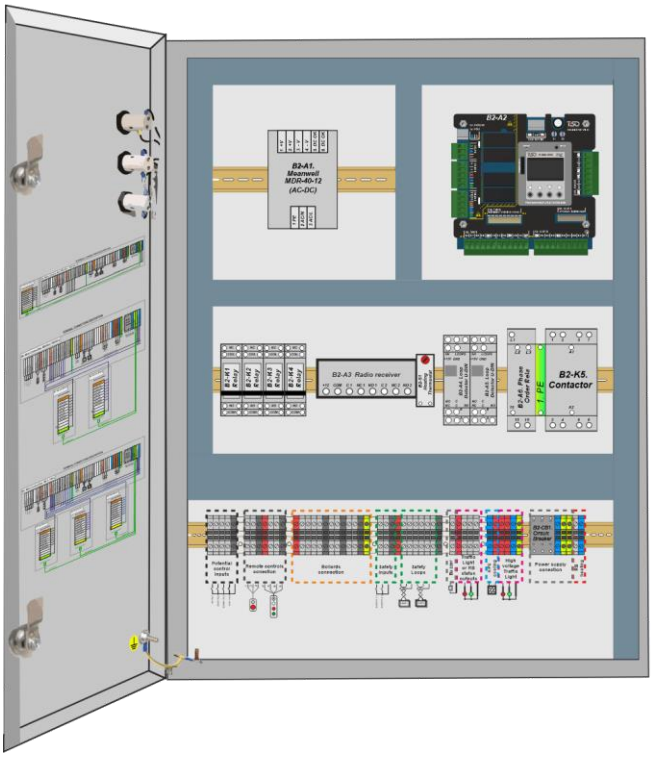
Original guide

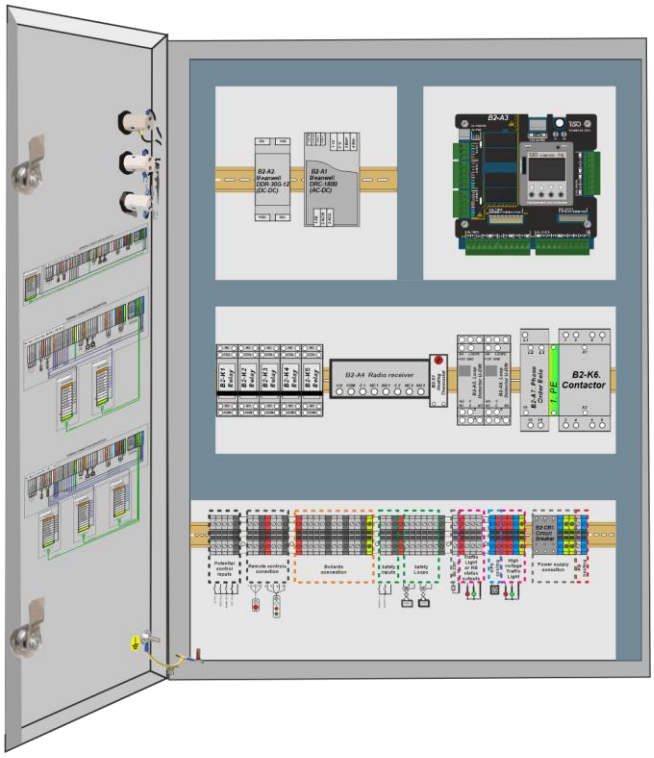
# OPERATION AND MAINTENANCE MANUAL. PART II.
# ELECTRICAL CONNECTION OF BOLLARDS (SERIES RB)

## for automatic anti-ram bollards with external hydraulic unit

**Electronic control unit RB108**




**Electronic control unit RB109**



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## INTRODUCTION

The Bollards be installed and connected to control unit, power supply network and other devices only by certified professionals strictly observing electrical and mechanical safety regulations!

This Manual must be scrutinized prior to the Bollard installation, connection, putting into operation and maintenance!

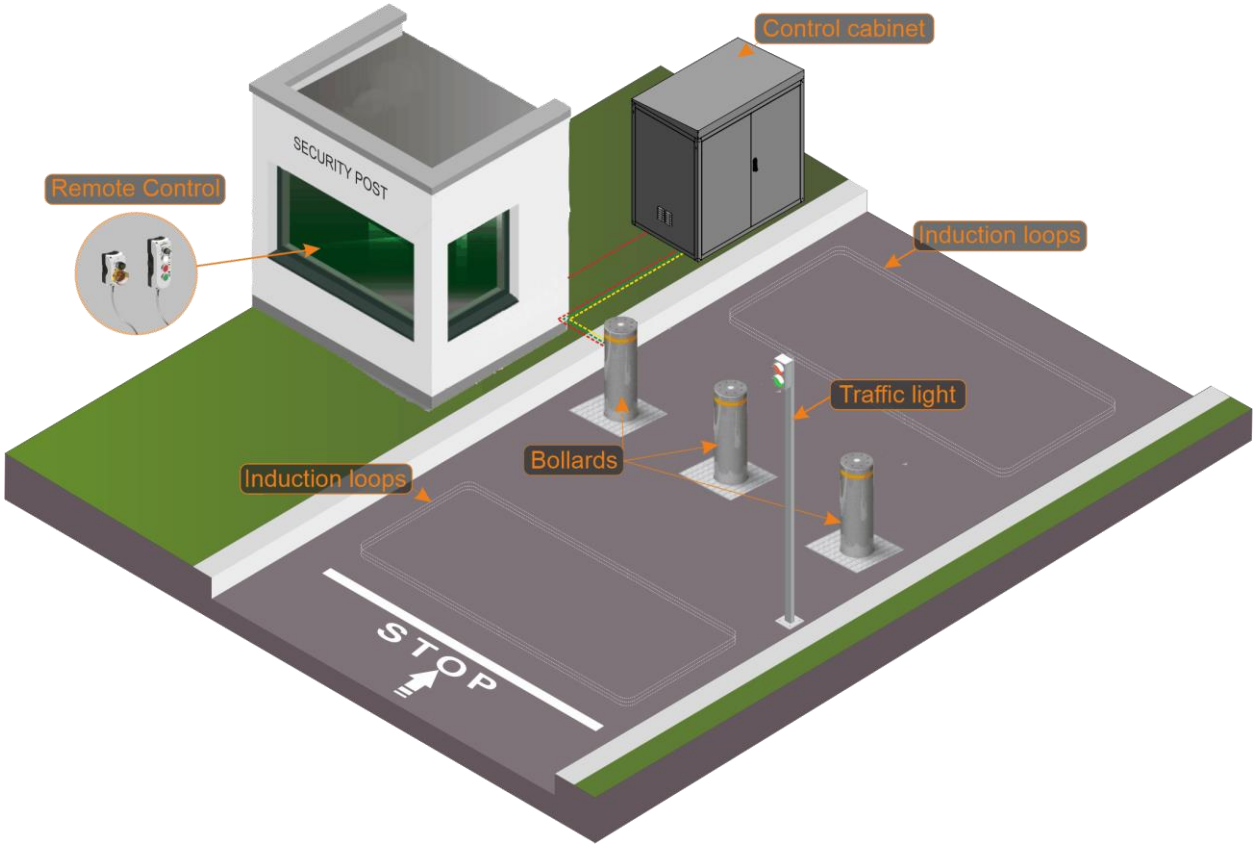


*Fig.1.* Access control system for a protected area



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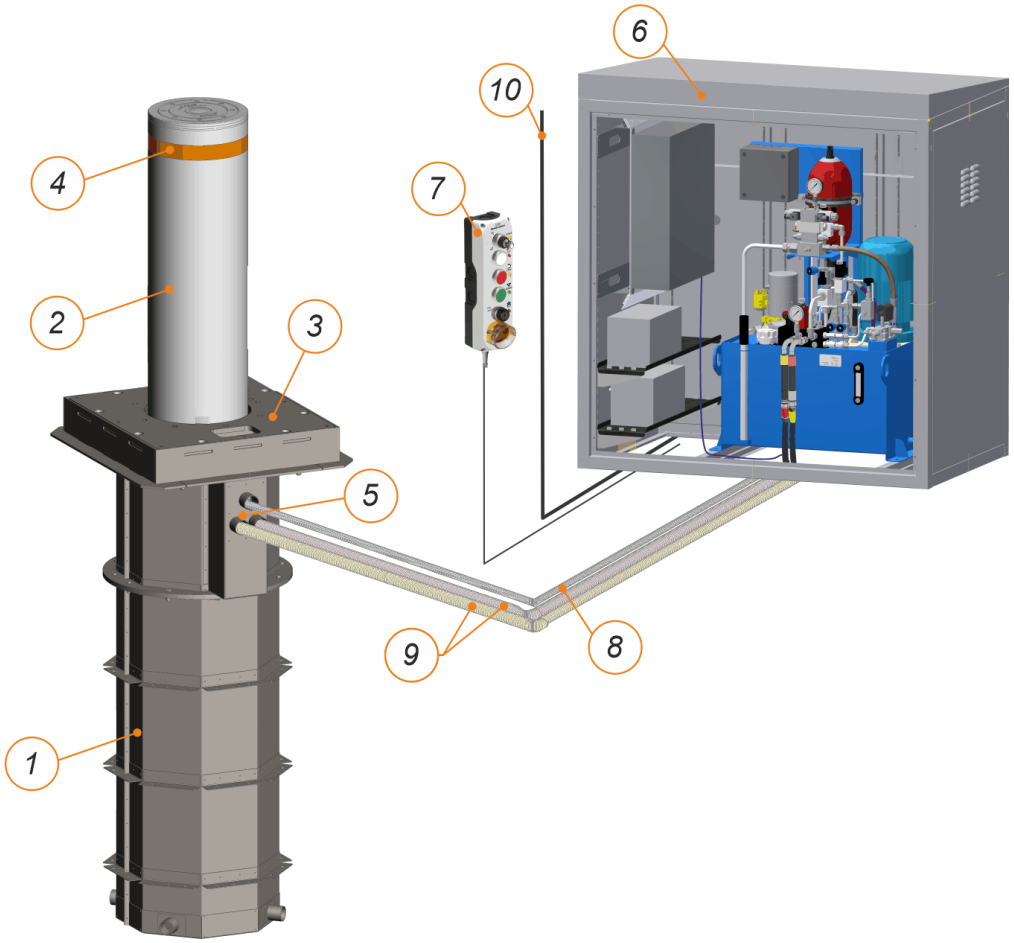
# 1. DESCRIPTION OF THE MAIN CONTROL COMPONENTS AND ELECTRICAL PARTS OF THE BOLLARD

## 1.1 The main control components and electrical parts of a Bollard

The Bollard include **external hydraulic unit.** The control unit is assembled a box and is located in the external hydraulic unit cabinet.

Accordingly electrical control cables and two hydraulic hoses are connected from the external hydraulic unit cabinet to the Bollard.

The distance from the external hydraulic unit equipped with control unit to the Bollard is defined by allowable length of hydraulic hoses.




***Legend:***

1. Installation casing;
2. Retractable tube;
3. Frame;
4. Reflective band;
5. Place for entering communications;
6. Control cabinet with HU and ECU:
   - Hydraulic unit (HU);
   - Electronic control unit (ECU);
7. Remote Control;
8. Cable connecting (OLFLEX CLASSIC 12x0,75);
9. Hydraulic high-pressure hoses (HPH);
10. Power cable (400V – 3 phase 50/60 Hz).

*Fig.2.* Main components of Bollard and control cabinet



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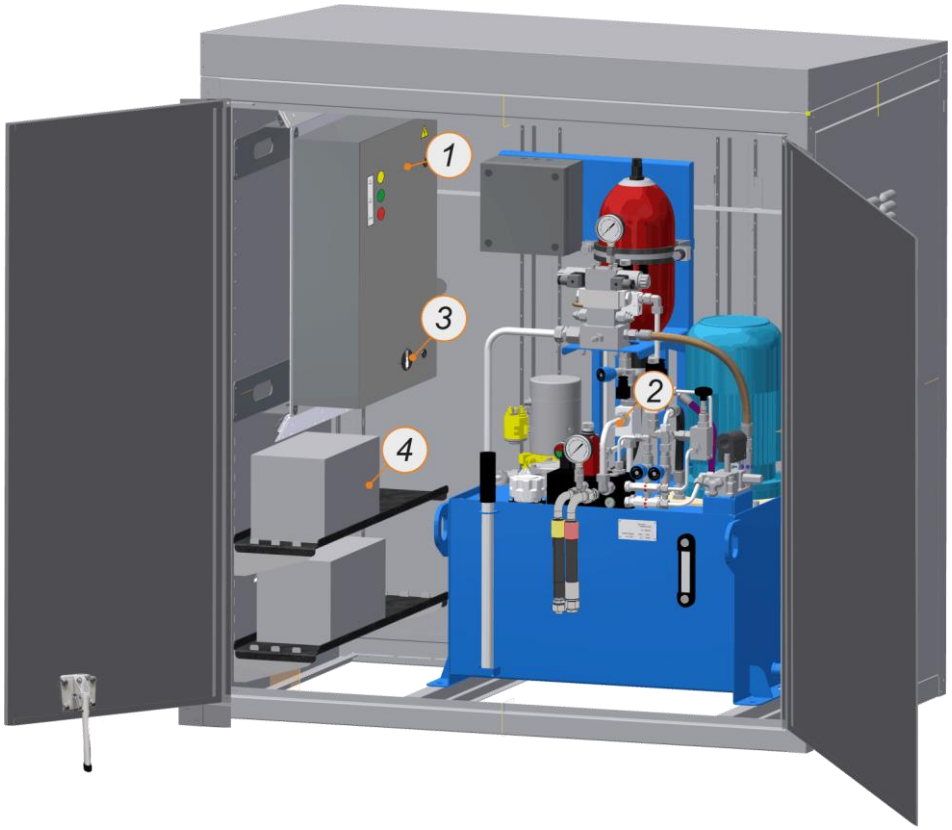
### 1.2 Control cabinet with ECU and HU




***Legend:***

1. Electronic control unit (ECU) RB108-1 / RB108-2 / RB108-3 / RB109-1 / RB109-2 / RB109-3
2. Hydraulic unit
3. Main power switch
4. UPS (uninterruptible power supply)
5. Door lock

**Unlocking the cabinet doors:**

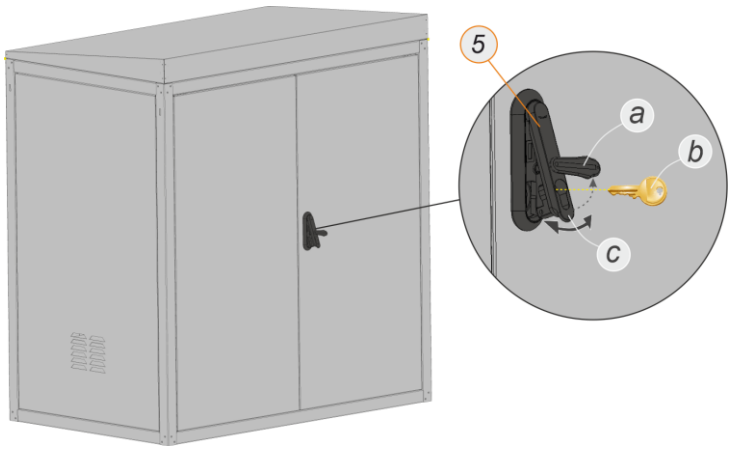



*Fig.3.* Assembly of Bollard control cabinet



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**1.3 Classification of electronic control units depending on selected functions**

| Number of bollards / Availability of UPS option | 1 | 2 | 3 |
|---|---|---|---|
| - | RB108-1 | RB108-2 | RB108-3 |
| Option UPS | RB109-1 | RB109-2 | RB109-3 |

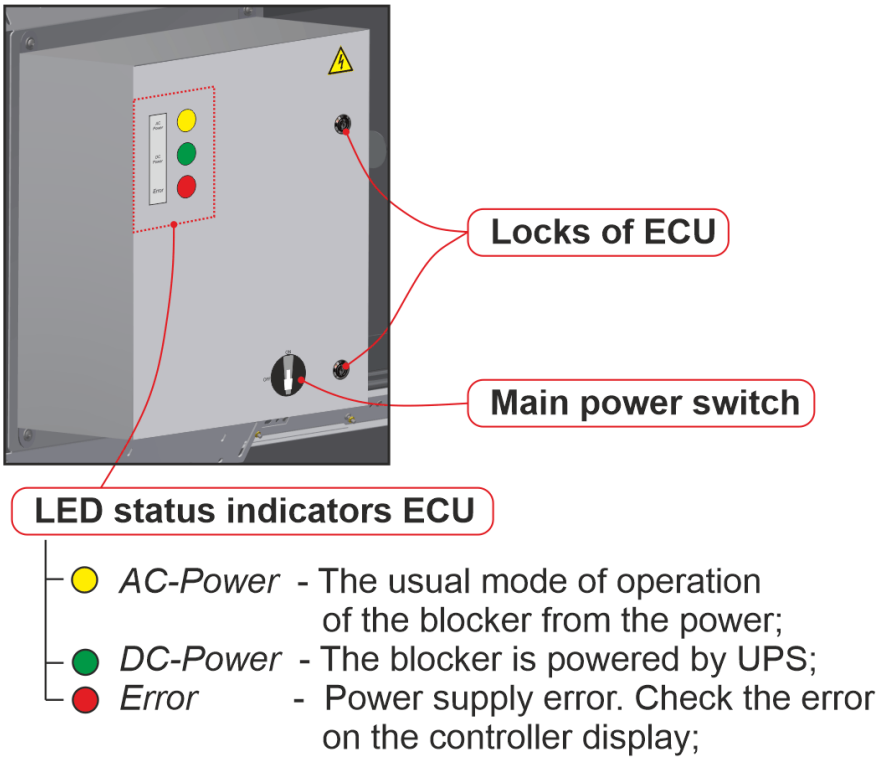
## 2. PURPOSE AND OPERATION OF ELECTRONIC CONTROL UNITS

### 2.1. Appearance and placement ECU ~~БЕУ~~ RB108-X / RB109-X

The Bollard electric control unit is a controller with auxiliary electric parts and is designed to control them.

The control unit is assembled in metal box. The Bollard power supply and control signals are connected to the control unit and electrical control cable and protective earthing cable are connected to the Bollard from control unit.

In general one control unit can control fully independently two independent homogeneous Bollards. All control units are assembled based on the versatile controllers PCB350.02.




*Fig~~Рис~~.4.* Appearance of the electronic control unit in the cabinet



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### 2.2. Description of the structural diagram ECU RB108 and RB109

The **Electronic Control Unit (ECU)** is a set of electronic components that can be divided into groups, each serving its own functional purpose.

There are two types of control units, which are identical in their functional purpose but slightly differ in their component structure.

