Tyco Electronics

Installation Guide

Tegra 710 and 810 Digital metering with relay output

Introduction

This manual provides operating and installation instructions for the Tegra 710 and 810 multifunction digital metering systems. Both Tegra metering systems combine a basic accuracy of 0.5% with fast response, optional RS485 or Relay output and an easy to read LCD display.

Tegra configurations and product codes

Description	Product Code
WITH RELAY O/P	TEGRA-710-200
WITH RS485 MODBUS™ O/P	TEGRA-710-010
WITH RELAY O/P	TEGRA-810-200
WITH RS485 MODBUS™ O/P	TEGRA-810-010

Warnings

In the interest of safety and functionality this product must be installed by qualified properly trained personnel abiding by local regulations. Voltages dangerous to human life are present at some of the terminal connection of this unit. Ensure that all supplies are de-energised before attempting any connection or disconnection. External installations must be sufficient to protect human life and equipment under fault conditions.

Caution

Follow the installation diagrams carefully. These products do not have internal fuses; therefore external fuses must be used for protection for safety under fault conditions. The current inputs of these products are designed for connection into systems via current transformers x/5A. Never open-circuit the secondary winding of a current transformer. Always ensure that the power is disconnected before separating the current connector from the Tegra. Operation outside specified limits may cause permanent damage or temporary disruption. Do not power or connect the instrument if any part is damaged.

Set up

To access the VT & CT set-up screens, press and hold the (▲) “up” and (▼) “down” keys at anytime when the product is switched on.
On completion of the Primary CT Set-up screen, the program exits Set-up mode and returns to the last selected display screen.
The following parameters can be programmed by the user in the order shown:

- Primary VT (Fixed secondary 230V)
- Primary CT (Fixed secondary 5A)

Setup Note 1

This procedure is used in the setup of the primary VT, CT , etc.
Press **“T”** to accept the currently displayed value and select the next set up screen.
Press the (▲) “up” and (▼) “down” keys to change the value of the flashing figure.
To move to the next figure press **“pK”** key.
To confirm the value and move to the next window press **“T”.**

To access the configuration setup mode screens below, in normal operation hold the **“pK”** down for approximately 3 seconds. On completion of the last set up screen, the program exits Set-up mode and returns to the last selected display screen.

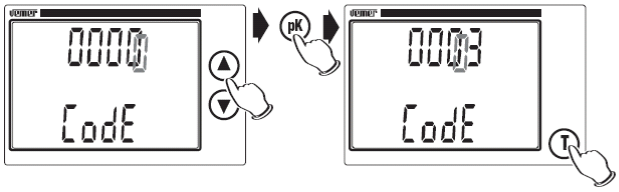
Before entering the programming menu, the user is asked to enter the password (Default setting is “0000”).
If an incorrect password is entered, the parameters will be displayed but it will not be possible to modify them.

The following parameters can be programmed by the user in the order shown:

- Relay output 1 programming
- Relay output 2 programming
- Integration time for the calculation of the integral mean of the power ratings.
- Display rear lighting management.
- Zeroing of active energy meters.
- Zeroing of reactive energy meters.
- Zeroing of peaks.
- Change of password protection.
- Setting time and date. (see page 11)

Press the (▲) "up" and (▼) "down" keys to change the value of the flashing figure.
Press **"T" f**rom the end menu to leave the programming mode**.**
(This takes place automatically if no key is pressed for approximately 60 seconds)

Changing the password



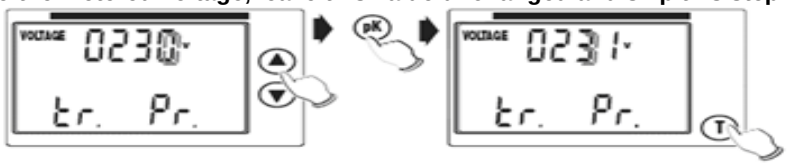
Press **"T"** from the **"code"** screen to enter the password setting screen.
Press the (▲) "up" and (▼) "down" keys to change the value of the flashing figure.
To move to the next figure press **"pK"** key.
Press **"T"** to save the password and return to the main programming menu.

Note: If you forget the password entered, the default password ("0000") can be reset by resetting the instrument (this may also occur accidentally if the power is cut off).

Primary VT setting

This product is set up for a fixed 230V secondary voltage for a single phase or 4 wire L-N system, when connected to a 3 wire L-L system with VT 's the primary voltage needs to be divide by √3 before entering, maximum primary input of 9999KV L-N can be displayed. The value displayed can be either Volts or Kilovolts by pushing the "**pK**" button after the far left figure is flashing and then pushing either the (▲) "up" and (▼) "down" keys to display the 'K' or pushing again to return to volts.

