

TITLE:

**Gateway CAN - Hitachi inverters
 SJ/L300P**

ID No: **SHW087-2**
 REV.: 1.0
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Gateway CAN - Hitachi inverters SJ/L300P

History			
Rev	Date	Description	By
1.0	26.05.'06	Created	G. De Giudici
1.1	15.06.'06	Updated physical interface, settings, mounting & direct access table	G. De Giudici
1.2	29.06.'06	Introduced machine status description & rearranged object description	G. De Giudici

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Date:	Date:	Date:

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1. Introduction

HI04 is a communication module controlling Hitachi L300P and SJ300 drives from CAN network. The module is mounted in the expansion bay. The module is powered through expansion connector which provides logical interface with the inverter and it is connectable to CAN-Bus through 5 pin connector. The CAN network can work up 1 Mbit/s. Two status leds describe the operating status.

The following operations are possible:

Control and monitoring of the drive from CAN

Start/Stop

Direction

Fault reset

Speed control

Acceleration/deceleration control

Access to drive parameters

1.1. Specification

HI04 specifications

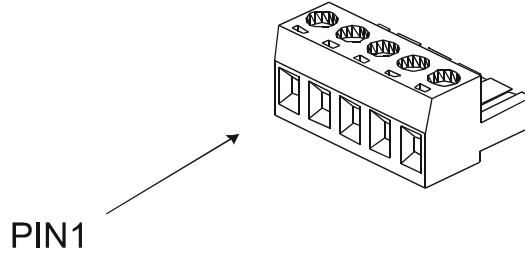
Power supply	Via Option port connector
Voltage range	4.75-5.25 VDC, 5 VDC nominal and 3.15-3.45 VDC, 3.3 VDC
Current range	nominal to be defined
Indicators	1 green LED 1 red LED
Addressing	Via dip switches (7 digit) range [1, 127] Note: 0 – reserved
Baud rate	Via dip switches (3 digit) 1 Mbaud [0] down to 10Kbaud [7]
Serial port RS422 Connector	RJ45 (used for service)
Temperature Operating	0 to 50 C°
Storage	-10 to 70 C°
Humidity	20 to 85%, non condensing
Dimensions WxDxH	To be defined
Weight	To be defined

1.2. Mechanical drawings

To be defined.

1.3. Physical interface

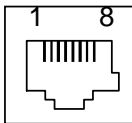
CAN bus interface



Standard CiA DR-303-1

Pin	Name	Description
1	CAN_GND	Ground
2	CAN_L	CAN_L bus line (dominant low)
3	(CAN_SHLD)	Optional CAN shield
4	CAN_H	CAN_H bus line (dominant high)
5	(CAN_V+)	Optional CAN external positive supply

RS422 (Service port)



Standard RJ45

Pin	Name	Description
1	+5V IN	Voltage supply for gateway
2	CHA+	Positive TX (RS422)
3	CHA-	Negative TX (RS422)
4	GND	Ground
5	CHB+	Positive RX (RS422)

6	CHB-	Negative RX (RS422)
7	GND	Ground
8	Not conn.	

1.4. Settings

Baud rate setting

Baud rate selection is made through dip-switch (see figure below).
Selection is made using three switch according to the following table.

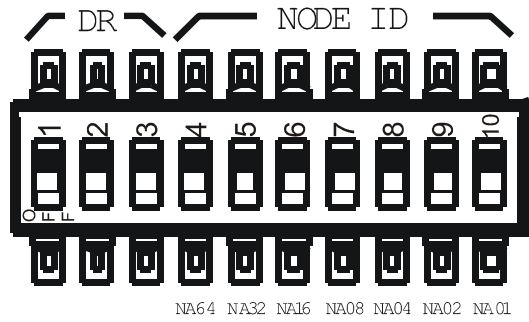
Baud rate	Switch n° 1	Switch n° 2	Switch n° 3
1 MB	OFF	OFF	OFF
800 KB	OFF	OFF	ON
500 KB	OFF	ON	OFF
250 KB	OFF	ON	ON
125 KB	ON	OFF	OFF
50 KB	ON	OFF	ON
25 KB	ON	ON	OFF
10 KB	ON	ON	ON

Node number

Node selection is made through dip-switch.
Selection is made using seven switch; address "0" is reserved for service.

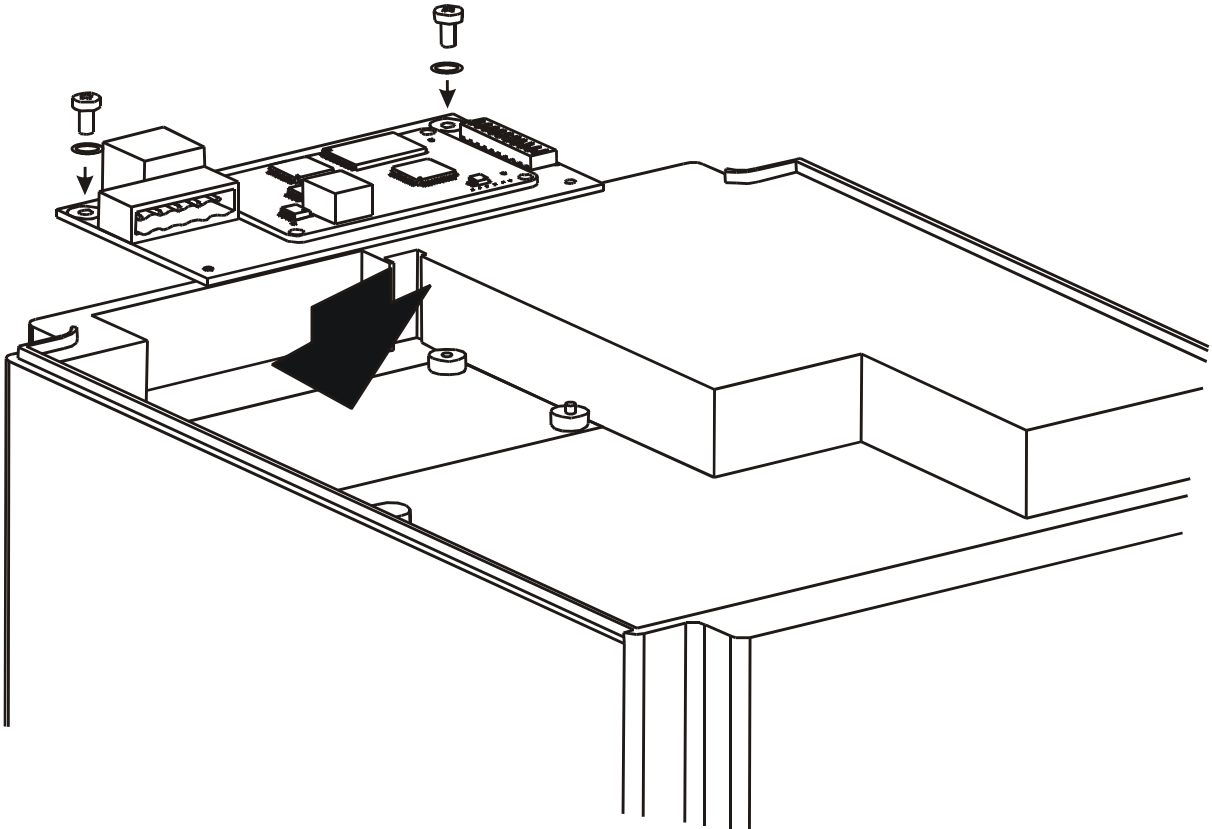
$$\text{Node ID} = \text{SW4} * 64 + \text{SW5} * 32 + \text{SW6} * 16 + \text{SW7} * 8 + \text{SW8} * 4 + \text{SW9} * 2 + \text{SW10} * 1$$

Note: SWX = Switch n° X.



