USER'S MANUAL
Rev. 08/2013

MULTIDRIVE
SERIAL COMMUNICATION MANUAL

00003

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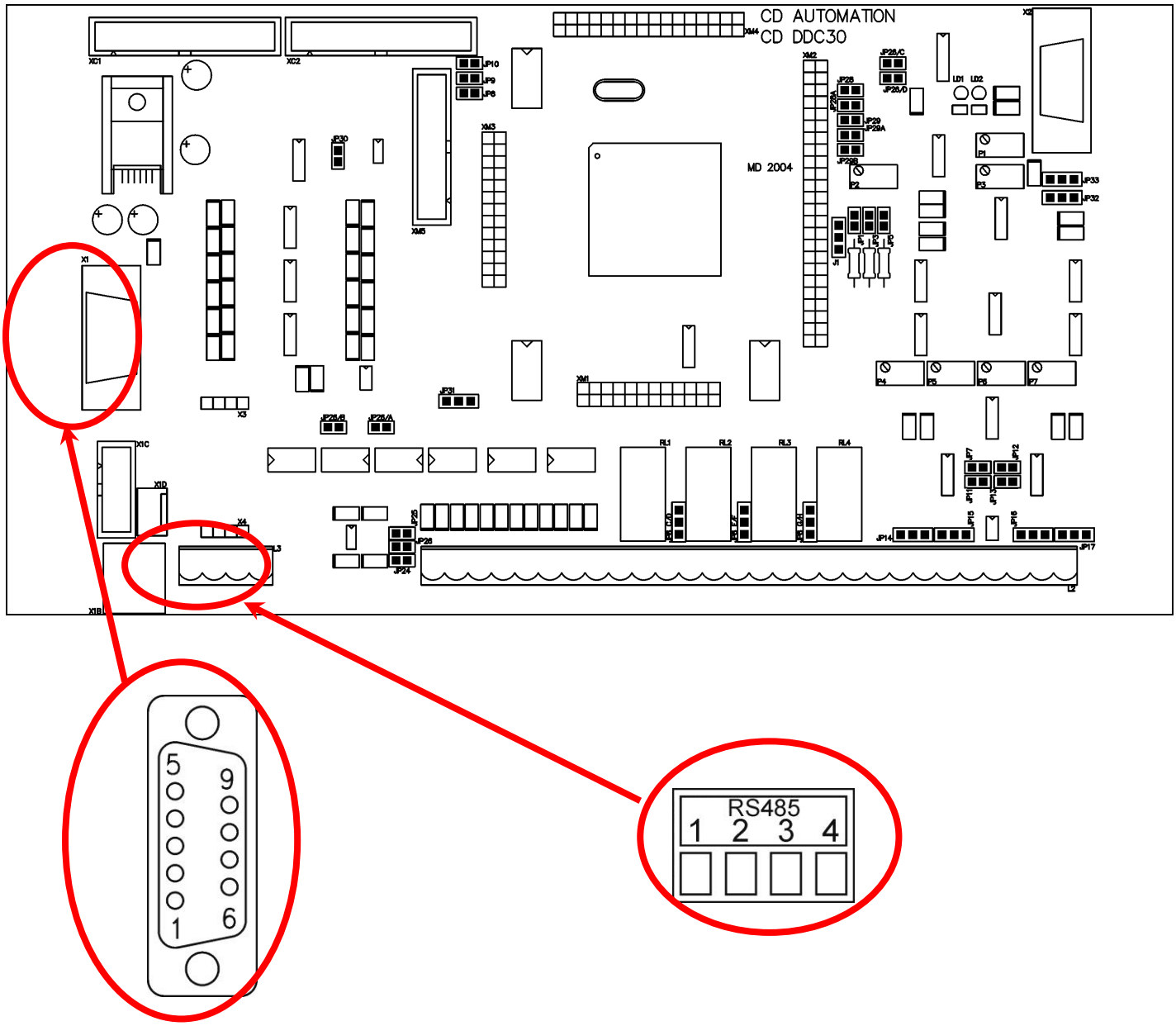
1 RS485 Serial Port

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 MULTIDRIVE.
On the 9pin DIN male connector is also possible connect the CD-EASY



Pin	Description
1	PMS5 (+5V)
2	GND 0V
3	GND 0V
4	Reserved (Rxd0)
5	GND 0V
6	RS485 A
7	RS485 B
8	nc
9	Reserved (Txd0)

Terminal	Description
1	RS485 A
2	RS485 B
3	For internal use
4	For internal use

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:

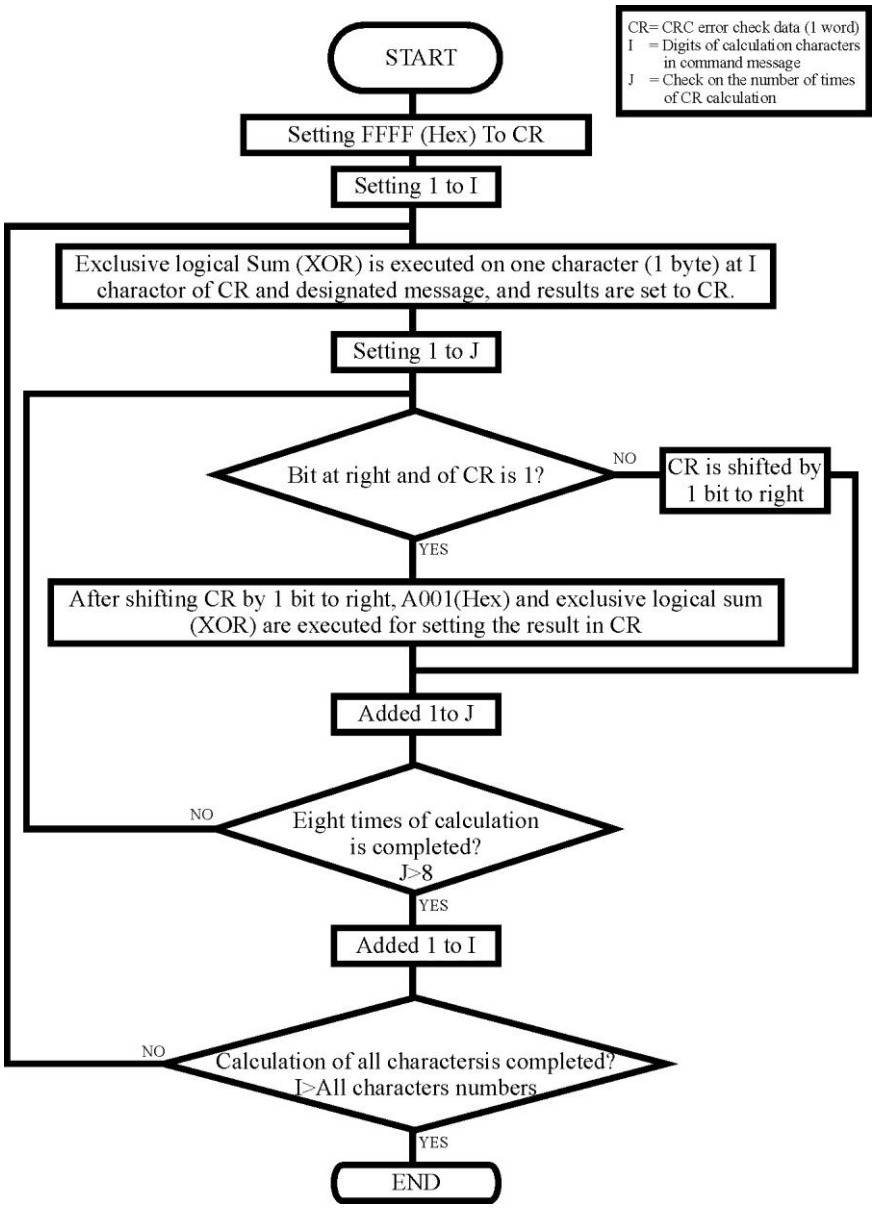
Most significant bit																Least significant bit
	Most significant Byte								Least significant Byte							

Reversed bit order:

Least significant bit																Most significant bit
	Least significant Byte								Most significant Byte							

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 **only one** specified number of parameter 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 that is

Address Unit	Function	Address of the First Parameter		N° of the Parameter		CRC 16	
	3 3Hex	HI	LO	0	1	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		CRC 16	
	3 3Hex	2	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 responses are returned for globally addressed queries.

3 Parameters List

Status Code/Alarm 1

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
AL_1	AL_1	1	H1	ALM	–	0	1	0	1	Bit 0 = 1 → Phase Loss Bit 1 = 1 → N.A. Bit 2 = 1 → N.A. Bit 3 = 1 → N.A. Bit 4 = 1 → External Alarm Bit 5 = 1 → Heat Sink Over Temp. Bit 6 = 1 → N.A. Bit 7 = 1 → N.A.

Par. Type	Unit Type
R	All

Status Code/Alarm 2

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
AL_2	AL_2	2	H2	ALM	–	0	1	0	1	Bit 0 = 1 → Thyristor Failure Bit 1 = 1 → Heater Break Alarm Bit 2 = 1 → Unbalanced Load Bit 3 = 1 → N.A. Bit 4 = 1 → N.A. Bit 5 = 1 → N.A. Bit 6 = 1 → N.A. Bit 7 = 1 → N.A.

