

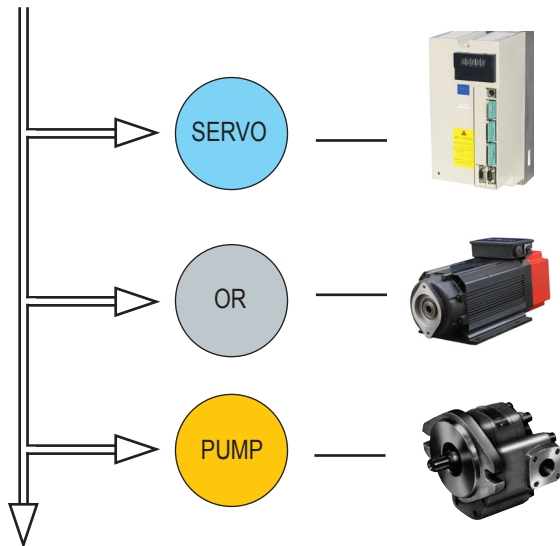


SMP AC SERVO HYDRAULIC DRIVE SYSTEM



北京超同步伺服股份有限公司
BEIJING CTB SERVO CO.,LTD.

Drive system from CTB, energy saving expert of injection molding machine



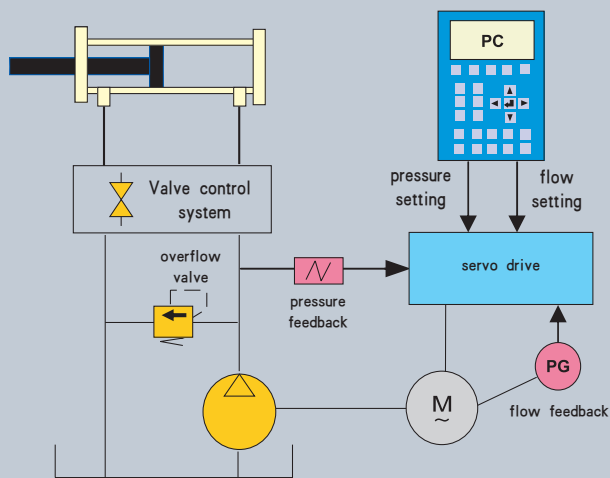
POWER SAVED

- ★ Built-in pressure PID optimization control algorithm, achieve high speed, precision control of injection molding machine.
- ★ Flat structure design, better for installation of injection molding machine
- ★ 3 times overload capacity, safe and reliable operation

- ★ Inner shaft type structure design, the installation of the oil pump will be more convenient, save space, reliable operation
- ★ Closed cooling air duct, the cooling efficiency is higher, low noise
- ★ Horizontal type structure, reduce the cost of installation

- ★ Suitable for gear pump, plunger pump, screw pump, and other fixed displacement pump
- ★ Automatically identify the characteristics of oil pump, give full play to the efficiency of pump
- ★ Provide pump selection solutions, achieve the optimal allocation scheme

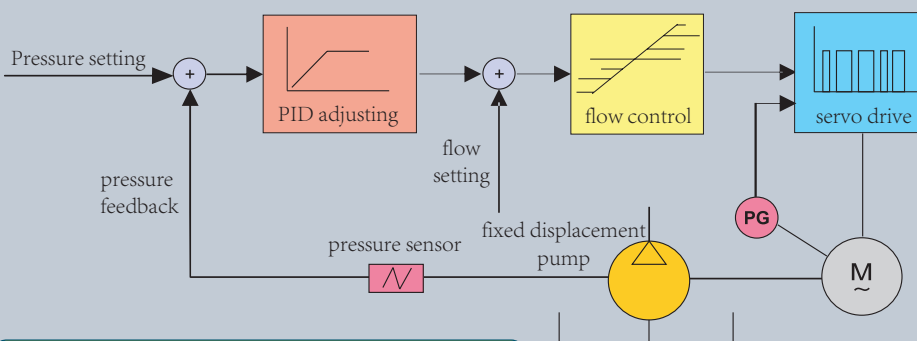
SMP system structure diagram



Control technology revolution of injection molding machine — pump control instead of valve control



SMP pressure control principle diagram



Built-in hydraulic control software of S M P system servo drive can truly realize:

The integration of control and drive

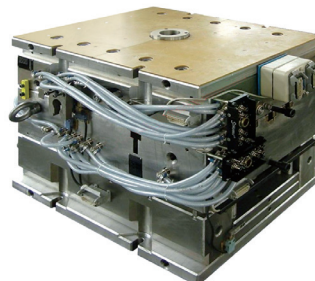
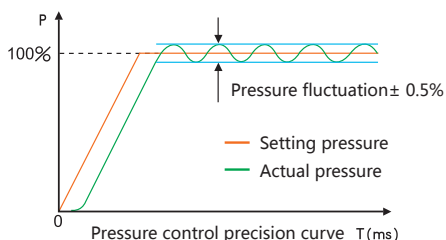
The integration of drive and motor

