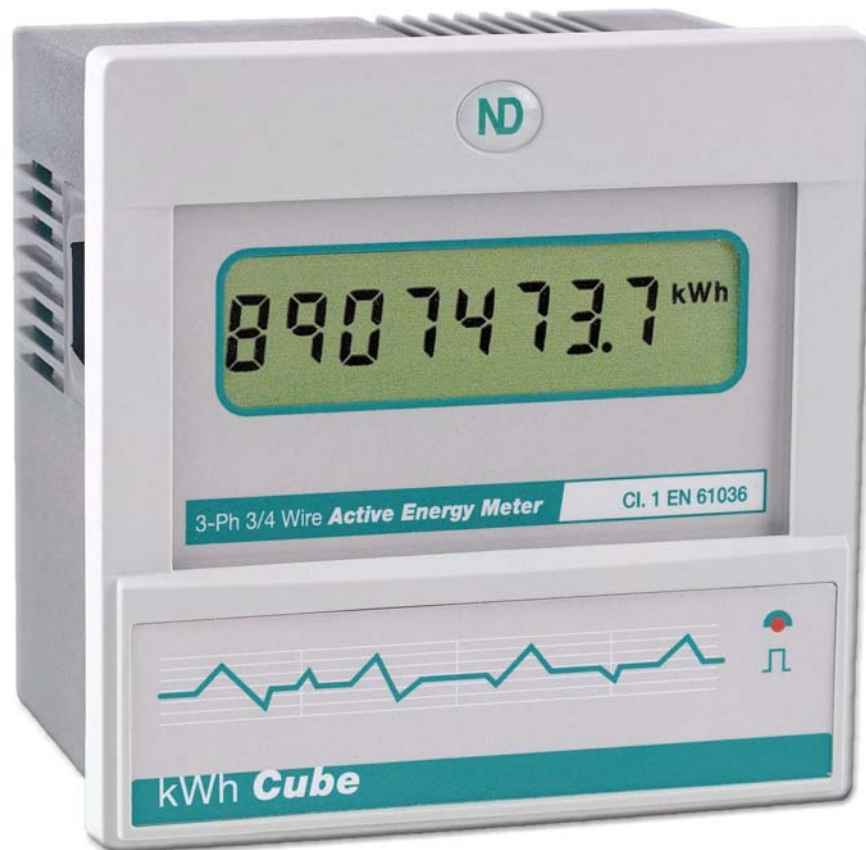


kWh Cube

PANEL MOUNTING kWh METER

OPERATING INSTRUCTIONS

March 2000



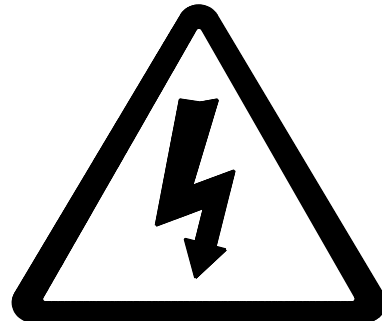
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1 Safety

This instruction sheet gives details of safe installation and operation of the *kWh Cube* electricity meter. Safety may be impaired if the instructions are not followed. Labels on each meter give details of equipment ratings for safe operation. Take time to examine all labels before commencing installation. Safety symbols on the meter have specific meanings.



CAUTION
REFER TO USER MANUAL



WARNING
RISK OF
ELECTRIC SHOCK

2 Cleaning

The front panel of the *kWh Cube* may be cleaned by wiping lightly with a soft, clean cloth. No solvents or cleaning agents should be used.

3 Features

- **MEASUREMENT** - The standard *kWh Cube* measures electrical energy (kWh) on single and/or three phase (3 or 4 wire) loads which may be balanced or unbalanced. Instantaneous kW is also available to aid commissioning.
- **LIQUID CRYSTAL DISPLAY** - The *kWh Cube* provides kW / kWh readings on an 8-digit LCD with LED backlight. In the event of power failure to the meter, kWh readings are stored for 10 years (minimum).
- **CT and/or PT INPUTS** - Connection to the *kWh Cube* is normally via Current and/or Potential Transformers. The meter is programmable to take into account scaling factors required to give direct readings of primary power and energy.
- **DISPLAY SCALING** - Displays are scaled conveniently to provide optimum resolution for the measured load. The display shows W, kW or MW with appropriate decimal points determined by the CT and/or PT programming.
- **PULSE OUTPUT** - The *kWh Cube* may be **OPTIONALLY** fitted with one or two pulse outputs suitable for input to building management systems. The unit may be programmed, to provide a single pulse per 1, 10, 100 or 1000 increments of the LCD energy register. A solid state relay (SPNO) is used giving 100ms pulses in the form of volt free 'contact closures'.

