

**EXPERTLINE**  
**RGB-DMX**  
**LED-Underwater-Illuminator**



**DANGER!**



Using the smart lamps illuminators outside of water can lead to overheating of the lamp, which in turn may burn exposed skin.



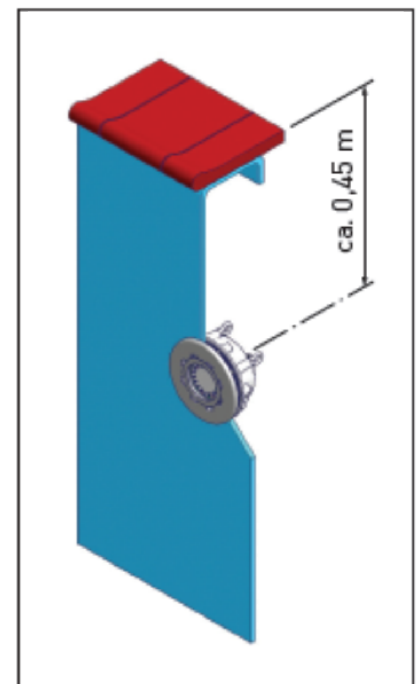
**ATTENTION!**



The smart lamps illuminator can only operate flawlessly if completely submerged in water. For this reason it may only be operated under water. Operation outside of the water may lead to destruction of the illuminator.

## 1. Useful information for the assembly of the smart lamps illuminator

- » To illuminate a pool optimally, at least 1 Watt LED light power (corresponding to about 120 lumens) per 1m<sup>3</sup> of water should be installed. Example: A 80m<sup>3</sup> pool should be fitted with 2 illuminators, each with a power of 40 Watts.
- » To avoid glare, the illuminators should not be fixed against the line of sight in the pool. We recommend assembling the illuminators on the longitudinal side, about 0.45m underneath the water surface.
- » The fixation method of the illuminators always depends on the nature of the pool. In principle we recommend assembly of the smart lamp illuminator using a smart lamp mounting niche.



## EXPERTLINE

## RGB-DMX

## LED-Underwater-Illuminator

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## 1. Warning notice

Please read the entire instructions before commencing assembly attentively, to avoid malfunction and early breakdown, as well as injuries.

Ensure that all information is well understood.

To avoid electric shocks, the power of the facility has to be turned off before any work is undertaken.

For planning, assembly and modification of electrical systems, the appropriate standards and directives of the country in which installation is taking place have to be taken into account.

Workings on low voltage systems may only be executed by qualified electricians – in Germany according to VDE 0100. Prevailing accident prevention procedures must be adhered to.

The entire electrical installation may only be executed by an appropriately trained technical professional.

For replacement of the connection cable, only use cables with appropriate cross section.

Using the smart lamps illuminators outside of water can lead to overheating of the lamp, which in turn may burn exposed skin.

Each installation step must be executed outside of the water under all circumstances!

The DMX Player Module, as well as the LED Driver Module, only feature a low protection class depending on the casing (IP40 – protected against foreign objects from 1.0mm diameter for DMX Player, IP30 – protected against foreign objects from 2.5mm diameter for LED Driver). For this reason operation of these modules must take place in a segregated, dry operation room.

Higher protection classes may be achieved through assembly in an appropriate switching unit.

The dimensions of the switching unit must be sufficient to facilitate an adequate heat dissipation of the entire power losses of the system at all times. For further information please refer to -> “Calculation of the casing volume and selection assistance”

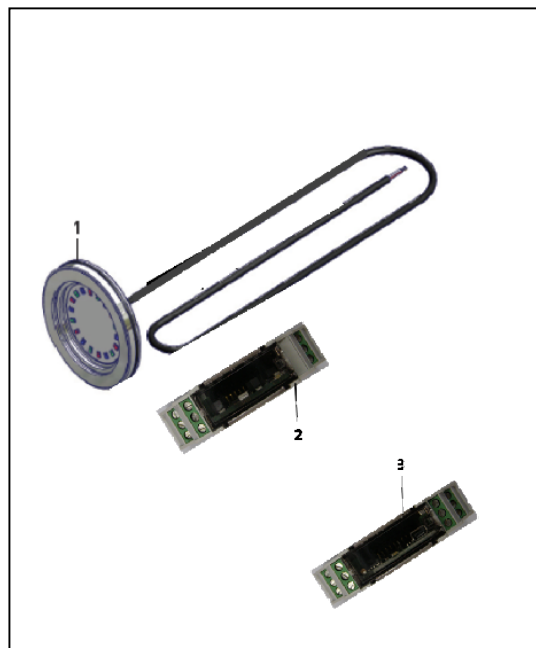
## 2. Packing contents

Please check the packing contents for the following items:

- 1 C0100600 - Illuminator RGB-DMX Ø 94,5mm, with 18 LEDs, Connection cable 3m
- 2 C0102000 - LED Controller Module for each lamp,

additionally

- 3 C0102100 - DMX-Player Interface once per installation



Additionally available:

Various Remote-Controllers



C0103300  
Control Pad LIGHT-DRIVE ELITE



C0103400  
Control Pad LIGHT-DRIVE JOG



C0103200  
Control Pad LIGHT-DRIVE RGB



### 3. Technical Details

#### RGB Illuminator:

|                      |                                                                             |
|----------------------|-----------------------------------------------------------------------------|
| Technology:          | DMX-controllable colour-Illuminator RGB for Safety Extra Low Voltage (SELV) |
| Protection class:    | III /DIN EN 61140 / VDE 0140-1                                              |
| IP protection class: | IP 68                                                                       |
| Voltage:             | 24VDC                                                                       |
| Current:             | 2,0A                                                                        |
| Peak power:          | 48W                                                                         |
| Light power:         | max. 2000 Lumen                                                             |
| Angle of radiation:  | 140°                                                                        |

#### LED-Controller Module:

|                      |                                                                 |
|----------------------|-----------------------------------------------------------------|
| Technology:          | DMX-controllable LED-Driver for Safety Extra Low Voltage (SELV) |
| Protection Class:    | III /DIN EN 61140 / VDE 0140-1                                  |
| IP protection class: | IP30                                                            |
| Voltage:             | 24VDC                                                           |
| Current:             | 0,125A                                                          |
| Max. power loss:     | 3W                                                              |

