The ABB i-bus® Light Controllers, LR/S x.16.1 (x = 2 or 4) are KNX modular installation devices in ProM Design for installation in the distribution board on 35 mm mounting rails. The connection to the ABB i-bus® is implemented via a bus connection terminal on the device shoulders. The LR/S can control dimmable electronic ballast or transformers with 1-10 V interface via 2 or 4 outputs depending on the device. For every output a floating switching contact (16 A) for direct switch on and off of the ballasts is available. The switching relays are particularly suitable for switching fluorescent lamp loads (AX) to DIN EN 60 669.

Manual switch ON and OFF of the individual outputs is possible in manual control independently of the bus or auxiliary voltages. The operating element on the switching relay directly indicates the switch status. A separate Light Sensor LF/U 2.1 can be separately connected on the Light Controller for each output. The Light Sensor measures brightness in closed rooms. The Light Controller undertakes constant light control for each output (control circuit) with this brightness value. It is possible to use several Light Sensors for a single output. The Light Controller and the connected Light Sensor are supplied with power via the KNX and do not require an additional power supply.

**Technical data**

<table>
<thead>
<tr>
<th>Supply</th>
<th>Operating voltage</th>
<th>Current consumption KNX</th>
<th>Maximum</th>
<th>Power consumption via KNX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21...30 V DC, made available by the bus</td>
<td>2.16.1</td>
<td>4.16.1</td>
<td>Max. 250 mW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.5 mA</td>
<td>10 mA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outputs control circuit</th>
<th>LR/S type</th>
<th>Number of control outputs 1-10 V (passive)</th>
<th>Max. current per control output</th>
<th>Max. number of ballast (2 mA/ballast)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.16.1</td>
<td>2</td>
<td>100 mA</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>4.16.1</td>
<td>4</td>
<td>100 mA</td>
<td>50</td>
</tr>
</tbody>
</table>

| Max. cable length, with max. load (100 mA) | 70 m with conductor cross-section 0.8 mm² | 100 m with conductor cross-section 1.5 mm² |

<table>
<thead>
<tr>
<th>Sensor input</th>
<th>LF/U 2.12)</th>
<th>Number of inputs</th>
<th>Max. cable length per sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>100 m, Ø 0.8 mm, P-YCYM or J-Y(ST)Y cable (SELV), e.g. shielded KNX bus cable</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Brightness detection</th>
<th>Lighting control operating range</th>
</tr>
</thead>
</table>
|                           | Optimised for 500 Lux.
|                           | 200 ...1200 Lux for rooms with average furnishing level (reflection 0.5)
|                           | max. 860 Lux in a very brightly furnished room (reflection 0.7)
|                           | max. 3000 Lux in a very darkly furnished room (reflection 0.2)

| The Lux values are measured values on the work surface (reference surface)³ |

<table>
<thead>
<tr>
<th>Outputs load circuit rated values</th>
<th>LR/S type</th>
<th>Number of load outputs (floating)</th>
<th>Uₙ, rated voltage</th>
<th>Iᵢ, rated current</th>
<th>Leakage loss per device at max. load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.16.1</td>
<td>2</td>
<td>250/440 V AC (50/60 Hz)</td>
<td>16 A-AC1 or 10 AX</td>
<td>2.6 W</td>
</tr>
<tr>
<td></td>
<td>4.16.1</td>
<td>4</td>
<td></td>
<td></td>
<td>5.2 W</td>
</tr>
</tbody>
</table>
### Load circuit (relay) switching currents

<table>
<thead>
<tr>
<th>Description</th>
<th>Current</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC1 operation (cos $\varphi = 0.8$) DIN EN 60 947-4-1</td>
<td>16 A</td>
<td>230 V</td>
</tr>
<tr>
<td>Fluorescent lighting load AX to DIN EN 60 669-1</td>
<td>10 AX/250 V (140 $\mu$F)</td>
<td></td>
</tr>
<tr>
<td>AC3 operation (cos $\varphi = 0.6$) DIN EN 60 947-4-1</td>
<td>8 A</td>
<td>230 V</td>
</tr>
<tr>
<td>Minimum switching performance</td>
<td>100 mA/12 V</td>
<td></td>
</tr>
<tr>
<td>DC current switching capacity (ohmic load)</td>
<td>100 mA/24 V</td>
<td></td>
</tr>
<tr>
<td>Lamp loads</td>
<td>10 A/24 V =</td>
<td></td>
</tr>
</tbody>
</table>

