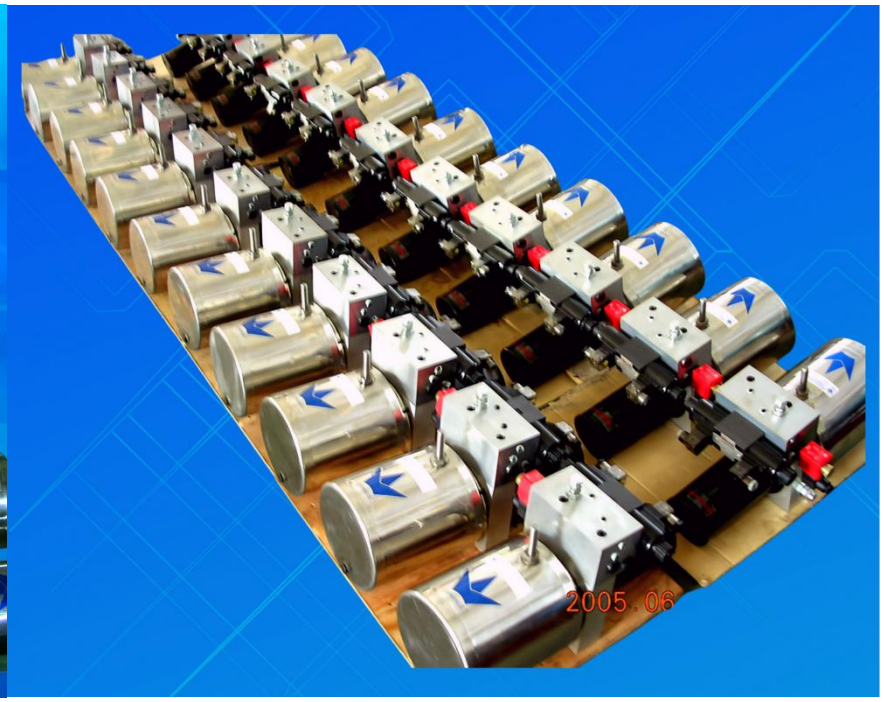
Photo of Hydraulic Power Pack



Hydraulic Power Pack

Hydraulic Power Pack (HPU), abbreviated as "HPU", features a modular integrated design that consolidates core components including motors, hydraulic pumps, oil tanks, control valve groups, filters, cooling systems, and intelligent control units into a unified structure. This system directly supplies pressurized hydraulic oil that meets specific pressure and flow requirements to external hydraulic systems. Serving as the "core power source" in industrial automation, construction machinery, and smart manufacturing fields, it provides reliable energy support for hydraulic actuators such as cylinders and motors.

Over three decades, URANUS has delivered tens of thousands of hydraulic power packs to global clients, many of which are customized solutions including servo systems, Electro-Hydraulic Actuation (EHA) systems, and 200MPa pressure-boosting systems. Our products have consistently received high praise for their performance, quality, cost-effectiveness, delivery reliability, and comprehensive after-sales service.

For standard performance configurations, please refer to URANUS' UP Series product catalog below.

优瑞纳斯®
URANUS

液 压 动 力 包

HYDRAULIC POWER PACK

UP Series Hydraulic Power Pack Selection Instructions

URANUS hydraulic power pack				
Rated pressure		User-defined within the range of 0.5~20MPa		___(MPa)
Rated flow		User-defined within the range of 0.2~22 L/minute		___(l/min)
Motor power supply	AC	Single-phase 220V 50HZ(0.55~2.2KW)		A
		Three-phase 380V 50HZ(0.55~4.0KW)		B
	DC	24V(0.3~3KW)		C
		12V(0.3~2KW)		D
Fundamental circuit				10
One-way fundamental circuit	Zero-leakage two-position two-way valve	Normally closed	11	a, b...
		Normally open	12	
Two-way fundamental circuit	Single valve		20	
External plate reversing valve	Multi-purpose Valve	Without unloading valve	21	
		With unloading valve	22	
Reversing valve operation mode	Electromagnet	AC	220V 50HZ	A
			380V 50HZ	B
		DC	24 V	C
			12 V	D
	Manual			S
Fuel tank volume (L)	Horizontal		3, 5, 7.5, 10	w_
	Vertical		12, 16, 20, 25, 30	L_
	Wall-mounted		3, 5, 7.5, 10, 12, 16, 20, 25, 30	G_
Pressure gauge			Stainless steel oil-filled shockproof pressure gauge	B
Booster	Standard		Boost ratio: 5:1, maximum pressure: 80MPa	Z
	Non-standard		Boost ratio (1.2~20), maximum pressure: 200MPa	Zt

UP □ X □ □ □ □ □ □ □ □

See Table 1

See Table 1 and Table 2.

See Table 2

See Figure 1

See Figure 1 and Figure 2 — No markings if no valve is equipped

See Figure 1, Figure 4, and Figure 5 — No markings if no valve is equipped

See Figure 4 — No markings if no reversing valve is equipped

No markings of sharing power supply with the motor

See Figure 3 and Table 3

No markings if no gauge is equipped

No markings if no booster is equipped

Zt means text description is required

Notes:

1. Hydraulic pack motor power N (KW)=0.02 × rated pressure (MPa) × rated flow (l/min). When N is greater than the maximum power value of the motor listed in Table 2, It has been beyond the supply range of UP series hydraulic pack, and you can order our UZ series hydraulic stations.
2. When DC motor is selected, the continuous operation shall not exceed two minutes every time it is powered on.

Model selection examples:

1. UP20×1.54A10L12B (see Figure 8)

   20MPa, 1.54 L/minute, 220V single-phase AC motor, 10-circuit vertical 12L fuel tank with pressure gauge.
2. UP8×1.4D11eW3 (see Figure 8)

   8MPa, 1.4 L/minute, 12V DC motor, 11e circuit normally-closed two-way solenoid valve with oil return constant-speed valve, two-way solenoid valve operating voltage DC 12V, horizontal 3L fuel tank.
3. UP20×2.24B22(Ol_7+Ya_9+C_1QS)L12B (see Figure 7)

   20MPa, 2.24 L/minute, 380V three-phase AC motor with 22 circuits; valve group 1: O-type functional three-position four-way spring reset solenoid directional valve with superimposed two-way check throttle valve; valve group 2: Y-type functional three-position four-way spring reset solenoid directional valve with superimposed two-way pilot operated check valve; valve group 3: C_1 steel ball positioning two-position four-way manual directional valve. Solenoid valve-operated AC 220V, vertical 12L fuel tank with a pressure gauge.

