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USER MANUAL

CANOPEN OPTION
OPC-E11S-COP
& OPCE11SCOPU

FOR FUJI FVR-E11S
& GE FUJI AF-300E11

DOC. NO. SDM-7529-010

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Preface

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Related documents

Document	Author
FVR-E11S INSTRUCTION MANUAL, Attached to inverter	Fuji Electric
CANopen communication profile DS301 Ver 3.0	Can In Automation
CANopen Device Profile for Drives and Motion Control DS402 Ver 1.1	Can In Automation

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1. Applicable inverters

Item	Description		
Inverter type	FVR-E11S (AF-300E11)		
Compatible Inverter Model number (GE Fuji version)	The last two digits of the model number should be A1 or later Example: 6KE1123X1A1		
ROM version number		EN, Japanese standard, JE, and GE Fuji version	0024 ～ 0999 (It is impossible to use version prior to 0024 inverter.)

NOTE:

This product can only be used for Inverters with ROM version numbers shown above.

Check the ROM number of your Inverter as follows using the inverter keypad.

a. Check the Digital display.

b. Press the [PRG] key of the Inverter once.

c. Select the "H44" with ∧,∨key and press the [FUNC/DATA] key.

The maintenance and inspection items are similar to the Inverter unit, for detail refer to the Inverter Instruction Manual.

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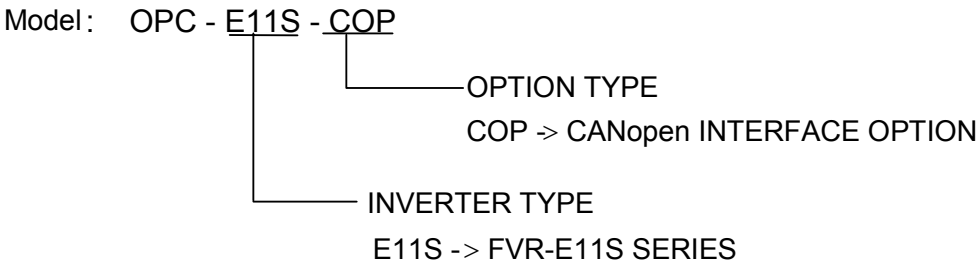
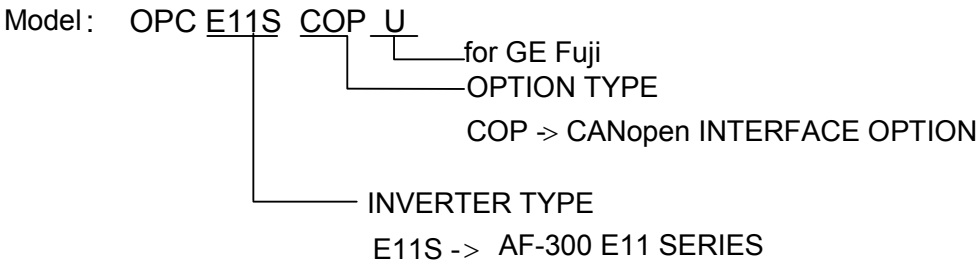
2. Receiving Inspection

Confirm the following items upon a receipt.

1) The model number matches your purchase order?

Check the model number printed on the circuit board.





Hereinafter, OPC-E11S-COP is used representing OPC-E11S-COP and OPCE11SCOPU.

2) Inspection for damage during transportation. Report damage to transportation carrier.

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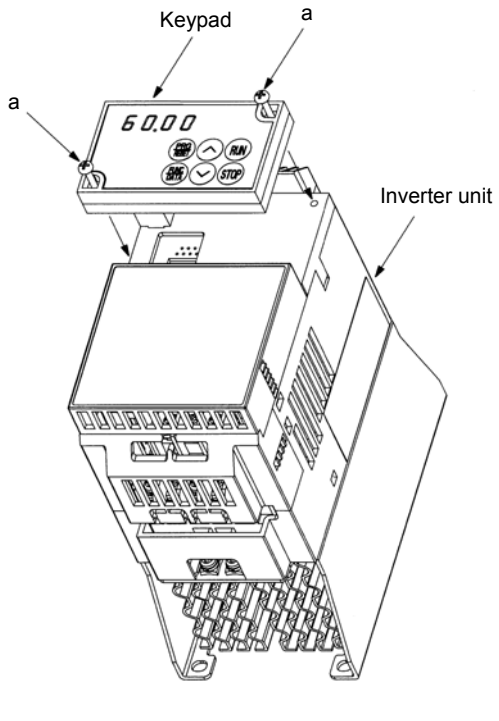
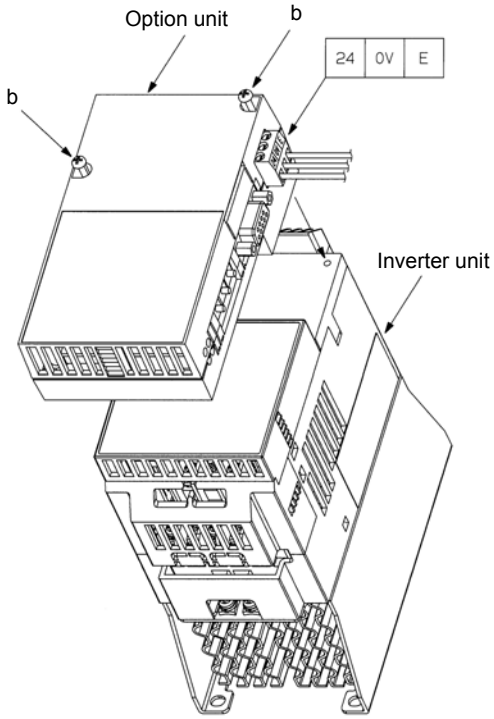
3. Installation

3.1 Installation Method

Please follow the installation procedure described as follows. Please install or detach the option after turning off the input power supply of the inverter and confirming that the charge lamp (CHARGE or CRG) has gone out.





Step1 **Step2 to 3**

Step1

Loosen the keypad panel mounting screws (M3) at **a** and detach the keypad panel.

If the keypad panel is handled abruptly, the connector will be broken.

Step2

Insert the option unit in the inverter unit and secure the option unit with two screws (M3) at **b**.

Step3

Connect the external power supply cables of +24V±10% and the ground cable to terminal of the option unit.

"E" means the Earth.

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3.2 Installation Checklist

After installation and wiring, check the following items.

[1] The wiring is correct.

[2] No loose wires or screws remain inside the Inverter.

[3] The screws and terminals are all tight.

[4] There are no loose threads of wires at terminals that may contact other terminals.

[5] Do not change JP4 on the conversion-board!

[6] OPC-E11S-COP cannot be used together with the Inverter keypad. Therefore, please set the following functions with the Inverter keypad before using OPC-E11S-COP.

Inverter parameters such as H30, E15, o27, o28, o31 to o38, are set correctly. (H30: Link Active/Inactive, E15:effect to Quick stop, o27 and o28: for RAS, o31 to o38: Data MAP I/O configuration.

[7] Please take electrostatic measures at handling because this Inverter is sensitive to the electrostatic discharge.

[8] Please connect an external power supply of +24V±10% to terminal (24,0V) of the OPC-E11S-COP. "E" means the Earth.

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4. CANopen option card OPC-E11S-COP

The OPC-E11S-COP option card gives an instant connection between Fuji E11S drives and CANopen. The option board will perform as an integrated part of the E11S drive and gives the user access to all relevant parameters, as well as control-/status signals needed to control the drive

The OPC-E11S-COP option card communicates according to the CANopen DS301 / DS402 specification. This means that it can communicate with all CANopen nodes that comply with this protocol, but it does not necessarily mean that all services available in these specifications are supported.

In a control system the OPC-E11S-COP option card will act as a slave node that can be read and written to, from another CANopen node such as a Controller or Host device. The OPC-E11S-COP will act as a slave in the system but can if configured transmit data to another slave.

5. Introduction to CANopen

CANopen is used for industrial automation, normally for the control of valves, sensors and I/O units.

CANopen has an international user organisation called CAN in Automation (CiA). For further information regarding CANopen matters not associated with OPC-E11S-COP, please contact CiA on e-mail: headquarters@can-cia.de.

General CANopen information is available on the Internet: www.can-cia.de

5.1 Technical features of CANopen

- CANopen specific cable (twisted pair)
- Access to intelligence present in low-level devices
- Master/Slave and Peer-to-Peer capabilities
- Selectable baudrates from 10kbit / s - 1Mbit/s
- Max distance 5000m
- Support for up to 127 nodes
- Node removal without severing the network
- Use of sealed or open-style connectors
- Provisions for the typical request/response oriented network communications
- Provisions for the efficient movement of I/O data
- Fragmentation for moving larger bodies of information

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5.2 Bus Topology

This section displays an example of a bus setup. The example includes several types of devices such as sensors, inverters and I/O modules. Please note that this is just an example setup and the devices connected to the network can be changed or more devices can be added at any time.

