

L2 Metering Solutions From Eaton

Energy metering is a small but significant element in the requirements of the current Edition of the UK Building Regulations Part L2. The requirements apply to non-domestic premises with a floor area greater than 500m² and effectively call for monitoring of the supply to any final distribution board with an input power greater than 50kW. This could include the vast majority of MCB distribution boards and calls for a fresh look at the design and installation of final distribution systems to achieve cost-effective solutions.

The UK Building Regulations Part L2: Conservation of fuel and power in buildings other than dwellings is now divided into two sub-sections – Part L2A applies to new buildings and L2B applies to existing buildings. The metering requirements are broadly similar but the focus is inevitably on ensuring that new buildings are designed to conserve fuel and power.

Requirements

The essential requirement of L2 is to provide sub-metering so that at least 90% of the estimated annual energy consumption of each fuel can be identified with various end-use categories such as heating, lighting, small power, ventilation, pumps and fans. This must form part of an overall metering strategy that will help operators understand the patterns of energy use in their buildings and, if possible, effect energy savings of at least 5-10%.

The requirements apply to premises with a floor area greater than 500m² (including separate buildings on multi-building sites). An additional requirement calls for automatic meter reading and data collection facilities in buildings with a total useful floor area greater than 1000m². The requirements apply to fuels such as gas, LPG and oil as well as to electricity.

Specific recommendations are made for plant and equipment for which separate metering should be provided as follows:

- Boiler installations greater than 50kW
- Chiller installations greater than 20kW
- Electric humidifiers greater than 10kW
- Motor control centres feeding pumps & fan loads greater than 10kW
- Final electricity distribution boards greater than 50kW

Final Distribution Boards

This last requirement is significant in that most Type B (three-phase) distribution boards are rated 125A or more and therefore exceed 50kW. So metering of supplies to all distribution boards should be considered.

Another important consideration is the fact that many final distribution boards supply both small power and lighting loads. Ideally, in many applications, these should be metered separately so that patterns of usage can be identified with each end use.

Where loads such as pumps and fans are fed directly from a main switchboard or panelboard, metering will normally be supplied at that point. Supplies to final distribution boards could be metered at this level also but, if lighting and small power loads are to be metered separately, this can potentially double the number of branch circuits on the main board and require additional cable feeds to more Sub Distribution boards.

However, the design of distribution boards is a delicate balance between compact dimensions and the provision of adequate space for wiring. This leaves little or no room to accommodate meters. Consequently, the installer is faced with two options:

- Install separate meters alongside the distribution boards
- Install distribution boards with integral meters

If loose meters are installed, the contractor will have to spend time selecting appropriate equipment and designing a suitable installation. The appearance of the finished installation may not be particularly satisfactory and, for the customer, the additional cost may be high.

The second option above normally involves ordering custom-built distribution boards to accommodate the meters. This is costly and can result in manufacturing delays, which are outside the control of the contractor. The answer to this is a new generation of standard final distribution boards with integral meters. Consequently, Eaton has developed standard "Meter Packs" as part of its new Memshield 3 distribution system. Eaton's first offerings are Type A - single-phase boards with single or dual channel metering (monitors two independent groups of load e.g. Lighting and power, separately, with one, two channel meter).

The availability of standard factory-built meter packs and metered distribution boards, available over the counter, puts the contractor back in control. At the same time it reduces the time and effort required to design the metering solution and install the meters. It enables the contractor to offer a quality, value-added product and enjoy a better profit margin than would otherwise be the case.

Meter Types

A number of factors should be considered when selecting a meter.

Where fiscal billing is involved it may be necessary to select an Ofgem-approved meter or an MID (Measurement & Instrumentation Directive) approved instrument. This will give both parties the assurance of an instrument that should be accepted in any dispute over billing. For other applications, normal meters will offer a cost-effective solution, frequently with a wider range of measurement functions and communication options.

The European standard for watt-hour meters, EN61036, classifies meters into two categories. Class 1 is the higher accuracy classification and is the type frequently used for sub-distribution metering. The lower accuracy Class 2 meters are widely used for the main intake position in an installation.

For lower power applications (normally up to 65A single phase and 100A three phase) a direct reading meter will be used (no external CT's); the incoming supply is taken to the meter and then an output from the meter feeds the distribution board. For higher power applications, current transformers (CTs) are used; the supply is taken directly to the distribution board and current transformers on the conductors measure the current flow.

CT measurement also requires a connection to the phase and neutral conductors to provide a reference voltage at the Meter; in some cases this requires use of one of the outgoing MCB ways in the distribution board. With Eaton's Memshield 3 distribution boards, the reference voltage can be taken from the busbar. This leaves the full complement of MCB ways available.

The normal requirement of a meter is to measure energy (kWh). In general this will be provided by a digital display. However, many instruments will also give a pulsed output, which can be used to transmit data to a building management system (BMS) or Automatic Metering System (AMS). This is normally restricted to kWh measurement.

Where additional information may be required, a multi-function meter will display data such as line voltage (V), current (A), power (kW), reactive power (kVAr) and power factor. In many cases, instruments will be capable of displaying many or all of these parameters. If remote collection of this data is required, however, a higher level of communication, such as Ethernet or RS-485, will be required.

Meter Packs

To meet the needs of part L2 of the Building Regulations introduced in England and Wales, Eaton's Memshield 3 meter packs provide simple integration with matched aesthetics. Multi-function DIN rail mounted meters measure electrical parameters on LV supplies to TPN distribution boards. They can also be used to meter single-phase loads. The units are supplied complete with CTs and wiring terminals. Versions are suitable for 100A - 250A applications and as well as a pulsed output for kWh, the meters can be used to monitor other parameters, including line voltage and current. Electrical connection to the associated distribution board does not occupy any of the outgoing circuits. Modbus and MID certified meter versions are also available. Double meter packs are also available for two standard TPN distribution boards facilitate separate monitoring of 'small power' and 'lighting' from one main supply.

Boards With Integral Meters

Eaton has also introduced a range of Type A single-phase distribution boards with integral meters. These include both single meter units and split-metering units for separate metering of lighting and small power loads. They use multi-function meters, which provide visual readout and pulsed output for measurement of kWh and can also provide visual readout of other parameters such as line voltage and current. Modbus RS485 RTU communication is offered as an alternative and provides access to additional electrical parameters.

The single-meter boards are available with 9 or 12 MCB ways (65A max). The split meter boards for independent metering of small power and lighting circuits are available in a 6 + 6 or 8 + 4 configuration. These split load versions employ a two channel Meter feeding two separate busbars within the board, each channel supplying a maximum of 65A. This allows the boards to be used up to their nominal rating of 100A total.

As mentioned previously, metering for plant and services such as pumps and fans can be provided on the outgoing side of switchboards and panelboards. Eaton has introduced outgoing metering facilities for its Series G panelboards up to 800A with removable side gland plates. They make use of side cable extension boxes with hinged doors and DIN 96mm x 96mm cut-outs. The contractor selects the version of Board with removable side gland plates, selects the meters and appropriate CT module to achieve the required solution and, without the need to customise the steel enclosure, fits the meters. Unused meter ways are simply blanked off with a clip-in cover.