

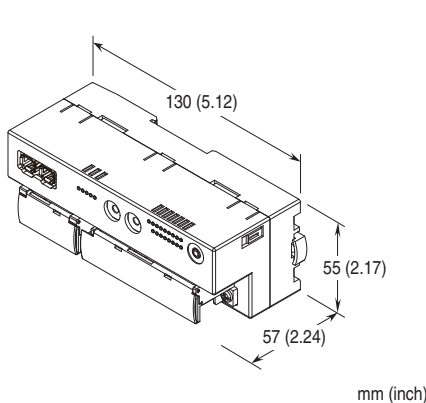
## Remote I/O R7G4H Series

### MECHATROLINK I/O MODULE

(encoder input, 1 point, screw terminal block, MECHATROLINK-III use)

#### Functions & Features

- 1 point encoder input (speed / position) module for MECHATROLINK-III
- Easy parameter setting with M-System's configurator software



## MODEL: R7G4HML3-6-PA1[1]-R[2]

### ORDERING INFORMATION

- Code number: R7G4HML3-6-PA1[1]-R[2]
- Specify a code from below for each of [1] and [2].  
(e.g. R7G4HML3-6-PA1A7-R/Q)
- Specify the specification for option code /Q  
(e.g. /C01/SET)

### TERMINAL BLOCK

- 6: Screw terminal block for power supply
- Connector for MECHATROLINK-III
- Screw terminal block for I/O

### I/O TYPE

PA1: Encoder input (speed / position) 1 point

### [1] INPUT

- A1: 5 V open collector
- A4: 12 V open collector
- A7: 24 V open collector
- J: RS-422 line driver pulse

### POWER INPUT

#### DC Power

R: 24 V DC

(Operational voltage range 24 V  $\pm$ 10 %, ripple 10 %p-p max.)

### [2] OPTIONS

blank: none

/Q: Options other than the above (specify the specification)

### SPECIFICATIONS OF OPTION: Q (multiple selections)

#### COATING (For the detail, refer to M-System's web site.)

/C01: Silicone coating

/C02: Polyurethane coating

/C03: Rubber coating

#### EX-FACTORY SETTING

/SET: Preset according to the Ordering Information Sheet  
(No. ESU-7772-PA1)

### RELATED PRODUCTS

- PC configurator software (model: R7CFG)

Downloadable at M-System's web site.

A dedicated cable is required to connect the module to the PC. Please refer to the internet software download site or the users manual for the PC configurator for applicable cable types.

### GENERAL SPECIFICATIONS

#### Connection

MECHATROLINK-III: MECHATROLINK-III connector

Power input, I/O: 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 mm<sup>2</sup> (AWG 22 to 16)

Screw terminal: Nickel-plated steel

Housing material: Flame-resistant resin (gray)

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

Status indicator LEDs: PWR, ERR, CON, LNK1, LNK2  
(Refer to the instruction manual for details)

Parameter setting: With PC configurator software (model: R7CFG)

- Data type
- Count mode
- Counter type
- Frequency range
- Drop out
- MECHATROLINK-III command

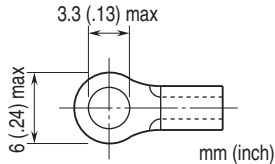
- Alarm type
- External latch

Refer to the instruction manual for detail.

**Command:** Data type, Latch, Reset, Latch data clear, Reset data clear, Preset and Alarm output

(For details refer to the instruction manual.)

## ■ Recommended solderless terminal



## MECHATROLINK-III COMMUNICATION

**Baud rate:** 100 Mbps

**Transmission distance:** 6300 m max.

**Distance between stations:** 100 m max.

**Transmission media:** MECHATROLINK cable (Model JEPMC-W6013-x-E, Yaskawa Controls Co., Ltd.)

**Connector:** TYCO AMP Industrial mini I/O connector

**Max. number of slaves:** 62

(The maximum number of slaves might change depending on the master unit. Refer to the manual of the master unit)

**Transmission cycle:** 125  $\mu$ sec., 250  $\mu$ sec., 500  $\mu$ sec., 1 - 64 msec. (with 1 msec. increments)

**Communication cycle:** 125  $\mu$ sec. through 64 msec.

**Applicable profile:** Standard I/O profile (cyclic communication)

Event-driven communication acquiring ID profile (event-driven communication)

**Transmission bytes:** 16 bytes

**Station address:** 03H through EFH (set with rotary switches)

**Cyclic communication:** Available

**Event-driven communication:** Available

**Slave monitoring:** None

## INPUT SPECIFICATIONS

### Sensor Excitation\* (External):

24 V DC  $\pm$  10 %, ripple 5 %p-p max., 20 mA to 1 A

\* Must be supplied since the input circuit also works with it.