4 Mounting the Unit

Panels should be of thickness 1mm to 4mm with a square cut-out of 92mm (+0.8 - 0.0). A minimum depth of 72mm should be allowed behind the panel for the meter. Remove the panel mounting clips and insert the meter into the cut-out from the front of the panel. Push the meter home. Ensure the screws in each panel mount clip are fully retracted and insert the clips as shown in the diagram below. Tighten the screws to secure the meter firmly in the panel.

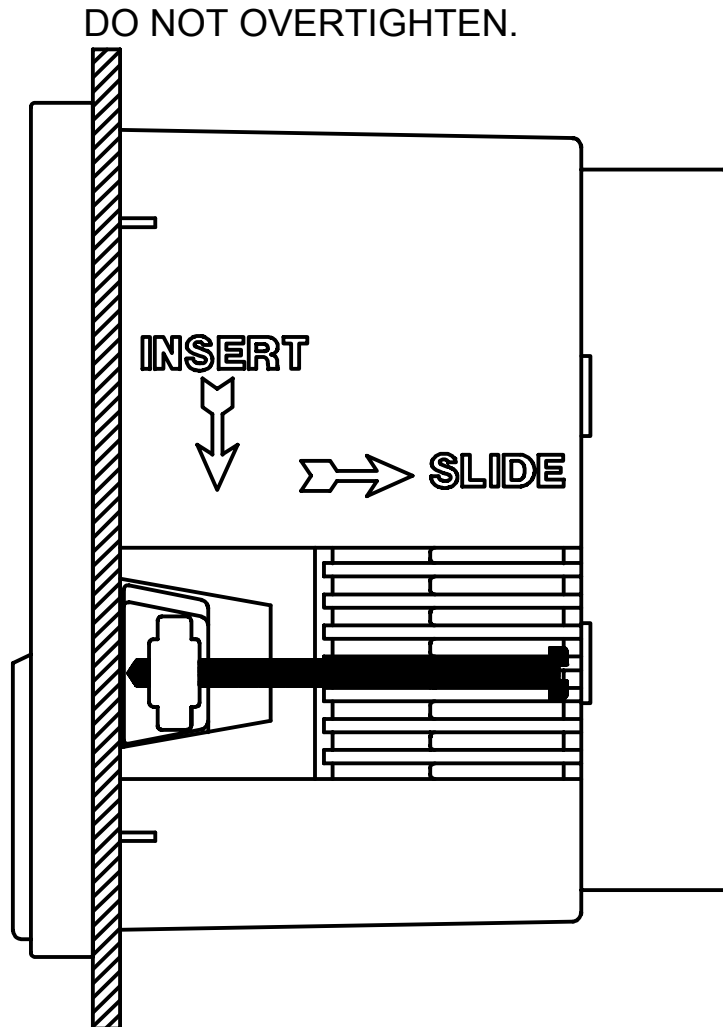


Figure 1 Fitting The Meter in a Panel

5 Current Inputs

Recommended external CTs should conform to Class 1 per IEC 60044-1. The secondary of the CT should be specified to suit the input rating defined on the meter label (5A as standard). Cables used for the current circuit should have a maximum conductor size of 4.0mm² and should be kept as short as possible to reduce cable losses loading the CT secondary.

WARNING

NEVER allow the secondary of a current transformer to become open circuit while a primary current flows. Under these conditions dangerous voltages may be produced at the secondary terminals.

6 Voltage Inputs

Cables used for the voltage measurement circuit should have minimum ratings of 600V, 250mA AC. The maximum conductor size is 4.0mm². External protection fuses are recommended for the voltage measurement inputs. These should be rated at 160mA max, Type F, with a voltage rating to suit the maximum inputs to the meter.

