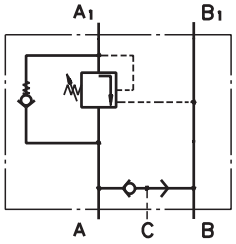
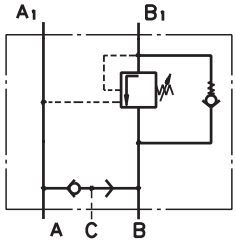
VALVES FOR HYDRAULIC MOTORS

CONTENTS

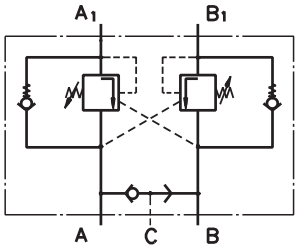
OVERCENTER VALVES WITH BRAKE CONTROL



Single Overcenter Valves with Brake Control type KPB … AE



Single Overcenter Valves with Brake Control type KPB … BE



Dual Overcenter Valves with Brake Control type KPB … D

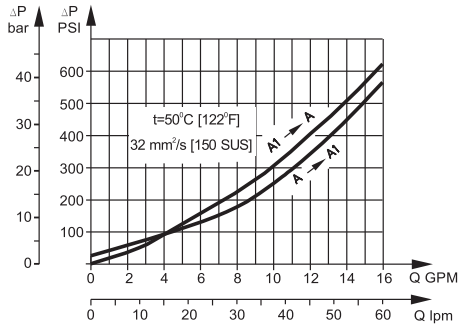
SPECIFICATION DATA

Parameters	Type											
	KPBR...E	KPBS...E	KPBR...D	KPBS...D	KPBW...E	KPBW...D	KPBHR...E	KPBHR...D	KPBT...E	KPBT...D	KPBV...E	KPBV...D
Flow Rate, lpm [GPM]	60 [15.85]								100 [26.4]		200 [52.8]	
Rated Pressure*, bar [PSI]	60÷280 [870÷4060]						70÷250 [1015÷3625]					
Pilot Ratio	4,25:1											
Weight, kg [lb]	3,020 [6.658]	2,900 [6.39]	3,060 [6.746]	2,920 [6.437]	3,050 [7.724]	3,140 [6.923]	2,300 [5.071]	2,400 [5.291]	5,400 [11.905]	5,800 [12.787]	9,200 [20.283]	9,750 [21.495]

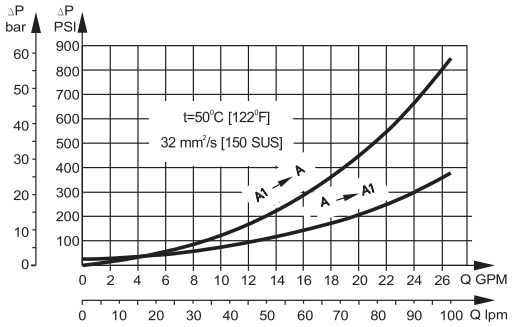
*Pressure Settings are at flow rate of 5 lpm [1.3 GPM] and viscosity 32 mm²/s [150 SUS] at 50 °C [122° F].

PRESSURE LOSSES

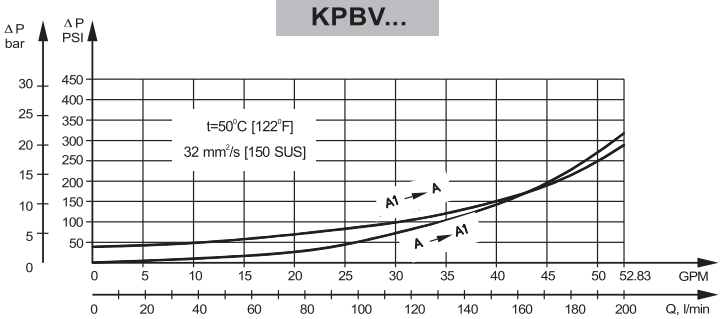
KPBR..., KPBS..., KPBW..., KPBHR...



KPBT...

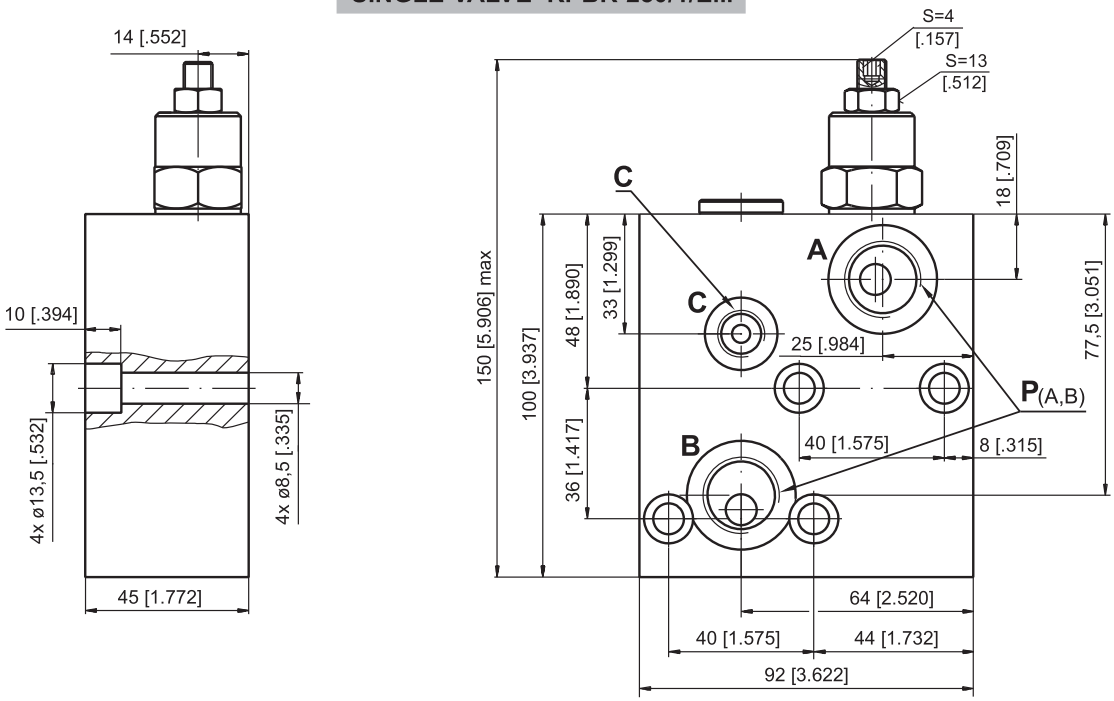


KPBV...

