

## 1.1

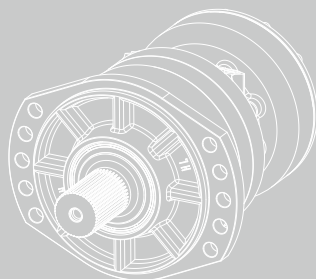
**Hengli**

®

# HRP03 series

## Radial piston hydraulic motor

The HRP03 series radial piston hydraulic motor, is a kind of low speed high torque hydraulic motor, disc valve structure, with high pressure, good stability at low speed, high volumetric efficiency and mechanical efficiency.



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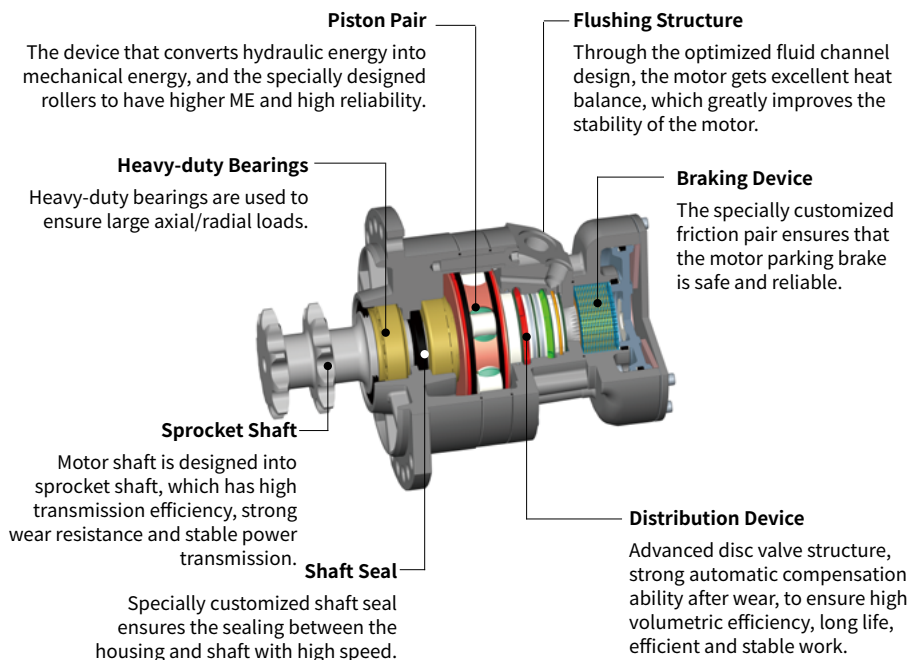
## Overview

The HRP03 series radial piston hydraulic motor, is a kind of low speed high torque hydraulic motor, disc valve structure, with high pressure, good stability at low speed, high volumetric efficiency and mechanical efficiency, and the motor can be equipped with various optional function modules.

## Advantages

- Using tapered roller bearing structure, can support larger axial and radial load.
- Advanced disc valve structure, radial piston, high volumetric efficiency, high torque and high reliability.
- More options including brake, variable speed valve, speed sensor, etc.
- Can withstand high speed and high pressure working environment.

## Standard structure



P - 0099

Specification

|                                  |                           |                       |         |      |      |      |      |
|----------------------------------|---------------------------|-----------------------|---------|------|------|------|------|
| Series                           |                           |                       | HRP03   |      |      |      |      |
| Motor performance                |                           |                       |         |      |      |      |      |
| Displacement                     |                           | cm <sup>3</sup> /rev. | 225     | 255  | 325  | 365  | 400  |
| Max.torque                       |                           | N·m                   | 1450    | 1640 | 1860 | 2090 | 2290 |
| Min.stable speed                 |                           | rpm                   | 5       |      |      |      |      |
| Max.speed                        | Displacement              | rpm                   | 475     | 420  | 330  | 295  | 270  |
|                                  | Variable displacement     | rpm                   | 620     | 550  | 430  | 385  | 350  |
| Pressure                         | Max.differential pressure | bar                   | 450     |      | 400  |      |      |
| Brake                            |                           |                       |         |      |      |      |      |
| Static braking torque            |                           | N·m                   | 2200    |      |      |      |      |
| Release pressure                 |                           | bar                   | 11 ~ 15 |      |      |      |      |
| Maximum pressure at brake port Z |                           | bar                   | 30      |      |      |      |      |
| Oil volume to operate brake      |                           | cm <sup>3</sup>       | 23      |      |      |      |      |

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- Make sure the motor is full of oil before use.
- The maximum torque is only available for small operating conditions.
- During motor running-in(at least 20 hours), it should not be operated without load at greater than 100rpm.
- The filtration standard of ISO 4406 cleaning standard 20/18/15 is recommended.
- High quality anti-wear hydraulic fluids are recommended.
- When the temperature is 50° , the minimum viscosity of the oil is recommended to be 20mm<sup>2</sup>/s.
- The recommended maximum operating temperature is 85° C.

