POWER TRANSDUCER **UMT 510/MT 510**
POWER TRANSDUCER & RECORDER **UMT 511/MT 511**

- All **single phase AC** network **measurements**.
- **Voltage and current auto range** measurements up to 600V$_{\downarrow}$, 12.5A.
- **Wide frequency** measurement **range** 16 Hz – 400 Hz.
- **Power accuracy** class **0.2** (IEC-688).
- **Serial or Ethernet** and **USB** communication.
- **8 MB** flash **internal memory**; (U)MT 511 only.
- Up to **two I/O modules**.
- Powerful **analogue out**; 6 voltage and current ranges, non-linear characteristics, etc..
- **User friendly** PC setting **software.**

Iskra®

FEATURES

- Measurements of instantaneous values of all single phase values; U, I, P, Q, S, f, φ, energy, THD U, THD I, MD.
- Power accuracy class 0.2.
- Recording of up to 8 measurands and 16 alarms in the internal memory (8 MB flash); (U)MT 511 only.
- 16 adjustable alarms.
- Frequency range from 16 Hz to 400 Hz.
- RS232/RS485 communication up to 115,200 bit/s or USB communication and Ethernet simultaneously.
- MODBUS communication protocol.
- Up to 2 inputs or outputs (analogue outputs, digital inputs, alarm (digital) outputs, pulse outputs).
- Universal power supply (two voltage ranges).
- Automatic range of nominal current and voltage (max. 12.5 A and 600 V_{L-N}).
- Housing for DIN rail mounting.
- User-friendly PC MiQen software.

DESCRIPTION

(U)MT 510/511 are intended for measuring and monitoring single-phase electrical power network. Input voltage and input current are electrically isolated from the system by means of high resistive input chain and current transformer respectively. It measures true RMS values by means of fast sampling of voltage and current signals, which makes instruments suitable for acquisition of transient events. A built-in microcontroller calculates measurands (voltage, current, frequency, energy, power, power factor, power angles, THD U, THD I, MD) from the measured signals.

COMPLIANCE WITH STANDARDS

Standard EN	*Description*
61010-1: 2001	*Safety requirements for electrical equipment for measurement, control and laboratory use*
60688:1995 / A2: 2001	*Electrical measuring transducers for converting AC electrical variables into analogue and digital signals*
61326-1:2006	*EMC requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements*
60529:1997/A1:2000	*Degrees of protection provided by enclosures (IP code)*
60 068-2-1/ -2/ -6/ -27/-30	*Environmental testing (-1 Cold, -2 Dry heat, -30 Damp heat, -6 Vibration, -27 Shock)*
UL 94	*Tests for flammability of plastic materials for parts in devices and appliances*

APPLICATION

The (U)MT 510/511 power transducer and recorder is used for a permanent monitoring of most of the single-phase AC network values. Records are stored in the internal memory for the period of the last three years. Wide range of various I/O modules makes (U)MT 510/511 a perfect choice for numerous applications. (U)MT 510/511 is delivered configured to default values. Subsequent customer configuration is possible with user friendly setting software MiQen. (U)MT 510/511 supports a wide range of communication interfaces. Standard serial RS232/485 with speed up to 115200 baud is perfect for simple applications and serial bus interfacing. Ethernet 10/100 is ideal for a long distance monitoring and configuration of numerous transducers. USB 2.0 can be used for a fast set-up or memory acquisition.

TECHNICAL DATA

Measurement input:

- Nominal frequency range 50 Hz, 60 Hz
- Measuring frequency range: 16 Hz–400 Hz (max. 1000 Hz)

Current measurements:

- Nominal value (I_N) 0.31 A...5 A
- Max. measured value 12.5 A sinusoidal
- Max. allowed value (thermal) 15 A cont.
- (acc. to IEC/EN 60 688) 20 × I_N ; 5 × 1 s
- Consumption < I^2 × 0.01 Ω per phase

Voltage measurements:

- Nominal value (UN) 57.7 V_{LN}...500 V_{LN}
- Max. measured value (cont.) 600 V_{LN}
- Max. allowed value (acc. to IEC/EN 60 688) 2 × U_N; 10 s
- Consumption < U^2 / 4.2 M Ω per phase
- Input impedance 4.2 M Ω per phase

System:

Voltage inputs can be connected either directly to low-voltage network or via a high-voltage transformer to high-voltage network.

