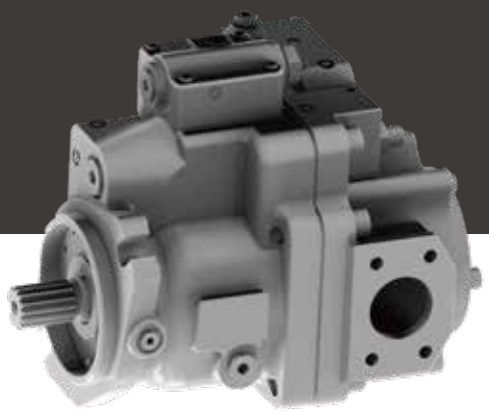
# Axial Piston Variable Pump
# HK3VL Series B

Size：80 mL/r
Rated pressure：32 MPa
Max.pressure：35 MPa



## Features

- Axial piston variable pump of swashplate design for open circuits
- Continuous high pressure
- High power to weight ratio
- Excellent suction characteristics
- Diverse control options, short control response time
- Low pulsation, low noise
- High reliability and long service life

## Contents

## Model Code

| | A | | C | F | | H | J | K | P | N | R | | T | | X | | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HK3VL | 80 | / | B | | — | 1 | | | | | | — | | — | | — | |

### Axial Piston Unit

| | | |
|---|---|---|
| — | Swashplate design, variable piston pump | HK3VL |

### Displacement

| | | | |
|---|---|---|---|
| A | Geometric displacement, in mL/r | 80 | |

### Series

| | | |
|---|---|---|
| C | Series B | B |

### Sealing Material

| | | | |
|---|---|---|---|
| F | | 80 | |
| | NBR seal + FKM Shaft seal | ● | N |
| | NBR seal | ● | P |
| | FKM seal | ● | V |

### Operation

| | | | |
|---|---|---|---|
| H | | 80 | |
| | Open circuit | ● | 1 |

### Through-Shaft Drive Mounting Type

| | | | | |
|---|---|---|---|---|
| J | Flange SAE J744 | Coupling sleeve | 80 | |
| | Without through drive | | ● | N00 |
| | Standard configuration: X-type 4-hole flange and 6 cc/rev gear pump | | ○ | X1 |
| | Standard configuration: X-type 4-hole flange and 10 cc/rev gear pump | | ○ | X2 |
| | SAE A 82-2 | SAE J744-16-4 9T 16/32DP | ● | K01 |
| | | SAE J744-19-4 11T 16/32DP | ● | K52 |
| | SAE B 101-2 | SAE J744-22-4 13T 16/32DP | ○ | K02 |
| | | SAE J744-25-4 15T 16/32DP | ○ | K04 |
| | SAE C 127-2 | SAE J744-32-4 14T 12/24DP | ○ | K07 |
| | | SAE J744-38-4 17T 12/24DP | ○ | K24 |
| | SAE C 127-4 | SAE J744-32-4 14T 12/24DP | ○ | K15 |
| | | SAE J744-38-4 17T 12/24DP | ○ | K16 |
| | SAE D 152-4 | SAE J744-44-4 13T 8/16DP | ○ | K17 |

### Direction of Rotation

| | | | |
|---|---|---|---|
| K | | 80 | |
| | CW | ● | R |
| | CCW(Tandem only) | ● | L |

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| HK3VL | 80 | / | B | | — | 1 | | | | | | — | | — | | — | |

### Mounting Flange

| | | 80 | |
|---|---|---|---|
| P | SAE J744 C 127-2 | ● | C2 |
| | SAE J744 C 127-2/4 | ○ | C4 |
| | SAE J744 D 152-4 | ○ | D4 |

### Drive Shaft

| | | 80 | |
|---|---|---|---|
| N | ANSI B92.1 spline shaft 1″ 15T 16/32DP | ● | S2 |
| | ANSI B92.1 spline shaft 1 1/4″ 14T 12/24DP | ● | S3 |
| | ANSI B92.1 spline shaft 1 1/2″ 17T 12/24DP | – | S4 |
| | ANSI B92.1 spline shaft 1 3/4″ 13T 8/16DP | – | S5 |
| | DIN 5480 W50×2×24×9g | – | D4 |
| | SAE J744-32-1 B7.94×44 parallel key shaft | ○ | K3 |
| | DIN 6885 14×9×75 parallel key shaft | – | K8 |

### Metric

| | | 80 | |
|---|---|---|---|
| R | Metric thread | ● | M |
| | UNC | ● | S |

### Variable Control Method

| | | | 80 | |
|---|---|---|---|---|
| T | Cover plate for fixed pump operation | | ○ | N |
| | Pressure Control | Only pressure control | ○ | DR |
| | | With load sensing, with orifice R4 | ○ | L0 |
| | | With load sensing, without orifice R4 | ○ | L1 |
| | | With remote pressure control | ○ | P0 |
| | | With electro-proportional displacement control — U=12V DC | ○ | DR-EP1 |
| | | With electro-proportional displacement control — U=24V DC | ○ | DR-EP2 |
| | Power Control | With pressure control+Load sensing, with orifice R4 | ○ | L0/1 |
| | | With pressure control+Load sensing, without orifice R4 | ● | L1/1 |
| | | With pressure control+Remote pressure control | ○ | P0/1 |
| | | With pressure control+Load sensing +Electro-proportional power control — U=12V DC | ● | L1/1-E1 |
| | | With pressure control+Load sensing +Electro-proportional power control — U=24V DC | ● | L1/1-E2 |
| | | With pressure control+Load sensing+Hydraulic proportional power control | ○ | L1/1-H0 |
| | | With pressure control+Electro-proportional displacement control — U=12V DC | ○ | DR/1-EP1 |
| | | With pressure control+Electro-proportional displacement control — U=24V DC | ○ | DR/1-EP2 |

## Model Code

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| HK3VL | 80 | / | B | | — | 1 | | | | | | — | | — | | — | |

### Connector for Solenoids

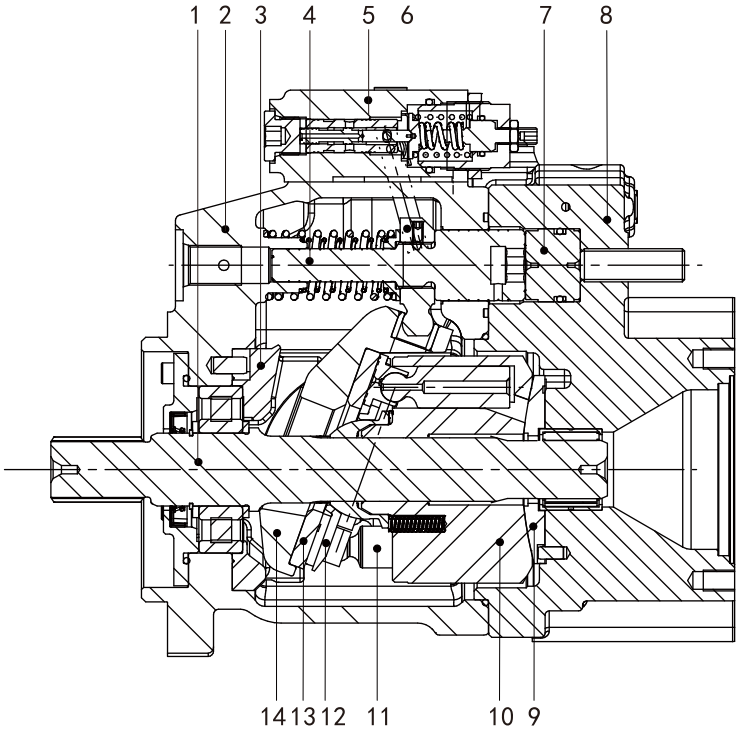
| | | 80 | |
|---|---|---|---|
| X | Without connector(without code) | ● | |
| | DEUTSCH DT04-2P,2-pin plastic connector | ● | D |
| | AMP Junior timer,2-pin plastic connector | ● | A |
| | DIN EN175301-803,3-pin plastic connector | ○ | H |

