A **VHR-22, VHR-23** equipment are the members of VERTESZ network quality analysers**.**. They fully comply the prescription of EN 50160 standards and satisfy the special needs of utility companies and other electric energy consumers. Thanks to their technical parameters and robust outdoor, vandal proof construction both the utilities, both the consumers can measure, store, process and evaluate the parameters of their MV or LV electric networks

Measured values are stored in specially encrypted, non-public files closing out the data manipulation possibilities. It is very important In case of legal disputes between the energy utility and the energy consumer.

■ , **application**

VHR 22 and VHR 23 equipment connected to MV (by MV transformers) or LV public distribution networks measure the line parameters prescribed by EN 50160 standard. Furthermore VHR 23 can measure current values, powers, energies and cos φ -s.

Both of them can act as a disturbance analyser, registration of waveform shapes.

They are used outside utility application where periodic or permanent needs are the quality control of voltages e.g., banks, hospitals, industries, shopping centres, office buildings, etc.

VHR-23 power and energy metering facilities are used for registering the consumption profiles of the consumers. Stored data are the base of energy or esco contracts between consumers and energy traders. Data could be used in all kind of energy counting systems as well.

■ **measured values**

The indoor (trafoboxes) or outdoor (electric poles) installed VHR-22 or VHR-23 equipment continuously measure the current, voltage values by their 12 kHz sampling rates and calculate the effective values, in 1-15 minutes averages. Register the min., max. values in the averaging periods. Store the voltage events classified in eight ranges, logging the events of operation of VHR-22 or VHR-23.

Measured values by EN 50160 standard

Voltages:

- Phase voltages effective values
- Line voltages effective values
- Symmetrical components
- Fast voltage transients (sums inside the averaging period)
- Voltage events (voltage interruption, deep, overvoltage values, classified in 8 ranges)
- Flicker values
- Harmonic components
- THD values
- Register transient wave shapes

Currents (VHR-23 only):

- Phase currents effective values
- Neutral wire current effective value
- Harmonic components
- THD values
- Peak factor
- Register transient wave shapes

Powers (VHR-23 only):

- Phases active powers
- Phases reactive powers
- Phases nominal powers
- Phase power factors (cos φ)

■ *disturbance analyser function*

Both VHR-22 and VHR-23 has disturbance analyser function for registering the voltage and/or current wave shapes. These features can be switched on during the programming phase of the equipment. Triggering condition can be set by which channels, which critical values, which direction (up or down), how long be the registering period before and after the event. In case of more conditions they are in logical "OR" relation.

■ *inputs*

VHR-22 register has 3 voltage inputs and one USB communication connector. VHR-23 has the same plus 3 current inputs.

VHR-23 three current inputs can be connected to three flexible current sensors (operation theory is Rogowsky coil). Their use is more simple than other equipment. The necessary high gain rate and integration of input current signals are inside VHR-23. There are seven measuring range, they can be set during programming phase.

Maximum input voltage level is 480 VAC. Connection methods are isolated banana plugs as standard accessories.

■

VHR-23 with voltage clamps and current sensors

There are warning LEDs on the equipment for signal failed phase order connection, any other failed currents, voltages connections, etc. By means of these the users are noticed in advance (Not at the end of measuring period!) about the installation problems.

■ *energy supply*

VHR-22, or VHR-23 are supplied from the measured lines. The blue wire of the four lead voltage cord must be connected to neutral lines, the others to the network lines L1, L2, L3 points. Single phase min. 100 VAC level is enough for correct operation. In case of total three phase voltage interrupts the built in Lithium accumulator has supplied the power until the end of actual averaging period.

■ **programming and communication**

VHR-22 and VHR-23 equipment have no any operation knobs, switches, etc. The reason is security, safety and reliability. The instruments are programmed, configured and read out only by authorised persons and their computers programs with protected password. Thank to this method nobody (except the authorised person) have any influence to the complete measuring cycle from programming, through measuring and read out the registered values. Name of handling console software is "VHR Konzol" run on a PC under Windows operation systems.