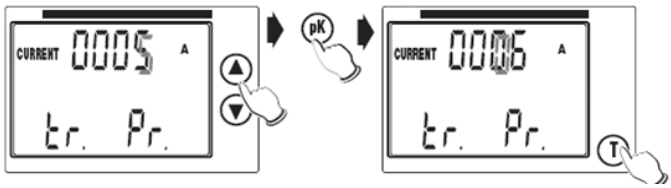
If there is no potential transformer (VT) associated with the Tegra, i.e. the voltage terminals are connected directly to the metered voltage, leave this value unchanged and skip this step.



Proceed to setup note 1

Primary CT setting

This parameter is the value of normal full scale current that will be displayed as line currents. This screen enables the user to display the line currents inclusive of ratios for X/5A CT.
Note: For the VT and CT primaries, any value from 0001 to 9999 can bet set. If the value is set to 0000 then the instrument will force this to 0001.



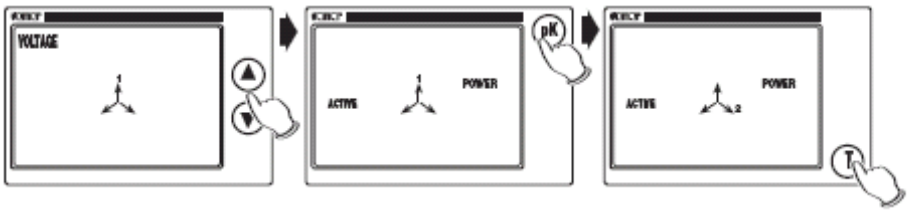
Proceed to setup note 1

Relay programming

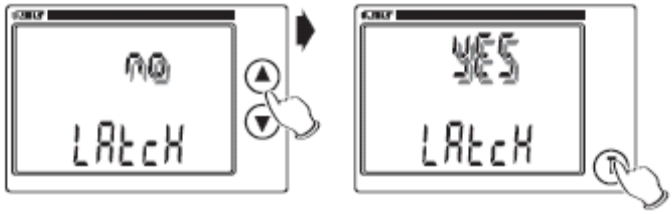
From the relay 1 (or 2) screen in normal programming mode, press **"T"** to gain access to relay 1 (or 2) programming menu screen.
The relay Parameters & functions that can be set by the user are as the following, in order:

- Operating value
- Latching
- Alarm mode
- Relay operating mode
- Set-point value
- Differential value
- Relay activation delay

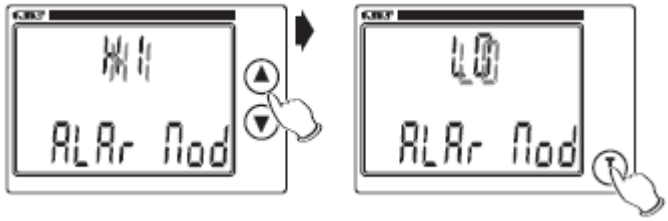
Press **"T"** to go from one menu to the next, also press **"T"** from the "Delay" menu to return to the relay 1 (or 2) menu.



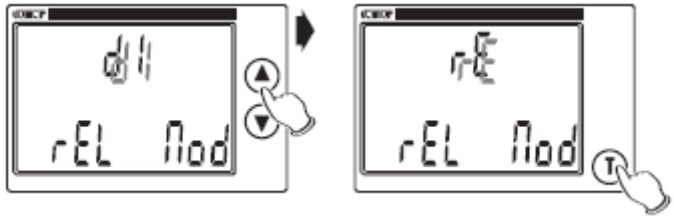
Press the (▲) "up" and (▼) "down" keys to select the value in which you require the relay to be activated.
The values that can be selected are as follows, in order : Voltage, Current, Active power, Apparent power, Reactive power, Cos w, Mean active power, Active power, Mean reactive power, Mean apparent power, Mean reactive power, Active energy and Concatenated voltage.
Press **"pK"** to select the phase (Where possible)
The absence of the phase symbol at the centre of the display indicates the system value.
Press **"T"** to confirm the value set.



