# APPROVAL REPORT FOR THE PATTERN AND CONSTRUCTION OF ELECTRICITY METERS ANNEX II, MODULE B MEASURING INSTRUMENT DIRECTIVE

MANUFACTURER : *Jiangsu Acrel Electrical Manufacturing. Co., Ltd.*

TYPE : *ADL400*

CLASS : *A or B or C (kWh)*

DESCRIPTION : *Polyphase, Active Import/Export (kWh), Electricity Meter*

Tested in accordance with EN 50470-1: 2006, Electricity metering equipment (AC)
Part 1: General requirements, tests and test conditions.
Metering equipment (class indexes A, B and C)

and

EN 50470-3: 2006, Electricity metering equipment (AC)
Part 3: Particular requirements - Static meters for active energy (class indexes A, B and C)

The meters tested satisfied the required specification.

ISSUED BY:

M.Gu

CHECKED BY:

K. Hunter
Test Engineer

REPORT ISSUE DATE: 25th August 2021

REPORT ISSUE NUMBER: 1

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**INTRODUCTION**

The type tests described were carried out in SGS Shanghai & SCM laboratory on behalf of:

CLIENT DETAILS: Jiangsu Acrel Electrical Manufacturing. Co., Ltd.
No.5,Dongmeng Road,Nanzha Street,Jiangyin City,
Jiangsu Province, China

ORDER No: SH-202102040279

APPLICATION RECEIVED DATE: March 4th 2021

DATE OF RECEIPT OF SAMPLES: March 24th 2021

DATE OF TESTS: March 25th 2021 to May 24th 2021

Conditions under which the type tests took place:

Unless otherwise stated, the meters were examined at an ambient temperature of 23°C ± 2°C, and after the voltage circuits had been connected to reference voltage for at least 1 hour.

Unless otherwise stated, Polyphase tests were tested with a standard phase sequence of L1-L2-L3 (corresponding to the Red, Yellow & Blue phases ).

The tests were conducted using equipment, traceable to National and International Standards.

## INFORMATION ON THE ELECTRICITY METERS TESTED

| | | |
|---|---|---|
| Manufacturer | : | Jiangsu Acrel Electrical Manufacturing. Co., Ltd. |
| Type | : | ADL400 |
| Class | : | A or B or C (kWh) |
| Temperature Range | : | -25°C to +55°C |
| Type of circuit | : | 3 phase 4 wire |
| Imin | : | 0.01A |
| Itr | : | 0.05A |
| In | : | 1A |
| Imax | : | 6A |
| Reference Supply Voltage | : | 3*230/400V |
| Rated Frequency | : | 50Hz |
| Pulse output constant | : | 10000p/kWh |
| Manufacturers Serial No. | : | XPLZ3836060010,SYZ21020330006,M8 |

**SUPPORTING DOCUMENTATION**

Accredited Laboratory tests reports:

Clause 5.4 Terminal block requirements

SGS. Report No. SHIN2107046133MR Issued: 9th July 2021

# SUMMARY OF TEST RESULTS

| Test Description | Requirements | | Performed | Result |
|---|---|---|---|---|
| | General EN50470-1 Clause | Static EN50470-3 Clause | | |
| Tests of insulation properties | | | | |
| Impulse voltage | 7.3.3 | | SGS Shanghai | Complied |
| AC voltage | 7.3.4 | 7.2 | SGS Shanghai | Complied |
| Tests of accuracy requirements | | | | |
| Accuracy at reference conditions | | 8.7.2 | SGS Shanghai | Complied |
| Repeatability | | 8.7.4 | SGS Shanghai | Complied |
| Meter constant | | 8.7.10 | SGS Shanghai | Complied |
| Starting condition | | 8.7.9.2 | SCM | Complied |
| No-load condition | | 8.7.9.3 | SGS Shanghai | Complied |
| Effect of influence quantities | | 8.7.5 | SGS Shanghai | Complied |
| Tests of effect of disturbances of long duration | | | | |
| Severe voltage condition | | 8.7.7.2 | SGS Shanghai | Complied |
| Reverse phase sequence | | 8.7.7.3 | SGS Shanghai | Complied |
| Voltage unbalance | | 8.7.7.4 | SGS Shanghai | Complied |
| Short time overcurrents | | 8.7.8 | SCM | Complied |
| Self-heating | | 8.7.7.5 | SGS Shanghai | Complied |
| Accuracy in the presence of harmonics | | 8.7.7.7 | SCM | Complied |
| Odd harmonics and sub-harmonics | | 8.7.7.9 | SCM | Complied |
| DC and even harmonics | | 8.7.7.8 | N/A | N/A |
| Operation of auxiliary devices | | 8.7.7.13 | N/A | N/A |
| Tests of electrical requirements | | | | |
| Power consumption | | 7.1 | SGS Shanghai | Complied |
| Heating | 7.2 | | SGS Shanghai | Complied |
| Tests for electromagnetic compatibility | | | | |
| Immunity to voltage dips and short interrupts | 7.4.4 | | SCM | Complied |
| Radio interference suppression | 7.4.13 | | SCM | Complied |
| Immunity to fast transients | 7.4.7 | 8.7.7.14 | SCM | Complied |
| Immunity to oscillatory waves | 7.4.10 | 8.7.7.16 | N/A | N/A |
| Immunity to radiated RF electromagnetic fields | 7.4.6 | 8.7.7.12 | SCM | Complied |
| Immunity to conducted RF disturbances | 7.4.8 | 8.7.7.15 | SCM | Complied |
| Immunity to electrostatic discharges | 7.4.5 | | SCM | Complied |
| Immunity to surges | 7.4.9 | | SCM | Complied |
| Immunity to AC magnetic fields | 7.4.12 | 8.7.7.11 | SCM | Complied |
| Immunity to continuous magnetic fields | 7.4.11 | 8.7.7.10 | SCM | Complied |
| Tests of the effect of climatic environments | | | | |
| Dry heat test (Test B) | 6.3.2 | | SGS Shanghai | Complied |
| Cold test (Test A) | 6.3.3 | | SGS Shanghai | Complied |
| Damp heat cyclic test (Test Db) | 6.3.4 | | SGS Shanghai | Complied |
| Solar Radiation (Test Sa) | 6.3.5 | | N/A | N/A |
| Mechanical tests | | | | |
| Vibration test (Test Fc) | 5.2.2.3 | | SGS Shanghai | Complied |
| Shock test (Test Ea) | 5.2.2.2 | | SGS Shanghai | Complied |
| Spring hammer test (Test Eh) | 5.2.2.1 | | SGS Shanghai | Complied |
| Protection against penetration of dust and water | 5.9 | | SGS Shanghai | Complied |
| Resistance to heat and fire | 5.8 | | SGS Shanghai | Complied |

**SUMMARY OF TEST RESULTS (cont.)**

Tests performed at SCM and SGS Shanghai Record No.: 2104201025

South China National Centre of Metrology (SCM)
The SCM laboratory is accredited by CNAS (Lab ID: L0730)
CNAS is recognised by the IAF as the accreditation body for China.

SGS-CSTC Standards Technical Service (Shanghai) Co., Ltd. Testing Center (SGS-Shanghai)
The SGS-Shanghai laboratory is accredited by CNAS (Lab ID: L0599)
CNAS is recognised by the IAF as the accreditation body for China.

## EN50470-1 GENERAL REQUIREMENTS:

| Clause | Requirements | Complied |
|---|---|---|
| 4.1 | Standard reference voltages | Yes |
| 4.2 | Standard current & current ranges | Yes |
| 4.3 | Standard reference frequency | Yes |
| 5.1 | The manufacturer shall specify the mechanical environment the meter is intended for. | Yes |
| | Meters shall be designed & constructed in such a way to avoid danger in normal use and conditions to avoid:<br>- electric shock<br>- excessive temperature<br>- fire<br>- penetration of solid objects, dust and water | Yes |
| 5.2.1 | Case can be sealed or closed in a way that protects internal parts and cannot be accessed without breaking a seal or the case | Yes |
| 5.3 | The window shall be transparent | Yes |
| 5.4 | Terminal requirements | Yes |
| | The terminal block material is capable of passing the tests given in EN ISO 75-2 | Yes |
| 5.5 | The terminals shall have a separate cover which can be sealed independently of the meter cover | Yes |
| 5.6 | Clearance and creepage requirements | Yes |
| 5.7 | Insulating encased meter of protective class II requirements | Yes |
| 5.10 | Register readable under normal conditions and the principal unit is kWh | Yes |
| | Non-volatile memory has a minimum retention time of 4 months | Yes |
| | In the case of multiple values displayed by a single display, it shall be possible to display the contents of all relevant memories. Automatic sequencing displays shall display each value for at least 5 seconds | Yes |
| | The register shall be able to record and display, starting from zero, for a minimum of 4000hrs, the energy corresponding to maximum current at reference voltage and unity power factor | Yes |
| | The display of the total energy supplied shall not be able to reset during use | Yes |
| 5.11 | The meter has a test output capable of being monitored for test purposes | Yes |
| 5.11.1 | The maximum pulse frequency of the optical test output shall be ≤ 2.5kHz and the pulse transition time shall be ≤ 20µs | Yes |
| 5.11.2 | The wavelength of the radiated signals for emitting systems is between 550nm and 1000nm | Yes |
| 5.12.1 | The meter bears the required information on the name plate | Yes |
| 5.12.2 | The meter has the connection diagram marked | Yes |
| 5.13 | An instruction manual for each meter type is made available | Yes |

**RELIABILITY & DURABILITY** EN50470-3 X-Ref. 9.0 & 10.0

An assessment was made using the failure rates of components in accordance with the SIEMENS NORM SN 29500 Edition 2009-06.

These values were then applied to a spreadsheet (OfgemModelv4.3.xls) in accordance with our guidance notes (Model Guidelines v1.4.doc) and given an overall predicted life, in years.

As part of the type approval process, SGS carried out the assessment to verify that the submitted reliability model accurately reflects the physical sample supplied in order to ascertain an accurate predicted life.

Supporting documentation has been provided and found to be satisfactory where components that are not covered by the SN 29500 (LCD's, Batteries, and Contactors etc.) have been used and any subsequent arguments have been resolved.

The Electronic Metering Reliability Model predicts that this meter has a life of

18.21 Years with reference to Reliability Report EMA291448/1/Reliability dated 1st September 2021

Where this relates to a family of meters, the reliability model was performed on the most component populated meter variant, so as to simulate the worst case scenario, and all other meter variants will be at least similar.

**SOFTWARE REVIEW** EN50470-3 X-Ref. 11.0

A review was carried out in accordance with the Welmec 7.2 2015 Software Guide (Measuring Instruments Directive 2014/32/EU)

The meter was stated to be Type P (Basic requirements for Embedded Software in a Built-for-purpose Measuring Instrument) and under Risk Class C. The meter was also considered for:-

Extension L - Specific software requirements for Long-term storage
Extension T - Specific software requirements for Data transmission
Extension D - Download of legally relevant software
Extension I-3 - Specific software requirements (Active electrical energy meters)

The review was performed on software version V1.01

Documentation provided by the manufacturer satisfied the requirement of the Welmec software guide.

## 1 INSULATION EN50470-1 X-Ref. 7.3

## 1.1 Impulse Voltage Test X-Ref. 7.3.3

| Sample No: M8 | Test Procedure: EN50470-1 Impulse Voltage |
|---|---|

**Environmental Conditions**

| | |
|---|---|
| Temperature | 23°C |
| Relative Humidity | 56.0 % |
| Barometric Pressure | 998 mB |

Impulse specification: Test level 6kV @ 0.5J open circuit
Time between impulse's 3s

The meter samples were placed on a flat conducting earth surface with the case wrapped in a conductive foil.

The test voltage was applied 10 times in each polarity between the points listed below:-

1) With one terminal of the voltage circuit connect to earth, the impulse voltage was applied between the common voltage/current meter terminal and earth.

2) With all meter terminals connected together, impulse voltage was applied between the meter terminals and earth.

During the tests auxiliary circuits with reference rated voltage ≤ 40V were connected to earth.

On completion of the above test, the meter was found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions, with no signs of damage or degradation in the meter's insulation properties.

## 1.2 AC Voltage Test

EN50470-1 X-Ref. 7.3.4

EN50470-3 X-Ref. 7.2

| Sample No: M8 | Test Procedure: EN50470-3 AC Voltage |
|---|---|

**Environmental Conditions**

| | |
|---|---|
| Temperature | 23°C |
| Relative Humidity | 56.0 % |
| Barometric Pressure | 998 mB |

Test level 2kV & 4kV Test duration 1 minute.

The a.c. voltage tests were conducted as follows:

1) Between all meter voltage and current circuits connected together, and earth.

2) Between all circuits not intended to be connected together in service, and earth.

The earth consisting of a conductive foil wrapped around the meter and connected to a flat conducting earth surface, upon which the meter was placed.

During the tests auxiliary circuits with reference rated voltage ≤ 40V were connected to earth.

On completion of the above test, the meter was found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions, with no signs of damage or degradation in the meter's insulation properties.

## 2 ACCURACY AT REFERENCE CONDITIONS EN50470-3 X-Ref. 8

### 2.1 Variation in Current X-Ref. 8.7.2

| Sample No: M8 | Test Procedure: EN50470-3 Acc 3P4W kWh +P |
|---|---|

Test Conditions: *Un:3*230/400V Fn: 50Hz*
*Imin: 0.01A Itr:0.05A In:1A Imax:6A*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Import Energy kWh*

| | | | Limit of % Error | | |
|---|---|---|---|---|---|
| CURRENT | PF Cos. ϕ | *% Error* | Accuracy | | |
| | | | Class A | Class B | Class C |
| Imin | 1.0 | -0.0870 | ±2.5 | ±1.5 | ±1.0 |
| Itr | - | -0.0785 | ±2.0 | ±1.0 | ±0.5 |
| 20Itr(Iref/In) | - | -0.0828 | ±2.0 | ±1.0 | ±0.5 |
| 0.5Imax | - | -0.0855 | ±2.0 | ±1.0 | ±0.5 |
| Imax | - | -0.1055 | ±2.0 | ±1.0 | ±0.5 |
| Itr | 0.5ind | 0.0301 | ±2.0 | ±1.0 | ±0.5 |
| 20Itr(Iref/In) | - | -0.0680 | ±2.0 | ±1.0 | ±0.5 |
| 0.5Imax | - | -0.1909 | ±2.0 | ±1.0 | ±0.5 |
| Imax | - | -0.2850 | ±2.0 | ±1.0 | ±0.5 |
| Itr | 0.8cap | -0.1274 | ±2.0 | ±1.0 | ±0.5 |
| 20Itr(Iref/In) | - | -0.0977 | ±2.0 | ±1.0 | ±0.5 |
| 0.5Imax | - | -0.0676 | ±2.0 | ±1.0 | ±0.5 |
| Imax | - | 0.0024 | ±2.0 | ±1.0 | ±0.5 |

**Repeatability** EN50470-3 X-Ref 8.2

| | | *R1* | *R2* | *R3* | Limit of % Error Variation | | |
|---|---|---|---|---|---|---|---|
| CURRENT | PF Cos. ϕ | *% Error Variance* | *% Error Variance* | *% Error Variance* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Imin | 1.0 | 0.00 | 0.01 | 0.01 | ±0.25 | ±0.15 | ±0.10 |
| Itr | - | 0.01 | 0.00 | 0.00 | ±0.20 | ±0.10 | ±0.05 |
| 20Itr(Iref/In) | - | -0.01 | 0.00 | 0.00 | ±0.20 | ±0.10 | ±0.05 |
| 0.5Imax | - | -0.01 | 0.00 | 0.00 | ±0.20 | ±0.10 | ±0.05 |
| Imax | - | 0.00 | -0.02 | 0.01 | ±0.20 | ±0.10 | ±0.05 |
| Itr | 0.5ind | 0.01 | 0.00 | 0.01 | ±0.20 | ±0.10 | ±0.05 |
| 20Itr(Iref/In) | - | 0.00 | 0.00 | 0.00 | ±0.20 | ±0.10 | ±0.05 |
| 0.5Imax | - | 0.00 | 0.01 | 0.00 | ±0.20 | ±0.10 | ±0.05 |
| Imax | - | 0.00 | 0.00 | -0.01 | ±0.20 | ±0.10 | ±0.05 |
| Itr | 0.8cap | 0.00 | -0.01 | -0.01 | ±0.20 | ±0.10 | ±0.05 |
| 20Itr(Iref/In) | - | 0.01 | 0.00 | 0.00 | ±0.20 | ±0.10 | ±0.05 |
| 0.5Imax | - | 0.01 | 0.01 | 0.01 | ±0.20 | ±0.10 | ±0.05 |
| Imax | - | 0.00 | -0.02 | 0.01 | ±0.20 | ±0.10 | ±0.05 |

**Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage circuits.** X-Ref. 8.7.2

Test Conditions: *Un:3*230/400V Fn: 50Hz*
*Imin: 0.01A Itr:0.05A In:1A Imax:6A*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Import Energy kWh*

| Elements/Lines | | I1 Element L1 | I2 Element L2 | I3 Element L3 | Limit of % Error | | |
|---|---|---|---|---|---|---|---|
| CURRENT | PF Cos. ϕ | *% Error* | *% Error* | *% Error* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0844 | -0.0855 | -0.1019 | ±3.0 | ±2.0 | ±1.0 |
| 20Itr | - | -0.0957 | -0.1059 | -0.1370 | ±3.0 | ±2.0 | ±1.0 |
| 0.5Imax | - | -0.1018 | -0.1207 | -0.1677 | ±3.0 | ±2.0 | ±1.0 |
| Imax | - | -0.1046 | -0.1268 | -0.1685 | ±3.0 | ±2.0 | ±1.0 |
| Itr | 0.5ind | -0.0220 | 0.0405 | 0.0759 | ±3.0 | ±2.0 | ±1.0 |
| 20Itr | - | -0.0874 | -0.0576 | -0.1191 | ±3.0 | ±2.0 | ±1.0 |
| 0.5Imax | - | -0.1722 | -0.1469 | -0.2832 | ±3.0 | ±2.0 | ±1.0 |
| Imax | - | -0.2600 | -0.2323 | -0.3602 | ±3.0 | ±2.0 | ±1.0 |

**Repeatability** EN50470-3 X-Ref 8.2

| R1 Element L1 | R2 Element L1 | R3 Element L1 | R1 Element L2 | R2 Element L2 | R3 Element L2 | R1 Element L3 | R2 Element L3 | R3 Element L3 | Limit of % Error Variation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *% Error Var.* | *% Error Var.* | *% Error Var.* | *% Error Var.* | *% Error Var.* | *% Error Var.* | *% Error Var.* | *% Error Var.* | *% Error Var.* | Accuracy | | |
| | | | | | | | | | Class A | Class B | Class C |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | -0.01 | 0.00 | 0.00 | ±0.30 | ±0.20 | ±0.10 |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.03 | 0.00 | ±0.30 | ±0.20 | ±0.10 |
| -0.01 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | ±0.30 | ±0.20 | ±0.10 |
| 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | ±0.30 | ±0.20 | ±0.10 |
| 0.00 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | ±0.30 | ±0.20 | ±0.10 |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.01 | 0.00 | -0.01 | ±0.30 | ±0.20 | ±0.10 |
| 0.00 | 0.00 | 0.01 | 0.00 | -0.01 | 0.00 | 0.00 | 0.03 | 0.00 | ±0.30 | ±0.20 | ±0.10 |
| 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | -0.01 | -0.01 | 0.00 | -0.02 | ±0.30 | ±0.20 | ±0.10 |

## Variation in Current(cont.)

X-Ref. 8.7.2

| Sample No: M8 | Test Procedure: EN50470-3 Acc 3P4W kWh -P |
|---|---|

Test Conditions: *Un:3*230/400V Fn: 50Hz*
*Imin: 0.01A Itr:0.05A In:1A Imax:6A*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Export Energy kWh*

| | | | Limit of % Error | | |
|---|---|---|---|---|---|
| CURRENT | PF Cos. ϕ | *% Error* | Accuracy | | |
| | | | Class A | Class B | Class C |
| Imin | 1.0 | -0.0965 | ±2.5 | ±1.5 | ±1.0 |
| Itr | - | -0.1061 | ±2.0 | ±1.0 | ±0.5 |
| 20Itr(Iref/In) | - | -0.1210 | ±2.0 | ±1.0 | ±0.5 |
| 0.5Imax | - | -0.1343 | ±2.0 | ±1.0 | ±0.5 |
| Imax | - | -0.1387 | ±2.0 | ±1.0 | ±0.5 |
| Itr | 0.5ind | 0.0164 | ±2.0 | ±1.0 | ±0.5 |
| 20Itr(Iref/In) | - | -0.1027 | ±2.0 | ±1.0 | ±0.5 |
| 0.5Imax | - | -0.2091 | ±2.0 | ±1.0 | ±0.5 |
| Imax | - | -0.2449 | ±2.0 | ±1.0 | ±0.5 |
| Itr | 0.8cap | -0.1580 | ±2.0 | ±1.0 | ±0.5 |
| 20Itr(Iref/In) | - | -0.1314 | ±2.0 | ±1.0 | ±0.5 |
| 0.5Imax | - | -0.0999 | ±2.0 | ±1.0 | ±0.5 |
| Imax | - | -0.0713 | ±2.0 | ±1.0 | ±0.5 |

## Repeatability

EN50470-3 X-Ref 8.2

| | | *R1* | *R2* | *R3* | Limit of % Error Variation | | |
|---|---|---|---|---|---|---|---|
| CURRENT | PF Cos. ϕ | *% Error Variance* | *% Error Variance* | *% Error Variance* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Imin | 1.0 | -0.01 | 0.00 | 0.00 | ±0.25 | ±0.15 | ±0.10 |
| Itr | - | 0.00 | -0.01 | 0.00 | ±0.20 | ±0.10 | ±0.05 |
| 20Itr(Iref/In) | - | 0.00 | 0.00 | 0.00 | ±0.20 | ±0.10 | ±0.05 |
| 0.5Imax | - | 0.00 | 0.00 | -0.01 | ±0.20 | ±0.10 | ±0.05 |
| Imax | - | 0.03 | 0.02 | 0.03 | ±0.20 | ±0.10 | ±0.05 |
| Itr | 0.5ind | 0.01 | 0.00 | -0.01 | ±0.20 | ±0.10 | ±0.05 |
| 20Itr(Iref/In) | - | 0.00 | 0.00 | 0.00 | ±0.20 | ±0.10 | ±0.05 |
| 0.5Imax | - | -0.01 | 0.00 | 0.00 | ±0.20 | ±0.10 | ±0.05 |
| Imax | - | -0.01 | -0.01 | -0.01 | ±0.20 | ±0.10 | ±0.05 |
| Itr | 0.8cap | 0.00 | 0.00 | 0.01 | ±0.20 | ±0.10 | ±0.05 |
| 20Itr(Iref/In) | - | 0.00 | 0.00 | 0.00 | ±0.20 | ±0.10 | ±0.05 |
| 0.5Imax | - | -0.01 | 0.00 | -0.01 | ±0.20 | ±0.10 | ±0.05 |
| Imax | - | 0.00 | 0.00 | 0.00 | ±0.20 | ±0.10 | ±0.05 |

**Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage circuits.** X-Ref. 8.7.2

Test Conditions: *Un:3*230/400V Fn: 50Hz*
*Imin: 0.01A Itr:0.05A In:1A Imax:6A*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Export Energy kWh*

| Elements/Lines | | I1 Element L1 | I2 Element L2 | I3 Element L3 | Limit of % Error | | |
|---|---|---|---|---|---|---|---|
| CURRENT | PF Cos. ϕ | *% Error* | *% Error* | *% Error* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0982 | -0.1001 | -0.1092 | ±3.0 | ±2.0 | ±1.0 |
| 20Itr(Iref/In) | - | -0.1057 | -0.1160 | -0.1404 | ±3.0 | ±2.0 | ±1.0 |
| 0.5Imax | - | -0.1190 | -0.1340 | -0.1695 | ±3.0 | ±2.0 | ±1.0 |
| Imax | - | -0.1185 | -0.1308 | -0.1852 | ±3.0 | ±2.0 | ±1.0 |
| Itr | 0.5ind | -0.0243 | 0.0194 | 0.0713 | ±3.0 | ±2.0 | ±1.0 |
| 20Itr(Iref/In) | - | -0.0975 | -0.0591 | -0.1211 | ±3.0 | ±2.0 | ±1.0 |
| 0.5Imax | - | -0.1794 | -0.1504 | -0.2858 | ±3.0 | ±2.0 | ±1.0 |
| Imax | - | -0.2607 | -0.2362 | -0.3367 | ±3.0 | ±2.0 | ±1.0 |

**Repeatability** EN50470-3 X-Ref 8.2

| R1 Element L1 | R2 Element L1 | R3 Element L1 | R1 Element L2 | R2 Element L2 | R3 Element L2 | R1 Element L3 | R2 Element L3 | R3 Element L3 | Limit of % Error Variation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *% Error Var.* | *% Error Var.* | *% Error Var.* | *% Error Var.* | *% Error Var.* | *% Error Var.* | *% Error Var.* | *% Error Var.* | *% Error Var.* | Accuracy | | |
| | | | | | | | | | Class A | Class B | Class C |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | ±0.30 | ±0.20 | ±0.10 |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | ±0.30 | ±0.20 | ±0.10 |
| 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | ±0.30 | ±0.20 | ±0.10 |
| -0.02 | 0.01 | -0.01 | 0.00 | -0.01 | 0.01 | 0.01 | 0.01 | 0.00 | ±0.30 | ±0.20 | ±0.10 |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | ±0.30 | ±0.20 | ±0.10 |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | ±0.30 | ±0.20 | ±0.10 |
| 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | ±0.30 | ±0.20 | ±0.10 |
| 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | -0.02 | ±0.30 | ±0.20 | ±0.10 |

## 2.2 Meter Constant X-Ref 8.7.10

The relation between the test output and the meter energy registers were checked to ensure the constant marking on the meter nameplate.

| Sample No: M8 | Test Procedure: EN50470-3 Meter Constant |
|---|---|

Test Conditions: *Un:3*230/400V* *Imax:6A* *Cos. $\phi$ = 1.0, 50Hz*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Import Energy kWh*

| Number of Pulses Recorded | Pulse Constant (p/ kWh) | LED Test Output (kWh) | Energy Registered By Meter (kWh) | Percentage difference between Energy Registered and LED Test Output (%) |
|---|---|---|---|---|
| 30005 | 10000 | 3.0005 | 3.000 | -0.02 |

Limit of % Error Variation: ± 0.20% for Class A
± 0.10% for Class B
± 0.05% for Class C

During the registration tests, rate registers not active were found not to have been corrupted.

| Sample No: M8 | Test Procedure: EN50470-3 Meter Constant |
|---|---|

Test Conditions: *Un:3*230/400V* *Imax:6A* *Cos. $\phi$ = 1.0, 50Hz*

Test Circuit: *3 phase 4 wire*

Measurement Mode*: Active Export Energy kWh*

| Number of Pulses Recorded | Pulse Constant (p/ kWh) | LED Test Output (kWh) | Energy Registered By Meter (kWh) | Percentage difference between Energy Registered and LED Test Output (%) |
|---|---|---|---|---|
| 30002 | 10000 | 3.0002 | 3.000 | -0.01 |

Limit of % Error Variation: ± 0.20% for Class A
± 0.10% for Class B
± 0.05% for Class C

During the registration tests, rate registers not active were found not to have been corrupted.

## 2.3 Starting and No-Load Condition X-Ref. 8.7.9

### Initial Start-up of the meter X-Ref. 8.7.9.2

| Sample No: M8 | Test Procedure: EN50470-3 Start-up |
|---|---|

The meter samples were fully functional within 5s after rated voltage Un was applied to the meter terminals.

### No-load Condition X-Ref. 8.7.9.3

| Sample No: M8 | Test Procedure: EN50470-3 Non Registration Test 115(%U) |
|---|---|

Tests were conducted as follows;

Test Conditions: *115% Un, current circuits open*

The minimum test duration in minutes being given by

$$\Delta t \geq \frac{240 \times 10^3}{k \cdot m \cdot U_{test} \cdot I_{st}} \text{ [min]}$$

where

k is the meter output constant (pulses per kWh )
m is the number of measuring elements
$U_{test}$ is the test voltage
$I_{st}$ is the starting current

The meter samples were tested for a period of at least Δt minutes, on completion of which, no changes in the energy registers were recorded, and the test output did not produce more than one pulse.

## Starting and No-Load Condition (cont.)

### Starting

X-Ref. 8.7.9.4

| Sample No: SYZ21020330006 | Test Procedure: EN50470-3 Starting Current 0.04Itr |
|---|---|

The meter commenced and continued to measure the applied active power in the import and export direction.

Test Conditions for Direct Connected meters

| | |
|---|---|
| Class A Active meters: | Umin, 0.05Itr, Cos. ϕ = 1.0, 50Hz |
| Class B Active meters: | Umin, 0.04Itr, Cos. ϕ = 1.0, 50Hz |
| Class C Active meters: | Umin, 0.04Itr, Cos. ϕ = 1.0, 50Hz |

## 2.4 Influence of Ambient Temperature

X-Ref. 8.7.5.2

| Sample No: M8 | Test Procedure: EN50470-3 Temp Variation 5°C to 30°C |
|---|---|

Test Conditions: *Un:3*230/400V Fn: 50Hz*
*Imin:0.01A Itr:0.05A In:1A Imax:6A*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Import Energy kWh*

Operating Temperature: *5°C to 30°C (Balanced Load)*

| Elements/Lines | | *Additional % Error* | *Additional % Error* | Limits of additional % error | | |
|---|---|---|---|---|---|---|
| CURRENT | PF Cos. ϕ | 5°C | 30°C | Accuracy | | |
| | | | | Class A | Class B | Class C |
| Imin | 1.0 | 0.1046 | -0.1164 | ±1.8 | ±0.9 | ±0.5 |
| Itr | - | 0.1122 | -0.1401 | ±1.8 | ±0.9 | ±0.5 |
| 20Itr(Iref/In) | - | 0.1000 | -0.1503 | ±1.8 | ±0.9 | ±0.5 |
| Imax | - | 0.1149 | -0.1556 | ±1.8 | ±0.9 | ±0.5 |
| Itr | 0.5ind | 0.1568 | 0.0046 | ±2.7 | ±1.3 | ±0.9 |
| 20Itr(Iref/In) | - | 0.0744 | -0.1259 | ±2.7 | ±1.3 | ±0.9 |
| Imax | - | -0.1182 | -0.3421 | ±2.7 | ±1.3 | ±0.9 |
| Itr | 0.8cap | 0.0776 | -0.1971 | ±2.7 | ±1.3 | ±0.9 |
| 20Itr(Iref/In) | - | 0.1049 | -0.1627 | ±2.7 | ±1.3 | ±0.9 |
| Imax | - | 0.1790 | -0.0887 | ±2.7 | ±1.3 | ±0.9 |

## Influence of Ambient Temperature (cont.)

X-Ref. 8.7.5.2

Sample No: M8 | Test Procedure: EN50470-3 Temp Variation 5°C to 30°C

**Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage circuits.**

| Operating Temperature 5°C | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elements/Lines | | I1 Element L1 | I2 Element L2 | I3 Element L3 | Limit of additional % error | | |
| CURRENT | PF Cos. ϕ | *Additional % Error* | *Additional % Error* | *Additional % Error* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Itr | 1.0 | 0.0737 | 0.0937 | 0.0934 | ±1.8 | ±0.9 | ±0.5 |
| 20Itr(Iref/In) | - | 0.0642 | 0.0719 | 0.0719 | ±1.8 | ±0.9 | ±0.5 |
| Imax | - | 0.0435 | 0.0584 | 0.0361 | ±1.8 | ±0.9 | ±0.5 |
| Itr | 0.5ind | 0.1449 | 0.1564 | 0.1707 | ±2.7 | ±1.3 | ±0.9 |
| 20Itr(Iref/In) | - | 0.0579 | 0.0849 | -0.0001 | ±2.7 | ±1.3 | ±0.9 |
| Imax | - | -0.1017 | -0.0619 | -0.3134 | ±2.7 | ±1.3 | ±0.9 |

| Operating Temperature 30°C | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elements/Lines | | I1 Element L1 | I2 Element L2 | I3 Element L3 | Limit of additional % error | | |
| CURRENT | PF Cos. ϕ | *Additional % Error* | *Additional % Error* | *Additional % Error* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.1458 | -0.1438 | -0.1560 | ±1.8 | ±0.9 | ±0.5 |
| 20Itr(Iref/In) | - | -0.1514 | -0.1652 | -0.1900 | ±1.8 | ±0.9 | ±0.5 |
| Imax | - | -0.1728 | -0.1765 | -0.2344 | ±1.8 | ±0.9 | ±0.5 |
| Itr | 0.5ind | -0.0907 | 0.0096 | 0.0455 | ±2.7 | ±1.3 | ±0.9 |
| 20Itr(Iref/In) | - | -0.1458 | -0.0976 | -0.1702 | ±2.7 | ±1.3 | ±0.9 |
| Imax | - | -0.3007 | -0.2688 | -0.5649 | ±2.7 | ±1.3 | ±0.9 |

