

# HUSSMANN®

## MagPak™ Energy Meter



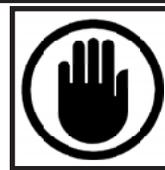
## *User Manual*

May 2017



## BEFORE YOU BEGIN

Read these instructions completely and carefully.



### CAUTION

This manual was written in accordance with originally prescribed equipment that is subject to change. Hussmann reserves the right to change all or part of the equipment for future stores such as, but not limited to, controllers, valves and electrical specifications. It is the installers responsibility to reference the refrigeration drawings supplied for each installation, as directed by the Engineer of Record.



### WARNING

#### PERSONAL PROTECTION EQUIPMENT (PPE)

Only qualified personnel should install and service this equipment. Personal Protection Equipment (PPE) is required whenever servicing this equipment. Always wear safety glasses, gloves, protective boots or shoes, long pants, and a long-sleeve shirt when working with this equipment. Observe all precautions on tags, stickers, labels and literature attached to this equipment.

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Hussmann nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Hussmann software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

## Safety information

### Important information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

#### **DANGER**

**DANGER** indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

#### **WARNING**

**WARNING** indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

#### **CAUTION**

**CAUTION** indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

#### **NOTICE**

**NOTICE** is used to address practices not related to physical injury.

### Please note

Electrical equipment should be installed, operated, serviced and maintained only by qualified personnel. No responsibility is assumed by Hussmann for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

## Notices

### FCC Part 15 notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This Class B digital apparatus complies with Canadian ICES-003.

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## About the manual

### Document scope

This manual is intended for use by designers, system builders and maintenance technicians with an understanding of electrical distribution systems and monitoring devices.

### Validity note

The meters are used to measure the amount of active energy consumed by an installation or a part of an installation.

This function meets the requirements for:

- consumption monitoring,
- evaluation of energy items (cost, accounting, etc.).

This function may also satisfy the power-saving incentives implemented by many countries.

# Contents

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	Safety information .....	4
	Notices .....	5
	About the manual .....	6
	Contents .....	7
<b>Chapter 1</b>	<b>Safety precautions .....</b>	<b>9</b>
<b>Chapter 2</b>	<b>Overview .....</b>	<b>10</b>
	Overview of meter functions .....	10
	Typical applications .....	10
<b>Chapter 3</b>	<b>Hardware and installation .....</b>	<b>11</b>
	Safety precautions .....	11
	Meter sealing points .....	11
	Input, output and communications wiring considerations .....	12
	Dismounting the meter from a DIN rail .....	12
<b>Chapter 4</b>	<b>Front panel display and meter setup .....</b>	<b>13</b>
	Overview .....	13
	Data display .....	14
	Resets .....	15
	Meter status information .....	16
	Meter information .....	16
	The device clock .....	16
	Device configuration .....	18
	Modifying parameters .....	19
	Configuration mode menus .....	20
<b>Chapter 5</b>	<b>Communications via Modbus .....</b>	<b>22</b>
	Modbus communication overview .....	22
	Modbus functions .....	23
	Command interface .....	24
	Modbus register list .....	27

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<b>Chapter 6 Specifications .....</b>	<b>33</b>
Electrical characteristics .....	33
Mechanical characteristics .....	33
Environmental characteristics .....	34
Measurement accuracy .....	34
Modbus communications .....	35
<b>Chapter 7 Troubleshooting .....</b>	<b>36</b>
Diagnosis screen .....	36
Diagnostic codes .....	37

# Chapter 1 Safety precautions

Installation, wiring, testing and service must be performed in accordance with all local and national electrical codes.

Carefully read and follow the safety precautions outlined below.

## **DANGER**

### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E in the USA, CSA Z462 or applicable local standards.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested and tagged. Pay particular attention to the design of the power system. Consider all power supply sources, particularly the potential for backfeed.
- Replace all devices, doors and covers before turning on power to this equipment.
- Do not exceed the device's ratings for maximum limits.

**Failure to follow these instructions will result in death or serious injury.**

## **WARNING**

### **UNINTENDED OPERATION**

Do not use the meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

**Failure to follow these instructions can result in death, serious injury or equipment damage.**

## **WARNING**

### **INACCURATE DATA RESULTS**

- Do not rely solely on data displayed on the front panel or in software to determine if the device is functioning correctly or compliant with all applicable standards.
- Do not use data displayed on the front panel or in software as a substitute for proper workplace practices or equipment maintenance.

**Failure to follow these instructions can result in death, serious injury or equipment damage.**

# Chapter 2 Overview

## Overview of meter functions

The meters provide the essential measurement capabilities (for example, current, voltage, and energy) required to monitor a 1- or 3-phase electrical installation.

The key features of the meters are:

- Measurement of active energy,
- Display (current, voltage, and energy measurements),
- Communications via Modbus

## Typical applications

This meter is a cost effective solution to monitor feeder circuits. This meter can monitor energy consumption by usage, by zone or by feeder in the cabinet. It can be used to monitor feeders in a main switchboard or to monitor the main in a distribution cabinet.

