

## 2.8 Temperature/resistance input module



Since heat generated near the thermocouple module (AAIS01) will affect the accuracy, the number of modules arranged side by side is limited. For details, see 5. Module mounting limitations given in Chapter 4.

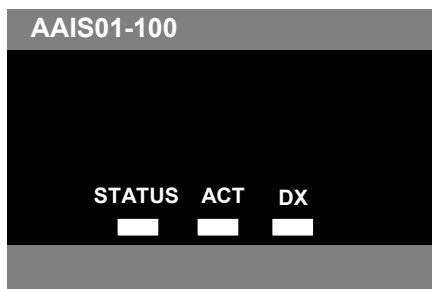
### • Outline

- Input signal of AAIS01 is JIS-J, -K, -E, -B, -R, -S, -T and -N (thermocouple)/mv (-100 to 150, -20 to 80mV). Input signal of AAIS02 is RTD: JIS Pt100, JPT100 (3-wire system), Sliding: 0 to 3000 $\Omega$  in all resistance.
- The number of outputs of AAIS01 is 16 points per module, and that of AAIS02 is 12 points per module.
- The module is capable of duplex.
- The MIL connector (40 pins) is used for external connection.

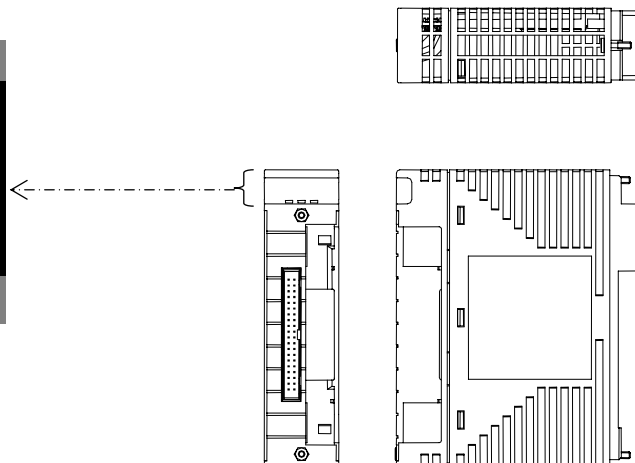
### • Appearance

Appearance of the temperature/resistance input module is shown below.

For external dimensions, see Chapter 8.



**Fig. 2.8.1 LED display**



**Fig. 2.8.2 Appearance of AAIS01 and AAIS02**

- Type name

**Table 2.8.1 Temperature/resistance input module**

Type name		Description
Type	AAIS01	Thermocouple/mV input module Thermocouple (JIS-R, -J, -K,-E,-T, -B, -S and N)/mV (-100 to 150 mV, -20 to 80mV), 16 points, common isolation
	AAIS02	Resistance bulb/sliding resistance input module Resistance bulb (JIS Pt 100Ω)/sliding resistance (0 to 3kΩ), 12 points, common isolation
Basic specification code	-1□□	Basic type
	-□0□	Basic specifications
	-□1□	G3 conformable: corrosion resistance gas, Class G3 (ISA S71.04) Note 1)
	-□□X	X is always set to 2.

Note 1) Basic specification is Class G2 (ISA S71.04).