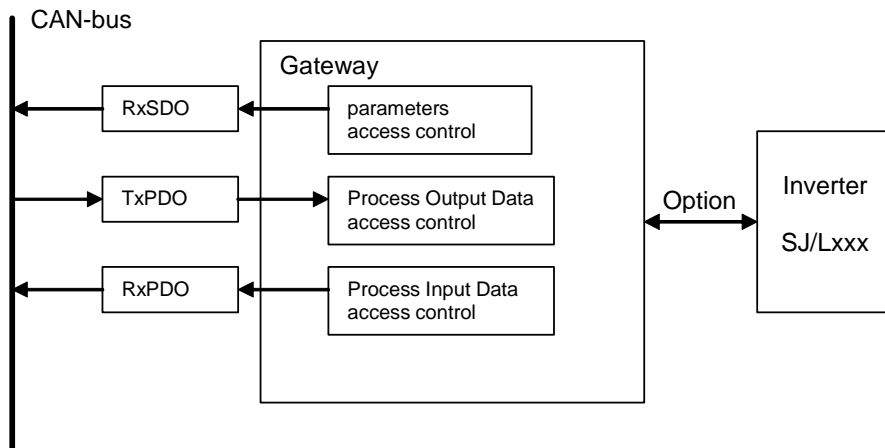
2. Installation

Install modules as described in the figure below.



3. Operation

After the installation and configuration, the module controls and monitors the drive following specifications proposed in CiA DSP-402 "CANopen Device Profile for Drives and Motion Control" (velocity mode profile), direct accessing, or following DSP-301 generic CANopen specification.



3.1. Principle of operation

The CANopen enables configuration and real time data exchange between peers on CAN network. The communication objects which participates in this data exchange are identified by COB-ID. The COB-ID consists of NodeID and the function code.

The final data destination are application objects which are all defined in the Device Object Dictionary. Every object in the Object Dictionary is identified by its unique 16-bit index, and objects that are of array/structure type use in addition a subindex for selecting the array/structure element. If there is an element of array/structure type the subindex 0 specifies the highest subindex used in that object.

Concerning profile data the Object Dictionary can be divided into three parts:

Index	Profile Area
1000-1FFF	Communication Profile Area
2000-5FFF	Manufacturer Specific Profile Area
6000-9FFF	Standard Profile Area

All objects can be accessed acyclically using the SDO protocol and some of them can also be accessed cyclically by using PDO transfer with configured PDO objects. PDO transfer is fast because it uses no protocol overhead (just 8 data bytes unconfirmed data transfer).

3.2. Service data object (SDO)

With Service Data Objects (SDOs) the access to entries of a device Object Dictionary is provided. The data transfer is performed by a kind of handshaking protocol – SDO protocol defined in the DS-301 standard. An object address (index and sub-index of the Object Dictionary) is used for selection which data set is to be transferred. The contents of the transferred data set are defined within the Object Dictionary. Only expedited transfer is supported.

The gateway provides one server SDO that is described by dictionary object 1200h with the following record:

Sub-Index	Type	Meaning
0h	UNSIGNED8	Number of supported entries in the record (default = 2)
1h	UNSIGNED32	COB-ID Client -> Server
2h	UNSIGNED32	COB-ID Server->Client

In the case of error in the SDO protocol execution the gateway will respond with standard abort code. Here is the table with possible abort code values:

Abort code	Meaning
0504 0001h	Client/server command specifier not valid or unknown.
0601 0001h	Attempt to read a write only object.
0601 0002h	Attempt to write a read only object.
0602 0000h	Object does not exist in the object dictionary.
0604 0000h	Object index is reserved.
0609 0011h	Sub-index does not exist.
0800 0020h	Data cannot be transferred or stored to the application – inverter not accessible.
0800 0021h	Data cannot be transferred or stored to the application because some other transfer process is in progress.

3.3. Cyclic communication (PDO process data exchange)

Real time data exchange is performed by means of "Process Data Objects (PDO)" and it is done with no protocol overhead. Concerning the trigger which starts the data transfer there are synchronous (triggered by SYNC message) and asynchronous (triggered by events) PDO transfers. There are received PDOs (RPDO) and transmit PDOs (TPDO). The gateway supports two TPDOs and two

RPDOs. Each PDO can exchange 8 data bytes, which can be composed of data of many device dictionary objects.

The PDOs correspond to entries in the device Object Dictionary and provide the interface to the application objects. Applying the SDO services to these objects configures these Object Dictionary entries.

Data type and mapping of application objects into a PDO is determined by a corresponding default PDO mapping structure within the Device Object Dictionary. For every PDO there are two definition objects, communication parameter object and mapping parameter object. These objects are by default located at the following indices in the Object Dictionary:

Index	Type	Object
1400h	20h	1st receive PDO communication parameter
1401h	20h	2nd receive PDO communication parameter
1600h	21h	1st receive PDO mapping parameter
1601h	21h	2nd receive PDO mapping parameter
1800h	20h	1st transmit PDO communication parameter
1801h	20h	2nd transmit PDO communication parameter
1A00h	21h	1st transmit PDO mapping parameter
1A01h	21h	2nd transmit PDO mapping parameter

Data type 20h is a record, which defines the PDO communication parameter, and it is of the following format:

Sub-Index	Type	Meaning
0h	UNSIGNED8	Number of supported entries in the record (default = 2)
1h	UNSIGNED32	COB-ID
2h	UNSIGNED8	transmission type

Data type 21h is a record, which defines the PDO mapping parameter and it is of the following format:

Sub-Index	Type	Meaning
0h	UNSIGNED8	Number of supported entries in the record (0-8)
1h – 8h	UNSIGNED32	Structure consisting of mapped object index (16 bit), subindex (8 bit) and object data length in bits (8 bit). For example 20010010h defines object 2001h, subindex 0h and data length of 16 bits (=word).

Data specified by mapping objects will be inserted into PDO from the byte 0 (first mapped object data followed by other).

4. Device Control

The gateway supports device control as specified by the DSP-402 drive control profile – velocity mode. The state machine execution and the format of control word and status word conform to the standard.

The state of the drive can be controlled by the control word and the state of the drive is shown in the status word. These two words are defined as a standard objects inside the Object Dictionary and can be accessed directly from the CAN-network by Process Data Objects (PDOs) and Service Data Objects (SDOs).

The state machine is controlled externally by the control word, external signals and internal signals like faults.

4.1. Profile standard dictionary objects

The gateway supports the following set of standard objects:

Index	Meaning	Format
6007h	abort_connection_option_code	Unsigned16
6040h	control word	Unsigned16
6041h	status word	Integer16
6042h	vl_target_velocity	Integer16
6043h	vl_velocity_demand	Integer16
6044h	vl_control_effort	Integer16
6046h	vl_velocity_min_max_amount	Struct
6048h	vl_velocity_acceleration	Struct
6049h	vl_velocity_deceleration	Struct
6060h	modes_of_operation	Integer8
6061h	modes_of_operation_display	Integer8

4.2. abort_connection_option_code (dictionary index 6007h)

This object controls the gateway action if the communication to the CAN bus is broken.

