INSTALLATION AND OPERATING MANUAL

EN

DIRIS MCM-48

Multi-circuit electric submeter – 48 channels

socomec
Innovative Power Solutions

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1. Introduction

The DIRIS MCM-48 meter is a revenue grade networked electric submeter capable of using 333 mV output Current Transformer (CT) or Rogowski style current sensors. The DIRIS MCM-48 has been designed with mechanical, electrical and software features that will appeal to those seeking a simplified approach to facility energy management.

2. Safety

2.1 Safety Specifications

	**DO NOT EXCEED V Line to Neutral or 480 volts Line to Line. Exceeding this voltage will cause damage to the meter and danger to the user. Always use a Potential Transformer (PT) for voltages in excess 480 volts.**

This general safety information is to be used by both the meter operator and servicing personnel. Socomec assumes no liability for user's failure to comply with these safety guidelines.	 **MCM-48-X-Y-Z**	Conforms to: UL 61010-1 Edition 3 (2016), CSA C22.2 No 61010-1-12 Edition 3 Update 2 (2016),
The DIRIS MCM-48 meter may be used up to 480 VAC in an overvoltage III category.		
CAUTION: THIS METER MAY CONTAIN LIFE THREATENING VOLTAGES. QUALIFIED PERSONNEL MUST DISCONNECT ALL HIGH VOLTAGE WIRING BEFORE SERVICING THE METER.		

Symbols on Equipment

WARNING. Denotes caution. See manual for a description of the meanings.

WARNING. DENOTES HIGH VOLTAGE. RISK OF ELECTRICAL SHOCK. LIFE THREATENING VOLTAGES MAY BE PRESENT. QUALIFIED PERSONNEL ONLY.

Equipment protected throughout by double insulation (IEC 536 Class II).

Symbols in Documentation

Contains additional information or shortcut information

2.2 Safety Information

Electrical equipment shall be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Socomec for any consequences arising out of the use of this material. A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

	**General Requirements** • Review the entire manual to familiarize yourself with the meter and any accessories. • Comply with local and national safety codes. • Use personal protective equipment if exposed to hazardous live conductors. • Installation shall be performed by licensed electricians only. • Equipment shall be accessible only to authorized personnel in a restricted area. • If the fuse is open inside the meter or the meter has visible damage disconnect all power sources from the meter.
	**Installation Requirements** • Use only copper conductors of the appropriate size for each terminal. • Upstream branch circuit protection breaker must be in the range of 1 – 15 amps. • Mains wiring shall be temperature rated for 90 ^{o}C (194 ^{o}F) or higher. • Mains wiring shall be no smaller than 14 AWG (1.6mm^2) for model MCM-48 / MCM-48-X • Mains wiring shall be no smaller than 12 AWG (2.0 mm^2) for model MCM-48-Z • Meter shall only be used with *UL Listed* Current Transformers (CT) or Rogowski Sensors. • Meter shall be installed and serviced with the power disconnected. • CT or Sensor wiring cannot exceed 75% of the cross-sectional area of conduits or troughs. • CT or Sensors cannot be placed in such a way that they impede ventilation. • CT or Sensors cannot be placed in an arc venting area of cabinetry. • CT or Sensors are NOT suitable for Class 2 wiring methods (i.e. splicing restrictions apply). • CT or Sensors shall be installed over insulated conductors only, no bare conductors or terminals. • CT or Sensor wiring or terminals blocks shall be temperature rated 75 ^{o}C (167 ^{o}F) or higher. • All un-used openings on the meter shall be plugged. • If the equipment is used in a manner not specified by Socomec, the protection provided by the equipment may be impaired.
	**California Proposition 65** **Warning:** Under normal circumstances the DIRIS MCM Power meter does not pose an exposure health risk to users of the product. The internal printed circuit board and associated electronic components have been selected, designed and manufactured to international RoHS standards where verifiable. As a complex electrical circuit, it must be assumed that internal components could have plastics or chemicals that are known to the State of California to cause cancer, birth defects or other reproduce harm. It is recommended therefore to dispose of the product through an electronics reclamation service to prevent such materials from entering the environment.

Safety Ratings

Description	Rating
Equipment Function	Networked Multi-Circuit Sub Meter
Connection Type	Permanent
Over-Voltage Category	III
Pollution Degree	2
Enclosure Type	Metallic / Bonded
Temperature Range	-20 ^{o}C to + 50 ^{o}F
Humidity Range	Non-condensing
Altitude	< 2000 meters
Ingress Protection Rating	40
Location	DRY only

1. Introduction

Le DIRIS MCM-48 est un sous-compteur électrique en réseau de qualité économique capable d'utiliser des capteurs de courant de sortie mV (CT) ou de style Rogowski. Le DIRIS MCM-48 a été conçu avec des fonctionnalités mécaniques, électriques et logicielles qui plairont à ceux qui recherchent une approche simplifiée de la gestion de l'énergie des installations.

2. Sécurité

2.1 Spécifications de sécurité

	**NE PAS DÉPASSER V Line to Neutral ou 480 volts Line to Line. Le dépassement de cette tension endommagera le compteur et mettra en danger l'utilisateur. Utilisez toujours un transformateur principal(PT) pour les tensions supérieures à 480 volts.**

Ces informations générales sur la sécurité doivent être utilisées à la fois par l'opérateur du compteur et par le personnel d'entretien. Socomec n'assume aucune responsabilité en cas de non-respect par l'utilisateur de ces consignes de sécurité.	c UL LISTED **MCM-48-X-Y-Z**	Conforme à: UL 61010-1 Edition 3 (2016), CSA C22.2 No 61010-1-12 Edition 3 Mettre à jour 2 (2016),
Le compteur DIRIS MCM-48 peut être utilisé jusqu'à 480 VAC dans une catégorie de surtension III.		
PRUDENCE: CE COMPTEUR PEUT CONTENIR DES TENSIONS POTENTIELLEMENT MORTELLES. LE PERSONNEL QUALIFIÉ DOIT DÉBRANCHER TOUT LE CÂBLAGE HAUTE TENSION AVANT D'ENTRETENIR LE COMPTEUR.		

Symboles sur l'équipement

AVERTISSEMENT. Dénote la prudence. Voir le manuel pour une description des significations.

AVERTISSEMENT. INDIQUE UNE HAUTE TENSION. RISQUE DE CHOC ÉLECTRIQUE. DES TENSIONS POTENTIELLEMENT MORTELLES PEUVENT ÊTRE PRÉSENTES. PERSONNEL QUALIFIÉ SEULEMENT.

Équipement protégé par une double isolation (IEC 536 Classe II).

Symboles dans la documentation

Contient des informations supplémentaires ou des informations de raccourci

2.2 Renseignements sur l'innocuité

Généralités

Le matériel électrique ne doit être installé, exploité, entretenu et entretenu que par du personnel qualifié. Socomec n'assume aucune responsabilité pour les conséquences découlant de l'utilisation de ce matériel. Une personne qualifiée est une personne qui possède des compétences et des connaissances liées à la construction, à l'installation et à l'exploitation d'équipements électriques et qui a reçu une formation en matière de sécurité pour reconnaître et éviter les dangers encourus.

Exigences générales

- Consultez l'intégralité du manuel pour vous familiariser avec le compteur et les accessoires.
- Se conformer aux codes de sécurité locaux et nationaux.
- Utilisez un équipement de protection individuelle si vous êtes exposé à des conducteurs sous tension dangereux.
- L'installation ne doit être effectuée que par des électriciens agréés.
- L'équipement ne doit être accessible qu'au personnel autorisé dans une zone réglementée.
- Si le fusible est ouvert à l'intérieur du compteur ou si le compteur présente des dommages visibles, débranchez toutes les sources d'alimentation du compteur.

Configuration requise pour l'installation

- Utilisez uniquement des conducteurs en cuivre de la taille appropriée pour chaque borne.
- Le disjoncteur de protection de circuit de dérivation en amont doit être compris entre 1 et 15 ampères.
- La température nominale du câblage secteur doit être de 90 °C (194 °F) ou plus.
- Le câblage secteur ne doit pas être inférieur à 14 AWG (1,6 mm²) pour le modèle MCM-48 / MCM-48-X
- Le câblage secteur ne doit pas être inférieur à 12 AWG (2,0 mm²) pour le modèle MCM-48-Z
- Le compteur ne doit être utilisé qu'avec *des* transformateurs de courant (CT) répertoriés UL ou des capteurs Rogowski.
- Le compteur doit être installé et entretenu avec l'alimentation déconnectée.
- Le câblage CT ou Sensor ne peut pas dépasser 75% de la section transversale des conduits ou des auges.
- La tomodensitométrie ou les capteurs ne peuvent pas être placés de manière à entraver la ventilation.
- CT ou capteurs ne peuvent pas être placés dans une zone de ventilation d'arc des armoires.
- La tomodensitométrie ou les capteurs ne conviennent PAS aux méthodes de câblage de classe 2 (c-à-d. des restrictions d'épissage s'appliquent).
- Le CT ou les capteurs doivent être installés uniquement sur des conducteurs isolés, pas de conducteurs ou de bornes nus.
- Le câblage ou les borniers CT / capteur doivent avoir une température nominale de 75 °C (167 °F) ou plus.
- Toutes les ouvertures inutilisées du compteur doivent être bouchées.
- Si l'équipement est utilisé d'une manière non spécifiée par Socomec, la protection fournie par l'équipement peut être altérée.

Cotes de sécurité

Description	Notation
Fonction de l'équipement	Sous-compteur multi-circuits en réseau
Type de connexion	Permanent
Catégorie de surtension	III
Degré de pollution	2
Type de boîtier	Métallique / Collé
Plage de température	-20 deg C to + 40 Deg C
Plage d'humidité	Sans condensation
Altitude	< 2000 Mètres
Indice de protection contre les infiltrations	40
Emplacement	SEC uniquement

3. Design Philosophy

The DIRIS MCM-48 design philosophy is simple; everything that represents “Best Practices” in sub metering is included in the design.

	**Electrical Safety:** The closer a device gets to the electrical grid and the larger the transformer feeding the installation the higher the risk of an electrical accident. Typical transformers can deliver 20 times their rated current under fault conditions. If unknown the user should assume that their connection to the grid will support 50kA of current (UL61010 Table AA.1).

Fuses. Circuit breakers are designed to protect wiring in buildings from excessive heating caused by circuit overloads. Circuit breakers are NOT capable of interrupting the enormous currents that can flow into a low impedance electrical failure such as a shorted semiconductor. Best practice is to protect each *HOT LEG* coming from the utility with a fuse capable of disconnecting 200kA of current. This protection will greatly reduce the chances of an arc flash within the power meter.

Surge / ESD. It is expected that the electric grid will routinely expose connected devices to short duration over-voltage stresses orders of magnitude higher than the service voltage. All high voltage and high energy events should be directed to earth ground through a dedicated path that does not intersect with the measurement circuitry or connected equipment. Floating and isolating designs can pass the electrical stress down to connected devices.

Universal Power Supply. A power meter is a very low wattage device but one that needs to operate over a wide range of excitation conditions. The DIRIS MCM-48 uses a wide-range three phase power supply and will power the meter if a voltage differential exists across any Line-to-Line combination.

Disconnects. Best practice for the installation of a power meters is achieved when a dedicated circuit breaker is installed that feeds only the power meter. It is recognized however that industrial locations, especially retrofits, may not be able to comply with this ideal and may instead daisy chain or splice from a nearby circuit. In such cases the DIRIS MCM-48 is offered with a built in disconnect “option -X” to allow the meter to be serviced independently of other circuits. We have introduced this feature to help facilitate safe installations of submetering.

Enclosure. The DIRIS MCM-48 is designed with the installer in mind. All fasteners are “top access” and captured so that they are accessible in any meter configuration and cannot come loose or be dropped. The DIRIS MCM-48 has no openings or buttons, which are the most common source of failure and tampering.

Durability and Style. You just invested in a piece of modern capital equipment, the DIRIS MCM-48 uses scratch and corrosion resistant anodized aluminum and high-quality plastics.

Multiple Data Models. The DIRIS MCM-48 supports several data organizational models for compatibility with a wide range of Modbus host types.

4. DIRIS MCM power meter overview

4.1 Meter Model

The MCM family of meters is a simplified design and is available with limited model variations: with or without a high voltage rotary disconnect. Product capabilities and variations may expand over time. The ordering model is formatted below.

M	C	M	-	4	8	-	A

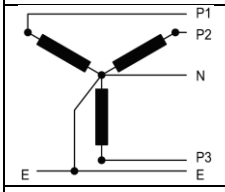
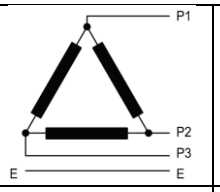
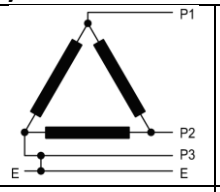
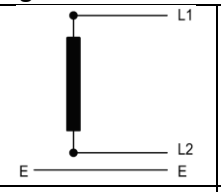
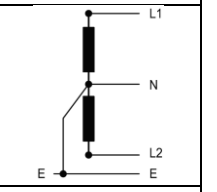
MODEL			CIRCUITS			DISCONNECT	
MCM	Meter Family	-	48	Number of CT Channels	-	N	None
						X	UL 508 Type

To simplify the model numbering system N indicates that a feature is NOT included and may be eliminated () if no further options are present.

Preferred Model # MCM-48™-X

4.2 Service types supported

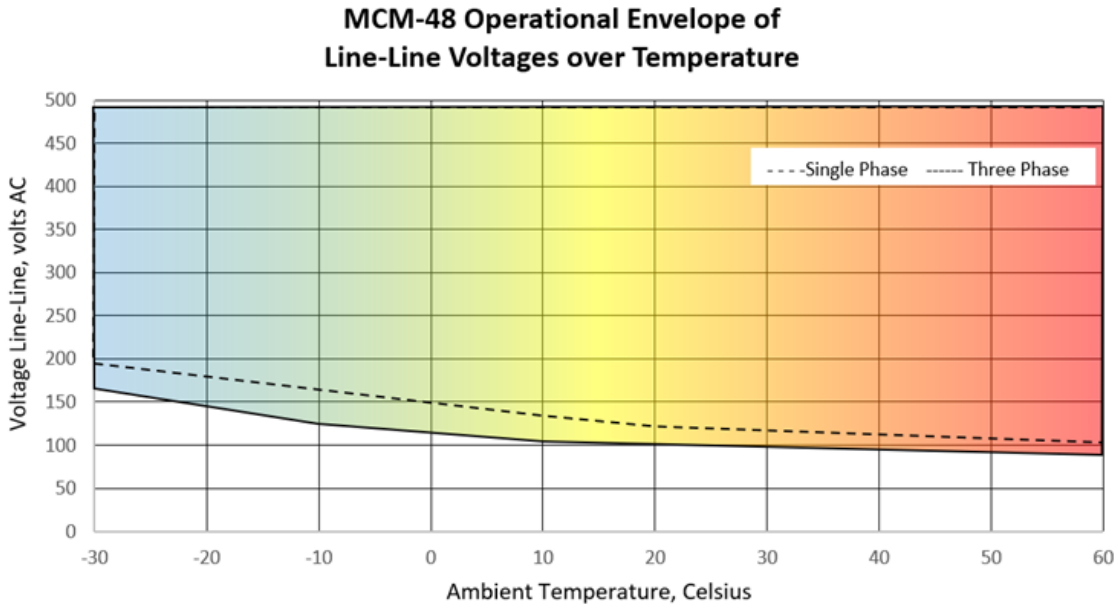
The DIRIS MCM-48 meter is intended for use in the following voltage supply services:

MAINS System Nominal Voltages					**Line to Neutral or Ground**	**CAT**
						
3P-4W Grounded	3P-3W Floating	3P-3W Grounded	2P-2W Floating	2P-3W Grounded		
120/208 127/220	110, 115 120, 127		110, 115 120, 127	110 / 220 115 / 230 120 / 240	150	III
220 / 380 230 / 400 240 / 415 260 / 440 277 / 480	220 230 240 277	200 277	220 230 240 277	240/440 240 / 480	300	III

4.3 DIRIS MCM technical characteristics

Electrical	
Service Types	Single Phase, Split Phase, Three Phase-Four Wire (WYE), Three Phase-Three Wire (Delta), Open Delta, Corner Grounded Delta, Center Grounded Delta
Voltage Channels	90-277 Volts AC Line-to-Neutral, 90 – 480 V Line-to-Line, CAT III.
Current Channels	333 mV output CT's. Typical Values (5,50,100,200,400) amps Rogowski Coil Sensors. Typical output Voltages (80,105,131 mV/kA @ 60 HZ)
Maximum Current Input	• 150% of current sensor rating. • 4000 A for ROG Rogowski coil sensors
Measurement Type	True RMS using continuous sampling
Line Frequency	50/60 Hz
Input Power	Internal three phase power supply (90 – 480 VAC), L1, L2 or L3 DC powered from 5V USB port (500 mA)
AC Protection	500 mA Slow Blow CC Class Fuse 200kA on each hot leg (L1,L2, and L3)
Power Out	5 VDC output, 100 mA steady state, 500 mA peak at Duty Cycle 10%, self-resetting fuse
Waveform Sampling	1800 samples per second
Parameter Update Rate	1 second
Measurements	Volts, Amps, kW, kVAR, kVA, aPF, dPF, kW demand, kVA demand, Import (Received) kWh, Export (Delivered) kWh, Net kWh, Import (Received) kVAh, Export (Delivered) kVAh, Net kVAh, Import (Received) kVARh, Export (Delivered) kVARh, Net kVARh, THD, Theta, Frequency. All parameters for each phase and system total.
Accuracy	0.2% ANSI C12.20-2010 Class 0.2
Resolution	Values reported in IEEE-754 single precision floating point format (32 bit).
Indicators	Cylon LED bar
Communication	
Hardware	RS-485, Ethernet, & USB (for configuration only)
Supported Protocols	Modbus RTU and Modbus TCP
Wiring Length	1200 meters with Data Range of 100K bits/second or less
RS-485 Loading	1/8 unit
Communication Rate	9600, 19200 (Default), 38400, 57600, 76800, 115200
Serial Protocol	8N1
Termination / Bias	None provided
Mechanical	
Wire Connections	Voltage Connection to PCB or "X" Disconnect: 12-14 #AWG, 600 VAC 105 deg C Voltage Connection to "Z" Disconnect: 10 – 12 #AWG, 600 VAC 105 ^{o}C CT Connection: 12-22 AWG 600 VAC 105 ^{o}C
Mounting	Wall Mounting (2 or 3 fastener locations)
Disconnect Switch	IP30 (if installed)
High Voltage Cover	IP30
Operating Temperature	-20 ^{o}C to + 50 ^{o}C (-4 ^{o}F to 104 ^{o}F) – See Operational Envelope

Humidity	5% to 95% non-condensing
Enclosure	Extruded anodized aluminum body End caps 94-V0 flammability rating, connections sized for 1–inch EMT conduit
Dimensions	(L) 39.4cm x (W) 28.0cm x (H) 7.9 cm (15.5” x 11.0” x 3.0”) – without Disconnect (L) 53.3cm x (W) 28.0cm x (H) 7.9 cm (21.0” x 11.0” x 3.0”) – with Disconnect ‘X’ (L) 59.0cm x (W) 28.0cm x (H) 7.9 cm (23.3” x 11.0” x 3.0”) – with Disconnect ‘Z’
Software	
Operating System	Windows® 7. Windows® 8, Windows® 10, Windows® 11
Communications Port	One USB Port required on PC, Type A or Type C
Safety	
FCC Compliance	This device has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at user’s own expense.
Serial/Ethernet Meters	Conforms to UL Std 61010-1, 3rd Edition, UL 61010-2-30:2010 Certified to CSA Std C22.2 No. 61010-1, 3rd Edition



5. Patent listing

Patent # 18/243,619

Title: SYSTEMS AND METHODS FOR DETECTION OF POWER METER MISCONFIGURATIONS

ABSTRACT:

Wiring and configuration errors are common in high density power and energy metering applications. This patent includes the mechanism and methodology to collect all the metering points at a location and analyze them for integrity. This algorithm analysis load conditions, calculates alternate interpretations of the incoming data and uses rules to predict the likelihood that the meter is connected correctly. The algorithm includes a visualization tool and the ability to manually or automatically correct common mistakes.

