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TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0045-T

ELDAŞ

Elektrik Elektronik Sanayi ve Tic.A.Ş.
1.Organize Sanayi Bölgesi Büyük Selçuklu Bulvarı No:2/A
Sincan 06935 - ANKARA /TURKEY

TESTING REPORT

AB-0045-T
EL-1601/R1
08-12

Customer name/address :	**Mikroelektronika AD** **Blagoja Parovića bb - Novakovići 78000 Banja Luka Bosnia and Herzegovina**
Order No:	**120701-10**
Name and identity of test item:	**Mikroelektronika Single Phase Multifunctional Electricity Meter Type MEM500, 1Phase-2 Wire, with S-FSK PLC Modem**
The date of receipt of test item:	**01.07.2012**
Remarks:	**0,25-5(80) A, 230 V, 50Hz, Class B, 1000 Imp/kWh, 3K7**
Date of test:	**23.07.2012 - 15.08.2012**
Number of pages of the Report:	**28**

The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

This report was prepared after applying test/tests to the samples that are sent to our company. (Note that this report does not involve other samples of the customer.)

Seal and Date	Person in Charge of Test	Head of testing laboratory
11.09.2012	Ahmet CANBOLAT	Ahmet ÖZCAN

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TEST STANDARDS

The tests were performed according to following standards

- EN 50470-1:2006
- EN 50470-3:2006

List of Test Equipment

The tests were performed using following test equipment.

Device/Equipment Name)	Brand	Serial No
Termohygrometer	OMKA	THG-05
Dust room	MATEŞ	
Rain test device	EMS	ST-2003
Reference watt-hour meter	Zera	D-53639
Cooled ıncubator	NÜVE	02-0261
400 A turned bobbin	Mateş	------
1000 A turned bobbin	Mateş	------
Combined Test Device	CT-2003	2003-04
Deepfreezer	DAIREI	6070011
Best EMC	Schaffner	200222-074SC
E Stacked Douple Log-Per.Antenna	Schwarzbeck	9128E 006
Solid State Power Amplifier 15W	Bonn Elektronik	035357A
Trilog-Broadband Antenna	Schwarzbeck	9168-142
N-Dampfungsglied 10dB DC-1GHz	Schwarzbeck	9234
Coupling Decoupling	EMC Elektronik Ltd.	2312040019
Termo Hygrometre	--	THG-01
Power Amplifier 55W	Milmega	991944
Solid State Power Amplifier 50W	Bonn Elektronik	035357B
Video Monitors	Philips	M2030409
Midi Camera	Samsung	.....
Emi Test Reciever	Rohde & Schwarz	100173
Signal Generator	Rohde & Schwarz	100845
E Field Probe	Ets-Lindgen	90405
Lisn	EMC Elektronik	0812040601
Ultra Compact Simulator	EM Test	V0630101686
ESD Simulator	EM Test	V0630101687

Short Description of EUT

Trademark	**:** MIKROELEKTRONIKA
Type	**:** MEM500
Basic Voltage	**:** 230 V
Minumum Current	**:** 0,25 A
Transitional Current	**:** 0,5 A
Reference Current	**:** 5 A
Maximum Current	**:** 80 A
Meter Constant	**:** 1000 imp/kWh
Class (EN 50470-1/3)	**:** B
Phase/Wire Number	**:** 1 Phase/ 2 wire
Tariff	**:** Multi Tariff
Reference frequency	**:** 50 Hz
In Door (IP 51)/Out Door (IP 54)	**:** Out Door (IP 54)
Specified Operating range	**:** 3K7
Communication Port	**:** Optical Interface (IR), Electrical Interface (RS-485), S-FSK PLC Modem

Test Name:Ambient Temperature Variation

EUT: MEM500 (120701-10/01)