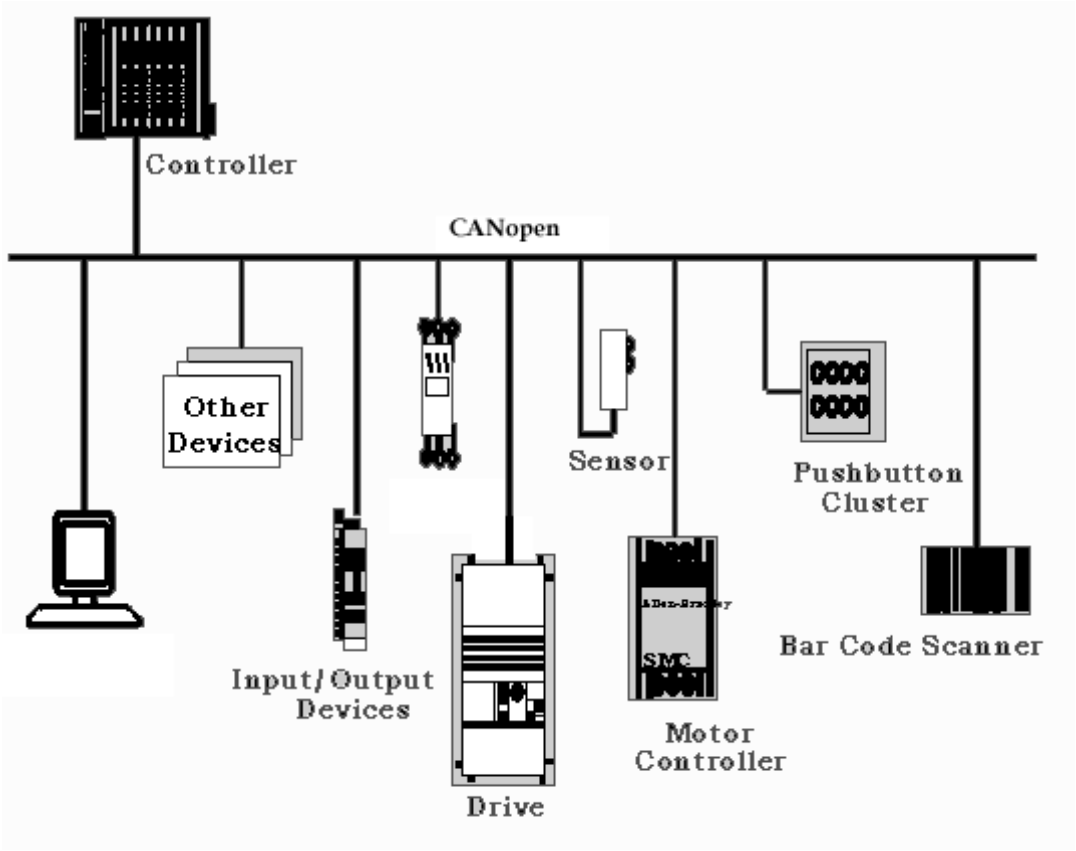

Figure 1. Bus topology of CANopen

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6. OPC-E11S-COP Overview

These sections contain all necessary information to start-up and use the OPC-E11S-COP option card.

6.1 Physical interface

Isolation: The bus signals are galvanically isolated from the rest of the card with a mounted DC / DC converter. As a standard the CANopen module does not use power supply from the bus.

Bus connection: The OPC-E11S-COP option card connects to the CANopen network with a 9-pin male DSUB connector as a standard. For the pin layout, refer to the table below. Several other connectors are also available for the CANopen fieldbus and are described below. (This option recommends to use a shield cable and CAN_SHLD.)

10 pole connector pins	DSUB pins	Screw terminal pins	Signal	Description
1	5	3	CAN_SHLD	Optional CAN Shield
2	1		-	Reserved
3	2	2	CAN_L	CAN_L bus line (dominant low)
4	3	1	CAN_GND	CAN Ground
5	7	4	CAN_H	CAN_H bus line (dominant high)
6	6		GND	Optional Ground
7	4		-	Reserved
8	9	5	CAN_V+	Optional CAN external power supply
9	8		-	Reserved
10	5	3	CAN_SHLD	Optional CAN Shield

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6.2 Configuration

6.2.1 Baudrate

The baudrate is configured with one decimal rotary switch. The baudrate switch is the rightmost switch of the three switches mounted on the card. See table below for supported baudrates.

Switch setting	Baudrate
0	Not Available
1	10 kbit / s
2	20 kbit / s
3	50 kbit / s
4	125 kbit / s
5	250 kbit / s
6	500 kbit / s
7	800 kbit / s
8	1 Mbit / s
9	Not available

PLEASE NOTE: The baudrate cannot be changed during operation.

6.2.2 Termination

CANopen uses standard CAN termination on the first and last node on the network. The termination resistor should be 120 ohm and connected between CAN_H and CAN_L on the bus. Note that the termination is only used when the OPC-E11S-COP module is the first or last node on the bus.

6.2.3 Node Address

The network node address is set with two rotary switches on the option board (ADDRESS_HIGH and ADDRESS_LOW). Possible node addresses are between 1 - 99 in decimal format. Looking at the front of the module, the middle switch is used for the ten setting and the leftmost switch is used for the setting of the integers.

The address is calculated in the following way

Address = (*Middle Switch Setting* x 10) + (*Leftmost Switch Setting* x 1)

PLEASE NOTE: The node address cannot be changed during operation.

6.2.4 EDS File

This file is used for configuring up the network. The EDS file can be delivered from Fuji or downloaded from the Fuji specific part of the HMS Fieldbus Systems website www.anybus.com. For this download a Fuji specific password will be issued.

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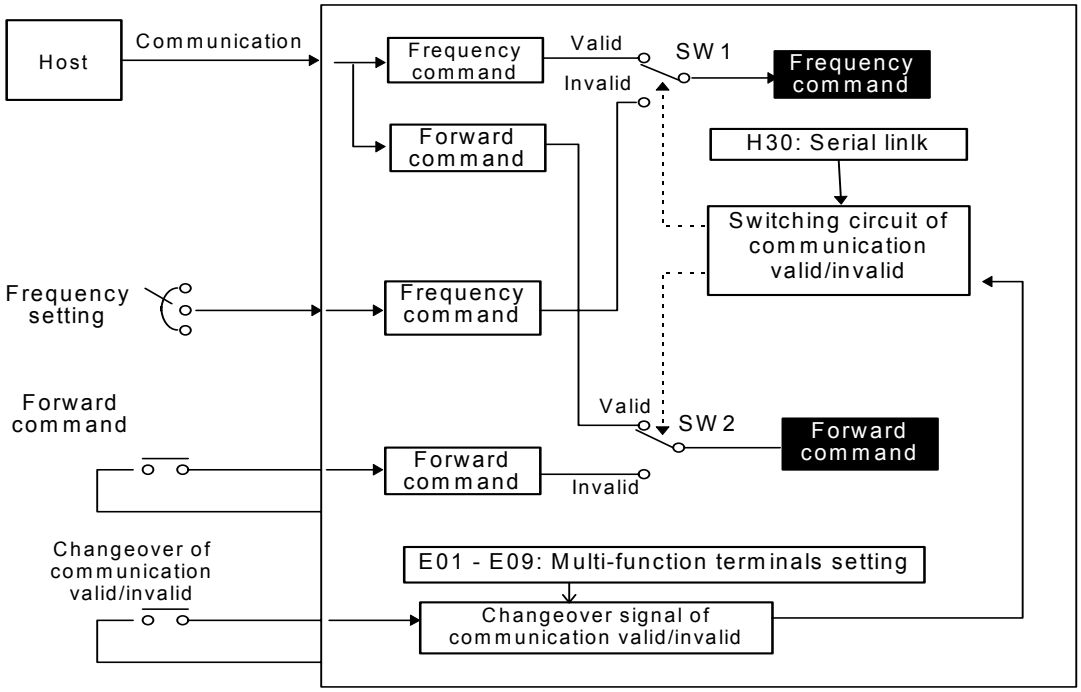
6.2.5 Changeover of communications

In order to enable the inverter control through the communication (by command data and operation data), the inverter function code "H30: Serial link (Function selection)" should be configured for a value of 1-3. The reading and writing of function data and functions are possible at any time regardless of the setting of Function code H30.



6.2.5.1 Changeover method for communication control

The changeover of the communication control can be performed by the multi-function command terminals (terminals X1-X5) on the inverter. However, it is necessary to configure the inverter's multi-function command input terminals (E01 – E05: X1–X5 terminals function) to the link operation selection (Data 18). If the multi-function command terminals have not been set to the link operation selection, the communication becomes valid automatically.

Input terminals	State
OFF	Communication invalid mode
ON	Communication valid mode (H30 setting)

Note:

1) Since all memories are initialized at switching power supply on, the command data and operation data must be write again from the upstream units.
2) Even when the communication is invalid, the writing of command data and operation data is valid, but it is not reflected by SW1 • SW2. The changeover without shock is possible by the way the data is set prior to the transition.

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6.2.5.2 Link function configuration (operation selection)

The setting (valid/invalid) for command data and operation data during the communication valid period is possible individually by the setting of " H30: Serial link (Function selection)". (By making the communication always valid without setting at the multi-function terminals, changeover for the H30 data valid/invalid can change over the communication valid/invalid, similar to the changeover with multi-function command terminals.)

Link function H30	During communication is valid		During communication is invalid
	SW1 (Command data)	SW2 (Operation data)	SW1, SW2
0	Invalid	Invalid	Invalid
1	Valid	Invalid	
2	Invalid	Valid	
3	Valid	Valid	

6.2.6 Fast Stop

The OPC-E11S-COP option board includes a function for quick stop action when a QUICK_STOP command is received from the master. In this case the drive will stop according to the time specified in parameter E11.

The quickstop time can be set via the keypad in variable E11 or with the fieldbus object h'604A.

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6.2.7 Data Map I/O Config

The OPC-E11S-COP supports one receive Process Data Object and one transmit Process Data Object to be mapped onto any parameter. This corresponds to four in data parameters and four out data parameters. The configuration of these Process Data Objects can be done in two ways:

1. Configuration from the keypad in O-parameter (o31 – o38) or
2. Configuration from the fieldbus by using object h'5FFC for the parameters going to the fieldbus from the inverter and h'5FFD for the parameters going from the fieldbus to the inverter.

If the configuration parameter listed below contains a communication number not equal to zero this number will be used and if the communication number is zero that object is not used on the bus. The corresponding number and parameter can be found in chapter 8.5(Parameter data format).

6.2.7.1 Configuration from the keypad

The Data Map I / O configuration can be changed from the keypad in the following parameters. Please see chapter 8.5(Parameter data format) for valid settings.

Parameter	Data Object Description	Corresponding Object In Fieldbus Configuration (Hex)	Data Object Access
o31	Number of Parameter In #1	5FFC / 1	R / O
o32	Number of Parameter In #2	5FFC / 2	R / O
o33	Number of Parameter In #3	5FFC / 3	R / O
o34	Number of Parameter In #4	5FFC / 4	R / O
o35	Number of Parameter Out #1	5FFD / 1	R / W
o36	Number of Parameter Out #2	5FFD / 2	R / W
o37	Number of Parameter Out #3	5FFD / 3	R / W
o38	Number of Parameter Out #4	5FFD / 4	R / W

6.2.7.2 Configuration from the Fieldbus

The Data Map I / O configuration can also be modified from the fieldbus during Pre-Operational mode. In this case the modification is done in the following configuration objects. Please see chapter 8.5(Parameter data format) for valid settings.

