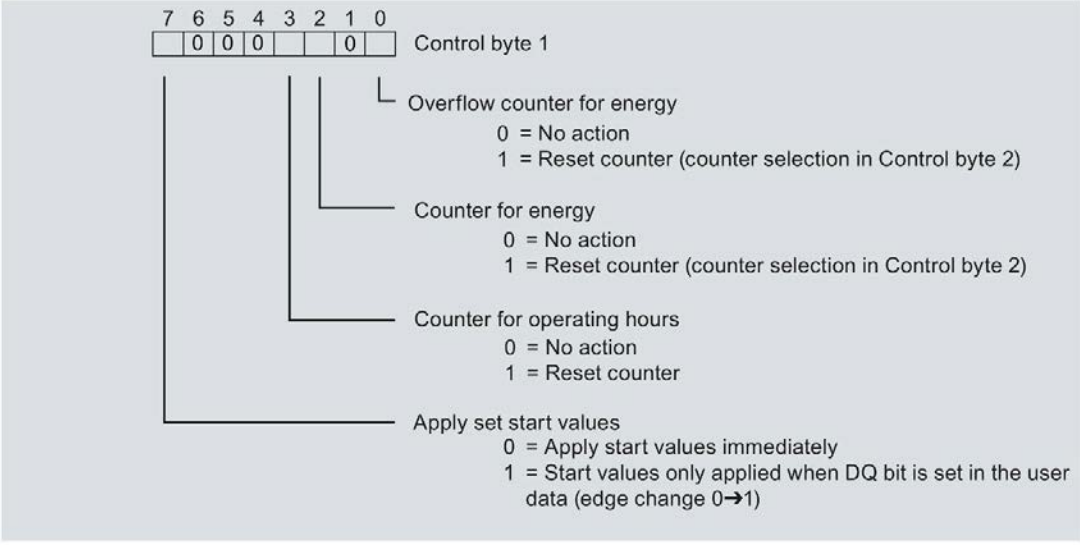
Control information

When data record 143 is written with the WRREC instruction, bytes 2 to 7 are used as phase-specific control information for energy counters, overflow counters, and operating hours counter. The length of the control information is 2 bytes for each phase:

- In control byte 1 you determine which counter you want to reset and the time when the counters are reset.
- In Control byte 2 you determine which energy counters and which overflow counters you want to reset.



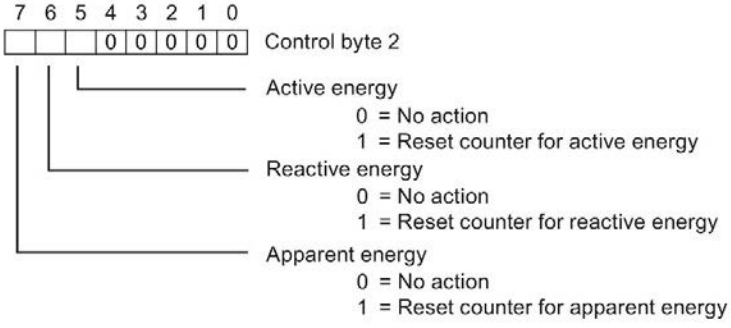


Figure 7-9 Control information DS 143

Error while transferring the data record 传输数据记录时出错

The module always checks all the values of the transferred data record. Only if all the values were transferred without errors does the module apply the values from the data record.

The WRREC instruction for writing data records returns error codes in the STATUS parameter, when errors occur.

The following table shows the module-specific error codes and their meaning for the measured value data record 143:

Error code in STATUS parameter (hexadecimal value)				Meaning	Solution
Byte 0	Byte 1	Byte 2	Byte 3		
DF	80	B0	00	Number of the data record unknown	Enter a valid number for the data record.
DF	80	B1	00	Length of the data record incorrect	Enter a valid value for the data record length.
DF	80	B2	00	Slot invalid or cannot be accessed.	Check the station whether the module is plugged in correctly. Check the assigned values for the parameters of the WRREC instruction
DF	80	E1	01	Reserved bits are not 0.	Check Byte 2 ... 7 and set the reserved bits back to 0.
DF	80	E1	39	Incorrect version entered.	Check Byte 0. Enter a valid version.
DF	80	E1	3A	Incorrect data record length entered.	Check the parameters of the WRREC instruction. Enter a valid length.
DF	80	E1	3C	At least one start value is invalid.	Check Bytes 8 ... 103 and Bytes 158 ... 169. The start values may not be negative.
DF	80	E1	3D	At least one start value is too large	Check Bytes 8 ... 103 and Bytes 158 ... 169. Observe the ranges of values for start values.