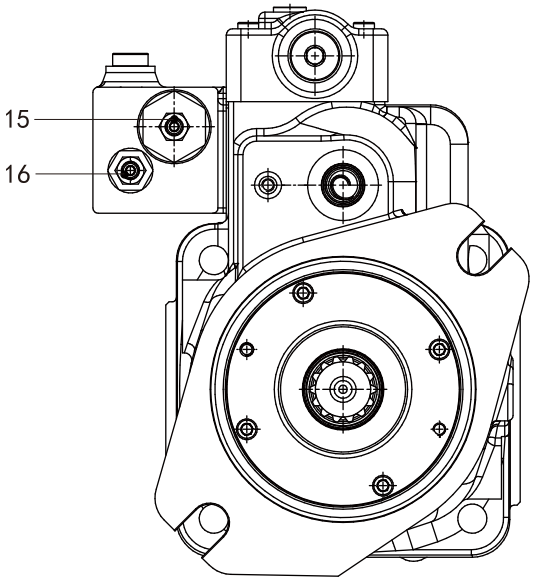
### Special Configuration

| | | 80 | |
|---|---|---|---|
| Y | Without special configuration (without code) | ● | |
| | Special configuration | ● | *** |

● Available ○ On request — Not available ▭ Recommended model

## Structure




1.Drive Shaft
2.Cradle
3.Housing
4.Control Piston
5.Power Control Valve
6.Variable Slide
7.Displacement Adjusting Shim
8.End Cap
9.Port Plate
10.Cylinder Block
11.Piston-Slipper Assembly
12.Retainer Plate
13.Thrust Plate
14.Cradle

15.Pressure Control Valve
16.Flow Control Valve

## Hydraulic Fluid

Mineral oil

## Working Viscosity

In order for the optimum efficiency and service life, it is recommended to select the working viscosity at working temperature within the range below:

$V_{opt}$ = optimal working viscosity 16...36 $mm^2/s$

It is subject to the reservoir temperature of an open circuit.

## Limit Viscosity

Limit viscosity：

$V_{min}$=10$mm^2/s$

Short-term operation，at permissible maximum leakage temperature of 90 ˚C

$V_{max}$=1000$mm^2/s$

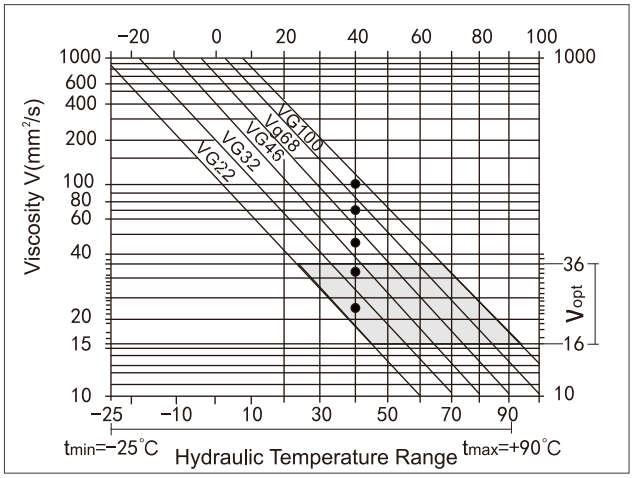
Short-term operation, cold start

## Temperature Range

$t_{min}$=-25˚C

$t_{max}$=90˚C

## Selection Diagram




## Instructions on Selection of Hydraulic Fluid

To select the correct hydraulic fluid, we must know the relationship between the fluid working temperature in the reservoir (open circuit) and the ambient temperature.

The hydraulic fluid should be so selected that the working viscosity in the working range is within the optimum range ($V_{opt}$ ,the shaded area on the selection diagram). The higher viscosity is recommended under the same conditions.

For example:
At an ambient temperature of X ˚C, the working temperature of the circuit is 60 ˚C. The viscosity within the optimum range ($V_{opt}$ ,shaded area) is VG46 or VG68 and the latter should be selected.

Note:
The leakage (case drain) temperature depends on the pressure and speed of the pump, and it is always higher than the reservoir temperature. However, the maximum temperature at any point within the system should not exceed 95˚C.

## Filtration

Finer filtration improves the cleanliness level of the hydraulic fluid, thus increasing the service life of the axial piston unit. To ensure normal operation of the axial piston unit, a cleanliness level of at：

NAS 1638,9

ISO/DIS 4406 18/15

## Mechanical Displacement Limiter

The mechanical displacement limiter is available for without through drive piston pumps and it realizes free adjustment of maximum displacement between 100%⇔50%.

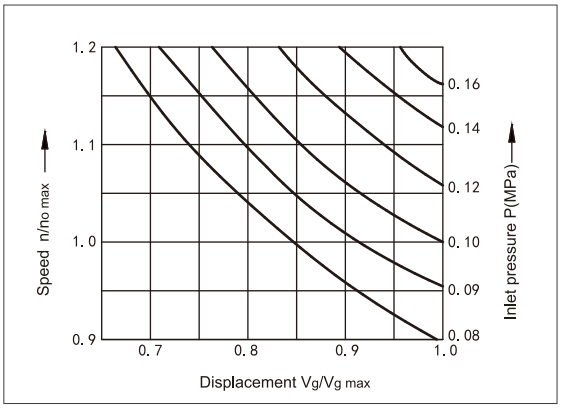
## Operating Pressure Range – inlet side

The absolute pressure at port S (suction port) determines the inlet pressure $p_{abs}$ at port S;

alternatively, displacement decreases with increasing speed.

pabsmin _____ 0.08MPa

pabsmax _____ 3MPa




## Operating Pressure Range – outlet side

Pressure at port P

$p_n$ _____ 32MPa

$p_{max}$ _____ 35MPa

## Case Drain Pressure

Maximum permissible pressure at drain port（L、$L_1$）

Maximum 0.5 bar higher than inlet pressure at port S

No higher than 2 bar absolute pressure

## Flow Direction

From port S to P

## Technical Data

| | | | | |
|---|---|---|---|---|
| Size | | | | 80 |
| Displacement | | $V_g$ | mL/r | 80 |
| Maximum Speed for Self-Priming[1)] | | $n_{o\ max}$ | rpm | 2400 |
| Maximum Speed[2)] | | $n_{o\ max}$ | rpm | 3000 |
| Maximum Flow | At $n_{o\ max}$ | $q_{v\ o\ max}$ | L/min | 192 |
| Rated Pressure | | P | MPa | 32 |
| Maximum Pressure | | $P_{max}$ | MPa | 35 |
| Max. torque at $V_{Gmax}$(△p=32MPa) | | $T_{o\ max}$ | Nm | 400 |
| Weight | | m | KG | 38. 5 |
| Case Volume | | | | 0. 8 |
| Temperature Range | | | ˚C | −20˜95 |
| Viscosity Range | | | $mm^2/s$ | 10˜1000[3)] |

1):Suction pressure: ensure 0 MPa at the flange under steady-state conditions, with absolute pressure above 0.1 MPa.
2):Increase suction pressure appropriately.
3):The viscosity is 200–1000 $mm^2/s$, and it needs to be preheated with a heater before formal operation.

## Specification Calculation

Flow $q_v = \frac{V_g \cdot n \cdot \eta_v}{1000}$ [L/min]

Torque $T = \frac{V_g \cdot \Delta p}{2 \cdot \pi \cdot \eta_{mh}}$ [Nm]

Power $P = \frac{2\pi \cdot T \cdot n}{60000} = \frac{q_v \cdot \Delta p}{60 \cdot \eta_t}$ [KW]

$V_g$ = Displacement,mL/r
Δp = Differential pressure,MPa
n = Speed,rpm
$\eta_v$ = Volumetric efficiency
$\eta_{mh}$ = Mechanical-hydraulic efficiency
$\eta_t$ = Total efficiency

## Variable Control Method

L1(L0)

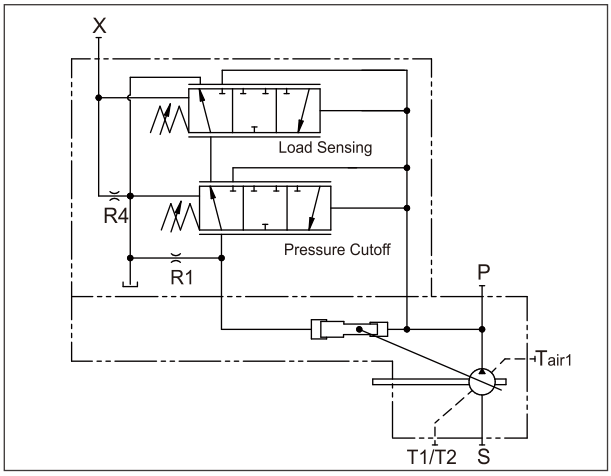
Load sensitive
Standard setting:15bar
Adjustable range:10bar-21bar