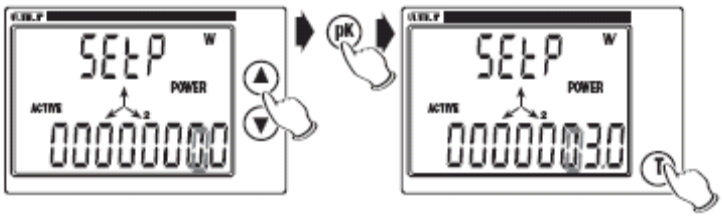
Press the (▲) "up" and (▼) "down" keys to activate or deactivate **"Latching"** mode and confirm by pressing **"T".**
When **"Latching"** mode is enabled**,** the display will go to the measurement screen for the value that has activated the relay (flashing) when the conditions that have generated the alarm are removed.



Select the maximum alarm mode **"Hi"** or the minimum **"Lo"** with the (▲) "up" and (▼) "down" keys and confirm by pressing **"T".**



Select the relay operating mode (direct **"dI"** or reverse **"rE"**) with the (▲) "up" and (▼) "down" keys and confirm by pressing **"T".**



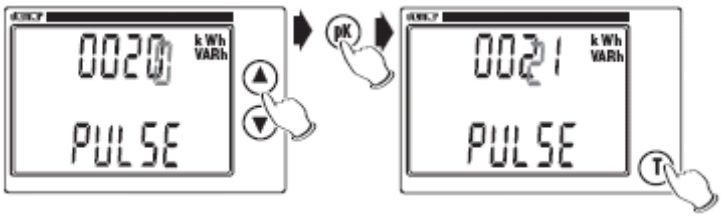
Set the set-point value for the measurement selected (visible on the display). Use the (▲) "up" and (▼) "down" keys to set the flashing digit and press **"pK"** to go to the next digit**.**
Press **"T"** to confirm.

Set the differential value (hysteresis) with the same procedure as that for the set point.

Set the relay activation delay value (in seconds) with the same procedure as that for the set-point.

Note: if the energy operation is selected (active for relay 1 or reactive for relay 2) the set-up movements from latching mode onwards will not be displayed, as they serve no purpose. In this case the relay will not operate as alarms, but as consumption indicators for active/reactive energy.

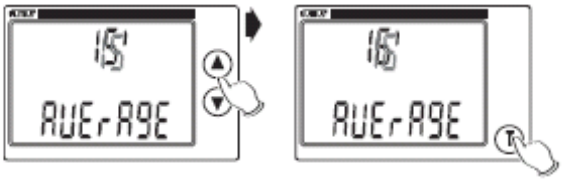
A screen will then be displayed for the setting of energy value corresponding to each pulse.



Press the (▲) "up" and (▼) "down" keys to select the value of the flashing digit and then press **"pK" t**o go to the next digit.
The default quantity of the pulses (which is selected by the modification of the VT & CT ratios and also on calibration) is equivalent to:
- 1 pulse every **"20 x CT primary value"** Wh/Varh, for VT primary up to 230V.
- 1 pulse every **"40 x CT primary value"** Wh/Varh, for VT primary from 230 to 580V.
- For VT primaries above 580V the pulsed output will be made inactive.

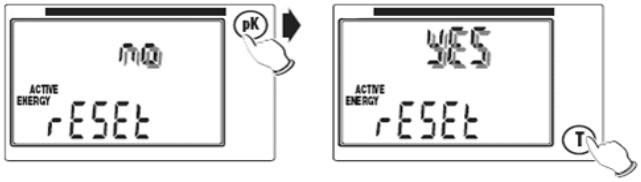
These are the minimum values that the pulses can be set for.
The duration of the pulse is always a constant and is equivalent to 100ms.

Setting the integration time



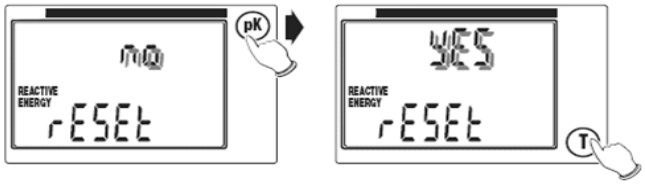
Press **"T"** from the **"Average"** screen to enter the mean power rating integration setting screen.
Press the "up" (▲) or "down" (▼) button to select the required value of Integration time.
It is possible to set an integration time from a minimum of 1 to a maximum of 60 (default value is 15)
To confirm the value and move to the next window press **"T".**

Zeroing the active energy meter



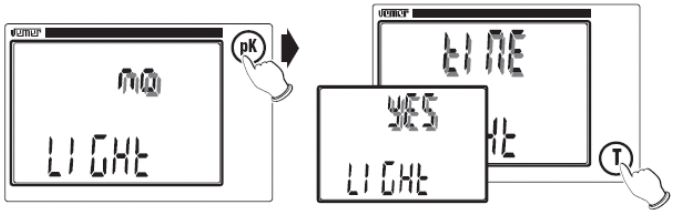
Press the (▲) "up" and (▼) "down" keys to select either **"Yes"** or **"No"** to reset active energy meter. To confirm the option you require and move to the next window, press **"T"**

