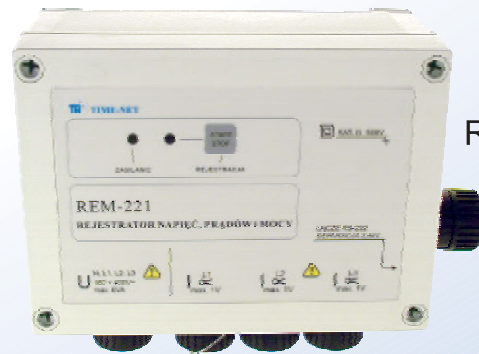


DEVICES FOR REGISTERING AND ANALYSING QUALITY OF ELECTRICAL POWER SUPPLY



REM - 211



REM - 221



REM - 370

Devices registering power supply quality are manufactured as portable and they enable measurement and registration of electrical values in **one-phase and three-phase low voltage systems** (REM-370 can perform the listed functions also in **medium voltage and high voltage systems**, when used together with relevant transformers). Analysers monitor, register, and analyse the events occurring in the network in accordance with the set program in order to detect disturbances, to diagnose fault states and determine their reasons and to perform other similar functions.

Averaging the measurement results makes it possible to estimate the **quality of power supply** regarding the conformity with requirements of **EN 50 160 standard** or standard **defined by user**, and enable automatic generation of the **relevant report**, which can be printed directly by the client.

The analysers fulfill the safety requirements set in the EN 61 010-1 standard for operating voltage 600 V, installation category III and environment pollution category 2.

Together with the device **effective and simple communicating software** working on the basis of Windows 95/98/NT/2000/XP operating system is delivered. This software **enables configuration of the device** in accordance with the user's requirements and **reception of measurement data** with their back-up, graphic or table-form presentation, **statistic analysis and print-out** or export to some external program (e.g. MS Excel).

Communication between the recorder and a PC computer is carried out by means of serial interface RS-232 with galvanic separation.

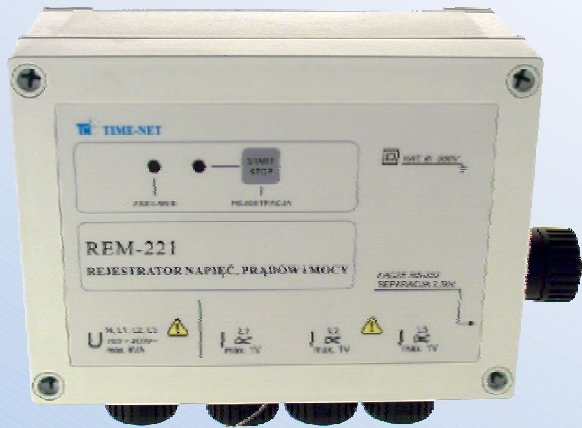
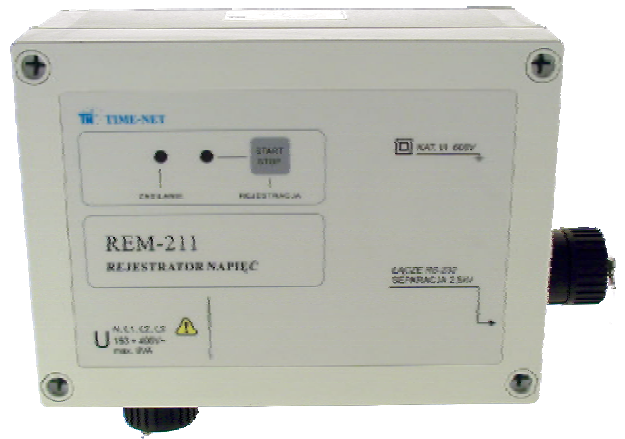
Series of REM analysers and the wide assortment of optional equipment presented in this card enable the **optimum selection of devices for the given requirements**.

These apparatuses and devices are particularly useful for:

- detecting illegal electrical energy inputs in the system;
- checking quality of supplied electrical energy;
- analysing the electrical power demand;
- reducing overloads;
- detecting supply breaks and overvoltages in the network;
- analysing phenomena occurring in industrial supply networks.

