

MAVOSYS | 10

Power Quality System

3-349-519-03
1/6.10



**Attention!**

Death, serious injury, or fire hazard could result from improper connection of this instrument. Read and understand this manual before connecting this instrument. Follow all installation and operating instructions while using this instrument.

Connection of this instrument must be performed in compliance with the National Electrical Code (ANSI/NFPA 70-2008) of USA and any additional safety requirements applicable to your installation.

Installation, operation, and maintenance of this instrument must be performed by qualified personnel only. The National Electrical Code defines a qualified person as "one who has the skills and knowledge related to the construction and operation of the electrical equipment and installations, and who has received safety training on the hazards involved."

Qualified personnel who work on or near exposed energized electrical conductors must follow applicable safety related work practices and procedures including appropriate personal protective equipment in compliance with the Standard for Electrical Safety Requirements for Employee Workplaces (ANSI/NFPA 70E-2004) of USA and any additional workplace safety requirements applicable to your installation.

**¡Atención!**

Una conexión incorrecta de este instrumento puede producir la muerte, lesiones graves y riesgo de incendio. Lea y entienda este manual antes de conectar. Observe todas las instrucciones de instalación y operación durante el uso de este instrumento.

La conexión de este instrumento a un sistema eléctrico se debe realizar en conformidad con el Código Eléctrico Nacional (ANSI/NFPA 70-2008) de los E.E.U.U., además de cualquier otra norma de seguridad correspondiente a su establecimiento.

La instalación, operación y mantenimiento de este instrumento debe ser realizada por personal calificado solamente. El Código Eléctrico Nacional define a una persona calificada como "una que esté familiarizada con la construcción y operación del equipo y con los riesgos involucrados."

El personal cualificado que trabaja encendido o acerca a los conductores eléctricos energizados expuestos debe seguir prácticas y procedimientos relacionados seguridad aplicable del trabajo incluyendo el equipo protector personal apropiado en conformidad con el estándar para los requisitos de seguridad eléctricos para los lugares de trabajo del empleado (ANSI/NFPA 70E-2004) de los E.E.U.U. y cualquier requisito de seguridad adicional del lugar de trabajo aplicable a su instalación.

**Attention!**

Si l'instrument est mal connecté, la mort, des blessures graves, ou un danger d'incendie peuvent s'en suivre. Lisez attentivement ce manuel avant de connecter l'instrument. Lorsque vous utilisez l'instrument, suivez toutes les instructions d'installation et de service.

Cet instrument doit être connecté conformément au National Electrical Code (ANSI/NFPA 70-2008) des Etats-Unis et à toutes les exigences de sécurité applicables à votre installation.

Cet instrument doit être installé, utilisé et entretenu uniquement par un personnel qualifié. Selon le National Electrical Code, une personne est qualifiée si "elle connaît bien la construction et l'utilisation de l'équipement, ainsi que les dangers que cela implique".

Le personnel qualifié qui travaillent dessus ou s'approchent des conducteurs électriques activés exposés doit suivre des pratiques en matière et des procédures reliées par sûreté applicable de travail comprenant le matériel de protection personnel approprié conformément à la norme pour des conditions de sûreté électriques pour les lieux de travail des employés (ANSI/NFPA 70E-2004) des Etats-Unis et toutes les conditions de sûreté additionnelles de lieu de travail applicables à votre installation.

**Achtung!**

Der falsche Anschluss dieses Gerätes kann Tod, schwere Verletzungen oder Feuer verursachen. Bevor Sie dieses Instrument anschließen, müssen Sie die Anleitung lesen und verstanden haben. Bei der Verwendung dieses Instruments müssen alle Installations- und Betriebsanweisungen beachtet werden.

Der Anschluss dieses Instruments muss in Übereinstimmung mit den nationalen Bestimmungen für Elektrizität (ANSI/NFPA 70-2008) der Vereinigten Staaten, sowie allen weiteren, in Ihrem Fall anwendbaren Sicherheitsbestimmungen, vorgenommen werden.

Installation, Betrieb und Wartung dieses Instruments dürfen nur von Fachpersonal durchgeführt werden. In dem nationalen Bestimmungen für Elektrizität wird ein Fachmann als eine Person bezeichnet, welche „mit der Bauweise und dem Betrieb des Gerätes sowie den dazugehörigen Gefahren vertraut ist.“

Fachpersonal, das mit oder neben berührbaren und stromführenden elektrischen Leitern arbeitet, muss die gültigen Richtlinien und Verfahren in Bezug auf Arbeitssicherheit einhalten einschließlich der geeigneten persönlichen Schutzausrüstung gemäß der US Norm für elektrische Sicherheitsbestimmungen am Arbeitsplatz (ANSI/NFPA 70E-2004) sowie zusätzliche Arbeitssicherheitsbestimmungen, die für die jeweilige Anlage gelten.

Definitions

WARNING statements inform the user that certain conditions or practices could result in loss of life or physical harm.

CAUTION statements identify conditions or practices that could harm the Mavosys 10, its data, other equipment, or property.

NOTE statements call attention to specific information.

Symbols

The following International Electrotechnical Commission (IEC) symbols are marked on the top and rear panel in the immediate vicinity of the referenced terminal or device:



Caution, refer to accompanying documents (this manual).



Alternating current (ac) operation of the terminal or device.



Direct current (DC) operation of the terminal or device.



Protective conductor terminal.

Definiciones

Las ADVERTENCIAS informan al usuario de ciertas condiciones o prácticas que podrían producir lesiones mortales o daño físico.

Las PRECAUCIONES identifican condiciones o prácticas que podrían dañar la Mavosys 10, sus datos, otros equipos o propiedad.

Las NOTAS llaman la atención hacia la información específica.

Símbolos

Los siguientes símbolos de la Comisión Internacional Electrotécnica (IEC) aparecen marcados en el panel superior y el posterior inmediatos al terminal o dispositivo en referencia:



Precaución, consulte los documentos adjuntos (este manual).



Operación de corriente alterna (ca) del terminal o dispositivo.



Operación de corriente continua (CC) del terminal o dispositivo.



Terminal de protección del conductor.

Définitions

Les messages d'AVERTISSEMENT préviennent l'utilisateur que certaines conditions ou pratiques pourraient entraîner la mort ou des lésions corporelles.


Les messages de MISE EN GARDE signalent des conditions ou pratiques susceptibles d'endommager "Mavosys 10", ses données, d'autres équipements ou biens matériels.


Les messages NOTE attirent l'attention sur certains renseignements spécifiques.

Symboles

Les symboles suivants de la Commission électrotechnique internationale (CEI) figurent sur le panneau arrière supérieur situé à proximité du terminal ou de l'unité cité:

 Mise en garde, consultez les documents d'accompagnement (ce manuel).

 Fonctionnement du terminal ou du dispositif sur le courant alternatif (c.a.).

 Fonctionnement du terminal ou de l'unité en courant continu (CC).

 Borne conductrice de protection.

Definitionen

WARNUNGEN informieren den Benutzer darüber, dass bestimmte Bedingungen oder Vorgehensweisen körperliche oder tödliche Verletzungen zur Folge haben können.


VORSICHTSHINWEISE kennzeichnen Bedingungen oder Vorgehensweisen, die zu einer Beschädigung von Mavosys 10, seiner Daten oder anderer Geräte bzw. von Eigentum führen können.

HINWEISE machen auf bestimmte Informationen aufmerksam.

Symbole

Die folgenden Symbole der Internationalen Elektrotechnischen Kommission (International Electrotechnical Commission; IEC) befinden sich auf der Abdeck- und Seitenplatte unmittelbar am betreffenden Terminal oder Gerät.

 Vorsichtshinweis, siehe Begleitdokumente (dieses Handbuch).

 Wechselstrombetrieb der Anschlussbuchse bzw. des Geräts.

 Gleichstrombetrieb der Anschlussbuchse oder des Geräts.

 Schutzleiter Anschlussbuchse

Safety precautions

The following safety precautions must be followed whenever any type of voltage or current connection is being made to the Mavosys 10.

- Connect the green safety (earth) ground first, before making any other connections.
- When connecting to electric circuits or pulse initiating equipment, open their related breakers. DO NOT install any connection of the instrument on live power lines.
- Connections must be made to the instrument first, then connect to the circuit to be monitored.
- Wear proper personal protective equipment, including safety glasses and insulated gloves when making connections to power circuits.
- Hands, shoes and floor must be dry when making any connection to a power line.
- Make sure the unit is turned OFF before connecting probes to the rear panel.
- Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.
- Pods should be connected first to the Mavosys 10, then connect to the circuit to be monitored.
- If the equipment is used in a manner not specified in this user's guide, the protection provided by the equipment may be impaired.

These safety precautions are repeated where appropriate throughout this manual.

Statements and Notices

Statement of warranty

All products of GMC-I Messtechnik GmbH are warranted to the original purchaser against defective material and workmanship for a period of one year from the date of delivery. GMC-I Messtechnik GmbH will repair or replace, at its option, all defective equipment that is returned, freight prepaid, during the warranty period. There will be no charge for repair provided there is no evidence that the equipment has been mishandled or abused. This warranty shall not apply to any defects resulting from improper or inadequate maintenance, buyer-supplied hardware/software interfacing, unauthorized modification or misuse of the equipment, operation outside of environmental specifications, or improper site preparation or maintenance.

Statement of reliability

The information in this manual has been reviewed and is believed to be entirely reliable, however, no responsibility is assumed for any inaccuracies. All material is for informational purposes only and is subject to change without prior notice.

Notice regarding 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 his/her own expense.

Notice regarding proprietary rights

This publication contains information proprietary to GMC-I Messtechnik GmbH. By accepting and using this manual, you agree that the information contained herein will be used solely for the purpose of operating equipment of GMC-I Messtechnik GmbH.

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1 Introduction

1.1 About the Mavosys 10

1.1.1 Mavosys 10 description

Mavosys 10 encompasses two world-class data acquisition products developed by GMC-I Messtechnik GmbH – the DataNode family of products for the Signature System® and the Mavowatt 70. This integration of power measurement capabilities coupled with an innovative modular design set the Mavosys 10 apart as a truly revolutionary product. The modular concept applies to both the hardware configuration and firmware architecture allowing the unit to be a multi-purpose instrument. Mavosys 10 works from being a diagnostic tool to providing preventive and predictive information as an embedded solution. The instrument is designed to operate either locally as a stand-alone unit with the optional LCD panel installed or via remote computer using the Encore Series Software. Mavosys 10 is compliant with IEEE1159, IEC61000-4-30 Class A, EN50160 standards, and more. It can be installed in a permanent or semi-permanent installation.

1.1.2 Interface to Mavosys 10

Mavosys 10 can operate locally as a stand-alone unit and/or remotely as a data acquisition module connected to the Encore Series Software:

1.1.2.1 Local operation with optional user interface

As a stand-alone unit, the Mavosys 10 can be outfitted with optional liquid crystal display (LCD) as user interface. The optional touch screen display is mounted on the front panel of the instrument (rack mount or switchgear mount). The LCD panel provides immediate accessibility to monitoring all measurement parameters and instrument setup and configurations. Refer to the Mavosys 10 User Interface Operations Guide for detailed instructions.

1.1.2.2 Remote computer operation

The Mavosys 10 can operate as a data acquisition module connected to the Encore Series Software. This software provides a centralized connection point for remote devices, turning the computer into a self-contained web server. Encore Series Software permits remote communications with the Mavosys 10, with the conventional Internet browser as user interface. Remote operation includes instrument setup and configurations and monitoring real-time parameters, disturbance and trend data. Refer to the Encore Series Software User's Guide for detailed operating instructions.

1.1.3 Data communication

Mavosys 10 can communicate data to the Encore Series Software via Ethernet (wired, wireless or fiber-optic based), RS485, and land/cellular modem via RS232. The physical modem is an external option and is not included as part of the standard product. This extends greater flexibility in the choice of communications interface for remote operation.

1.1.4 Input/Output modules

Mavosys 10 provides dedicated digital signal processing power via the separate and independent connection for each input/output module installed. This modular and configurable design shatters the traditional 8-channel (4 voltage, 4 current) instrument format. Choose from the voltage, current, and data acquisition modules to build from one to four instruments in a single, compact, cost-effective format. The available modules are:

- AC Voltage Modules – 4 channels using either terminal block, safety jack, or 25-pin connector to external voltage pods
- AC Current Modules – 4 channels for clamp-on CTs or 25-pin connector to external CT pod
- Digital Input Modules – 8 channels



Note

The Modules are factory-installed. They cannot be installed in the field and are not user accessible.

See Chapter 2 Controls, Indicators, and Connectors on page 4 for more information on the input modules. Chapter 3 Circuit Diagrams for Power Monitoring on page 24 contains wiring diagrams for when power measurements are to be made.

1.1.5 Virtual analyzer platform

At the heart of the Mavosys 10 is the virtual analyzer platform or 'instruments within an instrument' configuration. The virtual analyzer allows the instrument to distinguish data operations in multiple modules. The user can configure up to four virtual analyzers per Mavosys 10 instrument.

The Mavosys 10 firmware architecture is based on the concept of separating the various stages of acquisition, characterization, communications and visualization with clearly defined interfaces that decouple one from the other. The instrument can monitor power quality phenomena for troubleshooting and/or compliance purposes. It can record inrush conditions, carry out long-term statistical studies to establish performance baselines, and perform field-based equipment testing and evaluation for commissioning and maintenance. The firmware integrates intuitive instrument setup procedures for each module analyzer to ensure the capture of all relevant data for additional post process analysis, report writing, and data archiving using other compatible GMC-I Messtechnik GmbH software applications such as PQView®.

1.1.6 This guide

This guide is only part of a complete document set designed to provide comprehensive information about the Mavosys 10. It primarily contains instructions on how to set up the basic Mavosys 10 hardware for operation. It describes the input module interface and the wiring configurations possible for voltage/current connection. It also describes the data communication ports available in the back-plane of the instrument. An overview on how to set up the Mavosys 10 either as a stand-alone unit or as a data acquisition module connected to the Encore Series Software is included in this guide.

For operational description using the local LCD panel, refer to the Mavosys 10 User Interface Operations Guide (check with GMC-I Messtechnik GmbH for availability).

For operational description using remote communications via Encore Series Software, refer to the Encore Series Software User's Guide.

1.2 Unpacking the Mavosys 10

1.2.1 Unpacking

For maximum protection against possible shipping damage, the Mavosys 10 has been sealed in a two-piece, plastic suspension pack, enclosed within a durable shipping carton. After opening the carton, inspect the contents for possible shipping damage and check the carton inventory.

Unpack the Mavosys 10 from the carton as follows:

Step	Action
1	Remove any remaining literature inside the top of the carton.
2	Carefully remove the Mavosys 10 from its shipping carton.
3	Remove all accessories inside the carton. Check that the standard (see Chapter 1.3.1 Standard accessories on page 2) and optional accessories (see Chapter Appendix A Optional Accessories on page 44) you ordered are included.

1.2.2 Shipping damage inspection

Visually inspect the Mavosys 10 for possible shipping damage. If any damage exists, first notify and file an insurance claim with your carrier or underwriter or both. Then notify the sales department at GMC-I Messtechnik GmbH of your intentions to return the unit.

1.2.3 Repacking for return shipment

If the unit must be returned to GMC-I Service GmbH for service or repair, wrap the unit securely in heavy packaging material and place in a well padded box or crate to prevent damage. Do not return the Mavosys 10 in an unpadded box.

GMC-I Service GmbH will not be responsible for damage incurred during transit due to inadequate packing on your part.

1.3 Mavosys 10 Accessories

1.3.1 Standard accessories

The standard accessory included with the Mavosys 10 is the Mavosys 10 Installation Guide, 3-349-519-03.

1.3.2 Optional accessories

Refer to Appendix A for the list of hardware and software optional accessories available for use with Mavosys 10. The unit mainframe can be custom-built with optional input module connectors, communication port connectors, GPS antenna connector, and a 12V dc power input jack.

1.3.3 Technical specifications

Specifications for the Mavosys 10 measured parameters, computed parameters, voltage modules, current probes, and pod accessories are listed in Appendix B.

1.3.4 External dc power source

To connect to an external dc power source, refer to Appendix C.

1.3.5 Calibration

The recommended calibration interval for this unit is once every 12 months.

For calibration, please contact:

GMC-I Service GmbH

Service Center

Thomas-Mann-Str. 16-20

90471 Nürnberg • Germany

Phone +49 911 8602-0

Fax +49 911 8602-253

E-Mail service@gossenmetrawatt.com

This address is only valid in Germany. Please contact our representatives or subsidiaries for service in other countries.

1.4 Physical Description

1.4.1 Dimensions

The Mavosys 10 in the desktop enclosure without the optional LCD panel is a self-contained instrument weighing 4 pounds and measuring 11.25" width x 3.5" height x 7 3/4" depth.

When used with the LCD panel installed in 19" rack, the instrument weighs 5 pounds and has an 8" depth.

When used with the LCD panel installed in switchgear mounting enclosure, the instrument weighs 10 pounds and measures 7" width x 6.5" height x 8" depth.

1.4.2 Optional display panel

The optional user interface is a 1/4 VGA LCD panel with touch screen menus for local operation and configuration.

1.4.3 Connector panel

The backplane panel consists of industrial grade, voltage/current/pod connectors, communication port connectors, dc input power connector, and power switch. See Chapter 2 Controls, Indicators, and Connectors on page 4 for description.

1.4.4 External dc power source

To connect to an external dc power source, refer to Appendix C.

2 Controls, Indicators, and Connectors

2.1 External Components

2.1.1 Description

External components refer to operator related external controls, indicators and connectors.

2.1.2 Front panel

The Mavosys 10 front panel display may look different depending on the enclosure options specified.

2.1.2.1 Front panel without the local LCD User Interface

See below for description of the Mavosys 10 front display without the LCD user interface.



Figure 1

Part	Function
1	Status Indicator. LED will light steadily when abnormal condition is detected. The unit is operating normally when light is off.
2	Monitoring On. LED will light if monitoring is on. Monitoring status is off when light is off.
3	Power Indicator. LED will blink when the unit power switch is turned on. The number of blinks correspond to the number of modules installed.

2.1.2.2 Front panel with the optional LCD User Interface in Rack Mount and Switchgear Mount Display

The front view primarily shows the color touch screen LCD. See below for description of the Mavosys 10 front display with the LCD panel installed.



Figure 2

Part	Function
1	LCD Rack Mount Protective Enclosure with rack handles
2	Liquid Crystal Display (LCD). Provides 3.75 x 4.75 inches display consisting of 1/4 VGA size screen of text and graphic information. The color LCD is equipped with touch screen technology, operable using the finger and/or stylus. Touch screen display permits menu selection, alphanumeric data entry, and has a compact fluorescent (CCFL) backlighting that is on for low light level viewing. The following are some basic care instructions for the LCD monitor: <ul style="list-style-type: none"> • Use and store the unit within the specified temperature and humidity range. The LCD screen may be adversely affected by exposure to high temperature or humidity. Condensation or moisture produced by sudden temperature changes may also damage the LCD screen. Clean any moisture from surface immediately. • Be careful when cleaning or removing stains on the LCD surface. Gently wipe the surface with a soft cloth or cotton pad. Isopropyl alcohol may be used, but make sure that all solvent residue is removed. • Do not apply excessive force to the LCD surface. The LCD screen contains sensitive electronic components that may be damaged due to strong impact.
3	LCD Switchgear Mount Enclosure

2.1.3 Rear panel

As with the front panel, the Mavosys 10 rear panel display may also vary depending on the input module/s installed.

2.1.3.1 Rear Panel for 61STD Unit – Configurable to Up to Four Input Module Combinations

Mavosys 10 Standard (61STD) can accommodate up to four input modules with different types of connectors. The modules installed on the rear panel are customized based on user specifications. The rear panel consists of the input module connectors, communication ports, and power switch. See below for description of a typical Mavosys 10 rear panel. **Exact configuration is dependent on the optional input modules ordered.**

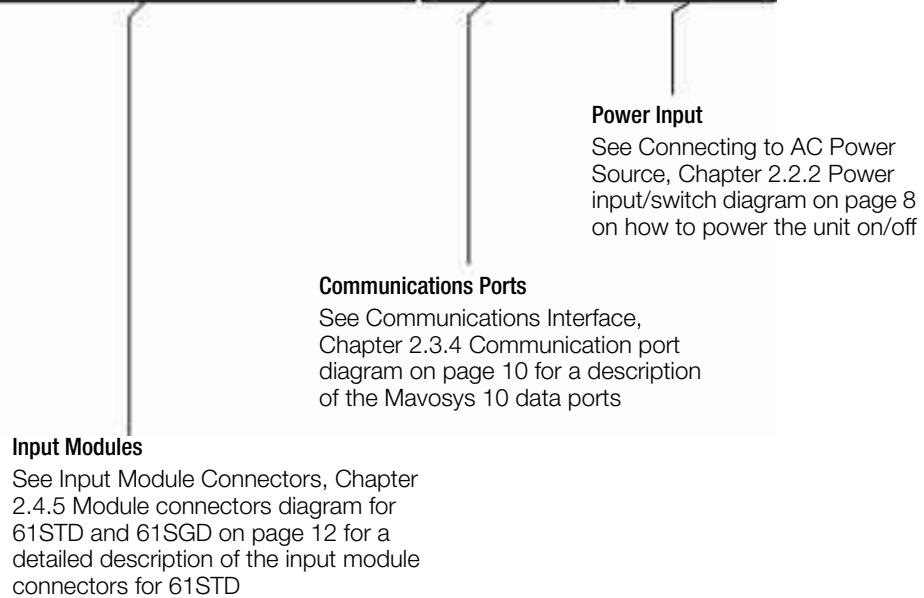


Figure 3



Note

GMC-I Messtechnik GmbH recommends that you leave adequate working space for rear panel connections to the Mavosys 10. This rear clearance space is necessary for proper installation of the measurement cables, probes and pods as well as external communications device for the Mavosys 10.

2.1.3.2 Rear Panel for 61VCM Unit – Single Module Unit

Mavosys 10 Voltage Compliance Monitor (61VCM) is a single module unit designed to interface with the AC/DC Voltage Module with terminal block connectors (61MVS). The 61VCM rear panel has built-in terminal block connectors to connect the voltage input module. The communication ports and power switch are similar to that of the Mavosys 10 Standard unit. See below for description of the 61VCM rear panel as configured for use in a 61VENCL.



Input Modules

See Input Module Connectors, Chapter 2.4.8 Module connectors diagram for 61VCM on page 15 for a detailed description of the input module connectors for 61VCM

Communications Ports

See Communications Interface, Chapter 2.3.4 Communication port diagram on page 10 for a description of the Mavosys 10 data ports

Power Input

See Connecting to AC Power Source, Chapter 2.2.2 Power input/switch diagram on page 8 on how to power the unit on/off

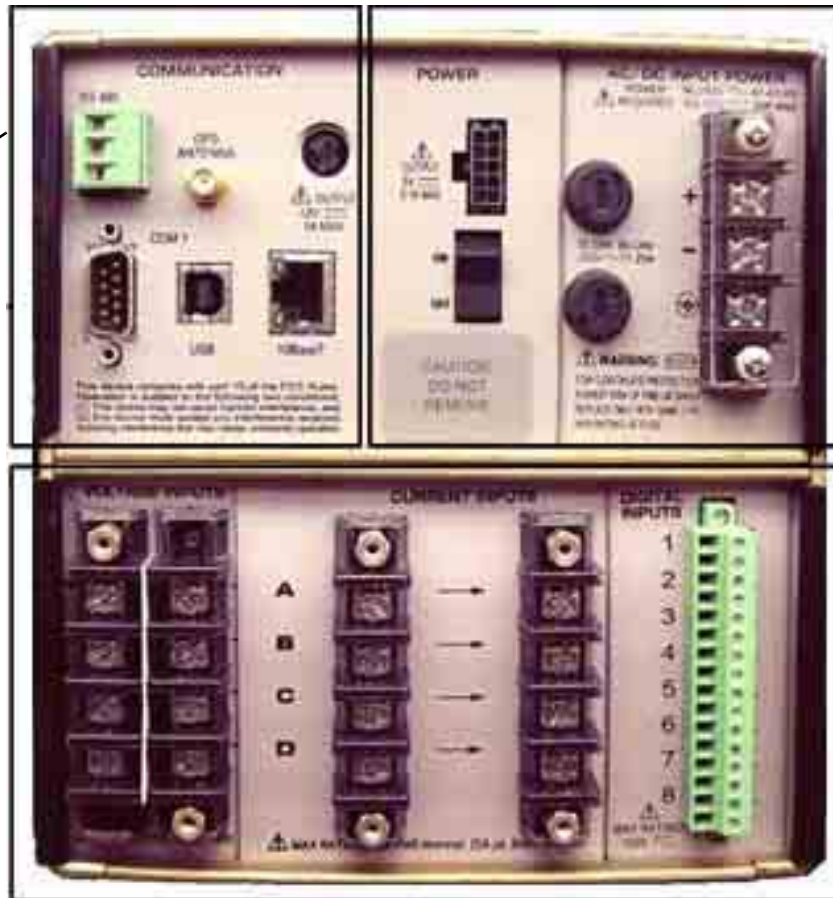
Figure 4

2.1.3.3 Rear Panel for 61SGD and 61SG Units – Switchgear Mounting Units

The 61SGD and 61SGD monitor (henceforth referred to as 61SGD in this section) is similar in functionality to the 61RMTD and 61RMT respectively, except that they are designed to be mounted into a switchgear enclosure, rather than a 19" rack, and the power supply inputs are different. All of the same input module options and communication options of the 61STD and 61RMTD are applicable. The power supply inputs are designed for 90-250Vac, 50/60Hz, or 105-125Vdc. A screw terminal strip is used to connect the appropriate gauge wire for the application. The positive and negative inputs are fused with user-replaceable fuses of the same type as provided with the product. See below for description of the 61SGD rear panel as configured with three modules.

Communications Ports

See Communications Interface, Chapter 2.3.4 Communication port diagram on page 10 for a description of the Mavosys 10 data ports



Input Modules

See Input Module Connectors, Chapter 2.4.5 Module connectors diagram for 61STD and 61SGD on page 12 for a detailed description of the input module connectors for 61SGD

Power Input

See Connecting to 90-250Vac/105-125Vdc Power Source, Chapter 2.2.2 Power input/switch diagram on page 8 on how to power the unit on/off

Figure 5

Optional enclosures

Optional enclosures for 61STD, 61RMTD, 61RMT, 61SG, 61SGD, 61VENCL, 61WENCL and 61VCM are available in GMC-I Messtechnik GmbH. See Chapter Appendix A Optional Accessories on page 44 – Enclosure Hardware Options for details.

