

DS100S

AC SERVO DRIVE MANUAL

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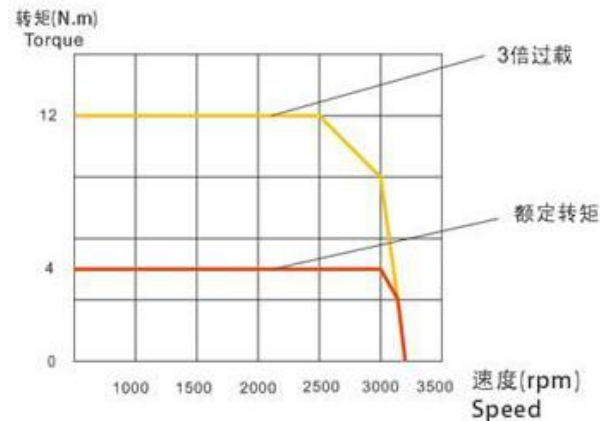


DS Series AC Servo Systems

Features

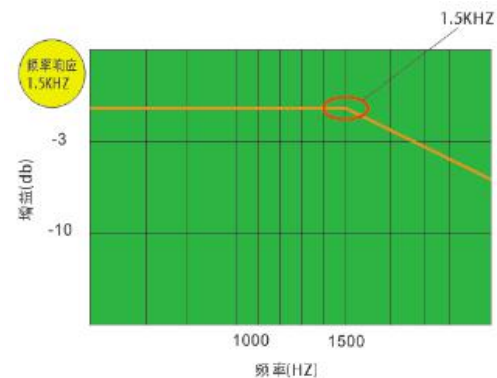
Strong Overload Capability

Because it adopts industrial intelligent power module IPM, it has advantages of strong overload capacity and high starting torque. Moreover the load that it withstands are three times stronger than the rated torque. it is pretty good on the occasion of which the load occurs fluctuations suddenly and that is required to start working quickly.



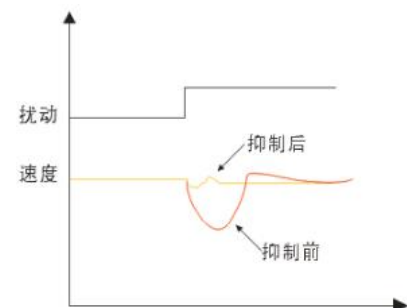
High Response Frequency: 1.5KHz

Due to the perfect use of the advanced PID control algorithm and the feed-forward torque, it greatly improves the dynamic response performance, and effectively shortens the setting time. And the dynamic time of acceleration and deceleration of the motor is short, which is usually within tens of milliseconds. The drive velocity response frequency can be up to 1.5KHz and the rated speed can be up to 3000rpm.



Excellent Anti-interference Ability

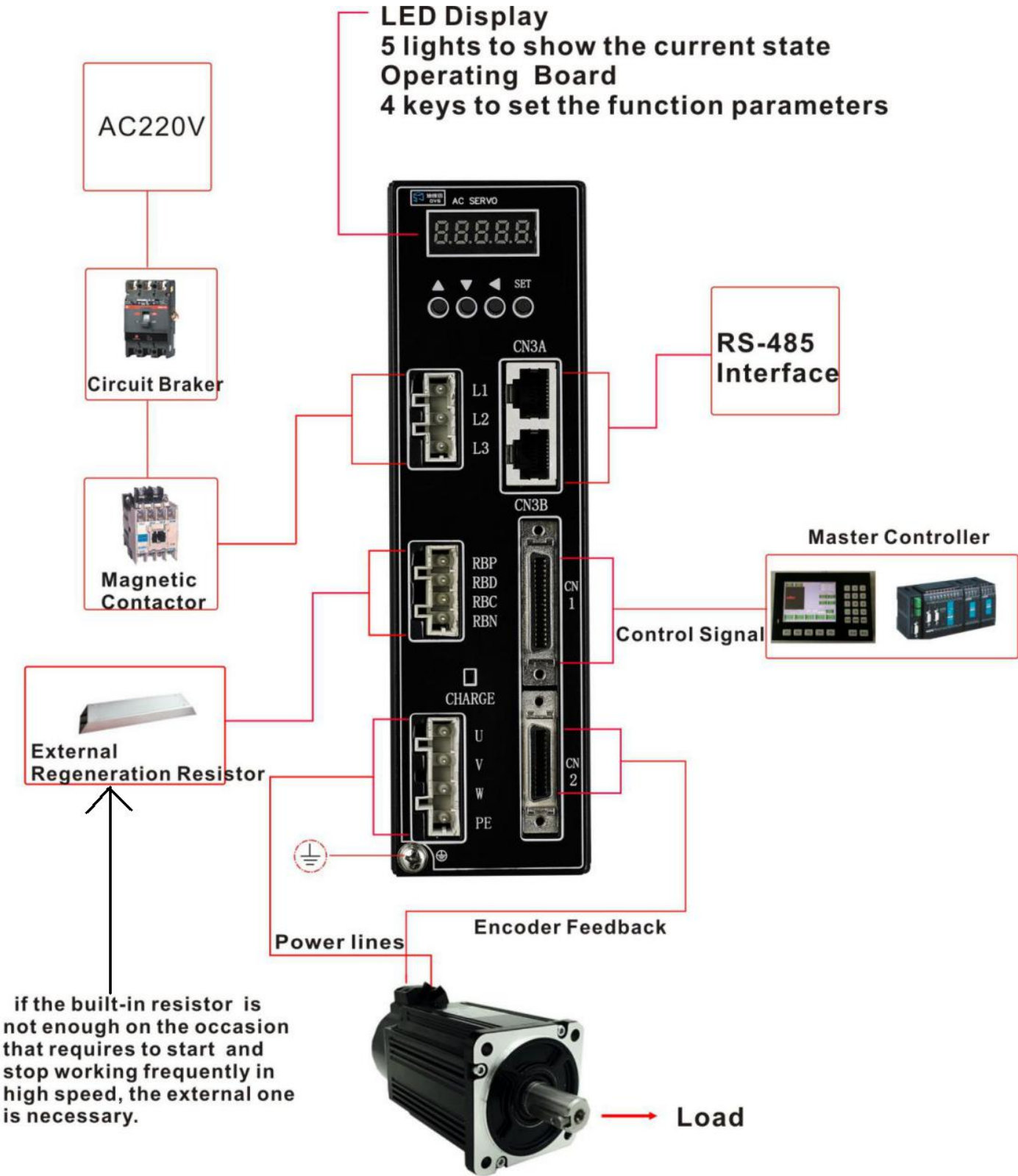
By real-time observation of external disturbance and real-time dynamic compensation, the speed fluctuation and torque fluctuation caused by external disturbance are reduced.



