DIAG_US µs ticker

Byte	Bit 7 ... 0
0...3	Value of the µs ticker at the moment of the diagnostic

µs ticker

In the SLIO module there is a timer (µs ticker). With PowerON the timer starts counting with 0. After 2^{32}-1µs the timer starts with 0 again.

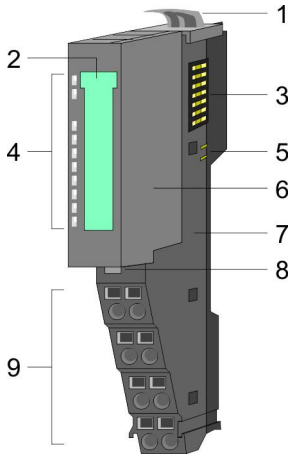
3.27 031-1PA00 - AI1x 3Ph 230/400V 1A

Properties

The module allows the measurement of electric data for counting energy and power measurement. Here, the voltage measurement of each phase is directly measured and the current is measured indirectly via current transformers. In consideration of the permissible total current, you can also perform an energy measurement on devices, which are within the same phase.

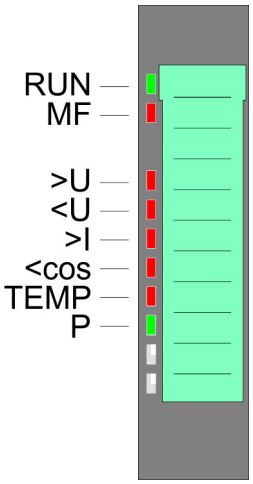
- 3-phase and neutral wires 230/400V 1A
- Retentive storage of the energy values
- Diagnostic function
- Resolution of the measured value 24bit
- The following measurands can be found in 4-quadrant operation:
  - Voltage, current
  - Electrical power
  - Electrical work
  - Harmonics
  - Phase shift cos φ
  - Frequency

Structure



1 Locking lever terminal module
2 Labeling strip
3 Backplane bus
4 LED status indication
5 DC 24V power section supply
6 Electronic module
7 Terminal module
8 Locking lever electronic module
9 Terminal

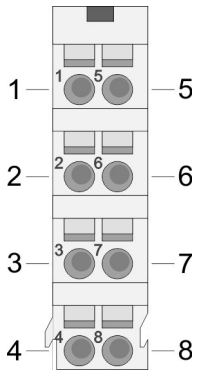
Status indication

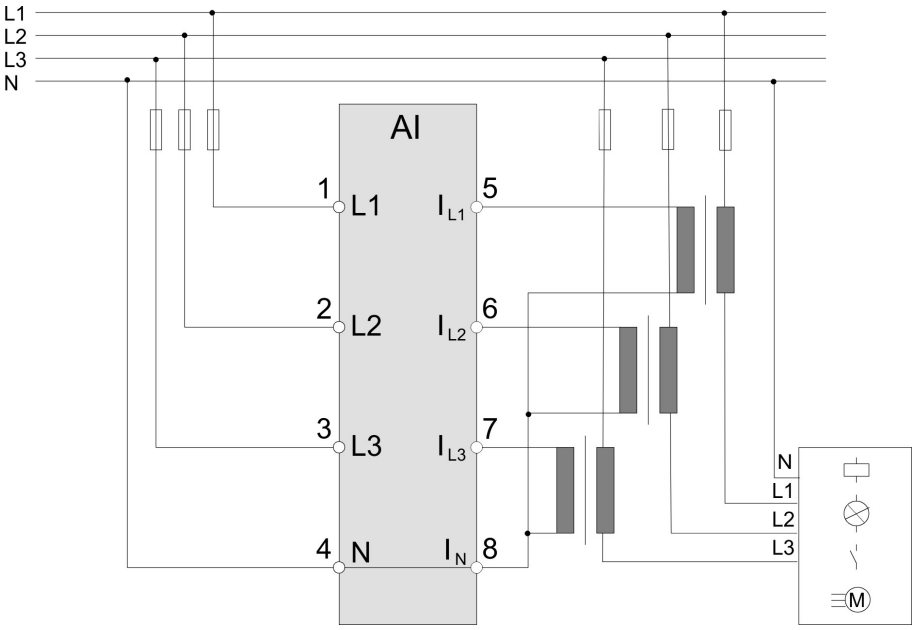


RUN	MF	Description	
green	red		
●	○	Bus communication is OK Module status is OK	
●	●	Bus communication is OK Module status reports an error	
○	●	Bus communication is not possible Module status reports an error	
○	○	Error at bus power supply	
X	B	Error in configuration *Chapter 2.8 'Trouble shooting - LEDs' on page 29*	
>U	red	○	Voltage in the parametrized range
		●	Voltage limit value exceeded
<U	red	○	Voltage in the parametrized range
		●	Voltage limit value undershot (omitted in 1-phase operation)
>I	red	○	Current in the parametrized range
		●	Current limit value exceeded
<cos	red	○	Phase shift cos φ in the parametrized range
		●	Phase shift cos φ limit value undershot (omitted in 1-phase operation)
TEMP	red	○	Temperature in the parametrized range
		●	Temperature limit value exceeded
P	green	B	P: Power-proportional blinks with increasing frequency proportional to the active power at 20 pulses/Wh. The current transformer factor is not considered.
on: ● | off: ○ | blinking: B | not relevant: X			

Pin assignment

For wires with a core cross-section of 0.08mm² up to 1.5mm². The voltage is measured directly. The current is determined indirectly via current transformers.





Pos.	Function	Type	Description
1	L1	I	Voltage measurement L1
2	L2	I	Voltage measurement L2
3	L3	I	Voltage measurement L3
4	N	I	Voltage measurement N
5	I_{L1}	I	Current measurement I_{L1}
6	I_{L2}	I	Current measurement I_{L2}
7	I_{L3}	I	Current measurement I_{L3}
8	I_N	I	Current measurement I_N
I: Input			

When using the 031-1PA00 the DC 24V power section supply of the further backplane bus is interrupted. By installing a power module after the 031-1PA00, the DC 24V power section supply at the backplane bus can be continued.

CAUTION!
Use only with terminal module 001-0AA40!
Please consider that the electronic module AI1x 3Ph 230/400V 1A may only be used at the terminal module 001-0AA40!

In-/Output area

At CPU, PROFIBUS and PROFINET the input respectively output area is embedded to the corresponding address area.