2.2 Connecting to AC Power Source

2.2.1 Power specifications

The Mavosys 10 AC adapter can be connected to a 90-265Vac power input source (dependent on model version) or directly to a 12Vdc external power source. Refer to Appendix C for information about connecting to an external dc power source.



Caution!

Always set the power switch to the off position before connecting or disconnecting the input power cable. Operation of the Mavosys 10 from an ac voltage source other than the rated voltage input stated on the unit nameplate can cause damage to the unit.



Precaucion!

Siempre fije el interruptor de encendido en la posición apagada antes de conectar o desconectar el cable de energía de entrada.
La operación del Mavosys 10 desde una fuente de voltaje de ca que no sea la entrada de voltaje nominal indicada en la placa de identificación de la unidad puede causar daños a la unidad.



Mise en garde!

Mettez toujours l'interrupteur dans la position ouverte avant de connecter ou de déconnecter le câble d'alimentation primaire. L'opération du Mavosys 10 avec une autre source de tension CA que la tension d'entrée nominelle indiquée sur la plaque signalétique peut abîmer l'appareil.



Vorsicht!

Vor dem Einstecken bzw. Ausstecken des Eingangsnetzkaabels den Netzschalter immer in die Aus-Stellung bringen. Der Betrieb des Mavosys 10 von einer Wechselfpannungsquelle, die nicht dem auf der Namensplatte der Einheit aufgeführten Nennspannungseingang entspricht, kann zur Beschädigung der Einheit führen.

2.2.2 Power input/switch diagram

The power switch panel includes LED indicators, On/Off power switch, power input decal and connector. See actual photo and description of power switch below.

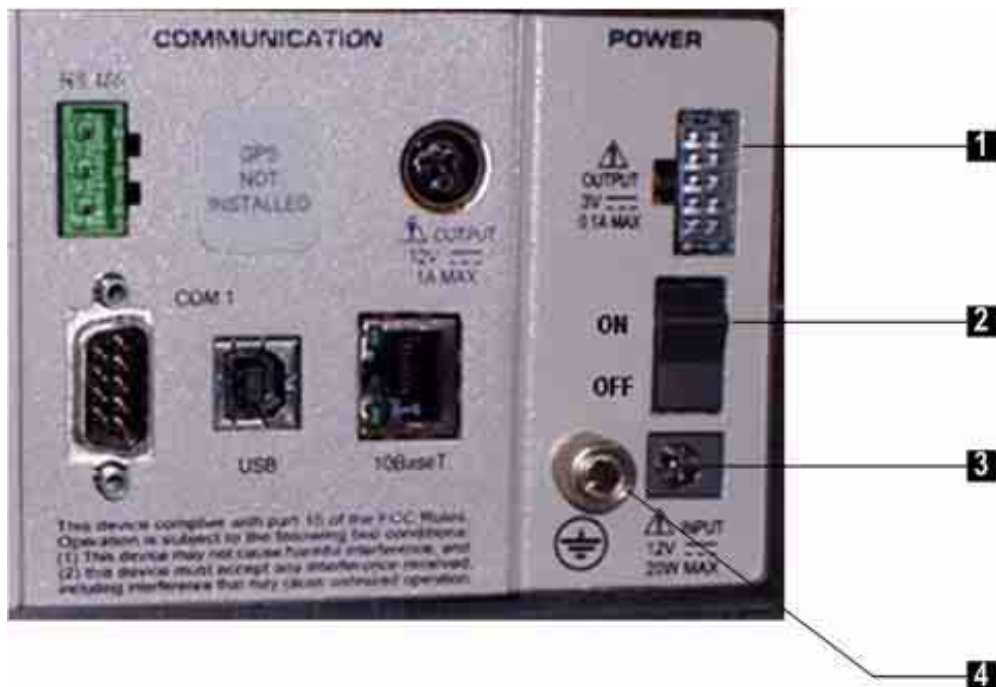


Figure 6

Part	Function
1	Output Power for Flex Probes. Requires cable DC3VFLEX (P/N 117067-G1).
2	ON/OFF Power Switch. Push for on, push for off.

Part	Function
3	Power input decal and connector. The decal provides information about input power rating. Plug in the AC Adapter output cable into the input connector. AC input power source is specified as follows: <ul style="list-style-type: none"> • Voltage range, 120/230V ac. • Frequency, 50/60Hz. • Power Consumption, 20W. See Chapter 2.2.3 Connecting to an AC power source on page 9 for the procedure on how to connect to an ac power source.
4	Ground LUG. Connect with suitable wire to earth ground conductor or connector.

2.2.3 Connecting to an AC power source

2.2.3.1 For Mavosys 10 Standard (61STD) and Single Module (61VCM) Units

Follow these steps to connect to an ac power source.

Step	Action
1	Set the power switch to OFF.
2	Verify the operating voltage range for your Mavosys 10, as marked on the power input decal.
3	Connect the appropriate power cord for the voltage rating of the unit. Make connection to the instrument first.
4	Connect power cord to the power source.
5	Turn power switch to ON.

2.2.3.2 For Switchgear (61SG and 61SGD) Mounting Units

Safety Disconnects

The mains supply power to the Mavosys 10 Series 61SG or SGD must be installed downstream from a switched current limiting device. The circuit protection device should be 20 Amps or less, and must be rated for the available voltage and fault current; 5 Amps fuses are preferred.



Attention!

All mains supply conductors connected to the Mavosys 10 Series 61SG or SGD must originate at circuit breakers or fuses rated 20 Amps or less.

You must provide a method for manually removing power from the Mavosys 10 Series 61SG or 61SGD such as a clearly labeled circuit breaker or a fused disconnect switch.

Step	Action
1	With all power OFF, connect the green ground wire to Safety (Earth) ground first before making any other connections.
2	Connect the positive (+) terminal of the mains supply to the positive (+) terminal of the instrument.
3	Connect the negative (-) terminal of the mains supply to the negative (-) terminal of the instrument.
4	Turn power switch to disconnect device to ON.
5	Turn power switch of the instrument to ON position.

2.3 Communications Interface

2.3.1 Communications options

The Mavosys 10 can communicate to a computer via Ethernet network, RS232, RS485, or land/cellular modem. This remote communication network enables the Mavosys 10 to act as a DataNode for the Encore Series Software, or as a stand-alone monitor.

2.3.2 Computer requirements

The computer used must be equipped with the same communication interface as the Mavosys 10. For example, if the instrument is using Ethernet, the computer must likewise be using Ethernet.

The computer must be loaded with the Encore Series Software package, which converts the computer into a web server and enables it to browse data and information collected by the Mavosys 10.



Attention!

To avoid the risk of electric shock, do not remove communications instrument until all power is de-energized to all power and measurement circuits.



¡Atención!

Para evitar el riesgo de descargas eléctricas, no retire el instrumento de comunicaciones hasta desconectar todo suministro de energía hacia todos los circuitos de energía y medición.

**Attention!**

Pour éviter le risque de choc électrique, ne retirez pas le instrument de communications avant que tous les circuits d'alimentation et de mesure aient été mis hors tension.

**Achtung!**

Zur Vermeidung eines elektrischen Schlags das Kommunikationsgerät erst trennen, wenn die Stromzufuhr zu allen Strom- und Messschaltungen unterbrochen wurde.

2.3.3 Remote operation guide

Remote operation setup and instructions for Mavosys 10 are contained in the Encore Series Software User's Guide.

2.3.4 Communication port diagram

The communications panel shows the location of data ports available in Mavosys 10. Actual photo and description of communications panel are shown below.

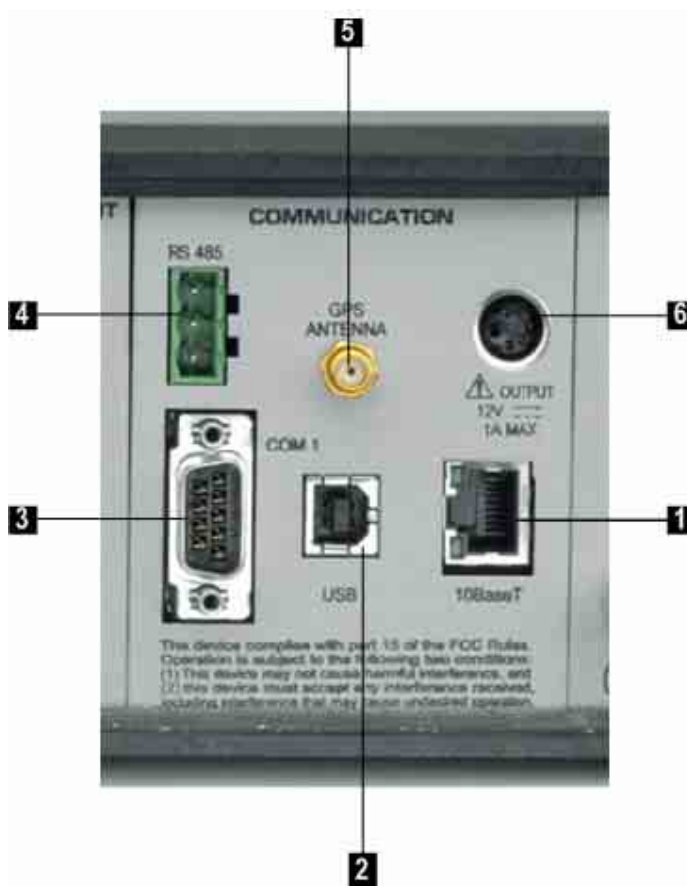


Figure 7

2.3.5 Parts table

Part	Function
1	10/100BaseT (RJ45). Allows connection via Ethernet cable.
2	USB. Not activated at this time; future option.
3	COM 1. RS232 serial port for land/cellular modem connection. Allows administrative set up of the Mavosys 10 for IP addressing, etc.
4	RS485 serial port. Can be used for multi-drop serial connections.
5	Optional GPS Antenna. Allows use of optional cable to active antenna.
6	Power Connector for External GM28/29 Modem.

2.3.6 Remote operation guide

See Chapter 4 Operational Description on page 34 for a discussion of the external communications device and software applications necessary for remote computer operation of Mavosys 10.

2.4 Input Module Connectors

2.4.1 Input modules for 61STD and 61SGD

Users can choose different types of analog and digital input modules that can be installed on the rear panel of the Mavosys 10 Standard (61STD) and Mavosys 10 Switchgear (61SGD) units. The modules must be selected at time of order. In case users want additional modules installed, the unit must be returned to the factory. The input modules allow a variety of voltage and current measurement cables, probe types, or pods to connect to the instrument for voltage, current, and/or digital signal monitoring.

The voltage and current connectors are designed in modular configuration, with the following analog input module measurement point interface:

- AC/DC Voltage Module with safety connectors (Model 61MVB)
- AC/DC Voltage Module with terminal block connectors (Model 61MVS)
- AC/DC Current Module with connectors for external CTs (Model 61MAC)
- AC/DC Module for Voltage or Current Pod (Model 61MZP)

The eight-channel digital input module Model 61MDIN allows users to monitor on/off type digital signals, such as breaker or switch signal positions. Digital inputs can be configured to provide demand interval synchronization, pulse counting, KYZ metering, or to provide start/stop monitoring control.

2.4.2 Input module for 61VCM

Mavosys 10 Voltage Compliance Monitor unit (61VCM) offers only one type of module interface:

- AC/DC Voltage Module with terminal block connectors (Model 61MVS)

The module connectors for 61VCM is factory installed and cannot be altered by users.

2.4.3 Input channels

Input channels for the modules installed on the rear connector panel are labelled $\pm A$, $\pm B$, $\pm C$, and $\pm D$. You must turn on any input channel to be used for monitoring. If a channel is not turned on, no data will be collected for it.



Attention!

Death, serious injury, or fire hazard could result from improper connection of this instrument. Read and understand this manual before connecting this instrument. Follow all installation and operating instructions while using this instrument.

Connection of this instrument must be performed in compliance with the National Electrical Code (ANSI/NFPA 70-2008) and any additional safety requirements applicable to your installation.

Installation, operation, and maintenance of this instrument must be performed by qualified personnel only. The National Electrical Code defines a qualified person as "one who has the skills and knowledge related to the construction and operation of the electrical equipment and installations, and who has received safety training on the hazards involved."

Qualified personnel who work on or near exposed energized electrical conductors must follow applicable safety related work practices and procedures including appropriate personal protective equipment in compliance with the Standard for Electrical Safety Requirements for Employee Workplaces (ANSI/NFPA 70E-2004) of USA and any additional workplace safety requirements applicable to your installation.



¡Atención!

Una conexión incorrecta de este instrumento puede producir la muerte, lesiones graves y riesgo de incendio. Lea y entienda este manual antes de conectar. Observe todas las instrucciones de instalación y operación durante el uso de este instrumento.

La conexión de este instrumento a un sistema eléctrico se debe realizar en conformidad con el Código Eléctrico Nacional (ANSI/NFPA 70-2008) de los E.E.U.U., además de cualquier otra norma de seguridad correspondiente a su establecimiento.

La instalación, operación y mantenimiento de este instrumento debe ser realizada por personal calificado solamente. El Código Eléctrico Nacional define a una persona calificada como "una que esté familiarizada con la construcción y operación del equipo y con los riesgos involucrados."

El personal cualificado que trabaja encendido o acerca a los conductores eléctricos energizados expuestos debe seguir prácticas y procedimientos relacionados seguridad aplicable del trabajo incluyendo el equipo protector personal apropiado en conformidad con el estándar para los requisitos de seguridad eléctricos para los lugares de trabajo del empleado (ANSI/NFPA 70E-2004) de los E.E.U.U. y cualquier requisito de seguridad adicional del lugar de trabajo aplicable a su instalación.



Attention!

Si l'instrument est mal connecté, la mort, des blessures graves, ou un danger d'incendie peuvent s'en suivre. Lisez attentivement ce manuel avant de connecter l'instrument. Lorsque vous utilisez l'instrument, suivez toutes les instructions d'installation et de service.

Cet instrument doit être connecté conformément au National Electrical Code (ANSI/NFPA 70-2008) des Etats-Unis et à toutes les exigences de sécurité applicables à votre installation.

Cet instrument doit être installé, utilisé et entretenu uniquement par un personnel qualifié. Selon le National Electrical Code, une personne est qualifiée si "elle connaît bien la construction et l'utilisation de l'équipement, ainsi que les dangers que cela implique".

Le personnel qualifié qui travaillent dessus ou s'approchent des conducteurs électriques activés exposés doit suivre des pratiques en matière et des procédures reliées par sûreté applicable de travail comprenant le matériel de protection personnel approprié conformément à la norme pour des conditions de sûreté électriques pour les lieux de travail des employés (ANSI/NFPA 70E-2004) des Etats-Unis et toutes les conditions de sûreté additionnelles de lieu de travail applicables à votre installation.



Achtung!

Der falsche Anschluss dieses Gerätes kann Tod, schwere Verletzungen oder Feuer verursachen. Bevor Sie dieses Instrument anschließen, müssen Sie die Anleitung lesen und verstanden haben. Bei der Verwendung dieses Instruments müssen alle Installation- und Betriebsanweisungen beachtet werden.

Der Anschluss dieses Instruments muss in Übereinstimmung mit den nationalen Bestimmungen für Elektrizität (ANSI/NFPA 70-2008) der Vereinigten Staaten, sowie allen weiteren, in Ihrem Fall anwendbaren Sicherheitsbestimmungen, vorgenommen werden.

Installation, Betrieb und Wartung dieses Instruments dürfen nur von Fachpersonal durchgeführt werden. In dem nationalen Bestimmungen für Elektrizität wird ein Fachmann als eine Person bezeichnet, welche „mit der Bauweise und dem Betrieb des Gerätes sowie den dazugehörigen Gefahren vertraut ist.“

Fachpersonal, das mit oder neben berührbaren und stromführenden elektrischen Leitern arbeitet, muss die gültigen Richtlinien und Verfahren in Bezug auf Arbeitssicherheit einhalten einschließlich der geeigneten persönlichen Schutzausrüstung gemäß der US Norm für elektrische Sicherheitsbestimmungen am Arbeitsplatz (ANSI/NFPA 70E-2004) sowie zusätzliche Arbeitssicherheitsbestimmungen, die für die jeweilige Anlage gelten.

2.4.4 Safety precautions

The following safety precautions must be followed whenever any type of voltage or current connection is being made to the Mavosys 10.

- Connect the green safety (earth) ground first, before making any other connections.
- When connecting to electric circuits or pulse initiating equipment, open their related breakers. DO NOT install any connection of the instrument on live power lines.
- Connections must be made to the instrument first, then connect to the circuit to be monitored.
- Wear proper personal protective equipment, including safety glasses and insulated gloves when making connections to power circuits.
- Hands, shoes and floor must be dry when making any connection to a power line.
- Make sure the unit is turned OFF before connecting probes to the rear panel.
- Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.
- Pods should be connected first to the Mavosys 10, then connect to the circuit to be monitored.
- If the equipment is used in a manner not specified in this user's guide, the protection provided by the equipment may be impaired.

2.4.5 Module connectors diagram for 61STD and 61SGD

The 61STD and 61SGD units can accommodate up to four input/output modules with different types of connectors. The modules installed on the rear panel are customized based on user specifications. The following pages describe how the optional voltage and current measurement cables, probes and pod accessories can connect to the 61STD or 61SGD for circuit monitoring.

The photo below shows the Mavosys 10 rear panel with four types of analog input module connectors. Digital input module connectors are also available (see Chapter Appendix A Optional Accessories on page 44) but not shown in photo.

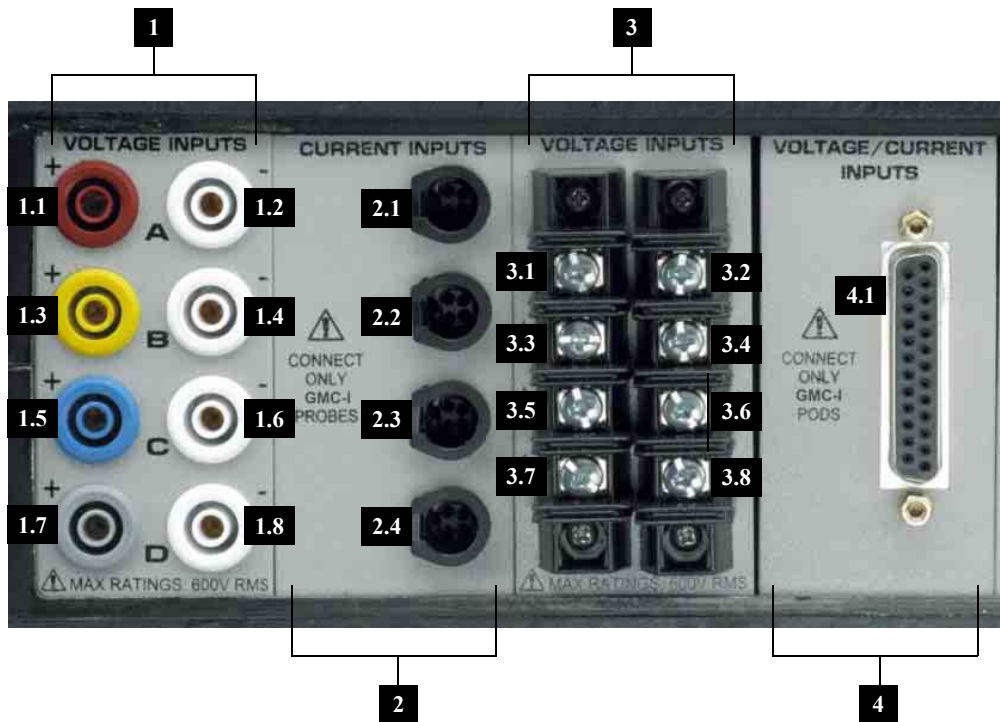


Figure 8

2.4.6 Parts table

Part	Function
1	AC Voltage Module with Safety Jack Connectors (Model 61MVB)
1.1	CH A, + Differential Voltage Input Connector; color red
1.2	CH A, - Differential Voltage Input Connector; color white
1.3	CH B, + Differential Voltage Input Connector; color yellow
1.4	CH B, - Differential Voltage Input Connector; color white
1.5	CH C, + Differential Voltage Input Connector; color blue
1.6	CH C, - Differential Voltage Input Connector; color white
1.7	CH D, + Differential Voltage Input Connector; color grey
1.8	CH D, - Differential Voltage Input Connector; color white
2	AC Current Module with Connectors for External CTs (Model 61MAC)
2.1	CH A, PROBE, Current Input Connector
2.2	CH B, PROBE, Current Input Connector
2.3	CH C, PROBE, Current Input Connector
2.4	CH D, PROBE, Current Input Connector
3	AC Voltage Module with Terminal Block Connectors (Model 61MVS)
3.1	CH A, + Differential Voltage Input Connector
3.2	CH A, - Differential Voltage Input Connector
3.3	CH B, + Differential Voltage Input Connector
3.4	CH B, - Differential Voltage Input Connector
3.5	CH C, + Differential Voltage Input Connector
3.6	CH C, - Differential Voltage Input Connector
3.7	CH D, + Differential Voltage Input Connector
3.8	CH D, - Differential Voltage Input Connector
4	AC Voltage/Current Module with 25-PIN DConnector (Model 61MZP)
4.1	25-PIN DConnector

Digital Input Module (Model 61MDIN) is also available as input module option. See Chapter 2.8.1 Digital input connections on page 23 for information on digital input connections.

2.4.7 Measurement cables, probes and pods

The input modules and the cables, probes and pods that connect to it are optional accessories listed in Appendix A Optional Accessories.

2.4.7.1 Voltage Measurement Cables (for Voltage Input Module with safety jack connectors – Model 61MVB)

Voltage measurement cables are stored in a cable pouch as part of the measurement cable set, P/N 116042-G3. Each cable set consists of a cable and alligator clip. Each alligator clip has an insulated safety grip. Red alligator clips are used for connection to the line connection (+) of voltage channels A, B, C, and D. Black alligator clips are used for the neutral or return line connection (-). See Chapter 2.5 Connecting Voltage Measurement Cables on page 17 for more information voltage cable connections.

2.4.7.2 Current Probes (for Current Input Module – Model 61MAC)

A variety of current cables and probes are available for connecting Channels A, B, C, and D to the current input jack. Typical current probes are illustrated on Chapter 2.6.4 Typical current probes.

2.4.7.3 Voltage/Current Pods (for Voltage/Current Input Module – Model 61MZP)

Connects to the Series 5500 Voltage/Current input module via the 25-PIN interface cable connector on the rear panel of the instrument. See Chapter 2.7 Connecting Voltage/Current Input Pods on page 21 for more information on voltage/current input pod connection.

The next pages describe the possible voltage and current assembly connections to the input connectors in the rear panel of Mavosys 10.



Note

Voltage and current probes are not shown connected to the specific input modules in the connection diagrams provided because the actual voltage cable and current probes used are dependent on the type of input modules and optional accessories purchased.

See Chapter 3 Circuit Diagrams for Power Monitoring on page 24 for the wiring connection diagrams to set up the instrument for monitoring.

2.4.8 Module connectors diagram for 61VCM

Actual photo below shows the rear panel of the Mavosys 10 Voltage Compliance Monitor unit (61VCM). The voltage input module is shown configured for installation in the 61VENCL optional enclosure.

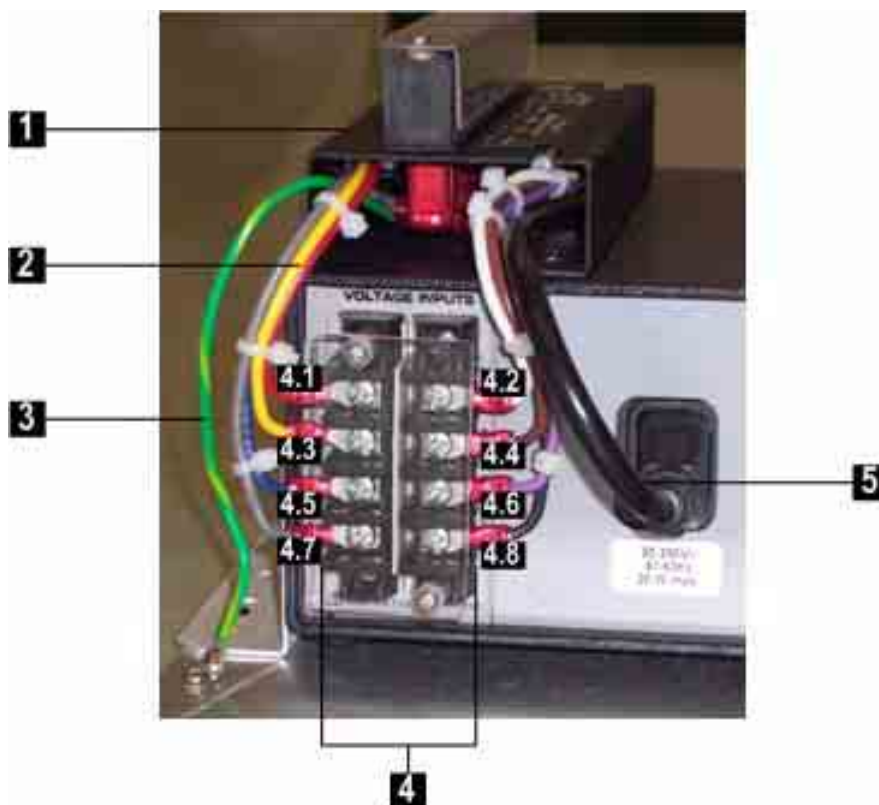


Figure 9

2.4.9 Parts table

Part	Function
1	Terminal Block Assembly for 61VENCL
2	Wiring from Terminal Block Assembly to Voltage Module
3	Terminal Block Assembly Ground Wire (attach to mounting plate w/ screw)
4	Voltage Input Module with Terminal Block Connectors
4.1	CH A, + Differential Voltage Input Connector, Red
4.2	CH A, - Differential Voltage Input Connector, White
4.3	CH B, + Differential Voltage Input Connector, Yellow
4.4	CH B, - Differential Voltage Input Connector, Brown
4.5	CH C, + Differential Voltage Input Connector, Blue
4.6	CH C, - Differential Voltage Input Connector, Violet
4.7	CH D, + Differential Voltage Input Connector, Gray
4.8	CH D, - Differential Voltage Input Connector, Black
5	Power Cord from Terminal Block Assembly connects to AC Receptacle in 61VCM unit

2.4.10 Wiring connectors

The photo and diagram below show wiring connection for terminal strip to voltage input module connectors on 61VCM unit when installed in the 61VENCL.



