YAMATAKE

Specification

DigitroniK
Digital Indicating Controller
SDC21

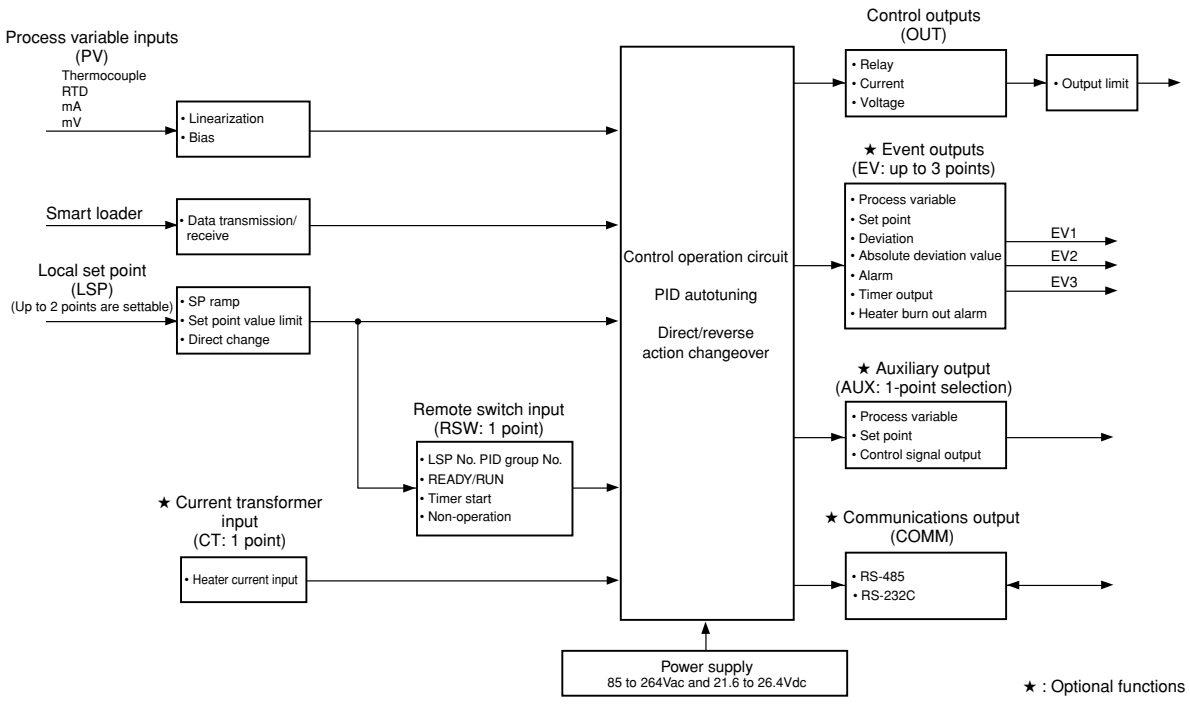
■ Features

The DigitroniK SDC21 is a compact digital indicating controller with multi-range and PID autotuning systems for various inputs, with time proportional (on/off) PID and continuous PID control action.
The SDC21 sends relay, voltage or current signals as control output signals.
The setup, control parameters and local set point data can be easily set using the smart loader package (order separately).

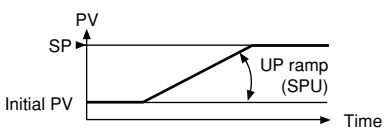
- Accuracy of ±0.3%FS
- Type of inputs and ranges can be selected by key operation.
- Two set points can be set, and each can be used by changeover.
- Auto tuning system with two groups of PID control constants.
- Normal and abnormal operations are indicated by an OK lamp for easy decision making.
- SP ramp setting function allows the ratio of each set points value to be changed.
- Four modes of action can be selected using a remote switch input.

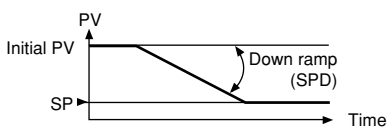
- Compact and lightweight
  (Dimensions; 96 x 96 x 115mm Weight; 500g)
- Optional functions ensure a wide range of applications:
  ★ Event outputs (up to 3 points)
  ★ Heater burnout alarm
  ★ Auxiliary outputs
  ★ RS-232C/485 Communications
- CE marking compliant
  Applicable standards: EN 61010-1, EN 50081-2, EN 50082-2

