BERNARD GRUPPE

Operating Instructions

BMC

BERNARD Mobility Controller

11/2026



The **BMC** connects up to four **BMA TLC** devices to the **controller** of a traffic signal system. It supplies the connected BMAs with power and transmits traffic-dependent requests via **potential-free contacts**.

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Data sheet V2.2

Technical data	
Function	**Interface** between the **BMA TLC** and the **traffic light controller**; supplies **power** to the connected **BMA TLCs**.
Number of BMAs	1 - 4
Outputs	12 potential-free (galvanically isolated) switches with screw connection. Imax = 700 mA, Umax = 60 VDC
Diagnostic outputs	Freely configurable, up to 4 potential-free (galvanically isolated) switches with screw connection. Imax = 700 mA, Umax = 60 VDC
Mounting	DIN rail
Connection cable BMA	**BMA V3** 2 cores. Cable cross-section and maximum cable length at **24 V** / **30 V** input voltage.

Cable cross-section	24 V	30 V
1.5 mm²	150 m	300 m
0.75 mm²	75 m	150 m
0.5 mm²	50 m	100 m

BMA V2
2 cores. Cable cross-section and maximum cable length at **24 V** / **30 V** input voltage.

Cable cross-section	24 V	30 V
0.75 mm²	75 m	120 m

Connection parameters	
Input voltage	24 - 30 VDC
Power consumption	≤ 2 W for BMC plus ≤ 25 W per connected BMA
Environmental requirements	
Temperature range	-20 °C to +60 °C
Humidity	≤ 95 % (at 25 °C)
Safety requirements	
CE tested according to	EMC 2014/30/EU Road traffic signal systems - Electromagnetic compatibility EN 50293
Conducted interference emission and interference radiation	Compliant with EN55032 (CISPR32) Class B

Technical data	
Dimensions	
L x W x H	108 x 115 x 61 mm
Weight	< 1 kg

NOTE

The supplier assumes no liability for compliance with local requirements or additional certifications that may be required in certain regions or markets. It is the responsibility of the purchaser or user to ensure that the product complies with local regulations and specific requirements that may go beyond the specified certifications. The supplier disclaims all liability for any damage or loss that may result from non-compliance with such additional requirements.

Scope of delivery

- 1 x BMC
- 1 x power supply
- 1 x connection cable (1 m) between power supply and BMC
- 1 x wiring harness for 12 contacts on the BMC

Operating instructions V2.2

For reasons of readability, the masculine form has been chosen in the text, the information refers to all genders.

List of abbreviations

BMA	BERNARD Mobility Analyser
BMC	BERNARD Mobility Controller
TLS	Traffic light system
OUT	Output-side switched contacts
PLC	Power line communication

Fundamentals

The BMC links the BERNARD Mobility Analyser (BMA) and a traffic light system (TLS). The BMA, an intelligent optical system for the identification of objects, can initiate vehicle-actuated switching recommendations, such as request, dimensioning and registration. This information is transmitted to the BMC and countermeasures (relieving the traffic light system) can be initiated.

Please be sure to observe the safety instructions for protection against electric shock and the risk of injury. Read the operating instructions carefully before starting work

These operating instructions must be kept in the vicinity of the BMC to ensure that it is used in accordance with the applicable safety regulations at all times;

- The operating instructions must be kept in a safe place! If the BMC is passed on to a third parties, they must be passed on with it.
- Use the BMC only for its intended purpose.
- Before commissioning, ensure that the mains voltage corresponds to the specified mains voltage.
- No voltage must be applied to the device during installation.
- Installation must be carried out by qualified personnel and must comply with all local regulations.
- The BMC can be damaged by even a slight shock. Ensure careful handling, storage and transportation.

All information and instructions in these operating instructions have been compiled taking into account the applicable standards and regulations, the state of the art and many years of knowledge and experience.

The manufacturer accepts no liability for damage in the following cases:

- Non-compliance with these instructions
- Use other than the intended use
- Use by insufficiently qualified personnel
- Unauthorized modifications
- Technical modifications
- Use of unauthorized spare parts

The actual scope of delivery may deviate from the explanations and illustrations described here in the case of special versions, the use of additional ordering options or due to the latest technical changes. The obligations agreed in the contract documents, the general terms and conditions as well as the manufacturer's terms of delivery and the statutory regulations valid at the time of conclusion of the contract shall apply.

In addition to the safety instructions in these operating instructions, the safety, accident prevention and environmental protection regulations applicable to the area of use must be observed. The following applies in particular:

- The operator must inform himself about the applicable health and safety regulations

- The operator must clearly regulate and define the responsibilities for installation, operation, troubleshooting, maintenance and cleaning;
- The operator must ensure that all persons handling the BMC have read and understood these instructions. In addition, he must train the personnel at regular intervals and inform them about the dangers
- The operator is responsible for ensuring that the BMC is always in perfect technical condition.

The following therefore applies:

- The operator must ensure that the maintenance intervals described in this manual are adhered to
- The operator must instruct the personnel regularly. An instruction log must be created for better follow-up.

General safety instructions

Safety instructions are identified by symbols in these operating instructions. The individual instructions are introduced by signal words that express the level of hazard.

The instructions must be followed to avoid accidents, personal injury and damage to property.

Explanation of symbols

DANGER

Danger! Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Warning! Indicates an imminently hazardous situation that must be avoided.

NOTE

Caution! Indicates a potentially hazardous situation which, if not avoided, may result in damage to property and the environment.

TIP

Hint! Highlights useful tips and recommendations.

Personnel qualification

Work on the BMC may only be carried out by a qualified electrician or by instructed persons under the direction and supervision of a qualified electrician in accordance with the electrotechnical regulations.

Life phase	Qualification
Mounting	Basic technical training of instructed personnel
Commissioning	Specialized electrical engineering training
Maintenance	Basic technical training of instructed personnel
Decommissioning	Specialized electrical engineering training
Disassembly	Basic technical training; instructed personnel

Intended use

> **NOTE**
>
> **Caution!** Unforeseeable risks of hazards may arise if the device is not used as intended, i.e. that is not described under intended use or that goes beyond the intended use.

The BMC is intended exclusively for controlling traffic light systems (individually depending on object classes, environmentally sensitive control, public transport priority) and for pedestrian flow detection (movement flows, counting, warning if limit values are exceeded). The BMC is designed for public use outdoors or in enclosed spaces.

