HALSANG Gate Control System

Release 1.0

Contents:

CHAPTER 1

General Safety Recommendations

Note

Before assembling and using the product for the first time, carefully read this user manual. Keep the manual for the entire period of product use and follow the recommendations contained herein.

1.1 General Information

- The device shall be used solely for its intended purpose. Any use beyond its designated function may cause damage to the product and create hazards for the operator. The manufacturer assumes no liability for damage resulting from improper use of the product.
- During assembly and operation, all applicable safety regulations and standards in force in the relevant country shall be strictly observed.
- The installed gate shall comply with the requirements of the Machinery Directive 2006/42/EC and standards EN 12605, EN 12604, and DIN EN 13241-1.
- The gate drive shall be installed in accordance with standards EN 12453, EN 12445, and EN 12635.

1.2 Installation and Maintenance

- Installation, connection, and initial commissioning shall be carried out only by qualified personnel.
- Prior to installing the controller with the drive unit, ensure that the gate has been correctly installed. The gate shall be rigid, stable, properly balanced, and capable of moving smoothly.
- The drive unit shall not be connected to the power supply until assembly and configuration have been fully completed.
- Before performing cleaning or maintenance, the device must be disconnected from the power supply.
- The operation of all safety devices shall be checked at least once per month. A full technical inspection shall be carried out at least once every six months.

- The use of non-original spare parts is strictly prohibited.
- Repairs or modifications to the device shall not be undertaken without the manufacturer's prior approval.

1.3 Operation

- The gate drive may be operated only after the prescribed maintenance activities have been carried out.
- Passing or driving through the gate while it is in motion is strictly prohibited.
- A safe distance from the gate shall be maintained during opening, closing, or automatic operation.
- The drive components must not be touched or interfered with while the gate is moving.
- The gate shall be operated only when its entire movement area is fully visible and free from obstructions.
- Before use, ensure that all safety devices (e.g., photocells, safety edges) are functioning correctly.
- The gate drive shall not be used for lifting persons or objects.
- The gate shall not be operated by children. Remote controls and operating devices must be kept out of their reach.

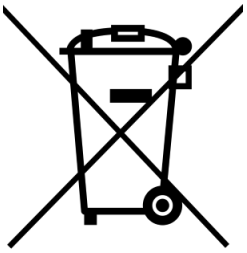
SIMPLIFIED EU DECLARATION OF CONFORMITY

CE

Manufacturer: Halsang, Targowisko 551, 32-015 Kłaj

Manufacturer declares that the equipment HALSANG Gate Control System is in compliance with Directives: EMC 2014/30/UE, LVD 2014/35/UE, ROHS 2011/65/UE, RED 2014/53/UE, MD 2006/42/UE

The full text of the EU declaration of conformity is available at the following internet address: **www.halsang.com**



In accordance with the applicable regulations on the disposal of unwanted equipment by private users in the European Union, items bearing this symbol must NOT be disposed of together with other household waste. In such cases, the user is responsible for proper disposal by delivering the device to a designated collection point or to the manufacturer, who will arrange for its further processing. Separate collection and recycling of unwanted equipment helps protect the natural environment and ensures that disposal is carried out in a manner that safeguards human health and the environment. This notice also applies to used batteries and accumulators.

CHAPTER 2

Product overview

The **HALSANG Gate Control System** is a universal control system designed for operating sliding gates, swing gates and turnstiles suitable for both industrial and residential applications. It provides a user-friendly interface for configuring gate parameters, monitoring gate status, and managing errors.

The GCU supports the following gate types:

- **Swing Gate Control**: Configurable for one or two wings, with support for absolute position encoders.
- **Sliding Gate Control**: Configurable for one or two wings, using limit switches for position detection.
- **Turnstile Control**: Support any number of automatic or manual turnstiles.

For sliding and swing gate control, the system supports two types of drives:

- **Traditional AC motors** (230V AC), controlled via an external Yaskawa GA500 inverter through the RS485 interface.
- **Brushless DC (BLDC) motors**, controlled via a BLDC driver board using the CAN communication interface.

Components Included in the Set:

- **GCU** (Gate Control Unit) Responsible for control logic and input/output signal management
- **GATE IO** module: Mounted on a DIN rail with spring terminals, enables the connection and integration of accessories, sensors, safety systems, and other peripheral devices.
- **Turnstile Controller** A dedicated controller board designed for managing turnstile-type gates.
- **BLDC Controller** A dedicated controller board designed for managing brushless DC (BLDC) motors in two versions: in round shape - BLDC TUBE and DIN rail mount - BLDC DIN.

External devices such as GATE IO, BLDC controllers, and turnstile controllers are integrated into the system via the **CAN interface**.

Remote drive control is available using transmitters operating at 867.84 MHz with the HALSANG transmission standard.

Specification

3.1 Technical Data

3.1.1 Gate Control Unit (GCU)

Parameter	Specification
Power Supply	24 V DC
RTC Clock	3 V (CR2032 battery)
Operating Temperature Range	–40 °C to +85 °C
Power Consumption (Standby)	< 10 W
RS485 Interfaces	2x RS485
CAN Interfaces	2x CAN
Transmitter Memory Capacity	100000 units

3.1.2 Gate IO

Parameter	Specification
Power Supply	24 V DC
Operating Temperature Range	–40 °C to +85 °C
Power Consumption (Standby)	< 10 W
Radio Receiver (Optional)	867.84 MHz FSK HALSANG
Board Fuse 24 V	1 A / 24 V DC
Output Load Capacity 24 V DC (24V OUT1, 24V OUT2)	5 A / 24 V DC
Output Load Capacity NO/NC OUT1, OUT2	3.15 A / 230 VAC or 5 A / 24 V DC
Output Load Capacity LAMP, LOCK/BRAKE	< 1 A (1.1 A fuse)
Output Load Capacity WIND	< 0.45 A (0.5 A fuse)
Output Load Capacity 24 V DC	< 1 A (1.1 A fuse)
Output Load Capacity 12 V DC ENCODER	< 0.45 A (0.5 A fuse)
Output Load Capacity 24 V DC PHOTO TX, RX	< 0.45 A (0.5 A fuse)
Output Load Capacity HV (HV1, HV2)	5 A
CAN IN	1x CAN
CAN OUT	1x CAN

3.1.3 BLDC Controller

Parameter	Specification
Power Supply	24 V DC
Operating Temperature Range	–40 °C to +85 °C
Power Consumption (Standby)	< 10 W
Maximum Motor Power (BLDC)	200 W
CAN	1x CAN IN 1x CAN OUT

3.1.4 Turnstile Controller

Parameter	Specification
Power Supply	24 V DC
Operating Temperature Range	–40 °C to +85 °C
Power Consumption (Standby)	< 10 W
Maximum Motor Power (Brushed)	200 W
CAN	1x CAN IN 1x CAN OUT
Output Load Capacity LAMP (+24V OUT, GND)	< 1 A

3.2 Dimensions

3.2.1 Gate Control Unit (GCU) dimensions

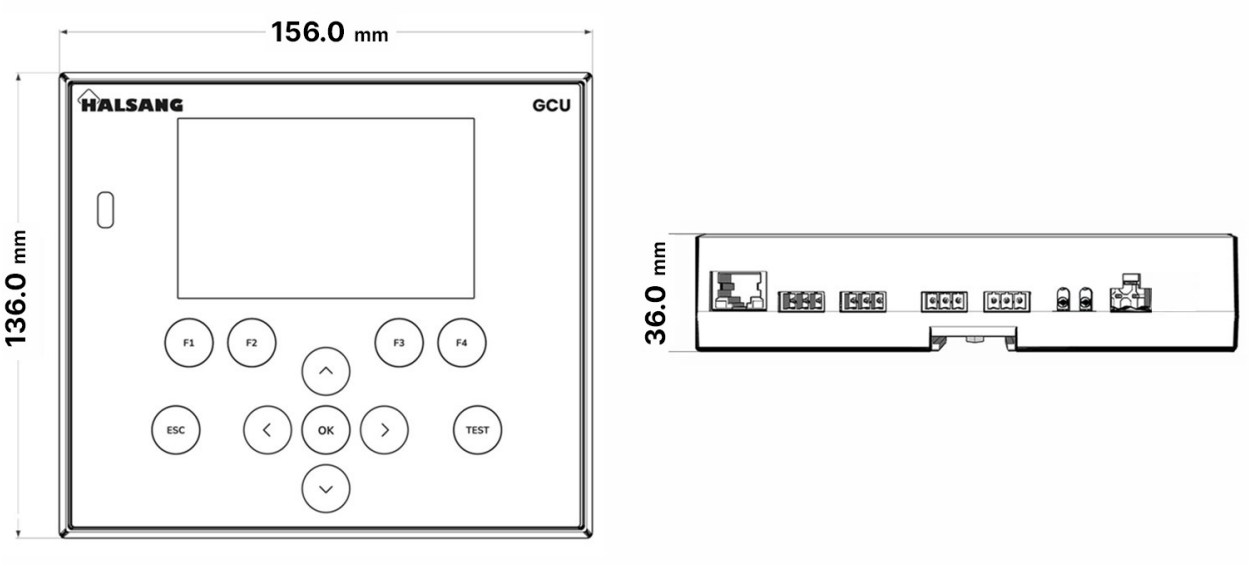


Fig. 1: Dimensions of the Gate Control Unit (GCU)