Figure 1 Hydraulic Schematic of UP Series Hydraulic Power Unit

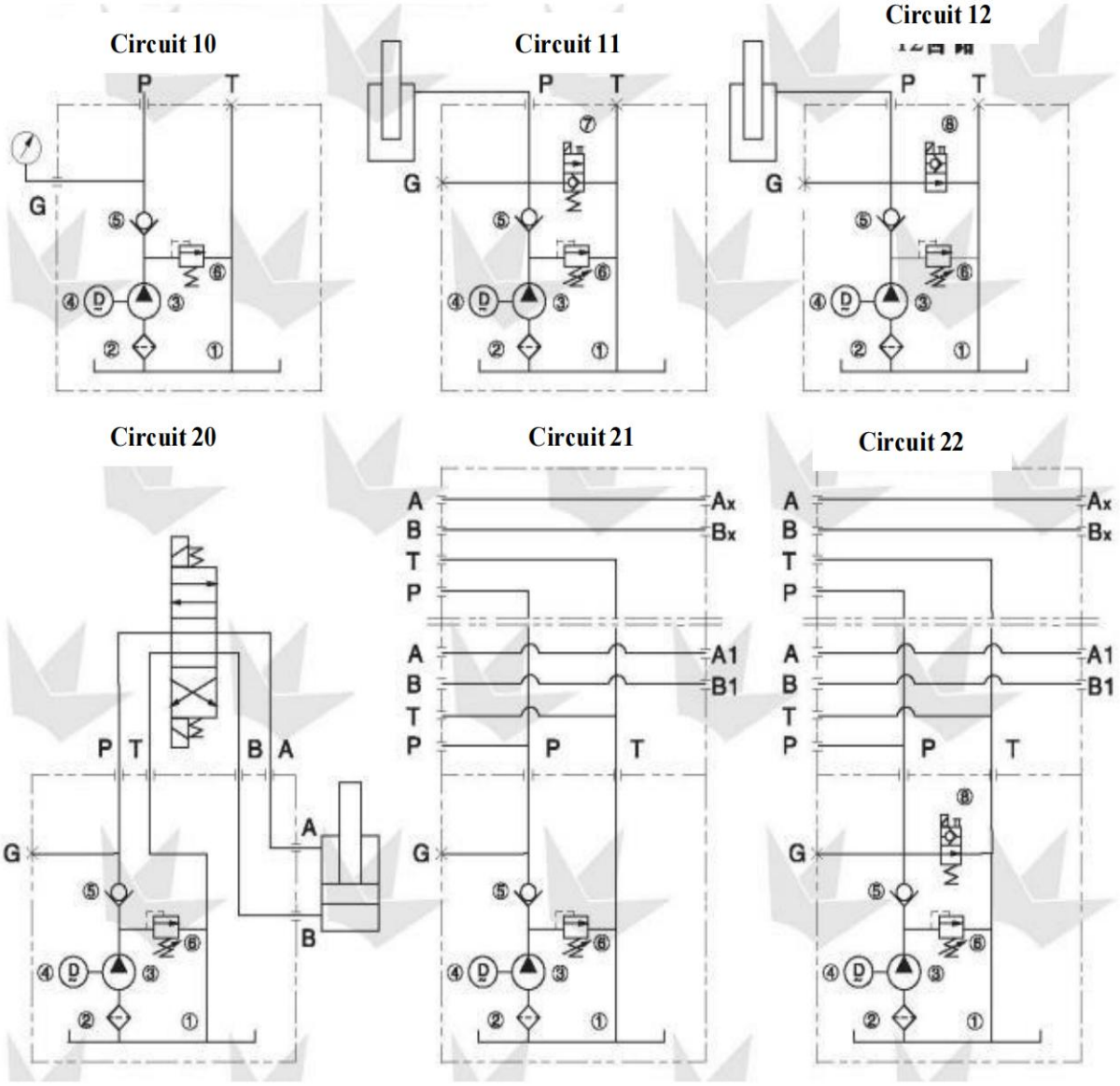


Figure 2 Symbols of Extended Circuit Valves

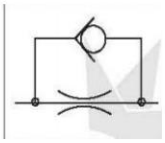
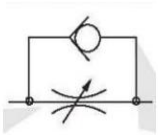
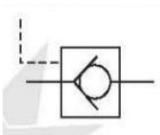
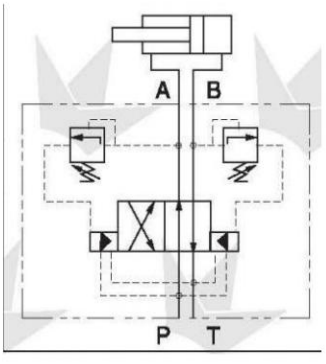
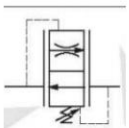
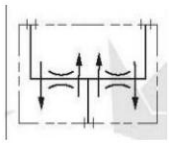
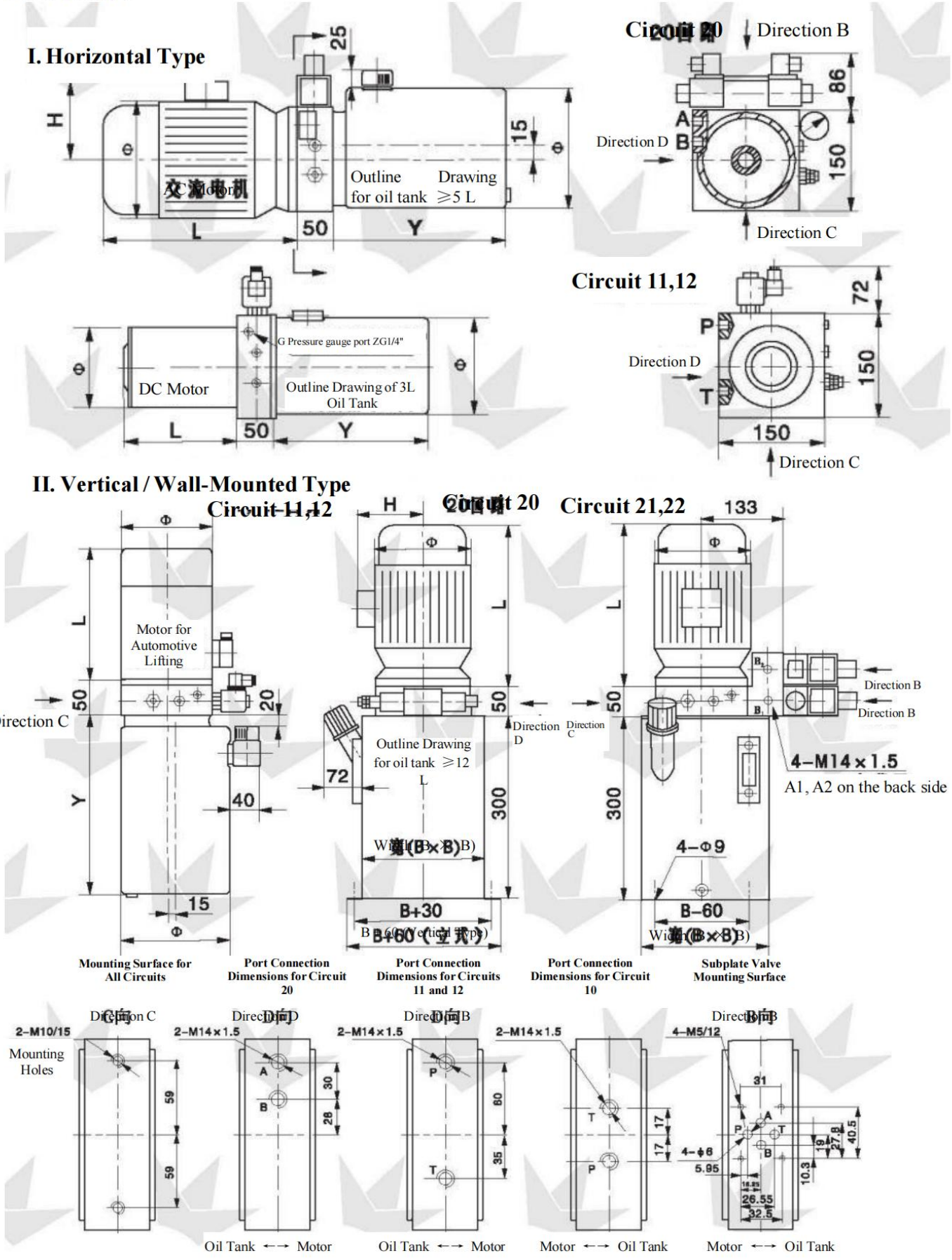
a Fixed Throttle	b Check Fixed Throttle Valve	c Check Adjustable Flow Valve	d Pilot-Operated Check Valve	Z Plate-Type Pilot-Operated Automatic Directional Valve
				
