

Specification Preliminary

EW620 I/O Series:

EW62N9386

EW62N9386 (EtherCAT ID Type Network Adapter)

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History

REV.	PAGES	REMARKS	DATE	Editor
1.06		Preliminary	19.01.2019	DHLEE

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1. Environment Specification

Environmental Specification	
Operation Temperature	-40°C °C ~ 70
UL Temperature	-20°C °C ~ 60
Storage Temperature	-40°C °C ~ 85
Relative Humidity	5% ~ 90% Non-condensing
Mounting	DIN Rail
General Specification	
Shock Operating	IEC 60068-2-27
Vibration Resistance	Sine Vibration (Based on IEC 60068-2-6) - 5 ~ 25Hz : ±1.6mm - 25 ~ 300Hz : 4g - Sweep Rate : 1 Oct/min, 20 Sweeps Random Vibration (Based on IEC 60068-2-64) - 10 ~ 40 Hz : 0.0125 g ² /Hz - 40 ~ 100 Hz : 0.0125 → 0.002 g ² /Hz - 100 ~ 500 Hz : 0.002 g ² /Hz - 500 ~ 2000 Hz : 0.002 → 1.3 x 10 ⁻⁴ g ² /Hz - Test time : 1hrs for each test
EMC Resistance Burst/ESD	EN 61000-6-2 : 2005 EN61000-6-4/All : 2011
Installation Pos. / Protect. Class	Variable/IP20
Product Certifications	CE

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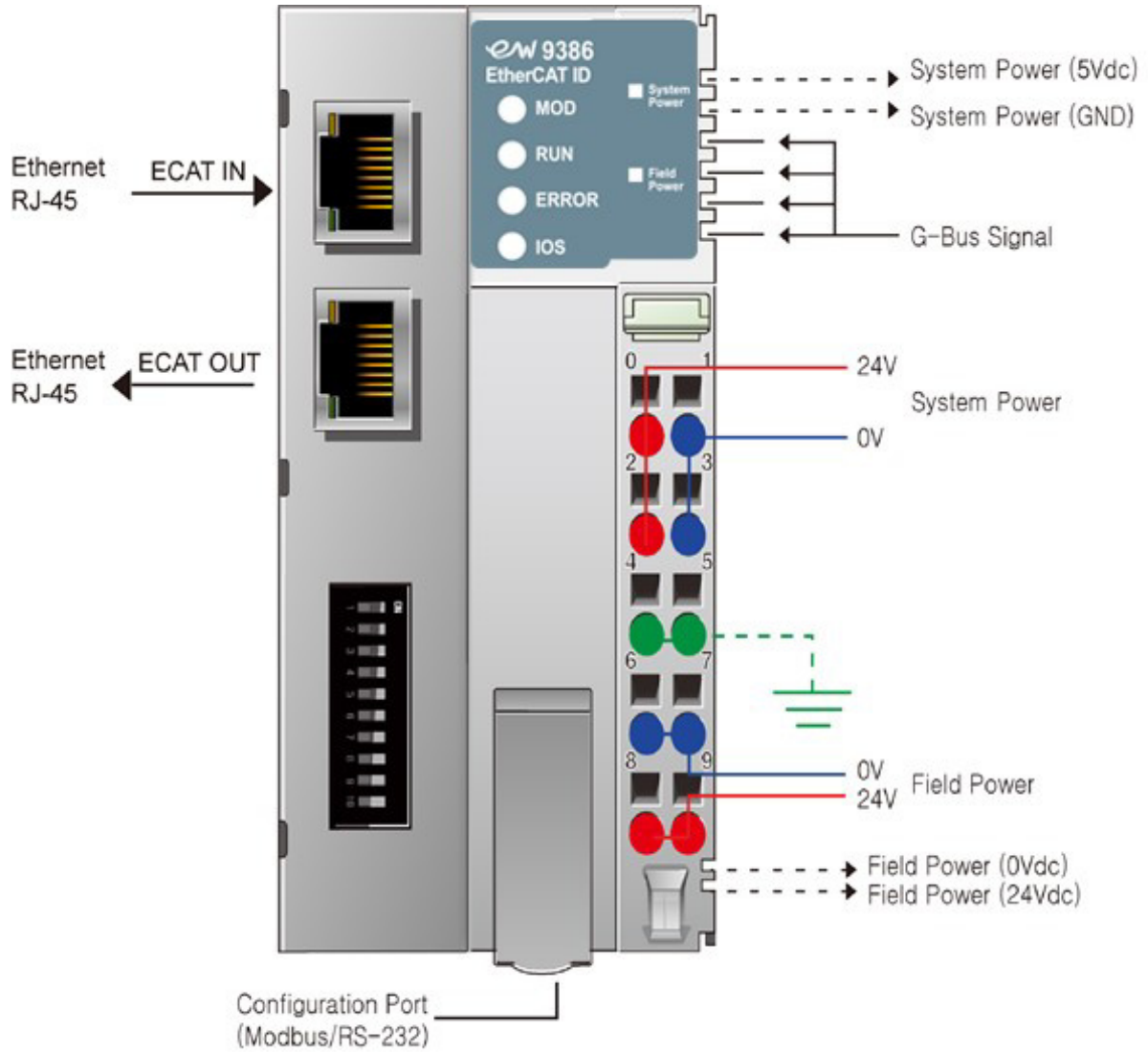
2. EW62N9386 (EtherCAT ID Type Network Adapter)

