This system has 2 brushless Machine with their shaft ends are insulated built on an aluminium base with glides. The machine is to be operated on the machine bench. All connections are brought out on the overhead connection box separated on 4 mm safety plugs. The machine is protected against overload by a built-in stator winding temperature switch against overload. The nominal data is shown on three nameplates on the connection box. In addition to the protective conductor connection, a fastening for equipotential bonding line is provided via M6 thread on the connection box.

Brushless controller with motor

- 1kW power brushless motor with electronic encoder
- Voltage --------400V
- Frequency 50 Hz
- Control of the system in frequency and voltage
- Mechanical braking system for the analysis of the torque
- Encoder outputs for the analysis of speed
- Display system for controlling and monitoring events
- Button start and stop action and automatic stop intervention in case of alarm.
- Complete software for PC interfaced to the system via RS485.

Braking resistance

Three-Phase Asynchronous Motor

- Power: 1.5 kW
- Excitation voltage: minimum 127 V
- Excitation current: minimum 4.9 A
- Power factor: minimum 0.7
- Voltage: 220/380 V Δ/Y
- 4 poles
- Rated speed: 1500 rpm, 50 Hz

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

- Type of construction: B3
- Shaft end: 1
- Base: Aluminium
- Terminal box: Top
- Temperature class: B (120°)
- Degree of protection (IP): IP20
- Temperature detectors: Bimetal switches 110° NC (normally closed)

Base

- Didactic equipment: this item must consist of a steel alloy varnished structure mounted on anti-vibration rubber feet, provided with slide guides for the fixing of one or two machines and with a coupling guard.
- Complete with a device for the locking of the rotor of the slip ring asynchronous machines in the short-circuit test.
- Composition:
- Light alloy base, leveled on the upper supporting planes, with two guides for all the couplings of machines rated 1 kW.
- In the lower section high sensitivity shock absorbers must be mounted, arranged to be fixed to a supporting plane.
- Removable butt strap in varnished plate.
- Flask for the blocked rotor test in varnished light alloy.

Three-Phase Synchronous Machine

- Didactic equipment
- Machine with smooth inductor and three-phase stator armature winding for operation either as an alternator or as a synchronous motor.
- Technical features:
- Alternator: Power: 1.1 kVA - Motor:
- Power: minimum 1 kW
- Voltage: 220/380 V D/Y
- Current: 2.9/1.7 A D/Y
- Speed: 3000 rpm
- Excitation: 175 V / 0.4 A
- It must be possible to couple the electrical machine with other electrical machines through a hub and spider elastic gear ring in polyurethane. It must be supplied with a hooked module in aluminum with PVC label and safety terminals for the electrical connection. A schematic diagram must be shown on the hooked module.
- Each machine must be mounted on a base and must be provided with: Plate that brings its axis height to the standard measure (112 mm). Plates for fixing to the base of the machine and Four screws for fixing of the machine with Inter Rail Distance of the plates: 160mm.
- Coupling Joint: Diameter: 40mm, length 40mm.
  The motor must be supplied with manual in English language.

Resistive load

- It must consist of a single or three-phase resistive step-variable load.
- **Mechanical features**: Metallic box: on the front panel all the controls, the protections, the output terminals and a schematic diagram on PVC label must be shown.

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

- **Electrical features :** The load must be composed by three resistances, with possibility of star, delta and parallel connection, controlled by three switches. With manual and automatic mode of operations, the inductance of each phase is separately adjustable on the following minimum steps

Position	Resistance	Max power per phase
1	1050 Ohm	46 W
2	750 Ohm	65 W
3	435 Ohm	110 W
4	300 Ohm	160 W
5	213 Ohm	230 W
6	150 Ohm	330 W
7	123 Ohm	400 W

Maximum power in single or three phase connection is 1200 W.

- **Rated voltage**
  - In star connection 380V.
  - In D connection is 220V.
  - In single-phase 220V.