Object (Hex)	SubIndex	Data Object Description	Corresponding Object In Keypad Configuration	Data Object Access
5FFC	1	Number of Parameter In #1	o31	R / O
5FFC	2	Number of Parameter In #2	o32	R / O
5FFC	3	Number of Parameter In #3	o33	R / O
5FFC	4	Number of Parameter In #4	o34	R / O
5FFD	1	Number of Parameter Out #1	o35	R / W
5FFD	2	Number of Parameter Out #2	o36	R / W
5FFD	3	Number of Parameter Out #3	o37	R / W
5FFD	4	Number of Parameter Out #4	o38	R / W

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6.3 Action at communication error

In case of occurring transmission errors (communication cutoff with the master), the following actions can be selected.

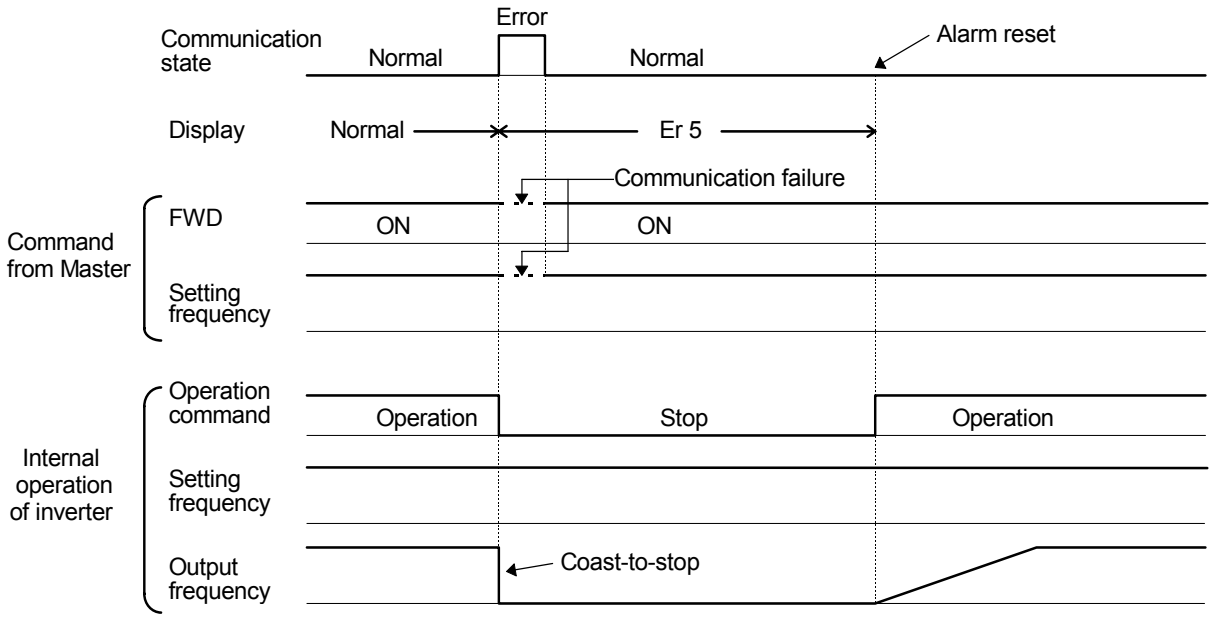
1) Select action when error is detected. (o27)

o27	Action at error detection		Remarks
0	Immediate forced stop	Er5	
1	Continue operation within o28 time and stop	Er5	Continue operation using the command just before the error within o28 time, but when restoring, operate following to the designation of communication.
2	Continue operation according to the last command received until restoration of the communication. If the communication is not restored before the o28 time expires, then immediate forced stop.	Er5	
3	Continue operation until restoration of the communication, and after the restoration, follow to designation of communication.	Automatic restoration after restoring communication	

2) Setting time of timer at error (o28)

0.0 – 60.0s

In a case of o27=0 (Mode of immediate forced stop at communication error detection)



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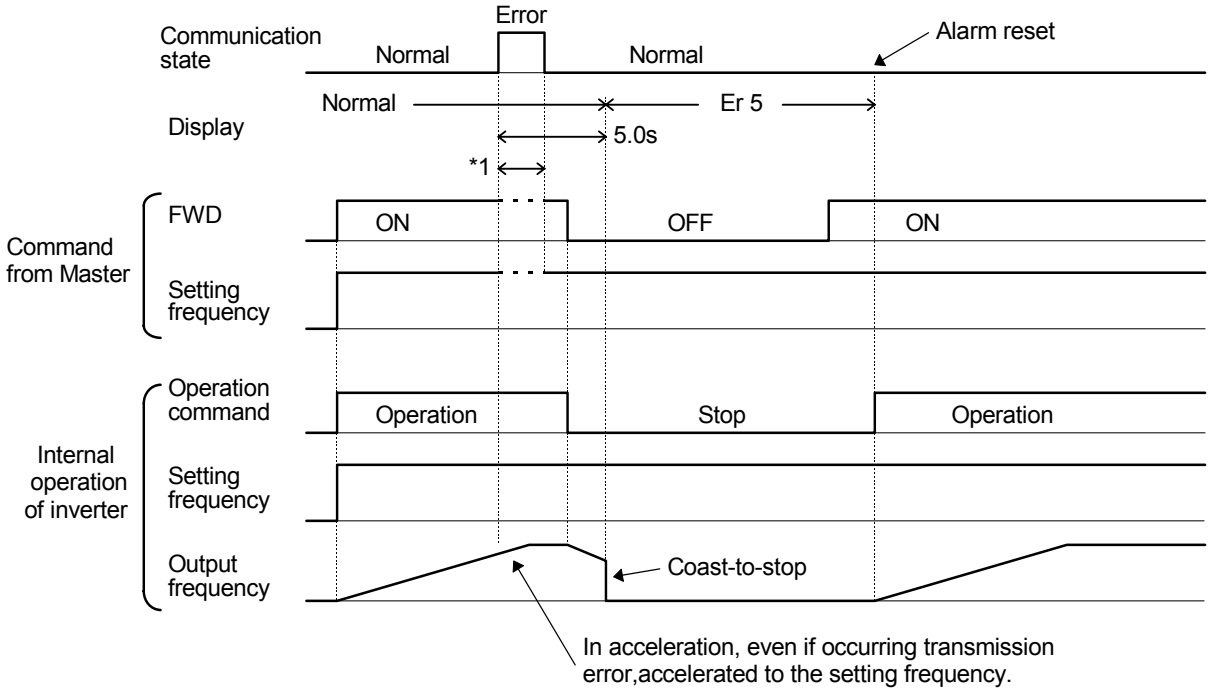
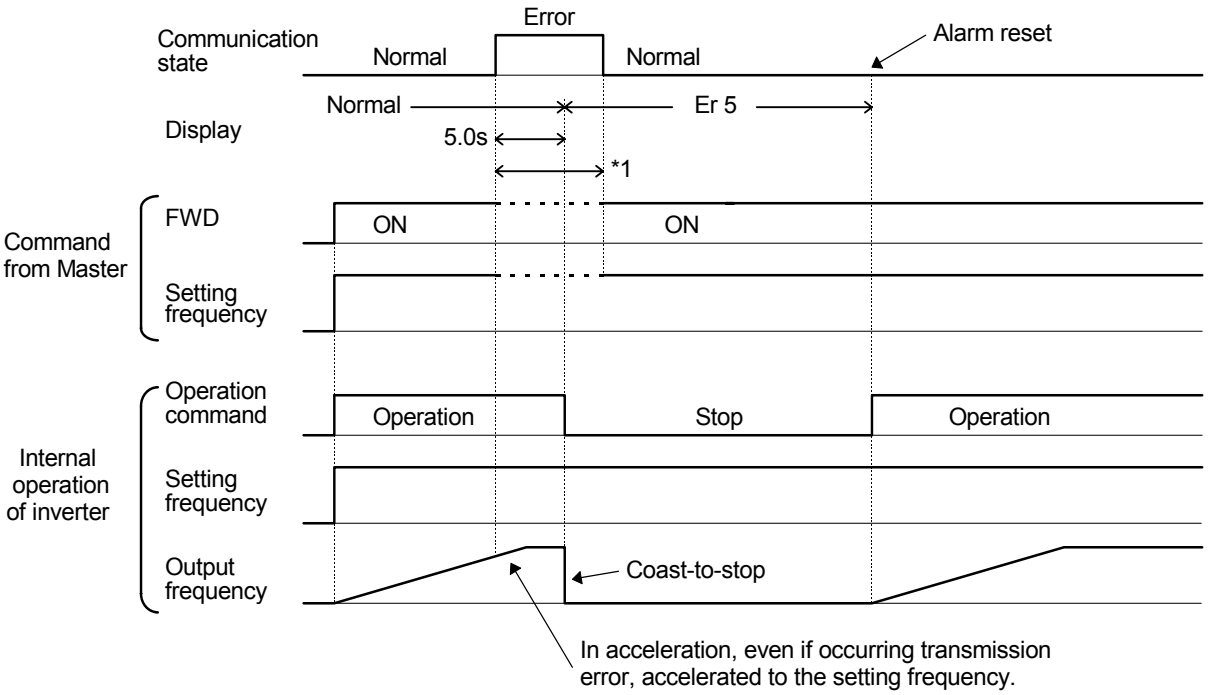
In a case of o27=1, o28=5.0 s (mode of immediate forced stop after 5 s at occurring communication error).



*1) In a period until restoring the communication, the last commands (command data and operation data) received before the error are kept.

In a case of o27=2, o28=5.0 s (the communication is not restored for 5.0 sec after error detection, and inverter trips Er5).



