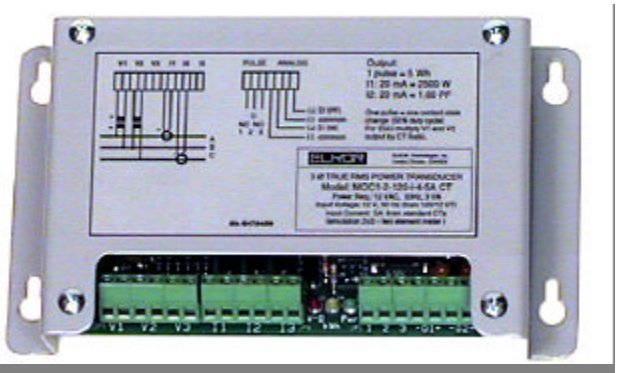


ELKOR MOC1 TRANSDUCER SET - MANUAL

Elkor MOC1 Power Transducer - Product Description

The MOC1 true RMS 3 phase transducer is a micro-processor based metering product that provides a cost effective and practical method for electrical load monitoring. It is designed for industrial and commercial applications as a sensor for the Energy Management system, or as a stand alone transducer.

The MOC1 is supplied with small interfacing voltage transformers, which act as low voltage PTs, for direct connection to any electrical system (Delta or Wye) up to 600 VAC. The first PT also provides 14 VAC power supply for the unit.

The transducer accepts standard 5A current transformers (CTs) or small current sensors (MCTs) that may be applied on 5A secondary wires of the existing CTs. This allows the MOC1-MCT unit to be connected to the existing metering current transformers without any interference. Other types of the mV output 'safe' CTs, including split core units, are also supported by this transducer.

The MOC1 features LED indication for improper input wiring (phase rotation, reversed CTs etc.) but its readings are not effected by reversed inputs polarity. For energy consumption (Watt-hours) the MOC1 provides one SPDT (Form C) dry contact with slow 50% duty cycle pulses or one standard 100 ms pulse output (for totalizers etc.). In addition, two 0-5 VDC analog signals are available (4-20 mA is optional). One of these AO signals is always proportional to instantaneous real power (Watts) while the other can be set to represent either VA, Iabc, Vabc or PF.

On requests, the MOC1 may be supplied mounted in a 20 Ga. steel chassis box together with its interfacing transformers and fuse blocks.

The unit may be calibrated to simulates a two-element meter and may be used in a 'delta' wired systems with two voltage transformers and two current transformers.

Each unit has a specific output signal range depending on the electrical systems parameters and the interfacing transformers used. The calibration data is included in Unit Data Sheet (copies attached).

There is no user adjustable parts on the board. All calibration data is stored in an EEPROM. For re-calibration the unit has to be returned to Elkor.

Elkor MOC1 Power Transducer - Specifications

INPUT:

Voltage: 600/347VRMS
480/277VRMS
230/127VRMS
208/120VRMS
240/120 (Split Phase)
Approved isolating transformer(s), will be provided with the MOC1.
In most applications only one transformer is sufficient {please refer to ordering inf.}.
Current: 5A from standard CTs (MOC1-CT);
MCTs 5A primary (MOC1-MCT)
Max. Ratings: Voltage - 700 VRMS

OUTPUT SIGNALS:

Pulse - reed relay, SPDT contact, 500mA maximum @24V, proportional to energy consumption (Wh), Max.0.1 Hz, 50% duty cycle or 100 ms pulse (opto -open collector)
Analog - two 0-5VDC (4-20mA) signals; one proportional to instantaneous Watts, second to either specified parameter: kVA, Averaged Current , Averaged Voltage or PF.

POWER SUPPLY REQUIREMENTS:

3 VA/12VAC - the 'on board' power supply uses 12VAC input supplied by the voltage isolating transformer (VT) provided with the board.