- Specifications

**Table 2.8.2 Specifications for temperature/resistance input module**

Item	Name of module	Thermocouple/mV input module	Resistance bulb /sliding resistor input module
Type		AAIS01	AAIS02
Operating ambient temperature		-20°C to +70°C (Note 1)	-20°C to +70°C (Note 1)
Rated input/output signal range (accuracy assurance)		Tc: JIS C1602 – 1995 J, K, E, B, R, S, T, N (thermocouple) JIS C1602 – 1981 J, K, E, B, R, S, T (thermocouple) IEC 584-1 (1989) N (thermocouple) Type B is excluded from cold junction compensation. mV: -100 to 150 mV, -20 to 80mV	RTD: JIS C1604-1997 Pt100, (3-wire system) JIS C1604-1989 Pt100, JPT100 (3-wire system) POT: All resistance 0 to 3000Ω Span resistance: 50% or more of all resistance
Allowable over-range (Possible range of conversion)		Rating ±10%	Rating ±10%
Absolute maximum input		±5V	±5V
Allowable signal source resistance		1000Ω or less (300Ω or less with duplex) Provisions for Zener barrier connection is included.	40Ω or less (line resistance per line) Provisions for Zener barrier connection is included.
Influence by allowable signal source resistance (1000Ω)		±3μV/10Ω	36mΩ/40Ω
Number of inputs/outputs		16 points (common isolation)	12 points (common isolation)
Conversion accuracy (accuracy rating) (note 2)		Tc: ±30μV as converted into thermal EMF mV: ±80μV at -100 to 150mV ±30μV at -20 to 80mV)	RTD: ±120mΩ Sliding resistance: 1.5Ω
Switching of rated input		ch1-ch16 per unit selection of Tc/mV	ch1-ch8 are dedicated to RTD input. ch9-ch12 per unit common selection of RTD/sliding resistor.
Temperature drift		Tc: ±30μV/10°C mV: ±80μV/10°C	RTD: ±120mΩ/10°C POT: ±1.5Ω/10°C
Input impedance	Power ON	2MΩ or more (1MΩ with duplex)	2MΩ or more (1MΩ with duplex)
	Power OFF	2MΩ or more	2MΩ or more
	Duplex standby	1MΩ or more	1MΩ or more
Burnout		Settable commonly in all points Setting: (Up/Down) Detection current: about 0.3μA Detection time: 60 sec.	Same as left
Reference junction compensation accuracy (Note 3)		Within ±1°C at ranges of 15°C to 45°C Within ±1.5°C at ranges of 0°C to 15°C and 45°C to 60°C Within ±2°C at ranges of -20°C to 0°C and 60°C to 70°C	-
Data update cycle		700 mS	
Resolution (AD)		TC: 15bit at (-20 to 80mV) mV: 15bit at (-100 to 150mV)	RTD: 15bit at (0 to 400Ω) POT: 14bit at (0 to 3000Ω)
Current consumption		5V DC: 450mA, max.	5V DC: 450mA, max.
		24V DC: Not used	24V DC: Not used
Withstand voltage		1500V AC	
Mass		0.3 kg, max.	
Duplex		Standard hardware conformable	

Note 1) When using beyond the range of 0 to 60°C, see Item 4.5 Mounting limitations given in Chapter 4.

Note 2) It is set at a temperature of about 25°C when adjustment is made.

Note 3) Reference junction compensation accuracy must meet the following conditions.

- Terminal connections are in temperature equilibrium.
- The same type as 1.25 sq or less thermocouple should be used.
- Thermocouple should be connected to the terminal block in order, starting from CH1.
- A module (including BIM) with heating values of 3W or more should not be mounted into a slot that is adjacent to the thermocouple module.
- Thermocouple module should not be mounted at an area which air flow generated by a ventilation fan flows.
- A heat generator unit should not be mounted under the thermocouple module nodes, or the module will be affected by the heat.

- **LED display**

The meaning of LED to be displayed is shown below.

**Table 2.8.3 Analog input module LED display**

Display LED	Color of display	Meaning
STATUS	Green	ON: Normal or minor fault OFF: Major fault (For the cause, see Item 4 in Chapter 4)
ACT	Green	ON: Input/Output activating OFF: Input/Output stop status
DX	Green	ON: Set as duplex module OFF: Set as a single module

- External cable connection terminal and terminal array of EUR terminal block
- ◆ External cable connection to and terminal assignment for thermocouple/mV (AAIS01)

