

LMSD-23 Electro-hydraulic Servo Drive



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LMSD-23 Electro-hydraulic Servo Drive Feature

High reliability, high stability

- Wide voltage range design, adapt to a variety of grid environment
- EMC design, adapt to the complex environment on site
- Full range of servo design, fully adapt to highly dynamic, high-intensity load operation of the injection molding machine
- The drives of 90KW and below have built-in braking unit, easy to install and wiring, higher reliability
- PCB board three paint coating process, fully adapt to wet, oil mist, dust, particles and other poor working conditions of the injection molding machine Motor temperature detection (support PTC, KTY84) and protection, pressure sensor power failure protection, effectively ensuring the safe operation of the injection molding machine system

Unique multi-pump parallel flow and multi-pump bypass/parallel flow control

Multi-pump parallel flow

- For the same large-tonnage unit, achieve synchronous operation
- High-speed CAN bus interaction, just need to set the master, slave
- Convenient debugging, hydraulic response is fully controlled by the master PI, the slave follow the master action
- When holding pressure, the master can be automatically removed from the slave running, more energy-efficient
- Special treatment of unstable motor speed during the sol when breaking high hardness materials

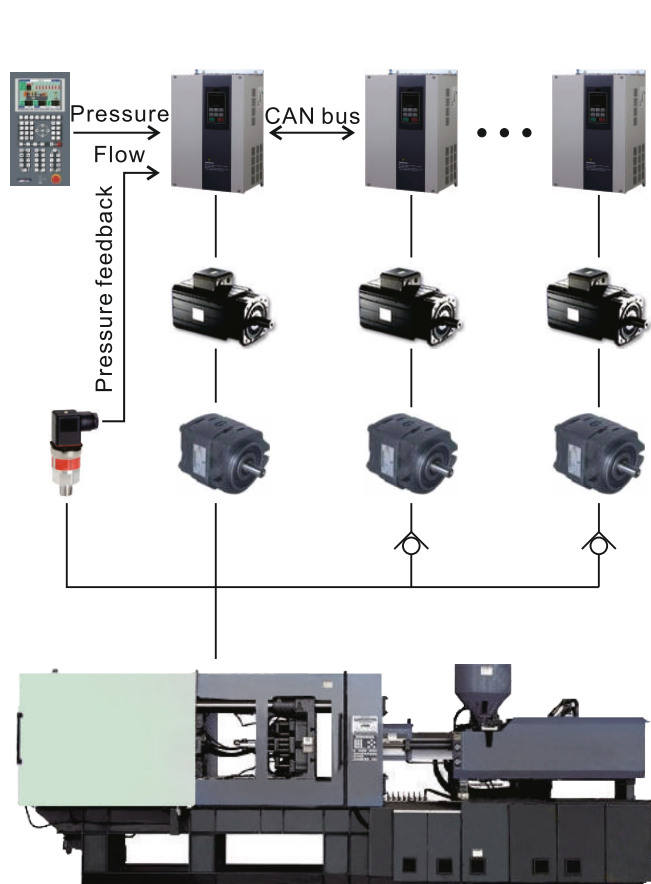
Multi-pump bypass / parallel flow

In the multi-pump hydraulic injection molding machine system, it can use complex control scheme of multi-pump parallel flow and bypass flow, injection molding machine system switches mode according to the needs of actual process, comparing with a simple multi-pump parallel flow system, with more energy-efficient, more efficient, etc.

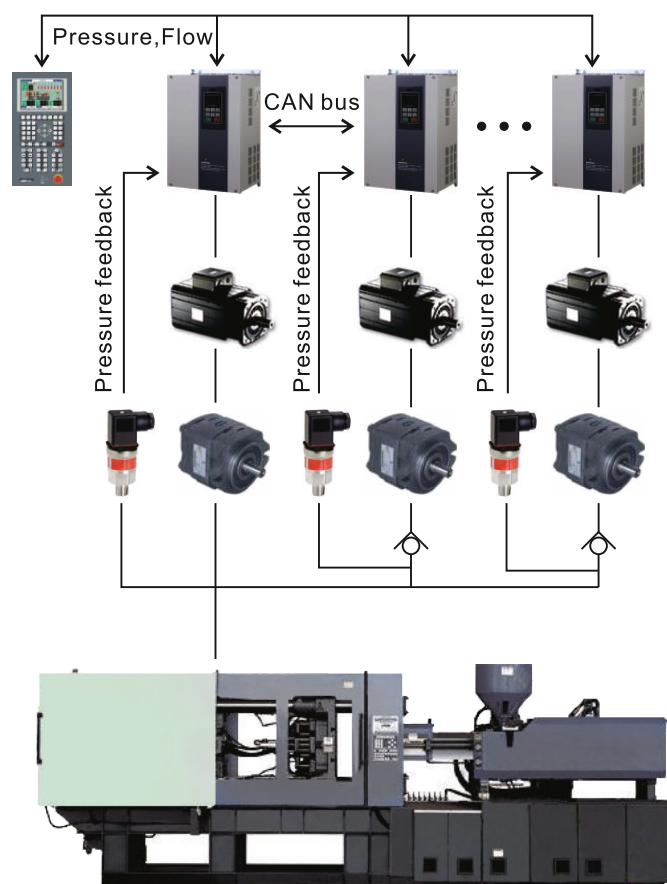
Unique dual displacement pump control

- The right amount of displacement switching, more energy efficient
- Fast response, fast cycling, more precise
- High sensitivity overflow, more reliable
- Saving power configuration, more environmentally friendly