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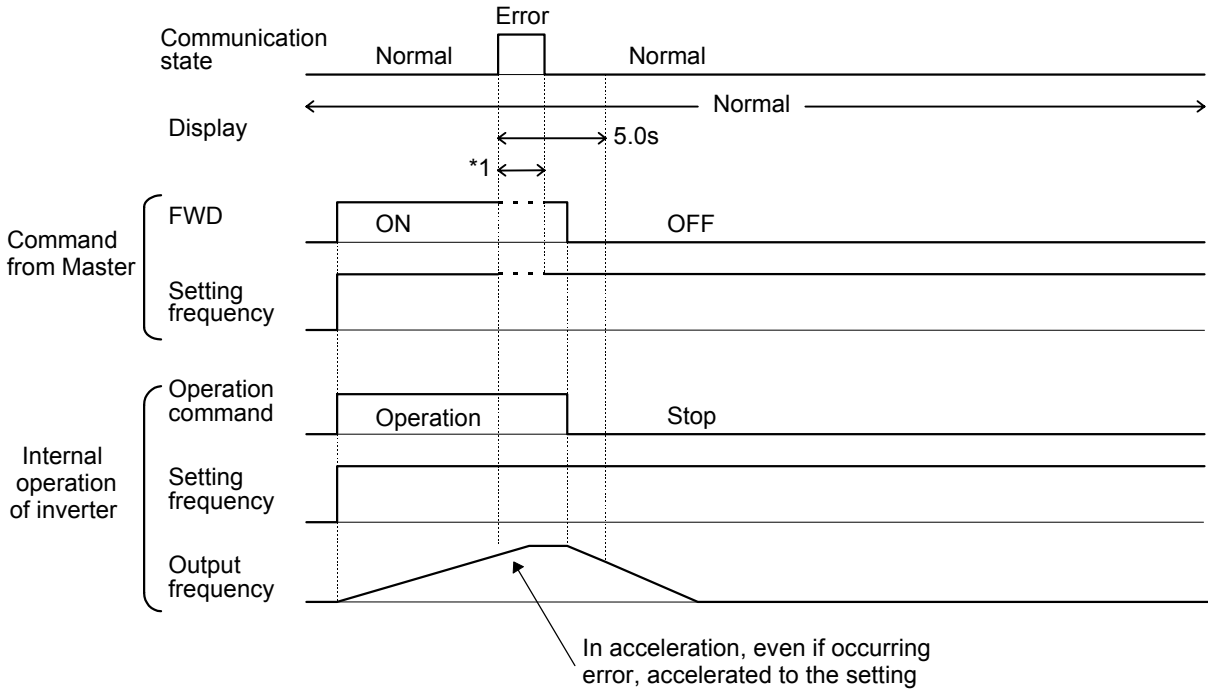
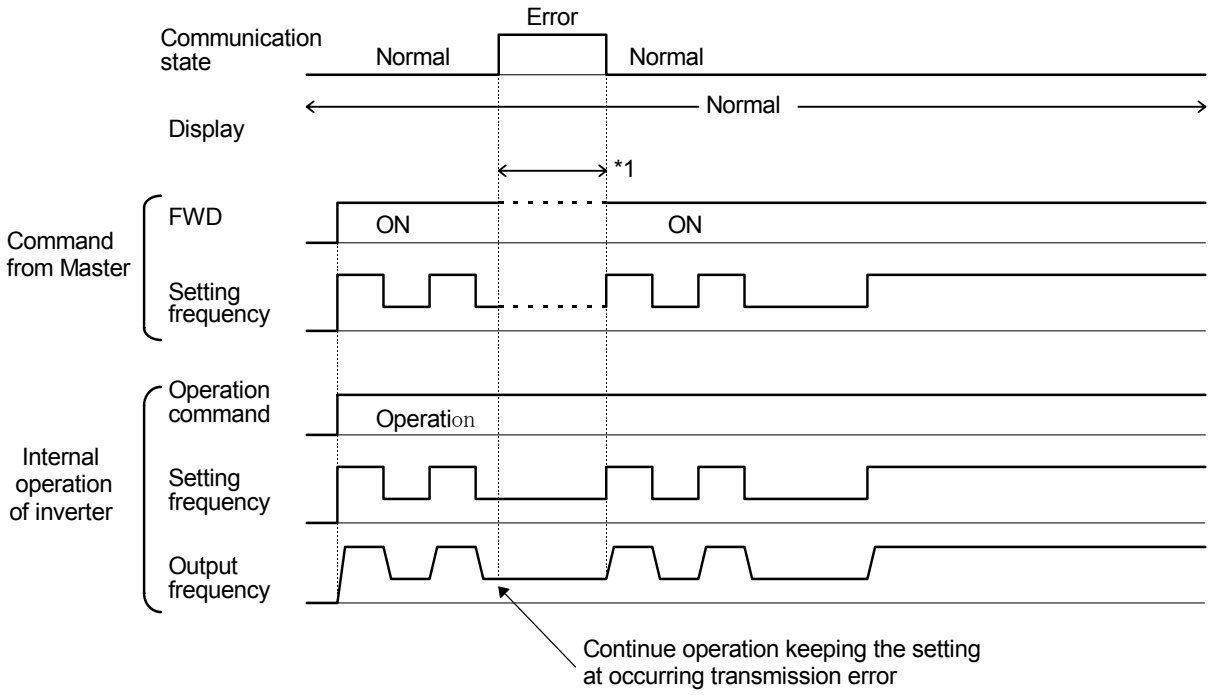
In a case of o27=2, o28=5.0 s (a communication error occurs, but restored within 5 s).



*1) In a period until restoring the communication, the commands (command data and operation data) just before the error are kept.

In a case of o27=3 (when a communication error occurs, the operation continues).



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6.4 Indication LED's

The module is equipped with four LED's mounted at the front and one LED on the board.

There are four status and indication LED's on the OPC-E11S-COP module. During start-up a LED test will be performed to make sure the LED's are working. Test sequence: Red - Green - Off.

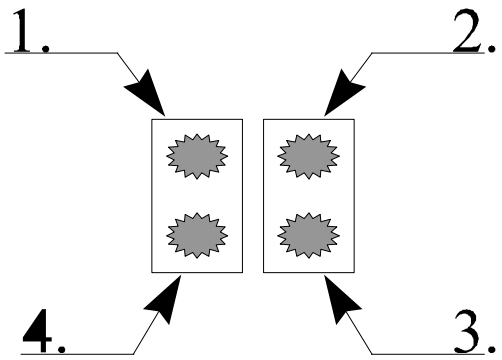

Figure 3. *LED's,*

There is also one additional Bicolour Watchdog LED on the module.

Led number	Name	Colour	Function
-	Watchdog (Centre of card)	Green / Red	Turned off -- Option board CPU not running Flashing green 2 HZ -- Initialisation Flashing red -- Error detected Other indication -- Unspecified
1	Not Used	-	-
2	State indication (Top right led)	Green / Red	Flashing green 2 HZ -- Module in Prepared Flashing green 1 HZ -- Module in Pre-Operational Lit green -- Module in Operational Flashing red 1 HZ -- Bus initialisation failed
3	Bus indication (Bottom right led)	Green / Red	Turned off -- Module power off or module not initialised. Flashing green 1Hz -- Bus off / Error passive Lit green -- Bus running Flashing red 1Hz -- Other Error
4	Power (Bottom left led)	Green	On

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7. Operating the drive via CANopen

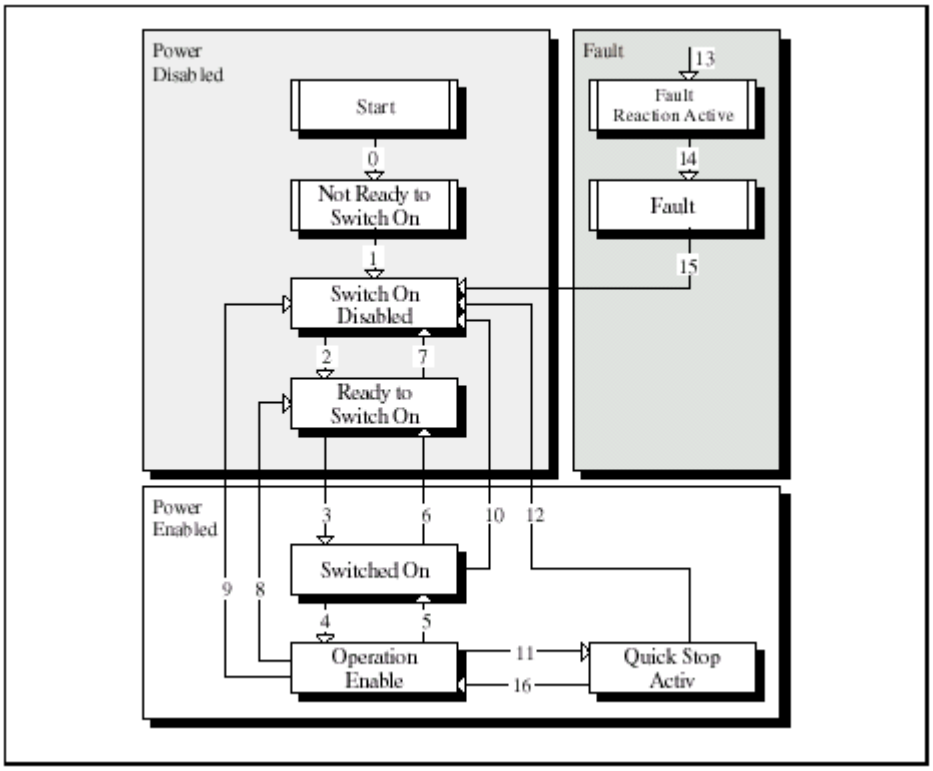
This section describes how to control the drive via control word/status word and how to access drive parameters. All parameters included from the DS402 profile and Manufacturer Specific objects are described.

7.1 State Transition Definition

The OPC-E11S-COP module has the following state transitions and states. The module has to be in the state Operation Enable in order to accept frequency and operation commands. In section 5.1.2 the events needed to change between different states are described. Some events are internally triggered but most of the events are triggered from the control word received on the bus.