The integration of electric and machinery

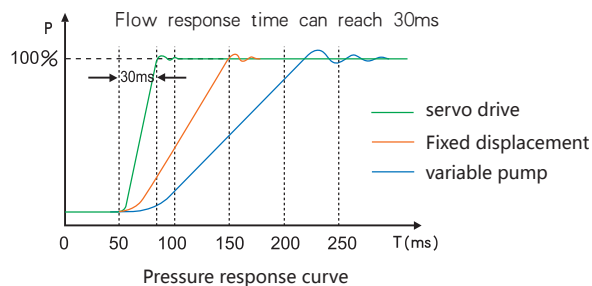
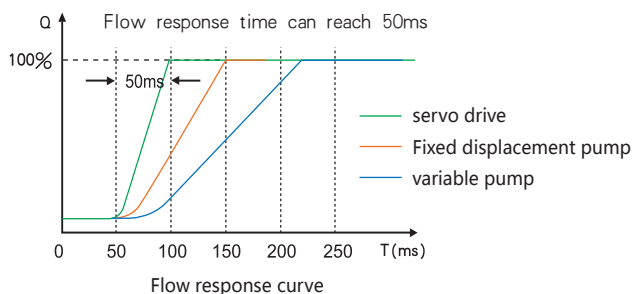
Provide complete hydraulic and mechanical control scheme for injection molding machine

SMP system achieve high accuracy control of hydraulic system

SMP system adopts high precision speed sensor as pressure detecting element, can realize full closed loop control of hydraulic system pressure, pressure control precision can be up to $\pm 0.5\%$.

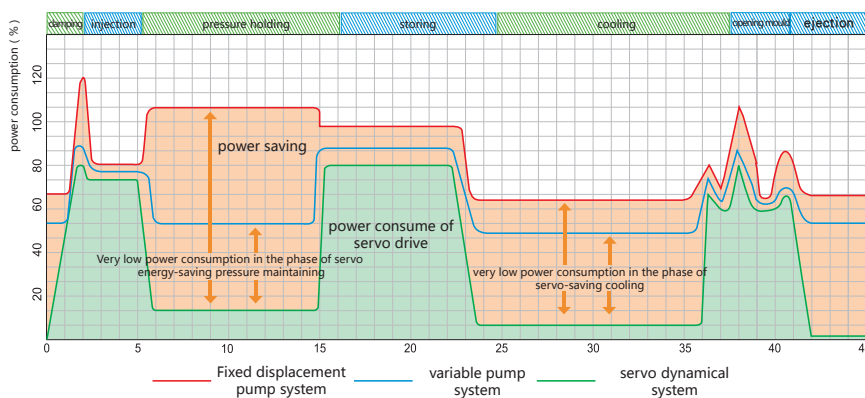


SMP system to achieve high response of hydraulic system control



SMP Low energy consumption system

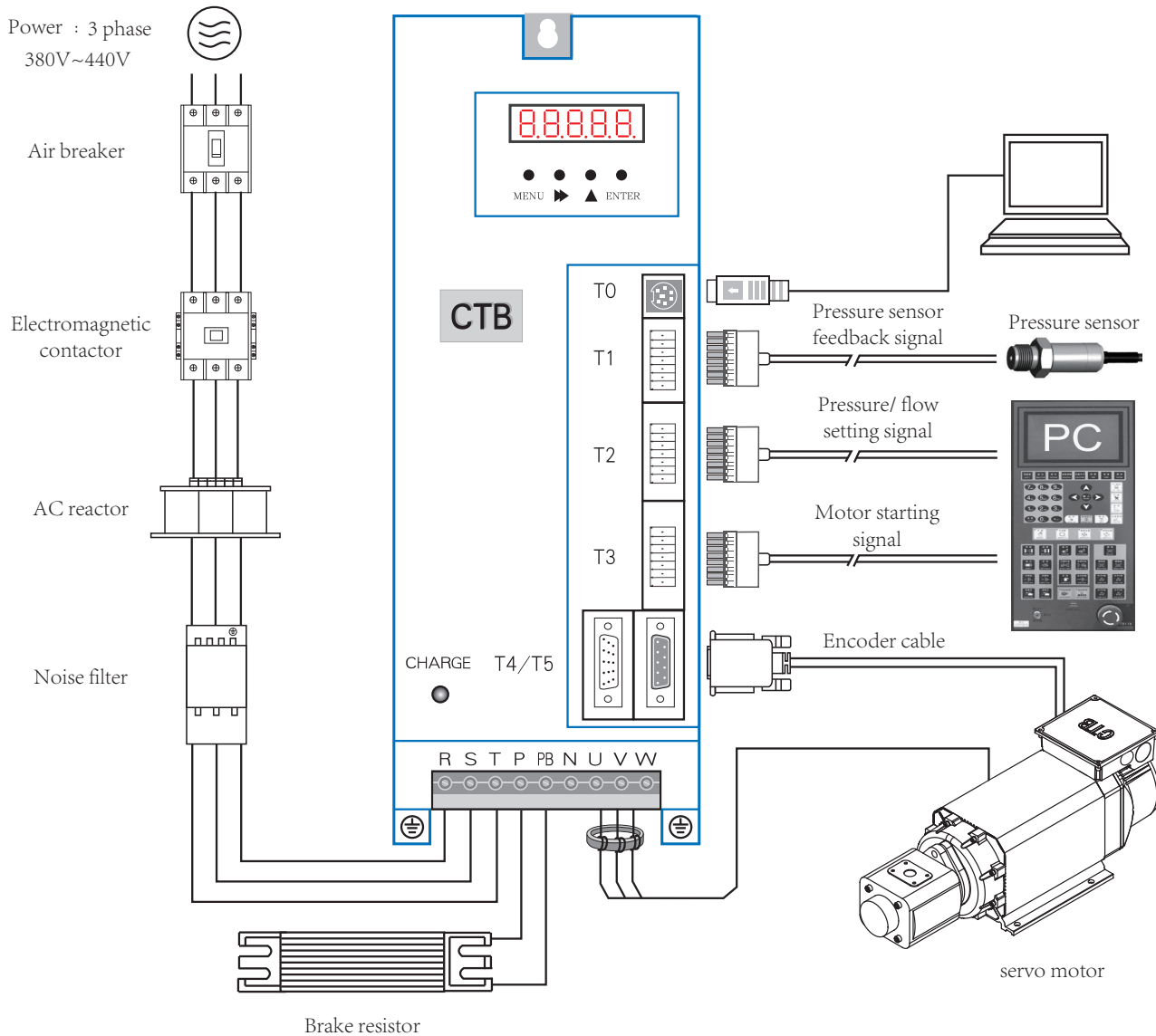
SMP system completely replace conventional hydraulic valve-controlled system, fixed displacement pump driven by high-performance servo motor, achieve pressure and flow control of hydraulic system through speed regulation of fixed displacement pump; Change of control process solves the high energy consumption of injection mould machine. Compared with traditional valve control system, pump control system can reach up to 70% of energy saving index, which is the biggest highlight of SMP system.