Environmental Conditions: 23 °C % 42 RH

Date: 23.07.2012 - 24.07.2012

Test Method Num: DT-EL-05

Applicable Standards:EN 50470-3 Article 8.3 , Table-6

Temperature Variation	Value of Current	Max measured additional error for each Power Factor			Limits of Additional Percentage Error for Class B	
		Cos f=1	Cos f=0,5	Cos f=0,8cap	Cos f=1	Cos f=0,5ind-08cap.
-40°C	$I_{min=}$ 0,25A	0,33	--	--	±3,1	--
	I_{tr} = 0,5A	0,30	0,22	0,25	±3,1	±4,4
	I_{ref} = 5A	0,33	0,37	0,37	±3,1	±4,4
	I_{max} = 80A	0,33	0,31	0,26	±3,1	±4,4
-25°C	$I_{min=}$ 0,25A	0,24	--	--	±2,4	--
	I_{tr} = 0,5A	0,24	0,21	0,21	±2,4	±3,4
	I_{ref} = 5A	0,21	0,24	0,31	±2,4	±3,4
	I_{max} = 80A	0,23	0,22	0,24	±2,4	±3,4
-10°C	$I_{min=}$ 0,25A	0,14	--	--	±1,6	--
	I_{tr} = 0,5A	0,11	0,13	0,16	±1,6	±2,3
	I_{ref} = 5A	0,14	0,11	0,14	±1,6	±2,3
	I_{max} = 80A	0,12	0,14	0,18	±1,6	±2,3
5°C	$I_{min=}$ 0,25A	0,02	--	--	±0,9	--
	I_{tr} = 0,5A	0,03	0,05	0,02	±0,9	±1,3
	I_{ref} = 5A	0,04	0,03	0,03	±0,9	±1,3
	I_{max} = 80A	0,02	0,02	0,04	±0,9	±1,3
30°C	$I_{min=}$ 0,25A	0,06	--	--	±0,9	--
	I_{tr} = 0,5A	0,08	0,06	0,06	±0,9	±1,3
	I_{ref} = 5A	0,07	0,03	0,04	±0,9	±1,3
	I_{max} = 80A	0,04	0,03	0,08	±0,9	±1,3
40°C	$I_{min=}$ 0,25A	0,14	--	--	±1,6	--
	I_{tr} = 0,5A	0,12	0,13	0,11	±1,6	±2,3
	I_{ref} = 5A	0,11	0,12	0,16	±1,6	±2,3
	I_{max} = 80A	0,16	0,14	0,14	±1,6	±2,3
55°C	$I_{min=}$ 0,25A	0,22	--	--	±2,4	--
	I_{tr} = 0,5A	0,26	0,27	0,24	±2,4	±3,4
	I_{ref} = 5A	0,24	0,26	0,21	±2,4	±3,4
	I_{max} = 80A	0,28	0,21	0,22	±2,4	±3,4
70°C	$I_{min=}$ 0,25A	0,30	--	--	±3,1	--
	I_{tr} = 0,5A	0,33	0,29	0,26	±3,1	±4,4
	I_{ref} = 5A	0,33	0,37	0,43	±3,1	±4,4
	I_{max} = 80A	0,38	0,35	0,37	±3,1	±4,4

Result : Positive

Test Name:Power Consumption Testing

EUT: MEM500 (120701-10/01)

Environmental Conditions: 22 °C % 42 RH

Date: 25.07.2012

Test Method Num: DT-EL-10

Applicable Standards: EN 50470-3 Article 7.1 - EN 62053-61 Article 4.3.1 Table 1

- The active and apparent power loss in each voltage circuit of a meter at reference voltage, reference temperature and reference frequency shall not exceed the values shown in table.

Power Consumption in each Voltage Circuit	Max.Power Consumption in each Voltage Circuit Given in 4.3.1
R : 4,96 W / 4,96 VA S : W T : W	5 W and 25 VA

R: 1 * 21,6 mA * 230 V = 4,96 W

R: 21,6 mA * 230 V = 4,96 VA

- The apparent power taken by each current circuit of a meter at reference current, reference frequency and reference temperature shall not exceed the values shown in table.

Power Consumption in Current Circuits	Max.Power Consumption in current Circuit Given in 7.1.3
R : 0,041 VA S : VA T : VA	4,0 VA

R: 8,2 mV * 5 A = 0,041 VA

Result : Positive

Test Name:Influence of Short-Time Overcurrents

EUT: MEM500 (120701-10/01)

Environmental Conditions: 22 °C % 42 RH

Date: 26.07.2012

Test Method Num: DT-EL-06

Applicable Standards:EN 50470-3 Article 8.6

Value of Current	Cos f	Error Difference (%) between ;before Overcurrents and after Overcurrents.	Max.Error Difference , Given in Article 8.6
(10 I_{tr})	1	0,04	1,5

Result : Positive

Testing Report

Test Name:Heating Testing
EUT: MEM500 (120701-10/01)
Environmental Conditions: 23 °C % 42 RH
Date: 27.07.2012
Test Method Num: DT-EL-08
Applicable Standards:EN 50470-1 Article 7.2

While the ambient temperature is 40°C the meter rated max. current and 1,15 times the reference voltage, tested.The duration of the test is two(2) hours. The temperature rise of the external surface shall not exceed 25 K.

