Magnescale

EtherCAT Interface Module

MG80-EC

Read all the instructions in the manual carefully before use and strictly follow them.
Keep the manual for future references.

Operating Manual

Contents

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- This software has been confirmed to operate with Windows 10 version 20H2.
  Operation is not guaranteed with regards to future Windows 10 updates.

1. Introduction

EtherCAT (Ethernet Control Automation Technology) is a high-performance industrial network system based on Ethernet system and realizes faster and more efficient communications.
Each node achieves a short communications cycle time by transmitting Ethernet frames at high speed.
Furthermore, even though EtherCAT is a unique protocol, it utilizes standard Ethernet technology for the physical layer, which provides excellent general-purpose applicability such as the ability to use Ethernet cables. This enables to fully utilize the effectiveness of EtherCAT not only in large control systems that require high processing speeds and system integrity, but also in small and medium control systems.

1.1. Features of EtherCAT

- Extremely high-speed communications with speed of 100 Mbps

It dramatically shortens the I/O response time from generation of input signals to transmission of output signals. By fully utilizing the optimized Ethernet frame bandwidth to transfer data using a high-speed repeat method, it is possible to efficiently transmit a wide variety of data.

- Extremely High Compatibility with Ethernet

EtherCAT is an open network with extremely high compatibility with conventional Ethernet systems.

1.2. Communications Types of EtherCAT

EtherCAT provides the following two types of communication functions.

- Process data communications functions (PDO communications)

This communication function is used to transfer process data in real time in a fixed-cycle.
By mapping logical process data space to each node by the EtherCAT master unit, it achieves fixed-cycle communications among the EtherCAT master unit and slave units.

➢ Mailbox communications functions (SDO communications)

It refers to message communications.

At any timing, the EtherCAT master unit transmits commands to slave units and the slave units return responses to the EtherCAT master unit.

It performs the following data communications:

- Read and write process data
- Make slave unit setting
- Monitor slave unit state

PDO communications constantly update the data every communication cycle on EtherCAT, and SDO communications are processed in between those updates.

1.3. **Configuration Elements of EtherCAT Network**

The overview of each configuration device is as follows:

➢ EtherCAT master unit

Administers the EtherCAT network, monitors the state of slave units, exchanges I/O data with slave units.

➢ EtherCAT slave unit

Outputs data received from the EtherCAT master unit through the EtherCAT network, or sends input data to the EtherCAT master unit through the EtherCAT network.

There are Digital I/O slave unit and Analog I/O slave unit. The MG80-EC is also classified as a EtherCAT slave unit.

➢ Configuration tool

It is a PC software for making setting of the EtherCAT network and each slave unit.

It can be used either by connecting to the EtherCAT master unit or as a substitute of the EtherCAT master unit.

➢ Communications cable

Uses cables of Ethernet category 5 (100BASE-TX) or higher, with double-shield (aluminum tape and braided shielding), which are connected straight.

➢ ESI (EtherCAT slave information) file

Describes information specific to EtherCAT Main modules in XML format unit.

You can make various setting such as the allocate slave unit process data by loading file.

- Unit power supply

Provides power for communications of each slave unit and internal operations.
Separate them from the I/O power supply when wiring.

- I/O power supply

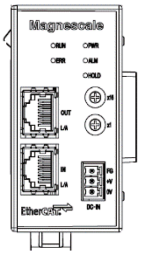
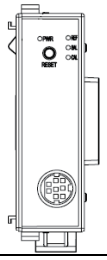
Provides power for input/output operations of external devices connected to slave units.
Separate from unit power supply when wiring.

2. Basic Information

The MG80-EC is a communications slave unit that processes EtherCAT communications between measuring units and a PLC to monitor the measured values, write parameters, and operate the measuring units.
The PDOs in EtherCAT communications can be used to monitor the measurement values without any programming. The SDOs provide the ability to read and write to any specified parameter.

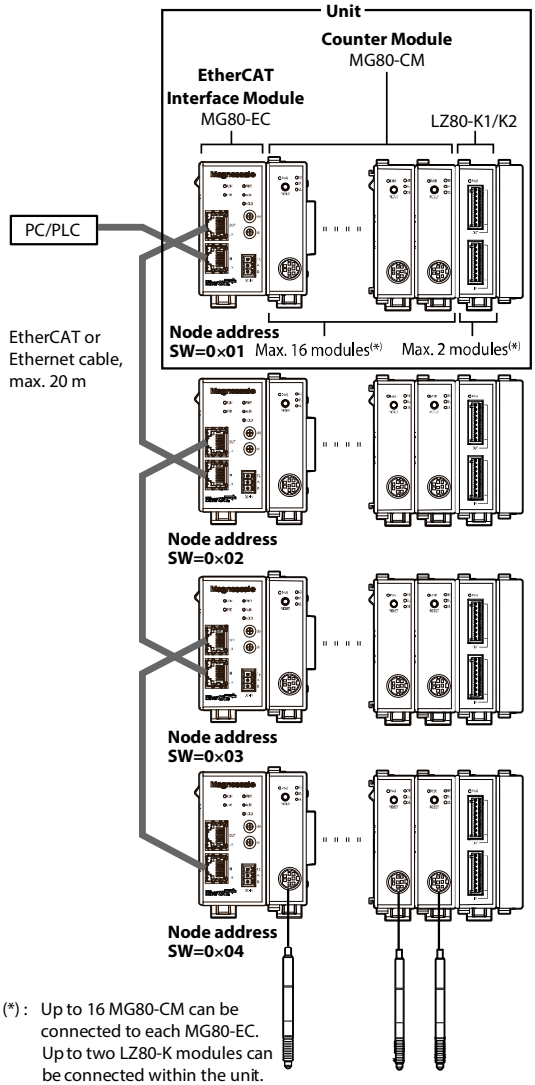
2.1. Equipment Used

The devices used when configuring a slave-side system with the MG80-EC are shown below.

Name	Description	Image
MG80-EC	EtherCAT interface unit Main module	
MG80-CM	Counter module	
DK800S series	Measuring unit DK805S/DK812S/DK830S	
DK series	Measuring unit DK10/25/50/100	
DT series (via MT13)	Measuring unit DT12/32/512	

2.2. **System configuration**

The MG80-EC can be connected to a counter module MG80-CM for connecting a measuring unit, and an I/O module LZ80-K1/K2 that can control the operation and outputs of the constituent units using external signals.



- Connect the measuring unit DK series to the MG80-CM.
- Measuring unit numbers are assigned automatically starting from 1 in order from the unit closest to the MG80-EC.
- For EtherNet/IP or Ethernet connection, prepare a shielded cable with a RJ-45 (8P8C) connector (straight connection).

3. Setting

3.1. Download of setting application and ESI file

1. Access to Magnescale Web (https://www.magnescale.com)
   「Products」
   →「Digital Gauge」
   →「Interface」
   →「MG80-NE/EI/PN/EC MG80-CM」
   →「Software」
   Download the Setting application from “Setting application for Windows PC”

   As above,
   download the ESI file from “Setting file.”
   The ESI file can be used regardless of the PLC manufacturer and the number of axes used.

2. Save the file in an appropriate location and extract it with decompression software.

3.2. About I/O data

When the ESI file is imported into the development environment, the I/O data is handled as Byte array data. Please refer to “6. EtherCAT communication” for I/O data mapping.

3.3. Setting various parameters

Various settings of MG80-EC can be performed from PC by using
“Setting application for Windows PC”

3.3.1. Connection

1. Preparation of "Setting application for Windows PC"
   Please place the downloaded "MG80SettingTool.exe" file in an arbitrary location.

2. Set the IP address and subnet mask of the PC on which the “Setting application for Windows PC” was downloaded.

   IP address : 192.168.100. XXX※1

   Subnet mask : 255.255.255.0

※1 Address that cannot be set to XXX

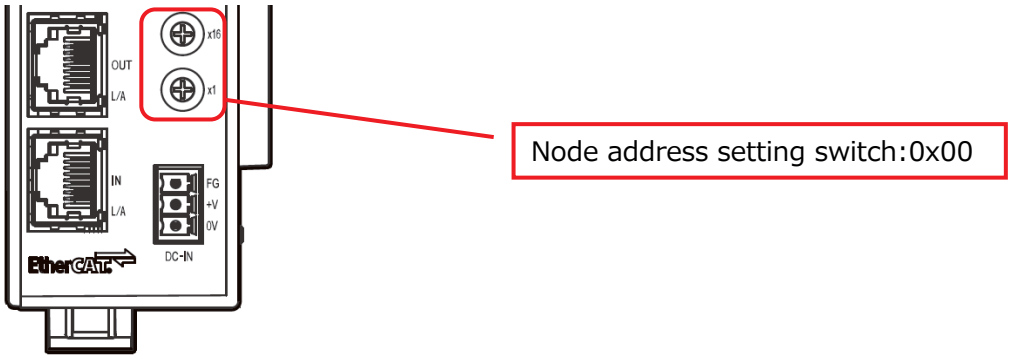
・“1” that is used when setting with the MG80-EC.

・Same address as other connected devices.

3. Set the node address setting switch on the MG80-EC to “0x00” to enter the setting mode and enable communication with the computer.
   In this case, the IP address is fixed to the following.

   IP address : 192.168.100.1

   Subnet mask : 255.255.255.0

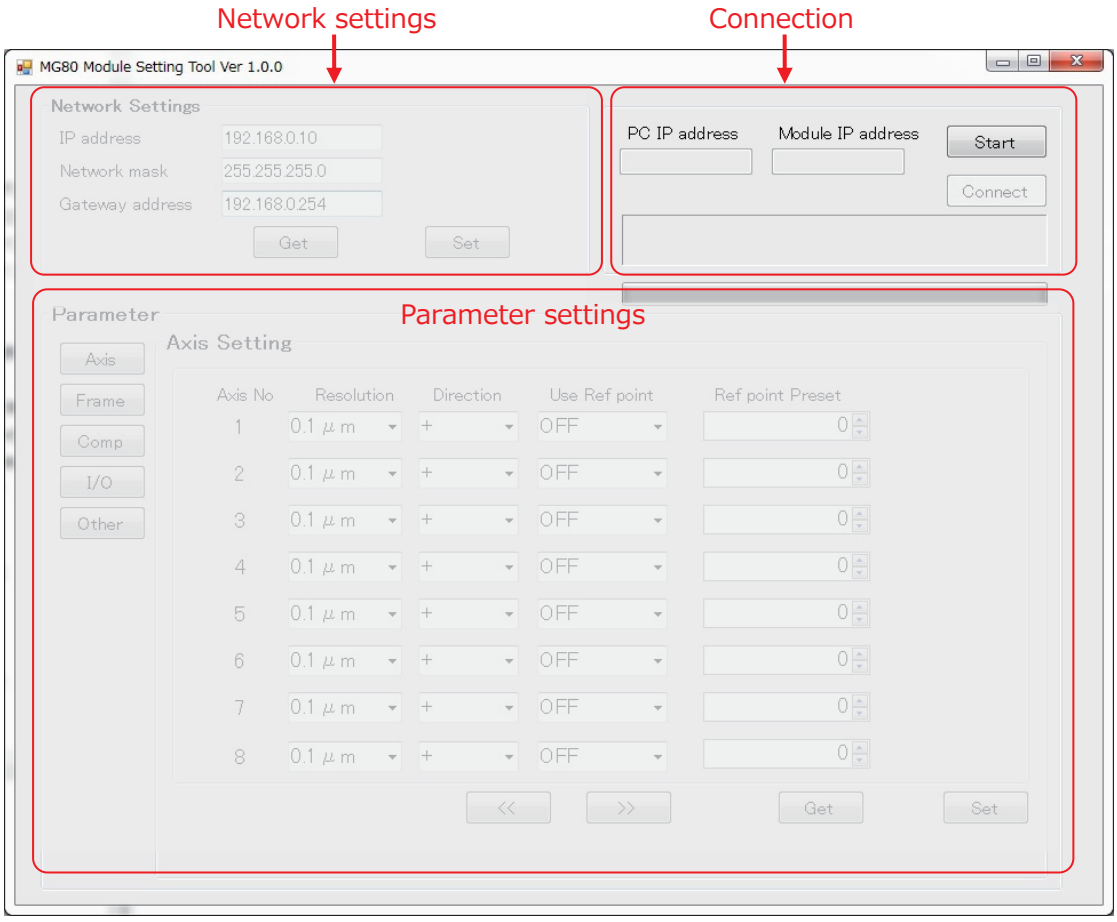


4. Connect the PC which “Setting application for Windows PC”” is installed and MG80-EC directly with Ethernet cable. Connect the power supply and turn on the MG80-EC.
   * The “Setting application for Windows PC” can be used when connected to either the IN side or OUT side port.

5. Click "MG80SettingTool.exe" on the PC on which "Setting application for Windows PC " is installed to start the application.

3.3.2. Setting method

Set the various operation parameters using the “Setting application for Windows PC.” When the “Setting application for Windows PC (MG80SettingTool.exe)” is started, the following screen appears.



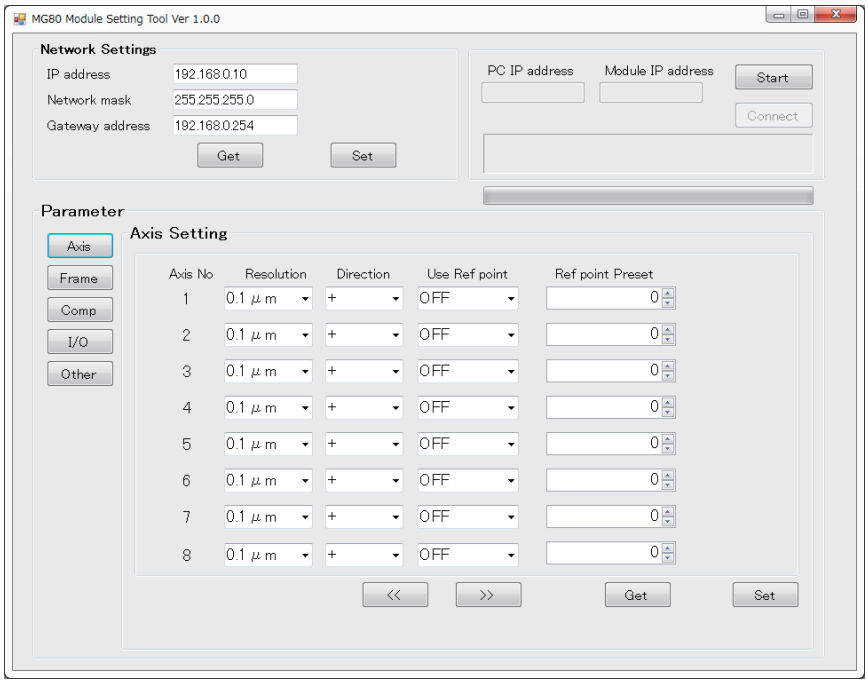
* The network settings are not used with the MG80-EC.

Follow the steps below to connect to the setting application for Windows PC.

① Click the Start button at the top right of the setting application.

② Click the Connect button at the top right of the setting application.

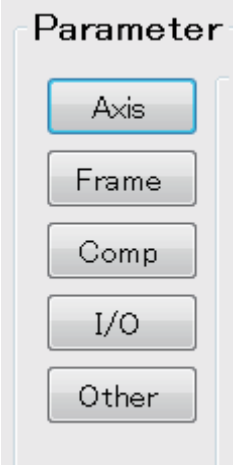
③ If the connection is successful, the network setting field and parameter setting field become valid.



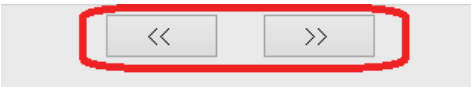
* If the connection fails, turn off the power of the MG80-EC and start again from the setting application.

3.3.2.1. Measurement parameter setting

Check that the following parameter setting fields are active.
* If not, redo the connection procedure described in the previous section.

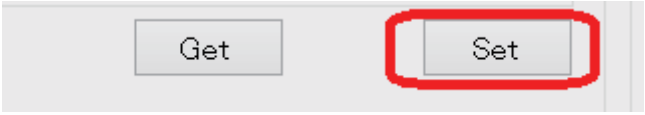


If there are multiple pages on each parameter screen, switch pages by cliking the page forward buttons.



After setting the parameters on each parameter screen, click the “Set” button at the bottom of the screen to send and save the parameters to MG80-EC.

Note)　If you do not click the “Set” button, it will not be saved in MG80-EC, so be sure to execute it on each screen.