e Constant-Speed Valve	↑ Adjustable Flow Valve	g Flow Control Valve	h Synchronizing Valve	
				

Figure 3 UP Series Hydraulic Power Unit – Outline, Installation, and Connection Dimensions



优瑞纳斯®
URANUS

Table 1 Gear Pumps for UP Series Hydraulic Power Units

Displacement (ml)	0.16	0.24	0.45	0.56	0.75	0.92	1.1	1.6	2.1	2.6	3.2	3.7	4.2	4.8	5.8	7.9
Rated pressure (MPa)	17						21				20		18		17	15
Peak Pressure (MPa)	20						25				24		22		21	19

Table 2 Motors for UP Series Hydraulic Power Units

A Single-phase AC power supply 220V 50Hz

Model	4L/0.55	4L/0.75	4L/1.1	4L/1.5	4L/2.2	2L/0.75	2L/1.1	2L/1.5	2L/2.2
Power (kW)	0.55	0.75	1.1	1.5	2.2	0.75	1.1	1.5	2.2
Rotating Speed r/min	1400					2800			
Φ mm	165	165	185	185		165	165	185	185
H mm	120	120	130	130		120	120	130	130
L mm	275	275	280	310	345	275	275	280	310
Weight (kg)	13.5	14.5	18	22	26	13.5	14.5	18	22

B Three-phase AC Power Supply 380V 50Hz

Model	4S/0.55	4S/0.75	4S/1.1	4S/1.5		2S/0.75	2S/1.1	2S/1.5	2S/2.2	4Y/2.2	4Y/3.0	4Y/4.0
Power (kW)	0.55	0.75	1.1	1.5		0.75	1.1	1.5	2.2	2.2	3.0	4.0
Rotating Speed r/min	1400 ❄					2800				1420		1440
Φ mm	165	165	180	180	152	165	165	185	185	220	220	240
H mm	120	120	130	130	110	120	120	130	130	180	180	190
L mm	275	275	280	305	230	275	275	280	305	370	370	380
Weight (kg)	13.5	14.5	18	21	16	13.5	14.5	18	21	34	38.5	44

❄Special Motor for Automotive Lifting Equipment

C DC Power Supply 24V							D DC Power Supply 12V				
Model	C0.3	C0.5	C0.8	C1.2	C2.0	C3.0	D0.3	D0.5	D0.8	D1.5	D2.0
Power (kW)	0.3	0.5	0.8	1.2	2.0	3.0	0.3	0.5	0.8	1.5	2.0
Rotating Speed r/min	3500~2000						4000~2300				
Φ mm	89	115				130	89	115			130
L mm	160	170				180	160	170			180
Weight (kg)	3.1	6.5				8.5	3.1	6.5			8.5

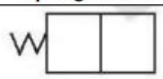
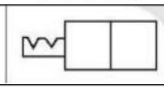
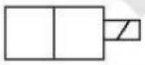
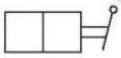
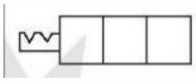
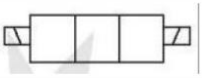
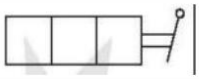
Table 3 Dedicated Oil Tanks for UP Series Hydraulic Power Units

Vertical Wall-Mounted					
Capacity (L)	12	16	20	25	30
Bmm	200	230	260	290	320
Weight (kg)	6	16	28	42	58

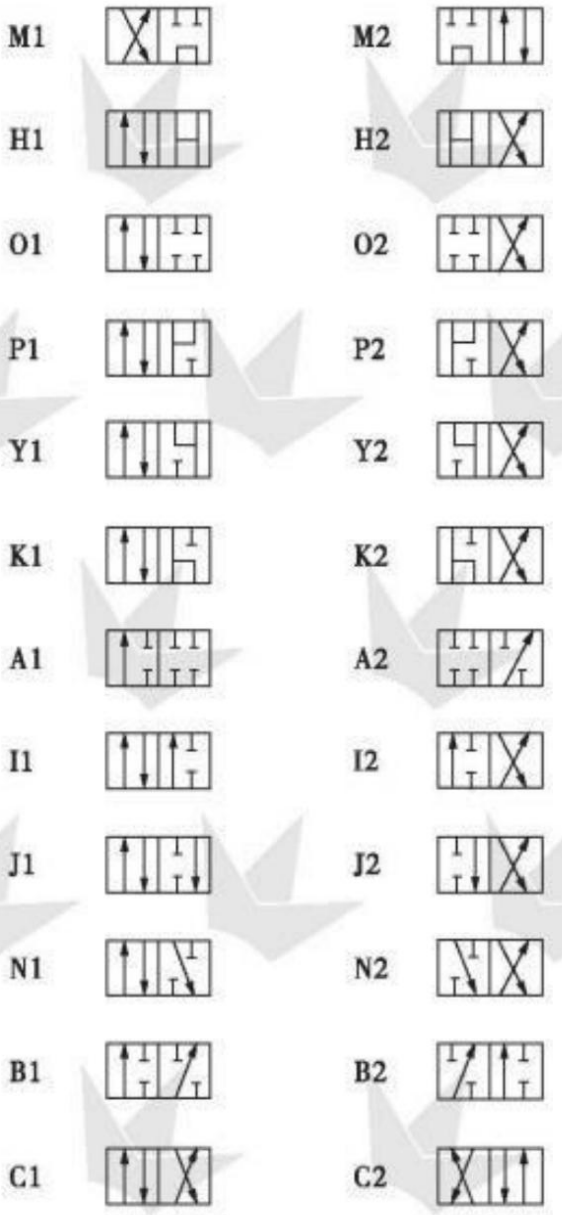
Horizontal Wall-Mounted				
Capacity (L)	3	5	7.5	10
Φmm	140	180		
Ymm	220	220	320	420
Weight (kg)	1	1.5	2	2.5

