ABB i-bus® KNX
Energy Module EM/S 3.16.1
Product Manual

Power and productivity
for a better world™

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1 General

With the intelligent power grids of tomorrow – the Smart Grids – electrical building installations will be facing new challenges. In order to increase the energy efficiency of buildings, it is necessary to record the electrical parameters of consumers in buildings. The ABB i-bus® KNX provides the optimum prerequisites for intelligent buildings.

By combining energy management with illumination and shutter control, heating, ventilation and surveillance, the use of the ABB i-bus® KNX enhances the living quality, comfort and safety and can be easily combined with cost-effectiveness and environmental awareness with minimal planning and installation effort. Furthermore, the flexible usage of rooms and the continuous adaptation to changing requirements are simple to realise.

The ABB i-bus® KNX Energy Module EM/S 3.16.1 records the energy consumption of the connected electrical loads in watt hours (Wh).

The active energy consumption per output is determined. Furthermore, the total consumption of all three outputs is also available. All meter values can be sent cyclically, on request or when a start or stop event has occurred such as a time, operating period or when a defined consumption threshold is reached.

For each output, the active power, current and voltage as well as further electrical variables (apparent power, crest factor, power factor and frequency) can be measured. The measured values are made available via the ABB i-bus® KNX. They can be monitored with threshold values. Should an overshoot or undershoot of a defined threshold occur, a warning can be sent.

The ETS application also enables simple load management (load control), where up to ten Energy Actuators can be interconnected.

1.1 Using the product manual

This manual provides you with detailed technical information relating to the function, installation and programming of the ABB i-bus® KNX Energy Module EM/S 3.16.1. The application of the device is described using examples.

The manual is divided into the following sections:

Chapter 1	General
Chapter 2	Device technology
Chapter 3	Commissioning
Chapter 4	Planning and application
Chapter A	Appendix

1.1.1 Structure of the product manual

All parameters are described in chapter 3.

Note
The Energy Module has 3 outputs. However, as the functions for all outputs are identical, only the functions of output A will be described.

1.1.2 Notes

Notes and safety instructions are represented as follows in this manual:

Note
Tips for usage and operation

Examples
Application examples, installation examples, programming examples

Important
These safety instructions are used as soon as there is danger of a malfunction without risk of damage or injury.

Caution
These safety instructions are used if there is a danger of damage with inappropriate use.

Danger
These safety instructions are used if there is a danger for life and limb with inappropriate use.

Danger
These safety instructions are used if there is a danger to life with inappropriate use.

1.2 Product and functional overview

The ABB i-bus® KNX Energy Module EM/S 3.16.1 is a modular installation device with module widths of 4 space units in Pro *M* design for installation in a distribution board.

The connection to the ABB i-bus® KNX is established using the front side bus connection terminal. The assignment of the physical addresses as well as the parameterization is carried out with the Engineering Tool Software from version ETS 3.0f or higher.

The following functions can be set:

- Recording of the active consumption in watt hours (Wh) with a main meter and a flexibly programmable intermediate meter for each output. The intermediate meter can be started and stopped in dependence on defined events (1 bit telegrams, time, and consumption). Warnings can be sent on the KNX depending on these events.
- Current, voltage, active power and frequency can be recorded and monitored with the aid of threshold values. Warnings can be sent on the KNX depending on these events. Recording of apparent power, power factor and crest factor are also available.
- A simple load control can be implemented. Every Energy Module can be configured as a master, and the total power of a system by up to ten further Energy Actuators can be recorded. Load shedding stages are sent on the bus, and the devices are shutdown according to their own programmable load shedding stage.

Individual outputs can be copied or exchanged to reduce the programming effort.

2 Device technology

2.1 Energy Module EM/S 3.16.1, MDRC

EM/S 3.16.1

The Energy Module is a modular installation device in Pro *M* design for installation in the distribution board. The load current per output is 20 A.

The connection of the outputs is implemented using universal head screw terminals. Each output is controlled separately via the KNX.

Individual outputs can be copied or exchanged to reduce the programming effort.

The parameterization is undertaken via the ETS. The connection to the KNX is implemented using the bus connection terminal on the front.

2.1.1 Technical data

Supply	Bus voltage	21…30 V DC
	Current consumption via bus	< 12 mA
	Power consumption via bus	Maximum 250 mW
	Power consumption on mains	≤ 0.7 W
Mains inputs (terminals 1, 3, 5)	Floating	3 x
	U_n rated voltage	250/440 V AC (50/60 Hz)
Load outputs (terminals 2, 4, 6)		3 x
	I_n rated current	16/20 A
	Device leakage loss at 3 x 16 A	3.0 W
	Device leakage loss at 3 x 20 A	4.2 W
Measuring range	Active consumption/active power	5.7 W…4,600 W (U_n = 230 V) 2.8 W…2,300 W (U_n = 115 V)
	Current (AC)	0.025…20 A
	Voltage (AC)	95…265 V
	Frequency	45…65 Hz
Accuracy[1)]	Active consumption/active power (250…500 mA)	± 6 % of actual value
	Active consumption/active power (500 mA…5 A)	± 3 % of actual value
	Active consumption/active power (5…20 A)	± 2 % of actual value
	Current (0.025…20 A)	± 1 % of actual value and ±10 mA
	Voltage (95…265 V)	± 1 % of actual value
	Frequency (45…65 Hz)	± 1 % of actual value
Starting current	< 25 mA	

Connections	KNX	Via bus connection terminals, 0.8 mm Ø, solid
	Load current circuits (1 terminal per contact)	Universal head screw terminal (PZ 1) 0.2… 4 mm^2 stranded, 2 x 0.2…2.5 mm^2 0.2… 6 mm^2 solid, 2 x 0.2…4 mm^2
	Ferrules without/with plastic sleeves	0.25…2.5/4 mm^2
	TWIN ferrules	0.5…2.5 mm^2 Contact pin length min. 10 mm
	Tightening torque	maximum 0.6 Nm
Operating and display elements	Button/LED	For assignment of the physical address
Enclosure	IP 20	To EN 60 529
Safety class	II, in the installed state	To EN 61 140
Insulation category	Overvoltage category	III to EN 60 664-1
	Pollution degree	2 to EN 60 664-1
KNX safety extra low voltage	SELV 24 V DC	
Temperature range	Operation	-5 °C…+45 °C
	Storage	-25 °C…+55 °C
	Transport	-25 °C…+70 °C
Ambient conditions	Maximum air humidity	93 %, no condensation allowed
Design	Modular installation device (MDRC)	Modular installation device, Pro *M*
	Dimensions	90 x 72 x 64.5 mm (H x W x D)
	Mounting width in space units (modules at 18 mm)	4
	Mounting depth in mm	64.5
Weight	in kg	0.16
Installation	On 35 mm mounting rail	To EN 60 715
Mounting position	As required	
Housing/colour	Plastic housing, grey	
Approvals	KNX to EN 50 090-1, -2	Certification
CE mark	In accordance with the EMC guideline and low voltage guideline	

1) The stated values apply only if no DC components are present. A DC component causes additional distortion of the measurement result.

Device type	Application program	Maximum number of Communication objects	Maximum number of group addresses	Maximum number of associations
EM/S 3.16.1	Measure 3f/…*	140	254	254

* … = current version number of the application program.

Note

The ETS and the current version of the device application program are required for programming.

The current application program can be found with the respective software information for download on the Internet at *www.abb.com/knx*. After import it is available in the ETS under *ABB/Energy management/Energy module*.

The device does not support the locking function of a KNX device in the ETS. If you inhibit access to all devices of the project with a *BCU code*, it has no effect on this device. Data can still be read and programmed.

Notes

Current values less than 25 mA are indicated as a 0 mA value on the KNX (starting current). For small load currents that are just above the minimum detection threshold of 25 mA, it is possible that a value of 0 mA is displayed due to the inaccuracies, even though a current is flowing.

The Energy Module is only suitable for recording measured values of *Loads*, i.e. the meters only record positive energy. Negative power values are discarded with load control, and negative instrument and power values (feedback) cannot be monitored with thresholds.

Important

With communication objects that can be written via the bus (e.g. threshold value limits), the range of values is not limited, i.e. even if the values that can be entered in the ETS for a threshold value or load limit can only be entered within defined limits, any value can be written to the communication object over the bus. It is therefore necessary to ensure that only permitted and useful values can be written to the communication object.

If the threshold value monitoring is to be used for equipment fault detection that only causes a slight change of less than 30 mA (7 W), mains voltage and current fluctuations due to ambient influences (e.g. temperature) and natural ageing of the load play a significant role. Even when these current changes are detected by the Energy Module, the detected current changes do not necessarily mean that a device has failed.

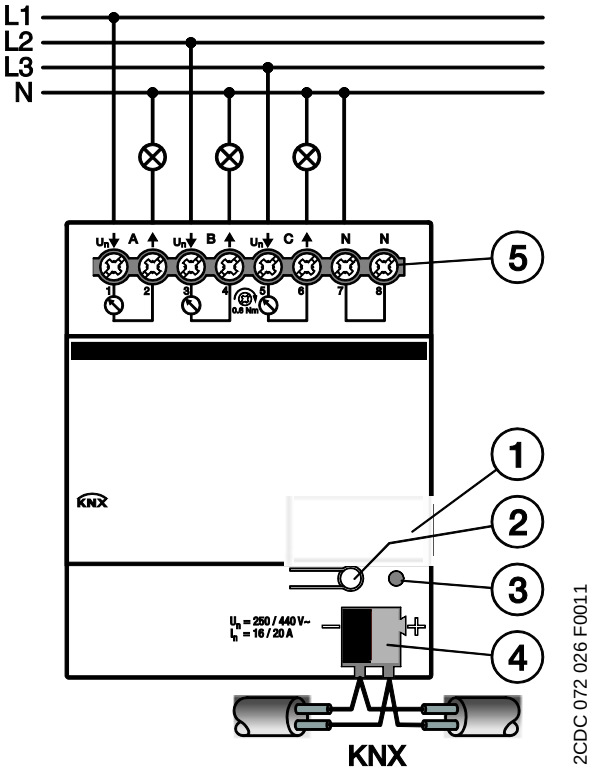
The outputs are electrically isolated from each other, i.e. they can be connected to different phase conductors within the voltage ranges permitted in the technical data. There may not be potential differences between the neutral conductor connection of the load and the neutral conductor connection on the Energy Module to ensure that useful measured values are delivered.

(Also refer to the note under Circuit diagram, page 10.)

Danger

In order to avoid dangerous touch voltages, which originate through feedback from differing phase conductors, all-pole disconnection must be observed when extending or modifying the electrical connections.

2.1.2 Circuit diagram



1 Label carrier

2 Button *Programming*

3 LED *Programming* (red)

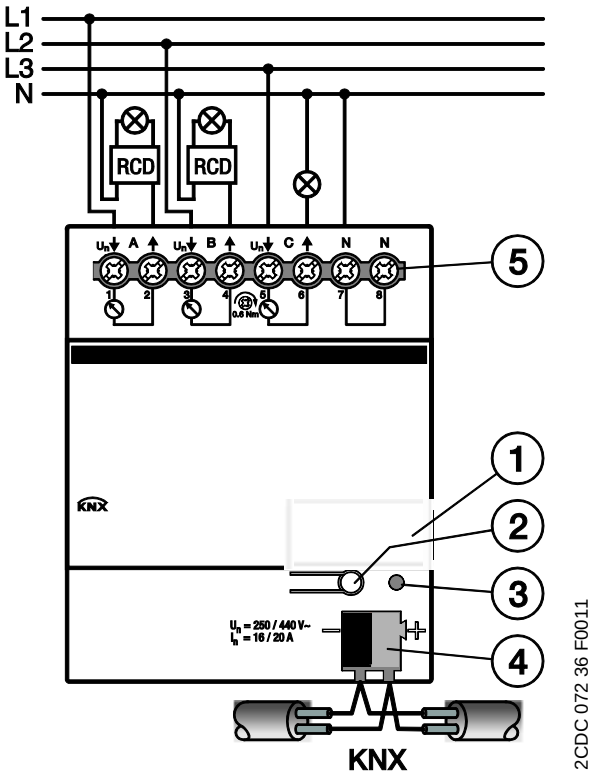
4 Bus connection terminal

5 Load circuits (A…C) each with 2 screw terminals, neutral conductor (N)

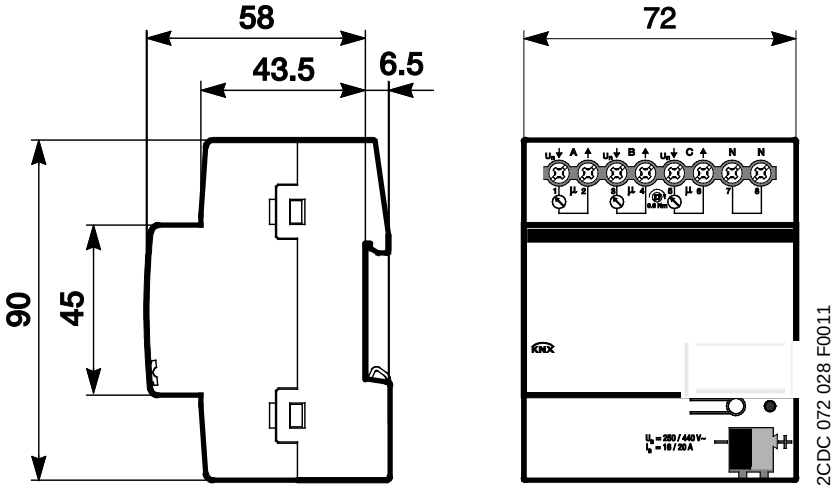
Important
Mains voltage must be present on at least one output, and the neutral conductor must be connected for supplying power to the measurement section.
No load currents may be conducted via the N terminal on the device.
Terminals 7 or 8 should be connected directly to the N busbar.
The second N terminal can be used to loop to further Energy Modules.

2.1.2.1 Connection example

If the outputs of the Energy Module are to be individually protected against residual currents, the RCD (earth-leakage circuit breaker) must be connected as follows.



2.1.3 Dimension drawing



2.2 Measurement methods

The Energy Module has its own evaluation electronics for detection and measurement of the various measured variables for each output, which can be programmed separately.

Current and voltage are measured directly; all other variables (meter values, active power, apparent power, power factor, crest factor, frequency) are derived from these values.

The measurement method, other than with the Switch Actuators SA/S, is a real RMS value measurement. The signal is scanned 100 times per period (at 50 Hz), and the RMS value is determined from these scanned values. The measuring accuracy is also assured with non-sinusoidal signals.

The measured values are evaluated every 200 ms. An overshoot of a threshold is therefore detected after 200 ms at the latest.

Current values less than 25 mA are displayed as value 0 (starting current). For this reason, even values derived from the current are indicated as a value of 0 even when a current less than 25 mA is flowing. Voltages less than 5 V as shown as 0 for technical reasons.

Note
The progression of the current and voltage curves is not analyzed, i.e., analysis of the signal waveform (e.g. FFT) is not undertaken. All values are determined by sampling the signal. Therefore, the power factor always results as the sum of the distortion power (e.g. dimmer currents) and displacement power (e.g. inductive or capacitive loads). This power factor does **not** (or only in special cases) comply with the cos φ (Cosine Phi) with a phase displacement current! It can also **not** be used for reactive power compensation!

2.3 Requesting status values and setting the cycle times

The 1 bit communication objects for requesting status values are enabled for the Energy Module at a central point. There is a 1 bit communication object each for requesting all status values, all meter values, all power values and all instrument values.

Furthermore, the cycle times for cyclic sending of telegrams are set at a central point with the Energy Module. There is a common cycle time for cyclic sending of all power values, all instrument values and all meter values.

On the individual communication objects, you can then set whether the value of the respective communication object should or should not be sent *cyclically* or *on request*.

2.4 Assembly and installation

The ABB i-bus® KNX Energy Module EM/S 3.16.1 is a modular installation device for installation in the distribution board on 35 mm mounting rails to EN 60 715.

The mounting position can be selected as required.

The electrical connection is implemented using screw terminals. The connection to the bus is implemented using the supplied bus connection terminal. The terminal assignment is located on the housing.

The device is ready for operation after connection to the bus voltage. Mains voltage must be present on at least one output, and the respective neutral conductor must be connected for supplying power to the measurement section.

Accessibility to the device for the purpose of operation, testing, visual inspection, maintenance and repair must be provided compliant to VDE 0100-520.

Commissioning requirements

In order to commission the device, a PC with ETS and a KNX interface, e.g. USB or IP, are required. The device is ready for operation after connection to the bus voltage supply.

The installation and commissioning may only be carried out by electrical specialists. The appropriate norms, guidelines, regulations and specifications should be observed when planning and setting up electrical installations.

Protect the device from damp, dirt and damage during transport, storage and operation.

Only operate the device within the specified technical data limits!

The device should only be operated in an enclosed housing (distribution board)!

Supplied state

The device is supplied with the physical address 15.15.255. The application program is preloaded. It is therefore only necessary to load group addresses and parameters during commissioning.

However, the complete application program can be reloaded if required. The entire application program is loaded after a change of the application program, after a discontinued download or after discharge of the device. The process takes significantly longer than loading parameters and group addresses.

Assignment of the physical address

The assignment and programming of the physical address is carried out in the ETS.

The device features a *Programming* button for assignment of the physical device address. The red LED *Programming* lights up after the button has been pushed. It switches off as soon as the ETS has assigned the physical address or the *Programming* button is pressed again.

Cleaning

If devices become dirty, they can be cleaned using a dry cloth or a cloth dampened with a soapy solution. Corrosive agents or solutions should never be used.

Maintenance

The device is maintenance-free. No repairs should be carried out by unauthorised personnel if damage occurs, e.g. during transport and/or storage.

3 Commissioning

The ABB i-bus® KNX Energy Module EM/S 3.16.1 records the energy consumption of the connected loads. Its three outputs feature the same functions. It is thus possible, depending on the application, to freely define every output and to parameterize it accordingly.

A short overview of all functions of the Energy Module can be found in the next chapter.

3.1 Overview

The following table provides an overview of the functions used by the Energy Module EM/S 3.16.1 and those possible with the application program *Measure 3f*.

