



**M+S HYDRAULIC**

# **HYDRAULIC BRAKES MOTOR-BRAKES & VALVE BLOCKS**



# ACCESSORIES and MOTOR-BRAKES

## CONTENTS

|                                                                                  | Page |
|----------------------------------------------------------------------------------|------|
| • Hydraulic Disc Brake for MP, MR and MS type LB/288 .....                       | 3    |
| • Hydraulic Disc Brake for MSS type LBS/289(290) and MSV type LBV/289(290) ..... | 6    |
| • Hydraulic Disc Brake for MTS type LBS/314(315) and MTV type LBV/314(315) ..... | 10   |
| • Hydraulic Disc Brake for MVS type LBS/313 and type LBS/316 .....               | 14   |
| • Hydraulic Disc Brake type B...R .....                                          | 18   |
| • Hydraulic Disc Brake type B...T .....                                          | 19   |
| • Hydraulic Disc Brake type B-130K.....                                          | 20   |
| • Hydraulic Motor-brakes type B/MR .....                                         | 21   |
| • Hydraulic Motor-Brakes type MT/B .....                                         | 27   |
| • Hydraulic Motor-Brakes type MT/BX .....                                        | 31   |
| • Hydraulic Motor-brakes type MTM/B .....                                        | 35   |
| • Hydraulic Motor-brakes type SW .....                                           | 41   |
| • Hydraulic Motor-brakes type TW .....                                           | 44   |
| • Overcenter Valves with Brake Control .....                                     | 47   |
| • Switch Valves .....                                                            | 55   |
| • Crossover Relief Valves .....                                                  | 57   |
| • Motor-Brakes Special Features .....                                            | 68   |
| • Application Calculation .....                                                  | 69   |

"M+S HYDRAULIC" can accept no responsibility for possible errors in catalogues, brochures and other printed material.

"M+S HYDRAULIC" reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequential changes being necessary in specifications already agreed.

# HYDRAULIC DISC BRAKES LB, LBS, LBV- Wet



## APPLICATION

- » Heavy Duty machinery
- » Wheel drives
- » Material handling
- » Mining
- » Agricultural machines
- » Conveyors
- » Door openers and swing drives etc.



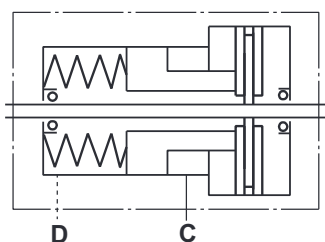
## GENERAL

|                                          |                                                                |
|------------------------------------------|----------------------------------------------------------------|
| <b>Fluid type</b>                        | Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)                |
| <b>Temperature range, °C [°F]</b>        | -40÷140 [-40÷284]                                              |
| <b>Viscosity range, mm<sup>2</sup>/s</b> | 20÷75 [98÷347]                                                 |
| <b>Filtration</b>                        | ISO code 20/16 (nominal filtration of 25 microns)              |
| <b>Maintenance</b>                       | Changed after the first 50-100 h, then after every 500-1500 h. |

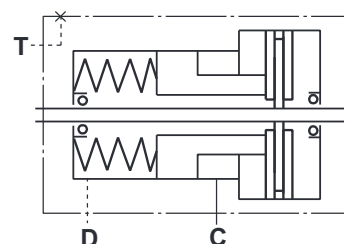
## CONTENTS

|                                                                 |     |
|-----------------------------------------------------------------|-----|
| Hydraulic Disc Brake for MP, MR and MS Motors type LB/288 ..... | 4÷5 |
| Hydraulic Disc Brake for MSS and MSV type LBS(V)/289 .....      | 6   |
| Hydraulic Disc Brake for MSS and MSV type LBS(V)/290 .....      | 7   |
| Output Shafts for LBS(LBV)/289, 290 .....                       | 8   |
| Specification data for LBS(LBV)/289, 290 .....                  | 8   |
| Internal Spline data for .../289,290 and .../314,315.....       | 8   |
| Load curve for LBS(LBV)/289, 290 .....                          | 9   |
| Order code for LB/288,LBS(LBV)/289, 290 .....                   | 9   |
| Hydraulic Disc Brake for MTS and MTV type LBS(LBV)/314 .....    | 10  |
| Hydraulic Disc Brake for MTS and MTV type LBS(LBV)/315 .....    | 11  |
| Specification data for LBS(LBV)/314, 315 .....                  | 12  |
| Load curve for LBS(LBV)/314, 315 .....                          | 12  |
| Output Shafts for LBS(LBV)/314, 315 .....                       | 13  |
| Order code for LBS(LBV)/314, 315 .....                          | 13  |
| Hydraulic Disc Brake for MVS type LBS/313 .....                 | 14  |
| Load curve for LBS/313 .....                                    | 14  |
| Hydraulic Disc Brake for MVS type LBS/316 .....                 | 15  |
| Load curve for LBS/316 .....                                    | 15  |
| Specification data for LBS/313, 316.....                        | 16  |
| Output Shafts for LBS/313, 316 .....                            | 16  |
| Internal Spline data for LBS/313, 316 .....                     | 17  |
| Order code for LBS/313, 316 .....                               | 17  |

### LB, LBS

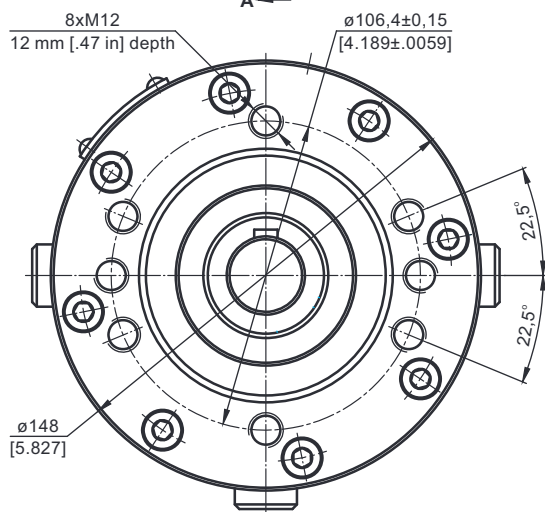
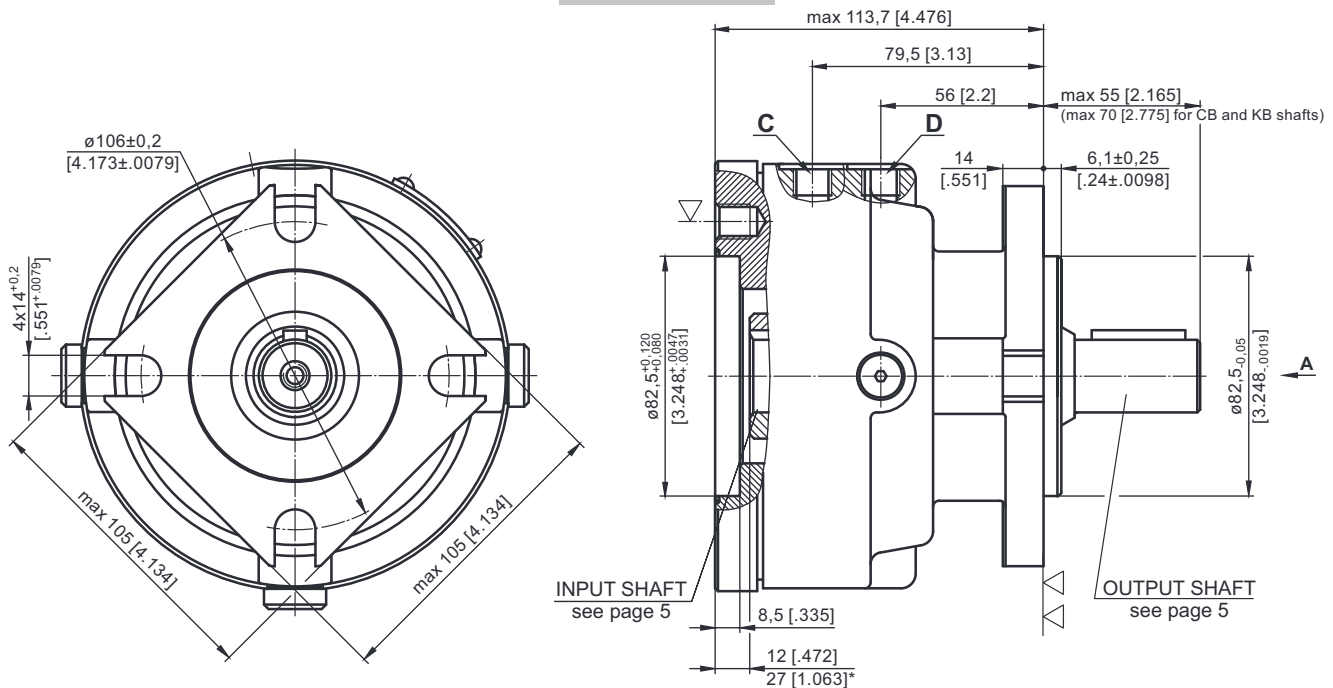


### LBV



# HYDRAULIC DISC BRAKE FOR FLANGE ATTACHMENT TO MP, MR AND MS HYDRAULIC MOTORS

## TYPE LB/288



▽ - Place for attachment (tightening torque for screw M12x30 - 12.9 DIN 912 - 7<sup>+0,5</sup> daNm [620<sup>+44</sup> lb-in])

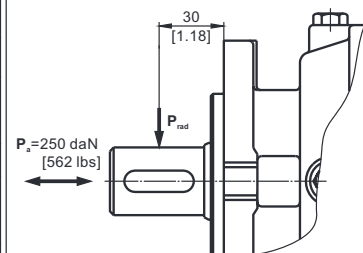
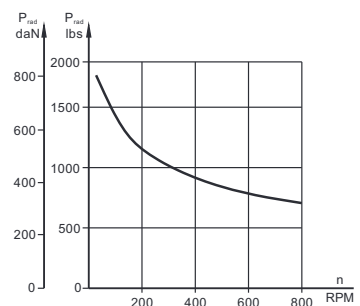
▽▽ - Place for attachment

C: Brake release Port - G<sup>1</sup>/<sub>4</sub>, 9 mm [0.35 in] depth

D: Drainage tap - G<sup>1</sup>/<sub>4</sub>, 9 mm [0.35 in] depth

\* - For Input Shaft Hole Versions **SH** and **SB**.

## LOAD CURVE



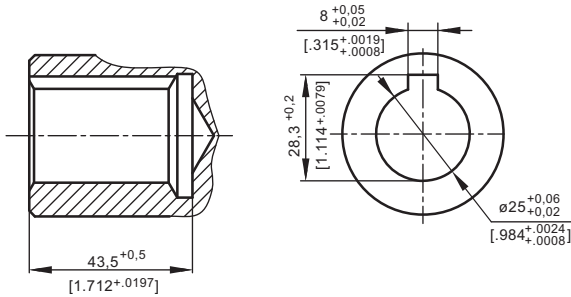
## SPECIFICATION DATA

| Description LB/288...                                                     | 7                     | 14                | 21                | 32                | 43                | 63                |
|---------------------------------------------------------------------------|-----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| *Min. Static Torque, daNm [lb-in]                                         | 6-8 [531-708]         | 13-15 [1150-1327] | 20-22 [1770-1947] | 31-34 [2743-3009] | 41-45 [3628-3982] | 61-64 [5399-5665] |
| Opening Pressure, min bar [PSI]                                           | 4-5 [58-73]           | 8-9 [116-130]     | 12-13 [174-188]   | 18-20 [260-290]   | 24-26 [348-377]   | 38-39 [550-565]   |
| max                                                                       | 300 [4350]            |                   |                   |                   |                   |                   |
| Min. oil quantity for brake releasing, cm <sup>3</sup> [in <sup>3</sup> ] | 7 - 8 [.427 - .488]   |                   |                   |                   |                   |                   |
| Oil volume, cm <sup>3</sup> [in <sup>3</sup> ]                            | 50 - 120 [3.5 - 7.35] |                   |                   |                   |                   |                   |
| Max. Pressure in drain space, bar [PSI]                                   | 0,5 [7.25]            |                   |                   |                   |                   |                   |
| Weight, kg [lb]                                                           | 9 [19.8]              |                   |                   |                   |                   |                   |

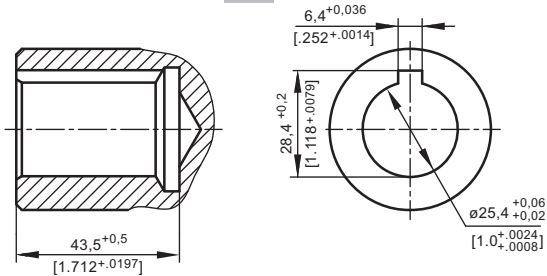
\*Static torque is obtained at working pressure - 0 bar [0 PSI].

## INPUT SHAFT HOLES

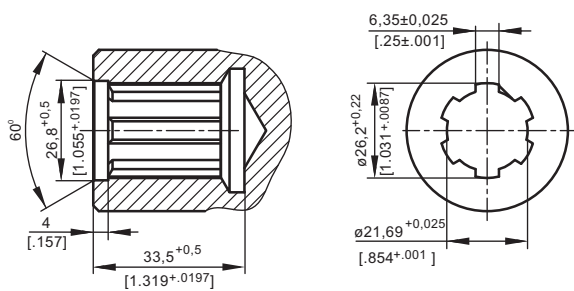
**C**



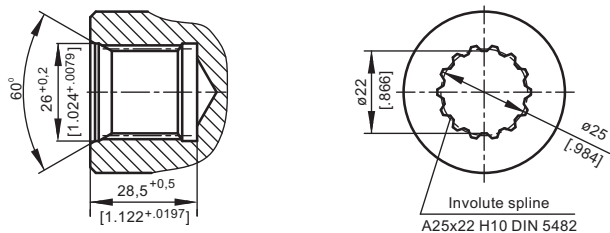
**CO**



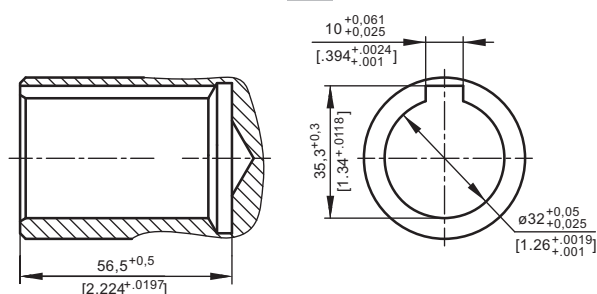
**SH**



**SB**

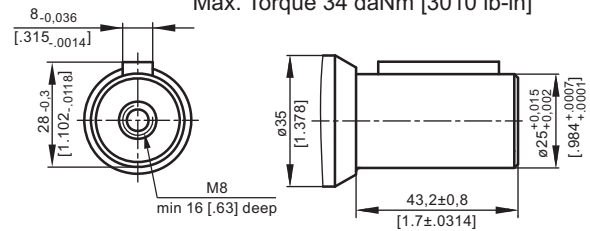


**CB**

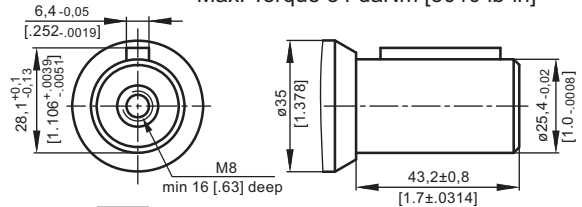


## OUTPUT SHAFT EXTENSIONS

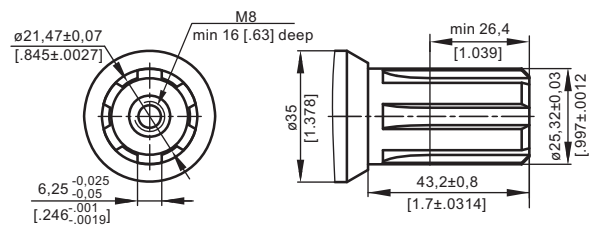
**C** -  $\varnothing 25$  straight, Parallel key A8x7x32 DIN 6885  
Max. Torque 34 daNm [3010 lb-in]



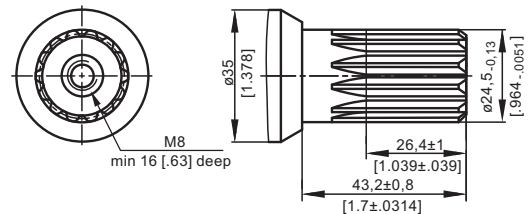
**CO** -  $\varnothing 1$ " straight, Parallel key  $\frac{1}{4}$ "x $\frac{1}{4}$ "x $\frac{1}{4}$ " BS46  
Max. Torque 34 daNm [3010 lb-in]



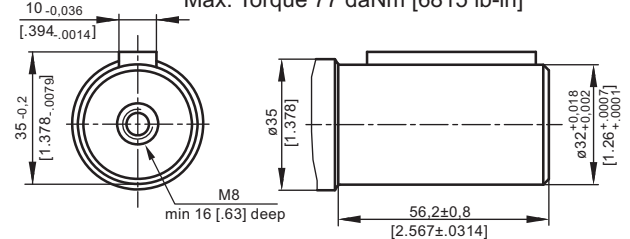
**SH** - splined, BS 2059 (SAE 6B)  
Max. Torque 40 daNm [3540 lb-in]



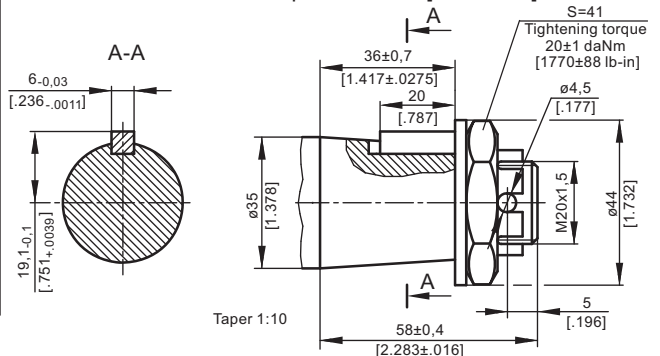
**SA** - splined, B25x22h9 DIN 5482  
Max. Torque 40 daNm [3540 lb-in]



**CB** -  $\varnothing 32$  straight, Parallel key A10x8x45 DIN 6885  
Max. Torque 77 daNm [6815 lb-in]

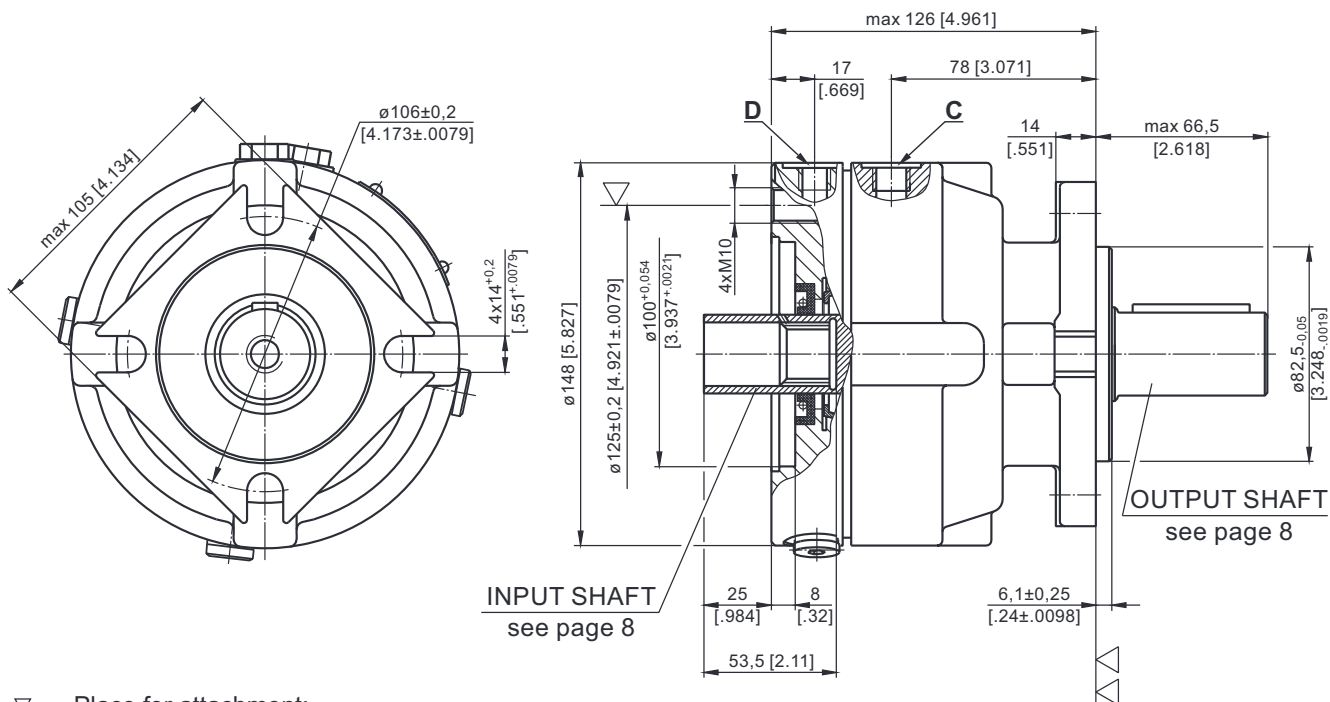


**KB** - tapered 1:10, Parallel key B6x6x20 DIN 6885  
Max. Torque 95 daNm [8400 lb-in]



# HYDRAULIC DISC BRAKE FOR FLANGE ATTACHMENT TO MSS AND MSV HYDRAULIC MOTORS

## TYPE LBS/289



▽ - Place for attachment:

LBS - tightening torque for screw M10x35 - 12.9 DIN 912 - 6,5<sup>+0,5</sup> daNm [575<sup>+44</sup> lb-in]

LBV - tightening torque for screw M10xL - 12.9 DIN 931 - 6,5<sup>+0,5</sup> daNm [575<sup>+44</sup> lb-in]

▽▽ - Place for attachment

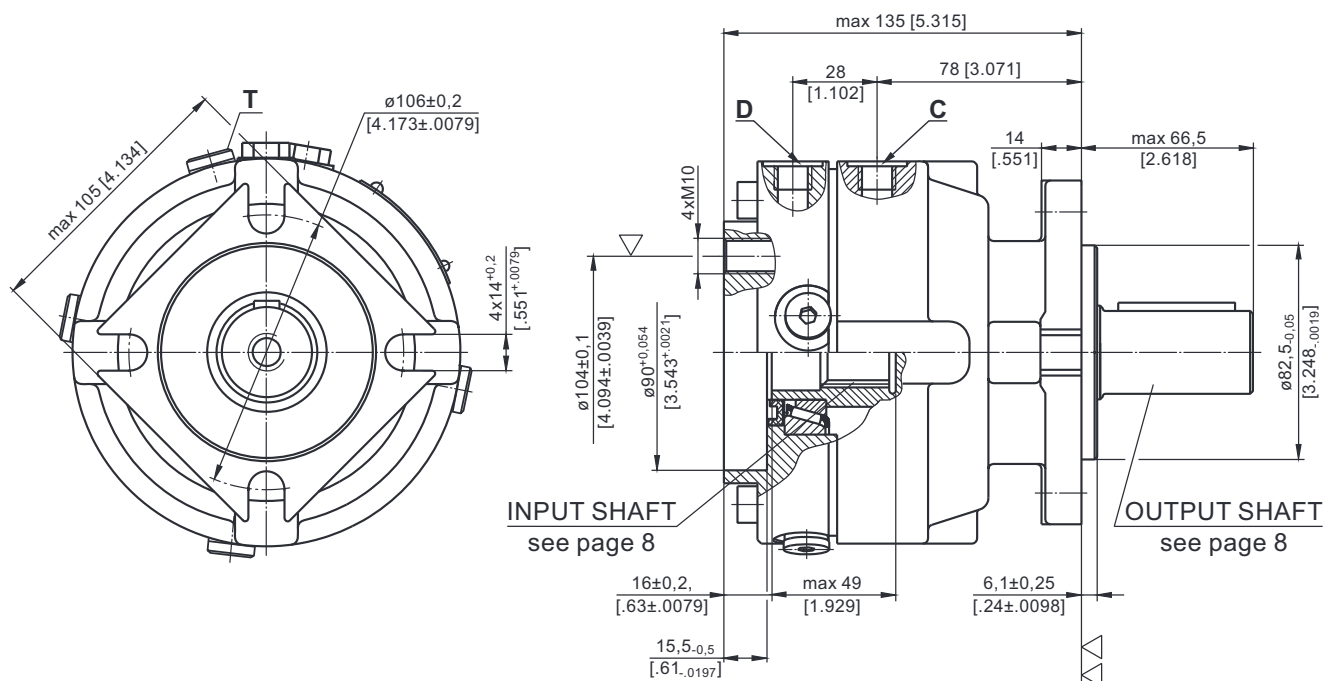


C: Brake release Port - G $\frac{1}{4}$ , 9 mm [.35 in] depth

D: Drain plug for the Brake - G $\frac{1}{4}$ , 9 mm [.35 in] depth

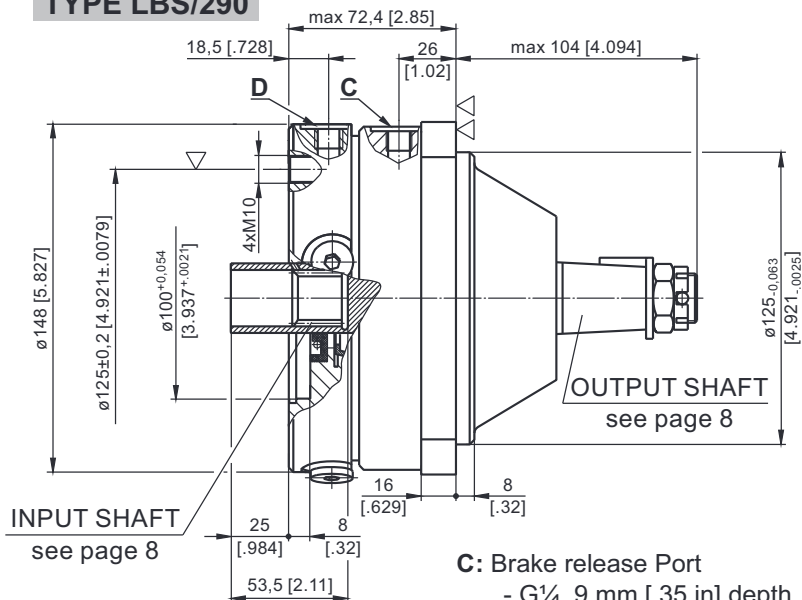
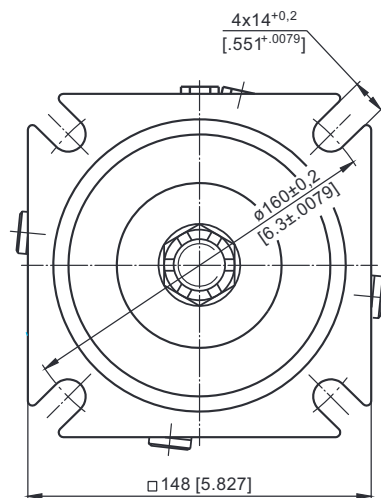
T: Drain plug for the Motor - G $\frac{1}{4}$ , 9 mm [.35 in] depth

## TYPE LBV/289



# HYDRAULIC DISC BRAKE FOR FLANGE ATTACHMENT TO MSS AND MSV HYDRAULIC MOTORS

## TYPE LBS/290



▽ - Place for attachment

LBS - tightening torque for screw M10x35 - 12.9 DIN 912 - 6,5<sup>+5</sup> daNm [575<sup>+44</sup> lb-in]

LBV - tightening torque for screw M10xL - 12.9 DIN 931 - 6,5<sup>+5</sup> daNm [575<sup>+44</sup> lb-in]

▽▽ - Place for attachment

**C:** Brake release Port

- G $\frac{1}{4}$ , 9 mm [.35 in] depth

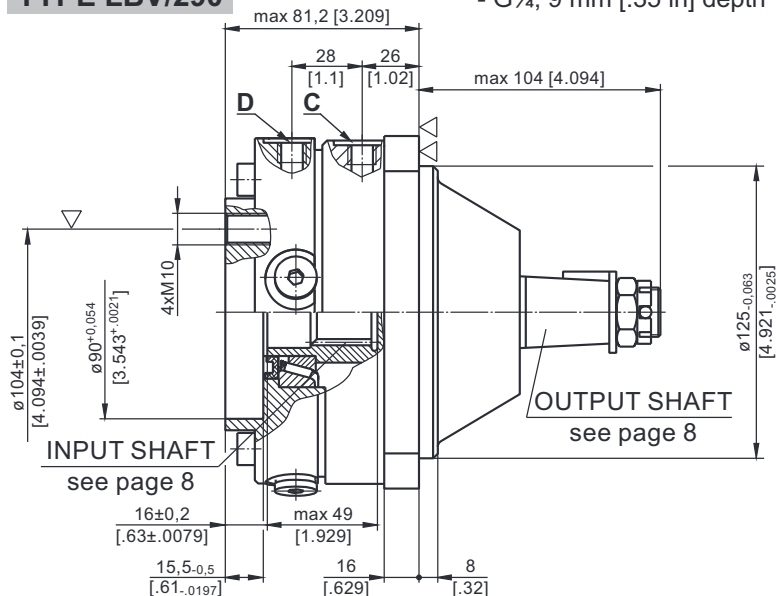
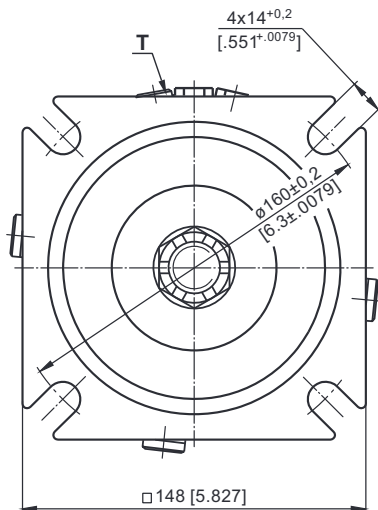
**D:** Drain plug for the Brake

- G $\frac{1}{4}$ , 9 mm [.35 in] depth

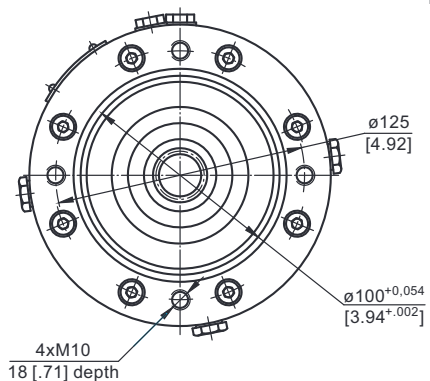
**T:** Drain plug for the Motor

- G $\frac{1}{4}$ , 9 mm [.35 in] depth

## TYPE LBV/290



## TYPE LBS/289(290)

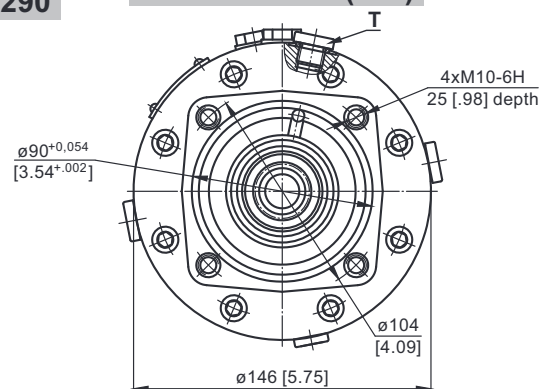


## INPUT FACE For Versions 289 and 290



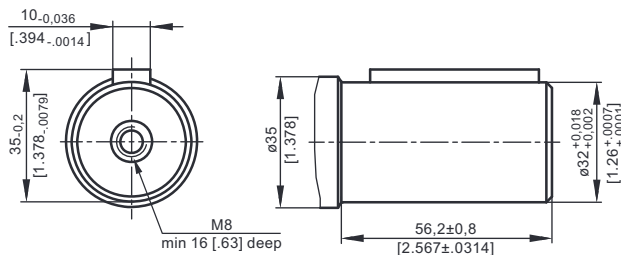
mm [in]

## TYPE LBV/289(290)

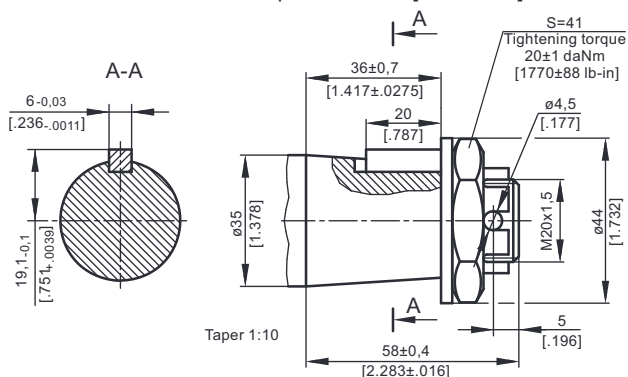


## OUTPUT SHAFT EXTENSIONS

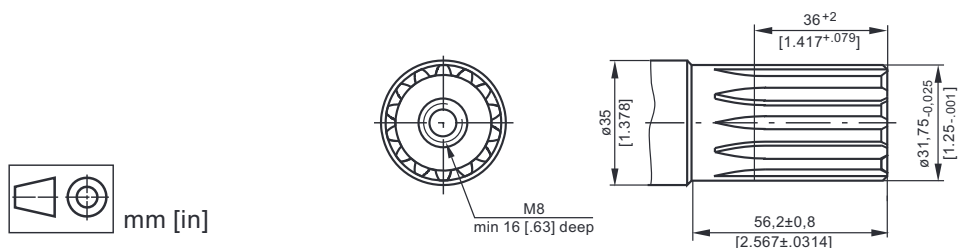
**CB** -  $\varnothing 32$  straight, Parallel key A10x8x45 DIN 6885  
Max. Torque 77 daNm [6815 lb-in]



**KB** - tapered 1:10, Parallel key B6x6x20 DIN 6885  
Max. Torque 95 daNm [8400 lb-in]



**SH** -  $\varnothing 1\frac{1}{4}$ " splined 14T, DP12/24 ANS B92.1-1970  
Max. Torque 95 daNm [8400 lb-in]



## SPECIFICATION DATA

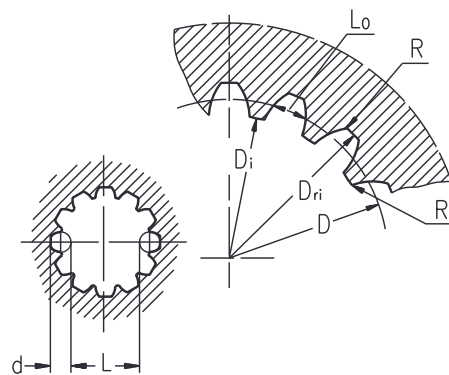
| Description<br>LBS/289(290)<br>LBV/289(290)                                 | 21                     | 32                   | 43                   | 63                   | L43                  | L63                  |
|-----------------------------------------------------------------------------|------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| *Min. Static Torque,<br>daNm [lb-in]                                        | 20-22<br>[1770-1947]   | 31-34<br>[2743-3009] | 41-45<br>[3628-3982] | 61-64<br>[5399-5665] | 41-45<br>[3628-3982] | 61-64<br>[5399-5665] |
| Opening Pressure, min<br>bar [PSI]                                          | 12-13<br>[174-188]     | 18-20<br>[260-290]   | 24-26<br>[348-377]   | 37-39<br>[540-565]   | 20-22<br>[290-320]   | 21-23<br>[305-333]   |
| max                                                                         | 300 [4350]             |                      |                      |                      |                      |                      |
| Min. oil quantity for brake<br>releasing cm <sup>3</sup> [in <sup>3</sup> ] | 7 - 8 [.427 - .488]    |                      |                      |                      |                      |                      |
| Oil volume cm <sup>3</sup> [in <sup>3</sup> ]                               | 50 - 120 [3.05 - 7.35] |                      |                      |                      |                      |                      |
| Max. Pressure in drain<br>space bar [PSI]                                   | 5 [72]                 |                      |                      |                      |                      |                      |
| Weight kg [lb]                                                              | 9 [19.8]               |                      |                      |                      |                      |                      |

\* Static torque is obtained at working pressure - 0 bar [0 PSI].

