SYNTEC

11kW second-generation single-axis driver hardware operating instructions

Servo Products

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SYNTEC

Servo Drive Operation Manual

2. Preface

Thank you for your continued support of our products. Our servo team is forever committed to the research and development of new products; we hope that our products and services can bring each user the best possible experience.

The SYNTEC high-performance servo drive series consists of our company's latest servo drive models. Each product is manufactured using high quality materials and has been through rigorous testing. In addition, our drives adopt precise vector control, guaranteeing high accuracy, high stability and high efficiency.

This Operation Manual includes the drive's hardware specifications, installation instructions, as well as wiring and signal descriptions, providing each user with detailed guidance. To achieve the best performance of our products and to maintain the safety of both personnel and equipment, please read this manual carefully before use and keep it in a safe place for future reference. If any doubts arise, please do not hesitate to contact our office--we will be happy to help!

3. Applicable models

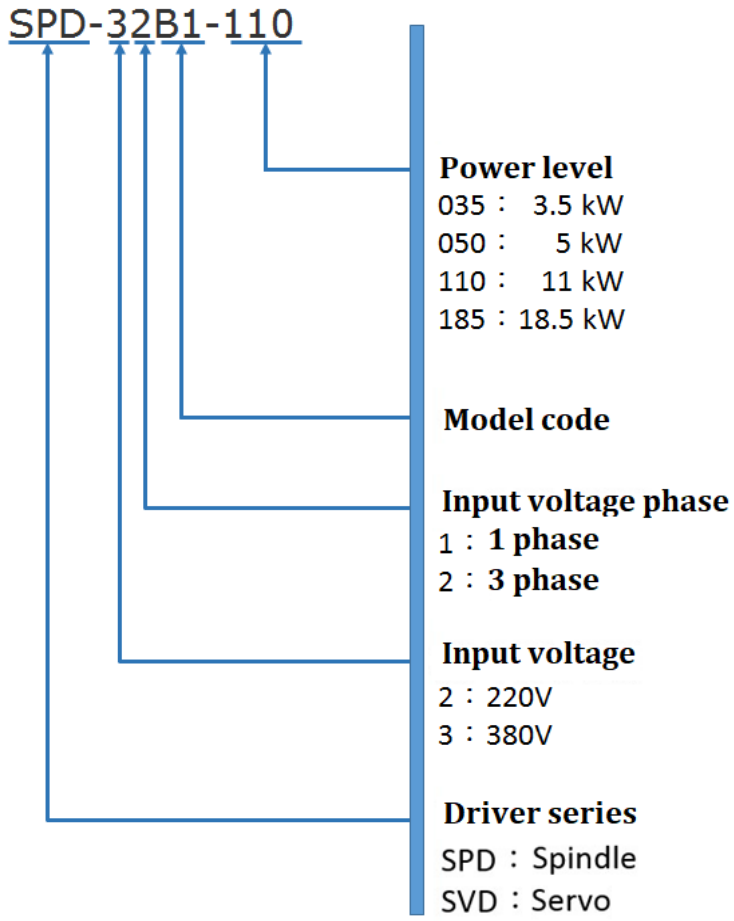
This single-axis operation manual is suitable for the new generation 11kW second-generation single-axis drive.