**RB108-1, RB108-2, RB108-3** – Standard control unit **without UPS option**.

**RB109-1, RB109-2, RB109-3** – Control unit **with UPS option**.

**Electronic control unit RB108-X without UPS option**

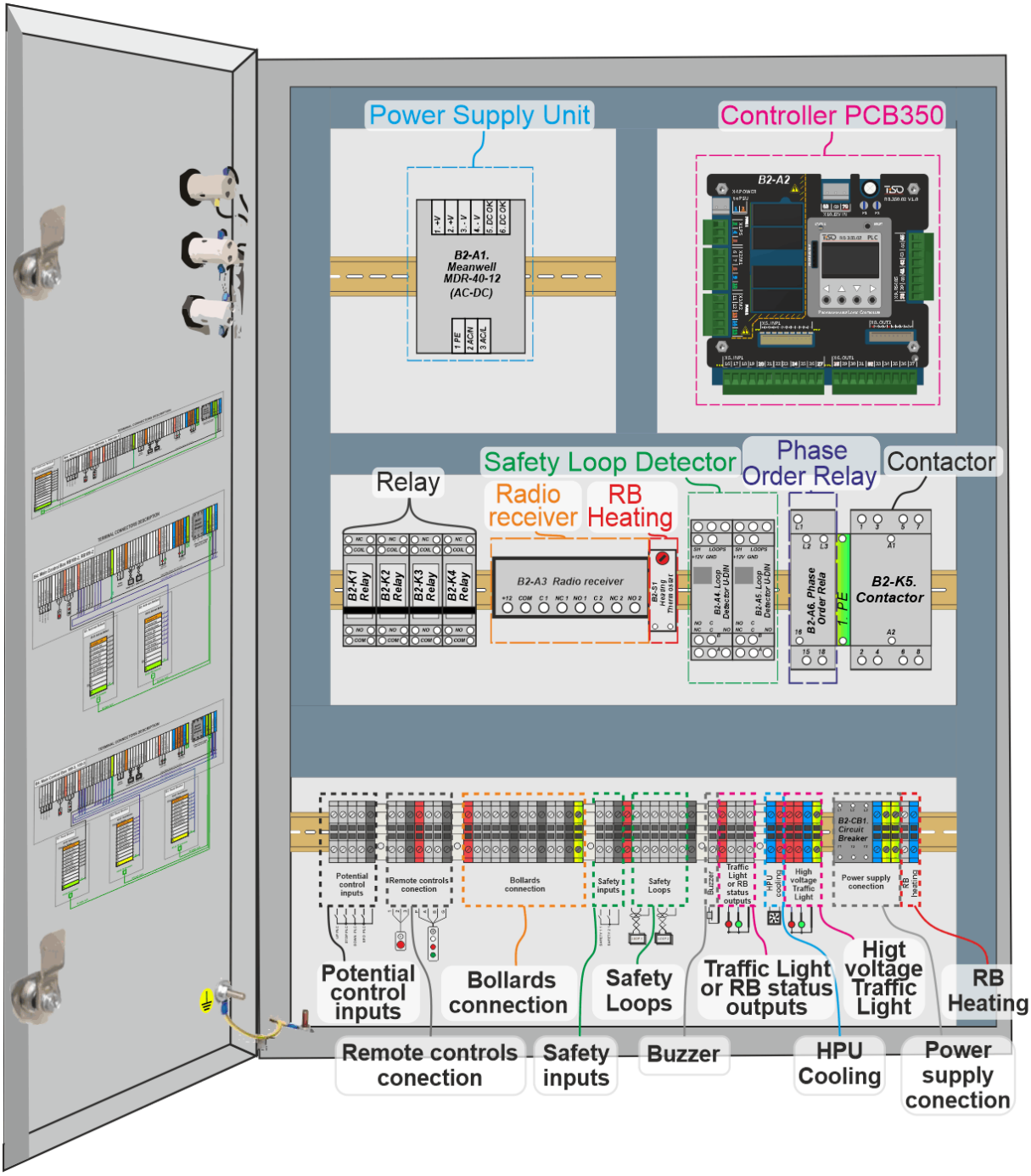


*Fig.5.* Main components of the electronic control unit RB108-X



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**Electronic control unit RB109-X with UPS option**

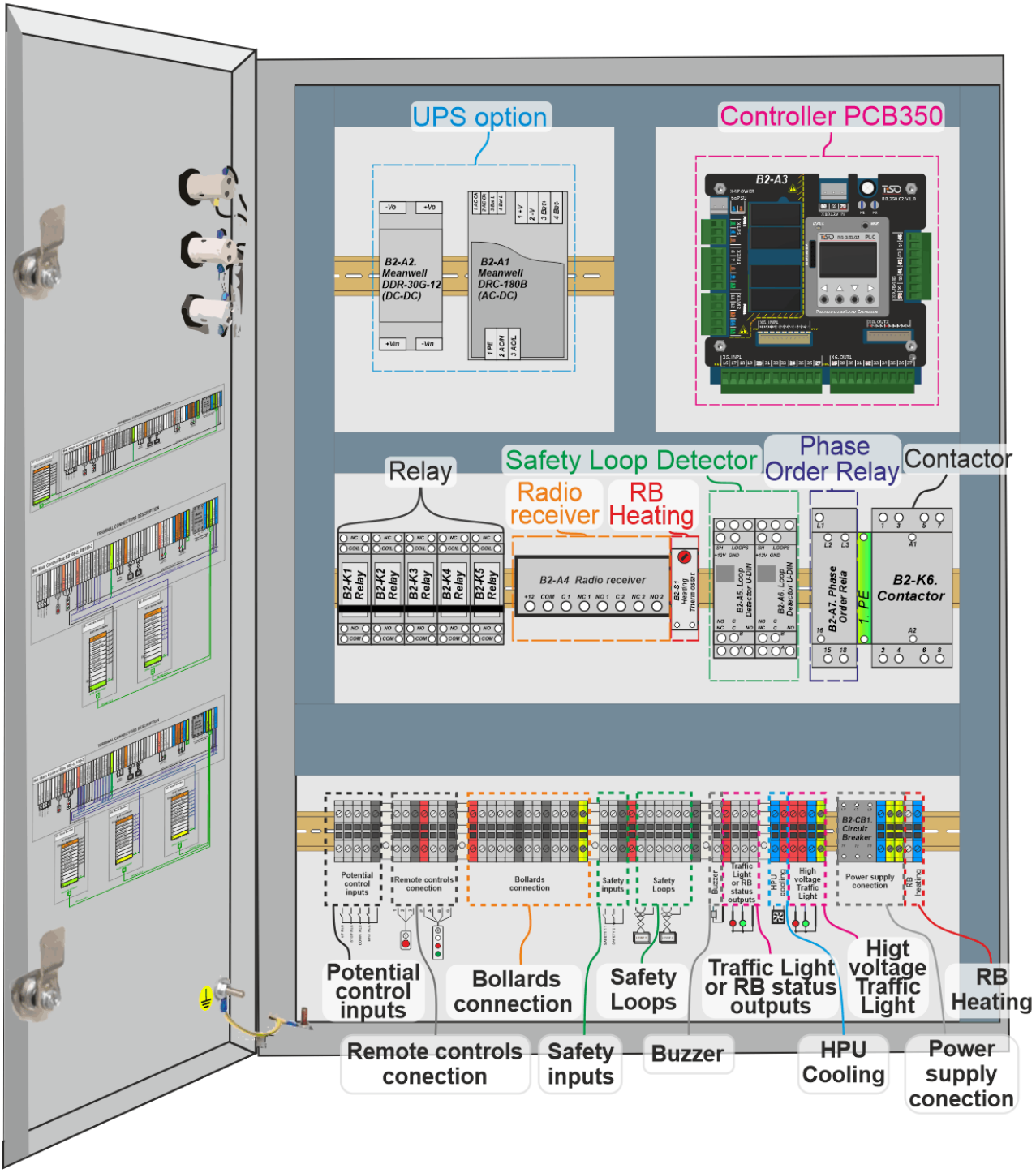


*Fig.6.* Main components of the electronic control unit RB109-X



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**Attention!**
The difference between the **RB108-1, RB108-2**, and **RB108-3** diagrams lies only in the number of connected bollards. The number of connected devices is indicated by the last digit in the diagram's name. Therefore, **RB108-1** means that only one device is connected to the control unit, and so on.
The **RB109-1, RB109-2**, and **RB109-3** diagrams also differ only in the number of connected bollards. Therefore, in the rest of the document, the diagrams will be referred to simply as **RB108** and **RB109**.

Since the device with the RB109 control unit is designed to operate from a battery in the absence of main power supply, all components of the diagram are powered by +24 V. In this configuration, all solenoid valves operate at +24 V. The main motor contactor is also powered by the same voltage. A key feature of the B2-A1 power supply unit is the built-in UPS function. This means the power supply automatically detects the absence of input voltage and switches to backup battery power. Because the PCB350 controller and the hydraulic system control relays operate at a nominal voltage of +12 V, a DC-DC converter from +24 V to +12 V is also installed in the control unit.

The RB108 control units do not include a UPS option and use a simpler power supply system. This version includes a single power supply that converts 230 V to +12 V for powering all components. In this configuration, different solenoid valves are used, which operate at 230 V AC.

*Table 1* - Description of Main Components of the Electronic Control Unit

| *№* | *Name of the Block (Terminals)* | *Function* |
|---|---|---|
| 1 | Controller PCB350.02 | TiSO Controller for Blocker Operation and Configuration |
| 2 | Power Supply Unit | Power Supply |
| 3 | UPS option (RB109) | Optional UPS (Uninterruptible Power Supply)<br>Battery Back-up for Power-off Situation |
| 4 | Relay Group | Relay (Hydraulic System) |
| 5 | Radio receiver (*1) | Optional Remote Radio Control |
| 6 | RB Heating (*2) | Thermostat with Regulator |
| 7 | Safety loop detector (*3) | Loop Detector for Vehicle Presence and Passage Detection |
| 8 | Phase Order Relay (*4) | Optional Phase Order Relay |
| 9 | Contactor | Main Contactor (for Motor Activation) |
| 10 | Main terminal block | Main Terminal Block B2-X1 |

**All external components are connected to the ECU via the terminal block B2-X1.**
The following are connected to these terminals:

1) Power supply and protective grounding cable of the Bollard;
2) External control signals for the device;
3) Indication and feedback sensors from the actuator part of the Bollard.



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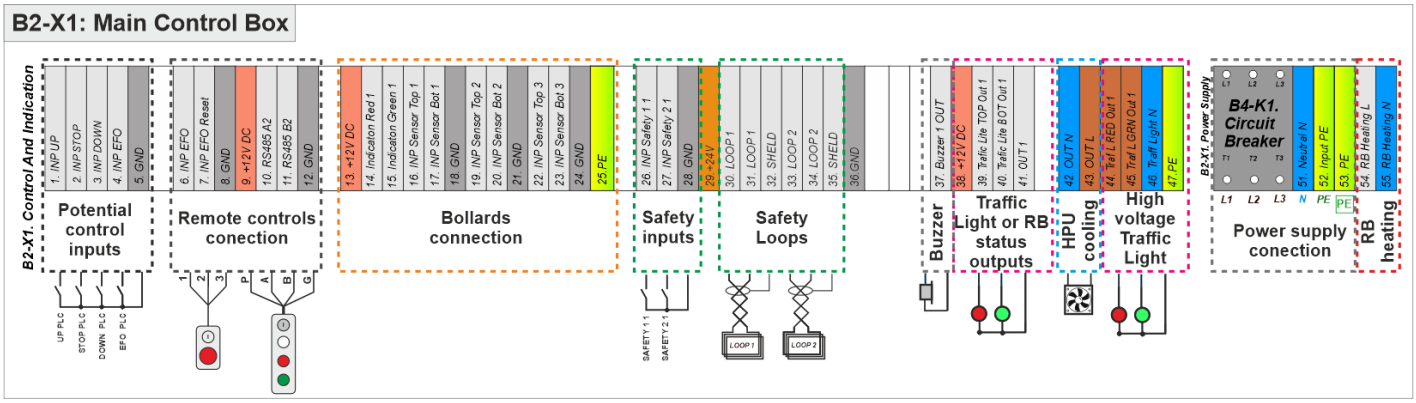


*Fig.7* – Main terminal block ECU

*Table 2* - Function of individual sections of the Main Terminal Block

| *№* | *Name of the Terminal Block B2-X1* | *Function* |
|---|---|---|
| 1 | Potential control inputs | External Control Signal Connection |
| 2 | Remote control connection | Remote control unit connection |
| 3 | Bollard connection | Connection of Communications with the Bollard |
| 4 | Safety inputs | Infrared barrier detector connection |
| 5 | Safety loops | Optional safety induction loop connection |
| 6 | HPU box buzzer output | Alarm signal for low oil level or high oil temperature |
| 7 | Traffic light or RB status outputs | Traffic light outputs or status outputs for upper/lower blocker positions |
| 8 | HPU cooling | Cooling system option |
| 9 | High voltage traffic light | Relay output for high-voltage traffic light connection |
| 10 | Power supply connection | Power supply connection for the Bollard |
| 11 | RB heating | Bollard heating option |

### 2.3. Components of the Electrical Schematic of the ECU

The electrical schematic of the Electronic Control Unit (ECU) includes both mandatory components and optional features. Components related to optional features are marked accordingly on the schematic. The list of all options and their designations is provided below:

- Emergency Fast Operation – ***EFO**
- Radio receiver – ***1**
- Heating thermostat – ***2**
- Loop detector – ***3**
- Phase Order Relay – ***4**
- Buzzer – ***6**
- Cooling – ***7**



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**Table 3** provides a description of all components of the electrical diagram for RB108, RB109. All diagram variants are shown in **Annex 1–6**.

*Table 3* - Name and purpose of the components of the ECU diagram.

| № | Designation | | Component name | | Purpose | |
|---|---|---|---|---|---|---|
| | RB108 | RB109 | RB108 | RB109 | RB108 | RB109 |
| 1 | B2-A1 | | Meanwell MDR-40-12 (AC-DC) | Meanwell DRC-180B (AC-DC) | Main power supply. Input: 230V, output: 12V. | Main power supply with built-in UPS option. Input: 230V, output: 24B. |
| 2 | - | B2-A2 | - | Meanwell DDR-30G-12 (DC-DC) | DC-DC step-down voltage converter. Used to convert 24V DC to 12V DC. | |
| 3 | B2-A2 | B2-A3 | PLC RB350 | | Universal programmable logic controller TISO PLC RB350. | |
| 4 | B2-A3 *1 | B2-A4 *1 | Radio receiver | | Signal receiver SATEL RXH-4K for radio control option | |
| 5 | B2-A4 *3 | B2-A5 *3 | Safety loop detector U-DIN 1 | | Vehicle detector ULTRA-DIN based on an induction loop. ULTRA-DIN vehicle loop detector. | |
| 6 | B2-A5 *3 | B2-A6 *3 | Safety loop detector U-DIN 2 | | Vehicle detector ULTRA-DIN based on an induction loop. ULTRA-DIN vehicle loop detector. | |
| 7 | B2-A6 *4 | B2-A7 *4 | Phase order relay | | Relay for determining the correct phase connection order. | |
| 8 | B2-K1 | | Relay | | Relay for switching the main electric motor contactor. | |
| 9 | B2-K2 | | Relay | | Relay for switching the slowdown electromagnetic valve. | |
| 10 | B2-K3 *EFO | | Relay | | Relay for switching the lifting electromagnetic valve in the EFO system. | |
| 11 | B2-K4 | | Relay | | Relay for switching the additional electric motor contactor. UPS option. | |
| 12 | B2-K4 | B2-K5 | Relay | | Relay for controlling 230V traffic light. | |
| 13 | B2-K5 | B2-K6 | Main motor contactor | | Main electric motor contactor. | |
| 14 | B2-L1 | | DC power green indicator | | 12V power presence indicator in the diagram. | |
| 15 | B2-L2 | | AC power yellow indicator | | AC power presence indicator at the input. | |
| 16 | B2-L3 | | ERROR red indicator | | Error indicator. | |
| 17 | B2-S1 *2 | | Heating thermostat | | Thermostat with a regulator. | |
| 18 | B2-CB1 | | Circuit breaker | | 3-phase power switch. | |
| 19 | B2-X1 | | Control and indication terminal block | | Main terminal block for connecting control signals and external indicators of the device. | |
| | | | Power supply terminal block | | Terminal block for connecting the power supply of the Bollard. | |



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### 2.4. Components of the electrical diagram of the hydraulic unit

An essential component of the Bollard is the external hydraulic unit, which is installed in the HU cabinet. The operation of the HU is controlled by signals from the ECU to the solenoid valves and by supplying power to the electric motor. The control unit is assembled in a box and located in the external cabinet of the hydraulic station. Accordingly, the control electrical cables and two hydraulic hoses are connected from the external hydraulic block cabinet to the Bollard. The distance from the external hydraulic station, equipped with the control unit, to the Bollard is determined by the permissible length of the hydraulic hoses. Table 4 lists all the electrical components of the HU.

*Table 4* - Name and purpose of the HU components.

| № | Designation | | Component name | | Purpose | |
|---|---|---|---|---|---|---|
| | RB108 | RB109 | RB108 | RB109 | RB108 | RB109 |
| 1 | - | B3-B1 | - | 2 x 12V battery | - | Backup batteries for the UPS system. |
| 2 | B3-M1 | | Main AC motor 3-phase | | Asynchronous AC electric motor. | |
| 3 | - | B3-M2 | - | 24V DC motor | - | Additional electric motor for the UPS system. |
| 4 | - | B3-M3 | - | 24V DC FAN | - | Cooling fan for the UPS system electric motor. |
| 5 | - | B3-K1 | - | 24V DC motor contactor | - | Contactor for the additional UPS electric motor. |
| 6 | B3-Y1 | | Valve R1.1 Up | | Electromagnetic valve of the HU. | |
| 7 | B3-Y2 | | Valve R1.2 Down | | Electromagnetic valve of the HU. | |
| 8 | B3-Y3 ***EFO** | | Valve R2 EFO charging | | Electromagnetic valve of the HU. | |
| 9 | B3-Y4 ***EFO** | | Valve R3 EFO rise up | | Electromagnetic valve of the HU. | |
| 10 | B3-Y5 | | Valve R4 damping | | Electromagnetic valve of the HU. | |
| 11 | B3-S1 ***EFO** | | EFO presure sensor | | Pressure sensor in the hydraulic accumulator. | |
| 12 | B3-S2 | | Low oil level sensor | | Low oil level sensor. | |
| 13 | B3-S3 | | High oil temperature sensor | | High oil temperature sensor. | |
| 14 | B3-M4 ***7** | | Cooling fan | | Cooling fan for the HU cabinet. | |
| 15 | B3-S5 ***7** | | Thermostat | | Thermostat for the HU cabinet cooling system. | |
| 16 | B3-S5 ***6** | | BUZZER | | Buzzer to attract attention. | |
| 17 | B3-H1 ***2** | | Heater | | Heater for the HU tank. | |
| 18 | B3-X1 | | Motor terminal block | | Terminal block for connecting the main electric motor. | |
| 19 | B3-X2 | | Electromagnetic valves terminal block | | Terminal block for connecting the HU electromagnetic valves. | |



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*Continuation of the table 4*

| | | | | | |
|---|---|---|---|---|---|
| 20 | B3-X3 | | Sensors terminal block | | Terminal block for connecting the HU feedback sensors. |
| 21 | - | B3-X4 | | 24V DC UPS Motor terminal block | Terminal block for connecting the additional UPS electric motor. |
| 22 | B3-X5 | | Cooler/buzzer terminal block | | Terminal block for connecting the cooling system and buzzer. |

### 2.5 Connection of the Hydraulic Unit (HU) to the Electronic Control Unit (ECU)

The hydraulic unit is a separate component of the blocker system. The connection of all electrical components of the hydraulic unit (HU) to the Electronic Control Unit (ECU) is carried out through terminal blocks located in the distribution box on the HU itself. Power and signal conductors are connected directly from the ECU components to the HU terminal blocks. Tables 5 and 6 describe all connections between the ECU and the HU.