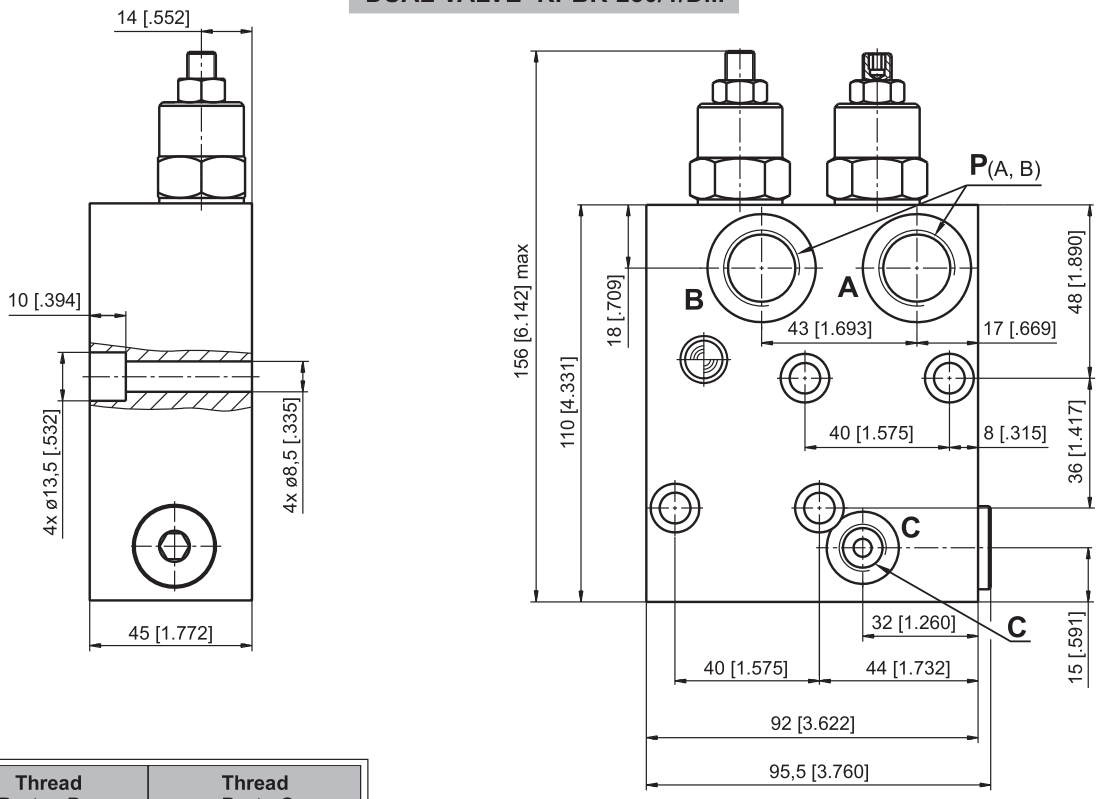


VALVES FOR MP, MR, MH HYDRAULIC MOTORS

SINGLE VALVE KPBR-250/1/E...



DUAL VALVE KPBR-250/1/D...



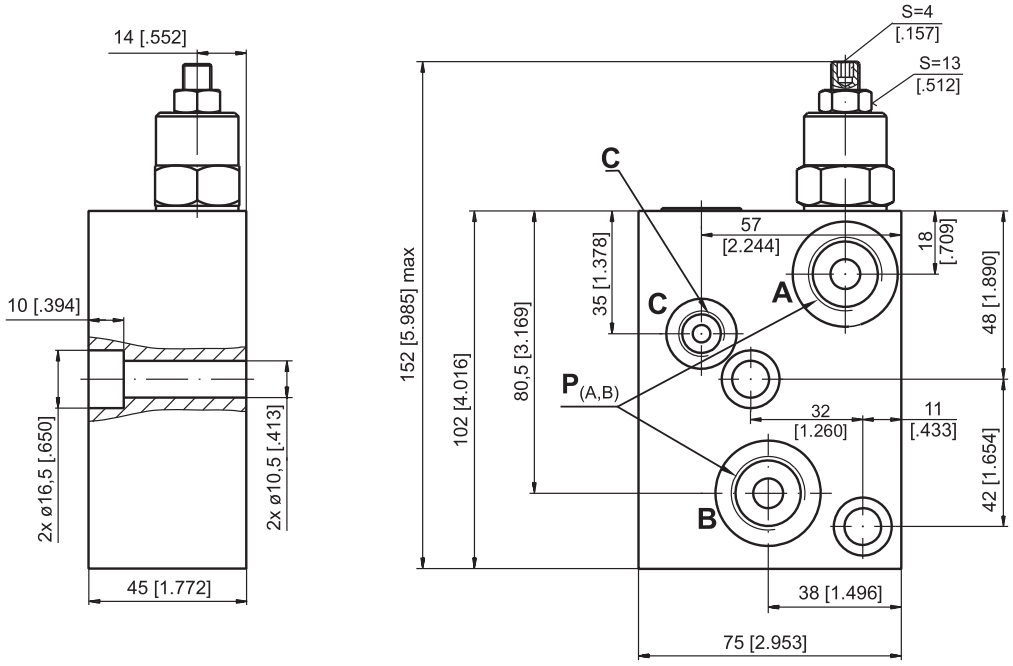
	Thread Ports - $P_{(A,B)}$	Thread Port - C
-	G1/2 16 [.63] depth	G1/4 12 [.47] depth
M	M22x1,5 16 [.63] depth	M14x1,5 12 [.47] depth
A	7/8 - 14 UNF O-ring 16 [.63] depth	7/16 - 20 UNF O-ring 12,7 [.50] depth

mm [in]

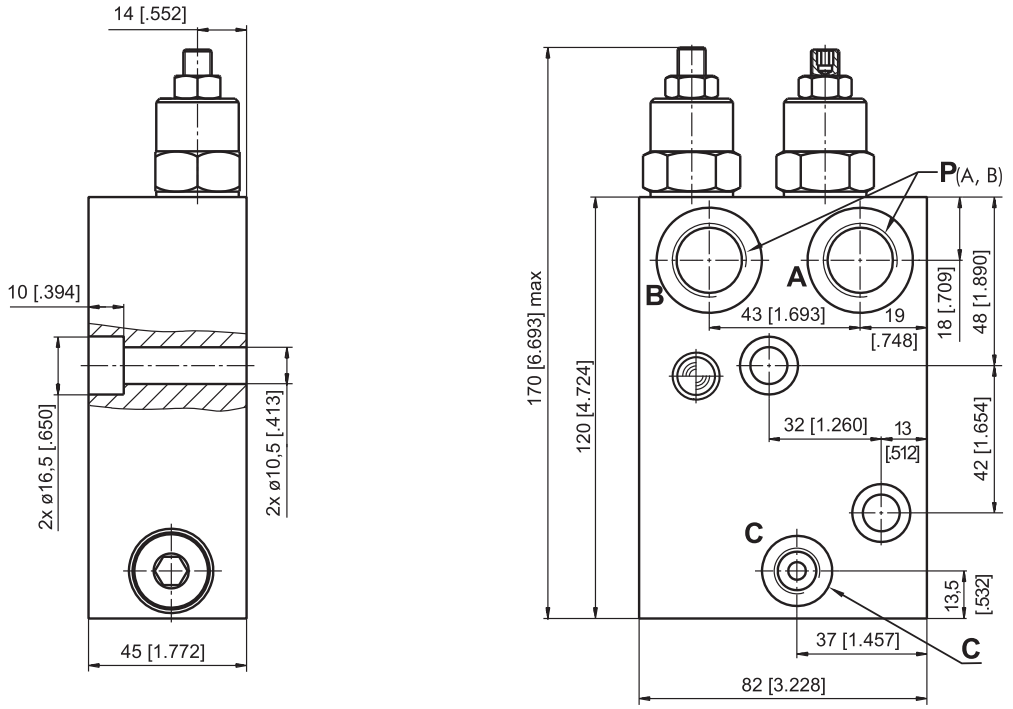
Note : KPBR Blocks are installed directly on MP, MR and MH Motors with four screws M8x45 - 8.8 DIN 912 or 5/16-18 UNC, 1.75 long ANSI B 18.3 . Tightening torque $2,0^{+0,5}$ daNm [177^{+44} lb-in].