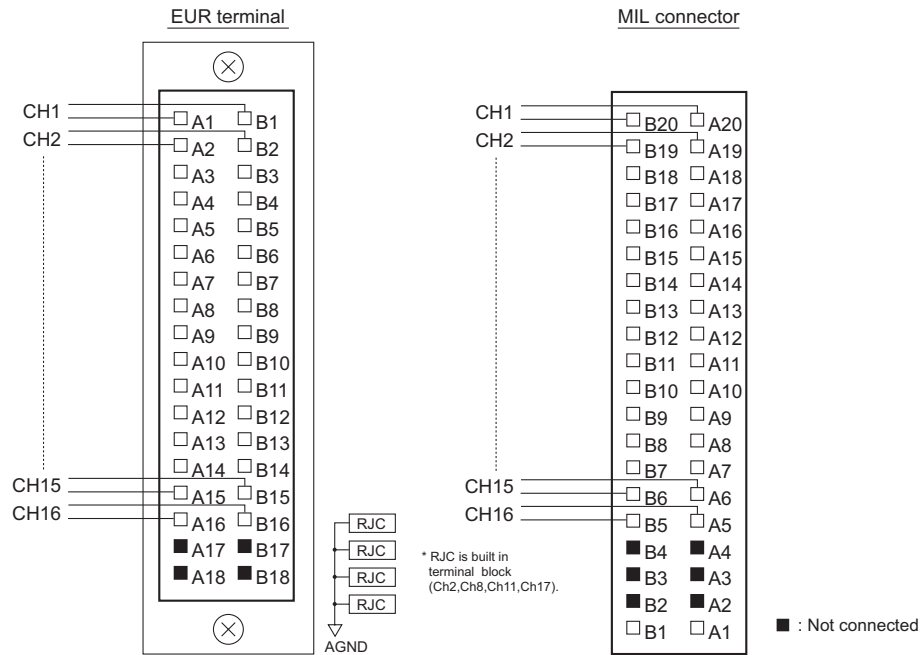


Fig. 2.8.3 External cable connections to thermocouple/mV (AAIS01)

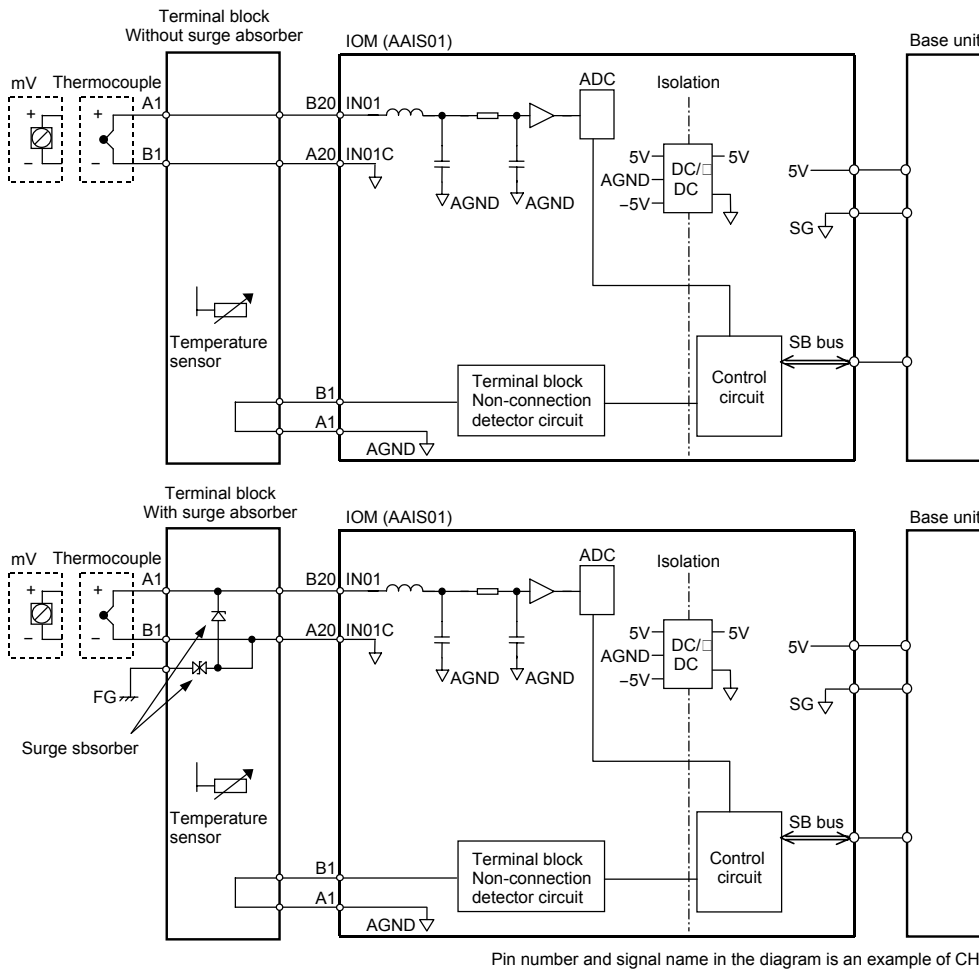


Fig. 2.8.4 External cable connection circuit for thermocouple/mV (AAIS01)