The unit must be supplied with a manual in English language

Inductive load

- It must consist of a single or three-phase inductive step-variable load. Housed in a metallic box.
  - **Mechanical features :** Metallic box: on the front panel all the controls, the protections, the output terminals and a schematic diagram on PVC label must be shown.
  - **Electrical features :** The load must be composed by three inductances, with possibility of star, delta and parallel connection, controlled by three switches With manual and automatic mode of operations the inductance of each phase is separately adjustable on the following minimum steps

Position	Inductance Max	Power per phase
1	4.46 H	34 VAr
2	3.19 H	48 VAr
3	1.84 H	83 VAr
4	1.27 H	121 VAr
5	0.90 H	171 VAr
6	0.64 H	242 VAr
7	0.52 H	297 VAr

- Max reactive power 890 VAr in three-phase or single-phase connection.
- Rated voltage
  - In star connection 380V,
  - In D connection is 220V,
  - In single-phase 220V.
  - The unit must be supplied with a manual in English language

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

Capacitive load

- **Mechanical features**: Metallic box: on the front panel all the controls, the protections, the output terminals and a schematic diagram on PVC label must be shown
- **Electrical features :** The load must be composed by three capacitors, with possibility of star, delta and parallel connection, controlled by three switches. As a function of the switch position, there must be the following phase a values(at50Hz): With manual and automatic mode of operations, the Capacitance of each phase is separately adjustable on the following minimum steps

Position	Capacitance	Max power per phase
1	2 µF	30 VAR
2	3 µF	45 VAR
3	5 µF	76 VAR
4	8 µF	121 VAR
5	10 µF	152 VAR
6	13 µF	197 VAR
7	18 µF	275 VAR

Max reactive power in single-phase or three-phase connection 825 VAr

- **Rated voltage**
  - In star connection 380V
  - In D connection is 220V
  - In single-phase 220V.
  - The unit must be supplied with a manual in English language

Three Phase Supply Unit

- **AC Machine excitation and droop V-Q controller**
  - Technical features
  - DC output: 0 to 240 Vdc, 2 A
  - Power supply: 230Vac 50/60Hz
- **Overhead Line Model – 360 Km**
- **Overhead Line Model – 110 Km**
- **Maximum demand meter**
  - The module must consist of a microprocessor controlled three-phase power analyzer.
  - It must have insulated front panel and it must be suitable for the measurement of voltages, currents, frequencies, active power, reactive power, apparent power.
    - Input voltage: 450 V (max 800 Vrms)
    - Input current: 5 A (max 20 Arms)
    - Operating frequency: 47 ÷ 63 Hz
- **Auxiliary supply:**
- single-phase from mains
- On the front panel, it must include a RS485 port, an on/off switch and LCD display with the following features:
- of reading points: 10 000 4 digits
- no. of reading points: 10 000 4 digits
- energy count: 8-digit counter
- reading updates: 1,1 seconds

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

- Supplied with manual in English language

Generator Synchronizing Relay

- It must consist in a numerical synchronizing relay which measures voltage and frequency of two inputs;
- The voltage, frequency and phase angle of the Generator input (G) must be individually compared with those of the Bus input (B) considered as reference.

Functions:

- Automatic Synchronization and Synchro-check
- Fast proportional Voltage and Frequency regulation
- Phase displacement checking with circuit breaker closing time control
- Anti-motoring
- Kicker pulse
- Event Recording
- Modbus Communication Protocol
- Synchronizing of the generator with the reference bus
- Normal/Dead Bus operation modes Adjustable Operate time delay
- Adjustable Max Voltage difference Anti-motoring control
- Automatic Adjusting of phase angle for circuit breaker close
- Adjustable Max Frequency difference
- Adjustable Max Phase displacement
- Adjustable Increase/Decrease pulses to speed regulator
- Adjustable Increase/Decrease pulses to voltage regulator
- Adjustable Min/Max Bus voltage for synchronizing operation
- Adjustable Min/Max Bus frequency for synchronizing operation
- Kicker pulse control on steady phase displacement
- Fast synchronization with control pulses proportional to speed and voltage difference
- 3 Digital Inputs optically isolated 2kV