#### DMX-Player Module:

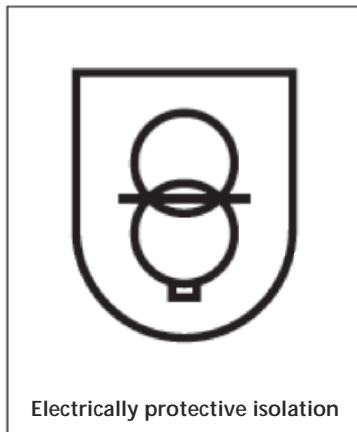
|                      |                                                                                        |
|----------------------|----------------------------------------------------------------------------------------|
| Technology:          | DMX-controllable Interface with galvanic isolation for Safety Extra Low Voltage (SELV) |
| Protection Class:    | III /DIN EN 61140 / VDE 0140-1                                                         |
| IP protection class: | IP40                                                                                   |
| Voltage:             | 24VDC                                                                                  |
| Current:             | 0,025A                                                                                 |
| Max. power loss:     | 0,6W                                                                                   |

#### Requirements mains adapter:

|                    |                                                                    |
|--------------------|--------------------------------------------------------------------|
| Protection Class:  | II                                                                 |
| Line voltage:      | Europe 170-250-/ 50-60Hz                                           |
| Secondary voltage: | 24V DC / Output power 50W per Illuminator/LED Controller connected |
| PFC Control:       | Active                                                             |

## 4. Declaration of Conformity

### 4.1 Labels and applied standards



BvR electronic GmbH hereby confirms that this product fulfils the conditions of the following EU standards:

2006/05/EEC Low voltage directive  
2004/108/EEC Electromagnetic Compatibility (EMC)  
2002/95/EEC RoHS  
DIN EN 61140 Safety Extra Low Voltage (SELV)

#### Tested Standards:

DIN EN 60598-1:2005  
DIN EN 60598-2-18:1996  
DIN EN 55015: 2000 + A1: 2001 + A2: 2002  
DIN EN 61000-6-3:01 + A11:04  
DIN EN 61000-3-2:06  
DIN EN 61000-6-1:01  
DIN EN 61000-4-4  
DIN EN 61547:95 + A1:00  
DIN EN 61000-4-5  
DIN EN 61000-4-11  
DIN EN 61000-4-2  
DIN EN 61000-4-6  
DIN EN 61140 (VDE 0140-1)  
DIN VDE 0100 Part 410, 412.1

## 5. Mechanical Assembly

### 5.1 Assembly in the smart lamps mounting niche

- Pass at least 1 meter of the 2.6m connection cable (6) through the corresponding opening and the IP 68 crimp connector of the mounting niche (5), so that the plug connector may be pulled above water for an eventual replacement of the lamp.
- Assemble the mounting niche together with the custom ExpertLine mounting flange (3), gaskets (4), and the 10 stainless steel socket head cap screws M10 x 25 (8) in the pool walls. Ensure that the mounting region on the pool wall is flat and smooth. This is imperative for proper water proofing

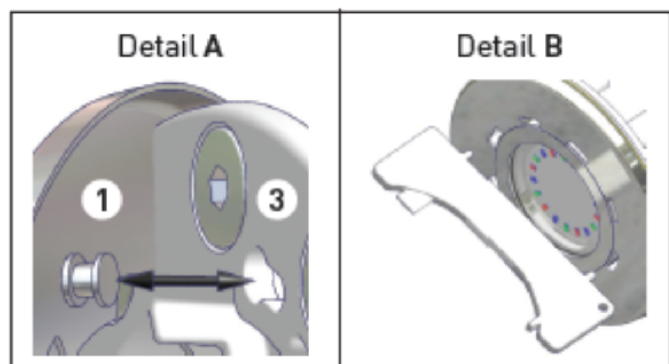
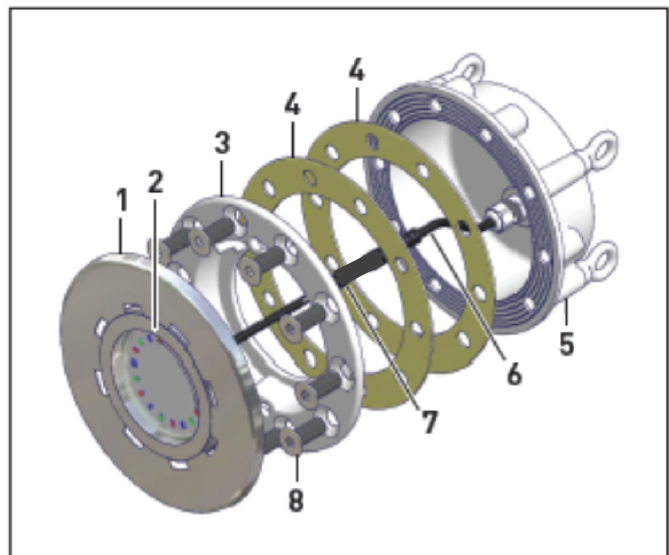


### ATTENTION!



Carefully tighten the screws in opposing pairs, to avoid over-tightening of the screw threads.

- Lightly press the illuminator (2) in the middle of the indentation of the mounting flange and wind the excess cable in the cavity at the back of the mounting niche.
- Fix the stainless steel cover to the front side by inserting the cover with both bolts in the corresponding notches and turning clockwise until it snaps into place (detail A). As moderate force is necessary for this step, the enclosed comb-shaped wrench may be used to facilitate this (detail B)



- A suitable spreader forceps may also be used for this step.

