APPLICATION NOTES

PROCESS CONTROLLER (ESM-XX50)'s
PROCESS INDICATOR (ESM-XX00)'s
TIMER&COUNTER (EZM-XX50)'s

PARAMETERS, SERIAL COMMUNICATION and MODBUS®

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1. Introduction

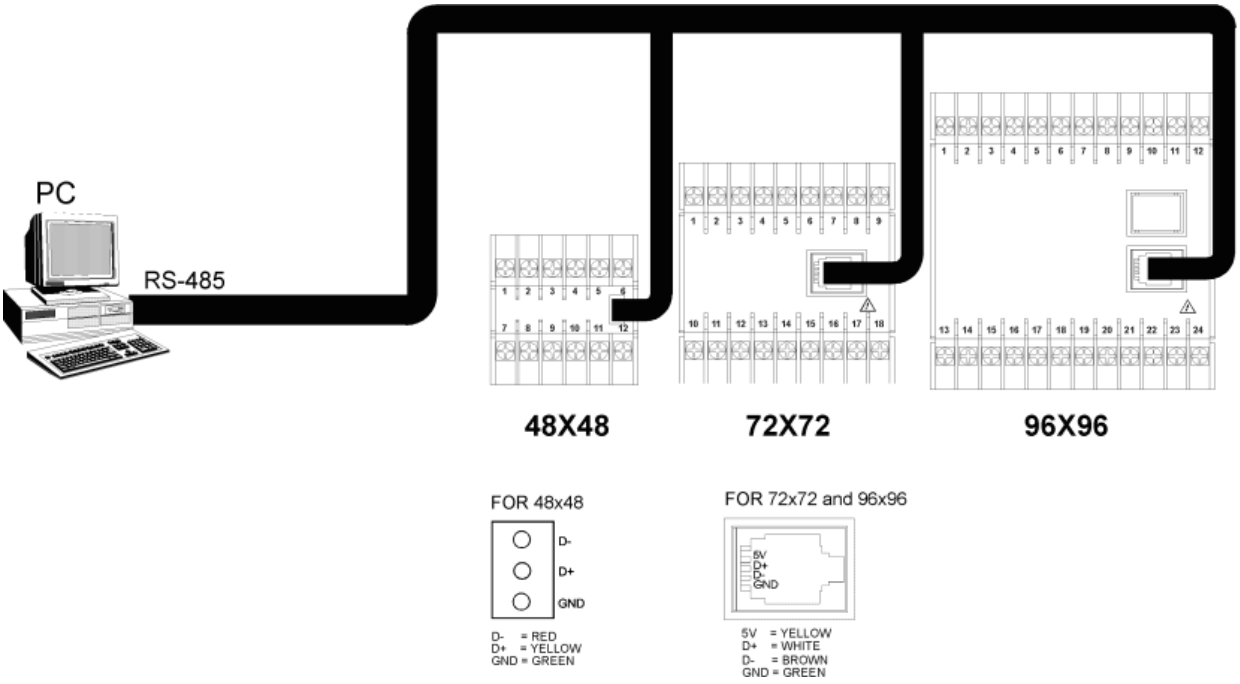
This manual describes the RS-232 and RS-485 communication using Modbus® protocol in Timer&Counter (EZM-XX50), Process Indicator (ESM-XX00) and Process Controller (ESM-XX50) instruments.

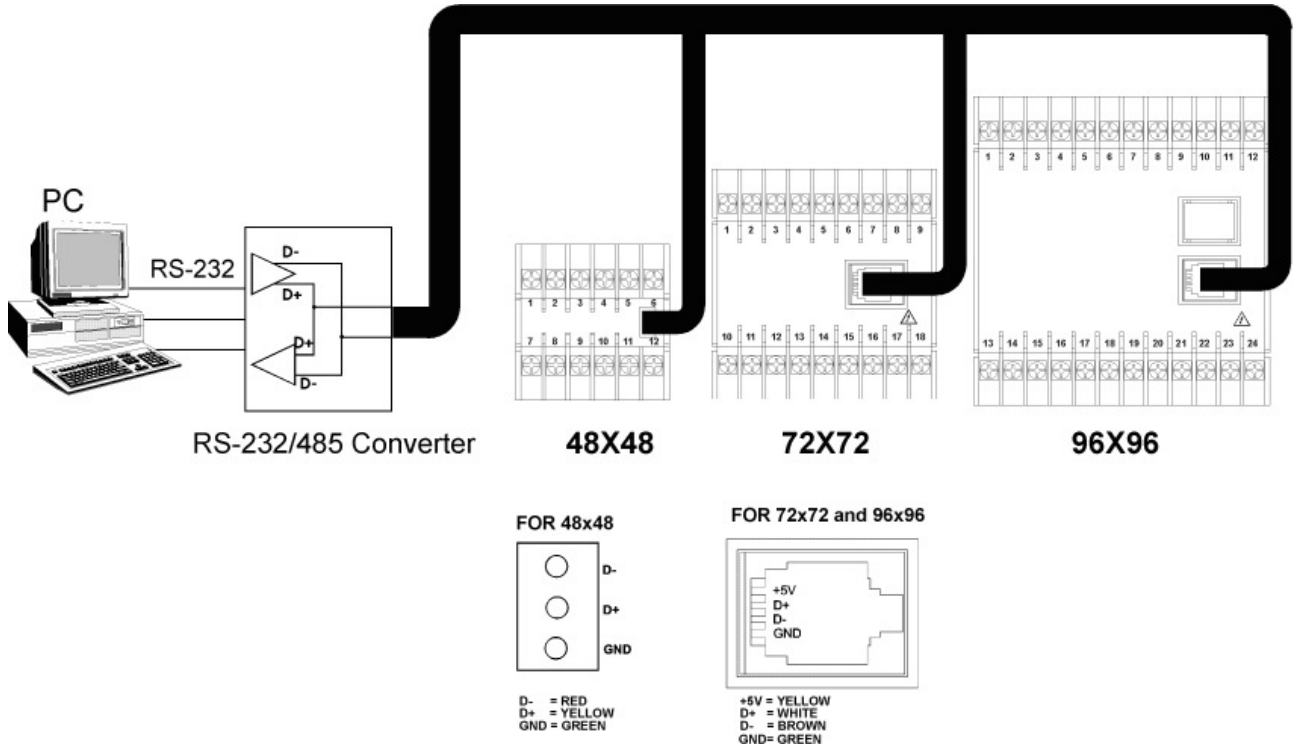
In Timer&Counter instruments Modbus® ASCII and RTU protocol is used. In Process Controller and Process Indicator instruments Modbus® RTU protocol is used.

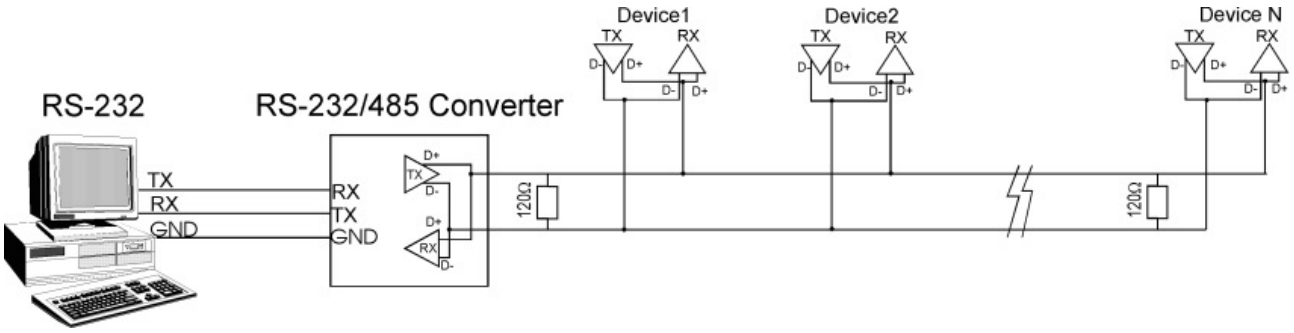
2. Connecting Devices To The Bus

Note : Each instrument connected to the bus must have a unique address
All instruments must be adjusted to the same mode (ASCII or RTU), baudrate, parity and stop bit.

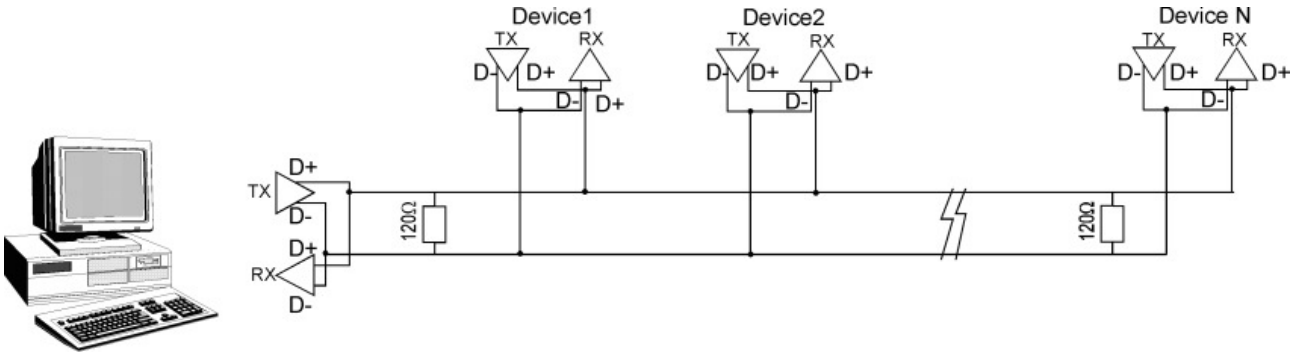
It is recommended to use twisted-pair cable for RS-485 connection in order to minimize signal errors due to the noise. To reduce cable reflections over long distances, RS-485 systems require line termination. This is achieved by putting two 120 Ω terminating resistors. One resistor must be put PC's input / output buffer and the other buffer of the last device.





