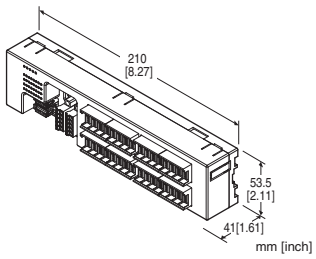
Remote I/O R7K4D Series

MECHATROLINK I/O MODULE

(NPN discrete input, PNP transistor output, 16 points each, e-CON connector, MECHATROLINK-I / -II use)

Functions & Features

• 16 points NPN discrete input & 16 points PNP transistor output module for MECHATROLINK-I / -II



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MECHATROLINK

MODEL: R7K4DML-B-DAC32B-R[1]

ORDERING INFORMATION

• Code number: R7K4DML-B-DAC32B-R[1]

Specify a code from below for [1].

(e.g. R7K4DML-B-DAC32B-R/Q)

• Specify the specification for option code /Q

(e.g. /C01)

TERMINAL BLOCK

B: Tension clamp terminal block for power supply
Connector for MECHATROLINK-I / -II for communication
e-CON connector for I/O

I/O TYPE

DAC32B: NPN discrete input &
PNP transistor output, 16 points each

POWER INPUT

DC Power

R: 24 V DC

(Operational voltage range 24 V ±10 %, ripple 10 %p-p max.)

[1] OPTIONS

blank: none

/Q: With options (specify the specification)

SPECIFICATIONS OF OPTION: Q

COATING (For the detail, refer to our web site.)

/C01: Silicone coating

/C02: Polyurethane coating

/C03: Rubber coating

GENERAL SPECIFICATIONS

Connection

MECHATROLINK: MECHATROLINK-I / -II connector

Power & Sensor excitation: Separable tension clamp terminal

I/O: e-CON connector

Housing material: Flame-resistant resin (gray)

Isolation: Input or output or sensor excitation to MECHATROLINK or FE to power

Status indicator LEDs: PWR, ERR, SD, RD

(Refer to the instruction manual for details)

Discrete I/O status indicator LED: Green LED turns on with I/O ON

MECHATROLINK COMMUNICATION

MECHATROLINK mode: Set with DIP switches

(MECHATROLINK-I or -II, data length; Factory setting: MECHATROLINK-II, data length 32 bytes)

(Refer to the instruction manual)

Station address: 60H - 7FH

(Function selected with Rotary SW. Factory setting: 61H).

(Refer to the instruction manual)

■ MECHATROLINK-I

Baud rate: 4 Mbps

Transmission distance: 50 m max.

Distance between stations: 30 cm min.

Transmission media: MECHATROLINK cable (Model JEPMC-W6003-x-E, Yaskawa Controls Co., Ltd.)

Max. number of Subordinate Devices: 15

(The maximum number of Subordinate Devices might change depending on the Main Device unit. Refer to the manual of the Main Device unit)

Transmission cycle: 2 msec. (fixed)

Data length: 17 bytes

■ MECHATROLINK-II

Baud rate: 10 Mbps

Transmission distance: 50 m max.

Distance between stations: 50 cm min.

Transmission media: MECHATROLINK cable (Model JEPMC-W6003-x-E, Yaskawa Controls Co., Ltd.)

Max. number of Subordinate Devices: 30

(The maximum number of Subordinate Devices might change depending on the Main Device unit. Refer to the manual of the Main Device unit)

Transmission cycle: 0.25 msec., 0.5 msec., 1 msec., 1.5 msec., 2 msec., 2.5 msec., 3 msec., 4 msec., 8 msec.

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Data length: 17 bytes / 32 bytes selectable (Must choose identical data size for all stations on one network)

INPUT SPECIFICATIONS

Common: Positive common (NPN) per 16 points
Maximum inputs applicable at once: No limit (at 24V DC)
Sensor excitation: 24 V DC ±10 %; ripple 5 %p-p max., ≤ 2 A (including discrete input load charge); rated current 8 A
ON voltage / current: ≥ 15 V DC (X0 through XF to +24V) / ≥ 3.5 mA
OFF voltage / current: ≤ 5 V DC (X0 through XF to +24V) / ≤ 1 mA
Input current: ≤ 5.5 mA per point at 24 V DC
Input resistance: Approx. 4.4 kΩ
ON delay: ≤ 0.5 msec.
OFF delay: ≤ 1.0 msec.