ACCURACY:

0.5% TRMS FS for current;
0.8% TRMS of full rated span for all other measured and calculated parameters (MOC1-3 and MOC1-2 @ rated frequency, PF1.0 to 0.7)

ENVIRONMENT:

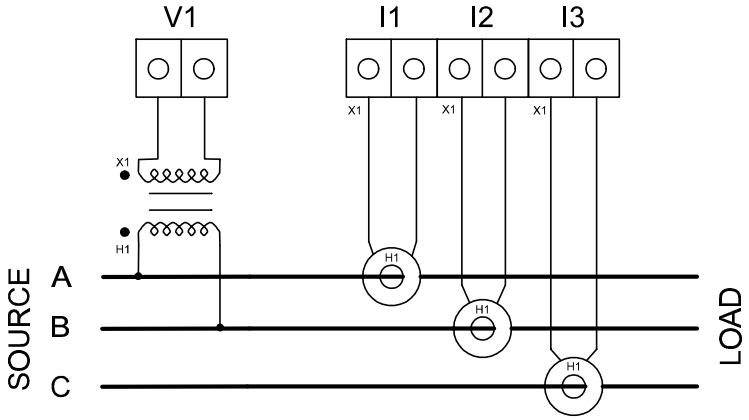
Indoor; 0-50 C, 10-90%RH non-condensing.

WARRANTY:

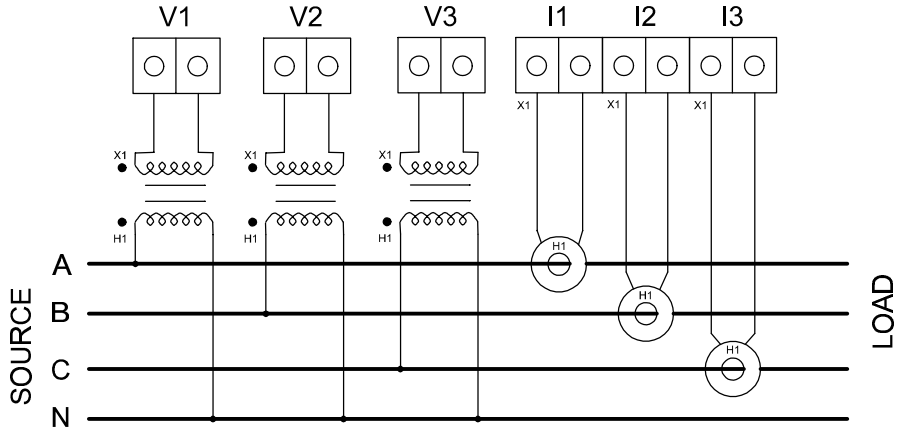
Full two years manufacturer's warranty.

MOC1 POWER TRANSDUCER - INPUT WIRING (MAX.600 V)*

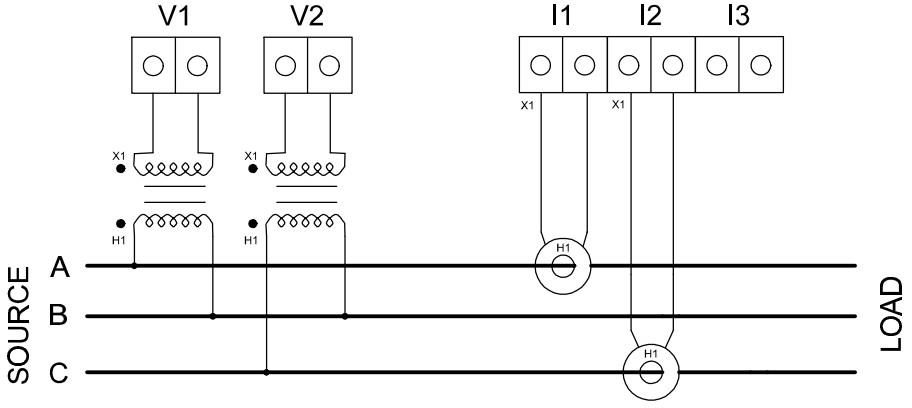
* above 600 V the VTs will be wired to 120 V secondaries of the PTs.