*Table 5* - Connection of HU to the ECU according to the diagram RB108

| № | Connecting to the ECU RB108 | Terminal name | Electrical component name HU |
|---|---|---|---|
| **B3-X1. Motor** | | | |
| 1 | B2-K5 | Motor L1 | B3-M1. Main AC motor 3-phase |
| 2 | | Motor L2 | |
| 3 | | Motor L3 | |
| 4 | B2-K5.1.PE | Motor PE | |
| **B3-X2. Valves** | | | |
| 1 | B2-A2; X2.M1; Out 6 | Valve R1.1 UP L | B3-Y1. Valve R1.1 (UP) |
| 2 | B2-A2; X2.M1; Out 7 | Valve R1.2 DOWN L | B3-Y2. Valve R1.2 (DOWN) |
| 3 | B2-A2; X3.M2; Out 11 | Valve R2 EFO Chrg L | B3-Y3. Valve R2 (EFO charging) |
| 4 | B2-K3; NO | Valve R3 EFO UP L | B3-Y4. Valve R3 (EFO Rise UP) |
| 5 | B2-K2; NO | Valve R4 Damping L | B3-Y5. Valve R4 (Damping) |
| 6 | B2-X1. Power Supply; 48.N | Valve R1.1 UP N | B3-Y1. Valve R1.1 (UP) |
| 7 | | Valve R1.2 DOWN N | B3-Y2. Valve R1.2 (DOWN) |
| 8 | | Valve R2 EFO Chrg N | B3-Y3. Valve R2 (EFO charging) |
| 9 | | Valve R3 EFO UP N | B3-Y4. Valve R3 (EFO Rise UP) |
| 10 | | Valve R4 Damping N | B3-Y5. Valve R4 (Damping) |



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*Continuation of the table 5*

| | | | |
|---|---|---|---|
| 11-15 | B2-X1. Power Supply; 49.N | Valve PE | B3-Y* |
| **B3-X3. Sensors** | | | |
| 1 | - | Pressure SW NC | B3-S1. EFO pressure sensor |
| 2 | B2-A2; X5.INP1; Inp 20 | Pressure SW COM | |
| 3 | B2-A2; X5.INP1; Inp 23 | Pressure SW NO | |
| 4 | B2-A2; X7.INP1; Inp 46 | Low oil SW NO | B3-S2. Low oil level sensor |
| 5 | B2-A2; X5.INP1; Inp 20 | Low oil SW COM | |
| 6 | - | Oil Temperature SW NC | B3-S3. High oil temperature sensor |
| 7 | B2-A2; X5.INP1; Inp 20 | Oil Temperature SW COM | |
| 8 | B2-A2; X7.INP1; Inp 47 | Oil Temperature SW NO | |
| 9 | B2-X1. Power Supply; 49.N | Sensors PE | B3-S* |

*Table 6* - Connection of HU to the ECU according to the diagram RB109

| **№** | **Connecting to the ECU RB109** | **Terminal name** | **Electrical component name HU** |
|---|---|---|---|
| **B3-X1. Motor** | | | |
| 1 | B2-K6 | Motor L1 | B3-M1. Main AC motor 3-phase |
| 2 | | Motor L2 | |
| 3 | | Motor L3 | |
| 4 | B2-K6.1.PE | Motor PE | |
| **B3-X2. Valves** | | | |
| 1 | B2-A2; X2.M1; Out 6 | Valve R1.1 UP +24V | B3-Y1. Valve R1.1 (UP) |
| 2 | B2-A2; X2.M1; Out 7 | Valve R1.2 DOWN +24V | B3-Y2. Valve R1.2 (DOWN) |
| 3 | B2-A2; X3.M2; Out 11 | Valve R2 EFO Chrg +24V | B3-Y3. Valve R2 (EFO charging) |
| 4 | B2-K3; NO | Valve R3 EFO UP +24V | B3-Y4. Valve R3 (EFO Rise UP) |
| 5 | B2-K2; NO | Valve R4 Damping +24V | B3-Y5. Valve R4 (Damping) |
| 6 | GND | Valve R1.1 UP GND | B3-Y1. Valve R1.1 (UP) |
| 7 | | Valve R1.2 DOWN GND | B3-Y2. Valve R1.2 (DOWN) |
| 8 | | Valve R2 EFO Chrg GND | B3-Y3. Valve R2 (EFO charging) |
| 9 | | Valve R3 EFO UP GND | B3-Y4. Valve R3 (EFO Rise UP) |
| 10 | | Valve R4 Damping GND | B3-Y5. Valve R4 (Damping) |



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*Continuation of the table 6*

| | | | |
|---|---|---|---|
| **B3-X3. Sensors** | | | |
| 1 | - | Pressure SW NC | B3-S1. EFO pressure sensor |
| 2 | B2-A3; X5.INP1; Inp 20 | Pressure SW COM | |
| 3 | B2-A3; X5.INP1; Inp 23 | Pressure SW NO | |
| 4 | B2-A3; X7.INP1; Inp 46 | Low oil SW NO | B3-S2. Low oil level sensor |
| 5 | B2-A3; X5.INP1; Inp 20 | Low oil SW COM | |
| 6 | - | Oil Temperature SW NC | B3-S3. High oil temperature sensor |
| 7 | B2-A3; X5.INP1; Inp 20 | Oil Temperature SW COM | |
| 8 | B2-A3; X7.INP1; Inp 47 | Oil Temperature SW NO | |
| **B3-X4. 24V DC UPS Motor** | | | |
| 1 | B2-A1; 4.Bat- | GND | B3-M2. 24V DC motor |
| 2 | B2-A1; 3.Bat+ | +24V DC | |
| 3 | B2-K4; NO | A1 | B3-K1. 24V DC motor contactor |

## 3. CONNECTING THE BLOCKER AND EXTERNAL DEVICES TO THE ELECTRONIC CONTROL UNIT

**ATTETION!**
The Control unit has a built-in power supply interrupter on the power voltage input.
But it does not have a built-in automatic circuit breaker from overload with a residual current circuit breaker or a differential automaton.
The Bollard (and hydraulic station) is installed on the street (outside) and is subject to atmospheric influences.
The control unit of the Bollard must necessarily be connected to the power supply through the Differential automat (for example ABB DS 204 AC)
Or through the circuit breaker from overload (for example PL4 Eaton) together with the Residual current circuit breaker (RCCB) (for example PF6 Eaton).

One or two Bollards are installed on roadbed. Control unit is located in metal box inside the external hydraulic unit cabinet. Electric cables and two hydraulic hoses are connected from the external hydraulic unit to the Bollard.

Each Bollard is connected to control unit with one control electric cable **Olflex Classic 12x0,75** and one **PE** cable **PV 1x2.5**.

The **RB108 / RB109** electronic control unit is connected to a **3-phase 400V AC** power supply network via a differential circuit breaker with overload protection and a residual current device (RCD). The current rating of the circuit breaker is selected based on the power consumption of the hydraulic power unit.

Control signals (for example, access control system), remote control panel B2-A1. Remote Control Panel (optional), emergency "Stop" button Remote Emergency Push Button "Stop" and actuating devices, for example, traffic lights, external siren, are also connected to control unit.

Wiring diagram of the Bollards to control unit **RB108 / RB109** and auxiliary devices is shown in **Annex 1-6**.

Diagram of connection of the Bollards to control unit **RB108 / RB109** is shown in **Annex 7-9**.



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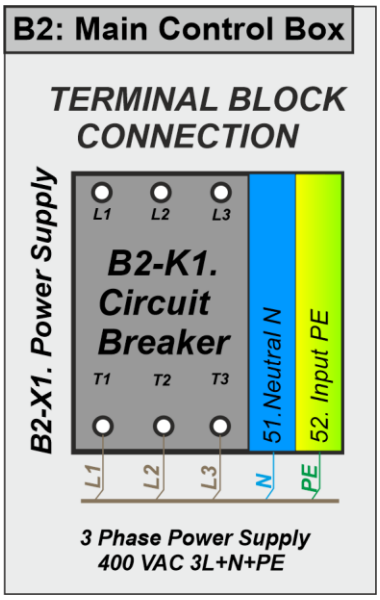
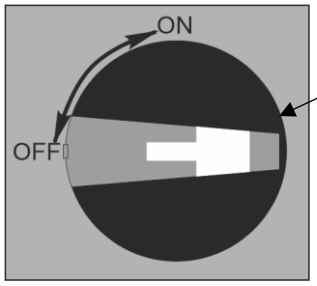
### 3.1 Connection of the Electronic Control Unit to the Power Supply

After completing all the main connections to the electronic control unit, it is necessary to connect the main power cable and supply voltage by switching on the power switch in the control cabinet.

**During connection of 3-phase power supply network 400V AC care should be taken not to confuse phases L1, L2, L3 of 3-phase power supply network with neutral N or protective earthing PE, otherwise the Bollard control unit fails.**




| Провід | **Power Supply** (Terminal block B2-X1 on the diagram) |
|---|---|
| 1 | 48.Power Supply Input L1 |
| 2 | 49.Power Supply Input L2 |
| 3 | 50.Power Supply Input L3 |
| 4 | 51.Power Supply Input N |
| 5 | 52.PE |



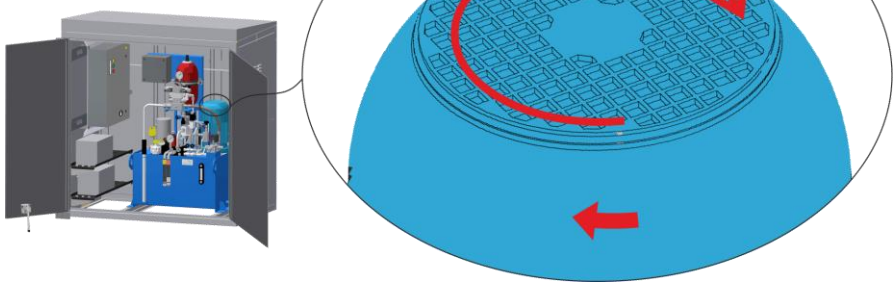

**Main power switch on the Control Unit (ECU)**

*Fig. 8* – Wiring Diagram for Connecting the Control Unit (ECU) to the Power Supply

**3-phase** motor is used in the Bollards with **3-phase 400VAC** power supply, rotation direction of which during raising and sinking depends on polarity of phases **L1**, **L2**, **L3**.
When the Bollard is activated for the first time, then **"UP"** and **"DOWN"** commands to be generated and the Bollard proper movement to be observed.
If the Bollard does not move, then any two phases on the industrial network voltage input to be changed, e.g. **"L1"** and **"L2"**. Thus the Bollard movement direction should comply with the required one.

THE MOTOR ROTATION DIRECTION MUST BE CLOCKWISE!

To change the direction of rotation, swap any two phases.





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### 3.2 Connecting the Bollard (Connection cable) to the control unit

The moving part of the blocker also contains electrical components that are connected to the ECU (Electronic Control Unit) using 12-core **Olflex Classic 12x0,75** cable. The cross-sectional area of each conductor is 0.75 mm². This cable is used to connect the +12V LED lighting and the limit switches, which are magnetic reed switches.

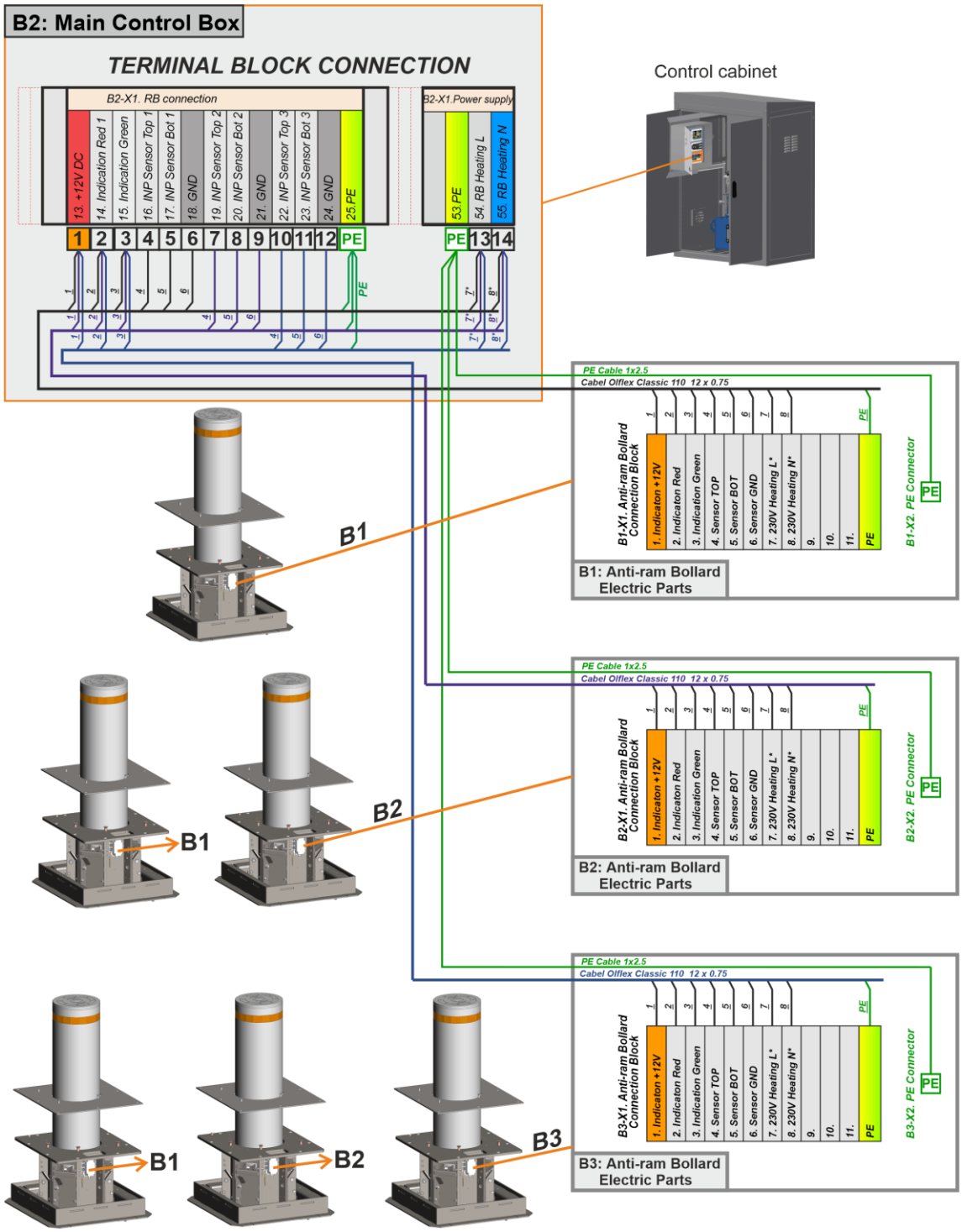


*Fig. 9* – Wiring Diagram for Connecting the Bollard to the ECU



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*Table 7* – Connecting the Bollard to the ECU RB108/RB109

| № | B2 Electronic control unit | B1 Bollard | B2 Bollard | B3 Bollard |
|---|---|---|---|---|
| | **Terminal block B2-X1** | **B1-X1** | **B2-X1** | **B3-X1** |
| 1 | 13. +12V DC Outputs 1 | 1. Indication +12V | 1. Indication +12V | 1. Indication +12V |
| 2 | 14. Indication Red | 2. Indication Red - | 2. Indication Red - | 2. Indication Red - |
| 3 | 15. Indication Green | 3. Indication Green - | 3. Indication Green - | 3. Indication Green - |
| 4 | 16. INP Sensor Top 1 | 4. INP Sensor Top 1 | - | - |
| 5 | 17. INP Sensor Bot 1 | 5. INP Sensor Bot 1 | - | - |
| 6 | 18. GND | 6. Sensor GND | - | - |
| 7 | 19. INP Sensor Top 2 | - | 4. INP Sensor Top 2 | - |
| 8 | 20. INP Sensor Bot 2 | - | 5. INP Sensor Bot 2 | - |
| 9 | 21. GND | - | 6. Sensor GND | - |
| 10 | 22. INP Sensor Top 3 | - | - | 4. INP Sensor Top 3 |
| 11 | 23. INP Sensor Bot 3 | - | - | 5. INP Sensor Bot 3 |
| 12 | 24. GND | - | - | 6. Sensor GND |
| 13 | 54. RB Heating L | 7. 230V Heating L* | 7. 230V Heating L* | 7. 230V Heating L* |
| 14 | 55. RB Heating N | 8. 230V Heating N* | 8. 230V Heating N* | 8. 230V Heating N* |
| PE | 25. PE | PE | PE | PE |
| | | **B1-X2** | **B2-X2** | **B3-X2** |
| PE | 53.PE | PE Connector M5 | PE Connector M5 | PE Connector M5 |

**Option*

**After connecting the blocker to the control unit, you can proceed with connecting the access control system and control panels:**

- Wired Remote Control Unit (АЮИА.115) to B2-X1;
- Wired industrial remote control units to B2-X1. Remote controls АЮИА.112-20, АЮИА.112-30, АЮИА.112-40, АЮИА.112-50, АЮИА.113-40 or АЮИА.113-60.
- Remote Emergency Push Button "Stop" (АЮИА.112-10) to B2-X1.
- Traffic light to B2-X1.

### 3.3 Connection of the access control system (Control panel, key fobs)

#### 3.3.1 Connection of the access control system

The Bollard can operate not only independently but also as part of an access control system. For example, it can be integrated into a sluice system consisting of multiple blockers or a combination of a blocker and a boom barrier. In such cases, the ECU has a separate group of potential inputs of the "dry contact" type.

*Table 8* - Inputs for connecting the access control system.

| № | Name of the output on terminal block B2-X1 | Purpose |
|---|---|---|
| 1 | INP UP | Command to raise the blocker. |
| 2 | INP STOP | Emergency stop command for the blocker. |
| 3 | INP DOWN | Command to lowering the blocker. |
| 4 | INP EFO | Command for emergency raising using the hydraulic accumulator (Emergency Fast Operation option). |
| 5 | GND | Common ground. |



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### 3.3.2 TiSO control panels

A wired control panel (CP) can be used to operate the Bollard.

Let's examine the structure of the panel **AUIA.115** and the control algorithm of the blocker.

In general, for blockers without the EFO (Emergency Fast Operation) option, the control panel includes pairs of identical buttons: **"UP"** – to raise, **"STOP"** – to stop, and **"DOWN"** – to lower.

Bollard is raised when "UP" button is pushed. The lamp near "UP" button will be blinking during raising. When Bollard reaches the uppermost position and stops, then the lamp near "UP" button will be steadily lit - UP position display.

Bollard is sunk when **"DOWN"** button is pushed. The lamp near **"DOWN"** button will be blinking during sinking. When Bollard reaches the lowermost position and stops, then the lamp near **"DOWN"** button will be steadily lit - DOWN position display.

Bollard is stopped when **"STOP"** button is pushed during raising or lowering.

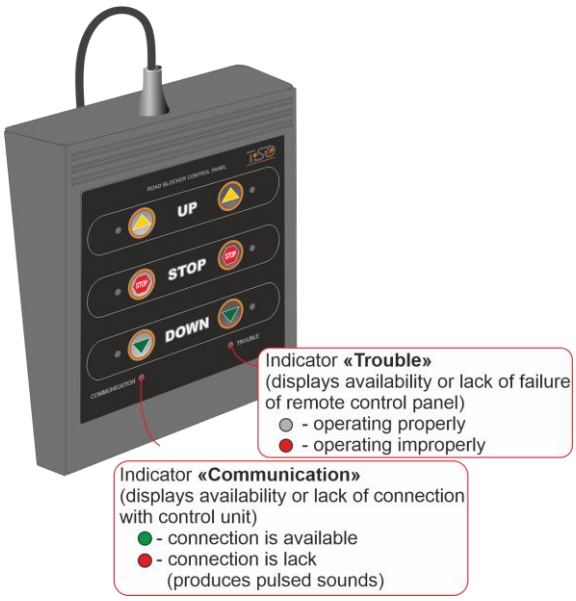


*Fig.10* - Control Panel AUIA.115 (example AUIA.115-01)

The remote control panel **RB115** is equipped with built-in Bollard movement alarm and produces harmonic signals during Bollard raising and sinking.

