August 2010

ABB STOTZ-KONTAKT GmbH
ABB i-bus® KNX
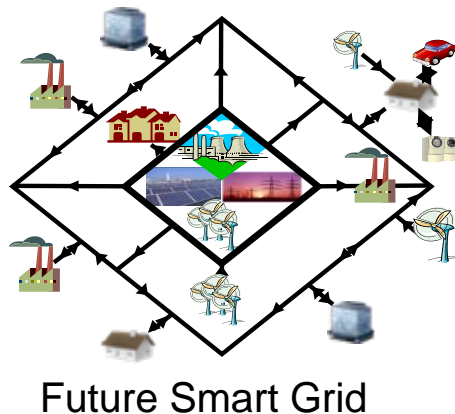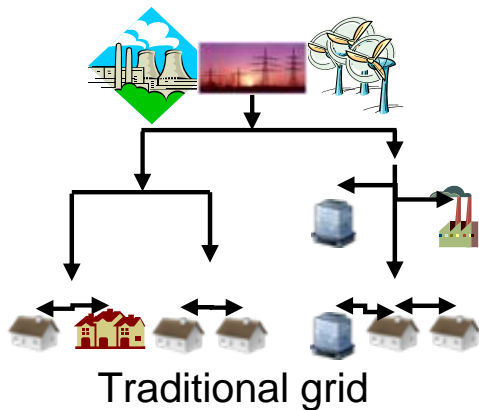# SE/S 3.16.1 Energy Actuator

Power and productivity
for a better world™

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SE/S 3.16.1 Energy Actuator
Overview

Traditional grid

Future Smart Grid

Starting position:

- Energy Efficiency in Buildings is becoming increasingly important

- Growing interest of consumers in power consumption and efficient use of available power

- Smart Buildings will react and interact with Smart Grids via flexible tariffs

- Smart Buildings will be able to switch on/off energy consumption
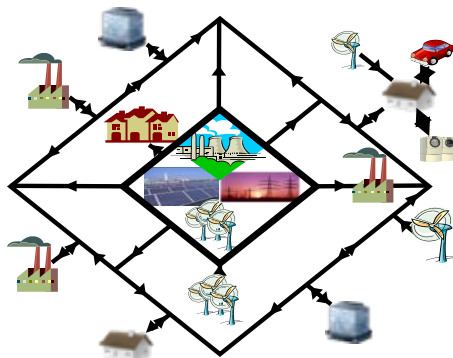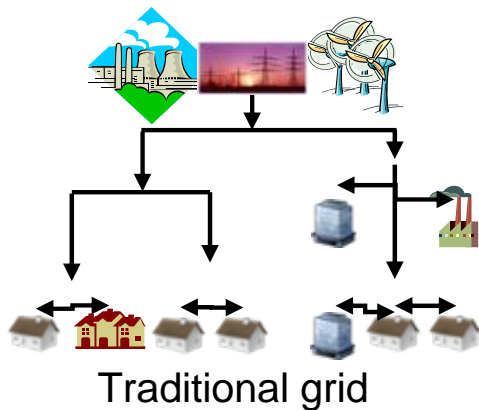
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SE/S 3.16.1 Energy Actuator
Overview

Traditional grid

Future Smart Grid

Goal:

- Sharing information about power consumption of individual electrical loads

- Transmit data for transparency and monitoring

- Depending on consumption or electrical values the building can switch loads on/off

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SE/S 3.16.1 Energy Actuator
Functions

1. Measures energy consumption in the terminal current circuit.

2. Various electrical values can be monitored.

3. Peak loads can be limited through a simple load control

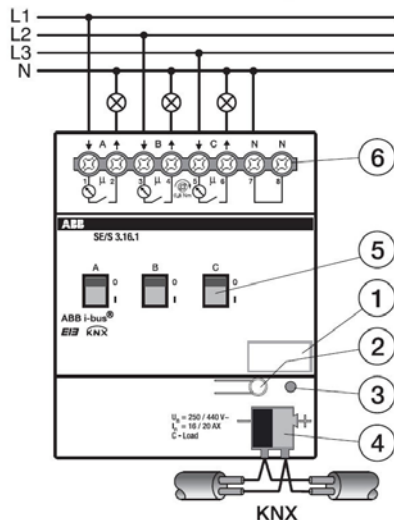4. The functionality of the existing ABB i-bus® KNX switch actuators is included