Zeroing the reactive energy meter



Press the (▲) "up" and (▼) "down" keys to select either **"Yes"** or **"No"** to reset active energy meter. To confirm the option you require and move to the next window, press **"T"**

Rear lighting setup



Press **"T"** from the **"Light"** screen to enter the rear lighting setting screen.
Press the (▲) "up" and (▼) "down" keys to select from one of the three options **"NO"** (rear light off), **"YES"** (on) or **"TIME"** (on for approximately 60 seconds after a key is pressed). To confirm the option set and to terminate the setting up procedure press **"T".**

When **"T"** is pressed, all the symbols in the display will come on for approximately 3 seconds, followed by the display of the main page.

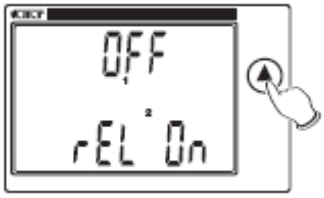
Note: If the power is cut off during the programming procedure, the instrument will memorise all the settings in place at the instant when this occurs.

Using the display screens

After 3 seconds of switch on or on completion of the setting up procedure the relay status screen will now be displayed.
If the (▲) "up" button is pressed screens 2 – 25 will be displayed in sequence if the (▼) "down" button is pressed then the trend is reversed. When the (▲) "up" button is pressed on the last screen it will return to the main screen.
If the voltage or the current is >999 the relevant measurement will flash to indicate that the unit is not set correctly (as prefix **K** or **M** is missing)

Note in the event of incorrect polarity connection of the CT's or incorrect correspondence of the VT inputs to the Ct inputs the phases numbers involved will not be displayed at the centre of the screen.

1) Relay status screen



The status of the two relays is displayed **("ON"** or **"OFF")**

1b) Relay switching screen

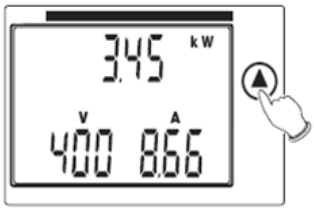
Press the **"pK"** repeatedly from the relay status to display the following, in order :

- the log of the instance when the last relay switching operation took place (Press **"T"** to move from one relay to another), this is expressed in time and date.
- the number of hours that has elapsed from the last reset of the instrument and the switching operation, this is expressed in hours and tenths of an hour.

Press the **"up"** key (▲) at any time to go to the next screen.

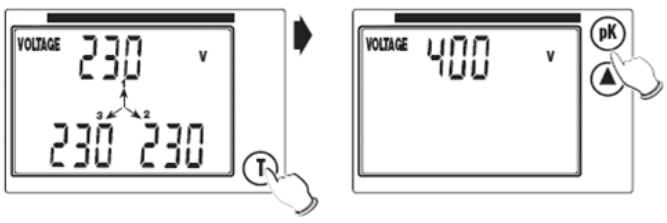
Note: when "pK" and "T" are pressed down and held down together for 3 seconds , the switching of both relays is forced for approximately 30 seconds (or a 100ms pulse is forced if the relays are set as "consumption indicators"). The status is confirmed by the complete lighting up of the central symbol in the display.

2) Main screen



The **system voltage, current** and **active power** are displayed
Press **"pK"** to display the value set for the CT primary.
Press **"T"** to display the value set for the VT primary.

3) Phase voltage screen



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The **phase voltages** are displayed. If the three phase system has no neutral then the voltages shown refer to fictitious star delta centre. To check the system voltage, press the **"T"** key to display it on screen.

Setup note 2
This procedure is for using the display functions of peak phase voltage, current and active, apparent and reactive power. If the **"pK"** is pressed repeatedly from one of the two phase voltage screen, then the following screens are displayed in order:

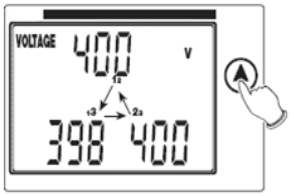
- The peak voltage values (the phase of system) with the **"V"** symbol unit flashing.
- The instant when the peak occurred (i.e. time and date).
- The number of hours lapsing between the start-up of the instrument and the occurrence of the peak (this is expressed in hours and tenths of a hour).

To zero the peak values simply press **"pK"** and **"T"** at the same time.
The (▲) "up" button can be pressed at anytime to move to the next screen.