7.1.1 State Diagram

At any time the OPC-E11S-COP will be in one of the following states. The events that are able to trigger a transition between the states are either sent with the control word or triggered by an internal action. All the events possible and the corresponding transition number are listed in the table in section 7.1.2 (Event Description)



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7.1.2 Event Description

The following state transitions are available in the CANopen drive profile. Transition 0 and 1 are triggered at startup and when all startup tests are performed the module will be in state 3. Some commands like fault reset can be triggered from more then one place. This command can be triggered both from the bus with the control word and from the keypad reset button.

State Transition number	Transition Name	Event
0	Startup => Not Ready To Switch On	Reset
1	Not ready to switch on => Switch on disabled	Self test and init successful
2	Switch on disabled => Ready to switch on	Shutdown command received
3	Ready to switch on => Switched on disabled	Switch on command received
4	Switched on => Operation enabled	Enable operation command received
5	Operation enabled => Switched on	Disable operation command received
6	Switched on => Ready to switch on	Shutdown command received
7	Ready to switch on => Switch on disabled	Disable Voltage or Quickstop command received
8	Operation enabled => Ready to switch on	Shutdown command received
9	Operation enabled => Switch on disabled	Disable voltage command received
10	Switched on => Switch on disable	Disable voltage or Quickstop command received
11	Operation enabled => Quick stop active	Quickstop command received
12	Quick stop active => Switch on disabled	Quickstop completed or Disable voltage command received
13	All states => Fault reaction active	Fatal fault has occurred in the drive
14	Fault reaction active => Fault	The fault action is completed
15	Fault => Switch on disabled	Fault reset command received
16	Quick stop active => Operation enabled	Enable operation command received

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7.1.3 Controlword state transition bits

The following bits in the control word have to be set to achieve a specific event. That command will later result in a state transition according to 7.1.2.

command/ Bit of the *controlword*	Bit 7 Fault Reset	Bit 3 Enable Operation	Bit 2 Quick Stop	Bit 1 Disable Voltage	Bit 0 Switch On	Transitions
Shutdown	0	X	1	1	0	2,6,8
Switch On	0	X	1	1	1	3
Disable Voltage	0	X	X	0	X	7,9,10,12
Quick Stop	0	X	0	1	X	7,10,11
Disable Operation	0	0	1	1	1	5
Enable Operation	0	1	1	1	1	4,16
Fault Reset		X	X	X	X	15

7.1.4 Status word state transition bits

After a change in the controlword according to 7.1.3 the node state will change and the state result will be indicated in the status word according to table listed below

State	Bit 6 Switch On Disable	Bit 5 Quick Stop	Bit 3 Fault	Bit 2 Operation Enable	Bit 1 Switched On	Bit 0 Ready to Switch On
Not Ready to Switch On	0	X	0	0	0	0
Switch On Disabled	1	X	0	0	0	0
Ready to Switch On	0	1	0	0	0	1
Switched On	0	1	0	0	1	1
Operation Enabled	0	1	0	1	1	1
Fault	0	X	1	1	1	1
Fault Reaction Active	0	X	1	1	1	1
Quick Stop Active	0	0	0	1	1	1

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7.2 Process Data Definition

In this section all the Process Data Objects existing in the module are listed and described. For more information regarding the manufacturer specific Process Data Object please see section 6.2.7(Data Map I/O Config) of this document.

7.2.1 Transmit Process Data Definition

In this section you can find all of the Process Data Objects that are transmitted from the inverter to the PLC.

PDO nr.	Name	Access	Remap
1	Status Word	R / O	No
2	Status Word / modes_of_operation_display	R / O	No
6	Status Word / Vl_control_effort	R / O	No
21	vl_target_velocity	R / W	No
22	vl_velocity_demand	R / O	No
23	vl_velocity_acceleration	R / W	No
24	vl_velocity_deceleration	R / W	No
25	vl_velocity_quick_stop	R / W	No
36	Manufacturer Specific 1	R / O	Yes

7.2.2 Receive Process Data Definition

In this section you can find all of the Process Data Objects that are transmitted from the PLC to the inverter.

PDO nr.	Name	Access	Remap
1	Control Word	R / W	No
2	Control Word / modes_of_operation	W / O	No
6	Control Word / vl_target_velocity	R / W	No
8	Control Word / modes_of_operation – broadcast	W / O	No
21	vl_velocity_acceleration	R / W	No
22	vl_velocity_deceleration	R / W	No
23	Vl_velocity_quick_stop	R / W	No
36	Manufacturer Specific 1	R / W	Yes

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7.3 Object Description

This section describes all the drive and manufacturer specific parameters included.

7.3.1 DS402 Specific Parameters

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6040	0	Controlword	Controlword according to DS402	UNSIGNED16	R/W

The controlword is used to send control commands to the inverter (PLC -> Inverter).

Bit # of the controlword	Description
0	Switch On
1	Disable Voltage
2	Quick Stop
3	Enable Operation
4 - 6	Not Used
7	Reset Fault
8	Halt
9-15	Reserved

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6041	0	Statusword	Statusword according to DS402	UNSIGNED16	R/O

The status word indicates the status of the drive to the PLC (inverter -> PLC)

Bit # of the statusword	Description
0	Ready to switch on
1	Switched On
2	Operation Enabled
3	Fault
4	Voltage Disabled
5	Quick Stop
6	Switch on disabled
7	Warning
8, 12-15	Not Used
9	Remote
10	Target Reached
11	Internal Limit Active

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Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6060	0	Modes_Of_Operation	Sets the mode of the device	INTEGER8	W / O

The OPC-E11S-COP supports the velocity mode of the DS402 profile, therefore changes to this object with other values than 2 have no affect.

Value	Description
2	Velocity mode

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6061	0	Modes Of Operation Display	Shows the mode of the device	INTEGER8	R / O

The OPC-E11S-COP support the velocity mode of the DS402 profile, therefore this object will always indicate 2.

Value	Description
2	Velocity mode

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6042	0	Vl_target_velocity	Required speed of the system	INTEGER16	R / W

The vl_target_velocity is the required velocity of the system. The velocity is specified in RPM.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6043	0	Vl_velocity_demand	Speed reference provided by the ramp function	INTEGER16	R / O

The vl_velocity_demand is the instantaneous velocity provided by the ramp function. The unit of this parameter is RPM. This value is changed only by the drive.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6044	0	Vl_control_effort	Output frequency to the inverter	INTEGER16	R / O

The vl_control_effort is the velocity of the motor spindle or load. The unit of this parameter is RPM.

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Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6046	0	Vl_min_max_value	Number of sub	UNSIGNED8	R / O

This object describes the minimum and maximum value allowed to be set.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6046	1	Vl_min_value	Minimum value	UNSIGNED32	R / W

The minimum value allowed to be set.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6046	2	Vl_max_value	Maximum value	UNSIGNED32	R / W

The maximum value allowed to be set.

Please note that the parameter F03 (Maximum frequency 1) will be changed even if the second motor is selected and the Max Amount is changed.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6048	0	Vl_acceleration	Number of sub	UNSIGNED8	R / O

The vl_acceleration parameter specifies the slope of the acceleration ramp. It is generated as the quotient of the delta_speed and delta_time sub parameters. Sub parameter 0 defines the number of sub indexes and will in this case always indicate 2. This data is mapped to the parameter F07 and can also be set via the keypad.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6048	1	Vl_acceleration delta_speed	Acceleration Delta Speed Value	UNSIGNED32	R / W

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6048	2	Vl_acceleration delta_time	Acceleration Delta Time Value	UNSIGNED16	R / W

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Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6049	0	Vl_deceleration	Number of sub	UNSIGNED8	R / O

The vl_deceleration parameter specifies the slope of the deceleration ramp. It is generated as the quotient of the delta_speed and delta_time subparameters. Sub parameter 0 defines the number of sub indexes and will in this case always indicate 2. This data is mapped to the parameter F08 and can also be set via the keypad.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6049	1	Vl_deceleration delta_speed	Deceleration Delta Speed Value	UNSIGNED32	R / W

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
6049	2	Vl_deceleration delta_time	Deceleration Delta Time Value	UNSIGNED16	R / W

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
604A	0	Vl_quickstop	Number of sub	UNSIGNED8	R / O

The vl_quickstop parameter specifies the slope of the quickstop ramp. It is generated as the quotient of the delta_speed and delta_time subparameters. Sub parameter 0 defines the number of sub indexes and will in this case always indicate 2.

This data is amapped to the parameter E11 and can also be set via the keypad.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
604A	1	Vl_quickstop delta_speed	Quickstop Delta Speed Value	UNSIGNED32	R / W

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
604A	2	Vl_quickstop delta_time	Quickstop Delta Time Value	UNSIGNED16	R / W

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
604D	0	Vl_pole_number	Number of poles of the connected motor	UNSIGNED8	R / W

This value describes or sets the number of poles of the connected motor. Accepted values are 2, 4, 6, 8, 10, 12and 14.

Please note that the parameter P01 (Number of motor 1 poles) will be changed even if the second motor is selected and the Pole Number (604D) is changed.

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7.3.2 Manufacturer Specific Parameters

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
2200	0	Bus_State	Bus state of the module	UNSIGNED8	R / O

Value	Description
1	Bus Running
2	Bus Off / Error Passive
3	Other Error

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
2300	0	Transmission_Rate	Time in 6ms for bus transfer	UNSIGNED16	R / W

This is the resolution for Process Data transmission if transmission type 254 is used. The time is specified in 5ms resolution.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
2800	0	Bus_Off_Control	Bus Off Down Time in ms	UNSIGNED16	R / W

After bus-off / Error passive this is the specified down time before reinitialisation of the fieldbus.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
3000	0	Module_State	The state of the module	UNSIGNED8	R / O

Value	Description
0	No bus connection
1	The initialisation of the bus failed
2	Module in state Prepared
3	Module in state Pre-Operational
4	Module in state Operational

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
5FFC	0	Nbr Of Sub	Man. specific In Config Subindex	UNSIGNED8	R / O

Describes the number of sub indexes available in this object.