SE/S 3.16.1 Energy Actuator
Functions Diagram
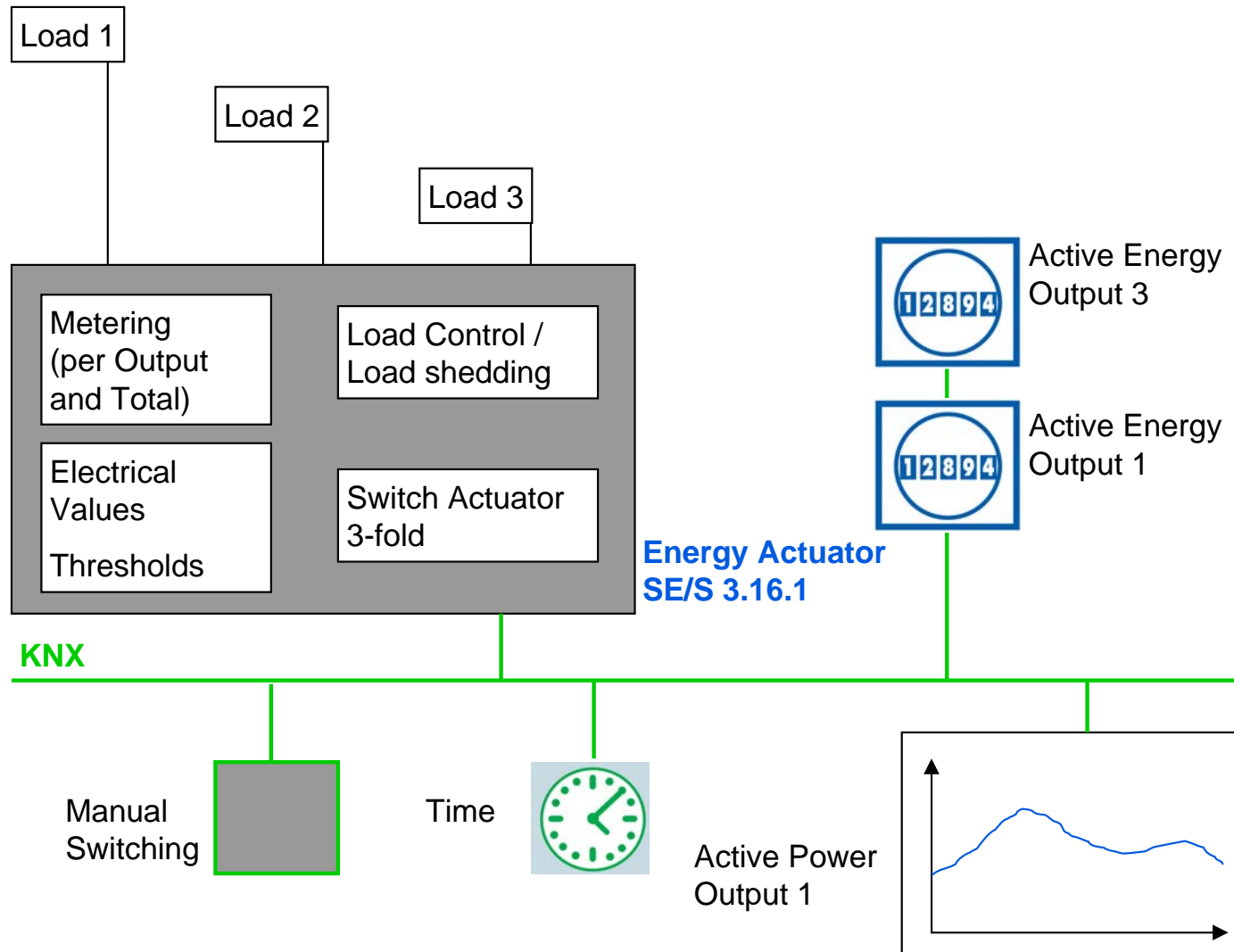
SE/S 3.16.1 Energy Actuator
Hardware

- Based on:
  ABB i-bus® KNX Switch
  Actuators:
  - 3 potential-free outputs
  - 4 modular widths
  - 16/20AX, C-Load

- Power supply:
  - Switching functionality
    over KNX
  - Measuring part over
    mains voltage
    (95..265V, 45...65 Hz)

SE/S 3.16.1 Energy Actuator
Hardware

Active consumption/active power	Measuring range	5.7 W…4,600 W (U_n = 230 V) 2.8 W…2,300 W (U_n = 115 V)
	Accuracy (250…500 mA)	± 6 % measuring value
	Accuracy (500 mA…5 A)	± 3 % measuring value
	Accuracy (5…20 A)	± 2 % measuring value
	Starting current	25 mA
Current	Measuring range (AC)	0.025…20 A
	Accuracy (0.025…20 A))	± 1 % of actual value and ± 10 mA
Voltage	Measuring range (AC)	95…265 V
	Accuracy (95…265 V))	± 1 % of actual value
Frequency	Measuring range	45…65 Hz
	Accuracy (45…65 Hz)	± 1 % of actual value

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SE/S 3.16.1 Energy Actuator
1. Energy Consumption

1. **Measures energy consumption in the terminal current circuit.**

2. Various electrical values can be monitored.

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4. The functionality of the existing ABB i-bus® KNX switch actuators is included
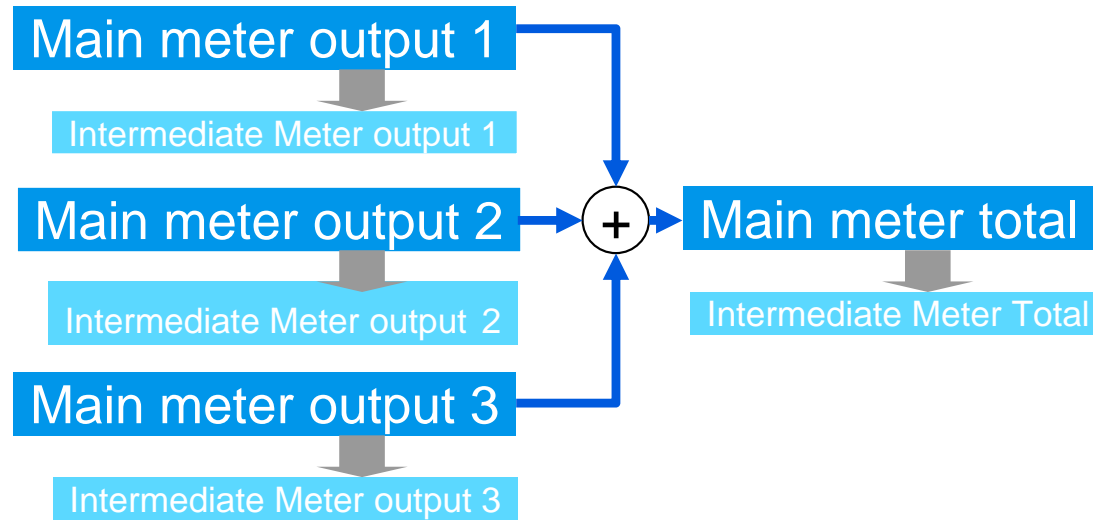
SE/S 3.16.1 Energy Actuator
1. Energy Consumption