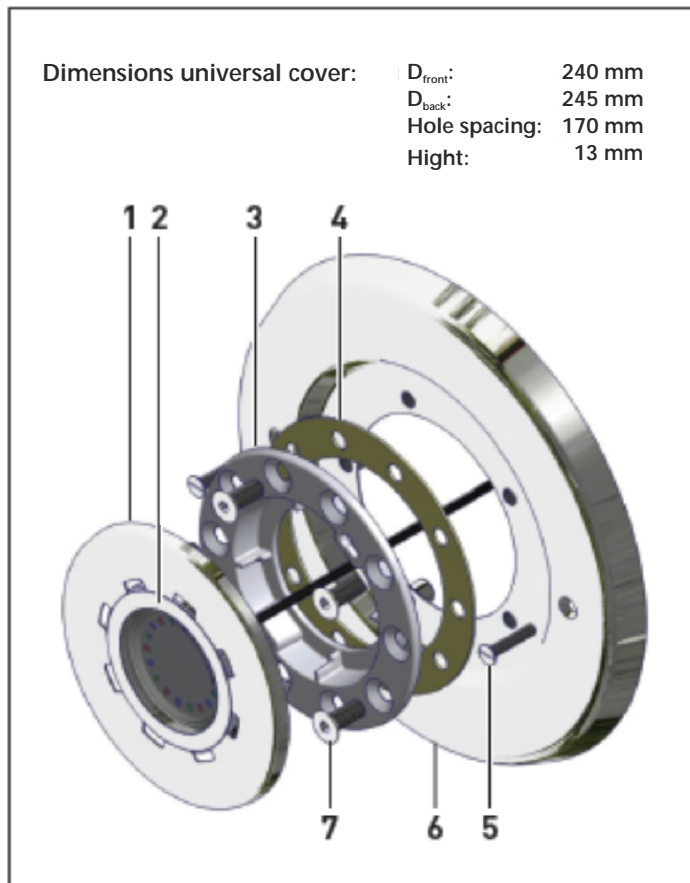
## 5.2 Assembly in the universal cover

The universal cover made of V4A stainless steel serves to retrofit existing illuminator systems of all kinds with smart lamps illuminators or to reinstall them in a wall.

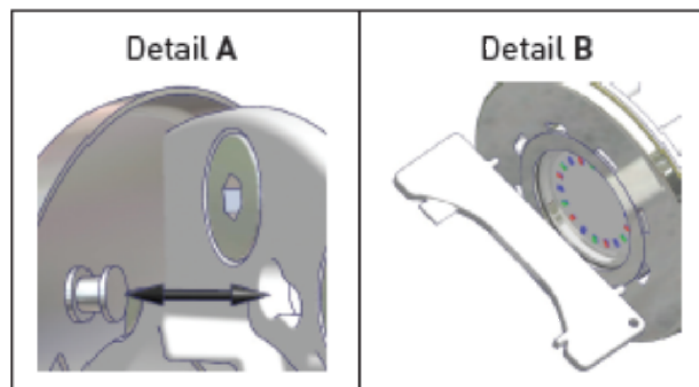
- Fix the universal cover (6) depending on local conditions either to the pool wall using plugs and stainless steel countersunk screws (5), or as appropriate with the help of an optionally available assembly kit in the attachment drillings of the existing mounting niche.

- Place the synthetic mounting flange (3) into the big middle opening and screw it together with the universal cover using the enclosed 5 stainless steel socket head cap screws M10 x 25 (7) and the gasket (4).

- Lightly press the illuminator (2) in the middle of the indentation of the mounting flange and wind the excess cable in the cavity at the back of the mounting niche.



- Fix the stainless steel cover (1) to the front side by inserting the cover with both bolts in the corresponding notches and turning clockwise until it snaps into place (detail A). As moderate force is necessary for this step, the enclosed comb-shaped wrench may be used to facilitate this (detail B)

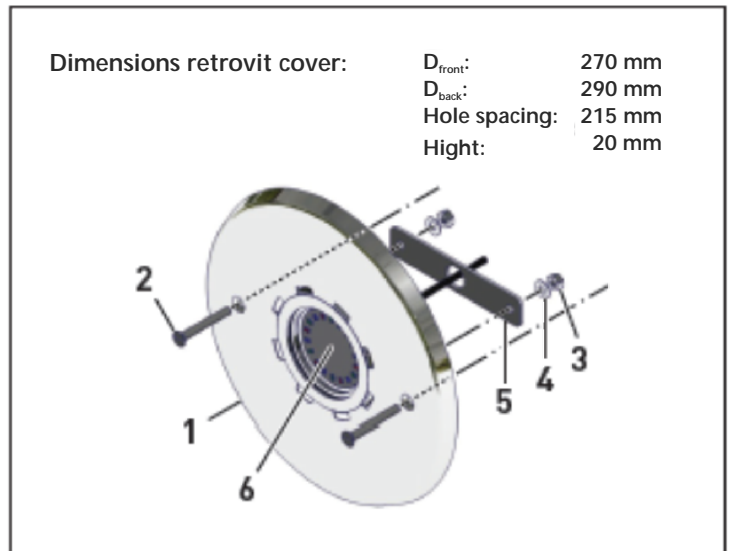


- A suitable spreader forceps may also be used for this step.

### 5.3 Assembly in the retrofit cover

The retrofit cover made of V4A stainless steel serves for 1:1 replacement of existing illuminator systems with smart lamps illuminators.

- Place the smart lamps illuminator (6) into the middle opening of the retrofit cover (1) from behind and screw together with both threaded bolts (not depicted) using the retainer (5), washers (4) and nuts (3).
- Mount the assembled retrofit cover with inserted illuminator into the position of the old illuminator set using both stainless steel countersunk screws (2). The bore holes are arranged in such a way that they are directly compatible with the replacing system.





## Note



These steps must be performed above water under all circumstances, to ensure that there is air in the protective sleeve.

### 5.4 Cable extension

Should an extension of an existing illuminator become necessary, the existing connection cable in the mounting niche often has to be connected to the connection cable of the smart lamps illuminator.

There are a number of possibilities for this purpose:

- complete replacement of the connection cable
- cable extension using a waterproof shrinking hose
- cable extension using a cast resin sleeve
- cable extension using a gel sleeve

**Note:** For a complete replacement of the connection cable it is often sensible to shorten the provided 2.6m connection cable to a length of about 1m for a better fit of the cable in the existing mounting niche.

## 6. Electrical Installation



### ATTENTION!



- For planning, assembly and modification of electrical systems, the appropriate standards and directives of the country in which installation is taking place have to be taken into account.
- Workings on low voltage systems may only be executed by qualified electricians – in Germany according to VDE 0100. Prevailing accident prevention procedures must be adhered to.
- To avoid electric shocks, the power of the facility has to be turned off before any work is undertaken.
- The entire electrical installation may only be executed by an appropriately trained technical professional.
- For replacement of the connection cable, only use cables with appropriate cross section.