OUTPUT SPECIFICATIONS

Common: Positive common (PNP) per 16 points
Maximum outputs applicable at once: No limit (at 24 V DC)
Sensor excitation: 24 V DC ±10 %, ripple 5 %p-p max., ≤ 2 A (including discrete output load charge); rated current 8 A
Rated output current: 0.1 A per point, 1.6 A per common
Residual voltage: ≤ 1.2 V
Leakage current: ≤ 0.1 mA
ON delay: ≤ 0.5 msec.
OFF delay: ≤ 1.0 msec.
Overload current protection function: Limits the current value when overcurrent is detected
Overheat protection function: Turns OFF the outputs when overheat is detected
(When driving an inductive load, connect a diode in parallel with the load.)

INSTALLATION

Power consumption: Approx. 75 mA (rated current 2 A)
Operating temperature: 0 to 55°C (32 to 131°F)
Storage temperature: -20 to +65°C (-4 to +149°F)
Operating humidity: 30 to 90 %RH (non-condensing)
Atmosphere: No corrosive gas or heavy dust
Mounting: Surface or DIN rail (35 mm rail)
Weight: 200 g (0.44 lb)

PERFORMANCE

Insulation resistance: ≥ 100 MΩ with 500 V DC
Dielectric strength: 1500 V AC @ 1 minute
(input or output or sensor excitaion to power)
500 V AC @ 1 minute (MECHATROLINK or FE to input or output or sensor excitation or power)

STANDARDS & APPROVALS

EU conformity:
EMC Directive
EMI EN 61000-6-4
EMS EN 61000-6-2
RoHS Directive

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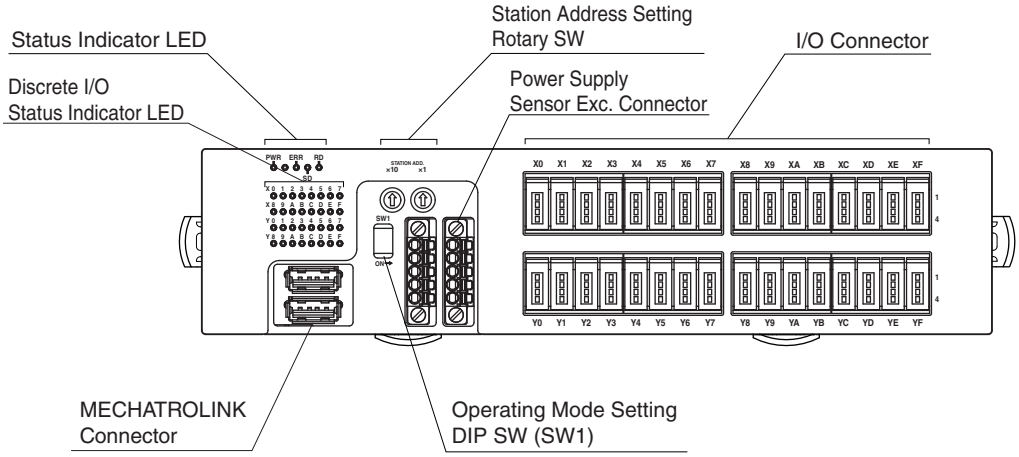
EXTERNAL VIEW



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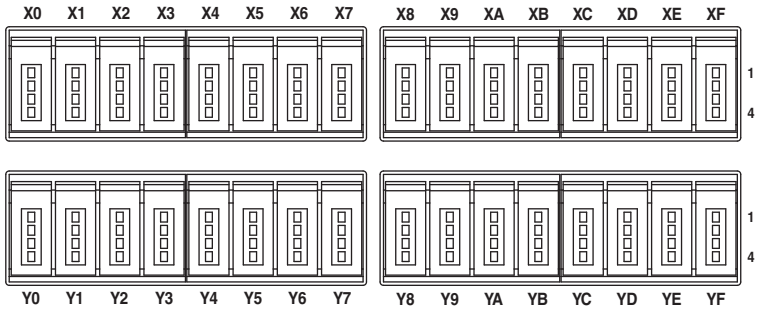
TERMINAL ASSIGNMENTS

■ I/O TERMINAL ASSIGNMENT

• e-CON connector

Recommended cable connector: 37104-( )-000FL (3M Company)

(The cable connector is not included in the package. Specify wire size instead of ( ); refer to the specifications of the product.)