优瑞纳斯®
URANUS

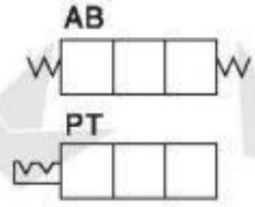
Figure 4 Plate-Type Directional Valve (Φ6 Port Diameter)

Plate-Type Valve	Positioning Method		Control Method	
	Spring Return	Ball Detent	Solenoid Actuated	Manually Operated
Two-Position, Four-Way				
Three-Position, Four-Way				
Marking method	No Marking	Q	A,B.C.D	S

Two-Position Four-Way Directional Valve Spool Functions (Φ6 Port Diameter)



Three-Position Four-Way Directional Spool Valve Functions (Φ6 Port Diameter)



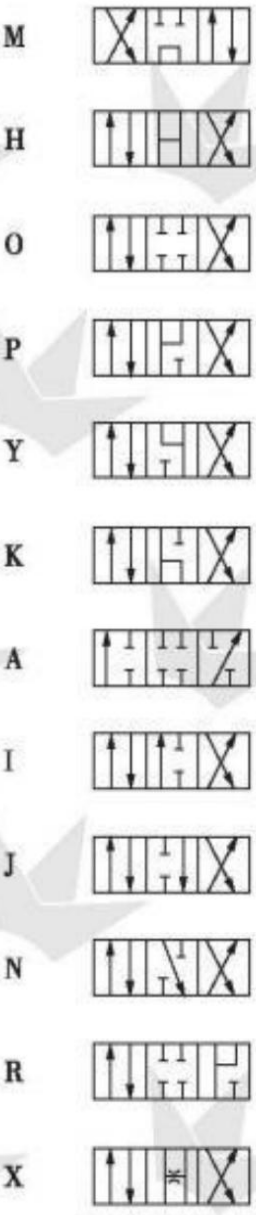
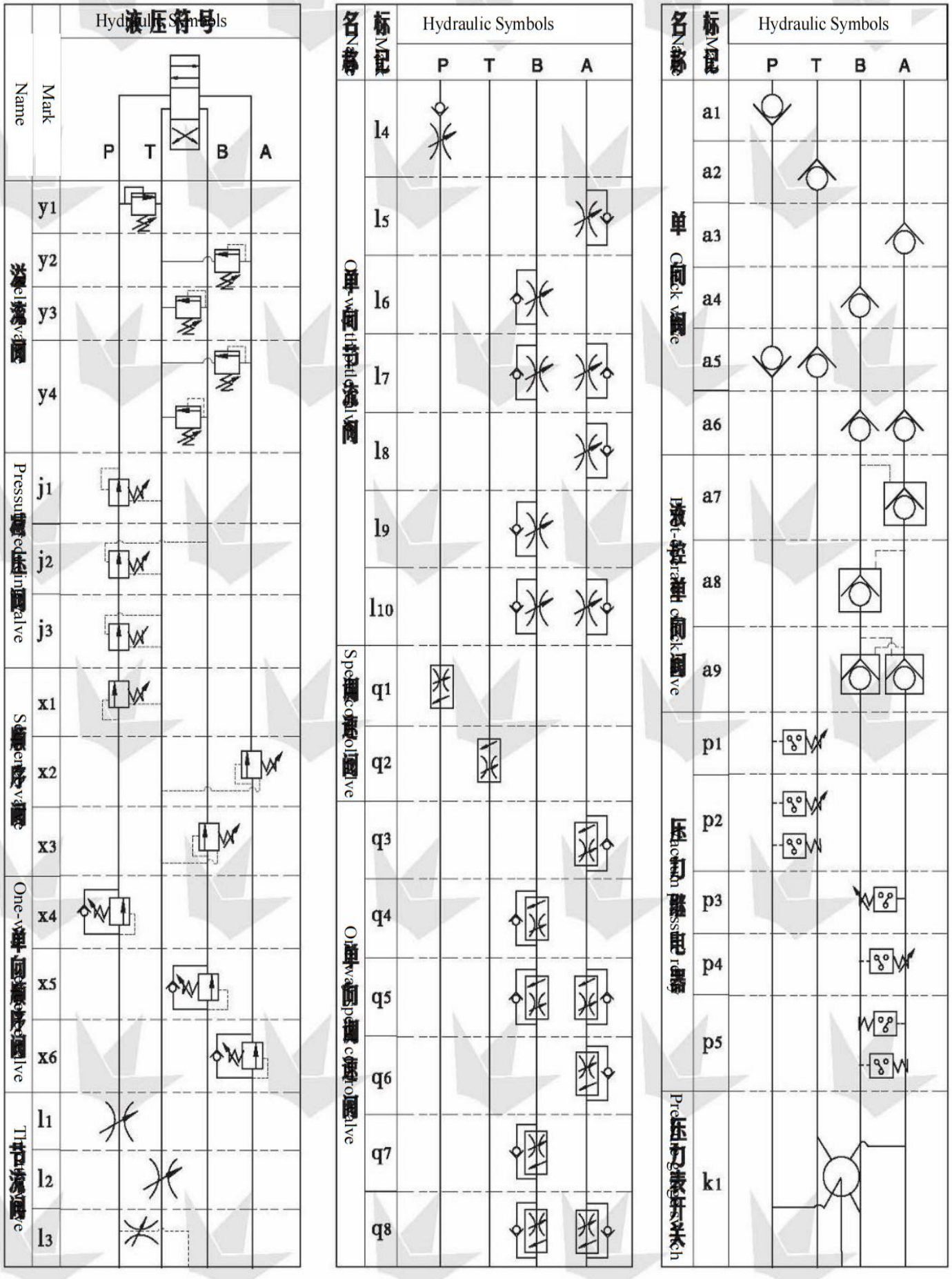


