STEK

Class A power quality analyser

Recording

Hundreds of parameters stored in memory every 10/12 periods.

Alarms

The parameters are monitored within configurable limits.

Transients

Fast events are captured and their characteristics are stored in memory.

TrueInrush

Studying loads during startup is now much simpler.

QUALISTAR Class A PQA 900

The Qualistar moves up a grade

- Voltage quality diagnostics
- Full compliance with IEC 61000-4-30 Class A
- Highly communicating instrument
- Qualistar range of easy-to-use products

IP 54 | WEB SERVER | WIFI | 1000V CAT IV | SD | Eco Conception

Measure up

Intended for inspection and maintenance teams on industrial or tertiary installations , the Qualistars give you a snapshot of the main electrical network quality features.

Comfortable to handle and equipped with an intuitive GUI, these analysers offer high measurement accuracy. They also feature numerous calculated values and several processing functions.

All the data recorded are saved on an accessible SD card. They can be transferred onto a PC by means of the software or by duplication on a USB drive connected directly to the Qualistar. The memory card can also be extracted.

Functions & Measurements

General

- Portable energy quality anaylser
- Instrument compliant with IEC 61000-4-30 edition 3.0 Class A for all functions
- Measurements on all installation types: three-phase, Aron connection, etc.
- Electrical network monitoring with setting of alarms
- IP54 casing 55 mm thick with stand
- IEC 61010 CAT IV 1000 V
- Parameterization with software for EN 50160 reports

Measurements

- All DC components taken into account
- Harmonics (amplitude and phase shift) from DC to the 63rd order
- Inter-harmonic subgroups from 0 to the 62nd order
- 2 carrier current frequencies monitored
- Measurement of P, N, Q_1, S and D power values (total and per phase)
- Measurement of energy values (total and per phase) with Energy valuation
- Internal GPS for precise UTC synchronization (NTP possible too)

Communication

- USB 2.0 external flash drive supported (host devices)
- USB 2.0 connection with a PC
- Ethernet 100 Mbps communication
- Wi-Fi 802.11b/g communication
- Webserver for a remote user interface with Android, Microsoft and iOS applications
- Backup and recording of screenshots (image and data)
- Recording and export to a PC
- Software for real-time data recovery and communication with a PC

Ergonomics

- Wide 7-inch colour LCD touch screen (WVGA)
- Real-time display of waveforms (4 voltage and 4 current)
- DC current sensor power supply
- 5 x 50 Hz/60 Hz AC/DC voltage inputs
- User-friendly, multlingual GUI
- Intuitive use
- User profiles
- Fully multi-task instrument
- Automatic recognition of different current sensors
- Display of phasor diagrams
- Waveforms at 512 samples per cycle, with Min/Max 2.5μs
- Real-time waveforms displayed from 1 cycle to 10/12 cycles

Calculations

- Calculation of K factor & FHL
- Calculation of distorting voltages and currents
- Calculation of Displacement Power Factor (DPF) and Power Factor (PF)
- Calculation of Pst & Plt flicker and the sliding Pst
- Calculation of unbalance (current and voltage)
- Waveform Inrush with a duration of 10 minutes
- RMS and Peak Inrush for up to 30 minutes
- Capture of hundreds of 2.5 μs transients
- Capture shockwaves up to 12kV with a resoluton of 500ns
- Recording of trends
- Trend recording period from 200 ms to 2 hrs

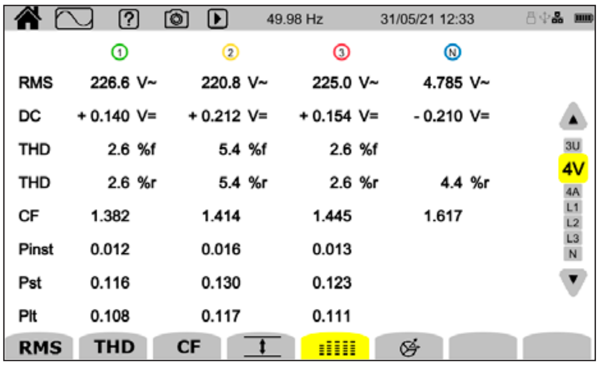
IEC 61000-4-30

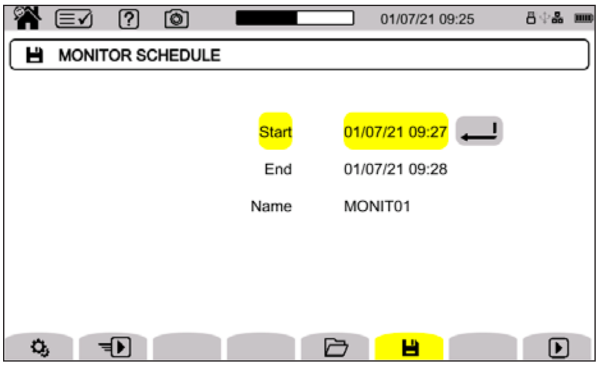
Definition of the measurement methods

The International Electrotechnical Commission (IEC) has drawn up the IEC 61000-4-30 standard. This standard defines:

- the methods for measuring the quality parameters for the supply of power to electrical power networks
- in the form of alternating current at a stated fundamental frequency
- and how to interpret the results.

The measurement parameters are described for each applicable parameter in terms which provide reliable, repeatable results, however the method is implemented.





EN 50160

Homogeneous tolerances

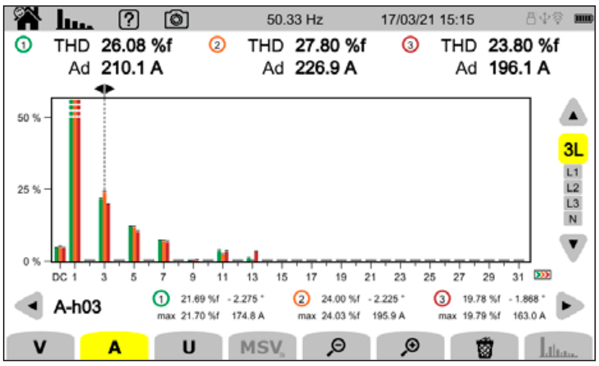
The EN 50160 standard characterizes the quality of the voltage supplied. It presents the different types of disturbances which may affect the voltage on a network. It lists the parameters to be monitored and defines how long the parameters should be monitored for.

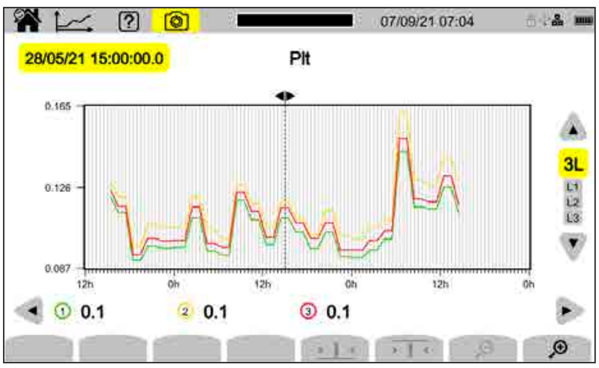
With the PAT3 software, the Monitoring mode can be used to set up a simplified configuration of all the limits to be monitored and the parameters to be recorded.

IEC 61000-4-7

Harmonics and interharmonics

The IEC 61000-4-7 standard defines the measurement methods for voltage quality analysers so that they remain compliant with the emission levels stipulated in certain standards (e.g. the harmonic current limits specified by IEC 61000-3-2) and for the measurement of harmonic currents and voltages on the power networks themselves.





IEC 61000-4-15

Short or long-term flicker

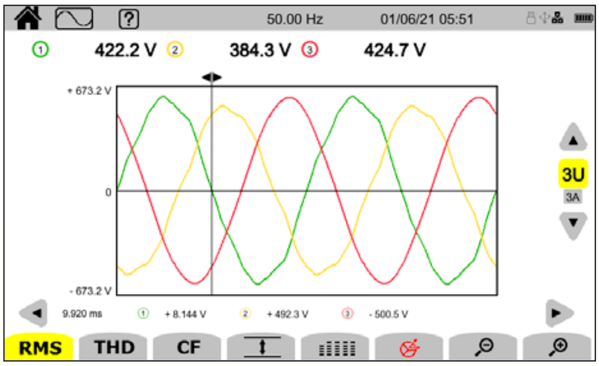
This is caused by mains voltage modulation. When it affects lighting, it gives an impression of unstable vision due to a light stimulus whose luminance or spectral distribution fluctuates over time.

There are 2 parameters calculated from the mains voltage.