VALVES FOR MS HYDRAULIC MOTORS

SINGLE VALVE KPBS-250/1/E...



DUAL VALVE KPBS-250/1/D...



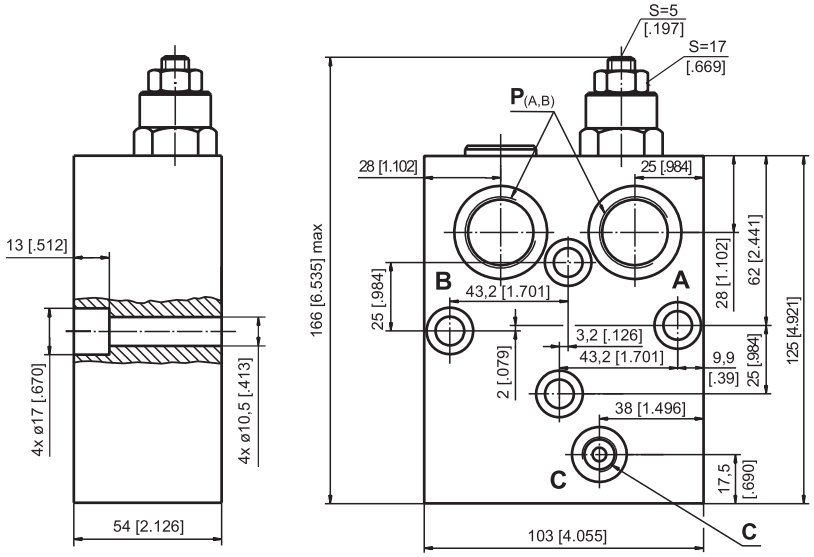
	Thread Ports - $P_{(A,B)}$	Thread Port - C
-	G1/2 16 [.63] depth	G1/4 12 [.47] depth
M	M22x1,5 16 [.63] depth	M14x1,5 12 [.47] depth
A	7/8 - 14 UNF O-ring 16 [.63] depth	7/16 - 20 UNF O-ring 12,7 [.50] depth

mm [in]

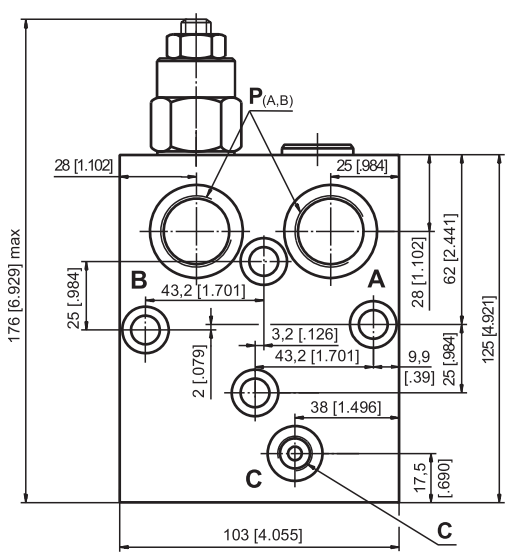
Note : KPBS Blocks are installed directly on MS Motors with two screws M10x45 - 8.8 DIN 912 or 3/8-16UNC, 1.75 long ANSI B 18.3 . Tightening torque 3,5 daNm [310 lb-in].

VALVES FOR MT HYDRAULIC MOTORS

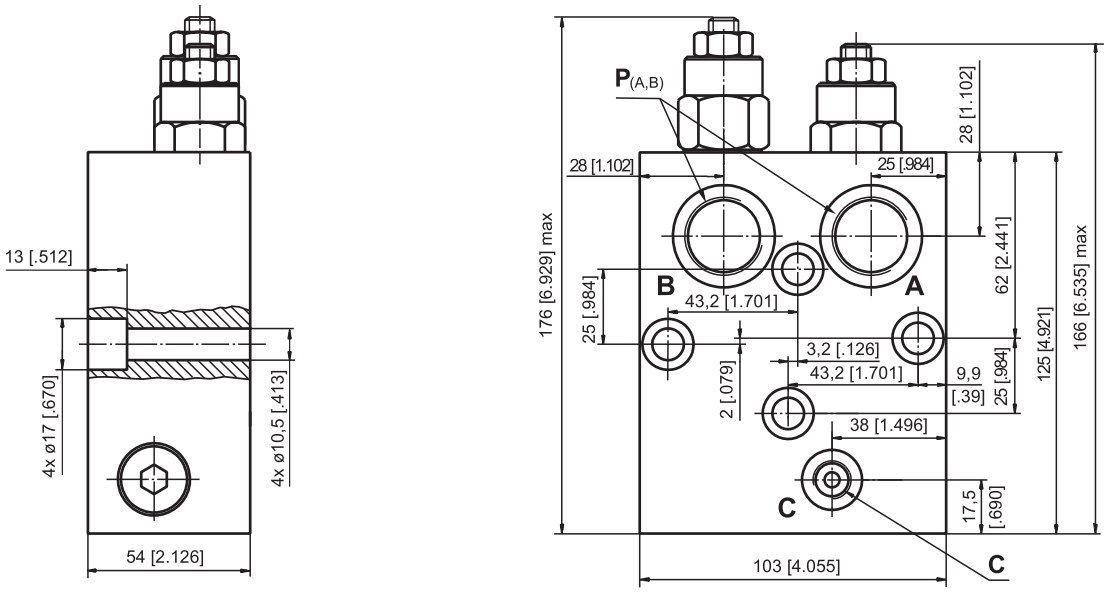
SINGLE VALVE KPBT-250/1/AE...



SINGLE VALVE KPBT-250/1/BE...