Position of the sensor at the terminal block	Back side near terminals	Back side in the middle
Temperature at the start (°C)	+40	+40
Temparature after 2 hours (°C)	+53	+49
Variation (°C)	+13	+9

Result : Positive

Test Name:Insulation Testing

EUT: MEM500 (120701-10/01)

Environmental Conditions: 22 °C % 42 RH

Date: 30.07.2012

Test Method Num: DT-EL-15

Applicable Standards:EN 50470-1 Article 7.3.3, EN 50470-1 Article:7.3.4

a) Impulse Voltage Tests for Circuits and between the Circuits : (Article 7.3.3.2)

İmpulse Waveform :1,2/50 impulse specified in IEC 60060-1

Voltage Rise Time: ± 30%

Voltage Fall Time : ± 20 %

Source İmpedance : (500 Ω ± 50 Ω)

Source Energy : (0,5 J ±0,05 J)

Test Voltage: In accordance with Table 3a or 3b 6 kV

Test Voltage Tolerance: $^{+0}_{-10}$ %

For each test , the impulse voltage is applied ten times with one polarity and then repeated with the other polarity .The minumum time between the impulses shall be 3 s.

After the test ;the meter shall show no damage and shall operate correctly.

After the test the percentage errors shall not exceed the limits given in Table-6

Remark: Test was applied to current and voltage circuits according to EN 50470-1 Article 7.3.3.2

Result: Positive

b) Impulse Voltage Test of Electric Circuits Relative to Earth: (Article 7.3.3.3)

The impulse voltage applied between all the electric circuits and earth.

Duringthe test no flashover, distruptive, discharge or puncture shall occur.

Remark: Test was applied to current and voltage circuits according to EN 50470-1 Article 7.3.3.3

Result: Positive

c) A.C Voltage Test: (EN 50470-1 Article:7.3.4)

The test voltage shall be 4kV and applied for 1 minute between parts of the meter which given in Table -5. During the test no flashover, disruptive discharge or puncture shall occur.

Remark: Test was applied to current and voltage circuits, auxiliary circuits was connected to earth.

Result: Positive

Result: Positive

Test Name:Protection against penetration of dust and water

EUT: MEM500 (120701-10/01)

Environmental Conditions: 23 °C % 41 RH

Date: 01.08.2012 - 02.08.2012

Test Method Num: DT-EL-36

Applicable Standards:EN 50470-1 Article 5.9

Degree of protection = Outdoor meter (IP54)
The EUT tested according to IEC 60529, under the following conditions.

-Meter in-non operating condition and mounted on a artificial wall.
-Any ingress of dust and water shall be only in a quantity not impairing the operation of the meter.
-After this test a insulation test is applied.

Error (%) before the test

Reference Current (5)A	ACTIVE			REACTIVE	
	cosf=1	cosf=0,5ind.	cosf=0,8cap.	sinf=1	sinf=-1
	-0,10	-0,27	-0,10	--	--

Error (%) after the test

Reference Current (5)A	ACTIVE			REACTIVE	
	cosf=1	cosf=0,5ind.	cosf=0,8cap.	sinf=1	sinf=-1
	-0,11	-0,26	-0,10	--	--

Result : Positive

Test Name:Immunity to Power Frequency Magnetic Fields of External Origin

EUT: MEM500 (120701-10/01)

Environmental Conditions: 22 °C % 40 RH

Date: 04.08.2012

Test Method Num: DT-EL-13

Applicable Standards:EN 50470-3 Article 8.5 , Table-9 ,EN 50470-1 Article 7.4.12

Current Value	Error Difference between Magnetic Induction of 0,5mT and Normal Conditions	Max.Error Difference Given in Article 8.5
10 Itr	0,04	2,0

Result : Positive

Testing Report

Test Name:Voltage Dips and Short İnterruptions

EUT: MEM500 (120701-10/01)

Environmental Conditions: 21 °C % 41 RH

Date: 04.08.2012

Test Method Num: DT-EL-18

Applicable Standards:EN 50470-1 Article 7.4.4

m = 1

U_n = 230 V

I_{max} = 80 A

$X = 10^{-6} \cdot m \cdot U_n \cdot I_{max} = 0{,}0184$ kWh

Voltage Interruptions	Change in the Register (kWh)	Max.Change in the Register (kWh),Given in Article 7.4.4
ΔU = %100 , Dt = 1 s	0	0,0184
ΔU = %100 , Dt = 20 ms	0	0,0184
ΔU = %50 , 1 minute.	0	0,0184