IX - Index for access via CANopen with s = Subindex, depends on number and type of analog modules

SX - Subindex for access via EtherCAT with Index 6000h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

Input area

Addr.	Name	Byte	Function	IX	SX
+0	B0 ... B3	4	Header byte 0 ... 3	6401h/s	01h
+4	D00 ... D11	2	User data input byte 0 ... 11	6401h/s+1	02h

Output area

Addr.	Name	Byte	Function	IX	SX
+0	B0 ... B3	4	Header byte 0 ... 3	6401h/s	01h
+4	D00 ... D11	2	User data output byte 0 ... 11	6401h/s+1	02h

3.27.1 Technical data

Order no.	031-1PA00
Type	SM 031
Module ID	0882 2880
Current consumption/power loss	
Current consumption from backplane bus	60 mA
Power loss	0.9 W
Rated load voltage	-
Status information, alarms, diagnostics	
Status display	yes
Interrupts	yes, parameterizable
Process alarm	no
Diagnostic interrupt	no
Diagnostic functions	yes, parameterizable
Diagnostics information read-out	possible
Module state	green LED
Module error display	red LED
Channel error display	-
Isolation	

Order no.	031-1PA00
Between channels	-
Insulation tested with	AC 2200 V
Energy measurement	
Number of channels for measuring	1* 1..3 phases U/I
Voltage measuring range	0..300 V each phase
Coupling voltage measurement	directly
Current range	-
Coupling current measurement	Transformer
Frequency range	46...64 Hz
Measurement accuracy	1 %
Available measurement	Active energy Temperature Frequency Voltage RMS Current RMS Active power Reactive power Apparent power Cos phi Harmonic voltage RMS Harmonic current RMS
Adjustable limits	Voltage RMS min/max Current RMS min/max Cos phi min Temperature max. Frequency min/max
Datasizes	
Input bytes	16
Output bytes	16
Parameter bytes	28
Diagnostic bytes	20
Housing	
Material	PPE / PPE GF10
Mounting	Profile rail 35 mm
Mechanical data	
Dimensions (WxHxD)	12.9 mm x 109 mm x 76.5 mm
Weight	60 g

Order no.	031-1PA00
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-25 °C to 70 °C
Certifications	
UL certification	-
KC certification	-

3.27.2 Safety precautions

Please note!

With the 031-1PA00 only AC voltages 230/400 V and currents can be measured. Please note when using the module the following safety instructions:

CAUTION!
This device is not certified for applications in
– in explosive environments (EX-zone)

CAUTION!
Connection and module exchange only without power!
– Before you start to work on at the module for installation or maintenance, you have to disconnect it from the main power source, i.e. the power line is to be switched off (possibly remove fuses)!
– The electronic module may only be replaced on power off!
– Only properly qualified electrical staff is allowed to install, connect and/or modify electrical equipment!
– Please adhere to the national rules and regulations of the location and/or country where the units are installed (installation, safety precautions, EMC ...).

CAUTION!
Provide overvoltage protection!
The module is designed for overvoltage category II. Provide a corresponding overvoltage protection in the supply lines (phases and neutral) so that a hazard to persons by touching on the low voltage side is excluded.

CAUTION!
Provide touch protection
Provide a touch protected wiring of the measurement and mark it with the according warnings!

CAUTION!
No use with System SLIO safety modules!
The simultaneous use of 031-1PA00 modules and System SLIO safety modules on the backplane bus is not permitted!

CAUTION!
Use only with terminal module 001-0AA40!
Please consider that the electronic module AI1x 3Ph 230/400V 1A may only be used at the terminal module 001-0AA40!

CAUTION!
Line voltage max. 400V!
The line voltage at a voltage connector must not exceed 400V!

CAUTION!
Do not exchange current and voltage connections!
Please note when connecting, that the current and voltage paths are not exchanged! The module will be destroyed by directly connecting one phase to a low-resistance current connector!

CAUTION!
Use current transformer with max. 1A!
You may only use current transformer with max. current of 1A! Please consider the data sheet of your current transformer!

CAUTION!
Note characteristics of current transformers!
- Please consider the data sheet of your current transformer!
- Some current transformer must not be operated in idle mode!
- Before commissioning your module must be connected to the secondary winding of the current transformer!

CAUTION!
All phases of one supply grid!
Please note that the phases to be measured must be from the same supply grid!

Reset energy counters after installation!
As soon as the module is supplied by the DC 24V power section supply, the measurement is started and the counting of the energy counters is continued with the retentive stored counter values. The measurement is not interrupted by STOP or RESET of the CPU respectively the bus coupler. After installing the module the energy counters should be reset by CMD-Frame. *'CMD Frame' on page 332*

3.27.3 Basics

3.27.3.1 Terms

Measurand

A *measurand* is a physical quantity that can be measured such as current, voltage or temperature. *'Measurands' on page 320*

Measured value

A *measured value* is a value of a measurand, which is determined by measurement or by calculation.

ID

In the module each *measurand* one *ID* is assigned. The access to the measured value of a measurand happens by means of the corresponding *ID*. *'Measurands' on page 320*

DS-ID

As soon as the module is supplied by the DC 24V power section supply, the measurement is started and the counting of the energy counters is continued with the retentive stored counter values. The measured values of all the measurands are stored in the module with one record set ID *DS-ID*. The following must be observed:

- All measured values with the same *DS-ID* come from the same measurement and are consistent.
- By specifying the *DS-ID* you can address the individual measured values of the same measurement.
- The *DS-ID* covers the values 1 ... 15. The start value can freely be selected.
- To refresh the measured values the *DS-ID* is to be incremented by 1. The value 15 must be followed by 1.
- If the *DS-ID* is incremented and there is still no new value available, the current value is returned with an error. *'Status communication' on page 324*
- *DS-ID* = 0 - Auto increment mode
  - With *DS-ID* = 0 there is a request with *auto increment mode*. Here the module always returns the current measured value. As soon as a new measured value is available, here the *DS-ID* is incremented by one within the values 1 ... 15. If there is no new measured value available, the *DS-ID* is not changed and a error message is returned. *'Status communication' on page 324*
- The uniqueness of a measured value always consists of the *ID* of the measurand and the *DS-ID*.

Frame

In the module you can combine some measurands to one data package (Frame), which is transferred in one step. One data package consists of 12byte user data. Considering the data length of 12 bytes, you can define the content of a frame by specifying the *ID* of the measurands. Up to 256 frames may be configured (*Frame 0* ... *Frame 255*). The following must be observed:

- The definition of *Frame 1* to *Frame 255* happens by the command *Set_Frame*. *'Set Frame' on page 327*.
- *Frame 0* with the corresponding measurands can exclusively be specified by the parametrization. *'Parameter data' on page 318*
- With telegram type *Zero Frame* the data package of Frame 0 can be accessed. After the start-up of the module there are automatic *Zero Frame* requests as long as the process data communication comes from the head module. *'Read Frame' on page 330*

FR-ID

When defining frames by means of *'Set Frame'*, via the *FR-ID* these are assigned to a number between 0 ... 255. By specifying the*FR-ID* you can request the corresponding frame.

Data type

In the following the data types are listed, which are used in the module. The length is to be considered particularly by the definition of *Frames*.

Data type	Length in byte	Description
UINT_8	1	Integer 8bit
UINT_16	2	Integer 16bit
UINT_32	4	Integer 32bit
INT_8	1	Signed integer 8bit
INT_16	2	Signed integer 16bit
INT_32	4	Signed integer 32bit
FLOAT	4	32bit floating point IEEE 754

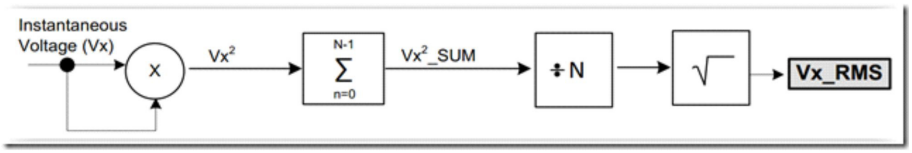
3.27.3.2 Principle of measurement

Calculation of the effective values of current and voltage

- 3-phase AC low-voltage networks are characterized by the following relationship:
  - Nominal voltage is the RMS voltage U_{RMS} e.g. $230V_{RMS}$ as star voltage between one of the three phase conductors (L1, L2 or L3) and the neutral conductor N.
- The module is used for detecting the current and voltage values and the energy values of all 3 phases. Here, the module measures the real effective value (True RMS) of voltages and currents.
- The sampling rate of the digitally processed measured values is 2.7 kHz. The time interval for the calculation of the actual values is 200 ms. This results in an evaluation window of the measured data of 540 measured values, which can be requested at any time.

