot valve. This pilot valve is integrated into the pump and is adjusted by a cam sleeve. The cam sleeve has a contour that is designed and machined for the individual displacement and the nominal power setting.

At a large displacement the opening pressure (given by the cam sleeve diameter) is lower than at small displacements. This makes the pump compensate along a constant power (torque) curve.

For all nominal powers of standard electrical motors Parker offers a dedicated cam sleeve. The exchange of this cam sleeve (e. g.: to change power setting) can easily be done without disassembly of the pump.

On top of that an adjustment of the power setting can be done within certain limits by adjusting the preload of the pilot control cartridge spring . That allows an adjustment of a constant power setting for other than the nominal speeds (1500 min^{-1}) or for other powers.

Ordering code for the power option

The first digit designates the power setting:

Code B = 3.0 kW etc. up to
Code S = 30 kW

The second digit designates the pilot flow source:

Code L internal pilot pressure, remote pressure function.

Code C external pilot pressure, combines power compensation with load-sensing compensation.

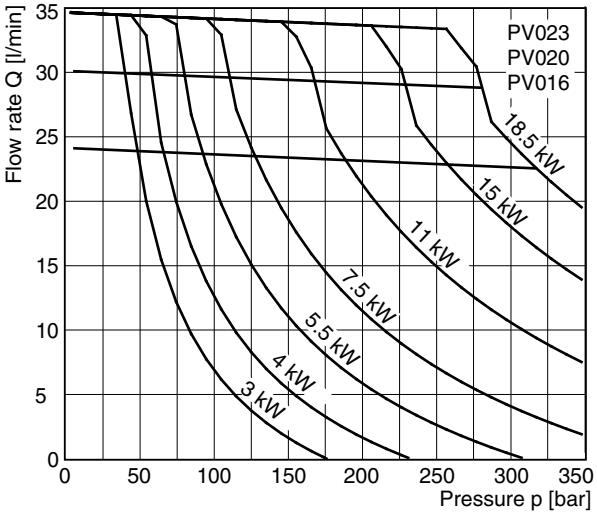
The third digit designates the possibility to adjust the overriding pressure compensation:

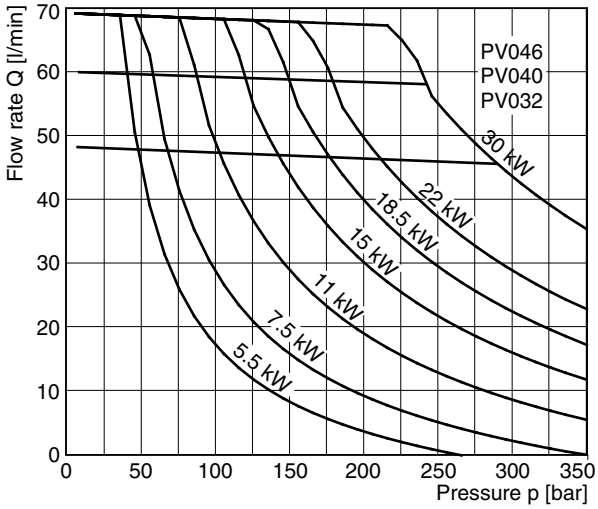
Code 1 comes with a top side NG6/D03 interface on the control valve to mount any suitable pilot valve or Parker pump accessories.

Code C includes a pilot valve for manual pressure adjustment. Max. setting: 350 bar.

The graphs below show typical power curves, collected during following conditions:

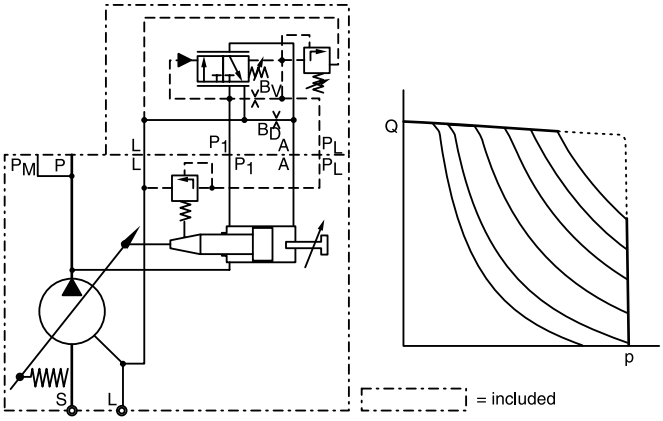
Speed : n = 1500 rev/min
Temperature : t = 50 °C
Fluid : HLP, ISO VG46
Viscosity : ν = 46 mm^2/s at 40 °C