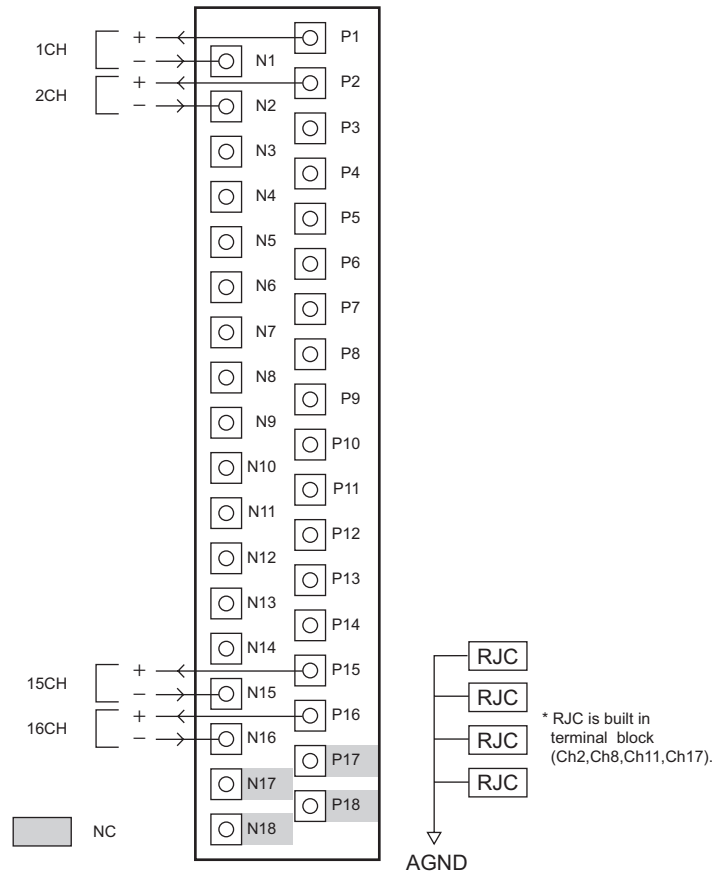
**Table 2.8.4 Terminal assignment of thermocouple/mV (AAIS01)**

Terminal block				AAIS01 connector			
EUR terminal				MIL connector (Note 1)			
Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal
A1	IN01	B1	IN01C	B20	IN01	A20	IN01C
A2	IN02	B2	IN02C	B19	IN02	A19	IN02C
A3	IN03	B3	IN03C	B18	IN03	A18	IN03C
A4	IN04	B4	IN04C	B17	IN04	A17	IN04C
A5	IN05	B5	IN05C	B16	IN05	A16	IN05C
A6	IN06	B6	IN06C	B15	IN06	A15	IN06C
A7	IN07	B7	IN07C	B14	IN07	A14	IN07C
A8	IN08	B8	IN08C	B13	IN08	A13	IN08C
A9	IN09	B9	IN09C	B12	IN09	A12	IN09C
A10	IN10	B10	IN10C	B11	IN10	A11	IN10C
A11	IN11	B11	IN11C	B10	IN11	A10	IN11C
A12	IN12	B12	IN12C	B9	IN12	A9	IN12C
A13	IN13	B13	IN13C	B8	IN13	A8	IN13C
A14	IN14	B14	IN14C	B7	IN14	A7	IN14C
A15	IN15	B15	IN15C	B6	IN15	A6	IN15C
A16	IN16	B16	IN16C	B5	IN16	A5	IN16C
A17	NC	B17	NC	B4	RJC2	A4	RJC1
A18	NC	B18	NC	B3	RJC3	A3	RJCCOM(G
				B2	RJC4	A2	CNTTYP
				B1	CBSE(Note2)	A1	GND

NC: Not connected

- Note 1) To detect that external cable is not connected to the MIL connector, short-circuit between A1 and B1 at the external cable. When using EUR terminal block, it is shorted in the EUR terminal block.
- Note 2) CBSE: Detection circuit signal that is not connected to terminal block.