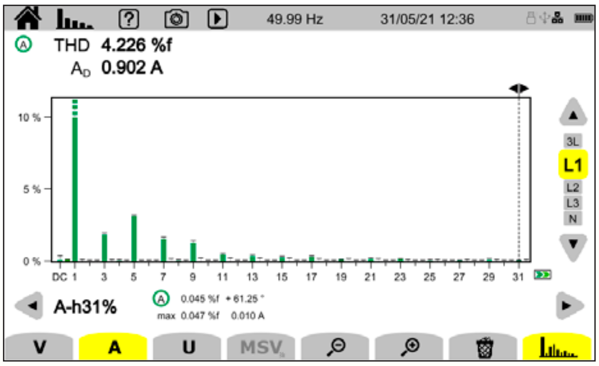
- P_{st} which is a short-term assessment based on a 10-minute observation period
- P_{lt} which is a long-term assessment, usually over a period of 2 hours

Viewing the signal and its components

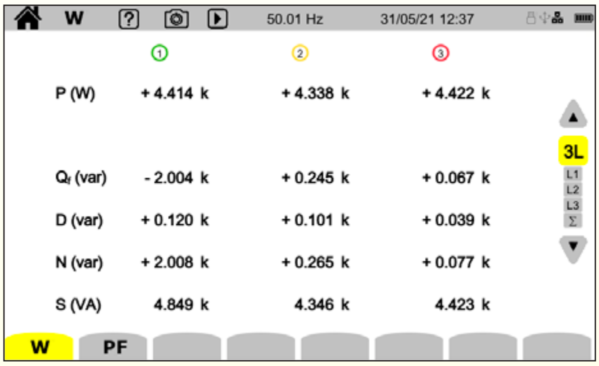
The PQA900 is an easy-to-use analytical tool. After connection, the PQA900 immediately and totally automatically displays the voltages up to 1,000 V AC and DC and the currents, thanks to a function which automatically recognizes the sensor connected. A large number of sensors are compatible with the Qualistar range.



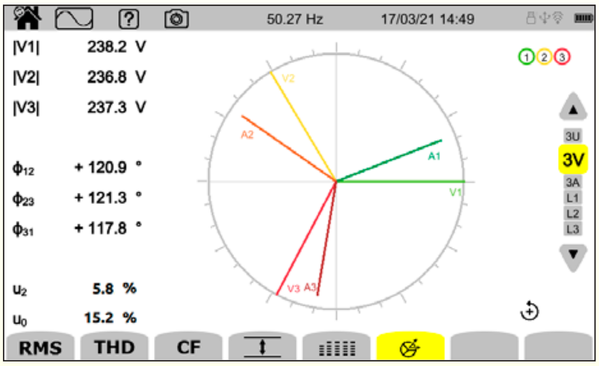
The Waveform mode automatically provides an oscillogram showing the voltage and/or current waveforms.



It is very simple to measure harmonics and interharmonics with the **PQA900** which is very easy to use as an analytical tool.

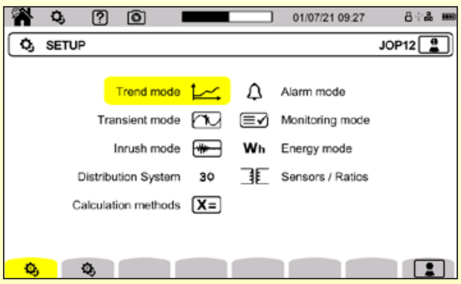


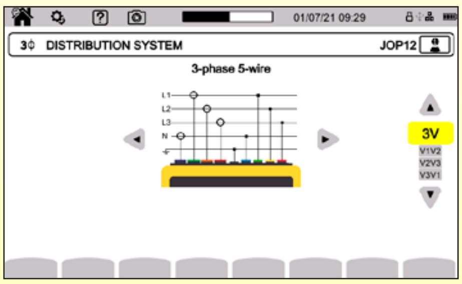
The **PQA900** can be used to monitor all the power values (P, Q, D, etc.) in real time over periods of varying durations. Measurement and analysis of all the power values measured enables you to perform a full power survey in compliance with the standards.

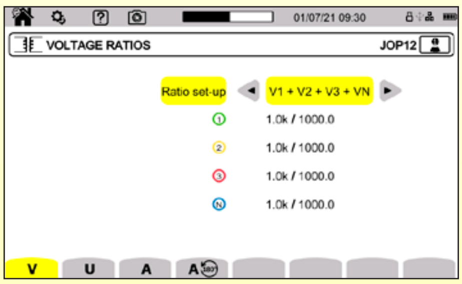


The phase relation between the voltages and currents is displayed with a vectorial diagram. The vectorial representation allows you to confirm that the instrument is connected to the mains.

With a simplified configuration

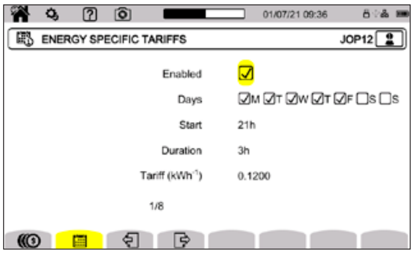


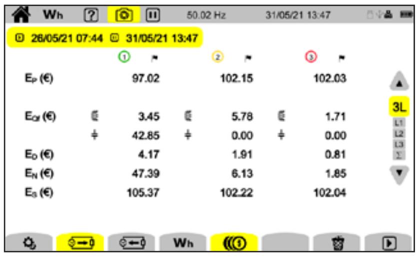


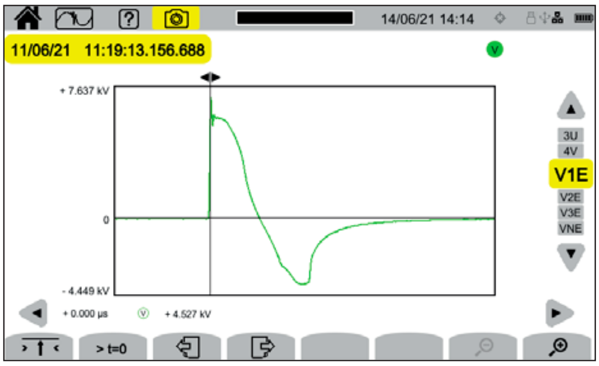


Energy valuation

The Qualistar Class A offers users all the measurements required to successfully implement energy efficiency projects and monitor electricity distribution.





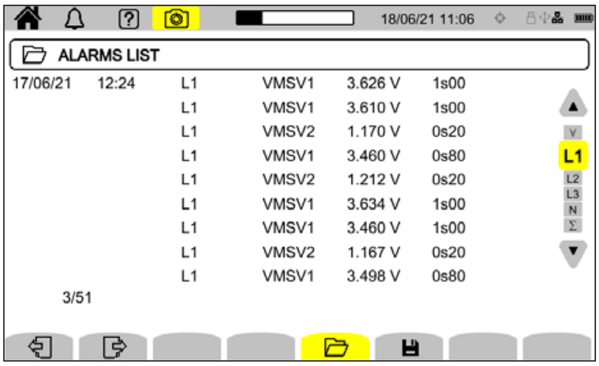


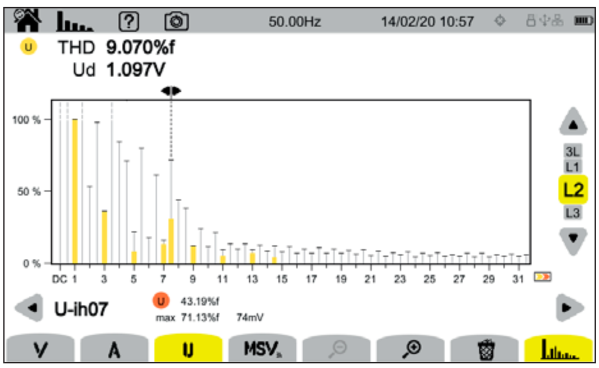
Shockwaves

Usually caused by lightning, shockwaves are spectacular instantaneous electrical voltage surges. They also propagate in the digital network. The Qualistar Class A can withstand shockwaves up to 12 kV which are sampled every 500 ns.

Carrier currents

In the harmonic analysis function, there is also a mode for monitoring carrier currents. After defining their frequency in the instrument, the command signals will then be measured.



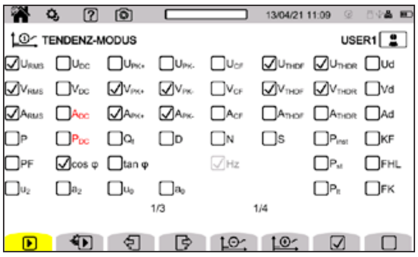


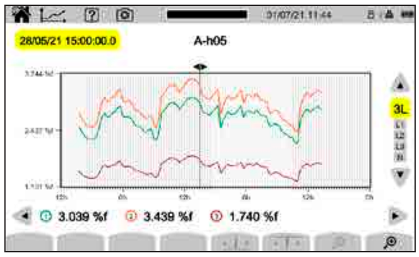
Interharmonics

The Qualistar Class A models can be used to measure and display the interharmonics, as requested in IEC 61000-4-7, for very precise analysis of all the disturbances on an electrical network.

Trend

The trend graph shows the variations of the parameters measured over time every 200ms.

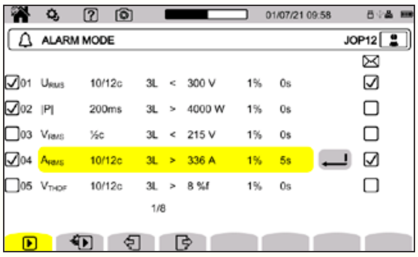


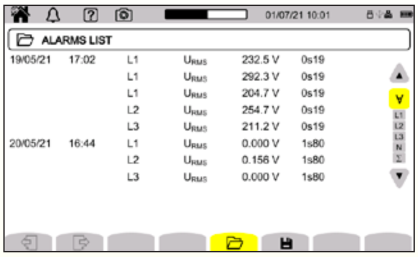


Alarms

Alarms for parameterizing the threshold overruns to be monitored, which are then recorded and time-stamped with the duration and extreme values.

