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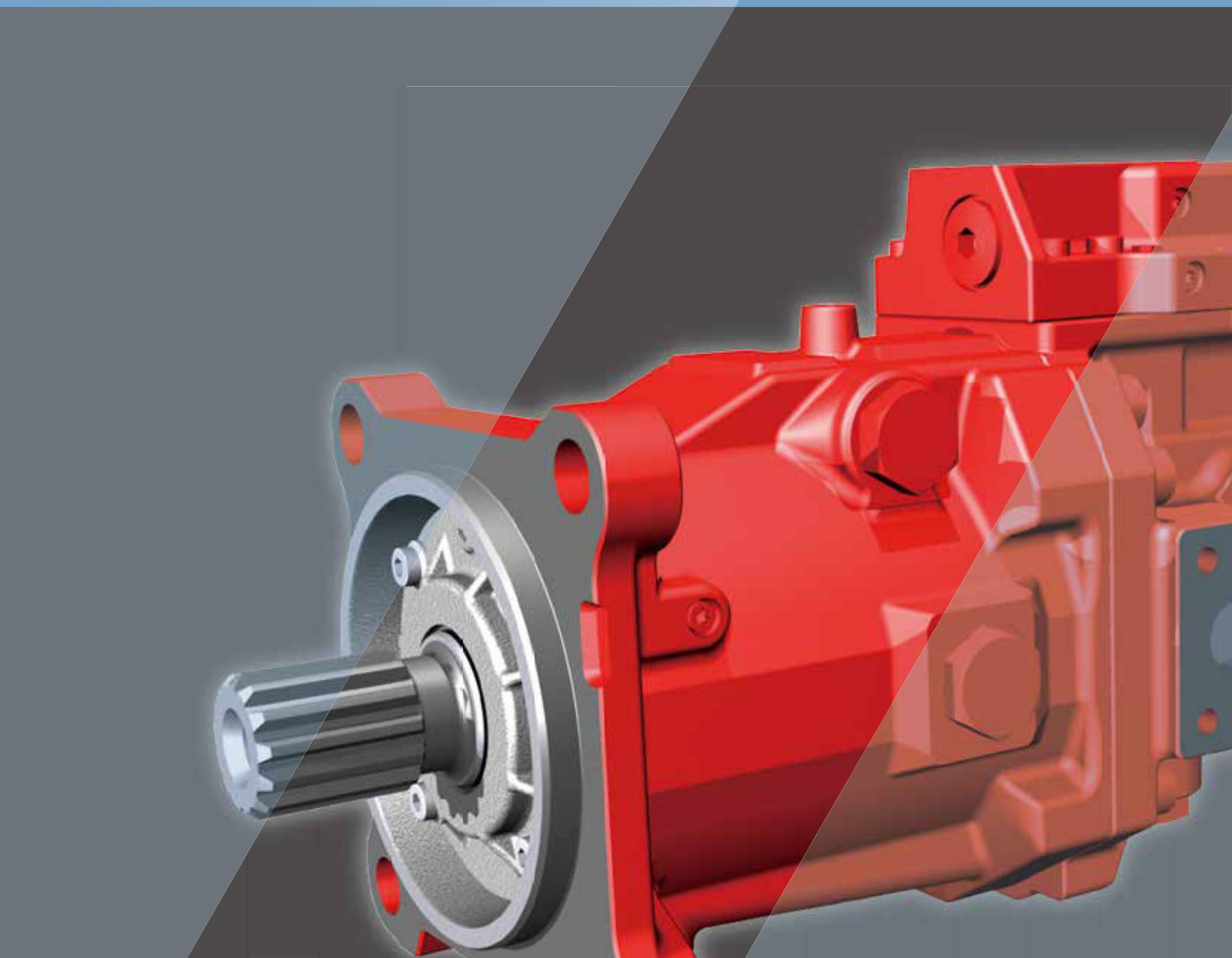
Swash Plate Type Axial Piston Motor

# M7V / M7VC / M7X Series

HT 17 G 107 0521 E



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# I . Applications / Product Usage

**The following must be taken into consideration before use.**

1. The operating condition of the products shown in this catalog varies depending upon each application. Therefore, the product suitability must be judged by the designer of the hydraulic system and/ or the person who finalizes the technical specifications of the machine after analysis and testing. The product specification shall be determined based on the latest catalog and technical documents. The system must be designed taking into account the possibility of machine failure to ensure that all safety, warning, and application requirements are met.

2. For the proper use of the products, descriptions given in the SAFETY PRECAUTIONS must be observed.

3. The technical information in this catalog represents typical characteristics and performance of the products as of the published date.

4. If the products are intended to use in the following, please consult with Kawasaki in advance.
   (1) Use of the product under the operating conditions or environments other than those described in the technical documents.
   (2) Use of the product in the nuclear sector, aviation sector, medical sector, and/or food sector.
   (3) Use of the product in applications which may cause substantial harm to others and their property, and especially in applications where ensuring safety is a requirement.

5. The information described in this catalog is subject to change without notice. For the latest information, please contact Kawasaki.

# Ⅱ. Safety Precautions

**Before using the product, you MUST read this catalog and MUST fully understand how to use the product. To use the product safely, you MUST carefully read all Warnings and Cautions in this catalog.**

## 1. Cautions related to operation


- Use the personal protective equipment to prevent injury when the product is in operation.


- Some components are heavy. Handle the product carefully not to hurt your hands and lower back.


- Do not step on, hit, drop , or apply strong force to the product, as these actions may cause operation failure, product damage, or oil leakage.


- Wipe off any oil on the product or the floor completely, as oil can create slippery conditions that may cause drop of the product and personal injury.

## 2. Warnings and cautions related to installation and removal of the product


- Installation, removal, piping, and wiring must be carried out by a qualified technician.


- Make sure that the hydraulic power unit is turned off and that the electric motor or engine has completely stopped before starting installation or removal. You must also check that the system pressure has dropped to zero.


- Make sure that the power source is turned off before installing electric components to reduce the risk of electric shock.


- Clean the threads and the mounting surface to prevent damage or oil leakage. Inadequate cleaning may cause insufficient torque and broken seals.


- Use the designated bolts and fasten them with prescribed torque when installing the product. Use of undesignated bolts, and excessive or insufficient tightening torque may induce operation failure, damage, or oil leakage.

## 3. Warnings and cautions for operation


- Always equip the product with explosion or ignition protection if it is used in potentially explosive or combustible atmospheres.


- Shield rotary parts, such as the motor and pump shaft, to avoid injury.


- Stop operation immediately, and take proper measures when the abnormality such as unusual noise, oil leakage, and smoke is found. Continuing operation under such condition may bring about damage, a fire hazard, or injury.


- Make sure that all pipes, hoses, and connecting points with pipes or hoses, are correctly connected and tightened before starting operation.


- Use the product under the operating conditions and limitations described in the catalog, drawings, and specification sheets.


- Do not touch the product in operation, to reduce the risk of skin burn.


- Use the proper hydraulic oil and maintain the correct cleanliness level to prevent premature wear and damage.

## 4. Cautions related to maintenance


- Never modify the product without approval from Kawasaki.


- Disassembly of the product will void the warranty.


- Keep the product clean and dry when storing or transporting.


- The seals may need to be replaced if the product has been stored for an extended period of time.


- Making adjustments of this product will result in the warranty being null and void.

# Ⅲ. Handling Precautions

## 1. Operating Fluid and Temperature Range

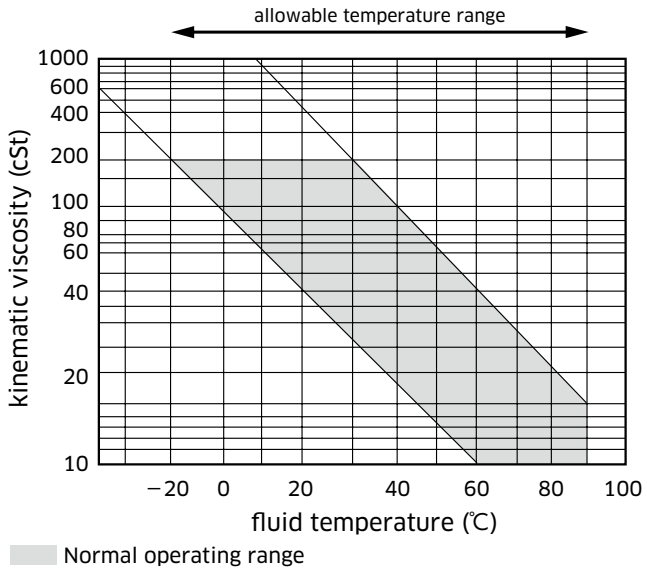
### 1) Operating fluid

Values shown in this catalog are based upon using mineral oil based anti-wear hydraulic fluid. To ensure optimal performance use of mineral oil based anti-wear hydraulic fluid is recommended.

### 2) Viscosity and temperature range

To minimize both oil and seal deterioration, a maximum operating temperature of 60℃ should be considered. Please note that the regulator may become slow to respond when operating at low temperatures (below 20℃) in extreme cold environments. At such low temperature it is strongly suggested that a warm up cycle is introduced until an operating temperature of 20℃ is achieved.

| | Normal operating range | Allowable range |
|---|---|---|
| Viscosity [mm²/s(cSt)] | 10 to 200 | 10 to 1000 |
| Fluid temperature [℃ (℉)] | −20 to +90 (−4 to +194) | |




## 2. Filtration and Contamination Control

### 1) Filtration of working oil

The most important means to prevent premature damage to the motor, associated equipment and to extend its working life, is to ensure that hydraulic fluid contamination control of the system is working effectively.

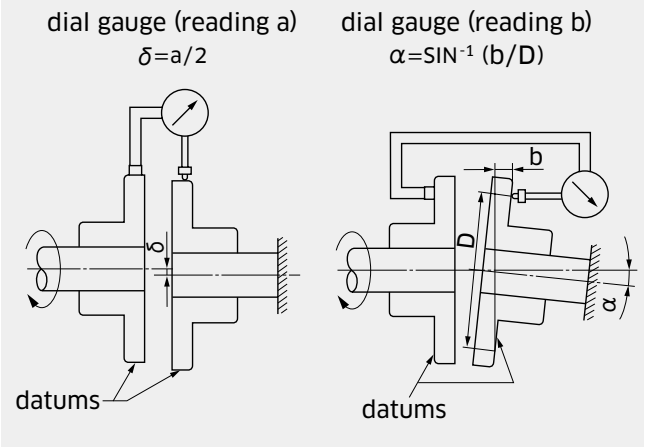
This begins by ensuring that at the time of installation that all piping, tanks etc. are rigorously cleaned. Flushing should be provided using an off line filtration system and after flushing the filter elements should be replaced.

### 2) Suggested acceptable contamination level

The relationship between contamination level and motor life is very difficult to predict as it depends on the type and nature of the contaminant present in the system. Sand or Silica in particular, due to its abrasive nature, does significantly reduce the expected life of a motor. Based on the precondition that there is no significant presence of Silica type substances then a minimum target cleanliness level should be -/18/15 ISO 4406 or SAE AS 4059E Table 1 Class 9 (NAS 1638 Class 9).

## 3. Connection of Driving Shaft

1) Install the motor horizontally to the shaft direction.
2) Alignment should be within specifications below.
   Parallel misalignment $\delta \leqq 0.05$mm
   (Dial gauge reading a = below 0.10mm)
   Angular misalignment $\alpha \leqq 0.2$deg




## 4. Oil Filling and Air Bleeding

### 1) Motor case filling

Be sure to fill the motor casing with oil through the drain port before start up. The motor contains bearings and high-speed sliding parts including pistons with shoes and a spherical bush that need to be continuously lubricated. Part seizure or total premature failure will occur very quickly if this procedure is not rigorously followed.

### 2) Air bleeding

Run the motor unloaded for a period of time to ensure that all residual air within the system is released.

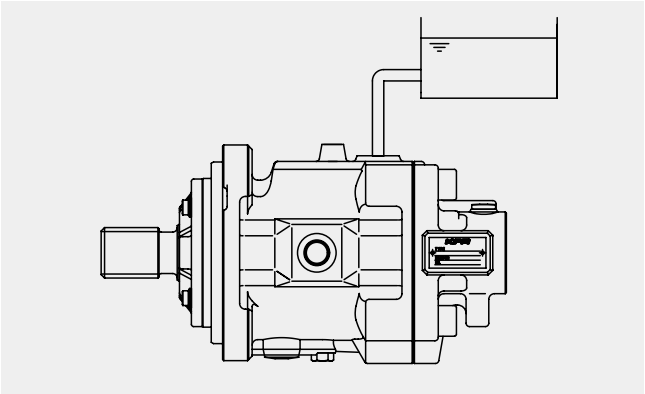
### 3) Long term out of usage

It is undesirable to leave the motor out of use for a long period e.g. a year or more. In such a situation it is recommended that the motor is run for a short period on a more frequent basis even if it is just unloaded.
If a motor is held in storage then rotating the shaft on a frequent basis is sufficient. If the motor is left out for a long period of time, it will require a service inspection.

## 5. Drain Piping

### 1) Location of the drain piping

Drain port at the highest position of the motor should be used.
Drain piping must be arranged as shown in the following figure so that the motor case is filled with the oil. The drain piping must be connected directly to the tank.

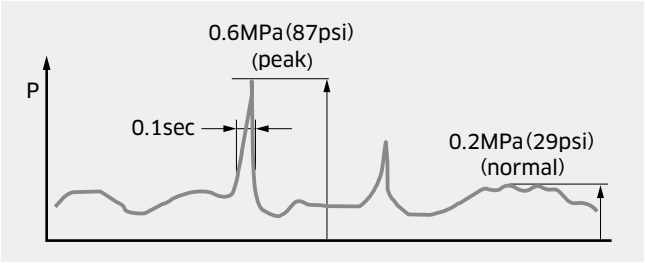


### 2) Size of the drain hose or pipe

The internal bore size must be larger in size than the drain port. Arrange the piping as short as possible.

### 3) Casing pressure

Permissible maximum case pressure is 0.2 MPa normally and 0.6 MPa peak. Refer to the following figure measured at the drain port of the motor.




### 4) Influence of casing pressure on beginning of control

An increase in casing pressure affects the beginning of control of the variable motor when a proportional displacement control, or a pressure related control is adopted. An increase in casing pressure induces an increase in control pressure at the beginning of control. This also has an influence on the control characteristics.

Please refer to the control options of M7V motors shown on page 11.

## 6. Thrust and Radial Load to the Shaft

### 1) Thrust load

Do not apply any form of thrust load to the shaft end.

### 2) Radial load

Radial load is acceptable under certain conditions. Please contact Kawasaki if a radial load is to be applied to the shaft. Bearing life may be influenced and reduced depending on the load magnitude, position and orientation of the load.

## 7. Direction of rotation

| Direction of rotation, viewed on drive shaft | | |
|---|---|---|
| Direction | Clockwise | Counter Clockwise |
| Flow | Port A to B | Port B to A |

# Ⅳ. Conversion Factors, Formula and Definition

## Conversion Factors

| | Formula | Note |
|---|---|---|
| Displacement | 1 $cm^3$ = 0.061 $in^3$ | |
| Pressure | 1 MPa = 145 psi | |
| Flow | 1 L/min = 0.264 gpm | US gallon |
| Torque | 1 Nm = 0.74 lb ft | |
| Power | 1 kW = 1.341 hp | |
| Weight | 1 kg = 2.205 lb | |

## Formula

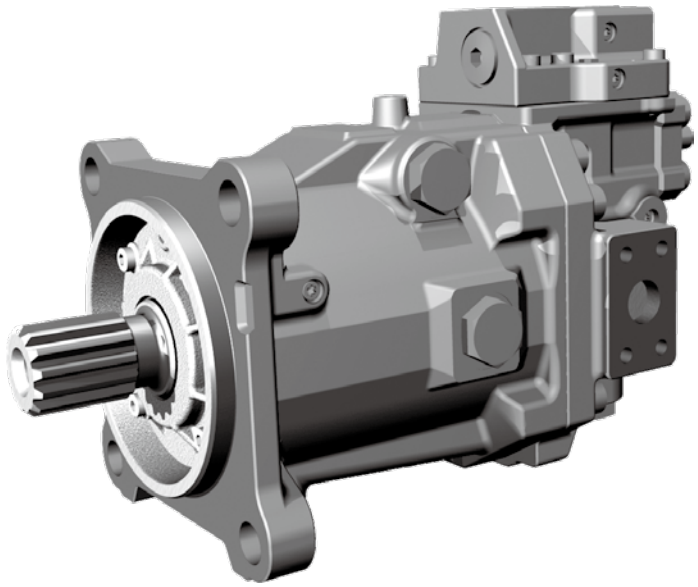
| | Metric system | | Imperial system | |
|---|---|---|---|---|
| **Input flow** | $Q = q \times N / (1000 \times \eta_v)$ | L/min | $Q = q \times N / (231 \times \eta_v)$ | gal/min |
| **Output torque** | $T = q \times \Delta P \times \eta_m / 2\pi$ | Nm | $T = q \times \Delta P \times \eta_m / 24\pi$ | lbf ft |
| **Output power** | $L = T \times N / 9550 = Q \times \Delta P \times \eta_t / 60$ | kW | $L = T \times N / 5252 = Q \times \Delta P \times \eta_t / 1714$ | hp |
| **Speed** | $N = Q \times 1000 \times \eta_v / q$ | $min^{-1}$ | $N = Q \times 231 \times \eta_v / q$ | rpm |

## Definition

| | | | |
|---|---|---|---|
| q | = | Motor displacement / rev. | $cm^3$ ($in^3$) |
| L | = | Output power | hp |
| N | = | Speed | $min^{-1}$ (rpm) |
| $N_{nom}$ | = | Max. speed at maximum displacement | |
| $\Delta P$ | = | $P_{high} - P_{low}$ | MPa (psi) |
| $P_{high}$ | = | High pressure | MPa (psi) |
| $P_{low}$ | = | Low pressure | MPa (psi) |
| $P_{nom}$ | = | Nominal pressure | |
| T | = | Output torque | Nm (lbf ft) |
| $\eta_v$ | = | Motor volumetric efficiency | |
| $\eta_m$ | = | Motor mechanical efficiency | |
| $\eta_t$ | = | Motor total efficiency | |

# M7V Series

## Variable Displacement Type Axial Piston Motors



### ■Specifications

Size : 85, 112, 160, 212
Nominal Pressure : 42 MPa (6,090 psi)
Maximum Pressure : 50 MPa (7,250 psi)

### ■General Descriptions

- Applicable to an open circuit and closed circuit.
- Applicable to construction machinery and industrial vehicles.
- Swash plate design allows for a compact motor.
- High power density
- Various control options make the motor suitable for a wide range of applications.

### ■Features

**Superior performance at High and Low speed**
Optimized rotary balance design enables high speed performance and excellent low speed characteristics.

**Low noise**
Swash plate configuration provides the low noise.

**Compact size**
Swash plate configuration provides the more compact structure and flexibility in system design.

**Long bearing life**
Swash plate configuration results in longer bearing life.

# 1 M7V Ordering Code

Model Code

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M7V | 112 | A | A | 1 | 1 | - | A | A | 1 | T1 | X | X | X | N | - | 01 |

**1. M7V Series**
M7V Series, Variable Displacement, Axial Piston Motor, Applicable in Both Open and Closed Loops.

**2. Size**

| | 85 | 112 | 160 | 212 |
|---|---|---|---|---|
| Standard Size | ● | ● | ● | ● |

**3. Series Specifications**

| | |
|---|---|
| A | Standard |

**4. Mounting Flange and Port Position***

| | Mounting | Port Position | 85 | 112 | 160 | 212 |
|---|---|---|---|---|---|---|
| A | SAE J744, 2-bolt Mount (for M7V85) | Rear | ● | ● | ● | ○ |
| | SAE J744, 4-bolt Mount (for M7V112/160/212) | | | | | |
| B | SAE J744, 2-bolt Mount (for M7V85) | Side | ● | ● | ● | ○ |
| | SAE J744, 4-bolt Mount (for M7V112/160/212) | | | | | |
| C | ISO 3019-2, 4-bolt Mount | Rear | ● | ● | ● | ● |
| D | ISO 3019-2, 4-bolt Mount | Side | ● | ● | ● | ● |
| E | SAE J744, 4-bolt Mount (for M7V85) | Rear | ● | — | — | — |
| F | SAE J744, 4-bolt Mount (for M7V85) | Side | ● | — | — | — |

**5. Port and Flange Fixing Thread***

| | Threaded Port Type | Flange Fixing Thread Type | 85 | 112 | 160 | 212 |
|---|---|---|---|---|---|---|
| 1 | ANSI ISO11926 | ANSI ASME B1.1 | ● | ● | ● | ○ |
| 4 | Parallel Piping ISO228 | Metric ISO724 | ● | ● | ● | ● |

**6. Shaft End***

| | Standard | Specifications | 85 | 112 | 160 | 212 |
|---|---|---|---|---|---|---|
| 1 | ANSI B92.1 | 1 1/2 in 17T 12/24DP | ● | — | — | — |
| 2 | ANSI B92.1 | 1 3/4 in 13T 8/16DP | — | ● | ● | — |
| 3 | ANSI B92.1 | 2 in 15T 8/16DP | — | — | ● | ○ |
| 4 | ANSI B92.1 | 1 3/8 in 21T 16/32DP | ● | — | — | — |
| 5 | DIN 5480 | W35x2x16x9 g | ● | — | — | — |
| 6 | DIN 5480 | W40x2x18x9 g | ● | ● | — | — |
| 7 | DIN 5480 | W45x2x21x9 g | — | ● | ● | — |
| 8 | DIN 5480 | W50x2x24x9 g | — | — | ● | ● |
| 9 | ANSI B92.1 | 1 1/4 in 14T 12/24DP | ● | — | — | — |

*Following combination of code [4], [5], and [6] is available.

| | Ordering Code | | |
|---|---|---|---|
| | Code[4] | Code[5] | Code[6] |
| M7V85 | A or B | 1 | 1 or 9 |
| | C or D | 4 | 5 or 6 |
| | E or F | 1 or 4 | 4 |
| M7V112 | A or B | 1 | 2 |
| | C or D | 4 | 6 or 7 |
| M7V160 | A or B | 1 | 2 or 3 |
| | C or D | 4 | 7 or 8 |
| M7V212 | A or B | 1 | 3 |
| | C or D | 4 | 8 |

● : Available
○ : Under development
— : Not available

# 1. M7V Ordering Code

Model Code

| 1 | 2 | 3 | 4 | 5 | 6 | | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M7V | 112 | A | A | 1 | 1 | - | A | A | 1 | T1 | X | X | X | N | - | 01 |

**7. Maximum Displacement**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Size | 85 | A : 85 | ● | B : 80 | ● | C : 75 | ● | D : 70 | ● |
| | 112 | A : 112 | ● | B : 107 | ● | C : 100 | ● | D : 95 | ● |
| | 160 | A : 160 | ● | B : 155 | ● | C : 150 | ● | D : 140 | ● |
| | 212 | A : 215 | ● | B : 200 | ● | C : 190 | ● | D : 180 | ● |

**8. Minimum Displacement**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | 85 | A : 51 | ● | B : 40 | ● | C : 30 | ● | D : — | — | D : — | — |
| | 112 | A : 68 | ● | B : 50 | ● | C : 40 | ● | D : 30 | ● | E : 22 | ● |
| | 160 | A : 96 | ● | B : 80 | ● | C : 60 | ● | D : 40 | ● | E : 32 | ● |
| | 212 | A : 86 | ● | B : 70 | ● | C : 60 | ● | D : — | — | E : — | — |

**9. Speed Sensor**

| | | 85 | 112 | 160 | 212 |
|---|---|---|---|---|---|
| 1 | w/o Speed Sensor | ● | ● | ● | ● |
| 2 | w/ Speed Sensor (A port side) | ● | ● | ● | ● |
| B | w/ Speed Sensor (B port side) | ● | ● | ● | ● |

○For code [10] [11] please refer to page 11.

**12. Accessories**

| | Flushing Valve | Internal Cooling | Flushing Flow | 85 | 112 | 160 | 212 |
|---|---|---|---|---|---|---|---|
| X | w/o Flushing Valve | w/ Internal Cooling | 1.8 L/min (M7V85/112), 5.0 L/min (M7V160/212) at ΔP(Lower Pressure - Drain Pressure)= 2.5MPa and $\nu$ =10mm²/s | ● | ● | ● | ● |
| 1 | w/o Flushing Valve | w/o Internal Cooling | — | ● | ● | ● | ● |
| 2 | w/ Flushing Valve | w/ Internal Cooling | 1.8 L/min (M7V85/112), 5.0 L/min (M7V160/212) at ΔP(Lower Pressure - Drain Pressure)= 2.5MPa and $\nu$ =10mm²/s | ○ | ○ | ○ | ○ |

**13. Counter Balance Valve**

| | | 85 | 112 | 160 | 212 |
|---|---|---|---|---|---|
| X | w/o Counter Balance Valve | ● | ● | ● | ● |
| 1 | w/ Counter Balance Valve Hoist at CW Rotation (A port inlet) | ○ | ○ | ○ | ○ |
| 2 | w/ Counter Balance Valve Hoist at CCW Rotation (B port inlet) | ○ | ○ | ○ | ○ |

**14. Response Speed of Control**

| | | 85 | 112 | 160 | 212 |
|---|---|---|---|---|---|
| N | Standard | ● | ● | ● | ● |

**15. Design Code**

| | | 85 | 112 | 160 | 212 |
|---|---|---|---|---|---|
| ** | 01~ | ● | ● | ● | ● |

● : Available
○ : Under development
— : Not available

# 1. M7V Ordering Code

Model Code

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M7V | 112 | A | A | 1 | 1 | - | A | A | 1 | T1 | X | X | X | N | - | 01 |

**10. Regulator(See the table on possible combinations of optional valve and regulator options.)**

| | | | | 85 | 112 | 160 | 212 |
|---|---|---|---|---|---|---|---|
| T | T1 | Electric Two Position Displacement Control | Negative Control, 24V | ● | ● | ● | ● |
| | T2 | | Negative Control, 12V | ● | ● | ● | ● |
| Y | Y1 | Hydraulic Two Position Displacement Control | Negative Control | ● | ● | ● | ● |
| | Y2 | | Positive Control | ● | ● | ● | ● |
| E | E1 | Electric Proportional Control | Negative Control, 24V | ● | ● | ● | ● |
| | E2 | | Positive Control, 24V | ● | ● | ● | ● |
| | E3 | | Negative Control, 12V | ● | ● | ● | ● |
| | E4 | | Positive Control, 12V | ● | ● | ● | ● |
| P | P1 | Hydraulic Proportional Control | Negative Control, Pi = 2.5MPa | ● | ● | ● | ● |
| | P2 | | Positive Control, Pi = 2.5MPa | ● | ● | ● | ● |
| | P3 | | Negative Control, Pi = 1.0MPa | ● | ● | ● | ● |
| | P4 | | Positive Control, Pi = 1.0MPa | ● | ● | ● | ● |
| H | H1 | Pressure Related Control | w/o Pressure Increase | ● | ● | ● | ● |
| | H2 | | w/ Pressure Increase | ● | ● | ● | ● |
| | H3 | | w/ Pressure Increase and Hydraulic Remote Control | ● | ● | ● | ● |

**11. Options for Optional Valves (See the table on possible combinations of optional valve and regulator options.)**

| | | | 85 | 112 | 160 | 212 |
|---|---|---|---|---|---|---|
| X | | w/o Any Optional Valve | ● | ● | ● | ● |
| A1 | | Pressure Control Valve | w/ a Pressure Control Valve | ● | ● | ● | ● |
| B | B1 | Electric Two Position Control Valve | w/ Electric Two Position Control Valve, 24V | ● | ● | ● | ● |
| | B2 | | w/ Electric Two Position Control Valve, 12V | ● | ● | ● | ● |
| C | C1 | Hydraulic Two Position Control Valve | w/ Hydraulic Two Position Control Valve, Negative Control | ● | ● | ● | ● |
| | C2 | | w/ Hydraulic Two Position Control Valve, Positive Control | ● | ● | ● | ● |

**★ M7V Control Options**

Note: The control options are common for all motor sizes.

| Regulator : Code [10] | | | | Options for Optional Valves (code [11]) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | w/o Any Optional Valve | w/ a Pressure Control Valve | w/ Electric Two Position Control Valve, 24V | w/ Electric Two Position Control Valve, 12V | w/ Hydraulic Two Position Control Valve, Negative Control | w/ Hydraulic Two Position Control Valve, Positive Control |
| | | | | X | A1 | B1 | B2 | C1 | C2 |
| T | T1 | Electric Two Position Displacement Control | Negative Control, 24V | ● | – | – | – | – | – |
| | T2 | | Negative Control, 12V | ● | – | – | – | – | – |
| Y | Y1 | Hydraulic Two Position Displacement Control | Negative Control | ● | – | – | – | – | – |
| | Y2 | | Positive Control | ● | – | – | – | – | – |
| E | E1 | Electric Proportional Control | Negative Control, 24V | ● | ● | – | – | – | – |
| | E2 | | Positive Control, 24V | ● | ○ | – | – | – | – |
| | E3 | | Negative Control, 12V | ● | ● | – | – | – | – |
| | E4 | | Positive Control, 12V | ● | ○ | – | – | – | – |
| P | P1 | Hydraulic Proportional Control | Negative Control (Pi = 2.5MPa) | ● | ● | – | – | – | – |
| | P2 | | Positive Control (Pi = 2.5MPa) | ● | ○ | – | – | – | – |
| | P3 | | Negative Control (Pi = 1.0MPa) | ● | ● | – | – | – | – |
| | P4 | | Positive Control (Pi = 1.0MPa) | ● | ○ | – | – | – | – |
| H | H1 | Pressure Related Control | w/o Pressure Increase | ● | – | ● | ● | ● | ● |
| | H2 | | w/ Pressure Increase | ● | – | ● | ● | ● | ● |
| | H3 | | w/ Pressure Increase and Hydraulic Remote Control | ● | – | ● | ● | ● | ● |

(Note)
For combination of two position control and pressure cut-off control, please select the pressure related control (code H) with two position control as option valve.