Energy | **Information (KNX)**
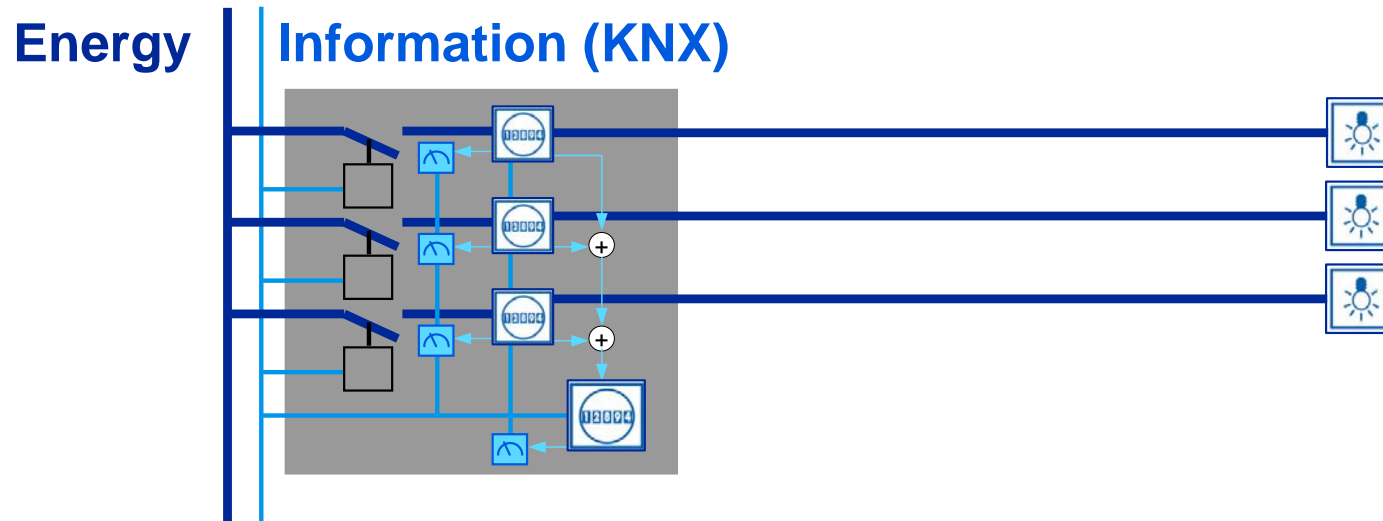
- There is one meter (Active Energy) per output

- The „Active Energy Total" (sum output 1-3) is available

- Meter readings can be sent on the KNX
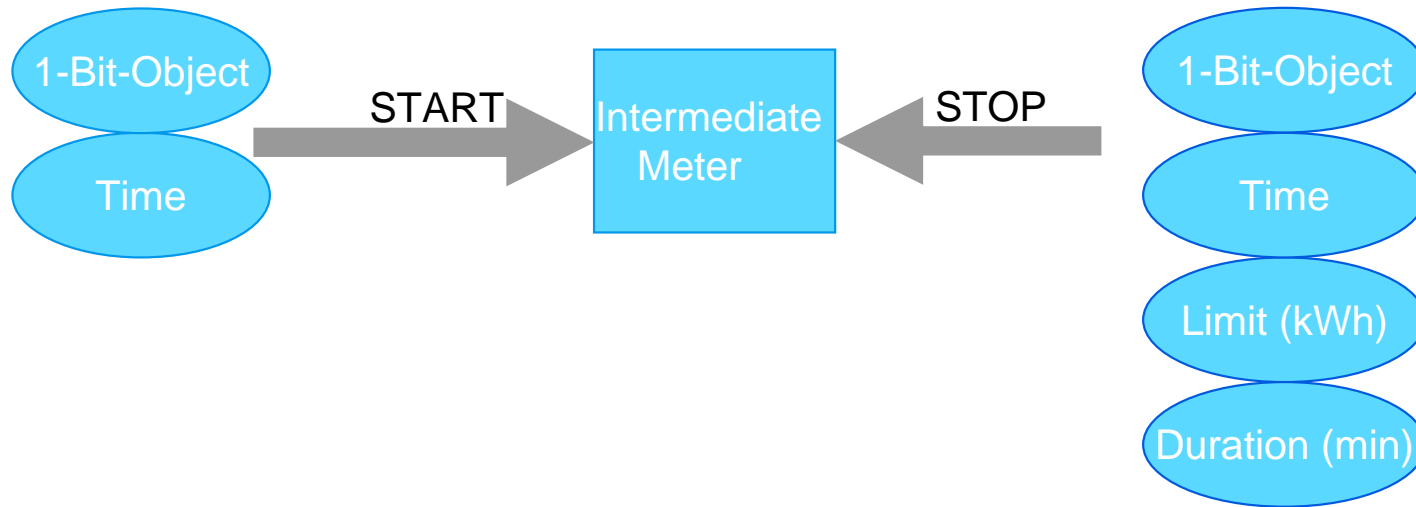
SE/S 3.16.1 Energy Actuator
1. Energy Consumption

