

ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION

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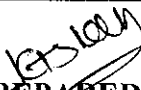
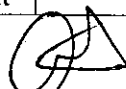
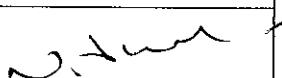
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TEST REPORT

Sheet 1 of 17

NAME & ADDRESS OF CUSTOMER M/s. RISHABH INSTRUMENTS PVT. LTD. F – 31, MIDC, Satpur, NASHIK – 422 007.	REPORT NO: T.03/11/433-1 DATE: 17.04.2008	
	CUSTOMER: RIPL/QAS/ERDA/01-2008/01 REF. NO. Dtd. 11/01/2008	
	DATE OF SAMPLE RECEIPT	DATE OF TESTING
	17.01.2008	20.02.2008 to 17.04.2008.
SAMPLE DESCRIPTION Name: Multi Function Instrument Make: Rishabh Model: Rish Master 3440 Range: Input Voltage: 415 V (L-L), 50 Hz Input Current: 1A / 5 A Auxiliary Supply Voltage:100 to 250 V AC/DC Optional Output: Two Analog output : 4-20 mA Externally powered 24 V DC Modbus RS 485 communication 1 Relay output Accuracy: $\pm 0.5\%$ of Range of Voltage, Current, Active, Reactive & Apparent Power. $\pm 1\%$ for Active Energy, Reactive Energy, Apparent energy. $\pm 1\%$ for Power Factor & Angle $\pm 0.15\%$ for Mid frequency $\pm 1\%$ of end value for Analog Output	SAMPLE IDENTIFICATION ERDA CODE NO: TDCCALWO 0057288-1 SR. NO. 07/12/2439	
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- Note:**
1. This report relates only to the particular sample received for testing in good condition at ERDA.
 2. This report cannot be reproduced in part under any circumstances.
 3. Publication of this report requires prior permission in writing from Director, ERDA.
 4. Only test asked for by the customer have been carried out.

No 1733928



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Date: 17.04.2008

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Report No. T.03/11/3351

TEST DETAILS

TEST DETAILS	TEST SPECIFICATION
1.(A) Intrinsic accuracy test for measured parameters and analog outputs.	As per customer requirement and test procedure as per Clause no.4.2., IEC:688:2002
(B) Intrinsic Error Test for Energy.	As per customer requirement and test procedure as per Clause no.8.1. IEC 62053-21-2003.
2. Variation due to Input Frequency	As per customer requirement and test procedure as per Clause no.6.5, IEC:688:2002
3. Variation due to Auxiliary supply voltage	As per customer requirement and test procedure as per Clause no.6.2. IEC:688:2002.
4. Variation due to Output Load	As per customer requirement and test procedure as per Clause no.6.9. IEC:688:2002
5. Variation due to Self Heating	As per customer requirement and test procedure as per Clause no.6.14, IEC:688:2002.
6. High Voltage Test	As per customer requirement.
7. Measurement of Burden on Input circuits	As per customer requirement
8. Overload withstood Test	As per customer requirement and test procedure as per Clause no.6.18.2, IEC:688:2002.
9. Influence of operating temperature variation at 0°C and +55 °C.	As per customer requirement and test procedure as per Clause no.6.4. IEC:688:2002.

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Report No. T.03/11/4391

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TEST DETAILS

TEST SPECIFICATION

10. Storage Temperature Test	As per customer requirement
11. Test for Relative humidity	As per customer requirement
12. Influence of Magnetic Field of external origin	As per customer requirement and test procedure as per Clause no.6.11, IEC:688:2002.
13. Variation due to continuous operation	As per customer requirement and test procedure as per Clause no.6.15, IEC:688:2002.
14. Vibration Test	As per customer requirement and test procedure as per IEC 60068-2-6
15. RS 485 communication Test	As per customer requirement.
16. Variation due to input voltage (+20 %) in Power	As per customer requirement and test procedure as per Clause no.6.6, IEC:688:2002.
17. Variation due to input Current (20 % to 120 %) in Power factor	As per customer requirement and test procedure as per Clause no.6.7, IEC:688:2002.
18. Variation due to Power factor	As per customer requirement and test procedure as per Clause no.6.8, IEC:688:2002.
19. Variation due to Distortion of Input Quantity factor	As per customer requirement and test procedure as per Clause no.6.10,IEC:688:2002.