● : Available
○ : Under development
— : Not available

# 2 Technical Information

## 2-1 Specifications

### M7V series

| Size | | 85 | 112 | 160 | 212 |
|---|---|---|---|---|---|
| Min. Displacement : $q_{min}$ | $cm^3$ ($in^3$) | 0 to 68 (0 to 4.2) | 0 to 90 (0 to 5.5) | 0 to 128 (0 to 7.9) | 0 to 170 (0 to 10.5) |
| Max. Displacement : $q_{max}$ | $cm^3$ ($in^3$) | 68 to 88.5 (4.2 to 5.2) | 90 to 112 (5.5 to 6.9) | 128 to 160 (7.9 to 9.8) | 170 to 215 (10.5 to 13.1) |
| Max. Speed : $N_{nom}$ / $N_{max}$ *1 | $min^{-1}$ (rpm) | 3,900 / 6,150 | 3,550 / 5,600 | 3,100 / 4,900 | 2,900 / 4,600 |
| Nominal pressure : $P_{nom}$ *2 | MPa (psi) | 42 (6,090) | | | |
| Max. Pressure : $P_{max}$ | MPa (psi) | 50 (7,250) | | | |
| Theoretical output torque | Nm (lbf ft) | 592 (437) | 749 (552) | 1,070 (789) | 1,437 (1,060) |
| Power | kW (hp) | 242 (325) | 278 (373) | 347 (465) | 436 (585) |
| Max. Flow : Q | L/min (gallon/min) | 345 (91) | 398 (105) | 496 (131) | 623 (165) |
| Moment of inertia | $kg \cdot m^2$ | 0.011 | 0.017 | 0.030 | 0.054 |
| Volume in the case | L (gallon) | 0.8 (0.21) | 1.0 (0.26) | 1.5 (0.40) | 2.0 (0.53) |
| Mass | kg (lb) | 39 (86) | 46 (101) | 65 (143) | 90 (198) |
| Temperature | ℃ (°F) | −20 to +115 (−4 to +239) at drain port<br>−20 to +90 (−4 to +194) at inlet port | | | |
| Coating | | Red synthetic resin primer | | | |

Values shown in the table above are theoretical values.

*1 : $N_{nom}$ : Max. speed at $q_{max}$.
$N_{max}$ : Max. speed at $q < 0.6q_{max}$.(M7V212 : Max speed at $q < 0.4q_{max}$.)
(In case that 1 is selected at ordering code [12] , $N_{max}$ goes down up to $N_{nom}$ regardless of displacement of the motor.)

*2 : Nominal pressure corresponds to the design pressure to provide proper performance, function, and service life.

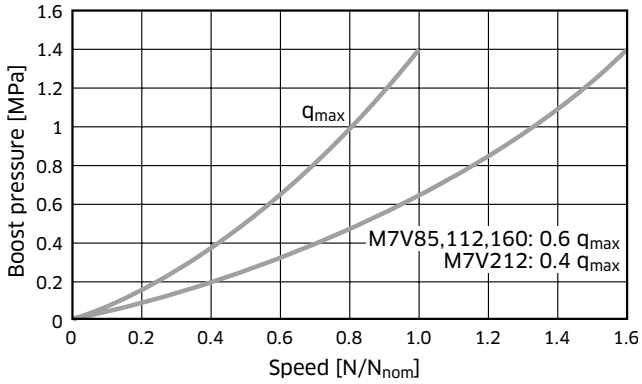
# 2-2 Precautions for System Design

## M7V series

### Minimum Boost Pressure

To prevent cavitation when the motor is operating in a pumping mode, a positive pressure is required at the suction port.
The figure on the right shows the minimum boost pressure requirement based on the regular operation. In case of a rapid change of the flow volume, more boost pressure must be applied.

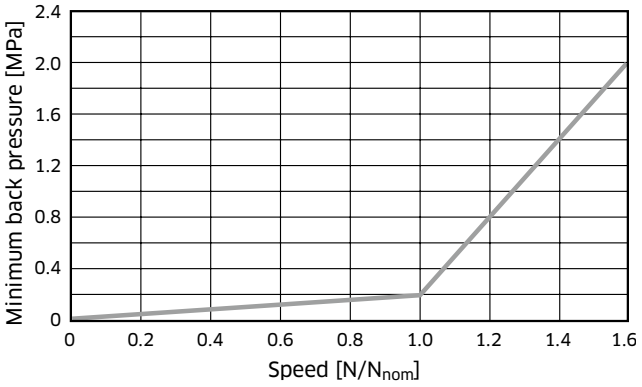
**Minimum boost pressure**




### Minimum Back Pressure

To ensure the optimal performance and life time the back pressure is required at the lower pressure port.
Motor casing pressure must be ≦ 0.2 MPa.

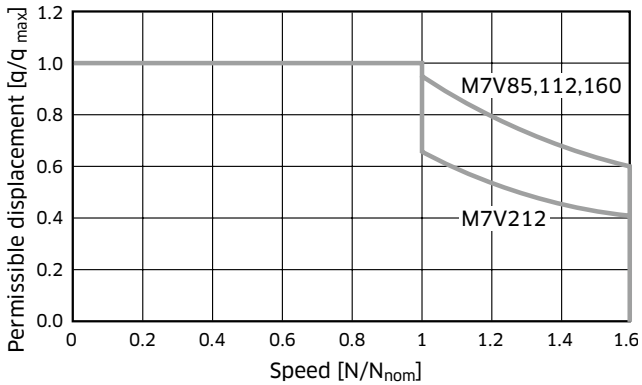
**Minimum back pressure**




### Permissible Displacement, Speed Related

The figure on the right shows permissible displacement in relation to the motor operating speed. Design the system not to exceed this requirement.

**Permissible displacement**




### Beginning of Control for Winch Device

For the safety reasons, winch devise are not permissible with beginning control at $q_{min}$.

# 2-3 Speed Sensor

## Ordering Code [9] : 1, 2, B

### ◆ 1 : w/o Speed Sensor

●A speed sensor is not installed.

### ◆ 2 : w/ Speed Sensor (A port side)

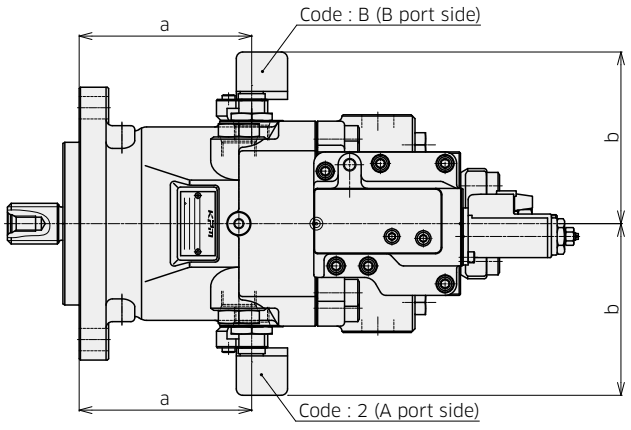
●A speed sensor that detects the motor speed and direction is installed at A port side.

### ◆ B : w/ Speed Sensor (B port side)

●A speed sensor that detects the motor speed and direction is installed at B port side.

#### Specification

Supply Voltage : 4.5V ~ 26V DC
Mating Connector : TE Connectivity AMP Superseal 1.5 series, 4 positions(part number : 282088)
IP Protection Rating : IP69K



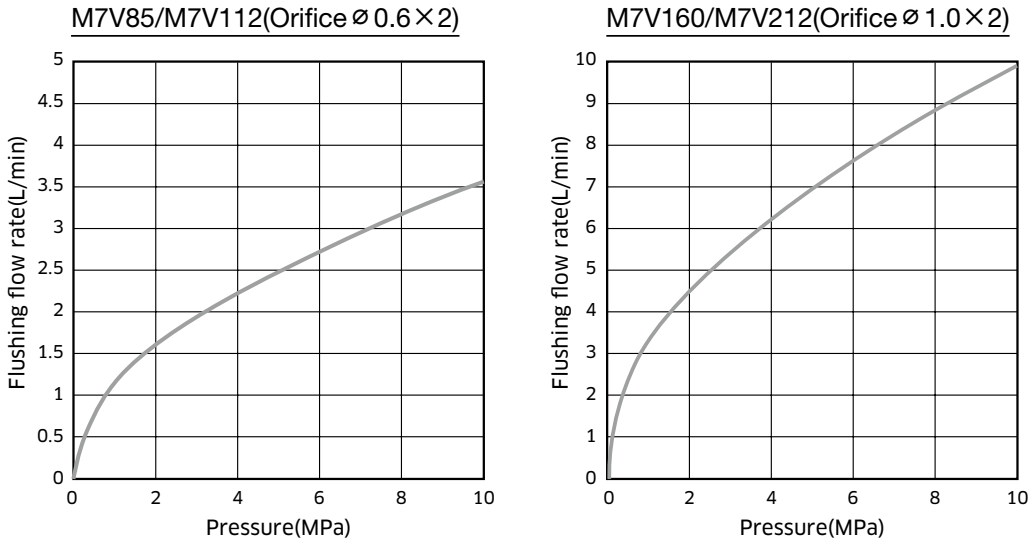

| | | | M7V85 | M7V112 | M7V160 | M7V212 |
|---|---|---|---|---|---|---|
| a [mm] | Code [4] | A, B | 134.5 | 144 | 158.5 | 175 |
| | | C, D | 110.5 | 112 | 126.5 | 143 |
| | | E, F | 151.5 | – | – | – |
| b [mm] | | | 134 | 139 | 147 | 155.5 |
| Pulse Frequency [pulse/rev] | | | 71 | 77 | 87 | 97 |

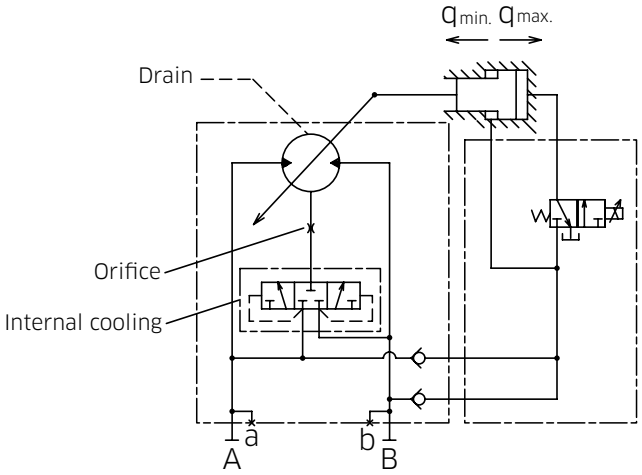
# 2-4 Accessory

## Ordering Code [12] : X, 1, 2

### ◆ X : w/o Flushing Valve, w/ Internal Cooling

- $N_{max}$ of motor spec is based on this configuration.
- A part of the hydraulic oil on the lower pressure is supplied to the inside of the motor casing to cool the rotary.
- When the motor is used in a series circuit, the internal cooling affects the performance of the second motor. Please contact Kawasaki to discuss in more detail. The graph below shows the relationship between lower pressure and the flushing flow.

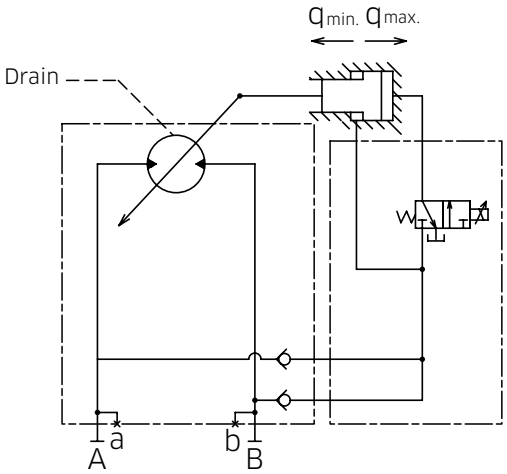


# 2. Technical Information

## 1 : w/o Flushing Valve, w/o Internal Cooling

- The flushing flow into the motor case is blocked.
- $N_{max}$ goes down up to $N_{nom}$ regardless of displacement of the motor.
- When the motor is used above $N_{nom}$ without internal cooling, excessive heat could be generated resulting in damage to the motor. Please contact Kawasaki to discuss in more detail.




## 2 : w/ Flushing Valve, w/ Internal Cooling(Under development)

- The function is chosen in case that the circuit needs additional cooling or minimum boost pressure needs to be ensured.

# 3 Regulators

## 3-1 Two Position Displacement Control

### Function

Two types of two position displacement control, the electric control type and hydraulic pilot control type, are available.

Two position control can switch the displacement between maximum and minimum displacement by applying the input current to the solenoid in case of the electric control or the pilot pressure externally supplied to the regulator.

### Control Options for Two Position Displacement Control

#### ● Pressure control

An M7V motor with two position displacement control can additionally have pressure control function. Refer to page 29 for details.

If the motor is equipped with both two position displacement control and pressure control, pressure control overrides proportional displacement control.

Under pressure control the motor maintains minimum displacement until the operating pressure reaches the pressure setpoint. Upon reaching the pressure setpoint the motor increases displacement to maximum to obtain the required output torque, while controlling the operating pressure. If the motor reaches maximum displacement without sufficient output torque, the motor increases pressure until the required output torque is attained.

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

## 3. Regulators

# 3-1 Two Position Displacement Control – Electric Control

## Ordering Code [10] [11] : T1X and T2X

### Function

Motor displacement is controlled between minimum and maximum by energizing the solenoid.

Control pressure is internally supplied by the port with the highest pressure.

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

**[Note]**

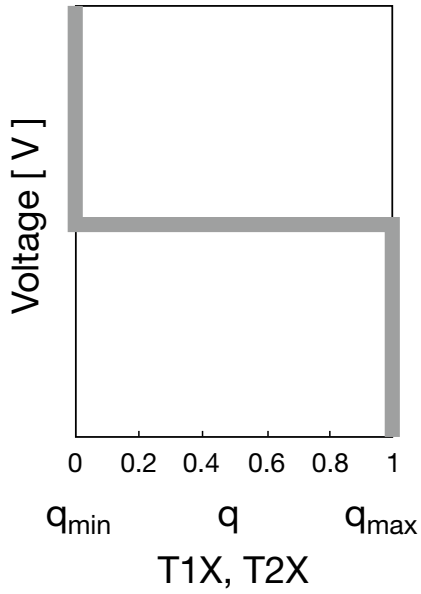
**Required minimum operating pressure for control : 2.0MPa**

| Control type | T1X, T2X | |
|---|---|---|
| Electric signal | OFF | ON |
| Displacement | Max. | Min. |
| Speed | Min. | Max. |

### Solenoid Specifications

| Code | T1X | T2X |
|---|---|---|
| Voltage | DC24V | DC12V |
| Resistance (20℃) | 41.5 Ω | 9.4 Ω |
| Rated electric power consumption (20℃) | ≦ 17 W | |
| Connector type | Tyco Electronics Japan DT04-2P | |

### Control Characteristics

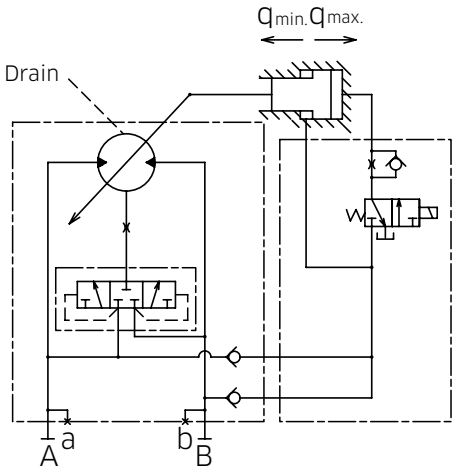



T1X, T2X

The control characteristics in the above is not adjustable.

The above data are independent of the motor size.

### Hydraulic Circuit




T1X, T2X

# 3-1 Two Position Displacement Control - Hydraulic Control

## Ordering Code[10][11] : Y1X, Y2X

### Function

Motor displacement is controlled between minimum and maximum by pilot pressure externally supplied.

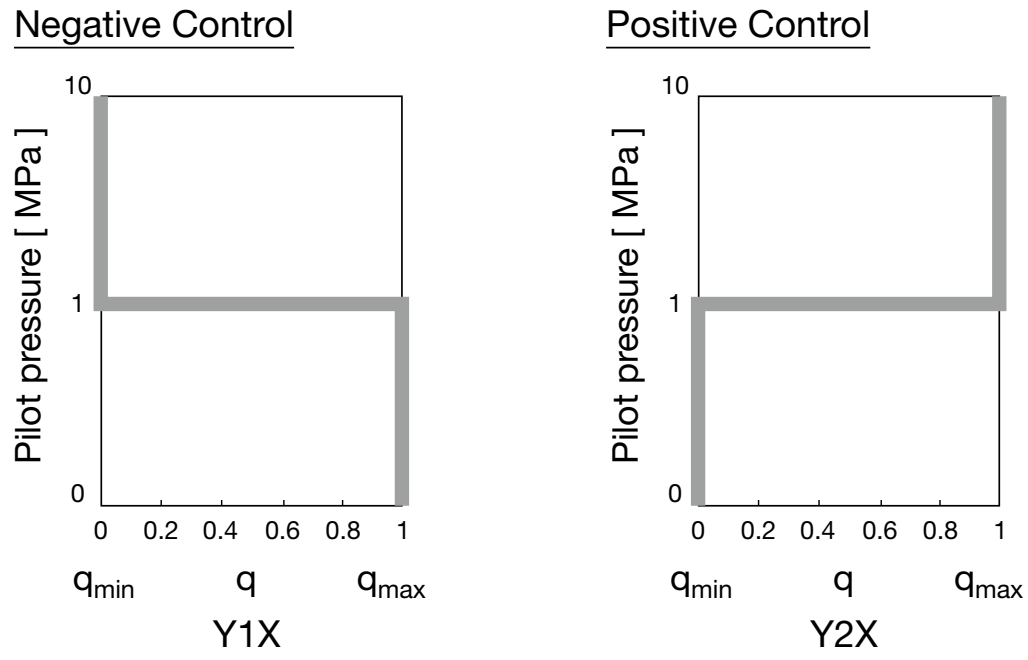
Control pressure is internally supplied by the port with the highest pressure.

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

**[Note]**
**Required minimum operating pressure for control: 2.0 MPa**
**Max. permissible pilot pressure : 10.0 MPa**

| Control type | Y1X | | Y2X | |
|---|---|---|---|---|
| Pilot pressure | OFF | ON (>1.0 MPa) | OFF | ON (>1.0 MPa) |
| Displacement | Max. | Min. | Min. | Max. |
| Speed | Min. | Max. | Max. | Min. |

### Control Characteristics



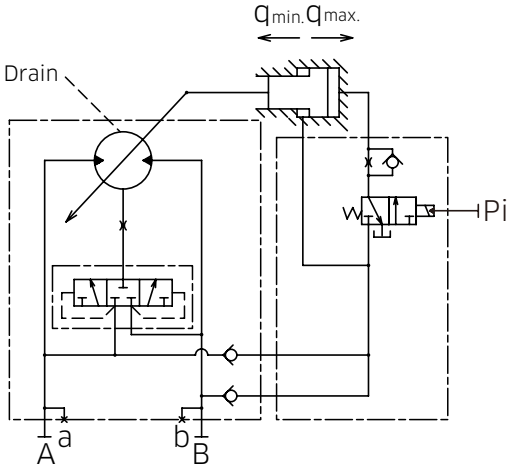

The control characteristics in the above is not adjustable.
The above data are independent of the motor size.

# 3-1 Two Position Displacement Control - Hydraulic Control

## Ordering Code[10][11] : Y1X, Y2X

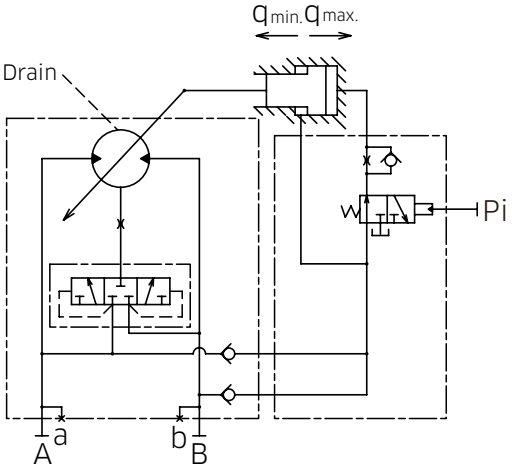
### Hydraulic Circuit

Negative Control




Y1X

Positive Control




Y2X

# 3-2 Proportional Displacement Control

## Function

There are two kinds of control methods in the proportional displacement control, namely electric proportional control and hydraulic proportional control. Proportional displacement control regulates motor displacement in proportion to either the input current of solenoid or external pilot pressure .

**[Note]**
**As stated in page 6, casing pressure has influence on proportional displacement control both electric and hydraulic. An increase in casing pressure induces an increase in control pressure at the beginning of control, and hence parallel shift of control characteristics.**

## Control Options for Proportional Displacement Control

### ● Pressure control

An M7V motor equipped with proportional control (either electric or hydraulic) can have pressure control function by using an optional valve (see page 11).

If the motor has both proportional control (either electric or hydraulic) and pressure control, pressure control overrides proportional displacement control.

Under pressure control the motor maintains minimum displacement until the operating pressure reaches the pressure setpoint. Upon reaching the pressure setpoint the motor increases displacement to maximum to obtain the required output torque, while controlling the operating pressure. If the motor reaches maximum displacement without sufficient output torque, the motor increases pressure until the required output torque is attained.

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

# 3-2 Proportional Displacement Control – Electric Proportional Control

## Ordering Code [10] [11] : E1X, E2X, E3X and E4X.

### Function

Displacement is steplessly controlled between two preset values, from maximum to minimum and vice versa, in proportion to the input current of solenoid.

Electric proportional control delivers negative or positive displacement controls which are proportional to the input current: negative control type E1X and E3X reduce displacement from maximum to minimum against an increase in the input current, while positive control type E2X and E4X increase displacement from minimum to maximum with an increase in the input current.

Control pressure is internally supplied by the port with the highest pressure.

### Solenoid Specifications

| Control type | E1*, E2* | E3*, E4* |
|---|---|---|
| Voltage | DC24V | DC12V |
| Rated current (20℃) | 0.7 A | 1.6 A |
| Resistance (20℃) | 15.0 Ω | 3.3 Ω |
| Rated power consumption (20℃) | ≦ 17 W | |
| Connector type | Tyco Electronics Japan DT04-2P | |
| Recommended dither condition | 100 Hz, 200 mAp-p | 150 Hz, 600 mAp-p |

"∗" = "X" (without any optional valve)
"A" (with a pressure control valve)

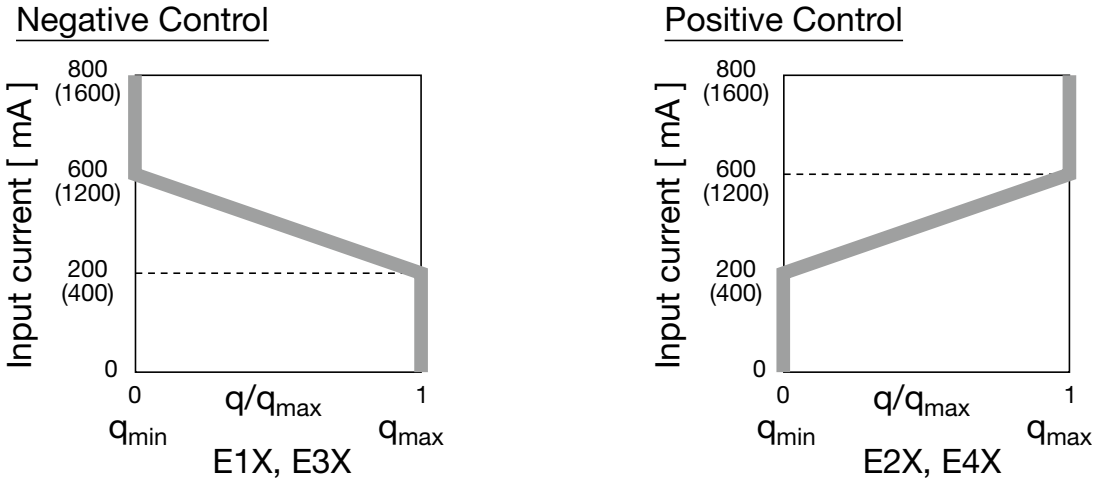
**[Note]**
**Required minimum operating pressure for control: 2.0 MPa.**

The above data are independent of the motor size.