Features of REM-211 and REM-221 power analysers:

- Built-in, fixed (permanent) memory enables to register approximately **260 000 records** of data (time, date, phase voltages, phase currents, active and reactive powers), typically for the **period of 4-5 weeks**, depending on the network parameters fluctuations.
- To each measurement session one can add the comments and each measurement record is marked with time and data stamp by the timer built-in in the registering device.
- Set of registered values is partially **configured by the user**, which enables to register more useful measurement data, and by means of this to prolong the registration period.
- The memory usage indicator shows, if there is still some free memory to register more data.



- Start and stop of the measurement registration can be initiated **manually, automatically at the preset time, automatically at preset conditions** (e.g. if some selected measured value increases above or drops below the set threshold value).
- Indicator of correctness for voltage leads connection signalizes the error in connection based on exchanging neutral and phase leads.
- REM-221 analyser is designed to be used together with **clamp-type current/voltage transformers**, which for measured nominal current give at their output the voltage signal amounting 1 VAC (rms), and with **flexible, active current loops**, which are supplied from the recorder.

Values registered by REM-211 and REM-221 registering analysers:

Designation	Parameter name	REM-211				REM-221			
		Parameter value				Parameter value			
		min.	max.	avg.	mom.	min.	max.	avg.	mom.
UL1, UL2, UL3	Voltages of phases: L1, L2, L3	X	X	X	X	X	X	X	X
IL1, IL2, IL3	Currents of phases: L1, L2, L3					X	X	X	X
P1, P2, P3	Active powers of phases: L1, L2, L3					X	X	X	X
Q1, Q2, Q3	Reactive powers of phases: L1, L2, L3					X	X	X	X
S1, S2, S3	Apparent powers of phases: L1, L2, L3								K
PFL1, PFL2, PFL3	Power factors of phases L1, L2, L3								K
tgL1, tgL2, tgL3	Power tangent of phases: L1, L2, L3								K
E1, E1, E3	Active energies of phases: L1, L2, L3 (total drawn from and returned)								X
F	Frequency for phase L1	X	X	X	X	X	X	X	X



REM-211 and REM-221 analysers equipped with hermetic connectors and the housing with IP65 protection class can be used for performing measurements in outdoor conditions.

X – value registered by the apparatus

K – value calculated by the computer program

- Momentary value – momentary value of the parameter, measured in the given moment (e.g. in the given second)
- Average value – arithmetic average of the parameter calculated on the basis of all momentary values for the given parameter, measured every 0,25 second during the preset averaging period, selected from the range from 1 minute to 15 minutes
- Maximum value – maximum value selected from all momentary values of the given parameters measured every 0,25 second during the preset averaging period
- Minimum value – minimum value selected from all momentary values of the given parameters measured every 0,25 second during the preset averaging period



Characteristic features of REM-370 power analysers:

- Built-in, fixed 3 MB memory enables to **register all measurements** performed by the registering device.
- Analyser detects in continuous manner **micro-breaks, breaks and overvoltages** in all phases.
- Values for all **harmonics** are calculated on the basis of the same set of samples, registered before starting the calculation.
- Built-in timer and calendar enable to **mark** registered measurement records **with time and data** stamp.
- Measurement **records** are **marked with the site of measurement name** (maximum 8 sites). It enables to perform **several measurement sessions at different sites**, without the necessity for transferring measurement data to the computer after each session.
- Set of **registered values** is **configured by the user**, which enables to register bigger number of the useful measurements and save the memory, and by means of this to **prolong the available registration time**.
- **Start and stop of the measurement** registration can be initiated manually, **automatically** at the preset time, automatically at preset conditions (e.g. if some selected measured value increases above or drops below the set threshold value).
- The **memory usage indicator** shows, if there is still some free memory to register more data and makes it easier to perform measurements at sites.
- **Optical interface RS-232** improves the level of safety and the **tightness of the housing**.
- REM-370 analysing device enables to connect **any current or voltage transformers** by inputting parameters of their primary and secondary sides and selecting the type of analyzed network: **star, delta or one-phase**. It can also be used together with **passive flexible loop current probes**, which not require battery-type supply.
- Plastic **housing** is designed for usage in industrial conditions and in outdoor cabinets, protecting the apparatus from the direct precipitation (protection degree **IP52**).
- **Built-in accumulator battery** enables to support the registering device operation for the period of approximately 2 hours, and the memory can be supported for approximately one year.