Result : Positive

Test Name:Immunity to Continuous Magnetic Fields of External Origin

EUT: MEM500 (120701-10/01)

Environmental Conditions: 22 °C % 42 RH

Date: 04.08.2012

Test Method Num: DT-EL-14

Applicable Standards:EN 50470-3 Article 8.5 , Table-9, EN 50470-1 Article 7.4.11

Current Value	Error Difference between Continuous Magnetic Induction and Normal Conditions	Max.Error Difference Given in Article 8.5
10 Itr	0,03	2,0

Result : Positive

Electrical Fast Transient / Burst Immunity Test

Test Method No	DT-EMC-06	**Related Standard:**	IEC 61000-4-4:2004 EN 50470-1
Environmental Cond.:	21°C, % 41 RH	**Date:**	15.08.2012

TEST CONDITIONS AND RESULTS

Testin tanımı:
(Test specification)

EUT has been placed on a nonconducted table 10 cm height from reference earth plane in shielded room. EuT has been supplied with 230 voltage and 5 Ampere.
Burst signal is applied to L,N couplings and error diffrence measured.

Test level:

□ 0.5 kV (Level 1)
□ 1 kV (Level 2)
□ 2 kV (Level 3)
■ 4 kV (Level 4)

Burst frequency :

■ 5,0 kHz
□ 2,5 kHz

Coupling time :

■ - - ≥ 60 s

Polarity :

■ Positive ■ Negative

Max. Error Difference (%) is % 4 according to EN 50470-3 article 8.5
Measured Max. Error Difference (%) is: 0,66
Result: Positive

Radiated, Radio Frequency, Electromagnetic Field Immunity Test

Test Method No:	DT-EMC-05	**Related Standard:**	IEC 61000-4-3:2006 EN 50470-1
Environmental Cond.:	21°C, % 41 RH	**Date:**	14.08.2012

TEST CONDITIONS AND RESULTS

Test specification: EUT has been supplied with 230 voltage in Anechoic Chamber on a wooden table that is above 80 cm height from floor.When 5 A has been applied to current circuit and without any current test has been made.In the horizontal and vertical positions of the antenna ,test is made by turning EUT four dimensions.

Frequency range : ■ 80 MHz – 1000 MHz ■ 1000 MHz – 2000 MHz

□ 27 MHz – 500 MHz

Field strength : □ 3 V/m ■ 10 V/m With current ■ 30 V/m Without current

Distance of antenna – EuT: ■ 1 m Without current ■ 3 m With current □ 10 m

Result: Positive

Radiated, Radio Frequency, Electromagnetic Field Immunity Test

Modulation : ■ AM 80% (Amplitude)
■ Sinusoidal 1kHz

Frequency step : ■ 1 % with 2 s dwell time

Polarization of antenna : ■ Horizontal ■ Vertical

Mode:	Without load	Without load
Side:	Front	Front
Polarization:	Horizontal	Vertical
Deviation(x):	0 Wh	0 Wh

Mode:	Without load	Without load
Side:	Back	Back
Polarization:	Horizontal	Vertical
Deviation(x):	0 Wh	0 Wh

Radiated, Radio Frequency, Electromagnetic Field Immunity Test

Mode:	Without load	Without load
Side:	Right	Right
Polarization:	Horizontal	Vertical
Deviation(x):	0 Wh	0 Wh

Mode:	Without load	Without load
Side:	Left	Left
Polarization:	Horizontal	Vertical
Deviation(x):	0 Wh	0 Wh

The application of the immunity test shall not produce a change in the register of more than x units and the test output shall not produce a signal equivalent to more than x units.