Good Position Following Capability

By adopting load identification and torque feed-forward advanced control algorithm, very small velocity ripple and position error can be achieved. Moreover, we configure 17-bit absolute encoder so that it can largely improve the stability in low speed and positioning accuracy. And it also provides control methods including position, velocity, torque, speed trial operation and JOG for our customers to choose conveniently.

DS Servo System Configuration



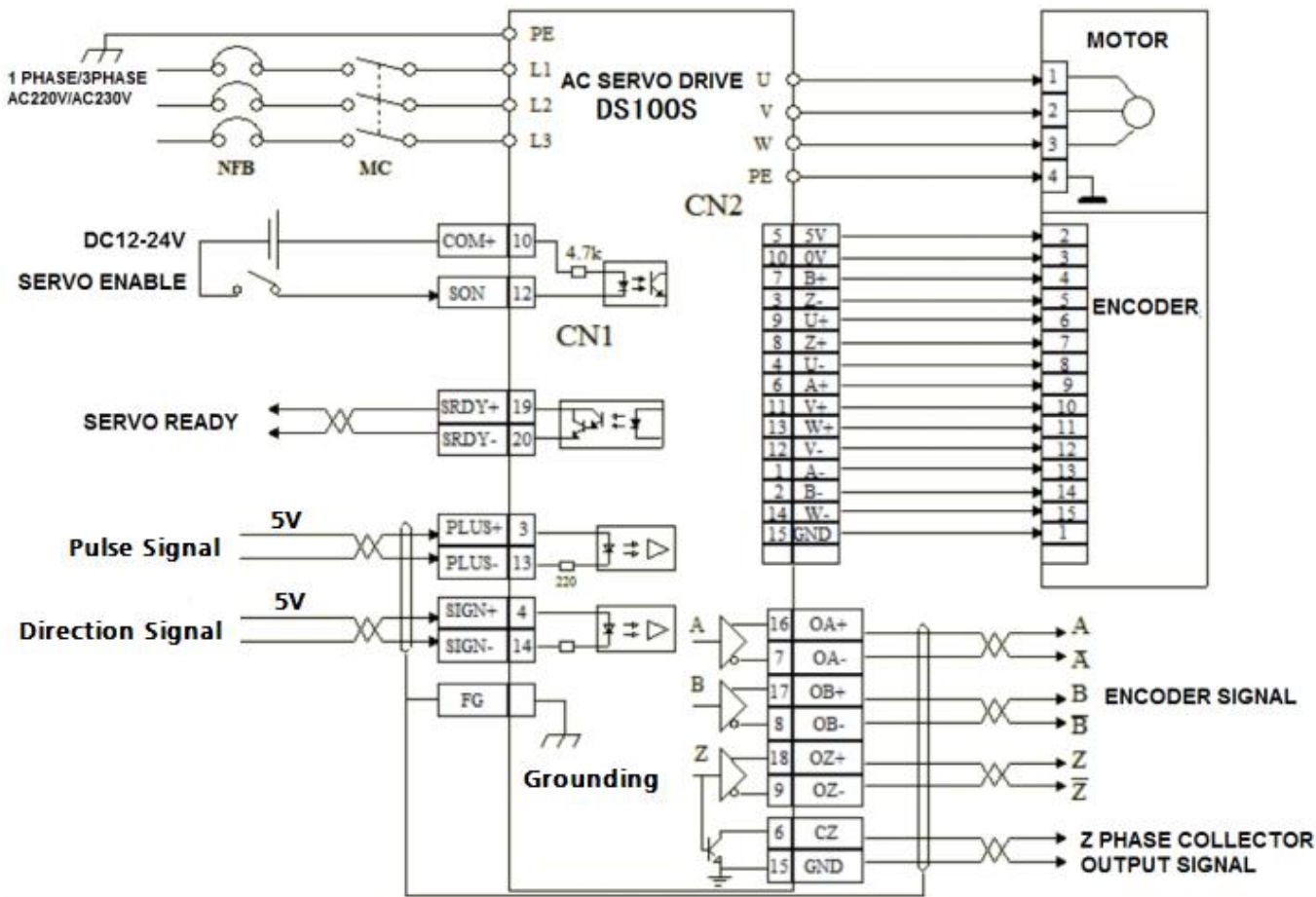
Notes:

“SET” Button: Enter the parameter settings or set the values to the selected parameter and exit.

