Multifunction network analyzer
Q15B4W - Q96B4W - Q96D4

OPERATING MANUAL

lpm0190.2 - Edition 11.09

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1. SAFETY PRECAUTIONS

The following general safety precautions must be observed during all phases of installation and operation of this instrument.

- Installation and operation of this instrument can be performed by qualified personnel only and according to the relevant Normatives.
- Servicing can be performed at Factory only.
- Before installing the instrument make sure that the housing is not damaged, otherwise the unit must be rejected and returned to the Factory for servicing.
- Ensure that the line and auxiliary power supply are switched off before connecting the instrument to the circuits.
- Wiring diagrams must be respected according to the required model.
- Make sure to operate the instrument according to the technical specifications as listed in this Manual.
- Do not operate the instrument in an explosive atmosphere and in presence of flammable liquids or vapours.
- The environmental operating conditions must be in the range as specified in this Manual.
- Never attempt to open the instrument's housing for any reason.
- Water or other liquid cleaners must be avoided.

Failure to comply with these precautions and with the instructions given elsewhere in this Manual violates safety standards of design, manufacture, and intended use of this instrument.
Langer Messtechnik GmbH assumes no liability for the Customer's failure to comply with these requirements.

⚠ When installing the meters, a protection of the voltage input terminals and of the auxiliary supply terminals must be carried out by means of fast or ultra fast fuses, with rated current at 1A or 2A, rated voltage suitable to the system voltage, and breaking power adequate to the short-circuit current available at the connection point (the types 10x38, with ceramic body, rated voltage at 500V or at 660V, gG or FF characteristic and breaking power at 100KA are normally suitable for this application).

NOTE: The contents of this Manual are subject to change without prior notice as a result of improvements in performances and functions.
Should you have any questions, please contact Langer Messtechnik GmbH.

2. TECHNICAL CHARACTERISTICS

led displays	4 (h. 10mm)
max. indication	999
decimal point position	automatic
status leds	lighted symbols
readings update	1 sec.
measuring type	TRMS
basic accuracy	±0.5% (Q15/964BW), ±1% (Q96D4)
input range	10-120% Un, 5-120% In
nominal input voltage Un	100÷400V
nominal input current In	1÷5A
operating frequency	45…65Hz
VT ratio (by steps of 0.01)	1÷999
CT ratio (by steps of 0.01)	1÷9999
continuous overload	2 x In; 1.2 x Un
short-term overload	20 x In; 2 x Un
current circuits consumption	< 0.5VA
voltage circuits consumption	< 0,5VA
standard power supply	**Q15/96B4W:** 230V±10% 45…65Hz, (on request 24V,48V,115V, 400Vac ±10% 45…65Hz; 24V,48V,110V,220Vdc +20/-10%; 20÷60V, 80÷280Vac/dc **Q96D4:** 115, 230V±10% 45…65Hz
power supply consumption	6VA (Q15/96B4W), 4VA (Q96D4)
operating temperature	-10…+23…+50°C
storage temperature	-30…+70°C
galvanic insulation	full
test voltage	2kV, 50Hz, 60sec.

energy counting (Q15/96B4W only)	kWh and kVarh
maximum counting	9999.999 GWh/GVArh
accuracy class	2 (kWh), 3 (kVArh)
bidirectionality	no
alarm outputs (optional, Q15/96B4W only)	Photo-mos 250V, 100mA
activation delay	programmable 0-99 sec.
programmability	variable, value, direction, nc/no, histeresys
pulse outputs (optional, Q15/96B4W only)	programmable as alternative to alarms
programmability	pulse value, nc/no
pulse duration	100 msec
serial interface (optional, Q15/96B4W only)	RS485 insulated
communication protocol	ModBus RTU
speed (bps)	9600/19200
communication parameters	1,8,N,2/1,8,E,1/1,8,O,1
addressing range	1…247 programmable

3. DISPLAY PAGES SEQUENCE

At the power on the display shows the first measurement page (that is the last page showed before the power off). The analyzer has, to display the performed measurements, 3 led displays, placed on the left side of the monitor, on which appear the values relevant to the 3 phases (phase variables), and an additional one, with a different colour, placed on the right side of the monitor, to display the system variables (sum or average of the phase variables according to the type). The phase variables displays are blue coloured (Q96B4W) or red coloured (Q96D4), the system variables display is red coloured (Q96B4W) or yellow coloured (Q96D4).