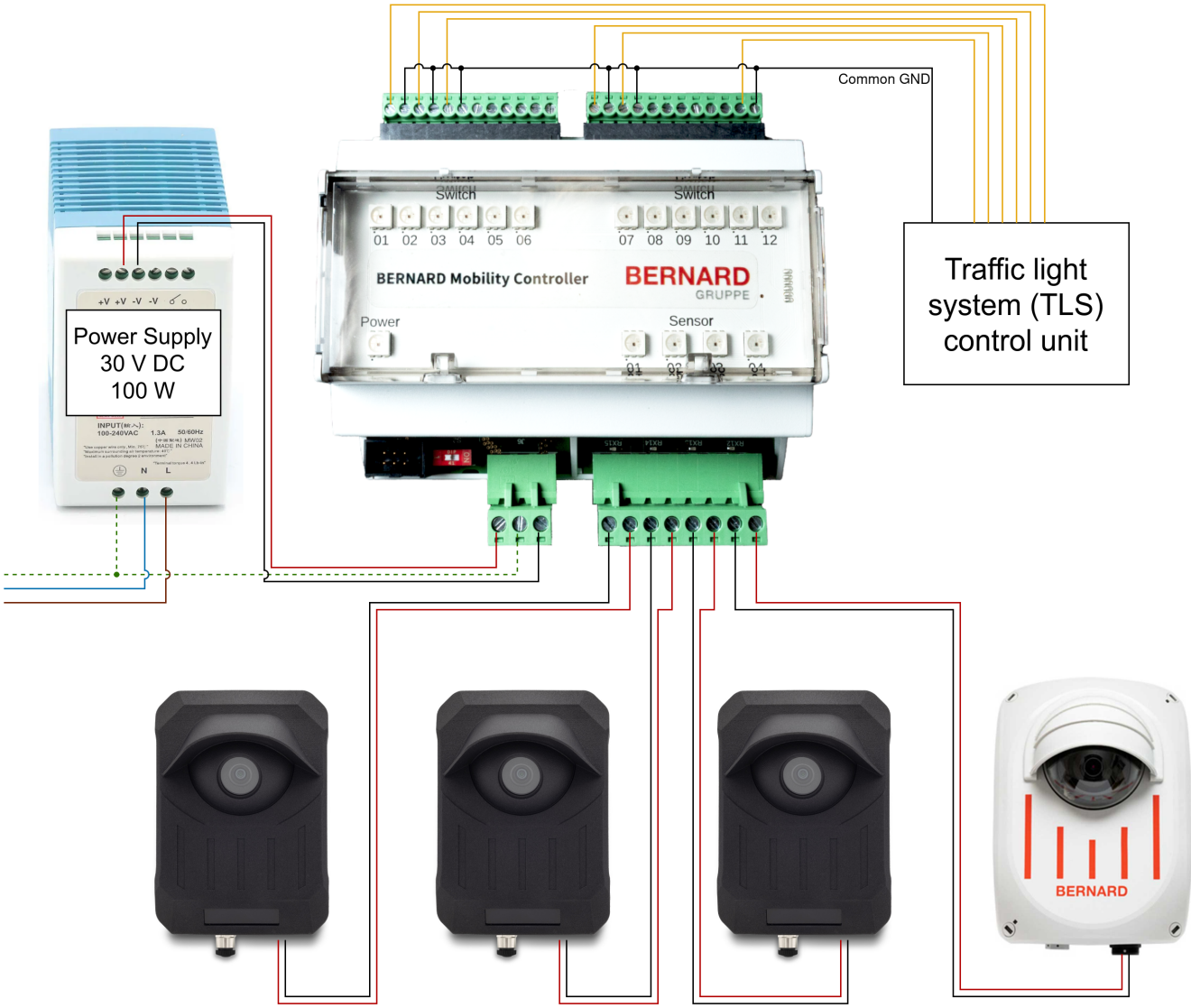
The BMC may only be used in accordance with the specifications in the operating instructions. All instructions, safety regulations and compliance with the prescribed operating, maintenance and servicing conditions must be observed. No modifications, attachments or conversions may be made to the BMC without the manufacturer's approval.

For damage resulting from improper use

- the operator bears sole responsibility.
- The manufacturer accepts no liability whatsoever.

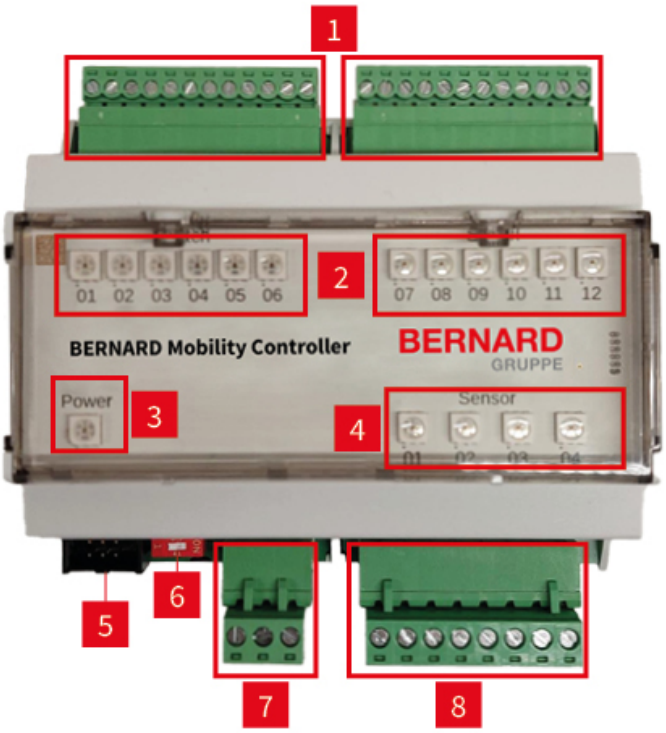
Schematic structure TLS- BMC - BMA

The following shows the schematic structure of an intelligent traffic light system (TLS) in conjunction with the BERNARD system. This system, consisting of power supply, BMC and BMA, is regarded as a single unit and as such fulfills the legal requirements. Up to four BMAs can be connected to one BMC. The BMAs communicate with the BMC via power line communication. The connection between the control unit of the TLS and the BMC is made via up to twelve potential-free optocoupler switching contacts, so that the BERNARD system is electrically isolated from the TLS and no electrical interference is to be expected.



System structure for operation with one TLS.

Description of the BMC



1 Clamping plugs potential-free contacts (OUT)

2 Status LEDs potential-free contacts

3 Power LED

4 Status LEDs BMA

5 Programming port

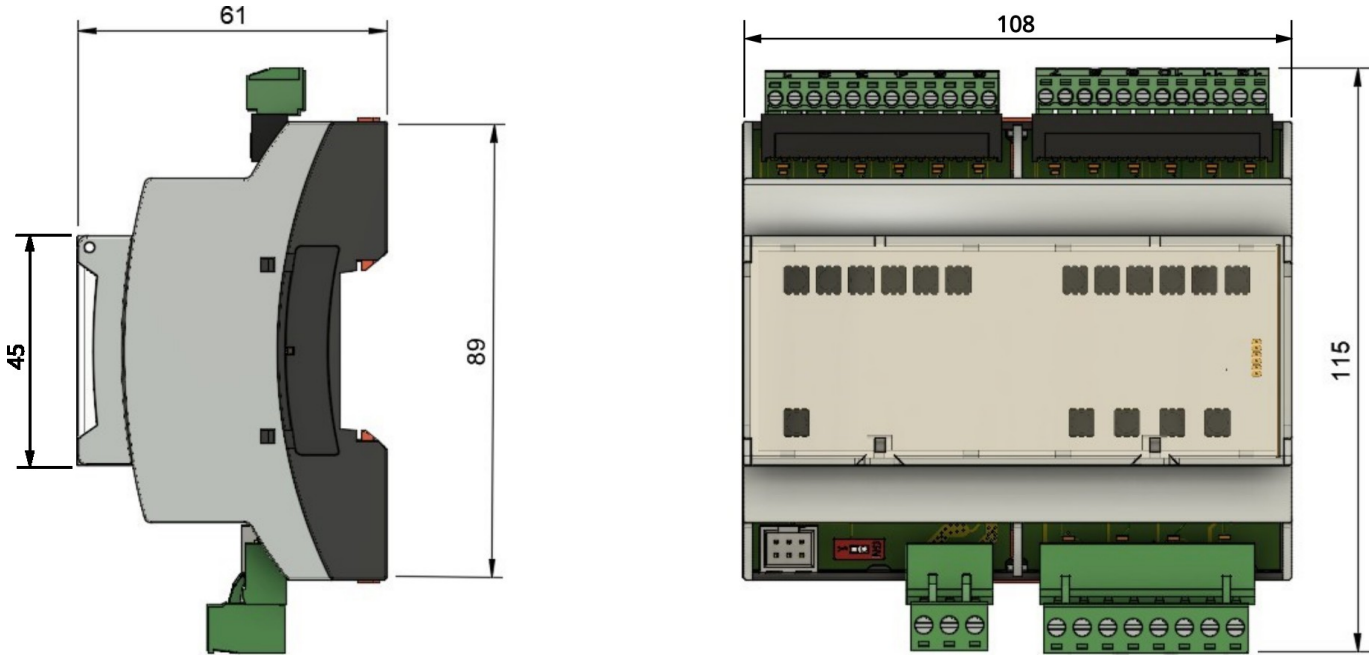
6 Master slave switch (position 1)