# 3-2 Proportional Displacement Control – Electric Proportional Control

## Ordering Code [10] [11] : E1X, E2X, E3X and E4X.

### Control Characteristics

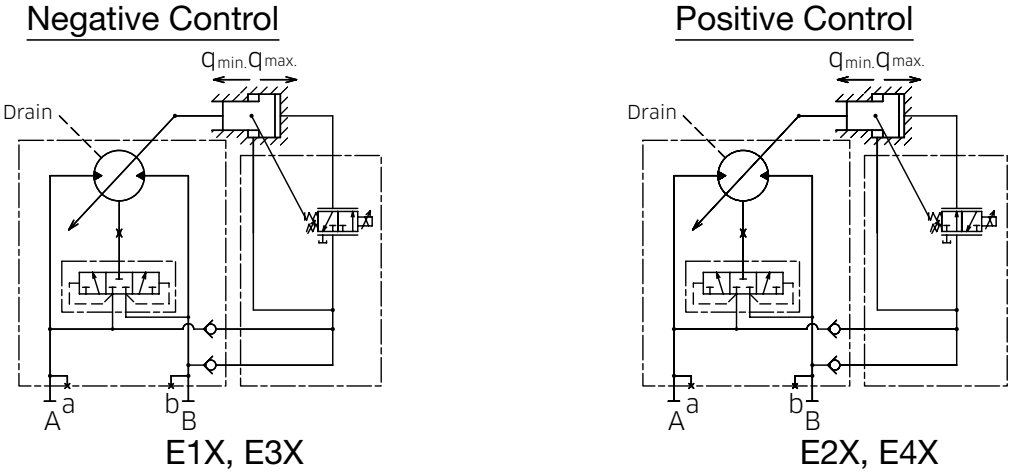



| Control type | | E1X, E3X (Negative control) | | E2X, E4X (Positive control) | |
|---|---|---|---|---|---|
| Input current | DC 24V (DC 12V) | 200mA (400mA) | 600mA (1200mA) | 200mA (400mA) | 600mA (1200mA) |
| Displacement | | Max. | Min. | Min. | Max. |
| Speed | | Min. | Max. | Max. | Min. |

Input current in ( ) is for the voltage of 12 V DC.

The control characteristics of E1X, E2X, E3X and E4X are not adjustable.These control points value are in case that the solenoid is mounted horizontal. In case that the solenoid is mounted vertical downward, the control point shifts -35mA (-70mA). In case that the solenoid is mounted vertical upward, the control point shifts +35mA (+70mA).

### Hydraulic Circuit



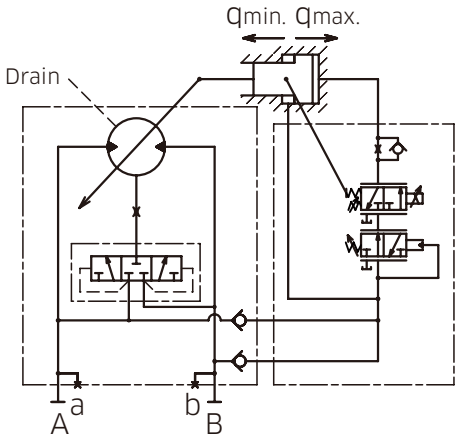

The above data are independent of the motor size.

# 3-2 Proportional Displacement Control – Electric Proportional Control with Pressure Control Valve

## Ordering Code [10] [11] : E1A1, E2A1, E3A1 and E4A1.

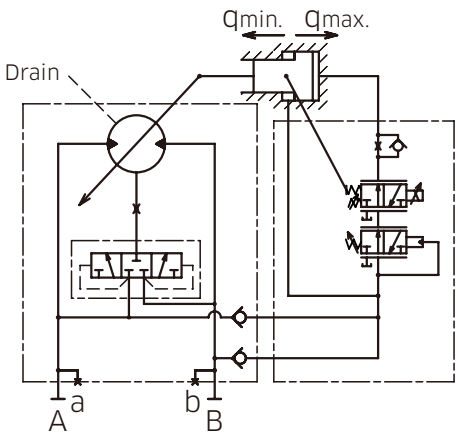
### Hydraulic Circuit

Negative Control with Pressure Control Valve




E1A1, E3A1

Positive Control with Pressure Control Valve




E2A1, E4A1

Electric proportional control can be combined with pressure control by using an optional valve. If the motor is equipped with electric proportional control and pressure control, pressure control overrides electric proportional control.

Under pressure control the motor maintains minimum displacement until the operating pressure reaches the pressure setpoint. Upon reaching the pressure setpoint the motor increases displacement to maximum to obtain the required output torque, while controlling the operating pressure. If the motor reaches maximum displacement without sufficient output torque, the motor increases pressure until the required output torque is attained.

Adjustable setting range of the pressure valve: 8~35 MPa

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

# 3-2 Proportional Displacement Control – Hydraulic Proportional Control

## Ordering Code [10] [11] : P1X, P2X, P3X and P4X.

### Function

Hydraulic proportional control regulates motor displacement between maximum to minimum in response to pilot pressure externally supplied to a regulator.

This control delivers negative or positive displacement controls which are proportional to an increase in external pilot pressure: negative control type P1X and P3X reduce displacement from maximum to minimum against an increase in pilot pressure, while positive control type P2X and P4X increase displacement from minimum to maximum with an increase in pilot pressure.

Control pressure is internally supplied by the port with the highest pressure.

**[Note]**
**Required minimum operating pressure for control: 2.0 MPa**
**Max. permissible pilot pressure : 10.0 MPa**

| Control type | P1X | | P2X | | P3X | | P4X | |
|---|---|---|---|---|---|---|---|---|
| Pilot pressure | 1.0 MPa* | 3.5 MPa | 1.0 MPa* | 3.5 MPa | 0.5 MPa* | 1.5 MPa | 0.5 MPa* | 1.5 MPa |
| Displacement | Max. | Min. | Min. | Max. | Max. | Min. | Min. | Max. |
| Speed | Min. | Max. | Max. | Min. | Min. | Max. | Max. | Min. |

The pressure with * in the above table is the standard start pressure at the beginning of each control. Adjustable range of pilot pressure at the beginning of control is shown in each control characteristics.

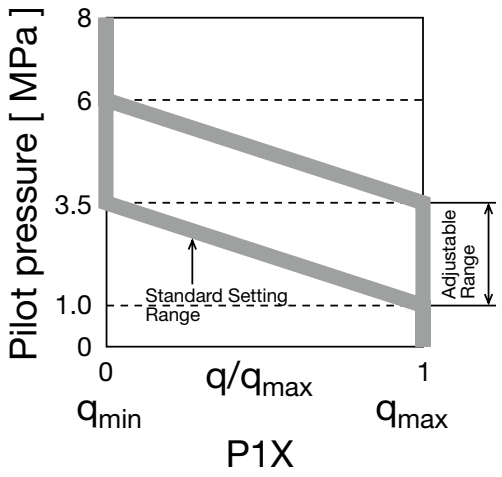
The above data are independent of the motor size.

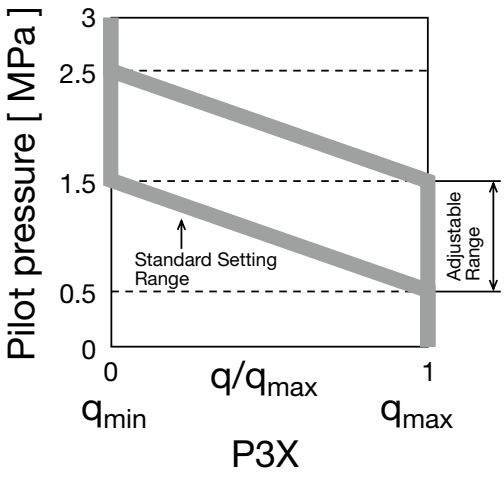
# 3-2 Proportional Displacement Control – Hydraulic Proportional Control

## Ordering Code [10] [11] : P1X, P2X, P3X and P4X.

### Control Characteristics

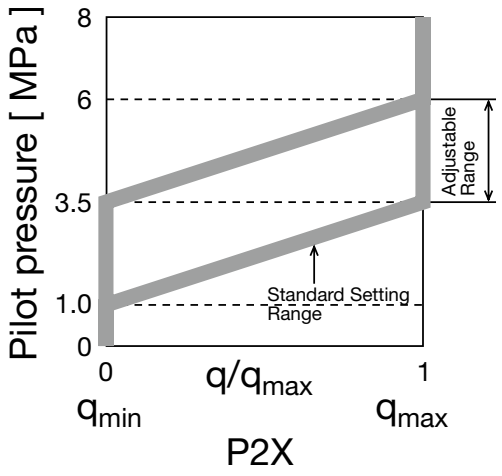
Negative Control

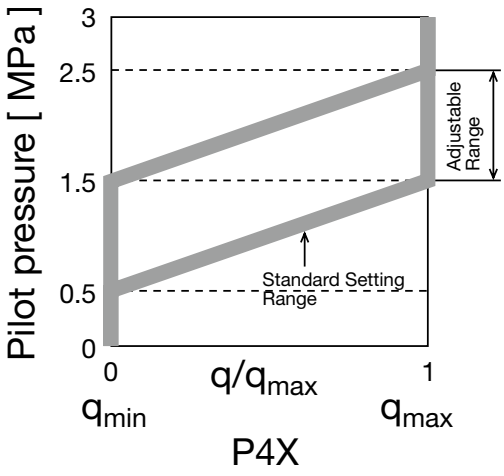



P1X is different from P3X in adjustable range and the control start pressure. Adjustable range of P1X is 2.5 MPa, while that of P3X is 1.0 MPa. Also, the control start pressure of P1X is 1.0 MPa, while that of P3X is 0.5 MPa.

Positive Control




P2X is different from P4X in adjustable range and the control start pressure. Adjustable range of P2X is 2.5 MPa, while that of P4X is 1.0 MPa.
Also, the control start pressure of P2X is 1.0 MPa , while that of P4X is 0.5 MPa.

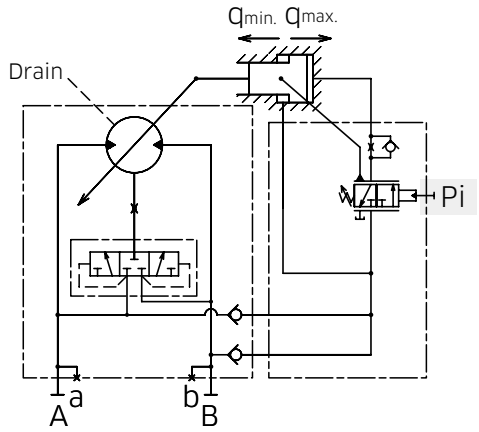
**[Note]**
**The above are the standard control characteristics of hydraulic proportional control. If non-standard characteristics is required, please contact Kawasaki.**

# 3-2 Proportional Displacement Control – Hydraulic Proportional Control

## Ordering Code [10] [11] : P1X, P2X, P3X and P4X.

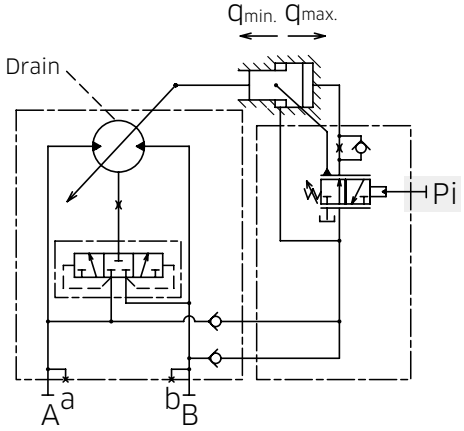
### Hydraulic Circuit

Negative Control




P1X, P3X

Positive Control




P2X, P4X

External pilot pressure is supplied via port Pi.

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.
The above data are independent of the motor size.

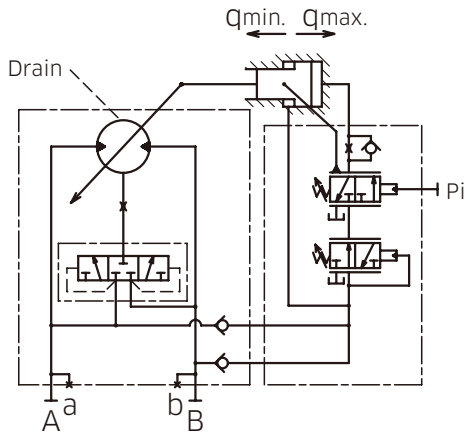
Allowable maximum pilot pressure (Pi): 10 MPa

# 3-2 Proportional Displacement Control – Hydraulic Proportional Control with Pressure Control Valve

## Ordering Code [10] [11] : P1A1, P2A1, P3A1 and P4A1.

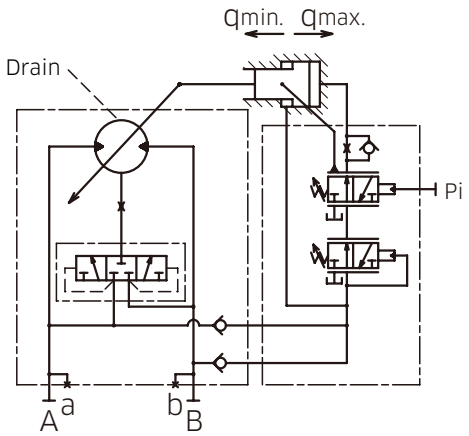
### Hydraulic Circuit

Negative Control with Pressure Control Valve




P1A1, P3A1

Positive Control with Pressure Control Valve




P2A1, P4A1

Hydraulic proportional control can be combined with pressure control by using an optional valve in an M7V motor. If it is equipped with both hydraulic proportional control and pressure control, the latter overrides the former.

Displacement shifts from minimum to maximum, when the operating pressure reaches the pressure setpoint. The motor increases displacement by gradually increasing the operating pressure until the required output torque is attained. If displacement reaches its maximum value without sufficient output torque, the operating pressure will rise until the required output torque is obtained.

Setting range of the pressure control valve: 8 to 35 MPa

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.
The above data are independent of the motor size.

# 3-3 Pressure Related Control

## Function

There are three kinds of control types in the pressure related control, that is constant pressure control (pressure control without pressure increase), pressure control with pressure increase, and pressure control with pressure increase and hydraulic remote control.

Displacement is controlled between minimum and maximum in line with the operating pressure.

Minimum displacement is maintained until the operating pressure reaches the pressure setpoint, and upon reaching the pressure setpoint of control it shifts to maximum displacement by controlling the operating pressure until the required output torque is obtained.

**[Note]**
**As stated in page 6, casing pressure affects the pressure related control. An increase in casing pressure induces an increase in control pressure at the beginning of control, and thus the parallel shift of the control characteristics.**

## Control Options for Constant Pressure Control

### ● Two position displacement control

An M7V motor with constant pressure control can add two position control by adopting an optional two position control valve (see page 11).

When an M7V motor is equipped with both constant pressure control and two position displacement control, constant pressure control overrides two position displacement control.

For detail of two position displacement control see page 18.

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

# 3-3 Pressure Related Control – Without Pressure Increase

## Ordering Code [10] [11] : H1X

### Function

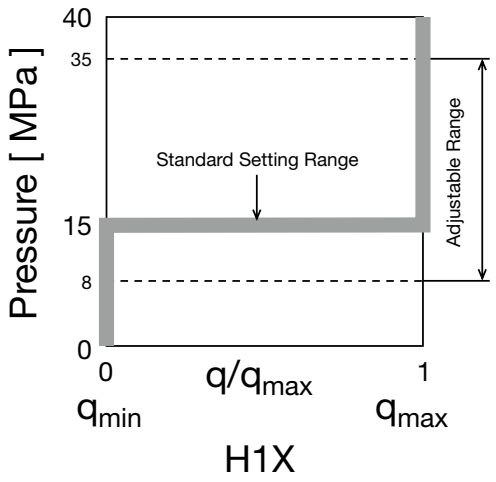
Displacement is controlled between minimum and maximum in line with the operating pressure. Minimum displacement is maintained until the operating pressure reaches a setpoint, and upon reaching the pressure setpoint it shifts to maximum displacement until the required output torque is obtained, while maintaining the set pressure.

Control pressure is internally supplied by the port with the highest pressure.

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

| Control type | H1X | |
|---|---|---|
| Displacement | Min. | Max. |
| Speed | Max. | Min. |
| Adjustable range for the control start pressure | 8 to 35 MPa | |

### Control Characteristics

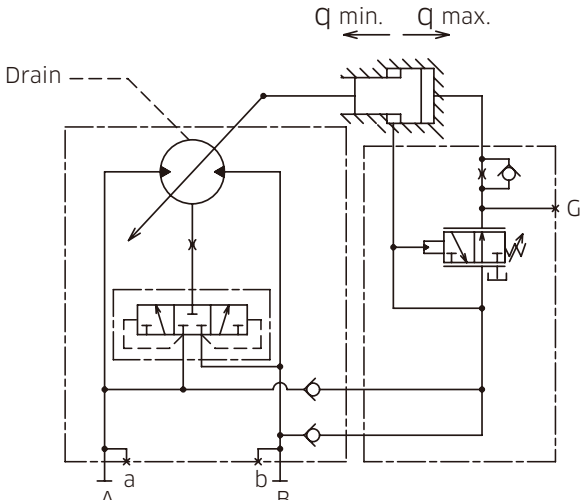



H1X

Control pressure in H1X is factory set at 15 MPa, and the above shows the standard control characteristics.
If non-standard characteristics is required, please contact Kawasaki.

The above data are independent of the motor size.

### Hydraulic Circuit

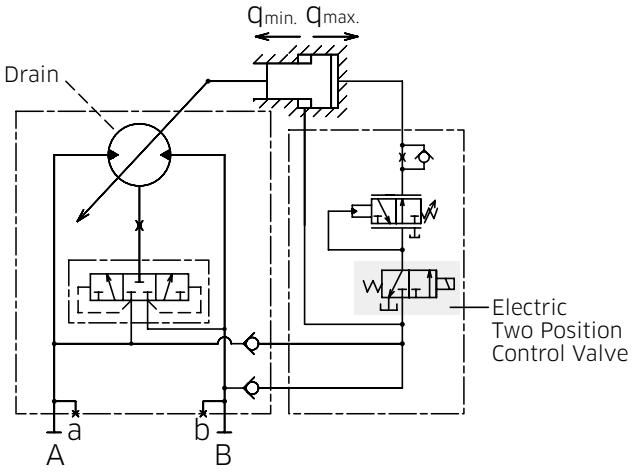



H1X

# 3-3 Pressure Related Control – Without Pressure Increase with Two Position Control Valve

## Ordering Code [10] [11] : H1B1 and H1B2

### Hydraulic Circuit




H1B1, H1B2

Pressure related control (pressure control without pressure increase) can be combined with electric two position displacement control by using an electric two position control valve. If the motor has both pressure related control and electric two position displacement control, pressure related control overrides electric two position displacement control.
Specifications of electric two position control valve is shown below.

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

### Solenoid Specifications

| Code | B1 | B2 |
|---|---|---|
| Voltage | DC24V | DC12V |
| Resistance (20℃) | 41.5 Ω | 9.5 Ω |
| Rated power consumption (20℃) | ≦ 17 W | |
| Connector type | Tyco Electronics Japan DT04-2P | |

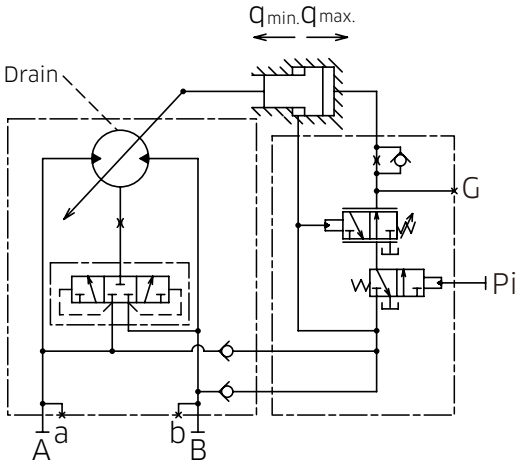
The above data are independent of the motor size.

# 3-3 Pressure Related Control – Without Pressure Increase with Hydraulic Two Position Control Valve

## Ordering Code [10] [11] : H1C1, H1C2

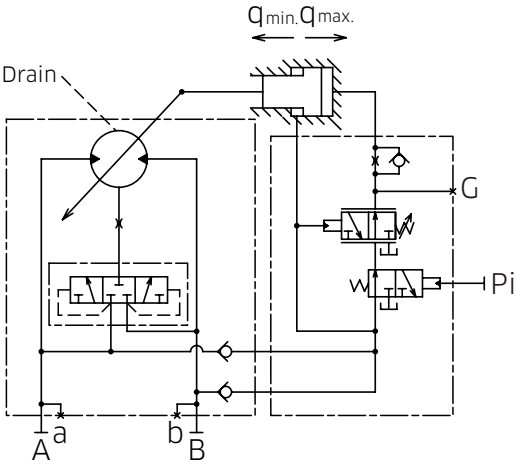
### Hydraulic Circuit

Pressure Control with Negative Two Position Control




H1C1

Pressure Control with Positive Two Position Control




H1C2

Pressure related control (pressure control without pressure increase) can be combined with hydraulic two position displacement control by using an hydraulic two position control valve. If the motor has both pressure related control and hydraulic two position displacement control, pressure related control overrides hydraulic two position displacement control.
For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

# 3-3 Pressure Related Control – With Pressure Increase

## Ordering Code [10] [11] : H2X

### Function

Displacement is controlled in line with operating pressure and load conditions.

The motor maintains minimum displacement until the operating pressure reaches a setpoint, and when it exceeds the pressure setpoint it shifts to maximum displacement.

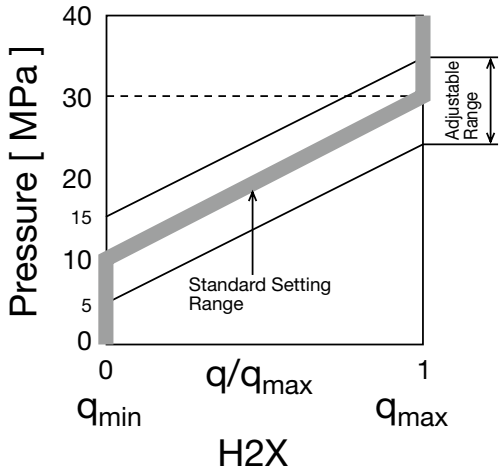
Displacement increases until the required output torque is obtained. If displacement reaches maximum without sufficient output torque, the operating pressure will rise until the required motor output torque is attained.

Control pressure is internally supplied by the port with the highest pressure.

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

| Control type | H2X | |
|---|---|---|
| Displacement | Min. | Max. |
| Speed | Max. | Min. |
| Factory setting of the control start pressure | 10 MPa | |
| Pressure increment | 20 MPa | |

### Control Characteristics

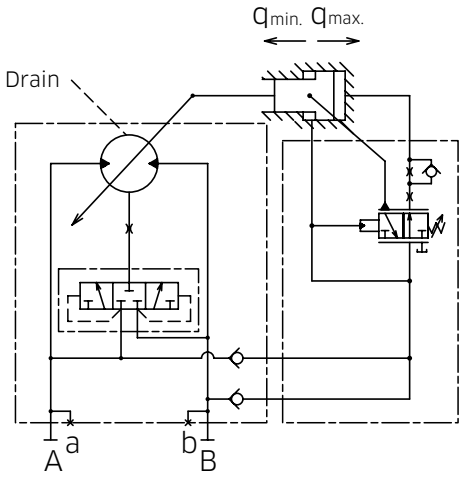



H2X

In H2 control the start of control pressure is factory set at 10 MPa, and the above shows the standard control characteristics.
If non-standard characteristics is required, please contact Kawasaki.

The above data are independent of the motor size.

### Hydraulic Circuit

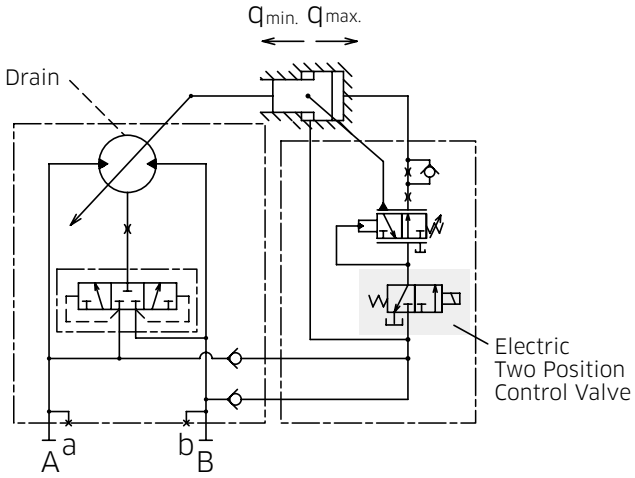



H2X

# 3-3 Pressure Related Control – With Pressure Increase and Two Position Control Valve

## Ordering Code [10] [11] : H2B1 and H2B2

### Hydraulic Circuit




H2B1, H2B2

Pressure related control (Pressure control with pressure increase) can be combined with electric two position displacement control by using an optional two position control valve. If the motor has both pressure related control and electric two position displacement control, pressure related control overrides electric two position displacement control.

Specifications of electric two position control valve is shown below.

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

### Solenoid Specifications

| Code | B1 | B2 |
|---|---|---|
| Voltage | DC24V | DC12V |
| Resistance (20℃) | 41.5 Ω | 9.5 Ω |
| Rated power consumption (20℃) | ≦ 17 W | |
| Connector type | Tyco Electronics Japan DT04-2P | |

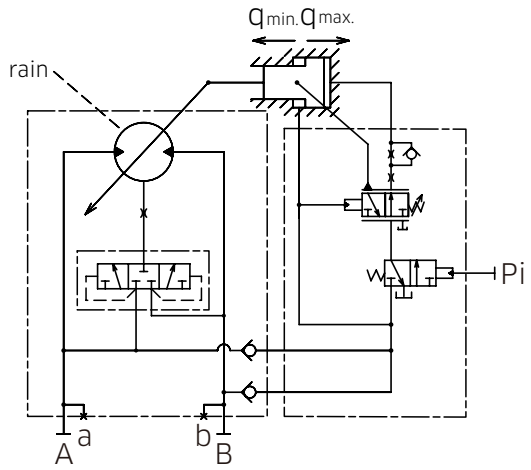
The above data are independent of the motor size.