$x=10^{-6}.m.U_n.I_{max=}kWh$

m is the number of measuring elements

U_n is the reference voltage

I_{max} is the maximum current

x=0,0184 kWh

Radiated, Radio Frequency, Electromagnetic Field Immunity Test

Modulation : ■ AM 80% (Amplitude)
■ Sinüs(sinusoidal) 1kHz

Frequency step : ■ (1 % with 2 s dwell time)

Polarization of antenna : ■ Horizontal ■ Vertical

Mode:	(With Current, 5 Ampere)	(With Current, 5 Ampere)
Side:	Front	Front
Polarization:	Horizontal	Vertical
Max. Error Difference:	1,11%	0,87%

Mode:	(With Current, 5 Ampere)	(With Current, 5 Ampere)
Side:	Back	Back
Polarization:	Horizontal	Vertical
Max. Error Difference:	1,07%	1,00%

Radiated, Radio Frequency, Electromagnetic Field Immunity Test

Mode:	(With Current, 5 Ampere)	(With Current, 5 Ampere)
Side:	Right	Right
Polarization:	Horizontal	Vertical
Max. Error Difference:	0,98%	1,03%
Mode:	(With Current, 5 Ampere)	(With Current, 5 Ampere)
Side:	Left	Left
Polarization:	Horizontal	Vertical
Max. Error Difference:	0,18%	0,85%

Immunity to Conducted Disturbances, Induced by Radio Frequency Fields

Test Method No:	DT-EMC-09	**Related Standard:**	IEC 61000-4-6:2006 EN 50470-1
Environmental Cond.:	22°C, % 42 RH	**Date:**	14.08.2012

TEST CONDITIONS AND RESULTS

Test specification : The supply peaks of the EUT is connected to CDN. When the devices has been applied with 230V, When 5A has been applied to current circuits,
Eut has been observed.

Frequency range : ■ 0,15 MHz – 80 MHz

Field strength : □ 3 V ■ 10 V

Modulation : ■ AM 80% Amplitude
■Sinusoidal 1kHz

Frequency step : ■ 1 % with 2 s dwell time

Max. Error Difference (%) is % 2 according to EN 50470-3 article 8.5

Measured Max. Error Difference (%) is: 0,18

Result:Positive

Electrostatic Discharge Immunity Test

Test Method No:	DT-EMC-01	**Related Standard:**	IEC 61000-4-2:2001 EN 50470-1
Environmental Cond.:	21°C, % 41 RH	**Date:**	15.08.2012

TEST CONDITIONS AND RESULTS

Test specification: EUT has been placed on a wooden table 80 cm height from floor in control room.When Eut is power on ,contact discharge has been applied to the conductive surfaces and to vertical and horizontal coupling plates,air discharge has been applied to noncunducted surfaces.

Contact discharge voltage :
- ■ – 2kV
- ■ – 4 kV
- ■ – 6 kV
- ■ – 8 kV

Air discharge voltage:
- ■ – 2 kV
- ■ – 4 kV
- ■ – 8 kV
- ■ – 15 kV

Discharge impedance :
- ■ – 330 Ω / 150 pF

Discharge factor :
- ■ - ≥ 1 s

Number of discharge :
- ■ - ≥ 10

Result:Positive

Electrostatic Discharge Immunity Test

Type of discharge :	■ **Direct discharge:**	■ **Contact discharge**
		■ **Air discharge**
	■ **Indirect discharge:**	■ **Contact discharge**
Polarity:	■ **Positive**	■ **Negative**
Discharge location:	■ **Horizontal coupling plate -HCP-**	
	■ **Vertical coupling plate -VCP-**	

The application of the electrostatic discharge shall not produce a change in the register of more than x units and the test output shall not produce a signal equivalent to more than x units.

$x=10^{-6}.m.U_n.I_{max=}kWh$

m (is the number of measuring elements)

U_n (is the reference voltage)

I_{max} (is the maximum current)

The electrostatic discharge application doesn't produce a change in the register and signal output.

x=0,0184 kWh

Surge Immunity Test

Test Method No:	DT-EMC-03	**Related Standard:**	IEC 61000-4-5:2005 EN 50470-1
Environmental Cond.:	21°C, % 42 RH	**Date:**	15.08.2012

TEST CONDITIONS AND RESULTS

Test specification: EUT has been placed on a wooden table 80 cm height from floor in control room. When Eut is power on ,surge signal has been applied to Line - Line couplings.