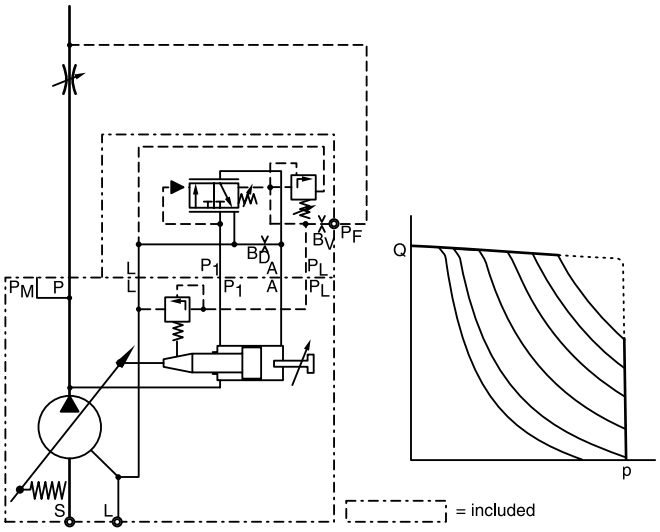
Power compensator code *LC

The control function of the power compensator is as described in the standard compensator section.
The pump will start to compensate, when the pilot valve(s), integrated into compensator and pump, create a differential pressure of 15 bar at the pilot orifice BV.
In addition to the standard pressure compensator the power option has an additional pilot valve in the pump housing. The pressure setting of this valve is controlled by a power feedback sleeve connected to the servo piston. At full displacement, the pressure setting is low and the pump will start to compensate at a lower pressure. The more the pump compensates, the more the feedback sleeve is moved by the down stroking servo piston. According to the contour of this sleeve, the pressure setting of the power pilot valve is raised.
That gives a constant power requirement for the pump drive. At low pressures the pump can provide a high flow output, at high pressures the flow output has to be lowered, to avoid overloading of the drive motor.
The contour of the power feedback sleeve is designed, to match the desired constant power curve (see following page). For each nominal setting a different contour sleeve is available. The last ordering code digit (*) defines the required setting (see ordering code pages).



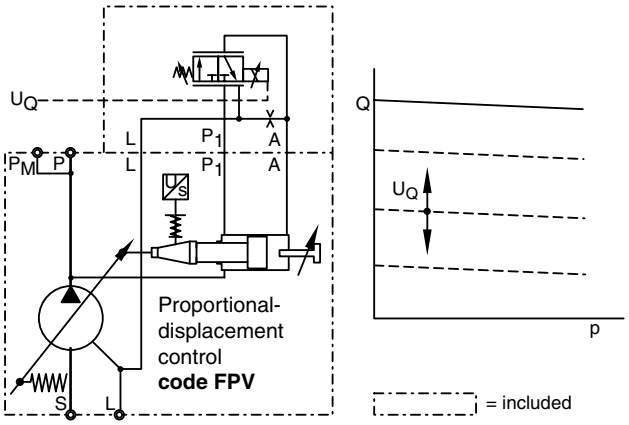
Power compensator code *CC

In code …CC. the power compensator has an additional load sensing port.
As for the load sensing compensator, code …FC the pilot pressure is not supplied internally, but from a load sensing port in the hydraulic system.
Please note: in this case the load sensing pressure differential is set to 15 bar in order to meet the constant power curve, which is laid out for a 15 bar pilot pressure differential.
With this feature the pump can be flow controlled by the main stream throttle valve, pressure controlled by the integrated pilot valve in the compensator and power controlled by the integrated pilot valve and contour sleeve in the pump housing.
Both power compensator versions: code …LC* and code …CC* can be ordered also with the top side interface for accessories (codes …L1* resp. …C1*), with a built on directional control valve for electrical unloading (codes …LW* resp. …CW*) and with a built on proportional pilot valve for electronic setting of the max. compensating pressure (codes …LD* resp. …CD*).



