# **Autonics**

Single-Phase, **LED Display Slim Power Controller SPR1 Series** 

INSTRUCTION MANUAL





Thank you for choosing our Autonics product. Please read the following safety considerations before use.

# Safety Considerations

XPlease observe all safety considerations for safe and proper product operation to avoid hazards.

※▲ symbol represents caution due to special circumstances in which hazards may occur.

▲ Warning Failure to follow these instructions may result in serious injury or death.

▲ Caution Failure to follow these instructions may result in personal injury or product damage.

#### **⚠** Warning

- 1. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipme ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster
- Failure to follow this instruction may result in fire, personal injury, or economic loss. 2. Install on the device panel, and ground to the bolt for grounding separately.
- Failure to follow this instruction may result in electric shock or fire.

  3. Do not connect, repair, or inspect the unit while connected to a power source.
- Failure to follow this instruction may result in electric shock or fire.

  4. Check 'Connections' before wiring.
- Failure to follow this instruction may result in fire.
- 5. Do not disassemble or modify the unit.

Failure to follow this instruction may result in electric shock or fire.

# **⚠** Caution

- Use the unit within the rated specifications.
   Failure to follow this instruction may result in fire or product damage.
- 2. Use dry cloth to clean the unit, and do not use water or organic solvent.
- Failure to follow this instruction may result in electric shock or fire.
- 3. Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present. Failure to follow this instruction may result in fire or explosion.
- Keep metal chip, dust, and wire residue from flowing into the unit.
   Failure to follow this instruction may result in fire or product damage.
- 5. Since leakage current still flows right after turning off the power or in the output OFF status do not touch the load terminal

Failure to follow this instruction may result in electric shock.

Ordering Information

### Specifications

Model		SPR1-1	SPR1-2	SPR1-3	SPR1-4		
Control ph	ase	Single-phase					
Rated load	voltage (50/60Hz)	110VAC~	220VAC~	380VAC~	440VAC~		
Power supply		100-240VAC~ 50	/60Hz				
Min. load	current	1A					
Permissibl	le voltage range	90 to 110% of rate	d voltage				
Power cor	nsumption		nt 25A/35A/50A: m nt 70A/100A/150A:				
Display me	ethod	3-digit 7-segment	LED				
Indicator		Alarm indicator/o	utput indicator/unit	ndicator: green LED (V, A) indicator: red	LED		
Control me	ethod	cc	nstant power feedl	constant current/co back control mode de, variable cycle c	Ü		
Applied loa	ad	Phase control, O     Cycle control: res		stance load, inducti	ve load		
Control inp	out	puls	e voltage (5-12VD0	ON/OFF contact (n	0 1 /		
Digital inp	ut (DI)		ing, AUTO/MAN sv		` ' '		
0	Alarm	250VAC~ 3A, 30VDC= 3A, 1c resistive load					
Output	Communication	ion RS485 communication output (Modbus RTU method), max. connection: 31 u					
Output rar	nge	• Phase control: 0 to 98% • Cycle control: 0 to 100% • ON/OFF control: 0%, 100%					
Output accuracy		<ul> <li>Normal control: within ±10% F.S. of rated load voltage</li> <li>Constant current feedback control: within ±3% F.S. of rated load current</li> <li>Constant voltage feedback control: within ±3% F.S. of rated load voltage</li> <li>Constant power feedback control: within ±3% F.S. of rated load power</li> </ul>					
Set metho	d	By front keys, by communication					
Functions		Output limit (OUT ADJ), AUTO/MAN selection, control method selection, RESET, SOFT START, SOFT UP/DOWN, output high/low limit, input correction, input slope correction, monitoring (control input, load voltage/current/power/resistance, power supply frequency, heatsink temperature)					
	Alarm		overvoltage alarm, heatsink overheat	fuse break alarm, SC alarm	CR error alarm,		
Cooling m	ethod	Rated load current 25A/35A/50A: natural cooling Rated load current 70A/100A/150A: forced air cooling (with the cooling fan)					
Insulation	resistance	Over 200MΩ (at 500VDC megger)					
Dielectric	strength	2,000VAC 50/60Hz for 1 min (between input terminals and power terminals)					
Output lea	kage current	Max. 10mArms					
Noise imm	nunity	±2kV the square wave noise (pulse width: 1μs) by the noise simulator					
Memory re	etention	Approx. 10 years (when using non-volatile semiconductor memory type)					
Vibration	Mechanical	0.75mm amplitude at frequency of 5 to 55Hz in each X, Y, Z direction for 2 hours					
VIDIALIOII	Malfunction	0.5mm amplitude a	t frequency of 5 to 5	55Hz in each X, Y, Z direction for 10 min			
Environ	Ambient temp.	-10 to 55°C, storag	je: -20 to 80°C				
ment	Ambient humi.	35 to 85%RH, stor	age: 35 to 85%RH				
Accessory	,	11-pin connector					
Approval		C€					
Approval Weight <sup>ж1</sup>		Rated load current 25A/35A/50A: approx. 1.6kg (approx. 1.3kg) Rated load current 70A: approx. 1.65kg (approx. 1.35kg) Rated load current 100A/150A: approx. 3.2kg (approx. 2.8kg)					

