

Operating Manual

Multi-Function Transducer



MULTIFUNCTION TRANSDUCER

Installation & Operating Instructions

Section	Contents
1.	Introduction
2.	Programming 2.1 Programming via micro USB port available at front of Transducer using USB cable 2.2 Programming via optional RS485(MODBUS) communication port
3.	USB/RS485(ModBus) 3.1 Accessing 3X & 4X registers for Reading Measured Values 3.2 Accessing 4X registers for Reading & Writing 3.3 Accessing 4X registers for Long Energy Reading & Writing
4.	Energy Calculations 4.1 Calculating ModBus Energy 4.2 Entering Energy Start Count
5.	Relay Output 5.1 Pulse Output 5.1.1 Energy Pulse Rate Divisor 5.2 Limit Output 5.3 Timer Output
6.	Phasor Diagram
7.	Installation 7.1 EMC Installation Requirement 7.2 Case Dimensions

- 7.3 Wiring
 - 7.4 Auxiliary Supply
 - 7.5 Fusing
 - 7.6 Earth/Ground Connections
- 8. Connection Diagrams
- 9. Specifications

1. Introduction

Multi Function transducer is used to measure and convert parameters of a single-phase or three-phase AC system with unbalanced & balanced load into a proportional load independent DC current or DC voltage output signal. It also provide digital output which can be configured for energy pulse output or limit output or timer output.



Transducer can be configured and programmed on site for the following :
PT Primary, PT Secondary, CT Primary, CT Secondary, Input Characteristics(i.e start, end and elbow value of Input) and

Output Characteristics (i.e Voltage or Current and start, end and elbow Value of outputs.)

1.1 LED Indication

ON LED	Aux. Supply Healthy Condition	Green LED Continuos ON
	Supply from USB	Red LED Continuos ON
AL - 1	Alarm 1 trigger Condition not occur	Green LED Continuos ON
	Alarm 1 trigger Condition occurred	Red LED Continuos ON
AL - 2	Alarm 2 trigger Condition not occur	Green LED Continuos ON
	Alarm 2 trigger Condition occurred	Red LED Continuos ON
AL - 3	Alarm 3 trigger Condition not occur	Green LED Continuos ON
	Alarm 3 trigger Condition occurred	Red LED Continuos ON
AL - 4	Alarm 4 trigger Condition not occur	Green LED Continuos ON
	Alarm 4 trigger Condition occurred	Red LED Continuos ON
Impulse LED	Energy monitoring and measurement	Red LED Blinking as per energy

Table 1: Measured Parameters

SR. No	Parameters	3P4W UNBL	3P3W UNBL	1PH 2W	3P4W BAL	3P3W BAL	3P3W U12I1	3P3W U23I1	3P3W U31I1
1	System Voltage	✓	✓	✓	✓	✓	✓	✓	✓
2	Per Phase (L1,L2,L3) Voltage	✓	✗	✗	✗	✗	✗	✗	✗
3	Phase to Phase(L12,L23,L31) Voltage	✓	✓	✗	✗	✗	✗	✗	✗
4	System Current	✓	✓	✓	✓	✓	✓	✓	✓
5	Per Phase (L1,L2,L3) Current	✓	✗	✗	✗	✗	✗	✗	✗
6	System Active Power	✓	✓	✓	✓	✓	✓	✓	✓
7	System Re-active Power	✓	✓	✓	✓	✓	✓	✓	✓
8	System Apparent Power	✓	✓	✓	✓	✓	✓	✓	✓
9	Per Phase (L1,L2,L3) Active Power	✓	✗	✗	✗	✗	✗	✗	✗
10	Per Phase (L1,L2,L3) Re-active Power	✓	✗	✗	✗	✗	✗	✗	✗
11	Per Phase (L1,L2,L3) Apparent Power	✓	✗	✗	✗	✗	✗	✗	✗
12	System Current Demand	✓	✓	✓	✓	✓	✓	✓	✓
13	System kVA Demand	✓	✓	✓	✓	✓	✓	✓	✓
14	System Import kW Demand	✓	✓	✓	✓	✓	✓	✓	✓
15	System Export kW Demand	✓	✓	✓	✓	✓	✓	✓	✓
16	System Ind. Var Demand	✓	✓	✓	✓	✓	✓	✓	✓
17	System Cap. Var Demand	✓	✓	✓	✓	✓	✓	✓	✓
18	System Max kVA Demand	✓	✓	✓	✓	✓	✓	✓	✓
19	System Max Imp kW Demand	✓	✓	✓	✓	✓	✓	✓	✓
20	System Max Exp kW Demand	✓	✓	✓	✓	✓	✓	✓	✓
21	System Max Ind Var Demand	✓	✓	✓	✓	✓	✓	✓	✓
22	System Max Cap Var Demand	✓	✓	✓	✓	✓	✓	✓	✓
23	System Max Current Demand	✓	✓	✓	✓	✓	✓	✓	✓
24	Per Phase (L1,L2,L3) Current Demand	✓	✗	✗	✗	✗	✗	✗	✗
25	Per Phase (L1,L2,L3) kVA Demand	✓	✗	✗	✗	✗	✗	✗	✗
26	Per Phase (L1,L2,L3) Import kW Demand	✓	✗	✗	✗	✗	✗	✗	✗
27	Per Phase (L1,L2,L3) Export kW Demand	✓	✗	✗	✗	✗	✗	✗	✗

Table 1: Continued...

SR. No	Parameters	3P4W UNBL	3P3W UNBL	1PH 2W	3P4W BAL	3P3W BAL	3P3W U1211	3P3W U2311	3P3W U3111
28	Per Phase (L1,L2,L3) Inductive Var Demand	✓	✗	✗	✗	✗	✗	✗	✗
29	Per Phase (L1,L2,L3) Capacitive Var Demand	✓	✗	✗	✗	✗	✗	✗	✗
30	Per Phase (L1,L2,L3) Max kVA Demand	✓	✗	✗	✗	✗	✗	✗	✗
31	Per Phase (L1,L2,L3) Max Import kW Demand	✓	✗	✗	✗	✗	✗	✗	✗
32	Per Phase (L1,L2,L3) Max Export kW Demand	✓	✗	✗	✗	✗	✗	✗	✗
33	Per Phase (L1,L2,L3) Max Ind Var Demand	✓	✗	✗	✗	✗	✗	✗	✗
34	Per Phase (L1,L2,L3) Max Cap Var Demand	✓	✗	✗	✗	✗	✗	✗	✗
35	Per Phase (L1,L2,L3) Max Current Demand	✓	✗	✗	✗	✗	✗	✗	✗
36	System Power Factor	✓	✓	✓	✓	✓	✓	✓	✓
37	Per Phase (L1,L2,L3) Power Factor	✓	✗	✗	✗	✗	✗	✗	✗
38	System Phase Angle	✓	✓	✓	✓	✓	✓	✓	✓
39	Per Phase (L1,L2,L3) Phase Angle	✓	✗	✗	✗	✗	✗	✗	✗
40	Frequency	✓	✓	✓	✓	✓	✓	✓	✓
41	RPM	✓	✓	✓	✓	✓	✓	✓	✓
42	System Import Active Energy	✓	✓	✓	✓	✓	✓	✓	✓
43	System Export Active Energy	✓	✓	✓	✓	✓	✓	✓	✓
44	System Ind Reactive Energy	✓	✓	✓	✓	✓	✓	✓	✓
45	System Cap Reactive Energy	✓	✓	✓	✓	✓	✓	✓	✓
46	System Apparent Energy	✓	✓	✓	✓	✓	✓	✓	✓
47	Per Phase (L1,L2,L3) Import Active Energy	✓	✗	✗	✗	✗	✗	✗	✗
48	Per Phase (L1,L2,L3) Export Active Energy	✓	✗	✗	✗	✗	✗	✗	✗
49	Per Phase (L1,L2,L3) Inductive Reactive Energy	✓	✗	✗	✗	✗	✗	✗	✗
50	Per Phase (L1,L2,L3) Capacitive Reactive Energy	✓	✗	✗	✗	✗	✗	✗	✗

Table 1: Continued...

SR. No	Parameters	3P4W UNBL	3P3W UNBL	1PH 2W	3P4W BAL	3P3W BAL	3P3W U12I1	3P3W U23I1	3P3W U31I1
51	Per Phase (L1, L2, L3) Apparent Energy	✓	✗	✗	✗	✗	✗	✗	✗
52	Neutral Current	✓	✗	✗	✗	✗	✗	✗	✗
53	System Voltage THD	✓	✓	✓	✓	✓	✓	✓	✓
54	Per Phase (L1, L2, L3) Voltage THD	✓	✗	✗	✗	✗	✗	✗	✗
55	System Current THD	✓	✓	✓	✓	✓	✓	✓	✓
56	Per Phase (L1, L2, L3) Current THD	✓	✗	✗	✗	✗	✗	✗	✗
57	Per Phase (L1, L2, L3) Individual Voltage Harmonics	✓	✓	✗	✗	✗	✗	✗	✗
58	Per Phase (L1, L2, L3) Individual Current Harmonics	✓	✓	✗	✗	✗	✗	✗	✗
59	Run Hour	✓	✓	✓	✓	✓	✓	✓	✓
60	On Hour	✓	✓	✓	✓	✓	✓	✓	✓
61	Number of Interruptions	✓	✓	✓	✓	✓	✓	✓	✓
62	Phase Reversal Indication	✓	✗	✗	✗	✗	✗	✗	✗
63	Current Reversal Indication	✓	✗	✓	✓	✓	✓	✓	✓
64	Phase Absent Indication	✓	✗	✗	✗	✗	✗	✗	✗

Note :

- i)3P4W UNBL - 3 Phase 4 Wire Unbalance
- ii)3P3W UNBL - 3 Phase 3 Wire Unbalance
- iii)1P2W - 1 Phase 2 Wire
- iv)3P4W BAL - 3 Phase 4 Wire Balance
- v)3P3W BAL - 3 Phase 3 Wire Balance
- vi)3P3W U12 I1 - 3 Phase 3 Wire Balanced Voltage1-2(L12) Current 1(I1)
- vii)3P3W U23 I1 - 3 Phase 3 Wire Balanced Voltage2-3(L23) Current 1(I1)
- viii)3P3W U31 I1 - 3 Phase 3 Wire Balanced Voltage3-1(L31) Current 1(I1)

2. Programming

Programming of transducer can be done in two ways :

2.1 Programming via micro USB port available at front of Transducer using USB cable.

2.2 Programming via optional RS485(MODBUS) communication port.

Note : Refer **TABLE 4** for programmable parameters with their register addresses.

2.1: Programming via micro USB port available at front of Transducers using USB cable.

(Refer **Section 3** for programming through USB)

Connections

PC → USB Cable → Transducer

For programming of Transducer, steps to be followed are:

1)Connect the PC / Laptop to the micro USB port on the Transducer using a suitable cable.

2)Launch the configuration software. The configuration software is provided on a CD along with software help file.(configuration can also be done by user software. For protocol, refer Section 3)

3)Establish the connection between configuration software and the Transducer.(Refer the software help file for detailed connection steps)

4)Once connected, the existing configurations of the Transducer can be read in the software.

5)Make the required changes and click the **Write** button for the new configurations to take place.

2.2: Programming via optional RS485 (MODBUS) Communication Port.

(Refer **Section 3** for programming through MODBUS)

Connections

PC → RS485(MODBUS) → Transducer

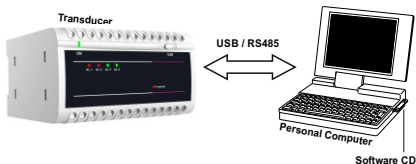
Transducer supports MODBUS (RS485) RTU protocol (2-wire).

Connection should be made using twisted pair shielded cable. All "A" and "B" connections are daisy chained together. The screens should also be connected to the "Gnd" terminal. To avoid the possibility of loop currents, an Earth connection should be made at one point on the network. Loop (ring) topology does not require any termination load. Line topology may or may not require terminating loads depending on the type and length of cable used. The impedance of the termination load should match the impedance of the cable and be at both ends of the line. The cable should be terminated at each end with a 120 ohm (1/4 Watt min.) resistor.

RS 485 network supports maximum length of 1.2km. Including the Master, a maximum of 32 instruments can be connected in RS485 network. The permissible address range for Transducer is between 1 and 247 for 32 instruments. Broadcast Mode (address 0) is not allowed.

Note : 1) Refer **TABLE 4** for MODBUS addresses of programmable parameters.

2) For Configurations through ModBus too, config software can be used.



3. USB / RS 485 (ModBus)

The maximum latency time of an Transducer is 300ms i.e. this is the amount of time that can pass before the first response character is output.

After sending any query through software (of the Master), it must allow 300 ms of time to elapse before assuming that the Transducer is not going to respond. If slave does not respond within 300 ms, Master can ignore the previous query and can issue fresh query to the slave.

The each byte in RTU mode has following format:

	8-bit binary, hexadecimal 0-9, A-F 2 hexadecimal characters contained in each 8-bit field of the message.
Format of Data Bytes	4 bytes (32 bits) per parameter. Floating point format (to IEEE 754), Most significant byte first (Alternative least significant byte first)
Error Checking Bytes	2 byte Cyclical Redundancy Check (CRC)
Byte format	1 start bit, 8 data bits, least significant bit sent first 1 bit for even/odd parity 1 stop bit if parity is used; 1 or 2 bits if no parity

Communication Baud Rate is user selectable between 4800, 9600, 19200, 38400, 57600 bps. for communication through ModBus and fixed 9600 for communication through USB.

Function code :

03	Read Holding Registers	Read content of read /write location (4X)
04	Read input Registers	Read content of read only location (3X)
16	Presets Multiple Registers	Set the content of read / write locations (4X)

Exception Cases : An exception code will be generated when Transducer receives ModBus query with valid parity & error check but which contains some other error (e.g. Attempt to set floating point variable to an invalid value) The response generated will be "Function code" ORed with HEX (80H). The exception codes are listed below

01	Illegal function	The function code is not supported by Transducer.
02	Illegal Data Address	Attempt to access an invalid address or an attempt to read or write part of a floating point value
03	Illegal Data Value	Attempt to set a floating point variable to an invalid value

3.1 Accessing 3X & 4X register for reading measured values :

Two consecutive 16 bit registers represent one parameter. Refer **TABLE 2** for the addresses of 3X and 4X registers used for parameters measured by the Transducer. Each parameter is held in the 3X as well as 4X registers. Modbus Code 04 and 03 are used to access all parameters in 3X and 4X registers respectively.

Example :

To read parameter,

Voltage2 from 3X: Start address = 00 02 Number of registers = 02

Watt2 from 4X: Start address = 00 0E Number of registers = 02

Note : Number of registers = Number of parameters x 2

Each Query for reading the data must be restricted to 40 registers or less. Exceeding the 40 parameter limit will cause a ModBus exception code to be returned.

Query for 3X read :

01 (Hex)	04 (Hex)	00(Hex)	02(Hex)	00(Hex)	02(Hex)	D0(Hex)	0B(Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Lo	CRC Low	CRC High

3X Response : Voltage 2 (219.254 V)

01 (Hex)	04 (Hex)	04 (Hex)	43 (Hex)	5B (Hex)	41 (Hex)	21 (Hex)	FB (Hex)	84 (Hex)
Device Address	Function Code	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

Query for 4X read:

01 (Hex)	03 (Hex)	00(Hex)	0E(Hex)	00(Hex)	02(Hex)	A5(Hex)	C8(Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Lo	CRC Low	CRC High

4X Response : Watt 2 (2000 W)

01 (Hex)	03 (Hex)	04 (Hex)	44 (Hex)	FA (Hex)	00 (Hex)	00 (Hex)	FA (Hex)	33 (Hex)
Device Address	Function Code	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

Byte Count : Total number of data bytes received.

Start Address High : Most significant 8 bits of starting address of the parameter requested.

Start Address Low : Least significant 8 bits of starting address of the parameter requested.

Number of register Hi : Most significant 8 bits of Number of registers requested.

Number of register Lo : Least significant 8 bits of Number of registers requested.

Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.

Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.

Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.

Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Table 2 : 3 X & 4 X register addresses for Measured Parameters**Table 2.1 : 3 X & 4 X register addresses for Regular Parameters**

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
30001	40001	1	Voltage L1 (Voltage L12 for 3P3W)	00	00
30003	40003	2	Voltage L2 (Voltage L23 for 3P3W)	00	02
30005	40005	3	Voltage L3 (Voltage L31 for 3P3W)	00	04
30007	40007	4	Current L1	00	06
30009	40009	5	Current L2	00	08
30011	40011	6	Current L3	00	0A
30013	40013	7	Watt L1	00	0C
30015	40015	8	Watt L2	00	0E
30017	40017	9	Watt L3	00	10
30019	40019	10	VA L1	00	12
30021	40021	11	VA L2	00	14
30023	40023	12	VA L3	00	16
30025	40025	13	Total VAR L1	00	18
30027	40027	14	Total VAR L2	00	1A
30029	40029	15	Total VAR L3	00	1C
30031	40031	16	Power Factor L1	00	1E
30033	40033	17	Power Factor L2	00	20
30035	40035	18	Power Factor L3	00	22
30037	40037	19	Phase Angle L1	00	24
30039	40039	20	Phase Angle L2	00	26
30041	40041	21	Phase Angle L3	00	28
30043	40043	22	Voltage Avg	00	2A
30045	40045	23	Voltage Sum	00	2C
30047	40047	24	Current Avg	00	2E
30049	40049	25	Current Sum	00	30
30051	40051	26	Watt Avg	00	32
30053	40053	27	Watt Sum	00	34
30055	40055	28	VA Avg	00	36
30057	40057	29	VA Sum	00	38
30059	40059	30	Total VAR Avg	00	3A
30061	40061	31	Total VAR Sum	00	3C
30063	40063	32	PF Avg	00	3E
30065	40065	33	PF Sum	00	40
30067	40067	34	Phase Angle Avg	00	42
30069	40069	35	Phase Angle Sum	00	44
30071	40071	36	Frequency	00	46
30073	40073	37	Wh import	00	48
30075	40075	38	Wh export	00	4A

Table 2.1 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
30077	40077	39	VARh import	00	4C
30079	40079	40	VARh export	00	4E
30081	40081	41	VAh	00	50
30085	40085	43	kw imp demand	00	54
30087	40087	44	max kw imp demand	00	56
30089	40089	45	kw exp demand	00	58
30091	40091	46	max kw exp demand	00	5A
30093	40093	47	kVAr Cap. demand	00	5C
30095	40095	48	max kVAr Cap. demand	00	5E
30097	40097	49	kVAr Ind. demand	00	60
30099	40099	50	max kVAr Ind. demand	00	62
30101	40101	51	kVA demand	00	64
30103	40103	52	max KVA demand	00	66
30105	40105	53	current demand	00	68
30107	40107	54	max current demand	00	6A
30109	40109	55	Wh import Overflow count	00	6C
30111	40111	56	Wh Import	00	6E
30113	40113	57	Wh export Overflow count	00	70
30115	40115	58	Wh export	00	72
30117	40117	59	VARh Cap. Overflow count	00	74
30119	40119	60	VARh Cap.	00	76
30121	40121	61	VARh Ind. Overflow count	00	78
30123	40123	62	VARh Ind.	00	7A
30125	40125	63	VAh Overflow count	00	7C
30127	40127	64	VAh	00	7E
30133	40133	67	System Voltage Max	00	84
30135	40135	68	System Voltage Min	00	86
30137	40137	69	RPM	00	88
30139	40139	70	Impulse Rate	00	8A
30141	40141	71	System Current Max	00	8C
30143	40143	72	System Current Min	00	8E
30145	40145	73	Wh import depending on update rate	00	90
30147	40147	74	Wh export depending on update rate	00	92
30149	40149	75	VARh Cap. depending on update rate	00	94
30151	40151	76	VARh Ind. depending on update rate	00	96
30153	40153	77	VAh depending on update rate	00	98
30155	40155	78	VAh gen depending on update rate	00	9A
30157	40157	79	Wh imp OFC depending on update rate	00	9C

Table 2.1 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
30159	40159	80	Wh exp OFC depending on update rate	00	9E
30161	40161	81	VARh Cap. OFC depending on update rate	00	A0
30163	40163	82	VARh Ind. OFC depending on update rate	00	A2
30165	40165	83	VAh OFC depending on update rate	00	A4
30169	40169	85	Re-Active Power Factor L1	00	A8
30171	40171	86	Re-Active Power Factor L2	00	AA
30173	40173	87	Re-Active Power Factor L3	00	AC
30175	40175	88	Average Re-Active Power Factor	00	AE
30177	40177	89	Sum Re-Active Power Factor	00	B0
30179	40179	90	LF Factor SgnQ(1-(P/S)) L1	00	B2
30181	40181	91	LF Factor SgnQ(1-(P/S)) L2	00	B4
30183	40183	92	LF Factor SgnQ(1-(P/S)) L3	00	B6
30185	40185	93	Average LF Factor SgnQ(1-(P/S))	00	B8
30187	40187	94	Sum LF Factor SgnQ(1-(P/S))	00	BA
30189	40189	95	Displacement Power Factor L1	00	BC
30191	40191	96	Displacement Power Factor L2	00	BE
30193	40193	97	Displacement Power Factor L3	00	C0
30195	40195	98	Average Displacement Power Factor	00	C2
30197	40197	99	Sum Displacement Power Factor	00	C4
30201	40201	101	V12	00	C8
30203	40203	102	V23	00	CA
30205	40205	103	V31	00	CC
30207	40207	104	VTHD-L1 (VTHD-L12 for 3P3W)	00	CE
30209	40209	105	VTHD-L2 (VTHD-L23 for 3P3W)	00	D0
30211	40211	106	VTHD-L3 (VTHD-L31 for 3P3W)	00	D2
30213	40213	107	ITHD-L1	00	D4
30215	40215	108	ITHD-L2	00	D6
30217	40217	109	ITHD-L3	00	D8
30219	40219	110	System V-THD	00	DA
30221	40221	111	System I-THD	00	DC
30225	40225	113	Neutral Current	00	E0
30227	40227	114	Run hour	00	E2
30229	40229	115	On Hour	00	E4
30231	40231	116	No. of interrupts	00	E6
30243	40243	122	Phase indicate	00	F2
30249	40249	125	Voltage VLN Unbalance	00	F8
30251	40251	126	Voltage VLL Unbalance	00	FA
30253	40253	127	Current Unbalance	00	FC

Table 2.1 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
30255	40255	128	Distortion VAr L1	00	FE
30257	40257	129	Distortion VAr L2	01	00
30259	40259	130	Distortion VAr L3	01	02
30261	40261	131	Distortion VAr AVG	01	04
30263	40263	132	Distortion VAr SUM	01	06
30265	40265	133	Fundamental VAr L1	01	08
30267	40267	134	Fundamental VAr L2	01	0A
30269	40269	135	Fundamental VAr L3	01	0C
30271	40271	136	Fundamental VAr AVG	01	0E
30273	40273	137	Fundamental VAr SUM	01	10
30295	40295	148	Tan phi R	01	26
30297	40297	149	Tan phi Y	01	28
30299	40299	150	Tan phi B	01	2A
30301	40301	151	Tan phi SYS	01	2C

Table 2.2 : 3 X & 4 X register addresses for Min & Max Values

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
31601	41601	1	Max Voltage L1	06	40
31603	41603	2	Max Voltage L2	06	42
31605	41605	3	Max Voltage L3	06	44
31607	41607	4	Min Voltage L1	06	46
31609	41609	5	Min Voltage L2	06	48
31611	41611	6	Min Voltage L3	06	4A
31613	41613	7	Max Voltage L12	06	4C
31615	41615	8	Max Voltage L23	06	4E
31617	41617	9	Max Voltage L31	06	50
31619	41619	10	Min Voltage L12	06	52
31621	41621	11	Min Voltage L23	06	54
31623	41623	12	Min Voltage L31	06	56
31625	41625	13	System Max Voltage LN	06	58
31627	41627	14	System Min Voltage LN	06	5A
31633	41633	17	Max Current L1	06	60
31635	41635	18	Max Current L2	06	62
31637	41637	19	Max Current L3	06	64
31639	41639	20	Min Current L1	06	66
31641	41641	21	Min Current L2	06	68
31643	41643	22	Min Current L3	06	6A

Table 2.2 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
31645	31645	23	System Max Current	06	6C
31647	31647	24	System Min Current	06	6E
31649	41649	25	Max W1	06	70
31651	41651	26	Max W2	06	72
31653	41653	27	Max W3	06	74
31655	41655	28	Min W1	06	76
31657	41657	29	Min W2	06	78
31659	41659	30	Min W3	06	7A
31661	41661	31	Max Sys W	06	7C
31663	41663	32	Min Sys W	06	7E
31665	41665	33	Max VAr1	06	80
31667	41667	34	Max VAr2	06	82
31669	41669	35	Max VAr3	06	84
31671	41671	36	Min VAr1	06	86
31673	41673	37	Min VAr2	06	88
31675	41675	38	Min VAr3	06	8A
31677	41677	39	Max SysVAr	06	8C
31679	41679	40	Min Sys VAr	06	8E
31681	41681	41	Max VA1	06	90
31683	41683	42	Max VA2	06	92
31685	41685	43	Max VA3	06	94
31687	41687	44	Min VA1	06	96
31689	41689	45	Min VA2	06	98
31691	41691	46	Min VA3	06	9A
31693	41693	47	Max Sys VA	06	9C
31695	41695	48	Min Sys VA	06	9E
31697	41697	49	Max PF1	06	A0
31699	41699	50	Max PF2	06	A2
31701	41701	51	Max PF3	06	A4
31703	41703	52	Min PF1	06	A6
31705	41705	53	Min PF2	06	A8
31707	41707	54	Min PF3	06	AA
31709	41709	55	Max SysPF	06	AC
31711	41711	56	Min Sys PF	06	AE
31713	41713	57	Max Reactive PF L1	06	B0
31715	41715	58	Max Reactive PF L2	06	B2
31717	41717	59	Max Reactive PF L3	06	B4
31719	41719	60	Min Reactive PF L1	06	B6

Table 2.2 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
31721	41721	61	Min Reactive PF L2	06	B8
31723	41723	62	Min Reactive PF L3	06	BA
31725	41725	63	Max Sys Reactive PF	06	BC
31727	41727	64	Min Sys Reactive PF	06	BE
31729	41729	65	Max PA1	06	C0
31731	41731	66	Max PA2	06	C2
31733	41733	67	Max PA3	06	C4
31735	41735	68	Min PA1	06	C6
31737	41737	69	Min PA2	06	C8
31739	41739	70	Min PA3	06	CA
31741	41741	71	Max SysPA	06	CC
31743	41743	72	Min Sys PA	06	CE
31745	41745	73	Max LF SgnQ L1	06	D0
31747	41747	74	Max LF SgnQ L2	06	D2
31749	41749	75	Max LF SgnQ L3	06	D4
31751	41751	76	Min LF SgnQ L1	06	D6
31753	41753	77	Min LF SgnQ L2	06	D8
31755	41755	78	Min LF SgnQ L3	06	DA
31757	41757	79	Max Sys LF SgnQ	06	DC
31759	41759	80	Min Sys LF SgnQ	06	DE
31761	41761	81	Max Sys Freq	06	E0
31763	41763	82	Min Sys Freq	06	E2

Table 2.3 : 3 X & 4 X register addresses for Energies

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
31801	41801	1	Sys Active Energy Import	07	08
31803	41803	2	Sys Active Energy Export	07	0A
31805	41805	3	Sys Reactive Energy Capacitive	07	0C
31807	41807	4	Sys Reactive Energy Inductive	07	0E
31809	41809	5	Sys Apparent Energy	07	10
31813	41813	7	Sys Active Energy Import OVF Count	07	14
31815	41815	8	Sys Active Energy Export OVF Count	07	16
31817	41817	9	Sys Reactive Energy Cap. OVF Count	07	18
31819	41819	10	Sys Reactive Energy Ind. OVF Count	07	1A
31821	41821	11	Sys Apparent Energy OVF Count	07	1C
31825	41825	13	Sys Active Energy Import on time	07	20
31827	41827	14	Sys Active Energy Export on time	07	22

Table 2.3 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
31829	41829	15	Sys Reactive Energy Cap. on time	07	24
31831	41831	16	Sys Reactive Energy Ind. on time	07	26
31833	41833	17	Sys Apparent Energy on time	07	28
31837	41837	19	Sys Active Energy Import OVF Count on update rate*	07	2C
31839	41839	20	Sys Active Energy Export OVF Count on update rate*	07	2E
31841	41841	21	Sys Reactive Energy Cap. OVF Count on update rate*	07	30
31843	41843	22	Sys Reactive Energy Ind. OVF Count on update rate*	07	32
31845	41845	23	Sys Apparent Energy OVF Count on update rate*	07	34
31849	41849	25	Sys Total Active Energy	07	38
31851	41851	26	Sys Total Reactive Energy	07	3A
31853	41853	27	Sys Total Apparent Energy	07	3C
31855	41855	28	Sys Total Active Energy OVF Count	07	3E
31857	41857	29	Sys Total Reactive Energy OVF Count	07	40
31859	41859	30	Sys Total Apparent Energy OVF Count	07	42
31861	41861	31	Sys Total Active Energy on update rate*	07	44
31863	41863	32	Sys Total Reactive Energy on update rate*	07	46
31865	41865	33	Sys Total Apparent Energy on update rate*	07	48
31867	41867	34	Sys Total Active Energy OVF Count on update rate*	07	4A
31869	41869	35	Sys Total Reactive Energy OVF Count on update rate*	07	4C
31871	41871	36	Sys Total Apparent Energy OVF Count on update rate*	07	4E
31873	41873	37	Active Energy Import L1	07	50
31875	41875	38	Active Energy Import L2	07	52
31877	41877	39	Active Energy Import L3	07	54
31879	41879	40	Active Energy Export L1	07	56
31881	41881	41	Active Energy Export L2	07	58
31883	41883	42	Active Energy Export L3	07	5A
31885	41885	43	Reactive Energy Capacitive L1	07	5C

Table 2.3 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
31887	41887	44	Reactive Energy Capacitive L2	07	5E
31889	41889	45	Reactive Energy Capacitive L3	07	60
31891	41891	46	Reactive Energy Inductive L1	07	62
31893	41893	47	Reactive Energy Inductive L2	07	64
31895	41895	48	Reactive Energy Inductive L3	07	66
31897	41897	49	Apparent Energy L1	07	68
31899	41899	50	Apparent Energy L2	07	6A
31901	41901	51	Apparent Energy L3	07	6C
31909	41909	55	Total Active Energy L1	07	74
31911	41911	56	Total Active Energy L2	07	76
31913	41913	57	Total Active Energy L3	07	78
31915	41915	58	Total Reactive Energy L1	07	7A
31917	41917	59	Total Reactive Energy L2	07	7C
31919	41919	60	Total Reactive Energy L3	07	7E
31921	41921	61	Total Apparent Energy L1	07	80
31923	41923	62	Total Apparent Energy L2	07	82
31925	41925	63	Total Apparent Energy L3	07	84
31927	41927	64	OVF Active Energy Import L1	07	86
31929	41929	65	OVF Active Energy Import L2	07	88
31931	41931	66	OVF Active Energy Import L3	07	8A
31933	41933	67	OVF Active Energy Export L1	07	8C
31935	41935	68	OVF Active Energy Export L2	07	8E
31937	41937	69	OVF Active Energy Export L3	07	90
31939	41939	70	OVF Reactive Energy Cap. L1	07	92
31941	41941	71	OVF Reactive Energy Cap. L2	07	94
31943	41943	72	OVF Reactive Energy Cap. L3	07	96
31945	41945	73	OVF Reactive Energy Ind. L1	07	98
31947	41947	74	OVF Reactive Energy Ind. L2	07	9A
31949	41949	75	OVF Reactive Energy Ind. L3	07	9C
31951	41951	76	OVF Apparent Energy L1	07	9E
31953	41953	77	OVF Apparent Energy L2	07	A0
31955	41955	78	OVF Apparent Energy L3	07	A2
31963	41963	82	Total Active Energy OVF Count L1	07	AA
31965	41965	83	Total Active Energy OVF Count L2	07	AC
31967	41967	84	Total Active Energy OVF Count L3	07	AE
31969	41969	85	Total Reactive Energy OVF Count L1	07	B0
31971	41971	86	Total Reactive Energy OVF Count L2	07	B2
31973	41973	87	Total Reactive Energy OVF Count L3	07	B4

Table 2.3 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
31975	41975	88	Total Apparent Energy OVF Count L1	07	B6
31977	41977	89	Total Apparent Energy OVF Count L2	07	B8
31979	41979	90	Total Apparent Energy OVF Count L3	07	BA
31981	41981	91	Active Energy Import L1 on update rate*	07	BC
31983	41983	92	Active Energy Import L2 on update rate*	07	BE
31985	41985	93	Active Energy Import L3 on update rate*	07	C0
31987	41987	94	Active Energy Export L1 on update rate*	07	C2
31989	41989	95	Active Energy Export L2 on update rate*	07	C4
31991	41991	96	Active Energy Export L3 on update rate*	07	C6
31993	41993	97	Reactive Energy Cap. L1 on update rate*	07	C8
31995	41995	98	Reactive Energy Cap. L2 on update rate*	07	CA
31997	41997	99	Reactive Energy Cap. L3 on update rate*	07	CC
31999	41999	100	Reactive Energy Ind. L1 on update rate*	07	CE
32001	42001	101	Reactive Energy Ind. L2 on update rate*	07	D0
32003	42003	102	Reactive Energy Ind. L3 on update rate*	07	D2
32005	42005	103	Apparent Energy L1 on update rate*	07	D4
32007	42007	104	Apparent Energy L2 on update rate*	07	D6
32009	42009	105	Apparent Energy L3 on update rate*	07	D8
32017	42017	109	Total Active Energy L1 on update rate*	07	E0
32019	42019	110	Total Active Energy L2 on update rate*	07	E2
32021	42021	111	Total Active Energy L3 on update rate*	07	E4
32023	42023	112	Total Reactive Energy L1 on update rate*	07	E6
32025	42025	113	Total Reactive Energy L2 on update rate*	07	E8

Table 2.3 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
32027	42027	114	Total Reactive Energy L3 on update rate*	07	EA
32029	42029	115	Total Apparent Energy L1 on update rate*	07	EC
32031	42031	116	Total Apparent Energy L2 on update rate*	07	EE
32033	42033	117	Total Apparent Energy L3 on update rate*	07	F0
32035	42035	118	OVF Active Energy Import L1 on update rate*	07	F2
32037	42037	119	OVF Active Energy Import L2 on update rate*	07	F4
32039	42039	120	OVF Active Energy Import L3 on update rate*	07	F6
32041	42041	121	OVF Active Energy Export L1 on update rate*	07	F8
32043	42043	122	OVF Active Energy Export L2 on update rate*	07	FA
32045	42045	123	OVF Active Energy Export L3 on update rate*	07	FC
32047	42047	124	OVF Reactive Energy Cap. L1 on update rate*	07	FE
32049	42049	125	OVF Reactive Energy Cap. L2 on update rate*	08	00
32051	42051	126	OVF Reactive Energy Cap. L3 on Update rate*	08	02
32053	42053	127	OVF Reactive Energy Ind. L1 on update rate*	08	04
32055	42055	128	OVF Reactive Energy Ind. L2 on update rate*	08	06
32057	42057	129	OVF Reactive Energy Ind. L3 on update rate*	08	08
32059	42059	130	OVF Apparent Energy L1 on update rate*	08	0A
32061	42061	131	OVF Apparent Energy L2 on update rate*	08	0C
32063	42063	132	OVF Apparent Energy L3 on update rate*	08	0E

Table 2.3 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
32071	42071	136	Total Active Energy OVF Count L1 on update rate*	08	16
32073	42073	137	Total Active Energy OVF Count L2 on update rate*	08	18
32075	42075	138	Total Active Energy OVF Count L3 on update rate*	08	1A
32077	42077	139	Total Reactive Energy OVF Count L1 on update rate*	08	1C
32079	42079	140	Total Reactive Energy OVF Count L2 on update rate*	08	1E
32081	42081	141	Total Reactive Energy OVF Count L3 on update rate*	08	20
32083	42083	142	Total Apparent Energy OVF Count L1 on update rate*	08	22
32085	42085	143	Total Apparent Energy OVF Count L2 on update rate*	08	24
32087	42087	144	Total Apparent Energy OVF Count L3 on update rate*	08	26

***Note :**

1. The values are updated depending on update rate which is settable by user. e.g. if user set update rate 15 min, then the values on these registers (marked with *) will get updated on every 15 min.