3.2.2 Gate-IO dimensions

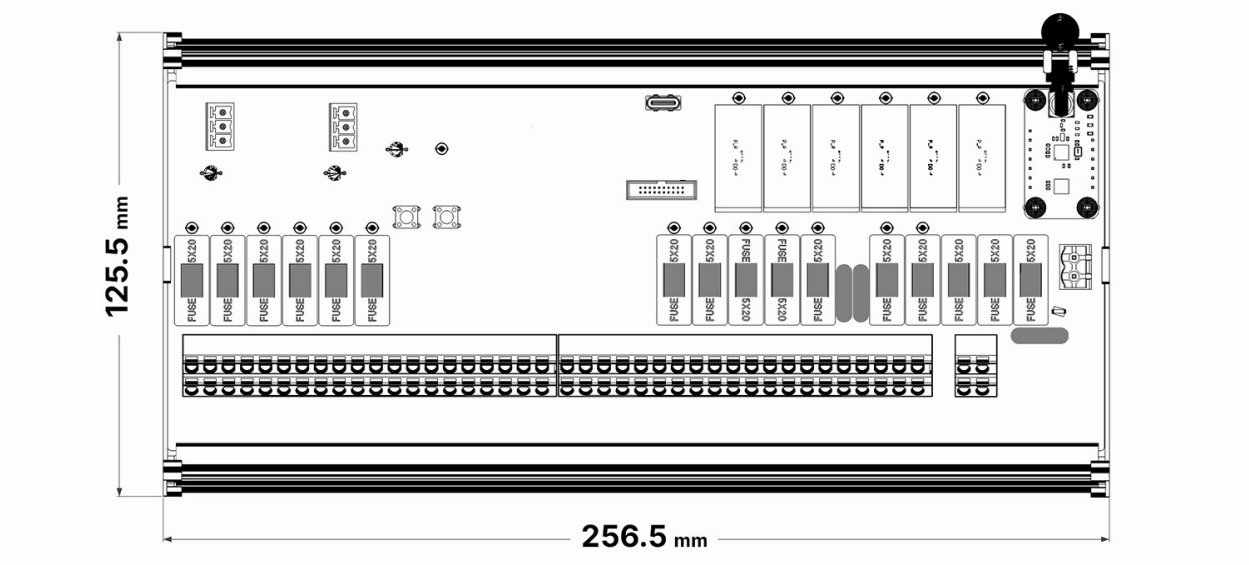


Fig. 2: Dimensions of the GATE-IO extension module

3.2.3 BLDC DIN dimensions

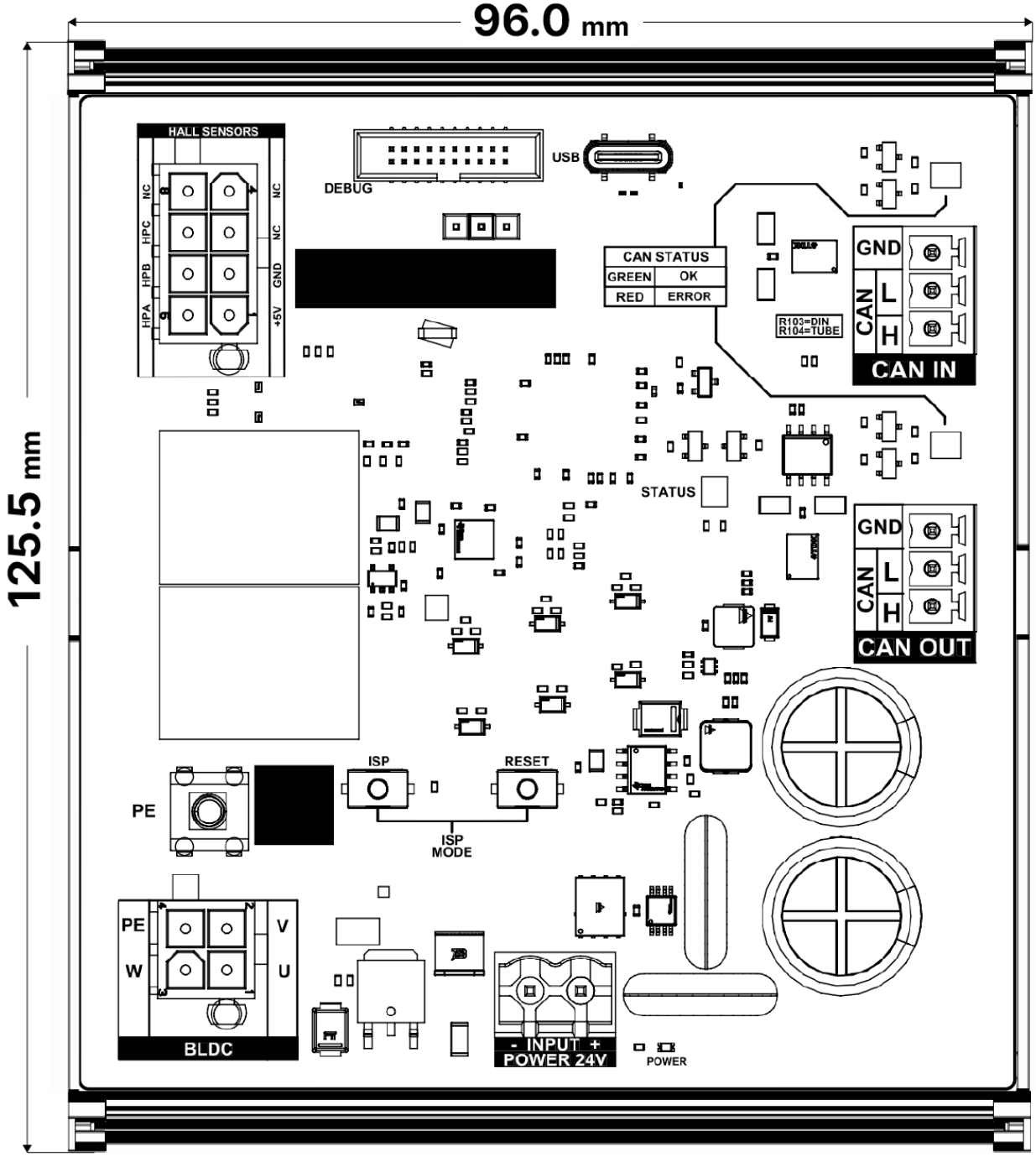


Fig. 3: Dimensions of the BLDC DIN extension module

3.2.4 BLDC TUBE dimensions

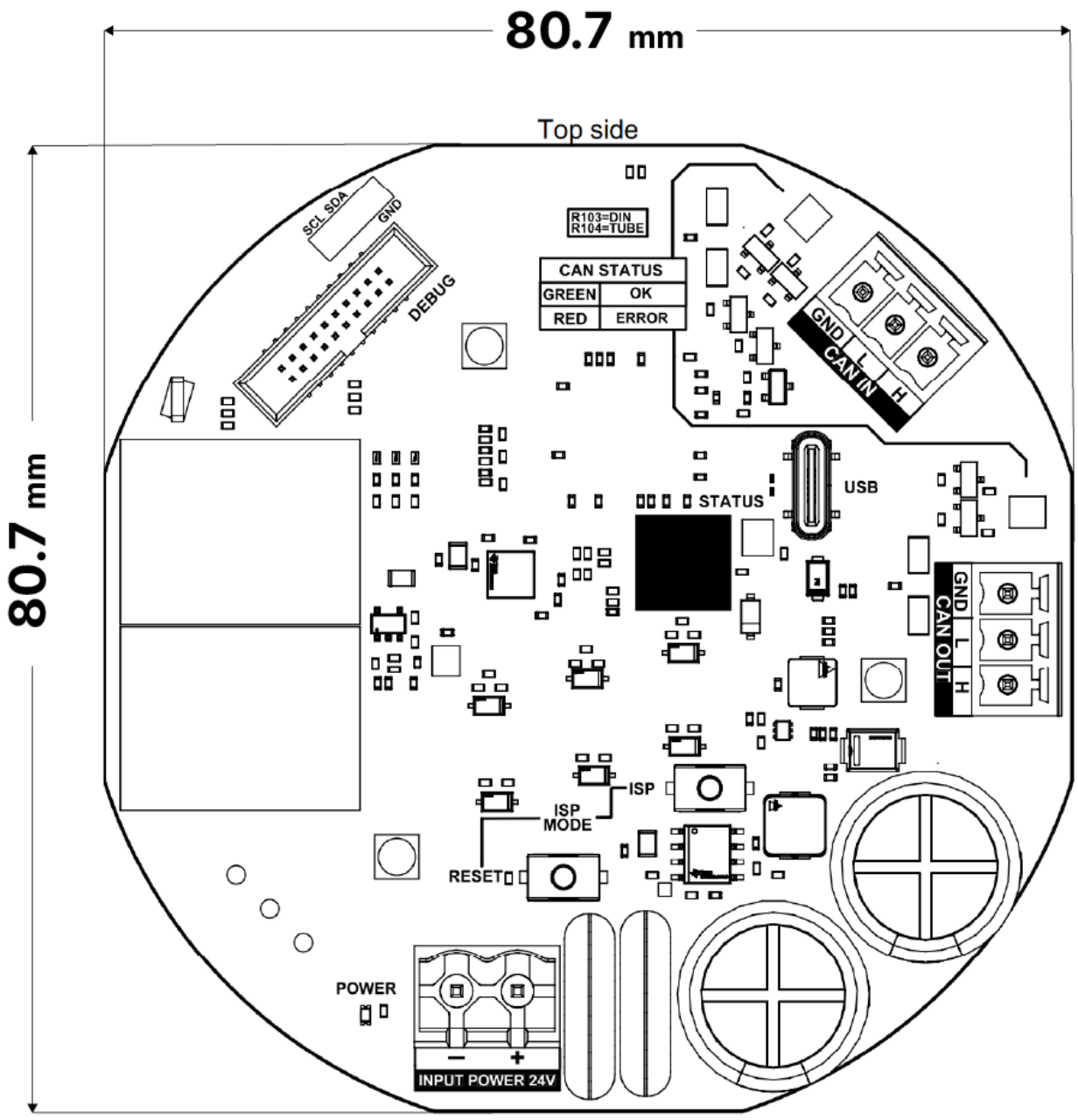


Fig. 4: Dimensions of the BLDC TUBE extension module

3.2.5 Turnstile dimensions

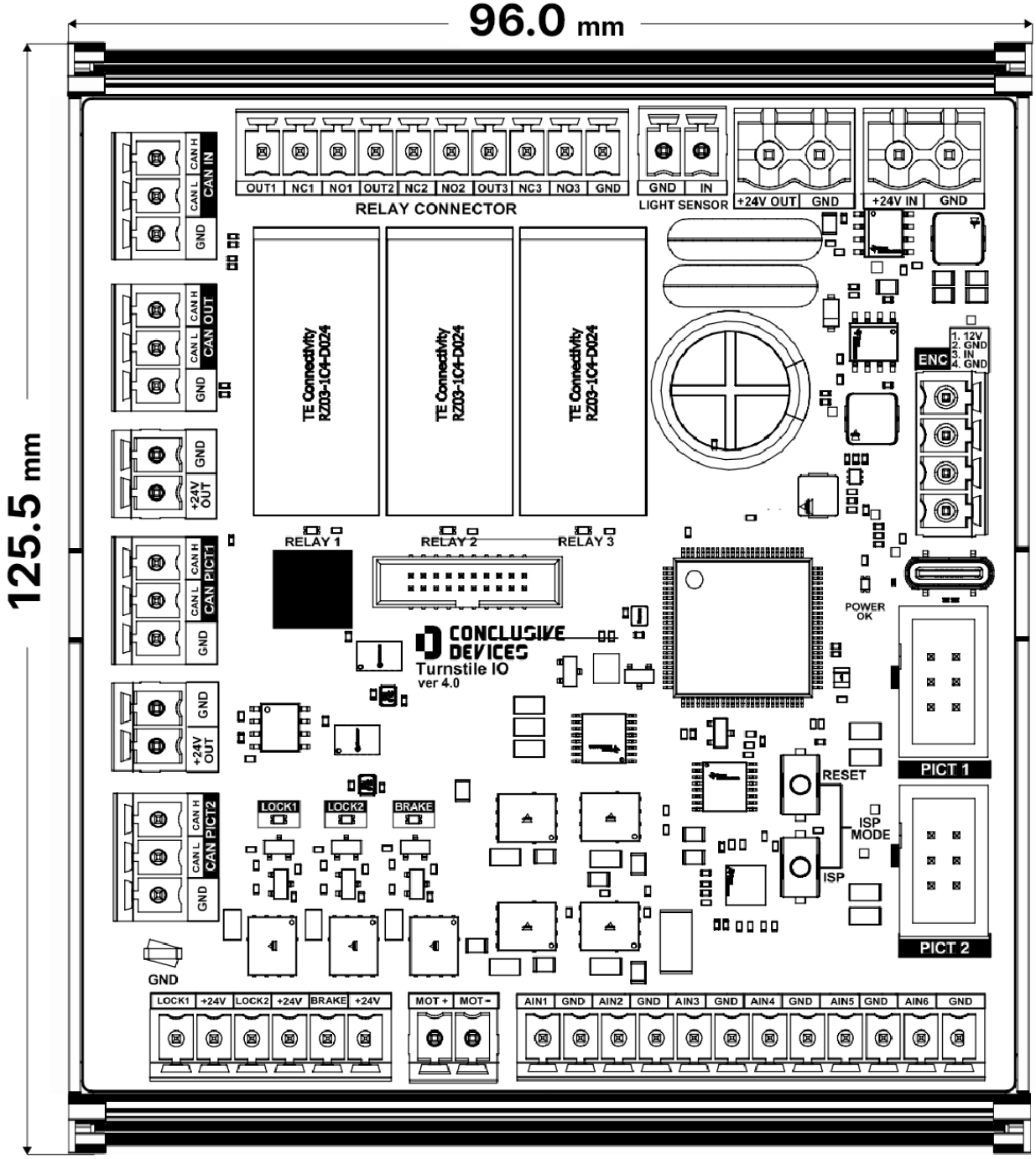


Fig. 5: Dimensions of the Turnstile extension module

3.3 Connectors and pinout

3.3.1 Gate Control Unit (GCU) connectors

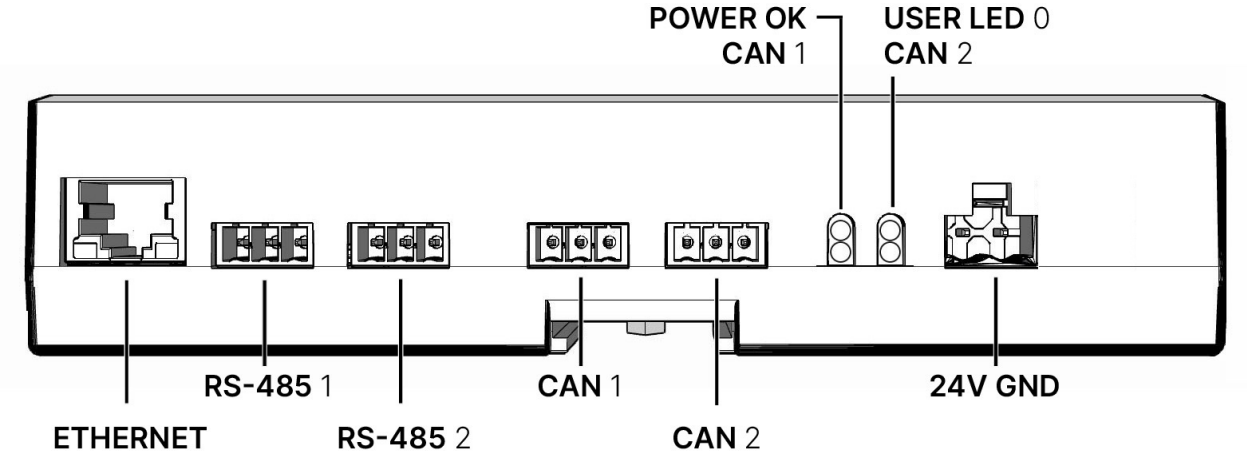


Fig. 6: Connectors of the Gate Control Unit (GCU)

3.3.2 RS485 Connectors

Pin	Signal	Notes
1	GND	
2	B-	
3	A+	

3.3.3 CAN Connectors

Pin	Signal	Notes
1	Isolated GND	
2	CAN L	
3	CAN H	

3.3.4 24V Power Connector

Pin	Signal	Notes
1	24V	
2	GND	

3.3.5 Gate-IO connectors

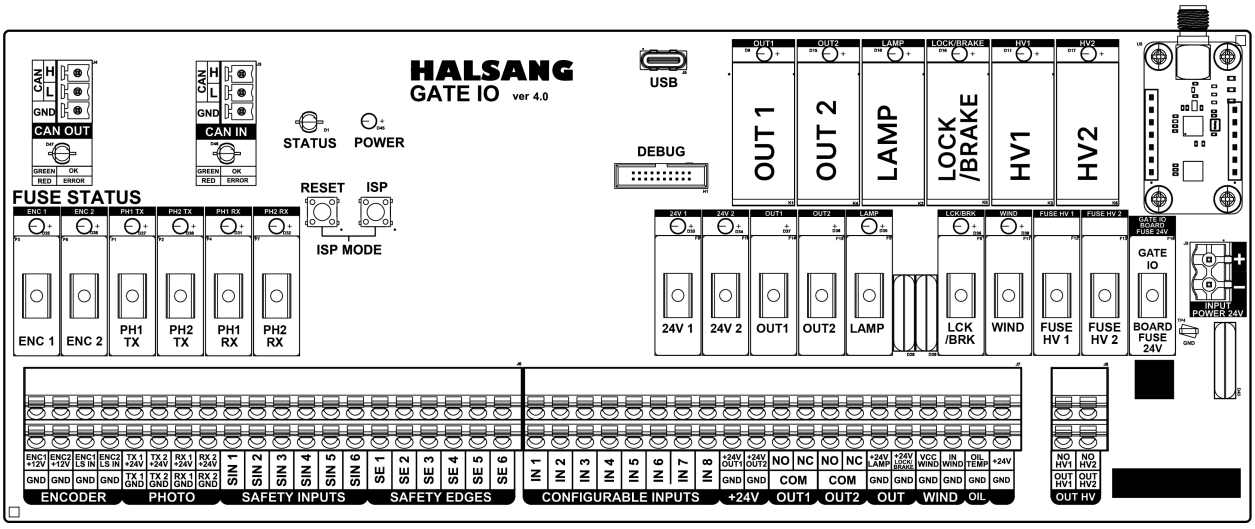


Fig. 7: Connectors of the GATE-IO extension module

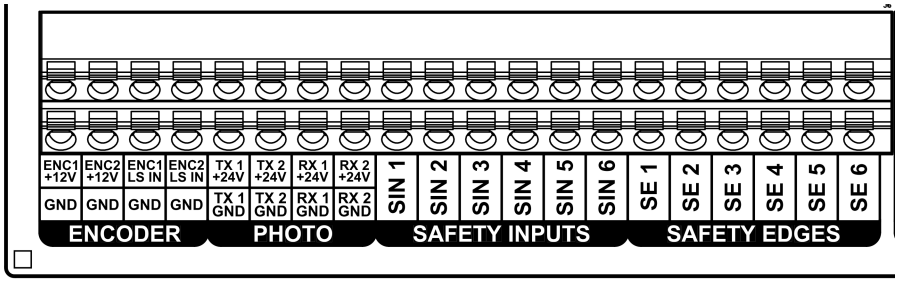


Fig. 8: Connectors of the GATE-IO extension module bottom left part (enlarged view)

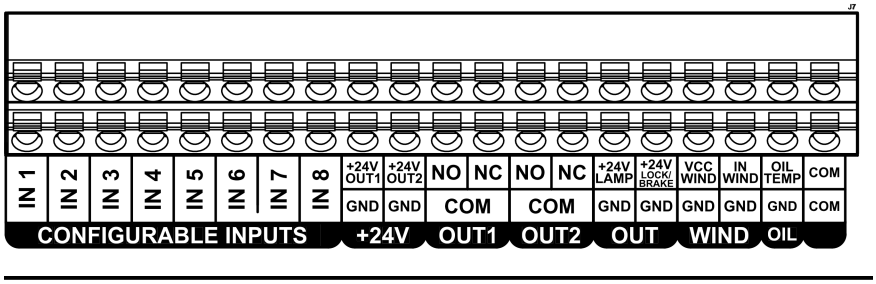


Fig. 9: Connectors of the GATE-IO extension module bottom right part (enlarged view)

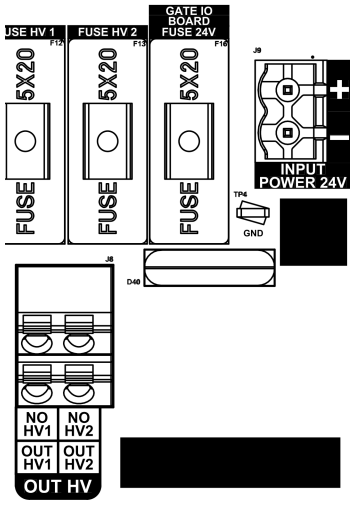


Fig. 10: Connectors of the GATE-IO extension module right part (enlarged view)

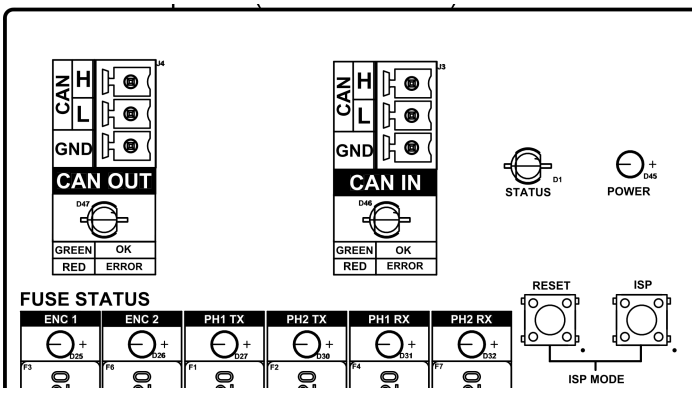


Fig. 11: Connectors of the GATE-IO extension module top left part (enlarged view)

3.3.6 BLDC DIN connectors

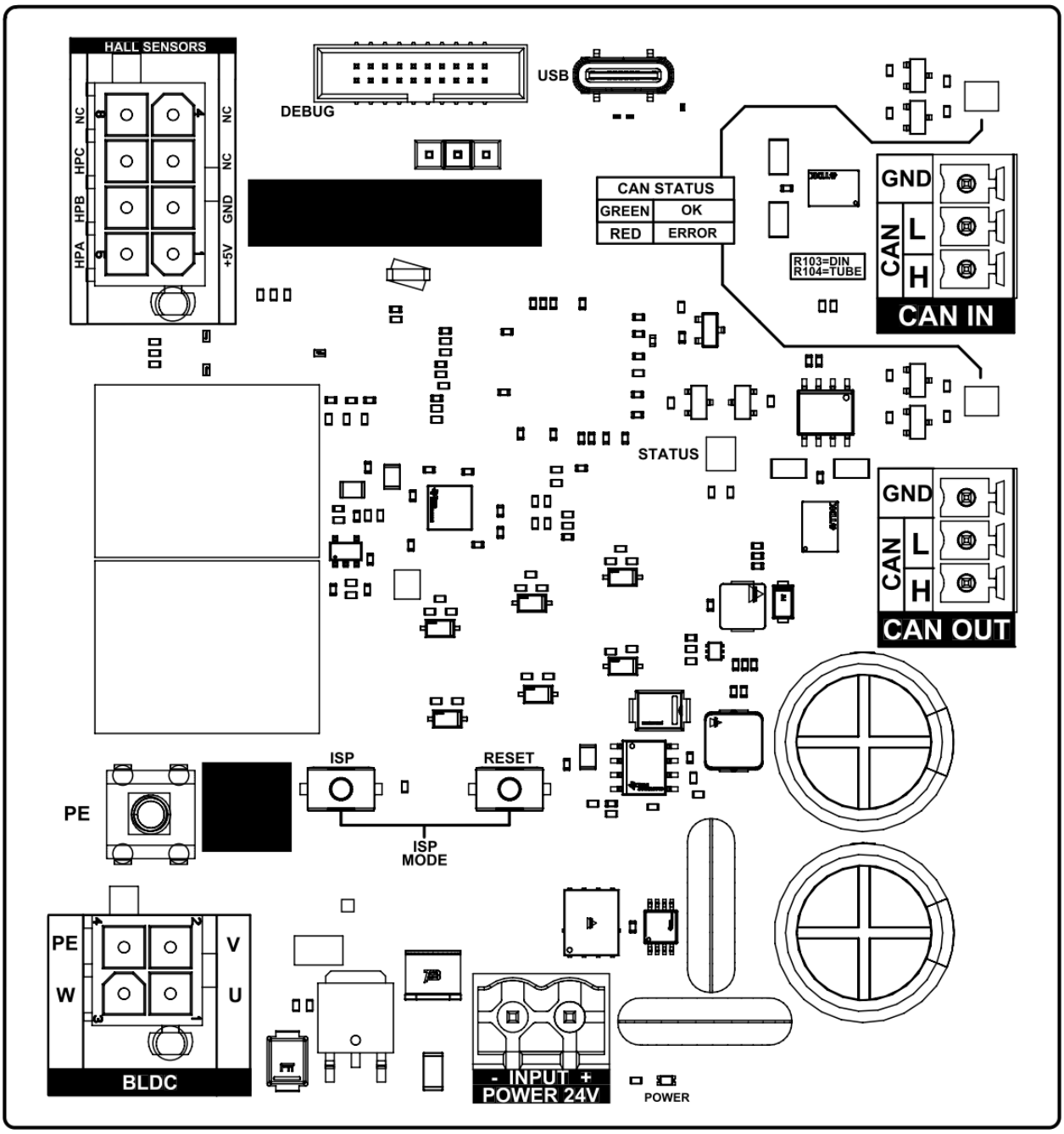


Fig. 12: Connectors of the BLDC DIN extension module

3.3.7 BLDC TUBE connectors

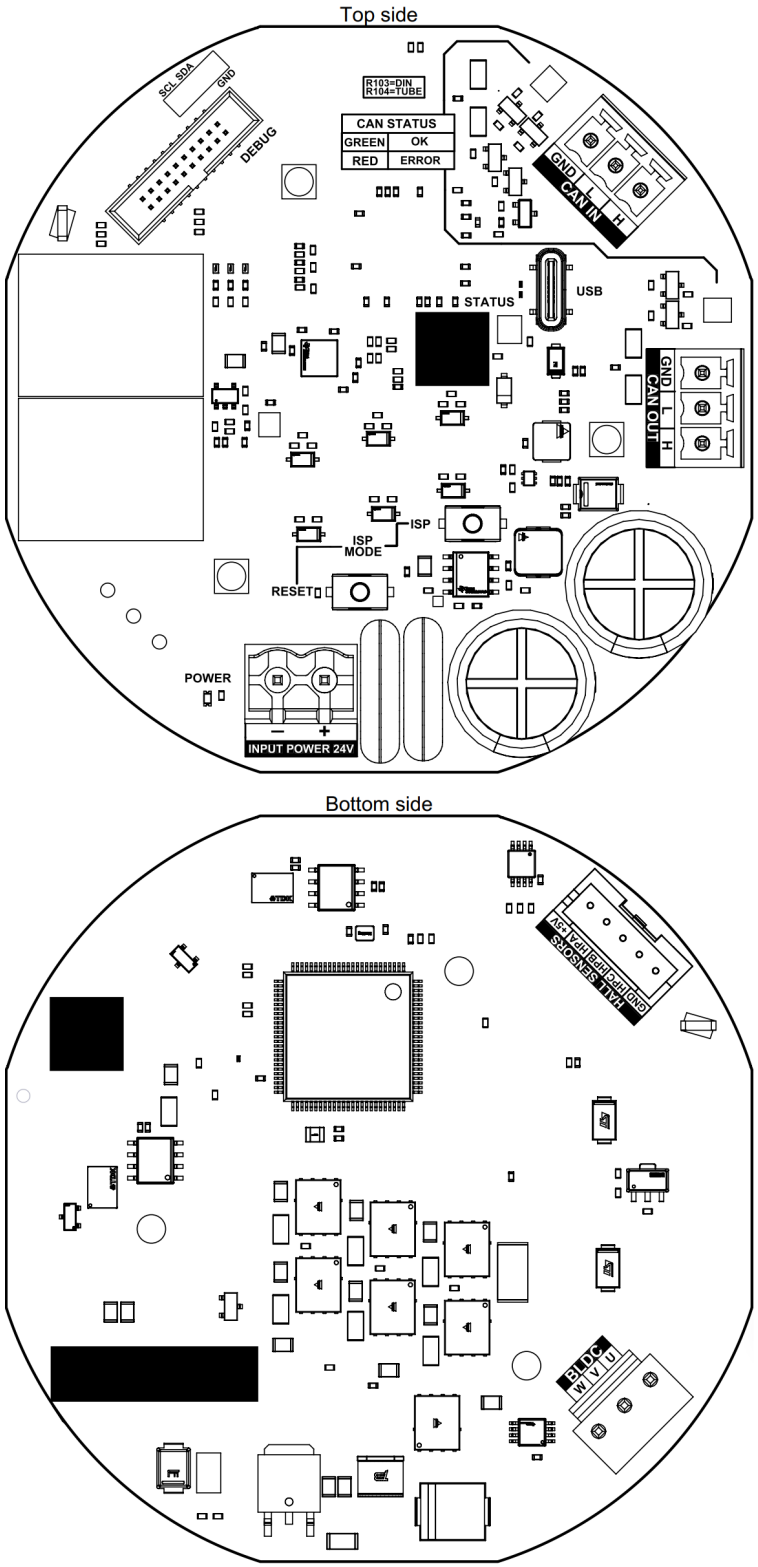


Fig. 13: Connectors of the BLDC TUBE extension module

3.3.8 Turnstile connectors

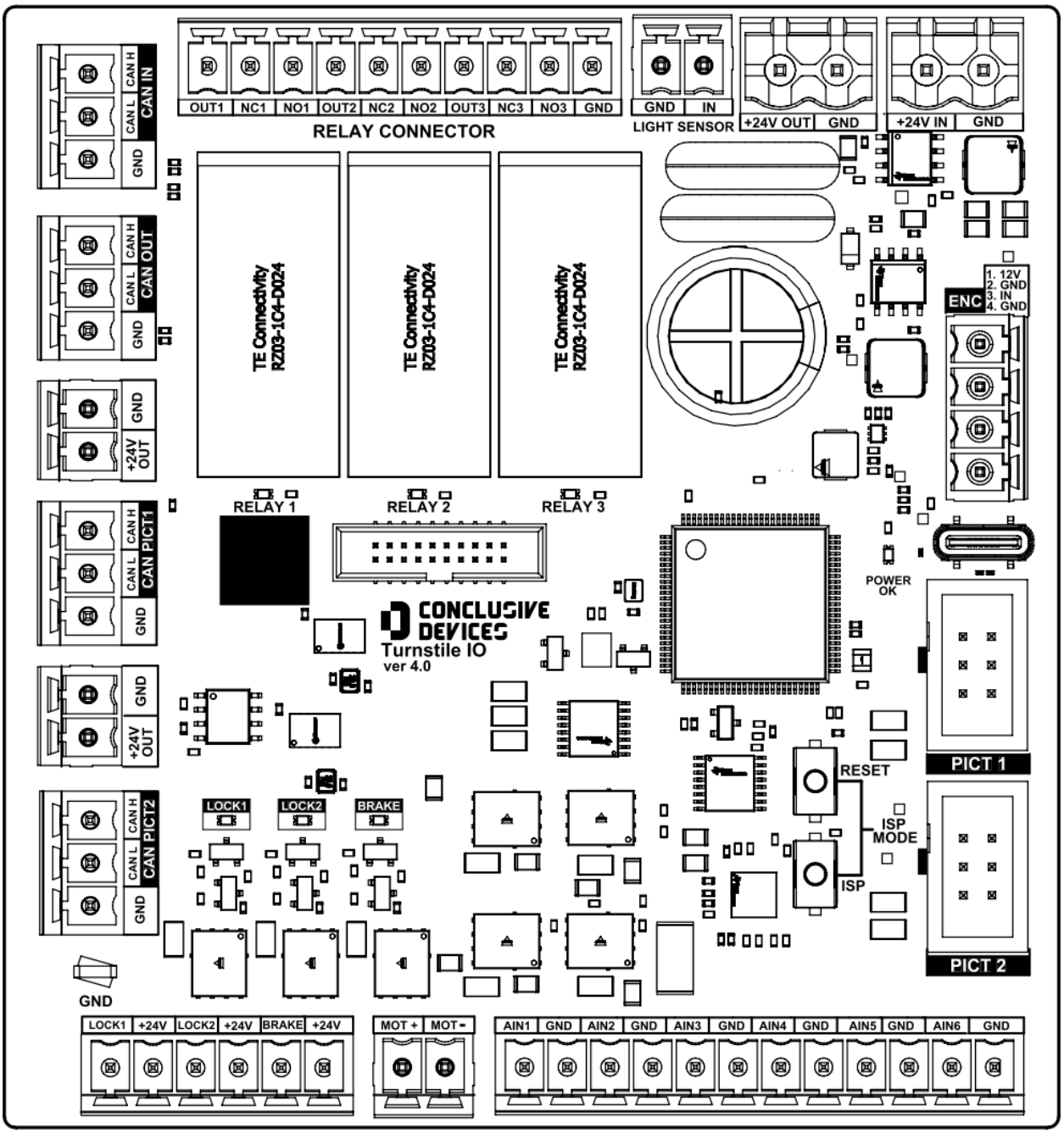


Fig. 14: Connectors of the Turnstile extension module

CHAPTER 4

Installation

4.1 Configurations

The HALSANG Gate Control System is a modular solution that can be flexibly adapted to different types of gates and operational requirements. Depending on the application, the system components can be combined in various configurations listed below:

4.1.1 AC Swing Gate

The AC Swing Gate configuration utilizes the HALSANG GCU (Gate Control Unit) in combination with the GATE IO module and two external Yaskawa GA500 inverters. This setup is designed specifically for controlling traditional 230V AC motors commonly used in swing gates.