Figure 10 Terminal strip housed inside the terminal block assembly

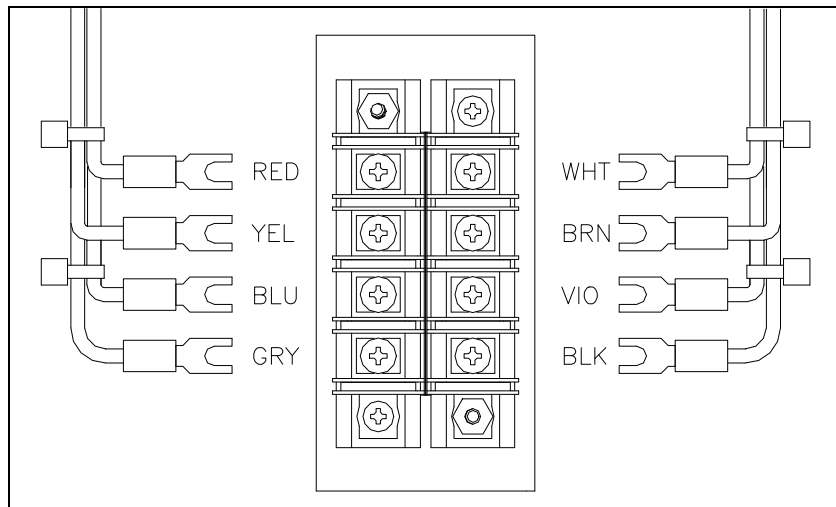


Figure 11 Wiring detail from terminal strip to voltage connectors on real panel of 61VCM

2.5 Connecting Voltage Measurement Cables

2.5.1 Measurement cable set

Description: Voltage measurement cables or customer-supplied wiring are used as connectors for Voltage input modules with safety jack or terminal block connectors, respectively.

Voltage Rating: Direct connection of all voltage measurement cables are rated at 600 Vrms max. For measuring voltages greater than 600 Vrms, potential transformers (PTs) must be used. Any customer-supplied wiring should be UL-listed for 600 Vrms minimum for inputs rated 600 Vrms max and 1000 V minimum for inputs rated 1000 V max.

2.5.2 Optional cable set for 61MVB

Description: A voltage measurement cable set, P/N 116042-G1, is available as an optional accessory to be used with the 61MVB Voltage Module.

Contents: The voltage measurement cables are shown on Chapter 2.5.4 Measurement cable set with optional fuse diagram. A cable set consists of eight, 6-foot channel measurement cable assemblies (probes), each with a detachable, alligator jaw, safety clip assembly (maximum jaw opening, 3/4 in (20 mm)). The safety clip assemblies are red (+) and black (-) for each of the four channels. One cable each of red (channel A), yellow (channel B), blue (channel C), and grey (channel D), and four each of white are provided.

A pouch for storage of the cables is included in the contents of the measurement cable set, but is not shown in the figure.

2.5.3 Optional fused voltage adapter

There are two optional fuse accessory kits available for use with the measurement cables. One kit (P/N FVA-1) contains one fused voltage adapter and one measurement connecting Red cable 50 cm in length. The other kit (P/N FVA-4) contains four voltage adapters and four measurement connecting cables 50 cm in length (one Red, one Yellow, one Blue, and one Grey).

The single fuse voltage adapter kit is used for one single voltage measurement input. While the four fuse voltage adapter kit is used for a three phase and neutral voltage measurement inputs. If these fuse kits are not used, it is recommended that the user use terminal strips to fused circuits, preferably with local disconnects.

2.5.4 Measurement cable set with optional fuse diagram

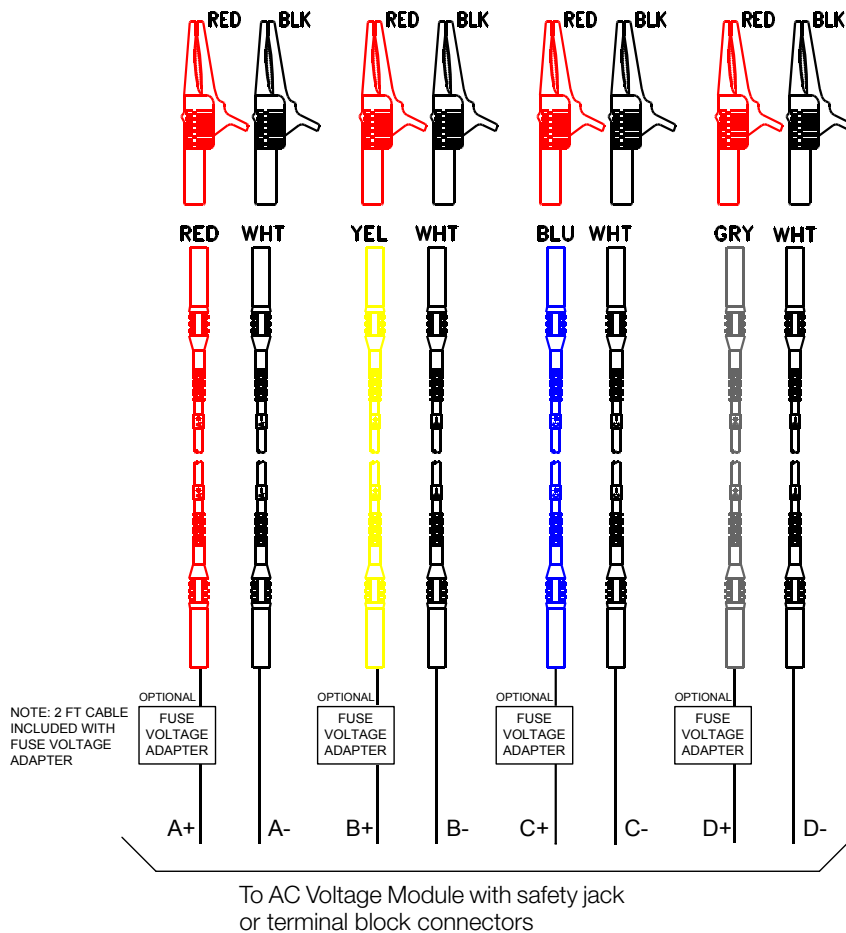


Figure 12



Attention!

To avoid the risk of electric shock or burns, always connect the safety (or earth) ground before making any other connections.

**Attention!**

To reduce the risk of fire, electrical shock, or physical injury it is strongly recommended to fuse the voltage measurement inputs.
Fuses must be located as close to the load as possible to maximize protection.

**Attention!**

For continued protection against risk of fire or shock hazard replace only with same type and rating of recommended fuse. Use only fast blow type fuse which is rated 600V. Recommended fuse type is Littelfuse, part number KLKDO.30 rated 600V AC/DC, 0.3A fast blow.

**Attention!**

Do not replace fuse again if failure is repeated. Repeated failure indicates a defective condition that will not clear with replacement of the fuse. Refer condition to a qualified technician.

Contact GMC-I Messtechnik GmbH Product Support for more information on the fused voltage adapter.

2.5.5 Voltage input connectors

There are two categories of voltage connectors in Voltage Input Modules: one for single phase voltage connections, designated VOLTAGE INPUTS, CH D; the other for three phase connections, designated VOLTAGE INPUTS CH A, CH B, CH C. See the voltage cable connections diagram below.

In general, the single phase channel D cable is used to measure the neutral to ground voltage. In this type connection it is referenced as channel D. This cable also can be used for any single phase connection. See Chapter 3 Circuit Diagrams for Power Monitoring on page 24 for the various circuit connections using this cable.

2.6 Connecting Current Probes

2.6.1 Types of current cables

Several GMC-I Messtechnik GmbH current probes can be used with the Current Input Module – Model 61MAC of the Mavosys 10. The following are two types of current cables available for connecting to the current input channels A, B, C, and D.

- CT Series Adapter Assembly.
- Four Channel Current Probe Cable Assembly (for TR25xx probes).

2.6.2 Types of current probes

A variety of current measurement probes and transformers are available that can be connected to these cables in a number of ways. For instance:

- TR25xx clamp-on current probes that provide a broad range of current measurements.
- Multiple probes and adapter cables that are currently used with GMC-I Messtechnik GmbH equipment i.e. Flex Core models and Hall-effect probe models.

Typical current probes are illustrated in Chapter 2.6.4 Typical current probes on page 19. A diagram showing current connection to a single phase circuit for general hookup is also provided in Chapter 2.6.7 Single phase current probe connection example on page 20 example.

2.6.3 Safety precautions

The following safety precautions apply to current probe connections.

- DO NOT attempt to measure current in any circuit in which the circuit to ground voltage exceeds the insulation rating of the current probe (600 Vrms max).
- Make sure the jaws of the current probe are tightly closed. Keep mating surfaces clean and free from foreign matter.

2.6.4 Typical current probes

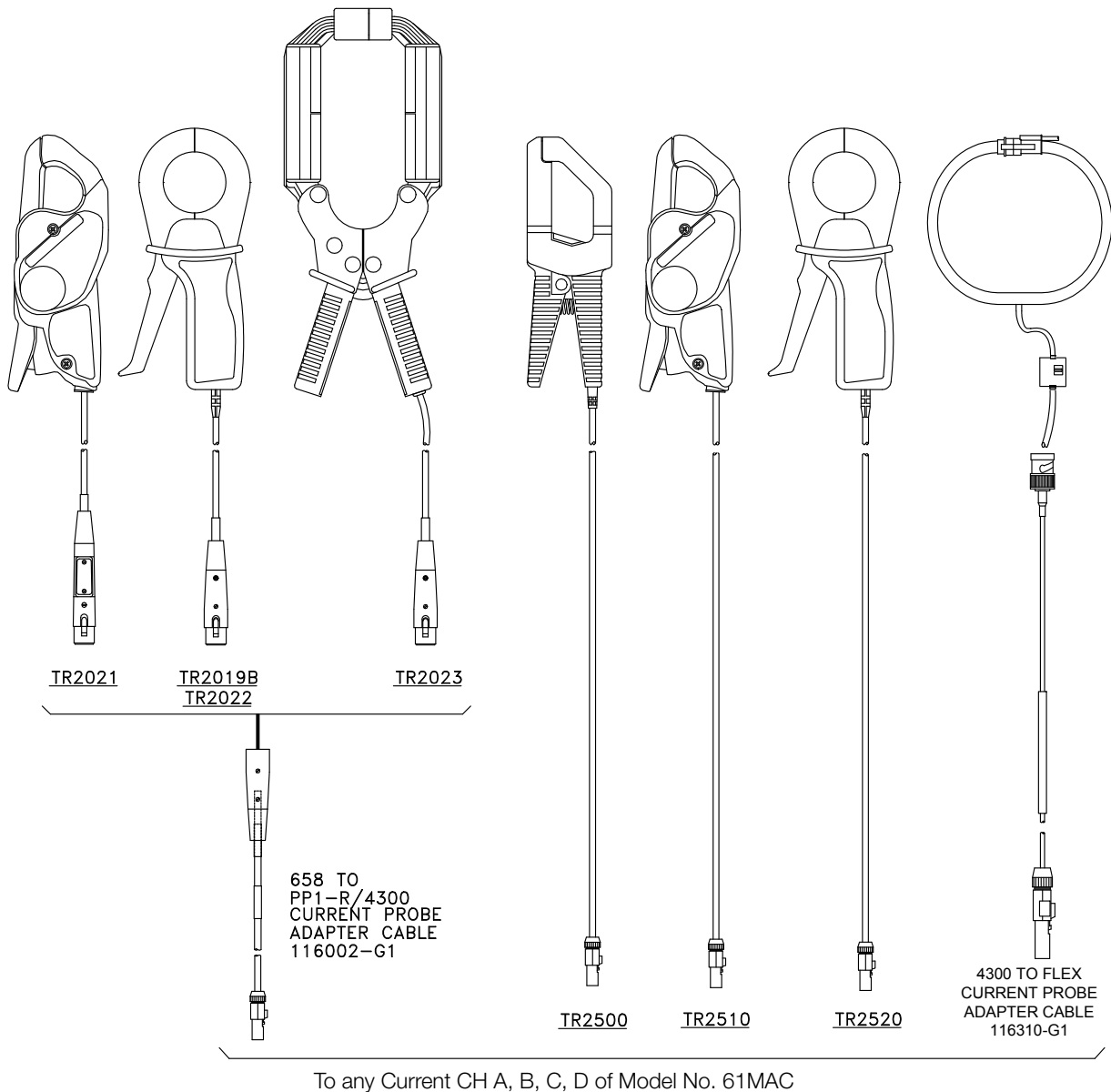


Figure 13



Note

The TR2500 can perform all current measurements except high frequency transient detection. Current probes TR2500 can be used interchangeably with TR2500A, TR2510 with TR2510A, and TR2520 with TR2520A.

Refer to Appendix A for descriptions and part numbers of probes and adapter cables. Refer to Appendix B for specifications of current connections.

2.6.5 Example

The diagram in Chapter 2.6.7 Single phase current probe connection example on page 20 shows how to connect a current probe for current monitoring of a single phase line. The channel to be monitored can be any channel so designated by the operator.



Attention!

DO NOT USE non-insulated current probe cores around a non-insulated wire. Probes of this type are designed for use around insulated wires only. Use only completely insulated probe cores with no exposed conductive areas of the core around non-insulated wires.



¡Atención!

No utilizar transformadores de corriente sin material aislante al rededor de conductores sin material aislante. Los Transformadores de corriente de este tipo están diseñados para ser utilizados solamente con conductores con aislamiento eléctrico. Utilizar transformadores de corriente completamente aislados alrededor de conductores sin aislamiento.



Attention!

N'EMPLOYEZ PAS les noyaux courants non-isolés de sonde autour d'un fil non-isolé. Des sondes de ce type sont conçues pour l'usage autour des fils isolés seulement. L'utilisation seulement a complètement isolé des noyaux de sonde sans des secteurs conducteurs exposés du noyau autour des fils non-isolés.



Achtung!

VERWENDEN Sie keine Stromzangen mit nicht isolierten Ferritkernen bei Messungen an nicht isolierten Leitungen. Stromzangen dieses Typs sind nur für Messungen an isolierten Leitern geeignet. Bitte verwenden Sie zur Messung an nicht isolierten Leitungen Stromzangen mit vollständig isoliertem Kernmaterial.

2.6.6 Probe positioning

An arrow marking on the handle is a guide to ensure that you position the probe with the arrow pointing towards the load when monitoring the line conductor. Correct positioning of the probe is necessary for correct power measurements, where in-phase voltage and current measurements are necessary. A positive watts reading indicates that the probe is pointed towards the load, and a negative reading indicates that the probe is pointed towards the source.

2.6.7 Single phase current probe connection example

The following diagram shows how to connect a current probe to channel A for current monitoring of a single phase line. The current probe may be connected to the return line if desired to measure the return current when checking for load current leakage, loop current relationships, etc. If measuring power, position the probe with the arrow pointing towards the load.

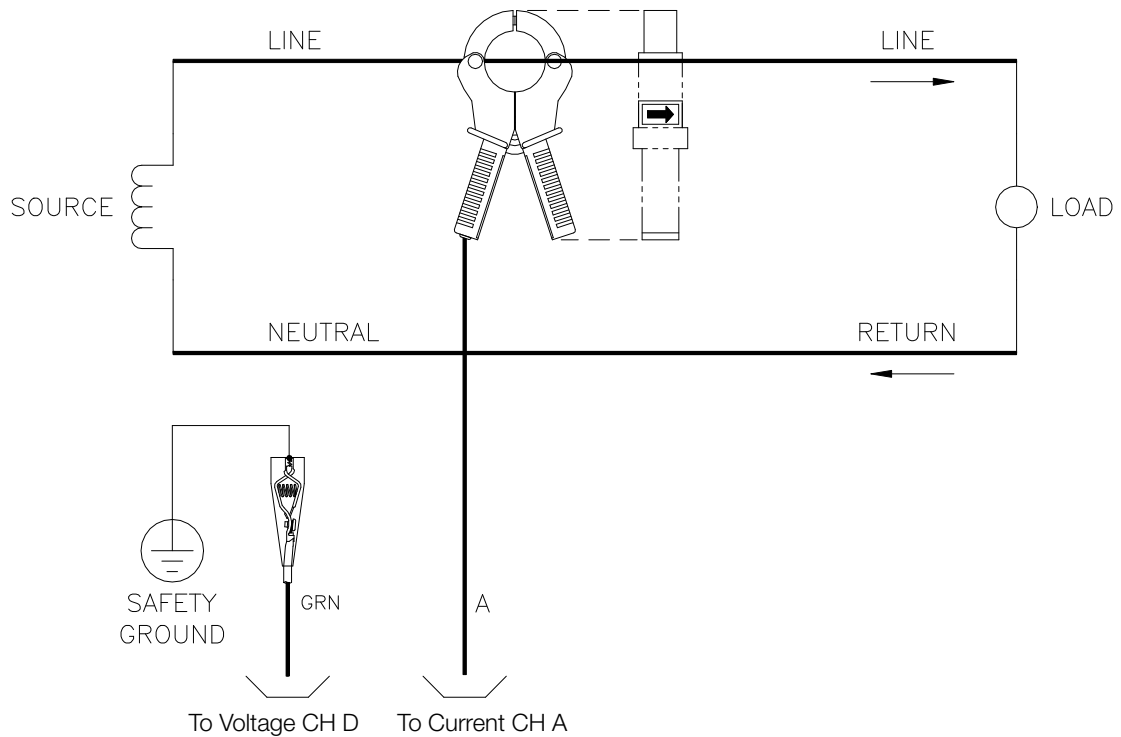


Figure 14



Note

The connection example shown above is not recommended without a voltage probe connected to ensure that the measurements are synchronized to the external source. If the configuration shown is used, an internal frequency reference must be entered.

2.7 Connecting Voltage/Current Input Pods

2.7.1 Pod types

Two Series 5500 input pod types, voltage and current, can connect alternatively to the same Voltage/Current Input Module Model No. 61MZP with 25-PIN interface cable connector. The inputs are attenuated to low voltage signals that can be measured by the Mavosys 10.

2.7.2 Caution

This equipment has been tested and found to comply with emissions and/or immunity requirements. The protective earth ground of the Mavosys 10 mainframe and the voltage/current pods must be connected to the same ground reference. Failure to do so is likely to result in undesired interference.

2.7.3 Pod assembly diagram

Photos of Model 5536 voltage pod and Model 5537 current pod are shown below. See pod assembly labels in Chapter 2.7.4 Pod assembly parts on page 21.



Figure 15

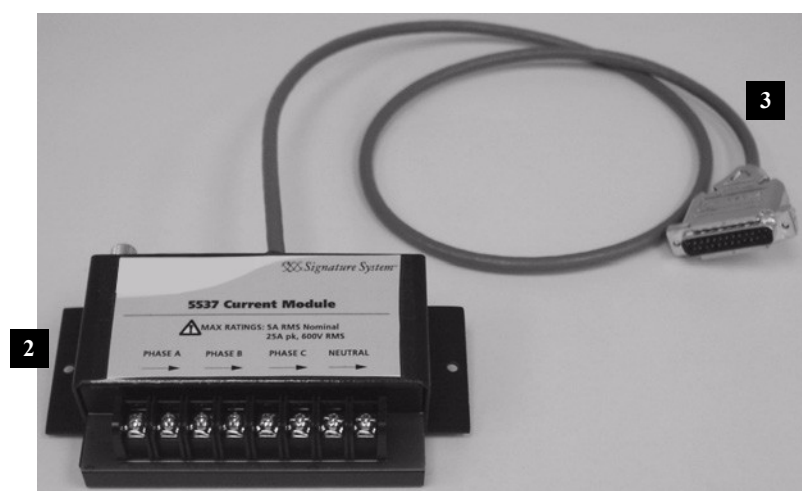


Figure 16

2.7.4 Pod assembly parts

Part	Function
1	Voltage Module. Accepts four 5-600 Vrms (AC or DC), ± 1000 Vpk channels A, B, C voltage, plus neutral and ground. Neutral to ground voltage range: 0.5 – 20 Vrms (AC or DC).
2	Current Module. Accepts four 0.01-5 Arms and up to #12 AWG wires. Measurement range allows 25 Apk.
3	Data cables. Enables connection of measurement pods to the Mavosys 10. Cable length is 3" (0.9m).

2.7.5 Example: Voltage pod connection

The figure below shows the rear panel of a 61STD unit with two input modules (61MZP) connected to Voltage and Current pods with external ferrite clamp installed.



Figure 17

2.7.6 Optional enclosure

Optional NEMA Enclosure Kit for 61STD unit (without display) connected to voltage/current pods is available from GMC-I Messtechnik GmbH. See Chapter Appendix A Optional Accessories on page 44 – Enclosure Hardware Options for details.

2.8 Connecting Digital Input Connectors

2.8.1 Digital input connections

Model 61MDIN is an eight channel, digital input module, providing users with the capability to monitor on/off-type digital signals, such as breaker or switch position indicators. The functionality of the inputs can be configured on a channel basis to also provide demand interval synchronization, pulse counting, KYZ metering or to provide start/stop monitoring control. Each channel can be individually labeled, is triggerable, and the polarity set as N/O or N/C.

Photo below shows the digital input module without the external connector.

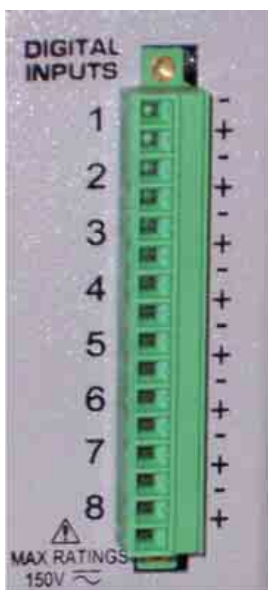


Figure 18

A logical one or HI condition is when the voltage level goes above 3.5 volts and a logical zero or LO condition is when the voltage level goes below 1.0 volts. Maximum input signal level is 150Vac or 150Vdc. If the inputs are configured for AC instead of DC signals, it is the rms value of the ac signal that is used to determine the state. This will also slow the response time down, as the rms value is computed over 100 msec window for operation on 50 or 60Hz systems.

All logic transitions are to be time stamped to the millisecond and available for simultaneous comparison by the user to data collected via other modules (V, I, other Digital input, etc). An "event" can be either set to occur on the change of state (edge-triggered) or at a particular state, HI/LO (level-triggered). Such events can be used to cross-trigger other modules and/or instruments to also record data.

The Meter screens will report the present state of the inputs. Trends and Events timeplots will indicate the signal level at the either 1 or 0 state at the time of data storage, as will waveform data. There is no min/max/average value, just the instantaneous value.

3 Circuit Diagrams for Power Monitoring

3.1 Connecting Power to the Voltage/Current Connections

3.1.1 Voltage and current connections

This section contains diagrams of voltage and current connections that are required when power measurements are to be made. The Mavosys 10 should be handled with care. After unpacking the unit, verify that all items ordered have been accounted for. Contact GMC-I Messtechnik GmbH Sales Department if any items are missing or damaged.

Position the Mavosys 10 on a dry, flat surface or mount with proper brackets or in an appropriate enclosure. Access to the power, measurement and communication connections is necessary.

Refer to the illustrations in Chapter 2 Controls, Indicators, and Connectors on page 4 for location of the various connectors on the rear panel of the unit.



Attention!

Death, serious injury, or fire hazard could result from improper connection of this instrument. Read and understand this manual before connecting this instrument. Follow all installation and operating instructions while using this instrument.

Connection of this instrument must be performed in compliance with the National Electrical Code (ANSI/NFPA 70-2008) and any additional safety requirements applicable to your installation.

Installation, operation, and maintenance of this instrument must be performed by qualified personnel only. The National Electrical Code defines a qualified person as "one who has the skills and knowledge related to the construction and operation of the electrical equipment and installations, and who has received safety training on the hazards involved."

Qualified personnel who work on or near exposed energized electrical conductors must follow applicable safety related work practices and procedures including appropriate personal protective equipment in compliance with the Standard for Electrical Safety Requirements for Employee Workplaces (ANSI/NFPA 70E-2004) of USA and any additional workplace safety requirements applicable to your installation.



¡Atención!

Una conexión incorrecta de este instrumento puede producir la muerte, lesiones graves y riesgo de incendio. Lea y entienda este manual antes de conectar. Observe todas las instrucciones de instalación y operación durante el uso de este instrumento.

La conexión de este instrumento a un sistema eléctrico se debe realizar en conformidad con el Código Eléctrico Nacional (ANSI/NFPA 70-2008) de los E.E.U.U., además de cualquier otra norma de seguridad correspondiente a su establecimiento.

La instalación, operación y mantenimiento de este instrumento debe ser realizada por personal calificado solamente. El Código Eléctrico Nacional define a una persona calificada como "una que esté familiarizada con la construcción y operación del equipo y con los riesgos involucrados."

El personal cualificado que trabaja encendido o acerca a los conductores eléctricos energizados expuestos debe seguir prácticas y procedimientos relacionados seguridad aplicable del trabajo incluyendo el equipo protector personal apropiado en conformidad con el estándar para los requisitos de seguridad eléctricos para los lugares de trabajo del empleado (ANSI/NFPA 70E-2004) de los E.E.U.U. y cualquier requisito de seguridad adicional del lugar de trabajo aplicable a su instalación.



Attention!

Si l'instrument est mal connecté, la mort, des blessures graves, ou un danger d'incendie peuvent s'en suivre. Lisez attentivement ce manuel avant de connecter l'instrument. Lorsque vous utilisez l'instrument, suivez toutes les instructions d'installation et de service.

Cet instrument doit être connecté conformément au National Electrical Code (ANSI/NFPA 70-2008) des Etats-Unis et à toutes les exigences de sécurité applicables à votre installation.

Cet instrument doit être installé, utilisé et entretenu uniquement par un personnel qualifié. Selon le National Electrical Code, une personne est qualifiée si "elle connaît bien la construction et l'utilisation de l'équipement, ainsi que les dangers que cela implique".

Le personnel qualifié qui travaillent dessus ou s'approchent des conducteurs électriques activés exposés doit suivre des pratiques en matière et des procédures reliées par sûreté applicable de travail comprenant le matériel de protection personnel approprié conformément à la norme pour des conditions de sûreté électriques pour les lieux de travail des employés (ANSI/NFPA 70E-2004) des Etats-Unis et toutes les conditions de sûreté additionnelles de lieu de travail applicables à votre installation.

**Achtung!**

Der falsche Anschluss dieses Gerätes kann Tod, schwere Verletzungen oder Feuer verursachen. Bevor Sie dieses Instrument anschließen, müssen Sie die Anleitung lesen und verstanden haben. Bei der Verwendung dieses Instruments müssen alle Installation- und Betriebsanweisungen beachtet werden.

Der Anschluss dieses Instruments muss in Übereinstimmung mit den nationalen Bestimmungen für Elektrizität (ANSI/NFPA 70-2008) der Vereinigten Staaten, sowie allen weiteren, in Ihrem Fall anwendbaren Sicherheitsbestimmungen, vorgenommen werden.