Value	Action
0	No action
1	Malfunction
2	Disable voltage
3	Quick stop
-1	Switch to local inverter commands (speed Control term., commands Input term.)

-2	Switch to local inverter commands (speed Keypad potent., commands Keypad)
-3	Switch to local inverter commands (speed F001 setting, commands Keypad)

4.3. Control word (dictionary index 6040h)

The bits used in the control word are:

Bit	Significance
0	Switch On
1	Enable Voltage
2	Quick Stop
3	Enable Operation
7	Reset Fault (raising edge)
8	Halt
14	Move Forwards
15	Move Backwards

4.4. Status word (dictionary index 0x6041)

Status word reports the inverter status. The used bits are the following:

Bit	Significance
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
9	Remote
10	Target reached
11	Internal limit active
14	Moving forwards
15	Moving backwards

4.5. vl_target_velocity (dictionary index 6042h)

This parameter indicates the speed reference to the inverter in rpm (revolution per minutes).

Access rights: Read/Write.

Resolution: 1 [rpm].

Setting range: 0 – 24000 [rpm].

4.6. vl_velocity_demand (dictionary index 6043h)

This parameter specifies the speed supplied to the motor in rpm (revolution per minutes).

Access rights: Read.

Resolution: 1 [rpm].

4.7. vl_control_effort (dictionary index 6044h)

This parameter specifies the actual speed of the motor in rpm (revolution per minutes).

Access rights: Read.

Resolution: 1 [rpm].

4.8. vl_velocity_min_max_amount (dictionary index 6046h)

The object is array of two 32-bit words.

Sub 1

This parameter indicates minimum speed to the inverter in rpm (revolution per minutes).

Access rights: Read/Write.

Resolution: 1 [rpm].

Setting range: 1 – 24000 [rpm].

Sub 2

This parameter indicates maximum speed to the inverter in rpm (revolution per minutes).

Access rights: Read/Write.

Resolution: 1 [rpm].

Setting range: 1 – 24000 [rpm].

4.9. vl_velocity_acceleration (dictionary index 6048h)

This parameter specifies slope of the acceleration ramp. It is generated by the quotient of the delta speed and delta time sub parameters.

Sub 1

Delta speed:
Access rights: Read/Write.
Resolution: 1 [rpm].
Setting range: 1 – 24000 [rpm].

Sub 2

Delta time:
Access rights: Read/Write.
Resolution: 0.01 [s].
Setting range: 0.01 – 3600.00 [s].

4.10. vl_velocity_deceleration (dictionary index 6049h)

This parameter specifies slope of the deceleration ramp. It is generated by the quotient of the delta speed and delta time sub parameters.

Sub 1

Delta speed:
Access rights: Read/Write.
Resolution: 1 [rpm].
Setting range: 1 – 24000 [rpm].

Sub 2

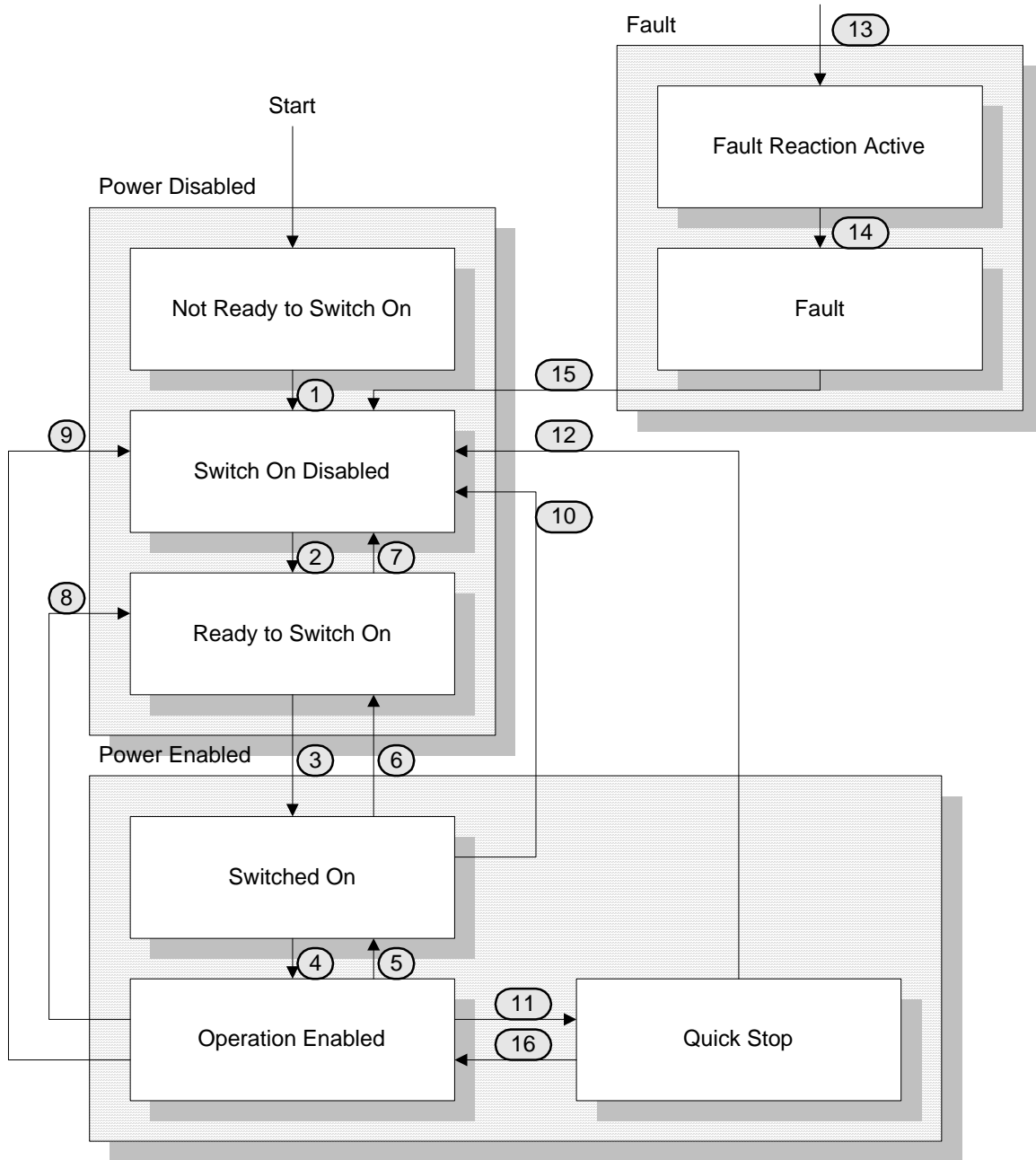
Delta time:
Access rights: Read/Write.
Resolution: 0.01 [s].
Setting range: 0.01 – 3600.00 [s].

4.11. modes_of_operation (dictionary index 6060h and 6061h)

Since the gateway supports only the velocity operation mode the value of this object is fixed to 2.

4.12. State machine

The gateway supports the state machine handling defined by DS-402 profile standard.