DUAL VALVE KPBT-250/1/D...



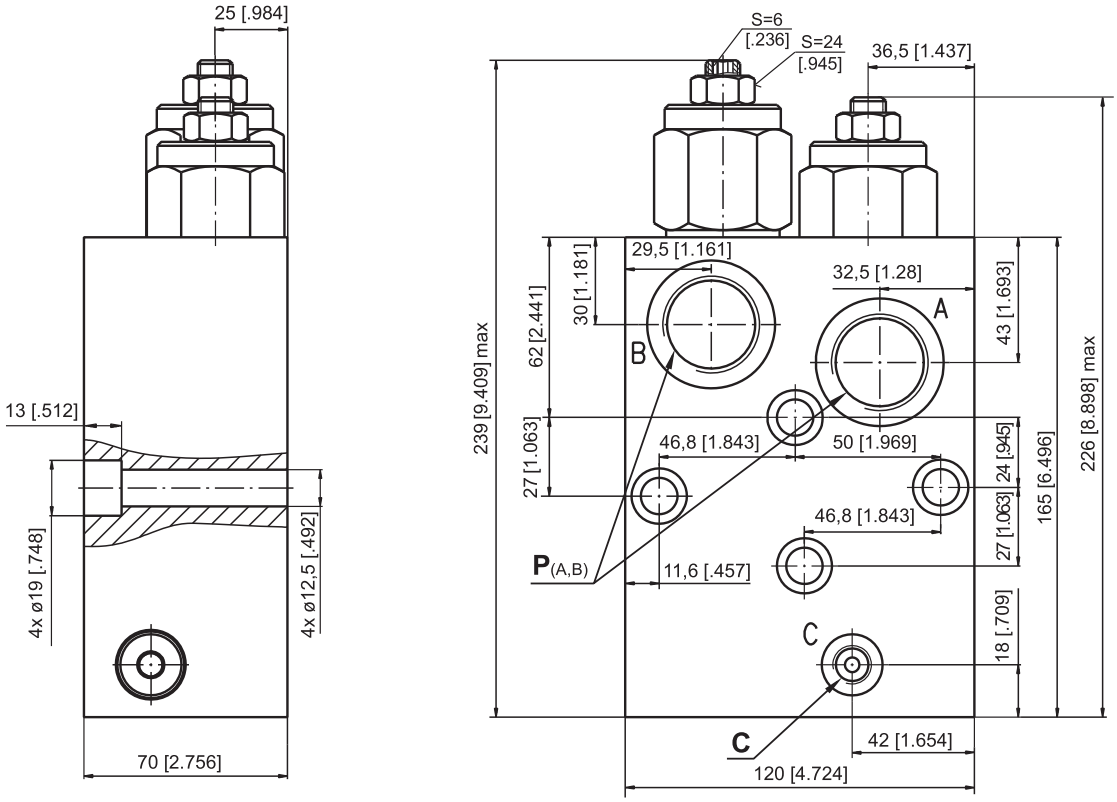
	Thread Ports - $P_{(A,B)}$	Thread Port - C
-	G3/4 17 [.67] depth	G1/4 14 [.55] depth
M	M27x2 17 [.67] depth	M14x1,5 14 [.55] depth
A	1 1/16-12 UN O-ring 17 [.67] depth	7/16 - 20 UNF O-ring 12,7 [.50] depth

mm [in]

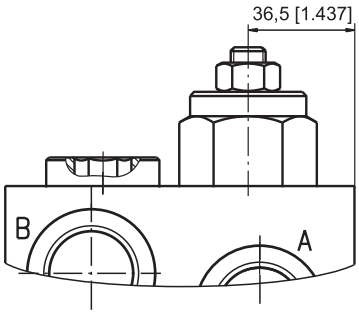
Note : KPBT Blocks are installed directly on MT Motors with four screws M10x50 - 8.8 DIN 912. Tightening torque 3,5 daNm [310 lb-in].

VALVES FOR MV HYDRAULIC MOTORS

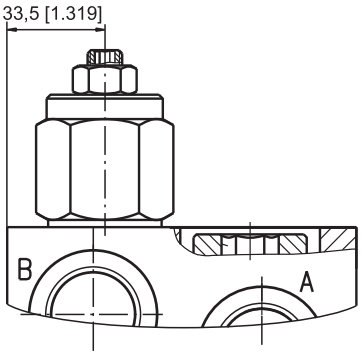
DUAL VALVE KPBV-250/1/D...



SINGLE VALVE KPBV-250/1/AE...



SINGLE VALVE KPBV-250/1/BE...



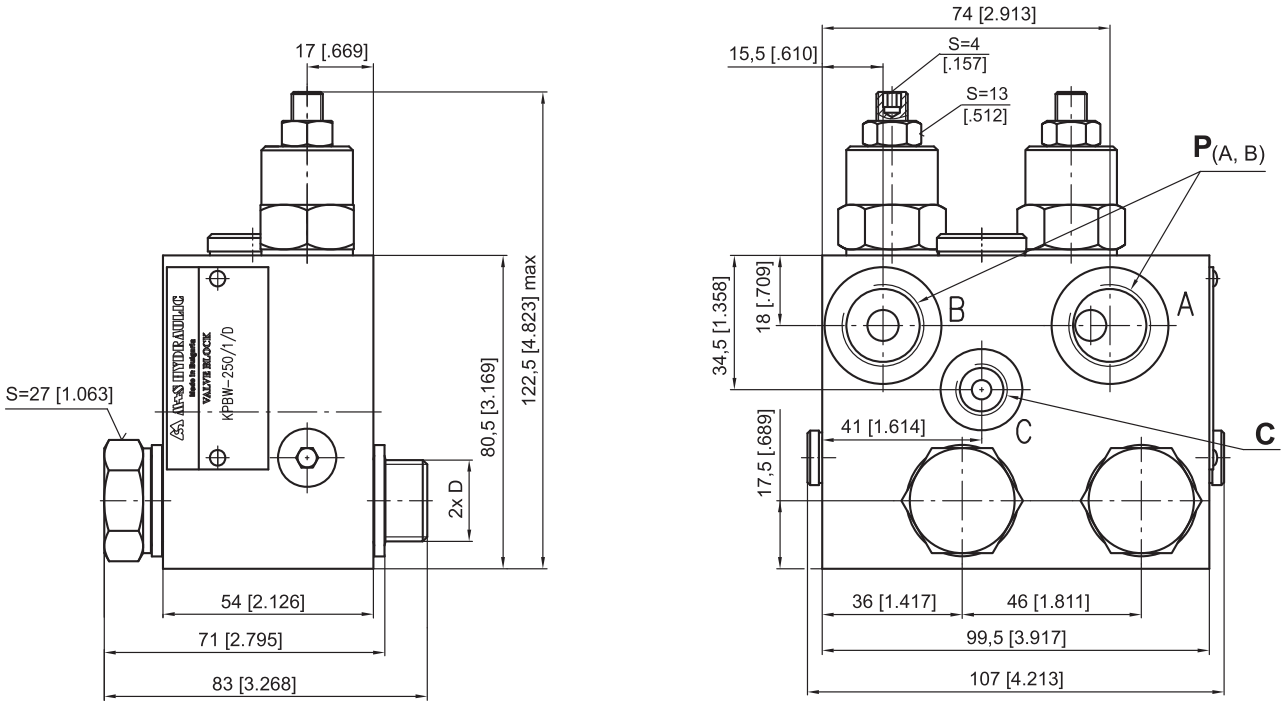
	Thread Ports - $P_{(A,B)}$	Thread Port - C
-	G 1 20 [.79] depth	G1/4 14 [.55] depth
M	M33x2 20 [.79] depth	M14x1,5 14 [.55] depth
A	1 5/16 - 12 UN O-ring 20 [.79] depth	7/16 - 20 UNF O-ring 12,7 [.50] depth

mm [in]