7 Clamping plug power

8 Clamping plug BMA connections

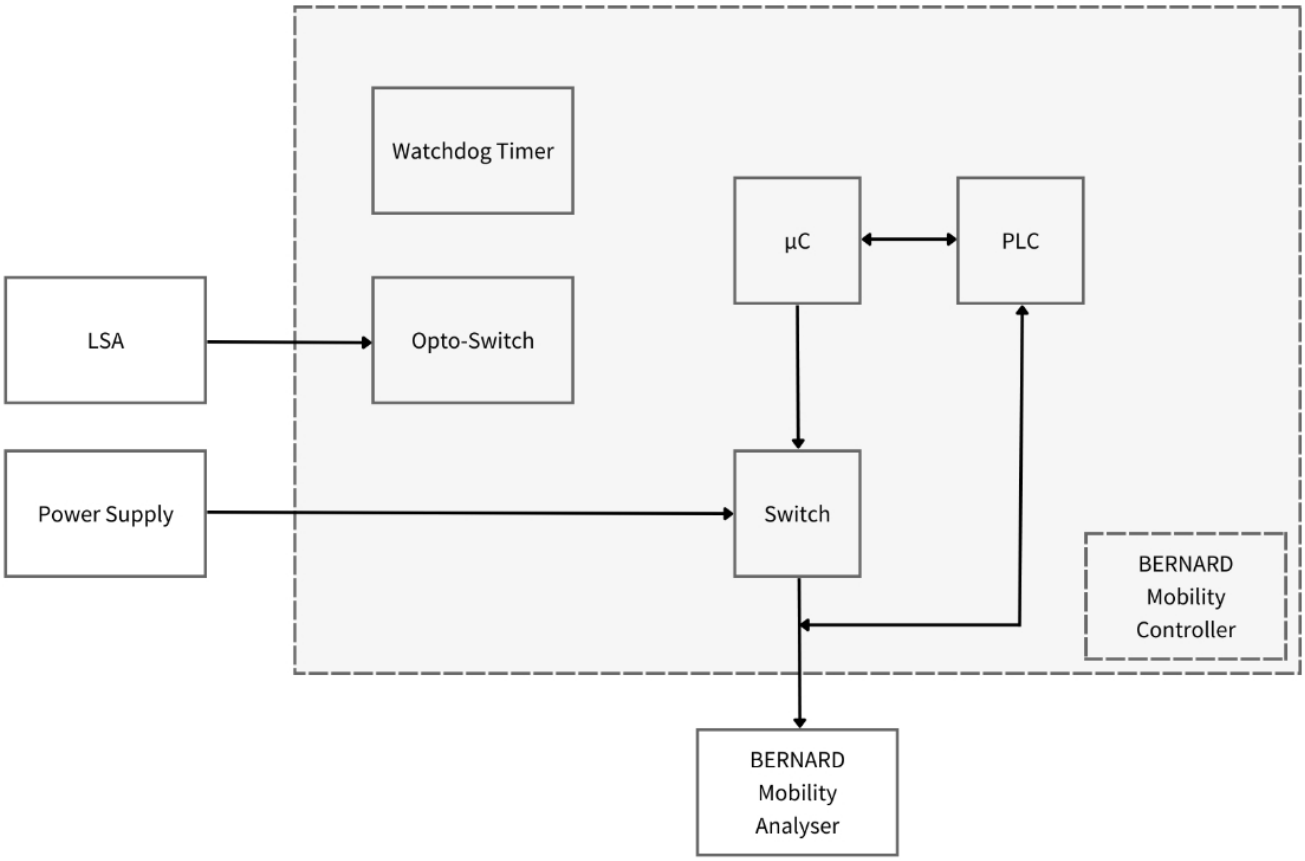
Elements of the BERNARD Mobility Controller

Device dimensions



Dimensions of the BMC in millimeters (mm)