Voltage measurement

Averaging



1. The square of the voltage measurement is calculated.
   ⇨ Vx^2
2. The sum of Vx^2 is calculated via the time interval n = 0 ... n = N-1.
   ⇨ Vx^2_SUM
3. Vx^2_SUM is divided by N the number of measurements.
4. From the result of the division, the square root is drawn.
   ⇨ **Average*Vx_RMS***

Current measurement

For current measurement you have to use external current transformers!

CAUTION!
Use current transformer with max. 1A!
You may only use current transformer with max. current of 1A! Please consider the data sheet of your current transformer!

CAUTION!
Note characteristics of current transformers!
- Please consider the data sheet of your current transformer!
- Some current transformer must not be operated in idle mode!
- Before commissioning your module must be connected to the secondary winding of the current transformer!

- *Please note that the overall accuracy of the assembly of measuring module and current transformers depends on the accuracy class of the transformers.*
- *The transformer factor is retentive stored and taken into account while counting.*
- *A change of the transformer factor is taken immediately recognized. Current counter values are not changed, new values are added.*
- *When the transformer factor was changed, current counter values are not changed, new values are added considering the new factor.*

Calculating power, energy

To calculate the effective power P, each time synchronous sample value of the currents and voltages are used. In this case, phase shifts between the currents and voltages are considered. The energy is calculated from integration of the power by time.

For the power is valid:

- *Positive sign (+): Consumed respectively received power*
- *Negative sign (-): Fed in power*

Determine frequency

The *frequency* of the phases is determined by a zero crossing detection of the sampled signals and calculating from the frequency.

Apparent power

$$S = U \times I$$

The *apparent power S* is a combination of *active power P* and *reactive power Q*. It is calculated from the product of effective current I_{eff} and *effective voltage* U_{eff}. With the apparent power you get the total power of a power grid.

Reactive power

$$Q = U \times I \times \sin \varphi$$

Reactive power Q means a load in the power grid, which opposes the current flow from the producer to the consumer. The reactive power is the product of current and voltage at a reactance. Reactive power forms to all devices that are connected to AC networks. With voltage supplied any electrical device generates an electromagnetic field. By alternating voltage, the magnetic field is regularly built and removed. During the removement the energy gained in the field is fed back into the power grid and results in a higher resistance to the applied current flow.

Active power

$$P = U \times I \times \cos \varphi$$

The *active power P* is the effectively used power. This is the part without phase shift between voltage and current and refers to a resistive load. In an AC voltage, the active power is calculated by multiplying the effective values of current and voltage.

Calculation of the power factor cos φ (phi)

In real networks energy consumers / producers typically are not purely ohmic. There is a phase shift between current and voltage. The *cos* φ is a measure of the phase shift between current and voltage of the basic frequency of the corresponding phase. The *total cos* φ is calculated by dividing *total active power P* and *total apparent power S*.

Harmonics

Harmonics are oscillations of the voltages and currents, whose frequency is an integer multiple of the basic frequency. The 1. harmonic is the basic frequency or mains frequency, nominally 50Hz or 60Hz. The level of harmonics is a measure for the network quality. Harmonics or harmonic oscillations are caused by equipment with nonlinear characteristics such as transformers, fluorescent lamps and

power electronic equipment such as rectifiers and thyristors. The non-sinus-shaped currents of these consumers cause the net interference voltages, which distorts the nominal line voltage. During parametrization you can specify the level of the harmonic. With this frequency the *'harmonic'* current and voltage values are filtered.

3.27.4 Connection

Please note

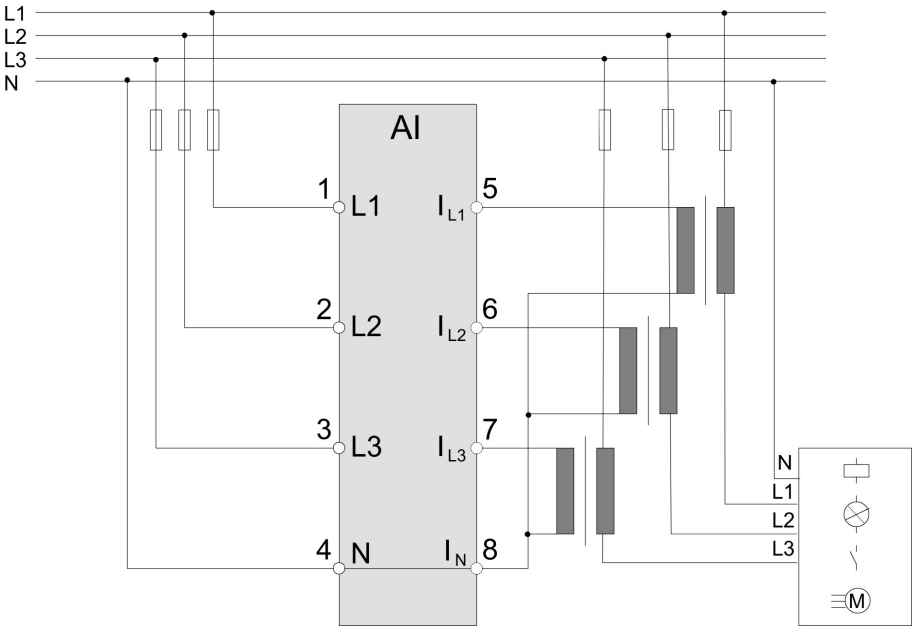
CAUTION!
Connection and module exchange only without power!
- Before you start to work on at the module for installation or maintenance, you have to disconnect it from the main power source, i.e. the power line is to be switched off (possibly remove fuses)!
- The electronic module may only be replaced on power off!
- Only properly qualified electrical staff is allowed to install, connect and/or modify electrical equipment!
- Please adhere to the national rules and regulations of the location and/or country where the units are installed (installation, safety precautions, EMC ...).

CAUTION!
Do not exchange current and voltage connections!
Please note when connecting, that the current and voltage paths are not exchanged! The module will be destroyed by directly connecting one phase to a low-resistance current connector!

CAUTION!
Use current transformer with max. 1A!
You may only use current transformer with max. current of 1A! Please consider the data sheet of your current transformer!

CAUTION!
All phases of one supply grid!
Please note that the phases to be measured must be from the same supply grid!