When Latch or Reset turns on, its current is added.

### Encoder excitation (External source; only for Ax)

A1: 5 V DC  $\pm$  5 %,  $\leq$  1 A

A4: 12 V DC  $\pm$  5 %,  $\leq$  1 A

A7: 24 V DC  $\pm$  5 %,  $\leq$  1 A

### ■ Encoder pulse input

#### Open collector

Maximum input frequency

- Position data: 400 kHz (quad multiplication)
- Speed data: 100 kHz

Input pulse, ON/OFF level

• 5 V: Approx. 4 V DC @ 4.4 mA,  $\geq$  3 k $\Omega$  / 3.3 V for OFF,  $\leq$  300  $\Omega$  / 1 V for ON

• 12 V: Approx. 10 V DC @ 5.7 mA,  $\geq$  3 k $\Omega$  / 6.5 V for OFF,  $\leq$  400  $\Omega$  / 1.8 V for ON

• 24 V: Approx. 22 V DC @ 7.8 mA,  $\geq$  3 k $\Omega$  / 11.5 V for OFF,  $\leq$  300  $\Omega$  / 2 V for ON

Pulse phase: A, B and Z

A and B phases are necessary to work.

Phase A/B

- Position data:  $\geq$  5  $\mu$ sec.
- Speed data:  $\geq$  5  $\mu$ sec.

Phase Z

$\geq$  1 msec. (firmware version 1.10)

$\geq$  0.5  $\mu$ sec. (firmware version 1.11 or later)

### RS-422 line driver pulse

Position data: 4 MHz (quad multiplication)

Speed data: 100 kHz

Receiver: Conforms to RS-422

Pulse phase: A, B and Z

A and B phases are necessary to work.

Phase A/B

- Position data:  $\geq$  0.5  $\mu$ sec.
- Speed data:  $\geq$  5  $\mu$ sec.

Phase Z

$\geq$  1 msec. (firmware version 1.10)

$\geq$  0.5  $\mu$ sec. (firmware version 1.11 or later)

### ■ Reset input: Discrete input

**Number of input:** 1

**Common:** Positive common

**Detecting voltage:** Supplied sensor excitation voltage

**Detecting current:** 5.5 mA per channel (@24 V DC)

**Detecting levels:**

$\geq$  15 V DC (between +24V1 and RST),  $\geq$  3.5 mA for ON

$\leq$  5 V DC (between +24V1 and RST),  $\leq$  1mA for OFF

**Input resistance:** Approx. 4.4 k $\Omega$

**ON delay time:**  $\leq$  50  $\mu$ sec.

**OFF delay time:**  $\leq$  500  $\mu$ sec.

**Pulse width:**  $\geq$  50 msec.

### ■ Latch input: Discrete input

**Number of input:** 1

**Common:** Positive common

**Detecting voltage:** Supplied sensor excitation voltage

**Detecting current:** 5.5 mA per channel (@24 V DC)

**Detecting levels:**

$\geq$  15 V DC (between +24 V1 and LCH),  $\geq$  3.5 mA for ON

$\leq$  5 V DC (between +24 V1 and LCH),  $\leq$  1mA for OFF

**Input resistance:** Approx. 4.4 k $\Omega$

**ON delay time:**  $\leq$  10  $\mu$ sec.

**OFF delay time:**  $\leq$  10  $\mu$ sec.

## OUTPUT SPECIFICATIONS

- **Alarm Output:** Open collector
- Number of output:** 2
- Common:** Negative common
- Rated load voltage:** 24 V DC  $\pm 10\%$
- Max. load current:** 0.1 A per point
- Voltage drop at ON:**  $\leq 1.2$  V
- Leakage current at OFF:**  $\leq 1$  mA
- ON delay:**  $\leq 50$   $\mu$ sec.
- OFF delay:**  $\leq 500$   $\mu$ sec.