If the blocker is equipped with the **EFO** (Emergency Fast Operation) option, the pair of identical **"STOP"** and **"DOWN"** buttons remains the same. The left **"UP"** button functions as usual and performs the standard **"UP"** operation. However, the right **"UP"** button is used to trigger the emergency fast raising operation – **EFO** (Control Panel AUIA.115-02).



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Let's examine the structure of the panel **AUIA.113-60** and the control algorithm of the blocker:

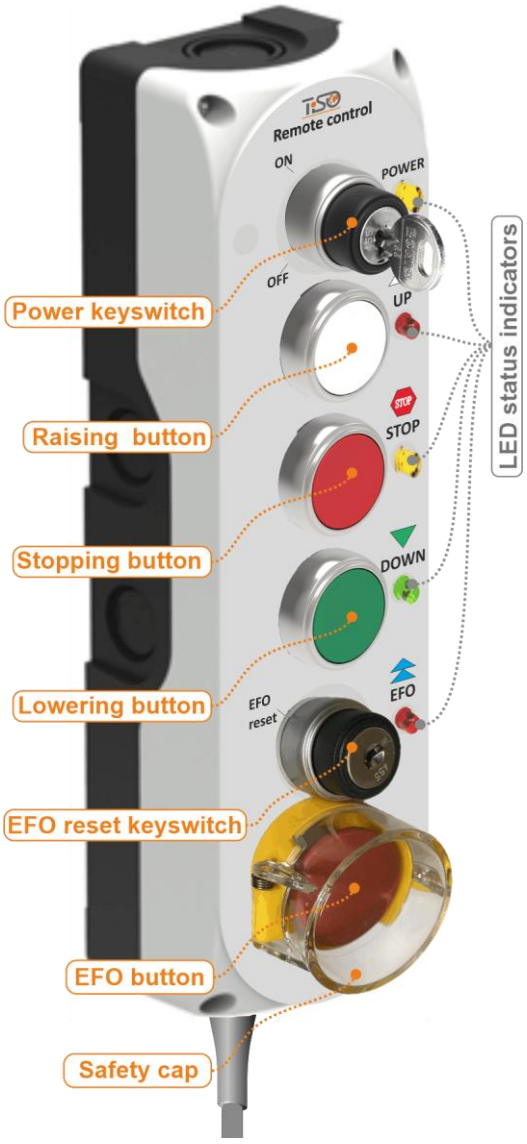


*Fig.11* – Structure of the Industrial Control Panel (example AUIA.113-60)

**1.Power keyswitch**

The key to turned to the ON POWER position for activated remote control panel. The yellow indicator will light up.

*This function is added to the system in order to prevent the Bollard from being operated by people other than the guard staff in case of emergency.

**2. Raising button**

Raising of the Bollard is done automatically.

In order to raise it automatically, push "UP" white button once. During the lifting of the blocker platform - the indicator flashes red.

**3. Lowering button**

Lowering of the Bollard is done automatically.

In order to lower it automatically, push "DOWN" green button once. During the lowering of the blocker platform - the indicator flashes green.

**4.Stopping button**

To stop raising or lowering the platform, push the red "STOP" button.

**5. EFO button (EMERGENCY FAST OPERATION)**:

In case of emergency, optional Emergency Fast Operation feature raises the Bollard to fully up position in less than 1 second, thanks to high-pressured accumulator.

This feature is activated by the panic button on remote control keyboard

- Open the safety cap.
- Press the red button EFO to raise the blocker platform emergency fast operation!

*At that time, all modes of operation of the Bollard will be blocked!*

**6. EFO reset keyswitch**

To restore normal control operation and enable operating all modes, and the button "EFO" to be ready for the next emergency raising of the platform, it is necessary:

- Insert the key into the keyswitch
- Turn the key to the EFO reset position and backward in first position
- Remove the key



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*Table 9* - TiSO Remote Control Panels

| Control panel group with RS 485 interface connection | | | |
|---|---|---|---|
| **AUIA.115-01**<br>RC-RS-6b.U-S-D+6LED | **AUIA.115-02**<br>RC-RS-6b.U-S-D-EFO +6LED | **AUIA.113-40**<br>RCI-RS-3b.U-S-D+1k.P+4LED | **AUIA.113-60**<br>RCI-RS-4b.U-S-D-EFO-SC+2k.R-P+5LED |
|  |  |  |  |

| Control panel group connected to potential inputs | | | | |
|---|---|---|---|---|
| **AUIA.112-10**<br>RCI-D-1b.EFO | **AUIA.112-20**<br>RCI-D-1b.EFO-SC+1k.R | **AUIA.112-30**<br>RCI-D-3b.U-S-D | **AUIA.112-40**<br>RCI-D-4b.U-S-D-EFO | **AUIA.112-50**<br>RCI-D-4b.U-S-D-EFO-SC+1k.R |
|  |  |  |  |  |

**Control Panels of type AUIA.113-XX – AUIA.115-XX** differ in that they have indicators showing the status of the blocker. These panels are connected to the ECU via the RS485 interface.

**Control Panels of type AUIA.112-XX** do not have blocker status indicators and are connected to potential-free inputs. A feature of this type of control panel is the ability to connect them directly to multiple ECU blockers.

### 3.3.2.1. Connection of TiSO control panels via RS485 interface

Various remote control panels may be supplied with a TiSO-manufactured blocker. However, the connection method for branded panels is always the same. Data transmission between these panels is carried out via the RS485 interface, which is a standard for industrial equipment. The remote control panel is supplied with a 4-core cable, 2 meters in length. It can be extended up to 500 meters using a twisted pair cable.



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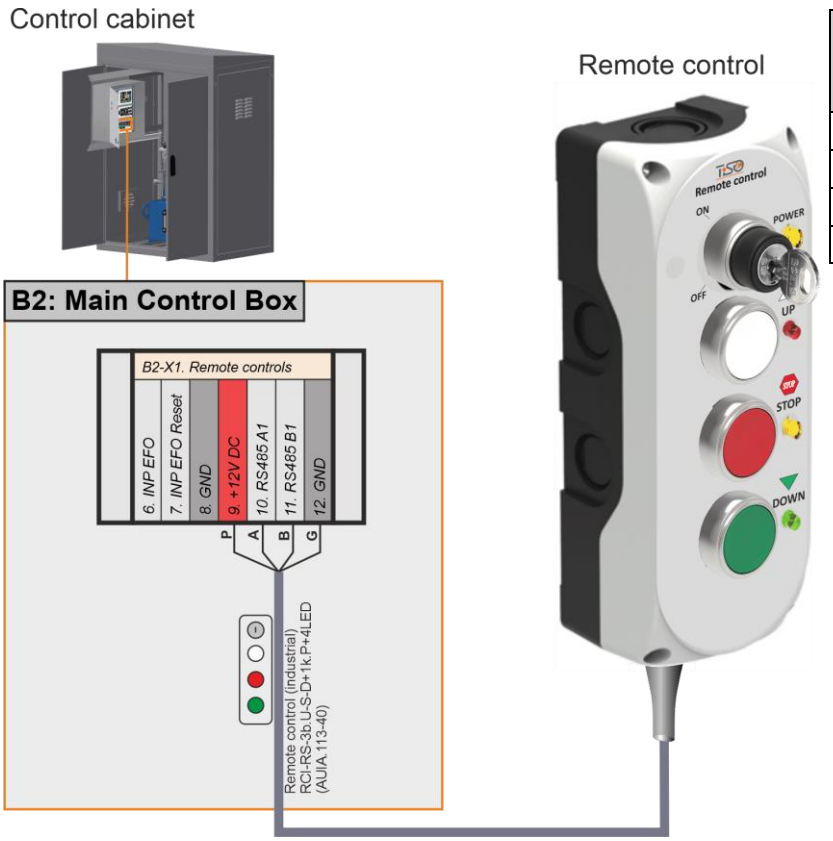
If the blocker model is equipped with the EFO option, one possible solution is the use of a dedicated control panel with an emergency lifting button (AUIA.112-10, AUIA.112-20).

| Control panel group with RS 485 interface connection | | | |
|---|---|---|---|
| **AUIA.115-01**<br>**RC-RS-6b.U-S-D+6LED** | **AUIA.115-02**<br>**RC-RS-6b.U-S-D-EFO +6LED** | **AUIA.113-40**<br>**RCI-RS-3b.U-S-D+1k.P+4LED** | **AUIA.113-60**<br>**RCI-RS-4b.U-S-D-EFO-SC+2k.R-P+5LED** |
|  |  |  |  |

*Table 10* – Connecting the industrial control panel (RS485) to the ECU




| Wire | Terminal block B2-X1. Remote controls part (in the ECU diagram) |
|---|---|
| P | 9. +12V DC |
| A | 10. RS485 A1 |
| B | 11. RS485 B1 |
| G | 12. GND |

*Fig. 12* - Connecting the industrial control panel to the ECU (example **AUIA.113-40 RCI-RS-3b.U-S-D+1k.P+4LED)**



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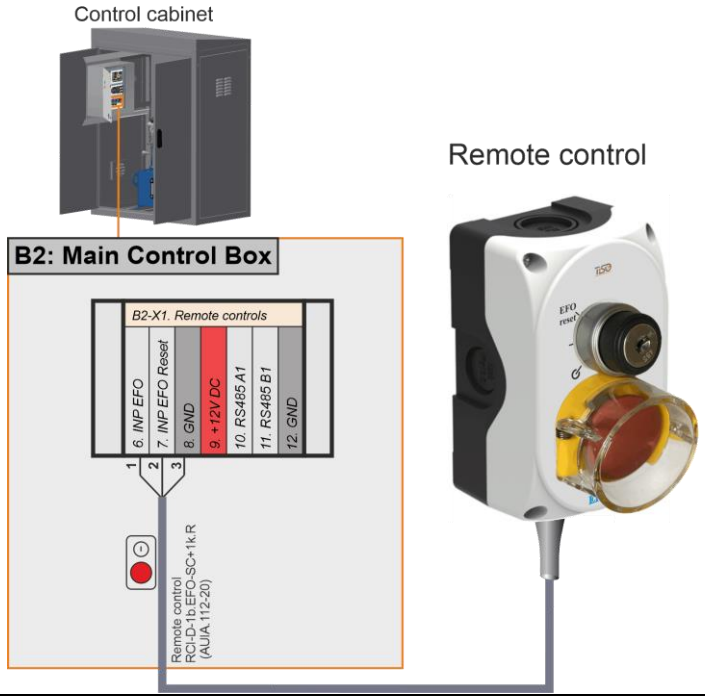
### 3.3.2.2. Connecting the remote control to potential control inputs

Blockers can be controlled both by proprietary TiSO control panels and by third-party devices. For control from an external system, dedicated inputs are provided in the ECU unit.

| Control panel group connected to potential inputs | | | | |
|---|---|---|---|---|
| **AUIA.112-10**<br>**RCI-D-1b.EFO** | **AUIA.112-20**<br>**RCI-D-1b.EFO-SC+1k.R** | **AUIA.112-30**<br>**RCI-D-3b.U-S-D** | **AUIA.112-40**<br>**RCI-D-4b.U-S-D-EFO** | **AUIA.112-50**<br>**RCI-D-4b.U-S-D-EFO-SC+1k.R** |
|  |  |  |  |  |

*Table 11* – Connection of control panels to «dry contact» inputs

| № | Output Name on Terminal Block B2-X1 | Purpose |
|---|---|---|
| Control panel connection inputs **AUIA.112-10, AUIA.112-20** | | |
| 6 | INP EFO | Command for emergency raising using the hydraulic accumulator (Emergency Fast Operation option) |
| 7 | INP EFO Reset | System reset command after emergency fast operation |
| 8 | GND | Common Ground |



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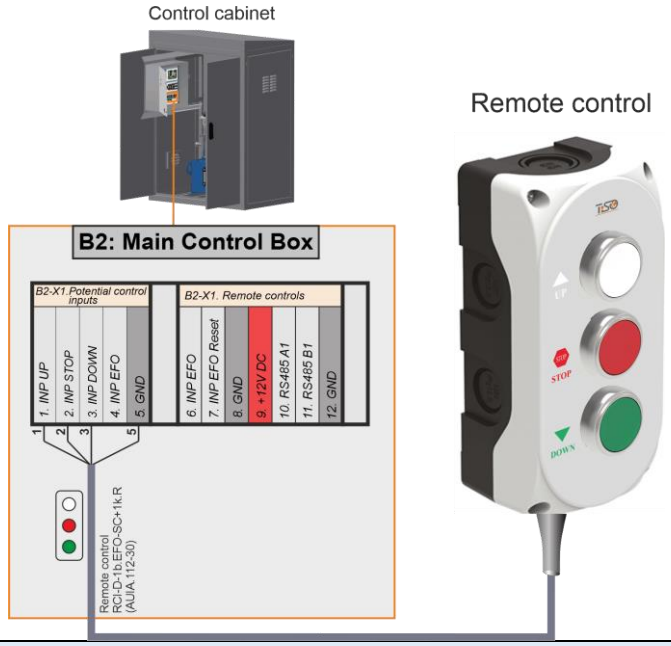
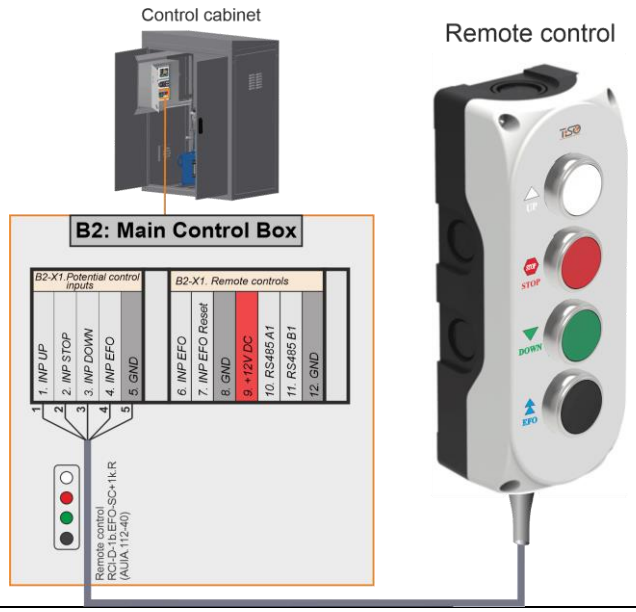
| Control panel connection inputs ПУ **AUIA.112-30** | | |
|---|---|---|
| 1 | INP UP | Command to Raise the Blocker |
| 2 | INP STOP | Emergency Stop Command for the Blocker |
| 3 | INP DOWN | Command to Lower the Blocker |
| 5 | GND | Common Ground |




| Control panel connection inputs **AUIA.112-40** | | |
|---|---|---|
| 1 | INP UP | Command to Raise the Blocker |
| 2 | INP STOP | Emergency Stop Command for the Blocker |
| 3 | INP DOWN | Command to Lower the Blocker |
| 4 | INP EFO | Command for emergency raising using the hydraulic accumulator (Emergency Fast Operation option) |
| 5 | GND | Common Ground |



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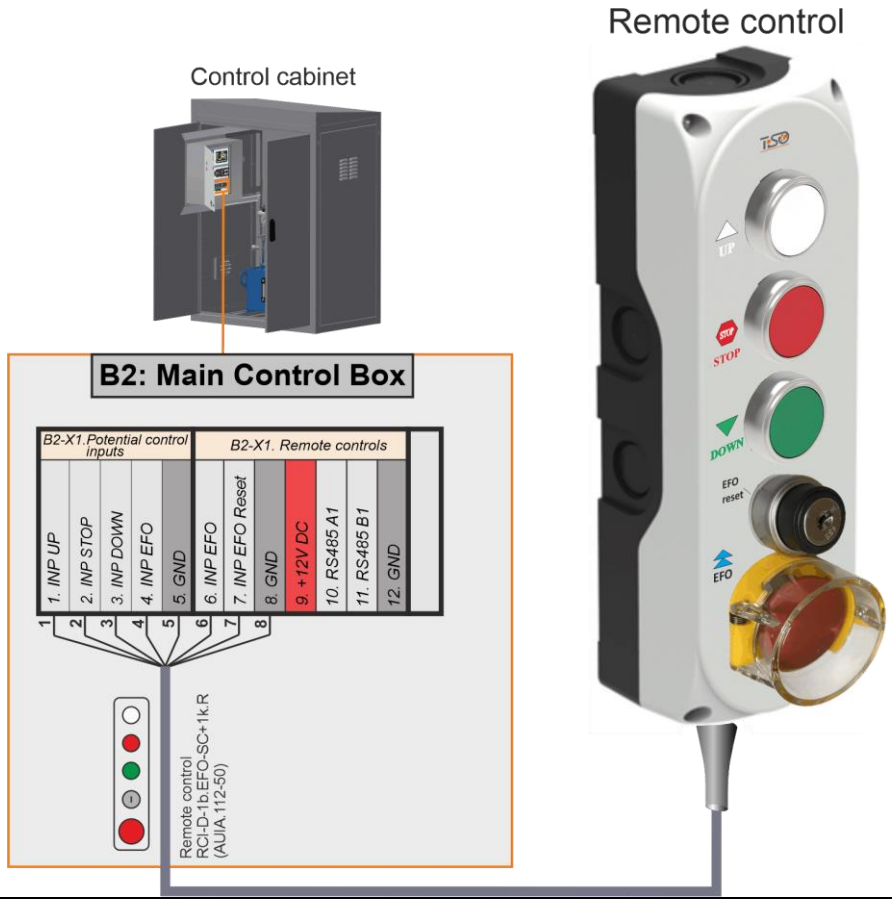
| Control panel connection inputs **AUIA.112-50** | | |
|---|---|---|
| 1 | INP UP | Command to Raise the Blocker |
| 2 | INP STOP | Emergency Stop Command for the Blocker |
| 3 | INP DOWN | Command to Lower the Blocker |
| 4 | INP EFO | Command for emergency raising using the hydraulic accumulator (Emergency Fast Operation option) |
| 5 | GND | Common Ground |
| 6 | INP EFO | Command for emergency raising using the hydraulic accumulator (Emergency Fast Operation option) |
| 7 | INP EFO Reset | System reset command after emergency fast operation |
| 8 | GND | Common Ground |



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### 3.3.3 Radio receiver - *1

The Bollard control unit may include additional option – **Bollard wireless control by remote control key fobs**.

For this option, a radio signal receiver is additionally installed in the ECU. The set also includes 2 remote control key fobs — Satel T-2. In the ECU diagram, the radio signal receiver is designated as B2-A3. Wireless Remote Controller Satel RE-2K.