3a) Peak phase voltage value screen

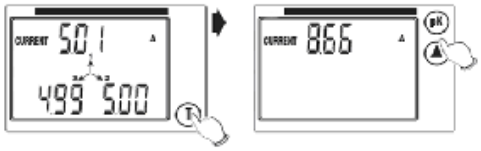
Proceed to setup note 2, section 3) Phase voltage screen, page 6

4) Concatenating voltage screen



The **concatenating voltages** between the phases are displayed

5) Phase current screen

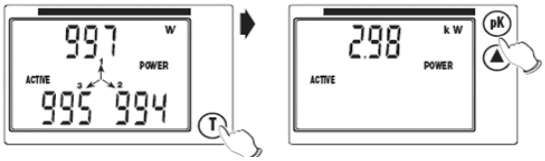


The phase currents are displayed.
To check the system current, press the **"T"** key to display it on screen

6) Peak phase current value screen

Proceed to setup note 2, section 3) Phase voltage screen, page 6

7) Active phase power screen

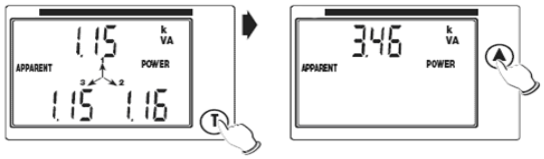


The active phase power is displayed.
To check the **active system power**, press the **"T"** key to display it on screen.

8) Active power peak value screen

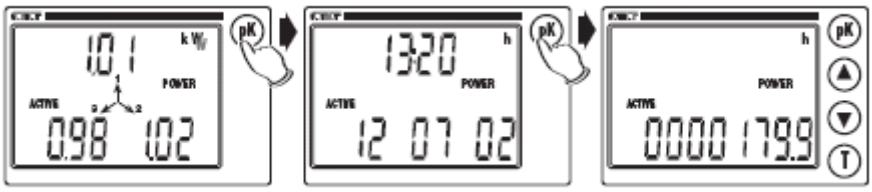
Proceed to setup note 2, section 3) Phase voltage screen, page 6

9) Apparent phase power screen



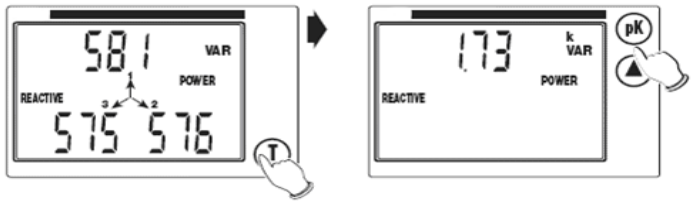
The **apparent phase powers** are displayed.
To check the **Apparent system power**, press the **"T"** key to display it on screen

9a) Apparent phase power screen



Proceed to setup note 2, section 3) Phase voltage screen, page 6

10) Reactive phase power screen

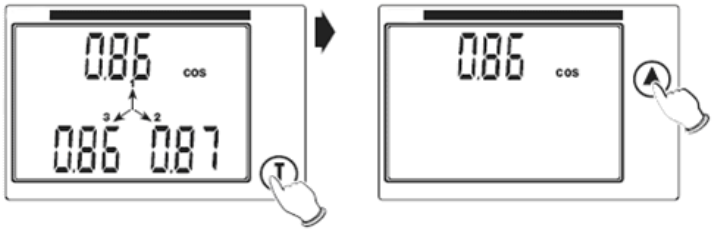


The **reactive phase powers** are displayed.
To check the **reactive system power**, press the **"T"** key to display it on screen.

11) Reactive power peak value screen

Proceed to setup note 2, section 3) Phase voltage screen, page 6

12) Phase power factor screen

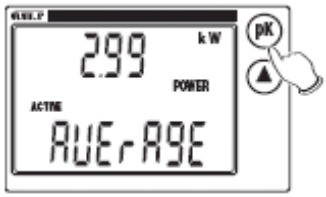


The phase power factors are displayed.
To check the **system power factor**, press the **"T"** key to display it on the screen.
The letter **"C"** indicates a capacitive phase shift and the letter **"L"** indicates an inductive phase shift.

13) Voltage-current phase shift screen

The voltage-current phase shifts are displayed in sixtieth degrees (the letter **"C"** indicates a capacitive phase shift, and **"L"** indicates an inductive phase shift).

14) Mean active system power rating screen

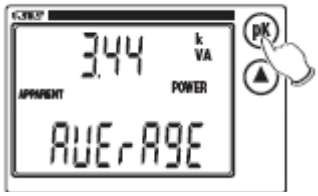


The **active system power** value is displayed over a mean of N minutes (can be set from 1 to 60) The default value is 15mins.