2.1. EW62N9386 Specification

Items	Specification
Communication Interface Specification	
Adapter Type	Slave Node (EtherCAT)
Max. Expansion Slot	63 slots
I/O Data Size	Max 128 bytes each slot
Max. Network Node	65,535
Baud Rate	100Mbps
Bus Connection	2 x RJ-45
Mac Address / IP Address	Not needed
Other Serial Port	RS232 for MODBUS/RTU, Touch Panel or IOGuide(ESA Software)
Serial Configuration (RS232)	Node : 1 (Fixed) Baud Rate : 115200 (Fixed) Data bit : 8 (Fixed) Parity bit : No parity (Fixed) Stop bit : 1 (Fixed)
Indicator	6 Status LEDs 1 Green/Red, Module Status (MOD) 1 Green/Red, Network Status (RUN) 1 Green, Error Status (ERROR) 1 Green/Red Expansion I/O Module Status (IOS) 1 Green, System Power Status 1 Green, Field Power Status
Module Location	Starter module left side of EW620-Series system
Field Power Detection	About 14Vdc
General Specification	
System Power	Supply voltage : 24Vdc nominal Supply voltage range : 15~32Vdc Protection : Output current limit (Min. 1.5A) Reverse polarity protection
Power Dissipation	70mA @ 24Vdc
Current for I/O Module	1.5A @ 5Vdc
Isolation	System power to internal logic : Non-Isolation System power I/O driver : Isolation
Field Power	Supply voltage : 24Vdc typical (Max. 32Vdc) * Field Power Range is different depending on IO Module series. Refer to IO Module's Specification.
Weight	167g
Module Size	54mm x 99mm x 70mm

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2.2. EW62N9386 Wiring Diagram

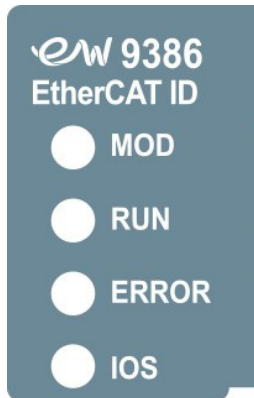


Pin No.	Signal Description	Signal Description	Pin No.
0	System Power, 24V	System Power, Ground	1
2	System Power, 24V	System Power, Ground	3
4	F.G	F.G	5
6	Field Power, Ground	Field Power, Ground	7
8	Field Power, 24V	Field Power, 24V	9

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2.3. EW62N9386 LED Indicator

2.3.1. LED Indicator



LED No.	LED Function / Description	LED Color
MOD	Module Status	Green/Red
RUN	Current Running Status	Green
ERROR	Error Status (EtherCAT)	Green
IOS	Extension Module Status	Green/Red
System Power	System Power Enable	Green
Field Power	Field Power Enable	Green

2.3.2. MOD (Module Status LED)

Status	LED	To indicate
Not Powered	OFF	power is not supplied to the unit.
Normal, Operational	Green	The unit is operating in normal condition.
Device in Standby	Flashing Green	The EEPROM parameter is not initialized yet. Serial Number is zero value (0x00000000)
Minor Fault	Flashing Red	The unit has occurred recoverable fault in self-testing. - EEPROM checksum fault.
Unrecoverable Fault	Red	The unit has occurred unrecoverable fault in self-testing. - Firmware fault

2.3.3. RUN (Current Running Status LED)

Status	LED	To indicate
Init	OFF	State of the EtherCAT State Machine: INIT = Initialization.
Pre-Operation	Blinking	State of the EtherCAT State Machine: PREOP = Pre-Operation.
Safe-Operation	Single Flash	State of the EtherCAT State Machine: SAFEOP = Safe-Operation.
Initialization or Bootstrap	Flashes	State of the EtherCAT State Machine: BOOT = Bootstrap (Update of the coupler firmware)
Operational	ON	State of the EtherCAT State Machine: Operational.