### Load circuit (relay) service life

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical endurance</td>
<td>&gt; 3 x 10$^6$</td>
</tr>
<tr>
<td>Electrical endurance to AC1 (240 V/cos $\varphi = 0.8$)</td>
<td>&gt; 10$^6$</td>
</tr>
<tr>
<td>AC5a (240 V/cos $\varphi = 0.45$)</td>
<td>&gt; 3 x 10$^4$</td>
</tr>
</tbody>
</table>

### Load circuit (relay) switching times

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. relay position change per output and minute if all relays are switched simultaneously. The position changes should be distributed over a minute.</td>
<td>60</td>
</tr>
<tr>
<td>Max. relay position change per output and minute if only one relay is switched</td>
<td>120</td>
</tr>
</tbody>
</table>

### Connections: ABB i-bus®

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>KNX bus connection terminal</td>
<td>0.8 mm Ø, single core</td>
</tr>
</tbody>
</table>

### Connections:

- **Control circuit**
  - Screw terminal with slotted screw
    - 0.2...2.5 mm² stranded
    - 0.2...4 mm² single core
  - sleeves without/plastic
    - 0.25...2.5/0.25...4 mm²
  - TWIN sleeves
    - 0.5...2.5 mm²
  - Tightening torque
    - Max. 0.6 Nm

- **Light sensor LF/U 2.1**
  - Screw terminal with universal head (PZ 1)
    - 0.2...4 mm² stranded, 2 x (0.2-2.5 mm²)
    - 0.2...6 mm² single core, 2 x (0.2-4 mm²)
  - sleeves without/plastic
    - 0.25...2.5/0.25...4 mm²
  - TWIN sleeves
    - 0.5...2.5 mm²
  - Tightening torque
    - Max. 0.8 Nm

### Operating and display elements

- Red LED and KNX button
- Switch position display
  - For assignment of the physical address
  - Relay operator

### Enclosure

- IP 20
- to DIN EN 60 529

### Safety class

- II
- to DIN EN 61 140/IEC 536

### Isolation category

- Overvoltage category
  - III to DIN EN 60 664-1
- Pollution degree
  - 2 to DIN 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

### Environmental conditions

- Humidity
  - Max. 93 %, moisture condensation should be excluded

### Design

- Modular installation device (MDRC)
  - ProM
- LR/S type
  - 2.16.1
- Dimensions (H x W x D)
  - 90 x 64.5 mm
- Width W in mm
  - 72
- Mounting width (modules at 18 mm)
  - 4
- Weight
  - in kg
  - 0.200
  - 0.330
- Installation
  - On 35 mm mounting rail
    - DIN EN 60 715
- Mounting position
  - as required

### Housing, colour

- Plastic housing, grey

### Approvals

- KNX to EN 50 090-2-2 Certification

### CE mark

- in accordance with the EMC guideline and low voltage guideline
1) The control current of 1-10 V devices determine the number of connectable ballast devices. Typical devices are between 0.4...4 mA.
2) Note: LF/U 1.1 not suitable
3) Rooms are lit up differently by the incidental daylight and the artificial lighting of the lamps, and not all surfaces in the rooms (walls, floor, furniture, etc.) reflect the light which falls on them in the same manner. Accordingly, even though there is an exactly calibrated constant lighting control in daily operation, deviations to the set target value may occur. These deviations may be up to +/- 100lx should the current ambient conditions in the room, and accordingly the reflection properties of the surfaces (paper, persons, reorganized or new furniture), differ significantly from the original ambient conditions at the time of calibration. Deviations may also occur if the Light Sensor is influenced by direct or reflected light falling on it which is not influenced or only slightly influenced by the surfaces in the detection range of the Light Sensor.
4) The maximum inrush-current peak (see table “Lamp loads”) may not be exceeded
5) The specifications only apply after the device has been connected to the bus voltage for min. 30 seconds. Typical delay of the relay is approx. 20 ms.
6) For multiple element lamps or other types, the number of electronic ballast devices must be determined using the peak inrush current of the electronic ballast. See the example: Planning and application.