Current inputs can be connected either directly to low-voltage network or shall be connected to network via a corresponding current transformer (with standard 1 A or 5 A outputs).

BASIC ACCURACY UNDER REFERENCE CONDITIONS

Total accuracy (measurements and analogue output) according to IEC/EN 60 688.

Accuracy is presented as percentage of reading of the measurand except when it is stated as an absolute value.

Measurand		*Accuracy (±% of reading)*	
Current Rms		*0.2*	*0.1*[3]
Voltage Rms		*0.2*	*0.1*[3]
Power (P, Q, S)		*0.2*	*0.15*[3]
Power factor (PF)		*0.1°*	
Frequency (f)		*10 mHz*	
angle (φ)		*0.1°*	
THD(U), THD(I)	*(0...400 %)*	*0.5*	
Active energy		*Class 1*	*0.5S*[1]
Reactive energy		*Class 2*	*0.5*[1]
Real time clock (RTC)[2]		*1 min/month*	

[1] *Optional*

[2] *(U)MT 511 only*

[3] *On communication*

COMMUNICATION

(U)MT 510/511 has a wide variety of communication possibilities to suit specific demands. It is equipped with two standard communication ports (COM1A and COM1B). This allows different users to access data from a device simultaneously and by using Ethernet communication, data can be accessed worldwide.

Different configurations are possible (to be specified with order).

Configuration	*COM1A*	*COM1B*
1	*RS232/485*[1]	*/*
2	*Ethernet*	*USB*

[1] *RS485 communication is available through DB9 or screw-in terminals, while RS232 is available only through DB9*

Serial communication:	RS232(1)	RS485(1)
Connection type	Direct	Network
Connection terminals	DB9(1)	screw terminals(1)
Function	Settings, measurements and records acquisition, firmware upgrade	
Insulation	Protection class I, 3.3 kV_{ACRMS} 1 min	
Max. connection length	3 m	1000 m
Transfer mode	Asynchronous	
Protocol	MODBUS RTU	
Transfer rate	2.4 kBaud to 115.2 kBaud	
Number of bus stations	/	≤ 32

(1) Both types of comm. are available but only one at a time

Ethernet:	
Connection type	Network
Connection terminals	RJ-45
Function	Settings, measurements and records acquisition, firmware upgrade
Insulation	Protection class I, 3.3 kV_{ACRMS} 1 min
Transfer mode	Asynchronous
Protocol	MODBUS TCP
Transfer rate	10/100 Mb/s autodetect

USB:	
Connection type	Direct
Connection terminals	USB-B
Function	Settings, measurements and records acquisition, firmware upgrade
Insulation	Protection class I, 3.3 kV_{ACRMS} 1 min
Transfer mode	Asynchronous
Protocol	MODBUS RTU
Transfer rate	USB 2.0

INPUT/OUTPUT MODULES

(U)MT 510 is equipped with four multipurpose input/outpu/(U)MT 511t slots. The following modules are available:

Alarm (digital) output	2 outputs	any I/O
Analogue output	2 outputs	any I/O
Pulse output	2 outputs	any I/O
Digital input	2 inputs	any I/O
Watchdog (status) output	2 outputs	any I/O

Analogue output:

Each of up to two analogue outputs is fully programmable and can be set to any of 6 hardware ranges, 4 current and 2 voltage, without opening an instrument. They all use the same output terminals.

Programmable DC current input:

Output range values –100 %...0...100 %

-1...0...1 mA	Range 1
-5...0...5 mA	Range 2
-10...0...10 mA	Range 3
-20...0...20 mA	Range 4
other ranges possible	by MiQen software

Burden voltage	10 V
External resistance	R_{Bmax} =10 V/I_{outN}

Programmable DC voltage input:

Output range values –100...0...100%

-1...0...1 V	Range 5
-10...0...10 V	Range 6
other ranges possible	by software

Burden current	5 mA
External resistance	R_{Bmin}= U_{outN}/5 mA

General:

Linearization	Linear, Quadratic
No. of break points	5
Output value limits	± 120% of nominal output
Response time (measurement and analogue output)	< 100 ms
Residual ripple	< 0.5 % p.p.