2.3.4. ERROR (Error State LED)

Status	LED	To indicate
No Error	OFF	No Error.
Invalid Configuration	Blinking	Invalid Configuration.
Unsolicited State Change	Single Flash	Local Error.
Application Watchdog Timeout	Double Flash	Process Data Watchdog Timeout / EtherCAT Watchdog Timeout.
Booting Error	Flashes	Booting Error.
PDI Watchdog Timeout	ON	Application Controller Failure.

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2.3.5. IOS LED (Extension Module Status LED)

Status	LED	To indicate
Not Powered	OFF	Device has no expansion module or may not be powered.
Internal Bus On-line, Do not Exchanging I/O	Flashing Green	Internal Bus is normal but does not exchanging I/O data. (Passed the expansion module configuration)
Internal Bus Connection, Run Exchanging I/O	Green	Exchanging I/O data.
Internal Bus Connection Fault during Exchanging I/O	Red	One or more expansion module occurred in fault state. - Changed expansion module configuration. - Internal Bus communication failure.
Expansion Configuration Failed	Flashing Red	Failed to initialize expansion module. - Detect invalid expansion module ID. - Overflow Input/Output size. - No expansion module. - Too many expansion module. - Initial protocol failure. - Mismatch vendor code between adapter and expansion module.

2.3.6. Field Power, System Power LED (Field Power, System Power Status LED)

Status	LED	To indicate
Not supplied field, system power	OFF	Not supplied 24Vdc field power, 5Vdc system power.
Supplied field, system power	Green	Supplied 24Vdc field power, 5Vdc system power.

2.3.7. Indicator states and flash rates

LED ON	Constantly ON
LED OFF	Constantly OFF.
LED flickering	Equal ON and OFF times with a frequency of approximately 10 Hz: ON for approximately 50ms and OFF for approximately 50ms.
LED blinking	Equal ON and OFF times with a frequency of approximately 2, 5Hz: ON for approximately 200ms followed by OFF for approximately 200ms.
LED single flash	One short flash (approximately 200ms) followed by a long OFF phase (approximately 1000ms)
LED double flash	A sequence of two short flashes (approximately 200ms), separated by an OFF phase (approximately 200ms). The sequence is finished by a long OFF phase (approximately 1000ms)
LED triple flash	A sequence of three short flashes (approximately 200ms), separated by an OFF phase (approximately 200ms). The sequence is finished by a long OFF phase (approximately 1000ms)

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2.4. EW62N9386 Electrical Interface

2.4.1. RJ-45 Socket



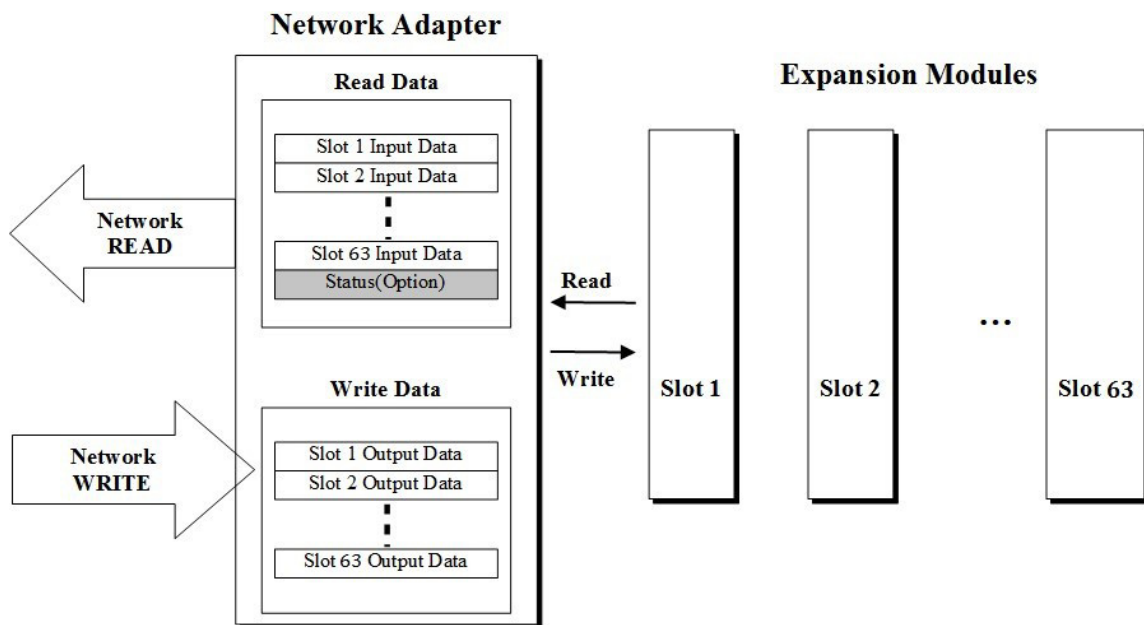
RJ-45	Signal Name	Description
1	TD+	Transmit +
2	TD-	Transmit -
3	RD+	Receive +
4	-	
5	-	
6	RD-	Receive -
7	-	
8	-	
Case	Shield	