%1: The weight includes packaging. The weight in parenthesis is for unit only. %Environment resistance is rated at no freezing or condensation.

# Unit Description Annonnah VI

# ① Bracket

indicator			
Indicato	r	Color	Function
RUN	Operation indicator	Green LED	Turns on in the RUN mode.
MAN	Manual control indicator	Green LED	Turns on when adjusting load output in the manual control mode.
ALM	Alarm indicator	Red LED	Flashes in alarming status.
OUT	Output indicator	Red LED	Turns on when load control outputs.

3 Display part: Displays settings of the front display [ dt 5] parameter in RUN mode, and displays parameter and setting value in setting mode.

Unit indicator

	(☆: Light ON/●: Light OFF)						
	Indicat	or	Dioploy				
	V A		Display				
	<ul><li>●</li><li>○</li><li>○</li><li>○</li><li>○</li></ul>		Resistance, input				
			Voltage				
	•	₽	Current				
	☆	☆	Power				

- (5) key: Enters parameter group, returns to RUN mode, moves parameters, and saves the setting value. ⑤ Setting value adjustment key
- : Enters SV setting mode and move digits Output limit adjuster (OUT ADJ)
   Limits output from 0 to 100%.

O Spacing

- (9) Terminal cover @ Alarm output and power input terminals
- 1 R. S. U load output terminals
- © Cooling fan: For models with the rated load current of 70A/100A/150A, a cooling fan is attached
- Bolt for grounding (M4)

# Connections

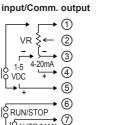
ON/OFF | O VDC

RS485

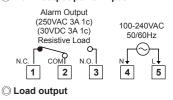
# Control input/Comm. output

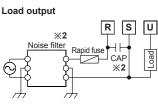
AUTO/MAN RESET

A(+) 10



# O Alarm output/power input



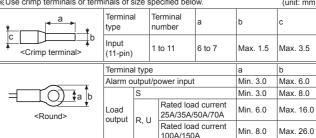


※1: This is only for models with RS485 communication output (SPR1-□□T□□). X2: When connecting noise filter and capacitor, it is appropriate for EMC. CAP : Rated load voltage 110VAC-220VAC  $\rightarrow$  1uF/250VAC

: Rated load voltage 380VAC-440VAC → 0.47uF/500VAC

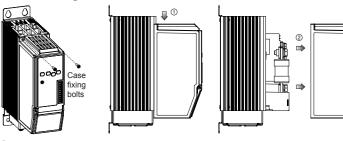
\*Tighten the terminal screw with the below tightening torque

Rated load	Cassification	Alarm output/	Load output			
current	Specification	power input	S	R, U		
25A, 35A,	Screw	M3	M3	M6		
50A, 70A	Tightening torque	0.5N·m	0.5N·m	5.5 to 6.0N·m		
4004 4504	Screw	M3	M3	M8		
100A, 150A	Tightening torque	0.5N·m	0.5N·m	6.5 to 7.0N·m		
over the prime terminals or terminals of size englished below.						