- ▲ UP Button: Increase the selected value by 1.
- ▼ DOWN Button: Decrease the selected value by 1.
- ◀ BACK Button: Press this to come back to before data.

Wiring Example in Position Mode

DN series Motor Connecting(15-Line Encoder)



DN series 15-line Motor Connecting(60mm、80mm、90mm)

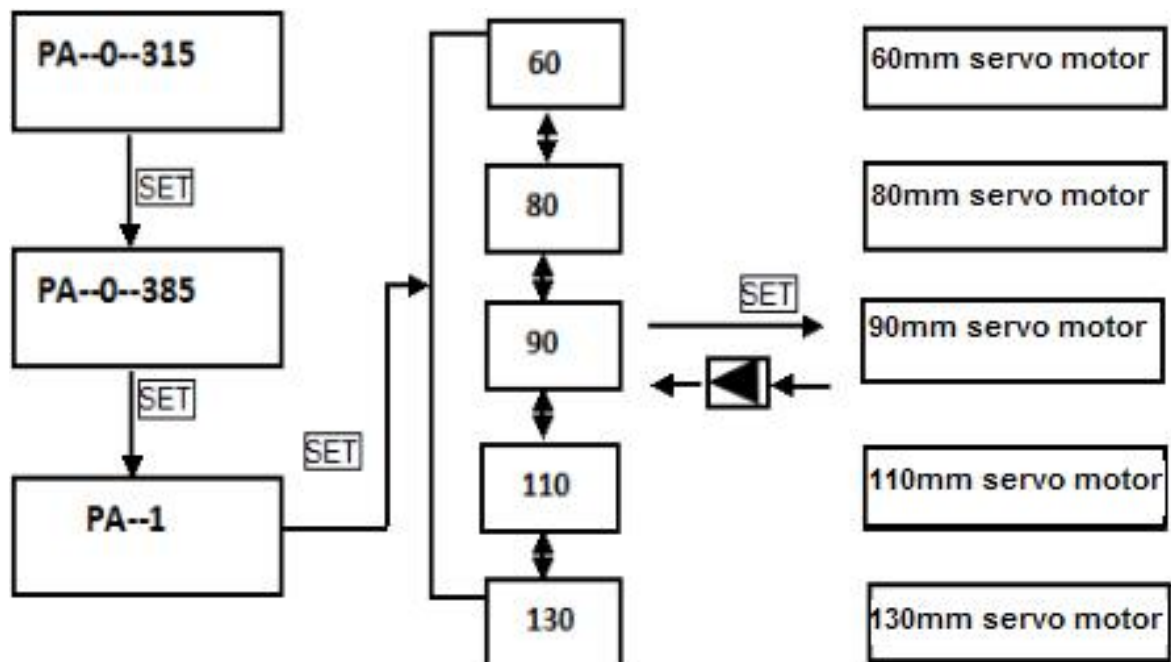
Power Line	Winding	U				V				W				PE		
	Plug	1				2				3				4		
Encoder Line	Signal	5V	0V	B+	Z-	U+	Z+	U-	A+	V+	W+	V-	A-	B-	W-	PE
	Plug	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1

Notes:

1. If use 3 phase AC220V main power supply, please connect with terminal L1,L2,L3.
2. If use 1 phase AC220V main power supply, please connect with terminal L1,L3.
3. Terminal CN2 please connect with the signal terminal of encoder.
4. Terminal CN1 should be connected following the above wiring picture.
5. Rated current of the external power supply(12~24vdc) for digital inputs and outputs should more than 100mA.
6. Recommend use AWG24-26 shielded cables for control and feedback signals, and correctly ground the shielded cable.
7. Cable for control signals(CN1) should be less than 3 meters, and cable for feedback signals(CN2) should be less than 10 meters.
8. Recommend use a circuit braker (NFB) to cut off power in the case of an overload, and use an electromagnetic contactor to switch servo motor on and off.

Motor Code Parameter Setting Steps

The code parameter PA-01 of a motor must be configured with the exact motor that you use. The value of PA-01 should be set referring to the following table. If there is a mismatching occurred, there will cause degradation or alarm. And needed attention that different types of code have different default parameters. For example, DS100H-75 whose factory default model of ac servo motor is 80ST-M02430. If there is necessary to modify the motor code or restore setting parameters that was set by manufacturer, please firstly modify PA-0 to 385, and then enter into PA-01, and finally press up key or down key to select the appropriate motor. The steps as the following picture showed:



Parameters In Position Mode

The following parameters need to be set when in position mode:

Parameter	Introduction	Value	Default Value
PA4	Controlling Method	0	0
PA11	Command pulses if the motor runs one roll.	Set by yourself	10000
PA14	To select position command pulse mode	Set by yourself	0
PA15	To reverse the direction of position command pulse	Set by yourself	0