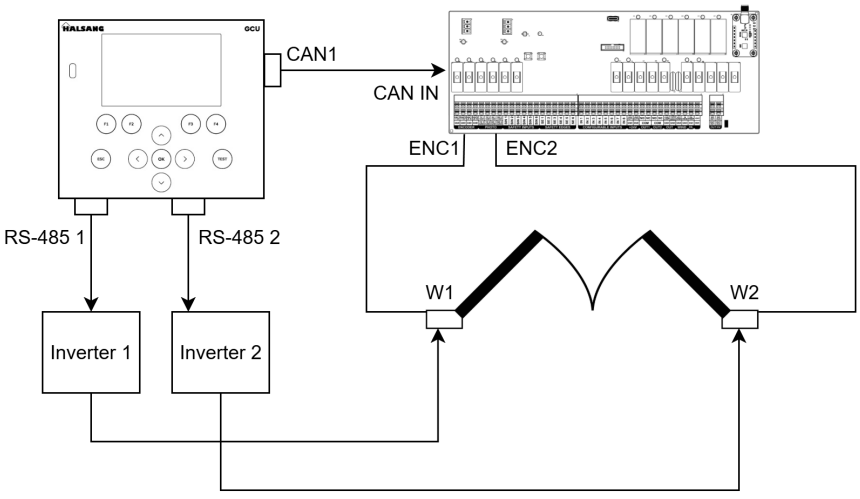


Fig. 1: AC Swing Gate Configuration

4.1.2 AC Sliding Gate

The AC Sliding Gate configuration utilizes the HALSANG GCU (Gate Control Unit) in combination with the GATE IO module and a single external Yaskawa GA500 inverter. This setup is designed specifically for controlling traditional 230V AC motors commonly used in sliding gates.

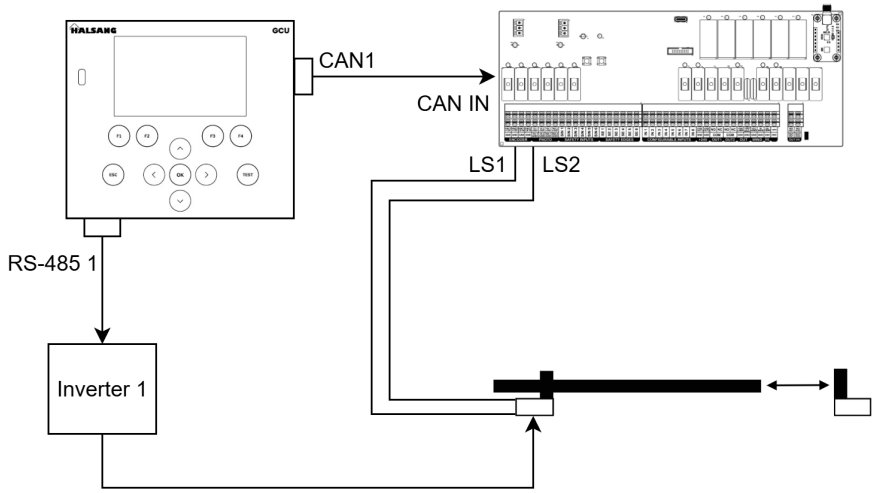


Fig. 2: AC Sliding Gate Configuration

4.1.3 BLDC Swing Gate

The BLDC Swing Gate configuration utilizes the HALSANG GCU (Gate Control Unit), the GATE IO module, and two BLDC controller boards to manage a pair of brushless DC motors.

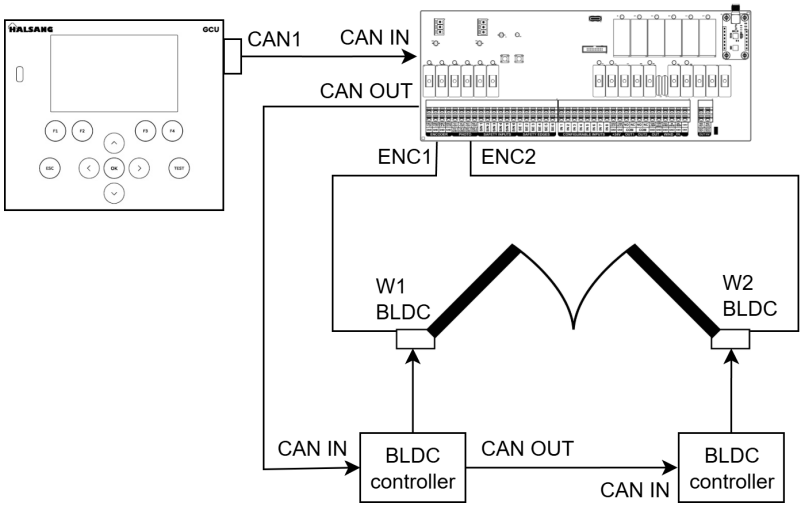


Fig. 3: BLDC Swing Gate Configuration

4.1.4 BLDC Sliding Gate

The BLDC Sliding Gate configuration utilizes the HALSANG GCU (Gate Control Unit), the GATE IO module, and a single BLDC controller board that operates one brushless DC motor.

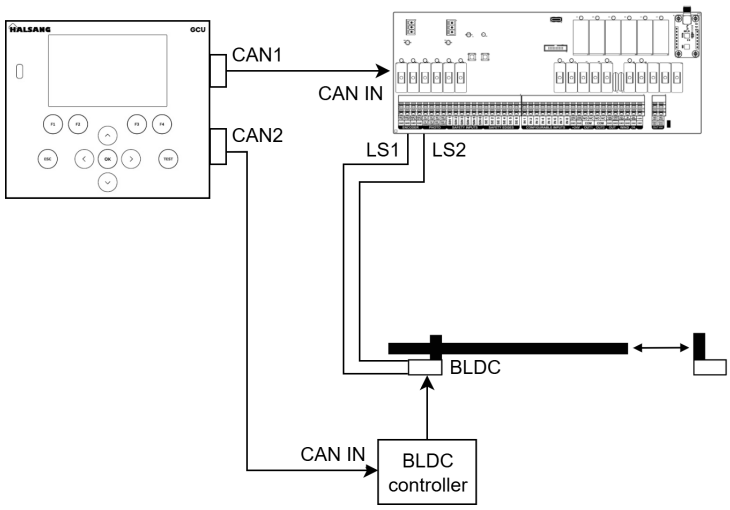


Fig. 4: BLDC Sliding Gate Configuration - variant 1

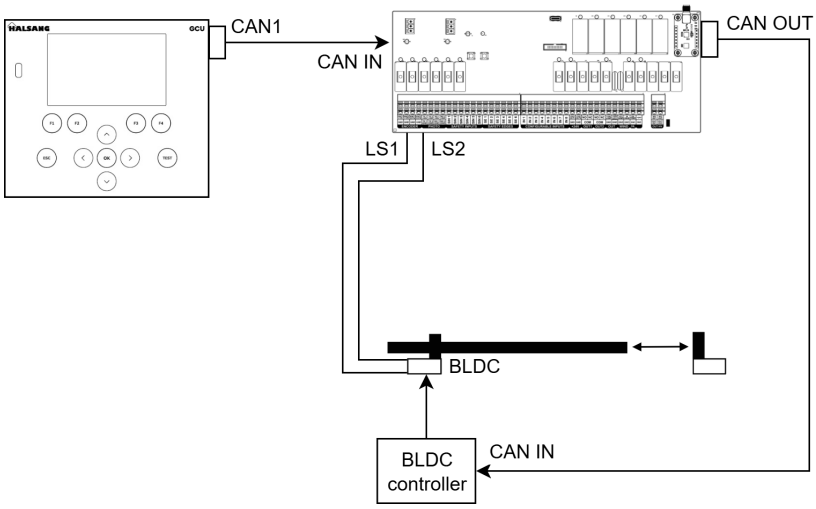


Fig. 5: BLDC Sliding Gate Configuration - variant 2

4.1.5 Turnstile Gate

The Turnstile Gate configuration is designed for managing and controlling turnstile-type access gates using the HALSANG control system. This configuration includes the HALSANG GCU (Gate Control Unit) and Turnstile Controller Board. Two Turnstiles can be connected in series via the CAN bus.

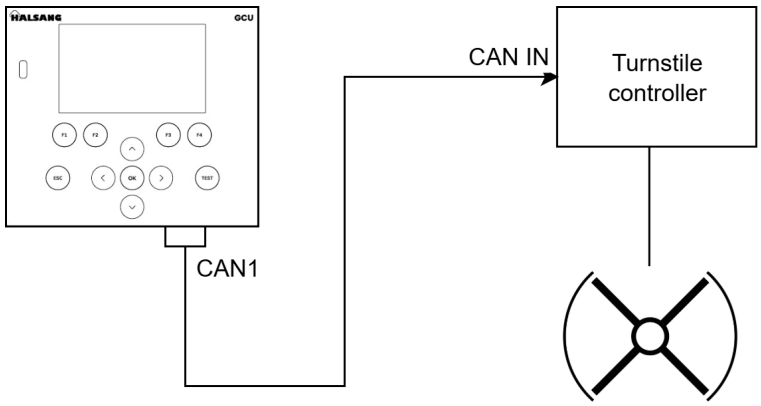


Fig. 6: Single Turnstile Gate Configuration

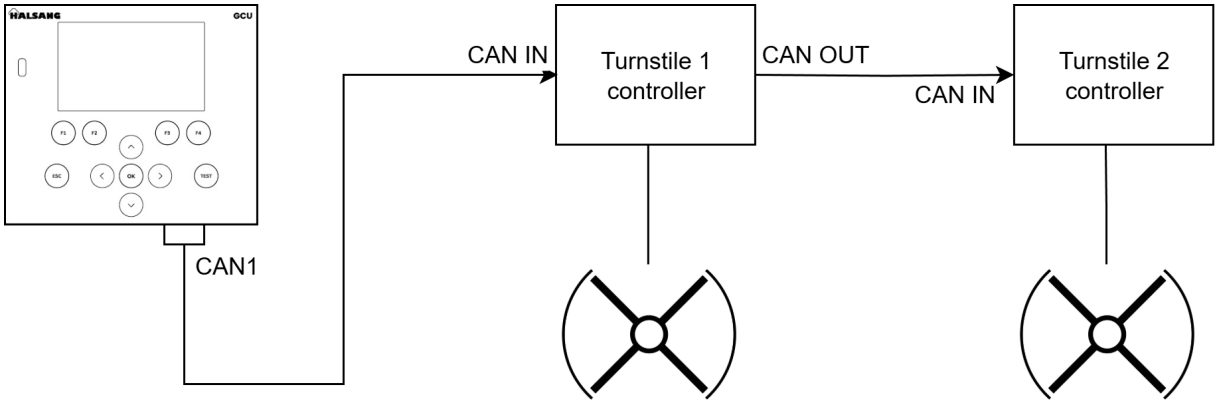


Fig. 7: Turnstile Gate Configuration with 2 turnstiles - variant 1

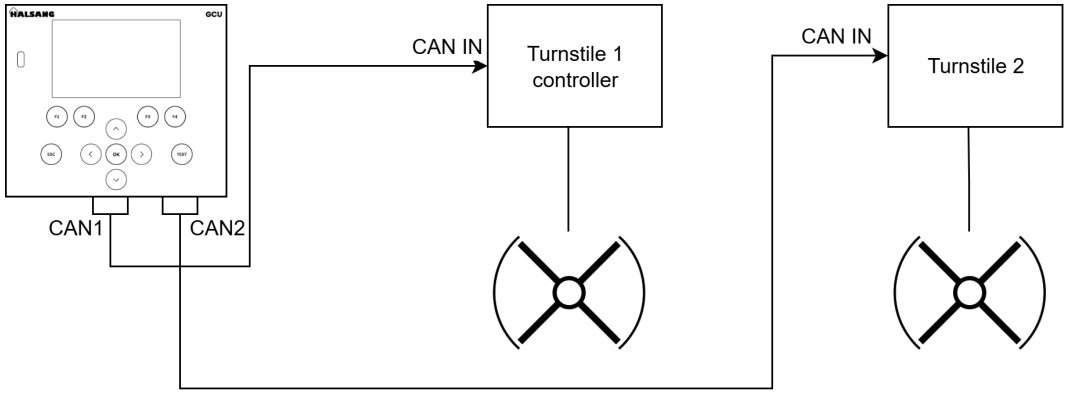


Fig. 8: Turnstile Gate Configuration with 2 turnstiles - variant 2

4.2 GCU and GATE-IO Installation

This section covers the installation and configuration of the GCU and GATE-IO modules for both swing gate and slide gate applications.

Warning

Before installation, ensure all safety requirements are met. All installation work must be carried out by qualified personnel, and electrical connections only by certified electricians.

1. Turn off the power supply to the gate drive before starting the installation.
2. Install Gate Control Unit (GCU) on a 35 mm DIN rail:

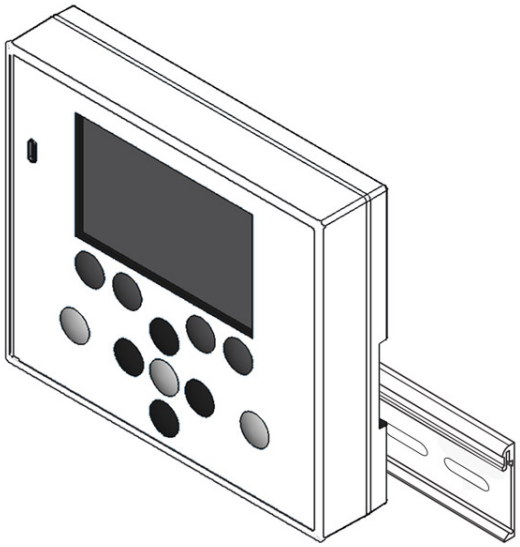


Fig. 9: Installing the GCU on a DIN rail

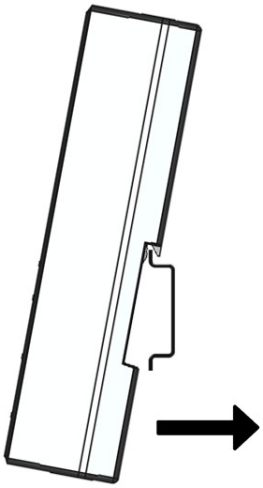


Fig. 10: Installing the GCU on a DIN rail

1. Install the GATE-IO extension module on the DIN rail next to the GCU.

Warning

The controller, along with the connection and expansion modules, must be installed in an additional enclosure or cabinet that provides protection against external weather conditions and meets the required protection rating for the operating environment.

4. Connect the GCU controller to the GATE IO expansion module using a CAN cable:

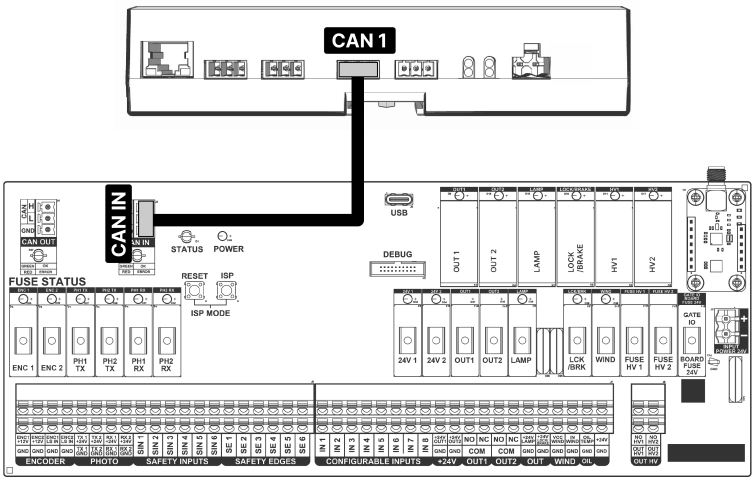


Fig. 11: Connecting the GCU to the GATE IO module

4.3 Connecting Devices

4.3.1 Connecting Wires

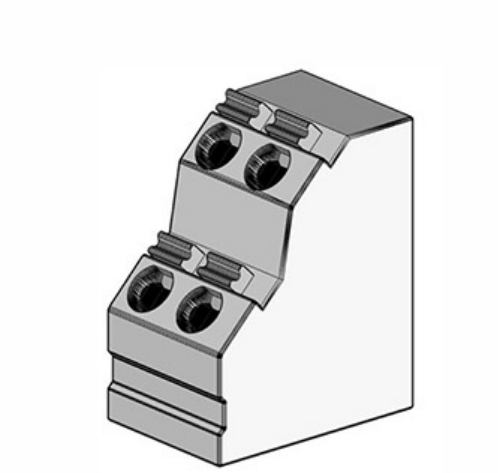


Fig. 12: Connecting devices to the HALSANG GATE IO extension module is done using spring clamp terminals located on the board.

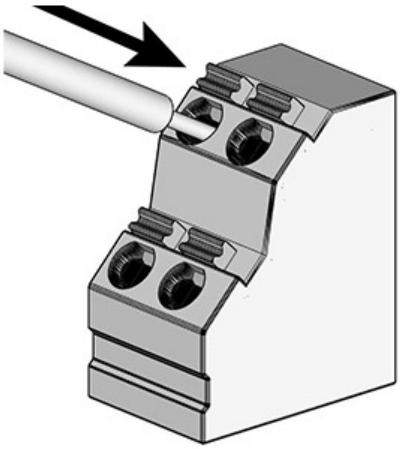


Fig. 13: The wire with a stripped end should be inserted into the appropriate terminal until it locks in the socket.

Disconnecting wires

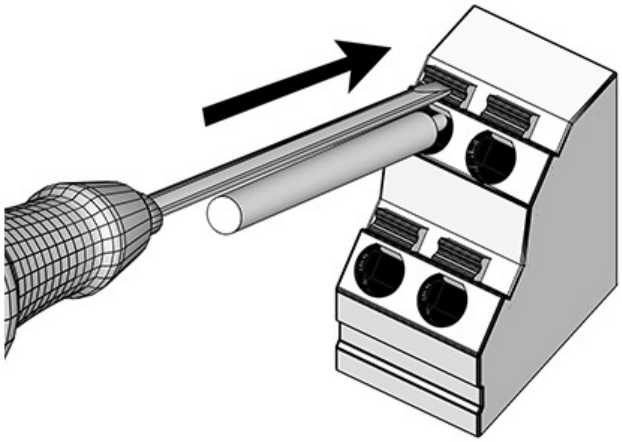


Fig. 14: To disconnect an inserted wire, press the button located above the selected terminal using a flat-head screwdriver.

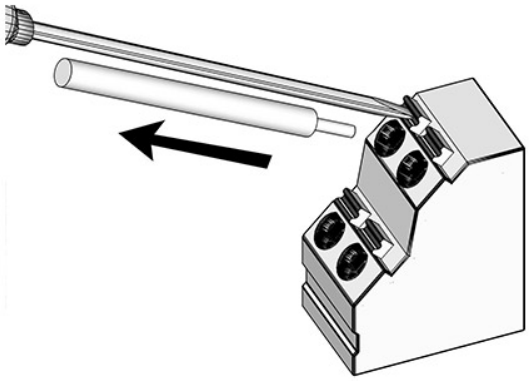


Fig. 15: Once the button is fully pressed, the wire will be released and can be removed from the socket.

4.3.2 Open and Close Limit Switches

Connecting Open and Close Limit Switches is optional.

The open and close limit switches are connected to inputs **ENC1/LS1 IN** and **ENC2/LS2 IN**. They are used to precisely stop the gate at its fully closed or fully open position. Adjust their position to ensure the gate opens and closes accurately.

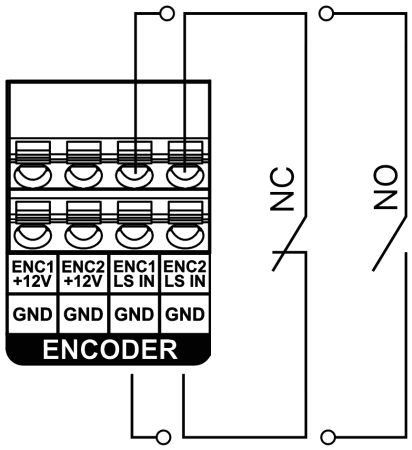


Fig. 16: Connecting Open and Close Limit Switches

4.3.3 Absolute Encoder

The connection of an absolute encoder is required, unless limit switches have been connected.

Absolute encoder(s) are connected to inputs **ENC1/LS1 IN** for the first wing and **ENC2/LS2 IN** for the second wing. They are used for precise stopping at the fully open or fully closed position, as well as optionally defining the deceleration point. Adjust their position to ensure the gate wings open and close accurately.

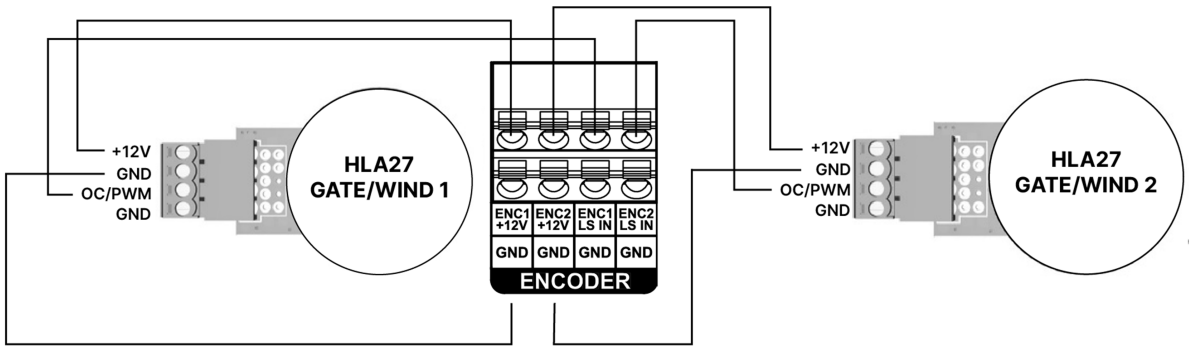


Fig. 17: Connecting Absolute Encoders

4.3.4 Photocells

Infrared photocells are a mandatory safety component and must be connected to the controller.

