

Technical Sheet
Conventional Double Column Vertical Lathe
Model: VTL-100CNC



(Pictures are shown with optional items for illustration. The real machine may vary with pictures shown.)

1. Introduction

The Double Column Vertical Lathe model VTL series is a modern machine with the-state-of-the-art **Superb Quality and Less Maintenance**. It is a combination of modern advanced mechanics, electrics and hydraulics basing on extensive experience and professional skills in the design and manufacturing of small and large vertical lathes. It is designed and manufactured with latest technology know-how, optimized design, quality material, fitting and best process for manufacturing and assembly. It is of high quality structure with heavily ribbed construction for superior rigidity, strength and dimensional stability with enhanced wear characteristics, designed to perform diverse operations.

It features,

- ★ High rigid thermo-symmetrical structure for superb stability even at severe cutting conditions
- ★ **Heavily-ribbed** m/c base and table guarantee heavy load and smooth rotation
- ★ **Variable spindle speeds and variable feed rates** for diverse cutting needs on various materials
- ★ Modular design **easy to be customized & tailored** to suit customer's diverse machining needs

It is manufactured to meet modern machining requirements with high speed cutters and carbide cutters for rough & finish machining of jobs of cast iron, cast steel, alloy steel, fabricated steel and other materials.

- Cutting permits:
- | | |
|------------------------------------|---------------|
| 1. I.D. & O.D. cylindrical turning | 2. End-facing |
| 3. I.D. & O.D. cone turning | 4. Grooving |



(Note: The right bottom two functions are available with its CNC counterpart only.)

Basing on its super rigid & stable structure, big machining capacities, efficient cutting yield, heavy table load

capacity, it has a wide application in,

- Valve / pump / bearing industries
- Hydro / steam turbine generators
- Foundry, casting, metallurgy
- Automotive, mold, aerospace, wind power, oil industries
- Mining, railway, earthmoving equipment, heavy electrics
- General engineering, sub-contracting workshops, etc

2. Machine Specifications

| Specifications | Unit | Parameter |
|--|--------|---------------------------------------|
| Max. turning diameter | mm | 10000 |
| Table diameter | mm | 7100 |
| Max. turning height | mm | 5000 |
| Max. allowable weight of workpiece | ton | 200 |
| Speed range of table | rpm | 0.23 – 14 |
| No. of speed ranges of table | step | 2 (variable speeds within each range) |
| Rapid moving speed | mm/min | 2000 |
| Feed rates of tool head | mm/min | 0.1 – 350 (variable rates) |
| Horizontal travel of tool heads | mm | 5150 |
| Vertical stroke of rams | mm | 2500 |
| Ram section | mm | 280x280 |
| Max. cutting force of tool head right / left | kN | 100 / 80 |
| The quantity of tool head | | One CNC and one manual |
| Power of main motor, DC | KW | DC132 |
| Cross rail moving speed | mm/min | 230 |
| Net weight of machine (appr.) | ton | 290 |
| Cross rail lifting motor power | KW | 15 |
| Machine size | mm | 19500x11500x11600 |
| CNC controller | | Siemens 828D |

Note: The machine & specifications are subject to change & modify without prior notice.

3. Main Features

- ★ Suitable for **400/50HZ/3Ph** power supply
- ★ Neat appearance with fine workmanship and machine finish
- ★ Main bodies made of **high grade cast iron** for super stability, reliability & longer machine life
- ★ Robust **thermo-symmetrical gantry structure** for assured heavy cutting capacity
- ★ Table with manual **4-pc chucking jaws** and **12 auxiliary T-slots for clamping**
- ★ **Forged shafts** used in the table speed change gear box
- ★ **Hardened & ground 40Cr alloy steel gears** for table speed change and smooth running
- ★ **Big axial hydrostatic bearing with oil pockets / slots** ensuring big table load capacity
- ★ Independent hydraulic power unit with **quality components**, easier for adjustment & maintenance
- ★ **2 ram tool heads** are equipped, ie. **one** can be used for finish turning, and **the other one** can be used for rough turning, or the two rams can be used at the same time
- ★ **Square tool holder** on ram end, especially suitable for deep hole machining
- ★ Rams are made of **high grade #45 steel, H.F. induction hardened and precision ground** for improved dynamic performance & longer life
- ★ Rams are **hydraulically counter-balanced** enhancing the cutting performance
- ★ **Nitrogen accumulators** equipped to compensate sudden pressure drop on rams as safety mechanism,
- ★ High power **AC** main motor with **VFD unit for variable speeds (Mitsubishi brand)** (optional **DC** main

motor with DC digit drive for variable speeds (PARKER brand)