7.5.2 Structure of the control and feedback interface DS 143

结构控制与反馈接口ds143

Introduction

数据记录143的字节2至7构成基于相位的控制和反馈接口，用于能量计数器的测量值数据记录。

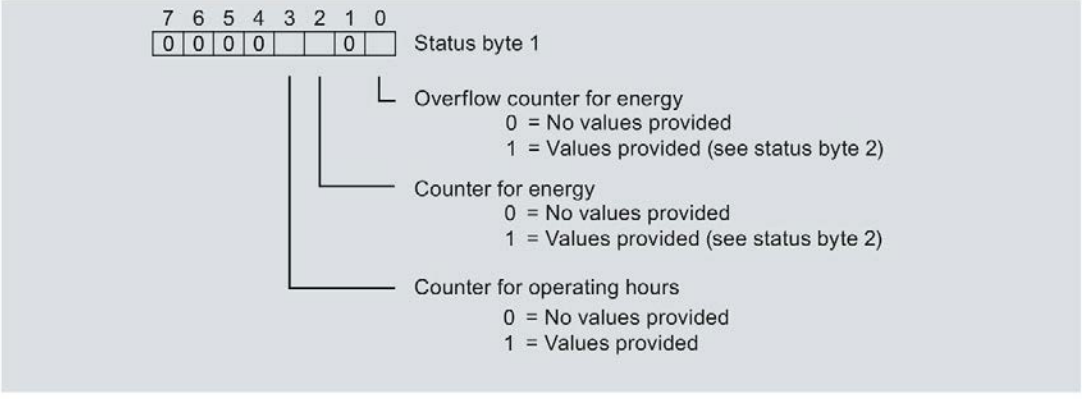
Bytes 2 to 7 of data record 143 form the phase-based control and feedback interface for the measured value data record of the energy counter.

- Bytes 2 and 3: Control and feedback interface for phase 1 字节2和字节3:阶段1的控制和反馈接口
- Bytes 4 and 5: Control and feedback interface for phase 2
- Bytes 6 and 7: Control and feedback interface for phase 3

Status information

When reading data record 143 with the RDREC instruction, bytes 2 ... 7 provide status information for the energy counter, overflow counter and operating hours counter.

The status information enables you to see which counters are returning their values in data record 143. If energy counters return their values in the status byte 1, then you can determine the type of energy counter with status byte 2.