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Report No. T.03/11/0255 2638382.

Date: 17.04.2008

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Sr. No.	Particulars of test And Clause no.	Requirements per Specification.	Obtained value	Remarks
1.	(A) Intrinsic Accuracy test. [As per customer requirement and Test procedure as per Clause No. 4.2 of IEC 60688:2002.]	When meter is under reference conditions the error for various parameter (As per Table 1,2 and 3) shall not exceed the limits as given in Table 1,2 and 3.	Error observed was less than limits given in Table 1,2 and 3.	Conforms
	(B) Intrinsic Error test. [As per customer requirement and Test procedure as per Clause No. 8.1 of IEC 62053:21-2003]	When meter is under reference conditions the error for energy parameter shall not exceed the limits as given in Table 4.	Error observed was less than limits given in Table 4.	Conforms

Table-1

Parameter : Voltage (L-N)								
Test Point (% of input range)	Test Meter Reading (V)			Standard Meter Rdg. (V)	Accuracy class (%)	% Error of Range		
	R	Y	B			R	Y	B
50	119.7	119.7	119.6	119.80	0.5	-0.04	-0.04	-0.08
100	239.5	239.5	239.5	239.60	0.5	-0.04	-0.04	-0.04
Parameter : Voltage (L-L)								
Test Point (% of input range)	Test Meter Reading (V)			Standard Meter Rdg. (V)	Accuracy class (%)	% Error of Range		
	R-Y	Y-B	B-R			R-Y	Y-B	B-R
50	207.3	207.2	207.2	207.50	0.5	-0.08	-0.13	-0.13
100	415.5	415.4	415.4	415.00	0.5	0.21	0.17	0.17
Parameter : Current								
Test Point (% of input range)	Test Meter Reading (A)			Standard Meter Rdg. (A)	Accuracy class (%)	% Error of Range		
	R	Y	B			R	Y	B
10	0.5	0.5	0.5	0.500	0.5	0.000	0.000	0.000
100	4.996	4.996	4.996	5.000	0.5	-0.080	-0.080	-0.080

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Date: 17.04.2008

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Report No. T.03/11/4581

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Parameter : Frequency

Test Point (Hz)	Test Meter Reading (Hz)			Standard Meter Rdg. (Hz)	Accuracy class (%)	% Error of Range		
	R	Y	B			R	Y	B
40	40.0	40.0	40.0	40.0	0.15	0.000	0.000	0.000
50	50.0	50.0	50.0	50.0	0.15	0.000	0.000	0.000
70	70.0	70.0	70.0	70.0	0.15	0.000	0.000	0.000

Parameter : Phase angle

Test Point (°)	Test Meter Reading (°)			Standard Meter Rdg. (°)	Accuracy class (%)	% Error of Range		
	R	Y	B			R	Y	B
0	0.1	0.1	0.1	0.0	1	0.056	0.056	0.056
60	60.0	60.0	60.0	60.0	1	0.006	0.006	0.006
180	180.1	180.1	180.1	180.0	1	0.056	0.056	0.056
270	270.0	270.0	270.0	270.0	1	0.000	0.000	0.000
360	360.0	360.0	360.0	359.9	1	0.056	0.056	0.056

Parameter : Active Power

$\cos \phi = 1.0$

Test Point (% of input range)	Test Meter Reading (kW)	Standard Meter Rdg. (W)	Accuracy class (%)	% Error of Range
10	0.036	35.94	0.5	0.167
100	3.586	3594	0.5	-0.223

Parameter : Reactive Power

$\sin \phi = 1.0$

Test Point (% of input range)	Test Meter Reading (kVAr)	Standard Meter Rdg. (VAr)	Accuracy class (%)	% Error of Range
10	0.036	35.94	0.5	0.167
100	3.588	3594	0.5	-0.139

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Report No. **1.03/14/433-1** Date: **17.04.2008**

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Table 3
Parameter : Apparent Power

Test Point (% of input range)	Test Meter Reading (kVA)	Standard Meter Rdg. (VA)	Accuracy class (%)	% Error of Range
10	0.036	35.94	0.5	0.167
100	3.589	3594	0.5	-0.139