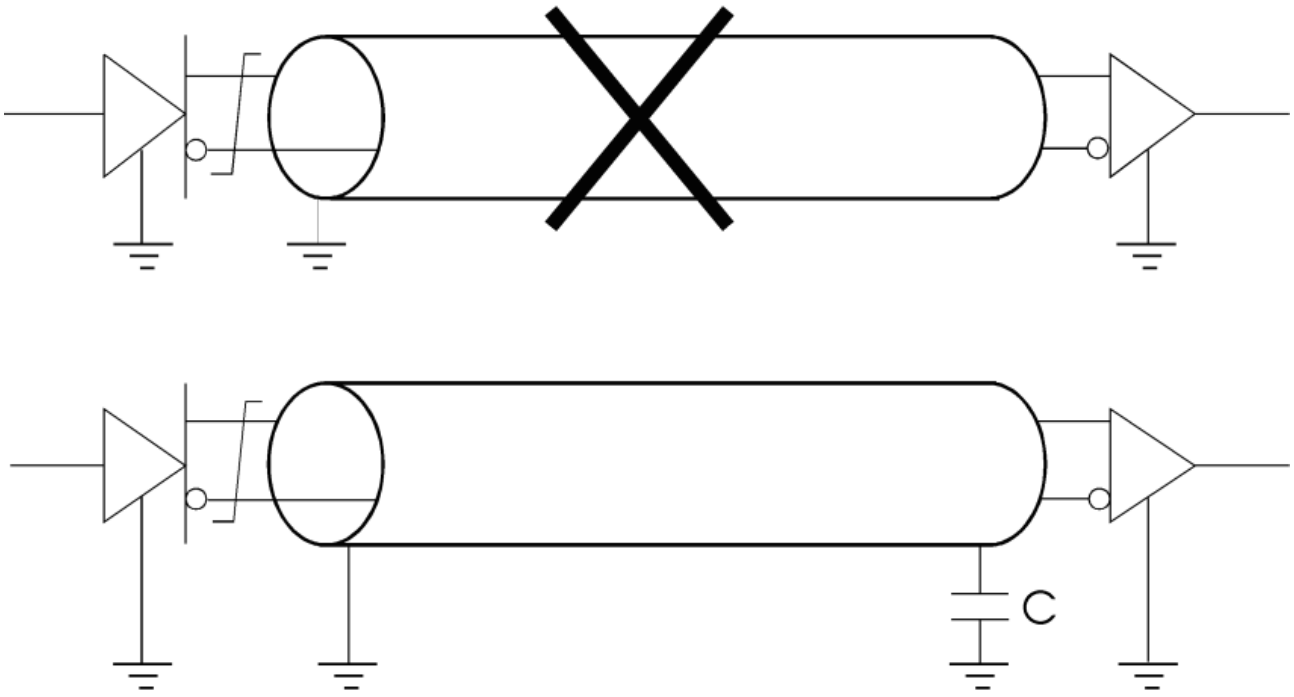


RS-485 interface with seperate converter.



RS-485 interface with plug in board

SHIELDING of the CABLE



When the shield is connected to ground at both ends, also high frequency interference is avoided. Circulating currents are avoided by a capacitor C in series with one of the ground terminals.

3. Modbus® Protocol

A communication protocol defines commands and data formats that will be known by all instruments on the system. Modbus® is a master-slave protocol with all transaction initiated by a single host (e.g. PC). Message packets contains device address, a command, data and a checksum for error detection. Each slave device continually monitors the bus looking for the beginning of the message. Message packets are detected by all slaves, but only one ,whose address matches that transmitted, answers it, others ignore the message.

3.1.Transmission Modes in Modbus®

3.1.1.Transmission Spesification

Interface	**:** RS-232 and RS-485
Communication System	**:** Half Dublex
Synchronizing system	**:** Start-stop synchronizing
Data Length	**:** 8 bits
Parity	**:** None, odd, even
Stop Bit	**:** 1, 2 stop bits
Transmission Rate	**:** 1200,2400,4800,9600 and 19200
Transmission Cable	: Twisted pair cable with shield.
Error Detection Techniques	:1. Parity Checks: None / Odd / Even parity 2. Longitudinal redundancy checks (LRC) :ASCII mode 3. Cyclic redundancy checks (CRC): RTU mode

3.1.2.Function Codes

Function Code 03 : Read Holding Register
Function Code 04 : Read Input Registers
Function Code 06 : Preset Single Register

3.2. Modbus® Message Framing

Modbus® messages transmit with frames. Beginning and ending of the frame is known by the slave devices. If the slave devices receive a character that is beginning of the frame, they read the address field and determine the owner of the device. Also they know when the message is completed. If the message isn't completed failures can be occurred.

3.2.1. ASCII Framing

In ASCII Mode, messages start with a colon ' : ' ASCII character (3A hex), and end with a carriage return – line feed (CR - LF ASCII character,0D - 0A hex)
The allowable characters are 0-9 and A-F. Devices on the network waits for the ' : ' (Start character) on the bus. If one is received each device decodes the address field to know if it is the owner of the message.

3.2.2. RTU Framing

In this mode messages start with a silent interval of at least 3.5 character times. After this interval device address is sent. The devices on the network waits for the silent intervals.When the first field is received each device decodes it to know if it is the owner of the message. After the last character is sent 3.5 character silent interval marks the end of the message. A new message can begin after this interval.

The whole message must be continuous. If a 1.5 character silent interval occur before completing the message, the device eliminates the received message and assumes that the next byte is the address field of a new message. If a new message begins earlier than 3.5 characters times, message will be considered the continuation of the message, then CRC field will not be okey for the message.

3.2.3. Address Field

In ASCII mode address field is two characters and in RTU mode address field has eight bits. Slave device address can be between 1-247.

3.2.4. Function Field

In ASCII mode function field is two characters and in RTU mode function field has eight bits. Function field tells the slave device which action will be performed. If there is no failure slave returns the same function code but if there is a failure to indicate the error slave device returns the function code with its most significant bit set to a logic 1. Error codes will be explained.

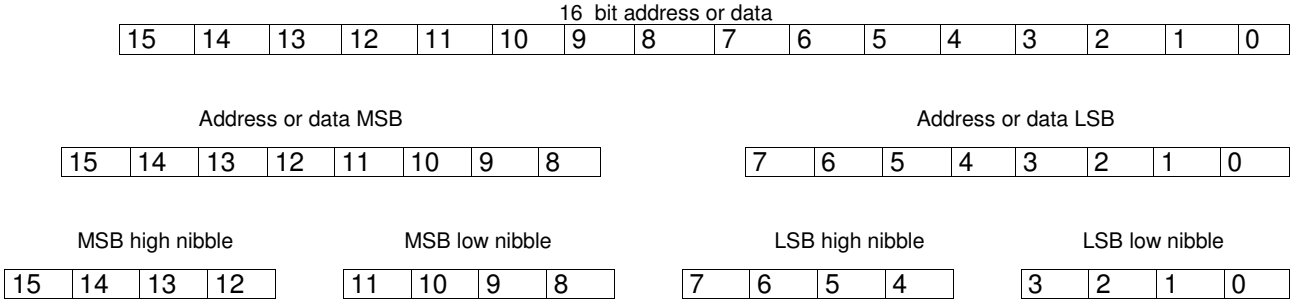
For example if master sends a message to read a group of holding registers and the function code will be:
0000 0011 (Hex 03)
If the slave takes the message without error, it returns back the same function code, but if there is an exception the function code will be:
1000 0011 (Hex 83)

3.2.5. Data Field

This field can include register addresses, how many byte will be read and the count of the read bytes.
For example if the master wants to read a group of holding registers, the data field includes the register address where to start to read, and how many registers are to be read.

3.3. ASCII and RTU Modes

Controllers can be set up to communicate on standard Modbus® networks using two transmission modes : ASCII or RTU. The mode determines how information will be packed into the message fields and decoded.



Note : 1 must be substracted from register address value when data is sent to the device or data is read from the device. E.g. If you want to read register address 15, 14 is sent for register address.

3.3.1. ASCII Mode

If the devices are setup to communicate using ASCII (American Standard Code for Information Interchange) mode, each 8-bit byte in a message is sent as two ASCII characters.

The format in ASCII mode is:
Coding system : Hexadecimal ASCII characters 0-9,A-F
Error Check Field : Longitudinal Redundancy Check (LRC)

3.3.1.1. LRC Calculation

The LRC is calculated by adding all message bytes discarding any carries and then two's complementing the result.

E.g. If slave ID is 1, command is 4, register address is 14 and register count is 1
LRC = slave ID+command+register address+register count
= 1+4+14+1
= 20
if LRC is bigger than 255, 256 must be substracted from LRC. (E.g. If LRC is 300 LRC = 300-256 = 44)

result = (255^LRC)+1

To send data to the instrument;

Slave ID : 1
Command : 6 (Preset Single Register)
Register address : 15
Data : 300

	ASCII	DECIMAL	HEX
Start Character	:	58	0x3A
Slave ID high nibble	0	48	0x30
Slave ID low nibble	1	49	0x31
Command high nibble	0	48	0x30
Command low nibble	6	54	0x36
Register Address MSB high nibble	0	48	0x30
Register Address MSB low nibble	0	48	0x30
Register Address LSB high nibble	0	48	0x30
Register Address LSB low nibble	E	69	0x45
Data MSB high nibble	0	48	0x30
Data MSB low nibble	1	49	0x31
Data LSB high nibble	2	50	0x32
Data LSB low nibble	C	67	0x43
LRC MSB	B	66	0x42
LRC LSB	E	69	0x45
13	CR	13	0xD
10	LF	10	0xA

To read data from the device;

Slave ID : 1
Command : 3 (Read Holding Register)
Register address : 15
Register count : 1

	ASCII	DECIMAL	HEX
Start Character	:	58	0x3A
Slave ID high nibble	0	48	0x30
Slave ID low nibble	1	49	0x31
Command high nibble	0	48	0x30
Command low nibble	3	51	0x33
Register Adres MSB high nibble	0	48	0x30
Register Adres MSB low nibble	0	48	0x30
Register Adres LSB high nibble	0	48	0x30
Register Adres LSB low nibble	E	69	0x45
Register Sayisi MSB high nibble	0	48	0x30
Register Sayisi MSB low nibble	0	48	0x30
Register Sayisi LSB high nibble	0	48	0x30
Register Sayisi LSB low nibble	1	49	0x31
LRC MSB	E	69	0x45
LRC LSB	D	68	0x44
CR	CR	13	0xD
LF	LF	10	0xA

Data is 300 in this register, the device sends the bytes below:

	ASCII	DECIMAL	HEX
Start Character	:	58	0x3A
Slave ID high nibble	0	48	0x30
Slave ID low nibble	1	49	0x31
Command high nibble	0	48	0x30
Command low nibble	3	51	0x33
Byte Count high nibble	0	48	0x30
Byte Count low nibble	2	50	0x32
Data MSB high nibble	0	48	0x30
Data MSB low nibble	1	49	0x31
Data LSB high nibble	2	50	0x32
Data LSB low nibble	C	67	0x43
LRC MSB	C	67	0x43
LRC LSB	D	68	0x44
CR	CR	13	0x0D
LF	LF	10	0x0A

Data MSB high nibble = Data MSB high nibble-48

Data MSB high nibble = 48-48 = 0

Data MSB low nibble = Data MSB low nibble -48

Data MSB low nibble = 49-48 = 1

Data LSB high nibble = Data LSB high nibble-48

Data LSB high nibble = 50-48 = 2

Data LSB low nibble = Data LSB low nibble-55

Data LSB low nibble = 67-55 = 12

Gelen Data = (Data MSB high nibble*16+Data MSB low nibble)*256+(Data LSB high nibble*16+Data LSB low nibble)

Gelen Data = (0*16+1)*256+(2*16+12)

Gelen Data = 256+32+12

= 300

3.3.2. RTU MODE

When controllers are set up to communicate on a Modbus® network using RTU (Remote Terminal Unit) mode, each 8-bit byte in a message contains two 4-bit hexadecimal characters. Each message must be transmitted in a continuous stream.