The following states are possible:

State	Meaning
Not Ready to Switch On	Power has been applied to the gateway. The drive function is disabled.
Switch On Disabled	Drive initialization is complete. The drive parameters have been set up. The drive function is disabled.
Ready to Switch On	The drive function is disabled.
Switched On	The drive function is disabled. If supported, power switched on.
Operation Enabled	No faults have been detected. The drive function is enabled and power is applied to the motor. (This corresponds to normal operation of the drive.)
Quick Stop Active	The Quick Stop function is being executed. The drive function is enabled and power is applied to the motor.
Fault Reaction Active	A non-fatal fault has occurred in the drive. The Quick Stop function is being executed. The drive function is enabled and power is applied to the motor.
Fault	A fault has occurred in the drive. The drive function is disabled. Fault reset should be done to re-enable the drive function

Description of state transitions:

Transition	Event	Action
1: Not ready to switch on -> Switch On Disabled	Reset	Drive initialization
2: Switch On Disabled -> Ready to Switch On	'Shutdown' command from host	None
3: Ready to Switch On -> Switched On	'Switch On' command from host	Power section switched on (or none if not supported)
4: Switched On -> Operation Enabled	'Enable Operation' command from host	The drive function is enabled
5: Operation Enabled -> Switched On	'Disable Operation' command from host	The drive operation will be disabled
6: Switched On -> Ready to Switch On	'Shutdown' command from host	The power section is switched off (or none if not supported)
7: Ready to Switch On -> Switch On Disabled	'Quick stop' command from host	None
8: Operation Enabled -> Ready to Switch On	'Shutdown' command from host	Quick stop executed
9: Operation Enabled -> Switch On Disabled	'Disable Operation' command from host	Quick stop executed
10: Switched On -> Switch On	'Disable Voltage' or	Quick stop executed

Disabled	'Quick Stop' command from host	
11: Operation Enabled -> Quick Stop Active	'Quick Stop' command from host	Quick stop executed
12: Quick Stop Active -> Switch On Disabled	'Quick Stop' is completed	The power section is switched off (or none if not supported)
13: All states -> Fault Reaction Active	A trip has occurred in the drive	Execute appropriate fault reaction (quick stop)
14: Fault Reaction Active -> Fault	The fault reaction is completed	The drive function is disabled
15: Fault -> Switch On Disabled	'Fault Reset' command from host	A reset of the fault condition is carried out if no fault exists
16: Quick Stop Active -> Operation Enable	'Enable Operation' command from host	The drive function is enabled

By manipulating bits in the control word the master can change the state of the slave.

Command/bit of the control word	Bit7 Fault Reset	Bit3 Enable Operation	Bit2 Quick Stop	Bit1 Disable Voltage	Bit0 Switch On	Transition
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	0 -> 1	x	x	x	x	15

The gateway will accept the setpoint only in the Operation Enabled state. The control word that forces the gateway into Operation Enabled state has bits 0-3 set. When gateway is in the Operation Enabled state the direction control bits in control word (bits 14 and 15) are active.

In the case of inverter trip the state machine will go into the Fault State (indicated by status word bit 3 – Fault). In order to quit the Fault State the master has to generate a raising edge (0->1) on the control word bit 7 (Fault Reset).

The slave state is indicated in the status word.

State	Bit6 Switch On Disable	Bit5 Quick Stop	Bit3 Fault	Bit2 Operation Enabled	Bit1 Switched On	Bit0 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	0	0	0	1	1	1

4.13. List of Parameters

Parameter can be divided into three categories:

Index	Profile Area
1000-1FFF	Communication Profile Area
2000-5FFF	Manufacturer Specific Profile Area
6000-9FFF	Profile Standardized Area

4.14. Profile Standard Parameters

Index	Subindex	Meaning	Format
6007h		abort_connection_option_code	Unsigned16
6040h		Control word	Unsigned16
6041h		status word	Integer16
6042h		vl_target_velocity	Integer16
6043h		vl_velocity_demand	Integer16
6044h		vl_control_effort	Integer16
6046h		vl_velocity_min_max_amount	Struct
	0	Number of entries (= 2)	Integer8
	1	Min velocity value	Unsigned32
	2	Max velocity value	Unsigned32
6048h		vl_velocity_acceleration	Struct
	0	Number of entries (= 2)	Integer8
	1	Delta velocity	Unsigned32
	2	Delta time (sec)	Unsigned16
6049h		vl_velocity_deceleration	Struct
	0	Number of entries (= 2)	Integer8
	1	Delta velocity	Unsigned32
	2	Delta time (sec)	Unsigned16
6060h		Modes_of_operation	Integer8
6061h		Modes_of_operation_display	Integer8

4.15. Profile Standard Communication Objects

Parentheses (=x) indicate the initial value. For example the first PDO receive object (0x1600) is by default configured to receive control word (0x6040) and velocity standard setpoint (0x6042).

Index	Sub-index	Meaning	Type
0x1000	0	Device type (=0x00010192)	Unsigned32
0x1001	0	Error register	Unsigned8

0x1005	0	COB-ID of sync PDO (0x80000080)	Unsigned32
0x1006	0	Communication cycle period	Unsigned32
0x1007	0	Synchronous window length	Unsigned32
0x1008	0	Manufacturer device name (= "SJLC")	String
0x1009	0	Manufacturer hardware version (= "MBC2")	String
0x100a	0	Software version (1.05)	String
0x100c	0	Guard time	Unsigned16
0x100d	0	Life time factor	Unsigned8
0x1014	0	COB-ID of emergency PDO (0x80000080)	Unsigned32
0x1018		Vendor ID	Struct
	0	Number of entries (=1)	Unsigned8
	1	Vendor ID (=0x15F)	Unsigned32
0x1200		Server SDO	Struct
	0	Number of entries (=2)	Unsigned8
	1	COB-ID Client -> Server (=NodeID+0x00000600)	Unsigned32
	2	COB-ID Server -> Client (=NodeID+0x00000580)	Unsigned32
0x1400		Receive PDO 1	
	0	Number of entries (=2)	Unsigned8
	1	COB-ID (=NodeID+0x00000200)	Unsigned32
	2	Transmission type (=254)	Unsigned8
0x1401		Receive PDO 2	
	0	Number of entries (=2)	Unsigned8
	1	COB-ID (=NodeID+0x00000300)	Unsigned32
	2	Transmission type (=254)	Unsigned8
0x1600		Receive PDO 1 Mapping	Struct
	0	Number of entries (=2)	Unsigned8
	1	Mapping 1 (=0x60400010)	Unsigned32
	2	Mapping 2 (=0x60420010)	Unsigned32
	3	Mapping 3	Unsigned32
	4	Mapping 4	Unsigned32
	5	Mapping 5	Unsigned32
	6	Mapping 6	Unsigned32
	7	Mapping 7	Unsigned32
	8	Mapping 8	Unsigned32
0x1601		Receive PDO 2 Mapping	Struct
	0	Number of entries (=0)	Unsigned8
	1	Mapping 1	Unsigned32
	2	Mapping 2	Unsigned32
	3	Mapping 3	Unsigned32
	4	Mapping 4	Unsigned32
	5	Mapping 5	Unsigned32
	6	Mapping 6	Unsigned32
	7	Mapping 7	Unsigned32
	8	Mapping 8	Unsigned32
0x1800		Transmit PDO 1 communication parameters	Struct
	0	Number of entries (=2)	Unsigned8
	1	COB-ID (=NodeID+0x00000180)	Unsigned32
	2	Transmission type (=254)	Unsigned8