## INTERNAL SPLINE DATA FOR THE ATTACHED COMPONENT

| Fillet Root Side Fit             |                 | LBS(V)/289<br>LBS(V)/290 |               | LBS(V)/314<br>LBS(V)/315 |               |
|----------------------------------|-----------------|--------------------------|---------------|--------------------------|---------------|
|                                  |                 | mm                       | inch          | mm                       | inch          |
| Number of Teeth                  | z               | 12                       | 12            | 16                       | 16            |
| Diametral Pitch                  | DP              | 12/24                    | 12/24         | 12/24                    | 12/24         |
| Pressure Angle                   |                 | 30°                      | 30°           | 30°                      | 30°           |
| Pitch Dia.                       | D               | 25,4                     | 1             | 33,8656                  | 1.3333        |
| Major Dia.                       | D <sub>ri</sub> | 28,0 <sup>+0,1</sup>     | 1.1 ± 1.098   | 38,4 <sup>+0,4</sup>     | 1.5118±1.5275 |
| Minor Dia.                       | D <sub>i</sub>  | 23,0 <sup>+0,033</sup>   | .907 ± .905   | 32,15 <sup>+0,06</sup>   | 1.2657±1.2673 |
| Space Width [Circular]           | Lo              | 4,308±0,020              | .1704 ± .1688 | 4,516±0,037              | .1763±.1791   |
| Fillet Radius                    | R               | 0,2                      | .008          | 0,5                      | .02           |
| Max. Measurement<br>between Pins | L               | 17,62 <sup>+0,15</sup>   | .699 ± .694   | 26,9 <sup>+0,10</sup>    | 1.063±1.059   |
| Pin Dia.                         | d               | 4,835±0,001              | .19039±.19031 | 4,835±0,001              | .19026±.19034 |
| Corrected                        | x.m             | +0,8                     | +0.031        | +1,0                     | +0.039        |

Standard ANS B92.1-1970, class 5  
[m=2.1166]



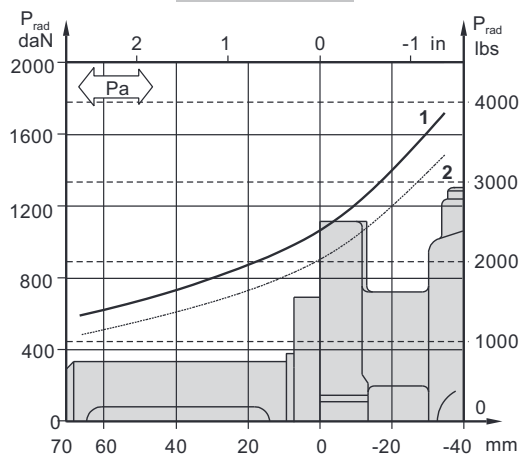
## LOAD CURVE

The curve applies to a B10 bearing life of 3000 hours at 200 RPM

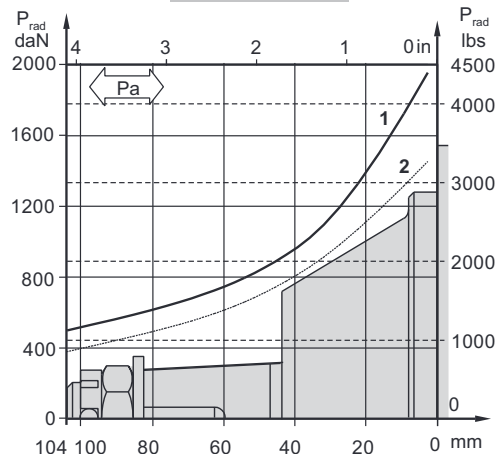
1:  $P_a < 350 \text{ daN}$  [ 787 lbs]

2:  $P_a = 500 \text{ daN}$  [1125 lbs]

LBS(V)/289



LBS(V)/290



## ORDER CODE - LB/288

|        |   |   |   |   |   |
|--------|---|---|---|---|---|
|        | 1 | 2 | 3 | 4 | 5 |
| LB/288 |   | - |   |   |   |

Pos.1 - **Input Shaft Hole**

C, CO, SH, CB, SB

Pos.2 - **Static Torque code** (See Specification data)

7, 14, 21, 32, 43, 63

Pos.3 - **Output Shaft Extensions\*\***

C -  $\varnothing 25$  straight, Parallel key A8x7x32 DIN 6885

CO -  $\varnothing 1$ " straight, Parallel key  $\frac{1}{4} \times \frac{1}{4} \times 1\frac{1}{4}$  BS46

SH -  $\varnothing 25,32$  splined BS 2059 (SAE 6B)

SA -  $\varnothing 24,5$  splined B25x22 DIN 5482

CB -  $\varnothing 32$  straight, Parallel key A10x8x45 DIN 6885

KB -  $\varnothing 35$  tapered 1:10, Parallel key B6x6x20 DIN6885

Pos.4 - **Option (Paint)\*\*\***

omit - no Paint

P - Painted

PC - Corrosion Protected Paint

Pos.5 - **Design Series**

omit - Factory specified

## ORDER CODE - LBS, LBV

|    |   |   |   |   |   |   |
|----|---|---|---|---|---|---|
|    | 1 | 2 | 3 | 4 | 5 | 6 |
| LB |   | / | - |   |   |   |

Pos.1 - **Type**

S - Disc Brake for short motor S- MSS

V - Disc Brake for very short motor V- MSV

Pos.2 - **Design code**

289 - for MSS and MSV Motors

290 - for MSS and MSV Motors (Wheel Mount)

Pos.3 - **Static Torque code** (See Specification data)

21, 32, 43, 63, L43, L63

Pos.4 - **Output Shaft Extensions\***

CB -  $\varnothing 32$  straight, Parallel key A10x8x45 DIN 6885

KB -  $\varnothing 35$  tapered 1:10, Parallel key B6x6x20 DIN6885

SH -  $\varnothing 1\frac{1}{4}$ " splined 14TANS B92.1-1970

Pos.5 - **Option (Paint)\*\***

omit - no Paint

P - Painted

PC - Corrosion Protected Paint

Pos.6 - **Design Series**

omit - Factory specified

## NOTES:

- \* The permissible output torque for shafts must not be exceeded! For Max. Torque values see data on pages 5 and 8.
- \*\* The color is by customer's request.

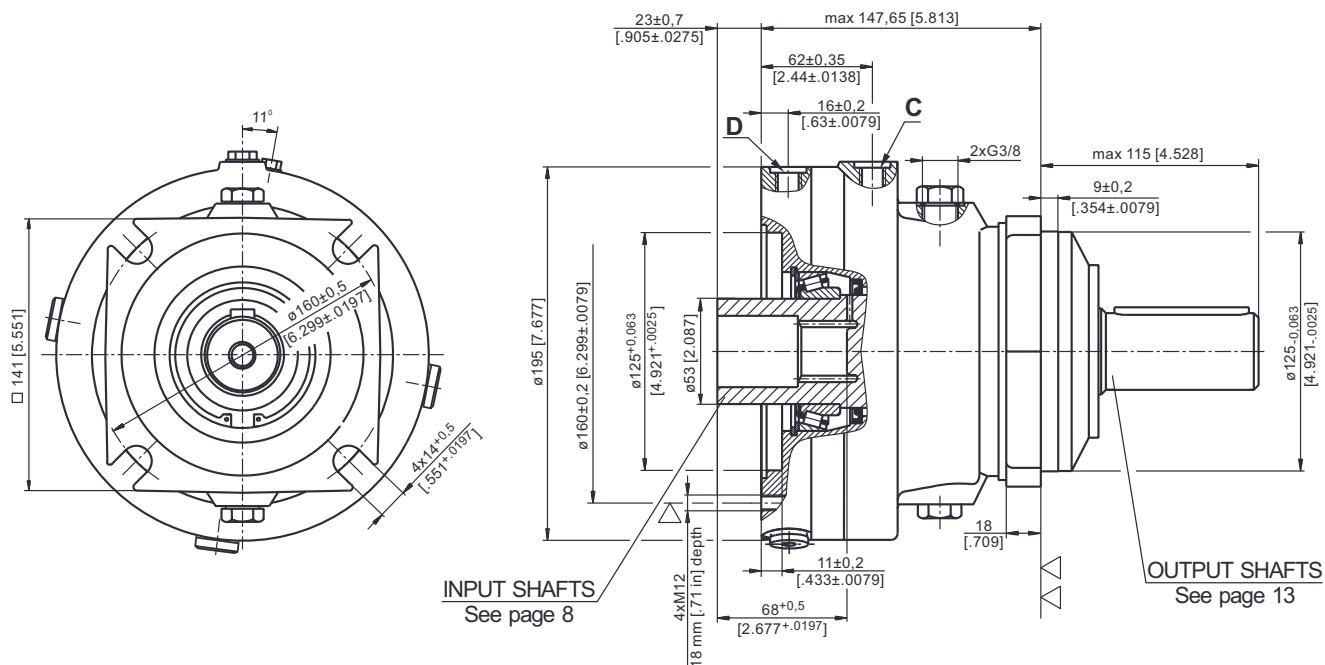
The Disc Brakes are mangano-phosphatized as standard.

## ATTENTION:

1. Hydraulic brake is delivered without oil (it is lubricated only).
2. Hydraulic brake is filled through the drain port **D**. Space is filled with  $50 \div 120 \text{ cm}^3$  [ $3.05 \div 7.32 \text{ in}^3$ ] mineral oil HLP (DIN 51524) or HM (ISO 6743/4). For LB/288 fill oil after hydraulic motor assembly.
3. In all brakes, friction discs and separators should be lubricated.

## HYDRAULIC DISC BRAKES FOR FLANGE ATTACHMENT TO MTS AND MTV HYDRAULIC MOTORS

### TYPE LBS/314



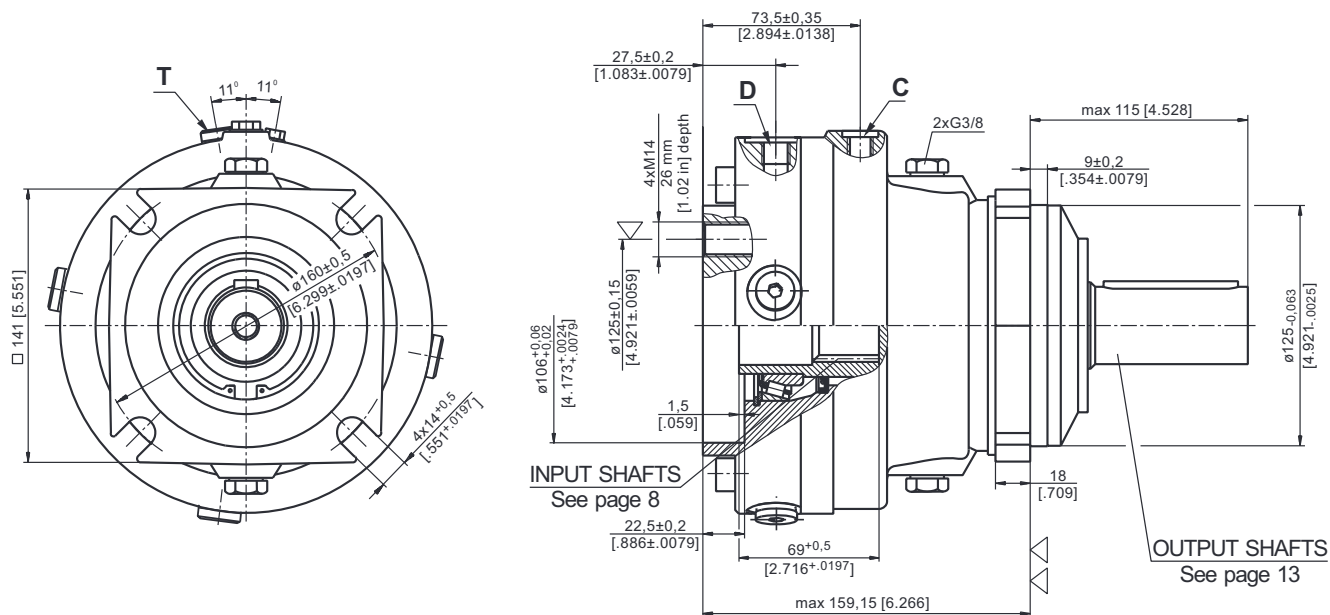
▽ - Place for attachment  
(tightening torque for screw M12x30 - 12.9 DIN 912,  
 $10^{+0.5}$  daNm [885<sup>+44</sup> lb-in])

▽▽ - Place for attachment

C: Brake release Port - G $\frac{1}{4}$ , 12 mm [.47 in] depth

D: Drainage tap - G $\frac{1}{4}$ , 12 mm [.47 in] depth

### TYPE LBV/314



▽ - Place for attachment  
(tightening torque for screw M14xL - 12.9 DIN 912,  
 $13^{+0.5}$  daNm [1150<sup>+44</sup> lb-in])

▽▽ - Place for attachment

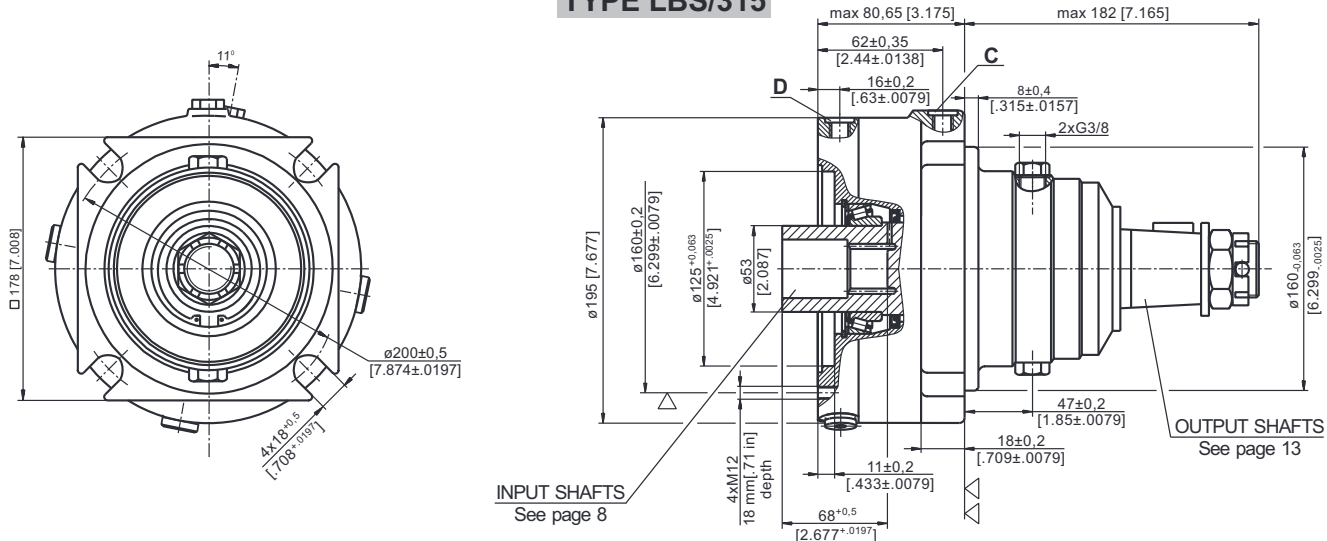
C: Brake release Port - G $\frac{1}{4}$ , 9 mm [.35 in] depth

D: Drain plug for the Brake - G $\frac{1}{4}$ , 9 mm [.35 in] depth

T: Drain plug for the Motor - G $\frac{1}{4}$ , 9 mm [.35 in] depth

# HYDRAULIC DISC BRAKES FOR FLANGE ATTACHMENT TO MTS AND MTV HYDRAULIC MOTORS

## TYPE LBS/315



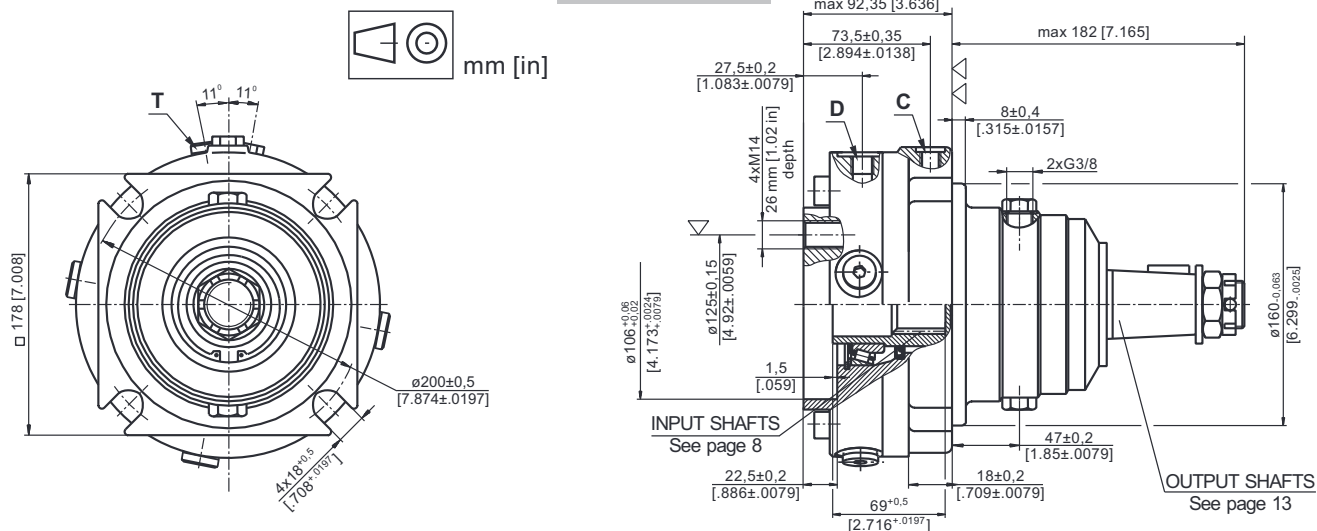
▽ - Place for attachment (tightening torque for screw M12x30 - 12.9 DIN 912,  $10^{+0.5}_{-0.1}$  daNm [885 $^{+44}_{-44}$  lb-in])

▽▽ - Place for attachment

C: Brake release Port - G $\frac{1}{4}$ , 12 mm [0.47 in] depth

D: Drainage tap - G $\frac{1}{4}$ , 12 mm [0.47 in] depth

## TYPE LBV/315



▽ - Place for attachment (tightening torque for screw M14xL - 12.9 DIN 912,  $13^{+0.5}_{-0.1}$  daNm [1150 $^{+44}_{-44}$  lb-in])

▽▽ - Place for attachment

C: Brake release Port - G $\frac{1}{4}$ , 9 mm [0.35 in] depth

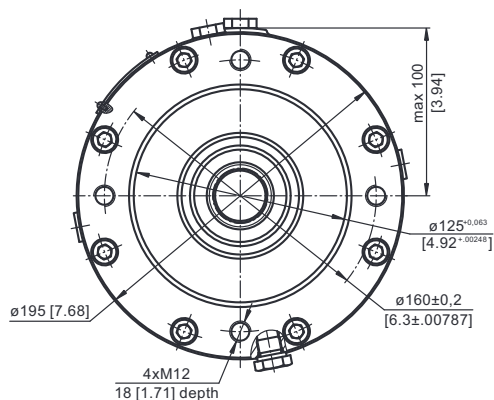
D: Drain plug for the Brake - G $\frac{1}{4}$ , 9 mm [0.35 in] depth

T: Drain plug for the Motor - G $\frac{1}{4}$ , 9 mm [0.35 in] depth

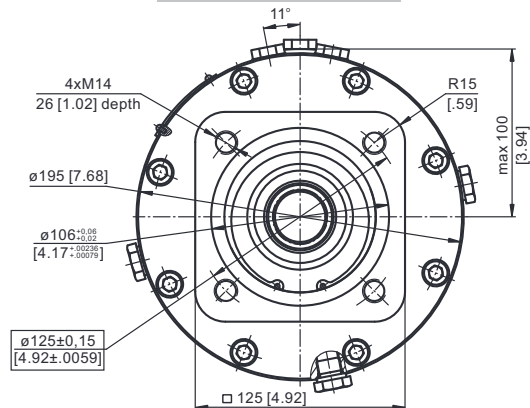
## INPUT FACE

For Versions 314 and 315

### TYPE LBS/314 (315)



### TYPE LBV/314 (315)



## SPECIFICATION DATA

| Description <b>LBS/314,315</b>                                              | <b>21</b>            | <b>29</b>            | <b>43</b>            | <b>65</b>            | <b>85</b>            | <b>110</b>              | <b>130</b>               |
|-----------------------------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-------------------------|--------------------------|
| *Min. Static Torque,<br>daNm [lb-in]                                        | 18-23<br>[1593-2036] | 28-33<br>[2478-2921] | 42-46<br>[3717-4071] | 61-70<br>[5399-6196] | 83-92<br>[7346-8143] | 108-118<br>[9559-10444] | 126-136<br>[11152-12037] |
| Opening Pressure min**<br>bar [PSI]                                         | 4-5<br>[58-72]       | 6-7<br>[87-101]      | 9-10<br>[130-145]    | 13-15<br>[188-217]   | 18-20<br>[261-290]   | 23-25<br>[333-362]      | 27-29<br>[391-420]       |
|                                                                             | max 300 [4350]       |                      |                      |                      |                      |                         |                          |
| Min. oil quantity for brake<br>releasing cm <sup>3</sup> [in <sup>3</sup> ] | 8-9<br>[.488-.549]   |                      |                      |                      |                      |                         |                          |
| Oil volume cm <sup>3</sup> [in <sup>3</sup> ]                               | 250                  |                      |                      |                      |                      |                         |                          |
| Max. Pressure in drain<br>space bar [PSI]                                   | 5 [72]               |                      |                      |                      |                      |                         |                          |
| Weight for .../314 kg [lb]                                                  | 24 [52.9]            |                      |                      |                      |                      |                         |                          |
| .../315                                                                     | 25 [55.1]            |                      |                      |                      |                      |                         |                          |

\*Static torque is obtained at working pressure - 0 bar.

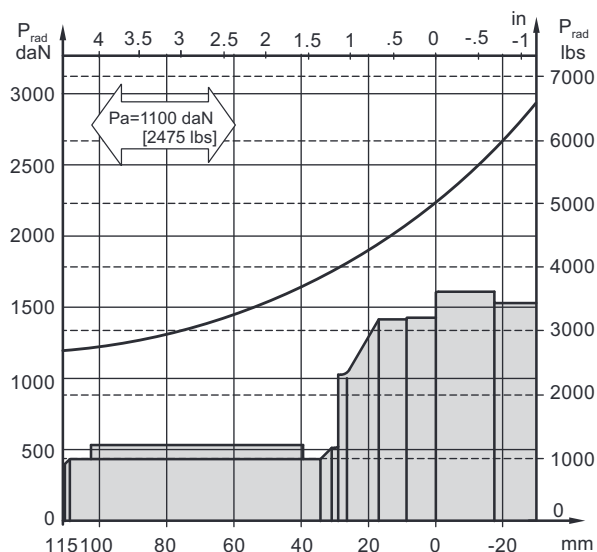
\*\*The indicated value is a difference between the inlet pressure for driving of the brake and the drain pressure.

Brakes must always have a drain line

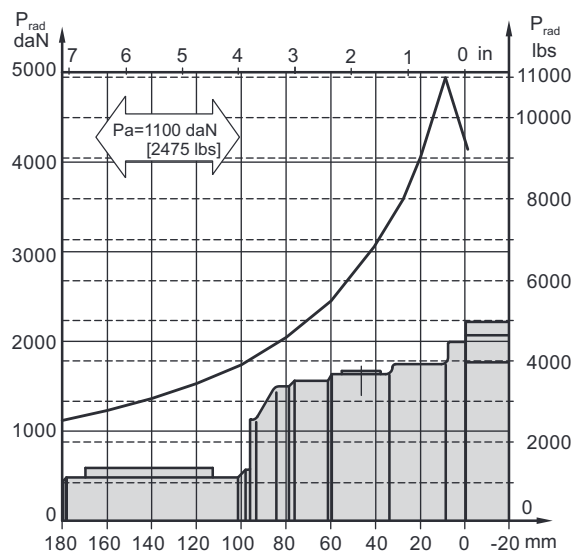
## LOAD CURVE

The output shaft runs in tapered bearings that permit high axial and radial forces. The permissible radial load on the shaft is shown for an axial load of 0 N as function of the distance from the mounting flange to the point of load application. The curves apply to a B10 bearing life of 2000 hours at 100 RPM.

**LBS(V) ... /314**

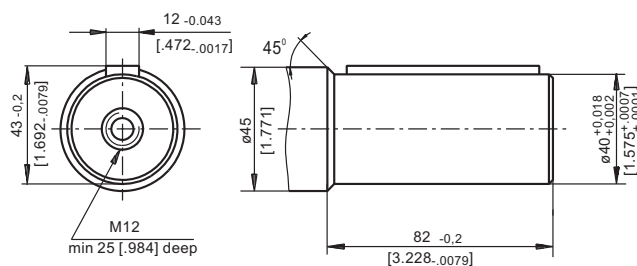


**LBS(V) ... /315**

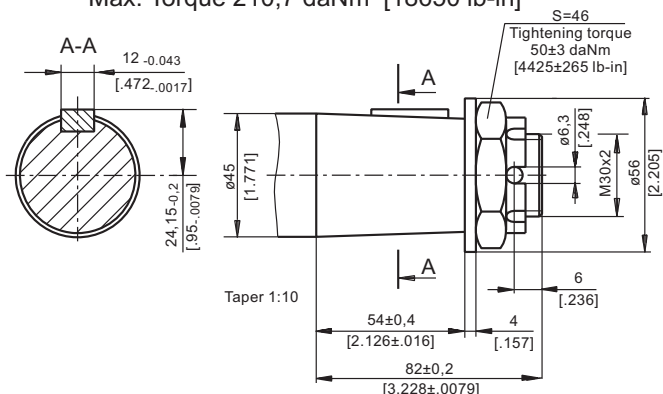


## OUTPUT SHAFT EXTENSIONS

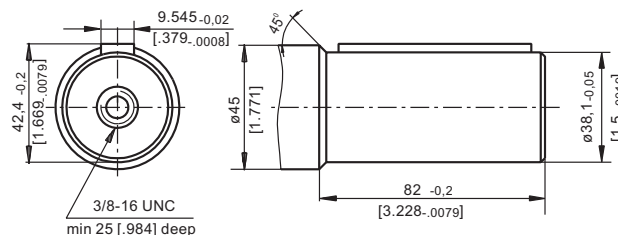
**C** - $\varnothing 40$  straight, Parallel key A12x8x70 DIN 6885  
Max. Torque 132,8 daNm [11755 lb-in]



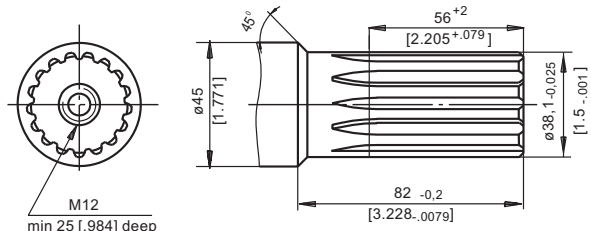
**K** -tapered 1:10, Parallel key B12x8x28 DIN 6885  
Max. Torque 210,7 daNm [18650 lb-in]



**CO** - $\varnothing 1\frac{1}{2}$ " straight, Parallel key  $\frac{3}{8}$ "x $\frac{3}{8}$ "x $2\frac{1}{4}$ " BS46  
Max. Torque 132,8 daNm [11755 lb-in]



**SH** - $\varnothing 1\frac{1}{2}$ " splined 17T, DP 12/24 ANSI B92.1-1976  
Max. Torque 132,8 daNm [11755 lb-in]



mm [in]

## ORDER CODE

| 1  | 2 | 3 | 4 | 5 | 6 |
|----|---|---|---|---|---|
| LB | / | - |   |   |   |

## Pos.1 - Type

- S** - Disc Brake for short motor **S** - MTS  
**V** - Disc Brake for very short motor **V** - MTV

## Pos.2 - Design code

- 314** - for MTS and MTV Motors  
**315** - for MTS and MTV Motors (Wheel Mount)

## Pos.3 - Static Torque code (See Specification data)

21, 29, 43, 65, 85, 110, 130

## Pos.4 - Output Shaft Extensions\*

- C** -  $\varnothing 40$  straight, Parallel key A12x8x70 DIN 6885  
**CO** -  $\varnothing 1\frac{1}{2}$ " straight, Parallel key  $\frac{3}{8}$ "x $\frac{3}{8}$ "x $2\frac{1}{4}$ " BS46  
**SH** -  $\varnothing 1\frac{1}{2}$ " splined 17T, ANSI B92.1-1976  
**K** -  $\varnothing 45$  tapered 1:10, Parallel key B12x8x28 DIN6885

## Pos.5 - Option (Paint)\*\*

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

## Pos.6 - Design Series

- omit - Factory specified

## NOTES:

- \* The permissible output torque for shafts must not be exceeded!  
\*\* The color is by customer's request.

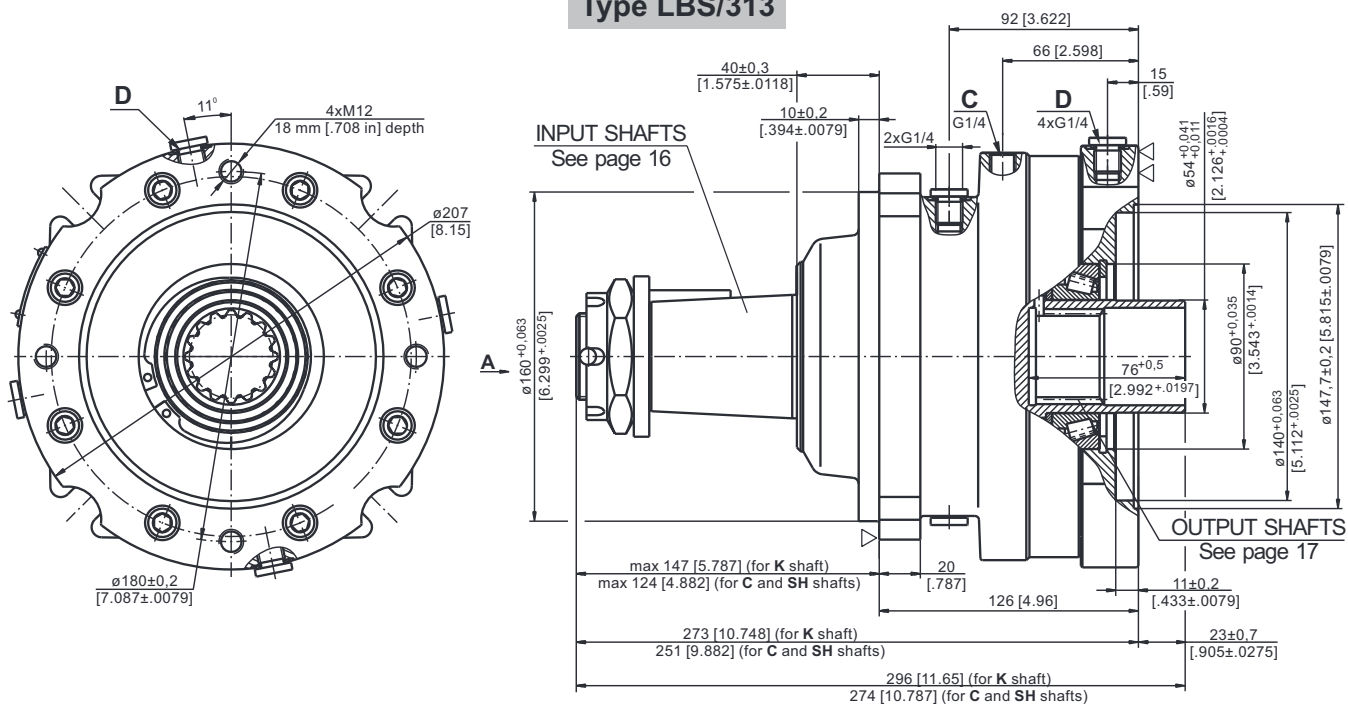
The Disc Brakes are mangano-phosphatized as standard.

## ATTENTION:

- Hydraulic brake is delivered without oil (it is lubricated only).
- Fill the brake through the drain port **D** with  $50 \div 120 \text{ cm}^3$  [3.05÷7.32 in<sup>3</sup>] mineral oil HLP (DIN 51524) or HM (ISO 6743/4). LB/288 must be filled after the motor is assembled on the brake.
- In all brakes, friction discs and separators should be lubricated.

# HYDRAULIC DISC BRAKES FOR FLANGE ATTACHMENT TO MVS HYDRAULIC MOTORS

## Type LBS/313

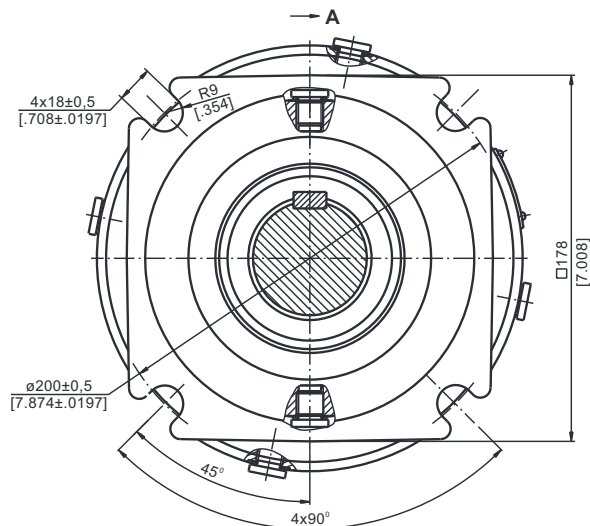


**C:** Brake release Port - G $\frac{1}{4}$ , 12 mm [.47 in] depth

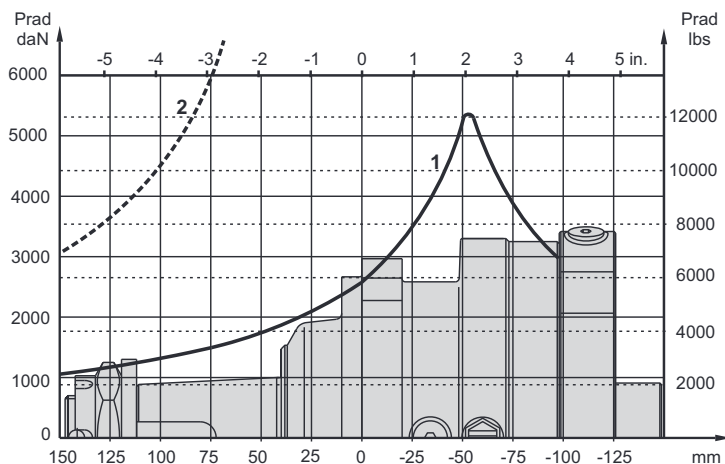
**D:** Drainage tap - G $\frac{1}{4}$ , 12 mm [.47 in] depth

▼- Place for attachment

▼▼- Place for attachment  
(tightening torque for screw M12x35 - 12.9 DIN 912,  
10<sup>+0.5</sup> daNm [885<sup>+44</sup> lb-in])



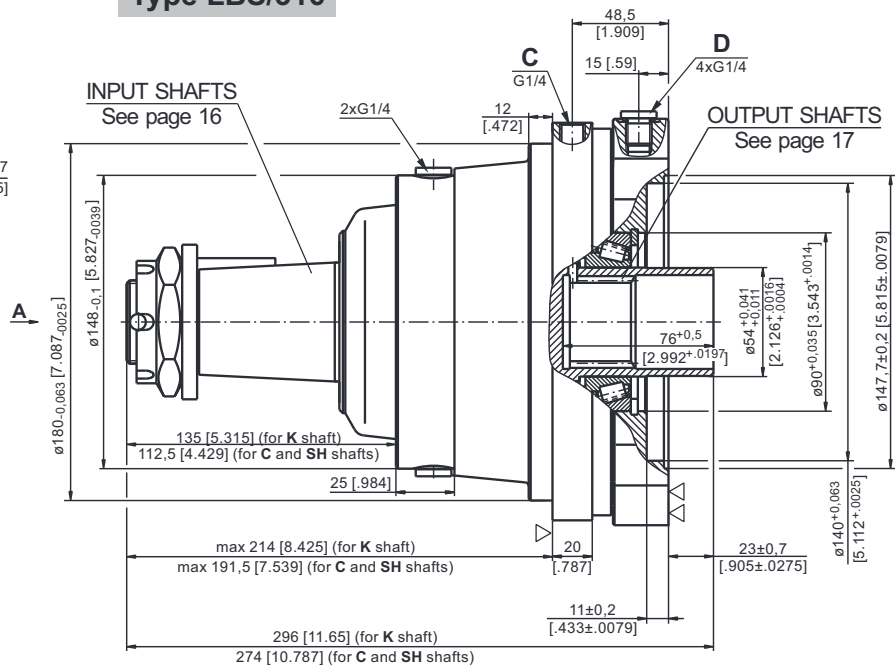
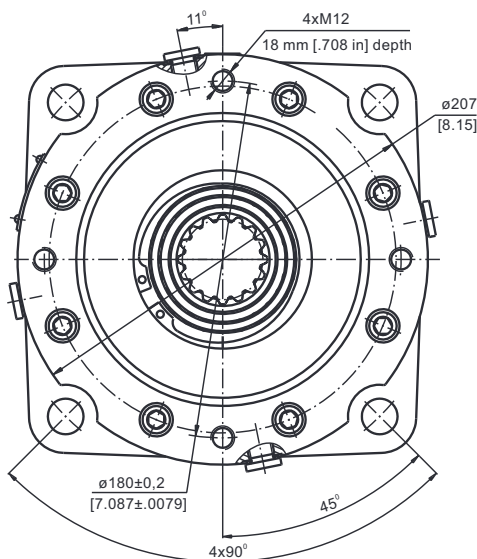
## PERMISSIBLE SHAFT LOADS



- 1 - Bearing curve: The curve applies to a B10 bearing life of 3000 hours at 200 RPM.
- 2 - Shaft curve: The curve represents Max. permissible radial shaft load with safety factor 3:1.

# HYDRAULIC DISC BRAKES FOR FLANGE ATTACHMENT TO MVS HYDRAULIC MOTORS

## Type LBS/316

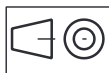


**C:** Brake release Port - G $\frac{1}{4}$ , 12 mm [.47 in] depth

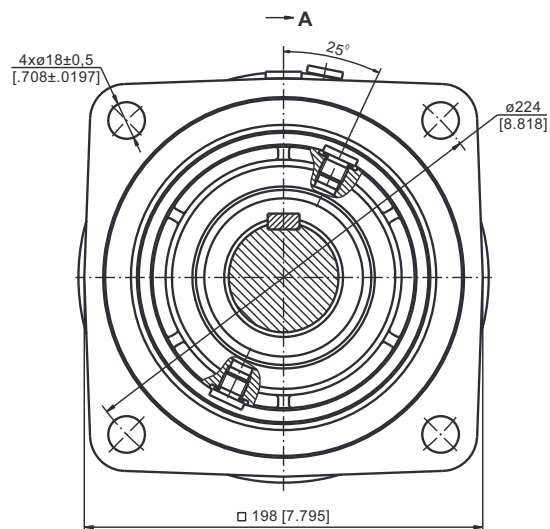
**D:** Drainage tap - G $\frac{1}{4}$ , 12 mm [.47 in] depth

▽ - Place for attachment

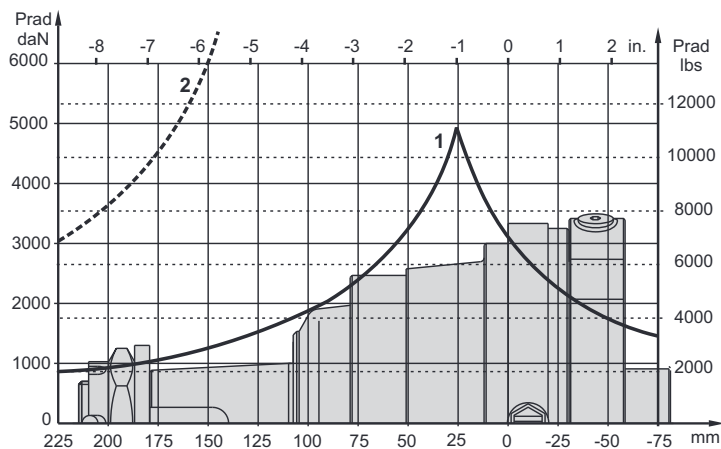
▽▽ - Place for attachment  
(tightening torque for screw M12x35 - 12.9 DIN 912,  
 $10^{+0.5}$  daNm [885 $^{+44}$  lb-in])



mm [in]



## PERMISSIBLE SHAFT LOADS



**1 - Bearing curve:** The curve applies to a B10 bearing life of 3000 hours at 200 RPM.

**2 - Shaft curve:** The curve represents Max. permissible radial shaft load with safety factor 3:1.

## SPECIFICATION DATA

| Description                                        | LBS/313,316 | 21                     | 29                   | 43                   | 65                   | 85                   | 110                     | 130                      |
|----------------------------------------------------|-------------|------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------|--------------------------|
| *Min. Static Torque,<br>daNm [lb-in]               |             | 18-23<br>[1593-2036]   | 28-33<br>[2478-2921] | 42-47<br>[3717-4160] | 61-71<br>[5399-6285] | 83-94<br>[7346-8320] | 108-118<br>[9559-10444] | 127-137<br>[11240-12125] |
| Opening Pressure min**<br>bar [PSI]                |             | 4-5<br>[58-72]         | 6-7<br>[87-101]      | 9-10<br>[130-145]    | 13-15<br>[188-217]   | 18-20<br>[261-290]   | 23-25<br>[333-362]      | 27-29<br>[391-420]       |
| max                                                |             | 300 [4350]             |                      |                      |                      |                      |                         |                          |
| Min. oil quantity for brake<br>releasing cm³ [in³] |             | 8 ÷ 9<br>[.488 ÷ .549] |                      |                      |                      |                      |                         |                          |
| Oil volume cm³ [in³]                               |             | 250 [15.25]            |                      |                      |                      |                      |                         |                          |
| Max. Pressure in drain<br>space bar [PSI]          |             | 5 [72]                 |                      |                      |                      |                      |                         |                          |
| Weight for .../313 kg [lb]                         |             | 25 [55.1]              |                      |                      |                      |                      |                         |                          |
| .../316                                            |             | 26 [57.3]              |                      |                      |                      |                      |                         |                          |

\*Static torque is obtained at working pressure - 0 bar.