Operation and Display Layer

Names Of Keys And Functions

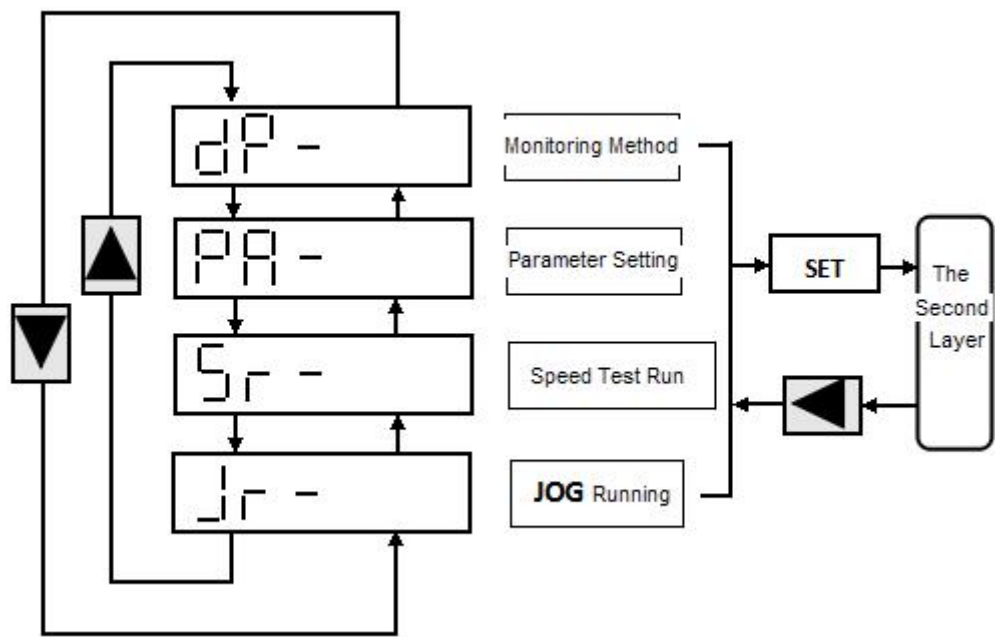
The panel consists of 5 LED and 4 keys including ↑、↓、←、**SET** to display all system status and set parameters. The operation is hierarchical. ← key indicates “back” and **SET** key indicates “forward” while it also has the meaning of “Enter” and ← key also has the meaning of “Cancel” and “Exit”. ↑ key indicates “Increasing ” and ↓ key indicates “decreasing”. If you press the ↑ key or ↓ key and maintain it, you would get a duplicate result and stay longer, the repetition rate is higher.

Steps To Set Parameters

Please firstly select “PA-”, and press SET key to enter the status of parameter setting mode. And use ↑ or ↓ to choose parameters and SET key to display the parameter’s value. You can modify the parameter’s value with ↑ or ↓. Press ↑ or ↓ key one time, the parameter increases or decreases by 1. Pressing and holding ↑ or ↓ key can make the value increased or decreased continuously. After modifying the value of the parameter, please press SET key and when the LED flashes two times, it means changes are completed. Finally please recharge, then the new parameter is effective.

Monitoring Status Content

There are four ways to select the mode of operation in the first layer and ↑ or ↓ key is used to change the way. Press SET key to enter into the second layer of the selected way and it will turn back to the first layer with ← key.



Pic 1. Operating display layer

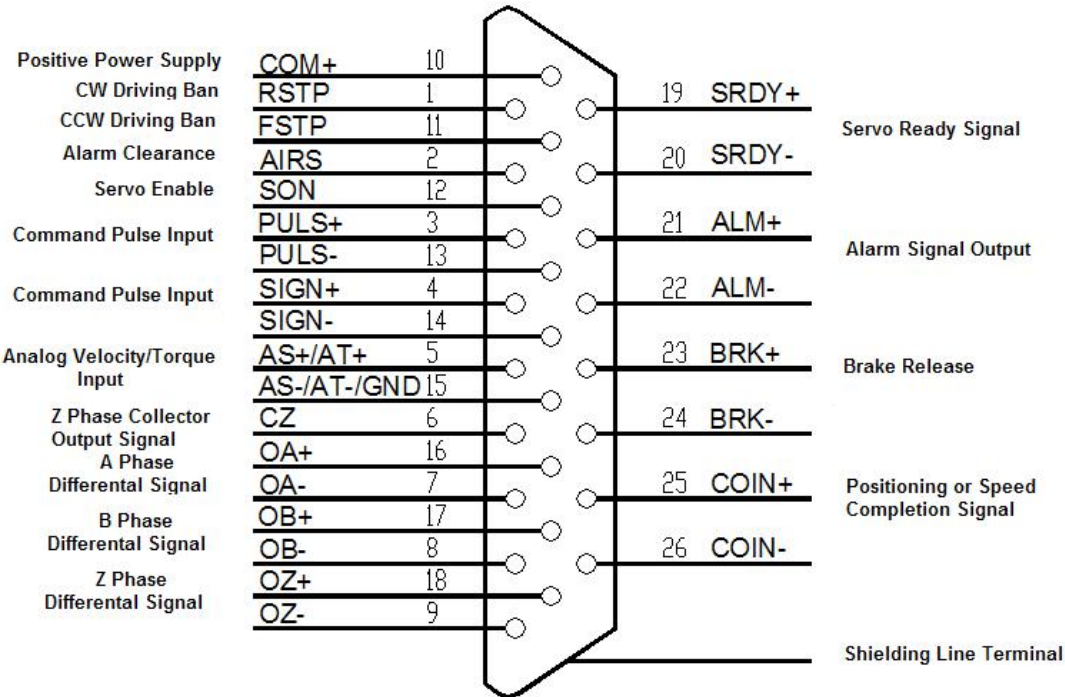
Monitoring

In the first layer, please select “DP--” and press the SET button to enter into monitoring mode. There are 16 displays in total. Users select the desired display mode with ↑ or ↓ key, and then press the SET key to enter into the specific states.