## Influence of Ambient Temperature (cont.)

X-Ref. 8.7.5.2

| Sample No: M8 | Test Procedure: EN50470-3 Temp Variation -10°C to 40°C |
|---|---|

Test Conditions: *Un:3*230/400V Fn: 50Hz*
*Imin:0.01A Itr:0.05A In:1A Imax:6A*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Import Energy kWh*

Operating Temperature: *-10°C to 40°C (Balanced Load)*

| Elements/Lines | | *Additional % Error* | *Additional % Error* | Limits of additional % error | | |
|---|---|---|---|---|---|---|
| CURRENT | PF Cos. ϕ | -10°C | 40°C | Accuracy | | |
| | | | | Class A | Class B | Class C |
| Imin | 1.0 | 0.3174 | -0.1719 | ±3.3 | ±1.6 | ±1.0 |
| Itr | - | 0.2939 | -0.1864 | ±3.3 | ±1.6 | ±1.0 |
| 20Itr(Iref/In) | - | 0.2778 | -0.2109 | ±3.3 | ±1.6 | ±1.0 |
| Imax | - | 0.2748 | -0.2056 | ±3.3 | ±1.6 | ±1.0 |
| Itr | 0.5ind | 0.3287 | 0.0054 | ±4.9 | ±2.3 | ±1.6 |
| 20Itr(Iref/In) | - | 0.2528 | -0.1396 | ±4.9 | ±2.3 | ±1.6 |
| Imax | - | 0.0541 | -0.3986 | ±4.9 | ±2.3 | ±1.6 |
| Itr | 0.8cap | 0.2483 | -0.2723 | ±4.9 | ±2.3 | ±1.6 |
| 20Itr(Iref/In) | - | 0.2848 | -0.2393 | ±4.9 | ±2.3 | ±1.6 |
| Imax | - | 0.3609 | -0.1595 | ±4.9 | ±2.3 | ±1.6 |

## Influence of Ambient Temperature (cont.)

X-Ref. 8.7.5.2

| Sample No: M8 | Test Procedure: EN50470-3 Temp Variation -10°C to 40°C |
|---|---|

**Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage circuits.**

| Operating Temperature -10°C | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elements/Lines | | I1 Element L1 | I2 Element L2 | I3 Element L3 | Limit of additional % error | | |
| CURRENT | PF Cos. ϕ | *Additional % Error* | *Additional % Error* | *Additional % Error* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Itr | 1.0 | 0.2083 | 0.2636 | 0.2891 | ±3.3 | ±1.6 | ±1.0 |
| 20Itr(Iref/In) | - | 0.2332 | 0.2379 | 0.2592 | ±3.3 | ±1.6 | ±1.0 |
| Imax | - | 0.2175 | 0.2089 | 0.2257 | ±3.3 | ±1.6 | ±1.0 |
| Itr | 0.5ind | 0.3015 | 0.3268 | 0.3263 | ±4.9 | ±2.3 | ±1.6 |
| 20Itr(Iref/In) | - | 0.2303 | 0.2602 | 0.1689 | ±4.9 | ±2.3 | ±1.6 |
| Imax | - | 0.0572 | 0.1137 | -0.1562 | ±4.9 | ±2.3 | ±1.6 |

| Operating Temperature 40°C | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elements/Lines | | I1 Element L1 | I2 Element L2 | I3 Element L3 | Limit of additional % error | | |
| CURRENT | PF Cos. ϕ | *Additional % Error* | *Additional % Error* | *Additional % Error* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.1808 | -0.1773 | -0.2004 | ±3.3 | ±1.6 | ±1.0 |
| 20Itr(Iref/In) | - | -0.1906 | -0.1987 | -0.2418 | ±3.3 | ±1.6 | ±1.0 |
| Imax | - | -0.2058 | -0.2170 | -0.2822 | ±3.3 | ±1.6 | ±1.0 |
| Itr | 0.5ind | -0.0733 | 0.0476 | 0.0604 | ±4.9 | ±2.3 | ±1.6 |
| 20Itr(Iref/In) | - | -0.1395 | -0.0882 | -0.1723 | ±4.9 | ±2.3 | ±1.6 |
| Imax | - | -0.3298 | -0.2876 | -0.5734 | ±4.9 | ±2.3 | ±1.6 |

## Influence of Ambient Temperature (cont.)

X-Ref. 8.7.5.2

| Sample No: M8 | Test Procedure: EN50470-3 Temp Variation -25°C to 55°C |
|---|---|

Test Conditions: *Un:3*230/400V Fn: 50Hz*
*Imin:0.01A Itr:0.05A In:1A Imax:6A*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Import Energy kWh*

Operating Temperature: *-25°C to 55°C (Balanced Load)*

| Elements/Lines | | *Additional % Error* | *Additional % Error* | Limits of additional % error | | |
|---|---|---|---|---|---|---|
| CURRENT | PF Cos. ϕ | -25°C | 55°C | Accuracy | | |
| | | | | Class A | Class B | Class C |
| Imin | 1.0 | 0.5470 | -0.1673 | ±4.8 | ±2.4 | ±1.4 |
| Itr | - | 0.5398 | -0.2026 | ±4.8 | ±2.4 | ±1.4 |
| 20Itr(Iref/In) | - | 0.5444 | -0.2390 | ±4.8 | ±2.4 | ±1.4 |
| Imax | - | 0.5839 | -0.2689 | ±4.8 | ±2.4 | ±1.4 |
| Itr | 0.5ind | 0.6207 | 0.1196 | ±7.2 | ±3.4 | ±3.1 |
| 20Itr(Iref/In) | - | 0.5497 | -0.0981 | ±7.2 | ±3.4 | ±3.1 |
| Imax | - | 0.3447 | -0.4041 | ±7.2 | ±3.4 | ±3.1 |
| Itr | 0.8cap | 0.5061 | -0.3397 | ±7.2 | ±3.4 | ±3.1 |
| 20Itr(Iref/In) | - | 0.5398 | -0.4357 | ±7.2 | ±3.4 | ±3.1 |
| Imax | - | -0.6378 | -0.2085 | ±7.2 | ±3.4 | ±3.1 |

## Influence of Ambient Temperature (cont.)

X-Ref. 8.7.5.2

| Sample No: M8 | Test Procedure: EN50470-3 Temp Variation -25°C to 55°C |
|---|---|

**Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage circuits.**

| Operating Temperature -25°C | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elements/Lines | | I1 Element L1 | I2 Element L2 | I3 Element L3 | Limit of additional % error | | |
| CURRENT | PF Cos. ϕ | *Additional % Error* | *Additional % Error* | *Additional % Error* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Itr | 1.0 | 0.4869 | 0.5066 | 0.5686 | ±4.8 | ±2.4 | ±1.4 |
| 20Itr(Iref/In) | - | 0.4734 | 0.4972 | 0.5408 | ±4.8 | ±2.4 | ±1.4 |
| Imax | - | 0.4621 | 0.4808 | 0.5097 | ±4.8 | ±2.4 | ±1.4 |
| Itr | 0.5ind | 0.5500 | 0.6328 | 0.6024 | ±7.2 | ±3.4 | ±3.1 |
| 20Itr(Iref/In) | - | 0.5112 | 0.5852 | 0.4446 | ±7.2 | ±3.4 | ±3.1 |
| Imax | - | 0.2910 | 0.3906 | 0.1484 | ±7.2 | ±3.4 | ±3.1 |

| Operating Temperature 55°C | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elements/Lines | | I1 Element L1 | I2 Element L2 | I3 Element L3 | Limit of additional % error | | |
| CURRENT | PF Cos. ϕ | *Additional % Error* | *Additional % Error* | *Additional % Error* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.2160 | -0.1420 | -0.2506 | ±4.8 | ±2.4 | ±1.4 |
| 20Itr(Iref/In) | - | -0.2700 | -0.2376 | -0.3375 | ±4.8 | ±2.4 | ±1.4 |
| Imax | - | -0.2141 | -0.2248 | -0.3776 | ±4.8 | ±2.4 | ±1.4 |
| Itr | 0.5ind | 0.0436 | 0.2565 | 0.1130 | ±7.2 | ±3.4 | ±3.1 |
| 20Itr(Iref/In) | - | -0.0974 | 0.1457 | -0.2796 | ±7.2 | ±3.4 | ±3.1 |
| Imax | - | -0.4265 | -0.1990 | -0.5156 | ±7.2 | ±3.4 | ±3.1 |

## 2.5 Voltage Variation

X-Ref. 8.7.5.3

| Sample No: M8 | Test Procedure: EN50470-3 Voltage Variation |
|---|---|

Test Conditions: *Un:3*230/400V* *Fn: 50Hz*
*Imin:0.01A* *Itr:0.05A* *In:1A* *Imax:6A*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Import Energy kWh*

| | | 110% Un *Additional* | 90% Un *Additional* | Limit of Additional % Error | | |
|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *% Error* | *% Error* | Accuracy | | |
| | | | | Class A | Class B | Class C |
| Imin | 1.0 | -0.0975 | -0.1027 | ±1.0 | ±0.7 | ±0.2 |
| Itr | - | -0.1069 | -0.1109 | ±1.0 | ±0.7 | ±0.2 |
| 20Itr(Iref/In) | - | -0.1190 | -0.1323 | ±1.0 | ±0.7 | ±0.2 |
| Imax | - | -0.1091 | -0.1336 | ±1.0 | ±0.7 | ±0.2 |
| Itr | 0.5ind | 0.0155 | 0.0072 | ±1.5 | ±1.0 | ±0.4 |
| 20Itr(Iref/In) | - | -0.0942 | -0.1069 | ±1.5 | ±1.0 | ±0.4 |
| Imax | - | -0.2633 | -0.2816 | ±1.5 | ±1.0 | ±0.4 |
| Itr | 0.8cap | -0.1583 | -0.1670 | ±1.5 | ±1.0 | ±0.4 |
| 20Itr(Iref/In) | - | -0.1351 | -0.1424 | ±1.5 | ±1.0 | ±0.4 |
| Imax | - | -0.0721 | -0.0850 | ±1.5 | ±1.0 | ±0.4 |

**Voltage Variation (cont)** X-Ref. 8.7.5.3

**Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage circuits.**

| 110% Un | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elements/Lines | | I1 Element L1 | I2 Element L2 | I3 Element L3 | Limit of additional % error | | |
| CURRENT | PF Cos. ϕ | *Additional % Error* | *Additional % Error* | *Additional % Error* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Itr | 1.0 | 0.1000 | -0.0969 | -0.1026 | ±1.5 | ±1.0 | ±0.3 |
| 20Itr(Iref/In) | - | -0.1094 | -0.1173 | -0.1394 | ±1.5 | ±1.0 | ±0.3 |
| Imax | - | -0.1306 | -0.1283 | -0.1792 | ±1.5 | ±1.0 | ±0.3 |
| Itr | 0.5ind | -0.0294 | 0.0284 | 0.0903 | ±2.0 | ±1.5 | ±0.5 |
| 20Itr(Iref/In) | - | -0.1049 | -0.0614 | -0.1160 | ±2.0 | ±1.5 | ±0.5 |
| Imax | - | -0.2521 | -0.2326 | -0.3253 | ±2.0 | ±1.5 | ±0.5 |

| 90% Un | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elements/Lines | | I1 Element L1 | I2 Element L2 | I3 Element L3 | Limit of additional % error | | |
| CURRENT | PF Cos. ϕ | *Additional % Error* | *Additional % Error* | *Additional % Error* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.1085 | -0.1065 | -0.1231 | ±1.5 | ±1.0 | ±0.3 |
| 20Itr(Iref/In) | - | -0.1176 | -0.1267 | -0.1546 | ±1.5 | ±1.0 | ±0.3 |
| Imax | - | -0.1353 | -0.1429 | -0.1914 | ±1.5 | ±1.0 | ±0.3 |
| Itr | 0.5ind | -0.0515 | 0.0073 | 0.0582 | ±2.0 | ±1.5 | ±0.5 |
| 20Itr(Iref/In) | - | -0.1197 | -0.0820 | -0.1356 | ±2.0 | ±1.5 | ±0.5 |
| Imax | - | -0.2798 | -0.2546 | -0.2397 | ±2.0 | ±1.5 | ±0.5 |

## 2.6 Frequency Variation

X-Ref. 8.7.5.4

| Sample No: M8 | Test Procedure: EN50470-3 Frequency Variation |
|---|---|

Test Conditions: *Un:3*230/400V* *Fn: 50Hz*
*Imin:0.01A* *Itr:0.05A* *In:1A* *Imax:6A*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Import Energy kWh*

| | | 102% Fn *Additional* | 98% Fn *Additional* | Limit of Additional % Error | | |
|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *% Error* | *% Error* | Accuracy | | |
| | | | | Class A | Class B | Class C |
| Imin | 1.0 | -0.0740 | -0.0927 | ±0.8 | ±0.5 | ±0.2 |
| Itr | - | -0.0731 | -0.1075 | ±0.8 | ±0.5 | ±0.2 |
| 20Itr(Iref/In) | - | -0.0802 | -0.1252 | ±0.8 | ±0.5 | ±0.2 |
| Imax | - | -0.0731 | -0.1107 | ±0.8 | ±0.5 | ±0.2 |
| Itr | 0.5ind | 0.0234 | 0.0273 | ±1.0 | ±0.7 | ±0.2 |
| 20Itr(Iref/In) | - | -0.0823 | -0.0900 | ±1.0 | ±0.7 | ±0.2 |
| Imax | - | 0.0446 | 0.0288 | ±1.0 | ±0.7 | ±0.2 |
| Itr | 0.8cap | -0.1066 | -0.1638 | ±1.0 | ±0.7 | ±0.2 |
| 20Itr(Iref/In) | - | -0.0893 | -0.1363 | ±1.0 | ±0.7 | ±0.2 |
| Imax | - | -0.0440 | -0.0840 | ±1.0 | ±0.7 | ±0.2 |

**Frequency Variation(cont)** X-Ref. 8.7.5.4

**Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage circuits.**

| 102% Fn | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elements/Lines | | I1 Element L1 | I2 Element L2 | I3 Element L3 | Limit of additional % error | | |
| CURRENT | PF Cos. ϕ | *Additional % Error* | *Additional % Error* | *Additional % Error* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0843 | -0.0830 | -0.1014 | ±1.0 | ±0.7 | ±0.3 |
| 20Itr(Iref/In) | - | -0.0892 | -0.1099 | -0.1337 | ±1.0 | ±0.7 | ±0.3 |
| Imax | - | -0.1091 | -0.1171 | -0.1600 | ±1.0 | ±0.7 | ±0.3 |
| Itr | 0.5ind | -0.0466 | 0.0132 | 0.0598 | ±1.3 | ±1.0 | ±0.3 |
| 20Itr(Iref/In) | - | -0.1037 | -0.0713 | -0.1324 | ±1.3 | ±1.0 | ±0.3 |
| Imax | - | -0.2486 | -0.2307 | -0.2382 | ±1.3 | ±1.0 | ±0.3 |

| 98% Fn | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elements/Lines | | I1 Element L1 | I2 Element L2 | I3 Element L3 | Limit of additional % error | | |
| CURRENT | PF Cos. ϕ | *Additional % Error* | *Additional % Error* | *Additional % Error* | Accuracy | | |
| | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.1027 | -0.1042 | -0.1189 | ±1.0 | ±0.7 | ±0.3 |
| 20Itr(Iref/In) | - | -0.1117 | -0.1287 | -0.1485 | ±1.0 | ±0.7 | ±0.3 |
| Imax | - | -0.1286 | -0.1411 | -0.1846 | ±1.0 | ±0.7 | ±0.3 |
| Itr | 0.5ind | -0.0280 | 0.0328 | -0.0907 | ±1.3 | ±1.0 | ±0.3 |
| 20Itr(Iref/In) | - | -0.0988 | -0.0634 | -0.1130 | ±1.3 | ±1.0 | ±0.3 |
| Imax | - | -0.2629 | -0.2405 | 0.0493 | ±1.3 | ±1.0 | ±0.3 |

## 2.7 Composite Error

X-Ref. 8.7.6

In addition to the accuracy requirements of clause 8.1 and 8.3, the composite error $e_c$ of the meter shall not exceed the values given below:

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature -25ºC | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | -25°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e(fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) | | |
| | | | | | | | Class A | Class B | Class C |
| Imin | 1.0 | -0.0870 | 0.5470 | -0.1027 | -0.0927 | 0.57 | ±7.0 | ±3.5 | ±1.7 |
| Itr | - | -0.0785 | 0.5398 | -0.1109 | -0.1075 | 0.57 | ±7.0 | ±3.5 | ±1.7 |
| 20Itr | - | -0.0828 | 0.5444 | -0.1323 | -0.1252 | 0.58 | ±7.0 | ±3.5 | ±1.7 |
| Imax | - | -0.1055 | 0.5839 | -0.1336 | -0.1107 | 0.62 | ±7.0 | ±3.5 | ±1.7 |
| Itr | 0.5ind | 0.0301 | 0.6207 | 0.0155 | 0.0273 | 0.62 | ±7.0 | ±3.5 | ±1.3 |
| 20Itr | - | -0.0680 | 0.5497 | -0.1069 | -0.0900 | 0.57 | ±7.0 | ±3.5 | ±1.3 |
| Imax | - | -0.2850 | 0.3447 | -0.2816 | -0.2562 | 0.59 | ±7.0 | ±3.5 | ±1.3 |
| Itr | 0.8cap | -0.1274 | 0.5061 | -0.1670 | -0.1638 | 0.57 | ±7.0 | ±3.5 | ±1.3 |
| 20Itr | - | -0.0977 | 0.5398 | -0.1424 | -0.1363 | 0.58 | ±7.0 | ±3.5 | ±1.3 |
| Imax | - | 0.0024 | -0.6378 | -0.0850 | -0.0840 | 0.65 | ±7.0 | ±3.5 | ±1.3 |

**Composite Error/MPE (cont)** X-Ref. 8.7.6

**Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage circuits.**

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature -25°C | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | -25°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 1 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0844 | 0.4869 | -0.1085 | -0.1027 | 0.52 | ±7.0 | ±4.0 | ±1.7 |
| 20Itr | - | -0.0957 | 0.4734 | -0.1176 | -0.1117 | 0.51 | ±7.0 | ±4.0 | ±1.7 |
| Imax | - | -0.1046 | 0.4621 | -0.1353 | -0.1286 | 0.51 | ±7.0 | ±4.0 | ±1.7 |
| Itr | 0.5ind | -0.0220 | 0.5500 | -0.0515 | -0.0466 | 0.55 | ±7.0 | ±4.0 | ±1.7 |
| 20Itr | - | -0.0874 | 0.5112 | -0.1197 | -0.1037 | 0.54 | ±7.0 | ±4.0 | ±1.7 |
| Imax | - | -0.2600 | 0.2910 | -0.2798 | -0.2629 | 0.55 | ±7.0 | ±4.0 | ±1.7 |

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature -25°C | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | -25°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 2 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0855 | 0.5066 | -0.1065 | -0.1042 | 0.53 | ±7.0 | ±4.0 | ±1.7 |
| 20Itr | - | -0.1059 | 0.4972 | -0.1267 | -0.1287 | 0.54 | ±7.0 | ±4.0 | ±1.7 |
| Imax | - | -0.1268 | 0.4808 | -0.1429 | -0.1411 | 0.54 | ±7.0 | ±4.0 | ±1.7 |
| Itr | 0.5ind | 0.0405 | 0.6328 | 0.0073 | 0.0328 | 0.63 | ±7.0 | ±4.0 | ±1.7 |
| 20Itr | - | -0.0576 | 0.5852 | -0.0820 | -0.0713 | 0.60 | ±7.0 | ±4.0 | ±1.7 |
| Imax | - | -0.2323 | 0.3906 | -0.2546 | -0.2405 | 0.57 | ±7.0 | ±4.0 | ±1.7 |

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature -25°C | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | -25°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 3 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.1019 | 0.5686 | -0.1231 | -0.1189 | 0.60 | ±7.0 | ±4.0 | ±1.7 |
| 20Itr | - | -0.1370 | 0.5408 | -0.1546 | -0.1485 | 0.60 | ±7.0 | ±4.0 | ±1.7 |
| Imax | - | -0.1685 | 0.5097 | -0.1914 | -0.1846 | 0.60 | ±7.0 | ±4.0 | ±1.7 |
| Itr | 0.5ind | 0.0759 | 0.6024 | 0.0903 | -0.0907 | 0.62 | ±7.0 | ±4.0 | ±1.7 |
| 20Itr | - | -0.1191 | 0.4446 | -0.1356 | -0.1324 | 0.50 | ±7.0 | ±4.0 | ±1.7 |
| Imax | - | -0.3602 | 0.1484 | -0.3253 | -0.2382 | 0.56 | ±7.0 | ±4.0 | ±1.7 |

## Composite Error/MPE (cont)

X-Ref. 8.7.6

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature -10°C | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | -10°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e(fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) | | |
| | | | | | | | Class A | Class B | Class C |
| Imin | 1.0 | -0.0870 | 0.3174 | -0.1027 | -0.0927 | 0.36 | ±5.0 | ±2.5 | ±1.3 |
| Itr | - | -0.0785 | 0.2939 | -0.1109 | -0.1075 | 0.34 | ±5.0 | ±2.5 | ±1.3 |
| 20Itr | - | -0.0828 | 0.2778 | -0.1323 | -0.1252 | 0.34 | ±5.0 | ±2.5 | ±1.3 |
| Imax | - | -0.1055 | 0.2748 | -0.1336 | -0.1107 | 0.34 | ±5.0 | ±2.5 | ±1.3 |
| Itr | 0.5ind | 0.0301 | 0.3287 | 0.0155 | 0.0273 | 0.33 | ±4.5 | ±2.5 | ±1.0 |
| 20Itr | - | -0.0680 | 0.2528 | -0.1069 | -0.0900 | 0.30 | ±4.5 | ±2.5 | ±1.0 |
| Imax | - | -0.2850 | 0.0541 | -0.2816 | -0.2562 | 0.48 | ±4.5 | ±2.5 | ±1.0 |
| Itr | 0.8cap | -0.1274 | 0.2483 | -0.1670 | -0.1638 | 0.36 | ±4.5 | ±2.5 | ±1.0 |
| 20Itr | - | -0.0977 | 0.2848 | -0.1424 | -0.1363 | 0.36 | ±4.5 | ±2.5 | ±1.0 |
| Imax | - | 0.0024 | 0.3609 | -0.0850 | -0.0840 | 0.38 | ±4.5 | ±2.5 | ±1.0 |

**Composite Error/MPE (cont)** X-Ref. 8.7.6

**Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage circuits.**

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature -10°C | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | -10°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 1 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0844 | 0.2083 | -0.1085 | -0.1027 | 0.27 | ±5.0 | ±3.0 | ±1.3 |
| 20Itr | - | -0.0957 | 0.2332 | -0.1176 | -0.1117 | 0.30 | ±5.0 | ±3.0 | ±1.3 |
| Imax | - | -0.1046 | 0.2175 | -0.1353 | -0.1286 | 0.31 | ±5.0 | ±3.0 | ±1.3 |
| Itr | 0.5ind | -0.0220 | 0.3015 | -0.0515 | -0.0466 | 0.31 | ±5.0 | ±3.0 | ±1.3 |
| 20Itr | - | -0.0874 | 0.2303 | -0.1197 | -0.1037 | 0.29 | ±5.0 | ±3.0 | ±1.3 |
| Imax | - | -0.2600 | 0.0572 | -0.2798 | -0.2629 | 0.47 | ±5.0 | ±3.0 | ±1.3 |

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature -10°C | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | -10°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 2 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0855 | 0.2636 | -0.1065 | -0.1042 | 0.31 | ±5.0 | ±3.0 | ±1.3 |
| 20Itr | - | -0.1059 | 0.2379 | -0.1267 | -0.1287 | 0.32 | ±5.0 | ±3.0 | ±1.3 |
| Imax | - | -0.1268 | 0.2089 | -0.1429 | -0.1411 | 0.32 | ±5.0 | ±3.0 | ±1.3 |
| Itr | 0.5ind | 0.0405 | 0.3268 | 0.0073 | 0.0328 | 0.33 | ±5.0 | ±3.0 | ±1.3 |
| 20Itr | - | -0.0576 | 0.2602 | -0.0820 | -0.0713 | 0.29 | ±5.0 | ±3.0 | ±1.3 |
| Imax | - | -0.2323 | 0.1137 | -0.2546 | -0.2405 | 0.44 | ±5.0 | ±3.0 | ±1.3 |

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature -10°C | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | -10°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 3 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.1019 | 0.2891 | -0.1231 | -0.1189 | 0.35 | ±5.0 | ±3.0 | ±1.3 |
| 20Itr | - | -0.1370 | 0.2592 | -0.1546 | -0.1485 | 0.36 | ±5.0 | ±3.0 | ±1.3 |
| Imax | - | -0.1685 | 0.2257 | -0.1914 | -0.1846 | 0.39 | ±5.0 | ±3.0 | ±1.3 |
| Itr | 0.5ind | 0.0759 | 0.3263 | 0.0903 | -0.0907 | 0.36 | ±5.0 | ±3.0 | ±1.3 |
| 20Itr | - | -0.1191 | 0.1689 | -0.1356 | -0.1324 | 0.28 | ±5.0 | ±3.0 | ±1.3 |
| Imax | - | -0.3602 | -0.1562 | -0.3253 | -0.2382 | 0.56 | ±5.0 | ±3.0 | ±1.3 |

## Composite Error/MPE (cont)

X-Ref. 8.7.6

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature Range 5°C | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 5°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e(fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) | | |
| | | | | | | | Class A | Class B | Class C |
| Imin | 1.0 | -0.0870 | 0.1046 | -0.1027 | -0.0927 | 0.19 | ±3.5 | ±2.0 | ±1.0 |
| Itr | - | -0.0785 | 0.1122 | -0.1109 | -0.1075 | 0.21 | ±3.5 | ±2.0 | ±1.0 |
| 20Itr | - | -0.0828 | 0.1000 | -0.1323 | -0.1252 | 0.22 | ±3.5 | ±2.0 | ±1.0 |
| Imax | - | -0.1055 | 0.1149 | -0.1336 | -0.1107 | 0.23 | ±3.5 | ±2.0 | ±1.0 |
| Itr | 0.5ind | 0.0301 | 0.1568 | 0.0155 | 0.0273 | 0.16 | ±3.5 | ±2.0 | ±0.7 |
| 20Itr | - | -0.0680 | 0.0744 | -0.1069 | -0.0900 | 0.17 | ±3.5 | ±2.0 | ±0.7 |
| Imax | - | -0.2850 | -0.1182 | -0.2816 | -0.2562 | 0.49 | ±3.5 | ±2.0 | ±0.7 |
| Itr | 0.8cap | -0.1274 | 0.0776 | -0.1670 | -0.1638 | 0.28 | ±3.5 | ±2.0 | ±0.7 |
| 20Itr | - | -0.0977 | 0.1049 | -0.1424 | -0.1363 | 0.24 | ±3.5 | ±2.0 | ±0.7 |
| Imax | - | 0.0024 | 0.1790 | -0.0850 | -0.0840 | 0.22 | ±3.5 | ±2.0 | ±0.7 |

**Composite Error/MPE (cont)** X-Ref. 8.7.6

**Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage circuits.**

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 5ºC | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 5ºC *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 1 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0844 | 0.0737 | -0.1085 | -0.1027 | 0.19 | ±4.0 | ±2.5 | ±1.0 |
| 20Itr | - | -0.0957 | 0.0642 | -0.1176 | -0.1117 | 0.20 | ±4.0 | ±2.5 | ±1.0 |
| Imax | - | -0.1046 | 0.0435 | -0.1353 | -0.1286 | 0.22 | ±4.0 | ±2.5 | ±1.0 |
| Itr | 0.5ind | -0.0220 | 0.1449 | -0.0515 | -0.0466 | 0.16 | ±4.0 | ±2.5 | ±1.0 |
| 20Itr | - | -0.0874 | 0.0579 | -0.1197 | -0.1037 | 0.19 | ±4.0 | ±2.5 | ±1.0 |
| Imax | - | -0.2600 | -0.1017 | -0.2798 | -0.2629 | 0.47 | ±4.0 | ±2.5 | ±1.0 |

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 5ºC | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 5ºC *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 2 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0855 | 0.0937 | -0.1065 | -0.1042 | 0.20 | ±4.0 | ±2.5 | ±1.0 |
| 20Itr | - | -0.1059 | 0.0719 | -0.1267 | -0.1287 | 0.22 | ±4.0 | ±2.5 | ±1.0 |
| Imax | - | -0.1268 | 0.0584 | -0.1429 | -0.1411 | 0.24 | ±4.0 | ±2.5 | ±1.0 |
| Itr | 0.5ind | 0.0405 | 0.1564 | 0.0073 | 0.0328 | 0.17 | ±4.0 | ±2.5 | ±1.0 |
| 20Itr | - | -0.0576 | 0.0849 | -0.0820 | -0.0713 | 0.15 | ±4.0 | ±2.5 | ±1.0 |
| Imax | - | -0.2323 | -0.0619 | -0.2546 | -0.2405 | 0.42 | ±4.0 | ±2.5 | ±1.0 |

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 5ºC | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 5ºC *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 3 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.1019 | 0.0934 | -0.1231 | -0.1189 | 0.22 | ±4.0 | ±2.5 | ±1.0 |
| 20Itr | - | -0.1370 | 0.0719 | -0.1546 | -0.1485 | 0.26 | ±4.0 | ±2.5 | ±1.0 |
| Imax | - | -0.1685 | 0.0361 | -0.1914 | -0.1846 | 0.32 | ±4.0 | ±2.5 | ±1.0 |
| Itr | 0.5ind | 0.0759 | 0.1707 | 0.0903 | -0.0907 | 0.23 | ±4.0 | ±2.5 | ±1.0 |
| 20Itr | - | -0.1191 | -0.0001 | -0.1356 | -0.1324 | 0.22 | ±4.0 | ±2.5 | ±1.0 |
| Imax | - | -0.3602 | -0.3134 | -0.3253 | -0.2382 | 0.62 | ±4.0 | ±2.5 | ±1.0 |

## Composite Error/MPE (cont)

X-Ref. 8.7.6

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 30°C | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 30°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e(fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) | | |
| | | | | | | | Class A | Class B | Class C |
| Imin | 1.0 | -0.0870 | -0.1164 | -0.1027 | -0.0927 | 0.20 | ±3.5 | ±2.0 | ±1.0 |
| Itr | - | -0.0785 | -0.1401 | -0.1109 | -0.1075 | 0.22 | ±3.5 | ±2.0 | ±1.0 |
| 20Itr | - | -0.0828 | -0.1503 | -0.1323 | -0.1252 | 0.25 | ±3.5 | ±2.0 | ±1.0 |
| Imax | - | -0.1055 | -0.1556 | -0.1336 | -0.1107 | 0.26 | ±3.5 | ±2.0 | ±1.0 |
| Itr | 0.5ind | 0.0301 | 0.0046 | 0.0155 | 0.0273 | 0.04 | ±3.5 | ±2.0 | ±0.7 |
| 20Itr | - | -0.0680 | -0.1259 | -0.1069 | -0.0900 | 0.20 | ±3.5 | ±2.0 | ±0.7 |
| Imax | - | -0.2850 | -0.3421 | -0.2816 | -0.2562 | 0.59 | ±3.5 | ±2.0 | ±0.7 |
| Itr | 0.8cap | -0.1274 | -0.1971 | -0.1670 | -0.1638 | 0.33 | ±3.5 | ±2.0 | ±0.7 |
| 20Itr | - | -0.0977 | -0.1627 | -0.1424 | -0.1363 | 0.27 | ±3.5 | ±2.0 | ±0.7 |
| Imax | - | 0.0024 | -0.0887 | -0.0850 | -0.0840 | 0.15 | ±3.5 | ±2.0 | ±0.7 |

**Composite Error/MPE (cont)** X-Ref. 8.7.6

**Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage circuits.**

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 30°C | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 30°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 1 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0844 | -0.1458 | -0.1085 | -0.1027 | 0.23 | ±4.0 | ±2.5 | ±1.0 |
| 20Itr | - | -0.0957 | -0.1514 | -0.1176 | -0.1117 | 0.24 | ±4.0 | ±2.5 | ±1.0 |
| Imax | - | -0.1046 | -0.1728 | -0.1353 | -0.1286 | 0.28 | ±4.0 | ±2.5 | ±1.0 |
| Itr | 0.5ind | -0.0220 | -0.0907 | -0.0515 | -0.0466 | 0.12 | ±4.0 | ±2.5 | ±1.0 |
| 20Itr | - | -0.0874 | -0.1458 | -0.1197 | -0.1037 | 0.23 | ±4.0 | ±2.5 | ±1.0 |
| Imax | - | -0.2600 | -0.3007 | -0.2798 | -0.2629 | 0.55 | ±4.0 | ±2.5 | ±1.0 |