Energy Module properties	**EM/S 3.16.1**
Type of installation	MDRC
Number of outputs	3
Module width (space units)	4
In rated current (A)	20 A

Parameterization options *General*	**EM/S 3.16.1**
Cyclic monitoring telegram (In operation)	n
Limit number of telegrams	n
Request status values via 1 bit communication object	n
Request instrument values via 1 bit communication object	n
Request power values via 1 bit communication object	n
Instrument values send cycle time	n
Power values send cycle time	n

Parameterization options *Metering (Wh)*	**EM/S 3.16.1**
Request meter readings via 1 bit communication object	n
Transmission delay meter readings	n
Meter readings send cycle time	n
Reset all meters via communication object	n
Enable meter reading total	n

Parameterization options *Meter reading total (Wh)*	**EM/S 3.16.1**
Meter total	n
Intermediate meter total	n
Trigger 1	n
– via communication object	n
– via time	n
Trigger 2	n
– via communication object	n
– via time	n
– via limit	n
– via duration	n
Reset intermediate meter via communication object	n
Reaction after download and ETS reset	n

Parameterization options *Functions*	**EM/S 3.16.1**
Monitor "Active power total"	
Send “Active power”	n
Threshold 1	n
– upper limit	n
– lower limit	n
– warning	n
Threshold 2	n
– upper limit	n
– lower limit	n
– warning	n
Reaction after download and ETS reset	n
Monitor "Frequency"	
Send frequency	n
Threshold 1	n
– upper limit	n
– lower limit	n
– warning	n
Threshold 2	n
– upper limit	n
– lower limit	n
– warning	n
Reaction after download and ETS reset	n

Parameterization options *Functions*	EM/S 3.16.1
Device is load control master	
Number of load shedding stages	n
Load limit can be changed	n
Reaction after download and ETS reset	n
Source for power values 1…4	n
Enable of additional power values [0…6]	n
Monitor power values cyclically	n
Reaction time when exceeding load limit	n
Reaction time when falling below load limit	n
Hysteresis for increasing load shedding	n
Deactivate load control" (master) at recovery of bus voltage	n

Parameterization options per output	EM/S 3.16.1
Function *Metering (Wh)*	
Send "Meter reading"	n
Send "Intermediate meter reading"	n
Trigger 1 (Start)	n
– via communication object	n
– via time	n
Reset "Intermediate meter reading" on trigger 1 (Start)	n
Send "Intermediate meter reading" on trigger 1 (Start)	n
Trigger 2	n
– via communication object	n
– via time	n
– via limit	n
– via duration	n
Stop "Intermediate meter reading" on trigger 2	n
Reset intermediate meter via communication object	n
Reaction after download and ETS reset	n
Function *Instruments and power values*	
Monitor active power	n
Monitor current	n
Monitor voltage	n
Enable apparent power	n
Enable power factor	n
Enable crest factor	n

3.1.1 Conversion

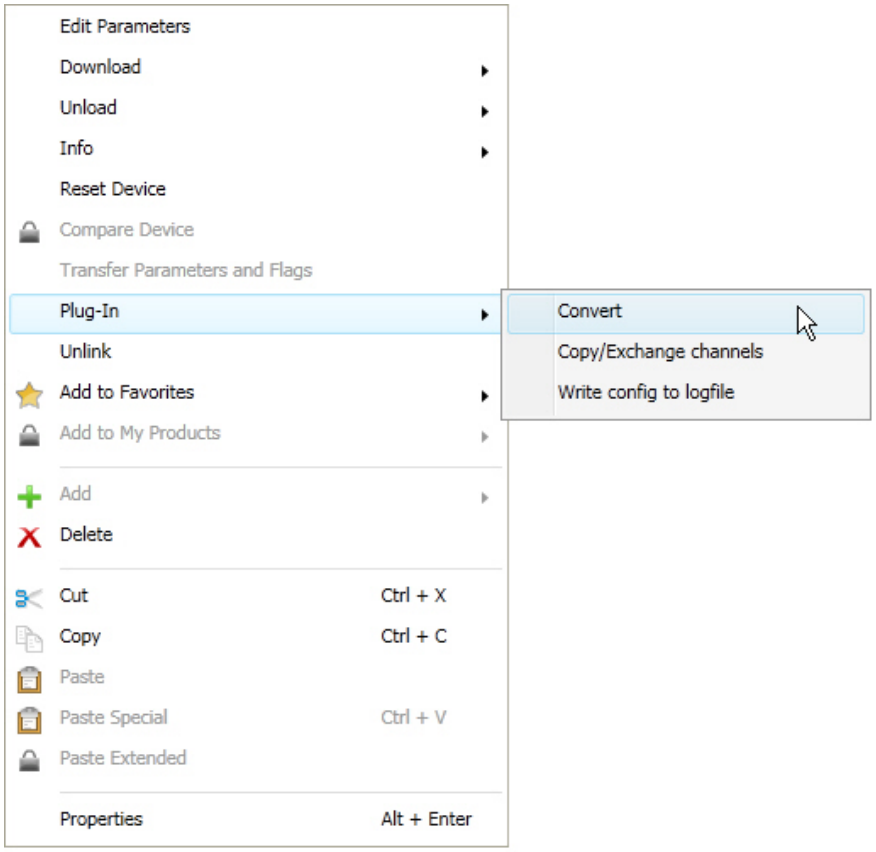
For ABB i-bus® KNX devices from ETS3 or higher, it is possible to assume the parameter settings and group addresses from earlier application program versions.

Furthermore, conversion can be applied to transfer the existing parameterization of a device to another device.

Note
When the term channels is used in the ETS, inputs and/or outputs are meant. In order to ensure that the ETS language generally applies for as many ABB i-bus® devices as possible, the word channels is used here.

3.1.1.1 Conversion procedure

- Import the current application program into the ETS.
- Insert the required device into the project.
- Right click on the product and select *Plug-in* > *Convert* in the context menu.
- Thereafter undertake the required settings in the *Convert* dialog.



- Finally, exchange the physical address and delete the old device.
- Should you wish to only copy individual channels within a device, use the function Copying and exchanging parameter settings, page 20.

3.1.2 Copying and exchanging parameter settings

Parameterization of devices can take a lot of time depending on the complexity of the application and the number of device outputs. To keep the commissioning work to the minimum possible, using the function *Copy/exchange channels*, parameter settings of an output can be copied or exchanged with freely selectable outputs. Optionally, the group addresses can be retained, copied or deleted in the target output.

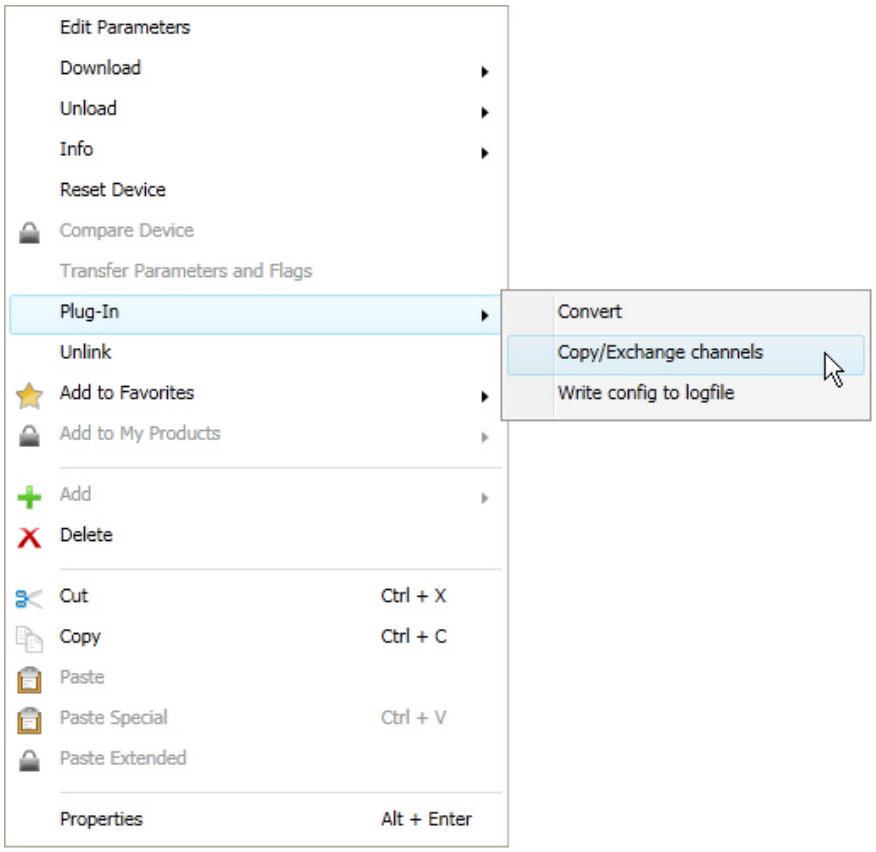
Note
When the term channels is used in the ETS, inputs and/or outputs are meant. In order to ensure that the ETS language generally applies for as many ABB i-bus® devices as possible, the word channels is used here.

The copy function for inputs/outputs is particularly useful with devices having the same parameter settings for several outputs, inputs or groups. For example, lighting in a room is frequently controlled in an identical manner. In this case, the parameter settings from input/output X can be copied to all other inputs/outputs or to a special input/output of the device. Thus the parameters for this input/output must not be set separately, which significantly shortens the commissioning time.

The exchange of parameter settings is useful, e.g. should the outputs be swapped when wiring the terminals. The parameter settings of the incorrectly wired outputs can be simply exchanged saving the requirement for time-consuming rewiring.

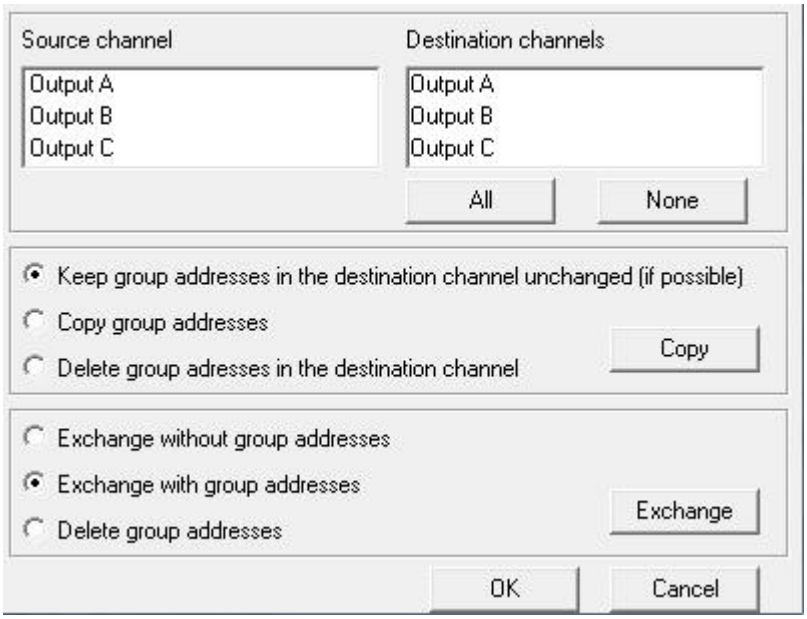
3.1.2.1 Procedure for copy and exchange

· Click with the right mouse button on the product, whose outputs you wish to copy or exchange, and select the context menu *Plug-in* > *Copy/exchange channels*.



Thereafter, undertake the required settings in the *Copy/exchange channels* dialog.

3.1.2.2 Dialog *Copy/exchange channel*



At the top left, you will see the Source channel selection window for marking the source channel. Beside it is located the selection window for the target channel or channels for marking the target channel or channels.

Source channel

With the selection of the source channel, you define which parameter settings should be copied or exchanged. Only one source channel can be selected at a time.

Target channels

With the selection of the target channel/channels, you define which channel/channels are to assume the parameter settings of the source channel.

- For the function *Exchange*, only one target output can be selected at a time.
- For the function *Copy*, different target channels can be selected simultaneously. For this purpose, press the Ctrl key and mark the required channels with the mouse cursor, e.g. channels B and C.

All	With this button, you select **all** available target channels, e.g. A…C.
None	Reset the selection of the target channel with this button.

Copy

The following options can be selected before copying the parameter settings:

- Leave the group addresses unchanged (if possible) in the target channel
- Copy group addresses
- Delete group addresses in the target channel

With this button, copy the settings of the source channel into the target channel or channels.

Exchange

The following options can be selected before exchanging the parameter settings:

- Retain group addresses
- Exchange group addresses
- Delete group addresses

With this button, exchange the settings of the source channel with the target channel.

Confirm your selection with this button, and the window closes.

Using this button, the window closes without accepting the changes.

3.2 Parameters

The parameterization of the Energy Module is implemented using the Engineering Tool Software ETS.

The application program is available in the ETS under *ABB/Energy management/Energy module*.

The following chapter describes the parameters of the device using the parameter window. The parameter window features a dynamic structure so that further parameters may be enabled depending on the parameterization and the function.

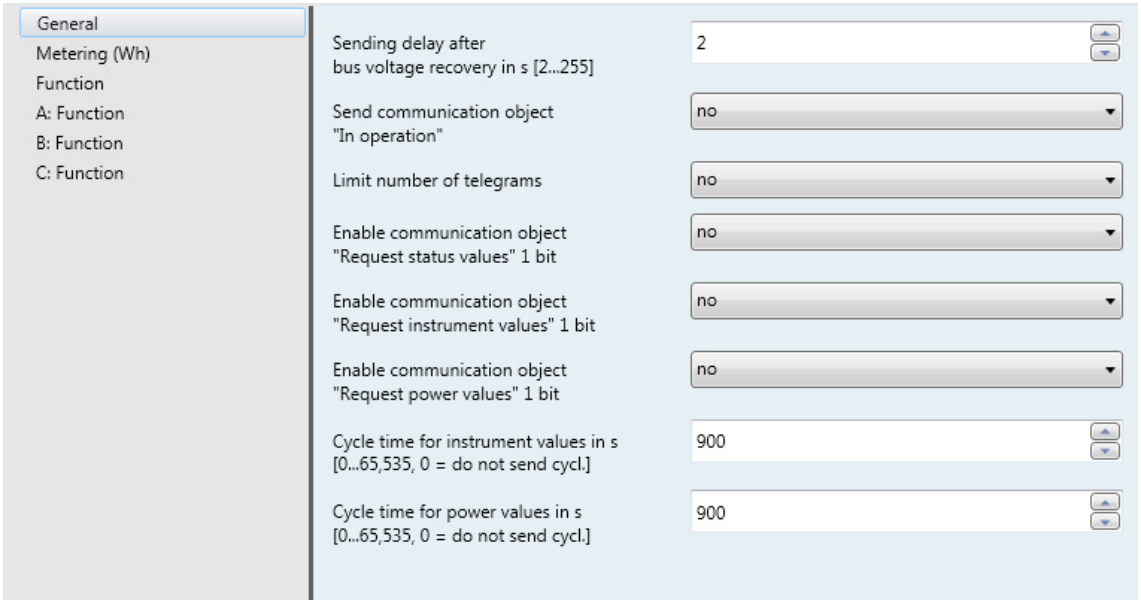
The default values of the parameters are underlined, e.g.:

Options: yes
no

Note
However, as the functions for all outputs are identical, only the functions of output A will be described.

3.2.1 Parameter window *General*

Higher level parameters can be set in the parameter window *General*.



Sending delay after
bus voltage recovery in s [2...255]

Options: 2…255

The device receives telegrams during the sending delay time. However, the telegrams are not processed and no telegrams are sent on the bus.

If communication objects are read during the sending delay, e.g. by a visualisation system, these read requests are stored, and a response is sent, after the sending delay has been completed.

An initialization time of about two seconds is included in the delay time. The initialisation time is the time that the processor requires to be ready to function.

How does the device behave with bus voltage recovery?

After bus voltage recovery, the device always waits for the send delay time to elapse before sending telegrams on the bus.

Send communication object "In operation"

Options: no
send value 0 cyclically
send value 1 cyclically

The communication object *In operation* indicates the presence of the device on the bus. This cyclic telegram can be monitored by an external device. If a telegram is not received, the device may be defective or the bus cable to the transmitting device may be interrupted.

- *no:* The communication object *In operation* is not enabled.
- *send value 0/1 cyclically:* The communication object *In operation* is sent cyclically on the KNX. The following parameter appears:

  Sending cycle time in s [1...65,535]

  Options: 1…60…65,535

  Here the time interval, at which the communication object *In operation* cyclically sends a telegram, is set.

Note
After bus voltage recovery, the communication object sends its value after the set sending and switching delay time.

Limit number of telegrams

Options: no
yes

This parameters limits the device generated KNX load. This limit relates to all telegrams sent by the device.

- *yes:* The following parameters appear:

  Max. number of sent telegrams [1...255]

  Options: 1…20…255

  in period

  Options: 50 ms/100 ms…1 s…30 s/1 min

  This parameter defines the number of telegrams sent by the device within a period. The telegrams are sent as quickly as possible at the start of a period.

Enable communication object "Request status values" 1 bit

Options: no
yes

- yes: A 1 bit communication object *Request status values* is enabled.

Using this communication object, the following status messages are requested in every case:

- Measurement circuit active
- Frequency error
- Diagnostics *Active power negative* for outputs A…C

The following status messages are sent depending on the parameterization:

- *Status intermediate meter total* (if Intermediate meter total is enabled)
- *Status intermediate meter* output A…C (if the intermediate meter total output A…C is enabled)
- *Load limit exceeded* (if function *Load control master* enabled)
- *Status load control* (if function *Load control master* enabled and *Monitor power values cyclically* is parameterized).

With the option *yes*, the following parameters appear:

Request with object value

Options: 0
1
0 or 1

- *0:* Sending status messages is requested with the value 0.
- *1:* Sending status messages is requested with the value 1.
- *0 or 1:* Sending status messages is requested with the values 0 or 1.

Enable communication object "Request instrument values" 1 bit

Options: no
yes

- *yes:* A 1 bit communication object *Request instrument values* is enabled.

Via this communication object, all instrument values can be requested, provided that they have been parameterized with the option *on request*.

- Current
- Voltage
- Frequency
- Power factor
- Crest factor.

With the option *yes*, the following parameters appear:

Request with object value

Options: 0
1
0 or 1

- *0:* Sending status messages is requested with the value 0.
- *1:* Sending status messages is requested with the value 1.
- *0 or 1:* Sending status messages is requested with the values 0 or 1.

Enable communication object "Request power values" 1 bit

Options: no
yes

- *yes:* A 1 bit communication object *Request power values* is enabled.

Via this communication object, all power values can be requested, provided that they have been parameterized with the option *on request*. These power values include:

- Active power (Output A…C)
- Active power total
- Apparent power (Output A…C)
- Send sum power values

With the option *yes*, the following parameters appear:

Request with object value

Options: 0
1
0 or 1

- *0:* Sending status messages is requested with the value 0.
- *1:* Sending status messages is requested with the value 1.
- *0 or 1:* Sending status messages is requested with the values 0 or 1.

Cycle time for instrument values in s [0...65,535, 0 = do not send cycl.]

Options: 0…900…65,535

A common cycle time for all instrument values is set with this parameter, provided that this has been parameterized with the option *Send cyclically*.

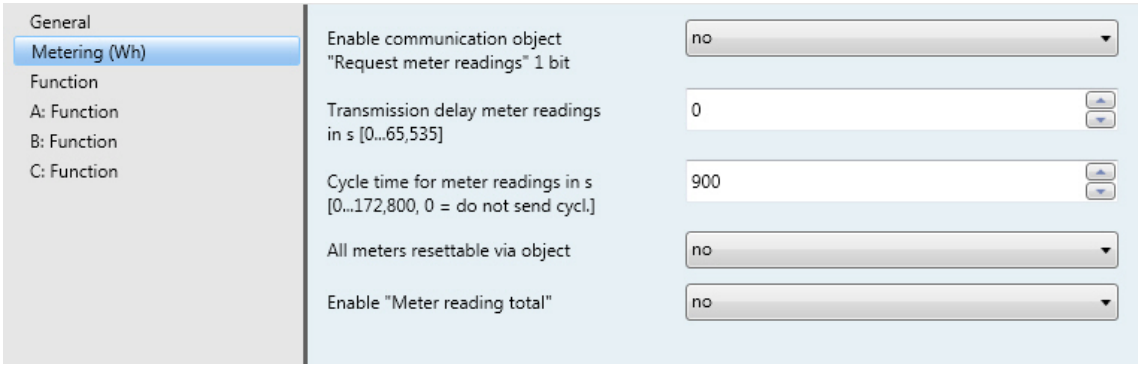
Cycle time for power values in s [0...65,535, 0 = do not send cycl.]