Connect the photocells in **series for NC configuration** and in **parallel for NO configuration**. The controller provides six inputs that can be configured as photocell inputs (PHOTOC. mode): **SIN1, SIN2, SIN3, SIN4, SIN5,** and **SIN6.**

Additionally, inputs **SIN1** and **SIN2** support the **PHOTOCELL TEST** function, which enhances safety by checking the correct operation of the photocells before any gate movement.

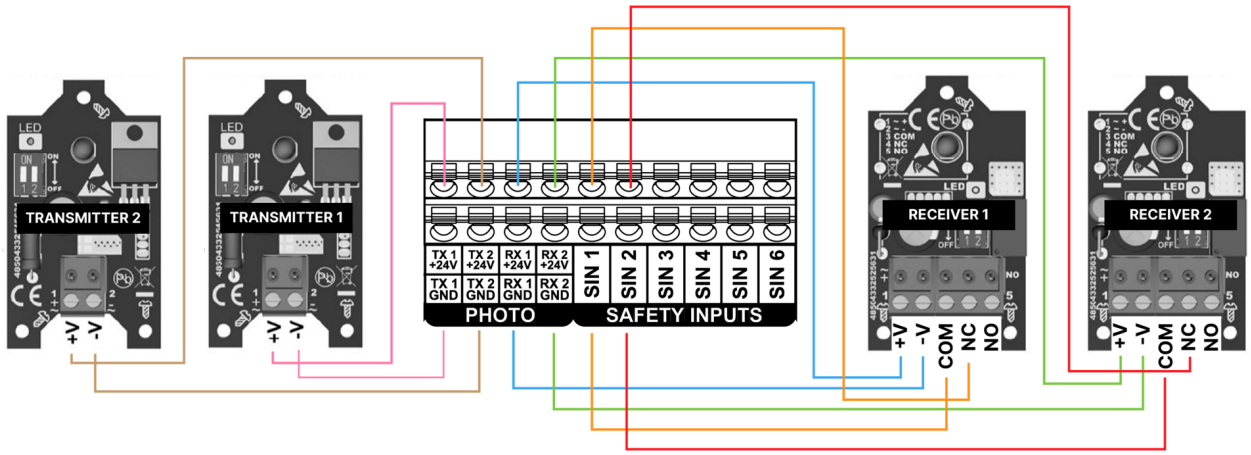


Fig. 18: Connecting Photocells 1-2

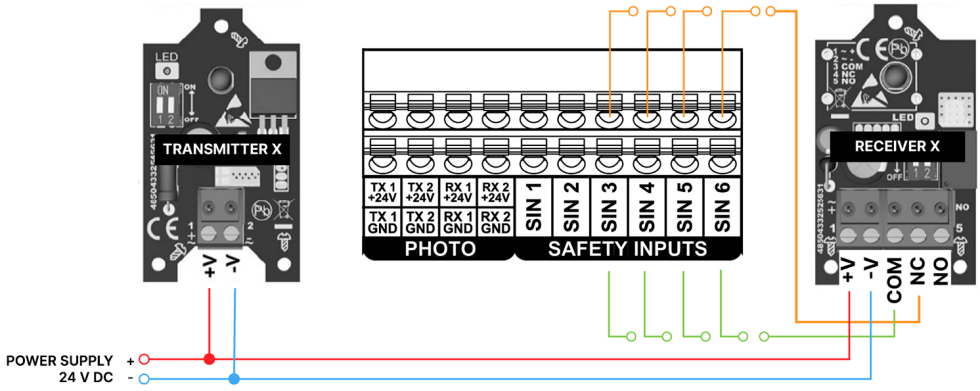


Fig. 19: Connecting Photocells 3-6

- **PHOTO TX n** - power supply for photocell transmitter *n*
- **PHOTO RX n** - power supply for photocell receiver *n*
- **+24V** - positive supply for the photocell auxiliary power
- **GND** - negative supply for the photocell auxiliary power
- **SINn** (PHOTOCELL) - NC/NO-COM contact of photocell *n*

4.3.5 Safety Stop

Safety Stop is essential for proper system operation and for ensuring safety. It should be wired in **series for NC type** and in **parallel for NO type** to the respective input. The controller provides six inputs that can be configured as Safety Stop inputs: **SIN1, SIN2, SIN3, SIN4, SIN5**, and **SIN6**.

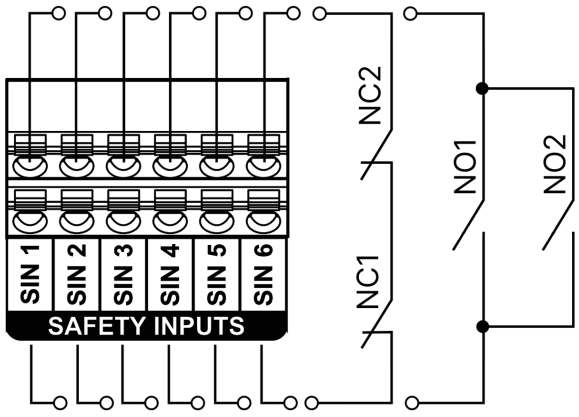


Fig. 20: Connecting Safety Stop

4.3.6 Safety Edges

Resistive-type safety devices (e.g., Safety Edges) that monitor the operating area of the gate are connected to inputs **SE1, SE2, SE3, SE4, SE5,** and **SE6**. They are essential when controlling motors without an overload detection function (e.g., 230 VAC).

Warning

When connecting multiple safety devices in parallel or in series, the terminating resistor must be installed on the last device in the chain.

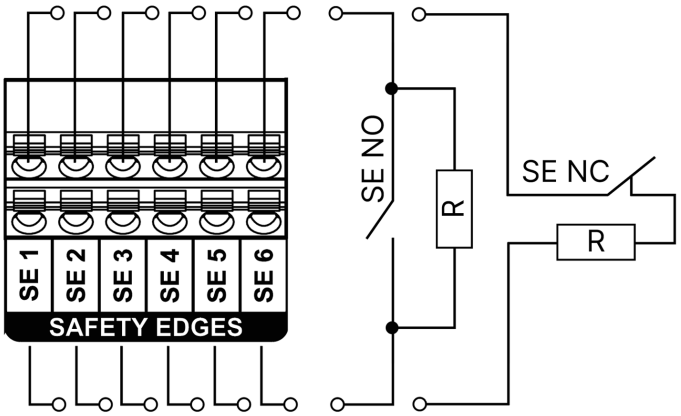


Fig. 21: Connecting Safety Edges

4.3.7 Decoupled Status

By connecting an additional limit switch to a universal input **CONFIGURABLE INPUTS 1–8**, the controller, upon detecting that the gate is decoupled, drives the gate to the end position at the programmed Safe Speed.

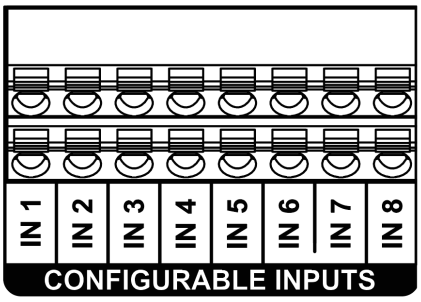


Fig. 22: Configurable Inputs

4.3.8 Control Buttons

Control Buttons and other control elements (e.g., external radio receivers) are connected to the configurable inputs: **IN1, IN2, IN3, IN4, IN5, IN6, IN7, IN8**.

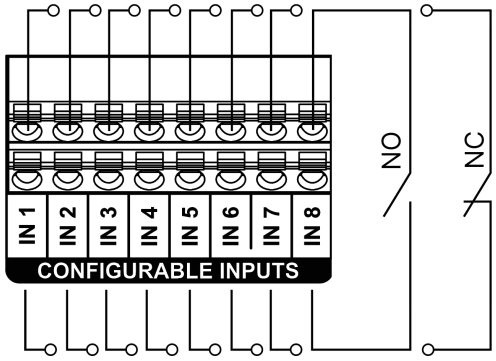


Fig. 23: Connecting Control Buttons

4.3.9 Accessories Power Supply

Power for external accessories/devices (24 VDC) can be provided via the HLA36 connection module. The 24 V OUT outputs, with a capacity of <1 A, are protected by fuses.

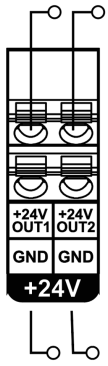


Fig. 24: Connecting External Accessories

4.3.10 External 230 VAC Inverters

GCU is compatible with **YASKAWA GA500** series inverters. Additionally, the universal outputs can be used as a safety measure to prevent unintended startup (see section on connecting universal outputs). Connection should be made using a cable with a connector to the RS485 port.

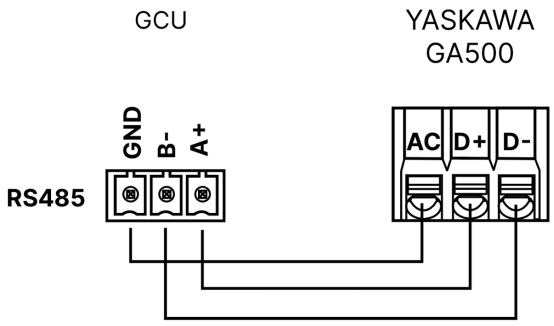


Fig. 25: Connecting 1 Inverter

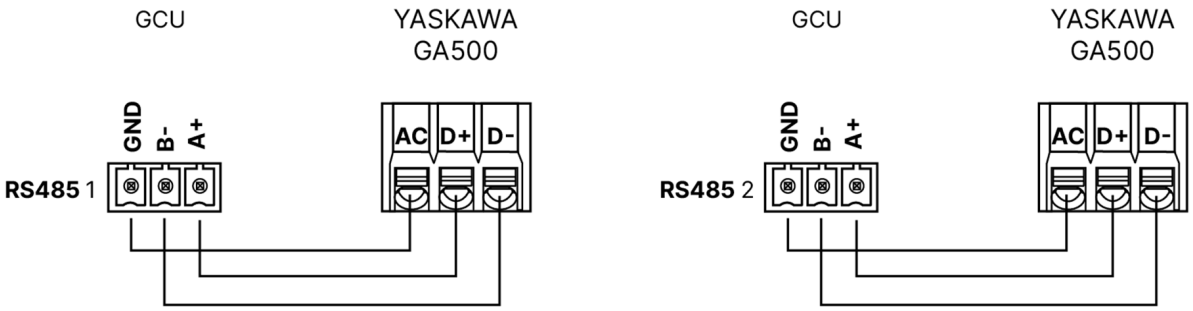


Fig. 26: Connecting 2 Inverters

4.3.11 Signal Lamp

The LAMP output is used for connecting a 24 V DC signal lamp.

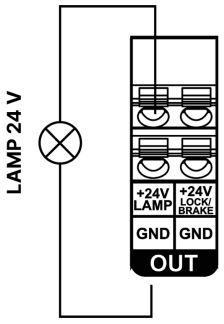


Fig. 27: Connecting Signal Lamp

4.3.12 Electric Strike / Brake

The **LOCK/BRAKE** output is used for connecting a 24 VDC electric strike or an external 24 V DC brake.

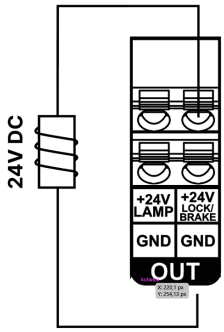


Fig. 28: Connecting Electric Strike / Brake

4.3.13 Universal Outputs

The outputs **OUT1**, **OUT2**, **OUT HV1**, and **OUT HV2** can perform various functions, such as controlling a traffic light or indicating the gate status (see the list of functions in the Programming section).

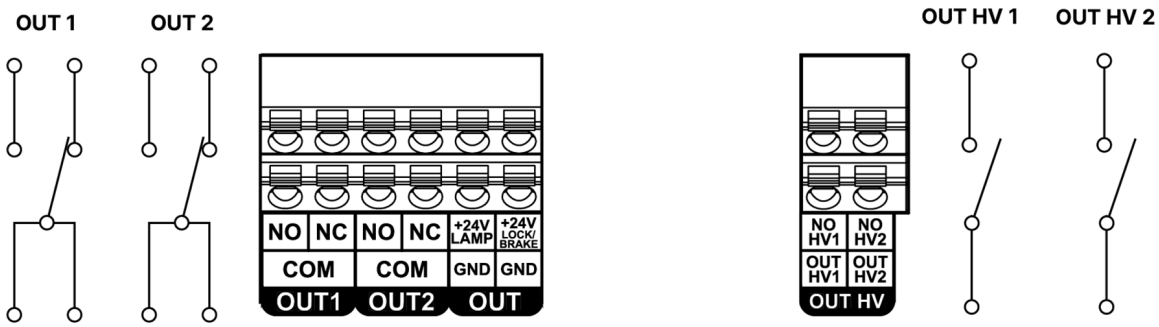


Fig. 29: Connecting Universal Outputs

4.3.14 External Antennas

GATE IO module is equipped with an optional built-in radio receiver operating at 867.84 MHz. The external antenna should be placed away from metal elements. The connection must be made using a 50 Ohm coaxial cable with an SMA connector and the lowest possible attenuation.

4.3.15 Power Supply and Startup

The final step is connecting the power supply. The 24 VDC power source (with capacity matched to the load) should be connected to the controller's 24VDC IN terminals and to the connection module's PWR2 24 VDC terminals. Additionally, the controller's 12 VDC power output should be connected to the PWR1 12 V terminals on the connection module.

Warning

The 230 VAC input supply for the 24 VDC source must be protected by an external circuit breaker (properly rated to ensure automatic disconnection in compliance with applicable standards) and a residual current device (RCD) with a rated residual operating current of 30 mA.

1. Connect the power supply according to the diagram below:

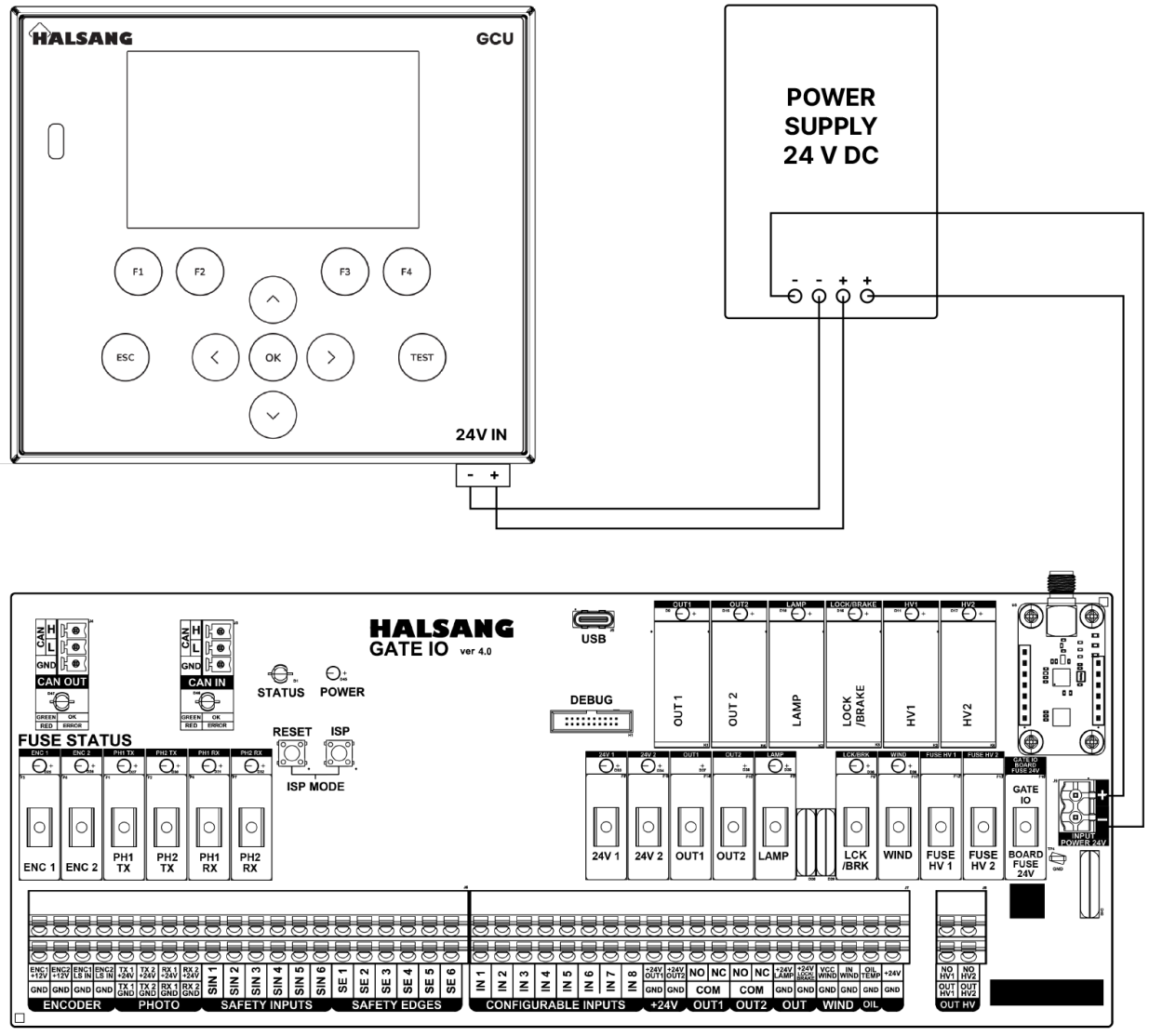


Fig. 30: Connecting Power Supply

2. Manually position the gate in the middle (or another position that ensures safety during motor direction testing).
3. Switch on the power

CHAPTER 5

Quick Start Guide

This guide will help you get started with the GCU (Generic Control Unit) quickly. It covers the basic steps to configure and use the GUI in swing and sliding gate setups with AC motors.

> **Note**
>
> All configuration settings are applied immediately after saving. No restart is required to apply the changes.

5.1 Getting Started

GCU settings can be edited through the menu system in the GUI.

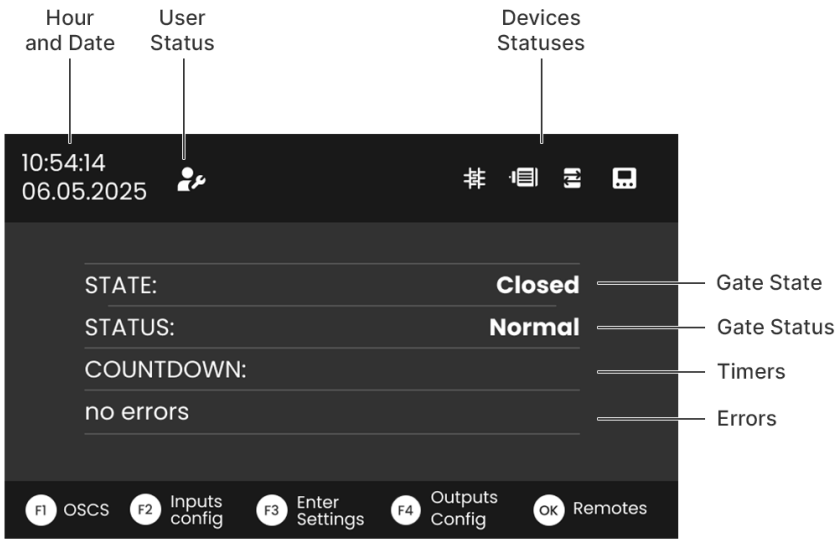


Fig. 1: Home screen of the Gate Control Unit (GCU) GUI

GUI can be operated using the built-in keyboard. Navigating through the menu is done using the following keys:

- **Up Arrow**: Move up in the menu
- **Down Arrow**: Move down in the menu
- **ESC**: Exit the current menu or go back to the previous menu
- **OK**: Enter the submenu, edit the value, or confirm the selection

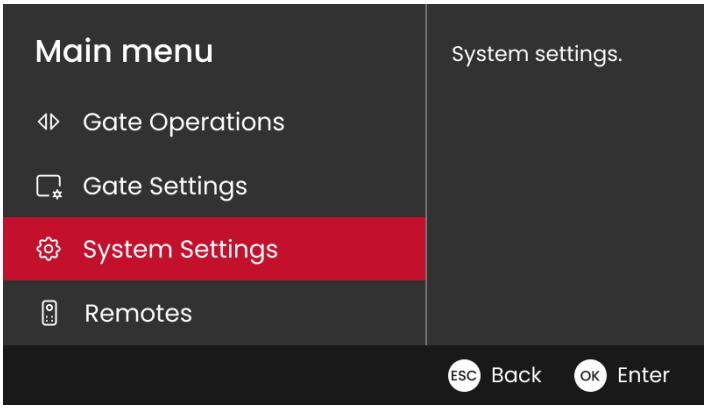


Fig. 2: Menu navigation in the Gate Control Unit (GCU) GUI

Editing numerical values, such as time or speed is done using a dedicated edit screen which allows to change digits one at a time. The following keys are used for editing numerical values:

- **Up Arrow**: Increase the current digit
- **Down Arrow**: Decrease the current digit
- **Left Arrow**: Move to the previous digit

- **Right Arrow**: Move to the next digit
- **ESC**: Exit the edit screen without saving changes
- **OK**: Save the changes and exit the edit screen

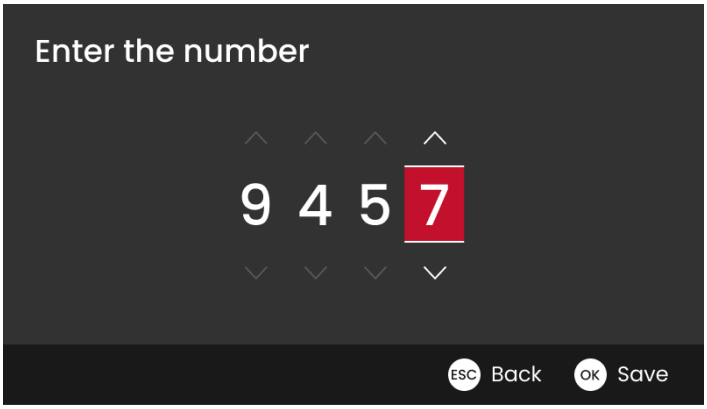


Fig. 3: Editing numerical value in the Gate Control Unit (GCU) GUI

5.2 Physical connections

Before starting the configuration, make sure that the GCU is properly connected to the AC inverters and the GateIO board.