The format in RTU mode is:
Coding System : 8 bit binary,hexadecimal 0-9,A-F
Error Check Field : Cyclical Redundancy Check (CRC)

To send data to the instrument;

Slave ID : 1
Command : 6 (Preset Single Register)
Register address : 15
Data : 300

Slave ID	1
Command	6
Register Adres MSB	0
Register Adres LSB	14
Data MSB	1
Data LSB	44
CRC MSB	232
CRC LSB	68

To read data from the instrument;

Slave ID : 1
Command : 3 (Read holding register)
Register address : 15
Register count : 1

If user wants to read the 15. input register from the device ID is 1 The datas are in right below)

Slave ID	1
Command	3
Register Adres MSB	0
Register Adres LSB	14
Register Count MSB	0
Register Count LSB	1
CRC MSB	229
CRC LSB	201

Data is 300 in this register, the device sends the bytes below:

Slave ID	1
Command	3
Byte Count	2
Data MSB	1
Data LSB	44
CRC MSB	184
CRC LSB	9

Gelen Data = Data MSB*256+Data LSB
Gelen Data = 1*256+44
= 300

3.3.2.1. CRC Calculation

A 16-bit CRC field is added to the end of the message. CRC is a calculation of a message contents. The slave device recalculates the CRC and compares with the CRC contained in the message. If two values aren't equal a failure occurs, slave device ignores the message.

A simpler method involves swapping the low and high order bytes of the CRC integer at the end of the calculation. This is shown in the following routine.

1- Load a 16-bit register (CRC Register) with FFFF Hex. (all1's).
2 - Exclusive-OR the first eight bits of the message with the low-order byte of the CRC register. Put the result in the CRC register.
3 - Shift the CRC register one bit to the right (divide by two), filling the MSB with a zero.
4 - If the bit shifted out in three is a one, Exclusive-OR the CRC register with the value A001 Hex.
5 - Repeat steps 3 and 4 until eight shifts have been performed and the bits tested. A single byte has thus been processed.
6 - Repeat steps 2 to 5 using the next eight-bit byte of the message until all bytes have been processed.
7 - The final contents of the CRC register are tagged on to the end of the message with the most significant byte first.
8 - Swap the low and high order bytes of the integer result.

An implementation of the CRC calculation in C code is show below.

```
unsigned int check_sum(unsigned char *buff, char start, char bytes)
{
        Char byte_cnt,bit_cnt; /* loop counters */
        unsigned int crc_reg; /* Result register */
        unsigned int CRCHi, CRCLO;/*Low and high order bytes of the crc*/
        /* Set the CRC register to all 1's */ crc_reg = 0xFFFF;
        /* Repeat for each byte of sub string */
        for(byte_cnt=start; byte_cnt<(bytes+start); byte_cnt++)
        {
                crc_reg = crc_reg ^ (Unsigned int)buff[byte_cnt]; /*EXOR CRC &Next Byte*/
                /* Test each bit of the CRC */
                for(bit_cnt=0; bit_cnt<8; bit_cnt++)
                {
                        if(crc_reg & 0x0001)
                        {
                                crc_reg = crc_reg >>1; /* IF LSB=1 EXOR
                                CRC with A001H*/
                                crc_reg = crc_reg ^ 0Xa001; /* Then shift
                                CRC toward LSB */
                        }
                        else crc_reg = crc_reg>>1; /* ELSE Shift CRC towards LSB */
                }

        }
        CRCLo=crc_reg>>8; /*Swap the low and high order bytes of the crc result*/
        CRCHi=crc_reg<<8;
        crc_reg = CRCLo+CRCHi;
        return crc_reg; /*Final CRC register Result */ }
```

3.4. Exception Responses

* If the slave does not receive the query because of a communication error , no response is returned. (Timeout Error)

* If the slave receives the query, but detects a communication error (parity, LRC or CRC) , no response is returned. (Timeout Error)

* If the slave receives the query without communication error, but can not handle it (e.g.if Master wants to read non-existent register), the slave will return an exception

The Error Codes are below:

01 : ILLEGAL FUNCTION : The function code received in the query is not an allowable action for the slave.
02 : ILLEGAL DATA ADDRESS : The data address received in the query is not an allowable address for the slave.
03 : ILLEGAL DATA VALUE : A value contained in the query data field is not an allowable value for the slave.
05 : ACKNOWLEDGE : The slave has accepted the request and is processing it, but a long duration of time will be required to do so. This response is returned to prevent a timeout error from occuring in the master. The master can next issue a Poll Program Complete message to determine if processing is completed.

08 : MEMORY PARITY ERROR : The slave attempted to read extended memory, but detected a parity error in the memory. The master can retry the request, but service may be required on the slave.

if there is a failure to indicate the error slave device returns the function code with its most significant bit set to a logic 1.
Command* = Command's most significant bit set to a logic 1.

RTU MODE	**ASCII MODE**
Slave ID	:
Command*	Slave ID high nibble
Error Code	Slave ID low nibble
CRC MSB	Command* high nibble
CRC LSB	Command* low nibble
	Error Code MSB
	Error Code LSB
	LRC MSB
	LRC LSB
	CR
	LF

4. Examples

4.1. Process Controller (ESM-XX50)

4.1.1. To read process value

To read process value (register address is 1) from the ESM-XX50 (slave ID is 1). 1 must be substracted from the register address . In here 0 (register address-1) will be used for register address.

Slave ID = 1
Command = 4
Register Address MSB = 0
Register Address LSB = 0
Register Count MSB = 0
Register Count LSB = 1

Slave ID	1
*Delay	*Delay
Command	4
*Delay	*Delay
Register Address MSB	0
*Delay	*Delay
Register Address LSB	0
*Delay	*Delay
Register Count MSB	0
*Delay	*Delay
Register Count LSB	1
*Delay	*Delay
CRC MSB	49
*Delay	*Delay
CRC LSB	202

After sending all the bytes, wait minimum one second and read the bytes in the receive buffer.If process value is 1500 in this register, the device sends the bytes below:

Slave ID	1
Command	4
Byte Count	2
Data MSB	5
Data LSB	220
CRC MSB	187
CRC LSB	249

Data = Data MSB*256+ Data LSB
Data = 5*256+220
Data = 1500

4.1.2. Change process set value

Slave ID is 1, process set value register address is 1 and 1000 will be the new set value.1 must be substracted from the register address . In here 0 (register address-1) will be used for register address.

Data = 1000
Data = 3*256+232 so Data MSB = 3
Data LSB = 232

Slave ID	= 1
Command	= 6
Register Address MSB	= 0
Register Address LSB	= 0
Data MSB	= 3
Data LSB	= 232

Slave ID	1
*Delay	*Delay
Command	6
*Delay	*Delay
Register Address MSB	0
*Delay	*Delay
Register Address LSB	0
*Delay	*Delay
Data MSB	3
*Delay	*Delay
Data LSB	232
*Delay	*Delay
CRC MSB	137
*Delay	*Delay
CRC LSB	116

After sending all the bytes, wait minimum one second and read the bytes in the receive buffer. If the slave receives the query and changes the set value 1000 correctly, the bytes which slave device has received, will be sent back.

Note : *Delay time must be put between two bytes. When a byte is written into the buffer after *Delay time next byte must be put into the buffer.

For 1200 bps minimum 9.17 msec maximum 13.76
For 2400 bps minimum 4.59 msec maximum 6.88
For 4800 bps minimum 2.30 msec maximum 3.44
For 9600 bps minimum 1.15 msec maximum 1.72
For 19200 bps minimum 0.57 msec maximum 0.86

4.2. Process Indicator (ESM-XX00)

4.2.1. To read process value

To read process value (register address is 1) from the ESM-XX00 (slave ID is 1). 1 must be substracted from the register address. In here 0 (register address-1) will be used for register address.

Slave ID = 1
Command = 4
Register Address MSB = 0
Register Address LSB = 0
Register Count MSB = 0
Register Count LSB = 1

Slave ID	1
*Delay	*Delay
Command	4
*Delay	*Delay
Register Address MSB	0
*Delay	*Delay
Register Address LSB	0
*Delay	*Delay
Register Count MSB	0
*Delay	*Delay
Register Count LSB	1
*Delay	*Delay
CRC MSB	49
*Delay	*Delay
CRC LSB	202

After sending all the bytes, wait minimum one second and read the bytes in the receive buffer.If process value is 523 in this register, the device sends the bytes below:

Slave ID	1
Command	4
Byte Count	2
Data MSB	2
Data LSB	11
CRC MSB	249
CRC LSB	151

Data = Data MSB*256+Data LSB
Data = 2*256+11
Data = 523

4.2.2. Change alarm1 set value

Slave ID is 1, process set value register address is 1 and 999 will be the new set value.1 must be substracted from the register address value. In here 0 (register address-1) will be used for register address.

Data = 999
Data = 3*256+231 so Data MSB = 3
Data LSB = 231

Slave ID = 1
Command = 6
Register Address MSB = 0
Register Address LSB = 0
Data MSB = 3

Data LSB = 231

Slave ID	1
*Delay	*Delay
Command	6
*Delay	*Delay
Register Address MSB	0
*Delay	*Delay
Register Address LSB	0
*Delay	*Delay
Data MSB	3
*Delay	*Delay
Data LSB	231
*Delay	*Delay
CRC MSB	201
*Delay	*Delay
CRC LSB	112

After sending all the bytes, wait minimum one second and read the bytes in the receive buffer. If the slave receives the query and changes the set value 999 correctly, the bytes which slave device has received, will be sent back.

Note : *Delay time must be put between two bytes. When a byte is written into the buffer after *Delay time next byte must be put into the buffer.

For 1200 bps minimum 9.17 msec maximum 13.76
For 2400 bps minimum 4.59 msec maximum 6.88
For 4800 bps minimum 2.30 msec maximum 3.44
For 9600 bps minimum 1.15 msec maximum 1.72
For 19200 bps minimum 0.57 msec maximum 0.86

4.3. Timer&Counter (EZM-XX50)

4.3.1. To read preset active value

4.3.1.1. ASCII Mode

To read preset active value (register address is 2 and 3) from the EZM-XX00 device (slave ID is 1). 1 must be substracted from the register address value. In here 1 and 2 (register address-1) will be used for register address.

Slave ID = 1
Command = 4
Register Address = 1
Byte Count = 2

	DECIMAL
Start Character	58
Slave ID high nibble	48
Slave ID low nibble	49
Command high nibble	48
Command low nibble	52
Register Address MSB high nibble	48
Register Address MSB low nibble	48
Register Address LSB high nibble	48
Register Address LSB low nibble	49
Byte Count MSB high nibble	48
Byte Count MSB low nibble	48
Byte Count LSB high nibble	48
Byte Count LSB low nibble	50
LRC MSB	70
LRC LSB	56
13	13
10	10

Note : *Delay time must be put between two bytes. When a byte is written into the buffer after *Delay time next byte must be put into the buffer.
*Delay value varies with the baud rate.