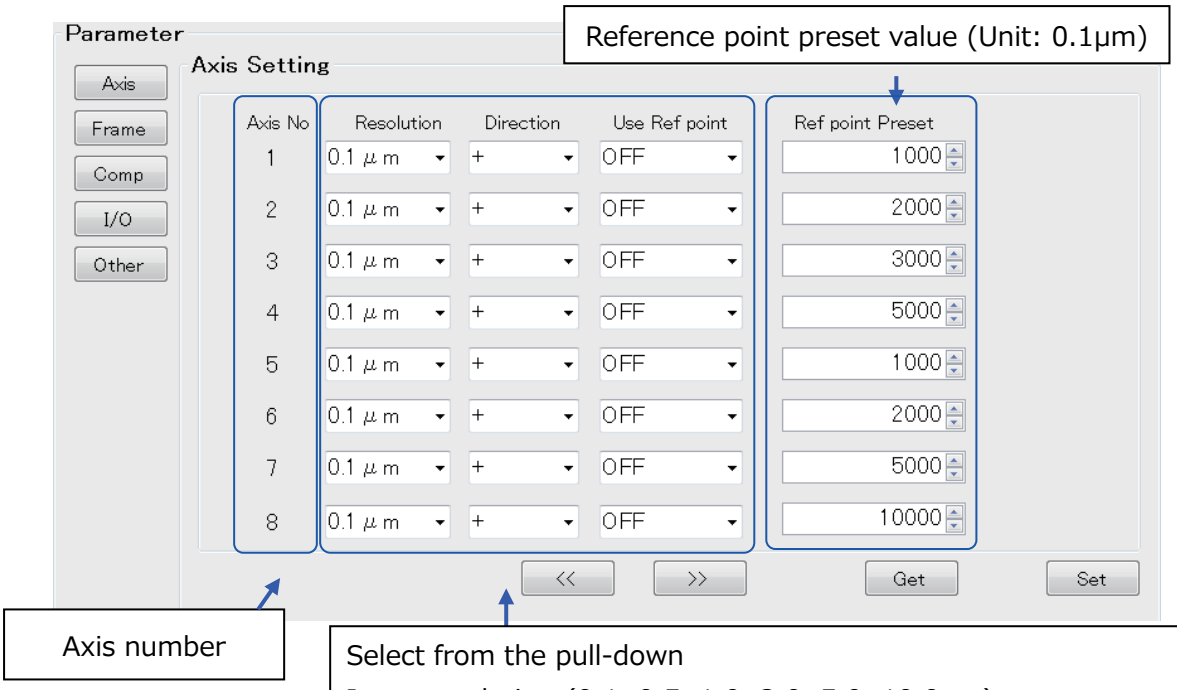


By cliking the “Get” button at the bottom of each parameter screen, you can get the parameters currently saved in MG80-EC.

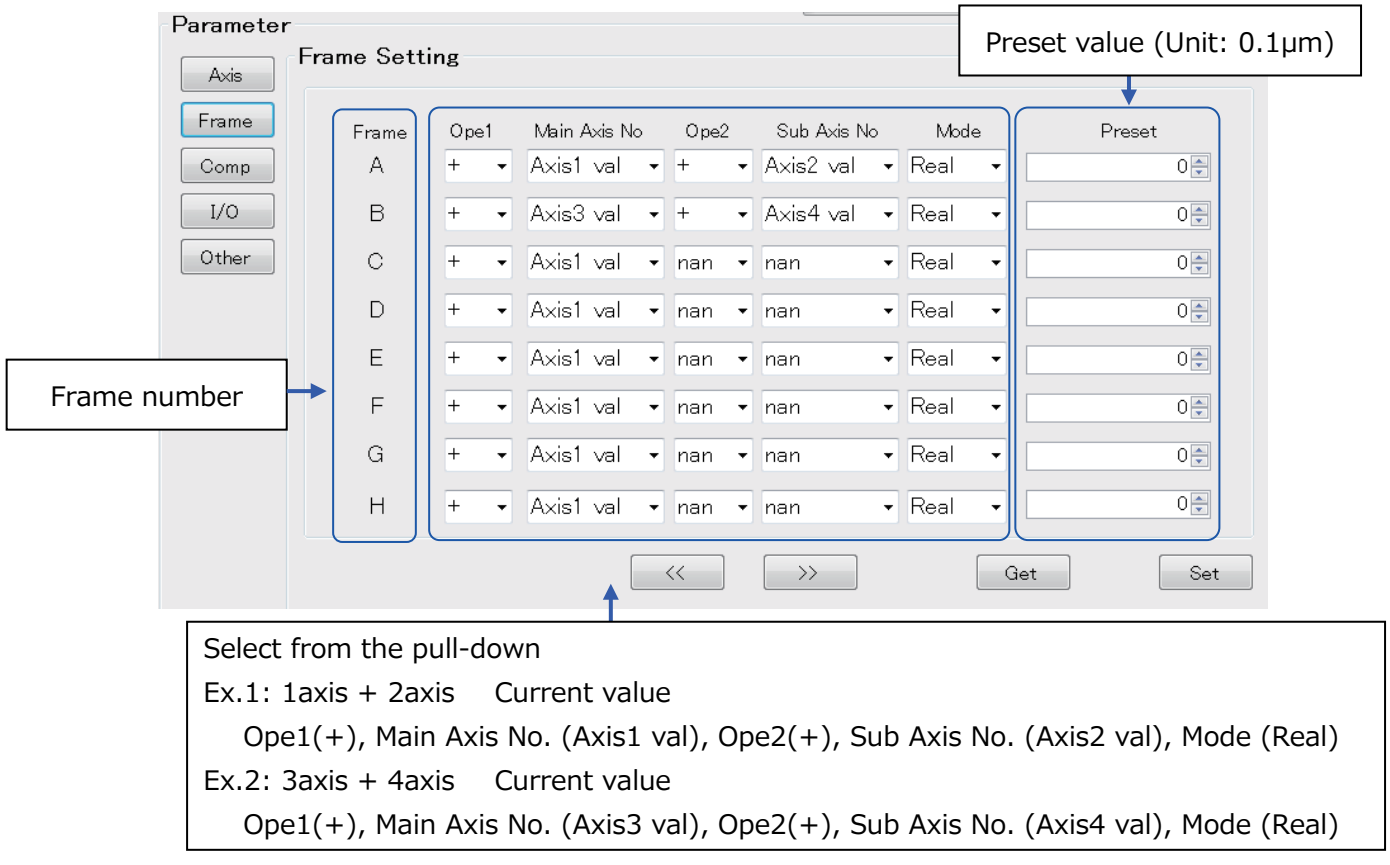
Setting items

No	Setting item (Parameter name)	Contents
1	Axis (Axis Setting)	Setting of input resolution, direction, reference point, and master preset value for each axis.
2	Frame (Frame Setting)	Addition and subtraction function, output mode, preset value setting for each frame
3	Comp (Comparator Setting)	Comparator threshold setting, number of step mode, setting of comparator use group number for each frame.
4	I/O (I/O Setting)	Function setting for each bit of I/O module input or output terminal
5	Other (Other Setting)	Settings for items other than the above items.

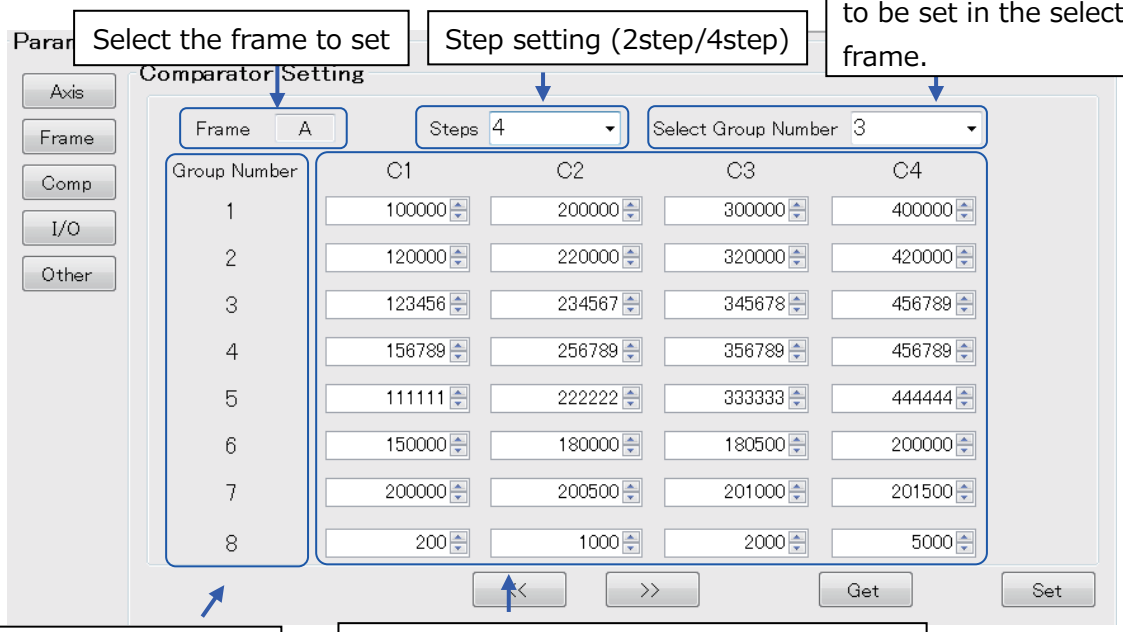
(1) Axis Setting screen



(2) Frame Setting screen



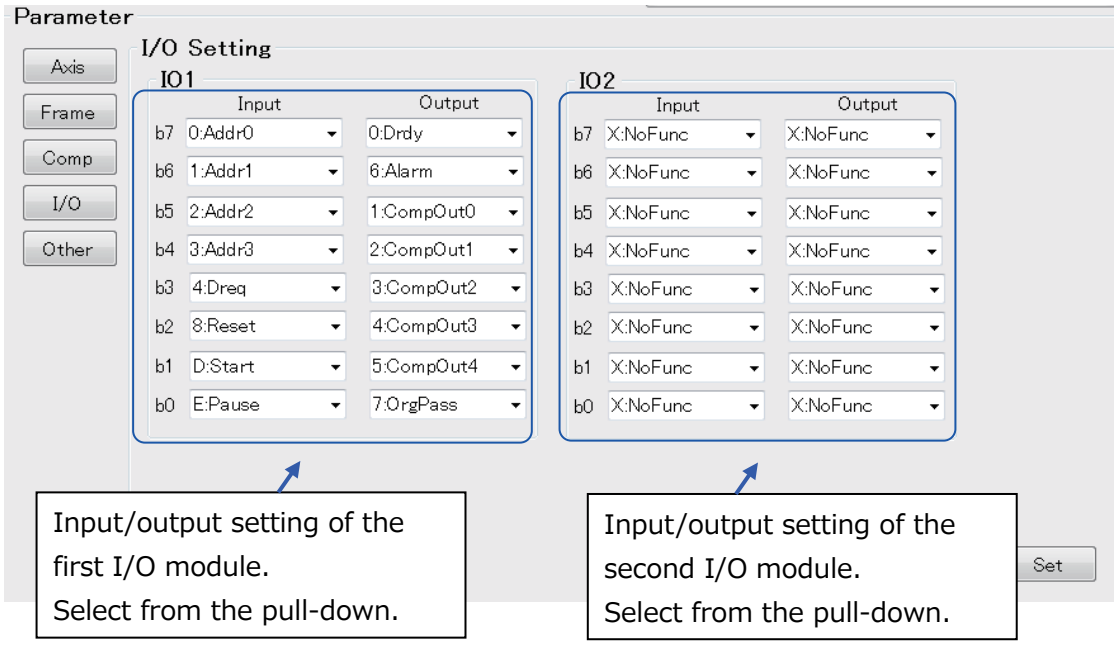
(3) Comparator Setting screen



Group number of comparator settings

Comparator setting
Use the spin button or the numeric keys to enter the values.
(Unit: 0.1μm)

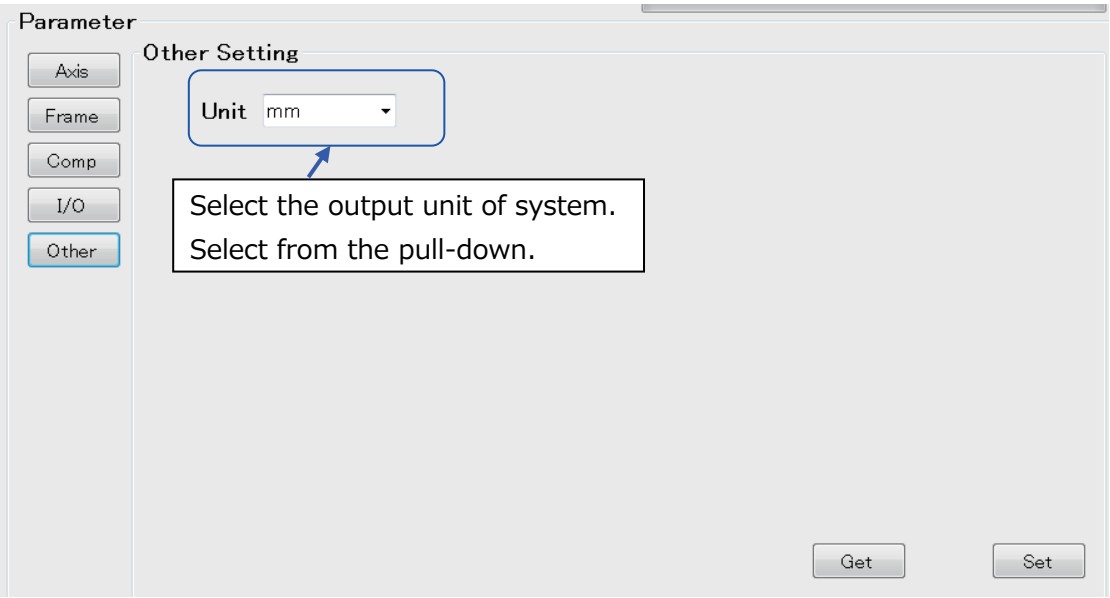
(4) I/O Setting screen



Input/output setting of the first I/O module.
Select from the pull-down.

Input/output setting of the second I/O module.
Select from the pull-down.

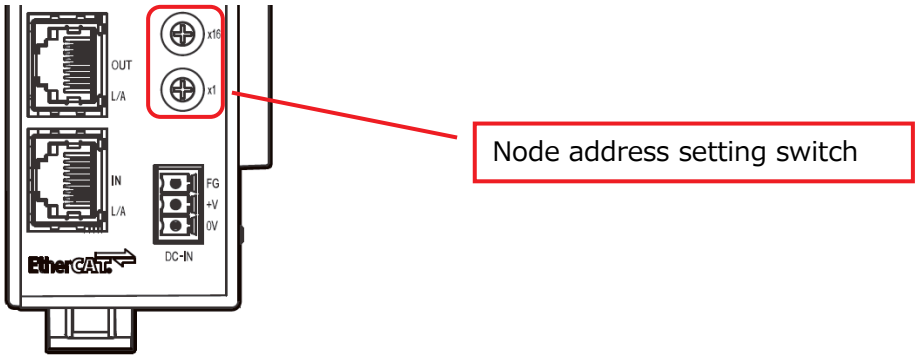
(5) Other Setting screen



3.3.3. Restart MG80-EC

1. After setting and saving all parameters, turn off the power.

2. Set the node address to be used in EtherCAT communications with the node address setting switch on the MG80-EC.



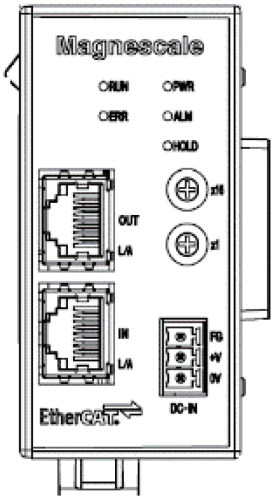
3. Restart the power to operate with the set parameters.

3.3.4. Starting EtherCAT Communications

For the procedure for starting EtherCAT communications, refer to the manual of the EtherCAT master unit.
Use the ESI file downloaded as described in “3.1 Download of setting application and ESI file.”

4. Specifications

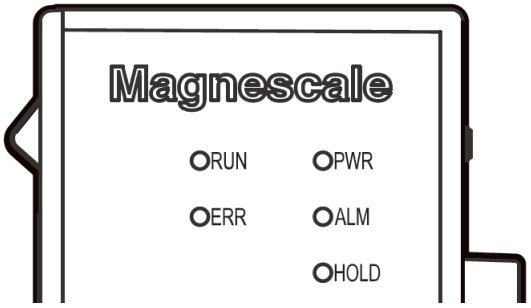
4.1. Interface specifications



Item			Specifications
Switch and Indication	Switch	Node address setting	Setting switch×2 pcs. (Hexadecimal output 8bit) Setting value: 0x00 — Setting mode. IP address is fixed to 192.168.100.1 Setting value: 0x01 to 0xFF — Operates in Operation mode. The node address is the setting value converted to decimal notation. However, when 0xFF is set, the node address is the value written in the EEPROM inside the MG80-EC. For the method of writing the node address value, refer to the manual of the EtherCAT master unit.
	Indication	LED lamp status	Refer to 4.2 LED indicator
Communi-cation I/F	LAN connector		RJ-45×2（100BASE-TX） Shielded cable.
		EtherCAT communication	・Transmits the measurement values, error information, and calculation results to the host device. ・ Receives instructions such as operation parameter changes from the host device. ・ The communication standard is the EtherCAT standard.
		TCP/IP communication	・ When the node address setting switch is set to “0x00,” the IP address is fixed to 192.168.100.1 and the mode becomes the Setting mode for communication by TCP/IP. In Setting mode, the operation parameters and IP address can be set using the “Setting application for Windows PC.”
Power	FG ×1 +V ×1 0V ×1	Terminal×1 (3 pole)	All modules and measuring units connected to MG80-EC are supplied from this power supply terminal.