Values registered by REM-370 power analyser:

Parameter name	Parameter value			
	min.	max.	avg.	mom.
Voltages of phases (rms): L1, L2, L3	X	X	X	X
Phase to phase voltages	X	X	X	X
Currents of phases (rms): L1, L2, L3	X	X	X	X
Active powers of phases: L1, L2, L3	X	X	X	X
Reactive powers of phases: L1, L2, L3	X	X	X	X
Apparent powers of phases: L1, L2, L3	X	X	X	X
Distortion power of phases: L1, L2, L3	X	X	X	X
Power factor of phases: L2, L2, L3	X	X	X	X
Power tangent of phases: L1, L2, L3	X	X	X	X
Distortion power factor of phases: L1, L2, L3	X	X	X	X
Frequency for phase L1	X	X	X	X
Shape of phase voltages				X
Shape of phase currents				X
Three phase voltage equivalent	X	X	X	X
Three phase current equivalent	X	X	X	X
Three phase active power	X	X	X	X
Three phase reactive power	X	X	X	X
Three phase apparent power	X	X	X	X
Three phase distortion power	X	X	X	X
Three phase power factor	X	X	X	X
Three phase power tangent	X	X	X	X
Three phase distortion power factor	X	X	X	X
Current of zero conductor (rms)	X	X	X	X
Peak average active power				X ^{*1)}
Peak average reactive power				X ^{*1)}
Peak average apparent power				X ^{*1)}
Three phase active energy drawn				X
Three phase active energy returned				X
Three phase reactive energy drawn				X
Three phase reactive energy returned				X
Three phase apparent energy				X
DC component of phase voltages	X	X	X	X
Basic component (H1) of phase voltages L1, L2, L3	X	X	X	X
Harmonics content for phase voltages L1, L2, L3 *2)	X	X	X	X
DC component of phase currents	X	X	X	X
Basic component (H1) of phase currents	X	X	X	X
Harmonics content for phase currents *2)	X	X	X	X
Power factors for each of the harmonics for phases L1, L2, L3	X	X	X	X
Symmetrical components of voltage: zero-, positive-, and negative sequence	X	X	X	X
Relation of symmetrical voltage components: negative sequence to positive sequence component	X	X	X	X
THD factor of harmonics content for phase voltages and currents *2)	X	X	X	X
Coefficients of peak for phase voltages and currents	X	X	X	X

*1) Peak value of average power for the selected period (1, 2, 5, 10, 15, 20, 30, 60 minutes) being read off at the moment when the record is created.

*2) Calculated in relation to RMS value or in relation to the basic component (the first harmonic).

Momentary value (Mom.) - momentary value of the parameter, measured at a given moment (e.g. at a given second).

Average value (Avg.) - arithmetic average of the parameter calculated on the basis of all momentary values for the given parameter, measured every 1 s, in the preset averaging period, selected from the range from 1 minute to 60 minutes.

Maximum value (Max.) - maximum value selected from all momentary values of the given parameters measured every 0,25 s, in the preset averaging period.

Minimum value (Min.) - minimum value selected from all momentary values of the given parameters measured every 0,25 s, in the preset averaging period.

Each set consist of: recorder, voltage leads with crocodile-type connectors, power supply cable, communication cable compatible with RS-232 interface for connecting the analyser with PC computer, computer software enabling to configure the recorder and readout and analysis of registered values, warranty certificate, operation manual for recorder and for relevant computer software.

Additionally the set of REM-211 and REM-221 recorders include holder for installing these apparatuses at the pillar.

