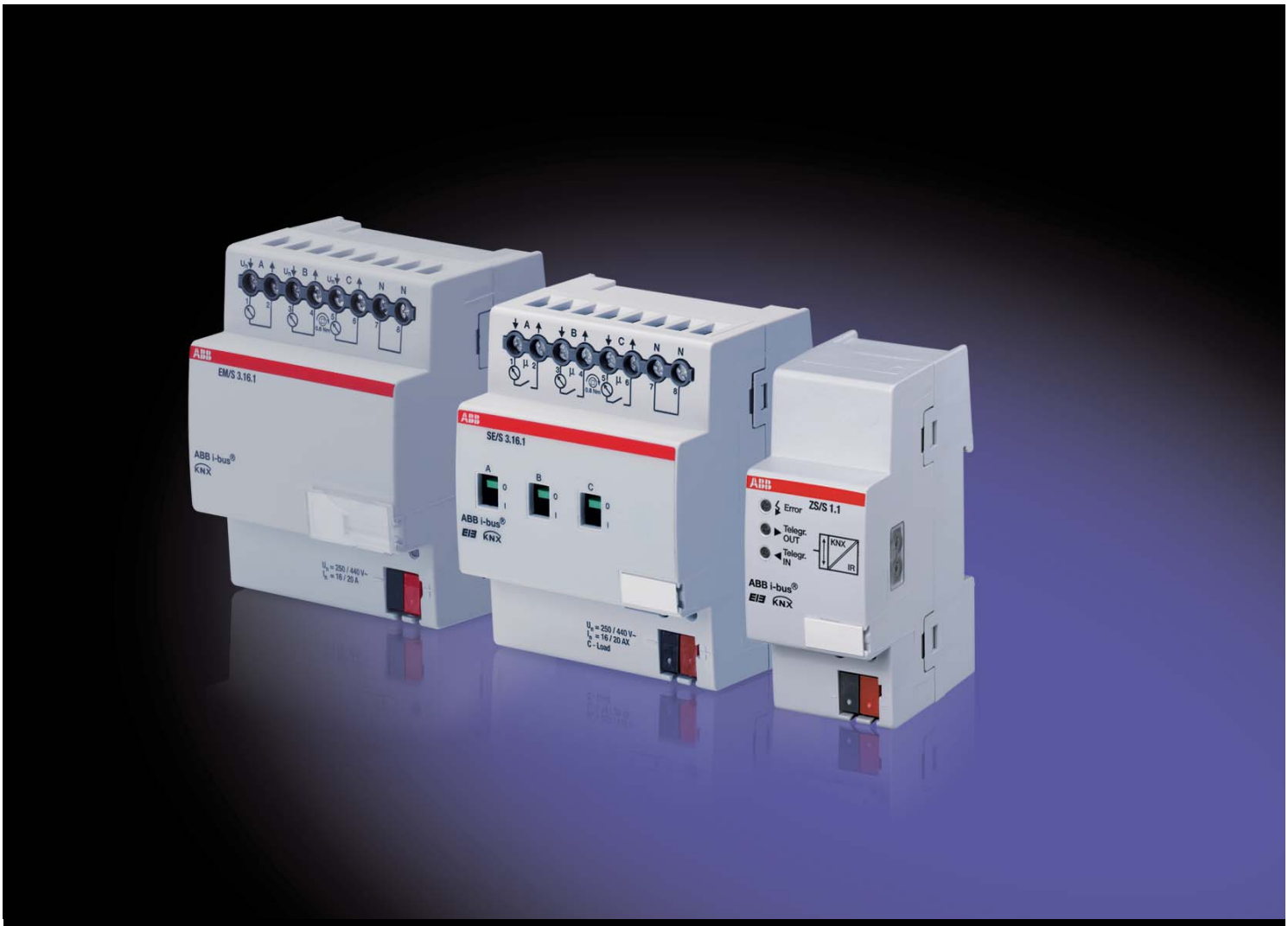


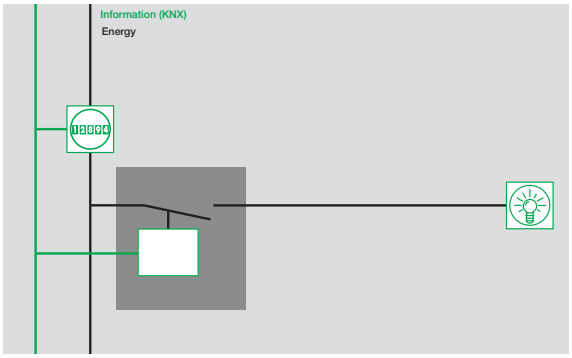
Energy measurement with ABB i-bus® KNX Product Information