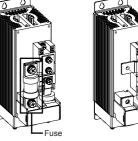
A Common the opening this do no rated load carrent							
	Wire specification						
Rated load current	Alarm output/	Load output					
	power input	S	R, U				
25A/35A/50A/70A	AWG 18 to 14	AWG 18 to 14	AWG 13 to 4				
100A/150A	AVVG 10 to 14		AWG 4 to 2/0				

# ■ Removing the Case



- 1	Opecification of case fixing boils						
١	Rated load current	Specification of bolts					
١	25A, 35A, 50A, 70A	M3					
١	100A, 150A	M4					

# Replacement of Fuse



O Specification of fuse fixing bolts

Rated load current Spec. of bolts 25A, 35A, 50A, 70A, M6 100A. 150A

### Recommended fuse specifications

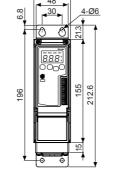
For replacing the fuse, please use the recommended fuse which has the below specifications (manufacture: PLISSMANN)

(Illaliulaciule, Di	USSIVIAININ)					
Rated load current	Model	Rated load current	Model	Rated load current	Model	
25A	50FE	50A	80ET	100A	FWH-150B	
35A	63ET	70A	100FE	150A	FWH-200B	
*The performance of the product is guaranteed only when using the fuse provided by us						

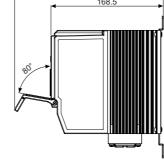
## Dimensions

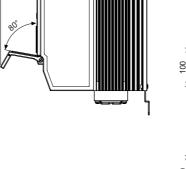
O Rated load current 25A/35A/50A

# 30 4-Ø6



O Rated load current 70A





When installing multiple power controllers. please keep space at least 50mm in horizontal and 100mm in vertical between power controllers for heat radiation



# High Temperature Caution

Panel

(unit: mm)

While supplying power to the load or right after turning off the power of the load, do not touch the body and heatsink.

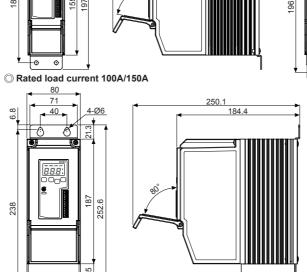
Failure to follow this instruction may result in a burn due to the high temperature.

#### SPR 1 - 2 70 T F F Non-fuse\* Feedback control Normal/constant current/constant voltage/constant power control Option output Alarm output Alarm+RS485 comm. output 25 25A 35 35A Rated load current 50 50A 70A 70 100 100A 150 150A 110VAC Rated load voltage 220VAC 380VAC 440VAC Control phase Solid State Power Regulator

X1: Product is not equipped with a rapid fuse inside. Install the suitable fuse for rated load current of

(slim type)

- (The performance of the product is guaranteed only when using the fuse provided by us.) \*The above specifications are subject to change and some models may be discontinued
- stBe sure to follow cautions written in the instruction manual, user manual, and the technical descriptions (catalog, homepage).



#### ■ Parameter Group

\*\*Hold the MODE key in RUN mode to enter into parameter group.

 $\ensuremath{\mathbb{X}}$  In parameter setting group, press the  $\ensuremath{\text{MODE}}$  key to move to other parameter in the group.

XPress the MODE key once after changing the setting value, to save the setting value and move to the

value.

XIf there is no key input for 30 sec while setting SV or the parameters, the new settings are ignored, and the unit will return to RUN mode with previous settings.

\*Hold the MODE key for 3 sec to save the setting value and return to RUN mode after changing the setting value.

RUN mode							
MODE	₩ODE 2 sec	₩ MODE 4 sec					
Monitoring group	Parameter 1 group [PR I]	Parameter 2 group [ PR2]					

O Monitoring group						
Display	Measuring range	Description	Unit	Factory default		
l n	0 to 100	Displays the present control input as percentage.	%	_		
L-u *1	0 to rated voltage range	Displays the present load voltage.	V	_		
L-A *1	0 to rated current range	Displays the present load current.	Α	_		
[ - u ×1	0 to rated power range	Displays the present load power.	kW	_ [		
L-r *1	0 to 100	Displays the present resistance as percentage compared to the set resistance of full load auto recognition.	%	_		
ŁñP	0 to 100	Displays the present temperature of heatsink.	°C			
Fr9	50, 60	Displays the present frequency of power supply.	Hz	_ [		

# Load Output Formula

Туре	Input		Display		Formula
Auto	Current	urrent DC4-20mA		420	Load output [%]
control	Voltage	1-5VDC	Int	1-5	= Control input [%] × Output slope (5LP) [%]
(AUTO)	RS485 communication			[oñ	Load output [%] = RS485 [%]
Manual control (MAN)	Output limit	Inside adjuster		1_r	Load output [%] = Inside adjuster [%]
		Outside adjuster	ñBn	E_r	Load output [%] = Outside adjuster [%]
		Inside/outside adjuster		E_1	Load output [%] = Inside adjuster [%] × Outside adjuster [%]