3 OR 4 wire system with equal voltages



4 wire (wye) system, three VTs & 3 CTs



3 wire (delta) system, two VTs & 2 CTs

MOC1 - Wiring Instructions (3 element meter)

The MOC1-3 can be used as a a 'three element meter' which means that it acts like three separate single phase meters with combined outputs. Each of these 'metering elements' should be wired properly and in sequence, therefore, as with any other electricity meter, the *phase rotation and order* is very important. The *polarity* of interfacing transformers is also important but not critical for the MOC1 unit. The transducer was designed to provide proper output regardless of wiring, however, the flashing red LED should be observed and any errors should be rectified.

In some existing installations the phase labeling and the CT polarity is unknown and this may create a possibility for erroneous wiring. The diagram on Fig 1. presents the proper wiring of the MOC1-3 transducer.

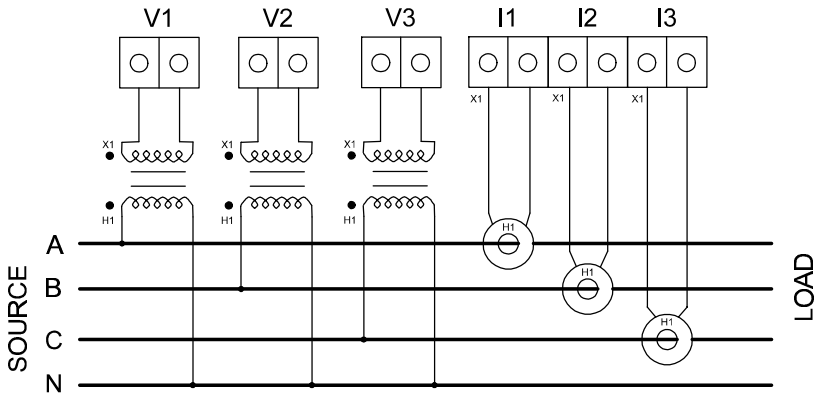


Fig.1: MOC1-3 as 'three element' meter - Proper Input Wiring

WIRING HINTS:

- Voltage Transformers (VTs) must be connected between designated phases with the neutral acting as a reference.
- The polarity of the Voltage Transformers (VT) must be observed. The H1 winding is to be connected to the appropriated phase with corresponding H2 connected to the Neutral. The X1 terminal should be connected to the left pole of the proper voltage input terminal.
- The first CT (associated with input I1) must be on the same phase as the H1 of the first voltage transformer.
- The second CT (Input I2) must be on the next (clockwise) phase, the same as the H1 of the next voltage transformer, etc.
- Polarity of the CTs and MCTs should be observed. The H1 marking (on standard CTs) and the white dot (on MCTs) must face the power source. If MCTs are used, the dot should face the X1 wire of the primary CT.
- The red diagnostics LED will be flashing if wrong polarity is detected.

MOC1 - Wiring Instructions (3 element meter) -c.d.

POLARITY:

The red LED on board will indicate improper polarity of current transformers (or MCTs) and/or wrong connection of the voltage transformer(s). The CTs should always face the source with their H1 side (sometimes this marking is hardly visible on black CT molding) while their X1 leads should be terminated at left pole of the appropriate current input terminal. Both, the CTs and the VTs should be wired as per Fig.1

If Elkor MCT current sensors are used, the dot should face the X1 (incoming) wire of the 5A CT (or the load). The MCTs should be wired as per Fig. 2. In existing metering the incoming CT wires are usually marked as I11 and I21 and I31.

PHASE ROTATION:

The red LED on board will not signal wrong phase rotation. The meter assumes that the phase shift caused by wrong rotation is due to bad power factor.