Installation, Betrieb und Wartung dieses Instruments dürfen nur von Fachpersonal durchgeführt werden. In dem nationalen Bestimmungen für Elektrizität wird ein Fachmann als eine Person bezeichnet, welche „mit der Bauweise und dem Betrieb des Gerätes sowie den dazugehörigen Gefahren vertraut ist.“

Fachpersonal, das mit oder neben berührbaren und stromführenden elektrischen Leitern arbeitet, muss die gültigen Richtlinien und Verfahren in Bezug auf Arbeitssicherheit einhalten einschließlich der geeigneten persönlichen Schutzausrüstung gemäß der US Norm für elektrische Sicherheitsbestimmungen am Arbeitsplatz (ANSI/NFPA 70E-2004) sowie zusätzliche Arbeitssicherheitsbestimmungen, die für die jeweilige Anlage gelten.

3.1.2 Safety precautions

The following safety precautions must be followed whenever any type of voltage or current connection is being made to the Mavosys 10.

- Connect the green safety (earth) ground first, before making any other connections.
 - When connecting to electric circuits or pulse initiating equipment, open their related breakers. DO NOT install any connection of the instrument on live power lines.
 - Connections must be made to the instrument first, then connect to the circuit to be monitored.
 - Wear proper personal protective equipment, including safety glasses and insulated gloves when making connections to power circuits.
 - Hands, shoes and floor must be dry when making any connection to a power line.
 - Make sure the unit is turned OFF before connecting probes to the rear panel.
 - Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.
 - Pods should be connected first to the Mavosys 10, then connect to the circuit to be monitored.
 - If the equipment is used in a manner not specified in this user's guide, the protection provided by the equipment may be impaired.
-

**Attention!**

To reduce the risk of fire, electric shock, or physical injury, it is strongly recommended that connections be made with all circuits de-energized and current carrying conductors fused. If it is necessary to make connections on energized circuits, these must be performed by Qualified Personnel ONLY with proper Personal Protective Equipment.

**Attention!**

To avoid the risk of electric shock or burns, always connect the safety (or earth) ground before making any other connections.

**Attention!**

To reduce the risk of fire, electrical shock, or physical injury it is strongly recommended to fuse the voltage measurement inputs. Fuses must be located as close to the load as possible to maximize protection.

**Attention!**

For continued protection against risk of fire or shock hazard replace only with same type and rating of recommended fuse. Use only fast blow type fuse which is rated 600V. Recommended fuse type is Littelfuse, part number KLKD.300 rated 600V AC/DC, 0.3A fast blow.

**Attention!**

Do not replace fuse again if failure is repeated. Repeated failure indicates a defective condition that will not clear with replacement of the fuse. Refer condition to a qualified technician.

3.1.3 Connection Guidelines

Refer to the appropriate connection diagram on pages 27 to 33 to connect power to the voltage/current input connections.

- Make sure all circuits are de-energized before making connections.
- Connect the data cables. Plug the measurement cables into the appropriate connectors on the rear panel of the Mavosys 10.
- Remove the terminal protective cover(s) from the Voltage Input Module(s).
- Route power wires in a safe manner in accordance with good practice and local codes.
- Connect the ground wire first, before making any other connections.
- Connect power source to the Voltage and Current Input Modules. Attach phase A, B, and C voltage connections plus neutral, if applicable, to the screw terminals on the Voltage Input Module(s) (5-600 Vrms, up to #12 AWG wire). The 61MVS is wired in a similar manner.
- Replace the terminal protective cover(s) at the front of the Voltage Input Module(s).
- When using the 61MZP with external current pods (553XAPOD), pass the CT secondary conductors (0.01-5 Arms and up to #12 AWG wire) through current tubes located on the face of the input module. The arrows on the input module point from source to load.
- When using the 61MAS1 or 61MAS5 current modules with internal CTs, connect the wires in a similar manner as to the 5537APOD.
- When using the 61MAC with external clamp-on CTs, be sure to observe the current and voltage specifications, as well as the arrow indicating the direction of the load.
- Turn the Mavosys 10 instrument ON by pushing the power switch. Proceed to Chapter 4 Operational Description on page 34.

3.2 Single Phase

Connection

Type: Single Phase

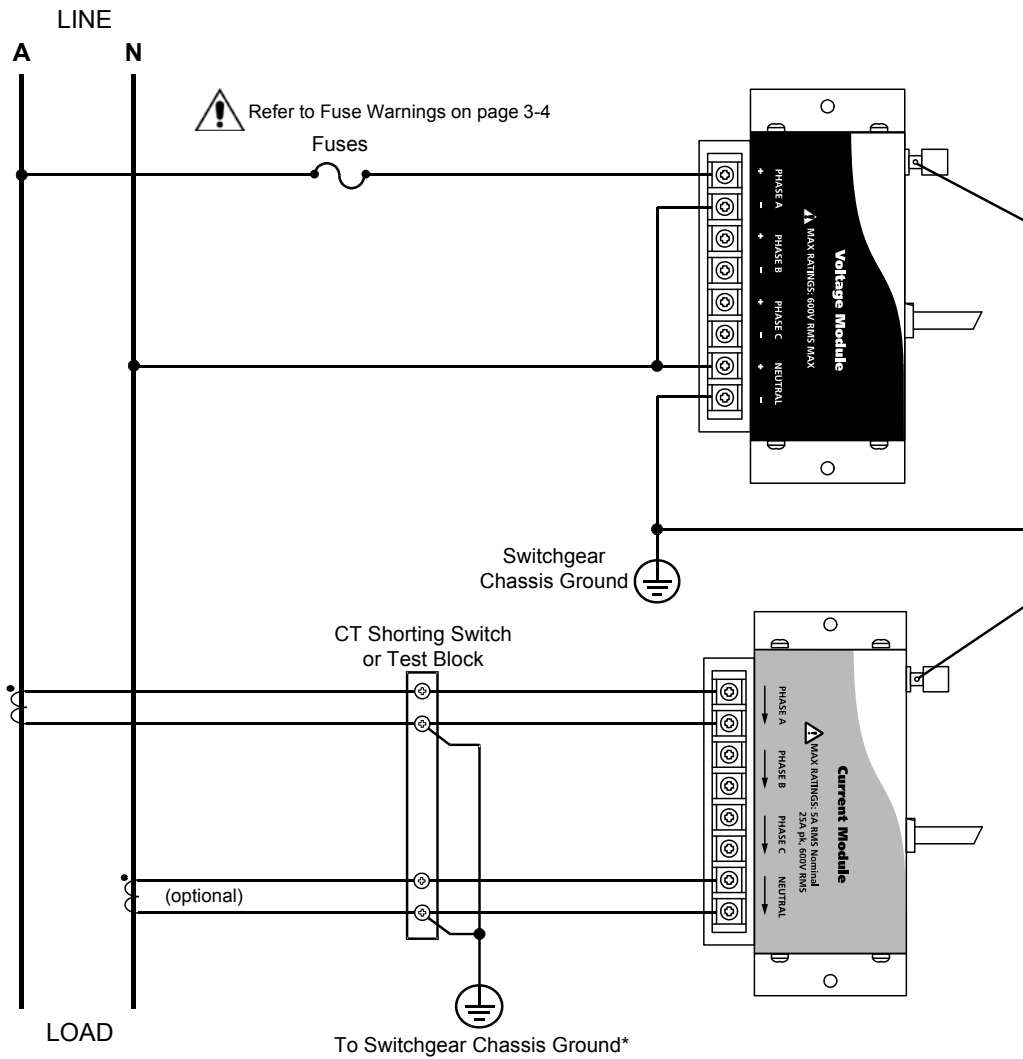


Figure 19



Caution!

Connections must be performed in compliance with all safety requirements applicable to your installation.



Note

Connections of CT leg to ground is recommended, but not required for proper operation.

3.3 Split Phase

Connection

Type: Split Phase

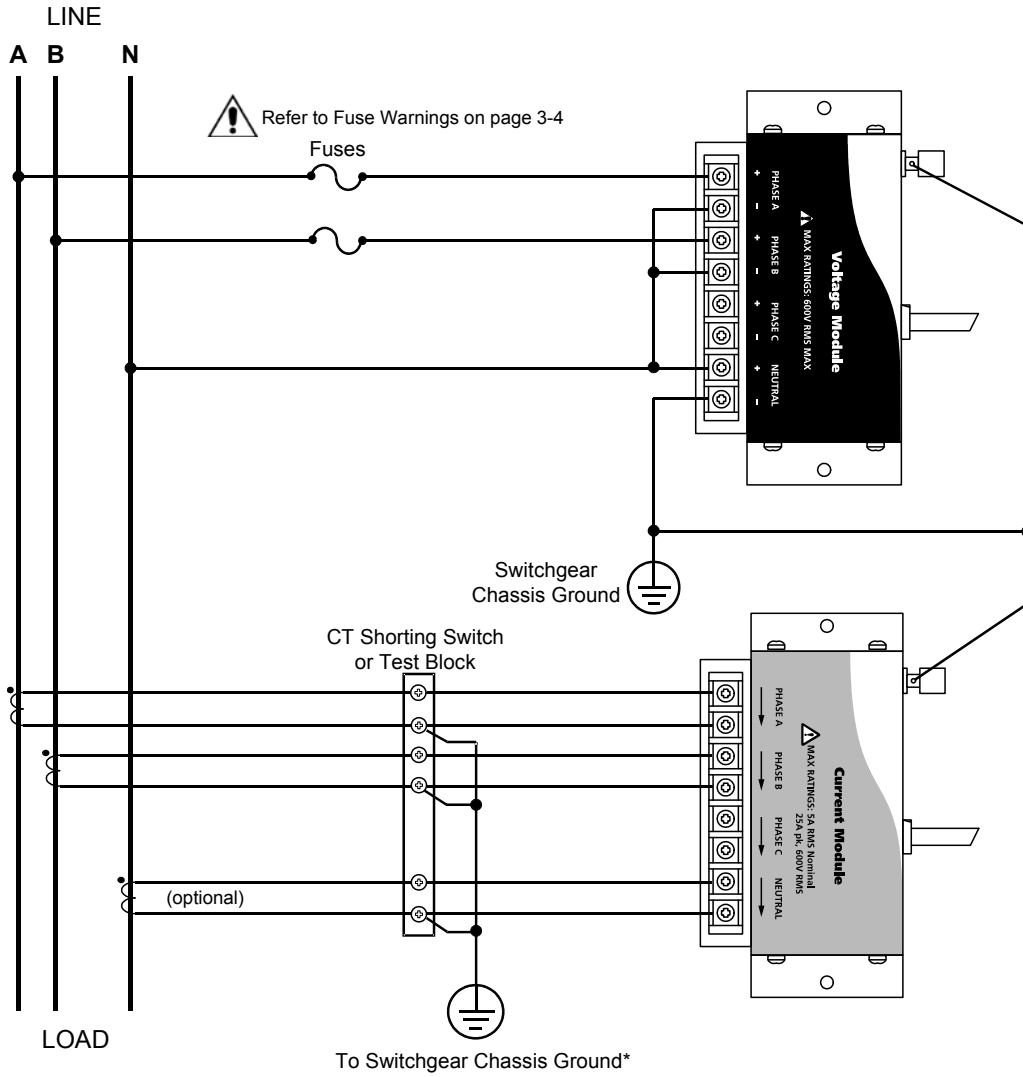


Figure 20



Caution!

Connections must be performed in compliance with all safety requirements applicable to your installation.



Note

Connections of CT leg to ground is recommended, but not required for proper operation.

3.4 3 Phase, Four Wire Wye

Connection

Type: 3 Phase, Four Wire Wye

Setup Mode: Wye

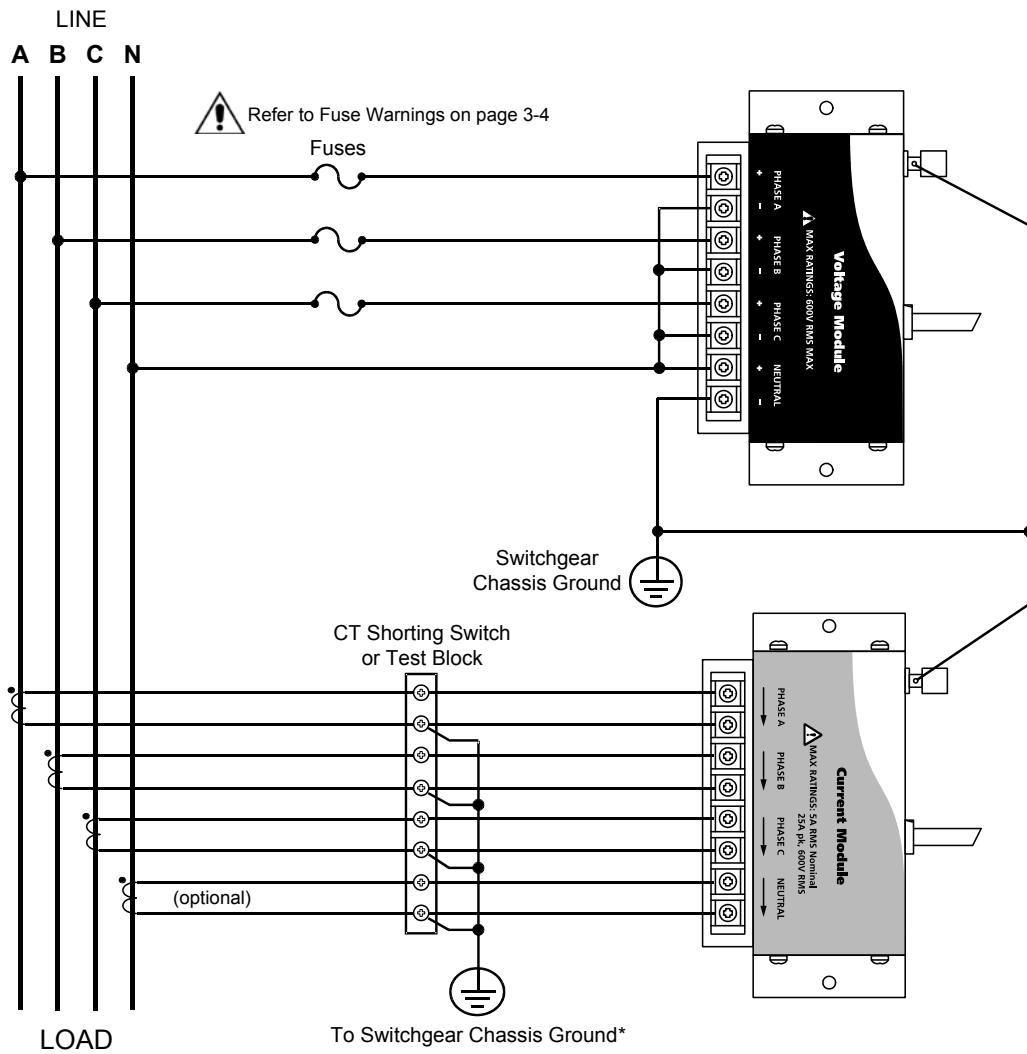


Figure 21



Caution!

Connections must be performed in compliance with all safety requirements applicable to your installation.



Note

Connections of CT leg to ground is recommended, but not required for proper operation.

3.5 3 Phase Delta

Connection

Type: 3 Phase Delta

Setup Mode: Delta

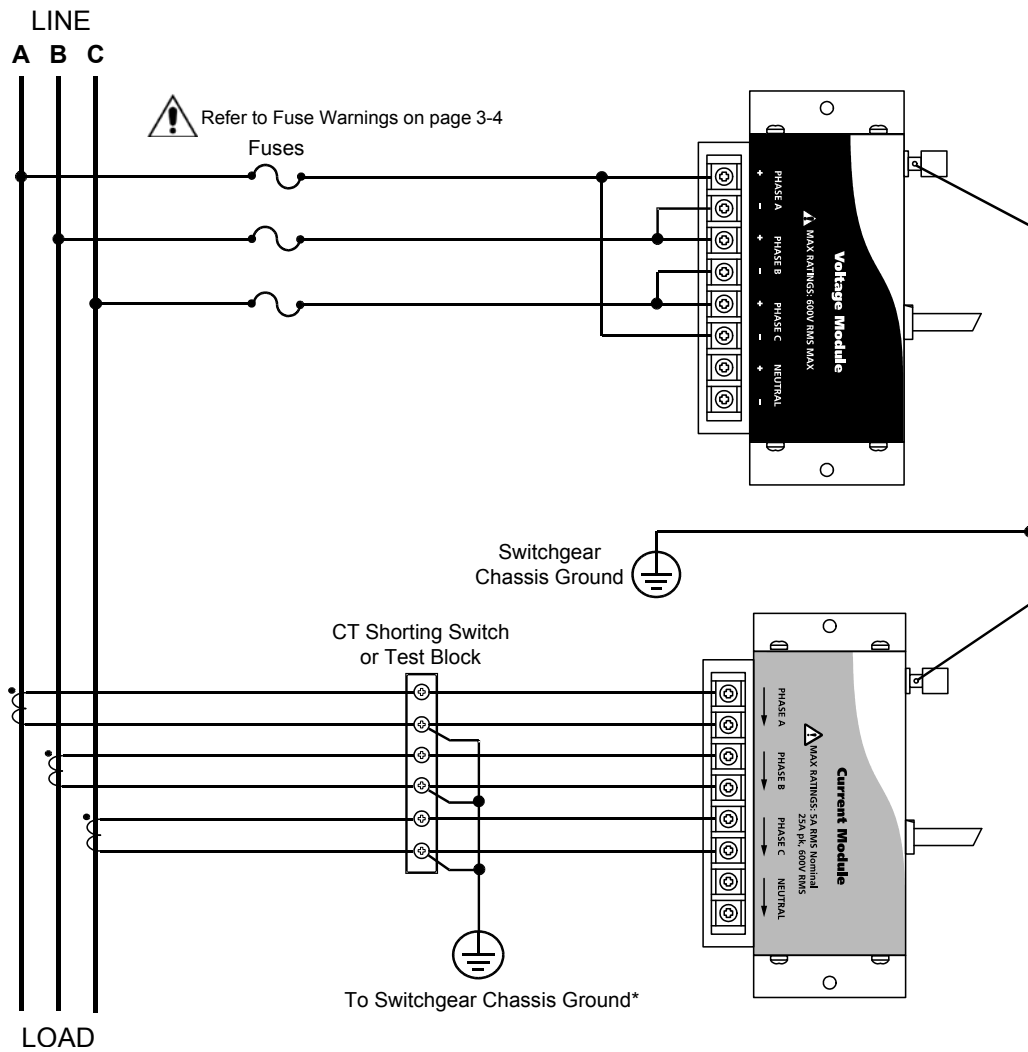


Figure 22



Caution!

Connections must be performed in compliance with all safety requirements applicable to your installation.



Note

Connections of CT leg to ground is recommended, but not required for proper operation.

3.6 3 Phase 2-Watt Delta

Connection

Type: 3 Phase, 2-Watt Delta

Setup Mode: Delta

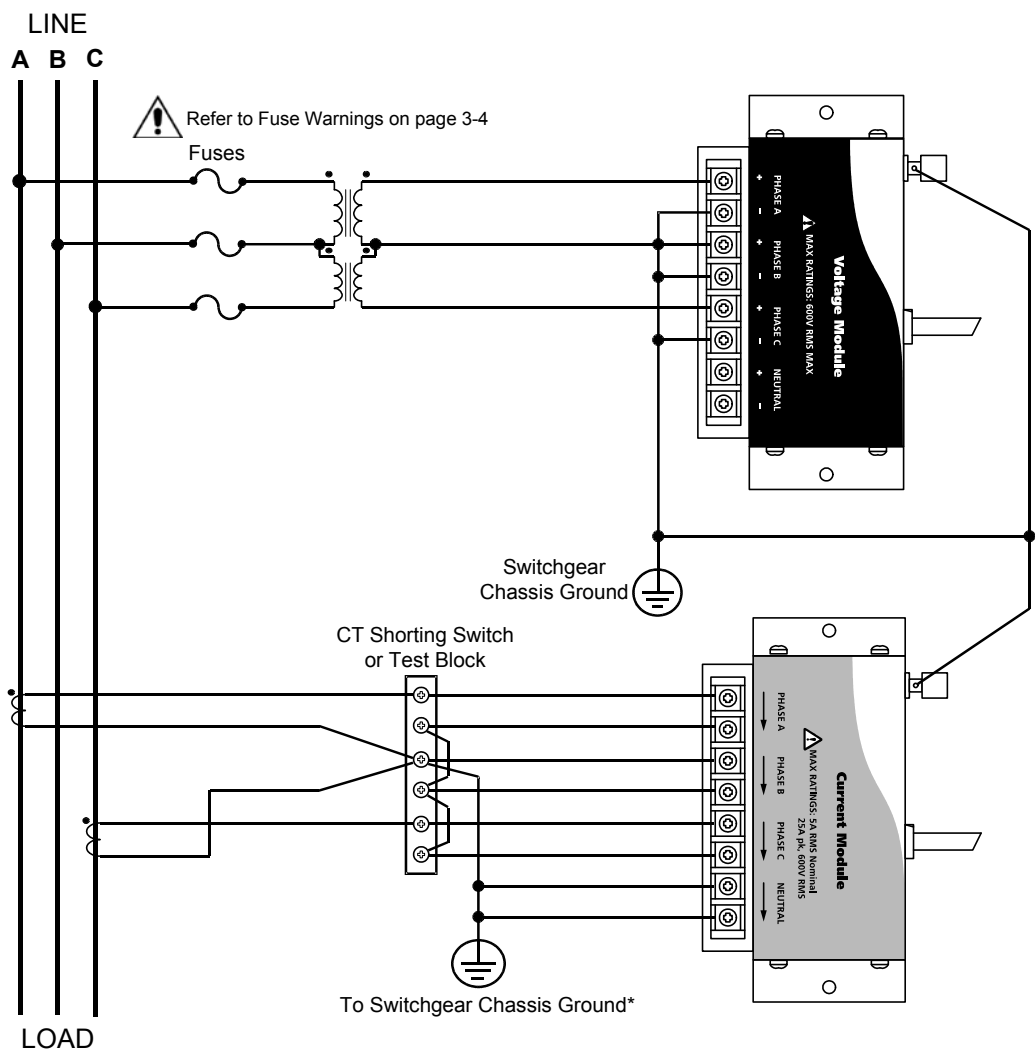


Figure 23



Caution!

Connections must be performed in compliance with all safety requirements applicable to your installation.



Note

Connections of CT leg to ground is recommended, but not required for proper operation.

3.7 2 1/2 Element without Voltage Channel B

Connection

Type: 2 1/2 Element without Voltage Channel B

Setup Mode: Delta

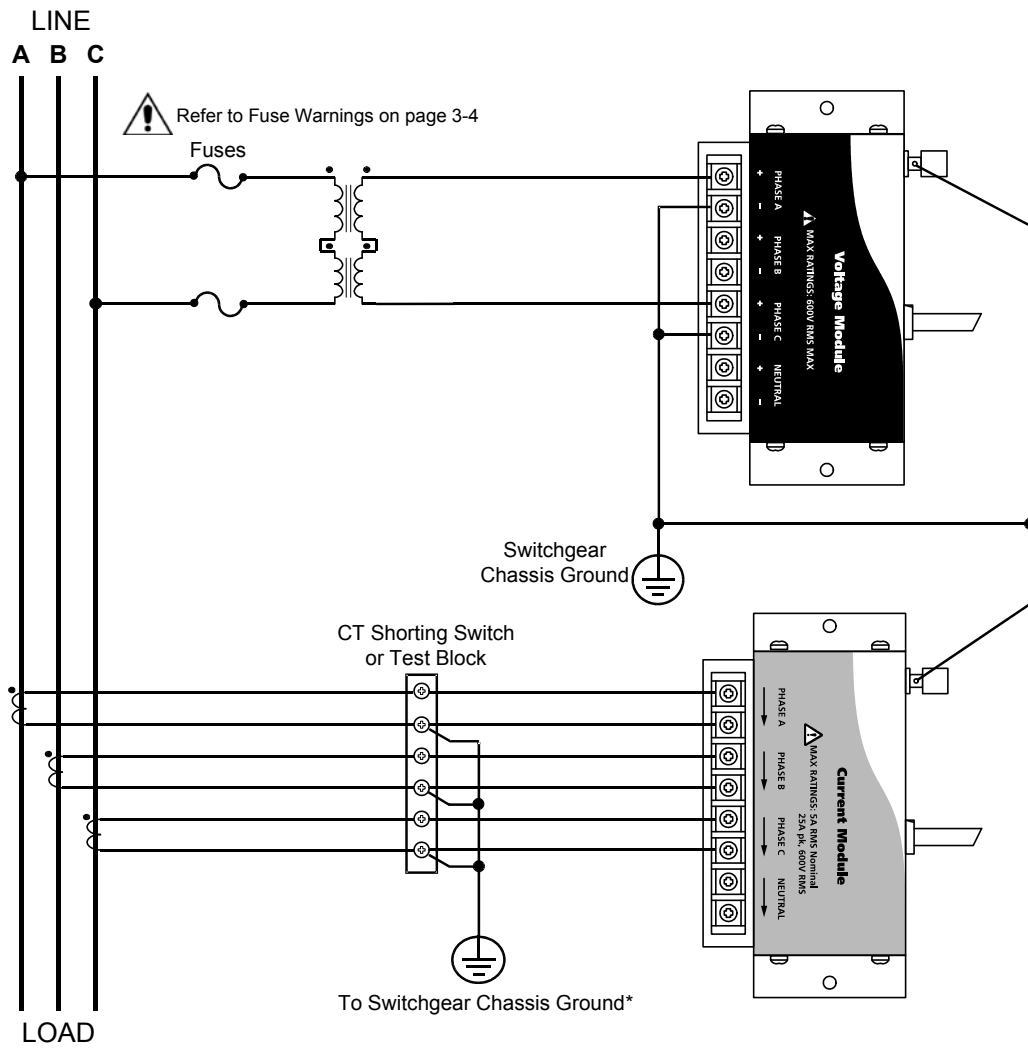


Figure 24



Caution!

Connections must be performed in compliance with all safety requirements applicable to your installation.



Note

Connections of CT leg to ground is recommended, but not required for proper operation.