Options: 0…900…65,535

A common cycle time for all power values is set with this parameter, provided that this has been parameterized with the option *Send cyclically*.

3.2.2 Parameter window *Metering (Wh)*

In parameter window *Metering (Wh)*, the higher-level settings that apply for all meters are undertaken, and the *Meter reading total* can be enabled here with the respective parameter window.



Enable communication object "Request meter readings" 1 bit

Options: no
yes

- *yes:* A 1 bit communication object *Request meter readings* is enabled. Using this communication object, all meter readings can be requested, provided that the meters have been enabled and they have been parameterized with the option *on request*.
- Meter total *Meter reading*
- Intermediate meter total *Meter reading*
- Meter *Meter reading* Output A…C
- Intermediate meter *Meter reading* Output A…C

With the option *yes*, the following parameters appear:

Request with object value

Options: 0
1
0 or 1

- *0:* Sending status messages is requested with the value 0.
- *1:* Sending status messages is requested with the value 1.
- *0 or 1:* Sending status messages is requested with the values 0 or 1.

Transmission delay meter readings in s [0...65,535]

Options: 0…65,535

The transmission delay time is used to minimize the bus load should the meter readings of several Energy Meters be requested simultaneously. When meter readings are requested, they will only be sent after the delay time has timed out.

Note
Should a send delay be set and a meter reading is sent *cyclically and on request*, the send delay is taken into consideration with the first cyclic sending and with every request.

Important
During the time where the sending delay of the meter readings is active, cyclic sending is interrupted for all meter readings, including those where do not send *on request* is parameterized. The cycle time continues to run in the background, and cyclic sending continues only after the send delay time has timed out.

Cycle time for meter readings in s [0...172,800, 0 = do not send cycl.]

Options: 0…900…172,800 (2 days)

This parameter determines the cycle time for cyclic sending of all meter values, provided that they are parameterized with the option *cyclically*.

All meters resettable via object

Options: no
yes

- *yes:* The 1 bit communication object Enable reset meters and Reset meter readings are enabled.

Using these communication objects, all meter readings (main and intermediate meters) are set to zero, and all intermediate meters are stopped.

For further information see: Communication objects, S. 58

Important
The meters can only be reset when the measurement electronics are active, i.e. rated voltage is present on at least one output.

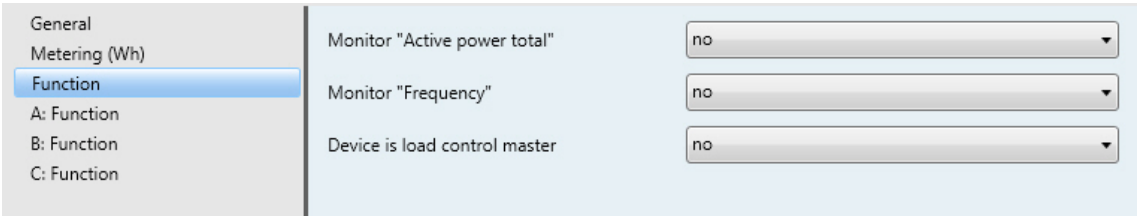
Enable "Meter reading total"

Options: no
yes

- *yes:* The parameter window *Meter reading total* as well as the communication objects for the *Meter total* and the *Intermediate meter total* are enabled.

3.2.3 Parameter window *Function*

In the parameter window *Function*, the functions and the corresponding communication objects for the entire device are enabled.



Monitor "Active power total"

Options: no
yes

- *yes:* The parameter window *Active power total* and the communication object *Active power (Active power total)* are enabled.

Monitor "Frequency"

Options: no
yes

- yes: The parameter window *Frequency* and the communication object *Frequency* (Frequency) are enabled.

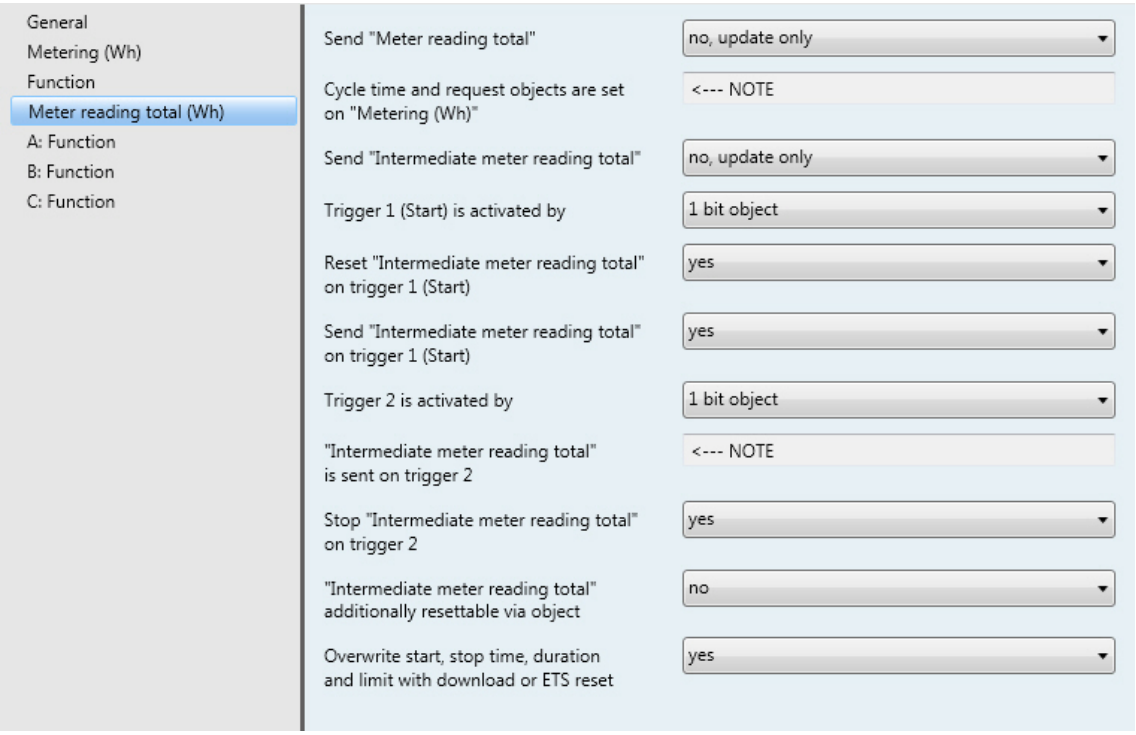
Device is load control master

Options: no
yes

- *yes:* The parameter window *Load control master* as well as the respective communication objects are enabled.

3.2.3.1 Parameter window *Meter reading total (Wh)*

In parameter window *Meter reading total*, the settings for the *Meter total* and the *Intermediate meter total* are undertaken.



Send "Meter reading total"

Send "Intermediate meter reading total"

Options: no, update only
cyclically
on request
cyclically and on request

The meter readings *Meter total* and *Intermediate meter total* are sent to suit parameterization. Setting of the cycle time and enabling of the request object occurs in the Parameter window Metering (Wh), page 29.

Furthermore, the readings of the Intermediate meter total are sent on the bus at starting and/or stopping.

Trigger 1 (Start) is activated by

Options: 1 bit object
Time

- *1 bit object:* The 1 bit communication object *Receive trigger 1* (Intermediate meter total) is enabled. The intermediate meter starts if a telegram with the value 1 is received on this communication object.
- *Time:* The 3 byte communication object *Trigger 1 change time* (Intermediate meter total) is enabled. The start time can be modified using this communication object. The following parameters appear:

Hour [0...23]

Options: 0…23

Minute [0...59]

Options: 0…59

Weekday

Options: Monday…Sunday
every day

The *Intermediate meter* (meter reading) starts if the parameterized time is received on the communication object *Receive time* (General).

Note
The time is only required once per device for all meters.

Reset "Intermediate meter reading total" on trigger 1 (Start)

Options: yes
no

This parameter determines whether the *Intermediate meter total* (Meter reading) is reset when a telegram is received on the communication object *Trigger 1…*. Alternatively, an additional 1 bit communication object can be enabled, see parameter window "Intermediate meter reading total" additionally resettable via object , page 35.

- *yes:* The meter reading of the *Intermediate meter total* is sent when a telegram is received and subsequently the *Intermediate meter total* is reset to zero.

Send "Intermediate meter reading total" on trigger 1 (Start)

Options: yes
no

This parameter determines whether the *Intermediate meter total* (Meter reading) is sent when a telegram is received on the communication object *Trigger 1…*.

Trigger 2 is activated by

Options: 1 bit object
Time
Limit
Duration

- *1 bit object:* The 1 bit communication object *Receive trigger 2* (Intermediate meter total) is enabled. The meter reading is sent if a telegram with the value 1 is received on this communication object. It is possible to parameterize whether the intermediate meter stops or does not stop.
- *Time:* The 3 byte communication object *Trigger 2 change time* (Intermediate meter total) is enabled. Using this communication object, the time for trigger 2 can be modified. The following parameters appear:

Hour [0...23]

Options: 0…23

Minute [0...59]

Options: 0…59

Weekday

Options: Monday…Sunday
every day

The intermediate meter is sent if the parameterized time is received on the communication object *Receive time* (General). It is possible to parameterize whether the intermediate meter stops or does not stop.

Note
The time is only required once per device for all meters.

- Limit: The 3 byte communication object *Trigger 2 change limit* (Intermediate meter total) is enabled. Using this communication object, the limit for trigger 2 can be modified.

Note
When *Limit* is selected, the intermediate meter total must be reset before a renewed start. This is adjustable via the parameter Reset *"Intermediate meter reading total" on trigger 1* (Start)" or via the separate 1 bit communication object *Reset*. If the parameterized limit is achieved, the meter reading is sent on the bus, and the intermediate meter stops.

The following parameter also appears with the selection *Limit*:

Limit in Wh [1...120,888,000]

Options: 1…5000…120,888,000

If the parameterized limit is achieved, the meter reading is sent on the bus, and the intermediate meter stops.

- Duration: The 2 byte communication object *Trigger 2 change duration* (Intermediate meter total) is enabled. Using this communication object, the duration until trigger 2 achieved is set. The following parameter appears:

Duration in min [1…65,535]

Options: 1…5…65,535

The meter reading is sent if the parameterized duration has elapsed. It is possible to parameterize whether the intermediate meter stops or does not stop.

"Intermediate meter reading"
is sent on trigger 2

<−−− NOTE

Stop "Intermediate meter reading total" on trigger 2

Options: yes
no

Note
This parameter is not available should *Limit* be selected beforehand.

- *no:* The intermediate meter sends its meter reading at trigger 2 and continues to count further (without reset).
- *yes:* The intermediate meter sends its meter reading at trigger 2 and stops. If the intermediate meter has stopped, the intermediate meter reading is not resent then Trigger 2 activates. The intermediate meter total can be restarted via the 1 bit communication object *Receive trigger 1* or via the parameterzied time *Trigger 1 change time*.

"Intermediate meter reading total" additionally resettable via object

Options: no
yes

- *yes:* The communication object *Reset (Intermediate meter total)* is enabled. When a telegram is received with the value 1 on the communication object, the meter reading is sent and subsequently reset to zero. The status of the meter is not changed, i.e. if the meter is metering, it will continue to take readings; if it is stopped, it will remain stopped.

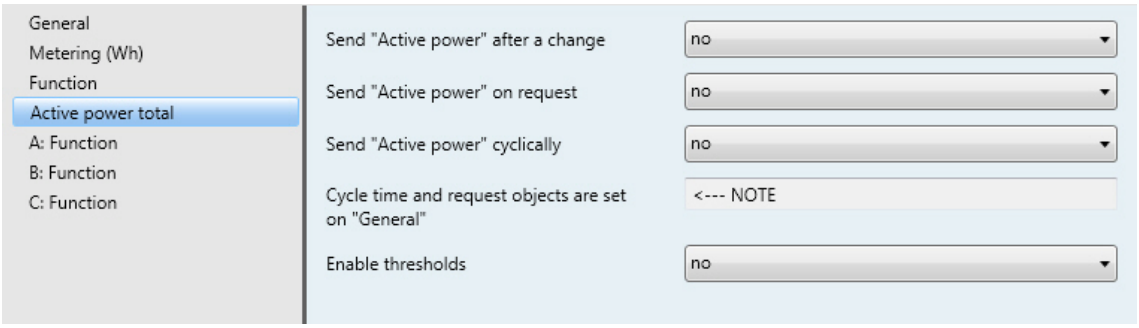
Overwrite start, stop time, duration and limit with download or ETS reset

Options: no
yes

- *yes:* After a download or ETS reset, the values changed on the bus are overwritten again with the parameter values.
- *no:* After a download or ETS reset, the values changed on the bus are retained.

3.2.3.2 Parameter window *Active power total*

In parameter window *Active power total*, the parameters and communication objects for recording and monitoring of the *Active power total* (sum of outputs A, B and C) are enabled. The parameter window is enabled when in Parameter window Function, page 31, the parameter *Monitor "Active power total"* has been selected with option *yes*.



Send "Active power" after a change

Options: no
yes

- *yes:* The value of the communication object *Active power* (Active power total) is sent on a change. The following parameter appears:

  Send "Active power" when +/- W [1 ...13,800]

  Options: 1…20…13,800

  This parameter determines which changes of the value of the communication object *Active power* are sent.

Send "Active power" on request

Options: no
yes

- *yes:* The value of the communication object *Active power* (Active power total) is sent when a telegram is received on the communication object *Request power values*. This communication object is enabled in the Parameter window General, page 25.

Send "Active power" cyclically

Options: no
yes

- *yes:* The communication object *Active power* (Active power total) is sent cyclically. The setting of the cycle time is undertaken in Parameter window General, page 25 (parameter *Cycle time for power values in s*).

Cycle time and request objects are set on "General"

<−−− NOTE

Enable thresholds

Options: no
yes

- *yes:* The parameters and communication objects for threshold 1 for monitoring the *Active power total* are enabled. The following parameters appear:

Overwrite thresholds with download or ETS reset

Options: no
yes

- *yes:* The threshold values can be modified via the bus. With this setting, after a download or ETS reset, the values changed on the bus are again overwritten with the parameterized values. This setting applies for threshold value 1 and threshold value 2.

Threshold 1 lower limit in W [0...13,800]

Options: 0…90…13,800

This is the lower hysteresis limit of threshold value 1. If the lower threshold is undershot, there is a warning if it has been parameterized.

For further information see: Instrument and power values, page 81

Threshold 2 upper limit in W [0...13,800]

Options: 0…100…13,800

This is the upper hysteresis limit of threshold value 1. If the upper threshold is exceeded, there is a warning if it has been parameterized.

For further information see: Instrument and power values, page 81

Threshold 1 warning

Options: do not send
send 0 when exceeding
send 1 when exceeding
send 0 when falling below
send 1 when falling below
exceeding 0, falling below 1
exceeding 1, falling below 0

If threshold value 1 is exceeded or undershot, the parameterized value of the communication object *Threshold 1 warning* (Active power total) is sent.

Note
Exceeding the threshold means that the upper limit is exceeded, falling below the threshold means that the lower limit is undershot.

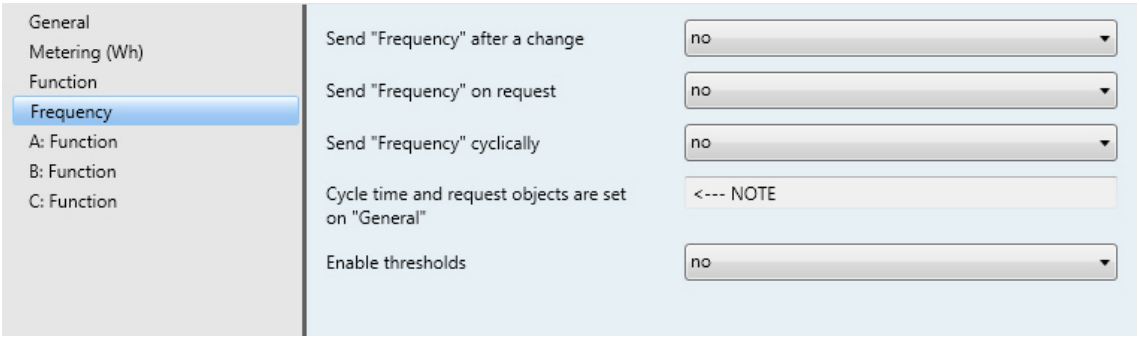
Enable threshold 2

Options: no
yes

Parameterization of threshold value 2 is identical to threshold value 1.

3.2.3.3 Parameter window *Frequency*

In parameter window *Frequency*, parameter and communication objects for the detection and monitoring of the frequency are enabled. The parameter window is enabled when in Parameter window Function, page 31, the parameter *Monitor "Frequency"* has been selected with option *yes*.



Send "Frequency" after a change

Options: no
yes

- *yes:* The value of the communication object *Frequency* is sent after a change. The following parameter appears:

  Send "Frequency" when +/- 0.1 Hz x value [1 ... 650]

  Options: 1… 5…650

  This parameter determines which changes of the value of the communication object *Frequency* are sent.

Send "Frequency" on request

Options: no
yes

- *yes:* The value of the communication object *Frequency* is sent when a telegram is received on the communication object *Request instrument values*. This communication object is enabled in the Parameter window General, page 25 (parameter *Cycle time for instrument values in s*).

Send "Frequency" cyclically

Options: no
yes

- *yes:* The communication object *Frequency* is sent cyclically. The setting of the cycle time is undertaken in Parameter window General, page 25 (parameter *Cycle time for instrument values in s*).

Cycle time and request objects are set on "General"

<--- NOTE

Enable thresholds

Options: no
yes

- *yes:* The parameters and communication objects for *Threshold 1* for monitoring the *Frequency* are enabled. The following parameters appear:

Overwrite thresholds with download or ETS reset

Options: no
yes

- *yes:* The threshold values can be modified via the bus. With this setting, after a download or ETS reset, the values changed on the bus are again overwritten with the parameterized values. This setting applies for threshold value 1 and threshold value 2.

Threshold 1 lower limit in 0.1 Hz x value [1...650]

Options: 0…450…650

This is the lower hysteresis limit of threshold value 1. If the lower threshold is undershot, there is a warning if it has been parameterized.

For further information see: Instrument and power values, page 81

Threshold 1 upper limit in 0.1 Hz x value [1...650]

Options: 0…500…650

This is the upper hysteresis limit of threshold value 1. If the upper threshold is exceeded, there is a warning if it has been parameterized.

For further information see: Instrument and power values, page 81

Threshold 1 warning

Options: do not send
send 0 when exceeding
send 1 when exceeding
send 0 when falling below
send 1 when falling below
exceeding 0, falling below 1
exceeding 1, falling below 0

If threshold value 1 is exceeded or undershot, the parameterized value of the communication object *Warning threshold 1 (Frequency)* is sent.

Note
Exceeding the threshold means that the upper limit is exceeded, falling below the threshold means that the lower limit is undershot.