- ★ 2 spindle speed steps, within each step gear variable speeds are achievable for the table,
- ★ AC servo feeding motors, digital drive unit & ball screws are used on ram heads for variable feeds,
- ★ High precision bearings used for supporting precision ball screws (X / Z axes) on ram heads,
- ★ Ballscrews on X / Z axes are refined with quenching and tempering,
- ★ Cross rail is clamped on columns for heavy duty cutting and de-clamped for movement,
- ★ The trapezoidal leadscrew for elevating / lifting cross rail is refined with quenching and tempering for enhanced stable mechanical characteristics.
- ★ One security nut is fitted on the trapezoidal leadscrew for lifting cross rail as a safety mechanism against sudden drop of cross rail due to worn-out of the leadscrew nut.
- ★ Anti-wear Zinc-Aluminum-Bronze alloy (ZnAl10-5) lining on sliding guide ways and wear-resistant Zinc-Aluminum-Bronze alloy (ZnAl10-5) lining engraved on table guide ways for longer machine life
- ★ Telescopic operation platform (opt.) on cross rail for easier observation and tool setting
- ★ Telescopic steel covers on cross rail guide ways to avoid intrusion of chips, dust, oil
- ★ Automatic compulsory lubrication system for ram heads and cross rail guide ways
- ★ Hydrostatic lubrication on cross rail guide ways with oil collection tray
- ★ IP 54 sealed dust-proof electric cabinet of spacious size for better heat exhaustion (industrial air conditioner available as an option)
- ★ High quality electrics with neat wiring and labeling are used for longer machine life
- ★ High energy efficient LED work light featuring UV-free, less power consumption, less heat, long life, high durability in even severe working conditions
- ★ Over-load trip protection integrated in the electric circuits for safe running,
- ★ Affluent safety & protection setting-ups & interlocks are integrated with the machine, etc.

4. Castings

The structural parts of the machine have an extra oversized design, which gives the machine a very high chip removal capacity and a very strong stiffness. Main bodies of the machine (ie., table, base, column, cross rail, saddle, main transmission gearbox, etc) are built with high rigid cast iron with lost foam foundry processing (LFF) and thermal annealing / vibratory stress relief (VSR) aging treatment.

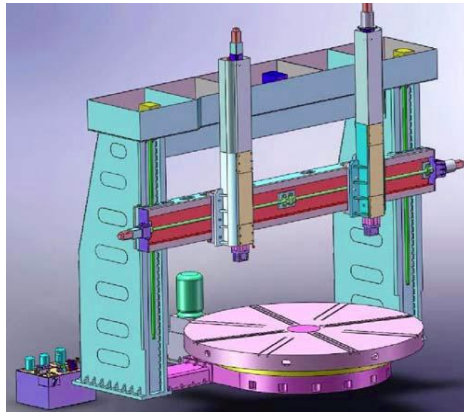
- resin sand casting / wooden pattern casting
- high grade, high intensity and low stress
- stress relieved castings to absorb the stresses and dampen the vibration during cutting



5. Machine Structure

★ **Super Rigid & Stable Thermo-Symmetrical Gantry Frame Structure**

The machine adopts a stable thermo-symmetrical gantry frame structure and consists mainly of base, table, R.H. and L.H. columns, cross rail, top beam, ram head, hydraulic system and electric system. Columns and cross rail are of box-shaped castings with numerous reinforced ribs. Two columns are connected through the top beam on the top so to form a superb rigid and stable structure that is qualified for stable and heavy cutting even at severe cutting conditions.



★ **Layout of Components**

One main motor and a speed change gearbox are fitted at the back of machine to drive the table. Cross rail moves up and down along front guide ways of columns. The ram tool head is seated on the guide ways of cross rail. The tool head is composed of carriage and ram. Ram is induction hardened & precision ground and jib strips are made of wear-resistant industrial alloy material and hand scraped for precision matching. Compulsory lubrication systems are used in main drive system and on sliding guide ways. Independent hydraulic power pack locates behind the machine for easier adjustment and maintenance. Independent electric cabinet is equipped for easier venting of heat and easier check.