■ Basic Function Block Diagram



■ Specifications

<table>
<tr><td rowspan="13">PV input</td><td>Type of input</td><td colspan="3">Multi-ranges of thermocouple, resistance temperature detector, DC voltage, and DC current.</td></tr>
<tr><td>Sampling cycle</td><td colspan="3">0.5s</td></tr>
<tr><td>Input bias</td><td colspan="3">Variable within –100 to +100U. U: °C, kPa, %, and other industrial units including decimal point positioning.</td></tr>
<tr><td rowspan="3">Input bias current</td><td>Thermocouple input</td><td>: 0.13μA</td><td rowspan="12">Note 1:
When the resistor or A line is broken:
Upscale + Alarm indication
When B line is broken:
Down scale + Alarm indication
When C line is broken:
Undefined indication + Alarm indication
When A and B lines are broken:
Upscale + Alarm indication
When B and C lines are broken:
Upscale + Alarm indication
When A and C lines are broken:
Upscale + Alarm indication
When A, B, and C lines are broken:
Upscale + Alarm indication</td></tr>
<tr><td>RTD input</td><td>: 1mA</td></tr>
<tr><td>DC voltage input</td><td>: –0.3μA</td></tr>
<tr><td>Input impedance</td><td>Current input</td><td>: 100Ω max.</td></tr>
<tr><td rowspan="2">Allowable wiring resistance</td><td>Thermocouple input</td><td>: 0.13μV/Ω max.</td></tr>
<tr><td>RTD input</td><td>: ±0.01%FS/Ω max.
(each wire with 85Ω max.)</td></tr>
<tr><td rowspan="4">Burnout</td><td>Thermocouple input</td><td>: Upscale + Alarm indication</td></tr>
<tr><td>RTD input</td><td>: (see Note 1)</td></tr>
<tr><td>DC voltage input</td><td>: Downscale + Alarm indication</td></tr>
<tr><td>DC current input</td><td>: Downscale + Alarm indication</td></tr>
<tr><td rowspan="9">Indication and setting</td><td>Indication method</td><td colspan="3">4 digit, 7 segment indication</td></tr>
<tr><td>OK lamp</td><td colspan="3">The control deviation value status is indicated by the green belt.</td></tr>
<tr><td>Number of setting points</td><td colspan="3">1 to 2 points. Optional selection and changeover use are enabled.</td></tr>
<tr><td>Data storage</td><td colspan="3">Non-volatile memory</td></tr>
<tr><td rowspan="2">Range</td><td colspan="3">Thermocouple or RTD input (see Table 1)</td></tr>
<tr><td colspan="3">DC voltage or current (programmable range) input: –1999 to +9999, to 3 decimal places.</td></tr>
<tr><td>Accuracy</td><td colspan="3">±0.3%FS±1 digit for display except for thermocouple B ranged between 0 and 260°C.</td></tr>
<tr><td rowspan="2">Resolution</td><td colspan="3">Thermocouple or RTD input: 1, 0.1°C or 1, 0.1°F (depends upon input type).</td></tr>
<tr><td colspan="3">DC voltage or current (programmable range) input: 1, 0.1, 0.01, 0.001 (depends upon input type).</td></tr>
<tr><td>Setting system</td><td colspan="3">Local: Direct change is enabled. (see Note 2)
Note 2: LSP direct change:
This function can change the LSP (local set point) without defining operation by the ENT key.</td></tr>
<tr><td rowspan="16">Control output</td><td>Model number</td><td>C21 0D</td><td>C21 6D</td><td>C21 5G</td></tr>
<tr><td>Output type</td><td>Relay contact</td><td>Voltage</td><td>Current</td></tr>
<tr><td>Control action</td><td>Time proportional PID</td><td>Time proportional PID</td><td>Continuous PID</td></tr>
<tr><td>Number of PID sets</td><td>2 sets</td><td>2 sets</td><td>2 sets</td></tr>
<tr><td>PID autotuning</td><td colspan="3">Automatic setting of PID value by limit cycle method.</td></tr>
<tr><td>Output rating</td><td>Contact type: SPDT
Resistive load: 250Vac, 5A</td><td>Open voltage: 22.5Vdc±15%
Internal resistance: 1.1kΩ±10%</td><td>Output current: 4 to 20mAdc
Load resistance: 600Ω max.
Output accuracy:
0.2% on standard conditions
Output resolution: Within 0.01%
Output update cycle: 0.5s</td></tr>
<tr><td>Proportional band (P): %FS</td><td>0.0 to 999.9
(on/off operation at P=0.0)</td><td>0.0 to 999.9
(on/off operation at P=0.0)</td><td>0.1 to 999.9
(on/off operation disabled)</td></tr>
<tr><td>Cycle time: s</td><td>5 to 120</td><td>1 to 120</td><td>—</td></tr>
<tr><td>Integral time (I): s</td><td>0 to 3600 (PD action at I=0)</td><td>0 to 3600 (PD action at I=0)</td><td>0 to 3600 (PD action at I=0)</td></tr>
<tr><td>Derivative time (D): s</td><td>0 to 1200 (PI action at D=0)</td><td>0 to 1200 (PI action at D=0)</td><td>0 to 1200 (PI action at D=0)</td></tr>
<tr><td>Manual reset: %</td><td>0 to 100</td><td>0 to 100</td><td>0 to 100</td></tr>
<tr><td>Differential gap: U</td><td>0 to 100 (when on/off operation)</td><td>0 to 100 (when on/off operation)</td><td>—</td></tr>
<tr><td rowspan="2">Output limiter %</td><td>Low-limit value</td><td>0 to high limit</td><td>0 to high limit</td><td>–10 to high limit</td></tr>
<tr><td>High-limit value</td><td>low limit to 100</td><td>low limit to 100</td><td>low limit to 100</td></tr>
<tr><td>Output action changeover</td><td>Direct/reverse changeover is enabled.</td><td>Direct/reverse changeover is enabled.</td><td>Direct/reverse changeover is enabled.</td></tr>
<tr><td rowspan="3">SP ramp</td><td>Function</td><td colspan="2">Sets the change rate of set value</td></tr>
<tr><td>Setting range</td><td colspan="2">0 to 9999U/m</td></tr>
<tr><td>Setting</td><td colspan="2">Setting of the rising rate of initial PV with respect to SP.
Valid when SPU ≠ 0
(SPU: Set Point Up)
 