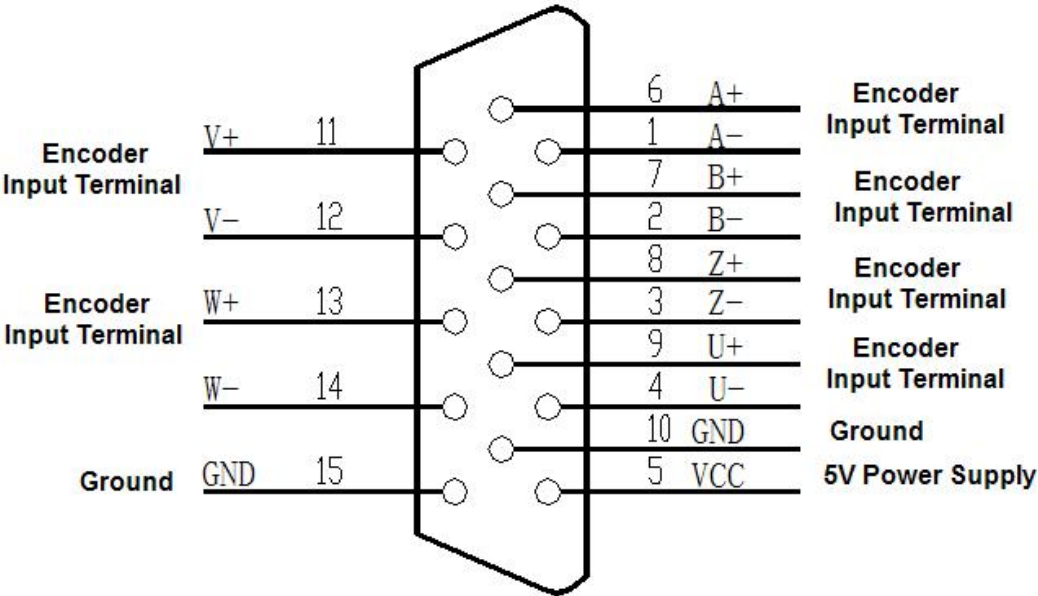
Monitoring	Operation	Example	Introduction
dP-SPd	<div>SET</div> <div> <div></div> <div></div> </div>	r 1000	Speed : 1000r / min
dP-PoS		P45806	The current position : 1245806
dP-PoS.		P. 12	
dP-CPo		C45810	Position Command : 1245810
dP-CPo.		C. 12	
dP-EPo		E 4	Position Deviation 4 pulse
dP-EPo.		E. 0	
dP-tt9		t 70	Motor Torque 70%
dP- I		I 2.3	Motor Current 2.3A
dP-Cnt		Cnt 0	Control Method 0
dP-APo		A 3265	Absolute Rotor Position 3265
dP- In		In	Input Terminal
dP-oUt		oUt	Output Terminal
dP-Cod		Cod	Encoder Signal
dP- rn		rn - on	Running State
dP-Err		Err 9	No.9 Alarming

Terminals

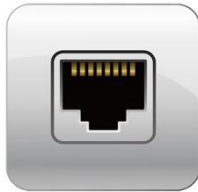
CN1 Connector



CN2 Connector



CN3 And CN3B Connector

RS485	Can be connected to the PC machine or controller through special serial cable, don't plug it with electric. Twisted pair shielded wires are suggested and less than 2 meters in length				
Terminal	CN3A	Name	CN3B	Name	Picture
1	VCC	Positive power supply	VCC	Positive power supply	
2	GND	Ground	GND	Ground	
3	TX-D	RS485 Transmitting end	TX-D	RS485 Transmitting end	
4	RSB	RS485 Communication signal	RSB	RS485 Communication signal	
5	RSA		RSA		
6	RXD	RS485 Receiving end	RXD	RS485 Receiving end	
7	GND	Ground	GND	Ground	
8	VCC	Positive power supply	NC	Free end	

External Regenerative Discharge Resistor Connecting Terminal

Terminal	Signal Name	Function	Induction
1	RBP	External braking resistor	Built-in: Usually shortly connect RBP and RBD. External: If use external resistor, please disconnect RBP and RBC. And external resistor connect between RBP and PBC. Please do not connect RBP and RBN together.
2	RBD		
3	RBC		
4	RBN	DC high voltage ground	

CN5 Connector

Terminal	Name	Function
1	BAT+	Dedicate power supply 3.6V of absolute encoders.
2	GND	

Parameter Function Introduction

No.	Name	Function	Parameter Range	Default Value
0	Password	1.User password is 315 to set or change parameters. 2.Motor type code is 385.	0-9999	315
1	Motor Type Code	1. Corresponding to different drives and motors with different power in the same series. 2. The different motor type code has different default parameters. If you want to use the function of recovering the default parameter, please make sure your current parameter is correct. 3.If want to edit the current parameter, please set the motor type code PA0 to 385 firstly.	80-90	80ST-M02430
3	Initial Display Status	0: Display the current motor speed 1:Display the current position is 5-bit low . 2: Display the current position is 5-bit high . 3: Display position command(command pulse accumulation) is 5-bit low. 4: Display position command(command pulse accumulation) is 5-bit high. 5:Display position deviation is 5-bit low. 6.Display position deviation is 5-bit high . 7.Display motor torque 8.Display motor current 9.Display current control mode 10.Display current temperature 11.Display speed command 12.Display torque command 13.Display absolute position of the rotor is 5-bit low . 14.Display absolute position of the rotor is 5-bit high . 15.Display input terminal state 16.Display output terminal state 17.Display encoder input signal 18.Display voltage value of main line of main circuit 19.Display alarming code 20.Display logic chip version number 21.Display the actuation state of the relay 22.Display external voltage state	0-23	0
4	Controlling Method	Through this number you can set drive controlling method: 0: position control mode 1: speed control mode 2: test running control mode 3: JOG control mode 6:torque control mode	0/1/2/3/6	0
5	Velocity Proportional Gain	1.set the proportional gain of speed loop regulator. 2.The value is bigger, the gain is higher and rigidity is	5-2000Hz	150