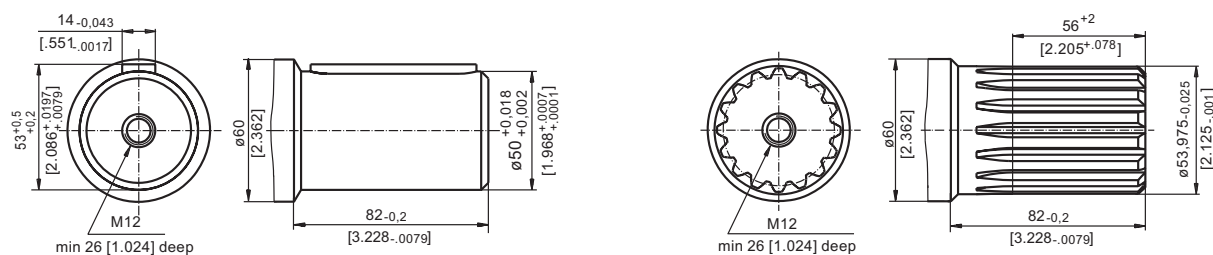
\*\*The indicated value is a difference between the inlet pressure for driving of the brake and the drain pressure.

Brakes must always have a drain line

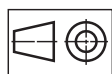
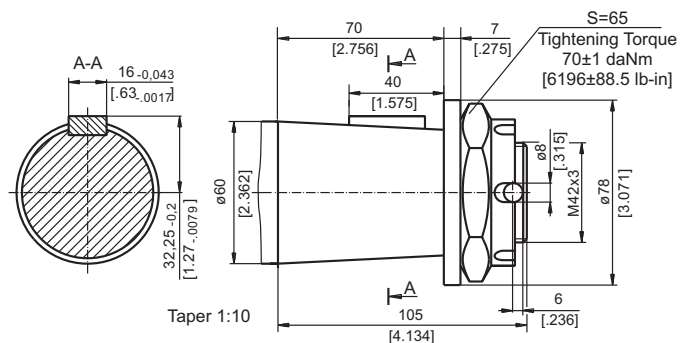
## SHAFT EXTENSIONS

**C** - ø50 straight, Parallel key A14x9x70 DIN 6885

**SH** -ø21/8"splined, 16 DP 8/16 ANS B92.1-1976



**K** -tapered 1:10, Parallel key B16x10x32 DIN 6885

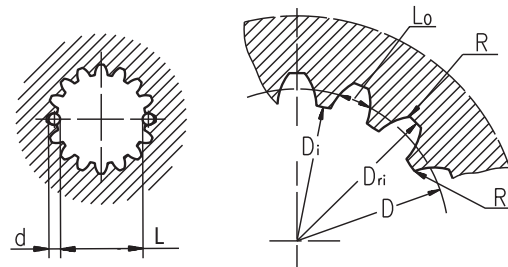


mm [in]

## INTERNAL SPLINE DATA FOR THE ATTACHED COMPONENT

Standard *ANS B92.1-1970, class 5*  
*[m=2.54; corrected x.m=+1,0]*

| Fillet Root Side Fit          |                 | mm                     | inch          |
|-------------------------------|-----------------|------------------------|---------------|
| Number of Teeth               | z               | 16                     | 16            |
| Diametral Pitch               | DP              | 10/20                  | 10/20         |
| Pressure Angle                |                 | 30°                    | 30°           |
| Pitch Dia.                    | D               | 40,640                 | 1.6           |
| Major Dia.                    | D <sub>ri</sub> | 45,2 <sup>+0,4</sup>   | 1.796±1.780   |
| Minor Dia.                    | D <sub>i</sub>  | 38,5 <sup>+0,039</sup> | 1.5175±1.516  |
| Space Width [Circular]        | L <sub>o</sub>  | 5,18±0,037             | .2055±.2025   |
| Fillet Radius                 | R               | 0,4                    | .015          |
| Max. Measurement between Pins | L               | 32,47 <sup>+0,15</sup> | 1.284±1.278   |
| Pin Dia.                      | d               | 5,6±0,001              | .22051±.22043 |



**Hardening Specification:**  
 HV=750±50 on the surface.  
 HV=560 at 0,7±0,2 mm [.035±.019in] case depth  
 Material: 20 MoCr4 EN 10084 or better.

## ORDER CODE

|      |   |   |   |  |   |  |   |  |   |
|------|---|---|---|--|---|--|---|--|---|
|      | 1 |   | 2 |  | 3 |  | 4 |  | 5 |
| LBS/ |   | - |   |  |   |  |   |  |   |

## Pos.1 - Designe code

**313** - for MVS Motors

**316** - for MVS Motors (Wheel mount)

## Pos.2 - Static Torque code (See Specification data)

21, 29, 43, 65, 85, 110, 130

## Pos.3 - Output Shaft Extensions\*

**C** - ø50 straight, Parallel key A14x9x70 DIN6885

**SH** - ø2 1/8" splined, ANSI B92.1-1976

**K** - ø60 tapered 1:10, Parallel key B16x10x32 DIN6885

## Pos.4 - Option (Paint)\*\*

omit - no Paint

**P** - Painted

**PC** - Corrosion Protected Paint

## Pos.5 - Design Series

omit - Factory specified

## NOTES:

\* The permissible output torque for shafts must be not exceeded!

\*\* The color is by customer's request.

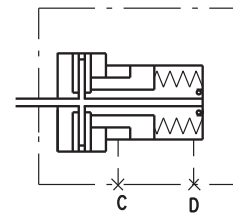
The Disc Brakes are mangano-phosphatized as standard.

## ATTENTION:

1. Hydraulic brake is delivered without oil (it is lubricated only).

2. In all brakes, friction discs and separators should be lubricated. Space is filled with 150 ÷ 300 cm<sup>3</sup> [9.15 ÷ 18.3 in<sup>3</sup>] mineral oil HLP (DIN 51524) or HM (ISO 6743/4).

The advantage of these brakes is that despite the smallest possible dimensions they preserve long-term life of the bearings at high radial shaft load.



## SPECIFICATION DATA

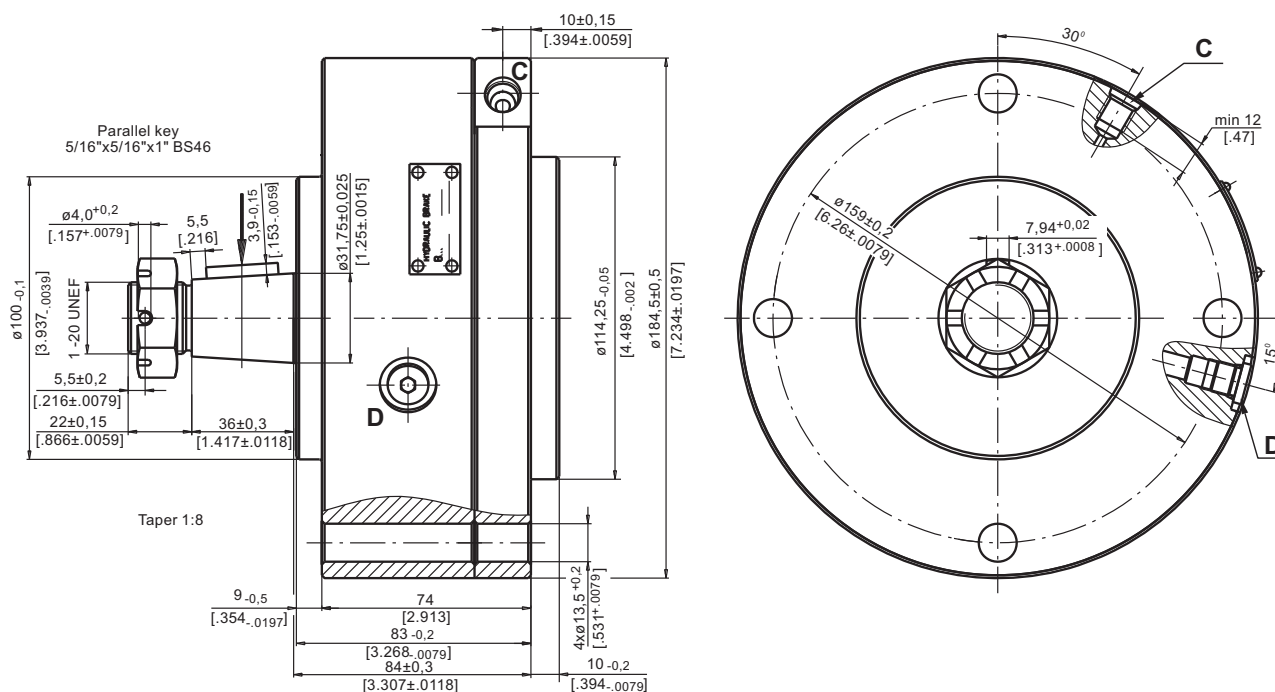
| Type                                  | B35R       | B55R       |
|---------------------------------------|------------|------------|
| Static Torque of Brake, daNm [lb-in]* | 35 [3100]  | 55 [4870]  |
| Initial Release Pressure, bar [PSI]   | 16 [232]   | 16 [232]   |
| Full Release Pressure, bar [PSI]      | 19 [275]   | 19 [275]   |
| Max. Operating Pressure, bar [PSI]    | 240 [3480] | 240 [3480] |
| Max. Speed, RPM                       | 90         | 90         |
| Cont. Radial Shaft Load daN [lbs]**   | 500 [1125] | 500 [1125] |
| Max. Radial Shaft Load daN [lbs]***   | 700 [1575] | 900 [2030] |

\* At 0 bar [0 PSI] back pressure

\*\* At radial shaft load of 500 daN [1125 lbs], applied at center-line of the key and speed of rotation 90 RPM, the bearing life is 1000 hours.

\*\*\* The permissible values of radial shaft load may occur for max. 10% of every minute

## DIMENSIONS AND MOUNTING DATA



**C** : Brake Release Port -7/16-20 UNF  
SAE J1926-1/ISO 11926-1

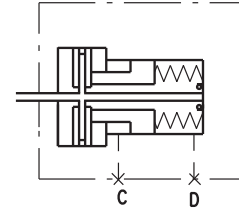
**D** : Drainage Tap - 7/16-20 UNF



# HYDRAULIC DISC BRAKES B...T- Wet

B..T brake is designed to be mounted to the wheels of low-speed agricultural and construction vehicles.

The advantage of these brakes is that despite the smallest possible dimensions they preserve long-term life of the bearings at high radial shaft load.



## SPECIFICATION DATA

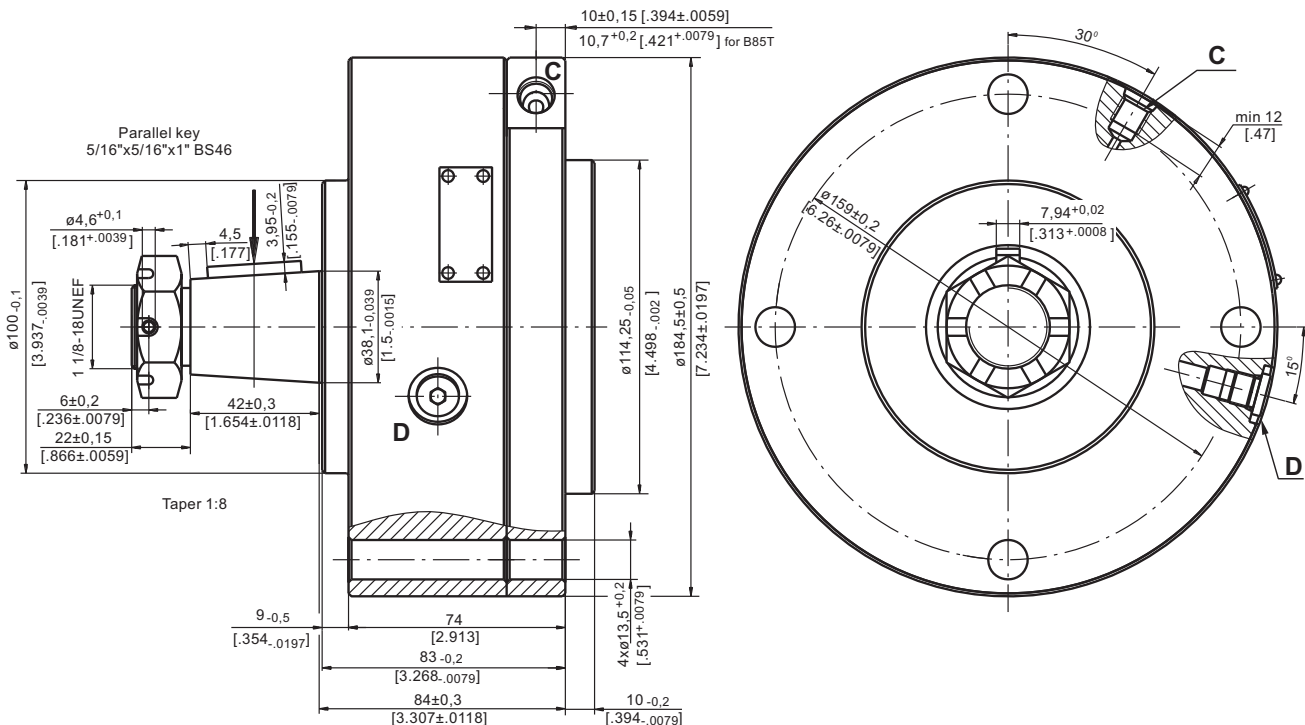
| Type                                  | B50T        | B55T        | B60T        | B65T        | B85T        |
|---------------------------------------|-------------|-------------|-------------|-------------|-------------|
| Static Torque of Brake, daNm [lb-in]* | 50 [4425]   | 55 [4870]   | 60 [5310]   | 65 [5750]   | 85 [7525]   |
| Initial Release Pressure, bar [PSI]   | 16 [232]    | 16 [232]    | 16 [232]    | 17 [246]    | 18 [260]    |
| Full Release Pressure, bar [PSI]      | 19 [275]    | 19 [275]    | 19 [275]    | 20 [290]    | 22 [320]    |
| Max. Operating Pressure, bar [PSI]    | 240 [3480]  | 240 [3480]  | 240 [3480]  | 240 [3480]  | 240 [3480]  |
| Max. Speed, RPM                       | 60          | 60          | 60          | 60          | 60          |
| Cont. Radial Shaft Load daN [lbs]**   | 1000 [2250] | 1000 [2250] | 1000 [2250] | 1000 [2250] | 1500 [3370] |
| Max. Radial Shaft Load daN [lbs]***   | 2150 [4830] | 2150 [4830] | 2150 [4830] | 2150 [4830] | 2250 [5060] |

\* At 0 bar [0 PSI] back pressure

\*\* At radial shaft load of 1000 daN [2250 lbs], applied at center-line of the key and speed of rotation 60 RPM, the bearing life is 1000 hours.

\*\*\* The permissible values of radial shaft load may occur for max. 10% of every minute

## DIMENSIONS AND MOUNTING DATA



- C : Brake Release Port - 7/16-20 UNF  
SAE J1926-1/ISO 11926-1
- D : Drainage Tap - 7/16-20 UNF

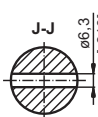
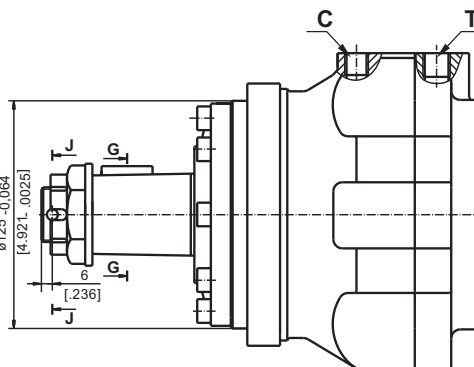


---

## SPECIFICATION DATA

\* At 0 bar [0 PSI] back pressure

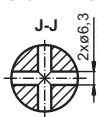
## DIMENSIONS AND MOUNTING DATA



**K** -tapered 1:10.

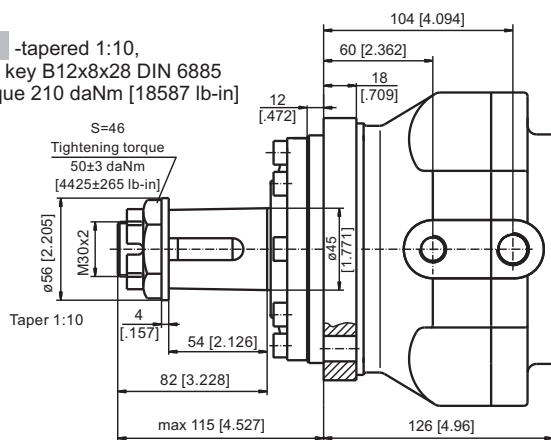
Parallel key B12x8x28 DIN 6885

3.43



**C** - Brake release port, G1/4.

**D** - Drainage tap, G3/8,



## PERMISSIBLE SHAFT LOADS



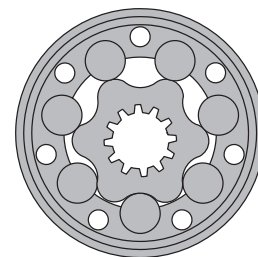
The curve applies to a B10 bearing

# HYDRAULIC MOTOR-BRAKE B/MR



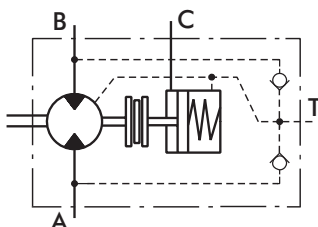
## APPLICATION

- » Conveyors
- » Feeding mechanism of robots and manipulators
- » Metal working machines
- » Textile machines
- » Agricultural machines
- » Food industries
- » Mining machinery etc.



## CONTENTS

|                               |       |
|-------------------------------|-------|
| Specification data .....      | 22+23 |
| Dimensions and mounting ....  | 24+25 |
| Shaft extensions .....        | 25    |
| Permissible shaft loads ..... | 26    |
| Order code .....              | 26    |



## OPTIONS

- » Model - Spool valve, roll-gerotor
- » Fully integrated friction disk brake
- » Side port
- » Shaft - straight
- » BSPP ports

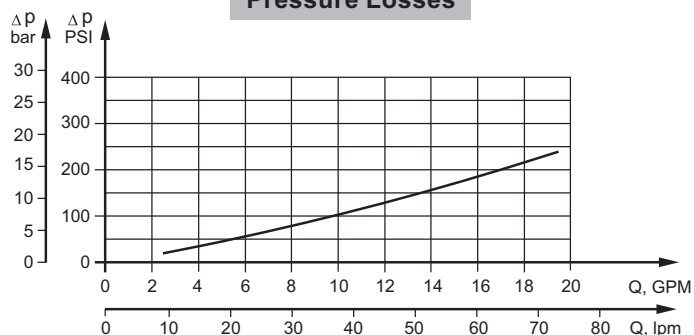
## GENERAL

|                                                                       |                                                                  |
|-----------------------------------------------------------------------|------------------------------------------------------------------|
| <b>Max. Displacement,</b> cm <sup>3</sup> /rev [in <sup>3</sup> /rev] | 397 [24.4]                                                       |
| <b>Max. Speed,</b> [RPM]                                              | 600                                                              |
| <b>Max. Torque,</b> daNm [lb-in]                                      | cont.: 61 [5400] int.: 57 [5045]                                 |
| <b>Max. Output,</b> kW [HP]                                           | 14,5 [19.5]                                                      |
| <b>Max. Pressure Drop,</b> bar [PSI]                                  | cont.: 175 [2540] int.: 200 [2900]                               |
| <b>Max. Oil Flow,</b> lpm [GPM]                                       | 75 [19.8]                                                        |
| <b>Min. Speed,</b> [RPM]                                              | 10                                                               |
| <b>Permissible Shaft Loads,</b> daN [lb-in]                           | P <sub>a</sub> =200 [450]                                        |
| <b>Pressure fluid</b>                                                 | Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)                  |
| <b>Temperature range,</b> °C [°F]                                     | -40÷140 [-40÷284]                                                |
| <b>Optimal Viscosity range,</b> mm <sup>2</sup> /s [SUS]              | 20÷75 [98÷347]                                                   |
| <b>Filtration</b>                                                     | ISO code 20/16 (Min. recommended fluid filtration of 25 microns) |

### Oil flow in drain line

| Pressure drop<br>bar [PSI] | Viscosity<br>mm <sup>2</sup> /s [SUS] | Oil flow in<br>drain line<br>lpm [GPM] |
|----------------------------|---------------------------------------|----------------------------------------|
| 100 [1450]                 | 20 [98]                               | 2,5 [.660]                             |
|                            | 35 [164]                              | 1,8 [.476]                             |
| 140 [2030]                 | 20 [98]                               | 3,5 [.925]                             |
|                            | 35 [164]                              | 2,8 [.740]                             |

### Pressure Losses



## SPECIFICATION DATA

| Type                                       |                         | B/MR<br>80     | B/MR<br>100    | B/MR<br>125     | B/MR<br>160     | B/MR<br>160 CB | B/MR<br>200      | B/MR<br>200 CB |
|--------------------------------------------|-------------------------|----------------|----------------|-----------------|-----------------|----------------|------------------|----------------|
| Displacement, cm³/rev<br>[in³/rev ]        |                         | 80,3<br>[4.90] | 99,8<br>[6.09] | 125,7<br>[7.67] | 159,6<br>[9.74] |                | 199,8<br>[12.19] |                |
| Max. Speed,<br>[RPM]                       | Cont.                   | 500            | 500            | 475             | 375             |                | 300              |                |
|                                            | Int.*                   | 600            | 600            | 600             | 470             |                | 375              |                |
| Max. Torque,<br>daNm [lb-in]               | Cont.                   | 19,5 [1725]    | 24 [2125]      | 30 [2655]       | 30 [2655]       | 39 [3450]      | 30 [2655]        | 45 [3980]      |
|                                            | Int.*                   | 22[1947]       | 28 [2480]      | 34 [3010]       | 39 [3450]       | 43 [3805]      | 39 [3450]        | 50 [4425]      |
|                                            | Peak**                  | 27 [2390]      | 32 [2832]      | 37 [3275]       | 46 [4070]       | 46 [4070]      | 56 [4960]        | 56 [4955]      |
| Max. Output,<br>kW [HP ]                   | Cont.                   | 8,4 [11.2]     | 10,8 [14.5]    | 12,5 [16.8]     | 10 [13.4]       | 11,5 [15.4]    | 7,8 [10.5]       | 11 [14.75]     |
|                                            | Int.*                   | 9,6 [12.9]     | 12 [16.1]      | 14,5 [19.5]     | 12,5 [16.8]     | 14 [18.8]      | 12,4 [16.6]      | 13 [17.4]      |
| Max. Pressure Drop,<br>bar [PSI]           | Cont.                   | 175 [2540]     | 175 [2540]     | 175 [2540]      | 135 [1960]      | 175 [2540]     | 105 [1523]       | 175 [2540]     |
|                                            | Int.*                   | 200 [2900]     | 200 [2900]     | 200 [2900]      | 175 [2540]      | 200 [2900]     | 145 [2103]       | 200 [2900]     |
|                                            | Peak**                  | 225 [3263]     | 225 [3263]     | 225 [3263]      | 225 [3263]      | 225 [3263]     | 225 [3263]       | 225 [3263]     |
| Max. Oil Flow,<br>l/min [GPM]              | Cont.                   | 40 [10.5]      | 50 [13.2]      | 60 [15.9]       | 60 [15.9]       |                | 60 [15.9]        |                |
|                                            | Int.*                   | 48 [12.7]      | 60 [15.9]      | 75 [19.8]       | 75 [19.8]       |                | 75 [19.8]        |                |
| Max. Inlet<br>Pressure,<br>bar [PSI]       | Cont.                   | 175 [2540]     |                |                 |                 |                |                  |                |
|                                            | Int.*                   | 200 [2900]     |                |                 |                 |                |                  |                |
|                                            | Peak**                  | 225 [3260]     |                |                 |                 |                |                  |                |
| Max. Starting Pressure, bar [PSI]          |                         | 10 [145]       | 10 [145]       | 9 [130]         | 7 [102]         |                | 5 [73]           |                |
| Min. Starting<br>Torque, daNm [lb-in]      | At max.press.drop Cont  | 15 [1330]      | 20 [1770]      | 25 [2215]       | 24 [2124]       | 32 [2832]      | 26 [2301]        | 41 [3628]      |
|                                            | At max.press.drop Int.* | 17 [1505]      | 23 [2035]      | 28 [2480]       | 32 [2832]       | 37 [3275]      | 33 [2920]        | 46 [4071]      |
| Min. Speed***, [RPM]                       |                         | 10             | 10             | 10              | 10              | 10             | 10               | 10             |
| Static Torque of Brake, daNm [lb-in]       |                         | 55 [4868]      |                |                 |                 |                |                  |                |
| Min. Brake Release Pressure****, bar [PSI] |                         | 13 [190]       |                |                 |                 |                |                  |                |
| Max.Opening Pressure, bar [PSI]            |                         | 200 [2900]     |                |                 |                 |                |                  |                |
| Weight, kg [lb]                            |                         | 11,0 [24.3]    | 11,2 [24.7]    | 11,4 [25.2]     | 11,6 [25.6]     | 11,7 [25.8]    | 12,2 [26.9]      | 12,3 [27.12]   |

\* Intermittent operation: the permissible values may occur for max. 10% of every minute.

\*\* Peak load: the permissible values may occur for max. 1% of every minute.

\*\*\* For speeds lower than given, consult factory or your regional manager.

\*\*\*\* Motor-brakes must always have a drain line. The brake release pressure is the difference between the pressure in the brake release line and the pressure in the drain line.

- Intermittent speed and intermittent pressure must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM ( ISO 6743/4).  
If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 13 mm<sup>2</sup>/s [70 SUS] at 50°C [122°F].
- Recommended maximum system operating temperature is 82°C [180°F].
- To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

### SPECIFICATION DATA (continued)

| Type                                                          |                         | B/MR<br>250      | B/MR<br>250 CB | B/MR<br>315      | B/MR<br>315 CB | B/MR<br>400   | B/MR<br>400 CB |
|---------------------------------------------------------------|-------------------------|------------------|----------------|------------------|----------------|---------------|----------------|
| Displacement, cm <sup>3</sup> /rev<br>[in <sup>3</sup> /rev ] |                         | 250,1<br>[15.26] |                | 315,7<br>[19.26] |                | 397<br>[24.4] |                |
| Max. Speed,<br>[RPM]                                          | Cont.                   | 240              |                | 190              |                | 150           |                |
|                                                               | Int.*                   | 300              |                | 240              |                | 190           |                |
| Max. Torque<br>daNm [lb-in]                                   | Cont.                   | 30 [2655]        | 54 [4780]      | 30 [2655]        | 55 [4868]      | 30 [2655]     | 55 [4868]      |
|                                                               | Int.*                   | 39 [3450]        | 57 [5045]      | 42 [3717]        | 57 [5045]      | 43 [3805]     | 57 [5045]      |
|                                                               | Peak**                  | 60 [5310]        | 71 [6285]      | 61 [5400]        | 71 [6285]      | 60 [5310]     | 70 [6195]      |
| Max. Output<br>kW [HP ]                                       | Cont.                   | 6,2 [8.3]        | 10 [13.4]      | 4,5 [6.1]        | 9 [12.1]       | 2,2 [2.9]     | 7 [9.4]        |
|                                                               | Int.*                   | 9,5 [12.7]       | 11 [14.7]      | 7,5 [10.1]       | 10 [13.4]      | 5,6 [7.5]     | 8,7 [11.7]     |
| Max. Pressure<br>Drop,<br>bar [PSI]                           | Cont.                   | 85 [1233]        | 175 [2540]     | 65 [942]         | 135 [1958]     | 45 [652]      | 105 [1523]     |
|                                                               | Int.*                   | 115 [1668]       | 185 [2683]     | 90 [1305]        | 145 [2103]     | 75 [1087]     | 115 [1668]     |
|                                                               | Peak**                  | 200 [2900]       | 225 [3263]     | 150 [2175]       | 180 [2610]     | 120 [1740]    | 140 [2030]     |
| Max. Oil Flow<br>l/min [GPM]                                  | Cont.                   | 60 [15.9]        |                |                  |                |               |                |
|                                                               | Int.*                   | 75 [19.8]        |                |                  |                |               |                |
| Max. Inlet<br>Pressure<br>bar [PSI]                           | Cont.                   | 175 [2540]       |                |                  |                |               |                |
|                                                               | Int.*                   | 200 [2900]       |                |                  |                |               |                |
|                                                               | Peak**                  | 225 [3260]       |                |                  |                |               |                |
| Max. Starting Pressure bar [PSI]                              |                         | 5 [73]           |                | 5 [73]           |                | 5 [73]        |                |
| Min. Starting<br>Torque, daNm [lb-in]                         | At max.press.drop Cont  | 24 [2125]        | 50 [4425]      | 26 [2300]        | 50 [4425]      | 24 [2125]     | 44 [3895]      |
|                                                               | At max.press.drop Int.* | 31 [2745]        | 51,5 [4560]    | 35 [3100]        | 51,8 [4585]    | 38 [3364]     | 50 [4425]      |
| Min. Speed***, [RPM]                                          |                         | 10               | 10             | 10               | 10             | 10            | 10             |
| Static Torque of Brake, daNm [lb-in]                          |                         | 55 [4868]        |                |                  |                |               |                |
| Min. Brake Release Pressure****, bar [PSI]                    |                         | 13 [190]         |                |                  |                |               |                |
| Max.Opening Pressure, bar [PSI]                               |                         | 200 [2900]       |                |                  |                |               |                |
| Weight, kg [lb]                                               |                         | 12,6 [27.8]      | 12,7 [28]      | 13,3 [29.3]      | 13,4 [29.5]    | 14 [30.9]     | 14,1 [31.1]    |

\* Intermittent operation: the permissible values may occur for max. 10% of every minute.

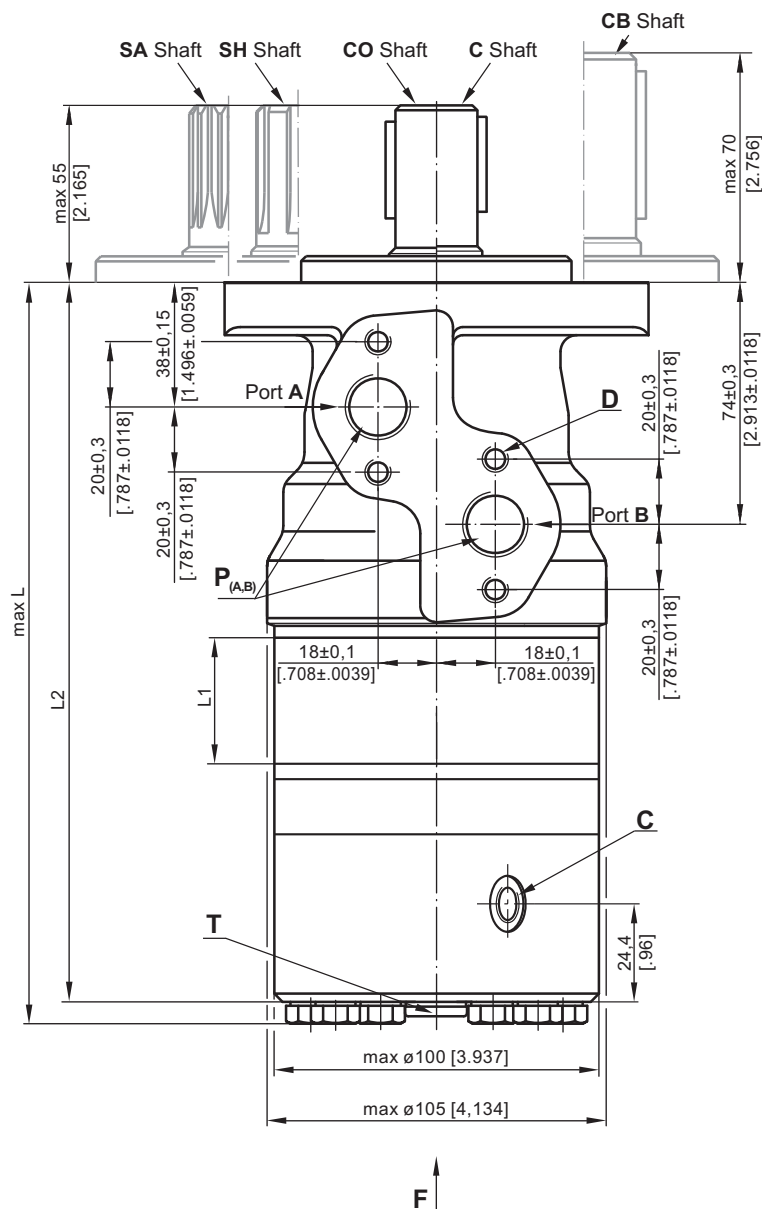
\*\* Peak load: the permissible values may occur for max. 1% of every minute.

\*\*\* For speeds lower than given, consult factory or your regional manager.

\*\*\*\* Motor-brakes must always have a drain line. The brake release pressure is the difference between the pressure in the brake release line and the pressure in the drain line.