7 Auxiliary Mains Supply (L & N)

The *kWh Cube* is supplied from an auxiliary mains input, isolated from the voltage measurement inputs. This may be connected separately or in parallel with the measurement inputs. Ensure the ratings detailed on the instrument label are not exceeded.

Separate connection of the auxiliary mains is advantageous when :

- Measurement voltages are expected to vary over a wide range
- Measurement voltages are unsuitable for meter supply
- Voltage inputs are taken from low power PT secondaries.

The auxiliary mains supply is internally fused at 250V, 100mA type T. External fusing is required if the auxiliary supply voltage exceeds 250V. The meter ratings are detailed on the instrument label.

8 Meter Connections

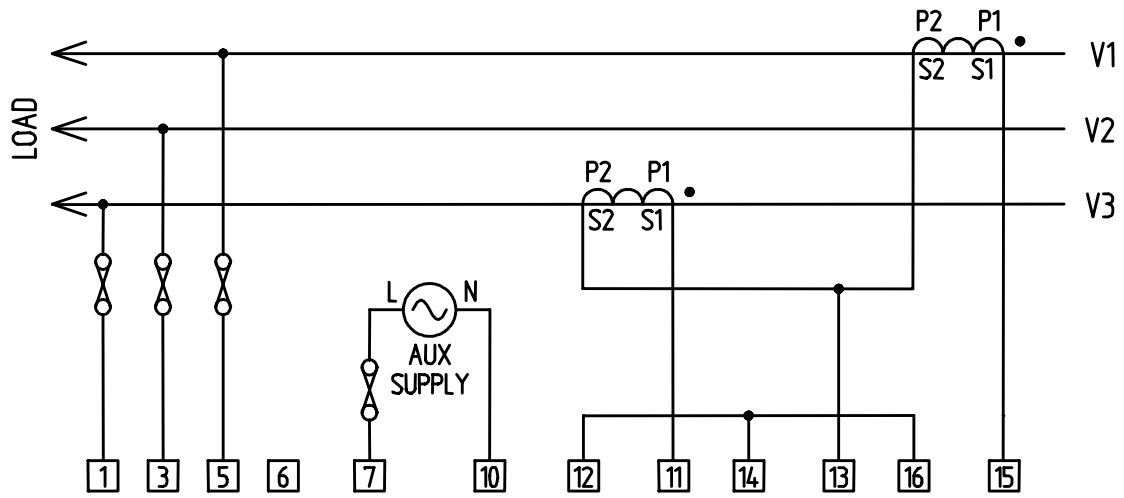


Figure 2 3-Phase 3-Wire (2CTs)

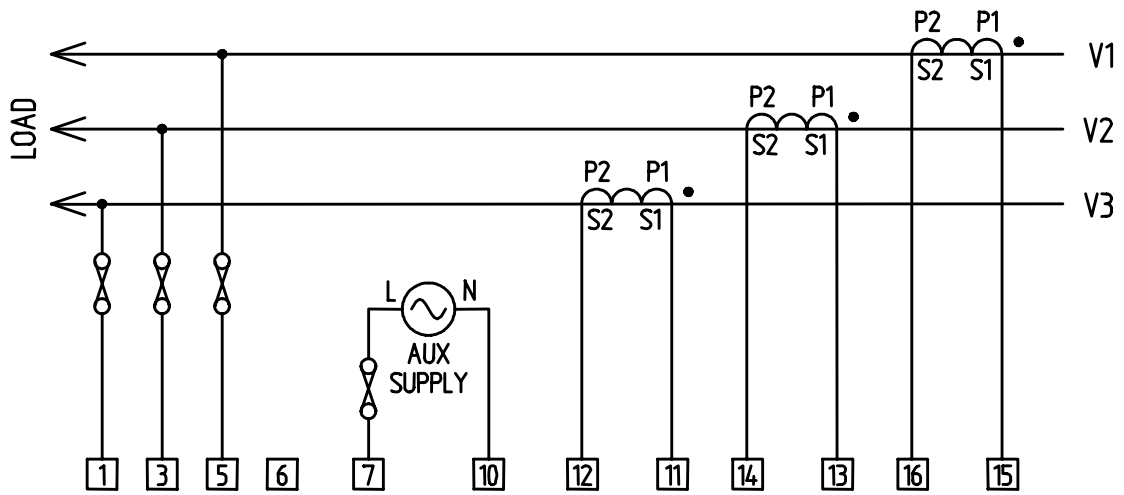


Figure 3 3-Phase 3-Wire (3CTs)