LMSD-23 Electro-hydraulic Servo Drive Feature



Multi-pump parallel flow program



Multi-pump bypass / parallel flow program

Easy parameter settings

- ▶ Factory empirical parameters, can satisfy the requirement of more than 90% of the field condition
- ▶ Many motor tuning mode selectable
- ▶ Operation panel rich parameters display
- ▶ Multiple sets of PI automatic switching, effective control the system response and overshoot
- ▶ Convenient PC TOOLING debugging software

LMSD-23 Electro-hydraulic Servo drive advantages

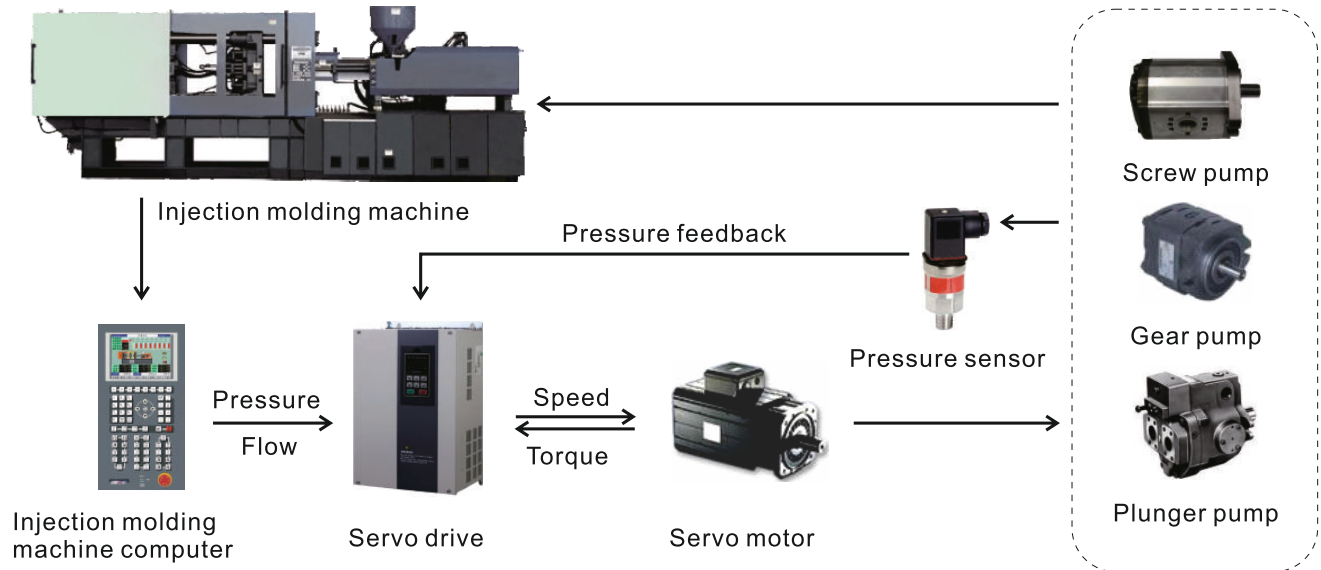
- ▶ The pressure sensor AI channel is 16bit AD with higher precision.
- ▶ Motor resolver PG feedback soft decoding, stronger anti-interference ability.
- ▶ Standard equipped with dual-channel CAN, system control coordination is more flexible.
- ▶ Host computer USB debugging interface, oil pressure online monitoring.
- ▶ Optimized oil pressure loop and motor control algorithm.
- ▶ The voltage regulation accuracy can be controlled within $\pm 0.5\text{bar}$.
- ▶ Brand new core hardware platform and compact structure.

Servo Motor Features

- ▶ The new permanent magnet embedded structure improves the weak magnetic overspeed and anti-demagnetization ability to meet the requirements of various working conditions in the electro-hydraulic industry.
- ▶ Industry-leading motor design technology platform, small motor size, light weight, low noise, strong overload capacity, ensure excellent electromagnetic performance.
- ▶ Mature manufacturing system, perfect process and quality standards, ensure stable and reliable product quality.
- ▶ Permanent magnets come from large domestic manufacturers, high performance, low loss, high energy efficiency, low temperature rise, small current and large torque.
- ▶ Built-in PTC and KTY temperature sensors, provide more protection for the motor.
- ▶ Support non-standard customization, suitable for a variety of occasions.
- ▶ A 9-core 6-meter encoder cable is included.