# 3-3 Pressure Related Control – With Pressure Increase and Hydraulic Two Position Control Valve

## Ordering Code [10] [11] : H2C1, H2C2

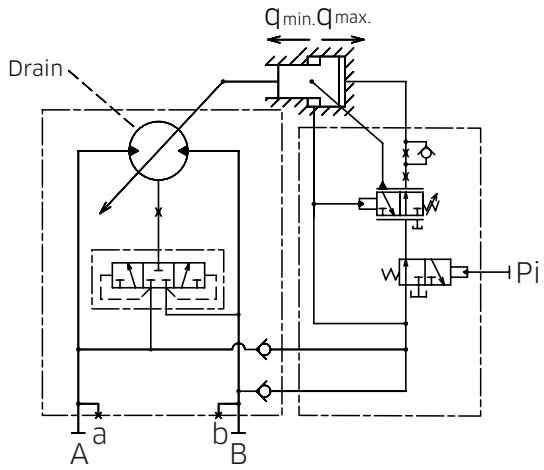
### Hydraulic Circuit

Pressure Control with Negative Two Position Control




H2C1

Pressure Control with Positive Two Position Control




H2C2

Pressure related control (pressure control with pressure increase) can be combined with hydraulic two position displacement control by using an hydraulic two position control valve. If the motor has both pressure related control and hydraulic two position displacement control, pressure related control overrides hydraulic two position displacement control.
For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

# 3-3 Pressure Related Control – With Pressure Increase and Hydraulic Remote Control

## Ordering Code [10] [11] : H3X

### Function

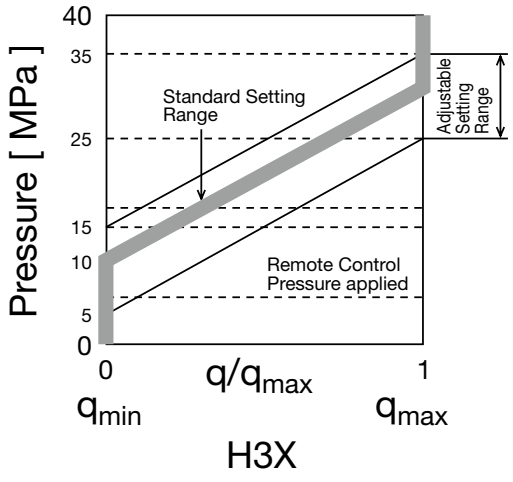
H3X control allows variations at the start of control pressure and control characteristics by applying the external remote control pressure. The application of external remote control pressure in H3X control reduces the control pressure at the beginning of the constant pressure control, and induces a parallel shift in the control characteristics.

Control pressure is internally supplied by the port with the highest pressure.

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

| Control type | H3X |
|---|---|
| Standard setting of the control start pressure | 10 MPa |
| External remote control sensitivity at port Pi | 1.7 MPa / 0.1 MPa |
| Max. permissible remote control pressure | ≦10 MPa |

### Control Characteristics



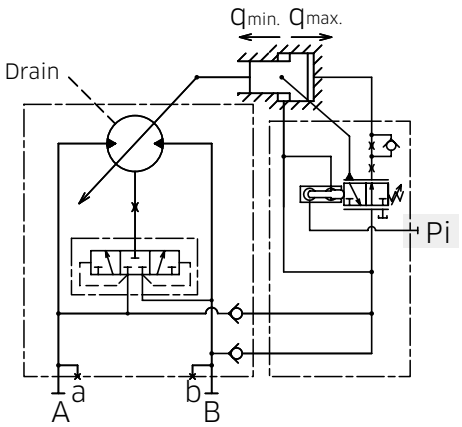

H3X

The remote pressure control in H3 type control provides variations in the control characteristics of H3 pressure related control.

For 0.1 MPa of remote control pressure the pressure at the start of control reduces by 1.7 MPa. With the remote pressure control the control characteristics shifts in parallel.

The above data are independent of the motor size.

### Hydraulic Circuit




H3X

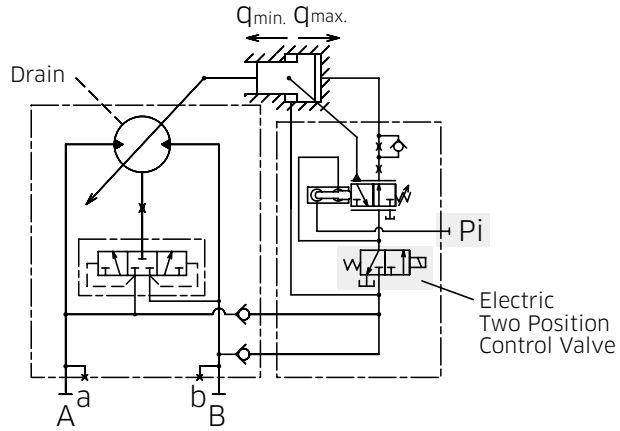
External remote control pressure is supplied via port Pi.

(Note)
In case Pi port is not used please connect the port Pi to drain line.
Allowable maximum pilot pressure (Pi): 10 MPa

# 3-3 Pressure Related Control
## – With Pressure Increase and Hydraulic Remote Control, and Two Position Control Valve

## Ordering Code [10] [11] : H3B1 and H3B2

### Hydraulic Circuit




H3B1, H3B2

Pressure related control (Pressure control with pressure increase and hydraulic remote control) can be combined with electric two position displacement control by using an optional two position control valve. If the motor has both pressure related control and electric two position displacement control, pressure related control overrides electric two position displacement control.

Specifications of electric two position control valve is shown below.

For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

### Solenoid Specifications

| Code | B1 | B2 |
|---|---|---|
| Voltage | DC24V | DC12V |
| Resistance (20℃) | 41.5 Ω | 9.5 Ω |
| Rated power consumption (20℃) | ≦ 17 W | |
| Connector type | Tyco Electronics Japan DT04-2P | |

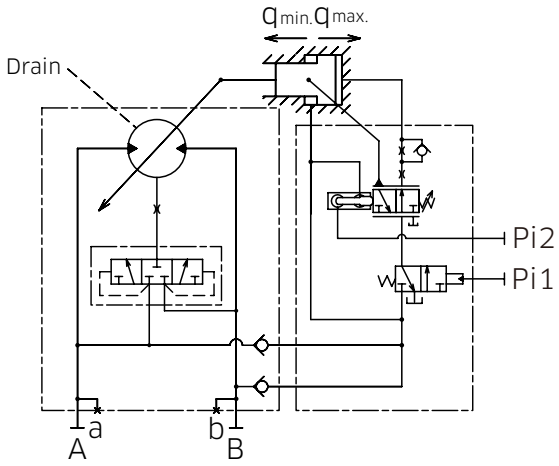
The above data are independent of the motor size.

# 3-3 Pressure Related Control – With Pressure Increase and Hydraulic Remote Control, and Hydraulic Two Position Control Valve

## Ordering Code [10] [11] : H3C1, H3C2

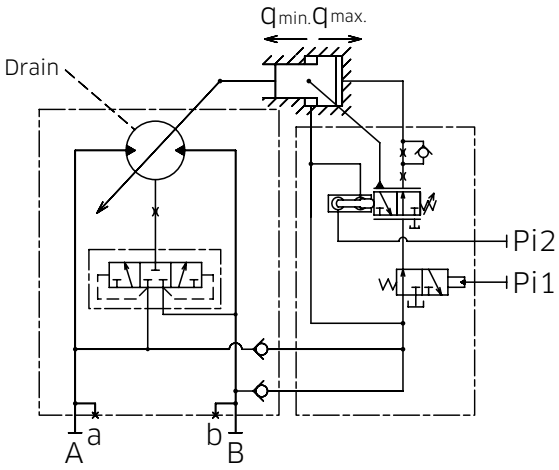
### Hydraulic Circuit

Pressure Control with Negative Two Position Control




H3C1

Pressure Control with Positive Two Position Control




H3C2

Pressure related control (pressure control with pressure increase and hydraulic remote control) can be combined with hydraulic two position displacement control by using an hydraulic two position control valve. If the motor has both pressure related control and hydraulic two position displacement control, pressure related control overrides hydraulic two position displacement control.
For safety reasons, winch devices are not permissible with beginning control at $q_{min}$.

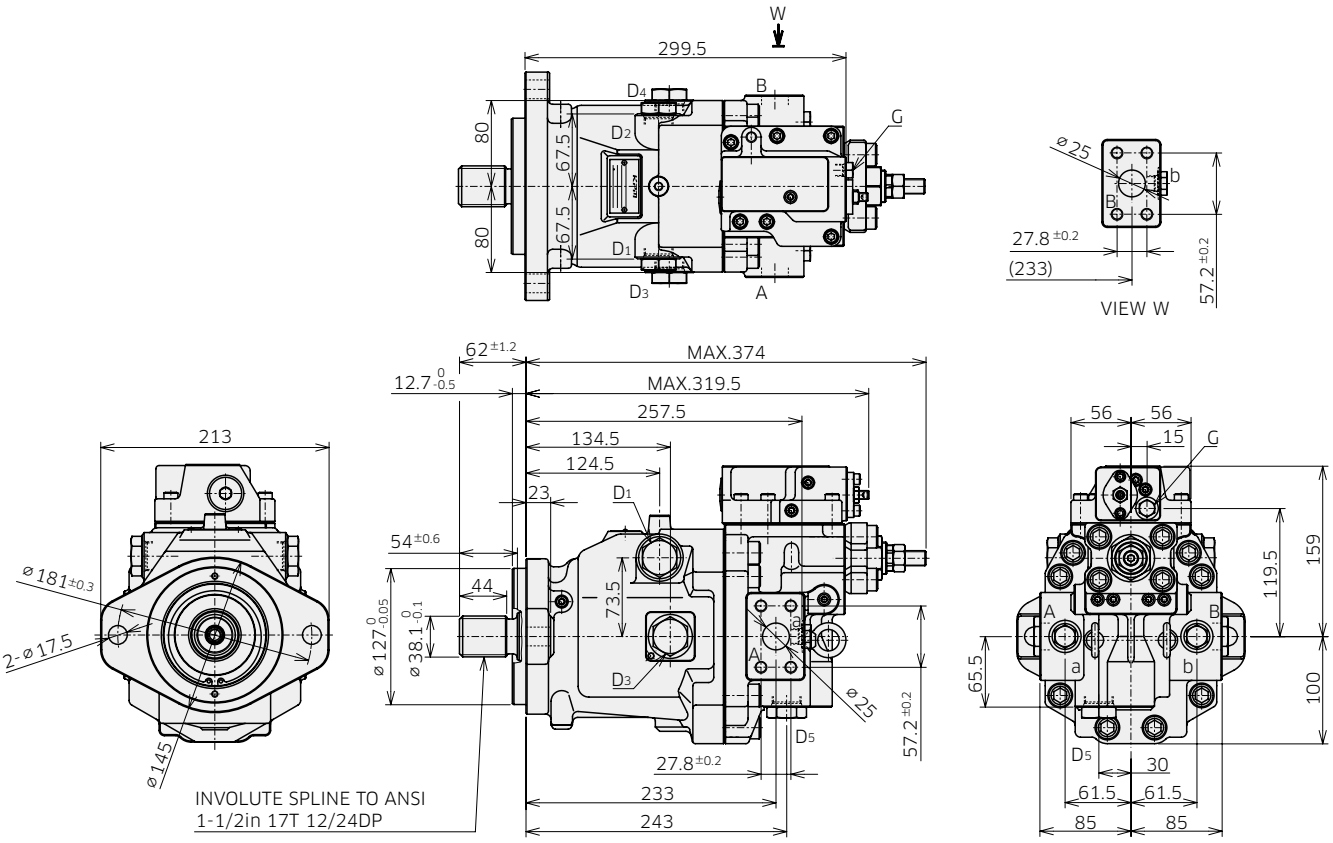
# 4 Dimensions

## 4-1 Installation Dimensions

*Dimensions in mm.

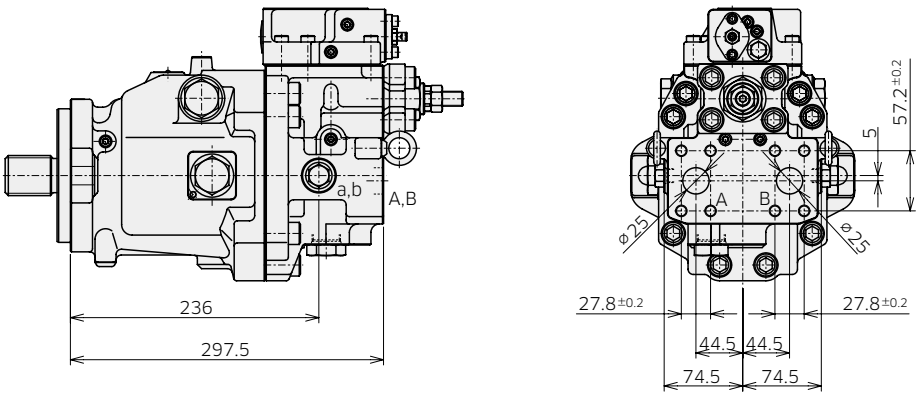
### ◆ M7V85 SAE 2bolt Mounting, Flange Ports at Side

Model Code : M7V 85 A B 1 1 – * * 1 H1 X X X N – * *




### ◆ M7V85 SAE 2bolt Rear Port

Model Code : M7V 85 A A 1 1 – * * 1 H1 X X X N – * *



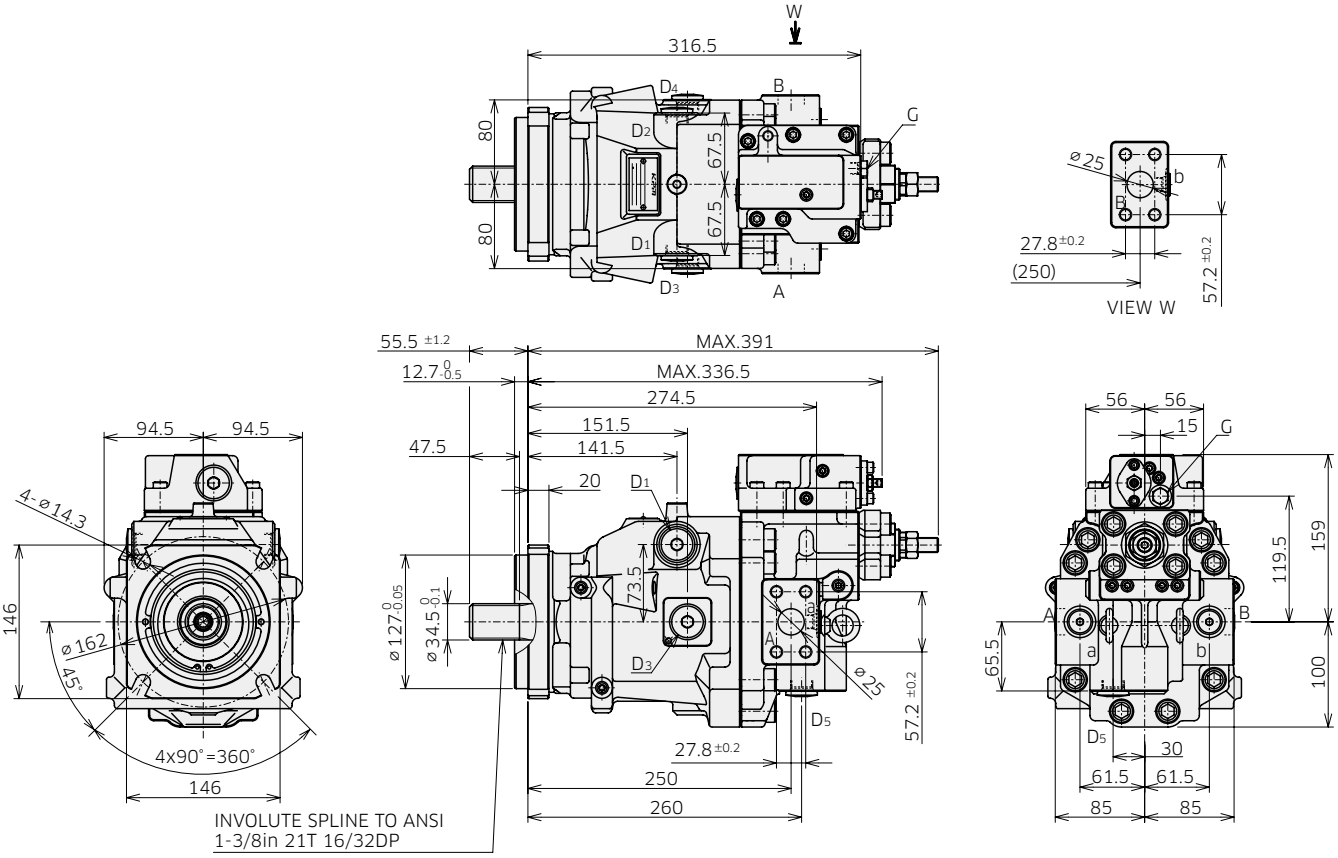

Refer to the page 52 and 53 for dimensions with other regulator options.

## 4. Dimensions

# 4-1 Installation Dimensions

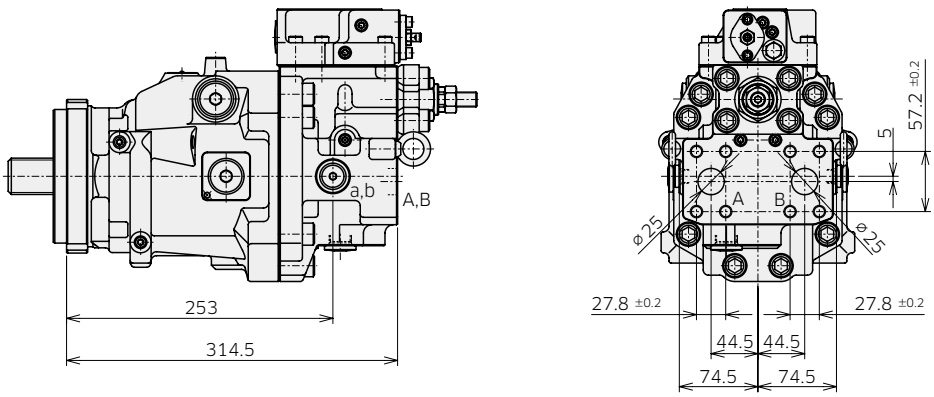
### ◆ M7V85 SAE 4bolt Mounting, Flange ports at Side

Model Code : M7V 85 A F 1 4 – ＊ ＊ 1 H1 X X X N – ＊＊




### ◆ M7V85 SAE 4bolt Rear Port

Model Code : M7V 85 A E 1 4 – ＊ ＊ 1 H1 X X X N – ＊＊



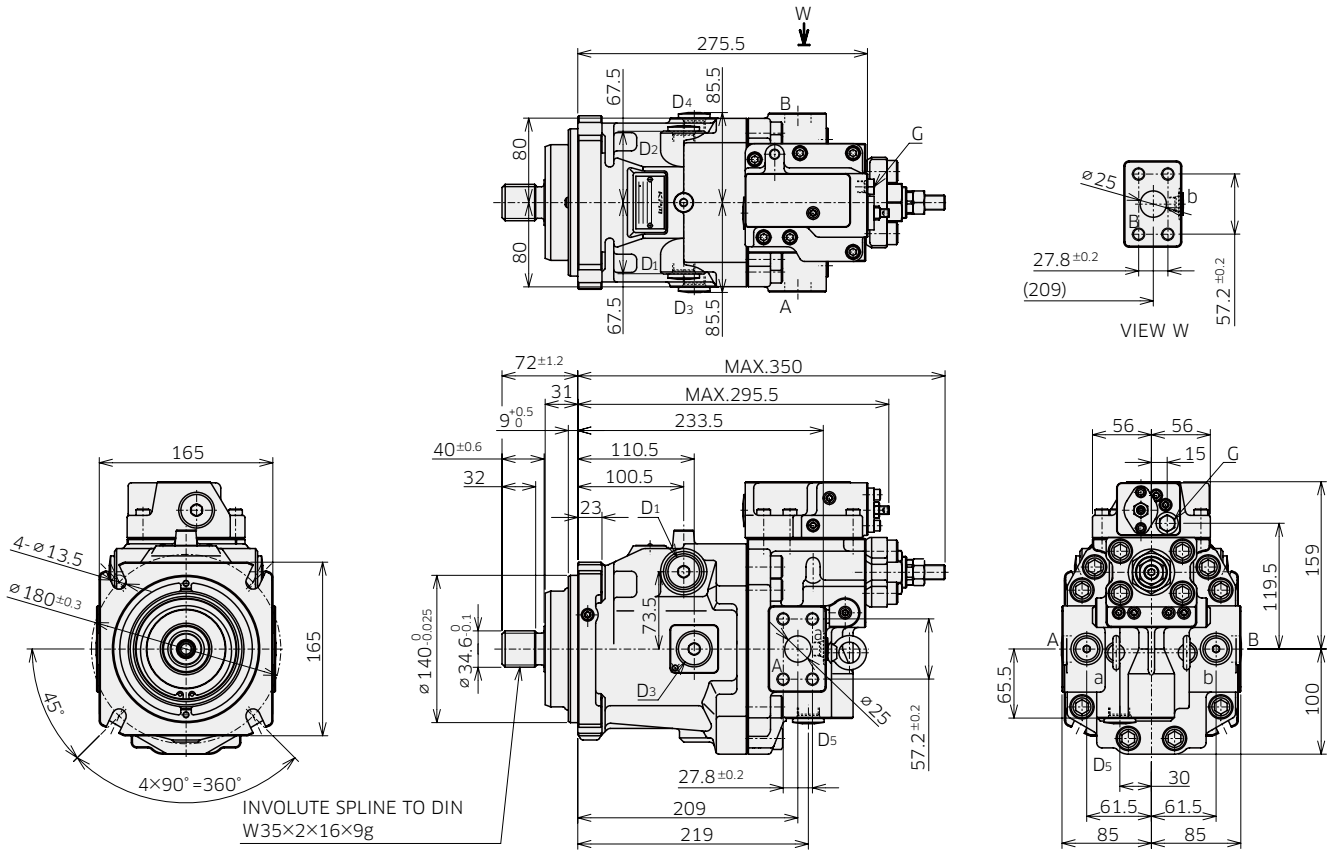

Refer to the page 52 and 53 for dimensions with other regulator options.

# 4-1 Installation Dimensions

*Dimensions in mm.

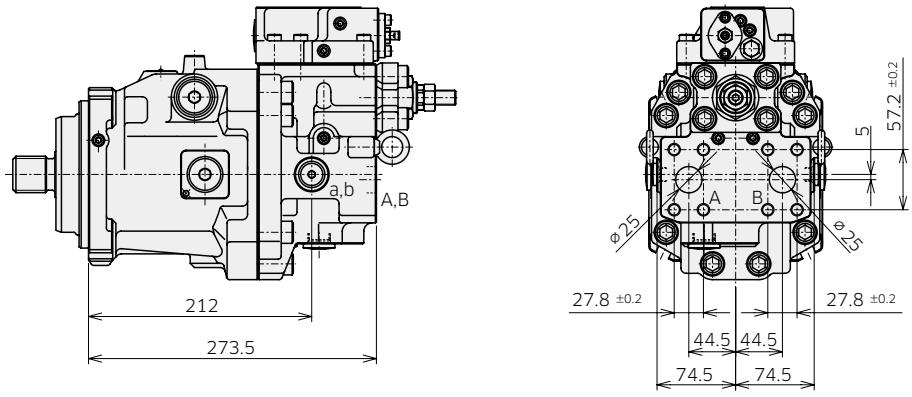
## M7V85 ISO Mounting, Flange ports at Side

Model Code : M7V 85 A D 1 5 – * * 1 H1 X X X N – * *




## M7V85 ISO Rear Port

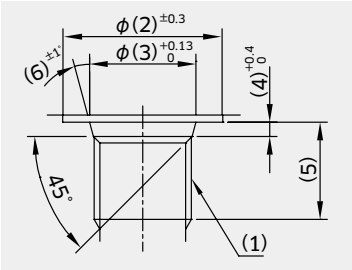
Model Code : M7V 85 A C 1 5 – * * 1 H1 X X X N – * *




Refer to the page 52 and 53 for dimensions with other regulator options.

## 4. Dimensions

# 4-1 Installation Dimensions




*Dimensions in mm.

## ◆ M7V85 Port and Flange Fixing Thread (Ordering Code: [5])

### Thread Port

ANSI thread type (Code : 1)

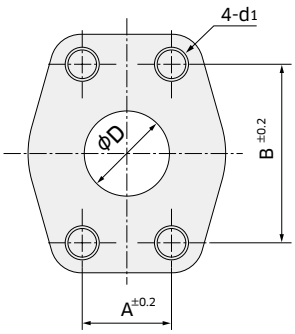
| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | 9/16-18UNF-2B | 24 | 15.6 | 2.5 | 12.7 | 12 | 59 |
| Gauge port | G | 7/16-20UNF-2B | 21 | 12.4 | 2.4 | 11 | 12 | 12 |
| Pilot port | Pi | 9/16-18UNF-2B | 25 | 15.6 | 2.5 | 12.7 | 12 | 59 |
| Drain port | D1 to D5 | 1-1/16-12UN-2B | 41 | 29.2 | 3.3 | 12.7 | 15 | 170 |

Parallel piping thread type (Code : 4)

| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | G 1/4 | 24 | 15.6 | 2.5 | 15 | 15 | 36 |
| Pilot port | Pi | G 1/4 | 24 | 15.6 | 2.5 | 14 | 15 | 36 |
| Drain port | D1 to D5 | G 1/2 | 34 | 22.6 | 2.5 | 12.7 | 15 | 108 |

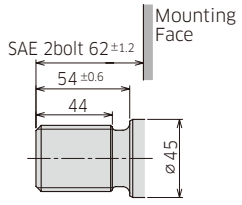
Flange port

| Port thread type code | d1 | A | B | D |
|---|---|---|---|---|
| 1 | 7/16-14UNC-2B | 27.8 | 57.2 | 25 |
| 4 | M12 | 27.8 | 57.2 | 25 |



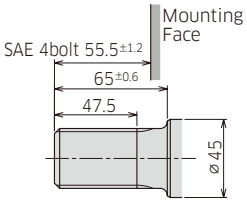

## ◆ Shaft End (Ordering Code [6])

**ANSI B92.1a**
(1-1/2in 17T 12/24DP)



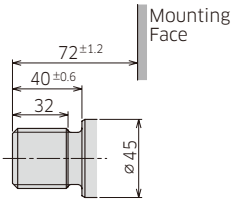

Code : 1

**ANSI B92.1a**
(1-3/8in 21T 16/32DP)



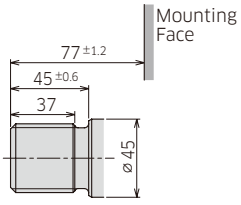

Code : 4

**DIN 5480**
(W35x2x16x9g)



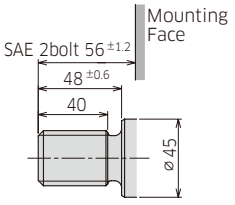

Code : 5

**DIN 5480**
(W40x2x18x9g)




Code : 6

**ANSI B92.1a**
(1-1/4in 14T 12/24DP)



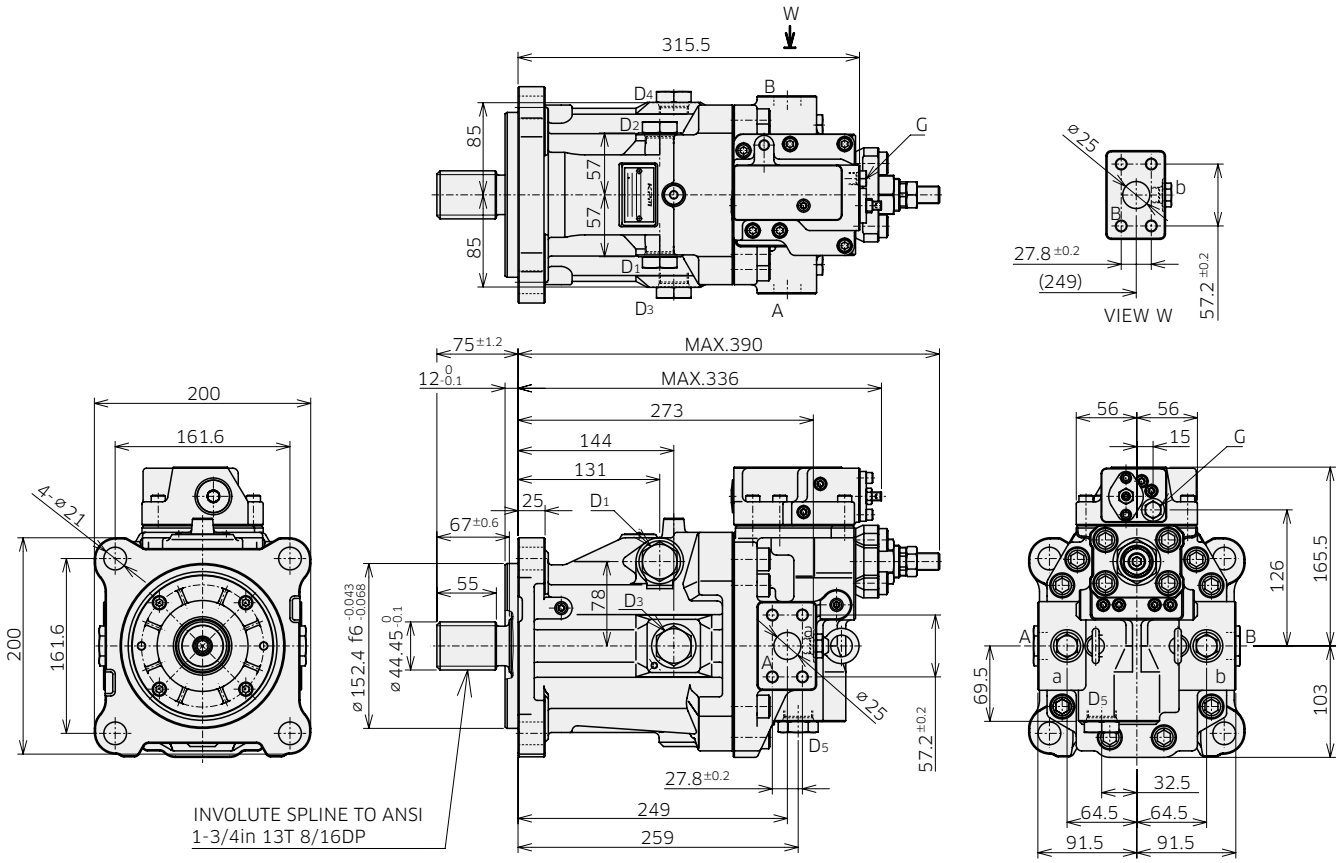

Code : 9

# 4-1 Installation Dimensions

*Dimensions in mm.