Patent # 18/243,602

Title: SYSTEMS AND METHODS FOR COLLECTING SENSOR DATA FROM POWER LINES FOR ELECTRICAL POWER MONITORING

ABSTRACT:

This patent covers a novel hardware design that allows the host microprocessor to manage the data originating across multiple IC's as a single large data object. A single data object facilitates the use of a Direct Memory Access (DMA) importing mode which is handled without consuming CPU cycles. This technique significantly increases the computational capabilities of a microprocessor in performing metrology calculations.

6. DIRIS MCM-48 Installation

Meter installation often includes coordination between organizations or groups of people with different responsibilities. Spend a few minutes considering who will be executing each portion of the installation and what tools are needed at each stage.

Planning

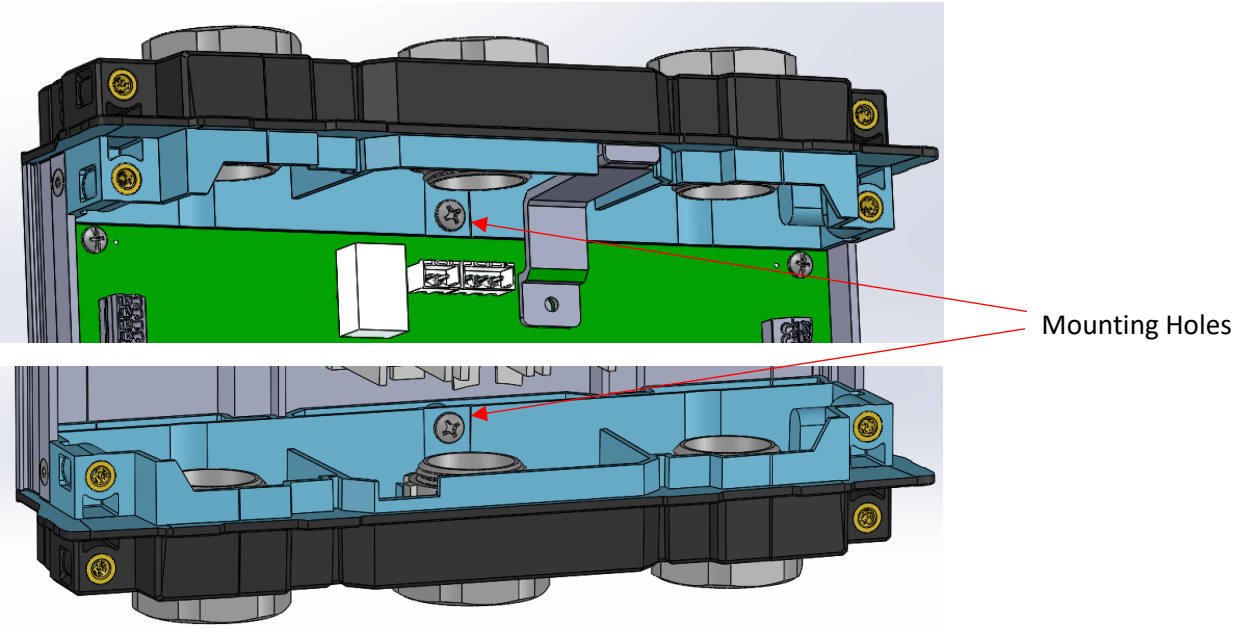
Things to consider include:

- Access to site documentation including predetermined element addresses and names.
- Laptop computers or tablets with pre-installed and tested software utilities.
- Extension cords and power strips.
- Communication cables.
- Access to or authority to set New Passwords.
- Appropriate fasteners and wall anchors.

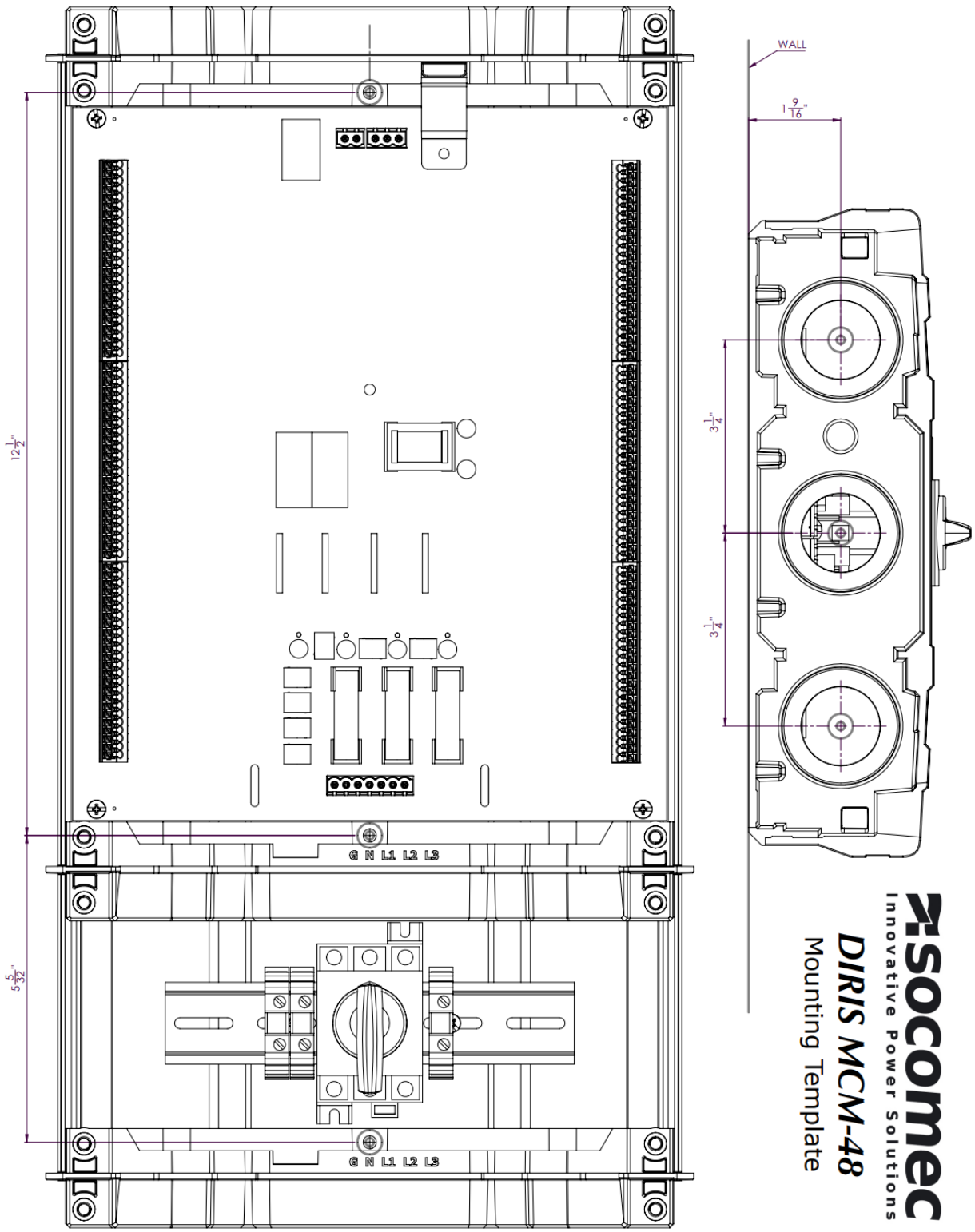
Mounting

The DIRIS MCM-48 is mounted to the wall using customer provided #8 - #10 fasteners. Ensure that the fasteners are appropriate for the type of surface: wood, concrete, drywall, metal etc. Screw holes are accessible with the top and / or disconnect covers removed and are easiest to access if mounted before conduit fittings are installed.

A full-size 1:1 scale paper drill template showing back plate and end cap conduit spacings will be provided with each DIRIS MCM-48 meter. In the event that the template has been discarded the meter itself can be used as the drill template by marking the drill locations on the wall from within the meter. The meter shall then be removed while any drilling operations are performed to avoid depositing debris within the meter. Don't be that guy!



Wall Mounting Through Center Holes



Drill and Punch Template

High Voltage Wiring

DANGER - Failure to follow these instructions can result in serious injury or death.
HAZARD OF ELECTRICAL SHOCK, EXPLOSION, OR ARC FLASH

- The MCM-48 voltage leads must be connected to the building through a dedicated disconnect.
- DO NOT EXCEED 480 VAC between any terminals (L-G, L-N or L-L)
- Use a Potential Transformer (PT) to reduce voltage if ANY system voltage exceeds 480 VAC
- The MCM-48 meters must always be installed in compliance with local electrical codes and standards.

Solid vs Stranded Wire

Either solid or stranded copper wiring is allowed at the meter or disconnect. The wiring space within these devices are tight. Best practice is to use the minimum stranded size and allow 4-6" additional length creating a small service loop. Wiring cut to the exact length is subject to mechanical stress that could compromise the connector. The use of crimped ferrules is recommended to eliminate the possibility of loose strands.

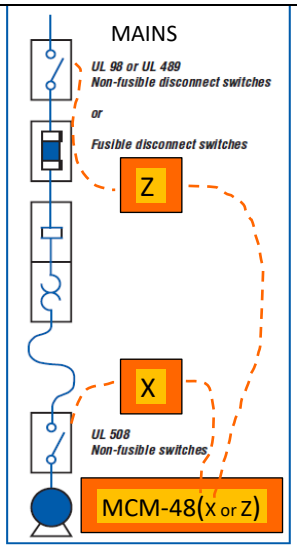
Meter Model	Termination Location	Wire Size	Solid or Stranded	Max Torque Rating (N-M) / lbf*in
MCM-48	PCB Connector	#12 - #14 AWG	THHN 600 VAC, 105 C	0.5 / 4.4
MCM-48-X	Disconnect and DIN Contacts	#12 - #14 AWG	THHN 600 VAC, 105 C	1.8 / 15.8
MCM-48-Z	Disconnect and DIN Contacts	#10 - #12 AWG	THHN 600 VAC, 105 C	1.8 / 15.8

DISCONNECT: The UL61010 safety certification for the MCM-48™ meter requires that the meter be installed using a marked (labeled) dedicated disconnect that is suitably located and easily reached.

The image on the right shows the certification requirements of over current protective devices downstream of the Line (Mains).

Best practice is to use a UL 489 listed three-phase circuit breaker within the load center and label this breaker as the meter disconnect. In this option the MCM-48 meter does not need a separate disconnect. The MCM-48-X meter can be installed using the UL 508 listed disconnect as a convenience for servicing the meter or in cases where the circuit is spliced downstream.

For industrial applications and especially retrofit installation it is not always practical to install a new dedicated breaker. When the upstream conditions of the meter are unknown or use the NEC tap rules the MCM-48-Z model should be used. The UL 98 listed disconnect meets the requirements of considering the meter its own sub panel.



ⓘ	When purchased with a disconnect option the DIRIS MCM-48 meter will include factory installed wiring between the downstream side of the disconnect and the PCB. The user does not need to remove the internal “high voltage cover” for meters with this option.

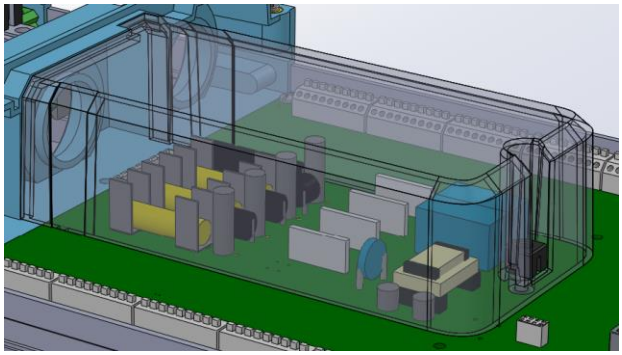
Protective Conductor Terminal

The first voltage network conductor connected to the DIRIS MCM-48 shall be the safety ground. This terminal is referred to as the “Protective Conductor Terminal”, “Safety Ground”, or “Bonding Terminal”. This terminal is internally connected to the metallic enclosure and connected to the overvoltage protection devices on the printed circuit board. The wire attached to the Safety Ground must be 14 AWG or larger and either bare copper wire or an NEC approved color (Green or Green with a yellow stripe).

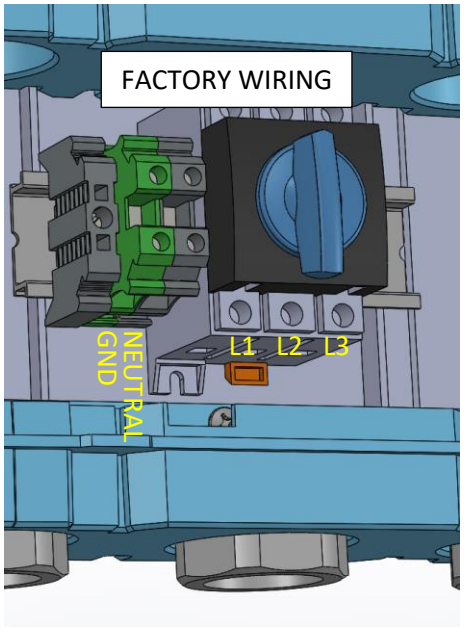
ⓘ	**Neutral vs Ground:** Installers are often confused about the difference between Neutral and Ground since these wires are connected back at the service panel. The ground wire is connected to all the overvoltage protection devices within the meter, included on each CT input and voltage terminal. Leaving the Ground wire disconnected defeats the ability of the DIRIS MCM-48 to protect itself from voltage spikes. The DIRIS MCM-48 uses the neutral terminal as a reference to a precision amplifier. Electrical signals coming from CT’s are sampled and computed relative to the voltages measured between the Neutral and line terminals to compute power metrics. Leaving the Neutral terminal open allows the voltage at this terminal to “float” to the instantaneous center of voltage which may cause unexpected reporting. A voltage surge that is mitigated by directing current to flow in the ground bonding will not be able to travel “back up” to the meter via the neutral because of the inductance of the wire and the low impedance connection to earth. **I only have 4 wires!:** If the wiring installer has not included a Neutral wire and it is not possible to add one then it is advised to connect the safety ground wire and add a jumper wire between the neutral terminal and safety ground. This provides a stable voltage for the reference amplifier and provides protection to the meter for voltage spikes below 2KV. Note that this is NOT a preferred solution.

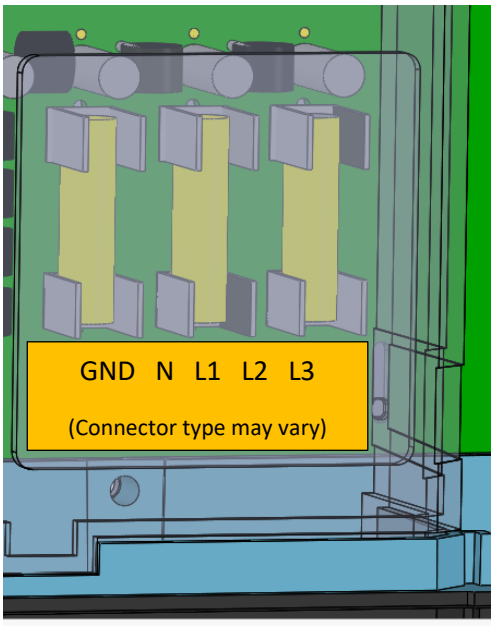
Wiring Access

Line Voltage connections are made accessible by removing either the disconnect cover (MCM-48™-X or -Z) or the main meter cover and then the high voltage cover. The high voltage cover is held in place by a captured fastener mounted to the PCB. The cover is translucent so you can see if the meter is wired without removing it. The precision resistors within are somewhat fragile so avoid bending them.



Internal High Voltage Cover





Customer Wiring Locations

⚠	**HAZARD OF ELECTRICAL SHOCK, EXPLOSION, OR ARC FLASH** • The DIRIS MCM-48 meter shall only be energized with the internal high voltage cover installed.

ⓘ	Although not strictly required by the NEC these wiring color codes are considered best practice and provided for reference

Region	Ground (G)	Neutral (N)	Line 1 (L1)	Line 2 (L2)	Line 3 (L3)
USA (LV)*	Green	White	Black	Red	Blue
USA (HV)*	Green	Grey	Brown	Orange	Yellow
Canada	Green	White	Red	Black	Blue

* USA (LV) This should be used for 120/208VAC 3 PHASE
* USA (HV) This should be used for 277/480VAC 3 PHASE.

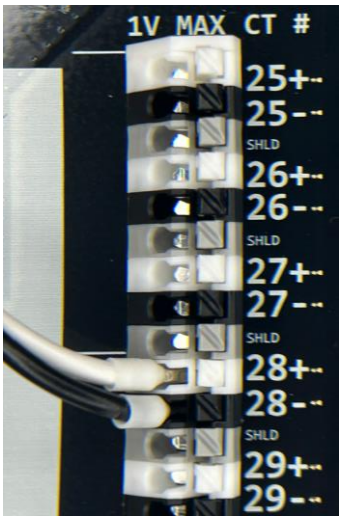
Low Voltage Wiring

All MCM-48™ low voltage connections are made outside of the high voltage cover and can be considered safe to work on in the presence of power provided that the meter is properly grounded (visual inspection) and that the high voltage cover remain in place.

Current Transformers Connector Inputs

Current transformers (333.3 mV type) and Rogowski Coil Sensors are connected along the edges of the Power Meter. The connectors are oriented such that the wires are inserted at a 45 degree angle facing the interior of the power meter. This orientation keeps the channel markers visible once the CT's wires are installed. The sensor terminals are color coded to match the polarity of the signal wires (+ White), (- Black) and (shield Grey). This color coding reduces installation errors associated with misalignment of loads into the terminal blocks. For ease of installation, current sensor lead length has been extended to 23 ft (7m) to eliminate the need for inline splicing for most applications. If the wire leads are shortened it is best practice to crimp a #22 ferrule onto the wire to prevent standing.

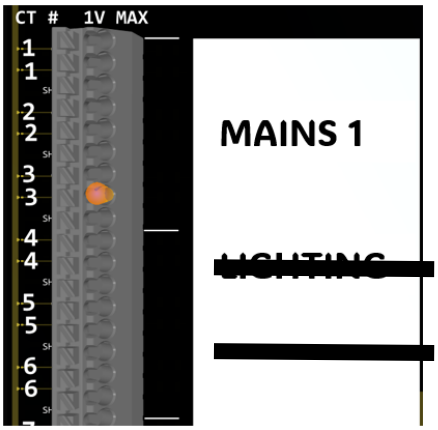
Left Hand Side



Right Hand Side

Load Notes

The DIRIS MCM-48™ printed circuit board provides a location to write any user notes or load designations directly on the power meter. This space is intended to be used if needed to keep track of load locations during installation.