Performance difference between SMP system and other systems

| System composition | Power consume | Response speed | Control precision | Hydraulic oil temp | System noise | Product efficiency | Cost | Cost performance |
|--------------------|-----------------|------------------|-------------------|--------------------|--------------|--------------------|----------------|------------------|
| Fixed pump | High | Relatively quick | Relatively high | High | High | Relatively high | Low | Low |
| Variable pump | Relatively high | slow | Relatively low | high | high | Relatively low | Relatively low | Relatively low |
| VF fixed pump | Relatively low | Relatively slow | Low | low | low | Low | Low | Relatively high |
| Servo fixed pump | Low | Quick | High | Low | Low | High | High | High |

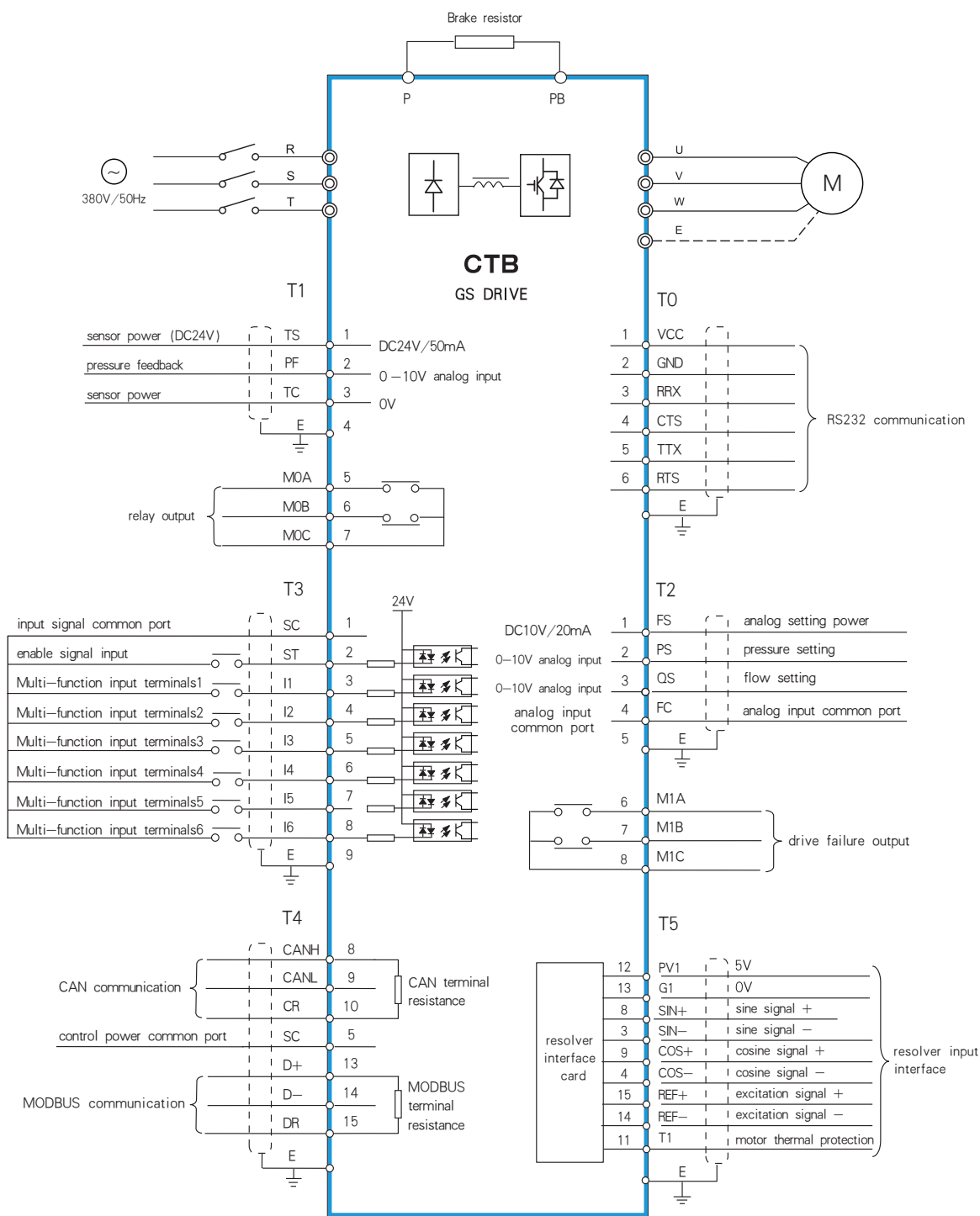
Electricity schematic diagram



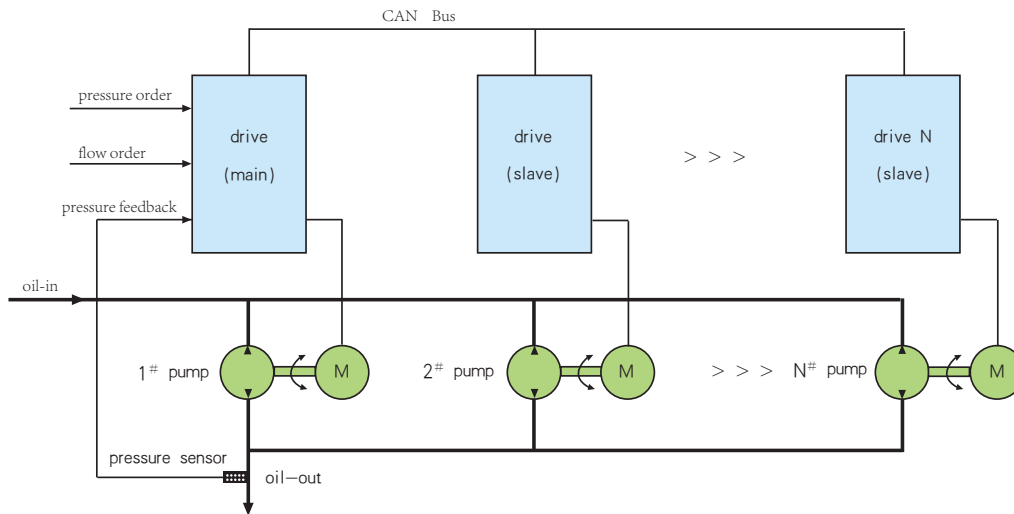
Component selection instruction

| Name | Application | Considerations in type selection | Remarks |
|---------------------------|---|--|---|
| Air breaker | Connect on or out off drive power | Type selection according to the 150% of rated current of drive | |