Test level :

□ 0.5 kV □ 1 kV

□ 2 kV ■ 4 kV

Output: ■ 2 ohm Source impedance □ 12 ohm Ground impedance

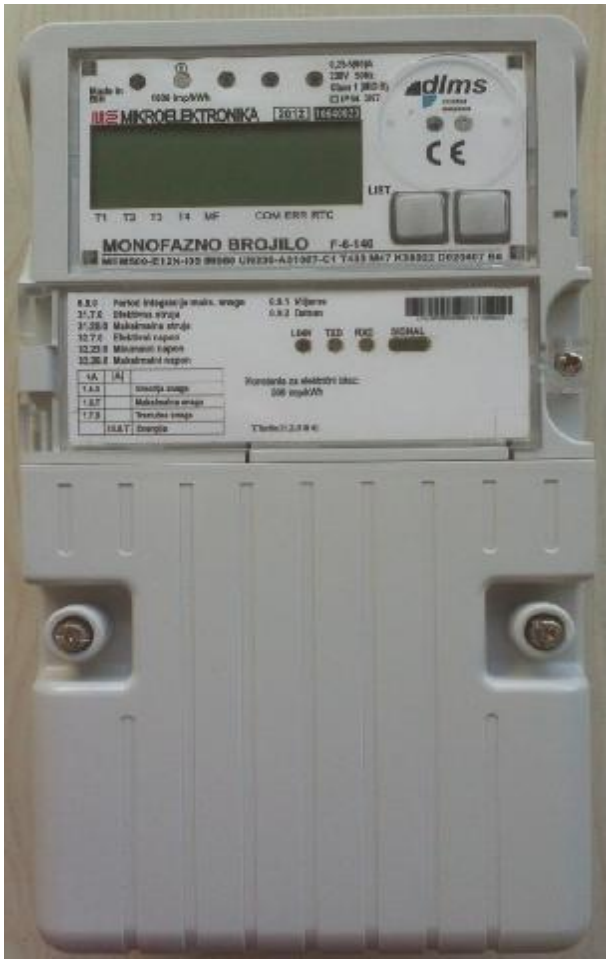
Phase Angle: 60°, 240°

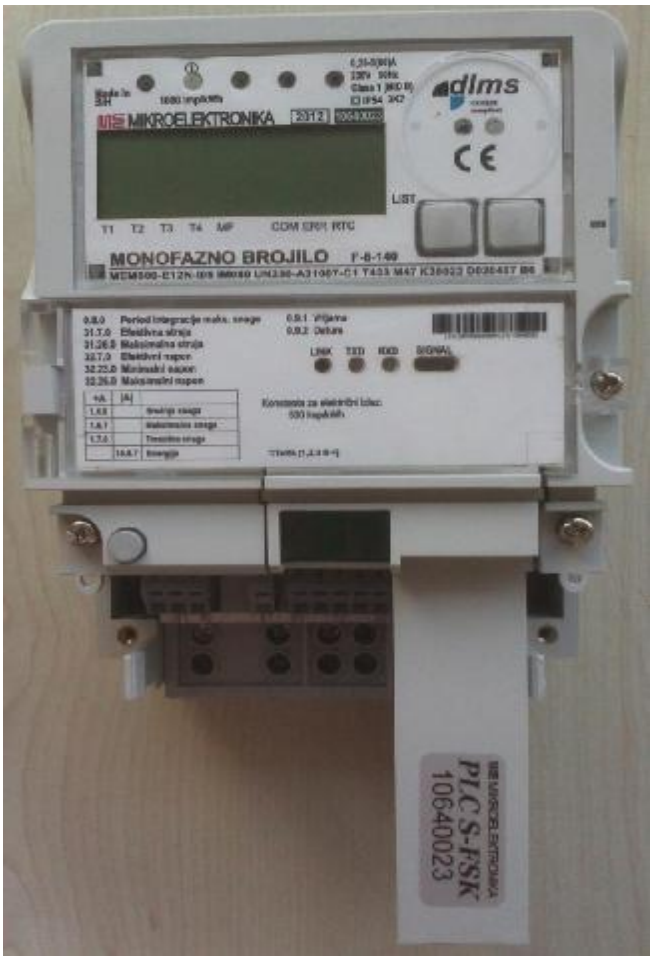
Application number : Repetition rate 1 minute

Polarity : Positive Negative

The application of the electrostatic discharge shall not produce a change in the register of more than x units and the test output shall not produce a signal equivalent to more than x units.
Result:Positive