4.2. **LED indicator**

The definition of LED display is described below.



[PWR] Power LED : Displays the operation status of this module.

Color	Status	Contents
Green	Turns off	Power off
	Lights up	Ready for operation after power on

[ALM] Alarm LED : Displays the alarm status of all modules.

Color	Status	Contents
Red	Turns off	Normal operation
	Lights up	Lights when an alarm occurs on any module.

[HOLD] Hold LED : Displays Hold status.

Color	Status	Contents
Orange	Turns off	All count data is released from hold.
	Lights up	Any count data is in hold status.

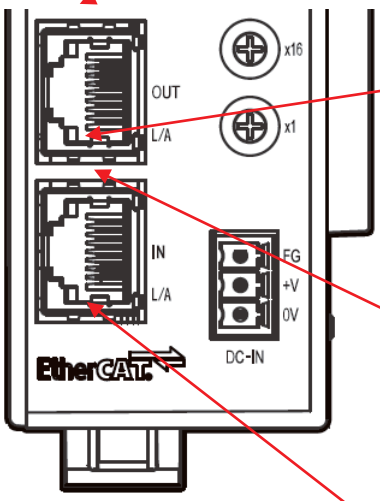
[RUN] RUN LED : Displays the RUN status according to the EtherCAT standard.

Color	Status	Contents
Green	Turns off	Power off or Init state
	Blinking	Pre-Operational state
	Single flash	Safe-Operational state
	Lights up	Operational state

[ERR] ERR LED : Displays the error status according to the EtherCAT standard.

Color	Status	Contents
Red	Turns off	No error
	Blinking	Illegal setting
	Single flash	Unrequested status change
	Double flash	Application WDT timeout
	Flickering	Boot error
	Lights up	PDO WDT timeout

Communication port status confirmation LED



Displays the link status of the communication port (OUT).

Color	Status	Contents
Green	Turns off	Link not established
	Lights up	Link established

[L/A]: Displays the EtherCAT standard link status of the communication port (OUT).

Color	Status	Contents
Green	Turns off	Link not established
	Lights up	Link established
	Blinking	In operation after establishing link.

Displays the link status of communication port (IN)

Color	Status	Contents
Green	Turns off	Link not established
	Lights up	Link established

[L/A]: Displays the EtherCAT standard link status of the communication port (IN).

Color	Status	Contents
Green	Turns off	Link not established
	Lights up	Link established
	Blinking	In operation after establishing link.

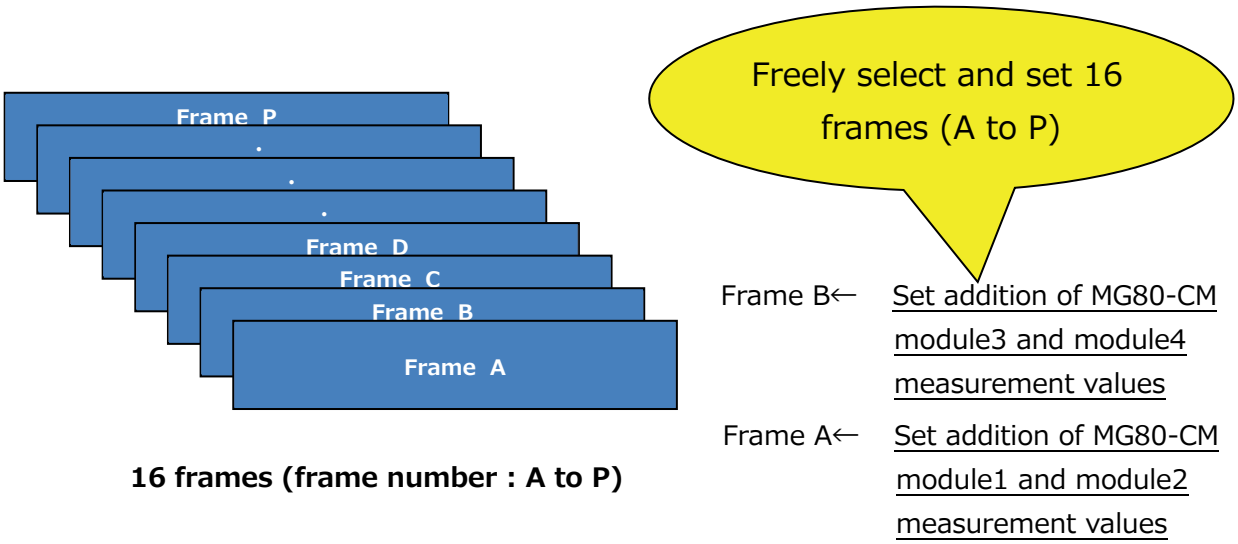
5. Function

5.1. Functions list

Item / Condition	Contents
Module configuration	
Number of connectable modules	Counter module MG80-CM : From 1 to 16units (Measuring unit 1 to 16 axes) I/O module LZ80-K1/K2 : Max. 2units
Resolution	
Measuring unit Input resolution	0.1μm/0.5μm/1μm/2μm/5μm/10μm
Data that can be output simultaneously	1 to 16 frames (1 axis to 16 axes when set to single axis)
Data capture capability	Max. 8000 data/s. * 16-axis data/2 ms
Peak hold function	Calculate maximum value, minimum value, peak to peak value of each frame
	Hold updating peak value during pause period
	Start recalculation of peak value by start
Output data type	
Single axis	Current value, maximum value, minimum value, peak to peak value of each axis
Addition and subtraction function	Current value, maximum value, minimum value, peak to peak value of 2-axis add/sub
Comparator	Compare the measurement data of each frame※ and output the comparator result.
Number of steps	2 steps/4 steps
Number of groups	8 groups
Reset	Reset count value to zero
Reference point	When using the reference point of the measuring unit, set the reference point position is use as the reference value
Preset	Rewrite the current value of frame to the set value.
Master preset	Set the value to be used as the master when setting the reference point. Reproduce the position as an absolute value by passing through the reference point after the power is restarted.
I/O module	The specified function can be assigned to each terminal of the I/O module. Perform the operation according to the assigned terminal function.

5.2. **Frame definition**

A frame is a constituent unit that can be used as an output value by freely selecting the calculated value, current value, peak to peak value, maximum value, and minimum value.
Up to 16 frames can be set for each unit (maximum connection configuration: MG80-EC x1, MG80-CM x 16, LZ80-K1/K2 x2).
Each of the 16 frames is called a frame number from A to P.
Each frame can be read as PDO communication of EtherCAT.
By setting the output value for each frame in advance, it can be read at any time during measurement.
The following is a setting example.



16 frames (frame number : A to P)

The contents to be output can be freely selected and set in one frame.
The frame setting method can be set as various operation parameters in the Setting application for Windows PC.
The frame can be set freely from 1 to 16 regardless of the number of MG80-CM connections.
For example, the same set contents can be set in multiple frames.

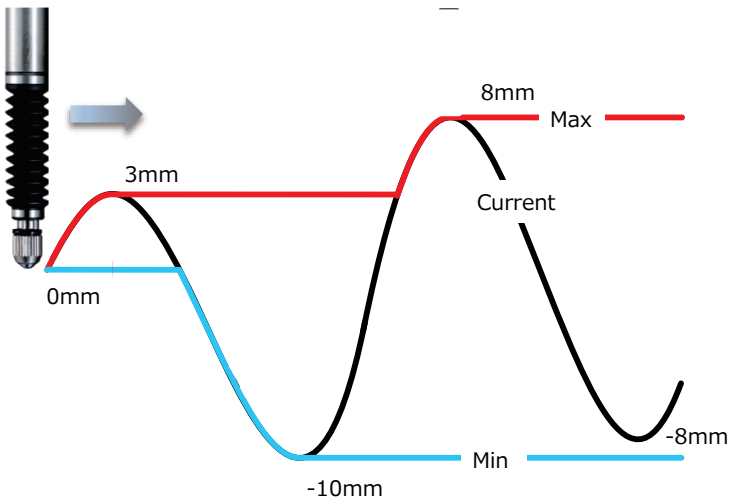
(Note)

- Calculations between different frames, such as adding frame A and frame B, cannot be performed.
- The calculation function can be used only in one unit (MG80-CM connected to MG80-EC).

5.3. **Detail of function**

5.3.1. Peak hold

The peak value (maximum value, minimum value, peak to peak value) of each frame is always retained.
An example of calculating the peak value is shown below.
When the measuring unit moves from left to right as shown below, the black line is the current value, red line is max. value and blue line is min. value.



Output
Max → 8mm
Min → -10mm
P-P → 18mm

Operation examples of Peak hold

Peak values are updated to satisfy the following formula, and stored in the RAM.

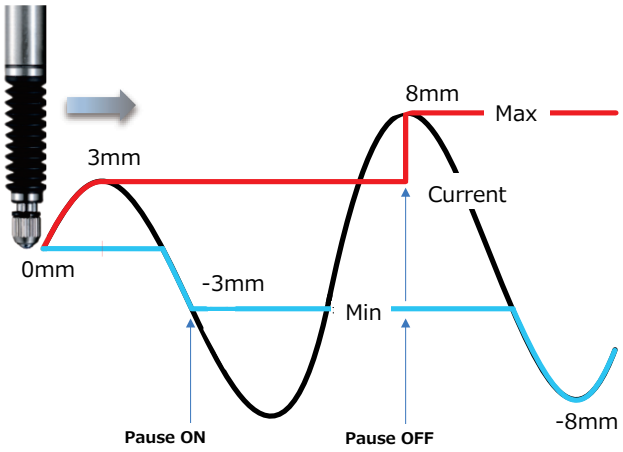
Minimum value ≦ Current value ≦ Maximum value

Peak to peak value＝Maximum value－Minimum value

5.3.2. Pause

This function holds the current value of the specified frame and the comparator output and peak value for the current value.

The transition of the peak value in the pause On / Off state is as shown below.



Operation example of Pause

5.3.3. Start

Starts measuring the peak value of the specified frame.

(Judgment starts from the current value in maximum and minimum value modes, or from 0 in peak-to-peak value mode.)

5.3.4. Reset

Set the measurement value of the specified frame to zero.

5.3.5. Preset

Rewrites the value of the current frame to an any value.

5.3.6. Master preset

By using the reference point of the measuring unit, the position can be reproduced as an absolute value when the power is restarted.

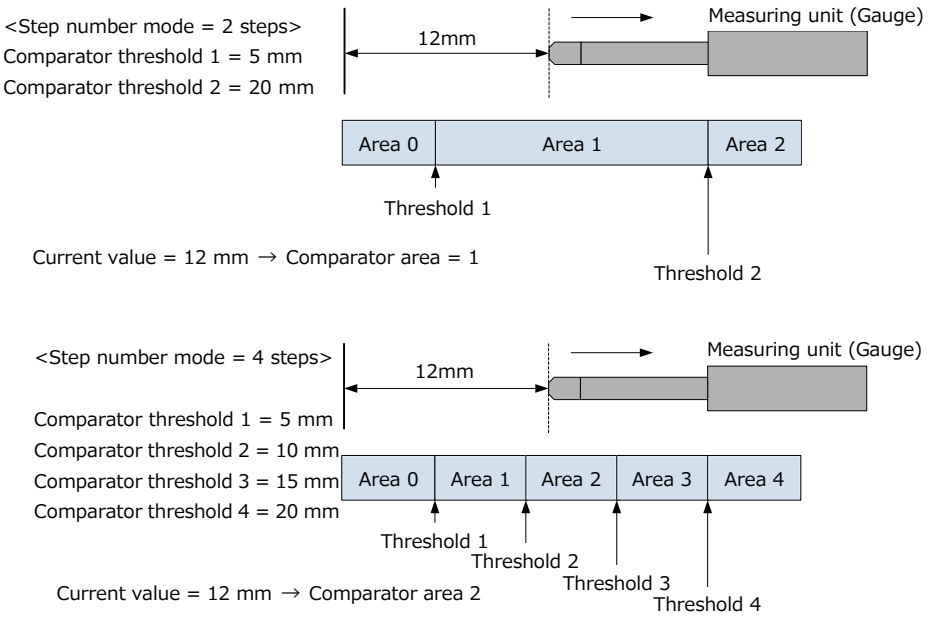
The procedure for master preset is as follows.

1. Set Reference Point Use Setting to ON with a ladder program, etc. and set the master preset value.
   This task can also be performed using the “Setting application for Windows PC (MG80SettingTool.exe).”
   (Use Ref point: ON; Ref point Preset: Master preset value)
2. Pass through the reference point of the measuring unit.
   When the reference point is detected, the “REF” LED of the MG80-CM lights up.
3. Align the measuring unit with the master work to be measured.
4. Call the master value with a ladder program, etc. (Master Preset Call Instruction command).

Restart the power and move the measuring unit past the reference point.
Absolute value from the Master preset position will be loaded.

5.3.7. Comparator

Up to 8 thresholds can be set for 2 or 4 (2 steps / 4 steps) for each set frame.
Outputs the judgment value for each set area.
The set can be specified by the comparator group number setting command.
The following is an example of comparator judgment when setting the number of steps.



Example of comparator judgment

5.3.8. Add/Sub function

Addition and subtraction of measurement values of two measuring units are possible.
The calculation result is output as measurement data (current value) for each frame.
Up to 16 frames can be set.

The calculation formula is shown below.
Axis calculation result (current value)

= ＜Sing1＞Measurement value of measuring unit Ⓐ
+ ＜Sing2＞Measurement value of measuring unit Ⓑ

(Example)
Measurement value of measuring unit Ⓐ = 10[μm]
Measurement value of measuring unit Ⓑ = 5[μm]
Calculation setting : Sign1 = +, Sign2 = −
Measured value after calculation (Current value) = (+10) + (−5) = 5[μm]

5.3.9. I/O module control

Functions can be assigned to the input and output terminals of the connected I/O module.

According to the signal status of the assigned input terminal, the operation status such as the comparator judgment of the main module can be changed, and the signal output of the output terminal can be controlled.

The function and detailed description are described below.

Function assignment of input of I/O terminal

Function	Contents
Target frame number (4bits:Addr0 to AddR3)	Specify the target frame number with the assigned 4 bits. * Target frame number = 1 to 16 (4 bits: 0000b to 1111b)
Data request input signal (1bit:Dreq)	When this signal is Low level, the functions assigned to the bits corresponding to each input terminal are executed.
Comparator group number (3bits:Comp0 to Comp3)	Specify the comparator group number with the assigned 3 bits. * Comparator group number =1 to 8 (The 3 bits to be set are 000b to 111b)
Reset (1bit:Reset)	When this signal and the data request input signal are both Low level, the frame specified by the target frame number (Addr0 to Addr3) is reset.
Preset call (1bit:Preset)	When this signal and the data request input signal are both Low level, preset call is executed for the frame specified by the target frame number (Addr0 to Addr3).
Reference point position clear (1bit:ResetOrg)	When this signal and the data request input signal are both Low level and Reference Point Use Setting is set to ON for the measuring unit of the frame specified by the target frame number, the reference point position is cleared.
Output data type (2bits:Mode0 to Mode1)	Specify the output data type with the assigned 2 bits. * Output data type 00b: Current value 01b: Maximum value 10b: Minimum value 11b: Peak-to-peak value

Start (1bit:Start)	When this signal and the data request input signal are both Low level, the frame specified by the target frame number is started.
Pause (1bit:Pause)	When this signal and the data request input signal are both Low level, pause ON is executed for the frame specified by the target frame number. Also, when the data request input signal becomes Low level while this signal is High level, pause OFF is executed for the frame specified by the target frame number.
No function (No_Func)	The terminal assigned to this function does not perform any operation.

Function assignment of I/O output terminal.

Function	Contents
Data ready output signal (1bit:Drdy)	When this signal is Low level, the output information assigned to each output terminal is output.
Comparator area number (5bits : Comp_Out0 to Comp_Out4)	The comparator area number is indicated by the assigned 5 bits. When the above data ready signal becomes Low level, the comparator area number is output to the output terminal assigned to this function.
Alarm occurrence (1bit : Alarm)	The alarm occurrence status is indicated by the assigned 1 bit. When the above data ready signal becomes Low level, the comparator area number is output to the output terminal assigned to this function.
Reference point pass (1bit : Org_pass)	The reference point pass status is indicated by the assigned 1 bit. When the above data ready signal becomes Low level, the comparator area number is output to the output terminal assigned to this function.
No function (No_Func)	The terminal assigned to this function does not perform any operation.

* Output signals are output when the data request input signal is Low level.