Setting of the falling rate of initial PV with respect to SP.
Valid when SPU ≠ 0
(SPD: Set Point Down)
 
</td></tr>
<tr><td>Remote switch input (RSW)</td><td>Number of input points</td><td colspan="3">1 point</td></tr>
<tr><td>Function</td><td colspan="3">Allocates an optional function selectively from:
LSP No.: PID group No. (interlock), READY/RUN changeover, timer start, and timer non-operation</td></tr>
<tr><td>Input rating</td><td colspan="3">Dry contact or open collector transistor, Off-terminal voltage: 5±1V, Turn-on current: 5±2mA</td></tr>
</table>

Optional functions	**Event (EV)**	**Number of output points**	1, 2, or 3 points selectable				
		Event type setting range	**Event type**	**Symbol**	**Setting range**	**Differential gap**	**Remarks**
			Process variable	PV	within PV rang	0 to 100U	—
			Set point	SP	within SP limit	0 to 100U	—
			Deviation	DEV	±PV range/2	0 to 100U	–1999U min.
			Absolute deviation	|DEV|	0 to PV span/2	0 to 100U	—
			Alarm	—	—	—	—
			Timer output	—	1 to 9999s	—	By remote switch input
			Heater burnout alarm	HB	0.0 to 50.0A	0 to 100U	By Optional function HB
		Output action	On/off				
		Output rating	SPDT relay contact, 240Vac, 5A, resistive load				
		Standby sequence	Presence or absence is selectable.				
	Heater burnout alarm (HB)	**Number of input points**	1 point				
		Maximum measurement heater current	Single-phase, 50Aac				
		Current indicating accuracy	±5%±1U				
		Detection setting range	0.1 to 49.9A				
		Output	Output relay can be selected from EV1, EV2 and EV3.				
	Auxiliary output (AUX)	**Number of output points**	1 point				
		Output type	One type is selectable from process variable (PV), set point (SP) and control output (OUT).				
		Output rating	4 to 20mAdc. Load resistance: 600Ω max.				
		Output accuracy	±0.2%FS (under standard conditions)				
		Output update cycle	0.5s				
	Communication	**Communication system**	Communication standard	**RS-485** Note 3		**RS-232C**	
			Network	1 to 16 units max. multi-dropped (slave mode only).		Peer-to-peer (slave mode only).	
			Mode	Half duplex		Half duplex	
			Synchronization	Start/stop		Start/stop	
		Interface system	Transmission	Balanced (differential)		Unbalanced	
			Type	Serial		Serial	
			Signal lines	5 transmit/receive lines		3 transmit/receive lines	
			Transmission speed	1200, 2400, 4800, or 9600bps selectable.		1200, 2400, 4800, or 9600bps selectable.	
			Communication distance	300m max.		15m max.	
			Other	Conforms to RS-485		Conforms to RS-232C	
		Message character	Character configuration	11 bits/character		11 bits/character	
			Format	1 start bit, even parity, and 1 stop bit (standard), or 1 start bit, no parity, 2 stop bits		1 start bit, even parity, and 1 stop bit (standard), or 1 start bit, no parity, 2 stop bits	
			Data length	8-bits		8-bits	
		Isolation	Input and output are completely isolated, except for the remote switch input.				
		Note 3: The RS-485 functions when connected with CMA50, MX100 or MA500 (DIM for DK link II).					
General specification	**Memory backup**	By non-volatile IC.					
	Rated power voltage	100 to 240Vac, 50 to 60Hz (AC model), or 24Vdc (DC model)					
	Operating power voltage	85 to 264Vac at 50Hz: 50±2Hz at 60Hz: 60±2Hz (AC model), 21.6 to 26.4V (DC model)					
	Inrush current	30A max. (AC model), or 20A max. (DC model)					
	Power consumption	18VA max. under operating conditions.					
	Insulation resistance	More than 50MΩ between the case or ground terminal and power terminal by 500Vdc megger.					
	Dielectric strength	1500Vac, for 1 min between the case or ground terminal and power terminal (AC model), or 500V 1 m (DC model)					
	Operating conditions	**Operating ambient temperature**	0 to 50°C				
		Operating ambient humidity	10 to 90%RH				
		Vibration resistance	2.0m/s² max.				
		Shock resistance	9.8m/s² max.				
	Transport/storage conditions	**Storage ambient temperature**	–20 to +70°C				
		Storage ambient humidity	10 to 95%RH				
		Vibration resistance	4.9m/s² max. 10 to 60Hz, for 2hr each in X, Y and Z directions.				
		Shock resistance	490m/s² max., 3 times vertically when packaged.				
		Package drop test	Drop height: 90cm (1 angle, 3 edges, and 6 planes, free fall)				
	Construction	Mask: Multilon Case: Polycarbonate					
	Colors	Mask: Dark gray Case: Light gray					
	Mounting	Panel flush mount					
	Installation	Vertical plane ±15°					
	Weight	Approx. 500g					