Ordering information

|       |   |    |    |    |   |    |   |    |
|-------|---|----|----|----|---|----|---|----|
| HRP03 | 1 | 02 | M2 | S2 | N | AA | B | AA |
| ①     | ② | ③  | ④  | ⑤  | ⑥ | ⑦  | ⑧ | ⑨  |

Radial Piston Series

|   |                                             |       |
|---|---------------------------------------------|-------|
| ① | Incurve multiple-action radial piston motor | HRP03 |
|---|---------------------------------------------|-------|

Single and Two Speed

|   |                           |   |
|---|---------------------------|---|
| ② | Single speed              | 1 |
|   | Two speed, gear ratio 2:1 | 2 |

Displacement cm<sup>3</sup>/rev.

|   |                      |    |
|---|----------------------|----|
| ③ | 225, Standard piston | 02 |
|   | 255, Standard piston | 03 |
|   | 325, Step piston     | 05 |
|   | 365, Step piston     | 06 |
|   | 400, Step piston     | 07 |

Port Connection

|   |                                                             |   |   |                      |
|---|-------------------------------------------------------------|---|---|----------------------|
| ④ |                                                             | 1 | 2 | Code                 |
|   | 7/8-14UNF(A, B), 9/16-18UNF(L), 3/4-16UNF(F)                | ● |   | M2/MB/MK/N8          |
|   | G1/2(A, B), G3/8(L), G1/2(F)                                | ● |   | M8/MV/MN/N9/NA       |
|   | 7/8-14UNF(A, B), 3/4-16UNF(L), 3/4-16UNF(F)                 | ● |   | N2/M5/M9             |
|   | G1/2(A, B), G3/8(L), G3/8(F)                                | ● |   | M3/MA/MF/MH/ML/M6/N3 |
|   | 1-1/16-12UN(A, B), 9/16-18UNF(L), 3/4-16UNF(F)              | ● |   | M7                   |
|   | 7/8-14UNF(A, B), 9/16-18UNF(L), 3/4-16UNF(F), 9/16-18UNF(X) |   | ● | M1/N5                |
|   | G1/2(A, B), G1/4(L), G1/4(F), G1/4(X)                       |   | ● | M4/ME/ND             |
|   | 7/8-14UNF(A, B), 3/4-16UNF(L), 3/4-16UNF(F), 9/16-18UNF(X)  |   | ● | MP                   |
|   | G1/2(A, B), G3/8(L), G3/8(F), G1/4(X)                       |   | ● | NE                   |

## Ordering information

### Output Shaft

|                                                                                                               | M2/MB/<br>M5/M9/<br>M3/MA/<br>MF/M7/<br>NA | N8/N9/<br>N2/N3/<br>MH/<br>ML/M6 | MV/MK/<br>MN | M8 | M1/MP/<br>NE | M4/ND/<br>ME/N5 | Code |
|---------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------|--------------|----|--------------|-----------------|------|
| 42 teeth splined shaft ANSIB92.1                                                                              |                                            |                                  |              |    | ●            |                 | S1   |
| 42 teeth splined shaft ANSIB92.1                                                                              | ●                                          |                                  |              |    |              |                 | S2   |
| Double-sprocket 10 teeth, Chain No. 80(B29.1)                                                                 | ●                                          |                                  |              |    |              |                 | S3   |
| Double-sprocket 9 teeth, Chain No. 100(ISO 606)                                                               | ●                                          |                                  |              |    |              |                 | S5   |
| Ø40 straight shaft, parallel key 12×8×70, center hole M12                                                     | ●                                          |                                  |              |    |              |                 | SA   |
| Pilot diameter Ø92.7×7, hub bolt Ø140 distribution circle 5×M14×1.5                                           |                                            | ●                                |              |    |              | ●               | W1   |
| Ø40 short shaft, parallel key 12×8×65, center hole M12                                                        |                                            |                                  |              | ●  |              |                 | S6   |
| Double-sprocket 11 teeth, (GB/T 1243)                                                                         | ●                                          |                                  |              |    |              |                 | SB   |
| Double-sprocket 9 teeth, Chain No. 100(GB/T 1243)                                                             | ●                                          |                                  |              |    |              |                 | SH   |
| ⑤ Double-sprocket 9 teeth, Chain No. 100(ISO 606)                                                             | ●                                          |                                  |              |    |              |                 | S4   |
| 17 teeth splined shaft SAE                                                                                    |                                            |                                  | ●            |    |              |                 | SC   |
| 42 teeth splined shaft ANSIB92.1                                                                              | ●                                          |                                  | ●            |    |              |                 | S7   |
| Ø40 shaft, parallel key 12×8×70, center hole M12, double bond slot                                            |                                            |                                  | ●            |    |              |                 | SD   |
| Bolt hole 10×M12×1.75, distribution Ø110 round; wheel disc Ø140, pilot Ø62.8                                  |                                            | ●                                |              |    |              |                 | W4   |
| Wheel pilot Ø92.7×7, wheel bolts Ø140 distribution 5×M14×1.5, wheel disc thickness 12                         |                                            | ●                                |              |    |              |                 | W5   |
| Pilot Ø77.6×6.5, wheel bolts Ø130 distribution 5×M14×1.5; wheel disc Ø170                                     |                                            | ●                                |              |    |              |                 | W6   |
| Pilot Ø77.6×6.5, wheel bolts Ø130 distribution 5×M14×1.5; wheel disc Ø170, 141.5 away from the flange surface |                                            | ●                                |              |    |              |                 | WF   |
| Wheel pilot Ø92.7×7, wheel bolts Ø140 distribution 10×M14×1.5                                                 |                                            | ●                                |              |    |              |                 | W8   |
| Double-sprocket 10T, Chain No. 80(B29.1)                                                                      |                                            |                                  |              |    | ●            |                 | SF   |
| Pilot Ø92.7×7, wheel bolts Ø140 distribution 5×M16×1.5                                                        |                                            |                                  |              |    |              | ●               | W7   |