W1 inverter should be connected to the leftmost RS485 port on the GCU, while W2 inverter should be connected to the rightmost RS485 port.

The GateIO board should be connected to the either the left or right CAN port.

5.3 Configuring AC inverter parameters

Note

This section applies to an AC gate setup only. When using BLDC motor drivers, skip this section.

The inverter parameters should be configured using the GA500 inverter user interface. For details on setting up the inverter, please refer to the Yaskawa GA500 Technical Manual.

The following table shows the recommended inverter parameters for the GA500:

Parameter	Inverter 1	Inverter 2	Description
B1-01	02	02	Reference frequency RS485
B1-02	02	02	Run commands RS485
E1-04	120	120	Maximum output frequency 120Hz
H5-01	01	02	Device address
H5-02	08	08	Transmission speed 115200bps
H5-04	00	00	Stop on transmission error: RAMP TO STOP
H5-07	01	01	RTS enabled
H5-11	00	00	Parameter save without ENTER command

5.4 Configuring BLDC motor drivers

> **Note**
>
> This section applies to a BLDC gate setup only. When using AC motors, skip this section.

Before attempting to configure BLDC motor drivers, make sure they are connected to the CAN interface.

Navigate to **Service and tests** menu, and then to **Nodes**. This will show you all of the reachable CAN devices, which should include the GateIO board and one or two BLDC motor drivers, depending on the gate configuration (single or dual wing).

If the motor drivers are reachable, it is necessary to assign each driver to a specific gate wing. To do so, navigate to **Gate Settings** menu, and then to **W1 configuration** or **W2 configuration**.

Now, select **Gate driver** option and choose the appropriate motor driver from the list.

In order to determine which *bldcX* instance controls which wing, you can compare the Serial Number of the motor driver with the Serial Number displayed in the **Nodes** menu.

5.5 Configuring date & time

To configure the date and time, navigate to the **Settings** menu and select **Date**. Enter the date in the *YYYY-MM-DD* format. After entering the date, press **OK** to save the changes. To set the time, navigate to the **Time** menu and enter the time in the *HH:MM* format. Again, press **OK** to save the changes.

5.6 Configuring global inputs

To configure global inputs and outputs, navigate to the **Gate Settings** menu and then select **Inputs configuration**. Here you can set up the gate-wide inputs such as Emergency Stop, Photocell or Safety Edges.

> **Note**
>
> For proper gate operation, it is required to configure at least two inputs:
>
> - Emergency Stop
> - Photocell

5.6.1 Setting input function and parameters

To configure an input function, navigate to the **Gate Settings** menu and select **Inputs configuration**. Now, find the input number you want to configure and press **OK**.

> **Note**
>
> Input names are displayed in the format *SINx/y*, *SEx/y* or *INx/y*, where *x* is the input number matching the GateIO board label and *y* is the board index. When only one GateIO board is used, the index is always *1*. For example, *SIN1/1* refers to the first safety input on the first GateIO board.

If the input source is connected to a normally closed (NC) contact, you should select the **Input is NC** option.

If the input source uses a resistor to detect open circuit, you should configure the installed resistor using the **Input resistor** option. Input resistors are typically used by the safety edges.

Function of the input can be set using the **Input function** option.

You can verify that the input is working correctly by checking the **Input state** option. It will update every time the input state changes.

5.6.2 Configuring encoder inputs

Encoder inputs are a special type of inputs that are used to read the position of the gate wing encoders. They have a fixed function and cannot be configured like regular inputs. However, you can still check their state and configure value inversion.

To configure value inversion, navigate to the desired encoder input in the **Inputs configuration** menu and select the **Input is inverted** option.

You can verify that the encoder input is working correctly by checking the **Input state** option. It will update every time the encoder position changes.

Warning

Encoder values should increase as the gate wing is moving towards the closed position. In other words, closed position should have the highest encoder value and the open position should have the lowest encoder value.

If the encoder values are increasing the other way around, you should enable the **Input is inverted** option for the encoder input.

Warning

Please make sure that the encoder value does not cross 0 value during the gate operation. If the encoder value crosses 0, it needs to be physically adjusted to the correct position before the gate can operate correctly.

5.7 Configuring global outputs

To configure global outputs, navigate to the **Gate Settings** menu and select **Outputs**. Here you can set up the gate-wide outputs such as Lamp, Semaphore Lights or E-Lock.

5.8 Configuring swing gate settings

The first step in configuring a swing gate is to set number of wings (1 or 2). Navigate to the **Gate Settings** menu and select **Gate Configuration**. Here you can set the gate type (Single - one wing, Dual - two wings).

Next, you should configure W1 and W2 wings. Navigate to the **Gate Settings** menu and select **W1 configuration**. Here you can set the parameters for W1 such as driver type, motor direction and encoder positions.

To configure encoder open and close positions, navigate to the **Encoder open position** and **Encoder close position** options respectively. Current encoder position as well as previously saved encoder posision will be shown on the screen. Use left arrow to move the gate wing in the open direction and right arrow to move it in the close direction. When the gate wing is in the desired position, press **OK** to save the position.

Note

When doing first time configuration, saved encoder posisions will read *0000*.

Warning

Pay attention to the actual movement direction. If the gate wing is moving in the opposite direction than expected, you should change the **Motor direction** option.

When finished configuring W1, repeat the same steps for W2 by selecting **W2 configuration** in the **Gate Settings** menu.

5.9 Configuring sliding gate settings

Sliding gates are configured in a similar way to swing gates, but use limit swiches instead of absolute position encoders.

To configure limit switches, navigate to the **Gate Settings** menu and select **W1 configuration**. Then select the **Open limit switch** and select the input that is connected to the open limit switch. Next, select the **Close limit switch** and select the input that is connected to the close limit switch. Only inputs that are configured as **Limit switch** function can be selected.

Note

By default, *LS1/x* and *LS2/x* inputs are configured as limit switches but any other inputs can be used as well.

Warning

Pay attention to the limit switch mapping. Incorrect mapping of the open and close limit switches can cause the wing to move past its limits, which can damage the gate or the motor. When not sure which limit switch maps to the open or close position, you can use the **Hold to run** mode to move the gate manually.

When finished configuring W1, repeat the same steps for W2 by selecting **W2 configuration** in the **Gate Settings** menu.

5.10 Testing the gate operation

It is recommended to test the gate operation after configuring the gate settings using the **Hold to run** mode. This mode allows you to manually move the gate.

Navigate to the **Gate operations** menu and select **Hold to run**. In this mode, you can use the **Left Arrow** and **Right Arrow** keys to move the gate wings in the open and close directions respectively.

5.11 Adding remotes

> **Note**
>
> This section applies to sliding gate and swing gate setups only, and requires a GATE-IO board with the optional radio receiver module installed.

To add remotes, navigate to the **Remotes** menu and select **Add remote**. The GCU will wait for a button on the remote to be pressed. Once the button is pressed, the GCU will register the remote and add it to the list of remotes.

5.12 Configuring Turnstile

This section describes the initial setup and configuration of a turnstile connected to the GCU.

5.12.1 Step 1: Physical Connections

Before starting the configuration, make sure that the GCU and Turnstile boards are properly connected to power supply. In single turnstile setups, connect the Turnstile board to either the left or right CAN port on the GCU. In dual turnstile setups, connect each Turnstile board to a separate CAN port in GCU or connect one Turnstile to GCU and second turnstile to CAN out conncted in first turnstile. Make sure that Can connection is working by checking leds on the Turnstile board and also in GUI under the **Service and tests** > **Nodes** menu.

Connect the all necessary inputs and outputs between the Turnstile board such as electromagnetic locks, brake, motor driver, sensors and authorization inputs.

5.12.2 Step 2: Configure turnstile type

The first step is to configure the turnstile type.

1. Navigate to **Settings** → **Turnstile settings** → **TS1 configuration**
2. Locate the **Layout** parameter and set it according to your turnstile model:
   - **3-arm**: For 3-wing turnstiles (typically 120° rotation per passage)
   - **4-arm**: For 4-wing turnstiles (typically 90° rotation per passage)
   - **Bicycle**: For bicycle/wheelchair turnstiles (typically +/- 90° roatation)
3. Repeat the same for the second turnstile if applicable (**TS2 configuration**)

5.12.3 Step 3: Configure Brake

Configure the electromagnetic brake.

1. Navigate to **Settings** → **Turnstile settings** → **TS1 configuration**
2. Locate the **Brake enabled** parameter and set it to **On** to enable the brake, **Off** to disable it
3. Set **Brake PWM** to 100% initially (range 20-100%, this value may be reduced experimentally to decrease current consumption, but must ensure sufficient braking force)
4. Optionally configure **Brake delay enabled** and **Brake delay time** if you need delayed brake engagement
5. Repeat the same for second turnstile if applicable (**TS2 configuration**)

5.12.4 Step 4: Configure Locks

Configure the electromagnetic locks (bolts) that secure the turnstile in locked position.

1. In the **TS1 configuration** menu, configure lock settings:
   - **Bolt 1 inverted**: Set to **On** if lock 1 is normally open (NO), **Off** if normally closed (NC)
   - **Bolt 2 inverted**: Set to **On** if lock 2 is normally open (NO), **Off** if normally closed (NC)
   - **Bolt 1 PWM**: Set PWM duty cycle for lock 1 (range 20-100%, typically 100%)
   - **Bolt 2 PWM**: Set PWM duty cycle for lock 2 (range 20-100%, typically 100%)
   - **Bolt in**: Select which bolt controls the entry direction (**Bolt 1** or **Bolt 2**)
2. Typical configuration:
   - For 3-wing or 4-wing turnstiles: one lock is inverted, the other is non-inverted
   - For HHTI mode: both locks have the same inversion setting
3. Repeat the same for second turnstile if applicable (**TS2 configuration**)

5.12.5 Step 5: Test Lock and Unlock Operation

Before proceeding, verify that the locks and brake operate correctly.

1. Navigate to **Turnstile operations** menu
2. Select **Lock TS1** - the locks should engage and you should hear the electromagnetic locks activate
3. Select **Unlock TS1** - the locks should release
4. Manually try to rotate the turnstile when locked (should be blocked) and when unlocked (should rotate freely)
5. If when unlocked the turnstile does not rotate freely, check the **Bolt 1 inverted** and **Bolt 2 inverted** settings and correct if necessary
6. Repeat the same for second turnstile if applicable

5.12.6 Step 6: Set Zero Position

The turnstile encoder must be calibrated to establish the zero reference position.

1. Navigate to **Settings** → **Turnstile settings** → **TS1 configuration**
2. Select **Set zero position** - turnstile shoud be unlocked and can be rotated manually.
3. In 3 or 4 arm turnstiles, manually rotate the turnstile to nearest locked position. In bicycle turnstiles, set the turnstile to the centered locked position.
4. Click **OK** to confirm - the current encoder position will be saved as the zero reference.
5. The turnstile will now use this position as the reference for all movements.
6. Repeat the same for second turnstile if applicable (**TS2 configuration**)

> **Note**
>
> Proper calibration is critical for accurate position control.

5.12.7 Step 7: Configure Motor

Enable the motor and configure speed and direction parameters.

1. In **TS1 configuration**, locate **Motor enabled** and set it to **On** if motor is used, **Off** if turnstile is purely manual
2. Configure motor speeds (range 20-100%):
   - **Speed 1 in**: Initial movement speed for entry direction (typically 40-60%)
   - **Speed 2 in**: Main passage speed for entry direction (typically 60-80%)
   - **Speed 1 out**: Initial movement speed for exit direction (typically 40-60%)
   - **Speed 2 out**: Main passage speed for exit direction (typically 60-80%)
3. Configure **Start angle**: Angle threshold to start motor assistance (range 0-2500 encoder units, where 2500 = 90 degrees). Typical value: 70-140 units (approximately 2.5-5 degrees)
4. Configure **Speed 2 angle**: Angle at which to switch from Speed 1 to Speed 2 during passage (range 0-2500 encoder units)
5. Set **Motor timeout** to maximum allowed motor run time (range 0-600 seconds, default ~10 seconds)
6. Verify **Motor direction reversed** setting:
   - If the motor rotates in the wrong direction during testing, set **Motor direction reversed** to **On**
7. Configure **In/Out reversed** if needed to swap entry/exit directions
8. Repeat for second turnstile if applicable

5.12.8 Step 8: Configure timing parameters

Configure timing parameters for turnstile operation.

1. In **TS1 configuration**, set the following parameters: **Open time**, **Trans time**, etc ..

5.12.9 Step 9: Test Passage Operation

Test the turnstile passage in both directions to verify motor operation and position detection.

1. Navigate to **Turnstile operations** > **TS1 operations** > **In** (or **Out** for exit direction)
2. If start angle is set to 0, the motor should start immediately to assist the passage; otherwise manually rotate the turnstile slightly to exceed the start angle
3. The turnstile should complete the programmed rotation angle (120° for 3-wing or 90° for 4-wing) and then lock
4. Repeat the test for exit direction using **Out**

> **Note**
>
> If motor is running in wrong direction, set **Motor direction reversed** to **On** in the TS1 configuration.

5.12.10 Step 10: Verify Reverse Rotation Protection

The turnstile should prevent rotation in the opposite (unauthorized) direction.

1. Unlock the turnstile for entry direction: **In**

2. Try to manually rotate the turnstile in the exit direction (opposite to authorized)
3. The turnstile should block this movement
4. If the turnstile allows movement in the wrong direction, check the **Bolt in** setting (should be **Bolt 1** or **Bolt 2** depending on your hardware configuration)
5. Configure **Reverse lock** parameter if additional locking in reverse direction is needed

5.12.11 Step 11: Configure Input Functions

Configure the inputs for sensors and authorization signals.

1. Navigate to **Settings** → **Turnstile settings** → **Inputs configuration**
2. Assign input functions as needed:
   - **TS In** / **TS Out**: Authorization inputs from access control system
   - **Sensor In** / **Sensor Out**: Proximity sensors for automatic motor activation
   - **TS FP In** / **TS FP Out**: Free pass mode activation inputs
   - Other specialized inputs as required by your installation
3. For each input, configure:
   - **Resistor**: If present, should match the value of the resistor used in the input circuit.
   - **Polarity**: NC (Normally Closed) or NO (Normally Open) to match sensor type

5.12.12 Step 12: Configure Additional Parameters

Fine-tune the turnstile operation by configuring additional parameters in **TS1 configuration**:

Queue Management:

- **Queue enabled**: Enable/disable passage queuing (default: Off)
- **Queue priority**: Set priority direction (**In** or **Out**) for queue processing

Free Pass Mode:

- **Free pass enter**: Enable free pass mode for entry direction (default: Off)
- **Free pass exit**: Enable free pass mode for exit direction (default: Off)
- **Bicycle Go**: Enable TS2 synchronization with TS1 for bicycle passages (default: Off)

Motor Protection:

- **Motor current limit**: Maximum allowed motor current (range 0-9.99 A, default ~3-5 A)
- **Motor current limit time**: Duration before overcurrent protection triggers (range 0-600 seconds)

Feedback and Alerts:

- **Feedback type**: **Standard** (pulse after passage) or **Door** (pulse during unlock)
- **Feedback time**: Duration of feedback pulse in Standard mode (range 0-600 seconds)
- **Buzzer time**: Warning time before automatic motor start (range 0-600 seconds)
- **Tamper time**: Duration of tamper alarm output (range 0-600 seconds)

Environmental Control:

- **Light sensor enabled**: Enable automatic lighting control (default: Off)

- **Light level**: Light threshold for lamp activation (range 0-4000, typical ~500-1000)
- **Fan enabled**: Enable automatic fan control (default: Off)
- **Fan enable temperature**: Temperature to start fan (range 20.0-50.0°C)
- **Fan disable temperature**: Temperature to stop fan (range 20.0-50.0°C)

Timed Input Mode:

- **Signal time**: Minimum signal duration for normal passage authorization (range 5.00-50.00 seconds)
- **Free pass signal time**: Minimum signal duration to activate free pass mode (range 50.00-250.00 seconds)

> **Note**
>
> Refer to the **Turnstile control** chapter for detailed descriptions of all configuration parameters and their interactions.

CHAPTER 6

Functional Description

6.1 Error handling

The GCU implements a comprehensive error handling and logging system that tracks, stores, and manages system errors and faults. This system provides detailed error information and management capabilities to help operators diagnose and resolve issues.

6.1.1 Error List and Navigation

The error management system provides a dynamic list of all system errors, displaying each error with its unique 4-digit hexadecimal error code and description. Operators can browse through all recorded errors and access detailed information for each one.

6.1.2 Detailed Error Information

For each error, the system displays comprehensive diagnostic information:

- **Name** - The error code name/identifier
- **Description** - Detailed description of the error condition
- **Message** - Specific error message providing context about the occurrence
- **Target** - The system component or target affected by the error
- **Active** - Current status indicating whether the error is still active (Yes/No)
- **Counter** - Number of times this error has occurred
- **Last occurrence** - Timestamp of the most recent error occurrence

6.1.3 Error Codes and Classification

Errors are identified using 4-digit hexadecimal codes (e.g., *0x1234*) which provide a standardized way to identify specific error conditions. Each error code is associated with a predefined description that explains the nature of the fault.

6.1.4 Error Management Operations

The system provides several error management capabilities:

- **List errors** - Browse all recorded errors in the system
- **Clear error** - Remove a specific error from the active error list
- **Clear all errors** - Remove all errors from the system simultaneously

6.1.5 Error Persistence and Storage

Errors are stored in the system's persistent memory, allowing error history to be maintained across system restarts. The error database is stored in the file named */errors/errors.mpack* on the eMMC filesystem.

6.1.6 Error Counter and Tracking

The system maintains occurrence counters for each error type, allowing operators to identify recurring issues and track error frequency patterns. This information is valuable for preventive maintenance and system optimization.

6.1.7 Active Error Monitoring

The system distinguishes between active errors (currently occurring) and historical errors (previously occurred but now resolved). This allows operators to focus on current issues while maintaining access to historical error information for troubleshooting purposes.

6.2 Voltage Rail Monitoring

The GCU monitors both the input 24V rail and the internal 3.3V and 5V voltage rails. If any of the voltage rails deviates by more than 10% from the nominal value, the GCU will record an error in the internal error memory.

6.3 Inspection intervals

Inspection intervals can be configured for a given number of open-close cycles, for an elapsed time interval, or both. When an inspection is due, all **Lamp** outputs will be emitting two short pulses every 5 seconds when gate is idle.

6.4 Memory Organization

The GCU uses an integrated eMMC flash memory to store configuration, logs and firmware update files. Installed eMMC size is 4 GB which allows to store pretty much unlimited number of log files and remote entries.

The eMMC memory uses a standard FAT32 file system, which allows reading it using any computer with a USB port. It can be accessed by connecting the GCU to a computer using a USB-C cable and then enabling the USB mass storage mode by using the **USB mass storage** option in the **System settings** menu.

The file system is organized as follows:

Table 1: File System Organization

Path	Description
/boot/boot0.elf	The application firmware executable file.
/config/gcu.mpack	The main configuration file.
/config/remotes.mpack	Contains the remote database.
/errors/errors.mpack	Contains the error database.
/logs	Contains log files generated by the GCU.
/coredumps	Contains core dump files generated by the GCU.

6.5 System info

The system info submenu is part of **System settings** and provides detailed information about the GCU state.

The system info menu displays the following information:

- **Firmware version** - Current firmware version running on the GCU
- **Hardware version** - Hardware revision of the GCU board
- **Serial number** - Unique serial number of the device
- **Build batch ID** - Manufacturing batch identifier
- **Build date** - Date when the firmware was compiled
- **Uptime** - Time elapsed since the last system restart
- **Reset cause** - Reason for the last system reset or restart
- **Board temperature** - Current temperature of the GCU circuit board
- **Board humidity** - Current humidity level measured by the onboard sensor

CHAPTER 7

Gate Control

7.1 Gate Operations

The GCU supports the following gate operations:

- **Open**: Opens the gate wings to the configured open position.
- **Close**: Closes the gate wings to the configured closed position.
- **Stop**: Stops the gate immediately, regardless of the current operation.
- **Wicket**: Opens or closes gate to a configured wicket position, allowing pedestrian access without fully opening the gate.
- **OSCS**: Open/Stop/Close/Stop operation
- **Hold To Run**: Slowly run in open or close direction while button is pressed or input is active.

7.2 Gate States

Gate can be in one of the following states:

- **Open**: Gate wings are fully open.
- **Closed**: Gate wings are fully closed.
- **Moving**: Gate wings are currently moving.
- **Stopping**: Gate wings are in the process of decelerating to a stop using soft-stop.
- **Stopped**: Gate wings are stopped between open and closed positions.
- **Wicket**: Gate wings are in wicket position, allowing pedestrian access.
- **Locking**: Gate wings are in the process of locking or unlocking.
- **Closed Unlocked**: Gate wings are closed and unlocked.
- **Waiting**: Gate is waiting to start due to open or close delay.

- **Unavailable**: Gate is not available for operation due to an error or configuration issue.

In addition to the above states, if a latch is configured, the latch itself can be in one of the following states:

- **Locked**: Latch is engaged and preventing the gate from opening.
- **Unlocked**: Latch is disengaged, allowing the gate to open.
- **Moving**: Latch is currently moving to engage or disengage.

7.3 Gate Wing Movement Profile

Gate wing movement is divided into the following phases, each with its own speed and acceleration/deceleration settings:

- **Soft start**: The initial phase where the gate wing accelerates from zero speed to the configured main speed. Soft start time is configurable.
- **Main movement**: The phase where the gate wing moves at the configured main speed.
- **Braking**: Gate wing decelerates from the main speed to the brake speed.
- **Soft stop**: The final phase where the gate wing decelerates from the brake speed to zero speed. Soft stop time is configurable.