Reset energy counters after installation!
As soon as the module is supplied by the DC 24V power section supply, the measurement is started and the counting of the energy counters is continued with the retentive stored counter values. The measurement is not interrupted by STOP or RESET of the CPU respectively the bus coupler. After installing the module the energy counters should be reset by CMD-Frame. ‘CMD Frame’ on page 332



3.27.5 Parameter data

DS - Record set for access via CPU, PROFIBUS and PROFINET
IX - Index for access via CANopen
SX - Subindex for access via EtherCAT with Index 3100h + EtherCAT-Slot

More can be found in the according manual of your bus coupler.

Name	Data type	Description	Default (dec.)	DS	IX	SX
CFG	UINT_8	Choice of phases and data formats	0	80h	3100h	01h
F0V1	UINT_8	Frame 0: Value 1 (ID)	1	81h	3101h	02h
F0V2	UINT_8	Frame 0: Value 2 (ID)	9		3102h	03h
F0V3	UINT_8	Frame 0: Value 3 (ID)	13		3103h	04h
F0V4	UINT_8	Frame 0: Value 4 (ID)	0		3104h	05h
F0V5	UINT_8	Frame 0: Value 5 (ID)	0		3105h	06h

Name	Data type	Description	Default (dec.)	DS	IX	SX
IRMS_MAX	UINT_32	Current upper limit [mA] Range of values: 0 ... 25000000	0	82h	3106h.. 3109h	07h
VRMS_MAX	UINT_16	Voltage upper limit [V] Range of values: 0 ... 500	260	83h	310Ah 310Bh	08h
VRMS_MIN	UINT_16	Voltage lower limit [V] Range of values: 0 ... 500	200		310Ch.. 310Dh	09h
PF_MIN	UINT_8	CosPhi lower limit [0.01] Range of values: 0 ... 100	30	84h	310Eh..	0Ah
T_MAX	UINT_16	Temperature upper limit [0.01 °C] Range of values: 0 ... 20000	7000	85h	310Fh.. 3110h	0Bh
F_MAX	UINT_16	Frequency upper limit [0.01 Hz] Range of values: 0 ... 20000	5100		3111h.. 3112h	0Ch
F_MIN	UINT_16	Frequency lower limit [0.01 Hz] Range of values: 0 ... 20000	4900		3113h.. 3114h	0Dh
CT_FACTOR	UINT_16	Current transformer factor Range of values: 1 ... 5000	1		3115h.. 3116h	0Eh
HARM	UINT_8	Harmonic number *‘Harmonics’ on page 316* Range of values: 1 ... 14	1	86h	3117h	0Fh
The parameters are transferred in big-endian format (byte order: high byte, low byte).						

- *After transferring the parameters to the module the status bits are reset and the measurement is interrupted for a short time!*
- *Please note when at least one phase is de-activated, the parameters PF_MIN and VRMS_MIN are ignored and set to "0".*
- *On error in the parametrization the MF LED blinks and you receive an error message.* *‘Status communication’ on page 324*

Data type *‘Data type’ on page 314*

CFG

Bit	Name	Description	Default
2 ... 0	reserved		0
3	Phase 1	Measurement phase L1 0: Measurement is activated 1: Measurement is de-activated	0

Bit	Name	Description	Default
4	Phase 2	Measurement phase L2 0: Measurement is activated 1: Measurement is de-activated	0
5	Phase 3	Measurement phase L3 0: Measurement is activated 1: Measurement is de-activated	0
6	Data type	Data type of the measured values in the user data 0: Integer (INT) 1: 32bit floating point (FLOAT) DIN IEEE 754	0
7	Byteorder	Data type of the measured values in the user data 0: Big-Endian: Byte order: high byte, low byte 1: Little-Endian: Byte order: low byte, high byte	0

F0V1 ... F0V5

In the module you can combine some measurands to one data package (Frame), which is transferred in one step.

'Frame' on page 314

By specifying the *ID* of the corresponding measurand, via *F0V1* ... *F0V5* the data areas of Frame 0 can be defined. Please note that here the user data length of 12 bytes is not exceeded.

'Measurands' on page 320

- Range of values: 0 ... 41
- Default:
  - F0V1: 1 (active energy consumer)
  - F0V2: 9 (total active power)
  - F0V3: 13 (total cos φ)
  - F0V4: 0
  - F0V5: 0

3.27.6 Measurands

ID	Description	Data type	Unit	Min. value	Max. value
1	Counter: Active energy consumer	INT_32	1Wh *	0	4 294 967 295
2	Counter: Active energy producer	INT_32	1Wh *	0	4 294 967 295
3	Counter: Active energy L1 consumer	INT_32	1Wh *	0	4 294 967 295
4	Counter: Active energy L1 producer	INT_32	1Wh *	0	4 294 967 295
5	Counter: Active energy L2 consumer	INT_32	1Wh *	0	4 294 967 295
6	Counter: Active energy L2 producer	INT_32	1Wh *	0	4 294 967 295
7	Counter: Active energy L3 consumer	INT_32	1Wh *	0	4 294 967 295
8	Counter: Active energy L3 producer	INT_32	1Wh *	0	4 294 967 295
9	Total active power	INT_32	1mW	0	3 750 000

ID	Description	Data type	Unit	Min. value	Max. value
10	Total reactive power	INT_32	1mW	0	3 750 000
11	Total apparent power	INT_32	1mW	0	3 750 000
12	Frequency	INT_16	0.01Hz	4600	6400
13	Total cos φ	INT_8	0.01	10	100
14	Temperature	INT_16	0.01°C	-2500	8500
15	Active power L1	INT_32	1mW	0	1 250 000
16	Reactive power L1	INT_32	1mW	0	1 250 000
17	Total power L1	INT_32	1mW	0	1 250 000
18	Voltage L1	INT_32	1mV	0	300 000
19	Current L1	INT_16	1mA	1000	5000
20	Cos phi L1	INT_8	0.01	100	100
21	Harmonic voltage L1	INT_32	1mV	0	300 000
22	Harmonic current L1	INT_16	1mA	1000	5000
23	Active power L2	INT_32	1mW	0	1 250 000
24	Reactive power L2	INT_32	1mW	0	1 250 000
25	Total power L2	INT_32	1mW	0	1 250 000
26	Voltage L2	INT_32	1mV	0	300 000
27	Current L2	INT_16	1mA	1000	5000
28	Cos phi L2	INT_8	0.01	100	100
29	Harmonic voltage L2	INT_32	1mV	0	300 000
30	Harmonic current L2	INT_16	1mA	1000	5000
31	Active power L3	INT_32	1mW	0	1 250 000
32	Reactive power L3	INT_32	1mW	0	1 250 000
33	Total power L3	INT_32	1mW	0	1 250 000
34	Voltage L3	INT_32	1mV	0	300 000
35	Current L3	INT_16	1mA	1000	5000
36	Cos phi L3	INT_8	0.01	100	100
37	Harmonic voltage L3	UINT_32	1mV	0	300 000
38	Harmonic current L3	UINT_16	1mA	1000	5000
39	Overflow energy meter Is incremented by 1 in case of overflow of the energy meter (ID = 1)	UINT_32			
40	Overflow energy meter Is incremented by 1 in case of overflow of the energy meter (ID = 2)	UINT_32			
41	*'Status measurement' on page 322*	UINT_16			

Resolution energy meter

The display resolution of the energy meter is 1Wh x *CT-FACTOR* (current transformer factor). *'Parameter data' on page 318*

Tolerance

The measuring tolerance for each measurand is continuously 1%.