6. EtherCAT communication

6.1. **EtherCAT Communications Specifications**

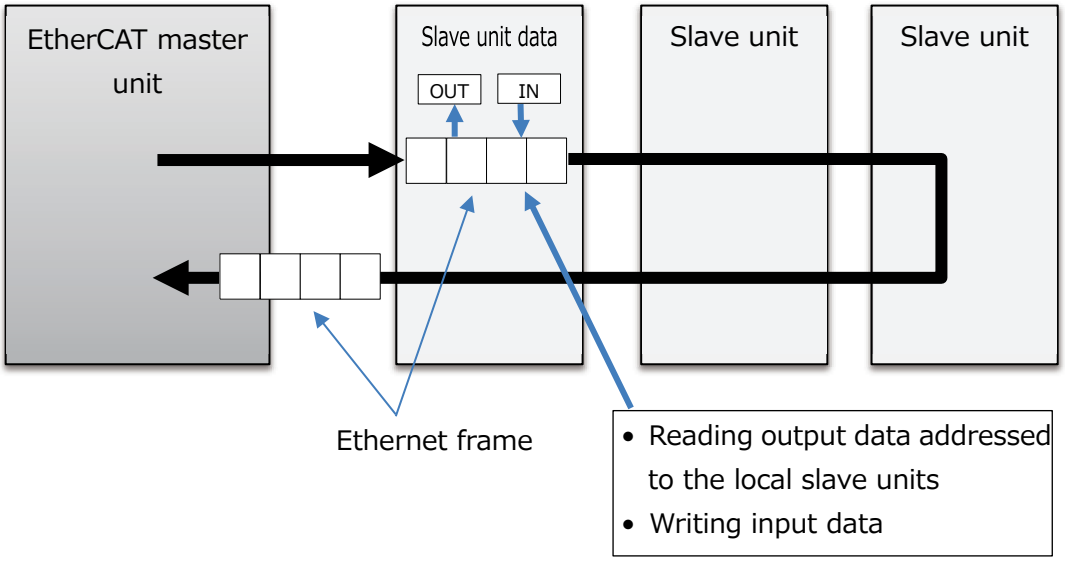
Item	Specification
Communication protocol	Communication protocol for EtherCAT (CoE)
Modulation	Base band
Baud rate	100 Mbps
Physical layer	100BASE-TX
Connectors	RJ45×2 IN: EtherCAT input OUT: EtherCAT output
Topology	Daisy chain
Communications media	Category 5 or higher
Communications distance	Distance between nodes 100 m max.
Node address setting method	Hexadecimal rotary switch setting
Node address range	0x01 to 0xFF *1
Indicator	LED indicators related to EtherCAT RUN×1 ERR×1 L/A IN (Link/Activity IN) ×1 L/A OUT (Link/Activity OUT) ×1
Process data	PDO mapping
PDO size/node	Max. 350 bytes
Mailbox	Emergency messages and SDO requests, SDO response
SYNCHRONIZATION mode	Free-Run mode (asynchronous), DC mode (synchronous) *2

*1 When the node address is set to 0x00, the unit operates in Setting mode, so EtherCAT communications are not performed.
When the node address is set to 0x01 to 0xFE (No. 1 to 254), that becomes the node address setting value. The node address value written in the EEPROM inside the MG80-EC is reflected only when the node address is set to 0xFF.
For the method of writing the node address value, refer to the manual of the EtherCAT master unit.

*2 The MG80-EC has only the Normal mode, and does not have the Detection Value Speed Priority mode of the Free-Run function of the MG50-EC.

6.2. **Overview of EtherCAT**

EtherCAT does not send data to individual slave nodes on the network, instead, it passes Ethernet frames through all of the slave nodes.
When frame passes through a slave node, the slave node reads and writes data in the areas allocated to it in the Ethernet frames in a few nanoseconds.
Ethernet frames sent from the EtherCAT master unit go through all the EtherCAT slave unit without stopping on the way. Once they reach the final slave unit, they are sent back from the final slave unit, pass through all slave units again, and return to the EtherCAT master unit.



6.3. **Communications Types of EtherCAT**

EtherCAT provides the two types of communication functions of PDO communications and SDO communications.
PDO communications constantly update the data every communication cycle on EtherCAT, and SDO communications are processed in between those updates.

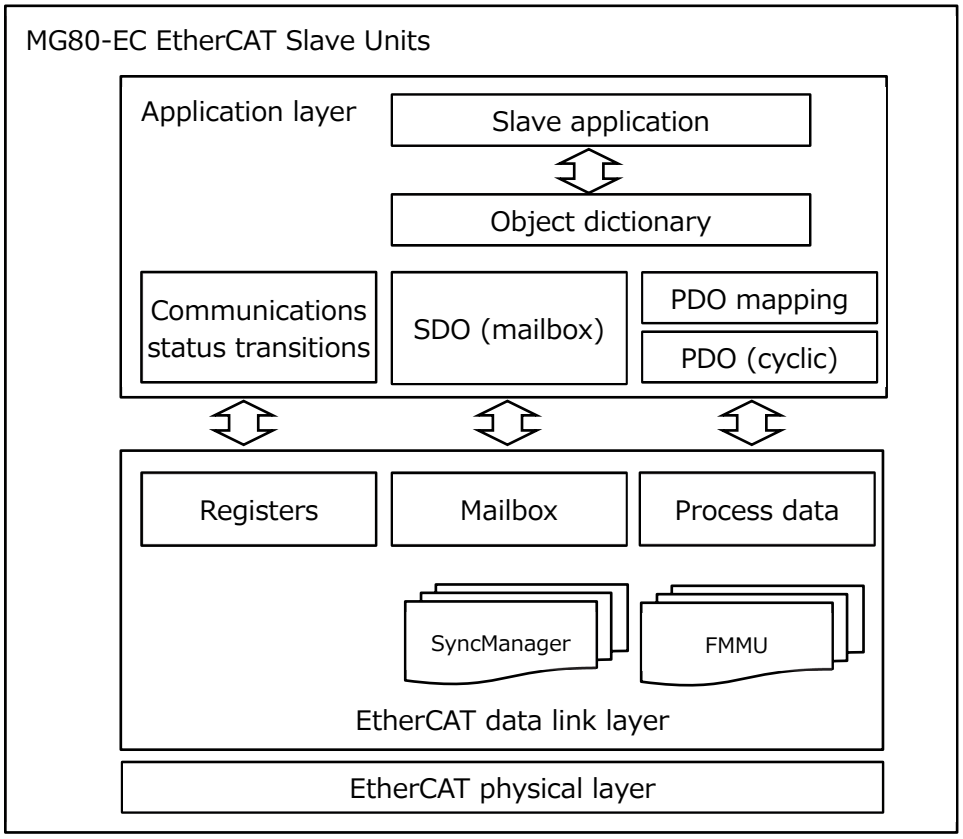
(1) Process data communications functions (PDO communications)
This communication function is used to transfer process data in a fixed cycle.
By mapping logical process data space to each node by the EtherCAT master unit, it achieves fixed-cycle communications among the EtherCAT master unit and slave units.

(2) Mailbox communications functions (SDO communications)
This refers to message communications in EtherCAT communications.
The EtherCAT master unit transmits commands to slave units and the slave units return responses to the EtherCAT master unit at any timing.

6.4. **EtherCAT Communications Protocol (CoE)**

The MG80-EC applies the device profile of the open network standard “CAN application protocol” to EtherCAT devices, so it uses “CAN application protocol over EtherCAT (CoE)”.

The figure below shows the structure of CoE in the MG80-EC.



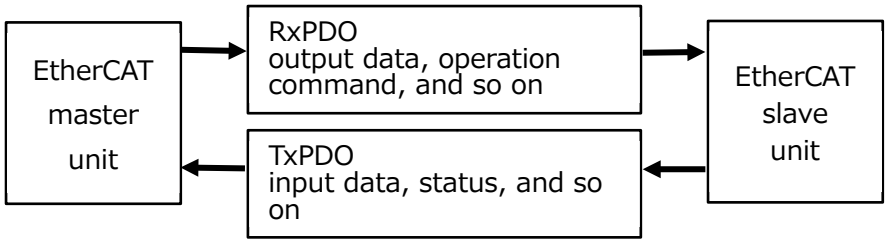
CAN application protocol has two types of object dictionaries, PDO (Process Data Object) and SDO (Service Data Object) .

PDO is composed of object dictionaries that can be mapped. The process data is defined by PDO mapping. PDO is primarily used in PDO communications for regularly exchanging process data.

Moreover, SDOs can read and write all object dictionaries and are used in non-fixed-cycle type communications.

6.5. **Process Data Objects (PDO)**

Process data objects (PDO) are used for data transfer in a fixed cycle.
PDOs include RxPDOs, which are used by the slaves to receive data from the EtherCAT master unit, and TxPDOs, which are used by the slaves to send data to the EtherCAT master unit.



(1) PDO Mapping Settings
The PDO mapping indicates the mapping for application objects between the object dictionary and PDO.
In this mapping table, indexes 1600 hex to 17FF hex are used for RxPDO and 1A00 hex to 1BFF hex are used for TxPDO.

(2) Sync Manager PDO Assignment Settings
A sync manager channel consists of several PDOs. The sync manager PDO assignment objects describe how these PDOs are related to the Sync Manager.
In this table, index 1C12 hex is for RxPDOs and 1C13 hex is for TxPDOs.

6.6. **Service Data Object (SDO)**

The MG80-EC supports SDO communications.
In Operation mode, operation parameters can be changed by reading and writing data in the object dictionary via SDO communications.
For details, refer to “8.1 Operation Parameters” and “8.2 Object Dictionary Structure.”

6.7. **EtherCAT Master Unit - Slave Unit Communications**

The MG80-EC has the two communication modes of FREE RUN mode and DC mode for EtherCAT communications between the master unit and slave unit.

(1) FREE RUN Mode

In the FREE RUN mode, a slave unit operates asynchronously with the EtherCAT master unit.

(2) DC Mode

In DC mode, slave unit communicate and operate synchronously with the EtherCAT master unit.

A mechanism called distributed clock (DC), where the EtherCAT master unit and slave unit share the same clock, is used for synchronization. Each of the DC mode-ready slave unit connected to EtherCAT shares the clock information. The input/output timing is synchronized with other slave unit by generating interrupt signals and executing input/output processing inside each slave unit according to the clock.

The DC mode supported by the MG80-EC is “DC mode 1.”

- Communications cycle

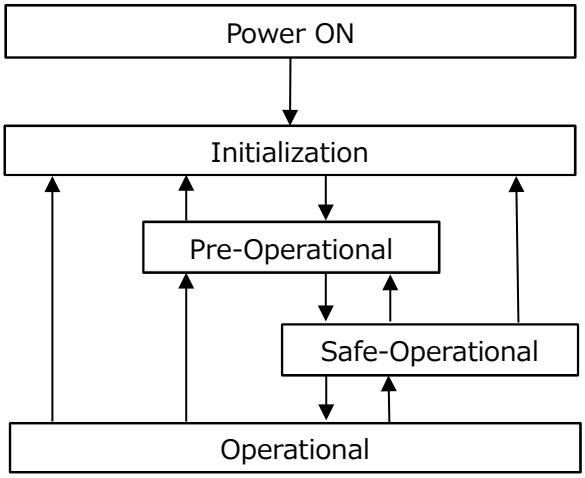
The communications cycle is determined by setting output frequency of Sync0 signal (interrupt signal in DC mode 1).

* The communications cycle settings are performed on the host device side (EtherCAT master unit). For the setting method, refer to the manual of the EtherCAT master unit to be used.

The minimum communications cycle time of the MG80-EC is 2 ms.

6.8. **EtherCAT Communications State Transitions**

The state transitions of EtherCAT slave unit communications control are shown below.



State	SDO communications	PDO transmission	PDO reception	Contents
Initialization (Init)	Not possible.	Not possible.	Not possible.	Communications are being initialized. Communications are not possible.
Pre-Operational (Pre-Op)	Possible	Not possible.	Not possible.	Only SDO communications are possible. This state is entered after initialization has been completed. It is used to initialize network settings.
Safe-Operational (Safe-Op)	Possible	Possible	Not possible.	PDO transmissions are possible in addition to SDO communications. PDO sendings can be used to send information such as status from the slave unit.
Operational (Op)	Possible	Possible	Possible	Normal communication state. PDO communications can be used to control the I/O data.

6.9. **Emergency Messages**

The MG80-EC notifies emergency messages to the host device (EtherCAT master unit) via SDO communications if it detects errors.

(1) Emergency Message Notification

To perform emergency message notification, make the Emergency message notification setting via SDO communications. (Notify / Not notify)

* The MG80-EC starts up with the “Not notify” setting. For use with the “Notify” setting, set to “Notify” via SDO communications from the host device after startup.

(2) Diagnosis History

The MG80-EC can save up to eight emergency messages in the internal memory when it detects errors. The saved messages can be read via SDO communications.

Indexes to be read are sub-indexes 06 hex to 0D hex (Diagnosis messages 1 to 8) among 10F3 hex (Diagnosis History).

The diagnosis history is saved from Diagnosis Message 1. When eight errors have been saved in order up to Diagnosis Message 8, the 9th error and onward are again saved from Diagnosis Massage 1.

The diagnosis history is saved even if emergency messages cannot be notified due to EtherCAT communications errors or when Emergency message notification is set to “Not notify.”
However, the history is not saved when a memory-related error occurs.

7. Details of Measurement Data

The MG80-EC arranges the values measured by the measuring units, calculation results, and other information in the TxPDO data of EtherCAT communications. The measurement values include the following.

(1) Measurement value for each frame
(2) Status of each counter module
(3) Comparator result for each frame
(4) Group number for each frame
(5) Output type for each frame
(6) Input signal of each I/O module
(7) Output signal of each I/O module

7.1. **Frame Measurement Value**

The measurement value of each frame obtained via the PDO data is 4 bytes (32 bits) in little endian format.

Frame measurement value

bit 31 to bit 24	bit 23 to bit 16	bit 15 to bit 8	bit 7 to bit 00
Measurement value			

Data arrangement

byte	Contents
+00	Value of bits 07 to 00
+01	Value of bits 15 to 08
+02	Value of bits 23 to 16
+03	Value of bits 31 to 24

Use measurement values as signed 4-byte integers.

7.2. **Counter Module Status**

The details of the status (8 bits) of each counter module obtained via the PDO data are shown below.

Details of counter module status bits

Bit number	Contents
7	1: CRC error occurred; 0: No error
6	1: Pause ON; 0: Pause OFF
5	Reserved. Zero output
4	Reserved. Zero output
3	1: Reference point passed; 0: Reference point not passed
2	Reserved. Zero output
1	1: Counter module error occurred; 0: No error
0	1: Axis overall error occurred; 0: No error

7.3. **Frame Comparator Result**

The comparator result (1 byte) of each frame obtained via the PDO data outputs the value of the comparator area determined according to the measurement value. In addition, the value to be output is as follows according to the comparator mode setting.

Frame comparator result (1 byte)

Mode	Comparator result output value
None	0: Comparator area 0
2 steps	0: Comparator area 0
	1: Comparator area 1
	2: Comparator area 2
4 steps	0: Comparator area 0
	1: Comparator area 1
	2: Comparator area 2
	3: Comparator area 3
	4: Comparator area 4

7.4. **Frame Comparator Group Number**

The comparator group number (1 byte) of each frame obtained via the PDO data outputs the group number set for each frame.

Frame comparator group number (1 byte)

Group number	Contents
1	Group number 1
2	Group number 2
3	Group number 3
4	Group number 4
5	Group number 5
6	Group number 6
7	Group number 7
8	Group number 8

7.5. **Frame Output Type**

The output type (1 byte) of each frame obtained via the PDO data outputs the output type set for each frame. The details are shown below.

Frame output type (1 byte)

Output type	Contents
0	Current value output
1	Maximum value output
2	Minimum value output
3	Peak-to-peak value output

7.6. **I/O Module Input Signal**

The I/O module input signal (8 bits) obtained via the PDO data outputs the status of the input signal of each I/O module.

I/O module input signal status (8 bits)

Bit number	Contents
0	1: Input signal CH1 is High; 0: Input signal CH1 is Low
1	1: Input signal CH2 is High; 0: Input signal CH2 is Low
2	1: Input signal CH3 is High; 0: Input signal CH3 is Low
3	1: Input signal CH4 is High; 0: Input signal CH4 is Low
4	1: Input signal CH5 is High; 0: Input signal CH5 is Low
5	1: Input signal CH6 is High; 0: Input signal CH6 is Low
6	1: Input signal CH7 is High; 0: Input signal CH7 is Low
7	1: Input signal CH8 is High; 0: Input signal CH8 is Low

7.7. **I/O Module Output Signal**

The I/O module output signal (8 bits) obtained via the PDO data outputs the status of the output signal of each I/O module.

I/O module output signal status (8 bits)

Bit number	Contents
0	1: Output signal CH1 is High; 0: Output signal CH1 is Low
1	1: Output signal CH2 is High; 0: Output signal CH2 is Low
2	1: Output signal CH3 is High; 0: Output signal CH3 is Low
3	1: Output signal CH4 is High; 0: Output signal CH4 is Low
4	1: Output signal CH5 is High; 0: Output signal CH5 is Low
5	1: Output signal CH6 is High; 0: Output signal CH6 is Low
6	1: Output signal CH7 is High; 0: Output signal CH7 is Low
7	1: Output signal CH8 is High; 0: Output signal CH8 is Low

8. Appendix

8.1. Operation Parameters

The operation parameters used in each function are recorded in the internal memory, and operations such as calculation processing are performed in accordance with those operation parameters.

Operation parameters are changed in Operation mode by rewriting the object setting values of the applicable parameters via SDO communications from the host device.

(For details of objects, refer to “8.2 Object Dictionary Structure.”)

Parameters can also be changed in Setting mode by using the dedicated software.

The details of the operation parameters are shown below.