Figure 5 Stackable Valve (Φ6 Port Diameter)



The UP series hydraulic power unit (hereinafter referred to as the UP power unit), manufactured by Tianjin URANUS Hydraulic Machinery Co., Ltd., integrates core components such as motors, pumps, valves, and oil tanks compactly through threaded cartridge valve blocks. This miniature hydraulic power unit utilizes high-quality pump and valve components, featuring low noise, high efficiency, zero external leakage, reliable operation, aesthetically pleasing design, and long service life. Leveraging the advantages of mass production, it offers more competitive prices while ensuring high quality. As a power source for small hydraulic cylinders and hydraulic motors, it has been widely applied in fields such as construction machinery, automobiles, agricultural machinery, metallurgy, machine tools, medical equipment, environmental protection, hydraulic tools, lifting platforms, and automated equipment. To facilitate user selection and application, the following technical specifications are provided:

1. Structural Configuration (see Figure 3): The core of the hydraulic power pack is a rectangular cartridge valve block measuring 150 × 150 × 50 mm^3. On the two large 150 × 150 mm faces of the valve block, one end is mounted with the motor, while the other end is mounted with the gear pump and oil tank. The motor drives the gear pump through a coupling. The pressure oil output from the gear pump flows directly from the pump front cover outlet into the valve block. Components such as the system relief valve, check valve, and two-position two-way directional valve are directly cartridge-mounted on the side of the valve block and interconnected via internal oil passages. Ports for the pressure gauge (G), inlet/outlet (P, T), and plate valve mounting (P, T, A, B), as well as fixed mounting holes, are all located on the side of the valve block. The suction filter is fixed on the pump's suction port at the rear cover. Both the pump and filter are enclosed within the oil tank, which is equipped with a fill port and a drain port.

2. Supply Scope : The UP series hydraulic power packs have a maximum rated pressure of 21 MPa and a system flow range of 0.22–22 L/min. They are available with four types of power supplies: single-phase AC 220V, three-phase AC 380V, and DC 24V or 12V, with dozens of motor specifications. The packs offer six standard circuits with multiple expandable circuits, and three installation types: horizontal, vertical, and hanging. Oil tank capacities range from 3 to 30 liters across nine sizes. The booster can provide a maximum output pressure of 200 MPa. The company also undertakes the manufacture of custom non-standard hydraulic power

packs. For system performance requirements exceeding the UP series specifications, please select the UZ series hydraulic station or a custom non-standard hydraulic station.

3. Model Specifications and Selection Method: Refer to page 1 of the sample for the UP series hydraulic power pack selection instructions. Detailed explanations are as follows:

UP	□ × □	□	□	□	□	□	□
1	2 3	4	5	6	7	8	9

3.1 UP is the abbreviation for URANUS HYDRAULIC POWER PACKS.

3.2 Rated pressure refers to the maximum working pressure required by the user's equipment, expressed in MPa. This pressure is generally calculated based on the operating conditions. For example, in systems using plunger cylinders or single-rod double-acting cylinders:

3.2.1 Calculation of Rated Pressure for Plunger Cylinder Systems:$P=4F/\pi d^2$

P — Rated pressure, in MPa; F — Required output thrust of the plunger cylinder, in Newtons (N); d — Diameter of the plunger, in millimeters (mm)

3.2.2 Calculation of Rated Pressure for Single-Rod Double-Acting Piston Cylinder Systems:

a. When a specific pushing force is required:$P_1=4F_1/\pi D^2$

b. When a specific pulling force is required:$P_2=4F_2/\pi(D^2-d^2)$

P1,P2 — Rated pressures, in MPa; F1 — Required output pushing force of the hydraulic cylinder, in Newtons (N). F2 — Required output pulling force of the hydraulic cylinder, in Newtons (N)

D — Piston diameter, in millimeters (mm); d — Piston rod diameter, in millimeters (mm); If both F1 and F2 are required, the maximum of P1 and P2 should be taken as the system's rated pressure. Of course, when determining the system's rated pressure, losses in the cylinder, valves, and piping must also be taken into account, which should be evaluated according to the actual operating conditions. The system pressure is set by the relief valve installed on the valve block, and it is generally adjusted at the factory according to the user's requirements. If it is necessary to readjust the pressure, follow these steps:a. Connect the system hydraulic lines and electrical circuits, then close the P and T ports. b. Unscrew the relief valve cap. c. Loosen the locking nut. d. Start the hydraulic power pack and allow the system pressure to rise to the originally set pressure. e. Rotate the valve spool (clockwise to increase pressure, counterclockwise to decrease pressure) while observing the pressure gauge until the pointer reaches the desired pressure. The set pressure must not exceed the rated pressure of the gear pump (see Table 1).

3.3 Rated Flow: This refers to the maximum flow rate required by the user's equipment, expressed in liters per minute (L/min). The system flow is generally calculated based on operational requirements. For example, considering systems using plunger cylinders and single-rod double-acting cylinders:

3.3.1 Rated Flow Calculation for Plunger Cylinder Systems: $Q=\pi d^2S/4t$

Q — Rated flow, in liters per minute (L/min); d — Plunger diameter, in decimeters (dm); S — Stroke, in decimeters (dm); t — Specified time for full plunger extension, in minutes

3.3.2 Rated Flow Calculation for Single-Rod Double-Acting Piston Cylinders:

a. When the piston must complete one full reciprocating cycle within a specified time:

$Q=\pi(2D^2-d^2)S/4t$

b. When the piston rod must extend within a specified time:$Q=\pi D^2 S /4t_1$

b. When the piston rod must extend within a specified time:$Q=\pi(D^2-d^2) S /4t_2$

Q — Rated flow, in L/min; D — Piston diameter, in decimeters (dm); d — Piston rod diameter, in decimeters (dm); S — Stroke, in decimeters (dm); t — Time for one full piston cycle, in minutest; t1 — Specified time for piston rod extension, in minutes; t2 — Specified time for piston rod retraction, in minutes If both b and c conditions apply, the maximum QQQ value should be selected. For the smaller flow end, a one-way throttle valve may be added for speed control.

The system rated flow is proportional to the pump displacement and motor speed. $Q=vn/1000$ Where:Q — System rated flow, in L/min; v — Pump displacement, in mL/rev; n — Motor speed, in RPM

The UP series hydraulic power packs include 16 different gear pump displacements; for details, see Table 1.

3.4 Motor Power Supply:The UP series hydraulic power packs are available with motors in four types of power supplies and dozens of specifications; see Table 2 for details.