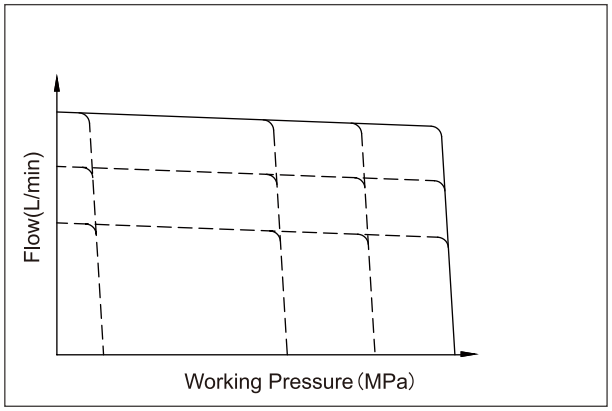
Pressure cut-off
Standard setting:320bar
Adjustable range:21bar-320bar

Difference between L1 and L0
With the L0 option, orifice R4 is present.
When using the L1 option, an external relief valve must be used to prevent pressure locking/overpressure, and in this case orifice R4 is sealed with a screw plug.

Function:
Within the control range, the pressure upstream and downstream of a throttle valve (orifice) in the hydraulic system is compared, maintaining the pressure drop (differential pressure Δp) across the orifice, thus keeping the pump flow constant. The pressure can be adjusted infinitely (steplessly) by the control valve.
By means of the load differential pressure (e.g., from a small orifice), the pump flow can be varied. The pump provides only the actual flow required by the actuator.
When the pressure setting is reached, pressure cutoff correspondingly adjusts the pump displacement back to the minimum displacement setting $V_{min}$.

### Hydraulic Circuit Diagram



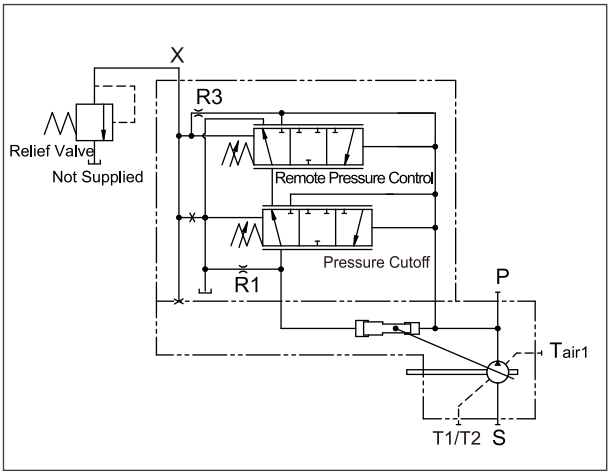



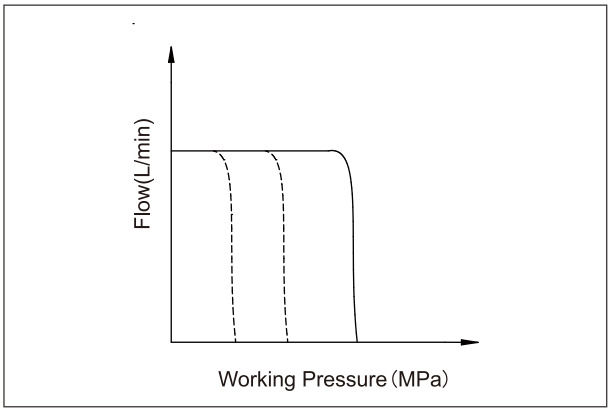

P0

Pressure cut-off
Standard setting:320bar
Adjustable range:21bar-320bar

Function:
When the pump pressure reaches the set pressure cutoff value, the pressure cutoff controller forces the pump back to minimum displacement. The pump pressure can be adjusted by connecting a remote relief valve to port X. Additionally, pressure can be relieved via a solenoid valve under low-pressure standby conditions.

### Hydraulic Circuit Diagram



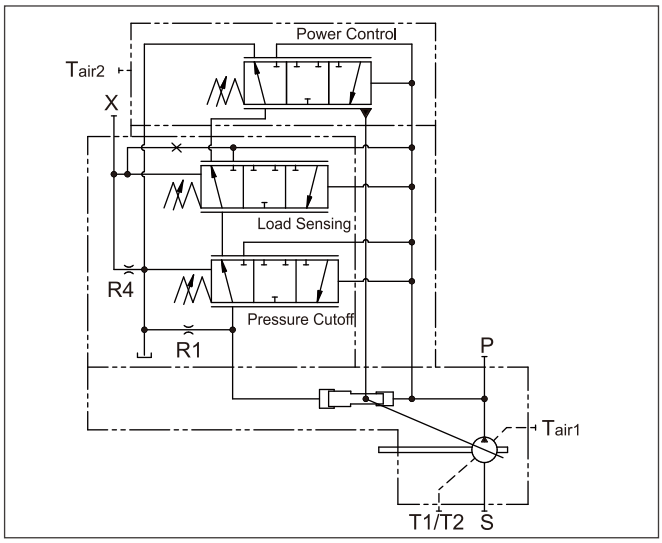
## Variable Control Method

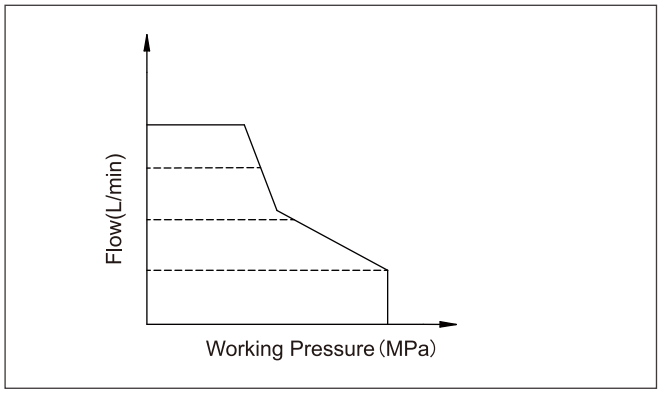
L1/1(L0/1)
Load sensitive
Standard setting:15bar
Adjustable range:10bar～21bar

Pressure cut-off
Standard setting:320bar
Adjustable range:21bar～320bar
Torque limiting

Function:
The swash plate angle of the pump decreases as the pump pressure increases, thereby limiting the input torque.
This effectively prevents damage to the power source caused by excessive load.
The torque limiting module uses two springs to counteract the spool pressure generated by the system pressure.
The appropriate input torque can be set by adjusting the screws on the inner and outer springs.

### Hydraulic Circuit Diagram




L1/1-E□
Load sensitive
Standard setting:15bar
Adjustable range:10bar～21bar

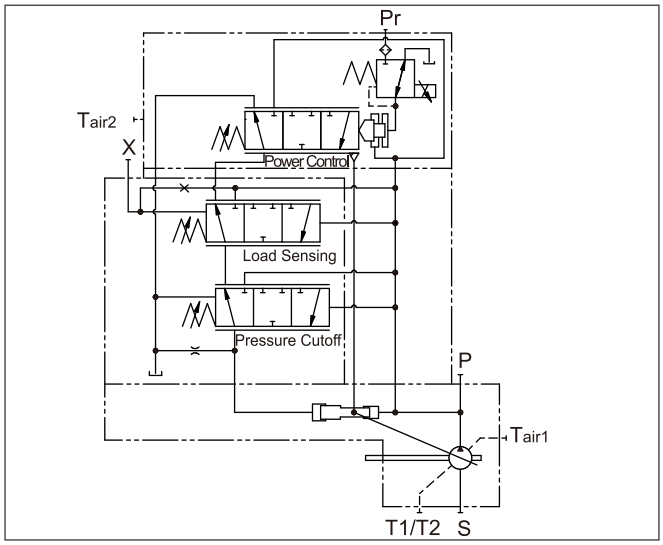
Pressure cut-off
Standard setting:320bar
Adjustable range:21bar～320bar
Pressure at port Pr:20bar～45bar