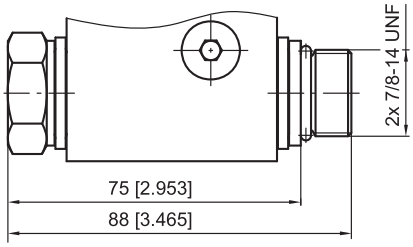
Note : KPBV Blocks are installed directly on MV Motors with four screws M12x70 - 8.8 DIN 912. Tightening torque 6,5 daNm [575 lb-in].

VALVES FOR RW and HW HYDRAULIC MOTORS

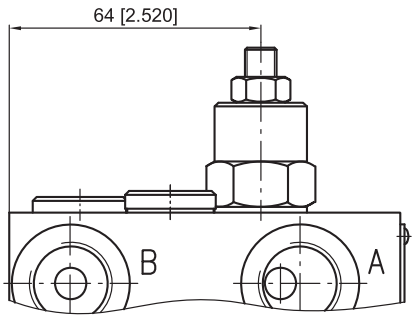
DUAL VALVE KPBW-250/1/D...



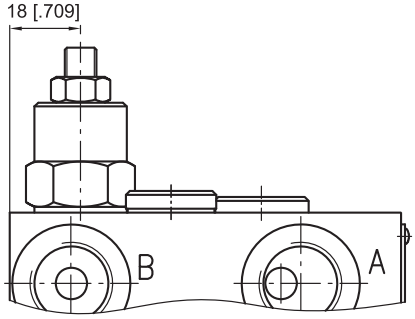
KPBW-...A



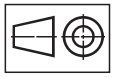
SINGLE VALVE KPBW-250/1/AE...



SINGLE VALVE KPBW-250/1/BE...



	Thread Ports - $P_{(A,B)}$	Thread Port - C	Thread Ports - D
-	G1/2 16 [.63] depth	G1/4 12 [.47] depth	G1/2 12 [.47] length
M	M22x1,5 16 [.63] depth	M14x1,5 12 [.47] depth	M22x1,5 12 [.47] length
A	7/8 - 14 UNF O-ring 16 [.63] depth	7/16 - 20 UNF O-ring 12,7 [.50] depth	7/8 - 14 UNF O-ring 13 [.51] length

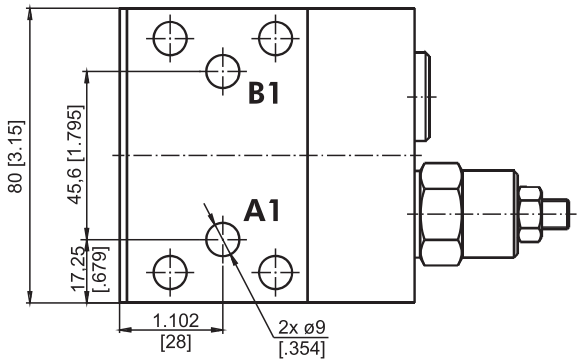


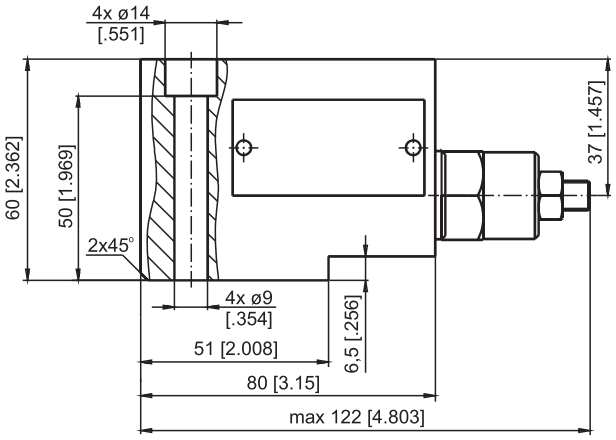
mm [in]

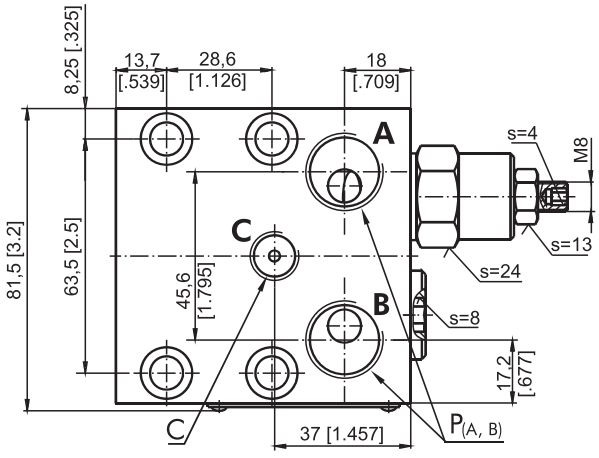
Note : KPBW Blocks assembly to RW or HW motors is done with two screws (thread D) included in the valve set. Tightening torque 8 daNm [710 lb-in].

VALVES FOR HP, HR HYDRAULIC MOTORS

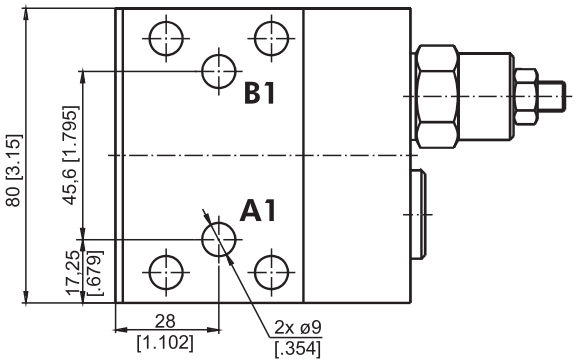
SINGLE VALVE KPBHR-250/1/AE...

