Busch Universal Master Dimmer 
Insert 
6593 U-500 
Power electronic module 
6594 U-500
Busch-Dimmer®

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| 1473-1-7871 | — 2 — |
1 Safety

Warning
Electric voltage!
Risk of death and fire due to electrical voltage of 230 V.
– Work on the 230V supply system may only be performed by authorised electricians!
– Disconnect the mains power supply prior to installation and/or disassembly!

2 Environment

Consider the protection of the environment!
Used electric and electronic devices must not be disposed of with domestic waste.
– The device contains valuable raw materials which can be recycled. Therefore, dispose of the device at the appropriate collecting depot.

2.1 Disposal
All packaging materials and devices bear the markings and test seals for proper disposal. Always dispose of the packaging material and electric devices and their components via the authorized collecting depots and disposal companies.
The products meet the legal requirements, in particular the laws governing electronic and electrical devices and the REACH ordinance.
(EU REACH ordinance and law for the implementation of the ordinance (EC) No.1907/2006)
## 3 Technical data

### General

| Capacity booster | Max. 1 power electronic module 6594 U ...
| Pushbutton input: | 230 V ~ ±10%, 50 / 60 Hz
| Max. pushbutton line length: | 100 m
| Max. total cable length between the control outputs (S-S, G-G): | Max. 30 cm from device to device
| Protection type: | IP 20
| Ambient temperature range: | 0 – +35°C (see Fig. 1)

### Device-specific

| Nominal voltage: | 6593U ...: 230 V ~ ±10%, 50 Hz
| 6594U ...: 230 V ~ ±10%, 50 Hz
| Nominal current: | 6593U ...: 1.83 A (universal master dimmer)
| 6594U ...: 1.37 A (power electronic module)
| Nominal power: | (dependent on ambient temperature (see Fig. 1))
| 6593U ...: 420 W/VA
| 6594U ...: 315 W/VA
| Minimum load: | 6593U ...: 60 W/VA
| 6594U ...: 200 W/VA
4 Reduction of the connection load (derating)

The dimmer heats up during operation because part of the connected load is lost and converted into heat. The specified rated power is designed for dimmer installation in a solid masonry wall. When installing the dimmer in a wall made of gas concrete, wood, or plasterboard, the maximum connection load must be reduced by 20%.

The connected load must always be reduced when several dimmers are installed one below the other or when other heat sources cause additional heating. In intensely heated-up rooms, the maximum connected load must be reduced according to the diagram.

Use the following formula for the calculation of the nominal power:

Nominal power = transformer losses\* + lamp power

\* 5% of the nominal transformer power in the case of electronic transformers
\* 20% of the nominal transformer power in the case of conventional transformers

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<table>
<thead>
<tr>
<th>Unit</th>
<th>Meaning</th>
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<tr>
<td>%</td>
<td>Nominal power</td>
</tr>
<tr>
<td>°C</td>
<td>Ambient temperature</td>
</tr>
</tbody>
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Fig. 1: Derating
5 Function

5.1 Load types

<table>
<thead>
<tr>
<th>Load types</th>
<th>Description</th>
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<tbody>
<tr>
<td><img src="image" alt="230 V incandescent lamps" /></td>
<td>230 V incandescent lamps</td>
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<tr>
<td><img src="image" alt="230 V halogen lamps" /></td>
<td>230 V halogen lamps</td>
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<td><img src="image" alt="Low-volt halogen lamps with conventional transformers" /></td>
<td>Low-volt halogen lamps with conventional transformers</td>
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<tr>
<td><img src="image" alt="Low-volt halogen lamps with electronic transformers" /></td>
<td>Low-volt halogen lamps with electronic transformers</td>
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</tbody>
</table>

**Note**

Conventional and electronic transformers must not be dimmed together. A mixed load of resistive and inductive, but also of resistive and capacitive consumers is possible.
### 5.2 Possible combinations

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<tr>
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<tbody>
<tr>
<td><img src="6593.png" alt="Image" /></td>
<td>6593 U ...</td>
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<td><img src="6455.png" alt="Image" /></td>
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<tr>
<td><img src="6813.png" alt="Image" /></td>
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<td><img src="6813.png" alt="Image" /></td>
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<td><img src="6810.png" alt="Image" /></td>
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<td><img src="6066.png" alt="Image" /></td>
<td>X</td>
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<tr>
<td><img src="6543.png" alt="Image" /></td>
<td>X</td>
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</table>

The dimmer can be controlled using additional control elements through the button auxiliary post input.
5.3 Universal master dimmer function
The device provides the following functions:

• Phase-angle/phase-section (load-dependent)
• Operation mode selection via handwheel
• Dark start function

5.4 Operation mode
The following operation modes can be selected using the handwheel:

1. Memory function on, soft on/off inactive (basic function)
2. Memory function on, soft on/off active*
3. Memory function off, soft on/off active*
4. Memory function on, soft on inactive, soft off active
5. Memory function on, soft on active, soft off inactive*

* Not in connection with Busch Watchdog sensors

Memory function:
The current brightness value is saved as a memory value at deactivation. The dimmer switches on with this value the next time it is activated.