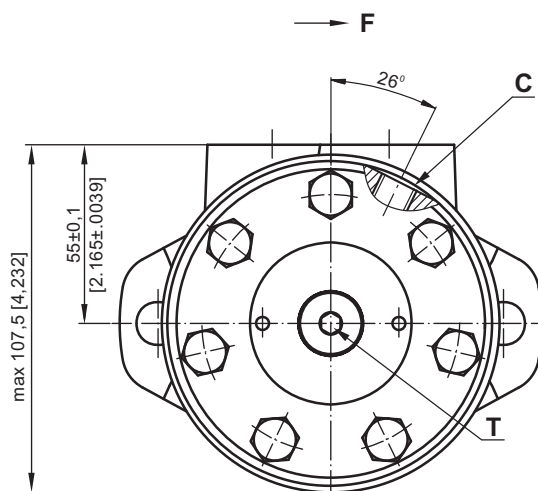
- Intermittent speed and intermittent pressure must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM ( ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 13 mm<sup>2</sup>/s [70 SUS] at 50°C [122°F].
- Recommended maximum system operating temperature is 82°C [180°F].
- To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

## DIMENSIONS AND MOUNTING DATA



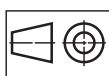
Shaft Dim.  
See Page 25

Flange Dim.  
See Page 25



- D** : 4xM8 - 13 mm [.51 in] depth  
**C** : G1/4 - 12 [.47 in] mm depth  
**P<sub>(A,B)</sub>** : 2xG1/2 - 15 [.59 in] mm depth  
**T** : G1/4 - 10 mm [.393 in] depth

| Type     | L1, mm [in]  | L2, mm [in]    | L, mm [in]    |
|----------|--------------|----------------|---------------|
| B/MR 80  | 14,0 [.551]  | 205,5 [8.091]  | 213,5 [8.405] |
| B/MR 100 | 17,4 [.685]  | 209,0 [8.228]  | 217,0 [8.543] |
| B/MR 125 | 21,8 [.858]  | 213,5 [8.405]  | 221,5 [8.720] |
| B/MR 160 | 27,8 [1.095] | 219,5 [8.642]  | 227,5 [8.957] |
| B/MR 200 | 34,8 [1.37]  | 226,5 [8.917]  | 234,5 [9.232] |
| B/MR 250 | 43,5 [1.713] | 235,0 [9.252]  | 243,0 [9.567] |
| B/MR 315 | 54,8 [2.157] | 246,5 [9.705]  | 254,5 [10.02] |
| B/MR 400 | 69,4 [2.732] | 261,0 [10.275] | 269,0 [10.59] |



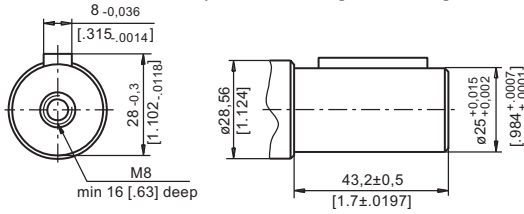
mm [in]

**Standard Rotation**  
 Viewed from Shaft End  
 Port A Pressurized - CW  
 Port B Pressurized - CCW

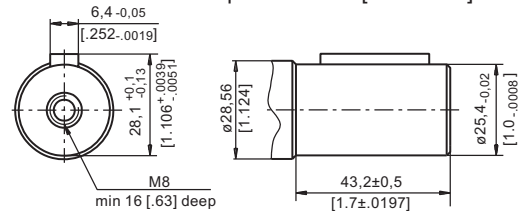
**Reverse Rotation**  
 Viewed from Shaft End  
 Port A Pressurized - CCW  
 Port B Pressurized - CW

## SHAFT EXTENSIONS

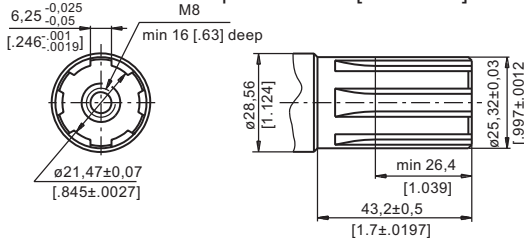
**C** -  $\varnothing 25$  straight, Parallel key A8x7x32 DIN 6885  
Max. Torque 34 daNm [3010 lb-in]



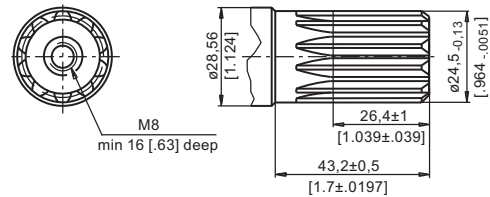
**CO** -  $\varnothing 1"$  straight, Parallel key  $\frac{1}{4}" \times \frac{1}{4}" \times 1\frac{1}{4}"$  BS46  
Max. Torque 34 daNm [3010 lb-in]



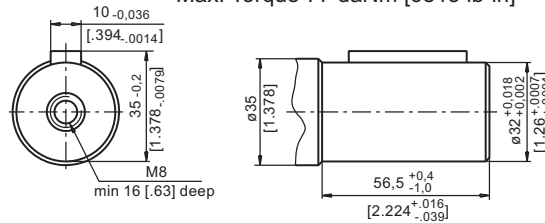
**SH** - splined, BS 2059 (SAE 6B)  
Max. Torque 40 daNm [3540 lb-in]



**SA** - splined, B25x22h9 DIN 5482  
Max. Torque 40 daNm [3540 lb-in]

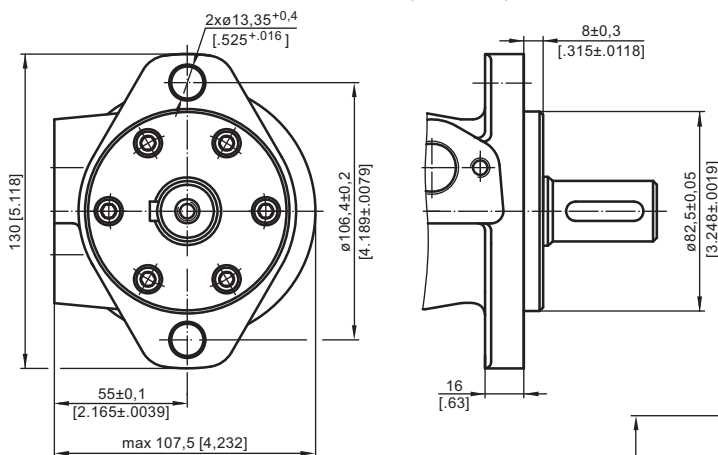


**CB** -  $\varnothing 32$  straight, Parallel key A10x8x45 DIN 6885  
Max. Torque 77 daNm [6815 lb-in]

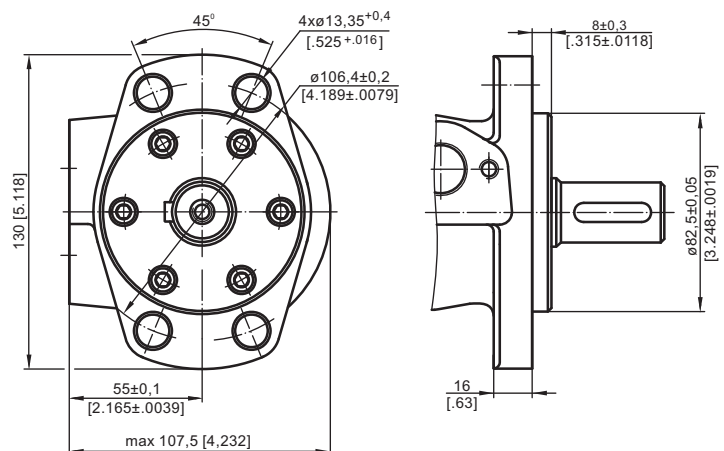


## MOUNTING

Oval Mount (2 Holes)

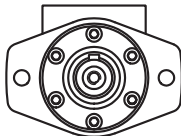
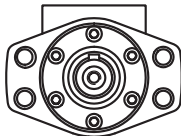


**F** - Oval Mount (4 Holes)



## PERMISSIBLE SHAFT LOADS

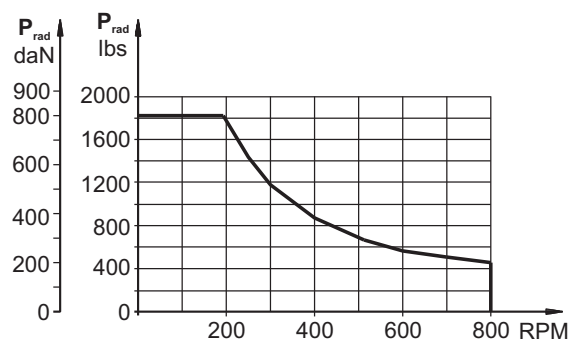
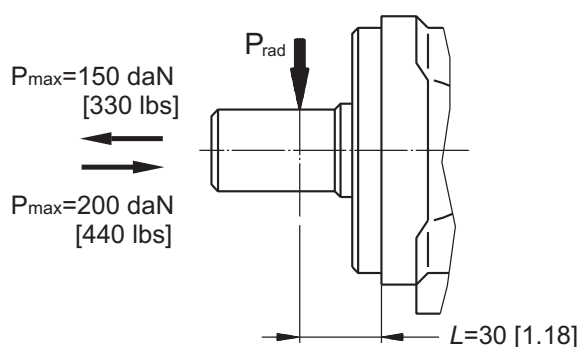
The permissible radial shaft load  $P_{rad}$  depends on the speed  $n$ , RPM; distance  $L$  from the point of load to the mounting flange and shaft version.

| Mounting Flange                       |  |  |
|---------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Shaft Version                         | cylindrical - C, CO<br>splined - SH, SA                                           | cylindrical - CB                                                                    |
| Radial Shaft Load $P_{rad}$ , in mm   | $\frac{800}{n} \times \frac{25000}{95+L}$ , daN*                                  | $\frac{800}{n} \times \frac{18750}{95+L}$ , daN*                                    |
| Radial Shaft Load $P_{rad}$ , in inch | $\frac{800}{RPM} \times \frac{2215}{3.74+L}$ , lbs*                               | $\frac{800}{RPM} \times \frac{1660}{3.74+L}$ , lbs*                                 |

\*  $n \leq 200$  RPM; max  $P_{rad}$ =800 daN [1800 lbs]

$n \geq 200$  RPM;  $L < 55$  mm [2.2 in]

Radial Shaft Load  $P_{rad}$  for C, CO Shaft Extensions by  $L=30$  mm [1.18 in]



## ORDER CODE

|                |   |   |   |   |   |
|----------------|---|---|---|---|---|
|                | 1 | 2 | 3 | 4 | 5 |
| <b>B / M R</b> |   |   |   |   |   |

### Pos.1 - Mounting Flange

omit - Oval mount, two holes

**F** - Oval mount, four holes

### Pos.2 - Displacement code

|            |                                                           |
|------------|-----------------------------------------------------------|
| <b>80</b>  | - 80,3 cm <sup>3</sup> /rev [ 4.90 in <sup>3</sup> /rev]  |
| <b>100</b> | - 99,8 cm <sup>3</sup> /rev [ 6.09 in <sup>3</sup> /rev]  |
| <b>125</b> | - 125,7 cm <sup>3</sup> /rev [ 7.67 in <sup>3</sup> /rev] |
| <b>160</b> | - 159,6 cm <sup>3</sup> /rev [ 9.74 in <sup>3</sup> /rev] |
| <b>200</b> | - 199,8 cm <sup>3</sup> /rev [12.19 in <sup>3</sup> /rev] |
| <b>250</b> | - 250,1 cm <sup>3</sup> /rev [15.26 in <sup>3</sup> /rev] |
| <b>315</b> | - 315,7 cm <sup>3</sup> /rev [19.26 in <sup>3</sup> /rev] |
| <b>400</b> | - 397,0 cm <sup>3</sup> /rev [24.40 in <sup>3</sup> /rev] |

### Pos.3 - Shaft Extensions\*

**C** - ø25 straight, Parallel key A8x7x32 DIN6885

**CO** - ø1" straight, Parallel key 1/4"x1/4"x1 1/4" BS46

**SH** - ø25,32 splined BS 2059 (SAE 6B)

**SA** - ø24,5 splined B 25x22 DIN 5482

**CB** - ø32 straight, Parallel key A10x8x45 DIN 6885

### Pos.4 - Special Features (see page 68)

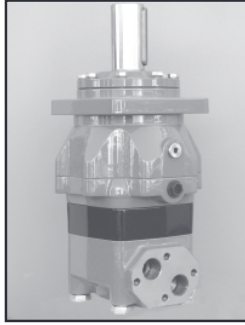
### Pos.5 - Design Series

omit - Factory specified

**NOTES:** \* The permissible output torque for shafts must not be exceeded!

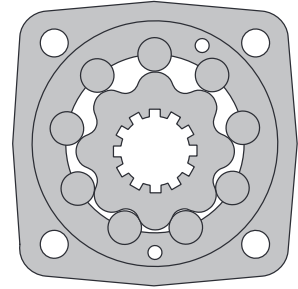
The motor-brakes are mangano-phosphatized as standard.

# HYDRAULIC MOTOR-BRAKE MT/B



## APPLICATION

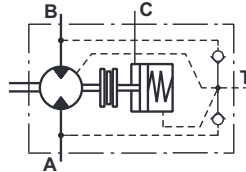
- » Conveyors
- » Metal working machines
- » Agricultural machines
- » Road building machines
- » Mining machinery
- » Food industries
- » Special vehicles
- » Plastic and rubber machinery etc.



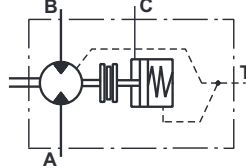
## CONTENTS

|                               |    |
|-------------------------------|----|
| Specification data .....      | 28 |
| Dimensions and mounting ..... | 29 |
| Permissible shaft loads ..... | 29 |
| Shaft extensions .....        | 30 |
| Order code .....              | 30 |

With check valves



Without check valves "1"



## OPTIONS

- » Model - Disc valve, roll-gerotor;
- » Fully integrated friction disk brake;
- » Side ports;
- » Shafts - straight, splined and tapered;
- » BSPP ports
- » Other special features

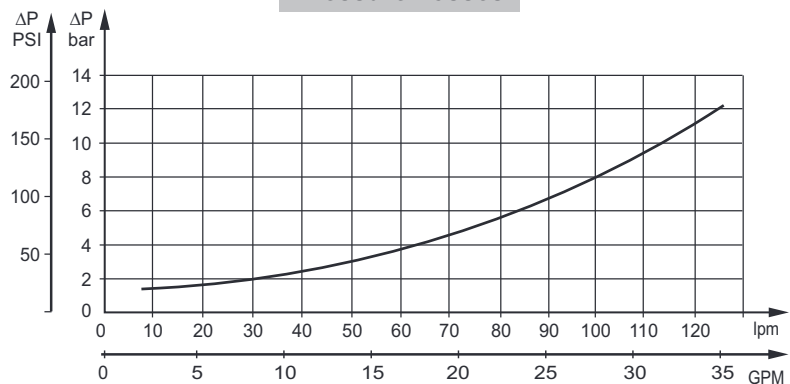
## GENERAL

|                                                                       |                                                                  |
|-----------------------------------------------------------------------|------------------------------------------------------------------|
| <b>Max. Displacement,</b> cm <sup>3</sup> /rev [in <sup>3</sup> /rev] | 724,3 [44.2]                                                     |
| <b>Max. Speed,</b> [RPM]                                              | 780                                                              |
| <b>Max. Torque,</b> daNm [lb-in]                                      | cont.: 130 [11505] int.: 148 [13100]                             |
| <b>Max. Output,</b> kW [HP]                                           | 40 [54]                                                          |
| <b>Max. Pressure Drop,</b> bar [PSI]                                  | cont.: 200 [2900] int.: 240 [3450]                               |
| <b>Max. Oil Flow,</b> lpm [GPM]                                       | 150 [40]                                                         |
| <b>Min. Speed,</b> [RPM]                                              | 5                                                                |
| <b>Permissible Shaft Loads,</b> daN [lbs]                             | P <sub>a</sub> =1000 [2248]                                      |
| <b>Pressure fluid</b>                                                 | Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)                  |
| <b>Temperature range,</b> °C [°F]                                     | -40÷140 [-40÷284]                                                |
| <b>Optimal Viscosity range,</b> mm <sup>2</sup> /s [SUS]              | 20÷75 [98÷347]                                                   |
| <b>Filtration</b>                                                     | ISO code 20/16 (Min. recommended fluid filtration of 25 microns) |

### Oil flow in drain line

| Pressure drop<br>bar [PSI] | Viscosity<br>mm <sup>2</sup> /s [SUS] | Oil flow in<br>drain line<br>lpm [GPM] |
|----------------------------|---------------------------------------|----------------------------------------|
| 140 [2030]                 | 20 [98]                               | 2,5 [.66]                              |
|                            | 35 [164]                              | 1,5 [.39]                              |
| 210 [3045]                 | 20 [98]                               | 5 [1.32]                               |
|                            | 35 [164]                              | 3 [.79]                                |

### Pressure Losses



## SPECIFICATION DATA

| Type                                                                   |                                | MT/B<br>160     | MT/B<br>200      | MT/B<br>250      | MT/B<br>315      | MT/B<br>400      | MT/B<br>500      | MT/B<br>630     | MT/B<br>725     |
|------------------------------------------------------------------------|--------------------------------|-----------------|------------------|------------------|------------------|------------------|------------------|-----------------|-----------------|
| <b>Displacement, cm<sup>3</sup>/rev</b><br>[in <sup>3</sup> /rev]      |                                | 161,1<br>[9.83] | 201,4<br>[12.29] | 251,8<br>[15.36] | 326,3<br>[19.90] | 410,9<br>[25.06] | 523,6<br>[31.95] | 631,2<br>[38.5] | 724,3<br>[44.2] |
| <b>Max. Speed,</b><br><b>[RPM]</b>                                     | Cont.                          | 625             | 625              | 500              | 380              | 305              | 240              | 197             | 172             |
|                                                                        | Int.*                          | 780             | 750              | 600              | 460              | 365              | 285              | 234             | 209             |
| <b>Max. Torque</b><br><b>daNm [lb-in]</b>                              | Cont.                          | 47 [4160]       | 59 [5220]        | 73 [6460]        | 95 [8410]        | 108 [9560]       | 122 [10800]      | 130 [11505]     | 127 [11240]     |
|                                                                        | Int.*                          | 56 [4960]       | 71 [6285]        | 88 [7790]        | 114 [10090]      | 126 [11150]      | 137 [12125]      | 148 [13100]     | 147 [13010]     |
| <b>Max. Output</b><br><b>kW [HP]</b>                                   | Cont.                          | 26,5 [36]       | 33,5 [45]        | 33,5 [45]        | 33,5 [45]        | 30 [40]          | 26,5 [36]        | 24,3 [33]       | 20,2 [27]       |
|                                                                        | Int.*                          | 32 [43]         | 40 [54]          | 40 [54]          | 40 [54]          | 35 [45]          | 30 [40]          | 27,5 [37]       | 26,8 [36]       |
| <b>Max. Pressure Drop</b><br><b>bar [PSI]</b>                          | Cont.                          | 200 [2900]      | 200 [2900]       | 200 [2900]       | 200 [2900]       | 180 [2600]       | 160 [2300]       | 140 [2030]      | 120 [1740]      |
|                                                                        | Int.*                          | 240 [3450]      | 240 [3450]       | 240 [3450]       | 240 [3450]       | 210 [3050]       | 180 [2600]       | 160 [2300]      | 140 [2030]      |
| <b>Max. Oil Flow</b><br><b>lpm [GPM]</b>                               | Cont.                          | 100 [26.5]      | 125 [33]         | 125 [33]         | 125 [33]         | 125 [33]         | 125 [33]         | 125 [33]        | 125 [33]        |
|                                                                        | Int.*                          | 125 [33]        | 150 [40]         | 150 [40]         | 150 [40]         | 150 [40]         | 150 [40]         | 150 [40]        | 150 [40]        |
| <b>Max. Inlet Pressure</b><br><b>bar [PSI]</b>                         | Cont.                          | 210 [3050]      | 210 [3050]       | 210 [3050]       | 210 [3050]       | 210 [3050]       | 210 [3050]       | 210 [3050]      | 210 [3050]      |
|                                                                        | Int.*                          | 250 [3600]      | 250 [3600]       | 250 [3600]       | 250 [3600]       | 250 [3600]       | 250 [3600]       | 250 [3600]      | 250 [3600]      |
| <b>Max. Return Pressure</b><br><b>with Drain Line, bar [PSI]</b>       | Cont.                          | 140 [2030]      | 140 [2030]       | 140 [2030]       | 140 [2030]       | 140 [2030]       | 140 [2030]       | 140 [2030]      | 140 [2030]      |
|                                                                        | Int.*                          | 175 [2540]      | 175 [2540]       | 175 [2540]       | 175 [2540]       | 175 [2540]       | 175 [2540]       | 175 [2540]      | 175 [2540]      |
| <b>Max. Starting Pressure with</b><br><b>Unloaded Shaft, bar [PSI]</b> |                                | 10 [150]        | 10 [150]         | 10 [150]         | 10 [150]         | 10 [150]         | 10 [150]         | 10 [150]        | 10 [150]        |
| <b>Min. Starting Torque</b><br><b>daNm [lb-in]</b>                     | At max. pressure<br>drop Cont. | 34 [3010]       | 43 [3800]        | 53 [4690]        | 74 [6550]        | 84 [7435]        | 95 [8410]        | 95 [8410]       | 95 [8410]       |
|                                                                        | At max. pressure<br>drop Int.* | 41 [3630]       | 52 [4600]        | 63 [5580]        | 89 [7880]        | 97 [8585]        | 106 [9380]       | 110 [9735]      | 115 [10180]     |
| <b>Min. Speed**, [RPM]</b>                                             |                                | 10              | 9                | 8                | 7                | 6                | 5                | 5               | 5               |
| <b>Static Torque of Brake, daNm [lb-in]</b>                            |                                | 143 [12657]     |                  |                  |                  |                  |                  |                 |                 |
| <b>Min. Brake Release Pressure***,</b><br><b>bar [PSI]</b>             |                                | 32-35           |                  |                  |                  |                  |                  |                 |                 |
|                                                                        |                                | [464-507]       |                  |                  |                  |                  |                  |                 |                 |
| <b>Max. Opening Pressure, bar [PSI]</b>                                |                                | 280 [4060]      |                  |                  |                  |                  |                  |                 |                 |
| <b>Max. Pressure in Drain Line, bar [PSI]</b>                          |                                | 5 [73]          |                  |                  |                  |                  |                  |                 |                 |
| <b>Weight, kg [lb]</b>                                                 |                                | 27,5 [60.6]     | 28 [61.7]        | 28,5 [62.8]      | 29,5 [65]        | 30,5 [67.2]      | 31,5 [69.4]      | 31 [68.3]       | 32 [70.5]       |

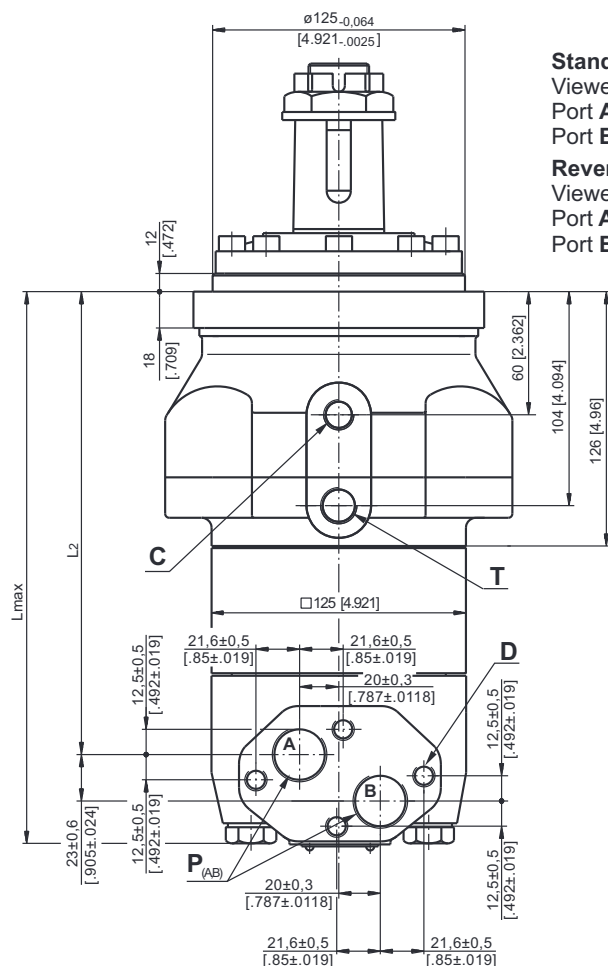
\* Intermittent operation: the permissible values may occur for max. 10% of every minute.

\*\* For speeds lower than given, consult factory or your regional manager.

\*\*\* Motor-brakes must always have a drain line. The brake release pressure is the difference between the pressure in the brake release line and the pressure in the drain line.

- Intermittent speed and intermittent pressure must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM ( ISO 6743/4).  
If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 13 mm<sup>2</sup>/s [70 SUS] at 50°C [122°F].
- Recommended maximum system operating temperature is 82°C [180°F].
- To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

## DIMENSIONS AND MOUNTING DATA



**Standard Rotation**  
Viewed from Shaft End  
Port A Pressurized - CW  
Port B Pressurized - CCW

**Reverse Rotation**  
Viewed from Shaft End  
Port A Pressurized - CCW  
Port B Pressurized - CW

Shaft Dim.  
See Page 30

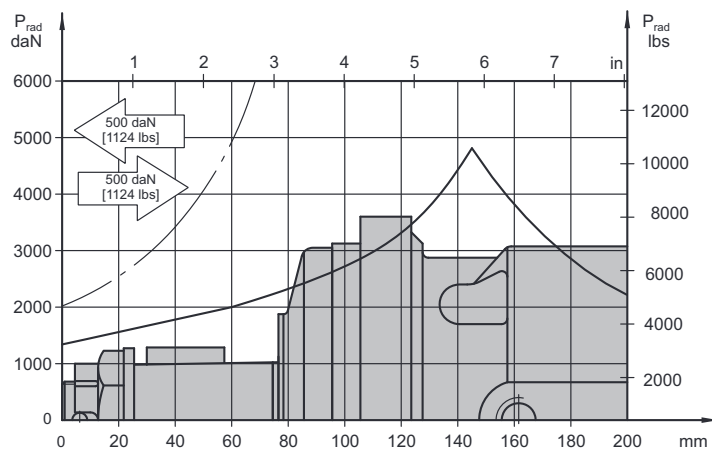


mm [in]

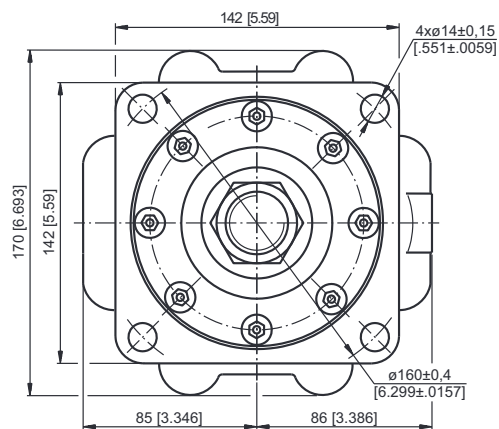
- P<sub>(A,B)</sub> - 2xG3/4, 17 mm [.669] depth
- C - Brake release port, G1/4, 12 mm [.472 in] depth
- T - Drainage tap, G3/8, 13 mm [.512] depth
- D - 4xM10, 10 mm [.394] depth

## PERMISSIBLE SHAFT LOADS

The curve applies to a B10 bearing life of 3000 hours at 200 RPM.  
Max. permissible radial shaft load with a safety factor of 3:1.



Warning: Drain line should always be used.

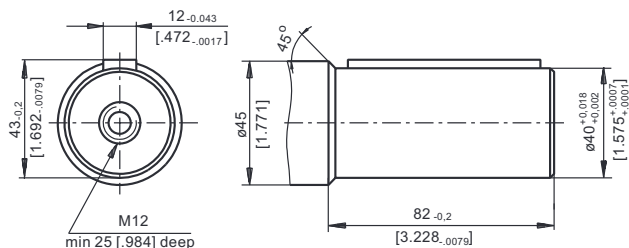


| Type     | *L1, mm [in] | L2, mm [in]  | Lmax, mm [in] |
|----------|--------------|--------------|---------------|
| MT/B 160 | 17 [.67]     | 178 [7.01]   | 228 [8.98]    |
| MT/B 200 | 22 [.87]     | 183 [7.21]   | 233 [9.17]    |
| MT/B 250 | 28,3 [1.11]  | 189,3 [7.45] | 239 [9.41]    |
| MT/B 315 | 37,5 [1.48]  | 198,5 [7.81] | 248 [9.76]    |
| MT/B 400 | 48 [1.89]    | 209 [8.23]   | 259 [10.2]    |
| MT/B 500 | 62 [2.44]    | 223 [8.78]   | 273 [10.8]    |
| MT/B 630 | 58 [2.28]    | 219 [8.62]   | 269 [10.6]    |
| MT/B 725 | 67 [2.64]    | 228 [8.98]   | 278 [10.9]    |

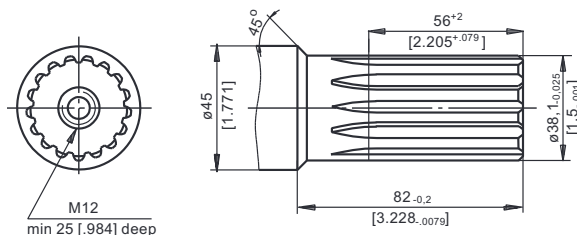
\* The width of the gerotor is  
3,5 mm [.138 in] greater than L<sub>1</sub>.

## SHAFT EXTENSIONS

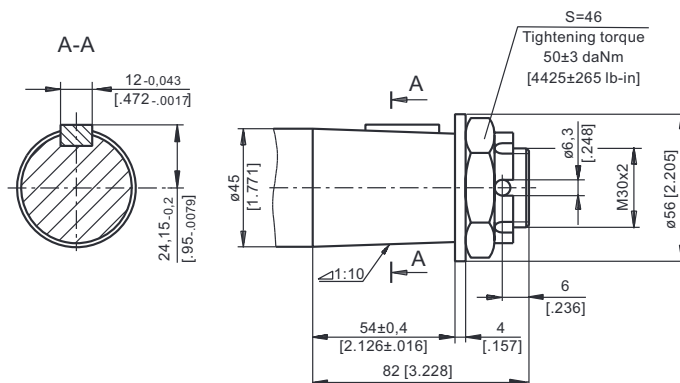
**C** -  $\varnothing 40$  straight, Parallel key A12x8x70 DIN 6885  
Max. Torque 123 daNm [10886 lb-in]



**SH** -  $\varnothing 1\frac{1}{2}$ " splined 17T, DP 12/24 ANSI B92.1-1976  
Max. Torque 123 daNm [10886 lb-in]



**K** - tapered 1:10, Parallel key B12x8x28 DIN 6885  
Max. Torque 210 daNm [18587 lb-in]



## ORDER CODE

| MT / B | 1 | 2 | 3 | 4 | 5 |
|--------|---|---|---|---|---|
|        |   |   |   |   |   |

### Pos.1 - Displacement code

|            |                                                           |
|------------|-----------------------------------------------------------|
| <b>160</b> | - 161,1 cm <sup>3</sup> /rev [ 9.83 in <sup>3</sup> /rev] |
| <b>200</b> | - 201,4 cm <sup>3</sup> /rev [12.29 in <sup>3</sup> /rev] |
| <b>250</b> | - 251,8 cm <sup>3</sup> /rev [15.36 in <sup>3</sup> /rev] |
| <b>315</b> | - 326,3 cm <sup>3</sup> /rev [19.90 in <sup>3</sup> /rev] |
| <b>400</b> | - 410,9 cm <sup>3</sup> /rev [25.06 in <sup>3</sup> /rev] |
| <b>500</b> | - 523,6 cm <sup>3</sup> /rev [31.95 in <sup>3</sup> /rev] |
| <b>630</b> | - 631,2 cm <sup>3</sup> /rev [38.50 in <sup>3</sup> /rev] |
| <b>725</b> | - 724,3 cm <sup>3</sup> /rev [44.20 in <sup>3</sup> /rev] |

### Pos.2 - Shaft Extensions\*

|           |                                                                 |
|-----------|-----------------------------------------------------------------|
| <b>C</b>  | - $\varnothing 40$ straight, Parallel key A12x8x70 DIN6885      |
| <b>SH</b> | - $\varnothing 1\frac{1}{2}$ " splined 17 DP12/24 ANS B922.1-76 |
| <b>K</b>  | - $\varnothing 45$ tapered 1:10, Parallel key B12x8x28 DIN 6885 |

### Pos.3 - Check Valves

|          |                        |
|----------|------------------------|
| omit     | - with check valves    |
| <b>1</b> | - without check valves |

### Pos.4 - Special Features (see page 68)

### Pos.5 - Design Series

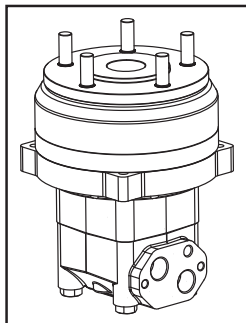
|      |                     |
|------|---------------------|
| omit | - Factory specified |
|------|---------------------|

### NOTES:

\* The permissible output torque for shafts must not be exceeded!

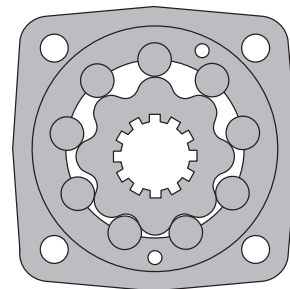
The motor-brakes are manganophosphatized as standard.

# HYDRAULIC MOTOR-BRAKE MT/BX



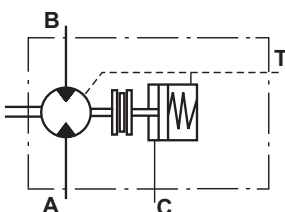
## APPLICATION

- » Conveyors
- » Metal working machines
- » Agricultural machines
- » Road building machines
- » Mining machinery
- » Food industries
- » Special vehicles
- » Plastic and rubber machinery etc.



## CONTENTS

|                               |    |
|-------------------------------|----|
| Specification data .....      | 31 |
| Dimensions and mounting ..... | 33 |
| Permissible shaft loads ..... | 34 |
| Order code .....              | 34 |



## OPTIONS

- » Model - Disc valve, roll-gerotor;
- » Fully integrated friction disk brake;
- » Side ports;
- » Shafts - straight, splined and tapered;
- » BSPP ports
- » Other special features

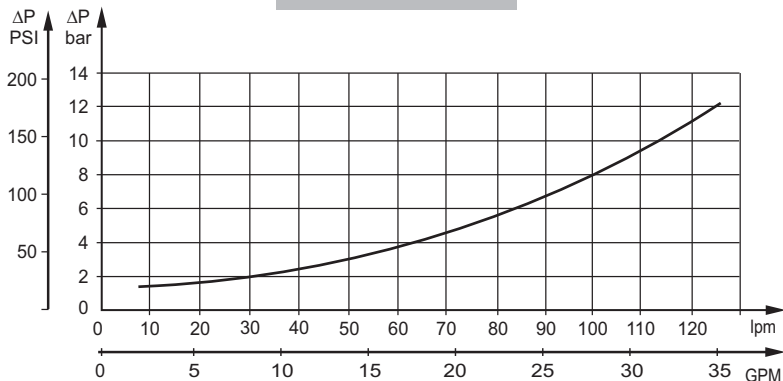
## GENERAL

|                                                                       |                                                                  |
|-----------------------------------------------------------------------|------------------------------------------------------------------|
| <b>Max. Displacement,</b> cm <sup>3</sup> /rev [in <sup>3</sup> /rev] | 523,6 [31.95]                                                    |
| <b>Max. Speed,</b> [RPM]                                              | 780                                                              |
| <b>Max. Torque,</b> daNm [lb-in]                                      | cont.: 122 [10780] int.: 137 [12125]                             |
| <b>Max. Output,</b> kW [HP]                                           | 40 [54]                                                          |
| <b>Max. Pressure Drop,</b> bar [PSI]                                  | cont.: 200 [2900] int.: 240 [3450]                               |
| <b>Max. Oil Flow,</b> lpm [GPM]                                       | 150 [40]                                                         |
| <b>Min. Speed,</b> [RPM]                                              | 5                                                                |
| <b>Permissible Shaft Loads,</b> daN [lbs]                             | P <sub>a</sub> =1000 [2248]                                      |
| <b>Pressure fluid</b>                                                 | Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)                  |
| <b>Temperature range,</b> °C [°F]                                     | -40÷140 [-40÷284]                                                |
| <b>Optimal Viscosity range,</b> mm <sup>2</sup> /s [SUS]              | 20÷75 [98÷347]                                                   |
| <b>Filtration</b>                                                     | ISO code 20/16 (Min. recommended fluid filtration of 25 microns) |

### Oil flow in drain line

| Pressure drop<br>bar [PSI] | Viscosity<br>mm <sup>2</sup> /s [SUS] | Oil flow in<br>drain line<br>lpm [GPM] |
|----------------------------|---------------------------------------|----------------------------------------|
| 140 [2030]                 | 20 [98]                               | 2,5 [.66]                              |
|                            | 35 [164]                              | 1,5 [.39]                              |
| 210 [3045]                 | 20 [98]                               | 5 [1.32]                               |
|                            | 35 [164]                              | 3 [.79]                                |

### Pressure Losses



## SPECIFICATION DATA

| Type                                                             |                           | MT/BX<br>160 | MT/BX<br>200  | MT/BX<br>250  | MT/BX<br>315  | MT/BX<br>400  | MT/BX<br>500  |
|------------------------------------------------------------------|---------------------------|--------------|---------------|---------------|---------------|---------------|---------------|
| <b>Displacement, cm<sup>3</sup>/rev [in<sup>3</sup>/rev]</b>     |                           | 161,1 [9.83] | 201,4 [12.29] | 251,8 [15.36] | 326,3 [19.90] | 410,9 [25.06] | 523,6 [31.95] |
| <b>Max. Speed,<br/>[RPM]</b>                                     | Cont.                     | 625          | 625           | 500           | 380           | 305           | 240           |
|                                                                  | Int.*                     | 780          | 750           | 600           | 460           | 365           | 285           |
| <b>Max. Torque<br/>daNm [lb-in]</b>                              | Cont.                     | 47 [4160]    | 59 [5220]     | 73 [6460]     | 95 [8410]     | 108 [9560]    | 122 [10800]   |
|                                                                  | Int.*                     | 56 [4960]    | 71 [6285]     | 88 [7790]     | 114 [10090]   | 126 [11150]   | 137 [12125]   |
| <b>Max. Output<br/>kW [HP]</b>                                   | Cont.                     | 26,5 [36]    | 33,5 [45]     | 33,5 [45]     | 33,5 [45]     | 30 [40]       | 26,5 [36]     |
|                                                                  | Int.*                     | 32 [43]      | 40 [54]       | 40 [54]       | 40 [54]       | 35 [45]       | 30 [40]       |
| <b>Max. Pressure Drop<br/>bar [PSI]</b>                          | Cont.                     | 200 [2900]   | 200 [2900]    | 200 [2900]    | 200 [2900]    | 180 [2600]    | 160 [2300]    |
|                                                                  | Int.*                     | 240 [3450]   | 240 [3450]    | 240 [3450]    | 240 [3450]    | 210 [3050]    | 180 [2600]    |
| <b>Max. Oil Flow<br/>lpm [GPM]</b>                               | Cont.                     | 100 [26.5]   | 125 [33]      | 125 [33]      | 125 [33]      | 125 [33]      | 125 [33]      |
|                                                                  | Int.*                     | 125 [33]     | 150 [40]      | 150 [40]      | 150 [40]      | 150 [40]      | 150 [40]      |
| <b>Max. Inlet Pressure<br/>bar [PSI]</b>                         | Cont.                     | 210 [3050]   | 210 [3050]    | 210 [3050]    | 210 [3050]    | 210 [3050]    | 210 [3050]    |
|                                                                  | Int.*                     | 250 [3600]   | 250 [3600]    | 250 [3600]    | 250 [3600]    | 250 [3600]    | 250 [3600]    |
| <b>Max. Return Pressure<br/>with Drain Line, bar [PSI]</b>       | Cont.                     | 140 [2030]   | 140 [2030]    | 140 [2030]    | 140 [2030]    | 140 [2030]    | 140 [2030]    |
|                                                                  | Int.*                     | 175 [2540]   | 175 [2540]    | 175 [2540]    | 175 [2540]    | 175 [2540]    | 175 [2540]    |
| <b>Max. Starting Pressure with<br/>Unloaded Shaft, bar [PSI]</b> |                           | 10 [150]     | 10 [150]      | 10 [150]      | 10 [150]      | 10 [150]      | 10 [150]      |
| <b>Min. Starting Torque<br/>daNm [lb-in]</b>                     | At max. press. drop Cont. | 34 [3010]    | 43 [3800]     | 53 [4690]     | 74 [6550]     | 84 [7435]     | 95 [8410]     |
|                                                                  | At max. press. drop Int.* | 41 [3630]    | 52 [4600]     | 63 [5580]     | 89 [7880]     | 97 [8585]     | 106 [9380]    |
| <b>Min. Speed**, [RPM]</b>                                       |                           | 10           | 9             | 8             | 7             | 6             | 5             |
| <b>Static Torque of Brake, daNm [lb-in]</b>                      |                           | 120 [10620]  |               |               |               |               |               |
| <b>Min. Brake Release Pressure***, bar [PSI]</b>                 |                           | 12 [174]     |               |               |               |               |               |
| <b>Max. Opening Pressure, bar [PSI]</b>                          |                           | 30 [435]     |               |               |               |               |               |
| <b>Max. Pressure in Drain Line, bar [PSI]</b>                    |                           | 5 [73]       |               |               |               |               |               |
| <b>Max. Pressure in Release Port C, bar [PSI]</b>                |                           | 75 [1088]    |               |               |               |               |               |
| <b>Weight, kg [lb]</b>                                           | MT/BX A...                | 32,8 [72.3]  | 33,3 [73.4]   | 34,0 [74.9]   | 35,0 [77.2]   | 36,3 [80.0]   | 37,6 [82.9]   |
|                                                                  | MT/BX B...                | 32,2 [70.9]  | 32,8 [72.3]   | 33,5 [73.9]   | 34,5 [76.1]   | 35,8 [78.9]   | 37,1 [81.8]   |

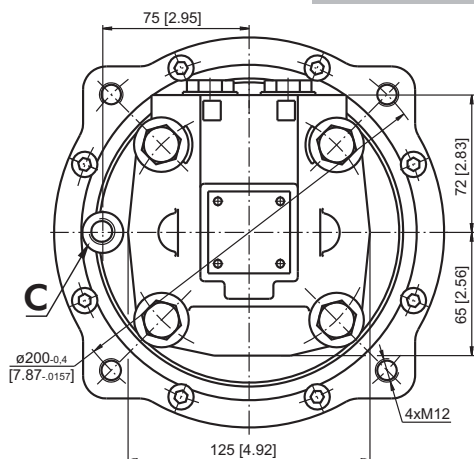
\* Intermittent operation: the permissible values may occur for max. 10% of every minute.

\*\* For speeds lower than given, consult factory or your regional manager.