Shielded RJ-45 Socket

2.6. I/O Process Image Map

An expansion module may have 3 types of data as I/O data, configuration parameter and memory register.

The data exchange between network adapter and expansion modules is done via an I/O process image data by EW620-Series protocol. The following figure shows the data flow of process image between network adapter and expansion modules.



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2.6.1. Example of Input Process Image (Input Register) Map

Input image data depends on slot position and expansion slot data type. Input process image data is only ordered by expansion slot position.

- For example slot configuration

Slot Address	Module Description
#0	EtherCAT Adapter
#1	8-discrete input
#2	8-discrete input
#3	4-analog input
#4	16-discrete input
#5	8-discrete input
#6	8-discrete input
#7	8-discrete input
#8	16-discrete input
#9	8-discrete input

- Input Process Image

TXPDO	Entries	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x1A01	0x6010	0	Discrete Input 8 pts (Slot#1)							
0x1A02	0x6020	1	Discrete Input 8 pts (Slot#2)							
0x1A03	0x6030	2	Analog Input Ch0 low byte (Slot#3)							
		3	Analog Input Ch0 high byte (Slot#3)							
		4	Analog Input Ch1 low byte (Slot#3)							
		5	Analog Input Ch1 high byte (Slot#3)							
		6	Analog Input Ch2 low byte (Slot#3)							
		7	Analog Input Ch2 high byte (Slot#3)							
		8	Analog Input Ch3 low byte (Slot#3)							
		9	Analog Input Ch3 high byte (Slot#3)							
0x1A04	0x6040	10	Discrete Input 8 pts (Slot#4)							
		11	Discrete Input 8 pts (Slot#4)							
0x1A05	0x6050	12	Discrete Input 8 pts (Slot#5)							
0x1A06	0x6060	13	Discrete Input 8 pts (Slot#6)							
0x1A07	0x6070	14	Discrete Input 8 pts (Slot#7)							
0x1A08	0x6080	15	Discrete Input 8 pts (Slot#8)							
		16	Discrete Input 8 pts (Slot#8)							
0x1A09	0x6090	17	Discrete Input 8 pts (Slot#9)							

Specification

2.6.2. Example of Output Process Image (Output Register) Map

Output image data depends on slot position and expansion slot data type. Output process image data is only ordered by expansion slot position.

- For example slot configuration

Slot Address	Module Description
#0	EtherCAT Adapter
#1	8-discrete output
#2	8-discrete output
#3	4-analog output
#4	4-relay output
#5	4-relay output
#6	8-discrete output
#7	8-discrete output
#8	4-analog output
#9	4-relay output
#10	16-discrete output