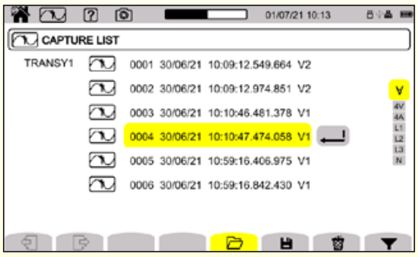
Users can be informed directly by email when an alarm is triggered.





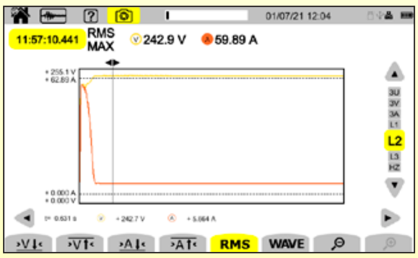
Transients

Transients correspond to peaks in the voltage or current waveform. Shockwaves are extremely fast transients with even greater possible amplitude

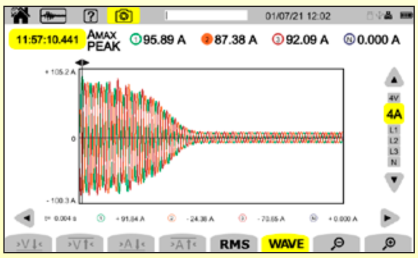


TrueInrush

For tests when starting up loads, these instruments can record ½-period values covering more than half an hour and the waveform of the signal (three-phase voltages and currents).

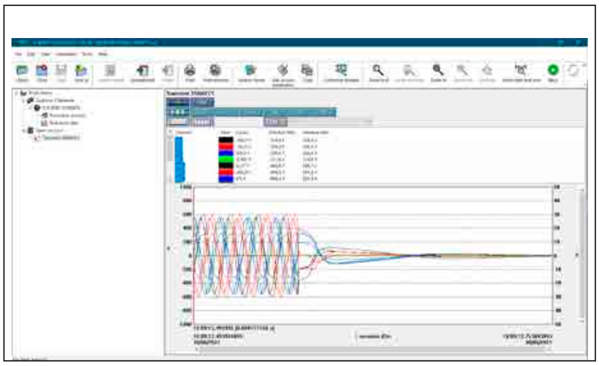


30 min



10 min

Software

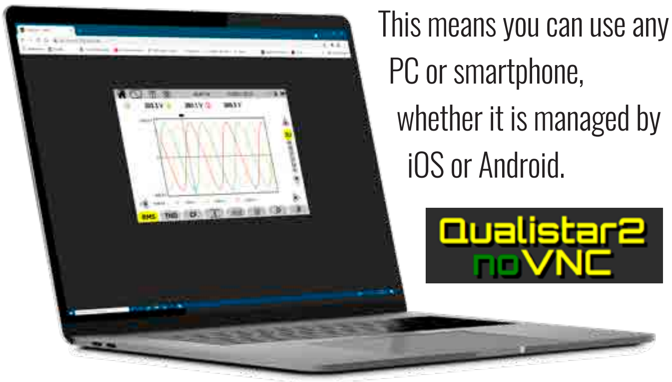


The Power Analyzer Transfer software processes the measurements made with the Qualistar Class A.

- Configuration of the instrument: setup, recording, alarms
- Real-time display
- Processing of all the recorded data
- Transfer of screenshots and transients
- Data export into spreadsheet (Excel, .CSV)
- Data export in graphic form in Windows™

The web server

The Qualistar Class A models are equipped with firmware for remote access. It can be controlled via VNC. which controls a remote machine while displaying its desktop. It can be activated from any browser (Chrome, Edge, Firefox, Qwant, etc,).



This means you can use any PC or smartphone, whether it is managed by iOS or Android.

Qualistar2 noVNC

Communication

In addition to using media such as SD cards and USB keys, it is possible to recover the measurements and communicate with the instrument remotely via USB, remote links, Wifi (direct or via server) or RJ45.

There is no limit to accessibility of the measurements.

IRD Server

All our IT networks are protected against external attack. Thanks to the provision of access to our IRD server, a single authorized IP output address allows you to transmit your measurements all over the world.

SCPI commands

With an integrated interfacing software layer, it is possible control your instrument via its own software application. SCPI commands are available for all the instrument's functions.

Data files in JSON format

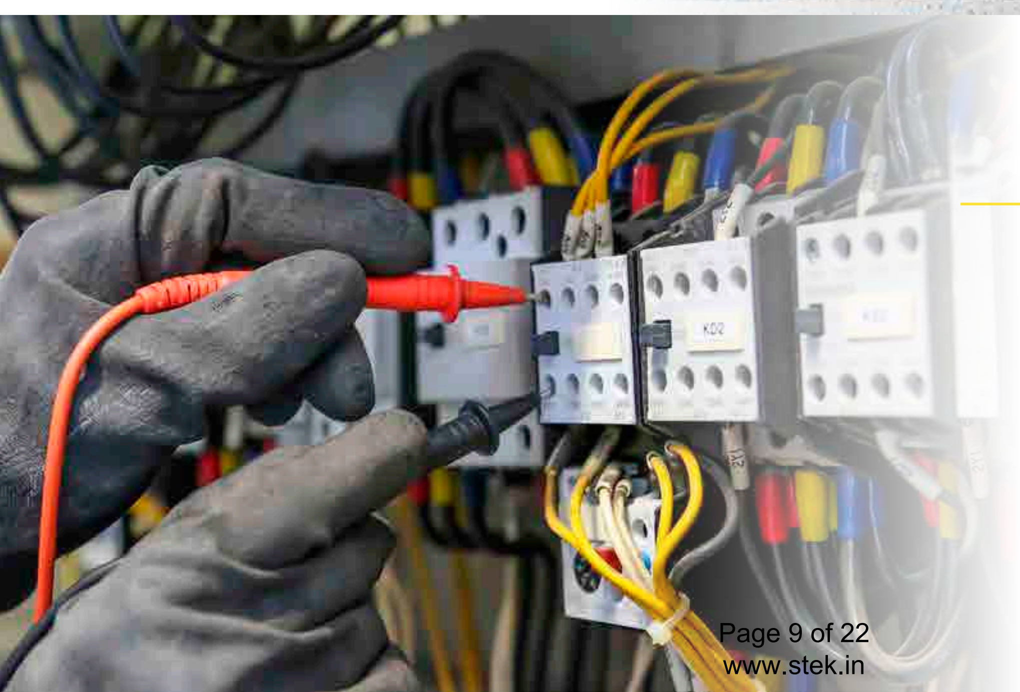
Saved in JSON format, all the recordings are accessible and can be processed with a third-party and/or proprietary application.

Tertiary and industrial

Today, electrical distribution networks are judged according to their ability to power loads causing disturbances and loads sensitive to disturbances.
The latter may take multiple forms.
A voltage quality analyser can be used to detect and qualify each one: outage, dip, voltage swell, flicker, THD, voltage variations, etc.

Energy efficiency

For energy diagnostics on a site, a logger must be set up to record the electrical power and energy consumed. Once all the measurements have been taken, the billing data are compared with the actual measurements.
The study determines whether corrective action needs to be taken. This action may take different forms: resizing of a transformer, implementation of filtering systems, replacement of faulty equipment, etc.
This analysis helps you to act in the right place at the right time to provide the best solution.



Power Quality

The spread of electronic power supplies in industrial processes has led to an increase in harmonic disturbances on the electrical network which have a direct impact on the quality of the energy distributed.
In the short or medium term, these disturbances may cause failures across all the electrical devices connected to the network in question.
Harmonic currents have negative effects on nearly all the components in the electrical system, creating new dielectric, thermal and/or mechanical stresses.

Current accessories

Model	MN93	MN93A	MA194	PAC 93	A193-450 A193-800	C193	E3N / E27	J93
Measurement range	500 mA to 200 Aac	0.005 Aac to 100 Aac	100 mA to 10 kAac	1 A to 1,000 Aac 1 A to 1,300 Adc	100 mA to 10 kAac	1 A to 1,000 Aac	50 mA to 10 Aac/dc 100 mA to 100 Aac/dc	50 A to 3,500 Aac 50 A to 5,000 Adc
Clamping diam. /length	20 mm	20 mm	Ø 70mm / 250mm Ø 100mm / 350mm Ø 300mm / 1,000mm	1 x Ø 39 mm 2 x Ø 25 mm	Ø 140 mm / 450 mm Ø 250 mm / 800 mm	52 mm	11.8 mm	72 mm
IEC 61010	600 V CAT III / 300 V CAT IV		1000 V CAT III / 600 V CAT IV	600 V CAT III / 300 V CAT IV	1000 V CAT III / 600 V CAT IV	600 V CAT IV	600 V CAT III / 300 V CAT IV	600 V CAT III / 300 V CAT IV

Essailec unit

A cable with an ESSAILEC plug can be used to perform tests without disturbing or interrupting the power supply circuit on the meters and the protection relays installed in the secondary circuits of current or voltage transformers. The main advantage is that it speeds up and simplifies measurement while ensuring maximum user safety.