4. Hardware specification

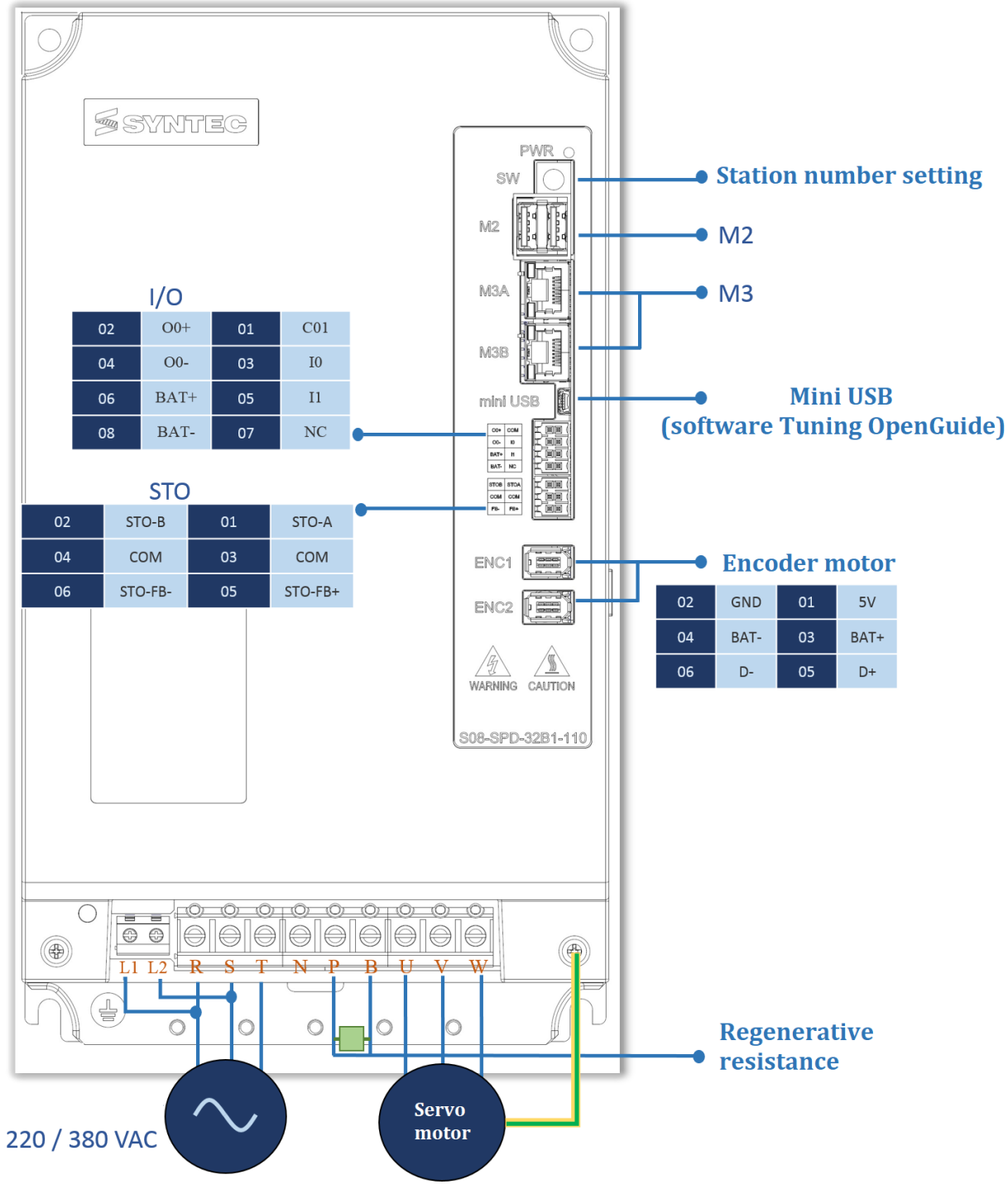
4.1. Description

Each drive undergoes strict quality inspection and anti-collision packaging before leaving the factory. Please check for impact damage upon receiving the product. Users should also compare the serial numbers on the outer box and on the product itself. If there is any discrepancy, please contact us immediately.

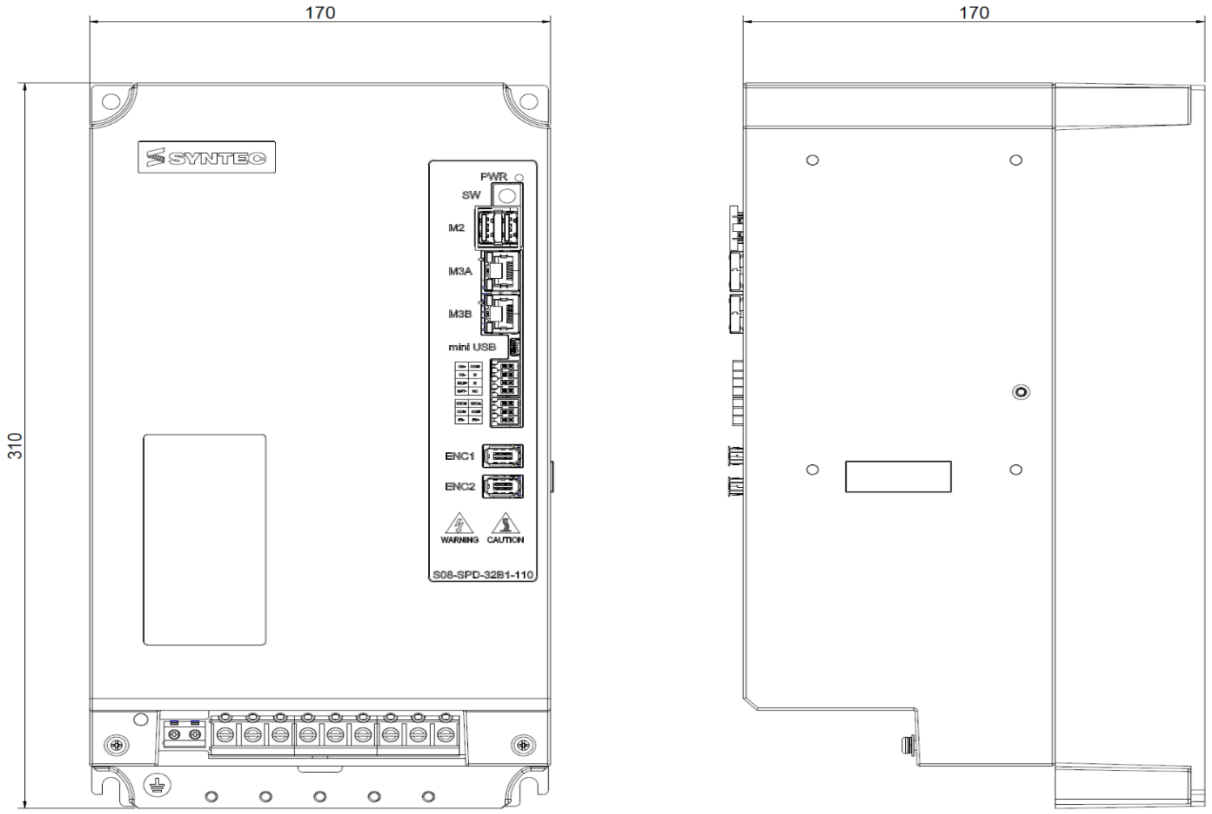
Model Description



4.2. Appearance introduction



4.3. Dimensions



4.4. Drive specification

Syntec Drive		SPD-32B1-110
Power	Rated Voltage	3-phase 380~460V 50/60Hz
	Voltage Error Bound	-15 ~ +10%
	Frequency Error Bound	±5%
Output	Rated Current	27A
	Over-current	150% 60s、200% 1s
Control Method		3-phase full wave rectification, SVPWM－VVVF control
Regenerator		External， refer to the Regenerator Selection section