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 30°C | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 30°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 2 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0855 | -0.1438 | -0.1065 | -0.1042 | 0.22 | ±4.0 | ±2.5 | ±1.0 |
| 20Itr | - | -0.1059 | -0.1652 | -0.1267 | -0.1287 | 0.27 | ±4.0 | ±2.5 | ±1.0 |
| Imax | - | -0.1268 | -0.1765 | -0.1429 | -0.1411 | 0.30 | ±4.0 | ±2.5 | ±1.0 |
| Itr | 0.5ind | 0.0405 | 0.0096 | 0.0073 | 0.0328 | 0.05 | ±4.0 | ±2.5 | ±1.0 |
| 20Itr | - | -0.0576 | -0.0976 | -0.0820 | -0.0713 | 0.16 | ±4.0 | ±2.5 | ±1.0 |
| Imax | - | -0.2323 | -0.2688 | -0.2546 | -0.2405 | 0.50 | ±4.0 | ±2.5 | ±1.0 |

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 30°C | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 30°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 3 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.1019 | -0.1560 | -0.1231 | -0.1189 | 0.25 | ±4.0 | ±2.5 | ±1.0 |
| 20Itr | - | -0.1370 | -0.1900 | -0.1546 | -0.1485 | 0.32 | ±4.0 | ±2.5 | ±1.0 |
| Imax | - | -0.1685 | -0.2344 | -0.1914 | -0.1846 | 0.39 | ±4.0 | ±2.5 | ±1.0 |
| Itr | 0.5ind | 0.0759 | 0.0455 | 0.0903 | -0.0907 | 0.16 | ±4.0 | ±2.5 | ±1.0 |
| 20Itr | - | -0.1191 | -0.1702 | -0.1356 | -0.1324 | 0.28 | ±4.0 | ±2.5 | ±1.0 |
| Imax | - | -0.3602 | -0.5649 | -0.3253 | -0.2382 | 0.78 | ±4.0 | ±2.5 | ±1.0 |

## Composite Error/MPE (cont)

X-Ref. 8.7.6

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 40ºC | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 40°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e(fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) | | |
| | | | | | | | Class A | Class B | Class C |
| Imin | 1.0 | -0.0870 | -0.1719 | -0.1027 | -0.0927 | 0.24 | ±5.0 | ±2.5 | ±1.3 |
| Itr | - | -0.0785 | -0.1864 | -0.1109 | -0.1075 | 0.25 | ±5.0 | ±2.5 | ±1.3 |
| 20Itr | - | -0.0828 | -0.2109 | -0.1323 | -0.1252 | 0.29 | ±5.0 | ±2.5 | ±1.3 |
| Imax | - | -0.1055 | -0.2056 | -0.1336 | -0.1107 | 0.29 | ±5.0 | ±2.5 | ±1.3 |
| Itr | 0.5ind | 0.0301 | 0.0054 | 0.0155 | 0.0273 | 0.04 | ±4.5 | ±2.5 | ±1.0 |
| 20Itr | - | -0.0680 | -0.1396 | -0.1069 | -0.0900 | 0.21 | ±4.5 | ±2.5 | ±1.0 |
| Imax | - | -0.2850 | -0.3986 | -0.2816 | -0.2562 | 0.62 | ±4.5 | ±2.5 | ±1.0 |
| Itr | 0.8cap | -0.1274 | -0.2723 | -0.1670 | -0.1638 | 0.38 | ±4.5 | ±2.5 | ±1.0 |
| 20Itr | - | -0.0977 | -0.2393 | -0.1424 | -0.1363 | 0.33 | ±4.5 | ±2.5 | ±1.0 |
| Imax | - | 0.0024 | -0.1595 | -0.0850 | -0.0840 | 0.20 | ±4.5 | ±2.5 | ±1.0 |

**Composite Error/MPE (cont)** X-Ref. 8.7.6

**Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage circuits.**

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 40ºC | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 40ºC *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 1 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0844 | -0.1808 | -0.1085 | -0.1027 | 0.25 | ±5.0 | ±3.0 | ±1.3 |
| 20Itr | - | -0.0957 | -0.1906 | -0.1176 | -0.1117 | 0.27 | ±5.0 | ±3.0 | ±1.3 |
| Imax | - | -0.1046 | -0.2058 | -0.1353 | -0.1286 | 0.30 | ±5.0 | ±3.0 | ±1.3 |
| Itr | 0.5ind | -0.0220 | -0.0733 | -0.0515 | -0.0466 | 0.10 | ±5.0 | ±3.0 | ±1.3 |
| 20Itr | - | -0.0874 | -0.1395 | -0.1197 | -0.1037 | 0.23 | ±5.0 | ±3.0 | ±1.3 |
| Imax | - | -0.2600 | -0.3298 | -0.2798 | -0.2629 | 0.57 | ±5.0 | ±3.0 | ±1.3 |

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 40ºC | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 40ºC *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 2 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0855 | -0.1773 | -0.1065 | -0.1042 | 0.25 | ±5.0 | ±3.0 | ±1.3 |
| 20Itr | - | -0.1059 | -0.1987 | -0.1267 | -0.1287 | 0.29 | ±5.0 | ±3.0 | ±1.3 |
| Imax | - | -0.1268 | -0.2170 | -0.1429 | -0.1411 | 0.32 | ±5.0 | ±3.0 | ±1.3 |
| Itr | 0.5ind | 0.0405 | 0.0476 | 0.0073 | 0.0328 | 0.07 | ±5.0 | ±3.0 | ±1.3 |
| 20Itr | - | -0.0576 | -0.0882 | -0.0820 | -0.0713 | 0.15 | ±5.0 | ±3.0 | ±1.3 |
| Imax | - | -0.2323 | -0.2876 | -0.2546 | -0.2405 | 0.51 | ±5.0 | ±3.0 | ±1.3 |

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 40ºC | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 40ºC *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 3 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.1019 | -0.2004 | -0.1231 | -0.1189 | 0.28 | ±5.0 | ±3.0 | ±1.3 |
| 20Itr | - | -0.1370 | -0.2418 | -0.1546 | -0.1485 | 0.35 | ±5.0 | ±3.0 | ±1.3 |
| Imax | - | -0.1685 | -0.2822 | -0.1914 | -0.1846 | 0.42 | ±5.0 | ±3.0 | ±1.3 |
| Itr | 0.5ind | 0.0759 | 0.0604 | 0.0903 | -0.0907 | 0.16 | ±5.0 | ±3.0 | ±1.3 |
| 20Itr | - | -0.1191 | -0.1723 | -0.1356 | -0.1324 | 0.28 | ±5.0 | ±3.0 | ±1.3 |
| Imax | - | -0.3602 | -0.5734 | -0.3253 | -0.2382 | 0.79 | ±5.0 | ±3.0 | ±1.3 |

## Composite Error/MPE (cont)

X-Ref. 8.7.6

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 55ºC | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 55°C *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e(fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) | | |
| | | | | | | | Class A | Class B | Class C |
| Imin | 1.0 | -0.0870 | -0.1673 | -0.1027 | -0.0927 | 0.23 | ±7.0 | ±3.5 | ±1.7 |
| Itr | - | -0.0785 | -0.2026 | -0.1109 | -0.1075 | 0.27 | ±7.0 | ±3.5 | ±1.7 |
| 20Itr | - | -0.0828 | -0.2390 | -0.1323 | -0.1252 | 0.31 | ±7.0 | ±3.5 | ±1.7 |
| Imax | - | -0.1055 | -0.2689 | -0.1336 | -0.1107 | 0.34 | ±7.0 | ±3.5 | ±1.7 |
| Itr | 0.5ind | 0.0301 | 0.1196 | 0.0155 | 0.0273 | 0.13 | ±7.0 | ±3.5 | ±1.3 |
| 20Itr | - | -0.0680 | -0.0981 | -0.1069 | -0.0900 | 0.18 | ±7.0 | ±3.5 | ±1.3 |
| Imax | - | -0.2850 | -0.4041 | -0.2816 | -0.2562 | 0.62 | ±7.0 | ±3.5 | ±1.3 |
| Itr | 0.8cap | -0.1274 | -0.3397 | -0.1670 | -0.1638 | 0.43 | ±7.0 | ±3.5 | ±1.3 |
| 20Itr | - | -0.0977 | -0.4357 | -0.1424 | -0.1363 | 0.49 | ±7.0 | ±3.5 | ±1.3 |
| Imax | - | 0.0024 | -0.2085 | -0.0850 | -0.0840 | 0.24 | ±7.0 | ±3.5 | ±1.3 |

**Composite Error/MPE (cont)** X-Ref. 8.7.6

**Polyphase meter carrying a single-phase load, with balanced voltage applied to the voltage circuits.**

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 55ºC | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 55ºC *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 1 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0844 | -0.2160 | -0.1085 | -0.1027 | 0.28 | ±7.0 | ±4.0 | ±1.7 |
| 20Itr | - | -0.0957 | -0.2700 | -0.1176 | -0.1117 | 0.33 | ±7.0 | ±4.0 | ±1.7 |
| Imax | - | -0.1046 | -0.2141 | -0.1353 | -0.1286 | 0.30 | ±7.0 | ±4.0 | ±1.7 |
| Itr | 0.5ind | -0.0220 | 0.0436 | -0.0515 | -0.0466 | 0.08 | ±7.0 | ±4.0 | ±1.7 |
| 20Itr | - | -0.0874 | -0.0974 | -0.1197 | -0.1037 | 0.21 | ±7.0 | ±4.0 | ±1.7 |
| Imax | - | -0.2600 | -0.4265 | -0.2798 | -0.2629 | 0.63 | ±7.0 | ±4.0 | ±1.7 |

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 55ºC | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 55ºC *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 2 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.0855 | -0.1420 | -0.1065 | -0.1042 | 0.22 | ±7.0 | ±4.0 | ±1.7 |
| 20Itr | - | -0.1059 | -0.2376 | -0.1267 | -0.1287 | 0.32 | ±7.0 | ±4.0 | ±1.7 |
| Imax | - | -0.1268 | -0.2248 | -0.1429 | -0.1411 | 0.33 | ±7.0 | ±4.0 | ±1.7 |
| Itr | 0.5ind | 0.0405 | 0.2565 | 0.0073 | 0.0328 | 0.26 | ±7.0 | ±4.0 | ±1.7 |
| 20Itr | - | -0.0576 | 0.1457 | -0.0820 | -0.0713 | 0.19 | ±7.0 | ±4.0 | ±1.7 |
| Imax | - | -0.2323 | -0.1990 | -0.2546 | -0.2405 | 0.47 | ±7.0 | ±4.0 | ±1.7 |

| | | Intrinsic Error | Temp. Error | Voltage Error | Freq. Error | Comp. Error | Operating Temperature 55ºC | | |
|---|---|---|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *e(Icosϕ)* | 55ºC *e(TIcosϕ)* | ±10% Un *e(UIcosϕ)* | ±2% fn *e (fIcosϕ)* | *% MPE* | Maximum Permissible Error (MPE) Line 3 | | |
| | | | | | | | Class A | Class B | Class C |
| Itr | 1.0 | -0.1019 | -0.2506 | -0.1231 | -0.1189 | 0.32 | ±7.0 | ±4.0 | ±1.7 |
| 20Itr | - | -0.1370 | -0.3375 | -0.1546 | -0.1485 | 0.42 | ±7.0 | ±4.0 | ±1.7 |
| Imax | - | -0.1685 | -0.3776 | -0.1914 | -0.1846 | 0.49 | ±7.0 | ±4.0 | ±1.7 |
| Itr | 0.5ind | 0.0759 | 0.1130 | 0.0903 | -0.0907 | 0.19 | ±7.0 | ±4.0 | ±1.7 |
| 20Itr | - | -0.1191 | -0.2796 | -0.1356 | -0.1324 | 0.36 | ±7.0 | ±4.0 | ±1.7 |
| Imax | - | -0.3602 | -0.5156 | -0.3253 | -0.2382 | 0.75 | ±7.0 | ±4.0 | ±1.7 |

## 3 VARIATION OF ERROR DUE TO DISTURBANCES OF LONG DURATION

EN50470-3 X-Ref. 8.7.7

### 3.1 Severe Voltage Variation

X-Ref. 8.7.7.2

| Sample No: M8 | Test Procedure: EN50470-3 Severe Voltage Variation |
|---|---|

Test Conditions: *Un:3*230/400V* *In:1A* *Fn: 50Hz*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Import Energy kWh*

| | | 80% Un | 115% Un | Critical Change % Error Limit | | |
|---|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *% Error* | *% Error* | Accuracy | | |
| | | | | Class A | Class B | Class C |
| 20Itr (Iref) | 1.0 | *-0.12* | *-0.08* | ±3.0 | ±2.1 | ±0.6 |
| 20Itr (Iref) | 0.5ind | *-0.12* | *0.07* | ±4.5 | ±3.0 | ±1.2 |

| | | < 80% Un | Critical Change % Error Limit | | |
|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *% Error* | Accuracy | | |
| | | | Class A | Class B | Class C |
| 20Itr (Iref/In) | 1.0 | *-0.14* | +10 to -100 | +10 to -100 | +10 to -100 |
| 20Itr (Iref/In) | 0.5ind | *-0.13* | +10 to -100 | +10 to -100 | +10 to -100 |

## 3.2 Reversed Phase Sequence

X-Ref. 8.7.7.3

| Sample No: M8 | Test Procedure: EN50470-3 Reversed Phase Sequence |
|---|---|

Test Conditions: *Un:3*230/400V* *In:1A* *Fn: 50Hz*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Import Energy kWh*

| | | | Critical Change % Error Limit | | |
|---|---|---|---|---|---|
| Current | Phase Sequence | *% Error* | Accuracy | | |
| | | | Class A | Class B | Class C |
| 0.1In | L1-L2-L3 | *-0.08* | - | - | - |
| 0.1In | L1-L3-L2 | *-0.09* | ±1.5 | ±1.5 | ±0.3 |

## 3.3 Voltage Unbalance

X-Ref. 8.7.7.4

| Sample No: M8 | Test Procedure: EN50470-3 Phase Interruption |
|---|---|

Test Conditions: *Un:3*230/400V* *In:1A* *Fn: 50Hz*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Import Energy kWh*

| Current | Network Phase/ Lines Connected | *% Error* | Critical Change % Error Limit | | |
|---|---|---|---|---|---|
| | | | Accuracy | | |
| | | | Class A | Class B | Class C |
| Iref/ In | L1 &L2 & L3 | *-0.08* | - | - | - |
| Iref/ In | L2 & L3 | *-0.11* | ±4.0 | ±2.0 | ±1.0 |
| Iref/ In | L1 & L3 | *-0.12* | ±4.0 | ±2.0 | ±1.0 |
| Iref/ In | L1 & L2 | *-0.10* | ±4.0 | ±2.0 | ±1.0 |
| Iref/ In | L3 | *-0.12* | ±4.0 | ±2.0 | ±1.0 |
| Iref/ In | L2 | *-0.12* | ±4.0 | ±2.0 | ±1.0 |
| Iref/ In | L1 | *-0.09* | ±4.0 | ±2.0 | ±1.0 |

## 3.4 Short-time Over Current X-Ref. 8.7.8

| Sample No: SYZ21020330006 | Test Procedure: EN50470-3 Short-Time Over-Current |
|---|---|

**Environmental Conditions**

| | |
|---|---|
| Temperature | 23 °C |
| Relative Humidity | 56.0 % |
| Barometric Pressure | 998 mB |

The test was applied under the following conditions:

Meter for direct connection:

Impulse current applied: 30.Imax for one half cycle at rated frequency = 10ms

The test was applied under the following conditions:

Meter for connection through current transformer:

Impulse current applied: 20.Imax for 0.5seconds

On completion of the above test, the meters voltage circuits were energised at reference voltage for 1 hour after which the meter was found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions.

Test Conditions: *Un:3*230/400V* *Itr:0.05A* *Fn: 50Hz*

Test Circuit: *3 phase 4 wire*

| | | | Critical Change % Error Limit | | |
|---|---|---|---|---|---|
| Current | PF Cos. ϕ | *% Error* | Accuracy | | |
| | | | Class A | Class B | Class C |
| 20Itr/In | 1.0 | -0.141 | ±1.5 | ±1.5 | ±1.5 |

## 3.5 Influence of Self Heating

X-Ref. 8.7.7.5

The meter voltage circuits were energised at reference voltage for at least 1 hour (class A), 2 hours(class B & C), without any current in the current circuits, after which the meter's maximum rated current was applied and the meter error determined every 5 minutes.