Braking phase begin (*p0*) and end (*p1*) are configurable as percentage of the total gate movement distance. Soft start (*t0-t1*) and soft stop (*t2-t3*) phases are configurable as time durations.

When gate wing stops as a result of a safety function activation, such as safety stop or safety edge activation, soft stop time is not used and instead the wing is stopped using the minimal stopping time of 0.1 second.

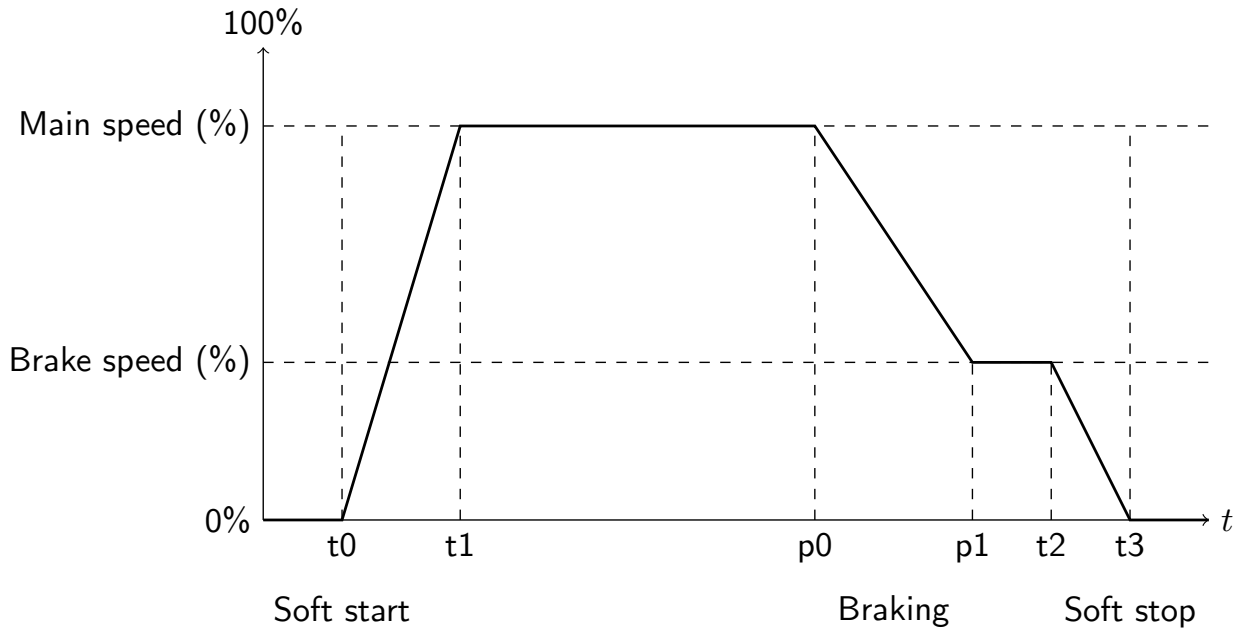


Fig. 1: Gate movement profile

7.4 Motor Driver Support

The GCU supports two types of motor drivers:

- Yaskawa GA500 series inverter
- BLDC motor driver (tube or DIN rail type)

Both driver types support configurable soft start and soft stop times, as well as current limit value and current limit response time.

When an overcurrent condition is detected, the GCU performs the back-off maneuver by reversing the gate wing for a short distance. See the *Safety Edge Support* section for more details on the back-off mechanism.

7.5 Absolute encoder support

For gates that have absolute position encoders, the GCU can read the encoder values to determine the position of the gate wings at any point in time without the need for calibration.

The only limitation is that the encoder value cannot cross the zero position during wing movement.

7.6 Virtual Encoder Support

For gates that do not have absolute position encoders, the GCU can simulate gate position using virtual encoders. This feature allows the GCU to calculate the gate position based on the motor speed and direction, providing a virtual position feedback.

Virtual encoders remember the minimum and maximum positions of the gate wings. When the distance between the limit switches changes, the virtual encoder limits should be reset to allow learning new minimum and maximum positions. This can be done using the **Reset learned positions** option in the input settings menu under the **Gate settings** > **Inputs configuration** section.

> **Note**
>
> There are two virtual encoders available, named *VENC1* and *VENC2*.

Virtual encoders can be in one of the three possible states:

- **Learning**: The GCU is learning the minimum and maximum positions of the gate wings.
- **Positioning**: The GCU is learning the current position of the gate wing.
- **Operational**: The GCU is has learned the current position of the gate wing and is ready to operate.

7.7 Photocell Support

The GCU supports one or more photocells connected to the GateIO inputs. Photocell functions can be configured independently for three different scenarios:

- **During opening**: Photocell function when gate is opening
- **During closing**: Photocell actfunctionion when gate is closing
- **When open**: Photocell function when gate is fully open

Additionally, a **Photocell Soft Stop** function can be enabled to stop the gate wing smoothly when the photocell is activated, instead of stopping immediately. When active, the **Soft stop** parameter is used to determine the deceleration time.

The following table summarizes the available photocell actions:

Table 1: Photocell Functions when gate is opening

Function	Photocell activation action	Photocell deactivation action	Action when gate fully opens
Off	None	None	None
Stop	Gate stops	None	None
Wait open	Gate stops	Gate start opening	None
Wait close	Gate stops	Gate starts closing	None
T1-T2	None	None	Auto-close time is changed to **Close timeout 2**

Table 2: Photocell Functions when gate is closing

Function	Photocell activation action	Photocell deactivation action	Action when gate fully opens
Off	None	None	None
Stop	Gate stops	None	None
Open	Gate starts opening	None	None
Wait open	Gate stops	Gate start opening	None
Wait close	Gate stops	Gate starts closing	None
T1-T2	None	None	Auto-close time is changed to **Close timeout 2**

Table 3: Photocell Functions when gate is fully open

Function	Action when photocell is activated	Action when photocell is deactivated
Off	None	None
Closing	None	Gate starts closing
Time reset	None	Auto-close time is reset
T1-T2	None	Auto-close time is reset and starts counting from **Close timeout 2**

7.8 Safety Edge Support

The GCU supports one or more safety edges connected to the GateIO inputs. Each safety edge can be independently configured to activate only during opening, only during closing, or during both opening and closing.

When a safety edge is activated, the gate wing stops immediately and performs a back-off maneuver by reversing the gate wing for a short distance.

The back-off has the following configurable parameters:

- **Back-off delay** - time delay before starting back-off maneuver (default: 0 ms)
- **Back-off time** - duration of the back-off maneuver (default: 1 s)
- **Back-off on open** - enable back-off maneuver when opening (default: enabled)
- **Back-off on close** - enable back-off maneuver when closing (default: enabled)

7.9 E-Lock Support

The gate can be optionally equipped with an electric lock (E-Lock) to secure the gate when closed. The GCU supports controlling the E-Lock through a configurable GateIO output, optionally negated.

7.10 Latch/Drop-bolt Support

7.11 Automatic Position Correction

The GCU supports automatic position correction for gates with absolute encoders. This feature allows to start the motor(s) when the gate position deviates from the expected position (eg. due to wind causing the wing to drift).

7.12 Unidirectional interlock/sluice

Two gates can be configured to work in a unidirectional interlock mode, where one gate must fully close before the other gate can open. This is useful for ensuring that only one gate is open at a time, preventing potential intrusion.

The interlock is operated through the following configurable inputs and outputs:

Table 4: Unidirectional interlock/sluice

Function	Type	Description
Sluice OP G1	Input	Starts gate G1 - should be connected to an external button
Sluice OP G2	Input	Starts gate G2 - should be connected to the **Sluice Start G2** output of the G2 gate
Sluice Lock	Input	Indicates that the other gate is fully closed - should be connected to the **Sluice Lock** output of the other gate
Sluice Lock	Output	Indicates that this gate is fully closed - should be connected to the **Sluice Lock** input of the other gate
Sluice Start G2	Output	Starts the G2 gate - should be connected to the **Sluice OP G2** input of the G2 gate

7.13 Hold To Run

The Hold To Run feature allows the gate to be moved slowly in either the open or close direction while a button is pressed in the GUI or an input is active. It is useful in case of a malfunction of one of the safety devices.

When Hold To Run is activated, the GCU enters the **Manual** mode in which all of the safety functions (Safety Stop, Photocell, Safety Edge) are disabled. Movement is performed at a speed defined by the **Safe speed** parameter.

When both Hold To Run Open and Hold To Run Close inputs are active at the same time, open direction has priority.

7.14 Keep Open, Keep Close, Keep wicket

The Keep Open, Keep Close, and Keep Wicket features allow the gate move into desired position and stay there for as long as the corresponding input is active.

Note

When Keep Open, Keep Close, or Keep Wicket is active, the gate is not accepting any other commands, including remote control commands.

7.15 Hold Open Sequence

The Hold Open Sequence input is a multi-function input that performs the following actions based on the duration of the input activation:

- **Short pulse** (less than 1 second): Perform OSCS command
- **Long pulse** (more than 5 seconds): Activate Keep Open function for as long as the input is active

7.16 Remote Programming

The GCU supports wireless remote control programming and management through the GUI. This feature allows operators to add, configure, and manage wireless remote controls.

7.16.1 Adding New Remotes

New remote controls can be added to the system through an automatic scanning process:

1. Select **Add remote** from the remote management menu
2. A scanning popup appears prompting to press any button on the new remote
3. The system automatically detects the remote's device ID when a button is pressed
4. The remote is added to the system with default button configurations

7.16.2 Remote Configuration

Each remote control supports up to 4 programmable buttons. For each button, the following gate actions can be assigned:

- **Cycle (open/close)** - Toggles between open and close operations
- **Open** - Opens the gate to the configured open position
- **Close** - Closes the gate to the configured closed position
- **Wicket** - Opens or closes gate to wicket position for pedestrian access
- **None** - Disables the button (no action assigned)

7.16.3 Default Button Assignment

When a new remote is added, the buttons are automatically configured with default actions:

- **Button 1** - Cycle (open/close)
- **Button 2** - Wicket
- **Button 3** - Open
- **Button 4** - Close

7.16.4 Remote Management Operations

- **List remotes** - View all configured remote controls in the system
- **Edit remote** - Modify button assignments for an existing remote
- **Remove remote** - Delete a remote control from the system
- **Remote cloning** - Enable or disable the ability to clone existing remotes

7.16.5 Remote Identification

Each remote control is identified by a unique device ID that is automatically detected during the scanning process. The remote ID is displayed in the configuration interface for easy identification and management.

7.16.6 Remote Cloning

Remote Cloning functionality allows to configure a new remote without accessing the GCU User Interface, using just an already configured remote.

CHAPTER 8

Turnstile control

8.1 Features Overview

The GCU provides a comprehensive set of features for turnstile control, including:

- Control of 3-arm and 4-arm turnstiles
- Control of bicycle turnstiles
- Support for automatic (motorized) or manual turnstiles
- Configurable speed and motor activation angle
- Support for free pass mode
- Light sensor support for automatic lighting control
- Calibration of turnstile position
- Real-time monitoring of turnstile status
- Integration with access control systems
- Customizable turnstile operation profiles
- Error handling and diagnostics
- Support for two turnstiles per GCU

8.2 Turnstile board hardware description

For proper turnstile operation the GCU must be connected to the turnstile control board via CAN bus. From GCU side the connection is done via CAN1 or CAN2 port. Second turnstile can be connected via CAN2 port in GCU or via CAN OUT port on first turnstile board.

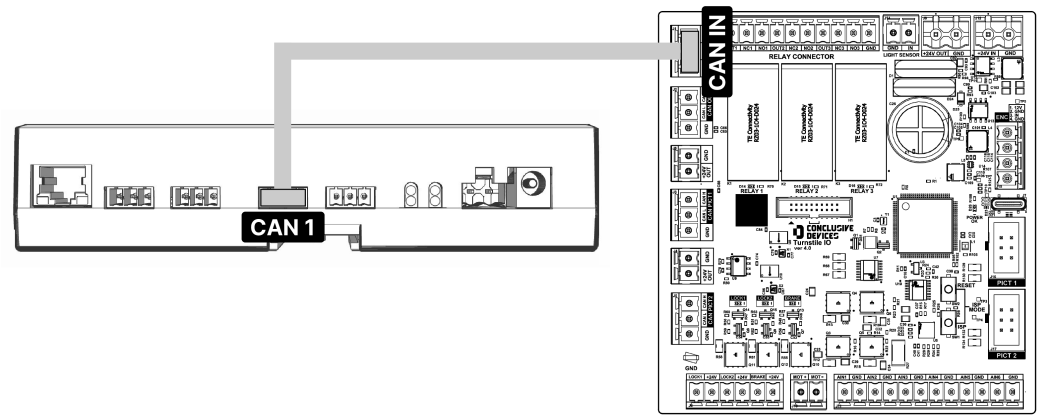


Fig. 1: Connection diagram for GCU to Turnstile connection.

Below are detailed descriptions of all connectors on the turnstile control board.

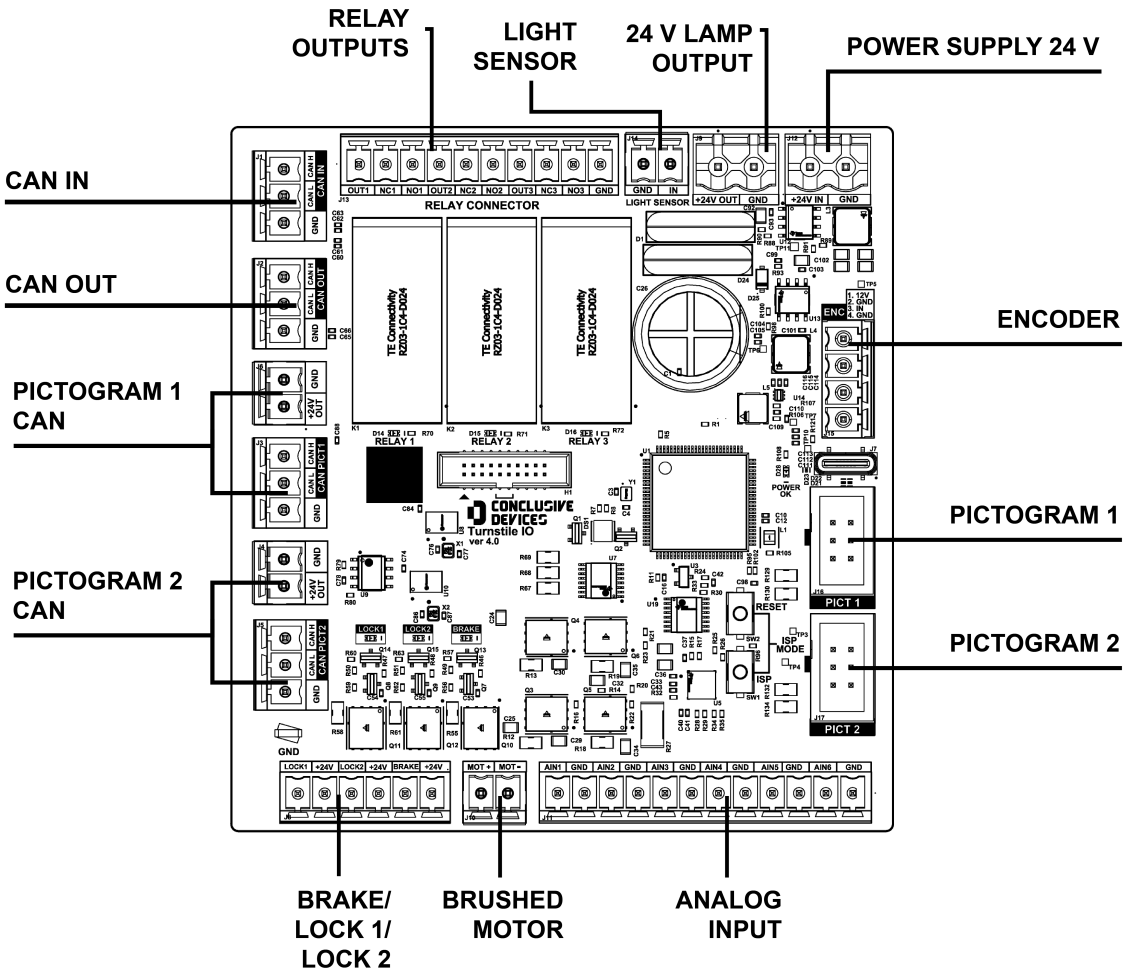


Fig. 2: Turnstile control board connector overview.

The turnstile board is powered by a 24V DC power supply (±10% tolerance, 21.6V - 26.4V). The main power connector is **J12**.

8.2.1 Connector J12: Main Power Supply

Table 1: J12 — Main Power Supply pinout

Pin	Signal
1	+24V DC input
2	Ground (GND)

Ensure the power supply can deliver sufficient current for the motor, brake, bolts, and control electronics. It must be at least 5A for typical installations.

8.2.2 Connector J9: Lamp output

Table 2: J9 — Lamp output pinout

Pin	Signal
1	Lamp +24V output
2	Lamp 0V (GND)

This output provides power for turnstile lighting, controlled by the GCU based on ambient light conditions when the light sensor feature is enabled. But it is also possible to use this output for other purposes - it is normal output but with fixed 24V voltage.

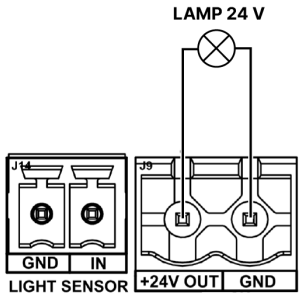


Fig. 3: Connection diagram for Lamp output connector.

8.2.3 Lamp sensor connector

Table 3: Lamp sensor connector pinout

Pin	Signal
1	Light sensor GND
2	Light sensor signal (LDR)

This connector is used to connect an ambient light sensor (LDR - Light Dependent Resistor) to enable automatic lighting control for the turnstile. When connected and enabled, the GCU can turn on or off the turnstile lighting based on ambient light levels detected by the sensor.

LDR Sensor Specifications:

- Type: Resistive light sensor (photoresistor)
- Resistance at 10 lux: 90 kΩ
- Connection: Pin 1 (LDR signal), Pin 2 (GND)

Installation Guidelines:

The LDR sensor must be mounted in a location where it can accurately measure ambien daylight without interference from artificial light sources. Avoid positioning the sensor where:

- Turnstile internal lighting can directly illuminate it
- External artificial lights (street lamps, building lights) affect readings
- Direct sunlight creates inconsistent measurements

Proper sensor placement ensures reliable automatic lighting control based on actual ambient light conditions.

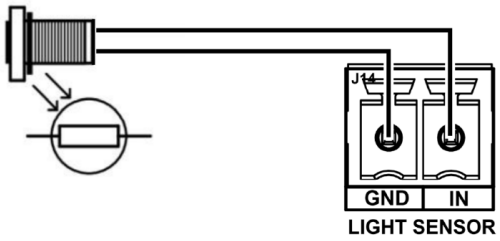


Fig. 4: Connection diagram for Light sensor connector.

8.2.4 Relay connector

Table 4: Relay connector pinout

Pin	Signal
1	Relay 1 OUT — COM
2	Relay 1 NC — Normally Closed
3	Relay 1 NO — Normally Open
4	Relay 2 OUT — COM
5	Relay 2 NC — Normally Closed
6	Relay 2 NO — Normally Open
7	Relay 3 OUT — COM
8	Relay 3 NC — Normally Closed
9	Relay 3 NO — Normally Open

This output provides 3 relay outputs that can be configured for various turnstile functions - all can be configured from the Turnstile Output Configuration menu. For debugging purposes, all 3 relays have additional LEDs to display the relay state.

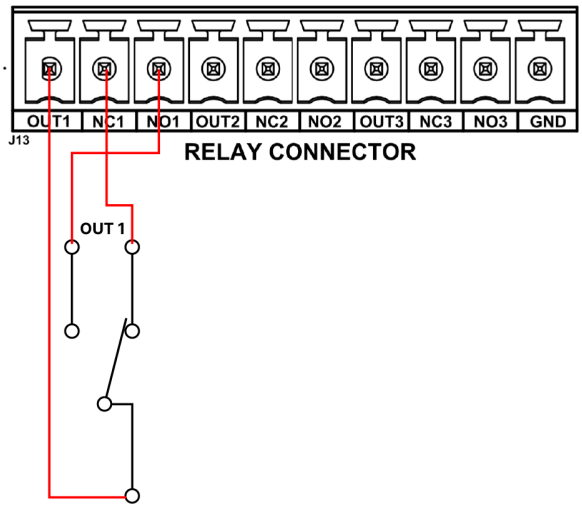


Fig. 5: Connection diagram for Relay output 1 connector. Output 2 and 3 are similar.

8.2.5 CAN IN connector

Table 5: CAN IN connector pinout

Pin	Signal
1	CAN H
2	CAN L
3	GND

This connector is used to connect the turnstile board to the GCU via CAN bus.

8.2.6 CAN OUT connector

Table 6: CAN OUT connector pinout

Pin	Signal
1	CAN H
2	CAN L
3	GND

This connector is used to daisy-chain multiple turnstile boards together via CAN bus.

8.2.7 CAN 1 PICT + Power

CAN:

Table 7: CAN 1 PICT — CAN pinout

Pin	Signal
1	CAN H
2	CAN L
3	GND

Power:

Table 8: CAN 1 PICT — Power pinout

Pin	Signal
1	24V DC output
2	GND

This connector provides CAN bus connection along with a 24V DC power output to power additional turnstile pictograms or accessories.

8.2.8 CAN 2 PICT + Power

CAN:

Table 9: CAN 2 PICT — CAN pinout

Pin	Signal
1	CAN H
2	CAN L
3	GND

Power:

Table 10: CAN 2 PICT — Power pinout

Pin	Signal
1	24V DC output
2	GND

This connector provides CAN bus connection along with a 24V DC power output to power additional turnstile pictograms or accessories.