| Electromagnetic contactor | Used to automatic power for drive or automatically cut off power supply if failure. | Type selection according to the 150% of rated current of drive | |
| AC reactor | To improve the power factor of power grid, restrain power higher harmonic | Type selection according to the 150% of rated current of drive | |
| Noise filter | Prohibit the interference of power from driver | Type selection according to the 150% of rated current of drive | |
| Braking resistor | Consuming the recovered energy of driver | Type selection according to the manufacture' s standard | Refer to Common used accessories selection(P10) |
| Filter magnetic ring | Prohibit the external radio frequency interference and common mode interference | Type selection according to the manufacture' s standard | Refer to Common used accessories selection(P10) |

Drive control wiring diagram



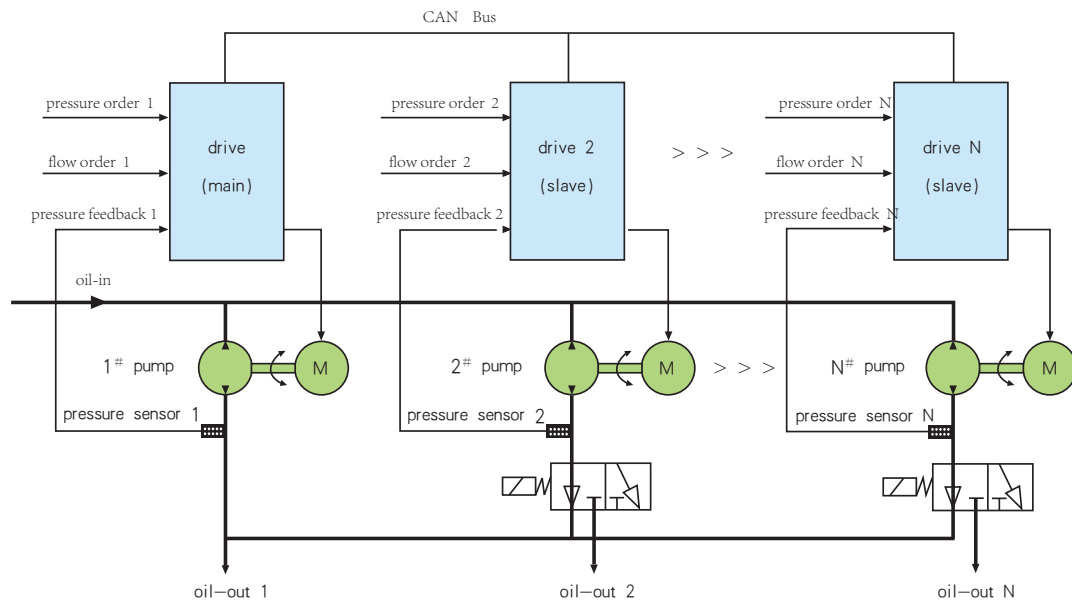
Multi-machine combination and split-flow scheme



Multi-Pump flow combination control scheme

The scheme is suitable for large tonnage injection molding machine, multi pump combination to form a big flow rate, flow combination is completely controlled by servo drive, no need PC control, pumps with different displacement can be arbitrary combination.