# Comprehensive Device Management Program [DAQMaster]

DAQMaster is a comprehensive device management software for setting parameters and monitoring processes. DAQMaster can be downloaded from our website at www.autonics.com

Item	Minimum specifications
System	IBM PC compatible computer with Pentium III or above
Operations	Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS232C serial port (9-pin), USB port

#### User Manual for Communication

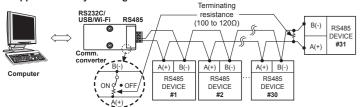
For the detail information and instructions, please refer to user manual for communication, and be sure to follow cautions written in the technical descriptions (catalog, homepage). Visit our homepage (www.autonics.com) to download manuals.

#### ■ RS485 Communication Output

Please refer to ' Ordering Information'

1. Communication Specifications								
Comm. protocol	Modbus RTU	Comm. speed	2400, 4800, 9600, 19200,					
Connection method	RS485	Comm. speed	38400 bps					
Application standard	Compliance with EIA RS485	Comm. response time	5 to 99ms (default: 20ms)					
Max. connections	31 units (address: 1 to 99)	Start bit	1-bit (fixed)					
Synchronization method	Asynchronous	Data bit	8-bit (fixed)					
Comm. method	Two-wire half duplex	Parity bit	None, Even, Odd					
Comm. distance	Max. 800m	Stop bit	1-bit, 2-bit					

#### 2. Application of system organization



communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately). Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48, SCM-US48I and SCM-38I.

#### ○ Parameter 1 group [PR I]

Display	Setting range	Description	Unit	Factory default
5-E	0 to 100	Set SOFT START time.	sec	3
U-E	0 to 100	Set SOFT UP time.	sec	3
d-E	0 to 100	Set SOFT DOWN time.	sec	3
L-L	0 ≤ L - L ≤ H - L ≤ 100	Set the output low-limit value.	%	0
H-L	021-124-12100	Set the output high-limit value.	%	100
5LP *2	0 to 100	In case of auto control (AUTO), set the output slop limit proportional to control input for limit load power.	%	100

#### ○ Parameter 2 group [PR2]

Display	Setting range		Description		Factory default
	420	DC4-20mA			
Ì	1-5	1-5VDC			
int **2	5 12	5-12VDC	Set the control input specification.	<b> </b> —	420
	anF ON/OFF contact				
	[oñ	RS485 comm.			
	PA	Phase control - Normal			
	⊔-F <sup>Ж1</sup>	Phase control - Constant voltage feedback			
[-ñ	[-F *1	Phase control - Constant current feedback	Set the control method.		PR
L-II	<u>u</u> -F <sup>*1</sup>	Phase control - Constant power feedback	Set the control method.		
	F - [	Cycle control - Fixed cycle			
	u-E	Cycle control - Variable cycle			
	onF	ON/OFF control			
	I _r Inside adjuste				
ñ8n <sup>₩2</sup>		Outside adjuster	In case of manual control (MAN), set the output limit		١.
nHn	E_1	Inside/Outside adjuster	method.	_	1-5
		adjuoto.	Set the compensated input value for the offset		
l∩b <sup>™2</sup>	ль <sup>ж2</sup> -99 to 99		between the actual input value and the measured input value.		0.0
5Pn *2	-99 to 99		Set the compensated input slope value between the actual input value 100% and the measured input value 100%.		0.0
	l n	Resistance and input			
di 5	L-u <sup>※1</sup>	Load voltage	Set the desired value to be displayed at the front display part.		l n
	L - A *1 Load current		uispiay part.		
ĺ	L - 및 **1 Load power				
o[∪ <sup>※1</sup>	0 10 120		Set the overcurrent alarm value.	%	150
o[t <sup>※1</sup>	0 to 100		Set the overcurrent alarm delay time.		5
0 U U **1	0 to 120		Set the overvoltage alarm value.	%	150
out <sup>※1</sup>			Set the overvoltage alarm delay time.		5
	off /on		It executes 100% control output for 3 sec and the load resistance value recognized automatically as the initial set when the function is ON.		oFF
НЬ∪ <sup>Ж1</sup>	<sup>×1</sup> <sub>o</sub> FF / 10 to 100		Set the heater break alarm value.	%	10
Adr *3	01 to 99		Assign the unique address when communicating.		0 1
ЬР5 <sup>Ж3</sup>	24, 48, 9	6, 192, 384	Set the speed of data transmission. Multiply by 100 to read the set value. (e.g.: 96=9600bps)		96
PrE *3	non / EuE / odd		A parity bit is a data communication method that adds an additional bit to each character in transmitted data as an indicator used to verify data loss and corruption.		non
5EP *3	1, 2		Set the number of bits to mark the end of a transmitted data string.		2
r Ľ.E *3	5 to 99		Set standby time to prevent communication errors when communicating with a slow master device (PC, PLC, etc.).		20
[āº *3	EnA	Enable	Enable or disable the setting of parameters stored in memory via communication from the master system	_	EnA
	d5.A Disable		(PC, PLC, etc.). Reading the set value in parameter is always possible.		
,	oFF	Unlock	The parameter group settings can not be changed		
LoC	LEI	PR I lock	when the function is ON.		oFF
	L[5	PR2 lock			
	1 no /4E2		If set the parameter to YES, reset all parameters to default.		