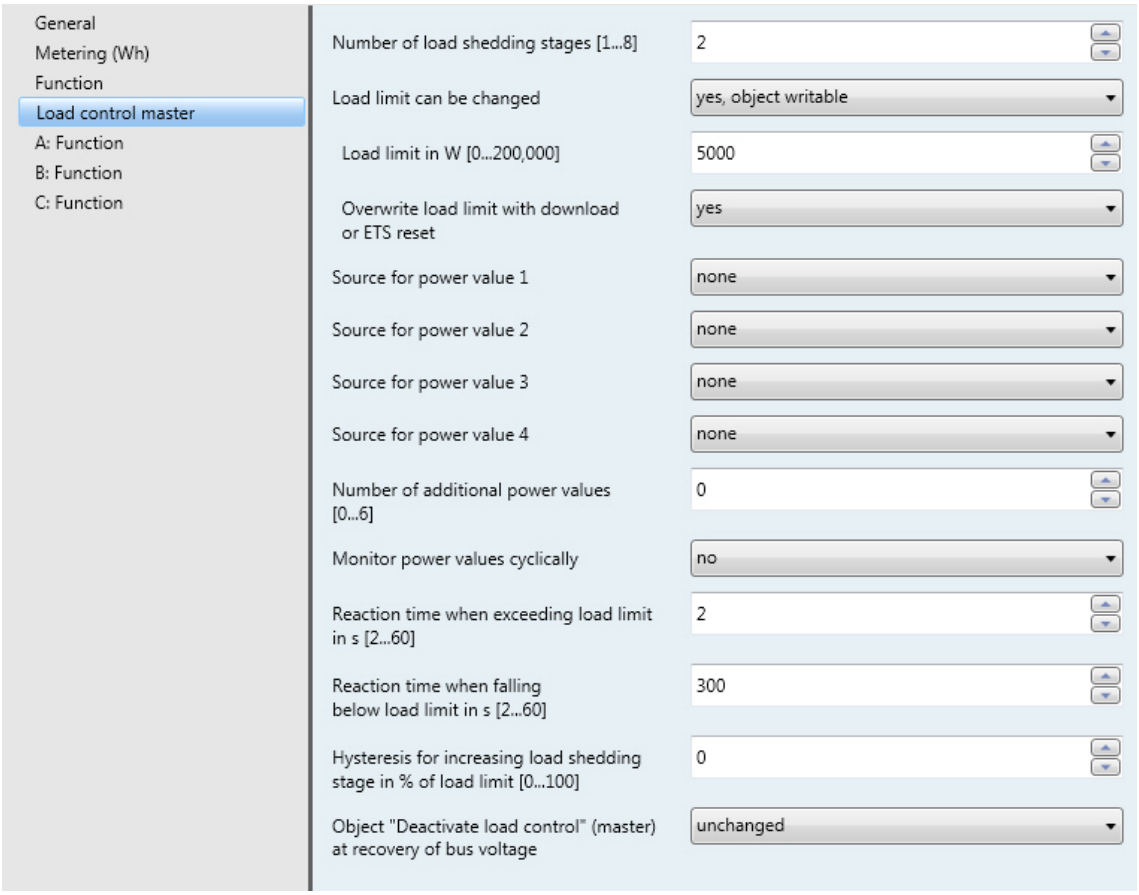
Enable threshold 2

Options: no
yes

Parameterization of threshold value 2 is identical to threshold value 1.

3.2.3.4 Parameter window *Load control master*

In the parameter window *Load control master*, the settings for the load control are undertaken, provided that the Energy Module is used as a master for load control. The parameter window is enabled when in Parameter window Function, page 31, the parameter *Device is load control master* has been selected with option *yes*.



Number of load shedding stages [1...8]

Options: 1…2…8

The slaves assigned to the master are assigned depending on the priority of the load shedding stage. If the parameterized load limit is exceeded, the master sends load shedding stages on the bus. The load shedding stage is increased, commencing at load shedding stage 1, until the load limit is no longer exceeded. If the load limit is exceeded, the load shedding limit is reduced again.

Load limit can be changed

Options: yes, 4 values selectable
yes, object writable

- *yes, 4 values selectable:* The communication objects *Choose load limit* and *Send load limit* are enabled. Using communication object *Choose load limit*, you can choose between four parameterized load limits. The following parameters appear:

Load limit 1 in W [0...200,000]

Load limit 2 in W [0...200,000]

Load limit 3 in W [0...200,000]

Load limit 4 in W [0...200,000]

Options 0…5000…200,000

Active load limit after download or ETS reset

Options: Load limit 1…4

The load limit parameterized here is active after a download or ETS reset.

- *yes, object writable:* The communication object *Receive load limit* is enabled. The parameterized load limit can be modified via the bus. The following parameters appear:

Load limit 1 in W [0...200,000]

Options: 0…5000…200,000

Overwrite load limit with download or ETS reset

Options: no
yes

- *yes:* The load limit can be modified via the bus. With this selection, the parameterized value is accepted again after a download or ETS reset.

Note
The following parameters determine, which of the up to 10 values are included for the calculation of the *Send sum power values*. The power values of the master can be used (outputs A, B, C and/or the total power) or the power values are received externally from a communication object, generally the active power total from other Energy Actuators. The power values 1…4 may receive their value internally or externally; power values 5…10 may only receive their value externally. The sum of these power values is compared to the parameterized load limit for load control purposes. If negative power values are received (power feed), they are not considered for load control.

Source for power value 1

Options: none
Active power Output A
external via communication object

- *none:* Power value 1 is not used, the communication object *Receive power value 1* is not enabled.
- *Active power Output A:* The active power of output A is used as power value 1. The communication object *Receive power value 1* is not enabled; it is linked internally.
- *external via communication object::* The communication object *Receive power value 1* is enabled and can receive an external power value via the bus.

Source for power value 2

Options: none
Active power Output B
external via communication object

The settings and functions are identical to those of the parameter *Source for power value 1*.

Source for power value 3

Options: none
Active power Output C
external via communication object

The settings and functions are identical to those of the parameter *Source for power value 1*.

Source for power value 4

Options: none
active power total
external via communication object

The settings and functions are identical to those of the parameter *Source for power value 1*.

Number of additional power values [0...6]

Options: 0…6

Depending on the selection, the communication objects *Receive power value 5* to *Receive power value 10* are enabled.

Monitor power values cyclically

Options: no
yes

- *yes:* The 4 byte communication object *Status load control* is enabled. Using this communication object, you monitor whether all enabled power values are received via the bus. The following parameter appears:

  Control period in s [20...65,535]

  Options: 20…65,535

  If the master does not receive all the external power values from the slaves within the parameterized control period, the missing values are requested via *Value Read* and an internal timer starts (10 s). After the timer has timed out, the corresponding error bit in the communication object *Status load control* is set and the value of the communication object is sent.

Reaction time when exceeding load limit in s [2...60]

Options: 2…60

If the sum of the power values exceeds the parameterized load limit, the master commences to send shedding stages on the bus after the parameterized time. The shedding stage is increased until the load falls below the load limit. The reaction time restarts before every further increase of the shedding stage.

Reaction time when falling below load limit in s [30...65,565]

Options: 30…300…65,565

If the load is again below the load limit (sufficient slaves have been shed), the master waits for the parameterized time and then commences in inverse sequence to reduce the shedding stages until shedding stage 0 is reached (i.e. all slaves are enabled) or the load limit is exceeded again.

Note
It is necessary to consider the reaction speed of the system. Depending on the number of shedding stages and parameterized reaction times, it may take a long time before all slaves are re-enabled. If the reaction times are too short and the system is frequently in an overload state (load limit exceeded), the maximum number of relay switching operations (service life) can be reached prematurely.

Hysteresis for increasing load shedding stage in % of load limit [0...100]

Options: 0…100

If the system is frequently at overload during operation, the hysteresis can prevent that a shedding stage is continuously switched on and off. The hysteresis is subtracted from the load limit. Only when the limit value is less than the load limit minus the hysteresis will the shedding stage be reduced.

Object "Deactivate load control" (master) at recovery of bus voltage

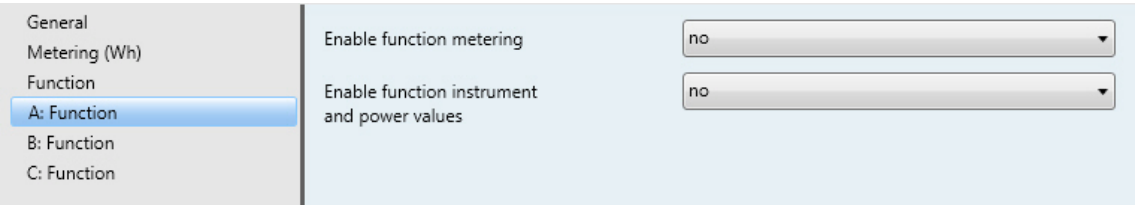
Options: unchanged
0 = load control activated
1 = load control deactivated

This parameter defines how the function *Load control master* should behave after bus voltage recovery.

- *unchanged*: The status of the function *Load control master* is saved at bus voltage failure and restored after bus voltage recovery.
- *0 = load control activated:* The function *Load control master* is active after bus voltage recovery.
- *1 = load control deactivated:* The function *Load control master* is not active after bus voltage recovery.

3.2.4 Parameter window *A: Function*

In this parameter window, the reaction of the output is determined and different functions can be enabled, whereby further parameter windows become available.



Enable function metering

Options: no
yes

- *no:* The parameter window *A: Metering (Wh)* is not enabled for output A.
- *yes:* The parameter window *A: Metering (Wh)* for output A and the corresponding communication objects are enabled.

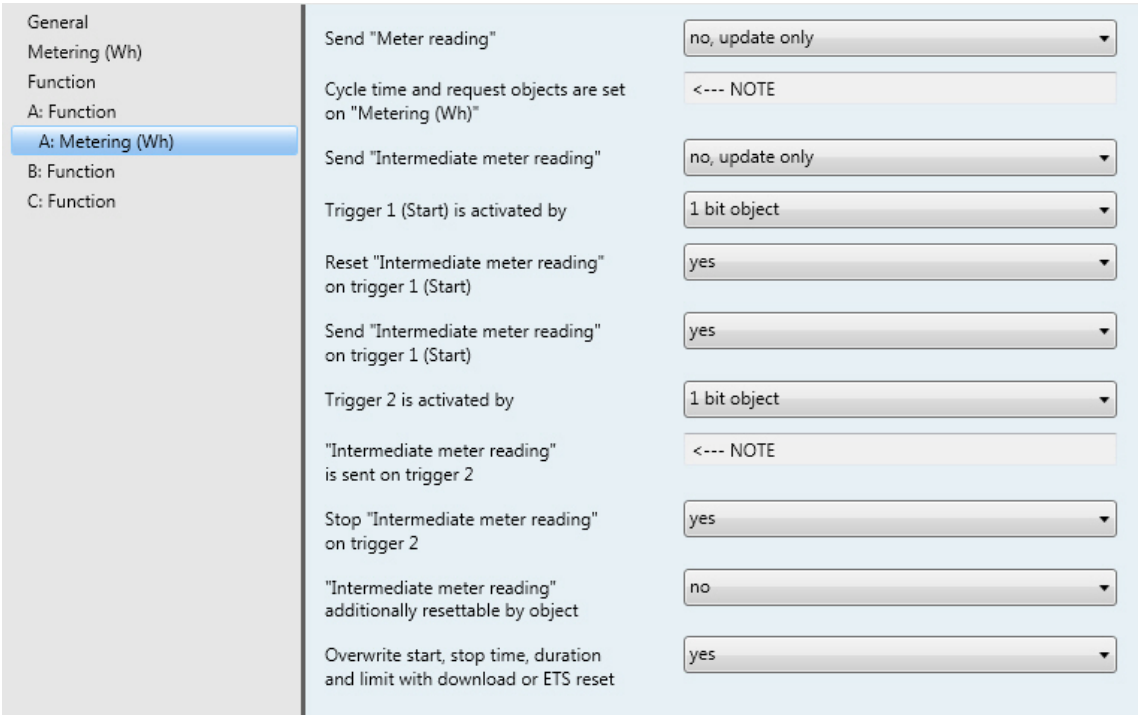
Enable function instrument and power values

Options: no
yes

- *no:* The parameter window *A: Instrument and power values* is not enabled for output A.
- *yes:* The parameter window *A: Instrument and power values* for output A and the corresponding communication objects are enabled.

3.2.4.1 Parameter window *A: Metering (Wh)*

In parameter window *A: Metering (Wh)*, the settings for the main meter and the intermediate meter of output A are undertaken.



Send "Meter reading"

Send "Intermediate meter reading"

Options: no, update only
cyclically
on request
cyclically and on request

The meter readings *Meter* and *Intermediate meter* are sent according to the parameterization options selected. Setting of the cycle time and enabling of the request object occurs in the Parameter window Metering (Wh), page 29.

Furthermore, the readings of the *Intermediate meter* are sent on the bus at start and/or stop.

Trigger 1 (Start) is activated by

Options: 1 bit object
Time

- *1 bit object:* The 1 bit communication object *Receive trigger 1* (A: Intermediate meter) is enabled. The intermediate meter starts if a telegram with the value 1 is received on this communication object.
- *Time:* The 3 byte communication object *Trigger 1 change time* (A: Intermediate meter) is enabled. The start time can be modified using this communication object. The following parameters appear:

Hour [0...23]

Options: 0…23

Minute [0...59]

Options: 0…59

Weekday

Options: Monday…Sunday
every day

The intermediate meter reading is sent if the parameterized time is received on the communication object *Receive time* (General).

Note
The time is only required once per device for all meters.

Reset "Intermediate meter reading" on trigger 1 (Start)

Options: yes
no

This parameter determines whether the *Intermediate meter total* (Meter reading) is reset when a telegram is received on the communication object *Trigger 1*…. Alternatively, an additional 1 bit communication object can be enabled, see parameter "Intermediate meter reading" additionally resettable by object , page 48.

- *yes:* The meter reading of the *Intermediate meter* is sent when a telegram is received and subsequently the *Intermediate meter* is reset to zero.

Send "Intermediate meter reading" on trigger 1 (Start)

Options: yes
no

This parameter determines whether the *Intermediate meter* (Meter reading) is sent when a telegram is received on the communication object *Trigger 1*….

Trigger 2 is activated by

Options: 1 bit object
Time
Limit
Duration

- *1 bit object:* The 1 bit communication object *Receive trigger 2* (A: Intermediate meter) is enabled. The meter reading is sent if a telegram with the value 1 is received on this communication object. It is possible to parameterize whether the intermediate meter stops or does not stop.
- *Time:* The 3 byte communication object *Trigger 2 change time* (A: Intermediate meter) is enabled. Using this communication object, the time for trigger 2 can be modified. The following parameters appear:

Hour [0...23]

Options: 0…23

Minute [0...59]

Options: 0…59

Weekday

Options: Monday…Sunday
every day

The meter reading is sent if the parameterized time is received on the communication object *Receive time* (general). It is possible to parameterize whether the intermediate meter stops or does not stop.

Note
The time is only required once per device for all meters.

- *Limit:* The 4 byte communication object *Trigger 2 change limit* (A: Intermediate meter) is enabled. Using this communication object, the limit for trigger 2 can be modified.

Note
When *Limit* is selected, the intermediate meter must be reset before a renewed start. This is adjustable via the parameter *Reset "Intermediate meter reading" on trigger 1 (Start)* or via the separate 1 bit communication object *Reset*. If the parameterized limit is achieved, the meter reading is sent on the bus, and the intermediate meter stops.

The following parameter also appears with the selection *Limit*:

Limit in Wh [1...120,888,000]

Options: 1…5000…120,888,000

If the parameterized limit is reached, the meter reading is sent, and the intermediate meter stops.

- *Duration:* The 2 byte communication object *Trigger 2 change duration* (A: Intermediate meter) is enabled. Using this communication object, the duration until trigger 2 achieved is set. The following parameter appears:

Duration in min [1...65,535]

Options: 1…5…65,535

The meter reading is sent if the parameterized duration has elapsed. It is possible to parameterize whether the intermediate meter stops or does not stop.

**"Intermediate meter reading"
is sent on trigger 2**

<−−− NOTE

**Stop "Intermediate meter reading"
on trigger 2**

Options: yes
no

Note
This parameter is not available should *Limit* be selected beforehand. Instead of the parameter *Reaction to stop*, the parameter *Contact position when limit is reached* appears with the same options as in parameter *Reaction to stop*.

- *no:* The intermediate meter sends its meter reading at trigger 2 and continues to count further (without reset).
- *yes:* The intermediate meter sends its meter reading at trigger 2 and stops. If the intermediate meter has stopped, the intermediate meter reading is not resent then Trigger 2 activates. The intermediate meter can be restarted via the 1 bit communication object *Receive trigger 1* or via the parameterzied time *Trigger 1 change time*.

**"Intermediate meter reading"
additionally resettable by object**

Options: no
yes

- *yes:* The communication object *Reset (A: Intermediate meter)* is enabled. When a telegram is received with the value 1 on the communication object, the meter reading is sent and subsequently reset to zero. The status of the meter is not changed, i.e. if the meter is metering, it will continue to take readings; if it is stopped, it will remain stopped.

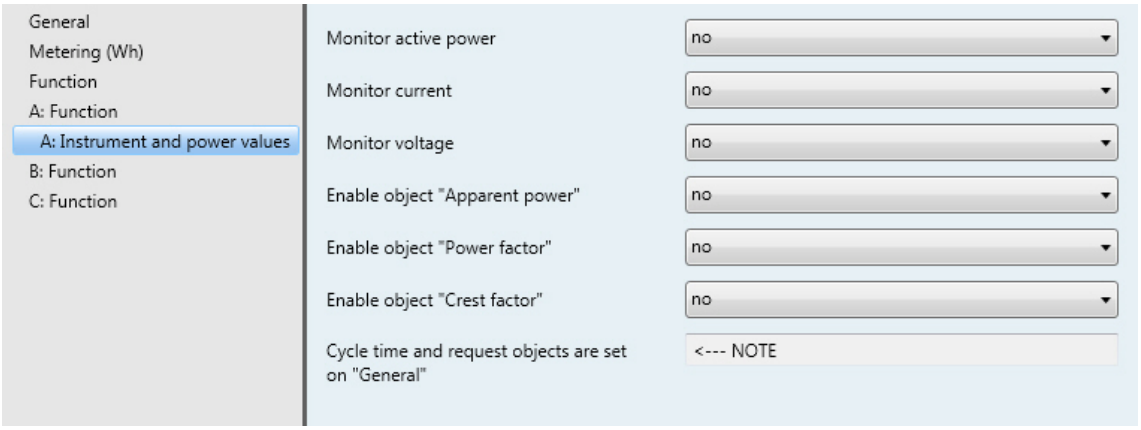
**Overwrite start, stop time, duration
and limit with download or ETS reset**

Options: no
yes

- *yes:* After a download or ETS reset, the values changed on the bus are overwritten again with the parameter values.
- *no:* After a download or ETS reset, the values changed on the bus are retained.

3.2.4.2 Parameter window *A: Instrument and power values*

In this parameter window, further parameter values for monitoring of the instrument and power values and the respective communication objects are enabled.



Monitor active power

Options: no
yes

· *yes:* The parameter window *Monitor active power* is enabled.

Monitor current

Options: no
yes

· *yes:* The parameter window *A: Monitor current* is enabled.

Monitor voltage

Options: no
yes

· *yes:* The parameter window *A: Monitor voltage* is enabled.