- ◆ Can automatically remove pump when holding pressure, using single pump for holding pressure, system can be more efficient and stable
- ◆ High-speed CAN bus communication between the pump, data transmission can be more accurate

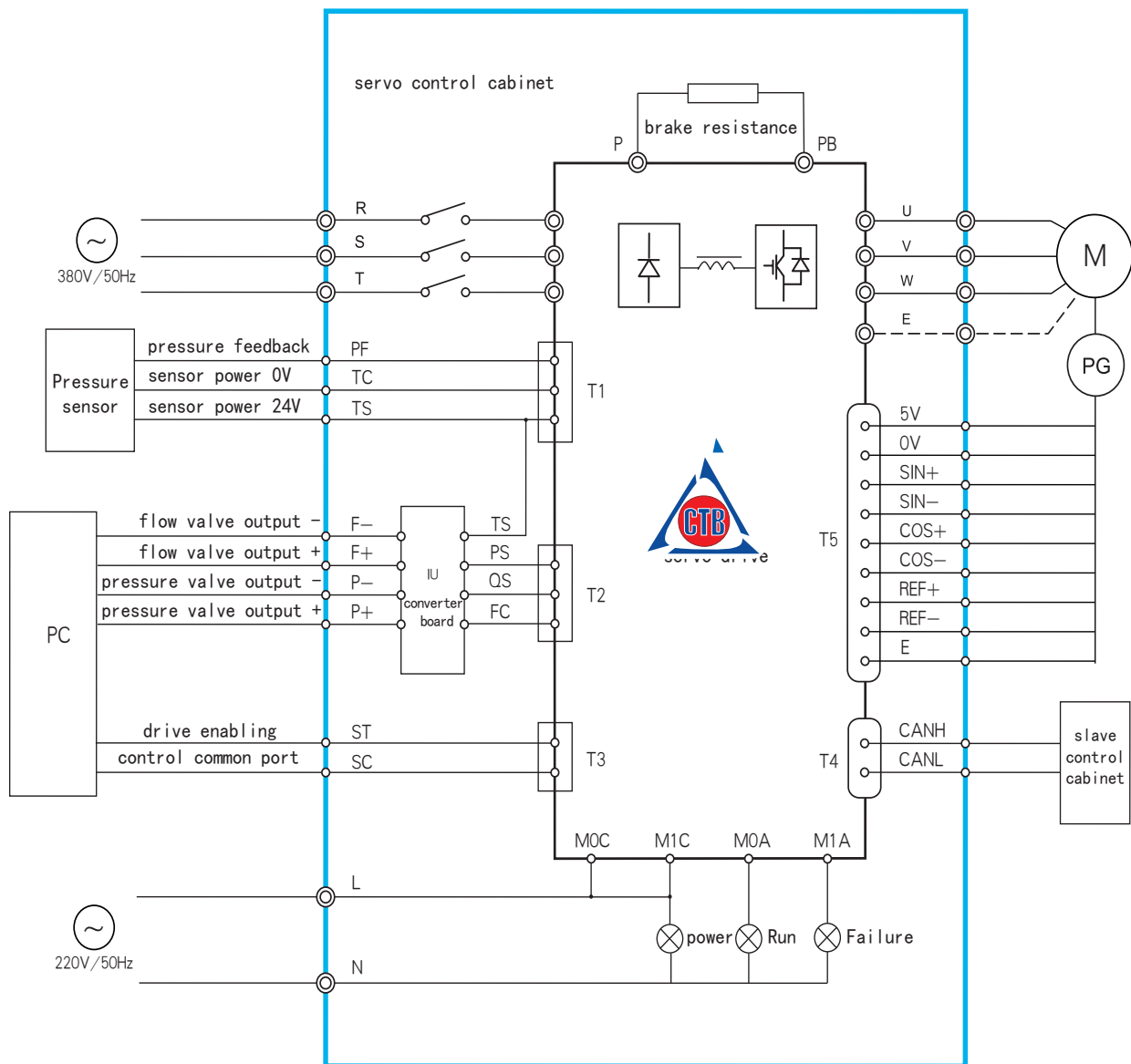


Multi-pump combination/split-flow control scheme

Except for flow control of big tonnage injection molding machine, in order to reduce production cycle, perform these operations, such as synchronous ejector pin, synchronization sol, minimize the cycle time, improve the production efficiency, achieve confluence, split-flow control via combination valve.

- ◆ Due to split-flow control, each pump need to configure independent pressure sensor
- ◆ SMP system has independent control interface used for confluence, split-flow control, easy to use

Servo control cabinet electrical schematic diagram



servo control cabinet performance index

| Drive model | Rated capacity (KVA) | Rated output (A) | Max current (A) | Adaptive motor power (kW) | Adaptive pumpage (cm ³ /r) |
|-------------|----------------------|------------------|-----------------|---------------------------|---------------------------------------|
| JSC-4011GS2 | 17 | 33 | 49.5 | 11/13 | 32/40 |
| JSC-4015GS2 | 21 | 42 | 63 | 15 | 50 |
| JSC-4018GS2 | 24 | 60 | 90 | 18 | 64 |
| JSC-4022GS2 | 30 | 60 | 90 | 22 | 80 |
| JSC-4030GS2 | 40 | 75 | 112.5 | 30 | 100 |
| JSC-4037GS2 | 50 | 75 | 112.5 | 35 | 125 |

Seal: dust-proof net structure is used for air vent, more adaptive for dust environment.
 Heat dissipation: built-in high power blower in cabinet, good cooling effect, more adaptive for high temperature and humidity environment.
 Compactness: compact cabinet structure, save installation space.
 Energy-saving: designed for energy saving renovation of traditional injection molding machine, energy saving can reach 70% (maximum)

Shape and mounting size of servo drive

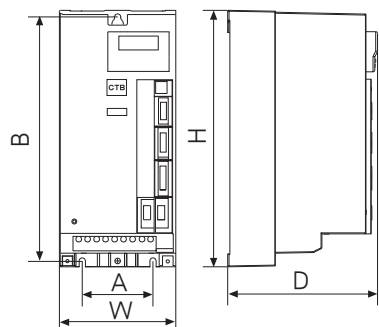


Figure 1 (5.5~11KW)