6. Base with Spindle and Bearing

The high grade cast iron made base is heavily reinforced ribbed and stress-relieved after rough machining to absorb extreme cutting forces ensuring high rigidity and stability of the machine base.



Heavy load short-shaft type spindle is placed in the center. High precision (P5 class) preloaded double-row cylindrical-roller thrust bearing is equipped for centering of the spindle radially. Inner conic ring of the bearings can eliminate the radial clearance effectively for high precision positioning of spindle and stable rotating at high speed. Big size hydrostatic bearing sections are adopted axially on the base for improved loading capacity & stability. Hydrostatic guideways are Zinc-Aluminum alloy lined and matched. Constant flow hydraulic oil flows in through regulating distribution mechanism.



(Extra Large Heavy-duty Loading Spindle Bearings and Hydrostatic Guide Ways)



(NSK, Timken & SKF spindle bearing, optional)

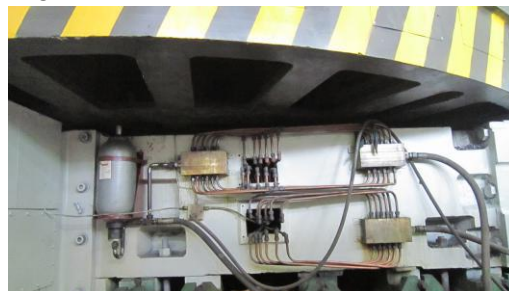
Constant flow synchronous pumps and a multi-head synchronized oil distributor are adopted to provide constant oil to each individual pocket or slot on the base upper guide ways via regulating valves. Oil pressure relay and thermal sensor are equipped. Once oil pressure is less than the rated value, alarms will be given and rotation of the table will not be allowed to avoid damage of the guide ways.

★ **Features of Table Hydrostatic Bearing:**

- a). Low friction for smooth rotation and long life of table,
- b). Heavy load capacity on table,
- c). Oil film between machine base and table absorbs cutting vibration & loads,
- d). Safety system regulating the hydrostatic pressure for optimum safety.

★ **Pressure Compensation System for Hydrostatic Table**

A big nitrogen pressure accumulator is equipped on the hydraulic power pack as a safety compensation system. When there is a sudden drop of hydrostatic power due to leakage or power cut-off, this system will function as a compensation for the drop of hydrostatic power. Thus, the table can run smoothly and table guide ways will not be damaged.



7. Table

The table is made of high grade cast iron with numerous reinforced ribs for superb rigidity. Heavy duty jaws are fitted on the table. A ring gear is fitted under the table. Surfaces under the table are engraved with wear-resistant Zinc-Aluminum alloy lining.



8. Cross Rail

Cross rail moves up and down along guide ways of columns. Lifting of the cross rail is through a mechanism that consists of an asynchronous motor, driving shafts, worm gear boxes, trapezoidal lead screws, etc. Cross rail is lifted simultaneously through the trapezoidal lead screws.