7. Presentation of Associated Current Sensors

The DIRIS MCM-48 meter is intended to be used with one of the three types of sensors manufactured by Socomec and selected based on the application.

- Compact Split-core: ***TR-W***
- High accuracy Split-core: ***ACCU-CT***
- High amperage Flexible Rogowski Coil: ***ROG***

All three of these current sensors benefit from an open-ended design (split-core) which facilitates installation without disconnecting electrical wires inside electrical panels, ideal for retrofit applications.

The Low voltage output signal make them non-intrusive and ideal for retrofit applications with existing electrical panels, eliminating the need for shorting blocks.

	The DIRIS MCM meter is also compatible with any third party 333 mV output current sensors.

	**Pre-installation checklist** Regardless of the model or brand of current sensors used with the DIRIS MCM meter, please observe the following recommendations when installing current sensors: • The CT's rated current should normally be greater than or equal to the maximum current of the measured circuit. Ensure that the fuse or circuit breaker's rating does not exceed the CT's maximum continuous current rating. • It is preferable to install the CT and DIRIS MCM meter close to each other. However, you may extend the CT wires by 100 feet (30 m) or more by using shielded twisted-pair cable and by running the CT wires away from high current and line voltage conductors. • When extending CT leads, we recommend using lead extensions with the same or larger gauge wire. • For highest accuracy, try to separate the CTs on different phases by 1.0 inch (25 mm) to minimize magnetic interference.

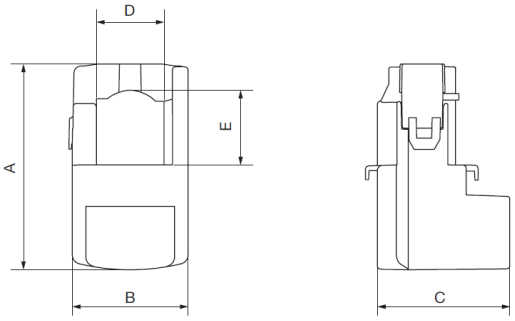
7.1 TR-W Split-core 333 mV current sensors

The **TR-W** are hinged split-core AC current sensors available in 63 A, 160 A, 250 A and 600 A primary rated currents.
The compactness of TR-W current sensors make them ideal for electrical panels having limited space for applications such as branch-circuit monitoring in panelboards.

7.1.1 TR-W range and characteristics

Ideal for retrofit applications - compact space	**TR-W Split-core 333mV current sensors**			
				
	TR-10W	**TR-14W**	**TR-21W**	**TR-32W**
Primary rating (A)	63	160	250	600
Secondary	333 mV	333 mV	333 mV	333 mV
Phase orientation	Arrow points towards Load	Arrow points towards Load	Arrow points towards Load	Arrow points towards Load
Polarity	White = Positive Black = Negative	White = Positive Black = Negative	White = Positive Black = Negative	White = Positive Black = Negative
Window size (in / mm)	Ø 0.39 / 10	Ø 0.55 / 14	Ø 0.83 / 21	Ø 1.26 / 32
Lead length (ft/m)	22 / 7	22 / 7	22 / 7	22 / 7
Accuracy	0.5%	0.5%	0.5%	0.5%
Voltage rating	600 Vac	600 Vac	600 Vac	600 Vac
cULus listed	UL61010	UL61010	UL61010	UL61010
Reference	**194S5010**	**194S5014**	**194S5021**	**194S5032**

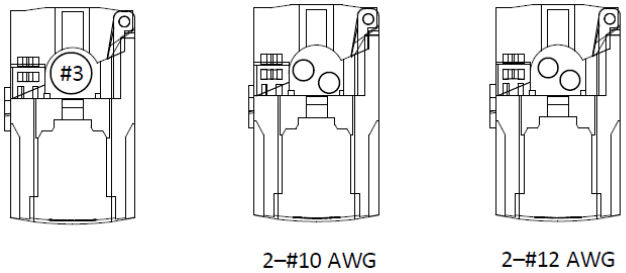
7.1.2 Dimensions (in/mm)



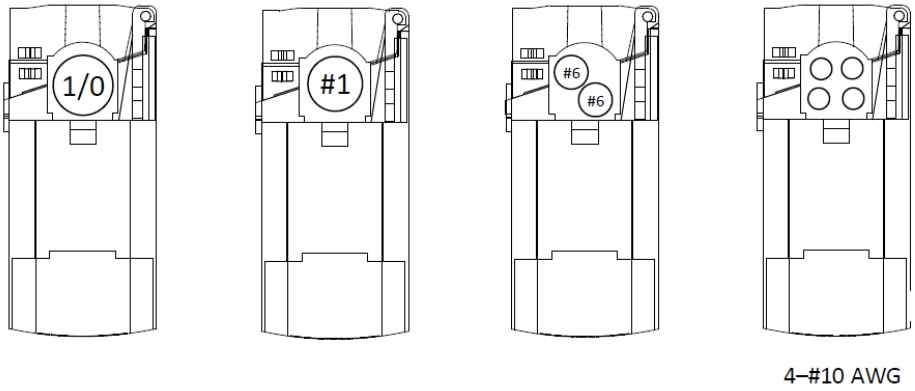
Model	A (in/mm)	B (in/mm)	C (in/mm)	D x E (in/mm)
TR-10W	1.73/44	1.02/26	1.10/28	Ø 0.39 / 10
TR-14W	2.64/67	1.14/29	1.10/28	0.55/14 x 0.59/15
TR-21W	2.56/65	1.46/37	1.69/43	0.83/21 x 0.91/23
TR-32W	3.39/86	2.09/53	1.85/47	1.26/32 x 1.30/33

Conductor sizes accepted by TR-W current sensors

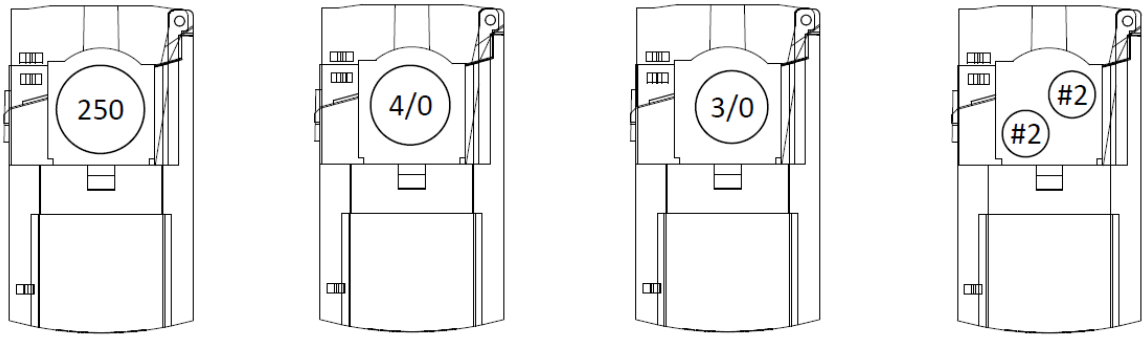
TR-10W



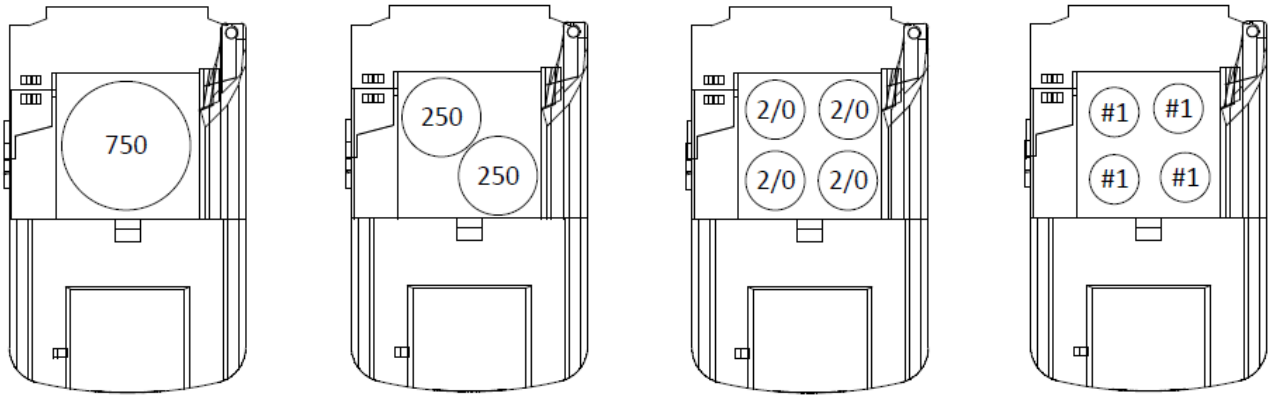
TR-14W



TR-21W



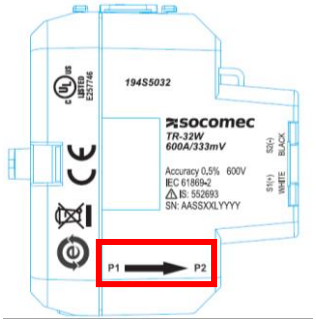
TR-32W



Notes: The diameter of conductors based on Southwire THHN insulated stranded copper wire.

7.1.3 Installing TR-W current sensors

1) Point the directional arrow toward the LOAD and away from the SOURCE.



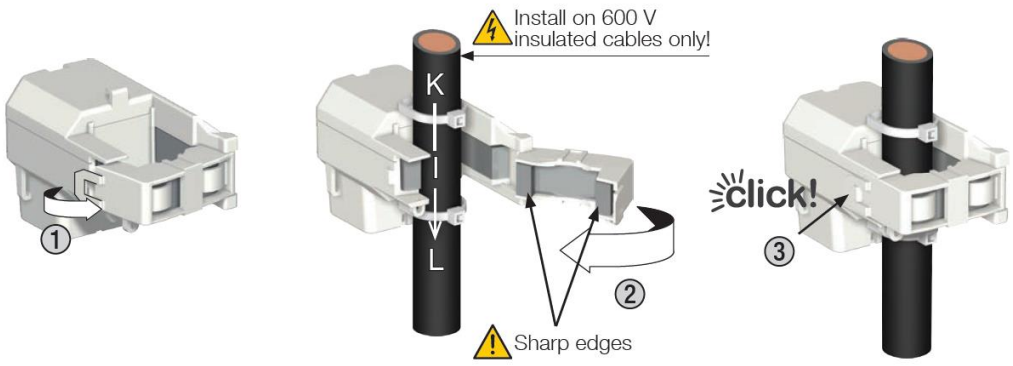
ⓘ	If the current sensor is mounted backwards, the measured active power (kW) will be negative. Best practice is to correct the current sensor's orientation, but in case it is impractical to change the wiring, the MCM-View configuration software also allows you to perform a software correction.

2) To open the CT, squeeze the knurled panels, then pull and rotate the top open.

3) Open the CT by undoing the latch and swinging the leg of the CT open.

4) Place the CT around the conductor and close the CT.

5) Re-connect the latch--you will hear it click when it is properly closed. The conductor should be in the inside of the CT window.



⚠	Before closing the TR-W sensor, check and make sure the mating surfaces are clean (no contamination, corrosion or debris which could increase the magnetic gap and decrease accuracy).

6) Optional: Secure the TR-W sensor using cable ties to push the conductor against the base of the opening.

7) Route the twisted black and white wires from the CT to the DIRIS MCM meter.
8) Secure the CTs and route the lead wires so that they do not directly contact live terminals or busses.
9) Connect the white and black wires to the white and black terminals on the DIRIS MCM meter.

ⓘ	• If the white and black wires are reversed, the measured active power (kW) will be negative. Best practice is to fix the CT polarity by swapping wires on the DIRIS MCM terminals, but the MCM-View configuration software also allows you to perform a software correction. • Be careful to match the CT to the voltage phases being measured. Make sure the ØA CT is measuring the current on the ØA conductor, and the same for phases B and C. Use colored labels or tape to identify the wires.

⚠	Do NOT clamp or pull out NON-INSULATED conductors carrying DANGEROUS VOLTAGE which could cause an electric shock, burn or arc flash. Ref. IEC 61010-2-032

7.2 ACTL Split-core 333 mV current sensors

The ACTL are high accuracy hinged split-core AC current sensors, offering outstanding linearity and very low phase angle error with a safe 0.333 Vac low voltage output.

The ACTL sensors are available in two window opening sizes:

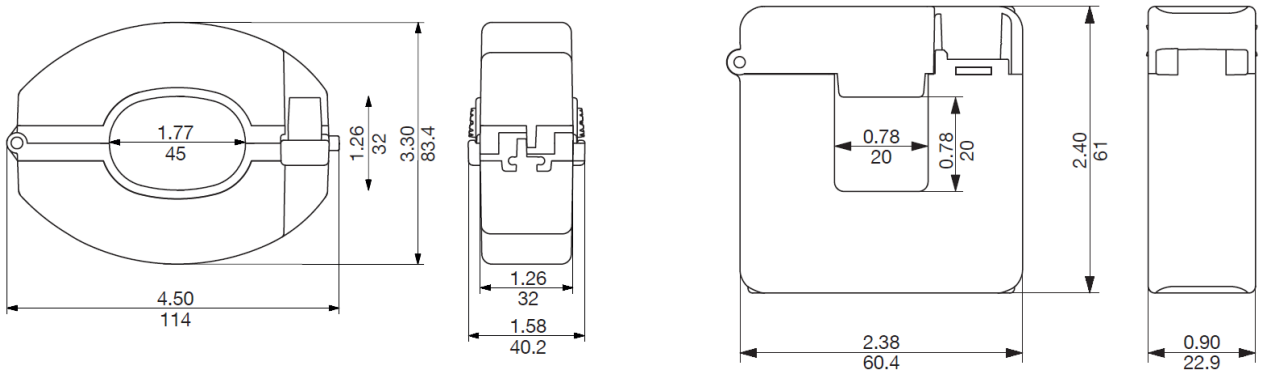
- The ACTL-0750 has a window opening of 0.75” x 0.75” for current measurements up to 250 amps
- The ACTL-1250, with its unique oval shaped window opening of 1.83” x 1.25” is designed for loads up to 600 amps.

7.2.1 ACTL range and characteristics

Ideal for retrofit applications - high accuracy	**ACTL-0750 Split-core 333 mV current sensors**					
						
Primary rating (A)	20	50	100	150	200	250
Secondary	333 mV	333 mV	333 mV	333 mV	333 mV	333 mV
Phase orientation	Arrow points towards source Label faces source					
Polarity	White = Positive Black = Negative					
Lead length (ft/m)	8 / 2.4	8 / 2.4	8 / 2.4	8 / 2.4	8 / 2.4	8 / 2.4
Window size (in / mm)	Ø 0.78 / 20	Ø 0.78 / 20	Ø 0.78 / 20	Ø 0.78 / 20	Ø 0.78 / 20	Ø 0.78 / 20
Accuracy	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Voltage rating	600 Vac	600 Vac	600 Vac	600 Vac	600 Vac	600 Vac
cULus Listed	UL2808	UL2808	UL2808	UL2808	UL2808	UL2808
Reference	**USACTL0750020C06**	**USACTL0750050C06**	**USACTL0750100C06**	**USACTL0750150C06**	**USACTL0750200C06**	**USACTL0750250C06**

Ideal for retrofit applications - high accuracy	**ACTL-1250 Split-core 333 mV current sensors**		
			
Primary rating (A)	250	400	600
Secondary	333 mV	333 mV	333 mV
Phase orientation	Arrow points towards source Label faces source		
Polarity	White = Positive Black = Negative		
Lead length (ft/m)	8 / 2.4	8 / 2.4	8 / 2.4
Window size (in / mm)	Ø 1.77 / 45	Ø 1.77 / 45	Ø 1.77 / 45
Accuracy	0.2%	0.2%	0.2%
Voltage rating	600 Vac	600 Vac	600 Vac
cULus Listed	UL2808	UL2808	UL2808
Reference	**USACTL1250250C02**	**USACTL1250400C02**	**USACTL1250600C02**

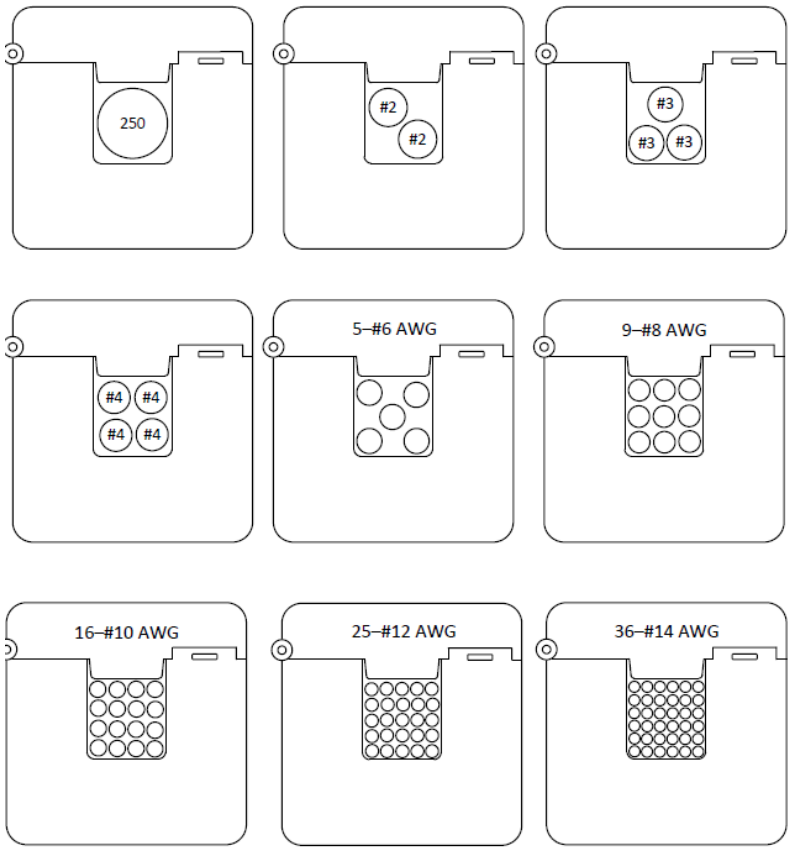
7.2.2 ACTL dimensions in / (mm)



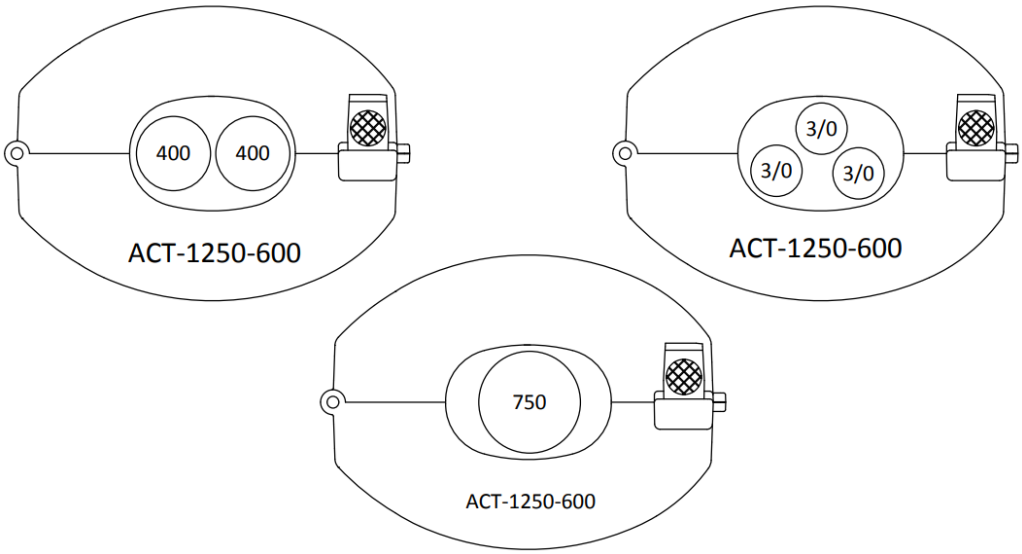
ACTL-1250

ACTL-0750

Conductor sizes accepted by ACTL-0750 current sensors



Conductor sizes accepted by ACTL-1250 current sensors



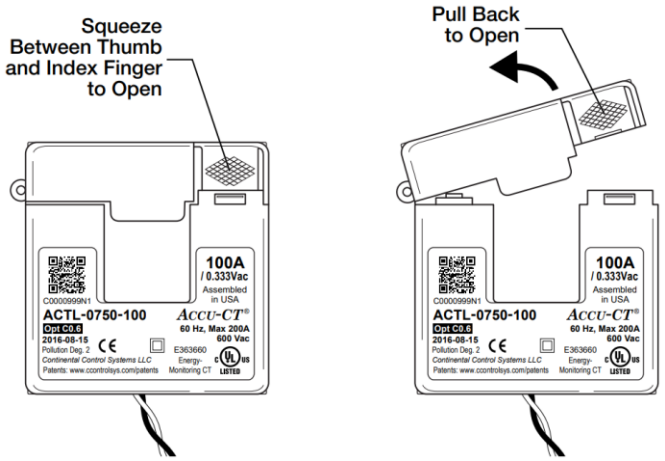
Notes: The diameter of conductors based on Southwire THHN insulated stranded copper wire.