Table 2.4 : 3 X & 4 X register addresses for Per Phase Demand

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
30601	40601	1	Sys kw Import Demand	02	58
30603	40603	2	Sys kw Export Demand	02	5A
30605	40605	3	Sys kVAr Import Demand	02	5C
30607	40607	4	Sys kVAr Export Demand	02	5E
30609	40609	5	Sys Kva Demand	02	60
30613	40613	7	Sys Current Demand	02	64
30617	40617	9	Sys kw Import Max Demand	02	68
30619	40619	10	Sys kw Export Max Demand	02	6A
30621	40621	11	Sys kVAr Import Max Demand	02	6C
30623	40623	12	Sys kVAr Export Max Demand	02	6E

Table 2.4 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
30625	40625	13	Sys Kva Max Demand	02	70
30629	40629	15	Sys Current Max Demand	02	74
30633	40633	17	kw Import Demand L1	02	78
30635	40635	18	kw Import Demand L2	02	7A
30637	40637	19	kw Import Demand L3	02	7C
30639	40639	20	kw Export Demand L1	02	7E
30641	40641	21	kw Export Demand L2	02	80
30643	40643	22	kw Export Demand L3	02	82
30645	40645	23	kVAr Import Demand L1	02	84
30647	40647	24	kVAr Import Demand L2	02	86
30649	40649	25	kVAr Import Demand L3	02	88
30651	40651	26	kVAr Export Demand L1	02	8A
30653	40653	27	kVAr Export Demand L2	02	8C
30655	40655	28	kVAr Export Demand L3	02	8E
30657	40657	29	Kva Demand L1	02	90
30659	40659	30	Kva Demand L2	02	92
30661	40661	31	Kva Demand L3	02	94
30669	40669	35	Current Demand L1	02	9C
30671	40671	36	Current Demand L2	02	9E
30673	40673	37	Current Demand L3	02	A0
30681	40681	41	kw Import Max Demand L1	02	A8
30683	40683	42	kw Import Max Demand L2	02	AA
30685	40685	43	kw Import Max Demand L3	02	AC
30687	40687	44	kw Export Max Demand L1	02	AE
30689	40689	45	kw Export Max Demand L2	02	B0
30691	40691	46	kw Export Max Demand L3	02	B2
30693	40693	47	kVAr Import Max Demand L1	02	B4
30695	40695	48	kVAr Import Max Demand L2	02	B6
30697	40697	49	kVAr Import Max Demand L3	02	B8
30699	40699	50	kVAr Export Max Demand L1	02	BA
30701	40701	51	kVAr Export Max Demand L2	02	BC
30703	40703	52	kVAr Export Max Demand L3	02	BE
30705	40705	53	Kva Max Demand L1	02	C0
30707	40707	54	Kva Max Demand L2	02	C2
30709	40709	55	Kva Max Demand L3	02	C4
30717	40717	59	Current Max Demand L1	02	CC
30719	40719	60	Current Max Demand L2	02	CE
30721	40721	61	Current Max Demand L3	02	D0

Table 2.5 : 3 X & 4 X register addresses for Individual Harmonics

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
32311	42311	1	VR Harmonic-1	09	06
32313	42313	2	IR Harmonic-1	09	08
32315	42315	3	VR Harmonic-2	09	0A
32317	42317	4	IR Harmonic-2	09	0C
32319	42319	5	VR Harmonic-3	09	0E
32321	42321	6	IR Harmonic-3	09	10
32323	42323	7	VR Harmonic-4	09	12
32325	42325	8	IR Harmonic-4	09	14
32327	42327	9	VR Harmonic-5	09	16
32329	42329	10	IR Harmonic-5	09	18
32331	42331	11	VR Harmonic-6	09	1A
32333	42333	12	IR Harmonic-6	09	1C
32335	42335	13	VR Harmonic-7	09	1E
32337	42337	14	IR Harmonic-7	09	20
32339	42339	15	VR Harmonic-8	09	22
32341	42341	16	IR Harmonic-8	09	24
32343	42343	17	VR Harmonic-9	09	26
32345	42345	18	IR Harmonic-9	09	28
32347	42347	19	VR Harmonic-10	09	2A
32349	42349	20	IR Harmonic-10	09	2C
32351	42351	21	VR Harmonic-11	09	2E
32353	42353	22	IR Harmonic-11	09	30
32355	42355	23	VR Harmonic-12	09	32
32357	42357	24	IR Harmonic-12	09	34
32359	42359	25	VR Harmonic-13	09	36
32361	42361	26	IR Harmonic-13	09	38
32363	42363	27	VR Harmonic-14	09	3A
32365	42365	28	IR Harmonic-14	09	3C
32367	42367	29	VR Harmonic-15	09	3E
32369	42369	30	IR Harmonic-15	09	40
32371	42371	31	VR Harmonic-16	09	42
32373	42373	32	IR Harmonic-16	09	44
32375	42375	33	VR Harmonic-17	09	46
32377	42377	34	IR Harmonic-17	09	48
32379	42379	35	VR Harmonic-18	09	4A
32381	42381	36	IR Harmonic-18	09	4C
32383	42383	37	VR Harmonic-19	09	4E
32385	42385	38	IR Harmonic-19	09	50

Table 2.5 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
32463	42463	77	VY Harmonic-8	09	9E
32465	42465	78	IY Harmonic-8	09	A0
32467	42467	79	VY Harmonic-9	09	A2
32469	42469	80	IY Harmonic-9	09	A4
32471	42471	81	VY Harmonic-10	09	A6
32473	42473	82	IY Harmonic-10	09	A8
32475	42475	83	VY Harmonic-11	09	AA
32477	42477	84	IY Harmonic-11	09	AC
32479	42479	85	VY Harmonic-12	09	AE
32481	42481	86	IY Harmonic-12	09	B0
32483	42483	87	VY Harmonic-13	09	B2
32485	42485	88	IY Harmonic-13	09	B4
32487	42487	89	VY Harmonic-14	09	B6
32489	42489	90	IY Harmonic-14	09	B8
32491	42491	91	VY Harmonic-15	09	BA
32493	42493	92	IY Harmonic-15	09	BC
32495	42495	93	VY Harmonic-16	09	BE
32497	42497	94	IY Harmonic-16	09	C0
32499	42499	95	VY Harmonic-17	09	C2
32501	42501	96	IY Harmonic-17	09	C4
32503	42503	97	VY Harmonic-18	09	C6
32505	42505	98	IY Harmonic-18	09	C8
32507	42507	99	VY Harmonic-19	09	CA
32509	42509	100	IY Harmonic-19	09	CC
32511	42511	101	VY Harmonic-20	09	CE
32513	42513	102	IY Harmonic-20	09	D0
32515	42515	103	VY Harmonic-21	09	D2
32517	42517	104	IY Harmonic-21	09	D4
32519	42519	105	VY Harmonic-22	09	D6
32521	42521	106	IY Harmonic-22	09	D8
32523	42523	107	VY Harmonic-23	09	DA
32525	42525	108	IY Harmonic-23	09	DC
32527	42527	109	VY Harmonic-24	09	DE
32529	42529	110	IY Harmonic-24	09	E0
32531	42531	111	VY Harmonic-25	09	E2
32533	42533	112	IY Harmonic-25	09	E4
32535	42535	113	VY Harmonic-26	09	E6
32537	42537	114	IY Harmonic-26	09	E8

Table 2.5 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
32387	42387	39	VR Harmonic-20	09	52
32389	42389	40	IR Harmonic-20	09	54
32391	42391	41	VR Harmonic-21	09	56
32393	42393	42	IR Harmonic-21	09	58
32395	42395	43	VR Harmonic-22	09	5A
32397	42397	44	IR Harmonic-22	09	5C
32399	42399	45	VR Harmonic-23	09	5E
32401	42401	46	IR Harmonic-23	09	60
32403	42403	47	VR Harmonic-24	09	62
32405	42405	48	IR Harmonic-24	09	64
32407	42407	49	VR Harmonic-25	09	66
32409	42409	50	IR Harmonic-25	09	68
32411	42411	51	VR Harmonic-26	09	6A
32413	42413	52	IR Harmonic-26	09	6C
32415	42415	53	VR Harmonic-27	09	6E
32417	42417	54	IR Harmonic-27	09	70
32419	42419	55	VR Harmonic-28	09	72
32421	42421	56	IR Harmonic-28	09	74
32423	42423	57	VR Harmonic-29	09	76
32425	42425	58	IR Harmonic-29	09	78
32427	42427	59	VR Harmonic-30	09	7A
32429	42429	60	IR Harmonic-30	09	7C
32431	42431	61	VR Harmonic-31	09	7E
32433	42433	62	IR Harmonic-31	09	80
32435	42435	63	VY Harmonic-1	09	82
32437	42437	64	IY Harmonic-1	09	84
32439	42439	65	VY Harmonic-2	09	86
32441	42441	66	IY Harmonic-2	09	88
32443	42443	67	VY Harmonic-3	09	8A
32445	42445	68	IY Harmonic-3	09	8C
32447	42447	69	VY Harmonic-4	09	8E
32449	42449	70	IY Harmonic-4	09	90
32451	42451	71	VY Harmonic-5	09	92
32453	42453	72	IY Harmonic-5	09	94
32455	42455	73	VY Harmonic-6	09	96
32457	42457	74	IY Harmonic-6	09	98
32459	42459	75	VY Harmonic-7	09	9A
32461	42461	76	IY Harmonic-7	09	9C

Table 2.5 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
32539	42539	115	VY Harmonic-27	09	EA
32541	42541	116	IY Harmonic-27	09	EC
32543	42543	117	VY Harmonic-28	09	EE
32545	42545	118	IY Harmonic-28	09	F0
32547	42547	119	VY Harmonic-29	09	F2
32549	42549	120	IY Harmonic-29	09	F4
32551	42551	121	VY Harmonic-30	09	F6
32553	42553	122	IY Harmonic-30	09	F8
32555	42555	123	VY Harmonic-31	09	FA
32557	42557	124	IY Harmonic-31	09	FC
32559	42559	125	VB Harmonic-1	09	FE
32561	42561	126	IB Harmonic-1	0A	00
32563	42563	127	VB Harmonic-2	0A	02
32565	42565	128	IB Harmonic-2	0A	04
32567	42567	129	VB Harmonic-3	0A	06
32569	42569	130	IB Harmonic-3	0A	08
32571	42571	131	VB Harmonic-4	0A	0A
32573	42573	132	IB Harmonic-4	0A	0C
32575	42575	133	VB Harmonic-5	0A	0E
32577	42577	134	IB Harmonic-5	0A	10
32579	42579	135	VB Harmonic-6	0A	12
32581	42581	136	IB Harmonic-6	0A	14
32583	42583	137	VB Harmonic-7	0A	16
32585	42585	138	IB Harmonic-7	0A	18
32587	42587	139	VB Harmonic-8	0A	1A
32589	42589	140	IB Harmonic-8	0A	1C
32591	42591	141	VB Harmonic-9	0A	1E
32593	42593	142	IB Harmonic-9	0A	20
32595	42595	143	VB Harmonic-10	0A	22
32597	42597	144	IB Harmonic-10	0A	24
32599	42599	145	VB Harmonic-11	0A	26
32601	42601	146	IB Harmonic-11	0A	28
32603	42603	147	VB Harmonic-12	0A	2A
32605	42605	148	IB Harmonic-12	0A	2C
32607	42607	149	VB Harmonic-13	0A	2E
32609	42609	150	IB Harmonic-13	0A	30
32611	42611	151	VB Harmonic-14	0A	32
32613	42613	152	IB Harmonic-14	0A	34

Table 2.5 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
32615	42615	153	VB Harmonic-15	0A	36
32617	42617	154	IB Harmonic-15	0A	38
32619	42619	155	VB Harmonic-16	0A	3A
32621	42621	156	IB Harmonic-16	0A	3C
32623	42623	157	VB Harmonic-17	0A	3E
32625	42625	158	IB Harmonic-17	0A	40
32627	42627	159	VB Harmonic-18	0A	42
32629	42629	160	IB Harmonic-18	0A	44
32631	42631	161	VB Harmonic-19	0A	46
32633	42633	162	IB Harmonic-19	0A	48
32635	42635	163	VB Harmonic-20	0A	4A
32637	42637	164	IB Harmonic-20	0A	4C
32639	42639	165	VB Harmonic-21	0A	4E
32641	42641	166	IB Harmonic-21	0A	50
32643	42643	167	VB Harmonic-22	0A	52
32645	42645	168	IB Harmonic-22	0A	54
32647	42647	169	VB Harmonic-23	0A	56
32649	42649	170	IB Harmonic-23	0A	58
32651	42651	171	VB Harmonic-24	0A	5A
32653	42653	172	IB Harmonic-24	0A	5C
32655	42655	173	VB Harmonic-25	0A	5E
32657	42657	174	IB Harmonic-25	0A	60
32659	42659	175	VB Harmonic-26	0A	62
32661	42661	176	IB Harmonic-26	0A	64
32663	42663	177	VB Harmonic-27	0A	66
32665	42665	178	IB Harmonic-27	0A	68
32667	42667	179	VB Harmonic-28	0A	6A
32669	42669	180	IB Harmonic-28	0A	6C
32671	42671	181	VB Harmonic-29	0A	6E
32673	42673	182	IB Harmonic-29	0A	70
32675	42675	183	VB Harmonic-30	0A	72
32677	42677	184	IB Harmonic-30	0A	74
32679	42679	185	VB Harmonic-31	0A	76
32681	42681	186	IB Harmonic-31	0A	78

Table 2.6 : 3 X & 4 X register addresses for Old Parameters

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
33301	43301	1	Old Energy Unit	0C	E4
33303	43303	2	Old Active Energy Import	0C	E6
33305	43305	3	Old Active Energy Export	0C	E8
33307	43307	4	Old Reactive Energy Capacitive	0C	EA
33309	43309	5	Old Reactive Energy Inductive	0C	EC
33311	43311	6	Old Apparent Energy	0C	EE
33315	43315	8	Old Active Energy Import OVF Count	0C	F2
33317	43317	9	Old Active Energy Export OVF Count	0C	F4
33319	43319	10	Old Reactive Energy Cap. OVF Count	0C	F6
33321	43321	11	Old Reactive Energy Ind. OVF Count	0C	F8
33323	43323	12	Old Apparent Energy OVF Count	0C	FA
33327	43327	14	Old Total Active Energy	0C	FE
33329	43329	15	Old Total Reactive Energy	0D	00
33331	43331	16	Old Total Apparent Energy	0D	02
33333	43333	17	Old Total Active Energy OVF Count	0D	04
33335	43335	18	Old Total Reactive Energy OVF Count	0D	06
33337	43337	19	Old Total Apparent Energy OVF Count	0D	08
33339	43339	20	Old Active Energy Import L1	0D	0A
33341	43341	21	Old Active Energy Import L2	0D	0C
33343	43343	22	Old Active Energy Import L3	0D	0E
33345	43345	23	Old Active Energy Export L1	0D	10
33347	43347	24	Old Active Energy Export L2	0D	12
33349	43349	25	Old Active Energy Export L3	0D	14
33351	43351	26	Old Reactive Energy Capacitive L1	0D	16
33353	43353	27	Old Reactive Energy Capacitive L2	0D	18
33355	43355	28	Old Reactive Energy Capacitive L3	0D	1A
33357	43357	29	Old Reactive Energy Inductive L1	0D	1C
33359	43359	30	Old Reactive Energy Inductive L2	0D	1E
33361	43361	31	Old Reactive Energy Inductive L3	0D	20
33363	43363	32	Old Apparent Energy L1	0D	22
33365	43365	33	Old Apparent Energy L2	0D	24
33367	43367	34	Old Apparent Energy L3	0D	26
33375	43375	38	Old Total Active Energy L1	0D	2E
33377	43377	39	Old Total Active Energy L2	0D	30
33379	43379	40	Old Total Active Energy L3	0D	32
33381	43381	41	Old Total Reactive Energy L1	0D	34
33383	43383	42	Old Total Reactive Energy L2	0D	36
33385	43385	43	Old Total Reactive Energy L3	0D	38

Table 2.6 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
33387	43387	44	Old Total Apparent Energy L1	0D	3A
33389	43389	45	Old Total Apparent Energy L2	0D	3C
33391	43391	46	Old Total Apparent Energy L3	0D	3E
33393	43393	47	Old OVF Active Energy Import L1	0D	40
33395	43395	48	Old OVF Active Energy Import L2	0D	42
33397	43397	49	Old OVF Active Energy Import L3	0D	44
33399	43399	50	Old OVF Active Energy Export L1	0D	46
33401	43401	51	Old OVF Active Energy Export L2	0D	48
33403	43403	52	Old OVF Active Energy Export L3	0D	4A
33405	43405	53	Old OVF Reactive Energy Cap. L1	0D	4C
33407	43407	54	Old OVF Reactive Energy Cap. L2	0D	4E
33409	43409	55	Old OVF Reactive Energy Cap. L3	0D	50
33411	43411	56	Old OVF Reactive Energy Ind. L1	0D	52
33413	43413	57	Old OVF Reactive Energy Ind. L2	0D	54
33415	43415	58	Old OVF Reactive Energy Ind. L3	0D	56
33417	43417	59	Old OVF Apparent Energy L1	0D	58
33419	43419	60	Old OVF Apparent Energy L2	0D	5A
33421	43421	61	Old OVF Apparent Energy L3	0D	5C
33429	43429	65	Old Total Active Energy OVF Count L1	0D	64
33431	43431	66	Old Total Active Energy OVF Count L2	0D	66
33433	43433	67	Old Total Active Energy OVF Count L3	0D	68
33435	43435	68	Old Total Reactive Energy OVF Count L1	0D	6A
33437	43437	69	Old Total Reactive Energy OVF Count L2	0D	6C
33439	43439	70	Old Total Reactive Energy OVF Count L3	0D	6E
33441	43441	71	Old Total Apparent Energy OVF Count L1	0D	70
33443	43443	72	Old Total Apparent Energy OVF Count L2	0D	72
33445	43445	73	Old Total Apparent Energy OVF Count L3	0D	74
33447	43447	74	Old Run hour	0D	76
33449	43449	75	Old On Hour	0D	78
33455	43455	78	Old No. of interrupts	0D	7E
33463	43463	82	Old Sys kw imp Max Demand	0D	86
33465	43465	83	Old Sys kw exp Max Demand	0D	88
33467	43467	84	Old Sys kVA _r Cap. Max Demand	0D	8A
33469	43469	85	Old Sys kVA _r Ind. Max Demand	0D	8C
33471	43471	86	Old Sys kVA imp Max Demand	0D	8E
33475	43475	88	Old Sys current Max demand	0D	92