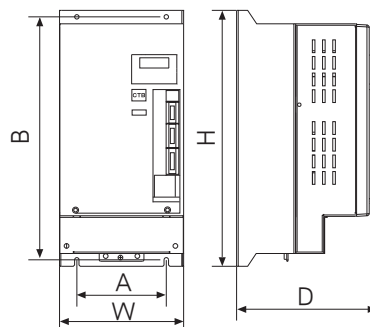
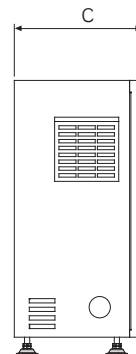
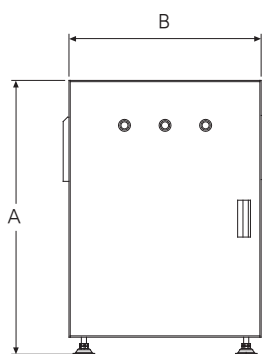


Figure 2 (15~45KW)

| Size(mm) Model | A | B | W | H | D | Wiring terminal bolt | Mounting bolt | Weight(kg) | Remark |
|-------------------|-----|-----|-----|-----|-----|----------------------|---------------|------------|------------|
| BKSC-4011GSX | 80 | 276 | 132 | 290 | 200 | line card width/5mm | M6 | 5 | (Figure 1) |
| BKSC-4015GSX | 140 | 380 | 194 | 400 | 228 | M6 | M6 | 14 | (Figure 2) |
| BKSC-4018GSX | | | | | | | | | |
| BKSC-4022GSX | 236 | 376 | 282 | 390 | 269 | M6 | M8 | 20 | |
| BKSC-4030GSX | | | | | | | | | |
| BKSC-4037GSX | 300 | 376 | 380 | 390 | 269 | M8 | M8 | 26 | |
| BKSC-4045GSX | | | | | | | | | |

Shape size of servo cabinet



| Model Size(mm) | JSC-4011GS2 | JSC-4015GS2 | JSC-4018GS2 | JSC-4022GS2 | JSC-4030GS2 | JSC-4037GS2 |
|-------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| A | 650 | 650 | 650 | 650 | 700 | 700 |
| B | 450 | 450 | 450 | 450 | 500 | 500 |
| C | 300 | 300 | 300 | 300 | 300 | 300 |

Induction servo motor standard specification

| Motor model | Rated torque (N·m) | Rated speed (r/min) | Max speed (r/min) | Rated power (kW) | Rated current (A) | System flux (l/min) | System pressure (MPa) | Adaptive pump pumpage (cm ³ /r) |
|--------------------|--------------------|---------------------|-------------------|------------------|-------------------|---------------------|-----------------------|--|
| CTB-4011ZRB20-35XJ | 53 | 2000 | 3000 | 11 | 21.5 | 76 | 14 | 32 |
| CTB-4015ZRB18-35XJ | 80 | 1800 | 3000 | 15 | 28.9 | 84 | 14 | 40 |
| CTB-4018ZRC18-35XJ | 100 | 1800 | 3000 | 18.5 | 35.1 | 100 | 14 | 50 |
| CTB-4022ZRC18-35XJ | 120 | 1800 | 3000 | 22 | 41.7 | 128 | 14 | 63 |
| CTB-4022ZRC15-35XJ | 140 | 1500 | 2500 | 22 | 42.3 | 144 | 14 | 80 |
| CTB-4030ZRD15-35XJ | 190 | 1500 | 2500 | 30 | 54.5 | 180 | 14 | 100 |
| CTB-4037ZRD15-35XJ | 235 | 1500 | 2500 | 37 | 66.8 | 225 | 14 | 125 |

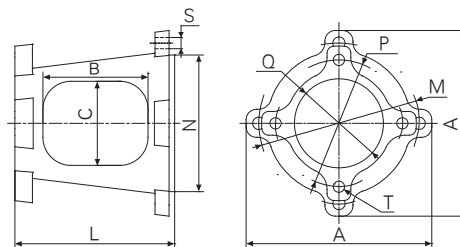
PMSM standard specification

| Motor model | Rated torque (N·m) | Rated speed (r/min) | Max speed (r/min) | Rated power (kW) | Rated current (A) | System flux (l/min) | System pressure (MPa) | Adaptive pump pumpage (cm ³ /r) |
|---------------------|--------------------|---------------------|-------------------|------------------|-------------------|---------------------|-----------------------|--|
| CTB-460TOPRB20-35XJ | 60 | 2000 | 2500 | 12.5 | 24.2 | 76 | 14 | 32 |
| CTB-485TOPRB18-35XJ | 85 | 1800 | 2000 | 16 | 28.9 | 84 | 14 | 40 |
| CTB-4100TPRB18-35XJ | 100 | 1800 | 2000 | 18.8 | 33.5 | 100 | 14 | 50 |
| CTB-4120TPRB18-35XJ | 120 | 1800 | 2000 | 23 | 41.5 | 128 | 14 | 63 |
| CTB-4140TPRC15-35XJ | 140 | 1500 | 1800 | 22 | 40.2 | 144 | 14 | 80 |
| CTB-4170TPRC15-35XJ | 170 | 1500 | 1800 | 27 | 48.7 | 180 | 14 | 100 |
| CTB-4220TPRC15-35XJ | 220 | 1500 | 1800 | 35 | 63.9 | 225 | 14 | 125 |