Reeling Box

This practical magnetized reeling box equipped with the MultiFix system lets you adjust the lengths of your cables. The reeling box can be opened to install banana cables for voltage measurements or MiniFlex MA194 sensors for current measurements, as required. It also makes it simple to stow your cables.

Handy Carrying Case

All-terrain bag with watertight base and shoulder strap (380 x 280 x 200 mm)

Inside Compartment for PQA900

Compartmented internal bag for storage.

Magnetized mounting system

Power supply accessories

PA40W-2

The PA40W power supply with charger can power the instrument when it is used over long periods, so that you can work without draining the internal battery. It can also be used to recharge the battery.

PA32ER

The PA32ER power supply/charger can also be used to connected directly to a 1,000 AC or DC electrical network, between phases or phase-neutral with banana leads.

	PA40W-2	PA32ER
Rated voltage and overvoltage category	600 V CAT III	1000 V CAT IV
Input voltage	100 to 260 V	100 to 1,000 VAC / 150 to 1,000 VDC
Input frequency	0 to 440Hz	DC, 40 to 70 Hz, 340 to 440Hz
Output power	40 W max	30 W max
Dimensions	160 x 80 x 57 mm	220 x 112 x 53 mm
Weight	460 g approx	900 g approx.

C8 adapter

Li-ion battery

Li-ion battery charge support

Basic Specifications of PQA900

Inputs	Voltage/current, isolated
Voltage	5 V to 1,000 V_{AC} and V_{DC}
IEC 61000-4-30 (Ed 3)	Class A (Full)
Screen	7" colour LCD touch screen: 800 x 480 (WVGA)
Clock / GPS	Yes, built-in
Real-time mode	Yes
Sampling rate	Voltage 400 kSps / Current 200 kSps / Surge 2 MSps
Power mode	Yes
Energy mode	Yes
Unbalance mode	Composite
Harmonics mode	DC to 63rd order
Interharmonics mode	0 to 62nd order
Trend recording	> 900 parameters
Alarm mode (types / number)	52 / 20,000
Carrier current detection mode	Yes
Inrush capture (number)	100
2.5 µs transients (number)	No maximum (SD card)
Shockwaves	Up to 12 kV sampled every 500ns
EN50160 monitoring mode	With PAT3 software
USB communication	Yes
SD card	Accessible, external
Ethernet	Yes
Wifi	Yes
Web server	Yes
USB key port (Type A)	Yes
Battery cartridge	Li-ion – 5800 Ah
IEC 61010 safety	CAT IV 1000V
Protection	IP54
Operating temperature	[+0 °C; +40 °C]
Environmental compliance	IEC 61557-12 & IEC 62586
Dimensions (H x L x D)	200x285x55 mm / 1.9 kg
Warranty	3 years

PQA900 Delivered with

- Safety datasheet
- Verification certificate
- 5 reeling boxes
- Removable wrist strap
- Shoulder bag
- Magnetic hook
- USB A/B cable 1.80 m long
- SD memory card
- Multilingual Quick Start Guide
- Set of 5 banana leads and crocodile clips
- Set of identification inserts and rings

PQA900 standard........P0116057

- PA40W-2 mains power supply/charger

PQA900-1000...........P01160658

- PA32ER mains power supply/charger

Accessories / Replacement parts

- 1000V STD PA32ER power supply............. P01103076
- PA40W-2 mains adapter.............................. P01102155
- C8 adapter.. P01103077
- Bag... P01298083
- SD card... P01103078
- Magnetized hook... P01103079
- Wrist strap... HX0122
- External battery charger support................. P01102130
- Li-ion battery.. P01296047
- C193 clamp.. P01120323B
- MN93 clamp... P01120425B
- MN93A clamp... P01120434B
- E27 clamp.. P01120027
- E3N/E27 adapter.. P01102081
- PAC93 clamp... P01120079B
- J93 clamp.. P01120110
- In-vehicle charger... HX0061
- AmpFlex® A193-450 mm clamp................. P01120556B
- AmpFlex® A193-800 mm clamp................. P01120531B
- MiniFlex MA194-250 mm clamp................. P01120593
- MiniFlex MA194-350 mm clamp................. P01120592
- MiniFlex MA194-1000 mm clamp.............. P01120594
- 5 A casing.. P01101959
- ESSAILEC casing.. P01102131
- PAC 93 mains adapter.................................. P01101967
- Reeling box.. P01102149
- Kit of banana leads with crocodile clips x5 P01295483
- C7 mains power cable.................................. P01295174

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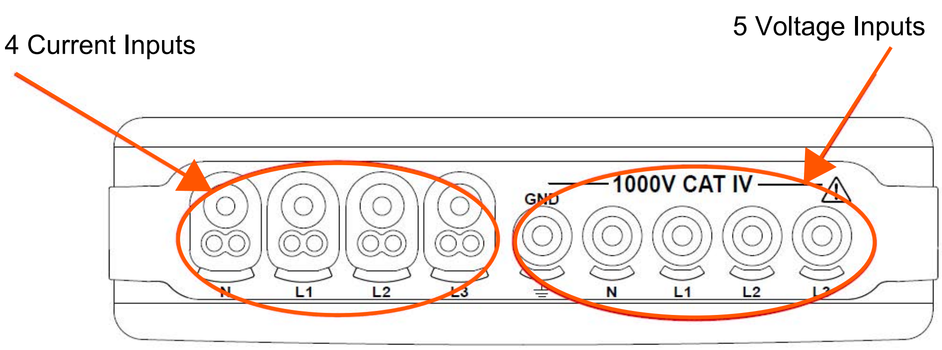
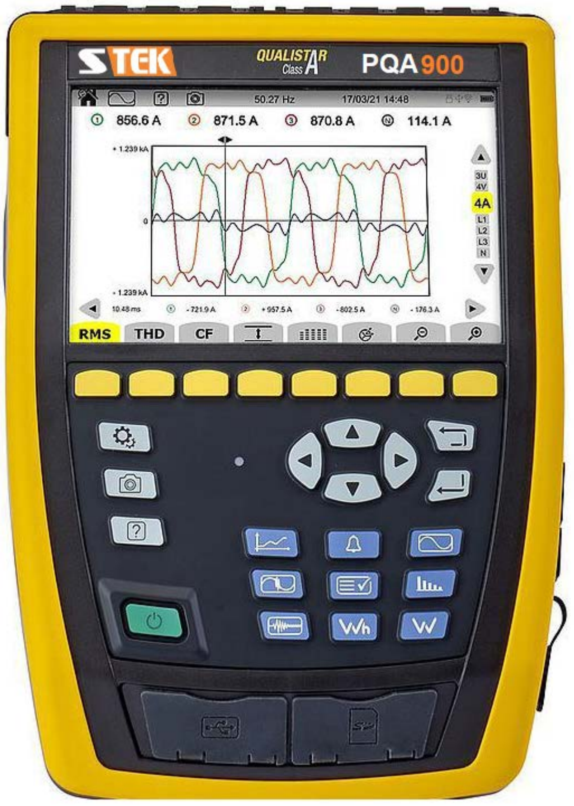
ACCURACY OF QualiStar PQA900 Instrument Alone (Without Current Transformer)

Currents and Voltages:

Measurement		Measurement range without ratio (with unity ratio)		Display resolution (with unity ratio)	Maximum intrinsic error
		Minimum	Maximum		
Frequency		42.50 Hz	69.00 Hz	10 mHz	±10 mHz
Voltage RMS(4)	phase-to-neutral	5.000 V	9,999 V (1)	4 digits	±(0.1% + 100 mV)
		10.00 V	600.0 V	4 digits	±(0,1 % U_{din})
		600.1 V	1,000 V	4 digits	±(0.1% + 1 V)
	phase-to-phase	5.000 V	19.999 V (1)	4 digits	±(0.1% + 100 mV)
		20.00	1,500 V	4 digits	±(0,1 % U_{din})
		1,501 V	2,000 V	4 digits	±(0.1% + 1 V)
DC voltage	phase-to-neutral	5.000 V	999.9 V	4 digits	±(0.5% + 500 mV)
		1,000 V	1,200 V (2)	4 digits	±(0.5% + 1 V)
	phase-to-phase	5.000 V	999.9 V	4 digits	±(0.5% + 500 mV)
		1,000 V	2,400 V (2)	4 digits	±(0.5% + 1 V)
Distorting RMS½	phase-to-neutral	2.000 V	1,000 V	4 digits	±(0.5% + 500 mV)
	phase-to-phase	2.000 V	999.9 V (1)	4 digits	±(0.5% + 500 mV)
		1,000 V	2000 V (1)	4 digits	±(0.5% + 1 V)
Distorting voltage	phase-to-neutral	2.000 V	999.9 V	4 digits	±(1.5% + 500 mV)
		1,000 V	1414 V (3)	4 digits	±(1.5% + 1 V)
	phase-to-phase	2.000 V	999.9 V	4 digits	±(1.5% + 500 mV)
		1,000 V	2828 V (3)	4 digits	±(1.5% + 1 V)
Instantaneous sensation of flicker ($P_{inst\,max}$)		0.000	12,00 (5)	4 digits	± 8%
Severity of short-term flicker (P_{st})		0.000	12,00 (5)	4 digits	Max ±(5%; 0.05)
Severity of long-term flicker (P_{lt})		0.000	12,00 (5)	4 digits	Max ±(5%; 0.05)
Crest factor (CF) (voltage and current)		1.000	9.999	4 digits	±(1% + 5 pt) CF < 4
					±(5% + 2 pt) CF ≥ 4