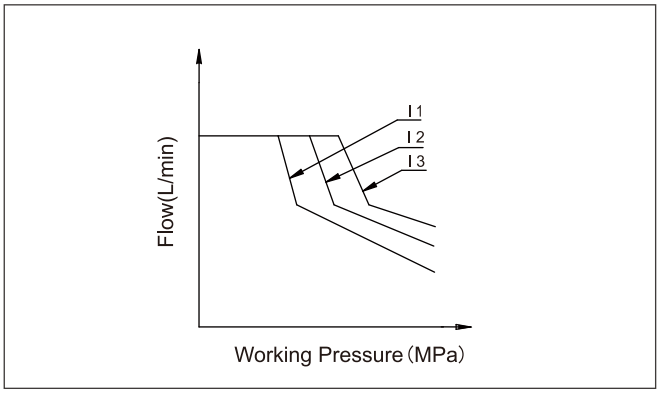
| Code | Voltage（V） |
|---|---|
| L1/1-E1 | 12 |
| L1/1-E2 | 24 |

Connector
DEUTSCH:DT04-2P-E005
AMP：174354-2、173706-1

Function:
By inputting different levels of current to the solenoid, the corresponding input torque of the pump is controlled. Each input current corresponds to one input torque of the pump. This enables the torque requirements of different operating modes to be met.

### Hydraulic Circuit Diagram



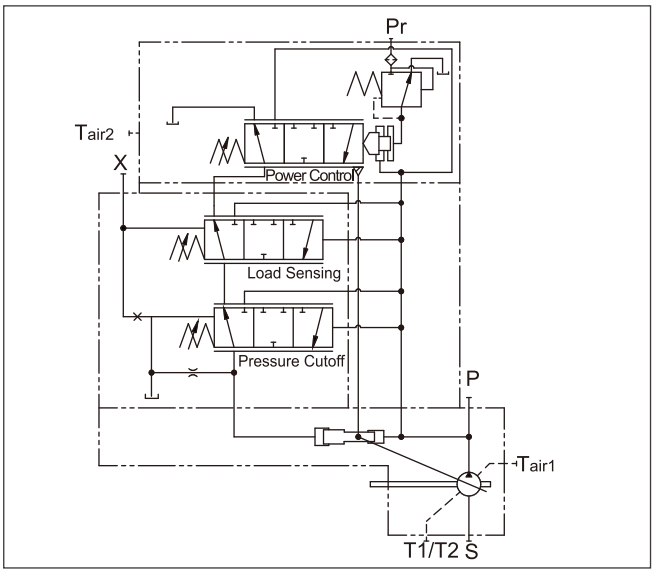
## Variable Control Method

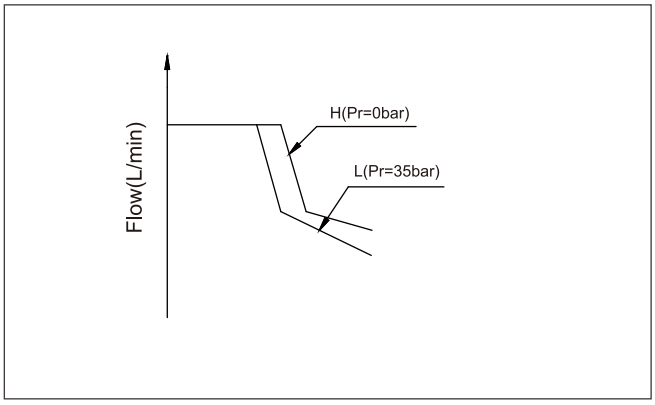
L1/1-H0
Load sensitive
Standard setting:15bar
Adjustable range:10bar～21bar

Pressure cut-off
Standard setting:320bar
Adjustable range:21bar～320bar
Pressure at port Pr:0bar～39bar

Function:
By inputting different levels of pressure through the pilot port Pr, the corresponding input torque of the pump is controlled. This allows the torque requirements of different operating modes to be met on an excavator.

### Hydraulic Circuit Diagram



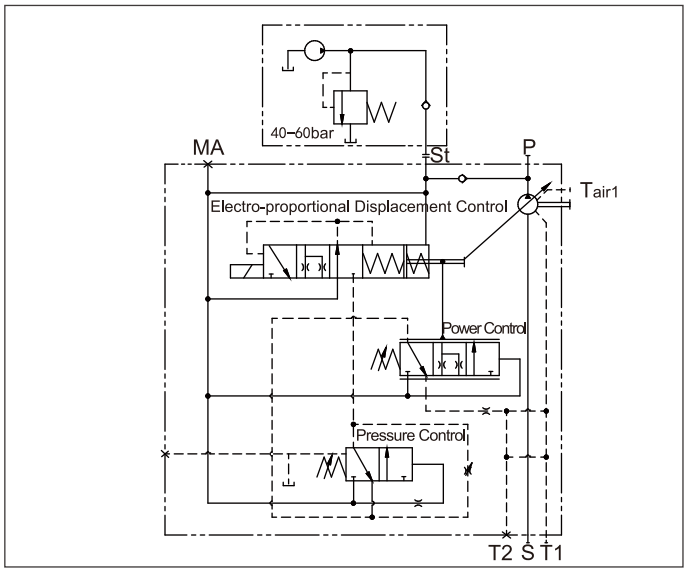



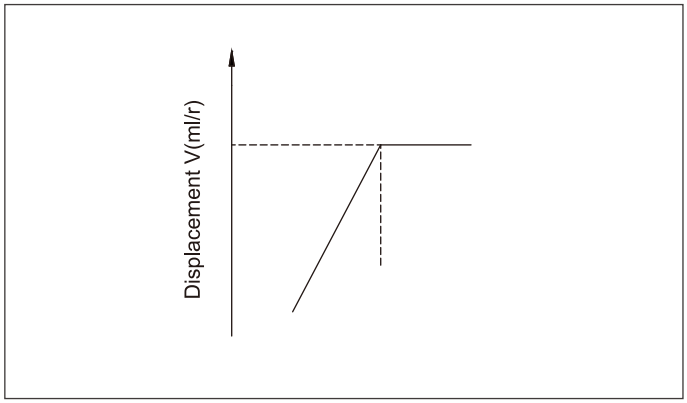

DR-EP□（DR/1-EP□）
The displacement of the variable displacement pump can be adjusted by varying the solenoid current.
The control current range is 300mA to 800mA (24 VDC) or 600 mA to 1600 mA (12 VDC).

| Code | Voltage（V） |
|---|---|
| EP1 | 12 |
| EP2 | 24 |

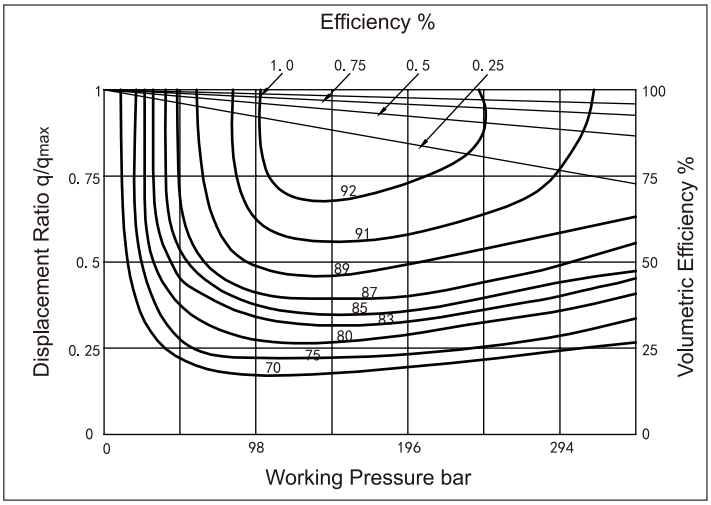
Function:
Once the servo pump is started, the main pump supplies servo pressure through port St. The solenoid valve is normally de-energized during startup, meaning that the spool is pushed by the metering spring to the stop position. This connects the passage to the large end of the servo piston, causing the swash plate to return to the zero displacement position. Pressure is always present at the small end of the control piston.
When the solenoid current is 300mA (for 24 VDC solenoid) or 600mA (for 12 VDC solenoid), the servo piston and spool move with the spring so that the large end of the servo piston is connected to the tank.
The servo piston then pushes against the spring force to rotate the swash plate, increasing the pump displacement.
When the spring force on the spring balances the pressure from the proportional solenoid, the proportional valve closes.
The electro-proportional displacement control valve with swash plate angle sensor enables closed-loop control of the system and the pump.