For 1200 bps minimum 9.17 msec maximum 13.76
For 2400 bps minimum 4.59 msec maximum 6.88
For 4800 bps minimum 2.30 msec maximum 3.44
For 9600 bps minimum 1.15 msec maximum 1.72
For 19200 bps minimum 0.57 msec maximum 0.86

After sending all the bytes, wait minimum one second and read the bytes in the receive buffer.If preset active value is 2530 in this register, the device sends the bytes below:

	DECIMAL
Start Character	58
Slave ID high nibble	48
Slave ID low nibble	49
Command high nibble	48
Command low nibble	52
Byte Count high nibble	48
Byte Count low nibble	50
First byte MSB high nibble	48
First byte MSB low nibble	48
First byte LSB high nibble	48
First byte LSB low nibble	48
Second byte MSB high nibble	48
Second byte MSB low nibble	57
Second byte LSB high nibble	69
Second byte LSB low nibble	50
LRC MSB	48
LRC LSB	69
CR	13
LF	10

Slave ID = (Slave ID high nibble)*16+Slave ID low nibble
Slave ID = (48-48)*16+(49-48)
Slave ID = 1

Command = (Command high nibble)*16+Command low nibble
Command = (48-48)*16+(52-48)
Command = 4

Byte Count = (Byte Count high nibble)*16+Byte Count low nibble
Byte Count = (48-48)*16+(50-48)
Byte Count = 2

First byte = (First byte MSB high nibble*16+First byte MSB low nibble)*256+(First byte LSB high nibble*16+First byte LSB low nibble)

First byte = ((48-48)*16+(48-48))*256+((48-48)*16+(48-48))
First byte = 0

Second byte = (Second byte MSB high nibble*16+Second byte MSB low nibble)*256+(Second byte LSB high nibble*16+Second byte LSB low nibble)

Second byte = ((48-48)*16+(57-48))*256+((69-55)*16+(50-48))
Second byte = 9*256+14*16+2
Second byte = 2304+224+2
Second byte = 2530

4.3.1.2. RTU Mode

To read preset active value (register address is 2 and 3) from the EZM-XX50 device (slave ID is 1). 1 must be substracted from the register address value. In here 1 and 2 (register address-1) will be used for register address.

Slave ID = 1
Command = 4
Register Address MSB = 0
Register Address LSB = 1
Register Count MSB = 0
Register Count LSB = 2

Slave ID	1
*Delay	*Delay
Command	4
*Delay	*Delay
Register Address MSB	0
*Delay	*Delay
Register Address LSB	1
*Delay	*Delay
Register Count MSB	0
*Delay	*Delay
Register Count LSB	2
*Delay	*Delay
CRC MSB	32
*Delay	*Delay
CRC LSB	11

After sending all the bytes, wait minimum one second and read the bytes in the receive buffer.If preset active value is 2530 in this register, the device sends the bytes below:

Slave ID	1
Command	4
Byte Count	4
First byte MSB	0
First byte LSB	0
Second byte MSB	9
Second byte LSB	226
CRC MSB	125
CRC LSB	157

First byte = First byte MSB*256+First byte LSB
First byte = 0*256+0
First byte = 0

Second byte = Second byte MSB*256+Second byte LSB
Second byte = 9*256+226
Second byte = 2530

Preset Active Value = First byte*65536+Second byte
Preset Active Value = 0*65536+2530
Preset Active Value = 2530

4.3.2. To change set1 value

4.3.2.1. ASCII Mode

Slave ID is 1, set1 register address is 32 and 33 and 72135 will be the new set1 value.1 must be substracted from the register address value. In here 31 and 32 (register address-1) will be used for register address.

Data = 72135
Data = 1*65536+6599 so First byte is 1
Second byte is 6599

First byte = 1
First byte = 0*256+1 so Data MSB is 0
Data LSB is 1

Data MSB = 0
Data MSB = 0*16+0 so Data MSB high nibble = 0
Data MSB low nibble = 0

Data LSB = 0
Data LSB = 0*16+1 so Data LSB high nibble = 0
Data LSB low nibble = 1

Slave ID = 1
Command = 6
Register Address MSB = 0
Register Address LSB = 31
Data MSB = 0
Data LSB = 1

	DECIMAL
Start Character	58
Slave ID high nibble	48
Slave ID low nibble	49
Command high nibble	48
Command low nibble	54
Register Address MSB high nibble	48
Register Address MSB low nibble	48
Register Address LSB high nibble	49
Register Address LSB low nibble	70
Data MSB high nibble	48
Data MSB low nibble	48
Data LSB high nibble	48
Data LSB low nibble	49
LRC MSB	68
LRC LSB	57
13	13
10	10

After sending all the bytes, wait minimum one second and read the bytes in the receive buffer.
If the slave receives the query and changes the set1 high byte 1 correctly, the bytes which slave device has received, will be sent back.

Second byte = 6599
Second byte = 25*256+199 so Data MSB is 25
Data LSB is 199

Data MSB = 25
Data MSB = 1*16+9 so Data MSB high nibble = 1
Data MSB low nibble = 9

Data LSB = 199
Data LSB = 12*16+7 so Data LSB high nibble = 12
Data LSB low nibble = 7

Slave ID = 1
Command = 6
Register Address MSB = 0
Register Address LSB = 32
Data MSB = 25
Data LSB = 199

	DECIMAL
Start Character	58
Slave ID high nibble	48
Slave ID low nibble	49
Command high nibble	48
Command low nibble	54
Register Address MSB high nibble	48
Register Address MSB low nibble	48
Register Address LSB high nibble	50
Register Address LSB low nibble	48
Data MSB high nibble	49
Data MSB low nibble	57
Data LSB high nibble	67
Data LSB low nibble	55
LRC MSB	70
LRC LSB	57
13	13
10	10

After sending all the bytes, wait minimum one second and read the bytes in the receive buffer.
If the slave receives the query and changes the set1 high byte 1 correctly, the bytes which slave device has received, will be sent back.

Note : *Delay time must be put between two bytes. When a byte is written into the buffer after *Delay time next byte must be put into the buffer.
*Delay value varies with the baud rate.

For 1200 bps minimum 9.17 msec maximum 13.76
For 2400 bps minimum 4.59 msec maximum 6.88
For 4800 bps minimum 2.30 msec maximum 3.44
For 9600 bps minimum 1.15 msec maximum 1.72
For 19200 bps minimum 0.57 msec maximum 0.86

4.3.2.2. RTU Mode

Slave ID is 1, set1 register address is 32 and 33 and 72135 will be the new set1 value.1 must be substracted from the register address value. In here 31 and 32 (register address-1) will be used for register address.

Data = 72135
Data = 1*65536+6599 First byte is 1
Second byte is 6599
First byte = 1
First byte = 0*256+1 so Data MSB = 0
Data LSB = 1

Slave ID = 1
Command = 6
Register Address MSB = 0
Register Address LSB = 31
Data MSB = 0
Data LSB = 1

Slave ID	1
*Delay	*Delay
Command	6
*Delay	*Delay
Register Address MSB	0
*Delay	*Delay
Register Address LSB	31
*Delay	*Delay
Data MSB	0
*Delay	*Delay
Data LSB	1
*Delay	*Delay
CRC MSB	121
*Delay	*Delay
CRC LSB	204

After sending all the bytes, wait minimum one second and read the bytes in the receive buffer.
If the slave receives the query and changes the set1 high byte 1 correctly, the bytes which slave device has received, will be sent back.

Second byte = 6599
First byte = 25*256+199 so Data MSB = 25
Data LSB = 199

Slave ID = 1
Command = 6
Register Address MSB = 0
Register Address LSB = 32
Data MSB = 25
Data LSB = 199

Slave ID	1
*Delay	*Delay
Command	6
*Delay	*Delay
Register Address MSB	0
*Delay	*Delay
Register Address LSB	32
*Delay	*Delay
Data MSB	25
*Delay	*Delay
Data LSB	199
*Delay	*Delay
CRC MSB	194
*Delay	*Delay
CRC LSB	2

After sending all the bytes, wait minimum one second and read the bytes in the receive buffer.
If the slave receives the query and changes the set1 high byte 1 correctly, the bytes which slave device has received, will be sent back.

5. ESM-XX50 Parameters List

Read Holding Register Command (4XXXX)
Holding registers can be read and written.

Operator parameters

Set list SEt LıSt			
40001	**PSEt**	Process SV	SU-L - SU-u
40002	ALr1	Alarm-1 SV	if process input selected SU-L-SU-u ,if analog input selected SUL2–SUu2
40003	ALr2	Alarm-2 SV	if process input selected SU-L-SU-u ,if analog input selected SUL2–SUu2
40004	ALr3	Alarm-3 SV	if process input selected SU-L-SU-u ,if analog input selected SUL2–SUu2

Running mode run LıSt			
40005	**tunn**	Tuning type	no Atun Stun At.St
40006	**Attn**	Auto tuning	no YES
40007	**Auto**	Manual/Automatic selection for control output	Auto man
40008	**rSSL**	Ramp-soak selection	Off run HoLd
40167	**ULSL**	valve control type selection (**CAUTION!!** When you changing this parameter there must be no electrical connections.)	(if modul 1 is relay out you can see and change this parameter else you can't use valve control) 0 = no valve control 1 = heating (reverse action) 2 = cooling (direct action) if your choice is heating or cooling; -modul1 output uses for open the valve and out3 output for close the valve. -you can't select pid output at the modul2 output)
40009	**bPLt**	Bumpless transfer	no YES

Display list dıSP LıSt			
40010	**tdSP**	Top display	0 PV 1 Deviation (SV-PV) **2 2nd sensor input (if equipment has 2nd sensor module)**
40011	**bdSP**	Bottom display (if working man mode always shows Power)	0 Local SV 1 Power(%) 2 ramp - soak display - no ramp - soak P.End - ramp - soak waiting HoLd - ramp segment rA 1-8 - soak segment So 1-8 3 2nd sensor input (if equipment has 2nd sensor module)

Ramp/Soak rmP SoA			
40012	**StrA**	Start ramp time	0 to 99h 59min **if set 0.0 start ramp doesn't work**
40013	**rSto**	Ramp-soak tolerance	0 - %50 F.S. if 0 doesn't work if (set value+rSto)<temp <(set value+rSto) ramp or soak time working else ramp or soak time holding & process waiting to came normal position
40014	**rStY**	Ramp-soak type	0 1-4 segment 1 5-8 segment 2 1-8 segment
40015	**PU_1**	1. target SV	SU-L – SU-u

40016	**tr_1**	1. ramp segment time	0 to 99h 59min
40017	**tS_1**	1. soak segment time	0 to 99h 59min
40018	**PU_2**	2. target SV	SU-L – SU-u
40019	**tr_2**	2. ramp segment time	0 to 99h 59min
40020	**tS_2**	2. soak segment time	0 to 99h 59min
40021	**PU_3**	3. target SV	SU-L – SU-u
40022	**tr_3**	3. ramp segment time	0 to 99h 59min
40023	**tS_3**	3. soak segment time	0 to 99h 59min
40024	**PU_4**	4. target SV	SU-L – SU-u
40025	**tr_4**	4. ramp segment time	0 to 99h 59min
40026	**tS_4**	4. soak segment time	0 to 99h 59min
40027	**PU_5**	5. target SV	SU-L - SU-u
40028	**tr_5**	5. ramp segment time	0 to 99h 59min
40029	**tS_5**	5. soak segment time	0 to 99h 59min
40030	**PU_6**	6. target SV	SU-L - SU-u
40031	**tr_6**	6. ramp segment time	0 to 99h 59min
40032	**tS_6**	6. soak segment time	0 to 99h 59min
40033	**PU_7**	7. target SV	SU-L - SU-u
40034	**tr_7**	7. ramp segment time	0 to 99h 59min
40035	**tS_7**	7. soak segment time	0 to 99h 59min
40036	**PU_8**	8. target SV	SU-L - SU-u
40037	**tr_8**	8. ramp segment time	0 to 99h 59min
40038	**tS_8**	8. soak segment time	0 to 99h 59min