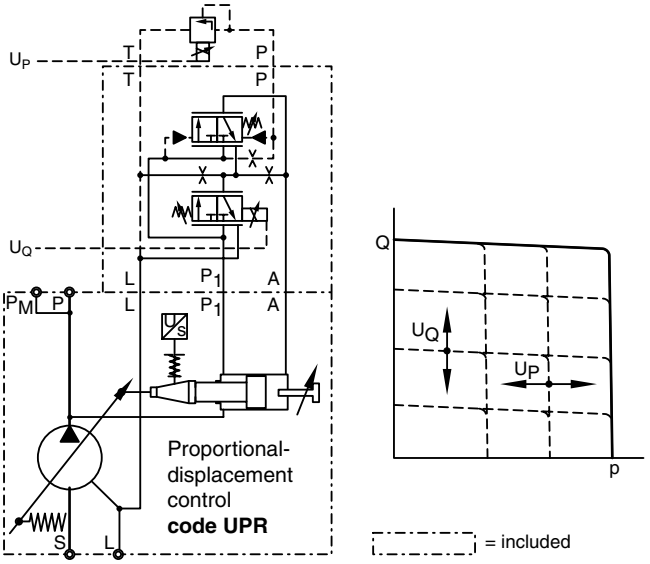
Proportional displacement control, code FPV

The proportional displacement control allows the adjustment of the pumps output flow with an electrical input signal.
The actual displacement of the pump is monitored by an LVDT and compared with the commanded displacement in an electronic control module PQDXXA. The command is given as an electrical input signal (0 - 10 V or 0 resp. 4 - 20 mA) from the supervising machine control. The command can also be provided by a potentiometer. The electronic control module offers a stabilized 10 V source to supply the potentiometer.
The electronic module compares permanently the input command and the actual displacement by powering the proportional solenoid of the control valve. A deviation from the commanded displacement leads to a modulation of the input current to the solenoid. The control valve then changes the control pressure (port A) until the correct displacement is adjusted.
Version FPV of the proportional control does not provide a pressure compensation. The hydraulic circuit must be protected by a pressure relief valve.

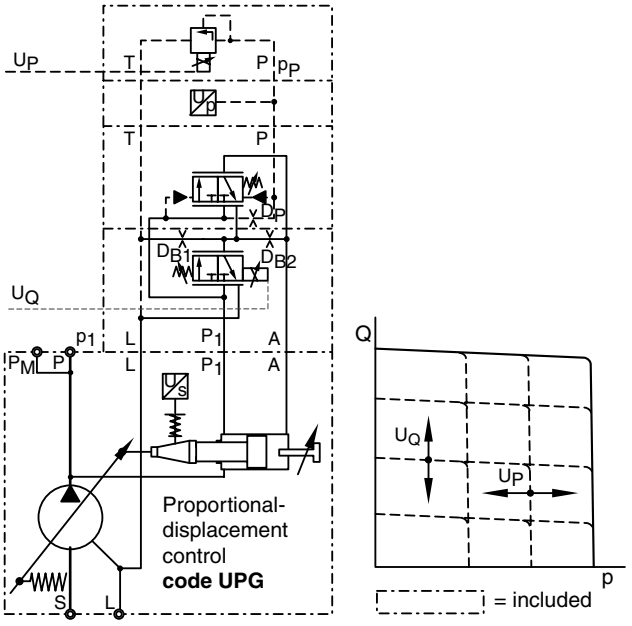


Proportional displacement control with overriding pressure control, codes UPR and UPG

In **version UPR** an additional pressure compensator valve can override the electrohydraulic displacement control. That adds pressure compensation to this control.
The compensator valve has an NG6/D03 interface on top to mount a pressure pilot valve. When using a proportional pressure pilot valve an electro-hydraulic p/Q control can be realized. The electronic driver modules are tuned for the valve type PVACPP* to get the best performance.
The electronic control module PQDXXA contains, beside the displacement control unit, also the driver electronics for the a. m. proportional pressure valves.

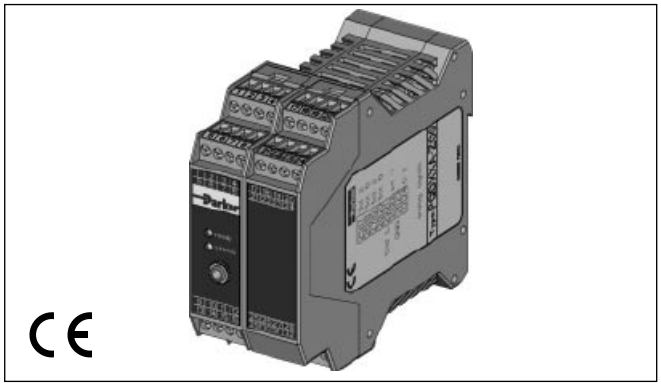


With **ordering code UPG** the proportional pressure pilot valve and a pressure transducer (Parker SCP 8181 CE) are included with the pump control. In combination with control module PQDXXA a closed loop pressure control of the pump outlet pressure is available.
Parker variable displacement pumps have a large servo piston. That leads to a extremely robust and stable pump control. On the other hand that requires high control flows (up to > 100 l/min). Parker has therefore chosen the 2-valve p/Q control concept, because in this case a hydraulic-mechanical compensator valve takes care of the pressure compensation of the pump. That allows a very fast pressure compensation and makes this the control unsensitive to fluid contamination. We see the 2-valve concept as a contribution to system and pressure control safety.