## Components of the pool illuminator DMX system

The Pool Illuminator DMX system consists at least of

- 1 DMX player module in a top hat rail casing (C0102100)
- 2 DMX-LED controller units in the top hat rail casing (C0102000)
- 1 top hat rail protective mains adapter with 24V/DC output voltage and 100W output power (C0102300)

These components are designated for assembly on top hat rails in a switching unit (distribution box).

- 2 DMX-Pool Illuminators (subsequently referred to as DMX lamps) (C0100300 or C0100600)

## Calculation of the power losses for installation in a switching unit

For dimensioning of the switching unit the entire power loss (power which is lost as heat during operation) has to be considered, to guarantee optimal heat removal (power dissipation).

This is calculated for a minimal configuration of a system with two lamps as follows:

| Component                                    | Quantity | individual power loss | total power loss |
|----------------------------------------------|----------|-----------------------|------------------|
| Mains adapter                                | 1        | 15W                   | 15W              |
|                                              | 2        | 3W                    | <u>6W</u>        |
| Overall 21W total power losses of the system |          |                       |                  |

For installation of a further lamp, an additional transformer with 24V/DC output voltage and 60W output power is required.

An example calculation for a system with three lamps is as follows:

| Component                                    | Quantity | individual power loss | total power loss |
|----------------------------------------------|----------|-----------------------|------------------|
| Mains adapter                                | 1        | 15W                   | 15W              |
| Mains adapter                                | 1        | 7W                    | 7W               |
| LED Driver                                   | 3        | 3W                    | <u>9W</u>        |
| Overall 31W total power losses of the system |          |                       |                  |

Information about the maximum power dissipation of an empty casing is specific to the manufacturer and the choice of model (e.g. Moisture Sensitivity Level)

The casing series C1 by the company Eaton may be used as an example, corresponding to protection class IP54.

## Casing series CI-K by company Eaton-Möller

| Casing CI-K                                                                                                 | CI-K...   |                 |                   |
|-------------------------------------------------------------------------------------------------------------|-----------|-----------------|-------------------|
| Power dissipation                                                                                           | Typ       | Dimensions      | Power dissipation |
|                                                                                                             |           | mm              | W                 |
| Maximum power dissipation of the insulation .....<br>casing CI-K in single setup, ambient temperature +20°C | CI-K1-95  | 80 × 137 × 95   | 10                |
|                                                                                                             | CI-K2-100 | 100 × 181 × 100 | 12,5              |
|                                                                                                             | CI-K2-145 | 100 × 181 × 145 | 18,5              |
|                                                                                                             | CI-K3-125 | 120 × 222 × 125 | 21,5              |
|                                                                                                             | CI-K3-160 | 120 × 222 × 160 | 25,5              |
|                                                                                                             | CI-K4-125 | 160 × 240 × 125 | 26                |
|                                                                                                             | CI-K4-160 | 160 × 240 × 160 | 29,5              |
|                                                                                                             | CI-K5-125 | 200 × 280 × 125 | 35                |
|                                                                                                             | CI-K5-160 | 200 × 280 × 160 | 41                |

Typ

Thus a casing with a volume of at least 4800 cm<sup>3</sup> must be used for the minimal configuration, e.g. the XBS MFK12 (C0102400), top hat rail distributor, 12 slots, with door.

For the configuration with three lamps, a casing with a volume of at least 7000cm<sup>3</sup> should be used, e.g. the XBS MFK18 (C0102500), top hat rail distributor, 18 slots, with door.

These calculations usually assume an ambient temperature of 25°C and a freestanding installation of the distributor boxes. When incorporated into walls or electric cabinets, or subject to higher ambient temperatures, the power dissipation is reduced and a bigger variant must be chosen accordingly.

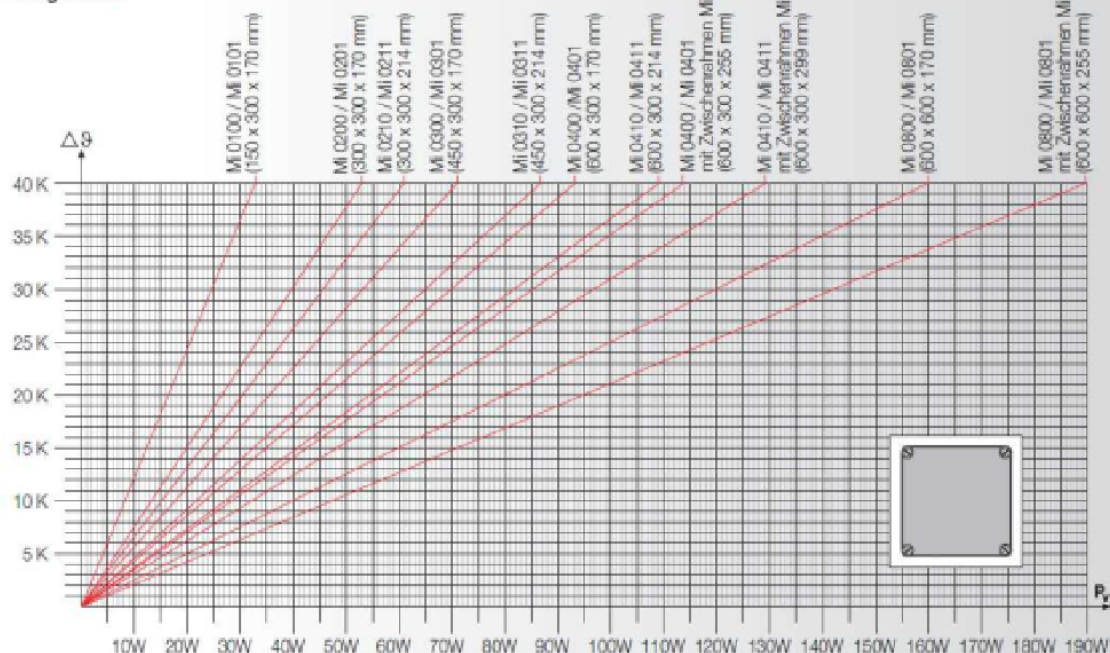
The technical documentation of the company Hensel provides insightful information for casing volume calculations:

[http://www.hensel-electric.de/mWeb/media/PDF\\_Link/mi\\_abstrahlbare\\_verlustlei\\_tech\\_daten.pdf](http://www.hensel-electric.de/mWeb/media/PDF_Link/mi_abstrahlbare_verlustlei_tech_daten.pdf)

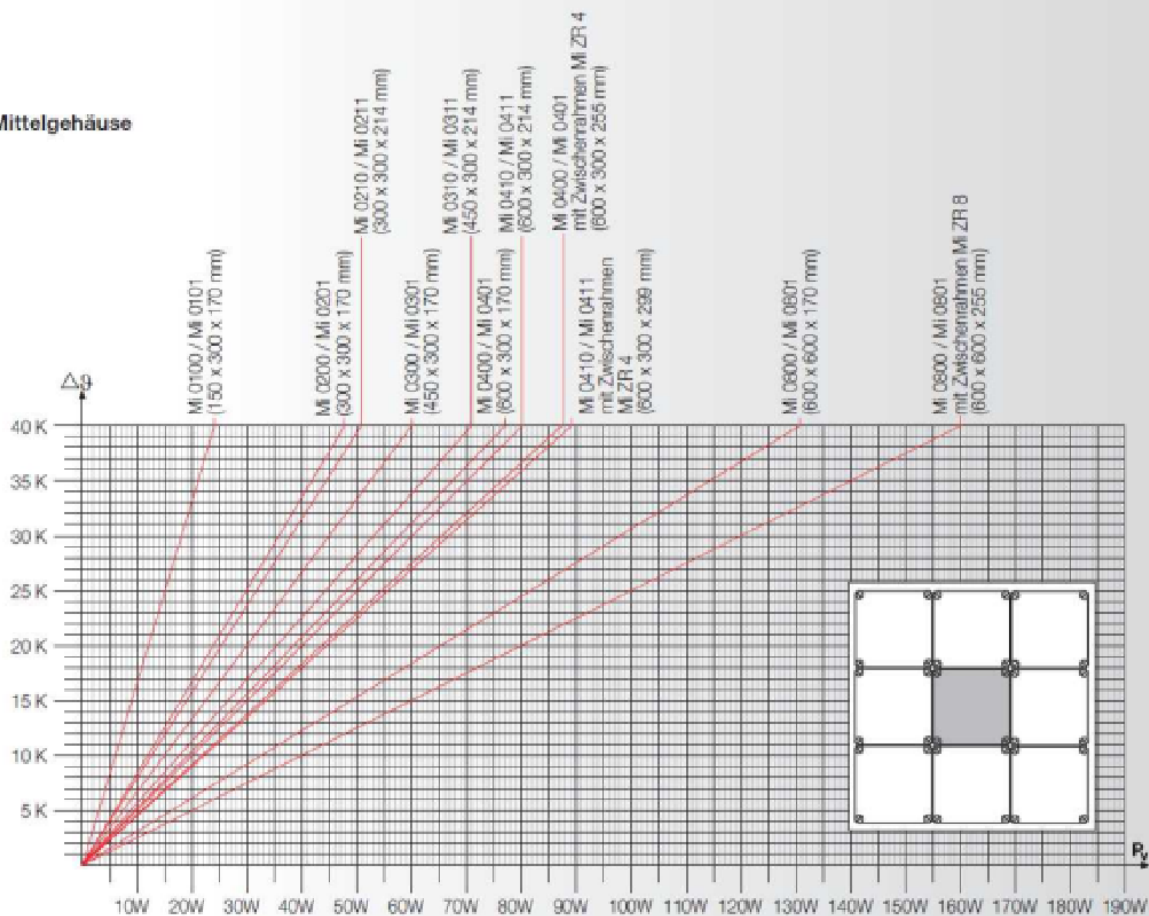


Temperaturerhöhung ( $\Delta\theta$ ) bei Mi-Gehäusen durch die Verlustleistung von elektrischen Betriebsmitteln