## INSTALLATION

- Current consumption**
  - DC: Approx. 80 mA
- Operating temperature:** -10 to +55°C (14 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:** 220 g (0.49 lb)

## PERFORMANCE

- Speed conversion accuracy:**  $\pm 0.1\%$
- Data range**
  - Speed:** 0 - 10000 of the input range
  - Position**
    - Ring:** 0 to 4 294 967 295
    - Linear:** -2 100 000 000 to +2 100 000 000
- Insulation resistance:**  $\geq 100$  M $\Omega$  with 500 V DC
- Dielectric strength:** 1500 V AC @ 1 minute  
(input or output or sensor excitation to MECHATROLINK or FE to power)

## STANDARDS & APPROVALS

- EU conformity:**
  - EMC Directive
    - EMI EN 61000-6-4
    - EMS EN 61000-6-2
  - RoHS Directive
    - EN 50581

## PC CONFIGURATOR

The following parameters can be set with using PC Configurator Software (model: R7CFG)  
Refer to the users manual for the R7CFG for detailed operation of the software program.

### ■ DATA TYPE

PARAMETER	SETTING RANGE	DEFAULT SETTING
Data type	Position Speed	Position

### ■ POSITION DATA MODE

PARAMETER	SETTING RANGE	DEFAULT SETTING
Reset value (linear counter)	Min. totalized value – Max. totalized value	0
Minimum totalized value (linear counter)	-2 100 000 000 to +2 099 999 999	-2 100 000 000
Maximum totalized value (linear counter)	-2 099 999 999 to +2 100 000 000	2 100 000 000
Count mode	Mode 0: x1 (phase A, B) Mode 1: x1 (phase A) Mode 2: x2 Mode 3: x4	Mode 3: x4
Data type	Linear counter Ring counter	Linear counter

### ■ SPEED DATA MODE

PARAMETER	SETTING RANGE	DEFAULT SETTING
Frequency range	0 – 100 kHz 0 – 10 kHz 0 – 1 kHz 0 – 100 Hz 0 – 10 Hz 0 – 1 Hz 0 – 0.1 Hz	0 – 100 kHz
Drop out (low-end cutout)	0.10 – 25.00 (%)	0.10 (%)
Bias adjustment	-320.00 – +320.00 (%)	0.00 (%)
Gain adjustment	-3.2000 – +3.2000	1.0000
Zero scale	-32 000 – +32 000	0
Full scale	-32 000 – +32 000	10 000

## ■ ALARM

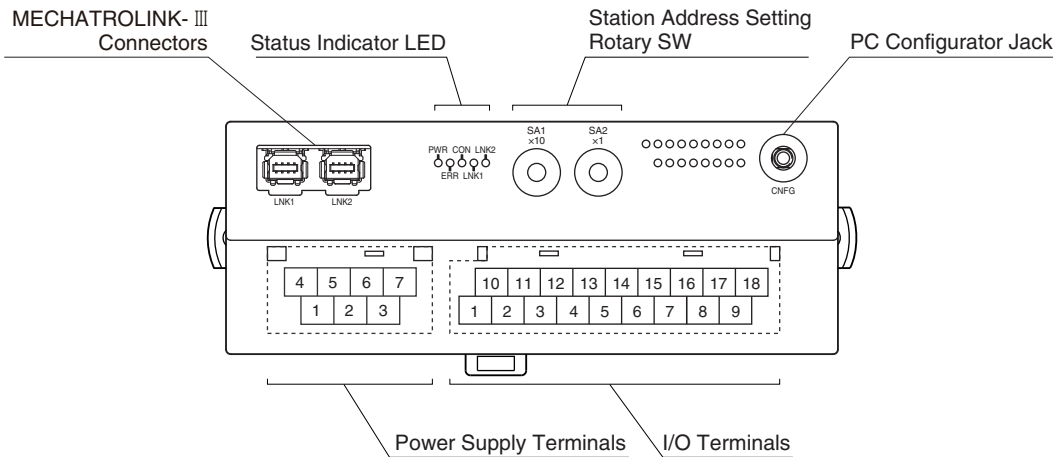
PARAMATER	SETTING RANGE	DEFAULT SETTING
MECHATROLINK-III command	Valid Invalid	Invalid
Alarm Type	Not used Speed high Speed low Position high Position low	Not used
Setpoint A (position data)	Linear high setpoint: Min to [Max-1] Linear low setpoint: [Min+1] to Max	100 000 000
Setpoint B (position data)	Ring high setpoint: 0 to 4 294 967 294 Ring low setpoint: 1 to 4 294 967 295	100 000 000
Hysteresis (deadband) A (position data)	Linear: < [Max – Min] [Hi Setpoint – Hysteresis] > Min [Lo Setpoint + Hysteresis] < Max	1 000
Hysteresis (deadband) B (position data)	Ring: 0 to 4 294 967 295 [Hi Setpoint – Hysteresis] > 0 [Lo Setpoint + Hysteresis] < 4 294 967 295	1 000
Setpoint A (speed data)	-15.00 to 115.00 (%)	80.00 (%)
Setpoint B (speed data)		80.00 (%)
Hysteresis (deadband) A (speed data)	0.00 to 115.00 (%)	5.00 (%)
Hysteresis (deadband) B (speed data)		5.00 (%)
Alarm power on delay	0.0 to 60.0 sec.	5.0 sec.
Alarm on delay timer	0.0 to 60.0 sec.	0.1 sec.
Alarm on hold timer	0.0 to 60.0 sec.	0.1 sec.