The phase designation is arbitrary but it has to provide clock-wise rotation and has to be consistent for voltage transformer and CT wiring. The CT wired to the first current input (I1) must be on the same phase as the H1 winding of the first voltage transformer.

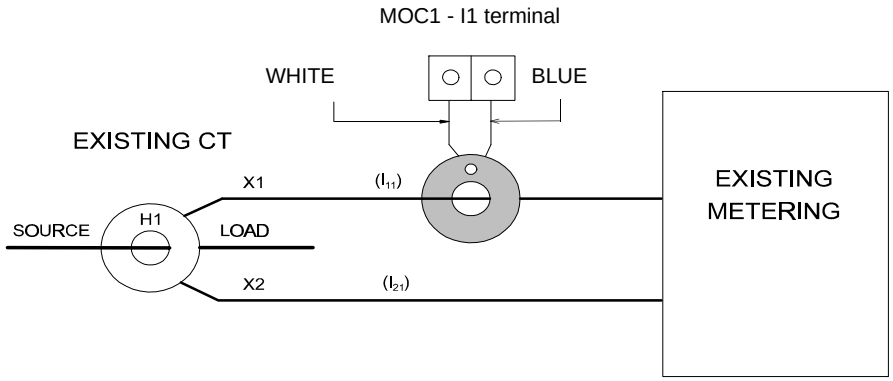


Fig.2 - MCT Wiring (one input shown)

USEFUL FORMULAS:

Power in 3 Phase Circuit: P = 1.73 x Vp x I x PF or P = 3 x Vf x I x PF

Voltage Relations: Vp = 1.73 x Vf {Vp - V phase-to-phase; Vf- V ph-to-ground}

MOC1 Current Output: kW (EGU) = CT Ratio x (output - 4) x FS Value/16

MOC1 Pulse Period (one 'flip'): T(sec) = 3600 x pulse Wh value /load(W)

MOC1 - Operating Instructions

1. Input Wiring Diagnostics

- The MOC1 transducer offers a Wiring Diagnostic feature to insure proper line wiring sequence, however, the **MOC1 should meter power, current and voltage correctly regardless of any erroneous wiring**. The red LED will be flashing if any of the input signals is reversed or misapplied. It takes a few seconds after the MOC1 is powered up for the processor to analyze the inputs and to activate the Wiring Diagnostics (W_D) LED. If the input wiring is correct the LED will be 'OFF' all the time.

2. Output Signals:

2.1 Watt-hour Pulses

- The MOC1 transducer provides dry contact pulses for energy consumption (Watt-hours). The Wh relay activity is indicated by the **yellow LED**. The relay delivers SPDT, 50% duty cycle pulses. This kind of output is sometimes referred to as 'KYZ'. The Wh contact changes its state after a pre-defined energy unit is measured (i.e. 5 Wh, 15 Wh, etc.). This predefined amount of energy depends on the line voltage and the CT current (usually 5A). It is factory programmed according to the specified line parameters. For Engineering Units (EGU) the MOC1 output should be multiplied by the CT ratio (and the PT ratio, if any high voltage PTs are used). *As an option, a 100 ms optically isolated (open collector) pulses are also available.*

- The MOC1 Wh pulses are easily monitored by any EMS system via a standard status point. They are programmed in such a way that their maximum frequency at full load is about 1 pulse every 10 seconds (0.1 Hz). Fast (100 ms) pulses are available as an option.

