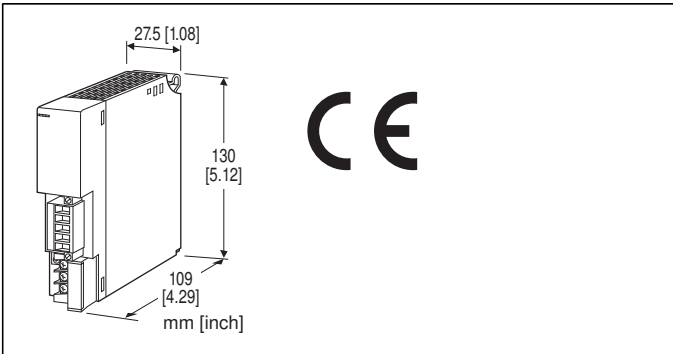


Remote I/O R3 Series

MODBUS INTERFACE MODULE



MODEL: R3-NM1-[1][2]

ORDERING INFORMATION

- Code number: R3-NM1-[1][2]
- Specify a code from below for each of [1] and [2].
(e.g. R3-NM1-R/CE/Q)
- Specify the specification for option code /Q
(e.g. /C01/SET)

[1] POWER INPUT

- N:** No power supply
AC Power
K3: 100 - 120 V AC
(Operational voltage range 85 - 132 V, 47 - 66 Hz) *
(CE not available)
L3: 200 - 240 V AC
(Operational voltage range 170 - 264 V, 47 - 66 Hz) *
(CE not available)
DC Power
R: 24 V DC
(Operational voltage range 24 V \pm 10 %, ripple 10 %p-p max.) *
- * Not selectable for use with independent power modules or network modules with the internal power input options.

[2] OPTIONS (multiple selections)

- Standards & Approvals
blank: Without CE
/CE: CE marking
Other Options
blank: none
/Q: Option other than the above (specify the specification)

SPECIFICATIONS OF OPTION: Q (multiple selections)

- COATING (For the detail, refer to our web site.)
/C01: Silicone coating
/C02: Polyurethane coating
/C03: Rubber coating
EX-FACTORY SETTING
/SET: Preset according to the Ordering Information Sheet
(No. ESU-8354)

PACKAGE INCLUDES...

- Terminating resistor (110 Ω , 0.25 W)

GENERAL SPECIFICATIONS

Connection

- Modbus:** Euro type connector terminal
(applicable wire size: 0.2 to 2.5 mm², stripped length 7 mm)
Internal bus: Via the Installation Base
(model: R3-BSx)
Internal power: Via the Installation Base (model: R3-BSx)
Power input, RUN contact output: M3 separable screw terminal (torque 0.5 N·m)
Screw terminal: Nickel-plated steel
Isolation: Modbus to internal bus or internal power to power input to RUN contact output to FG
Input error data: Input value setting at input module error with side DIP SW
Main/Sub switching control in dual communication mode: Selectable with the side DIP SW (refer to the manual)
Dual communication setting: Set with the side DIP switch
Data allocation setting: Set with the side DIP switch
RUN indicator: Bi-color (green/red) LED; Green ON in normal communication; Red ON when receiving data (Function selected with DIP SW)
ERR indicator: Bi-color (green/red) LED; Green blinking / ON (0.1 sec.) at communication or setting error; Red ON at transmitting data (Function selected with DIP SW)

■ RUN CONTACT OUTPUT

- **ON when RUN indicator is green (Modbus in normal communication)**
- Rated load:** 250 V AC @ 0.5 A ($\cos \theta = 1$)
30 V DC @ 0.5 A (resistive load)
(Less than 50 V AC to conform with EU Directive)
- Maximum switching voltage:** 250 V AC or 30 V DC
- Maximum switching power:** 250 VA or 150 W
- Minimum load:** 1 V DC @ 1 mA
- Mechanical life:** 2×10^7 cycles (300 cycles/min.)
When driving an inductive load, external contact protection and noise quenching recommended.

MODBUS COMMUNICATION

RS-485

Standard: Conforms to TIA/EIA-485-A

Transmission distance: 500 meters max.

Transmission media: Shielded twisted-pair cable
(CPEV-S 0.9 dia.)