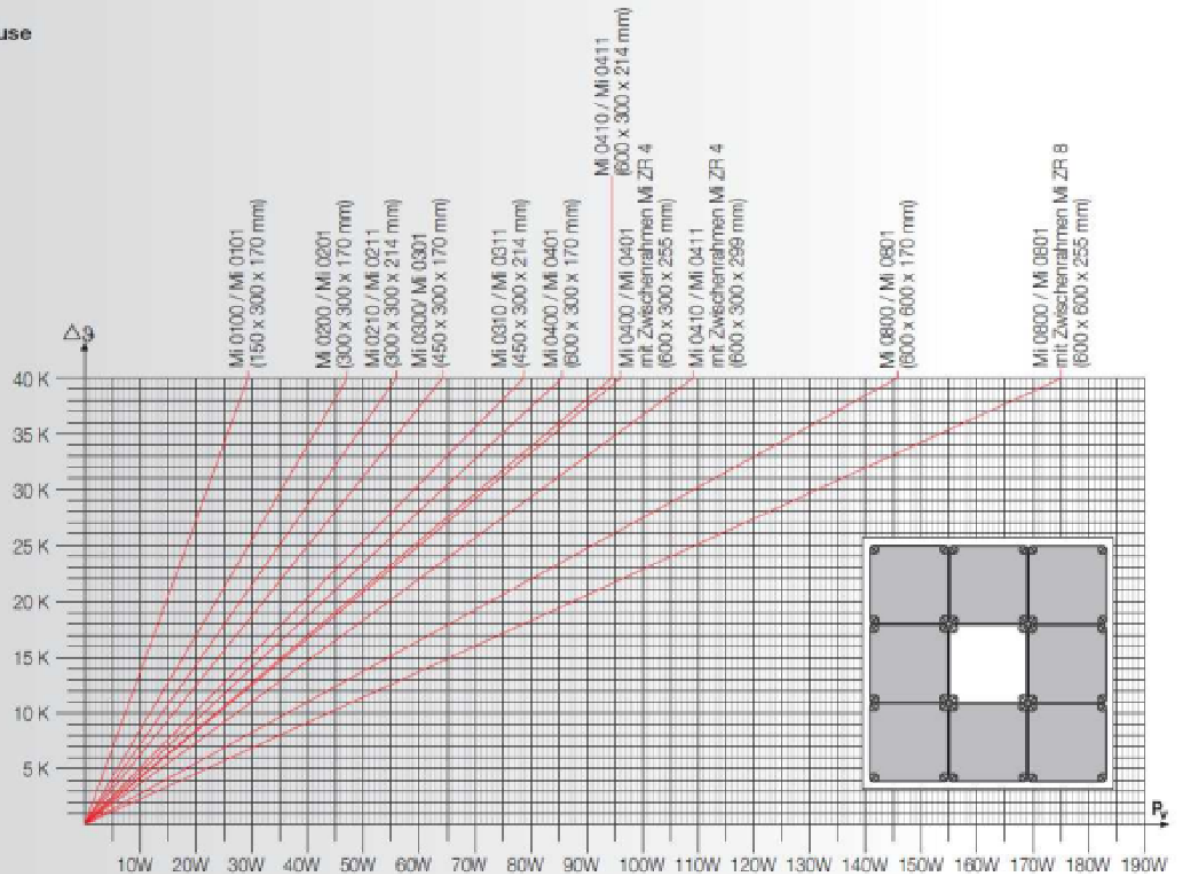
**Einzelgehäuse**



**Mittelgehäuse**



Randgehäuse



**Achtung!**

Die maximal zulässige Temperatur im Innern der (des) Gehäuse(s) ( $\vartheta_{max}$ ) wird bestimmt durch:

1. Maximal zulässige Umgebungstemperatur der eingebauten elektrischen Betriebsmittel (Angaben der Gerätehersteller beachten)
2. Grenztemperatur der inneren Verdrahtung und der eingeführten Kabel und Leitungen
3. Temperaturbeständigkeit der Gehäusewerkstoffe und der Leitungseinführungen etc.

**Beispiel: Berechnung der maximal zulässigen Verlustleistung ( $P_v$ )**

|                                                                                                                  |                                                                                                          |
|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Maximal zulässige Temperatur im Innern des Gehäuses ( $\vartheta_{max}$ ):                                       | z.B. 55° C                                                                                               |
| Umgebungstemperatur der (des) Gehäuse(s) ( $\vartheta_u$ ):                                                      | 25° C                                                                                                    |
| Maximal zulässige Erwärmung im Innern des Gehäuses:                                                              | $\Delta\vartheta = \vartheta_{max} - \vartheta_u = 55^\circ \text{C} - 25^\circ \text{C} = 30 \text{ K}$ |
| Maximal zulässige Verlustleistung der eingebauten Betriebsmittel inklusive Verdrahtung ( $P_v$ ) gemäß Diagramm: | Gehäuse Größe 3 (540 x 270 x 163 mm)                                                                     |
| Einzelgehäuse:                                                                                                   | $P_v = 53 \text{ W}$                                                                                     |
| Mittelgehäuse:                                                                                                   | $P_v = 45 \text{ W}$                                                                                     |
| Randgehäuse:                                                                                                     | $P_v = 48 \text{ W}$                                                                                     |

**Beispiel: Berechnung der Temperatur im Innern des Gehäuses ( $\vartheta$ )**

|                                                             |                                                                                                                                      |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Umgebungstemperatur der (des) Gehäuse(s) ( $\vartheta_u$ ): | 25° C                                                                                                                                |
| Verlustleistung der eingebauten Betriebsmittel ( $P_v$ ):   | 30 W                                                                                                                                 |
| Erwärmung im Innern des Gehäuses gemäß Diagramm um:         | $\Delta\vartheta$                                                                                                                    |
| Gehäuse Größe 3 (540 x 270 x 163 mm) Einzelgehäuse:         | $\Delta\vartheta = 17 \text{ K}; \vartheta_i = \vartheta_u + \Delta\vartheta = 25^\circ \text{C} + 17 \text{ K} = 42^\circ \text{C}$ |
| Gehäuse Größe 3 (540 x 270 x 163 mm) Mittelgehäuse:         | $\Delta\vartheta = 20 \text{ K}; \vartheta_i = \vartheta_u + \Delta\vartheta = 25^\circ \text{C} + 20 \text{ K} = 45^\circ \text{C}$ |
| Gehäuse Größe 3 (540 x 270 x 163 mm) Randgehäuse:           | $\Delta\vartheta = 19 \text{ K}; \vartheta_i = \vartheta_u + \Delta\vartheta = 25^\circ \text{C} + 19 \text{ K} = 44^\circ \text{C}$ |

## Example schematic of an installation of four RGB DMX illuminators

DMX is based on RX485 and uses a symmetrical transmission procedure. The differential signal lies in between  $\pm 1.5V$  and  $\pm 5V$ .

Through the symmetrical transmission DMX provides high noise immunity, as external interference applies to both data connections evenly, and the receiver measures the differential signal rather than the absolute signal.

The signals are thus labelled " DMX+" and " DMX-" for the transmission, and " DMX GND" for the ground (electric screen).

" DMX-" must NEVER be connected to " DMX GND" .

The player interface, as well as the LED Controller Modules, are designed for an input voltage of 24V, a mains adapter output power of 50W should be used per driver module with connected lamp.

The player interface module provides a galvanic isolation between the external controller and the smart lamps DMX system, further increasing operational safety.

Furthermore, the 8-bit resolution DMX signal is converted to a 16-bit signal internally, to realize a smoother transition between colours.

## Casing integration and wiring

### General considerations

For failure-free operation, the following general rules concerning the installation in a distributor casing have to be considered:

Do not install DMX control wires close to power lines, as they can give rise to magnetic fields. Cable shielding is ineffective for low frequency magnetic fields.

An obligatory margin of 10mm between individual LED Controller Modules on the slit casing side must be adhered to, otherwise overheating and failure of the driver may occur.

