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21A SERIES

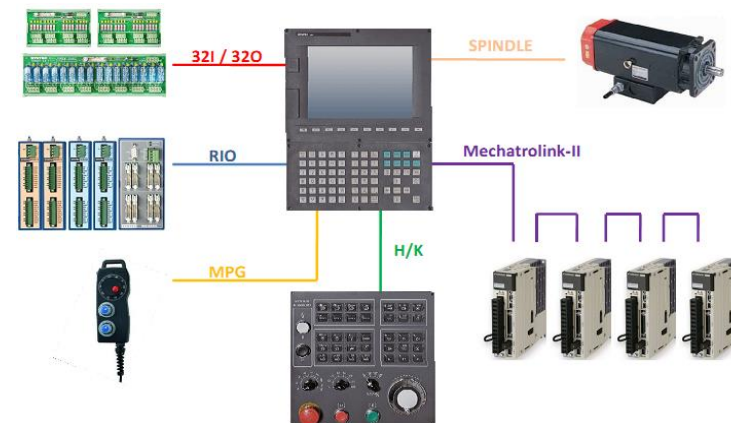Date : 2014/06/19

21A Series Controller Description

   The Syntec 21A Series Controllers uses the Yaskawa Mechatrolink-II serial (bus) communications control method, which not only improves upon the problems traditional general pulse-type controllers have in terms of wiring and scalability, but also makes the system simpler, more scalable, and easier to assemble.

   The 21A Series can control a maximum of 6 servo motor axes simultaneously. In terms of I/O, besides the 32 Direct Input and Output provided by the controller itself, the RIO serial interface can also be used to connect to external I/O modules, allowing customers to decide whether or not to add RIO modules based on their IO needs, thereby providing an even higher degree of flexibility.

   The spindle output can be chosen to be serial communication based, DA based, or pulse command based. Besides the serial spindle options, other more economic spindle solutions are also available.

- Lathes come standard with 3 sets of axial
- Millers come standard with 6 sets of axial
- Spindle commands: support 2DA, pulse, serial (select 1 out of 3)
- Comes standard with 32I/32O, with the option to expand to up to 96I/96O
- Supports 8 and 10.4 inch full-color backlit LED displays
- The front frame has an industrial waterproof design, with many optimized operation panels to choose from according to your requirements
- Built-in open PLCs and MACROs
- Real-time power outage data storage
- Many optimized operation panels to choose from according to your requirements
- Handheld MPG port
- International safety certification
- Many types of serial ports: RS-485,EtherNET
- Hot-swappable USB port available at the front.
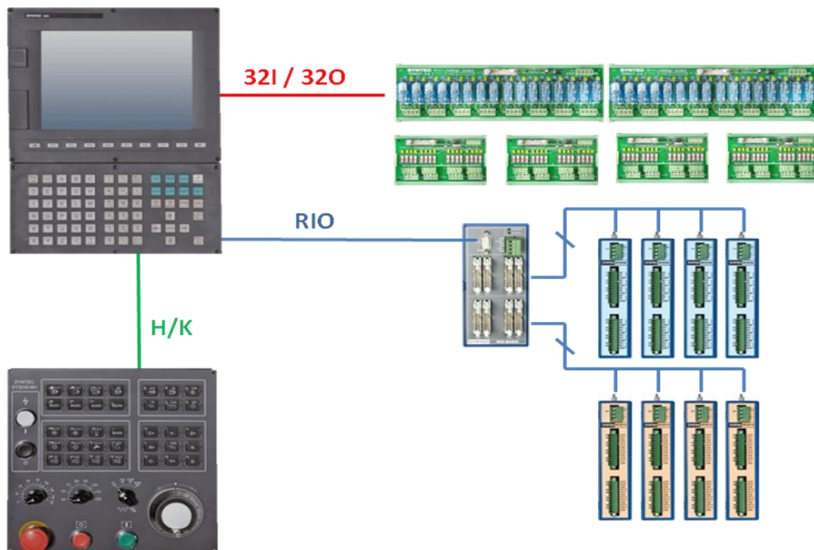
■ **21A Series Architecture**

Product Features

- **Mechatrolink-Ⅱ Architecture: dedicated network for high-speed motion control**