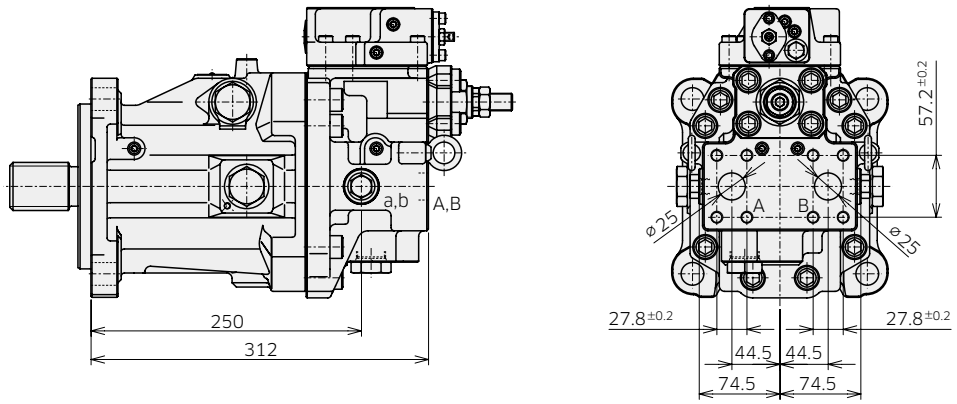
## M7V112 SAE Mounting, Flange Ports at Side

Model Code : M7V 112 A B 1 2 – * * 1 H1 X X X N – * *




## M7V112 SAE Rear Port

Model Code : M7V 112 A A 1 2 – * * 1 H1 X X X N – * *




Refer to the page 52 and 53 for dimensions with other regulator options.

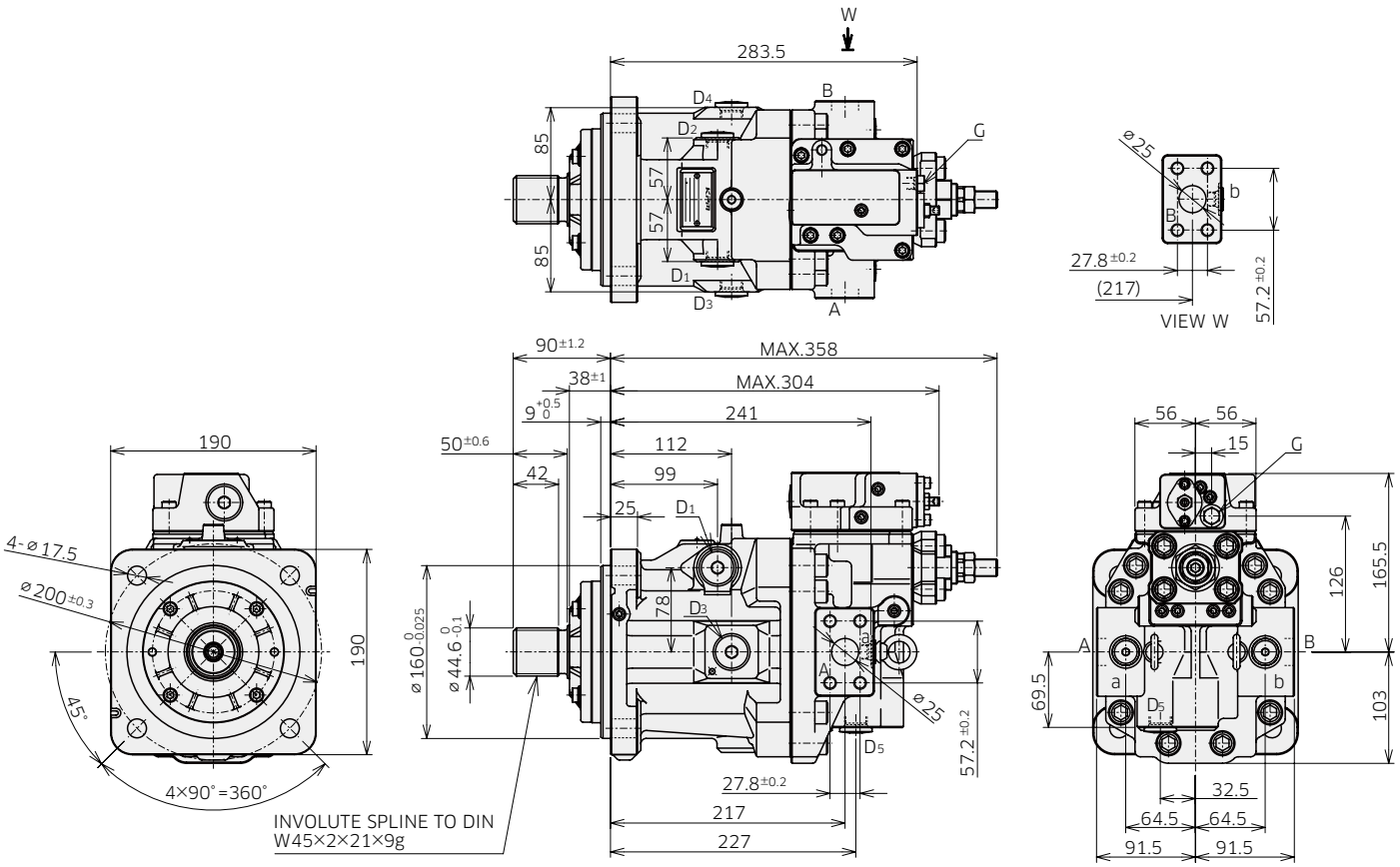
## 4. Dimensions

# 4-1 Installation Dimensions

*Dimensions in mm.

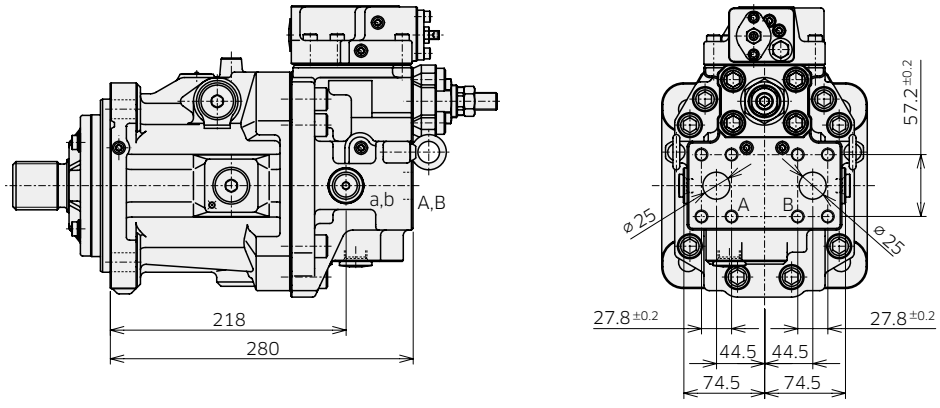
### M7V112 ISO Mounting, Flange Ports at Side

Model Code : M7V 112 A D 4 7 – * * 1 H1 X X X N – * *



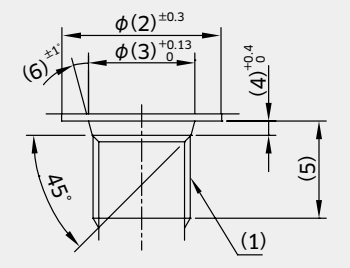

### M7V112 ISO Rear Port

Model Code : M7V 112 A C 4 7 – * * 1 H1 X X X N – * *




Refer to the page 52 and 53 for dimensions with other regulator options.

# 4-1 Installation Dimensions




*Dimensions in mm.

## ◆ M7V112 Port and Flange Fixing Thread (Ordering code: [5])

### Thread Port

ANSI thread type (Code : 1)

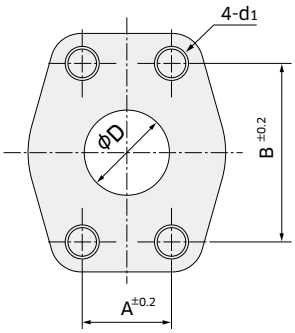
| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | 9/16-18UNF-2B | 25 | 15.6 | 2.5 | 12.7 | 12 | 59 |
| Gauge port | G | 7/16-20UNF-2B | 21 | 12.4 | 2.4 | 11 | 12 | 12 |
| Pilot port | Pi | 9/16-18UNF-2B | 25 | 15.6 | 2.5 | 12.7 | 12 | 59 |
| Drain port | D1 to D5 | 1-1/16-12UN-2B | 41 | 29.2 | 3.3 | 12.7 | 15 | 170 |

Parallel piping thread type (Code : 4)

| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | G 1/4 | 25 | 15.6 | 2.5 | 15 | 15 | 36 |
| Pilot port | Pi | G 1/4 | 24 | 15.6 | 2.5 | 14 | 15 | 36 |
| Drain port | D1 to D5 | G 1/2 | 34 | 22.6 | 2.5 | 12.7 | 15 | 108 |

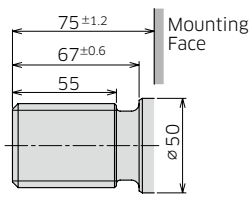
Flange port

| Port thread type code | d1 | A | B | D |
|---|---|---|---|---|
| 1 | 7/16-14UNC-2B | 27.8 | 57.2 | 25 |
| 4 | M12 | 27.8 | 57.2 | 25 |



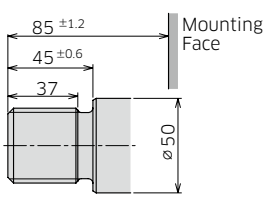

## ◆ Shaft End (Ordering Code [6])

**ANSI B92.1a**
(1-3/4in 13T 8/16DP)



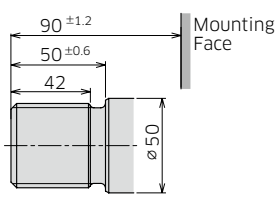

Code : 2

**DIN 5480**
(W40x2x18x9g)




Code : 6

**DIN 5480**
(W45x2x21x9g)



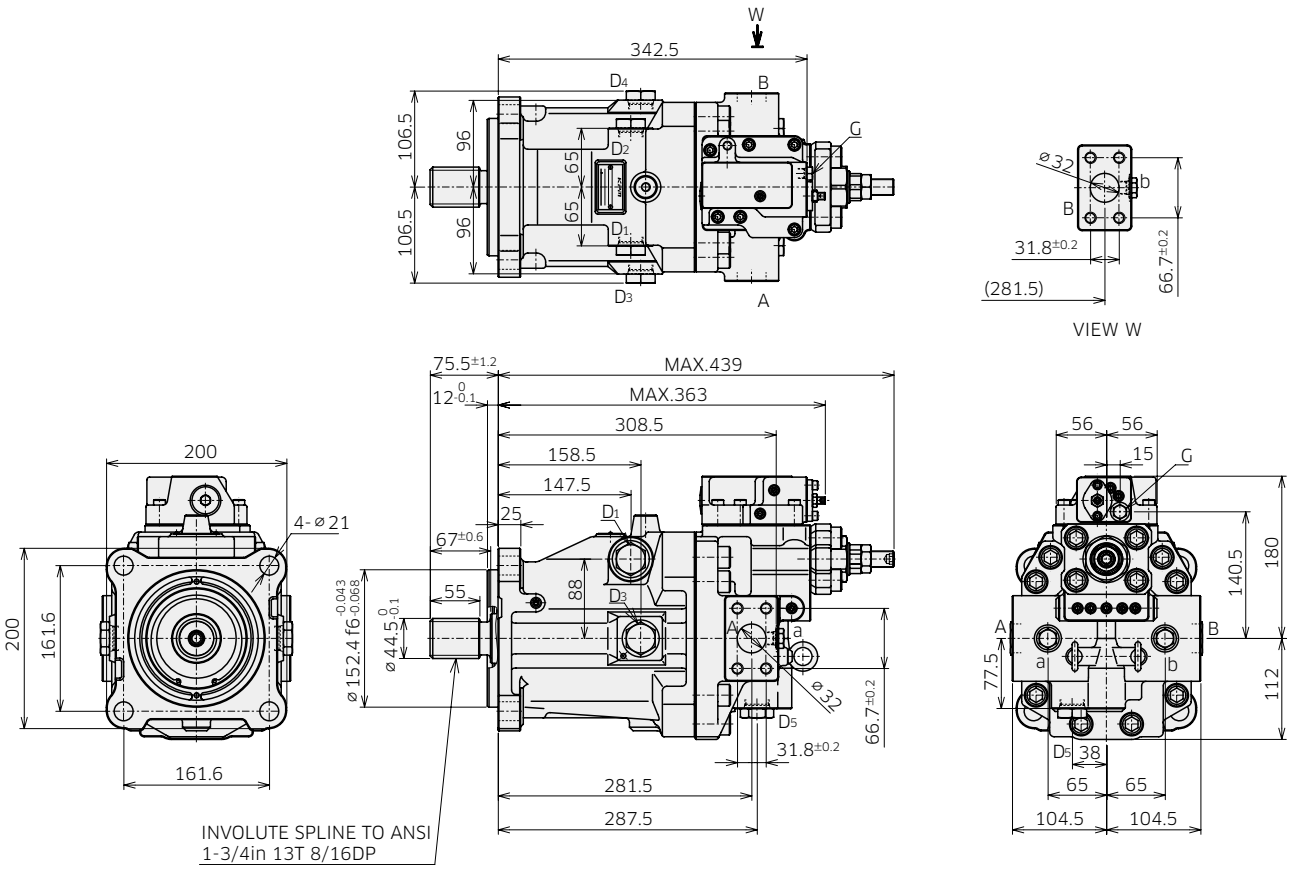

Code : 7

## 4. Dimensions

# 4-1 Installation Dimensions

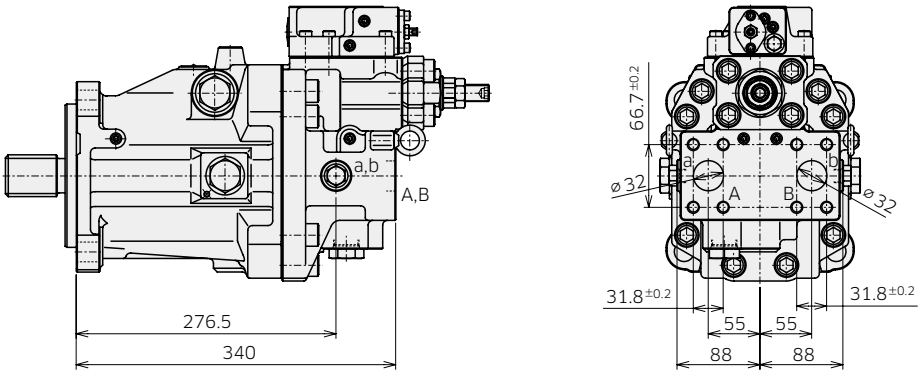
### M7V160 SAE Mounting, Flange Ports at Side

Model Code : M7V 160 A B 1 2 – * * 1 H1 X X X N – * *




### M7V160 SAE Rear Port

Model Code : M7V 160 A A 1 2 – * * 1 H1 X X X N – * *



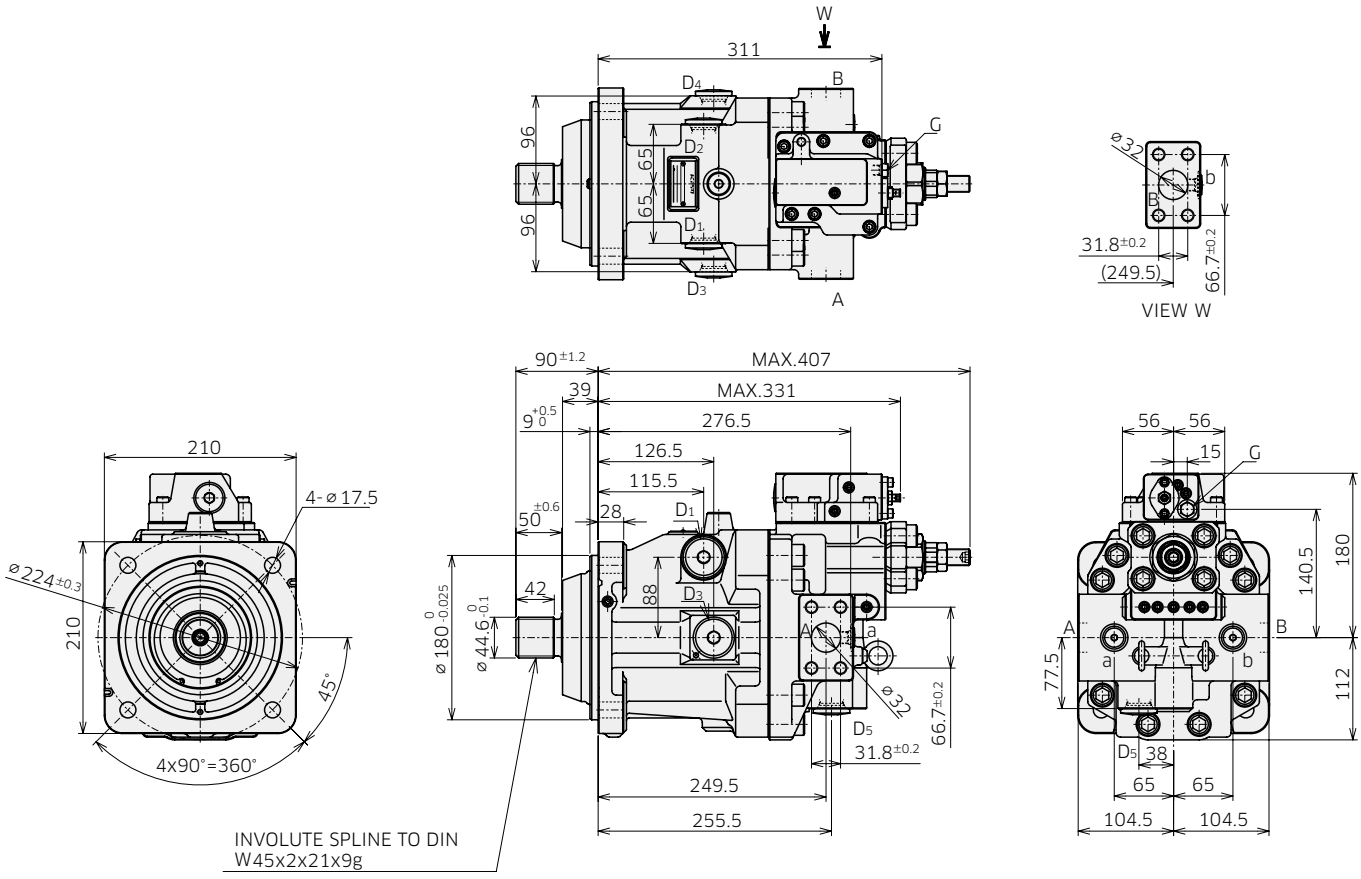

Refer to the page 52 and 53 for dimensions with other regulator options.

# 4-1 Installation Dimensions

∗Dimensions in mm.

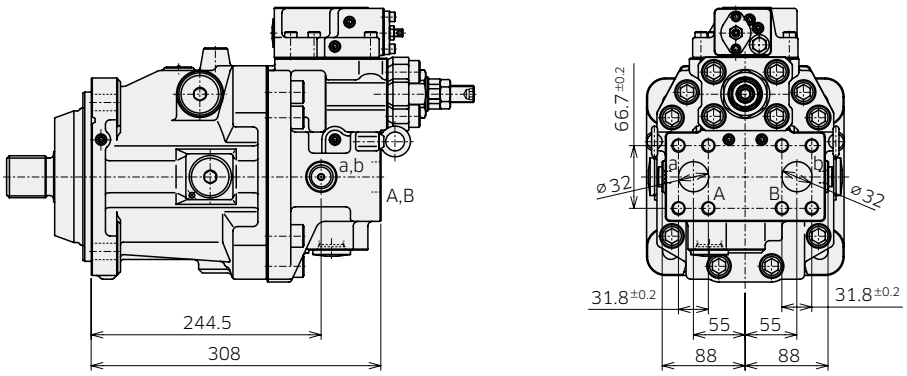
## M7V160 ISO Mounting, Flange Ports at Side

Model Code : M7V 160 A D 4 7 – ∗ ∗ 1 H1 X X X N – ∗∗




## M7V160 ISO Rear Port

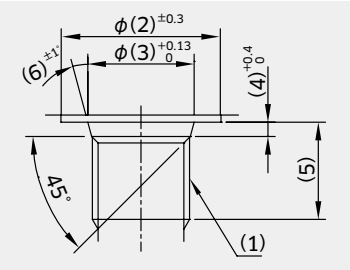
Model Code : M7V 160 A C 4 7 – ∗ ∗ 1 H1 X X X N – ∗∗




Refer to the page 52 and 53 for dimensions with other regulator options.

## 4. Dimensions

# 4-1 Installation Dimensions




*Dimensions in mm.

### ◆ M7V160 Port and Flange Fixing Thread (Ordering code: [5])

### Thread Port

ANSI thread type (Code : 1)

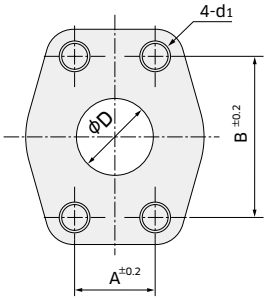
| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | 9/16-18UNF-2B | 25 | 15.6 | 2.5 | 12.7 | 12 | 59 |
| Gauge port | G | 7/16-20UNF-2B | 21 | 12.4 | 2.4 | 11 | 12 | 12 |
| Pilot port | Pi | 9/16-18UNF-2B | 25 | 15.6 | 2.5 | 12.7 | 12 | 59 |
| Drain port | D1 to D5 | 1-1/16-12UN-2B | 41 | 29.2 | 3.3 | 16.7 | 15 | 170 |

Parallel piping thread type (Code : 4)

| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | G 1/4 | 25 | 15.6 | 2.5 | 15 | 15 | 36 |
| Pilot port | Pi | G 1/4 | 24 | 15.6 | 2.5 | 14 | 15 | 36 |
| Drain port | D1 to D5 | G 3/4 | 45 | 30.8 | 3.5 | 16.7 | 15 | 170 |

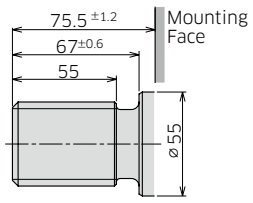
Flange Port

| Port thread type code | d1 | A | B | D |
|---|---|---|---|---|
| 1 | 1/2-13UNC-2B | 31.8 | 66.7 | 32 |
| 4 | M14 | 31.8 | 66.7 | 32 |



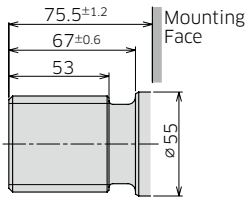

### ◆ Shaft End (Ordering Code [6])

**ANSI B92.1a**
(1-3/4in 13T 8/16DP)



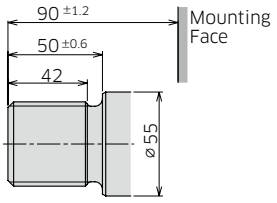

Code : 2

**ANSI B92.1a**
(2in 15T 8/16DP)



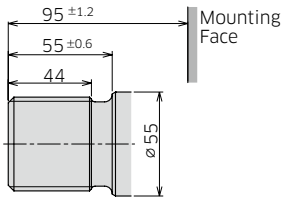

Code : 3

**DIN 5480**
(W45x2x21x9g)




Code : 7

**DIN 5480**
(W50x2x24x9g)



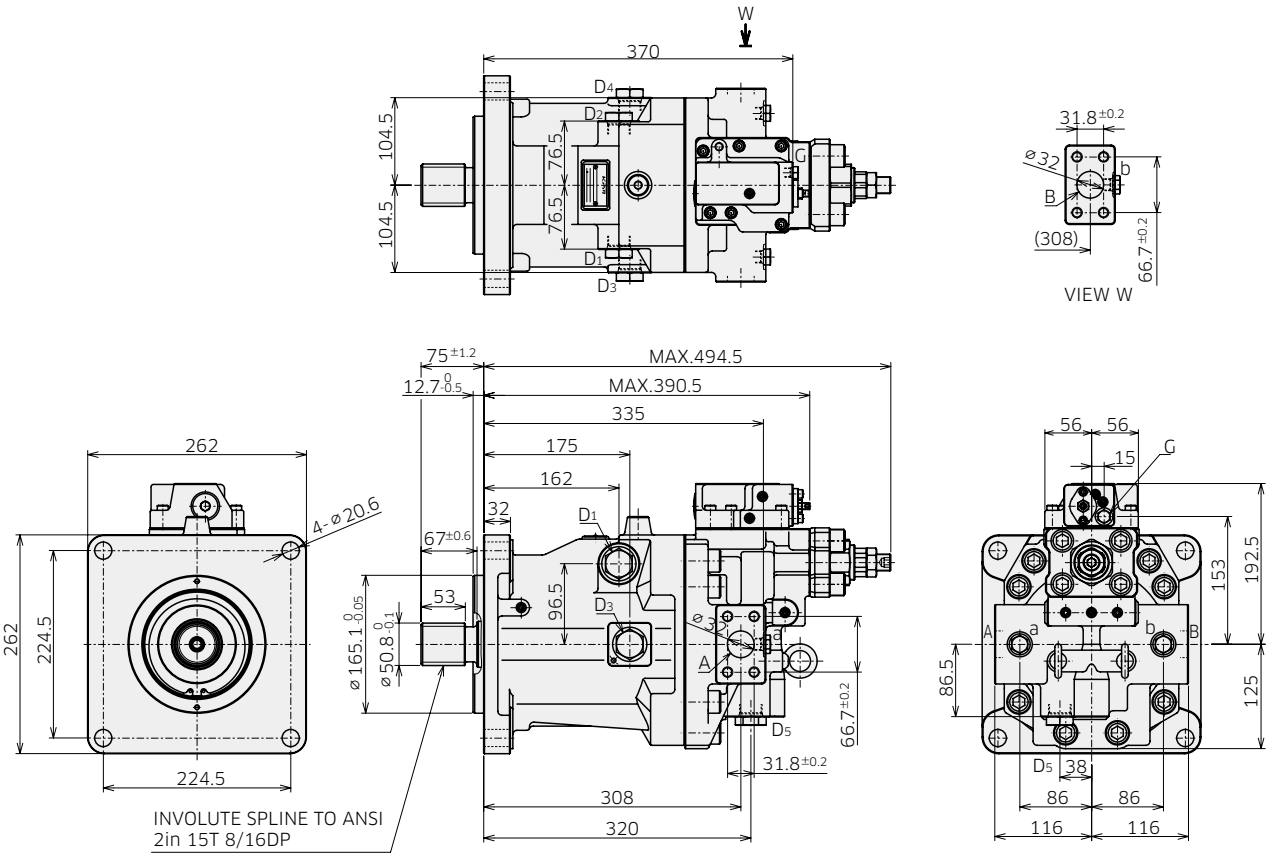

Code : 8

# 4-1 Installation Dimensions

*Dimensions in mm.