Injection Molding Machine Electro-hydraulic Servo System Solutions

Servo pump system components

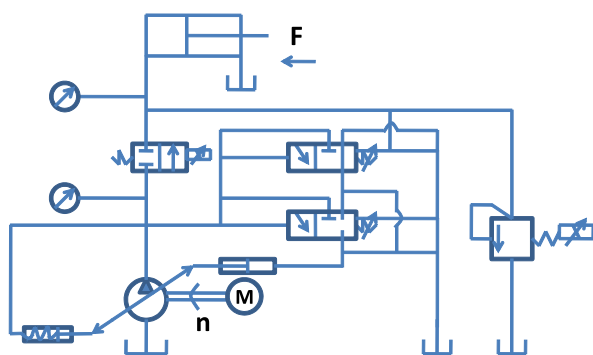
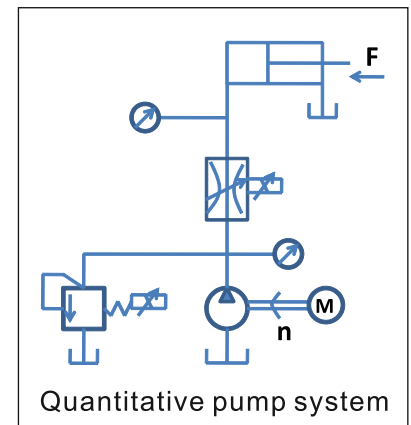


Comparison of all kinds of pump system

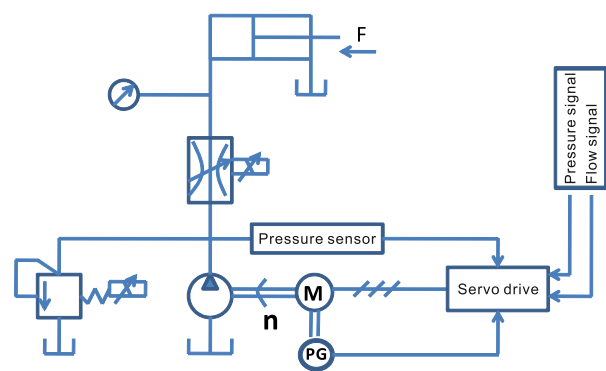
Traditional quantitative pump injection molding machine has a very serious energy wastage. According to the statistics show that in the past, its maximum operating efficiency is not more than 40%, energy-saving reform for such injection molding machine is imperative.

Variable pump injection molding machine mine energy-saving transformation space of oil circuit from the perspective of hydraulic components, , thereby improving the efficiency of the oil circuit system. But restricted by its control mode, the system cannot completely eliminate the throttling, overflow losses.

Servo drive injection molding machine transforms traditional oil circuit from the speed adjustment mode from the perspective of electrical control, using accurate, fast, and reliable characteristics of modern control systems, can eliminate the throttling losses from its source and reduce overflow losses.



Variable pump system

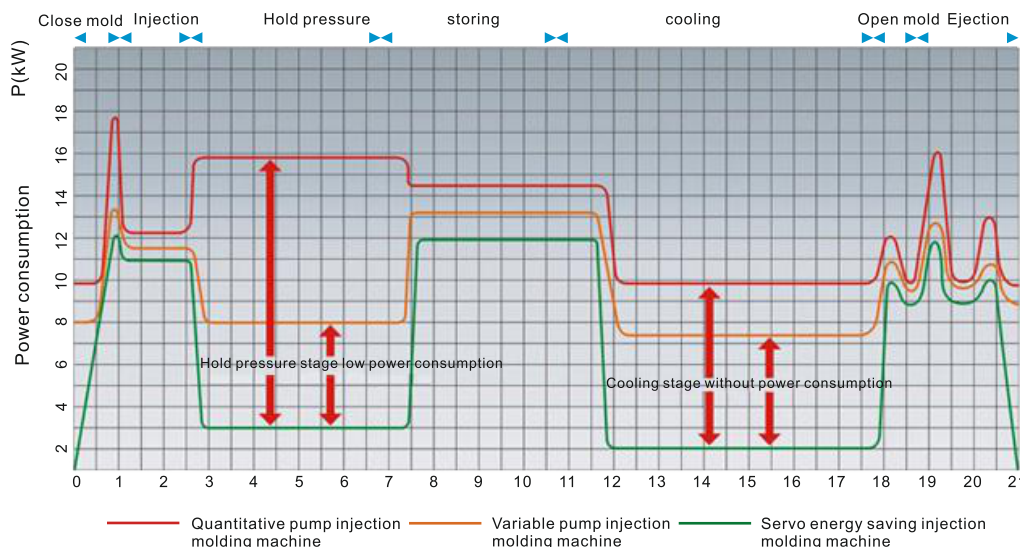


Servo pump system

Injection Molding Machine Hydraulic Servo System Advantages

Energy saving

Servo drives apply modern control technology, fully play the speed adjustment performance of servo motor, combine with a high-speed and high response PID algorithm, provide pressure as required, compared with the original quantitative pump or variable pump system, the highest energy saving rate can reach more than 80%.



Precision

High position repeatability

Fast response servo drive to pressure, flow, ensure the open mold and close mold precision of injection molding machine, injection end position error can be controlled within 0.1mm.