3.8 2 1/2 Element without Voltage Channel C

Connection

Type: 2 1/2 Element without Voltage Channel C

Setup Mode: Delta

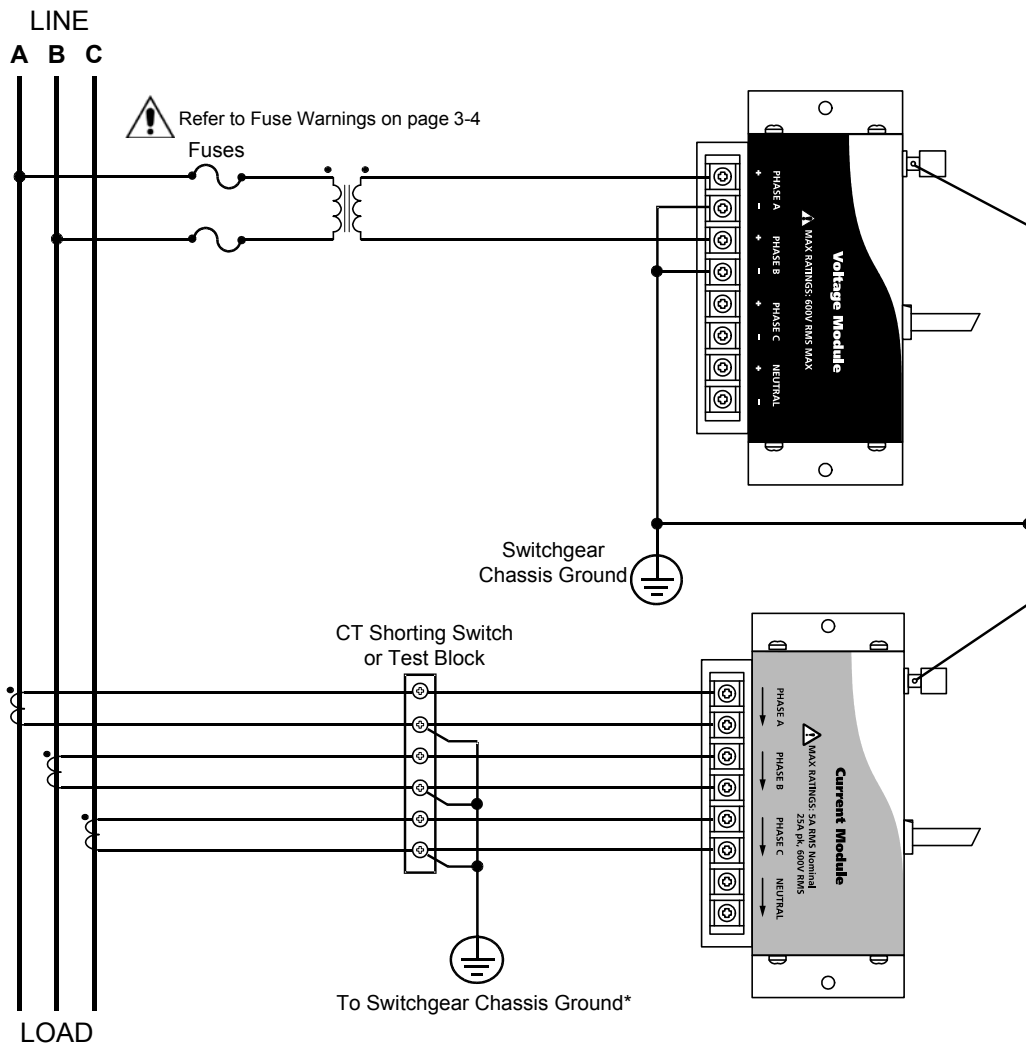


Figure 25



Caution!

Connections must be performed in compliance with all safety requirements applicable to your installation.



Note

Connections of CT leg to ground is recommended, but not required for proper operation.

4 Operational Description

4.1 Input Settings

4.1.1 Introduction

This chapter contains operational description of the hardware functions of the Mavosys 10, configurable through Encore Series Software or through the optional user interface when installed. Section A describes the external communications device and software applications necessary for remote operation of Mavosys 10. Section B describes the Mavosys 10 as a stand-alone unit with the LCD screen installed.

For detailed information on Mavosys 10 remote operation, refer to the Encore Series Software User's Guide. For local operation and functional screen display, refer to the Mavosys 10 Optional User Interface Guide (check with GMC-I Messtechnik GmbH for availability).

4.1.2 Virtual analyzer platform

The Mavosys 10 uses the concept of virtual analyzers to interface with the modular design of the mainframe. Mavosys 10 operation is dependent on the type of input/output modules installed on the rear panel of the instrument. As described in Chapter 2 Controls, Indicators, and Connectors on page 4, the Mavosys 10 Standard can have a maximum of 4 modules, with separate and independent connection for each input/output module. The user can configure up to four virtual analyzers, depending on module types installed. The instrument is factory-set to pair voltage and current modules in adjacent slots together as a virtual analyzer. If the two sets of voltage and current modules are present, there will be two virtual analyzers. If one voltage and three current modules are present, each current module will be paired up with the voltage module to make three virtual analyzers.

Virtual analyzers operate independently of each other. Each has its own set of functional icons in the local user interface, which when pressed allows users to view data from. For example, after the user selects Virtual Analyzer 2 configured to monitor voltage and current data, the user can then press the Meter icon to view voltage and current meter values. Similar concept applies to Scope, Harmonics, Trend, Events and Setup. Virtual analyzer tag names can be specified by the user, for example "UPS#4".

4.1.3 Circuit type

You must select a circuit type when you are collecting data for power parameters such as watts, VAs, PF, and VARs. If you don't select the proper circuit type, the ABC totals will not be calculated correctly.

Mavosys 10 can monitor the following power configurations:

- Single Phase
- Split Phase
- 3 Phase Wye
- 3 Phase Delta
- 3 Phase 2-Watt Meter Delta
- Generic
- 2 1/2 Element without V Chan B
- 2 1/2 Element without V Chan C

While monitoring any of the above configurations, Mavosys 10 can also be connected to monitor neutral to ground voltage and neutral to ground current.

4.1.4 Scale factors

Definition: Scale factors are the ratio of input to output for a particular current transformer (CT) or potential transformer (PT). Scale factors are entered into the Mavosys 10 (from the Encore Series Software or local user interface) and then multiplied automatically by the measured voltage and current so that the correct values will be recorded and displayed.

If voltage and current connections are made without using any of the above named devices, the scale factor should be set to 1.

When to use: Scale factors other than 1 must be entered for the following conditions.

- A GMC-I Messtechnik GmbH current probe is connected to a permanently installed CT.
- The current connections are made using a GMC-I Messtechnik GmbH ISO box.
- The voltage connections are made using a PT.

Range: The scale factor that is entered into the user interface must be between 0.001 and 999,900.

Memory Functions

4.2 Data Collection

4.2.1 Real-time monitoring

Mavosys 10 allows you to view power quality phenomena as it happens, when it happens. The instrument is able to capture and process data in real time, and allows users to view it in Scope mode and Meter mode.

4.2.2 Event monitoring

The data collection function of the Mavosys 10 controls how timed and disturbance events are recorded and saved to memory during monitoring of an electrical system. This function consists of the settings for the interval for timed readings, parameter thresholds, and waveform capture.

4.2.3 When to monitor events

Mavosys 10 can monitor an electrical system in situations where scope or meter measurements in real time do not give the data that you need to diagnose a problem. The length of time you monitor a circuit can vary from a few minutes to a few weeks or more depending on your application.

4.2.4 Parameter threshold

Threshold is a user entered value (or limit) that the Mavosys 10 compares to a measurement to decide if an event occurs. For example, on a circuit with a nominal voltage of 120V rms, the high and low limits could be set to 132V and 108V, respectively. If the input voltage exceeds 132V rms, or falls below 108V rms, the limit is exceeded and an event is produced. The Mavosys 10 saves this limit crossing to memory as an event. The return to normal would also be saved as an event.

4.2.5 Setup

Setup is a list of parameter thresholds and waveform capture settings for each channel that controls the way the Mavosys 10 records event data. In essence, a setup is a list of the criteria that the Mavosys 10 uses to determine what constitutes an event and what waveform data is saved when an event occurs.

4.2.6 Event

Event is any data that the Mavosys 10 saves to memory, usually based on exceeding a programmed measurement threshold but also including the measurement return to normal.

4.2.7 Waveform Capture

A function that saves the actual voltage and/or current waveforms that occurred at the time of an event.



Note

Waveform capture consumes much more memory than just textual capture. Careful planning for which parameters you want to capture waveforms, will help you increase the number of events that can be saved in memory.

4.3 Memory Functions

4.3.1 Memory backup

Mavosys 10 uses an internal 4MB non-volatile flash memory for program storage. Data will not be lost if the battery pack is removed.

4.3.2 Flash memory data storage

The Mavosys 10 hardware has a flash memory storage of 1GB, depending on user specification.

Section A: External Communications Interface

4.4 Remote Computer Operation

4.4.1 Introduction

This section provides an overview on how to connect the Mavosys 10 for external communications to a remote computer using the Encore Series Software.

4.4.2 Remote user interface guide

For more information about operating the Mavosys 10 from a computer, refer to the Encore Series Software User's Guide.

4.4.3 Computer requirements

The computer used must be equipped with the same communication interface as the Mavosys 10. For example, if the instrument is using Ethernet, the computer must likewise be using Ethernet.

4.4.4 Communications interface

There are five types of connectors in the rear panel of the Mavosys 10 for remote communication to a computer:

- RJ-45 for 10BaseT connection via Ethernet cable to a network or computer. The RJ-45 connector can also be used for external modem connections.
- RS-485 for 10BaseT connection using crossover wiring and cable
- USB communication port (future use)
- COM 1, 9-pin RS232 communication port
- GPS antenna cable connector (optional)

Refer to Chapter 2 Controls, Indicators, and Connectors on page 4 for diagrams of the connectors found on the rear panel of the Mavosys 10.



Caution!

Only qualified personnel should attempt installation and connection of the Mavosys 10 to a communication network.

4.5 Connection Setup via Modem

4.5.1 External modem

The Mavosys 10 is connected for modem operation by installation of an optional external land-based modem device and connection of the local telephone line to the RJ-45 10BaseT communications port. Model 61MDM external modem is available in GMC-I Messtechnik GmbH as an optional accessory for the Mavosys 10.

Modem communication is also possible through wireless communication. The Mavosys 10 supports GSM and GPRS service by installing the optional 61GSM-US or 61GSM-EU wireless modems. GSM is a global modem communication system that can support data rates of about 9kbps. GPRS is an added service to GSM that can increase the data rate to about 40kbps.

The communication service is provided by user, not by GMC-I Messtechnik GmbH.

4.5.2 Reference guide

Remote operation instructions to configure the Mavosys 10 DataNode for modem communications are described in the next section. The procedure describes operation of the Mavosys 10 with all connections being made correctly and the unit fully operational.

4.6 Configuring the Mavosys 10 DataNode for Modem Communication

4.6.1 Mavosys 10 DataNode

The Mavosys 10 DataNode can be configured to communicate with the Encore Series Software running on a computer (or 5502/5504 InfoNode) using analog or land-based modems (versus GSM/GPRS wireless modems). For communication to operate properly, a compatible modem would need to be connected to the serial port on the rear panel of the Mavosys 10, as well as to the computer (either internal card-based or external modem). The recommended modem for the Mavosys 10 is a 61MDM, which is a 56kbps modem.



Note

The Mavosys 10 can collect a large amount of data, depending on how it is set up and on the amount of event activity. Data size of 10Mbytes per day is not unusual. Downloading this amount of data from a number of Mavosys 10 units through analog modems may not be practical in larger systems, since download time multiplied by the number of units may exceed the polling rate. A 56kbps modem will typically download maximum of 3-5kbytes per second, which requires approximately an hour to download a day's data. The number of waveforms per event and the number of journalled parameters should be limited in such applications.

4.6.2 Procedure

Configuring the Mavosys 10 DataNode for modem communications consists of five major steps: setting up the modem for use with the Mavosys 10 unit; configuring the computer to set up Mavosys 10 for modem communications; configuring the Mavosys 10 communications for modem operation; setting up the dial-up network for the computer; and Mavosys 10 DataNode setup in Encore Series Software. Follow the instructions below to configure the system for modem communications.

STEP 1: Set up the modem for use with the Mavosys 10 unit.

- 1.1 Connect the modem to the computer's serial port with a "straight-through" serial cable.
- 1.2 Use HyperTerminal to connect to the modem with the following settings:
HyperTerminal Settings:

Baud	115200
Data Bits	8
Parity	None
Stop Bits	1
- 1.3 Turn off the ECHO function by typing **ATE0<cr>**.
- 1.4 Turn on the RTS/CTS hardware flow control by typing **AT&K3 <cr>**.
- 1.5 Save the changes to the modem's setup memory by typing **AT&W<cr>**.

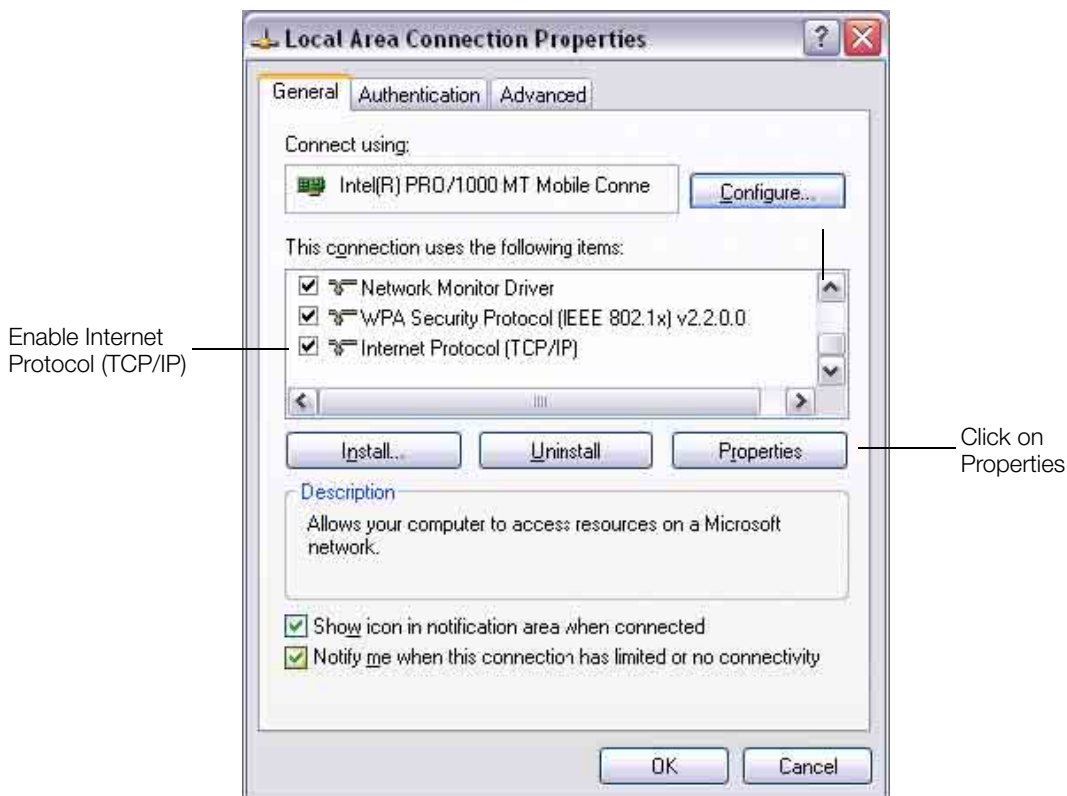
STEP 2: Set up the computer for modem communications.

- 2.1 Connect a "crossover" Ethernet cable (typically orange in color) from the Mavosys 10's RJ45 Ethernet port to the computer's Ethernet network port
- 2.2 From the desktop, select: **Start > Control Panel > Network Connections**.
- 2.3 Depending on the type of modem and other communication options in the computer, a screen similar to the example below will appear. Right-click on the **Local Area Connection** icon to display menu selection.

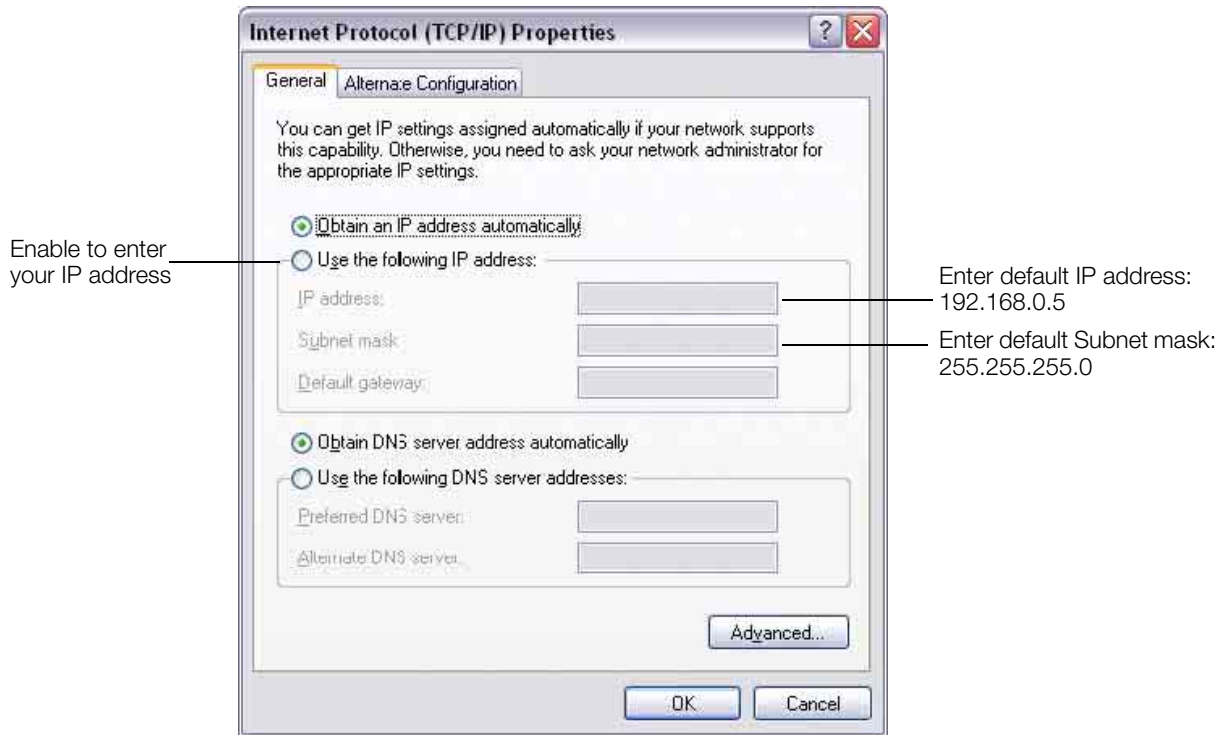


Local Area Connection icon

- 2.4 Select **Properties** in menu list to display the Local Area Connection Properties screen shown below.



2.5 Check to enable **Internet Protocol (TCP/IP)** then click on the **Properties** button. The following screen will appear:



2.6 Select **Use the following IP address** to set up the IP in a range compatible with the range of the Mavosys 10. Once you click on the radio button, the fields to enter the IP address and Subnet mask will be enabled.

- If this is an uninstalled system where the IP of the Mavosys 10 has not been configured by the user, use the default settings shown below.

Default Settings:

IP Address	192.168.0.5
Subnet Mask	255.255.255.0

- If the IP is already configured on the Mavosys 10, then the first three sets of digits of the IP must be the same. The last set of number should be in the range of 1 to 255, but not the identical number as the Mavosys 10.

2.7 When done configuring the IP address, click on the **OK** button.

STEP 3: Configure the Mavosys 10 communications for modem operation.

3.1 Open a web browser e.g. **Internet Explorer** and **type in the default IP address 192.168.0.20** in the address bar.

3.2 When done entering IP address, click on the Go button or press return. The Mavosys 10 log-in screen will be displayed.



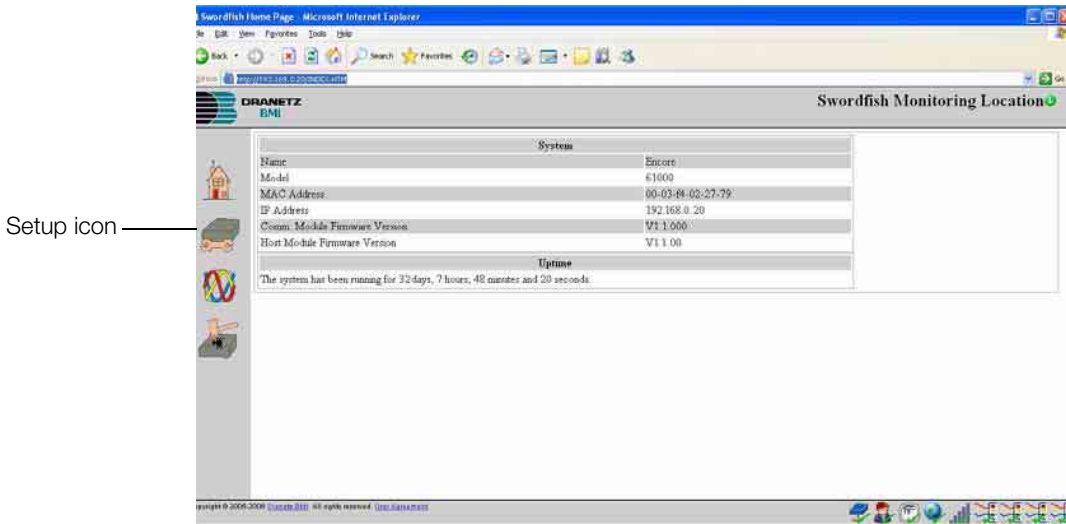
- Enter the user-configured User name and Password.
- If the User name and Password have not been configured by the user, use the following default settings: type in **admin** for User name and **password** for Password.



Note

Use lowercase characters when entering user name and password.

3.3 After typing in the user name and password, click on the **OK** button. The Mavosys 10 Home Page will be displayed.



3.4 Click on the **Setup** icon on the left side bar. The Mavosys 10 Setup page will be displayed.



- 3.5 In the **TCP/IP** section, set the **IP Address**, **Subnet Mask**, and **Gateway** as required for the LAN where the unit will be connected. Typically, the Subnet mask is 255.255.255.0 and the Gateway is 0.0.0.0. Consult your IT department for different configurations if required.
- 3.6 Specify the instrument to which the **Serial port** settings apply. Click on the **Used for** down arrow to display the pull down menu and select **Modem (PPP)**.
- 3.7 Proceed to the **PPP** setup box and make sure it is **Enabled**. Click on the **Yes** radio button. The DataNode IP and Remote IP are left in their default settings. The PPP Modem Init (initialization) string should also be left in its default setting (which appears as a blank).



Note

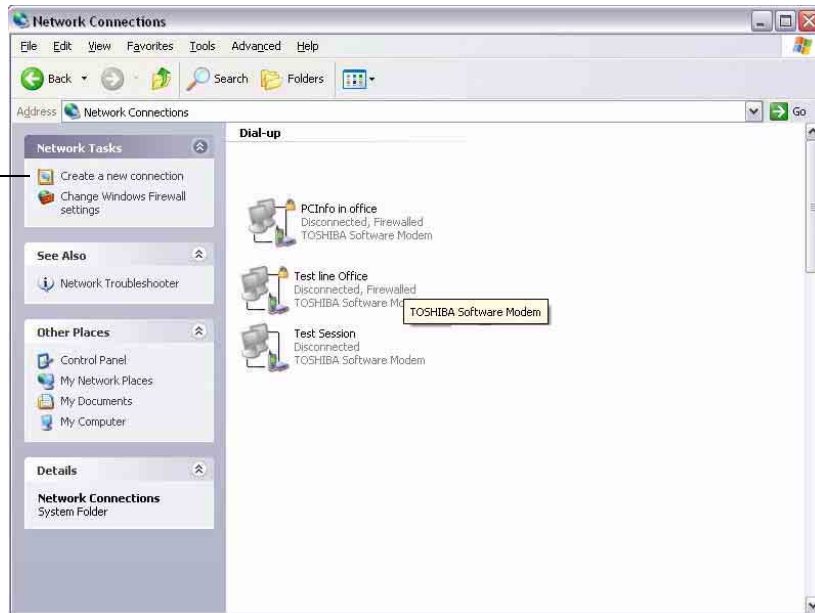
Use a different modem initialization string if the modem requires something specific.

- 3.8 When done setting up the Mavosys 10 for modem operation, press **Submit Changes** at the bottom of page.
- 3.9 Disconnect the cross-over Ethernet cable from the instrument and the computer. Connect the instrument to the LAN using the provided standard Ethernet cable (usually grey cable).
- 3.10 Reconfigure the computer for normal operation on the LAN, which will usually require restoring the original configurations modified in Step 2.1.
- 3.11 The Mavosys 10 can now be contacted using the Encore Series Software.

STEP 4: Set the dial-up network for the computer.

- 4.1 Dial-up networking should be set up on the computer running the Encore Series Software. This will allow the computer modem to communicate with the Mavosys 10 modem. Dial-up network uses the typical operating system communication functions found in Windows XP or similar operating systems.
- 4.2 From the desktop, select **Start > Control Panel > Network Connections**. The Network Connections window will be displayed.
- 4.3 Click on **Create a new connection** on the left side bar.

