

SIEMENS



SIMATIC

S7-1200

SM 1238 Energy Meter 480VAC (6ES7238-5XA32-0XB0)

Manual

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Answers for industry.

SIMATIC

S7-1200 SM 1238 Energy Meter 480VAC (6ES7238-5XA32-0XB0)

Manual

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

 DANGER

indicates that death or severe personal injury will result if proper precautions are not taken.
--

 WARNING
--

indicates that death or severe personal injury may result if proper precautions are not taken.

 CAUTION
--

indicates that minor personal injury can result if proper precautions are not taken.
--

NOTICE

indicates that property damage can result if proper precautions are not taken.
--

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 WARNING
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Preface

Purpose of the documentation

This SM 1238 Energy Meter 480VAC (6ES7238-5XA32-0XB0) device manual complements the system manual for the S7-1200 Programmable controller (<https://support.industry.siemens.com/cs/ww/en/view/107623221>). Functions that generally apply to the PLC system are described in the S7-1200 system manual.

This manual and the system manual provide the technical information necessary to develop and commission energy metering automation.

Conventions

Please also observe notes marked as follows:

Note

A note contains important information on the product described in the documentation, on the handling of the product, and identifies parts of the documentation that are important to understand.

Security information

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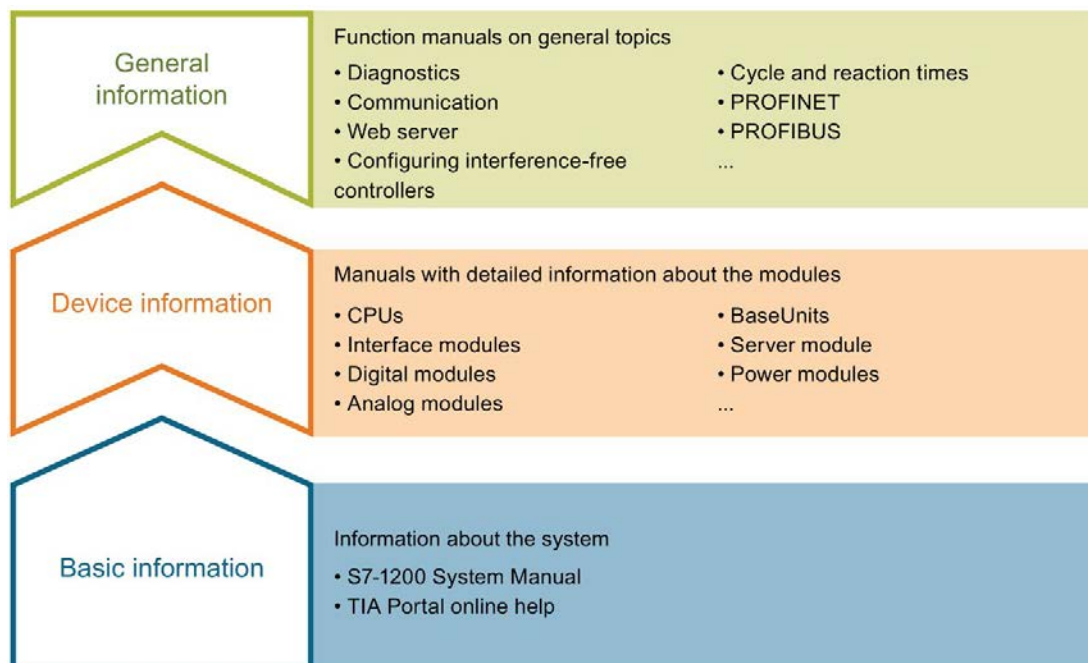
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Documentation guide

The documentation for the SIMATIC S7-1200 programmable controller is arranged into three areas.

This arrangement enables you to access the specific content that you need.



Basic information

The S7-1200 system Manual and Getting Started describe in detail the configuration, installation, wiring, and commissioning of a SIMATIC S7-1200 programmable logic control system. The TIA portal and STEP 7 online help also support you during configuration and programming.

Device information

This device manual contains a compact description of the module-specific information, such as properties, terminal diagrams, characteristics, and technical specifications.

General information

The function manuals contain detailed descriptions on general topics regarding the SIMATIC S7-1200 system (for example, diagnostics, communication, Motion Control, and Web server).

You can download the documentation free of charge from the Internet (<https://www.siemens.com/global/en/home/products/automation/systems/industrial.html>).

Changes and supplements to the manuals are documented in a Product Information document.

S7-1200 system manual

The system manual contains the documentation of the SIMATIC S7-1200.

You can find the S7-1200 system manual on the Internet
(<https://support.industry.siemens.com/cs/ww/en/view/91696622>).