15) Mean active power rating peak value screen

Proceed to setup note 2, section 3) Phase voltage screen, page 6

16) Mean apparent system power rating screen.

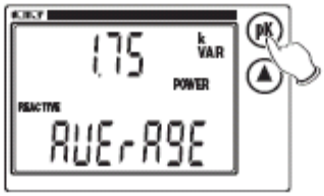


The **apparent system power rating** is displayed over a mean of N minutes (can be set from 1 to 60) The default value is 15mins.

17) Apparent mean power rating peak value screen

Proceed to setup note 2, section 3) Phase voltage screen, page 6

18) Mean reactive system power rating screen



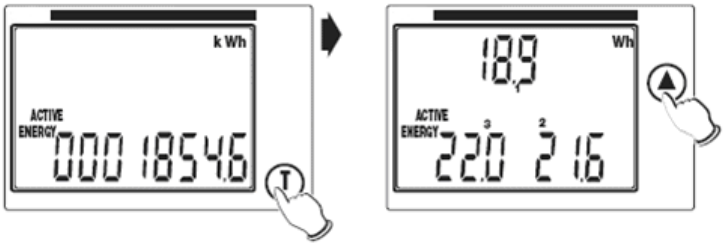
The **reactive system power rating** is displayed over a mean of N minutes (can be set from 1 to 60) The default value is 15mins.

19) Mean reactive power rating peak value screen

Proceed to setup note 2, section 3) Phase voltage screen, page 6

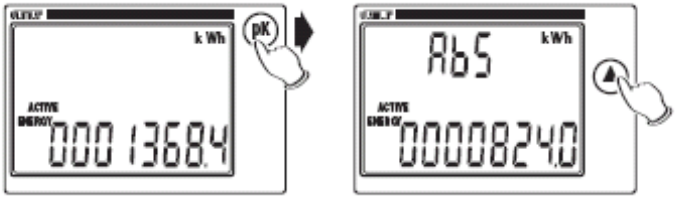
Note: If the "pK" and "T" keys are held down together for three seconds from display screens 14 – 19, the integration of the mean active, reactive and apparent power ratings is obtained.
The central symbols in the display flash to confirm this operation, which can be used to synchronise the calculation of the power rating with the power supply company.

20) Total active energy screen



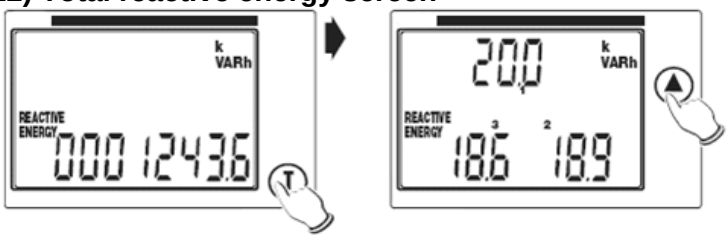
The **total active energy** is displayed.
The **"T"** key is used to display the **partial active energy** of the single phases (These energy readings are zeroed each time the total active energy is increased).

21) Total absolute active energy screen



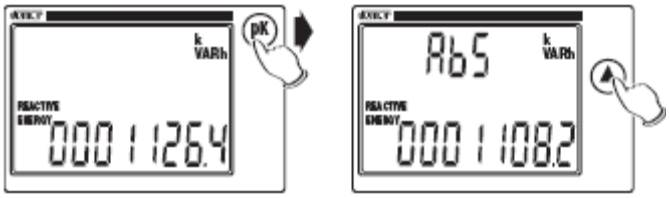
If the **"pK"** key is pressed from the total active energy screen, then the value of the absolute active energy is displayed, with the symbol **"Abs".**
This value cannot be zeroed, except due to meter overflow at 9999999.9kwh.

22) Total reactive energy screen



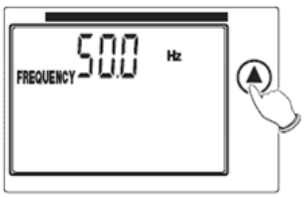
The **total reactive energy** is displayed. The **"T"** key is used to display **the partial reactive energy** readings for the single phases (These energy readings are zeroed each time the total active energy is increased).