Attachments	Item	Model No.	Quantity	Options	Item	Part No.	Weight
	Unit indicating label	**N-3132**	1 sheet	(sold	Smart loader package	**SLP-C20J20**	—
	Mounting bracket	**81405411-001**	2 pcs	separately)	Hard dustproof cover	**81446083-001**	—
	Instruction manual	**No. CP-UM-1470E**	1 book		Soft dustproof cover	**81446087-001**	—
	—	—			Terminal cover	**81446084-001**	—
	—	—			Current transformer (5.8mm dia. hole)	**QN206A**	Approx. 12g
	—	—			Current transformer (12mm dia. hole)	**QN212A**	Approx. 50g

Table 1 Types of Inputs and Ranges (Selectable at setup)

Type of input	Symbol	°C range	°F range	Type of input	Symbol	°C range	°F range
Thermocouple	K	0 to 1200	0 to 2200	**Thermocouple**	Ni-Mo	0 to 1300	32 to 2327
		0.0 to 800.0	0 to 1400		DIN U	–199.9 to +400.0	–300 to +700
		–200.0 to +400.0	–300 to +700		DIN L	0.0 to 800.0	0 to 1400
	J	0 to 1200	0 to 2000	**RTD**	JIS Pt100	–199.9 to +500.0	–300 to +700
		0.0 to 800.0	0 to 1400			–100.0 to +200.0	–150.0 to +400.0
		–200.0 to +400.0	–300 to +700		JIS JPt100	–199.9 to +500.0	–300 to +700
	E	0.0 to 800.0	0 to 1400		(IEC)	–100.0 to +200.0	–150.0 to +400.0
	T	–200.0 to +400.0	–300 to +700	**DC current, voltage**	4 to 20mA	Scaling setting range	
	R	0 to 1600	0 to 3000		0 to 20mA	–1999 to +9999	
	S	0 to 1600	0 to 3000		1 to 5V	(Decimal point position is variable.)	
	B	0 to 1800	0 to 3200		0 to 5V		
	N	0 to 1300	32 to 2372		0 to 10mV		
	PL II	0 to 1300	32 to 2372		0 to 100mV		
	WRe5-26	0 to 2300	0 to 4000		–10 to +10mV		

■ Model Selection Guide

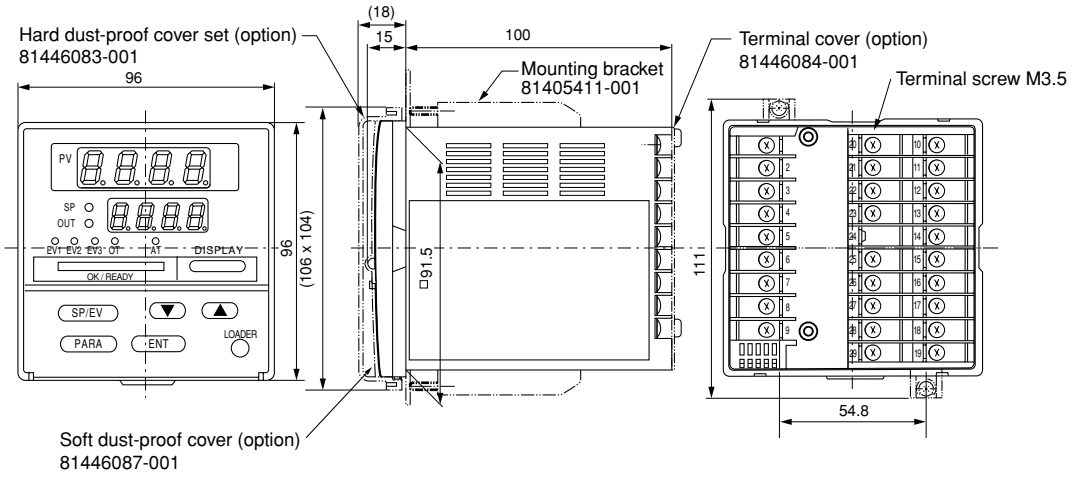
I | II | III | IV | V Example: C210DA00001

I	II	III	IV	V	Specifications (○: Included —: Not included)							
Basic model number	**Control action**	**Power supply**	**Optional function**	**Option**								
C21					Digital controller							
	0D				Time proportional PID: Relay contact 250Vac, 5A resistive load							
	6D				Time proportional PID: Voltage 22.5Vdc±10%							
	5G				Continuous PID: Current 4 to 20mAdc Resistive load: Lower than 600Ω							
		A0			85 to 264Vac, 50/60Hz							
		D0			21.6 to 26.4Vdc							
					Event			**Current transformer input**	**Auxiliary output**	**Communications**		**Remarks**
					EV1	**EV2**	**EV3**	**HB**	**AUX**	**RS-485**	**RS-232C**	
			00		—	—	—	—	—	—	—	
			01		○	○	—	—	—	—	—	
			02		○	○	—	—	○	—	—	
			03		○	○	—	—	○	○	—	
			04		○	○	—	—	○	—	○	
			05		○	○	○	○	○	—	—	No HB is provided with 5G type.
			06		○	○	○	○	—	○	—	No HB is provided with 5G type.
			07		○	○	○	○	—	—	○	No HB is provided with 5G type.
			08		○	○	—	○	○	○	—	Not applicable to 5G type.
			09		○	○	—	○	○	—	○	Not applicable to 5G type.
				01	Not available.							