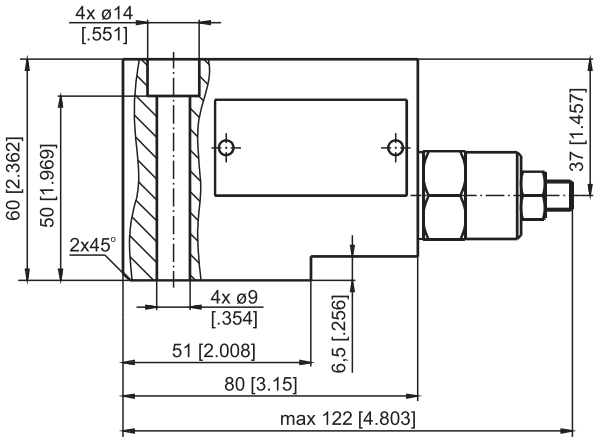


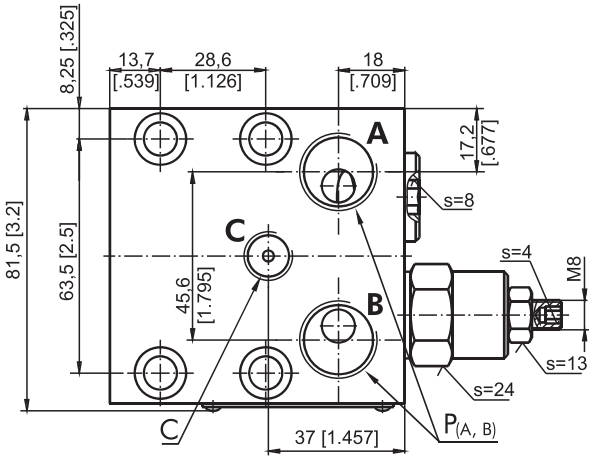




SINGLE VALVE KPBHR-250/1/BE...







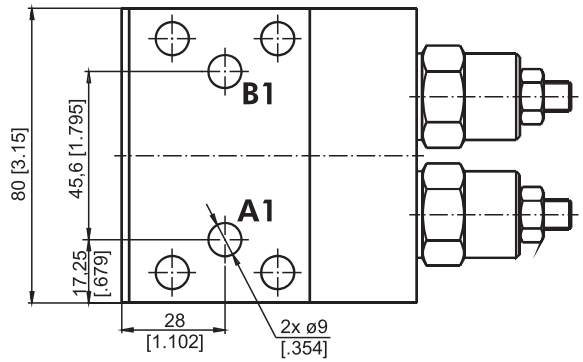
	Thread Ports - $P_{(A,B)}$	Thread Ports - C
A	7/8 - 14 UNF O-ring 17 [.67] deep	7/16 - 20 UNF O-ring 12,7 [.50] deep
-	G1/2 17 [.67] deep	G1/4 14 [.55] deep
M	M22x1,5 17 [.67] deep	M14x1,5 14 [.55] deep

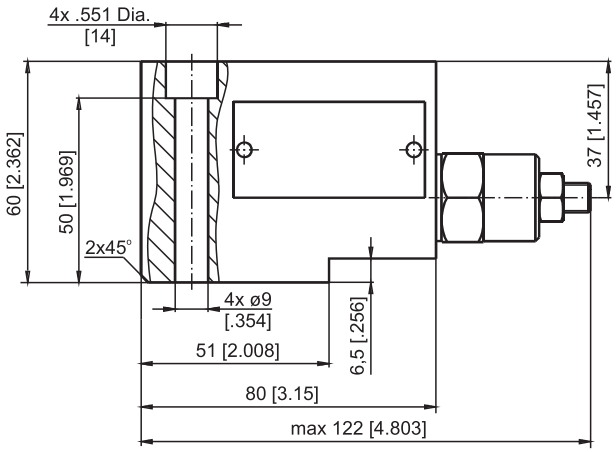
mm [in]

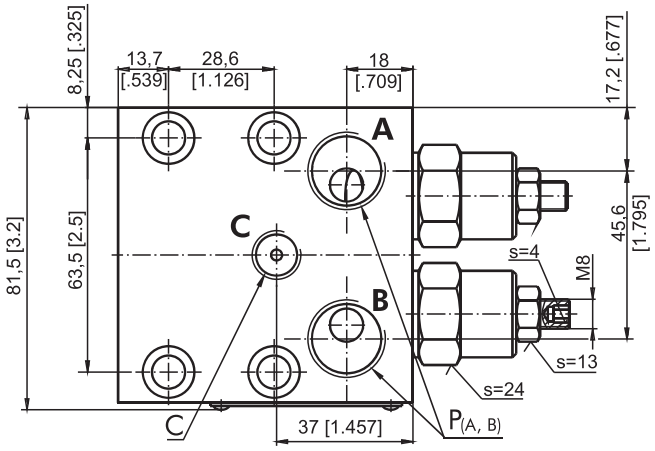
Note : **KPBHR** Blocks are installed directly on HP and HR Motors with four bolts 5/16-18UNC, 2.5 long or M8x60 - 8.8 DIN 912. Tightening torque $2,0^{+0,5}$ daNm [177^{+44} lb-in].

VALVES FOR HP, HR HYDRAULIC MOTORS

DUAL VALVE KPBHR-250/1/D...







	Thread Ports - $P_{(A,B)}$	Thread Ports - C
A	7/8 - 14 UNF O-ring 17 [.67] deep	7/16 - 20 UNF O-ring 12,7 [.50] deep
-	G1/2 17 [.67] deep	G1/4 14 [.55] deep
M	M22x1,5 17 [.67] deep	M14x1,5 14 [.55] deep

mm [in]

Note : **KPBHR** Blocks are installed directly on HP and HR Motors with four bolts 5/16-18UNC, 2.5 long or M8x60 - 8.8 DIN 912. Tightening torque $2,0^{+0,5}$ daNm [177^{+44} lb-in].

ORDER CODE - OVERCENTER VALVES WITH BRAKE CONTROL

	1	2	3	4	5	6	7
KPB		-		/		/				

Pos.1 - Housing Type

R	- Valve block for MP, MR and MH Motors
S	- Valve block for MS Motors
W	- Valve block for RW and HW Motors
T	- Valve block for MT Motors
V	- Valve block for MV Motors
HR	- Valve block for HP and HR Motors

Pos.2 - Pressure Range, bar [PSI]

250	- 70÷250 [1015÷3625], Std Setting 250 bar@5 lpm

Pos.3 - Pilot Ratio

1	- 4,25:1

Pos.4 - Number of Valves

D	- Two Valves - Dual
E	- One Valve - Single (for R and S only)
AE	- One Valve on line A - Single (for T,V,W,HP and HR)
BE	- One Valve on line B - Single (for T,V,W,HP and HR)

Pos.5 - Threaded Ports

omit	- BSPP thread - ISO 228
M	- Metric thread - ISO 262
A	- Unified inch screw threads ANSI B 1.1 - 1982

Pos.6 - Option [Paint]**

omit	- no Paint
P	- Painted
PC	- Corrosion Protected Paint

Pos.7 - Design Series

omit	- Factory specified

Notes: * Color at customer's request.