Power and productivity
for a better world™

Energy measurement with ABB i-bus® KNX

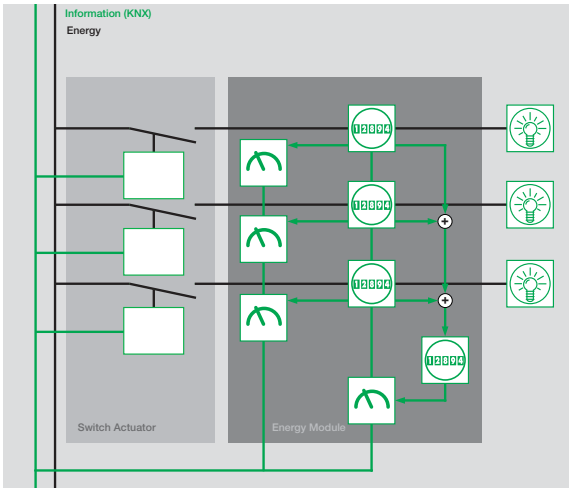
ABB offers various solutions for decentral energy measurement on the basis of the KNX standard.

Variant 1



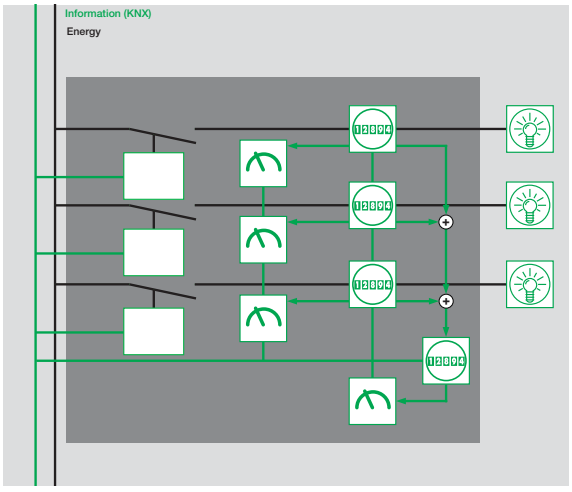
Electronic energy meters make the current energy values available on the KNX bus system in conjunction with a KNX interface. The measured data can be intermediately stored, evaluated and visualized from here.

Variant 2



The Energy Module can record the energy consumption for the individual devices. It is used particularly when upgrading existing KNX systems and wherever energy measurement is required without switch functions. It facilitates a detailed and transparent insight into the energy consumption of a building.
The current meter values can be sent and evaluated.

Variant 3



The Energy Actuator facilitates control of the connected consumer loads via the ABB i-bus® KNX. For each of the three switch channels, the individual consumption can be measured in the same way as for the Energy Module. For every channel, the proven functionality of the ABB i-bus® KNX Switch Actuators are available.

Intermediate meter for electrical energy

Electrical consumer (load)

Energy meter

ABB i-bus® KNX
Meter Interface Module ZS/S 1.1

Recording and processing of energy values and the current meter readings is continuously gaining in importance. This is not just because of the rising energy costs, but also because of the frequently demanded evaluation and query options via a distributed reading point.
Comfortable and economic solutions for modern energy management can be realized with the Meter Interface Module ZS/S 1.1.

Consumption and measured values of the electrical energy consumption meters are recorded by the Meter Interface Module ZS/S 1.1 and transferred via the ABB i-bus® KNX. The device features an infra-red interface, which ABB energy meters of types DELTAplus, DELTAsingle, ODIN, ODINsingle or the new energy meters of the A-Series can be read.
The information and data, which is read, can be used, for example, for cost centre accounting, energy optimization, monitoring of installations and visualization.