Enable object "Apparent power"

Options: no
yes

· *yes:* The communication object *Apparent power* (A: Apparent power) is enabled. The following parameters appear:

Send "Apparent power" after a change

Options: no
yes

· yes: The value of the communication object *Apparent power* (A: Apparent power) is sent after a change. The following parameter appears:

Send "Apparent power" when +/- VA [1...4,600]

Options: 1… 5…4,600

This parameter determines which changes of the value of the communication object *Apparent power* are sent.

Send "Apparent power" on request

Options: no
yes

- *yes:* The value of the communication object *Apparent power* is sent when a telegram is received on the communication object *Request power values*. This communication object is enabled in the Parameter window General, page 25.

Send "Apparent power" cyclically

Options: no
yes

- *yes:* The value of the communication object *Apparent power* is sent cyclically. The setting of the cycle time is undertaken in Parameter window General, page 25 (parameter *Cycle time for power values in s*).

Enable object "Power factor"

Options: no
yes

- *yes:* The value of the communication object *Power factor* (A: Power factor) is enabled. The following parameters appear:

Send "Power factor" after a change

Options: no
yes

- *yes:* The value of the communication object *Power factor* (A: Power factor) is sent after a change. The following parameter appears:

Send "Power factor" when +/- 0.01 x value [1...100]

Options: 1…5…100

This parameter determines which changes of the value of the communication object *Power factor* are sent.

Send "Power factor" on request

Options: no
yes

- *yes:* The value of the communication object *Power factor* is sent when a telegram is received on the communication object *Request instrument values*. This communication object is enabled in the Parameter window General, page 25.

Send "Power factor" cyclically

Options: no
yes

· *yes:* The value of the communication object *Power factor* is sent cyclically. The setting of the cycle time is undertaken in Parameter window General, page 25 (parameter *Cycle time for instrument values in s*).

Enable object "Crest factor"

Options: no
yes

· *yes:* The communication object *Crest factor current* (A: Crest factor current) is enabled. The following parameters appear:

Send "Crest factor" after a change

Options: no
yes

· *yes:* The value of the communication object *Crest factor current* (A: Crest factor current) is sent after a change. The following parameter appears:

Send "Crest factor" when +/- 0.1 x value [1...100]

Options: 1… 5…100

This parameter determines which changes of the value of the communication object *Crest factor current* are sent.

Send "Crest factor" on request

Options: no
yes

· *yes:* The value of the communication object *Crest factor current* is sent when a telegram is received on the communication object *Request instrument values*. This communication object is enabled in the Parameter window General, page 25.

Send "Crest factor" cyclically

Options: no
yes

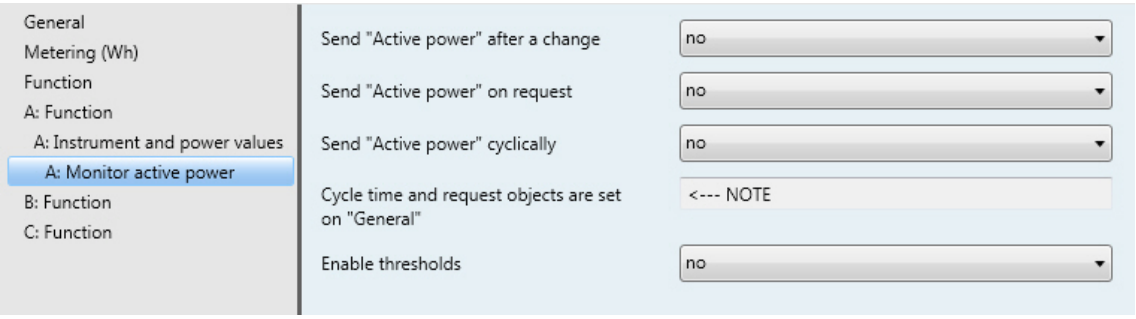
· *yes:* The value of the communication object *Crest factor current* is sent cyclically. The setting of the cycle time is undertaken in Parameter window General, page 25 (parameter *Cycle time for instrument values in s*).

Cycle time and request objects are set on "General"

<−−− NOTE

3.2.4.2.1 Parameter window *A: Monitor active power*

In the parameter window *A: Monitor active power*, the parameters and the communication objects for the detection and monitoring of the active power of output A are enabled.



Send "Active power" after a change

Options: no
yes

· *yes:* The value of the communication object *Active power* is sent on a change. The following parameter appears:

Send "Active power" when +/- W [1 ...4,600]

Options: 1… 5…4,600

This parameter determines which changes of the value of the communication object *Active power* are sent.

Send "Active power" on request

Options: no
yes

· *yes:* The value of the communication object *Active power* is sent when a telegram is received on the communication object *Request power values*. This communication object is enabled in the Parameter window General, page 25.

Send "Active power" cyclically

Options: no
yes

· *yes:* The value of the communication object *Active power* is sent cyclically. The setting of the cycle time is undertaken in Parameter window General, page 25 (parameter *Cycle time for power values in s*).

Cycle time and request objects are set on "General"

<−−− NOTE

Enable thresholds

Options: no
yes

- *yes:* The parameters and communication objects for threshold 1 for monitoring the Active power of output A are enabled. The following parameters appear:

Overwrite thresholds with download or ETS reset

Options: no
yes

- *yes:* The threshold values can be modified via the bus. With this setting, after a download or ETS reset, the values changed on the bus are again overwritten with the parameterized values. This setting applies for threshold value 1 and threshold value 2.

Threshold 1 lower limit in W [0...4,600]

Options: 0…5…4,600

This is the lower hysteresis limit of threshold value 1. If the lower threshold is undershot, there is a warning if it has been parameterized.

For further information see: Instrument and power values, page 81

Threshold 1 upper limit in W [0...4,600]

Options: 0…100…4,600

This is the upper hysteresis limit of threshold value 1. If the upper threshold is exceeded, there is a warning if it has been parameterized.

For further information see: Instrument and power values, page 81

Threshold 1 warning

Options: do not send
send 0 when exceeding
send 1 when exceeding
send 0 when falling below
send 1 when falling below
exceeding 0, falling below 1
exceeding 1, falling below 0

If threshold value 1 is exceeded or undershot, the parameterized value of the communication object *Threshold 1 warning* (Active power) is sent.

Note
Exceeding the threshold means that the upper limit is exceeded, falling below the threshold means that the lower limit is undershot.

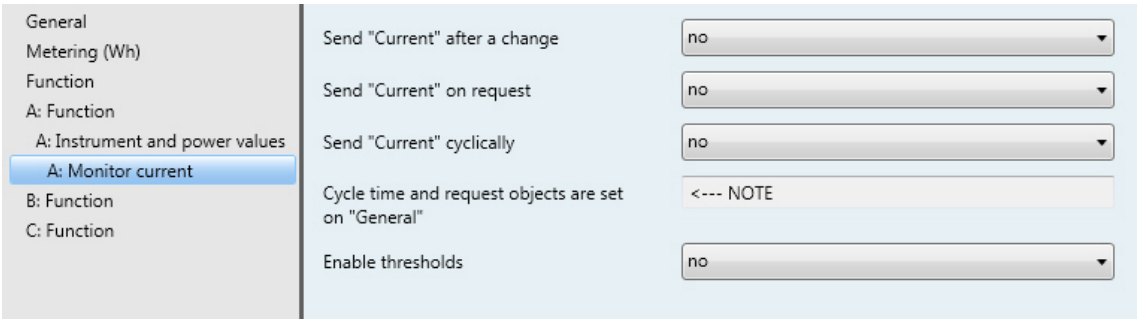
Enable threshold 2

Options: no
yes

Parameterization of threshold value 2 is identical to threshold value 1.

3.2.4.2.2 Parameter window *A: Monitor current*

In the parameter window *A: Current value*, the parameters and the communication objects for the detection and monitoring of the current value of output A are enabled.



Send "Current" after a change

Options: no
yes

· *yes:* The value of the communication object *Current value* is sent on a change. The following parameter appears:

Send "Current" when +/- mA [1...20,000]

Options: 1…50…20,000

This parameter determines which changes of the value of the communication object *Current value* are sent.

Send "Current" on request

Options: no
yes

· *yes:* The value of the communication object *Current value* is sent when a telegram is received on the communication object *Request instrument values*. This communication object is enabled in the Parameter window General, page 25.

Send "Current" cyclically

Options: no
yes

· *yes:* The value of the communication object *Current value* is sent cyclically. The setting of the cycle time is undertaken in Parameter window General, page 25 (parameter *Cycle time for power values in s*).

Cycle time and request objects are set on "General"

<−−− NOTE

Enable thresholds

Options: no
yes

- *yes:* The parameters and communication objects for threshold 1 for monitoring the *Current value* of output A are enabled. The following parameters appear:

Overwrite thresholds with download or ETS reset

Options: no
yes

- *yes:* The threshold values can be modified via the bus. With this setting, after a download or ETS reset, the values changed on the bus are again overwritten with the parameterized values. This setting applies for threshold value 1 and threshold value 2.

Threshold 1 lower limit in 100 mA x value [0...200]

Options: 0…1…200

This is the lower hysteresis limit of threshold value 1. If the lower threshold is undershot, there is a warning if it has been parameterized.

For further information see: Instrument and power values, page 81

Threshold 1 upper limit in 100 mA x value [0...200]

Options: 0…3…200

This is the upper hysteresis limit of threshold value 1. If the upper threshold is exceeded, there is a warning if it has been parameterized.

For further information see: Instrument and power values, page 81

Threshold 1 warning

Options: do not send
send 0 when exceeding
send 1 when exceeding
send 0 when falling below
send 1 when falling below
exceeding 0, falling below 1
exceeding 1, falling below 0

If threshold value 1 is exceeded or undershot, the parameterized value of the communication object *Threshold 1 warning* (Current value) is sent.

Note
Exceeding the threshold means that the upper limit is exceeded, falling below the threshold means that the lower limit is undershot.

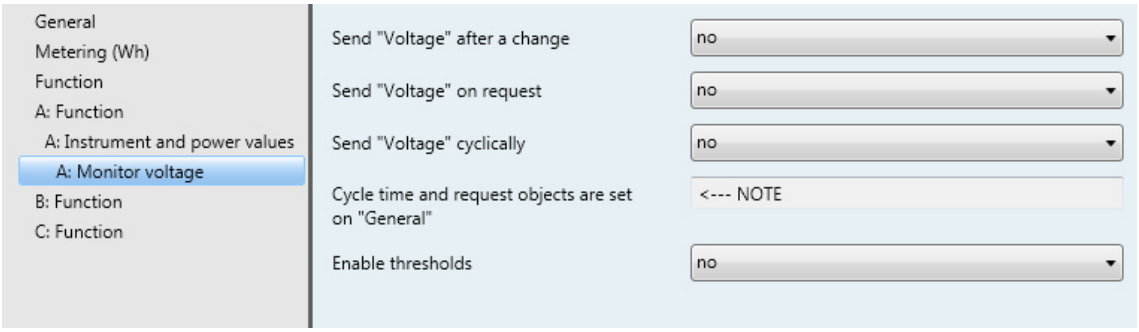
Enable threshold 2

Options: no
yes

Parameterization of threshold value 2 is identical to threshold value 1.

3.2.4.2.3 Parameter window *A: Monitor voltage*

In the parameter window *A: Monitor voltage*, the parameters and the communication objects for the detection and monitoring of the voltage of output A are enabled.



Send "Voltage" after a change

Options: no
yes

- *yes:* The value of the communication object *Voltage* is sent on a change. The following parameter appears:

  Send "Voltage" when +/- V [1...265]

  Options: 1…5…265

  This parameter determines which changes of the value of the communication object *Voltage* are sent.

Send "Voltage" on request

Options: no
yes

- *yes:* The value of the communication object *Voltage* is sent when a telegram is received on the communication object *Request instrument values*. This communication object is enabled in the Parameter window General, page 25.

Send "Voltage" cyclically

Options: no
yes

- *yes:* The value of the communication object *Voltage* is sent cyclically. The setting of the cycle time is undertaken in Parameter window General, page 25 (parameter *Cycle time for power values in s*).

Cycle time and request objects are set on "General"

<−−− NOTE

Enable thresholds

Options: no
yes

- *yes:* The parameters and communication objects for threshold 1 for monitoring the *Voltage* of output A are enabled. The following parameters appear:

Overwrite thresholds with download or ETS reset

Options: no
yes

- *yes:* The threshold values can be modified via the bus. With this setting, after a download or ETS reset, the values changed on the bus are again overwritten with the parameterized values. This setting applies for threshold value 1 and threshold value 2.

Threshold 1 lower limit in V [95...265]

Options: 95…95…265

This is the lower hysteresis limit of threshold value 1. If the lower threshold is undershot, there is a warning if it has been parameterized.

For further information see: Instrument and power values, page 81

Threshold 1 upper limit in V [95...265]

Options: 95…100…265

This is the upper hysteresis limit of threshold value 1. If the upper threshold is exceeded, there is a warning if it has been parameterized.

For further information see: Instrument and power values, page 81

Threshold 1 warning

Options: do not send
send 0 when exceeding
send 1 when exceeding
send 0 when falling below
send 1 when falling below
exceeding 0, falling below 1
exceeding 1, falling below 0

If threshold value 1 is exceeded or undershot, the parameterized value of the communication object *Threshold 1 warning* (Voltage) is sent.

Note
Exceeding the threshold means that the upper limit is exceeded, falling below the threshold means that the lower limit is undershot.

Enable threshold 2

Options: no
yes

Parameterization of threshold value 2 is identical to threshold value 1.

3.3 Communication objects

In this chapter, the communication objects of the Energy Module EM/S 3.16.1 are described. The description is divided into blocks, which relate to the name of the communication object.

General - Communication objects, valid for the entire Energy Module

Output A…C - Communication objects that relate to the corresponding output.

In order to obtain a quick overview of the function possibilities of the Energy Module, all communication objects are listed in an overview table. The detailed function can be examined in more detail in the subsequent description of the individual communication objects.

Note
Some communication objects are dynamic and are only visible if the corresponding parameters are activated in the application program.

3.3.1 Short overview of the communication objects

CO* No.	Function	Name	Data Point Type (DPT)	Length	Flags				
					C	R	W	T	A
0	In operation	General	DPT 1.002	1 bit	x			x	
1…3	Not assigned								
4	Request status values	General	DPT 1.017	1 bit	x		x		
5	Request meter readings	General	DPT 1.017	1 bit	x		x		
6	Request instrument values	General	DPT 1.017	1 bit	x		x		
7	Request power values	General	DPT 1.017	1 bit	x		x		
8	Receive time	General	DPT 10.001	3 byte	x		x		
9	Measurement circuit active	Diagnostics	DPT 1.011	1 bit	x	x		x	
11	Enable reset meter readings	Meter reading	DPT 1.003	1 bit	x	x	x		
12	Reset meter readings	Meter reading	DPT 1.015	1 bit	x		x		
13	Deactivate load control	Load control master	DPT 1.003	1 bit	x	x	x		
15	Status load control	Load control master	DPT 27.001	4 byte	x	x		x	
16	Load limit exceeded	Load control master	DPT 1.005	1 bit	x	x		x	
17	Receive power value 1	Load control master	DPT 14.056	4 byte	x		x	x	x
18	Receive power value 2	Load control master	DPT 14.056	4 byte	x		x	x	x
19	Receive power value 3	Load control master	DPT 14.056	4 byte	x		x	x	x
20	Receive power value 4	Load control master	DPT 14.056	4 byte	x		x	x	x
21	Receive power value 5	Load control master	DPT 14.056	4 byte	x		x	x	x
22	Receive power value 6	Load control master	DPT 14.056	4 byte	x		x	x	x
23	Receive power value 7	Load control master	DPT 14.056	4 byte	x		x	x	x
24	Receive power value 8	Load control master	DPT 14.056	4 byte	x		x	x	x
25	Receive power value 9	Load control master	DPT 14.056	4 byte	x		x	x	x
26	Receive power value 10	Load control master	DPT 14.056	4 byte	x		x	x	x
27	Send sum power values	Load control master	DPT 14.056	4 byte	x	x		x	
28	Send load shedding stage	Load control master	DPT 236.001	1 byte	x	x		x	
29	Choose load limit	Load control master	DPT 5.010	1 byte	x		x		
30	Send load limit	Load control master	DPT 14.056	4 byte	x	x		x	
	Receive/send load limit	Load control master	DPT 14.056	4 byte	x	x	x	x	
31	Meter reading	Meter total	DPT 13.010	4 byte	x	x		x	
32	Meter reading	Intermediate meter total	DPT 13.010	4 byte	x	x		x	
33	Status	Intermediate meter total	non DPT	1 byte	x	x		x	
34	Receive trigger 1	Intermediate meter total	DPT 1.017	1 bit	x		x		
	Trigger 1 change time	Intermediate meter total	DPT 10.001	3 byte	x	x	x	x	
35	Receive trigger 2	Intermediate meter total	DPT 1.017	1 bit	x		x		
	Trigger 2 change time	Intermediate meter total	DPT 10.001	3 byte	x	x	x	x	
	Trigger 2 change limit	Intermediate meter total	DPT 13.010	4 byte	x	x	x	x	
	Trigger 2 change duration	Intermediate meter total	DPT 7.006	2 byte	x	x	x	x	
36	Reset	Intermediate meter total	DPT 1.015	1 bit	x		x		

* CO = communication object

CO* No.	Function	Name	Data Point Type (DPT)	Length	Flags				
					C	R	W	T	A
37	Active power	Active power total	DPT 14.056	4 byte	x	x		x	
38	Threshold 1 lower limit	Active power total	DPT 14.056	4 byte	x	x	x	x	
39	Threshold 1 upper limit	Active power total	DPT 14.056	4 byte	x	x	x	x	
40	Threshold 1 warning	Active power total	DPT 1.005	1 bit	x	x		x	
41	Threshold 2 lower limit	Active power total	DPT 14.056	4 byte	x	x	x	x	
42	Threshold 2 upper limit	Active power total	DPT 14.056	4 byte	x	x	x	x	
43	Threshold 2 warning	Active power total	DPT 1.005	1 bit	x	x		x	
44	Frequency	Frequency	DPT 14.033	4 byte	x	x		x	
45	Threshold 1 lower limit	Frequency	DPT 14.033	4 byte	x	x	x	x	
46	Threshold 1 upper limit	Frequency	DPT 14.033	4 byte	x	x	x	x	
47	Threshold 1 warning	Frequency	DPT 1.005	1 bit	x	x		x	
48	Threshold 2 lower limit	Frequency	DPT 14.033	4 byte	x	x	x	x	
49	Threshold 2 upper limit	Frequency	DPT 14.033	4 byte	x	x	x	x	
50	Threshold 2 warning	Frequency	DPT 1.005	1 bit	x	x		x	
51	Frequency error	Diagnostics	DPT 1.005	1 bit	x	x		x	
62	Active power negative	A: Diagnostics	DTP 1.011	1 bit	x	x		x	
74	Meter reading	A: Meter	DPT 13.010	4 byte	x	x		x	
75	Meter reading	A: Intermediate meter	DPT 13.010	4 byte	x	x		x	
76	Status	A: Intermediate meter	non DPT	1 byte	x	x		x	
77	Receive trigger 1	A: Intermediate meter	DPT 1.017	1 bit	x		x		
	Trigger 1 change time	A: Intermediate meter	DPT 10.001	3 byte	x	x	x	x	
78	Receive trigger 2	A: Intermediate meter	DPT 1.017	1 bit	x		x		
	Trigger 2 change time	A: Intermediate meter	DPT 10.001	3 byte	x	x	x	x	
	Trigger 2 change limit	A: Intermediate meter	DPT 13.010	4 byte	x	x	x	x	
	Trigger 2 change duration	A: Intermediate meter	DPT 7.006	2 byte	x	x	x	x	
79	Reset	A: Intermediate meter	DPT 1.015	1 bit	x		x		
82	Active power	A: Active power	DPT 14.056	4 byte	x	x		x	
83	Threshold 1 lower limit	A: Active power	DPT 14.056	4 byte	x	x	x	x	
84	Threshold 1 upper limit	A: Active power	DPT 14.056	4 byte	x	x	x	x	
85	Threshold 1 warning	A: Active power	DPT 1.005	1 bit	x	x		x	
86	Threshold 2 lower limit	A: Active power	DPT 14.056	4 byte	x	x	x	x	
87	Threshold 2 upper limit	A: Active power	DPT 14.056	4 byte	x	x	x	x	
88	Threshold 2 warning	A: Active power	DPT 1.005	1 bit	x	x		x	