- External cable connection terminal and terminal array of screw terminal block



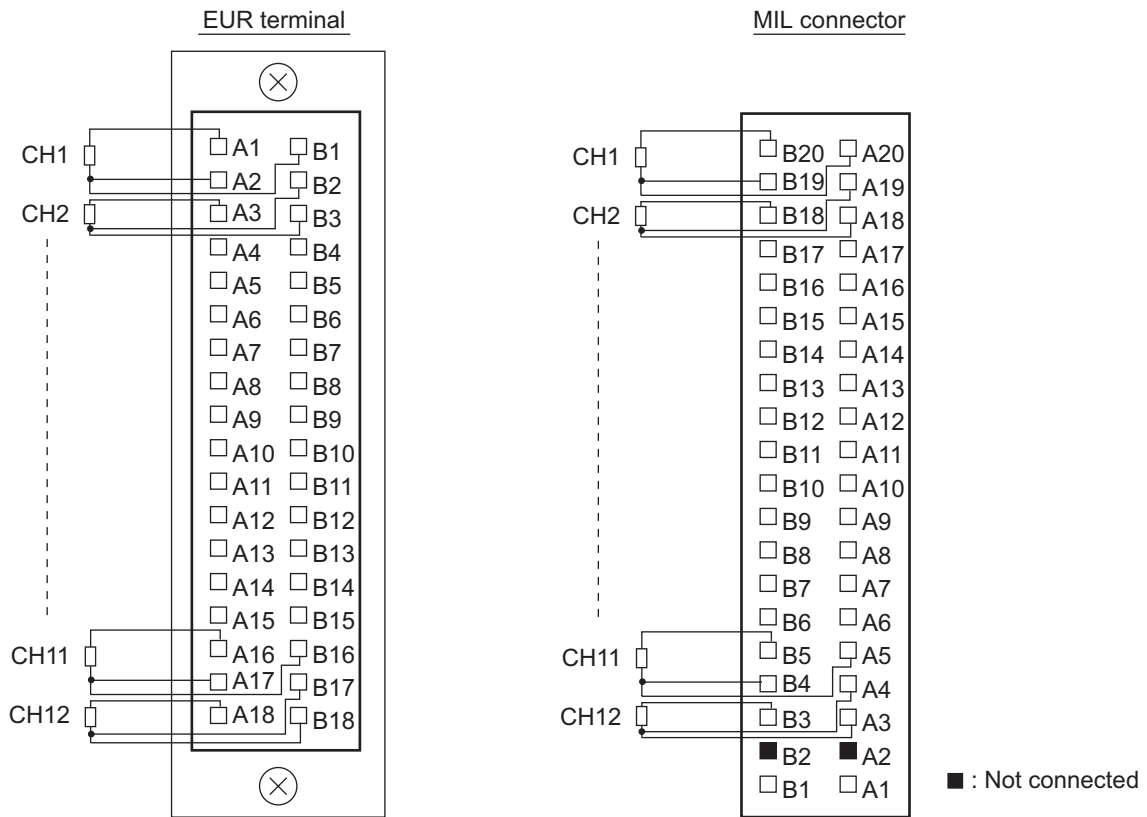
**Fig. 2.8.5 External cable connection of AAIS01**

**Table 2.8.5 Terminal assignment of thermocouple/mV (AAIS01)**

Pin No	Name of signal	Pin No	Name of signal
N1	IN01C	P1	IN01
N2	IN02C	P2	IN02
N3	IN03C	P3	IN03
N4	IN04C	P4	IN04
N5	IN05C	P5	IN05
N6	IN06C	P6	IN06
N7	IN07C	P7	IN07
N8	IN08C	P8	IN08
N9	IN09C	P9	IN09
N10	IN10C	P10	IN10
N11	IN11C	P11	IN11
N12	IN12C	P12	IN12
N13	IN13C	P13	IN13
N14	IN14C	P14	IN14
N15	IN15C	P15	IN15
N16	IN16C	P16	IN16
N17	NC	P17	NC
N18	NC	P18	NC

- **External cable connection to and terminal assignment for EUR terminal block**
  - ◆ External cable connection to and terminal assignment for resistance bulb/sliding resistor (AAIS02)