Caution

The connection of a 230 V mains voltage supply to one of the 1-10 V outputs or sensor inputs leads to the destruction of the 1-10 V end stage or the corresponding sensor input.

Control and load ends are electrically isolated from the KNX. The individual relays are potential free (floating). When connecting the control line it is important to consider that the control outputs each feature a common reference ground with one another.

Several electronic ballast with a 1-10 V interface can be controlled by one output of the Light Controller. The number of dimmable ballast per output is limited both by the switching and the control powers of the Light Controller. For calculation example see: Planning and application.
ABB i-bus® KNX  Light Controller, 1-10 V, x-fold, 16 A, MDRC
LR/S x.16.1, 2CDG 110 08x R0011

User programs

<table>
<thead>
<tr>
<th></th>
<th>Number of Communication objects</th>
<th>Max. number of group addresses</th>
<th>Max. number of associations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Dim 2f 1-10V/1</td>
<td>62</td>
<td>254</td>
<td>255</td>
</tr>
<tr>
<td>Control Dim 4f 1-10V/1</td>
<td>118</td>
<td>254</td>
<td>255</td>
</tr>
</tbody>
</table>

Note

For a detailed description of the application program see “Light controller LR/S x.16.1 and light sensor LF/U 2.1” product manual. It is available free-of-charge at www.ABB.de/KNX.

The programming requires EIB Software Tool ETS2 V1.3 or higher. If ETS3 is used a “.VD3” or higher type file must be imported.

The application program for the ETS2/ETS3 can be found at ABB/EIB Lighting Devices/Illumination and Light Sensors/Control Dim xf 1-10V/1, (x = 2 or 4, number of outputs).

The devices do not support the closing function of a project or the KNX devices in the ETS. If you inhibit access to all devices of the project with a BA password (ETS2) or a BCU code (ETS3), it has no effect on this device. Data can still be read and programmed.

Circuit diagram

1. Label carrier
2. KNX programming button
3. Red KNX programming LED
4. KNX connection terminal
5. Switch position display and ON/OFF manual actuation
6. Load circuit, for each 2 screw terminals
7. Control circuits (1…10 V) for each 2 screw terminals
8. Light Sensor inputs, for each 2 screw terminals
9. Light sensor LF/U 2.1

Caution

All-pole disconnection must be observed in order to avoid dangerous touch voltages which originate from feedback from differing phase conductors.

Important

An open 1-10 V control line produces the maximum ballast brightness. A short circuited control line generates the minimum dimming value.

The minimum dimming value is also set if the control cable polarity is reversed. In all three cases dimming of the lighting is not possible.
Note

An open Light Sensor cable (max. cable resistance) means the same as a dark room for the Light Controller. The 1-10 V output is controlled with maximum brightness during control. The same behaviour is also exhibited with a short circuit and if the sensor cable polarity is reversed.

The sensor value can be read via the object Sensor value (No. 32, 57, 82 or 107) of the corresponding output. This value corresponds with the measured value on the sensor input, the Light Sensor detects the light luminance within its detection range. The value does not comply with the lighting intensity in Lux measured with a Lux meter underneath the Light Sensor. In all three fault scenarios (open circuit, short circuit and incorrect polarity) the value read via the object Sensor value is equal to 0. This value corresponds with the value of absolute darkness.

Dimension drawing

<table>
<thead>
<tr>
<th></th>
<th>LR/S 2.16.1</th>
<th>LR/S 4.16.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>72 mm</td>
<td>108 mm</td>
</tr>
<tr>
<td></td>
<td>4 space units</td>
<td>6 space units</td>
</tr>
</tbody>
</table>