		stronger. The parameter value is set according to your exact servo driving system model and the load. Generally, the greater the load inertia, the bigger the value. 3. Please set a little high value if the system condition does not generate oscillation.		
6	Velocity Integral Constant	1. To set the integration time constant. 2. The value is smaller, the integral speed is faster and the ability of system in resisting deviation is stronger. But if it is too small, it will happen over controlling.	1-1000ms	75
9	Position Proportional Gain	1. To set the proportional gain of position loop regulator. 2. The value is bigger, the gain is higher and its rigidity is stronger. So the position lag is smaller under the same frequency command pulse condition. But if it is too big, it will happen oscillation. 3. The parameter value is set according to your exact servo driving system model and the load.	1-1000/s	40
11	Number of output pulses of 1 rotation turn of the motor	1. Set the number of output pulses of 1 rotation turn of the motor. 2. When set number "0", PA-12(position command pulse frequency divider) and PA-13(position command pulse frequency) are effective.	0-30000	10000
12	The numerator of position command pulse	1. To set the electric gear ratio in position command pulse. 2. In position control mode, it is convenient to match all kinds of pulse source through set the parameter PA12 and PA13, which helps to reach ideal control resolution(angle/pulse). 3. $P \times G = N \times C \times 4$ P: pulses of input command; G: electric gear ratio; N: motor rotation number; C: number of photoelectric encoder in per rotation, default value is 2500. 4. For example, input command pulse P is 6000, servo motor rotate a roll: $G = (N \times C \times 4) / P = (1 \times 2500 \times 4) / 6000 = 5/3$, So PA12 should be set to 5, PA13 should be set to 3.	0-32767	0
13	Denominator of position command pulse	The same as the above	1-32767	10000
14	Position command pulse input method	1. Set the method of position command pulse. 2. To set one of input methods through parameters: 0: Pulse+Direction 1: CCW pulse/CW pulse 2: phase A and phase B quadrature pulse input. Remark: CCW: observe from the motor axial direction. It defines CCW in counter clock wise and CW in clock wise.	0-2	0
15	Command Pulse Direction	Setting: 0: Normal 1: Reverse position command pulse	0-1	0
19	Position Command Smooth Filter	1. To filter the command pulse. Acceleration and deceleration are with exponential form. The value is time constant.	0-30000*0.1ms	300

		<p>2.The filter does not lose the input pulse, but the delay of the instruction occurs.</p> <p>3.The filter applies in</p> <p>(1. PC controller without acceleration and deceleration function.</p> <p>(2. The electronic gear frequency is a little big(>10).</p> <p>(3.The command frequency is a little low.</p> <p>4.When the motor runs, there is a step to jump.</p> <p>5.When set the value"0", the filter does not work.</p>																		
53	8-bit low input terminal force ON control word	<p>To set the input terminal to force the ON effectively.</p> <p>1.For unforced ON terminal, it needs to control ON in the external connection. For forced ON terminal, external connection is unnecessary, and it is automatic to set ON inside the drive.</p> <p>2.8-bit binary number as representation, if it is 0, it means input terminal does not force ON. If it is 1, it means input terminal forces ON. The binary numbers represent the input terminals as following:</p> <table><tr><td>7</td><td>6</td><td>5</td><td>4</td></tr><tr><td>RIL</td><td>FIL</td><td>INH</td><td>CLE</td></tr><tr><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>RSTP</td><td>FSTP</td><td>ALRS</td><td>SON</td></tr></table> <p>RIL: CW torque limitation</p> <p>FIL: CCW torque limitation</p> <p>INH: Command pulse inhibit</p> <p>CLE: Deviation counter clearance</p> <p>SON: Servo enable</p> <p>ALRS: Alarming clearance</p> <p>FSTP: CCW drive inhibit</p> <p>RSTP: CW drive inhibit</p>	7	6	5	4	RIL	FIL	INH	CLE	3	2	1	0	RSTP	FSTP	ALRS	SON	00000000-1111111	00000000
7	6	5	4																	
RIL	FIL	INH	CLE																	
3	2	1	0																	
RSTP	FSTP	ALRS	SON																	
59	Command Pulse Effective Edge	<p>0: The rising edge of pulse is effective</p> <p>1: The falling edge of pulse is effective</p>	0-1	0																