ORDER CODE - SWITCH VALVES

	1	2	3	4
KPW				

Pos.1 - Housing Type

R	- Valve block for MP, MR and MH Motors
S	- Valve block for MS Motors
T	- Valve block for MT Motors
V	- Valve block for MV Motors

Pos.2 - Threaded Ports

omit	- BSPP thread - ISO 228
M	- Metric thread - ISO 262
A	- Unified inch screw threads ANSI B 1.1 - 1982

Pos.3 - Option [Paint]**

omit	- no Paint
P	- Painted
PC	- Corrosion Protected Paint

Pos.4 - Design Series

omit	- Factory specified

Notes: * Color at customer's request.

ORDER CODE - CROSSOVER RELIEF VALVE

	1	2	3		4	5	6
KP				/			

Pos.1 - Number of Valves

D	- Two Valves - Dual
E	- One Valve - Single (for **R** and **S** only)
EA	- One Valve on line A - Single (for **T, V** and **W** only)
EB	- One Valve on line B - Single (for **T, V** and **W** only)

Pos.2 - Housing Type

R	- Valve block for MP, MR and MH Motors
S	- Valve block for MS Motors
W	- Valve block for RW and HW Motors
T	- Valve block for MT Motors
V	- Valve block for MV Motors

Pos.3 - Pressure Range, bar [PSI]

100*	- 30÷100 [435÷1450], Std Setting 100 bar@5 lpm
210*	- 50÷210 [725÷3050], Std Setting 210 bar@5 lpm
300*	- 80÷300 [1160÷4350], Std Setting 250 bar@5 lpm
210**	- 80÷210 [1160÷3050], Std Setting 210 bar@5 lpm
100***	- 10÷100 [145÷1450], Std Setting 100 bar@5 lpm
250***	- 20÷250 [290÷3625], Std Setting 250 bar@5 lpm

Pos.4 - Threaded Ports

omit	- BSPP thread - ISO 228
M	- Metric thread - ISO 262
A	- Unified inch screw threads ANSI B 1.1 - 1982

Pos.5 - Option [Paint]***

omit	- no Paint
P	- Painted
PC	- Corrosion Protected Paint

Pos.6 - Design Series

omit	- Factory specified

Notes:
* Useful for types **R** and **S** only.
** Useful for types **T** only.
*** Useful for types **V** only.
**** Color at customer's request.

The Valve Blocks are mangano phosphatized as standard.

ORDER CODE - CROSSOVER RELIEF VALVE

	1	2	3		4	5	6
K P				/			

Pos.1 - Number of Valves

D	- Two Valves - Dual

Pos.2 - Housing Type

HR	- Valve block for HR Motors
RK	- Valve block for RK and GHL Motors

Pos.3 - Pressure Range, bar [PSI]

40	- 10÷ 40 [145÷ 580], Std Setting 100 bar@5 lpm
100	- 30÷100 [435÷1450], Std Setting 100 bar@5 lpm
250	- 80÷250 [1160÷3625], Std Setting 250 bar@5 lpm

Pos.4 - Threaded Ports

omit	- BSPP thread - ISO 228
M	- Metric thread - ISO 262
A	- Unified inch screw threads ANSI B 1.1 - 1982

Pos.5 - Option [Paint]*

omit	- no Paint
P	- Painted
PC	- Corrosion Protected Paint

Pos.6 - Design Series

omit	- Factory specified

Notes: * Color at customer's request.

The Valve Blocks are mangano phosphatized as standard.

MOTOR-BRAKE SPECIAL FEATURES

Special Feature Description	Order Code	Motor type					
		B/MR	MT/B	MT/BX	MTM/B	SW	TW
Low Leakage	LL	O	-	O	O	-	-
Low Speed Valving	LSV	O	-	O	O	-	-
Free Running	FR	-	-	-	O		-
Reinforced Unit	HD	-	O	-	O	-	-
Reverse Rotation	R	O	O	O	O	-	-
Paint*	P	O	O	O	O	O	O
Corrosion Protected Paint*	PC	O	O	O	O	O	O
Special Paint**	PS	O	O	O	O	O	O
	PCS						
Check Valves		S	S***	S	-	S	S

O	Optional
-	Not applicable
S	Standard

* Colour at customer's request.
** Non painted feeding surfaces, colour at customer's request.
*** Without check valves for **HD** option.

APPLICATION CALCULATION

VEHICLE DRIVE CALCULATIONS

1.Motor speed: n, RPM

$$n = \frac{2{,}65 \times v_{km} \times i}{R_m} \qquad n = \frac{168 \times v_{mi} \times i}{R_{in}}$$

v_{km} - vehicle speed, km/h;
v_{mi} - vehicle speed, mil/h;
R_m - wheel rolling radius, m;
R_{in} - wheel rolling radius, in;
i - gear ratio between motor and wheels.
If no gearbox, use i=1.

2.Rolling resistance: RR, daN [lbs]
The resistance force resulted in wheels contact with different surfaces:

$$RR = G \times \rho$$

G- total weight loaded on vehicle, daN [lbs];
ρ- rolling resistance coefficient (Table 1).

Table 1

Rolling resistance coefficient In case of rubber tire rolling on different surfaces	
Surface	**ρ**
Concrete- faultless	0.010
Concrete- good	0.015
Concrete- bad	0.020
Asphalt- faultless	0.012
Asphalt- good	0.017
Asphalt- bad	0.022
Macadam- faultless	0.015
Macadam- good	0.022
Macadam- bad	0.037
Snow- 5 cm	0.025
Snow- 10 cm	0.037
Polluted covering- smooth	0.025
Polluted covering- sandy	0.040
Mud	0.037÷0.150
Sand- Gravel	0.060÷0.150
Sand- loose	0.160÷0.300

3.Grade resistance: GR, daN [lbs]

$$GR = G \times (\sin\alpha + \rho \times \cos\alpha)$$

α- gradient negotiation angle (Table 2)

Table 2

Grade %	α Degrees	Grade %	α Degrees
1%	0° 35'	12%	6° 5'
2%	1° 9'	15%	8° 31'
5%	2° 51'	20%	11° 19'
6%	3° 26'	25%	14° 3'
8%	4° 35'	32%	18°
10%	5° 43'	60%	31°

4. Acceleration force: FA, daN [lbs]
Force **FA** necessary for acceleration from 0 to maximum speed **v** and time **t** can be calculated with a formula:

$$FA = \frac{v_{km} \times G}{36 \times t}, [daN] \qquad FA = \frac{v_{mi} \times G}{22 \times t}, [lbs];$$

FA- acceleration force, daN [lbs];
t- time, [s].