High-speed serial bus, simple wiring and strong noise suppression capabilities.
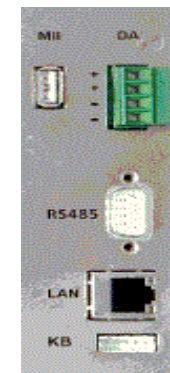

- **IO Architecture**

- **Complete System Functionality**

The system provides complete lathing and milling functionalities, a simple windows-based operating interface that is easy to learn to use, and precise synchronous movement interpolation, allowing users to easily produce perfected work pieces.
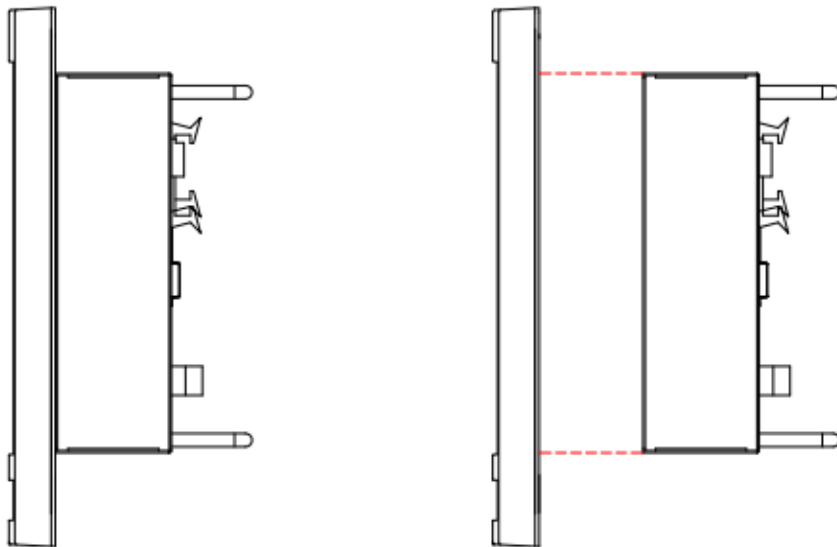

- **Advanced Transmission Mechanism**

In addition to the traditional RS-485 interface, the system also has an advanced 10/100 MHz Ethernet port as well as hot-swappable USB ports, which boost software transmission speeds as well as enhance convenience and stability.
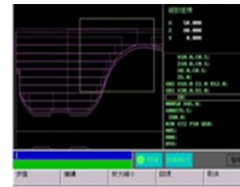
■ Easily Maintainable System Architecture

This next-generation controller is built using high-density integration technologies and incorporates an extremely well-thought-out design. Its compact and modular design allows on-site personnel to easily perform maintenance with just a single screwdriver.
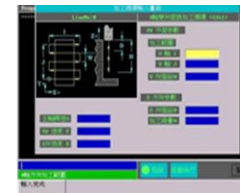
■ User-Friendly Operation Interface

❑**Simulation**
-**Syntax check**
-**3D simulation and step simulation**
-**Magnify at any ratio**
-**Integrated environment that can also check trajectory coordinates and program contents**
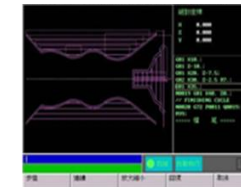
❑**Multi-pocketed Complex Cutting cycle**
-**The user only needs to enter the external appearance of the work piece, and the CNC will automatically figure out the cutting path and cycle**
-**Can be used with A, R, and C**
-**Can perform multi-pocketed processing with one run of the program**

❑**Graphical Dialogue**
-**X/Y axis single/dual-direction surface milling cycles**
-**Track-type/square-type/round-type trench rocessing cycles**
-**Round-hole/angled-line hole/curved-hole checkerboard hole drilling cycles**

❑**Processing execution**
-**Integrated operation environment**
-**Processing parameter configuration**
-**Program coordinate and cutting tool configurations are made on the same page**

❑**Hand Wheel Processing Simulation**
The MPG can be used to control software processing speeds
Rotate the MPG forwards/backward to move the cutting tool forwards/backwards along its path
Turn the MPG to fast and the cutting tool will move faster along its path
Turn the MPG to slow and the cutting tool will move slower along its path
Turn the MPG to stop and the machine will stop