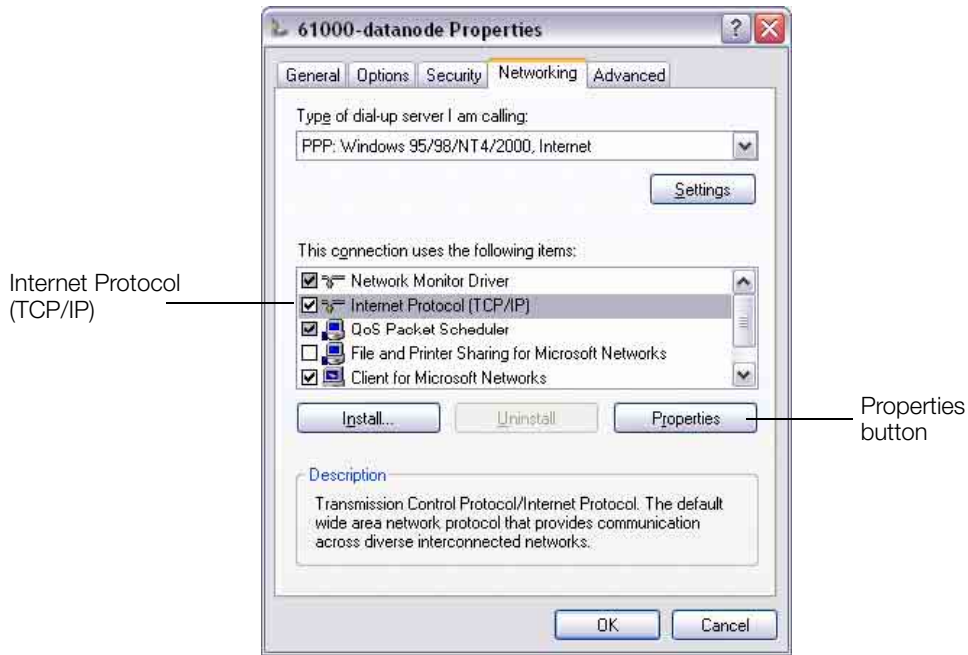
Click to Create a new connection



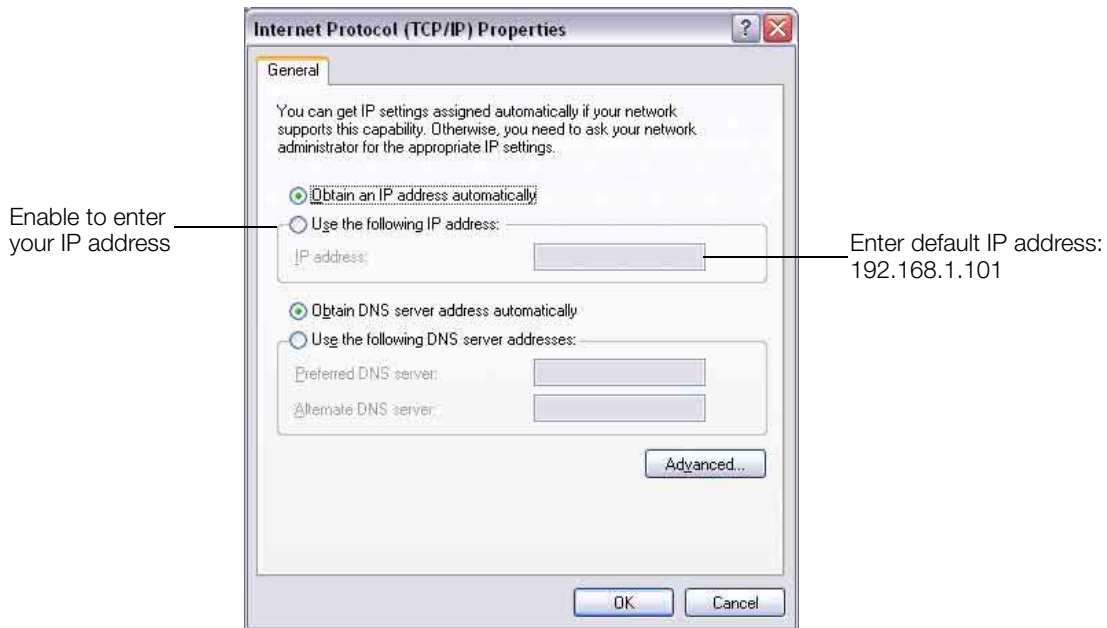
- 4.4 Follow the screen prompts in the dialog boxes and enter the appropriate information. Include a name for the connection setup.
- 4.5 Once the new site has been created, the new icon representing the information that you entered will appear in the dial-up networking list.
- 4.6 Right-click on the new dial-up connection icon, then select **Properties** from the menu list. The following screen will appear.



4.7 Click to open the **Networking** tab. The following screen will appear:



4.8 Check to enable **Internet Protocol (TCP/IP)** then click on the **Properties** button. The following screen will appear:



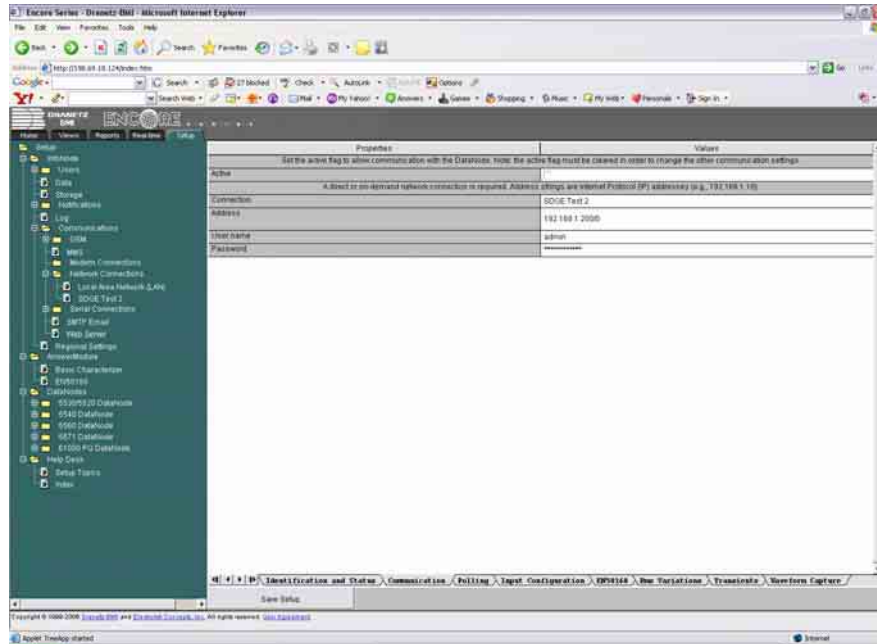
4.9 Select **Use the following IP address** to set up the IP in a range compatible with the range of the Mavosys 10. Once you click on the radio button, the field to enter the IP address will be enabled.

4.10 Enter the default **IP address 192.168.1.101** into the IP address box, or whatever the Modem IP address was programmed in Step 3.

STEP 5: Set up the Mavosys 10 DataNode in Encore Series Software.

- 5.1 The Mavosys 10 DataNode can now be added to the Encore Series Software system as a DataNode using modem communications.
- 5.2 Dial-up networking name and settings are automatically detected by the Encore Series Software and will appear under the **Network Connections** folder.
- 5.3 In the setup tree and in the drop-down box under the **Communication** tab, select the desired dial-up site for the appropriate DataNode.

For example: The Encore Series Network Connection setup screen below shows dial-up site name SDGE Test 2.



4.7 Connection Setup via COM1 RS232

Connect one end of the 9-pin RS232 connector into the COM1 RS232 port located on the rear panel of the Mavosys 10. Connect the other end of the RS232 connector to any available serial COM port on your computer. The COM1 RS232 port can also be used to connect optional external modem device, including cellular GSM.



Note

RS232 connection is not operational at this time; future option.

4.8 Connection Setup via GPS Antenna

4.8.1 Antenna requirements

Mavosys 10 will comply with emissions and/or immunity requirements with antenna cable lengths of 100 feet. Cable lengths exceeding 100 feet may result in undesired interference. Shielded cables and shielded connectors must be used when connecting external devices to the GPS antenna port of the Mavosys 10.

4.8.2 Reference guide

Remote operation instructions for antenna connection are contained in the Encore Series Software User's Guide. It describes the operation of the Mavosys 10 with all connections being made correctly and the unit fully operational.

Section B: Local Operation

4.9 Stand-Alone Unit

4.9.1 Optional user interface

The Mavosys 10 can operate as a stand-alone unit with an optional color liquid crystal display (LCD) as user interface. The touch screen display is mounted on the front of the rack-mount option or as a stand-alone panel, depending on user specification. The LCD panel provides immediate access to monitoring all measurement parameters and configurations.

Local operation of the Mavosys 10 consists of connecting the measurement cables, verifying correct measurement connections, and verifying that voltage and current measurements are being monitored.

4.9.2 Language selection

Menu screens for the Mavosys 10 optional user interface are available for display in multiple languages. Users have the option to set screen display in the language available. The screens appear in the English language by default.

4.9.3 Reference guide

Refer to the Mavosys 10 User Interface Operations Guide (check with GMC-I Messtechnik GmbH for availability) for detailed instructions on how to set up and operate the Mavosys 10 with the LCD panel.

4.9.4 Safety precautions

The following safety precautions must be followed whenever any type of voltage or current connection is being made to the Mavosys 10.

- Connect the green safety (earth) ground first, before making any other connections.
- When connecting to electric circuits or pulse initiating equipment, open their related breakers. DO NOT install any connection of the instrument on live power lines.
- Connections must be made to the instrument first, then connect to the circuit to be monitored.
- Wear proper personal protective equipment, including safety glasses and insulated gloves when making connections to power circuits.
- Hands, shoes and floor must be dry when making any connection to a power line.
- Make sure the unit is turned OFF before connecting probes to the rear panel.
- Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.
- Pods should be connected first to the Mavosys 10, then connect to the circuit to be monitored.
- If the equipment is used in a manner not specified in this user's guide, the protection provided by the equipment may be impaired.

These safety precautions are repeated where appropriate throughout this manual.

4.10 Basic Operation

4.10.1 Battery pack

The normal power source for the Mavosys 10 is the 50/60Hz 120/230V ac power source with back-up from the internal battery pack. The external power adapter (either AC Adapter/Battery Charger or DC-DC converter) is used to charge the battery. Always charge the battery fully before use. Mavosys 10 will always operate on the power adapter and is designed to do so, regardless of the state of charge of the battery.

4.10.2 AC power source

The Mavosys 10 can be operated from a 50/60Hz 120/230V ac power source.

Connect the ac adapter output cable to the input connector on the rear panel of the Mavosys 10. Connect the appropriate ac adapter power cord for the country to an appropriate outlet.

4.10.3 Turn-on procedure

Follow these steps to turn on the Mavosys 10 and display the Home screen. Home screen is frequently referenced as the starting point for all major functionalities of Mavosys 10.

Step	Action
1	Verify that the power switch on the Mavosys 10 connector panel is turned off.
2	Verify that the power to the circuit to be measured is turned off.
3	Connect the measurement cables for the type of circuit being measured as described in Chapter 2 Controls, Indicators, and Connectors on page 4. See the appropriate connection diagram in Chapter 3 Circuit Diagrams for Power Monitoring on page 24. Typical voltages measured are 120V ac nominal per phase with a load current (dependent upon module type or current probe).
4	Turn on power to the circuit to be measured.
5	Turn on power to the Mavosys 10.
6	Verify that the LCD (if available) displays instrument-specific information. The Home screen contains the icons used to access instrument functions.

Appendix A Optional Accessories

A.1 Introduction

This appendix lists the optional accessories for Mavosys 10. It covers the hardware accessories available for use with the instrument and the GMC-I Messtechnik GmbH software applications used to download and view event data in a computer.

Topic	See Page
Hardware Accessories List	44
Enclosure Hardware Options	46
Software Accessories List	60


Ordering information

To order accessories, contact GMC-I Messtechnik GmbH Product Support at:

GMC-I Messtechnik GmbH
Südwestpark 15
90449 Nürnberg • Germany
Attention: Product Support

Tel: +49 911 8602-0
Fax: +49 911 8602-777
E-Mail: info@gossenmetrawatt.com
www.gossenmetrawatt.com

A.2 Hardware Accessories List

Accessory	Part Number
Current Probe Options	
<i>Clamp-On AC/DC Probes</i>	
AC/DC Current Probe, 150A, With AC Adapter	PR150/SP1 (Z817P)
AC/DC Current Probe, 150A, Battery Powered	PR150/SP2 (Z817N)
AC/DC Current Probe, 1500A, With AC Adapter	PR1500/SP7 (Z817Q)
AC/DC Current Probe, 1500A, Battery Powered	PR1500/SP8 (Z817O)
<i>Flex-AC Probes</i>	
FLEX Current Probe, 30A/300A/3000A, 24"	RR-3035A-24
FLEX Current Probe, 30A/300A/3000A, 36"	RR-3035A-36
FLEX Current Probe, 30A/300A/3000A, 48"	RR-3035A-48
FLEX Current Probe, 60A/600A/6000A, 24"	RR-6035A-24
FLEX Current Probe, 60A/600A/6000A, 36"	RR-6035A-36
FLEX Current Probe, 60A/600A/6000A, 48"	RR-6035A-48
 Note For split core type CTs and solid core type CTs, contact the GMC-I Messtechnik GmbH factory.	
<i>Clamp-On AC Probes</i>	
Current Probe Assembly, 1 to 300A RMS	TR-2019B (Z817E)
Current Probe Assembly, 1 to 30A RMS	TR-2021 (Z817D)
Current Probe Assembly, 10 to 1000A RMS	TR-2022 (Z817F)
Current Probe Assembly, 10 to 3000A RMS	TR-2023 (Z817G)
Current Probe, 10 to 500A	TR-2500A (Z817B)
AC Current probe, 1V/A, 1A	TR-2501
Current Probe, 1 to 10A	TR-2510A (Z817A)
Current Probe, 10 to 3000A	TR-2520A (Z817C)
AC Current probe, 5MV/A, 300A	TR-2530A
AC Current probe, 1.5MV/A, 1000A	TR-2540A
AC Current probe, 15MV/A, 100A	TR-2550A (Z817U)
Measurement Cable Options	
Adapter Cable, 658 Current Probe to 4300	CA-4300 (Z817H)
Adapter Cable, 4300/FLEX	CA4300BNC (Z817S)
Single Phase Measurement Cord, 115V, US	SPMEASCORD-US
Single Phase Measurement Cord, 250V, Europe	SPMEASCORD-EURO
Single Phase Measurement Cord, 250V, UK	SPMEASCORD-UK
Single Phase Measurement Cord, 250V, Australia	SPMEASCORD-AUST
Probe Adapter Cable, Hypertronics to Redel	TRTOREDEL
Flex-R Probe Power Adapter	TRTORFLEX
Voltage Cable Accessory Pack	VCP-4300

Accessory	Part Number	
Fuse Voltage Adapter, for single phase connection	FVA-1	
Fuse Voltage Adapter, for three phase connection	FVA-4	
<i>Probe Power Supplies</i>		
AC Adapter, 110VAC, 9VDC, 200MA, US	ACADP-PR9VUS	
AC Adapter, 220VAC, 9VDC, 500MA, Euro	ACADP-PR9VEURO	(Z817R)
AC Adapter, 240VAC, 9VDC, 500MA, UK	ACADP-PR9VUK	
<i>Input/Output Modules</i>		
Input Module, 600V, Safety Connectors	61MVB	(M819H)
Input Module, Voltage/Current, External Pod	61MZP	(M819I)
Input Module, 600V, Screw Terminals	61MVS	(M819G)
Input Module, Current, Probe Interface	61MAC	(M819N)
Input Module, Current, Internal CTs, 1A	61MAS1	(M819L)
Input Module, Current, Internal CTs, 5A	61MAS5	(M819M)
Input Module, Digital, 8 Chan, 125VDC	61MDIN	(M819S)
Input Module, Blank Filler Panels	61FILR	
External Ferrite Clamp-On	115346-G1	
<i>Pod Interface Options</i>		
POD, 5A:5X, 4 Channel, External Interface, Screw Terminal	5537 APOD	(M819Q)
POD, 5A:5X, 4 Channel, External Interface, Wire Passthr		
POD, 5A:20X, 4 Channel, External Interface, Wire Passthr	5533 APOD	(M819O)
POD, 1A:5X, 4 Channel, External Interface, Screw Terminal	5534 APOD	(M819P)
POD, 600V, 4 Channel, External Interface, Screw Terminal	5536 VPOD	(M819K)
POD, 1000V, 4 Channel, External Interface, Screw Terminal		
<i>Enclosures</i>		
Rack Mount Kit for Mainframe, With Display	61RMTD	(M819U)
Rack Mount Kit for Mainframe, Without Display	61RMT	
Rack Mount Kit for Mainframe, Without Display, Metal	61RMTS	(M819V)
Large NEMA Box for Mainframe, Without Display	61WENCL	(M819W)
Single Module Enclosure for Mainframe (61VCM / M818D)	61VENCL	(M819X)
Brackets, Wall Mounting for Mavosys 10, Pair	61BRKTS	(Z819G)
Rack Mount for Switchgear (61SG / M819B, 61SGD / M819C)	61SGRMT	(Z819I)
<i>Mainframe Power Supply</i>		
Power Supply, 100-250 VAC, US Cord	61PSAC-US	
Power Supply, 100-250 VAC, Euro Cord	61PSAC-EURO	(M819E)
Power Supply, 100-250 VAC, UK Cord	61PSAC-UK	
Power Supply, 100-250 VAC, Australian Cord	61PSAC-AUST	
Power Supply, 120-300 VDC, Station Battery	61PSDC-SB	(M819F)
<i>Mainframes</i>		
Mavosys 10 Series Mainframe, with Overlay, Standard	61STD	(M819A)
Mavosys 10 Series Mainframe, without Overlay	61ST	
Mavosys 10 Series Mainframe, with Overlay, Voltage Compliance Monitor – Single Module Unit	61VCM	
<i>Time Synch Options</i>		
Antenna, GPS, with Pole Mount and 10-foot Cable	61GPSANT10	(Z819E)
Antenna, GPS, with Pole Mount and 100-foot Cable	61GPSANT100	(Z819F)
<i>Communication Options</i>		
GPS Adapter Cable, BNC to SMA	61CAGPS	(Z819H)
Digital Wireless Modem	61GSM	(Z819D)
External Modem, 56K	61MDM	
Ethernet Cable, STD 10Base T, 5"	10BTSTD	
Ethernet Cable, Null 10Base T, 6"	10BTNUL	
Remote Display/Touchscreen	61TD	
<i>Miscellaneous Accessory Options</i>		
High Voltage DC Option	61SGHDC	
Host/Comm Module, with GPS	61HCG	(M819D)
Host/Comm Module, without GPS	61HC	(M819J)
Field Handbook for Electrical Energy Management	HB114415	
Field Handbook for Power Quality Analysis	HB114414-S	

A.3 Enclosure Hardware Options

A.3.1 Rack Mount Panel With Display (61RMTD)

Diagram below shows the rack mount panel for Mavosys 10 Standard (61STD) mainframe, with optional screen display (P/N 61RMTD). Distance specifications for mounting are shown below.

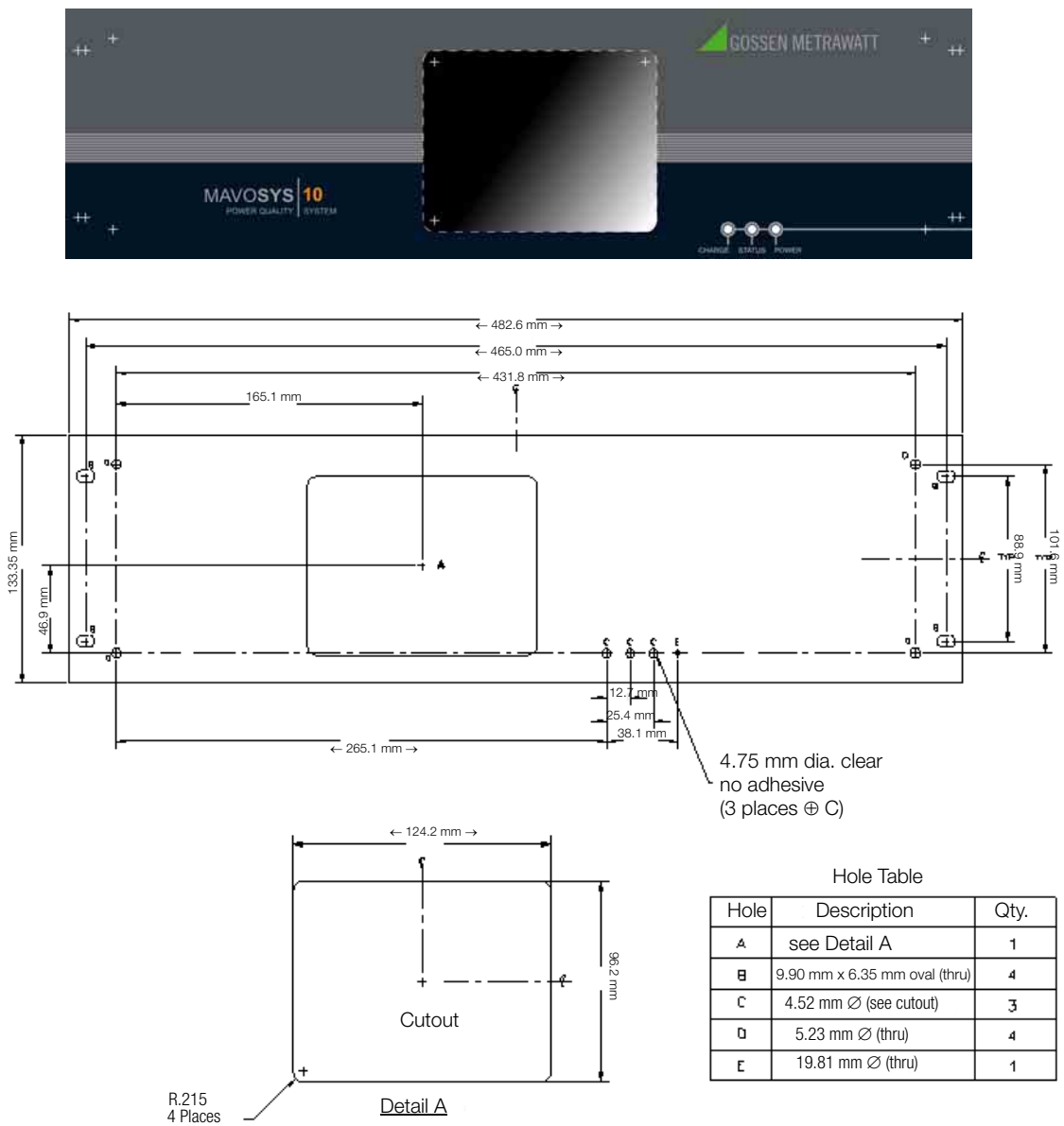



Figure 26 Rack Mount Panel with Display

A.3.2 61RMTD Outline Dimensions

The diagram below shows the outline dimensions for the Rack Mount Panel with Display (61RMTD).

 **Note**
Outline dimensions are to be used for reference only, subject to change without notice. For questions, contact the GMC-I Messtechnik GmbH Product Support at +49 911 8602-0.

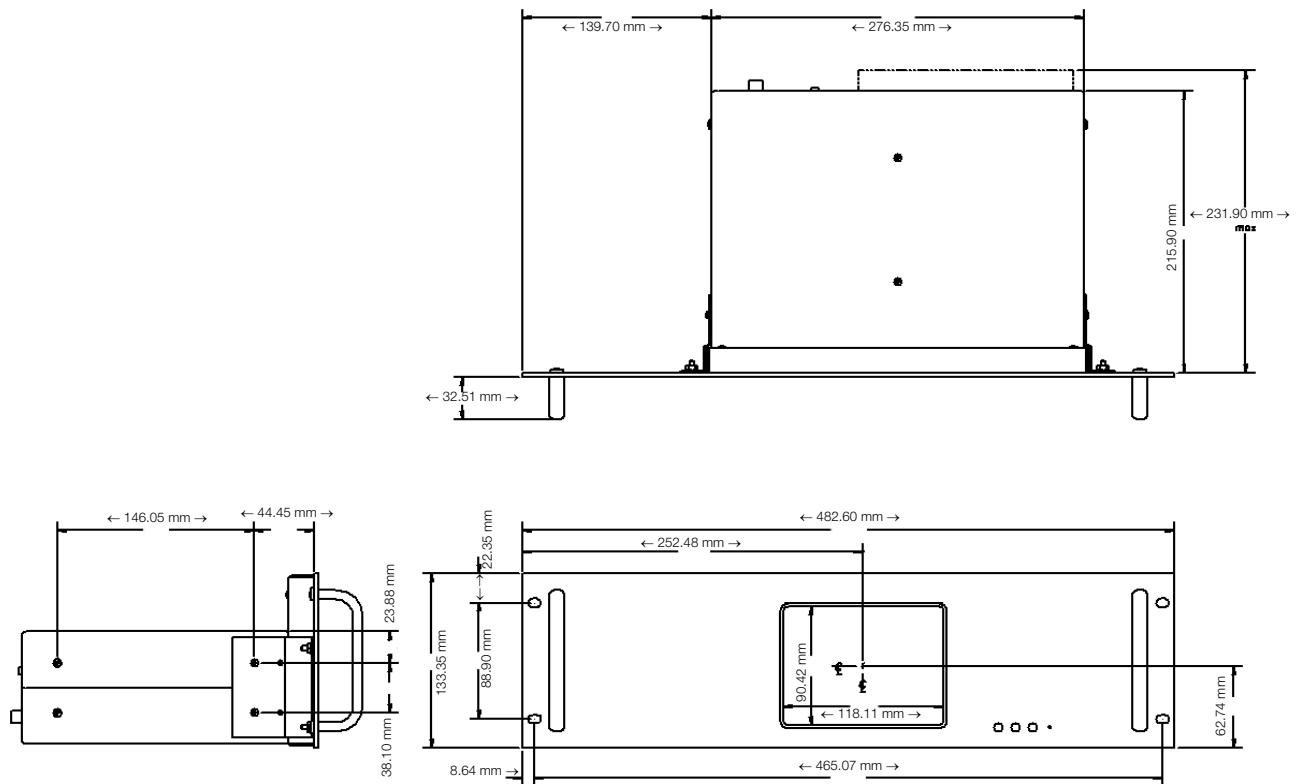
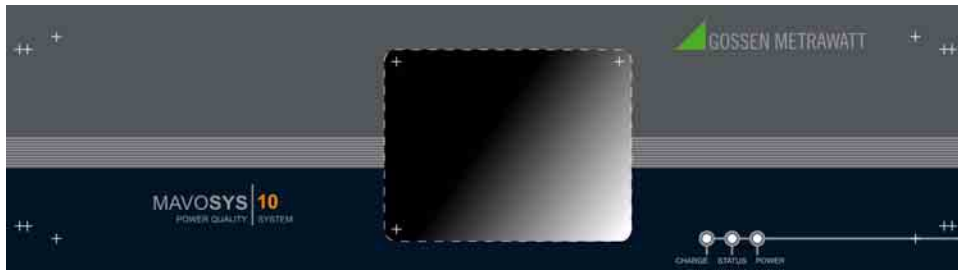


Figure 27 61RMTD outline dimensions

A.3.3 61RMTS Outline Dimensions

The diagram below shows the outline dimensions for the Rack Mount Panel without Display (61RMTS).



Note

Outline dimensions are to be used for reference only, subject to change without notice. For questions, contact the GMC-I Messtechnik GmbH Product Support at +49 911 8602-0.