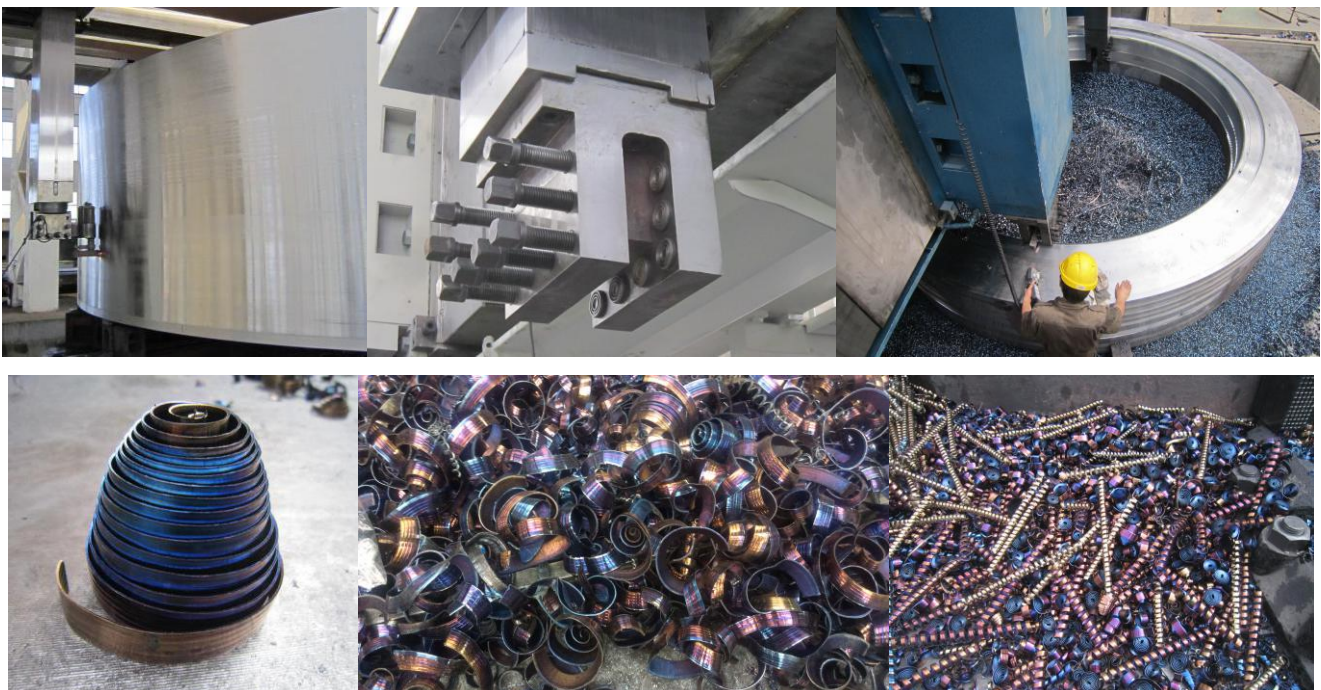
- Cross rail will be clamped automatically on to the column after reaching the required position and will be relieved for movement. Clamping pads are equipped to assure stable & reliable clamping of the cross rail for preparation of heavy cutting.
- **Automatic** compulsory lubrications unit is equipped for lubrication of the guide ways.
- **Telescopic covers** are equipped on the cross rail to keep it from intrusion of chips & dusts.
- Contacting surfaces at the back of the saddle and ram housing are lined with wear-resistant **Zinc-Aluminum-Bronze alloy (ZnAl10-5) lining (superior to and better than old style Turcite-B plastic coating)** for smoother travels and longer machine life.



9. Vertical Ram Head

Vertical tool head is designed to ensure high rigidity and stability under extreme cutting conditions and is composed of saddle, ram, transmission system, etc.

- The ram is made of **high grade steel** to achieve resistance to static, dynamic, torsion and bending stresses and **induction hardened and precision ground**.
- The ram is **balanced** with hydraulic cylinder.
- Square tool holder is fitted on the ram head, especially suitable for deep hole machining.
- Control of the ram head is through buttons & switches on the control panel.
- AC **servo motors and ball screws** are used to on both ram tool heads.



★ **Brake Unit in Z Axis Motor**

An automatic brake unit is integrated in Z axis servo motor. The motor will brake automatically when power cuts off so that the ram tool head does not fall to damage the workpiece.

★ **Pressure Compensation Balance System for Ram Heads**

Nitrogen pressure accumulator is equipped to control the hydraulic balancing cylinder as a safety compensation system. When there is a sudden drop of hydraulic power due to leakage or power cut-off, this system will function as a compensation for the drop of hydrostatic power and balance the weight of the ram tool head. This system increases productivity due to faster responding time and enhance cutting performance due to a more balanced ram too head. It saves energy as no electric power is needed and also there will be less noise generated during movement of the ram.

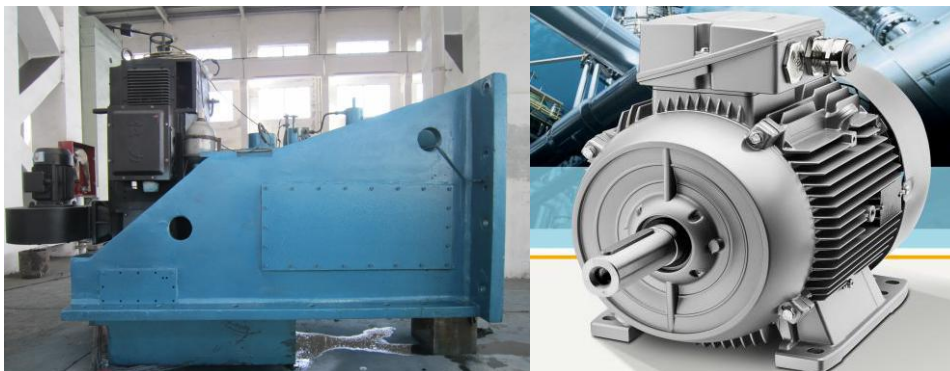


10. Main Transmission System

The main transmission system for table rotation is separate & independent of the feeding system of ram tool head so that each of them functions independently & reliably without interruption with each other.