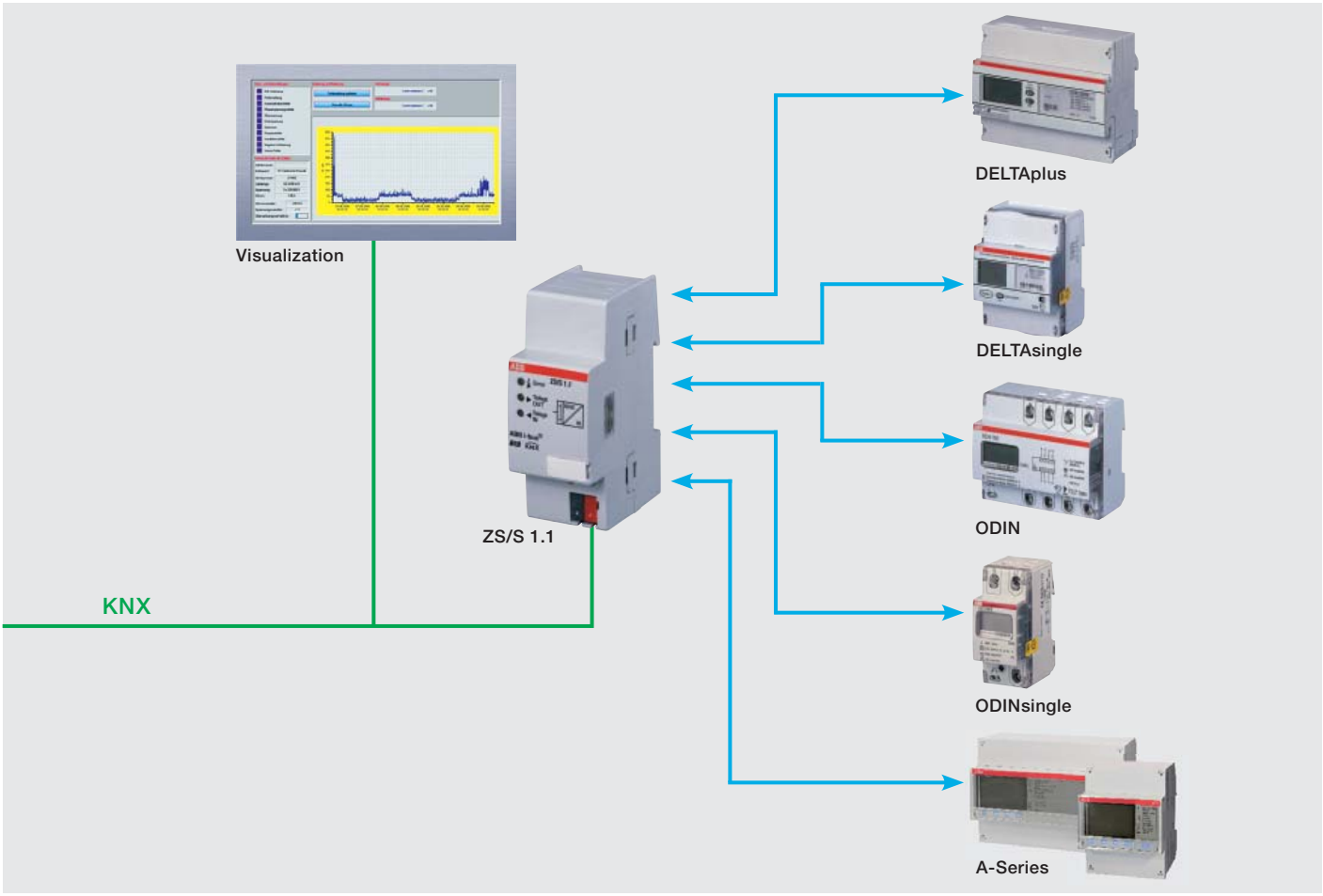
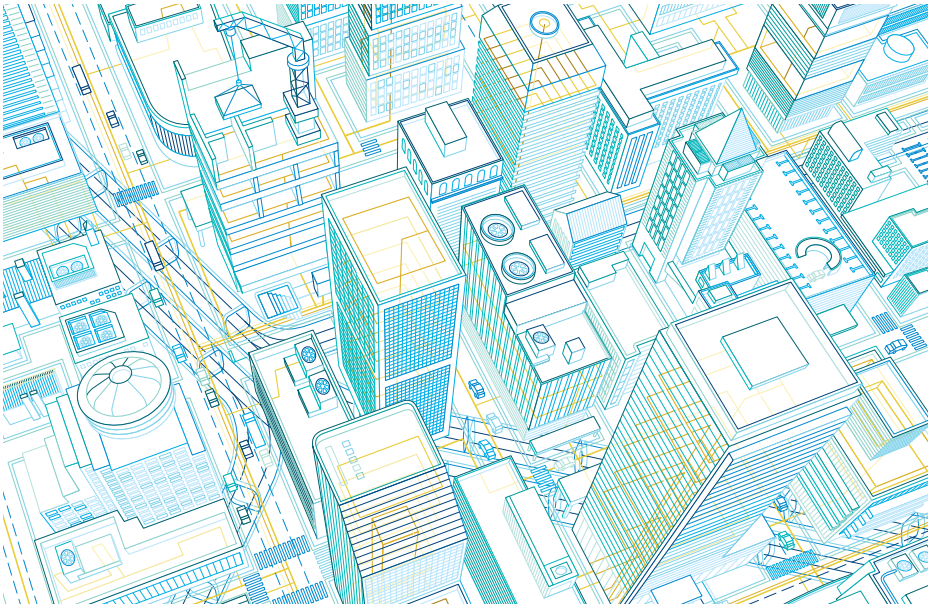


ABB i-bus® KNX
Energy Module EM/S 3.16.1



The ABB i-bus® KNX Energy Module EM/S 3.16.1 facilitates detailed analysis of energy consumption of electrical consumers in buildings, which are controlled via KNX.