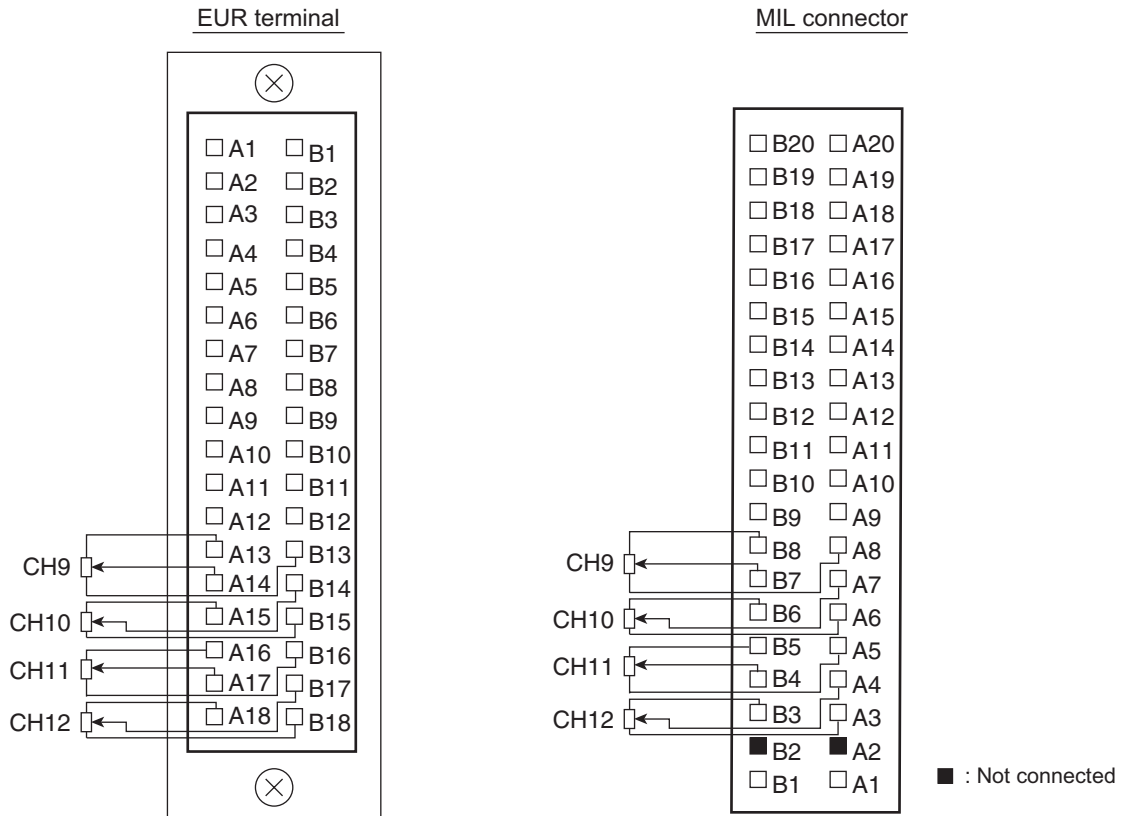
(1) AAIS02 (resistance bulb)



