

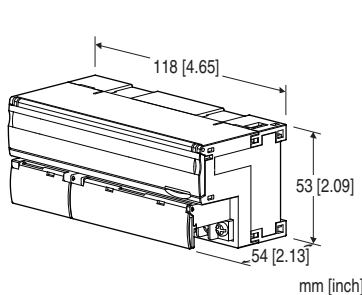
Remote I/O R7 Series

MECHATROLINK I/O MODULE

(DC voltage/current input, 4 points, isolated, MECHATROLINK-I / -II use)

Functions & Features

- 4 points DC voltage/current input module for MECHATROLINK -I/ -II
- Extension module can be connected
- Input range can be selected with the front DIP switches for all channels
- Individual channels, zero adjustment, span adjustment, and scaling can be set with the configurator software (model: R7CON)



MODEL: R7ML-SV4-R[1]

ORDERING INFORMATION

- Code number: R7ML-SV4-R[1]
Specify a code from below for [1].
(e.g. R7ML-SV4-R/Q)
- Specify the specification for option code /Q
(e.g. /C01)

I/O TYPE

SV4: DC voltage/current input (10 V/20 mA), 4 points

POWER INPUT

DC Power

R: 24 V DC

(Operational voltage range 24 V $\pm$ 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

RELATED PRODUCTS

- PC Configurator cable (model: MCN-CON or COP-US)
- PC configurator software (model: R7CON)
Downloadable at our web site.
- Discrete input extension module (model: R7ML-EAx)
- Discrete output extension module (model: R7ML-ECx)

GENERAL SPECIFICATIONS

Connection

MECHATROLINK: MECHATROLINK-I/-II connector

Power input, input: M3 separable screw terminal (torque 0.5 N·m)

Solderless terminal: Refer to the drawing at the end of the section.

Recommended manufacturer: Japan Solderless Terminal MFG. Co., Ltd., Nichifu Co., Ltd.

Applicable wire size: 0.25 to 1.65 mm² (AWG 22 to 16)

Screw terminal: Nickel-plated steel

Housing material: Flame-resistant resin (gray)

Isolation: Input 0 to input 1 to input 2 to input 3 to MECHATROLINK or FG to power

Zero adjustments: Configurable via R7CON

Span adjustments: Configurable via R7CON

Input range: Selectable with the DIP SW on the front of the unit or configurable via R7CON

Extension: No extension (*), Discrete input 8 or 16 points, Discrete output 8 or 16 points

Selectable with the front DIP SW

(*) Factory default setting

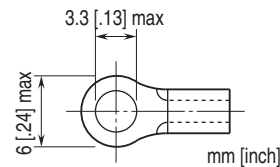
Conversion rate: Selectable with the front DIP SW

Status indicator LEDs: PWR, RUN, ERR, SD, RD

(Refer to the instruction manual)

Configurator connection: 2.5 dia. miniature jack

■Recommended solderless terminal



MECHATROLINK COMMUNICATION

MECHATROLINK mode: Set with DIP switches

(MECHATROLINK-I or -II, data length; Factory default setting: MECHATROLINK-II; data length (17 bytes)

(Refer to the instruction manual)

Station address: 60H - 7FH

(Function selected with Rotary SW. Factory default setting:

60H) (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: 0.5 msec., 1 msec., 1.5 msec., 2 msec., 4 msec., 8 msec.

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

INPUT SPECIFICATIONS

■ DC Current

Input resistor: 70 Ω

Input range: -20 to +20 mA DC, 0 to 20 mA DC, 4 to 20 mA DC

■ Narrow span voltage

Input resistance: $\geq 100 \text{ k}\Omega$

Input range: -1 to +1 V DC, 0 to 1 V DC, -0.5 to +0.5 V DC

■ Wide span voltage

Input resistance: $\geq 1 \text{ M}\Omega$

Input range: -10 to +10 V DC (*), -5 to +5 V DC, 0 to 10 V DC, 0 to 5 V DC, 1 to 5 V DC