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Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
5FFC	1 – 4	In Config #1-4	Man. specific In Config #1-4	UNSIGNED8	R / W

In this area the configuration of the Data Map I/O is performed. Every sub index is a new parameter that can be mapped as an I/O parameter in Process Data Object.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
5FFD	0	Nbr Of Sub	Man. specific Out Config Subindex	UNSIGNED8	R / O

Describes the number of sub indexes available in this object.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
5FFD	1 – 4	Out Config #1-4	Man. specific Out Config #1-4	UNSIGNED8	R / W

In this area the configuration of the Data Map I/O is performed. Every sub index is a new parameter that can be mapped as an I/O parameter in Process Data Object.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
5FFE / 5FFF	0 / 0	Nbr Of Sub	Man Specific Parameters	UNSIGNED8	R / O

Describes the number of sub indexes available in this object.

Object (Hex)	Sub (Hex)	Object Name	Object Description	Object Type	Access
5FFE / 5FFF	1 – 128 / 1-121	Man Specific 1	Man Specific Parameters	UNSIGNED16	See Section 0

In this area you can access all parameters available in the drive. In object 5FFEh you can access all parameters in the drive from S01 (Sub1) to E30 (Sub128) and in object 5FFFh you can access all parameters from E31 (Sub 1) - o50 (Sub (121). Some are read only and some are read / write. For more information about the specific parameters see section 8 (Parameters specific for communication).

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7.4 Emergency Message Definition

The following emergency messages are available in the OPC-E11S-COP option board

Object (Hex)	Object Name	Corresponding Bit
5000	Device Hardware	
6000	Device Software	
2301	Overcurrent (During Acceleration)	OC1
2302	Overcurrent (During Deceleration)	OC2
2303	Overcurrent (Constant Speed)	OC3
3211	Overvoltage (During Acceleration)	OU1
3212	Overvoltage (During Deceleration)	OU2
3213	Overvoltage (Constant Speed)	OU3
3220	Undervoltage	LU
3130	Input Phase Loss	Lin
4310	Overheat Of Heat Sink In Inverter	OH1
9000	External Alarm Input	OH2
4210	Overheat Of DB Resistance	dbH
2211	Electronic Thermal Overl. Relay (Motor 1)	OL1
2212	Electronic Thermal Overl. Relay (Motor 2)	OL2
2200	Electronic Thermal Overl. Relay (Inverter)	OLU
5500	Memory Error	Er1
7520	Keypad Panel Communication Error	Er2
5220	CPU Error	Er3
7510	Option Communication Error	Er4
7511	Option Error	Er5
F004	Operating Proc Error	Er6
7200	Output Phase Loss Error	Er7
B100	RS485 Communication Error	Er8

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8. Parameters specific for communication

To operate the inverters or to monitor the state via communication, the following parameters are available for communication in addition to the configuration functions of the inverters. These parameters are a common data format applicable to inverter types on and after E11 series, so that it is possible to access different inverter types by the same program on the host side.

8.1 Command data

Code	Name	Unit	Variable range	Min. unit	Read/write
S01	Setting frequency (p.u.)	-	-20000–20000 (Maximum frequency at ±20000)	1	R/W
S05	Setting frequency	Hz	0.00–400.00	0.01	R/W

R: Reading

W: Writing

Note:

1) The data writing exceeding the setting range is possible, but the actual action will be restricted within the inverter.
2) When the command data is read, it is not the command data of actual action but the command data communicated before (the final command data can be obtained by reading of the monitoring data described later).

8.2 Operation command data

Code	Name	Unit	Variable range	Min. unit	Read/write
S06	Operation command	-	Refer to the data format [11]	-	R/W

Note:

1) Since X1–X5 are multi-function inputs, it is necessary to set the functions with E01–E05.
2) The alarm reset is executed, when RST signal changes from ON to OFF even there are no alarming factors.
3) The data writing exceeding the setting range is possible, but the actual action will be restricted within the inverter.

4) When the operation commands are instructed through the communication, the relation to the inverter terminal commands becomes as follows.

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Function				Command	
Classification		Symbol	Name	Transmission	Terminal block
Operation command		FWD/REV	FWD/REV command	Valid	Invalid
Multi-function command	0–3	SS1, 2, 4, 8	Multistep freq. selection		
	4	RT1	ACC/DEC time selection		
	5	HLD	3-wire operation stop command	Invalid	
	6	BX	Coast-to-stop command	Valid	
	7	RST	Alarm reset		
	8	THR	Trip command (External fault)	Invalid	Valid
	9	Hz2/Hz1	Freq. set. 2 / Freq. set. 1	Valid	Invalid
	10	M2/M1	Motor 2 / Motor 1		
	11	DCBRK	DC brake command		
	12	TL2/TL1	Torque limiter 2 / Torque limiter 1		
	13,14	UP, DOWN	UP, DOWN command	Invalid	Valid
	15	WE-KP	Write enable for KEYPAD	Valid	Invalid
	16	Hz/PID	PID control cancel		
	17	IVS	Inverse mode changeover (terminals 12 and C1)		
	18	LE	Link enable (Bus, RS485)	Invalid	Valid

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8.3 Function data

Code	Name		Unit	Variable range	Min. unit	Read/Write
S08	Acceleration time	F07	s	0.1–3600.0	0.1	R/W
S09	Deceleration time	F08	s	0.1–3600.0	0.1	R/W
S10	Torque limit level 1 (Driving)	F40	%	20.00–200.00	1.00	R/W
S11	Torque limit level 2 (Braking)	F41	%	0.00, 20.00–200.00	1.00	R/W

Note:

1) The writing to out of the range is treated as out of range error.
2) The acceleration and deceleration time S08 and S09 are assigned to "F07: Acceleration time 1" and "F08: Deceleration time 1" respectively.
3) The torque limit level 1 and 2 of S10 and S11 are assigned to "F40: Torque limit 1 (Driving)" and "F41: Torque limit 1 (Braking)" respectively

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8.4 Monitoring data

Code	Description	Unit	Range	Min. unit	Read/Write
M01	Setting frequency (Final data)	-	-20000–20000 (Maximum frequency at ±20000)	1	R
M05	Setting frequency (Final data)	Hz	0–400.00	0.01	R
M06	Output frequency 1	-	-20000–20000 (Maximum frequency at ±20000)	1	R
M07	Torque calculation value	%	-200.00–200.00	0.01	R
M08	Torque current	%	-200.00–200.00	0.01	R
M09	Output frequency 1	Hz	0.00–400.00	0.01	R
M10	Input power	%	0.00–200.00	0.01	R
M11	Output current	%	0.00–200.00 (Inverter rating at 100.00)	0.01	R
M12	Output voltage	V	0.0–600.0	1.0	R
M13	Operation command (Final data)	-	Refer to the data format [11]	-	R
M14	Operating state	-	Refer to the data format [13]	-	R
M15	Y1-Y2 output terminal data	-	Refer to the data format [12]	-	R
M16	Fault memory 0	-	Refer to the Alarm code table below	-	R
M17	Fault memory (1st prior)	-			
M18	Fault memory (2nd prior)	-			
M19	Fault memory (3rd prior)	-			
M20	Operating time	h	0–65000	1	R
M21	DC link circuit voltage	V	0–1000	1	R
M23	Type code	-	Refer to the data format [14]	-	R
M24	Capacity code	-	Refer to the data format [9]	-	R
M25	ROM version	-	0–9999	1	R
M26	Transmission error code (RS 485)	-	Refer to the Alarm code table below	-	R
M46	Life of main circuit capacitor	%	0.0–100.0	0.1	R
M48	Life of cooling fan	h	0–65000	1	R

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Note :

1) The output frequency 1 is before slip compensation.

2) Alarm code

Code	Description		Code	Description	
0	No alarm	---	31	Memory error	Er1
1	Overcurrent (During acceleration)	OC1	32	KEYPAD panel communication error	Er2
2	Overcurrent (During deceleration)	OC2	33	CPU error	Er3
3	Overcurrent (While running at constant speed)	OC3	34	Option communication error	Er4
6	Overvoltage (During acceleration)	OU1	35	Option error	Er5
7	Overvoltage (During deceleration	OU2	36	Operating proc.error	Er6
8	Overvoltage (While running at constant speed)	OU3	37	Output phase loss error	Er7
10	Undervoltage	LU	38	RS485 communication error	Er8
11	Input phase loss	Lin	71	Check sum error	
			72	Parity error	
17	Overheat of heat sink in inverter	OH1	73	Other errors	
18	External alarm input	OH2	74	Format error	
22	Overheat of DB resistance	dbH	75	Command error	
23	Electronic thermal overload relay (Motor1)	OL1	76	Priority of link	
24	Electronic thermal overload relay (Motor2)	OL2	77	No writing right for error	
25	Electronic thermal overload relay (Inverter)	OLU	78	Function code error	
			79	Forbidden writing error	
			80	Data error	
			81	Error during writing	

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8.5 Parameter data format

The data formats for various parameter data of the inverters are defined here. The data shall be prepared according to the following data format specifications. The instruction manual of inverter shall be referred to for the range and unit of data. The communication number is used to access inverter parameters through the fieldbus option and to configure Global Database Transaction.