Table 2.6 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
33479	43479	90	Old kw Imp Max Demand L1	0D	96
33481	43481	91	Old kw Imp Max Demand L2	0D	98
33483	43483	92	Old kw Imp Max Demand L3	0D	9A
33485	43485	93	Old kw Exp Max Demand L1	0D	9C
33487	43487	94	Old kw Exp Max Demand L2	0D	9E
33489	43489	95	Old kw Exp Max Demand L3	0D	A0
33491	43491	96	Old kVAr Imp Max Demand L1	0D	A2
33493	43493	97	Old kVAr Imp Max Demand L2	0D	A4
33495	43495	98	Old kVAr Imp Max Demand L3	0D	A6
33497	43497	99	Old kVAr Exp Max Demand L1	0D	A8
33499	43499	100	Old kVAr Exp Max Demand L2	0D	AA
33501	43501	101	Old kVAr Exp Max Demand L3	0D	AC
33503	43503	102	Old Kva Max Demand L1	0D	AE
33505	43505	103	Old Kva Max Demand L2	0D	B0
33507	43507	104	Old Kva Max Demand L3	0D	B2
33515	43515	108	Old Current Max Demand L1	0D	BA
33517	43517	109	Old Current Max Demand L2	0D	BC
33519	43519	110	Old Current Max Demand L3	0D	BE

Table 2.7 : 3 X & 4 X register addresses for Digital Output Parameters

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
33701	43701	1	Relay1 Output Status	0E	74
33703	43703	2	Relay2 Output Status	0E	76
33705	43705	3	Relay3 Output Status	0E	78
33707	43707	4	Relay4 Output Status	0E	7A
33709	43709	5	Timer 1 On delay	0E	7C
33711	43711	6	Timer 2 On delay	0E	7E
33713	43713	7	Timer 3 On delay	0E	80
33715	43715	8	Timer 4 On delay	0E	82
33717	43717	9	Timer 1 Off delay	0E	84
33719	43719	10	Timer 2 Off delay	0E	86
33721	43721	11	Timer 3 Off delay	0E	88
33723	43723	12	Timer 4 Off delay	0E	8A
33725	43725	13	Timer 1 No. of Cycles	0E	8C
33727	43727	14	Timer 2 No. of Cycles	0E	8E
33729	43729	15	Timer 3 No. of Cycles	0E	90
33731	43731	16	Timer 4 No. of Cycles	0E	92

Table 3 : 3 X & 4 X register addresses for 32-bit Integer Energy

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
30801	40801	1	Sys Active Energy Import	03	20
30803	40803	2	Sys Active Energy Export	03	22
30805	40805	3	Sys Reactive Energy Cap.	03	24
30807	40807	4	Sys Reactive Energy Ind.	03	26
30809	40809	5	Sys Apparent Energy	03	28
30813	40813	7	Sys Active Energy Import OVF Count	03	2C
30815	40815	8	Sys Active Energy Export OVF Count	03	2E
30817	40817	9	Sys Reactive Energy Cap. OVF Count	03	30
30819	40819	10	Sys Reactive Energy Ind. OVF Count	03	32
30821	40821	11	Sys Apparent Energy OVF Count	03	34
30825	40825	13	Sys Active Energy Import on update rate*	03	38
30827	40827	14	Sys Active Energy Export on update rate*	03	3A
30829	40829	15	Sys Reactive Energy Cap. on update rate*	03	3C
30831	40831	16	Sys Reactive Energy Ind. on update rate*	03	3E
30833	40833	17	Sys Apparent Energy on update rate*	03	40
30837	40837	19	Sys Active Energy Import OVF Count on update rate*	03	44
30839	40839	20	Sys Active Energy Export OVF Count on update rate*	03	46
30841	40841	21	Sys Reactive Energy Cap. OVF Count on update rate*	03	48
30843	40843	22	Sys Reactive Energy Ind. OVF Count on update rate*	03	4A
30845	40845	23	Sys Apparent Energy OVF Count on update rate*	03	4C
30849	40849	25	Sys Total Active Energy	03	50
30851	40851	26	Sys Total Reactive Energy	03	52
30853	40853	27	Sys Total Apparent Energy	03	54
30855	40855	28	Sys Total Active Energy OVF Count	03	56
30857	40857	29	Sys Total Reactive Energy OVF Count	03	58
30859	40859	30	Sys Total Apparent Energy OVF Count	03	5A
30861	40861	31	Sys Total Active Energy on update rate*	03	5C

Table 3 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
30863	40863	32	Sys Total Reactive Energy on update rate*	03	5E
30865	40865	33	Sys Total Apparent Energy on update rate*	03	60
30867	40867	34	Sys Total Active Energy OVF Count on update rate*	03	62
30869	40869	35	Sys Total Reactive Energy OVF Count on update rate*	03	64
30871	40871	36	Sys Total Apparent Energy OVF Count on update rate*	03	66
30873	40873	37	Active Energy Import L1	03	68
30875	40875	38	Active Energy Import L2	03	6A
30877	40877	39	Active Energy Import L3	03	6C
30879	40879	40	Active Energy Export L1	03	6E
30881	40881	41	Active Energy Export L2	03	70
30883	40883	42	Active Energy Export L3	03	72
30885	40885	43	Reactive Energy Cap. L1	03	74
30887	40887	44	Reactive Energy Cap. L2	03	76
30889	40889	45	Reactive Energy Cap. L3	03	78
30891	40891	46	Reactive Energy Ind. L1	03	7A
30893	40893	47	Reactive Energy Ind. L2	03	7C
30895	40895	48	Reactive Energy Ind. L3	03	7E
30897	40897	49	Apparent Energy L1	03	80
30899	40899	50	Apparent Energy L2	03	82
30901	40901	51	Apparent Energy L3	03	84
30909	40909	55	Total Active Energy L1	03	8C
30911	40911	56	Total Active Energy L2	03	8E
30913	40913	57	Total Active Energy L3	03	90
30915	40915	58	Total Reactive Energy L1	03	92
30917	40917	59	Total Reactive Energy L2	03	94
30919	40919	60	Total Reactive Energy L3	03	96
30921	40921	61	Total Apparent Energy L1	03	98
30923	40923	62	Total Apparent Energy L2	03	9A
30925	40925	63	Total Apparent Energy L3	03	9C
30927	40927	64	OVF Active Energy Import L1	03	9E
30929	40929	65	OVF Active Energy Import L2	03	A0
30931	40931	66	OVF Active Energy Import L3	03	A2
30933	40933	67	OVF Active Energy Export L1	03	A4

Table 3 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
30935	40935	68	OVF Active Energy Export L2	03	A6
30937	40937	69	OVF Active Energy Export L3	03	A8
30939	40939	70	OVF Reactive Energy Cap. L1	03	AA
30941	40941	71	OVF Reactive Energy Cap. L2	03	AC
30943	40943	72	OVF Reactive Energy Cap. L3	03	AE
30945	40945	73	OVF Reactive Energy Ind. L1	03	B0
30947	40947	74	OVF Reactive Energy Ind. L2	03	B2
30949	40949	75	OVF Reactive Energy Ind. L3	03	B4
30951	40951	76	OVF Apparent Energy L1	03	B6
30953	40953	77	OVF Apparent Energy L2	03	B8
30955	40955	78	OVF Apparent Energy L3	03	BA
30963	40963	82	Total Active Energy OVF Count L1	03	C2
30965	40965	83	Total Active Energy OVF Count L2	03	C4
30967	40967	84	Total Active Energy OVF Count L3	03	C6
30969	40969	85	Total Reactive Energy OVF Count L1	03	C8
30971	40971	86	Total Reactive Energy OVF Count L2	03	CA
30973	40973	87	Total Reactive Energy OVF Count L3	03	CC
30975	40975	88	Total Apparent Energy OVF Count L1	03	CE
30977	40977	89	Total Apparent Energy OVF Count L2	03	D0
30979	40979	90	Total Apparent Energy OVF Count L3	03	D2
30981	40981	91	Active Energy Import L1 on update rate*	03	D4
30983	40983	92	Active Energy Import L2 on update rate*	03	D6
30985	40985	93	Active Energy Import L3 on update rate*	03	D8
30987	40987	94	Active Energy Export L1 on update rate*	03	DA
30989	40989	95	Active Energy Export L2 on update rate*	03	DC
30991	40991	96	Active Energy Export L3 on update rate*	03	DE
30993	40993	97	Reactive Energy Cap. L1 on update rate*	03	E0
30995	40995	98	Reactive Energy Cap. L2 on update rate*	03	E2
30997	40997	99	Reactive Energy Cap. L3 on update rate*	03	E4

Table 3 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
31005	41005	103	Apparent Energy L1 on update rate*	03	EC
31007	41007	104	Apparent Energy L2 on update rate*	03	EE
31009	41009	105	Apparent Energy L3 on update rate*	03	F0
31017	41017	109	Total Active Energy L1 on update rate*	03	F8
31019	41019	110	Total Active Energy L2 on update rate*	03	FA
31021	41021	111	Total Active Energy L3 on update rate*	03	FC
31023	41023	112	Total Reactive Energy L1 on update rate*	03	FE
31025	41025	113	Total Reactive Energy L2 on update rate*	04	00
31027	41027	114	Total Reactive Energy L3 on update rate*	04	02
31029	41029	115	Total Apparent Energy L1 on update rate*	04	04
31031	41031	116	Total Apparent Energy L2 on update rate*	04	06
31033	41033	117	Total Apparent Energy L3 on update rate*	04	08
31035	41035	118	OVF Active Energy Import L1 on update rate*	04	0A
31037	41037	119	OVF Active Energy Import L2 on update rate*	04	0C
31039	41039	120	OVF Active Energy Import L3 on update rate*	04	0E
31041	41041	121	OVF Active Energy Export L1 on update rate*	04	10
31043	41043	122	OVF Active Energy Export L2 on update rate*	04	12
31045	41045	123	OVF Active Energy Export L3 on update rate*	04	14
31047	41047	124	OVF Reactive Energy Cap. L1 on update rate*	04	16
31049	41049	125	OVF Reactive Energy Cap. L2 on update rate*	04	18
31051	41051	126	OVF Reactive Energy Cap. L3 on update rate*	04	1A
31053	41053	127	OVF Reactive Energy Ind. L1 on update rate*	04	1C

Table 3 : Continued...

Address (3X)	Address (4X)	Parameter Number	Parameter	Start address Hex	
				High Byte	Low Byte
31055	41055	128	OVF Reactive Energy Ind. L2 on update rate*	04	1E
31057	41057	129	OVF Reactive Energy Ind. L3 on update rate*	04	20
31059	41059	130	OVF Apparent Energy L1 on update rate*	04	22
31061	41061	131	OVF Apparent Energy L2 on update rate*	04	24
31063	41063	132	OVF Apparent Energy L3 on update rate*	04	26
31071	41071	136	Total Active Energy OVF Count L1 on update rate*	04	2E
31073	41073	137	Total Active Energy OVF Count L2 on update rate*	04	30
31075	41075	138	Total Active Energy OVF Count L3 on update rate*	04	32
31077	41077	139	Total Reactive Energy OVF Count L1 on update rate*	04	34
31079	41079	140	Total Reactive Energy OVF Count L2 on update rate*	04	36
31081	41081	141	Total Reactive Energy OVF Count L3 on update rate*	04	38
31083	41083	142	Total Apparent Energy OVF Count L1 on update rate*	04	3A
31085	41085	143	Total Apparent Energy OVF Count L2 on update rate*	04	3C
31087	41087	144	Total Apparent Energy OVF Count L3 on update rate*	04	3E
31105	41105	153	Run Hour	04	50
31107	41107	154	On Hour	04	52
31113	41113	157	No of Interruption	04	58

***Note :**

1. The values are updated depending on update rate which is settable by user. e.g. if user set update rate 15 min, then the values on these registers (marked with *) will get updated on every 15 min.

3.2 Accessing 4 X register for Reading & Writing

Each setting is held in the 4X registers. ModBus code 03 is used to read the current setting & code 16 is used to write/change the setting. Refer **Table 4** for 4X Register addresses.

Example: Reading System type

System Type: Start address = 1772 (Hex)

Number of registers = 02

Note : Number of registers = Number of Parameters x 2

Query :

Device Address	01 (Hex)
Function Code	03 (Hex)
Start Address High	17 (Hex)
Start Address Low	72 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
CRC Low	61 (Hex)
CRC High	A4 (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.

Start Address Low : Least significant 8 bits of starting address of the parameter requested.

Number of register High : Most significant 8 bits of Number of registers requested.

Number of register Low : Least significant 8 bits of Number of registers requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Response: System Type (3phase 4 wire = 3)

Device Address	01 (Hex)
Function Code	03 (Hex)
Byte Count	04 (Hex)
Data Register- 1 High Byte	40 (Hex)
Data Register- 1 Low Byte	40 (Hex)
Data Register- 2 High Byte	00 (Hex)
Data Register- 2 Low Byte	00 (Hex)
CRC Low	E5 (Hex)
CRC High	F3 (Hex)

Byte Count : Total number of data bytes received.

Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.

Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.

Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.

Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Example : Writing System type

System type : Start address = 1772 (Hex)

Number of registers = 02

Note: Number of registers = Number of Parameters x 2

Query:(Change System type to 3phase 3wire = 2)

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address High	17 (Hex)
Starting Address Low	72 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
Byte Count	04 (Hex)
Data Register- 1 High Byte	40 (Hex)
Data Register- 1 Low Byte	00 (Hex)
Data Register- 2 High Byte	00 (Hex)
Data Register- 2 Low Byte	00 (Hex)
CRC Low	8B (Hex)
CRC High	62 (Hex)

Byte Count : Total number of data bytes received.

Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.

Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.

Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.

Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.

(Note : Two consecutive 16 bit register represent one parameter)

Response:

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	17 (Hex)
Start Address Low	72 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
CRC Low	E4 (Hex)
CRC High	64 (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.

Start Address Low : Least significant 8 bits of starting address of the parameter requested.

Number of register High : Most significant 8 bits of Number of registers requested.

Number of register Low : Least significant 8 bits of Number of registers requested.

(Note : Two consecutive 16 bit register represent one parameter)

3.3 Accessing 4X register for Long Energy Reading & Writing

For setting Energy start count in long energy format following query format should be used for writing energy start count. First, send query (at address 1790) to unlock the parameter.

Note: For parameter to be unlocked, refer TABLE 7 for energy parameter selection.

Query: (Query for Unlock to enter System Active Energy Import)

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address High	17 (Hex)
Starting Address Low	90 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
Byte Count	04 (Hex)
Data Register- 1 High Byte	3F (Hex)
Data Register- 1 Low Byte	80 (Hex)
Data Register- 2 High Byte	00 (Hex)
Data Register- 2 Low Byte	00 (Hex)
CRC Low	1C (Hex)
CRC High	CF (Hex)

Byte Count : Total number of data bytes transmitted.

Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.

Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.

Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.

Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Response:

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	17 (Hex)
Start Address Low	90 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
CRC Low	44 (Hex)
CRC High	51 (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.

Start Address Low : Least significant 8 bits of starting address of the parameter requested.

Number of register High : Most significant 8 bits of Number of registers requested.

Number of register Low : Least significant 8 bits of Number of registers requested.

Once the Unlock query is sent, next send query for writing Energy start count. For Example: Query for writing energy start count of 999999999 for System Active Import Energy.

Note: Refer TABLE 3 for register address of the selected parameter.

Query: (Query enter System Active Energy Import)

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address High	03 (Hex)
Starting Address Low	20 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
Byte Count	04 (Hex)
Data Register- 1 High Byte	3B (Hex)
Data Register- 1 Low Byte	9A (Hex)
Data Register- 2 High Byte	C9 (Hex)
Data Register- 2 Low Byte	FF (Hex)
CRC Low	DE (Hex)
CRC High	5C (Hex)

Byte Count : Total number of data bytes received.

Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.

Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.

Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.

Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Value(3B,9A, C9,FF) represents 999999999.

Response:

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	03 (Hex)
Start Address Low	20 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
CRC Low	CD (Hex)
CRC High	C1 (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.

Start Address Low : Least significant 8 bits of starting address of the parameter requested.

Number of register High : Most significant 8 bits of Number of registers requested.