Encoder		Supported interfaces：Tamagawa, SYNNET, NIKON, FeeDAT Extended encoder modules： Supports Tamagawa, SYNNET, NIKON, ABZ, Serial, SSI, BiSS (Does NOT support UVW wire-saving encoders) (For more about extended encoder modules, refer to Servo 10PX1/10PX3 Extended Module Operation Manual)
PC Interface		USB
Controller Serial Communication		Mechatrolink II, Mechatrolink III
I/O Signal	**Digital Input**	2 ports, function alterable
	Digital Output	1 port, function alterable
	STO	Dual-channel Safety Torque Off switch (2I 1O)
Cooling Method		Fan cooling
Environment	**Temperature**	0℃ ~ 55℃(If the surrounding temperature exceeds 45℃, implement forced air circulation), storage: -20～65℃ (non-freezing)
	Humidity	Maximum 90% RH (non-condensing), storage: under 90%RH (non-condensing)
	Location	Indoors (avoid direct sunlight); keep away from oil, dust, and corrosive or flammable gases
	Altitude	Below 1000 m until sea level
	Vibration	Maximum 5.9 m/s^2
Weight		7.0 kg

5. Handling and installation

5.1. Transport

The entire body of the drive must be held during transportation. To avoid the risk of falling, do NOT hold the drive by its upper cover or by any individual part.

5.2. Installation Environment Conditions and Precautions

Installation Environment Conditions

- Locations without high heat generating devices.
- Locations without floating dust or metal particles.
- Locations without corrosive or flammable gasses and liquids.
- Locations without water, steam, dust, or oily dust.
- Locations without electromagnetic noise interference.
- A sturdy, vibration-free location.
- Suitable ambient temperature is 0 ° C ~ 55 ° C; if the ambient temperature is above 45 ° C, please put the drive in a well-ventilated place or in an air-conditioned room.

Installation Precautions

- Install the drive in the direction specified by the instructions; incorrect positioning may lead to servo failure.
- When installing the drive, do not block its ventilation holes and do not place it upside down, otherwise the drive may malfunction.
- Do not use on or near flammable materials.
- Make sure that each fastening point is tight when fixing the drive in place.
- Install on a surface that can withstand the weight.

Operation Precautions

- For long-term operation, it is recommended to maintain an ambient temperature below 45 °C to ensure product reliability.
- If the product is installed in an electrical cabinet, the size and ventilation of the cabinet must prevent any internal electronic devices from overheating. Also pay attention to whether the machine's vibrations will affect other electronics in the cabinet.
- To enhance cooling circulation, maintain sufficient space between all sides and surrounding objects of the drive and the baffles (walls); also take care not to block the ventilation holes, otherwise the drive may malfunction.

Other Precautions

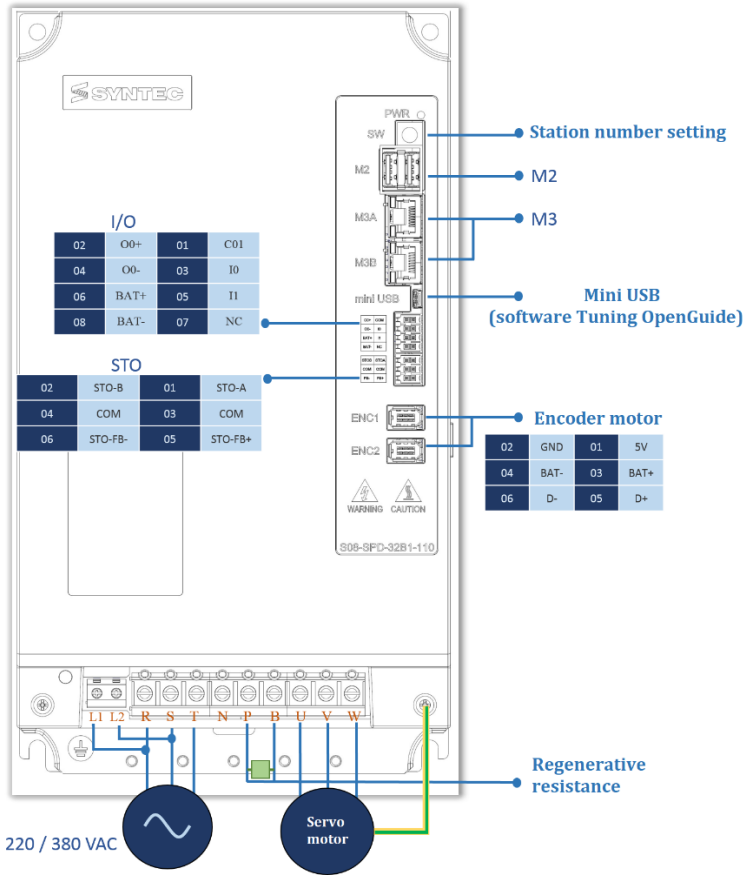
- The cable between the drive and the motor should not be stretched too tightly.
- Do not place heavy objects on top of the drive.
- Keep the drive clear from conductive objects such as metal and screws or combustibles such as oil.