The test was conducted at power factors of both Cos. ϕ = 1.0 and Cos. ϕ = 0.5 ind.

| Sample No: M8 | Test Procedure: EN50470-3 Self Heating |
|---|---|

Test Conditions: *Un:3*230/400V* *Fn: 50Hz*
*Imax:6A* *PF: Cos. ϕ = 1.0, Cos.ϕ = 0.5*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Energy kWh*

Measurement mode-Active Energy kWh

| Elapsed Test time (minutes) | Un Im Cos.ϕ = 1.0 | Un Im Cos.ϕ = 0.5 |
|---|---|---|
| | *% Error* | *% Error* |
| 1 | -0.1364 | -0.2614 |
| 5 | -0.1514 | -0.3097 |
| 10 | -0.1563 | -0.3163 |
| 15 | -0.1732 | -0.3188 |
| 20 | -0.1765 | -0.3251 |
| 25 | -0.1808 | -0.3245 |
| 30 | -0.1861 | -0.3270 |
| 35 | -0.1870 | -0.3257 |
| 40 | -0.1879 | -0.3251 |
| 45 | -0.1897 | -0.3276 |
| 50 | -0.1874 | -0.3278 |
| 55 | -0.1879 | -0.3326 |
| 60 | -0.1967 | -0.3266 |

Critical Change of % Error Limit:

Class C ±0.2% @ Cos. ϕ = 1.0 & ±0.2% @ Cos. ϕ = 0.5ind
Class B ±0.7% @ Cos. ϕ = 1.0 & ±1.0% @ Cos. ϕ = 0.5ind
Class A ±1.0% @ Cos. ϕ = 1.0 & ±1.5% @ Cos. ϕ = 0.5ind

## 3.6 Harmonic Components in the Current and Voltage Circuits X-Ref. 8.7.7.7

| Sample No: SYZ21020330006 | Test Procedure: EN50470-3 Harmonics Tests |
|---|---|

Test Conditions: *Un:3*230/400V* *Fn: 50Hz* *PF: Cos. $\phi$ = 1.0*
*In:1A* *Imax:6A*

Fundamental Frequency Current: $I_0$ = 0.5 Imax
Fundamental frequency Voltage: $U_0$ = Un
Content of 5th Harmonic Current: $I_5$ = 40% of $I_0$
Content of 5th Harmonic Voltage: $U_5$ = 10% of Un

Resulting harmonic power due to the 5th harmonic presence: $P_{resultant}$ = 1.04 $P_0$

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Energy kWh*

| Waveform | *% Error* | Critical Change % Error Limit Accuracy | | |
|---|---|---|---|---|
| | | Class A | Class B | Class C |
| Fundamental Only ( $P_0$ ) 0.5 Imax | *-0.115* | - | - | - |
| Fundamental + 5th Harmonic ($P_{resultant}$ = 1.04 $P_0$ ) | *-0.149* | ±1.0 | ±0.8 | ±0.5 |

## 3.7 Influence of Odd and Sub Harmonics in the AC Current Circuit X-Ref. 8.7.7.9

| Sample No: SYZ21020330006 | Test Procedure: EN50470-3 Harmonics Tests |
|---|---|

Test Conditions: *Un:3*230/400V* *Fn: 50Hz* *PF: Cos. $\phi$ = 1.0*
*0.5In:0.5A*

Reference Current Waveform: $I_{ref}$ = 5Itr or 0.5In
Reference Voltage: U = Un
Test Current Phase-Fired Waveform: $I_{test} = 2 \cdot I_{ref}$
Firing Points: 5ms and 15ms ± 1ms
Test Current Burst fired Waveform: $I_{test} = 2 \cdot I_{ref}$
Distortion Factor on the Voltage Waveform: < 0.5 % THD

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Energy kWh*

| Waveform | *% Error* | Critical Change % Error Limit Accuracy | | |
|---|---|---|---|---|
| | | Class A | Class B | Class C |
| Fundamental Only 5Itr / 0.5In | *-0.127* | - | - | - |
| Waveform Phase-fired Test current | *-0.123* | ±6.0 | ±3.0 | ±1.5 |
| Waveform Burst fired Test current | *0.037* | ±6.0 | ±3.0 | ±1.5 |

## 4 ELECTRICAL REQUIREMENTS — EN50470-1 X-Ref. 7

## 4.1 Power Consumption — EN50470-3 X-Ref. 7.1

| Sample No: M8 | Test Procedure: EN50470-3 Power Consumption |
|---|---|

### Environmental Conditions

| | |
|---|---|
| Temperature | 23 °C |
| Relative Humidity | 56.0 % |
| Barometric Pressure | 998 mB |

| | Volts/V | Amps/A | VA | Watts/W |
|---|---|---|---|---|
| Wiring Configuration: 3 Phase 4 Wire | | | | |
| Voltage Circuit: **L1** | *230* | *0.0016* | *0.37* | *0.24* |
| Voltage Circuit: **L2** | *230* | *0.0016* | *0.36* | *0.24* |
| Voltage Circuit: **L3** | *230* | *0.0016* | *0.36* | *0.36* |
| Current Circuit: **L1** | *0.0056* | *1* | *0.0056* | --- |
| Current Circuit: **L2** | *0.0050* | *1* | *0.0050* | |
| Current Circuit: **L3** | *0.0054* | *1* | *0.0054* | |

Power consumption limits shall not exceed the following based on IEC 62053-61: 1998-02

| Voltage Circuits | Single Phase | | Two Element | | Three Element | |
|---|---|---|---|---|---|---|
| Basic Meter | 2W | 10VA | 2W | 10VA | 2W | 10VA |
| Multi-Energy Meter | 3W | 15VA | 2.5W | 12.5VA | 2W | 10VA |
| Multi-Function Meter | 5W | 25VA | 3.5W | 17.5VA | 3W | 15VA |

Current Circuits

CT connected 1.0VA for Class A, B & C

## 4.2 Test of Influence of Heating

EN50470-1 X-Ref. 7.2

| Sample No: M8 | Test Procedure: EN50470-3 Heating |
|---|---|

Test Conditions: *115%Un:264.5V* *Imax:6A* *Fn: 50Hz*

| | | |
|---|---|---|
| Ambient Temperature | : | 40°C |
| Test Duration | : | 2 hours |
| Surface Temperature Rise | : | 10.2K |

Permissible temperature rise: 25K

Surface temperature of the meter was measured on the meter back, approximately 10mm above the meter terminal block.

On completion of the above tests, the meters were found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions, with no signs of damage or degradation in the meter's insulation properties.

## 5 ELECTROMAGNETIC COMPATIBILITY (E.M.C.) EN50470-1 X-Ref. 7.4

## 5.1 Immunity to Voltage Dips and Interruptions X-Ref. 7.4.4

| Sample No: XPLZ3836060010 | Test Procedure: EN50470-3 Voltage Dips |
|---|---|

**Environmental Conditions**

| | |
|---|---|
| Power Supply | 230V, 50Hz |
| Temperature | 23°C |
| Relative Humidity | 56% |
| Barometric Pressure | 998mB |

Test Circuit: *3 phase 4 wire, in the case of Polyphase meters tests were conducted on each voltage circuit in turn.*

The tests were applied under the following conditions;

- voltage and auxiliary circuits energised with reference voltage
- current circuits open.

| | | |
|---|---|---|
| Test a) | Voltage interruption of : | V = 100% |
| | Interruption time : | 1s |
| | Number of interruptions : | 3 |
| | Restoring time between interruption : | 50ms |
| Test b) | Voltage interruption of : | V = 100% |
| | Interruption time: | 20ms |
| | Number of interruptions: | 1 |
| Test c) | Voltage depression of : | V=50% |
| | Depression time: | 60s |
| | Number of depressions: | 1 |

The application of the above tests did not produce a change in the meter registers of more than ***x*** kWh, and the test output did not produce a signal equivalent of more than ***x*** kWh, where ***x*** is given by

$$\boldsymbol{x} = 10^{-6} \cdot m \cdot Un \cdot Imax$$

## 5.2 Immunity to Electrostatic Discharges (ESD) EN50470-1 X-Ref. 7.4.5

| Sample No: XPLZ3836060010 | Test Procedure: EN50470-3 Electrostatic Discharge |
|---|---|

The meter was tested in accordance with IEC 61000-4-2 as follows:

**Environmental Conditions**

| | |
|---|---|
| Power Supply | 3*230/400V, 50Hz |
| Temperature | 23°C |
| Relative Humidity | 52% |
| Barometric Pressure | 998mB |

**E.S.D Generator specification:**

**Test level severities:** 8kV contact, conductive surfaces / coupling planes
15kV air gap discharge - non conducting surfaces
**Polarity:** Positive and negative
**Number of discharges:** 10 at each polarity
**Rise time of discharge current:** <1ns
**Pulse duration (50%):** 30ns
**Time between discharges:** 1s

Meter in operating condition with the voltage and auxiliary circuits energised. Current circuits open.

The application of the electrostatic discharge did not produce a change in the meter registers of more than ***x*** kWh, and the test output did not produce a signal equivalent of more than ***x*** kWh, where ***x*** is given by

$$x = 10^{-6} \cdot m \cdot Un \cdot Imax$$

On completion of the above tests, the meter was found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions.

## 5.3 Immunity to Electromagnetic HF Fields

EN50470-1 X-Ref. 7.4.6
EN50470-3 X-Ref. 8.7.7.12

| Sample No: XPLZ3836060010 | Test Procedure: EN50470-1 Radiated Immunity |
|---|---|

The meter was tested in accordance with IEC 61000-4-3 in the SCM Anechoic chamber as follows:

**Environmental Conditions**

| | |
|---|---|
| Temperature | 23°C |
| Relative Humidity | 56% |
| Barometric Pressure | 998mB |

**Port:** Enclosure
**Test Level:** 10 V/m (test 1) & 30 V/m (test 2)
**Frequency Range:** 80-2000 MHz
**Dwell Time:**
**Frequency Step Size:** 1%
**Modulation:** 80%, 1 kHz Amplitude Modulation.

**Operating Mode:**

Test 1) Voltage and auxiliary circuits energised with reference voltage, current (20Itr) in the current circuits, Cos. ϕ = 1.

Test 2) Voltage and auxiliary circuits energised with reference voltage, without any current in the current circuits. Current circuits open circuit.

**Test Results (80-2000MHz)**

| EUT Face | Polarity | *Test 1 Maximum % Error Observed* | *Test 2* | Critical Change % Error Limit | |
|---|---|---|---|---|---|
| | | | | Accuracy | |
| | | | | Class B | Class C |
| Front | Horizontal | *-0.37* | *Note 1* | ±2.0 | ±1.0 |
| Front | Vertical | *-0.38* | *Note 1* | ±2.0 | ±1.0 |
| Rear | Horizontal | *-0.38* | *Note 1* | ±2.0 | ±1.0 |
| Rear | Vertical | *-0.39* | *Note 1* | ±2.0 | ±1.0 |
| LHS | Horizontal | *-0.39* | *Note 1* | ±2.0 | ±1.0 |
| LHS | Vertical | *-0.38* | *Note 1* | ±2.0 | ±1.0 |
| RHS | Horizontal | *-0.37* | *Note 1* | ±2.0 | ±1.0 |
| RHS | Vertical | *-0.37* | *Note 1* | ±2.0 | ±1.0 |

**Note 1:** No change of register information and no signal outputs observed

The application of the RF electromagnetic field did not produce a change in the meter registers of more than ***x*** kWh, and the test output did not produce a signal equivalent of more than ***x*** kWh, where ***x*** is given by

$$x = 10^{-6} \cdot m \cdot Un \cdot Imax$$

where

*x* is the critical change value in kWh
*m* is the number of measuring elements
*Un* is the reference voltage
*Imax* is the maximum current

## 5.4 Immunity to Electrical Fast Transients

EN50470-1 X-Ref. 7.4.7
EN50470-3 X-Ref. 8.7.7.14

| Sample No: SYZ21020330006 | Test Procedure: EN50470-1 Fast Transient Bursts |
|---|---|

The meter was tested in accordance with IEC 61000-4-4 as follows:

**Environmental Conditions**

| | |
|---|---|
| Temperature | 23°C |
| Relative Humidity | 52% |
| Barometric Pressure | 998mB |

**Transient/Burst specification:**

**Pulse level severity:** 4kV – current and voltage circuits
2kV – auxiliary circuits
**Rise time:** 5ns
**Width:** 50ns
**Repetition Rate:** 5 kHz
**Burst Duration:** 15ms
**Burst Period:** 300ms
**Burst Generation:** Asynchronous (Common mode)

**Operating mode:**

The meter voltage circuits were energised at reference voltage Un, with 20Itr Cos. ϕ = 1.0 in the current circuits.

Test voltage severity level ±4kV, Repetition Rate 5kHz voltage and current circuits
Test voltage severity level ±2kV, Repetition Rate 5kHz auxiliary circuits > 40V

The test voltage was applied on the current and voltage circuits in common mode, for a test duration of 60 seconds at each polarity.

## Immunity to Electrical Fast Transients (cont)

### Test Results

| | | Critical Change % Error Limit | | |
|---|---|---|---|---|
| Test Voltage (kV) | *% Error* | Accuracy | | |
| | | Class A | Class B | Class C |
| No FTB applied | | - | - | - |
| ±4 (Voltage & Current Circuits) | *0.37* | ±6.0 | ±4.0 | ±2.0 |
| ±2 (Auxiliary Circuits of > 40V) | - | ±6.0 | ±4.0 | ±2.0 |

On completion of the above test, the meter was found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions, with no signs of damage or corruption to meter register data.

## 5.5 Immunity to Conducted Disturbances

EN50470-1 X-Ref. 7.4.8
EN50470-3 X-Ref. 8.7.7.15

| Sample No: SYZ21020330006 | Test Procedure: EN50470-1 Conducted Immunity |
|---|---|

The meter was tested in accordance with IEC 61000-4-6 as follows:

**Environmental Conditions**

| | |
|---|---|
| Temperature | 23°C |
| Relative Humidity | 52% |
| Barometric Pressure | 998mB |

**Ports:** Current, Voltage and Auxiliary Circuits
**Test Level:** 10 V
**Frequency Range:** 0.15 to 80 MHz
**Dwell Time:** 2 Secs
**Frequency Step Size:** 1%
**Modulation:** 80%, 1kHz Amplitude Modulation.

**Operating Mode:**

Voltage and auxiliary circuits energised with reference voltage and with 20Itr applied

**Test Results:**

| MUT Port | Frequency Range (MHz) | *Maximum % Error Observed* | Critical Change % Error Limit Accuracy | | |
|---|---|---|---|---|---|
| | | | Class A | Class B | Class C |
| Voltage & Current Circuits | 0.15 to 80 | *0.25* | ±3.0 | ±2.0 | ±1.0 |

## 5.6 Immunity to Surges

EN50470-1 X-Ref 7.4.9

| Sample No: SYZ21020330006 | Test Procedure: EN50470-1 Surge |
|---|---|

The meter was tested in accordance with IEC 61000-4-5 as follows:

**Environmental Conditions**

| | |
|---|---|
| Temperature | 23°C |
| Relative Humidity | 56% |
| Barometric Pressure | 998mB |

| | |
|---|---|
| **Ports:** | Voltage and Auxiliary Circuits |
| **Test Voltage:** | 4kV mains, 1kV auxiliary |
| **Test Mode:** | Differential (line to line) |
| **Phase Angle:** | 60° and 240° relative to zero crossing |
| **Number of Tests:** | 5 positive and 5 negative |
| **Repetition Rate:** | 1/min |

**Operating mode:**

The meter voltage circuits were energised at reference voltage Un, without any current in the current circuits

The application of the surge immunity test voltage did not produce a change in the meter registers of more than $x$ kWh and the test output did not produce a signal equivalent of more than $x$ kWh, where $x$ is given by

$$x = 10^{-6} \cdot m \cdot Un \cdot Imax$$

## 5.7 Radio Interference Measurement EN50470-1 X-Ref. 7.4.13

### Radiated Emissions

| Sample No: XPLZ3836060010 | Test Procedure: EN50470-1 Radiated Emissions |
|---|---|

The meter was tested in accordance with EN55022 as follows:

### Environmental Conditions

| | |
|---|---|
| Power Supply | 3*230/400V, 50Hz |
| Temperature | 23°C |
| Relative Humidity | 56% |
| Barometric Pressure | 998mB |

The MUT compliance measurements were performed in the SCM Semi-Anechoic chamber (which is in compliance with the site attenuation requirements of EN55016-1-4:2007, A1:2008).

The measurement distance was 3m and the limit has been adjusted using inverse proportionality factor of 20dB per decade.

### Operating Mode

The MUT was operated with voltage and auxiliary circuits energised with reference voltage and a current of between 0.1Iref and 0.2Iref and 1m leads attached to all terminals.