No.		ID	FUNCTION	No.		ID	FUNCTION
X0	1	+24V	24V DC	X8	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X0	Input 0		4	X8	Input 8
X1	1	+24V	24V DC	X9	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X1	Input 1		4	X9	Input 9
X2	1	+24V	24V DC	XA	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X2	Input 2		4	XA	Input 10
X3	1	+24V	24V DC	XB	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X3	Input 3		4	XB	Input 11
X4	1	+24V	24V DC	XC	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X4	Input 4		4	XC	Input 12
X5	1	+24V	24V DC	XD	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X5	Input 5		4	XD	Input 13
X6	1	+24V	24V DC	XE	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X6	Input 6		4	XE	Input 14
X7	1	+24V	24V DC	XF	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X7	Input 7		4	XF	Input 15

No.		ID	FUNCTION	No.		ID	FUNCTION
Y0	1	NC	Unused	Y8	1	NC	Unused
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	Y0	Output 0		4	Y8	Output 8
Y1	1	NC	Unused	Y9	1	NC	Unused
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	Y1	Output 1		4	Y9	Output 9
Y2	1	NC	Unused	YA	1	NC	Unused
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	Y2	Output 2		4	YA	Output 10
Y3	1	NC	Unused	YB	1	NC	Unused
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	Y3	Output 3		4	YB	Output 11
Y4	1	NC	Unused	YC	1	NC	Unused
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	Y4	Output 4		4	YC	Output 12
Y5	1	NC	Unused	YD	1	NC	Unused
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	Y5	Output 5		4	YD	Output 13
Y6	1	NC	Unused	YE	1	NC	Unused
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	Y6	Output 6		4	YE	Output 14
Y7	1	NC	Unused	YF	1	NC	Unused
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	Y7	Output 7		4	YF	Output 15

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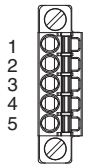
■ POWER SUPPLY, SENSOR EXCITATION

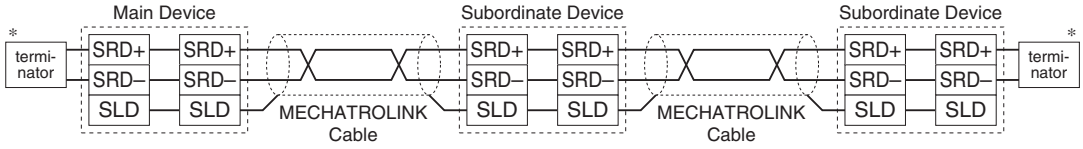
Cable connector: FMC1,5 / 5-STF-3,5
(Phoenix Contact) (included in the package)
Applicable wire size: 0.2 – 1.5 mm²; stripped length 10 mm
Recommended solderless terminal

- AI0,25-10YE 0.25 mm² (Phoenix Contact)
- AI0,34-10TQ 0.34 mm² (Phoenix Contact)
- AI0,5-10WH 0.5 mm² (Phoenix Contact)
- AI0,75-10GY 0.75 mm² (Phoenix Contact)
- A1-10 1.0 mm² (Phoenix Contact)
- A1,5-10 1.5 mm² (Phoenix Contact)



1.	PWR+	Power Supply (24V DC)
2.	PWR–	Power Supply (0V)
3.	FE	Functional earth
4.	SNSR.EXC+	Sensor excitation (24V DC)
5.	SNSR.EXC–	Sensor excitation (0V)

■ MECHATROLINK CONNECTION



*Terminator
Be sure to connect the terminating resistors to the unit at both ends of transmission line.
Use the terminating resistor dedicated for MECHATROLINK: Model JEPMC-W6022, Yaskawa Controls Co., Ltd.
Certain types of Main Device units may have incorporated terminating resistors. Consult the instruction manual of the Main Device unit.

MECHATROLINK RELATED COMMANDS

R7K4DML (Simple I/O) communicates with I/O service with no processor, therefore it uses a connectionless communication protocol.
There is no application layer either; the R7K4DML interchanges I/O data via data link layer.

■ MECHATROLINK DATA LINK LAYER COMMAND DESCRIPTIONS

The following tables explain the two Commands supported by the R7K4DML.

• MDS Command (04H) Data Format

BYTE	COMMAND	RESPONSE	REMARKS
0	MDS (04H)	S(0) (90H)	Message Data Search (MDS) Command: Read the ID from Subordinate Device station(s) S(0): Response to MDS
1	0	ID	
2	0		
3	0	0	All 0
4	0	0	
5	0	0	
6	0	0	
7	0	0	
8	0	0	
9	0	0	
10	0	0	
11	0	0	
12	0	0	
13	0	0	
14	0	0	
15	0	0	
16	0	0	
17 : 31	0 : 0	0 : 0	Byte 17 through 31 are always 0 in the 32-byte mode. These bytes are unavailable for MECHATROLINK-I and MECHATROLINK-II in the 17-byte mode.

