USER'S MANUAL
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REVO CL
SERIAL COMMUNICATION MANUAL

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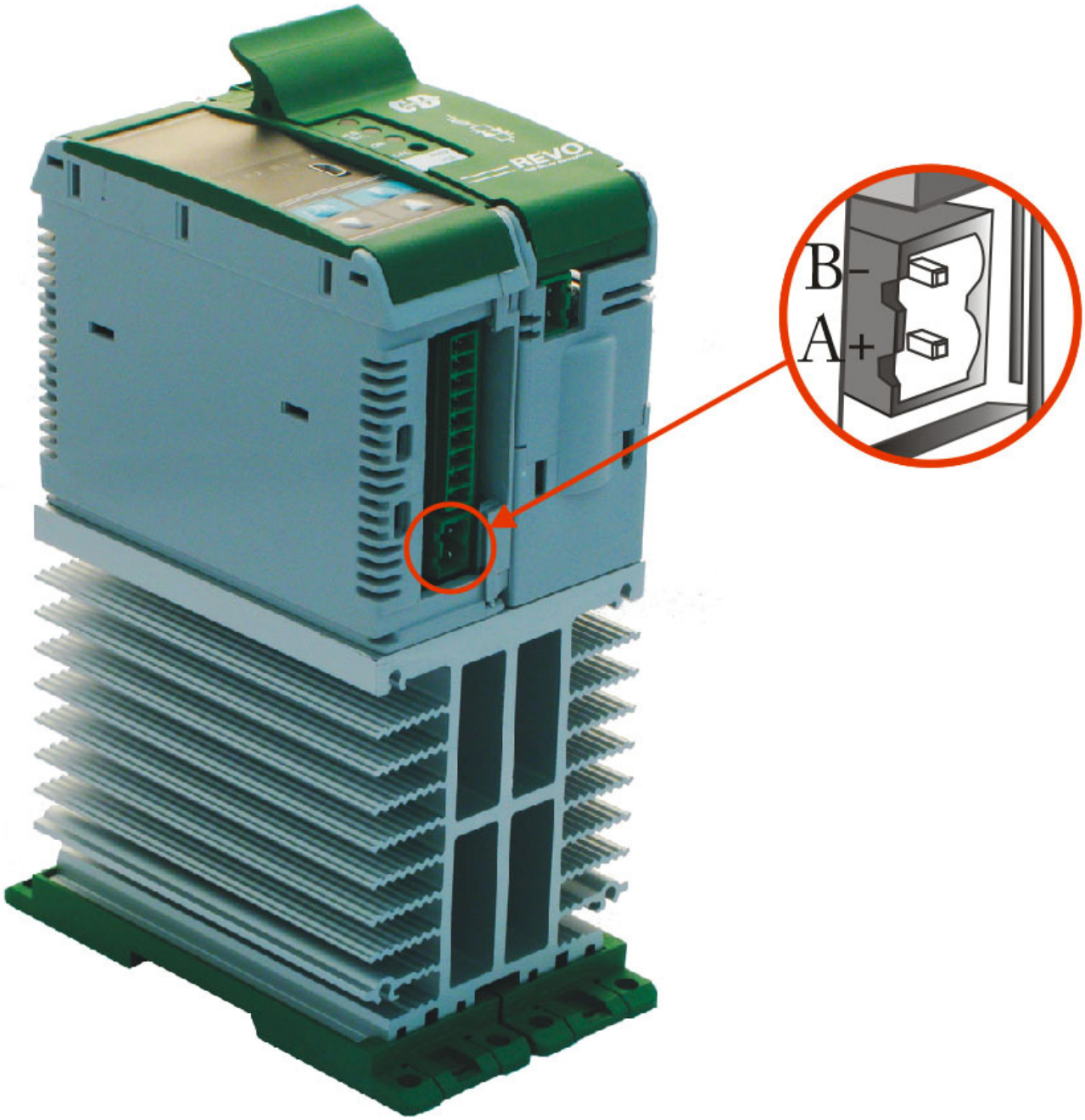
1 RS485 Serial Port