When determining system pressure, flow rate, and motor power supply, please note the following:

a. Hydraulic Power Pack Motor Power: $N(kW)=0.02\times P(MPa)\times Q(L/min)$ Where:N — Motor power, kW; P — System rated pressure, MPa; Q — System rated flow, L/min. If the calculated NNN exceeds the maximum motor power listed in Table 2, it is beyond the supply range of the UP series hydraulic power pack. In this case, the UZ series micro hydraulic power pack may be selected.

b. The speed of DC motors is inversely proportional to the working pressure, with an approximate range of 2000–3500 RPM. The average flow rate is estimated based on 2500 RPM. Each continuous operation of the DC motor after energizing must not exceed 2 minutes.

c. Users usually only provide system rated pressure, rated flow, and power supply type. Pump and motor specifications are determined by the supplier. To save investment and energy, when specifying pressure and flow, please ensure they closely match actual operating conditions and avoid selecting values that are too high or too low.

3.5 Hydraulic Circuits:Due to space limitations, this catalog only presents six commonly used standard circuits (see Figure 1). Various other system circuits can also be provided according to user requirements.

Circuit 10: Basic circuit. Commonly used as a hydraulic source for externally connected valve assemblies, it can also directly drive a single-acting hydraulic motor.

Operating Principle:The electric motor (④) drives the gear pump (③) to rotate. The working fluid is drawn from the oil tank (①) through the mesh filter (②) into the pump. The pressurized fluid from the gear pump passes through the check valve (⑤) and exits via the pressure port (P□). It then flows through the user's external valve assembly to the actuators, such as hydraulic motors or hydraulic cylinders. After performing work, the fluid returns to the oil tank via the return port (T□). Component ⑥ is an adjustable threaded cartridge-type relief valve used to set the system pressure. When the actuator's working pressure reaches the relief valve's set pressure, the fluid is diverted back to the oil tank, maintaining the system pressure at the set value and providing overpressure protection. When the actuator's working pressure reaches the relief valve's set pressure, the fluid is diverted back to the oil tank, maintaining the system pressure at the set value and providing overpressure protection.

Circuit 11: Single-Acting Normally Closed Basic Circuit This circuit is based on the 10-circuit design with the addition of a leak-free, normally closed, threaded cartridge two-way solenoid directional valve (⑦). It is suitable for short-duration operations with extended pressure-holding requirements—for example, single-acting hydraulic cylinders used for lifting heavy loads. During operation, the motor starts under load, and the hydraulic cylinder completes the lifting action before the motor is stopped. Because the circuit uses a leak-free, normally closed cartridge two-way valve together with a check valve, the piston will not settle as long as the cylinder and piping

are free of leaks. When piston descent is required, reversing the two-way valve allows the working fluid in the cylinder to flow back to the oil tank through the valve, resetting the piston. The two-way valve can be actuated electrically, manually, or electrically with manual override. On the side of the valve block, a standby return port (T) is provided next to the pressure port (P). When a double-acting cylinder is used with only one chamber in operation, this port can serve as a leakage return or vent port for the unused chamber.

Circuit 12: Double Normally Open Basic Circuit This circuit is derived from the circuit 11 by replacing the normally closed two-way valve (⑦) with a normally open two-way valve (⑧). It is suitable for long-duration, continuous, and frequent lifting operations that require short-term pressure holding. The motor (④) starts without load, and the two-way valve (⑧) shifts, allowing pressure oil to enter the hydraulic cylinder. After the lifting action is completed, if pressure holding is required, keeping the two-way valve (⑧) from resetting will maintain pressure even if the cylinder has slight leakage. The pressure oil flows back to the tank via the relief valve (⑥). However, this pressure-holding method should not be used for extended periods, as the fluid will heat up quickly. Once the two-way valve (⑧) resets, the working fluid in the cylinder returns to the tank through the valve, and the piston resets. This circuit is also suitable for spring-return plunger-type hydraulic presses.

Extended Circuits: Various hydraulic valves can be installed on the valve block, or multiple tube-type or plate-type valves can be connected in series to form diverse extended circuits (see Figure 7). For example, the 11a circuit enables slow lowering of heavy-load plunger cylinders, commonly used when the load is constant or changes minimally. The 11e circuit, with a cartridge constant-speed valve installed, ensures a consistent lowering speed of the plunger cylinder within the rated load range, regardless of load variations. This circuit is commonly applied in forklift load-lifting operations.

Circuit 20: Single Four-Way Valve Basic Circuit This circuit is based on the 10-circuit, with an added plate-type directional valve mounting port on the cartridge valve block. The plate valve can be directly mounted on the side of the valve block. Therefore, this circuit must be equipped with a plate-type directional valve for operation. It is commonly used in applications with short operation times and long stop periods, where the motor operates intermittently. If long continuous motor operation is required, a three-position four-way directional valve (types M or

H) with the PT ports open in the neutral position should be used. These valves allow the motor to rotate without load in the neutral position, letting pressure fluid return directly to the tank, preventing system overheating and energy waste. This circuit is typically applied to double-acting hydraulic cylinders. Upon motor startup and directional valve shifting, pressure fluid flows from the P port through the valve into the A chamber of the cylinder. Fluid in the B chamber returns to the tank via the T port. After the valve shifts, pressure fluid enters the B chamber, and fluid from the A chamber returns to the tank, realizing the reciprocating motion of the hydraulic cylinder. Additionally, various functional valves can be stacked, cartridge-installed, or connected in series on the valve block (see Figures 2 and 5) to form extended hydraulic circuits as needed.

Circuits 21 & 22: When controlling more than one actuator simultaneously, select the circuits 21 or 22 . Circuit 21: Without a load-unloading valve, it is typically used for applications with short operation times and long stop periods. Circuit 22: Equipped with a solenoid-operated unloading valve, it is suitable for frequent directional changes and long-duration operation.

In this circuit, the pumped pressure fluid can flow directly back to the tank through a normally open two-way solenoid directional valve (⑧), allowing the motor to run unloaded. This prevents energy waste and system overheating. When system pressure is required, the solenoid of valve ⑧ is energized, blocking the return path of pressure fluid and building system pressure. Since both circuits 21 and 22 contain multiple valve components, it is recommended to group and label them sequentially during selection. Providing the required hydraulic schematic is highly advisable. Selection examples can be found on page 1 of the catalog.

All valves for the 21 and 22 circuits are mounted on a single transition manifold plate, which is fixed to the side of the hydraulic power pack's valve block (see Figure 3, circuits 21 & 22). The hydraulic passages in the plate are connected to the valve block, ensuring fluid communication.