7.2.3 Installing ACTL current sensors

1) Point the SOURCE directional arrow toward the current source and away from the load: the utility meter or the circuit breaker for branch circuits. In this situation, the label should be facing the source.

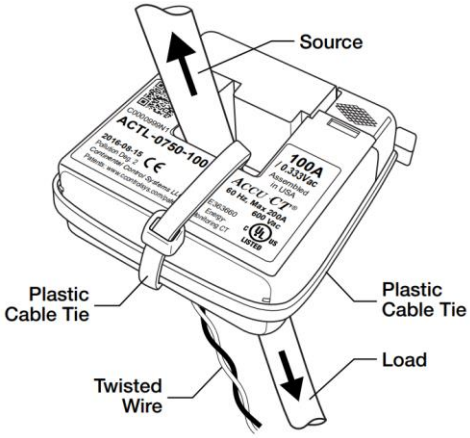
ⓘ	If the current sensors are mounted backwards, the measured active power (kW) will be negative. Best practice is to fix the CT orientation, but in case it is impractical to change current sensor wiring, the MCM-View configuration software also allows you to perform a software correction.

2) To open the CT, squeeze the knurled panels, then pull and rotate the top open.



⚠	Before closing the ACTL sensor, check and make sure the mating surfaces are clean (no contamination, corrosion or debris which could increase the magnetic gap and decrease accuracy).

3) Place the CT around the conductor and close the CT.



4) Optional: Secure the CT to the conductor with a cable tie.
5) Optional: For added security, wrap a cable tie around the outside of the CT.
6) Route the twisted black and white wires from the CT to the DIRIS MCM meter.
7) Secure the CTs and route the lead wires so that they do not directly contact live terminals or busses.
8) Connect the white and black wires to the white and black terminals on the DIRIS MCM meter.

ⓘ	• If the white and black wires are reversed, the measured active power (kW) will be negative. Best practice is to fix the CT polarity by swapping wires on the DIRIS MCM terminals, but the MCM-View configuration software also allows you to perform a software correction. • Be careful to match the CT to the voltage phases being measured. Make sure the ØA CT is measuring the current on the ØA conductor, and the same for phases B and C. Use colored labels or tape to identify the wires.

⚠	Do NOT clamp or pull out NON-INSULATED conductors carrying DANGEROUS VOLTAGE which could cause an electric shock, burn or arc flash. Ref. IEC 61010-2-032

7.3 ROG Rogowski coil 131mV current sensor

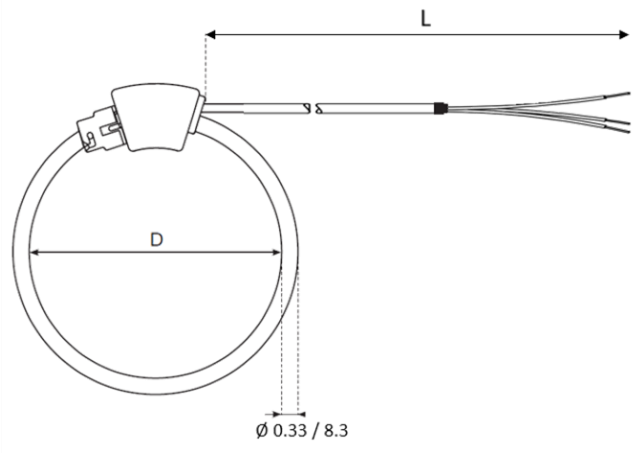
The ROG Rogowski current sensors are flexible rope style AC current sensors delivering an output signal of 131 mV / 1000 A @60Hz, and are compatible with the DIRIS MCM power meters, with no additional integrator or power supply required.

They are ideal for applications with high currents (up to 4000 A, busbars and multiple sets of parallel conductors where conventional rectangular or rigid split-core sensors will not fit.

7.3.1 ROG range and characteristics

Ideal for busbars or higher currents	**Rogowski 131mV current sensors**			
				
	ROG-80	**ROG-120**	**ROG-200**	**ROG-300**
Output Signal	131 mV / kA @ 60Hz	131 mV / kA @ 60Hz	131 mV / kA @ 60Hz	131 mV / kA @ 60Hz
Phase orientation	Arrow points towards load	Arrow points towards load	Arrow points towards load	Arrow points towards load
Polarity	White = Positive Black = Negative Gray = Shield	White = Positive Black = Negative Gray = Shield	White = Positive Black = Negative Gray = Shield	White = Positive Black = Negative Gray = Shield
Window size (in / mm)	Ø 3.15 / 80	Ø 4.72 / 120	Ø 7.87 / 200	Ø 11.81 / 300
Lead length (ft/m)	22 / 7	22 / 7	22 / 7	22 / 7
Accuracy	0.5%	0.5%	0.5%	0.5%
Voltage rating	600 Vac	600 Vac	600 Vac	600 Vac
cULus Listed	UL2808	UL2808	UL2808	UL2808
Reference	**194S1080**	**194S1120**	**194S1200**	**194S1300**

7.3.2 ROG dimensions



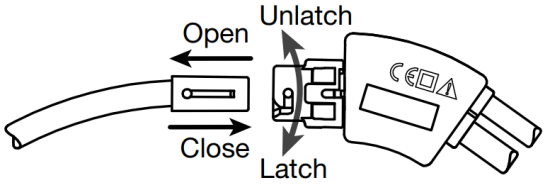
Model	D (in/mm)	Loop length (in/mm)	L (ft / m)
ROG-80	3.15 / 80	9.88 / 251	22 / 7
ROG-120	4.72 / 120	14.84 / 377	22 / 7
ROG-200	7.87 / 200	24.72 / 628	22 / 7
ROG-300	11.81 / 300	37.09 / 942	22 / 7

7.3.3 Installing ROG current sensors

1) Point the SOURCE directional arrow toward the LOAD and away from the SOURCE.

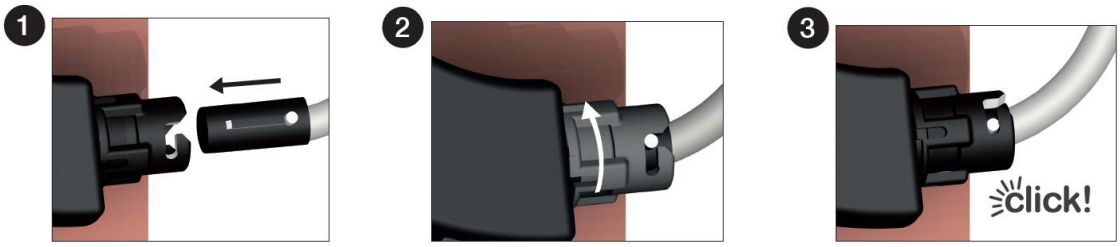
ⓘ	If the current sensors are mounted backwards, the measured active power (kW) will be negative. Best practice is to fix the CT orientation, but in case it is impractical to change current sensor wiring, the MCM-View configuration software also allows you to perform a software correction.

2) To open the ROG current sensor, twist the locking ring counterclockwise until it unlatches the cap, then gently pull the removable coil end free (very little force should be required).



3) Place the coil around the primary conductor, group of conductors, or busbar.

4) Close the coil by inserting the coil cap into the junction (rotate if needed for proper alignment). Twist the locking ring clockwise until it latches (about a quarter turn).



5) Route the twisted black and white wires from the ROG sensor to the DIRIS MCM meter. Be sure to route the lead wires so that they do not directly contact live terminals or busses.

6) Connect the white, black and gray wires to the white and black terminals on the DIRIS MCM meter.

ⓘ	• If the white and black wires are reversed, the measured active power (kW) will be negative. Best practice is to fix the ROG sensor polarity by swapping wires on the DIRIS MCM terminals, but the MCM-View configuration software also allows you to perform a software correction. • Be careful to match the ROG sensor to the voltage phases being measured. Make sure the ØA sensor is measuring the current on the ØA conductor, and the same for phases B and C. Use colored labels or tape to identify the wires.

⚠	Do NOT clamp or pull out NON-INSULATED conductors carrying DANGEROUS VOLTAGE which could cause an electric shock, burn or arc flash. Ref. IEC 61010-2-032

7.4 Splicing

When the standard lead wires of current sensors are not long enough, you can extend them by splicing on additional wire.

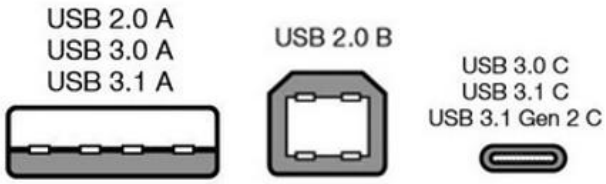
- You may want to shorten the original CT wires, especially if you are going to use shielded cable and ground the shield to earth ground.
- Avoid creating large loops or gaps between the white and black wires at the junction point, because this can increase electrical interference.
- **Best practice is to use lever-nut splicing connectors (WAGO) which provide a secure and reliable connection of lead wires.**
- Twist-on wire connectors (wire-nuts) may be used but only if they are rated for connecting the stranded CTs wires, typically #18 to #22 AWG to the gauge of the extension wire. Do not use wire nuts (typically red or yellow sizes) used for electrical work; they are too large to make reliable connections with smaller stranded wires! For reliable connections, be sure to follow the manufacturer's instructions.
- Butt splice and other styles of crimp connections can work well if a ratcheting crimping tool specifically designed for the crimp connector is use. **Caution!**: low-cost, general purpose crimping tools do not always make reliable connections. After crimping, tug on the wires to make sure that they do not pull out of the crimp.

8. Meter Communication

The DIRIS MCM-48™ is a programmable device and must be configured to match the site conditions where it will be installed. The DIRIS MCM-48™ is configured through a PC Windows application called "MCM-View" running on a Windows computer (typically a laptop) connected over a Universal Serial Bus (USB).

8.1 Universal Serial Bus (USB)

The USB connection is intended for temporary use during configuration or product upgrade. The USB connection will provide power to the meter allowing it to be configured off-line. In response to the international standardization initiative around USB type C connectors, the DIRIS MCM-48™ will be transitioning away from the classical use of Type B connectors in this industry to Type C. In the interim, host computers may be connected using either Type B or Type C USB cables on the meter end. The host computer (laptop) end will either be Type A (also waning in popularity) or a Type C connection. The underlying protocol in both cases is USB 2.0. Under the 2.0 standard the DIRIS MCM-48 is configured to negotiate for 500mA of operational current at 5.0 volts from the host.



ⓘ	**USB Pitfalls** • Do not plug two cables into the DIRIS MCM-48 meter at the same time. • Some USB type C cables are intended for charging devices only and don't contain data conductors. • Do not plug USB C chargers into the DIRIS MCM-48 meter. • Modbus RTU is not currently supported over the USB interface. • The use of USB hubs or port expanders may not provide the DIRIS MCM-48 enough current to operate, especially if using a radio module. Best practices are to connect to the host PC directly.

Trouble Shooting USB

The PC Windows driver used with the DIRIS MCM-48™ is included in Windows 8 and beyond. There are some known resource conflict / arbitration issues that may prevent your computer from recognizing the meter. Please see the appendix materials for additional information.

8.2 Ethernet

The DIRIS MCM-48™ can connect to a Local Area Network (LAN) using Ethernet 10/100 Base T signaling. This speed is typical of Cat 5 or Cat 6 wiring.

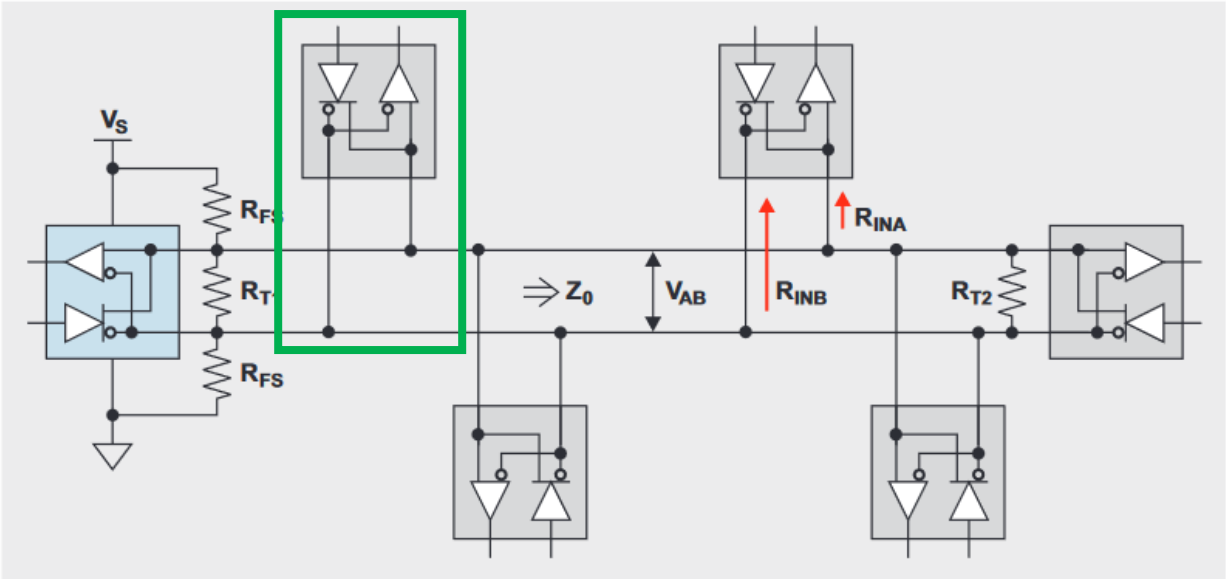
ⓘ	**Ethernet** • MCM-View (configuration program) communicates over USB, not Ethernet. • The system default is DHCP. Static addresses can be set using MCM-View • Direct PC to Meter connections using third party Modbus tools will require Static addressing.

8.3 Serial Peripherals

The DIRIS MCM-48™ serial connection points include auxiliary power (PWR), RS-485, and Radio Connectors. The Auxiliary power and RS-485 connections are color coded to match the supplied 4 conductor radio cable with the RF-HUB node wireless system. Color coding reduces wiring errors in cases where the radio needs to be remotely mounted requiring the supplied cable to be spliced and extended. This connection can be extended up to 100 ft.

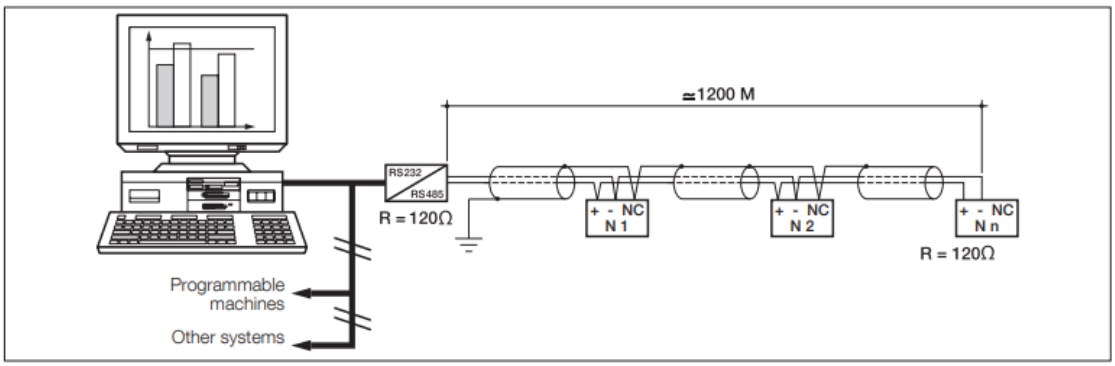
Serial Connector

The MCM-48™ serial connector is an RS-485 slave device with a 1/8 impedance load and is designed to connect as a stub connection in a multidrop twisted pair network (below in green).



RS-485

- The DIRIS MCM meter does NOT include 120 ohm termination resistors.
- Adding a 120 ohm resistor across the A/B terminals may help if the meter is at the end of the physical network.
- Best practice is to place “bias resistors” at the RS-485 Master. These are often neglected.
- The reference terminal is connected to earth ground through a 250 ohm resistor and may help if the common mode signal is out of the transceiver range of +5 to -9 volts DC.



Typical RS-485 Wired Network.

Aux Power

The Auxiliary power connector provides +5VDC for powering an RF End node accessory radio. The steady state power available from this connector is ¼ watt, peaking to ½ watt. Attaching a load greater than this may work temporarily but will eventually overheat the power supply causing an interruption in power to the entire meter.

Radio Connector

The Radio connector is simply a more convenient physical connector than the spring block and is internally tied to the Aux power and RS-485 terminals beside it. The RF End node will be supplied with a connector having a mating plug with this connector.

RF Wireless Peripherals

See the section on MCM-48 accessories.

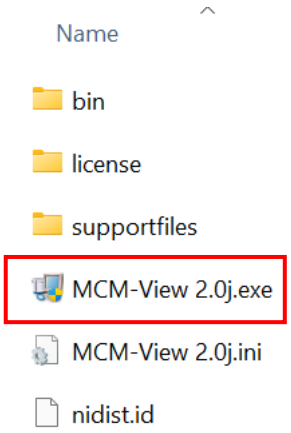
9. Configuring the DIRIS MCM-48

The MCM-View application is a PC Windows application used to visualize and configure settings for the MCM-48 meter. It is an intuitive graphical application designed to configure settings on the DIRIS MCM-48 meter, show real time measurements, and suggest configuration fixes in the case of an incorrect setup.