Ordering information

Paint Option

|   |             |   |
|---|-------------|---|
| ⑥ | No Paint    | N |
|   | Black       | B |
|   | Hengli blue | C |
|   | Yellow      | Y |

Brake

|   |                                                             |                                                        |       |                            |                 |              |       |
|---|-------------------------------------------------------------|--------------------------------------------------------|-------|----------------------------|-----------------|--------------|-------|
| ⑦ |                                                             | M3/N2/N3/<br>M5/M7/M8/<br>M9/MA/MB/<br>MF/ML/N8/<br>N9 | M2/M6 | MV/<br>MN/<br>MH/<br>MK/NA | M1/M4/<br>MP/NE | N5/ME/<br>ND | 代号    |
|   | No brakes                                                   |                                                        | ●     | ●                          |                 | ●            | AA    |
|   | Static braking torque 2200N·m, port Z 9/16-18UNF            | ●                                                      | ●     |                            |                 |              | A1/A2 |
|   | Static braking torque 2200N·m, port Z G1/4                  | ●                                                      | ●     |                            |                 |              | A4    |
|   | Static braking torque 2200N·m, port Z G1/4                  | ●                                                      | ●     |                            |                 |              | A5    |
|   | Static braking torque 2200N·m, port Z G3/8                  | ●                                                      | ●     |                            |                 |              | A6    |
|   | Static braking torque 2200N·m, port Z G1/4, M6 exhaust port | ●                                                      | ●     |                            |                 |              | AD    |
|   | Static braking torque 2200N·m, port Z G1/4                  | ●                                                      | ●     |                            | ●               | ●            | A3/A7 |
|   | Static braking torque 2200N·m, port Z 9/16-18UNF            |                                                        |       |                            | ●               | ●            | A5/A8 |

Flushing Valve

|   |                                                         |                                                                                    |       |    |
|---|---------------------------------------------------------|------------------------------------------------------------------------------------|-------|----|
| ⑧ |                                                         | M1/N5/N2/M2/M3/ME/M4/N3/M5/M6/M7/<br>M8/MV/MN/M9/MA/MB/MF/MK/MP/N8/N9/<br>NA/ND/NE | MH/ML | 代号 |
|   | No flushing valve                                       | ●                                                                                  | ●     | A  |
|   | There is a flushing valve with a flow rate of 5L/min    | ●                                                                                  |       | B  |
|   | There is a flushing valve with a flow rate of 7L/min    | ●                                                                                  |       | C  |
|   | There is a flushing valve with a flow rate of 10L/min   | ●                                                                                  |       | D  |
|   | There is a flushing valve with a flow rate of 12.5L/min | ●                                                                                  |       | E  |
|   | There is a flushing valve with a flow rate of 13.5L/min | ●                                                                                  |       | F  |