Transmission setting: DIP switch (front)

Data: RTU (Binary) or ASCII

Parity: None, even or odd

Baud rate: 4800, 9600, 19.2 k, 38.4 k (bps)

Node address: Rotary switch; 01 - F7

INSTALLATION

Power consumption

•AC: Approx. 20 VA

•DC: Approx. 12 W

Current consumption (no power supply): 100 mA

Output current (power supply): 250 mA continuous at 20 V
DC; 400 mA for 10 minutes

Operating temperature: -10 to +55°C (14 to 131°F)

Operating humidity: 30 to 90 %RH (non-condensing)

Atmosphere: No corrosive gas or heavy dust

Mounting: Installation Base (model: R3-BSx)

Weight: 200 g (0.44 lb)

PERFORMANCE

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

Dielectric strength: 1500 V AC @ 1 minute (Modbus to
internal bus or internal power to power input to RUN contact
output to FG)

STANDARDS & APPROVALS

EU conformity:

EMC Directive

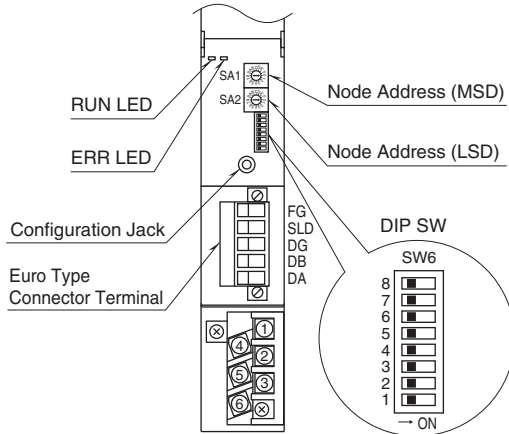
EMI EN 61000-6-4

EMS EN 61000-6-2

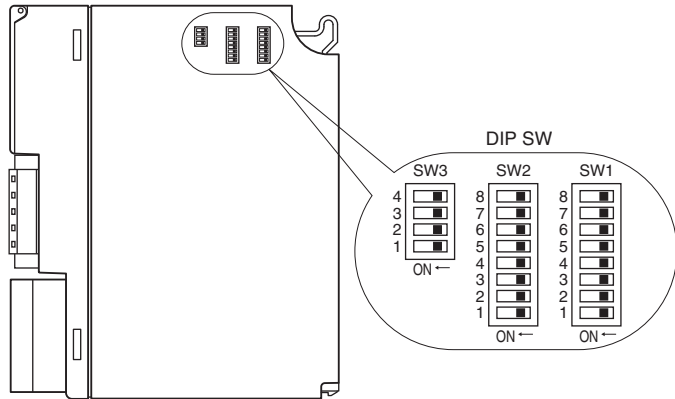
RoHS Directive

EXTERNAL VIEW

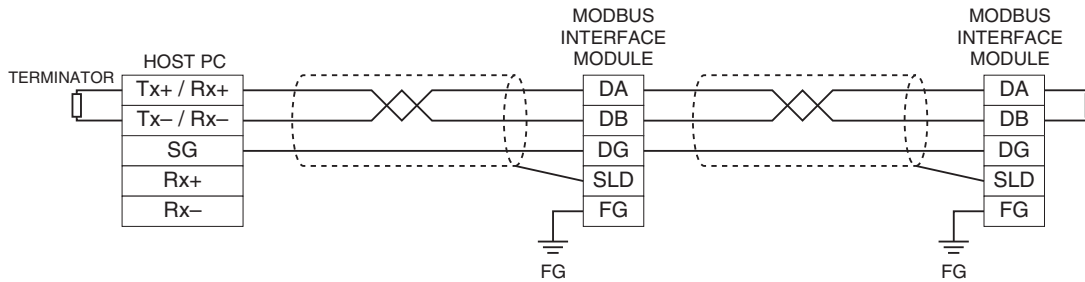
FRONT VIEW



SIDE VIEW



COMMUNICATION CABLE CONNECTIONS



MODBUS FUNCTION CODES & SUPPORTED CODES

■ Data & Control Functions

| CODE | NAME | | |
|------|---------------------------|---|---|
| 01 | Read Coil Status | X | Digital output from the slave (read/write) |
| 02 | Read Input Status | X | Status of digital inputs to the slave (read only) |
| 03 | Read Holding Registers | X | General purpose register within the slave (read/write) |
| 04 | Read Input Registers | X | Collected data from the field by the slave (read only) |
| 05 | Force Single Coil | X | Digital output from the slave (read/write) |
| 06 | Preset Single Register | X | General purpose register within the slave (read/write) |
| 07 | Read Exception Status | | |
| 08 | Diagnostics | X | |
| 09 | Program 484 | | |
| 10 | Poll 484 | | |
| 11 | Fetch Comm. Event Counter | X | Fetch a status word and an event counter |
| 12 | Fetch Comm. Event Log | X | A status word, an event counter, a message count and a field of event bytes |
| 13 | Program Controller | | |
| 14 | Poll Controller | | |
| 15 | Force Multiple Coils | X | Digital output from the slave (read/write) |
| 16 | Preset Multiple Registers | X | General purpose register within the slave (read/write) |
| 17 | Report Slave ID | X | Slave type / 'RUN' status |
| 18 | Program 884/M84 | | |
| 19 | Reset Comm. Link | | |
| 20 | Read General Reference | | |
| 21 | Write General Reference | | |
| 22 | Mask Write 4X Register | | |