## Functions/Advantages

Functions	Advantages
Can directly measure feeders up to: 125 A Embedded current transformers (CTs)	Saves installation time and space in the cabinet No wiring to manage Clear distribution network
Can be used for single-phase multi-circuit monitoring	3 single feeders can be monitored with a single meter

## Chapter 3 Hardware and installation

This section provides supplemental information to help mount and install your meter. It is intended to be used in conjunction with the installation sheet that ships in the box with your meter. See your device's installation sheet for information related to installation, such as dimensions, mounting and wiring instructions.

### Safety precautions

Installation, wiring, testing and service must be performed in accordance with all local and national electrical codes.

#### DANGER

##### HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E in the USA, CSA Z462 or applicable local standards.
- Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
- Use only split-core LVCT or Rogowski Coil current sensors which provide reinforced insulation rated for the nominal voltage of the system to be measured and measurement category CAT III or CAT IV.
- Use only split-core LVCT or Rogowski Coil current sensors which comply with the IEC/EN/UL/CSA 61010-1 or IEC/EN/UL/CSA 61010-2-032 standard.
- Always follow the current sensor installation instructions provided by the current sensor manufacturer.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- Do not exceed the device's ratings for maximum limits.
- Do not touch the current terminal when the meter is energized.

**Failure to follow these instructions will result in death or serious injury.**

1. Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
2. Always use a properly rating voltage sensing device to confirm that all power is off.

### Meter sealing points

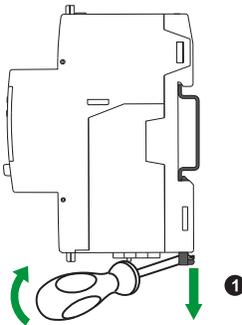
All meters have sealing covers and sealing points to help prevent access to inputs and outputs and current and voltage connections.

## Input, output and communications wiring considerations

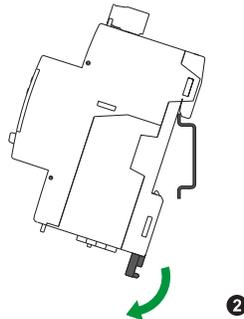
- The pulse output is compatible with S0 format, and the programmable digital output is compatible with S0 format when configured as a pulse output.
- The digital input and output are electrically independent.
- The digital output is polarity-independent.

## Dismounting the meter from a DIN rail

1. Use a flat-tip screwdriver ( $\leq 6.5$  mm / 0.25 in) to lower the locking mechanism and release the meter.

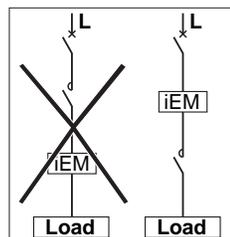


2. Lift the meter out and up to free it from the DIN rail.



## Considerations when associated with a contactor

- When the meter is associated with a contactor, connect the meter upstream of the contactor.
- The meter must be protected by a circuit breaker.



# Chapter 4 Front panel display and meter setup

## Overview

The meter features a front panel with signaling LEDs, a graphical display, and menu buttons that allow you to access the information required to operate the meter and modify parameter settings.

The front panel also allows you to display, configure and reset parameters.

Some meters have the Multi Tariff feature, which allows you to configure different tariffs.

## Data display

### Data display screen overview

The diagram shows a graphical display screen with the following elements and callouts:

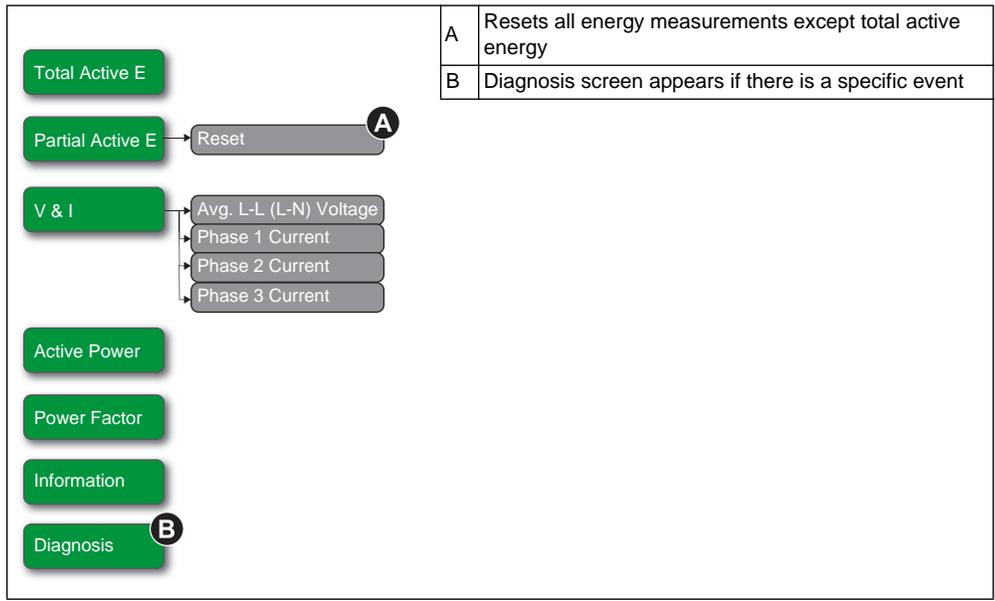
- A:** Points to the measurement text "Total Ea Import".
- B:** Points to the measurement category "Ea / Er = active / reactive energy (if available)".
- C:** Points to the numerical value "1234.5".
- D:** Points to the active tariff "T1".
- E:** Points to the scroll-through button (downward arrow).
- F:** Points to the OK button.
- G:** Points to the ESC button.
- H:** Points to the date and time "23 Apr 2014 12:00".
- I:** Points to the unit "kWh".
- J:** Points to an exclamation mark icon in the top right corner.