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- Manuals, characteristics, operating manuals, certificates
- Product master data

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Application examples

The application examples support you with various tools and examples for solving your automation tasks. Solutions are shown in interplay with multiple components in the system - separated from the focus in individual products.

You can find Applications examples on the Internet
(<https://support.industry.siemens.com/cs/ww/en/sc/2054>).

TIA Selection Tool

With the TIA Selection Tool, you can select, configure and order devices for Totally Integrated Automation (TIA).

This tool is the successor of the SIMATIC Selection Tool and combines the known configurators for automation technology into one tool.

With the TIA Selection Tool, you can generate a complete order list from your product selection or product configuration.

You can find the TIA Selection Tool on the Internet

(<http://w3.siemens.com/mcms/topics/en/simatic/tia-selection-tool>).

See also

SIMATIC manual overview

(<https://www.siemens.com/global/en/home/products/automation/systems/industrial/plc/s7-1200.html>)

Product overview

2.1 Area of application

Introduction

Energy efficiency is increasingly important to industry. Rising energy prices, increasing pressure to improve profitability, and the growing awareness of climate protection are important reasons to reduce energy costs and monitor energy consumption.

Where can you use the SM 1238 Energy Meter 480VAC?

SM 1238 Energy Meter 480VAC is designed for machine-level deployment in a S7-1200 system. The module records over 200 different electrical measurement and energy values. It lets you measure the energy requirements of individual components of a production plant down to the machine level.

Using the measured values provided by the SM 1238 Energy Meter 480VAC, you can determine energy consumption and power demand. You can determine consumption forecasts and efficiency from the measured values. Power measurements are relevant for load management and maintenance. In addition, you can use the measurements for energy reporting and for determining the CO₂ footprint.

Note

Measuring dangerous electrical quantities

The SM 1238 Energy Meter 480VAC is not tested according to DIN EN 61010-2-030 and may therefore not be used to verify, measure or monitor protective measures according to DIN EN 61557.

Qualified personnel must ensure through additional measures that no danger ensues for humans and the environment, if there is an incorrect measurement.

Measuring with SM 1238 Energy Meter 480VAC

A typical AC power network for a production plant is divided into three voltage ranges:

- The infeed of the entire plant
- The distribution, for example, to individual lines within the plant
- The end electrical loads such as the machines in a production line.

The following figure shows measurement in an electricity supply network:

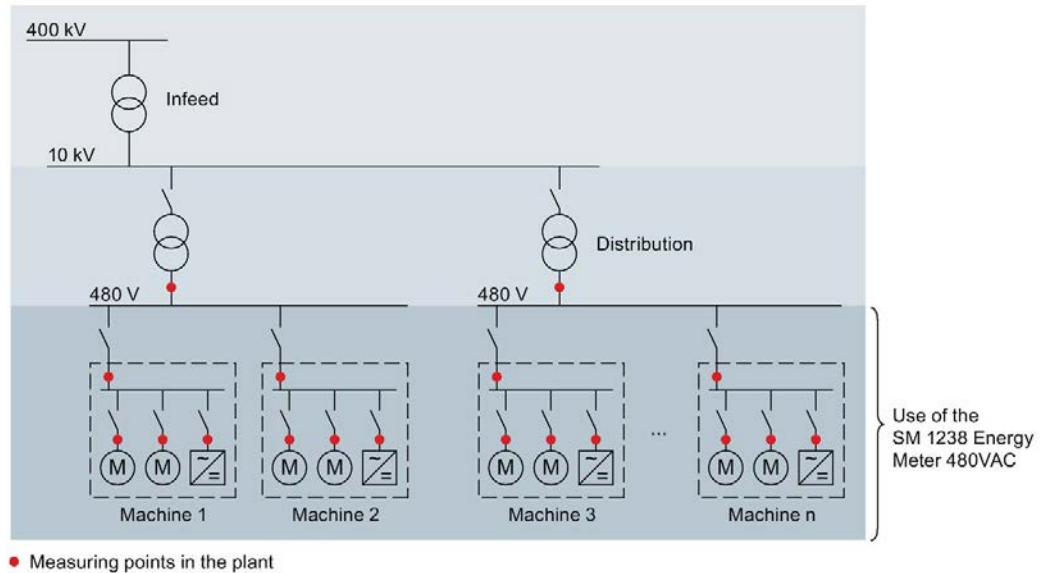


Figure 2-1 Use of the SM 1238 Energy Meter 480VAC

Advantages of the SM 1238 Energy Meter 480VAC

The SM 1238 Energy Meter 480VAC has the following advantages:

- Space-saving especially for use in a control cabinet
- You can plug in a maximum of eight Energy Meter modules to one S7-1200 PLC
- Expansion of existing I/O to monitor and record power consumption

2.2 Properties of the SM 1238 Energy Meter 480VAC

Article number

6ES7238-5XA32-0XB0

Powering the module

Module revision F-stand 1 modules are powered from the L1 input voltage and require a minimum of 90 V AC for module operation. Module revision F-stand 2 and higher are powered from the CPU bus and will operate with an input voltage of 0 V AC on L1.