3.6 Directional Valve Control Methods:There are various control methods for directional valves. Figure 4 lists only two commonly used types: electric and manual. When the solenoid valve operates with the same power supply as the electric motor, no additional notation is required. Similarly, if a 220V solenoid coil shares the same power source as a 380V motor, no marking is needed. For control methods other than those listed in the table, please use the letter "X" to indicate and provide a textual or graphical explanation. The directional valves referred to in this section include both two-way valves and additional plate-type directional valves. If

an electrically operated valve with manual adjustment is required, the suffix “S” should be added (e.g., AS, BS, CS, DS).

3.7 Tank Capacity and Mounting Types:The UP series hydraulic power units are available in three installation types: W—horizontal, L—vertical, and G—wall-mounted, as shown in Figure 3. The designation consists of the installation type letter code followed by the tank capacity in liters. For example, a vertical tank with a capacity of 20 liters is designated as “L20.”

3.7.1 W—Horizontal Hydraulic Power Unit:In this configuration, the valve block connects the motor and the oil tank horizontally on either side. During installation, the unit is fixed via two M10 threaded holes (15 mm deep) located on the side of valve block C. The horizontal oil tanks are available in four capacities: 3 L, 5 L, 7.5 L, and 10 L. Overall dimensions are shown in Figure 3.

3.7.2 L—Vertical Hydraulic Power Unit:In this configuration, the valve block connects the motor and the oil tank vertically (top and bottom). During installation, the unit is fixed using four Φ9 through-holes on the base feet of the oil tank. The vertical oil tanks are available in five capacities: 12 L, 16 L, 20 L, 25 L, and 30 L. Overall dimensions are shown in Figure 3.

3.7.3 G – Suspended (Hanging) Hydraulic Power Pack: This type uses the two M10 × 15 mm deep mounting holes on the C-side of the valve block to suspend either a horizontal or vertical hydraulic power pack. For a horizontal-suspended oil tank, the straight oil port of the horizontal tank is replaced with a 90° port so that the oil port points upward and remains above the oil level. For a vertical-suspended oil tank, the vertical tank is supplied without mounting feet. All other dimensions and shapes are identical to the horizontal and vertical versions. When selecting the oil tank, two factors must be considered:

a. System Flow Rate:The oil tank capacity is generally 1 to 4 times the system flow rate. A lower coefficient is used when the system operates at a low working frequency, while a higher coefficient is applied for high-frequency operation. When the ambient temperature around the system is low, the coefficient is smaller; when the ambient temperature is high and heat dissipation conditions are poor, the coefficient should be larger.

b. Supplementary Oil Volume Required When the Hydraulic Cylinder Rod Extends:The oil tank capacity should be at least 1.2 to 2 times the supplementary oil volume required by the hydraulic cylinder.

Calculation of the Supplementary Oil Volume Q(Unit: Liter):

Plunger Cylinder:$Q=\pi d^2S/4$ where d — piston rod diameter (unit: dm); S— stroke (unit: dm).

Single-Rod Double-Acting Piston Cylinder (both chambers used): where d — piston rod diameter (unit: dm); S — stroke (unit: dm).

Single-Rod Double-Acting Piston Cylinder (one chamber used):When used as a push cylinder:$Q=\pi D^2S/4$; D — piston rod diameter (unit: dm); S is as defined above.

When used as a pull cylinder:$Q=\pi(D^2-d^2)S/4D$, where D, d, and S are as defined above.

Double-Rod Double-Acting Equal-Speed Cylinder: Q=0

By comprehensively comparing items a and b, an appropriate oil tank capacity can then be determined.

3.8 Pressure Gauge:The front face of the valve block is equipped with a ZC1/4" pressure gauge port C, which is used by the user for system pressure adjustment and inspection during commissioning. The C port is sealed with a threaded plug before delivery.

Upon request, a stainless-steel, oil-free, vibration-resistant pressure gauge can be installed at the factory.

3.9 Intensifier:The hydraulic power unit supplies oil to the intensifier through a two-position or three-position four-way directional valve. After being pressurized by the intensifier, the high-pressure oil is continuously delivered to the system. This setup is commonly used with plunger cylinders, spring-return cylinders, and single-chamber high-pressure double-acting cylinders. The schematic diagram is shown in Figure 6. The standard intensifier has a pressure ratio of 5:1, with an output flow rate equal to 10% of the input flow rate, and a maximum output pressure of 80 MPa. Non-standard intensifiers are available in 11 different pressure ratios, ranging from 1.2:1 to 20:1. The maximum input/output flow rates are 70 L/min

Advantages of the Intensifier: a. The output pressure is adjustable. b. It can continuously deliver pressurized fluid. c. Equipped with a leak-free, hydraulically controlled check valve. d. Under normal pressure, the primary circuit supplies oil directly, and the intensifier only operates under high pressure—thus improving efficiency and saving energy. e. As the primary low-pressure circuit is used for control, the failure rate is very low, performance is reliable, and service life is long.

4. Operating Instructions and Precautions:

4.1 Working Fluid and Operating Conditions:It is recommended to use anti-wear hydraulic oil, turbine oil, machine oil, or other mineral oils with a viscosity of 25–40 cSt. The cleanliness level of the working fluid should meet NAS 1638 Class 9 or ISO 4406 Class 19/15 or better. The operating temperature of the working fluid should be maintained within the range of 15–60 °C. If special working fluids or higher/lower operating temperatures are required, please specify this when placing the order.

During initial installation and commissioning, it is essential to maintain the proper oil level in the reservoir. This is especially important when the hydraulic cylinder is large and the reservoir capacity is relatively small. Before operation, ensure that the piston rod of the hydraulic cylinder is fully retracted, the cylinder is completely filled with oil, and the oil level in the reservoir remains sufficiently high.

4.2 Installation: Secure the hydraulic power pack using fastening bolts. Vertically mounted power packs that are not subject to movement may also be placed directly on a flat floor.

4.3 Piping Connections: According to the hydraulic schematic, use clean piping and fittings to correctly connect the power pack's ports to the actuators.

4.4 Motor and Solenoid Valves: When wiring the motor and solenoid valves, pay particular attention to the power supply, voltage, and for DC motors, ensure that the polarity matches the nameplate exactly. AC motors must be reliably grounded; operation without grounding is strictly prohibited. Ensure the motor junction box is protected against water and moisture. During initial wiring, jog the motor and carefully check the rotation direction. The motor rotation must match the arrow indication; reverse rotation with the pump or dry running without oil is strictly forbidden. For DC motors, continuous energization should not exceed 2 minutes at a time.

4.5 Initial No-Load Test: With the actuators unloaded, start the motor and perform a dry-run test. Check that all components operate smoothly, without leaks or abnormal noise. Once confirmed fault-free, gradually apply load until normal operation is achieved.

5. Maintenance:

Since the hydraulic power pack contains only a single mesh suction filter, it is essential to always ensure that the actuators and piping remain clean to prevent any contamination particles from entering the system.