A	Measurement
B	Ea / Er = active / reactive energy (if available)
C	Value
D	Active tariff (if applicable)
E	Scroll through the available screens
F	View more screens related to the measurement category (if available)
G	Go back to previous screen
H	Date and time (if applicable)
I	Unit
J	Icon indicating date / time are not set

**Related topics**

- See “Data display screens” on page 14 for information on the screens available on each meter model.

**Data display screens**



**Related topics**

- See “Troubleshooting” on page 37 for more information on the Diagnosis screen and a list of diagnostic codes.
- See “Resets” on page 16 for more information on meter resets.

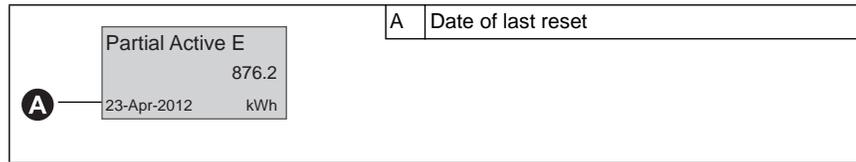
## Resets

The following resets are available

Reset	Description
Partial energy	Clears all active and reactive energy accumulated since the last reset. this does not reset the total active and reactive energy accumulation.
Input metering	Clears all input metering energy data. you can only reset the input metering accumulation using software.

### Resetting accumulated energy using the display

1. Navigate to the **Partial Active E** or **Partial Reactive E** screen. The screen displays the date of the last reset. For example:



2. Press and hold **ESC**. The **Reset** screen appears.
3. Press **OK** to confirm the reset and enter the meter password when prompted.

**NOTE:** Regardless of the screen you use to access this reset, accumulations of both Partial Active Energy and the Partial Reactive Energy (if available) are cleared.

### Related topics

- See your software documentation for information on resetting the input metering accumulation.

## Meter status information

Two LEDs on the front panel indicate the current status of the device: the green status LED and the yellow energy pulsing LED.

The icons in the table below indicate the LED state as follows:

-  = LED is off
-  = LED is on
-  = LED is flashing

Status LED	Energy pulsing LED	Description
		Off
	 1s > 	On, no pulse counting
		On, with pulse counting
		Error, pulse counting stopped
		Abnormal, with pulse counting

### Related topics

See the section for the protocol of your device for information on the communication LED:

- “Troubleshooting” on page 37
- “Communications LED indicator for Modbus devices” on page 23
- 
- 
- 

## Meter information

Meter information (for example, model and firmware version) is available on the information screen. In display mode, press the down arrow until you reach the information screen:



## The device clock

You must reset the time to account for any time change (for example, to switch the time from standard time to daylight savings time).

## Clock behavior

You are not prompted to set the date and time when the meter is powered up. You can enter configuration mode to set the date and time. If you have not set the clock, the following icon appears on the display  .

When power is interrupted, the date and time are reset and you must enter configuration mode to configure the clock, if you require time information.

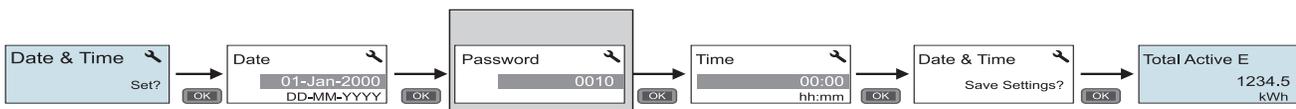
## Date/time format

The date is displayed in the following format: DD-MMM-YYYY.

The time is displayed using the 24-hour clock in the following format: hh:mm:ss.

## Setting the clock initially

The following diagram illustrates how to set the clock when you initially power up the device or after a power failure. To set the clock during normal operation, see the section on device configuration.



**NOTE:** Password entry is only required for meters that support a password.

## Related topics

- See [""](#) on page 18 for information on setting the clock during normal device operation.

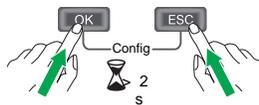
## Device configuration

The default factory settings (as applicable based on your model) are listed in the following table:

Menu	Factory settings
Wiring	3PH4W
CT Ratio	Varies depending on meter model
CT & VT Ratio	Varies depending on meter model
Frequency	50 Hz
Date	1-Jan-2000
Time	00:00:00
Overload Alarm	Disable
Digital Output	Disable
Digital Input	Input Status
Pulse Output	100 imp / kWh
Communication	Varies depending on protocol
Com.Protection	Enable
Contrast	5
Password	0010

### Entering configuration mode

1. Press and hold **OK** and **ESC** at the same time for about 2 seconds.
2. Enter the meter password, if prompted. The **Access Counter** screen displays, indicating the number of times the configuration mode has been accessed.