(*) Factory default setting

INSTALLATION

Current consumption

•DC: Approx. 70 mA

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: DIN rail (35 mm rail)

Weight: 220 g (0.49 lb)

PERFORMANCE

Conversion rate / conversion accuracy:

10 msec./ $\pm 0.8 \%$, 20 msec./ $\pm 0.4 \%$, 40 msec./ $\pm 0.2 \%$, 80 msec./ $\pm 0.1 \%$ (*)

(*) Factory setting

Data range: 0 – 10000 of the input range

(Scaling of converted data is configurable with the configurator software (model: R7CON))

Temp. coefficient: $\pm 0.015 \%/^{\circ}\text{C}$ ($\pm 0.008 \%/^{\circ}\text{F}$)

Response time: Conversion rate $\times 2 + 50$ msec. (0 – 90 %)

Insulation resistance: $\geq 100 \text{ M}\Omega$ with 500 V DC

Dielectric strength: 1500 V AC @ 1 minute

(input 0 to input 1 to input 2 to input 3 to power)

500 V AC @ 1 minute (MECHATROLINK or FG to input or power)

STANDARDS & APPROVALS

EU conformity:

EMC Directive

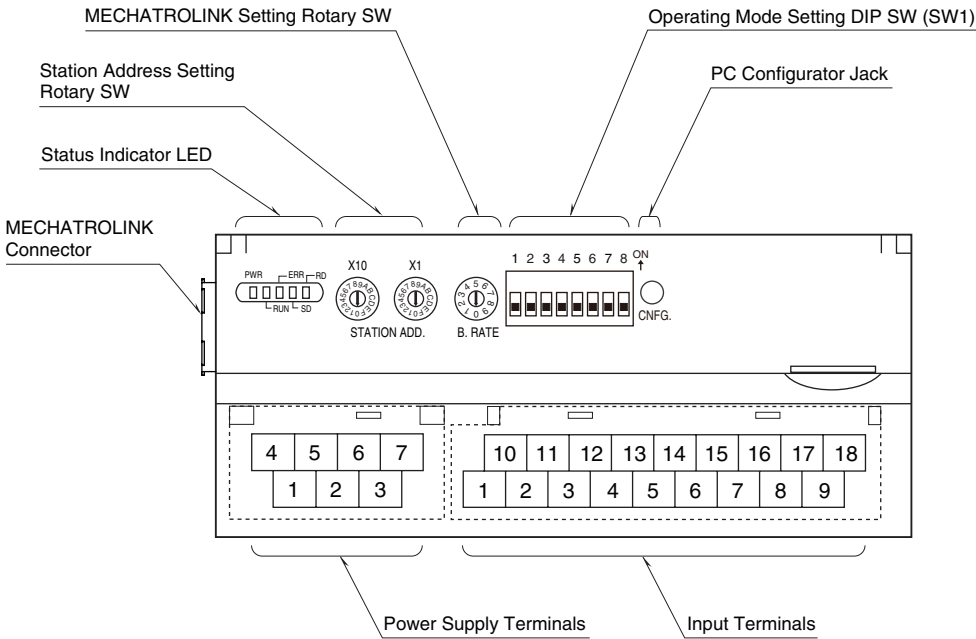
EMI EN 61000-6-4

EMS EN 61000-6-2

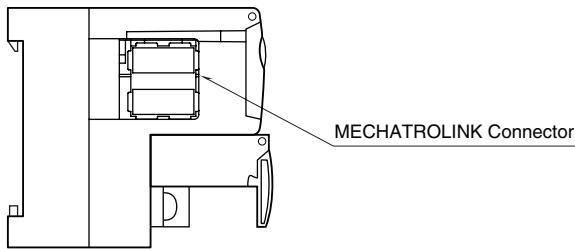
RoHS Directive

EXTERNAL VIEW

FRONT VIEW

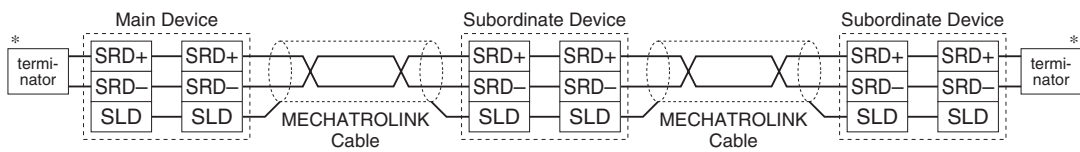


SIDE VIEW



COMMUNICATION CABLE CONNECTIONS

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 for the Main Device.