Technician parameters

Process input configuration	**PınP ConF**

40039	**ıSSL**	Input signal selection	TC (L,J,K,R,S,T,B,E,N,C) RTD (PT100,JPT100), PTC (900ohm/25℃), NTC (1000ohm/25℃) mA, mV, V

Process input configuration			**TC (L.J,K,R,S,T,B,E,N,C)**				
40040	TCSL	Type and input scale selection(TC)	0 (L)	-148℉	1562℉	-100℃	850℃
			1 (L)	-148.0℉	999.9℉	-100.0℃	850.0℃
			2 (J)	-328℉	1652℉	-200℃	900℃
			3 (J)	-199.9℉	999.9℉	-199.9℃	900.0℃
			4 (K)	-328℉	2372℉	-200℃	1300℃
			5 (K)	-199.9℉	999.9℉	-199.9℃	999.9℃
			6 (R)	32℉	3092℉	0℃	1700℃
			7 (R)	32.0℉	999.9℉	0.0℃	999.9℃
			8 (S)	32℉	3092℉	0℃	1700℃
			9 (S)	32.0℉	999.9℉	0.0℃	999.9℃
			10 (T)	-328℉	752℉	-200℃	400℃
			11 (T)	-199.9℉	752.0℉	-199.9℃	400.0℃
			12 (B)	111℉	3272℉	44℃	1800℃
			13 (B)	111.0℉	999.9℉	44.0℃	999.9℃
			14 (E)	-238℉	1292℉	-150℃	700℃
			15 (E)	-199.9℉	999.9℉	-150.0℃	700.0℃
			16 (N)	-328℉	2372℉	-200℃	1300℃
			17 (N)	-199.9℉	999.9℉	-199.9℃	999.9℃
			18 (C)	**32℉**	**3261℉**	**0℃**	**2300℃**
			19 (C)	32.0℉	999.9℉	0.0℃	999.9℃
40064	**unıt**	Unit selection	℃ ℉				
40065	**LoL**	Lower limit of the input range	scale min – upL				
40066	**uPL**	Upper limit of the input range	LoL - scale max (FS = upL – LoL)				
40067	**PuoF**	PV offset	-10 to 10%FS With this function, predetermined value is added to the input reading				
40068	**ıFLt**	Time constant of input filter	0.0 to 900.0 seconds				
40069	**CJnC**	Cold junction compensation	no = Does not perform the RCJ YES = Performs the RCJ				

Process input configuration			***RTD*** **(PT100, JPT100, PTC, NTC)**				
40041	**rtdS**	Type and input scale selection(RTD)	0 (PT100)	-328℉	1202℉	-200℃	650℃
			1 (PT100)	-199.9℉	999.9℉	-199.9℃	650.0℃
40064	**unıt**	Unit selection	℃ ℉				
40065	**LoL**	Lower limit of the input range	scale min – **uPL**				
40066	**uPL**	Upper limit of the input range	**LoL** - scale max				
40067	**PuoF**	PV offset	-10 to 10%FS With this function, predetermined value is added to the input reading				
40068	**ıFLt**	Time constant of input filter	0.0 to 900.0 seconds				

Process input configuration			**(mV,V,mA)**
40042	**uASL**	Type and input scale selection(mA,mV,V)	0 (0...50mV) 1 (0...5V) 2 (0...10V) 3 (0...20mA) 4 (4...20mA)

40043	**dPnt**	Point position	0 9999 1 999.9 2 99.99 3 9.999
40044	**uCAL**	User calibration	0 None 1 Two Point 2 Multi Point
40045	**TpoL**	Two point Low point value	-1999 – 9999
40046	**TpoH**	Two point High point value	-1999 – 9999
40047	**Po00**	Multi point Disp out val 0	-1999 – 9999
40048	**Po01**	Multi point Disp out val 1	-1999 – 9999
40049	**Po02**	Multi point Disp out val 2	-1999 – 9999
40050	**Po03**	Multi point Disp out val 3	-1999 – 9999
40051	**Po04**	Multi point Disp out val 4	-1999 – 9999
40052	**Po05**	Multi point Disp out val 5	-1999 – 9999
40053	**Po06**	Multi point Disp out val 6	-1999 – 9999
40054	**Po07**	Multi point Disp out val 7	-1999 – 9999
40055	**Po08**	Multi point Disp out val 8	-1999 – 9999
40056	**Po09**	Multi point Disp out val 9	-1999 – 9999
40057	**Po10**	Multi point Disp out val 10	-1999 – 9999
40058	**Po11**	Multi point Disp out val 11	-1999 – 9999
40059	**Po12**	Multi point Disp out val 12	-1999 – 9999
40060	**Po13**	Multi point Disp out val 13	-1999 – 9999
40061	**Po14**	Multi point Disp out val 14	-1999 – 9999
40062	**Po15**	Multi point Disp out val 15	-1999 – 9999
40063	**Po16**	Multi point Disp out val 16	-1999 – 9999
40064	**unıt**	Unit selection	℃ ℉ U _ =No unit
40065	**LoL**	Lower limit of the input range	scale min – **uPL**
40066	**uPL**	Upper limit of the input range	LoL - scale max
40067	**PUoF**	PV offset	-10 to 10%FS With this function, predetermined value is added to the input reading
40068	**IFLt**	Time constant of input filter	0.0 to 900.0 seconds

PID control parameters		**Pıd ConF**	
40070	**P-Ht**	Propotional Band for heating	0.0 to 999.9% of the FS
40071	**ı-Ht**	Integral Time for heating	0 to 3600 seconds
40072	**d-Ht**	Derivative Time for heating	0.0 to 999.9 seconds
40073	**Ct-H**	Cycle time of control output(heating)	1 to 150 seconds For contact output: typical 30 second For SSR-driving output: typical 1 to 2 second (if ULSL heating or cooling you can't see this parameter)
40074	**oLLH**	Low output limit (heating)	0.0 to ouLH Not avaiable for double heat/cool action
40075	**ouLH**	High output limit (heating)	oLLH To 100.0
40076	oLtH	Output minimum on time (heating)	0.0 to Ct-H 0.0 is 50 msec (if ULSL heating or cooling you can't see this parameter)
40077	**CCoE**	cooling side proportional band coefficient	0.0 to 100.0 % (P-Ht * CCoE/100=P-CL) if (0.0) no coefficient
40078	**P-CL**	Proportional band for cooling	0.0 to 999.9% of the FS
40079	**ı-CL**	Integral time for cooling	0 to 3600 seconds
40080	**d-CL**	Derivative time for cooling	0.0 to 999.9 seconds
40081	**Ct-C**	Cycle time for control output(cooling)	1 to 150 seconds (Avaiable for dual output only)

			For contact output: typical 30 second For SSR-driving output: typical 1 to 2 second (if ULSL heating or cooling you can't see this parameter)
40082	**oLLC**	Low output limit (cooling)	0.0 to ouLC Not avaiable for double heat/cool action
40083	**ouLC**	High output limit (cooling)	oLLC To 100.0
40084	**oLtC**	Output minimum on time(cooling)	0.0 to Ct-C 0.0 is 50 msec (if ULSL heating or cooling you can't see this parameter)
40085	**Ar**	Anti-reset windup	0 to 100% FS
40086	**SuoF**	SV offset value	-50 to 50 % FS
40087	**PoFS**	pid output offset	if only cooling pid -100.0 to 0 if only heating pid 0.0 to 100.0 if cooling & heating pid -100.0 to 100.0 adding pid output
40088	**PoSS**	pid output offset with set point	if only cooling pid -100.0 to 0 if only heating pid 0.0 to 100.0 if cooling & heating pid -100.0 to 100.0 adding pid output (PoSS * PUAL / FS)
40089	**Strn**	Measured value stable range	1 – max. scale
40090	**o-db**	Proportional band shift(Overlap/Deadband)	-50.0 to 50.0 % FS adding PUAL for cooling control
40091	**Sbou**	Output setting when in sensor break	if only cooling pid -100.0 to 0 if only heating pid 0.0 to 100.0 if cooling & heating pid -100.0 to 100.0

Input/Output Modul –1 configuration [Outputs(Relay,SSR)] ıoP1 ConF				
40092	**out1**	Output function	HEAt	Heating (reverse action)
			cooL	Cooling (direct action)
			Lout	Logic output

Input/Output Modul –1 configuration [Outputs(Relay,SSR)] (Heat or Cool)				
40093	**Con1**	Control action	on.oF	ON/OFF Control
			Pıd	PID Control

Input/Output Modul –1 configuration [Outputs(Relay,SSR)] (ON/OFF control)				
40094	**HYS1**	Hysteresis	0 % 50 FS	
40095	**HYn1**	Hysteresis mode	0	SV+(HYS/2) and SV-(HYS/2)
			1	SV and SV+HYS or SV and SV-HYS
40096	**tm1**	Minimum OFF time	0.0 100.0 sn	

Input/Output Modul –1 configuration [Outputs(Relay,SSR)] (Logic output)				
40097	**Lou1**	Logic output function	0	Alarm output
			1	Manual/Automatic
			2	Sensor break
			3	PV out of range
			4	analog input sensor break
			5	analog input sensor PV out of range

Input/Output Modul –1 alrm sensor type sel [Outputs(Relay,SSR)](Logic out)				
40162	**ALS1**	Alarm sensor selection	0	Process input sensor
			1	Analog modul sensor

Input/Output Modul –1 configuration [Outputs(Relay,SSR)] (Logic out-Alarm)				
40098	**Alt1**	Type	0	Process high alarm
			1	Process low alarm
			2	Deviation high alarm not available if analog in selected
			3	Deviation low alarm not available if analog in selected
			4	Deviation band alarm not available if analog in selected
			5	Deviation range alarm not available if analog in selected
40099	**ALH1**	Alarm hysteresis	if process in selected 0 - %50 FS, if analog in selected 0 - %50 FS2	

Input/Output Modul –1 configuration [Analog Output]				
40100	**oAt1**	Output type	0	0-20 mA
			1	4-20 mA

Input/Output Modul –1 configuration [Analog Output]				
40101	**OuA1**	Function	HEAt	Heating
			cooL	Cooling
			rEtr	Retransmission

Input/Output Modul –1 configuration [Analog Output] (Retransmission)				
40102	**rEt1**	Retransmission Function	rt.Pr	Retransmission of PV
			rt.Er	Retransmission of error
			rt.PU	Retransmission of SV

Input/Output Modul –1 configuration [Logic input]				
40160	**Lin1**	Function	0	Manual / Automatic (when logic input closed, changes Auto program parameter, if man changes to Auto, if Auto changes to man)
			1	Start – Stop the AT (when logic input closed, changes Attn program parameter, if no changes to YES, if YES changes to no)
			2	run / off the ramp (when logic input closed, changes rSSL program parameter, if run or HoLd changes to oFF, if oFF changes to run)
			3	run / hold the ramp (when logic input closed, changes rSSL program parameter, if run changes to HoLd, if HoLd changes to run)