## ■ LATCH AND RESET

PARAMETER	SETTING RANGE	DEFAULT SETTING
External latch	Valid Invalid command via MECHATROLINK-III	Valid
MECHATROLINK-III latch	Valid Invalid	Valid
MECHATROLINK-III latch data clear	Valid Invalid	Valid
External reset	Valid Invalid	Valid
MECHATROLINK-III reset	Valid Invalid	Valid
MECHATROLINK-III reset data clear	Valid Invalid	Valid
Z reset / Z latch*1	Invalid Z reset valid Z latch valid*1	z reset valid

\*1. Selectable when the firmware version is V1.11 or later.

## EXTERNAL VIEW



## TERMINAL ASSIGNMENTS

### ■R7G4HML3-6-PA1J (RS-422 LINE DRIVER PULSE INPUT)

10	11	12	13	14	15	16	17	18
SNSR EXC-	A-	B-	Z-	+24V1	GND	GND	GND	GND
1	2	3	4	5	6	7	8	9
SNSR EXC+	A+	B+	Z+	+24V1	LCH	RST	OCA	OCB

Pin. No.	ID	FUNCTION
1	SNSR EXC +	SENSOR EXCITATION +
2	A +	PHASE A +
3	B +	PHASE B +
4	Z +	PHASE Z +
5	+ 24V1	24V DC
6	LCH	LATCH INPUT
7	RST	RESET INPUT
8	OCA	OPEN COLLECTOR OUTPUT A
9	OCB	OPEN COLLECTOR OUTPUT B
10	SNSR EXC -	SENSOR EXCITATION -
11	A -	PHASE A -
12	B -	PHASE B -
13	Z -	PHASE Z -
14	+ 24V1	24V DC
15	GND	0V
16	GND	0V
17	GND	0V
18	GND	0V

## ■R7G4HML3-6-PA1Ax (OPEN COLLECTOR INPUT)

10	11	12	13	14	15	16	17	18
SNSR ENCDR-	ENCDR+	Z	V-	+24V1	GND	GND	GND	GND
1	2	3	4	5	6	7	8	9
SNSR EXC+	A	B	V+	+24V1	LCH	RST	OCA	OCB

Pin. No.	ID	FUNCTION
1	SNSR EXC +	SENSOR EXCITATION +
2	A	PHASE A
3	B	PHASE B
4	V +	ENCODER POWER OUTPUT +
5	+ 24V1	24V DC
6	LCH	LATCH INPUT
7	RST	RESET INPUT
8	OCA	OPEN COLLECTOR OUTPUT A
9	OCB	OPEN COLLECTOR OUTPUT B
10	SNSR/ ENCDR -	SENSOR EXCITATION - / ENCODER POWER INPUT -
11	ENCDR +	ENCODER POWER INPUT +
12	Z	PHASE Z
13	V -	ENCODER POWER OUTPUT -
14	+ 24V1	24V DC
15	GND	0V
16	GND	0V
17	GND	0V
18	GND	0V

## ■POWER SUPPLY TERMINAL ASSIGNMENT

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

- 1. NC -
- 2. NC -
- 3. FE Functional earth
- 4. NC -
- 5. NC -
- 6. +24V Power supply (24V DC)
- 7. 0V Power supply (0V)

## MECHATROLINK RELATED COMMANDS

Commands available with the unit are as follow.