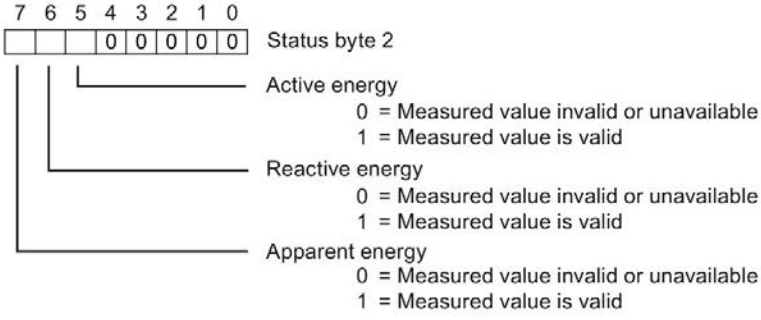
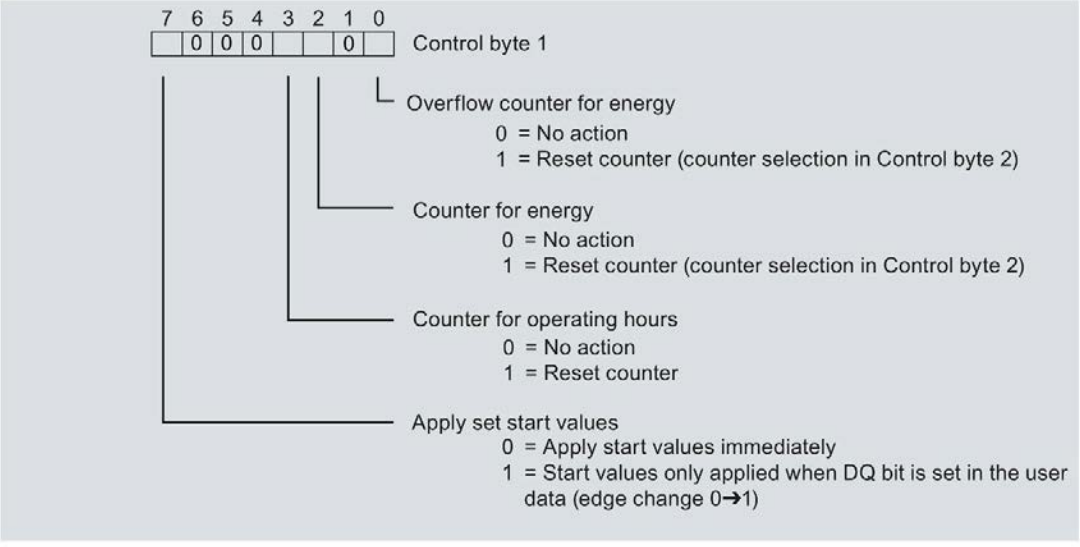


Figure 7-10 Status information DS 143

Control information

When data record 143 is written with the WRREC instruction, bytes 2 ... 7 are used as phase-specific control information for energy counters, overflow counters, and operating hours counter. The length of the control information is 2 bytes for each phase:

- In control byte 1 you determine which counter you want to reset and the time when counters are reset.
- In Control byte 2 you determine which energy counters and which overflow counters to reset.



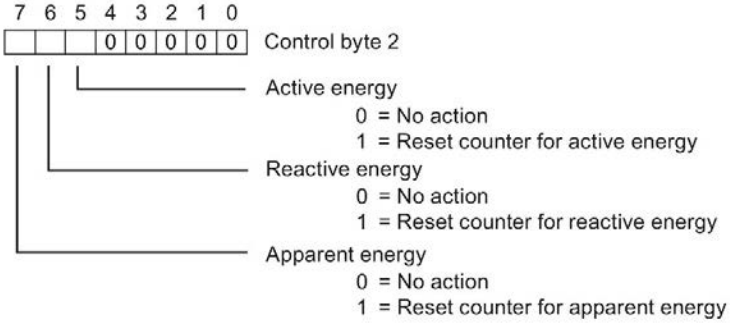


Figure 7-11 Control information DS 143

Operating hours counter 8

8.1 How the operating hours counter works

Introduction

The SM 1238 Energy Meter 480VAC provides one operating hour counter for each phase (L1:ID 65505, L2:ID 65506, L3:ID 65507). The operating hours of the load connected to a phase are counted when there is load current greater than the configurable "Low limit electrical current measurement". The operating hours value for all phases (L1L2L3:ID 65504) is the largest operating hour value accumulated on any one phase. The operating hours counter has a value range from 0 to 3.4 x 10^{38}. The values are stored retentively in the module and can be read via the data record 143 (energy counter data record) and data record 150 (Advanced measurements and status values).

Configuring

You configure the following operating hours counter setting in STEP 7 (TIA Portal):

- Activation of the gate for the operating hours counter

Changing properties in RUN

The following table shows the supported control information:

Control information	Default value	Available in
Open / close operating hours counter gate [1]	Closed	Module version output user data [2]
Set initial value	0	Data record 143
Reset operating hours counter	0	Module version output user data [2]

[1] Effective only with enabled gate configuration

[2] Gate and reset control for individual phases is supported only for module versions with 12 bytes of output user data.

8.2 Resetting the operating hours counter

8.2.1 Introduction

Introduction

At the beginning of a factory production run, it may be useful to reset the operating hours counters of the Energy meter. Resetting here means that the operating hours counters are reset to their start value.