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 and at the same time integrate the consumers in the load compensation, it is necessary to switch electrical devices in buildings on and off based on external signals such as time, consumption thresholds or similar. The ABB i-bus® KNX provides the optimum prerequisites for intelligent buildings.

The Energy Module facilitates the recording and analysis of active energy consumption down to the consumer level. When assigned to an energy meter, the consumption values in an electrical circuit can be evaluated in a transparent fashion right down to the device level. This detailed consumption analysis allows for good evaluation of the amortization periods for infrastructural measures or specific optimization of the building control for increasing the energy efficiency.

For each of the three channels, 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 KNX. They can be monitored with threshold values. Should an overshoot or undershoot of a defined threshold occur, a telegram can be sent on the bus, and an assigned consumer, for example, can be switched.

Application

Active consumption measurement

Monitoring of electrical values

Benefits

Recording and representation of energy consumption of individual consumers

Enhancement of the energy efficiency

Product

Energy Module EM/S 3.16.1

ABB i-bus® KNX
Energy Actuator SE/S 3.16.1

The ABB i-bus® KNX Energy Actuator SE/S 3.16.1 is a Switch Actuator that records the energy consumption of the connected electrical loads in the building.

The Energy Actuator determines the active energy consumption per switching output. Furthermore, it provides the total consumption of all three outputs. 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. Moreover, when a stop event occurs the assigned output can be switched off.

For each channel, 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 KNX. They can be monitored with threshold values. Should an overshoot or undershoot of a defined threshold occur, a warning can be sent or a channel switched.

The ETS application also enables a simple load management functionality, where up to ten Energy Actuators can be interconnected. The electrical loads connected to the three floating switch outputs can be switched via KNX or manually directly on the device.

Application

Active consumption measurement

Monitoring of electrical values

Load management through load control

Switch Actuator, 3-fold

Benefits

Detection and representation of energy consumption in buildings

Enhancement of the energy efficiency

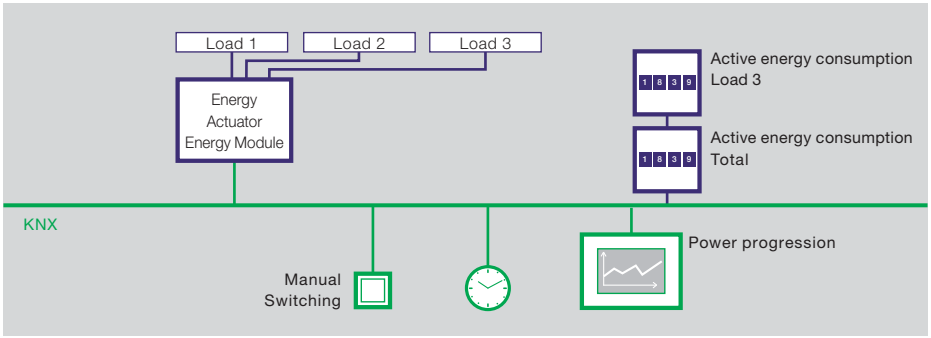
Intelligent control of the loads in the end circuit

Product

Energy Actuator SE/S 3.16.1

	Energy Module EM/S	Energy Actuator SE/S
Detection of power consumption values		
Meter per channel	•	•
Meter total (as a sum of the channel meters)	•	•
Intermediate meter per channel (can be controlled via KNX)	•	•
Intermediate meter total (as a sum of the channel intermediate meters and can be controlled via KNX)	•	•
Instrument and power values		
Threshold monitoring sending a warning when there is an overshoot/undershoot for current, voltage, frequency, active power (per channel and total)	•	•
Switching dependent on thresholds	–	•
Load control		
Master function	•	•
Slave function	–	•
Switch function	–	•