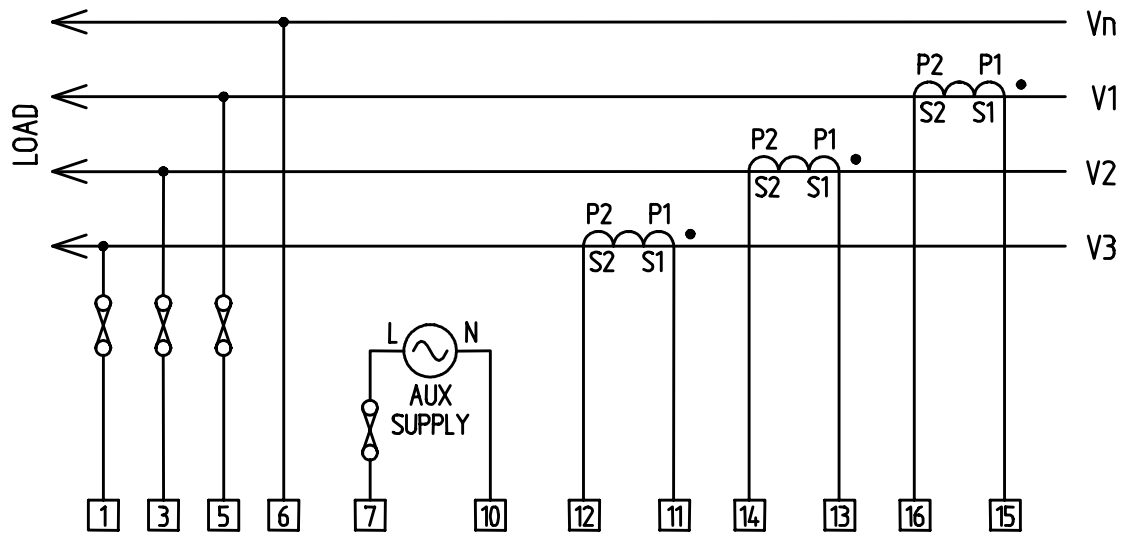


Figure 4 3-Phase 4-Wire

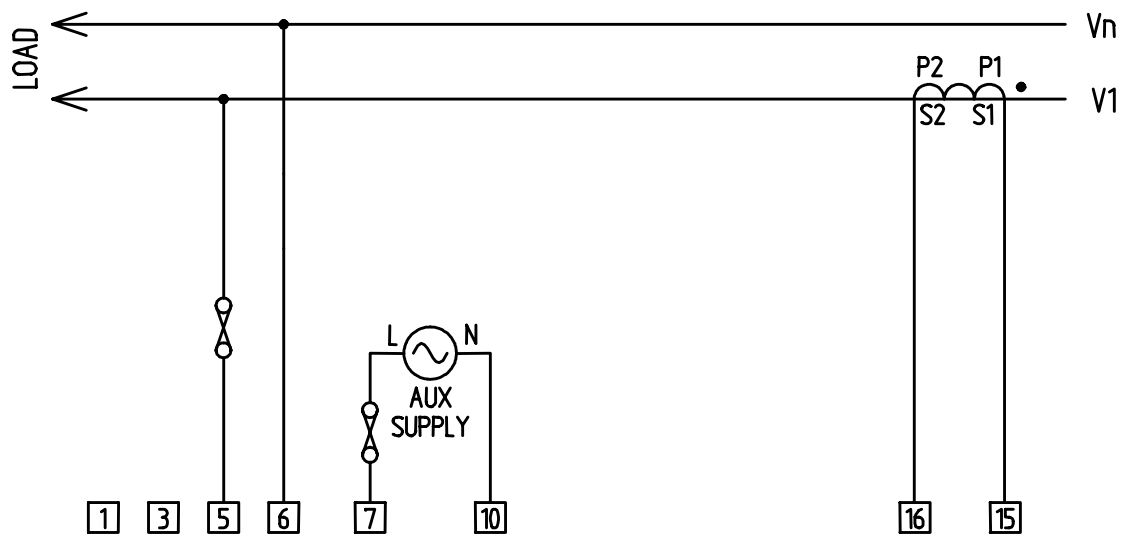


Figure 5 Single Phase


8.1 Reverse Connections

If the **kWh Cube** detects negative power at its input terminals the 'REV CT' message is displayed and the kWh register is frozen. This condition is most commonly caused by wiring errors. The most common of these errors is incorrect orientation of CT primaries (P1/P2) or secondaries (S1/S2).