- If the cable connecting the motor and the drive is longer than 20 meters, please thicken the U, V, W and encoder cables.
- Do not drop or impact the drive.
- Do not force the drive to operate if it is damaged.

6. Wiring and signal

6.1. Peripheral device wiring diagram

SPD-32B1-110



Installation Precautions:

- Before powering on, check if the U, V, W, and G terminals are correctly wired to the motor. An incorrect UVW sequence may lead to rotation in the reverse direction or even motor malfunction; at that point, Encoder Testing and Magnetic Pole Offset Detection must be re-performed. An incorrect G wiring may cause damage to the motor or the drive.
- It is recommended to provide the power supply of the controller through any two terminals of the RST.

- When wiring the host controller, select either general servo signal or serial servo signal-- not both.

Wiring Instructions

- **Power supply:**

Input power from R, S, T, L1, L2
L1 and L2 are optional

- **Encoder Terminals:**

Single-axis Axial Type (SVD) has one set of encoder feedback (6PIN) and Spindle Type (SPD) has two sets of encoder feedback (6PIN); each set of encoder terminals has a 5V power output (up to 150mA).
Supports encoder interface of Tamagawa, SYNTEC, and NIKON.
Supports expansion modules that connect other encoder interfaces (refer to Servo 10PX1/10PX3 Expansion Module Guide).
Battery voltage checking for absolute encoders.

- **Host Controller Serial Communication:**

Mechatrolink-II Serial 10Mbps
Mechatrolink-III Serial 100Mbp
EtherCAT Serial 100Mbps (Currently unsupported)

- **General IO Signal:**

2 DI ports
1 DO port
Absolute Battery Voltage Input
Note
NC: Empty port
I port: Input a voltage of 24V relative to COM
O port: O0+ and O0- are internally conductive

- **STO I/O:**

2 Safety inputs (STO-A, STO-B)
1 Safety feedback (STO-FB)

- **USB Communication:**

Connects to PC to set the servo's internal parameters and monitor the operation status.

- **LED :**

Operation Status and Power indicator.

6.2. Drive connector and terminal description

Name	Terminal	Description
Main Loop Power Input Terminal	R, S, T	Connects to 3-phase AC
Controller Power	L1, L2	Optional L1 and L2, depending on wiring schematic
Motor Power Input Terminal	U, V, W	Connects to motor
Regenerator Terminal	P, B2	Connects to external regenerative resistor
Serial Communication Interface	M2	Connects to host controller (either M2 or M3)
Serial Communication Interface	M3A, M3B	Connects to host controller (either M2 or M3)
USB Port	mini USB	Connects to PC's USB port
General Signal IO		Connects to host controller
Safe Torque Off (STO)		STO terminal
Encoder Feedback	ENC1	Connects to motor encoder
2nd Encoder Feedback	ENC2	Connects to loaded encoder
Ground Terminal		Connects to ground

Wiring Precautions:

Keep the six power lines R, S, T and U, V, W away from other signal lines, at least a 30 cm distance if possible.

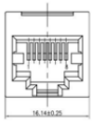
When the power is cut off, the drive's internal capacitor still contains a large amount of charge-- do NOT touch the six power lines R, S, T, and U, V, W. Please wait until the charging light goes out.

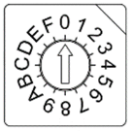
When lengthening the encoder cable, apply twisted pair cabling to the encoder cable and the grounding signal cable. Do not exceed a length of 20 m (65.62 in or 14 ft); if it is absolutely necessary to do so, please use a signal line with twice the wire diameter in order to minimize signal attenuation.

Please wire according to relevant regulations. Select the wire diameter according to motor wattage, as follows:

Type	Wattage	Wire Diameter
Axial	100W~850W	20AWG
	850W~7.5kW	16AWG
Spindle	7.5kW and below	12AWG
	11kW and above	10AWG

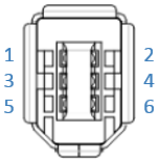
6.3. Interface pin definition

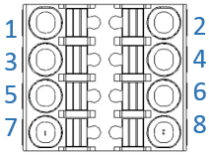
M3 Serial Servo /EtherCAT Serial		
		
Pin	**Name**	**Description Description**
1	TX+	Differential Signal (+)
2	TX-	Differential signal (-)
3	RX+	Differential Signal (+)
4	NC	--
5	NC	--
6	RX-	Differential signal (-)
7	NC	--
8	NC	--

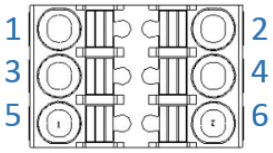
Station Number							
							
0	N/A	**4**	Station No. 4	**8**	Station No. 8	**C**	Station No. 12
1	Station No. 1	**5**	Station No. 5	**9**	Station No. 9	**D**	Station No. 13
2	Station No. 2	**6**	Station No. 6	**A**	Station No. 10	**E**	Station No. 14
3	Station No. 3	**7**	Station No. 7	**B**	Station No. 11	**F**	Station No. 15