The outputs 1 and 2 may be either short or open-circuited. They are electrically insulated from each other (500 VACrms) and from all other circuits (3320 VACrms).

All output range values can be altered subsequently (zoom scale) using the setting software, but a supplementary error results (see INTRINSIC ERROR).

Alarm (digital) output:

Type	*Relay switch*
Rated voltage	*48 V AC/DC (+40% max)*
Max. switching current	*200 mA*
Contact resistance	*≤ 100 mΩ (100 mA, 24 V)*
Impulse	*Max. 4000 imp/hour*
	Min. length 100 ms
Insulation voltage	
Between coil and contact	*4000 VDC*
Between contacts	*1000 VDC*

Pulse output

Type	*Solid state*
Max. voltage	*40 V AC/DC*
Max. current	*30 mA (R_{ONmax} = 8 Ω)*
Pulse length	*programmable*
	2 ms…1000 ms

Digital input

Rated voltage	*48 V AC/DC (+ 40% max)*
Max. current	*< 1.5 mA*
Min. signal width	*20 ms*
Min. pause width	*40 ms*
SET voltage	*40 %...120 % of rated voltage*
RESET voltage	*0 %...10 % of rated voltage*

Watchdog (status) output

Type	*Relay switch*
Normal operation	*Relay in ON position*
Failure detection delay	*≈1.5 s*
Rated voltage	*48 V AC/DC (+40 % max)*
Max. switching current	*1000 mA*
Contact resistance	*≤ 100 mΩ (100 mA, 24 V)*

UNIVERSAL POWER SUPPLY

Standard (high):

Nominal voltage AC	*80 V… 276 V*
Nominal frequency	*40 Hz… 65 Hz*
Nominal voltage DC	*70 V… 300 V*
Consumption	*< 5 VA*
Power-on transient current	*< 20 A ; 1 ms*

Optional (low):

Nominal voltage AC	*48 V… 77 V*
Nominal frequency	*40 Hz… 65 Hz*
Nominal voltage DC	*19 V… 70 V*
Consumption	*< 5 VA*
Power-on transient current	*< 20 A ; 1 ms*

SAFETY:

Protection:	*protection class I*
⚠ ⏚	*(protective earth terminal due to touchable metal parts (USB-B, RJ-45, DB9), current limiting fuse 1 A on aux. supply*
	Voltage inputs via high impedance
	Double insulation for I/O ports and COM1 port
Pollution degree	*2*
Installation category	*CAT III ; 600 V⏚ meas. inputs*
	CAT III ; 300 V⏚ aux. supply
	Acc. to EN 61010-1
Test voltages	*UAUX↔I/O, COM1: 2210 VACrms*
	UAUX↔U inputs: 3320 VACrms
	U, I inputs↔I/O, COM1: 3320 VACrms
	U inputs↔I inputs: 3320 VACrms
Enclosure material	*PC/ABS*
	Acc. to UL 94 V-0
Enclosure protection	*IP 40 (IP 20 for terminals)*

MECHANICAL

Dimensions	*(100 × 127 ×75) mm*
Mounting	*Rail mounting (35 × 15) mm*
	acc. to DIN EN 50 022
Enclosure material	*PC/ABS, PC (sliding cover)*
Flammability	*Acc. to UL 94 V-0*
Weight	*375 g*

AMBIENT CONDITIONS:

Ambient temperature	*usage group II*
	0…15…30…45 °C
	Acc. to IEC/EN 60 688
Operating temperature	*-30 °C to +70 °C (2x rated class)*
Storage temperature	*-40 °C to +70 °C*
Average annual humidity	*≤93% r.h.*

REFERENCE CONDITIONS:

Ambient temperature	*15°C …30°C*
Relative humidity	*≤93% r.h.*
Voltage input	*57.7 V…500 V*
Current input	*0.31 A…5 A*
Frequency	*45 Hz…65 Hz*
Active/Reactive power factor	*cosϕ = 1, sinϕ = 1*
Waveform	*Sinus*