Parameter : Power Factor

Test Point	Test Meter Reading (PF)	Standard Meter Rdg (PF)	Accuracy class (%)	% Error of Range
0.5 Lag	0.49 L	0.50 Lag	1	-1.00
UPF	1.0	1.00	1	0.00
0.8 Lead	0.8 C	0.80 Lead	1	0.00

Parameter : Analog Out put (4- 20 mA) , Output A

Sr.No.	Standard Input applied. (kW)	Standard meter reading (mA)	Accuracy class (%)	% Error of span
1	0	4.008	1	-0.04
2	359.4	8.026	1	-0.13
3	718.8	11.949	1	0.26
4	1078.2	15.956	1	0.22
5	1437.6	19.956	1	0.22

Parameter : Analog Out put (4- 20 mA) , Output B

Sr.No.	Standard Input applied. (kW)	Standard meter reading (mA)	Accuracy class (%)	% Error of span
1	0	4.016	1	-0.08
2	359.4	8.036	1	-0.18
3	718.8	11.969	1	0.16
4	1078.2	15.967	1	0.16
5	1437.6	19.955	1	0.23

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Parameter : Active Energy

CURRENT	Power factor	ACCURACY CLASS (%)	% ERROR
Ib	1.0	± 1.0	-0.72
Ib	0.5 lag	± 1.0	-0.59
Ib	0.8 lead	± 1.0	-0.79
0.2Ib	1.0	± 1.0	-0.66
0.2Ib	0.5 lag	± 1.5	-0.25
0.2Ib	0.8 lead	± 1.5	-0.40
0.1Ib	1.0	± 1.5	-0.40
0.1Ib	0.5 lag	± 1.5	-0.35
0.1Ib	0.8 lead	± 1.5	-0.48
0.05Ib	1.0	± 1.5	-0.14

Sr. No.	Particulars of test And Clause no.	Requirement as per Specification.	Obtained value	Remarks														
2.	Variation due to the frequency of the input quantity [Test procedure as per customer requirement & as per Clause No. 6.5 of IEC 60688:2002]	<p>Apply following parameter one by one with nominal value of input frequency and record the value of UUT for each case.</p> <p>At a constant value of the measurand, reduce the input frequency to the lower limit (40 Hz) and record the value of the UUT.</p> <p>Increase the frequency to the to the upper limit (70 Hz) & record the value of the UUT .</p> <p>The variation shall not exceed 100 % of the class index.</p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Test point</th> </tr> </thead> <tbody> <tr> <td>Voltage (V_{LN} & V_{LL})</td> <td>@ 100% of range</td> </tr> <tr> <td>Line Current</td> <td>@ 100% of range</td> </tr> <tr> <td>Active Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Reactive Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Apparent Power.</td> <td>@ 100% of range</td> </tr> <tr> <td>Frequency</td> <td>@ 100% of range</td> </tr> </tbody> </table>	Parameter	Test point	Voltage (V _{LN} & V _{LL})	@ 100% of range	Line Current	@ 100% of range	Active Power,	@ 100% of range	Reactive Power,	@ 100% of range	Apparent Power.	@ 100% of range	Frequency	@ 100% of range	Variation in error observed was less than 100% of the class index.	Conforms
Parameter	Test point																	
Voltage (V _{LN} & V _{LL})	@ 100% of range																	
Line Current	@ 100% of range																	
Active Power,	@ 100% of range																	
Reactive Power,	@ 100% of range																	
Apparent Power.	@ 100% of range																	
Frequency	@ 100% of range																	