Phase variables displays

To display the performed measurements you must push the buttons ⇑ for Q15 or left ↻ for Q96 (forward) and ⇓ for Q15 or ↺ for Q96 (backward). The indications of the measurement type which is currently displayed are implemented

by the yellow leds placed under the displays; the indication of the multiplier (**k** = kilo or **M** = mega) is implemented by two yellow leds placed over the displays.

- Line voltage L1-L2, L2-L3, L3-L1 (led VΔ)
- Phase voltage L1 - L2 - L3 (led V$\curlyvee$)
- Phase current L1 - L2 - L3 (led A)
- Phase active power L1 - L2 - L3 (led W)
- Phase reactive power L1 - L2 - L3 (led Var)
- Phase power factor L1 - L2 - L3 (led P.F.)
- Phase termal current L1 - L2 - L3 calculated in a 15 minutes period (led A_{avg})
- Phase maximum termal current L1 - L2 - L3 (led A_{max})
- Resettable partial functioning hours counter (L1), settable maintenance hours counter (L2), total functioning hours counter (L3) (led h↑h↓ht). **Q15B4W** and **Q96B4W** only performs these measurements.
  The maintenance hours counter performs a count-down; when it reaches zero, the led h↑h↓ht flashes until you set the counter again.

The analyzer doesn't display negative active power because doesn't provide measurement bidirectionality. When on a phase there is a negative active power because of a wrong connection, on that display the measured value and the message **Err** appear alternatively, whatever may be the displayed variable.
In reactive power and power factor measurements, when the display showes such variables, to distinguish a capacitive measurement from an inductive one, the measured value and the message **cAP** appear alternatively.

System variables display

To display the performed measurements you must push the button ↻ for Q15 or right ↻ for Q96 (forward only). The indications of the measurement type which is currently displayed are implemented by the yellow leds placed under the display; the indication of the multiplier (**k** = kilo or **M** = mega or **G** = giga) is implemented by three yellow leds placed on the right of the display.

- Average line voltage (led $\Sigma V\Delta$)
- 3-phase system active power (led ΣW)
- 3-phase system reactive power (led ΣVAr)
- 3-phase system apparent power (led ΣVA)
- 3-phase average power maximum demand calculated in a 15 minutes period (led ΣW_{max})
- **Q15/Q96B4W:** switchboard internal temperature, frequency, total imported active energy (KWh+) (led °CHzWh) Phase displays L1 and L2 show temperature and frequency, active energy (7 digit) is shown on phase display L3, system variables display and an additional digit placed between the two displays; when the analyzer display the energy, the buttons ⇑ (left ↻) and ⇓ (↺) don't operate.
- **Q96D4:** frequency (led Hz)
- Total reactive energy (led Varh). **Q15B4W** and **Q96B4W** only performs this measurement. Reactive energy is shown on 7 digit and the buttons ⇑ (left ↻) and ⇓ (↺) don't operate.

In reactive power measurement, when the display showes such variable, to distinguish a capacitive measurement from an inductive one, the measured value and the message **cAP** appear alternatively.

4. PARAMETERS SETTING

For parameters setting you employ all three buttons.
To enter in configuration menu you must push simultaneously ⇑ (left ↻) and ⇓ (↺), named **SETUP** too.
In the menu pages, i.e. Ct ratio setting, pushing the button ↻ for Q15 or right ↻ for Q96 you can move the cursor and select the digit to modify or the digital point to set or the multiplier to set. Entering in the menu page the first digit is selected and by the button ↻ (right ↻) you move the cursor according to the sequence **0 . 0 . 0 k M 0**.... where k and M are the multipliers implemented by two yellow leds placed over the displays. When you select the digit to modify, this one blinks, then modify by ⇑ for Q15 or left ↻ for Q96; move to the following digit and so on until the complete setting. When you select a decimal point, this one blinks; by ⇑ (left ↻) you can make active or non-active it: in the first case the blinking is long, in the second case the blinking is short. All the same you can make active or non-active the multipliers.