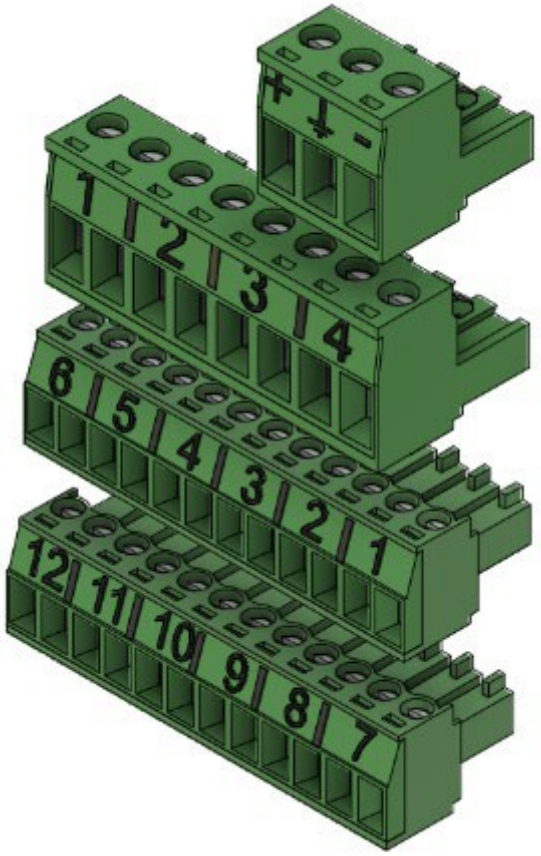
Block diagram



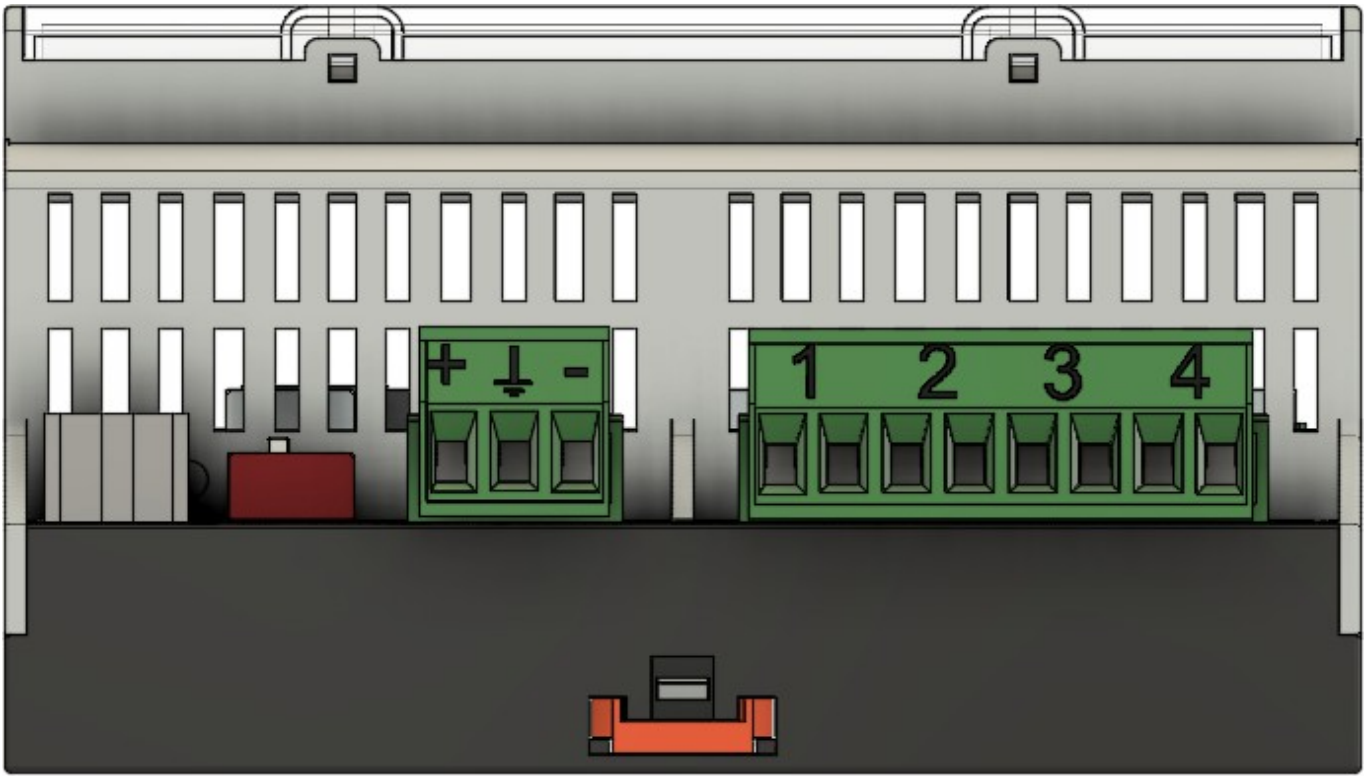
Block diagram of the BMC

Terminal connections

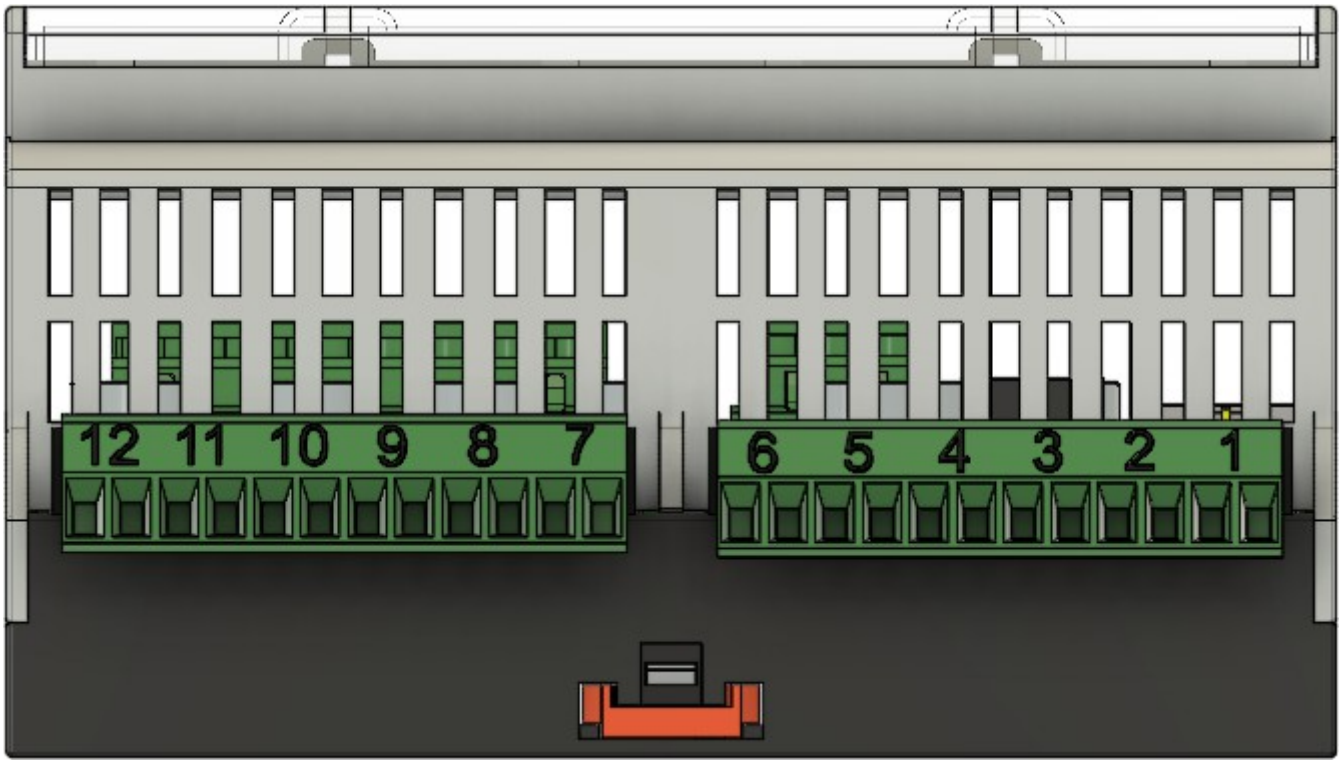
Suitable for stranded or solid wire with a conductor cross-section of 0.129 to 3.31 mm² or AWG 22 to 12. For the power and BMA connections, a wire cross-section of ≥0.75mm² or ≤ AWG 18 is recommended.



Terminal connectors from top to bottom: Power, BMA connections, floating contacts 1-6, floating contacts 7-12



Front view



Rear view

Power supply

The following power supply is used to supply the BMC with power: Meanwell MDR-100-24 (datasheet | manual). The power supply is supplied with the BMC. Only the use of this power supply is recommended. With a cable length > 5 m, the DC voltage must be set to 30 V using "+V Adj" to compensate for a possible voltage drop on the connecting cable between the BMC and BMA. A cable cross-section greater than 0.75 mm² is recommended for the connecting cable between the BMC and BMA.