### The front panel display in configuration mode

The diagram below illustrates the various elements of the display in configuration mode:

	A	Parameter
	B	Setting
	C	Indicates that the setting impacts the Multi Tariff feature
	D	Configuration mode icon

### Related topics

- See “Modifying parameters” on page 20 for instructions on using the front panel buttons to configure list and numeric value settings.
- See “Configuration mode menus” on page 21 for a diagram of your device’s configuration screens.

## Com. Protection setting

For meters with communications capabilities, you can enable or disable the Com. Protection setting. If this setting is enabled, you must use the display to configure certain settings (for example, wiring or frequency, etc.) and perform resets; you cannot use communications.

The protected settings and resets are:

- Power system settings (for example, wiring, frequency, CT ratios)
- Date and time settings
- Multi-tariff settings
- Communications settings
- Partial energy reset

## Modifying parameters

There are two methods for modifying a parameter, depending on the type of parameter:

- selecting a value in a list (for example, selecting 1PH2W L-N from a list of available power systems), or
- modifying a numerical value, digit by digit (for example, entering a value for the date, time or VT primary).

**NOTE:** Before you modify any parameters, ensure that you are familiar with the HMI functionality and navigation structure of your device in configuration mode.

### Related topics

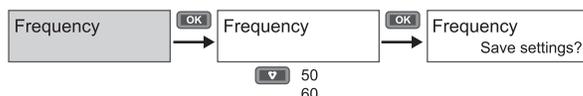
- See “Configuration mode menus” on page 21 for information on navigating the configuration menus on your device.

## Selecting a value from a list

1. Use the down button to scroll through the parameter values until you reach the desired value.
2. Press **OK** to confirm the new parameter value.

### Example: Configuring a list value

To set the nominal frequency of the meter:



1. Enter configuration mode and press the down button until you reach **Frequency** then press **OK** to access the frequency configuration.
2. Press the down button to select the frequency you want then click **OK**. Press **OK** again to save your changes.

## Modifying a numerical value

When you modify a numerical value, the digit on the far right side is selected by default (except for Date/Time).

The parameters listed below are the only ones for which you set a numerical value (if the parameter is available on your device):

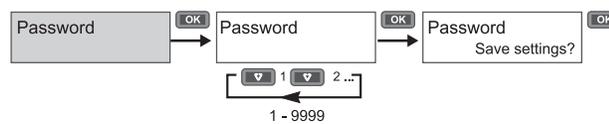
- Date
- Time
- Pick Up Value for an overload alarm
- Voltage Transformer (VT) Primary
- Current Transformer (CT) Primary
- Password
- Address of the meter

To modify a numerical value:

1. Use the down button to modify the selected digit.
2. Press **OK** to shift to next digit. Modify the next digit, if needed, or press okay to move to the next digit. Continue to move through the digits until you reach the last digit then press **OK** again to confirm the new parameter value.  
If you enter an invalid setting for the parameter, when you press **OK** after setting the left-most number, the cursor shifts back to the right-most number so you can enter a valid value.

### Example: configuring a numeric value

To set the password:



1. Enter configuration mode and press the down button until you reach **Password** then press **OK** to access the password configuration.
2. Press the down button to increment the selected digit or press **OK** to move to the next digit to the left. When you reach the left-most digit, press **OK** to move to the next screen. Press **OK** again to save your changes.

### Canceling an entry

To cancel the current entry, press the **ESC** . The change is canceled and the button screen reverts to the previous display.

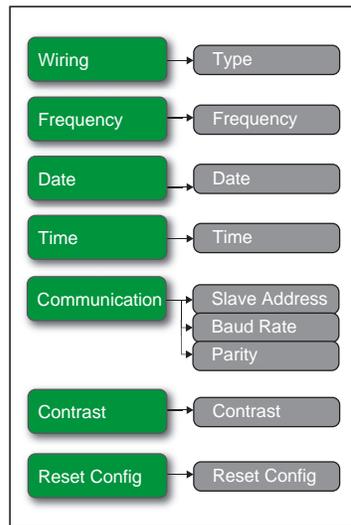
## Configuration mode menus

The diagrams below show the configuration navigation for each device.

### Related topics

- See “Modifying parameters” on page 20 for instructions on how to change settings.

## Configuration menu



Section	Parameter	Options	Description
Wiring	Type	3PH4W 1PH2W L-N 1PH2W L-L 1PH3W L-L-N 3PH3W 1PH4W Multi L-N	Select the power system type the meter is wired to.
Frequency	Frequency	50 60	Select the frequency of the electrical power system, in Hz.
Date	Date	DD-MMM-YYYY	Set the current date using the specified format.
Time	Time	hh:mm	Set the time using the 24-hour format.
Communication	Slave Address	1 - 247	Set the address for this device. The address must be unique for each device in a communications loop.
	Baud Rate	19200 38400 9600	Select the speed for data transmission. The baud rate must be the same for all devices in a communications loop.
	Parity	Even Odd None	Select None if the parity bit is not used. The parity setting must be the same for all devices in a communications loop. <b>NOTE:</b> Number of stop bits = 1.