ID

Each measurand one *ID* is assigned. The access to the measured value of a measurand happens by means of the corresponding *ID*.

Data type

'Data type' on page 314

Status measurement

With *status measurement* you get information about limit violations.

- The limit values can be defined via the parametrization. *'Parameter data' on page 318*
- The *status measurement* is refreshed together with the other measurement values, as soon as the DS-ID is incremented.
- Set bits of *status measurement* remain set as long as they are acknowledged by *'CMD Frame' on page 332*.
- Byte order: high byte, low byte (big endian)

Byte	Description
0	0: de-activated, 1: activated ■ Bit 0: Voltage at phase L2 below limit value (L2: VRMS_MIN) ■ Bit 1: Voltage at phase L3 below limit value (L3: VRMS_MIN) ■ Bit 2: Voltage at phase L1 above limit value (L1: VRMS_MAX) ■ Bit 3: Voltage at phase L2 above limit value (L2: VRMS_MAX) ■ Bit 4: Voltage at phase L3 above limit value (L3: VRMS_MAX) ■ Bit 5: Temperature above limit value (T_MAX) ■ Bit 6: Frequency below limit value (F_MIN) ■ Bit 7: Temperature above limit value (T_MAX)
1	0: de-activated, 1: activated ■ Bit 0 – 0: deleted via CMD Frame (0x04) – 1: if there was a RESET of the module. This happens after PowerON. ■ Bit 1: Current at phase L1 above limit value (L1: IRMS_MAX) ■ Bit 2: Current at phase L2 above limit value (L2: IRMS_MAX) ■ Bit 3: Current at phase L3 above limit value (L3: IRMS_MAX) ■ Bit 4: Efficiency cos φ phase L1 below limit value (L1: PF_MIN) ■ Bit 5: Efficiency cos φ phase L2 below limit value (L2: PF_MIN) ■ Bit 6: Efficiency cos φ phase L3 below limit value (L3: PF_MIN) ■ Bit 7: Voltage at phase L1 below limit value (L1: VRMS_MIN)

3.27.7 Process data communication

Overview

During runtime the communication with the module happens via telegrams in the process image. Here you have the following possibilities:

- Read measured value
- Define Frame with measurands
- Read Frame with measured values
- Send control command

3.27.7.1 Structure

Telegram

The communication takes place via the I/O area of the head module. The head module sends via the output area a request telegram to the module. This responds with the requested data within the input area of the head module. Depending on the used head module this may take several cycles to complete, until the data are received in the input area. To ensure the consistency of all measured values, which originate from the same measurement, are stored in the module under one *'DS-ID' on page 313*. For input and output data the telegram has a length of 16byte and the following structure:

Byte	Function
B0	B0: Header byte 0 ■ Bit 3 ... 0: *'Status communication' on page 324* ■ Bit 6 ... 4: Telegram type ■ Bit 7: 0 fix reserved
B1	B1: Header byte 1 ■ ID of the measurand (1 ... 41) *'Measurands' on page 320* – Each measurand one *ID* is assigned. The access to the measured value of a measurand happens by means of the corresponding *ID*
B2	B2: Header byte 2 ■ Bit 3 ... 0: Data set ID (DS-ID) of the measured value (1 ... 15) ■ Bit 7 ... 4: Length of the user data (1 ... 12)
B3	B3: Header byte 3 - *Common status* ■ Bit 0: Frequency *F_MAX* exceeded ■ Bit 1: Frequency *F_MIN* undershot ■ Bit 2: Temperature *T_MAX* exceeded ■ Bit 3: Voltage *VRMS_MAX* exceeded ■ Bit 4: Voltage *VRMS_MIN* undershot ■ Bit 5: Efficiency *PF_MIN* undershot ■ Bit 6: Current *IRMS_MAX* exceeded ■ Bit 7: reserved
D00	D00 ... D11: User data: ■ User data for data to be sent and received
...	
D11	

Status communication

Via the header byte (bit 3 ... 0) the status of the communication can be determined. On error no user data are transferred i.e. the length of the user data is 0. Please note that low error IDs are overridden by higher error IDs.

Status	Designation
0x00	OK (no error)
0x01	Error: No new measured values available
0x02	Error: *DS-ID*
0x03	Error: Telegram length
0x04	Error: *Frame* too big
0x05	Error: *Frame* not defined
0x06	Error: Measurand not available *Chapter 3.27.6 'Measurands' on page 320*
0x07	Error: *'CMD Frame'* - Command could not be executed
0x08	Error: *'Set Frame'* - Frame definition is not valid (Set Frame)
0x09	Error: Telegram type not available - invalid request
0x0A	Error: Parameter - the last parameter set was not valid
0x0E	External error - Please contact our support
0x0F	Internal error - Please contact our support On an *internal error* (0x0F) all the measurements are stopped and a Reset of the module to default parameters is triggered! Here all counter values and Frame definitions are deleted!

Telegram types

By specifying the *Telegram type* the content of the responded data is defined. The following telegram types are available:

Type	Designation	Page
0x00	*'Zero Frame'*: Accessing *Frame 0*	*325*
0x01	*'Read Value'*: Read the measured value of a measurand	*326*
0x02	*'Read Frame'*: Read a previously defined data package (Frame)	*330*
0x03	*'Set Frame'*: Define the data areas of a data package (Frame)	*327*
0x04	*'CMD Frame'*: Send a command	*332*

Data set ID - DS-ID

The measured values of one measurement are accessible in the module via one DS-ID. *'DS-ID' on page 313*

Length of the user data

Length of user data are specified from D00 ... D11: On error no user data are transferred i.e. the length of the user data is 0 and the module returns an error ID.

Range of values: 0 ... 12

Common status

With this byte you get an overview of possible error messages. With *'Status measurement' on page 322* you get detailed information about an error.

- Bit 0: Frequency *F_MAX* exceeded
- Bit 1: Frequency *F_MIN* undershot
- Bit 2: Temperature *T_MAX* exceeded
- Bit 3: Voltage *VRMS_MAX* exceeded
- Bit 4: Voltage *VRMS_MIN* undershot
- Bit 5: Efficiency *PF_MIN* undershot
- Bit 6: Current *IRMS_MAX* exceeded
- Bit 7: reserved

User data

Depending on the telegram type, here up to 12 byte user data can be found.

3.27.7.2 Telegram types

Telegram types

By specifying the *Telegram type* the content of the responded data is defined. The following telegram types are available:

Type	Designation	Page
0x00	*'Zero Frame'*: Accessing *Frame 0*	*325*
0x01	*'Read Value'*: Read the measured value of a measurand	*326*
0x02	*'Read Frame'*: Read a previously defined data package (Frame)	*330*
0x03	*'Set Frame'*: Define the data areas of a data package (Frame)	*327*
0x04	*'CMD Frame'*: Send a command	*332*

3.27.7.2.1 Zero Frame

This telegram type is the same as the telegram type *'Read Frame'* applied at *Frame 0*. After the start-up of the module there are automatic *Zero Frame* requests as long as the process data communication comes from the head module. *'Read Frame' on page 330*

3.27.7.2.2 Read Value

With *'Read Value'* all the measured values can be requested.