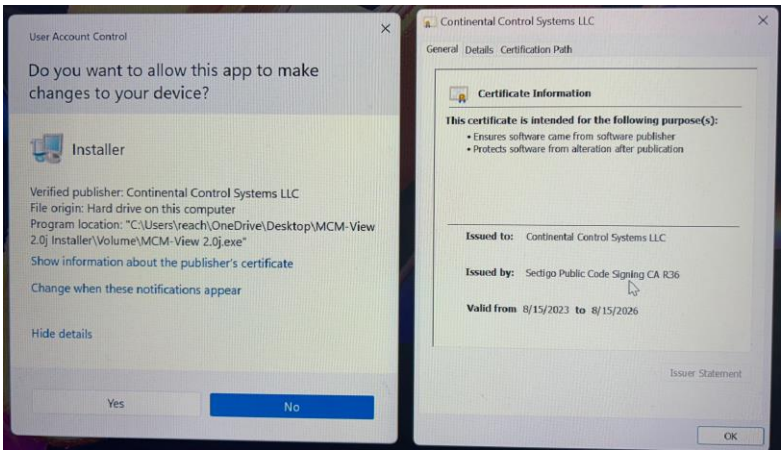
The configuration is also reflected and available for Read / Write access through Modbus registers. Minor edits to existing configuration elements can be done with low risk using registers but new content creation is highly discouraged. MCM-View uses validation rules to ensure that the only valid configurations are saved to the meter. Writing configuration registers over a third-party tool may lead to internally inconsistent definitions or an inoperable meter. Please contact Socomec if there is a need to remotely configure a fleet of power meters.

9.1 MCM-View installation

The MCM-View application can be downloaded as a zip folder from the Socomec website at the following link:
https://www.socomec.us/en-us/resource-center/resource-type/software-95#main-wrapper
Best practices are to copy the zip folder to your local computer and then then unzip it. Double click on the "MCM-View xx.exe" file to start installation.



⚠	**PC Security / Virus Checkers** • PC security measures can interfere with the installation procedure causing it to fail. • The installation may take more than one attempt after clearing files identified by a virus checker. • The PC permissions may need to be elevated to Admin to provide access to needed locations.



The MCM-View application should identify itself as a verified publisher under a certificate issued to Continental Control Systems.

Upon successful completion of the installation process a shortcut will appear on the desktop as shown below. Use this icon or launch the software as MCM-View under the windows icon.

9.2 MCM-View Modes

There are two viewer modes: offline and online mode. When the program is in offline mode, it means there is not a meter connected to the computer. This mode restricts the content of the MCM-View to allow the creation of a meter configuration and save it for future use. This feature allows some work to be conducted ahead of an installation based on documentation. All functions are available in online mode.

Connecting a Meter

⚠	Best practices are to connect a DIRIS MCM-48 meter to the configuration PC over a USB cable before launching the MCM-View application. This will avoid the application opening in Offline Mode!

A meter that is connected while MCM-View is in offline mode will not be recognized by the program. To fix this, restart MCM-View.

When MCM-View is opened after a meter is connected it will automatically connect to the meter and read the configuration currently saved to the meter. If MCM-View is opened when there is not a meter connected to the computer, MCM-View will notify the user and begin in offline mode.

	USB Sounds • A computer with a working sound output will produce a sound notification “bo-deep” if the computer can successfully enumerate a COM port. • Disconnecting an MCM-48 meter will free up the com port with a disconnecting sound notification “de-boop”

9.3 MCM-View Tabs

The MCM-View is navigated using four tabs: Configuration, Realtime, Utility, and Load Analysis.

- **Configuration:** Offers an all-in-one view of the current configuration of the meter. The configuration can be easily edited from this tab by pressing the “gear” settings icon next to each indicated load.

- **Realtime:** Displays the current readings from the meter. An in-depth view of real time values for each load can be accessed by clicking on the Zoom button next to the load.

- **Utility:** allows for viewing and editing of metrology settings, RS-485 settings, and Ethernet settings. It also provides a way to perform a firmware upgrade of the meter.

- **Load Analysis:** Analysis three phase wye loads and identifies potentially misconfigured elements and suggests possible corrections.

9.3.1 Configuration tab

Parts of a Load (Element)

A load (also referred to within this industry as an element) represents a single load and its configuration within a multi-element meter. Each load in MCM-View corresponds to a physical set of current transformer inputs on the DIRIS MCM-48 meter. Loads are made up of one, two, or three CT’s and their configuration. Each CT is numbered in MCM-View in the same format as the CT connection points on the DIRIS MCM-48 meter. A small ‘-‘ mark helps identify groups of three where configurations restrictions exist.

The above image shows an example configuration for a single element. The above element is named “LOAD1”. The load type is Wye (3P+N – 3CT) with a voltage reference configuration of: L1->N, L2->N, L3->N respectively. The load has been configured to use a current transformer with a 100 amp rating and a multiplier of 1.0.

Below are icons found on the configuration tab and their meaning:


Clicking here will open the Load Configuration dialog window.


Clicking here will open the Copy Configuration dialog window.

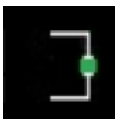

Represents that the load is using a magnetic-core CT.

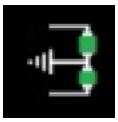

Represents that the load is using a Rogowski coil.


Represents that the load is configured as a Wye load.


Represents that the load is configured as a 2CT Delta.

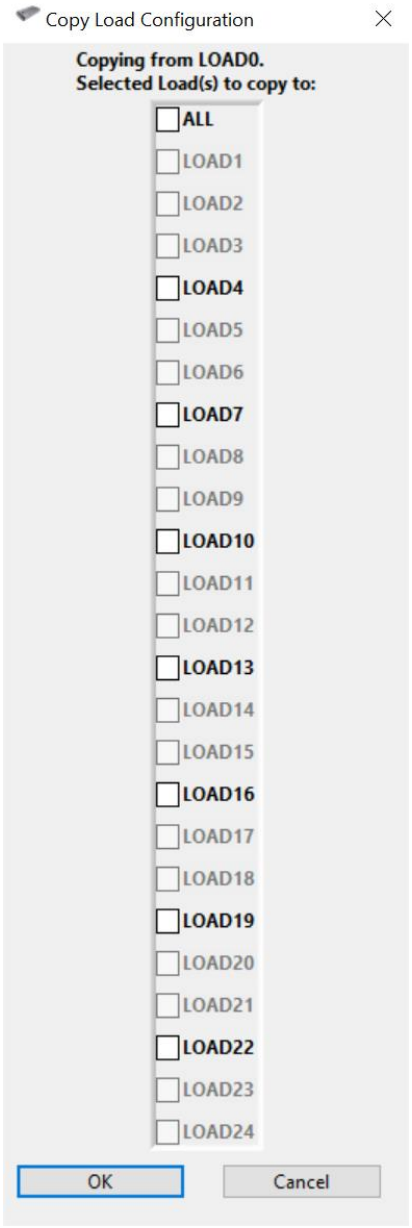

Represents that the load is configured as a 3CT Dela.


Represents that the load is configured as a Single-Phase plug load.


Represents that the load is configured as a Split Phase load.

Copying Loads

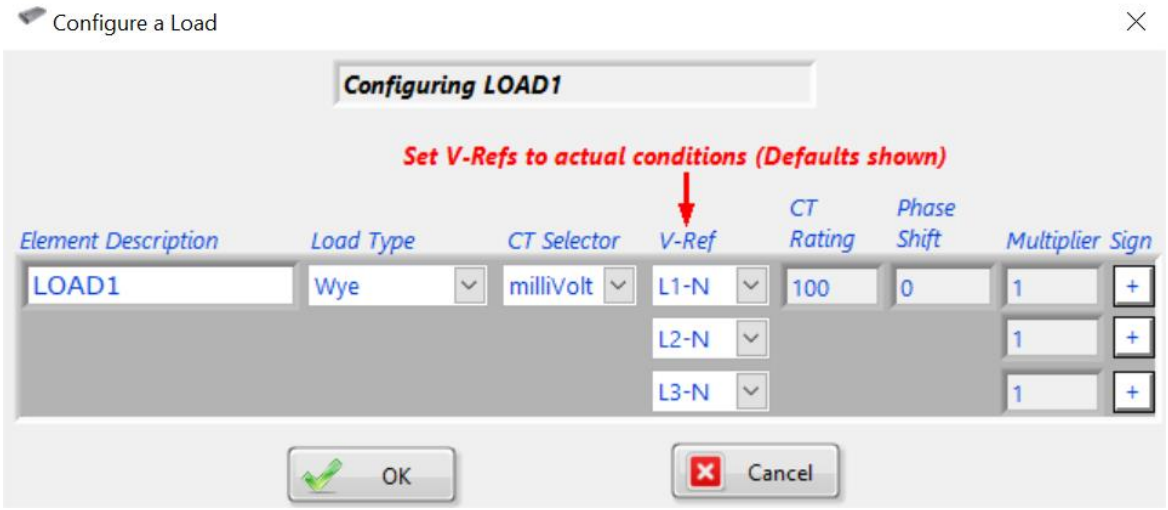
Clicking on the “Copy Configuration” icon will open the Copy Load Configuration Dialog window. In this window, select all the loads to copy the selected configuration to. Clicking “OK” copies this configuration from the source load to all selected destination loads. Checking the ALL option will automatically check all available loads of the source type. To exit this dialog without making changes, click the Cancel option.



When copying from loads 1-24 (left side of the DIRIS MCM-48), the user will only be able to select loads 1-24 as the destination. When copying from loads 25-48, the user will only be able to select lines 25-48 (right hand side of the DIRIS MCM-48) as the destination. Copy ignores the name of the load. Be sure to give each load a unique and meaningful name to help reduce errors.

Configuring a Load (Element)

To configure a load (element), click on the “Load Configuration” icon. This will open the Load Configuration dialog window containing the user selectable items described below.



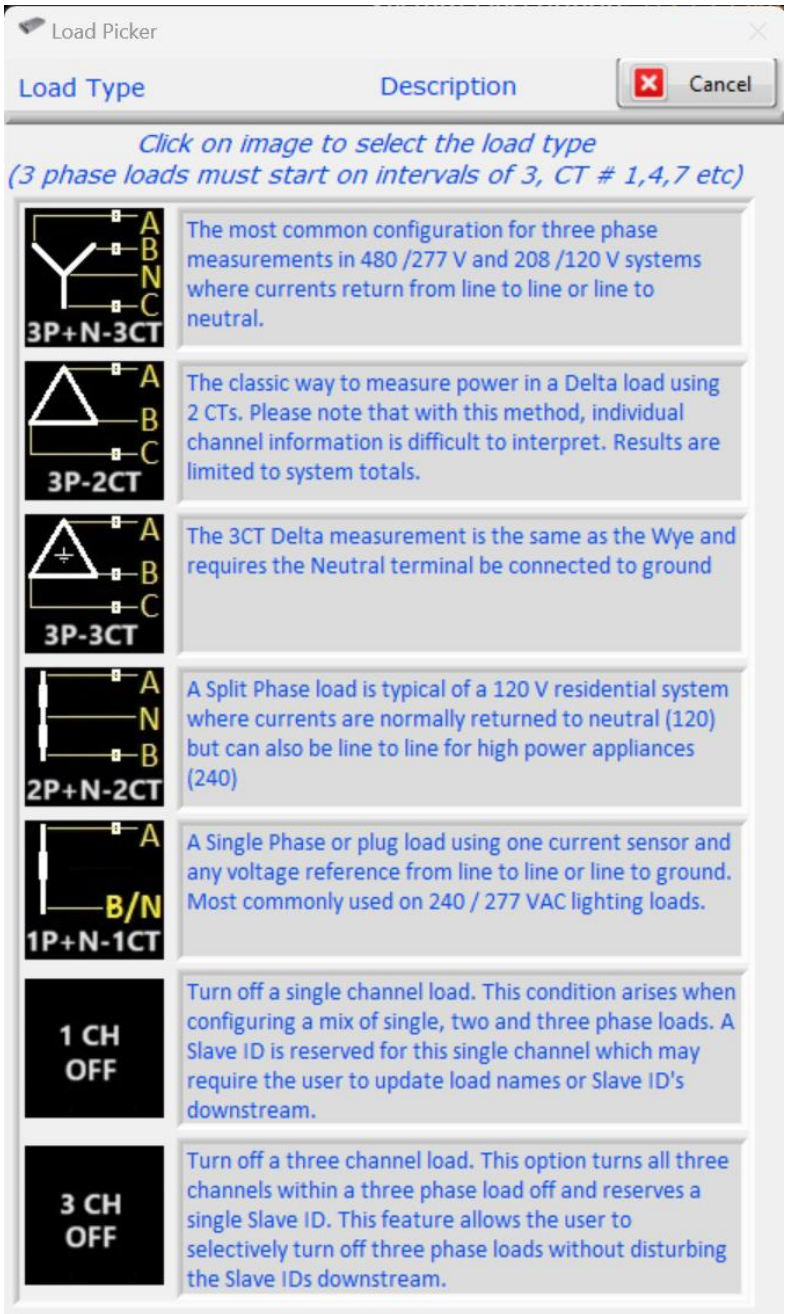
1) **Element Description**
   The name of the element that is currently being configured. This name will appear on the Configuration tab next to the configured element. This field is limited to 15 characters.
2) **Load Type**
   Clicking this drop-down will open the Load Type Selector Dialog. The options for load type are: Delta, Wye, Split Phase, and Single Phase. From this selector a channel can also be turned off by selecting 1 CH OFF or 3 CH OFF to turn off one or three channels, respectively. This is covered in more detail below.
3) **CT Selector**
   Clicking this drop-down will open the CT Selector Dialog. The options for magnetic-core CT’s and Rogowski Coil CT’s. There is also an option available for selecting and entering a custom CT with custom rating and phase shift values.
4) **V-Ref**
   Configure these values to match the actual configuration of the load. This step can be tricky when wires have not been color coded.
5) **CT Rating**
   This is automatically filled when choosing a Socomec CT. This field can be changed by selecting the custom CT option in the CT Selector and filling in the relevant CT rating in the CT Selector Dialog.
6) **Phase Shift**
   This is automatically filled when choosing a Socomec CT. This field can be changed by selecting the custom CT option in the CT Selector and filling in the relevant CT phase shift in the CT Selector Dialog.
7) **Multiplier**
   A CT multiplier can be used to multiply the selected range by a multiplication factor. Common uses of this multiplier include cascaded CT’s where an existing 5 amp CT is buried inside a panel and a second “mV” type CT is installed to the secondary. Here a multiplier can be used to account for both CT ranges.

8) Sign

Changing the sign from + to – reverses the direction of the relevant CT. This is used to help correct a backwards CT when the wiring is no longer accessible. It is always best practice to correct wiring errors rather than rely on electronic compensation.

Load Type

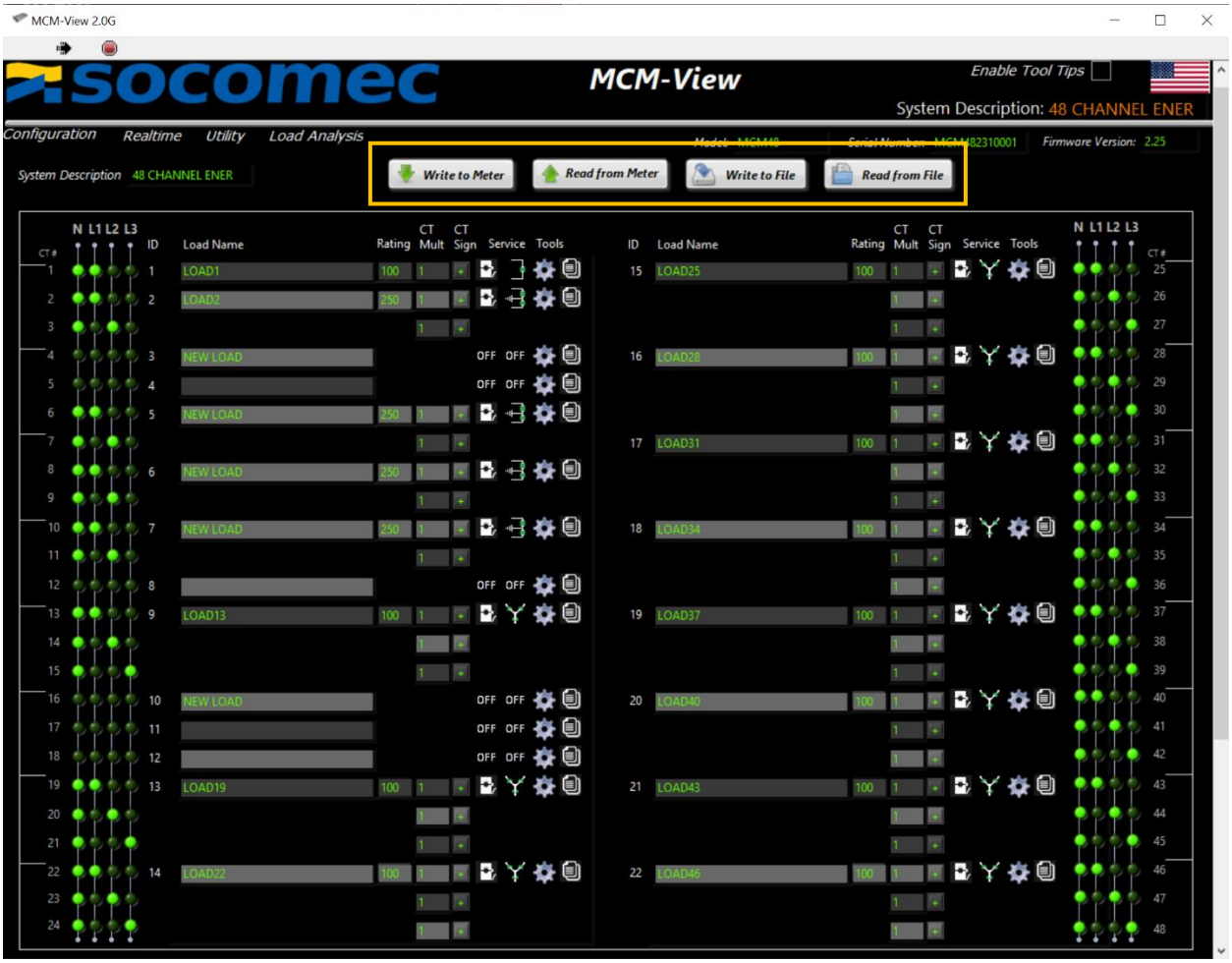
The load types supported by the DIRIS MCM-48 are shown below along with some common use cases.



Supported Load Types.

Writing and Saving Meter Configurations.

The content displayed on MCM-View shows the desired configuration. This configuration only takes effect when written to the meter's memory.