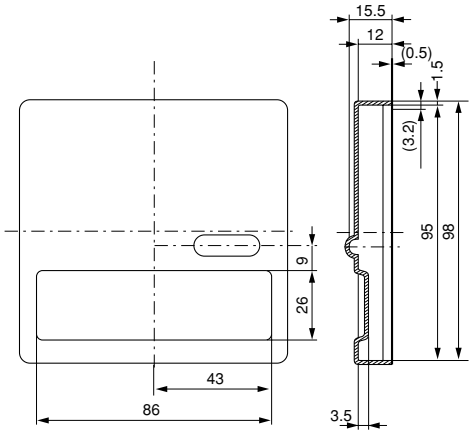
■ Dimensions

C21 instrument

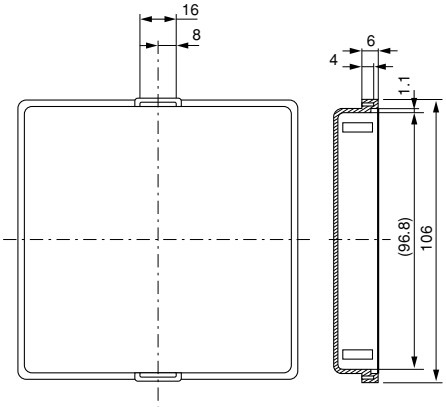
(Unit: mm)



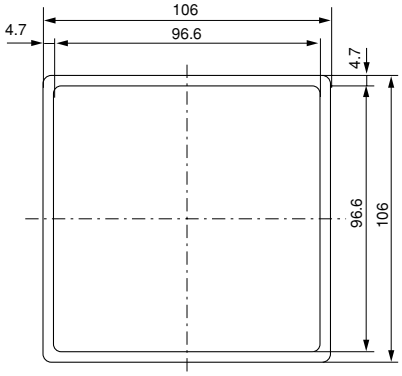
Soft dust-proof cover
Part No. 81446087-001



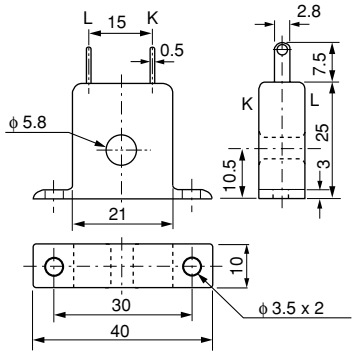
Hard dust-proof cover set
Part No. 81446083-001



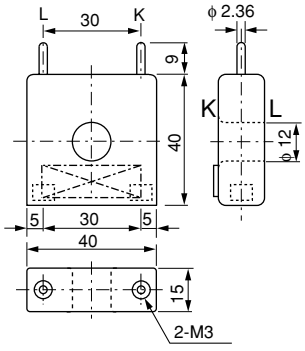
Packing



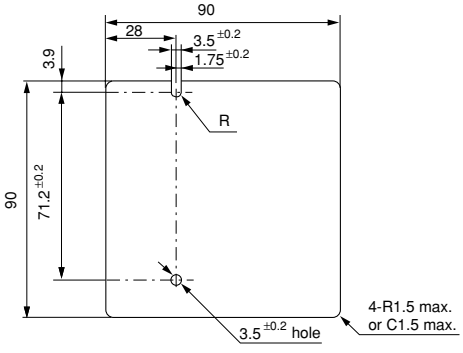
Current transformer
Model QN206A



Current transformer
Model QN212A

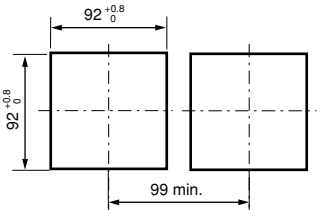


Terminal cover set
Part No. 81446084-001

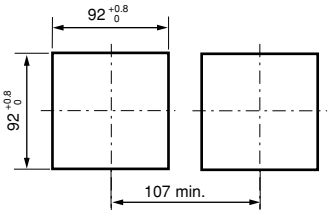


Panel cutout

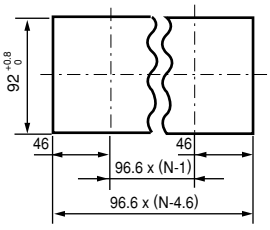
For standard application or with soft dust-proof cover