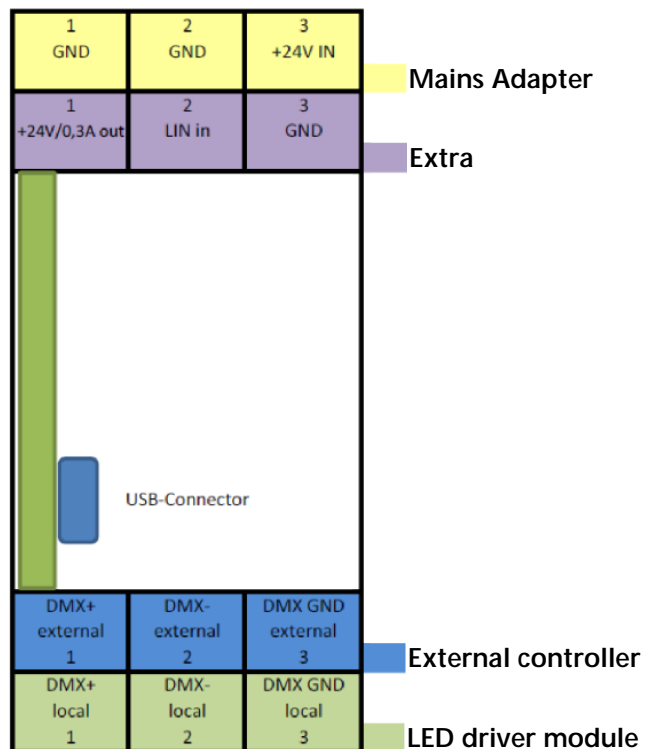
When using a two story distributor box it is recommended to install the mains adapters in the upper part, and the player interface module and LED controller modules in the lower part for enhanced heat dissipation.

Make sure to wire both the white AND the brown wire (both GND) of the DMX lamp to the DMX controller. The cross section of one wire is not sufficiently large to hold the entire current.

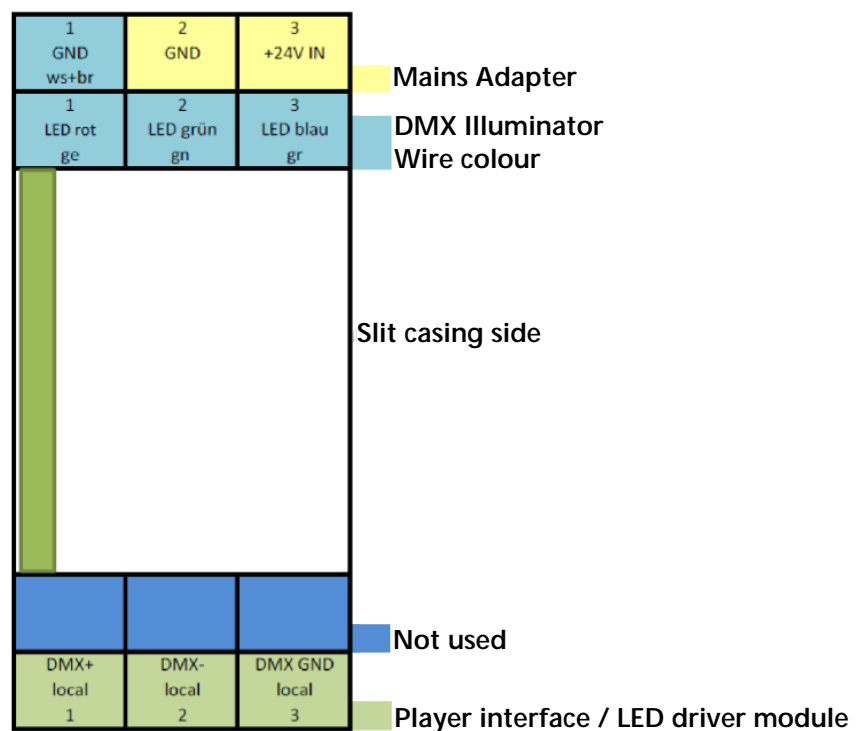
Connect the internal DMX control signal (DMC local) in parallel as a bus from the player interface up to the last LED controller. A 120R terminal resistance is to be connected between DMX+ and DMX- of the final LED driver module.