Parker Hannifin
Pump and Motor Division
Chemnitz, Germany

The digital control module code PQDXXA-Z00 is designed for rail mounting.



Features

- Digital control circuit
- Parameter setting via RS-232 interface
- All settings (ramps, MIN/MAX, control parameters) can be stored digitally and recalled from a PC to duplicate settings to other modules
- Ramp time up to 60 seconds
- Compatible to the relevant european EMC specifications
- Easy to use PC based setup software
- Covers all displacements from 16 to 270 cm³/rev
- Covers all functions: displacement control, displacement control with open loop pressure control, displacement control with closed loop pressure control and displacement control with closed loop pressure control and electronic power limitation.

Ordering code

PQD	XX	A	–	Z00
Digital control module for p/Q control	**For all frame sizes series PV**	**Version A**		**Option**

Please order the "interface cable to PC" separately.
Ordering code: PQDX-XA-KABEL

Technical data

Mounting style		Snap-on mounting for EN50022 rail
Body material		Polycarbonate
Inflammation class		V2...V0 acc. UL 94
Mounting position		any
Env. temperature range	[°C]	-20...+55
Protection class		IP 20 acc. DIN 40 050
Weight	[g]	160
Duty ratio	[%]	100
Supply voltage	[V]	18...30VDC, ripple <5% eff.
Rush in current	[A]	22 for 0.2 ms
Current consumption	[A]	< 4 for p/Q control ; < 2 for Q-control
Resolution	[%]	0.025 (power 0.1)
Interface		RS232C, 9600 baud, 3.5 mm cinch
EMC		EN 50 081-2, EN 50 082-2
Connctors		Screw terminals 0.2...2.5 mm², plug in style
Cables	[mm²]	1.5 (AWG 16) overall braid shield, for supply and solenoid connection 0.5 mm² (AWG 20) overall braid shield, for sensor and command signal connections
Max. cable length	[m]	50

For programming the module via PC, an interface cable is needed, please order separately.

Programming software

The programming of the p/Q control module is done in an easy to learn mode. To select the pump model and size and to set the control paramters the program **ProPVplus** must be started. This program runs under WINDOWS® 95 and higher.
The latest version of this software can be downloaded at the following internet address:

http://www.parker.com/euro_hcd

The software offers the following features:
A **TERMINAL** window to set or read out the control parameters of the module. Settings as well as comments entered in the terminal window can be stored also in RTFformat (opens e. g. under WORD or other text editors)
A **MONITOR** window allows to display process variables in numerical format.

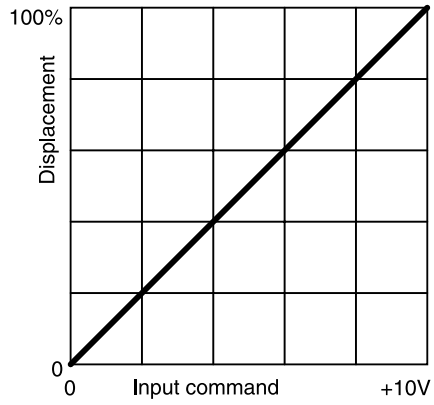
An **OSZILLOSKOP** window displays process variables as curves. The oscilloscope offers a start - stop function. The images can be saved and stored e. g. for import into other programs.

Features

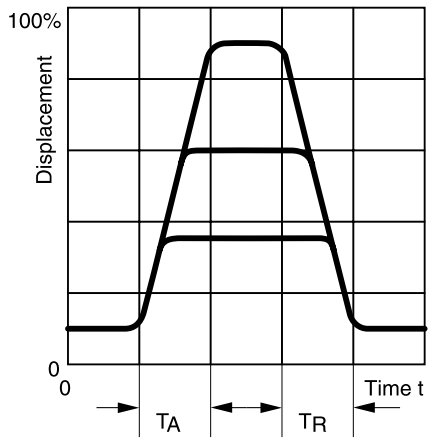
- Display and documentation of parameter sets
- Save ond reload of optimized parameter sets
- Offers oscilloscope function for easy performance evaluation and optimization
- Pre-optimized parameter sets for all PVplus piston pump
- Sizes already in E^2PROM memory

Diagrams

Typical static characteristic



Typical dynamic characteristic



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