8.2 Optional Pulse Output(s)

An isolated pulse output (#1) may optionally be provided on the **kWh Cube**. The pulse output provides a volt free contact pair closure for a programmable number of increments (1, 10, 100 or 1000) of the energy display. (e.g. 1 pulse per 10 kWh). The signal provided is designed to interface to building management systems, data collectors, remote counters etc.

On completion of the programmed number of counts the Pulse Output terminals momentarily appear short circuit (100ms). At all other times the pins appear open circuit. The Pulse Output terminals are isolated (@ 2.5kV) from all other parts of the instrument providing safe connection to external systems.

Each pulse output is indicated on the front panel of the **kWh Cube** by a single flash of the  LED.

A second pulse output (#2), which provides an identical signal to that described above, may optionally be provided. This is isolated (50V DC) from the first and may be used as an input to a supplementary external system.

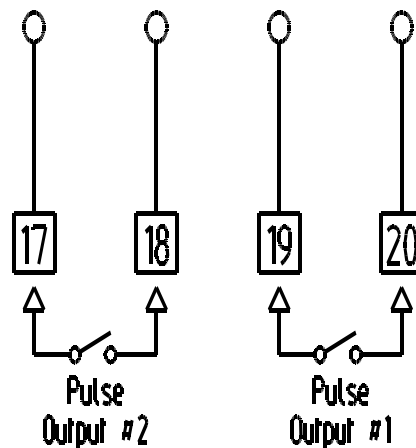


Figure 6 Pulse Output Connection

9 Commissioning

Three keys hidden behind the front panel are used during commissioning to setup meter scaling and test the instantaneous measured load. The keys are accessible by pressing the areas highlighted below.

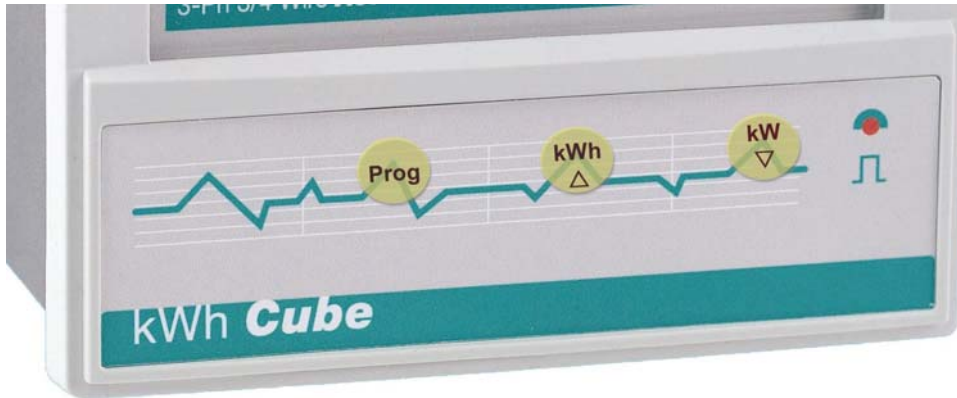


Figure 7 Front Panel Hidden Keys

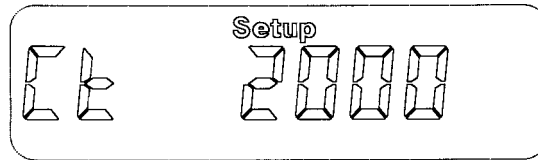
9.1 Programming Setup Parameters

The kWh Cube may be programmed to suit the system in which it is to be installed. Before programming the meter, take a note of the CT Primary Current Rating in Amps, the PT Primary/Secondary Ratio (1.0 if not fitted) and the meter Nominal Voltage rating (meter label). kWh readings are scaled using two multiplying factors CT and SCAL. The display output is set automatically to provide optimum resolution depending on nominal kW programming.