Input/Output Modul –1 configuration [Analog input]			
40130	**ıSL1**	Analog input Modul 1 Input signal selection	TC (L,J,K,R,S,T,B,E,N,C)
			RTD (PT100,JPT100), PTC (900ohm/25℃), NTC (1000ohm/25℃)
			mA, mV, V

Analog input-1 configuration TC (L.J,K,R,S,T,B,E,N,C)							
40131	**TSL1**	Analog input Modul 1 Type and input scale selection(TC)	0 (L)	-148℉	1562℉	-100℃	850℃
			1 (L)	-148.0℉	999.9℉	-100.0℃	850.0℃
			2 (J)	-328℉	1652℉	-200℃	900℃
			3 (J)	-199.9℉	999.9℉	-199.9℃	900.0℃
			4 (K)	-328℉	2372℉	-200℃	1300℃
			5 (K)	-199.9℉	999.9℉	-199.9℃	999.9℃
			6 (R)	32℉	3092℉	0℃	1700℃
			7 (R)	32.0℉	999.9℉	0.0℃	999.9℃
			8 (S)	32℉	3092℉	0℃	1700℃
			9 (S)	32.0℉	999.9℉	0.0℃	999.9℃
			10 (T)	-328℉	752℉	-200℃	400℃
			11 (T)	-199.9℉	752.0℉	-199.9℃	400.0℃
			12 (B)	111℉	3272℉	44℃	1800℃
			13 (B)	111.0℉	999.9℉	44.0℃	999.9℃
			14 (E)	-238℉	1292℉	-150℃	700℃
			15 (E)	-199.9℉	999.9℉	-150.0℃	700.0℃
			16 (N)	-328℉	2372℉	-200℃	1300℃
			17 (N)	-199.9℉	999.9℉	-199.9℃	999.9℃
			18 (C)	32℉	3261℉	0℃	2300℃
			19 (C)	32.0℉	999.9℉	0.0℃	999.9℃
40138	**unt1**	Analog input Modul 1 Unit selection	℃				
			℉				
40139	**LoL1**	Analog input Modul 1 Lower limit of the input range	Second Sensor scale min – upL1				
40140	**UpL1**	Analog input Modul 1 Upper limit of the input range	LoL1 - Second Sensor scale max				
40141	**ıPU1**	Analog input modul 1 PV offset	-10 to 10% (FS1 = upL1 – LoL1) With this function, predetermined value is added to the input reading				
40142	**ıFL1**	Time constant of Analog input modul 1 input filter	0.0 to 900.0 seconds				
40143	**CJn1**	Analog input Modul 1 Cold junction compensation	no = Does not perform the RCJ				
			YES = Performs the RCJ				
40144	**rES1**	Analog input Remote Selection	YES				
			no				

Analog input-1 configuration RTD (PT100, JPT100, PTC, NTC)							
40132	**rtS1**	Analog input Modul 1 Type and input scale selection(RTD)	0	-328℉	1202℉	-200℃	650℃
			1 (PT100)	-199.9℉	999.9℉	-199.9℃	650.0℃
40138	**unt1**	Analog input Modul 1 Unit selection	℃				
			℉				
40139	**LoL1**	Analog input Modul 1 Lower limit of the input range	Second Sensor scale min – UpL1				
40140	**uPL1**	Analog input Modul 1 Upper limit of the input range	LoL1 - Second Sensor scale max				
40141	**ıPU1**	Analog input modul 1 PV offset	-10 to 10% FS1 With this function, predetermined value is added to the input reading				
40142	**ıFL1**	Time constant of Analog input modul 1 input filter	0.0 to 900.0 seconds				
40144	**ReS1**	Analog input Remote Selection	YES				
			no				

Analog input-1 configuration (mV,V,mA)				
40133	**uAS1**	Analog input Modul 1 Type and input scale selection (mA,mV,V)	0 0-20 type	
			1 4-20 type	
40134	**dPn1**	Analog input Modul 1 Point position	0=9999	
			1=999.9	
			2=99.99	
			3=9.999	
40135	**ıCA1**	Analog input Modul 1 User calibration	0	None
			1	Two point
40136	**IcL1**	Analog input Modul 1 Two point Low point value	-1999 – 9999	
40137	**ıCH1**	Analog input Modul 1 Two point High point value	-1999 – 9999	
40138	**unt1**	Analog input Modul 1 Unit selection	℃	
			℉	
			U	
			_ =No unit	
40139	**LoL1**	Analog input Modul 1 Lower limit of the input range	Second Sensor scale min – **UpL1**	
40140	**uPL1**	Analog input Modul 1 Upper limit of the input range	LoL1 - Second Sensor scale max	
40141	**ıPU1**	Analog input modul 1 PV offset	-10 to 10% **FS1** With this function, predetermined value is added to the input reading	
40142	**IFL1**	Time constant of Analog input modul 1 input filter	0.0 to 900.0 seconds	
40144	**rES1**	Analog input Remote Selection	YES	
			no	

Input/Output Modul –2 configuration [Outputs(Relay,SSR)] ıoP2 ConF				
40103	**out2**	Output function	HEAt	Heating (reverse action)
			cooL	Cooling (direct action)
			Lout	Logic output

Input/Output Modul –2 configuration [Outputs(Relay,SSR)] (Heat or Cool)				
40104	**Con2**	Control action	on.oF	ON/OFF Control
			Pıd	PID Control

Input/Output Modul –2 configuration [Outputs(Relay,SSR)] (ON/OFF control)				
40105	**HYS2**	Hysteresis	0 % 50 FS	
40106	**HYn2**	Hysteresis mode	0	SV+(HYS/2) and SV-(HYS/2)
			1	SV and SV+HYS or SV and SV-HYS
40107	**tm2**	Minimum OFF time	0.0 100.0 sn	

Input/Output Modul –2 configuration [Outputs(Relay,SSR)] (Logic output)				
40108	**Lou2**	Logic output function	0	Alarm output
			1	Manual/Automatic
			2	Sensor break
			3	PV out of range
			4	analog input sensor break
			5	analog input sensor PV out of range

Input/Output Modul –2 alrm sensor type sel [Outputs(Relay,SSR)](Logic out)				
40163	**ALS2**	Alarm sensor selection	0	Process input sensor
			1	Analog modul sensor

Input/Output Modul –2 configuration [Outputs(Relay,SSR)] (Logic out-Alarm)				
40109	**Alt2**	Type	0	Process high alarm
			1	Process low alarm
			2	Deviation high alarm not available if analog in selected
			3	Deviation low alarm not available if analog in selected
			4	Deviation band alarm not available if analog in selected
			5	Deviation range alarm not available if analog in selected
40110	**ALH2**	Alarm hysteresis	if process in selected 0 - %50 FS, if analog in selected 0 - %50 FS1	

Input/Output Modul –2 configuration [Analog Output]				
40111	**oAt2**	Output type	0	0-20 mA
			1	4-20 mA

Input/Output Modul –2 configuration [Analog Output]				
40112	**OuA2**	Function	HEAt	Heating
			cooL	Cooling
			rEtr	Retransmission

Input/Output Modul –2 configuration [Analog Output] (Retransmission)				
40113	**Ret2**	Retransmission Function	rt.Pr	Retransmission of PV
			rt.Er	Retransmission of error
			rt.PU	Retransmission of SV

Input/Output Modul –2 configuration [Logic input]				
40161	**Lin2**	Function	0	Manual / Automatic (when logic input closed, changes Auto program parameter, if man changes to Auto, if Auto changes to man)
			1	Start – Stop the AT (when logic input closed, changes Attn program parameter, if no changes to YES,
			2	run / off the ramp (when logic input closed, changes RssL program parameter, if run or HoLd changes
			3	run / hold the ramp (when logic input closed, changes rSSL program parameter, if run changes to HoLd, if HoLd changes to run)

Input/Output Modul –2 configuration [Analog input]			
40145	**ıSL2**	Analog input Modul 2 Input signal selection	TC (L,J,K,R,S,T,B,E,N,C)
			RTD (PT100,JPT100), PTC (900ohm/25℃), NTC (1000ohm/25℃)
			mA, mV, V

Analog input-2 configuration TC (L.J,K,R,S,T,B,E,N,C)							
40146	**TSL2**	Analog input Modul 2 Type and input scale selection(TC)	0 (L)	-148℉	1562℉	-100℃	850℃
			1 (L)	-148.0℉	999.9℉	-100.0℃	850.0℃
			2 (J)	-328℉	1652℉	-200℃	900℃
			3 (J)	-199.9℉	999.9℉	-199.9℃	900.0℃
			4 (K)	-328℉	2372℉	-200℃	1300℃
			5 (K)	-199.9℉	999.9℉	-199.9℃	999.9℃
			6 (R)	32℉	3092℉	0℃	1700℃
			7 (R)	32.0℉	999.9℉	0.0℃	999.9℃

			8 (S)	32℉	3092℉	0℃	1700℃
			9 (S)	32.0℉	999.9℉	0.0℃	999.9℃
			10 (T)	-328℉	752℉	-200℃	400℃
			11 (T)	-199.9℉	752.0℉	-199.9℃	400.0℃
			12 (B)	111℉	3272℉	44℃	1800℃
			13 (B)	111.0℉	999.9℉	44.0℃	999.9℃
			14 (E)	-238℉	1292℉	-150℃	700℃
			15 (E)	-199.9℉	999.9℉	-150.0℃	700.0℃
			16 (N)	-328℉	2372℉	-200℃	1300℃
			17 (N)	-199.9℉	999.9℉	-199.9℃	999.9℃
			18 (C)	32℉	3261℉	0℃	2300℃
			19 (C)	32.0℉	999.9℉	0.0℃	999.9℃
40153	**unt2**	Analog input Modul 2 Unit selection	℃				
			℉				
40154	**LoL2**	Analog input Modul 2 Lower limit of the input range	Second Sensor scale min – upL2				
40155	**UpL2**	Analog input Modul 2 Upper limit of the input range	LoL2 - Second Sensor scale max				
40156	**ıPU2**	Analog input modul 2 PV offset	-10 to 10% FS2 (FS2 = upL2 – LoL2) With this function, predetermined value is added to the input reading				
40157	**ıFL2**	Time constant of Analog input modul 2 input filter	0.0 to 900.0 seconds				
40158	**CJn2**	Analog input Modul 2 Cold junction compensation	no = Does not perform the RCJ				
			YES = Performs the RCJ				
40159	**rES2**	Analog input 2 Remote Selection	YES				
			no				

Analog input-2 configuration RTD (PT100, JPT100, PTC, NTC)							
40147	**rtS2**	Analog input Modul 2 Type and input scale selection(RTD)	0 (PT100)	-328℉	1202℉	-200℃	650℃
			1 (PT100)	-199.9℉	999.9℉	-199.9℃	650.0℃
40153	**unt2**	Analog input Modul 2 Unit selection	℃				
			℉				
40154	**LoL2**	Analog input Modul 2 Lower limit of the input range	Second Sensor scale min – UpL2				
40155	**uPL2**	Analog input Modul 2 Upper limit of the input range	LoL2 - Second Sensor scale max				
40156	**ıPU2**	Analog input modul 2 PV offset	-10 to 10% FS2 With this function, predetermined value is added to the input reading				
40157	**ıFL2**	Time constant of Analog input modul 2 input filter	0.0 to 900.0 seconds				
40159	**rES2**	Analog input 2 Remote Selection	YES				
			no				