Transportation, packaging disposal and storage

> **NOTE**
>
> **Caution!** Damage due to incorrect transportation! Incorrect transportation can cause considerable material damage

Only open and completely remove the packaging at the actual installation site.

Transportation

The BMC is packed by the manufacturer for transportation. The delivery should be checked for completeness and transport damage immediately upon receipt so that remedial action can be taken quickly if necessary.

Disposal of the packaging: Separate the packaging materials accordingly and take them to the appropriate collection points for recycling and environmental protection.

Storage

If possible, the device must be stored in a dry and dust-free place. Avoid direct UV radiation.

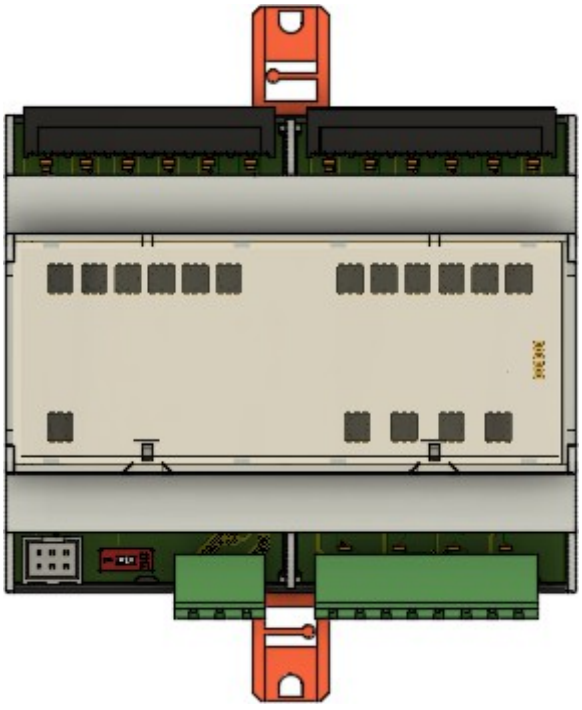
Installation

The installation of the BMC in combination with one or more BMAs is described below.

> **NOTE**
>
> **Caution!** Incorrect handling or inattention can lead to injuries or crushing. Installation only by a suitably trained specialist or demonstrably instructed personnel. Local safety, accident prevention and environmental protection regulations must be observed during installation.

> **TIP**
>
> **Hint!** Ensure that connected cables have been connected correctly. Cables must be firmly clamped in the connection blocks. It is therefore recommended to check each cable clamp before commissioning.

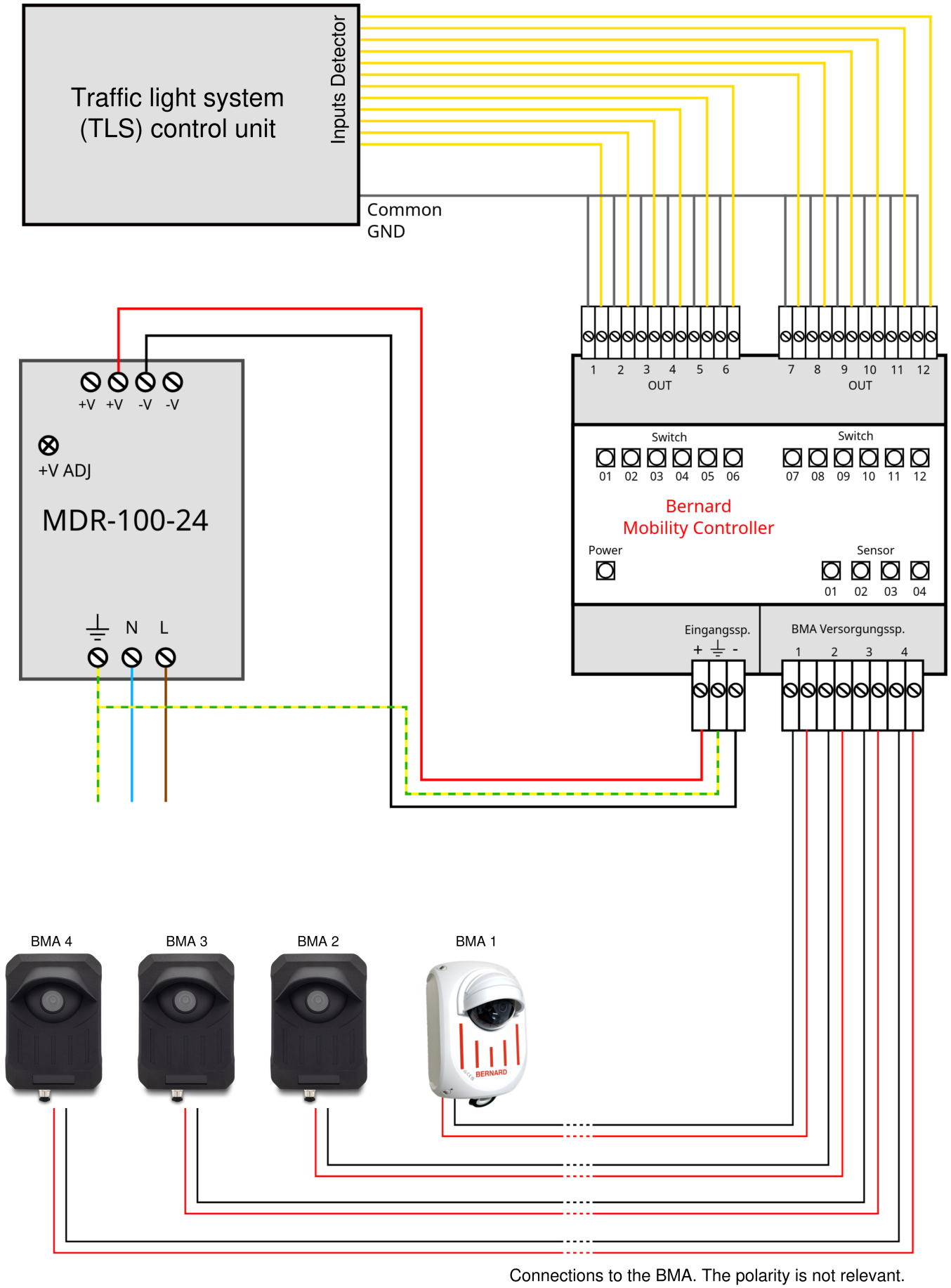
1. De-energize the system
2. Snap the Power Supply onto the DIN rail. For a cable length > 5 m: Set the DC voltage to 30 V using "+V Adj".
3. disconnect all connection blocks from the BMC
4. open the BMC baselatch (orange) as shown in the illustration. Place the BMC on the DIN rail and close the baselatch again. The BMC should now be firmly seated on the DIN rail.



BMC with extended base latches

1. Establish the 24V DC connection between the power supply and the BMC connection block (see wiring diagram). Check the connections and plug the connection block into the BMC.

2. Connect the cables to the BMA with the BMA connection block (see wiring diagram). The polarity is not relevant. Check the connections and plug the connection block into the BMC.
3. Connect the cables from the control unit to the connection block of the potential-free contacts. As shown in the wiring diagram, connect the common ground of the control unit to one of the two outputs of the potential-free contacts. Check the connections and plug the connection block into the BMC.
4. Establish a 230V AC mains connection to the power supply: Connect the protective earth conductor (PE), the neutral conductor (N) and the phase conductor (L) to the power supply as shown in the wiring diagram.