Mini USB communication Mini USB Port		
		
1	5V	5V power supply
2	DM	USB differential signal (-)
3	DP	USB Differential Signal (+)
4	GND	Power Reference GND
5	GND	Power Reference GND

M2 serial servo M2 Serial		
		
1	--	--
2	D-	Differential signal (-)
3	D+	Differential Signal (+)
4	--	--

Encoder Feedback			
			
1	5V	**2**	GND
3	BAT+	**4**	BAT-
5	D+	**6**	D-

IO interface signal IO Signal Port			
			
1	C01	**2**	O0 +
3	I0	**4**	O0-
5	I1	**6**	BAT+
7	NC	**8**	BAT-

STO signal STO Signal Port			
			
1	STO-A	**2**	STO-B
3	STO-COM	**4**	STO-COM
5	STO-FB +	**6**	STO-FB

6.4. Syntec encoder external analog temperature wiring diagram

Distinguishing among the PTC130 temperature sensor, the normally closed (NC) contact, and the KTY84 temperature sensor:

- On the label of PTC130 temperature sensor signal line, "PTC130" is labelled right underneath "Thermal Protection."
- On the label of normally closed (NC) contact temperature sensor signal line, "(NC)" is labelled right underneath "Thermal Protection," as in Figure 1.
- On the label of KTY84 temperature sensor signal line, "KTY84" is labelled right underneath "Thermal Protection," as in Figure 2. In addition, the KTY84 motor has a "KTY84" label attached to the motor casing, as in Figure 3.

Figure 1 (Figure 1)	**Figure 2 (Figure 2)**

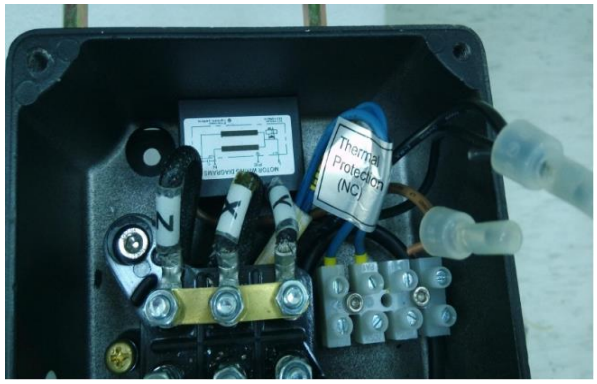
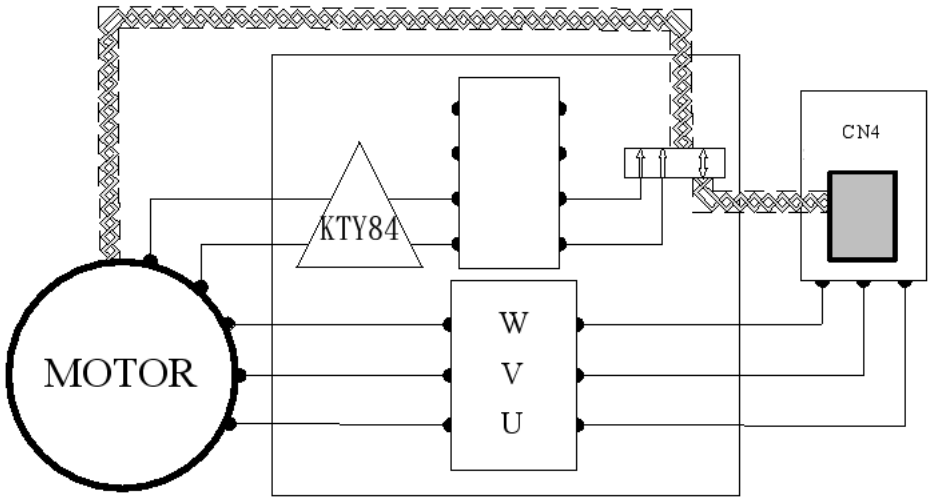



Figure 3 (Figure 3)	
	

Analog Temperature Sensor Wiring Diagram (using encoder header K22)

- Connect the motor's temperature sensor terminal to the SYNTEC encoder's temperature sensor terminal

- Set the parameters Pn-743 and Pn-744 (If the SYNTEC encoder is connected to the 2nd feedback, then set the parameters Pn-747 and Pn-748 instead).



6.5. Regeneration resistor selection

6.5.1. Overview of Regenerative Resistor Selection

The recommended capacities for Syntec regenerative resistors are listed in the following table:

Drive Model No.	Recommended Capacitance (Note 1)	Recommended Resistance (Minimum Value, Refer to Note 2)
SPD-32B1-110	2000 W	20 Ω

Note:

1. The Recommended Regeneration Resistance Table is designed for general machining situations. If these values do no meet the actual application conditions, users can refer to the Detailed Selection Guide for Regenerative Resistors and select a regenerator of higher power.
2. Recommended resistance = operating voltage / maximum brake current, and it is the minimum regenerative resistance of the drive. If no suitable resistance value is found, users must select a regenerator of higher power.