X1. Displayed only for receiption control infection.X2: Set the below parameters available depends on the control input.

Туре	Input	nput		у	Input correction [! nb]	Input slope correction [5 P n ]	Output slope [5 L P]	Monitoring value	
	Current	DC4-20mA		420	0	0	0		
Auto	Voltage	1-5VDC	2VDC   1 nE 5 12 ×	1-5	0	0	0	7	
control	pulse voltage	5-12VDC		×	×	0	The last		
(AUTO)	No-voltage	ON/OFF contact		onF	×	×	0	control	
	RS485 comm	nunication		[oñ	×	×	×	input	
		Inside adjuster		1				value 0 to 100%	
Manual control	Output limit	Outside adjuster	ñRn	E_r	×	×	×	0 10 1005	
(MAN)	Output IIIIII	Inside/outside adjuster		E_!					

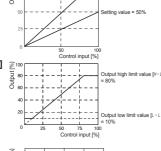
X3: Displayed only for models with RS485 comm, output

#### ■ Functions

#### Output limit (OUT ADJ)

This function will be [Control input (%) × OUT ADJ (%) = Output and it controls the power supplied into the load. Although control input is 100% (5V or 20mA), the output is the 50% which is proportioned with OUT ADJ. \*\*This function can not be used for ON/OFF control method.





hen output applied to I

RUN/STOP | 6 9

AUTO/MAN ON/OFF 9

RESET ON 9

# ○ SOFT START [5-b]

When the power is supplied, this function is able to protect the load when it controls load (molybdan, white gold, infrared lamp) with inrush current or the width of rising temperature in big (SV is big). SOFT START set time (T) is the required time that output reaches to 100%, and it is differentiated by OUT ADJ set value.

XThis function can not be used for ON/OFF control method

#### SOFT UP/DOWN [☐-E/d-E]

Unlike SOFT START which operates only once at supplying power, this function protects load from the inrush current in the RUN mode. When reached to the target output value, operation stops.

\*\*This function can not be used for ON/OFF control method.

### 

It compensates the offset between actual input value and measured input value.

E.g.) When input monitoring value is 5% at 4mA in DC4-20mA control input, setting I ab to -5 calibrates the input monitoring value to 0%.

#### ○ Input slope correction [5Pn]

It compensates the gain of the measured 100% input for actual 100% input value.

Calibrated monitoring value=Monitoring value+ Monitoring value ×5 Pn

E.g.) When the input monitoring value is 99% at 4mA in DC4-20mA control input, setting 5 Pn to 1 calibrates the input monitoring value to 100%.

# O RUN/STOP switching

RUN/STOP status of the power controller can be switched with the external

RUN/STOP contact.
In the RUN mode, the operation indicator on the front turns on.

#### O AUTO/MANUAL selection

Operation mode (auto control/manual control) of the power controller can be selected with the external AUTO/MAN contact.

In the manual control mode, the manual control indicator on the front turns on.

In the event of system anomalies and alarms, RESET input restarts the power controller.(Parameters are not initialized.) Or, hold the ⊌, keys for 2 sec, to operates RESET.