Connections to the BMA. The polarity is not relevant.

Wiring diagram

Commissioning

DANGER

Danger! Danger due to electric current! Failure to observe the safety instructions may result in injury or death!

WARNING

Warning! Commissioning may only be carried out by appropriately trained specialist personnel. (see also chapter Personnel qualification).

1. Switch on the system.
2. The power LED on the power supply should light up
3. The power LED on the BMC should light up yellow for 5 seconds and then change to green. The connected BMAs are now supplied with power via the BMC.
4. As soon as the BMA has started up (this can take a few minutes), the BMA can be configured via the Bernard Control Center and a corresponding potential-free contact can be assigned to the region of interest zones. See Configuration of the BMC in the BERNARD Control Center.
5. If a zone is configured, the corresponding BMC switch LED should light up when the zone is occupied.

For further steps on operating the BERNARD Control Center, please refer to the "BERNARD Control Center" operating instructions.

LED display

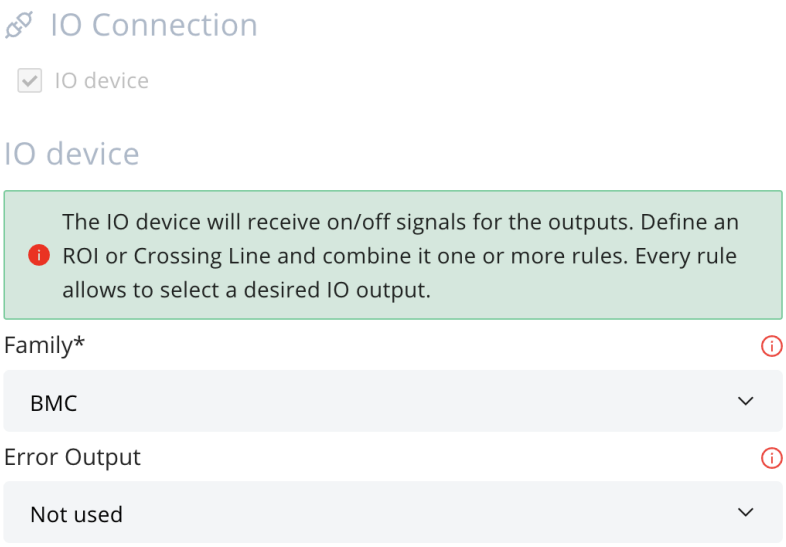
The RGB LEDs of the BMC show the following functions:

- Power LED:
- **Off:** BMC switched off.
- **Yellow:** BMC starts (5 seconds).
- **Green:** BMC in operation.
- Sensor LEDs:
- **Flashing green:** Heartbeat received from corresponding BMA (4 second interval).
- **White:** BMA watchdog active.
- Switch LEDs:
- **Off:** Contact open.
- **Green:** Contact closed.

Configuration of the BMC in the BERNARD Control Center

System configuration is carried out via the **Bernard Control Center**.

1. Select the corresponding **BMA** in the Control Center.
2. In the settings, enable the checkbox **“IO-device”** (see figure).
3. Save the changes using the **“Save”** button at the bottom of the page.

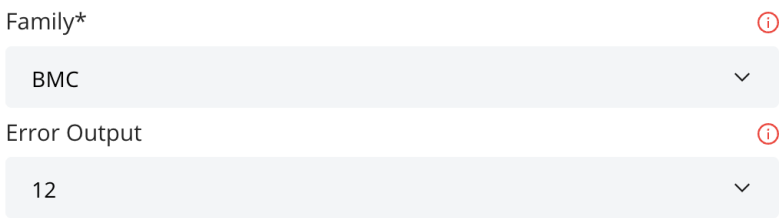


IO-device configuration of the BMC

> **INFO**
>
> The BMC's twelve potential-free contacts form a shared pool and are not divided into fixed blocks per BMA. One BMA can use all twelve; adding BMAs does not change the numbering or require equal allocation. A 9/1/1/1 split is therefore valid. Error outputs use contacts from the same pool and reduce the number available for event rules.

Configuration of the Error Output (optional)

A contact of the IO device can be used to signal errors to the controller.



Error output

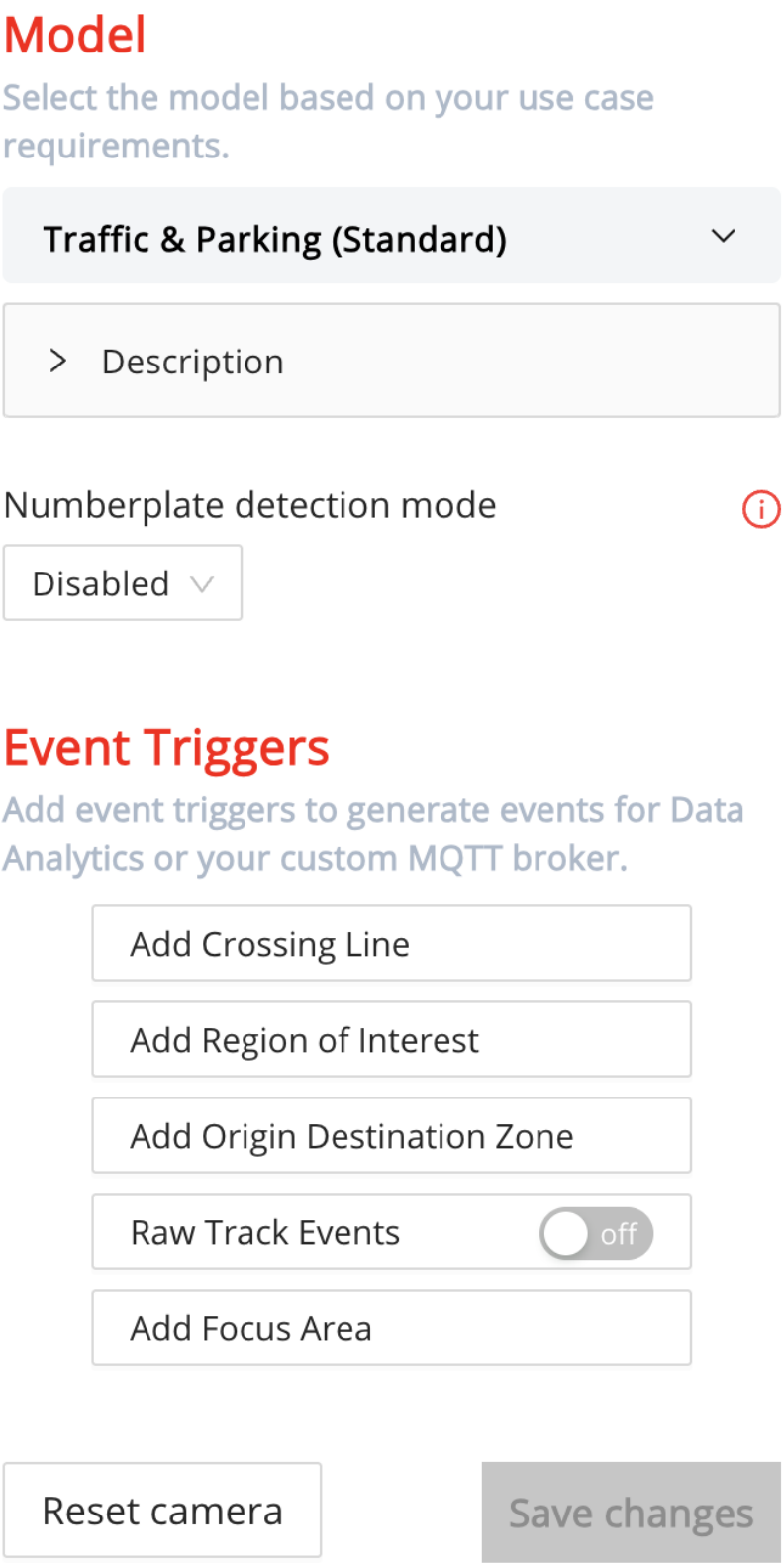
- **Contact closed (enabled):**
- BMC and BMA TLC are in normal operation.
- **Contact open (disabled):** one of the following conditions applies:

- **BMA TLC**
  - Insufficient power supply
  - Temporary interruption of processing (e.g., during configuration changes or software update)
  - Processing stopped due to an error
- **BMC**
  - Insufficient power supply
  - Connection to the BMA TLC lost (e.g., cable break)

Configuration of Event Triggers, Rules, and BMC Contacts

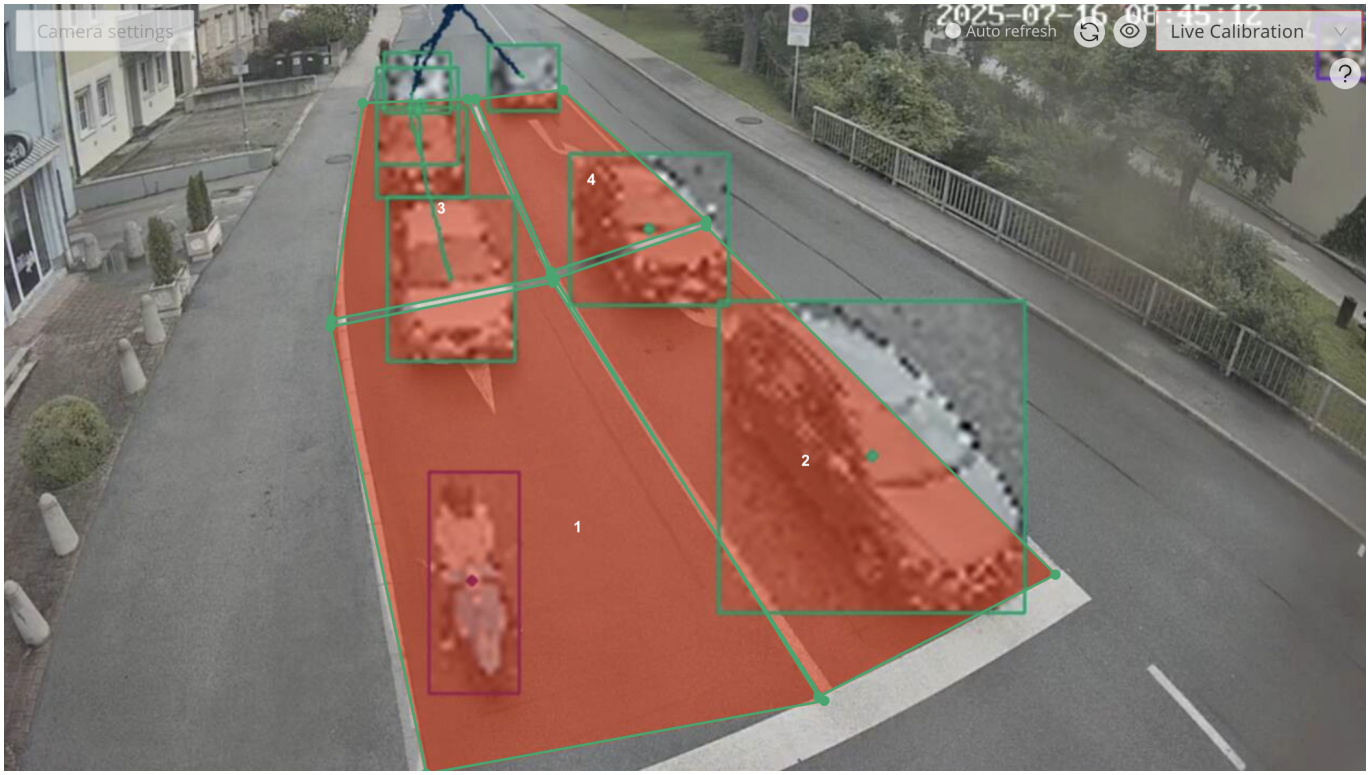
The assignment of **Region of Interest (ROI) zones** and **Crossing Lines (CL)** to contacts is done in the section **“Model & Event Triggers”** (bottom left in the camera view).

1. Open the **“Event Trigger”** section.
2. Add the desired **ROI zones** or **Crossing Lines**.
3. Save the changes with **“Save”**.



Event Trigger Configuration

After completing the configuration, the overview may look similar to the example shown below:



Example Application with Configured Region of Interest (ROI) Zones

Configured Event Triggers

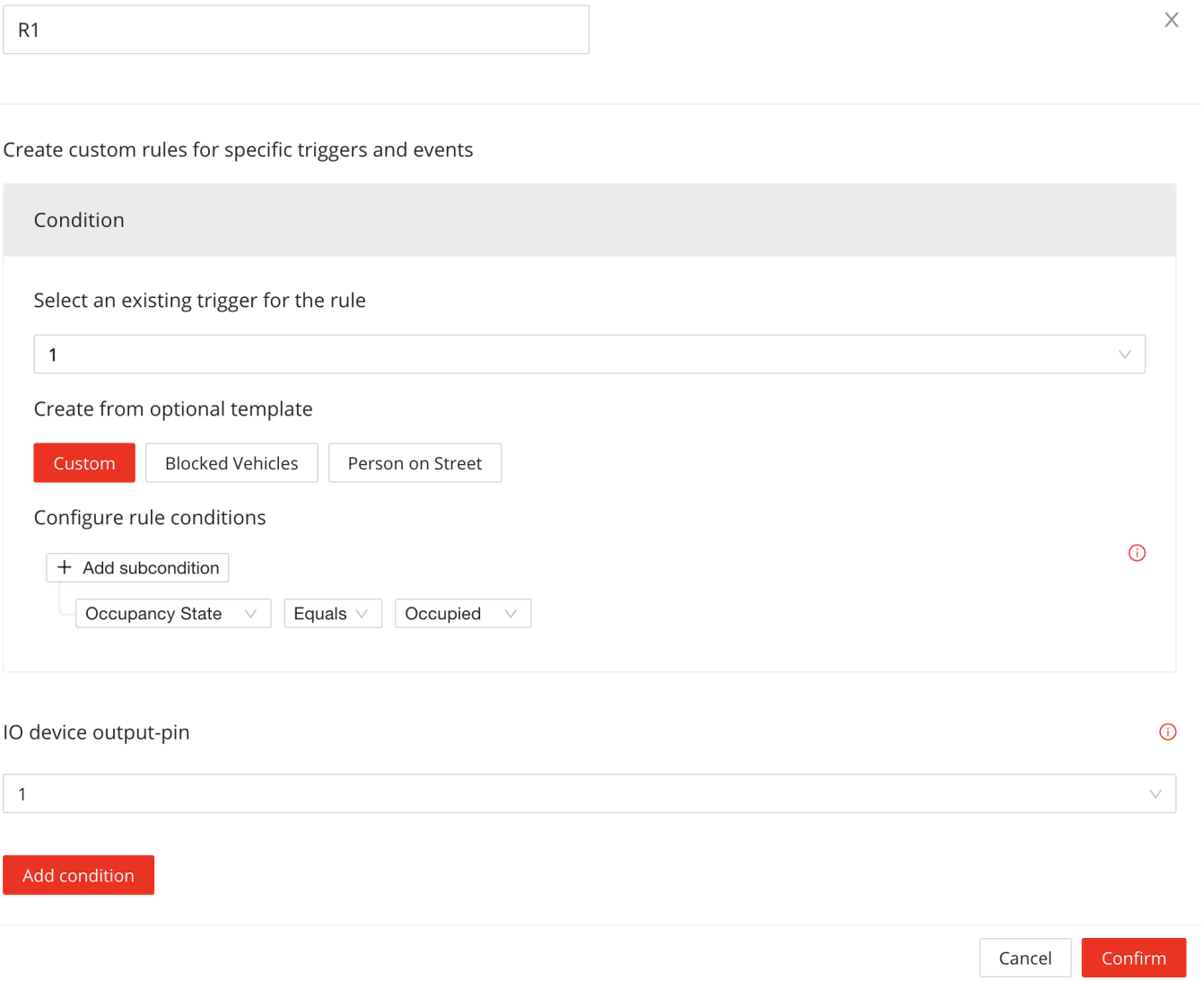
Select, edit or delete the current event triggers.