PROFILE	COMMAND	CODE	FUNCTION
Common command	NOP	00H	No operation command
	ID_RD	03H	Read ID command
	CONFIG	04H	Setup device command
	ALM_RD	05H	Read alarm or warning command
	ALM_CLR	06H	Clear alarm or warning command
	CONNECT	0EH	Establish connection command
	DISCONNECT	0FH	Release connection command
Standard I/O profile	DATA_RWA	20H	Transmit I/O data

## DATA CONVERSION

### ■ ENCODER INPUT (SPEED CONVERSION DATA)

Encoder input data is converted into digital representations of 0 – 100% proportional to each scaled range.

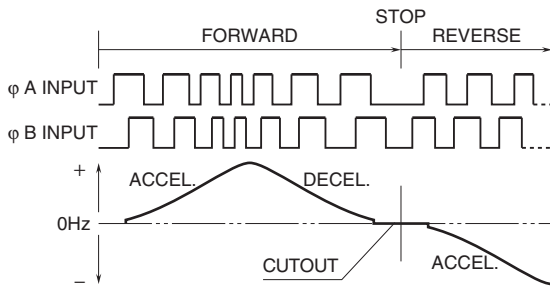
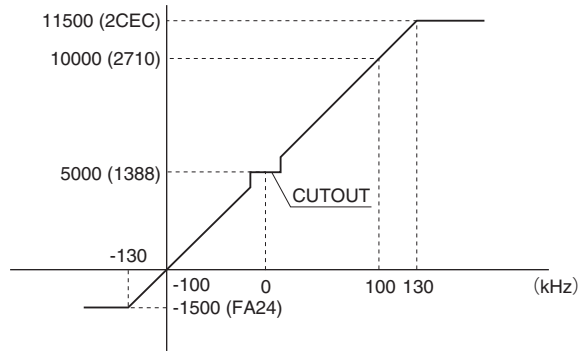
The converted % values are multiplied by 100 and expressed in 16 bits.

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% respectively.

#### · Input Range 0 – 100 kHz

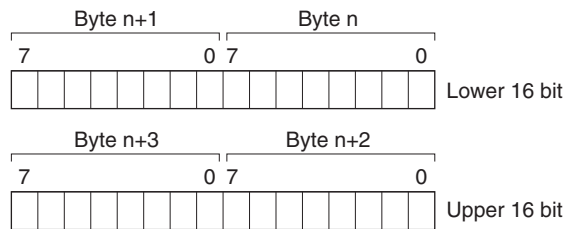
Input Value	Input %	Converted Data, Decimal	Converted Data, Hex
-130kHz	-15%	-1500	FA24
-100kHz	0%	0	0
0kHz	50%	5000	1388
100kHz	100%	10000	2710
130kHz	115%	11500	2CEC



## I/O DATA DESCRIPTIONS

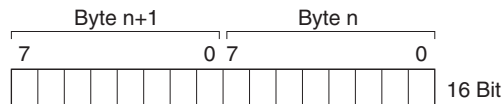
Scaling of analog I/O module is configurable with the configurator software (model: R7CFG). Refer to the software manual for details.

### ■ PULSE POSITION CONVERSION



Position conversion data is represented in 16-bit binary. Negative value is represented in 2's complements.