- Output Process Image

RXPDO	Entries	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x1601	0x7010	0	Discrete Output 8 pts (Slot#1)							
0x1602	0x7020	1	Discrete Output 8 pts (Slot#2)							
0x1603	0x7030	2	Analog Output Ch0 low byte (Slot#3)							
		3	Analog Output Ch0 high byte (Slot#3)							
		4	Analog Output Ch1 low byte (Slot#3)							
		5	Analog Output Ch1 high byte (Slot#3)							
		6	Analog Output Ch2 low byte (Slot#3)							
		7	Analog Output Ch2 high byte (Slot#3)							
		8	Analog Output Ch3 low byte (Slot#3)							
		9	Analog Output Ch3 high byte (Slot#3)							
0x1604	0x7040	10	Discrete Output low 4 pts (Slot#4)							
0x1605	0x7050	12	Discrete Output low 4 pts (Slot#5)							
0x1606	0x7060	13	Discrete Output low 8 pts (Slot#6)							
0x1607	0x7070	14	Discrete Output low 8 pts (Slot#7)							
0x1608	0x7080	15	Analog Output Ch0 low byte (Slot#8)							
		16	Analog Output Ch0 high byte (Slot#8)							
		17	Analog Output Ch1 low byte (Slot#8)							
		18	Analog Output Ch1 high byte (Slot#8)							
		19	Analog Output Ch2 low byte (Slot#8)							
		20	Analog Output Ch2 high byte (Slot#8)							
		21	Analog Output Ch3 low byte (Slot#8)							
22	Analog Output Ch3 high byte (Slot#8)									
0x1609	0x7090	24	Discrete Output low 8 pts (Slot#9)							
0x160A	0x70A0	25	Discrete Output low 8 pts (Slot #10)							
		26	Discrete Output high 8 pts (Slot #10)							

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3. EtherCAT Basics

The EtherCAT protocol uses an officially assigned EtherType inside the Ethernet Frame. The use of this EtherType allows transport of control data directly within the Ethernet frame without redefining the standard Ethernet frame. The frame may consist of several sub-telegrams, each serving a particular memory area of the logical process images that can be up to 4 gigabytes in size. Addressing of the Ethernet terminals can be in any order because the data sequence is independent of the physical order. Broadcast, Multi-cast and communication between slaves are possible

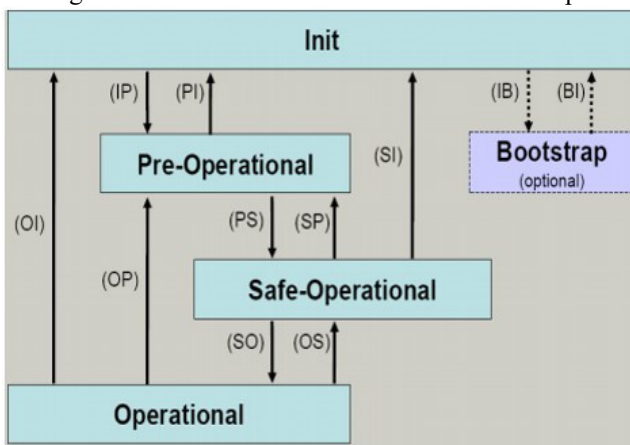
3.1. EtherCAT State Machine

The state of the EtherCAT slave is controlled via the EtherCAT State Machine (ESM). Depending upon the state, different functions are accessible or executable in the EtherCAT slave. Specific commands must be sent by the EtherCAT master to the device in each state, particularly during the boot up of the slave.

A distinction is made between the following states:

- Init
- Pre-Operational
- Safe-Operational and
- Operational
- Bootstrap

The regular state of each EtherCAT slave after bootup is the OP state.



Init

After switch-on the EtherCAT slave in the Init state. No mailbox or process data communication is possible.

The EtherCAT master initializes sync manager channels 0 and 1 for mailbox communication.

Pre-Operational (Pre-Op)

During the transition between Init and Pre-Op the EtherCAT slave checks whether the mailbox was initialized correctly.

In Pre-Op state mailbox communication is possible, but not process data communication. The EtherCAT master initializes the sync manager channels for process data (from sync manager channel 2), the FMMU channels and, if the slave supports configurable mapping, PDO mapping or the sync manager PDO assignment. In this state the settings for the process data transfer and perhaps terminal-specific parameters that may differ from the default settings are also transferred.

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Safe-Operational (Safe-Op)

During transition between Pre-Op and Safe-Op the EtherCAT slave checks whether the sync manager channels for process data communication and, if required, the distributed clocks settings are correct. Before it acknowledges the change of state, the EtherCAT slave copies current input data into the associated DP-RAM areas of the EtherCAT slave controller (ECSC).

In Safe-Op state mailbox and process data communication is possible, although the slave keeps its outputs in a safe state, while the input data are updated cyclically.

Operational (Op)

Before the EtherCAT master switches the EtherCAT slave from Safe-Op to Op it must transfer valid output data. In the Op state the slave copies the output data of the masters to its outputs. Process data and mailbox communication is possible.