TERMINAL ASSIGNMENTS**■ INPUT TERMINAL ASSIGNMENT**

10 VL0	11 I0	12 VL1	13 I1	14 NC	15 VL2	16 I2	17 VL3	18 I3
1 VH0	2 COM0	3 VH1	4 COM1	5 NC	6 VH2	7 COM2	8 VH3	9 COM3

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	VH0	Wide span volt. 0	10	VL0	Narrow span volt. 0
2	COM0	Common 0	11	I0	Current range 0
3	VH1	Wide span volt. 1	12	VL1	Narrow span volt. 1
4	COM1	Common 1	13	I1	Current range 1
5	NC	No connection	14	NC	No connection
6	VH2	Wide span volt. 2	15	VL2	Narrow span volt. 2
7	COM2	Common 2	16	I2	Current range 2
8	VH3	Wide span volt. 3	17	VL3	Narrow span volt. 3
9	COM3	Common 3	18	I3	Current range 3

■ POWER SUPPLY TERMINAL ASSIGNMENT

4 NC	5 NC	6 +24V	7 0V
1 NC	2 NC	3 FG	

NO.	ID	FUNCTION, NOTES
1	NC	----
2	NC	----
3	FG	FG
4	NC	----
5	NC	----
6	+24V	Power input (24V DC)
7	0 V	Power input (0V)

MECHATROLINK RELATED COMMANDS

Related commands are as follows.

Command of MECHATROLINK has a two-layer structure, which is composed of Data Link Layer (upper layer) and Application Layer (lower layer). All the Application Layer Commands are located in lower layer of Data Link Layer (CDRW).

COMMAND	COMMAND NAME	COMMAND (hexadecimal)	DESCRIPTION
Data Link Layer Command	MDS	04H	Product type reading
	CDRW	03H	Data transmission
Application Layer Command	NOP	00H	Invalid
	ID_RD	03H	Product information reading
	CONNECT	0EH	Communication start with Main Device
	DISCONNECT	0FH	Communication stop with Main Device
	DATA_RWA	50H	I/O data update

■ DATA LINK LAYER COMMAND

• MDS (04H) Command Data Format

Reads product type.

Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
0	04H	90H	Product type reading
1	00H	00H	Reserved
2	00H	80H	Intelligent I/O
3 – 31	00H	00H	3 – 17 bytes at 17-byte mode

• CDRW (03H) Command Data Format

Data transmission command is located in upper layer of Application Layer Command.

Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
0	03H	90H	Data transmission
1	CMD	RCMD	CMD : Application Layer command RCMD : Response (Same value as Application Layer Command)
2	00H	ALARM	Error code (Refer to the following table)
3	00H	STATUS1	Transmission status (Refer to the following table)
4	00H	STATUS2	Reserved
5 – 31	XX	YY	Depend upon the Application Layer Command

• ALARM

Communication error codes at the Subordinate Device are sent to the Main Device.

ERROR CODE (hexadecimal)	DESCRIPTION	CLASSIFICATION
00H	MECHATROLINK communication is in normal status	----
01H	Unsupported command is received.	Warning
02H	Command execution conditions are not met.	Warning
03H	Data in the command is not correct.	Warning
04H	Synchronization Error	Error

• STATUS1

The status of the Subordinate Device is sent to the Main Device in accordance with the classification of the error codes at ALARM.