Feeder Manager Relay

- Three-phase Current, Voltage and Earth Fault multifunction relay for protection and management of MV/HV distribution lines.
- Real time measurements of the primary value of the input quantities are continuously available from relay's display and from the serial communication port.
- Relay's programming and setting must be made directly by the front face keyboard or via the serial communication ports.
- Setting, event recording and oscillography must be stored into nonvolatile memory (E2prom). The relay must be fitted with a multi voltage, auto ranging power supply unit self-protected and transformer isolated.
- Three levels for phase overcurrent independently programmable as directional or non-directional
- Three levels for Earth Fault independently programmable as directional or non-directional
- Selectable Time current curves according to IEC and IEEE standards
- Two over/under voltage levels
- Two over/under frequency levels
- Zero sequence overvoltage level

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

- Two Negative Sequence current levels
- One Positive Sequence overvoltage level
- One Negative Sequence under voltage level
- Two Reactive Power (VAR) control levels (optional)
- Trip circuit supervision
- Associated Circuit Breaker control (OPEN / CLOSE)
- Breaker failure protection
- RS232 serial communication port on Front Face
- RS485
- Output relays totally user programmable
- Digital inputs user programmable

Power circuit breaker

- Three-phase power circuit breaker with normally closed auxiliary contact.
- Contact load capability: 400 Vac & 3 A
- Supply voltage: single-phase from mains
- The item must include two light push buttons (one red and one green) and must have insulated front panel.
- The unit must be supplied with a manual in English language

Double bus bar with two disconnects

- Module with insulated panel
- Suitable for extending the double bus bar system.
- The module must have insulated front panel and four light push buttons (two red and two green).
- Each bus bar must have a supply branch that will be connected or disconnected by using a disconnect or
- It must be possible to control manually the power breaker switch using two couples of push-buttons "on "and "off" or externally via the switching contact PLC or RELAY.
- This power contacts state shall be indicated by LEDs:
  - Green led = open contacts
  - Red led = closed contacts
- While at SIGNAL OUTPUT terminals will be available a TTL level .
  - Low level (0V) = open contacts
  - High level (5V) = closed contacts
- The RS flip-flop state shall be indicated by a led:
  - Yellow led = set flip-flop.
- 4 mm. safety terminal and 2 mm. terminals included on the front panel for the electrical connection.
- It must be supplied with manual in English language

Reactive power controller

- Relay for automatic adjustment of the power factor in systems with inductive load.
- Power factor adjustment range: 0.9 ... 0.98 inductive
- Sensitivity: 0.2 ... 1.2 K

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

- 2 decimal digit display
- Output relay for batteries connection: 4 NO contacts with LED indication
- Output relay contact: 400 Vac, 5 A
- Supply voltage: three-phase from mains
- Ammetric input circuit: 5 A (250 mA min.)
- Automatic detection of the frequency

❖ **Switchable capacitor battery**

- Switching system with which different capacitance values that must be possible to connect to the mains for reactive power compensation.
- Four switching levels each consisting of 3 capacitors in star connection with discharging resistors:
  - level 1 (b1 coil): 3 x 2 µF/450 V
  - level 2 (b2 coil): 3 x 4 µF/450 V
  - level 3 (b3 coil): 3 x 8 µF/450 V
  - level 4 (b4 coil): 3 x 16 µF/450 V
- Compensation power: max 1360 VAr at 50 Hz, 380 V
- It must be possible to control separately each switching level:
- internally, through 4 toggle switches
- externally, through 4 control inputs
- Coil operating voltage: 220 Vac

Rephasing capacitors

- Rephasing capacitors module for induction machine.