Par. Type	Unit Type
R	All

Local/Remote Set-point 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
L--r	L--r	3	H3	Sw	0	0	1	0	1	0 = Analog setpoint 1 = Digital setpoint

Par. Type	Unit Type
R/W	All

Local Set-point Value

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
L_SP	L_SP	4	H4	%	0	0	4095	0	100,0

Par. Type	Unit Type
R/W	All

Enable Start/Stop from serial Link

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
P005	P005	5	H5	Sw	0	0	1	0	1	0= Start/Stop from terminal 1= Start/Stop from terminal + serial link NOTE: Terminal command work in series mode with serial communication commands

Par. Type	Unit Type
R/W	All

Remote Set-point value

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
r_SP	r_SP	8	H8	%	0	0	4095	0	100,0	With input 4÷20mA: Input 4mA P008 r_SP = 0% Input 12mA P008 r_SP = 50% Input 20mA P008 r_SP = 100

Par. Type	Unit Type
R	All

Voltage Supply

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_Ln	V_Ln	11	HB	V	–	0	4095	0	1000

Par. Type	Unit Type
R	All

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	19	H13	%	100,0	2048	4095	50,0	100,0

Par. Type	Unit Type
R/W	All

Firing Mode Selection (1-3 PH)

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	23	H17	Sw	1*	0	2	0	2	0= Burst Firing 1= Phase Angle 2= Delay Triggering + Burst Firing

Par. Type	Unit Type
R/W	1-3 PH Only

Firing Mode Selection (2PH)

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
F ir	Fir	23	H17	Sw	0*	0	2	0	2	0= Burst Firing 1= Delay Triggering + Burst Firing

Par. Type	Unit Type
R/W	2PH Only

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
rP_u	rP-u	24	H18	sec	2	0	1000	0	1000

Par. Type	Unit Type
R/W	All

Ramp Down

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
rP_d	rP-d	25	H19	sec	2	0	1000	0	1000

Par. Type	Unit Type
R/W	All

Average voltage output on the three phase(V)

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	31	H1F	V	–	0	1000	0	1000

Par. Type	Unit Type
R	All

Average Power output on the three phase

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value	Min Value DEC	Max Value DEC	Min Value UM
Po	Po	32	H20	Kw	–	0	1000	0	1000

Par. Type	Unit Type
R	All

RMS Current value on phase R (2-3 PH)

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
A__r	A__r	33	H21	A	–	0	1000	0	1000

Par. Type	Unit Type
R	2-3 PH Only

RMS Current value (1PH)

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
Aout	Aout	34	H22	A	–	0	1000	0	1000

Par. Type	Unit Type
R	1 PH Only

RMS Current value on phase S (2-3 PH)

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
A_S	A__S	34	H22	A	–	0	1000	0	1000

Par. Type	Unit Type
R	2-3 PH Only

RMS Current value on phase T (2-3 PH)

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
A_t	A__t	35	H23	A	–	0	1000	0	1000

Par. Type	Unit Type
R	2-3 PH Only

Start/Stop

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
P045	P045	45	H2D	Puls	0	0	1	0	1	0 = Stop 1 = Start

Par. Type	Unit Type
R/W	All

Reset

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
P047	P047	47	H2F	Puls	0	0	1	0	1	0 = No opeation 1 = Enable RESET

Par. Type	Unit Type
R/W	All

Save value Minimum input 1

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
LiA1	LiA1	57	H39	Sw	0	0	1	0	1	0 = Default 1 = Save value

Par. Type	Unit Type
R/W	All

Save value Maximum input 1

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
HiA1	HiA1	58	H3A	Sw	0	0	1	0	1	0 = Default 1 = Save value

Par. Type	Unit Type
R/W	All

Save value Minimum input 2

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
LiA2	LiA2	59	H3B	Sw	0	0	1	0	1	0 = Default 1 = Save value

Par. Type	Unit Type
R/W	All

Save value Maximum input 2

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
HiA2	HiA2	60	H3C	Sw	0	0	1	0	1	0 = Default 1 = Save value

Par. Type	Unit Type
R/W	All

Save value Minimum input 3

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
LiA3	LiA3	61	H3D	Sw	0	0	1	0	1	0 = Default 1 = Save value

Par. Type	Unit Type
R/W	All

Save value Maximum input 3

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
HiA3	HiA3	62	H3E	Sw	0	0	1	0	1	0 = Default 1 = Save value

Par. Type	Unit Type
R/W	All

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	66	H42	%	100,0	0	4095	0	160,0