The individual functions
Active consumption measurement



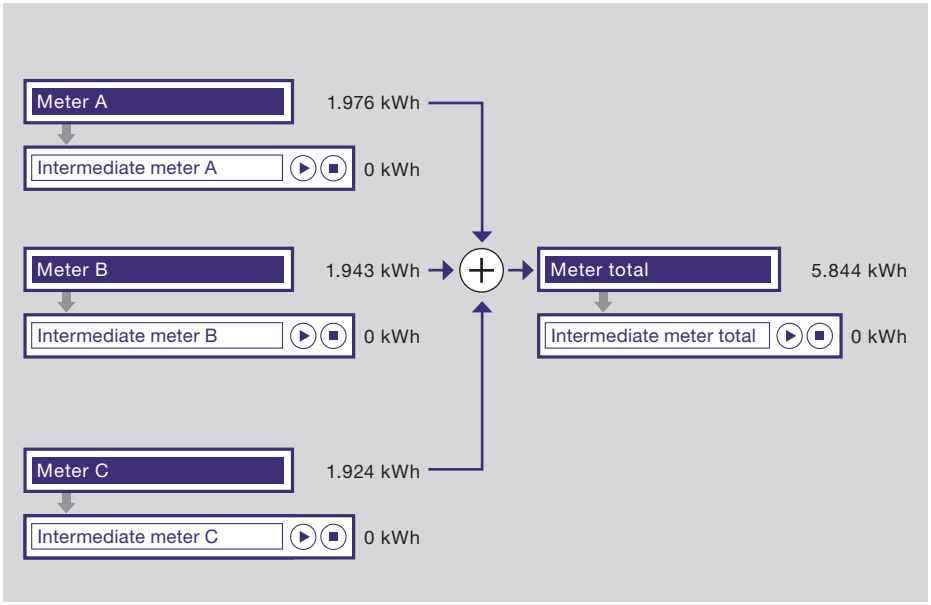
Overview

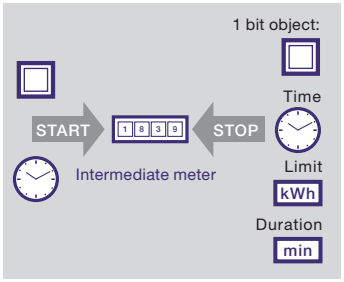
Main and intermediate meters

For every channel, the active energy consumption is measured continuously by a meter (meter channel A...C).
The total consumption is determined by the addition of the three channel-related meter readings and also made available (Meter total).

The special feature:

Every meter is assigned with an intermediate meter, which can be parameterized for individual measuring tasks.
Each of the four intermediate meters can be started, stopped and reset via the KNX bus.
The meter values can be sent cyclically, on request or when a start of stop event occurs.





Benefits
Recording of the energy consumption in the end circuit
Switching in dependance on commands, time and Energy Actuator consumption
Availability of the data on the KNX

The individual functions
Instrument and power values

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

Instrument values
- Current value (per channel)
- Voltage (per channel)
- Frequency

Power values
- Active power (per channel)
- Active power total (sum of channels A…C)

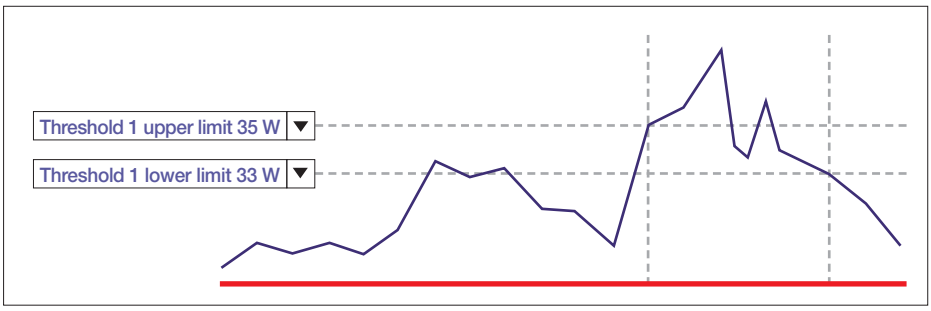
Two thresholds are available for each of these values. Warnings can be sent or an additional switch reaction can be parameterized on the Energy Actuator, dependent on whether thresholds are exceeded or the value falls below the threshold.

Further values (without threshold monitoring)
- Apparent power
- Crest factor (current)
- Power factor

These values can be sent or read via the KNX bus.

