

**EnerSolis**

**ES 52000HC / ES 60000HC**

**ES3060KBN / ES3063KBN**

**ES3066KBN / ES3075KBN**

**Modbus/JBUS**

**Protocol**

Introduction.....	2
Introduction JBUS Function .....	3
PV Protocol for J-BUS.....	5
GENERAL TABLE DATA AREA DEFINITION .....	6
JBUS Table .....	7
1. Alarms.....	7
GENERAL VECTOR INDEX.....	7
Alarms Data Sequence .....	7
Alarms Data Area.....	7
2. Errors.....	9
GENERAL VECTOR INDEX.....	9
Errors Data Sequence.....	9
Errors Data Area .....	9
3. Measurements .....	12
GENERAL VECTOR INDEX.....	12
Measurements Data Area .....	12

## Introduction

This document describes the Helios Inverter protocol, adopted to communicate with all communication products, like Supervisor, Network communication, etc...

This protocol will be implemented in the PV equipment, in order to use the same driver for all products.

### COMMUNICATION LAYERS

<b>APPLICATIONS</b>
<i>PV MONITOR</i>
<b>DATA TABLE</b>
<i>FIXED</i>
<b>ADDRESS SPECIFICATION</b>
<i>JBUS P</i>
<b>JBUS TRANSPORT PROTOCOL</b>
<b>HARDWARE</b>
<i>RS485</i>

### GENERAL MESSAGE FORMAT

SLAVE NUMBER (1 byte)	Specified the destination node
FUNCTION CODE (1 byte)	Specified a READ or WRITE data command
DATA FIELD	Information to read or write data (Address, value, number of data...)
CONTROL WORD (CRC16) (2 bytes, 1 word)	Algorithm calculation of each data

### JBUS FUNCTION

<b>READ WORD:</b>	<b>code function 3</b>
<b>WRITE 1 WORD:</b>	<b>code function 6 (Ex. Commands)</b>
<b>WRITE SEVERAL WORDS:</b>	<b>code function 16 (Ex. Identifiers)</b>

## Introduction JBUS Function

### FUNCTION 0x3

Ex. Request to slave number1, the data (10 words) beginning at 0xC000 (Address)

#### Request

Slave Number	Function READ	Address High	Address Low	0	Nb of word to read	CRC Low	CRC High
1	0x03	0xC0	0x00	0	10		

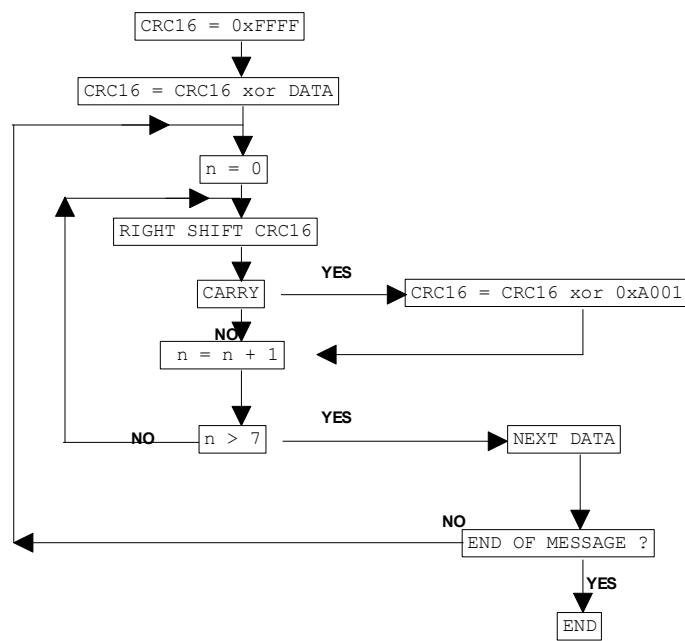
Slave message

#### Response

Slave Number	Function READ	Nb of byte	First data hi byte	First data low byte	Next data	CRC Low	CRC High
1	0x03	20	0x20	0x02	.....		