## Ordering information

### Special Features

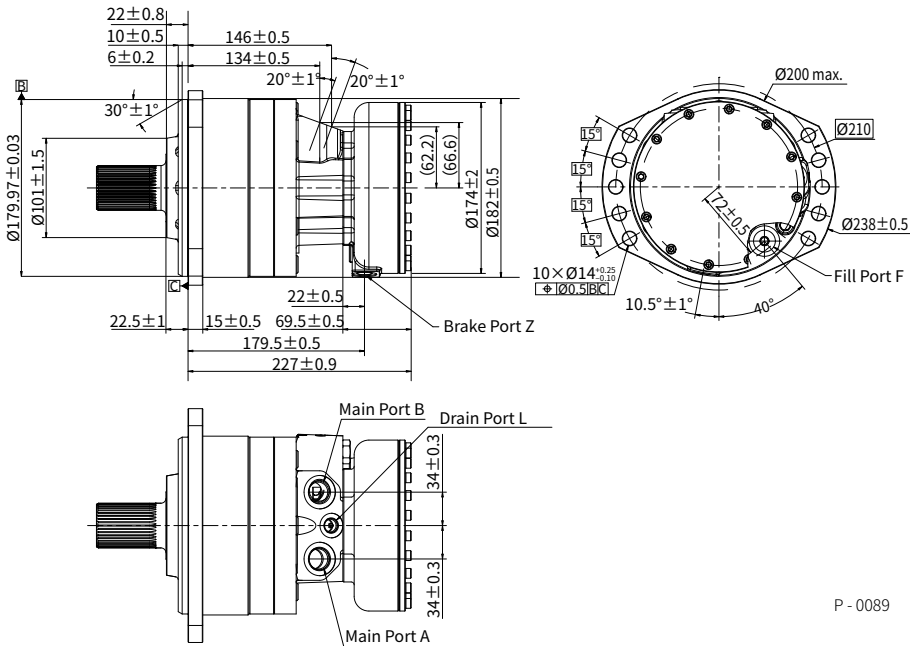
| ⑨ |                                         | N5/N2/M2/M3/ME/N3/M5/M6/M7/<br>M8/MV/MN/M9/MA/MB/MF/MK/<br>MP/N8/NA/NE/MH/ML | M1/M4/N9/ND | 代号 |
|---|-----------------------------------------|------------------------------------------------------------------------------|-------------|----|
|   | Standard                                | ●                                                                            | ●           | AA |
|   | High temperature, FKM                   | ●                                                                            | ●           | V1 |
|   | Low temperature                         | ●                                                                            | ●           | V2 |
|   | Speed sensor cavity                     |                                                                              | ●           | S1 |
|   | Speed sensor (with direction judgement) |                                                                              | ●           | S2 |

T - 0091

**Note:** ● =Available; For the other types of port forms, output forms and brake port orientations, please contact Hengli's application engineer for consultation.

Installation size

· Single speed shaft output: Take HRP03107M2S2BA1BAA for example



P - 0089

Note: The weight of the connection shown in the figure is 35kg.

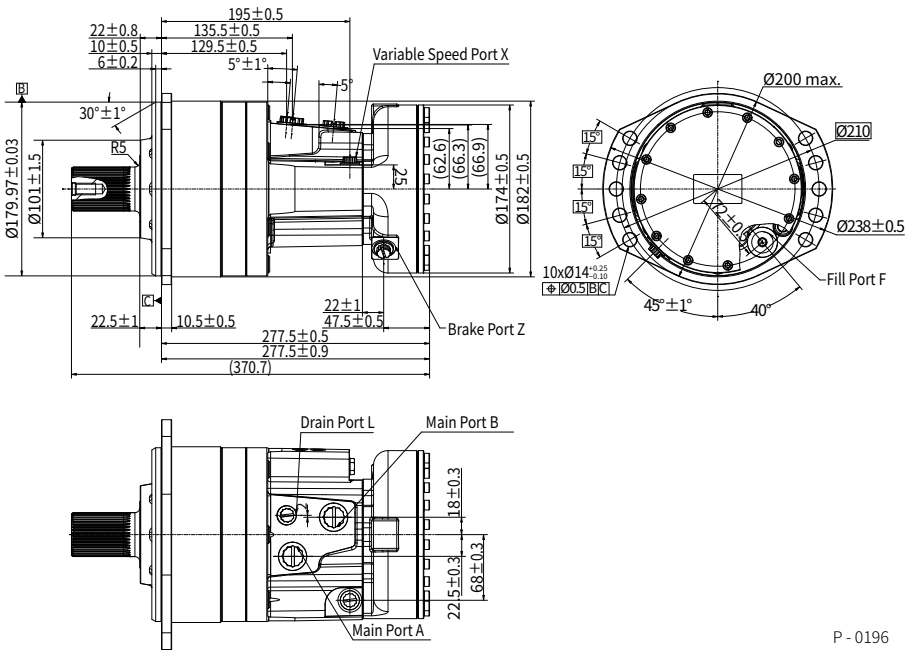
| Name | Port Function | M2/MB      | M5/M9     | M3/MA/MF | M7          | NA   |
|------|---------------|------------|-----------|----------|-------------|------|
| A, B | Main Port     | 7/8-14UNF  | 7/8-14UNF | G1/2     | 1-1/16-12UN | G1/2 |
| L    | Drain Port    | 9/16-18UNF | 3/4-16UNF | G3/8     | 9/16-18UNF  | G3/8 |
| F    | Fill Port     | 3/4-16UNF  | 3/4-16UNF | G3/8     | 3/4-16UNF   | G1/2 |

T - 0093



Installation size

·Two speed shaft output: Take HRP03207M1S1BA5BAA for example



P - 0196

Note: The weight of the connection shown in the figure is 37.5kg.