Soft OFF:
The dimmer decreases slowly from the set brightness to the minimum brightness and then switches OFF.

Soft ON:
Starting at the minimum brightness, the dimmer switches on and increases slow to the set brightness value.

5.5 Capacity boosting
Capacity is boosted via a power electronic module 6594U.

5.6 Protective functions
The device provides the following protective functions:

• Inrush current limitation through soft start
• Electronic overload/overtemperature protection
• Electronic short-circuit protection
• Thermal fuse
6 Connection

Caution
If illuminated pushbuttons are used, only pushbuttons with a separate N-connection are allowed. Contact-parallel illumination is not permitted.

Note on radio interference suppression
The dimmer contains electronic interference suppression and is thus "low-noise." The S and G data lines are to be seen as internal connecting lines and should be laid over as short a distance as possible (see the "Technical data" chapter on page 4).

Fig. 3: Busch universal master dimmer with pushbutton operation

The N-connection is required only in special cases (e.g., noise development when the connected electronic transformer is switched off! It has no influence on noises of the connected transformer when it is on).

Fig. 4: Capacity booster of the universal master dimmer with power electronic module, pushbutton operation.

During operation with power electronic module 6594U ..., the controlled outputs must be connected to guarantee all protective functions of the dimmer system.
In pushbutton mode, the phase of the extension unit and the phase of the supply voltage must be the same. With pushbutton extensions, the lighting glow lamp should not be connected with parallel contacts (use pushbutton with N connection). When laying lines, ensure that there is sufficient space between the control and load lines (5 cm minimum).

- The maximum line length of the pushbutton auxiliary post is 100 m.
- Changing the line routing of existing two-way circuits and intermediate switch circuits is not necessary.

**Note regarding conventional transformers**

- During the operation of conventional transformers, each transformer must be fuse-protected on the primary side according to manufacturer’s specifications. Only safety transformers according to DIN EN 61558 should be used.
- Switching the load through a serial switch contact is not permissible since overcurrents and overvoltages can occur at reactivation, which could possibly lead to a destruction of the dimmer.
- The secondary-side idling of conventional transformers is permitted neither during commissioning nor during operation.
- Operate conventional transformers always at the nominal transformer load.
- To achieve the same brightness level of the halogen lamps over the entire adjusting range from bright to dark, transformers with the same secondary voltage and the same power should be used.
7 Mounting / Installation

Warning
Electric voltage!
Risk of death and fire due to electrical voltage of 230 V.
– Low-voltage and 230 V cables must not be installed together in a flush-mounted socket!
In case of a short-circuit there is the danger of a 230 V load on the low-voltage line.

7.1 Requirements for the electrician

Warning
Electric voltage!
Install the device only if you have the necessary electrical engineering knowledge and experience.
• Incorrect installation endangers your life and that of the user of the electrical system.
• Incorrect installation can cause serious damage to property, e.g. due to fire.

The minimum necessary expert knowledge and requirements for the installation are as follows:
• Apply the “five safety rules” (DIN VDE 0105, EN 50110):
  1. Disconnect from power;
  2. Secure against being re-connected;
  3. Ensure there is no voltage;
  4. Connect to earth;
  5. Cover or barricade adjacent live parts.
• Use suitable personal protective clothing.
• Use only suitable tools and measuring devices.
• Check the type supply network (TN system, IT system, TT system) to secure the following power supply conditions (classic connection to ground, protective earthing, necessary additional measures, etc.).
7.2 Mounting
The device may only be installed in suitable flush-mounted sockets (DIN 49073-1) or a suitable surface-mounted housing.

7.3 Mains and load connection
The mains connection takes place at terminals L and N. The load is connected to the terminals → (controlled outputs). Connection to terminal N is an option and serves for reducing the noise on the transformer load when switched off.

7.4 Mounting in connection with other devices
7.4.1 Mounting in connection with an IR control element (remote control)
In combination with the IR control element 6066 ..., the mounting site should lie within the specified values for the IR receiving range. Please note that the IR receiving range may vary due to extraneous light (e.g., sunlight, illumination).

Attachment of the control element:
In the case of the IR control element 6066 ..., set the desired address first. Put the control element on the dimmer. Make sure that the IR control element does not jam in the frame.

Removal of the control element:
Use the provided left and right notches for leverage.

7.5 Mounting with Busch Watchdog Flush-Mounted Sensors
The dimmer can be operated with the Busch Watchdog 180 Flush-Mounted Sensors 6810 ..., 6800-104(M) ... or higher; in the process, a switching function (ON/FF) is possible - but no dimming function! The mounting height depends on the selection of the flush-mounted sensor.
Further information on mounting height, the adjustment of the flush-mounted sensors, and so on can be found in the pertinent operating instructions of the respective flush-mounted sensor.