Bit	DEFINITION	DESCRIPTION
0	Error Bit	1 : Error, 0 : Normal
1	Warning Bit	1 : Warning, 0 : Normal
2	Command Ready Bit	1 : Command can be accepted (ready), 0 : Command cannot be accepted (busy)
3 – 7	Unused	----

■ APPLICATION LAYER COMMAND

Application Layer Command is located in lower layer of Data Link Layer Command (CDRW). Following tables are details on bytes 5 through 31 dependent upon Application Layer Command.

Note : At 17 bytes mode, bytes dependant upon Application Layer Command are to be 5 through 17.

• NOP (00H) Command Data Format

0, which indicates invalid command, is sent to the Main Device.

Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
5 – 31	00H	00H	Invalid

• ID_RD (03) Command Data Format

Reads product information. (max. 8 bytes at a time) Repeat reading multiple times in order to read out all the data.

Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
5	DEVICE_CODE	DEVICE_CODE	DEVICE_CODE : Selection of product information 00 : Product model (data length : 32 bytes) 02 : Product version (data length : 32 bytes) 0F : Vendor code (data length : 48 bytes)
6	OFFSET	OFFSET	OFFSET : Specify read position
7	SIZE	SIZE	SIZE : Specify length of read data (max. 8 bytes)
8 – 15	00H	ID	Product information data
16 – 31	00H	00H	Unused

• **CONNECT (0EH) Command Data Format**

Starts communication with the Main Device.

Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
5	VER	VER	MODE : Selection of MECHATROLINK version 10 : MECHATROLINK - I 21 : MECHATROLINK - II
6	COM_MODE	COM_MODE	COM_MODE : Selection of data length 00 : 17-byte mode 80 : 32-byte mode
7	COM_TIME	COM_TIME	COM_TIME : Communication cycle (milliseconds) MECHATROLINK-I: Multiples of two (2) MECHATROLINK-II: Integral multiples of the transmission cycle
8 – 31	00H	00H	Unused

• **DISCONNECT (0FH) Command Data Format**

Stops communication with the Main Device.

Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
5 – 31	00H	00H	Unused

• **DATA_RWA (50H) Command Data Format**

Transmits I/O data from/to the Main Device. Data allocation is as follows.

Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
5	00H	Input 0 low 8 bits	
6	00H	Input 0 high 8 bits	
7	00H	Input 1 low 8 bits	
8	00H	Input 1 high 8 bits	
9	00H	Input 2 low 8 bits	
10	00H	Input 2 high 8 bits	
11	00H	Input 3 low 8 bits	
12	00H	Input 3 high 8 bits	
13	Discrete output data of extension module low 8 bits	Discrete input data of extension module low 8 bits or echo back of set value at command area	
14	Discrete output data of extension module high 8 bits	Discrete input data of extension module high 8 bits or echo back of set value at command area	“0” for R7ML-EA8 and R7ML-EC8x
15	00H	Status low 8 bits	See I/O data status
16	00H	Status high 8 bits	See I/O data status
17 – 31	00H	00H	Unused

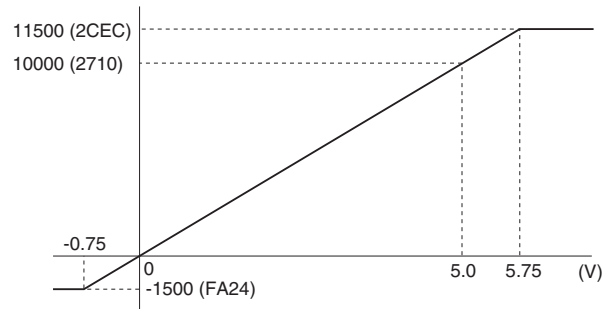
DATA CONVERSION

■ INPUT RANGE AND DATA CONVERSION (FACTORY DEFAULT SETTING)

Analog input data is converted into digital representations of 0 – 100% proportional to each scaled range.
The converted % values are multiplied by 100 and expressed in 16 bits.
Overrange input is possible from -15 to +115% of the nominal range.
When the signal exceeds the limit, the data is fixed at -15% or +115%.