Item			Set value		Default
Measuring unit settings	Measuring unit 1 to Measuring unit 16	Sign	00	Positive direction	00
			01	Minus direction	
		Input Resolution	01	0.1um	01
			02	0.5um	
			03	1.0um	
			04	2.0um	
			05	5.0um	
			06	10.0um	
		Reference point	00	OFF	00
			01	ON	
		Reference point position clear	00	-	00
			01	Clears the reference point position.	
Axis Calculation	Frame A to Frame P	1st sign	00	Plus sign	00
			01	Minus sign	
		Main axis No.	00	Measuring unit 1 value	Same value as frame number
			01	Measuring unit 2 value	
			02	Measuring unit 3 value	
			03	Measuring unit 4 value	
			04	Measuring unit 5 value	
			05	Measuring unit 6 value	
			06	Measuring unit 7 value	
			07	Measuring unit 8 value	
			08	Measuring unit 9 value	
			09	Measuring unit 10 value	
			0A	Measuring unit 11 value	
			0B	Measuring unit 12 value	
			0C	Measuring unit 13 value	
			0D	Measuring unit 14 value	
			0E	Measuring unit 15 value	
			0F	Measuring unit 16 value	
		2nd sign	00	Plus sign	FF
			01	Minus sign	
			FF	No reference axis	

		Reference axis No	00	Measuring unit 1 value	00
			01	Measuring unit 2 value	
			02	Measuring unit 3 value	
			03	Measuring unit 4 value	
			04	Measuring unit 5 value	
			05	Measuring unit 6 value	
			06	Measuring unit 7 value	
			07	Measuring unit 8 value	
			08	Measuring unit 9 value	
			09	Measuring unit 10 value	
			0A	Measuring unit 11 value	
			0B	Measuring unit 12 value	
			0C	Measuring unit 13 value	
			0D	Measuring unit 14 value	
			0E	Measuring unit 15 value	
			0F	Measuring unit 16 value	
Output type	Flame A to Flame P	Output type	00	Current values	00
			01	Maximum values	
			02	Minimum values	
			03	Peak to peak values	
Comparator setting	Flame A to Flame P	Comparator group number	01	Group 1	01
			02	Group 2	
			03	Group 3	
			04	Group 4	
			05	Group 5	
			06	Group 6	
			07	Group 7	
			08	Group 8	
		Step number mode	00	None	00
			02	Step 2	
			04	Step 4	
		Comparator thresholds in 4 steps for groups 1 to 8	Step 1	Compare threshold 1 -999999999 to 999999999	0
			Step 2	Compare threshold 2 -999999999 to 999999999	
			Step 3	Compare threshold 3 -999999999 to 999999999	
			Step 4	Compare threshold 4 -999999999 to 999999999	
Reset	Flame A to Flame P	Reset for each frame	00	-	00
			01	Reset execution	
Preset	Flame A to Flame P	Presets for each frame	Preset value -999999999 to 999999999		0
		Preset call	00	-	00
			01	Preset call execution	
Master Preset	Measuring unit 1 to 16	Preset for each measuring unit	Master preset value -999999999 to 999999999		0
		Master	00	-	00
		Preset call	01	Master preset call execution	

Start	Flame A to Flame P	Start for each frame	00	-	00
			01	Start execution	
Pause	Flame A to Flame P	Pause for each frame	00	Pause OFF	00
			01	Pause ON	
I/O input function	IO1 to IO2	Bit specification	00	Bits 0	00
			01	Bits 1	
			02	Bits 2	
			03	Bits 3	
			04	Bits 4	
			05	Bits 5	
			06	Bits 6	
			07	Bits 7	
		Input function for each bit Bits 0 to 7	00	Target ID (bit 0)	FF
			01	Target ID (bit 1)	
			02	Target ID (bit 2)	
			03	Target ID (bit 3)	
			04	Data request signal	
			05	Comparator group (bit 0)	
			06	Comparator group (bit 1)	
			07	Comparator group (bit 2)	
			08	Reset command	
			09	Preset call command	
			0A	Reference point position clear	
			0B	Output value mode (bit 0)	
			0C	Output value mode (bit 1)	
			0D	Start signal	
			0E	Pause signal	
			FF	No function	
I/O output function	IO1 to IO2	Bit specification	00	Bits 0	00
			01	Bits 1	
			02	Bits 2	
			03	Bits 3	
			04	Bits 4	
			05	Bits 5	
			06	Bits 6	
			07	Bits 7	
		Onput function for each bit Bits 0 to 7	00	Data Ready signal	FF
			01	Comparator area 0	
			02	Comparator area 1	
			03	Comparator area 2	
			04	Comparator area 3	
			05	Comparator area 4	
			06	Alarm output	
			07	Reference point pass flag	
			FF	No function	

8.2. **Object Dictionary Structure**

The MG80-EC exchanges data with the host device using the CoE protocol of EtherCAT.

The CoE protocol uses the object dictionary of CAN application protocol as its base. A four-digit hexadecimal value index is assigned for each object, and the indexes are configured in the areas shown below.

Indexes	Area	Contents
0000 hex to 0FFF hex	Data Type area	Definitions of data types
1000 hex to 1FFF hex	CoE Communications area	Definitions of variables related to communications
2000 hex to 2FFF hex	Manufacturer Specific area 1	–
3000 hex to 05FFF hex	Manufacturer Specific area 2	Variables defined for data handled by the MG80-EC
6000 hex to 9FFF hex	Device Profile area	Variables defined for CiA401 device profiles
A000 hex to FFF hex	Reserved area	–

The object dictionary is accessed by specifying the index value and the sub-index for each object.

The MG80-EC uses the objects in the “CoE Communications area” from 1000 hex to 1FFF hex and the “Manufacturer Specific area 2” from 3000 hex to 5FFF hex. These objects are listed below.

(1) CoE Communications area object list

Index(Hex)	Contents	Sub Index	Detailed contents
1000	Device type	0	–
1001	Error Register	0	–
1008	Manufacturer Device Name	0	–
1009	Manufacturer Hardware Version	0	–
100A	Manufacturer Software Version	0	–
1018	Identity Object	0	Number of Entries
		1	Vendor ID
		2	Product Code
		3	Revision Number
		4	Serial Number
10F3	Diagnosis History	0	Number of Entries
		1	Maximum Messages
		2	Newest Message
		5	Flag
		6 to 13	Diagnosis Message 1 to Diagnosis Message 8
1600 to 17FF	RxPDO Mapping Table	–	–
1A00 to 1BFF	TxPDO Mapping Table	–	–
1C00 to 1C13	Sync Manager Communication Table	–	–

(2) Manufacturer Specific area 2 object list

Index(Hex)	Contents	Sub Index	Detailed contents
3000	Measuring Unit Communication Status	1	Communication Busy
		2	Communication Error
3001	Number of Measuring Units	1	Number of Measuring Units Setting
		2	Number of Dummies Setting
		3	Number of Connected Measuring Units
3002	Input Filter	1	Input Filter Setting
		2	Input Filter Information
3004	Dummy Setting	1	Dummy Setting
		2	Dummy Information
		3	Dummy Response Setting
3005	Input Delay Time Status	1	Input Delay Time Status
300A	Measuring Unit Communication Status Communication Busy	1	–
300B	Measuring Unit Status	1	–
300C	TxPDO Mapping Mode	1	TxPDO Mapping Mode Setting
		2	TxPDO Mapping Mode Information
300D	Measuring Unit Warning Status 16bit	1	–
3020	Read Input Bits Read Input Bits 0 to 63	1 to 64	–
4000+(N-1)×80	Type of Measuring Unit	1	–
4004+(N-1)×80	Threshold 1 Settings	1	–
4005+(N-1)×80	Threshold 2 Settings	1	–
4006+(N-1)×80	Measuring Unit Status	1	–
4008+(N-1)×80	Output Mode Setting	1	–
4009+(N-1)×80	Detection Value	1	–
400A+(N-1)×80	Operating Mode	1	–
400B+(N-1)×80	Detection Function	1	–
4011+(N-1)×80	Display Digits	1	–
4015+(N-1)×80	Eco Function	1	–
4016+(N-1)×80	Key Lock Setting	1	–
4017+(N-1)×80	Display Blinking Setting	1	–
4020+(N-1)×80	Hysteresis Width Setting	1	–
4022+(N-1)×80	Hysteresis Width 2 Setting	1	–
4033+(N-1)×80	2-point Setting (1st point)	1	–
4034+(N-1)×80	2-point Setting (2nd point)	1	–

4036+(N-1)×80	1-point Setting, ±Tolerance Setting Setup	1	–
4038+(N-1)×80	Reference Point Use Setting	1	–
4039+(N-1)×80	Preset Value Setting	1	–
403B+(N-1)×80	Tolerance Setting High	1	–
403C+(N-1)×80	Tolerance Setting Low	1	–
403E+(N-1)×80	±Tolerance Setting	1	–
4042+(N-1)×80	Measuring Unit Initialization	1	–
4071+(N-1)×80	Direction Setting	1	–
4072+(N-1)×80	Output Mode Selection	1	–
4075+(N-1)×80	Preset call	1	–
5000 to 5010	Master Cyclic Input Information 1 to 17	1 to 16	–
5800 to 580F	Frame A to P measurement Values	1	–
5820 to 582F	Measuring Unit Bit Information 1 to 16	1 to 8	–
		9	Measuring Unit A Phase Bit
		10	Measuring Unit B Phase Bit
		11	Measuring Unit Z Phase Bit
		12 to 24	–
5850 to 585F	Measuring Unit Status 1 to 16	1	–
5860 to 586F	Frame A to P Information	1	Comparator Result
		2	Output type
		3	Comparator Group Number
5870 to 5871	I/O Module 1 and 2 Information	1	Input Terminal Information
		2	Output Terminal Settings
5A00 to 5A0F	Frame A to P Parameter Settings	1	Input Resolution Setting
		2	Reference Point Use Setting
		3	Reference Point Position Clear Instruction
		4	Axis Calculation Settings
		5	Output Type Setting
		6	Comparator Group Number Setting
		7	Comparator Mode Setting
		8 to 39	Comparator Thresholds 1 to 32 (group number 1 to 8, thresholds 1 to 4)
		40	Preset Value Setting
		41	Master Preset Value Setting

		42	Reset Instruction
		43	Preset call
		44	Master preset call
		45	Start Instruction
		46	Pause Instruction
5A10 to 5A11	I/O Module 1 and 2 Parameter Settings	1	Input Terminal Function Setting
		2	Output Terminal Function Setting
5B00	Unit Setting	1	–
5B01	Parameter Backup Instruction	1	–
5B02	Parameter Initialization Instruction	1	–

* N = 1 to 16.

8.3. **Details of Object Dictionary**

In this manual, object details are described in the following format.

Index <Index number>: Object name

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)

(1) Index, object name

This is the index number and object name of the object given by a four-digit hexadecimal number.

(2) Sub-index

The Sub-index range is 0 to 255.

(3) Contents

Gives a description of the object.

(4) Size

The object size is given in bytes. The value type is given in parentheses.

Data type	Abbreviation	Size	Range
Boolen	BOOL	1bit	True(1)、False(0)
Unsigned8	U8	1Byte	0 to 255
Unsigned16	U16	2Byte	0 to 65535
Unsigned32	U32	4Byte	0 to 4294967295
Unsigned64	U64	8Byte	0 to 18446744073709551615
Integer8	INT8	1Byte	-128 to 127
Integer16	INT16	2Byte	-32768 to 32767
Integer32	INT32	4Byte	-2147483648 to 2147483647
Visible string	VS	–	–

(5) Access

Indicates whether the object is read only, or read and write.

RO: Read only

RW: Read and write

(6) PDO map

Indicates the PDO mapping possibility.

(7) Setting range, default setting

The possible range of settings. The default value set before product shipment is given in parentheses.

8.3.1. Details of Communication Object Dictionary

(1) Index <1000 hex>: Device Type

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Device Typ	4Byte (U32)	RO	Not possible	– (0001 019 hex)

Indicates the CoE device profile number.

(2) Index <1001 hex>: Error Register

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Error Register	1Byte (U8)	RO	Not possible	– (00 hex)

Indicates the error type that occurs in a slave unit.

bit	Name	bit	Name
0	Generic error	4	Communication Error
1	Current error	5	Device profile-specific error
2	Voltage error	6	Reserved
3	Temperature error	7	Manufacturer-specific error

(3) Index <1008 hex>: Manufacturer Device Name

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Manufacturer Device Name	20Byte (VS)	RO	Not possible	– (MG80-EC)

Indicates the slave unit device name.

This is “MG80-EC” for this unit.

(4) Index <1009 hex>: Manufacturer Hardware version

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Manufacturer Hardware Version	20Byte (VS)	RO	Not possible	– (Differ by slave unit types)

Indicates the version of the slave unit hardware.

(5) Index <100A hex>: Manufacturer Software version

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Manufacturer Software Version	20Byte (VS)	RO	Not possible	– (Differ by slave unit types)

Indicates the version of the slave unit software.

(6) Index <1018 hex>: Identity Object

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	– (04 hex)
1	Vendor ID	4Byte (U32)	RO	Not possible	– (0000 0871 hex)
2	Product Code	4Byte (U32)	RO	Not possible	– (0000 0002 hex)
3	Revision Number	4Byte (U32)	RO	Not possible	– (Differ by slave unit types)
4	Serial Number	4Byte (U32)	RO	Not possible	– (0000 0000 hex)

Indicates the device information.

Sub-index 1 gives the manufacturer identifier.
Sub-index 2 gives the product code of the manufacturer.
Sub-index 3 gives the revision number of the device.
Bits 0 to 15: Minor revision number
Bits 16 to 31: Major revision number

(7) Index<10F3Hex> : Diagnosis Message

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	– (0D hex)
1	Maximum Messages	1Byte (U8)	RO	Not possible	– (–)
2	Newest Message	1Byte (U8)	RO	Not possible	– (–)
5	Flag	2Byte (U16)	RW	Not possible	0000 hex to 0001 hex (0000 hex)
6 to 13	Diagnosis Message 1 to 8	23Byte (VS)	RO	Not possible	– (–)

Indicates up to eight diagnosis messages.

It also sets whether or not to notify emergency messages.

Sub-index 1 gives the maximum number of error messages.

Sub-index 2 gives the Sub-index number of the latest message in the diagnosis history.

Sub-index 5 is the control flag of the diagnosis history.

This control flag sets whether or not to notify emergency messages.

0001 hex: Notify setting

0000 hex: Not notify setting

It is set to 0000 hex (Not notify) when the power is turned ON.

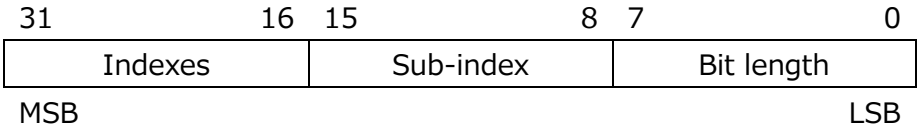
Sub-indexes 6 to 13 indicate the diagnosis messages.

Eight errors are stored in order from Sub-index 6 to Sub-index 13.

The 9th error and onward are again stored from Sub-index 6.

8.3.2. Details of PDO Mapping Objects

Indexes 1600 hex to 17FF hex are used for the RxPDO mapping settings and indexes 1A00 hex to 1BFF hex are used for the TxPDO mapping settings. Sub-indexes 1 and onward provide information about the object being mapped.



Bits 0 to 7: Bit length of the mapped object.
(For example, in case of 32 bits, 20 hex is given.)
Bits 8 to 15: Sub-index number of the mapped object.
Bits 16 to 31: Index number of the mapped object.

The MG80-EC locates mapping settings for the MG50 and mapping settings for the MG80 in the following indexes.

① RxPDO mapping settings for the MG80 : 1600Hex to 1610Hex
② TxPDO mapping settings for the MG50 : 1A00Hex to 1ABCHex
③ TxPDO mapping settings for the MG80 : 1B00Hex to 1B45Hex

(1) Index <1600 hex to 1610 hex>: 1st to 17th RxPDO

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (10 hex)
1 to 16	1st RxPDO PDO entries 1 to 16	4Byte (U32)	RO	Possible	– (5000 0101 hex 5000 0201 hex to 5000 0F01 hex 5000 1001 hex)
1 to 16	2nd RxPDO PDO entries 1 to 16	4Byte (U32)	RO	Possible	– (5001 0101 hex 5001 0201 hex to 5001 0F01 hex 5001 1001 hex)
～	～	～	～	～	～

1 to 16	PDO entries 1 to 16	4Byte (U32)	RO	Possible	– (500F 0101 hex 500F 0201 hex to 500F 0F01 hex 500F 1001 hex)
1 to 16	17th RxPDO PDO entries 1 to 16	4Byte (U32)	RO	Possible	– (5010 0101 hex 5010 0201 hex to 5010 0F01 hex 5010 1001 hex)

Gives the 1st to 17th RxPDO mapping for the MG80.

(2) Index <1A00 hex>: 1st TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (6100 0110 hex)

Gives the 1st TxPDO mapping for the MG50.

(3) Index <1A01 hex>: 2nd TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (6100 0210 hex)

Gives the 2nd TxPDO mapping for the MG50.