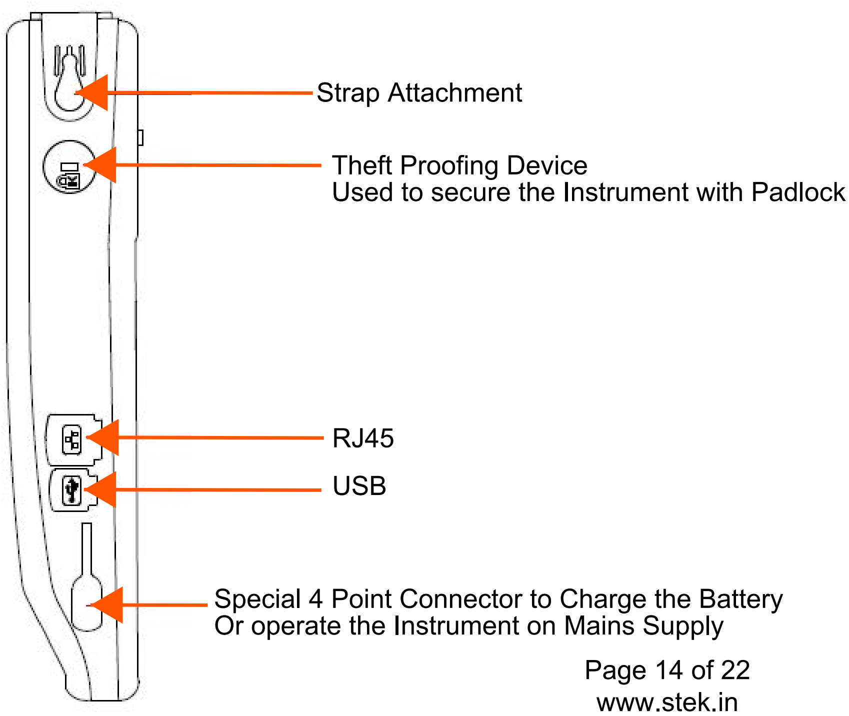
1: Provided that the voltages between the individual terminals and earth do not exceed 1000 VRMS.
2: Limitation of voltage inputs.
3: 1000 x √2 ≈ 1414; 2000 x √2 ≈ 2828.
4: Total RMS value and RMS value of the fundamental.
5: The limits specified in IEC 61000-3-3 are: P_{st} < 1,0 and P_{lt} < 0,65. Values greater than 12 are unrealistic and no uncertainty is specified for them.

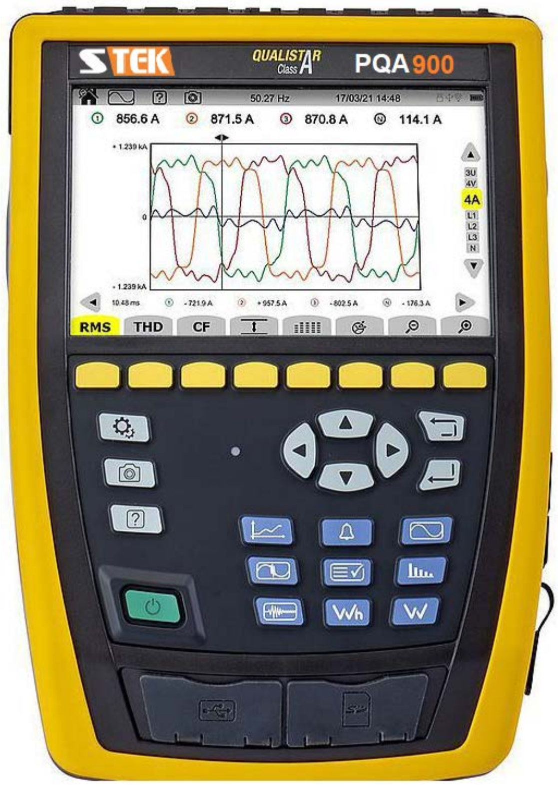




Measurement		Measurement range without ratio (with unity ratio)		Display resolution (with unity ratio)	Maximum intrinsic error
		Minimum	Maximum		
RMS current (4)	J93 clamp	3.000 A	164.9 A	4 digits	±(0.5% + 200 mA)
		165.0 A	1980 A	4 digits	±0.5 % (6)
		1981 A	3500 A	4 digits	±(0.5% + 1 A)
	C193 clamp PAC93 clamp	1.000 A	47.09 A	4 digits	±(0.5% + 200 mA)
		47.10 A	566.0 A	4 digits	±0.5 % (6)
		566.1 A	1,000 A	4 digits	±(0.5% + 200 mA)
	MN93 clamp	200.0 mA	9.429 A	4 digits	±(0.5% + 20 mA)
		9.430 A	113.0 A	4 digits	±0.5 % (6)
		113.1 A	200.0 A	4 digits	±(0.5% + 200 mA)
	E3N, E27 or E94 clamp (10 mV/A) MN93A clamp (100 A)	100.0 mA	4.709 A	4 digits	±(0.5% + 20 mA)
		4.710 A	56.60 A	4 digits	±0.5 % (6)
		56.61 A	100.0 A	4 digits	±(0.5% + 200 mA)
	E3N, E27 or E94 clamp (100 mV/A)	10.00 mA	353.9 mA	4 digits	±(0.5% + 2 mA)
		354.0 mA	4.240 A	4 digits	±0.5 % (6)
		4.241 A	10.00 A	4 digits	±(0.5% + 10 mA)
	MN93A clamp (5 A) 5 A adapter Essailec® adapter	5.000 mA	176.9 mA	4 digits	±(0.5% + 2 mA)
		177.0 mA	2.120 A	4 digits	±0.5 % (6)
		2.121 A	5.000 A	4 digits	±(0.5% + 2 mA)
	MINI94 clamp	50.0 mA	9.429 A	4 digits	±(0.5 % + 20 mA)
		9.430 A	113.0 A	4 digits	±0.5 % (6)
		113.1 A	200.0 A	4 digits	±(0.5 % + 200 mA)
	AmpFlex® A193 MiniFlex® MA194 (10 kA)	10.00 A	299.9 A	4 digits	±(0.5% + 3 A)
		300.0 A	3,000 A	4 digits	±0.5 % (6)
		3001 A	10,000 A	4 digits	±(0.5% + 3 A)
	AmpFlex® A193 MiniFlex® MA194 (1000 A)	1.000 A	29.99 A	4 digits	±(0.5% + 0.5 A)
		30.00 A	300.0 A	4 digits	±0.5 % (6)
		300.1 A	1,000 A	4 digits	±(0.5% + 0.5 A)
	AmpFlex® A193 MiniFlex® MA194 (100 A)	100.0 mA	2.999 A	4 digits	±(0.5% + 100 mA)
		3.000 A	30.00 A	4 digits	±0.5 % (6)
		30.01 A	100 A	4 digits	±(0.5% + 3 A)
DC current	J93 clamp	3 A	5000 A	4 digits	±(1% + 1 A)
	PAC93 clamp	1 A	1300 A (1)	4 digits	±(1% + 1 A)
	E3N, E27 or E94 clamp (10 mV/A)	100 mA	100 A (1)	4 digits	±(1% + 100 mA)
	E3N, E27 or E94 clamp (100 mV/A)	10 mA	10 A (1)	4 digits	±(1% + 10 mA)

4: Total RMS value and RMS value of the fundamental.
6: The intrinsic uncertainty of class A is ± 1%.





Measurement		Measurement range without ratio (with unity ratio)		Display resolution (with unity ratio)	Maximum intrinsic error
		Minimum	Maximum		
Distorting RMS½ (8)	J93 clamp	1.000 A	3500 A	4 digits	±(1% + 1 A)
	C193 clamp PAC93 clamp	1.000 A	1000 A	4 digits	±(1% + 1 A)
	MN93 clamp	200.0 mA	200.0 A	4 digits	±(1% + 1 A)
	E3N, E27 or E94 clamp (10 mV/A) MN93A clamp (100 A)	100.0 mA	100.0 A	4 digits	±(1% + 100 mA)
	E3N, E27 or E94 clamp (100 mV/A)	10.00 mA	10.00 A	4 digits	±(1% + 10 mA)
	MN93A clamp (5 A) 5 A adapter Essailec® adapter	5.000 mA	5.000 A	4 digits	±(1% + 10 mA)
	MINI94 clamp	50.0 mA	200.0 A	4 digits	±(1 % + 1 A)
	AmpFlex® A193 MiniFlex® MA194 (10 kA)	10.00 A	10.00 kA	4 digits	±(2.5% + 5 A)
	AmpFlex® A193 MiniFlex® MA194 (1000 A)	10.00 A	1000 A	4 digits	±(2.5% + 5 A)
	AmpFlex® A193 MiniFlex® MA194 (100 A)	100.0 mA	100.0 A	4 digits	±(2.5% + 200 mA)
Peak current (PK)	J93 clamp	1.000 A	4950 A (7)	4 digits	±(1% + 2 A)
	C193 clamp PAC93 clamp	1.000 A	1414 A (7)	4 digits	±(1% + 2 A)
	MN93 clamp	200.0 mA	282.8 A (7)	4 digits	±(1% + 2 A)
	E3N, E27 or E94 clamp (10 mV/A) MN93A clamp (100 A)	100.0 mA	141.4 A (7)	4 digits	±(1% + 200 mA)
	E3N, E27 or E94 clamp (100 mV/A)	10.00 mA	14.14 A (7)	4 digits	±(1% + 20 mA)
	MN93A clamp (5 A) 5 A adapter Essailec® adapter	5.000 mA	7.071 A (7)	4 digits	±(1% + 20 mA)
	MINI94 clamp	50.0 mA	282.8 A (7)	4 digits	±(1 % + 2 A)
	AmpFlex® A193 MiniFlex® MA194 (10 kA)	10.00 A	14.14 kA (7)	4 digits	±(3% + 5 A)
	AmpFlex® A193 MiniFlex® MA194 (1000 A)	10.00 A	1414 kA (7)	4 digits	±(3% + 5 A)
	AmpFlex® A193 MiniFlex® MA194 (100 A)	100.0 mA	141.4 A (7)	4 digits	±(3% + 600 mA)