Analog input-2 configuration (mV,V,mA)				
40148	**uAS2**	Analog input Modul 2 Type and input scale selection (mA,mV,V)	0 0-20 type	
			1 4-20 type	
40149	**dPn2**	Analog input Modul 2 Point position	0 = 9999	
			1 = 999.9	
			2 = 99.99	
			3 = 9.999	
40150	**ıCA2**	Analog input Modul 2 User calibration	0	None
			1	Two point
40151	**IcL2**	Analog input Modul 2 Two point Low point value	-1999 – 9999	

40152	**ıCH2**	Analog input Modul 2 Two point High point value	-1999 – 9999
40153	**unt2**	Analog input Modul 2 Unit selection	℃
			℉
			U
			_ =No unit
40154	**LoL2**	Analog input Modul 2 Lower limit of the input range	Second Sensor scale min – UpL2
40155	**uPL2**	Analog input Modul 2 Upper limit of the input range	LoL2 - Second Sensor scale max
40156	**ıPU2**	Analog input modul 2 PV offset	-10 to 10% FS2 With this function, predetermined value is added to the input reading
40157	**IFL2**	Time constant of Analog input modul 2 input filter	0.0 to 900.0 seconds
40159	**rES2**	Analog input 2 Remote Selection	YES
			no

Output –3 configuration [Relay] out3 ConF				
40114	**out3**	Output function	HEAt	Heating (reverse action)
			cooL	Cooling (direct action)
			Lout	Logic output

Output –3 configuration [Relay] (Heating or Cooling)				
40115	**Con3**	Control action	on.oF	ON/OFF Control
			Pıd	PID Control

Output –3 configuration [Relay] (ON/OFF control)				
40116	**HYS3**	Hysteresis	0 % 50 FS	
40117	**HYn3**	Hysteresis mode	0	SV+(HYS/2) and SV-(HYS/2)
			1	SV and SV+HYS or SV and SV-HYS
40118	**tm3**	Minimum OFF time	0.0 100.0 sn	

Output –3 configuration [Relay] (Logic output)				
40119	**Lou3**	Logic output function	0	Alarm output
			1	Manual/Automatic
			2	Sensor break
			3	PV out of range
			4	analog input sensor break
			5	analog input sensor PV out of range

Input/Output Modul –3 alrm sensor type sel [Outputs(Relay,SSR)](Logic output)				
40164	**ALS3**	Alarm sensor selection	0	Process input sensor
			1	Analog modul sensor
Output –3 configuration [Relay] (Logic output-Alarm)				
40120	**Alt3**	Type	0	Process high alarm
			1	Process low alarm
			2	Deviation high alarm not available if analog in selected
			3	Deviation low alarm not available if analog in selected
			4	Deviation band alarm not available if analog in selected
			5	Deviation range alarm not available if analog in selected
40121	**ALH3**	Alarm hysteresis	if process in selected 0 - %50 FS, if analog in selected 0 - %50 FS1 or 0 - %50 FS2 (which analog input modul is available)	

General		**GEnn ConF**	
40122	**SU-L**	SV lower limiter	Scale min to SU-u These parameter set the setting range low limit of the SV
40123	**SU-u**	SV upper limiter	SU-L to Scale max These parameters set the setting range high limit of the SV

40165	**SUL2**	Second Sensor SV lower limiter	Second Sensor Scale min to SUu2 These parameter set the setting range low lim of the AUL1,AUL2 and AUL3
40166	**SUu2**	Second Sensor SV upper limiter	SUL2 to Second Sensor Scale max These parameter set the setting range high lim of the AUL1,AUL2 and AUL3
40168	**ULtt**	motor travel time	15 - 600 sec(if ULSL no you can't see this parameter)
40169	**ULHY**	minimum output step	0.1 – 5.0 % (if ULSL no you can't see this parameter)

Communication Com ConF			
40124	**Sadr**	Slave address	1-247
40125	**bAud**	Baud rate	0 = 1200 1 = 2400 2 = 4800 3 = 9600 4 = 19200
40126	**Prty**	Parity	0 = none 1 = odd 2 = even
40127	**Stpb**	Stop bit	0 = 1 stop bit 1 = 2 stop bits

Password PASS ConF			
40128	**oPPS**	Operator password	0 – 9999 0 no operator password protection enter 0 in the operator password input mode for only look operator parameters
40129	**tCPS**	Technician password	0 – 9999 0 no technician password protection enter 0 in the technician password input mode for only look technician parameters

Read Input Register Command (3XXXX)
Input registers can not be changed by the user. Input registers can be only read.

Address	**Parameter Name**	**Parameter Description**
30001	**Process Variable**	If input type is tc or pt ; if tc or pt is even number, it hasn't got a point ; if tc or pt is odd number, it has a

		point If other is selected, point is determined by the parameter dpnt range= -1999 - 9999
30002	**Output Power**	-100.0 to 100.0
30003	**Set Value**	**SU-L – SU-h**
30004	**Modul Types**	Reading Value XXYY XX = Modul1 Type YY = Modul2 Type Moduls Present in the ESM-XX50 Relay Out Modul = 00000000 SSR Out Modul = 00001000 Analog Out Modul = 00000100 Logic Input Modul = 00001100 Current in Modul = 00000010 2. Sensor in Modul =00001010 No Modul =00001110
30005	**Analog Output Modul-1**	0 to 60000
30006	**Analog Output Modul-2**	0 to 60000
30007	**Leds**	Reading Value XXYY for ESM-7750 OR ESM-9950 XX-bit 0 – remote led XX-bit 1 – auto led XX-bit 2 – man led XX-bit 3 – ramp led XX-bit 4 – XX-bit 5 – at led XX-bit 6 – XX-bit 7 – sv led YY-bit 0 – op3 led YY-bit 1 – v led YY-bit 2 – op1 led YY-bit 3 – op2 led YY-bit 4 – YY-bit 5 – f led YY-bit 6 – c led YY-bit 7 – for ESM-4450 XX-bit 0 – f led XX-bit 1 – c led XX-bit 2 – XX-bit 3 – XX-bit 4 – auto led XX-bit 5 – XX-bit 6 – XX-bit 7 – man led YY-bit 0 – remote led YY-bit 1 – op3 led YY-bit 2 – op2 led YY-bit 3 – sv led YY-bit 4 – ramp led YY-bit 5 – op1 led YY-bit 6 – at led YY-bit 7 – v led
30008	**Errors**	Reading Value XXYY XX=0 YY=Errors bit 0 – sensor break bit 1 – reading value overflow from Upl bit 2 – reading value underflow from LoL bit 3 – tuning can't ended before 8 hours bit 4 – reading heater current value exceeded current set value bit 5 – reading value overflow from uPL1 or uPL2 bit 6 – reading value underflow from LoL1 or LoL2 bit 7 – second sensor, sensor break
30009	**Decimal Point Selection**	0 = XXXX 1 = XXX.X 2 = XX.XX

		3 = X.XXX
30010	**Ramp-Soak**	Reading Value XXYY XX = 0 YY = Ramp Soak Type bit 0 – ramp-soak number bit0 bit 1 – ramp-soak number bit1 bit 2 – ramp-soak number bit2 bit 3 – ramp-soak number bit3 bit 4 – 0 bit 5 – ramp-soak holding bit 6 – first energy on ramp working bit 7 – if set soak else ramp working example: 00001000 --> 8. ramp working 00101000 --> 8. ramp holding 10001000 --> 8. soak working 10101000 --> 8. soak holding 01000000 --> 8. first energy on ramp working 01100000 --> 8. first energy on ramp holding
30011	**Second Sensor Variable**	If input type is tc or pt ; if tc or pt is 2*k, it hasn't got a point ; if tc or pt is 2*k+1, it has a point If other is selected, point is determined by the parameter (dpn1 or dpn2 parameters. range= -1999 – 9999
3 0012	**Top Display Selection**	0 = process value display (decimal point dpnt) 1 = (set value – process value) dispaly (decimal point dpnt) 2 = second sensor process value display (decimal point dpn1 or dpn2 which sensor is available)
30013	**Bottom Display Selection**	0 = set value display (decimal point dpnt) 1 = output % power display 2 = ramp&soak display
30014	**Second Sensor Decimal Point Selection**	0 = XXXX 1 = XXX.X 2 = XX.XX 3 = X.XXX
30015	**Instrument Type & Revision No**	Reading Value XXYY XX = Instrument Type 4 = ESM-4450 5 = ESM-7750 6 = ESM-9950 YY = Revision Number
30016	**out1 Relay or SSR Output1 Function**	0 = heat 1 = cool 2 = logic out
30017	**Con1 Output1 Control Action**	0 = on.Of 1 = Pid
30018	**ouA1 Analog Output1 Function**	0 = heat 1 = cool 2 = retransmission
30019	**out2 Relay or SSR Output1 Function**	0 = heat 1 = cool 2 = logic out
30020	**Con2 Output1 Control Action**	0 = on.Of 1 = Pid
30021	**ouA2 Analog Output1 Function**	0 = heat, 1 = cool, 2 = retransmission
30022	**out3 Relay or SSR Output1 Function**	0 = heat, 1 = cool, 2 = logic out
30023	**Con3 Output1 Control Action**	0 = on.Of, 1 = Pid

After power up revision number of the device is seen at the top display. At the bottom display, first two digit implements the ouput type that is connected to the first modul. Second two digit implements the output type that is connected to the second modul.

For SSR output type : oS
For Relay output type : or
For analog output type : oA
For analog input type : iA
For digital input type : id
If modul is empty : E

6. ESM-XX00 Parameters List

Read Holding Register Command (4XXXX)
Holding registers can be read and written.