The serial communication port RS485 is available on the Command Terminals and on the 9pin DIN male connector.
On this port may be done a network up to 127 REVO M.
On the 9pin DIN male connector is also possible connect the CD-EASY

Terminal	Description
A+	RS485 A
B-	RS485 B



2 MODBUS communication

The serial communication port of the thyristor unit is two-wire RS485 type.
This port use an half-duplex system.
When a Unit must transmit active the transmission line, and when there are not units in transmission the outputs are fixed to high impedance.
The serial communication port allows to communicate between the thyristor units and a MASTER device (ex. an computer or a terminal). The cable must be rated for use to data transfer

2.1 MODBUS RTU Protocol

The communication is based on the standard industrial MODBUS RTU with the following

- The Baud rate can be 4800-9600-19200 Baud (Standard 19200).
- The Preset Multiple Registers (Funct. 16) is limited to the writing of a single parameter for message.

The following MODBUS functions are supported:

Function	Description
03	Read Holding Registers
16	Preset Multiple Registers

The unit support the Broadcast messages:
It' possible send a Broadcast messages using the address 0, all the units respond at the message without sending back any reply.

2.2 Message Format

The transmission format is a 1 bit start, 8 date bit, and 1 bit stop with no parity verification.
Each message terminate after a said time of "time out", equal at 3.5 time of a character transmission, where there are not transitions on the transmission line.
The first Byte of each message is always the address of the unit that is a value from 1 to 255 or 0 for the broadcast messages, the second is always the function number, and the rest of the message depends of the function demand.

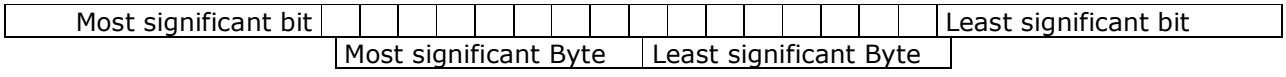
When a Slave receive an message, the unit send an answer with the same structure but with the information demanded.

Each message is followed by CRC (Cyclic Redundancy Check) with two byte. The CRC identify the incongruity situations of the message, in this case the receiver ignore the message.
The CRC is calculated in accordance with a formula that imply a recursive division of the data by a polynomial.
The polynomial divisor is:
$2^{16} + 2^{15} + 2^2 + 1$(Hex 18005)
but is modified in two ways:

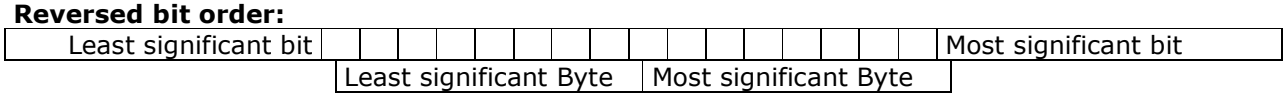
- Since the bits order are reversed, then the binary pattern is also reversed, and the most significant bit (MSB) is the right-most bit.
- Since interest only the remainder, the right-most bit could be discarded.

Therefore, the polynomial divisor has value: Hex A001

Normal bit order:

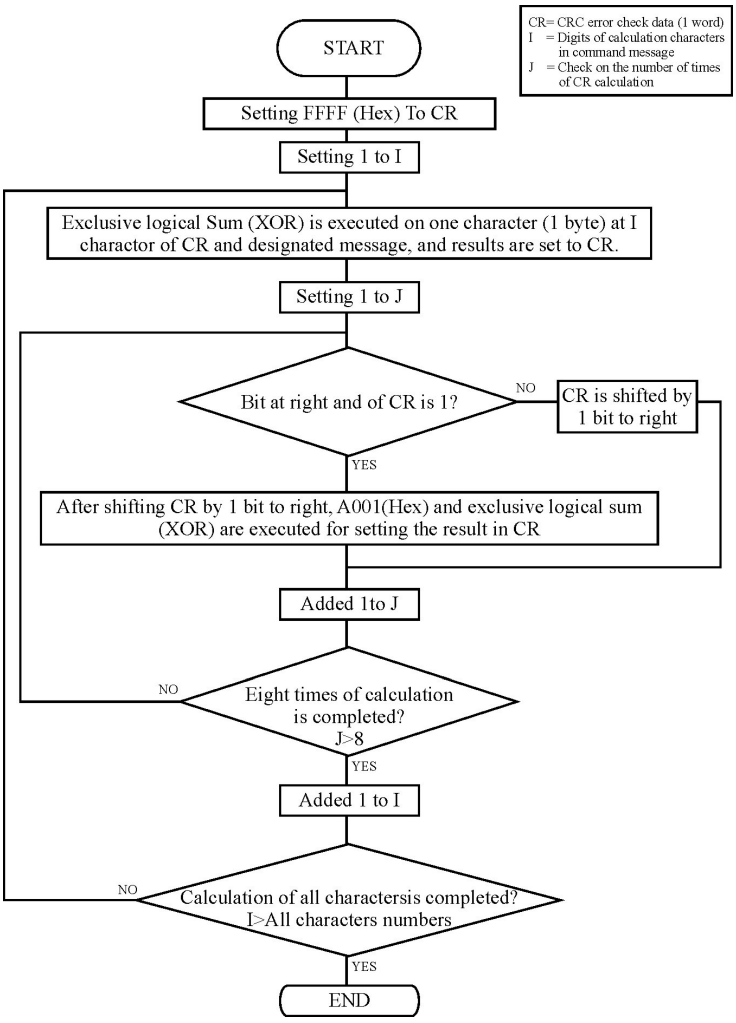


Reversed bit order:



N.B.: With the reversed bit order, also the CRC16 returns the with the reversed bit order

The following flow-diagram show how to organize the CRC 16 bit.



C Language CRC 16 Example

```
static short CRC16 (unsigned char *p_first,unsigned char *p_last)
{
        unsigned int crc=0xffff;
        short j;
        for (;p_first<=p_last;p_first++)
        {
                crc ^= *p_first;
                for(j=8;j>0;j--)
                {
                if(crc & 0x0001)
                        {
                        crc = crc >> 1;
                        crc ^= 0xA001;
                        }
                 else
                        {
                        crc = crc >> 1;
                        }
                }
        }
  return (crc);
}
```

2.3 Read Holding Registers

This function reads the instantaneous value of a specified number of parameters from an address. The message is composed by 8 Byte: one Byte is for the address, one for the function (03 Hex), two Byte for the first parameter to read, two Byte for the total number of parameters to read and finally two Byte for the CRC:

Address Unit	Function	Address of the First Parameter		N° of the Parameter		CRC 16	
	3 3Hex	HI	LO	HI	LO	LO	HI

The answer is an echo of the first two Byte (address and function), one byte with the number of following byte to exclusion of the CRC, the demanded values and finally two Byte for the CRC:

Address Unit	Function	N° of Byte	First Parameter Value			Last parameter value		CRC 16	
	3 3Hex		HI	LO	…	HI	LO	LO	HI

2.4 Preset Multiple Registers

This function could write only a parameter for each message.
The message is composed by 11 Byte: one Byte for the address, one for the function (10 Hex), two Byte for first parameter to write, two Bytes for the N° of parameters, fixed to 1 (0001 Hex), one Byte with the number of following Bytes, fixed to 2 (02 Hex), two Byte for the CRC:

Address Unit	Function	Address of the First Parameter		N° of the Parameter		N° of Byte	Value to write		CRC 16	
	16 10Hex	HI	LO	0	1	2	HI	LO	LO	HI

The answer is an echo of the first two Byte (address and function), two Byte for first written parameter, two Byte with the N° of parameters, fixed to 1 (0001 Hex), two Byte for the CRC:

Address Unit	Function	Address of the First Parameter		N° of the Parameter		CRC 16	
	16 10Hex	HI	LO	0	1	LO	HI

2.5 Error and exception responses

If a message contains an altered character, if fails the CRC, or if the received message contains a syntax error (for example the number of the byte or of the words is not correct), then the unit will ignore the message.