Confirm and return by the button ⇓ for Q15 or ↺ for Q96.
You can exit from the menu pushing simultaneously ⇑ (left ↻) and ⇓ (↺): you enter in the page **SAu. E .P** where is requested if you want to save the configuration; by ⇑ (left ↻) you can choose **YES** or **no**.
The question **SAu. E .P** is displayed twice.

The sequence of the menu pages is listed below.

CT ratio (ct): set the ratio value (from 1 to 10.0k) by ⇑ (left ↻) and ↻ (right ↻) as above described; every time you edit a new CT ratio value the energy measurements are reset; press ⇓ (↺). **i.e.** if the CT ratio is 150/5A you must set the ratio **30.0**, if the CT ratio is 10000/5A you must set the ratio **2.00k**. See the subsequent **NOTE**.
VT ratio (ut): set the ratio value (from 1 to 999) by ⇑ (left ↻) and ↻ (right ↻); every time you edit a new VT ratio value the energy measurements are reset; press ⇓ (↺). **i.e.** if the VT ratio is 400/100V you must set the ratio **4.00**, if the VT ratio is 20kV/100V you must set the ratio **200**. See the subsequent **NOTE**.
NOTE: when you set the CT and VT ratioes, remember that CT x VT must be at the most equal to 288600 corresponding to a nominal power of 1 GW.
Digital output 1 (do 1) (Q15/96B4W only): the analyzer can provide two alarm outputs alternatively programmable as pulse outputs for active and reactive energy retransmission. Choose by ⇑ (left ↻) the variable **(tYP)** (the indication is implemented by the yellow leds). When the variable is a phase variable (i.e. voltage or current) choose the phase **(Ph 1, Ph2, Ph3)** by ↻ (right ↻). If the variable is h↑h↓ht you can choose h↑ **(hP)** or h↓ **(hr)** by ↻ (right ↻). If the variable is °CHzWh you can choose **nc**, **h2** or **En** by ↻ (right ↻) and if the variable is **En**, the pulse output is associated to the active energy. If the variable is Varh, the pulse output is associated to the reactive energy. At last you can choose **oFF** to deactivate the output; a setting of CT or VT ratio also automatically sets the digital outputs as **oFF**. Press ⇓ (↺).
Alarm output:
- choose by ⇑ (left ↻) the alarm type as minimum **(1 1n)** or maximum **(1AH)** and choose by ↻ (right ↻) if the contact must be normally open **(no)** or normally closed **(nc)**; press ⇓ (↺)

- set the alarm threshold value **(SEt)** by ⇑ (left ↻) and ↻ (right ↻) (maximum value of powers depends on nominal power and is 1.00 M for the other variables); premere ⇓ (↺)
- set the activation delay **(dLY)** by ⇑ (left ↻) and ↻ (right ↻); press ⇓ (↺)
- set the hysteresis value on restore from an alarm **(hYS)**, in % of the threshold value, by ⇑ (left ↻) and ↻ (right ↻); press ⇓ (↺)

Pulse output:

- set the pulse weight **(:9t)** by ⇑ (left ↻) and ↻ (right ↻); the value must be compatible with the nominal power (the period between two pulses can't be less than 200 msec or more than 7200 sec); press ⇓ (↺)
- choose, by ⇑ (left ↻) or ↻ (right ↻), if the contact must be normally open **(no)** or normally closed **(nc)**; press ⇓ (↺)

Digital output 2 (do2) (Q15/96B4W only): see digital output 1.

Serial output parameters (485) (Q15/96B4W only):

- set, by ⇑ (left ↻) or ↻ (right ↻), the baud-rate value **(bPS)** which can be 9600 **(9.6)** or 19200 **(19.2)**; press ⇓ (↺)
- choose, by ⇑ (left ↻) or ↻ (right ↻), the parity **(PAr)** which can be none **(non)** or even **(EvE)** or odd **(odd)**; press ⇓ (↺)
- set the logic address **(Adr)**, from 1 to 247, by ⇑ (left ↻) and ↻ (right ↻) as above described; press ⇓ (↺)

Hours counter (Q15/96B4W only):

- reset the partial functioning hours counter **(hP)** by ⇑ (left ↻) or restore it by ↻ (right ↻); press ⇓ (↺)
- set the count-down maintenance hours counter **(hñ)** by ⇑ (left ↻) and ↻ (right ↻), the max value is 8760 hours (one year); press ⇓ (↺) **NOTE:** remember that you can't reset the total functioning hours counter.