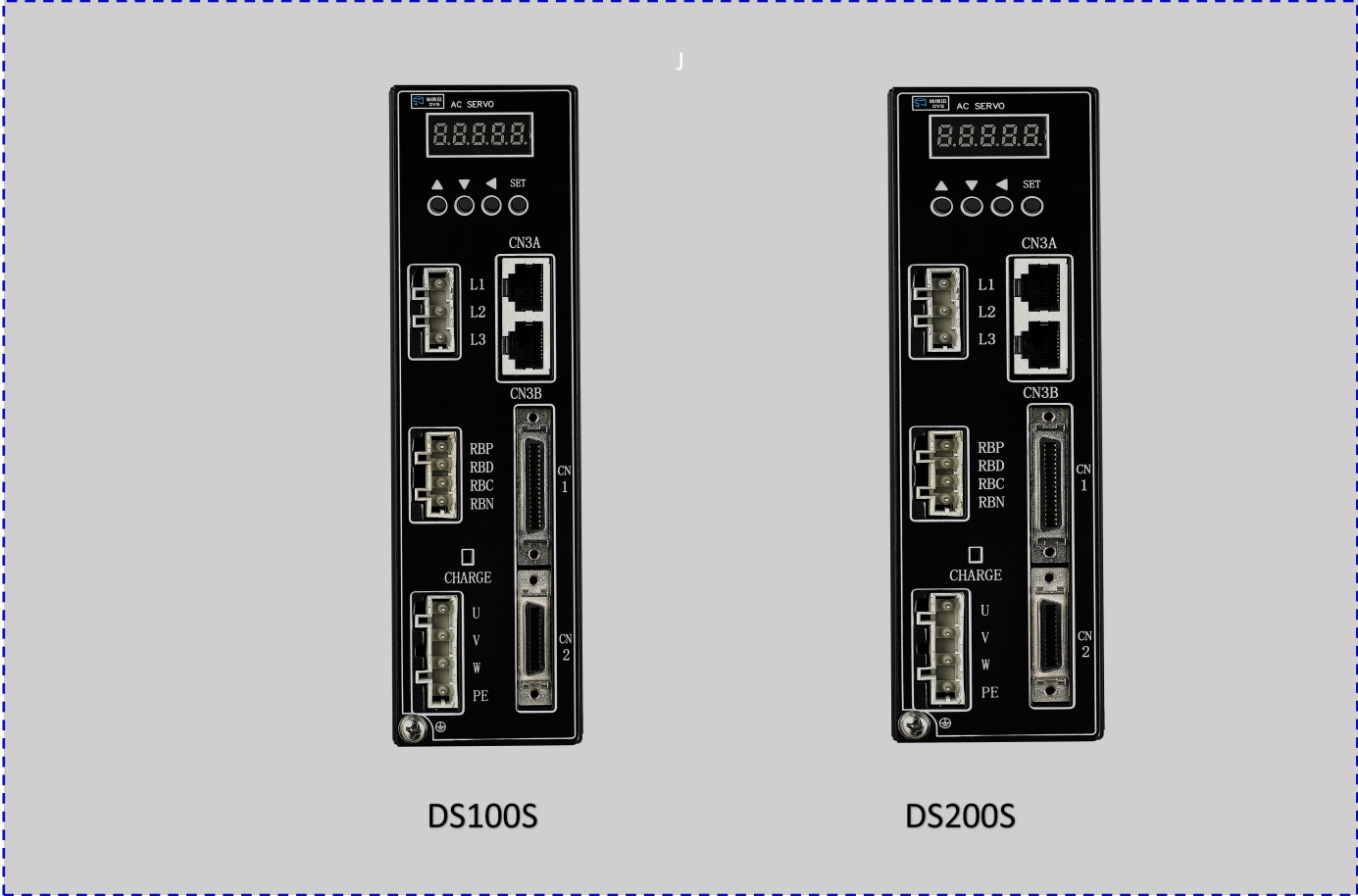
Fault Code indication

Code No.	Fault Name	Indication
--	Normal	
1	Over Speed	Motor speed over than the setting values.
2	Main Circuit Over Voltage	The voltage of main circuit is too high
3	Main Circuit Under Voltage	The voltage of main circuit is too low
4	Position Error	The value of position deviation counter is over than the setting value.
5	Drive Over Heat	The temperature of the drive is high
6	Speed Amplifier Saturation Fault	Speed adjustment for long time saturation
7	Drive inhibit Error	Speed adjustment in saturation for long time
8	Position deviation accumulation was out of range	Absolute value of position deviation accumulation is over than 2^{30} .
9	Encoder Error	Encoder Signal Error
10	Disconnection Alarm	Power line UVW disconnected or one phase disconnected
11	IPM module Error	IPM smart module error
13	Drive Overload	Servo drive and motor overload(overheat instantaneously)
14	Brake Fault	Brake circuit Error
15	Encoder Counter Error	Encoder counts wrongly
20	EEPROM Error	EEPROM error
23	Current Collecting Circuit Fault	Current collecting circuit fault
30	Encoder Z Pulse Missing	Encoder Z pulse Error
32	Encoder UVW Signal Error	All UVW signal in high level or low level. Or the encoder is mismatching.
33	UVW Signal Fault	No high resistance in powering up time series
34	UVW Signal Unstable	UVW Signal Unstable
36	When connecting to 9-line encoder, illegal state states for long time	When connecting to 9-line encoder, illegal state states for long time
42	AC Input Under Voltage	AC input under voltage
47	Over Voltage When Main Circuit In Powering Up	Over voltage when main circuit in powering up
50	Encoder Communication Error	Communication error when connects with the absolute encoder.
51	Encoder Communication Disconnect	The drive and encoder communication disconnect.
55	Encoder CRC Checking Wrongly	Encoder gets wrong data when transmitting is disturbed.
56	MODBUS frame is too long.	Data Receiving from MODBUS frame is too long

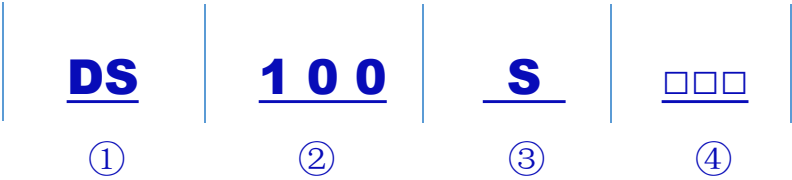


DS Series AC Servo Drives

Module



Part Number



Number	Description
①	DS Series AC Servo Drive
②	100: under 0.75KW , 200: under2.2KW, 300:under 3.4KW
③	S : standard ac servo drive compatible with 2500-line encoder 10000ppr.
④	Power Range : 40:50-400W 75:400W-1000W