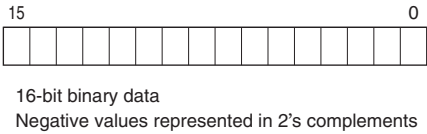
• Input Range 0 – 5V DC

Input Value	Input %	Converted Data, Decimal	Converted Data, Hex
≤ -0.75V	-15%	-1500	FA24
0V	0%	0	0
5V	100%	10000	2710
≥ 5.75V	115%	11500	2CEC

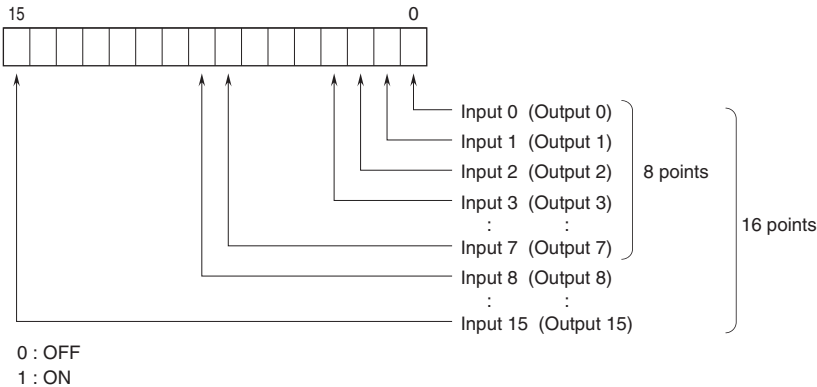


I/O DATA DESCRIPTIONS

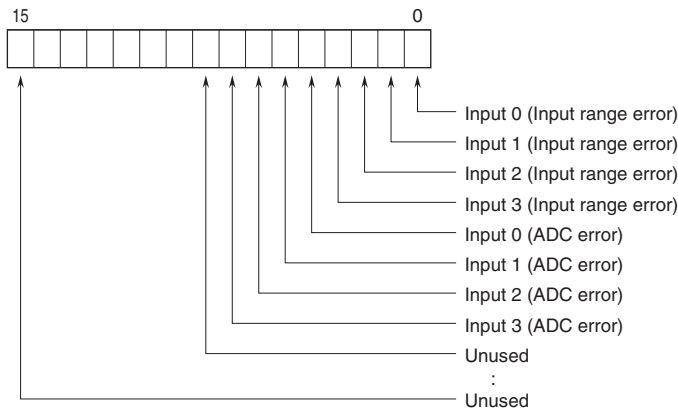
■ ANALOG INPUT



■ DISCRETE I/O

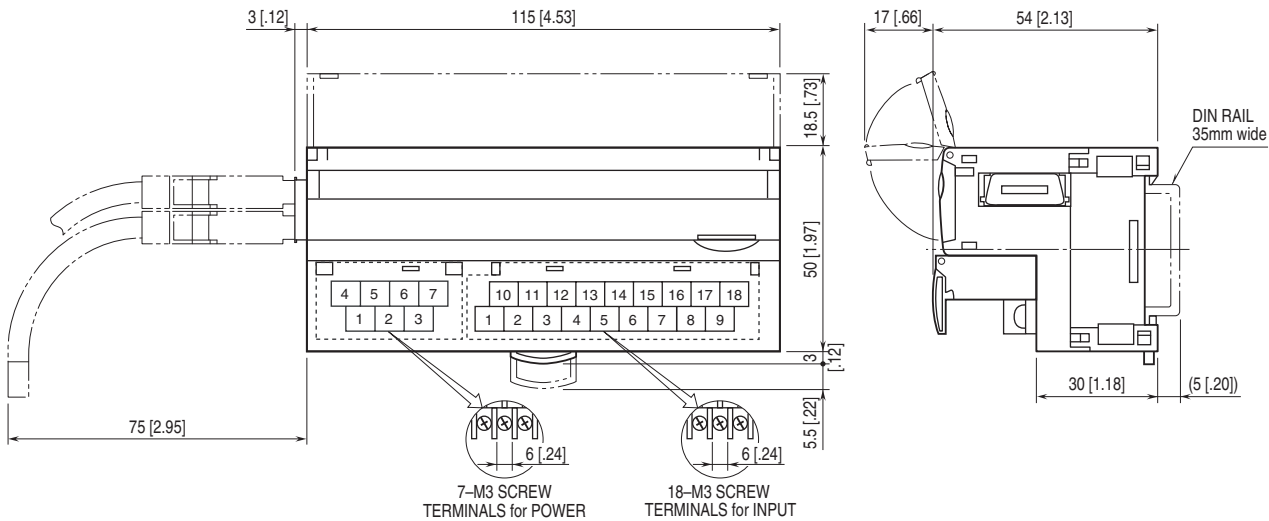


■ STATUS



Input range error ($\leq -15\%$, $\geq +115\%$)
0 : Normal 1 : Error
ADC error (no response from ADC)
0 : Normal 1 : Error

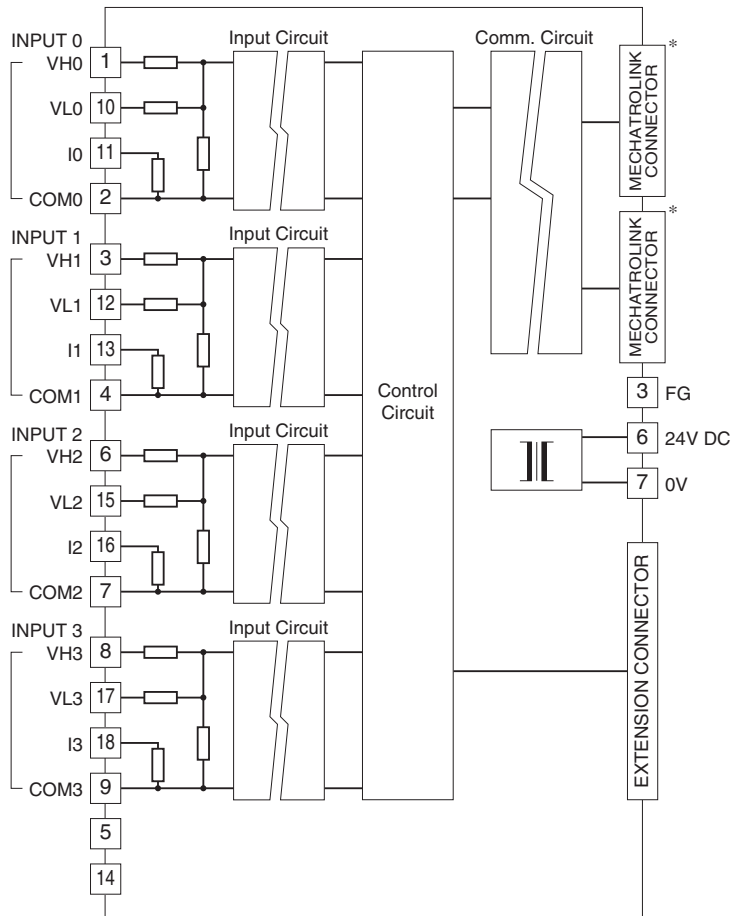
EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm [inch]



SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

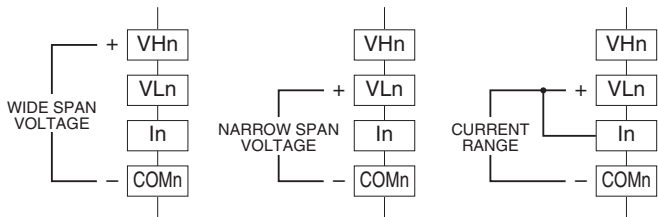
Note: In order to improve EMC performance, bond the FG terminal to ground.

Caution: FG terminal is NOT a protective conductor terminal.



*MECHATROLINK connectors are internally connected.
The network cable can be connected to either one.

Input Connection Examples



Be sure to close across VLn and In terminals for a current input.



Specifications are subject to change without notice.