Example: the first data is  $(0x20 * 0x100) + 0x02 = 0x2002$

## CRC 16 CALCULATION



## Example of CRC calculation

```
unsigned int CALCUL_CRC(unsigned int *Msg, unsigned int lenght)
{
    unsigned int Crc;
    int i,n;
    Crc = 0xFFFF;
    for ( i = 1 ; i <= lenght ; i++ )
    {
        Crc ^= Msg[i];
        for ( n = 1 ; n <= 8 ; n++ )
        {
            /* if CRC is even */
            if ((Crc % 2) == 0)
                /* to right decrement */
                Crc >>= 1;
            else
            {
                Crc >>= 1;
                Crc ^= 0xA001;
            }
        }
    }
    return( Crc );
}
```

## PV Protocol for J-BUS

DATA BASE	INFORMATION CODING
Alarms	ALxx for Alarms
Errors	Erxx for Errors
Measurements	Mxx for Measurements

## GENERAL TABLE DATA AREA DEFINITION

DATA	Length in word	TYPE	Information	Jbus Function	Start Address	End Address
Alarms	3	bit	47 Alarms	3 (r)	0xC000	0xC002
Errors	4	bit	63 Error	3 (r)	0xC010	0xC013
Measurements	96	word	96 Measurements	3 (r)	0xC020	0xC07F

r : read

## JBUS Table

### 1. Alarms

Ex. Request to slave number 1(Alarms)

#### Request

Slave Number	Function READ	Address High	Address Low	0	Nb of word to read	CRC Low	CRC High
1	0x03	0xC0	0x00	0	0x03		

#### Response

Slave Number	Function READ	Nb of byte	First data high byte	First data low byte	Next data	CRC Low	CRC High
1	0x03	0x06	AL15~AL08	AL07~AL00	.....		

### GENERAL VECTOR INDEX

Address High	Address Low	End Address	DATA AREA	LENGTH (IN WORDS)
0xC0	0x00	0xC002	Alarms	3

### Alarms Data Sequence

Word 0		Word 1		Word 3	
High	Low	High	Low	High	Low
AL15...AL08	AL07...AL00	AL31...AL24	AL23...AL16	AL47...AL40	AL39...AL32

### Alarms Data Area

CODE Type(bit)	Description	Necessary
AL00	Utility Voltage Over Rang	
AL01	Utility Voltage Under Rang	
AL02	Utility Frequency Over Rang	
AL03	Utility Frequency Under Rang	
AL04	Boost:A-Input Voltage Over Rang	
AL05	Boost:A-Input Voltage Under Rang	
AL06	Boost:B-Input Voltage Over Rang	



AL07	Boost:B-Input Voltage Under Rang	
AL08	Anti-islanding general alarm	
AL09	Reserve	
AL10	Ground current fault general alarm	
AL11	Ground impedance fault general alarm	
AL12	Reserve	
AL13	Utility Phase Fault	
AL14~AL20	Reserve	
AL21	Calculate Fail	
AL22	Reserve	
AL23	Reserve	
AL24	Reserve	
AL25	Over Temperature Derating	
AL26~AL30	Reserve	
AL31	DC Varistor Fault	
AL32	AC Varistor Fault	
AL33	Boost:C-Input Voltage Over Rang	
AL34	Boost:C-Input Voltage Under Rang	
AL35	Boost:D-Input Voltage Over Rang	
AL36	Boost:D-Input Voltage Under Rang	
AL37	DC Varistor Fault-1	
AL38	AC Varistor Fault-1	
AL39	Door Normal Open	
AL40	DC Varistor Fault-2	
AL41	AC Varistor Fault-2	
AL42	DC Input Standard/Parallel Setting Fail	
AL43	AC Switch OFF	
AL44~AL47	Reserve	

## 2. Errors

Ex. Request to slave number 1(Errors)

### Request

Slave Number	Function	Address High	Address Low	0	Nb of word to read	CRC Low	CRC High
1	0x03	0xC0	0x10	0	0x04		

### Response

Slave Number	Function	Nb of byte	First data high byte	First data low byte	Next data	CRC Low	CRC High
1	0x03	0x08	Er15~Er08	Er07~Er00	.....		

## GENERAL VECTOR INDEX

Address High	Address Low	End Address	DATA AREA	LENGTH (IN WORDS)
0xC0	0x10	0xC013	Errors	4

## Errors Data Sequence

Word 0		Word 1		Word 3	
High	Low	High	Low	High	Low
Er15...Er08	Er07...Er00	Er31...Er24	Er23...Er16	Er47...Er40	Er39...Er32
Word 4					
High	Low				
Er63...Er56	Er55...Er48				

## Errors Data Area

CODE Type(bit)	Description	Necessary
Er00	DC BUS Charge Fault	
Er01	Reserve	
Er02	Slave CPU Fault	
Er03	Reserve	
Er04	Reserve	
Er05	Reserve	
Er06	EPO (Emergency Power Off Mode)	
Er07	DC BUS Voltage Over-Rang	