* CO = communication object

CO* No.	Function	Name	Data Point Type (DPT)	Length	Flags				
					C	R	W	T	A
89	Current value	A: Current	DPT 14.019	4 byte	x	x		x	
90	Threshold 1 lower limit	A: Current	DPT 14.019	4 byte	x	x	x	x	
91	Threshold 1 upper limit	A: Current	DPT 14.019	4 byte	x	x	x	x	
92	Threshold 1 warning	A: Current	DPT 1.005	1 bit	x	x		x	
93	Threshold 2 lower limit	A: Current	DPT 14.019	4 byte	x	x	x	x	
94	Threshold 2 upper limit	A: Current	DPT 14.019	4 byte	x	x	x	x	
95	Threshold 2 warning	A: Current	DPT 1.005	1 bit	x	x		x	
96	Voltage	A: Voltage	DPT 14.027	4 byte	x	x		x	
97	Threshold 1 lower limit	A: Voltage	DPT 14.027	4 byte	x	x	x	x	
98	Threshold 1 upper limit	A: Voltage	DPT 14.027	4 byte	x	x	x	x	
99	Threshold 1 warning	A: Voltage	DPT 1.005	1 bit	x	x		x	
100	Threshold 2 lower limit	A: Voltage	DPT 14.027	4 byte	x	x	x	x	
101	Threshold 2 upper limit	A: Voltage	DPT 14.027	4 byte	x	x	x	x	
102	Threshold 2 warning	A: Voltage	DPT 1.005	1 bit	x	x		x	
103	Apparent power	A: Apparent power	DPT 14.056	4 byte	x	x		x	
105	Power factor	A: Power factor	DPT 14.057	4 byte	x	x		x	
106	Crest factor current	A: Crest factor current	DPT 14.057	4 byte	x	x		x	
120… 166	Output B, the same CO as output A	B: see output A							
180… 226	Output C, the same CO as output A	C: see output A							

* CO = communication object

3.3.2 Communication objects *General*

No.	Function	Object name	Data type	Flags
0	**In operation**	**System**	**1 bit DPT 1.002**	**C, T**
This communication object is enabled when in the Parameter window General, page 25, the parameter *Send communication object "In operation"* is selected with the option *send value 0 cyclically* or *send value 1 cyclically*. In order to regularly monitor the presence of the Energy Module on the ABB i-bus® KNX, an in operation monitoring telegram can be sent cyclically on the bus.. As long as the communication object is activated, it sends an *In operation* telegram. Telegram value 1 = system in operation with option *send value 1 cyclically* 0 = system in operation with option *send value 0 cyclically*				
1…3				
Not assigned				
4	**Request status values**	**General**	**1 bit** **DPT 1.017**	**C, W**
This communication object is enabled if in Parameter window General, page 25, the parameter *Enable communication object "Request status values" 1 bit* has been selected with the option *yes*. If a telegram with the value x (x = 0; 1; 0 or 1) is received on this communication object, all status objects are sent on the bus, as long as these have been programmed with the option *on request* or *after a change* or *on request*. Some status objects are sent in every case; see the description of the parameter in chapter 3.2.1. The following function results for the value x = 1: Telegram value: 1 = All status messages are sent. 0 = no reaction.				
5	**Request meter readings**	**General**	**1 bit** **DPT 1.017**	**C, W**
This communication object is enabled if in Parameter window Metering (Wh), page 29, the parameter *Enable communication object "Request meter readings" 1 bit* has been selected with the option yes. If a telegram with the value x (x = 0; 1; 0 or 1) is received on the communication object, all meter readings are sent on the bus, as long as these have been programmed with the option *on request* or *cyclically and on request*, refer to the description of the parameter in chapter 3.2.2. The following function results for the value x = 1: Telegram value: 1 = all meter readings are sent. 0 = no reaction.				
6	**Request instrument values**	**General**	**1 bit** **DPT 1.017**	**C, W**
This communication object is enabled if in Parameter window General, page 25, the parameter *Enable communication object "Request instrument values" 1 bit* has been selected with the option *yes*. If a telegram with the value x (x = 0; 1; 0 or 1) is received in the communication object, all instrument values are sent on the bus, as long as these have been programmed with the option *on request* or *after a change or on request*. Some status objects send in every case, see the description of the parameter in chapter 3.2.1. The following function results for the value x = 1: Telegram value: 1 = all instrument values are sent. 0 = no reaction.				

No.	Function	Object name	Data type	Flags
7	**Request power values**	**General**	**1 bit** **DPT 1.017**	**C, W**

This communication object is enabled if in Parameter window General, page 25, the parameter *Enable communication object "Request power values" 1 bit* has been selected with the option *yes*.

If a telegram with the value x (x = 0; 1; 0 or 1) is received on this communication object, all power values are sent on the bus, as long as these have been programmed with the option *on request* or *after a change* or *on request*. Some status objects send in every case, see the description of the parameter in chapter 3.2.1.

The following function results for the value x = 1:

Telegram value: 1 = All power values are sent.
0 = no reaction.

8	**Receive time**	**General**	**3 byte** **DPT 10.001**	**C, W**

This communication object is always enabled. The time (day/hour/minute/second) is received via the bus with this communication object.

If the time has been selected with an intermediate counter as trigger 1 or trigger 2, trigger 1 or trigger 2 are activated when the parameterized time is received on the bus. The evaluation is on a minute basis, i.e. the seconds are not taken into account. If the same time is received several times, i.e., the time is sent more than once a minute, a renewed reception does not cause a reaction.

In order to ensure that the parameterized time for trigger 1 or trigger 2 is received, the time must be sent once a minute on the bus (external timer).

9	**Measurement circuit active**	**Diagnostics**	**1 bit** **DPT 1.011**	**C, R, T**

This communication object is always enabled. It indicates that the measurement electronics of the Energy Module are “working”. The value of the communication object is sent on a change and when a telegram is received on the communication object *Request status values*.

The measurement section is supplied with power from one of the output circuits A…C.

If the rated voltage (see Technical data on page 7) is present on at least one of the outputs, the measurement values are recorded and are available on the KNX side.

Telegram value: 1 = On at least one (any) output of the Energy Module rated voltage is present, measurement values are recorded.
0 = No rated voltage is present on any of the outputs, measurement values are not recorded.

11	**Enable reset meters**	**Meter reading**	**1 bit** **DPT 1.003**	**C, R, W**

This communication object is enabled if in Parameter window Metering (Wh), page 29, the parameter *All meters resettable per object* has been selected with the option *yes*.

The internal timer starts when a telegram with the value 1 is received on this communication object. If a telegram with the value 1 is received within 10 s after the start of the timer on the communication object *Reset meter readings* (communication object no. 12), all main and intermediate meters are reset and stopped.

Note

All meter readings are lost and cannot be restored.

Important

The meters can only be reset when the measurement electronics are active, i.e. rated voltage is present on at least one output.

12	**Reset meter readings**	**Meter reading**	**1 bit** **DPT 1.015**	**C, W**

See communication object 11.

3.3.3 Communication objects *Load control master*

No.	Function	Object name	Data type	Flags
13	**Deactivate load control**	**Load control master**	**1 bit** **DPT 1.003**	**C, R, W**

This communication object is enabled when in Parameter window Function, page 31, the parameter *Device is load control master* has been selected with option *yes*.

Using this communication object, the function *Load control master* can be deactivated via the receipt of a corresponding telegram.

Telegram value:
0 = The function *Load control master* is active.
1 = The function *Load control master* is deactivated. The communication object *Send load shedding stage* is sent with the value “Shedding stage 0”, all slaves are thus enabled. The communication object no. 28 *Send load shedding stage* is written with the value 128 and sent (shedding stage 0, load control not active).

The value of the communication object after bus voltage recovery can be parameterized in the Parameter window Load control master, page 40.

14				

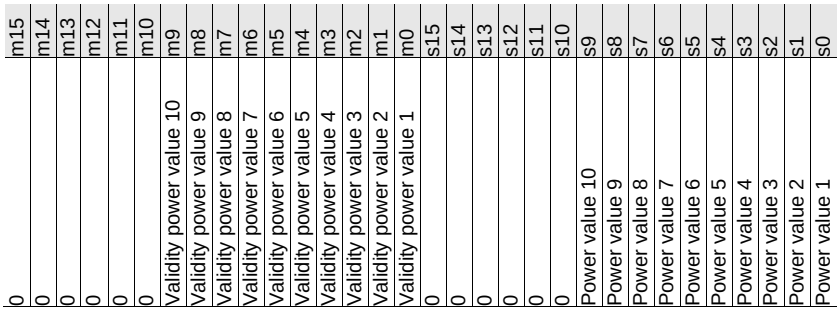
Not assigned

15	**Status load control**	**Load control master**	**4 byte** **DPT 27.001**	**C, R, T**

This communication object is enabled when in Parameter window Load control master, page 40, the parameter *Monitor power values cyclically* have been selected with the option *yes*. The value of the communication object is sent on a change or when a telegram is received on the communication object *Request status values*.

The communication object consists of a mask that defines the valid bits and their data. The data indicates the monitoring faults of the power values.

If the master does not receive all the external power values from the slaves within the parameterized control period, the missing values are requested via *Value Read* and an internal timer starts (10 s). After the timer has timed out, the corresponding error bit is set and the value of the communication object is sent.



Bit value mask:
1 = The respective status bit is valid and is evaluated.
0 = The respective status bit is invalid and will not be evaluated.

Bit value status:
1 = Monitoring error, the monitored value has not been received
0 = The monitored value has not been received within the monitoring period

Note

Monitoring of power values 1…4 is only active provided that the corresponding parameter *Source for power value 1…4* has been parameterized with the option *external via communication object* and a power value has been received.

No.	Function	Object name	Data type	Flags
16	**Load limit exceeded**	**Load control master**	**1 bit** **DPT 1.005**	**C, R, T**
This communication object is enabled when in Parameter window Function, page 31, the parameter *Device is load control master* has been selected with option *yes*. The value of the communication object is sent on a change and when a telegram is received on the communication object *Request status values*. The master adds the received power values to *Send sum power values* (communication object no. 27). If the sum is greater than the parameterized permitted load limit, the value of the communication object is set to 1 and sent. If the sum is less than the allowed load limit (minus hysteresis), the value of the communication object is reset to 0.				
17… 26	**Receive power value 1…10**	**Load control master**	**4 byte** **DPT 14.056**	**C, R, T, U**
These communication objects are enabled, provided that in Parameter window Function, page 31, the parameter *Device is load control master* has been selected with the option yes and in Parameter window Load control master, page 40, the parameter *Source for power value 1…4* (communication objects no. 17…20) has been selected with the option *external via communication object* as well as the parameter *Number of additional power values [1…6]* (communication objects no. 21…27) have been selected with a number > 0. The external power values are received via these communication objects (up to 10). Power values 1…4 can also be alternatively linked internally with power values output 1…3 or the total power of the device.				
27	**Send sum power values**	**Load control master**	**4 byte** **DPT 14.056**	**C, R, T**
This communication object is enabled provided that in Parameter window Function, page 31, the parameter *Device is load control master* has been selected with option *yes*. The value of the communication object is internally calculated from the sum or the received power values and the internally linked power values.				
28	**Send load shedding stage**	**Load control master**	**1 byte** **DPT 236.001**	**C, R, T**
This communication object is enabled provided that in Parameter window Function, page 31, the parameter *Device is load control master* has been selected with option *yes*. The master sends the shedding stage on the bus as soon as the *Sum power values* (communication object no. 27) has exceeded the parameterized load limit. Format: 8 bit: DPPPSSSS D (Bit 7): 1 = Load control is not active, received shedding stages are not evaluated and slaves are enabled. 0 = Load control is active, received shedding stages are evaluated. P (Bit 6…4) [000b…111b]: If more than one master is available in the system, these bits can determine the priorities of the masters among themselves. The Energy Module always sends P = 0. S (Bit 3…0) [0000b-1111b]: This is the actual shedding stage. Telegram value: S = 0000b: Shedding stage 0, the slaves are enabled S = 0001b: Shedding stage 1 … S = 1000b: Shedding stage 8 Shedding stages 9 to 16 are not used with the Energy Module. If the load limit is exceeded, load shedding stage 1 is sent. All slaves with load shedding stage 1 then switch off.. The *Sum power values* is then recalculated and compared with the load limit. If this is still exceeded, load shedding stage n + 1 is sent until the load limit is below the limit (before every increase in the shedding stage, the parameterized *Reaction time when exceeding load limit* is completed beforehand). Should the value be below the load limit minus the hysteresis again, the shedding stage is reduced in steps (taking the *Reaction time when falling below load limit* into consideration).				

No.	Function	Object name	Data type	Flags
29	**Choose load limit**	**Load control master**	**1 byte** **DPT 5.010**	**C, W**
This communication object is enabled when in Parameter window Load control master, page 40, the parameter *Load limit can be changed* has been selected with the option *yes, 4 values selectable*. With this communication object, one of the 4 parameterized load limits can be selected as the active load limit. Value range [0…255] Telegram value: 0 = Load limit 1 active 1 = Load limit 2 active 3 = Load limit 3 active 4 = Load limit 4 active 5…255: not allowed. The active load limit after download or ETS reset is parameterized.				
30	**Send load limit**	**Load control master**	**4 byte** **DPT 14.056**	**C, R, T**
This communication object is enabled when in Parameter window Load control master, page 40, the parameter *Load limit can be changed* has been selected with the option *yes, 4 values selectable*. Four parameterized load limits are available. The active load limit can be viewed using this communication object.				
30	**Receive/send load limit**	**Load control master**	**4 byte** **DPT 14.056**	**C, R, T**
This communication object is enabled when in Parameter window Load control master, page 40, the parameter *Load limit can be changed* has been selected with the option *yes, object writable*. Only 1 load limit is available. It can be displayed and modified using this communication object.				

3.3.4 Communication objects *Meter total*

No.	Function	Object name	Data type	Flags
31	**Meter reading**	**Meter total**	**4 byte** **DPT 13.010**	**C, R, T**
This communication object is enabled if in Parameter window Metering (Wh), page 29, the parameter *Enable "Meter reading total"* has been selected with the option *yes*. The value of the communication object is calculated from the sum of the meter outputs A…C. The *Meter total* can only be reset via communication objects no. 11 and 12.				

3.3.5 Communication objects *Intermediate meter total*

Note
The functions of communication objects no. 34 and 35 change depending on the parameterization.

No.	Function	Object name	Data type	Flags
32	**Meter reading**	**Intermediate meter total**	**4 byte** **DPT 13.010**	**C, R, T**
This communication object is enabled if in Parameter window Metering (Wh), page 29, the parameter *Enable "Meter reading total"* has been selected with the option *yes*. The *Intermediate meter total* is derived from the *Meter total*. It is controlled via communication objects no. 33…36.				
33	**Status**	**Intermediate meter total**	**1 byte** **non DPT**	**C, R, T**
This communication object is enabled if in Parameter window Metering (Wh), page 29, the parameter *Enable "Meter reading total"* has been selected with the option *yes*. The value of the communication object is sent when a telegram is received on the communication object *Request status values*. This communication object indicates whether the counter is currently started or stopped and whether the meter reading could be erroneous. This can be the case, for example, during a start or stop event if bus voltage is not available and this event is thus not recorded. Telegram value: Bit 0: 1 = Meter reading is started 0 = meter reading is stopped Bit 1: 1 = Since the last reset of the intermediate meter a bus voltage failure or download has occurred. The meter reading may not be correct. 0 = Since the last reset of the intermediate meter no bus voltage failure or download has occurred. Bit 2…7: Not used, 0.				
34	**Receive trigger 1**	**Intermediate meter total**	**1 bit** **DPT 1.017**	**C, W**
This communication object is enabled if in Parameter window Meter reading total (Wh), page 32, the parameter *Trigger 1 (Start) is activated by* has been selected with the option *1 bit object*. The intermediate meter starts if a telegram with the value 1 is received via this communication object. You can parameterize whether the intermediate readings are reset and/or sent.				

No.	Function	Object name	Data type	Flags
34	**Trigger 1 change time**	**Intermediate meter total**	**3 byte DPT 10.001**	**C, R, W, T**
This communication object is enabled if in Parameter window Meter reading total (Wh), page 32, the parameter *Trigger 1 (Start) is activated by* has been selected with the option *Time*. The parameterized start time can be modified using this communication object. If the parameterized start time is received via the communication object *Receive time* (communication object no. 8), the intermediate meter starts. You can parameterize whether the intermediate readings are reset and/or sent.				
35	**Receive trigger 2**	**Intermediate meter total**	**1 bit** **DPT 1.017**	**C, W**
This communication object is enabled if in Parameter window Meter reading total (Wh), page 32, the parameter *Trigger 2 (Start) is activated by* has been selected with the option *1 bit object*. The intermediate meter reading is sent if a telegram with the value 1 is received via this communication object. You can parameterize whether the intermediate meter stops or continues to count when trigger 2 is received. If the intermediate meter has stopped, the intermediate meter reading is not resent if a telegram with the value 1 is received.				
35	**Trigger 2 change time**	**Intermediate meter total**	**3 byte** **DPT 10.001**	**C, R, W, T**
This communication object is enabled if in Parameter window Meter reading total (Wh), page 32, the parameter *Trigger 2 (Start) is activated by* has been selected with the option *Time*. The parameterized start time can be modified using this communication object. If the parameterized start time is received via the communication object *Receive time* (communication object no. 8), the intermediate meter reading is sent. You can parameterize whether the intermediate meter stops or continues to count when trigger 2 is received. If the intermediate meter has stopped, the intermediate meter reading is not resent if a telegram with the value 1 is received.				
35	**Trigger 2 change limit**	**Intermediate meter total**	**4 byte** **DPT 13.010**	**C, R, W, T**
This communication object is enabled if in Parameter window Meter reading total (Wh), page 32, the parameter *Trigger 2 (Start) is activated by* has been selected with the option *Limit*. The parameterized limit can be modified using this communication object. If the parameterized limit is reached, the intermediate meter reading is sent and the intermediate meter stops.				
35	**Trigger 2 change duration**	**Intermediate meter total**	**2 byte** **DPT 7.006**	**C, R, W, T**
This communication object is enabled if in Parameter window Meter reading total (Wh), page 32, the parameter *Trigger 2 (Start) is activated by* has been selected with the option *Duration*. The parameterized duration can be modified using this communication object. The intermediate meter reading is sent when the parameterized duration is reached. You can parameterize whether the intermediate meter stops or continues to count when trigger 2 is received. If the intermediate meter has stopped, the intermediate meter reading is not resent if a telegram with the value 1 is received.				
36	**Reset**	**Intermediate meter total**	**1 bit DPT** **1.015**	**C, W**
This communication object is enabled if in Parameter window Meter reading total (Wh), page 32, the parameter *Intermediate meter total* has been selected with the option *yes*. The intermediate meter is reset if a telegram with the value 1 is received via this communication object.				