Trigger Name	Type	UUID	Action
4	ROI	0a240df0-965e-4326-a03f-84cdf130de32	
3	ROI	710d0ea9-341b-4a29-83bb-24074160b5a6	
2	ROI	4b1dae85-d210-4ae2-aa6f-d283e98fc48d	
1	ROI	49b58105-29f0-4062-8036-a06058b41470	

Configured Event Triggers

To configure potential-free contacts, proceed as follows:

1. In the Control Center, open the **“Custom Rules”** section.
2. Click **“New Rule”**.
3. Define the conditions under which the contact should be switched (e.g., triggered by an ROI or a Crossing Line).
4. Save the rule.



Rule Configuration in the Control Center

In this configuration, the potential-free contact 1 of the BMC is closed as long as an object (vehicle/ person) is located in zone “1”. More complex conditions can also be configured, for example: The contact is only switched for specific vehicle classes (e.g., prioritizing buses).

Add rules for additional zones and then click **“Save”**. The contacts will then be switched according to the configured rules.

Custom Rules

Rules can customize the default trigger logic.

New rule

Rule Name	Trigger Name	IO Pin	Rule	Action
R1	1	1	Region of interest-Occupancy State Equals Occupied	
R2	2	2	Region of interest-Occupancy State Equals Occupied	
R3	3	3	Region of interest-Occupancy State Equals Occupied	
R4	4	4	Region of interest-Occupancy State Equals Occupied	

Overview of Event Triggers with Configured Rules

NOTE

The configuration of rules for Crossing Lines is similar to that of ROIs. However, the functionality differs: For **Crossing Lines**, the configured contact is closed for a short time interval (approx. 150 ms) as soon as the defined rule is fulfilled (e.g., when a vehicle crosses the Crossing Line in the “In” direction). This makes it possible to use the contact, for example, to count the number of passing vehicles.

Maintenance

In the interest of constant operational readiness, a visual inspection of the BMC and the BMA and cleaning of the acrylic dome of the BMA should be carried out at least once a year by a suitably trained specialist or demonstrably instructed personnel (see Personnel qualification). Software updates are carried out by the manufacturer with the customer's consent.

Cleaning

> **NOTE**
>
> **Caution!** The use of rough cleaning cloths can damage the acrylic element and thus impair its function.

Only clean dust and grease on the acrylic with a soft cloth and a little cleaning alcohol. If the device has been stored for a long time, you can use a dry cloth to remove the dust residue on the housing.

Malfunctions

If the system malfunctions, the following points should be checked one after the other.

Fault	Possible cause	Remedy
Power supply LED does not light up	Defective or interrupted supply line.	Check the electrical supply line.
	Power supply is defective.	Replace the power supply. Contact the support team.
BMC power LED does not light up	Defective or interrupted supply line.	Check the electrical supply line.
	BMC is defective.	Contact the support team.
Sensor LED of the connected BMA does not flash green every 4 seconds (no heartbeat is received from the BMA)	Defective or interrupted supply line to the BMA.	Check the electrical supply line. If the BMA itself is in operation ("Online" connection in the Control Center), the supply line is not the problem.
	The supply cable to the BMA is too long.	The voltage drop on the supply cable is too great for a reliable power supply to the BMA. Use a shorter supply cable or a cable with a larger cross-section.
	BMA is still in the start-up process or is performing an update.	Check again after 10 minutes.
	BMA not correctly configured.	See Configuration of the BMC in the BERNARD Control Center.
	Communication between BMA and BMC is disrupted, e.g. by electromagnetic interference from parallel lines.	Contact the support team. Use shielded twisted-pair cables.
Status LED of the potential-free contact does not light up although the vehicle is in the zone.	BMA not correctly configured.	See Configuration of the BMC in the BERNARD Control Center.
Status LED of the potential-free contact lights up, but the control unit does not register switching operation	Defective or interrupted cable. Incorrect assignment in the control unit.	Check the electrical cable. Check the assignment in the control unit.

Decommissioning, dismounting and disposal

DANGER

Danger! Electrical current: Ensure that the power supply is switched off or disconnected. Failure to do so may result in serious injury or death.

NOTE

Warning! Decommissioning only by authorized and competent persons.

NOTE

Warning! Incorrect handling or inattention can lead to injuries or crushing.

To decommission the BMC, disconnect the system from the power supply. Remove all terminal plugs from the BMC. Open the base latch and dismount the BMC. The cables can then be removed from the terminal plugs.

At the end of its service life, the BMC must be disposed of properly. The local disposal regulations apply to the disposal of all device parts and packaging materials.

Do not dispose of the BMC in the residual waste. In accordance with European Directive 2012/19/EU on waste electrical and electronic equipment and its transposition into national law, used electrical and electronic equipment must be collected separately and recycled in an environmentally friendly manner.

Regulations

GDPR

No personal data is read or processed in the BMC. This means that the use of the BMC is harmless under data protection law.

Safety

The BMC complies with the Electromagnetic Compatibility Directive 2014/30/EU. This results in the CE certification affixed to the underside of the device.

Environmental management

The BERNARD Gruppe is committed to producing its products in a sustainable and environmentally friendly manner. The BMC complies with the RoHS Directive 2011/65/EU.

Modification

It is not permitted to modify the BMC in any way. Any modifications will invalidate the manufacturer's service and liability with immediate effect.