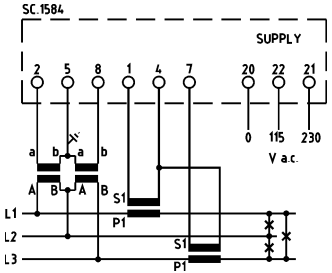
Reset of the current and power average and maximum values (rES ñAH): reset the values **(YES)** by ⇑ (left ↻) or no **(no)** by ↻ (right ↻); press ⇓ (↺). If you chose **no** you enter in the next page, if you chose **YES**, for safety you enter in the same page again and must repeat the procedure and to finish it pressing ⇓ (↺).

Reset of the energy values (rES En)(Q96B4W only): reset the values **(YES)** by ⇑ (left ↻) or no **(no)** by ↻ (right ↻); press ⇓ (↺). If you chose **no** you enter in the next page, if you chose **YES**, for safety you enter in the same page again and you must repeat the procedure and to finish it pressing ⇓ (↺).

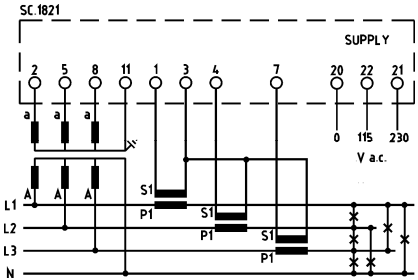
Firmware release: the page shows **uEr** and the firmware release i.e. **2.27**; press ⇓ (↺)

Now the sequence starts again with CT ratio setting.

5. WIRING DIAGRAMS

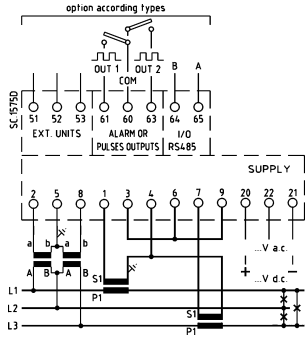


Q96D4 – 3-phase 3 wires line

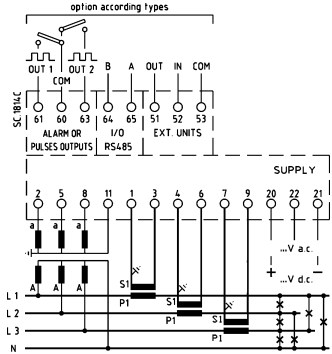


Q96D4 – 3-phase 4 wires line

⚠ Current inputs are intended to be used with CT; direct connection and connection of the secondary winding to ground are not allowed.

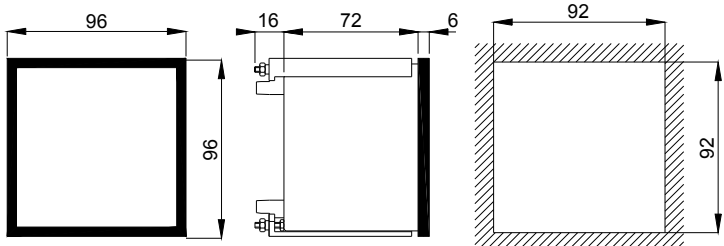


Q15B4W - Q96B4W* – 3-phase 3 wires line
*Without terminal no 22

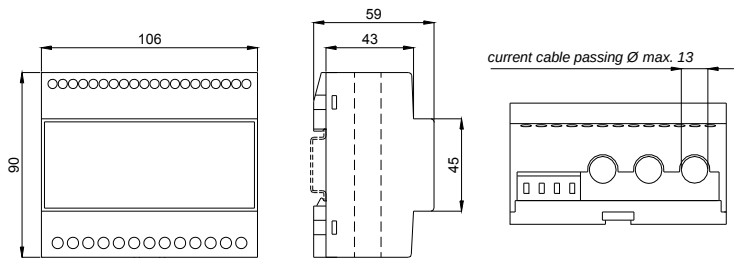


Q15B4W - Q96B4W* – 3-phase 4 wires line
*Without terminal no 22

6. OVERALL DIMENSIONS



Q96B4W - Q96D4



Q15B4W