PRODUCT PICTURE





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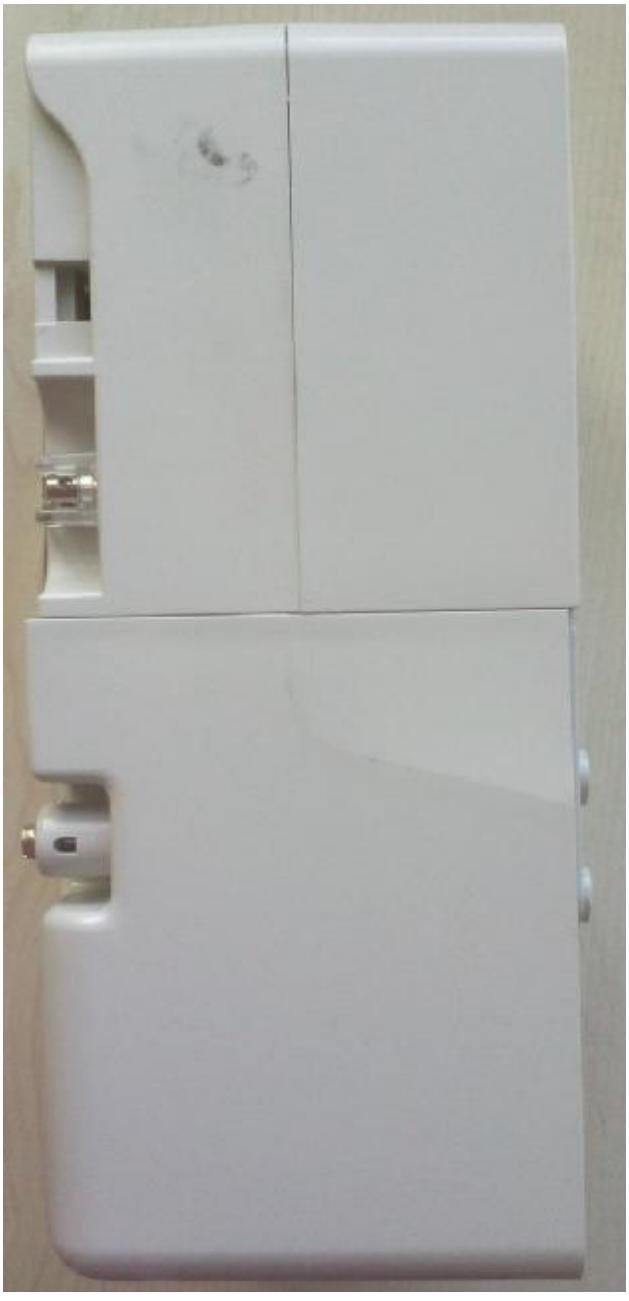