These recorders can work with the range of offered by us current transformers and other optional accessories offered by us such as:

- Measurement clamps for cables with maximum diameter 15 mm or 52 mm, with various current ranges.
- Elastic current loops designed for outdoor operation.
- Miniature printer type MDI-57 (only for REM-370).
- Current/voltage adapters without galvanic separation type INTA/1, INTA/5.
- Current/voltage adapters with galvanic separation type SEPA5/1.
- Transportation suitcases.

Detailed description of available additional accessories can be found in relevant catalogue cards.

Function and technical parameters	REM-211	REM-221	REM-370
Power supply	160- 400V~ from any phase	160- 400V~ from any phase	100- 400V~ from phase L1
Built-in accumulator battery	option	option	+
Minimum time of operation on battery supply	1 hour (option)	1 hour (option)	2 hours
Minimum time for storage of registered measurement records	1 year	1 year	1 year
Measurements trough voltage transformers	-	-	+
Number of voltage ranges changed automatically	1	1	4
Direct voltage inputs	400V~ (RMS)	400V~ (RMS)	400V~ (RMS)
Maximum scale for direct voltage inputs	500V~	500V~	750V~
Minimum measured voltage	5V~	5V~	1V~
Resolution for voltage indications	1V~	1V~	3 significant digits
Resolution for voltage registration when registering dynamic changes	1 - 4V~ (programmable)	1 - 4V~ (programmable)	-
Detection and registration of overvoltages	-	-	from 1,2ms
Detection and registration of micro-breaks	-	-	from 2,4ms
Compatible current transformers with 1VAC output signal	n.a.	100, 200, 300, 500, 600, 1000, 2000A	without limitations for value
Number of current ranges changed automatically	n.a.	2	4 or 6* ¹⁾
Direct current inputs	n.a.	1V~ (RMS)	1V~ (RMS)
Minimum measured signal at direct current inputs	n.a.	2mV~	2mV~
Resolution for current indications	n.a.	0,2A~* ²⁾	3 significant digits
Resolution for current registration when registering dynamic changes	n.a.	1 - 4A~* ²⁾ (programmable)	-
Error of basic measurements (20% - 100% of range)	< 1%	< 1%	< 0,6%
Range for frequency measurement (input L1 - N)	38 - 76Hz	38 - 76Hz	38 - 76Hz
Frequency measurement error	< 0,03%	< 0,03%	< 0,03%
Number of measurement stations distinguished by analyser	not limited* ³⁾	not limited* ³⁾	max. 8
Period for carrying out basic measurements	0,25s	0,25s	1s
Period for carrying out harmonics measurements	n.a.	n.a.	10 - 20s
Time distance between writing the records into memory	0,25s.- 15min.	0,25s.- 15min.	1s.- 60min.
Averaging period	1 - 15min.	1 - 15min.	1 - 60min.
Memory capacity	3MB	6MB	3MB
Serviced connection arrangements	3 phases - star	3 phases - star	1 phase, 3 phases star and delta
Registration of shape for voltage and current oscillations	-	-	+
Registration of indicating vectors diagrams for voltage and currents	-	-	+
Automatic start/stop of measurements at preset time	+	+	+
Generation of the report on accordance with EN 50 160 standard at PC	+	+	+
Generation of the reports from measurements at mini-printer MDI-57	-	-	option
Overall dimensions of housing	180x130x85	180x130x85	137x132x138
Measurements of apparatus with connectors and interfaces	244x192x85	244x192x85	137x132x138
Weight	1,8kg	1,8kg	1,9kg
Protection class according to EN 60 529 standard	IP65	IP65	IP52
Operating temperature range	-30 50°C	-30 50°C	-25 55°C
Allowed relative humidity / Allowed partial water vapor condensation	100% / yes	100% / yes	90% / no
Possibility of installation on the pillar	+	+	-

n.a. - not applicable

*¹⁾ 4 for clamp-type transformers, 6 for passive flexible current loop

*²⁾ For transformers with rating 100 A. For transformer with other rating it change proportionally.

*³⁾ For REM-211 and REM-221 separation of measurements originating from different stations is possible by means of the computer software.

Manufacturer reserves the right for introducing construction changes in the above described equipment.