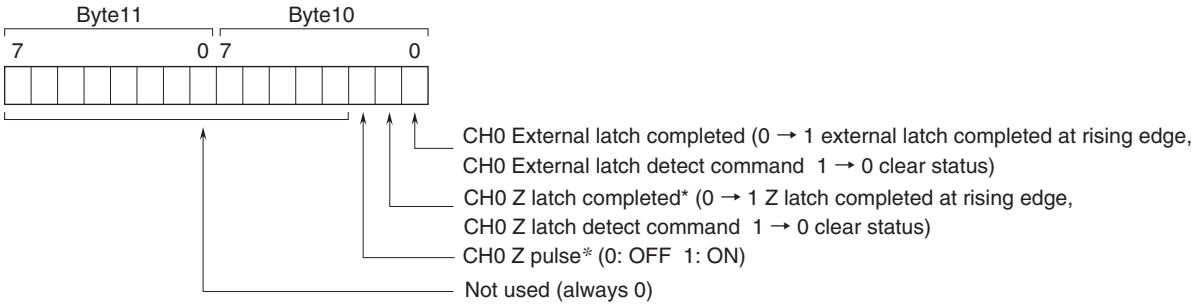
### ■ PULSE SPEED DATA



Speed data is represented in 16-bit binary. Negative value is represented in 2's complements.