Main meter output 1

Intermediate Meter output 1

Main meter output 2 → + → Main meter total

Intermediate Meter output 2

Intermediate Meter Total

Main meter output 3

Intermediate Meter output 3

- Depending on meter values switching of the loads is possible

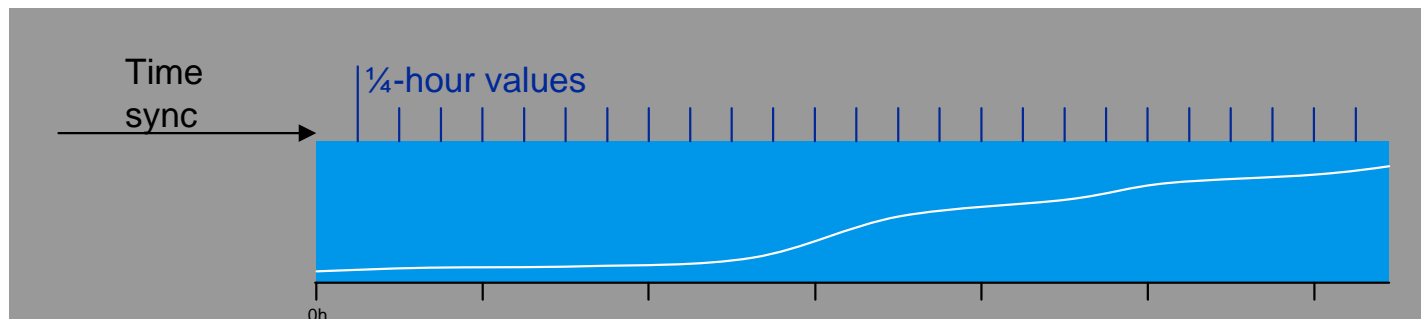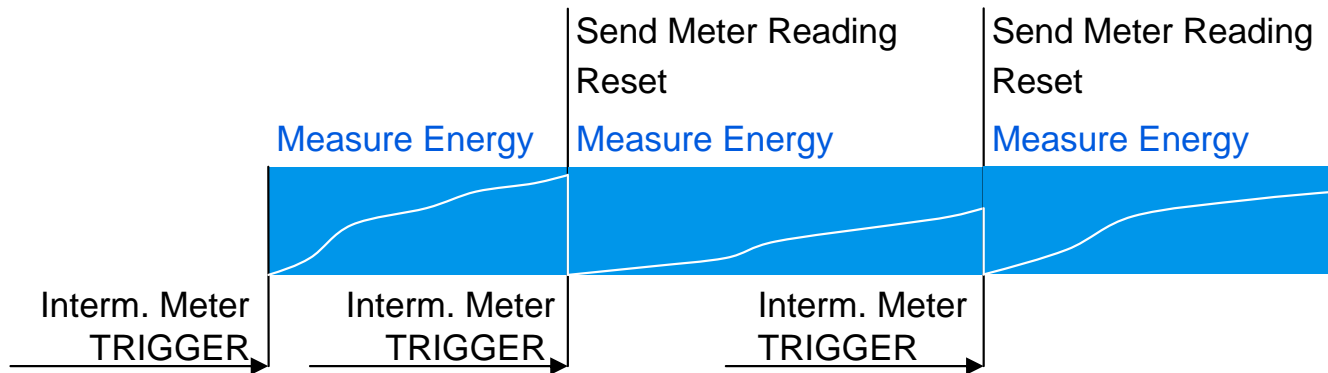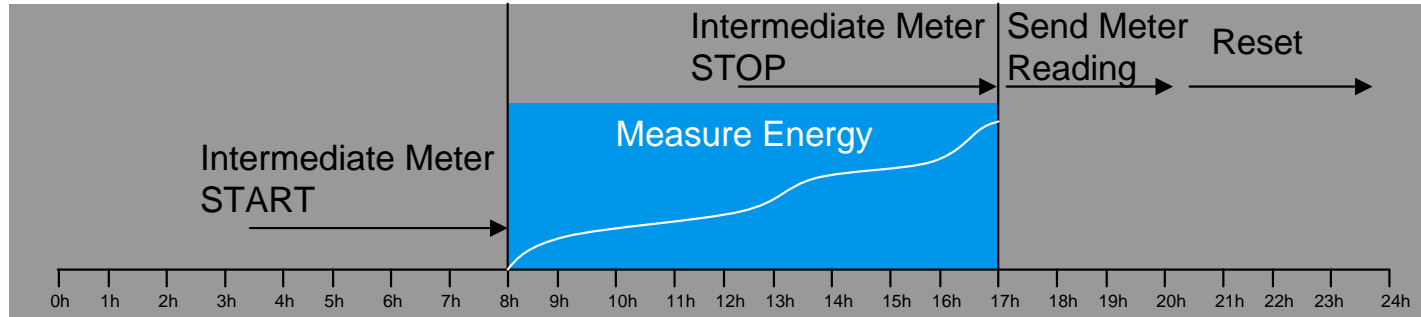- Flexible „Intermediate Meters" are available (one per output and total)