List of parameter data format

Code	Communication No. decimal (Hex.)	Name	Data Format	Code	Communication No. decimal (Hex.)	Name	Data Format
-	0	-	-	-	45(2D)	-	-
S01	1(1)	Setting frequency (p.u.)	[2]	-	46(2E)	-	-
-	2(2)	-	-	-	47(2F)	-	-
-	3(3)	-	-	-	48(30)	-	-
-	4(4)	-	-	-	49(31)	-	-
S05	5(5)	Setting frequency	[5]	-	50(32)	-	-
S06	6(6)	Operation command	[11]	-	51(33)	-	-
-	7(7)	-	-	-	52(34)	-	-
S08	8(8)	Acceleration time	[3]	-	53(35)	-	-
S09	9(9)	Deceleration time	[3]	-	54(36)	-	-
S10	10(A)	Torque limit level 1	[5] *1	-	55(37)	-	-
S11	11(B)	Torque limit level 2	[5] *1	-	56(38)	-	-
-	12(C)	-	-	-	57(39)	-	-
-	13(D)	-	-	-	58(3A)	-	-
-	14(E)	-	-	-	59(3B)	-	-
M01	15(F)	Setting frequency (Final data)	[2]	M46	60(3C)	Life of main circuit capacitor	[3]
-	16(10)	-	-	-	61(3D)	-	-
-	17(11)	-	-	M48	62(3E)	Life of cooling fan	[1]
-	18(12)	-	-	-	63(3F)	-	-
M05	19(13)	Setting frequency (Final data)	[5]	-	64(40)	-	-
M06	20(14)	Output frequency 1	[2]	-	65(41)	-	-
M07	21(15)	Torque calculation value	[6]	-	66(42)	-	-
M08	22(16)	Torque current	[6]	-	67(43)	-	-
M09	23(17)	Output frequency 1	[5]	-	68(44)	-	-
M10	24(18)	Input power	[5]	-	69(45)	-	-
M11	25(19)	Output current	[5]	F00	70(46)	Data protection	[1]

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M12	26(1A)	Output voltage	[3]	F01	71(47)	Frequency command 1	[1]
M13	27(1B)	Operation command (Final data)	[11]	F02	72(48)	Operation method	[1]
M14	28(1C)	Operating state	[13]	F03	73(49)	Maximum output frequency 1	[1]
M15	29(1D)	Y1-Y2 output terminal data	[12]	F04	74(4A)	Base frequency 1	[1]
M16	30(1E)	Fault memory 0	[1]	F05	75(4B)	Rated voltage 1	[1]
M17	31(1F)	Fault memory (1st prior)	[1]	F06	76(4C)	Maximum output voltage 1	[1]
M18	32(20)	Fault memory (2nd prior)	[1]	F07	77(4D)	Acceleration time 1	[10]
M19	33(21)	Fault memory (3rd prior)	[1]	F08	78(4E)	Deceleration time 1	[10]
M20	34(22)	Operating time	[1]	F09	79(4F)	Torque boost 1	[3]
M21	35(23)	DC link circuit voltage	[1]	F10	80(50)	Electronics thermal overload relay 1	[1]
-	36(24)	-	-			(Selection)	
M23	37(25)	Type code	[14]	F11	81(51)	Electronics thermal overload relay 1	[10]
M24	38(26)	Capacity code	[9]			(Level)	
M25	39(27)	ROM version	[1]	F12	82(52)	Electronics thermal overload relay 1	[3]
M26	40(28)	Transmission error processing code	[1]	F13	83(53)	Electronics thermal overload relay (Braking resistor)	[1]
-	41(29)	-	-	F14	84(54)	Restart after momentary power failure	[1]
-	42(2A)	-	-			(Selection)	
-	43(2B)	-	-				
-	44(2C)	-	-				

*1) 999 is treated as $7FFF_H$.

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Code	Communication No. decimal (Hex.)	Name	Data Format	Code	Communication No. decimal (Hex.)	Name	Data Format
F15	85(55)	Frequency limiter (High)	[1]	-	135(87)	-	-
F16	86(56)	Frequency limiter (Low)	[1]	E40	136(88)	Display coefficient A	[10]
F17	87(57)	Gain (for frequency setting signal)	[3]	E41	137(89)	Display coefficient B	[10]
F18	88(58)	Bias frequency	[4]	-	138(8A)	-	-
F20	89(59)	DC brake (Starting frequency)	[3]	-	139(8B)	-	-
F21	90(5A)	DC brake (Braking level)	[1]	-	140(8C)	-	-
F22	91(5B)	DC brake (Braking time)	[3]	C01	141(8D)	Jump frequency 1	[1]
F23	92(5C)	Starting frequency	[3]	C02	142(8E)	Jump frequency 2	[1]
F24	93(5D)	Starting frequency (Holding time)	[3]	C03	143(8F)	Jump frequency 3	[1]
F25	94(5E)	Stop frequency	[3]	C04	144(90)	Jump frequency (Width)	[1]
F26	95(5F)	Motor sound (Carrier frequency)	[1] *1	C05	145(91)	Multi-step frequency 1	[5]
F27	96(60)	Motor sound (Sound tone)	[1]	C06	146(92)	Multi-step frequency 2	[5]
F30	97(61)	FMA terminal (Voltage adjust)	[1]	C07	147(93)	Multi-step frequency 3	[5]
F31	98(62)	FMA terminal (Function selection)	[1]	C08	148(94)	Multi-step frequency 4	[5]
F33	99(63)	FMP terminal (Pulse rate multiplier)	[1]	C09	149(95)	Multi-step frequency 5	[5]
F34	100(64)	FMP terminal (Voltage adjust)	[1]	C10	150(96)	Multi-step frequency 6	[5]
F35	101(65)	FMP terminal (Function selection)	[1]	C11	151(97)	Multi-step frequency 7	[5]
F36	102(66)	30Ry operation mode	[1]	-	152(98)	-	-
				C30	153(99)	Frequency setting 2	[1]
F40	103(67)	Torque limit 1 (Driving)	[1]	C31	154(9A)	Analog input offset (terminal 12) /	[4]
F41	104(68)	Torque limit 1 (Braking)	[1]			Analog input bias (terminal 12)	
F42	105(69)	Torque vector control 1	[1]	C32	155(9B)	Analog input offset (terminal C1) /	[4]
E01	106(6A)	X1 terminal function	[1]			Analog input gain (terminal 12)	
E02	107(6B)	X2 terminal function	[1]	C33	156(9C)	Analog filter	[5]
E03	108(6C)	X3 terminal function	[1]	P01	157(9D)	Motor 1 (Number of poles)	[1]
E04	109(6D)	X4 terminal function	[1]	P02	158(9E)	Motor 1 (Capacity)	[5]
E05	110(6E)	X5 terminal function	[1]	P03	159(9F)	Motor 1 (Rated current)	[10]
-	111(6F)	-	-	-	160(A0)	-	-
-	112(70)	-	-	P05	161(A1)	Motor 1 (On-line tuning)	[1]
-	113(71)	-	-	P06	162(A2)	Motor 1 (No-load current)	[10]
-	114(72)	-	-	P07	163(A3)	Motor 1 (%R1)	[5]
E10	115(73)	Acceleration time 2	[10]	P08	164(A4)	Motor 1 (%X)	[5]
E11	116(74)	Deceleration time 2	[10]	P09	165(A5)	Motor 1 (Slip compensation control)	[5]
-	117(75)	-	-	H03	166(A6)	Data initializing	[1] *2

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-	118(76)	-	-	H04	167(A7)	Auto-reset (Times)	[1]
-	119(77)	-	-	H05	168(A8)	Auto-reset(Reset interval)	[1]
-	120(78)	-	-	H06	169(A9)	Fan stop operation	[1]
E16	121(79)	Torque limiter 2 (Driving)	[1]	H07	170(AA)	ACC/DCC pattern (Mode selection)	[1]
E17	122(7A)	Torque limiter 2 (Braking)	[1]	-	171(AB)	-	-
E20	123(7B)	Y1 terminal function	[1]	H09	172(AC)	Start mode (Pick-up mode)	[1]
E21	124(7C)	Y2 terminal function	[1]	H10	173(AD)	Energy-saving operation	[1]
-	125(7D)	-	-	H11	174(AE)	Deceleration mode	[1]
-	126(7E)	-	-	H12	175(AF)	Instantaneous overcurrent limiting	[1]
-	127(7F)	-	-	H13	176(B0)	Auto-restart (Restart time)	[3]
				H14	177(B1)	Auto-restart (Frequency fall rate)	[5]
E30	128(80)	Frequency arrival (FAR)	[3]	-	178(B2)	-	-
		(Detecting width)		-	179(B3)	-	-
E31	129(81)	Frequency detection 1 (FDT)	[1]	-	180(B4)	-	-
		(level)		-	181(B5)	-	-
E32	130(82)	Frequency detection (FDT)	[3]	H20	182(B6)	PID control (Mode selection)	[1]
		(Hysteresis width)		H21	183(B7)	PID control (Feed back signal)	[1]
E33	131(83)	Overload early warning	[1]	H22	184(B8)	PID control (P-Gain)	[5]
		(Mode selection)		H23	185(B9)	PID control (I-time)	[3]
E34	132(84)	Overload early warning 1 (level)	[10]	H24	186(BA)	PID control (D-time)	[5]
E35	133(85)	Overload early warning (Timer time)	[3]	H25	187(BB)	PID control (Feedback filter)	[3]
-	134(86)	-	-				

*1) 0.75 kHz is treated as 0000H

*2) The communication might not be able to be continued by writing (data 1).

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Code	Commu-nication No. decimal (Hex.)	Name	Data Format	Code	Commu-nication No. decimal (Hex.)	Name	Data Format
H26	188(BC)	PTC thermistor (Mode selection)	[1]	o36	235(EB)	Bus Configuration Parameter 07	[1]
H27	189(BD)	PTC thermistor (Level)	[5]	o37	236(EC)	Bus Configuration Parameter 08	[1]
H28	190(BE)	Droop operation	[4]	o38	237(ED)	Bus Configuration Parameter 09	[1]
H30	191(BF)	Serial link (Function selection)	[1]	o39	238(EE)	Bus Configuration Parameter 10	[1]
H31	192(C0)	RS485 (Address)	[1] *1	o40	239(EF)	Bus Configuration Parameter 11	[1]
H32	193(C1)	RS485 (Mode selection on error)	[1] *1	o41	240(F0)	Bus Configuration Parameter 12	[1]
H33	194(C2)	RS485 (Timer time)	[3] *1	o42	241(F1)	Bus Configuration Parameter 13	[1]
H34	195(C3)	RS485 (Baud rate)	[1] *1	o43	242(F2)	Bus Configuration Parameter 14	[1]
H35	196(C4)	RS485 (Data length)	[1] *1	o44	243(F3)	Bus Configuration Parameter 15	[1]
H36	197(C5)	RS485 (Parity check)	[1] *1	o45	244(F4)	Bus Configuration Parameter 16	[1]
H37	198(C6)	RS485 (Stop bits)	[1] *1	o46	245(F5)	Bus Configuration Parameter 17	[1]
H38	199(C7)	RS485 (No response detection time)	[1] *1	o47	246(F6)	Bus Configuration Parameter 18	[1]
H39	200(C8)	RS485 (Response interval)	[5] *1	o48	247(F7)	Bus Configuration Parameter 19	[1]
A01	201(C9)	Maximum frequency 2	[1]	o49	248(F8)	Bus Configuration Parameter 20	[1]
A02	202(CA)	Base frequency 2	[1]	o50	249(F9)	Bus Configuration Parameter 21	[1]
A03	203(CB)	Rated voltage 2 (at base speed)	[1]	o51	250(FA)	Bus Configuration Parameter 22	[1]
A04	204(CC)	Maximum output voltage 2	[1]	o52	251(FB)	Bus Configuration Parameter 23	[1]
A05	205(CD)	Torque boost 2	[3]	o53	252(FC)	Bus Configuration Parameter 24	[1]
A06	206(CE)	Electronics thermal 2 (Selection)	[1]	o54	253(FD)	Bus Configuration Parameter 25	[1]
A07	207(CF)	Electronics thermal 2 (Level)	[10]	o55	254(FE)	Bus Configuration Parameter 26	[1]
A08	208(D0)	Electronics thermal 2 (Thermal time constant)	[3]	-	255(FF)	-	-
A09	209(D1)	Torque vector control 2	[1]				
A10	210(D2)	Motor 2 (Number of motor-2 poles)	[1]				
A11	211(D3)	Motor 2 (Capacity)	[5]				
A12	212(D4)	Motor 2 (Rated current)	[10]				
-	213(D5)	-	-				
A14	214(D6)	Motor 2 (On-line tuning)	[1]				
A15	215(D7)	Motor 2 (No load current	[10]				
A16	216(D8)	Motor 2 (%R1 setting)	[5]				
A17	217(D9)	Motor 2 (%X setting)	[5]				
A18	218(DA)	Motor 2 (Slip compensation control 2)	[5]				
-	219(DB)	-	-				
-	220(DC)	-	-				
-	221(DD)	-	-				