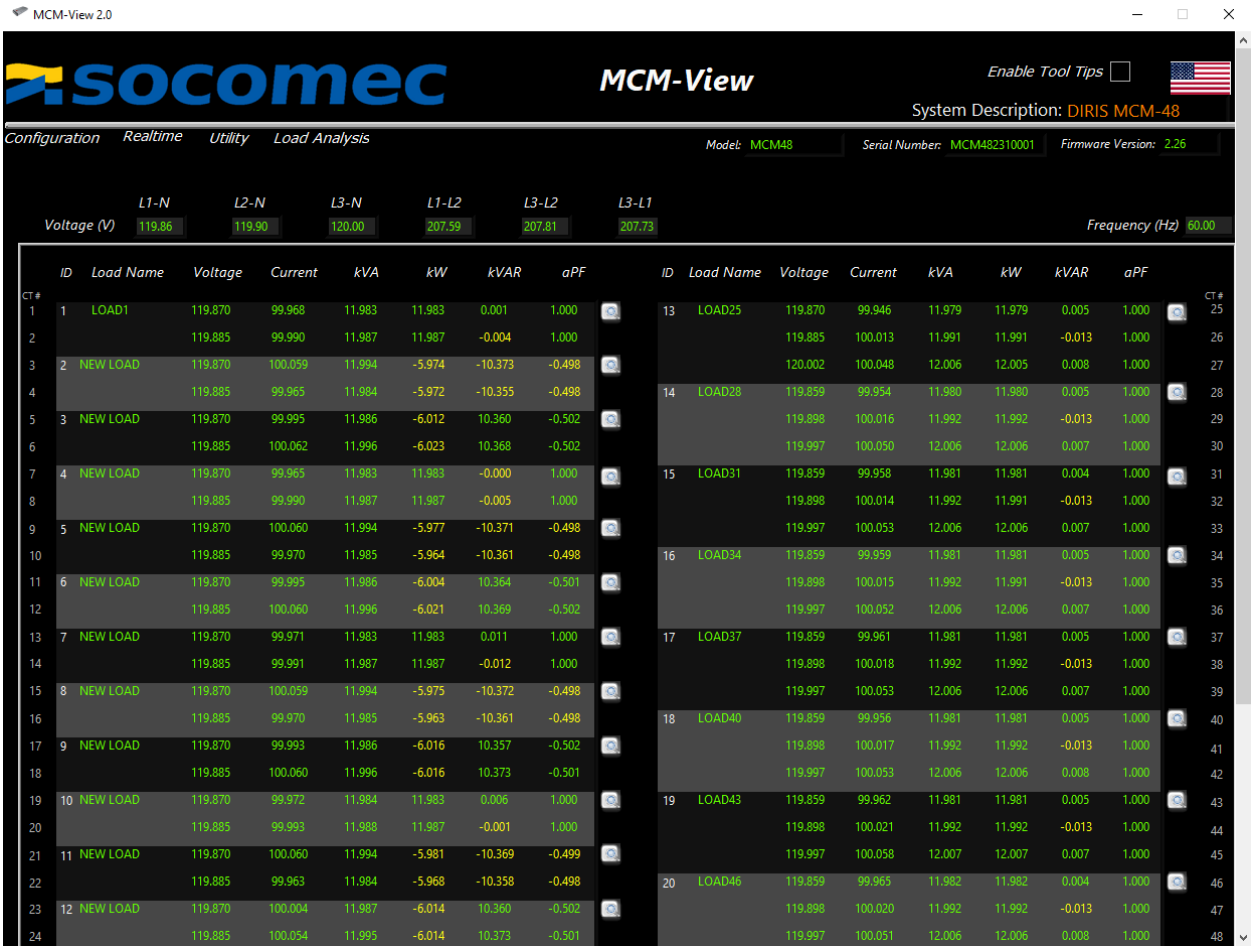


1) **Write to Meter**
   Saves the configurations displayed to the meter. This function is unavailable in offline mode.
2) **Read from Meter**
   Reads the configurations currently saved to the meter and loads them into the display so they can easily be viewed and changed. This function is unavailable in offline mode.
3) **Write to File**
   Saves configured settings to a file stored on the computer at the path: "Documents\Socomec\DIRIS MCM".
4) **Read from File**
   Opens a dialog to select a file to read input from. The selected file will be read and its settings are shown in the display. Note that reading settings from file does not automatically save those settings to the meter.

ⓘ	Note that reading settings from file does not automatically save those settings to the meter. To save settings shown in the display to the meter, click the "Write to Meter" button.

9.3.2 Realtime Tab

The Realtime tab shows readings for each of the configured loads in “Real Time”. If an element has been configured to be off, an empty placeholder will show in the display for the relevant CTs. Loads are visually separated by black and grey background boundaries.



On this page you will find the measured line to neutral and line to line voltages which are common to all loads.

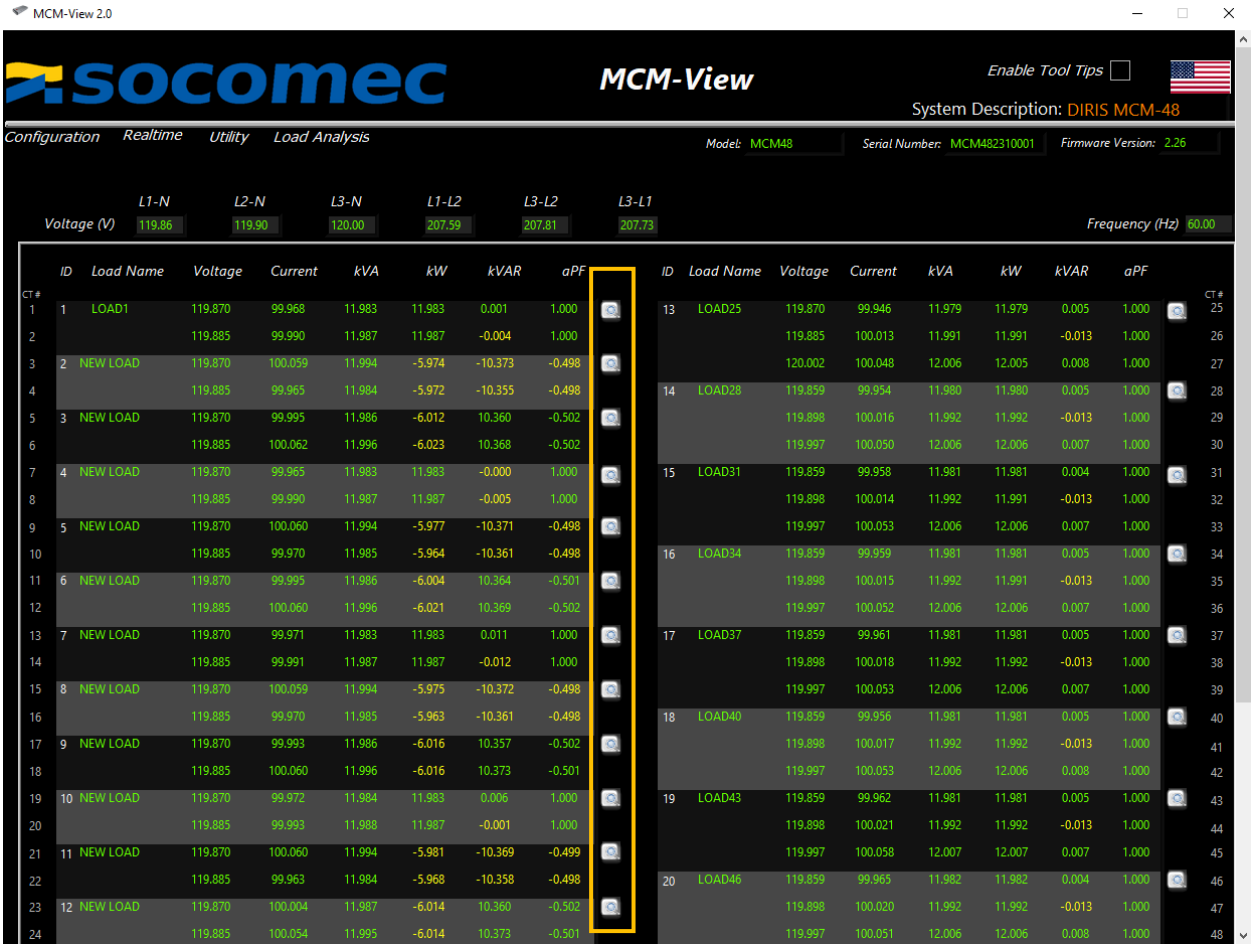
The real time readings update approximately every 2 seconds depending on the speed of the host computer. The following measurements are displayed for each load:

- Voltage
- Current
- kVA – Apparent Power
- kW – Active Power
- kVAR – Reactive Power
- aPF – Apparent Power Factor

The measurements are validated against typical conditions and change color to draw attention to loads that may indicate a configuration mistake.

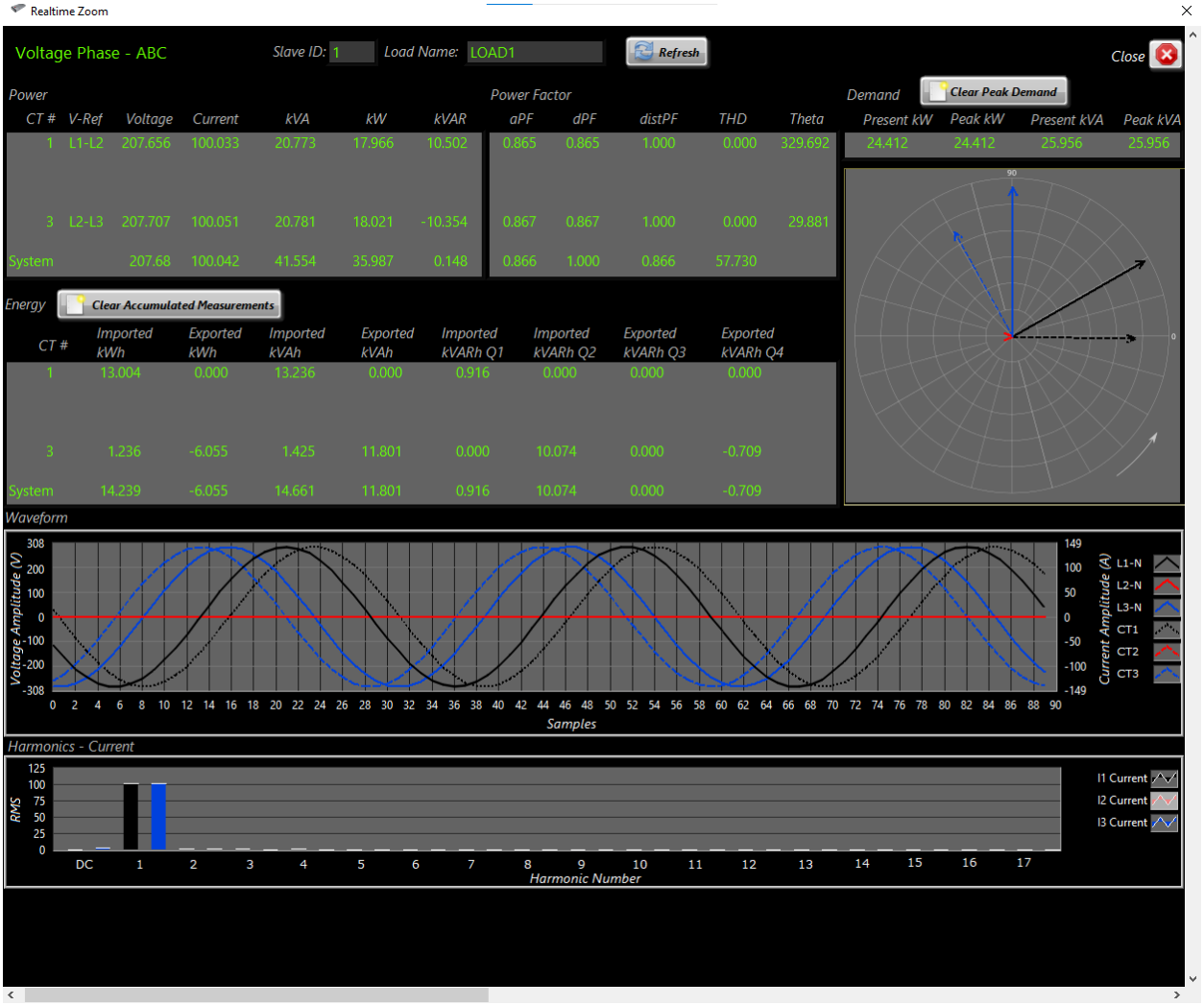
Green text in this application indicates that the field is “read only”. A yellow value indicates one of the following:

- The current is less than 0.5% of its CT rating,
- The kW and/or kVAR are negative (which may indicate a configuration error), or
- The absolute power factor is less than 0.5



A more detailed version of each load can be viewed by pressing the magnifying glass button (Zoom tool) next to the load you want more detail on. This opens up the Realtime Zoom screen.

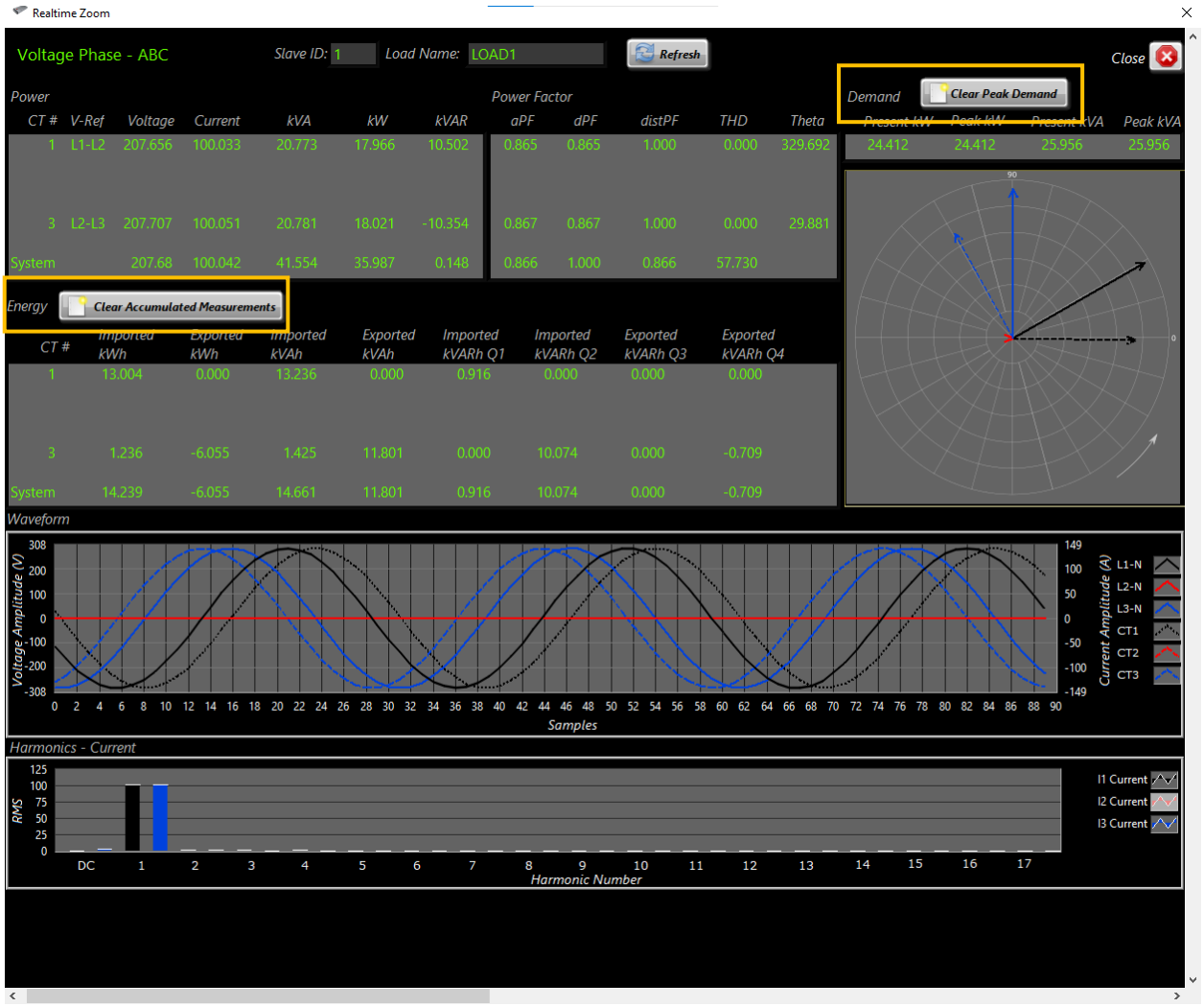
Realtime Zoom



The Realtime Zoom feature displays more detailed information about the selected load. Each Realtime Zoom page displays the following measurements for each channel:

- Voltage
- Current
- kVA – Apparent Power
- kW – Active Power
- kVAR – Reactive Power
- aPF – Apparent Power Factor
- dPF – Displacement Power Factor
- THD – Total Harmonic Distortion
- Theta – Angle between the voltage and the current
- Imported/Exported kWh – Active Energy
- Imported/Exported kVAh – Apparent Energy
- Imported/Exported kVARh – Reactive Energy

There is a polar plot of the voltage and current vectors in the upper left of the Realtime Zoom page. The image uses the voltage vector associated with the first CT as the 0 degree reference. To collect a new data set for visualization, click the refresh button.



From this page, you can clear all accumulated values for the selected load by clicking the “Clear Accumulated Measurements” button. You can also clear the peak demand for the selected load by clicking on the “Clear Peak Demand” button.

The waveform graph visualizes the voltage and current based on a 20 millisecond sample. This data will move when refreshed.