When the hard dust-proof cover is used



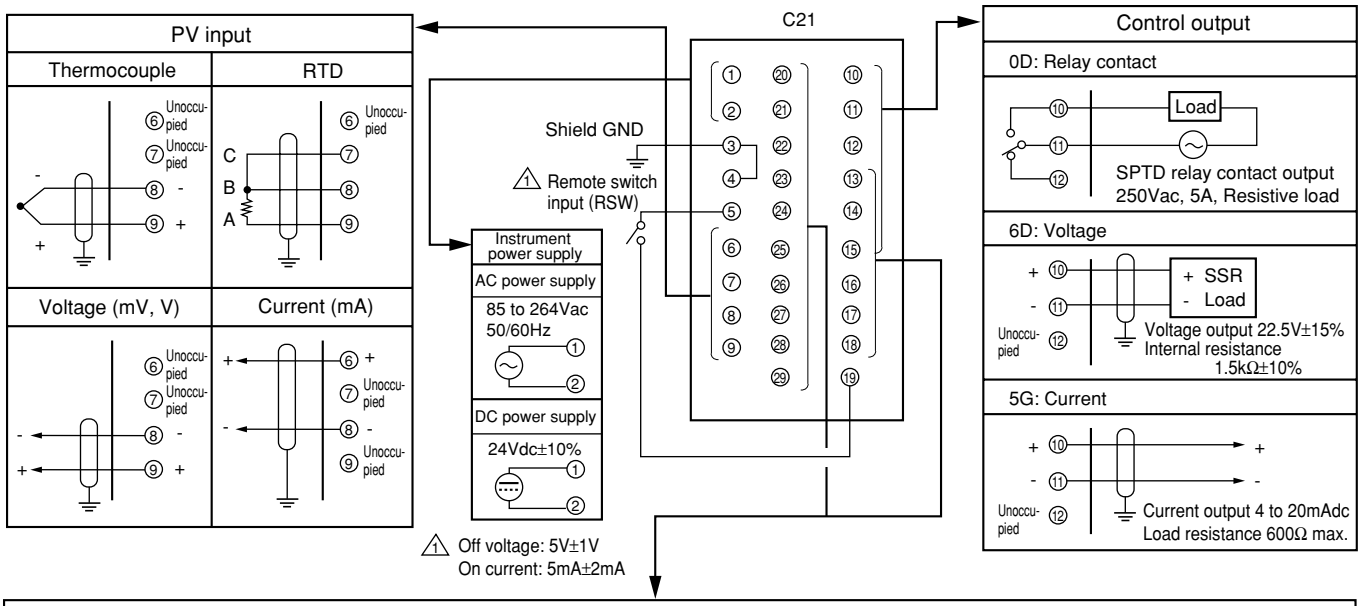
Lateral serial mounting



(N: No. of mouting units)

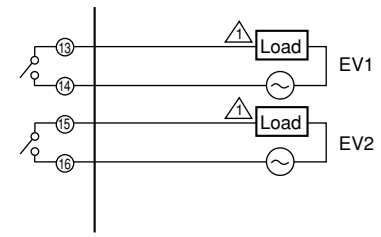
Note: Ambient temperature must be 40°C max. even for side-by-side mounting.

■ Wiring



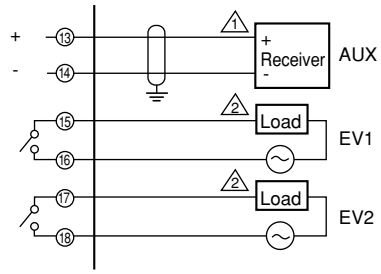
Optional functions

001: EV1, EV2



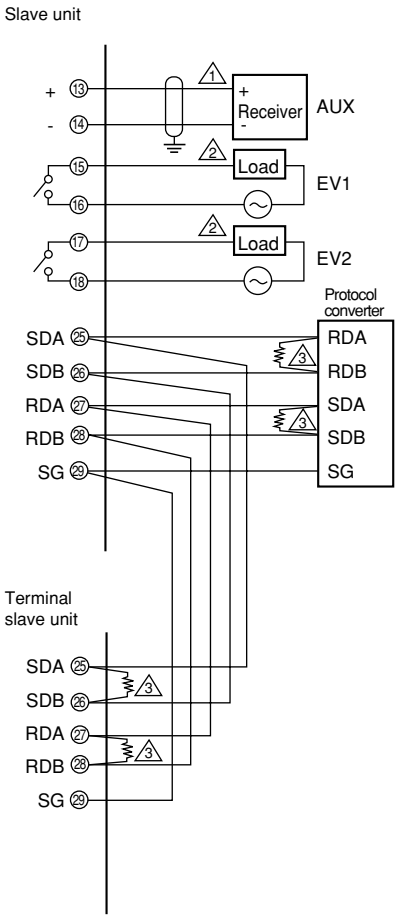
1 SPST relay contact 250Vac 5A
Resistive load

002: EV1, EV2, AUX



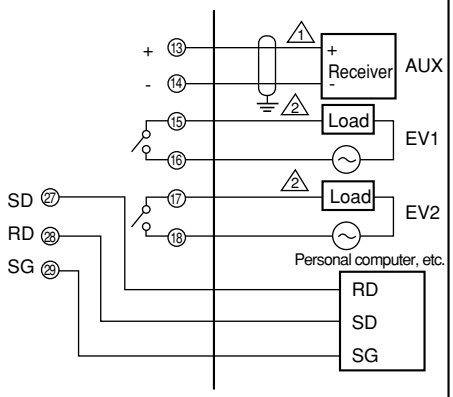
1 4 to 20mAdc
Load resistance: 600Ω max.
2 SPST relay contact 250Vac 5A
Resistive load