Properties

The module has the following technical properties:

- Measurement of electrical variables from single-phase, two-phase and three-phase AC power supply networks
- Maximum nominal voltage between two outer conductors 480 V AC (max. phase voltage 277 V AC)
- Recording of:
 - Voltages
 - Currents
 - Phase angles
 - Power (electrical load - active W, reactive var, apparent VA)
 - Energy usage counter (electrical work)
 - Frequencies
 - Minimum and maximum values
 - Power factors (ratio of real power/apparent power)
 - Operating hours counter

The module supports the following functions:

- Firmware update
- I&M identification data
- Reconfiguration in RUN
- Diagnostics interrupts

Configuration tool

You can configure the module with STEP 7 (TIA Portal) V13 SP1 with Update 8 or higher and HSP 0151.

Accessories

SM 1238 Energy Meter 480VAC modules are shipped with keyed terminal blocks installed. If you need additional terminal blocks, a terminal block kit (a special keyed terminal block is required) must be ordered separately.

You can find additional information on the accessories in the S7-1200 system manual (<https://support.industry.siemens.com/cs/ww/en/view/91696622>).

2.3 Firmware updates and S7-1200 CPU version compatibility

The SM 1238 Energy Meter 480VAC module is compatible with S7-1200 CPUs that have firmware version V4.1 or higher.

SM 1238 Energy Meter 480VAC firmware update via SD card and S7-1200 CPU V4.1 is not supported.

Supported methods to update SM 1238 Energy Meter 480 VAC firmware

Using **S7-1200 CPU V4.1**:

- TIA Portal signal module firmware loader
- S7-1200 CPU Webserver firmware loader
- SIMATIC Automation Tool firmware update

Using **S7-1200 CPU V4.2** (or higher):

- TIA Portal signal module firmware loader
- S7-1200 CPU Webserver firmware loader
- SIMATIC Automation Tool firmware update
- SD card via S7-1200 CPU card slot loader

Note

For F-Stand 1 modules firmware update process requires power from phase 1

Before starting a firmware update, you must plug the SM 1238 Energy Meter 480VAC into an S7-1200 CPU **and** connect phase 1 (90 V AC minimum) to the Energy meter's UL1 and N terminals.

Wiring

3.1 Connecting AC power and the measured load

General safety instructions

WARNING

Danger to life and dangerous system conditions can occur if the following requirements are not met

A switch or circuit-breaker must be included in the installation.

The switch or circuit-breaker must be suitably located and easily reached.

The switch or circuit-breaker must be marked as the disconnecting device for the equipment.

WARNING

Danger to life due to electric shock

Touching live parts can lead to death or severe injuries.

Before beginning any work de-energize the system and the Energy Meter and short-circuit installed transformers.

WARNING

Danger to life, dangerous system conditions and material damage possible

Removing and inserting the Energy Meter under live voltage is prohibited!

If you remove and insert the Energy Meter under live voltage during operation, the transformers used can produce dangerous induction voltages and electric arcs and dangerous system conditions can arise.

The Energy Meter may only be removed and inserted during operation if the measured voltages applied to the module are disconnected at all phases at the terminals UL1, UL2, UL3 **and** special electrical current transformer terminals are used that short-circuit the transformer at the secondary side when removed.

CAUTION

Use only in AC networks

The Energy Meter is destroyed if used with direct voltage / direct current.

Use the Energy Meter solely to measure the electrical characteristics of AC networks.

3.1 Connecting AC power and the measured load

Supplying the module

For F-Stand 1 modules the module is always supplied via UL1 and N. The required minimum voltage is 90 VAC.

AC power source grounding systems

The SM 1238 Energy Meter 480VAC works with the following IEC defined grounding systems.

- TN
- TT
- IT: You must create an artificial N-conductor (for example, by means of a 1:1 voltage transformer) in IT networks due to the missing neutral conductor. You can then use the module.

Protecting the connection cables

To protect the connection cables at UL1, UL2 and UL3, make sure there is adequate cable protection, especially after conductor cross-sectional area transitions.

If short-circuit resistance according to IEC 61439-1:2009 is ensured by the design, there is no need for separate line protection devices at the power line phase connections.