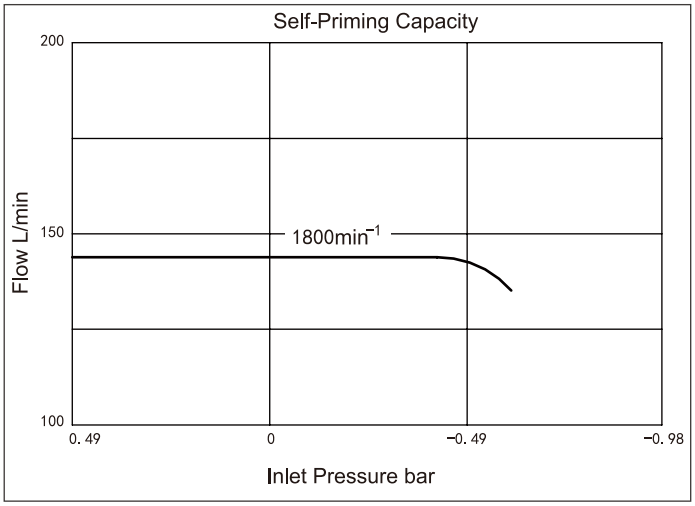
### Hydraulic Circuit Diagram

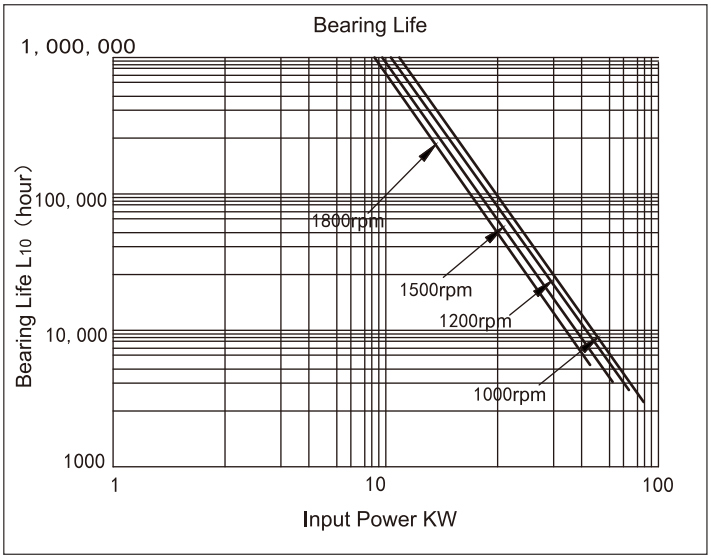


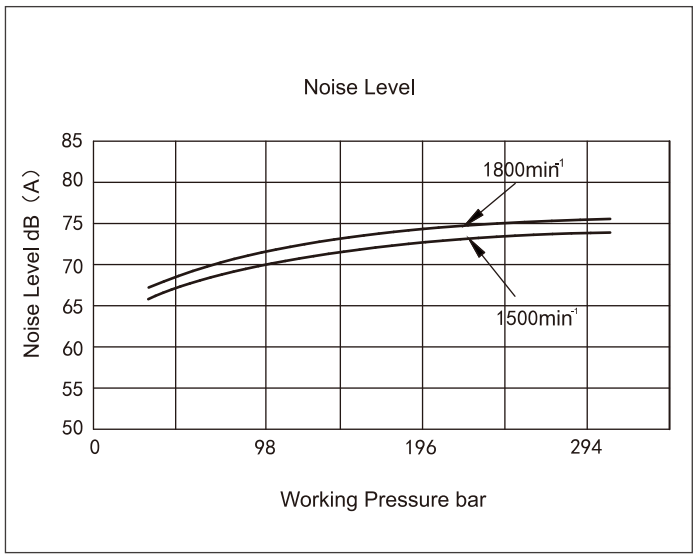



## Characteristic Curve



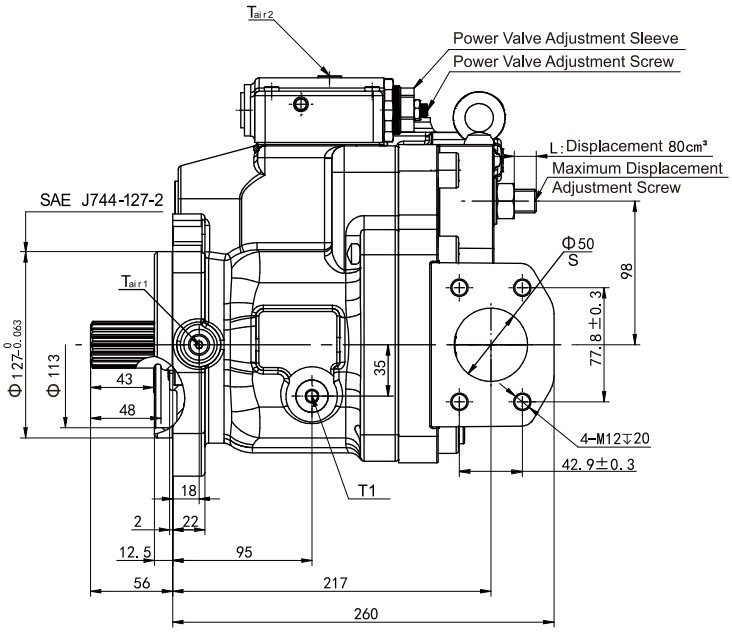

1.The values shown in the diagram other than bearing life are not guaranteed values but average values. Bearing life is a calculated value based on t he basic rated life.

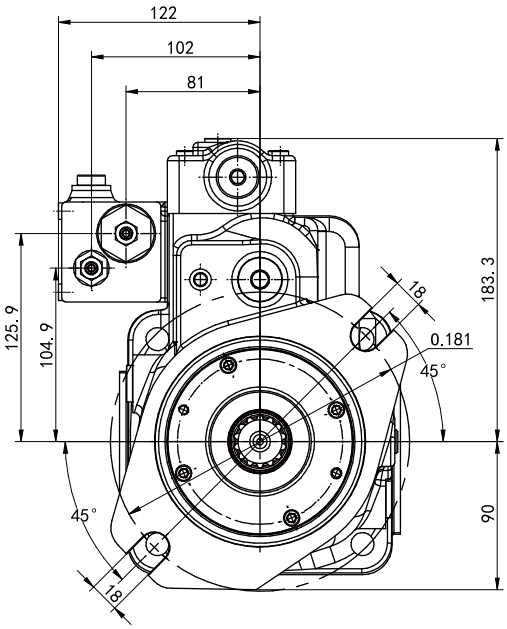
2.The noise value refers to the pump-alone noise measured in a noise-free environment (measured 1 m diagonally behind the pump).

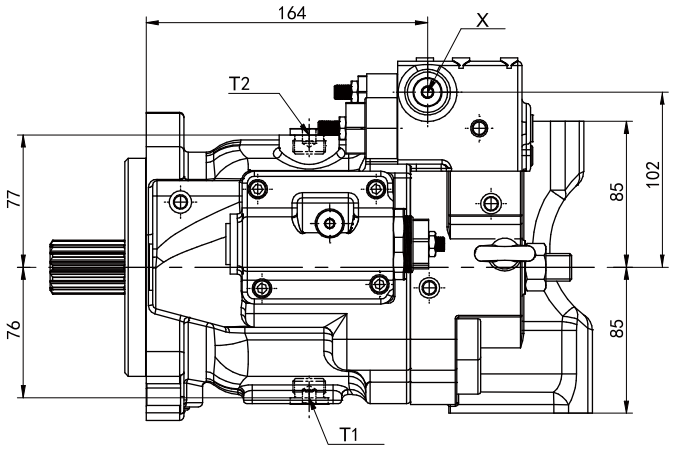
3.In actual operation, the noise level of the pump unit may be higher than the value shown in the diagram above.