The table is driven by a VFD drive unit controlled AC main motor (opt. DC digital driven DC main motor) and one 2-step gearbox. Within each of the 2 speed steps, **variable speeds** can be achievable. Gear change is done by pressing buttons on the control panel to activate hydraulic cylinder to shift the gears

- (Opt. DC) **AC main motor with Variable Frequency Drive (VFD)** for **variable spindle speeds**.
- **Hardened & ground gears** in spindle speed change gearbox.
- Easy gear change by pressing buttons on operation panel station.



(SIEMENS Motor, optional)

11. Axial Feeding System

X axis: horizontal travel of ram head

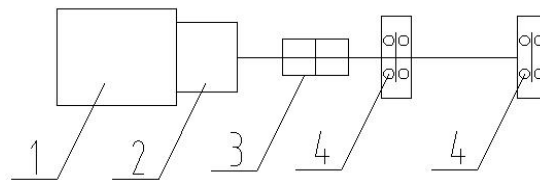
Z axis: vertical travel of ram

- **Servo motors** are adopted to drive the **ball screws** horizontally and vertically on both ram heads.

- **Planetary gear speed reducer** units are equipped to increase the torque output.
- **Variable feed rates** can be achieved both horizontally and vertically on both ram heads.



Axis Driving Diagram:



1 – Servo feeding motor, 2 – planetary gearbox, 3 – flexible coupling, 4 – supporting bearings of ball screws

| L.H.S. Ram Head | |
|----------------------------------|---|
| Servo feeding motor (X / Z axes) | HUDA / CTB, China (optional YASKAWA, Japan) |
| Ballscrew (X / Z axes) | BEST / NJGY, China / (optional HIWIN, Taiwan) |
| R.H.S. Ram Head | |
| Servo feeding motor (X / Z axes) | HUDA / CTB, China (optional YASKAWA, Japan) |
| Ballscrew (X / Z axes) | BEST / NJGY, China / (optional HIWIN, Taiwan) |

12. **Hydraulic & Lubrication System**

Hydraulic system of the machine is adopted for table hydrostatic system, table speed change and lubrication system. The hydraulic system is a combination of high quality hydraulic components, optimized hydraulic circuit with an integrated manifold module, advanced design, reliable functioning and easy maintenance. High quality & reliable hydraulic valves are used for reliable performance.

The hydraulic power pack is composed of pumps, motors, solenoid valves, directional valves, pressure relay, pressure gauge, oil distributors, etc.

Oil pumping systems are integrated in the machine for reliable functioning and easier maintenance.

- Provide hydraulic power for hydrostatic table.
- Provide hydraulic power for lubrication of spindle, gearbox.
- Provide hydraulic power for table speed change cylinder.
- Provide hydraulic power for ram balancing.



(KOMPASS, VICKERS, REXROTH & HAWA Valves, CASAPPA pumps, optional)

13. Electrical System

A reliable & optimized electrical system is adopted on the machine. The electrical components are mainly placed in the electric cabinet. Operation buttons are put on the operation panel for easier operation.

- Independent electric cabinet for easier operation and maintenance.
- **High quality electrics** are equipped in the electric cabinet for longer machine life.
- Neat wiring and enclosed cabinet to keep away of intrusion of dusts, humidity.
- **PLC unit** is equipped for reliable electrical control.
- Swivel pendent button panel / stationary station. (Other panels can also be customized at request).



14. Interlock & Protection

An interlock is set for interlock of the table and feed of the left / right tool heads. Oil pump starts before rotation of the table. Table stops firstly and then the oil pump. When the table rotates continuously, feed of the tool heads can only be allowed. When the spindle breaks down, stop the feed firstly and then stop the spindle after time lapsing.