INTRINSIC-ERROR (FOR ANALOGUE OUTPUTS):

For intrinsic-error for analogue outputs with bent or linear-zoom characteristic multiply accuracy class with correction factor (c). Correction factor c (the highest value applies):

Linear characteristic

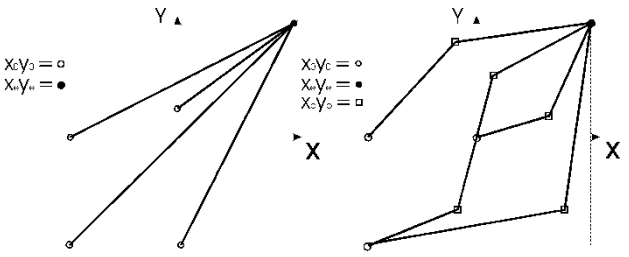
$$c = \frac{1-\frac{y_0}{y_e}}{1-\frac{x_0}{x_e}} \quad or \quad c = 1$$

Bent characteristic

$$x_{b-1} \le x \le x_b$$

b – number of break point (1 to 5)

$$c = \frac{y_b - y_{b-1}}{x_b - x_{b-1}} \cdot \frac{x_e}{y_e} \quad or \quad c = 1$$



Limit of the output range

Examples of settings with linear and bent characteristic.

RECORDER

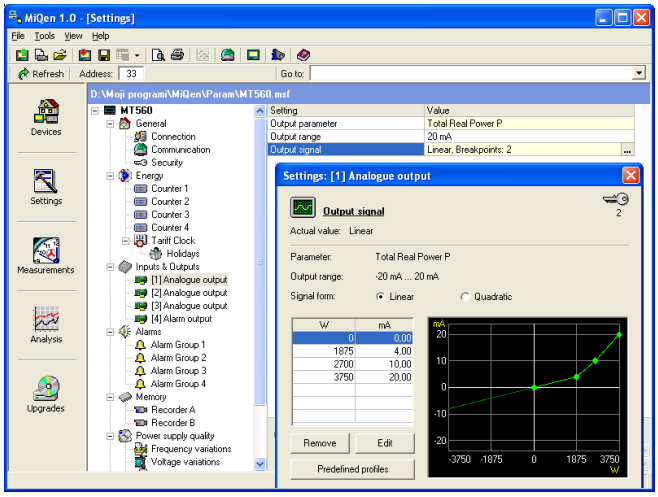
A built-in recorder (8Mb) enables storing measurements and detected alarms; (U)MT 511 only.

ALARMS

(U)MT560/550 supports recording and storing of 32 alarms in four groups. A time constant of maximal values in a thermal mode, a delay time and switch-off hysteresis are defined for each group of alarms.

MIQEN - SETTING AND ACQUISITION SOFTWARE

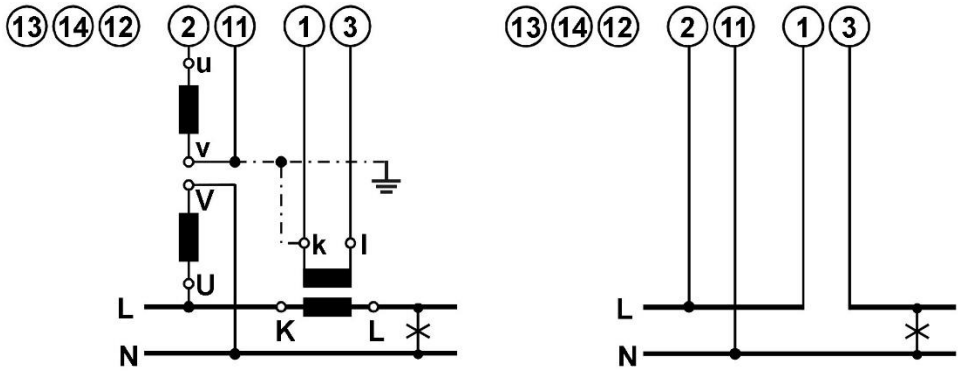
MiQen software is intended for supervision of (U)MT 510/511 and many other instruments on a PC. Network and the transducer setting, display of measured and stored values and analysis of stored data in the transducer are possible via the serial, Ethernet or USB communication. The information and stored measurements can be exported in standard Windows formats. Multilingual software functions on Windows 98, 2000, NT, XP operating systems.