If the received message is correct but contains a not valid value, the unit will send an answer of exception (5 byte):

Address Unit	Function	Error Code	CRC 16	
			LO	HI

The byte with the function number, represent the function number of the message that has caused the error with the first Bit set to 1 (ex. the function 3 becomes 0x83) The error code could be one of the followings:

Error Code	Name	Cause
1	ILLEGAL FUNCTION	Function not supported.
2	ILLEGAL DATA ADDRESS	Address out of range.
3	ILLEGAL DATA VALUE	Attempt to write invalid or action not carried out.

NOTE: If you write a parameter's value equal at his actual value this is a valid transaction and don't cause an error.

2.6 Address Configuration

The thyristor unit is assigned a unique device address by the user in the range 1 (default) to 127 using the parameter P115 Addr in the Hardware menu. This address is used to recognise the messages queries to her assigned.
The thyristor unit does not respond at the messages queries that don't have the same assigned address.

The thyristor unit will also accept global messages (Broadcast) sends at the address 0. No

3 Parameters List

Average voltage Output

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
Uout	Vout	10	HA	V	–	0	1023	0	1023

Par. Type
R

Current Output

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
A	A	11	HB	A	–	0	1023	0	102,3	for size from 30 to 90A
					–	0	1023	0	1023	for size from 120 to 700A

Par. Type
R

Power Output

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
P	P	12	HC	%	–	0	1023	0	100,0

Par. Type
R

Status Table

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
P013	P013	13	HD	DI	–	0	1	0	1	Bit 0 = 1 → Short circuit on SCR Bit 0 = 0 → NO Short circuit on SCR Bit 1 = 1 → Load Failure (HB Alarm) Bit 1 = 0 → NO Load Failure (HB Alarm) Bit 2 = 1 → Output signal ON Bit 2 = 0 → Output signal Off Bit 3 = 1 → HB Calibration in progress Bit 3 = 0 → NO HB Calibration in progress Bit 4 = 1 → Current Limit active Bit 4 = 0 → Current Limit Not Active Bit 5 = 1 → Heat sink over temperature Bit 5 = 0 → NO Heat sink over temperature Bit 6 = 1 → not used. Bit 6 = 0 → not used. Bit 7 = 1 → not used. Bit 7 = 0 → not used. Bit 8 = 1 → Digital input 1 On d.1 Bit 8 = 0 → Digital input 1 oFF d.1 Bit 9 = 1 → Digital input 2 On d.2 Bit 9 = 0 → Digital input 2 oFF d.2

Par. Type
R

Command Table

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
P014	P014	14	HE	SW	0	0	1	0	1	Bit 0 = 1 → not used. Bit 0 = 0 → not used. Bit 1 = 1 → Setpoint Digital Bit 1 = 0 → Setpoint Analog Bit 2 = 1 → Enable * Bit 2 = 0 → Disable * Bit 3 = 1 → Reset HB Alarm Bit 4 = 1 → Current Limit Setting in Digital Via Panel/ RS485 Bit 4 = 0 → Current Limit Analog * Only with DI1 or DI2 not setted as enable

Par. Type
R/W

Digital Set Point

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
SP	SP	15	HF	%	100,0	0	1023	0	100,0	Input 4mA P015 SP = (0) 0% Input 12mA P015 SP = (512) 50% Input 20mA P015 SP = (1024) 100%

Par. Type
R/W

Maximum Output

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
outN	OutN	16	H10	%	100	0	255	0	100

Par. Type
R/W

Current Limit

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
CL	CL	17	H11	%	0,0	0	1023	0	100,0