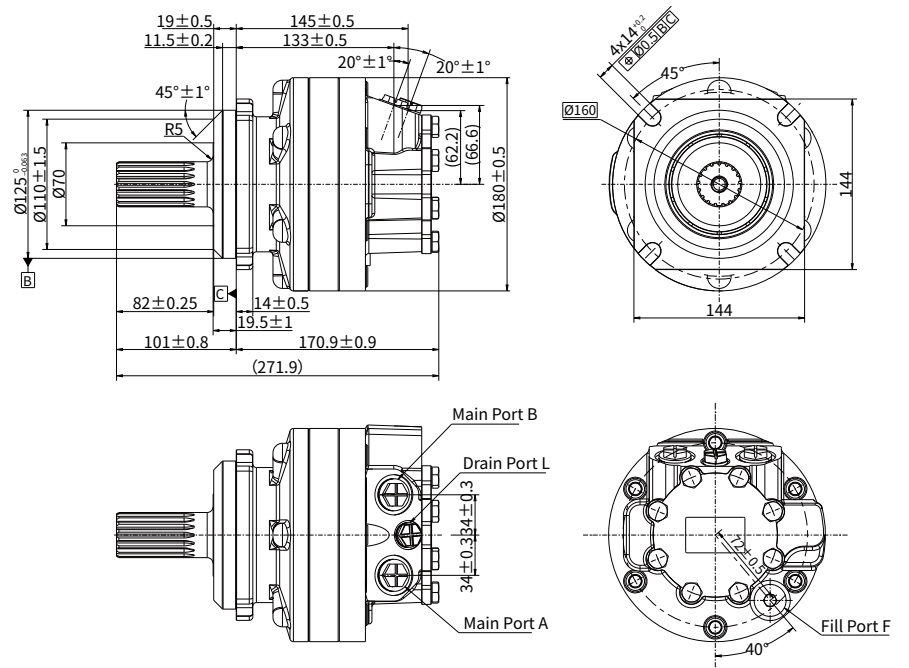
| Name | Port Function       | M1         | MP         | NE   |
|------|---------------------|------------|------------|------|
| A, B | Main Port           | 7/8-14UNF  | 7/8-14UNF  | G1/2 |
| L    | Drain Port          | 9/16-18UNF | 3/4-16UNF  | G3/8 |
| F    | Fill Port           | 3/4-16UNF  | 3/4-16UNF  | G3/8 |
| X    | Variable Speed Port | 9/16-18UNF | 9/16-18UNF | G3/4 |

T - 0168



Installation size

· 4-hole SAE flange: Take HRP03107MVSCBAAAA for example



P - 0286

Note: The weight of the connection shown in the figure is 21.58kg.

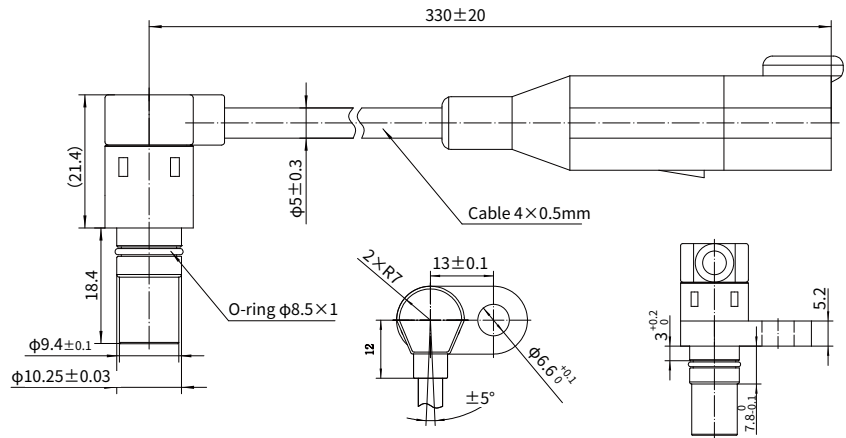
| Name | Port Function | MV/MN | MK         |
|------|---------------|-------|------------|
| A, B | Main Port     | G1/2  | 7/8-14UNF  |
| L    | Drain Port    | G3/8  | 9/16-18UNF |
| F    | Fill Port     | G1/2  | 3/4-16UNF  |

T - 0214



Speed sensor

· Speed sensor: S2



P - 0272

|                                                          |                                                         |
|----------------------------------------------------------|---------------------------------------------------------|
| Dimensions                                               | $\phi 10.25$ / $L=18.4$ mm                              |
| Voltage                                                  | 8-32VDC                                                 |
| Input Current                                            | <15mA                                                   |
| Sensing distance                                         | 0.2~2mm                                                 |
| Power reverse protection (Y/N)                           | Yes                                                     |
| Power input overcurrent and overvoltage protection (Y/N) | Yes                                                     |
| Maximum output current                                   | 50mA                                                    |
| Voltage drop                                             | $\leq 3$ VDC                                            |
| Working frequency                                        | 0-20KHz                                                 |
| Output signal                                            | A, B                                                    |
| Operating temperature                                    | -40°C ~+125°C                                           |
| Protection                                               | IP67/IP69K                                              |
| Shell material                                           | Copper/plastic                                          |
| Pressure resistance of measuring surface                 | 10bar                                                   |
| Connector                                                | Cable 0.33m, Injection 4-core DEUTSCH DT04-4P-EP04 plug |