Number of register Low : Least significant 8 bits of Number of registers requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Table 4 : 4 X register addresses

Address (Register)	Para No.	Parameter	Read/ Write	Start address Hex		Default Value
				High Byte	Low Byte	
46003	1	System Type	R/Wp	17	72	3
46005	2	PT Primary	R/Wp	17	74	500
46007	3	CT Primary	R/Wp	17	76	5
46009	4	PT Secondary	R/Wp	17	78	500
46011	5	CT Secondary	R/Wp	17	7A	5
46013	6	System Frequency Selection	R/Wp	17	7C	50
46019	9	Demand Integration Time	R/Wp	17	82	8
46021	10	Energy Unit	R/Wp	17	84	2
46023	11	Energy Digit Reset Count	R/Wp	17	86	8
46027	13	Energy Update rate on MODBUS	R/Wp	17	8A	15
46029	14	Impulse on Energy Selection	R/Wp	17	8C	1
46031	15	Impulse Rate	R	17	8E	-
46033	16	Energy Para Select for Start Count	R/Wp	17	90	0
46035	17	Enter Energy Start Count	R/Wp	17	92	0
46037	18	Reset Parameters	R/Wp	17	94	0
46039	19	Password	R/Wp	17	96	0
46041	20	Factory Reset Mode	R/Wp	17	98	0
46045	22	Number of Poles	R/Wp	17	9C	2
46049	24	Current Noise Cutoff (mA)	R/Wp	17	A0	0
46051	25	Node Address	R/Wp	17	A2	1
46053	26	RS485 Setup Code	R/Wp	17	A4	4
46055	27	Register Order/Word Order	R/Wp	17	A6	0
46057	28	Pulse Width	R/Wp	17	A8	100
46059	29	Pulse Divisor	R/Wp	17	AA	1
46061	30	Relay1 Output Select	R/Wp	17	AC	0
46063	31	Relay1 Parameter Select	R/Wp	17	AE	0
46065	32	Relay1 Limit1 Alarm Setting (Hi/Lo)	R/Wp	17	B0	0
46067	33	Relay1 Limit1 Trip point	R/Wp	17	B2	10
46069	34	Relay1 Limit1 Hysteresis	R/Wp	17	B4	0.5
46071	35	Relay1 Limit 2 Para select	R/Wp	17	B6	0
46073	36	Relay1 Limit 2 Alarm Setting (Hi/Lo)	R/Wp	17	B8	0
46075	37	Relay1 Limit 2 Trip point	R/Wp	17	BA	10
46077	38	Relay1 Limit 2 Hysteresis	R/Wp	17	BC	0.5
46079	39	Relay1 Limit 3 Para select	R/Wp	17	BE	0
46081	40	Relay1 Limit 3 Alarm Setting (Hi/Lo)	R/Wp	17	C0	0
46083	41	Relay1 Limit 3 Trip point	R/Wp	17	C2	10
46085	42	Relay1 Limit 3 Hysteresis	R/Wp	17	C4	0.5

Table 4 : Continued...

Address (Register)	Para No.	Parameter	Read/ Write	Start address Hex		Default Value
				High Byte	Low Byte	
46087	43	Relay1 Logic Operation Setting	R/Wp	17	C6	0
46089	44	Relay1 Configuration (Enr/De-Enr)	R/Wp	17	C8	1
46091	45	Relay1 delay(On)	R/Wp	17	CA	1
46093	46	Relay1 delay(Off)	R/Wp	17	CC	0
46103	51	Relay2 output select	R/Wp	17	D6	0
46105	52	Relay2 Limit1 Para select	R/Wp	17	D8	0
46107	53	Relay2 Limit1 Alarm Setting (Hi/Lo)	R/Wp	17	DA	0
46109	54	Relay2 Limit1 Trip point	R/Wp	17	DC	10
46111	55	Relay2 Limit1 Hysteresis	R/Wp	17	DE	0.5
46113	56	Relay2 Limit 2 Para select	R/Wp	17	E0	0
46115	57	Relay2 Limit 2 Alarm Setting (Hi/Lo)	R/Wp	17	E2	0
46117	58	Relay2 Limit 2 Trip point	R/Wp	17	E4	10
46119	59	Relay2 Limit 2 Hysteresis	R/Wp	17	E6	0.5
46121	60	Relay2 Limit 3 Para select	R/Wp	17	E8	0
46123	61	Relay2 Limit 3 Alarm Setting (Hi/Lo)	R/Wp	17	EA	0
46125	62	Relay2 Limit 3 Trip point	R/Wp	17	EC	10
46127	63	Relay2 Limit 3 Hysteresis	R/Wp	17	EE	0.5
46129	64	Relay2 Logic Operation Setting	R/Wp	17	F0	0
46131	65	Relay2 Configuration (Enr/De-Enr)	R/Wp	17	F2	1
46133	66	Relay2 delay(On)	R/Wp	17	F4	1
46135	67	Relay2 delay(Off)	R/Wp	17	F6	0
46145	72	Relay3 output select	R/Wp	18	00	0
46147	73	Relay3 Limit1 Para select	R/Wp	18	02	0
46149	74	Relay3 Limit1 Alarm Setting (Hi/Lo)	R/Wp	18	04	0
46151	75	Relay3 Limit1 Trip point	R/Wp	18	06	10
46153	76	Relay3 Limit1 Hysteresis	R/Wp	18	08	0.5
46155	77	Relay3 Limit 2 Para select	R/Wp	18	0A	0
46157	78	Relay3 Limit 2 Alarm Setting (Hi/Lo)	R/Wp	18	0C	0
46159	79	Relay3 Limit 2 Trip point	R/Wp	18	0E	10
46161	80	Relay3 Limit 2 Hysteresis	R/Wp	18	10	0.5
46163	81	Relay3 Limit 3 Para select	R/Wp	18	12	0
46165	82	Relay3 Limit 3 Alarm Setting (Hi/Lo)	R/Wp	18	14	0
46167	83	Relay3 Limit 3 Trip point	R/Wp	18	16	10
46169	84	Relay3 Limit 3 Hysteresis	R/Wp	18	18	0.5
46171	85	Relay3 Logic Operation Setting	R/Wp	18	1A	0
46173	86	Relay3 delay(On)	R/Wp	18	1C	1
46175	87	Relay3 delay(Off)	R/Wp	18	1E	1
46177	88	Relay3 Configuration (Enr/De-Enr)	R/Wp	18	20	0

Table 4 : Continued...

Address (Register)	Para No.	Parameter	Read/ Write	Start address Hex		Default Value
				High Byte	Low Byte	
46187	93	Relay4 output select	R/Wp	18	2A	0
46189	94	Relay4 Limit1 Para select	R/Wp	18	2C	0
46191	95	Relay4 Limit1 Alarm Setting (Hi/Lo)	R/Wp	18	2E	0
46193	96	Relay4 Limit1 Trip point	R/Wp	18	30	10
46195	97	Relay4 Limit1 Hysteresis	R/Wp	18	32	0.5
46197	98	Relay4 Limit 2 Para select	R/Wp	18	34	0
46199	99	Relay4 Limit 2 Alarm Setting (Hi/Lo)	R/Wp	18	36	0
46201	100	Relay4 Limit 2 Trip point	R/Wp	18	38	10
46203	101	Relay4 Limit 2 Hysteresis	R/Wp	18	3A	0.5
46205	102	Relay4 Limit 3 Para select	R/Wp	18	3C	0
46207	103	Relay4 Limit 3 Alarm Setting (Hi/Lo)	R/Wp	18	3E	0
46209	104	Relay4 Limit 3 Trip point	R/Wp	18	40	10
46211	105	Relay4 Limit 3 Hysteresis	R/Wp	18	42	0.5
46213	106	Relay4 Logic Operation Setting	R/Wp	18	44	0
46215	107	Relay4 delay(On)	R/Wp	18	46	1
46217	108	Relay4 delay(Off)	R/Wp	18	48	1
46219	109	Relay4 Configuration (Enr/De-Enr)	R/Wp	18	4A	0
46241	120	Timer 1 Start stop	R/Wp	18	60	0
46243	121	Timer 2 Start stop	R/Wp	18	62	0
46245	122	Timer 3 Start stop	R/Wp	18	64	0
46247	123	Timer 4 Start stop	R/Wp	18	66	0
46249	124	Analog Output1 Type	R/Wp	18	68	2
46251	125	Analog Output1 Parameter	R/Wp	18	6A	0
46253	126	Elbow Function Selection for Output 1	R/Wp	18	6C	0
46255	127	Input Start Value for Output1	R/Wp	18	6E	0
46257	128	Input Elbow Value for Output1	R/Wp	18	70	0
46259	129	Input End Value for Output1	R/Wp	18	72	415
46261	130	Output1 Start Value	R/Wp	18	74	-20
46263	131	Output1 Elbow Value	R/Wp	18	76	0
46265	132	Output1 End Value	R/Wp	18	78	20
46267	133	Analog Output2 Type	R/Wp	18	7A	2
46269	134	Analog Output2 Parameter	R/Wp	18	7C	0
46271	135	Elbow Function Selection for Output 2	R/Wp	18	7E	0
46273	136	Input Start Value for Output2	R/Wp	18	80	0
46275	137	Input Elbow Value for Output2	R/Wp	18	82	0
46277	138	Input End Value for Output2	R/Wp	18	84	415
46279	139	Output2 Start Value	R/Wp	18	86	-20
46281	140	Output2 Elbow Value	R/Wp	18	88	0

Table 4 : Continued...

Address (Register)	Para No.	Parameter	Read/ Write	Start address Hex		Default Value
				High Byte	Low Byte	
46283	141	Output2 End Value	R/Wp	18	8A	20
46285	142	Analog Output3 Type	R/Wp	18	8C	2
46287	143	Analog Output3 Parameter	R/Wp	18	8E	0
46289	144	Elbow Function Selection for Output 3	R/Wp	18	90	0
46291	145	Input Start Value for Output3	R/Wp	18	92	0
46293	146	Input Elbow Value for Output3	R/Wp	18	94	0
46295	147	Input End Value for Output3	R/Wp	18	96	415
46297	148	Output3 Start Value	R/Wp	18	98	-20
46299	149	Output3 Elbow Value	R/Wp	18	9A	0
46301	150	Output3 End Value	R/Wp	18	9C	20
46303	151	Analog Output4 Type	R/Wp	18	9E	2
46305	152	Analog Output4 Parameter	R/Wp	18	A0	0
46307	153	Elbow Function Selection for Output 4	R/Wp	18	A2	0
46309	154	Input Start Value for Output4	R/Wp	18	A4	0
46311	155	Input Elbow Value for Output4	R/Wp	18	A6	0
46313	156	Input End Value for Output4	R/Wp	18	A8	415
46315	157	Output4 Start Value	R/Wp	18	AA	-20
46317	158	Output4 Elbow Value	R/Wp	18	AC	0
46319	159	Output4 End Value	R/Wp	18	AE	20
46321	160	Output1 Mode (Normal / Simulation)	R/Wp	18	B0	0
46323	161	Output 1 Sim Value	R/Wp	18	B2	0
46325	162	Output2 Mode (Normal / Simulation)	R/Wp	18	B4	0
46327	163	Output 2 Sim Value	R/Wp	18	B6	0
46329	164	Output3 Mode (Normal / Simulation)	R/Wp	18	B8	0
46331	165	Output 3 Sim Value	R/Wp	18	BA	0
46333	166	Output4 Mode (Normal / Simulation)	R/Wp	18	BC	0
46335	167	Output 4 Sim Value	R/Wp	18	BE	0
46357	178	Version no.	R	18	D4	-

Note : Wp - Write protected , R - Read only , R/Wp - Read & Write protected

Explanation for 4 X register :

NOTE: Writing any invalid values (non-applicable values) to any of the following locations will result in modbus error.

Address	Parameter	Description
46003	System Type	This address is used to set the System type. Write one of the following value to this address. 1 : 1 Phase 2 Wire 2 : 3 Phase 3 Wire Unbalanced 3 : 3 Phase 4 Wire Unbalanced 4 : U31 I1 Balance 5 : U23 I1 Balance 6 : U12 I1 Balance 7 : 3 Phase 3 Wire Balanced 8 : 3 Phase 4 Wire Balanced
46005	PT Primary	This address allows the user to set PT Primary value (in terms of VL-L). The settable range is 100 VL-L to 1200 kVL-L for all system types & also depends on the per phase 1800MVA Restriction of power combined with CT primary.
46007	CT Primary	This address allows the user to set CT Primary value. The settable range is 1 to 9999 . It also depends on the per phase 1800 MVA Restriction of power combined with PT primary.
46009	PT Secondary	This address is used to read and write the PT secondary value. The settable range is 100-600VLL .
46011	CT Secondary	This address is used to read and write the CT secondary value. Write one of the following values to this address. 1 : 1A CT secondary 5 : 5A CT secondary Note: For External CT model CT Secondary is not settable from modbus.

Address	Parameter	Description
46013	System Frequency Selection	This address is used to set the frequency of the input. Write 50 : For 50 Hz input 60 : For 60Hz input
46019	Demand Integration Time	Demand period represents demand time in minutes. The applicable values are ranging from 5 to 60 .
46021	Energy Unit	This address is used to set energy output in Wh,kWh & Mwh. Write one of the following value to this address. 1 : Energy in Wh. 2 : Energy in KWh. 3 : Energy in MWh.
46023	Energy Digit Reset Count	This address is used to set maximum energy count after which energy on modbus will roll over to zero. valid values are 7 , 8 and 9 .
46027	Energy Update Rate	This address is used to specify update rate of energy in corresponding 3X registers. The valid values for update rate are from 1 to 60 min.
46029	Impulse on Energy Selection	This address is used to select the energy to which impulse is to be assigned. Writing any other value will return an error. To assign the value refer TABLE 5 .
46031	Impulse Rate	This address allows the user to read the impulse rate which is calculated depending on the nominal system power.
46033	Energy Para Select for Start Count	This address is used to select the parameter whose start count (initial value) is to be set. Refer TABLE 7 .
46035	Enter Energy Start Count	This address is used to set the start count of the parameter selected in address 46033. The start count of the parameter should be in the range specified in TABLE 7 .

Address	Parameter	Description
46037	Reset Parameters	This address is used to reset different parameters. Write specific value to this register to reset the corresponding parameter. Following are the values to reset various data. 1: Energy Reset 2: Demand Reset 3: System Min Values Reset 4: System Max Values Reset 5: Run hour & On hour Reset 6: No of Interruptions Reset 7: Reset All data
46039	Password	This address is used to set & reset the password. Valid Range of Password which can be set is 0000 - 9999. 1) If password lock is present & if this location is read it will return zero. 2) If password lock is absent & if this location is read it will return one. 3) If password lock is present & to disable this lock first send valid password to this location then write "0000" to this location 4) If password lock is present & to modify 4X parameter first send valid password to this location so that 4X parameter will be accessible for modification. 5) If for in any of the above case invalid password is send then meter will return exceptional error 2.
46041	Factory Reset	This address allows the user to reset the Transducer to factory settings. Refer the Default Values in TABLE 4 for factory settings. Write 5555 at this address to reset the Transducer.
46045	Number of Poles	This address is used to set the no. of poles of generator of which RPM is to be measured. The value must be between 2 to 40 and a multiple of 2.

Address	Parameter	Description
46049	Current Noise Cut-off (mA)	This address is used to set the noise current cutoff. The valid values ranges from 0 to 30 (mA).
46051	Node Address	This register address is used to set Device address between 1 to 247 .
46053	RS485 Set-up Code	This address is used to set the baud rate, Parity and Number of stop bits. Refer to TABLE 6 for details.
46055	Word Order	Word Order controls the order in which Transducer receives or sends floating - point numbers:- normal or reversed register order. In normal mode, the two registers that make up a floating point numbers are sent most significant bytes first. In reversed register mode, the two registers that make up a floating point numbers are sent least significant bytes first. To set the mode, write the value '2141.0' into this register and the Transducer will detect the order used to send this value and set that order for all ModBus transaction involving floating point numbers.
46057	Pulse Width of Relay	This address is used to set pulse width of the Pulse output. Write one of the following values to this address: 60 : 60 ms 100 : 100 ms 200 : 200 ms
46059	Pulse Divisor	This address is used to set pulse divisor of the Pulse output. Write one of the following values to this address for energy unit Wh : 1 : Divisor 1 10 : Divisor 10 100 : Divisor 100 1000 : Divisor 1000 In energy unit kWh or MWh , divisor will be 1 by default.