Visualization example

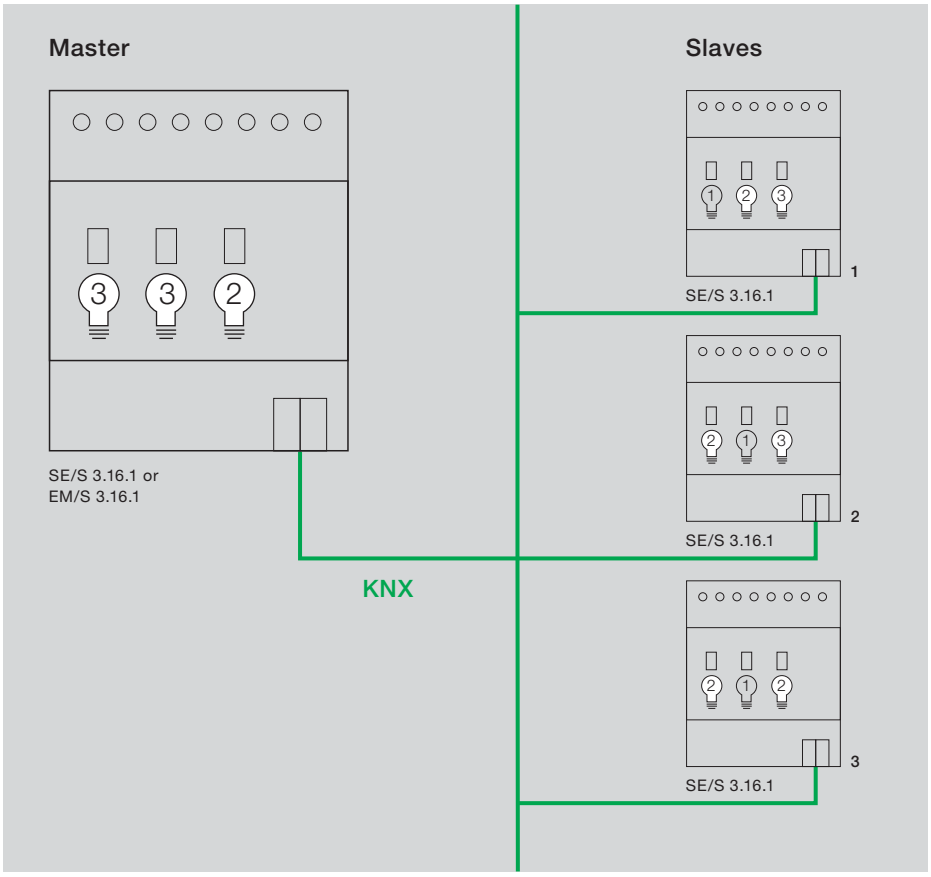
Measuring processor active	
Active power total	88 W
Frequency	50.04 Hz
A: Current	0.14 A
A: Voltage	227 V
A: Apparent power	32 W
A: Power factor	0.93
A: Crest factor current	1.51
A: Active power	30 W



Benefits
Monitoring and signaling of equipment failures
Detection of voltage failures and frequency fluctuations
Evaluation of the load
Switching dependent on thresholds

The individual functions
Load control

With load control, an Energy Actuator or an Energy Module can be parameterized as a master that can control up to ten further Energy Actuators as slaves. The master receives power values from the slaves that are added internally to the power total (sum of power values). If the power total exceeds a parameterized load limit, the master sends up to eight load shedding stages on the bus. The load limit can be modified via the bus, e.g. in dependence on the time or the currently valid power tariff.
With the slave devices, every output can be assigned with its own shedding stage. If a slave receives the shedding stage, it switches all outputs off with the respective shedding stage. If the total power still exceeds the load limit, after a shedding stage has been switched off, the master will then send the next shedding stage, until the total power is again below the allowed limit. After an adjustable waiting time has passed, the master will attempt to switch the shedding stages back on in reverse order.



Visualization example

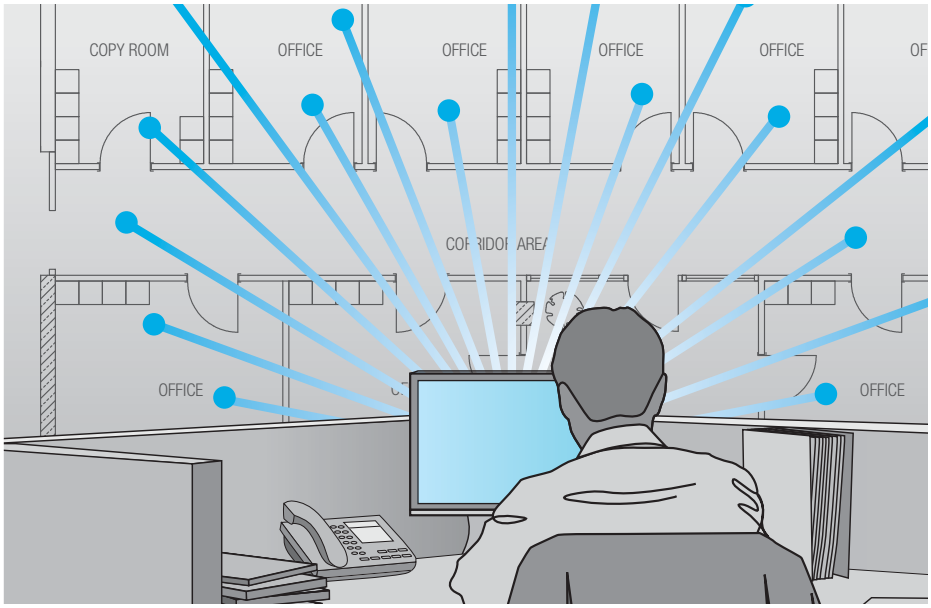
Load control active	
Load limit	3000 W
Load limit exceeded	NO
Send load shedding stage	1
Sum power values (master and slaves)	2650 W