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-	222(DE)	-	-				
-	223(DF)	-	-				
-	224(E0)	-	-				
-	225(E1)	-	-				
-	226(E2)	-	-				
o27	227(E3)	Mode selection on error	[1]				
o28	228(E4)	Timer time setting	[3]				
o30	229(E5)	Bus Configuration Parameter 01	[1]				
o31	230(E6)	Bus Configuration Parameter 02	[1]				
o32	231(E7)	Bus Configuration Parameter 03	[1]				
o33	232(E8)	Bus Configuration Parameter 04	[1]				
o34	233(E9)	Bus Configuration Parameter 05	[1]				
o35	234(EA)	Bus Configuration Parameter 06	[1]				

*1) Read-only from communication.

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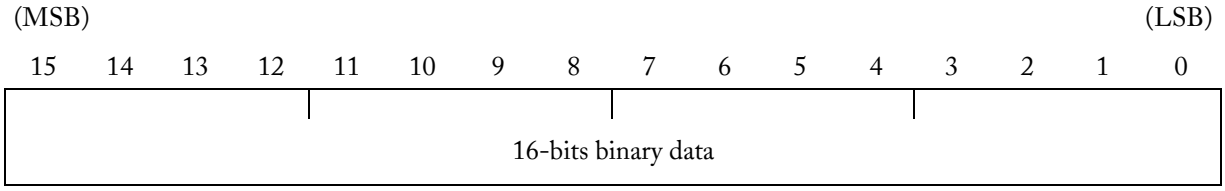
8.6 Data format specification

All data within the data field of the communication frame consist of 16 bits binary data.



(Negative data is treated with two's complement.)

Data format [1] **Integer data (Positive): Min. unit 1**

Example) If F15 (Frequency limiter, high limit) = 60 Hz,

$60 * 1 = 60 = 003C_H$ -> | 0 | 0 | 3 | C |

Data format [2] **Integer data (Positive, negative): Min. unit 1**

Example) If F18 (Bias frequency) = -20 Hz,

$-20 * 1 = -20 = FFEC_H$(two's complement) -> | F | F | E | C |

Data format [3] **Decimal data (Positive): Min. unit 0.1**

Example) If F17 Gain (for frequency setting signal) = 100.0%,

$100.0 * 10 = 1000 = 03E8_H$ -> | 0 | 3 | E | 8 |

Data format [4] **Decimal data (Positive, negative): Min. unit 0.1**

Example) If H28 (Droop operation) = -5.0Hz,

$-5.0 * 10 = -50 = FFCE_H$(two's complement) -> | F | F | C | E |

Data format [5] **Decimal data (Positive): Min. unit 0.01**

Example) If C05 (Multi-step frequency 1) = 50.25 Hz,

$50.25 * 100 = 5025 = 13A1_H$ -> | 1 | 3 | A | 1 |

Data format [6] **Decimal data (Positive, negative): Min. unit 0.01**

Example) If M07 (Actual torque value) = -85.38%,

$-85.38 * 100 = -8538 = DEA6_H$(two's complement) -> | D | E | A | 6 |

Data format [7] **Decimal data (Positive): Min. unit 0.001**

Example) If o05 (Constant I of feedback speed controller) = 0.105s,

$0.105 * 1000 = 105 = 0069_H$ -> | 0 | 0 | 6 | 9 |

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Data format [8] **Decimal data (Positive, negative): Min. unit 0.001**

Example) If being -1.234,

-1.234 * 1000 = -1234 = $FB2E_H$(two's complement) -> | F | B | 2 | E |

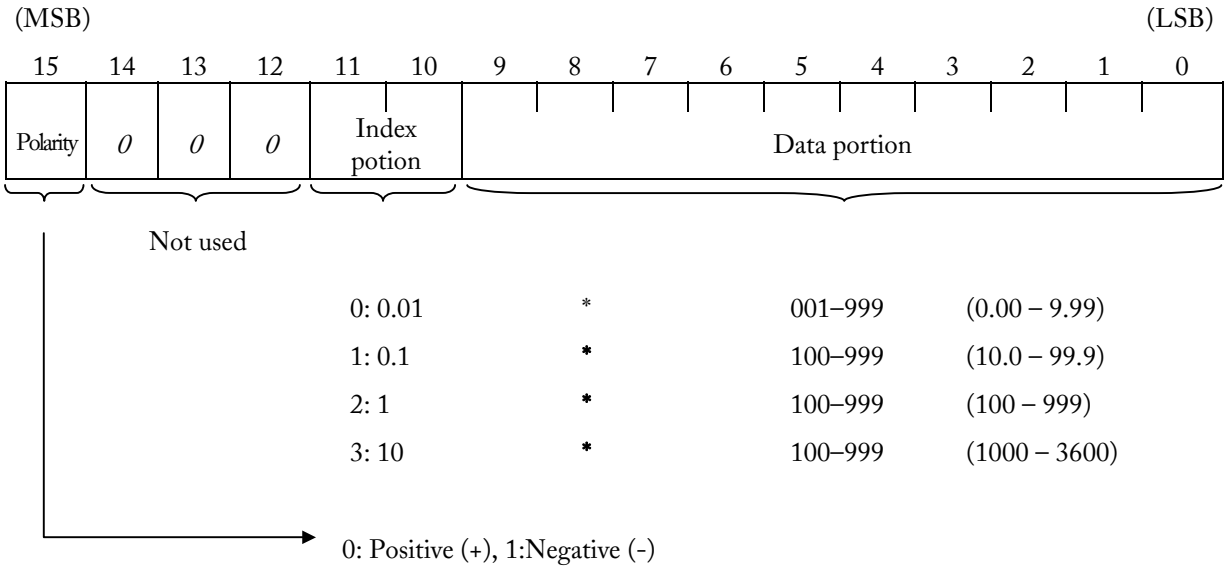
Data format [9] **Capacity code**

Code	FVR-E11S : Capacity (kW)	AF300E11 : Capacity (HP)
10	0.1	0.12
20	0.2	0.25
40	0.4	0.5
75	0.75	1
150	1.5	2
220	2.2	3
370	3.7	5
550	5.5	7.5
750	7.5	10

Example) If 3.7kW

Since 3.7 * 100 = 370 = 0172_H -> | 0 | 1 | 7 | 2 |

Exponential data (ACC/DEC time, current value, display coefficient)



Example) F07 (Acceleration time 1) = 20.0 s,

20.0 = 0.1 * 200 -> | 0 | 4 | C | 8 |

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Data format [11] Operation command

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
(RST)	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	X5	X4	X3	X2	X1	REV	FWD

Alarm reset command | Not used | Multi-function command | FWD: Forward rotation command | REV: Reverse rotation command

(All bits are ON by 1)

Example) If M13 (Operation command, Final command) = FWD, X1, X5 = ON,

$0000\ 0000\ 0100\ 0101_b = 0045_H$ ->

0	0	4	5

Data format [12] Universal output terminal

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	Y2	Y1

Not used | Universal command

(All bits are ON by 1)

Example) If M15 (Universal output terminal) = Y1, Y2 = ON,

$0000\ 0000\ 0000\ 0011_b = 0003_H$ ->

0	0	0	3

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Data format [13] Operating status

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	-		RL	ALM	DEC	ACC	IL	VL	TL	NUV	BRK	INT	EXT	REV	FWD

(All bit are ON or active by 1)

FWD:	In forward operation	IL:	In current limiting
REV:	In reverse operation	ACC:	In acceleration
EXT:	In DC braking (or in pre-excitation)	DEC:	In deceleration
		ALM:	Alarm
INT:	Inverter Base Of	RL:	Transmission valid
BRK:	In braking		
NUV:	DC link voltage is establishment (Undervoltage condition at 0)		
TL:	In torque limiting		
VL:	In voltage limiting		

Example) Omitted (Monitoring method is similar as in the formats [11] and [12].)

Data format [14] Type code

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Unit type				Generation				Series				Voltage series			

Code	Type	Generation	Series	Voltage series
1	VG	11th series	For Japan	100V single phase
2	G	-	For Asia	200V single phase
3	P	-	For China	200V three phase
4	E	-	For Europe	400V three phase
5	C	-	For USA	575V three phase
6	S	-	-	-

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Data format [15] Code setting (1 – 4 figures)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data 4				Data 3				Data 2				Data 1			

Example) If "o22:Ai function selection" = 123,

Since $123 = 0123_H$ ⇒

0	1	2	3