Address	Parameter	Description
46061	Relay 1 Output Select	This address is used to select the Relay operation as None / Pulse / Limit / Timer. Write one of the following values to this address. 0 : None 1 : Pulse 2 : Limit 3 : Timer
46063	Relay 1 Parameter Select	This address is used to assign the Parameter to Relay. Pulse relay : Refer TABLE 9 . Limit - 1 relay : Refer TABLE 10 . Timer relay : Refer TABLE 11 .
46065	Relay 1 Limit - 1 Alarm Setting	This address is used to set the alarm for the selected Limit -1 parameter. 0 : High Alarm 1 : Low Alarm
46067	Relay 1 Limit - 1 Trip Point	This address is used to set the trip point in %. Any value between 10 to 100 for Lo- alarm & 10 to 120 for Hi-alarm can be written to this address. For energy parameters, the valid range is 10-9999999 . (refer TABLE 10).
46069	Relay 1 Limit - 1 Hysteresis	This address is used to set the hysteresis between 0.5% to 50.0% .
46071	Relay 1 Limit - 2 Para Select	Same as Relay 1 Limit - 1
46073	Relay 1 Limit - 2 Alarm Setting	
46075	Relay 1 Limit - 2 Trip Point	
46077	Relay 1 Limit - 2 Hysteresis	

Address	Parameter	Description
46079	Relay 1 Limit - 3 Para Select	Same as Relay 1 Limit - 1
46081	Relay 1 Limit - 3 Alarm Setting	
46083	Relay 1 Limit - 3 Trip Point	
46085	Relay 1 Limit - 3 Hysteresis	
46087	Relay 1 Logic Operation Setting	This address is used to set the logic operation between the Limit (1-2-3) output parameters. Valid values are : 0 : None 1 : AND 2 : OR
46089	Relay 1 Configuration Select	This address is used to set the Configuration for Relay 1. Valid values are : 0 : Energize 1 : De-Energize
46091	Relay 1 Delay (On)	This address is used to set the On delay in seconds in range of 1 to 9999 for Limit and Timer Relay
46093	Relay 1 Delay (Off)	This address is used to set the Off delay in seconds in range of 1 to 9999 for Limit and Timer Relay.
46103	Relay 2 Output Select	Same as Relay - 1
46105	Relay 2 Parameter Select	
46107	Relay 2 Limit - 1 Alarm Setting	
46109	Relay 2 Limit - 1 Trip Point	
46111	Relay 2 Limit - 1 Hysteresis	

Address	Parameter	Description
46113	Relay 2 Limit - 2 Para Select	Same as Relay - 1
46115	Relay 2 Limit - 2 Alarm Setting	
46117	Relay 2 Limit - 2 Trip Point	
46119	Relay 2 Limit - 2 Hysteresis	
46121	Relay 2 Limit - 3 Para Select	
46123	Relay 2 Limit - 3 Alarm Setting	
46125	Relay 2 Limit - 3 Trip Point	
46127	Relay 2 Limit - 3 Hysteresis	
46129	Relay 2 Logic Operation Setting	
46131	Relay 2 Configuration Select	
46133	Relay 2 Delay (On)	
46135	Relay 2 Delay (Off)	
46145	Relay 3 Output Select	Same as Relay - 1
46147	Relay 3 Para Select	
46149	Relay 3 Limit - 1 Alarm Setting	
46151	Relay 3 Limit - 1 Trip Point	

Address	Parameter	Description
46153	Relay 3 Limit - 1 Hysteresis	Same as Relay - 1
46155	Relay 3 Limit - 2 Para Select	
46157	Relay 3 Limit - 2 Alarm Setting	
46159	Relay 3 Limit - 2 Trip Point	
46161	Relay 3 Limit - 2 Hysteresis	
46163	Relay 3 Limit - 3 Para Select	
46165	Relay 3 Limit - 3 Alarm Setting	
46167	Relay 3 Limit - 3 Trip Point	
46169	Relay 3 Limit - 3 Hysteresis	
46171	Relay 3 Logic Operation Setting	
46173	Relay 3 Delay (On)	
46175	Relay 3 Delay (Off)	
46177	Relay 3 Configuration Select	Same as Relay - 1
46187	Relay 4 Output Select	
46189	Relay 4 Para Select	
46191	Relay 4 Limit - 1 Alarm Setting	

Address	Parameter	Description
46193	Relay 4 Limit - 1 Trip Point	Same as Relay - 1
46195	Relay 4 Limit - 1 Hysteresis	
46197	Relay 4 Limit - 2 Para Select	
46199	Relay 4 Limit - 2 Alarm Setting	
46201	Relay 4 Limit - 2 Trip Point	
46203	Relay 4 Limit - 2 Hysteresis	
46205	Relay 4 Limit - 3 Para Select	
46207	Relay 4 Limit - 3 Alarm Setting	
46209	Relay 4 Limit - 3 Trip Point	
46211	Relay 4 Limit - 3 Hysteresis	
46213	Relay 4 Logic Operation Setting	
46215	Relay 4 Delay (On)	
46217	Relay 4 Delay (Off)	
46219	Relay 4 Configuration Select	
46241	Relay Timer 1 Start / Stop	This address is used to start/stop the timer for Relay 1 in timer mode with following options: 0: Stop 1: Start

Address	Parameter	Description
46243	Relay Timer 2 Start / Stop	This address is used to start/stop the timer for Relay 2 in timer mode with following options: 0: Stop 1: Start
46245	Relay Timer 3 Start / Stop	This address is used to start/stop the timer for Relay 3 in timer mode with following options: 0: Stop 1: Start
46247	Relay Timer 4 Start / Stop	This address is used to start/stop the timer for Relay 4 in timer mode with following options: 0: Stop 1: Start
46249	Analog Output 1 Type	This address is used to set analog output 1 type as Voltage or Current with following options : 1: Voltage 2: Current
46251	Analog Output 1 Parameter	This address is used to set the parameter for Analog Output 1. Refer Table 8 for parameter selection.
46253	Elbow Function selection for Output 1	This address is used to Enable/Disable the Elbow function of Analog output 1 with following options: 0: Disable 1: Enable
46255	Input Start Value for Output 1	This address is used to set the Input Start value for Analog output 1 depending on the output parameter selected.
46257	Input Elbow Value for Output 1	This address is used to set the Input Elbow value for Analog output 1 depending on the output parameter selected.
46259	Input End Value for Output 1	This address is used to set the Input End value for Analog output 1 depending on the output 1 parameter selected.
46261	Output 1 Start Value	This address is used to set the Output Start value for Analog output 1.
46263	Output 1 Elbow Value	This address is used to set the Output Elbow value for Analog output 1.
46265	Output 1 End Value	This address is used to set the Output End value for Analog output 1.

Address	Parameter	Description
46267	Analog Output 2 Type	Same as Analog Output 1
46269	Analog Output 2 Parameter	
46271	Elbow Function selection for Output 2	
46273	Input Start Value for Output 2	
46275	Input Elbow Value for Output 2	
46277	Input End Value for Output 2	
46279	Output 2 Start Value	
46281	Output 2 Elbow Value	
46283	Output 2 End Value	
46285	Analog Output 3 Type	Same as Analog Output 1
46287	Analog Output 3 Parameter	
46289	Elbow Function selection for Output 3	
46291	Input Start Value for Output 3	
46293	Input Elbow Value for Output 3	

Address	Parameter	Description
46295	Input End Value for Output 3	Same as Analog Output 1
46297	Output 3 Start Value	
46299	Output 3 Elbow Value	
46301	Output 3 End Value	
46303	Analog Output 4 Type	Same as Analog Output 1
46305	Analog Output 4 Parameter	
46307	Elbow Function selection for Output 4	
46309	Input Start Value for Output 4	
46311	Input Elbow Value for Output 4	
46313	Input End Value for Output 4	
46315	Output 4 Start Value	
46317	Output 4 Elbow Value	
46319	Output 4 End Value	
46321	Output 1 Mode	This address is used to set the Mode of Analog Output 1. 0 : Normal 2 : Simulation
46323	Output 1 Sim Value	This address is used to set the Analog output 1 simulation value as per output type selected.

Address	Parameter	Description
46325	Output 2 Mode	Same as Analog Output Mode 1
46327	Output 2 Sim Value	
46329	Output 3 Mode	Same as Analog Output Mode 1
46331	Output 3 Sim Value	
46333	Output 4 Mode	Same as Analog Output Mode 1
46335	Output 4 Sim Value	
46357	Firmware Version No.	This address is read only and displays the firmware version of the Transducer.

TABLE 5 : Impulse Energy Selection

Parameter Number	Parameter
0	None
1	System Active Energy
2	System Reactive Energy
3	System Apparant Energy
4	Active Energy L1
5	Active Energy L2
6	Active Energy L3
7	Apparant Energy L1
8	Apparant Energy L2
9	Apparant Energy L3
10	Reactive Energy L1
11	Reactive Energy L2
12	Reactive Energy L3

TABLE 6 : RS 485 Set-up Code

Baud Rate	Parity	Stop Bit	Decimal value
4800	NONE	1	0
4800	NONE	2	1
4800	EVEN	1	2
4800	ODD	1	3
9600	NONE	1	4
9600	NONE	2	5
9600	EVEN	1	6
9600	ODD	1	7
19200	NONE	1	8
19200	NONE	2	9
19200	EVEN	1	10
19200	ODD	1	11
38400	NONE	1	12
38400	NONE	2	13
38400	EVEN	1	14
38400	ODD	1	15
57600	NONE	1	16
57600	NONE	2	17
57600	EVEN	1	18
57600	ODD	1	19

NOTE : Codes not listed in the **Table 6** may **give rise to** unpredictable results including loss of **communication**. Exercise caution when attempting to **change mode via** direct Modbus writes.

TABLE 7 : Energy Parameter Selection and Start Count

Parameter Number	Parameter	Range
1	Sys Active Energy Import	1 to 999999999
2	Sys Active Energy Export	1 to 999999999
3	Sys Reactive Energy Cap.	1 to 999999999
4	Sys Reactive Energy Ind.	1 to 999999999
5	Sys Apparent Energy	1 to 999999999
7	Sys Active Energy Import Overflow Count	1 to 999999
8	Sys Active Energy Export Overflow Count	1 to 999999
9	Sys Reactive Energy Capacitive Overflow Count	1 to 999999
10	Sys Reactive Energy Inductive Overflow Count	1 to 999999
11	Sys Apparent Energy Overflow Count	1 to 999999
25	Sys Total Active Energy	1 to 999999999
26	Sys Total Reactive Energy	1 to 999999999
27	Sys Total Apparent Energy	1 to 999999999
28	Sys Total Active Energy Overflow Count	1 to 999999
29	Sys Total Reactive Energy Overflow Count	1 to 999999
30	Sys Total Apparent Energy Overflow Count	1 to 999999
37	Active Energy Import L1	1 to 999999999
38	Active Energy Import L2	1 to 999999999
39	Active Energy Import L3	1 to 999999999
40	Active Energy Export L1	1 to 999999999
41	Active Energy Export L2	1 to 999999999
42	Active Energy Export L3	1 to 999999999
43	Reactive Energy Capacitive L1	1 to 999999999
44	Reactive Energy Capacitive L2	1 to 999999999
45	Reactive Energy Capacitive L3	1 to 999999999
46	Reactive Energy Inductive L1	1 to 999999999
47	Reactive Energy Inductive L2	1 to 999999999
48	Reactive Energy Inductive L3	1 to 999999999
49	Apparent Energy L1	1 to 999999999
50	Apparent Energy L2	1 to 999999999
51	Apparent Energy L3	1 to 999999999
55	Total Active Energy L1	1 to 999999999
56	Total Active Energy L2	1 to 999999999
57	Total Active Energy L3	1 to 999999999
58	Total Reactive Energy L1	1 to 999999999
59	Total Reactive Energy L2	1 to 999999999
60	Total Reactive Energy L3	1 to 999999999
61	Total Apparent Energy L1	1 to 999999999

TABLE 7 : Continued...

Parameter Number	Parameter	Range
62	Total Apparent Energy L2	1 to 999999999
63	Total Apparent Energy L3	1 to 999999999
64	Overflow Active Energy Import L1	1 to 999999
65	Overflow Active Energy Import L2	1 to 999999
66	Overflow Active Energy Import L3	1 to 999999
67	Overflow Active Energy Export L1	1 to 999999
68	Overflow Active Energy Export L2	1 to 999999
69	Overflow Active Energy Export L3	1 to 999999
70	Overflow Reactive Energy Capacitive L1	1 to 999999
71	Overflow Reactive Energy Capacitive L2	1 to 999999
72	Overflow Reactive Energy Capacitive L3	1 to 999999
73	Overflow Reactive Energy Inductive L1	1 to 999999
74	Overflow Reactive Energy Inductive L2	1 to 999999
75	Overflow Reactive Energy Inductive L3	1 to 999999
76	Overflow Apparent Energy L1	1 to 999999
77	Overflow Apparent Energy L2	1 to 999999
78	Overflow Apparent Energy L3	1 to 999999
82	Total Active Energy Overflow Count L1	1 to 999999
83	Total Active Energy Overflow Count L2	1 to 999999
84	Total Active Energy Overflow Count L3	1 to 999999
85	Total Reactive Energy Overflow Count L1	1 to 999999
86	Total Reactive Energy Overflow Count L2	1 to 999999
87	Total Reactive Energy Overflow Count L3	1 to 999999
88	Total Apparent Energy Overflow Count L1	1 to 999999
89	Total Apparent Energy Overflow Count L2	1 to 999999
90	Total Apparent Energy Overflow Count L3	1 to 999999

TABLE 8 : Parameters for Analog Output

Para No.	Parameter	3 Phase 4 Wire	3 Phase 3 Wire	1 Phase 2 Wire	Other System Types
0	Volts 1	✓	✓	✓	✗
1	Volts 2	✓	✓	✗	✗
2	Volts 3	✓	✓	✗	✗
3	Current 1	✓	✓	✓	✗
4	Current 2	✓	✓	✗	✗
5	Current 3	✓	✓	✗	✗
6	Watt 1	✓	✗	✓	✗
7	Watt 2	✓	✗	✗	✗
8	Watt 3	✓	✗	✗	✗
9	VA 1	✓	✗	✓	✗
10	VA 2	✓	✗	✗	✗
11	VA 3	✓	✗	✗	✗
12	VAr 1	✓	✗	✓	✗
13	VAr 2	✓	✗	✗	✗
14	VAr 3	✓	✗	✗	✗
15	PF1	✓	✗	✓	✗
16	PF2	✓	✗	✗	✗
17	PF3	✓	✗	✗	✗
18	PA1	✓	✗	✓	✗
19	PA2	✓	✗	✗	✗
20	PA3	✓	✗	✗	✗
21	Volts Average	✓	✓	✗	✓
23	Current Average	✓	✓	✗	✓
26	Watts sum	✓	✓	✗	✓
28	VA sum	✓	✓	✗	✓
30	VAr sum	✓	✓	✗	✓
31	PF Average	✓	✓	✗	✓
33	PA Average	✓	✓	✗	✓
35	Frequency	✓	✓	✓	✓
84	Re-Active PF L1	✓	✗	✓	✗
85	Re-Active PF L2	✓	✗	✗	✗
86	Re-Active PF L3	✓	✗	✗	✗
87	Avg Re-Active PF	✓	✓	✗	✓
89	LF SgnQ(1-(P/S)) L1	✓	✗	✓	✗
90	LF SgnQ(1-(P/S)) L2	✓	✗	✗	✗
91	LF SgnQ(1-(P/S)) L3	✓	✗	✗	✗
92	Avg LF SgnQ(1-(P/S))	✓	✓	✗	✓
100	V12	✓	✗	✗	✗

TABLE 8 : Continued...

Para No.	Parameter	3 Phase 4 Wire	3 Phase 3 Wire	1 Phase 2 Wire	Other System Types
101	V23	✓	✗	✗	✗
102	V31	✓	✗	✗	✗
127	Distortion VAr L1	✓	✗	✓	✗
128	Distortion VAr L2	✓	✗	✗	✗
129	Distortion VAr L3	✓	✗	✗	✗
131	SUM Distortion Var	✓	✓	✗	✓
150	Sys kw Import Demand	✓	✓	✓	✓
151	Sys kw Export Demand	✓	✓	✓	✓
152	Sys kVAr Import Demand	✓	✓	✓	✓
153	Sys kVAr Export Demand	✓	✓	✓	✓
154	Sys Kva Demand	✓	✓	✓	✓
156	Sys Current Demand	✓	✓	✓	✓
158	Sys kw Import Max Demand	✓	✓	✓	✓
159	Sys kw Export Max Demand	✓	✓	✓	✓
160	Sys kVAr Import Max Demand	✓	✓	✓	✓
161	Sys kVAr Export Max Demand	✓	✓	✓	✓
162	Sys Kva Max Demand	✓	✓	✓	✓
164	Sys Current Max Demand	✓	✓	✓	✓
166	kw Import Demand L1	✓	✗	✗	✗
167	kw Import Demand L2	✓	✗	✗	✗
168	kw Import Demand L3	✓	✗	✗	✗
169	kw Export Demand L1	✓	✗	✗	✗
170	kw Export Demand L2	✓	✗	✗	✗
171	kw Export Demand L3	✓	✗	✗	✗
172	kVAr Import Demand L1	✓	✗	✗	✗
173	kVAr Import Demand L2	✓	✗	✗	✗
174	kVAr Import Demand L3	✓	✗	✗	✗
175	kVAr Export Demand L1	✓	✗	✗	✗
176	kVAr Export Demand L2	✓	✗	✗	✗
177	kVAr Export Demand L3	✓	✗	✗	✗
178	Kva Demand L1	✓	✗	✗	✗
179	Kva Demand L2	✓	✗	✗	✗
180	Kva Demand L3	✓	✗	✗	✗
184	Current Demand L1	✓	✗	✗	✗
185	Current Demand L2	✓	✗	✗	✗
186	Current Demand L3	✓	✗	✗	✗
190	kw Import Max Demand L1	✓	✗	✗	✗
191	kw Import Max Demand L2	✓	✗	✗	✗

TABLE 8 : Continued...

Para No.	Parameter	3 Phase 4 Wire	3 Phase 3 Wire	1 Phase 2 Wire	Other System Types
192	kw Import Max Demand L3	✓	✗	✗	✗
193	kw Export Max Demand L1	✓	✗	✗	✗
194	kw Export Max Demand L2	✓	✗	✗	✗
195	kw Export Max Demand L3	✓	✗	✗	✗
196	kVAr Import Max Demand L1	✓	✗	✗	✗
197	kVAr Import Max Demand L2	✓	✗	✗	✗
198	kVAr Import Max Demand L3	✓	✗	✗	✗
199	kVAr Export Max Demand L1	✓	✗	✗	✗
200	kVAr Export Max Demand L2	✓	✗	✗	✗
201	kVAr Export Max Demand L3	✓	✗	✗	✗
202	Kva Max Demand L1	✓	✗	✗	✗
203	Kva Max Demand L2	✓	✗	✗	✗
204	Kva Max Demand L3	✓	✗	✗	✗
208	Current Max Demand L1	✓	✗	✗	✗
209	Current Max Demand L2	✓	✗	✗	✗
210	Current Max Demand L3	✓	✗	✗	✗

4. Energy Calculations

4.1 Caculating ModBus Energy

In case of energy auto-ranging the energy shown on modbus will be in terms of Overflow count (OF) & main energy counter (M) based on energy unit/resolution & energy digit reset count (EDRC). So energy on modbus will have unit set in energy resolution on modbus (ie. Wh or kWh or MWh) & overflow energy counter (OF) on modbus will increment when main energy counter (M) on modbus will cross the number of digits set in energy digit reset count (EDRC) register (i.e. 7 or 8 or 9).

$$\text{Total Energy} = \text{OF} \times 10^{\text{EDRC}} + \text{M}$$

Where: OF => Overflow Count on modbus

e.g.

Modbus register for Overflow count (OF):

Wh import Overflow count => 30813 Or 40813

M => Main Energy Counter on modbus

e.g.

Modbus registers for Main energy Count (M):

Wh import => 30801 Or 40801

NOTE : Refer **TABLE 2.3** for modbus register addresses for energy parameters.

EDRC => Energy digit reset count set by user from modbus
(Refer Register 46023).

Example for Calculating Energy from modbus Energy Counters:

Energy unit/resolution on modbus register 46021 is set to 2 (ie. It will measure energy in kWh).