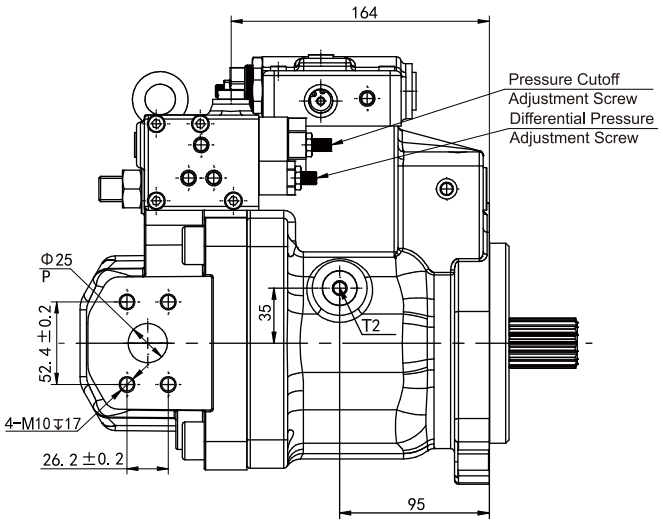
## Installation Dimensions

L1/1



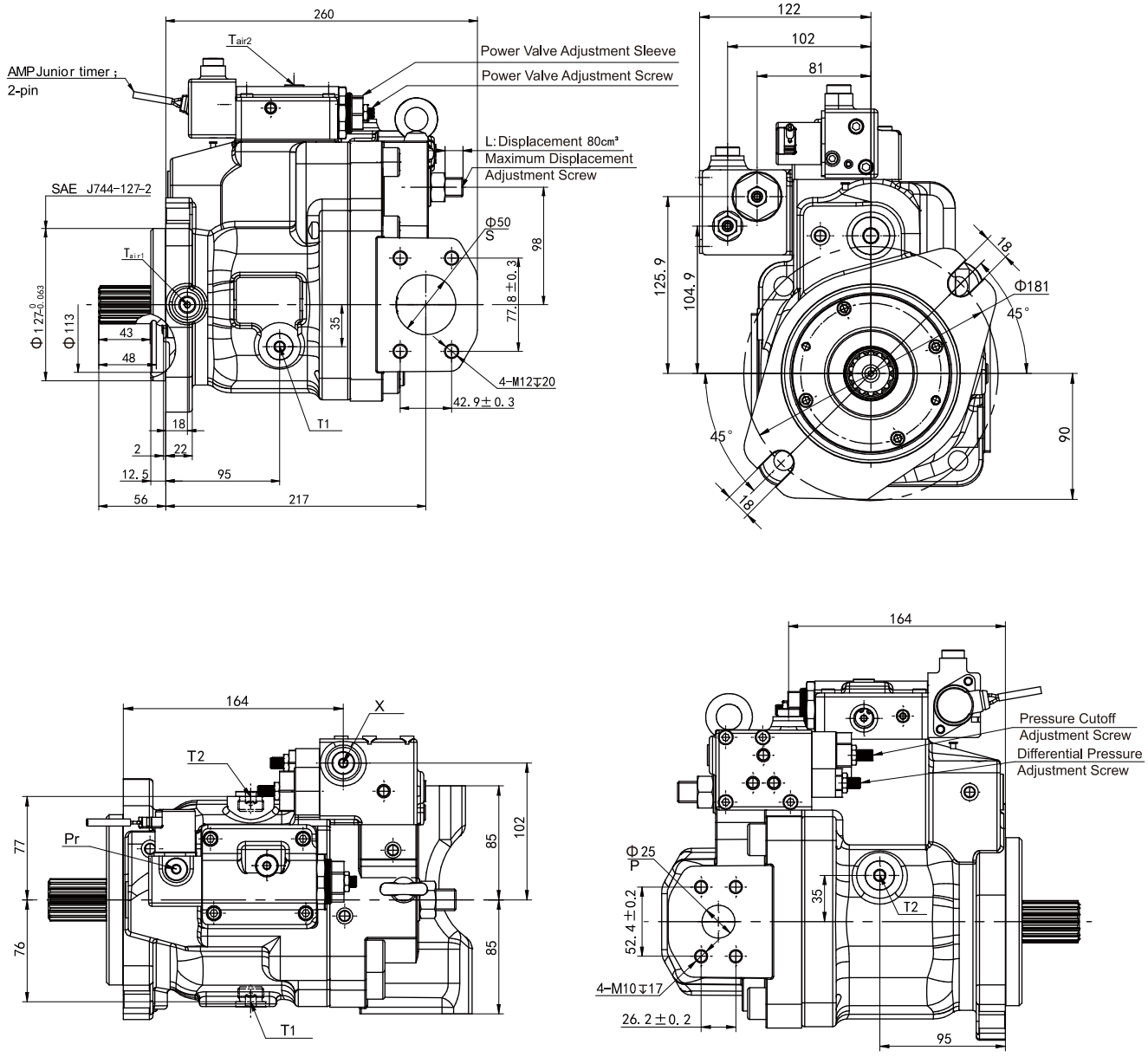



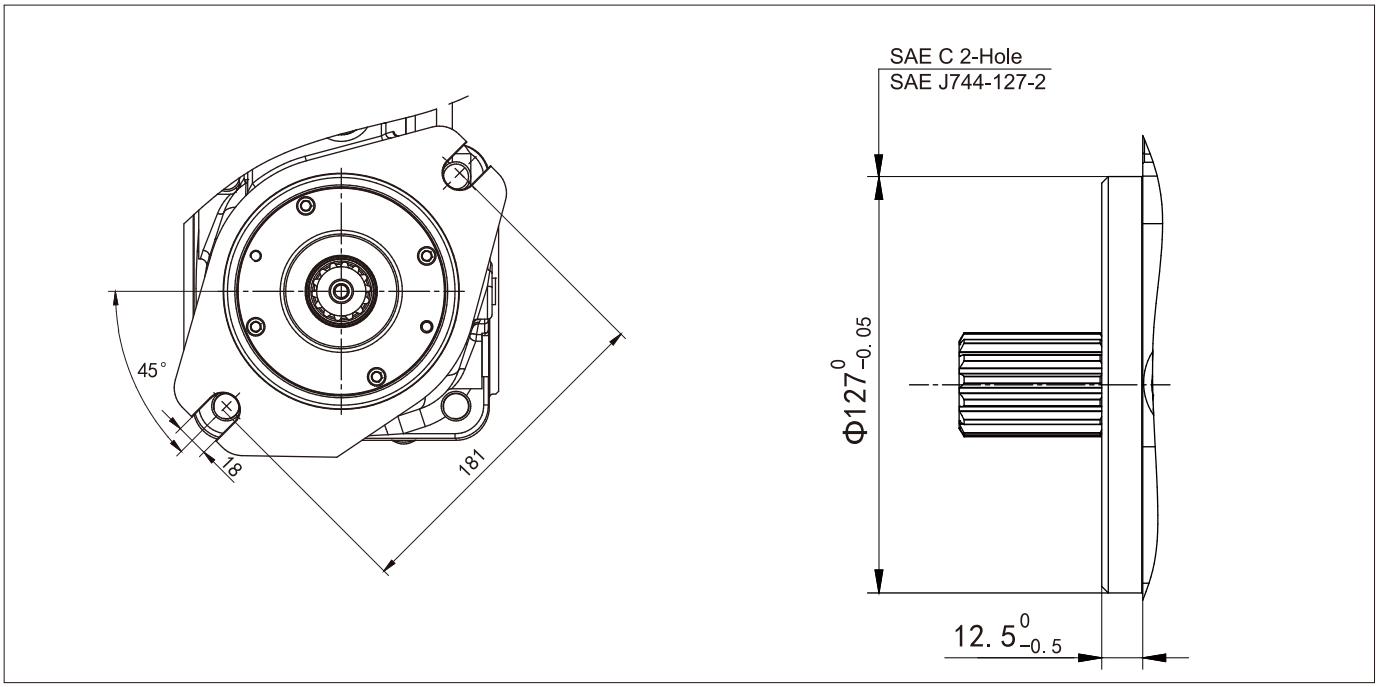
## Installation Dimensions

L1/1-E1(L1/1-E2)