■ Thoughtful Diagnostic and Development Tools

■ Complete Software Application Support

❑**On line ladder**
-I, O, C, S inspection page
-Real-time Ladder display
-Search for components
-The PLC can issue alert messages in Chinese and English

❑**Alert records**
-Records 200 alert messages in the alert history, with dates, hours, minutes, seconds, and alert content
-Capable of further displaying reason for malfunction and methods used for troubleshooting

❑**MACRO Support**
-Windows based Macro development environment
-Can communicate with the PLC via register bits
-Completely compatible with CNC operating environments

-Open and store files
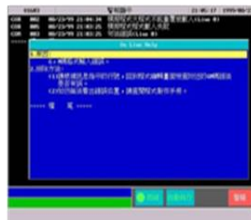-Step simulation and three-view diagram simulation
-System parameter and variable configuration

Macro Syntax

Logic Computation Command
◆ AND , OR , XOR , . . .
◆ +, -, ×, /, . . .
◆ <.=.>. . . .

Digit Function Command
◆SIN , COS , TAN , . . .
◆ ASIN , ACOS , ATAN , . . .
◆ SQRT , . . .
◆ MAX , MIN

Structural Process Control Command
◆ GOTO
◆ IF < > THEN
   END_IF
◆ WHILE < > DO
   END_WHILE
. . . .

❑**Parameter Settings**
-Parameter group configuration
-Comprehensive descriptions of the meaning of parameters
-Password protection
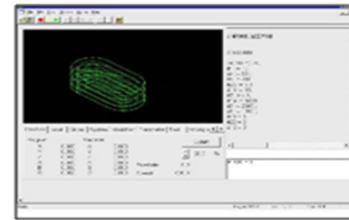-Supports user-defined parameters

❑**Production Records**
-Provides complete records for 100 completed processing programs, including the program name, start time, total processing time, as well as number of work pieces
-Monitors the production rate of programs in execution

❑**Ladder Support**
-Windows based PLC software development
-Online Ladder display, making troubleshooting easier
-PLC executes servo movement commands

-Editing Function Table
● Open file, save file
● Add Ladder footnote (Chinese and English)
● Cut, copy, paste
● Search,…
● Syntax check