There are three types of regenerative resistors commonly used in CNC machining: wirewound resistors, ripple resistors, and aluminum-housed resistors; users can select the type according to their needs. The following chart compares the three types of brake resistors:

Resistor Type	Wirewound	Ripple	Alumium-Housed
Characteristics			
Heat Dissipation	Poor	Average	Excellent
Operating Power Range	Large (30~20000W)	Large (30~20000W)	Small (40~2000W)
Operating Resistance Range	2~1000Ω	2~1000Ω	0.1~10KΩ
Cost	Low	Average	High
Dimensions Length X Width X Height (Unit: mm)	Large (362 x 70 x 138)	Large (362 x 70 x 138)	Small (335 x 76 x 44)

6.5.2. Detailed Selection Guide for Regeneration Resistors

Motors do Negative Work under External Torque Load

Motors generally do positive work while operating, but they may do negative work when the output torque direction is opposite of the rotation direction. For instance, the motor may output torque to resist the inertia during braking, or it may experience an external torque load while in torque mode...etc. During those times, the external force is doing positive work through the motor and transferring that energy to the drive; that is, the motor acts as a generator. When this happens, the regenerative resistor must quickly dissipate the energy in order to prevent flooding the DC terminal voltage.

Suppose the external torque load is T_L and the unit is a percentage of the rated torque (%). The speed at that instance in time is Wr (rpm). The regenerative resistance power must be greater than the External Torque Power = T_L x Rated Torque x (Wr x 2π/60).

For example, if the external torque is 50% of rated torque, the speed is 2000 (rpm), and the motor rated torque is 2 (Nm), then the external torque produces a power of 0.5 * 2 * 2000 * 2π / 60 ≈ 210 W. To be safe, that number is usually multiplied by a safety factor of around 2 ~ 3, therefore the user needs to select a regenerative resistor of more than 420W.

Free of External Torque Load

Assuming that the motor moves back and forth, the energy generated by the inertial force during braking will be poured back into the drive. At this time, the capacitor of the DC bus terminal of the drive is the first buffer to absorb and reuse the energy. However, the absorption of energy by the capacitor causes the DC bus voltage to rise, so when the voltage rises to a certain level, the second buffered regenerative resistor is turned on to convert the energy into heat and discharge it.

The calculation method of the regenerative energy generated by the spindle motor of the drive during braking is provided below, and the user can calculate the required resistance according to different occasions.

E_0 in the table below is the regenerative energy required to dissipate from the rated speed to the standstill when the motor is load-free, $E_0 = J*\omega_r^2/182$, where J is the rotor inertia (kg-m^2) and ωr is the rated speed of the motor (Rpm). And Ec is the energy that the DC bus capacitor can absorb, $Ec = C*(V_{b,max}^2-V_b^2)/2$, where C is the capacitance value of the DC bus terminal. $V_{b,max}$ is the maximum voltage that the DC bus can withstand, the 220V drive can withstand 400 V, and the 380V drive can withstand 800 V. The V_b value is the rated voltage of the DC bus, and the value is 2 times the root of the input supply voltage.

Considering the actual application, assume that the load inertia ratio is N times the motor inertia. If the speed is braked from the rated M times to zero speed, the regenerative resistor must consume $\mathbf{E_0(N+1)*M^2-Ec}$ Joule. If the motor reciprocating cycle (Time of accelerating, being steady, to decelerating) is T sec, then the regenerative resistor power $W = \mathbf{1.2}[E_0*(N+1)*M^2-Ec]/T$, 1.2 is the safety factor.

In addition, according to the application of the spindle cover, the allowable frequency index is provided for the user to select. The allowable frequency is defined as the continuous acceleration and deceleration of the motor. In the case where the regenerative resistor and the motor are not overheated, the maximum number of round trips per minute is equal to 60 seconds divided by the round trip period T, i.e. 60/T. For example, when the milling machine is performing drilling and tapping, the spindle will frequently perform acceleration and deceleration (single drilling involves two acceleration and deceleration actions). If it is desired that the regenerative resistor is not prone to overheating and

smoke, the number of drilling per minute must be limited to less than half of the allowable frequency.

M3 Single-axis Drive ─ Spindle Motor

Drive Model No.	**Motor Model No.**	**Rotor Inertia J (10^{-4} kg-m^2)**	**Load-free Rated Speed to Zero Speed Regenerative Energy Eo(joule)***	**Capacitor Absorbed Energy Ec(joule)**
SPD-32B1-110	SP-L5.5-18	40.6	200	368
	SP-L5.5-24	30.7	151	368
	SP-M7.5-10	204.6	252	368
	SP-M11-08	238.0	294	368
	SP-M7.5-08A	111.1	236	368
	SP-M11-08A	183.5	244	368
	SP-M11-12	248.5	307	368
	SP-M15-07	548.82	678.5	368
	SP-M18-07	663.76	820.6	368

Milling Spindle Package

(The following tables are all computed using a 100% load inertia ratio; bolded numbers denote the recommended power.)