MiQen software is intended for:

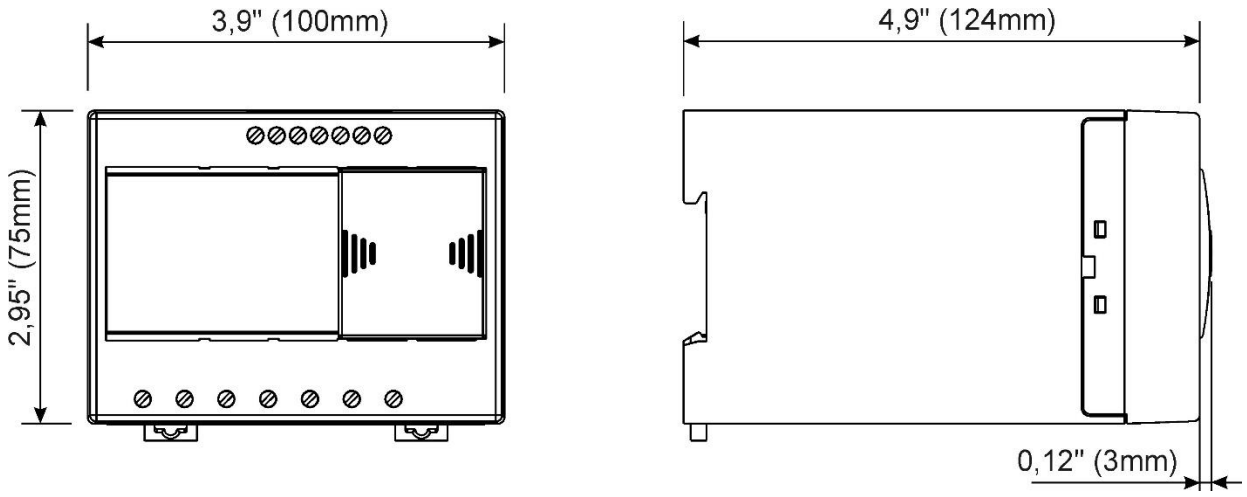
- Setting all of the instruments parameters (online and offline).
- Viewing current measured readings.
- Complete I/O modules configuration.
- Upgrading instruments firmware.
- Searching the net for devices.
- Virtual interactive instrument.
- Comprehensive help support.

CONNECTION

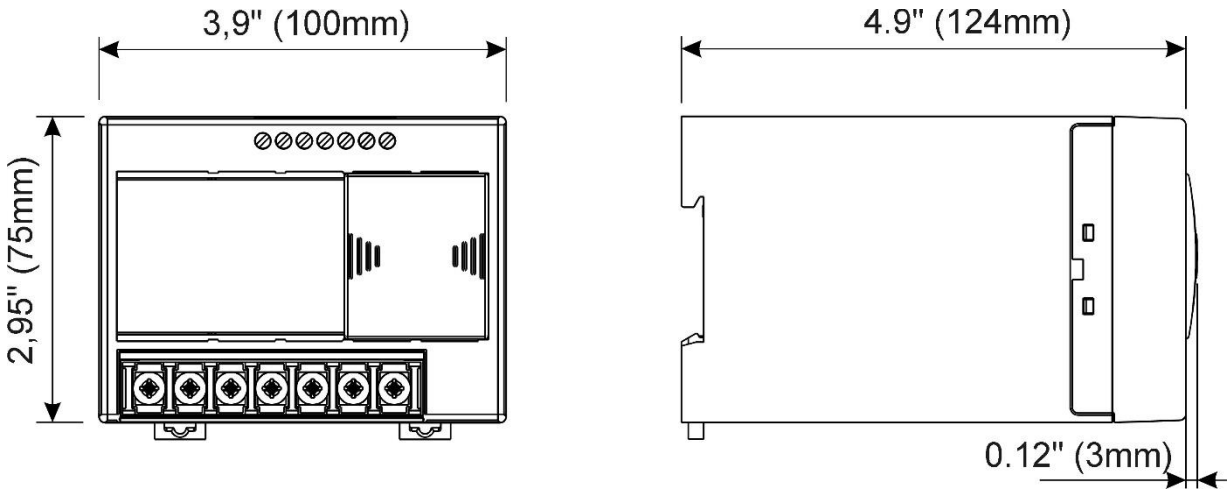
System/ connection	*Terminal assignment*
Single-phase connection *1b (1W)*	