Ladder Syntax

◆ Contact point: normally open, normally closed
◆ Coil: normally open, normally closed, positive edge, negative edge, always return
◆ Arithmetic commands:
◆ Timer, counter
◆ Data movement: MOV
◆ Cutting tool commands: ROT
◆ Software control commands: JMP, JSR
◆ Call subroutine
◆ Directly execute PLC shaft movement commandSpecify PLC shaft for executing movement program instruction…………………..
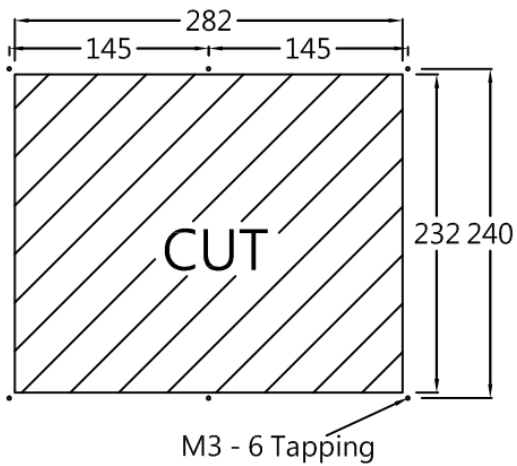
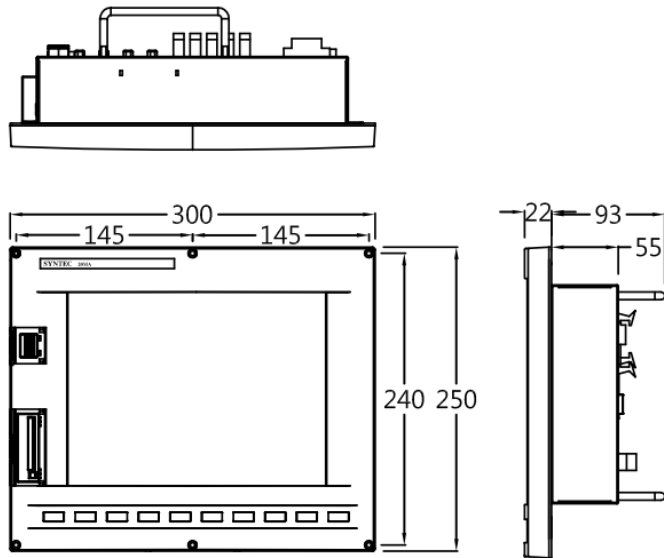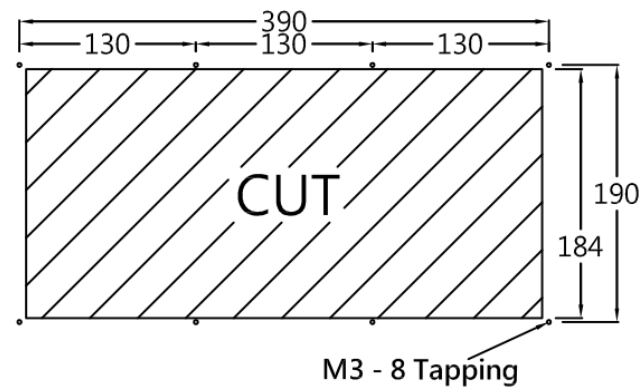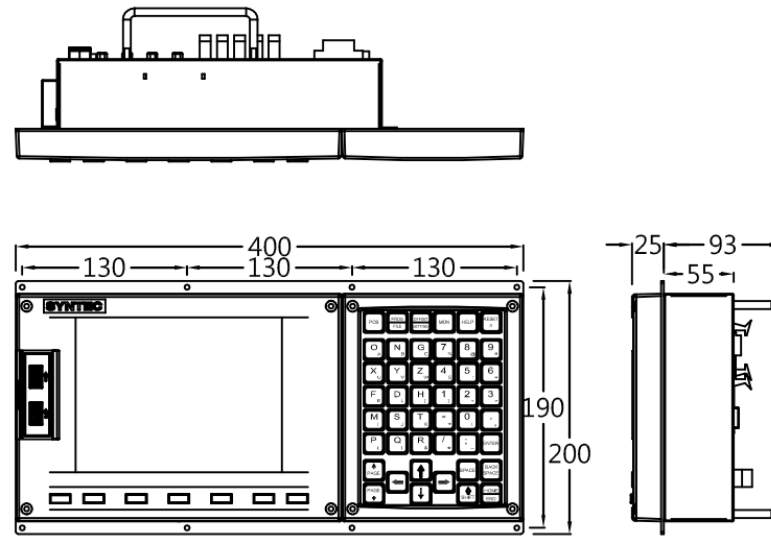■ **External Appearance of the Product (21A-SEP-DG)**

■ **External Appearance of the Product (21A-DG)**

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■ Structural Dimensions (21A-SEP-DG)

M3 - 6 Tapping

■ Structural Dimensions (21A-DG)

M3 - 8 Tapping

■ Connector Interface Definitions

Please mind the voltage values as well as positive and negative polarities

● X1 Connector Definitions

X1	PIN	SIGNAL	PIN	SIGNAL
	20	INPUT8	19	INPUT0
	18	INPUT9	17	INPUT1
	16	INPUT10	15	INPUT2
	14	INPUT11	13	INPUT3
	12	INPUT12	11	INPUT4
	10	INPUT13	09	INPUT5
	08	INPUT14	07	INPUT6
	06	INPUT15	05	INPUT7
	04	GND	03	GND
	02	---	01	---

● X2 Connector Definitions

X2	PIN	SIGNAL	PIN	SIGNAL
	20	INPUT24	19	INPUT16
	18	INPUT25	17	INPUT17
	16	INPUT26	15	INPUT18
	14	INPUT27	13	INPUT19
	12	INPUT28	11	INPUT20
	10	INPUT29	09	INPUT21
	08	INPUT30	07	INPUT22
	06	INPUT31	05	INPUT23
	04	GND	03	GND
	02	---	01	---

● Y1 Connector Definitions

Y1	PIN	SIGNAL	PIN	SIGNAL
	20	OUTPUT8	19	OUTPUT0
	18	OUTPUT9	17	OUTPUT1
	16	OUTPUT10	15	OUTPUT2
	14	OUTPUT11	13	OUTPUT3
	12	OUTPUT12	11	OUTPUT4
	10	OUTPUT13	09	OUTPUT5
	08	OUTPUT14	07	OUTPUT6
	06	OUTPUT15	05	OUTPUT7
	04	GND	03	GND
	02	24V	01	24V