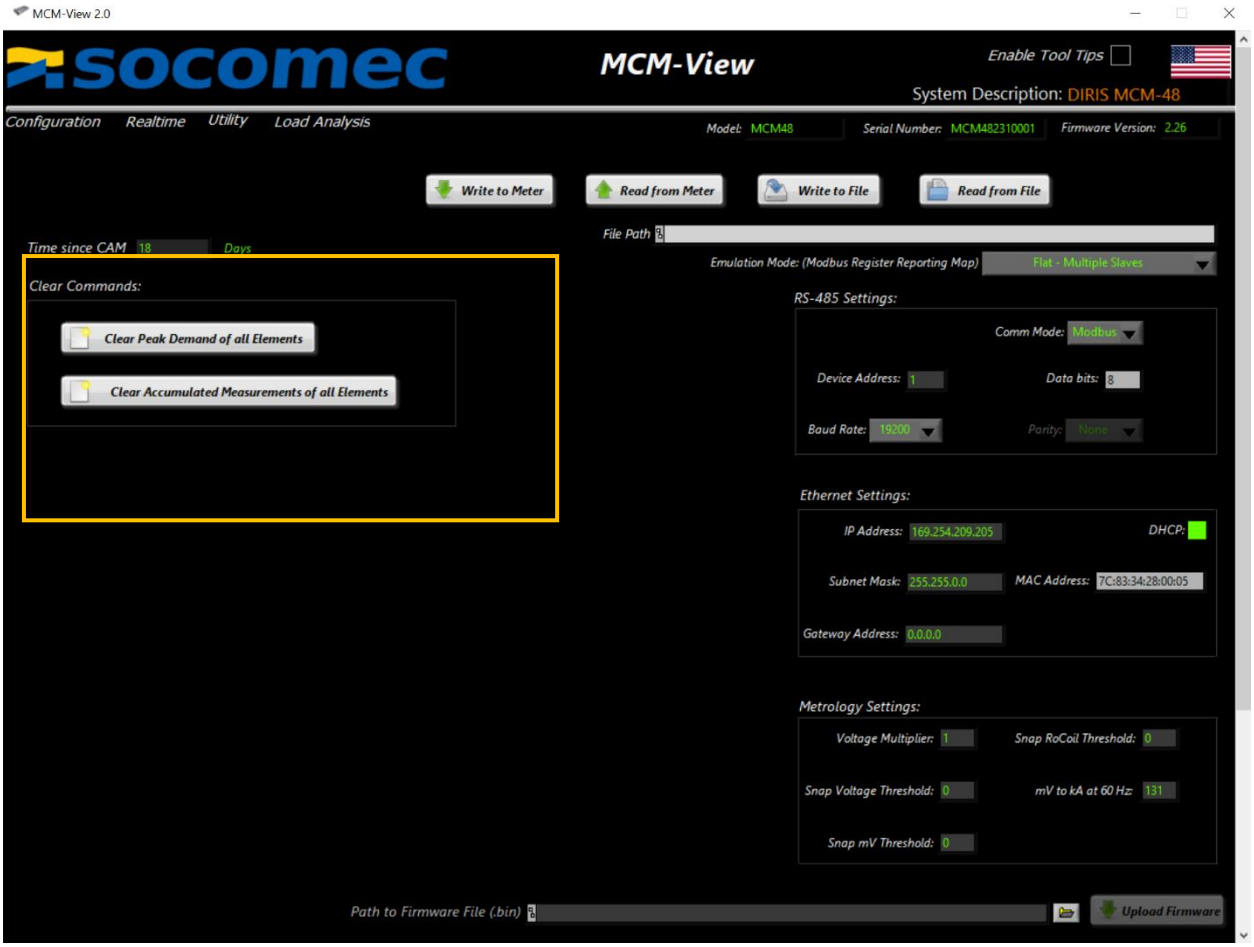
The harmonics chart displays the computed current harmonics based on a 20 millisecond sample. Note that higher harmonics are slightly under-reported due to measurement bandwidth.

Note that this view does not show values updating in real-time. To update the values, click the “Refresh” button at the top of the screen.

ⓘ	Note that the measurements show in the Realtime Zoom page do not update in real time. To update the values, click the “Refresh” button found at the top of the page next to the Load Name.

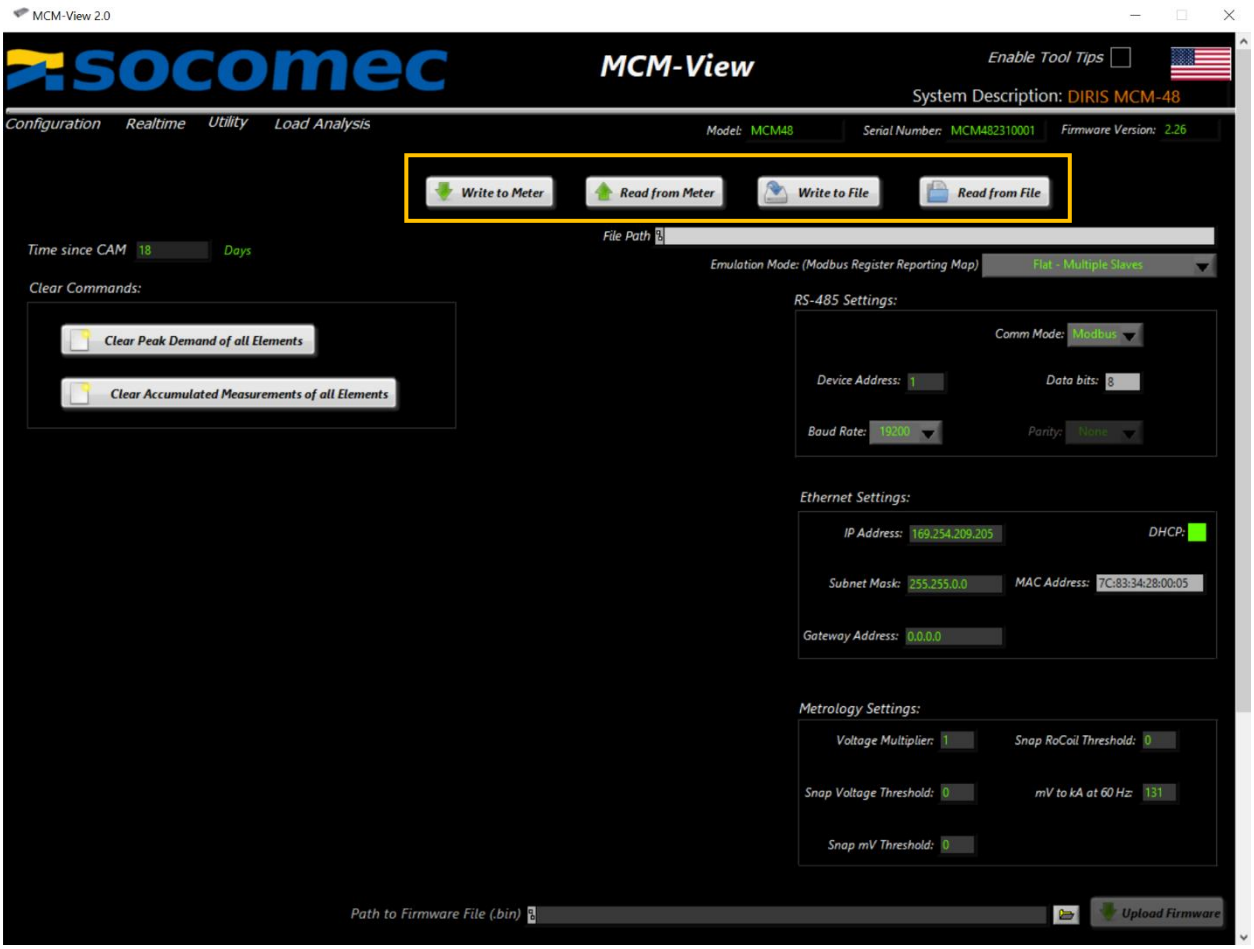
9.3.3 Utility Tab

Clear Commands



1) **Clear Peak Demand of all Elements**
   Clears the peak kW and kVA of all loads. This can be verified by looking at the Realtime Zoom page of each element under the Realtime tab.
2) **Clear Accumulated Measurements of all Elements**
   Clears the accumulated measurement readings for all loads. This can be verified by looking at the Realtime Zoom page of each element under the Realtime tab.
3) **Time Since CAM**
   Shows how much time has elapsed since the last time all accumulated measurements were cleared. When the “Clear Accumulated Measurements of all Elements” button is pressed, this value will start counting up from 0 seconds. To update this value, read settings from the meter or switch to a different tab and then return to the Utility tab.

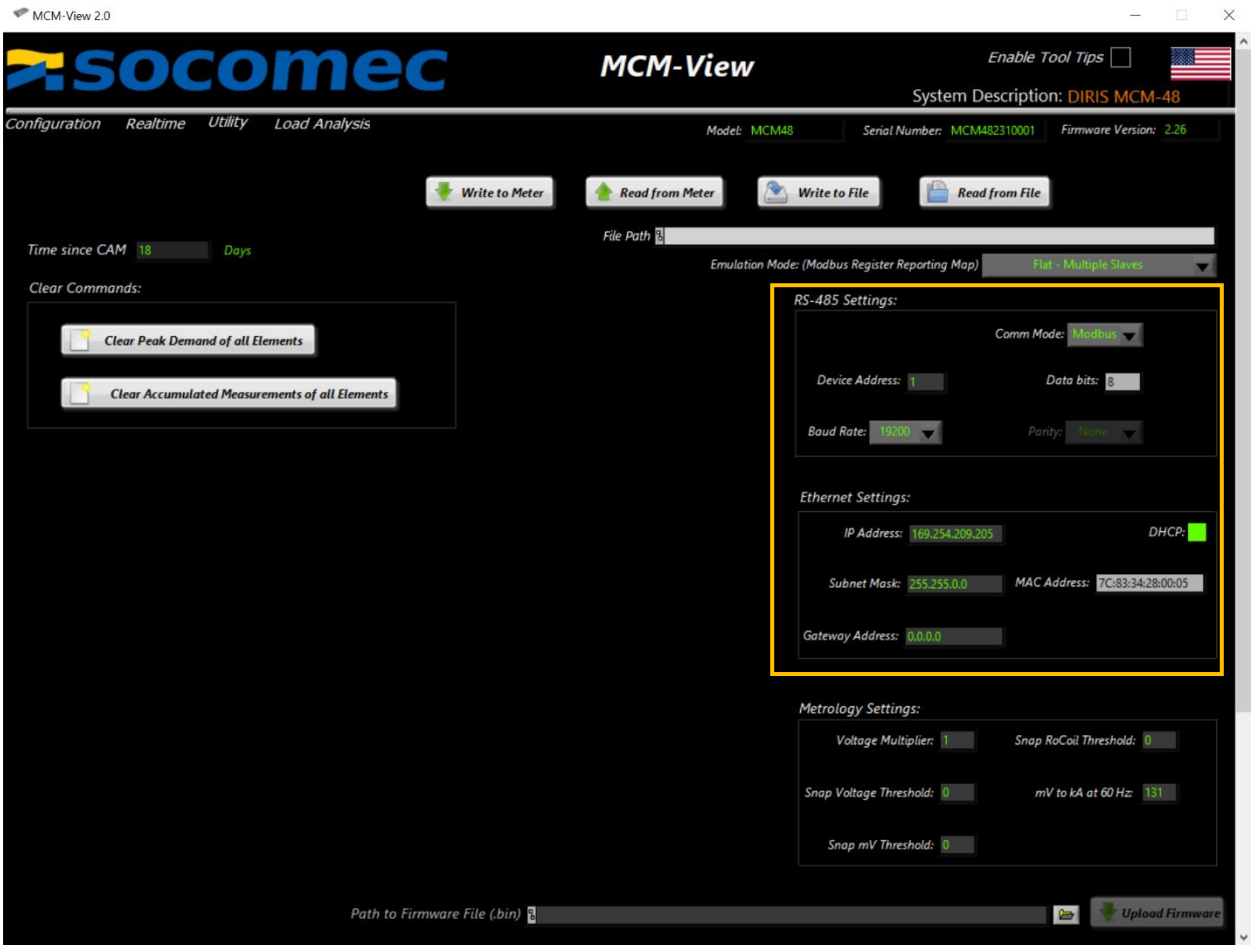
Save Settings



1) **Write to Meter**
   Saves the configured settings for RS-485, Ethernet, and Metrology and stores them in non-volatile memory on the meter. This function is not available in offline mode.
2) **Read from Meter**
   Reads the saved settings from non-volatile memory on the DIRIS MCM-48 that is connected. These settings will be displayed so they can easily be viewed and changed. This function is not available in offline mode.
3) **Write to File**
   Saves the currently configured settings to a file store on your computer at the following path: “Documents\Socomec\DIRIS MCM”.
4) **Read from File**
   Opens a dialog to select a file to read input from. The settings saved in the selected file are shown in the display.

ⓘ	Note that reading settings from file does not automatically save those settings to the meter. To save settings shown in the display to the meter, click the “Write to Meter” button.

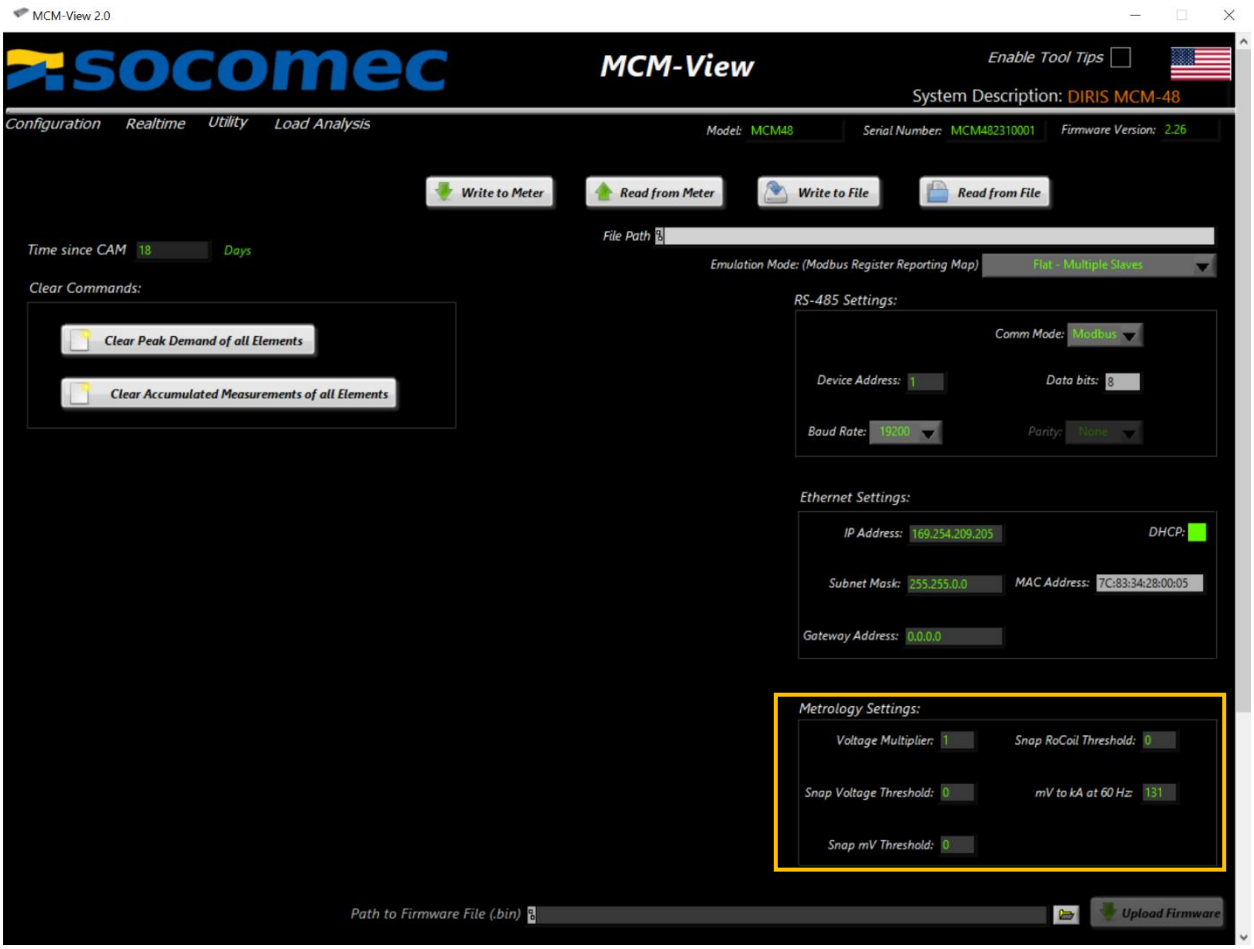
RS-485 and Ethernet Settings



The RS-485 and Ethernet settings allow for different ways for a user to communicate with the meter. Refer to these settings to define the parameters for a serial communication or an Ethernet connection. These settings can be modified to match the user's needs.

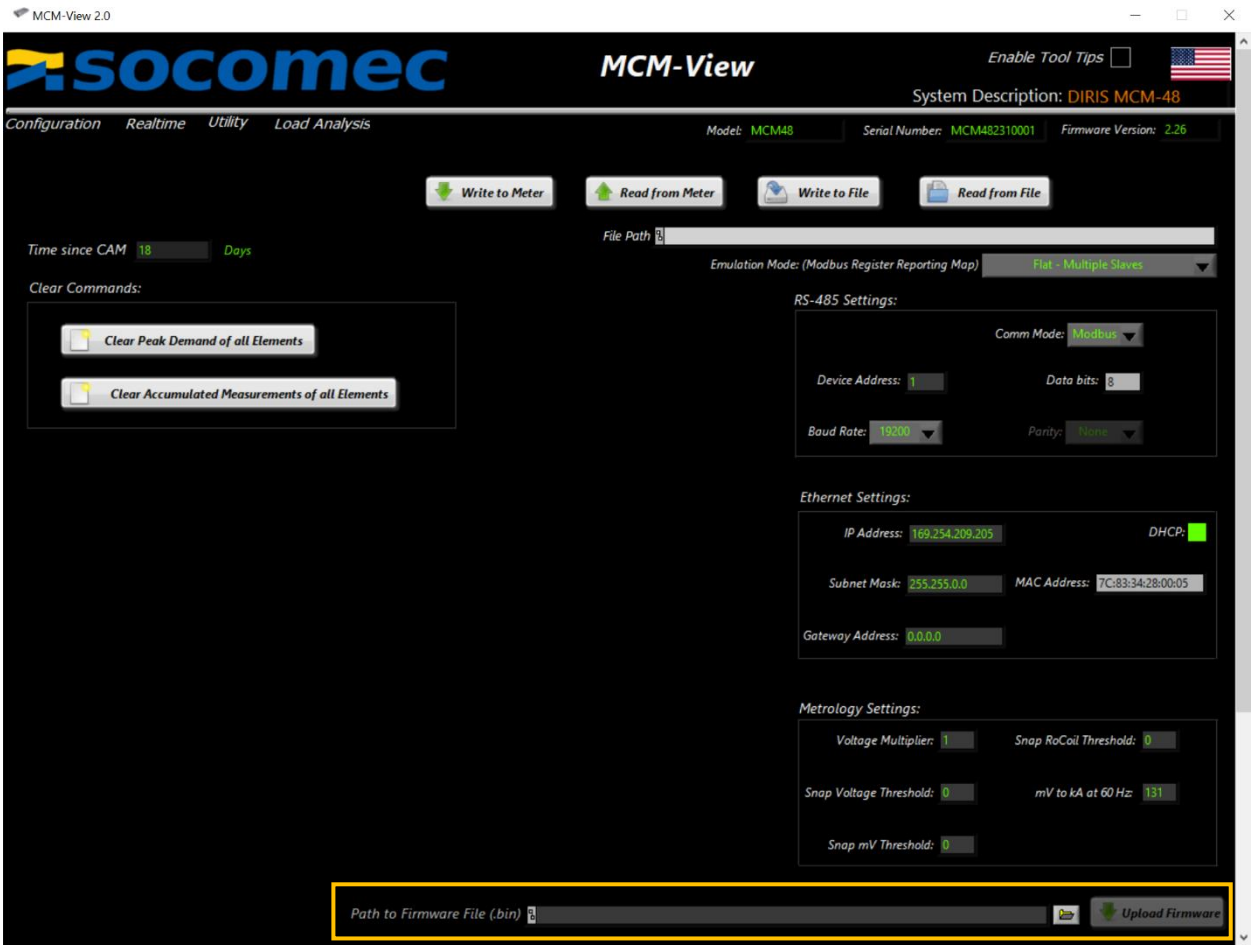
If a DHCP server is available, check the DHCP box, and save the settings to the meter. Give the DHCP server time to assign an IP address (up to 20 seconds or more), and then click the "Read from Meter" button. If an available IP address was assigned by the server, it will populate in the "IP Address" box when settings are read from the meter. If an available static IP address is known and a DHCP server is unavailable, put the available IP address in the "IP Address" box.