003: EV1, EV2, AUX, RS-485



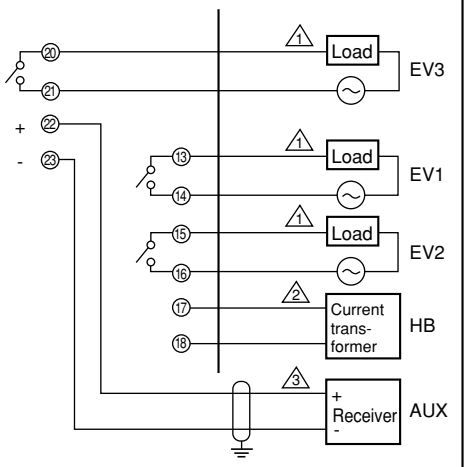
1 4 to 20mAdc
Load resistance: 600Ω max.
2 SPST relay contact 250Vac, resistive load
3 Terminating resistance: 150Ω, 1/2W min.

004: EV1, EV2, AUX, RS-232C



1 4 to 20mAdc Load resistive: 600Ω max.
2 SPST relay contact 250Vac, resistive load

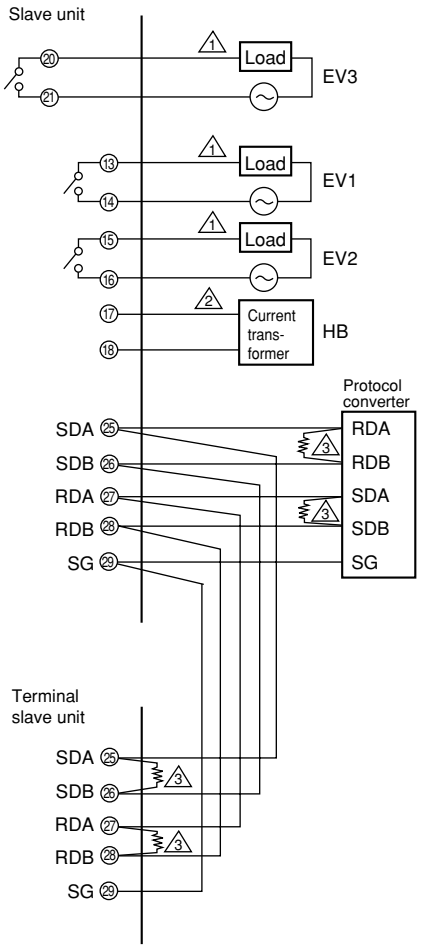
005: EV1, EV2, EV3, HB, AUX



1 SPST relay contact 250Vac 5A, resistive load
2 Unpolarized
3 4 to 20mAdc
Load resistance: 600Ω max.

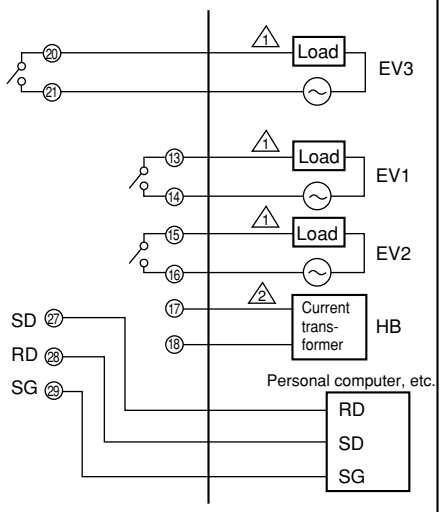
Optional functions

006: EV1, EV2, EV3, HB, RS-485



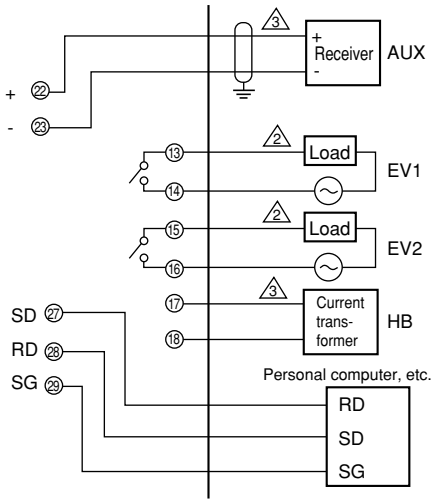
1 SPST relay contact 250Vac 5A, resistive load
2 Unpolarized
3 Terminating resistance 150Ω, 1/2W min.

007: EV1, EV2, EV3, HB, RS-232C



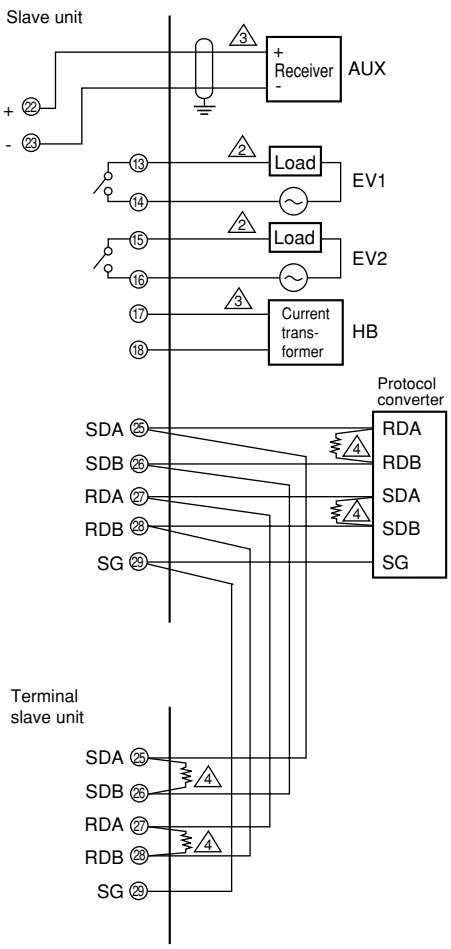
1 SPST relay contact 250Vac 5A, resistive load
2 Unpolarized