● Y2 Connector Definitions

Y2	PIN	SIGNAL	PIN	SIGNAL
	20	OUTPUT24	19	OUTPUT16
	18	OUTPUT25	17	OUTPUT17
	16	OUTPUT26	15	OUTPUT18
	14	OUTPUT27	13	OUTPUT19
	12	OUTPUT28	11	OUTPUT20
	10	OUTPUT29	09	OUTPUT21
	08	OUTPUT30	07	OUTPUT22
	06	OUTPUT31	05	OUTPUT23
	04	GND	03	GND
	02	24V	01	24V

● RIO Connector Definitions

RIO	PIN	SIGNAL	PIN	SIGNAL
	1	RIO_1_Tx+	6	RIO_2_Tx+
	2	RIO_1_Tx-	7	RIO_2_Tx-
	3	RIO_1_Rx+	8	RIO_2_Rx+
	4	RIO_1_Rx-	9	RIO_2_Rx-
	5	NC↵		

● HK Connector Definitions

HK	PIN	SIGNAL	PIN	SIGNAL
	26	---	25	XDI55
	24	XDI54	23	XDI53
	22	XDI52	21	XDI51
	20	XDI50	19	XDI49
	18	XDI48	17	5V
	16	GND	15	XDO62
	14	XDO61	13	XDO60
	12	XDO59	11	XDO58
	10	XDO57	09	XDO56
	08	XDO55	07	XDO57
	06	XDO53	05	XDO52
	04	XDO51	03	XDO50
	02	XDO49	01	XDO48

● SPINDLE Connector Definitions

SPINDLE	PIN	SIGNAL
	1	DA-
	2	DA-
	3	DA+
	4	DA+

- RS485 Connector Definitions

RS485	PIN	SIGNAL	PIN	SIGNAL
	1		6	TXD485-
	2		7	TXD485+
	3		8	NC
	4		9	5V
	5	GND		

Wiring-Side RS485 Front Schematic Diagram

- MECHATROLINK Connector Definitions

MECHATROLINK	PIN	SIGNAL
	1	NC
	2	DATA
	3	DATA
	4	SH

- SP Connector Definitions

SP	PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL
	1	A+	6	C-	11	CW+
	2	A-	7	ALM+	12	CW-
	3	B+	8	ALM-	13	CCW+
	4	B-	9	SERVO-ON	14	CCW-
	5	C+	10	SERVO-CLR	15	OUT_COM

- MPG Connector Definitions

MPG	PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL
	1	MPG_A+	6		11	XDI 60
	2	MPG_A-	7	XDI56	12	XDI 61
	3	MPG_B+	8	XDI 57	13	XDI 62
	4	MPG_B-	9	XDI 58	14	GND
	5		10	XDI 59	15	+5V

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■ **21A Series Product Specifications**

O Standard　　− Not supported　　△ Optional

PS/2	−
RS232/RS422/RS485	−/−/1
CF card	−
USB	2/1

Product Specifications		
Model	21TA	21MA
Control command format	Serial	
Largest main system axis group	2	
Largest PLC axis group number	1	
Standard control axis number	3	6
Maximum control axis number (optional)	3	6
Maximum spindle number	2	4
Maximum synchronous control axis number (single axis group)	3	4
Smallest unit of control - mm	0.0001	
Maximum number of work piece coordinate sets	32	100
Maximum number of tool compensation sets	96	
Number of pre-read single-sections	1000	
Single-section processing time – number of single sections / seconds	300	1000
Hardware Specifications		
I/O (standard)	32/32	
I/O (optional)	−	96/96
DA	2	
Display	8/10.4	
RJ-45	1	
VGA output	−	

Compensation		
Model	21TA	21MA
Backlash compensation		O
Pitch error compensation		O
Angle compensation		O
Temperature-rise compensation		O
Two-dimensional compensation	−	O
Operation		
MPG simulation		O
Program idle		O
Selective stop		O
Single-section execution		O
Virtual MPG		O
Pause point activation		O
Break point activation		O
External offset settings		O
MPG offset function	−	O
Program Input		
Selective jump		O
B-stop / end of program		O
Interrupt-type MACRO (M96/M97)		−
M198 subroutine call		−
G code expansion		O