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Report No. T.03/14/423

Sr. No.	Particulars of test And Clause no.	Requirements as per Specification.	Obtained value	Remarks														
3.	Variation due to Auxiliary supply Voltage. [As per customer requirement and test procedure as per Clause no.6.2, IEC: 688:2002.]	<p>Apply following parameter one by one with nominal value of auxiliary supply voltage and record the value of UUT for each case.</p> <p>At a constant value of the measurand, reduce auxiliary supply voltage to the lower limit (85% of nominal value) and record the value of the UUT.</p> <p>Increase the auxiliary supply voltage to the upper limit (120% of nominal value) of the supply voltage and record the value of UUT .</p> <p>The variation shall not exceed 50 % of the class index.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 50%;">Parameter</th> <th style="width: 50%;">Test point</th> </tr> </thead> <tbody> <tr> <td>Voltage (V_{L-N} & V_{L-L})</td> <td>@ 100% of range</td> </tr> <tr> <td>Line Current</td> <td>@ 100% of range</td> </tr> <tr> <td>Active Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Reactive Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Apparent Power.</td> <td>@ 100% of range</td> </tr> <tr> <td>Frequency</td> <td>@ 100% of range</td> </tr> </tbody> </table>	Parameter	Test point	Voltage (V _{L-N} & V _{L-L})	@ 100% of range	Line Current	@ 100% of range	Active Power,	@ 100% of range	Reactive Power,	@ 100% of range	Apparent Power.	@ 100% of range	Frequency	@ 100% of range	Variation in error observed was less than 50% of the class index.	Conforms
Parameter	Test point																	
Voltage (V _{L-N} & V _{L-L})	@ 100% of range																	
Line Current	@ 100% of range																	
Active Power,	@ 100% of range																	
Reactive Power,	@ 100% of range																	
Apparent Power.	@ 100% of range																	
Frequency	@ 100% of range																	
4.	Variation due to Output load [As per customer requirement and test procedure as per Clause no.6.9, IEC:688:2002]	<p>Apply a value of output load equal to the mean of the nominal range (250 Ohm) and record the value of the UUT at 100 % of Input range.(239.6 V, 5A, UPF)</p> <p>At a constant value of the measurand, reduce the resistance of the out put load to the lower limit (0% of the nominal value) and record the value of the UUT. Increases the resistances of the output load to the upper limit (200% of the nominal value) and record the value of the signal.</p> <p>The variation shall not exceed 50 % of the class index.</p>	Variation in error observed was less than 50% of the class index.	Conforms														

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Report No. T.03/11/025

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Sr. No.	Particulars of test And Clause no.	Requirements as per Specification.	Obtained value	Remarks
5.	Variation due to Self heating As per customer requirement and test procedure as per Clause no.6.14, IEC:688:2002.]	The meter shall be at ambient temperature and shall have been disconnected for at least 4 hour. Energize the meter for preconditioning as per Table 2 of IEC:60688-2002. After 1 minute and before the third minute, determine the value of the UUT. Repeat this procedure between the 30 th and 35 th minute after energization. The variation shall not exceed 100 % of the class index.	Variation in error observed was less than 100% of the class index	Conforms
	High Voltage Test [As per customer requirement]	Apply the HV at power frequency (50 Hz) for 1 minute between the terminal of Group A and Group B as given in the Table- 5.	No breakdown or arcing or sparking observed during test.	Conforms

Table-5

Sr. No.	Terminal Group A	Terminal group B	Test Voltage
1.	Input Voltage ,current and all out put terminals	Aux. supply terminals	2.2 kV
2.	All Input ,Aux terminals and output terminals	Outer surface	2.2 kV
3.	Input Voltage and Current terminals	All output terminals	2.2 kV
4.	Input current terminals	Input Voltage Terminals	2.2 kV

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Sr. No.	Particulars of test And Clause no.	Requirements as per Specification.	Obtained value	Remarks
7.	Burden measurement. [As per Customer requirement]	Measure burden at rated voltage in phase voltage circuits. The measured value shall be ≤ 0.2 VA Measure burden at rated current in phase current circuits. The measured value shall be ≤ 0.6 VA	Burden measured was less 0.2 VA in all phase voltage circuits. Burden measured was less 0.6 VA in all phase current circuits.	Conforms
8	Overload withstand Test. (A) Continuous overload.[As per customer requirement and test Procedure as per Clause No. 6.18.1 of IEC 60688:2002.) (B)Short duration overload. [As per customer requirement and Test procedure as per Clause No. 6.18.2 of IEC 60688:2002]	The meter shall withstand application of excessive inputs simultaneously for 24 Hours. (a)Voltage inputs, including auxiliary's supplies, shall be subjected to 120% of the nominal value of the voltage. (b)Current inputs shall be subjected to 120% of the nominal value of the current. The test shall be made under reference condition. The excessive input amplitudes of short duration which shall be applied to meter is : (a) For voltage inputs: 200% of nominal value of the measured voltage applied for 1 second and repeated 10 times at 10 second intervals. (b) For current inputs: 20 times the nominal value of the measured current applied for 1 second and repeated 5 times at 300 second intervals. After test keep meter de-energized for 2 hours and after that meter functionality shall be checked. Meter shall comply with specified limits of intrinsic error as per Table 1, 2 and 3)	Meter was working satisfactory. Meter complies with specified accuracy limits as per Table 1,2 and 3.	Conforms