| 23 | Read/Write 4X Register | | |
| 24 | Read FIFO Queue | | |

■ Exception Codes

| CODE | NAME | | |
|------|----------------------|---|--|
| 01 | Illegal Function | X | Function code is not allowable for the slave |
| 02 | Illegal Data Address | X | Address is not available within the slave |
| 03 | Illegal Data Value | X | Data is not valid for the function |
| 04 | Slave Device Failure | | |
| 05 | Acknowledge | | |
| 06 | Slave Device Busy | | |
| 07 | Negative Acknowledge | | |
| 08 | Memory Parity Error | | |

■ Diagnostic Subfunctions

| CODE | NAME | | |
|------|------------------------------|---|---|
| 00 | Return Query Data | X | Loop back test |
| 01 | Restart Comm. Option | X | Reset the slave and clear all counters |
| 02 | Return Diagnostic Register | X | Contents of the diagnostic data (2 bytes) |
| 03 | Change ASCII Input Delimiter | X | Delimiter character of ASCII message |
| 04 | Force Listen Only Mode | X | Force the slave into Listen Only Mode |

MODBUS I/O ASSIGNMENT

| | ADDRESS | DATA FORMAT | NAME |
|------------------------|-------------|-------------|--|
| Coil (0X) | 1 – 1024 | | Digital Output (discrete output) |
| | 1025 | | Main / Sub Switching Command (valid only with SW3-3 set to ON) |
| Inputs (1X) | 1 – 1024 | | Digital Input (discrete input) |
| | 1025 – 1040 | | Module Status |
| | 1041 – 1056 | | Error Status |
| | 1057 – 1072 | | Data Error Status |
| Input Registers (3X) | 1 – 256 | I | Analog Input |
| | 257 – 768 | F | Analog Input |
| Holding Registers (4X) | 1 – 256 | I | Analog Output |
| | 257 – 768 | F | Analog Output |

I : Integer, 0 – 10000 (0 – 100%)

F : Floating (32-bit data cannot be accessed using floating addresses.)

Note: DO NOT access addresses other than mentioned above. Such access may cause problems such as inadequate operation.

- Module Status indicates whether individual I/O modules are mounted or not. The bit corresponding to the mounted slot turns to “1,” and the unmounted slot to “0.”

- Error Status indicates error status for each module as described below. The bit corresponding to such module turns to “1.”

R3-TSx, R3-RSx, R3-US4: Input burnout

R3-DA16A: Power input in error or disconnected

R3-YSx: Output current error (e.g. load unconnected)

R3-PC16A: External power supply in error or disconnected

- Data Error Status indicates overrange (R3-US4: out of -10% to +110%; the other types: out of -15% to +115%) status for each module. The bit corresponding to such module turns to “1.”