• CDRW Command (03H) Data Format

BYTE	COMMAND	RESPONSE	REMARKS
0	CDRW (03H)	ACK (01H)	Cyclic Data Read/Write (CDRW) Command: Link transmission Acknowledge (ACK): Positive response to CDRW
1	Out Data: Lowest	In Data: Lowest	Order of data: Little Endian
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16	Out Data: Highest	In Data: Highest	
17 : 31	 (Out Data: Highest)	 (In Data: Highest)	Byte 17 through 31 are unavailable for MECHATROLINK-I and MECHATROLINK-II in the 17-byte mode. (Only available for MECHATROLINK-II in the 32-byte mode)

I/O DATA DESCRIPTIONS

■ 17-BYTE MODE

•16 points input data

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	In7	In6	In5	In4	In3	In2	In1	In0
2	In15	In14	In13	In12	In11	In10	In9	In8
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
⋮	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0

•16 points output data

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
⋮	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	Out7	Out6	Out5	Out4	Out3	Out2	Out1	Out0
16	Out15	Out14	Out13	Out12	Out11	Out10	Out9	Out8

■ 32-BYTE MODE

•16 points input data

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	In7	In6	In5	In4	In3	In2	In1	In0
2	In15	In14	In13	In12	In11	In10	In9	In8
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
⋮	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0

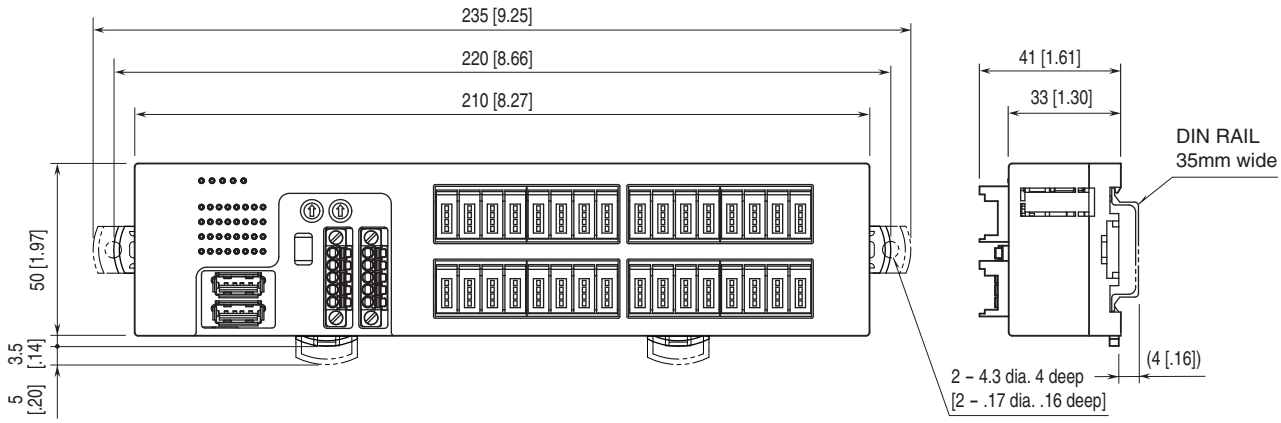
•16 points output data

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
⋮	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	Out7	Out6	Out5	Out4	Out3	Out2	Out1	Out0
32	Out15	Out14	Out13	Out12	Out11	Out10	Out9	Out8

0: OFF, 1: ON

At the loss of communication, output is hold. (last data correctly received is hold)

EXTERNAL DIMENSIONS unit: mm [inch]