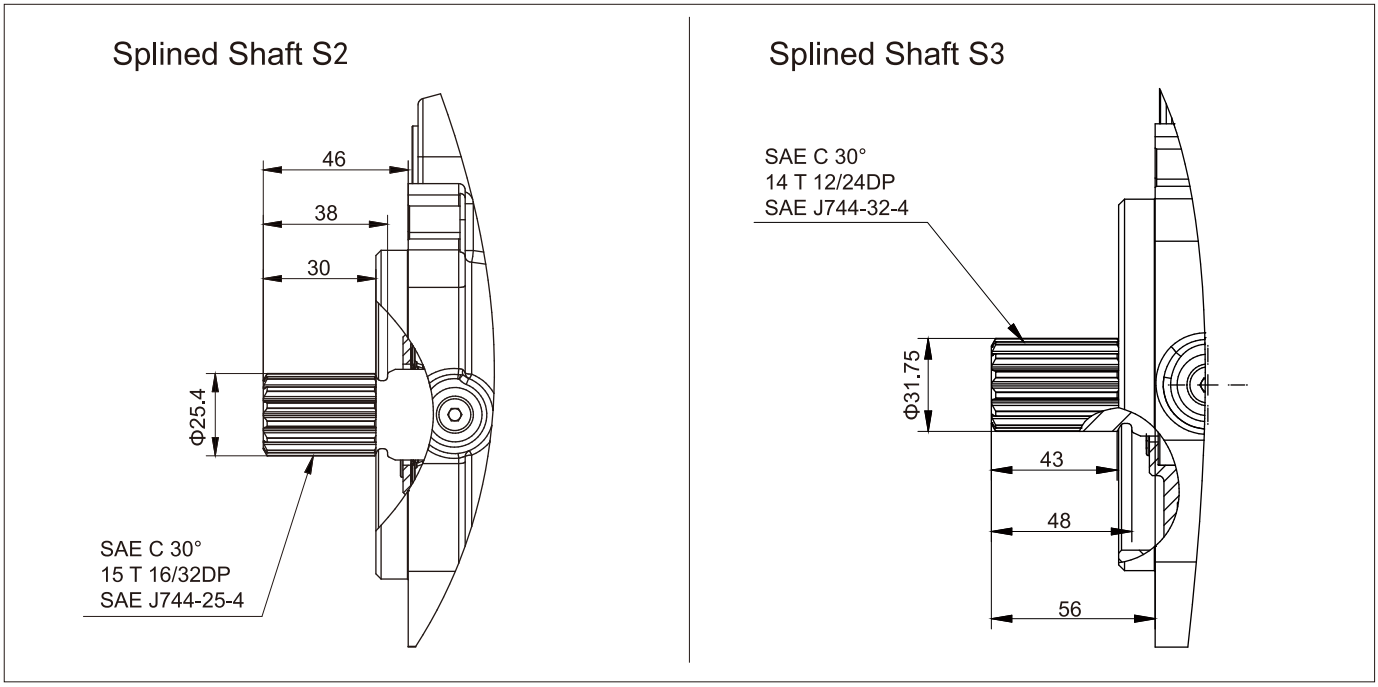



| | Port | Port size and type | | | Torque Nm |
|---|---|---|---|---|---|
| P | Outlet Port | 1″SAE J518C Code 61(5000psi) | M(Metric) | M10(17deep) | 57 |
| | | | S(UNC) | 3/8-16UNC-2B(17deep) | |
| S | Inlet Port | 2″SAE J518C Code 61(3000psi) | M(Metric) | M12(20deep) | 98 |
| | | | S(UNC) | 1/2-13UNC-2B(20deep) | |
| T1/2 | Drain Port | ISO11926 3/4-16UNF-2B,16deep,O-ring seal | | | 80 |
| X | LS Control Port | ISO11926 7/16-20UNF-2B,11.5deep,O-ring seal | | | 12 |
| Tair1 | Air Bleed Port | ISO11926 7/16-20UNF-2B,17deep,O-ring seal | | | 12 |
| Tair2 | Air Bleed Port | ISO6149-1 M10×1,8.5deep,O-ring seal | | | 12 |
| Pr | Pilot Port | ISO11926 7/16-20UNF-2B,11.5deep,O-ring seal | | | 12 |