- Main / Sub Switching Commands given to the network modules result as follows:

| MAIN' MODULE | 'SUB' MODULE | OUTPUT MODE |
|--------------|--------------|---|
| 1 | 0 | Main bus is used; Red light turns on at RUN LED of the I/O modules. |
| 0 | 1 | Sub bus is used; Green light turns on at RUN LED of the I/O modules. |
| 1 | 1 | Main bus is used; Amber light turns on at RUN LED of the I/O modules. |
| 0 | 0 | Output is invalid; RUN LED of the I/O modules turns off. |

TRANSMISSION DATA DESCRIPTIONS

The DIP SW located at the side of the module specifies each I/O module's data allocation (occupied data area).

For example, when the data areas are assigned as shown below:

| | |
|----------|---|
| Module 1 | 4 |
| Module 2 | 4 |
| Module 3 | 4 |
| Module 4 | 1 |
| Module 5 | 1 |
| Module 6 | 1 |
| Module 7 | 1 |

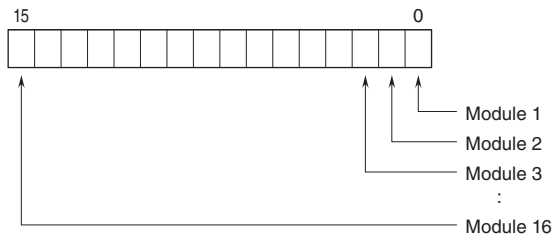
Then the I/O data are assigned as in the table below:

| | ADDRESS | POSITION | | ADDRESS | POSITION |
|------------------------|---------|-----------|--------------------------|-----------|----------|
| Input Registers (3X) | 1 – 4, | 257 – 264 | Coil (0X) Inputs (1X) | 1 – 64 | Slot 1 |
| Holding Registers (4X) | 5 – 8, | 265 – 272 | | 65 – 128 | Slot 2 |
| | 9 – 12, | 273 – 280 | | 129 – 192 | Slot 3 |
| | 13, | 281 – 282 | | 193 – 208 | Slot 4 |
| | 14, | 283 – 284 | | 209 – 224 | Slot 5 |
| | 15, | 285 – 286 | | 225 – 240 | Slot 6 |
| | 16, | 287 – 288 | | 241 – 256 | Slot 7 |

For Coil (0X) and Inputs (1X), addresses 16 times assigned data areas (Data Allocation Type) are allotted with the Data Allocation Type '1' and '4.' With '8' and '16,' 64 (4 × 16) are automatically allotted.

MODULE STATUS, ERROR STATUS, DATA ERROR STATUS

Shows each module's availability and error status.



I/O DATA DESCRIPTIONS

The data allocations for typical I/O modules are shown below.
Refer to the manual for each module for detailed data allocations.

■ ANALOG DATA (16-bit data, models: R3-SV4, YV4, DS4, YS4, US4, etc.)

16-bit binary data.

Basically, 0 to 100% of the selected I/O range is converted into 0 to 10000 (binary).

-15 to 0 % is a negative range represented in 2's complement.

In case of R3-US4, -10 to 0% is a negative range represented in 2's complement.



■ TEMPERATURE DATA (16-bit data, models: R3-RS4, TS4, US4, etc.)

16-bit binary data.

With °C temperature unit, raw data is multiplied by 10. For example, 25.5°C is converted into 255.

With °F temperature unit, the integer section of raw data is directly converted into the data.

For example, 135.4°F is converted into 135.

Minus temperature is converted into negative values, represented in 2's complements.



■ ANALOG DATA (16-bit data, models: R3-CT4A, CT4B, etc.)

16-bit binary data.

Integer obtained by multiplying unit value (A) by 100.

In case of CLSE-R5, integer obtained by multiplying unit value (A) by 1000.



■ ACCUMULATED COUNT DATA (32-bit data, models: R3-PA2, PA4A, WT1, WT4, etc.)

32-bit binary data is used for accumulated counts and encoder positions.

Lower 16 bits are allocated from the lowest address to higher ones, higher 16 bits in turn.

32-bit data cannot be accessed using floating addresses.

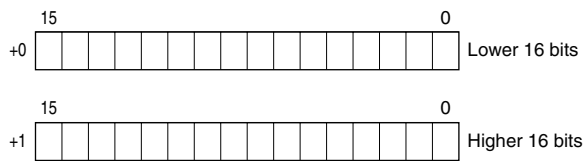


■ BCD DATA (32-bit data, models: R3-BA32A, BC32A, etc.)