0x1801		Transmit PDO communication parameters	Struct
	0	Number of entries (=2)	Unsigned8
	1	COB-ID (NodeID+0x00000280)	Unsigned32
	2	Transmission type (=254)	Unsigned8
0x1a00		Transmit PDO 1 Mapping	Struct
	0	Number of entries (=2)	Unsigned8
	1	Mapping 1 (=0x60410010)	Unsigned32
	2	Mapping 2 (=0x60440010)	Unsigned32
	3	Mapping 3	Unsigned32
	4	Mapping 4	Unsigned32
	5	Mapping 5	Unsigned32
	6	Mapping 6	Unsigned32
	7	Mapping 7	Unsigned32
	8	Mapping 8	Unsigned32
0x1a01		Transmit PDO 2 Mapping	Struct
	0	Number of entries (=0)	Unsigned8
	1	Mapping 1	Unsigned32
	2	Mapping 2	Unsigned32
	3	Mapping 3	Unsigned32
	4	Mapping 4	Unsigned32
	5	Mapping 5	Unsigned32
	6	Mapping 6	Unsigned32
	7	Mapping 7	Unsigned32
	8	Mapping 8	Unsigned32

4.16. Profile Manufacturer Objects

The profile manufacturer objects are represented according to their original values, without any normalization. For example, parameter 1 (output frequency at present) is represented as number 0-36000 what should be interpreted as 0.00 – 360.00 Hz. All manufacturer objects are simple variables (sub-index = 0). When writing to the inverter every parameter value is checked on min/max limits. If it is outside the range the min/max value is set instead.

Please check the inverter documentation for the min/max limits and normalization factors.

index	sub	Size (byte)	Description
0x2001	0	4	A020 1st setting Multispeed freq
0x2002	0	4	A220 2nd setting Multispeed freq
0x2003	0	4	A320 3rd setting Multispeed freq
0x2004	0	4	A021 Multispeed frequency 1
0x2005	0	4	A022 Multispeed frequency 2
0x2006	0	4	A023 Multispeed frequency 3
0x2007	0	4	A024 Multispeed frequency 4
0x2008	0	4	A025 Multispeed frequency 5
0x2009	0	4	A026 Multispeed frequency 6
0x200A	0	4	A027 Multispeed frequency 7
0x200B	0	4	A028 Multispeed frequency 8
0x200C	0	4	A029 Multispeed frequency 9
0x200D	0	4	A030 Multispeed frequency 10

0x200E	0	4	A031 Multispeed frequency 11
0x200F	0	4	A032 Multispeed frequency 12
0x2010	0	4	A033 Multispeed frequency 13
0x2011	0	4	A034 Multispeed frequency 14
0x2012	0	4	A035 Multispeed frequency 15
0x2013	0	4	A061 1st Upper limiter frequency
0x2014	0	4	A261 2nd Upper limiter frequency
0x2015	0	4	A062 1st Lower limiter frequency
0x2016	0	4	A262 2nd Lower limiter frequency
0x2017	0	4	F002 1st Acceleration time 1
0x2018	0	4	F202 2nd Acceleration time 1
0x2019	0	4	F302 3rd Acceleration time 1
0x201A	0	4	F003 1st Deceleration time 1
0x201B	0	4	F203 2nd Deceleration time 1
0x201C	0	4	F303 3rd Deceleration time 1
0x201D	0	1	Inverter code
0x201E	0	4	A092 1st Acceleration time 2
0x201F	0	4	A292 2nd Acceleration time 2
0x2120	0	4	A392 3rd Acceleration time 2
0x2021	0	4	A093 1st Deceleration time 2
0x2022	0	4	A293 2nd Deceleration time 2
0x2023	0	4	A393 3rd Deceleration time 2
0x2024	0	4	A011 Start frequency of O terminal
0x2025	0	4	A012 End frequency of O terminal
0x2026	0	4	A101 Start frequency of OI terminal
0x2027	0	4	A102 End frequency of OI terminal
0x2028	0	4	A063 Jumping frequency 1
0x2029	0	4	A065 Jumping frequency 2
0x202A	0	4	A067 Jumping frequency 3
0x202B	0	4	A069 Frequency of stopping acceleration
0x202C	0	4	A095 1st Frequency of 2-stage acceleration
0x202D	0	4	A295 2nd Frequency of 2-stage acceleration
0x202E	0	4	A096 1st Frequency of 2-stage deceleration
0x202F	0	4	A296 2nd Frequency of 2-stage deceleration
0x2030	0	4	b007 Frequency of frequency matching
0x2031	0	4	b053 Deceleration time of Non-stop operation at Instantaneous power failure
0x2032	0	4	C042 Arrival frequency at acceleration1
0x2033	0	4	C043 Arrival frequency at deceleration1
0x2034	0	4	C045 Arrival frequency at acceleration2
0x2035	0	4	C046 Arrival frequency at deceleration2
0x2036	0	2	A003 1st Base frequency
0x2037	0	2	A203 2nd Base frequency
0x2038	0	2	A303 3rd Base frequency
0x2039	0	2	A38 Jogging frequency
0x203A	0	2	A004 1st Maximum frequency
0x203B	0	2	A204 2nd Maximum frequency
0x203C	0	2	A304 3rd Maximum frequency
0x203D	0	4	H020 1st Primary resistor R1 of motor
0x203E	0	4	H220 2nd Primary resistor R1 of motor
0x203F	0	4	H021 1st Secondary resistor R2 of motor
0x2040	0	4	H221 2nd Secondary resistor R2 of motor
0x2041	0	4	H022 1st Inductance L of motor
0x2042	0	4	H222 2nd Inductance L of motor
0x2043	0	4	H023 1st No load current Io of motor
0x2044	0	4	H223 2nd No load current Io of motor
0x2045	0	4	H024 1st Inertia J of motor
0x2046	0	4	H224 2nd Inertia J of motor
0x2047	0	4	H030 1st Primary resistor R1 of motor (Auto)
0x2048	0	4	H230 2nd Primary resistor R1 of motor (Auto)
0x2049	0	4	H031 1st Secondary resistor R2 of motor (Auto)
0x204A	0	4	H231 2nd Secondary resistor R2 of motor (Auto)
0x204B	0	4	H032 1st Inductance L of motor (Auto)
0x204C	0	4	H232 2nd Inductance L of motor (Auto)
0x204D	0	4	H033 1st No load current Io of motor (Auto)
0x204E	0	4	H233 2nd No load current Io of motor (Auto)
0x204F	0	4	H034 1st Inertia J of motor (Auto)
0x2050	0	4	H234 2nd Inertia J of motor (Auto)