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Report No. T.03/11/085

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Sr. No.	Particulars of Test And Clause no.	Requirements as per Specification.	Obtained value	Remarks												
9.	Influence of Temperature variation at 0°C & 50°C. [As customer requirement and Test procedure as per Clause No 6.4 of IEC 60688:2002]	At reference temperature (23°C) keep meter energized for 2 hours and measure error for the following parameter. Increase temperature to 50°C and keep meter energized for 2 hours and measure error for the following parameter. Variation in error shall not exceed 100% of specified accuracy limits. Reduce the temperature to 0°C and keep meter energized for 2 hours and measure error for error for the following parameter. Variation in error shall not exceed 100% of specified accuracy limits. <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Parameter</th> <th style="width: 50%;">Test point</th> </tr> </thead> <tbody> <tr> <td>Voltage (V_{L-N} & V_{L-L})</td> <td>@ 100% of range</td> </tr> <tr> <td>Line Current</td> <td>@ 100% of range</td> </tr> <tr> <td>Active Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Reactive Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Apparent Power.</td> <td>@ 100% of range</td> </tr> </tbody> </table>	Parameter	Test point	Voltage (V _{L-N} & V _{L-L})	@ 100% of range	Line Current	@ 100% of range	Active Power,	@ 100% of range	Reactive Power,	@ 100% of range	Apparent Power.	@ 100% of range	Variation observed was less than 100 % of specified accuracy limits. Variation observed was less than 100 % of specified accuracy limits.	Conforms
Parameter	Test point															
Voltage (V _{L-N} & V _{L-L})	@ 100% of range															
Line Current	@ 100% of range															
Active Power,	@ 100% of range															
Reactive Power,	@ 100% of range															
Apparent Power.	@ 100% of range															
10.	Storage temperature Test at -20 °C to 65 °C. [As per Customer requirement]	The meter shall be keep in de-energized condition at -20° C for a period of 4 hours and after that the meter shall be keep at 23°C for a period of 2 hours. After that meter shall meet the requirement of intrinsic accuracy test for following parameter. The meter shall be keep in de-energized condition at 65° C for a period of 4 hours and after that the meter shall be keep at 23°C for a period of 2 hours. After that meter shall meet the requirement of intrinsic accuracy test for following parameter. <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Parameter</th> <th style="width: 50%;">Test point</th> </tr> </thead> <tbody> <tr> <td>Voltage (V_{L-N} & V_{L-L})</td> <td>@ 100% of range</td> </tr> <tr> <td>Line Current</td> <td>@ 100% of range</td> </tr> <tr> <td>Active Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Reactive Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Apparent Power.</td> <td>@ 100% of range</td> </tr> </tbody> </table>	Parameter	Test point	Voltage (V _{L-N} & V _{L-L})	@ 100% of range	Line Current	@ 100% of range	Active Power,	@ 100% of range	Reactive Power,	@ 100% of range	Apparent Power.	@ 100% of range	Error observed was less than limits of error. Error observed was less than limits of error.	Conforms
Parameter	Test point															
Voltage (V _{L-N} & V _{L-L})	@ 100% of range															
Line Current	@ 100% of range															
Active Power,	@ 100% of range															
Reactive Power,	@ 100% of range															
Apparent Power.	@ 100% of range															