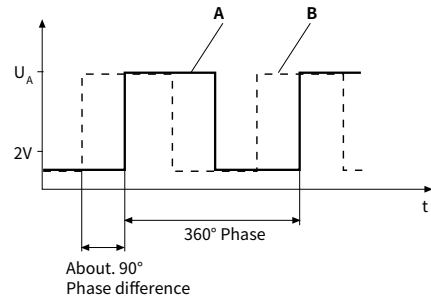
T - 0208

Speed sensor

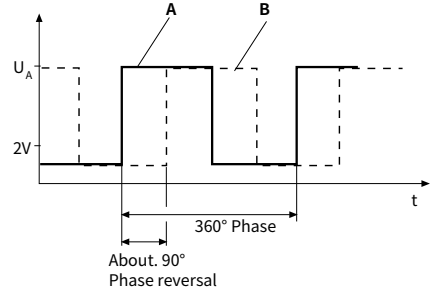
·Speed sensor: S2

■ OUTPUT SIGNAL

↻ The measured gear rotates clockwise



↻ The measured gear rotates counterclockwise



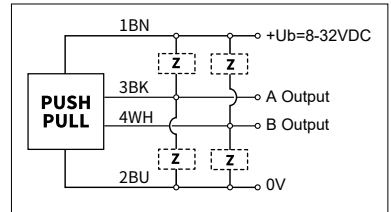
P - 0273

■ TERMINAL ASSIGNMENT

|                     |                                                                                   |     |    |    |    |
|---------------------|-----------------------------------------------------------------------------------|-----|----|----|----|
| Signal              |  | +Ub | 0V | A  | B  |
| Color               |  | BN  | BU | BK | WH |
| 4 core plug<br>DT04 |  | 1   | 2  | 3  | 4  |

P - 0274

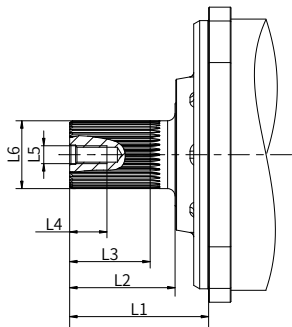
■ WIRING DIAGRAM



P - 0275

Shaft end dimensions

· Splined Shaft

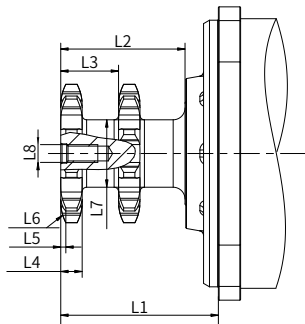


P - 0090

| Code  | L1                                          |                                                        | L2        | L3     | L4     | L5  | L6                                   |
|-------|---------------------------------------------|--------------------------------------------------------|-----------|--------|--------|-----|--------------------------------------|
| S1/S2 | 93.2±0.8                                    |                                                        | 70.7±0.3  | 54min. | 25min. | M12 | Ø45.52 <sup>+0.25</sup> <sub>0</sub> |
| SC    | 101±0.8                                     |                                                        | 82±0.25   | 57min. |        |     | Ø38.1                                |
| S7    | 93.2±0.8<br>(*Suitable for common housings) | 90.2±0.8<br>(*Suitable for 4-hole SAE flange housings) | 71.2±0.25 | 54min. |        |     | Ø45.52 <sup>+0.25</sup> <sub>0</sub> |