0x2051	0	2	A043 1st Break point of manual torque boost
0x2052	0	2	A243 2nd Break point of manual torque boost
0x2053	0	2	A343 3rd Break point of manual torque boost
0x2054	0	2	A052 Frequency of DC braking start
0x2055	0	2	A055 Time of DC braking working
0x2056	0	2	A058 Time of DC braking working for beginning of inverter running
0x2057	0	2	A064 Width of jumping frequency 1
0x2058	0	2	A066 Width of jumping frequency 2
0x2059	0	2	A068 Width of jumping frequency 3
0x205A	0	2	A070 Time of stopping to accelerate
0x205B	0	2	A073 Integrate (I) gain of PID control
0x205C	0	2	A074 Differential (D) gain of PID control
0x205D	0	2	A075 Scale of PID control
0x205E	0	2	A086 Response time of Energy saving function
0x205F	0	2	b003 Waiting time of retry
0x2060	0	2	b012 Level of 1st Electronic thermal protection
0x2061	0	2	b212 Level of 2nd Electronic thermal protection
0x2062	0	2	b312 Level of 3rd Electronic thermal protection
0x2063	0	2	b015 Free electronic thermal frequency 1
0x2064	0	2	b016 Free electronic thermal current 1
0x2065	0	2	b017 Free electronic thermal frequency 2
0x2066	0	2	b018 Free electronic thermal current 2
0x2067	0	2	b019 Free electronic thermal frequency 3
0x2068	0	2	b020 Free electronic thermal current 3
0x2069	0	2	b100 Free V/F control frequency 1
0x206A	0	2	b101 Free V/F control voltage 1
0x206B	0	2	b102 Free V/F control frequency 2
0x206C	0	2	b103 Free V/F control voltage 2
0x206D	0	2	b104 Free V/F control frequency 3
0x206E	0	2	b105 Free V/F control voltage 3
0x206F	0	2	b106 Free V/F control frequency 4
0x2160	0	2	b107 Free V/F control voltage 4
0x2061	0	2	b108 Free V/F control frequency 5
0x2062	0	2	b109 Free V/F control voltage 5
0x2063	0	2	b110 Free V/F control frequency 6
0x2064	0	2	b111 Free V/F control voltage 6
0x2065	0	2	b112 Free V/F control frequency 7
0x2066	0	2	b113 Free V/F control voltage 7
0x2067	0	2	b022 Level of Overload restriction 1
0x2068	0	2	b023 Constant value of Overload restriction 1
0x2069	0	2	b025 Level of Overload restriction 2
0x206A	0	2	b026 Constant value of Overload restriction 2
0x206B	0	2	b034 Display time of warning
0x206C	0	2	b051 Starting voltage of Nonstop operation for Instantaneous power failure
0x206D	0	2	b052 Starting voltage of OV-LAD stop at Nonstop operation for Instantaneous power failure
0x206E	0	2	b054 Frequency width of starting deceleration at Nonstop operation for Instantaneous power failure
0x206F	0	2	b082 Minimum frequency
0x2070	0	2	b086 Coefficient of converting frequency
0x2071	0	2	b090 Usage rate of BRD
0x2072	0	2	b096 On level of BRD
0x2073	0	2	b099 Level of Thermister error
0x2074	0	2	b121 Waiting time for establishing external braking condition
0x2075	0	2	b122 Waiting time for acceleration at external braking
0x2076	0	2	b123 Waiting time for stop at external braking
0x2077	0	2	b124 Waiting time for confirmation signal at external braking
0x2078	0	2	b125 Release frequency of external braking
0x2079	0	2	b126 Release current of external braking
0x207A	0	2	H005 1st Speed response gain
0x207B	0	2	H205 2nd Speed response gain
0x207C	0	2	H006 1st Stability gain

0x207D	0	2	H206 2nd Stability gain
0x207E	0	2	H306 3rd Stability gain
0x207F	0	2	H050 1st Proportional gain of speed control (PI control)
0x2080	0	2	H250 2nd Proportional gain of speed control (PI control)
0x2081	0	2	H051 1st Integral gain of speed control (PI control)
0x2082	0	2	H251 2nd Integral gain of speed control (PI control)
0x2083	0	2	H052 1st Proportional gain of speed control (P control)
0x2084	0	2	H252 2nd Proportional gain of speed control (P control)
0x2085	0	2	H060 1st Limiter of 0Hz control
0x2086	0	2	H260 2nd Limiter of 0Hz control
0x2087	0	2	H070 PI Proportion gain Change
0x2088	0	2	H071 PI Integral gain Change
0x2089	0	2	H072 P Proportion gain Change
0x208A	0	2	P044 Timer setting of communication timeout Whilst running (SJ-DN)
0x208B	0	1	A043 1st Break point of manual torque boost
0x208C	0	1	A243 2nd Break point of manual torque boost
0x208D	0	1	A343 3rd Break point of manual torque boost
0x208E	0	1	A052 Frequency of DC braking start
0x208F	0	1	A055 Time of DC braking working
0x2090	0	1	A058 Time of DC braking working for beginning of inverter running
0x2091	0	1	A064 Width of jumping frequency 1
0x2092	0	1	A066 Width of jumping frequency 2
0x2093	0	1	A068 Width of jumping frequency 3
0x2094	0	2	A070 Time of stopping to accelerate
0x2095	0	2	A073 Integrate (I) gain of PID control
0x2096	0	2	A074 Differential (D) gain of PID control
0x2097	0	2	A075 Scale of PID control
0x2098	0	2	A086 Response time of Energy saving function
0x2099	0	2	b003 Waiting time of retry
0x209A	0	2	b012 Level of 1st Electronic thermal protection
0x209B	0	2	P049 Motor poles setting for revolutions per minute (SJ-DN)
0x209C	0	2	P048 Inverter action when Idle mode detected (SJ-DN)
0x209D	0	2	P045 Inverter action When communication error (SJ-DN)
0x209E	0	2	P047 Polled I/O INPUT Instance number (SJ-DN)
0x209F	0	2	P046 Polled I/O OUTPUT Instance number (SJ-DN)
0x20A0	0	2	C029 Selection of AMI function
0x20A1	0	2	C087 Adjustment of AMI output
0x20A2	0	2	C088 Adjustment of Offset of AMI output
0x20A3	0	2	C091 Selection of Debug mode method
0x20A4	0	2	C041 Level1 of overload restriction warning
0x20A5	0	1	C111 Level2 of overload restriction warning
0x20A6	0	1	C044 Level over acceptable deviation of PID control
0x20A7	0	1	C063 Level f detecting Zero speed
0x20A8	0	1	C061 Warning Level of electronic thermal protection
0x20A9	0	1	C078 Waiting time of communication start
0x20AA	0	1	P011 Pulse number of the encoder
0x20AB	0	1	P014 Stop position at Orientation mode
0x20AC	0	1	P015 Speed at Orientation mode
0x20AD	0	1	P017 Defining Area of completion of Orientation mode
0x20AE	0	1	P018 Delay time of completion Orientation mode
0x20AF	0	1	P020 The numerator of electric gear
0x20B0	0	1	P021 The denominator of electric gear