Par. Type	Unit Type
R/W	All

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	70	H46	Sw	1*	0	3	0	3	0 = Current feed-back (rms value) 1 = Voltage feed-back (rms value) 2 = Power feed-back VxI 3 = External feed-back

Par. Type	Unit Type
R/W	All

Burst Firing Setting

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	83	H53	Cyc.	8 *	1	255	1	255	Not Used in F ir = Phase Angle

Par. Type	Unit Type
R/W	All

Ramp setting in Burst Firing (1-3 PH)

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
bF_r	bF_r	84	H54	Cyc.	0 4 With S+BF	0	100	0	100

Par. Type	Unit Type
R/W	1-3 PH Only

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
dt	dt	85	H55	°	80	0	100	0	100

Par. Type	Unit Type
R/W	All

Analog / Digital current limit 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
CL_i	CL_i	90	H5A	Sw	1	0	1	0	1	0 = Analog, Current Limit from analog input (terminals 21-22) 1 = Digital, Current Limit from parameter P091 CL

Par. Type	Unit Type
R/W	All

Internal current limit value

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	91	H5B	%	100,0	0	4095	0	100,0

Par. Type	Unit Type
R/W	All

Analogue Output Type (Retransmition)

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
o4NA	o4NA	97	H61	Sw	0 *	0	1	0	1	0 = 0 ÷ 10Vdc / 0 ÷ 20mA 1 = 4 ÷ 20mA

Par. Type	Unit Type
R/W	All

Define the load type connection (2-3 PH)

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
LoAd	LoAd	98	H62	Sw	0 *	0	3	0	3	0=star 1=star+N 2=delta 3=open delta

Par. Type	Unit Type
R/W	2-3PH Only

Digital input 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
C_di	C_di	103	H67	Sw	1	0	4	0	4	0 = Additional Reset Alarm 1 = Setpoint Zero 2 = Feed-back Selection 3 = Setpoint Analog/Digital 4 = External Alarm

Par. Type	Unit Type
R/W	All

Analog Output 1 Scaling

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
G_A1	G_A1	104	H68	Kw	100,0	0	3000	0	300,0	for size from 25 to 300A
					1000	0	3000	0	3000	for size upper to 300A

Par. Type	Unit Type
R/W	All

Analog Output 2 Scaling (1PH)

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
G_A2	G_A2	106	H6A	V	1000	0	3000	0	3000

Par. Type	Unit Type
R/W	1 PH Only

Analog Output 1 Scaling (2-3 PH)

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
G_A2	G_A2	106	H6A	A	100,0	0	3000	0	300,0	for size from 25 to 300A
					1000	0	3000	0	3000	for size upper to 300A

Par. Type	Unit Type
R/W	2-3PH Only

Analog Output 1 Scaling

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
G_A3	G_A3	108	H6C	A	100,0	0	3000	0	300,0	for size from 25 to 300A
					1000	0	3000	0	3000	for size upper to 300A

Par. Type	Unit Type
R/W	All

Analog Output 4 Scaling (1PH)

Par. Display	Par. Name	Address DEC	Address HEX	UM	Default Value UM	Min Value DEC	Max Value DEC	Min Value UM	Max Value UM
G_A4	G_A4	110	H6E	Hz	100,0	0	3000	0	300,0

Par. Type	Unit Type
R/W	1 PH Only

Analog Output 4 Scaling (2-3 PH)

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
G_A4	G_A4	110	H6E	A	100,0	0	3000	0	300,0	for size from 25 to 300A
					1000	0	3000	0	3000	for size upper to 300A

Par. Type	Unit Type
R/W	2-3PH Only

Digital output 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
do_2	do_2	112	H70	Sw	1	0	3	0	3	0 = Thyristor Failure 1 = Heater Break Alarm (HB) 2 = Unbalanced Load 3 = Current limit active

Par. Type	Unit Type
R/W	All

Digital output 3 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
do_3	do_3	113	H71	Sw	0	0	3	0	3	0 = Thyristor Failure 1 = Heater Break Alarm (HB) 2 = Unbalanced Load 3 = Low voltage

Par. Type	Unit Type
R/W	All

Baud Rate on serial port

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	114	H72	Sw	2	0	2	0	2	0 = 4800 1 = 9600 2 = 19200

Par. Type	Unit Type
R/W	All

Address Number

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	115	H73	Hd	1	1	127	1	127

Par. Type	Unit Type
R/W	All

Operative 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	U_OP	116	H74	V	400*	100	4095	24	1000

Par. Type	Unit Type
R/W	All

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	119	H77	A	CD3000 E Max Current	0	3000	0	300,0	for size from 25 to 300A
						0	3000	0	3000	for size upper to 300A

Par. Type	Unit Type
R/W	All

* Default Value if not specified in the Order Code