**Radiated Emissions (cont)**

**Results: Pass**

Limit values of equipment

| Frequency/MHz | Test distance 10m,QP/dB(μV/m) |
|---|---|
| 30～230 | 30 |
| 230～1000 | 37 |

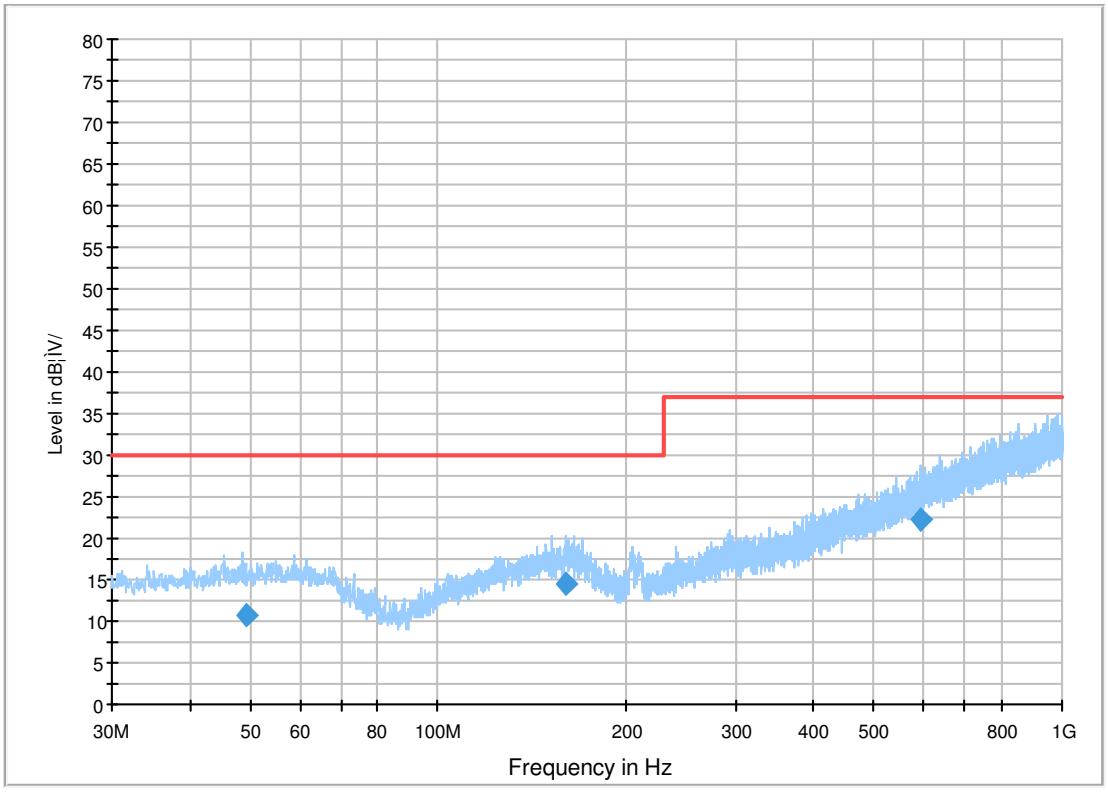
**Horizontal Polarisation Worse Case Emissions Compliance Measurements 30 – 1000MHz**

Test data

| Sample No. | Frequency | Measuring value | Antenna Factor +Cable loss | Standard value | Over limit | Detector | Height | Azimuth |
|---|---|---|---|---|---|---|---|---|
| | MHz | dB(μV/m) | dB | dB(μV/m) | dB | | cm | deg |
| - | 49.390000 | 10.8 | 13.8 | 30.0 | 19.2 | QP | 100.0 | 29.0 |
| | 160.247400 | 14.5 | 15.3 | 30.0 | 15.5 | QP | 100.0 | 16.0 |
| | 593.578200 | 22.3 | 23.3 | 37.0 | 14.7 | QP | 120.0 | 45.0 |

Test curves

RE 30MHz-1GHz



**Radiated Emissions (cont)**

**Results: Pass**

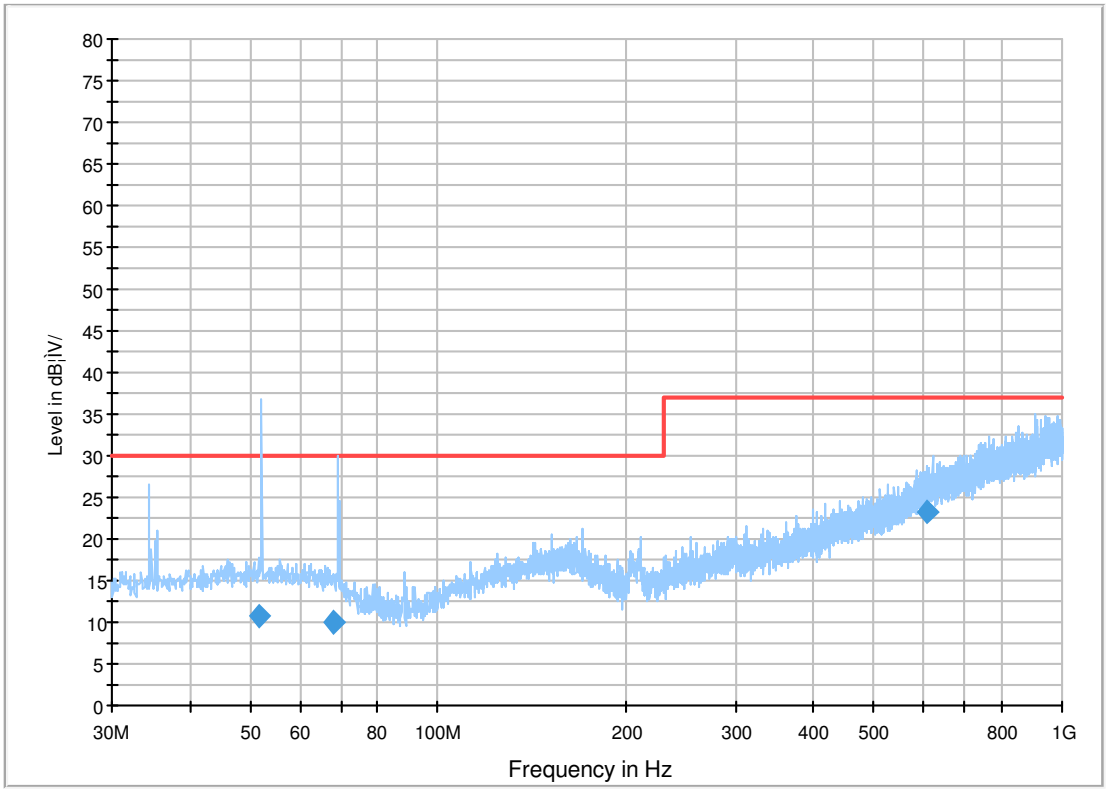
**Vertical Polarisation Worse Case Emissions Compliance Measurements 30 – 1000MHz**

Test data

| Sample No. | Frequency | Measuring value | Antenna Factor +Cable loss | Standard value | Over limit | Detector | Height | Azimuth |
|---|---|---|---|---|---|---|---|---|
| | MHz | dB(µV/m) | dB | dB(µV/m) | dB | | cm | deg |
| - | 51.605600 | 10.7 | 13.9 | 30.0 | 19.3 | QP | 100.0 | 15.0 |
| | 68.176200 | 10.1 | 12.5 | 30.0 | 19.9 | QP | 100.0 | -43.0 |
| | 607.302800 | 23.1 | 23.7 | 37.0 | 13.9 | QP | 100.0 | -45.0 |

Test curves

RE 30MHz-1GHz



## Conducted Emissions

| Sample No: XPLZ3836060010 | Test Procedure: EN50470-1 Conducted Emissions |
|---|---|

The meter was tested in accordance with EN55022 as follows:

### Environmental Conditions

| | |
|---|---|
| Power Supply | 3*230/400V, 50Hz |
| Temperature | 23°C |
| Relative Humidity | 56% |
| Barometric Pressure | 998mB |

The emissions on the AC mains were measured in the frequency range 0.15 – 30 MHz

### Operating Mode

The MUT was operated with voltage and auxiliary circuits energised with reference voltage and a current of between 0.1Iref and 0.2Iref and 1m leads attached to all terminals.

## Conducted Emissions (cont)

**Results: Pass**

**Equipment Limit values**

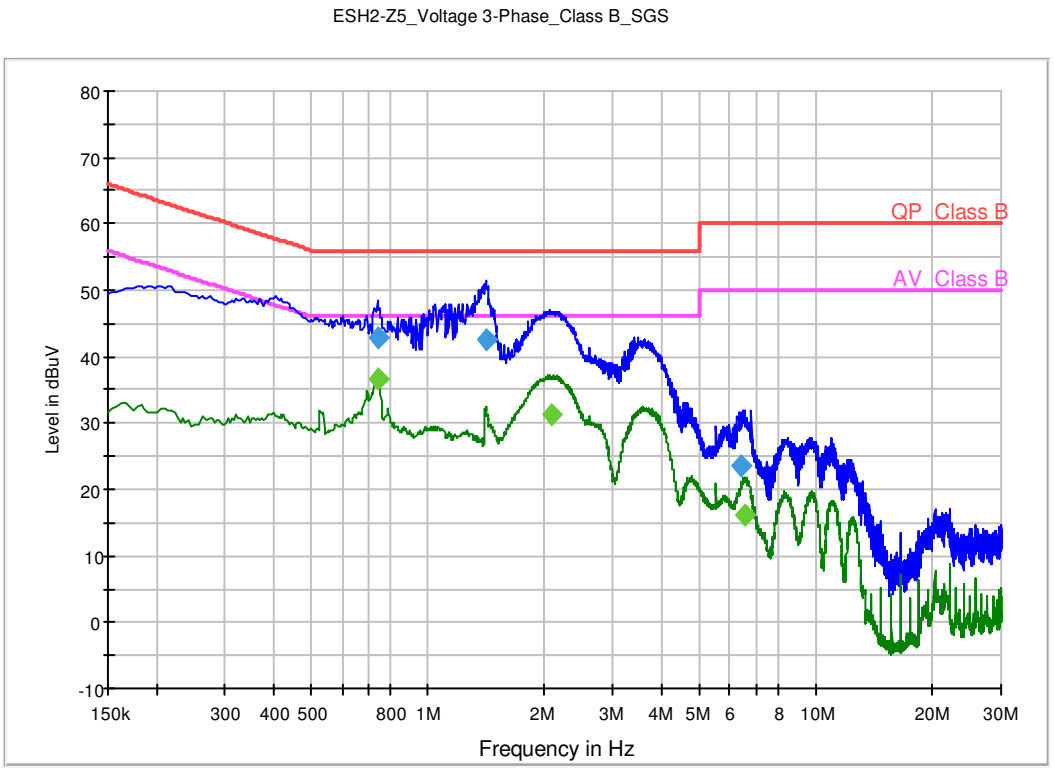
| Frequency(MHz) | AVG /dB(μV) | QP /dB(μV) |
|---|---|---|
| 0.15～0.5 | 56～46 | 66～56 |
| 0.5～5 | 46 | 56 |
| 5～30 | 50 | 60 |

**Line 1 Terminal Worst Case Emissions Compliance Measurements**

Data of conducted emission

| Sample No. | Frequency | Measuring value | Corr. factors+ Cable loss | Standard value | Over Limit | Detector |
|---|---|---|---|---|---|---|
| | MHz | dB(μV) | dB | dB(μV) | dB | |
| - | 0.741000 | 42.7 | 10.1 | 56.0 | 13.3 | QP |
| | 1.417000 | 42.7 | 10.1 | 56.0 | 13.3 | QP |
| | 6.405000 | 23.6 | 10.3 | 60.0 | 36.4 | QP |
| | 0.741000 | 36.6 | 10.1 | 46.0 | 9.4 | AVG |
| | 2.077000 | 31.4 | 10.1 | 46.0 | 14.6 | AVG |
| | 6.549000 | 16.0 | 10.3 | 50.0 | 34.0 | AVG |

Curves of conducted emission



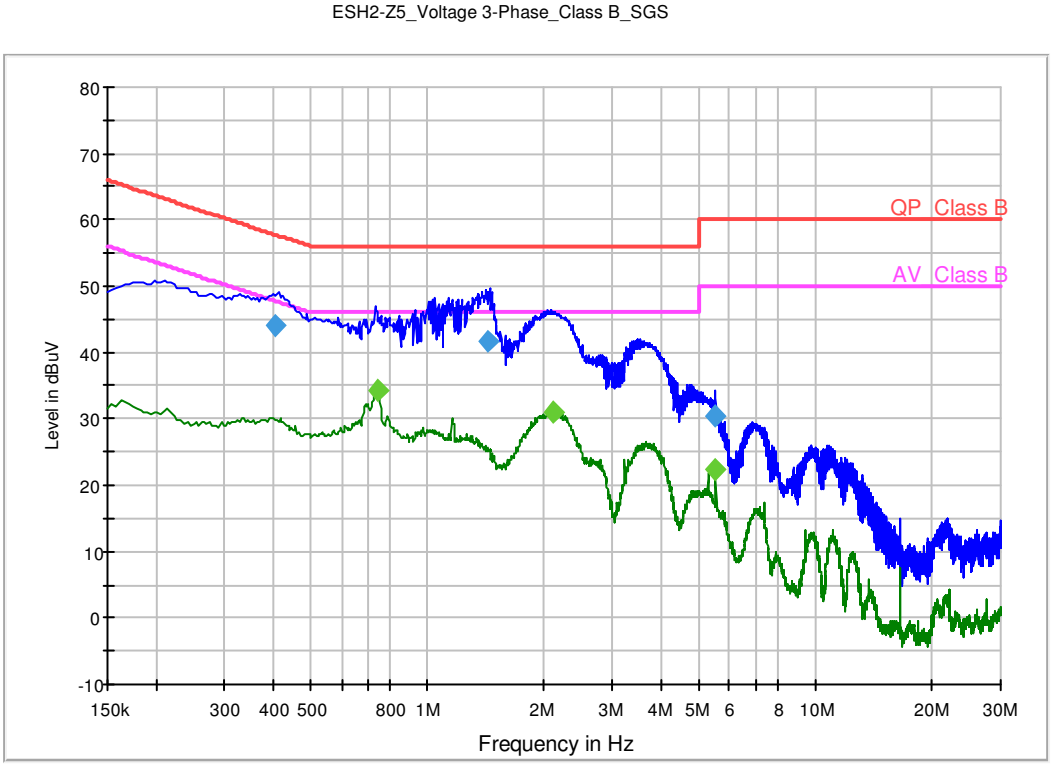
## Conducted Emissions (cont)

### Line 2 Terminal Worst Case Emissions Compliance Measurements

Data of conducted emission

| Sample No. | Frequency | Measuring value | Corr. factors+ Cable loss | Standard value | Over Limit | Detector |
|---|---|---|---|---|---|---|
| | MHz | dB(μV) | dB | dB(μV) | dB | |
| - | 0.405000 | 44.0 | 10.1 | 13.8 | 13.8 | QP |
| | 1.441000 | 41.7 | 10.1 | 14.3 | 14.3 | QP |
| | 5.529000 | 30.3 | 10.2 | 29.7 | 29.7 | QP |
| | 0.745000 | 34.2 | 10.1 | 11.8 | 11.8 | AVG |
| | 2.097000 | 31.1 | 10.1 | 14.9 | 14.9 | AVG |
| | 5.529000 | 22.5 | 10.2 | 27.5 | 27.5 | AVG |