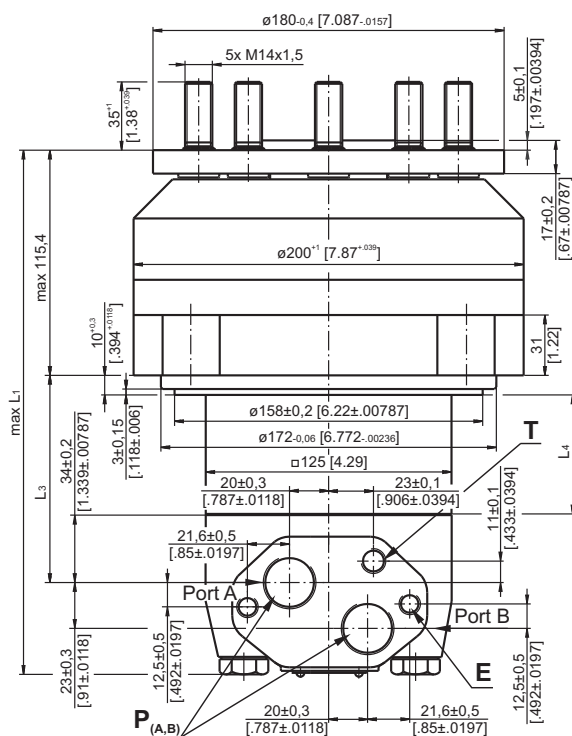
\*\*\* Motor-brakes must always have a drain line. The brake release pressure is the difference between the pressure in the brake release line and the pressure in the drain line.

- Intermittent speed and intermittent pressure must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).  
If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 13 mm<sup>2</sup>/s [70 SUS] at 50°C [122°F].
- Recommended maximum system operating temperature is 82°C [180°F].
- To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

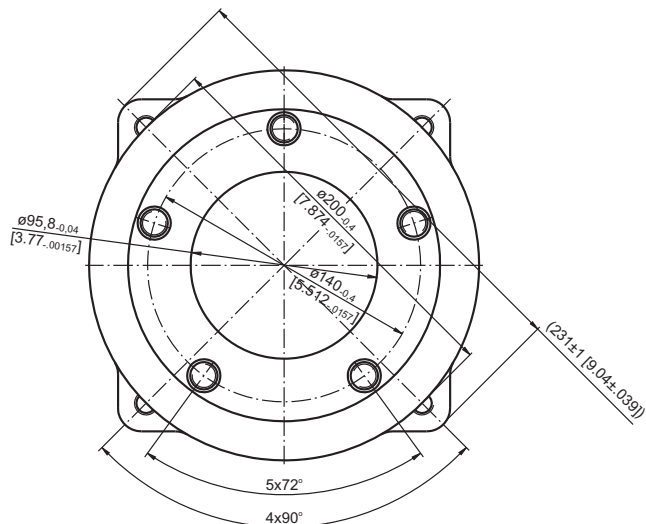
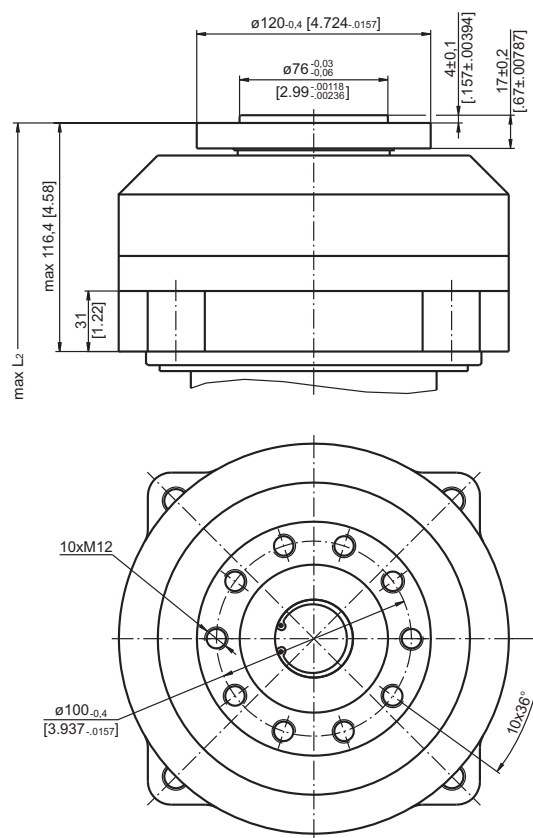
## DIMENSIONS AND MOUNTING DATA



**A** Wheel bolt flange



**B** Threaded hole flange



| Type      | L <sub>1</sub> ,mm [in] | L <sub>2</sub> ,mm [in] | L <sub>3</sub> ,mm [in] | *L <sub>4</sub> ,mm [in] |
|-----------|-------------------------|-------------------------|-------------------------|--------------------------|
| MT/BX 160 | 227 [8.937]             | 228 [8.976]             | 62,5 [2.461]            | 16,5 [.649]              |
| MT/BX 200 | 232 [9.134]             | 233 [9.173]             | 67,5 [2.657]            | 21,5 [.846]              |
| MT/BX 250 | 238 [9.370]             | 239 [9.409]             | 73,8 [2.906]            | 27,8 [1.094]             |
| MT/BX 315 | 247 [9.724]             | 248 [9.764]             | 83,0 [3.268]            | 37,0 [1.457]             |
| MT/BX 400 | 258 [10.157]            | 259 [10.197]            | 93,5 [3.681]            | 47,5 [1.870]             |
| MT/BX 500 | 272 [10.709]            | 273 [10.748]            | 107,5 [4.232]           | 61,5 [2.421]             |

\* The width of the gerolor is 3,5 mm greater than L<sub>4</sub>.



|                        | Versions |                                         |
|------------------------|----------|-----------------------------------------|
|                        | 2        | 4                                       |
| P <sub>(A,B)</sub>     | 2xG3/4   | 2x1 <sup>1</sup> / <sub>16</sub> -12 UN |
| T - Drainage tap       | G1/4     | 9/16-18 UNF                             |
| C - Brake release port | G1/4     | 9/16-18 UNF                             |
| E                      | 2xM10    | 2xM10                                   |

**Standard Rotation**  
Viewed from Shaft End  
Port A Pressurized - CW  
Port B Pressurized - CCW

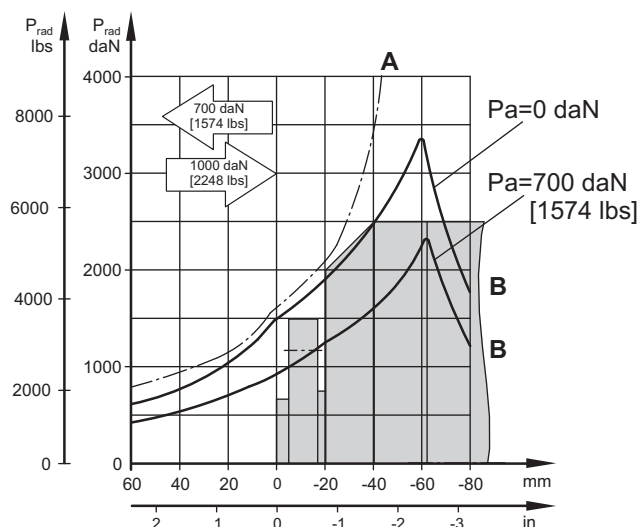
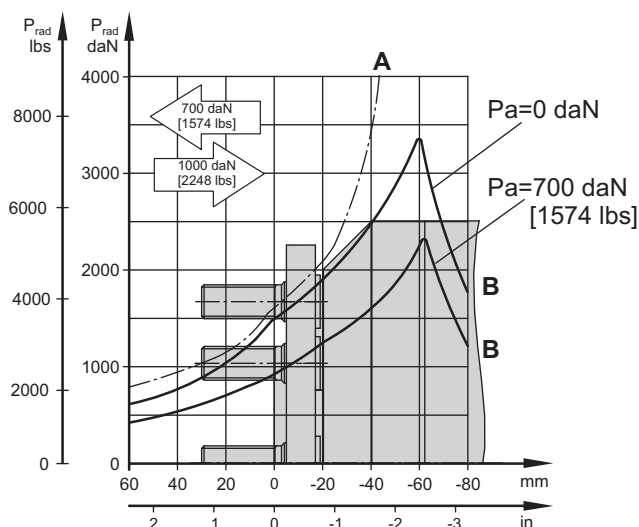
**Reverse Rotation**  
Viewed from Shaft End  
Port A Pressurized - CCW  
Port B Pressurized - CW

## PERMISSIBLE SHAFT LOADS

The load diagram is valid for an average bearings life of 3000 hours at 50 RPM

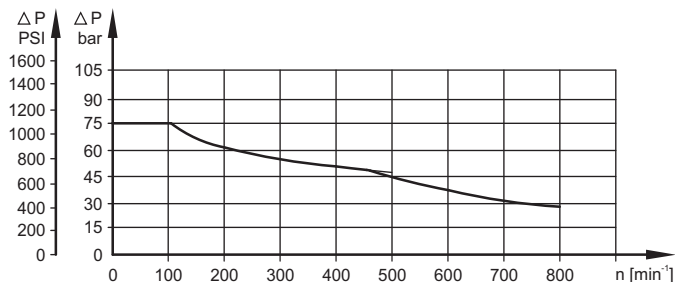
**A** - Permissible radial shaft load.

**B** - Max. radial shaft load. Any shaft load exceeding the values shown in the curve will involve a risk of breakage



Warning: Drain line should always be used.

## MAX. PERMISSIBLE SHAFT SEAL PRESSURE



## ORDER CODE

|              | 1 | 2 | 3 | 4 | 5 |
|--------------|---|---|---|---|---|
| <b>MT/BX</b> |   |   |   |   |   |

### Pos.1 - Flange type

- A** - Wheel bolt flange 5xM14 on ø180
- B** - Threaded hole flange 10xM12 on ø120

### Pos.2 - Displacement code

- 160** - 161,1 cm³/rev [ 9.83 in³/rev]
- 200** - 201,4 cm³/rev [12.29 in³/rev]
- 250** - 251,8 cm³/rev [15.36 in³/rev]
- 315** - 326,3 cm³/rev [19.90 in³/rev]
- 400** - 410,9 cm³/rev [25.06 in³/rev]
- 500** - 523,6 cm³/rev [31.95 in³/rev]

### Pos.3 - Port Size/Type [standard manifold to each]

- 2** - side ports, 2xG3/4, G1/4, BSP thread, ISO 228
- 4** - side ports, 2x1 1/16-12 UN, O-ring, 9/16-18 INF

### Pos.4 - Special Features (see page 68)

### Pos.5 - Design Series

omit - Factory specified

### NOTES:

\* Color at customer's request.

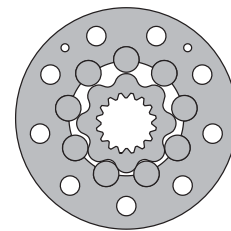
The motor-brakes are manganophosphatized as standard.

# HYDRAULIC MOTOR-BRAKE MTM/B



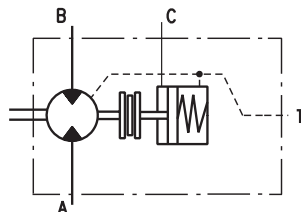
## APPLICATION

- » Skid Steer Loaders
- » Metal working machines
- » Trenchers
- » Augers
- » Agricultural machines
- » Road building machines
- » Special vehicles
- » Mine machines
- » Woodworking and sawmill machinery
- » Conveyors etc.



## CONTENTS

|                               |       |
|-------------------------------|-------|
| Specification data .....      | 36    |
| Dimensions and mounting ..    | 37÷38 |
| Shaft extensions .....        | 39    |
| Permissible shaft loads ..... | 40    |
| Order code .....              | 40    |



## OPTIONS

- » Model - Disc valve, roll-gerotor;
- » Fully integrated friction disk brake;
- » Side ports;
- » Shafts - straight, splined and tapered;
- » BSPP ports
- » Other special features

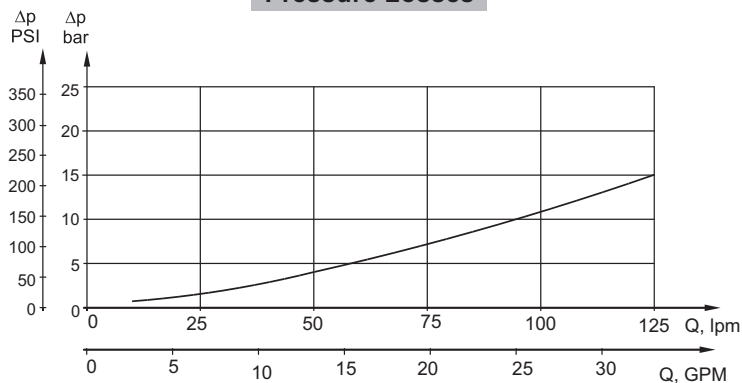
## GENERAL

|                                                                       |                                                                  |
|-----------------------------------------------------------------------|------------------------------------------------------------------|
| <b>Max. Displacement,</b> cm <sup>3</sup> /rev [in <sup>3</sup> /rev] | 724,3 [44.2]                                                     |
| <b>Max. Speed,</b> [RPM]                                              | 750                                                              |
| <b>Max. Torque,</b> daNm [in-lb]                                      | cont.: 175 [15490] int.: 215 [16030]                             |
| <b>Max. Output,</b> kW [HP]                                           | 70 [94]                                                          |
| <b>Max. Pressure Drop,</b> bar [PSI]                                  | cont.: 250 [3600] int.: 350 [5080]                               |
| <b>Max. Oil Flow,</b> lpm [GPM]                                       | 150 [40]                                                         |
| <b>Permissible Shaft Loads</b> daN [lbs]                              | P <sub>a</sub> =1000 [2250]                                      |
| <b>Pressure fluid</b>                                                 | Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)                  |
| <b>Temperature range,</b> °C [°F]                                     | -40÷140 [-40÷284]                                                |
| <b>Optimal Viscosity range,</b> mm <sup>2</sup> /s [SUS]              | 20÷75 [98÷347]                                                   |
| <b>Filtration</b>                                                     | ISO code 20/16 (Min. recommended fluid filtration of 25 microns) |

### Oil flow in drain line

| Pressure drop<br>bar [PSI] | Viscosity<br>mm <sup>2</sup> /s [SUS] | Oil flow in<br>drain line<br>lpm [GPM] |
|----------------------------|---------------------------------------|----------------------------------------|
| 200 [2900]                 | 20 [98]                               | 2,5 [.660]                             |
|                            | 35 [164]                              | 1,5 [.400]                             |
| 275 [3990]                 | 20 [98]                               | 4 [1.057]                              |
|                            | 35 [164]                              | 2,5 [.660]                             |

### Pressure Losses



## SPECIFICATION DATA

| Type                                                         |        | MTM/B<br>200     | MTM/B<br>250     | MTM/B<br>315    | MTM/B<br>400     | MTM/B<br>470   | MTM/B<br>500     | MTM/B<br>630    | MTM/B<br>725    |
|--------------------------------------------------------------|--------|------------------|------------------|-----------------|------------------|----------------|------------------|-----------------|-----------------|
| Displacement,<br>cm <sup>3</sup> /rev [in <sup>3</sup> /rev] |        | 201,4<br>[12.29] | 251,8<br>[15.36] | 326,3<br>[19.9] | 410,9<br>[25.06] | 475<br>[28.97] | 494,9<br>[30.17] | 631,2<br>[38.5] | 724<br>[44.2]   |
| Max. Speed,<br>[RPM]                                         | Cont.  | 625              | 500              | 380             | 305              | 260            | 250              | 196             | 170             |
|                                                              | Int.*  | 750              | 600              | 460             | 365              | 315            | 300              | 235             | 215             |
| Max. Torque,<br>daNm [lb-in]                                 | Cont.  | 72 [6375]        | 90 [7965]        | 116 [10265]     | 147 [13010]      | 171 [15135]    | 172 [15225]      | 175 [15490]     | 160 [14160]     |
|                                                              | Int.*  | 102 [9030]       | 128 [11330]      | 163 [14425]     | 206 [18232]      | 215 [16030]    | 215 [16030]      | 215 [16030]     | 192 [17000]     |
|                                                              | Peak** | 115 [10180]      | 144 [12745]      | 186 [16460]     | 235 [20800]      | 240 [21240]    | 240 [21240]      | 255 [22570]     | 240 [21240]     |
| Max. Output,<br>kW [HP]                                      | Cont.  | 41 [55]          | 41 [55]          | 41 [55]         | 41 [55]          | 41 [55]        | 37,5 [50]        | 29 [39]         | 26 [35]         |
|                                                              | Int.*  | 65 [87]          | 70 [94]          | 70 [94]         | 70 [94]          | 55 [74]        | 51 [68]          | 45 [60]         | 40 [54]         |
| Max. Pressure Drop,<br>bar [PSI]                             | Cont.  | 250 [3600]       | 250 [3600]       | 250 [3600]      | 250 [3600]       | 250 [3600]     | 230 [3340]       | 185 [2680]      | 160 [2320]      |
|                                                              | Int.*  | 350 [5080]       | 350 [5080]       | 350 [5080]      | 350 [5080]       | 315 [4570]     | 280 [4060]       | 225 [3260]      | 210 [3045]      |
|                                                              | Peak** | 400 [5800]       | 400 [5800]       | 400 [5800]      | 400 [5800]       | 350 [5080]     | 320 [4640]       | 270 [3985]      | 260 [3770]      |
| Max. Oil Flow,<br>lpm [GPM]                                  | Cont.  | 125 [33]         | 125 [33]         | 125 [33]        | 125 [33]         | 125 [33]       | 125 [33]         | 125 [33]        | 125 [33]        |
|                                                              | Int.*  | 150 [40]         | 150 [40]         | 150 [40]        | 150 [40]         | 150 [40]       | 150 [40]         | 150 [40]        | 150 [40]        |
| Max. Starting Pressure with<br>Unloaded Shaft, bar [PSI]     |        | 6 [87]           | 6 [87]           | 6 [87]          | 6 [87]           | 6 [87]         | 6 [87]           | 6 [87]          | 6 [87]          |
| Min. Starting Torque,<br>daNm [lb-in]                        |        | 60<br>[5310]     | 75<br>[6640]     | 97<br>[8585]    | 122<br>[10800]   | 142<br>[12570] | 143<br>[12655]   | 144<br>[12745]  | 148<br>[13100]  |
| Static Torque of Brake,<br>daNm [lb-in]                      |        | 200 [17700]      |                  |                 |                  |                |                  |                 |                 |
| Min. Brake Release<br>Pressure***, bar [PSI]                 |        | 14 [203]         |                  |                 |                  |                |                  |                 |                 |
| Full Opening Pressure,<br>bar [PSI]                          |        | 40 [580]         |                  |                 |                  |                |                  |                 |                 |
| Max. Pressure in Release<br>Port C, bar [PSI]                |        | 120 [1740]       |                  |                 |                  |                |                  |                 |                 |
| Weight, kg [lb]                                              |        | 37,5<br>[82.7]   | 37,9<br>[83.6]   | 39,1<br>[86.2]  | 41,3<br>[91.1]   | 44,1<br>[97.2] | 46,0<br>[101.4]  | 49,1<br>[108.2] | 52,0<br>[114.6] |

\* Intermittent operation: the permissible values may occur for max. 10% of every minute.

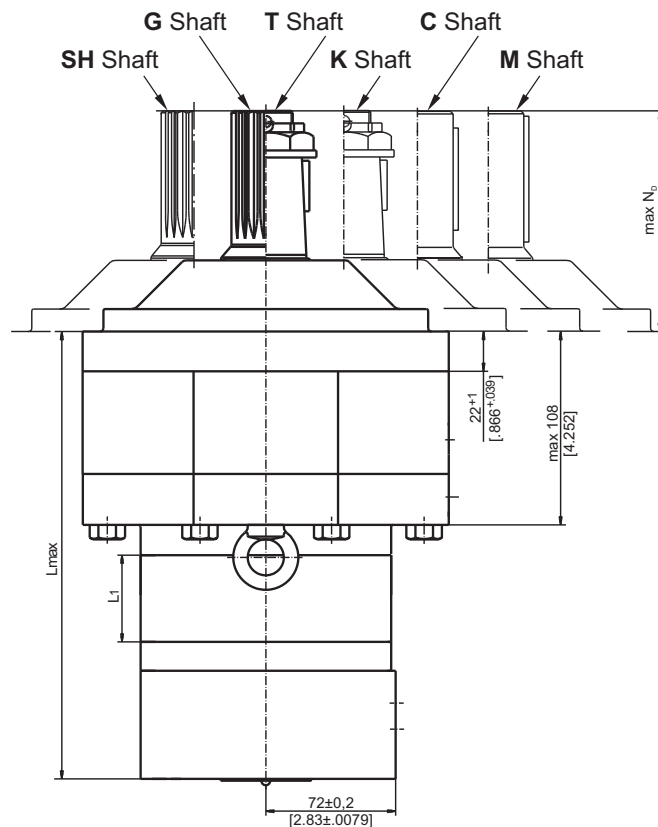
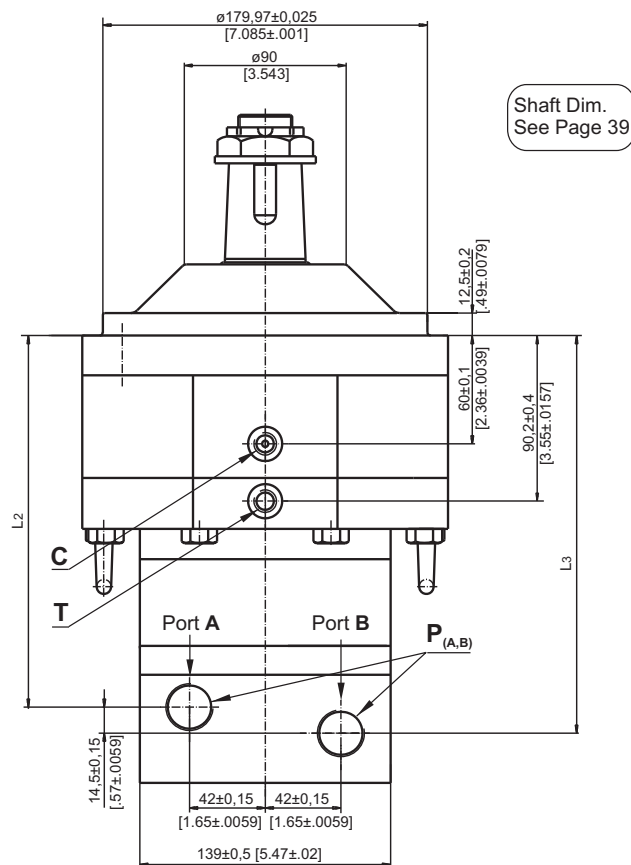
\*\* Peak load: the permissible values may occur for max. 1% of every minute.

\*\*\* Motor-brakes must always have a drain line. The brake release pressure is the difference between the pressure in the brake release line and the pressure in the drain line.

- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).  
If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 13 mm<sup>2</sup>/s [70 SUS] at 50°C [122°F].
- Recommended maximum system operating temperature is 82°C [180°F].
- To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

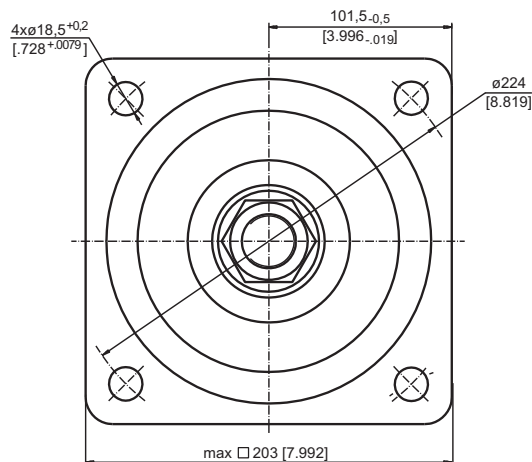
## DIMENSIONS AND MOUNTING DATA - MTM/B D

**D** - Bolt flange 4x $\varnothing 18.5$  mm  
spigot diameter 7.086 in [ $\varnothing 180$  mm]



**Standard Rotation**  
Viewed from Shaft End  
Port A Pressurized - CW  
Port B Pressurized - CCW

**Reverse Rotation**  
Viewed from Shaft End  
Port A Pressurized - CCW  
Port B Pressurized - CW



| Type        | L, mm [in]   | L2, mm [in]  | L3, mm [in]  | L1, mm [in] |
|-------------|--------------|--------------|--------------|-------------|
| MTM/B D 200 | 226 [8.90]   | 184 [7.24]   | 198,5 [7.86] | 25 [.98]    |
| MTM/B D 250 | 232,5 [9.15] | 190 [7.48]   | 204,5 [8.05] | 31,3 [1.23] |
| MTM/B D 315 | 241,5 [9.51] | 199,5 [7.85] | 214 [8.43]   | 40,5 [1.59] |
| MTM/B D 400 | 252 [9.92]   | 210 [8.27]   | 224,5 [8.84] | 51 [2.01]   |
| MTM/B D 470 | 260 [10.24]  | 218 [8.58]   | 232,5 [9.15] | 59 [2.32]   |
| MTM/B D 500 | 249 [9.80]   | 207 [8.15]   | 221,5 [8.72] | 48 [1.89]   |
| MTM/B D 630 | 262 [10.32]  | 220 [8.66]   | 234,5 [9.23] | 61 [2.40]   |
| MTM/B D 725 | 271 [10.67]  | 229 [9.02]   | 243,5 [9.59] | 70 [2.76]   |

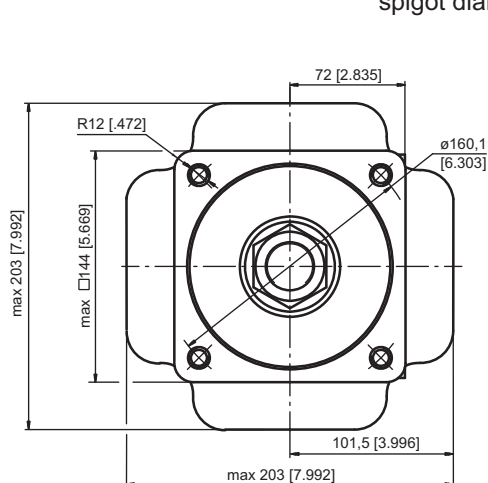
**Note:** For  $N_b$  see page 39

**C** : Brake release port  
**T** : Drainage tap

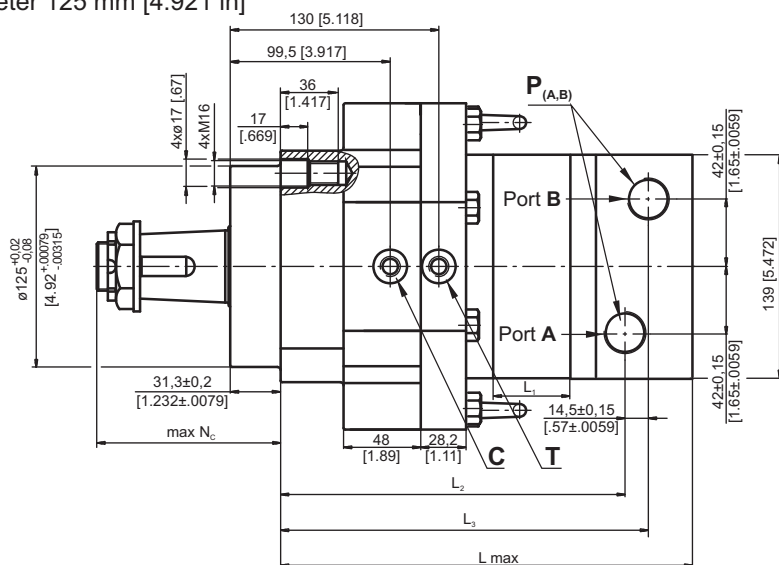
|                    | Versions          |                          |
|--------------------|-------------------|--------------------------|
|                    | 2                 | 4                        |
| P <sub>(A,B)</sub> | 2xG $\frac{3}{4}$ | 2x1 $\frac{1}{16}$ -12UN |
| T                  | G $\frac{1}{4}$   | $\frac{9}{16}$ -18UNF    |
| C                  | G $\frac{1}{4}$   | $\frac{7}{16}$ -20 UNF   |

## DIMENSIONS AND MOUNTING DATA MTM/B C and MTM/B AC

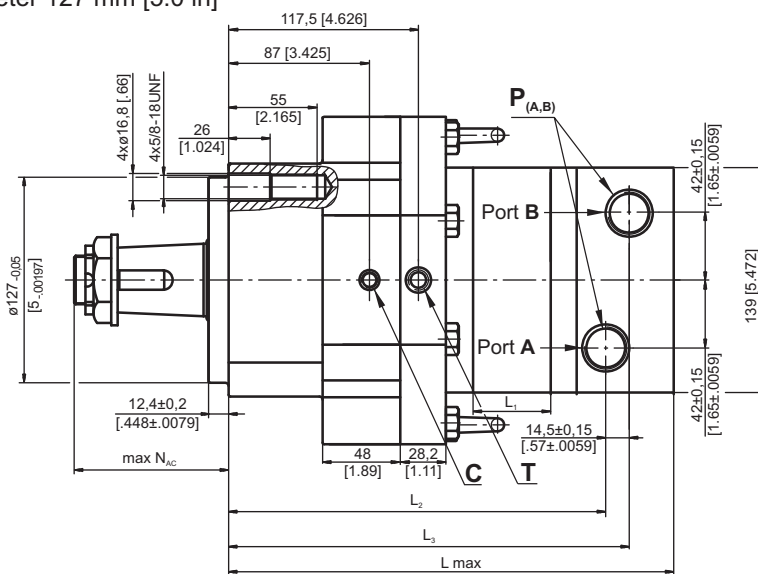
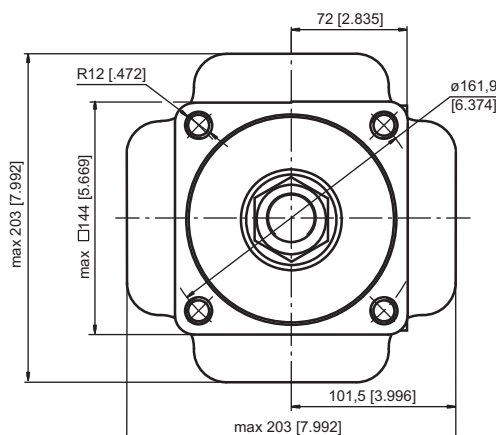
**C** - Thread hole flange 4xM16  
spigot diameter 125 mm [4.921 in]



Shaft Dim.  
See Page 39



**AC** - Thread hole flange 4x5/8-18 UNF  
spigot diameter 127 mm [5.0 in]



**C** : Brake release port  
**T** : Drainage tap

|                | Versions                        |                                        |
|----------------|---------------------------------|----------------------------------------|
|                | 2                               | 4                                      |
| <b>P (A,B)</b> | 2xG <sup>3</sup> / <sub>4</sub> | 2x1 <sup>1</sup> / <sub>16</sub> -12UN |
| <b>T</b>       | G <sup>1</sup> / <sub>4</sub>   | 9 <sup>16</sup> -18UNF                 |
| <b>C</b>       | G <sup>1</sup> / <sub>4</sub>   | 7 <sup>16</sup> -20 UNF                |

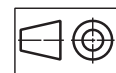
Note: For N<sub>c</sub> and N<sub>Ac</sub> see page 39

### Standard Rotation

Viewed from Shaft End  
Port A Pressurized - **CW**  
Port B Pressurized - **CCW**

### Reverse Rotation

Viewed from Shaft End  
Port A Pressurized - **CCW**  
Port B Pressurized - **CW**



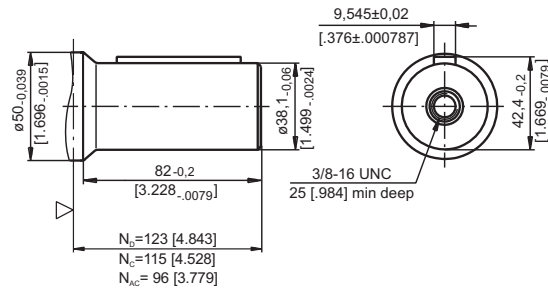
mm [in]

| Type        | L, mm [in]   | L2, mm [in]  | L3, mm [in]  | Type         | L, mm [in]    | L2, mm [in]  | L3, mm [in]   | L1, mm [in] |
|-------------|--------------|--------------|--------------|--------------|---------------|--------------|---------------|-------------|
| MTM/B C 200 | 233 [9.17]   | 191 [7.92]   | 205,5 [8.09] | MTM/B AC 200 | 252 [9.92]    | 210 [8.27]   | 224,5 [8.84]  | 25 [0.98]   |
| MTM/B C 250 | 239,3 [9.42] | 197,3 [7.77] | 211,8 [8.34] | MTM/B AC 250 | 258,5 [10.18] | 216,5 [8.25] | 231 [9.09]    | 31,3 [1.23] |
| MTM/B C 315 | 248,5 [9.48] | 206,5 [8.13] | 221 [8.70]   | MTM/B AC 315 | 267,5 [10.53] | 225,5 [8.88] | 240 [9.45]    | 40,5 [1.59] |
| MTM/B C 400 | 259 [10.19]  | 217 [8.54]   | 231,5 [9.11] | MTM/B AC 400 | 278 [10.94]   | 236 [9.29]   | 250,5 [9.186] | 51 [2.01]   |
| MTM/B C 470 | 267 [10.51]  | 225 [8.86]   | 239,5 [9.43] | MTM/B AC 470 | 286 [11.26]   | 244 [9.61]   | 258,5 [10.18] | 59 [2.32]   |
| MTM/B C 500 | 256 [10.08]  | 214 [8.43]   | 228,5 [8.99] | MTM/B AC 500 | 275 [10.83]   | 233 [9.17]   | 247,5 [9.74]  | 48 [1.89]   |
| MTM/B C 630 | 269 [10.59]  | 227 [8.94]   | 241,5 [9.51] | MTM/B AC 630 | 288 [11.34]   | 246 [9.68]   | 260,5 [10.26] | 61 [2.40]   |
| MTM/B C 725 | 278 [10.94]  | 236 [9.29]   | 250,5 [9.86] | MTM/B AC 725 | 297 [11.69]   | 255 [10.04]  | 269,5 [10.61] | 70 [2.76]   |

## SHAFT EXTENSIONS

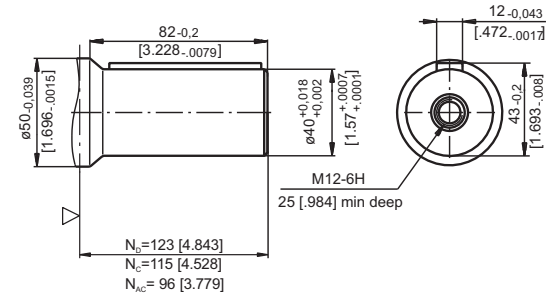
**C**

1½" [38,1] straight, Parallel key ¾" x ¾" x 2¼" BS46  
Max. Torque 133 daNm [11770 lb-in]



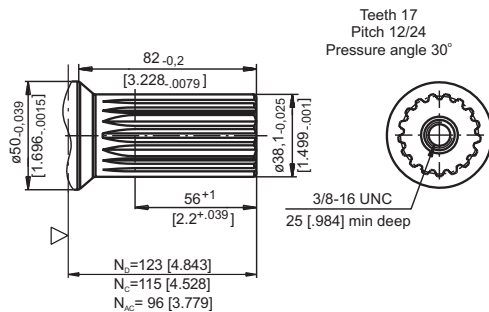
**M**

ø40 straight, Parallel key A12x8x70  
Max. Torque 133 daNm [11770 lb-in]



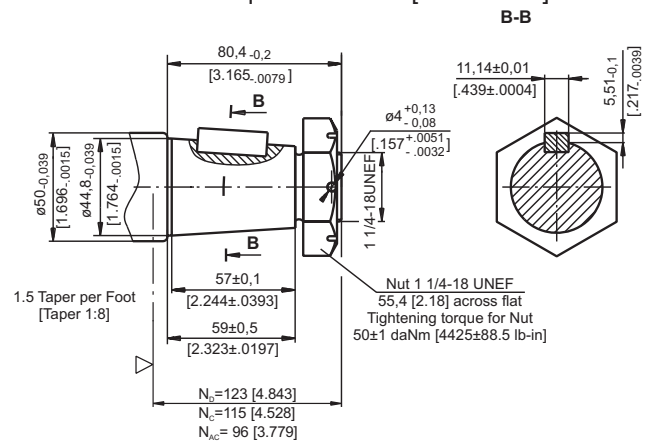
**G**

17T Splined, 1½" [38,1] ANS B92.1-1976  
Max. Torque 210 daNm [18580 lb-in]



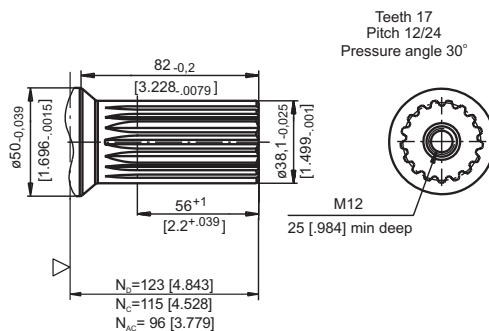
**T**

1¾" [44,5] SAE J501 Tapered 1:8  
Parallel key 7/16" x 1¼" BS46  
Max. Torque 210 daNm [18580 lb-in]



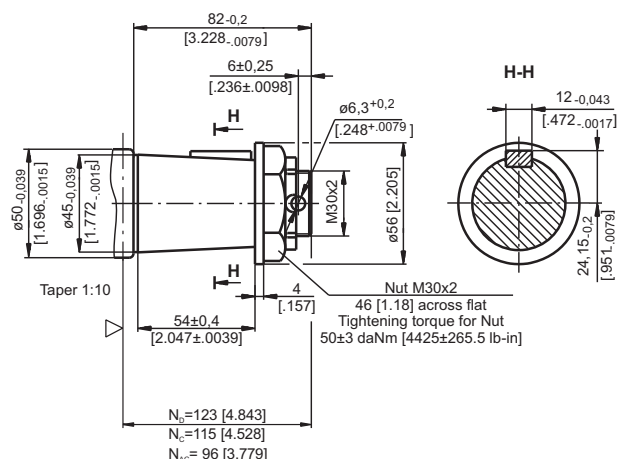
**SH**

17T Splined, 1½" [38,1] ANS B92.1-1976  
Max. Torque 210 daNm [18580 lb-in]



**K**

ø45 Tapered 1:10  
Parallel key 12x8x28 DIN 6885  
Max. Torque 210 daNm [18580 lb-in]

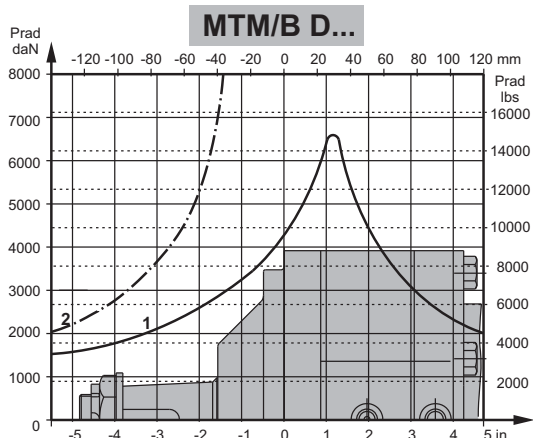


▽ - Motor Mounting Surface

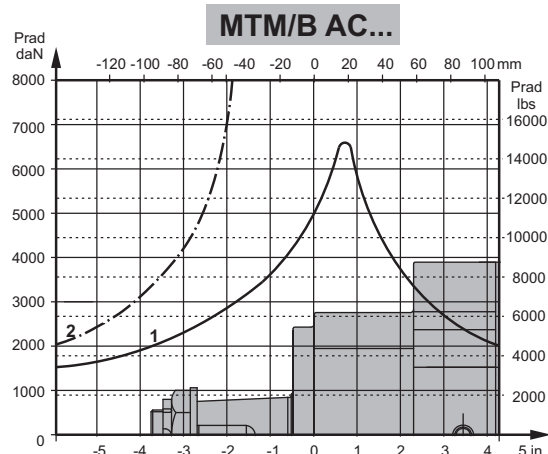
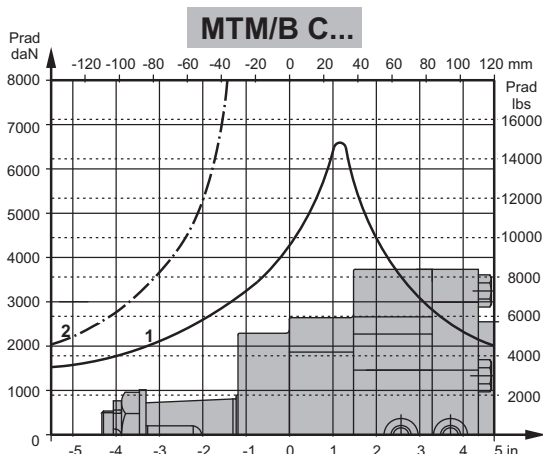
N<sub>D</sub> - for D flange  
N<sub>C</sub> - for C flange  
N<sub>AC</sub> - for AC flange



## PERMISSIBLE RADIAL SHAFT LOADS



- 1 - Bearing curve: The curve applies to a B10 bearing life of 2000 hours at 100 RPM.
- 2 - Shaft curve: The curve represents Max. permissible radial shaft load with safety factor 2:1.