23) Total absolute reactive energy screen



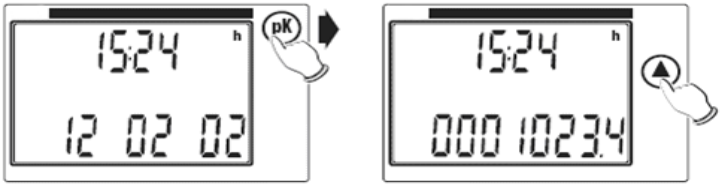
If the **"pK"** key is pressed from the total active energy screen, then the value of the absolute reactive energy is displayed, with the symbol **"Abs".**
This value cannot be zeroed, except due to meter overflow at 9999999.9kwh.

24) Frequency



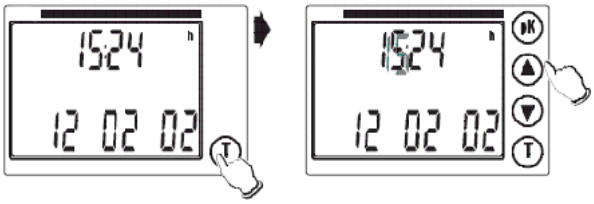
The frequency being displayed is measured from the voltage phase 1.

25) Time and date screen



The time and date are displayed in dd-mm-yy format.
The **"pK"** key is used to move from the display of the time and date lapsed since the instrument was switched on (expressed in hours and tenths of an hour). The (▲) "up" button can be pressed at anytime to move to the next screen.

26) Setting the time and date



Press "T" from the **"Time"** screen to enter the and date setting.
Press the "up" (▲) or "down" (▼) button to select the required value of the flashing number.
Press **"pK"** to move to the next number. The **"T"** key can be pressed at any time to return to the time display page, with the memorisation of the modifications entered.

Note: up to the entry of the first setting, the time and date will flash. The time and date will also flash in the peak value screens.

Technical Specification

Inputs

Nominal rated input voltage	50 – 500V ac L-L (30-300V L-N) 50/60Hz
Nominal input voltage burden	< 2 VA
Nominal rated input current	0.25 – 6A a.c. rms (Internal Shunt)
Nominal input current burden	< 2 VA

System CT primary values 1-9999 A (secondary 5 A)
System VT primary values 1-9999 V (secondary 230 V)

Auxiliary

Standard supply voltage	195.5V - 253V AC 50/60Hz
Supply burden	< 4 VA

Measuring ranges

Values of measured quantities for which accuracy is defined.

Voltage	30 – 550V (minimum voltage 10V)
Current	0.25 - 6A (minimum current 20 mA)
Frequency	47 – 63Hz
Power Factor	0.2 IND – 0.2 CAP
Power	100 MW per phase
Energy	100 MWh

Accuracy

Voltage	0.5 % ± 1 digit
Current	0.5 % ± 1 digit
Frequency	± 0.1Hz
Power factor	± 3 digit

Active power (W)	1% ± 1 digit
Reactive power (var)	1 % ± 1 digit
Apparent power (VA)	1 % ± 1 digit
Active energy (Wh)	class 2
Reactive energy (varh)	class 3

Reference conditions of influence quantities

Influence quantities are variables which affect measurement errors to a minor degree. Accuracy is verified under nominal value (within specified tolerance) of these conditions.

Ambient temperature	20°C
Input frequency	50 or 60Hz
Input waveform	Sinusoidal
Auxiliary supply voltage	230V
Auxiliary supply frequency	50 or 60 Hz
Magnetic field of external origin	Terrestrial flux.

Standards

EMC Emissions	EN 61000-6-3
EMC Immunity	EN 61000-6-2
Safety	EN 61010-1

Insulation

CT primary to voltage circuits	Principal (EN61010-1)
Relay “contact” to voltage circuits	Reinforced (EN 61010-1)
RS485 to voltage circuits	Reinforced (EN 61010-1)
Analogue to voltage circuits	NA
Auxiliary supply to voltage circuits	Principal (EN 61010-1)

Environmental

Operating temperature	0 to +50°C *
Storage temperature	-20 to +60°C *
Relative humidity	10 - 90 % not condensing
Warm up time	1 minute
Shock	0.5 J

* Maximum operating and storage temperatures are in the context of typical daily and seasonal variation. This product is not designed for permanent operation or long term storage at maximum specified temperatures.