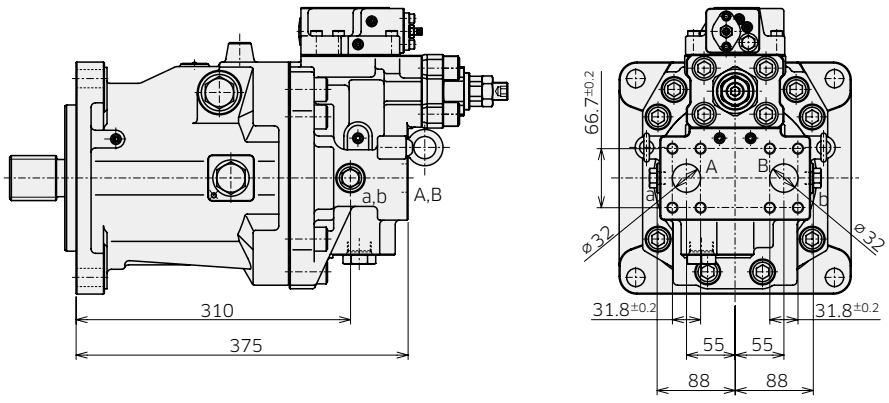
## M7V212 SAE Mounting, Flange Ports at Side

Model Code : M7V 212 A B 1 3 – * * 1 H1 X X X N – * *




## M7V212 SAE Rear Port

Model Code : M7V 212 A A 1 3– * * 1 H1 X X X N – * *




Refer to the page 52 and 53 for dimensions with other regulator options.

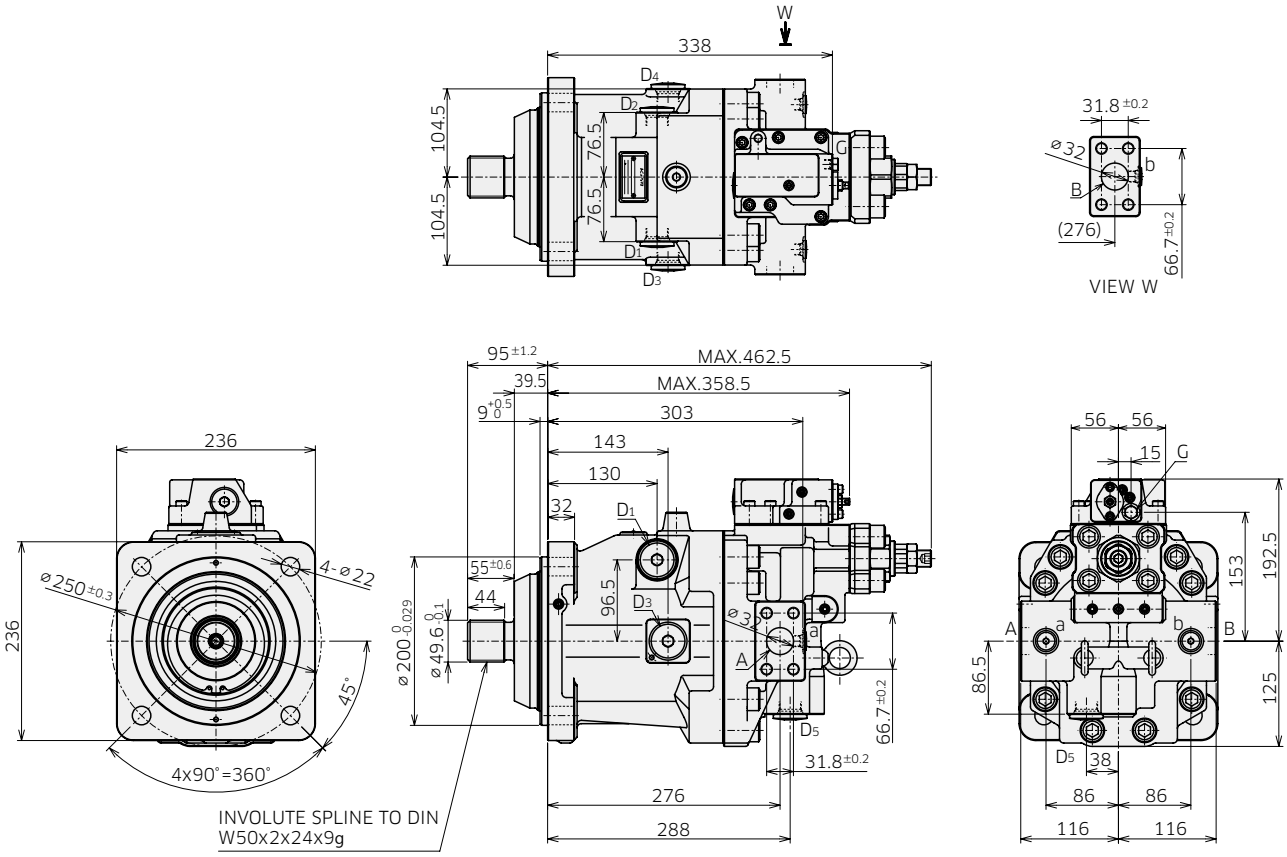
## 4. Dimensions

# 4-1 Installation Dimensions

∗Dimensions in mm.

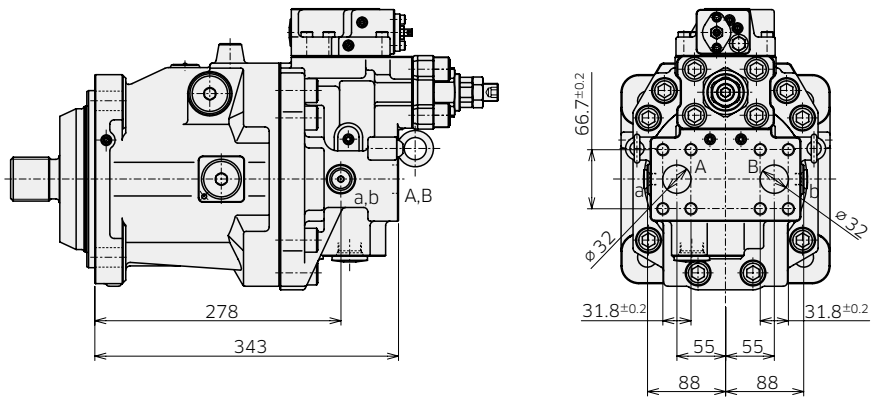
### ◆ M7V212 ISO Mounting, Flange Ports at Side

Model Code : M7V 212 A D 4 8 – ∗ ∗ 1 H1 X X X N – ∗∗



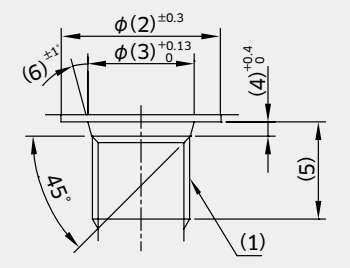

### ◆ M7V212 ISO Rear Port

Model Code : M7V 212 A C 4 8 – ∗ ∗ 1 H1 X X X N – ∗∗




Refer to the page 52 and 53 for dimensions with other regulator options.

# 4-1 Installation Dimensions




*Dimensions in mm.

## M7V212 Port and Flange Fixing Thread (Ordering code: [5])

### Thread Port

ANSI thread type (Code : 1)

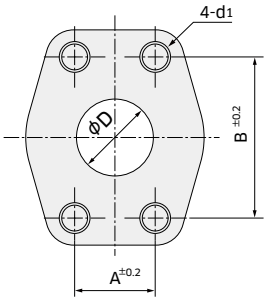
| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | 9/16-18UNF-2B | 25 | 15.6 | 2.5 | 12.7 | 12 | 59 |
| Gauge port | G | 7/16-20UNF-2B | 21 | 12.4 | 2.4 | 11 | 12 | 12 |
| Pilot port | Pi | 9/16-18UNF-2B | 25 | 15.6 | 2.5 | 12.7 | 12 | 59 |
| Drain port | D1 to D5 | 1-1/16-12UN-2B | 41 | 29.2 | 3.3 | 19 | 15 | 170 |

Parallel piping thread type (Code : 4)

| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | G 1/4 | 25 | 15.6 | 2.5 | 15 | 15 | 36 |
| Pilot port | Pi | G 1/4 | 24 | 15.6 | 2.5 | 14 | 15 | 36 |
| Drain port | D1 to D5 | G 3/4 | 45 | 30.8 | 3.5 | 20 | 15 | 170 |

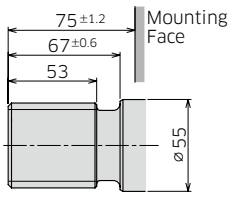
Flange port

| Port thread type code | d1 | A | B | D |
|---|---|---|---|---|
| 1 | 1/2-13UNC-2B | 31.8 | 66.7 | 32 |
| 4 | M14 | 31.8 | 66.7 | 32 |



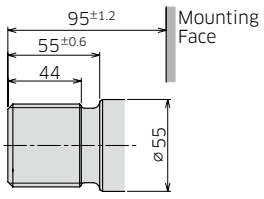

## Shaft End (Ordering Code [6])

**ANSI B92.1a**
(2in 15T 8/16DP)




Code : 3*

**DIN 5480**
(W50x2x24x9g)



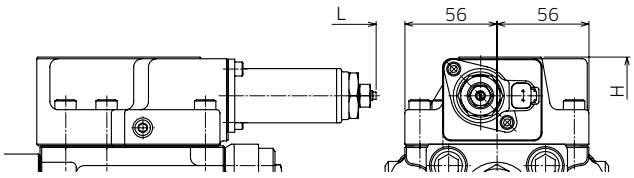

Code : 8

*Code 3 is under development.

# 4-2 Regulators Installation Dimensions

*Dimensions in mm.

## Electric Two Position Displacement Control
### Regulator Code: T1, T2

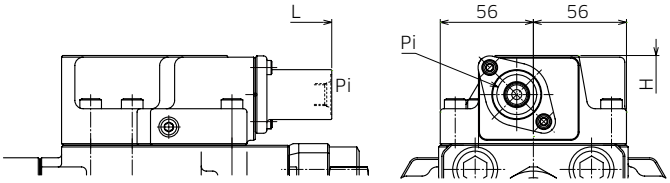



Dimension L : Length from mounting face.
Dimension H : Height from shaft center.

Dimension L, H (mm)

| Motor size | Mounting type | Dimension | |
|---|---|---|---|
| | | L | H |
| 85 | SAE 2bolt | 390 | 159 |
| | SAE 4bolt | 407 | |
| | ISO | 366 | |
| 112 | SAE | 406 | 164 |
| | ISO | 374 | |
| 160 | SAE | 433 | 180 |
| | ISO | 401 | |
| 212 | SAE | 461 | 193 |
| | ISO | 429 | |

## Hydraulic Two Position Displacement Control
### Regulator Code: Y1,Y2




Dimension L : Length from mounting face.
Dimension H : Height from shaft center.

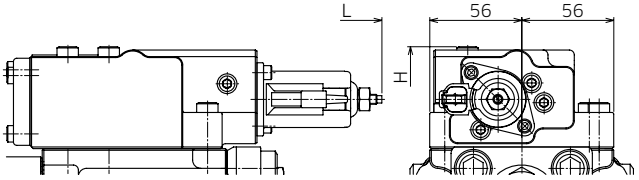
Dimension L, H (mm)

| Motor size | Mounting type | Dimension | | |
|---|---|---|---|---|
| | | L | H | H1 |
| 85 | SAE 2bolt | 345 | 159 | 135.5 |
| | SAE 4bolt | 362 | | |
| | ISO | 321 | | |
| 112 | SAE | 361 | 165.5 | 142 |
| | ISO | 329 | | |
| 160 | SAE | 388 | 180 | 156.5 |
| | ISO | 356 | | |
| 212 | SAE | 416 | 192.5 | 169 |
| | ISO | 384 | | |

# 4-2 Regulators Installation Dimensions

*Dimensions in mm.

## Electric Proportional Control
### Regulator Code: E1, E2, E3 and E4

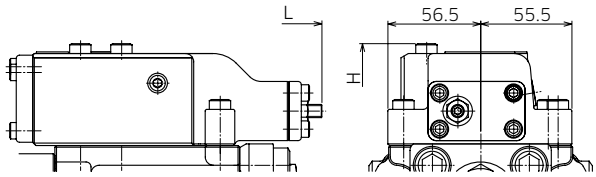



Dimension L : Length from mounting face.
Dimension H : Height from shaft center.

Dimension L, H (mm)

| Motor size | Mounting type | Dimension | |
|---|---|---|---|
| | | L | H |
| 85 | SAE 2bolt | 392 | 167 |
| | SAE 4bolt | 409 | |
| | ISO | 368 | |
| 112 | SAE | 408 | 172 |
| | ISO | 376 | |
| 160 | SAE | 435 | 188 |
| | ISO | 403 | |
| 212 | SAE | 463 | 201 |
| | ISO | 431 | |

## Pressure Related Control
### (with Pressure Increase)
### Regulator Code: H2




Dimension L : Length from mounting face.
Dimension H : Height from shaft center.

Dimension L, H (mm)

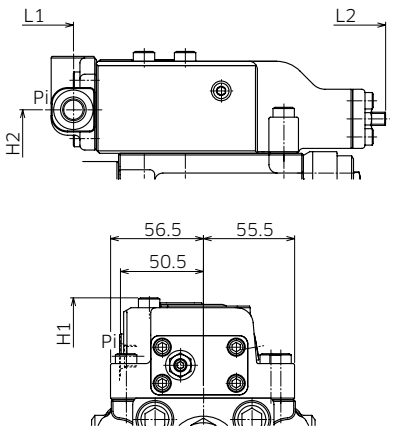
| Motor size | Mounting type | Dimension | |
|---|---|---|---|
| | | L | H |
| 85 | SAE 2bolt | 348 | 167 |
| | SAE 4bolt | 365 | |
| | ISO | 324 | |
| 112 | SAE | 364 | 172 |
| | ISO | 332 | |
| 160 | SAE | 391 | 188 |
| | ISO | 359 | |
| 212 | SAE | 419 | 201 |
| | ISO | 387 | |

## Pressure Related Control
### (with Pressure Increase Hydraulic Remote Control)
### Regulator Code: H3

## Hydraulic Proportional Control
### Regulator Code: P1, P2, P3 and P4

Dimension L, H (mm)

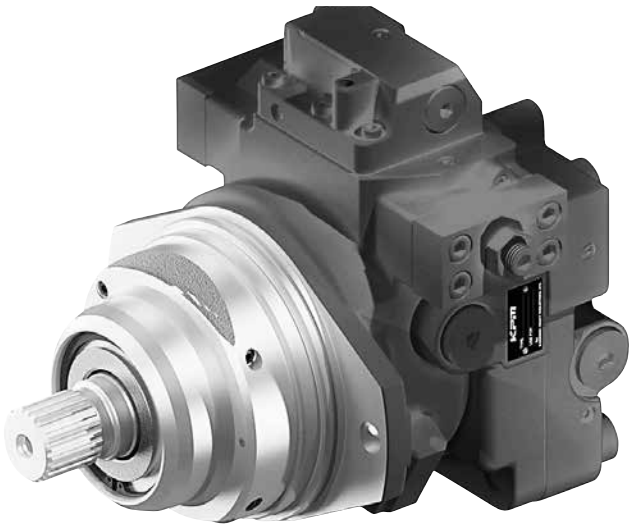
| Motor size | Mounting type | Dimension | | | |
|---|---|---|---|---|---|
| | | L1 | L2 | H1 | H2 |
| 85 | SAE 2bolt | 158 | 348 | 167 | 132 |
| | SAE 4bolt | 175 | 365 | | |
| | ISO | 134 | 324 | | |
| 112 | SAE | 174 | 364 | 172 | 137 |
| | ISO | 142 | 332 | | |
| 160 | SAE | 201 | 391 | 188 | 153 |
| | ISO | 169 | 359 | | |
| 212 | SAE | 229 | 419 | 201 | 165 |
| | ISO | 197 | 387 | | |




Dimension L : Length from mounting face.
Dimension H : Height from shaft center.

# M7VC Series

## Variable Displacement Type Axial Piston Motors (Cartridge type)



## ■Specifications

Size : 160

Nominal Pressure : 42MPa (6,090 psi)
Maximum Pressure : 50MPa (7,250 psi)

## ■General Descriptions

- Applicable to an open circuit and closed circuit.
- Applicable to construction machinery and industrial vehicles.
- Swash plate design allows for a compact motor.
- High power density.

## ■Features

### Superior performance at High and Low speed

Optimized rotary balance design enables high speed perfomance and excellent low speed characteristics.

### Low noise

Swash plate configuration provides the low noise.

### Compact size

Swash plate configuration provides the more compact structure and flexibility in system design.

### Long bearing life

Swash plate configuration results in longer bearing life.

### Cartridge type

Space saving configuration, easy to install into the gearbox.

# 5 M7VC Ordering Code

Model Code

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M7VC | 160 | A | C | 4 | 7 | - | A | A | 1 | T1 | X | X | X | N | - | 01 |

**1. M7VC Series**

M7VC Series, Variable Displacement, Axial Piston Motor, Cartridge Type, Applicable in Both Open and Closed Loops.

**2. Size**

| | 160 |
|---|---|
| Standard Size | ● |

**3. Series Specifications**

| | |
|---|---|
| A | Standard |

**4. Mounting Flange and Port Position***

| | Mounting | Port Position | 160 |
|---|---|---|---|
| C | ϕ200(ϕ250 - 2 bolt mount) | Rear | ● |
| D | | Side | ○ |
| E | | Bottom | ○ |

**5. Port and Flange Fixing Thread***

| | Type of Threaded Port | Thread Type for Flange Port | 160 |
|---|---|---|---|
| 1 | ANSI ISO11926 | ANSI ASME B1.1 | ○ |
| 4 | Parallel Piping ISO228 | Metric ISO724 | ● |

**6. Shaft End***

| | Standard | Specifications | 160 |
|---|---|---|---|
| 2 | ANSI B92.1 | 1 3/4 in 13T 8/16DP | ○ |
| 3 | ANSI B92.1 | 2 in 15T 8/16DP | ○ |
| 7 | DIN 5480 | W45x2x21x9 g | ● |
| 8 | DIN 5480 | W50x2x24x9 g | ● |

*Following combination of code [5], [6] is available.

| | Ordering Code | |
|---|---|---|
| | Code[5] | Code[6] |
| M7VC160 | 1 | 2 or 3 |
| | 4 | 7 or 8 |

● : Available
○ : Under development
— : Not available

# 5. M7VC Ordering Code

Model Code **M7VC 160 A C 4 7 - A A 1 T1 X X X N - 01**

(1 2 3 4 5 6 7 8 9 10 11 12 13 14 15)

**7. Maximum Displacement**

| Size | 160 | A : 160 | ● | B : 155 | ● | C : 150 | ● | D : 140 | ● |
|---|---|---|---|---|---|---|---|---|---|

**8. Minimum Displacement**

| Size | 160 | A : 96 | ● | B : 80 | ● | C : 60 | ● | D : 40 | ● | E : 32 | ● |
|---|---|---|---|---|---|---|---|---|---|---|---|

**9. Speed Sensor**

| | | 160 |
|---|---|---|
| 1 | w/o Speed Sensor | ● |
| 2 | w/ Speed Sensor | ● |

○For code [10] [11] please refer to page 57.

**12. Accessories**

| | Flushing Valve | Internal Cooling | Flushing Flow | 160 |
|---|---|---|---|---|
| X | w/o Flushing Valve | w/ Internal Cooling | 5.0 L/min (M7VC160) at ΔP(Lower Pressure - Drain Pressure)= 2.5MPa and $\nu$ =10mm²/s | ● |
| 1 | w/o Flushing Valve | w/o Internal Cooling | — | ● |
| 2 | w/ Flushing Valve | w/ Internal Cooling | 5.0 L/min (M7VC160) at ΔP(Lower Pressure - Drain Pressure)= 2.5MPa and $\nu$ =10mm²/s | ○ |

**13. Counter Balance Valve**

| | | 160 |
|---|---|---|
| X | w/o Counter Balance Valve | ● |
| 1 | w/ Counter Balance Valve Hoist at CW Rotation (A port inlet) | ○ |
| 2 | w/ Counter Balance Valve Hoist at CCW Rotation (B port inlet) | ○ |

**14. Response Speed of Control**

| | | 160 |
|---|---|---|
| N | Standard | ● |

**15. Design Code**

| | | 160 |
|---|---|---|
| ** | 01~ | ● |

● : Available
○ : Under development
— : Not available

# 5. M7VC Ordering Code

Model Code

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M7VC | 160 | A | C | 4 | 7 | - | A | A | 1 | T1 | X | X | X | N | - | 01 |

**10.Regulator(See the table on possible combinations of optional valve and regulator options.)**

| | | | | 160 |
|---|---|---|---|---|
| T | T1 | Electric Two Position Displacement Control | Negative Control, 24V | ● |
| | T2 | | Negative Control, 12V | ● |
| Y | Y1 | Hydraulic Two Position Displacement Control | Negative Control | ● |
| | Y2 | | Positive Control | ● |
| E | E1 | Electric Proportional Control | Negative Control, 24V | ● |
| | E2 | | Positive Control, 24V | ● |
| | E3 | | Negative Control, 12V | ● |
| | E4 | | Positive Control, 12V | ● |
| P | P1 | Hydraulic Proportional Control | Negative Control, Pi = 2.5MPa | ● |
| | P2 | | Positive Control, Pi = 2.5MPa | ● |
| | P3 | | Negative Control, Pi = 1.0MPa | ● |
| | P4 | | Positive Control, Pi = 1.0MPa | ● |
| H | H1 | Pressure Related Control | w/o Pressure Increase | ● |
| | H2 | | w/ Pressure Increase | ● |
| | H3 | | w/ Pressure Increase and Hydraulic Remote Control | ● |

**11. Options for Optional Valves (See the table on possible combinations of optional valve and regulator options.)**

| | | | 160 |
|---|---|---|---|
| X | w/o Any Optional Valve | | ● |
| A1 | Pressure Control Valve | w/ a Pressure Control Valve | ● |
| B | B1 | Electric Two Position Control Valve | w/ Electric Two Position Control Valve, 24V | ● |
| | B2 | | w/ Electric Two Position Control Valve, 12V | ● |
| C | C1 | Hydraulic Two Position Control Valve | w/ Hydraulic Two Position Control Valve, Negative Control | ● |
| | C2 | | w/ Hydraulic Two Position Control Valve, Positive Control | ● |

**★ M7V Control Options**

Note: The control options are common for all motor sizes.

| | | | | Options for Optional Valves (code [11]) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | w/o Any Optional Valve | w/ a Pressure Control Valve | w/ Electric Two Position Control Valve, 24V | w/ Electric Two Position Control Valve, 12V | w/ Hydraulic Two Position Control Valve, Negative Control | w/ Hydraulic Two Position Control Valve, Positive Control |
| Regulator : Code [10] | | | | X | A1 | B1 | B2 | C1 | C2 |
| T | T1 | Electric Two Position Displacement Control | Negative Control, 24V | ● | – | – | – | – | – |
| | T2 | | Negative Control, 12V | ● | – | – | – | – | – |
| Y | Y1 | Hydraulic Two Position Displacement Control | Negative Control | ● | – | – | – | – | – |
| | Y2 | | Positive Control | ● | – | – | – | – | – |
| E | E1 | Electric Proportional Control | Negative Control, 24V | ● | ● | – | – | – | – |
| | E2 | | Positive Control, 24V | ● | ○ | – | – | – | – |
| | E3 | | Negative Control, 12V | ● | ● | – | – | – | – |
| | E4 | | Positive Control, 12V | ● | ○ | – | – | – | – |
| P | P1 | Hydraulic Proportional Control | Negative Control (Pi = 2.5MPa) | ● | ● | – | – | – | – |
| | P2 | | Positive Control (Pi = 2.5MPa) | ● | ○ | – | – | – | – |
| | P3 | | Negative Control (Pi = 1.0MPa) | ● | ● | – | – | – | – |
| | P4 | | Positive Control (Pi = 1.0MPa) | ● | ○ | – | – | – | – |
| H | H1 | Pressure Related Control | w/o Pressure Increase | ● | – | ● | ● | ● | ● |
| | H2 | | w/ Pressure Increase | ● | – | ● | ● | ● | ● |
| | H3 | | w/ Pressure Increase and Hydraulic Remote Control | ● | – | ● | ● | ● | ● |

(Note)
For combination of two position control and pressure cut-off control, please select the pressure related control (code H) with two position control as option valve.

● : Available
○ : Under development
— : Not available

# 6 Technical Information

## 6-1 Specifications

### M7VC Series

| Size | | 160 |
|---|---|---|
| Min. Displacement : $q_{min}$ | $cm^3$ ($in^3$) | 0 to 128<br>(0 to 7.9) |
| Max. Displacement : $q_{max}$ | $cm^3$ ($in^3$) | 128 to 160<br>(7.9 to 9.8) |
| Max. Speed : $N_{nom}$ / $N_{max}$ *1 | $min^{-1}$ (rpm) | 3,100 / 4,900 |
| Nominal pressure : $P_{nom}$ *2 | MPa (psi) | 42 (6,090) |
| Max. Pressure : $P_{max}$ | MPa (psi) | 50 (7,250) |
| Theoretical output torque | Nm (lbf ft) | 1,070 (789) |
| Power | kW (hp) | 347 (465) |
| Max. Flow : Q | L/min (gallon/min) | 496 (131) |
| Moment of inertia | $kg \cdot m^2$ | 0.030 |
| Volume in the case | L (gallon) | 2.5 (0.66) |
| Mass | kg (lb) | 72 (158) |
| Temperature | ℃ (°F) | −20 to +115 (−4 to +239) at drain port<br>−20 to +90 (−4 to +194) at inlet port |
| Coating | | Red synthetic resin primer |

Values shown in the table above are theoretical values.