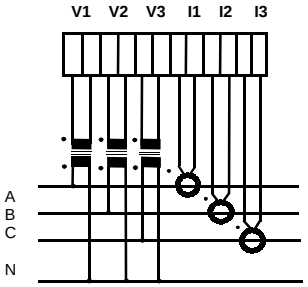
2.2 Analog Outputs

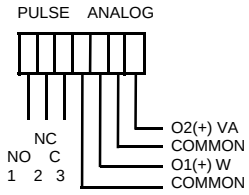
- Two analog outputs deliver 0-5 VDC or 0-10 VDC (4-20 mA signal is optional). V1 (or I1) is always proportional to instantaneous real power (Watts). V2 (or I2) is proportional to other power parameter selected at the time of ordering. If not specified, apparent power (VA) is present on the V2 (or I2) terminal as a factory set default parameter. The analog output signal is highly linear in its entire span range. The signals are factory pre-scaled depending on the value of line voltage and the CTs' secondary current, as per order. These values are referred to as 'generic outputs'. To obtain Engineering Units (EGU) the generic output signals should be multiplied by CT ratio (and PT ratio,if any).
- When specified, the optional 4-20 mA outputs are sourcing (max 600 R loop) and no extra power supply is required for the current loop. The large **orange LEDs** indicates the loop continuity and the 4-20 mA current flow.

3. Grounding Considerations:

The MOC1 transducer should be grounded via the Energy Management System common ground (in one point only) to eliminate any possible ground loops. **In effect, this connection will ground the secondary leads of the input transformers.** If other grounding arrangements are required for the primary CTs, the MOC1 transducer c/w MCT current sensors may be ordered.

NOTE: The Unit Data Sheet (UDS) calibration card is issued for each MOC1 transducer. This sheet contains details regarding output signal scaling, wiring and the unit identification.





Output:
1 pulse = 15 Wh
O1: 5 V = 7500 W
O2: 5 V = 7500 VA
One pulse = one contact state change (50% duty cycle)
For EGU multiply outputs by CT Ratio.

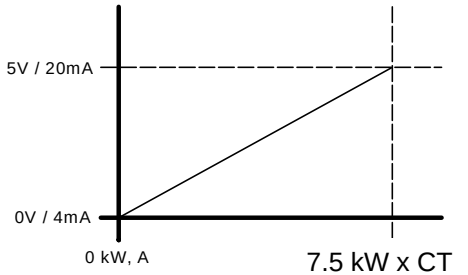
ELKOR Technologies Inc.
London, Ontario CANADA

MOC1 - OUTPUT SIGNAL SCALING

ANALOG OUTPUTS:

V_1 & I_1 - kW

V_2 & I_2 - kVA



CONTACT OUTPUT: kWh

RELAY CHANGES STATE EVERY: 15 Wh x CT ratio

CT RATIO: ???:5 A

Product Identification

Serial Number: 04878
Calibration Date: October 9, 2000
Algorithm: 3v3i

Ordering Code: MOC1-3-347-v-1-5ACT

Operating Range:

Nominal Operating Conditions:
Line Voltage Range: 600/347 (four wire system) (- 20%, +10 %)
Input Current Range: 0 to 5.0 A via CTs
Current Overload: 20 % (6.0 A), continuos
Accuracy: Better than 1.0 % FS for all parameters
True RMS Algorithm; 10 Bit Output Resolution