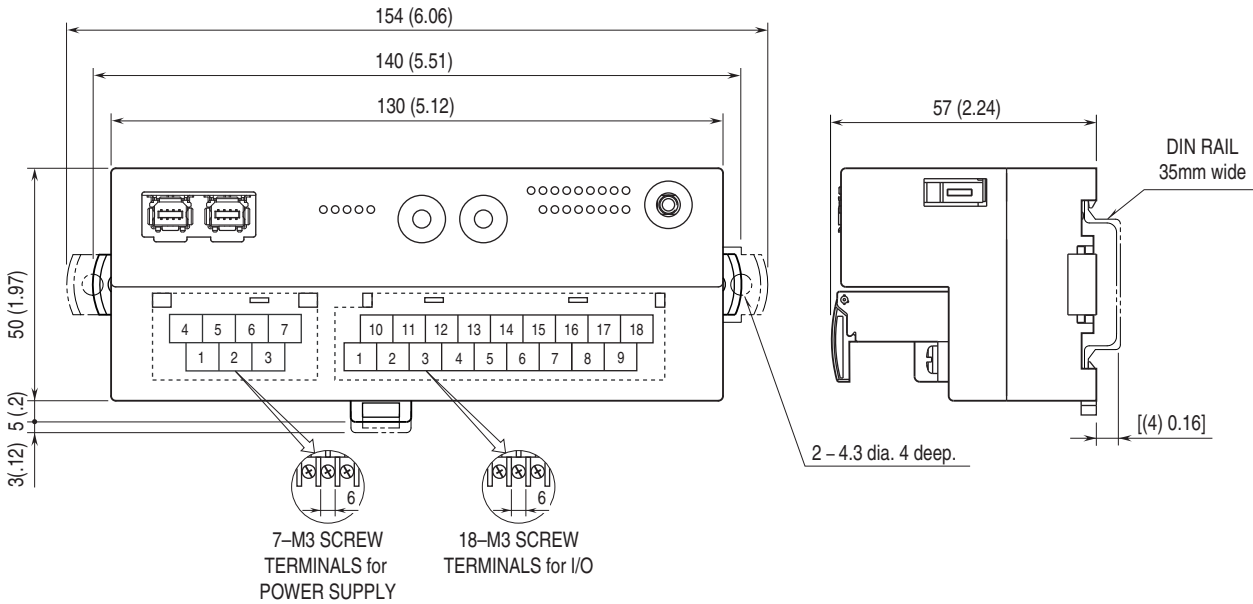
# MODEL: R7G4HML3-6-PA1

## ■ STATUS

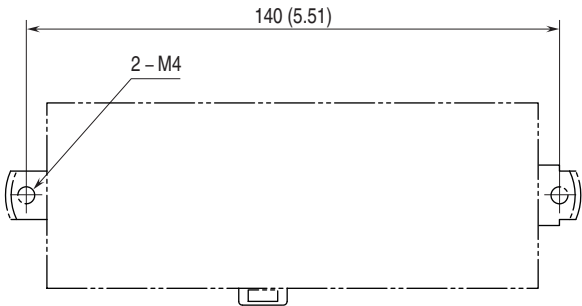


\* Available when the firmware version is V1.11 or later

## EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm (inch)



## MOUNTING REQUIREMENTS unit: mm (inch)



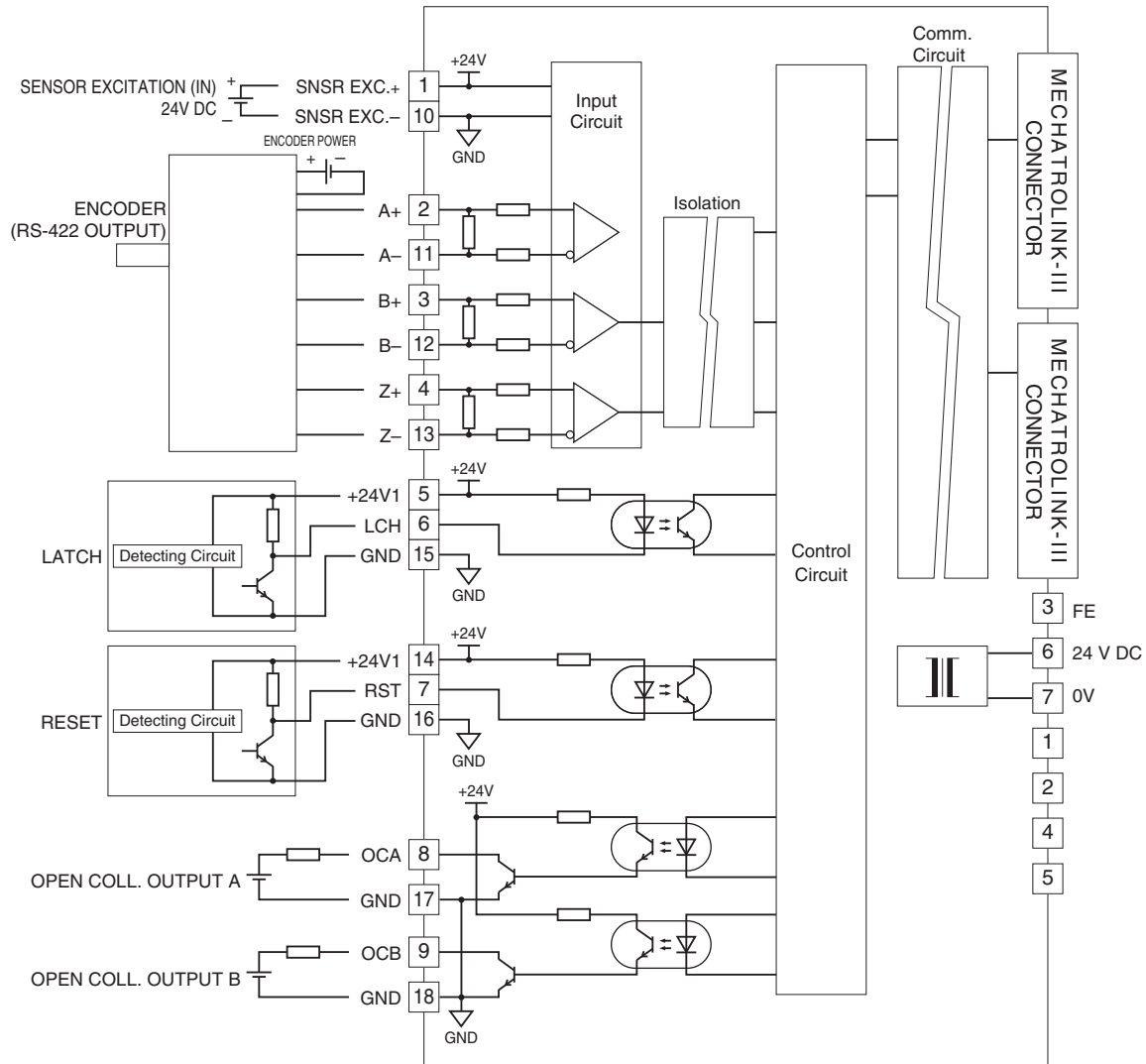


## SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

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

Caution: FE terminal is NOT a protective conductor terminal.