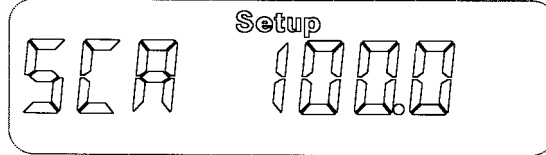
$$\text{Nominal kW} = 3 \times V_{\text{nom}} \times \text{CT} \times \text{SCAL}$$

Nominal kW	Resolution
< 1,44 kW	1 Wh
< 14,40 kW	0.01 kWh
< 144,00 kW	0.1 kWh
< 1,44 MW	1 kWh
< 14.4 MW	0.01 MWh
< 144 MW	0.1 MWh

To enter programming mode Press **PROG** and **hold** for 5 seconds. The unit shows the CT Primary Setup screen.



The CT primary rating may be adjusted in 10A steps by pressing the Δ or ∇ keys until the desired current is displayed. Press **PROG** when the selection is complete.

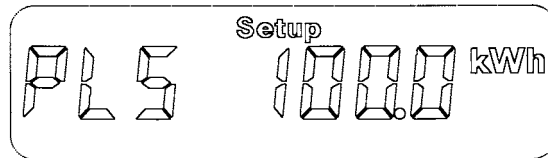


A Scaling factor (0.1, 1.0, 10.0 or 100.0) is provided which, multiplied by the CT setting, allows for external PTs and/or non-standard CTs.

EXAMPLE : If CTs are rated at 200A and 11000:110 PTs are used.
CT=200 and SCAL=100.0

EXAMPLE : If CTs are rated at 25A and No PTs are used.
CT=250 and SCAL=0.1

Press the Δ or ∇ keys until the desired Scaling Factor is displayed. Press **PROG** when the selection is complete.



Pulse output is optional on the **kWh Cube**. If no pulse output is fitted this setting has no effect on meter operation.

Pulse output rate may be set to provide 1 pulse after each 1, 10, 100 or 1000 increments of the LCD register. Press the Δ or ∇ keys until the desired Pulse Rate is displayed. Press **PROG** when the selection is complete.

9.2 kW Display

A display of instantaneous primary kW is available by pressing the 'kW' key. This display remains visible for 1 minute before the unit reverts to normal kWh mode. The kWh key may be used to return to kWh mode before the minute has elapsed.

10 SPECIFICATION

AUX MAINS	Nominal 230V, $\pm 15\%$, 45-65Hz Optional 110V Burden 3W max
VOLTAGE	Nominal $U_n = 400V$ L-L, 230V L-N Optional $U_n = 110V$ L-L, 63.5V L-N Other voltages available to special order AC 45-65Hz fundamental Range = $U_n \pm 20\%$ Burden 0.1W per phase Overload 2 x U_n for 2 Seconds
CURRENT	Nominal $I_b = 5A$ rms Optional $I_b = 1A$ rms Range = 0.005 I_b to 1.2 I_b Burden 0.1VA per phase. Overload 40 x I_b for 1 Sec
DISPLAY	Liquid Crystal (LCD). 8 x 9mm Digits + Legends Backlight green LED Memory 10 Years in the event of power fail.
PULSE*	Normally Open Volt Free Contacts. Contact Rating 50V, 150mA, 5VA AC/DC. 100mS Closure per display increment. Switching Time (t_r , t_f) 2mS max Contact Bounce 0.5mS max.
STANDARDS	Accuracy EN 61036 Class 1 (kWh) Safety EN 61010-1 (Installation category 3) EMC EN 50081-1 (Commercial Emissions) EN 50082-2 (Industrial Immunity)
CASE	DIN 96x96x80mm (72mm Behind panel) Mablex UL94-V-0 self-extinguishing Cut out 92mmx92mm (+0.8 -0.0) Panel 1mm to 4mm thick
TERMINALS	Rising Cage 0.25mm ² to 4mm ²
OPERATION	-10°C to 55°C. <75% RH non condensing
STORAGE	-25°C to 70°C. < 85% RH non condensing

* Optional

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