Load Manager

- Load management module with 3 independent single-phase outputs for the dynamic study of different load types. The outputs are switchable via Modbus RTU protocol using RS485 serial port or through the front panel using dedicated switches. It can be used as load when inserting the included lamps in the sockets, to connect 3 different loads to a single phase or to manage 3 phases independently.

  Technical features:
- Power supply: 90÷260 Vac, 50÷60 Hz
- Communication: Modbus RTU RS485 (2 wire).
- 3 single phase outputs, 110…230Vac - 500W m

Human Machine Interface module

- Industrial Human Machine Interface module with 7’’ TFT display. It is designed to be used and interfaced with a wide range of automation products including PLC, industrial instruments and drives, through its communication ports. It can be placed either on a desk or inserted in a frame.

  Technical features:
  - Power supply: 90V-230V, 50/60Hz
  - Display
  - Type: 7” TFT
  - Resolution: 800 x 400
  - Color: 16.7M
  - Touch panel: 4-wire resistive type
  - Memory: 128 MB (Flash and RAM memory)

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

- Processor: 32 bits RISC Cortex-A8 600MHz
- RTC Built-in
- I/O ports
  - 1 RS232 serial port
  - 1 RS485 2Wire serial ports
  - 1 RS485 4Wire serial ports
  - 1 Ethernet port
  - 1 USB port

Supplied with power and data cables, brackets and programming software.

Active and reactive energy three phase counter

Module with insulated panel, microprocessor controlled three-phase power analyser.
Measurement of voltages, currents, frequencies, active power, reactive power, apparent power.

- Connection: Three-phase - 3 or 4 wire
- Reference voltage, Un: 230 (400) V...240 (415) V
- Limit range of operation: 110 (190) V...254 (440) V
- Basic current, In: 10A - Maximum current, Imax: 63A
- Communication: RS485 galvanically insulated from input means
- Display type:
- LCD Backlit, 8 digits
- Active energy: Total, Partial (resettable) or Double tariff
- Reactive energy: Total, Partial (resettable) or Double tariff
- Power: Active, Reactive, Apparent, max. demand
- Averaging time period: 5/8/10/15/20/30/60') and peak max. Demand (resettable).
- 4 mm safety terminals for electrical connections included.

Invertor Grid

- Grid tie power inverter that must ensure that the power supplied will be in phase with the grid power.
- The module shall have 12 V solar panel input, ground terminal and AC terminals; in this module power inverter must be programmed to supply load from PV source and surplus energy will be sent to the mains grid.
- The module must have insulated front panel and include the following elements:
  1. Island protection indicator
  2. Output power indicators
  3. PV panel input terminals
  4. PE terminal
  5. Mains terminals
- Current Max.: 30A
- Voltage: 12V
- Power: 360W

Single phase inverter charger

- **Battery**
  - systems technical features
  - Tension nominal: 12 V / 100 Ah:

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

- **Photovoltaic Inclinable Module**
  - didactic equipment
  - 85W, 12V, complete cell for measuring of solar radiation and with a sensor temperature.

- **Panel with lamps for Photovoltaic Trainer**
  - It must be possible to adjust manually or automatically the light intensity controlled by a potentiometer through a 0-10 V input, to allow to perform experiments with different light intensities, then simulating the light conditions from dawn to dusk.
  - 4 halogen lamps 300 W each.
  - Dimmer to control the intensity of light.
  - 10 A Differential Circuit Breaker.
  - 10 k Potentiometer

- **Measurement module for photovoltaic panels**
  - Voltage measurement
  - Current measurement
- **DC Active load---------- compatible with smart grid loads**
- **Transformer with rectifier and filter**
  - Single phase transformer with full-wave rectifier and capacitive filter to power DC load from AC single phase supply