The following section describes how you

- Reset operating hours counters via the outputs of the user data.
- Reset operating hours counters via data record 143.

8.2.2 Resetting the operating hours counter by user data

Introduction

Due to the differing lengths of the output data, resetting the operating hours counters depends on the configured module version.

If you use module versions with 12 bytes output data, you can

- Reset operating hours counters for **all** phases.
- Reset operating hours counters for each **individual** phase.

If you use the module version with 2 bytes output data, you always reset **all** the operating hours counters simultaneously. Resetting the counters by phases is only possible via data set DS 143 for this module version, for details see section Structure for energy counters (DS 143) (Page 151).

Reset procedure for module versions with 12 bytes of output data

Set the reset bit (Bit 5) in Control byte 1 from 0 to 1 through a positive edge change.

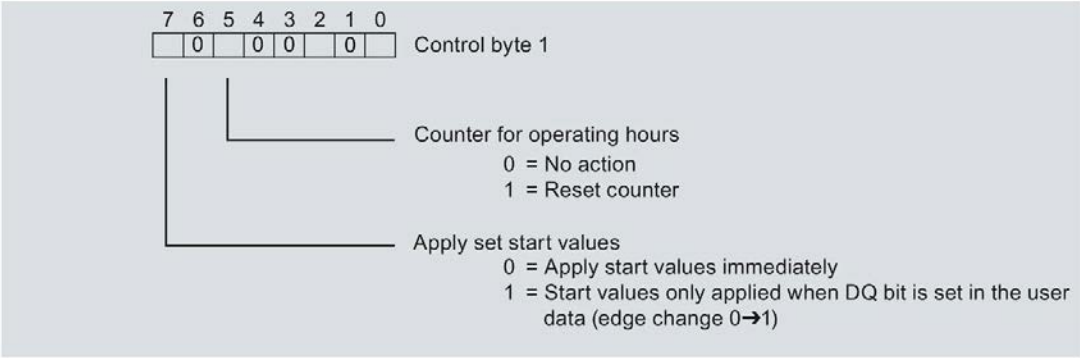


Figure 8-1 Resetting the operating hours counters for module versions with 12 bytes of output data

图8-1重置具有12字节输出数据的模块版本的操作小时计数器

Reset procedure for module version with 2 bytes of output data

Set the reset bit (Bit 5) in Control byte 1 from 0 to 1 through a positive edge change.

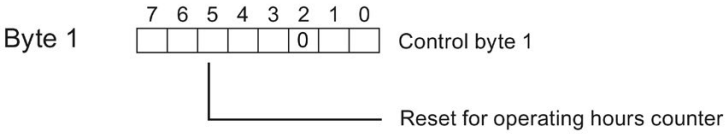


Figure 8-2 Resetting the operating hours counters for module version with 2 bytes of output data

图8-2使用2字节的输出数据重置模块版本的操作小时计数器

Start values

After the reset, the operating hours counters count with the assigned start values (default = 0). You can change the start values for the operating hours counters via data record DS 143, for details see section Structure for energy counters (DS 143) (Page 151).

8.2.3 Resetting the operating hours counter by data set DS 143

Introduction

For all the module versions, you can reset the operating hours counters via the data record DS 143. Resetting the Operating hours counters for each individual phase is possible.

Procedure for all module versions via data record DS 143

1. Set the reset bit (Bit 3) in Control byte 1 to 1.
2. In Control byte 1, set Bit 7 for when to apply the start values:
   - Bit 7 to 0, if the start values are applied immediately after the transfer of the data record
   - Bit 7 to 1, if the start values are only applied after the reset bit has been set in the output data of the user data.