Bootstrap

In the Boot state the slave firmware can be updated. The Boot state can only be reached via the Init state.

In the Boot state mailbox communication via the file access over EtherCAT (FoE) protocol is possible, but no other mailbox communication and no process data communication.

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3.2. CoE Interface

3.2.1. parameter management in the EtherCAT system

The CiA organization (CAN in Automation) pursues among other things the goal of creating order and exchange ability between devices of the same type by the standardization of device descriptions. For this purpose so-called profiles are defined, which conclusively describe the changeable and unchangeable parameters of a device. Such a parameter encompasses at least the following characteristics:

- Index number – for the unambiguous identification of all parameters. The index number is divided into a main index and a subindex in order to mark and arrange associated parameters.
 - Main index
 - Subindex, offset by a colon ':'
- Official name – in the form of an understandable, self-descriptive text
- Specification of changeability, e.g. whether it can only be read or can also be written
- A value – depending upon the parameter the value can be a text, a number or another parameter index.

Index Range

The relevant ranges for EtherCAT fieldbus users are:

x1000 : This is where fixed identity information for the device is stored, including name, manufacturer, serial number etc., plus information about the current and available process data configurations.

x8000 : This is where the operational and functional parameters for all channels are stored, such as filter settings or output frequency.

Other important ranges are:

x4000 : In some EtherCAT devices the channel parameters are stored here (as an alternative to the x8000 range).

x6000 : Input PDOs ("input" from the perspective of the EtherCAT master) **x7000**

: Output PDOs ("output" from the perspective of the EtherCAT master)

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3.2.2. Communication Objects

Index	Sub-index	Name	Flags	Default value
1000		Device type	RO	0x00001389
1001		Gbus Status	RO	Normal Operation : 0x00 **
1002		Master Fault Aaction	RW	0x00
1008		Device name	RO	EW62N9386(ESA)
1009		Hardware version	RO	EW62N9386.v1
100A		Software version	RO	1.000
1018		Identity	RO	0x05
	01	Vendor ID (ESA: 029D)	RO	0x0000029D
	02	Product code	RO	0x4E419386
	03	Revision	RO	0x0001000
	04*	Serial number	RO	0xFFFFFFFF
	05	Release date	RO	0x20160823
10F1		Error Settings	RO	0x02
	01	Local Error Reaction	RO	0x00000000
	02	Sync Error Counter Limit	RO	0x00000004
1601*		Slot#x, GT--xxxx,RXPDO	RO	0xnn
	01	SubIndex 001	RO	0x7010:01, 8

	nn	SubIndex nnn	RO	0x7010:nn, 8
1A01*		Slot#x, GT-xxxx,TXPDO	RO	0xnn
	01	SubIndex 001	RO	0x6010:01, 8

	nn	SubIndex nnn	RO	0x6010:nn, 8
1C00		Sync manager type	RO	0x04
	01	SubIndex 001	RO	0x01
	02	SubIndex 002	RO	0x02
	03	SubIndex 003	RO	0x03
	04	SubIndex 004	RO	0x04
1C12		RxPDO assign	RO	0x01
	01	SubIndex 001	RO	0x1601
1C13		TxPDO assign	RO	0x02
	01	SubIndex 001	RO	0x1A01

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	02	SubIndex 002	RO	0x1A02
7010*	GT-xxxx		RO	0xnn
	01	Byte#0	RW P	0x00

	nn	Byte#nnn	RW P	0x00
8000	EW62N9386(Parameter)		RO	
	01	Byte#0	RW	
	02	Byte#1	RW	
	03	Byte#2	RW	
	04	Byte#3	RW	
8nn0*	GT-xxxx(Parameter)		RO	
	01	Byte#0	RW	

	nn	Byte#nnn	RW	
F000	Module device profile		RO	
	01	Module index distance	RO	
	02	Maximum numver of modules	RO	
F010*	Module List		RO	
	01	Subindex 001 (EW62N9386)	RO	0x00009386

	63	Subindex 063	RO	0x0000xxxx
F050	Detected Module Ident List		RO	
	01...	SubIndex 001	RO	

*This value can be changed depending on the configuration of expansion modules

** Gbus Status

- Normal Operation : 0x00
- Communication Fault : 0x02
- Configuration Failed : 0x03
- No Expansion Module : 0x04
- Vendor Error : 0x07
- Not expected slot : 0x08
- CRC Error : 0x09