Maximum allowable distance from remote control key fob to control unit is **25 m.**

*Table 12* - Radio control receiver connector designations

| № | Radio receiver terminal | Component Name | | Terminal Name |
|---|---|---|---|---|
| | | RB108 | RB109 | |
| 1 | SS | Not used | | - |
| 2 | +12V | +12 V | | +12 V |
| 3 | COM | GND | | GND |
| 4 | C1 | GND | | GND |
| 5 | NC1 | Not used | | - |
| 6 | NO1 | B2-A2, X5.INP1 | B2-A3, X5.INP1 | 16 |
| 7 | C2 | GND | | GND |
| 8 | NC2 | Not used | | - |
| 9 | NO2 | B2-A2, X5.INP1 | B2-A3, X5.INP1 | 18 |

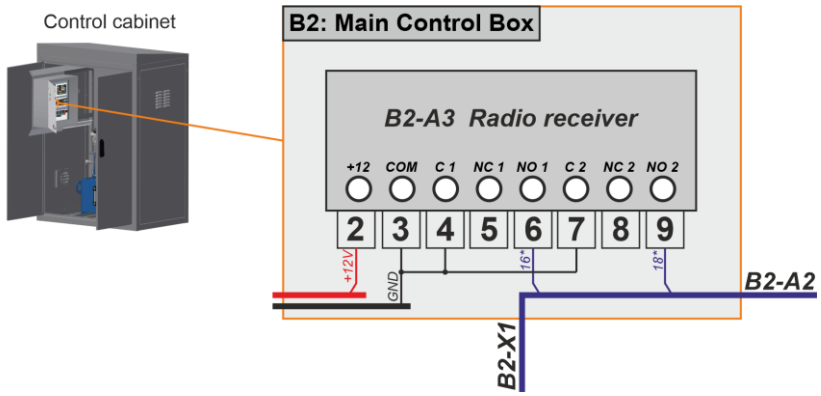


*Fig. 13* - Connection of the radio receiver option in the ECU


*Fig. 14* - Remote control key fobs **Satel T-2**


*Fig. 15* - Radio receiver controller Satel **RE-2K**



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Green **"UP"** button of remote control pendant **Satel T-2** to be pushed to **raise** the Bollard.

Red **"DOWN"** button of remote control pendant **Satel T-2** to be pushed to **sink** the Bollard.

To add new remote control pendants **Satel T-2** in storage of wireless controller **Satel RE-2K** it is necessary to open top cover and:

1) Programming button "PROGRAM" to be pushed – LED of wireless controller Satel RE-2K starts blinking green.
2) Any button of remote control pendant to be pushed – LED starts blinking red.
3) Button of remote control pendant to be repushed – LED is lit green.
4) Remote control pendant is added.

More details on wireless controller **Satel RE-2K** can be found on the manufacturer's website by reference: https://www.satel.pl/en/produktid/483 .

### 3.4 Protective induction loops - *3

The Bollard control unit may include additional option – **protective induction loops**.

One or two induction loops are installed in roadbed next to the Bollards, are connected to control unit and are used to prevent the Bollard raising when a vehicle is over it.

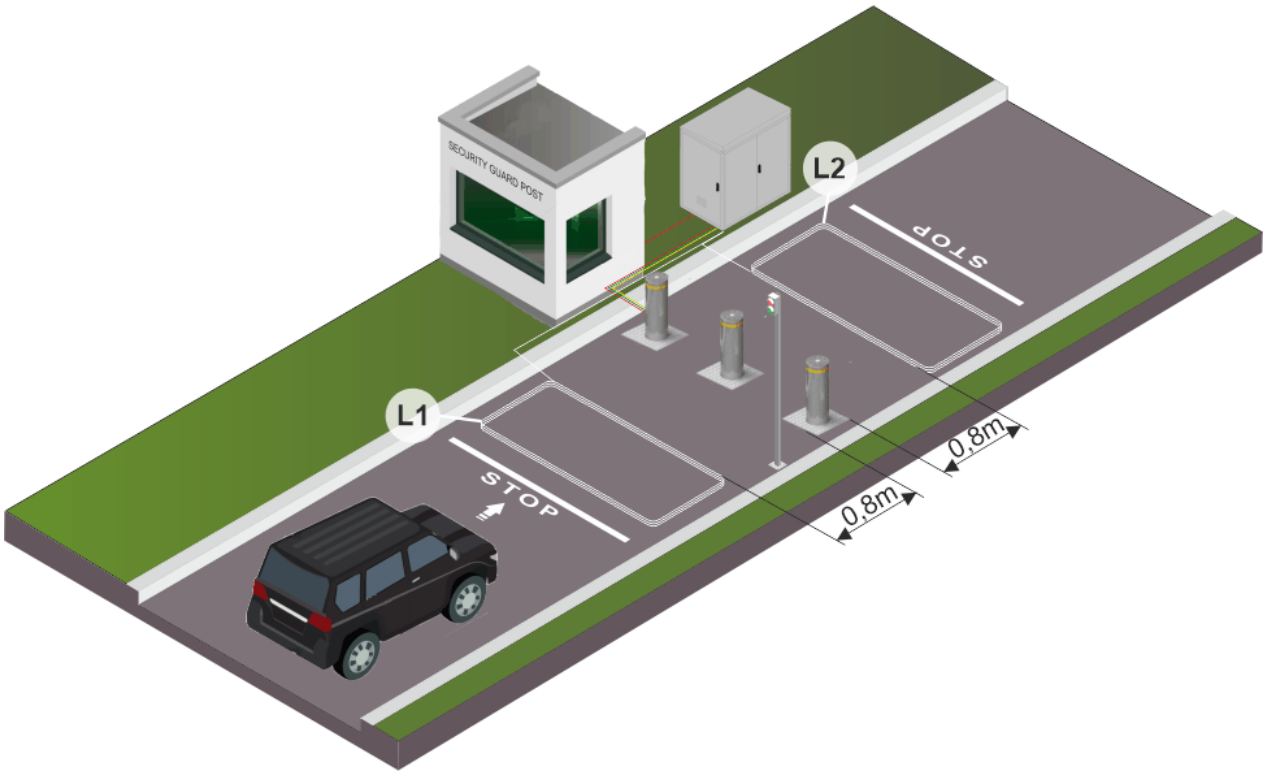


*Fig.16* – Induction Loops in design position



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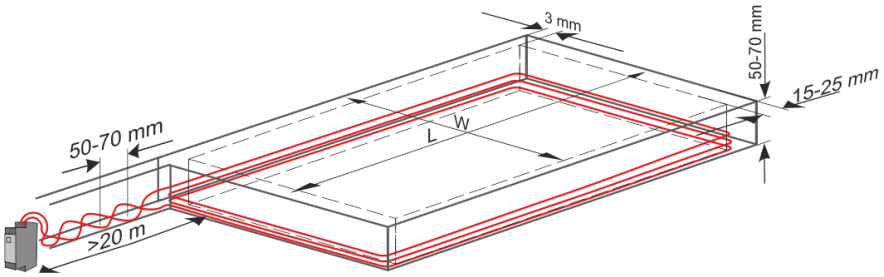
Induction Loops in the Design Position




If a Bollard has **induction loop** option, then control unit contains one or two controllers of induction loops **B2-A4, B2-A5 (B2-A5, B2-A6 for ECU 109) Safety Loop Detector A EMX ULTRADIN***

Kit may also include some cables **SIF1.0** for preparation of induction loops. Maximum allowable distance from induction loop to control unit is **20 m**.

Induction loop responds to vehicle metal and at its location there should not be metal in road surface. Minimum distance from induction loop to the Bollard metal parts is **500 mm**.

A trench of **50-70 mm** depth and **15-25 mm** width according to induction loop size is made for installation of induction loop in road surface. A trench is also made from the edge of induction loop to control unit.

Induction loop is **3-4** turns of cable **SIF1.0** to be installed in trench the ends of which are twisted between them and connected to induction loop controller of control unit. Cable **SIF1.0** can be laid in plastic corrugated tube or plastic pipe. After induction loop is laid in pipe it is filled with sand and covered with cement or asphalt grout.

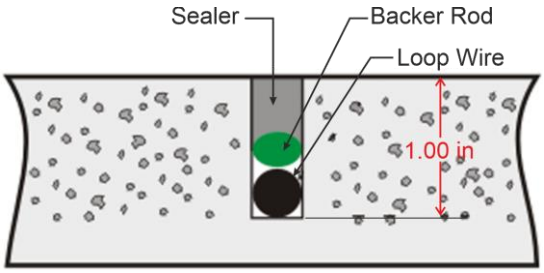



**Table 13 -** Contains recommended induction loop size, number of turns and vehicle detection height

| Loop size Length | Loop size width | Turns | Detection Height Feet |
|---|---|---|---|
| 2 (0.61m) | 2 (0.61m) | 5 | 1.6 (0.488m) |
| 2 (0.61m) | 4 (1.22m) | 4 | 1.6 (0.488m) |
| 2 (0.61m) | 6 (1.83m) | 4 | 1.6 (0.488m) |
| 2 (0.61m) | 8 (2.44m) | 3 | 1.6 (0.488m) |
| 2 (0.61m) | 10 (3.05m) | 3 | 1.6 (0.488m) |
| 2 (0.61m) | 12 (3.66m) | 3 | 1.6 (0.488m) |
| 2 (0.61m) | 14 (4.27m) | 3 | 1.6 (0.488m) |
| 2 (0.61m) | 16 (4.88m) | 3 | 1.6 (0.488m) |
| 2 (0.61m) | 18 (5.49m) | 3 | 1.6 (0.488m) |
| 2 (0.61m) | 20 (6.10m) | 3 | 1.6 (0.488m) |
| | | | |
| 4 (1.22m) | 4 (1.22m) | 4 | 3.2 (0.975m) |
| 4 (1.22m) | 6 (1.83m) | 4 | 3.2 (0.975m) |
| 4 (1.22m) | 8 (2.44m) | 3 | 3.2 (0.975m) |
| 4 (1.22m) | 10 (3.05m) | 3 | 3.2 (0.975m) |
| 4 (1.22m) | 12 (3.66m) | 3 | 3.2 (0.975m) |
| 4 (1.22m) | 14 (4.27m) | 3 | 3.2 (0.975m) |
| 4 (1.22m) | 16 (4.88m) | 3 | 3.2 (0.975m) |
| 4 (1.22m) | 18 (5.49m) | 3 | 3.2 (0.975m) |



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*Continuation of the table 13*

| | | | |
|---|---|---|---|
| 4 (1.22m) | 20 (6.10m) | 3 | 3.2 (0.975m) |
| 4 (1.22m) | 22 (6.71m) | 3 | 3.2 (0.975m) |
| 4 (1.22m) | 24 (7.32m) | 3 | 3.2 (0.975m) |
| 4 (1.22m) | 26 (7.93m) | 3 | 3.2 (0.975m) |
| 4 (1.22m) | 28 (8.54m) | 3 | 3.2 (0.975m) |
| 4 (1.22m) | 30 (9.14m) | 2 | 3.2 (0.975m) |
| 4 (1.22m) | 32 (9.75m) | 2 | 3.2 (0.975m) |
| 4 (1.22m) | 33 (10.06m) | 2 | 3.2 (0.975m) |
| 4 (1.22m) | 34 (10.36m) | 2 | 3.2 (0.975m) |
| 4 (1.22m) | 36 (10.97m) | 2 | 3.2 (0.975m) |
| 4 (1.22m) | 38 (11.58m) | 2 | 3.2 (0.975m) |
| 4 (1.22m) | 40 (12.20m) | 2 | 3.2 (0.975m) |
| | | | |
| 6 (1.83m) | 6 (1.83m) | 4 | 4.8 (1.463m) |
| 6 (1.83m) | 8 (2.44m) | 3 | 4.8 (1.463m) |
| 6 (1.83m) | 10 (3.05m) | 3 | 4.8 (1.463m) |
| 6 (1.83m) | 12 (3.66m) | 3 | 4.8 (1.463m) |
| 6 (1.83m) | 14 (4.27m) | 3 | 4.8 (1.463m) |
| 6 (1.83m) | 16 (4.88m) | 3 | 4.8 (1.463m) |
| 6 (1.83m) | 18 (5.49m) | 3 | 4.8 (1.463m) |
| 6 (1.83m) | 20 (6.10m) | 2 | 4.8 (1.463m) |
| 6 (1.83m) | 22 (6.71m) | 2 | 4.8 (1.463m) |
| 6 (1.83m) | 24 (7.32m) | 2 | 4.8 (1.463m) |
| 6 (1.83m) | 26 (7.93m) | 2 | 4.8 (1.463m) |
| 6 (1.83m) | 28 (8.54m) | 2 | 4.8 (1.463m) |
| 6 (1.83m) | 30 (9.14m) | 2 | 4.8 (1.463m) |
| 6 (1.83m) | 32 (9.75m) | 2 | 4.8 (1.463m) |
| 6 (1.83m) | 33 (10.06m) | 2 | 4.8 (1.463m) |
| 6 (1.83m) | 34 (10.36m) | 2 | 4.8 (1.463m) |
| 6 (1.83m) | 36 (10.97m) | 2 | 4.8 (1.463m) |
| 6 (1.83m) | 38 (11.58m) | 2 | 4.8 (1.463m) |
| 6 (1.83m) | 40 (12.20m) | 2 | 4.8 (1.463m) |
| | | | |
| 8 (2.44m) | 4 (1.22m) | 4 | 3.2 (0.975m) |
| 8 (2.44m) | 6 (1.83m) | 4 | 4.8 (1.463m) |
| 8 (2.44m) | 8 (2.44m) | 3 | 5.6 (1.71m) |
| 8 (2.44m) | 10 (3.05m) | 3 | 5.6 (1.71m) |
| 8 (2.44m) | 12 (3.66m) | 3 | 5.6 (1.71m) |
| 8 (2.44m) | 14 (4.27m) | 3 | 5.6 (1.71m) |
| 8 (2.44m) | 16 (4.88m) | 3 | 5.6 (1.71m) |
| 8 (2.44m) | 18 (5.49m) | 2 | 5.6 (1.71m) |
| 8 (2.44m) | 20 (6.10m) | 2 | 5.6 (1.71m) |
| 8 (2.44m) | 22 (6.71m) | 2 | 5.6 (1.71m) |
| 8 (2.44m) | 24 (7.32m) | 2 | 5.6 (1.71m) |
| 8 (2.44m) | 26 (7.93m) | 2 | 5.6 (1.71m) |
| 8 (2.44m) | 28 (8.54m) | 2 | 5.6 (1.71m) |
| 8 (2.44m) | 30 (9.14m) | 2 | 5.6 (1.71m) |
| 8 (2.44m) | 32 (9.75m) | 2 | 5.6 (1.71m) |



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*Continuation of the table 13*

| | | | |
|---|---|---|---|
| 8 (2.44m) | 33 (10.06m) | 2 | 5.6 (1.71m) |
| 8 (2.44m) | 34 (10.36m) | 2 | 5.6 (1.71m) |
| 8 (2.44m) | 36 (10.97m) | 2 | 5.6 (1.71m) |
| 8 (2.44m) | 38 (11.58m) | 2 | 5.6 (1.71m) |
| 8 (2.44m) | 40 (12.20m) | 2 | 5.6 (1.71m) |

Two twisted ends of cable **SIF1.0** of each induction loop to be connected to terminals **"LOOP"** and **"LOOP"** of **Safety Loop Detector EMX ULTRADIN** induction loop controller of control unit.

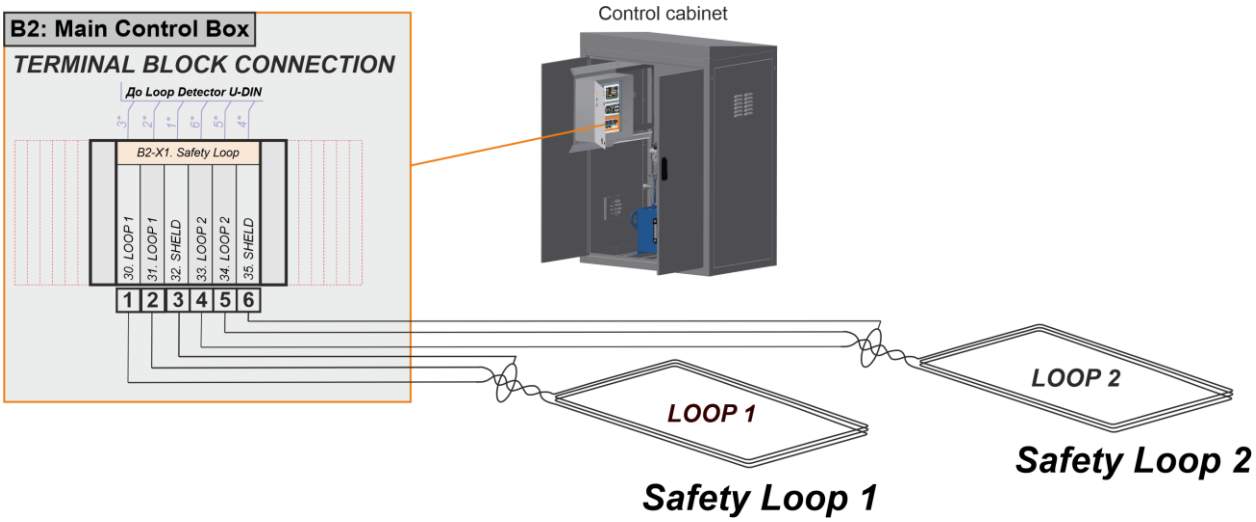


*Fig. 17* - Connection of Induction Loops to the ECU

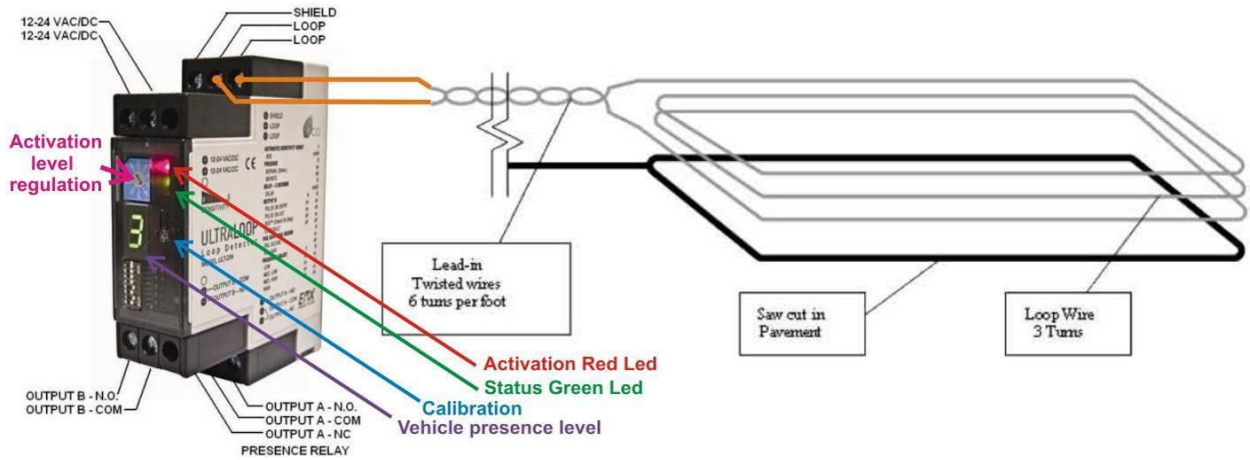


*Fig.18* - Diagram of connection of induction loop to **Safety Loop Detector EMX ULTRADIN** induction loop controller of control unit



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| Terminal pin | Description |
|---|---|
| 1 | Shield – Earth Ground |
| 2 | Loop Connection |
| 3 | Loop Connection |
| 4 | Power 12-24 VDC/AC |
| 5 | Power 12-24 VDC/AC |
| 6 | No Connection |
| 7 | Output B – NO (normally open contact) |
| 8 | Output B – COM (common contact) |
| 9 | No Connection |
| 10 | Output A – NC (normally closed contact) |
| 11 | Output A – COM (common contact) |
| 12 | Output A – NO (normally open contact) |

*Fig.19* - Designation of Induction Loop Controller Connectors

After installing the induction loop, connecting it to the controller, and switching on the power, press the **"Reset"** button **(5)** and wait 10 seconds for the controller to calibrate.

**Sensitivity setting (1)** – the regulator position determines the vehicle presence level at which the detector is triggered. Typically, it is set to a value of 4–5.