T - 0216

· Double-sprocket Shaft



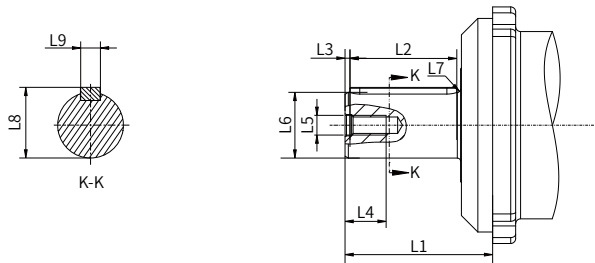
P - 0091

| Code | L1         | L2        | L3     | L4                                    | L5      | L6       | L7                                     | L8                   |
|------|------------|-----------|--------|---------------------------------------|---------|----------|----------------------------------------|----------------------|
| S3   | 106.35±0.8 | 83.85±0.2 | 39±0.2 | 2x14.45 <sup>0</sup> <sub>-0.3</sub>  | 4x3.43  | 4xR29.2  | 2xØ45.52 <sup>+0.25</sup> <sub>0</sub> | M12 $\nabla$ 25 min. |
| S5   | 122.65±0.8 | 97.65±0.2 | 47±0.2 | 2x17.58 <sup>0</sup> <sub>-0.3</sub>  | 4x4.128 | 4xR31.75 | 2xØ58 <sup>+0.25</sup> <sub>0</sub>    |                      |
| SB   | 109±0.8    | 86.5±0.2  | 40±0.2 | 2x15 <sup>0</sup> <sub>-0.3</sub>     | 4x3.3   | 4xR25.4  | 2xØ60 <sup>+0.25</sup> <sub>0</sub>    |                      |
| SH   | 103.8±0.3  | 81.3±0.2  | 47±0.2 | 2x17.95 <sup>0</sup> <sub>-0.43</sub> | 4x4.1   | 4xR31.75 | 2xØ59±0.1                              |                      |
| S4   | 126.5±0.5  | 101.5±0.2 | 54±0.2 | 2x17.58 <sup>0</sup> <sub>-0.43</sub> | 4x4.128 | 4xR31.75 | 2xØ58 <sup>+0.25</sup> <sub>0</sub>    |                      |
| SF   | 106.35±0.3 | 83.85±0.2 | 39±0.2 | 2x14.45 <sup>0</sup> <sub>-0.3</sub>  | 4x3.43  | 4xR29.2  | 2xØ45.52 <sup>+0.25</sup> <sub>0</sub> |                      |

T - 0217

Shaft end dimensions

•Straight Shaft

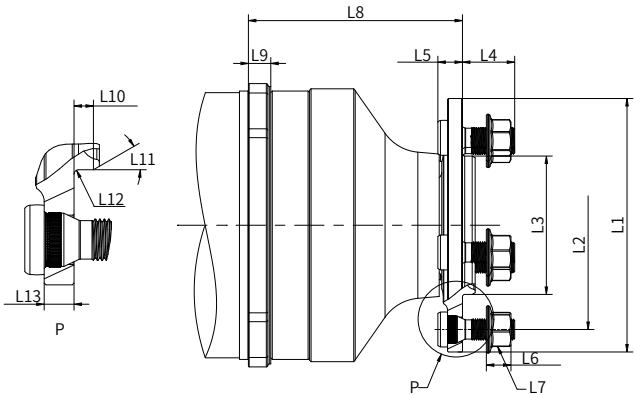


P - 0246

| Code | L1        | L2                                 | L3       | L4      | L5  | L6                                      | L7   | L8                              | L9                                |
|------|-----------|------------------------------------|----------|---------|-----|-----------------------------------------|------|---------------------------------|-----------------------------------|
| SA   | 114.6±0.8 | 70 <sup>0</sup> <sub>-0.74</sub>   | 5±0.25   | 25 min. | M12 | Ø40 <sup>+0.018</sup> <sub>+0.002</sub> | R3.5 | 43 <sup>0</sup> <sub>-0.3</sub> | 12 <sup>0</sup> <sub>-0.043</sub> |
| S6   | 89.8±0.8  | 65 <sup>0</sup> <sub>-0.74</sub>   | 3±0.25   |         |     | Ø40 <sup>0</sup> <sub>-0.016</sub>      | R2   |                                 |                                   |
| SD   | 111.6±0.8 | 2x70 <sup>0</sup> <sub>-0.74</sub> | 2x5±0.25 |         |     | Ø40 <sup>0</sup> <sub>-0.016</sub>      | R3.5 |                                 |                                   |

T - 0218

•Wheel Bolts



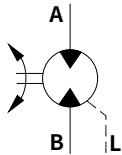
P - 0245

| Code | L1   | L2       | L3                                  | L4 | L5   | L6   | L7          | L8         | L9 | L10      | L11 | L12       | L13 |
|------|------|----------|-------------------------------------|----|------|------|-------------|------------|----|----------|-----|-----------|-----|
| W1   | Ø170 | Ø140     | Ø92.7±0.1                           | 35 | 16.5 | 16.5 | 5xM14x1.5   | 143.5±1.15 | 15 | 6.5±0.25 | 30° | R1.5 max. | 10  |
| W4   | Ø140 | Ø110±0.1 | Ø62.8±0.1                           | -  | -    | -    | 10xM12x1.75 | 151.2      | 13 | -        | -   | -         | -   |
| W5   | Ø170 | Ø140±0.1 | Ø92.7±0.1                           | 33 | 18.5 | 16.5 | 5xM14x1.5   | 143.5±1.15 | 13 | 6.5±0.25 | 30° | R1        | 12  |
| W6   | Ø170 | Ø130±0.1 | Ø77.6±0.1                           | 35 | 16.5 | 16.6 | 5xM14x1.5   | 145.5±1.15 | 13 | 6.5±0.25 | 30° | R1        | 10  |
| W7   | Ø170 | Ø140     | Ø92.7±0.1                           | 40 | 15   | 21   | 5xM16x1.5   | 145.5±1.15 | 15 | 6.5±0.25 | 30° | R1 max.   | 10  |
| W8   | Ø170 | Ø140±0.1 | Ø92.7±0.1                           | 35 | 16.5 | 16.6 | 10xM14x1.5  | 143.5±1.15 | 13 | 6.5±0.25 | 30° | R1        | 10  |
| WF   | Ø170 | Ø140±0.1 | Ø77.6 <sup>0</sup> <sub>-0.05</sub> | 35 | 16.5 | 16.5 | 5xM14x1.5   | 141±0.5    | 13 | 6.5      | 30° | R1        | 10  |