### ORDER CODE

|              |   |   |   |   |   |   |
|--------------|---|---|---|---|---|---|
|              | 1 | 2 | 3 | 4 | 5 | 6 |
| <b>MTM/B</b> |   |   |   |   |   |   |

#### Pos.1 - Mounting Flange

- AC** - Flange 4x5/8-18UNC, spigot dia.  $\varnothing 127$  mm [5 in]
- C** - Flange 4xM16, spigot dia.  $\varnothing 125$  mm [4.92 in]
- D** - Flange 4x $\varnothing 18,5$  [.73], spigot dia.  $\varnothing 180$  mm [7.09 in]

#### Pos.2 - Displacement code

- 200** - 201,4 cm<sup>3</sup>/rev [12.29 in<sup>3</sup>/rev]
- 250** - 251,8 cm<sup>3</sup>/rev [15.36 in<sup>3</sup>/rev]
- 315** - 326,3 cm<sup>3</sup>/rev [19.90 in<sup>3</sup>/rev]
- 400** - 410,9 cm<sup>3</sup>/rev [25.06 in<sup>3</sup>/rev]
- 470** - 475,0 cm<sup>3</sup>/rev [28.97 in<sup>3</sup>/rev]
- 500** - 523,6 cm<sup>3</sup>/rev [31.95 in<sup>3</sup>/rev]
- 630** - 631,2 cm<sup>3</sup>/rev [38.52 in<sup>3</sup>/rev]
- 725** - 724,3 cm<sup>3</sup>/rev [44.20 in<sup>3</sup>/rev]

#### Pos.3 - Shaft Extensions\*

- C** - 1½" [38,1] straight, Parallel key 3/8x3/8x2 1/4"
- G** - 1½" [38,1] 17T Splined (3/8-16 UNC)
- M** - 40 mm straight, Parallel key 12x8x70
- T** - 1:8 Tapered, Parallel key 7/16x7/16x1 1/4"
- SH** - 1½" [38,1] 17T Splined (M12)
- K** - 1:10 Tapered, Parallel key 12x8x28

#### Pos.4 - Port Size/Type

- 2** - side ports, 2xG 3/4, G1/4, BSP thread, ISO 228
- 4** - side ports, 2x1 1/16-12 UN, O-ring, 9/16-18 UNF, 7/16-20UNF

#### Pos.5 - Special Features

- omit - Reinforced motor **HD\*\*** (always)

For Other **Special Features** see page 68

#### Pos.6 - Design Series

- omit - Factory specified

#### Notes:

- \* The permissible output torque for shafts must not be exceeded!
- \*\* The drain line must always be opened!

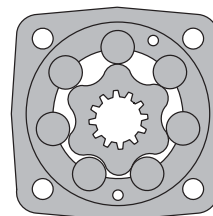
The motor-brakes are mangano-phosphatized as standard.

# HYDRAULIC MOTOR-BRAKES SW500B350V



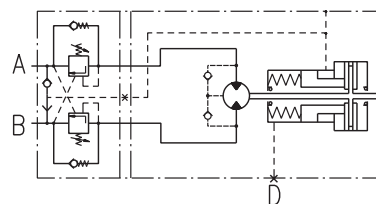
## APPLICATION

- » Wheel drives
- » Conveyors
- » Rotators
- » Positioners
- » Winches
- » Swing drives
- » Door openers



## CONTENTS

|                               |    |
|-------------------------------|----|
| Specification data .....      | 41 |
| Dimensions and mounting ..... | 42 |
| Permissible shaft loads ..... | 42 |
| Function diagrams .....       | 43 |
| Order code .....              | 43 |



## SPECIFICATION DATA

| Type                                                                                 |                           | SW500B350V          |
|--------------------------------------------------------------------------------------|---------------------------|---------------------|
| Displacement, cm <sup>3</sup> /rev [in <sup>3</sup> /rev]                            |                           | 475,3 [29]          |
| Max. Speed,<br>RPM                                                                   | Cont.                     | 16                  |
|                                                                                      | Int.*                     | 25                  |
| Max. Torque,<br>daNm [lb-in]                                                         | Cont.                     | 82 [7260]           |
|                                                                                      | Int.*                     | 95 [8420]           |
| Max. Output,<br>kW [HP]                                                              | Cont.                     | 0,9 [1.3]           |
|                                                                                      | Int.*                     | 2,4 [3.3]           |
| Max. Pressure Drop,<br>bar [PSI]                                                     | Cont.                     | 125 [1800]          |
|                                                                                      | Int.*                     | 145 [2100]          |
| Max. Oil Flow,<br>lpm [GPM]                                                          | Cont.                     | 8 [2]               |
|                                                                                      | Int.*                     | 12 [3]              |
| Max. Return Pressure without Drain Line<br>or Max. Pressure in Drain Line, bar [PSI] |                           | 100 [1450]          |
| Min. Starting Torque,<br>daNm [lb-in]                                                | At max. press. drop Cont. | 72 [6400]           |
|                                                                                      | At max. press. drop Int.* | 75 [6650]           |
| Min. Speed**, RPM                                                                    |                           | 5                   |
| Static Torque for the Brake***, daNm [lb-in]                                         |                           | 164 [14 515]        |
| Release Pressure ±10%,<br>bar [PSI]                                                  | initial                   | 25...28 [363...406] |
|                                                                                      | full                      | 31 [449.6]          |
| Max. Steering Pressure, bar [PSI]                                                    |                           | 245 [3553]          |
| Max. Pressure in Drain Space for the Brake, bar [PSI]                                |                           | 0,5 [7]             |
| Pilot Ratio for the Valve                                                            |                           | 4,25:1              |

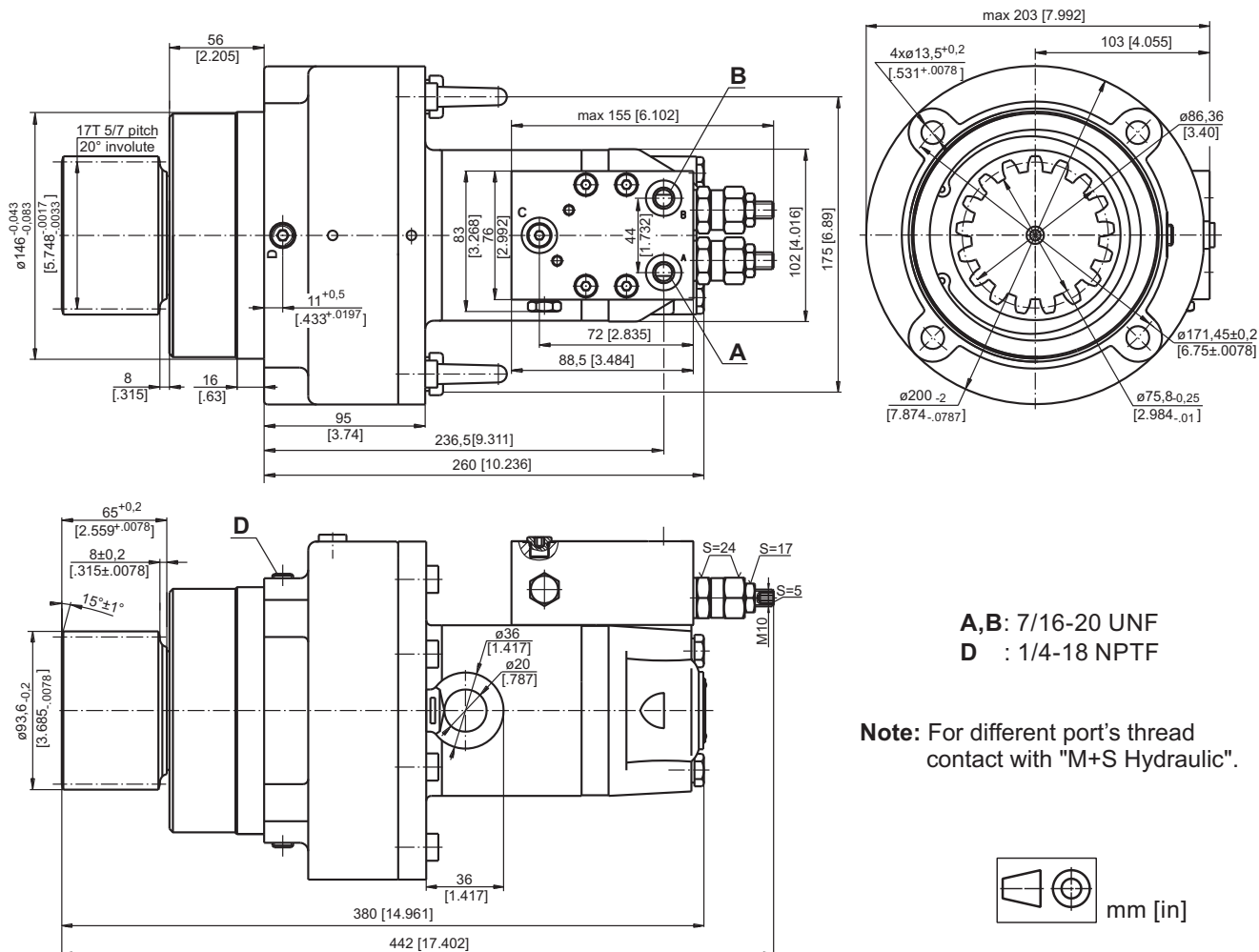
\* Intermittent operation: the permissible values may occur for max. 10% of every minute.

\*\* For speeds of 5 RPM lower than given, consult factory or your regional manager.

\*\*\* Static torque is obtained at working pressure - 0 PSI [0 bar].

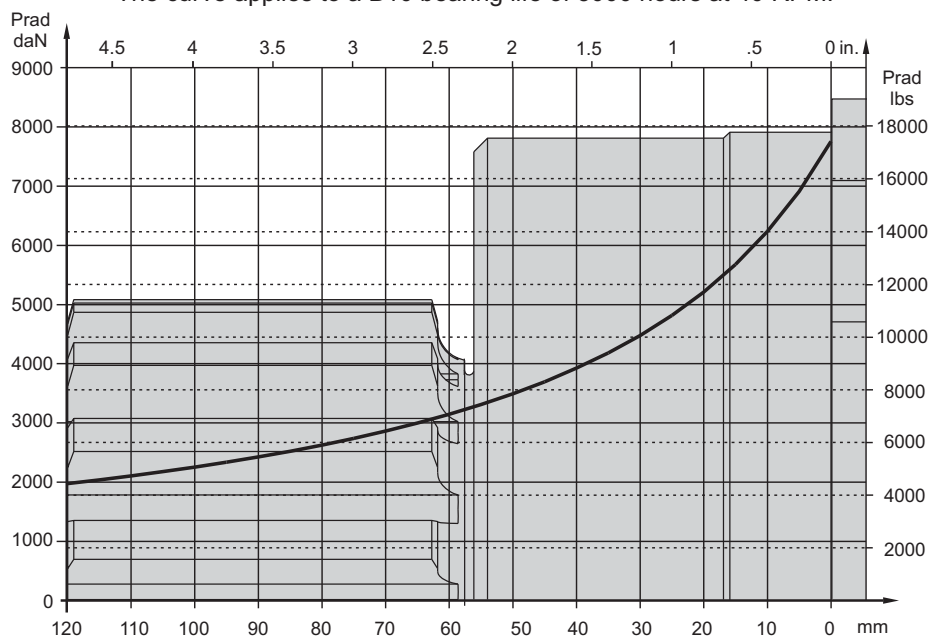
Space is filled with 125±20 cm<sup>3</sup> [7.63±1.22 in<sup>3</sup>] mineral oil HLP (DIN 51524) or HM (ISO 6743/4).

## DIMENSIONS AND MOUNTING



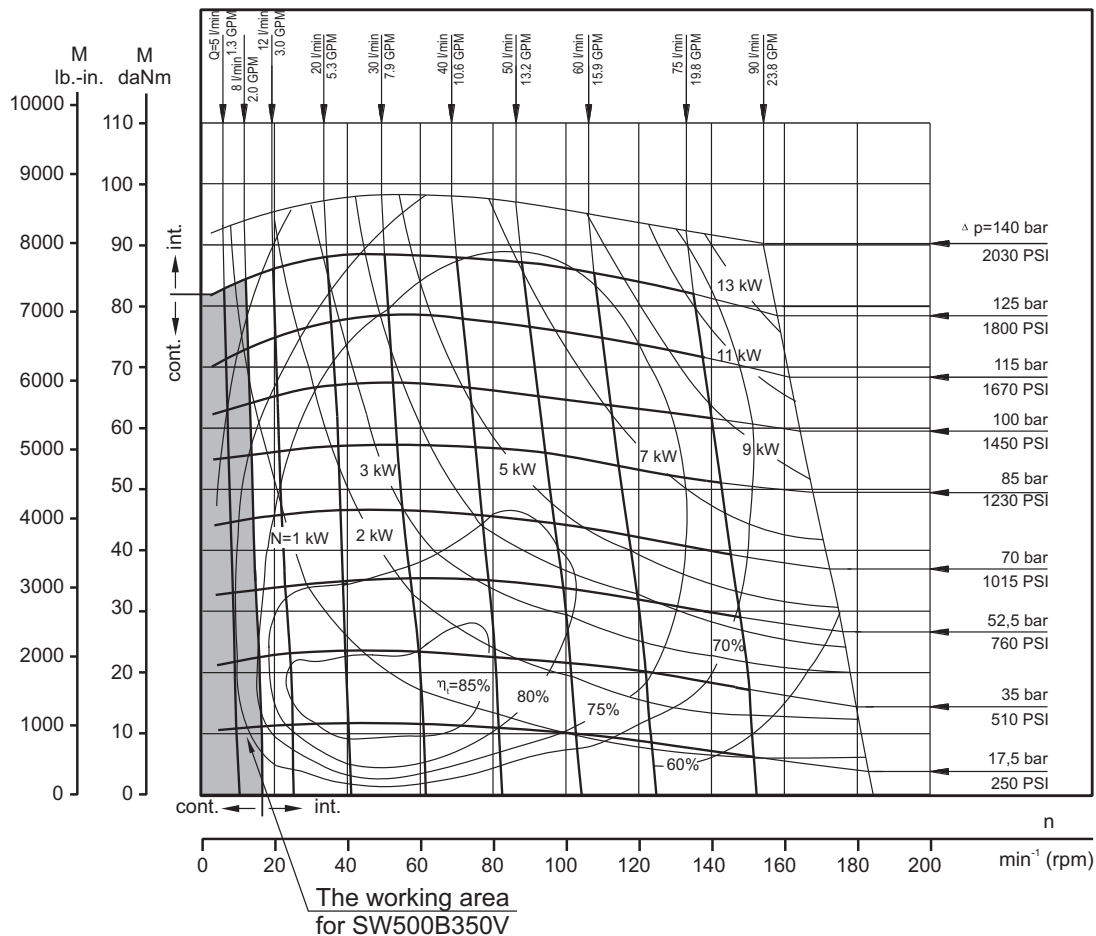
## PERMISSIBLE SHAFT LOADS

The curve applies to a B10 bearing life of 3000 hours at 40 RPM.



## FUNCTION DIAGRAMS

### SW 500



## ORDER CODE

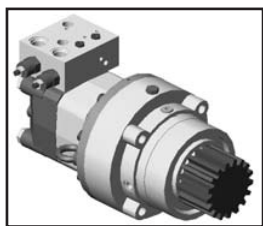
| 1        | 2        | 3          | 4        | 5          | 6        | 7 | 8 |
|----------|----------|------------|----------|------------|----------|---|---|
| <b>S</b> | <b>W</b> | <b>500</b> | <b>B</b> | <b>350</b> | <b>V</b> |   |   |

- Pos.1 - Type**  
**S** - Motor MLHS
- Pos.2 - Displacement code**
- Pos.3 - Brake**
- Pos.4 - Brake Type**

- Pos.5 - Shaft Extension**  
omit - 17T PITCH splined
- Pos.6 - Valve**
- Pos.7 - Special Features** (see page 68)
- Pos.8 - Design Series**  
omit - Factory specified

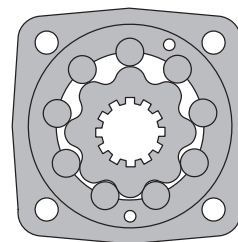
The motor-brakes are mangano-phosphatized as standard.

# HYDRAULIC MOTOR-BRAKES TW500B350...V



## APPLICATION

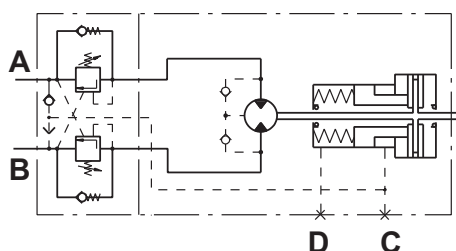
- » Wheel drives
- » Conveyors
- » Rotators
- » Positioners
- » Winches
- » Swing drives
- » Door openers



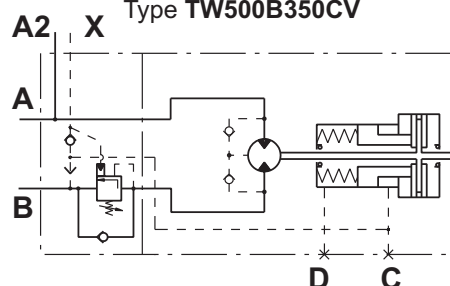
## CONTENTS

|                               |    |
|-------------------------------|----|
| Specification data .....      | 44 |
| Dimensions and mounting ..... | 45 |
| Function diagrams .....       | 45 |
| Order code .....              | 46 |

Motor-Brake  
Type **TW500B350V**



Motor-Brake  
Type **TW500B350CV**



## SPECIFICATION DATA

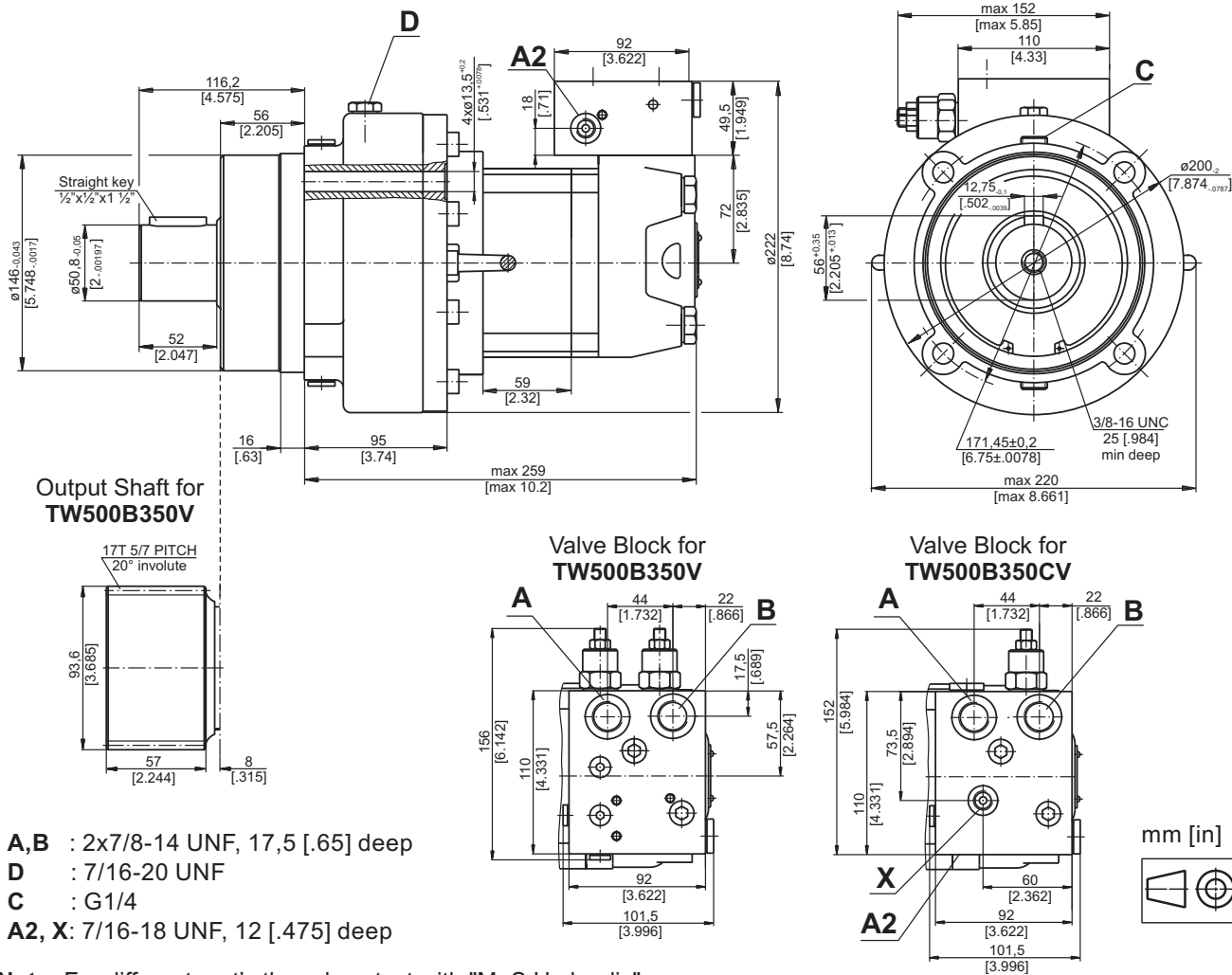
| Type                                                                                 |                           | TW500B350...V           |
|--------------------------------------------------------------------------------------|---------------------------|-------------------------|
| Displacement, cm <sup>3</sup> /rev [in <sup>3</sup> /rev]                            |                           | 475 [29]                |
| Max. Speed,<br>RPM                                                                   | Cont.                     | 40                      |
|                                                                                      | Int.*                     | 60                      |
| Max. Torque,<br>daNm [lb-in]                                                         | Cont.                     | 114 [10 000]            |
|                                                                                      | Int.*                     | 135 [12 000]            |
| Max. Output,<br>kW [HP]                                                              | Cont.                     | 4,1 [5.4]               |
|                                                                                      | Int.*                     | 7,0 [9.39]              |
| Max. Pressure Drop,<br>bar [PSI]                                                     | Cont.                     | 170 [2500]              |
|                                                                                      | Int.*                     | 200 [2900]              |
| Max. Oil Flow,<br>lpm [GPM]                                                          | Cont.                     | 20 [5.3]                |
|                                                                                      | Int.*                     | 35 [9.2]                |
| Max. Return Pressure without Drain Line<br>or Max. Pressure in Drain Line, bar [PSI] |                           | 75 [1088]               |
| Min. Starting Torque,<br>daNm [lb-in]                                                | At max. press. drop Cont. | 95 [8400]               |
|                                                                                      | At max. press. drop Int.* | 112 [9940]              |
| Min. Speed**, RPM                                                                    |                           | 5                       |
| Static Torque for the Brake***, daNm [lb-in]                                         |                           | 164 [14515]             |
| Release Pressure ±10%,<br>bar [PSI]                                                  | initial                   | 22,5...27,5 [326...400] |
|                                                                                      | full                      | 28...34 [406...493]     |
| Max. Steering Pressure, bar [PSI]                                                    |                           | 245 [3553]              |
| Max. Pressure in Drain Space for the Brake, bar [PSI]                                |                           | 0,5 [7]                 |
| Pilot Ratio for the Valve                                                            |                           | 4,25:1                  |

\* Intermittent operation: the permissible values may occur for max. 10% of every minute.

\*\* For speeds of 5 RPM lower than given, consult factory or your regional manager.

\*\*\* Static torque is obtained at working pressure - 0 bar [0 PSI].

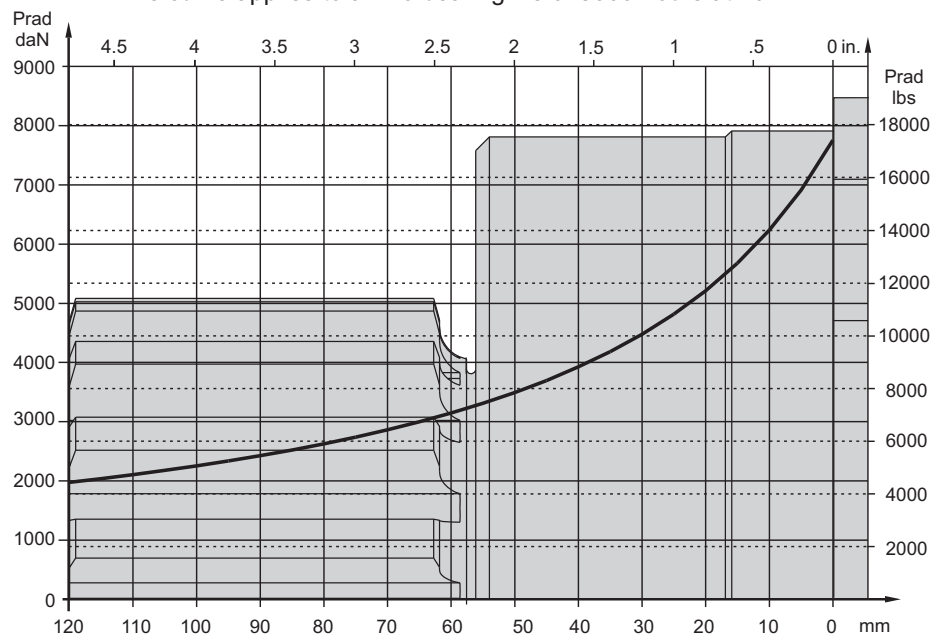
## DIMENSIONS AND MOUNTING



**Note:** For different port's thread contact with "M+S Hydraulic".

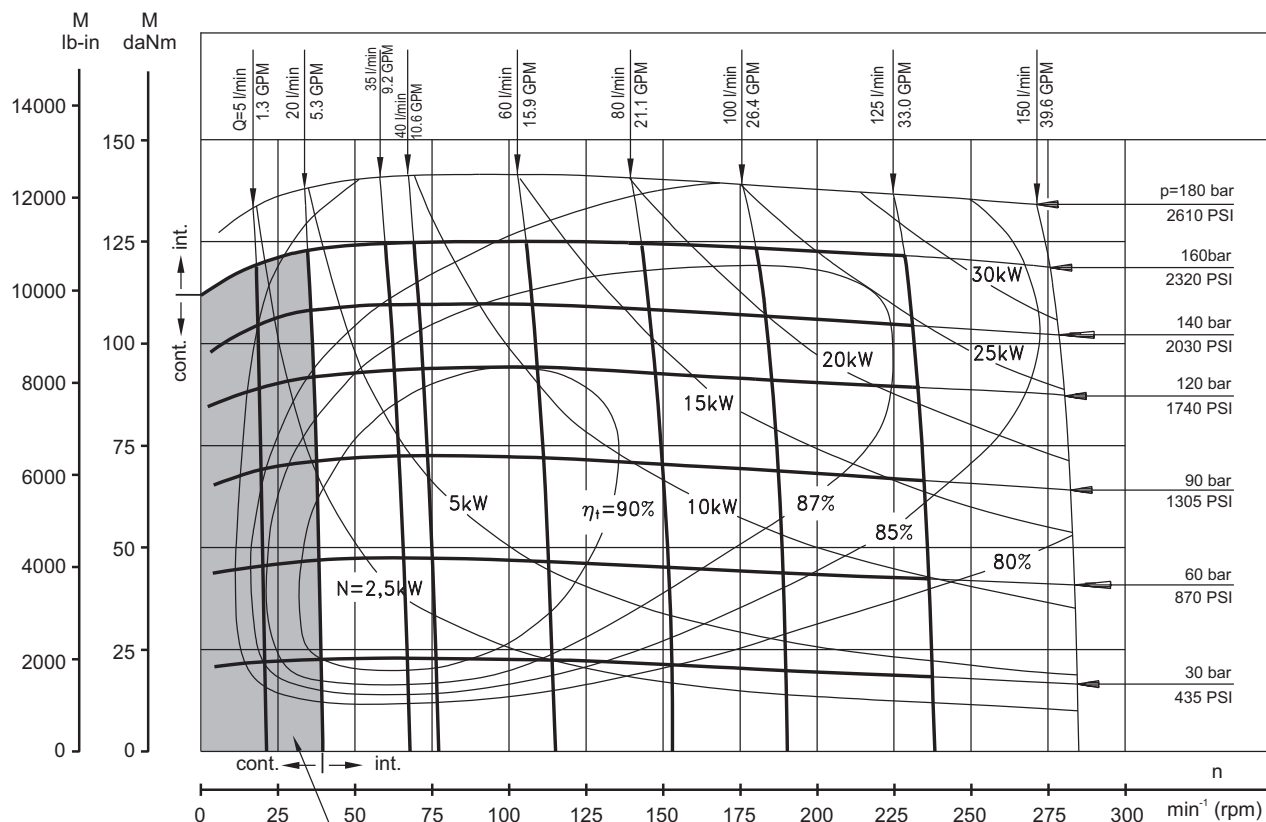
## PERMISSIBLE SHAFT LOADS

The curve applies to a B10 bearing life of 3000 hours at 40 RPM.



## FUNCTION DIAGRAMS

### TW 500



The working area  
for TW500B350V

## ORDER CODE

| 1 | 2 | 3   | 4 | 5   | 6 | 7 | 8 |
|---|---|-----|---|-----|---|---|---|
| T | W | 500 | B | 350 | V |   |   |

Pos.1 - Type

T - Motor MLHT

Pos.2 - Displacement code

Pos.3 - Brake

Pos.4 - Brake Type

Pos.5 - Shaft Extension\*

omit - 17T 5/7 pitch 20° involute

C - Straight key 1/2"x1/2"x1 1/2"

Pos.6 - Valve

Pos.7 - Special Features (see page 68)

Pos.8 - Design Series

omit - Factory specified

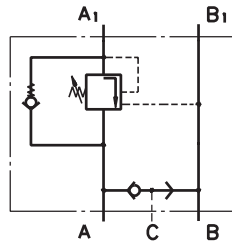
The motor-brakes are mangano-phosphatized as standard.

# VALVES FOR HYDRAULIC MOTORS

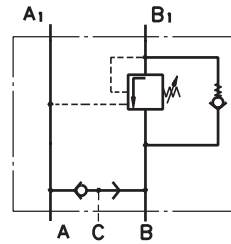
## CONTENTS

|                                            |                                                  |
|--------------------------------------------|--------------------------------------------------|
| Valves for MP, MR and MH type KPBR ... 48  | Crossover Relief Valves ..... 57                 |
| Valves for MS type KPBS ..... 49           | Valves for MP, MR and MH type KP...R ..... 58    |
| Valves for MT type KPBT ..... 50           | Valves for MS type KP...S ..... 58               |
| Valves for MV type KPBV ..... 51           | Valves for MT type KP...T ..... 59               |
| Valves for RW and HW type KPBW ..... 52    | Valves for MV type KP...V ..... 61               |
| Valves for HP and HR type KPBHR...E ... 53 | Valves for RW and HW type KP...W ..... 63        |
| Valves for HP and HR type KPBHR...D ... 54 | Valves for HR and RK type KPDHR and KPDRK ... 65 |
| Switch valves type KPWR and KPWS .... 55   | Order Code ..... 66+67                           |
| Switch valves type KPWT and KPWV ..... 56  |                                                  |

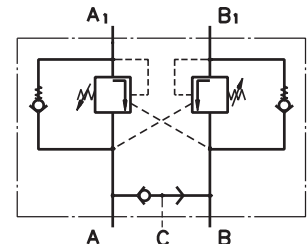
## OVERCENTER VALVES WITH BRAKE CONTROL



Single Overcenter Valves  
with Brake Control  
type KPBR ... AE



Single Overcenter Valves  
with Brake Control  
type KPBR ... BE



Dual Overcenter Valves  
with Brake Control  
type KPBR ... D

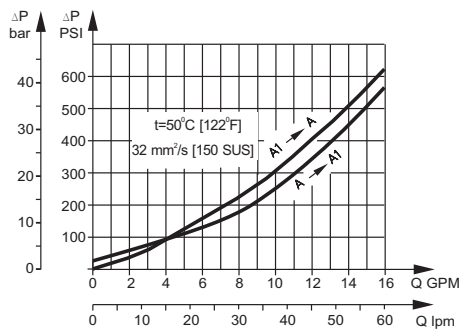
## SPECIFICATION DATA

| 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<br>[GPM]       | 60<br>[15.85]        |                 |                  |                  |                  |                  |                       |                  | 100<br>[26.4]     |                   | 200<br>[52.8]     |                   |
| Rated bar<br>Pressure*, [PSI] | 60÷280<br>[870÷4060] |                 |                  |                  |                  |                  | 70÷250<br>[1015÷3625] |                  |                   |                   |                   |                   |
| Pilot Ratio                   | 4,25:1               |                 |                  |                  |                  |                  |                       |                  |                   |                   |                   |                   |
| Weight, kg<br>[lb]            | 3,020<br>[6.658]     | 2,900<br>[6.39] | 3,060<br>[6.746] | 2,920<br>[6.437] | 3,050<br>[7.724] | 3,140<br>[6.923] | 2,300<br>[5.071]      | 2,400<br>[5.291] | 5,400<br>[11.905] | 5,800<br>[12.787] | 9,200<br>[20.283] | 9,750<br>[21.495] |

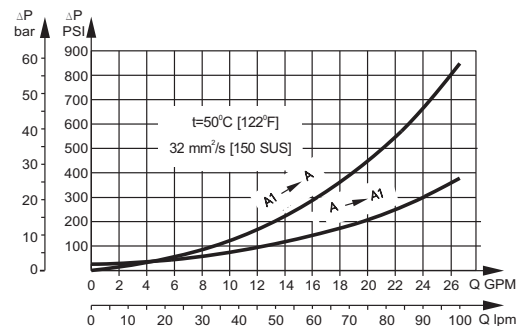
\*Pressure Settings are at flow rate of 5 lpm [1.3 GPM] and viscosity 32 mm<sup>2</sup>/s [150 SUS] at 50 °C [122 °F].

## PRESSURE LOSSES

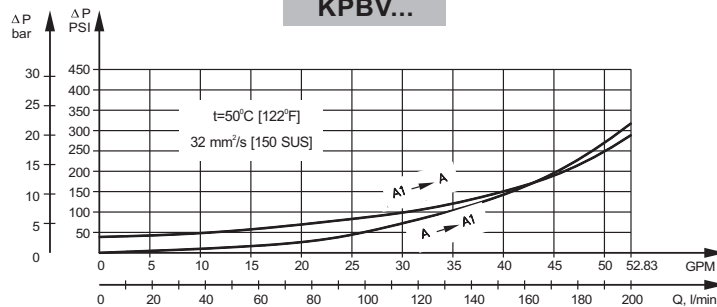
### KPBR..., KPBS..., KPBW..., KPBHR...