Section	Parameter	Options	Description
Contrast	Contrast	1-9	Increase or decrease the value to increase or decrease the display contrast.
Reset Config	Reset Config	—	Settings are reset to their defaults, except for Password. Meter restarts.

# Chapter 5 Communications via Modbus

## Modbus communication overview

The information in this section assumes that you have an advanced understanding of Modbus communications, your communications network and the power system that your meter is connected to.

There are three different ways of using Modbus communication:

- by sending commands using the command interface (see “Command interface overview” on page 25)
- by reading the Modbus registers (see “Modbus register list” on page 28)
- by reading Device Identification (see “” on page 33)

## Modbus communications settings

Before communicating with the device using Modbus protocol, use the display to configure the following settings:

Settings	Possible values
Baud rate	9600 Baud 19 200 Baud 38 400 Baud
Parity	Odd Even None <b>NOTE:</b> number of stop bits = 1
Address	1–247

## Communications LED indicator for Modbus devices

The yellow communications LED indicates the status of communication between the meter and the master as follows:

If...	Then...
The LED is flashing	Communication with the device has been established. <b>NOTE:</b> If there is an error online, the LED also flashes.
The LED is off	There is no active communication between the master and the slave

### Related topics

- For more information on the Modbus protocol, see the Modbus organization website at [www.modbus.org](http://www.modbus.org).
- See “Meter sealing points” on page 11 for the location of the communications LED.

## Modbus functions

### Function list

The table below lists the supported Modbus functions:

Function code		Function name
Decimal	Hexadecimal	
3	0x03	Read Holding Registers
16	0x10	Write Multiple Registers
43/14	0x2B/0x0E	Read Device Identification

For example:

- To read different parameters from the meter, use function 3 (Read).
- To change the tariff, use function 16 (Write) to send a command to the meter.

### Table format

Register tables have the following columns:

Register Address	Action (R/W/WC)	Size	Type	Units	Range	Description
------------------	-----------------	------	------	-------	-------	-------------

- *Register Address*: Modbus address of register encoded in the Modbus frame, in decimal (dec)
- *Action*: The read/write/write by command property of the register
- *Size*: The data size in Int16
- *Type*: The encoding data type
- *Units*: The unit of the register value
- *Range*: The permitted values for this variable, usually a subset of what the format allows
- *Description*: Provides information about the register and the values that apply

### Unit table

The following data types appear in the Modbus register list:

Type	Description	Range
UInt16	16 bit unsigned integer	0 – 65535
Int16	16 bit signed integer	-32768 to +32767
UInt32	32 bit unsigned integer	0 – 4 294 967 295
Int64	64 bit unsigned integer	0 – 18 446 744 073 709 551 615
UTF8	8 bit field	multibyte character encoding for Unicode
Float32	32 bit value	Standard representation IEEE for floating number (with single precision)
Bitmap	—	—
DATETIME	See below	—

DATETIME format:

Word	Bits																
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
1	Reserved (0)								R4 (0)	Year (0 – 127)							
2	0				Month (1 – 12)				WD (0)				Day (1 – 31)				
3	SU (0)	0		Hour (0 – 23)				iV	0	Minute (0 – 59)							

Word	Bits															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4	Millisecond (0 – 59999)															
R4 :	Reserved Bit															
Year :	7 bits (year from 2000)															
Month :	4 bits															
Day :	5 bits															
Hour :	5 bits															
Minute :	6 bits															
Millisecond :	2 octets															
WD (day of the week) :	1–7: Sunday–Saturday															
SU (summer time) :	Bit to 0 if this parameter is not used.															
IV (validity of received data) :	Bit to 0 if this parameter is not valid or not used.															

## Command interface

### Command interface overview

The command interface allows you to configure the meter by sending specific command requests using Modbus function 16.

### Command request

The following table describes a Modbus command request:

Slave Number	Function Code	Command block		CRC
		Register Address	Command Description	
1–247	16	5250 (up to 5374)	The command is made of a command number and a set of parameters. See the detailed description of each command in the command list. <b>NOTE:</b> All the reserved parameters can be considered as any value, e.g. 0.	Checking

The following table describes the command block:

Register Address	Content	Size (Int16)	Data (example)
5250	Command Number	1	2008 (Set Tariff)
5251	(Reserved)	1	0
5252–5374	Parameter	n	4 (Tariff=4) <b>NOTE:</b> Command number 2008 supports only one parameter with the size of 1.

### Command result

The command result can be obtained by reading registers 5375 and 5376.