**Fig. 2.8.6 External cable connection of resistance bulb/sliding resistor (AAIS02) (resistance bulb)**

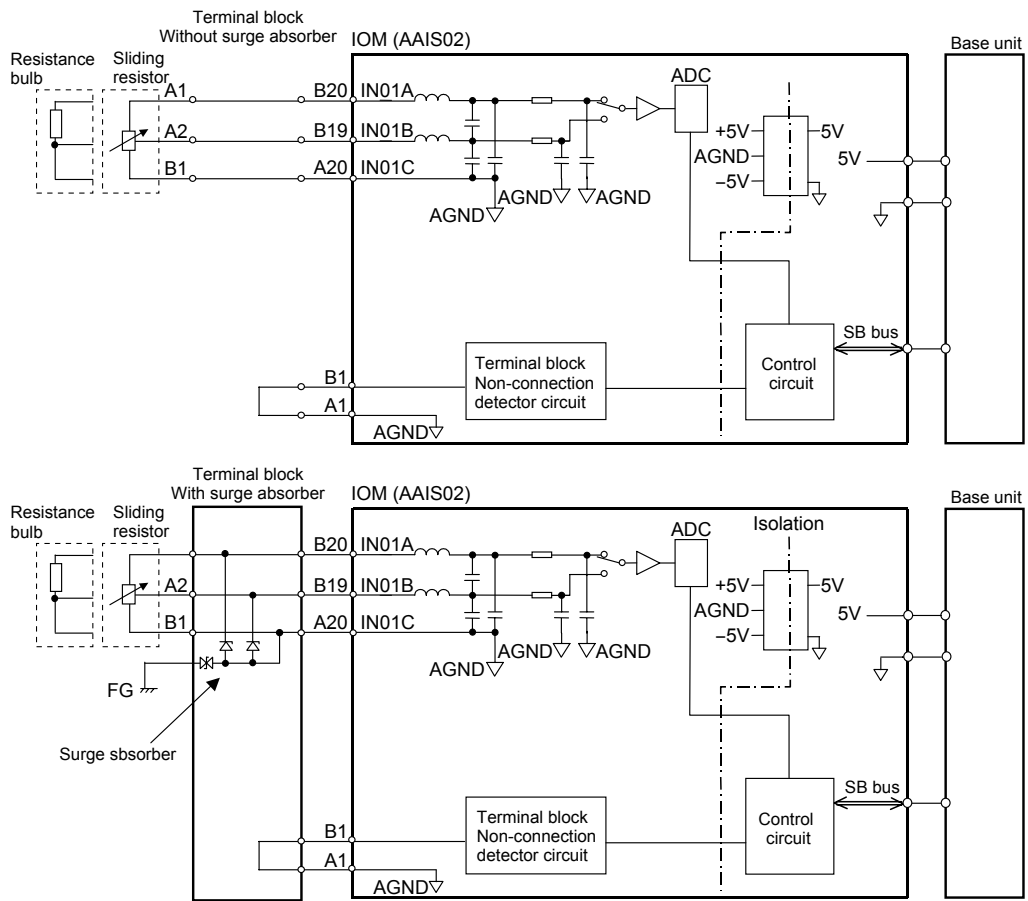


(2) AAIS02 (sliding resistor) – Note 1



Note 1) The sliding resistor has only a function of 4 channels consisting of ch 9 to ch12.

**Fig. 2.8.7 External cable connection of resistance bulb/sliding resistor (AAIS02) – sliding resistor**



Pin number and signal name in the diagram is an example of CH1

**Fig. 2.8.8 External cable circuit for resistance bulb/sliding resistor (AAIS02)**

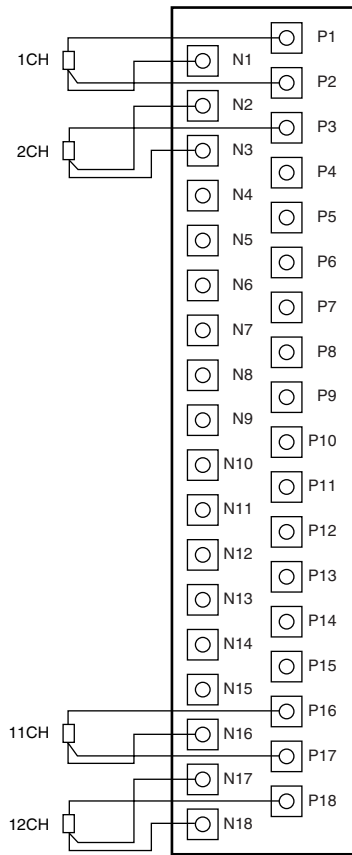
**Table 2.8.6 Terminal assignment of resistance bulb/sliding resistor (AAIS02)**

Terminal block				AAIS02 connector			
EUR terminal				MIL connector (Note 1)			
Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal	Pin No.	Name of signal
A1	IN01A	B1	IN01C	B20	IN01A	A20	IN01C
A2	IN01B	B2	IN02B	B19	IN01B	A19	IN02B
A3	IN02A	B3	IN02C	B18	IN02A	A18	IN02C
A4	IN03A	B4	IN03C	B17	IN03A	A17	IN03C
A5	IN03B	B5	IN04B	B16	IN03B	A16	IN04B
A6	IN04A	B6	IN04C	B15	IN04A	A15	IN04C
A7	IN05A	B7	IN05C	B14	IN05A	A14	IN05C
A8	IN05B	B8	IN06B	B13	IN05B	A13	IN06B
A9	IN06A	B9	IN06C	B12	IN06A	A12	IN06C
A10	IN07A	B10	IN07C	B11	IN07A	A11	IN07C
A11	IN07B	B11	IN08B	B10	IN07B	A10	IN08B
A12	IN08A	B12	IN08C	B9	IN08A	A9	IN08C
A13	IN09A	B13	IN09C	B8	IN09A	A8	IN09C
A14	IN09B	B14	IN10B	B7	IN09B	A7	IN10B
A15	IN10A	B15	IN10C	B6	IN10A	A6	IN10C
A16	IN11A	B16	IN11C	B5	IN11A	A5	IN11C
A17	IN11B	B17	IN12B	B4	IN11B	A4	IN12B
A18	IN12A	B18	IN12C	B3	IN12A	A3	IN12C
				B2	NC	A2	NC
				B1	CBSE	A1	GND