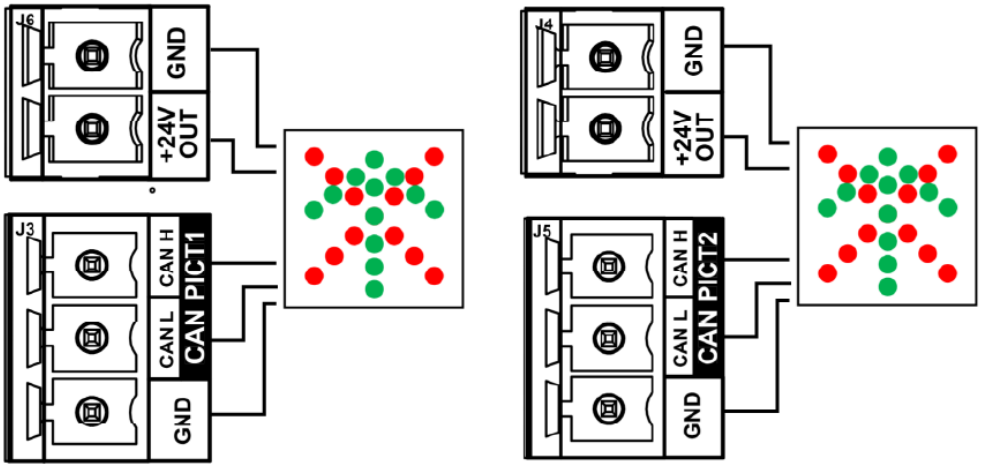


Fig. 6: Connection diagram for both pictogram CAN connector.

8.2.9 Outputs connector

Table 11: Outputs connector pinout

Pin	Signal
1	Lock 1 pin 1 (24V)
2	Lock 1 pin 2 (GND)
3	Lock 2 pin 1 (24V)
4	Lock 2 pin 2 (GND)
5	Brake pin 1 (24V)
6	Brake pin 2 (GND)

This connector provides outputs to control the turnstile locking bolts and brake mechanism. The polarization of the lock and brake outputs is not important. **Lock 1** is default used for IN direction locking and Lock 2 for

OUT direction locking - this can be changed from the configuration menu. To reduce power consumption and heat generation in the coils, PWM signal can be used for lock and brake control - the PWM duty cycle can be configured from the turnstile configuration menu.

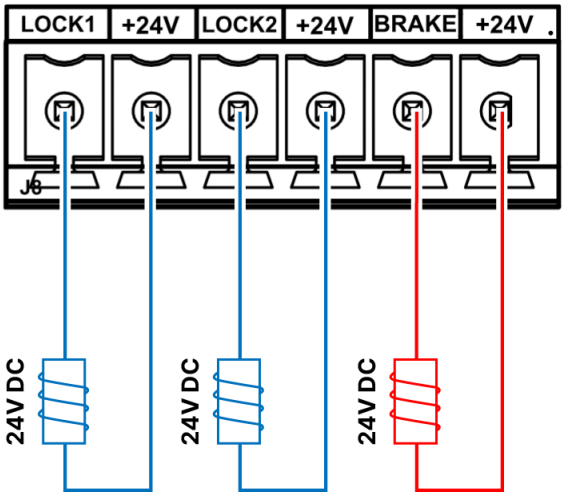


Fig. 7: Connection diagram for lock 1, lock 2 and brake connector.

8.2.10 Motor connector

Table 12: Motor connector pinout

Pin	Signal
1	Motor +
2	Motor -

This connector allows connection to the turnstile brushed motor. The motor is driven by a PWM signal to control speed and torque. Motor polarity is important - reversing the motor wires will reverse the turnstile rotation direction. This can be corrected from the configuration menu by enabling the "Motor direction reversed" option.

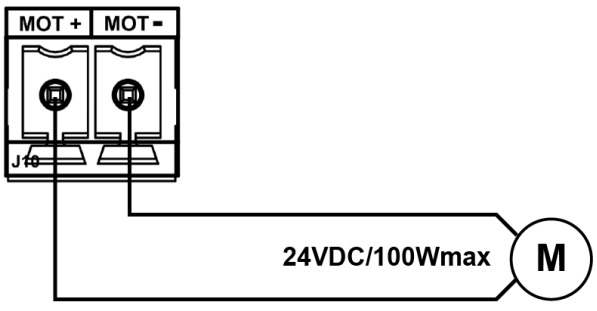


Fig. 8: Connection diagram for motor connector.

8.2.11 AIN connector

Table 13: AIN connector pinout

Pin	Signal
1	AIN1
2	GND
3	AIN2
4	GND
5	AIN3
6	GND
7	AIN4
8	GND
9	AIN5
10	GND
11	AIN6
12	GND

This connector provides up to 6 analog inputs. Each analog input can be configured for various turnstile functions and supports multiple input types:

- **NO (Normally Open)** - contact closes when activated
- **NC (Normally Closed)** - contact opens when activated
- **2K** - 2k Ohm resistor termination
- **4.1K** - 4.1k Ohm resistor termination
- **8.2K** - 8.2k Ohm resistor termination
- **16.4K** - 16.4k Ohm resistor termination

All inputs can be configured from the Turnstile Input Configuration menu.

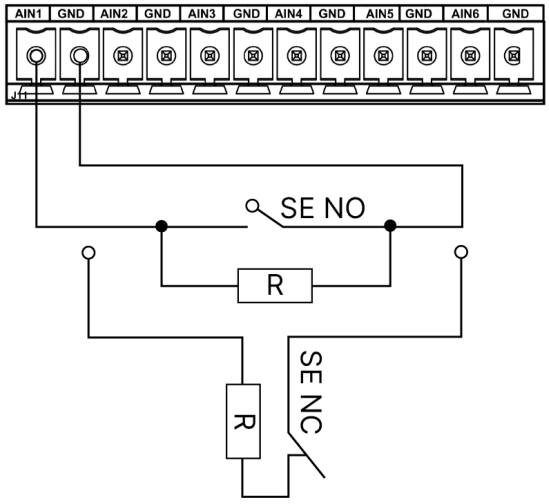


Fig. 9: Connection diagram for inputs connector.

8.2.12 PICT 1 connector

Table 14: PICT 1 connector pinout

Pin	Signal
1	Red entry LED
2	Red entry LED
3	Green entry LED
4	Green entry LED
5	+24V
6	+24V

This connector is used to connect turnstile pictogram LEDs for entry indication. The red and green LEDs indicate whether entry is allowed or denied. The +24V pins provide power for the LEDs.

8.2.13 PICT 2 connector

Table 15: PICT 2 connector pinout

Pin	Signal
1	Red exit LED
2	Red exit LED
3	Green exit LED
4	Green exit LED
5	+24V
6	+24V

This connector is used to connect turnstile pictogram LEDs for exit indication. The red and green LEDs indicate whether exit is allowed or denied. The +24V pins provide power for the LEDs.

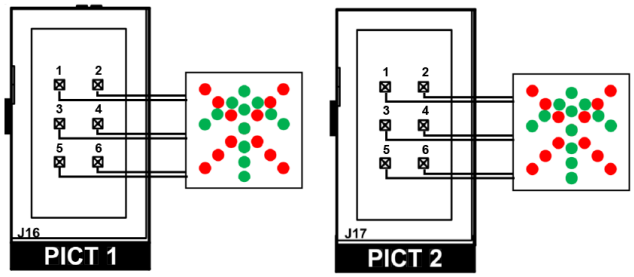


Fig. 10: Connection diagram for both pictograms connectors.

8.2.14 ENC connector

Table 16: ENC connector pinout

Pin	Signal
1	+12V encoder power
2	GND
3	Encoder signal
4	GND

This is the connector for the PWM type encoder.

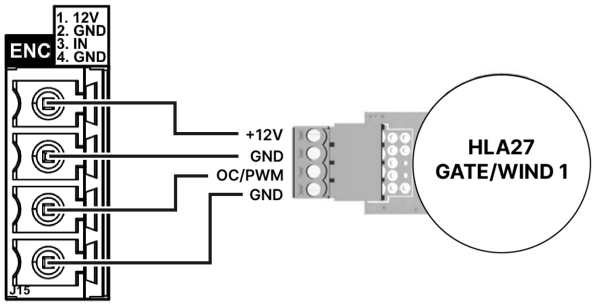


Fig. 11: Connection diagram for encoder connector.

8.3 Status LED Indicators

The turnstile board features a dual-color (red/green) status LED that provides visual indication of system health and communication status.

8.3.1 Startup Sequence

For approximately 1 second after power-up, both LEDs alternate rapidly (blinking orange effect), then turn off.

8.3.2 Status Indication Logic

The LED operates with the following priority-based logic:

1. **Power Voltage Error (Highest Priority)**
   - Green LED: Off
   - Red LED: Blinking
   - Condition: Main supply voltage is outside 22-26V range, or any internal voltage rail (3.3V, 5V, 12V) is outside ±10% of nominal value
1. **Normal Operation with CAN Communication**
   - Green LED: Blinking
   - Red LED: Off
   - Condition: All voltages are correct and CAN bus communication is active
2. **CAN Communication Lost**
   - Green LED: Blinking
   - Red LED: Blinking (synchronized with green)
   - Condition: All voltages are correct but CAN bus communication is not established

Voltage Monitoring:

Power is considered correct when:

- Main supply voltage: 22-26V DC
- Internal 3.3V rail: 2.97-3.63V (±10%)
- Internal 5V rail: 4.5-5.5V (±10%)

- Internal 12V rail: 10.8-13.2V (±10%)

All internal voltage rails must be within tolerance for the system to operate normally. These rails power the microcontroller, encoders, CAN transceiver, and other critical components.

8.4 Turnstile Operations

The GCU supports the following turnstile operations:

- **Enter**: Allow to pass in the enter direction.
- **Exit**: Allow to pass in the exit direction.
- **Stop**: Stop turnstile movement and disallow further movement.
- **Lock**: Lock the turnstile to prevent any movement.
- **Unlock** : Unlock the turnstile to allow movement.

Free pass mode can be enabled for either or both directions, allowing continuous passage without individual authorization. This can be enabled from inputs or from the configuration menu.

8.5 Turnstile states

Each configured turnstile can be in one of the following states:

- **Locked**: The turnstile is locked and cannot be moved.
- **Unlocked for entry**: The turnstile is unlocked and allows entry.
- **Unlocked for exit**: The turnstile is unlocked and allows exit.
- **Unlocked for both directions**: The turnstile is unlocked and allows entry and exit.
- **Free pass for entry**: The turnstile is in free pass mode for entry.
- **Free pass for exit**: The turnstile is in free pass mode for exit.
- **Free pass for both directions**: The turnstile is in free pass mode for both entry and exit.
- **Open In**: The turnstile is open and in the process of allowing passage - this state exists only on bicycle turnstiles.
- **Open Out**: The turnstile is open and in the process of allowing passage - this state exists only on bicycle turnstiles.
- **Sabotaged**: The turnstile has detected a sabotage condition.
- **Error**: The turnstile is in an error state and cannot be operated.

8.6 Turnstile Movement Profile

Turnstile movement is divided into four phases:

- **Waiting for manual start**
- **Speed 1**
- **Speed 2**
- **Stopped**

In the initial state, **Waiting for manual start**, the turnstile is stationary and waiting for the user to initiate movement. Angle that initiates the movement is configurable - it can be also set to 0 to make turnstile initiate movement automatically. If sensor input is used to detect user presence, the turnstile will initiate movement automatically when the sensor is triggered.

Motor-assisted passage can operate at different speeds for ENTRY and EXIT directions, and with two programmable speeds: Speed 1 and Speed 2 (for example, to allow the turnstile to stop more smoothly). After the motor starts, the turnstile rotates at Speed 1, and after reaching the Speed 2 Angle position, it switches to Speed 2.

The turnstile starts moving with **Speed 1** and then changes speed to **Speed 2** after moving a configurable angle defined by the **Speed 2 angle** parameter.

It is possible to configure different speeds for entry and exit directions independently, allowing optimization of passage comfort and throughput for each direction.

8.7 Calibration

The turnstile requires calibration of encoder zero position which determines the positions of the turnstile arms in the locked state. For 3 or 4 arm turnstiles calibration is done by moving the turnstile to the locked position and issuing a zero positions calibration command. For bicycle turnstiles, calibration is done by moving the turnstile to the closed position and issuing a zero position calibration command.

8.8 TS1, TS2 and function index

The GCU supports configuration of up to 2 turnstiles simultaneously (TS1 through TS2). Each turnstile must be assigned a unique function index (1-2) to be properly recognized and configured by the system.

Configuring Turnstile Function Index: 1. Navigate to the **Nodes** menu in the GCU interface 2. Select the node corresponding to your turnstile 3. Assign the appropriate function index (1 for TS1, 2 for TS2)

Once a node is properly configured with a turnstile function and index, it will appear in the turnstile configuration menu as TSx (where x is the function index). Only properly configured turnstiles will be visible in the configuration menu.

8.9 Features

8.9.1 Light Sensor Support

The GCU supports integration with light sensors to control turnstile lighting. When a light sensor is connected and enabled, the GCU can automatically turn on or off the turnstile lighting based on ambient light conditions detected by the sensor.

8.9.2 Queue Management

The queue management feature allows the turnstile to buffer multiple authorization signals received during an ongoing passage cycle, rather than discarding them. This is particularly useful in high-traffic environments where users may present their credentials in rapid succession.

When queue management is disabled, the controller ignores any authorization signals received while a passage is already in progress. Each new passage can only begin after the previous cycle has fully completed.

When queue management is enabled, authorization pulses received during an active passage are counted and stored in an internal queue. The turnstile then rotates by the combined angle of all queued passages, stopping

briefly between each one to allow the next person to initiate movement. The cycle ends when all queued passages have been completed, or when the configured **Open time** or **Transition time** expires.

If authorizations are queued for both the entry and exit directions simultaneously, the direction defined by the **Queue priority** setting is served first.

> **Note**
>
> Queue management configuration parameters (**Queue enabled**, **Queue priority**) are described in the Configuration chapter.

8.9.3 Random Screening

Random Screening is a security feature that randomly selects individuals for additional security checks. The system uses a configurable random counter to determine when to trigger screening.

How Random Screening Works:

1. **Initialization**: When screening is enabled, the system generates a random counter value between **Screening low** and **Screening high**
2. **Countdown**: Each completed passage decrements the counter by 1
3. **Screening Trigger**: When the counter reaches 0, the next person is stopped for screening:
   - Passage is rejected with access denied
   - The **Screening active** output is activated
   - Entry or exit pictogram blinks to indicate screening is required
   - The person remains in pending state until screening is completed
5. **Screening Completion**: When the screening input is deactivated (screening inspection complete):
   - The pending person is allowed to pass automatically
   - The counter is reset to a new random value
   - Screening active output is deactivated
6. **Independent Control**: Screening operates independently for entry (IN) and exit (OUT) directions

Use Cases:

- Airport security random checks
- Public transportation security screening
- Event venue security protocols
- Customs border control random inspections

8.9.4 FPS Mode — Fire Protection System

The Fire Protection System (FPS) mode is an emergency operation mode designed for evacuation scenarios. When activated for a given direction, the turnstile remains permanently unlocked for that direction and no individual authorization is required for each passage.

FPS mode can be enabled independently for the entry and exit directions, or for both simultaneously. It is typically triggered via a dedicated input connected to the building's fire alarm system, ensuring immediate response when an evacuation is initiated.

FPS mode can also be activated via a properly configured input: **Fire Passage In**, **Fire Passage Out**, or **Fire Passage In/Out**.

8.9.5 Free Pass Mode

Free Pass mode provides continuous motor-assisted passage without requiring individual authorization for each person. Unlike FPS mode, which is intended for emergencies, Free Pass is used in normal operation scenarios where unrestricted flow is desired — for example, during shift changes or peak hours. When Free Pass mode is active for a given direction, the turnstile remains permanently unlocked in that direction and the motor activates automatically for each passage. To prevent the turnstile from spinning on its own due to vibrations or minor disturbances, the system automatically enforces a minimum **Start angle** of 300 encoder units while Free Pass is active. This ensures the user must physically initiate movement before motor assistance begins. The original **Start angle** value is restored once Free Pass mode is deactivated. Free Pass mode can be enabled independently for entry, exit, or both directions simultaneously. It can be activated from the configuration menu, via dedicated inputs (**Free Pass In**, **Free Pass Out**, **Free Pass In/Out**), or automatically through timed inputs when the signal duration exceeds the configured **Free pass signal time** threshold.

8.10 Turnstile Input Functions

The turnstile has 6 available inputs. All can be configured with different functions depending on the application requirements. The following input functions are available for turnstile operation:

8.10.1 Movement Control Inputs

In
: Command input to authorize and initiate entry direction passage. When activated, the turnstile unlocks to allow one person to pass in the entry direction.

Out
: Command input to authorize and initiate exit direction passage. When activated, the turnstile unlocks to allow one person to pass in the exit direction.

8.10.2 Presence Sensor Inputs

Sensor in
: Presence sensor for entry direction. Detects when a person begins to pass through the turnstile in the entry direction. Used for automatic motor activation and safety monitoring. Related to the **Sensor time** parameter in turnstile settings. **Sensor time** in turnstile settings defines the delay between sensor activation and motor start.

Sensor out
: Presence sensor for exit direction. Detects when a person begins to pass through the turnstile in the exit direction. Used for automatic motor activation and safety monitoring. Related to the **Sensor time** parameter in turnstile settings. **Sensor time** in turnstile settings defines the delay between sensor activation and motor start

Detect in
: Additional detection sensor for entry direction. Provides secondary presence detection for enhanced safety and anti-passback functionality. It's related only for bicycle turnstiles. When falling signal is detected on this input, the turnstile will start closing after the **Detect time** parameter expires.

Detect out
: Additional detection sensor for exit direction. Provides secondary presence detection for enhanced safety and anti-passback functionality. It's related only for bicycle turnstiles. When falling signal is detected on this input, the turnstile will start closing after the **Detect time** parameter expires.

8.10.3 Free Pass Mode Control

Free Pass In
Enable free pass mode for entry direction. When activated, the turnstile remains continuously unlocked for entry passages without requiring individual authorization commands.

Free Pass Out
Enable free pass mode for exit direction. When activated, the turnstile remains continuously unlocked for exit passages without requiring individual authorization commands.

Free Pass In/Out
Enable free pass mode for both directions simultaneously. When activated, the turnstile remains continuously unlocked for passages in both entry and exit directions.

8.10.4 Multi-Turnstile Control

TS 1+2 In
Simultaneous authorization command for entry on both TS1 and TS2. Behavior is related to the "Bicycle Go" feature in turnstile settings.

- When "Bicycle Go" is disabled, TS2 opens immediately upon receiving the signal from this input
- When "Bicycle Go" is enabled, TS2 opens only after movement is detected on TS1.

TS 1+2 Out
Simultaneous authorization command for exit on both TS1 and TS2. Behavior is related to the "Bicycle Go" feature in turnstile settings.

- When "Bicycle Go" is disabled, TS2 opens immediately upon receiving the signal from this input
- When "Bicycle Go" is enabled, TS2 opens only after movement is detected on TS1.

TS 2 In
Specific authorization command for TS2 entry only. It works when TS1 is unlocked.

TS 2 Out
Specific authorization command for TS2 exit only. It works when TS1 is unlocked.

8.10.5 Timed Input Functions

Turnstile Timed In / Turnstile Timed Out
Timed inputs allow the turnstile to interpret input signals based on their duration, enabling different behaviors for short and long signals. **Timed In** applies to the entry direction and **Timed Out** to the exit direction.

The system recognizes three types of signal durations:

Short Pulse (Normal Passage)

- Duration: Less than **Signal time** parameter
- Behavior: Authorizes a single passage
- The passage authorization is defined by a complete pulse (two edges - rising and falling)

Ignored Pulse

- Duration: Between **Signal time** and **Free pass signal time** parameters
- Behavior: Signal is ignored by the controller
- This prevents unintended activation from signals of intermediate duration

Long Pulse (Free Pass Mode)

- Duration: Longer than **Free pass signal time** parameter
- Behavior: Activates Free Pass mode
- Free Pass mode remains active as long as the input signal is present
- Free Pass mode is deactivated when the input signal ends

8.10.6 Fire Protection System Control

Fire Passage In / Fire Passage Out / Fire Passage In/Out
Activates FPS (Fire Protection System) mode for the entry direction, exit direction, or both simultaneously. When active, the turnstile remains permanently unlocked for the configured direction(s), no individual authorization is required. FPS mode is typically triggered by a building fire alarm system to enable immediate evacuation.

8.10.7 Test and Special Modes

Test
Activates special simple_ts mode for turnstile 1 and 2. When a signal is present on this input, the turnstile operates in test mode, allowing manual rotation without motor assistance or locking. When the signal is removed, the turnstile end last test cycle and returns to normal operation.

8.10.8 Random Screening Control

Random Screening In / Random Screening Out
Enables random screening mode for the entry or exit direction. When active, the system initializes a random counter (between **Screening low** and **Screening high**); each passage decrements it. When the counter reaches zero, the next person is blocked, the **Screening active** output activates, and the directional pictogram blinks. The person is released when this input is deactivated, after which the counter resets to a new random value.