### KPBT...

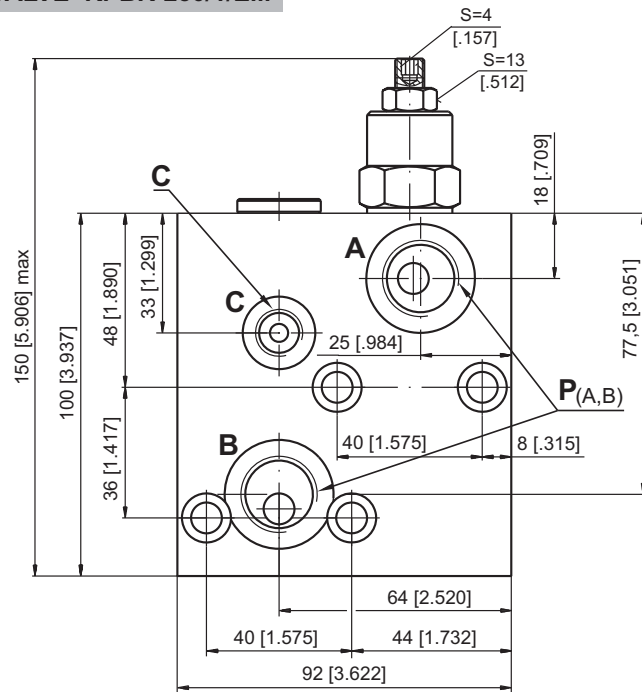
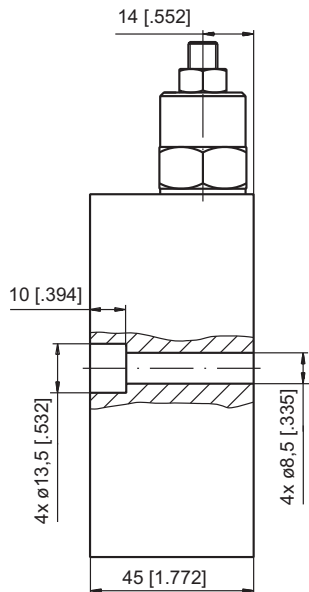


### KPBV...

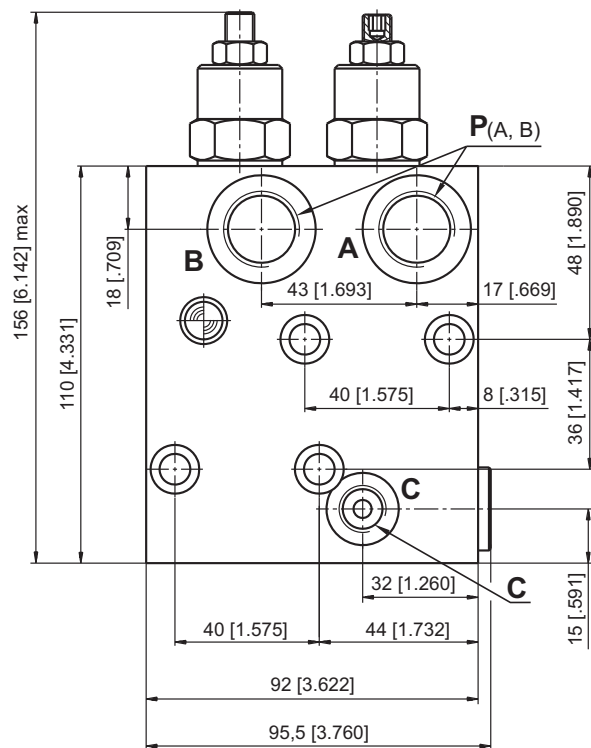
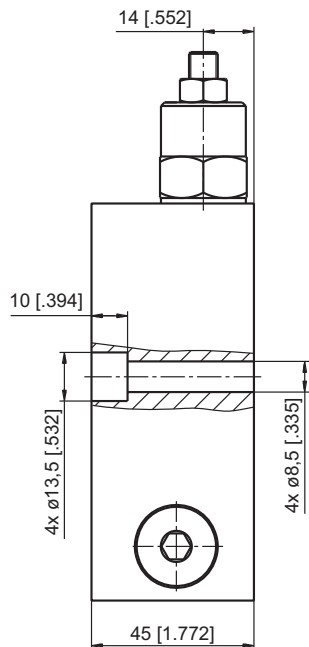


## VALVES FOR MP, MR, MH HYDRAULIC MOTORS

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



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



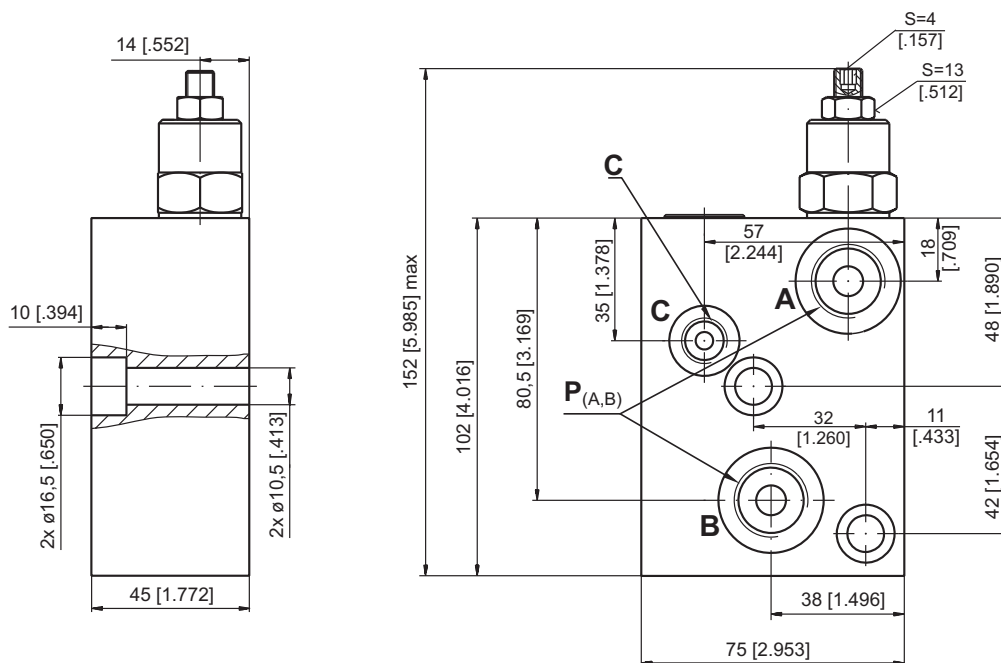
|   | Thread<br>Ports - P <sub>(A,B)</sub>   | Thread<br>Port - C                       |
|---|----------------------------------------|------------------------------------------|
| - | G1/2<br>16 [.63 ] depth                | G1/4<br>12 [.47] depth                   |
| M | M22x1,5<br>16 [.63 ] depth             | M14x1,5<br>12 [.47] depth                |
| A | 7/8 - 14 UNF<br>O-ring 16 [.63 ] depth | 7/16 - 20 UNF<br>O-ring 12,7 [.50] depth |



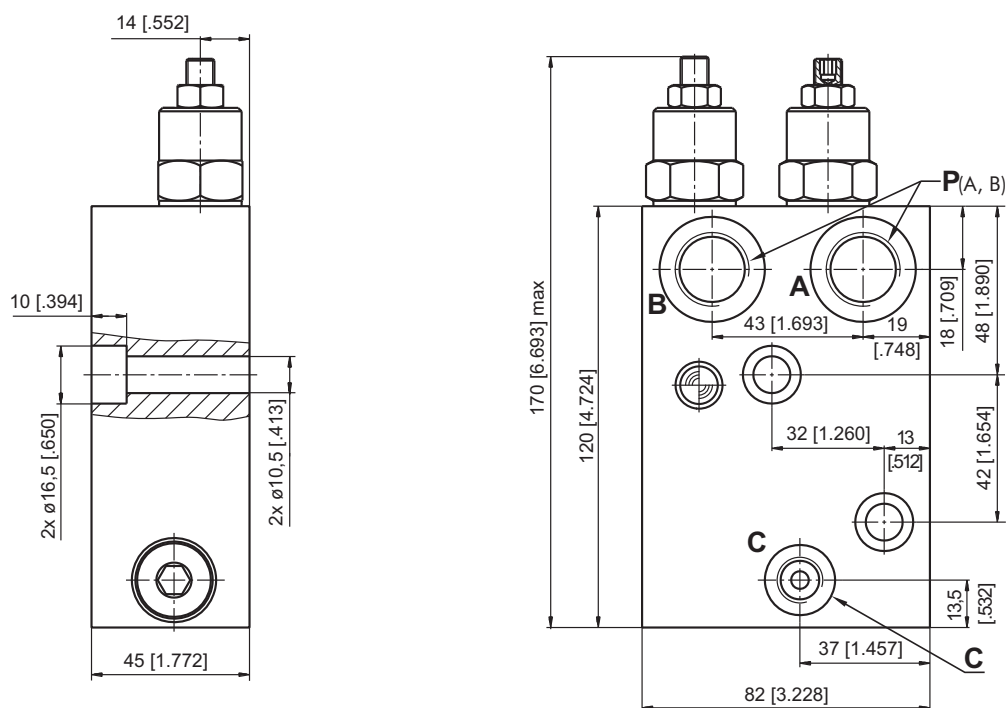
**Note :** **KPBR** Blocks are installed directly on MP, MR and MH Motors with four screws M8x45 - 8.8 DIN 912 or 5/16-18 UNC, 1.75 long ANSI B 18.3 . Tightening torque  $2,0^{+0.5}$  daNm [177<sup>+44</sup> lb-in].

## VALVES FOR MS HYDRAULIC MOTORS

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



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



|   | Thread Ports - P <sub>(A,B)</sub>     | Thread Port - C                          |
|---|---------------------------------------|------------------------------------------|
| - | G1/2<br>16 [.63] depth                | G1/4<br>12 [.47] depth                   |
| M | M22x1,5<br>16 [.63] depth             | M14x1,5<br>12 [.47] depth                |
| A | 7/8 - 14 UNF<br>O-ring 16 [.63] depth | 7/16 - 20 UNF<br>O-ring 12,7 [.50] depth |

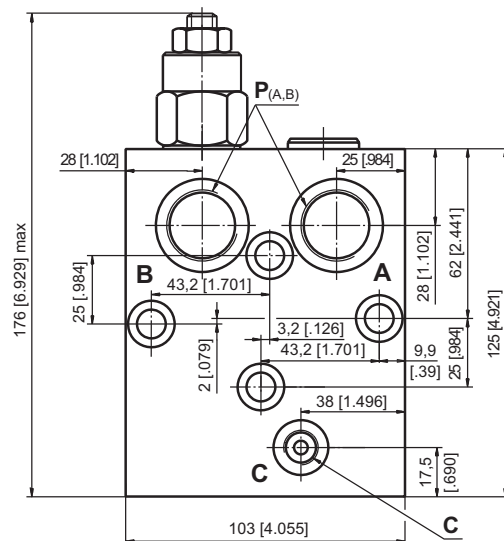
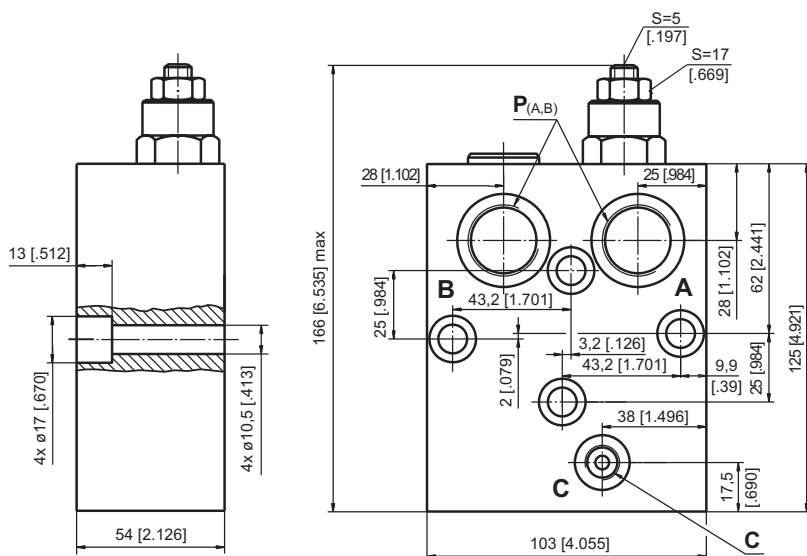


**Note :** KPBS Blocks are installed directly on MS Motors with two screws M10x45 - 8.8 DIN 912 or 3/8-16UNC, 1.75 long ANSI B 18.3 . Tightening torque 3,5 daNm [310 lb-in].

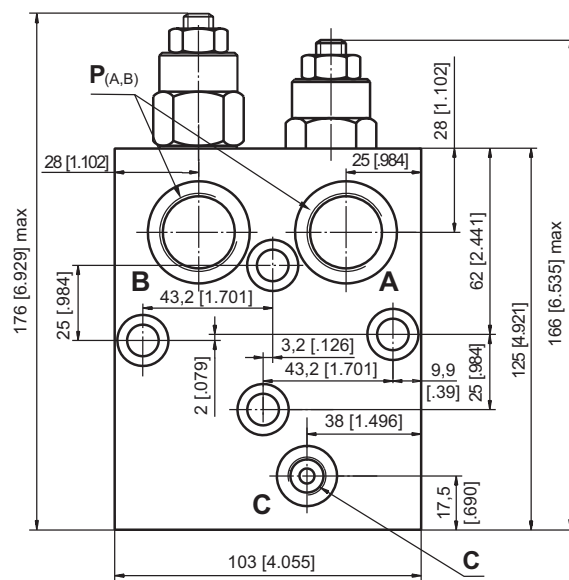
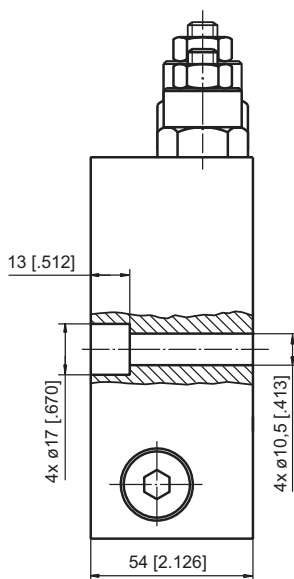
## VALVES FOR MT HYDRAULIC MOTORS

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

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



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



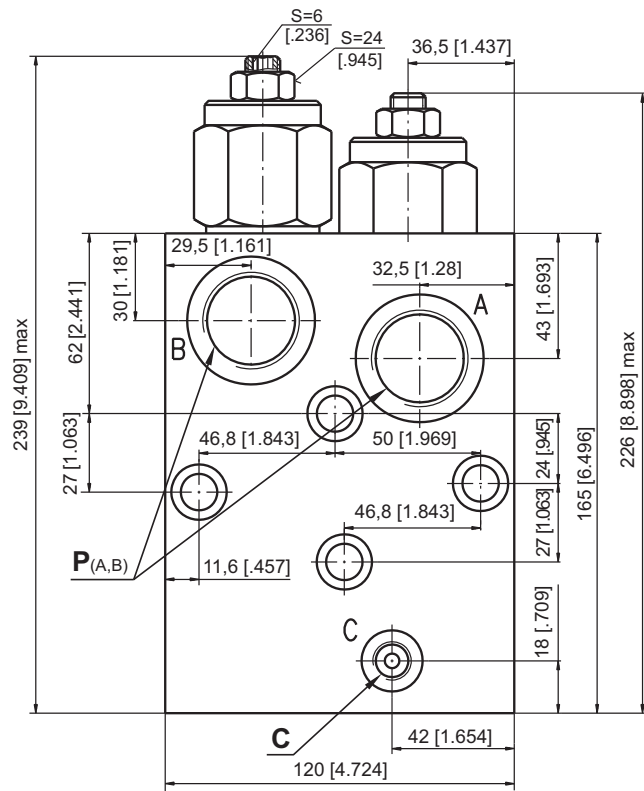
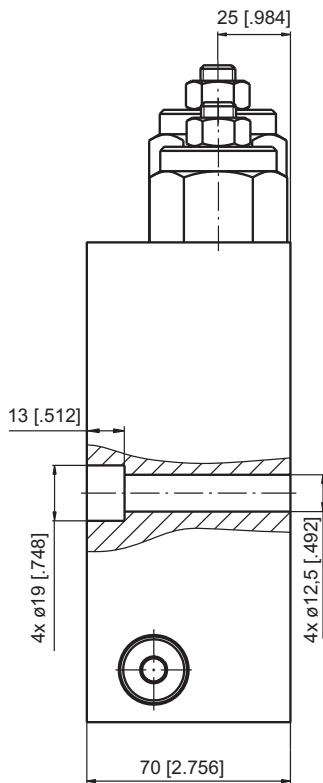
|   | Thread Ports - P <sub>(A,B)</sub>     | Thread Port - C                          |
|---|---------------------------------------|------------------------------------------|
| - | G3/4<br>17 [.67] depth                | G1/4<br>14 [.55] depth                   |
| M | M27x2<br>17 [.67] depth               | M14x1,5<br>14 [.55] depth                |
| A | 1 1/16-12 UN<br>O-ring 17 [.67] depth | 7/16 - 20 UNF<br>O-ring 12,7 [.50] depth |



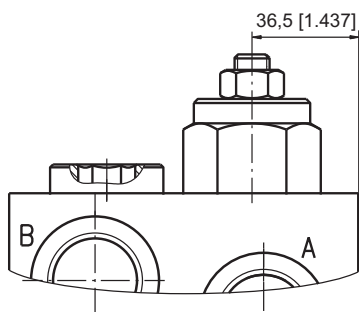
**Note :** KPBT Blocks are installed directly on MT Motors with four screws M10x50 - 8.8 DIN 912. Tightening torque 3,5 daNm [310 lb-in].

## VALVES FOR MV HYDRAULIC MOTORS

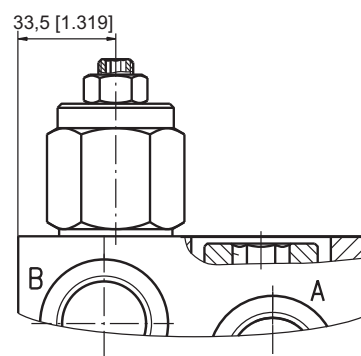
**DUAL VALVE KPBV-250/1/D...**



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



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



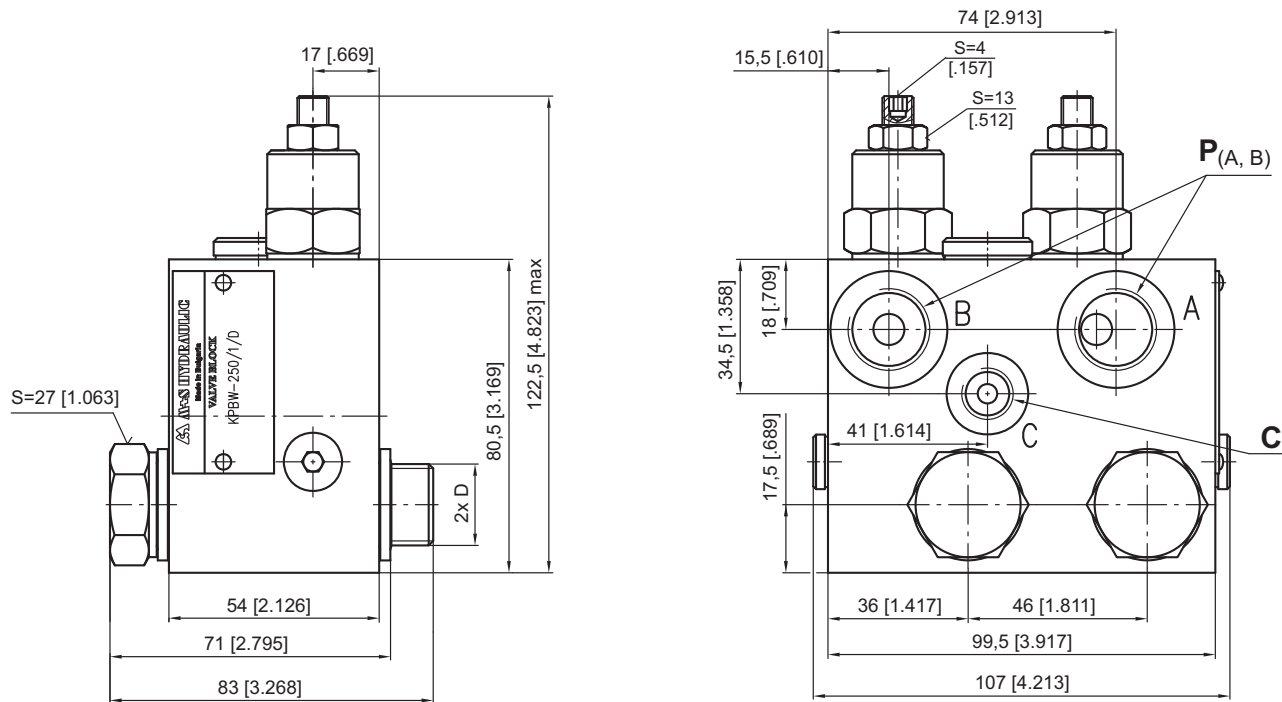
|   | Thread<br>Ports - P <sub>(A,B)</sub>    | Thread<br>Port - C                       |
|---|-----------------------------------------|------------------------------------------|
| - | G 1<br>20 [.79] depth                   | G1/4<br>14 [.55] depth                   |
| M | M33x2<br>20 [.79] depth                 | M14x1,5<br>14 [.55] depth                |
| A | 1 5/16 - 12 UN<br>O-ring 20 [.79] depth | 7/16 - 20 UNF<br>O-ring 12,7 [.50] depth |



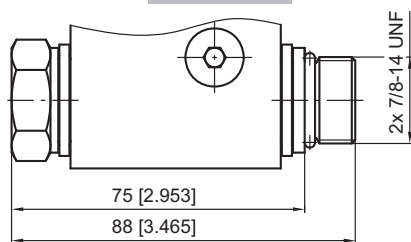
**Note :** **KPBV** Blocks are installed directly on MV Motors with four screws M12x70 - 8.8 DIN 912. Tightening torque 6,5 daNm [575 lb-in].

## VALVES FOR RW and HW HYDRAULIC MOTORS

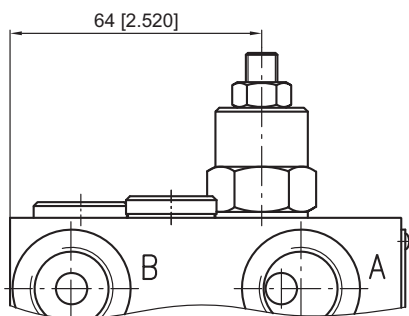
### DUAL VALVE KPBW-250/1/D...



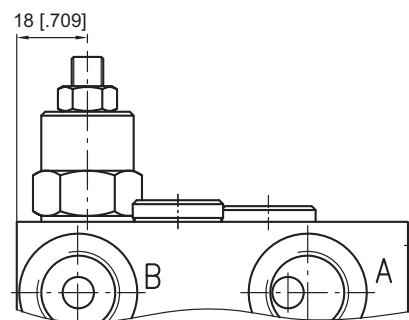
### KPBW-...A



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



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



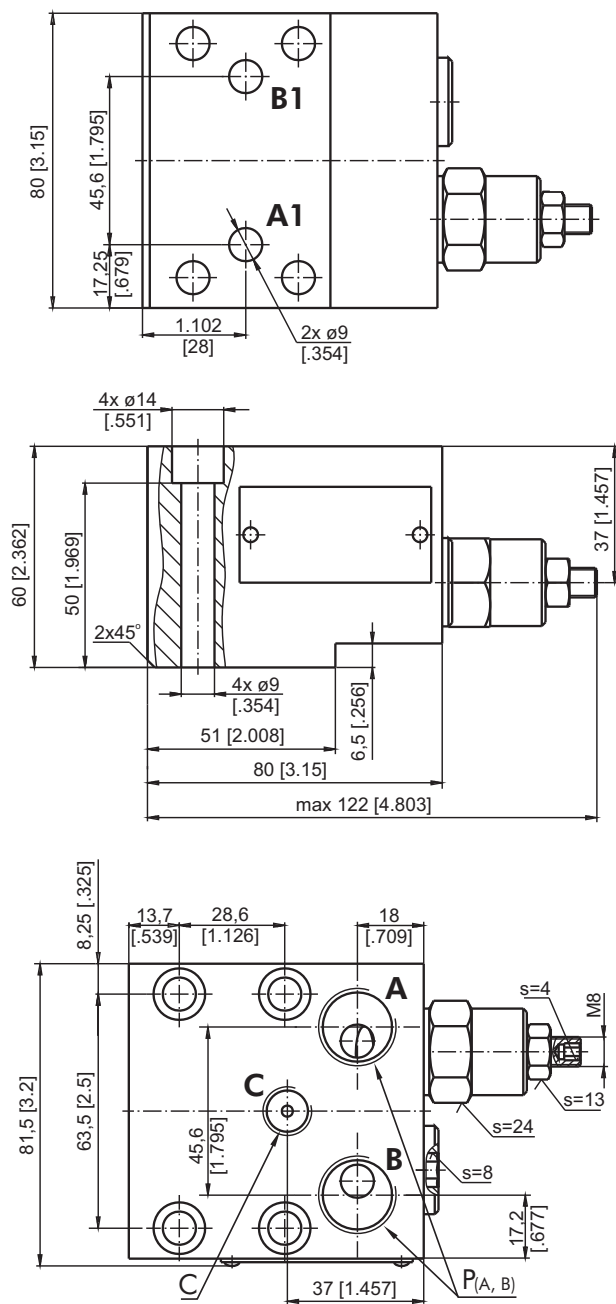
|   | Thread Ports - P (A,B)                | Thread Port - C                          | Thread Ports - D                       |
|---|---------------------------------------|------------------------------------------|----------------------------------------|
| - | G1/2<br>16 [.63] depth            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



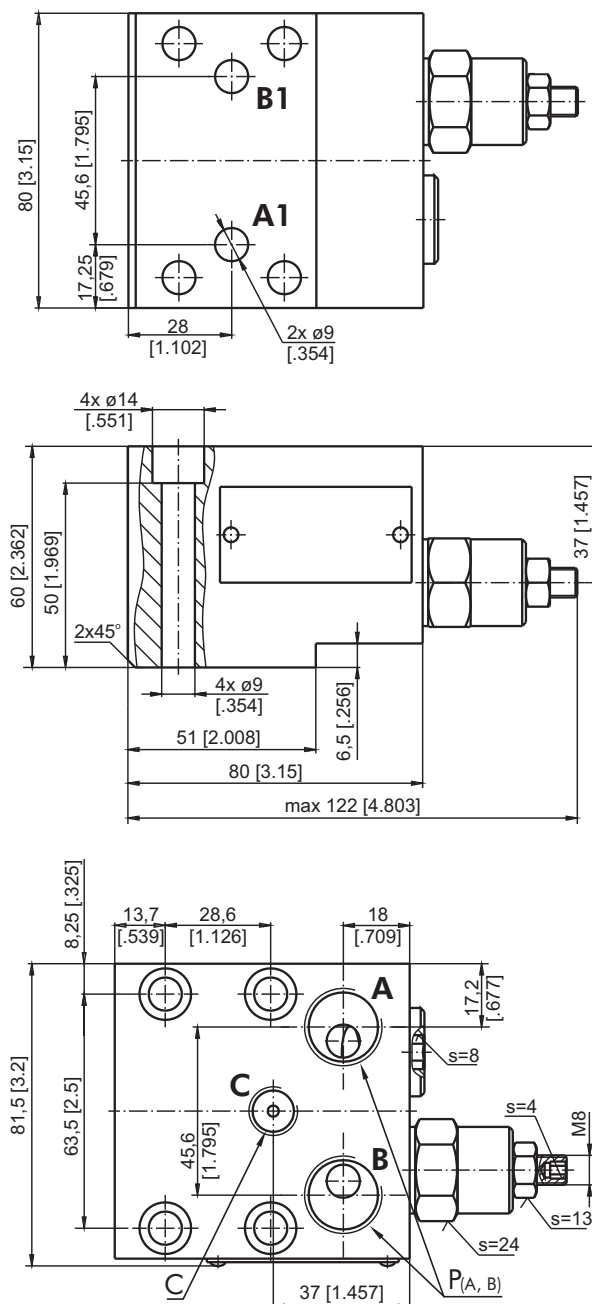
**Note :** KPBW Blocks assembly to RW or HW motors is done with two screws (thread D) included in the valve set. Tightening torque 8 daNm [710 lb-in].

**VALVES FOR HP, HR HYDRAULIC MOTORS**

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



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



|          | Thread Ports - P<br>(A,B)            | Thread Ports - C                        |
|----------|--------------------------------------|-----------------------------------------|
| <b>A</b> | 7/8 - 14 UNF<br>O-ring 17 [.67] deep | 7/16 - 20 UNF<br>O-ring 12,7 [.50] deep |
| <b>-</b> | G1/2<br>17 [.67] deep                | G1/4<br>14 [.55] deep                   |
| <b>M</b> | M22x1,5<br>17 [.67] deep             | M14x1,5<br>14 [.55] deep                |

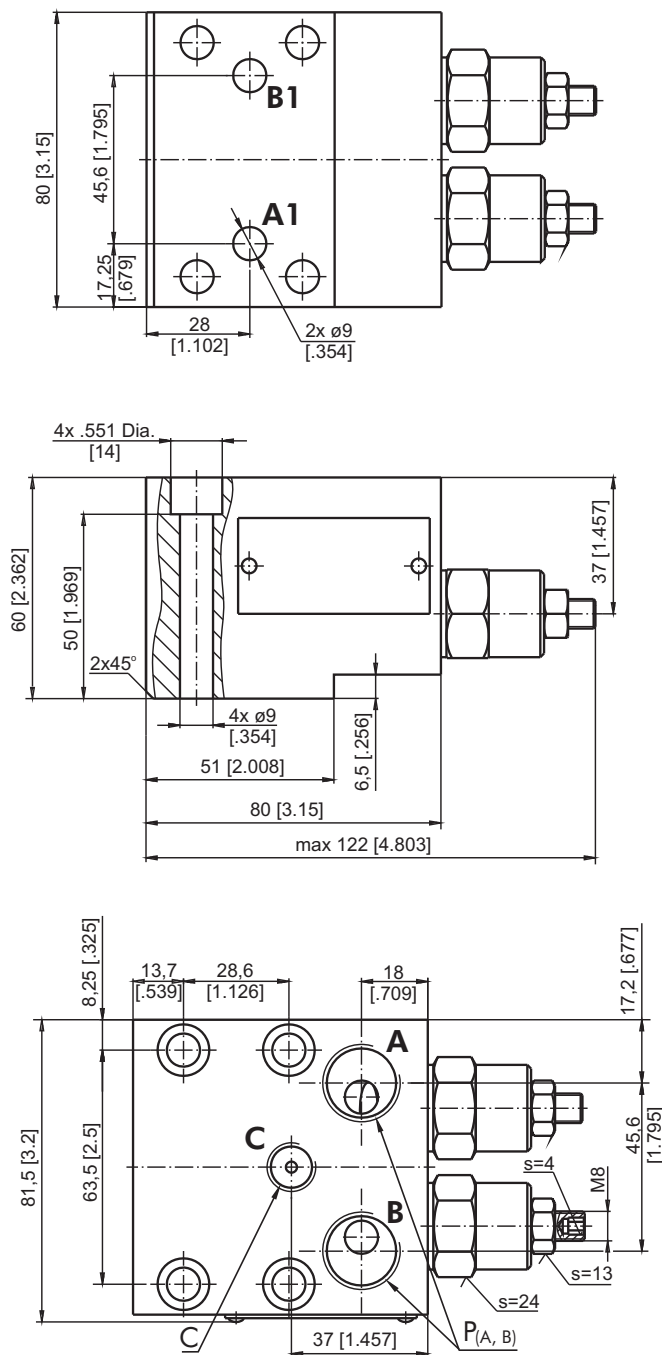


mm [in]

**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<sup>+0.5</sup> daNm [177<sup>+44</sup> lb-in].

**VALVES FOR HP, HR HYDRAULIC MOTORS**

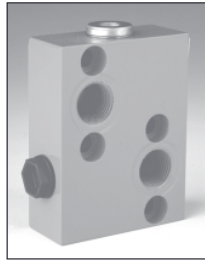
**DUAL VALVE KPBHR-250/1/D...**



|          | Thread Ports - P <sub>(A,B)</sub>    | Thread Ports - C                        |
|----------|--------------------------------------|-----------------------------------------|
| <b>A</b> | 7/8 - 14 UNF<br>O-ring 17 [.67] deep | 7/16 - 20 UNF<br>O-ring 12,7 [.50] deep |
| <b>-</b> | G1/2<br>17 [.67] deep                | G1/4<br>14 [.55] deep                   |
| <b>M</b> | M22x1,5<br>17 [.67] deep             | M14x1,5<br>14 [.55] deep                |

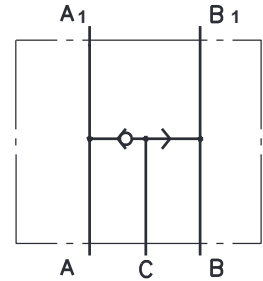


**Note :** KPBHR Blocks are installed directly on HP and HR Motors with four bolts 5/16-18UNC, 2.5 long or M8x60 - 8.8 DIN 912. Tightening torque 2,0<sup>+0,5</sup> daNm [177<sup>+44</sup> lb-in].

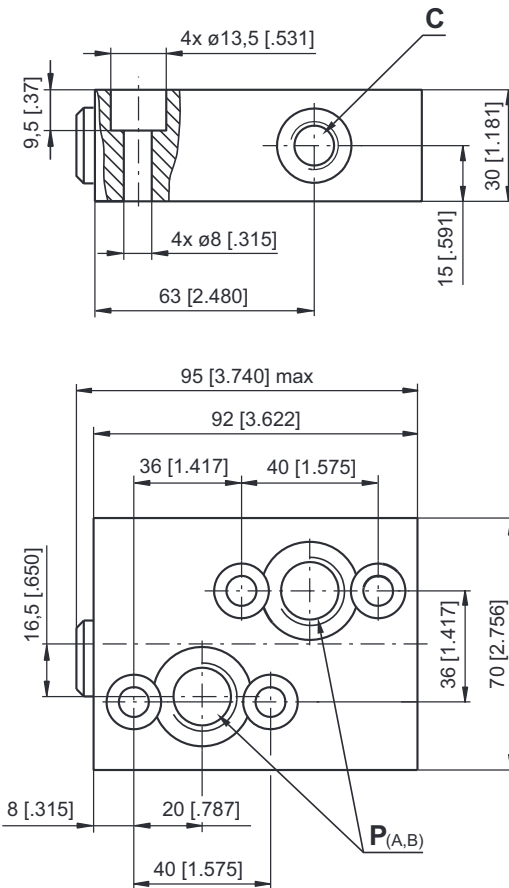


**SPECIFICATION DATA**

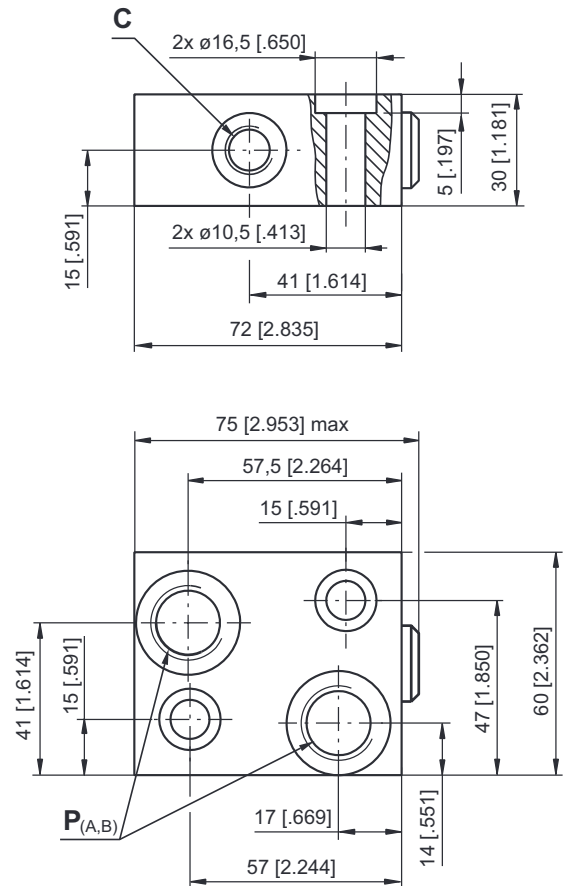
| Parameters                 | Type          |               |
|----------------------------|---------------|---------------|
|                            | KPWR          | KPWS          |
| Flow Rate , l/min [GPM]    | 60            | [15.85]       |
| Rated Pressure , bar [PSI] | 250           | [3625]        |
| Weight , kg [lb]           | 0,850 [1.874] | 0,670 [1.477] |



**VALVE FOR MP, MR, MH HYDRAULIC MOTORS  
KPWR**



**VALVE FOR MS HYDRAULIC MOTORS  
KPWS**



mm [in]

|   | Thread Ports - P <sub>(A,B)</sub>     | Thread Port - C                          |
|---|---------------------------------------|------------------------------------------|
| - | G1/2<br>17 [.67] depth                | G1/4<br>14 [.55] depth                   |
| M | M22x1,5<br>17 [.67] depth             | M14x1,5<br>14 [.55] depth                |
| A | 7/8 - 14 UNF<br>O-ring 17 [.67] depth | 7/16 - 20 UNF<br>O-ring 12,7 [.50] depth |

**Note:** KPWR Blocks are installed directly on MP, MR and MH Motors with four screws M8x30 - 8.8 DIN 912 or 5/16-18UNC, 1.25 [.049] long ANSI B 18.3 .

Tightening torque 2,0<sup>+0,5</sup> daNm [177<sup>+44</sup> lb-in].

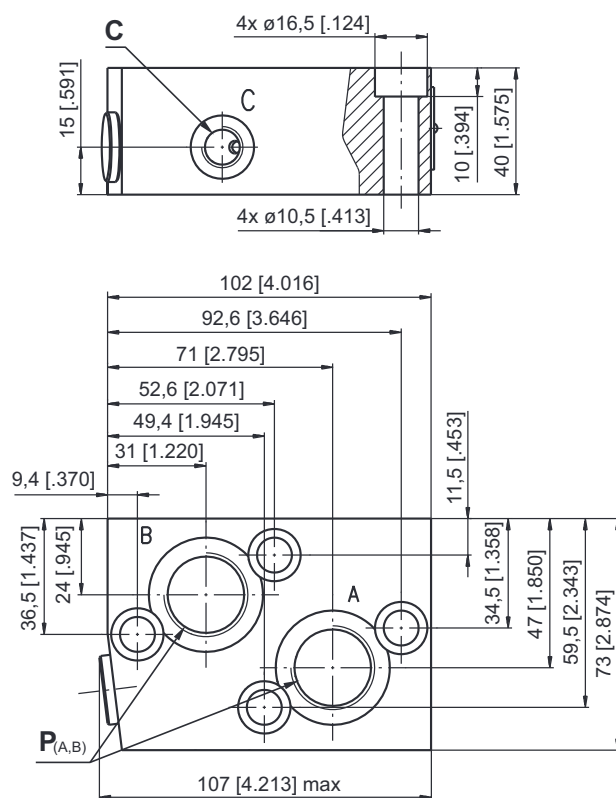
KPWS Blocks are installed directly on MS Motors with two screws M10x35 - 8.8 DIN 912 or 3/8-16UNC, 1.5 [.059] long ANSI B 18.3. Tightening torque 3,5 daNm [336 lb-in].