The following table describes the command result:

Register Address	Content	Size (Int16)	Data (example)
5375	Requested Command Number	1	2008 (Set Tariff)
5376	Result Command result codes: – 0 = Valid Operation – 3000 = Invalid Command – 3001 = Invalid Parameter – 3002 = Invalid Number of Parameters – 3007 = Operation Not Performed	1	0 (Valid Operation)

**Command list****Set Date/Time**

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
1003	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	2000–2099	Year
	W	1	UInt16	—	1–12	Month
	W	1	UInt16	—	1–31	Day
	W	1	UInt16	—	23	Hour
	W	1	UInt16	—	0–59	Minute
	W	1	UInt16	—	0–59	Second
	W	1	UInt16	—	—	(Reserved)

## Set Wiring

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
2000	W	1	UInt16	–	–	(Reserved)
	W	1	UInt16	–	–	(Reserved)
	W	1	UInt16	–	–	(Reserved)
	W	1	UInt16	–	0, 1, 2, 3, 11,13	Power System Configuration 0 = 1PH2W L-N 1 = 1PH2W L-L 2 = 1PH3W L-L-N 3 = 3PH3W 11 = 3PH4W 13 = 1PH4W L-N
	W	1	UInt16	Hz	50, 60	Nominal Frequency
	W	2	Float32	–	–	(Reserved)
	W	2	Float32	–	–	(Reserved)
	W	2	Float32	–	–	(Reserved)
	W	1	UInt16	–	–	(Reserved)
	W	1	UInt16	–	–	(Reserved)
	W	2	Float32	V	VT Secondary– 1000000.0	VT Primary
	W	1	UInt16	V	100, 110, 115, 120	VT Secondary
	W	1	UInt16	–	1, 2, 3	Number of CTs
	W	1	UInt16	A	1–32767	CT Primary
					5000	N/A
	W	1	UInt16	mV	333, 1000	N/A
				uV/kA/ Hz	1167	N/A
	W	1	UInt16	–	–	(Reserved)
	W	1	UInt16	–	–	(Reserved)
	W	1	UInt16	–	–	(Reserved)
	W	1	UInt16	–	–	(Reserved)
	W	1	UInt16	–	0, 1, 2	VT Connection type: 0 = Direct Connect 1 = 3PH3W (2 VTs) 2 = 3PH4W (3 VTs)

### Communications Setup

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
5000	W	1	UInt16	–	–	(Reserved)
	W	1	UInt16	–	–	(Reserved)
	W	1	UInt16	–	–	(Reserved)
	W	1	UInt16	–	1–247	Address
	W	1	UInt16	–	0, 1, 2	Baud Rate 0 = 9600 1 = 19200 2 = 38400
	W	1	UInt16	–	0, 1, 2	Parity 0 = Even 1 = Odd 2 = None
	W	1	UInt16	–	–	(Reserved)

### Reset Partial Energy Counters

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
2020	W	1	UInt16	–	–	(Reserved) Partial Active Energy and Phase Energy registers will be reset.

## Modbus register list

### System

Register Address	Action (R/W/WC)	Size	Type	Units	Description
30	R	20	UTF8	–	Meter Name
50	R	20	UTF8	–	Meter Model
70	R	20	UTF8	–	Manufacturer
130	R	2	UInt32	–	Serial Number
132	R	4	DATETIME	–	Date of Manufacture
136	R	5	UTF8	–	Hardware Revision
1637	R	1	UInt16	–	Present Firmware Version (DLF format): X.Y.ZTT
1845–1848	R/WC	1 X 4	UInt16	–	Date/Time Reg. 1845: Year (b6:b0) 0–99 (year from 2000 to 2099) Reg. 1846: Month (b11:b8), Weekday (b7:b5), Day (b4:b0) Reg. 1847: Hour (b12:b8), Minute (b5:b0) Reg. 1848: Millisecond

## Meter Setup and Status

Register Address	Action (R/W/WC)	Size	Type	Units	Description
2004	R	2	UInt32	Second	N/A
2014	R	1	UInt16	–	Number of Phases
2015	R	1	UInt16	–	Number of Wires
2016	R/WC	1	UInt16	–	Power System 0 = 1PH2W L–N 1 = 1PH2W L–L 2 = 1PH3W L–L with N 3 = 3PH3W 11 = 3PH4W 13 = 1PH4W multi L with N
2017	R/WC	1	UInt16	Hz	Nominal Frequency
2025	R	1	UInt16	–	N/A
2026	R/WC	2	Float32	V	N/A
2028	R/WC	1	UInt16	V	N/A
2029	R/WC	1	UInt16	–	N/A
2030	R/WC	1	UInt16	A	N/A
2031	R/WC	1	UInt16	A	N/A
2036	R/WC	1	UInt16	–	N/A

## Command Interface

Register Address	Action (R/W/WC)	Size	Type	Units	Description
5250	R/W	1	UInt16	–	Requested Command
5252	R/W	1	UInt16	–	Command Parameter 001
5374	R/W	1	UInt16	–	Command Parameter 123
5375	R	1	UInt16	–	Command Status