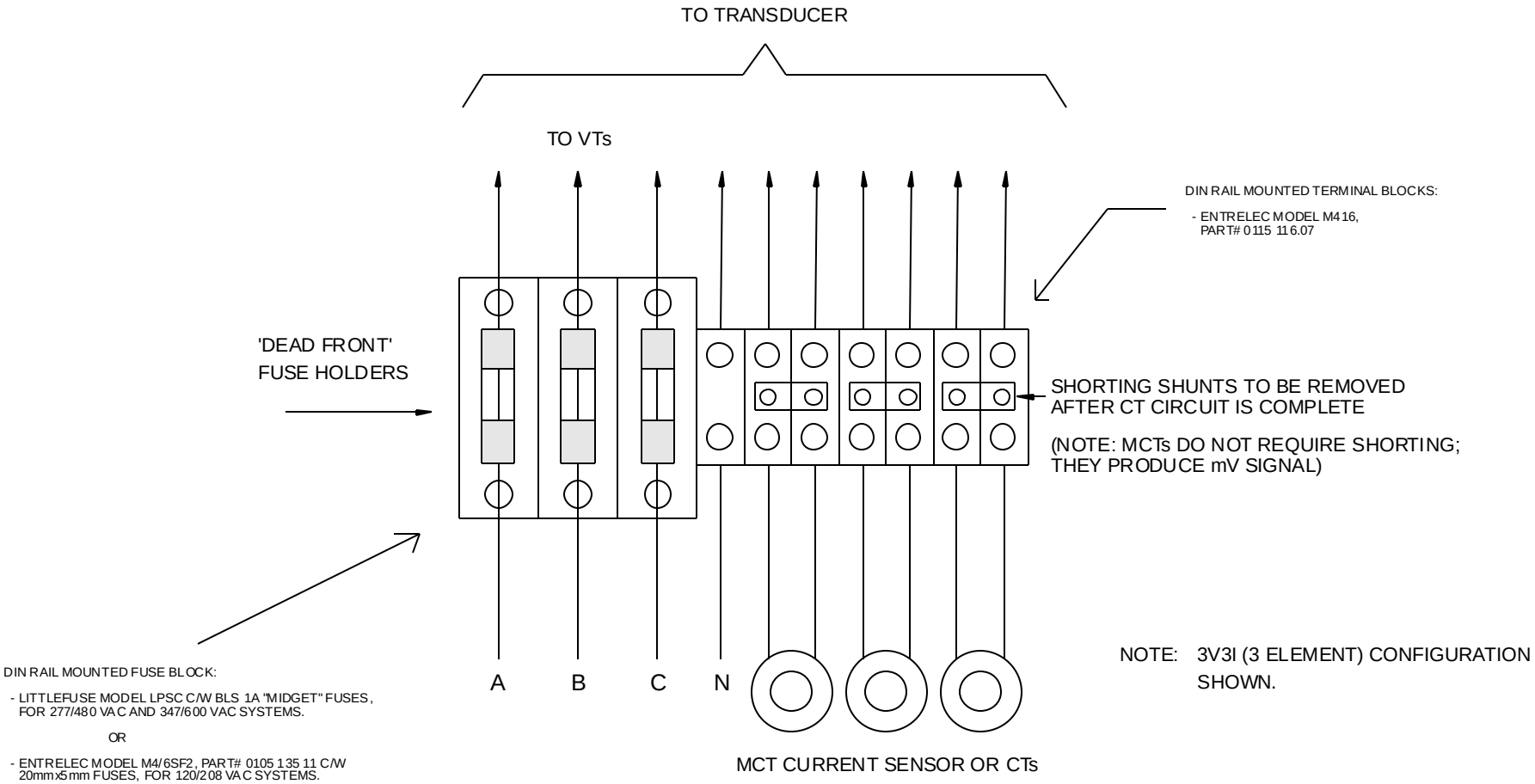
Absolute Maximum Input Ratings:
Line Voltage: 680 VAC (phase to phase)
Input Current: 10 A (CTs secondary)

Output Scaling:

Pulsed Output: **1 pulse** per each **15 Wh**
Analog Output 1: **5 V = 7500 W**
Analog Output 2: **5 V = 7500 VA** (Averaged Iabc)
FOR EGU MULTIPLY THE ABOVE BY CT RATIO

ELKOR Technologies Inc.

MOC1 Power Transducer - Unit Data Sheet



NOTE: 3V3I (3 ELEMENT) CONFIGURATION SHOWN.

ELKOR Technologies Inc.		
DRAWN: PCK/ICC	TITLE: VT FUSE & CT SHORTING BLOCK RECOMMENDED WIRING.	CODE: I-BLOCK
CHECKED: CKK		
DATE: 01/06/15	FILE: IBLOCK.T4G	SHEET: 1 OF 1