High pressure control precision

Servo drive with high-speed DSP, combined with optimized high response and high precision PID algorithm to ensure the stability of the system pressure, pressure fluctuations can be controlled under ± 0.5 bar.

High efficiency

High motor speed

Compared with the original asynchronous motors, higher speed of servo motor enhance the output of the pump to improve the overall efficiency of the injection molding machine.

High response speed

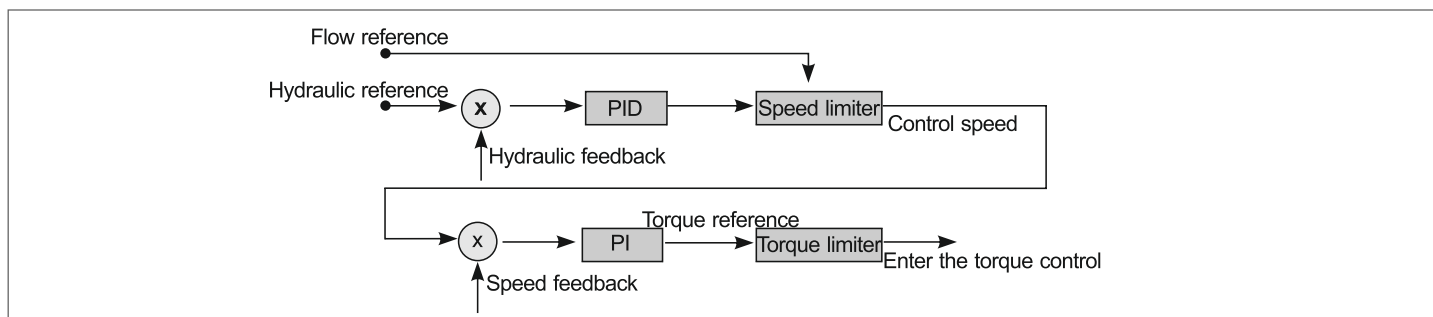
Fastest response speed can be up to 20ms, effectively improve the speed of the hydraulic system to build pressure.

Low noise

Rely on optimized PID control algorithm of servo drive, match high-performance permanent magnet servo motor, greatly reduce operating noise of the injection molding machine, achieve quiet operation, effectively improve the working environment.

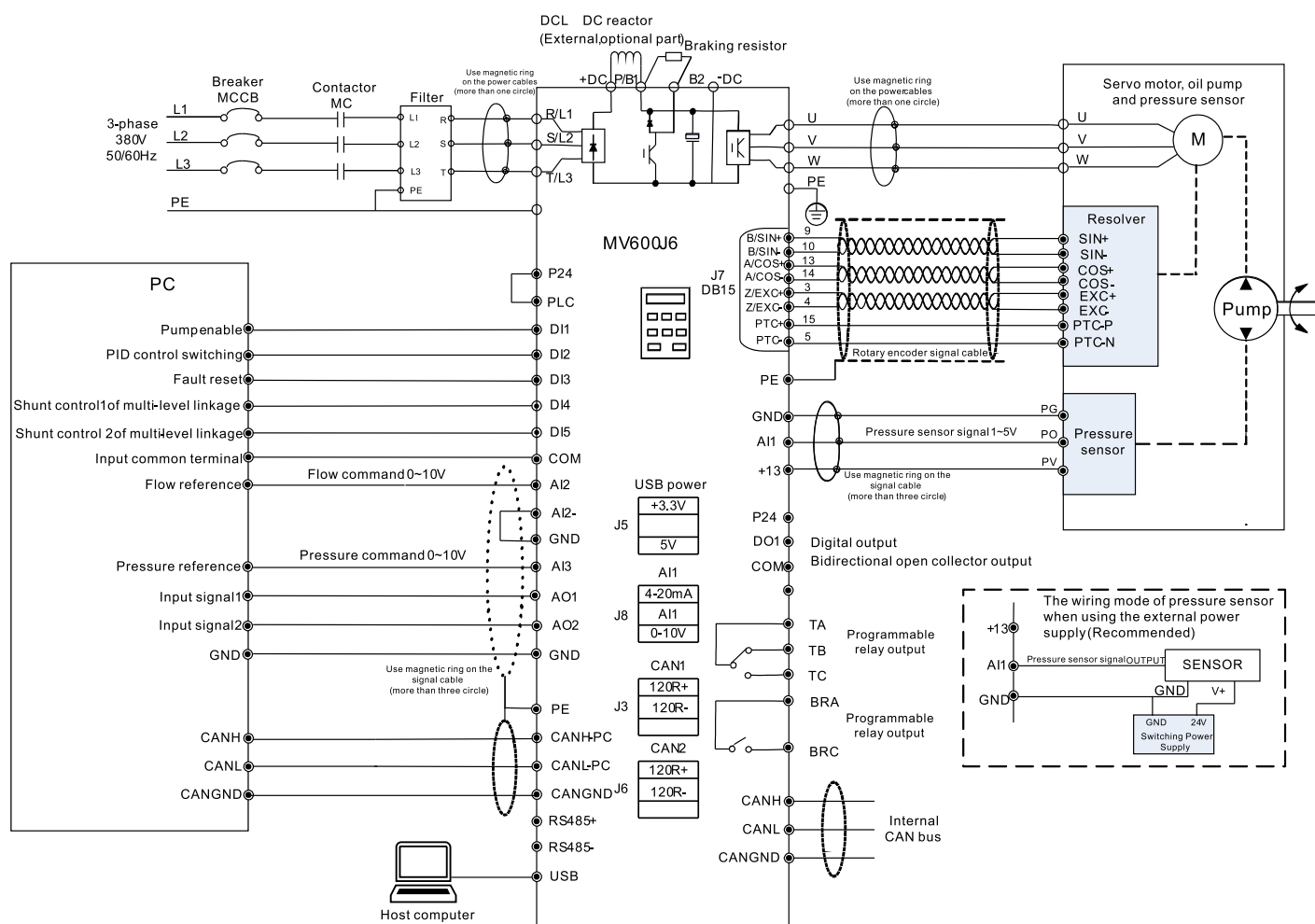
LMSD-23 Electro-hydraulic Servo Drive Single System Control