(4) Index <1A02 hex>: 3rd TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (6100 0310 hex)

Gives the 3rd TxPDO mapping for the MG50.

(5) Index <1A03 hex>: 4th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (6100 0410 hex)

Gives the 4th TxPDO mapping for the MG50.

(6) Index <1A04 hex>: 5th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (10 hex)
1 to 16	PDO entries 1 to 16	4Byte (U32)	RO	Possible	– (3020 0101 hex 3020 0201 hex to 3020 0F01 hex 3020 1001 hex)

Gives the 5th TxPDO mapping for the MG50.

(7) Index <1A05 hex>: 6th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (10 hex)
1 to 16	PDO entries 1 to 16	4Byte (U32)	RO	Possible	– (3020 1101 hex 3020 1201 hex to 3020 1F01 hex 3020 2001 hex)

Gives the 6th TxPDO mapping for the MG50.

(8) Index <1A06 hex>: 7th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (10 hex)
1 to 16	PDO entries 1 to 16	4Byte (U32)	RO	Possible	– (3020 2101 hex 3020 2201 hex to 3020 2F01 hex 3020 3001 hex)

Gives the 7th TxPDO mapping for the MG50.

(9) Index <1A07 hex>: 8th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (10 hex)
1 to 16	PDO entries 1 to 16	4Byte (U32)	RO	Possible	– (3020 3101 hex 3020 3201 hex to 3020 3F01 hex 3020 4001 hex)

Gives the 8th TxPDO mapping for the MG50.

(10) Index <1A08 hex>: 9th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (300A 0108 hex)

Gives the 9th TxPDO mapping for the MG50.

(11) Index <1A09 hex>: 10th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (08 hex)
1 to 8	PDO entry 1 to 8	4Byte (U32)	RO	Possible	– (3000 0101 hex 3000 0201 hex to 3000 0701 hex 3000 0801 hex)

Gives the 10th TxPDO mapping for the MG50.

(12) Index <1A0A hex>: 11th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (02 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (3001 0108 hex)
2	PDO entry 2	4Byte (U32)	RO	Possible	– (3001 0208 hex)

Gives the 11th TxPDO mapping for the MG50.

(13) Index <1A0B hex>: 12th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (300B 0120 hex)

Gives the 12th TxPDO mapping for the MG50.

(14) Index <1A0D hex>: 14th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (300D 0110 hex)

Gives the 14th TxPDO mapping for the MG50.

(15) Index <1A4C, 1A4D, 1A4F, 1A50 hex>: 77th, 78th, 80th and 81st TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (4004 0120 hex 4005 0120 hex 4084 0120 hex 4085 0120 hex)

Gives the 77th, 78th, 80th and 81st TxPDO mapping for the MG50.

(16) Index <1A52, 1A53, 1A55, 1A56 hex>: 83rd, 84th, 86th and 87th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (4104 0120 hex 4105 0120 hex 4184 0120 hex 4185 0120 hex)

Gives the 83rd, 84th, 86th and 87th TxPDO mapping for the MG50.

(17) Index <1A58, 1A59, 1A5B, 1A5C hex>: 89th, 90th, 92nd and 93rd TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (4204 0120 hex 4205 0120 hex 4284 0120 hex 4285 0120 hex)

Gives the 89th, 90th, 92nd and 93rd TxPDO mapping for the MG50.

(18) Index <1A5E, 1A5F, 1A61, 1A62 hex>: 95th, 96th, 98th and 99th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (4304 0120 hex 4305 0120 hex 4384 0120 hex 4385 0120 hex)

Gives the 95th, 96th, 98th and 99th TxPDO mapping for the MG50.

(19) Index <1A64, 1A65, 1A67, 1A68 hex>: 101st, 102nd, 104th and 105th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (4404 0120 hex 4405 0120 hex 4484 0120 hex 4485 0120 hex)

Gives the 101st, 102nd, 104th and 105th TxPDO mapping for the MG50.

(20) Index <1A6A, 1A6B, 1A6D, 1A6E hex>: 107th, 108th, 110th and 111th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (4504 0120 hex 4505 0120 hex 4584 0120 hex 4585 0120 hex)

Gives the 107th, 108th, 110th and 111th TxPDO mapping for the MG50.

(21) Index <1A70, 1A71, 1A73, 1A74 hex>: 113th, 114th, 116th and 117th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (4604 0120 hex 4605 0120 hex 4684 0120 hex 4685 0120 hex)

Gives the 113th, 114th, 116th and 117th TxPDO mapping for the MG50.

(22) Index <1A76, 1A77, 1A79, 1A7A hex>: 119th, 120th, 122nd and 123rd TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (4704 0120 hex 4705 0120 hex 4784 0120 hex 4785 0120 hex)

Gives the 119th, 120th, 122nd and 123rd TxPDO mapping for the MG50.

(23) Index <1AA6, 1AA7, 1AA9, 1AAA hex>: 167th, 168th, 170th and 171st TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (4009 0120 hex 4089 0120 hex 4109 0120 hex 4189 0120 hex)

Gives the 167th, 168th, 170th and 171st TxPDO mapping for the MG50.

(24) Index <1AAC, 1AAD, 1AAF, 1AB0 hex>: 173rd, 174th, 176th and 177th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (4209 0120 hex 4289 0120 hex 4309 0120 hex 4389 0120 hex)

Gives the 173rd, 174th, 176th and 177th TxPDO mapping for the MG50.

(25) Index <1AB2, 1AB3, 1AB5, 1AB6 hex>: 179th, 180th, 182nd and 183rd TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (4409 0120 hex 4489 0120 hex 4509 0120 hex 4589 0120 hex)

Gives the 179th, 180th, 182nd and 183rd TxPDO mapping for the MG50.

(26) Index <1AB8, 1AB9, 1ABB, 1ABC hex>: 185th, 186th, 188th and 189th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (4609 0120 hex 4689 0120 hex 4709 0120 hex 4789 0120 hex)

Gives the 185th, 186th, 188th and 189th TxPDO mapping for the MG50.

(27) Index <1B00 hex to 1B0F hex>: 257th TxPDO Mapping to 272nd TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (5800 0120 hex 5801 0120 hex 5802 0120 hex to 580E 0120 hex 580F 0120 hex)

Gives the 257th to 272nd TxPDO mapping for the MG80.

(28) Index <1B10 hex>: 273rd TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (0A hex)
1 to 10	PDO entry 1 to 10	4Byte (U32)	RO	Possible	– (5810 0101 hex 5810 0201 hex 5810 0301 hex to 5810 0901 hex 5810 0A01 hex)

Gives the 273rd TxPDO mapping for the MG80.

(29) Index <1B11 hex to 1B20 hex>: 274th TxPDO Mapping to 289th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (18 hex)
1 to 24	274th TxPDO PDO entry 1 to 24	4Byte (U32)	RO	Possible	– (5820 0101 hex 5820 0201 hex to 5820 1701 hex 5820 1801 hex)
1 to 24	275th TxPDO PDO entry 1 to 24	4Byte (U32)	RO	Possible	– (5821 0101 hex 5821 0201 hex to 5821 1701 hex 5821 1801 hex)
～	～	～	～	～	～
1 to 24	288th TxPDO PDO entry 1 to 24	4Byte (U32)	RO	Possible	– (582E 0101 hex 582E 0201 hex to 582E 1701 hex 582E 1801 hex)
1 to 24	289th TxPDO PDO entry 1 to 24	4Byte (U32)	RO	Possible	– (582F 0101 hex 582F 0201 hex to 582F 1701 hex 582F 1801 hex)

Gives the 274th to 289th TxPDO mapping for the MG80.

(30) Index <1B21, 1B22 hex>: 290th and 291st TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (5830 0108 hex 5840 0108 hex)

Gives the 290th and 291st TxPDO mapping for the MG80.

(31) Index <1B23 hex to 1B32 hex>: 292nd TxPDO Mapping to 307th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (01 hex)
1	PDO entry 1	4Byte (U32)	RO	Possible	– (5850 0108 hex 5851 0108 hex to 585E 0108 hex 585F 0108 hex)

Gives the 292nd to 307th TxPDO mapping for the MG80.

(32) Index <1B33 hex to 1B42 hex>: 308th TxPDO Mapping to 323rd TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (03 hex)
1 to 3	308th TxPDO PDO entry 1 to 3	4Byte (U32)	RO	Possible	– (5860 0108 hex 5860 0208 hex 5860 0308 hex)
1 to 3	309th TxPDO PDO entry 1 to 3	4Byte (U32)	RO	Possible	– (5861 0108 hex 5861 0208 hex 5861 0308 hex)
～	～	～	～	～	～
1 to 3	322th TxPDO PDO entry 1 to 3	4Byte (U32)	RO	Possible	– (586E 0108 hex 586E 0208 hex 586E 0308 hex)
1 to 3	323th TxPDO PDO entry 1 to 3	4Byte (U32)	RO	Possible	– (586F 0108 hex 586F 0208 hex 586F 0308 hex)

Gives the 308th to 323rd TxPDO mapping for the MG80.

(33) Index <1B43 hex to 1B44 hex>: 324th TxPDO Mapping to 325th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (02 hex)
1 to 2	324th TxPDO PDO entry 1 to 2	4Byte (U32)	RO	Possible	– (5870 0108 hex 5870 0208 hex)
1 to 2	325th TxPDO PDO entry 1 to 2	4Byte (U32)	RO	Possible	– (5871 0108 hex 5871 0208 hex)

Gives the 324th to 325th TxPDO mapping for the MG80.

(34) Index <1B45 hex>: 326th TxPDO Mapping

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Objects	1Byte (U8)	RO	Not possible	– (05 hex)
1 to 5	PDO entry 1 to 5	4Byte (U32)	RO	Possible	– (5880 0120 hex 5880 0220 hex 5880 0320 hex 5880 0420 hex 5880 0520 hex)

Gives the 326th TxPDO mapping for the MG80.

8.3.3. Sync Manager Communication Objects

The communication memory of EtherCAT is set by the objects from 1C00 hex to 1C13 hex.

(1) Index <1C00 hex>: Sync Manager Communication Type

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Sync Manager Channels Used	1Byte (U8)	RO	Not possible	– (04 hex)
1	Communication Type SM0	1Byte (U8)	RO	Not possible	– (01 hex)
2	Communication Type SM1	1Byte (U8)	RO	Not possible	– (02 hex)
3	Communication Type SM2	1Byte (U8)	RO	Not possible	– (03 hex)
4	Communication Type SM3	1Byte (U8)	RO	Not possible	– (04 hex)

The sync manager has the following settings.

SM0: Mailbox receive (EtherCAT master unit to slave unit)
SM1: Mailbox transmit (slave unit to EtherCAT master unit)
SM2: Process data output (EtherCAT master unit to slave unit)
SM3: Process data input (slave unit to EtherCAT master unit)

(2) Index <1C10 hex>: Sync Manager 0 PDO Assignment

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Assigned PDOs	1Byte (U8)	RO	Not possible	– (00 hex)

Gives the number of PDO mappings used by the sync manager.
The mailbox receive sync manager does not have PDOs.

(3) Index <1C11 hex>: Sync Manager 1 PDO Assignment

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Assigned PDOs	1Byte (U8)	RO	Not possible	– (00 hex)

Gives the number of PDO mappings used by the sync manager.

The mailbox transmit sync manager does not have PDOs.

(4) Index <1C12 hex>: Sync Manager 2 PDO Assignment

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Assigned RxPDOs	1Byte (U8)	RW *1	Not possible	00 hex to 11 hex (11 hex)
1 to 17	RxPDO Mapping Assignment 1 to 17	2Byte (U16)	RW *1	Not possible	1600 hex to 17FF hex (1600 hex to 1610 hex)

*1 “RO” is set if there is no RxPDO.

Gives the RxPDO used by the sync manager.

(5) Index <1C13 hex>: Sync Manager 3 PDO Assignment

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Assigned TxPDOs	1Byte (U8)	RW *2	Not possible	00 hex to 46 hex (46 hex)
1 to 17	TxPDO Mapping Assignment 1 to 70	2Byte (U16)	RW *2	Not possible	1A00 hex to 1BFF hex (1B00 hex to 1B45 hex)

*2 “RO” is set if there is no TxPDO.

Gives the TxPDO used by the sync manager.

[Precaution]

A maximum of 350 bytes of PDOs can be assigned for the MG80-EC.

Do not assign more than 350 bytes of PDOs.

8.3.4. Manufacturer Specific Objects

The manufacturer-specific objects of the MG80-EC include objects for the MG50 and objects for the MG80.

[Precaution]
Objects for the MG50-EC are located in indexes 3000 hex to 4FFF hex, and some of these object functions are not available for the MG80 even if the setting is changed.

(1) Index <3000 hex>: Measuring Unit Communication Status

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	08 hex (08 hex)
1	Communication Busy	1bit (BOOL)	RO	Possible	00 hex to 01 hex Bit 0 = ON: Communication busy (in progress) (00 hex)
2	Communication Error	1bit (BOOL)	RO	Possible	00 hex to 01 hex Bit 0 = ON: Communication error occurred (00 hex)
3 to 8	予約	1bit (BOOL)	RO	Possible	00 hex to 01 hex (00 hex)

Indicates the communication status between the MG80-EC and the measuring units.
Sub-index 1 gives the communication busy status.
Sub-index 2 gives the communication error status.
* The “Measuring Unit Communication Status” function is not available for the MG80-EC. It is fixed to 00 hex.

(2) Index <3001 hex>: Number of Measuring Units

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	03 hex (03 hex)
1	Number of Measuring Units Setting	1Byte (U8)	RW	Possible	00 hex to 1E hex (10 hex)
2	Number of Dummies Setting	1Byte (U8)	RO	Possible	00 hex to 01 hex (00 hex)
3	Number of Connected Measuring Units	1Byte (U8)	RO	Possible	00 hex to 01 hex (10 hex)

Sub-index 1 gives the set number of measuring units.

Sub-index 2 gives the set number of dummies.

Sub-index 3 gives the number of connected (recognized) measuring units.

* The “Number of Measuring Units Setting” function is not available for the MG80-EC, even if set.
  Also, “Number of Connected Measuring Units” is fixed to 10 hex and “Number of Dummies Setting” is fixed to 00 hex.

(3) Index <3002 hex>: Input Filter

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	02 hex (02 hex)
1	Input Filter Setting	1bit (BOOL)	RW	Not possible	00 hex: Input filter disable 01 hex: Input filter enable (00 hex)
2	Input Filter Information	1bit (BOOL)	RO	Not possible	00 hex: Input filter disable 01 hex: Input filter enable (00 hex)

Sub-index 1 sets the input filter setting.

Sub-index 2 gives the input filter setting.

* The “Input Filter Setting” function is not available for the MG80-EC, even if set.
  Also, “Input Filter Information” is fixed to 00 hex.

(4) Index <3004 hex>: Dummy Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	03 hex (03 hex)
1	Dummies Setting	4Byte (U32)	RW	Not possible	0000 0000 hex to 3FFF FFFF hex (0000 0000 hex)
2	Dummy Information	4Byte (U32)	RO	Not possible	0000 0000 hex to 3FFF FFFF hex (0000 0000 hex)
3	Dummy Response Setting	1Byte (U8)	RW	Not possible	00 hex: Dummy normal response 01 hex: Dummy error response (00 hex)

Sub-index 1 sets the dummy setting.

Sub-index 2 gives the dummy setting.

Sub-index 3 sets the dummy response setting.

* “Dummy Setting” and “Dummy Response Setting” do not function with the MG80-EC, even if set.
  Also, “Dummy Information” is fixed to 00 hex.

(5) Index <3005 hex>: Input Delay Time Status

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Input Delay Time	1Byte (U8)	RO	Possible	00 hex : Undefined 01 hex : Standard 02 hex : High Speed 03 hex : Low Speed1 04 hex : Low Speed2 05 hex : TxPDO Normal Mode Type (00 hex)

Sub-index 1 gives the input delay time.

* “Input Delay Time” is fixed to 00 hex (Undefined) for the MG80-EC.

(6) Index <300A hex>: Measuring Unit Communication Status 8bit

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Measuring Unit Communication Status 8bit	1Byte (U8)	RO	Possible	00 hex to 02 hex Bit 0 = ON: Communication in progress Bit 1 = ON: Number of connected measuring units disagreement (00 hex)

Sub-index 1 indicates the measuring unit communication status.

* “Measuring Unit Communication Status 8bit” is fixed to 00 hex for the MG80-EC.

(7) Index <300B hex>: Measuring Unit Warning Status

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Measuring Unit Status	4Byte (U32)	RO	Possible	0000 0000 hex to 3FFF FFFF hex Corresponding bit = ON: Warning occurred (0000 0000 hex)

Sub-index 1 gives the measuring unit warning status.

* “Measuring Unit Warning Status” is fixed to 0000 0000 hex for the MG80-EC.

(8) Index <300C hex>: TxPDO Mapping Mode

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	02 hex (02 hex)
1	TxPDO Mapping Mode Setting	1Byte (U8)	RW	Not possible	00 hex: Normal mode 01 hex: Speed Priority mode (00 hex)
2	TxPDO Mapping Mode Information	1Byte (U8)	RO	Not possible	00 hex: Normal mode 01 hex: Speed Priority mode (00 hex)

Sub-index 1 sets the TxPDO mapping mode.