SE/S 3.16.1 Energy Actuator
1. Energy Consumption

- The „Intermediate Meters" can be started and stopped by certain events

- After a stop-event a reset is possible, the output can switch off and/or the meter can restart

SE/S 3.16.1 Energy Actuator
Intermediate Meters - Examples

SE/S 3.16.1 Energy Actuator
2. Electrical Values - Thresholds

1. Measures energy consumption in the terminal current circuit.

2. Various electrical values can be monitored.

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4. The functionality of the existing ABB i-bus® KNX switch actuators is included

SE/S 3.16.1 Energy Actuator
2. Electrical Values - Thresholds

KNX Objects	- Apparent Power - Power Factor - Crest Factor

KNX Objects + **Thresholds**	- Active Power Total - Frequency

KNX Objects + **Thresholds +** **Switching**	- Active Power - Current - Voltage

SE/S 3.16.1 Energy Actuator
2. Electrical Values - Thresholds
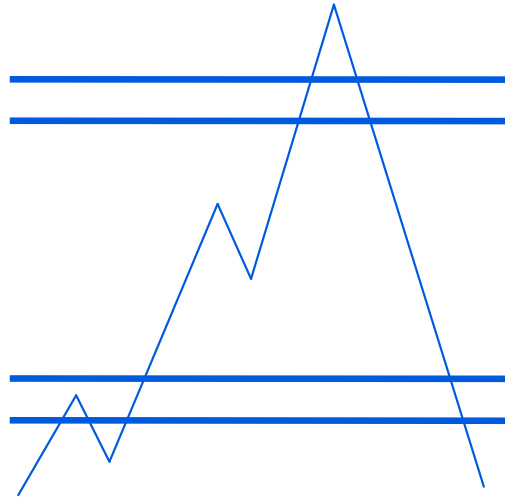
- Active Power
- Current
- Voltage
- Apparent Power
- Power Factor
- Crest Factor
- Frequency

- Electrical parameters can be monitored with thresholds

- Depending on thresholds a warning can be sent on KNX or switching is possible

- Thresholds are flexible (2 per value)

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SE/S 3.16.1 Energy Actuator
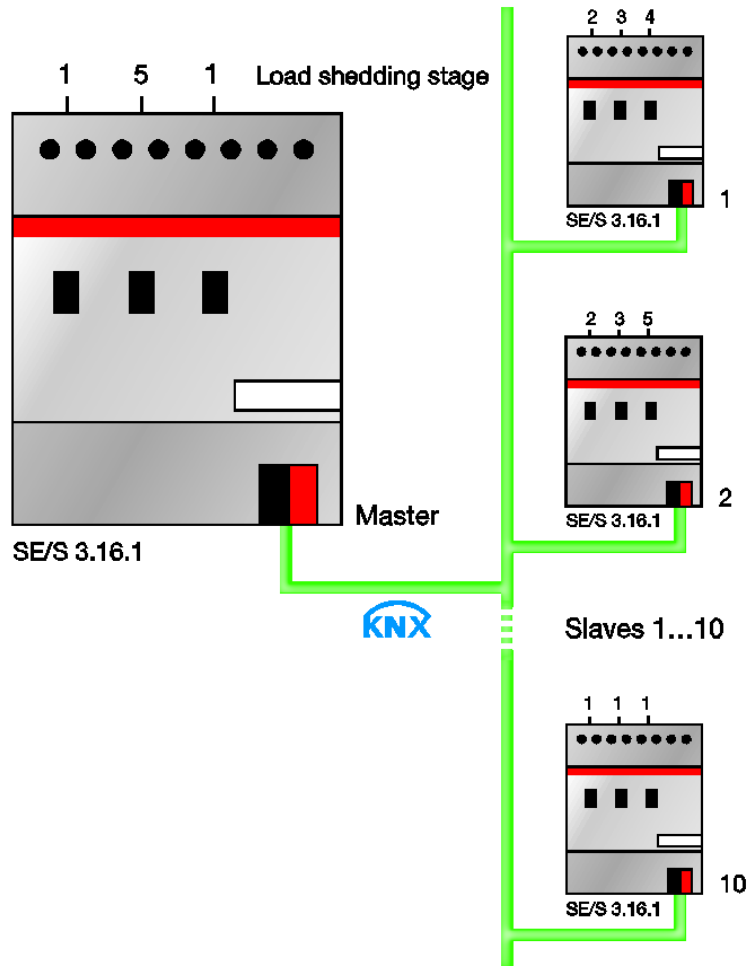# 3. Load Control