Overflow count (OF) value on modbus register 30813 for watt Import is 25.

Energy main counter (M) value on modbus register 30801 for watt import is 2587413.189

Energy digit reset count (EDRC) set by user in modbus register 46023 is 8.
Then,

$$\begin{aligned}
 \text{Total Energy} &= 25 \times 10^8 + 2587413.189 \\
 &= 2500000000 + 2587413.189 \\
 &= 2502587413.189 \text{ kWh}
 \end{aligned}$$

Note:

Overflow count (OF) on modbus will reset to 0 if it exceeds 99999999 in case of Wh resolution, 99999 in case of kWh resolution & 99 in case of Mwh resolution.

4.2 Entering Energy start count

(Applicable for Transducer with USB or ModBus(optional))

Energy start count is the feature that allows user to set count from which the meter should start incrementing energy. The start count can be set for main energy start counter & Overflow energy start Counter separately from modbus or USB. Setting of energy start count is dependent on Energy resolution & Energy digit reset count (EDRC).

Energy unit/resolution on modbus can be set by user from modbus or USB (refer modbus register 46021).

Value for Energy resolution can be set to Wh,kWh or MWh.

Minimum resolution of energy that can be set in energy start count register is, the Energy resolution set by user.

For Eg.: Energy start count can be set to minimum 1Wh, if the value on modbus register 46021 is set to Wh or Energy start count can be set to minimum 1MWh, if the value on modbus register 46021 is set to MWh.

Maximum value that can be set in the main energy start count register is $(10^{(EDRC-1)})$.

Where:

EDRC => Energy digit reset count set by user from ModBus / USB
(Refer Register 46023)

Example for calculating maximum limit of main energy start count :

If EDRC is 7 then Maximum value that can be set in the main energy start count (M) register is

$$\begin{aligned} &= (10^{(EDRC)}-1) \\ &= ((10^7)-1) \\ &= (10000000-1) \\ &= 9999999 \end{aligned}$$

Similarly if EDRC is 8, the maximum value is 99999999 & if EDRC is 9, maximum value is 999999999.

Maximum value that can be set in the Overflow energy start count register is 99999999 for Wh renergy resolution, 99999 for kWh energy resolution, 99 for MWh resolution.

Note: Energy start Count can only be entered in integer value.

5. Relay Output

The Meter is provided with relay for pulse output, limit switch and as a Timer.

5.1 Pulse Output

Pulse Output is the potential free, very fast acting relay contact which can be used to drive an external mechanical counter for energy measurement.

TABLE 9 : Parameters for Pulse Output

Parameter Number	Parameter	3 Phase 4 Wire	All Other System Types
0	Sys Wh import	✓	✓
1	Sys Wh export	✓	✓
2	Sys VARh import	✓	✓
3	Sys VARh export	✓	✓
4	Sys VAh	✓	✓
6	Active Energy Import L1	✓	✗
7	Active Energy Import L2	✓	✗
8	Active Energy Import L3	✓	✗
9	Active Energy Export L1	✓	✗
10	Active Energy Export L2	✓	✗
11	Active Energy Export L3	✓	✗
12	Reactive Energy Import L1	✓	✗
13	Reactive Energy Import L2	✓	✗
14	Reactive Energy Import L3	✓	✗
15	Reactive Energy Export L1	✓	✗
16	Reactive Energy Export L2	✓	✗
17	Reactive Energy Export L3	✓	✗
18	Apparent Energy L1	✓	✗
19	Apparent Energy L2	✓	✗
20	Apparent Energy L3	✓	✗
24	Total Sys Active Energy	✓	✓
25	Total Sys Reactive Energy	✓	✓
26	Total Sys Apparent Energy	✓	✓
27	Total Active Energy L1	✓	✗
28	Total Active Energy L2	✓	✗
29	Total Active Energy L3	✓	✗
30	Total Reactive Energy L1	✓	✗
31	Total Reactive Energy L2	✓	✗
32	Total Reactive Energy L3	✓	✗

5.1.1 Energy Pulse Rate Divisor

1.For Energy Output in Whr

Divisor	Pulse rate	
	Pulse	System Power*
	1 per Whr	Up to 3600 W
1	1 per kWhr	Up to 3600 kW
	1 per MWhr	Above 3600 kW up to 30000 kW
	1 per 10Whr	Up to 3600 W
10	1 per 10kWhr	Up to 3600 kW
	1 per 10MWhr	Above 3600 kW up to 30000 kW
100	1 per 100Whr	Up to 3600 W
	1 per 100kWhr	Up to 3600 kW
	1 per 100MWhr	Above 3600 kW up to 30000 kW
1000	1 per 1000Whr	Up to 3600 W
	1 per 1000kWhr	Up to 3600 kW
	1 per 1000MWhr	Above 3600 kW up to 30000 kW
Pulse Duration 60 ms,100 ms or 200 ms		

2.For Energy Output in kWhr

Divisor	Pulse rate	
	Pulse	System Power*
1	1 per kWhr	Up to 3600 kW
	1 per MWhr	Above 3600 kW

3.For Energy Output in MWhr

Divisor	Pulse rate
	Pulse
1	1 per MWhr

Above options are also applicable for Apparent and Reactive Energy.

***Note:**

- 1) System power = $3 \times \text{CT(Primary)} \times \text{PT (Primary)} \text{ L-N}$ for 3 Phase 4 Wire
- 2) System power = $\text{Root3} \times \text{CT(Primary)} \times \text{PT (Primary)} \text{ L-L}$ for 3 Phase 3 Wire
- 3) System power = $\text{CT(Primary)} \times \text{PT(Primary)} \text{ L-N}$ for 1 Phase 2 Wire

5.2 Limit Switch

Limit switch can be used to monitor the measured parameter (Refer **TABLE 10**) in relation with to a set limit. Three limits can be configured separately with user settable Parameter, Alarm setting, Trip point, Hysteresis for each. Depending on the Logical Operator, Relay configuration, Energize & De-Energize delay, relay can be configured in any of the four modes given below :-

- 1) Alarm - High & Relay - Energized
- 2) Alarm - High & Relay - De-Energized
- 3) Alarm - Low & Relay - Energized
- 4) Alarm - Low & Relay - De-Energized

High Alarm:

If Alarm - High and Relay - Energized **or** Alarm - High and Relay - De-Energized combination is configured then relay will get Energized or De-energized, when selected parameter is greater than or equal to trip point.

Low Alarm:

If Alarm - Low and Relay - Energized or Alarm - Low and Relay - De-Energized combination is configured then relay will get Energized or De-energized, when selected parameter is less than or equal to trip point.

Note:

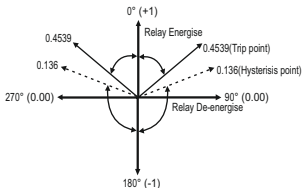
- 1) For Alarm-Low configuration, set the values of trip point & hysteresis such that % trip point + % hysteresis should be less than 100% Value.
- 2) The Alarm Setting is fixed for 3 limit parameters individually & depending on logical operator, the relay will Energized & De-Energized

Example for PF:

For Alarm - High and Relay - Energized combination, if trip point is 70% & hysteresis is 30%, then trip value = $0.7 \times 90^\circ = 63^\circ$. Tripping PF = $\cos(63) = 0.4539$ & hysteresis = $0.3 \times 0.4539 = 0.136$.

Hence, the relay will energize above 0.4539 and de-energize below 0.3179.

Note: This function will work irrespective of +/- sign. It depends only on value.



Trip point:

Trip point can be set in the range as specified in **TABLE 10** of nominal value for Alarm - High & 10% to 100 % of nominal value for Alarm - Low.

Hysteresis:

Hysteresis can be set in the range of 0.5% to 50 % of set trip point. If Alarm - High & Relay - Energized **or** Alarm - High & Relay - De-Energized combination is selected then relay will get Energized or De-energized respectively, if set parameter value is less than Hysteresis. Similarly for the combinations of Alarm - Low & Relay - Energized or Alarm - Low & Relay - De-Energized.

Note : In case of Alarm - Low if trip point is set greater than 80% then the maximum hysteresis can be set such that the total Trip point+ Hysteresis(% of trip point value) will not exceed 120% of range.

For example :If trip point is set at 90%, then maximum 33.3% hysteresis should be set such that, $[90 + 29.99 (33.3\% \text{ of } 90)] = 120$.

ON Delay:

The ON delay can be set in the range from 1 to 9999 seconds to Energize the Relay.

OFF Delay:

The OFF delay can be set in the range from 1 to 9999 seconds to De-energize the Relay.

Examples of different configurations :

Parameter No. 4 (Current1)

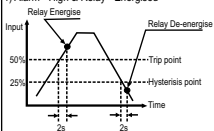
Trip Point = 50%

Hysteresis = 50% of trip point

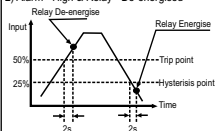
ON Delay: 2 sec

OFF Delay: 2 sec

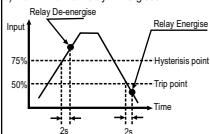
1) Alarm - High & Relay - Energised



2) Alarm - High & Relay - De-energised



3) Alarm - Low & Relay - Energised



4) Alarm - Low & Relay - De-energised

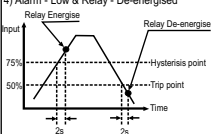


TABLE 10 : Parameters for Limit Output

Para No.	Parameter	3P 4W	3P 3W	1P 2W	Other System Types	Trip Point Set Range	100% Value
0	None	✓	✓	✓	✓	-	-
1	Volts 1	✓	✓	✓	✗	10 - 120 %	Vnom (L-N)
2	Volts 2	✓	✓	✗	✗	10 - 120 %	Vnom (L-N)
3	Volts 3	✓	✓	✗	✗	10 - 120 %	Vnom (L-N)
4	Current 1	✓	✓	✓	✗	10 - 120 %	Inom
5	Current 2	✓	✓	✗	✗	10 - 120 %	Inom
6	Current 3	✓	✓	✗	✗	10 - 120 %	Inom
7	Watt 1	✓	✗	✓	✗	10 - 120 %	Nom ⁽³⁾
8	Watt 2	✓	✗	✗	✗	10 - 120 %	Nom ⁽³⁾
9	Watt 3	✓	✗	✗	✗	10 - 120 %	Nom ⁽³⁾
10	VA 1	✓	✗	✓	✗	10 - 120 %	Nom ⁽³⁾
11	VA 2	✓	✗	✗	✗	10 - 120 %	Nom ⁽³⁾
12	VA 3	✓	✗	✗	✗	10 - 120 %	Nom ⁽³⁾
13	VAr 1	✓	✗	✓	✗	10 - 120 %	Nom ⁽³⁾
14	VAr 2	✓	✗	✗	✗	10 - 120 %	Nom ⁽³⁾
15	VAr 3	✓	✗	✗	✗	10 - 120 %	Nom ⁽³⁾
16	PF1 #	✓	✗	✓	✗	10 - 90 %	90°
17	PF2 #	✓	✗	✗	✗	10 - 90 %	90°
18	PF3 #	✓	✗	✗	✗	10 - 90 %	90°
19	PA1 #	✓	✗	✓	✗	10 - 90 %	180°
20	PA2 #	✓	✗	✗	✗	10 - 90 %	180°
21	PA3 #	✓	✗	✗	✗	10 - 90 %	180°
22	Volts Average	✓	✓	✗	✓	10 - 120 %	Vnom ⁽²⁾
24	Current Average	✓	✓	✗	✓	10 - 120 %	Inom
27	Watts sum	✓	✓	✗	✓	10 - 120 %	Nom ⁽³⁾
29	VA sum	✓	✓	✗	✓	10 - 120 %	Nom ⁽³⁾
31	VAr sum	✓	✓	✗	✓	10 - 120 %	Nom ⁽³⁾
32	PF Average #	✓	✓	✗	✓	10 - 90 %	90°
34	PA Average #	✓	✓	✗	✓	10 - 90 %	360°
36	Frequency #	✓	✓	✓	✓	10 - 90 %	66 Hz ⁽¹⁾
37	Sys Wh Import	✓	✓	✓	✓	10 - 9999999	Nom ⁽³⁾
38	Sys Wh Export	✓	✓	✓	✓	10 - 9999999	Nom ⁽³⁾
39	Sys VArh Capacitive	✓	✓	✓	✓	10 - 9999999	Nom ⁽³⁾
40	Sys VArh Inductive	✓	✓	✓	✓	10 - 9999999	Nom ⁽³⁾
41	Sys VAh	✓	✓	✓	✓	10 - 9999999	Nom ⁽³⁾
43	Watt Demand Import	✓	✓	✓	✓	10 - 120 %	Nom ⁽³⁾
44	Watt Max Demand Import	✓	✓	✓	✓	10 - 120 %	Nom ⁽³⁾
45	Watt Demand Export	✓	✓	✓	✓	10 - 120 %	Nom ⁽³⁾

TABLE 10 : Continued...

Para No.	Parameter	3P 4W	3P 3W	1P 2W	Other System Types	Trip Point Set Range	100% Value
46	Watt Demand Max Export	✓	✓	✓	✓	10 - 120 %	Nom ⁽³⁾
47	VAr Demand Cap.	✓	✓	✓	✓	10 - 120 %	Nom ⁽³⁾
48	VAr Max Demand Cap.	✓	✓	✓	✓	10 - 120 %	Nom ⁽³⁾
49	VAr Demand Ind.	✓	✓	✓	✓	10 - 120 %	Nom ⁽³⁾
50	VAr Demand Max Ind.	✓	✓	✓	✓	10 - 120 %	Nom ⁽³⁾
51	VA Demand	✓	✓	✓	✓	10 - 120 %	Nom ⁽³⁾
52	VA Max Demand	✓	✓	✓	✓	10 - 120 %	Nom ⁽³⁾
53	Current Demand	✓	✓	✓	✓	10 - 120 %	Inom
54	Current Max Demand	✓	✓	✓	✓	10 - 120 %	Inom
85	Re-Active PF L1	✓	✗	✓	✗	10 - 90 %	90°
86	Re-Active PF L2	✓	✗	✗	✗	10 - 90 %	90°
87	Re-Active PF L3	✓	✗	✗	✗	10 - 90 %	90°
88	Avg Re-Active PF	✓	✓	✗	✓	10 - 90 %	90°
90	LF SgnQ(1-(P/S)) L1	✓	✗	✓	✗	10 - 90 %	90°
91	LF SgnQ(1-(P/S)) L2	✓	✗	✗	✗	10 - 90 %	90°
92	LF SgnQ(1-(P/S)) L3	✓	✗	✗	✗	10 - 90 %	90°
93	Avg LF SgnQ(1-(P/S))	✓	✓	✗	✓	10 - 90 %	90°
95	Displacement PF L1	✓	✗	✓	✗	10 - 90 %	90°
96	Displacement PF L2	✓	✗	✗	✗	10 - 90 %	90°
97	Displacement PF L3	✓	✗	✗	✗	10 - 90 %	90°
98	Avg Displacement PF	✓	✓	✗	✓	10 - 90 %	90°
101	V12	✓	✗	✗	✗	10 - 120 %	Vnom (L-L)
102	V23	✓	✗	✗	✗	10 - 120 %	Vnom (L-L)
103	V31	✓	✗	✗	✗	10 - 120 %	Vnom (L-L)
128	Distortion VAr L1	✓	✗	✓	✗	10 - 120 %	Nom ⁽³⁾
129	Distortion VAr L2	✓	✗	✗	✗	10 - 120 %	Nom ⁽³⁾
130	Distortion VAr L3	✓	✗	✗	✗	10 - 120 %	Nom ⁽³⁾
132	SUM Distortion VAr	✓	✓	✗	✓	10 - 120 %	Nom ⁽³⁾
133	Fundamental VAr L1	✓	✗	✓	✗	10 - 120 %	Nom ⁽³⁾
134	Fundamental VAr L2	✓	✗	✗	✗	10 - 120 %	Nom ⁽³⁾
135	Fundamental VAr L3	✓	✗	✗	✗	10 - 120 %	Nom ⁽³⁾
137	SUM Fundamental VAr	✓	✓	✗	✓	10 - 120 %	Nom ⁽³⁾
198	Relay manually off	✓	✓	✓	✓	1	-
199	Relay manually on	✓	✓	✓	✓	1	-
200	Sys Wh import	✓	✓	✓	✓	10-9999999	Nom ⁽³⁾
201	Sys Wh export	✓	✓	✓	✓	10-9999999	Nom ⁽³⁾
202	Sys VARh Capacitive	✓	✓	✓	✓	10-9999999	Nom ⁽³⁾
203	Sys VARh Inductive	✓	✓	✓	✓	10-9999999	Nom ⁽³⁾

TABLE 10 : Continued...