## SWITCH VALVE (continued)

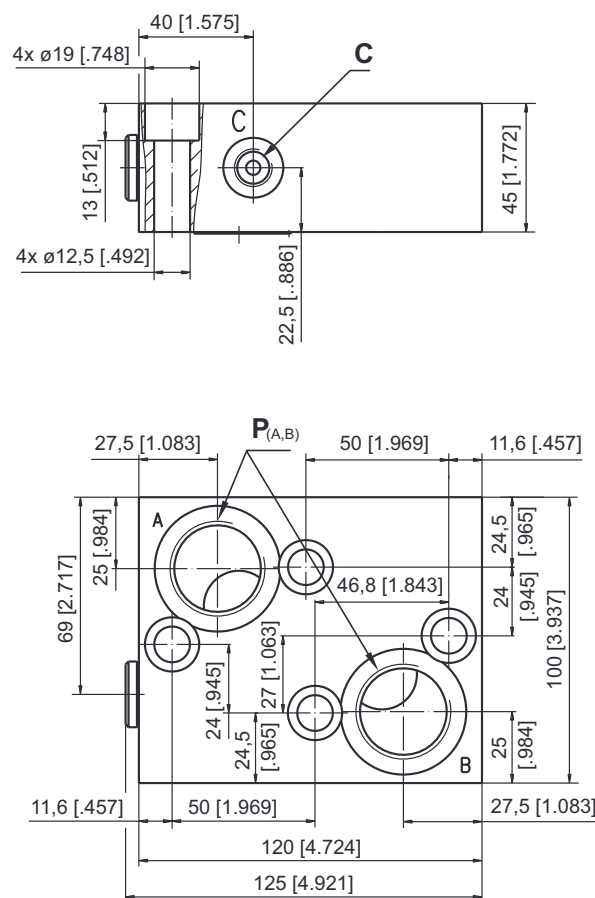
### SPECIFICATION DATA

| Parameters                 | Type          |               |
|----------------------------|---------------|---------------|
|                            | KPWT          | KPWV          |
| Flow Rate , l/min [GPM]    | 100 [26.4]    | 200 [52.8]    |
| Rated Pressure , bar [PSI] | 250           | [3625]        |
| Weight , kg [lb]           | 1,800 [3.968] | 3,150 [6.945] |

#### VALVE FOR MT HYDRAULIC MOTORS KPWT



#### VALVE FOR MV HYDRAULIC MOTORS KPWV



|   | Thread Ports - P <sub>(A,B)</sub>     | Thread Port - C                          |
|---|---------------------------------------|------------------------------------------|
| - | G3/4<br>17 [.67] depth                | G1/4<br>14 [.55] depth                   |
| M | M27x2<br>17 [.67] depth               | M14x1,5<br>14 [.55] depth                |
| A | 1 1/16-12 UN<br>O-ring 17 [.67] depth | 7/16 - 20 UNF<br>O-ring 12,7 [.50] depth |

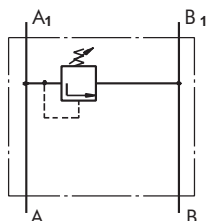


|   | Thread Ports - P <sub>(A,B)</sub>       | Thread Port - C                          |
|---|-----------------------------------------|------------------------------------------|
| - | G 1<br>20 [.79] depth                   | G1/4<br>14 [.55] depth                   |
| M | M33x2<br>20 [.79] depth                 | M14x1,5<br>14 [.55] depth                |
| A | 1 5/16 - 12 UN<br>O-ring 20 [.79] depth | 7/16 - 20 UNF<br>O-ring 12,7 [.50] depth |

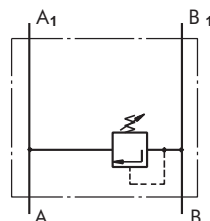
**Note:** KPWT Blocks are installed directly on MT Motors with four screws M10x40 - 8.8 DIN 912.  
Tightening torque 3,5 daNm [336 lb-in].

KPWV Blocks are installed directly on MV Motors with four screws M12x45 - 8.8 DIN 912.  
Tightening torque 6,5 daNm [425 lb-in].

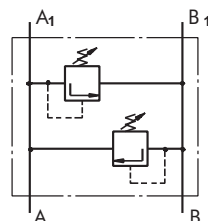
## CROSSOVER RELIEF VALVES



Single Crossover  
Relief Valve  
type KPE ...



Single Crossover  
Relief Valve  
type KPE ...



Dual Crossover  
Relief Valve  
type KPD ...

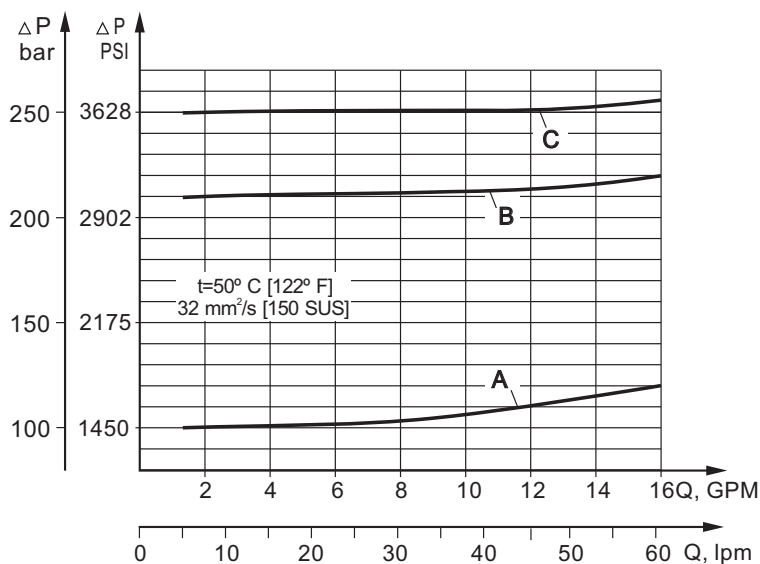
## SPECIFICATION DATA

| Parameters                     | Type                    |                         |                         |      |
|--------------------------------|-------------------------|-------------------------|-------------------------|------|
|                                | KPER                    | KPDR                    | KPES                    | KPDS |
| Flow Rate , lpm [GPM]          | 60 [15.85]              |                         |                         |      |
| Pressure Range* , bar<br>[PSI] | 30 ÷ 100;<br>[435÷1450] | 50 ÷ 210;<br>[725÷3050] | 80 ÷ 300<br>[1160÷4350] |      |
| Weight , kg<br>[lb]            | 1,55<br>[3.42]          |                         | 1,50<br>[3.31]          |      |

\*Pressure Settings are at flow rate of 5 lpm [1.32 GPM]  
and viscosity 32 mm<sup>2</sup>/s [150 SUS] (50 °C [122° F]).

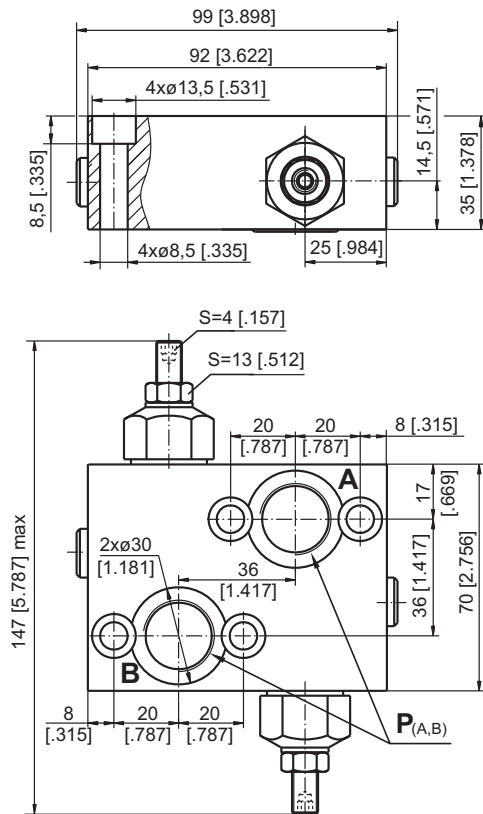
## Rated Pressure

A → 100 bar [1450 PSI]  
B → 210 bar [3050 PSI]  
C → 250 bar [3625 PSI]

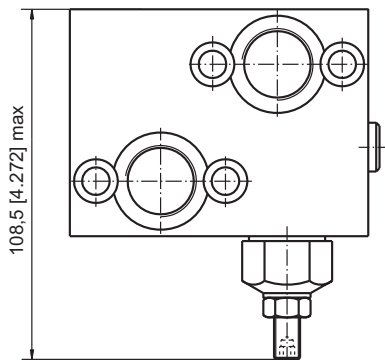


**VALVES FOR MP, MR, MH  
HYDRAULIC MOTORS**

**DUAL VALVE KPDR**



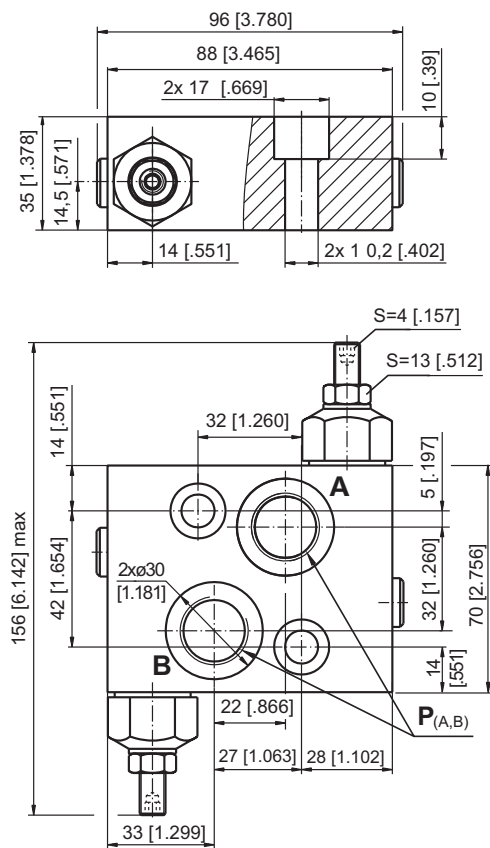
**SINGLE VALVE KPER**



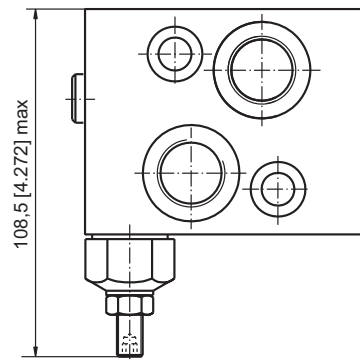
|   | Thread<br>Ports - P<br>(A,B)           |
|---|----------------------------------------|
| - | G1/2<br>20 [0.79] depth                |
| M | M22x1,5<br>20 [0.79] depth             |
| A | 7/8 - 14 UNF<br>O-ring 20 [0.79] depth |

**VALVES FOR MS  
HYDRAULIC MOTORS**

**DUAL VALVE KPDS**



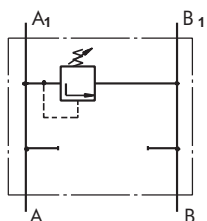
**SINGLE VALVE KPES**



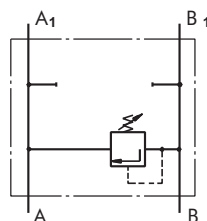
**Note :** **KPDR** and **KPER** Blocks are installed directly on MP, MR and MH Motors with four screws M8x35 - 8.8 DIN 912 or 5/16-18 UNC, 1.5 long ANSI B 18.3 . Tightening torque 2,0<sup>+0,5</sup> daNm [177<sup>+44</sup> lb-in].

**KPDS** and **KPES** Blocks are installed directly on MS Motors with two screws M10x35 - 8.8 DIN 912 or 3/8-16 UNC, 1.5 long ANSI B 18.3 . Tightening torque 3,5 daNm [310 lb-in].

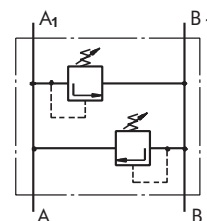
## VALVES FOR MT HYDRAULIC MOTORS



Single Crossover  
Relief Valve  
type KPEAT ...



Single Crossover  
Relief Valve  
type KPEBT ...



Dual Crossover  
Relief Valve  
type KPDT ...

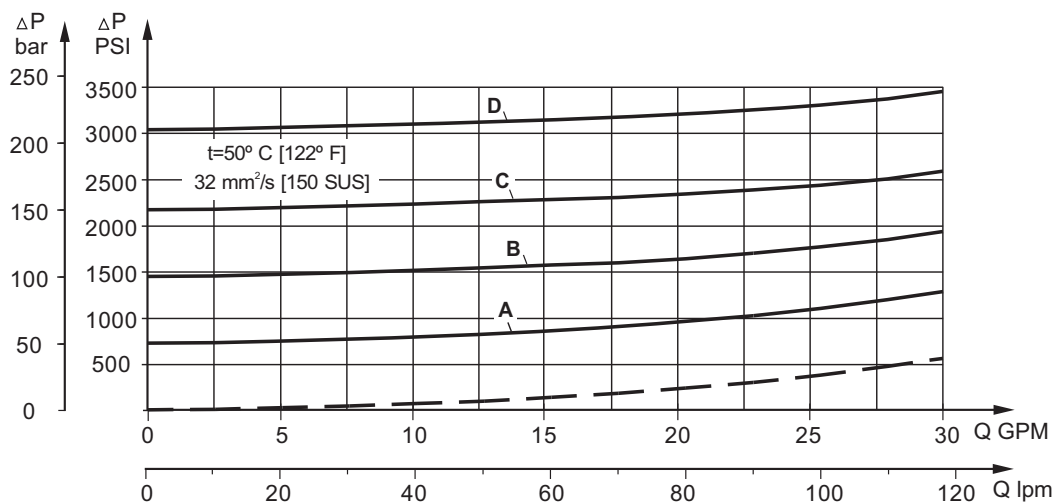
## SPECIFICATION DATA

| Parameters                     | Type                  |                 |
|--------------------------------|-----------------------|-----------------|
|                                | KPE...T               | KPDT            |
| Flow Rate , lpm [GPM]          | 120 [32]              |                 |
| Pressure Range* , bar<br>[PSI] | 80÷210<br>[1160÷3050] |                 |
| Weight , kg<br>[lb]            | 5,10<br>[11.24]       | 5,54<br>[12.21] |

\*Pressure Settings are at flow rate of 5 lpm [1.32 GPM]  
and viscosity 32 mm<sup>2</sup>/s [150 SUS] (50 °C [122° F]).

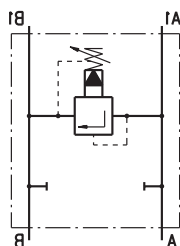
## Rated Pressure

- A → 50 bar [725 PSI]
- B → 100 bar [1450 PSI]
- C → 150 bar [2175 PSI]
- D → 210 bar [3045 PSI]

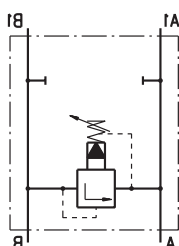




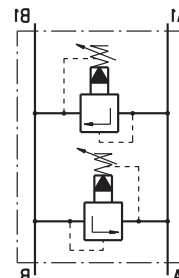
## VALVES FOR MV HYDRAULIC MOTORS



Single Crossover  
Relief Valve  
type KPEAV ...



Single Crossover  
Relief Valve  
type KPEBV ...



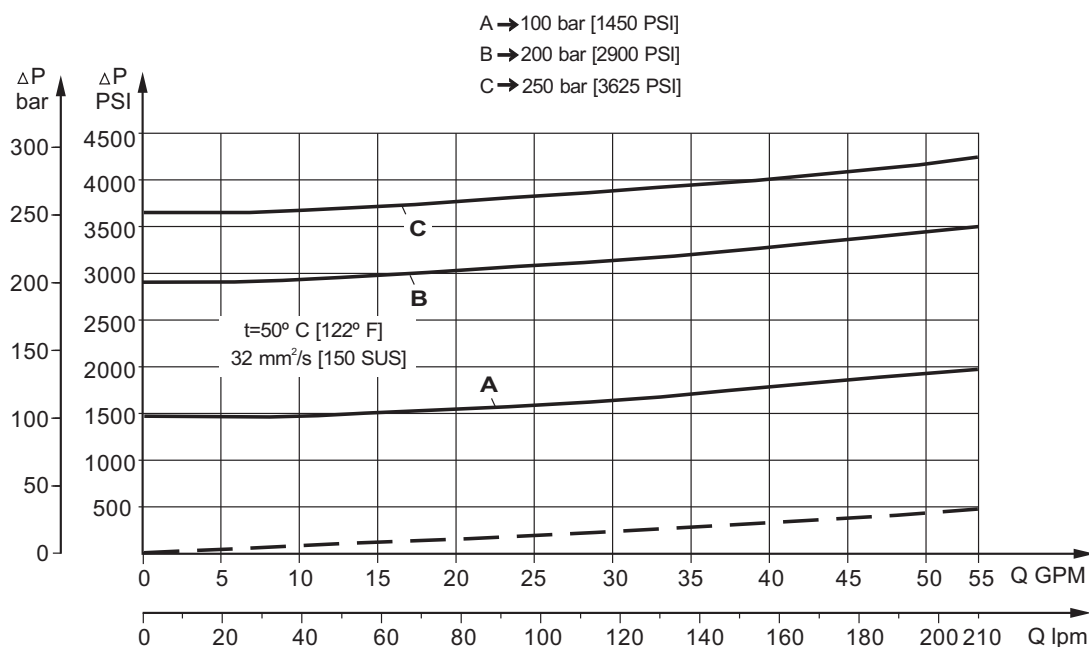
Dual Crossover  
Relief Valve  
type KPDV ...

### SPECIFICATION DATA

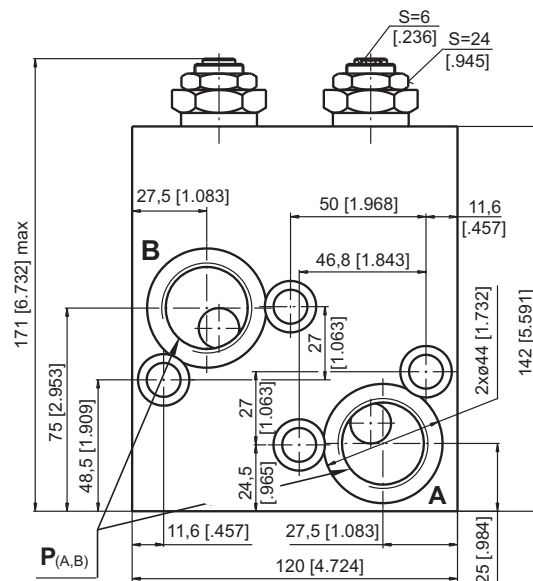
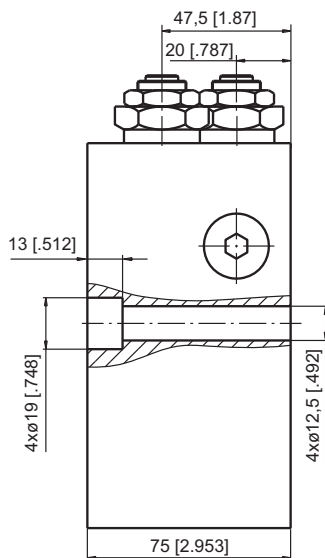
| Parameters            | Type                         |         |         |
|-----------------------|------------------------------|---------|---------|
|                       | KPEAV                        | KPEBV   | KPDV    |
| Flow Rate , lpm [GPM] | 200 [53]                     |         |         |
| Pressure Range* , bar | 10÷100; 20÷250               |         |         |
|                       | [PSI] [145÷1450]; [290÷3625] |         |         |
| Weight , kg           | 4,90                         | 7,10    | 8,00    |
|                       | [lb]                         | [10.8]  | [15.65] |
|                       |                              | [17.64] |         |

\*Pressure Settings are at flow rate of 5 lpm [1.3 GPM]  
and viscosity 32 mm<sup>2</sup>/s [150 SUS] (50 °C [122° F]).

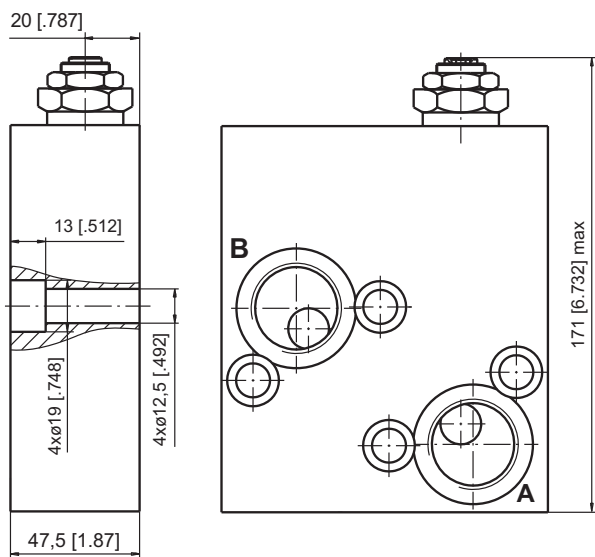
### Rated Pressure



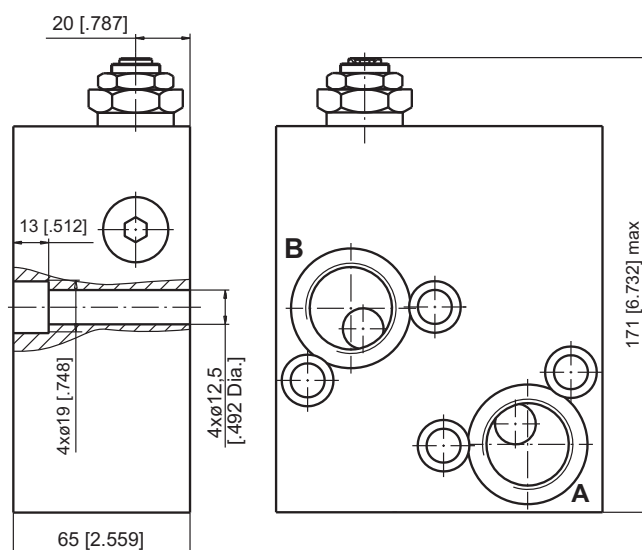
**DUAL VALVE KPDV**



**SINGLE VALVE KPEAV**



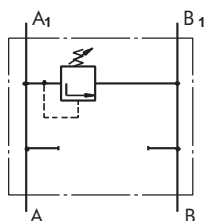
**SINGLE VALVE KPEBV**



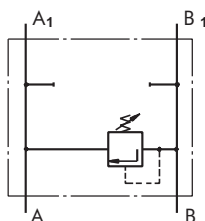
|   | Thread Ports - P <sub>(A,B)</sub>        |
|---|------------------------------------------|
| - | G1-A<br>20 [0.79] depth                  |
| M | M33x2<br>20 [0.79] depth                 |
| A | 1 5/16 - 12 UN<br>O-ring 20 [0.79] depth |

**Note :** KPDV Blocks are installed directly on MV Motors with four screws M12x75 - 8.8 DIN 912.  
KPEAV Blocks are installed directly on MV Motors with four screws M12x50 - 8.8 DIN 912.  
KPEBV Blocks are installed directly on MV Motors with four screws M12x65 - 8.8 DIN 912.  
Tightening torque 7,5 daNm [665 lb-in].

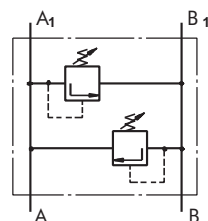
## VALVES FOR RW and HW HYDRAULIC MOTORS



Single Crossover  
Relief Valve  
type KPEAW ...



Single Crossover  
Relief Valve  
type KPEBW ...



Dual Crossover  
Relief Valve  
type KPDW ...

### SPECIFICATION DATA

| Parameters                     | Type                                                            |                 |
|--------------------------------|-----------------------------------------------------------------|-----------------|
|                                | KPE...W                                                         | KPDW            |
| Flow Rate , lpm [GPM]          | 60 [15.85]                                                      |                 |
| Pressure Range* , bar<br>[PSI] | 5 ÷ 40; 30 ÷ 100; 80 ÷ 250<br>[75÷580]; [435÷1450]; [1160÷3625] |                 |
| Weight , kg<br>[lb]            | 2,700<br>[5.95]                                                 | 2,800<br>[6.17] |

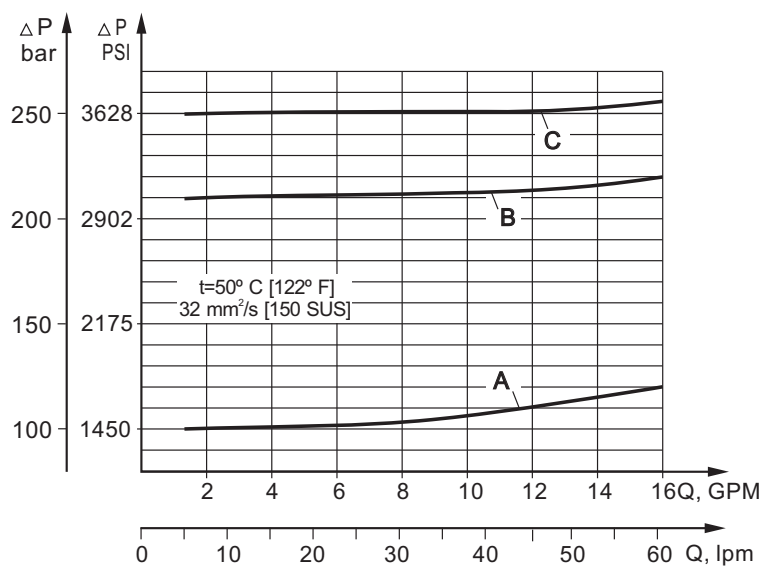
\*Pressure Settings are at flow rate of 5 lpm [1.32 GPM]  
and viscosity 32 mm<sup>2</sup>/s [150 SUS] (50 °C [122° F]).

### Rated Pressure

A → 100 bar [1450 PSI]

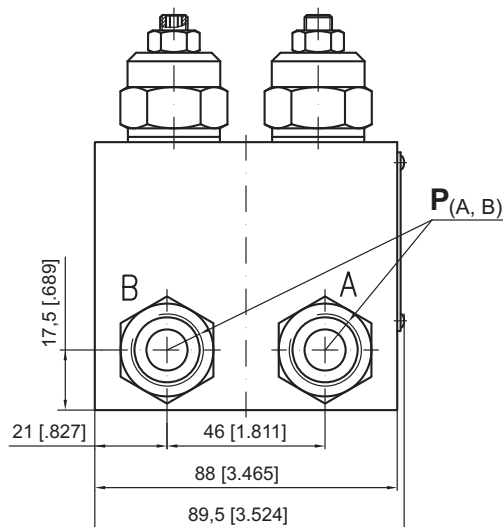
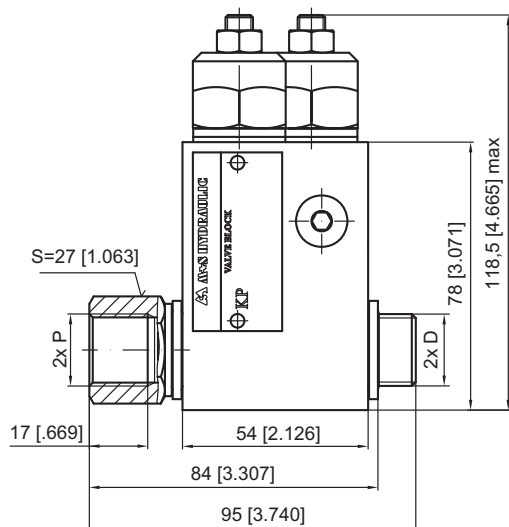
B → 210 bar [3050 PSI]

C → 250 bar [3625 PSI]

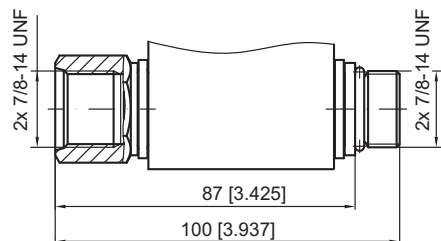


**VALVES FOR RW and HW HYDRAULIC MOTORS**

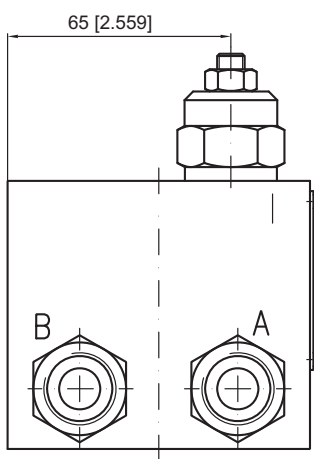
**DUAL VALVE KPDW...**



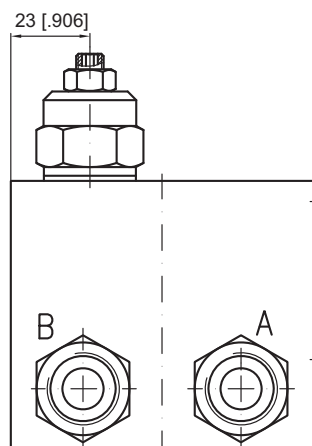
**KPDW-...A**



**SINGLE VALVE KPEAW...**



**SINGLE VALVE KPEBW...**

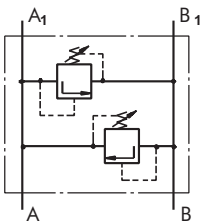


|   | Thread Ports - P <sub>(A,B)</sub>     | Thread Ports - D                       |
|---|---------------------------------------|----------------------------------------|
| - | G1/2<br>16 [.63] depth                | G1/2<br>12 [.47] length                |
| M | M22x1,5<br>16 [.63] depth             | M22x1,5<br>12 [.47] length             |
| A | 7/8 - 14 UNF<br>O-ring 16 [.63] depth | 7/8 - 14 UNF<br>O-ring 13 [.51] length |

**Note :** KPDW and KPE..W 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].

## CROSSOVER RELIEF VALVES

### SPECIFICATION DATA



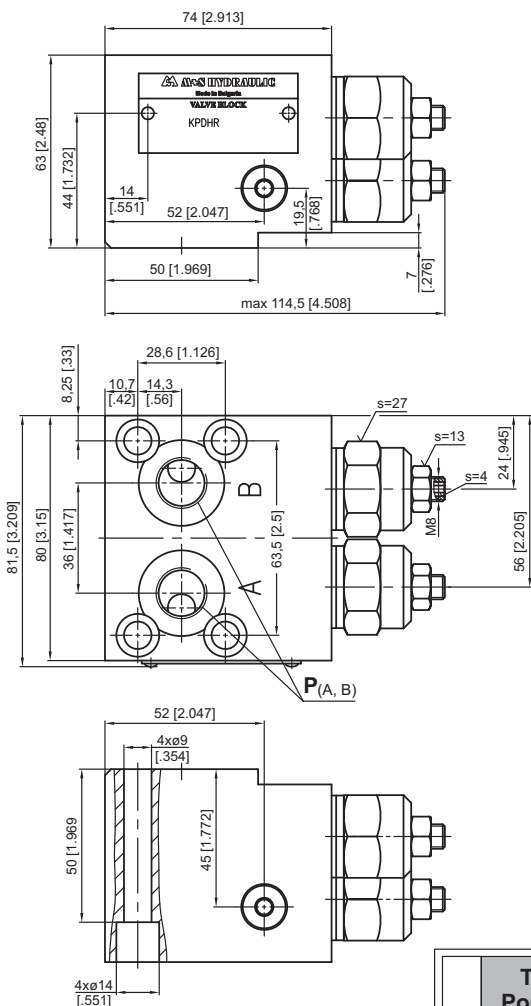
Dual Crossover Relief Valves  
type KPDHR... and KPDRK...

| Parameters           | Type       |            |             |           |            |             |
|----------------------|------------|------------|-------------|-----------|------------|-------------|
|                      | KPDHR      |            |             | KPDRK     |            |             |
| Flow Rate, lpm [GPM] | 60 [15.85] |            |             |           |            |             |
| Pressure bar         | 5÷40       | 30÷100     | 80÷250      | 10÷40     | 30÷100     | 80÷250      |
| Range*, [PSI]        | [70÷580]   | [435÷1450] | [1160÷3625] | [145÷580] | [435÷1450] | [1160÷3625] |
| Weight, kg           | 2,420      |            |             | 1,600     |            |             |
| [lb]                 | [5.34]     |            |             | [3.53]    |            |             |

\*Pressure Settings are at flow rate of 5 lpm [1.3 GPM] and viscosity 32 mm<sup>2</sup>/s [150 SUS] (50 °C [122° F]).

### VALVES FOR HP AND HR HYDRAULIC MOTORS

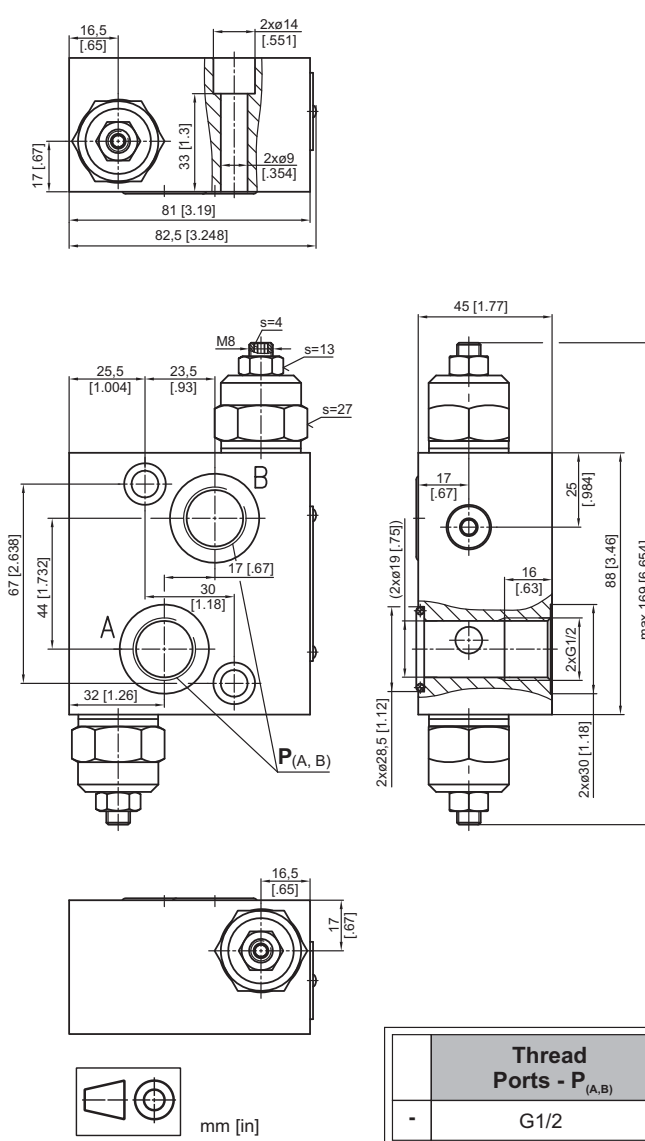
#### DUAL VALVE KPDHR



| Thread Ports - P <sub>(A,B)</sub> |                   |
|-----------------------------------|-------------------|
| -                                 | G3/8              |
| M                                 | M18x1,5           |
| A                                 | 3/4-16 UNF O-ring |

### VALVES FOR RK HYDRAULIC MOTORS

#### DUAL VALVE KPDRK



| Thread Ports - P <sub>(A,B)</sub> |      |
|-----------------------------------|------|
| -                                 | G1/2 |

**Note :** KPDHR Blocks are installed directly on HP and HR Motors with four screws M8x60 - 8.8 DIN 912 or 5/16-18 UNC, 2.5 long ANSI B 18.3 .  
 KPDRK Blocks are installed directly on RK Motors with two screws M8x45 - 8.8 DIN 912 or 5/16-18 UNC, 1.75 long ANSI B 18.3 .  
 Tightening torque 2,0<sup>+0.5</sup> daNm [177<sup>+45</sup> lb-in].

## ORDER CODE - OVERCENTER VALVES WITH BRAKE CONTROL

| 1     | 2 | 3 | 4 | 5 | 6 | 7 |
|-------|---|---|---|---|---|---|
| K P B | - | / | / |   |   |   |

### 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 |
|-------|---|---|---|
| K P W |   |   |   |

### 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 |
|-----|---|---|---|---|---|
| K P |   |   | / |   |   |

### 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 |
| <b>K P</b> |   |   |   | / |   |   |

**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  |

|          |                |
|----------|----------------|
| <b>O</b> | Optional       |
| <b>-</b> | Not applicable |
| <b>S</b> | 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

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

$v_{km}$  - vehicle speed, km/h;

$v_{mi}$  - vehicle speed, mi/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];

$\rho$  - rolling resistance coefficient (Table 1).

Table 1

| Rolling resistance coefficient<br>In case of rubber tire rolling on different surfaces |             |
|----------------------------------------------------------------------------------------|-------------|
| Surface                                                                                | $\rho$      |
| 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]

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

$\alpha$  - gradient negotiation angle (Table 2)

Table 2

| Grade % | $\alpha$ Degrees | Grade % | $\alpha$ 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:

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

$FA$  - 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;

$\eta_m$  - 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<br>$f$ |
|---------------------------------|--------------------------|
| 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                      |

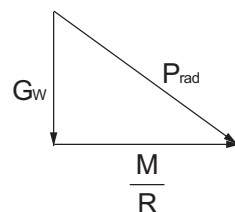
### 9.Radial motor loading: $P_{rad}$ , daN [lbs]

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.

$G_w$  - Weight held by wheel;

$P_{rad}$  - Total radial loading of motor shaft;

$M/R$ - Motion force.

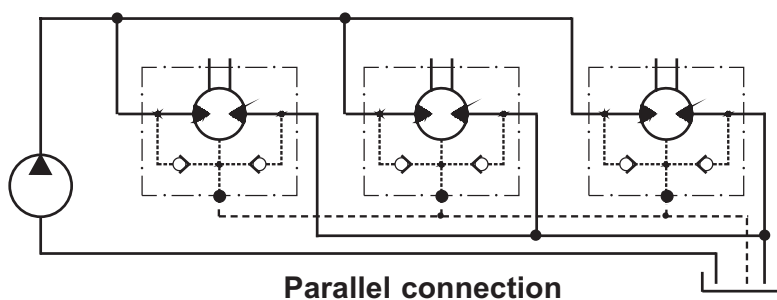
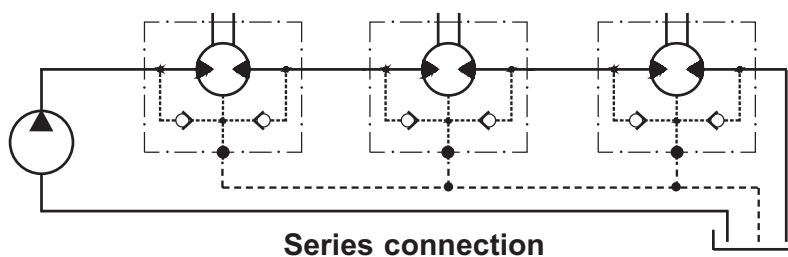


$$P_{rad} = \sqrt{G_w^2 + \left(\frac{M}{R}\right)^2}$$

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.



# 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.



**M+S HYDRAULIC**

68, Kozloduy St., 6100 Kazanlak, Bulgaria

Tel.: ++359 431 65167

++359 431 64271

Fax: +359 431 64114

E-Mail: [msh@ms-hydraulic.com](mailto:msh@ms-hydraulic.com)

URL: <http://www.ms-hydraulic.com>