**ULTRAMETER display (4)** – shows the sensitivity level when a vehicle is detected near the loop.

**Red indicator (2)** – indicates the presence of a vehicle on the loop.

**Green indicator (3)** – indicates that the detector is powered and operational.

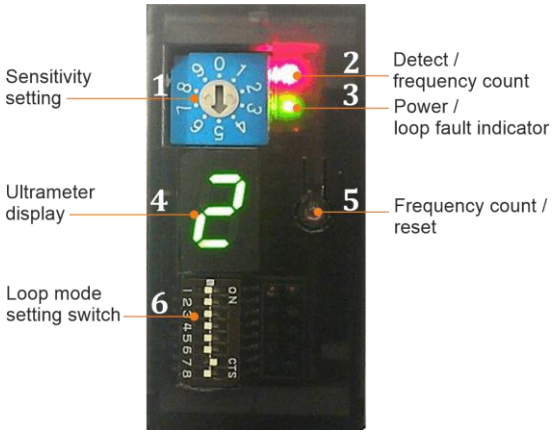


*Fig.20* - Induction Loop Controller Designation

**DIP SWITCH (6)** – switch for loop mode settings: Automatic Sensitivity Boost / Infinite Presence Mode / Delay Mode / Output B / Fail Safe Secure / Frequency Setting.

More details on induction loop controller **EMX ULTRADIN** can be found on the manufacturer's website by reference: https://www.emxaccesscontrolsensors.com/product/ultra-din/

### 3.5 Connecting the UPS (Battery*) Function for ECU RB109

The Bollard is capable of operating in emergency situations during power outages if an additional uninterruptible power supply (UPS) function is connected. Its hydraulic station, in addition to the main 3-phase 400VAC electric motor, is equipped with an additional 24VDC electric motor powered by two 12VDC car batteries (60–100 Ah) connected in series.

**The 12V 60–100 Ah batteries must be connected with the main power supply to the ECU switched off.**

**Batteries are not included in the delivery package.*



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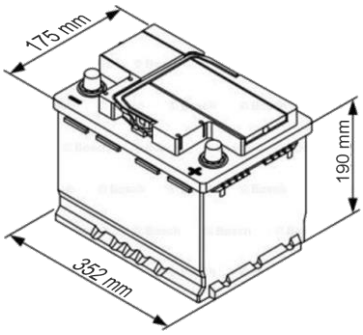
**Specifications of the connected batteries**

| Parameter | Value |
|---|---|
| Quantity | 2 pcs (2 x 12VDC = 24VDC) |
| Bettery type | Lead - acid |
| Operating voltage | 12VDC |
| Capacity | 60 ... 100 A/h |
| Starting current | > 500 A |
| Battery terminal dimensions | "+" - 19,5 mm; "-" – 17.9 mm (European type) |
| Maximum dimensions LxWxH | 352 mm x175 mm x190 mm |




If you are using the UPS function, you need to connect 2 batteries to the terminals at the ends of the red and black cables in order to connect the batteries in series using the cable connector with fuse holder from the kit, according to the provided wiring diagram.


**Attention!**
Be careful when connecting the two batteries and installing them on the shelf in the hydraulic power unit cabinet.
Follow the polarity and the connection sequence as shown in the wiring diagram!
Incorrect connection may result in damage to the control unit.

The "+" terminal of the **FIRST** car battery must be connected to the **RED wire** with the "+" terminal for battery connection.

The "–" terminal of the **SECOND** car battery must be connected to the **BLACK wire** with the "–" terminal for battery connection.

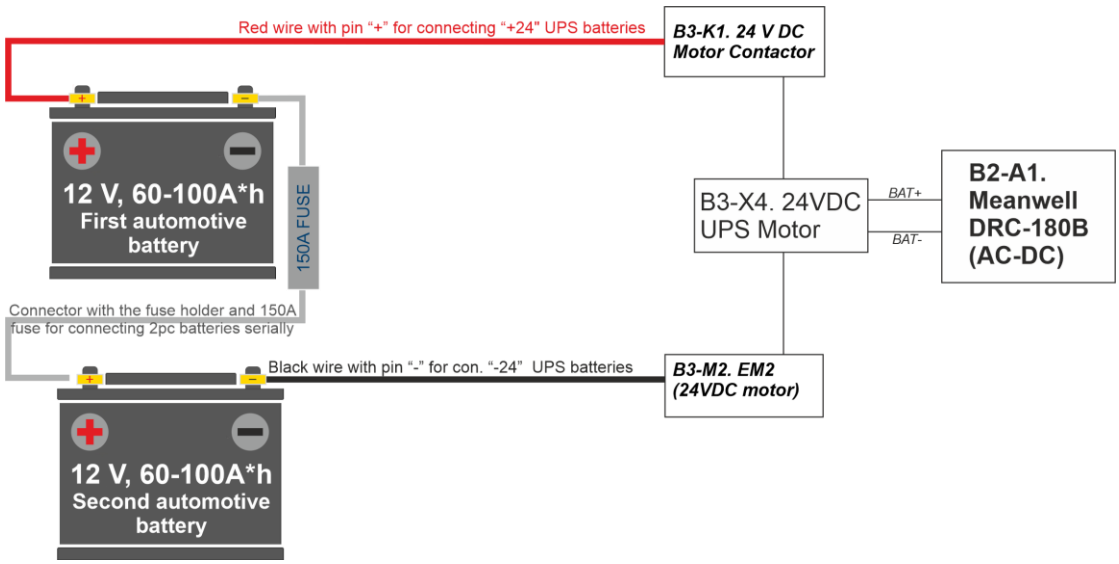



*Fig. 21* - Connecting the UPS Function



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The "–" terminal of the **FIRST** car battery must be connected to the **"+"** terminal of the **SECOND** car battery in series using the connector with the **WHITE** cable and fuse holder **(FUSE)** from the kit, according to the following wiring diagram.

**Attention!**
If you are not using the UPS function and are not connecting the batteries, the terminals at the ends of the red and black battery connection cables must be securely insulated to prevent short circuits between each other and against the metal enclosure!
Otherwise, the control unit may become damaged!


If the batteries are connected, the controller monitors their status and charges them with a current of 2A when necessary.

For the UPS function to operate correctly, the batteries must be in good condition, without deep discharge. Their capacity and starting current must be within the normal range.

**Attention!**
When connecting the UPS, after switching off the main 400V AC power supply, the Road Blocker will not switch to UPS power automatically!

To activate the UPS function**,** the main power supply must first be switched ON on the control unit (ECU)! In the event of a power outage, the Road Blocker will then automatically switch to UPS power.



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### 3.6 Connecting the Traffic Light Option

The traffic light serves as a status indicator for the blocker. It is also connected to the main terminal block B2-X1 of the ECU. The ECU supports connection of both **low-voltage** and **high-voltage** versions of the traffic light. The **low-voltage version** operates at **+12V** and is switched via an **open collector (open drain)** output. For traffic lights powered by **230V**, separate **relay outputs** are provided on B2-X1.

*Table 14* – Designation of Traffic Light Connection Terminals

| **+12V Traffic Light Connection** | **Terminal block B2-X1. (Traffic light or RB status out)** |
|---|---|
| Color | |
| Common + | 35. +12V DC |
| Red | 36. Traffic light red / top out (GND) |
| Green | 37. Traffic light green / bottom out (GND) |
| **230V Traffic Light Connection** | **Terminal block B2-X1. (High voltage traffic light)** |
| Color | |
| Red | 41. Traffic light red out (L) 230V |
| Green | 42. Traffic light green out (L) 230V |
| Common N | 43. Traffic light N |
| PE | 44. PE |

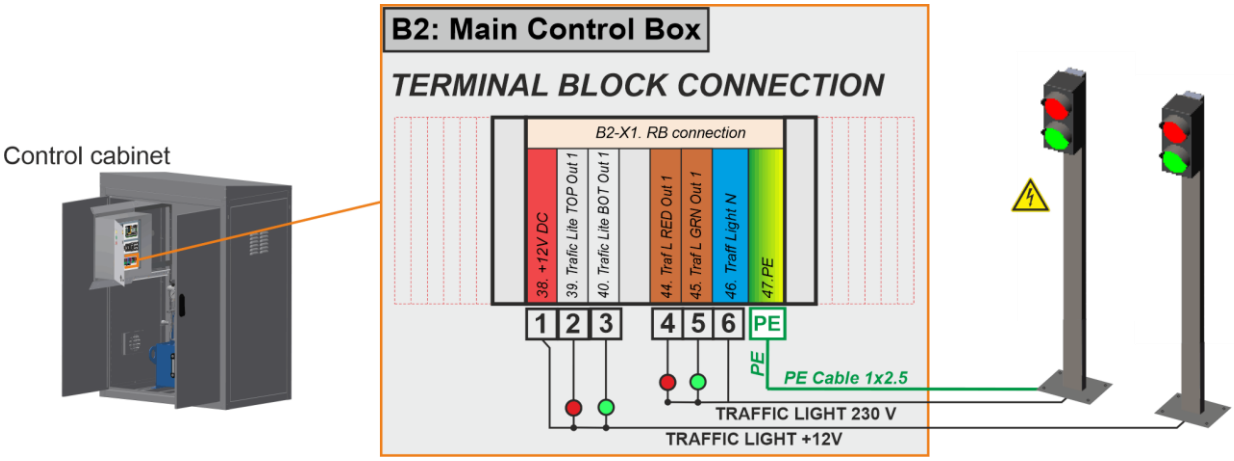


*Fig. 22* - Connecting the Traffic Light



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### 3.7 Oil Heating Option in the Hydraulic System - *2.

When the oil heating option is present, a thermostat is installed in the ECU. It ensures the uninterrupted operation of the hydraulic station cabinet and maintains a fixed temperature regime.

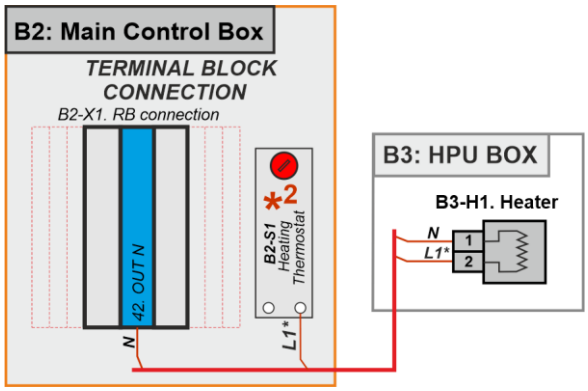


*Fig. 23* - Connecting the heating thermostat


*Fig. 24* - Thermostat Din Rail Mount NC Thermostat 15 Degree C (hcet hc301 15/5)

### 3.8 Oil Cooling Option in the Hydraulic System - *7.

The external hydraulic station cooling fan with a cooling thermostat is used when the blockers are installed in hot countries or when the intensity of blocker use is very high. The thermostat is installed in the hydraulic station cabinet and ensures control of the set temperature regime.

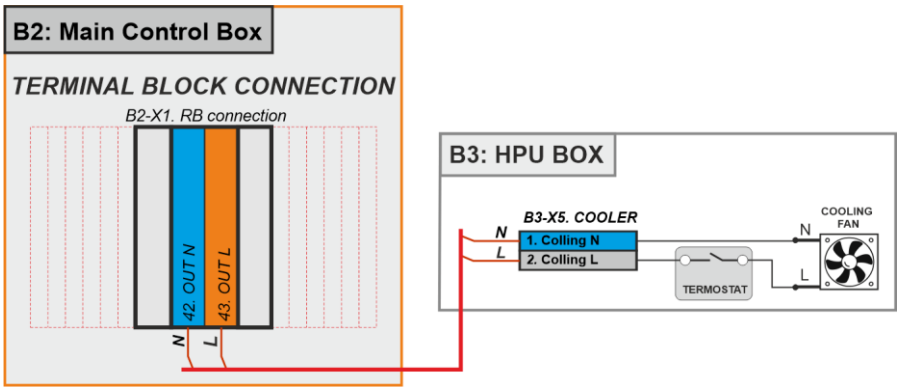


*Fig. 25* - Connecting the cooling thermostat


*Fig. 26* - Thermostat Din Rail Mount NO Thermostat 0 to 60 Degree C (GM-KTS011)

### 3.9 Connection of the Phase Order Relay Option - *4.

The **Phase Order Relay** is designed to detect the correct sequence of phases connected to the hydraulic station motor. If the phases are connected incorrectly, the blocker movement will be reversed, meaning the blocker will lower when it receives the “up” command. One possible reason for the **B2-L3 “Error” indicator** blinking is an incorrect phase order. This issue can be identified using the RB350 controller by navigating to the “ERR” (Error Log) page. If the error "[14] Phase order" is listed, the power supply connection to the ECU should be checked.



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## 4. PCB.350 TISO controller as a component of the electronic control unit

### 4.1 Description of the PCB.350 controller

The PCB350 controller manages the operation of devices by analyzing signals from potential inputs of angle position sensors and wired control panels connected via the RS485 interface. It sets the potential outputs depending on the blocker's status.

The PCB.350 controller allows for the configuration of key parameters for controlling blockers and initiating operation. The front panel of the controller features an OLED display and 4 control buttons for displaying the current status of the controller and the settings menu. The PCB.350 controller is integrated into the electronic control unit. The devices controlled by this unit are TiSO automatic road blockers with an external hydraulic station.

### 4.2 Purpose of the connectors of the controller PCB350.02

The purpose of the connectors of the PCB350.02 controller when using it for an external hydraulic station in electronic control units RB108 / 109 is shown in Fig.27.

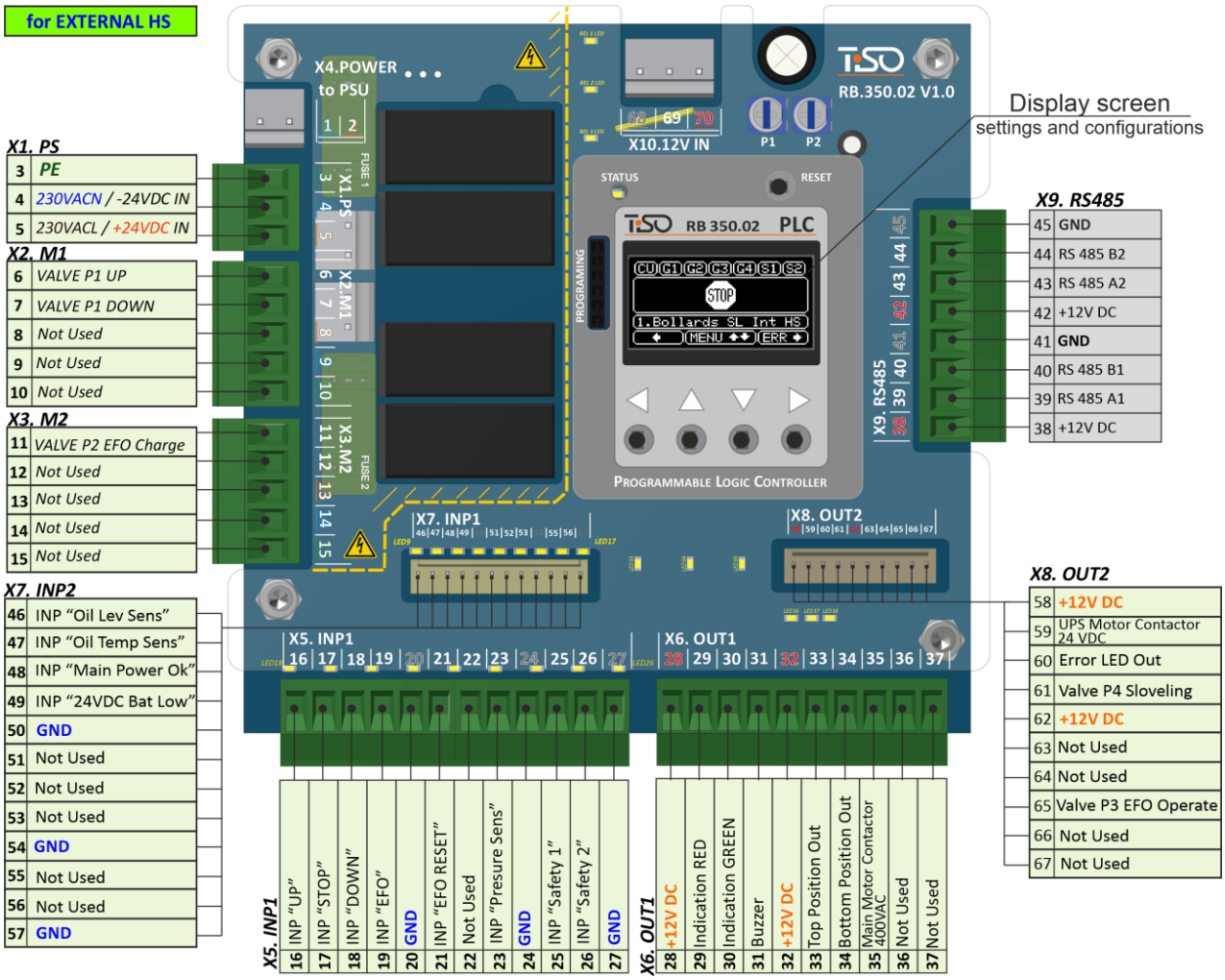


*Fig.27* - Purpose of the connectors of the controller PCB.350.02 (when using an external hydraulic station)



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*Table 15* - Purpose of the connectors of the controller PCB350.02

| № | Component | Purpose |
|---|---|---|
| 1 | **X1 PS Power Supply** | **Power Supply –** Terminal block for connection the controller supply voltage **230VAC** or **24VDC** |
| 2 | Terminal block **X2 M1** | Terminal block for connection the Hydrostation Valves and Motor Contactor |
| 3 | Terminal block **X3 M2** | Terminal block for connection of the Hydrostation Valves |
| 4 | Fuse **F1** | **Fuse 1** – Fuse **6A 250VAC** of the **X2 M1** |
| 5 | Fuse **F2** | **Fuse 2** – Fuse **6A 250VAC** of the **X3 M2** |
| 6 | Terminal block **C1** | **C1** – Not Used in this configuration |
| 7 | Terminal block **C2** | Not Used in this configuration |
| 8 | Terminal block **X5 INP1** | **Inputs 1** – Terminal block for connection of the Road Blocker control inputs, sensors and auxiliary devices |
| 9 | Terminal block **X6 OUT1** | **Outputs 1** – Terminal block for connection of the Road Blocker actuating devices and auxiliary devices |
| 10 | Terminal block **X7 INP2** | **Inputs 2** – Terminal block for connection of the Road Blocker control inputs, sensors and auxiliary devices |
| 11 | Terminal block **X8 OUT2** | **Outputs 2** – Terminal block for connection of the Road Blocker actuating devices and auxiliary devices |
| 12 | Terminal block **X9 RS485** | **Interface RS485** – Terminal block for connection of the Road Blocker wired remote control panel and angular position sensors |
| 13 | Terminal block **X4 230V TO PSU** | Not Used in this configuration |
| 14 | Terminal block **X10. 12V from PSU** | **12V DC from Power Supply Unit** – Terminal block for connection of the power supply unit voltage **12VDC** to the controller **PCB350.02** |
| 15 | Switch **SW1- SW8** | **Switch 1-8** – Switch of the control unit mode and configuration parameter setting |
| 16 | Indicators **LED1-LED8** | Displays of mode and configuration parameters |
| 17 | Indicators **LED9-LED17** | Displays of the Road Blocker2 input **INP2** status |
| 18 | Indicators **LED18-LED26** | Displays of the Road Blocker1 input **INP1** status |
| 19 | Indicators **LED27-LED32** | Displays of the Road Blocker2 output **OUT2** status |
| 20 | Indicators **LED33-LED38** | Displays of the Road Blocker1 output **OUT1** status |

### 4.3 Display for viewing settings and configurations of the PCB 350 controller

**1) Loading screen**

Then the device is turned on or after it is restarted, the logo and software version will be displayed on the screen for one second.