High-Speed, High-Precision				Fast controller-based spindle positioning (C61)		O
Model		21TA	21MA	Frond and back Dipole architecture		O
Constant Jerk control		O		Data backup and restoration (MB)		O
Cross-section S-curve acceleration and deceleration		–	O	Boot screen customization		O
Automatic corner deceleration		O		Favorites	–	O
Circular radius speed limit		O		Project protection function	–	O
Multiple sets of high-speed high-precision parameters		–	O	Access privilege management	–	O
Fast user parameters		–		RemoteAP monitoring		O
SPA function		–	O	Programming		
Virtual circular radius function		–		Background editing		O
High-speed high-precision control mode I (G05.1Q1)		–	O	Editing protection		O
High-speed high-precision control mode II (G05P10000)		–	△	Data Transfer Function		
NURBS interpolation		–	△	NETWORK/FTP		O/O
Tool and Blade Management				DNC(Network)		O
Automatic blade calibration		–	O	DNC(USB)	–	O
Tool and blade usage life management		O		Information Display		
Supportive Functions				Graphical simulation		O
Mechanical lock (R-bit)		O		Optical scale missing pulse self-diagnostics		O
Software cycle limit		O		Five-Axis Function		
Spindle rotation speed detection		O		Five-axis blade tip control (RTCP)		–
Axial coupling function		–	O	Characteristic coordinate system (tilted-surface processing) (G43.4)		–
Dynamic axial coupling function		–	O			
Feedback coupling function		O	–	Characteristic coordinate system training (G68.2)		–
Fast tapping retraction		O		Smooth blade tip function (Smooth TCP)		–
Virtual axis function		–	O			
Axis swapping function		O				
Serial machine swapping function		O				

■ G Code Commands

Model	21TA	Model	21MA
Elliptical cutting (clockwise) (G02.1)	O	High-speed high-precision mode (G05)	O
Parabolic cutting (clockwise) (G02.2)	O	Path smoothing mode (G05.1)	O
Cylindrical interpolation (G07.1)	O	NURBS curve interpolation (G06.2)	O
Activate polar coordinate interpolation (G12.1)	O	Thread cutting (G33)	O
External radius / internal radius lathing and cutting cycle (G20)	O	Automatic blade measurement command (G37)	—
Threaded lathing and cutting cycle (G21)	O	Blade offset (G45~G48)	O
Threaded lathing and cutting mid-phase blade entry cycle (G21.2)	O	Tilted surface processing (G68.2)	O
Edge and surface lathing and cutting cycle (G24)	O	High-speed pecking-type drilling cycle (G73)	O
Jumping function (G31)	O	Left-handed tapping cycle (G74)	O
Thread cutting (G33)	O	Fine boring cycle (G76)	O
Variable-pitch thread cutting (G34)	O	Drilling cycle (G81)	O
Blade tip control (G43.4)	—	Suspended hole-bottom drilling cycle (G82)	O
Polygonal cutting (G51.2)	O	Pecking-type drilling cycle (G83)	O
Blade calibration for tilted surface processing (G53.1)	—	Tapping cycle (G84)	O
Operating coordinate system configuration (G54~G59.9)	O	Drilling cycle (G85)	O
Mirroring function (lathe) (G68)	O	High-speed drilling cycle (G86)	O
Tilted surface processing (G68.2)	—	Backside fine boring cycle (G87)	O
Duplex cutting cycles (G72~G78)	O	Semi-automatic fine boring cycle (G88)	O
Fixed drilling cycles (G80,G83~G89)	O	Suspended hole-bottom boring cycle (G89)	O
Default absolute zero coordinated system (G92.1)	O		
Inversed time feed (G93)	O		
Equal surface cutting speeds (G96)	O		
Spindle synchronization function (G114.1)	O		
Spindle bearing function (G114.3)	O		

■ **21A Series Operating Environment**

Model	21A Series
Operating environment	-10 ~ 55°C
Storage environment	-40 ~ 70°C
Cooling method	Natural Cooling
Safety certification	CE
Operating voltage	100V~240V, 60Hz
Power consumption	Approximately 5W