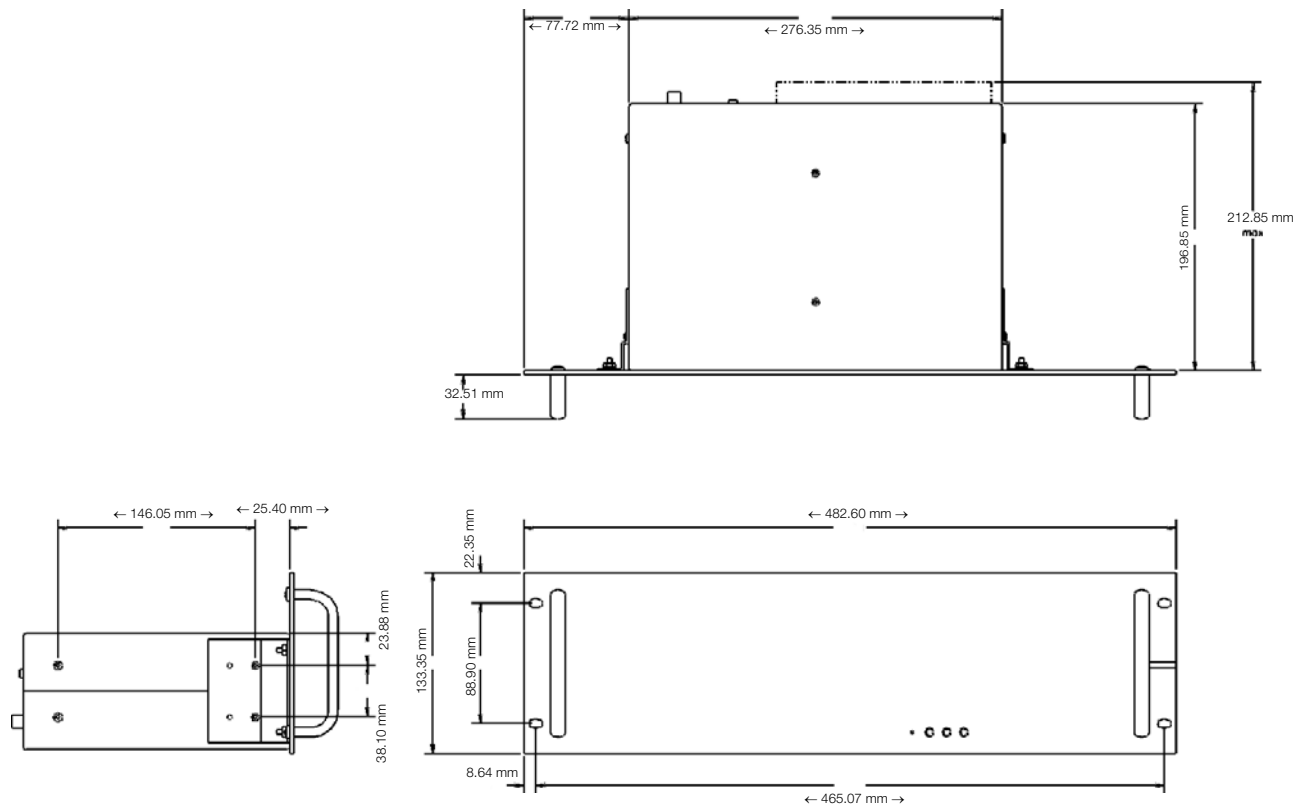


Figure 28 61RMTS outline dimensions

A.3.4 61SGD Outline Dimensions

Diagram below shows the rack mount panel for Mavosys 10 Switchgear mainframe, with optional screen display (P/N 61SGD). Distance specifications for mounting are shown below.



Note

Outline dimensions are to be used for reference only, subject to change without notice. For questions, contact the GMC-I Messtechnik GmbH Product Support at +49 911 8602-0.

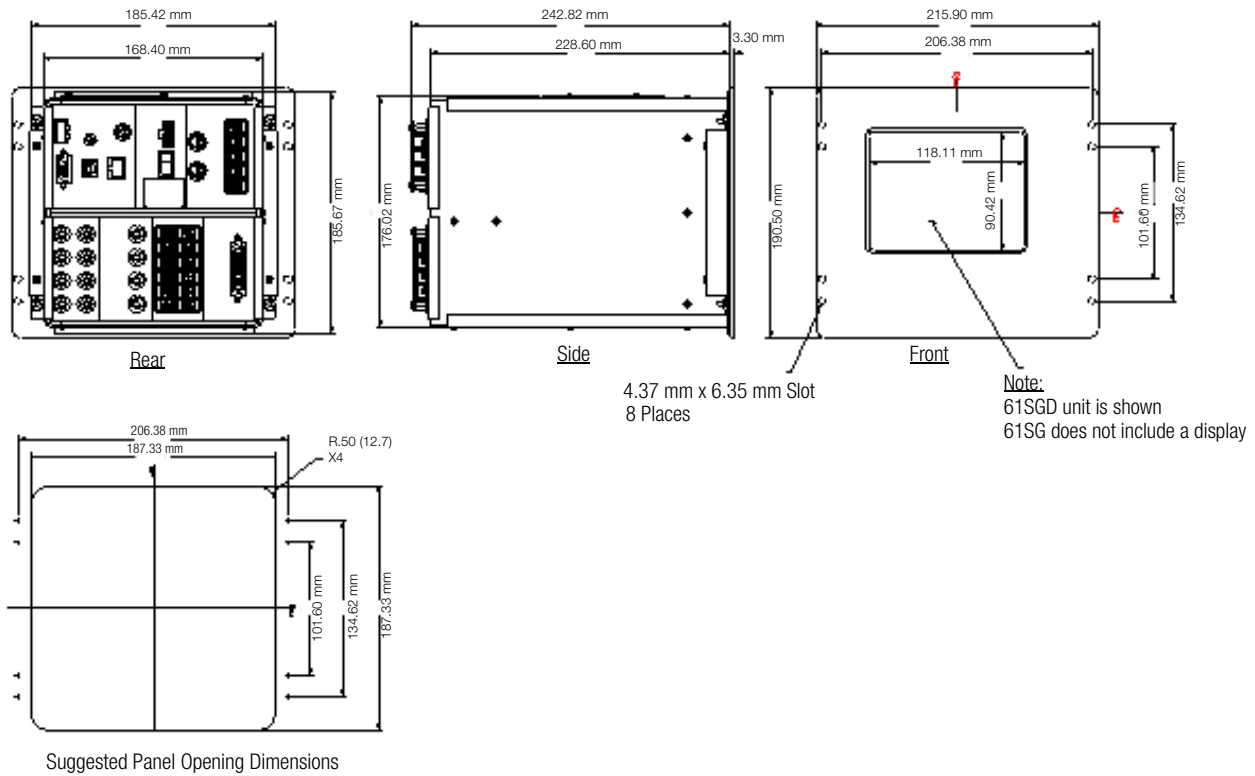


Figure 29 61SGD outline dimensions

A.3.5 Rack Mount Panel Without Display (61RMT)

Diagram below shows the rack mount enclosure without provision for screen display (P/N 61RMT), in unassembled view. Rack mount panel and handle facing back.

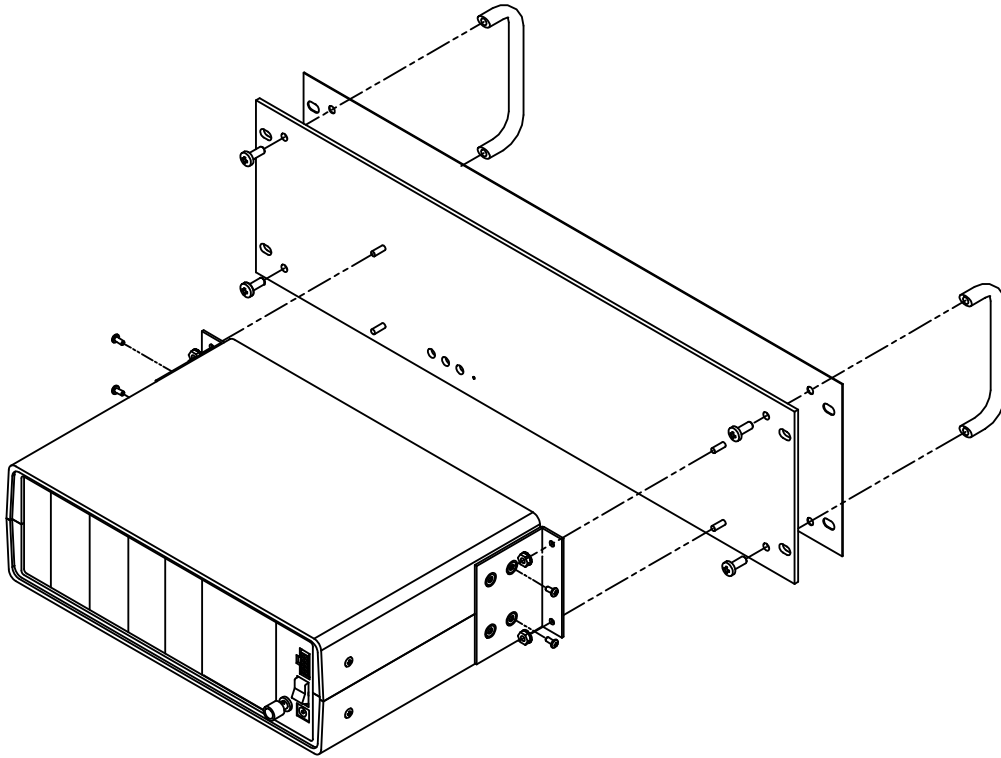


Figure 30 Rack Mount Panel Without Display (unassembled)

Diagram below shows the same rack mount enclosure as above (P/N 61RMT), in assembled view. Rack mount panel and handle facing front.

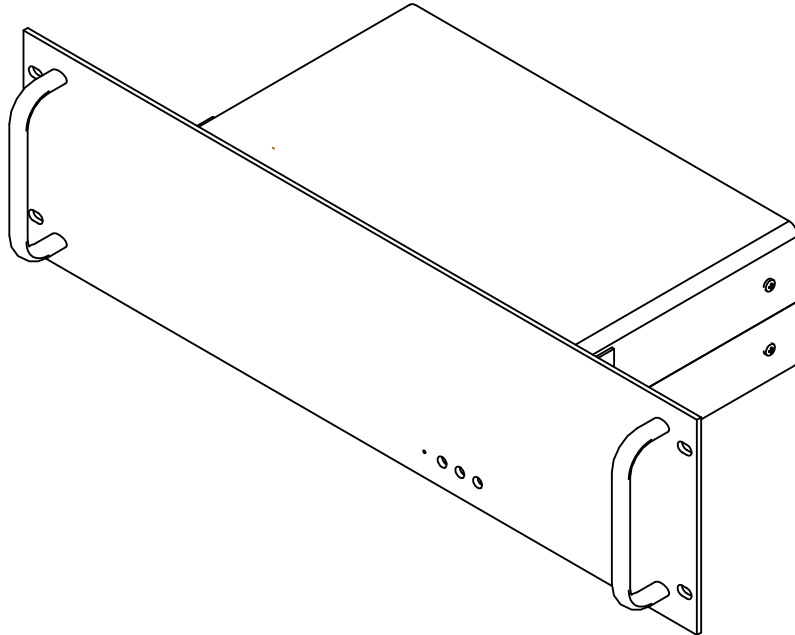



Figure 31 Rack Mount Panel Without Display (assembled)

A.3.6 61TD Outline Dimensions

The diagram below shows the outline dimensions for the Touchscreen Display (61TD).

 **Note**
Outline dimensions are to be used for reference only, subject to change without notice. For questions, contact the GMC-I Messtechnik GmbH Product Support at +49 911 8602-0.

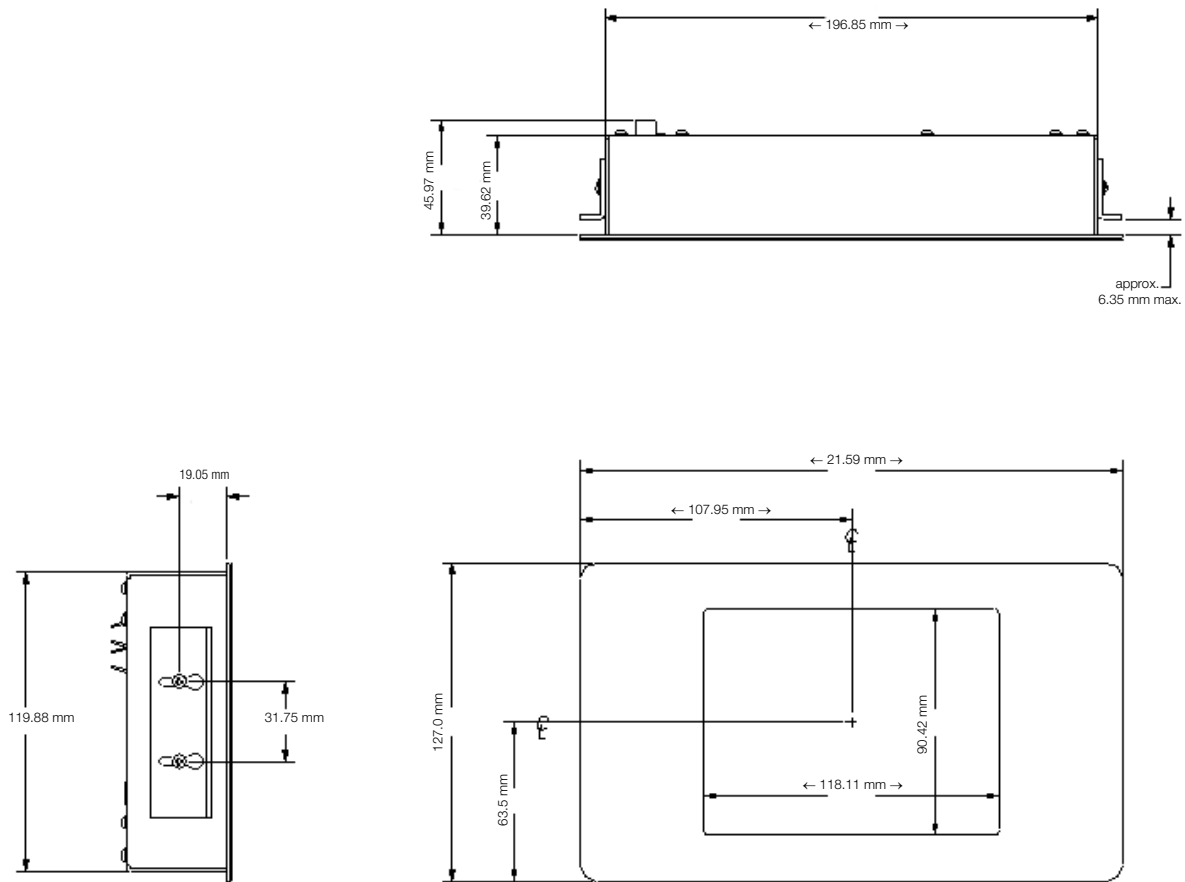


Figure 32 61TD outline dimensions

A.3.7 NEMA 4 Pod Enclosure Kit 116848-G1 with 61BRKTS

Actual photo below shows the 4 Pod Enclosure Kit for Mavosys 10 Standard (61STD) mainframe, with 4 61MZP Modules.



Figure 33 NEMA 4 Pod Enclosure Kit (P/N 116848-G1)



Figure 34 Contained in NEMA 4 Pod Enclosure – 61STD unit connected to two each of voltage and current input pods; power source assembly is shown on the right in a NEMA 4 Data Enclosure.

A.3.8 61WENCL Outline Dimensions

The diagram below shows the outline dimensions for the NEMA Enclosure Kit (61WENCL) for Mavosys 10 Standard unit. See actual photos of 61WENCL in Chapter A.3.9 NEMA Enclosure Kit (61WENCL) on page 54.

Note
 Outline dimensions are to be used for reference only, subject to change without notice. For questions, contact the GMC-I Messtechnik GmbH Product Support at +49 911 8602-0.

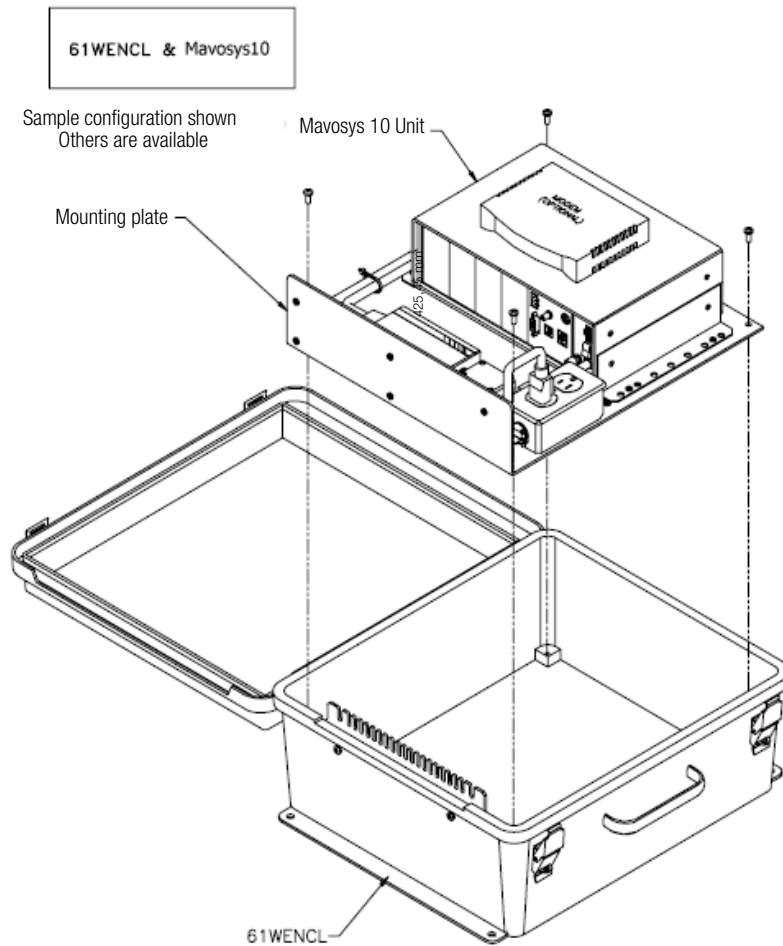
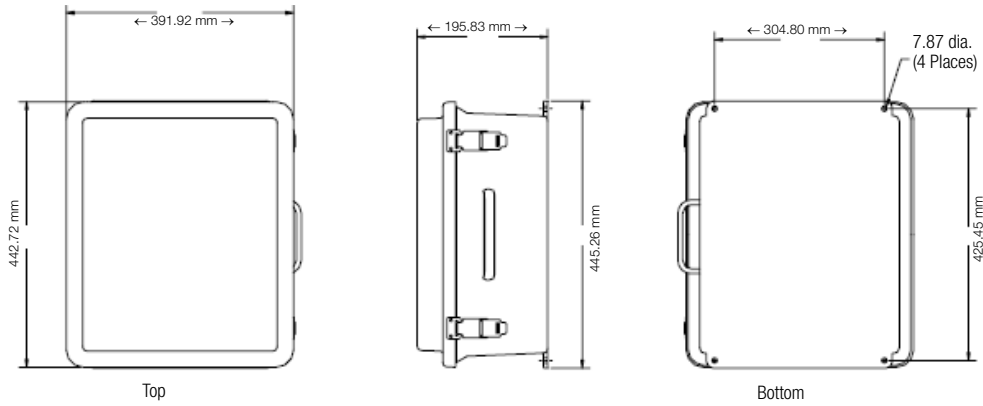


Figure 35 61WENCL outline dimensions

A.3.9 NEMA Enclosure Kit (61WENCL)

Actual photos of the 61WENCL are shown below.



Figure 36 NEMA Enclosure Kit (61WENCL)



Figure 37 Contained in NEMA Enclosure – 61STD unit connected to voltage and current input pods; power source assembly is shown on the right.

A.3.10 Dimensions for Mavosys 10 Single Module Unit (61VCM)

The diagram below shows the outline dimensions for the Mavosys 10 Series Single Module Unit – Voltage Compliance Monitor (61VCM).



Note

Outline dimensions are to be used for reference only, subject to change without notice. For questions, contact the GMC-I Messtechnik GmbH Product Support at +49 911 8602-0.

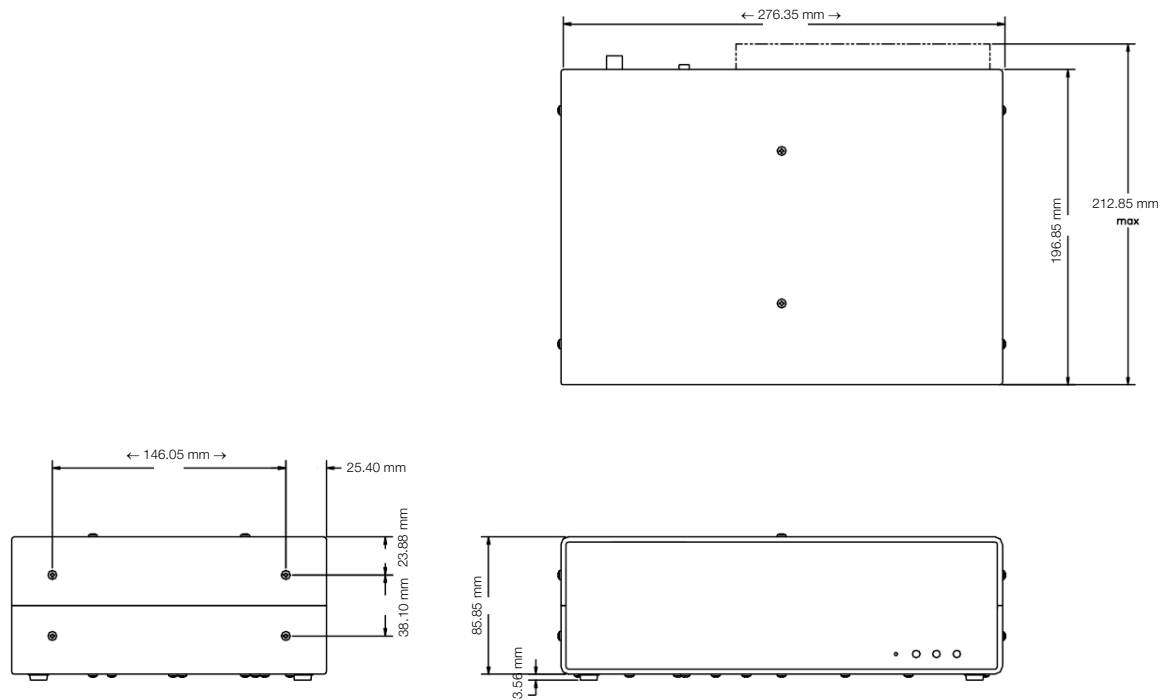


Figure 38 61 Single Module Unit (61VCM) outline dimensions

A.3.11 Single Module Enclosure Assembly (61VENCL)

Diagram below shows the enclosure assembly for the 61VCM unit called Single Module Enclosure Assembly (61VENCL). 61VENCL outline dimensions are shown in Chapter A.3.12 61VENCL Outline Dimensions on page 57.

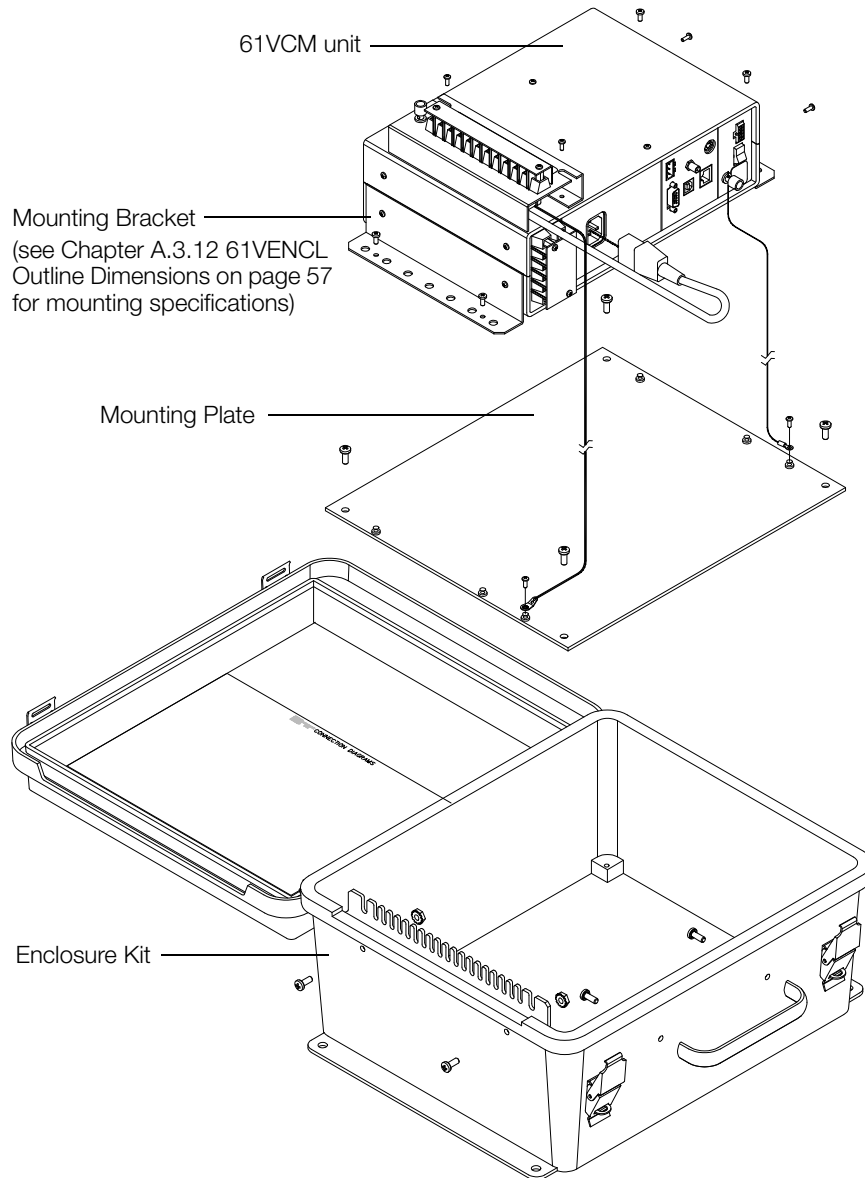



Figure 39 Single Module Enclosure Assembly

A.3.12 61VENCL Outline Dimensions

The diagram below shows the outline dimensions for the Single Module Enclosure Assembly (61VENCL).

 **Note**
Outline dimensions are to be used for reference only, subject to change without notice. For questions, contact the GMC-I Messtechnik GmbH Product Support at +49 911 8602-0.