Register Address	Action (R/W/WC)	Size	Type	Units	Description
5376	R	1	UInt16	–	Command Result codes: 0 = Valid Operation 3000 = Invalid Command 3001 = Invalid Parameter 3002 = Invalid Number of Parameters 3007 = Operation Not Performed
5377	R/W	1	UInt16	–	Command Data 001
5499	R	1	UInt16	–	Command Data 123

## Communication

Register Address	Action (R/W/WC)	Size	Type	Units	Description
6500	R	1	UInt16	–	Protocol 0 = Modbus
6501	R/WC	1	UInt16	–	Address
6502	R/WC	1	UInt16	–	Baud Rate: 0 = 9600 1 = 19 200 2 = 38 400
6503	R/WC	1	UInt16	–	Parity: 0 = Even 1 = Odd 2 = None <b>NOTE:</b> number of stop bits = 1

## Meter Data

### Current, voltage, power, power factor and frequency

Register Address	Action (R/W/WC)	Size	Type	Units	Description
<b>Current</b>					
3000	R	2	Float32	A	I1: phase 1 current
3002	R	2	Float32	A	I2: phase 2 current
3004	R	2	Float32	A	I3: phase 3 current
3010	R	2	Float32	A	Current Avg
<b>Voltage</b>					
3020	R	2	Float32	V	Voltage L1–L2
3022	R	2	Float32	V	Voltage L2–L3
3024	R	2	Float32	V	Voltage L3–L1
3026	R	2	Float32	V	Voltage L–L Avg
3028	R	2	Float32	V	Voltage L1–N
3030	R	2	Float32	V	Voltage L2–N
3032	R	2	Float32	V	Voltage L3–N
3036	R	2	Float32	V	Voltage L–N Avg
<b>Power</b>					
3054	R	2	Float32	kW	Active Power Phase 1
3056	R	2	Float32	kW	Active Power Phase 2
3058	R	2	Float32	kW	Active Power Phase 3
3060	R	2	Float32	kW	Total Active Power
3068	R	2	Float32	kVAR	N/A
3076	R	2	Float32	kVA	N/A
<b>Power Factor</b>					
3084	R	2	Float32	–	Total Power Factor: -2 < PF < -1 = Quad 2, active power negative, capacitive -1 < PF < 0 = Quad 3, active power negative, inductive 0 < PF < 1 = Quad 1, active power positive, inductive 1 < PF < 2 = Quad 4, active power positive, capacitive
<b>Frequency</b>					
3110	R	2	Float32	Hz	Frequency

## Energy, energy by tariff and input metering

Most energy values are available in both signed 64-bit integer and 32-bit floating point format.

The energy and energy by tariff measurements listed below are preserved through power failures.

Energy reset and active tariff information					
Register Address	Action (R/W/WC)	Size	Type	Units	Description
3252	R	4	DATE TIME	–	Energy Reset Date and Time
3554	R	4	DATE TIME	–	N/A
4191	R/WC	1	UInt16	–	N/A  <b>NOTE:</b> You can only set the tariff using this method if the Tariff Mode is set to by Communication.

Energy values – 64-bit integer					
Register Address	Action (R/W/WC)	Size	Type	Units	Description
<b>Total Energy (cannot be reset)</b>					
3204	R	4	Int64	Wh	Total Active Energy Import
3208	R	4	Int64	Wh	N/A
3220	R	4	Int64	VARh	N/A
3224	R	4	Int64	VARh	N/A
<b>Partial Energy</b>					
3256	R	4	Int64	Wh	Partial Active Energy Import
3272	R	4	Int64	VARh	N/A
<b>Phase Energy</b>					
3518	R	4	Int64	Wh	Active Energy Import Phase 1
3522	R	4	Int64	Wh	Active Energy Import Phase 2
3526	R	4	Int64	Wh	Active Energy Import Phase 3
<b>Input Metering Counter</b>					
3558	R	4	Int64	Unit	N/A

Energy values – 32-bit floating point					
Register Address	Action (R/W/WC)	Size	Type	Units	Description
<b>Total Energy (cannot be reset)</b>					
45100	R	2	Float32	Wh	Total Active Energy Import
45102	R	2	Float32	Wh	N/A
45104	R	2	Float32	VARh	N/A
45106	R	2	Float32	VARh	N/A
<b>Partial Energy</b>					
45108	R	2	Float32	Wh	Partial Active Energy Import
45110	R	2	Float32	VARh	N/A
<b>Phase Energy</b>					
45112	R	2	Float32	Wh	Active Energy Import Phase 1
45114	R	2	Float32	Wh	Active Energy Import Phase 2
45116	R	2	Float32	Wh	Active Energy Import Phase 3
<b>Input Metering Counter</b>					
45118	R	2	Float32	Unit	N/A

# Chapter 6 Specifications

## Power system inputs

Characteristic	Value
Measured voltage	Wye: 100 - 277 V L-N, 173 - 480 V L-L $\pm 20\%$ Delta: 173 - 480 V L-L $\pm 20\%$
Maximum current	125 A
Measured current	1 A to 125 A
Overload	332 V L-N or 575 V L-L
Voltage impedance	6 M $\Omega$
Current impedance	< 0.2 m $\Omega$
Frequency	50 / 60 Hz $\pm 10\%$
Measurement category	III
Minimum wire temperature rating required	105 °C (221 °F)
Burden	< 10 VA at 125 A
Wire	50 mm <sup>2</sup> / 1 AWG
Wire strip length	13 mm / 0.5 in
Torque	3.5 Nm / 30.9 in•lb