Table 3

7: $3500 \times \sqrt{2} \approx 4950$; $1000 \times \sqrt{2} \approx 1414$; $200 \times \sqrt{2} \approx 282.8$; $100 \times \sqrt{2} \approx 141.4$; $10 \times \sqrt{2} \approx 14.14$; $10000 \times \sqrt{2} \approx 14140$; $6500 \times \sqrt{2} \approx 9192$;

8: RMS½: RMS values of the voltages measured in 1 cycle, starting at a zero crossing of the fundamental, refreshed at each half-cycle.

ACCURACY OF QualiStar PQA900 Instrument Alone (Without Current Transformer)

Power And Energy:

Measurement		Measurement range without ratio (with unity ratio) Minimum	Maximum	Display resolution (with unity ratio) (11)	Maximum intrinsic error
Active power (P) (1)	Without Flex®	1.000 W (3)	10.00 MW (4)	4 digits (5)	±(1% + 10 pt) |cos φ| ≥ 0,8
					±(1.5% + 10 pt) 0,2 ≤ |cos φ| < 0,8
	AmpFlex® MiniFlex®	1.000 W (3)	10.00 MW (4)	4 digits (5)	±(1% + 10 pt) |cos φ| ≥ 0,8
					±(1.5% + 10 pt) 0,5 ≤ |cos φ| < 0,8
Reactive power (Q_f) (2) and non-active power (N)	Without Flex®	1.000 var (3)	10.00 Mvar (4)	4 digits (5)	±(1% + 10 pt) |sin φ| ≥ 0,5 and THD ≤ 50%
					±(1.5% + 10 pt) 0,2 ≤ |sin φ| < 0,5 and THD ≤ 50%
	AmpFlex® MiniFlex®	1.000 var (3)	10.00 Mvar (4)	4 digits (5)	±(1.5% + 10 pt) |sin φ| ≥ 0,5 and THD ≤ 50%
					±(1.5% + 20 pt) 0,2 ≤ |sin φ| < 0,5 and THD ≤ 50%
Distorting power (D) (7)		1.000 var (3)	10.00 Mvar (4)	4 digits (5)	±(2 % S +(0,5 % n_{max} + 50 pt) THD_A ≤ 20 %f and |sin φ| ≥ 0,2
					±(2 % S +(0,7 % n_{max} + 10 pt) THD_A > 20 %f and |sin φ| ≥ 0,2
Apparent power (S)		1.000 VA (3)	10.00 MVA (4)	4 digits (5)	±(1% + 10 pt)
DC power (Pdc)		1.000 W (8)	6.000 MVA (9)	4 digits (5)	±(1% + 10 pt)
Power factor (PF)		-1	1	0.001	±(1.5% + 10 pt) |cos φ| ≥ 0,2
Active energy (E_P) (1)	Without Flex®	1 Wh	9 999 999 MWh (6)	up to 7 digits (5)	±(1% + 10 pt) |cos φ| ≥ 0,8
					±(1.5% + 10 pt) 0,2 ≤ |cos φ| < 0,8
	AmpFlex® MiniFlex®	1 Wh	9 999 999 MWh (6)	up to 7 digits (5)	±(1% + 10 pt) |cos φ| ≥ 0,8
					±(1.5% + 10 pt) 0,5 ≤ |cos φ| < 0,8
Reactive energy (E_{Qf}) (2) and non-active energy (E_N) (2)	Except Flex®	1 varh	9 999 999 Mvarh (6)	up to 7 digits (5)	±(1% + 10 pt) |sin φ| ≥ 0,5 and THD ≤ 50%
					±(1.5% + 10 pt) 0,2 ≤ |sin φ| < 0,5 and THD ≤ 50%
	AmpFlex® MiniFlex®	1 varh	9 999 999 Mvarh (6)	up to 7 digits (5)	±(1.5% + 10 pt) |sin φ| ≥ 0,5 and THD ≤ 50%
					±(1.5% + 20 pt) 0,2 ≤ |sin φ| < 0,5 and THD ≤ 50%
Distorting energy (E_D)		1 varh	9 999 999 Mvarh (6)	up to 7 digits (5)	±(2 % S +(0,5 % n_{max} + 50 pt) THD_A ≤ 20 %f and |sin φ| ≥ 0,2
					±(2 % S +(0,7 % n_{max} + 10 pt) THD_A ≤ 20 %f and |sin φ| ≥ 0,2
Apparent energy (E_S)		1 VAh	9 999 999 MVAh (6)	up to 7 digits (5)	±(1% + 10 pt)
DC energy (E_{PDC})		1 Wh	9 999 999 MWh (10)	up to 7 digits (5)	±(1% + 10 pt)

Table 4

1: The uncertainties on the active power and energy measurements are greatest at |cos φ| = 1 and typical for the other phase differences.
2: The uncertainties on the reactive power and energy measurements are greatest at |sin φ| = 1 and typical for the other phase differences.
3: For the MN93A clamps (5 A) or the 5 A adapters.
4: For the AmpFlex® and the MiniFlex® and for a single-phase, 2-wire connection.
5: The resolution depends on the current sensor used and on the value to be displayed.
6: The energy corresponds to more than 114 years of the associated maximum power with unity ratios.
7 : n_{max} is the highest order of which the harmonic level is not zero. THD_A is the THD of the current.
8: For 100 mV/A E3N, E27 or E94 clamps.
9: For J93 clamps and a single-phase, 2-wire connection.
10: The energy corresponds to more than 190 years of the maximum power Pdc at unit ratios.
11: The display resolution is determined by the apparent power (S) or apparent energy (Es)

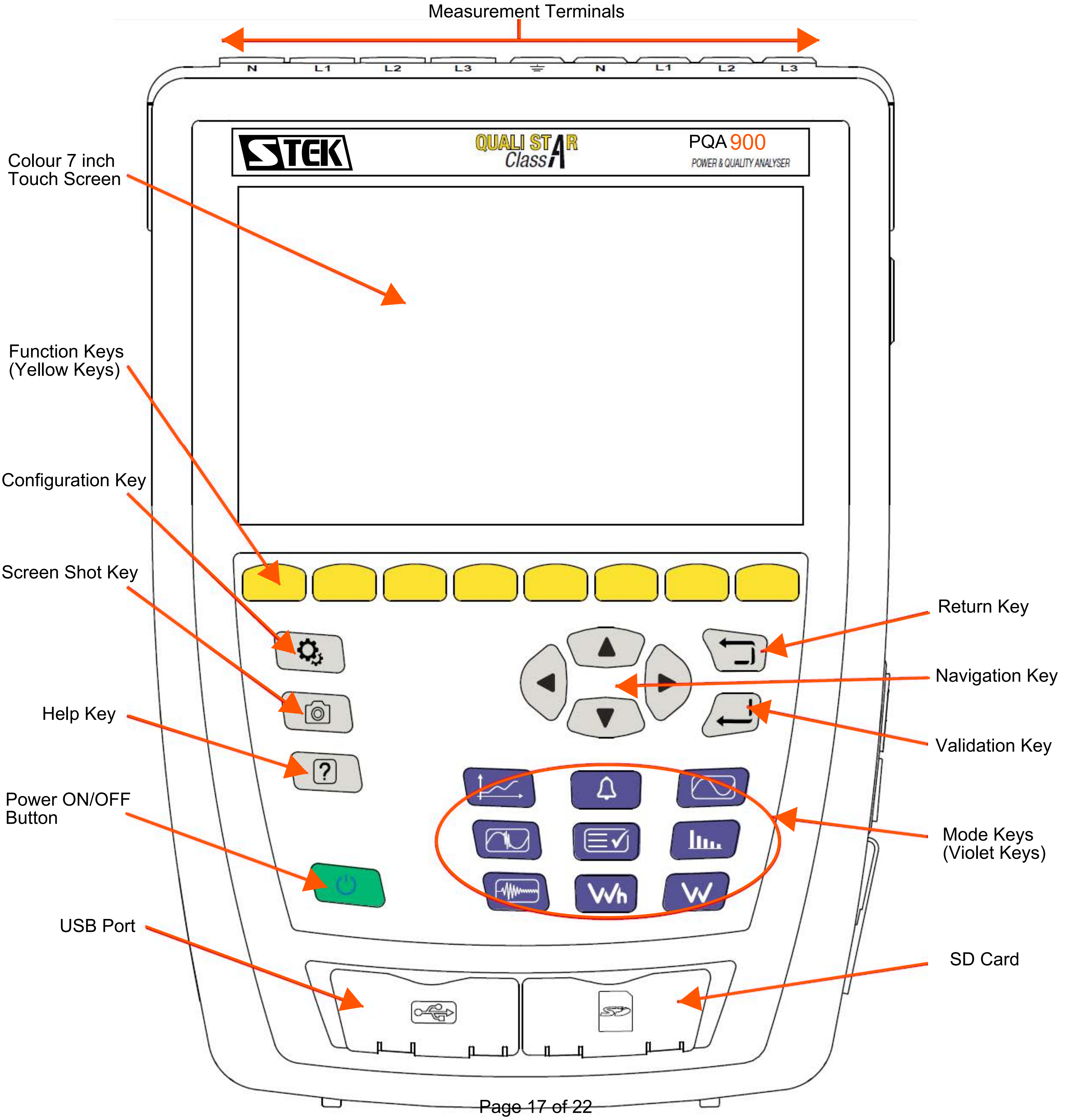
ACCURACY OF QualiStar PQA900 Instrument Alone (Without Current Transformer)