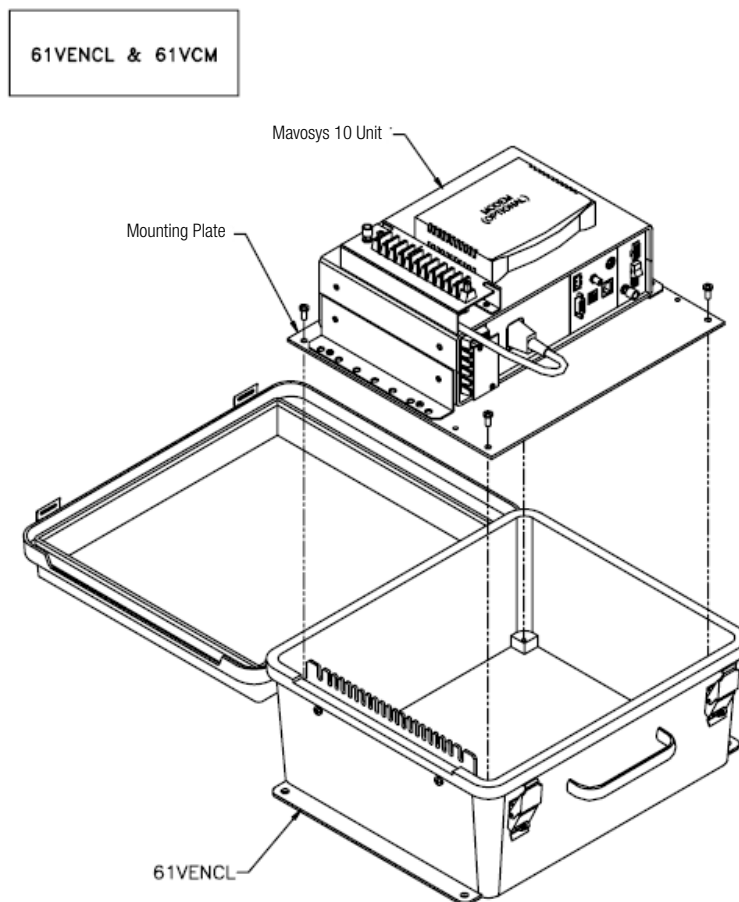
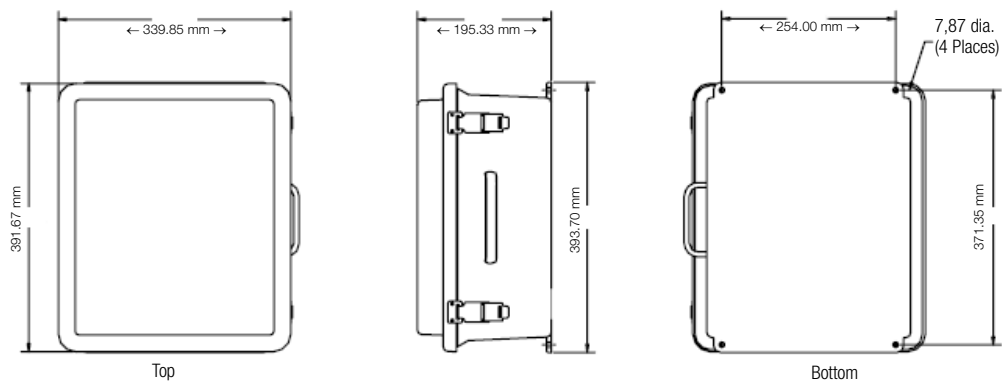


Figure 40 Single Module Enclosure Assembly

A.3.13 61BRKT Outline Dimensions

The diagram below shows the outline dimensions for the 61BRKT.



Note

Dimensions diagrams are to be used for reference only, subject to change without notice. For questions, contact the GMC-I Messtechnik GmbH Product Support at +49 911 8602-0.

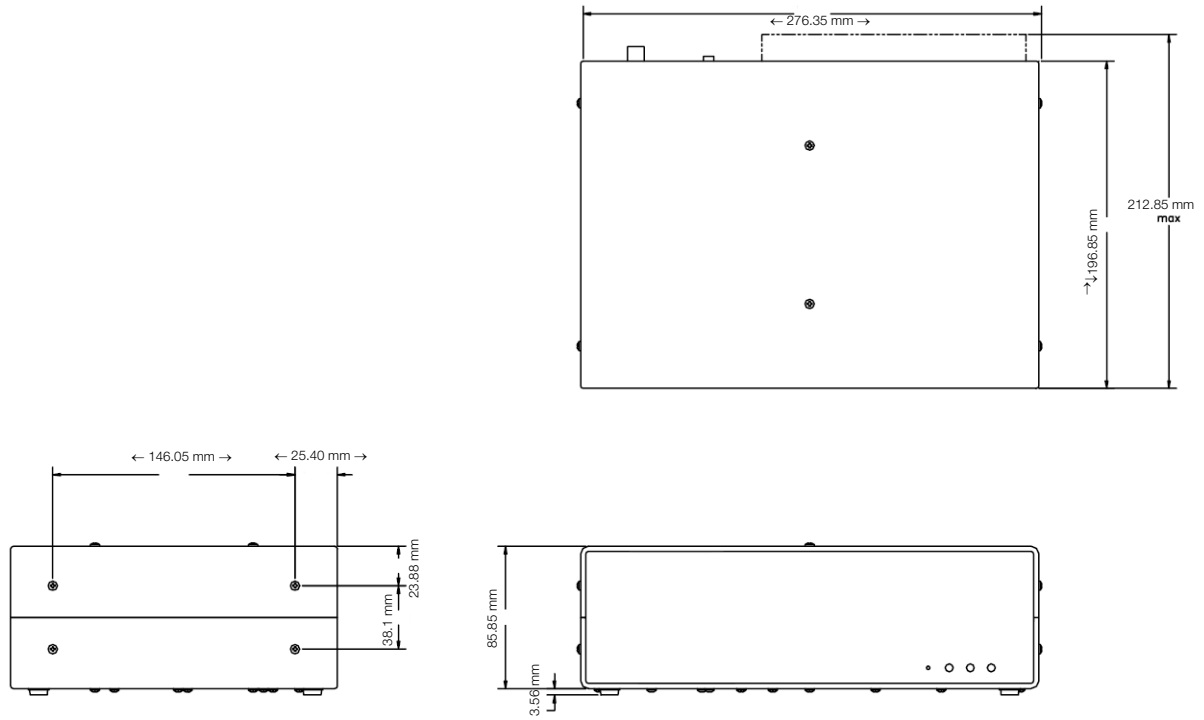
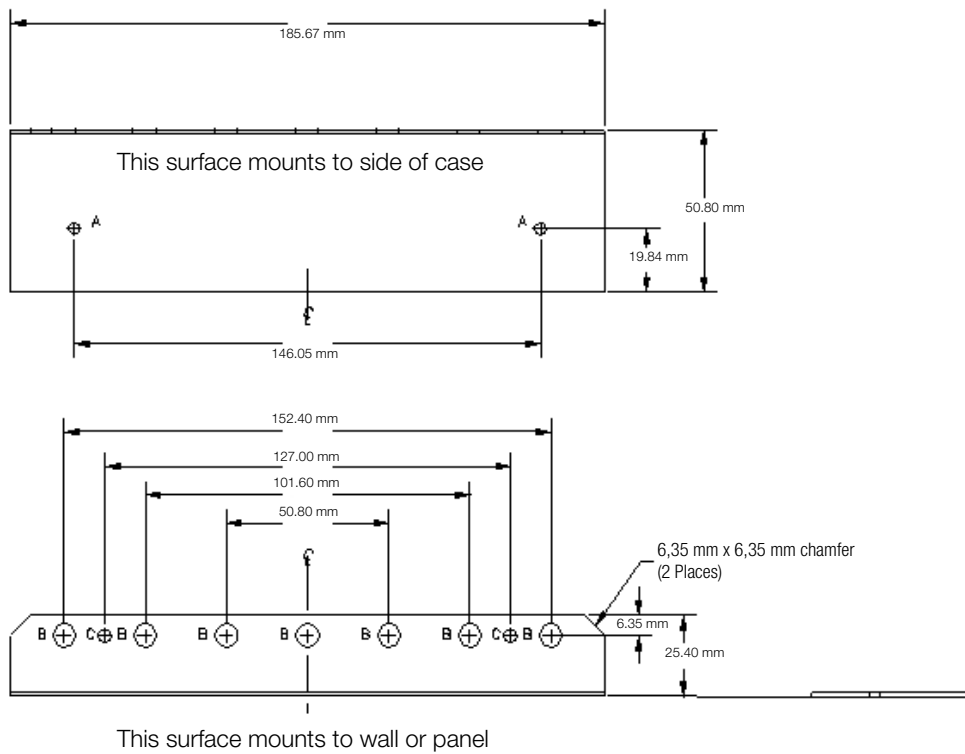


Figure 41 61BRKT outline dimensions

A.3.14 Mounting Bracket for 61VCM

Diagram below shows the distance specifications for the mounting brackets (61BRKT), necessary to mount the 61VCM to a surface wall or to the mounting plate in the enclosure assembly.



Hole Table

Hole	Description	Qty.
A	3.556 mm Dia.	2
B	7.137 mm Dia.	7
C	3.962 mm Dia.	2

Figure 42 61BRKT outline dimensions

A.4 Software Accessories List

A.4.1 Accessories List

Accessory	Part Number
Encore Series® Software	
Encore Series® Software	ENCORE-SW (Z820A)
Replacement HASP for Encore Series Software	117468-G1
PQView®	
PQView V3.x	PQVIEW

A.4.2 Encore Series® Software

Encore Series Software provides a centralized connection point for remote devices, turning your computer into a self-contained server for a user designed power monitoring network. Encore Series Software allows remote set up and operation of Mavosys 10. The user interface is a conventional Internet browser, with access restricted only to authorized users. The Encore Series Software program requires that the proper GMC-I Messtechnik GmbH computer hardware lock (called a HASP driver) be installed in the computer.

A.4.3 PQView®

PQView® is a database management program that is used to archive, view and analyze event data downloaded in the computer.

Appendix B Technical Specifications

B.1 General Specifications

B.1.1 Dimensions

Mavosys 10 without LCD panel

Size: 11.25" width x 3.5" height x 7 3/4" depth

Weight: 4 pounds

Mavosys 10 Standard (61STD) with LCD panel installed in 19" Rack

Size: 8" depth

Weight: 5 pounds

Mavosys 10 Switchgear (61SGD) with LCD panel installed in 19" Rack

Size: 7" width x 6.5" height x 8" depth

Weight: 10 pounds

B.1.2 Environmental

Operating: -10 to 60 °C (-15 to 140 °F)



Note

Operating range if optional local display is not included.

Storage: -40 to 85 °C (-40 to 185 °F)

Humidity: 95% non-condensing

Altitude: 3000m (9480 ft) maximum

B.1.3 System Time Clock

Time displayed in analog or digital (12 or 24 hour) format (*if optional local display is included*)

Resolution:

Events: 1 millisecond

Optional Local Display: 1 second

Clock Accuracy:

Without Synchronization: Internal clock is accurate to ± 30 seconds per month

Network Time Protocol: ± 10 msec or better, typical, depending on network traffic

Optional Internal GPS Receiver: ± 1 msec accuracy

B.1.4 Mains Supply

Installation Category II, Pollution Degree 2

B.1.5 Power Requirements

Use external UL/CE approved battery charger with international plugs.

For 61STD and 61VCM:

Voltage: 120/230Vac, 50/60 Hz, 12Vdc output

Consumption: 20 watts max

For 61SG and 61SGD:

Voltage: 90-250Vac, 47-63 Hz, 105-125Vdc output

Consumption: 30 watts max

Internal batteries: More than 1/4 hour run-time while communicating and backlight turned off (if optional local display is included).

Under normal use, the internal backup battery pack requires periodic replacement every 2 years.

Contact GMC-I Service GmbH Service Center for servicing.

B.1.6 Installation categories

Installation categories are defined as follows.

Installation Category	Definition
I	Connection or measurement that limits transient over-voltages to a low level. Examples: Electronic circuits that employ protective devices providing low level secondary outputs.
II	Connection or measurement at the local-level electrical distribution supplied by a fixed installation. Examples: Voltage level supplied by a standard wall outlet to power appliances or portable tools.
III	Connection or measurement at the entrance of the building installation where power is distributed within the environment at a fixed or permanent installation. Examples: Equipment such as circuit breakers, panel boxes and similar devices that are part of the fixed or permanent installation.
IV	Connection or measurement at the origin of the installation. Examples: Equipment such as electricity meters and primary overcurrent protection equipment.

Pollution Degree	Definition
2	Normally only non-conductive pollution occurs. Occasionally, temporary conductivity caused by condensation is to be expected.

B.1.7 Display interface (optional)

For Mavosys 10 with LCD panel

Operating: 0 to 50 °C (32 to 122 °F)

Type: 1/4 VGA color graphic, touch screen Liquid Crystal Display (LCD) with compact fluorescent (CCFL) backlighting. Programmable backlight time-out to reduce power consumption. Reactivates with touch.

Resolution: 360 x 240 dot matrix

Viewing Area: 3.75 x 4.75 inches

B.1.8 Communication

Connect to the Mavosys 10 mainframe using either of the following external interface:

- RJ-45 connector for Ethernet
- RS-485 for serial multi-drop connection
- RS232 9-PIN serial port connector to external modem
- USB connector (not activated at this time)
- GPS antenna cable connector
- Modem
- Wireless Modem

B.2 Measurement Parameters

B.2.1 Voltage

Type: AC Voltage Modules

Sampling rate: 512 samples per cycle

Connection:

Safety jack connectors (Model 61MVB)

Screw terminals (Model 61MVS – part number 117250-G1)

Voltage/Current external pod (Model 61MZP):

- 5536 voltage pod

Channels A, B, C, D Input Range: 0 – 600Vrms

Installation Category: CAT III, Pollution Degree 2

Input impedance: (Differential) 10 MW, minimum, Input to Ground on internal AC input configurations

Impedance: (line to line) 20 MW

Crest factor: Maximum 2.0 at full scale

RMS accuracy:

±0.1% of Reading, ±0.05% Full Scale, over 7KHz bandwidth (1 second rms readings) for low/medium frequency module
0.1% of Reading, over the nominal operating range of 50% to 100% Full Scale, as per 61000-4-30 Class A requirements, over the frequency range specified by 61000-4-30 Class A

Transient Duration: 32 usec standard at 60Hz; 39 usec at 50Hz

CMMR: -80 dB

Phase: Each voltage/current pair (i.e. Channel A voltage, Channel A current) are sampled simultaneously to preserve phase relationship

Frequency: Frequency ranges, user selectable

For standard model:

15 – 70 Hz for low frequency data, with 16 2/3, 20, 50 and 60 Hz defaults in Auto-Config

Type: AC Voltage Modules

Sampling rate: 512 samples per cycle

Connection:

- 5539 voltage pod

Channels A, B, C, D Input Range: 0 – 1000Vrms

Installation Category: CAT III, Pollution Degree 2, 1000Vrms
CAT IV, Pollution Degree 2, 600Vrms

Input impedance: (Differential) 20 MW, minimum, Input to Ground on internal AC input configurations

Impedance: (line to line) 40 MW

Crest factor: Maximum 2.0 at full scale

RMS accuracy:

±0.1% of Reading, ±0.05% Full Scale, over 7KHz bandwidth (1 second rms readings) for low/medium frequency module
0.1% of Reading, over the nominal operating range of 50% to 100% Full Scale, as per 61000-4-30 Class A requirements, over the frequency range specified by 61000-4-30 Class A

Transient Duration: 32 usec standard at 60Hz; 39 usec at 50Hz

CMMR: -80 dB

Phase: Each voltage/current pair (i.e. Channel A voltage, Channel A current) are sampled simultaneously to preserve phase relationship

Frequency: Frequency ranges, user selectable

For standard model:

15 – 70 Hz for low frequency data, with 16 2/3, 20, 50 and 60 Hz defaults in Auto-Config

B.2.2 Current

Type: AC Current Modules

Sampling rate: 512 samples per cycle

Connection:

Hypertronics connectors to interface to:

- TR25xx clamp-on current probes (Model 61MAC)
- Flex-core models via external cable adapter
- Hall-effect probe models via external cable adapter

Voltage/Current external pod (Model 61MZP):

- 553x current pod

Screw Terminal connection to:

Current Modules with Internal CTs – Model 61MAS1

- Part No.: 117715-G2
- Nominal Rating: 1 Amps
- Overload: 5X
- No. of Turns: 1000
- Internal Burden: 750 W
- VA Burden at nominal input: 0.00075 VA

Screw Terminal connection to:

Current Modules with Internal CTs – Model 61MAS5

- Part No.: 117715-G1
- Nominal Rating: 5 Amps
- Overload: 5X
- No. of Turns: 1000
- Internal Burden: 121 W
- VA Burden at nominal input: 0.00303 VA

Installation Category: CAT III, Pollution Degree 2

Channels A,B,C, D crest factor: Maximum of 3 at full scale

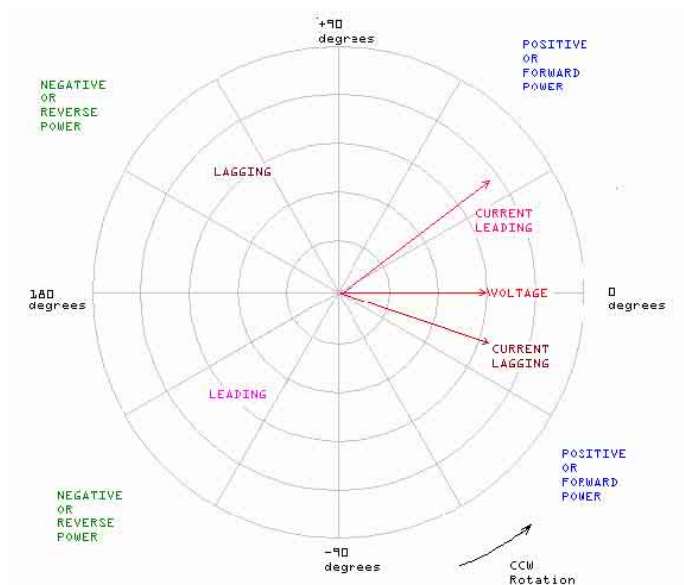
RMS accuracy: $\pm 0.1\%$ of Reading $\pm 0.05\%$ Full Scale plus Probe accuracy, 3KHz bandwidth (1 second rms readings) for low/medium frequency module

Transient accuracy: $\pm 10\%$ of Reading, $\pm 0.5\%$ Full Scale over 1MHz bandwidth for high frequency transient module

Transient Input: 3 times Probe Rated Nominal Input (GMC-I Messtechnik GmbH probes)

Transient Duration: depends on probe bandwidth

Power Accuracy: 0.2% W of reading typical for -0.8 to +0.8 PF, nominal voltage and 10% to nominal current; forward and reverse power flow.



B.2.3 Voltage Pods

Type: Voltage Pods

Connection:

Screw terminals (Model 5536 – part number 116850-G1)

Screw terminals (Model 5531 – part number 83004787-G2)

Input impedance: (Differential) 2 MW, minimum, Input to Ground

Impedance: (line to line) 4 MW

Installation Category: CAT III, Pollution Degree 2

B.2.4 Current Pods

Type: Current Pods

Ch 4 has TR connector to:

Current Pod – Model 5538

- Part No.: 116895-G1
- Nominal Rating: 5 Amps
- Overload: 5X
- No. of Turns: 1000
- Internal Burden: 121 W
- VA Burden at nominal input: 0.00303 VA

Screw Terminal connection to:

Current Pod – Model 5537

- Part No.: 116870-G1
- Nominal Rating: 5 Amps
- Overload: 5X
- No. of Turns: 1000
- Internal Burden: 121 W
- VA Burden at nominal input: 0.00303 VA

Screw Terminal connection to:

Current Pod – Model 5534

- Part No.: 116870-G2
- Nominal Rating: 1 Amps
- Overload: 5X
- No. of Turns: 1000
- Internal Burden: 750 W
- VA Burden at nominal input: 0.00075 VA

Current Tube pod connection to:

Current Pod – Model 5533

- Part No.: 116692-G1
- Nominal Rating: 5 Amps
- Overload: 20X
- No. of Turns: 600
- Internal Burden: 15 W
- VA Burden at nominal input: 0.00104 VA

Current Tube pod connection to:

Current Pod – Model 5532

- Part No.: 83004789-G2
- Nominal Rating: 5 Amps
- Overload: 5X
- No. of Turns: 1000
- Internal Burden: 121 W
- VA Burden at nominal input: 0.00303 VA

Installation Category: CAT III, Pollution Degree 2

B.2.5 Digital Input

Type: Digital Input Module (Model 61MDIN)

Connectors:

- Phoenix connector type with screw terminal

Digital Input Range:

- High state: > 3 Vdc
- Low state: < 1 Vdc
- Maximum input voltage: 150V ac or dc

Input impedance: >1 MW

Minimum Pulse Width: 1 msec

Installation Category: CAT III, Pollution Degree 2

B.3 Enclosure Ingress Protection Ratings

B.3.1 Model 61STD

Solids: 5

Liquids: 0

Mechanical: 1

IP Rating: IP 501

Display Type: Standard

B.3.2 Model 61VCM

Solids: 5

Liquids: 0

Mechanical: 1

IP Rating: IP 501

Display Type: Single voltage module

B.3.3 Model 61RMT

Solids: 5

Liquids: 0

Mechanical: 1

IP Rating: IP 501

Display Type: Rack mount no display

B.3.4 Model 61RMTD

Solids: 4

Liquids: 0

Mechanical: 0

IP Rating: IP 400

Display Type: Rack mount with display

B.3.5 Model 61WENCL

Solids: 5

Liquids: 3

Mechanical: 1

IP Rating: IP 501

Display Type: Fiberglass external enclosure

B.3.6 Model 116848-G1

Solids: 5

Liquids: 4

Mechanical: 2

IP Rating: IP 542

Display Type: Metal external enclosure

B.3.7 Model 61SGD

Solids: 4

Liquids: 0

Mechanical: 0

IP Rating: IP 400

Display Type: Rack mount with display

B.3.8 Model 61SG

Solids: 5

Liquids: 0

Mechanical: 1

IP Rating: IP 501

Display Type: Rack mount without display

Appendix C Connecting an External DC Power Supply

C.1 Introduction

An external dc source of power can be connected to the Mavosys 10 for normal operation. This may be required where ac power is not available or operation from the internal battery may extend past the batteries capability.

An external stand-alone +12Vdc power supply of at least 5 amps capacity may be used. Connection is made to the input power connector through an optional dc cable assembly.



Attention!

Physical injury or damage to the instrument could result from incorrect connections. Always observe correct polarity. Make connections to the Mavosys 10 first and then make connections to the external dc power source.



¡Atención!

Podrían producirse lesiones físicas o daños al instrumento debido a conexiones incorrectas. Siempre observe la polaridad correcta. Efectúe primero las conexiones al Mavosys 10 y luego haga las conexiones a la fuente de energía de corriente continua externa.



Attention!

Des connexions incorrectes risquent de causer des blessures aux personnes ou l'endommagement du matériel. Observez toujours la polarité correcte. Faites les connexions au Mavosys 10 en premier, puis branchez sur la source d'alimentation c.c. externe.



Achtung!

Falsche Verbindungen können zu Verletzungen oder Schäden am Gerät führen. Immer auf richtige Polarität achten. Zuerst Anschlüsse mit dem Mavosys 10 und dann Anschlüsse mit der externen Gleichspannungsquelle vornehmen.

C.1.1 Fuses

Internal 12V dc circuitry is protected by resettable fuses mounted on the internal power supply. These fuses will operate when an excessive external 12V voltage is applied or when a fault condition within the internal circuit is experienced. To reset the fuse, turn power off to the Mavosys 10, disconnect the 12V power cord, wait 5 seconds, then reconnect.

C.2 Connecting the DC Input Cable



Attention!

Physical injury, or equipment damage could result if the cable is connected incorrectly. Verify all connections are correct before proceeding.



¡Atención!

Podrían producirse lesiones físicas o daños al equipo si se conecta incorrectamente el cable. Compruebe que todas las conexiones estén correctas antes de proceder.



Attention!

Une connexion incorrecte du câble risque de causer des blessures aux personnes ou l'endommagement du matériel. Vérifiez que toutes les connexions sont correctes avant de poursuivre.



Achtung!

Bei einem falschen Anschluss des Kabels kann es zu Verletzungen oder Schäden am Gerät kommen. Vor dem Fortfahren überprüfen, ob alle Anschlüsse ordnungsgemäß vorgenommen wurden.

C.2.1 External power source

The external power source is 12 V DC.

C.2.2 Connecting the cable

Follow these steps when connecting the DC cable to the Mavosys 10.

Step	Action
1	Turn off power to Mavosys 10.
2	Turn off power to external power source.
3	Disconnect ac power cable connected to Mavosys 10 input power connector. Connect plug of dc cable to Mavosys 10 input power connector.
4	If external power supply is used, turn on its power. If power supply is adjustable, set output to 12V dc
5	Connect dc cable alligator clips to external power source (battery or power supply). Red leads to positive (+) terminal and black leads to negative (-) terminal.
6	Turn on power to the Mavosys 10.

C.2.3 Disconnecting the cable

When external DC power is no longer required, perform the connecting procedure above in reverse order.

Appendix D External Ferrite Clamp-On

D.1 Installing External Ferrite Clamps

D.1.1 Introduction

This section describes how to install an external ferrite clamp-on (P/N 115346-G1) that is required when the Mavosys 10 mainframe is configured with more than 2 modules. When the mainframe is equipped with more than 2 modules this filter is required for any slots that are configured for modules 61MVS, 61MVB, or 61MDIN to meet emissions/immunity compliance requirements. For these factory configurations, a ferrite clamp-on is supplied for each applicable module to be installed over factory or customer-supplied wires as described in this section.



Attention!

Disconnect all power sources connected to the instrument before installation of filter parts.



Caution!

This equipment has been tested and found to comply with emissions and/or immunity requirements. The ferrite clamp-on must be installed before operating the equipment since failure to do so may result in undesired interference.

D.1.2 Installation Procedure

61MVB Module

STEP 1: The clamp-on ferrite (P/N 115346-G1) is supplied with both halves secured. Unsnap the halves of the ferrite clamp-on and open it.

STEP 2: Place ferrite clamp-on over all wires to the module so that all wires pass through the center.

STEP 3: Snap the ferrite clamp-on closed until it is fully secured.

Actual photo below shows the ferrite clamp-on properly installed for 61MVB Module.



61MVS Module

STEP 1: The clamp-on ferrite (P/N 115346-G1) is supplied with both halves secured. Unsnap the halves of the ferrite clamp-on and open it.

STEP 2: Place ferrite clamp-on over all wires to the module so that all wires pass through the center.

STEP 3: Snap the ferrite clamp-on closed until it is fully secured.

Actual photo below shows the ferrite clamp-on properly installed for 61MVS Module.



61MDIN Module

STEP 1: The clamp-on ferrite (P/N 115346-G1) is supplied with both halves secured. Unsnap the halves of the ferrite clamp-on and open it.

STEP 2: Place all wires through the center of the first ferrite half and then wrap the wires around the first core half. Continue to wrap the wires around the second core half making sure that the wires pass through the center of the filter.

STEP 3: Snap the ferrite clamp-on closed until it is fully secured.

Actual photo below shows the ferrite clamp-on properly installed for 61MDIN Module.



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 **GOSSEN METRAWATT**
GMC-I Messtechnik GmbH
Südwestpark 15
90449 Nürnberg • Germany

Phone +49 911 8602-111
Fax +49 911 8602-777
E-Mail info@gossenmetrawatt.com
www.gossenmetrawatt.com