## Flange Mounting

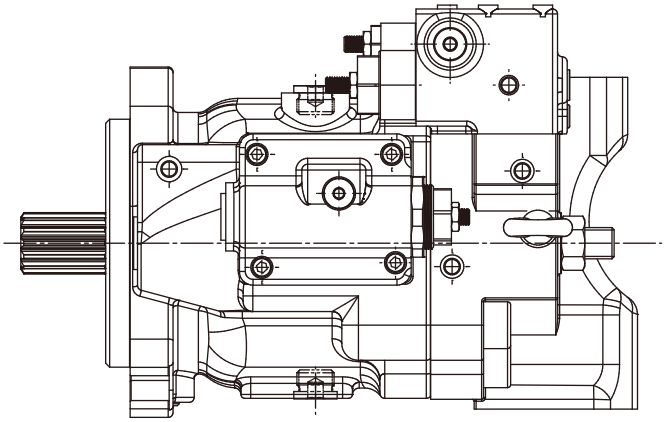



## Drive Shaft

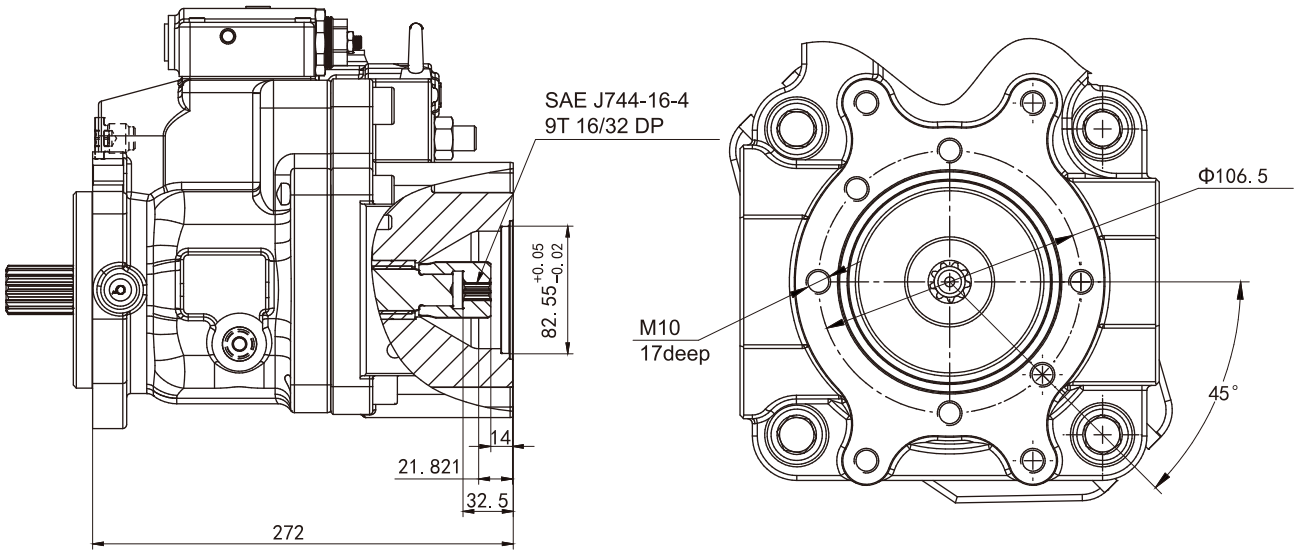


## Through-Drive Mounting

N00
Without through-shaft drive

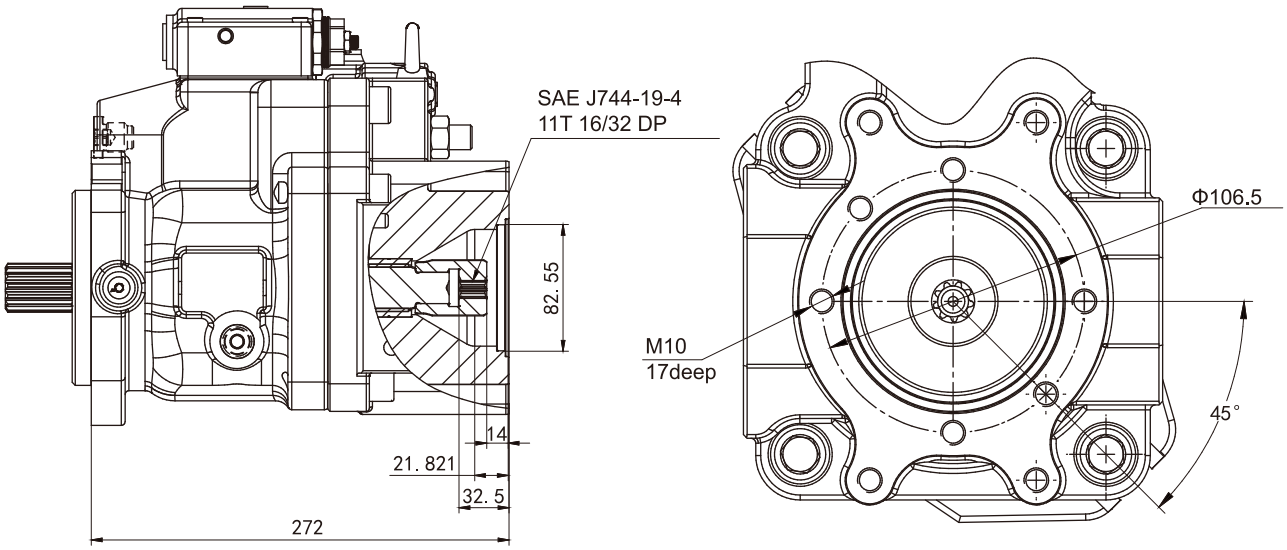


K01
SAE A 82-2 + 5/8″ SAE J744-16-4 9T 16/32DP



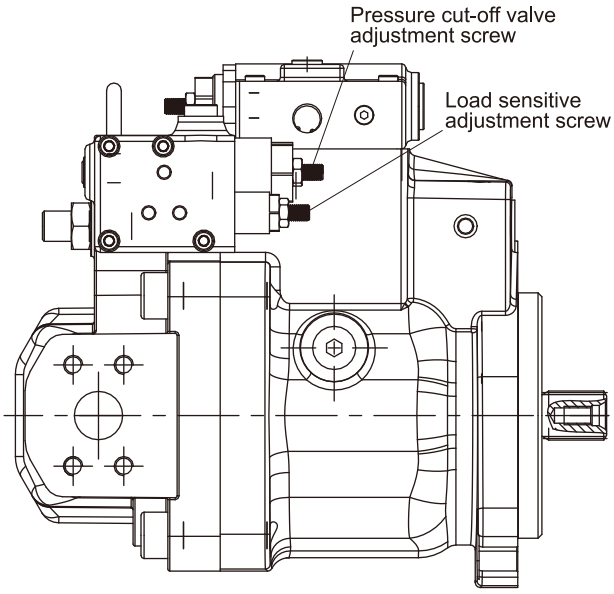
## Through-Drive Mounting

K52
SAE A 82-2 + 3/4″ SAE J744-19-4 11T 16/32DP



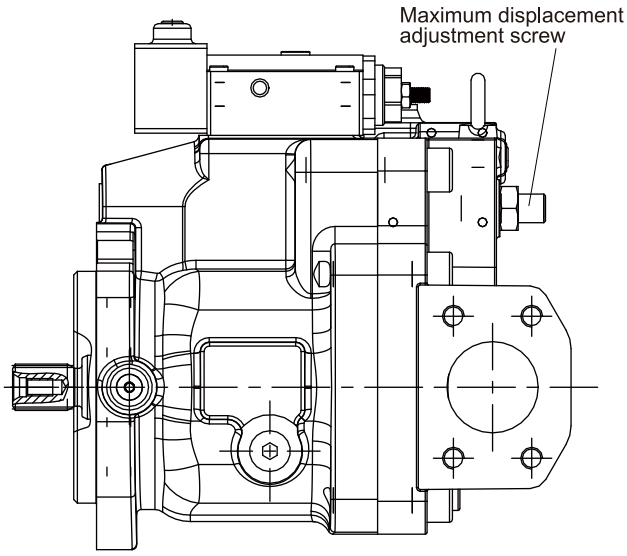
## Control valve and Maximum displacement adjustment

### Control Valve Adjustment




| Size | Adjustment amount per screw rotation(bar) | | Factory settings<br>Pressure control：<br>320 bar<br>Differential pressure setting：<br>15 bar |
|---|---|---|---|
| | Pressure Control Valve | Load Sensing Valve | |
| 80 | 80 | 13 | |

### Maximum displacement adjustment




| Size | Adjustment amount per screw rotation(mL/r) | Maximum displacement adjustment range(mL/r) | Factory settings<br>Maximum displacement |
|---|---|---|---|
| 80 | 6 | 35-80 | |

## Installation Instructions

Before using this product, you must read the operation manual or operator's manual and fully understand how to use this product.
For safe use of this product, you must carefully read all warnings and precautions in this manual. You must comply with relevant safety regulations and rules.

**Precautions related to operation:**
Use safety equipment to avoid injury when operating the product.
Pay close attention to handling methods to prevent hand or foot injuries due to excessive product weight or improper lifting posture.
Do not step on the product, strike it, or place any objects on it. These actions may cause product failure or oil leakage.
Thoroughly wipe away any oil spills on the product or floor; otherwise, oil may cause slipping, which could lead to product falling or personal injury.
Use the specified bolts and tighten them to the specified torque during installation. Using non-specified bolts or improper torque (insufficient or excessive) may cause malfunctions, leakage, or other issues.
Before performing wiring or any power-related work, turn off the power supply to avoid electric shock.
Thoroughly clean threaded parts and mounting surfaces; otherwise, damage or oil leakage due to poor sealing may occur.
Use the product within the specifications stated in the product catalog, including parameters, drawings, and instruction manuals.
During operation, keep your body away from the product, as it may become hot and cause burns.
Use the appropriate hydraulic fluid and keep the contamination level within the recommended range; otherwise, the product may not function properly or may be damaged.

**Warnings and precautions related to installing and removing the product:**
Installation, piping/tubing connections, and wiring of the product must be performed by qualified personnel.
Before starting installation or removal, ensure that the power supply to the hydraulic power unit is turned off and that the electric motor or engine has come to a complete stop. Also check that the system pressure has dropped to zero.

**Warnings and precautions related to operation：**
Never use a product without explosion-proof protection in an environment where explosion or combustion may occur.
Install a protective cover over rotating parts (such as the motor shaft and pump shaft) to prevent fingers, etc., from being caught and causing injury.
If you notice abnormal noise, oil leakage, smoke, or any other abnormality, stop operation immediately. Continuing to run may cause part damage, fire, or explosion.
Ensure that piping/tubing connections and wiring are correct and that all connections have been tightened to the specified torque, especially before first start-up.

**Precautions related to maintenance：**
Do not modify the product without authorization.
Do not disassemble or reassemble the product without authorization. Otherwise, it may cause malfunctions or prevent the product from operating properly.
When transporting or storing the product, pay attention to ambient temperature, humidity, and dust to prevent rust or dust accumulation on the product.
After long-term storage, replacement of seals may be required.

# Since 2002

## Over twenty years of deep cultivation in the field of hydraulic Solutions

HYTEK is a high technology enterprise integrating R&D, production, sales and service of hydraulic power products. Provides professional hydraulic transmission control products and solutions for construction machinery, road machinery, material handling machinery, agricultural and forestry machinery, industrial equipment and other fields.
After more than 20 years of continuous R&D, technological innovation, market development and application services, technical level and the scale of production and sales have been on the forefront of the industry.
Hytek has been committed to helping the development of subdivided industries with innovative hydraulic technology, "focusing on the challenges and pressures of customers, providing competitive products and solutions, reducing costs and increasing efficiency for customers, and continuously creating maximum value".

## Product Series

- Open Circuit Pump
- Closed Circuit Pump
- Fixed Displacement Motor
- Variable Displacement Motor
- Hydrostatic Transmission Unit
- Internal Gear Pump
- Vane Pump
- Proportional valve/ Industrial Hydraulic Valve

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