Parameters Assosiated With Power Values:

Measurement	Measurement range		Display resolution	Maximum intrinsic error
	Minimum	Maximum		
Fundamental phase differences	-179°	180°	0.1°	±2°
cos φ (DPF, PF_1)	-1	1	4 digits	±5 pt
tan φ	-32.77 (1)	32.77 (1)	4 digits	±1° if THD < 50%
Voltage unbalance (u_0)	0%	100%	0.1%	±3 pt if $u_0 \leq 10\%$
				±10 pt if $u_0 > 10\%$
Current unbalance (a_0)	0%	100%	0.1%	±10 pt

Table 5

1: |tan φ| = 32.767 corresponds to φ = ±88.25° + k × 180° (with k a natural integer)



ACCURACY OF QualiStar PQA900 Instrument Alone (Without Current Transformer)

HARMONICS:

Measurement	Measurement range		Display resolution	Maximum intrinsic error
	Minimum	Maximum		
Harmonic level of voltage (τ_n)	0%	1500%f 100%r	0.1% τ_n < 1000 %	±(2.5% + 5 pt)
			1% $\tau_n \geq$ 1000 %	
Harmonic level of current (τ_n) (except Flex®)	0%	1500%f 100%r	0.1% τ_n < 1000 %	±(2 % + (n × 0.2 %) + 10 pt) n ≤ 25
			1% $\tau_n \geq$ 1000 %	±(2 % + (n × 0.6 %) + 5 pt) n > 25
Harmonic level of current (τ_n) (AmpFlex® and MiniFlex®)	0%	1500%f 100%r	0.1% τ_n < 1000 %	±(2 % + (n × 0.3 %) + 5 pt) n ≤ 25
			1% $\tau_n \geq$ 1000 %	±(2 % + (n × 0.6 %) + 5 pt) n > 25
Total harmonic distortion (THD) of voltage (with respect to the fundamental) of the voltage	0%	999.9%	0.1%	±(2.5% + 5 pt)
Total harmonic distortion (THD) (with respect to the fundamental) of the current (except Flex®)	0%	999.9%	0.1%	±(2.5% + 5 pt) if ∀ n ≥ 1, $t_n \leq$ (100 ÷ n) [%]
				or
				±(2 % + (n_{max} × 0.2 %) + 5 pt) $n_{max} \leq$ 25
				±(2 % + (n_{max} × 0.5 %) + 5 pt) n_{max} > 25
Total harmonic distortion (THD) (with respect to the fundamental) of the current (AmpFlex® and MiniFlex®)	0%	999.9%	0.1%	±(2.5% + 5 pt) if ∀ n ≥ 1, $t_n \leq$ (100 ÷ n^2) [%]
				or
				±(2 % + (n_{max} × 0.3 %) + 5 pt) $n_{max} \leq$ 25
				±(2 % + (n_{max} × 0.6 %) + 5 pt) n_{max} > 25
Total harmonic distortion (THD) of voltage (with respect to the signal without DC)	0%	100%	0.1%	±(2.5% + 5 pt)
Total harmonic distortion (THD) of the current (with respect to the signal without DC) (except Flex®)	0%	100%	0.1%	±(2.5% + 5 pt) if ∀ n ≥ 1, $t_n \leq$ (100 ÷ n) [%]
				or
				±(2 % + (n_{max} × 0.2 %) + 5 pt) $n_{max} \leq$ 25
				±(2 % + (n_{max} × 0.5 %) + 5 pt) n_{max} > 25
Total harmonic distortion (THD) of the current (with respect to the signal without DC) (AmpFlex® and MiniFlex®)	0%	100%	0.1%	±(2.5% + 5 pt) if ∀ n ≥ 1, $t_n \leq$ (100 ÷ n^2) [%]
				or
				±(2 % + (n_{max} × 0.3 %) + 5 pt) $n_{max} \leq$ 25
				±(2 % + (n_{max} × 0.6 %) + 5 pt) n_{max} > 25
Harmonic loss factor (FHL)	1	99.99	0.01	±(5 % + (n_{max} × 0.4 %) + 5 pt) $n_{max} \leq$ 25
				±(10 % + (n_{max} × 0.7 %) + 5 pt) n_{max} > 25
K factor (FK)	1	99.99	0.01	±(5 % + (n_{max} × 0.4 %) + 5 pt) $n_{max} \leq$ 25
				±(10 % + (n_{max} × 0.7 %) + 5 pt) n_{max} > 25
Phase differences of harmonics (order ≥ 2)	-179°	180°	1°	±(1.5° + 1° x (n ÷ 12.5)

$Nmax_{max}$ is the highest order of which the harmonic level is not zero.

Measurement		Measurement range (with unity ratio) Minimum	Measurement range (with unity ratio) Maximum	Display resolution (with unity ratio)	Maximum intrinsic error
RMS voltage of harmonic (order n ≥ 2)	phase-to-neutral	2 V	1000 V (1)	4 digits	±(2.5% + 1 V)
				4 digits	
	phase-to-phase	2 V	2000 V (1)	4 digits	±(2.5% + 1 V)
				4 digits	
Distorting voltage (RMS)	phase-to-neutral (Vd)	2 V	1000 V (1)	4 digits	±(2.5% + 1 V)
				4 digits	
	phase-to-phase (Ud)	2 V	2000 V (1)	4 digits	±(2.5% + 1 V)
				4 digits	
RMS current of harmonic RMS (3) (order n ≥ 2)	J93 clamp	1 A	3500 A	4 digits	n ≤ 25: ±(2 % + (n x 0.2%) + 1 A)
				4 digits	n > 25: ±(2 % + (n x 0.5%) + 1 A)
	C193 clamp PAC93 clamp	1 A	1000 A	4 digits	n ≤ 25: ±(2 % + (n x 0.2%) + 1 A)
				4 digits	n > 25: ±(2 % + (n x 0.5%) + 1 A)
	MN93 clamp	200 mA	200 A	4 digits	n ≤ 25: ±(2 % + (n x 0.2%) + 1 A)
				4 digits	n > 25: ±(2 % + (n x 0.5%) + 1 A)
	E3N, E27 or E94 clamp (10 mV/A) MN93A clamp (100 A)	100 mA	100 A	4 digits	n ≤ 25: ±(2 % + (n x 0.2%) + 100 mA)
				4 digits	n > 25: ±(2 % + (n x 0.5%) + 100 mA)
	E3N, E27 or E94 clamp (100 mV/A)	10 mA	10 A	4 digits	n ≤ 25: ±(2 % + (n x 0.2%) + 10 mA)
				4 digits	n > 25: ±(2 % + (n x 0.5%) + 10 mA)
	MN93A clamp (5 A) 5 A adapter Essailec® adapter	5 mA	5 A	4 digits	n ≤ 25: ±(2 % + (n x 0.2%) + 10 mA)
				4 digits	n > 25: ±(2 % + (n x 0.5%) + 10 mA)
	MINI94 clamp	5 mA	5 A	4 digits	n ≤ 25 : ±(2 % + (n x 0.2%) + 10 mA)
				4 digits	n > 25 : ±(2 % + (n x 0.5%) + 10 mA)
	AmpFlex® A193 MiniFlex® MA194 (10 kA)	10 A	10 kA	4 digits	n ≤ 25: ±(2 % + (n x 0.3%) + 1 A + (AfRMS(2) x 0.1%))
				4 digits	n > 25: ±(2 % + (n x 0.6%) + 1 A + (AfRMS(2) x 0.1%))
	AmpFlex® A193 MiniFlex® MA194 (6500 A)	10 A	6500 A	4 digits	n ≤ 25: ±(2 % + (n x 0.3%) + 1 A + (AfRMS(2) x 0.1%))
				4 digits	n > 25: ±(2 % + (n x 0.6%) + 1 A + (AfRMS(2) x 0.1%))
	AmpFlex® A193 MiniFlex® MA194 (100 A)	100 mA	100 A	4 digits	n ≤ 25: ±(2 % + (n x 0.2%) + 30 pt)
				4 digits	n > 25: ±(2 % + (n x 0.5%) + 30 pt)
Distorting current (RMS) (Ad) (3)	J93 clamp	1 A	3500 A	4 digits	±((n_{max} x 0.4%) + 1 A)
	C193 clamp PAC93 clamp	1 A	1000 A	4 digits	±((n_{max} x 0.4%) + 1 A)
				4 digits	
	MN93 clamp	200 mA	200 A	4 digits	±((n_{max} x 0.4%) + 1 A)
	E3N, E27 or E94 clamp (10 mV/A) MN93A clamp (100 A)	0.1 A	100 A	4 digits	±((n_{max} x 0.4%) + 100 mA)
				4 digits	
	E3N, E27 or E94 clamp (100 mV/A)	10 mA	10 A	4 digits	±((n_{max} x 0.4%) + 10 mA)
				4 digits	
	MN93A clamp (5 A) 5 A adapter Essailec® adapter	5 mA	5 A	4 digits	±((n_{max} x 0.4%) + 10 mA)
	MINI94 clamp	50 mA	200 A	4 digits	±((n_{max} x 0.4%) + 1 A)
	AmpFlex® A193 MiniFlex® MA194 (10 kA)	10 A	10 kA	4 digits	±((n_{max} x 0.4%) + 1 A)
				4 digits	
	AmpFlex® A193 MiniFlex® MA194 (6500 A)	10 A	6500 A	4 digits	±((n_{max} x 0.4%) + 1 A)
				4 digits	
	AmpFlex® A193 MiniFlex® MA194 (100 A)	100 mA	100 A	4 digits	±(n_{max} x 0.5%) + 30 pt)
				4 digits	