1. Measures energy consumption in the terminal current circuit.

2. Various electrical values can be monitored.

3. **Peak loads can be limited through a simple load control**

4. The functionality of the existing ABB i-bus® KNX switch actuators is included

SE/S 3.16.1 Energy Actuator
3. Load Control

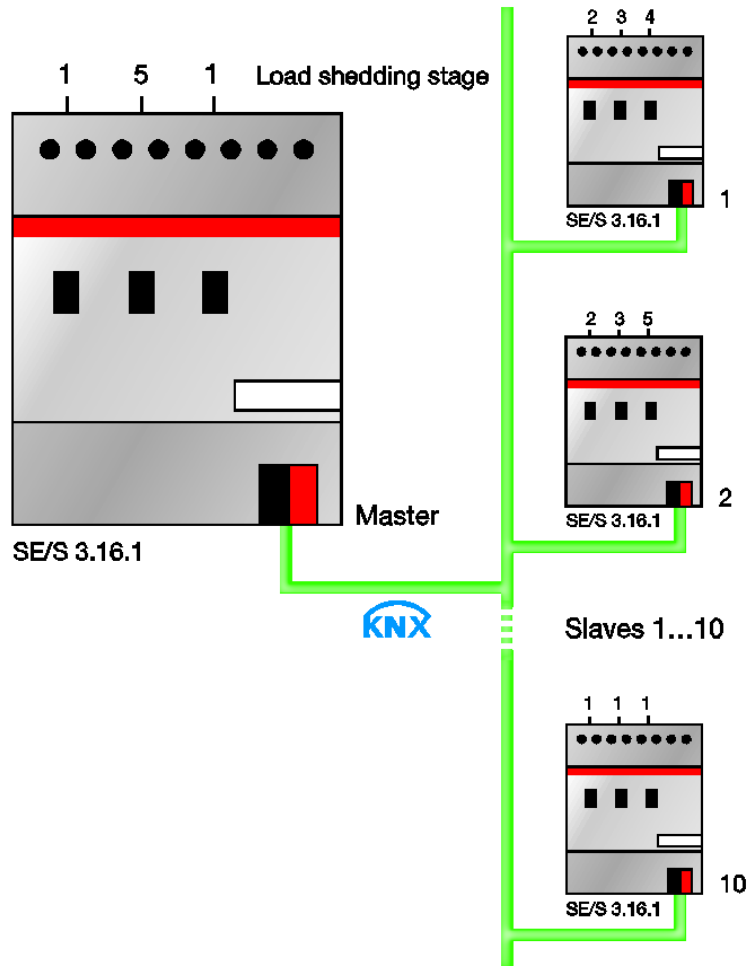
Load control with Energy Actuators

- Can be used to limit maximum power loading

- Depending on a Load Limit outputs of the Energy Actuator can be switched off

- Each Energy Actuator can be „Load Control Master"

- Each output can be „Load Control Slave"

SE/S 3.16.1 Energy Actuator
3. Load Control Master
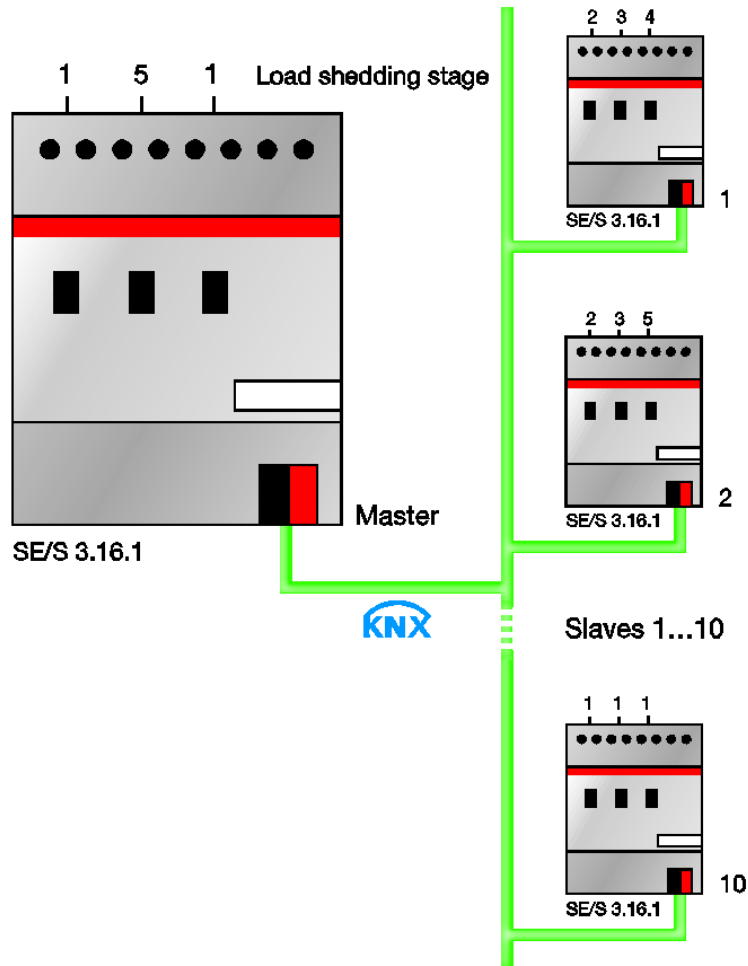

Load control with Energy Actuators

- The master can receive up to 10 Active Power Values

- Those values are summed up

- If the „Sum Active Power Values" exceeds the Load Limit, „Load Shedding Stages" (up to 8) are sent on the bus

SE/S 3.16.1 Energy Actuator
3. Load Control Slave

Load control with Energy Actuators

- Each output has a „Load Shedding Stage" assigned (1-8)