Time	Display		Operation		Clear alarm		
Туре	Error	Priority	Alarm	Output	Clear alarm		
SCR error alarm <sup>*1</sup>	5Er	1	• Error messege				
Overcurrent alarm*1	0-0	2			Re-supply the power		
Heatsink overheat		flashes.  • Alarm indicator	Output stops.    (SCR OFF)	RESET     Switch to STOP mod			
Overvoltage alarm <sup>*1</sup>	0-0	5	(ALM) flashes.  • Alarm output turns ON	, ,			
Fuse break alarm	FU5	3			Automatically cleare		
Heater break alarm <sup>*1</sup>	k alarm <sup>ж1</sup> H-ь 6			Continues operation	when returning with the setting range		

※1: This is only for feedback control models.

XWhen multiple alarms occur at the same time, the highest priority error message will be displayed based on priority.

# 1) SCR error alarm

Even though output is 0%, if the current of 10% or more of the rated load current flows for over 3 sec continuously, SCR error alarm occurs.

#### 2) Overcurrent alarm

This function protects the load from overcurrent.

If the current flows over the overcurrent alarm setting value  $[o \mathcal{L} u]$  and setting delay time  $[o \mathcal{L} L]$ , overcurrent alarm occurs.

## 3) Heatsink overheat alarm

When the temperature of a heatsink is over 85°C, heatsink overheat alarm occurs.

#### 4) Overvoltage alarm

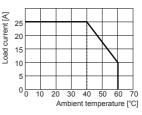
This function protects the load from overvoltage. If the current flows over the overvoltage alarm setting value [pub] and setting delay time [pub].

5) Heater break alarm

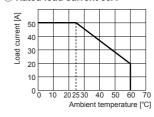
Comparing the full load resistance value and the current load resistance value, if the current load resistivity is maintained under the setting value [Hbu] for over 3 sec continuously, heater break alarm occurs. This alarm operates when control output is over 10% and load current is over 10% of the rated current. Output does not stop and operates normally.

## Derating Curve

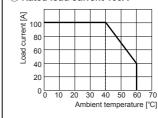
## Rated load current 25A



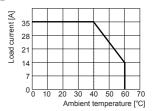
#### Rated load current 50A



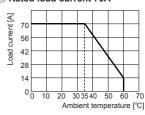
#### Rated load current 100A



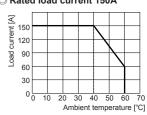
## Rated load current 35A



#### O Rated load current 70A



#### Rated load current 150A



# Cautions during Use

- 1. Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- 2. Use the product, after 3 sec of supplying power.

3. Before use, set the mode and function according to the specification, Especially, be cautious that the product does not operate when OUT ADJ. is set to 0%. Since changing the mode/parameter during operation may result in malfunction, set the mode and function after disconnecting load output.

- . Re-supply the power to the unit after the unit is discharged completely. Failure to follow this instruction may result in malfunction.
- 5. To ensure the reliability of the product, install the product on the panel or metal surface vertically to the around
- Install the unit in the well ventilated place.
- 7. While supplying power to the load or right after turning off the power of the load, do not touch the body and heat sink. Failure to follow this instruction may result in a burn due to the high temperature.
- 3. Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Do not wire to terminals which are not used.
- 10. Since inter element can be damaged when using with coil load, inductive load, etc., the inrush current must be under the rated load current.
- . Do not use near the equipment which generates strong magnetic force or high frequency noise. 12. This unit may be used in the following environmer
- ①Indoors (in the environment condition rated in 'Specifications')

■ Temperature/Humidity Transducers

■ Tachometer/Pulse (Rate) Meters

SSRs/Power Controllers

Timers

Panel Meters

②Altitude max. 2.000m

③Pollution degree 2

④Installation category III

# ■ Major Products



Fiber Optic Sensors ■ Door Sensors

Area Sensors

Proximity Sensors Pressure Sensors

Rotary Encoders

■ Display Units

■ Switching Mode Power Supplies ■ Control Switches/Lamps/Buzzers
■ I/O Terminal Blocks & Cables

Stepper Motors/Drivers/Motion Controllers Graphic/Logic Panels

Field Network Devices

■ Laser Marking System (Fiber, CO₂, Nd: YAG) ■ Laser Welding/Cutting Syste

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