An interlock is set for interlock of the table and the cross rail. When the table rotates, movement of the cross rail is not allowed. There are four limit switches that give signals for unclamp / release of the cross rail. No feed is allowed when the cross rail is unclamped / released. No moving up / down is allowed when the cross rail is clamped / braked. An alarm indicator is fitted on the control panel.

An interlock is set for interlock of the speed change and movement of the table. During the speed change of the table, other movement of the table is not allowed.

15. Power Grinding Head (Optional)

For special application, a power grinding head with independent power supply can be fitted at end of the ram for grinding functions.



| | #1 | #2 |
|----------------------|----------------|----------------|
| Power of spindle | 5.5 kW | 5.5 kW |
| Speed of spindle | 1500 – 6000rpm | 1500 – 3000rpm |
| Diameter of spindle | 170 mm | 200 mm |
| Length (approximate) | 555 mm | 555 mm |

16. Machine Guards and Coolant System (Optional)

Enclosed machine guards and coolant system with pumps and hose can be provided at request.



17. Manufacturing Standards

Accuracy: generally as per GB standards JB4116-96 (basically equivalent to ISO 3655-1986)

- a). Axial run-out of working table: 0.02mm within 1000mm diameter, 0.01mm more per extra 1000mm
- b). Radial run-out of working table: 0.02mm within 1000mm diameter, 0.01mm more per extra 1000mm

18. Machine Color

- a). Machine base: dark grey RAL7016
- b). Others: light grey RAL7032
- c). Colors other than standard ones can be made at extra charges as per customer's request.

19. Documentation

The following documentation will be supplied on hard copy after installation of the machine:

- a). Machine operation manual
- b). Manuals for independent functioning units, ie. air conditioner, oil chilling unit, etc, if ordered

20. Working Conditions

- a). Power supply: 380V ± 10%, 50Hz ± 1Hz, 3Ph
- b). Ambient temperature: 5°C - 45°C
- c). Relative humidity: ≤ 85% (at 20°C)
- d). Altitude: ≤ 1500mm
- e). Environment: clear from harmful gas, liquids, dusts and vibration, magnetic and radiation sources, etc

21. Main Components

| No. | Item | Mfgs | Remarks |
|-----|-----------------|--|--------------------------------------|
| 1 | AC main motor | Qingdao Yuandong Electric Motor Co., Ltd. or other makers www.qdyuandong.com | Opt. SIEMENS brand, Germany |
| 2 | CNC system | Siemens AG www.siemens.com | Siemens brand |
| 3 | Servo motor | Siemens AG www.siemens.com | Siemens brand |
| 4 | Spindle bearing | Luoyang LYC Bearing www.lyc.cn Harbin Bearing www.bearinghrb.com Wafangdian Bearing www.zwz-bearing.com | Opt.: NSK / FAG / SKF / TIMKEN brand |
| 5 | Ballscrew | BEST or NJYG www.njyigong.cn | Optional: HIWIN |
| 6 | PLC unit | LS Industrial Systems www.lsis.com | Opt. MITSUBISHI / OMRON brand |
| 7 | Low voltage | LS Industrial Systems www.lsis.com | Opt. SCHNEIDER / |

| | | |
|--------------------|---|-------------------------|
| electrics (mainly) | CHINT Electrics Co., Ltd. www.chint.com DELIXI Group www.delixi.com or others | ABB / SIEMENS brands |
|--------------------|---|-------------------------|

22. Standard Accessories

| No. | Item | Qty. | Remarks |
|-----|---|-------|------------------|
| 1 | Chuck jaws | 4 pcs | |
| 2 | Tool holder | 2 pcs | For turning |
| 3 | Foundation leveling blocks & anchor bolts | 1 set | In accessory box |
| 4 | Maintenance spanners | 1 set | In accessory box |
| 5 | Oil gun | 1 pc | In accessory box |

23. Easy Worn Consumable Parts & Components (Available on Chargeable Basis)

| No. | Item | Remarks |
|-----|------------------|----------------------|
| 1 | Oil sealing ring | |
| 2 | Oil filter net | |
| 3 | Pressure gauge | Hydraulic power pack |
| 4 | Solenoid valve | Hydraulic power pack |
| 5 | Pressure relay | Hydraulic power pack |

(Note: It may vary with m/c with different configuration.)