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Date: 17.04.2008

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Report No. T.03/14/4255

Sr. No.	Particulars of Test And Clause no.	Requirements as per Specification	Obtained value	Remarks														
11	Test for Relative Humidity. [As per Customer requirement]	<p>The meter shall be keep in de-energized condition for a period of 24 hours at 40°C and relative humidity 90 % RH (non condensing)</p> <p>After that meter shall meet the requirement of intrinsic accuracy test for following parameter.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Parameter</th> <th style="width: 50%;">Test point</th> </tr> </thead> <tbody> <tr> <td>Voltage (V_{L-N} & V_{L-L})</td> <td>@ 100% of range</td> </tr> <tr> <td>Line Current</td> <td>@ 100% of range</td> </tr> <tr> <td>Active Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Reactive Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Apparent Power.</td> <td>@ 100% of range</td> </tr> <tr> <td>Frequency.</td> <td>@ 100% of range</td> </tr> </tbody> </table>	Parameter	Test point	Voltage (V _{L-N} & V _{L-L})	@ 100% of range	Line Current	@ 100% of range	Active Power,	@ 100% of range	Reactive Power,	@ 100% of range	Apparent Power.	@ 100% of range	Frequency.	@ 100% of range	Error observed was less than limits of error.	Conforms
Parameter	Test point																	
Voltage (V _{L-N} & V _{L-L})	@ 100% of range																	
Line Current	@ 100% of range																	
Active Power,	@ 100% of range																	
Reactive Power,	@ 100% of range																	
Apparent Power.	@ 100% of range																	
Frequency.	@ 100% of range																	
12.	Variation due to Magnetic field of external origin [As per customer requirement and Test procedure as per Clause No. 6.11 of IEC 60688:2002.]	<p>The meter is placed in the centre of a coil of 1 m mean diameter, of square cross section and of radial thickness small compared with the diameter 400 ampere-turns in this coil will produce at the centre of the coil, in absence of the meter under test, a magnetic field strength of 0.4kA/m. The magnetic field shall be produced by a current of the same kind and frequency as that which energizes the measuring circuit and shall be such as to have the most unfavorable combination of phase and operation, The value of a.c. fields are expressed in r.m.s. values.</p> <p>Record the value of UUT for following parameter in absence of external magnetic field and in presence of external magnetic field.</p> <p>The variation shall not exceed 100 % of the class index.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Parameter</th> <th style="width: 50%;">Test point</th> </tr> </thead> <tbody> <tr> <td>Voltage (V_{L-N} & V_{L-L})</td> <td>@ 100% of range</td> </tr> <tr> <td>Line Current</td> <td>@ 100% of range</td> </tr> <tr> <td>Active Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Reactive Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Apparent Power.</td> <td>@ 100% of range</td> </tr> <tr> <td>Frequency.</td> <td>@ 100% of range</td> </tr> </tbody> </table>	Parameter	Test point	Voltage (V _{L-N} & V _{L-L})	@ 100% of range	Line Current	@ 100% of range	Active Power,	@ 100% of range	Reactive Power,	@ 100% of range	Apparent Power.	@ 100% of range	Frequency.	@ 100% of range	Variation in error observed was less than 100% of the class index.	Conforms
Parameter	Test point																	
Voltage (V _{L-N} & V _{L-L})	@ 100% of range																	
Line Current	@ 100% of range																	
Active Power,	@ 100% of range																	
Reactive Power,	@ 100% of range																	
Apparent Power.	@ 100% of range																	
Frequency.	@ 100% of range																	