Enclosure

Sealing	IP 40 (54 front side installed)
Mounting	DIN rail 4 modules, panel mounting version 72mm DIN-rail mounting, plastic moulded case. ABS + polycarbonate alloy UL94-V0
Weight	0.25 kg DIN-rail and panel mounting (Overall)

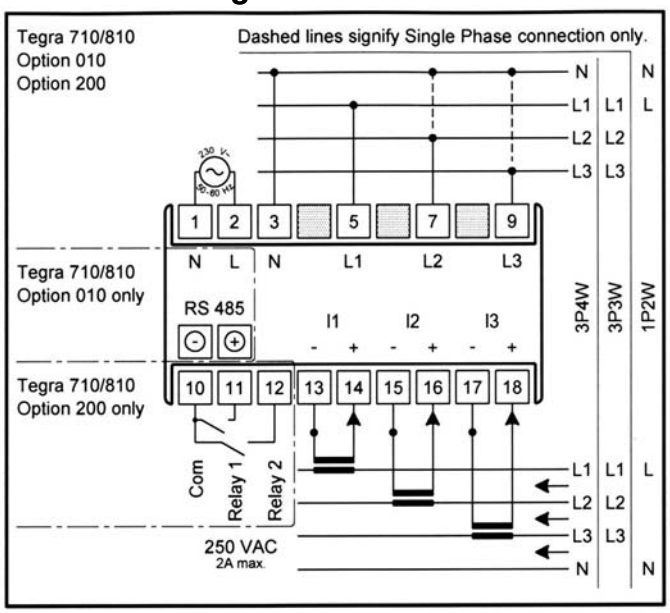
Serial Communications Option

Baud rate	max 9600 bps (programmable)
Parity	None, Odd or Even
Protocol	Modbus RTU (RS485)

Active Energy or Reactive Energy Pulsed Output Option

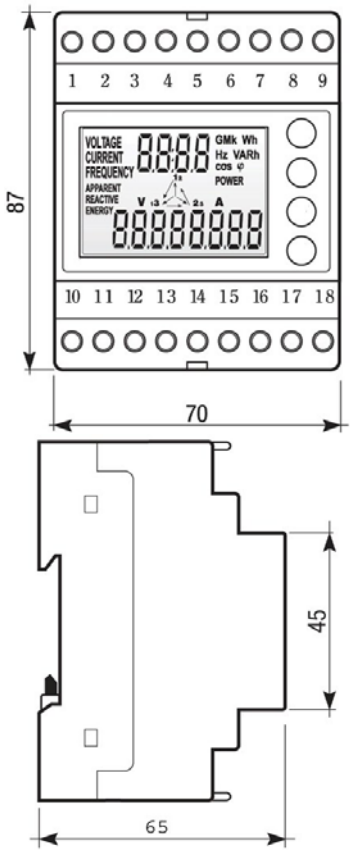
Default pulse rate	1 pulse each "20 x primary CT" Wh or varh for VT primary till 230 V 1 pulse each "40 x primary CT" Wh or varh for VT primary from 230 V to 580 V
Pulsed Output	Relay (free contact)
Pulsed Duration	100 ms

Connection diagram

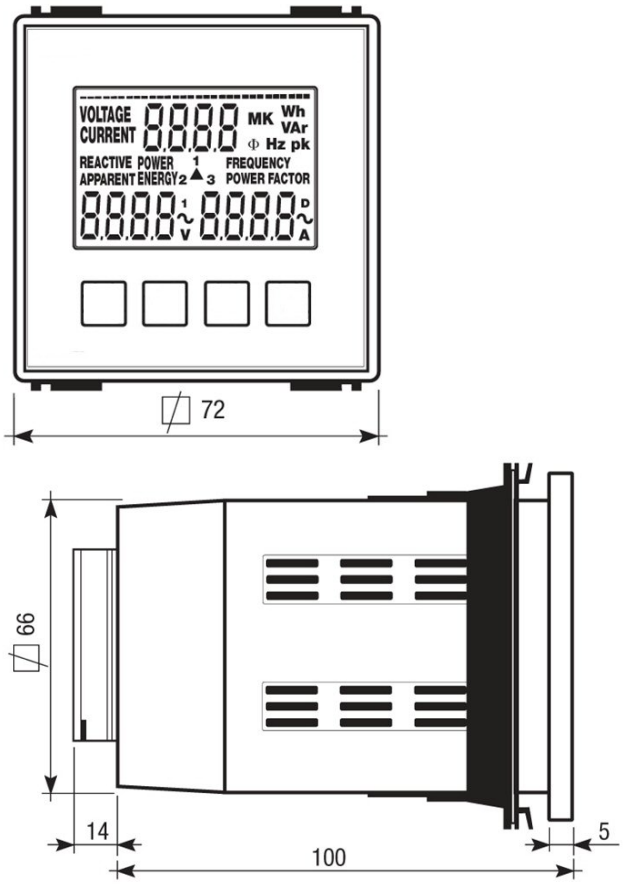


Dimensions in mm

Tegra 710



Tegra 810



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