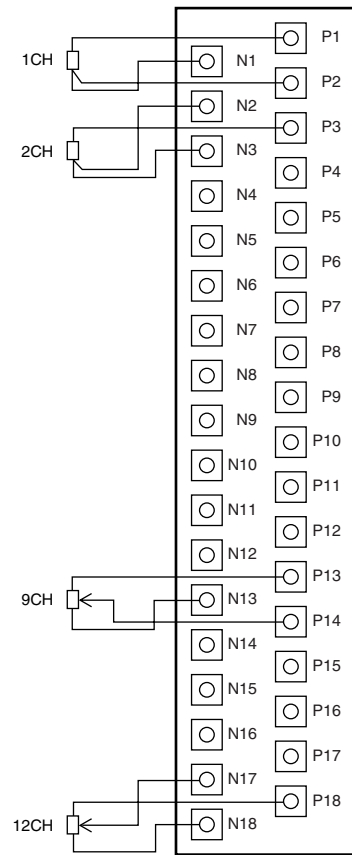
NC: Not connected

- Note 1) To detect that external cable is not connected to the MIL connector, short-circuit between A1 and B1 at the external cable. When using EUR terminal block, it is shorted in the EUR terminal block.
- Note 2) CBSE: Detection circuit signal that is not connected to terminal block.

- External cable connection terminal and terminal array of screw terminal block



**Fig. 2.8.9 External cable connection of resistance bulb**

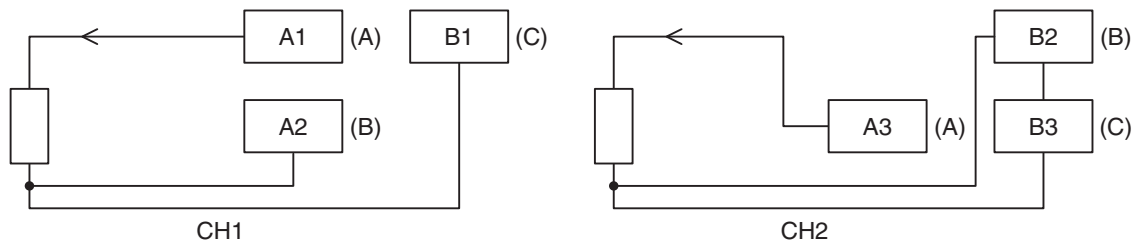


**Fig. 2.8.10 External cable connection of sliding resistor**

**Table 2.8.7 Terminal assignment of analog input module (AAI01, AAI01)**

Pin No	Name of signal	Pin No	Name of signal
N1	IN01C	P1	IN01A
N2	IN02B	P2	IN01B
N3	IN02C	P3	IN02A
N4	IN03C	P4	IN03A
N5	IN04B	P5	IN03B
N6	IN04C	P6	IN04A
N7	IN05C	P7	IN05A
N8	IN06B	P8	IN05B
N9	IN06C	P9	IN06A
N10	IN07C	P10	IN07A
N11	IN08B	P11	IN07B
N12	IN08C	P12	IN08A
N13	IN09C	P13	IN09A
N14	IN10B	P14	IN09B
N15	IN10C	P15	IN10A
N16	IN11C	P16	IN11A
N17	IN12B	P17	IN11B
N18	IN12C	P18	IN12A

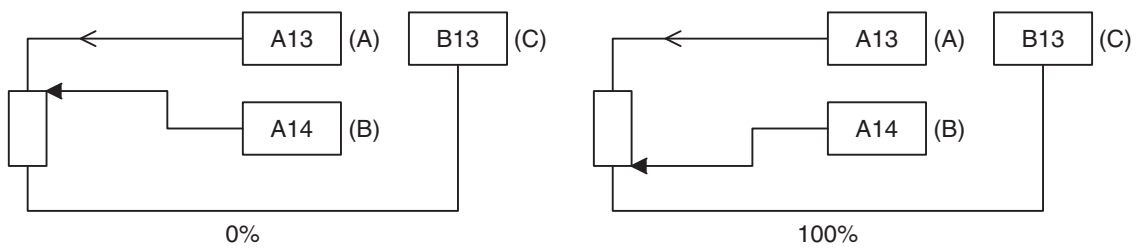
◆ An example of thermocouple connections to EUR terminal is shown below.



→ Shows the direction of measured current

**Fig. 2.8.11 Definition of external cable connections of sliding resistor (AAIS02)**

◆ The definition of 0% and 100% sliding resistance is shown below (with EUR terminal CH9).



→ Shows the direction of measured current

**Fig. 2.8.12 Definition of external cable connection of sliding resistor (AAIS02)**