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Sr. No.	Particulars of test And Clause no.	Requirements as per Specification.	Obtained value	Remarks														
13	Variation due to continuous operation [As per customer requirement and test procedure as per Clause no.6.15, IEC:688:2002.]	<p>Energize the meter under reference condition for at least the preconditioning period. Record the value of UUT for the following parameter.</p> <p>After a convenient period of continuous operation (for 6 hours), record the value of UUT for the following parameter.</p> <p>The variation shall not exceed 100 % of the class index.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Parameter</th> <th>Test point</th> </tr> </thead> <tbody> <tr> <td>Voltage (V_{L-N} & V_{L-L})</td> <td>@ 100% of range</td> </tr> <tr> <td>Line Current</td> <td>@ 100% of range</td> </tr> <tr> <td>Active Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Reactive Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Apparent Power.</td> <td>@ 100% of range</td> </tr> <tr> <td>Frequency.</td> <td>@ 100% of range</td> </tr> </tbody> </table>	Parameter	Test point	Voltage (V _{L-N} & V _{L-L})	@ 100% of range	Line Current	@ 100% of range	Active Power,	@ 100% of range	Reactive Power,	@ 100% of range	Apparent Power.	@ 100% of range	Frequency.	@ 100% of range	Variation in error observed was less than 100% of the class index.	Conforms
Parameter	Test point																	
Voltage (V _{L-N} & V _{L-L})	@ 100% of range																	
Line Current	@ 100% of range																	
Active Power,	@ 100% of range																	
Reactive Power,	@ 100% of range																	
Apparent Power.	@ 100% of range																	
Frequency.	@ 100% of range																	
14.	Vibration Test [As per customer requirement and test procedure as per Clause no.6.23 & as per IEC 60068-2-6]	<p>Meter is subjected to</p> <p>a) Frequency range: 10-55-10 Hz</p> <p>b) Displacement Amplitude : ±0.15 mm</p> <p>c) Sweep rate: 1 octave per Minute.</p> <p>d) No Sweep cycles: 5 cycles in each axis.</p> <p>e) Direction: All three mutually perpendicular axis.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Parameter</th> <th>Test point</th> </tr> </thead> <tbody> <tr> <td>Voltage (V_{L-N} & V_{L-L})</td> <td>@ 100% of range</td> </tr> <tr> <td>Line Current</td> <td>@ 100% of range</td> </tr> <tr> <td>Active Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Reactive Power,</td> <td>@ 100% of range</td> </tr> <tr> <td>Apparent Power.</td> <td>@ 100% of range</td> </tr> <tr> <td>Frequency.</td> <td>@ 100% of range</td> </tr> </tbody> </table>	Parameter	Test point	Voltage (V _{L-N} & V _{L-L})	@ 100% of range	Line Current	@ 100% of range	Active Power,	@ 100% of range	Reactive Power,	@ 100% of range	Apparent Power.	@ 100% of range	Frequency.	@ 100% of range	After test meter function normally, no mechanical damage was observed.	Conforms
Parameter	Test point																	
Voltage (V _{L-N} & V _{L-L})	@ 100% of range																	
Line Current	@ 100% of range																	
Active Power,	@ 100% of range																	
Reactive Power,	@ 100% of range																	
Apparent Power.	@ 100% of range																	
Frequency.	@ 100% of range																	
15	RS 485 Modbus Communications output. (As per Customer requirement)	All parameters should be available via modbus interface at 9600 baud rate. Reading shall match with instrument display reading.	Reading available via modbus interface at 9600 baud rate are matching with display reading.(As per Table 6 ,7)	Conforms														

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VOLTAGE (L-N)

Test point (% of input range)	Display on Test Meter (V)			Standard Meter Rdg. (V)	Output of RS 485 Modbus (V)		
	R	Y	B		R	Y	B
10	119.7	119.7	119.6	119.80	119.7	119.7	119.6
100	239.5	239.5	239.5	239.60	239.5	239.5	239.5

VOLTAGE (L-L)

Test point (% of input range)	Display on Test Meter (V)			Standard Meter Rdg. (V)	Output of RS 485 Modbus (V)		
	R	Y	B		R	Y	B
50	207.3	207.2	207.2	207.50	207.3	207.2	207.2
100	415.5	415.4	415.4	415.00	415.5	415.4	415.4

CURRENT

Test point (% of input range)	Display on Test Meter (A)			Standard Meter Rdg. (A)	Output of RS 485 Modbus (A)		
	R	Y	B		R	Y	B
50	0.5	0.5	0.5	0.500	0.5	0.5	0.5
100	4.996	4.996	4.996	5.000	4.996	4.996	4.996

Frequency

Test point (Hz)	Display on Test Meter (Hz)			Standard Meter Rdg. (Hz)	Output of RS 485 Modbus (Hz)		
	R	Y	B		R	Y	B
40	40.0	40.0	40.0	40.0	40.0	40.0	40.0
50	50.0	50.0	50.0	50.0	50.0	50.0	50.0
70	70.0	70.0	70.0	70.0	70.0	70.0	70.0

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tdc@erda.org, ene@erda.org

PHASE ANGLE

Test point (°)	Display on Test Meter (°)			Standard Meter Rdg. (°)	Output of RS 485 Modbus (°)		
	R	Y	B		R	Y	B
0	0.1	0.1	0.1	0.0	0.1	0.1	0.1
60	60.0	60.0	60.0	60.0	60.0	60.0	60.0
180	180.1	180.1	180.1	180.0	180.1	180.1	180.1
270	270.0	270.0	270.0	270.0	270.0	270.0	270.0
359	359.1	359.1	359.1	359.0	359.1	359.1	359.1

Active Power

Test point (% of input range)	Display on test meter (kW)	Standard meter reading. (W)	Output of RS 485 Modbus (kW)
10	0.036	35.94	0.036
100	3.586	3594	3.586

Reactive Power

Test point (% of input range)	Display on test meter (kvar)	Standard meter reading. (VAr)	Output of RS 485 Modbus (kvar)
10	0.036	35.94	0.036
100	3.588	3594	3.588