T - 0219

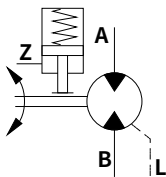
Hydraulic diagram

· Motor without brakes



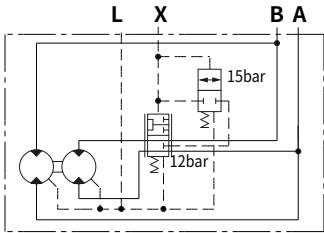
P - 0085

· Motor with parking brake



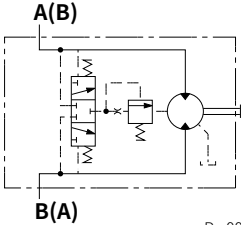
P - 0086

· Schematic diagram of a two-speed motor



P - 0087

· Flushing valve schematic



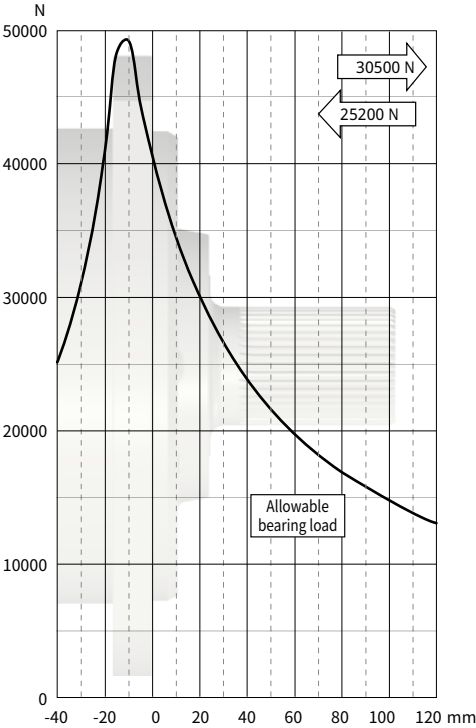
P - 0088

Allowable shaft load/bearing curve

As shown in the figure, when the axial load is 0, the radial allowable load of the output shaft is related to the distance from the flange mounting surface to the load action point.

The solid line shows the allowable radial load of the bearing based on life with 2000hrs. Denote use hydraulic fluids containing anti-wear additives, and rated output torque and motor speed of 50rpm, the differential pressure is 250 bar, the operating oil temperature is 50°C .

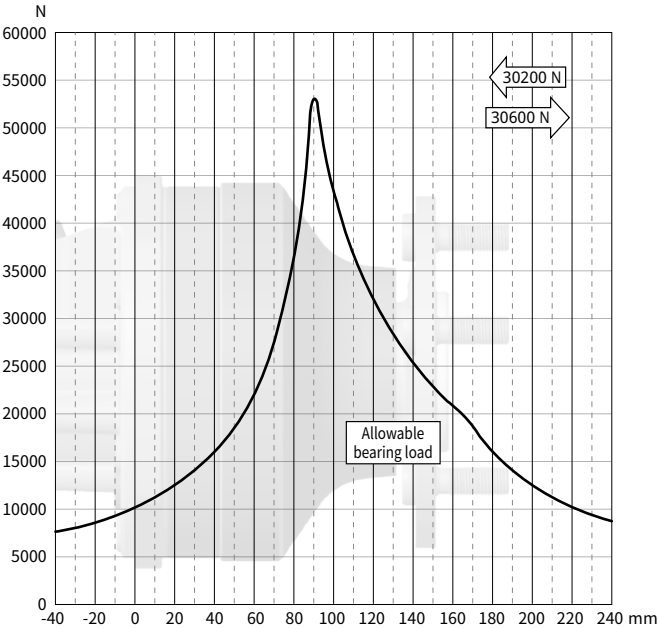
· Shaft Output Bearing Curve



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# Allowable shaft load/bearing curve

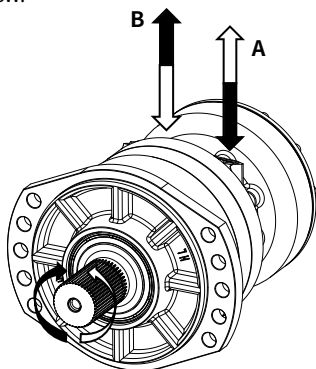
· Wheel Output Bearing Curve



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## Rotation direction: CW

When facing the motor shaft extension direction, port A is high pressure oil, the output shaft rotates CW; Otherwise, it rotates CCW.



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