- If the slave receices its own stage, it switches off
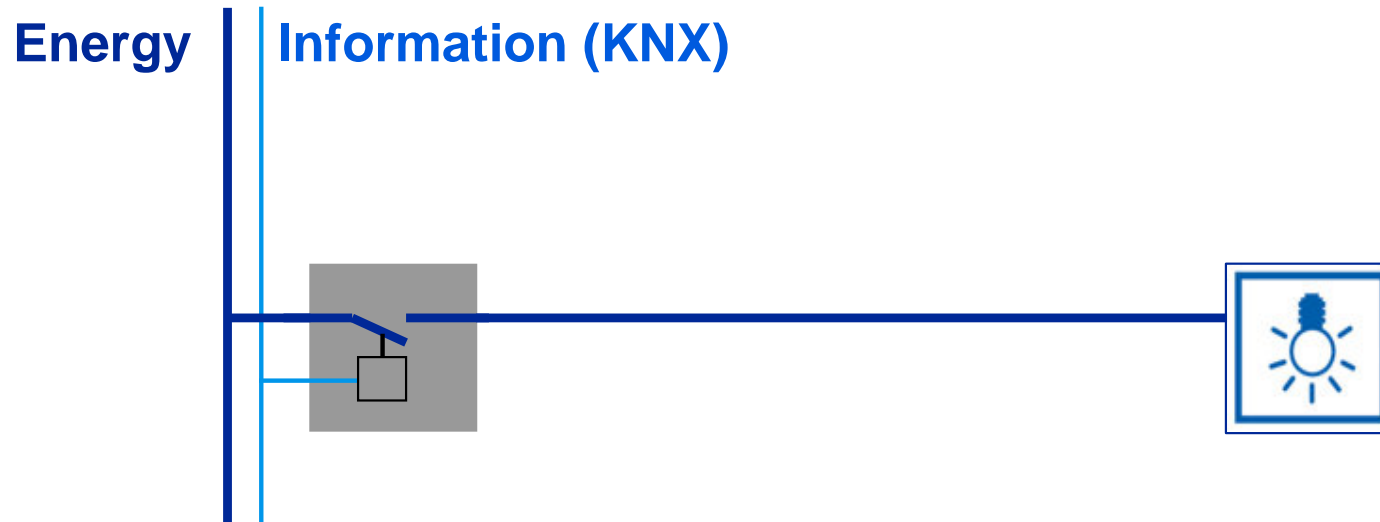
SE/S 3.16.1 Energy Actuator
4. Switching Functionality

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4. The functionality of the existing ABB i-bus® KNX switch actuators is included

SE/S 3.16.1 Energy Actuator
4. Switching Functionality
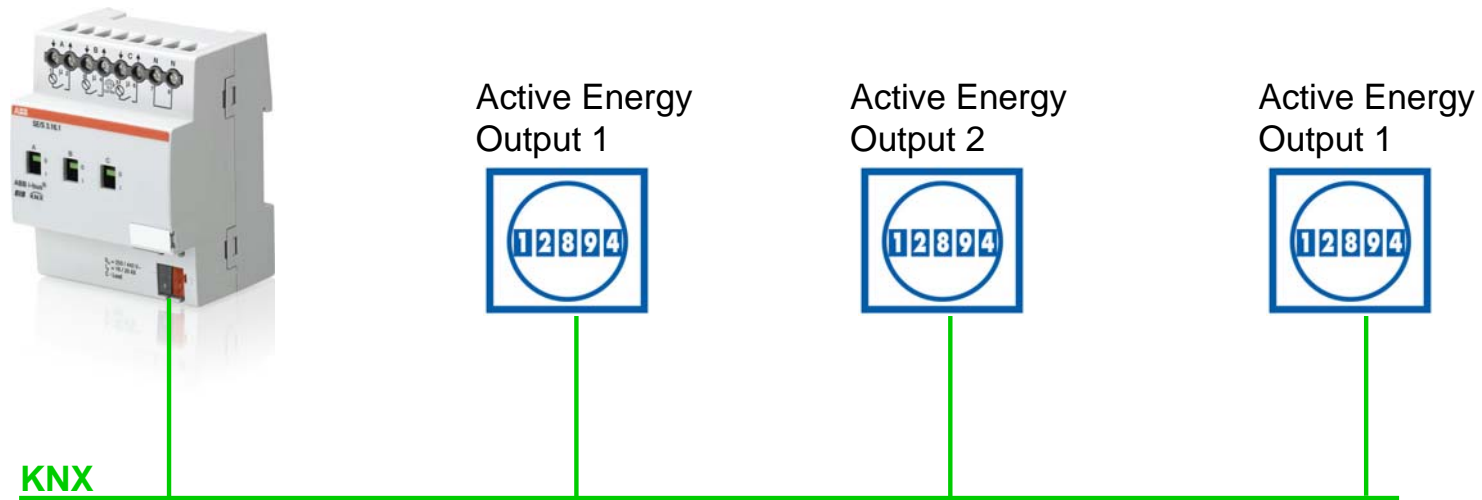
Energy | **Information (KNX)**

Most functions of the Switch Actuators are included:
(Intelligent Relais)

- Time (delay, staircase lighting, flashing)

- Scene-control (8-bit)

- Logic

- Priority and Safety Operation

Outputs of the Energy Actuator can be used as „normal"
Switch Actuators

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SE/S 3.16.1 Energy Actuator
Application - Metering