Pressure flow control algorithm



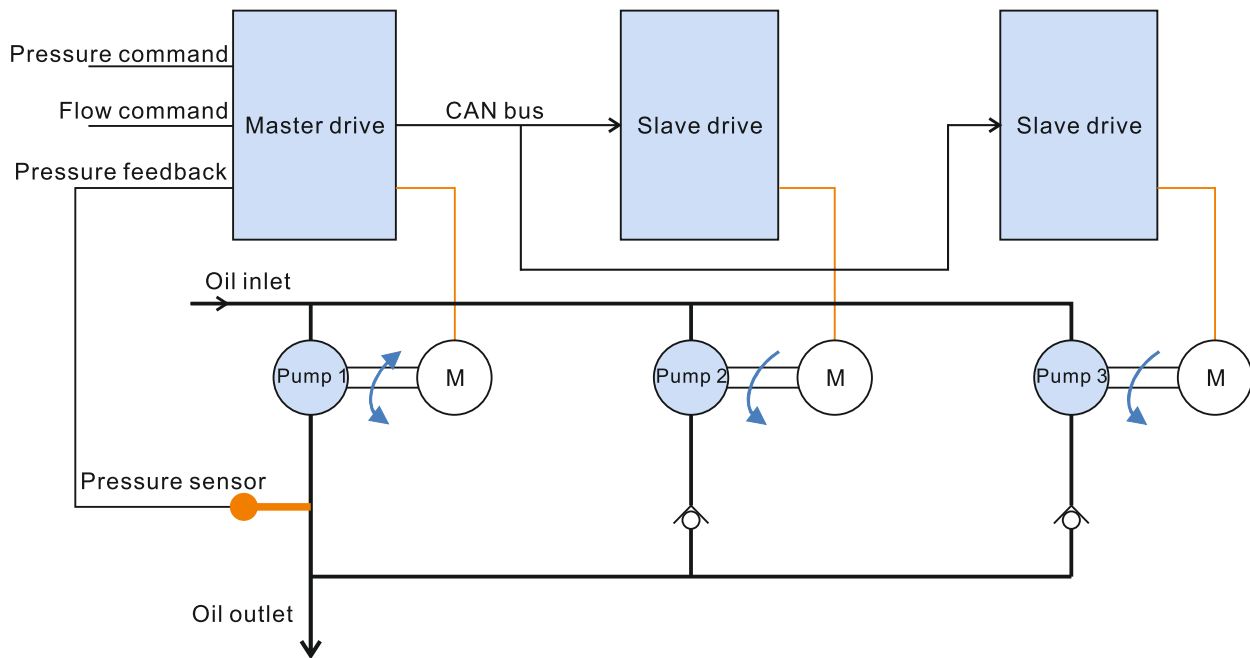
Servo drive pressure flow control algorithm