009: EV1, EV2, HB, AUX, RS-232C



1 4 to 20mAdc Load resistance: 600Ω min.
2 SPST relay contact 250Vac 5A, resistive load
3 Unpolarized

008: EV1, EV2, HB, AUX, RS-485



1 4 to 20mAdc Load resistance: 600Ω min.
2 SPST relay contact 250Vac 5A, resistive load
3 Unpolarized
4 Terminatng resistance 150Ω 1/2W min.

■ Cautions for wiring

1. Isolation

The section bounded by a solid line (——) is isolated from the rest of the circuit.

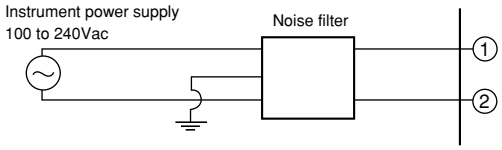
The section bounded by a dotted line (- - - -) is not isolated from the rest of the circuit.

CT input	Digital circuit	Current output (Control output)
		Current output (Auxiliary output)
PV input		Voltage output (Control output)
		Relay output (Control output)
		Event output 1
		Event output 2
		Event output 3
Remote switch input		Communication I/O

2. Power supply noise

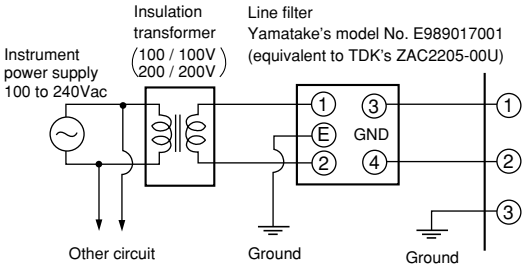
(1) Noise reduction techniques

Always use a noise filter to suppress the influence of noise as much as possible, even if noise is unnoticeable.



(2) When noise is evident

If noise is observable, suppress it by using an insulation transformer and line filter.



3. Noise

Possible noise sources in the installation environment are:

Relays and contacts, electromagnetic coils, solenoid valves, power lines (specifically, those higher than 100Vac), motor commutators, phase angle control SCRs, radio equipment, welding machines, high-voltage ignition devices, etc.

(1) Suppression techniques for quick rising noise

A CR filter is effective for quick rising noise.

Recommended filter: Yamatake's model No. **81446365-001**
(equivalent to Matsuo Electric **953M500333311**)

(2) Suppression technique, for noise with large peaks:

A varistor is effective for reducing noise with large peaks. However, care should be taken to avoid shorting if varistor is faulty.

Recommended varistor:

Yamatake's model No. **81446366-001** (for 100Vac)
No. **81446367-001** (for 200Vac)

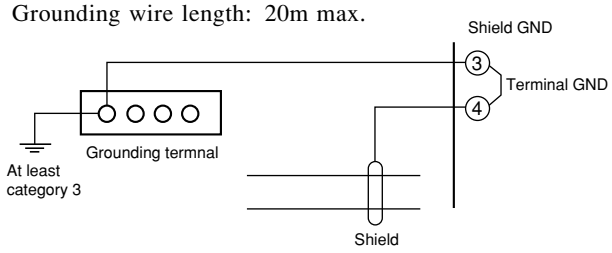
4. Grounding

Ground this controller at a single point to GND terminal ③ to ④. Don't connect any jumper wiring. Prepare a grounding terminal board separately if grounding of a shield wire is difficult.

Grounding type: At least category 3 (100Ω max.)

Grounding wire: Soft copper wire (AWG14) of more than 2mm^2.

Grounding wire length: 20m max.



5. Wiring operations

(1) Don't bundle the primary and secondary power lines together, and don't run them in the same wiring conduit or duct after carrying out noise countermeasures.

(2) Run the input/output and communication lines more than 50cm from drive power or power lines of higher than 100Vac. Don't run these wires in the same wiring conduit or duct.

6. Check after wiring

After wiring, be sure to check the connecting line conditions. Be careful: incorrect wiring will cause the instrument to fail.

⚠ RESTRICTIONS ON USE

This product has been designed, developed and manufactured for general-purpose application in machinery and equipment. Accordingly, when used in the applications outlined below, special care should be taken to implement a fail-safe and/or redundant design concept as well as a periodic maintenance program.

- **Safety devices for plant worker protection**
- **Start/stop control devices for transportation and material handling machines**
- **Aeronautical/aerospace machines**
- **Control devices for nuclear reactors**

Never use this product in applications where human safety may be put at risk.

Specifications are subject to change without notice.

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