3.3.6 Communication objects *Active power total*

No.	Function	Object name	Data type	Flags
37	**Active power**	**Active power total**	**4 byte** **DPT 14.056**	**C, R, T**
The communication object is enabled when in Parameter window Function, page 31, the parameter *Monitor "Active power total"* has been selected with option *yes*. The value of the communication object is calculated from the sum of the active powers of outputs A…C and sent on the bus in watts. If the active power of one or more outputs is negative (power feed), it may occur that the total active power may also be negative. The communication object can send negative power values, but the threshold values cannot monitor them (only positive threshold values).				
38	**Threshold 1 lower limit**	**Active power total**	**4 byte** **DPT 14.056**	**C, R, W, T**
This communication object is enabled if in Parameter window Active power total, page 36, the parameter *Enable thresholds* has been selected with the option yes. *Threshold 1 lower limit* and *Threshold 1 upper limit* are the hysteresis limits of threshold value 1. If the value falls below the lower limit or exceeds the upper limit, a parameterized reaction occurs (warning is sent).				
39	**Threshold 1 upper limit**	**Active power total**	**4 byte** **DPT 14.056**	**C, R, W, T**
See communication object 38.				
40	**Threshold 1 warning**	**Active power total**	**1 bit** **DPT 1.005**	**C, R, T**
This communication object is enabled if in Parameter window Active power total, page 36, the parameter *Enable thresholds* has been selected with the option *yes*. The warning is sent with the parameterized value if threshold value 1 is exceeded or fallen below.				
41	**Threshold 2 lower limit**	**Active power total**	**4 byte** **DPT 14.056**	**C, R, W, T**
See Threshold 1.				
42	**Threshold 2 upper limit**	**Active power total**	**4 byte** **DPT 14.056**	**C, R, W, T**
See Threshold 1.				
43	**Threshold 2 warning**	**Active power total**	**1 bit** **DPT 1.005**	**C, R, T**
See Threshold 1.				

3.3.7 Communication objects *Frequency*

No.	Function	Object name	Data type	Flags
44	**Frequency**	**Frequency**	**4 byte** **DPT 14.033**	**C, R, T**
The communication object is enabled when in Parameter window Function, page 31, the parameter Monitor "Frequency" has been selected with option *yes*. The value of the communication object is sent in Hertz on the bus.				
45	**Threshold 1 lower limit**	**Frequency**	**4 byte** **DPT 14.033**	**C, R, W, T**
This communication object is enabled if in Parameter window Frequency, page 38, the parameter *Enable thresholds* has been selected with the option *yes*. *Threshold 1 lower limit* and *Threshold 1 upper limit* are the hysteresis limits of threshold value 1. If the value falls below the lower limit or exceeds the upper limit, a parameterized reaction occurs (warning is sent).				
46	**Threshold 1 upper limit**	**Frequency**	**4 byte** **DPT 14.033**	**C, R, W, T**
See communication object 45.				
47	**Threshold 1 warning**	**Frequency**	**1 bit** **DPT 1.005**	**C, R, T**
This communication object is enabled if in Parameter window Frequency, page 38, the parameter *Enable thresholds* has been selected with the option *yes*. The warning is sent with the parameterized value if threshold value 1 is exceeded or fallen below.				
48	**Threshold 2 lower limit**	**Frequency**	**4 byte** **DPT 14.033**	**C, R, W, T**
See Threshold 1.				
49	**Threshold 2 upper limit**	**Frequency**	**4 byte** **DPT 14.033**	**C, R, W, T**
See Threshold 1.				
50	**Threshold 2 warning**	**Frequency**	**1 bit** **DPT 1.005**	**C, R, T**
See Threshold 1.				
51	**Frequency error**	**Diagnostics**	**1 bit** **DPT 1.005**	**C, R, T**
This communication object is always enabled. It signals when the frequency is out of the range $40 \leq f \leq 70$ Hz . The value of the communication object is sent on a change and when a telegram is received on the communication object *Request status values*. Telegram value: 1 = The frequency is $f < 40$ Hz or $f > 70$ Hz 0 = The frequency is $40 \geq f \leq 70$ Hz				

3.3.7.1 Communication objects *A: Diagnostics*

No.	Function	Object name	Data type	Flags
62	**Active power negative**	**A: Diagnostics**	**1 bit** **DTP 1.011**	**C, R, T**
This is a diagnostics bit for the output. The value of the communication object is sent when a telegram is received on the communication object *Request status values*. 1 = Active power negative 0 = Active power positive				

3.3.7.2 Communication objects *A: Meter*

No.	Function	Object name	Data type	Flags
74	**Meter reading**	**A: Meter**	**4 byte** **DPT 13.010**	**C, R, T**
This communication object is enabled if in Parameter window A: Function, page 44, the parameter *Enable function metering* has been selected with the option *yes*. The *Meter* can only be reset via communication objects 11 and 12.				

3.3.7.3 Communication objects *A: Intermediate meter*

No.	Function	Object name	Data type	Flags
75	**Meter reading**	**A: Intermediate meter**	**4 byte** **DPT 13.010**	**C, R, T**
This communication object is enabled if in Parameter window A: Function, page 44, the parameter *Enable function metering* has been selected with the option *yes*. The intermediate meter is derived from the meter total. It is controlled via communication objects no. 76…79.				
76	**Status**	**A: Intermediate meter**	**1 byte** **non DPT**	**C, R, T**
This communication object is enabled if in Parameter window A: Function, page 44, the parameter *Enable function metering* has been selected with the option *yes*. The value of the communication object is sent when a telegram is received on the communication object *Request status values*. This communication object indicates whether the counter is currently started or stopped and whether the meter reading could be erroneous. This can be the case, for example, during a start or stop event if bus voltage is not available and this event is thus not recorded. Telegram value: Bit 0: 1 = Meter reading is started 0 = Meter reading is stopped Bit 1: 1 = Since the last reset of the intermediate meter a bus voltage failure or download has occurred. The meter reading may not be correct. 0 = Since the last reset of the intermediate meter no bus voltage failure or download has occurred. Bit 2…7: not used, 0.				
77	**Receive trigger 1**	**A: Intermediate meter**	**1 bit** **DPT 1.017**	**C, W**
This communication object is enabled if in Parameter window A: Metering (Wh), page 45, the parameter *Trigger 1 (Start) is activated by* has been selected with the option *1 bit object*. The intermediate meter starts if a telegram with the value 1 is received via this communication object. You can parameterize whether the intermediate readings are reset and/or sent.				

No.	Function	Object name	Data type	Flags
77	**Trigger 1 change time**	**A: Intermediate meter**	**3 byte** **DPT 10.001**	**C, R, W, T**
This communication object is enabled if in Parameter window A: Metering (Wh), page 45, the parameter *Trigger 1 (Start) is activated by* has been selected with the option *Time*. The parameterized start time can be modified using this communication object. If the parameterized start time is received via the communication object *Receive time* (no. 8), the intermediate meter starts. You can parameterize whether the intermediate readings are reset and/or sent.				
78	**Receive trigger 2**	**A: Intermediate meter**	**1 bit** **DPT 1.017**	**C, W**
This communication object is enabled if in Parameter window A: Metering (Wh), page 45, the parameter *Trigger 2 is activated by* has been selected with the option *1 bit object*. The intermediate meter reading is sent if a telegram with the value 1 is received via this communication object. You can parameterize whether the intermediate meter stops or continues to count when trigger 2 is received. If the intermediate meter has stopped, the intermediate meter reading is not resent if a telegram with the value 1 is received.				
78	**Trigger 2 change time**	**A: Intermediate meter**	**3 byte** **DPT 10.001**	**C, R, W, T**
This communication object is enabled if in Parameter window A: Metering (Wh), page 45, the parameter *Trigger 2 is activated by* has been selected with the option *Time*. The parameterized stop time can be modified using this communication object. If the parameterized stop time is received via the communication object *Receive time* (no. 8), the intermediate meter reading is sent. You can parameterize whether the intermediate meter stops or continues to count when trigger 2 is received. If the intermediate meter has stopped, the intermediate meter reading is not resent if a telegram with the value 1 is received.				
78	**Trigger 2 change limit**	**A: Intermediate meter**	**4 byte** **DPT 13.010**	**C, R, W, T**
This communication object is enabled if in Parameter window A: Metering (Wh), page 45, the parameter *Trigger 2 is activated by* has been selected with the option *Limit*. The parameterized limit can be modified using this communication object. If the parameterized limit is reached, the intermediate meter reading is sent and the intermediate meter stops. If the intermediate meter has stopped, the intermediate meter reading is not resent if a telegram with the value 1 is received.				
78	**Trigger 2 change duration**	**A: Intermediate meter**	**2 byte** **DPT 7.006**	**C, R, W, T**
This communication object is enabled if in Parameter window A: Metering (Wh), page 45, the parameter *Trigger 2 is activated by* has been selected with the option *Duration*. The parameterized duration can be modified using this communication object. The intermediate meter reading is sent when the parameterized duration is reached. You can parameterize whether the intermediate meter stops or continues to count when trigger 2 is received. If the intermediate meter has stopped, the intermediate meter reading is not resent if a telegram with the value 1 is received.				
79	**Reset**	**A: Intermediate meter**	**1 bit** **DPT 1.015**	**C, W**
This communication object is enabled if in Parameter window A: Metering (Wh), page 45, the parameter *"Intermediate meter reading" additionally resettable by object* has been selected with the option *yes*. The intermediate meter is reset if a telegram with the value 1 is received via this communication object.				

3.3.7.4 Communication objects *A: Instrument and power values*

No.	Function	Object name	Data type	Flags
82	**Active power**	**A: Active power**	**4 byte** **DPT 14.056**	**C, R, T**
The communication object is enabled when in Parameter window A: Instrument and power values, page 49, the parameter *Monitor active power* has been selected with option *yes*. The value of the communication object is sent in watts on the bus. If the active power is negative (power feed), the value of the communication object can be issued, but not monitored by threshold values (only positive threshold values).				
83	**Threshold 1 lower limit**	**A: Active power**	**4 byte** **DPT 14.056**	**C, R, W, T**
This communication object is enabled if in Parameter window A: Monitor active power, page 52, the parameter *Enable thresholds* has been selected with the option *yes*. *Threshold 1 lower limit* and *Threshold 1 upper limit* are the hysteresis limits of threshold value 1. If the value falls below the lower limit or exceeds the upper limit, a parameterized reaction occurs (warning is sent).				
84	**Threshold 1 upper limit**	**A: Active power**	**4 byte** **DPT 14.056**	**C, R, W, T**
See communication object 83.				
85	**Threshold 1 warning**	**A: Active power**	**1 bit** **DPT 1.005**	**C, R, T**
This communication object is enabled if in Parameter window A: Monitor active power, page 52, the parameter *Enable thresholds* has been selected with the option *yes*. The warning is sent with the parameterized value if threshold value 1 is exceeded or fallen below.				
86	**Threshold 2 lower limit**	**A: Active power**	**4 byte** **DPT 14.056**	**C, R, W, T**
See Threshold 1.				
87	**Threshold 2 upper limit**	**A: Active power**	**4 byte** **DPT 14.056**	**C, R, W, T**
See Threshold 1.				
88	**Threshold 2 warning**	**A: Active power**	**1 bit** **DPT 1.005**	**C, R, T**
See Threshold 1.				
89	**Current value**	**A: Current**	**4 byte** **DPT 14.019**	**C, R, T**
The communication object is enabled when in Parameter window A: Instrument and power values, page 49, the parameter *Monitor current* has been selected with option *yes*. The value of the communication object is sent in Amperes on the bus.				

No.	Function	Object name	Data type	Flags
90	**Threshold 1 lower limit**	**A: Current**	**4 byte** **DPT 14.019**	**C, R, W, T**
This communication object is enabled if in Parameter window A: Monitor current, page 54, the parameter *Enable thresholds* has been selected with the option *yes*. *Threshold 1 lower limit* and *Threshold 1 upper limit* are the hysteresis limits of threshold value 1. If the value falls below the lower limit or exceeds the upper limit, a parameterized reaction occurs (warning is sent).				
91	**Threshold 1 upper limit**	**A: Current**	**4 byte** **DPT 14.019**	**C, R, W, T**
See communication object 90.				
92	**Threshold 1 warning**	**A: Current**	**1 bit** **DPT 1.005**	**C, R, T**
This communication object is enabled if in Parameter window A: Monitor current, page 54, the parameter *Enable thresholds* has been selected with the option *yes*. The warning is sent with the parameterized value if threshold value 1 is exceeded or fallen below.				
93	**Threshold 2 lower limit**	**A: Current**	**4 byte** **DPT 14.019**	**C, R, W, T**
See Threshold 1.				
94	**Threshold 2 upper limit**	**A: Current**	**4 byte** **DPT 14.019**	**C, R, W, T**
See Threshold 1.				
95	**Threshold 2 warning**	**A: Current**	**1 bit** **DPT 1.005**	**C, R, T**
See Threshold 1.				
96	**Voltage**	**A: Voltage**	**4 byte** **DPT 14.027**	**C, R, T**
The communication object is enabled when in Parameter window A: Instrument and power values, page 49, the parameter *Monitor active power* has been selected with option *yes*. The value of the communication object is sent in volts on the bus.				
97	**Threshold 1 lower limit**	**A: Voltage**	**4 byte** **DPT 14.027**	**C, R, W, T**
This communication object is enabled if in Parameter window A: Monitor voltage, page 56, the parameter *Enable thresholds* has been selected with the option *yes*. *Threshold 1 lower limit* and *Threshold 1 upper limit* are the hysteresis limits of threshold value 1. If the value falls below the lower limit or exceeds the upper limit, a parameterized reaction occurs (warning is sent).				
98	**Threshold 1 upper limit**	**A: Voltage**	**4 byte** **DPT 14.027**	**C, R, W, T**
See communication object 97.				

No.	Function	Object name	Data type	Flags
99	**Threshold 1 warning**	**A: Voltage**	**1 bit** **DPT 1.005**	**C, R, T**
This communication object is enabled if in Parameter window A: Monitor voltage, page 56, the parameter *Enable thresholds* has been selected with the option *yes*. The warning is sent with the parameterized value if threshold value 1 is exceeded or fallen below.				
100	**Threshold 2 lower limit**	**A: Voltage**	**4 byte** **DPT 14.027**	**C, R, W, T**
See Threshold 1.				
101	**Threshold 2 upper limit**	**A: Voltage**	**4 byte** **DPT 14.027**	**C, R, W, T**
See Threshold 1.				
102	**Threshold 2 warning**	**A: Voltage**	**1 bit** **DPT 1.005**	**C, R, T**
See Threshold 1.				
103	**Apparent power**	**A: Apparent power**	**4 byte** **DPT 14.056**	**C, R, T**
This communication object is enabled when in Parameter window A: Instrument and power values, page 49, the parameter communication object *Enable object "Apparent power"* has been selected with the option *yes*. The value of the communication object is sent in VA on the bus.				
105	**Power factor**	**A: Power factor**	**4 byte** **DPT 14.057**	**C, R, T**
This communication object is enabled when in Parameter window A: Instrument and power values, page 49, the parameter communication object *Enable object "Power factor"* has been selected with the option *yes*.				
106	**Crest factor current**	**A: Crest factor current**	**4 byte** **DPT 14.057**	**C, R, T**
This communication object is enabled when in Parameter window A: Instrument and power values, page 49, the parameter communication object *Enable object "Crest factor"* has been selected with the option *yes*.				

4 Planning and application

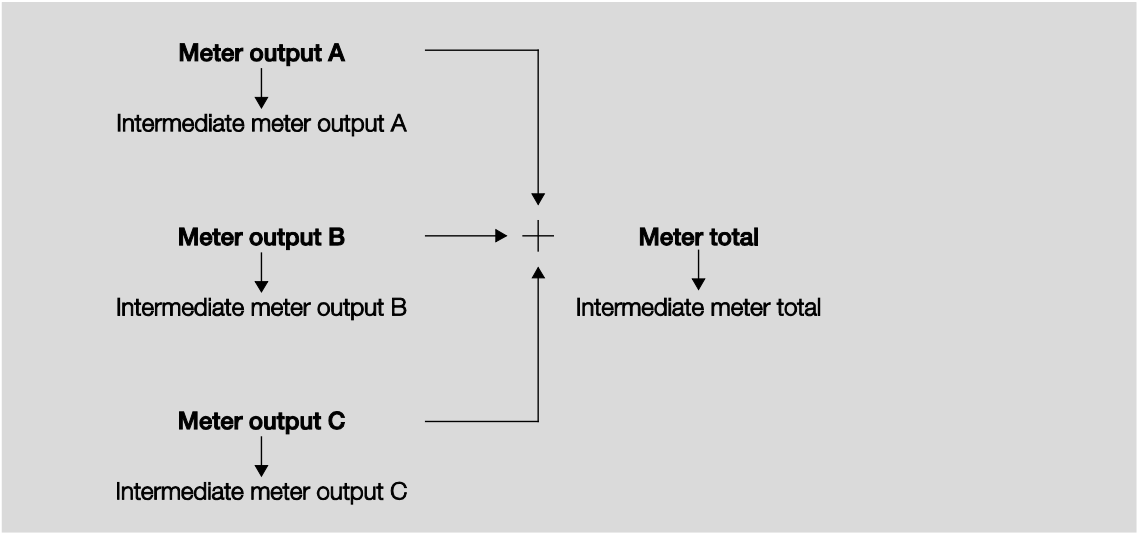
4.1 Functions

The following functions are available and are explained in this chapter. A detailed description of the parameters and communication objects can be found in chapter 3.

- Meter reading
- Instrument and power values
- Load control

4.1.1 Meter reading

For each output, there is a meter and a flexibly parameterized intermediate meter for detection of the active energy consumption of the connected loads in Wh. The three meters of outputs A, B and C are added to give the *Meter total*, for which an intermediate meter is also available.



The general settings for all meters are undertaken in the Parameter window Metering (Wh), page 29, and the *"Meter reading total"* is also enabled here. In Parameter window General, page 25, the main and intermediate meters for the respective outputs are enabled.

In “normal” operation, the intermediate meters can be reset via 1 bit communication objects or defined events (Trigger 1, see below). If the main meter is also to be reset in exceptional cases, this can be undertaken using communication objects no. 11 and 12 (*Enable reset meters* and *Reset meter readings*). All main and intermediate meters are then stopped and reset.

The meter readings of the main meter (outputs A…C and total) can be sent cyclically and on request. They are buffered both in the event of mains voltage failure as well as bus voltage failure.