Because the hydraulic power pack has a relatively small oil tank, it is necessary to constantly monitor for fluid leakage. In particular, if there is significant external leakage from the hydraulic cylinders, the working fluid must be replenished promptly to maintain the proper oil level. Running the pump dry can cause pump damage and cavitation in the hydraulic cylinder seals.

After the first 100 hours of operation with newly added fluid, replace it with fresh fluid. Thereafter, replace the fluid annually (approximately every 3,000 operating hours). When the hydraulic power pack is used in environments with vibration, anti-vibration pads should be installed.

Figure 6 Hydraulic Circuit Diagram of the Booster

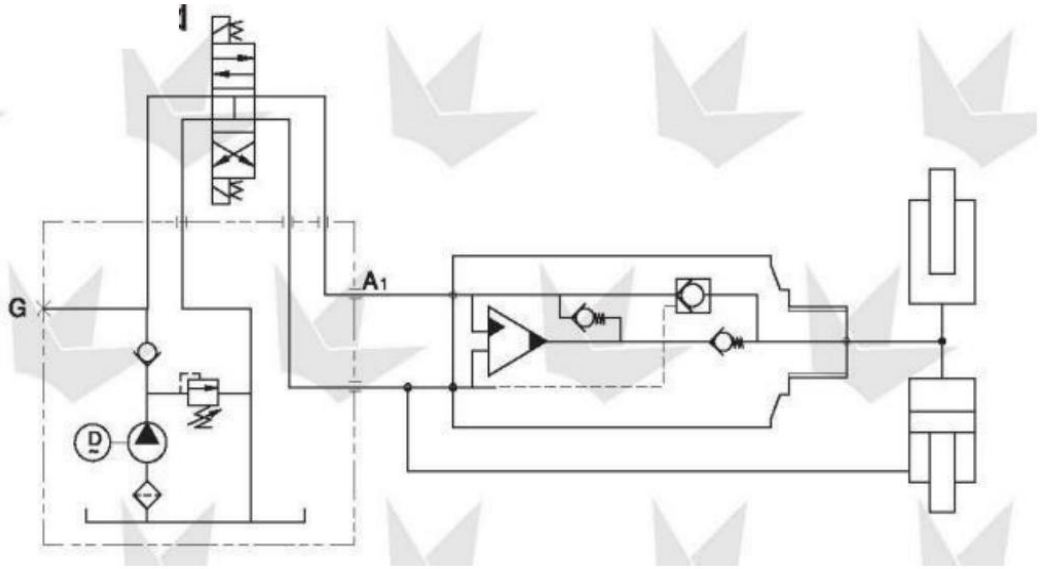
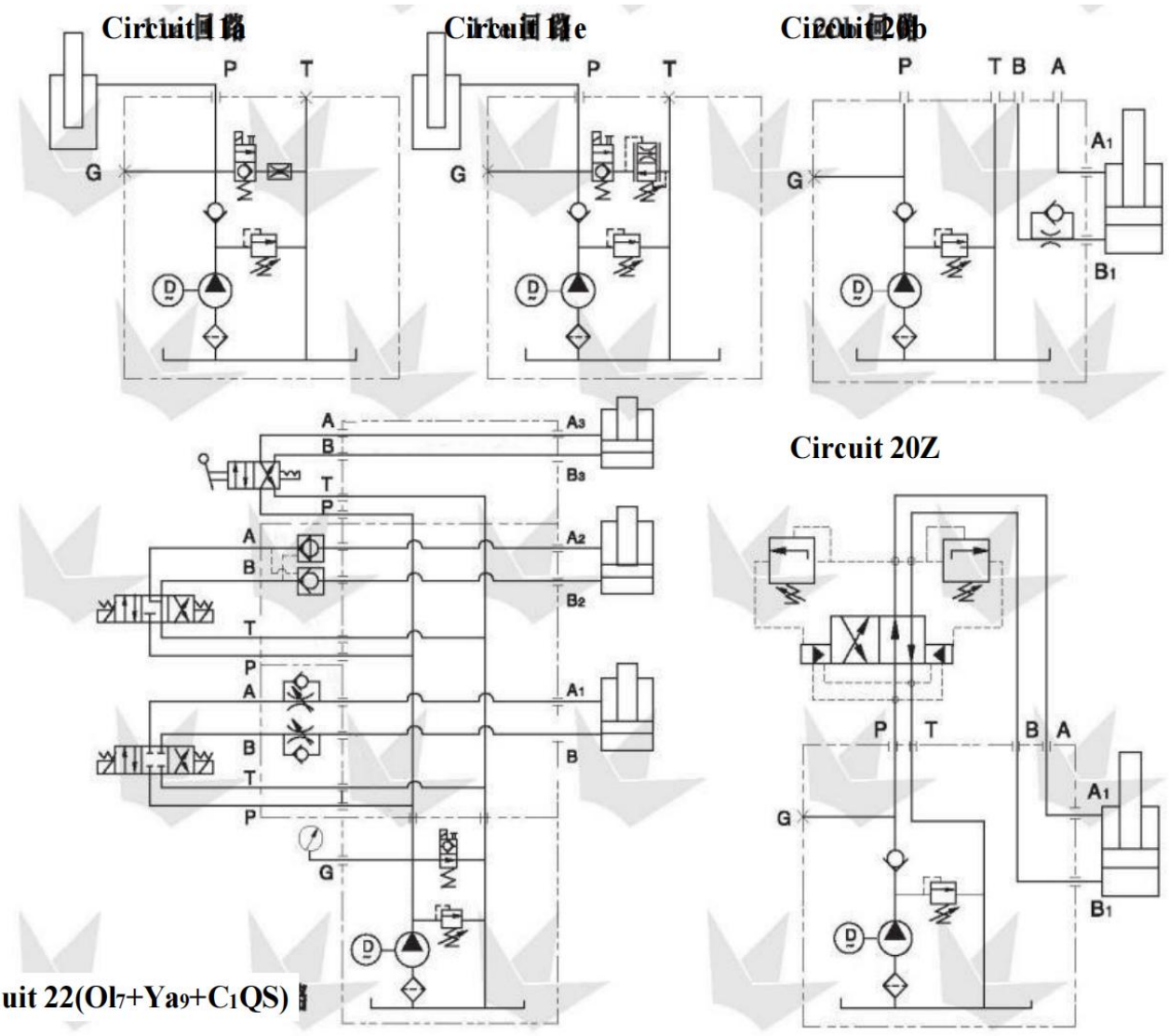


Figure 7 Example Hydraulic Circuit Diagram of Extended Circuits for UP Series Hydraulic Power Packs



Circuit 22(Ol7+Ya9+C1QS)

Figure 8 Example Hydraulic Circuit Diagram of a UP Series Hydraulic Power Pack