Benefits:
Limitation of the total power of up to 10 devices (30 channels)
Prioritization of the individual channels ensuring that important consumers remain “on line” in the event of a load limit being exceeded.

Note

In addition to the described functions, with the Energy Actuator, the proven software functions of ABB i-bus® KNX Switch Actuators (Time, Scene, Safety, Logic, Forced operation) can be used.

Technical Data
Energy Actuators and Energy Modules



Technical data

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 measuring value and ± 10 mA
	Voltage (95…265 V)	± 1 % of measuring value
	Frequency (45…65 Hz)	± 1 % of measuring value
Starting current	25 mA	

[1)] The stated values apply only if no DC components are present.

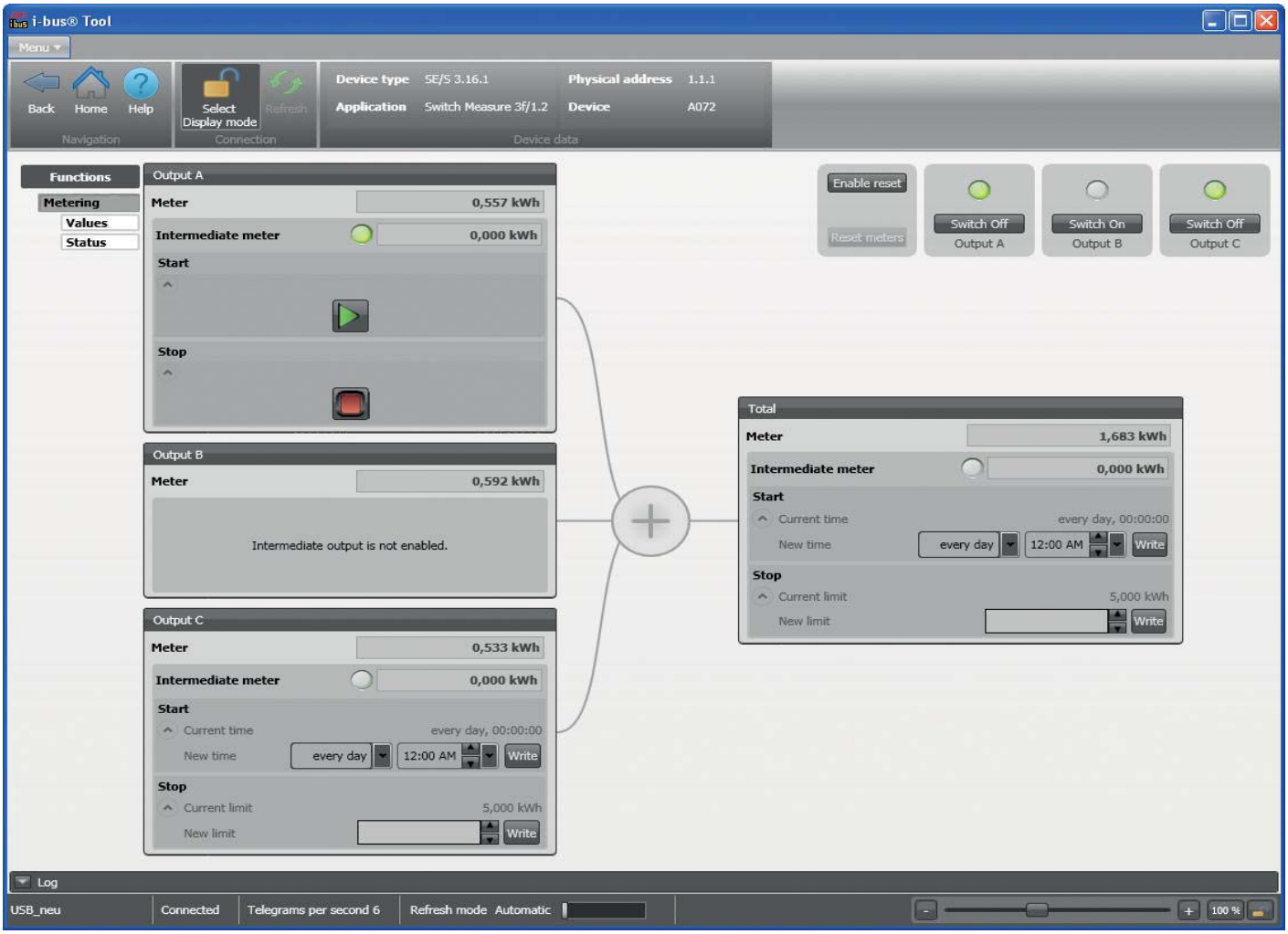
i-bus® Tool
Display and evaluate device information