7.6 Auxiliary posts
Any number of pushbuttons (e.g., 2020 ...) can be connected in parallel for switching and dimming via the Terminal 1 pushbutton input. Sensing is performed to the left (L).
8 Commissioning

8.1 Universal master dimmer function
Upon connection of the supply voltage, the microprocessor integrated in the dimmer evaluates the characteristics of the connected service load and decides whether phase-angle or phase-section control is to be employed. During this calibration process, the lighting installation switches on for up to 2 seconds.

Notes
- To guarantee precise load detection by the dimmer, it must not be operated with a short circuit or with secondarily idling, conventional transformers when the mains voltage is additionally switched on.
- Universal master dimmers and power electronic modules heat up during operation because part of the connection load is lost and converted into heat.
- If the ambient temperature rises above 35°C during operation, the connection load must be reduced according to the diagram; see Fig. 1 on page 5.
  At an ambient temperature of 50°C, the allowed power is reduced to 57%, at 60°C to 28%.

8.2 Overload
When activating the electronic overload protection (overload or overtemperature due to incorrect installation or insufficient cooling), the set brightness of the lighting system is reduced. When overload/overtemperature lasts for more than 10 minutes, the dimmer will switch itself off.
The mains voltage must be switched off to remedy faults. The load of the dimmer must be checked and reduced if pertinent. Once the overload is eliminated and after a subsequent cool-down phase, the dimmer is again ready for operation.

8.3 Short-circuit
In case of a brief short-circuit of the load, the dimmer disconnects the connected loads and re-connects them afterwards. In case of a permanent short-circuit, the dimmer switches off completely. The mains voltage must be switched off to remedy faults. After the short-circuit has been rectified, the dimmer is ready for operation.
9 Operation

9.1 Operation with the pushbutton control element (pushbutton operation)

9.1.1 Switching ON
- Briefly press the pushbutton auxiliary post.

9.1.2 Activation with dark start function
- Keep the pushbutton auxiliary post pressed.
The dimmer starts with the basic brightness and becomes "brighter" as long as the pushbutton is pressed.

9.1.3 Dimming
- Keep the pushbutton auxiliary post pressed.
The dimmer changes the brightness of the connected lighting system. With every stop, the dimming direction is reversed. At maximum brightness, the dimmer stops; at minimum brightness, the dimming direction changes.

9.1.4 Switching OFF
- Briefly press the control element/pushbutton auxiliary post.

9.1.5 Special functions
Switching OFF with soft OFF function (handwheel position 4):
- Briefly press the control element/pushbutton auxiliary post.
The current brightness value is saved as a memory value. The dimmer decreases slowly from the set brightness to the minimum brightness and then switches OFF.

Or

Switching ON with soft ON function (handwheel position 5):
- Briefly press the control element/pushbutton auxiliary post.
The saved brightness value (memory) is changed starting with the minimum brightness.
9.2 Operation with Busch Watchdog Flush-Mounted Sensors

9.2.1 Type designation in the Busch Watchdog programme
These operating instructions describe both the Busch Watchdog (Art. No. 6810 ...) and the comfort sensors (Art. No. 6800-104(M) ...) as "flush-mounted sensors." Please pay attention to the correct type assignment in the description. The type designation can be found on the back side of the respective device.

After the interruption of the mains voltage or mains connection, the dimmer switches the connected consumers - independent of the brightness set on the sensor
- on for 80 seconds when flush-mounted sensors 6810 ... are used
- on for the selected duration (at least one minute at time settings < 1 minute) when flush-mounted sensors 6800-104(M) ... are used (exception: short-time pulse).

Note
The soft OFF function is possible to the full extent from version ...-104(M) ....

9.2.2 Auxiliary post operation
In connection with flush-mounted sensors, auxiliary post operation is possible via
- activation by NO contact button or
- auxiliary post insert 6805U ...

9.2.2.1 Passive auxiliary post operation by means of NO contact button
The function performed on the NO contact pushbutton causes the connected consumers to be switched independent of the measured brightness
- for about 80 seconds when flush-mounted sensors 6810 ... are used
- for the time set on the flush-mounted sensor when flush-mounted sensors 6800-104(M) ... are used

Note
- Deactivation/dimming is not possible through the auxiliary post.
- Multiple activation when the illumination is switched on leads to a "reset" of the previously expired time.

9.2.2.2 Active auxiliary post operation (Busch Watchdog) with 6805U ... and flush-mounted sensors
Since the main unit and auxiliary post each have a separate dusk value setting the current brightness conditions at the mounting position can be taken into consideration individually.

The actual switch-OFF delay results when adding the time set on the main unit and on the auxiliary post. In connection with the flush-mounted sensors 6800--104(M) ..., it is recommended to operate the auxiliary posts with the "short-time pulse" time setting if the times set on the main unit can be observed as precisely as possible.

Note
Further information on mounting height can be found in the pertinent operating instructions of the respective flush-mounted sensor.

9.3 Operation with the Busch Watchdog Presence 6813(-183)-101 ... , 6813/11-24 ... , 6813/11-183 ...
Detailed information can be found in the pertinent operating instructions of the presence detector.

9.4 Operation with timer control element 6455 ...
Detailed information can be found in the pertinent operating instructions of the control element.
A member of the ABB Group

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