Para No.	Parameter	3P 4W	3P 3W	1P 2W	Other System Types	Trip Point Set Range	100% Value
204	Sys VAh	✓	✓	✓	✓	10-9999999	Nom ⁽³⁾
206	Active Energy Import L1	✓	x	x	x	10-9999999	Nom ⁽³⁾
207	Active Energy Import L2	✓	x	x	x	10-9999999	Nom ⁽³⁾
208	Active Energy Import L3	✓	x	x	x	10-9999999	Nom ⁽³⁾
209	Active Energy Export L1	✓	x	x	x	10-9999999	Nom ⁽³⁾
210	Active Energy Export L2	✓	x	x	x	10-9999999	Nom ⁽³⁾
211	Active Energy Export L3	✓	x	x	x	10-9999999	Nom ⁽³⁾
212	Reactive Energy Cap. L1	✓	x	x	x	10-9999999	Nom ⁽³⁾
213	Reactive Energy Cap. L2	✓	x	x	x	10-9999999	Nom ⁽³⁾
214	Reactive Energy Cap. L3	✓	x	x	x	10-9999999	Nom ⁽³⁾
215	Reactive Energy Ind. L1	✓	x	x	x	10-9999999	Nom ⁽³⁾
216	Reactive Energy Ind. L2	✓	x	x	x	10-9999999	Nom ⁽³⁾
217	Reactive Energy Ind. L3	✓	x	x	x	10-9999999	Nom ⁽³⁾
218	Apparent Energy L1	✓	x	x	x	10-9999999	Nom ⁽³⁾
219	Apparent Energy L2	✓	x	x	x	10-9999999	Nom ⁽³⁾
220	Apparent Energy L3	✓	x	x	x	10-9999999	Nom ⁽³⁾
224	Total Sys Active Energy	✓	✓	✓	✓	10-9999999	Nom ⁽³⁾
225	Total Sys Reactive Energy	✓	✓	✓	✓	10-9999999	Nom ⁽³⁾
226	Total Sys Apparent Energy	✓	✓	✓	✓	10-9999999	Nom ⁽³⁾
227	Total Active Energy L1	✓	x	x	x	10-9999999	Nom ⁽³⁾
228	Total Active Energy L2	✓	x	x	x	10-9999999	Nom ⁽³⁾
229	Total Active Energy L3	✓	x	x	x	10-9999999	Nom ⁽³⁾
230	Total Reactive Energy L1	✓	x	x	x	10-9999999	Nom ⁽³⁾
231	Total Reactive Energy L2	✓	x	x	x	10-9999999	Nom ⁽³⁾
232	Total Reactive Energy L3	✓	x	x	x	10-9999999	Nom ⁽³⁾

***Note : Parameters 1,2,3 are L-N Voltage for 3P4W & L-L for 3P3W.**

1)For frequency 0% corresponds to 45 Hz & 100% corresponds to 66 Hz

2)For 3P4W & 1P2W the nominal value is VLN & that for 3P3W is VLL.

3)Nominal value for power is calculated from nominal voltage & current values.

4)Nominal value is to be considered with set CT/PT primary values.

5)For single phase L1 Phase values are to be considered as system values.

5.3 Timer Output

Timer output can be used to operate the Relay in a cyclic manner. The user can define the ON period and OFF period and also the number of times this cycle is to be repeated. The number of Cycles (N) can be indefinite or 1 to 9999.

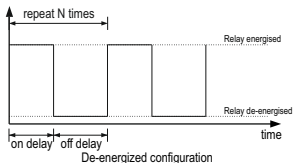
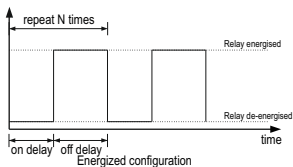


TABLE 11 : Number of Cycles for Timer Relay

Code	Description
0	Unlimited
1 to 9999	Fixed Cycles

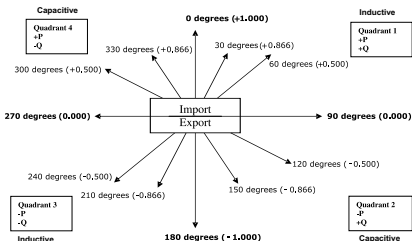
6. Phasor Diagram

Quadrant 1: 0° to 90°

Quadrant 3: 180° to 270°

Quadrant 2: 90° to 180°

Quadrant 4: 270° to 360°



Connections	Quadrant	Sign of Active Power(P)	Sign of Reactive Power(Q)	Sign of Power Factor(PF)	Inductive/ Capacitive
Import	1	+ P	+ Q	+	L
Import	4	+ P	- Q	+	C
Export	2	- P	+ Q	-	C
Export	3	- P	- Q	-	L

Inductive means Current lags Voltage

When Multifunction Meter displays Active power (P) with " + " (positive sign), the connection is **"Import"**.

Capacitive means Current leads Voltage

When Multifunction Meter displays Active power (P) with " - " (negative sign), the connection is **"Export"**.

7. Installation

Transducer can be mounted either on a top-hat rail or directly on to a wall by a mounting plate.



As the front of the enclosure conforms to IP 40. The terminals of the product should be protected from liquids.

The Transducer should be mounted in a reasonably stable ambient temperature and where the operating temperature is within the range -20 to +70 °C. Vibration should be kept to a minimum and the product should not be mounted where it will be subjected to excessive direct sunlight.

Caution

1. In the interest of safety and functionality this product must be installed by a qualified engineer, abiding by any local regulations.
2. Voltages dangerous to human life are present at some of the terminal connections of this unit. Ensure that all supplies are de-energised before attempting any connection or disconnection.
3. These products do not have internal fuses therefore external fuses must be used to ensure safety under fault conditions.

7.1 EMC Installation Requirements

This product has been designed to meet the certification of the EU directives when installed to a good code of practice for EMC in industrial environments, e.g.

1. Screened output and low signal input leads or have provision for fitting RF suppression components, such as ferrite absorbers, line filters etc., in the event that RF fields cause problems.

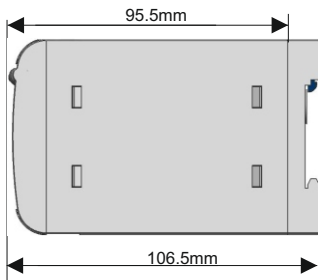
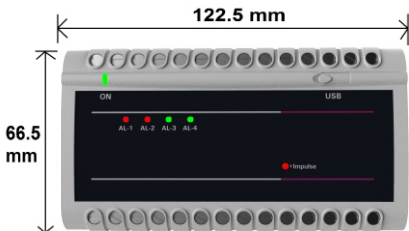
Note: It is good practice to install sensitive electronic instruments that are performing critical functions, in EMC enclosures that protect against electrical interference which could cause a disturbance in function.

2. Avoid routing leads alongside cables and products that are, or could be, a source of interference.

3. To protect the product against permanent damage, surge transients must be limited to 2kV pk. It is good EMC practice to suppress differential surges to 2kV at the source. The unit has been designed to automatically recover in the event of a high level of transients. In extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 5 seconds to restore correct operation. The Current inputs of these products are designed for connection in to systems via Current Transformers only, where one side is grounded.

4. ESD precautions must be taken at all times when handling this product.

7.2 Case Dimensions

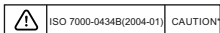


7.3 Wiring

Input connections are made directly to screw-type terminals with indirect wire pressure. Numbering is clearly marked on the connector. Choice of cable should meet local regulations. Terminal for both Current and Voltage inputs will accept upto 4mm^2 (12AWG) solid or 2.5mm^2 stranded cable.

Note : It is recommended to use **wire with lug** for **connection with meter**.

Wire: It is suggested to use wire with a temperature rating of at least 83 Deg. C



7.4 Auxiliary Supply

Meter should ideally be powered from a dedicated supply, however powered from the signal source, provided the source remains within it may be the limits of the chosen auxiliary voltage range.

7.5 Fusing

It is recommended that all voltage lines are fitted with 1 Amp HRC fuses or circuit breaker to disconnecting the device.

Specification : Disconnecting device used must be relevant requirements of IEC-60974-1 & IEC-60947-3 For Aux: At most 1.5 times of applied power supply

For measuring input : At most 1.5 times of measuring input.

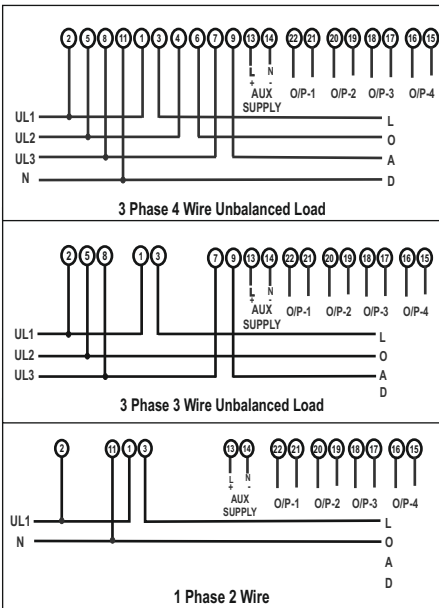
(Switching time of the device should be < 0.1 sec for Aux & I/P both)

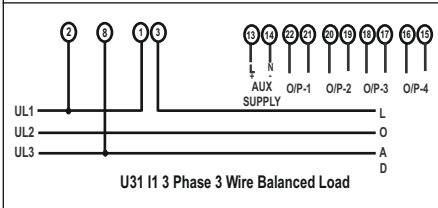
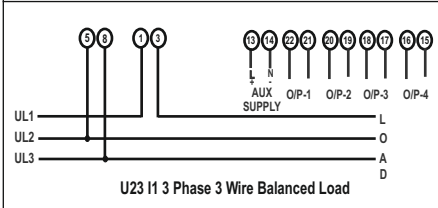
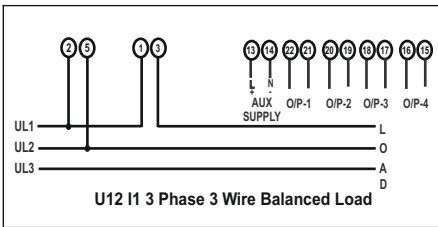
7.6 Earth/Ground Connections

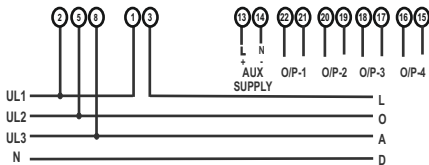
For safety reasons, CT secondary connections should be grounded in accordance with local regulations.

***Note :** Refer this Manual wherever the **CAUTION** symbol is marked.

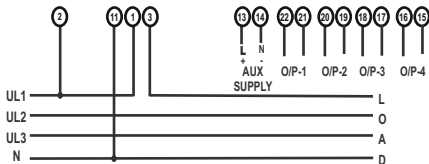
8. Connection Diagrams





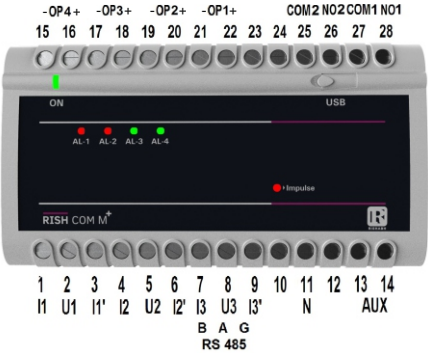


3 Phase 3 Wire Balanced Load



3 Phase 4 Wire Balanced Load

Terminal Diagram



9. Specifications

Measured Parameter

Please refer **Table 1** for List of measured parameters.

Network Type Supported by transducer :

Single Phase / 3 phase 3 wire Unbalanced / 3 phase 4 wire Unbalanced / U12 I1 3 phase 3 wire Balanced / U23 I1 3 phase 3 wire Balanced / U31 I1 3 phase 3 wire Balanced / 3 phase 3 wire Balanced / 3 phase 4 wire Balanced

Nominal Voltage Input(U_N)

Nominal input Voltage (AC RMS) (PT Secondary range)	$100\text{ V} \leq U_N \leq 600\text{ VL-L}$
PT Primary range	100V to 1200 KVL-L
Nominal Frequency F_N	40 Hz to 70 Hz
Nominal input Voltage burden	$< 0.3\text{ VA}$ per phase at U_N
Overload Capacity	$1.5 * U_N$ continuously, $2 * U_N$ for 1 second, repeated 10 times at 10 seconds intervals

Nominal Current Input(I_N)

Nominal input Current (AC RMS) (CT Secondary range)	$1\text{ A} \leq I_N \leq 5\text{ A}$
CT Primary range	1 A to 9999 A
Nominal Frequency F_N	40 Hz to 70 Hz
Nominal input Current burden	$< 0.3\text{ VA}$ per phase at I_N
Overload Capacity	$2 * I_N$ continuously, $20 * I_N$ for 1 second, repeated 5 times at 5 seconds intervals.

Allowed measuring range end values X2 (calibration factor Xc)

Current Input	$0.50 < (X2/\text{Rated Value}) < 2.0$
Voltage Input	$0.60 < (X2/\text{Rated Value}) < 1.5$
Power Input	$0.30 < (X2/\text{Rated Value}) < 1.5$
Frequency Input	$40 \text{ Hz} < X2 < 70 \text{ Hz}$
Power Factor	$0 < X2 < 1$
Phase Angle	$0 < X2 < 175 \text{ Deg}$

Rated value is the nominal value of selected input parameter as per Network type.

Measuring Output Y(For 4 Analog Outputs)

Output type	Load independent DC Voltage, DC Current On site selectable through USB or RS-485 Interface.
Load independent DC output	Unipolar 0...20mA / 4...20mA or 0...10V. Bipolar -20mA...0...+20mA or -10V....0....+10V.
Output burden with DC current output signal	$0 \leq R \leq 15V/Y2$
Output burden with DC voltage output signal	$Y2/(2 \text{ mA}) \leq R \leq \infty$
Current limit under overload $R=0$	$\leq 1.25 * Y2$ with current output $\leq 100 \text{ mA}$ with voltage output
Voltage limit under $R=\infty$	$\leq 1.25 * Y2$ with voltage output $\leq 30 \text{ V}$ with current output
Residual Ripple in Output signal	$\leq 0.4\% \text{ pk-pk}$
Response Time	$\leq 300 \text{ ms}$

Auxiliary Power Supply

AC/DC Auxiliary Supply	85V... 285 VAC-DC (240V Nominal Value)
AC Auxiliary supply frequency range	45 to 65 Hz
Auxiliary supply consumption	< 10VA

Accuracy of Analog Output as per selected input Parameter (Acc. to IEC / EN 60688)

Reference Value	Output End Value Y2 (Voltage or Current)
Voltage	$\pm 0.2C$
Current	$\pm 0.2C$
Frequency	$\pm 0.2C$
Power Factor / Phase Angle	$\pm 0.5C$
Active Power	$\pm 0.2C$
Reactive Power	$\pm 0.5C$
Apparent Power	$\pm 0.2C$

Factor C

(The highest value applies if calculated C is less than 1, then C=1 applies)

Linear characteristics

$$C = \frac{Y2 - Y0}{X2 - X0} \times \frac{X2}{Y2} \quad \text{or } C=1$$

Bent characteristics

$$\text{For } X0 \leq X \leq X1 \quad C = \frac{Y1 - Y0}{X1 - X0} \times \frac{X2}{Y2} \quad \text{or } C = 1$$

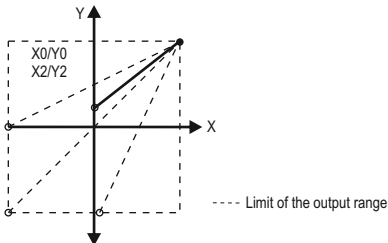
$$\text{For } X1 \leq X \leq X2 \quad C = \frac{Y2 - Y1}{X2 - X1} \times \frac{X2}{Y2} \quad \text{or } C = 1$$

Reference conditions for Accuracy:

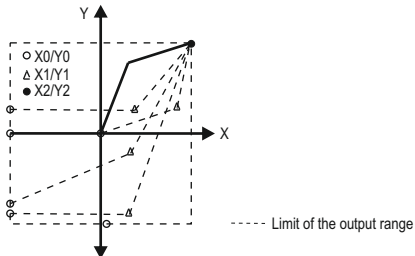
Ambient temperature	23°C +/- 1°C
Pre-conditioning	30 min acc. to IEC / EN 60688
Input Variable	Voltage Rated / Current Rated
Input waveform	Sinusoidal, Distortion factor 0.005
Input signal frequency	50 or 60Hz
Active / Reactive factor	Cos Φ =1 resp. Sin Φ = 1
For Phase Angle & Power Factor Transducer	Reference Value For Phase angle = 90° For power factor = 0.5
Auxiliary supply voltage	At nominal range
Output Load	Rn = 7.5 V / Y2 $\pm$ 1% With DC current output signal Rn = Y2 / 1 mA $\pm$ 1% With DC voltage output signal
Miscellaneous	Acc. to IEC / EN 60688

Output Characteristics

Example of setting with Linear Characteristics



Example of setting with Bent Characteristics



X_0 = Start value of input
 Y_0 = Start value of output
 X_1 = Elbow value of input

Y_1 = Elbow value of output
 X_2 = End value of input
 Y_2 = End value of output

Additional Error

Temperature influence
 Variation due to Radiated
 Susceptibility test

$\pm 0.2\%/10^\circ\text{C}$
 Input Voltage Error $\pm 4\%$ of V_n

Influence of Variations

As per IEC / EN 60688 standard.

Output stability $< 30 \text{ min}$

Safety

Protection Class
 Protection

II (Protection Isolated, EN 61010)
 IP 40, housing according to
 EN 60 529
 IP 20 ,terminal according to
 EN 60 529

Pollution degree
 Installation Category

2
 III

Insulation Voltage	1min. (EN 61010-1) 3.3kV RMS, Input versus outer surface 3.3kV RMS, Input versus all other circuits 3.3kV RMS, Auxiliary supply versus outer surface and output 500V RMS, Output versus outer surface
--------------------	--

Installation Data

Mechanical Housing	Lexan 940 (polycarbonate) Flammability Class V-0 acc. To UL 94, self extinguishing, non dripping, free of halogen
Mounting position	Rail mounting / wall mounting
Weight	Approx. 0.5kg

Connection Terminal

Connection Element	Conventional Screw type terminal with indirect wire pressure
Permissible cross section of the connection lead	$\leq 4.0 \text{ mm}^2$ single wire or $2 \times 2.5 \text{ mm}^2$ fine wire

Environmental

Operating temperature	-20°C...23°C...55°C(usage Group II)
Storage temperature	-30 °C to 80 °C
Relative humidity	0...95%RH(Non Condensing)
Altitude	2000m max

Ambient tests

EN 60068-2-6

Acceleration

Frequency range

Rate of frequency sweep

Number of cycles

EN 60068-2-7

Acceleration

IEC 61326-1: 2012, Table

Vibration

 ± 2 g

10....150...10Hz

1 octave/minute

10, in each of the three axes

Shock

3 x 50g

3 shocks in each direction

Electromagnetic compatibility

RS-485 Connection

RS-485		
B	A	G

Meaning of symbols on the instrument



Warning concerning a point of danger
(Attention:observe documentation)



Equipment protected through by
Double insulation or reinforced
insulation



DC voltage /Current



AC/DC voltage

The Information contained in these installation instructions is for use only by installers trained to make electrical power installations and is intended to describe the correct method of installation for this product. It is the user's responsibility to determine the suitability of the installation method in the user's field conditions.

NOTE

NOTE

NOTE