∗1 : $N_{nom}$ : Max. speed at $q_{max}$.
$N_{max}$ : Max. speed at $q < 0.6q_{max}$.
(In case that 1 is selected at ordering code [12] , $N_{max}$ goes down up to $N_{nom}$ regardless of displacement of the motor.)

∗2 : Nominal pressure corresponds to the design pressure to provide proper performance, function, and service life.

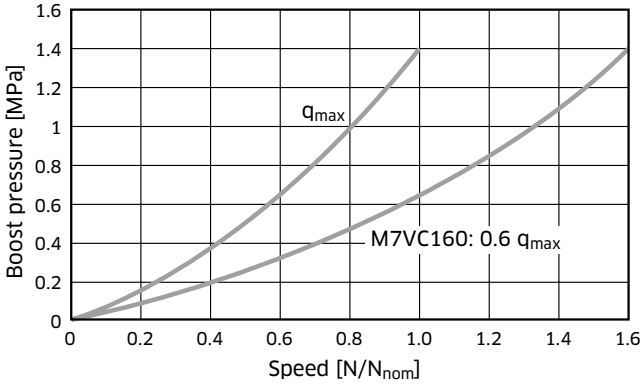
# 6-2 Precautions for System Design

## M7VC series

### Minimum Boost Pressure

To prevent cavitation when the motor is operating in a pumping mode, a positive pressure is required at the suction port.
The figure on the right shows the minimum boost pressure requirement based on the regular operation. In case of a rapid change of the flow volume, more boost pressure must be applied.

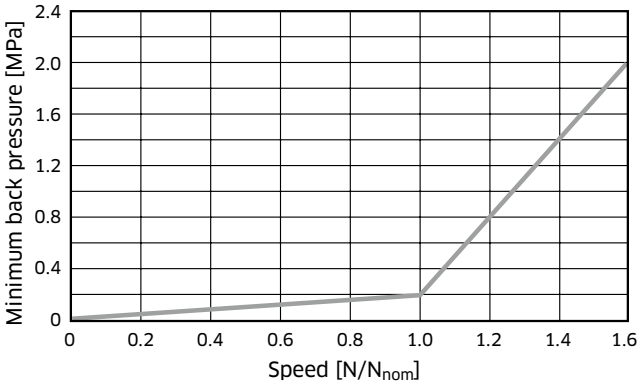
**Minimum boost pressure**




### Minimum Back Pressure

To ensure the optimal performance and life time the back pressure is required at the lower pressure port.
Motor casing pressure must be ≦ 0.2 MPa.

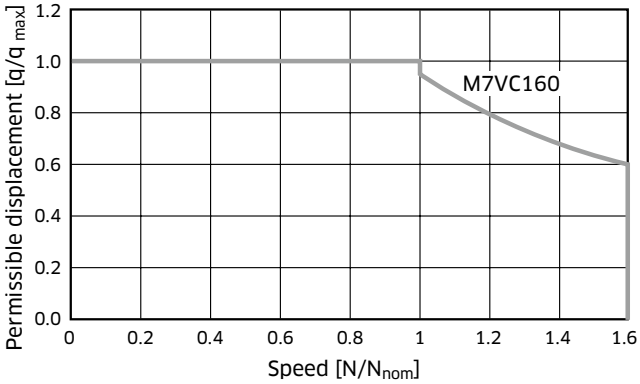
**Minimum back pressure**




### Permissible Displacement, Speed Related

The figure on the right shows permissible displacement in relation to the motor operating speed. Design the system not to exceed this requirement.

**Permissible displacement**




### Beginning of Control for Winch Device

For the safety reasons, winch devise are not permissible with beginning control at $q_{min}$.

# 6-3 Speed Sensor

## Ordering Code [9] : 1, 2

### ◆ 1 : w/o Speed Sensor

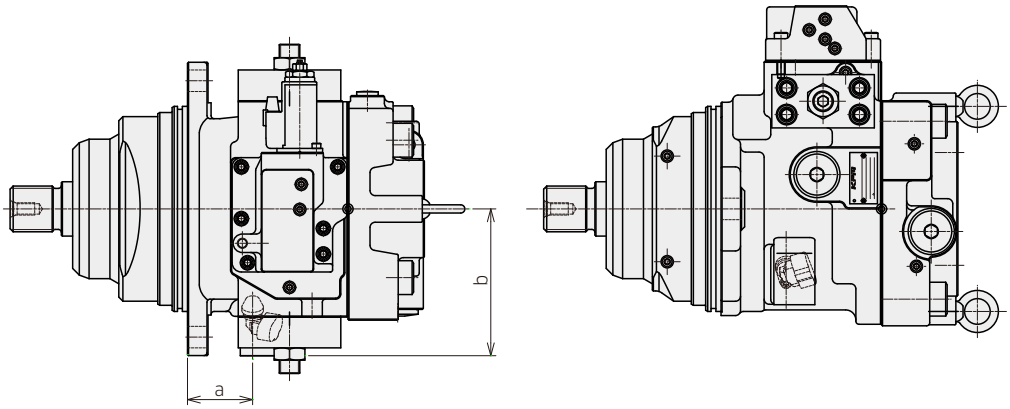
●A speed sensor is not installed.

### ◆ 2 : w/ Speed Sensor

●A speed sensor that detects the motor direction and measures the rotational speed of the motor is installed at the position as below figure.

#### Specification

Supply Voltage : 4.5V ~ 26V DC
Mating Connector : TE Connectivity AMP Superseal 1.5 series, 4 positions(part number : 282088)
IP Protection Rating : IP69K




| | M7VC160 |
|---|---|
| a [mm] | 63.5 |
| b [mm] | 143 |
| Pulse Frequency [pulse/rev] | 87 |

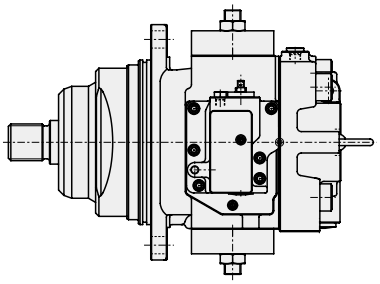
# 7 Dimensions

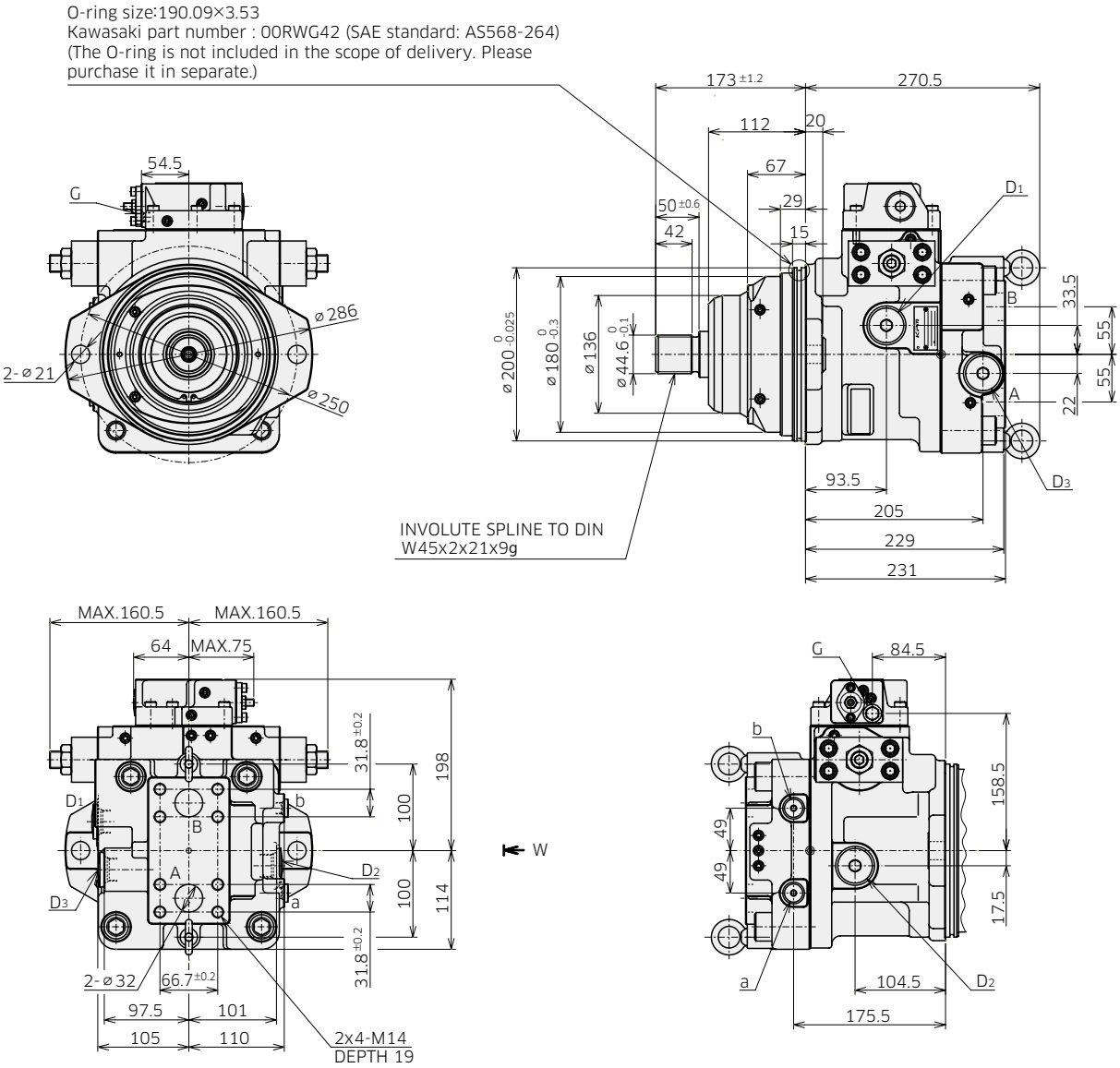
## 7-1 Installation Dimensions

∗Dimensions in mm.

### ◆ M7VC160,Rear Port

Model Code : M7VC 160 A C 4 7 – ∗∗∗∗∗∗∗∗

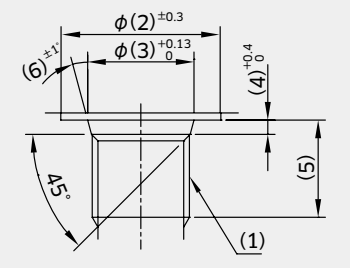





Refer to the page 63 and 64 for dimensions with other regulator options.

## 7. Dimensions

# 7-1 Installation Dimensions




*Dimensions in mm.

### ◆ M7VC160 Port and Flange Fixing Thread (Ordering code [5])

### Thread Port

ANSI thread type (Code : 1)

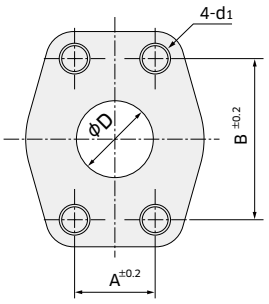
| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | 9/16-18UNF-2B | 25 | 15.6 | 2.5 | 12.7 | 12 | 59 |
| Gauge port | G | 7/16-20UNF-2B | 21 | 12.4 | 2.4 | 11 | 12 | 12 |
| Pilot port | Pi | 9/16-18UNF-2B | 25 | 15.6 | 2.5 | 12.7 | 12 | 59 |
| Drain port | D1 to D5 | 1-1/16-12UN-2B | 41 | 29.2 | 3.3 | 16.7 | 15 | 170 |

Parallel piping thread type (Code : 4)

| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | G 1/4 | 25 | 15.6 | 2.5 | 15 | 15 | 36 |
| Pilot port | Pi | G 1/4 | 24 | 15.6 | 2.5 | 14 | 15 | 36 |
| Drain port | D1 to D5 | G 3/4 | 45 | 30.8 | 3.5 | 16.7 | 15 | 170 |

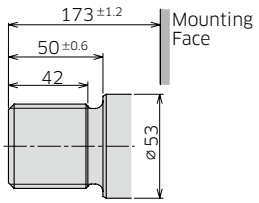
Flange Port

| Port thread type code | d1 | A | B | D |
|---|---|---|---|---|
| 1 | 1/2-13UNC-2B | 31.8 | 66.7 | 32 |
| 4 | M14 | 31.8 | 66.7 | 32 |



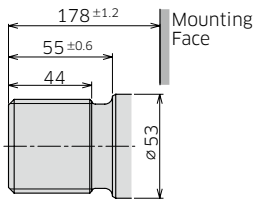

### ◆ Shaft End (Ordering Code [6])

**DIN 5480**
(W45x2x21x9g)




Code : 7

**DIN 5480**
(W50x2x24x9g)

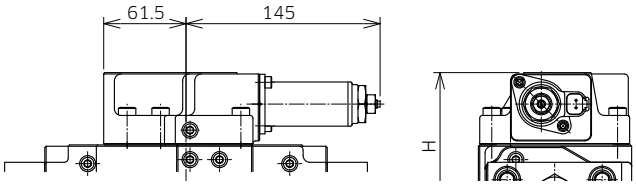



Code : 8

# 7-2 Regulators Installation Dimensions

*Dimensions in mm.

## Electric Two Position Displacement Control
### Regulator Code: T1, T2

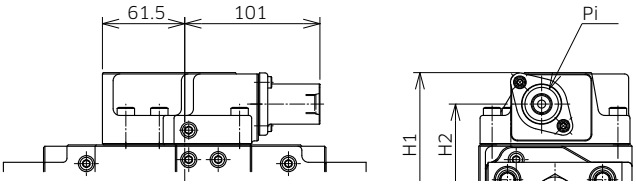



Dimension H : Height from shaft center.

Dimension H (mm)

| Motor size | Dimension |
|---|---|
| | H |
| 160 | 198 |

## Hydraulic Two Position Displacement Control
### Regulator Code: Y1,Y2




Dimension H : Height from shaft center.

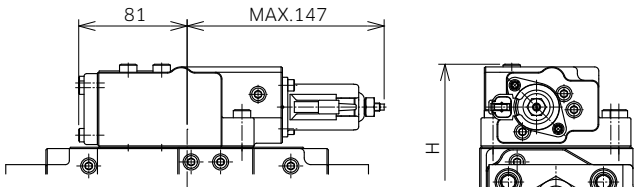
Dimension H1, H2 (mm)

| Motor size | Dimension | |
|---|---|---|
| | H1 | H2 |
| 160 | 198 | 175 |

# 7-2 Regulators Installation Dimensions

*Dimensions in mm.

## ◆ Electric Proportional Control
### Regulator Code: E1, E2, E3 and E4

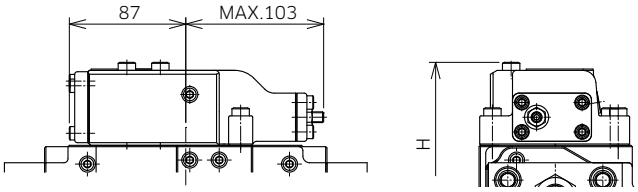



Dimension H : Height from shaft center.

Dimension H (mm)

| Motor size | Dimension |
|---|---|
| | H |
| 160 | 206 |

## ◆ Pressure Related Control
### (with Pressure Increase)
### Regulator Code: H2




Dimension H : Height from shaft center.

Dimension H (mm)

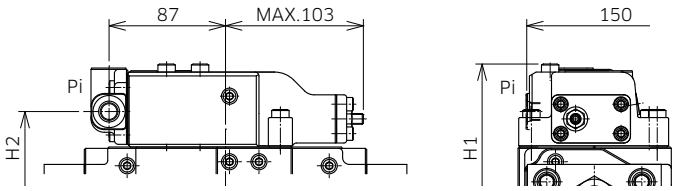
| Motor size | Dimension |
|---|---|
| | H |
| 160 | 206 |

## ◆ Pressure Related Control
### (with Pressure Increase Cut-Off Shift)
### Regulator Code: H3

## ◆ Hydraulic Proportional Control
### Regulator Code: P1, P2, P3 and P4

Dimension H1, H2 (mm)

| Motor size | Dimension | |
|---|---|---|
| | H1 | H2 |
| 160 | 206 | 171 |




Dimension H : Height from shaft center.

# M7X Series

## Fixed Displacement Type Axial Piston Motors

### ■Specifications

Size : 85, 112, 160

Nominal Pressure : 42 (6,090 psi)
Maximum Pressure : 50 (7,250 psi)

### ■General Descriptions

- Applicable to an open circuit and closed circuit.
- Applicable to construction machinery and industrial vehicles.
- Swash plate design allows for a compact motor.
- High power density.

### ■Features

**Superior performance at High and Low speed**

Optimized rotary balance design enables high speed perfomance and excellent low speed characteristics.

**Low noise**

Swash plate configuration provides the low noise.

**Compact size**

Swash plate configuration provides the more compact structure and flexibility in system design.

**Long bearing life**

Swash plate configuration results in longer bearing life.

# 8 M7X Ordering Code

Model Code

| 1 | 2 | 3 | 4 | 5 | 6 | | 7 | 8 | 9 | 10 | | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M7X | 85 | A | A | 1 | 2 | - | A | 3 | B | 1 | - | * |

**1. M7X Series**

M7X Series, Fixed Displacement, Axial Piston Motor, Applicable in Both Open and Closed Loops

**2. Size**

| | 85 | 112 | 160 |
|---|---|---|---|
| Standard Size | ● | ● | ● |

**3. Series Specifications**

| | |
|---|---|
| A | Standard |

**4. Mounting Flange and Port Position**

| | Mounting | Port Position | 85 | 112 | 160 |
|---|---|---|---|---|---|
| A | SAE J744, 4-bolt Mount | Rear | ● | ● | ● |
| B | SAE J744, 4-bolt Mount | Side | ● | ● | ● |
| C | ISO3019-2, 4-bolt Mount | Rear | ● | ● | ● |
| D | ISO3019-2, 4-bolt Mount | Side | ● | ● | ● |

**5. Port and Flange Fixing Thread**

| | Thread Port Type | Flange Fixing Thread Type | 85 | 112 | 160 |
|---|---|---|---|---|---|
| 1 | ANSI ISO11926 | ANSI ASME B1.1 | ● | ● | ● |
| 4 | Parallel Piping ISO228 | Metric ISO724 | ● | ● | ● |

**6. Shaft End**

| | Standard | Specification | 85 | 112 | 160 |
|---|---|---|---|---|---|
| 2 | ANSI B92.1 | 1 3/4 in 13T 8/16DP | — | ● | ● |
| 4 | ANSI B92.1 | 1 3/8 in 21T 16/32DP | ● | — | — |
| 5 | DIN5480 | W35x2x16x9 g | ○ | — | — |
| 6 | DIN5480 | W40x2x18x9 g | ● | ● | — |
| 7 | DIN5480 | W45x2x21x9 g | — | ● | ● |
| 8 | DIN5480 | W50x2x24x9 g | — | ○ | ● |
| 9 | ANSI B92.1 | 1 1/4 in 14T 12/24DP | ● | — | — |

**7. Displacement Sett**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Size | 85 | A : 90 | ● | B : 80 | ● | C : 75 | ○ | D : 85 | ● |
| | 112 | A : 112 | ● | B : — | — | C : — | — | D : — | — |
| | 160 | A : 160 | ● | B : — | — | C : — | — | D : — | — |

**8. Optional Valve**

| | Counter Balance Valve | Flushing Valve | 85 | 112 | 160 |
|---|---|---|---|---|---|
| Blank | w/o Counter Balance Valve | w/o Flushing Valve | ● | ● | ● |
| X | w/ Counter Balance Valve Hoist at CW rotation (A port inlet) viewed from the shaft end | w/o Flushing Valve | ○ | ○ | ○ |
| Y | w/ Counter Balance Valve Hoist at CCW rotation (B port inlet) viewed from the shaft end | w/o Flushing Valve | ○ | ○ | ○ |
| Z | w/o Counter Balance Valve | w/ Flushing Valve | ○ | ○ | ○ |

**9. Port Option for Loop Flushing Valve Assembly**

| | | 85 | 112 | 160 |
|---|---|---|---|---|
| Blank | w/o Any Accessory | ● | ● | ● |
| A | Parallel Piping ISO228 | ○ | ○ | ○ |
| B | ANSI ISO11926 | ○ | ○ | ○ |

**10. Speed Sensor**

| | | 85 | 112 | 160 |
|---|---|---|---|---|
| 1 | w/o Speed Sensor | ● | ● | ● |
| 2 | w/ Speed Sensor (A port side) | ● | ● | ● |
| B | w/ Speed Sensor (B port side) | ● | ● | ● |

**11. Design Code**

| | | 85 | 112 | 160 |
|---|---|---|---|---|
| ** | 01~ | ● | ● | ● |

● : Available
○ : Under development
— : Not available

# 9 Technical Information

## 9-1 Specifications

### M7X Series

| Size | | 85 | 112 | 160 |
|---|---|---|---|---|
| Max. Displacement : $q_{max}$ | $cm^3$ ($in^3$) | 90 (5.5) | 112 (6.9) | 160 (9.8) |
| Max. Speed : $N_{nom}$ | $min^{-1}$ (rpm) | 4,500 | 3,550 | 3,100 |
| Nominal pressure : $P_{nom}$ *1 | MPa (psi) | 42 (6,092) | | |
| Max. Pressure : $P_{max}$ *2 | MPa (psi) | 50 (7,252) | | |
| Theoretical output torque | Nm (lbf ft) | 602 (444) | 749 (552) | 1,070 (789) |
| Power | kW (hp) | 284 (381) | 278 (373) | 347 (465) |
| Max. Flow : Q | L/min (gallon/min) | 405 (107) | 398 (105) | 496 (131) |
| Moment of inertia | $kg \cdot m^2$ | 0.011 | 0.017 | 0.030 |
| Volume in the case | L (gallon) | 0.5 (0.21) | 0.5 (0.21) | 1.2 (0.32) |
| Mass | kg (lb) | 26 | 34 | 45 |
| Temperature | ℃ (°F) | −20 to +115 (−4 to +239) at drain port<br>−20 to +90 (−4 to +194) at inlet port | | |
| Coating | | Red synthetic resin primer | | |

*1 : Nominal pressure corresponds to the design pressure to provide appropriate performance, function, and service life.
: Nominal pressure corresponds to the design pressure at which the products will function properly.

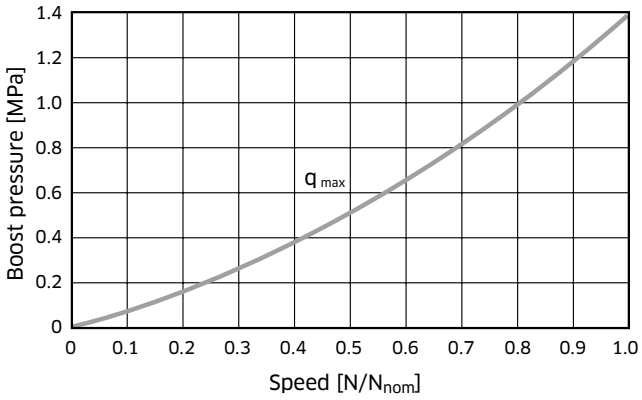
*2 : Summation of pressure on A and B port shall be 56 MPa or less.

# 9-2 Precautions for System Design

## Minimum. Boost Pressure

To prevent cavitation when the motor is operating in a pumping mode, a positive pressure is required at the suction port.
The figure on the right shows the minimum boost pressure requirement based on regular operation. In case of a rapid change of the flow, more boost pressure must be applied.

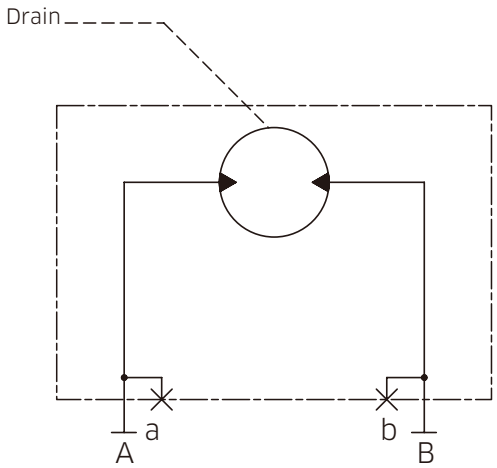
**Minimum boost pressure**



# 9-3 Optional Valve

## Ordering Code [8] : Blank, X, Y, Z

### ◆ Blank : w/o Counter Balance Valve, w/o Flushing Valve




### ◆ X, Y : w/ Counter Balance Valve, w/o Flushing Valve (Under development)

Counter Balance Valve is used for hoisting on the winch application.

### ◆ Z : w/o Counter Balance Valve, w/ Flushing Valve (Under development)

The function is chosen in case that the circuit needs additional cooling or minimum boost pressure needs to be ensured.

# 9-4 Speed Sensor

## Ordering Code [10] : 1, 2, B

### ◆ 1 : w/o Speed Sensor

●A speed sensor is not installed.

### ◆ 2 : w/ Speed Sensor (A port side)

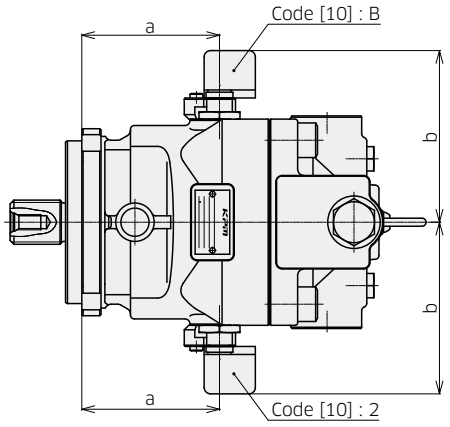
●A speed sensor that detects the motor speed and direction is installed at A port side.

### ◆ B : w/ Speed Sensor (B port side)

●A speed sensor that detects the motor speed and direction is installed at B port side.