- **Photovoltaic panel simulator**
  - Variable DC power supply that emulates a photovoltaic panel. The V/I characteristic of the output vary in function of the irradiation setting. Functional characteristics • Voltage control in function of the V/I characteristic curve of a photovoltaic solar panel.
  - Irradiation control.
  - Local or remote control via Modbus RTU serial communication.
  - Display of output V, I and P. Technical features:
  - Power supply: 230Vac, 50/60Hz
  - Voc output: configurable 0-48Vdc.
  - Isc output: configurable 0-4A

- **Communication Modbus**
  - didactic equipment
  - Didactic equipment: module with insulated front panel including:
    - Two RS485 inputs and six RS485 outputs.
    - Analog output 1 0 to 10V
    - Analog output 2 0 to 10V
  - One switch for power on/off and a port for power supply connector.
  - The unit must be supplied with a manual in English language.

- **Computer**
  - All-In-One Personal Computer (desk top): - with 500 SSD, 1TB hard drive size, 4Ghz, 32GB RAM, Quad.
  - Slim shape

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

24 inch

- **Three-phase transformer**
  - Three-phase transformer for feeding a transmission line model 380 kV with scale factor 1:1000
  - Primary:
    - 3 x 380 V windings with tap at 220 V star or delta connection
  - Secondary:
    - 3 x 220 V windings with taps at +5%, -5%, -10%, -15% star connection for 3 x 380 V.
  - various star and delta connections possible.
  - Tertiary
  - 3 x 220 V
  - Delta connection Rated power: 1000 VA

- **Kit of Connecting leads**
  - Set of connecting leads based on the rating of the system

- **Workbench**
  - Workbench with melamine flatbed. Two holes are present on the flatbed to allow the assembly of a three-level frame.
  - Dimensions: 80x120x90 (HxWxL)
  - Complete with locking wheels
  - Workbench supplied with 15 sockets protected by a thermal magnetic circuit breaker.
- **Multifunctional bench**
  - Multifunctional bench used in machine laboratories as support for
  - Electrical machines.
  - Technical features:
    - Dimensions:80x60x90cm (HxWxL)
    - Complete with locking wheels

- **Frame**
  - Metal frame for assembling the modules of the laboratory

- **Three-phase isolation transformer**
  - Isolation transformer to be placed between the three phase mains and the laboratories providing a three-phase secondary voltage with isolated neutral suitable for the module's operation.
  - Technical features:
    - Three-phase mains input with +10%/-10% adjustment
    - Output: 400V with +5% /-5% adjustments. o 3 x three phase CEE sockets (3P+N+E) o 2 x single phase CEE sockets (2P+E) o 2 x single phase type F socket
  - 16 A, 30 mA differential magneto-thermal protection.
  - Motor-protection circuit-breaker: 6.3 to 10 A.
  - Mushroom emergency stops push-button
  - Maximum output power: 6 KVA

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

- **Holder for Leads**
  - **Three-Phase Power Quality Analyzers**
  - 4 inputs
  - 3 phases and neutral referenced to PE (5 connectors)
- Measurement category
  - 1000 V CAT III / 600 V CAT IV
  - Maximum input voltage
    - 1000 V rms / 1000 V dc (1700 Vpk)
  - Nominal voltage rang
    - Wye and single phase: variable (50 V – 1000 V)
    - Delta: Variable (100 V – 1000 V)
    - IEC 61000-4-30 Class A compliance for the nominal voltages (Vdin) 100 V – 690 V
- Input impedance Input impedance
  - 10 MΩ between P-P and P-N, 5 MΩ between P-PE and N-PE
- Bandwidth
  - DC to 30 kHz for PQ measurements, excluding transients
- Resolution
  - 24-bit synchronous sampling
- Sampling frequency
  - 80 kS/s at 50/60 Hz
- Scaling
- 1:1, variable for use of potential transformers

- **Voltage transients**
  - Measurement range ±8 kV
  - Sampling rate
    - 1775: 1 MS/s 1777: 1 MS/s, 20 MS/
  - Bandwidth
    - DC to 1 MHz
  - Trigger
    - Adjustable trigger level. Triggers on high-frequency components > 1.5 kHz
  - Resolution
  - 14-bit synchronous sampling
- **Current inputs**
  - Number of inputs