Request

Byte	Value	Description
B0	0x10	■ Bit 3 ... 0: Error code (not relevant) ■ Bit 6 ... 4: 001 Telegram type *'Read Value'* ■ Bit 7: 0 fix reserved
B1	?	■ *'ID' on page 313* of the measurand
B2	0x?0	■ Length user data: 0
		■ *'DS-ID' on page 313* of the measured value to be read
B3	0x00	■ Common status (not relevant)
D00	-	■ User data (not relevant)
...		
D11		

Response

Byte	Value	Description
B0	0x10	■ Bit 3 ... 0: *'Status communication' on page 324* ■ Bit 6 ... 4: 001 Telegram type *'Read Value'* ■ Bit 7: 0 fix reserved
B1	...	■ *ID* of the measurand from the request
B2	...	■ Length of the user data with measured values in byte
		■ *DS-ID* of the measured value from the request, which was read
B3	...	■ *'Common status' on page 325*
D00	...	■ User data with the requested measured value ■ Byte order: high byte, low byte (big endian)
...		
D11		

Example *'Read Value'* In the example with *ID* = 14 the temperature of the module for *DS-ID* = 1 is requested.

Request

Byte	Value	Description
B0	0x10	Telegram type *'Read Value'*
B1	0x0E	*'ID' on page 313* of the measurand
B2	0x01	*'DS-ID' on page 313* of the measured value to be read (*DS-ID* = 1)
B3	0x00	Common status (not relevant)
D00	-	User data (not relevant)
...		
D11		

Response

Byte	Value	Description
B0	0x10	Telegram type *'Read value'* from the request
B1	0x0E	*ID* of the measurand from the request
B2	0x21	Length of the user data here temperature 2 byte
		DS-ID of the measured value from the request, which was read
B3	0x00	*'Common status' on page 325*: OK
D00	0x00	User data with the requested temperature e.g. 35°C
D01	0x23	

3.27.7.2.3 Set Frame

Overview In the module you can combine some measurands to one data package (Frame), which is transferred in one step *'Frame' on page 314*. With *'Set Frame'* a Frame can be built.

Request

Byte	Value	Description
B0	0x30	■ Bit 3 ... 0: Error code (not relevant) ■ Bit 6 ... 4: 011 Telegram type *'Set Frame'* ■ Bit 7: 0 fix reserved
B1	?	■ *'FR-ID' on page 314* of the Frame to be set
B2	0x0?	■ Length user data: 1 byte each measurand
		■ *DS-ID* here fix 0
B3	0x00	■ Common status (not relevant)

Byte	Value	Description
D00 ... D11	?	■ 1 byte each measurand regarding that the measured values do not exceed the total length of 12 byte. Here, the format of the measured values is taken into account. ↳ *'Measurands' on page 320* ↳ *'Data type' on page 314*

Response

Byte	Value	Description
B0	0x30	■ Bit 3 ... 0: ↳ *'Status communication' on page 324* ■ Bit 6 ... 4: 011 Telegram type *'Set Frame'* ■ Bit 7: 0 fix reserved
B1	...	■ *FR-ID* of the Frame from the request
B2	...	■ Length of the user data from the request ■ *DS-ID* here fix 0
B3	...	■ ↳ *'Common status' on page 325*
D00 ... D11	...	■ User data from the request

Example *'Set Frame'* Here a Frame with *FR-ID* 0x01 is defined. The Frame contains the following measurands:

- ID: 03: Counter: Active energy L1 (consumer)
- ID: 13: total cos φ
- ID: 12: Frequency

Request

Byte	Value	Description
B0	0x30	Telegram type *'Set Frame'*
B1	0x01	*'FR-ID' on page 314* of the Frame to be read (*FR-ID* = 1)
B2	0x03	Length user data: 3 byte
B3	0x00	Common status (not relevant)
D00	0x03	User data with the ID of the measurands
D01	0x0D	
D02	0x0C	
D03	-	Remaining user data are not relevant
...		
D11		

Response

Byte	Value	Description
B0	0x30	Telegram type *'Set Frame'* from the request
B1	0x01	*FR-ID* of the Frame from the request
B2	0x03	Length of the user data from the request
B3	0x00	*'Common status' on page 325*: OK
D00	0x03	User data from the request
D01	0x0D	
D02	0x0C	
D03	-	Remaining user data are not relevant
...		
D11		

3.27.7.2.4 Read Frame

Overview

In the module you can combine some measurands to one data package (Frame), which is transferred in one step.

↳ *'Frame' on page 314*

With *'Read Frame'* a Frame can be requested.

Request

Byte	Value	Description
B0	0x20	■ Bit 3 ... 0: Error code (not relevant) ■ Bit 6 ... 4: 010 Telegram type *'Read Frame'* ■ Bit 7: 0 fix reserved
B1	?	■ ↳ *'FR-ID' on page 314* of the Frame to be read
B2	0x00	■ Length of the user data is 0
	?	■ ↳ *'DS-ID' on page 313* of the measured value to be read
B3	0x00	■ Common status (not relevant)
D00	-	■ Common status (not relevant)
...		
D11		

Response

Byte	Value	Description
B0	0x20	■ Bit 3 ... 0: ↳ *'Status communication' on page 324* ■ Bit 6 ... 4: 010 Telegram type *'Read Frame'* ■ Bit 7: 0 fix reserved
B1	...	■ *FR-ID* of the Frame from the request
B2	...	■ Length of the user data with measured values in byte
	...	■ *DS-ID* of the measured value from the request, which was read
B3	...	■ ↳ *'Common status' on page 325*
D00	...	■ User data with the requested Frame with measured values ■ Byte order: high byte, low byte (big endian)
...		
D11		

Example *'Read Frame'* In the example the previously via *'Set Frame'* defined *FR-ID* (0x01) is requested with the following measurands:

- ID: 03: Counter: Active energy L1 (consumer): 4byte
- ID: 13: total cos φ: 1byte
- ID: 12: Frequency 2byte

Request

Byte	Value	Description
B0	0x20	Telegram type *'Read Frame'*
B1	0x01	*'FR-ID' on page 314* of the Frame to be read (*FR-ID* = 1)
B2	0x71	Length of the user data is 7 *'DS-ID' on page 313* of the measured value to be read (*DS-ID* = 1)
B3	0x00	Common status (not relevant)
D00	-	User data (not relevant)
...		
D11		

Response

Byte	Value	Description
B0	0x20	Telegram type *'Read value'* from the request
B1	0x01	*FR-ID* of the Frame from the request
B2	0x71	Length of the Frame with measured values: 7 *DS-ID* of the measured value from the request
B3	0x00	*'Common status' on page 325*: OK
D00	0x00	Counter: Active energy L1 (consumer): 500kWh
D01	0x07	
D02	0xA1	
D03	0x20	
D04	0x5A	Total cos φ: 0.9
D05	0x13	Frequency: 50Hz
D06	0x88	
D07	-	Remaining user data are not relevant
...		
D11		

3.27.7.2.5 CMD Frame

With *'CMD Frame'* you can send control commands to the module. This can trigger various actions or be used for reading and writing of control registers. The following control commands are available:

- Reset the energy counter
- Reset the status bits
- Request the firmware version

Request

Byte	Value	Description
B0	0x40	■ Bit 3 ... 0: Error code (not relevant) ■ Bit 6 ... 4: 100 Telegram type *'CMD Frame'* ■ Bit 7: 0 fix reserved
B1	?	■ *CMD-ID* of the control command, which is to be executed – 0x01: Reset of all energy counters – 0x03: Reset the status bits – 0x04: Request the firmware version
B2	?	■ Length of the user data depending on *CMD-ID* – 0x01: Reset of all energy counters (length user data: 0byte) – 0x03: Reset the status bits: (length user data: 4byte) – 0x04: Request the firmware version (Length user data: 0byte)
	?	■ *DS-ID* (not relevant)
B3	0x00	■ Common status (not relevant)
D00 ... D11	-	■ User data depending on *CMD-ID* – 0x01: Reset of all energy counters (user data: not relevant) – 0x03: Reset the status bits: (User data: 4byte with the corresponding set bits) – 0x04: Request the firmware version (user data: not relevant)

Response

Byte	Value	Description
B0	0x40	■ Bit 3 ... 0: *'Status communication' on page 324* ■ Bit 6 ... 4: 100 Telegram type *'CMD Frame'* ■ Bit 7: 0 fix reserved
B1	...	■ *CMD-ID* from the request
B2	...	■ Length of the user data depending on *CMD-ID* – 0x01: Reset of all energy counters (length user data: 0byte) – 0x03: Reset the status bits: (length user data: 4byte) – 0x04: Request the firmware version (Length user data: 10byte)
		■ *DS-ID* (not relevant)
B3	...	■ *'Common status' on page 325*
D00	...	■ User data depending on *CMD-ID* – 0x01: Reset of all energy counters (user data: nothing)

Byte	Value	Description
...		– 0x03: Reset the status bits: (User data: 4byte with the corresponding set bits) – 0x04: Request the firmware version (user data: 10byte with the version information) ■ Byte order: high byte, low byte (big endian)
D11		

Firmware version

- Byte 2... 0: Firmware version
- Byte 5 ... 3: Protocol version
  - Byte 3: Major
  - Byte 4: Minor
  - Byte 5: Revision
- Byte 9 ... 6: Measuring chip version
  - Byte 6: Day
  - Byte 7: Month
  - Byte 8: Year (hundreds)
  - Byte 9: Year (one)

Example *'CMD Frame'* In this example all the status bits are reset.

Request

Byte	Value	Description
B0	0x40	Telegram type *'CMD Frame'*
B1	0x03	*CMD-ID*: Reset the status bits
B2	0x40	Reset the status bits: (length user data: 4byte)
B3	0x00	Common status (not relevant)
D00	0xFF	User data: Reset the status bits
D01	0xFF	
D02	0xFF	
D03	0xFF	

Response

Byte	Value	Description
B0	0x40	Telegram type *'CMD Frame'* from the request
B1	0x03	*CMD-ID* from the request
B2	0x40	Length of the user data from the request
B3	0x00	*'Common status' on page 325*: OK
D00	0xFF	User data from the request
D01	0xFF	
D02	0xFF	
D03	0xFF	

3.27.7.2.6 Example

Communication

Here the communication and the query of the status bits (*ID* = 41) are described on an example.

No.	Request	Response	Description
1	0x10 0x01 0x03 0x00		An *ID* and *DS-ID* is requested: e.g.: M 1-3 M (*ID*)-(*DS-ID*)
3		0x10 0x01 0x43 0x01 (4 byte data)	M 1-3 indicates frequency exceeded.
4	0x10 0x29 0x03 0x00		Query the status bits M 41-3.
5		0x10 0x29 0x43 0x05 0x00 0x00 0x80 0x00	Frequency exceeded and temperature exceeded is reported.
6	0x10 0x29 0x04 0x00		Query the status bits M 41-4.
7		0x10 0x29 0x44 0x05 0x00 0x00 0xA0 0x00	The status bit were refreshed (*ID* = 41) and temperature exceeded is reported.
8	0x40 0x03 0x45 0x00 0x00 0x00 0xA0 0x00		Reset the status bits.
9		0x40 0x03 0x45 0x00 0x00 0x00 0xA0 0x00	Status bits have been reset.
10	0x10 0x29 0x05 0x00		Query the status bits M 41-5.
11		0x10 0x29 0x45 0x04 0x00 0x00 0x00 0x00	Status bits have been reset. Temperature exceeded is reported.

3.27.8 Error messages and diagnostics

3.27.8.1 Status and error messages

Common status

'Common status' on page 325

Status communication

'Status communication' on page 324

Status measurement

'Status measurement' on page 322

3.27.8.2 Diagnostic data

This module does not support diagnostic interrupt functions, the diagnostics data serve for information about this module. On error the corresponding channel LED of the module is activated and the error is registered in the diagnostics data.

The following errors are listed in the diagnostics data:

- Error in configuration / parametrization

DS - Record set for access via CPU, PROFIBUS and PROFINET. The access happens by DS 01h. Additionally the first 4 bytes may be accessed by DS 00h.

IX - Index for access via CANopen. The access happens by IX 2F01h. Additionally the first 4 bytes may be accessed by IX 2F00h.

SX - Subindex for access via EtherCAT with Index 5005h.

More can be found in the according manual of your bus coupler.

Name	Bytes	Function	Default	DS	IX	SX
ERR_A	1	Diagnostic	00h	01h	2F01h	02h
MODTYP	1	Module information	15h			03h
ERR_C	1	reserved	00h			04h
ERR_D	1	Diagnostic	00h			05h
CHTYP	1	Channel type	71h			06h
NUMBIT	1	Number diagnostic bits per channel	08h			07h
NUMCH	1	Number of channels of a module	01h			08h
CHERR	1	Channel error	00h			09h
CH0ERR	1	Channel-specific error channel 0	00h			0Ah
CH1ERR… CH7ERR	7	reserved	00h			0Bh ... 11h
DIAG_US	4	µs ticker	00h			13h

ERR_A Diagnostic

Byte	Bit 7 ... 0
0	■ Bit 0: set at module failure ■ Bit 1: set at internal error ■ Bit 2: set at external error ■ Bit 3: set at channel error ■ Bit 4: set at external auxiliary supply missing ■ Bit 6 ... 5: reserved ■ Bit 7: set at error in parameterization

MODTYP Module information

Byte	Bit 7 ... 0
0	■ Bit 3 ... 0: module class – 0101b analog module ■ Bit 4: set at channel information present ■ Bit 7 ... 5: reserved

ERR_D Diagnostic

Byte	Bit 7 ... 0
0	■ Bit 2 ... 0: reserved ■ Bit 3: set at internal diagnostics buffer overflow ■ Bit 4: set at internal communication error ■ Bit 7 ... 5: reserved

CHTYP Channel type

Byte	Bit 7 ... 0
0	■ Bit 6 ... 0: Channel type – 70h: Digital input – 71h: Analog input – 72h: Digital output – 73h: Analog output – 74h: Analog input/-output – 76h: Counter ■ Bit 7: reserved

NUMBIT Diagnostic bits

Byte	Bit 7 ... 0
0	Number of diagnostic bits per channel (here 08h)

NUMCH Channels

Byte	Bit 7 ... 0
0	Number of channels of the module (here 01h)

CHERR Channel error

Byte	Bit 7 ... 0
0	■ Bit 0: set at error in channel 0

CH0ERR Channel-specific

Byte	Bit 7 ... 0
0	Channel-specific error channel 0 ■ Bit 0: set at configuration / parametrization error ■ Bit 7 ... 1: reserved

CH1ERR ... CH7ERR reserved

Byte	Bit 7 ... 0
0	reserved

DIAG_US µs ticker

Byte	Bit 7 ... 0
0...3	Value of the µs ticker at the moment of the diagnostic

µs ticker

In the SLIO module there is a timer (µs ticker). With PowerON the timer starts counting with 0. After 2^{32}-1µs the timer starts with 0 again.