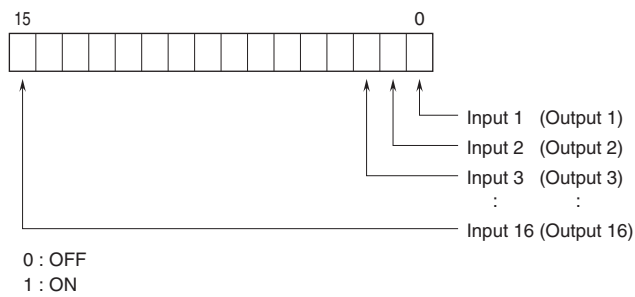
32-bit binary data is used for BCD.

Lower 16 bits are allocated from the lowest address to higher ones, higher 16 bits in turn.

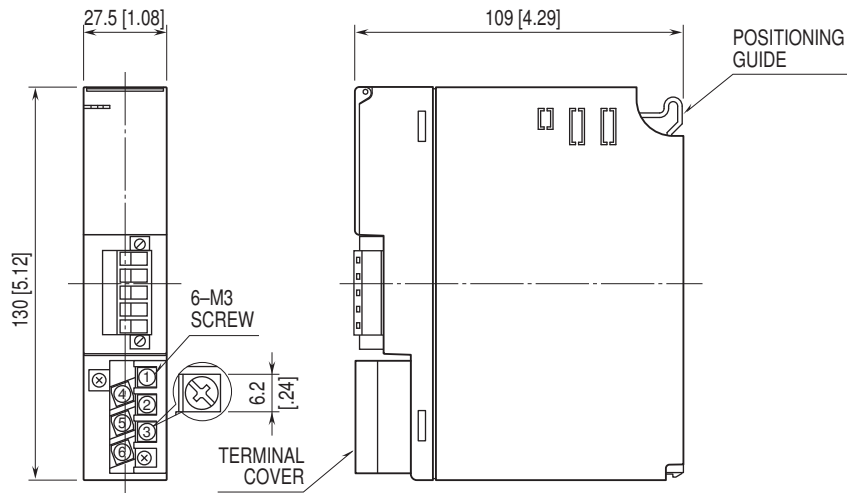
32-bit data cannot be accessed using floating addresses.



■ 16-POINT DISCRETE DATA (models: R3-DA16, DC16, etc.)



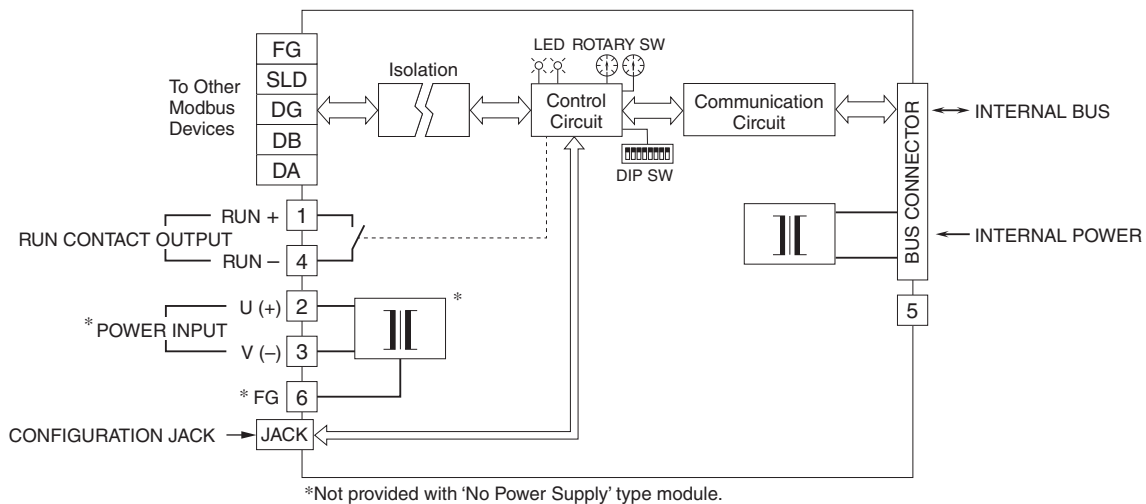
EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm [inch]



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.



Specifications are subject to change without notice.