Specifications

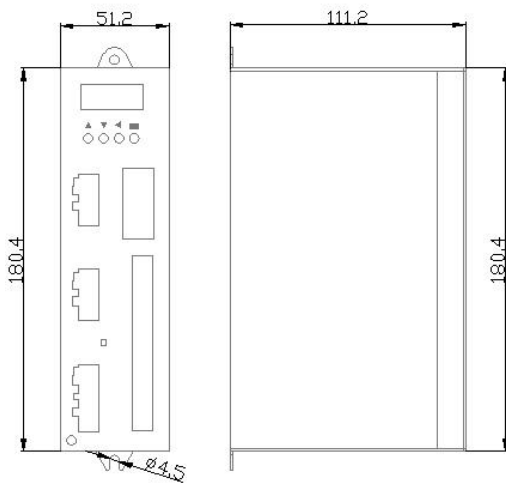
Parameters	DS100S-40	DS100S-75
Output Power	50W-400W	400W-1000W
Main Supply	1 phase/3 phase AC220V-240V 50/60Hz	
Power Supply for Control Circuit	1 phase 220VAC	
Control Method	0: position control 1: velocity control 2: test trial control 3: JOG control 4: torque control	
Protect Function	over speed/under voltage/over voltage/over current/over load/encoder error/control supply error/position error	
Monitoring Function	velocity/current position/command pulse accumulation/position error/motor torque/motor current/working state	
Control Input	1.servo enable 2.alarm clearance 3.CCW driving ban 4.CW driving ban 5.deviation counter clear zero 6.command pulse ban 7.CCW torque limitation 8. CW torque limitation	
Control Output	servo ready/servo alarm/GPS test/mechanical brake	
Resistance Braking	Built-in/Built-out	
Suitable Load	Less than 5 times of the motor inertia	
Display	5 LEDs , 4 keys	
Command Input	1: pulse+direction 2: CCW/CW 3: A phase/B phase	
Electronic Gear Ratio	1/32767-32767	

Operating Environment

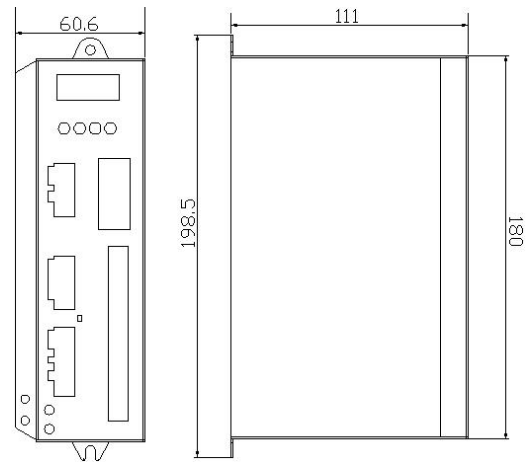
Cooling		Natural Cooling or Forced Cooling
Operating Environment	Environment	Avoid dust, oil fog and corrosive gases
	Ambient Temp	0~+40℃
	Humidity	40%RH to 90%RH, no condensation
	Vibration	5.9m/s ² MAX
Storage Temperature		-20℃ to 80℃

Dimension

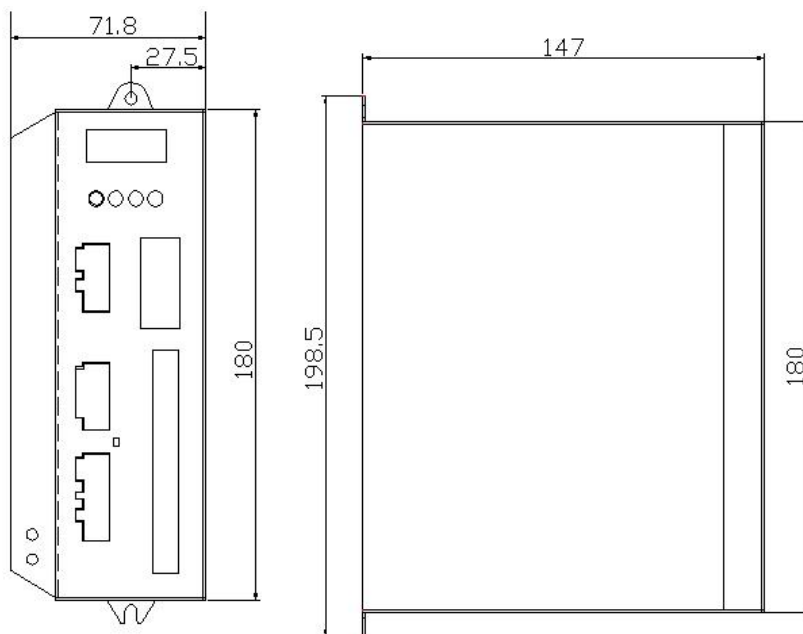
DS100S-40(50W~400W)



DS100S-75(400W~750W)



DS200S(1KW~2.2KW)



NOTE:

1. Install the drives indoors, where the drives are not subjected to rain or direct sun beams. The drives are not waterproof.
2. Install the drives where the products are not subjected to corrosive atmospheres, and free from splash of inflammable gas, grinding oil, oil mist, iron powder or chips etc.
3. Install the drives in a well-ventilated and low humidity and dust-free place.
4. Install in vertical position, and reserve enough space around the servo drive for ventilation or effective cooling.