3.27.9 Use handling block

3.27.9.1 Include VIPA library

Overview

The VIPA specific blocks can be found in the service area of www.vipa.com as library download file at Downloads > VIPA LIB. The library is available as packed zip file. As soon as you want to use VIPA specific blocks you have to import them into your project. Execute the following steps:

1. Unzip Zip file
2. "Retrieve" the library
3. Open library and transfer blocks into the project

Unzip the Zip file

- Start your unzip application with a double click on the Zip file and copy the unzipped file to your work directory. It is not necessary to extract this file, too.

Retrieve library

1. To retrieve your library for the CPUs, start the SIMATIC manager from Siemens. Open the dialog window for archive selection via *'File ➔ Retrieve'*. Navigate to your work directory.
2. Select the unzipped file and click at [Open].
3. Select a destination folder where the blocks are to be stored.
4. With [OK] the extraction is started.

Open library and transfer blocks into the project

1. Open the library after the extraction.
2. Open your project and copy the FB 325 and the UDT 325 from the library into the directory "blocks" of your project.
   ⇨ Now you have access to the blocks via your user application.
3. To use the UDT with your data block, create a new data block in your project and enter at *'Type'* in the declaration view UDT 325.
   ⇨ The data block is created and the structure of the UDT is used.

3.27.9.2 FB 325 - EM_COM_1

Overview

This module enables the communication with the module 031-1PA00 for energy metering and power measurement. For the communication a data block is necessary. Here the DB gets its structure from the UDT 325 EM_COM_1. The block has the following functionalities:

- Load default parameters after start-up
- Storage of parameters, limit values, measured values and messages
- Transfer of consistent measured values
- Definition of the measured values by means of an UDT structure
- Communication by means of telegram type and ID
- Functional diagnostics, connection monitoring and error message evaluation

Parameter

Parameter	Declaration	Data type	Description
MODE	INPUT	BYTE	■ 0x01 = Data exchange via process data Currently only the MODE = 1 is supported
MEAS_DATA	IN_OUT	UDT	■ UDT for the measured values
CHANNEL_ IN	INPUT	ANY	Pointer to the input data ■ With MODE = 0x01 exclusively data type BYTE and length 16 are permitted. Example: P#E100.0 BYTE 16 or P#DB10.DBX0.0 BYTE 16
CHANNEL_OUT	INPUT	ANY	Pointer to the output data ■ With MODE = 0x01 exclusively data type BYTE and length 16 are permitted. Example: P#A100.0 BYTE 16 or P#DB10.DBX16.0 BYTE 16

3.27.9.2.1 UDT 325 - EM_COM_1

UDT - Header

Name	Declaration	Data type	Description
Timeout	INPUT	TIME	■ Timeout for reading measured values
Polltime	INPUT	TIME	■ Interval for the periodic reading
Control_Global	INPUT	BYTE	0: de-activated, 1: activated ■ Bit 0: Periodic execution according to the *Poll-time* (default) ■ Bit 1: Immediate execution - bit is to be reset after the execution. ■ Bit 6 ... 2: reserved ■ Bit 7: Re-initialization of the block by the configuration is sent again
Status_Global	OUTPUT	BYTE	Block status ■ 0x00: Not processed ■ 0x01: In process (BUSY) ■ 0x02: Ready without error (DONE) ■ 0x80: Error on processing (ERROR)
Status Alarm_Global	OUTPUT	BYTE	Corresponds to B3: Header byte 3 - *Common status* ■ Bit 0: Frequency *F_MAX* exceeded ■ Bit 1: Frequency *F_MIN* undershot ■ Bit 2: Temperature *T_MAX* exceeded ■ Bit 3: Voltage *VRMS_MAX* exceeded ■ Bit 4: Voltage *VRMS_MIN* undershot ■ Bit 5: Efficiency *PF_MIN* undershot ■ Bit 6: Current *IRMS_MAX* exceeded ■ Bit 7: reserved *'Common status' on page 325*

Name	Declaration	Data type	Description
Cmd	INPUT	BYTE	0: de-activated, 1: activated ■ Bit 0: Reset the energy counters ■ Bit 1: Trigger Reset at current transformer ■ Bit 2: Reset *status measurement* ↳ *'Status measurement' on page 322* – If several bits are set, they are sequentially processed.
Status_Cmd	OUTPUT	BYTE	Status command ■ 0x00: Not processed ■ 0x01: In process (BUSY) ■ 0x02: Ready without error (DONE) ■ 0x80: Error on processing (ERROR)
Jobtime	OUTPUT	TIME	■ Duration to read the measured values respectively to run a command
DsID	OUTPUT	BYTE	Number of the current DS-ID ↳ *'DS-ID' on page 313*
Frame_ID	OUTPUT	BYTE	Number of the current FR-ID ↳ *'FR-ID' on page 314*
Error_ID	OUTPUT	WORD	Detailed error information
Reserved		ARRAY of BYTE (1...28)	reserved

UDT - data

After the header data, in the UDT there are the measurands sequentially listed with the following structure:

Name	Declaration	Data type	Description
Name	IN_OUT	STRUCT	■ Name of the measurand
Read_Mode	INPUT	BYTE	■ Bit 0: Accessing the measured value – 0: Measured value is not read – 1: Measured value is read
Value	OUTPUT	DWORD	■ Current measured value

ERROR IDs

ERROR ID	Description
0x0000	no error
0x8070	Error: Parameter MODE
0x8073	Error: Parameter CHANNEL_IN does not match MODE
0x8074	Error: Parameter CHANNEL_OUT does not match MODE
0x8080	Error: Write parameter: Data length is beyond 1 or 2 byte

ERROR ID	Description
0x8081	Error: Write parameter: Timeout detected when writing
0x8091	Error: Read measured value: Timeout detected when reading
0x80A1	Error: Telegram type not available - invalid request
0x80A2	Error: Frame not defined
0x80A3	Error: Measurand not available
0x80A4	Error: Telegram length
0x80A5	Error: Frame too big
0x80A6	Error: No new measured values available
0x80A7	Error: DS-ID
0x80A8	Error: "CMD Frame" - Command could not be executed
0x80AF	Internal error - Please contact our support! On an internal error (0x0F) all the measurements are stopped and a reset to the default parameters of the module is triggered! Here all counter values and Frame definitions are deleted!