Apparent Power

Test point (% of input range)	Display on test meter (kVA)	Standard meter reading. (VA)	Output of RS 485 Modbus (kVA)
10	0.036	35.94	0.036
100	3.589	3594	3.589

Power factor

Test point (% of input range)	Display on test meter (PF)	Standard meter reading. (PF)	Output of RS 485 Modbus (PF)
0.5 LAG	0.49 L	0.50 L	0.49 L
UPF	1.000	1.000	1.000
0.8 Lead	0.8C	0.8 C	0.80C

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Sr. No.	Particulars of test And Clause no.	Requirements as per specification	Observed value	Remarks
16	Variation in power due to input voltage [Test procedure as per Clause No. 6.6 of IEC 60688:2002 & as per customer requirement]	<p>Apply nominal value of the input voltage and input current at unity power factor (239.6V, 5A,UPF) and record the value of the active power for each phase and system power on UUT.</p> <p>At a constant value of the measurand, reduce the input voltage to the lower limit (80% of nominal value) and record the value of the active power for each phase and system power on UUT.</p> <p>At a constant value of the measurand, increase the input voltage to the upper limit (120% of nominal value) and record the value of the active power for each phase and system power on UUT.</p> <p>The variation shall not exceed 50 % of the class index.</p>	Variation in error observed was less than 50% of the class index.	Conforms
17.	Variation in power factor due to input current [As per customer requirement and test procedure as per Clause no.6.7. IEC:688:2002.]	<p>Apply the nominal value of the input voltage and input current at unity power factor (239.6V, 5A,UPF) and record the value of power factor for each phase and system power factor on UUT.</p> <p>At a constant value of the measurand, reduce the input current to the lower limit (20% of nominal value) and record value of power factor for each phase and system power factor on UUT.</p> <p>At a constant value of the measurand, increase the current to the upper limit (120% of nominal value) of the Input current and record value of power factor for each phase and system power factor on UUT .</p> <p>The variation shall not exceed 50 % of the class index.</p>	Variation in error observed was less than 50% of the class index.	Conforms

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18.	<p>Verification of power due to Power factor [As per customer requirement and test procedure as per Clause no.6.8. IEC:688:2002.]</p>	<p>Apply the following input quantity with no distortion and record the value of power for each phase and system power on UUT.</p> <p>At a constant value of the measurand. increase the input current to 100% of the nominal value and reduce the power factor to 0.5 lag/lead respectively and record the value of power for each phase and system power on UUT.</p> <p>The variation shall not exceed 50 % of the class index.</p> <p>Apply 5 % of the nominal value of the input current at a unity power factor and record the value of power for each phase and system power on UUT</p> <p>At a constant value of the measurand, increase the input current to 10% of the nominal value and reduce the power factor to 0.5 lag/lead respectively and record value of power for each phase and system power on UUT.</p> <p>The variation shall not exceed 50 % of the class index</p>	<p>Conforms</p> <p>Variation in error observed was less than 50% of the class index.</p> <p>Variation in error observed was less than 50% of the class index.</p>					
19.	<p>Variation due to Distortion of the input quantity [As per customer requirement and Test procedure as per Clause No. 6.10 of IEC 60688:2002.]</p>	<p>Apply the following input quantity with no distortion and record the value of the UUT.</p> <p>Introduce third 3rd distortion of factor 0.2 maintaining the r.m.s. value constant and record the value of the UUT. The phase relationship between the harmonics and the fundamental should be varied so as to determine the most unfavorable conditions. The test is performed with distorted current waveform and then repeated with distorted voltage waveform.</p> <p>The variation shall not exceed 200 % of the class index.</p> <table border="1" data-bbox="392 1758 1058 1866"> <thead> <tr> <th>Parameter</th> <th>Test point</th> </tr> </thead> <tbody> <tr> <td>Active Power,</td> <td>@ 0% .25% , 50%. 75% and 100% of range</td> </tr> </tbody> </table>	Parameter	Test point	Active Power,	@ 0% .25% , 50%. 75% and 100% of range	<p>Conforms</p> <p>Variation in error observed was less than 200% of the class index.</p>	
Parameter	Test point							
Active Power,	@ 0% .25% , 50%. 75% and 100% of range							

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