SP-L5.5-12

Resistor Power Operating Speed	**Allowable Frequency (times/min)**			
	500W	800W	**1KW**	2KW
1 Times the Rated Speed	Unlimited			
2 Times the Rated Speed	18	29	**37**	74
3 Times the Rated Speed	7	11	**14**	28
4 Times the Rated Speed	3	6	**7**	15

SP-L5.5-18

Resistor Power Operating Speed	**Allowable Frequency (times/min)**			
	500W	800W	**1KW**	2KW
1 Times the Rated Speed	Unlimited			
2 Times the Rated Speed	20	32	**40**	81
3 Times the Rated Speed	7	12	**15**	30
4 Times the Rated Speed	4	6	**8**	16
5 Times the Rated Speed	2	4	**5**	10
6 Times the Rated Speed	1	3	**3**	7

SP-L5.5-24

Resistor Power Operating Speed	**Allowable Frequency (times/min)**			
	500W	800W	**1KW**	2KW
1 Times the Rated Speed	Unlimited			

2 Times the Rated Speed	29	47	**59**	118
3 Times the Rated Speed	11	16	**21**	42
4 Times the Rated Speed	5	8	**11**	22
5 Times the Rated Speed	3	5	**6**	13
6 Times the Rated Speed	2	3	**4**	9
7 Times the Rated Speed	1	2	**3**	6
8 Times the Rated Speed	1	2	**2**	5

SP-SL5.5-24

Resistor Power Operating Speed	**Allowable Frequency (times/min)**			
	500W	800W	**1KW**	2KW
1 Times the Rated Speed	86	138	**173**	347
2 Times the Rated Speed	11	17	**22**	44
3 Times the Rated Speed	4	7	**9**	18
4 Times the Rated Speed	2	3	**4**	9
4.8 Times the Rated Speed	1	2	**3**	6

SP-M5.5-12

Resistor Power Operating Speed	**Allowable Frequency (times/min)**			
	500W	800W	**1KW**	2KW
1 Times the Rated Speed	Unlimited			
2 Times the Rated Speed	18	29	**37**	74

3 Times the Rated Speed	7	11	**14**	28
4 Times the Rated Speed	3	6	**7**	**15**
5 Times the Rated Speed	2	3	**4**	9
6 Times the Rated Speed	1	2	**3**	6
7 Times the Rated Speed	1	1	**2**	4
8 Times the Rated Speed	0.9	1	**1**	3

SP-L7.5-18

Resistor Power Operating Speed	**Allowable Frequency (times/min)**			
	1KW	1.2KW	**2KW**	3KW
1 Times the Rated Speed	122	147	245	367
2 Times the Rated Speed	18	21	**36**	54
3 Times the Rated Speed	7	9	**15**	22
4 Times the Rated Speed	4	4	**8**	12
5 Times the Rated Speed	2	3	**5**	7
6 Times the Rated Speed	1	2	**3**	5

SP-M7.5-12

Resistor Power Operating Speed	**Allowable Frequency (times/min)**			
	1KW	1.2KW	**2KW**	3KW
1 Times the Rated Speed	Unlimited			
2 Times the Rated Speed	42	50	**84**	126
3 Times the Rated Speed	15	19	**31**	47
4 Times the Rated Speed	8	10	**17**	25
5 Times the Rated Speed	5	6	**10**	15

6 Times the Rated Speed	3	4	**7**	10
7 Times the Rated Speed	2	3	**5**	8
8 Times the Rated Speed	2	2	**4**	6

SP-M11-08

Resistor Power Operating Speed	**Allowable Frequency (times/min)**			
	1.6KW	2KW	**3KW**	4KW
1 Times the Rated Speed	Unlimited			
2 Times the Rated Speed	33	42	**63**	84
3 Times the Rated Speed	13	17	**26**	34
4 Times the Rated Speed	7	9	**14**	18
5 Times the Rated Speed	4	5	**8**	11
5.3 Times the Rated Speed	4	5	**7**	10

SP-M15-07

Resistor Power Operating Speed	**Allowable Frequency (times/min)**			
	1.6KW	2KW	**3KW**	4KW
1 Times the Rated Speed	135	169	**254**	338
2 Times the Rated Speed	23	28	**43**	57
3 Times the Rated Speed	9	12	**18**	24
4 Times the Rated Speed	5	6	**10**	13
4.7 Times the Rated Speed	3	4	**7**	9

Lathe spindle cover

Lathing Spindle Package

SP-M5.5-08A

Resistor Power Inertia Ratio (N)	**Allowable Frequency of the Motor's External Regenerator under 2 Times the Rated Speed (times/min)**			
	600W	800W	**1KW**	2KW
5 Times the Inertia Ratio	3	4	**5**	10
6 Times the Inertia Ratio	2	2	**3**	6
7 Times the Inertia Ratio	1	2	**2**	5
8 Times the Inertia Ratio	1	1	**1**	3
10 Times the Inertia Ratio	0.7	0.9	**1**	2
12 Times the Inertia Ratio	0.5	0.6	**0.8**	1

SP-M7.5-08A

Resistor Power Inertia Ratio (N)	**Allowable Frequency of the Motor's External Regenerator under 2 Times the Rated Speed (times/min)**			
	1KW	1.5KW	**2KW**	3KW
5 Times the Inertia Ratio	4	6	**8**	12
6 Times the Inertia Ratio	2	4	**5**	8
7 Times the Inertia Ratio	2	3	**4**	6
8 Times the Inertia Ratio	1.	2	**3**	4
10 Times the Inertia Ratio	1	1	**2**	3
12 Times the Inertia Ratio	0.7	1	**1**	2

SP-M11-08A

Resistor Power Inertia Ratio (N)	**Allowable Frequency of the Motor's External Regenerator under 2 Times the Rated Speed (times/min)**			
	2KW	2.4KW	**3KW**	4KW
5 Times the Inertia Ratio	5	6	**7**	10
6 Times the Inertia Ratio	3	4	**5**	6
7 Times the Inertia Ratio	2	3	**3**	5
8 Times the Inertia Ratio	1	2	**2**	3
10 Times the Inertia Ratio	1	1	**1**	2
12 Times the Inertia Ratio	0.8	1	**1**	1