Table 6

1: Provided that the voltages between the individual terminals and earth do not exceed 1000 VRMS.
2: RMS value of the fundamental.
3: n_{max} is the highest order of which the harmonic level is not zero.

Current And Voltage Ratios:

Ratio	Minimum	Maximum
Voltage	$\frac{100}{1000 \times \sqrt{3}}$	$\frac{9999900 \times \sqrt{3}}{0.1}$
Current [1]	1/5	60,000 / 1

Table 7

1: Only for the 5 A MN93A clamps and the 5 A adapters.

Specifications Of Current Transformers (Clamp on CT)

The measurement error on the RMS current and the phase error must be added to the errors of the instrument in the case of measurements that use the current measurements: powers, energies, power factors, tangents, etc.

Type of sensor	RMS current at 50/60 Hz (ARMS)	Maximum error at 50/60 Hz	Maximum error on φ at 50/60 Hz
AmpFlex® A193	[1 000 A ... 12 000 A]	±(1,2% + 1 A)	± 0,5°
	[100 A ... 1 000 A]	±(1,2% + 0,5 A)	
	[5 A ... 100 A]	±(1,2% + 0,2 A)	
	[0,1 A ... 5 A]	±(1,2% + 0,2 A)	-
MiniFlex® MA194	[1 000 A ... 12 000 A]	±(1% + 1 A)	± 0,5°
	[100 A ... 1 000 A]	±(1% + 0,5 A)	
	[5 A ... 100 A]	±(1% + 0,2 A)	
	[0,1 A ... 5A]	±(1% + 0,2 A)	-
J93 clamp 3,500 A	[50 A ... 100 A]	±(2% + 2.5 A)	± 4°
	[100 A ... 500 A]	±(1.5% + 2.5 A)	± 2°
	[500 A ... 2,000 A]	± 1%	± 1°
	[2,000 A ... 3,500 A]	± 1%	± 1.5°
C193 clamp 1,000 A	[1 A ... 50 A]	± 1%	-
	[50 A ... 100 A]	± 0.5%	± 1°
	[100 A ... 1,200 A]	± 0.3%	± 0.7°
PAC93 clamp 1,000 A	[0.5 A ... 100 A]	±(1.5% + 1 A)	± 2.5°
	[100 A ... 800 A]	± 2.5%	± 2°
	[800 A ... 1,000 A]	± 4%	± 2°
MN93 clamp 200 A	[0.5 A ... 5 A]	±(3% + 1 A)	-
	[5 A ... 40 A]	±(2.5% + 1 A)	± 5°
	[40 A ... 100 A]	±(2% + 1 A)	± 3°
	[100 A ... 240 A]	±(1% + 1 A)	± 2.5°
MN93A clamp 100 A	[0.2 A ... 5 A]	±(1% + 2 mA)	± 4°
	[5 A ... 120 A]	± 1%	± 2.5°
MN93A clamp 5 A	[0.005 A ... 0.25 A]	±(1.5% + 0.1 mA)	-
	[0.25 A ... 6 A]	± 1%	± 5°
E3N, E27 or E94 clamp (BNC) 100 A	[0.5 A ... 40 A]	±(4% + 50 mA)	± 1°
	[40 A ... 70 A]	±15%	± 1°
E3N, E27 or E94 clamp (BNC) 10 A	[0.1 A ... 7 A]	±(3% + 50 mA)	± 1.5°
MINI94 clamp 200 A	[0.05 A ... 10 A]	± (0.2% + 20mA)	± 1°
	[10 A ... 200 A]		± 0.2°
Three-phase 5 A adapter	[5 mA ... 50 mA[	±(1% + 1.5 mA)	± 1°
	[50 mA ... 1 A[	±(0.5% + 1 mA)	± 0°
	[1 A ... 5 A]	±0.5%	± 0°

Table 8

This table does not take into account possible distortion of the measured signal (THD) because of the physical limitations of the current sensor (saturation of the magnetic circuit or of the Hall effect sensor).

Limitation of the AmpFlex® and of the MiniFlex®

As is true of all Rogowski sensors, the output voltage of the AmpFlex® and of the MiniFlex® is proportional to the frequency. A high current at high frequency can saturate the current input of the instruments.

To avoid saturation, it is necessary to satisfy the following condition:

$$\sum_{n=1}^{n=\infty} [n.\ I_n] < I_{nom}$$

With I_{nom} being the range of the current sensor
n the order of the harmonic
I_n the current of the harmonic of order n

For example, the input current range of a dimmer must be one fifth of the current range selected on the instrument. Wave-train dimmers having a non-integer number of periods are not compatible with Flex® type sensors.

This requirement does not take into account the limitation of the pass band of the instrument, which can lead to other errors.

Uncertainty Of The Real Time Clock

17.2.6. UNCERTAINTY OF THE TIME-REAL CLOCK

The uncertainty of the real-time clock is at most 80 ppm (instrument 3 years old used at an ambient temperature of 50°C).

With a new instrument used at 25°C, this uncertainty is no more than 30 ppm.

Memory Card and Storage Capacity

The PQA 900 is delivered with a 16GB Card
Depending on their Capabilities, SD card can store as bellow:

	2 GB	32 GB	64 GB
Various functions	■ 50 screenshots ■ 16,362 alarms ■ 210 searches for transients and 5 searches for shock waves ■ 1 inrush current capture, RMS+PEAK – 10 min ■ 1 trend recording of all parameters for 20 hours with a 3s sampling period	■ 50 screenshots ■ 16,362 alarms ■ 210 searches for transients and 5 searches for shock waves ■ 1 inrush current capture, RMS+PEAK – 10 min ■ 1 trend recording of all parameters for 6 days with a 3s sampling period	■ 50 screenshots ■ 16,362 alarms ■ 210 searches for transients and 5 searches for shock waves ■ 1 inrush current capture, RMS+PEAK – 10 min ■ 1 trend recording of all parameters for 40 days with a 3s sampling period
or a single trend recording of all parameters per EN 50160.	■ 0.4 day with a sampling period of 200 ms. ■ 1.9 day with a sampling period of 1 s. ■ 5.6 days with a sampling period of 3 s.	■ 0.75 day with a sampling period of 200 ms. ■ 3.75 days with a sampling period of 1 s. ■ 11.25 days with a sampling period of 3 s.	■ 3 days with a sampling period of 200 ms. ■ 15 days with a sampling period of 1 s. ■ 45 days with a sampling period of 3 s.

	32 GB	64 GB
Various functions	■ 50 screenshots ■ 16,362 alarms ■ 210 searches for transients and 5 searches for shock waves ■ 1 inrush current capture, RMS+PEAK – 10 min ■ 1 trend recording of all parameters for 84 days with a 3s sampling period	■ 50 screenshots ■ 16,362 alarms ■ 210 searches for transients and 5 searches for shock waves ■ 1 inrush current capture, RMS+PEAK – 10 min ■ 1 trend recording of all parameters for 174 days with a 3s sampling period
or a single trend recording of all parameters per EN 50160.	■ 6 days with a sampling period of 200 ms. ■ 30 days with a sampling period of 1 s. ■ 90 days with a sampling period of 3 s.	■ 12 days with a sampling period of 200 ms. ■ 90 days with a sampling period of 1 s. ■ 180 days with a sampling period of 3 s.

The shorter the recording interval and the longer the duration of a recording, the larger the file will be.