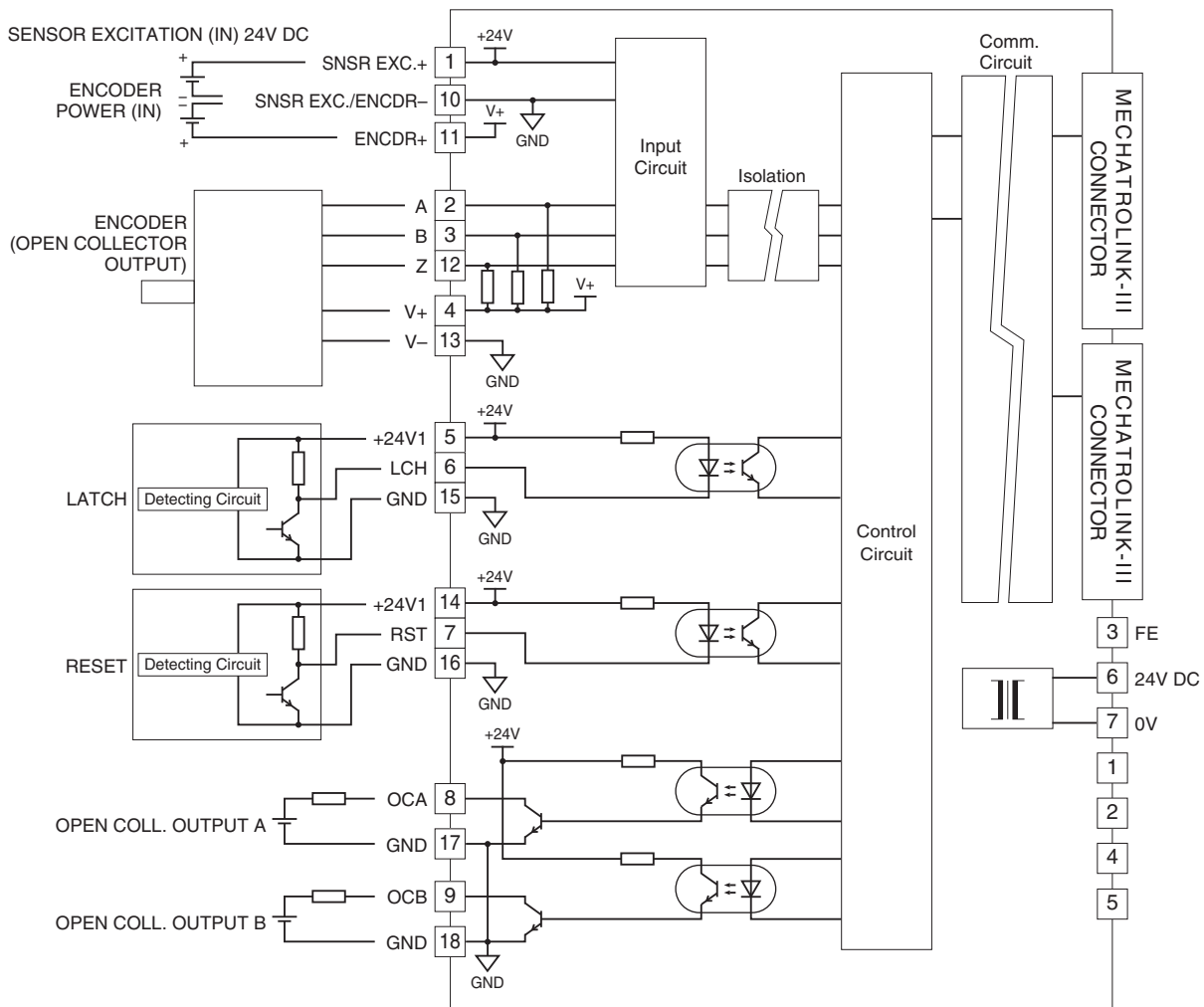
### ■ R7G4HML3-6-PA1J (RS-422 LINE DRIVER PULSE INPUT)



Note. For wiring of encoder input, use twisted pair cable with shield. Be sure to ground the shield.

# MODEL: R7G4HML3-6-PA1

## ■ R7G4HML3-6-PA1x (OPEN COLLECTOR INPUT)



Note. For wiring of encoder input, use twisted pair cable with shield. Be sure to ground the shield.



Specifications are subject to change without notice.