Main circuit and control circuit terminal wiring diagram

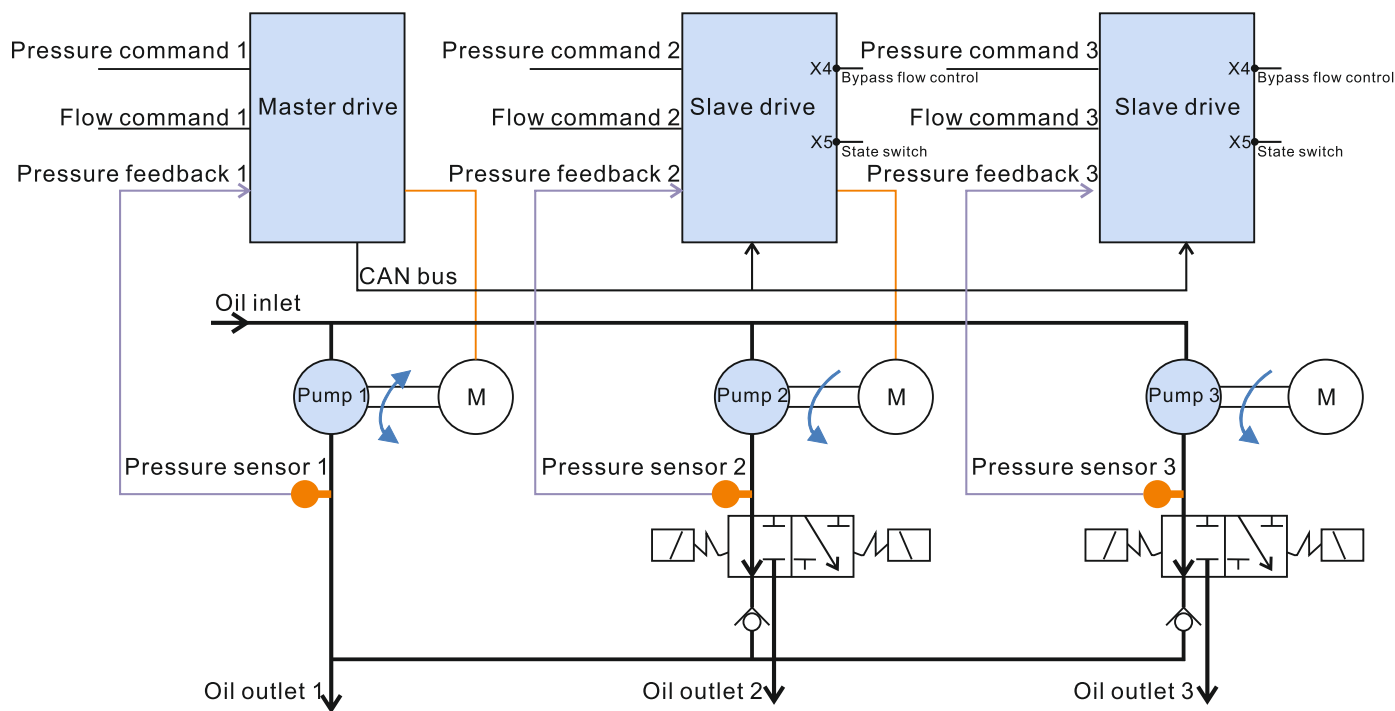


LMSD-23 Electro-hydraulic Servo Drive multi-system control

Multi-system control mode 1(parallel flow diagram)

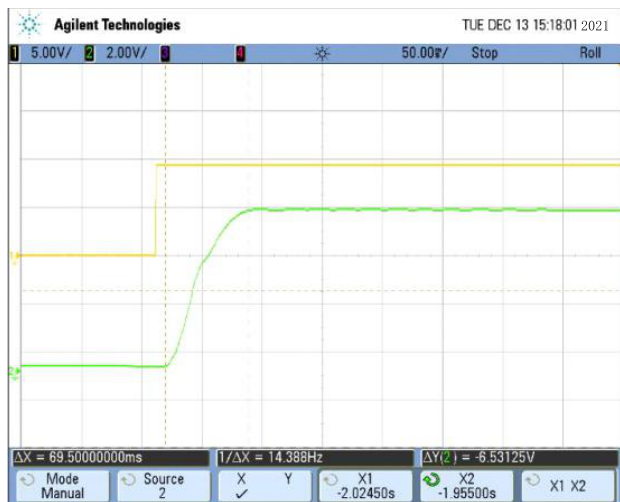


Multi-system control mode 2(parallel /bypass flow diagram)



LMSD-23 Electro-hydraulic Servo drive field test Waveforms

Building pressure



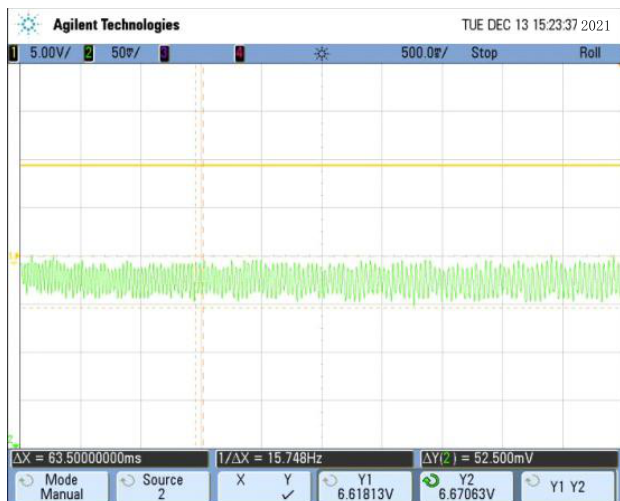
Building pressure time of 175bar is 64.5ms.

Unloading pressure



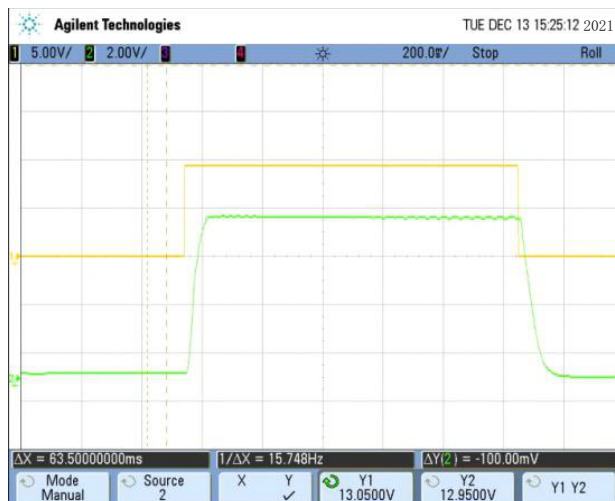
Unloading pressure time of 175 bar is less than 100ms.