Sub-index 2 gives the TxPDO mapping mode information.

* The “TxPDO Mapping Mode Setting” function is not available for the MG80-EC, even if set.

  Also, “TxPDO Mapping Mode Information” is fixed to 00 hex for the MG80-EC.

(9) Index <3020 hex>: Read Input Bits

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	40 hex (40 hex)
1 to 64	Read Input Bits Read Input Bits 0 to 63	1bit (BOOL)	RO	Possible	00 hex: Input Bit = OFF 01 hex: Input Bit = ON (00 hex)

Sub-indexes 1 to 64 give the input bits of the measuring unit.

* “Read Input bits” is fixed to 00 hex for the MG80-EC.

Objects for each measuring unit are located in the range of indexes 4000 hex to 4FFF hex.

The index range is determined by the corresponding measuring unit.
The index range for each measuring unit is shown below.

Measuring unit number N	Index range
1	4000 hex to 407F hex
2	4080 hex to 40FF hex
3	4100 hex to 417F hex
4	4180 hex to 41FF hex
5	4200 hex to 427F hex
6	4280 hex to 42FF hex
7	4300 hex to 437F hex
8	4380 hex to 43FF hex
9	4400 hex to 447F hex
10	4480 hex to 44FF hex
11	4500 hex to 457F hex
12	4580 hex to 45FF hex
13	4600 hex to 467F hex
14	4680 hex to 46FF hex
15	4700 hex to 477F hex
16	4780 hex to 47FF hex

* N = 1 to 16.

The objects for each measuring unit are described on the following pages.

(10) Index <4000+(N-1)×80 hex>: Type of Measuring Unit

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Type of Measuring Unit	2Byte (U16)	RO	Not possible	0000 hex to FFFF hex * Model code of the measuring unit (Example) MF10-CM: 0460 hex (0000 hex)

Sub-index 1 gives the model number of the measuring unit.

* “Type of Measuring Unit” is fixed to 0000 hex for the MG80-EC.

(11) Index <4004+(N-1)×80 hex>: Threshold 1 Settings

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Threshold 1 Settings	4Byte (INT32)	RW	Possible	-999999999 to 999999999 C4653601 hex to 3B9AC9FF hex (0000 0000 hex)

Sub-index 1 sets Threshold 1.

* “Threshold 1” is the value of “2-step mode, group number 1 threshold 1” for the MG80-EC.

(12) Index <4005+(N-1)×80 hex>: Threshold 2 Settings

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Threshold 2 Settings	4Byte (INT32)	RW	Possible	-999999999 to 999999999 C4653601 hex to 3B9AC9FF hex (0000 0000 hex)

Sub-index 1 sets Threshold 2.

* “Threshold 2” is the value of “2-step mode, group number 1 threshold 2” for the MG80-EC.

(13) Index <4006+(N-1)×80 hex>: Measuring Unit Status

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Measuring Unit Status	2Byte (U16)	RO	Possible	0000 hex to FFFF hex Bit 0 = ON: Normal operation Bit 1 = ON: DPC-ON Bit 2 = ON: Tolerance judgment ST-ON Bit 9 = ON: EEPROM error Bit 10 = ON: Load short-circuit error Bit 11 = ON: Head-related error (0000 hex)

Sub-index 1 gives the measuring unit status.

* “Measuring Unit Status” is fixed at 0000 hex for the MG80-EC.

(14) Index <4008+(N-1)×80 hex>: Output Mode Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Output Mode Setting	2Byte (U16)	RW	Possible	0000 hex to FFFF hex 0000 hex: Normal Detection mode 0001 hex: Area Detection mode 0002 hex to FFFF hex: Not used (0000 hex)

Sub-index 1 sets the output mode.

* The “Output Mode Setting” function is not available for the MG80-EC, even if set.

(15) Index <4009+(N-1)×80 hex>: Detection Value

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Detection Value	4Byte (INT32)	RO	Possible	-2147483648 to 2147483647 8000 0000 hex to 7FFF FFFF hex (0000 0000 hex)

Sub-index 1 gives the detection value of the measuring unit.

* “Detection Value” is the “frame measurement value” for the MG80-EC.

(16) Index <400A+(N-1)×80 hex>: Operating Mode Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Operating Mode Setting	2Byte (U16)	RW	Not possible	0000 hex to FFFF hex 0000 hex : NO 0001 hex : NC 0002 hex to FFFF hex : Not used (FFFF hex)

Sub-index 1 sets the operating mode.

* The “Operating Mode Setting” function is not available for the MG80-EC, even if set.

(17) Index <400B+(N-1)×80 hex>: Detection Function Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Detection Function Setting	2Byte (U16)	RW	Not possible	0000 hex to FFFF hex 0000 hex: SHS (super high speed) 0001 hex: HS (high speed) 0002 hex: STND (standard) 0003 hex: GTGA (high resolution) 0004 hex to FFFF hex : Not used (FFFF hex)

Sub-index 1 sets the detection function.

* The “Detection Function Setting” function is not available for the MG80-EC, even if set.

(18) Index <4011+(N-1)×80 hex>: Display Digits Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Display Digits Setting	2Byte (U16)	RW	Not possible	0000 hex to FFFF hex 0000 hex: 4 digits 0001 hex: 3 digits 0002 hex: 2 digits 0003 hex: 1 digits 0004 hex to FFFF hex: Not used (FFFF hex)

Sub-index 1 sets the display digits.

* The “Display Digits Setting” function is not available for the MG80-EC, even if set.

(19) Index <4015+(N-1)×80 hex>: Eco Function Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Eco Function Setting	2Byte (U16)	RW	Not possible	0000 hex to FFFF hex 0000 hex: Eco function OFF 0001 hex: Eco function ON 0002 hex: Eco function Lo 0003 hex to FFFF hex: Not used (FFFF hex)

Sub-index 1 sets the eco function.

* The “Eco Function Setting” function is not available for the MG80-EC, even if set.

(20) Index <4016+(N-1)×80 hex>: Key Lock Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Key Lock Setting	2Byte (U16)	RW	Not possible	0000 hex to FFFF hex 0000 hex: Key Lock OFF 0001 hex: Key Lock ON 0002 hex to FFFF hex: Not used (FFFF hex)

Sub-index 1 sets the key lock setting.

* The “Key Lock Setting” function is not available for the MG80-EC, even if set.

(21) Index <4017+(N-1)×80 hex>: Display Blinking Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Display Blinking Setting	2Byte (U16)	RW	Not possible	0000 hex: Display blinking OFF 0001 hex: Display blinking ON (0000 hex)

Sub-index 1 sets the display blinking setting.

* The “Display Blinking Setting” function is not available for the MG80-EC, even if set.

(22) Index <4020+(N-1)×80 hex>: Hysteresis Width Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Hysteresis Width Setting	2Byte (U16)	RW	Not possible	0000 hex to FFFF hex 0000 hex: Standard 0001 hex: User setting 0002 hex to FFFF hex: Not used (FFFF hex)

Sub-index 1 sets the hysteresis width setting.

* The “Hysteresis Width Setting” function is not available for the MG80-EC, even if set.

(23) Index <4022+(N-1)×80 hex>: Hysteresis Width 2 Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Hysteresis Width 2 Settin	4Byte (U32)	RW	Not possible	0000 0000 hex to 05F5 E0FF hex (0000 0000 hex)

Sub-index 1 sets the hysteresis width 2 setting.

* The “Hysteresis Width 2 Setting” function is not available for the MG80-EC, even if set.

(24) Index <4033+(N-1)×80 hex>: 2-point Setting (1st point)

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	2-point Setting (1st point)	2Byte (U16)	RW	Not possible	0000 hex to 0001 hex Write 0001 hex to execute. (0000 hex)

Sub-index 1 executes the 1st point of 2-point setting.

* The “2-point Setting (1st point)” function is not available for the MG80-EC, even if set.

(25) Index <4034+(N-1)×80 hex>: 2-point Setting (2nd point)

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	2-point Setting (2nd point)	2Byte (U16)	RW	Not possible	0000 hex to 0001 hex Write 0001 hex to execute. (0000 hex)

Sub-index 1 executes the 2nd point of 2-point setting.

* The “2-point Setting (2nd point)” function is not available for the MG80-EC, even if set.

(26) Index <4036+(N-1)×80 hex>: 1-point Setting, ±Tolerance Setting Setup

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	1-point Setting, ±Tolerance Setting Setup	2Byte (U16)	RW	Not possible	0000 hex to 0001 hex Write 0001 hex to execute. (0000 hex)

Sub-index 1 starts execution of the 1-point setting, ±tolerance setting setup.

* The "1-point Setting, ±Tolerance Setting Setup" function is not available for the MG80-EC, even if set.

(27) Index <4038+(N-1)×80 hex>: Reference Point Use Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Reference Point Use Setting	2Byte (U16)	RW	Not possible	0000 hex to FFFF hex 0000 hex: Reference point used. 0001 hex: Reference point not used. 0002 hex to FFFF hex: Not used (FFFF hex)

Sub-index 1 sets the reference point use setting.

* The "Reference Point Use Setting" function is not available for the MG80-EC, even if set.

(28) Index <4039+(N-1)×80 hex>: Preset Value Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Preset Value Setting	4Byte (INT32)	RW	Not possible	-999999999 to 999999999 C4653601 hex to 3B9AC9FF hex (0000 0000 hex)

Sub-index 1 sets the preset value.

* “Preset Value” is the value of “Preset Value for Each Frame” for the MG80-EC.

(29) Index <403B+(N-1)×80 hex>: Tolerance Setting High

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Tolerance Setting High	4Byte (INT32)	RW	Not possible	-19999 9999 to 9999 9999 FECE D301 hex to 05F5 E0FF hex (0000 0000 hex)

Sub-index 1 sets the tolerance setting high side.

* The “Tolerance Setting High” function is not available for the MG80-EC, even if set.

(30) Index <403C+(N-1)×80 hex>: Tolerance Setting Low

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Tolerance Setting Low	4Byte (INT32)	RW	Not possible	-19999 9999 to 9999 9999 FECE D301 hex to 05F5 E0FF hex (0000 0000 hex)

Sub-index 1 sets the tolerance setting low side.

* The “Tolerance Setting Low” function is not available for the MG80-EC, even if set.

(31) Index <403E+(N-1)×80 hex>: ±Tolerance Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	±Tolerance Setting	2Byte (U16)	RW	Not possible	0000 hex to 0001 hex Write 0001 hex to execute. (0000 hex)

Sub-index 1 sets the ±tolerance setting.

* The "±Tolerance Setting" function is not available for the MG80-EC, even if set.

(32) Index <4042+(N-1)×80 hex>: Measuring Unit Initialization

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Measuring Unit Initialization	2Byte (U16)	RW	Not possible	0000 hex to 0001 hex Write 0001 hex to execute. (0000 hex)

Sub-index 1 executes measuring unit initialization.

* The "Measuring Unit Initialization" function is not available for the MG80-EC, even if set.

(33) Index <4071+(N-1)×80 hex>: Direction Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Direction Setting	2Byte (U16)	RW	Not possible	0000 hex to FFFF hex 0000 hex: Normal 0001 hex: Reversed (0000 hex)

Sub-index 1 sets the direction setting.

* The "Direction Setting" function is not available for the MG80-EC, even if set.

(34) Index <4072+(N-1)×80 hex>: Output Mode Selection

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Output Mode Selection	2Byte (U16)	RW	Not possible	0000 hex to FFFF hex 0000 hex: Normal 0001 hex: Hybrid (0000 hex)

Sub-index 1 sets the output mode selection.

* The “Output Mode Selection” function is not available for the MG80-EC, even if set.

(35) Index <4075+(N-1)×80 hex>: Preset Call

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Preset Call	2Byte (U16)	RW	Not possible	0000 hex to 0001 hex 0000 hex: Cleared 0001 hex: Executed (0000 hex)

Sub-index 1 executes the preset.

* This is “Frame Preset Call” for the MG80-EC.

- Objects for the MG80 are located in indexes 5000 hex to 5FFF hex.
- The objects at indexes 5000 hex to 59FF hex are used for PDO communications.
  Indexes 5000 hex to 57FF hex are for RxPDO communications (host device to MG80-EC).
  Indexes 5800 hex to 59FF hex are for TxPDO communications (MG80-EC to host device)
- The objects at indexes 5A00 hex to 5FFF hex are used for SDO communications.
  Indexes 5A00 hex to 5FFF hex are for SDO communications (host device ⇔ MG80-EC).

The details of the objects are described below.

(36) Index <5000 hex to 500F hex>: Master Cyclic Input Information 1 to 16

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	10 hex (10 hex)
1 to 16	Master Cyclic Input Information bit 0 to bit 15	1bit (BOOL)	RO	Possible	00 hex: Input Bit = OFF 01 hex: Input Bit = ON (00 hex)

Indexes 5000 hex to 500F hex are respectively the master cyclic input information 1 to 16.

Sub-indexes 1 to 16 give bits 0 to 15 of the master cyclic input information.

The details of each bit are shown below.

bit0	Name	Remarks
0	Master Cyclic Input Information bit 0	Reserved. It is fixed to 00 hex.
1	Master Cyclic Input Information bit 1	Reserved. It is fixed to 00 hex.
2	Master Cyclic Input Information bit 2	Reserved. It is fixed to 00 hex.
3	Master Cyclic Input Information bit 3	Reserved. It is fixed to 00 hex.
4	Master Cyclic Input Information bit 4	Reserved. It is fixed to 00 hex.
5	Master Cyclic Input Information bit 5	Reserved. It is fixed to 00 hex.
6	Master Cyclic Input Information bit 6	Reserved. It is fixed to 00 hex.
7	Master Cyclic Input Information bit 7	Reserved. It is fixed to 00 hex.
8	Master Cyclic Input Information bit 8	Reserved. It is fixed to 00 hex.
9	Master Cyclic Input Information bit 9	Reserved. It is fixed to 00 hex.
10	Master Cyclic Input Information bit 10	Reserved. It is fixed to 00 hex.
11	Master Cyclic Input Information bit 11	Reserved. It is fixed to 00 hex.

12	Master Cyclic Input Information bit 12	Reserved. It is fixed to 00 hex.
13	Master Cyclic Input Information bit 13	Reserved. It is fixed to 00 hex.
14	Master Cyclic Input Information bit 14	Reserved. It is fixed to 00 hex.
15	Master Cyclic Input Information bit 15	Reserved. It is fixed to 00 hex.

(37) Index <5010 hex>: Master Cyclic Input Information 17 1

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	10 hex (10 hex)
1 to 16	Master Cyclic Input Information bit0 to bit15	1bit (BOOL)	RO	Possible	00 hex: Input Bit = OFF 01 hex: Input Bit = ON (00 hex)

Index 5010 hex is the master cyclic input information 17.

Sub-indexes 1 to 16 give bits 0 to 15 of the master cyclic input information.
The details of each bit are shown below.

bit0	Name	Remarks
0	Master Cyclic Input Information bit 0	Reserved. It is fixed to 00 hex.
1	Master Cyclic Input Information bit 1	Reserved. It is fixed to 00 hex.
2	Master Cyclic Input Information bit 2	Reserved. It is fixed to 00 hex.
3	Master Cyclic Input Information bit 3	Reserved. It is fixed to 00 hex.
4	Master Cyclic Input Information bit 4	Reserved. It is fixed to 00 hex.
5	Master Cyclic Input Information bit 5	Reserved. It is fixed to 00 hex.
6	Master Cyclic Input Information bit 6	Reserved. It is fixed to 00 hex.
7	Master Cyclic Input Information bit 7	Reserved. It is fixed to 00 hex.
8	Master Cyclic Input Information bit 8	Reserved. It is fixed to 00 hex.
9	Master Cyclic Input Information bit 9	Reserved. It is fixed to 00 hex.
10	Master Cyclic Input Information bit 10	Reserved. It is fixed to 00 hex.
11	Master Cyclic Input Information bit 11	Reserved. It is fixed to 00 hex.
12	Master Cyclic Input Information bit 12	Reserved. It is fixed to 00 hex.
13	Master Cyclic Input Information bit 13	Reserved. It is fixed to 00 hex.
14	Master Cyclic Input Information bit 14	Reserved. It is fixed to 00 hex.
15	Master Cyclic Input Information bit 15	Reserved. It is fixed to 00 hex.

(38) Index <5800 hex to 580F hex>: Frame A to P Measurement Values

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Frame A to P Measurement Values	4Byte (INT32)	RO	Possible	-2147483648 to 2147483647 8000 0000 hex to 7FFF FFFF hex (0000 0000 hex)

Indexes 5800 hex to 580F hex are respectively the frame A to frame P measurement values.

Sub-index 1 gives the frame-measurement value.

(39) Index <5820 hex to 582F hex>: Measuring Unit Bit Information 1 to 16

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	18 hex (18 hex)
1 to 24	Measuring Unit Bit Information bit 0 to bit 23	1bit (BOOL)	RO	Possible	00 hex: Input Bit = OFF 01 hex: Input Bit = ON (00 hex)

Indexes 5820 hex to 582F hex are respectively the measuring unit bit information 1 to 16.