Console software communicates with the instruments by USB channels or by GPRS modems. By means of these ways the control and configuration commands can be downloaded to the equipment or the registered data can be read out.

In case of GPRS communication both the control PC, both the instrument have equipped with special modems. Only VERTESZ delivered modems can communicate with VHR-22, or VHR-23 instruments.

The register equipment

The following data must be set during VHR-XX configuration by "VHR Konzol": Voltage range, current range, averaging time, length of measuring period, starting condition, selection of measured values, starting condition of disturbance analyser, etc. Furthermore base data of minutes must be defined e.g. transformer identification number, measured place address, endpoint number, etc.

Measured values are stored in an encrypted file. It can be transformed to .xls, or.csv structure by "VHR Konzol" program. Register file contains not only the measured values but the configuration parameters, the voltage events with phase ID, their length, their types, etc. The file contains the event log of the instrument during the operation, e.g, programming time, installation time, starting date and time, etc. as well.

■ **other application software**

Trendanal – graphical evaluation software for displaying the registered values (.xls, .vhx, .vad, .mdb), in curves form. Program can open directly the encrypted register files as .vhx, and .vad. The same graph contains more curves by the same time period, e.g. more voltage, more current values registered with different instruments. The curves can be scrolled, panned, zoomed, and moved. Each curve can be equipped with cursor. Upper and lower limit lines can be defined and displayed. A complex analysis can be executed by Trendanal. .xls, .mdb files import are helped.

Reginfo – automatic control and evaluation database system for clients who have big number of VHR-XX equipment. It can manage a lot of user authentication, store an instrument register, measuring place register, measured values database. It can calculate statistical reports for the quality of distribution networks, generate report minutes for state authorities, for clients in case of quality reclamation. It can automatically program the selected instrument and lots of similar other function.

■ **Further VHR-XX register instruments of VERTESZ Elektronika**
- VHR-10
- VHR-11
- VHR-12
- VHR-14
- VHR-20
- VHR-21

Installation diagram of VHR-23

Branch line
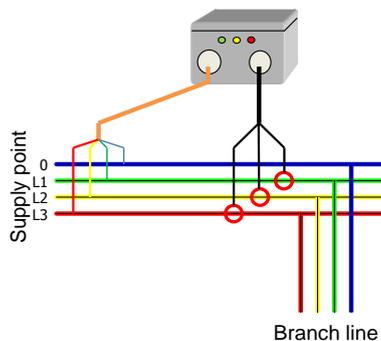
- **technical data**

Data are valid between T=0…+50ºC range

Supply:	
Power supply:	230V AC
Energy consumption:	max. 4VA GPRS without communication
	max. 8VA GPRS during communication
Voltage range:	Min.: 138V single phase
	Max.: 480V
Isolation strength	CAT. III @ 230V
Size of internal data memory	64Mbyte (VHR-22 32Mbyte)

General inputs (meauring):	
Input signal:	Periodical (45-55Hz)
	Waveform optional
Nominal frequency:	50Hz

Current input for flexible current sensors	
Nominal ranges:	50A, 100A, 200, 400, 800, 1600 and 3200A (programmable)
Lasting overload:	10kA in all ranges

Voltage inputs (230V):	
Nominal range:	0-230V AC
Overload	480V AC

Accuracy	
Voltage (phase effective values and symmetrical components):	0,2% (0,02-1,2U_{Nom})
Current effective values	0,2% (0,02-1,2I_{Nom}) without current sensor
	1% with flexible current sensor
Power (P, Q, S)	0,5 % without current sensor
	3% and ±0,5° with flexible current sensors

Mechanical data:	
Protection: (housing)	IP65
Size:	260 x 160 x 90 mm without fixing consoles
	380 x 160 x 12 mm with fixing consoles
Mass:	3,84kg

Others	
Communication	
	USB connector, GPRS modem
Sampling rate:	12kHz
Averaging time	1-15 minutes(1 minutes steps)
Switch-on time	max. 60s
Position	Optional
Operation temperature	0ºC - 50ºC
Enclosure	electromagnetically shielded, UV protected plastic box and signal cables
Noise immunity	IEC 60255