Steady pressure



Pressure sensor range 250bar, 0 ~ 10V output. Hold pressure 175bar, pressure fluctuations is $\pm 0.65\text{kg / cm}^2$.

Full cycle



Fast response to cyclical building pressure, hold pressure, unloading pressure instructions.

LMSD-23 Electro-hydraulic Servo Drive Quick Selection

Calculate the torque required by pump, determine motor selection

A rated displacement q (ml / rev) of the pump, produce a certain pressure p (bar), according to the hydraulic theory, the torque required to drive the pump is as follows:

$$T_{\text{pump}} = 0.0159 \cdot p \cdot q (\text{N} \cdot \text{m})$$

Considering that the motor has a certain overload capability, and the injection molding machine is not been in a state of maximum torque, rated torque of pump motor is calculated as follows:

$$T_{\text{motor}} = T_{\text{pump}} / 1.4 \sim 1.6$$

Related motor parameters table, firstly select the motor torque. According to the data provided by different motor manufacturers, usually a motor torque have three speed segments 1500rpm, 1700rpm, 2000rpm, according to different pump of system configuration, select the speed, determine the motor.

Calculate the drive rated current, determine the drive selection

After the motor is determined, according to the value of the motor k_t , calculating the drive maximum current required to provide:

$$I_{\text{drive max}} = T_{\text{pump}} / k_t$$

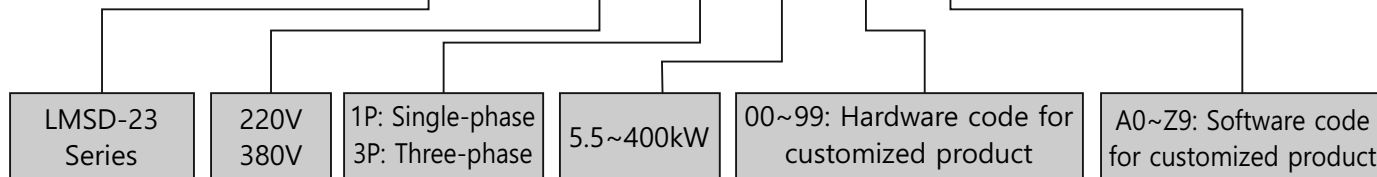
Computing according to drive overload 1.5 times in 1 min, the drive rated current is:

$$I_{\text{rated}} = 1.2 \cdot I_{\text{drive max}} / 1.5$$

Note: Due to the accuracy of the parameters provided by each motor and pump manufacturers is different, in order to improve the safety and stability of the system, multiplied by a safety factor of 1.2 should be considered in the drive selection. The drive model can be preliminary selected according to drive rated current.