0x20B1	0	1	P022 Feed forward gain of position control
0x20B2	0	1	P023 Loop gain of position control
0x20B3	0	1	P026 Level of detecting over speed
0x20B4	0	1	P027 Value of detecting over deviation
0x20B5	0	1	F004 Selection of running direction for DIG-OPE
0x20B6	0	1	A001 Selection of frequency command destination
0x20B7	0	1	A002 Selection of running command destination
0x20B8	0	1	A005 Selection of AT function
0x20B9	0	1	A006 Selection of O2 terminal function
0x20BA	0	1	A013 Starting rate of O terminal
0x20BB	0	1	A014 End rate of O terminal
0x20BC	0	1	A015 Selection of starting function of O terminal
0x20BD	0	1	A016 Sampling number of fetching data from "0"
0x20BE	0	1	A103 Starting rate of OI terminal
0x20BF	0	1	A104 End rate of OI terminal
0x20C0	0	1	A105 Selection of starting function of OI terminal
0x20C1	0	1	A019 Selection of Multispeed method
0x20C2	0	1	A039 Selection of Jogging method
0x20C3	0	1	A041 Selection of 1st Torque boost Method
0x20C4	0	1	A241 Selection of 2nd Torque boost Method
0x20C5	0	1	A042 Value of 1st Manual torque boost
0x20C6	0	1	A242 Value of 2nd Manual torque boost
0x20C7	0	1	A342 Value of 3rd Manual torque boost
0x20C8	0	1	A044 Selection of 1st Control method
0x20C9	0	1	A244 Selection of 2nd Control method
0x20CA	0	1	A344 Selection of 3rd Control method
0x20CB	0	1	A045 Gain of output voltage
0x20CC	0	1	A051 Selection of DC braking method
0x20CD	0	1	A053 Delay time of DC braking start
0x20CE	0	1	A054 Power of DC braking(end of running)
0x20CF	0	1	A056 Selection of edge/level action of DC braking trigger
0x20D0	0	1	A057 Power of DC braking(start of running)
0x20D1	0	1	A059 Carrier frequency of DC braking
0x20D2	0	1	A071 Selection of PID control presence
0x20D3	0	1	A072 Proportional(P) gain of PID control
0x20D4	0	1	A076 Selection of feedback destination for PID control
0x20D5	0	1	A081 Selection of AVR function
0x20D6	0	1	A082 Selection of Motor voltage
0x20D7	0	1	A085 Selection of operation mode
0x20D8	0	1	A094 Selection of 1st 2-stage accel/decel Method
0x20D9	0	1	A294 Selection of 2nd 2-stage accel/decel Method
0x20DA	0	1	A097 Selection of acceleration pattern
0x20DB	0	1	A098 Selection of deceleration pattern
0x20DC	0	1	A131 Curve constant of acceleration
0x20DD	0	1	A132 Curve constant of deceleration
0x20DE	0	1	b001 Selection of retry method
0x20DF	0	1	b002 Acceptable time for Instantaneous power failure
0x20E0	0	1	b004 Selection of method(action) at instantaneous power and under voltage
0x20E1	0	1	b005 Retry number of instantaneous power and under voltage
0x20E2	0	1	b006 Selection of fail phase function
0x20E3	0	1	b013 Selection of characteristic of 1st electronic thermal protection
0x20E4	0	1	b213 Selection of characteristic of 2nd electronic thermal protection
0x20E5	0	1	b313 Selection of characteristic of 3rd electronic thermal protection
0x20E6	0	1	b021 Selection of method of overload restriction1

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0x20E7	0	1	b024 Selection of method of overload restriction2
0x20E8	0	1	b031 Selection of method of Software lock
0x20E9	0	1	b037 Selection of Display
0x20EA	0	1	b040 Selection of method of Torque limiter
0x20EB	0	1	b041 Level of torque limiter in forward and drive (1st quadrant)
0x20EC	0	1	b042 Level of torque limiter in reverse and regenerative (2nd quadrant)
0x20ED	0	1	b043 Level of torque limiter in reverse and drive (3rd quadrant)
0x20EE	0	1	b044 Level of torque limiter in forward and regenerative (4th quadrant)
0x20EF	0	1	b045 Selection of LAD stop by torque
0x20F0	0	1	b035 Selection of running direction limitation
0x20F1	0	1	b046 Selection of preventive of reverse running
0x20F2	0	1	b036 Selection of method of reducing voltage start
0x20F3	0	1	b050 Selection of Non stop operation at instantaneous power failure
0x20F4	0	1	b080 Adjustment of AM(analog monitor)
0x20F5	0	1	b081 Adjustment of FM(digital monitor)
0x20F6	0	1	b083 Carrier frequency(PWM frequency)
0x20F7	0	1	b084 Selection of Initialization
0x20F8	0	1	b085 Selection of initialized data
0x20F9	0	1	b087 Selection of STOP key function
0x20FA	0	1	b088 Selection free run function
0x20FB	0	1	b091 Selection of action at stop
0x20FC	0	1	b092 Selection of action of cooling fan
0x20FD	0	1	b095 Selection of BRD function
0x20FE	0	1	b098 Selection of Thermister function
0x20FF	0	1	b120 Selection of external braking function
0x2100	0	1	C001 Selection of function in Intelligent input 1
0x2101	0	1	C002 Selection of function in Intelligent input 2
0x2102	0	1	C003 Selection of function in Intelligent input 3
0x2103	0	1	C004 Selection of function in Intelligent input 4
0x2104	0	1	C005 Selection of function in Intelligent input 5
0x2105	0	1	C006 Selection of function in Intelligent input 6
0x2106	0	1	C007 Selection of function in Intelligent input 7
0x2107	0	1	C008 Selection of function in Intelligent input 8
0x2108	0	1	C011 Selection of a(NO) or b(NC) contact in Intelligent input 1
0x2109	0	1	C012 Selection of a(NO) or b(NC) contact in Intelligent input 2
0x210A	0	1	C013 Selection of a(NO) or b(NC) contact in Intelligent input 3
0x210B	0	1	C014 Selection of a(NO) or b(NC) contact in Intelligent input 4
0x210C	0	1	C015 Selection of a(NO) or b(NC) contact in Intelligent input 5
0x210D	0	1	C016 Selection of a(NO) or b(NC) contact in Intelligent input 6
0x210E	0	1	C017 Selection of a(NO) or b(NC) contact in Intelligent input 7
0x210F	0	1	C018 Selection of a(NO) or b(NC) contact in Intelligent input 8
0x2110	0	1	C019 Selection of a(NO) or b(NC) contact in FW input
0x2111	0	1	C101 Selection of UP/DOWN function
0x2112	0	1	C102 Selection of RESET function