Sub-indexes 1 to 24 give bits 0 to 23 of the measuring unit bit information. The details of each bit are shown below.

bit0	Name	Remarks
0	Measuring unit bit information bit 0	Reserved. It is fixed to 00 hex.
1	Measuring unit bit information bit 1	Reserved. It is fixed to 00 hex.
2	Measuring unit bit information bit 2	Reserved. It is fixed to 00 hex.
3	Measuring unit bit information bit 3	Reserved. It is fixed to 00 hex.
4	Measuring unit bit information bit 4	Reserved. It is fixed to 00 hex.
5	Measuring unit bit information bit 5	Reserved. It is fixed to 00 hex.
6	Measuring unit bit information bit 6	Reserved. It is fixed to 00 hex.
7	Measuring unit bit information bit 7	Reserved. It is fixed to 00 hex.
8	Measuring unit bit information bit 8	Reserved. It is fixed to 00 hex.
9	Measuring unit bit information bit 9	It gives the bit information of phase A of the asix.
10	Measuring unit bit information bit 10	It gives the bit information of phase B of the asix.
11	Measuring unit bit information bit 11	It gives the bit information of phase Z of the asix.
12	Measuring unit bit information bit 12	Reserved. It is fixed to 00 hex.
13	Measuring unit bit information bit 13	Reserved. It is fixed to 00 hex.
14	Measuring unit bit information bit 14	Reserved. It is fixed to 00 hex.
15	Measuring unit bit information bit 15	Reserved. It is fixed to 00 hex.
16	Measuring unit bit information bit 16	Reserved. It is fixed to 00 hex.
17	Measuring unit bit information bit 17	Reserved. It is fixed to 00 hex.
18	Measuring unit bit information bit 18	Reserved. It is fixed to 00 hex.
19	Measuring unit bit information bit 19	Reserved. It is fixed to 00 hex.
20	Measuring unit bit information bit 20	Reserved. It is fixed to 00 hex.
21	Measuring unit bit information bit 21	Reserved. It is fixed to 00 hex.
22	Measuring unit bit information bit 22	Reserved. It is fixed to 00 hex.
23	Measuring unit bit information bit 23	Reserved. It is fixed to 00 hex.

(40) Index <5850 hex to 585F hex>: Measuring Unit Status 1 to 16

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Measuring Unit Status	1Byte (U8)	RO	Possible	00 hex to FF hex (00 hex)

Indexes 5850 hex to 585F hex are respectively the measuring unit status 1 to 16.

Sub-index 1 gives the measuring unit status.
The details of each bit are shown below.

bit0	Name	Remarks
7	Measuring Unit Status bit 7	When this bit is ON, a CRC error has occurred.
6	Measuring Unit Status bit 6	When this bit is ON, pause is ON.
5	Measuring Unit Status bit 5	Reserved. It is fixed to 00 hex.
4	Measuring Unit Status bit 4	Reserved. It is fixed to 00 hex.
3	Measuring Unit Status bit 3	When this bit is ON, the reference point was passed.
2	Measuring Unit Status bit 2	Reserved. It is fixed to 00 hex.
1	Measuring Unit Status bit 1	When this bit is ON, a measuring unit error has occurred.
0	Measuring Unit Status bit 0	When this bit is ON, an axis overall error has occurred.

(41) Index <5860 hex to 586F hex>: Frame A to P Information

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	03 hex (03 hex)
1	Comparator Result	1Byte (U8)	RO	Possible	00 hex to 04 hex Comparator areas 0 to 4 (00 hex)
2	Output type	1Byte (U8)	RO	Possible	00 hex to 03 hex 00 hex: Current value output 01 hex: Maximum value output 02 hex: Minimum value output 03 hex: Peak-to-peak value output (00 hex)
3	Comparator Group Number	1Byte (U8)	RO	Possible	01 hex to 08 hex Group number 1 to 8 (01 hex)

Indexes 5860 hex to 586F hex are respectively the frame A to frame P information.

Sub-index 1 gives the comparator result area number.
Sub-index 2 gives the output type of the frame-measurement value.
Sub-index 3 gives the group number used by the comparator result calculation.

(42) Index <5870 hex to 5871 hex>: I/O Module 1 and 2 Information

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	02 hex (02 hex)
1	I/O module input signal	1Byte (U8)	RO	Possible	00 hex to FF hex (00 hex)
2	I/O module output signal	1Byte (U8)	RO	Possible	00 hex to FF hex (00 hex)

Index 5870 hex is the I/O module 1 information.
Index 5871 hex is the I/O module 2 information.

Sub-index 1 gives the I/O module input signal.
Sub-index 2 gives the I/O module output signal.
The details of each bit are shown below.

I/O module input signal bit arrangement

bit0	Name	Remarks
7	I/O module input signal bit 7	Indicates the status of I/O module input terminal 7.
6	I/O module input signal bit 6	Indicates the status of I/O module input terminal 6.
5	I/O module input signal bit 5	Indicates the status of I/O module input terminal 5.
4	I/O module input signal bit 4	Indicates the status of I/O module input terminal 4.
3	I/O module input signal bit 3	Indicates the status of I/O module input terminal 3.
2	I/O module input signal bit 2	Indicates the status of I/O module input terminal 2.
1	I/O module input signal bit 1	Indicates the status of I/O module input terminal 1.
0	I/O module input signal bit 0	Indicates the status of I/O module input terminal 0.

I/O module output signal bit arrangement

bit0	Name	Remarks
7	I/O module output signal bit 7	Indicates the status of I/O module output terminal 7.
6	I/O module output signal bit 6	Indicates the status of I/O module output terminal 6.
5	I/O module output signal bit 5	Indicates the status of I/O module output terminal 5.
4	I/O module output signal bit 4	Indicates the status of I/O module output terminal 4.
3	I/O module output signal bit 3	Indicates the status of I/O module output terminal 3.
2	I/O module output signal bit 2	Indicates the status of I/O module output terminal 2.
1	I/O module output signal bit 1	Indicates the status of I/O module output terminal 1.
0	I/O module output signal bit 0	Indicates the status of I/O module output terminal 0.

(43) Index <5A00 hex to 5A0F hex>: Frame A to P Parameter Settings

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	2E hex (2E hex)
1	Input Resolution Setting	2Byte (U16)	RW	Not possible	0000 hex to FFFF hex ※1 (0000 hex)
2	Reference Point Use Setting	1Byte (U8)	RW	Not possible	00 hex to 01 hex ※1 (00 hex)
3	Reference Point Position Clear Instruction	1Byte (U8)	RW	Not possible	00 hex to 01 hex ※1 (00 hex)
4	Axis Calculation Settings	4Byte (U32)	RW	Not possible	0000 0000 hex to FFFF FFFF hex ※1 (FFFF XX00 hex) Frame A: XX = 00: Axis 1 Frame B: XX = 01: Axis 2 Frame C: XX = 02: Axis 3 to Frame P: XX = 0F: Axis 16
5	Output Type Setting	1Byte (U8)	RW	Not possible	00 hex to 03 hex ※1 (00 hex)
6	Comparator Group Number Setting	1Byte (U8)	RW	Not possible	01 hex to 08 hex ※1 (01 hex)
7	Comparator Step Number Mode Setting	2Byte (U16)	RW	Not possible	0000 hex to 0004 hex ※1 (0000 hex)
8 to 39	Comparator Threshold 1 to 32	4Byte (INT32)	RW	Not possible	-999999999 to 999999999 C4653601 hex to 3B9AC9FF hex (0000 0000 hex)
40	Preset Value Setting	4Byte (INT32)	RW	Not possible	-999999999 to 999999999 C4653601 hex to 3B9AC9FF hex (0000 0000 hex)
41	Master Preset Setting	4Byte (INT32)	RW	Not possible	-999999999 to 999999999 C4653601 hex to 3B9AC9FF hex (0000 0000Hex)
42	Reset Instruction	1Byte (U8)	RW	Not possible	00 hex to 01 hex ※1 (00 hex)
43	Preset Call Instruction	1Byte (U8)	RW	Not possible	00 hex to 01 hex ※1 (00 hex)
44	Master Preset Call Instruction	1Byte (U8)	RW	Not possible	00 hex to 01 hex ※1 (00 hex)
45	Start Instruction	1Byte (U8)	RW	Not possible	00 hex to 01 hex ※ (00 hex)
46	Pause Instruction	1Byte (U8)	RW	Not possible	00 hex to 01 hex ※1 (00 hex)

Indexes 5A00 hex to 5A0F hex are respectively the frame A to frame P parameter settings.

Sub-index 1 sets the input resolution.
Sub-index 2 sets reference point use for the axis.
Sub-index 3 executes reference point position clear for the axis.
Sub-index 4 sets the axis calculation setting
Sub-index 5 sets the output type.
Sub-index 6 sets the comparator group number.
Sub-index 7 sets the comparator step number mode.
Sub-indexes 8 to 11 set thresholds 1 to 4 for the group number 1 comparators.
Sub-indexes 12 to 15 set thresholds 1 to 4 for the group number 2 comparators.
Sub-indexes 16 to 15 set thresholds 1 to 4 for the group number 3 comparators.
Sub-indexes 20 to 15 set thresholds 1 to 4 for the group number 4 comparators.
Sub-indexes 24 to 15 set thresholds 1 to 4 for the group number 5 comparators.
Sub-indexes 28 to 15 set thresholds 1 to 4 for the group number 6 comparators.
Sub-indexes 32 to 15 set thresholds 1 to 4 for the group number 7 comparators.
Sub-indexes 36 to 39 set thresholds 1 to 4 for the group number 8 comparators.
Sub-index 40 sets the preset value.
Sub-index 41 sets the master preset value.
Sub-index 42 executes reset.
Sub-index 43 executes preset call.
Sub-index 44 executes master preset call.
Sub-index 45 executes start.
Sub-index 46 executes pause.

*1 The details of each parameter setting are described below.

① Input Resolution

Input Resolution is a 2-byte parameter setting. The details are shown below.

Offset	Contents
+00	Sign 00 hex: + (positive) 01 hex: - (negative)
+01	Input Resolution 01 hex : 0.1 um 02 hex : 0.5 um 03 hex : 1.0 um 04 hex : 2.0 um 05 hex : 5.0 um 06 hex : 10 um

② Reference Point Use Setting

Reference Point Use Setting is a 1-byte parameter setting. The details are shown below.

Offset	Contents
+00	Use Ref point 00 hex: Reference point not used. 01 hex: Reference point used.

③ Reference Point Position Clear Instruction

Reference Point Position Clear Instruction is a 1-byte parameter setting. The details are shown below.

Offset	Contents
+00	Reference Point Position Clear Instruction 01 hex: Executes reference point position clear.

④ Axis Calculation Settings

Axis Calculation Setting is a 4-byte parameter setting. The details are shown below.

Offset	Contents
+00	Sign 1 00 hex: + (positive) 01 hex: - (negative)
+01	Main axis number 00 hex: Axis 1 01 hex: Axis 2 to 0F hex: Axis 16
+02	Sign 2 00 hex: + (positive) 01 hex: - (negative) FF hex: No reference axis
+03	Reference axis number 00 hex: Axis 1 01 hex: Axis 2 to 0F hex: Axis 16 * When Sign 2 is set to “FF hex: No reference axis,” the reference axis number becomes an invalid parameter (FF hex).

⑤ Output Type Setting

Output Type Setting is a 1-byte parameter setting. The details are shown below.

Offset	Contents
+00	Output Type Setting 00 hex: Current value 01 hex: Maximum value 02 hex: Minimum value 03 hex: Peak-to-peak value

⑥ Comparator Group Number Setting

Comparator Group Number Setting is a 1-byte parameter setting. The details are shown below.

Offset	Contents
+00	Comparator Group Number Setting 01 hex: Group number 1 02 hex: Group number 2 to 08 hex: Group number 8

⑦ Comparator Step Number Mode Setting

Comparator Step Number Mode Setting is a 2-byte parameter setting. The details are shown below.

Offset	Contents
+00	Comparator Step Number Mode Setting 00 hex: 0 steps mode 02 hex: 2 steps mode 04 hex: 4 steps mode
+01	00 hex 固定

⑧ Reset Instruction

Reset Instruction is a 1-byte parameter setting. The details are shown below.

Offset	Contents
+00	Reset Instruction 01 hex : Executes reset.

⑨ Preset Call Instruction

Preset Call Instruction is a 1-byte parameter setting. The details are shown below.

Offset	Contents
+00	Preset Call Instruction 01 hex: Executes preset call.

⑩ Master Preset Call Instruction

Master Preset Call Instruction is a 1-byte parameter setting. The details are shown below.

Offset	Contents
+00	Master Preset Call Instruction 01 hex: Executes master preset call. * The Master Preset Call function is available only when Reference Point Use Setting is ON. Also, Master Preset Call cannot be used together with Preset Call.

⑪ Start Instruction

Start Instruction is a 1-byte parameter setting. The details are shown below.

Offset	Contents
+00	Start Instruction 01 hex: Executes start.

⑫ Pause Instruction

Pause Instruction is a 1-byte parameter setting. The details are shown below.

Offset	Contents
+00	Pause Instruction 00 hex: Pause OFF 01 hex: Pause ON

(44) Index <5A10 hex to 5A11 hex>: I/O Module 1 and 2 Parameter Settings

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	02 hex (02 hex)
1	Input Terminal Function Setting	2Byte (U16)	RW	Not possible	0000 hex to FFFF hex *1 (FFXX hex) XX = 00: Input terminal bit 0 XX = 01: Input terminal bit 1 to XX = 07: Input terminal bit 7
2	Output Terminal Function Setting	2Byte (U16)	RW	Not possible	0000 hex to FFFF hex *1 (FFXX hex) XX = 00: Output terminal bit 0 XX = 01: Output terminal bit 1 to XX = 07: Output terminal bit 7

Indexes 5A10 hex and 5A11 hex are respectively the I/O module 1 and I/O module 2 parameter settings.
Sub-index 1 sets the input terminal function.
Sub-index 2 sets the output terminal function.

*1 The details of each parameter setting are described below.

① Input Terminal Function Setting
Input Terminal Function Setting is a 2-byte parameter setting. The details are shown below.

Offset	Contents
+00	Input terminal number 00 hex: Input terminal bit 0 01 hex: Input terminal bit 1 02 hex: Input terminal bit 2 03 hex: Input terminal bit 3 04 hex: Input terminal bit 4 05 hex: Input terminal bit 5 06 hex: Input terminal bit 6 07 hex: Input terminal bit 7
+01	Input terminal function 00 hex: Addr0: Address bit 0 01 hex: Addr1: Address bit 1 02 hex: Addr2: Address bit 2

	03 hex: Addr3: Address bit 3 04 hex: Dreq: Data request 05 hex: Comp0: Comparator group number bit 0 06 hex: Comp1: Comparator group number bit 1 07 hex: Comp2: Comparator group number bit 2 08 hex: Reset: Reset instruction 09 hex: Preset: Preset call instruction 0A hex: ResetOrg: Reference point position clear instruction 0B hex: Mode 0: Output type bit 0 0C hex: Mode 1: Output type bit 1 0D hex: Start: Start instruction 0E hex: Pause: Pause instruction FF hex: No Func: No function

② Output Terminal Function Setting

Output Terminal Function Setting is a 2-byte parameter setting. The details are shown below.

Offset	Contents
+00	Output terminal number 00 hex : Output terminal bit 0 01 hex : Output terminal bit 1 02 hex : Output terminal bit 2 03 hex : Output terminal bit 3 04 hex : Output terminal bit 4 05 hex : Output terminal bit 5 06 hex : Output terminal bit 6 07 hex : Output terminal bit 7
+01	Output terminal function 00 hex: Drdy: Data Ready signal 01 hex: CompOut0: Comparator result bit 0 02 hex: CompOut1: Comparator result bit 1 03 hex: CompOut2: Comparator result bit 2 04 hex: CompOut3: Comparator result bit 3 05 hex: CompOut4: Comparator result bit 4 06 hex: Alarm: Alarm signal FF hex: No Func: No function

(45) Index <5B00 hex>: Unit Setting

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01ex (01 hex)
1	Unit Setting	1Byte (U8)	RW	Not possible	00 hex : mm 01 hex : Other (※) (00 hex)

Index 5B00 hex is the unit setting.

Sub-index 1 sets the unit.

※Other=mm/25.4

(46) Index <5B01 hex>: Parameter Backup Instruction

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Parameter Backup Instruction	1Byte (U8)	RW	Not possible	00 hex to 01 hex 01 hex: Executes backup. (00 hex)

Index 5B01 hex is the parameter backup setting.

Sub-index 1 executes parameter backup.

(47) Index <5B02 hex>: Parameter Initialization Instruction

Sub Index	Contents	Size	Access	PDO map	Setting range (default setting)
0	Number of Entries	1Byte (U8)	RO	Not possible	01 hex (01 hex)
1	Parameter Initialization Instruction	1Byte (U8)	RW	Not possible	00 hex to 01 hex 01 hex: Executes initialization. (00 hex)

Index 5B02 hex is the parameter initialization setting.

Sub-index 1 executes parameter initialization.

日本からの輸出時における注意

本製品(および技術)は輸出令別表第1の16の項(外為令別表16の項)に該当します。キャッチオール規制による経済産業省の許可要否につきましては、輸出者様にてご確認ください。

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