Motor performance index

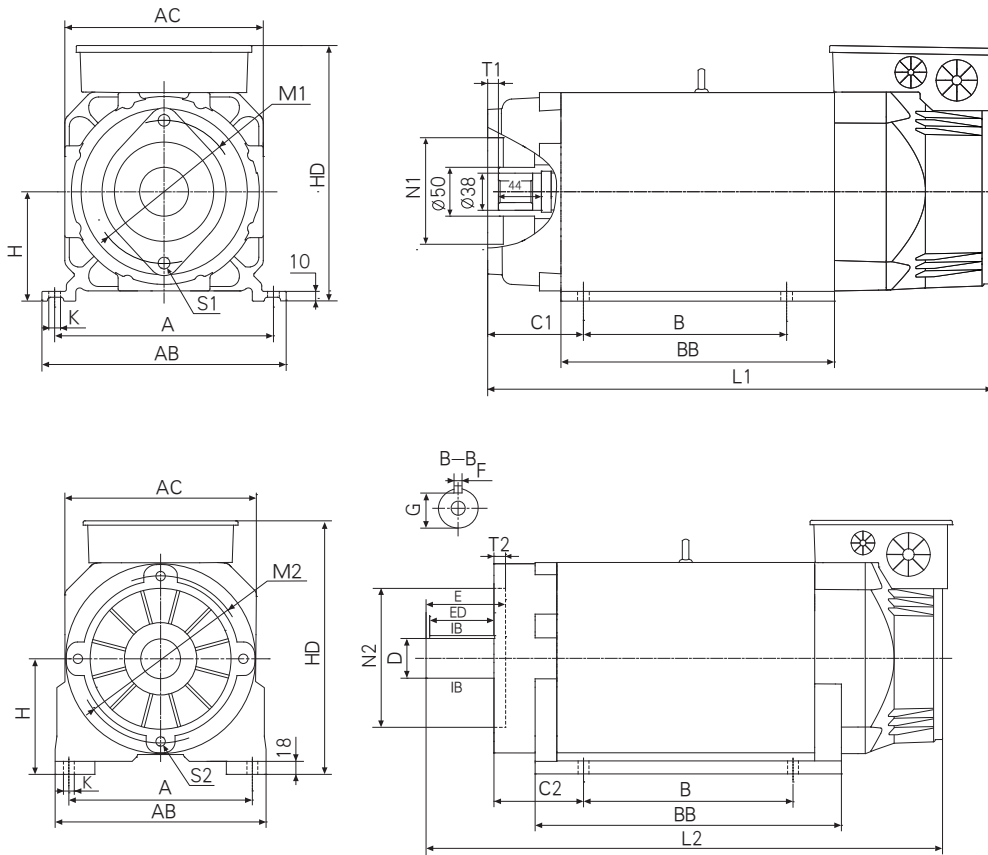
| Name | Encoder | Shaft extension (X) | Mounting method | Cooling method | Protection grade | Insulation grade | Rated temperature rise | Vibration grade | Noise | Ambient tem | Ambient humidity |
|-------|----------|-------------------------------|-----------------|----------------|------------------|------------------|------------------------|-----------------|-------|-------------|------------------|
| Index | Resolver | N: Inner shaft J: With key | B35 | Air cooling | IP55 | F class | 90 K | S | ≤70dB | -15~45°C | ≤95%RH |

Mounting size figure of pump sleeve



| Pump sleeve model | L | B | C | A | M | N | S | P | Q | T |
|-------------------|-----|-----|-----|-----|-----|-----|------|-----|-------|-----|
| BT4B | 173 | 108 | 90 | 196 | 172 | 152 | 12 | 146 | 101.6 | M12 |
| BT5B | 197 | 132 | 90 | 210 | 172 | 152 | 12 | 181 | 127 | M16 |
| BT5C | 228 | 150 | 120 | 265 | 229 | 195 | 17.5 | | | |
| BT6C | 228 | 150 | 120 | 265 | 229 | 195 | 17.5 | 229 | 152.4 | M20 |