ALARM SET			
40001	**AUL1**	Alarm-1 SV	SU-L - SU-u
40002	**AUL2**	Alarm-2 SV	SU-L - SU-u
40003	**AUL3**	Alarm-3 SV	SU-L - SU-u

Technician parameters

Process input configuration **PınP ConF**

40004	**Issl**	Input signal selection	TC (L,J,K,R,S,T,B,E,N,C)
			RTD (PT100,JPT100), PTC (900ohm/25℃), NTC (1000ohm/25℃)
			mA, mV, V

Process input configuration			**TC (L.J,K,R,S,T,B,E,N,C)**				
40005	**TCSL**	Type and input scale selection(TC)	0 (L)	-148℉	1562℉	-100℃	850℃
			1 (L)	-148.0℉	999.9℉	-100.0℃	850.0℃
			2 (J)	-328℉	1652℉	-200℃	900℃
			3 (J)	-199.9℉	999.9℉	-199.9℃	900.0℃
			4 (K)	-328℉	2372℉	-200℃	1300℃
			5 (K)	-199.9℉	999.9℉	-199.9℃	999.9℃
			6 (R)	32℉	3092℉	0℃	1700℃
			7 (R)	32.0℉	999.9℉	0.0℃	999.9℃
			8 (S)	32℉	3092℉	0℃	1700℃
			9 (S)	32.0℉	999.9℉	0.0℃	999.9℃
			10 (T)	-328℉	752℉	-200℃	400℃
			11 (T)	-199.9℉	752.0℉	-199.9℃	400.0℃
			12 (B)	111℉	3272℉	44℃	1800℃
			13 (B)	111.0℉	999.9℉	44.0℃	999.9℃
			14 (E)	-238℉	1292℉	-150℃	700℃
			15 (E)	-199.9℉	999.9℉	-150.0℃	700.0℃
			16 (N)	-328℉	2372℉	-200℃	1300℃
			17 (N)	-199.9℉	999.9℉	-199.9℃	999.9℃
			18 (C)	32℉	3261℉	0℃	2300℃
			19 (C)	32.0℉	999.9℉	0.0℃	999.9℃
40029	**unIt**	Unit selection	℃				
			℉				
40030	**LoL**	Lower limit of the input range	scale min – upL (if reading value < upL display blink with reading value & uuuu)				
40031	**uPL**	Upper limit of the input range	LoL - scale max (FS = upL – LoL) (if reading value > LoL display blink with reading value & nnnn)				
40032	**PuoF**	PV offset	-10 to 10%FS With this function, predetermined value is added to the input reading				
40033	**IFLt**	Time constant of input filter	0.0 to 600.0 seconds				
40034	**CJnC**	Cold junction compensation	no = Does not perform the RCJ				
			YES = Performs the RCJ				

Process input configuration			***RTD*** **(PT100, JPT100, PTC, NTC)**				
40006	**rtdS**	Type and input scale selection(RTD)	0 (PT100)	-328℉	1202℉	-200℃	650℃
			1 (PT100)	-199.9℉	999.9℉	-199.9℃	650.0℃
40029	**unIt**	Unit selection	℃				
			℉				
40030	**LoL**	Lower limit of the input range	scale min – upL (if reading value < upL display blink with reading value & uuuu)				
40031	**uPL**	Upper limit of the input range	LoL - scale max **(FS = upL – LoL)** (if reading value > LoL display blink with reading value & nnnn)				
40032	**PuoF**	PV offset	-10 to 10%FS With this function, predetermined value is added to the input reading				
40033	**IFLt**	Time constant of input filter	0.0 to 600.0 seconds				

Process input configuration			**(mV,V,mA)**
40007	**uASL**	Type and input scale selection(mA,mV,V)	0 (0...50mV)
			1 (0...5V)
			2 (0...10V)
			3 (0...20mA)
			4 (4...20mA)
40008	**Dpnt**	Point position	0=9999
			1=999.9
			2=99.99
			3=9.999
40009	**uCAL**	User calibration	0 None
			1 Two Point
			2 Multi Point
40010	**TpoL**	Two point Low point value	-1999 – 9999
40011	**TpoH**	Two point High point value	-1999 – 9999

40012	**Po00**	Multi point Disp out val 0	-1999 – 9999
40013	**Po01**	Multi point Disp out val 1	-1999 – 9999
40014	**Po02**	Multi point Disp out val 2	-1999 – 9999
40015	**Po03**	Multi point Disp out val 3	-1999 – 9999
40016	**Po04**	Multi point Disp out val 4	-1999 – 9999
40017	**Po05**	Multi point Disp out val 5	-1999 – 9999
40018	**Po06**	Multi point Disp out val 6	-1999 – 9999
40019	**Po07**	Multi point Disp out val 7	-1999 – 9999
40020	**Po08**	Multi point Disp out val 8	-1999 – 9999
40021	**Po09**	Multi point Disp out val 9	-1999 – 9999
40022	**Po10**	Multi point Disp out val 10	-1999 – 9999
40023	**Po11**	Multi point Disp out val 11	-1999 – 9999
40024	**Po12**	Multi point Disp out val 12	-1999 – 9999
40025	**Po13**	Multi point Disp out val 13	-1999 – 9999
40026	**Po14**	Multi point Disp out val 14	-1999 – 9999
40027	**Po15**	Multi point Disp out val 15	-1999 – 9999
40028	**Po16**	Multi point Disp out val 16	-1999 – 9999
40029	**unıt**	Unit selection	℃ ℉ U _ =No unit
40030	**LoL**	Lower limit of the input range	scale min – upL (if reading value < upL display blink with reading value & uuuu)
40031	**uPL**	Upper limit of the input range	LoL - scale max **(FS = upL – LoL)** (if reading value > LoL display blink with reading value & nnnn)
40032	**PUoF**	PV offset	-10 to 10%FS With this function, predetermined value is added to the input reading
40033	**IFLt**	Time constant of input filter	0.0 to 600.0 seconds

Input/Output Modul –1 configuration [Outputs(Relay,SSR)] out1 ConF				
40035	**Lou1**	Logic output function	0	Alarm output
			1	Sensor break
			2	PV out of range

Output Modul –1 configuration [Outputs(Relay,SSR)] (Logic output-Alarm)				
40036	**Alt1**	Type	0	Process high alarm
			1	Process low alarm
40037	**ALH1**	Alarm hysteresis	0 - %50 FS	

Output Modul –1 configuration [PROCESS VALUE Analog Output]				
40038	**oAt1**	Output type	0	0-20 Ma
			1	4-20 mA

Output Modul –2 configuration [Outputs(Relay,SSR)] out2 ConF				
40039	**Lou2**	Logic output function	0	Alarm output
			1	Sensor break
			2	PV out of range

Output Modul –2 configuration [Outputs(Relay,SSR)] (Logic output-Alarm)				
40040	**Alt2**	Type	0	Process high alarm
			1	Process low alarm
40041	**ALH2**	Alarm hysteresis	0 - %50 FS	

Output Modul –2 configuration [PROCESS VALUE Analog Output]				
40042	**oAt2**	Output type	0	0-20 Ma
			1	4-20 mA

Output –3 configuration [Relay] out3 ConF				
40043	**Lou3**	Logic output function	0	Alarm output
			1	Sensor break
			2	PV out of range

Output –3 configuration [Relay] (Logic output-Alarm)				
40044	**Alt3**	Type	0	Process high alarm
			1	Process low alarm
40045	**ALH3**	Alarm hysteresis	0 - %50 FS	

General Genn ConF			
40046	**SU-L**	SV lower limiter	Scale min to SU-u These parameter set the setting range low limit of the SV
40047	**SU-u**	SV upper limiter	SU-L to Scale max These parameters set the setting range high limit of the SV

Communication Com ConF			
40048	**Sadr**	Slave address	1-247
40049	**bAud**	Baud rate	0=1200 1=2400 2=4800 3=9600 4=19200
40050	**Prty**	Parity	0=none 1=odd 2=even
40051	**Stpb**	Stop bit	0=1 stop bit 1=2 stop bits

Password PASS ConF			
40052	**tCPS**	Technician password	0 – 9999 0 no technician password protection enter 0 in the technician password input mode for only look technician parameters

Read Input Register Command (3XXXX)

Input registers can not be changed by the user. Input registers can be only read.

Address	Parameter Name	Parameter Description
30001	**Process Variable**	If input type is tc or pt ; if tc or pt is even number, it hasn't got a point ; if tc or pt is odd number, it has a point If other is selected, point is determined ny the parameter dpnt range= -1999 - 9999
30004	**Modul Types**	Reading Value XXYY XX = Modul1 Type, YY = Modul2 Type Moduls Present in the ESM-XX00 Relay Out Modul = 00000000 SSR Out Modul = 00001000 Analog Out Modul = 00000100 No Modul = 00001110
30005	**Analog Output Modul 1**	0 to 60000
30006	**Analog Output Modul 2**	0 to 60000

30007	**Leds**	Reading Value XXYY for ESM-7700 OR ESM-9900 YY-bit 0 – op3 led YY-bit 1 – v led YY-bit 2 – op1 led YY-bit 3 – op2 led YY-bit 5 – f led YY-bit 6 – c led for ESM-4400 XX-bit 0 – f led XX-bit 1 – c led YY-bit 1 – op3 led YY-bit 2 – op2 led YY-bit 5 – op1 led YY-bit 7 – v led
30008	**Errors**	Reading Value XXYY XX = 0 YY = Errors bit 0 – sensor break bit 1 – reading value overflow from **uPL** bit 2 – reading value underflow from **LoL**
30009	**Decimal Point Selection**	0 = XXXX 1 = XXX.X 2 = XX.XX 3 = X.XXX
30015	**Instrument Type & Revision No**	Reading Value XXYY XX = Instrument Type 7 = ESM-4400 8 = ESM-7700 9 = ESM-9900 YY = Revision Number

When power up revision number is shown on the display, then output type of modul1 is shown in first two digit and output type of modul2 is shown in second two digit .

For SSR output type : oS
For Relay output type : or
For analog output type : oA
If the modul is empty : E

7. EZM-XX50 Parameters List

Read Input Register Command (3XXXX)
Input registers can not be changed by the user. Input registers can be only read.

Address	Parameter Name	Range
30001	Preset Active Value Signed	0-1
30002	Preset Active Value High	0-1
30003	Preset Active Value Low	0-65535
30004	Batch Active Value High	0-1
30005	Batch Active Value Low	0-65535
30006	NPN / PNP Seçimi	0-1
30007	Fonksiyon Seçimi	1-5
30008	Out1 Durumu	0-1
30009	Out2 Durumu	0-1

Address	Parameter Name	Range
30010	SSR1 Durumu	0-1
30011	SSR2 Durumu	0-1
30012	Total Active Value High	0-232
30013	Total Active Value	0-65535
30014	Total Active Value Low	0-65535
30015	EZM Slave Code	0-65535
30016	Display Decimal Point	0-4
30017	Set Point-1 High	0-1
30018	Set Point-1 Low	1-65535
30019	Set Point-2 High	0-1
30020	Set Point-2 Low	1-65535

Read Holding Register Command (4XXXX)
Holding registers can be read and written.

Address	Parameter Name	Range
40001	Input Type and Function	0-7
40002	Functions	0-2
40003	Measurement Type	0-1
40004	Contact Bounce Protection Time	0-250
40005	Time Base	0-6
40006	Output Function	0-7
40007	Input Signal Timeout	1-10
40008	MT Time	0-99.9
40009	Out1 Function	0-2
40010	Out2 Function	0-1
40011	Out1 Alarm Function	0-4
40012	Output-1 Hysteresis	0-50000
40013	Output-2 Hysteresis	0-50000
40014	Out1 Action	0-1
40015	Out2 Action	0-1
40016	Out1 Pulse Time	0-99.99
40017	Out2 Pulse Time	0-99.99
40018	Control On Mode	0-3
40019	Direction of CV	0-1
40020	Display Decimal Point	0-4
40021	Power On Reset	0-1
40022	Set Offset	0-1
40023	Slave ID	1-247
40024	Modbus Communication Type	0-1
40025	Parity Checking	0-2
40026	Baud Rate Speed	0-4
40027	Stop Bit	0-1
40028	Reset&Preset Protection	0-5
40029	Multiplication Factor-1	1-9999
40030	Multiplication Factor-2 High	0-1
40031	Multiplication Factor-2 Low	1-65535
40032	Set Point-1 High	0-1
40033	Set Point-1 Low	1-65535
40034	Set Point-2 High	0-1
40035	Set Point-2 Low	1-65535
40036	Reset Button	0-1
40037	Password	0-9999