Active Energy
Output 1

Active Energy
Output 2

Active Energy
Output 1

KNX

- Measure the power consumption in the terminal current circuit
  → Information about every consumer is available and can be
  visualized

- With the Intermediate Meters it is possible to switch loads
  dependent on energy consumption

SE/S 3.16.1 Energy Actuator
Application - Thresholds

| Voltage	Frequency	Active Power

KNX
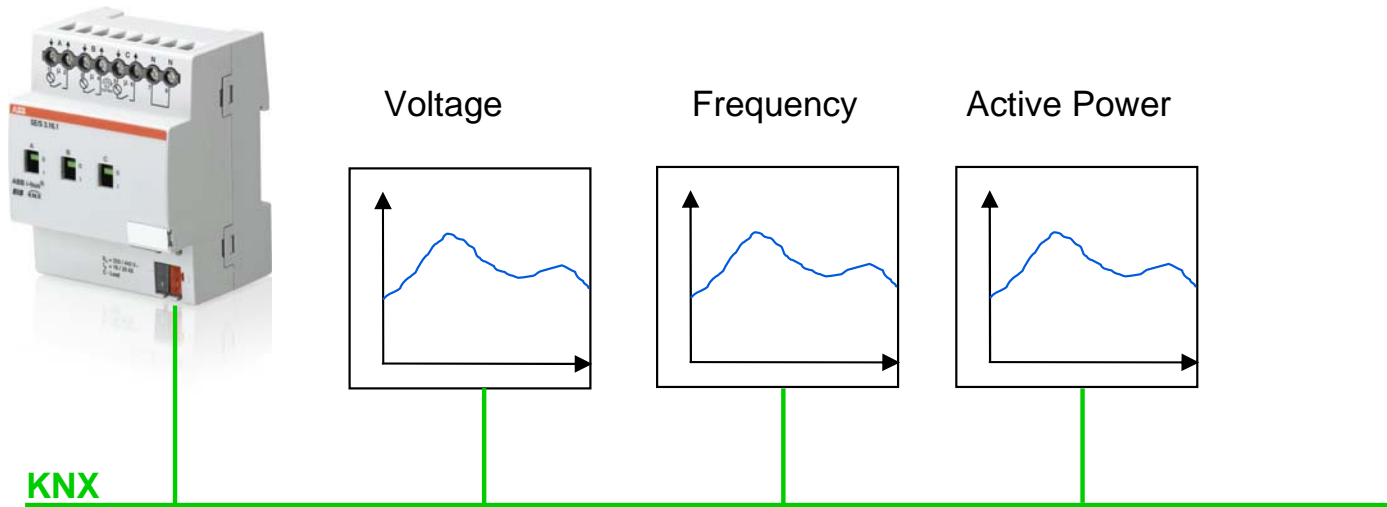
Each value can be monitored with thresholds
→ Warnings can be sent or the output can switch on/off

- Detection of equipment failure, recognize aging of components

- Allow output only to switch on if a certain voltage level is available

- In countries with unstable power supply: Count number of power breakdowns

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SE/S 3.16.1 Energy Actuator
Application – Load Control

Master

Slave   Slave   Slave

KNX
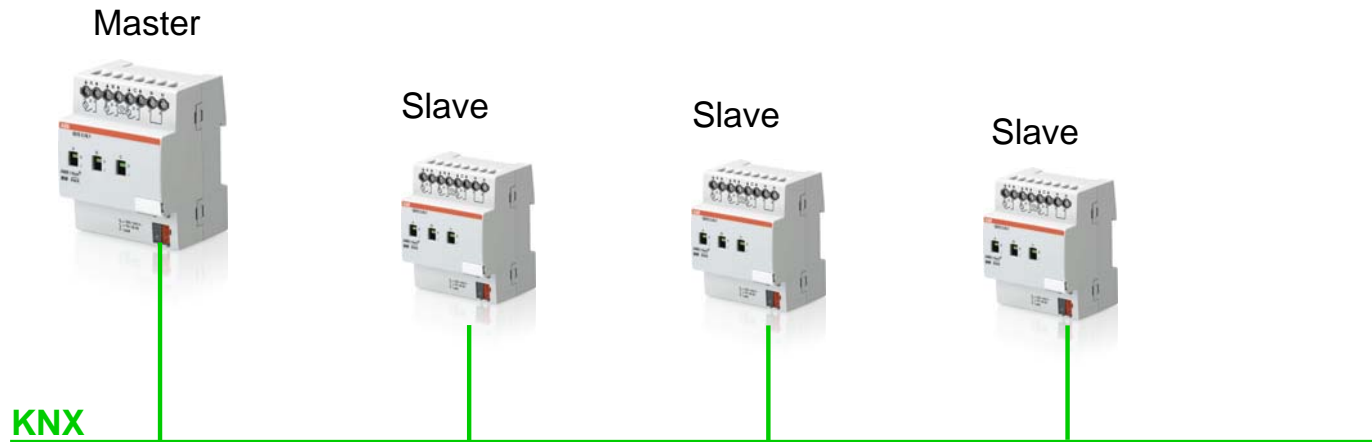
- There are countries where each household has only a certain maximum power supply
  → To avoid tripping of the main circuit breaker consumers with low priority can be switched off during peak times

- In case of charging batteries with a generator, the Energy Actuator can make sure that a maximum charging power is not exceeded

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