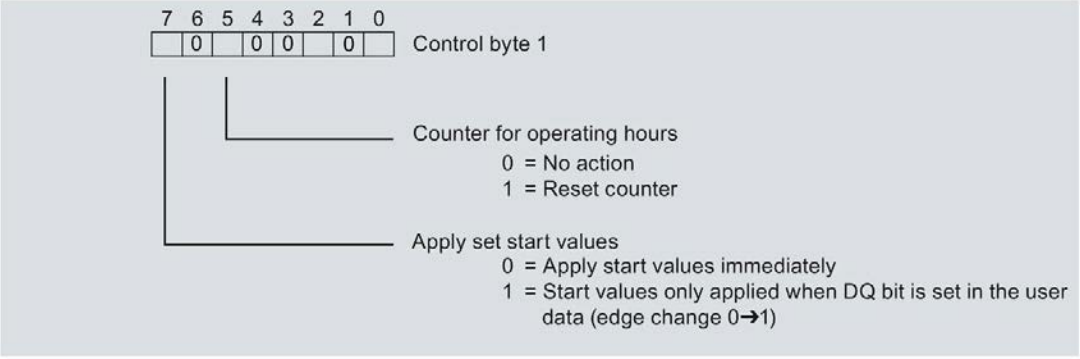


Figure 8-3 Operating hours counter control information DS 143

Start values

You assign when the start values are applied in Control byte 1 via Bit 7. After the reset the operating hours counters, count with the assigned start values (default = 0). You can change the start values for the operating hours counters via data record DS 143.

Minimum and maximum values 9

9.1 Minimum and maximum values

Introduction

The SM 1238 Energy Meter 480VAC stores the highest and lowest measured or calculated value, for a series of measured and calculated values. The values are stored retentively in the module and can be read using measured value data records 144 and 145.

Benefits

Your program logic can read peak values and detect irregularities in power consumption.

Calculation of minimum and maximum values

Minimum and maximum values are calculated only for phases that are used with the configured connection type. Existing minimum and maximum values that are not calculated are initialized with 0. If faults such as under or overcurrent occur during operation, then new minimum and maximum values are calculated.

The measured and calculated values are initialized as follows during commissioning of the SM 1238 Energy Meter 480VAC.These initial values ensure that the first calculation of minimum and maximum values provides a plausible result:

- Maximum values for measured and calculated values are initialized with minimum values.
- Minimum values for measured and calculated values are initialized with maximum values.

Configuring

You must configure the module with the STEP 7 (TIA Portal) Device configuration to activate the minimum and maximum values feature.

Enable calculation of minimum and maximum values in the Module parameters > AI configuration > Measurement properties.

Reset minimum and maximum values in RUN mode

Your program logic can write the PLC output Q bytes in the I/O interface that control the SM 1238 Energy Meter 480VAC value reset process.

Note

Automatic reset

If you change the parameters for current or voltage transformers, the minimum and maximum values are reset automatically to their initial values.

9.2 Resetting minimum and maximum values

Description

At the beginning of a factory production run, it may be useful to reset the minimum and maximum values of the Energy Meter. The minimum and maximum values are reset to their initial values. Initial values are described, in section Measured value record for maximum values (DS 144) (Page 156) and section Measured value record for minimum values (DS 145) (Page 157).

The size of the output data interface (2 bytes or 12 bytes) is determined by the configured Module version parameter.

If you use the module version "2 bytes I/ 2 bytes O" with a program interface of 2 Q bytes:

- You can only reset all minimum and maximum values of all variables on all three phases simultaneously.

If you use any of the other module versions, then you get a program control interface of 12 Q bytes:

- You can select which minimum and maximum values to reset and then reset these values on all three phases simultaneously **or**
- You can assign which values to reset for each of the three phases (the same or different variables for each phase) and then reset the minimum and maximum values for each phase.

Reset procedure for "2 bytes I/ 2 bytes O" module version

Set the reset bit (bit 0 or bit 1) in Control byte 1 from 0 to 1 through a positive edge transition.