Ordering code

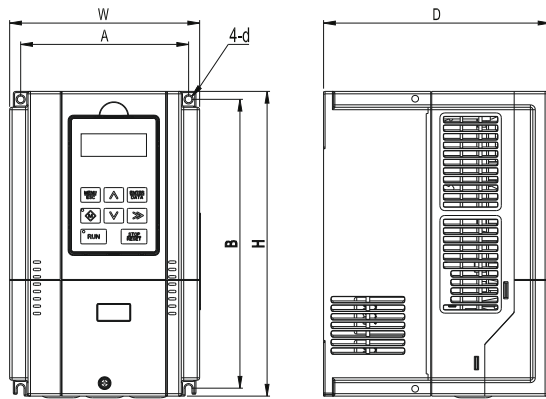
LMSD-23-380V 3P 11- ** A*



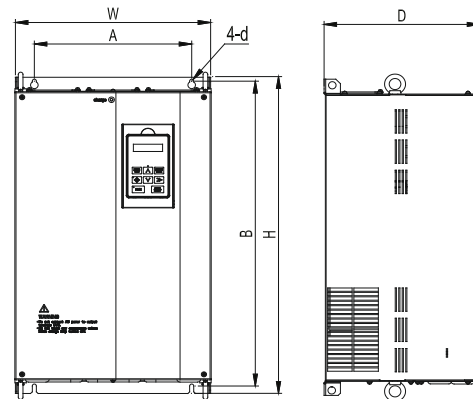
Electro-hydraulic Servo drive	Input power	Rated capacity (kVA)	Rated Input current (A)	Rated Output current (A)	Braking resistor value (Ω)	Braking Torque(%)	Braking Unit	Note
LMMSD-23-380V-3P5.5	Three-phase 380V~480V -15%~+10%	8.5	14.5	13.0	1000W/45 Ω	120	Built-in	Plastic structure
LMMSD-23-380V-3P7.5		11.0	20.5	17.0	1000W/45 Ω	200		
LMMSD-23-380V-3P11		17.0	26.0	25.0	1500W/32 Ω	200		
LMMSD-23-380V-3P15		21.0	35.0	32.0	1500W/32 Ω	200		
LMMSD-23-380V-3P18.5		24.0	38.5	37.0	2500W/25 Ω	200		
LMMSD-23-380V-3P22		30.0	46.5	45.0	2500W/20 Ω	200		
LMMSD-23-380V-3P30		40.0	62.0	60.0	3000W/20 Ω	150		
LMMSD-23-380V-3P37		50.0	76.0	75.0	4000W/16 Ω	120		
LMMSD-23-380V-3P45		60.0	92.0	90.0	5000W/16 Ω	200		
LMMSD-23-380V-3P55		72.0	113.0	110.0	6000W/9 Ω	160		
LMMSD-23-380V-3P75		100.0	157.0	152.0	8000W/9 Ω	120	External	Sheet metal structure
LMMSD-23-380V-3P90		116.0	180.0	176.0	10000W/7 Ω	200		
LMMSD-23-380V-3P110		138.0	214.0	210.0	12000W/6 Ω	160		
LMMSD-23-380V-3P132		167.0	256.0	253.0	14000W/6 Ω	130		
LMMSD-23-380V-3P160		200.0	307.0	304.0	15000W/4 Ω	200		
LMMSD-23-380V-3P200		250.0	385.0	380.0	9600W/13.6 Ω *3	130		
LMMSD-23-380V-3P220		280.0	430.0	426.0	40kW/3.2 Ω *1	140		
LMMSD-23-380V-3P280		355.0	525.0	495.0	40kW/2 Ω *1	140		
LMMSD-23-380V-3P315		445.0	590.0	585.0	60kW/3.2 Ω *1	120		
LMMSD-23-380V-3P355		500.0	665.0	650.0	60kW/3.2 Ω *1	110		
LMMSD-23-380V-3P400		565.0	785.0	725.0	60kW/2 Ω *1	110		

Note: *2 means that two braking resistors are connected in parallel, and so on.

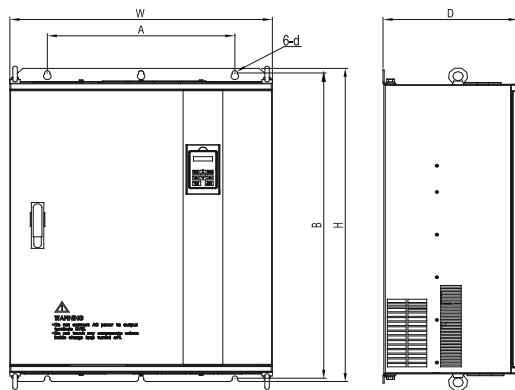
Mounting Dimensions



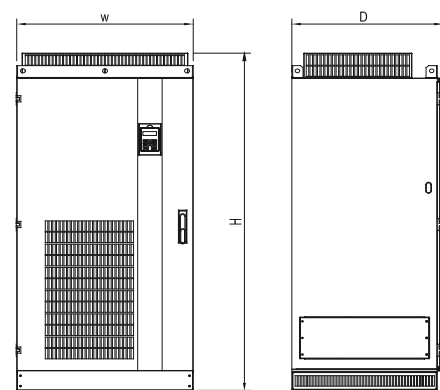
Mounting dimensions for products of R3,R4



Mounting dimensions for products of R5,R6,R7,R7P



Mounting dimensions for products of R9P,R10



Mounting dimensions for products of R11

Enclosure model	Drive model	A(mm)	B(mm)	H(mm)	W(mm)	D(mm)	Diameter of mounting aperture (mm)	Gross weight ±0.5(kg)
R3	LMSD-23-380V-3P5.5	137	236	249	155	198	5.5	4
	LMSD-23-380V-3P7.5							
	LMSD-23-380V-3P11							
	LMSD-23-380V-3P15							
R4	LMSD-23-380V-3P18.5	186	314.5	330	209	206	6.5	9
	LMSD-23-380V-3P22							
	LMSD-23-380V-3P30							
R5	LMSD-23-380V-3P37	220	437.5	451.5	284.5	213	6.5	21
	LMSD-23-380V-3P45							
R6	LMSD-23-380V-3P55	270	549	570	335	262	7	41
	LMSD-23-380V-3P75							
R7	LMSD-23-380V-3P90	270	579	600	335	292	7	49
R7P	LMSD-23-380V-3P110	290	641	672	374	296	12	55
	LMSD-23-380V-3P132							
	LMSD-23-380V-3P160							
R9P	LMSD-23-380V-3P200	370	827.5	849.5	530	350	12	154
R10	LMSD-23-380V-3P220	500	932	956	700	361.5	14	216
	LMSD-23-380V-3P280							
	LMSD-23-380V-3P315							
R11	LMSD-23-380V-3P355	-	-	1624	710	610	-	250
	LMSD-23-380V-3P400							

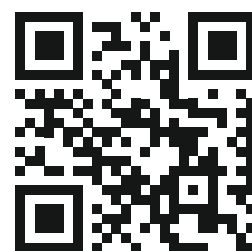


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