DIMENSIONAL DRAWING

Dimensions for MT 510/MT 511 (standard EU clamp style terminals):



Dimensions for UMT 510/UMT 511 (ring type terminal block):



CONNECTION TABLE

Function			Connection
Measuring input:	AC current	IL1	1/3
	AC voltage	UL1	2
		N	11
		I/O	
Inputs / outputs:	Module 1	⊖→ +	15
		⊖→ —	16
	Module 2	⊖→ +	17
		⊖→ —	18
Auxiliary power supply:		+ / AC (L)	13
		– / AC (N)	14
		GROUND	12
Communication:	RS485	Rx / A	23*#
		NC	24*#
		Tx / B	25*#

* If ETHERNET/USB communication is supported, terminals 23, 24, and 25 are not used (unconnected)
# RS232 communication is available only on DB9 connection terminal under transparent cover

DATA FOR ORDERING

(U)MT 510/511:

The following data shall be stated:

Type of a transducer
Type of power supply
Type of communication
Type of I/O module(s)
Required energy accuracy

Supplement:

MiQen software

ORDERING

When ordering (U)MT 510/511, all required specifications should be stated in compliance with the ordering code. Additional information could be stated regarding functionality of analogue outputs. Default settings for analogue outputs provided that no ordering information is given will be:

Analogue output	*Input quantity*	*Output quantity*
AO1	*P1 (-2500...0...2500)W*	*-20...0...20 mA*
AO2	*Q1 (-2500...0...2500)var*	*-20...0...20 mA*

If different analogue output settings are required, a proper input quantity / output quantity pair for each analogue output should be provided.

The transducers automatic range of input current (5 A) and voltage (500 V_{L-N}) is not stated in the code.

Example of ordering:

MT 511 with EU style clamp terminals and with a universal-HI supply is connected to a universal high voltage and 5 A secondary current on 50 Hz network. Ethernet & USB communication, digital input as I/O1 and relay output as I/O2.

Voltage and current nominal value are due to auto-range fixed to max. nominal value and are therefore omitted from ordering code.

Example ordering code:

MT 511 S H E F M

				Relay (alarm) output
			Digital input 48 $V_{AC/DC}$	
		Ethernet & USB		
	70 V_{DC}.. 300 V_{DC}, 80 V_{AC}... 276 V_{AC}			
50 Hz, 60 Hz				

GENERAL ORDERING CODE

All specifications are obligatory except function of analogue output(s), which should be stated in a form of description.

Device Type	Nominal freq.	Aux. power supply	Comm. COM1	I/O module 1	I/O module 2	
(U)MT51X	**X**	**X**	**X**	**X**	**X**	
				A		Analogue output*
				S		Pulse output
				M		Relay (alarm) output
				W		Watchdog output
				F		Digital input 48 $V_{AC/DC}$
				N		Without
			R			RS232 & 485 DB9 + Terminal *
			E			Ethernet & USB
		H				70...300 V_{DC}, 80...276 V_{AC} *
		L				19...70 V_{DC}, 48...77 V_{AC}
	S					50 Hz, 60 Hz *
	A					400 Hz
MT 510						EU style clamp terminals
MT 511						
UMT 510						ring style terminal block
UMT 511						