Curves of conducted emission



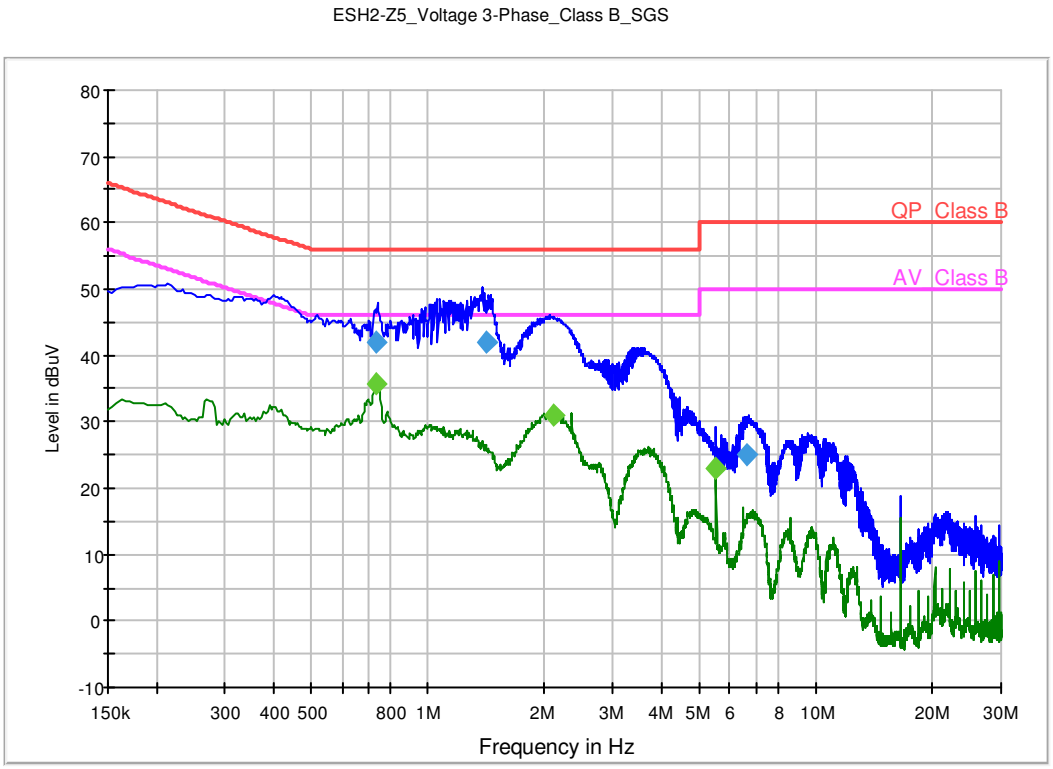
## Conducted Emissions (cont)

### Line 3 Terminal Worst Case Emissions Compliance Measurements

Data of conducted emission

| Sample No. | Frequency | Measuring value | Corr. factors+ Cable loss | Standard value | Over Limit | Detector |
|---|---|---|---|---|---|---|
| | MHz | dB(μV) | dB | dB(μV) | dB | |
| - | 0.737000 | 42.1 | 10.1 | 56.0 | 13.9 | QP |
| | 1.413000 | 42.1 | 10.1 | 56.0 | 13.9 | QP |
| | 6.661000 | 25.0 | 10.3 | 60.0 | 35.0 | QP |
| | 0.737000 | 35.7 | 10.1 | 46.0 | 10.3 | AVG |
| | 2.113000 | 31.1 | 10.1 | 46.0 | 14.9 | AVG |
| | 5.529000 | 22.9 | 10.3 | 50.0 | 27.1 | AVG |

Curves of conducted emission



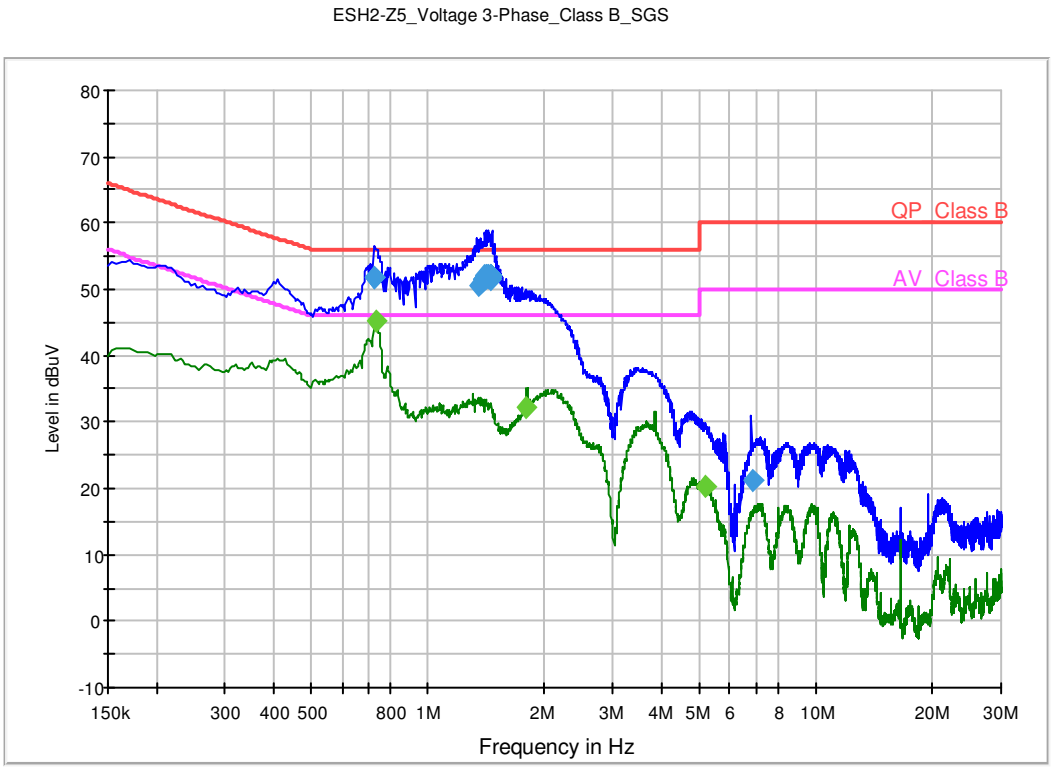
## Conducted Emissions (cont)

### Neutral Terminal Worst Case Emissions Compliance Measurements

Data of conducted emission

| Sample No. | Frequency | Measuring value | Corr. factors+ Cable loss | Standard value | Over Limit | Detector |
|---|---|---|---|---|---|---|
| | MHz | dB(μV) | dB | dB(μV) | dB | |
| - | 1.453000 | 51.9 | 10.1 | 56.0 | 4.1 | QP |
| | 1.457000 | 51.6 | 10.1 | 56.0 | 4.4 | QP |
| | 6.841000 | 21.2 | 10.3 | 60.0 | 38.8 | QP |
| | 0.733000 | 45.3 | 10.1 | 46.0 | 0.7 | AVG |
| | 1.789000 | 32.1 | 10.1 | 46.0 | 13.9 | AVG |
| | 5.201000 | 20.2 | 10.3 | 50.0 | 29.8 | AVG |

Curves of conducted emission



## 5.8 Magnetic Induction of External origin 0.5mT

EN50470-1 X-Ref. 7.4.12
EN50470-3 X-Ref 8.7.7.11

AC magnetic induction of external origin, produced by a coil of one metre diameter, field strength at its centre 0.5mT (400 Ampere turns)

| Sample No: XPLZ3836060010 | Test Procedure: EN50470-3 AC Mag Fields |
|---|---|

Test Conditions: *Un:3*230/400V* *Fn: 50Hz*
*In:1A* *PF: Cos. ϕ = 1.0*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Import Energy kWh*

| Phase angle of the field with respect to U3 (Vph) | Direction of field orientation | | | Critical Change % Error Limit | | |
|---|---|---|---|---|---|---|
| | X - Z | Y - Z | X - Y | Accuracy | | |
| | *% Error* | *% Error* | % Error | Class A | Class B | Class C |
| No Field Applied | | | | - | - | - |
| 0° | -0.10 | -0.09 | -0.11 | ±3.0 | ±2.0 | ±1.0 |
| 30° | -0.11 | -0.09 | -0.11 | ±3.0 | ±2.0 | ±1.0 |
| 60° | -0.11 | -0.10 | -0.11 | ±3.0 | ±2.0 | ±1.0 |
| 90° | -0.10 | -0.09 | -0.10 | ±3.0 | ±2.0 | ±1.0 |
| 120° | -0.10 | -0.10 | -0.10 | ±3.0 | ±2.0 | ±1.0 |
| 150° | -0.10 | -0.10 | -0.10 | ±3.0 | ±2.0 | ±1.0 |
| 180° | -0.11 | -0.09 | -0.11 | ±3.0 | ±2.0 | ±1.0 |
| 210° | -0.11 | -0.09 | -0.11 | ±3.0 | ±2.0 | ±1.0 |
| 240° | -0.10 | -0.09 | -0.11 | ±3.0 | ±2.0 | ±1.0 |
| 270° | -0.10 | -0.10 | -0.11 | ±3.0 | ±2.0 | ±1.0 |
| 300° | -0.11 | -0.11 | -0.11 | ±3.0 | ±2.0 | ±1.0 |
| 330° | -0.11 | -0.11 | -0.11 | ±3.0 | ±2.0 | ±1.0 |
| 360° | -0.11 | -0.11 | -0.11 | ±3.0 | ±2.0 | ±1.0 |

## 5.9 Continuous Magnetic Induction of External Origin

EN50470-1 X-Ref.7.4.11
EN50470-3 X-Ref 8.7.7.10

The continuous magnetic induction was obtained using an electromagnetic coil of 1000 Ampere-turns. This magnetic field was applied to all accessible surfaces of the meter samples when mounted as for normal use.

| Sample No: SYZ21020330006 | Test Procedure: EN50470-3 DC Magnetic Field P |
|---|---|

Test Conditions: *Un:3*230/400V* *Fn: 50Hz*
*In:1A* *PF: Cos. $\phi$ = 1.0*

Test Circuit: *3 phase 4 wire*

Measurement Mode: *Active Import Energy kWh*

| | | Critical Change % Error Limit | | |
|---|---|---|---|---|
| Electromagnetic Position | *% Error* | Accuracy | | |
| | | Class A | Class B | Class C |
| No field applied | *-0.097* | - | - | - |
| Left side of meter | *-0.108* | ±3.0 | ±2.0 | ±1.0 |
| Front of meter | *-0.118* | ±3.0 | ±2.0 | ±1.0 |
| Right side of meter | *-0.112* | ±3.0 | ±2.0 | ±1.0 |
| Top of meter | *-0.124* | ±3.0 | ±2.0 | ±1.0 |

## 6 CLIMATIC INFLUENCES EN50470-1 X-Ref. 6

### 6.1 Dry Heat Test X-Ref. 6.3.2

| Sample No: M8 | Test Procedure: EN50470-1 Dry Heat |
|---|---|

The meter was tested in accordance with IEC 60068-2-2 as follows:

Meter in the non-operating condition
Method Bb (with gradual change of temperature)
Temperature +70°C ± 2°C
Duration of the test 72h

On completion of the above test, the meter was found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions with no signs of damage or degradation in the meter's insulation properties.

## 6.2 Cold Test

X-Ref. 6.3.3

| Sample No: M8 | Test Procedure: EN50470-1 Cold |
|---|---|

The meter was tested in accordance with IEC 60068-2-1 as follows:

Meter in the non-operating condition
Method Ab (with gradual change of temperature)
Temperature -25°C ± 3°C
Duration of the test 72h

On completion of the above test, the meter was found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions, with no signs of damage or corruption to meter register data.

## 6.3 Damp Heat Cyclic Test

X-Ref. 6.3.4

| Sample No: M8 | Test Procedure: EN50470-1 Damp Heat |
|---|---|

The meter was tested in accordance with IEC 60068-2-30 as follows:

Meter with reference voltage applied
Upper Temperature of +40°C
Duration of the test: 6 cycles

On completion of the above test, the meter was found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions with no signs of damage or degradation in the meter's insulation properties.

## 7 MECHANICAL REQUIREMENTS EN50470-1 X-Ref. 5

## 7.1 Vibration Test X-Ref. 5.2.2.3

| Sample No: M8 | Test Procedure: EN50470-1 Vibration |
|---|---|

**Environmental Conditions**

| | |
|---|---|
| Temperature | 23° C |
| Relative Humidity | 56.0 % |
| Barometric Pressure | 998 mB |

The meter was tested in accordance with IEC 60068-2-6 as follows:

Meter in the non-operating condition
Test Procedure A
Frequency Range of 10 Hz to 150 Hz (Transition frequency of 60 Hz)
For F < 60 Hz, constant amplitude of movement 0.075 mm
For F > 60 Hz, constant acceleration of 9.8 $m/s^2$ (1g)
10 sweep cycles per axis

On completion of the above test, the meter was found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions.

## 7.2 Shock Test

X-Ref. 5.2.2.2

| Sample No: M8 | Test Procedure: EN50470-1 Shock |
|---|---|

### Environmental Conditions

| | |
|---|---|
| Temperature | 23° C |
| Relative Humidity | 56.0 % |
| Barometric Pressure | 998 mB |

The meter was tested in accordance with IEC 60068-2-27 as follows:

Meter in the non-operating condition
Half Sine Pulse
Peak Acceleration of 30 gn (300 m/s$^2$)
Pulse Duration of 18 ms

On completion of the above test, the meter was found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions.

## 7.3 Spring Hammer Test

X-Ref. 5.2.2.1

| Sample No: M8 | Test Procedure: EN50470-1 Spring Hammer |
|---|---|

### Environmental Conditions

| | |
|---|---|
| Temperature | 23° C |
| Relative Humidity | 56.0 % |
| Barometric Pressure | 998 mB |

The meter was tested in accordance with IEC 60068-2-75 as follows:

Kinetic Energy of Spring Hammer 0.2 Nm ± 0.02 Nm

The meter case and terminal cover where acted upon all external surfaces, including the display window. After the test no damage was evident and the meter continued to function correctly.

## 7.4 Penetration of Dust & Water

X-Ref. 5.9

| Sample No: M8 | Test Procedure: EN50470-1 Dust & Water |
|---|---|

The meter was tested in accordance with IEC 60529 as follows:

Dust Test: IP5X, non-operating condition, Neither under, nor over pressure

Water Test: IPX1, non-operating condition

The meter is put inside the meter box

On completion of the above test, the meter was found to function correctly and within the accuracy specification when subsequently operated under reference operating conditions with no signs of damage or degradation in the meter's insulation properties.

## 7.5 Resistance to Heat & Fire

X-Ref. 5.8

| Sample No: M8 | Test Procedure: EN50470-1 Heat & Fire |
|---|---|

The meter was tested in accordance with IEC 60695-2-11 as follows:

**Test:** Terminal block tested at 960°C for 30 seconds.

**Result:** Flames extinguish with 30 seconds

**Test:** Terminal cover and meter case tested at 650°C for 30 seconds.

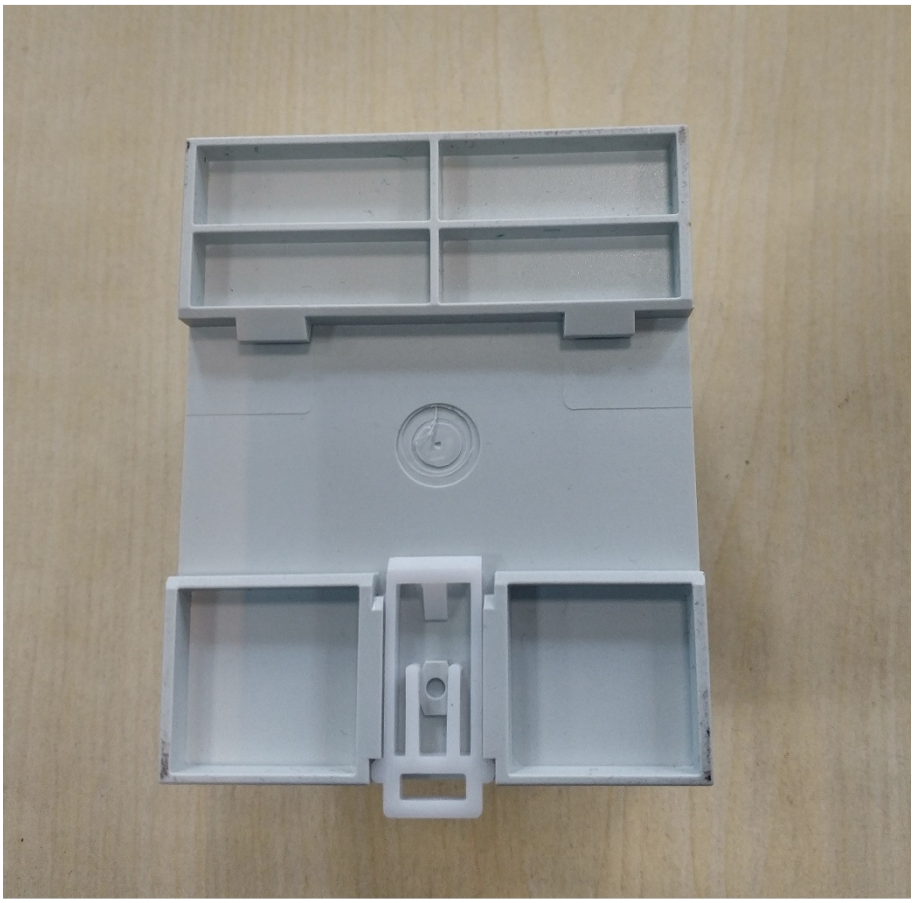
**Result:** Does not produce drips or flames

## ANNEX A - Photographs of Meter Under Test

### Front of Meter Under Test

## Side of Meter Under Test

## Rear of Meter Under Test



**** End of Document ****