Motor shape and mounting size



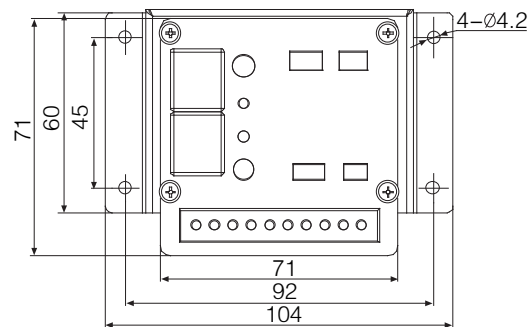
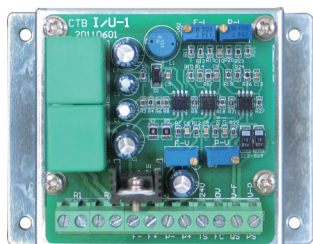
| Motor model | L1 | L2 | BB | B | A | AB | AC | H | HD | K | C1 | C2 | N1 | N2 | T1 | T2 | S1 | S2 | M1 | M2 | E | ED | D | F | G |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-------|-----|----|----|----|----|-----|-----|-----|----|----|----|----|
| CTB-4011ZRB20-35XJ | 485 | 545 | 235 | 178 | 224 | 250 | 204 | 112 | 260 | 12 | 98 | 95 | 101.6 | 152 | 11 | 14 | 12 | 10 | 146 | 172 | 80 | 60 | 38 | 10 | 33 |
| CTB-4015ZRB18-35XJ | 550 | 610 | 300 | 208 | | | | | | | | | | | | | | | | | | | | | |
| CTB-4018ZRC18-35XJ | 515 | 618 | 307 | 173 | 254 | 292 | 265 | 160 | 350 | 15 | 122 | 124 | 101.6 | 195 | 11 | 16 | 12 | 16 | 146 | 229 | 110 | 90 | 55 | 16 | 49 |
| CTB-4022ZRC18-35XJ | 560 | 663 | 352 | 218 | | | | | | | | | | | | | | | | | | | | | |
| CTB-4022ZRC15-35XJ | - | 688 | 377 | 243 | 279 | 349 | 300 | 180 | 410 | 15 | - | 129 | - | 195 | - | 16 | - | 16 | - | 229 | 110 | 90 | 55 | 16 | 49 |
| CTB-4030ZRD15-35XJ | - | 710 | 311 | 211 | | | | | | | | | | | | | | | | | | | | | |
| CTB-4037ZRD15-35XJ | - | 765 | 366 | 266 | 224 | 250 | 204 | 112 | 260 | 12 | 98 | 95 | 101.6 | 152 | 11 | 14 | 12 | 10 | 146 | 172 | 80 | 60 | 38 | 10 | 33 |
| CTB-460TOPRB20-35XJ | 415 | 475 | 165 | 90 | | | | | | | | | | | | | | | | | | | | | |
| CTB-485TOPRB18-35XJ | 460 | 520 | 210 | 140 | 254 | 292 | 265 | 160 | 350 | 15 | - | 124 | - | 195 | - | 16 | - | 16 | - | 229 | 110 | 90 | 55 | 16 | 49 |
| CTB-4100TPRB18-35XJ | 485 | 545 | 235 | 178 | | | | | | | | | | | | | | | | | | | | | |
| CTB-4120TPRB18-35XJ | 530 | 590 | 280 | 208 | 224 | 250 | 204 | 112 | 260 | 12 | 98 | 95 | 101.6 | 152 | 11 | 14 | 12 | 10 | 146 | 172 | 80 | 60 | 38 | 10 | 33 |
| CTB-4140TPRC15-35XJ | - | 585 | 274 | 140 | | | | | | | | | | | | | | | | | | | | | |
| CTB-4170TPRC15-35XJ | - | 610 | 299 | 165 | 254 | 292 | 265 | 160 | 350 | 15 | - | 124 | - | 195 | - | 16 | - | 16 | - | 229 | 110 | 90 | 55 | 16 | 49 |
| CTB-4220TPRC15-35XJ | - | 675 | 364 | 230 | | | | | | | | | | | | | | | | | | | | | |

Note:

1. Installation size of motor can be provided non-standard design based on user needs.
2. Users need more detailed technical data in the mechanical design, please contact CTB sales engineer.

IU transfer board

Computer control signal of pressure flow (traditional injection molding machine) is 0 ~ 1 A current-mode signal, IU transfer board can convert current signal into voltage signal of 0-10V, which can be received by servo drive. IU transfer board used in servo renovation of traditional injection molding machine, convenient installation, reliable performance



Common parts



Pressure sensor



Star coupling



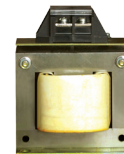
Pump sleeve



Brake resistance

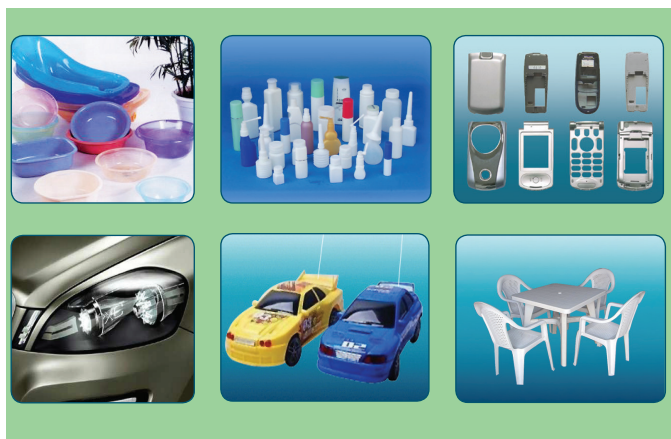


Filter



Reactor

| induction servo motor model | Permanent magnet synchronous servo motor model | Pressure sensor | Star coupling | Pump sleeve | Brake resistance | Filter |
|-----------------------------|--|-----------------|---------------|-------------|------------------|--------|
| CTB-4011ZRB20-35XJ | CTB-460TOPRB20-35XJ | 8472 | XL-32-38 | BT4B | 300/40 | 30 |
| CTB-4015ZRB18-35XJ | CTB-485TOPRB18-35XJ | 8472 | XL-32-38 | BT4B | 300/40 | 30 |
| CTB-4018ZRC18-35XJ | CTB-4100TPRB18-35XJ | 8472 | XL-40-38 | BT5B | 600/32 | 40 |
| CTB-4022ZRC18-35XJ | CTB-4120TPRB18-35XJ | 8472 | XL-40-38 | BT5B | 600/32 | 40 |
| CTB-4022ZRC15-35XJ | CTB-4140TPRC15-35XJ | 8472 | XL-50-55 | BT6C | 1200/20 | 60 |
| CTB-4030ZRD15-35XJ | CTB-4170TPRC15-35XJ | 8472 | XL-50-55 | BT6C | 1200/20 | 60 |
| CTB-4037ZRD15-35XJ | CTB-4220TPRC15-35XJ | 8472 | XL-50-55 | BT6C | 1200/20 | 80 |



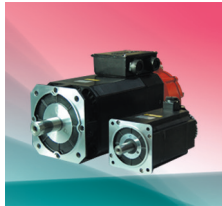
Surpass selfhood
keep pace with the world



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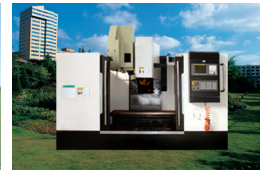


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