5.Tractive effort: DP, daN [lbs]
Tractive effort DP is the additional force of trailer. This value will be established as follows:
-acc.to constructor's assessment;
-as calculating forces in items 2, 3 and 4 of trailer; the calculated sum corresponds to the tractive effort requested.

6.Total tractive effort: TE, daN [lbs]
Total tractive effort **TE** is total effort necessary for vehicle motion; that the sum of forces calculated in items from 2 to 5 and increased with 10 % because of air resistance.

$$TE = 1{,}1 \times (RR + GR + FA + DP)$$

RR - force acquired to overcome the rolling resistance;
GR- force acquired to slope upwards;
FA- force acquired to accelerate (acceleration force);
DP- additional tractive effort (trailer).

7.Motor Torque moment: M, daNm [lb-in]
Necessary torque moment for every hydraulic motor:

$$M = \frac{TE \times R_m[R_{in}]}{N \times i \times \eta_M}$$

N- motor numbers;
η_M - mechanical gear efficiency (if it is available).

8.Cohesion between tire and road covering: M_W, daNm [lb-in]

$$M_W = \frac{G_W \times f \times R_m[R_{in}]}{i \times \eta_M}$$

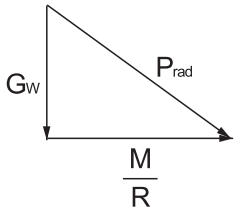
To avoid wheel slipping, the following condition should be observed $M_W > M$
f - frictional factor;
G_W - total weight over the wheels, daN [lbs].

Table 3

Surface	Frictional factor f
Steel on steel	0.15 ÷ 0.20
Rubber tire on polluted surface	0.5 ÷ 0.7
Rubber tire on asphalt	0.8 ÷ 1.0
Rubber tire on concrete	0.8 ÷ 1.0
Rubber tire on grass	0.4

9.Radial motor loading: P_{rad} , daN [lbs]

When motor is used for vehicle motion with wheels mounted directly on motor shaft, the total radial loading of motor shaft P_{rad} is a sum of motion force and weight force acting on one wheel.



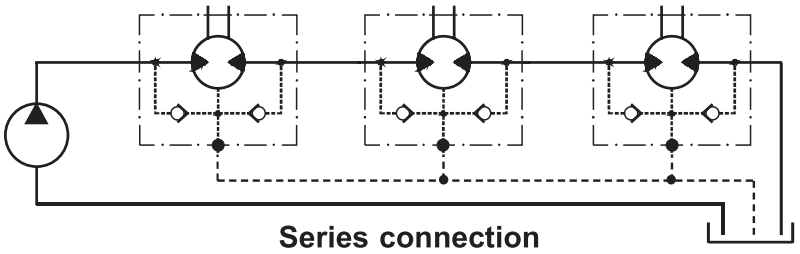
$$P_{rad}=\sqrt{G_W^2+\left(\frac{M}{R}\right)^2}$$

G_W - Weight held by wheel;
P_{rad} - Total radial loading of motor shaft;
M/R- Motion force.

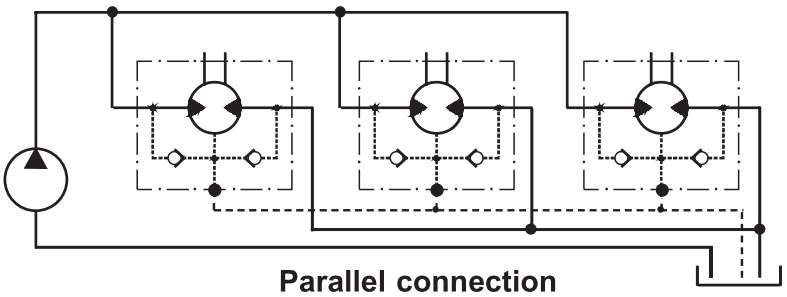
In accordance with calculated loadings the suitable motor from the catalogue is selected.

DRAINAGE SPACE AND DRAINAGE PRESSURE

Advantages in oil drainage from drain space: Cleaning; Cooling and Seal lifetime prolonging.



Series connection



Parallel connection

WARRANTY

M+S Hydraulic warrants, that its products, supplied directly to original equipment manufacturer, authorized distributor or other customer, will be free of defects in material or workmanship at the time of shipment from M+S Hydraulic and will conform to the products technical documentation (drawings and specifications) under sale agreement with Buyer.

This warranty will apply only to defects appearing within applicable Warranty period, mentioned below. If Buyer notifies M+S Hydraulic within the Warranty period about any such defects, M+S, at its sole option will replace or repair the defective products or their parts found by M+S Hydraulic to be defective in material or workmanship.

THE FOREGOING LIMITED WARRANTY IS AVAILABLE ONLY IF “M+S HYDRAULIC” IS PROMPTLY NOTIFIED IN WRITTEN OF THE ALLEGED DEFECT AND DOES NOT COVER FAILURE TO FUNCTION CAUSED BY DAMAGE TO THE PRODUCT, IMPROPER INSTALLATION, UNREASONABLE USE OR ABUSE OF THE PRODUCT, FAILURE TO PROVIDE OR USE OF IMPROPER MAINTENANCE OR USUAL, DEGRADATION OF THE PRODUCT DUE TO PHYSICAL ENVIRONMENTS OF AN USUAL NATURE. THE FOREGOING REMEDIES ARE THE SOLE AND EXCLUSIVE REMEDIES AVAILABLE TO CUSTOMER. To facilitate the inspection, M+S Hydraulic may require return of the product/part, which Buyer claims to be defective.

M+S Hydraulic shall not be liable for labor costs or any other expenses incurred during the disassembling or reinstalling of the product/part.

In case the claimed products are returned to M+S Hydraulic in bad condition: dirty, disassembled, with damaged or missing parts during transportation, the warranty will be considered as not applicable and the products will not be liable to repair.

Warranty periods

New products: The Warranty period is limited to 24 consecutive months (2 years) from the date of production of the product.

Repaired products: If the product is repaired in M+S Hydraulic during its warranty period, the warranty period of the repaired item shall continue for the balance of original Warranty period or for a period equal to 50% of the original new product Warranty period, whichever is later.

Spare parts: The Warranty period for Spare parts is 12 consecutive months (1 year) from the dispatch date of such parts from M+S Hydraulic.

LIMITATION OF LIABILITY M+S Hydraulic's liability for claim of any kind, for loss or damage arising out of, connected with or resulting from an order, or from the performance or branch thereof, or from the design, manufacture, sale delivery, operation or use of any of its products shall be limited to, at M+S 's sole option, replacement, repair of any defective product or the issuance of a credit to Customer against any future purchases. Cash refunds will not be made under any circumstances and Customer will not be entitled to recover any damages of any kind against M+S Hydraulic, including but not limited to incidental or consequential damages, whether direct or indirect, known or unknown, foreseen or unforeseen.