Metrology Settings



1) **Voltage Multiplier**
   A potentiometer ratio, if there is one installed in the measurement system. The multiplier can also be used for field calibration, if necessary.
2) **Snap Voltage Threshold**
   Defines when the meter will report 0 instead of displaying a small value. Expressed in volts. Unused voltage inputs will fluctuate unless they are tied to neutral or ground.
3) **Snap mV Threshold**
   Defines when the current for mV magnetic core sensor types will report 0 instead of displaying a small value. Expressed as a percentage. Settings this value prevents that are turned off from accumulating energy.
4) **Snap RoCoil Threshold**
   Defines when the current for Rogowski types will report 0 instead of displaying a small value. Expressed as a percentage. Settings this value prevents that are turned off from accumulating energy.
5) **mV to kA at 60 Hz**
   Controls the amplitude characteristics of Rogowski coil current sensors. The default value is 131 (mV per kA at 60Hz).

Firmware Upgrade



The firmware upgrade tool in the MCM-View provides the simplest way to upgrade the firmware of the DIRIS MCM-48. To select a file, click on the open folder button. Only files with a .bin extension will be accepted.

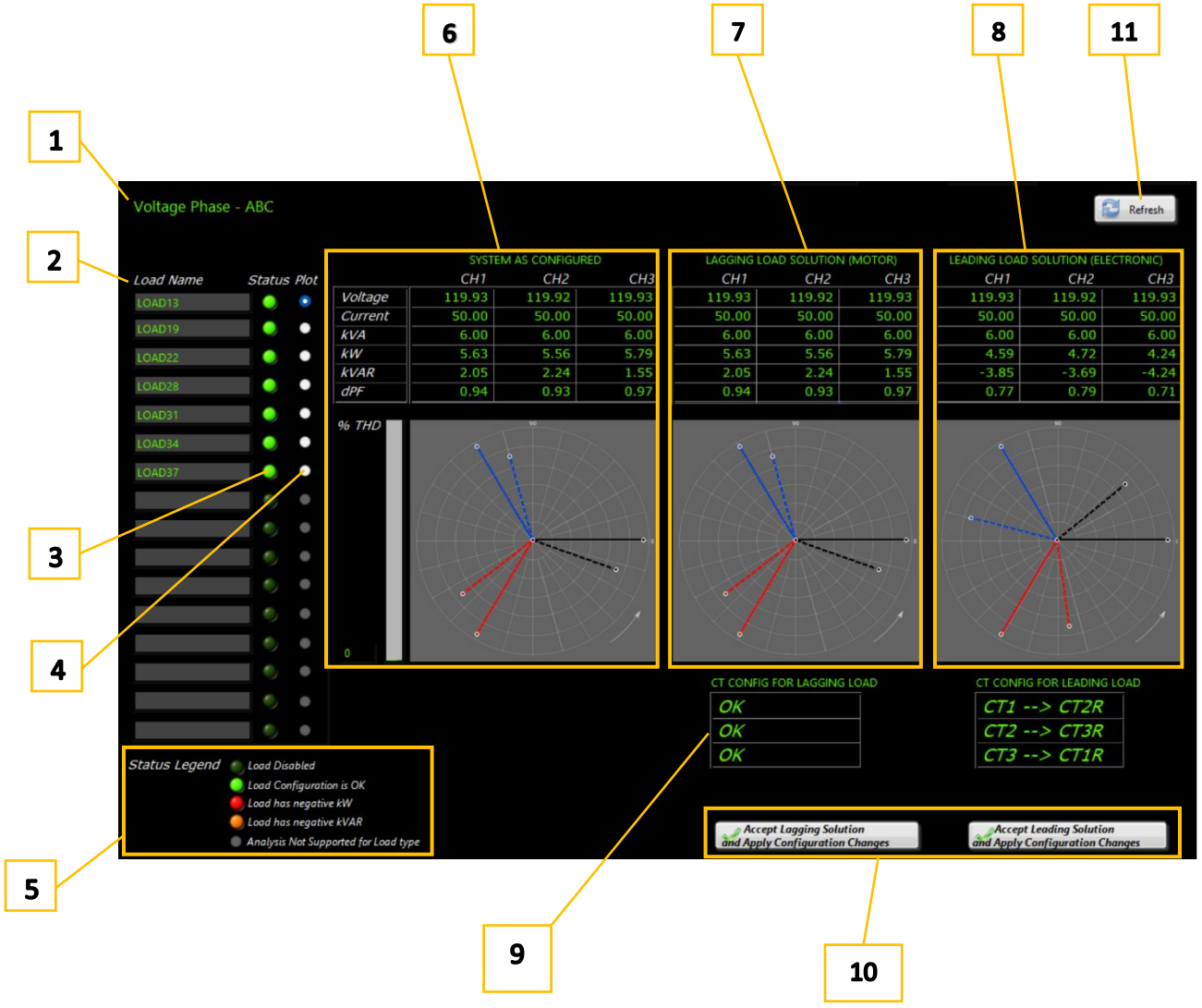
Once a file has been selected, click the “Upload Firmware” button. This starts the process of loading the firmware onto the DIRIS MCM-48. Once the upload has begun, it takes 30 - 60 seconds to update the meter.

ⓘ	Do not disconnect the meter from the computer while the firmware is being updated. This could result in a loss of data and may make the meter inoperative.

9.3.4 Load Analysis

MCM-View includes a tab dedicated to Load Analysis. This tab can be helpful in trouble-shooting common wiring errors in three phase Wye circuits. The polar plotting on this page is an idealized diagram based on the selected load type and the reported values in the associated tables. These plots are not based on FFT analysis as is done in the Realtime Zoom page.

ⓘ	**Load Analysis:** The methodology used by the load analyzer is effective for normal loads found in commercial buildings with power factors above 0.60. This utility will not work on Power Factor Correction Capacitors, chemical plating loads etc. It is up to the user to decide whether the load is correctly instrumented or not. This information is provided to prompt the user to double check if the loads are unusual which may result from an incorrect configuration such as the CT type or phase assignments.



1) **Voltage Phase Rotation**
   Although the DIRIS MCM meter does not need to know the voltage rotation to correctly compute power or energy, it is helpful in visualizing the electrical system. This field indicates the measured voltage rotation (ABC or ACB). The polar diagrams are always drawn to reflect counterclockwise rotation but will swap the L2 and L3 vectors in reflection of the detected voltage rotation.
2) **Load Table Names**
   The Load Names for all Wye configured loads will be presented in this table. Two-Phase and Single-phase loads do not include ambiguity and cannot be ranked by correlation. Graphical corrections for Delta + 2CT loads using Blondell metering theory will not generate recognizable diagrams and have been omitted.
3) **Status**
   An indicator provides a glimpse at the status of each Wye configured load. **Green** indicates a load where Power Factor, Power, and VAR sign reflect normal loads. **Yellow** indicates a load where the VAR is negative. This is becoming more common with electronic loads or high efficiency lighting but should be reviewed. **Red** indicates that the power is negative. Unless it is known that the load is a source (PV, Wind, etc), this typically implies the CT was installed backwards.
4) **Plot**
   This radio button selects which load is being analyzed.
5) **Legend**
   Describes the meaning of the Status legend.
6) **System As Configured**
   The data table and polar plot in this section reflect the data coming from the load under the existing configuration. The polar plot is an idealized plot based on detected rotation and numeric values.
7) **Solution Maximizing System Power with Positive Total VAR**
   Using the data coming from the “As Configured” system, the Load Analyzer computes all the possible combinations that would result from changes in the instrumentation and visualizes that solution with the constraint that the total VARs are positive.
8) **Solution Maximizing System Power with Negative Total VAR**
   Using the data coming from the “As Configured” system, the Load Analyzer computes all the possible combinations that would result from changes in the instrumentation and visualizes that solution with the constraint that the total VARs are negative.
9) **CT Configurations**
   The CT configuration table underneath each respective solution explains how to re-arrange the existing CT’s to produce the estimated results. For example, CT1 -> CT2R suggests that the CT wires be removed from Channel 1 and inserted into Channel 2, but in a backwards orientation. Again, these are suggestions that correct typical installation errors. When the term “OK,OK,OK” exists, it means that the “As Configured” solution matches one of the two possible maximum power solutions and is probably correct, nice job!
10) **Accept Alternate Solution**
    If it is determined that an error has been made in the instrumentation and it is not possible to physically change the CT connections, then it is also possible to correct the installation by re-defining the voltage references used for this load. This is accomplished by pressing the button beneath one of the suggested alternative solutions. This is only recommended when the installer no longer has access to the DIRIS MCM or wants to quickly experiment where uncertainty exists.

11) Refresh

The data on this tab is static unless a new load is selected using the Plot radio button or the refresh button is pressed. Either action will cause MCM-View to acquire a new 20 millisecond sample from the meter.

10. Register Maps

The DIRIS MCM meter family supports multiple registers set mappings in support of differing host requirements and existing scripting. The choice of register mapping scheme brings with it a set of tradeoffs to be considered. These registers are documented in both Excel and in HTML web page format for convenience.

One important concept common to all mapping schemes is the classification of data objects to be belonging to a “System” or “Load” scope. Within each scope, related registers are grouped together by function: Settings, Command, Energy, Power etc.

System Scope: Settings, objects, or data values that are common to the entire Power Meter (this includes Voltage).

Load Scope: Settings, objects, or data values that are unique to a particular load.

10.1 Modbus register documentation

Register Documentation is provided in two electronic formats, MS Excel and HTML.

MS Excel: Best for viewing the entire map at one time. Note there are TWO Tabs: System & Load. This format has additional usage notes that do not appear in the HTML table.

HTML: Best for using on a mobile device or for searching based on a partial string

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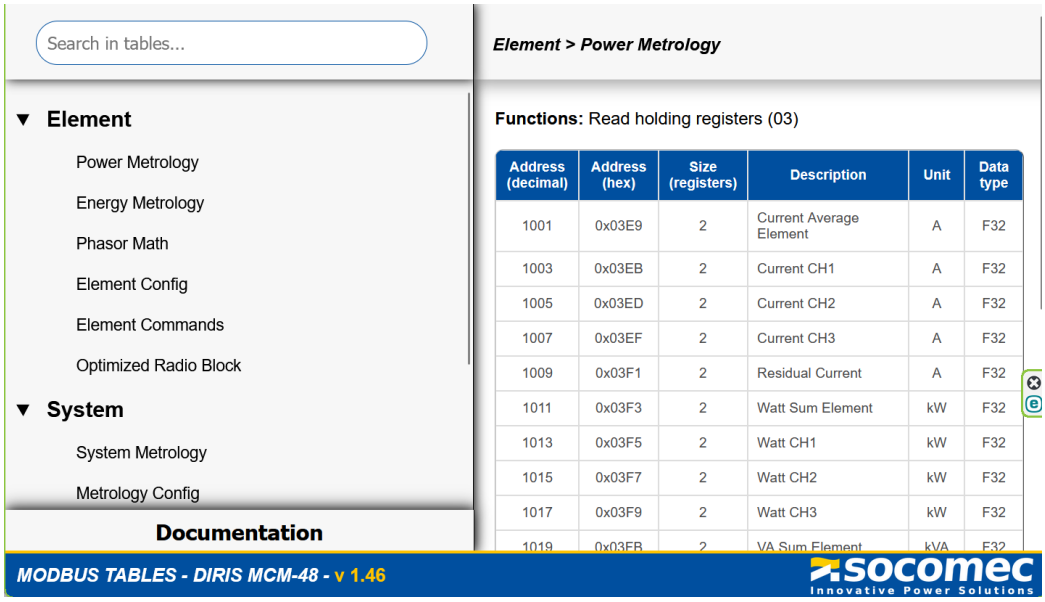
MCM-48 REGISTER POINT LIST

Notes:

All SYSTEM Registers are 0 -999
TWO ADDRESS MODES ARE AVAILABLE
REGISTER ADDRESS MODE [Register 612]
FLAT - Element Registers are 1001 - 1999, Slade ID's 1-16, 24, or 48
HOTEL - Element Registers are at 1K intervals, Single Slave ID

Point Name	Modbus Register	Item Description	Units	Data Type
SYSTEM METROLOGY	-	SYSTEM METROLOGY	-	-
Voltage L to N Avg Element (MSW)	101	Voltage L to N Avg Element	V	float32
Voltage L to N Avg Element (LSW)	102			
Voltage L1 to N (MSW)	103	Voltage L1 to N (AN)	V	float32
Voltage L1 to N (LSW)	104			
Voltage L2 to N (MSW)	105	Voltage L2 to N (BN)	V	float32
Voltage L2 to N (LSW)	106			
Voltage L3 to N (MSW)	107	Voltage L3 to N (CN)	V	float32
Voltage L3 to N (LSW)	108			
Voltage L to L Avg Element (MSW)	109	Voltage L to L Avg Element	V	float32

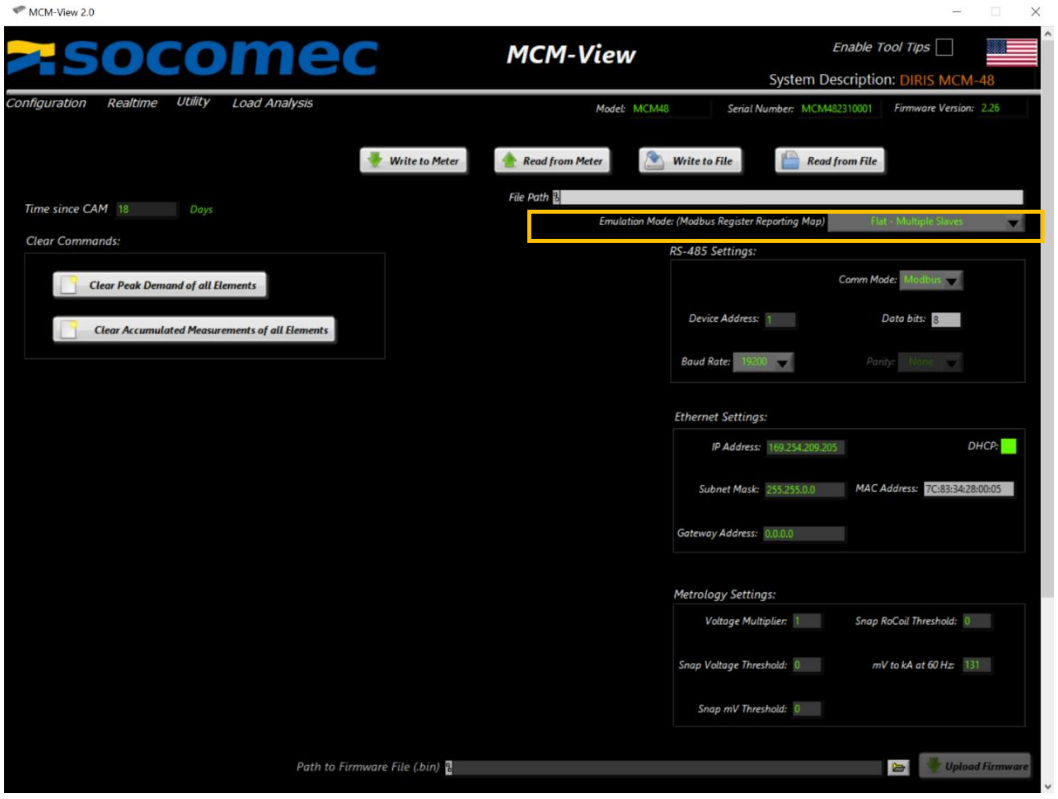
Excel Documentation: DIRIS MCM-48 Register List



HTML Documentation: DIRIS MCM-48 Register List

10.2 Modbus Emulation Mode

The DIRIS MCM-48 can report measurement data via Modbus using 2 different “Emulation modes”. You can choose between Flat (Multiple Modbus slaves, one per element) or Hotel (one unique Modbus slave address). The emulation mode can be selected from the “Utility” page:



Flat Mode

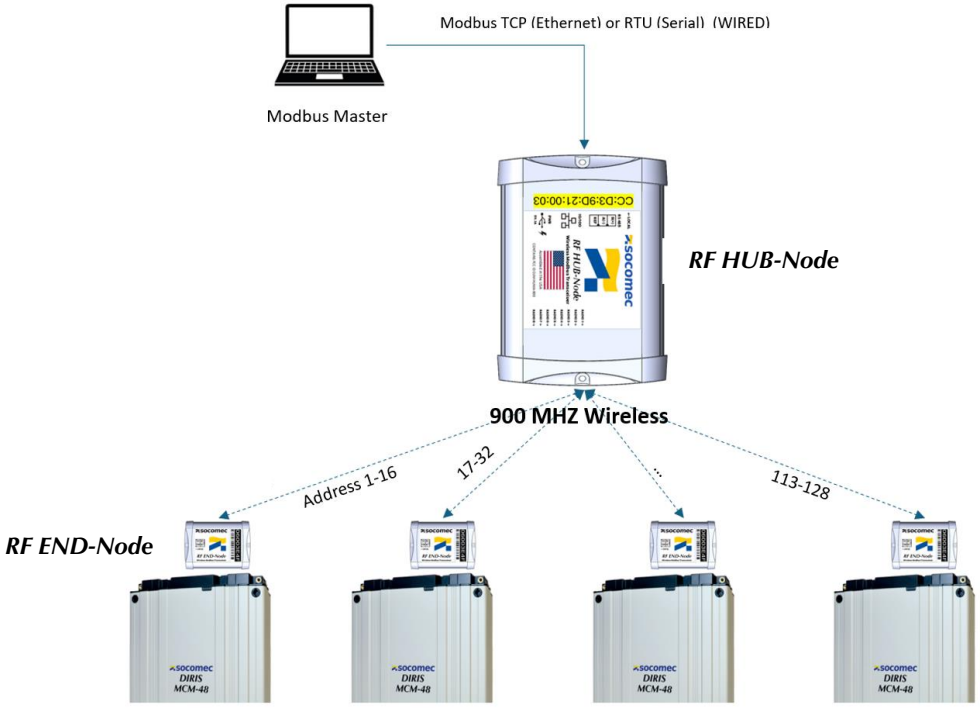
In the DIRIS MCM “Flat” mapping scheme, a unique Modbus Address (also called Slave ID) is associated with each load. The host script queries data in a loop using the same register numbers but changing the Slave ID to point to a different load. Note that the DIRIS MCM meter is available with a wireless network option (RF END-Node) that uses this scheme.

Hotel Model

In the “Hotel” Modbus mapping scheme, each Load is designated as a floor in a data addressing model where floors are separated by 1000. This scheme is popular for host systems that would attempt to open a new TCP/IP socket for each Load. Here a single Slave ID is used but the host script loops through a sequence adding 1000 to reach the next load. This scheme is not well suited to the RF radio system.

11. MCM RF Accessories

The RF wireless system is designed to replace Ethernet LAN network infrastructure and Modbus RS-485 multidrop wiring runs with a secure local wireless network. The system is designed as a “star” or “Wheel” network with a Modbus Master physically connected to the RF-*Hub Node* which remotely communicates with wireless *End Nodes.* Each end node services a wired RS-485 sub-network or device with up to 48 slave devices or addresses. The End Nodes are powered from the DIRIS MCM-48 directly and do not need a separate power source. The system uses encryption and is not discoverable, a great solution for reaching power meters where no IT infrastructure exists.



If you need any assistance, please email our support team at tech.us@socomec.com.
For all other inquiries, contact info.us@socomec.com.

For more information on our other products and solutions, visit our website at www.socomec.us

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