Using the plug-in for the ABB i-bus® KNX Energy Actuator SE/S, e.g. the following functions are possible:

- Display main and intermediate meters
- Start, stop and reset intermediate meters
- Display of the current power values for active power, apparent power and power factor as well as current, voltage, crest factor and frequency
- Display of status values.

The plug-in for the ABB i-bus® KNX Energy Module EM/S has the same functions as the Energy Actuator, except the functions for the switch outputs, as they are not available on the EM/S.

i-bus® Tool – Plug-In for Energy Actuator SE/S

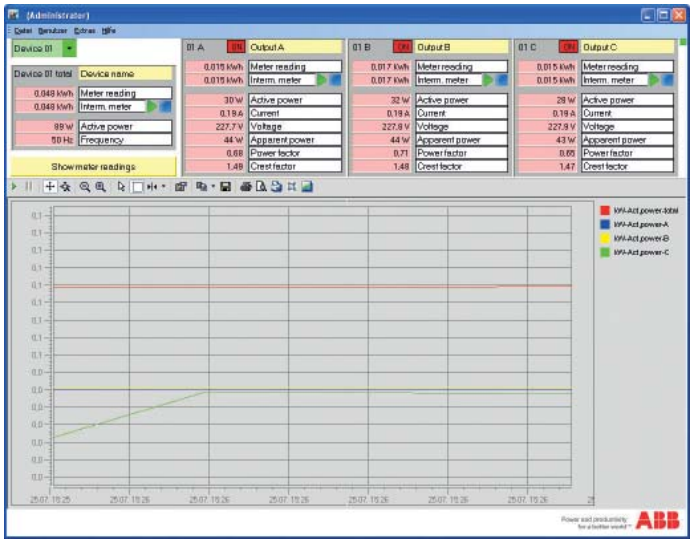


Energy monitoring
Save, display and evaluate energy and power values

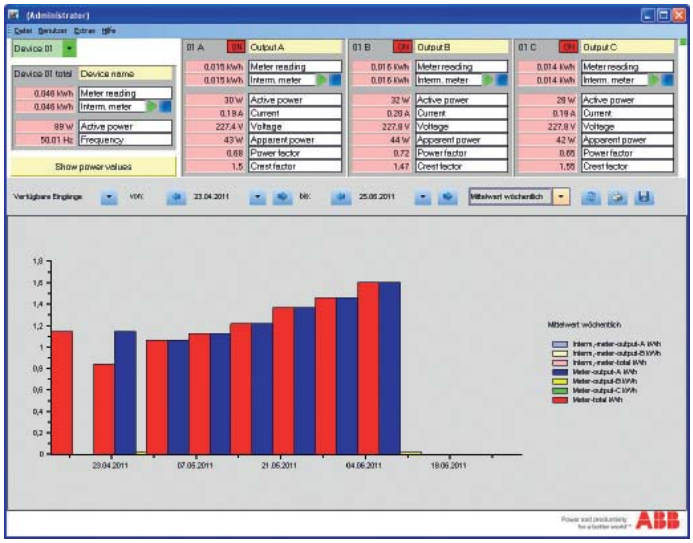
Energy monitoring for ABB i-bus KNX incorporates a preprepared ETS project for up to twelve Energy Actuators as well as an appropriate fully functional visualization solution for representation and further processing of the detected measured values. Using the conversion function in the ETS software, the Energy Actuators can also be converted to Energy Modules and used for monitoring.

The visualization solution supports the following functions

- Display of the main and intermediate meters
- Starting and stopping the intermediate meter
- Power monitor
- Energy value monitor
- Saving of the energy values as a .csv file
- Permanent monitoring operation



Power monitor



Energy monitor

The visualization solution was created using the visualization software “EisBär KNX” with the friendly assistance of Alexander Maier GmbH. Further information is available at http://www.busbaer.com. Here you can obtain a license for expansion of the visualization software for further KNX devices.

Power and productivity for a better world™

Should you have interest in a solution, please contact your local sales representative.

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