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0x2113	0	1	C103 Selection of frequency matching function at RESET
0x2114	0	1	C021 Selection of function in Intelligent output 11
0x2115	0	1	C022 Selection of function in Intelligent output 12
0x2116	0	1	C023 Selection of function in Intelligent output 13
0x2117	0	1	C024 Selection of function in Intelligent output 14
0x2118	0	1	C025 Selection of function in Intelligent output 15
0x2119	0	1	C026 Selection of function in Alarm relay output
0x211A	0	1	C027 Selection of FM function
0x211B	0	1	C028 Selection of AM function
0x211C	0	1	C086 Adjustment of offset of AM
0x211D	0	1	C031 Selection of a(NO) or b(NC) contact in Intelligent output 11
0x211E	0	1	C032 Selection of a(NO) or b(NC) contact in Intelligent output 12
0x211F	0	1	C033 Selection of a(NO) or b(NC) contact in Intelligent output 13
0x2120	0	1	C034 Selection of a(NO) or b(NC) contact in Intelligent output 14
0x2121	0	1	C035 Selection of a(NO) or b(NC) contact in Intelligent output 15
0x2122	0	1	C036 Selection of a(NO) or b(NC) contact in Alarm relay output
0x2123	0	1	C040 Selection of output mode of overload warning signal
0x2124	0	1	C055 Level of over torque in forward and drive (1st quadrant)
0x2125	0	1	C056 Level of over torque in reverse and regenerative (2nd quadrant)
0x2126	0	1	C057 Level of over torque in reverse and drive (3rd quadrant)
0x2127	0	1	C058 Level of over torque in forward and regenerative (4th quadrant)
0x2128	0	1	C062 Selection of Alarm code
0x2129	0	1	C070 Selection of Data command
0x212A	0	1	C071 Selection of communication speed for RS485
0x212B	0	1	C072 Selection of Inverter address for RS 485
0x212C	0	1	C073 Selection of bit length of data for RS485
0x212D	0	1	C074 Selection of parity (odd or even) for RS485
0x212E	0	1	C075 Selection of stop bit for RS485
0x212F	0	1	H001 Selection of Auto-tuning presence
0x2130	0	4	H002 Selection of Motor constant for 1st motor
0x2130	0	4	H202 Selection of Motor constant for 2nd motor
0x2131	0	2	H003 Selection of Motor capacity for 1st motor
0x2132	0	2	H203 Selection of Motor capacity for 2nd motor
0x2133	0	2	H004 Selection of Motor poles for 1st motor
0x2134	0	2	H204 Selection of Motor poles for 2nd motor
0x2135	0	2	P012 Selection of Control Mode
0x2136	0	2	P013 Selection of method of Pulse lines input
0x2137	0	2	P016 Set of Orientation direction
0x2138	0	2	P019 Selection of location of electric gear
0x2139	0	1	P001 Selection of action at option1 error
0x213A	0	4	P002 Selection of action at option2 error
0x213B	0	4	P010 Selection of feedback option
0x213C	0	2	P025 Selection of Available of compensation of secondary resistor
0x213D	0	2	P031 Acc/Dec input mode selection
0x213E	0	4	P032 Stop position setting input mode selection
0x213F	0	4	d016 Set of Accumulated time during running
0x2140	0	4	d017 Set of Accumulated time during power ON
0x2141	0	4	C085 Adjusting value of Thermister
0x2142	0	2	C081 Adjustment of O terminal

0x2143	0	2	C083 Adjustment of O2 terminal
0x2144	0	4	C082 Adjustment of OI terminal
0x2145	0	4	C121 Adjustment of Zero of O terminal
0x2146	0	4	C123 Adjustment of Zero of O2 terminal
0x2147	0	4	C122 Adjustment of Zero of OI terminal
0x2148	0	2	d080 Accumulated number of Trip(error)
0x2149	0	2	Pointer of history of last trip(error)
0x214A	0	4	Factor and Status of Trip1
0x214B	0	4	Frequency of Trip1
0x214C	0	4	Output current of Trip1
0x214D	0	4	PN voltage (DC voltage) of Trip1
0x214E	0	2	Accumulated time during running of Trip1
0x214F	0	2	Accumulated time during power ON of Trip1
0x2150	0	4	Factor and Status of Trip2
0x2151	0	4	Frequency of Trip2
0x2152	0	4	Output current of Trip2
0x2153	0	4	PN voltage (DC voltage) of Trip2
0x2154	0	2	Accumulated time during running of Trip2
0x2155	0	2	Accumulated time during power ON of Trip2
0x2156	0	4	Factor and Status of Trip3
0x2157	0	4	Frequency of Trip3
0x2158	0	4	Output current of Trip3
0x2159	0	4	PN voltage (DC voltage) of Trip3
0x215A	0	2	Accumulated time during running of Trip3
0x215B	0	2	Accumulated time during power ON of Trip3
0x215C	0	4	Factor and Status of Trip4
0x215D	0	4	Frequency of Trip4
0x215E	0	1	Output current of Trip4
0x215F	0	1	PN voltage (DC voltage) of Trip4
0x2160	0	1	Accumulated time during running of Trip4
0x2161	0	1	Accumulated time during power ON of Trip4
0x2162	0	4	Factor and Status of Trip5
0x2163	0	4	Frequency of Trip5
0x2164	0	4	Output current of Trip5
0x2165	0	4	PN voltage (DC voltage) of Trip5
0x2166	0	4	Accumulated time during running of Trip5
0x2167	0	4	Accumulated time during power ON of Trip5
0x2168	0	4	Factor and Status of Trip6
0x2169	0	4	Frequency of Trip6
0x216A	0	4	Output current of Trip6
0x216B	0	4	PN voltage (DC voltage) of Trip6
0x216C	0	4	Accumulated time during running of Trip6
0x216D	0	4	Accumulated time during power ON of Trip6
0x216E	0	4	C195(debug mode) Selection of Area code of inverter
0x216F	0	4	C196(debug mode) Selection of Capacity code of inverter
0x2170	0	4	C197(debug mode) Selection of Voltage of inverter
0x2171	0	4	C198(debug mode) Selection of Changeover of inverter mode
0x2172	0	4	P049 Motor poles setting for revolutions per minute (SJ-DN)
0x2201	0	4	d001 Output frequency
0x2202	0	4	d004 Feedback data of PID control
0x2203	0	4	d007 Value of conversion of frequency
0x2204	0	4	d101(debug mode) Output frequency after Vector control
0x2205	0	4	d016 Accumulated time during running
0x2206	0	4	d017 Accumulated time during Power ON
0x2207	0	4	F001 Set frequency(Hz) / PID Setpoint (%)
0x2208	0	2	d002 Output current
0x2209	0	2	d005 Status of Input terminal
0x220A	0	2	d014 Input electric power
0x220B	0	2	d106(debug mode) MCU Version
0x220C	0	2	d102(debug mode) DC voltage
0x220D	0	2	d103(debug mode) On time of BRD running
0x220E	0	2	d104(debug mode) Used rate of electronics

			thermal protection
0x220F	0	2	d006 Status of output terminal
0x2210	0	2	d013 Output voltage
0x2211	0	1	d003 Direction of present running
0x2212	0	4	Upper input information of terminal for RS485
0x2213	0	4	Lower input information of terminal for RS485
0x2214	0	4	Set frequency for RS485
0x2215	0	2	Analog data from attached potentiometer for setfrequency
0x2216	0	1	run command for operater
0x2217	0	1	run command for RS485
0x2301	0	4	Status of Inverter
0x2302	0	4	Setting frequency
0x2303	0	4	Output frequency
0x2304	0	1	Direction of setting revolution
0x2305	0	1	Direction of output revolution
0x2306	0	4	Output information of terminal
0x2307	0	4	Upper input information of terminal
0x2308	0	4	Lower input information of terminal
0x2309	0	2	Rated Output Current A)
0x230A	0	1	Status of SET function
0x230B	0	4	Terminal frequency (after select function)
0x230C	0	4	Terminal frequency (O input only)
0x230D	0	4	Terminal frequency (OI input only)
0x230E	0	4	Terminal frequency (O2 input only)
0x230F	0	4	Real frequency by Encorder for V2 mode
0x2310	0	1	Torque Limit value by O2input

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4.17. Led operations

Green	Red	Meaning
ON	OFF	NORMAL condition. CANbus ok. Inverter is in remote mode.
ON	ON	CANbus DISCONNECT.
BLINKING	OFF	INVERTER COMM. BROKEN
BLINKING	ON	CANbus DISCONNECT.
OFF	OFF	FAULT. Check Inverter/gateway supply.
OFF	ON	WARNING: if address switches are in 00 position, the gateway is in CONFIGURATION MODE and it cannot work.