Er08	DC BUS Voltage Under-Rang	
Er09	Inverter output current Over-Rang	
Er10	Inverter temperature Over-Rang	
Er11	Inverter output power Over-Rang	
Er12	Charger Fault	
Er13	Inverter Output Current Transient Protection	
Er14	PLL(Phase-Locked Loop) Fault	
Er15	Reserve	
Er16	Reserve	
Er17	EEPROM Data Error ,Use Default Value	
Er18	Heatsink temperature Over-Rang	
Er19	Reserve	
Er20	Reserve	
Er21	Reserve	
Er22	Inverter Relay Fault	
Er23	Reserve	
Er24	Inverter Current sense Fault	
Er25	Boost A - Input current Over-Rang	
Er26	Boost B - Input current Over-Rang	
Er27	Inverter Input Current Transient Protection	
Er28	Reserve	
Er29	Inverter Output Current Balance Over-Rang	
Er30~Er36	Reserve	
Er37	Fan out of order	
Er38	Reserve	
Er39	Reserve	
Er40	Reserve	
Er41	Boost A current Sense Fault	
Er42	Boost B current Sense Fault	
Er43	Output Balance current Sense Fault	
Er44	Reserve	
Er45	Boost C – Input current Over-Rang	
Er46	Boost D – Input current Over-Rang	
Er47	Reserve	
Er48	Inverter IGBT GFAULT	
Er49	Inverter IGBT OCFAULT	
Er50	Inverter IGBT UVLO	

Er51	Boost AB IGBT GFAULT	
Er52	Boost CD IGBT GFAULT	
Er53	Boost AB IGBT UVLO	
Er54	Boost CD IGBT UVLO	
Er55	Fan Type1 Fault	
Er56	Fan Type2 Fault	
Er57	Inverter Connector Fault	
Er58~Er63	Reserve	

### 3. Measurements

Ex. Request to slave number 1(Measurements)

#### Request

Slave Number	Function READ	Address High	Address Low	0	Nb of word to read	CRC Low	CRC High
1	0x03	0xC0	0x20	0	10		

#### Response

Slave Number	Function READ	Nb of byte	First data high byte	First data low byte	Next data	CRC Low	CRC High
1	0x03	20	0x20	0x02	.....		

Example: the first data is  $(0x20 * 0x100) + 0x02 = 0x2002$

### GENERAL VECTOR INDEX

Address High	Address Low	End Address	DATA AREA	LENGTH (IN WORDS)
0xC0	0x20	0xC07F	Measurements	96

### Measurements Data Area

ADRESS INDEX	CODE	Description	Unit	Necessary
0xC020	M00	Output power	KW*100(1)	
0xC021	M01	AC voltage phase L1	V	
0xC022	M02	AC voltage phase L2	V	
0xC023	M03	AC voltage phase L1-L2	V	
0xC024	M04	AC output current L1	A*10(2)	
0xC025	M05	AC output current L2	A*10(2)	
0xC026	M06	AC frequency (L1)	Hz*10(2)	
0xC027	M07	DC-Bus Positive-voltage	V	
0xC028	M08	DC-Bus Negative-voltage	V	
0xC029	M09	Inverter internal temperature	°C	
0xC02A	M10	Inverter Heat sink temperature	°C	
0xC02B	M11	DC1 input voltage	V	
0xC02C	M12	DC2 input voltage	V	
0xC02D	M13	DC1 input current	A*10(2)	

0xC02E	M14	DC2 input current	A*10(2)	
0xC02F	M15	Input Power A	KW*100(1)	
0xC030	M16	Input Power B	KW*100(1)	
0xC031~ 0xC032	M17, M18	Total Output Power	KW-H(3)	
0xC033~ 0xC03B	M19~M27	Reserve		
0xC03C	M28	AC voltage phase L2-L3	V	
0xC03D	M29	AC frequency L2	Hz*10(2)	
0xC03E	M30	AC voltage phase L3	V	
0xC03F	M31	AC voltage phase L3-L1	V	
0xC040	M32	AC frequency L3	Hz*10(2)	
0xC041	M33	AC output current L3	A*10(2)	
0xC042~ 0xC04D	M34~ M45	Reserve		
0xC04E	M46	DC3 input voltage	V	
0xC04F	M47	DC4 input voltage	V	
0xC050	M48	DC3 input current	A*10(2)	
0xC051	M49	DC4 input current	A*10(2)	
0xC052	M50	Input Power C	KW*100(1)	
0xC053	M51	Input Power D	KW*100(1)	
	M52~M96	Reserve		

P.S: (1) The number must be in unit\*100 format.

Example: M04 = 1234 mean 12.34 KW

(2) The number must be in unit\*10 format.

Example: M04 = 1234 mean 123.4 A

(3) The data is (0xC031 \* 65536) + 0xC032.

Example: 0xC031 = 1234 , 0xC032 = 5678, Total Power = 1234 \* 65536 + 5678.