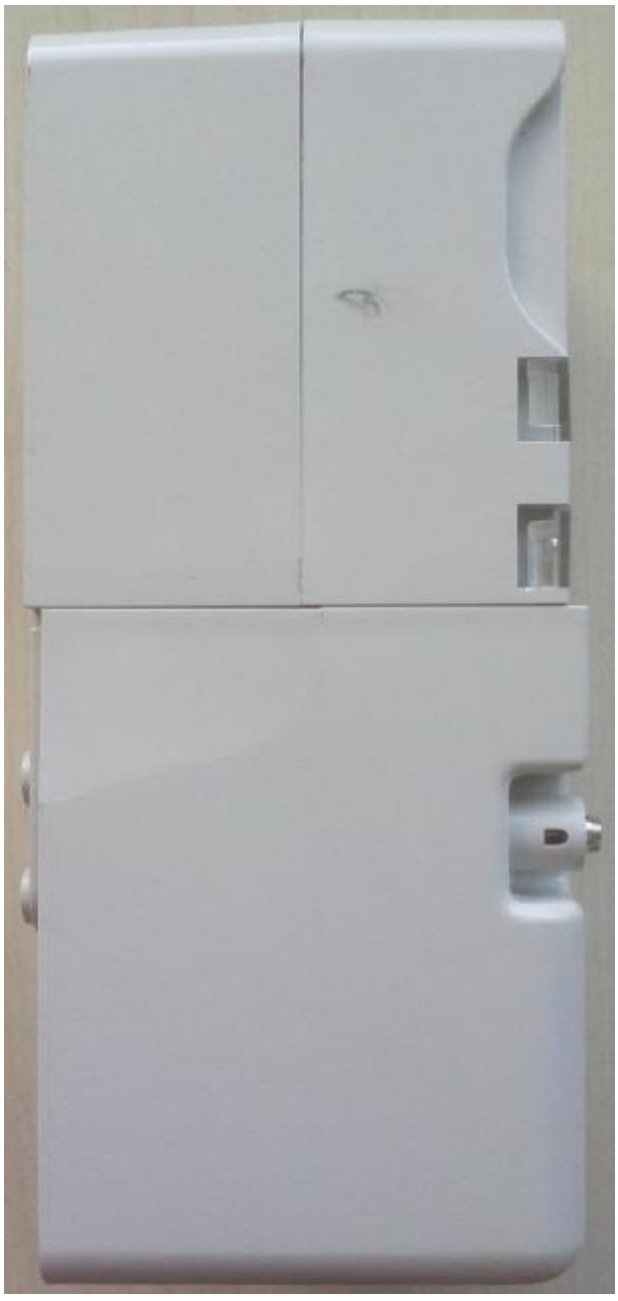

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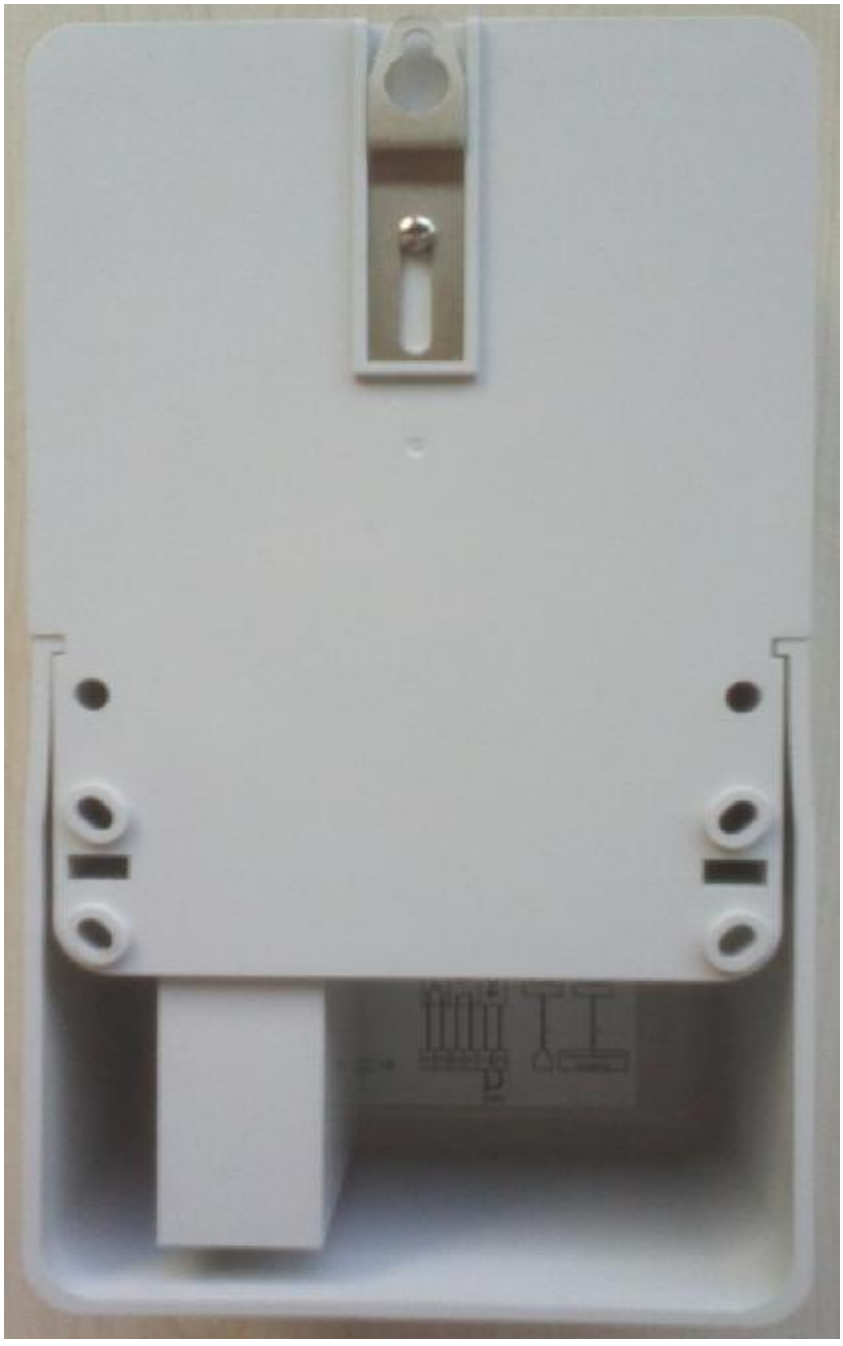

PRODUCT PICTURE