Functionality and configuration of the intermediate meters (Intermediate meter total and intermediate meter output) are always fundamentally the same.

Configuration and function of the intermediate meters:

The meter readings of the intermediate meter are derived from the respective main meter. The meter reading is not lost in the event of a bus voltage failure; however at bus voltage failure or ETS reset, it is possible that a trigger may be “missed”. This is then indicated in the status byte of the intermediate meter.

Example
The intermediate meter should be started by the time 8:00. Due to a bus voltage failure, the time telegram “8:00” is not sent by the timer and the Energy Module receives “8:01” directly after “7:59”. As a result, the intermediate meter is not started, the intermediate meter is then not correct. (However, the meter reading of the main meter is correct in this case).

Every intermediate meter has two triggers (trigger 1 and trigger 2).

Trigger 1 is the start event for the intermediate meter. It is possible to select whether the intermediate meter is started by the receipt of a 1 bit telegram or a time (external timer). Optionally, the meter reading at trigger 1 can be sent and/or reset. The start time can be parameterized but can also be changed via the bus.

The meter reading is sent on trigger 2. Optionally, the intermediate meter can be stopped with trigger 2. If the intermediate meter is stopped, the intermediate meter reading is not sent when triggered by trigger 2. For trigger 2, a 1 bit communication object, a time, a duration (in minutes) or a limit (in Watt hours) can be selected.

In addition to trigger 1 and trigger 2, a 1 bit communication object *Reset* can be enabled.

This enables a very flexible parameterization of the intermediate meter.

Application examples

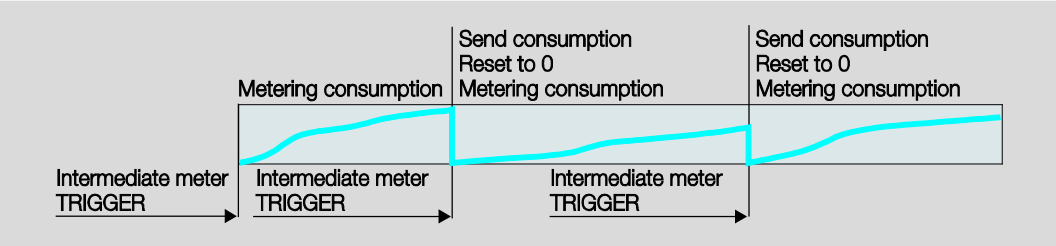
1. Parameterization:

   Trigger 1 (Start) is activated by = 1 bit communication object
   At Trigger 1 (Start)

   Reset "Intermediate meter" = yes
   At Trigger 1 (Start)

   Send "Intermediate meter" = yes

   Trigger 2 is activated by = 1 bit communication object
   (trigger 2 is not used however)



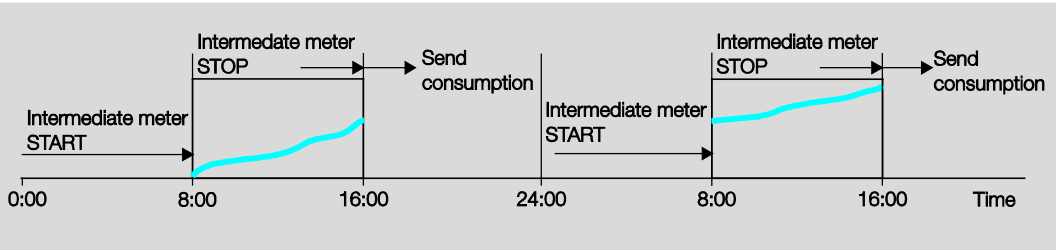
   The intermediate meter is sent, reset and restarted every time a telegram with the value 1 is received on trigger 1 (1 bit).

2. Parameterization:

   Trigger 1 (Start) is activated by = Time (8:00)

   Trigger 2 is activated by = Time (16:00)

   The intermediate meter records consumption every day from 8:00 to 16:00, then sends the meter readings and continues to count the following day.

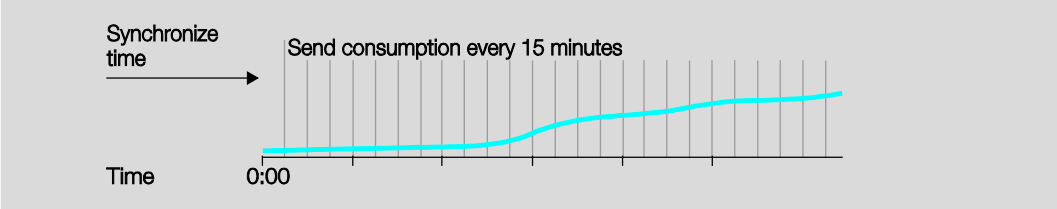


3. Parameterization:

   Trigger 1 (Start) is activated by = Time (00:00)

   Trigger 2 is activated by = Duration (15 minutes)

   The intermediate meter counts continuously and sends the meter reading every 15 minutes. Synchronization with the timer occurs daily at 00:00.



4. Parameterization:

   Trigger 1 (Start) is activated by = 1 bit communication object

   At Trigger 1 (Start)
   Reset "Intermediate meter" = yes

   Trigger 2 is activated by = Limit (5 kWh)

   The intermediate counter is enabled (1 bit communication object).

4.1.2 Instrument and power values

The following values can be monitored by threshold values with the Energy Module:

Instrument values

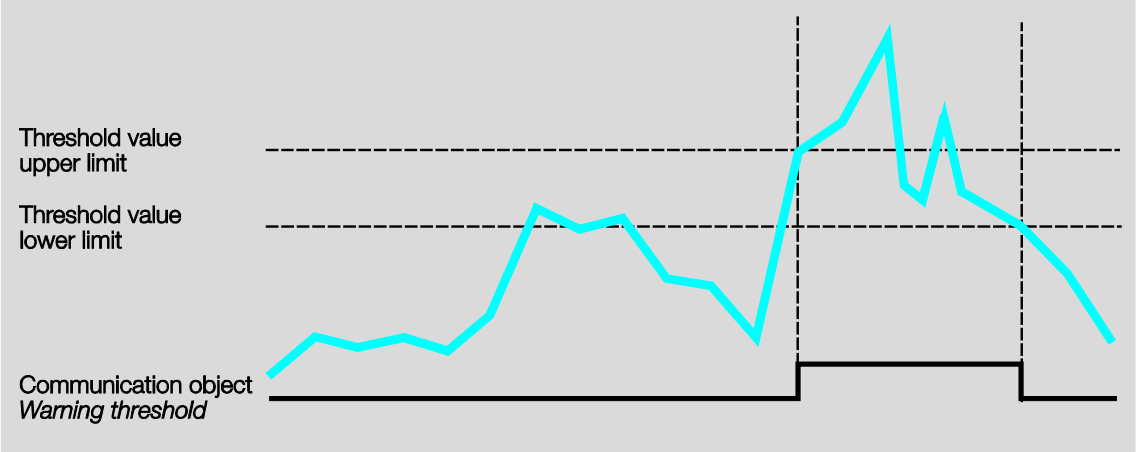
- Current value (per output)
- Voltage (per output)
- Frequency

Power values

- Active power (per output)
- Active power total (sum of outputs A…C)

Two thresholds are available for each of these values. Warnings can be sent dependent on whether thresholds are exceeded or the value falls below the threshold.

Each threshold value has an upper and lower limit. These are the hysteresis limits of the threshold values. Exceeding a threshold means that the upper limit is exceeded, falling below the threshold means that the lower limit is undershot.



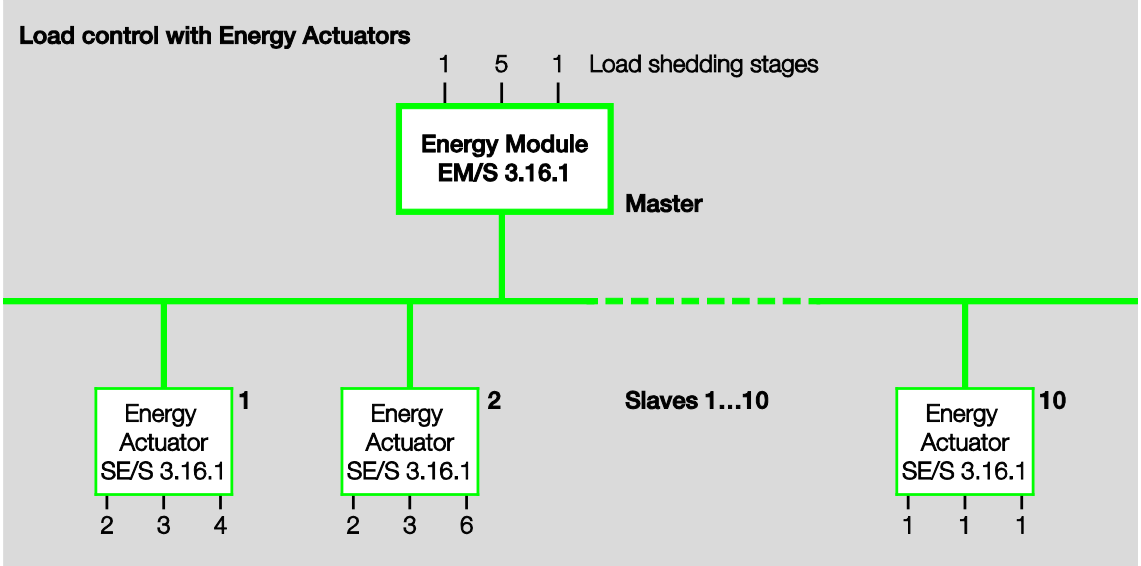
Apparent power, power factor and crest factor cannot be monitored with threshold values, but are available as communication objects for each output.

Note
The progression of the current and voltage curves is not analyzed, i.e., analysis of the signal waveform (e.g. FFT) is not undertaken. All values are determined by sampling the signal. Therefore, the power factor always results as the sum of the distortion power (e.g. dimmer currents) and displacement power (e.g. inductive or capacitive loads). This power factor does **not** (or only in special cases) comply with the cos φ (Cosine Ph) with a phase displacement current! It can also **not** be used for reactive power compensation!

4.1.3 Load control

The *Load control* is a functionality of the Energy Module, where the Energy Module is parameterized as a master that can control up to ten further Energy Actuators SE/S 3.16.1 as slaves. The master receives *Power values* from the slaves that are added internally to the *Send sum power values*. If the *Send sum power values* exceeds a parameterized load limit, the master sends *Load shedding stages* on the bus.

A separate *Load shedding stage* can be parameterized with every slave for each output. The slave receives the *Shedding stage* and switches all outputs off with the respective shedding stage. The master increases the *Shedding stage* until the *Send sum power values* falls below the allowed load limit.



The *Power values*, which the master receives can be the respective *Active power total* of another Energy Module, the *Active power* of an individual output or the *Power values* of the master. Furthermore, the received power values can be the power values of another KNX device, e.g. the Meter Interface Module ZS/S.

Function of the load control

The number of shedding stages that the master can send is determined in accordance with the number of priority stages that should be switched with the slaves. If the system only has two priority stages available, for example (priority 1 = always on; priority 2 can be switched off if required), one shedding stage is sufficient.

A *Load limit* can be parameterized on the master that cannot be exceeded. Alternatively, a load limit is available that can be changed via the bus, or there are four load limits available that can be alternately actively switched via a communication object.

Up to ten communication objects can be enabled that receive power values. The *Power values 1…4* can also be internally logically linked, i.e. the *Active power Output A…C* or the *Active power total* of the master.

The received power values of the slave should generally be sent *after a change*. As soon as the master receives a new *Power value*, the sum of the power values is recalculated and a shedding stage is sent on the bus if necessary. Additionally, a cyclic monitoring time can be set. If the power values are not received within this monitoring period, the missing value is requested. If the value has still not been received, the corresponding bit in the diagnostic byte *Status load control* is set.

Depending on how fast the system should react, the reaction time is selected for when the load limit is exceeded and for when it is under the limit. If the value falls below the load limit, after the *Reaction time when exceeding load limit* has been completed, shedding stage 1 is sent on the bus. If the load limit is still exceeded, after a renewed *Reaction time when exceeding load limit* has been performed, the next shedding stage is sent until the value is again below the load limit. After the *Reaction time when falling below load limit* has been completed, the master reduces the shedding stage (restart attempt).

The service life of the slave relays must be considered with the parameterization of the reaction times. The system must be designed to ensure that the load control is only active at peak times or the reaction times for exceeding or falling below the load limit must be selected to be correspondingly long, so that frequent switching is avoided.

4.2 Reaction at download and ETS reset

The following values of the communication objects can be changed via the bus:

- Tíme, duration and limit with the intermediate meters
- All threshold limits
- Load limit with load control

Should you intend these values changed via the bus to be overwritten after a download or an ETS reset with the parameterized values, the corresponding parameters *Overwrite … with download or ETS reset* must be set to *yes*. With no, the values changed via the bus on download and ETS reset are retained.

4.3 Reaction at bus voltage recovery and ETS reset

With the following communication objects, you can parameterize the value at which they should be written after bus voltage recovery or an ETS reset:

- Deactivate load control master (only the value of the communication object at bus voltage recovery can be parameterized)

What is an ETS reset?

Generally an ETS reset is defined as a reset of the device via the ETS. The ETS reset is initiated in the ETS under the menu item *Commissioning* with the function *Reset device*. This stops the application program and it is restarted.

What is the difference between a download and a full download or an application update?

In the ETS, a differentiation can normally be made between partial programming and a download of the complete application program. ABB i-bus® devices generally only perform a partial download even with the selection Application program under the menu item *Commissioning* > *Programming*. A download of the complete application program, provided that only the parameter settings are changed, is unnecessary and takes time.

Note
The download column in the following table applies both for partial download as well as the download of the complete application. If the device is discharged via the ETS (*Commissioning* > *Discharge…*) or if a new version of the application is loaded, the behaviour at full download/application update (right column) applies.

In the following table, the behaviour of the Energy Module is represented in the overview:

Reaction on:	Bus voltage recovery	Download	ETS reset	Full download/application update
Values of the communication objects	Generally, the values of the communication objects can be programmed. If not the communication object is written with the value 0.	Values are retained.	As with bus voltage recovery	As with bus voltage recovery
Values that can be modified via the bus	Values are retained.	Values are saved or overwritten with the parameterized values depending on the setting of the parameter *Overwrite … with download or ETS reset*.	As with download	Values are overwritten by the parameterized values.

Load control master

Reaction on:	Bus voltage recovery	Download	ETS reset	Full download/application update
Communication objects: Receive power value X	Power values are lost and set with the value 0.	Power values are retained.	As with bus voltage recovery	As with bus voltage recovery
Communication object: Deactivate load control master	The response can be parameterized: · active · not active · unchanged.	If the function *Load control master* was active before the download, it will be reactivated after a download. If the function was not active before a download, it will not be activate after a download.	Is set to the value 0.	Is set to the value 0.
Evaluation	The power values will be requested via Value Read. Evaluation starts after an evaluation delay of 10 s.	As with bus voltage recovery	As with bus voltage recovery	As with bus voltage recovery
Load limit	The active load limit before bus voltage failure will be set again after bus voltage recovery.	**Load limit can be changed = *yes, object writable*** The parameter *Overwrite load limit with download or ETS reset* determines whether the parameter values are accepted. **Load limit can be changed = *yes, 4 values selectable*** The parameter *Active load limit after download ETS reset* determines the limit to be set.	As with download	**Load limit can be changed = *yes, object writable*** The parameter *Overwrite load limit with download or ETS reset* determines whether the parameter values are accepted. **Load limit can be changed = *yes, 4 values selectable*** Load limit 1 is active.

Meter (total and outputs A…C)

Reaction on:	Bus voltage recovery	Download	ETS reset	Full download/application update
Value of the communication object	Is retained.	Is retained.	Is retained.	Is retained.

Intermediate meter (total and outputs A…C)

Reaction on:	Bus voltage recovery	Download	ETS reset	Full download/application update
Value of the communication object	Is retained.	Is retained.	Is set to the value 0.	Is set to the value 0.
Start/stop event	**Trigger 1 (Start):** Is retained. **Trigger 2 (Stop):** Is retained. **Time:** Every new event that concerns a parameterized start/stop time leads to an event, e.g.: The intermediate meter (IM) should start at 15:00. Before bus voltage failure, the time 15:00:01 is received; the IM starts. The bus fails. After bus voltage recovery, the time 15:00:45 is received, the IM restarts.	A parameter decides whether the values in the parameters are accepted.	As with download	As with download
Metering process	If the IM did not meter before bus voltage failure, then IM will not meter after bus voltage recovery. If the IM metered before bus voltage failure, the following applies: **1 bit object:** The IM continues to meter after bus voltage recovery. **End time:** The IM continues to meter after bus voltage recovery. **Duration:** The IM continues to meter after bus voltage recovery. The IM calculates its remaining time, completes it and then stops. **Metering volumes:** The IM continues to meter after bus voltage recovery. The IM continues to meter until the metering volume is reached.	If the IM did not meter before download, then the IM will not meter after download. If the IM metered before download, then the IM will meter after download. If Trigger 1/2 of the IM has been changed at download, or the parameter should be accepted at download, the IM is set to the value 0 and stopped.	Is stopped and the metered value is set to the value 0.	As with ETS reset

Voltage, current, power, active power total, frequency (output A…C)

Reaction on:	Bus voltage recovery	Download	ETS reset	Full download/application update
Value of the communication object	It is set to the value 0 and refreshed with the next transmission of the measurement electronics.	As with bus voltage recovery	As with bus voltage recovery	As with bus voltage recovery
Values of the communication objects *Threshold x*	Is retained.	A parameter decides whether the values are accepted.	As with download	Parameterized values are accepted.
Values of the communication objects *Threshold warning*	Are sent after the first evaluation of the threshold with the current value, if the corresponding value is either larger than the upper limit or less than the lower limit, and the warning should be sent.	As with bus voltage recovery	As with bus voltage recovery	As with bus voltage recovery
Evaluation	The evaluation of the threshold values restart. The state of the hysteresis is lost.	As with bus voltage recovery	As with bus voltage recovery	As with bus voltage recovery

A Appendix

A.1 Scope of delivery

The ABB i-bus® KNX Energy Module EM/S 3.16.1 is supplied together with the following components. Please check the items received using the following list.

- 1 x EM/S 3.16.1, MDRC
- 1 x installation and operating instructions
- 1 x bus connection terminal (red/black)

A.2 Code table Status intermediate meter (nos. 33, 76, 136 and 196), NON DPT

The following table shows you the telegram code of the status of the intermediate meter total and outputs A…C in hexadecimal and binary code.

Bit No.		7	6	5	4	3	2	1	0
8 bit value	Hexadecimal	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Download or bus voltage failure since the last reset of the intermediate meter	Meter is started (1) or stopped (0)
0	00								
1	01								n
2	02							n	
3	03							n	n
4	04	Not defined							
...									
255	FF								

empty = value 0

n = value 1, applicable

A.3 Ordering information

Device type	Product name	Order No.	bbn 40 16779 EAN	Price group	Weight 1 pc. [kg]	Pack unit [pc.]
EM/S 3.16.1	Energy Module, 3F, 16/20 A, MDRC	2CDG 110 148 R0011	**87706 0**	P2	0.16	1

Notes

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