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

- 4 inputs 3 phases and Neutral, range selected automatically to attached sensor

- Range
- AC
  - 4 inputs 3 phases and Neutral, range selected automatically to attached sensor
  - 1 A to 1500 A with i17XX-FLEX1500 12
  - 1 A to 1500 A with i17XX-FLEX1500 24
  - A to 3000 A with i17XX-FLEX3000 24
  - 6 A to 6000 A with i17XX-FLEX6000 36
  - 40 mA to 40 A with clamp i40s-EL
  - 4 A to 400 A with clamp i400s-EL
- DC
  - 20 A to 2000 A with 80i-2010-EL clamp
- Bandwidth
  - DC to 30 kHz
- Resolution
  - 24-bit synchronous sampling
- Sampling frequency
  - 80 kS/s at 50/60 Hz
- Scaling
- 1:1, variable
- Input voltage
  - Clamp: 50 mV / 500 mV rms; CF 2.8 Rogowski Coil: 15 mV / 150 mV rms at 50 Hz, 18 mV / 180 mV rms at 60 Hz; CF 4 all at nominal probe range
- Input impedance
- 11 kΩ

- **Aux inputs**
  - Wired connection with 17xx-AUX adapter

Number of inputs 2

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

- Input range
  - Direct: 0 V dc to ± 10 V dc
- Input impedance
  - Direct: 2.92 MΩ
- Scale factor Scale factor
  - Format: mx + b (gain and offset) user configurable
- Displayed units
  - User configurable (up to 8 characters, for example °C, psi, or m/s)
- Input mains frequency
  - DC, 50/60 Hz ±15 % (42.5 Hz … 57.5 Hz, 51 Hz … 69 Hz)
- Topologies
  - 1-φ, 1-φ IT, Split phase, 3-φ delta, 3-φ wye IT, 3-φ Aron/Blondel (2 element delta), 3-φ delta open leg, 3-φ high leg delta
- Data storage
  - 8 GB internal (expandable with microSD card)
- Memory size
  - Typical 10 logging sessions of 8 weeks with 1-minute intervals and 100 events. The number of possible logging sessions and logging period depends on user requirements. Typical 10 logging sessions of 8 weeks with 1-minute intervals and 100 events. The number of possible logging sessions and logging period depends on user requirements
- Real-time accuracy
  - Internal: 3 ppm (0.26 s per day, 8 s per month) NTP (internet time): Depending on internet latency, typical < 0.1 s absolute to UTC
  - GPS: < 1 ms absolute to UTC

- **Trend interval**
  - Measured parameter
  - Trend interval
    - User selectable: 1 sec, 3 sec, 5 sec, 10 sec, 30 sec, 1 min, 5 min, 10 min, 15 min, 30 min
  - Averaging interval min/max values
    - Voltage, Current: ½ cycle RMS (20 ms at 50 Hz, 16.7 ms at 60 Hz) Aux, Power: 200 ms

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

- Total harmonic distortion
  - THD for voltage and current is calculated on 50 harmonics

- **Trend interval**
  - **Power quality measurements**
    - Measured parameter
      - Harmonics
        - h0 … h50 % fund and RMS for voltage, current and power Phase angles for voltage and current up to h11
      - Inter-harmonics
        - ih0… ih50 % fund and RMS for voltage and current
    - Super-harmonics
      - 2–9 kHz with 200 Hz bins
      - 9–30 kHz with 2 kHz bins
      - RMS for voltage and current
    - Grouped, sub-grouped and single harmonic bins according to IEC 61000-4-7.
    - Method selected automatically based on configured PQ standard or user configurable
    - Total harmonic distortion
    - Calculated on up to 50 harmonics (depends on selected PQ standard
    - Mains signaling Mains signaling
      - 2 frequencies in the range from 110 Hz to 3000 Hz
    - Events
      - Voltage
        - Dip, swell, interruption, rapid voltage change, mains signaling, wave shape deviation, transients
      - Current
        - Inrush current
      - Triggered recording
        - Half cycle RMS of voltage and current for 10 s
        - Waveform of voltage and current for 10/12 cycles Mains signaling: 200 ms RMS of mains signaling voltage up to 120 s Transients: Waveform of voltage