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**2) Start screen**

The start screen on the PCB.350.02 controller display consists of four main fields (Fig.28):

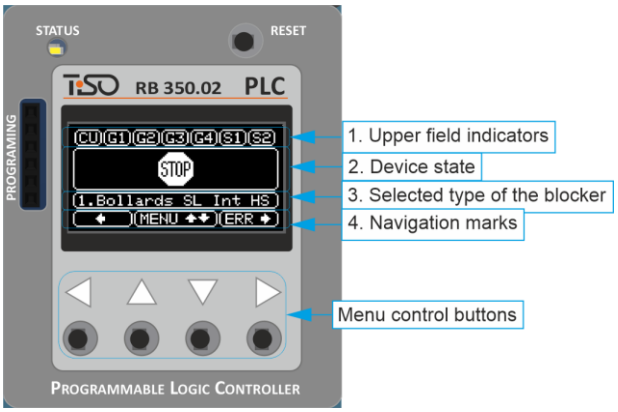


*Fig. 28* – Start screen of the controller display PCB.350.02

*Table 16*– Main fields of the start screen on the PCB350 controller display

| *Field name* | *Description* | *Label* |
|---|---|---|
| 1. Upper field indicators | - indicator, which is responsible for communication with the remote control | CU |
| | - the indicator responsible for communication with the 1th inclinometer. | G1 |
| | - the indicator responsible for communication with the 2th inclinometer. | G2 |
| | - the indicator responsible for communication with the 3th inclinometer. | G3 |
| | - the indicator responsible for communication with the 4th inclinometer. | G4 |
| | - active induction loop indicator 1.1 or 1.2. | S1 |
| | - active induction loop indicator 2.1 or 2.2. | S2 |
| | If there is no communication with the remote control, protractors or inactive induction loops, then the inscription in the indicator is absent. | |
| 2. Device state | The number and current state of blockers is displayed in the center of the start screen. The number of the blocker is displayed in the field next to the state sign. If in item "9. Number of blocker" 1 device is selected, then only one state icon will be shown on the display. | 1⇧ 2⇩<br>STOP |
| 3. Selected type of the blocker | This field displays the name of the blocker whose logic is currently being processed. | BOLLARDS T INT HS |
| 4. Navigation marks | • Switching to the list of statuses and states of inputs/outputs. | INFO |
| | • Switching to the settings menu is carried out by long pressing the buttons ⇧ or ⇩. | MENU |
| | • Switching to the list of errors is carried out by long pressing the button ⇨. | ERR |



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**3) Setup menu**

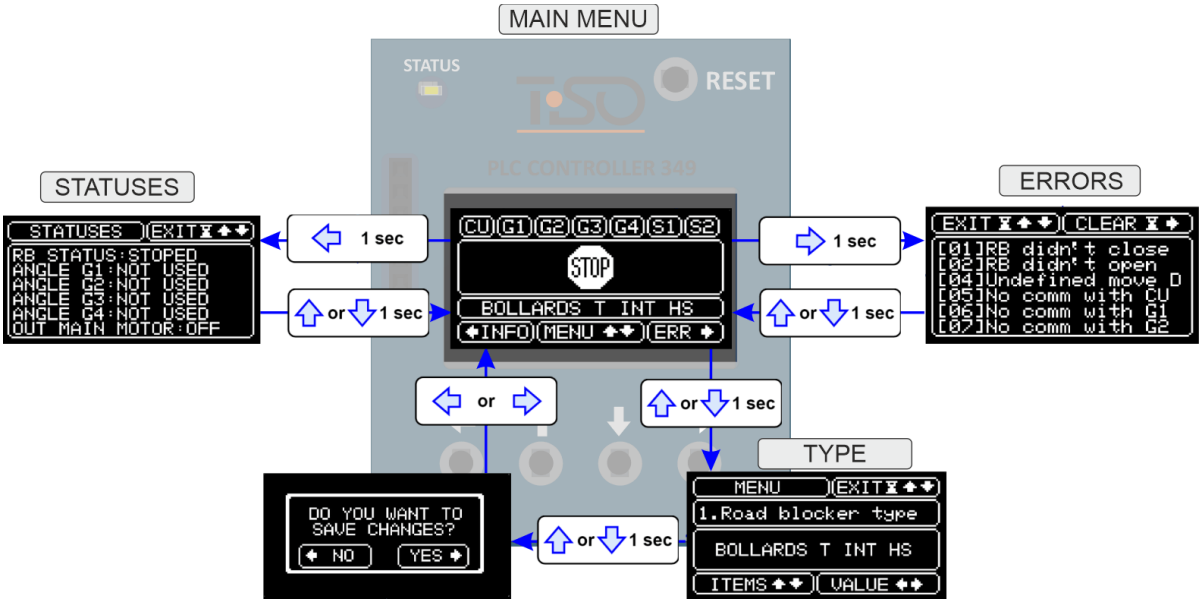


*Fig. 29* – Diagram of entering and exiting the settings menu.

The settings menu is intended for changing the device parameters. It is quite simple and consists of three main parts:

**"Item name " (1)**

**The number and name of the settings** item are displayed in the first field. The text is displayed as a moving line, if the name of the item is longer than the width of the screen.

**"Mode of operation or value of the item "(2)**

The name of the mode or value is displayed in the second field. If the parameter is set as a value (a), then fields with its maximum (b) and minimum (c) possible values are displayed on the screen.


**"Navigation inscriptions" (3)**

The fields are intended for navigation highlighted above and below. In these fields there are inscriptions and graphic symbols that explain which function this or that button corresponds to.

*Table 17* - Navigation Fields

| | |
|---|---|
| • Switching between settings items is carried out with a short press of the buttons and . | ITEMS |
| • Changing the parameter itself is carried out by pressing the buttons and . Increasing or decreasing numerical parameters can be accelerated by holding down the buttons. | VALUE |
| • To exit the settings to the start screen, you need to press and hold the button for 1 second or | EXIT |
| After a long press on the buttons or , a screen will appear asking "Do you want to save the changes?". After the user clicks "yes" or "no", the program will return to the start screen. | |



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If a newer version of the software has been downloaded to the controller, then for the correct operation of the device, the settings should be reset to the factory settings. To do this, you need to find an item «22. Reset to factory settings» in the menu. Then press and hold the button for 1 second. In the window that appeared on the screen, you need to confirm the action by pressing the button . After these actions, it must be configured for the desired type of blocker.

**For operating settings, parameters, and a description of possible errors** of the PCB350.02 controller, refer to Tables 3 and 5 in the device setup manual *«PCB 350.02 DEVICE SETUP GUIDE v.1.5.0»*

## 5. SYSTEM OPERATION CHECK

After ensuring that all device components are connected properly, you can begin the verification and setup process.

1. The first step is to check the device type in the PCB350 controller settings. Open the **ECU** and access the PCB350 controller. On the main display screen, field **№ 3** shows the «**Selected blocker type».** The operation logic of the entire system depends on the selected type. The blocker type field should display **«BOLLARD HS EXT HS».** If a different blocker type is shown on the display, it must be changed to the correct one.For more details on changing the blocker type and other settings, refer to Tables 3 and 5 of the. **«PCB 350.02 DEVICE SETUP GUIDE v.1.5.0».**
2. Now, you can issue a command for raising or lowering the device from the control panel. If everything is connected correctly, the device will perform the corresponding movement.
3. The blocker can be controlled either via the control panel or through potential inputs.

## 6. POSSIBLE MALFUNCTIONS AND TROUBLESHOOTING METHODS

After the initial connection or after a certain period of operation, some malfunctions or errors may occur. These can range from minor issues such as **“traffic light not working”** to more serious faults that affect the proper functioning of the blocker system.

**Table 18** provides a list of the most common malfunctions and possible solutions.

*Table 18*

| № | Malfunction | Possible Cause | Solution | "ERROR" Indicator |
|---|---|---|---|---|
| 1 | Bollard does not raise or lower when receiving Raise/Lower commands. | Hydraulic hoses from the hydraulic station (HS) to the blocker are not connected or connected incorrectly. | Check and correctly connect the hydraulic hoses according to the instructions. | - |
| | | Insufficient oil level in the hydraulic station. If the oil level sensor option is available, it can be checked. | Check the oil level in the hydraulic station. Refill as needed. | Blinking (if oil level sensor B3-S2 is present). |



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*Continuation of the table 18*

| | | | | |
|---|---|---|---|---|
| | | Incorrect operation of the limit switches. | Check the wiring according to the diagram in **Annex 1**. If a limit switch is faulty, replace it. | - |
| 2 | Blocker moves in the opposite direction | Incorrect phase order connection (**L1, L2, L3**) of the 3-phase power supply. | Swap two of the phases (e.g., **L1** and **L2**) as described in Section **3.1 "Connecting the Electronic Control Unit to the Power Supply"**. | Blinking (if phase order relay B2-A7 or B2-A6 is present). |
| 3 | The hydraulic station keeps running for a long time after the blocker reaches the upper or lower position. | Incorrect operation of the limit switches. | Check the wiring according to the diagram in **Annex 1**. If a limit switch is faulty, replace it. | Blinking (if no connection). |
| | | Incorrect blocker type or quantity selected. | Check the selected blocker type and related parameters in the **PCB350** settings menu. See **"PCB 350.02 DEVICE SETUP GUIDE v.1.5.0"** for details. | - |
| 4 | The blocker's light or sound signal is not working | The light or sound signaling device of the blocker is not connected or is connected incorrectly. | Check the connection according to the diagrams in **Annex 1** and **Annex 2**, or refer to sections **"3.2 Connecting the Bollard to the ECU"** and **"3.6 Connecting the traffic light."** | - |
| | | Incorrect indication mode is enabled on the PCB350 controller. | Change the indication or status output mode of the controller. This can be done in the settings menu of the **PCB350 controller**. For more details, see **"PCB 350.02 DEVICE SETUP GUIDE v.1.5.0"**. | - |



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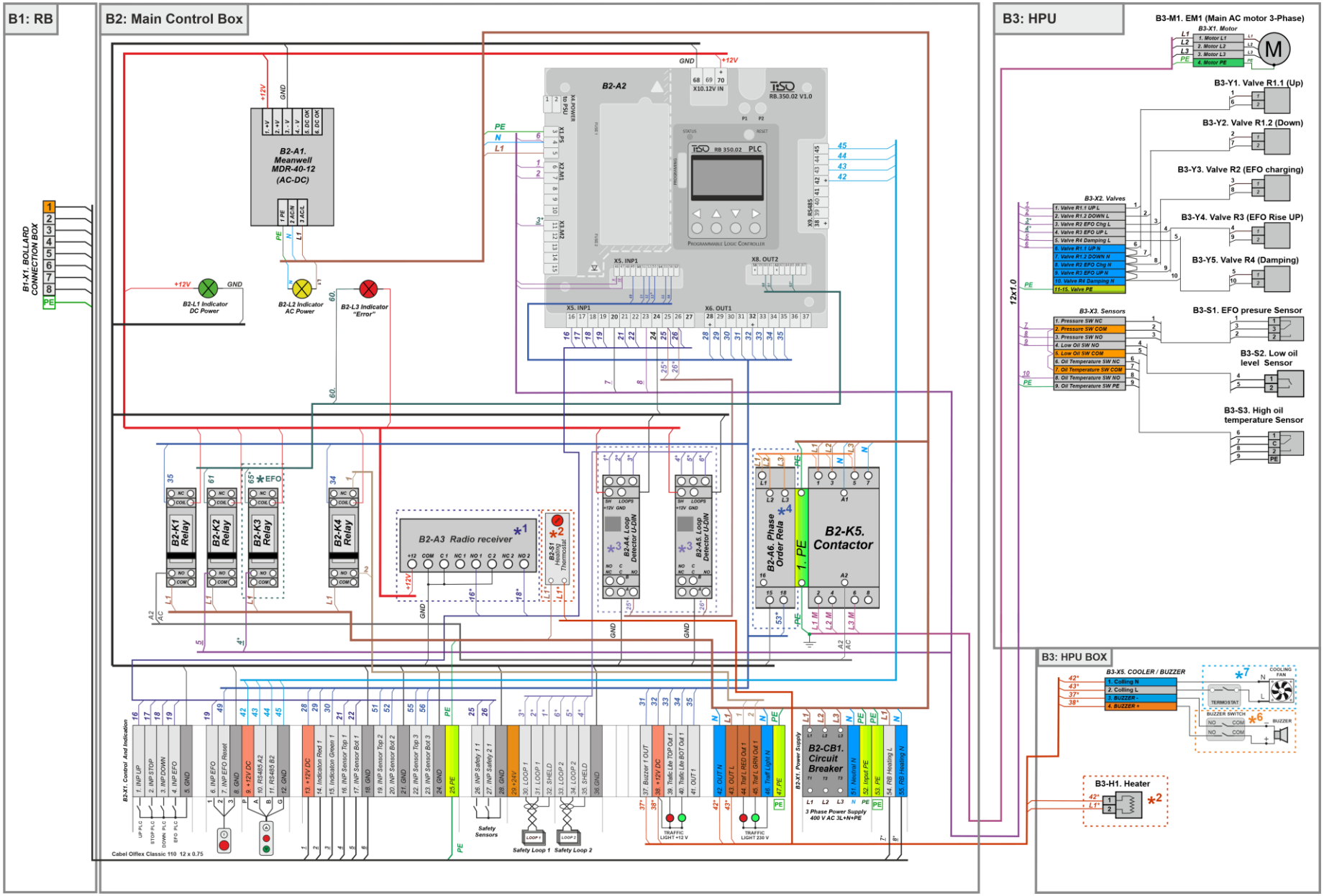
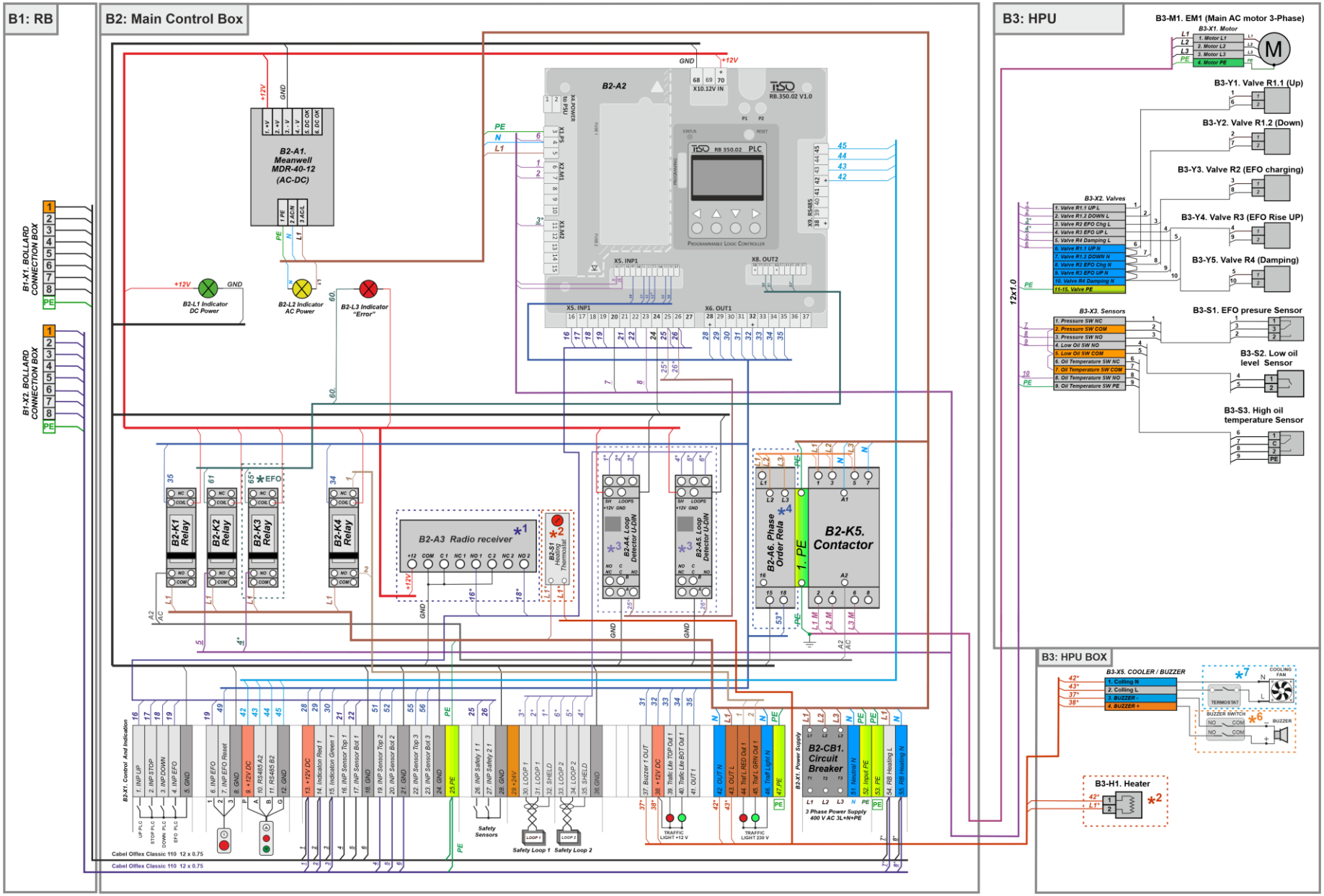
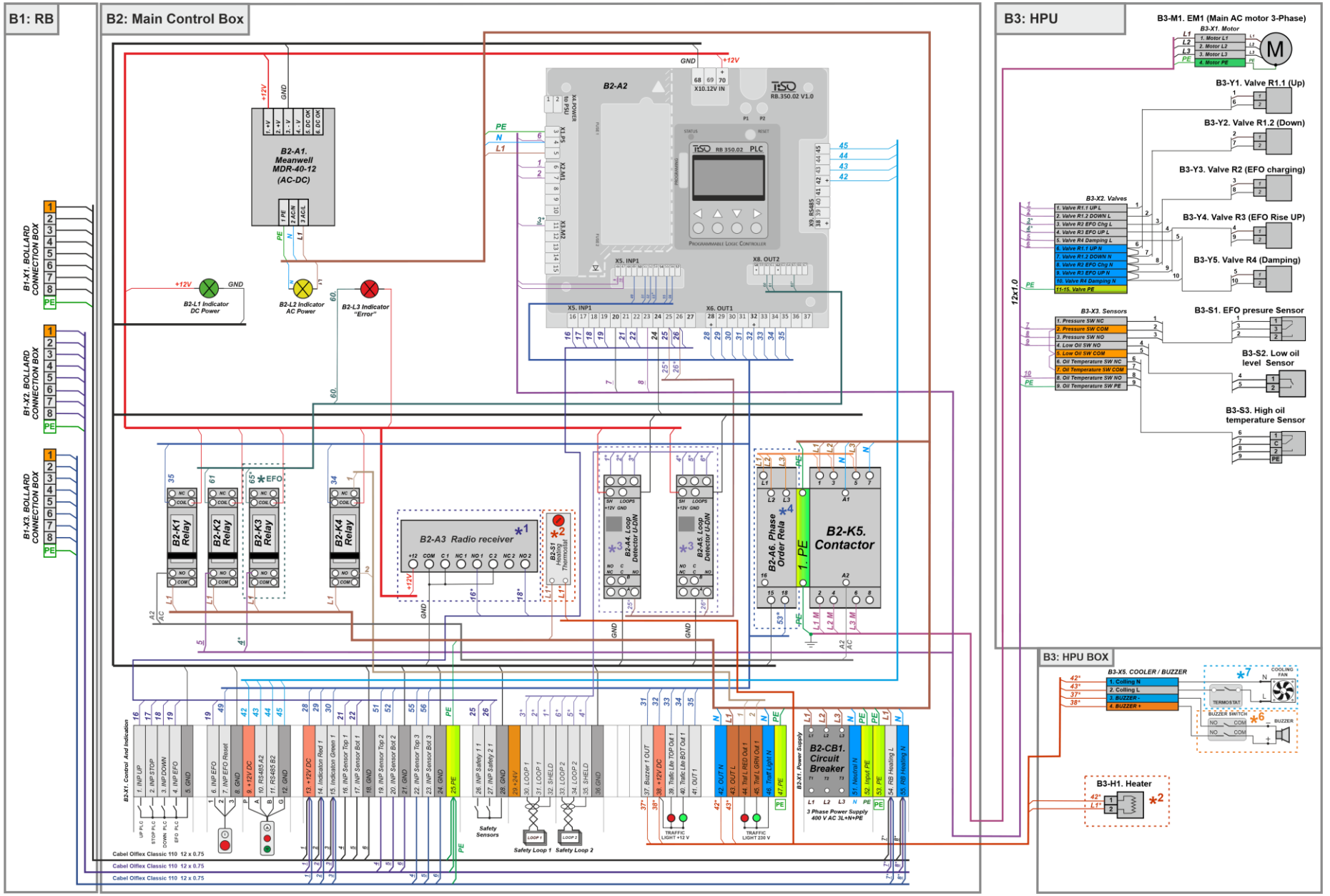
# Annex 1. - Wiring diagram of the Bollards to control unit RB108-1+EFO rev. 1.4