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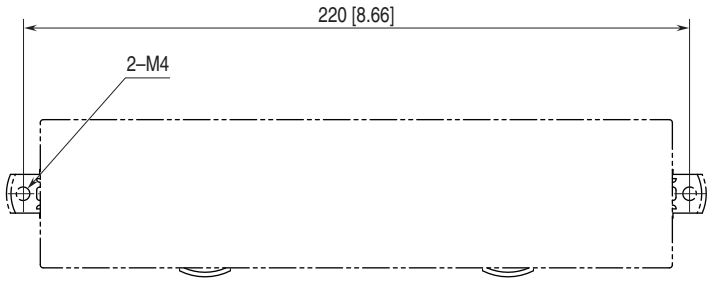
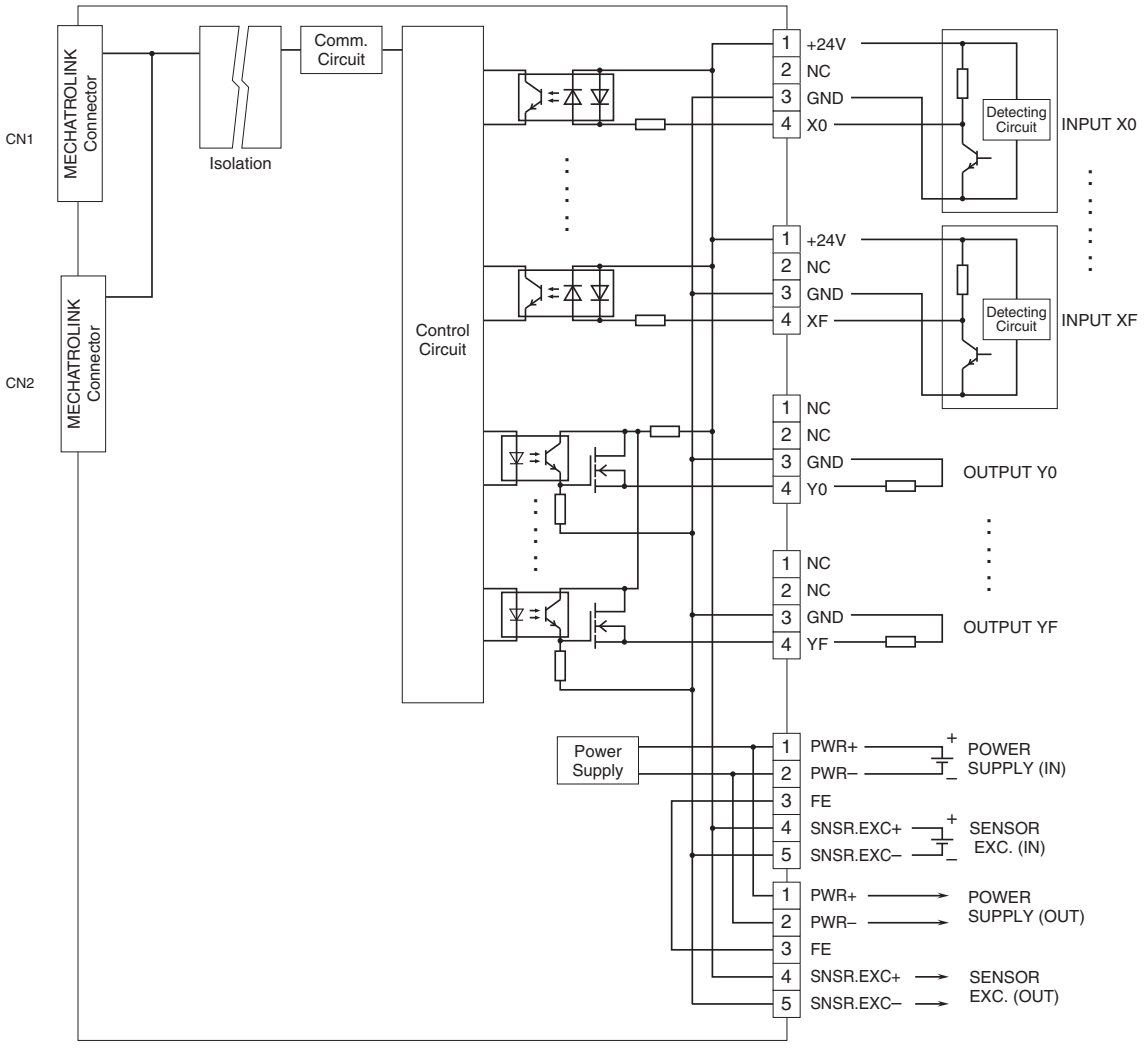
MOUNTING REQUIREMENTS unit: mm [inch]



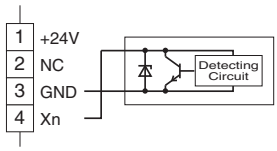
SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

Note: In order to improve EMC performance, bond the FE terminal to ground.

Caution: FE terminal is NOT a protective conductor terminal.



■ 2–Wire Sensor



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⚠ Specifications are subject to change without notice.

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