- **Standard compliance**
  - Power IEEE 1459
  - Harmonics
    - IEC 61000-4-7: Class 1 IEEE 519 (short time and very short time harmonics)
    - IEC 61000-4-15 Class F1
  - IEC 61000-4-30 Class A, IEC 62586 PQI-A-PI
  - Power quality compliance
    - EN 50160 + GOST + NEQUAL + NETCODE + FOL
  - Ethernet
    - 1 Gbit/s 1000BASE-T
  - USB type A
- USB 2.0 high speed for USB flash drives to transfer measurement data, firmware updates and license installation. Max. supply current: 500 mA
  - USB-C
- USB 2.0 high speed for data download to PC and calibration (requires USB type A to USB-C or USB-C to USB-C cable) Auxiliary power supply for the Analyzer (requires USB C power adapter PD 2.0 or higher with 9 V 1.8 A support) USB 3.0 super-speed for USB-C flash drives to transfer measurement data, firmware updates and license installation. Max. supply current: 900 mA
  - Wi-Fi/BLE module1
- 802.11 ac 2.4 GHz / 5 GHz, support for concurrent access point and client mode Bluetooth 5.0/BLE Antenna: Internal and external2
  - LTE/4G module3
    - LTE-A Cat 12 Worldwide LTE-A and UMTS/HSPA+ coverage LTE-A Cat 12 Worldwide LTE-A and UMTS/HSPA+ coverage Antenna: External2
  - GPS
    - MCX connector to attach a GNSS antenna for GPS/GLONASS2
  - **Warranty**
    - Analyzer: 2 years (battery not included) Accessories:
    - **1 year (including battery)**
  - Calibration cycle **2 years**
  - Size (L X W X HD) 28.0 cm x 19.0 cm x 6.2 cm (11.0 in x 7.5 in x 2.4 in
  - Weight: 2.1 kg (4.6 lb)
  - Anti-theft protection
    - Slot to support Kensington lock

❖ **Environmental specifications**

- Operating temperature range
  - -10 °C to 50 °C
- Storage temperature range

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

- -20 °C to 60 °C
- Operating humidity
  - IEC 60721-3-3: 3K5, modified:
  - -10 °C to 30 °C: ≤95 %, no condensation or ice
  - 35 °C: 70 %
  - 40 °C: 55 %
  - 50 °C: 35 %
- IP Rating
  - IEC 60529: IP50
- Vibration

IEC 60721-3-3 / 3M2

- **Power supply**
  - Voltage range
    - 100 V – 600 V -15 % / +10 % (85 V … 660 V)
  - Power consumption
    - Max. 40 VA
  - Mains frequency
    - 50/60 Hz (42.5 Hz … 69 Hz)
  - UPS
  - Li-Ion battery BP1770 with extended temperature range, customer replaceable. On-battery runtime: 1.5 hours.

- **Safety**
  - General
    - IEC 61010-1: Pollution Degree 2
  - Power supply
    - Overvoltage Category IV 600 V With Mains Adapter MA-C8: Overvoltage Category II 300 V
  - Measurement
    - IEC 61010-2-030: CAT IV 600 V, CAT III 1000 V
  - Altitudes 2000 m to 4000 m
    - Derate to: Power Supply: Category IV 300
    - With MA-C8 Adapter: Category II 150 V
    - Measurement: CAT IV 300 V, CAT III 600 V, CAT II 1000 V

- **One Teacher and Student Manual with all the possible experiments**

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