*** - standard**

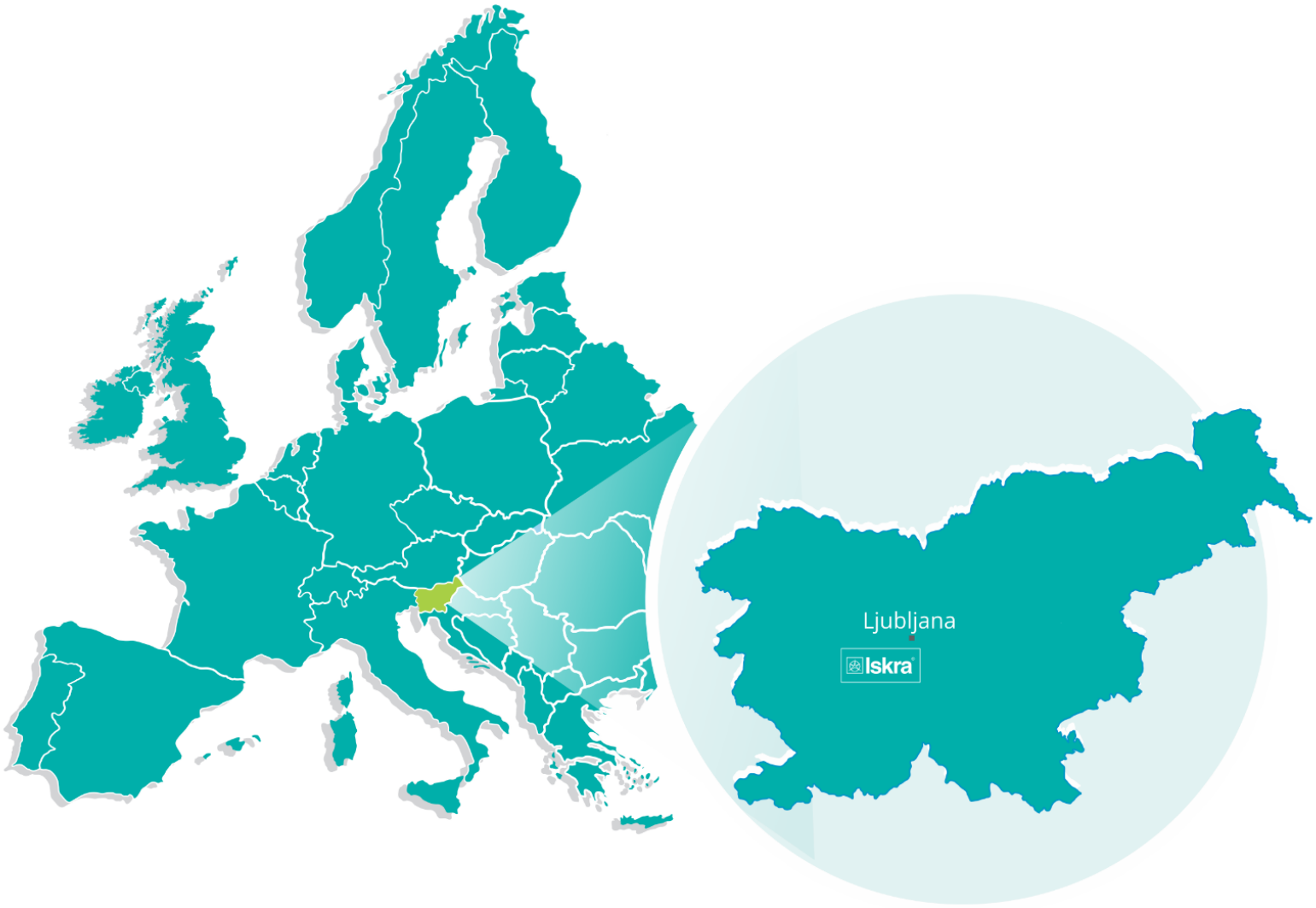
DISPOSAL

It is forbidden to deposit electrical and electronic equipment as municipal waste.

The manufacturer or provider shall take waste equipment free of charge.

DICTIONARY:

RMS	*Root Mean Square*
PO	*Pulse output*
TI	*Tariff input*
PA	*Power angle (between current and voltage)*
PF	*Power factor*
THD	*Total harmonic distortion*
Ethernet	*IEEE 802.3 data layer protocol*
MODBUS/DNP3	*Industrial protocol for data transmission*
MiQen	*ISKRA setting and acquisition Software*
AC	*Alternating quantity*
IR	*Infrared (optical) communication*
RTC	*Real Time Clock*



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