Par. Type
R/W

Firing Mode Selection

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
Fir	Fir	18	H12	Sw	3*	0	1024	0	1024	4= Phase Angle PA 20=Soft Start + Phase Angle PASt 35=Delay Triggering + Burst Firing bFdt

Par. Type
R/W

Feed Back Selection

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
FEEd	Feed	19	H13	Sw	1*	0	1024	0	1024	0 = V2 U2 1 = NO Feed Back noonE 32 = Voltage V U 64 = Current I I 128 = Power V X I P

Par. Type
R/W

Burst Firing Cycles

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
bF_n	BF_n	20	H14	N. Cyc	4*	1	255	1	255	Only with Fir = DelayTrigg. + Burst Firing

Par. Type
R/W

Delay Triggering

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
dt	dt	22	H16	°	1	1	255	1	255	Only with Fir = DelayTrigg. + Burst Firing

Par. Type
R/W

Soft Start – Ramp Up

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
rP_u	rP_u	23	H17	sec	255	0	255	0	255	Only with Fir = Phase Angle

Par. Type
R/W

Proportional Band

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
Pb	Pb	26	H1A	%	17	0	255	1	255

Par. Type
R/W

Integral Time

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
t i	ti	27	H1B	%	20	0	255	0	255

Par. Type
R/W

HB Delay

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
Hb_d	HB_d	28	H1C	sec	20	0	255	0	255

Par. Type
R/W

HB Sensitivity

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
Hb_S	Hb_s	29	H1D	%	100	0	100	0	100

Par. Type
R/W

Baud Rate

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
bAud	bAud	30	H1E	SW	2	0	3	0	3	0 = 4800 baud 1 = 9600 baud 2 = 19200 baud 3= 38400 baud

Par. Type
R/W

Address

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
Addr	Addr	31	H1F	Add	1	1	255	1	255

Par. Type
R/W

Digital Input 1 Configuration

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
Cdi1	Cdi1	32	H20	SW	1	0	3	0	3	0 = Enable EnAb 1 = Change To V FeedBack Fbtr 2 = L/R Enable LrC 3 = Change Firing PA/xx FirC

Par. Type
R/W

Digital Input 2 Configuration

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
Cdi2	Cdi2	33	H21	SW	1	0	3	0	3	0 = Enable EnAb 1 = Change To V FeedBack Fbtr 2 = L/R Enable LrC 3 = Change Firing PA/xx FirC

Par. Type
R/W

Digital Output 1 Configuration

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
Cdo1	Cdo1	34	H22	SW	0	0	3	0	3	0 = Enable HB SCR ALEn 1 = Disable HB SCIL 2 = Disable SCR HbIL 3 = Disable HB SCR ILEn

Par. Type
R/W

Operative Load Voltage

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
U_oP	V_oP	37	H25	V	229	0	1023	0	1023

Par. Type
R/W

Load Nominal Current

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
A_Lo	A_Lo	38	H26	A	UnitType Current	0	1023	0	102,3	for size from 30 to 90A
						0	1023	0	1023	for size from 120 to 700A

Par. Type
R/W

TA Size

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
Ct	Ct	39	H27	A	_	0	1023	0	102,3	for size from 30 to 90A
						0	1023	0	1023	for size from 120 to 700A

Par. Type
R

Decimal Point Position

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
dP	dP	40	H28	–	_	0	1	0	1	0 = XXXX 1 = XXX . X

Par. Type
R

Max Voltage of Unit

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
nU	NU	41	H29	V	–	0	1023	0	1023

Par. Type
R

Auxiliary Voltage

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
Au_U	Au_V	43	H2B	V	0	0	1023	0	1023

Par. Type
R/W

Input type

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM	Sample Values and Note
A_In	A-Ln	44	H2C	SW	1	0	3	0	3	1 = 0-10 Vdc 0_10 2 = 4-20 mA 4_20 3= 0-20 mA 0_20

Par. Type
R/W