## Mechanical characteristics

Characteristic	Value	Meters
IP degree of protection	Front panel	IP40
	Meter body	
	Meter body except bottom wiring surface	IP20
Impact rating	IK08	
Active energy display range	In kWh: 8 + 1 digits up to 99999999.9	

Characteristic	Value	Meters
Energy pulsing LED (yellow) <sup>1</sup>		
	200 flashes / kWh	

<sup>1</sup>The pulses / kWh of the energy pulsing LED cannot be changed.

## Environmental characteristics

Characteristic	Value	Meters
Operating temperature	-25 to 55 °C (-13 to 131 °F) (K55)	
Storage temperature	-40 to 85 °C (-40 to 185 °F)	
Pollution degree	2	
Relative humidity	5% – 95% RH non-condensing Maximum dewpoint 36 °C (97 °F)	
Location	For indoor use only Not suitable for wet locations	
Altitude	< 3000 m (9842 ft) above sea level	

## Measurement accuracy

Characteristic	Value	Meters
125 A	Class 1 conforming to IEC 62053-21 and IEC 61557-12 (PMD DD): $I_{max}=125$ A, $I_b=20$ A, and $I_{st}=0.08$ A	
	Class B conforming to EN 50470-3: $I_{max}=125$ A, $I_{ref}=20$ A, $I_{min}=1$ A, and $I_{st}=0.08$ A	

## Modbus communications

Characteristic	Value	Meters
Number of ports	1	
Labels	0V, D0/-, D1/+ $\oplus$ (shield)	
Parity	Even, Odd, None	
Baud rate	9600, 19200, 38400	
Isolation	4.0 kV rms	
Wire	2.5 mm <sup>2</sup> / 14 AWG shielded twisted pair	
Wire strip length	7 mm / 0.28 in	
Torque	0.5 Nm / 4.4 in•lb	

### ***Related topics***

- See “Communications via Modbus” on page 23 for information on Modbus communications.

# Chapter 7 Troubleshooting

The meter does not contain any user-serviceable parts. If the meter requires service, contact your local Hussmann representative.

## **NOTICE**

### **RISK OF DAMAGE TO THE METER**

- Do not open the meter case.
- Do not attempt to repair any components of the meter.

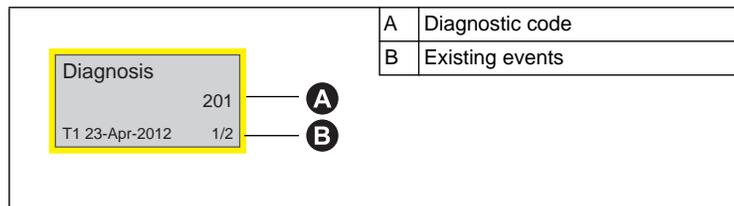
**Failure to follow these instructions can result in equipment damage.**

Do not open the meter. Opening the meter voids the warranty.

## Diagnosis screen

The Diagnosis screen lists any current diagnostic codes.

**NOTE:** The Diagnosis screen only appears if there is a specific event.



1. Press the down button to scroll through the main display screens until you reach the **Diagnosis** screen.
2. Press the  button to scroll through any existing events.

### **Related topics**

- See “Data display” on page 13 for more information on navigating to the Diagnosis screen.

## Diagnostic codes

If the diagnostics code persists after following the instructions below, please contact Technical Support.

Diagnostic code <sup>1</sup>	Description	Possible solution
–	LCD display is not visible.	Check and adjust LCD contrast.
–	Push buttons do not respond.	Restart the meter by powering off and powering on again.
101	Metering stops due to an EEPROM error. Press <b>OK</b> to display total energy consumption.	Enter configuration mode and select <b>Reset Config</b> .
102	Metering stops due to a lack of a calibration table. Press <b>OK</b> to display total energy consumption.	Enter configuration mode and select <b>Reset Config</b> .
201	Metering continues. Mismatch between frequency settings and frequency measurements.	Correct the frequency settings according to the nominal frequency of the power system.
202	Metering continues. Mismatch between wiring settings and wiring inputs.	Correct the wiring settings according to wiring inputs.
203	Metering continues. Phase sequence reversed.	Check the wire connections and correct the wiring settings if needed.
204	Metering continues. Total active energy is negative due to incorrect voltage and current connections.	Check the wire connections and correct the wiring settings if needed.
205	Metering continues. Date and Time have been reset due to a loss of power.	Set the Date and Time.
206	Metering continues. Pulse is missing due to overload on energy pulse output.	Check the energy pulse output settings and correct if needed.
207	Metering continues. Abnormal internal clock function.	Restart the meter by powering off and powering on again then reset the date and time.

<sup>1</sup> Not all diagnostic codes apply to all devices.

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