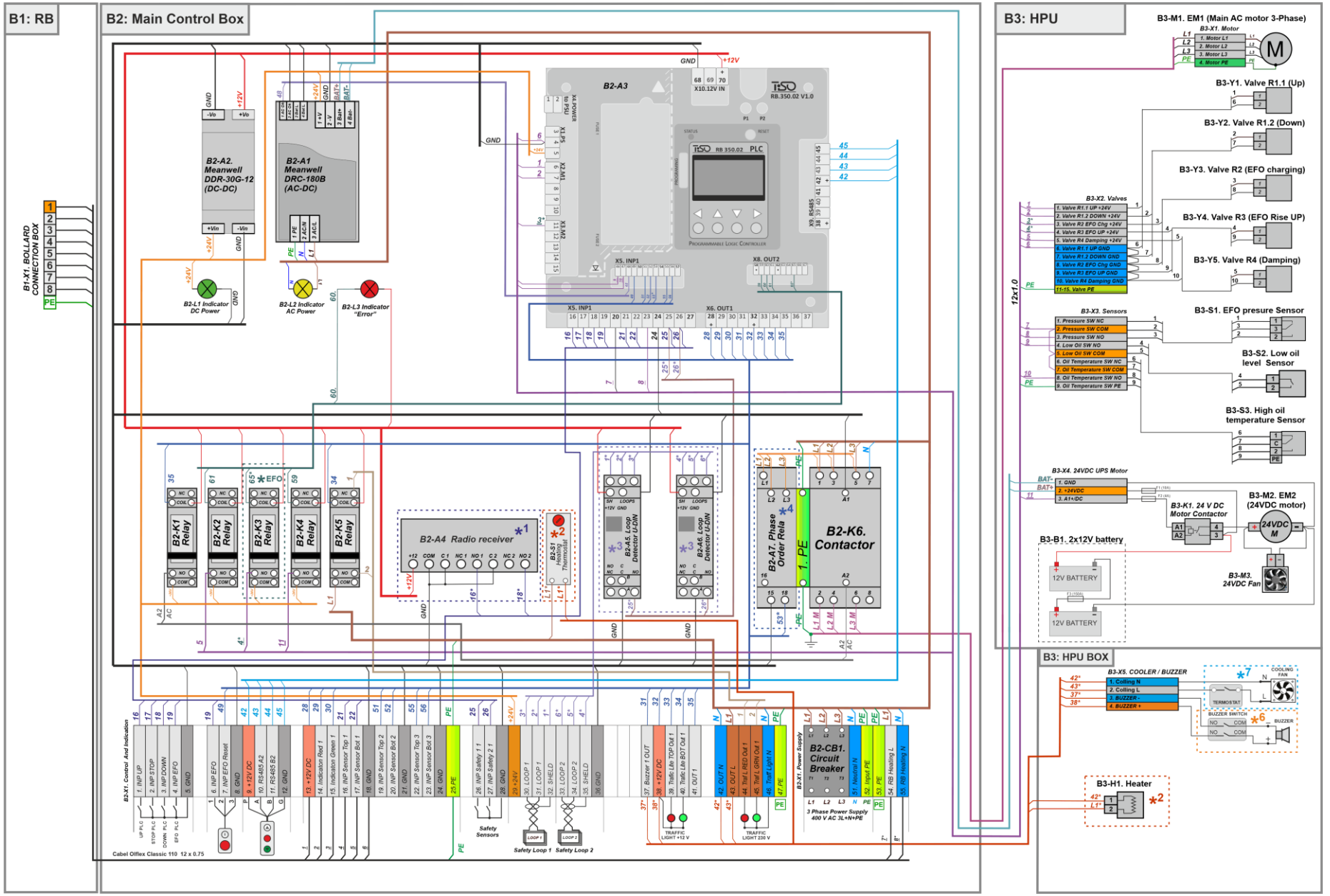
# Annex 2. - Wiring diagram of the Bollards to control unit RB108-2+EFO rev. 1.4



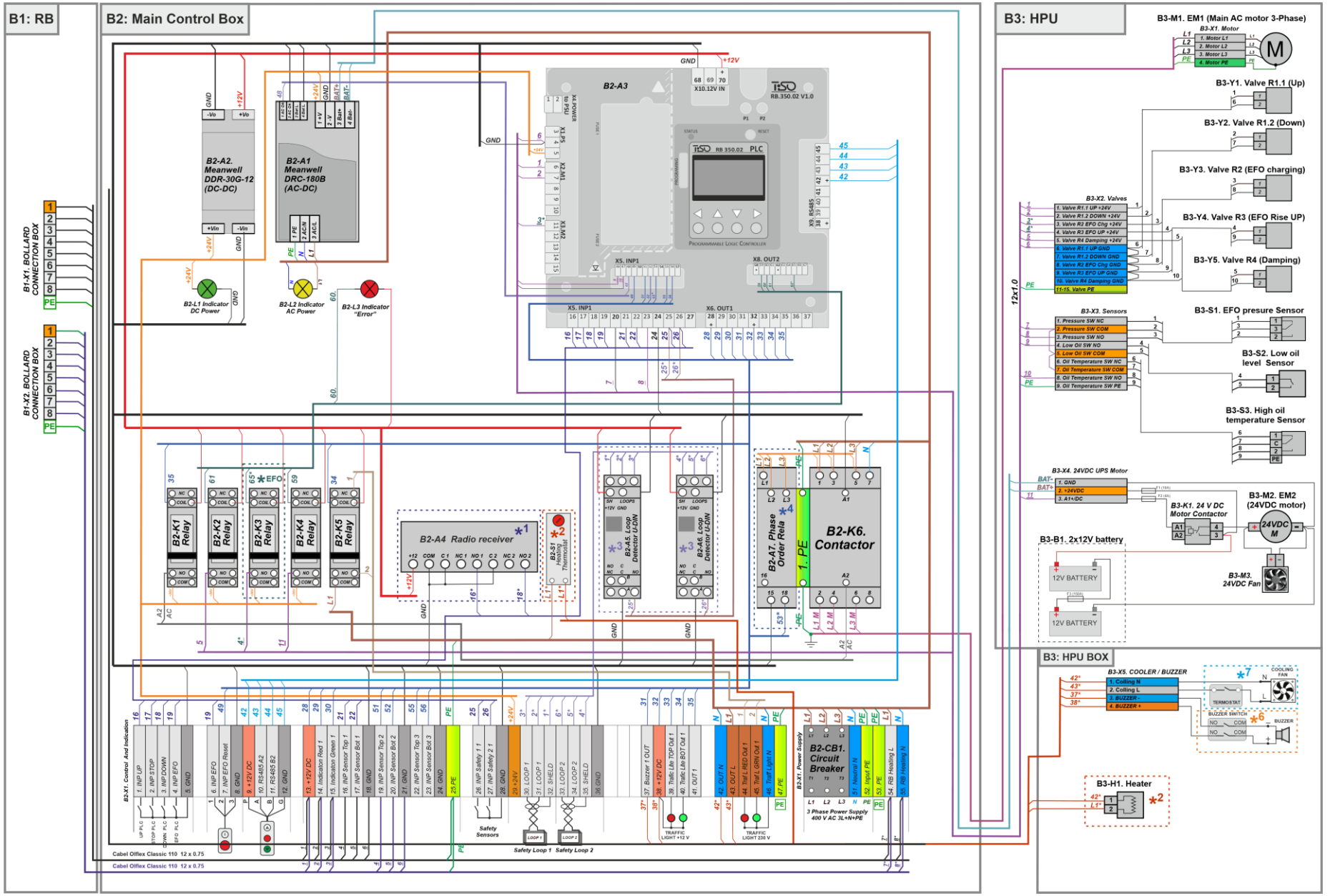
# Annex 3. - Wiring diagram of the Bollards to control unit RB108-3+EFO rev. 1.4



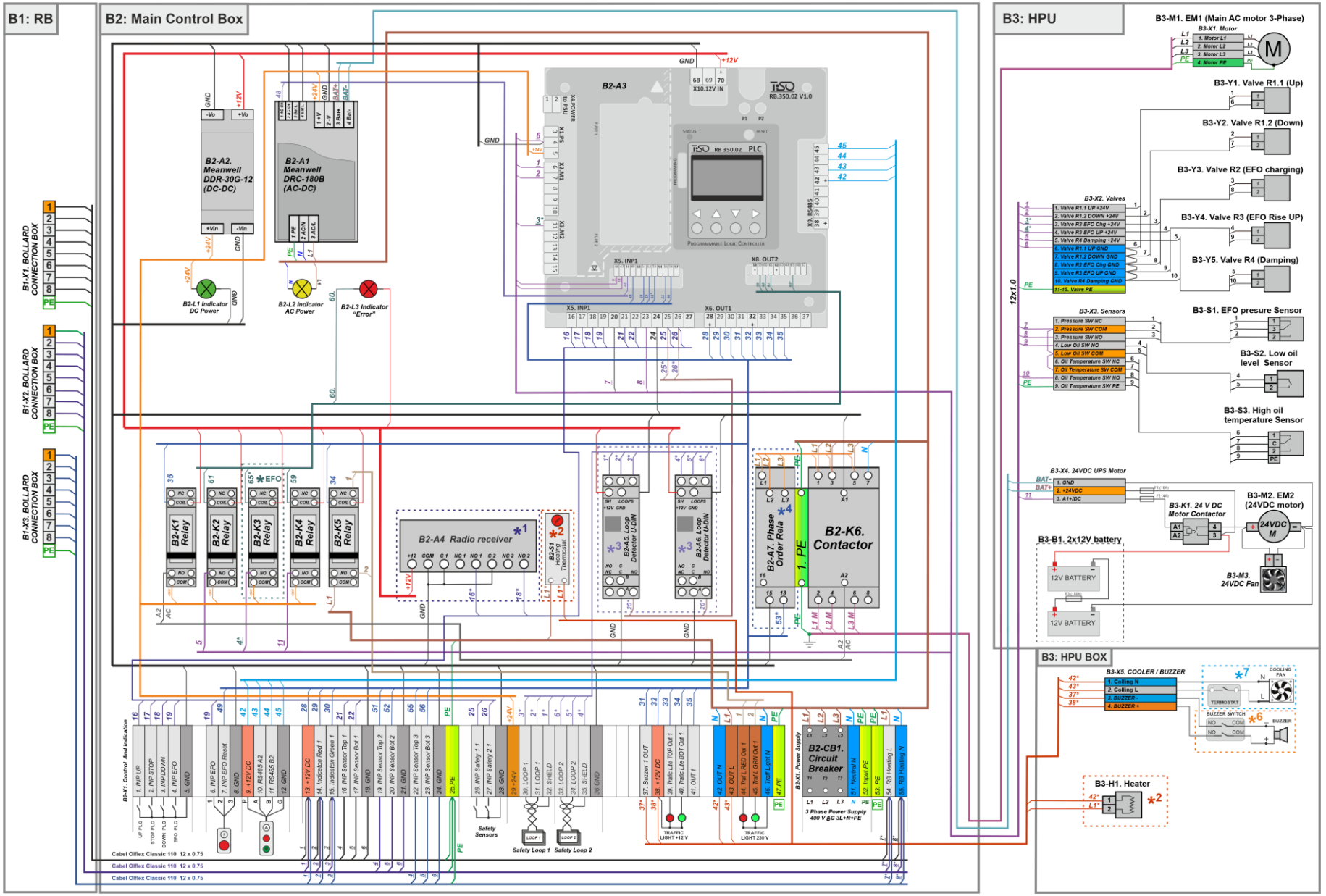
# Annex 4. - Wiring diagram of the Bollards to control unit RB109-1+UPS+EFO rev. 1.4



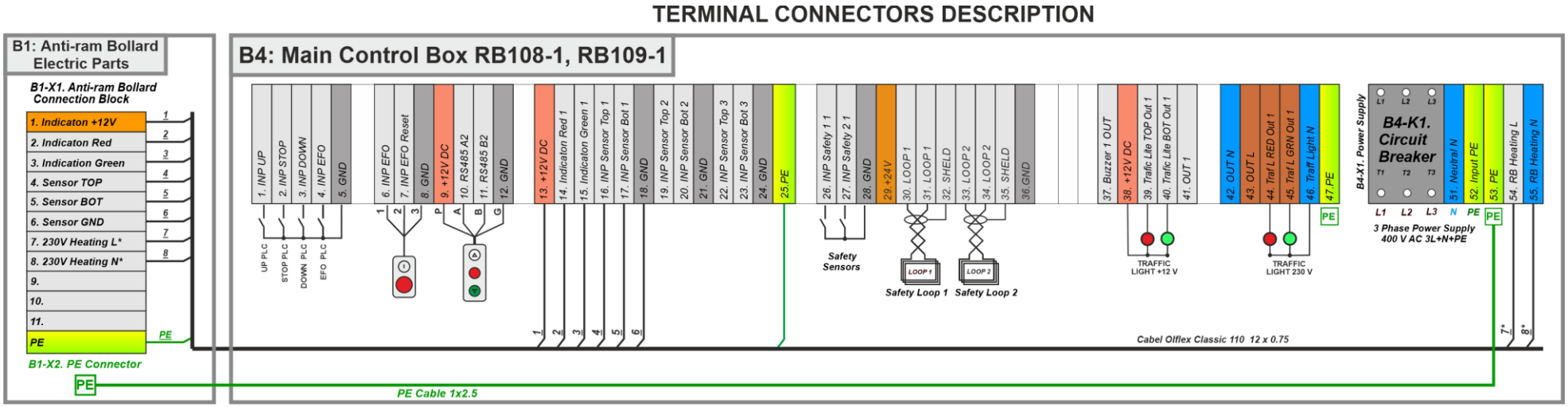
# Annex 5. – Wiring diagram of the Bollards to control unit RB109-2+UPS+EFO rev. 1.4



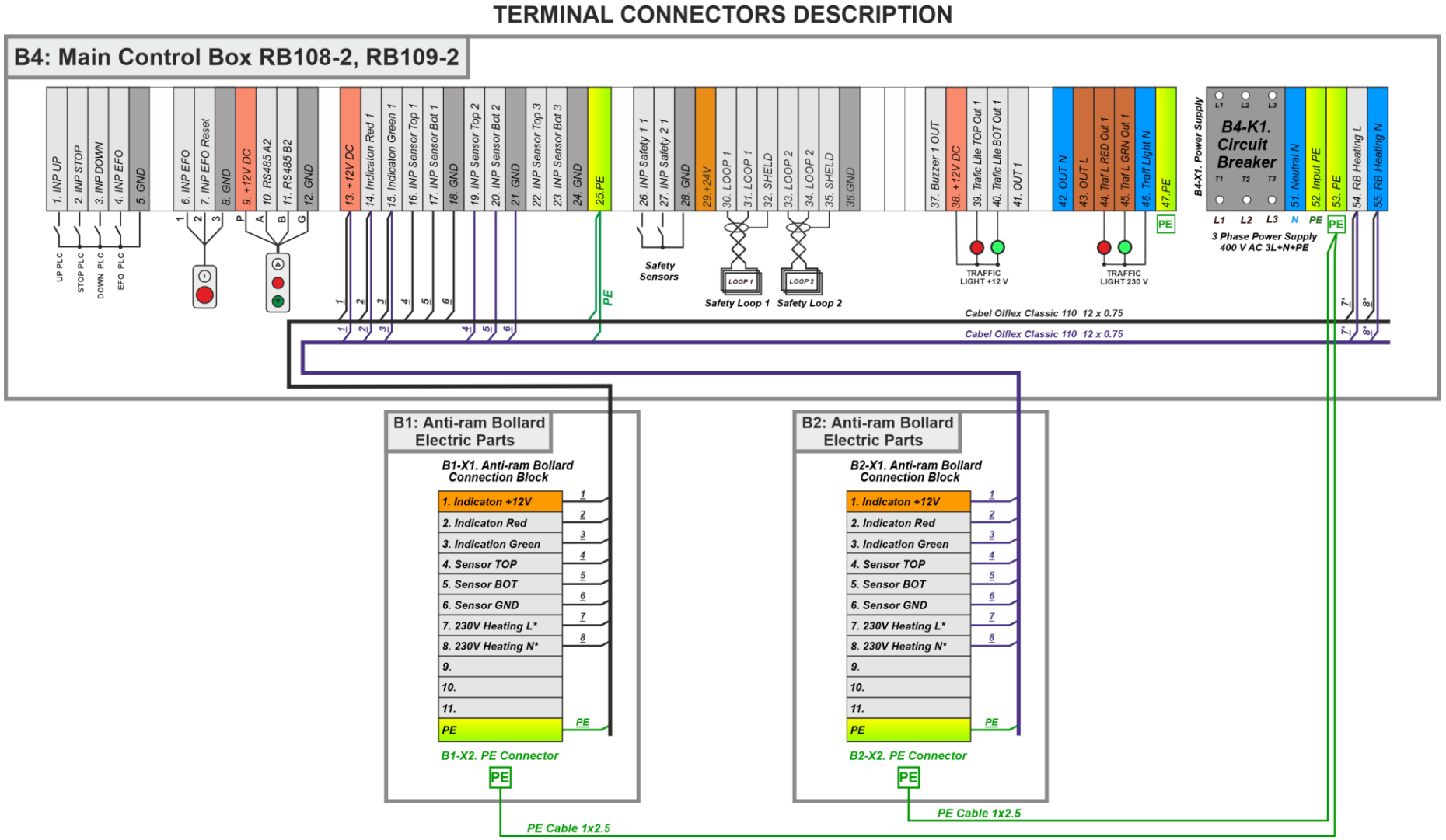
# Annex 6. – Wiring diagram of the Bollards to control unit RB109-3+UPS+EFO rev. 1.4



**Annex 7. – Diagram of connection of the Bollards to control unit RB108-1 / RB109-1**



**Annex 8. – Diagram of connection of the Bollards to control unit RB108-2 / RB109-2**



**Annex 9. – Diagram of connection of the Bollards to control unit RB108-3 / RB109-3**