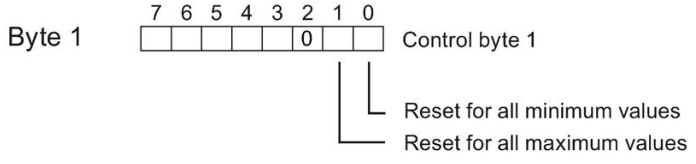


Figure 9-1 Resetting all minimum and maximum values for all phases with "2 bytes I/ 2 bytes O" module version

Reset procedure for module versions with 12 bytes of output data

1. Set the category bits (bits 0 ... 4) of the measured values that you want to reset to 1 in control byte 2 (all phases), byte 7 (phase 1), byte 9 (phase 2), or byte 11 (phase 3).
2. Set the reset bit 0 (minimum values) or bit 1 (maximum values) in Control byte 1 (all phases), byte 6 (phase 1), byte 8 (phase 2), or byte 10 (phase 3), from 0 to 1 creating a positive edge change in the output Q data.

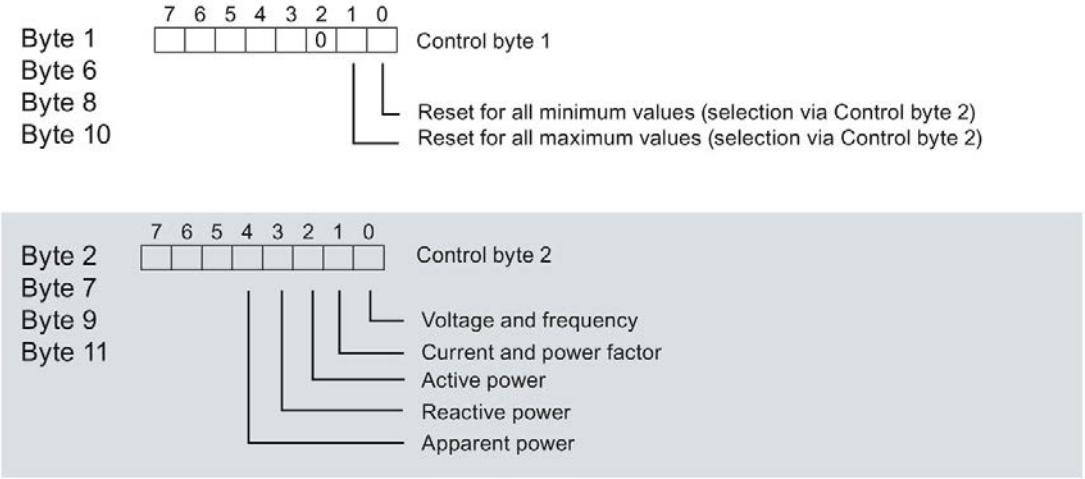


Figure 9-2 Resetting selected phases and minimum and maximum values, for module versions with 12 bytes of output data

Phase-based measurements 10

10.1 Phase-based measurements

Introduction

The SM 1238 Energy Meter 480VAC makes the measured values of individual phases available.

- Via Process data variants
  - Phase L1 measurements with Process data variants 154 ($9A_H$) and 155 ($9B_H$)
  - Phase L2 measurements with Process data variants 156 ($9C_H$) and 157 ($9D_H$)
  - Phase L3 measurements with Process data variants 158 ($9E_H$) and 159 ($9F_H$)
- Via measured value data records
  - Phase L1, L2 and L3 measurements with data record 142
  - Phase L1 measurements with data record 147
  - Phase L2 measurements with data record 148
  - Phase L3 measurements with data record 149

Process data variants

Using Process data variants 154 ($9A_H$) ... 159 ($9F_H$), you can evaluate the following measured values for each phase of an AC / three-phase network:

- Quality information
- Current and voltage
- Active, reactive and apparent power
- Active, reactive and apparent energy
- Power factor

You can find the structure of the Process data variants in section L1 phase-based values data record (DS 147) (Page 158).

Measured value data records

Using measured value data records DS 142, DS 147, DS 148, and DS 149 you can evaluate the following measured values for each phase of an AC three-phase network:

- Quality information
- Current and voltage
- Minimum current and minimum voltage
- Maximum current and maximum voltage
- Active, reactive and apparent power
- Minimum active, reactive and apparent power
- Maximum active, reactive and apparent power
- Active, reactive and apparent energy
- Minimum active, reactive and apparent energy
- Maximum active, reactive and apparent energy
- Power factor
- Minimum power factor
- Maximum power factor

You can find the structure of the measured value data records in section L1 phase-based values data record (DS 147) (Page 158).