#### Specification

Supply Voltage : 4.5V ~ 26V DC
Mating Connector : TE Connectivity AMP Superseal 1.5 series, 4 positions(part number : 282088)
IP Protection Rating : IP69K




| | | | M7X85 | M7X112 | M7X160 |
|---|---|---|---|---|---|
| a [mm] | Code [4] | A, B | 107.5 | 116.5 | 124.5 |
| | | C, D | 85.0 | 84.5 | 94.5 |
| b [mm] | | | 134 | 139 | 147 |
| Pulse Frequency [pulse/rev] | | | 71 | 77 | 87 |

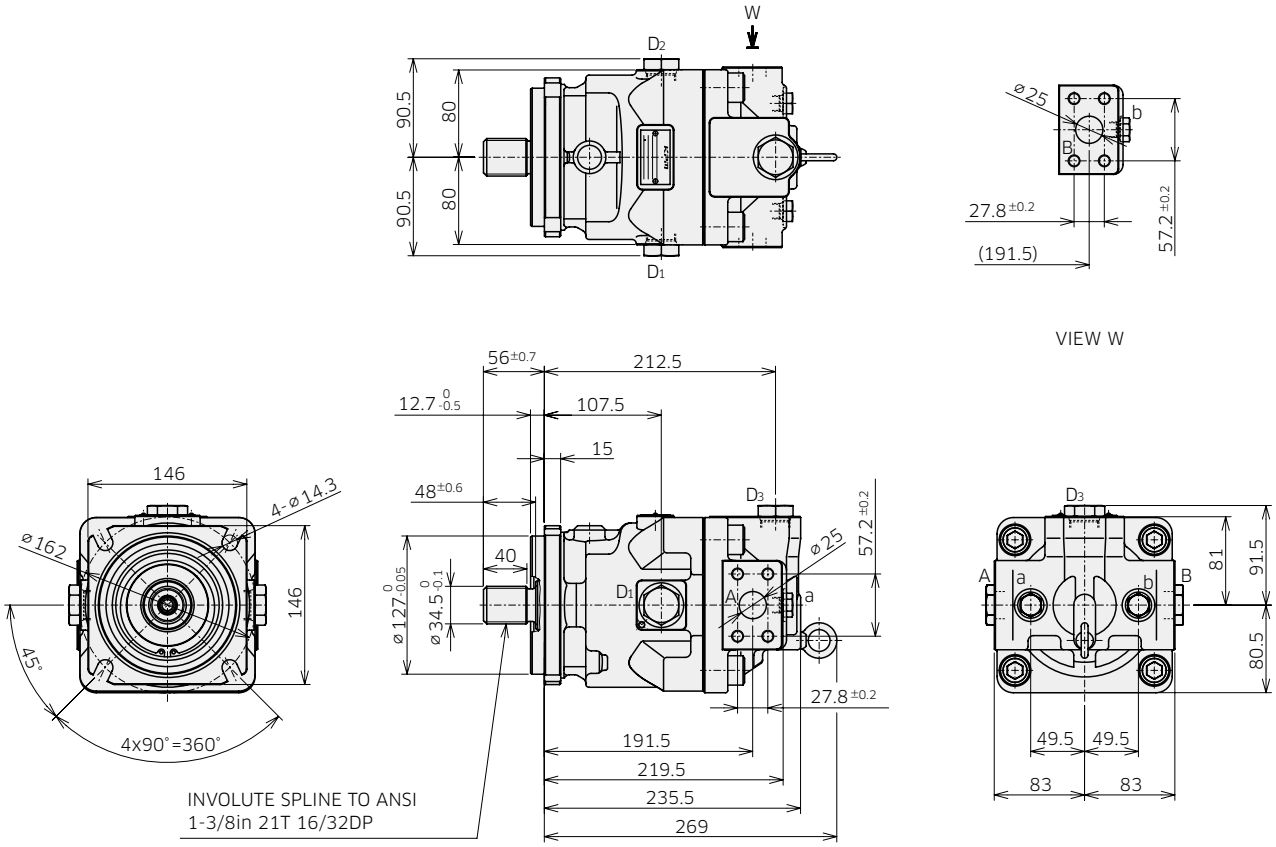
# 10 Dimensions

## Installation Dimensions

*Dimensions in mm.

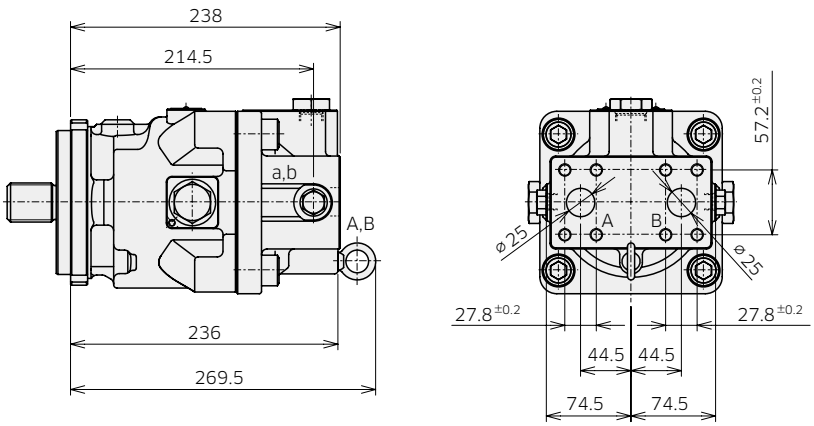
### M7X85 SAE Mounting, Side Port

Model Code : M7X 85 A B 1 4 – A 1




### M7X85 SAE Mounting, Rear Port

Model Code : M7X 85 A A 1 4 – A 1



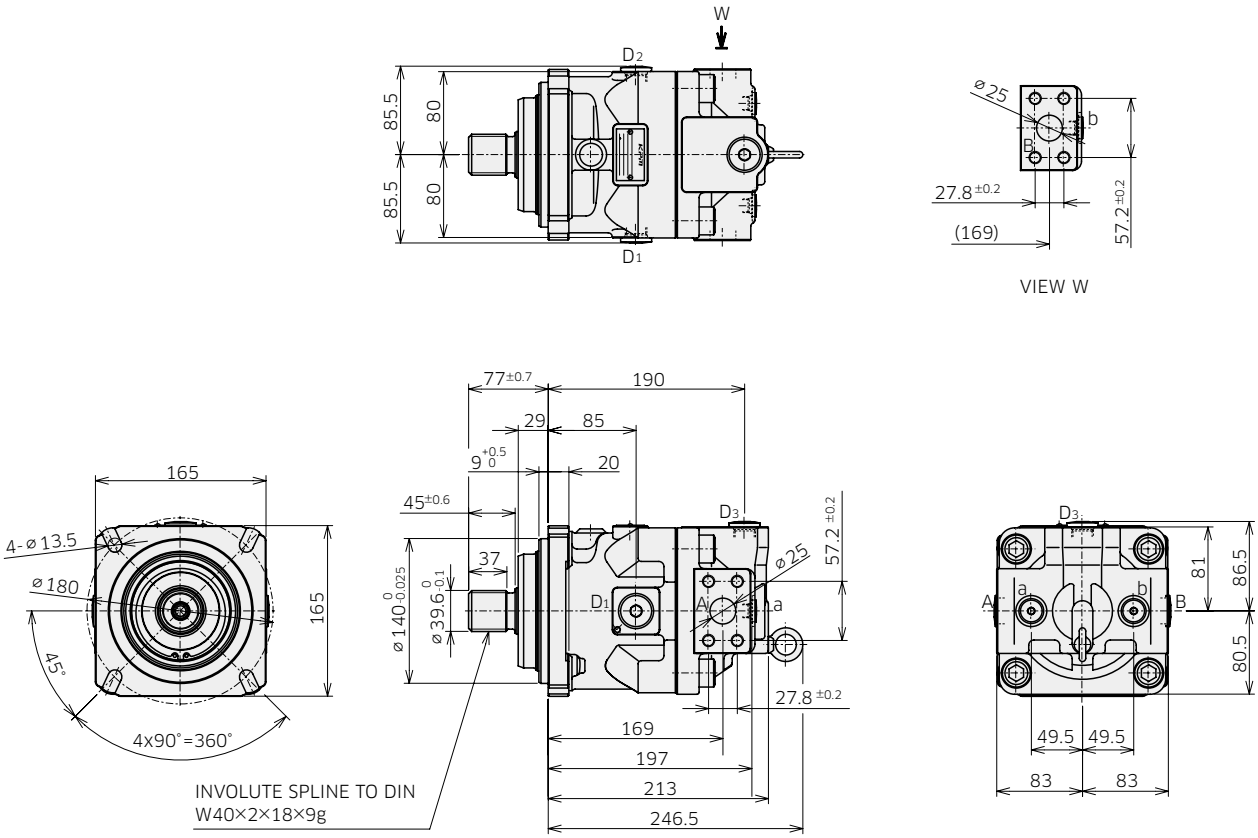
## 10. Dimensions

# Installation Dimensions

*Dimensions in mm.

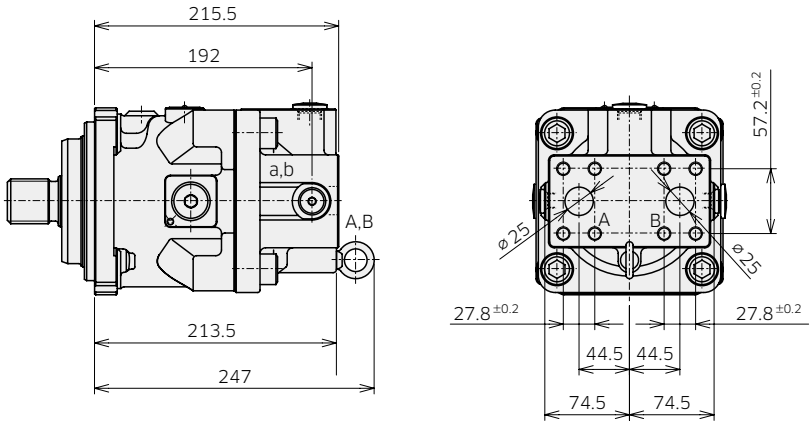
### M7X85 ISO Mounting, Side Port

Model Code : M7X 85 A D 4 6 – A 1

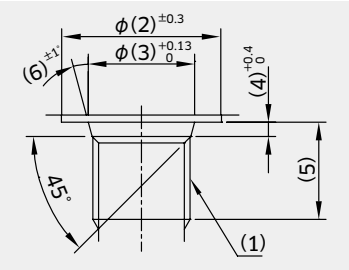



### M7X85 ISO Mounting, Rear Port

Model Code : M7X 85 A C 4 6 – A 1



# Installation Dimensions




*Dimensions in mm.

## M7X85 Port and Flange Fixing Thread (Ordering Code [5])

### Drain and Gauge Port

ANSI thread type (Code : 1)

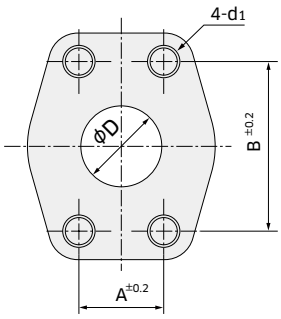
| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | 9/16-18UNF-2B | 24 | 15.6 | 2.5 | 15 | 12 | 59 |
| Drain port | D1 to D3 | 1-1/16-12UN-2B | 41 | 29.2 | 3.3 | 19 | 15 | 170 |

Parallel piping thread type (Code : 4)

| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | G 1/4 | 24 | 15.6 | 2.5 | 15 | 15 | 36 |
| Drain port | D1 to D3 | G 1/2 | 34 | 22.6 | 2.5 | 19 | 15 | 108 |

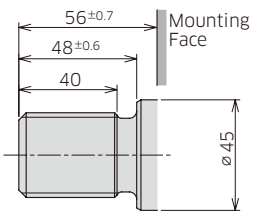
Flange port

| Port thread type code | d1 | A | B | D |
|---|---|---|---|---|
| 1 | 7/16-14UNC-2B | 27.8 | 57.2 | 25 |
| 4 | M12 | 27.8 | 57.2 | 25 |



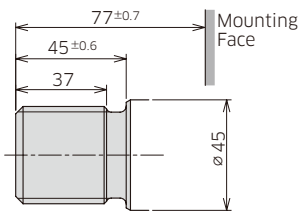

## Shaft End (Ordering Code [6])

**ANSI B92.1a**
(1-3/8in 21T 16/32DP)



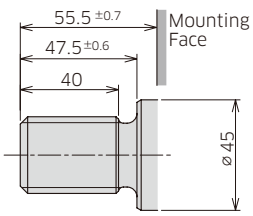

Code : 4

**DIN 5480**
(W40x2x18x9g)




Code : 6

**ANSI B92.1a**
(1-1/4in 14T 12/24DP)




Code : 9

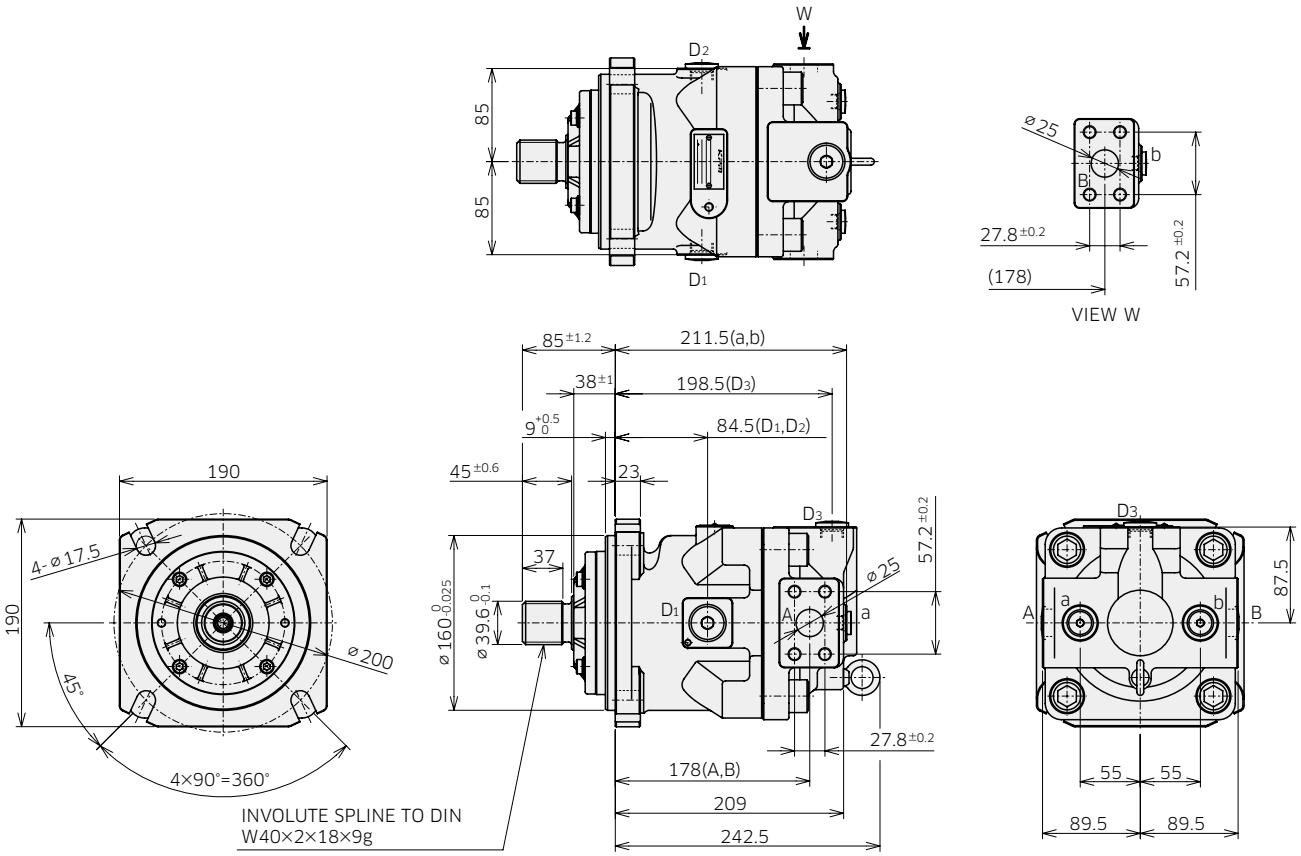
## 10. Dimensions

# Installation Dimensions

*Dimensions in mm.

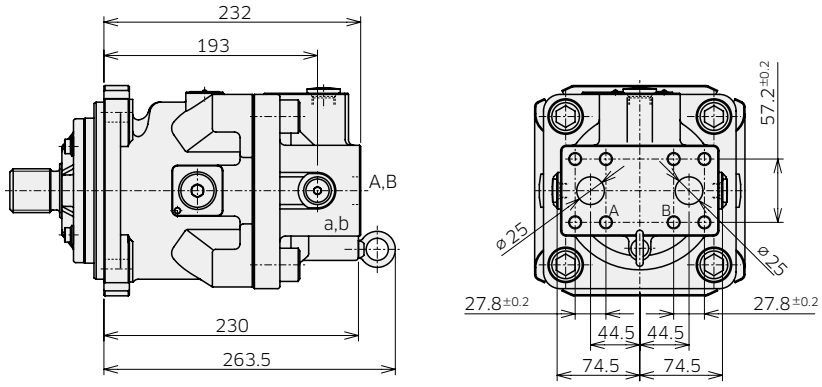
### M7X112 ISO Mounting, Side Port

Model Code : M7X 112 A D 4 6 – A 1

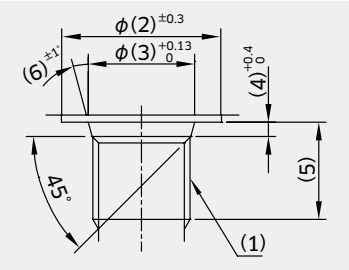



### M7X112 ISO Mounting, Rear Port

Model Code : M7X 112 A C 4 6 – A 1



# Installation Dimensions




*Dimensions in mm.

## M7X112 Port and Flange Fixing Thread (Ordering Code [5])

### Drain and Gauge Port

ANSI thread type (Code : 1)

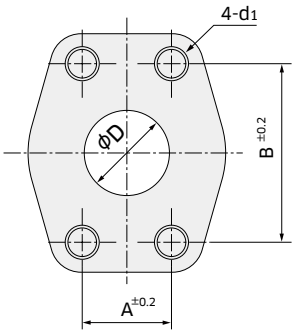
| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | 9/16-18UNF-2B | 24 | 15.6 | 2.5 | 15 | 12 | 59 |
| Drain port | D1 to D3 | 1-1/16-12UN-2B | 41 | 29.2 | 3.3 | 19 | 15 | 170 |

Parallel piping thread type (Code : 4)

| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | G 1/4 | 24 | 15.6 | 2.5 | 15 | 15 | 36 |
| Drain port | D1 to D3 | G 1/2 | 34 | 22.6 | 2.5 | 19 | 15 | 108 |

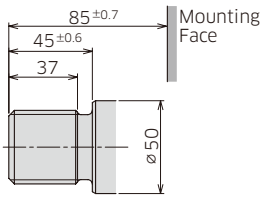
Flange port

| Port thread type code | d1 | A | B | D |
|---|---|---|---|---|
| 1 | 7/16-14UNC-2B | 27.8 | 57.2 | 25 |
| 4 | M12 | 27.8 | 57.2 | 25 |



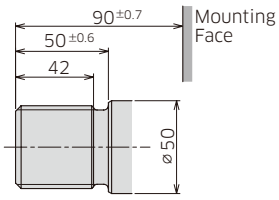

## Shaft End (Ordering Code [6])

**DIN 5480**
(W40x2x18x9g)




Code : 6

**DIN 5480**
(W45x2x21x9g)




Code : 7

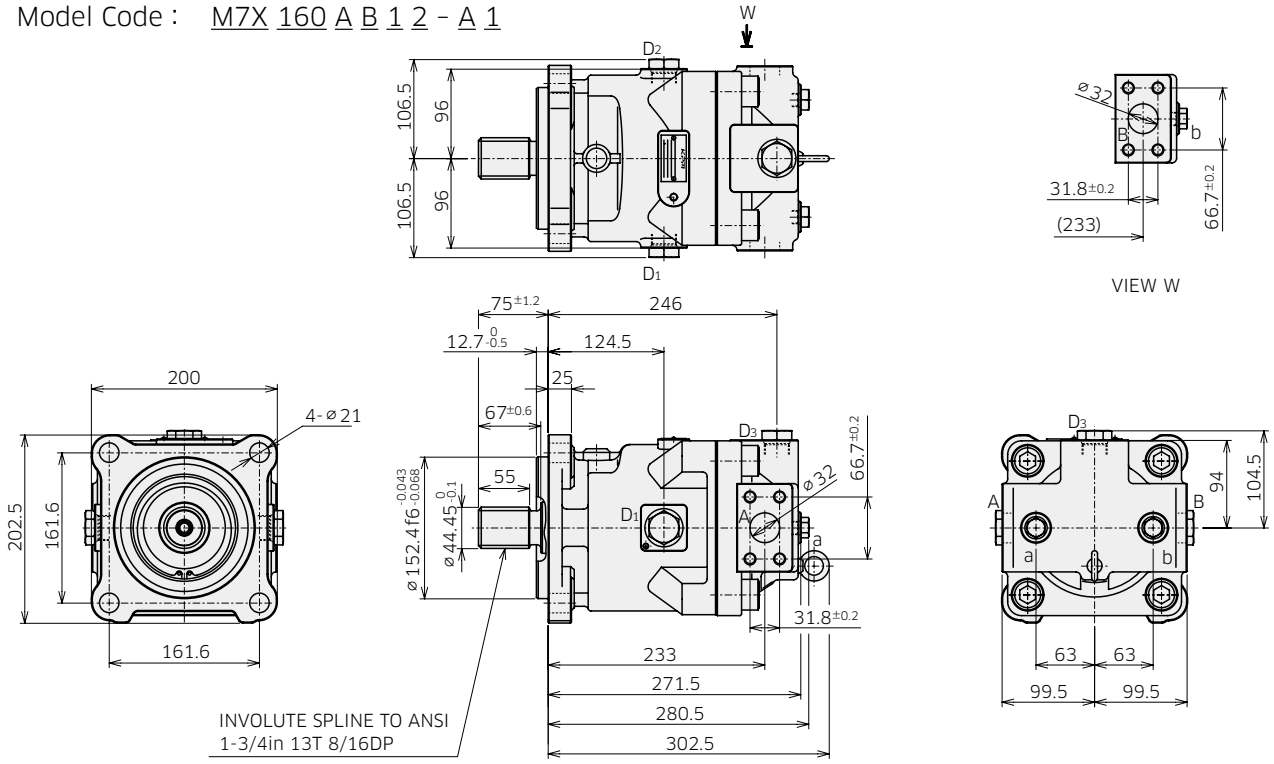
## 10. Dimensions

# Installation Dimensions

*Dimensions in mm.

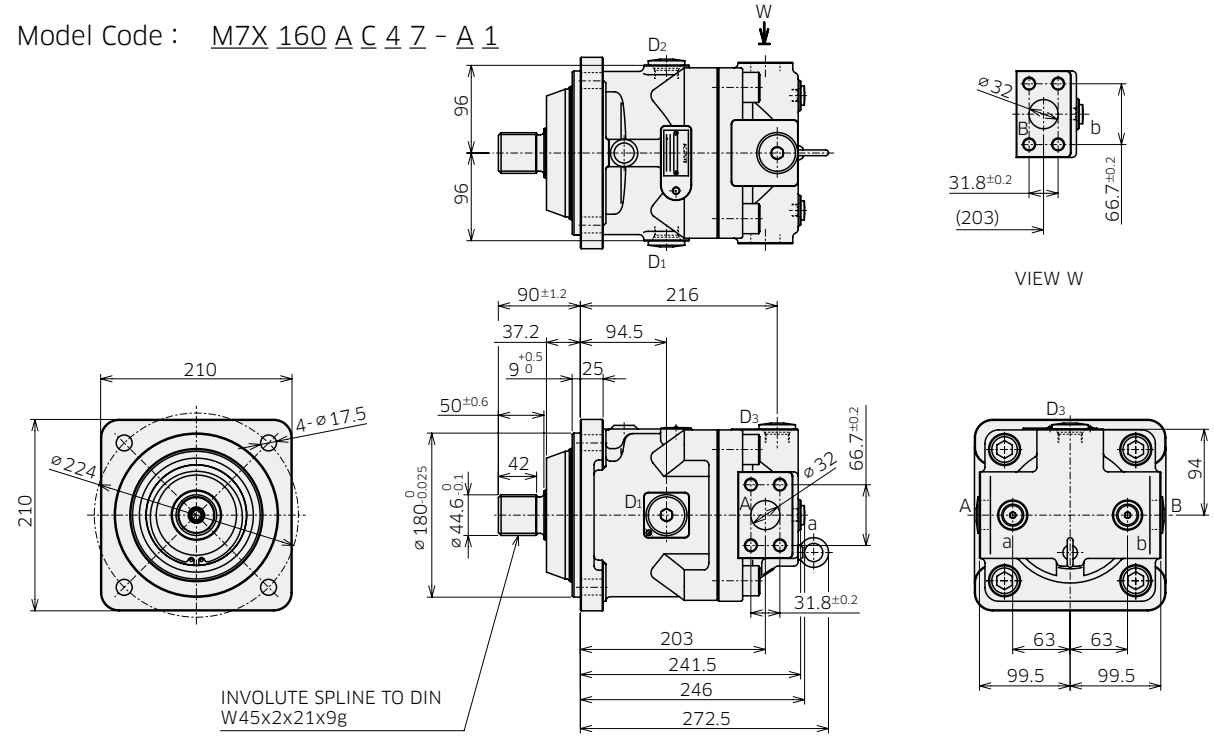
### M7X160 SAE Mounting, Side Port

Model Code : M7X 160 A B 1 2 – A 1

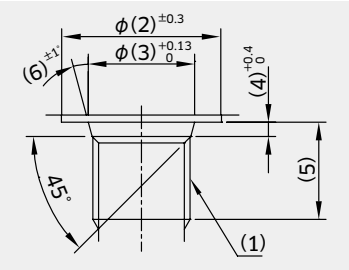



### M7X160 ISO Mounting, Side Port

Model Code : M7X 160 A C 4 7 – A 1



# Installation Dimensions




*Dimensions in mm.

## M7X160 Port and Flange Fixing Thread (Ordering Code [5])

### Drain and Gauge Port

ANSI thread type (Code : 1)

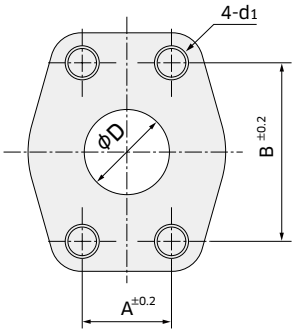
| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | 9/16-18UNF-2B | 24 | 15.6 | 2.5 | 12.7 | 12 | 59 |
| Drain port | D1 to D3 | 1-1/16-12UN-2B | 41 | 29.2 | 3.3 | 19 | 15 | 170 |

Parallel piping thread type (Code : 4)

| | Symbol | (1) | (2) | (3) | (4) | (5) | (6) | Tightening torque (Nm) |
|---|---|---|---|---|---|---|---|---|
| Gauge port | a, b | G 1/4 | 24 | 15.6 | 2.5 | 15 | 15 | 36 |
| Drain port | D1 to D3 | G 3/4 | 45 | 30.8 | 3.5 | 20 | 15 | 170 |

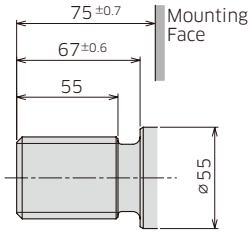
Flange port

| Port thread type code | d1 | A | B | D |
|---|---|---|---|---|
| 1 | 1/2-13UNC-2B | 31.8 | 66.7 | 32 |
| 4 | M14 | 31.8 | 66.7 | 32 |



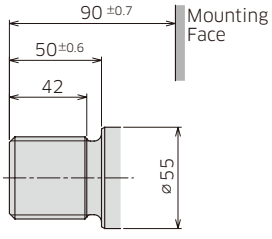

## Shaft End (Ordering Code [6])

**ANSI B92.1a**
(1-3/4in 13T 8/16DP)




Code : 2

**DIN 5480**
(W45x2x21x9g)




Code : 7

# M7V, M7VC, M7X Inquiry Form

Please go to the page below link. An Inquiry Form which is formed by excel is available at the download section.
https://global.kawasaki.com/en/industrial_equipment/hydraulic/motors/m7v_m7x.html

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**The specified data is for product description purposes only and may not be deemed to be guaranteed unless expressly confirmed in the contract.**

Data sheet: PDC021/04.2020