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Resistor Power Inertia Ratio (N)	**Allowable Frequency of the Motor's External Regenerator under 2 Times the Rated Speed (times/min)**			
	1KW	2KW	**3KW**	4KW
1 Times the Inertia Ratio	39	78	118	157
2 Times the Inertia Ratio	8	16	24	32
3 Times the Inertia Ratio	3	6	10	13
4.6 Times the Inertia Ratio	1	2	4	5

6.6. KTY84 temperature sensor and over temperature protection

The KTY84 temperature sensor can be installed on drives and encoders. This section details how to activate the sensor and its thermal protection function.

The KTY84 thermistor is an analog type temperature sensing element; its resistance value changes with temperature.

6.6.1. Installation

A KTY84 temperature sensor installed on a drive has two signal lines; refer to the【Wiring and Signals】section for wiring diagrams.

6.6.2. Drive Parameters Setting

Parameter	Parameter Name	Range	Default
Pn-74A	Disable Encoder Int. Thermal Protection	0~1	0
Pn-74B	Disable Encoder Ext.(1) Thermal Protection	0~1	0
Pn-74C	Disable Encoder Ext.(2) Thermal Protection	0~1	0
Pn-74E	Disable 2nd Int. Thermal Protection	0~1	0
Pn-74F	Disable 2nd Ext.(1) Thermal Protection	0~1	0
Pn-740	Enable KTY84 Thermal Protection	0~1	1
Pn-741	Motor KTY84 Thermal Protection Level	80~150 (℃)	120
Pn-742	Encoder Int. KTY84 Protection Lv.	0~145 (℃)	0
Pn-743	Encoder Ext.(1) KTY84 Protection Lv.	0~145 (℃)	0
Pn-744	Encoder Ext.(2) KTY84 Protection Lv.	0~145 (℃)	0
Pn-746	2nd Encoder Int. KTY84 Protection Lv.	0~145 (℃)	0
Pn-747	2nd Encoder Ext.(1) KTY84 Protection Lv.	0~145 (℃)	0
Pn-748	2nd Encoder Ext.(2) KTY84 Protection Lv.	0~145 (℃)	0
Pn-750	Disable 2nd Ext.(2) Thermal Protection	0~1	0

Above is the table of parameters relevant to the KTY84 thermal protection function. Set Pn-740 as 1 to enable the function, then the system will trigger the overheat alarm AL-200 if the measured temperature exceeds the level set in Pn-741.

To enable thermal protection for Syntec encoders, simply set the thermal protection level to a value within the range 0~145℃. If this level is already factory-set, it cannot be modified.

There are two ways to disable the thermal protection function, as follows:

For drives before V2.1.8, set the thermal protection level to 0.

For V2.1.8 and onward, use the parameter "Disable Encoder Int. Thermal Protection".

Example: Set Pn-742 "Encoder Int. KTY84 Protection Lv." as 140℃. To disable the protection, set Pn-74A "Disable Encoder Int. Thermal Protection" as 1.

If the temperature exceeds the protection level, a corresponding overheat alarm will be triggered as follows:

Alarm Code	Alarm Name
Alarm 220	Motor Over Temperature
Alarm 320	Encoder Internal Over Temperature
Alarm 321	Encoder External(1) KTY84 Over Temperature
Alarm 322	Encoder External(2) KTY84 Over Temperature
Alarm 324	2nd Encoder Internal Over Temperature
Alarm 325	2nd Encoder External(1) KTY84 Over Temperature
Alarm 326	2nd Encoder External(2) KTY84 Over Temperature

For diagnosis and troubleshooting of overheat alarms, refer to the table below:

Possible Reason	Checking	Solution
Motor Cooling System Abnormality	Check the motor cooling system	Change the cooling system
Analog Temperature Sensor Signal Abnormality	Check if the analog temperature feedback is fine	1. Check if the wiring is loose or abnormal 2. Check if the parameters Pn7-40, Pn7-41 are correct
Incorrect Motor Rated Current Setting	Check the rated current value	Check the input parameters. Re-tune if modifications are required.
Insufficient of Acc/Dec Time	Check the Acc/Dec parameters	Increase the Acc/Dec Time
Excessive Load	Check if the load rate continues to exceed 100%	Replace the motor with one of greater power

Users can observe the temperatures measured by KTY84 through status monitoring variables.

These variables correspond to the measured temperatures as follows:

Status Monitoring Variables	Parameter Descriptions
Pn-D60	Measured Temperature via KTY84 with Syntec Drive
Pn-D61	Measured Temperature via Feedback Syntec Encoder Internal KTY84
Pn-D62	Measured Temperature via Feedback Syntec Encoder External(1) KTY84
Pn-D63	Measured Temperature via Feedback Syntec Encoder External(2) KTY84
Pn-D64	Measured Temperature via Feedback Syntec Encoder External(3) KTY84

Status Monitoring Variables	Parameter Descriptions
Pn-D65	Measured Temperature via 2nd Feedback Syntec Encoder Internal KTY84
Pn-D66	Measured Temperature via 2nd Feedback Syntec Encoder External(1) KTY84