## Pin allocation of the modules

### DMX Player Interface

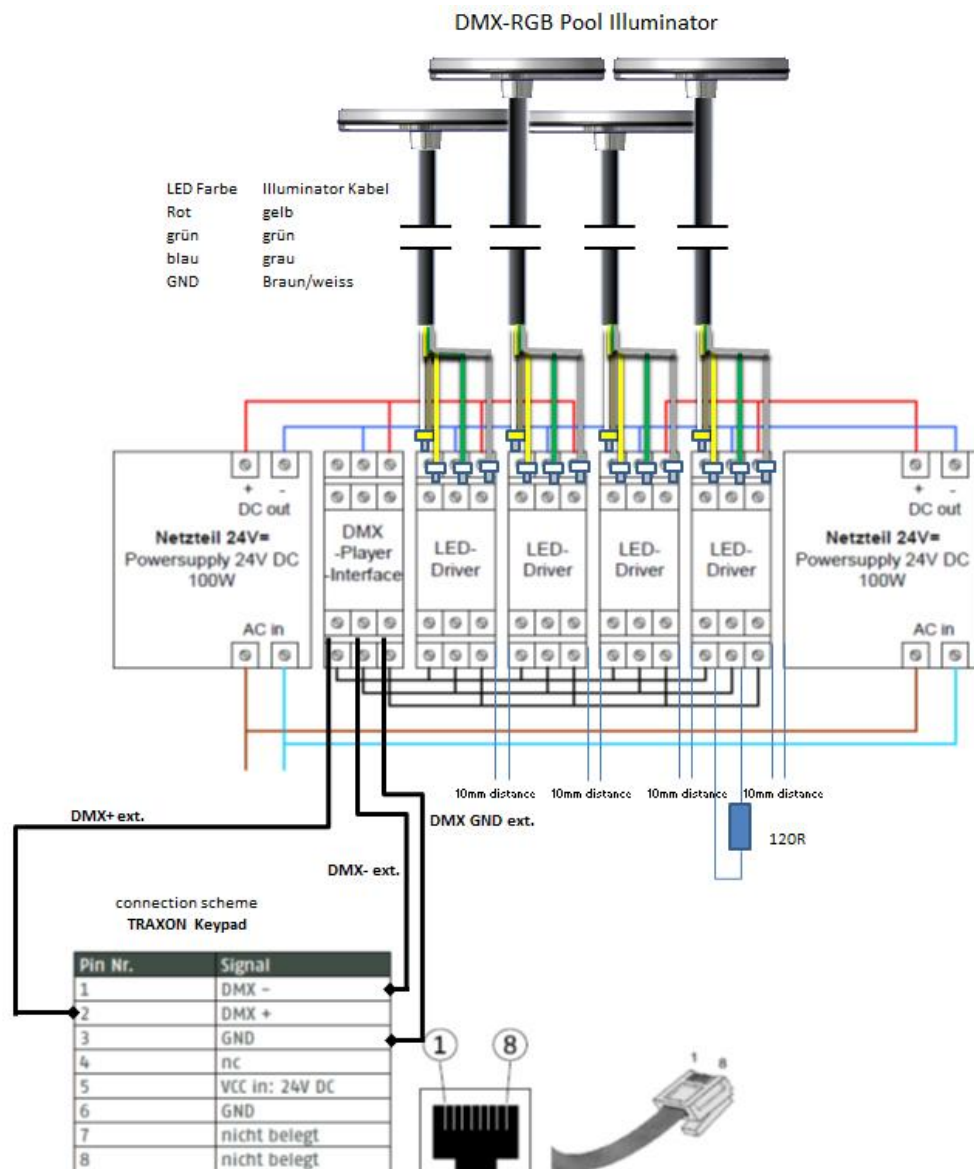


### DMX RGB LED Controller





## Example schematic of an installation of four RGB DMX illuminators



For operation of two LED controller modules, a 100W mains adapter is required. The ground (negative terminal) of the 24V voltage supply (" DC out -" depicted in dark blue) is to be connected through ALL modules. The positive terminal of the 24V voltage supply (" DC out +", depicted in red) may only be connected to two LED driver modules. The supply of the DMX player module can be effected by means of either one of mains adapters 1 and 2.

The DMX bus (depicted in black) is connected in parallel – starting from the DMX player module up to the final LED driver module.

LED colour    Illuminator cabel  
 Red            yellow  
 Green          green  
 Blue          grey  
 GND          brown/white

DMX+ Module1    -> DMX+ Module2    -> DMX+ Module3  
 DMX- Module1    -> DMX- Module2    -> DMX- Module3  
 DMX GND Module1 -> DMX GND Module2 -> DMX GND Module3

A 120R terminal resistance is to be connected between DMX+ and DMX- of the final LED driver module.

## Installation example



## 8. Detection and clearing of faults



### ATTENTION!



Should deviations from the usual state arise during operation of the system, turn off the smart lamps illuminator and seek a competent professional for fault clearing.

Conduct fault detection and clearing according to the following table:

| Type of fault                                   | Potential Cause                                                                                                | Correction                                                                                                                                                                                                                                        |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Failure of the smart lamps illuminators         | Defective 230V fuse                                                                                            | Check 230V fuse and replace in case of defect                                                                                                                                                                                                     |
|                                                 | Disruption in the power supply                                                                                 | Inspection of mains adapters and connections to be performed by qualified technician                                                                                                                                                              |
|                                                 | Illuminator defective                                                                                          | Replacement of illuminator by qualified technician                                                                                                                                                                                                |
| Illuminator working, but light clearly too weak | Insufficient cooling                                                                                           | Water temperature too high; only temperatures up to 37°C are permissible.                                                                                                                                                                         |
|                                                 | Faulty assembly, heat transfer surfaces are blocked                                                            | Ensure that heat transfer surfaces are freestanding and accessible                                                                                                                                                                                |
|                                                 | Water circulation is impaired                                                                                  | Ensure that heat transfer surfaces are freestanding and accessible                                                                                                                                                                                |
|                                                 | The intensity of the LEDs decreases over time, the maximum operation duration of 10000 hours has been exceeded | Replacement of illuminator by qualified technician                                                                                                                                                                                                |
| Illuminators flicker                            | Defective contact in the electric circuit or corrosion at the contacts                                         | Inspection of all electrical connections and cables by a qualified technician and replacement in case of defect                                                                                                                                   |
|                                                 | Faulty power supply                                                                                            | Measure current and voltage at the mains adapters. In case of deviations from the usual state, replacement of adapters by technician                                                                                                              |
|                                                 | Voltage drop caused by long supply cables                                                                      | Measure voltage at the illuminator; installation of cable with a bigger cross section by qualified technician if necessary.<br><br>For other interferences and deviations turn off the illuminator immediately and contact a qualified technician |

## 9. Warranty and guarantees

- The "Warranty conditions for products of the BvR electronics GmbH" must be adhered to by all means. These can be found and accessed separately at [www.bvrelectronic.de](http://www.bvrelectronic.de) under the section "Download".
- All components of the LED underwater illuminators must be installed and wired as a connected technical system by a qualified technician.
- Combination with third-party products, especially regarding the power supply system, is strictly prohibited and voids any guarantees.
- It is mandatory to only use compatible smart lamps main adapters for each smart lamps illuminator. They are designed to match the product's current and power perfectly. Installation of other mains adapters may lead to substantial faults in functionality and pose a threat to your safety. BvR electronics can not be held accountable in this case.
- Unusual, extreme ambient conditions, such as under and over voltage, voltage peaks, excessive amounts of switching cycles, extreme incident UV radiation, frost, illicit changes, extremely high exposure to chemicals (e.g. chlorine, nitrite, fluoride, phosphate) voids any guarantees on the part of BvR electronics.
- The customer is responsible for compliance with the required water standards. BvR electronics may not be held accountable if required water parameters are not met.
- Moisture and intruded water in the smart lamps illuminators do not present a fault in functionality, as the lamps will continue to operate orderly. The product features multiple water barriers, so that intruding water does not affect the functionality of the illuminators.
- Caused by constantly changing availability and improvement of technical components such as capacitors, LEDs and transistors, technical data, especially light colour and colour impression, can not be guaranteed in case of replacement deliveries. Changes in technical data must thus be explicitly reserved.
- The surface of the illuminators is covered by a special ceramic film that acts as corrosion protection ("Hard coating"). Minor damages of the protective layer can lead to an instantaneous onset of corrosion under certain water conditions. Avoid scratches and other damages on the surface of the product by all means. Any guarantees become void under such circumstances.

Edition 12/14 technical changes / error reserved