8.11 Turnstile Output Functions

The GCU provides configurable output channels for turnstile control and status indication. Outputs can be assigned various functions to control external devices, provide feedback signals, and indicate system status. Each output can operate in different states (On, Off, Blink) depending on its assigned function. The following output functions are available for turnstile operation:

8.11.1 Feedback Outputs

In Feedback
Provides feedback signal for entry direction passage. The behavior depends on the **Feedback type** setting:

- **Standard mode**: Activates after passage completion for the duration specified by **Feedback time**
- **Door mode**: Activates upon authorization command and deactivates when turnstile locks

Out Feedback
Provides feedback signal for exit direction passage. The behavior depends on the **Feedback type** setting:

- **Standard mode**: Activates after passage completion for the duration specified by **Feedback time**
- **Door mode**: Activates upon authorization command and deactivates when turnstile locks

8.11.2 Sensor Indication Outputs

These outputs provide visual or electrical indication during sensor-assisted passage sequences. The naming convention indicates the output behavior during two distinct phases:

- **First letter**: Output state during **Sensor time** countdown
- **Second letter**: Output state during motor movement

Sensor LL (Lamp-Lamp)
Output remains continuously ON during both the countdown phase and the movement phase. Typically used for warning lamps that need to stay illuminated throughout the entire sensor-assisted passage.

Sensor PP (Pulse1-Pulse2)
Output pulses during both phases, potentially with different pulse patterns. The first pulse pattern occurs during countdown, and the second pattern during movement.

Sensor LP (Lamp-Pulse2)
Output stays ON during the countdown phase, then switches to pulsing during the movement phase. Useful for escalating alerts as the passage progresses.

Sensor PL (Pulse1-Lamp)
Output pulses during the countdown phase, then stays continuously ON during the movement phase. Provides a warning pulse followed by sustained indication during motor operation.

8.11.3 Alert and Status Outputs

Buzzer
Controls the turnstile buzzer for audible alerts during sensor-assisted passages. When a proximity sensor detects a user and the **Sensor time** countdown begins, the buzzer activates **Buzzer time** seconds before motor activation. This provides an audible warning to the user that automatic motor assistance will start shortly. The buzzer timing ensures users are aware of impending motor activation.

Tamper
Activates when tamper/sabotage condition is detected. Remains active for the duration specified by **Tamper time** parameter. Used to trigger external alarms or security systems.

Lamp
Controls turnstile lighting. Can be automatically controlled by the light sensor when **Light sensor enabled** is active, based on ambient light levels and the **Light level** threshold.

Fan
Controls the cooling fan for the turnstile control cabinet. Automatically activated based on internal temperature when **Fan enabled** is active, using **Fan enable temperature** and **Fan disable temperature** thresholds.

8.11.4 Status Indication Outputs

Open
Active when the turnstile is unlocked and ready for passage — i.e. after receiving an authorization command, or while Free Pass or FPS mode is active.

Close
Active when the turnstile is locked and not allowing passage — i.e. after a passage has been completed and the turnstile has returned to the locked position with no pending authorization.

8.11.5 Security and Access Control

Screening active

Active while a person is blocked and awaiting security screening — i.e. when the random screening counter has reached zero and the passage has been stopped. Deactivates when the **Random Screening In** or **Random Screening Out** input is released, allowing the pending person to proceed.

CHAPTER 9

Configuration Reference

9.1 System settings

This section describes the system settings of the Gate Control Unit.

System settings can be accessed through the main menu of the GUI under the **System settings** option.

9.1.1 Enable gate controls

This setting enables or disables control of gate devices. When enabled, the Gate Control Unit can operate gates and associated gate functions. To control any gate, this setting must be enabled.

9.1.2 Enable turnstile controls

This setting enables or disables control of turnstile devices. When enabled, the Gate Control Unit can operate turnstiles and associated turnstile functions. To control any turnstile, this setting must be enabled.

> **Note**
>
> Simultaneous control of gates and turnstiles is not possible. Only one control mode can be active at a time. When one control mode is enabled, the other is automatically disabled. If you enable **Enable gate controls**, the **Enable turnstile controls** will be automatically switched off, and vice versa.

9.1.3 Language

This setting allows to change the GUI language.

> **Note**
>
> Log files will always be stored in English, regardless of the selected language.

9.1.4 Backlight

This settings allows to configure the backlight of the LCD screen. Brightness can be adjusted between 10% and 100% in 10% increments where 0 means 10% and 9 means 100%.

9.1.5 Keyboard backlight

This setting allows to configure the backlight of the keyboard. Brightness can be adjusted between 10% and 100% in 10% increments where 0 means 10% and 9 means 100%.

9.1.6 Backlight timeout

This setting allows to configure the backlight timeout in seconds. After the configured time of inactivity, the backlight will turn off to save power. Setting the value to 0 disables the timeout and keeps the backlight always on.

9.1.7 Inspection

This option shows the current inspection status of the Gate Control Unit. It indicates the number of days and gate cycles remaining until the next required inspection.

In **Service** mode, the inspection status can be reset after performing the inspection.

9.1.8 Authorization

This setting allows to configure the authorization level required to access various system and gate or turnstile settings. The following authorization levels are available:

- **User** - Allows access to basic settings and gate operation
- **Service** - Allows access to advanced settings and maintenance functions
- **Factory** - Allows access to factory presets and limits

9.1.9 Date

This setting allows to configure the date. The date is entered in the *YYYY-MM-DD* format. After entering the date, press **OK** to save the changes. Date change is immediately applied and does not require a restart of the GUI.

9.1.10 Time

This setting allows to configure the time. The time is entered in the *HH:MM* format. After entering the time, press **OK** to save the changes. Time change is immediately applied and does not require a restart of the GUI.

9.1.11 Heater enable temperature

This setting allows to configure the temperature at which the heater is enabled. The temperature is entered in degrees Celsius. The heater will be enabled when the temperature falls below the configured value.

Warning

The heating function will only work if the heater is connected to an output configured as **Heater on** function.

9.1.12 Heater disable temperature

This setting allows to configure the temperature at which the heater is disabled. The temperature is entered in degrees Celsius. The heater will be disabled when the temperature rises above the configured value.

9.1.13 Enable USB mass storage

This function allows to enable the USB mass storage mode. When enabled, the GCU will appear as a USB mass storage device when connected to a computer via the USB-C port.

9.1.14 Enter USB bootloader

This function allows to enter the USB bootloader mode. When enabled, the GCU will enter the USB bootloader mode allowing to flash the firmware via USB-C port.

9.1.15 Factory reset

This function allows to reset the GCU to factory settings. It will erase all settings and configurations and restore the default settings. Use this function with caution as it will erase all your configurations.

> **Note**
>
> Date and time settings will not be reset to default values, but will remain unchanged after the factory reset.

9.2 Gate settings

9.2.1 Gate configuration

This settings allows to configure number of gate wings. Allowed values are **Single** for a single wing gate and **Dual** for a double wing gate.

9.2.2 Inputs configuration

Inputs configuration allows to configure the function, polarity and parameters of the configurable inputs from the GateIO board.

Input is NC

This option allows to configure the input as a normally closed (NC) contact. When enabled, the input will be considered active when the contact is closed and inactive when the contact is open.

Input resistor

This option allows to configure the input resistor value. It is used to detect open circuit on the input. Following resistor values can be selected:

- **None** - no resistor is used
- **2K** - 2k Ohm resistor is used
- **4.1K** - 4.1k Ohm resistor is used
- **8.2K** - 8.2k Ohm resistor is used
- **16.4K** - 16.4k Ohm resistor is used

Input function

This option allows to configure the function of the input. Following functions can be selected in the gate mote:

- **Off** - input is disabled
- **Limit switch** - input is used as a limit switch
- **Photocell** - input is used as a photocell
- **Safety stop** - input is used as a safety stop
- **Decoupling status** - input is used to signal motor decoupling status from the gate
- **Safety edge open** - input is used as a safety edge for opening direction
- **Safety edge close** - input is used as a safety edge for closing direction
- **Safety edge open/close** - input is used as a safety edge for both directions
- **Ex open** - same as **Safety edge open**, but not signaled on a relevant output
- **Ex close** - same as **Safety edge close**, but not signaled on a relevant output
- **Open** > **Stop** > **Close** > **Stop** - input is used as an external OSCS command
- **Open** - input is used for external open command
- **Close** - input is used for external close command
- **Stop** - input is used to stop gate movement
- **Hold to run - open** - gate opens at safe speed only while input is active
- **Hold to run - close** - gate closes at safe speed only while input is active
- **Keep open if active** - gate remains open while input is active
- **Keep closed if active** - gate remains closed while input is active
- **Cabinet open** - input signals that control cabinet is open
- **E-Lock** - input is used for electromagnetic lock feedback
- **Latch locked** - input signals that latch is in locked position
- **Latch unlocked** - input signals that latch is in unlocked position

Following functions can be selected in the turnstile mode:

- **Off** - input is disabled
- **In** - input is used for turnstile entry control
- **Out** - input is used for turnstile exit control
- **Sensor In** - input is used as a turnstile entry sensor
- **Sensor Out** - input is used as a turnstile exit sensor
- **Detect In** - input is used for turnstile entry detection
- **Detect Out** - input is used for turnstile exit detection
- **Test** - input is used for turnstile testing functions
- **Free Pass In** - input is used for turnstile free pass entry control
- **Free Pass Out** - input is used for turnstile free pass exit control
- **Free Pass In/Out** - input is used for turnstile free pass bidirectional control

- **Turnstile 1+2 In** - input is used for controlling entry on both turnstiles
- **Turnstile 1+2 Out** - input is used for controlling exit on both turnstiles
- **Turnstile 2 In** - input is used for controlling entry on TS2
- **Turnstile 2 Out** - input is used for controlling exit on TS2
- **Turnstile Timed In** - see *Timed Input Functions*
- **Turnstile Timed Out** - see *Timed Input Functions*
- **Fire Passage In** - input activates Fire Protection System mode for entry direction
- **Fire Passage Out** - input activates Fire Protection System mode for exit direction
- **Fire Passage In/Out** - input activates Fire Protection System mode for both directions
- **Random Screening In** - input activates random screening mode for entry direction
- **Random Screening Out** - input activates random screening mode for exit direction

Input is inverted

This option only applies to the encoder inputs. It allows to invert the input value. When enabled, the input value will be inverted, meaning that the encoder values increase in the opposite direction.

Input state

This option allows to check the current state of the input. It will update every time the input state changes. It is useful for debugging and verifying that the input is working correctly.

Learning state

This option only applies to the virtual encoder inputs. It allows to check the current learning state of th virtual encoder.

Reset learned positions

This option allows to reset the learned open and close positions of the virtual encoder inputs. It is useful when the encoder positions need to be recalibrated or if the gate length has changed.

9.2.3 Outputs configuration

Output function

This option allows to configure the function of the output. Following functions can be selected in the gate mote:

- **Off** - output is disabled
- **Opened** - output is active when gate is in opened position
- **Closed** - output is active when gate is in closed position
- **Lamp** - output controls a lamp
- **Pulse (2 Hz)** - output generates a 2 Hz pulse signal
- **E-Lock** - output controls an electromagnetic lock
- **E-Lock (negated)** - output controls an electromagnetic lock with inverted logic
- **Brake** - output controls a brake
- **Brake (negated)** - output controls a brake with inverted logic

- **Green light** - output controls a green indicator light
- **Red light** - output controls a red indicator light
- **Stop** - output signals stop condition
- **Photocell output** - output relays photocell signal
- **Safety edge close** - output signals safety edge activation during closing
- **Safety edge open** - output signals safety edge activation during opening
- **Safety edge open/close** - output signals safety edge activation during both directions
- **Alarm** - output activates an alarm signal
- **Cabinet open** - output signals that control cabinet is open
- **Service needed** - output signals that service is required
- **Heater on** - output controls heater activation
- **Power fail** - output signals previous power failure condition
- **Sluice Lock** - output controls sluice lock mechanism
- **Sluice Start G2** - output signals sluice start of Gate 2
- **RF Output Monostable** - output generates a monostable signal upon remote activation
- **RF Output Bistable** - output toggles state upon remote activation

Following functions can be selected in the turnstile mode:

- **Off** - output is disabled
- **In Feedback** - output signals turnstile entry feedback
- **Out Feedback** - output signals turnstile exit feedback
- **Sensor LL**
- **Sensor PP**
- **Sensor LP**
- **Sensor PL**
- **Buzzer**
- **Lamp**
- **Fan**
- **Tamper**
- **Open** - output signals turnstile is in open state
- **Close** - output signals turnstile is in closed state
- **Screening active** - output signals that random screening is in progress

Output state

This option allows to check the current state of the output. It will update every time the output state changes. It is useful for debugging and verifying that the output is working correctly.

9.2.4 Gate parameters

This section allows to configure various parameters of the gate operation.

Speed 1

This setting allows to configure the primary operating speed of the gate motor. The speed is specified as a percentage of the maximum motor speed.

Speed 2

This setting allows to configure the secondary operating speed of the gate motor. This speed is typically used for specific gate operations or conditions.

Brake speed

This setting allows to configure the speed at which the gate operates when braking is active. This is typically a lower speed used during the final phase of gate movement.

Safe speed

This setting allows to configure the safe operating speed of the gate. This speed is used when safety conditions require reduced gate movement speed.

Soft start

This setting allows to configure the soft start time in miliseconds. During this time, the gate gradually accelerates from zero to the configured operating speed.

Soft stop

This setting allows to configure the soft stop time in miliseconds. During this time, the gate gradually decelerates from the operating speed to a complete stop.

Brake begin

This setting allows to configure the position where braking begins during gate movement. The position is specified as a percentage of the total gate travel.

Brake end

This setting allows to configure the position where braking ends during gate movement. The position is specified as a percentage of the total gate travel.

Wicket position

This setting allows to configure the wicket gate position. The wicket is a small door within the main gate that can be opened independently.

Motor current limit

This setting allows to configure the maximum current limit for the gate motor in amperes. This protects the motor from overcurrent conditions.

Motor current limit time

This setting allows to configure the time duration in miliseconds for which the motor current limit is enforced before triggering protective actions.

Motor timeout

This setting allows to configure the maximum time in seconds that the motor is allowed to run before timing out. This prevents continuous operation in case of malfunction.

Open time

This setting allows to configure the time in seconds that the gate remains open before automatically closing.

Open time 2

This setting allows to configure an alternative open time duration in seconds. This provides flexibility for different operating scenarios.

Open delay

This setting allows to configure the delay in seconds before the gate starts opening after receiving an open command.

Close delay

This setting allows to configure the delay in seconds before the gate starts closing after receiving a close command or after the open time expires.

Warning light type

This setting allows to configure the type of warning light behavior. The following types can be selected:

- **Off** - warning light is disabled
- **Lamp** - lamp output is used for warning light
- **Red** - red semaphore light is used for warning light
- **Lamp & Red** - both lamp and red semaphore light are used for warning light

W1-W2 delay

This setting allows to configure the delay in seconds between wing 1 and wing 2 movement in dual-wing gate configurations.

Stall detection time

This setting allows to configure the time in seconds for stall detection. If the motor is stalled for this duration, protective actions will be triggered.

Photocell alarm time

This setting allows to configure the time in seconds after which a photocell alarm is triggered if the photocell remains obstructed.

Photocell open function

This setting allows to configure the function of the photocell when the gate is in the open position. Following open functions can be selected:

- **Off** - photocell open function is disabled
- **Closing** - gate will close when the photocell is deactivated
- **Time reset** - gate will reset its open time when the photocell is deactivated
- **T1-T2** - gate will start counting the **Open time 2**

Photocell opening function

This setting allows to configure the function of the photocell during gate opening movement. This determines how the gate responds to photocell activation while opening. Following opening functions can be selected:

- **Off** - photocell opening function is disabled
- **Stop** - gate will stop when the photocell is activated
- **Wait open** - gate will pause opening while the photocell is activated and then open
- **Wait close** - gate will pause opening while the photocell is activated and then close
- **T1-T2** - gate will start counting the **Open time 2**

Photocell closing function

This setting allows to configure the function of the photocell during gate closing movement. This determines how the gate responds to photocell activation while closing. Following closing functions can be selected:

- **Off** - photocell opening function is disabled
- **Stop** - gate will stop when the photocell is activated
- **Wait open** - gate will pause opening while the photocell is activated and then open
- **Wait close** - gate will pause opening while the photocell is activated and then close
- **Open** - gate will start reverse movement direction to opening

Gate backoff on open

This setting enables or disables the gate backoff function during opening. When enabled, the gate will reverse slightly before completing the opening sequence.

Gate backoff on close

This setting enables or disables the gate backoff function during closing. When enabled, the gate will reverse slightly before completing the closing sequence.

Gate backoff delay

This setting allows to configure the delay in miliseconds for the gate backoff function. This determines how long the gate waits before executing the backoff movement.

Dynamic close

This setting enables or disables dynamic closing functionality. When enabled, the gate closing behavior adapts based on operating conditions.

Photocell slow stop

This setting enables or disables slow stop behavior when a photocell is activated. When enabled, the gate will decelerate gradually instead of stopping immediately.

Gate auto adjustment

This setting enables or disables automatic gate adjustment functionality. When enabled, the gate will automatically adjust its operation parameters over time.

Gate auto adjustment interval

This setting allows to configure the interval in seconds between automatic gate adjustments when auto adjustment is enabled.

9.2.5 W1/W2 configuration

This section allows to configure the individual wing settings for dual-wing gate configurations.

Sensor type

This setting allows to configure the type of position sensor used for the gate wing. Following sensor types can be selected:

- **Encoder** - uses an encoder for precise position feedback
- **Limit switch** - uses limit switches to detect open and closed positions

Gate driver

This setting allows to select the gate driver module used to control the gate wing motor. The available drivers depend on the installed hardware configuration.

Motor direction reversed

This setting allows to reverse the motor direction for the gate wing. When enabled, the motor rotation direction is inverted, which may be necessary depending on the mechanical installation.

Encoder

This setting is available when **Encoder** sensor type is selected. It allows to configure which encoder input is used for position feedback of the gate wing.

Encoder open position

This setting is available when **Encoder** sensor type is selected. It allows to configure the encoder position value that corresponds to the fully open gate position.

Encoder closed position

This setting is available when **Encoder** sensor type is selected. It allows to configure the encoder position value that corresponds to the fully closed gate position.

Virtual encoder

This setting is available when **Limit switch** sensor type is selected. It allows to configure which virtual encoder input is used for position estimation of the gate wing.

Open limit switch

This setting is available when **Limit switch** sensor type is selected. It allows to configure which input is used as the open limit switch for the gate wing.

Close limit switch

This setting is available when **Limit switch** sensor type is selected. It allows to configure which input is used as the close limit switch for the gate wing.

Brake output

This setting allows to configure which output is used to control the brake for the gate wing motor. The brake is typically used to hold the gate in position when stopped.

Use latch

This setting enables or disables the use of a mechanical latch for the gate wing. When enabled, additional latch-related settings become available for configuration.

Latch locked input

This setting is available when **Use latch** is enabled. It allows to configure which input is used to detect when the latch is in the locked position.

Latch unlocked input

This setting is available when **Use latch** is enabled. It allows to configure which input is used to detect when the latch is in the unlocked position.

Latch output

This setting is available when **Use latch** is enabled. It allows to configure which output is used to control the latch mechanism for locking and unlocking.

9.3 Turnstile Settings

The Gate Control Unit supports configuration of up to two turnstiles (TS1 and TS2). Each turnstile can be configured independently with its own set of parameters.

9.3.1 Turnstile configuration

This section describes the configuration parameters available for each turnstile.

Layout

This setting allows to configure the physical layout of the turnstile. The following layouts are supported:

- **3-wing** - Three-wing turnstile configuration
- **4-wing** - Four-wing turnstile configuration
- **HHTI** - HHTI turnstile configuration

Encoder reversed

This setting allows to reverse the encoder direction for the turnstile position feedback. When enabled, the encoder values will increase in the opposite direction, which may be necessary depending on the mechanical installation.

Motor direction reversed

This setting allows to reverse the motor rotation direction for the turnstile. When enabled, the motor will rotate in the opposite direction, which may be required depending on the mechanical configuration.

Motor enabled

This setting enables or disables the turnstile motor. When disabled, the turnstile will operate in manual mode.

Motor timeout

This setting allows to configure the maximum time in seconds that the turnstile motor is allowed to run before timing out. This prevents continuous operation in case of malfunction.

Brake enabled

This setting enables or disables the turnstile brake system. When enabled, the brake will be used to hold the turnstile in position and provide controlled movement resistance.

Brake delay enabled

This setting enables or disables brake delay functionality. When enabled, there will be a controlled delay between brake engagement and disengagement to ensure smooth turnstile operation.

Brake delay time

This setting allows to configure the brake delay time in miliseconds. This determines how long the system waits before engaging the brake after turnstile movement stops.

In/Out reversed

This setting allows to reverse the entry and exit directions of the turnstile. When enabled, the turnstile will interpret entry commands as exit and vice versa.

Bolt 1 inverted

This setting allows to invert the logic of Bolt 1 control. Typical in 3 or 4 wing configuration - one of the bolts are inverted. For swing turnstiles, both bolts are usually inverted or non-inverted.

Bolt 2 inverted

This setting allows to invert the logic of Bolt 2 control. Typical in 3 or 4 wing configuration - one of the bolts are inverted. For swing turnstiles, both bolts are usually inverted or non-inverted.

Bolt in

Selects which bolt is used for locking the turnstile in the entering direction.

- **Bolt 1** - Bolt 1 is used for entry locking
- **Bolt 2** - Bolt 2 is used for entry locking

Queue enabled

This setting enables or disables queue management functionality. When enabled, the turnstile will queue entry and exit requests (see *Queue Management*).

Queue priority

This setting allows to configure whether entry or exit requests have priority when both are queued. Allowed values are:

- **In** - Entry requests have priority over exit requests
- **Out** - Exit requests have priority over entry requests

Start angle

This setting allows to configure the starting angular position of the turnstile. The angle is specified in encoder units and defines the reference position for turnstile operation.

Open time

This setting allows to configure the time duration in seconds that the turnstile remains in the open state before automatically returning to the closed position. The value can be specified with up to two decimal places.

Transition time

This setting allows to configure the time duration in seconds for the turnstile to complete a full rotation transition. This parameter affects the speed of turnstile movement during operation. The value can be specified with up to two decimal places.

Speed 1 in

This setting allows to configure the primary speed for inward turnstile movement (entering direction). The speed is specified as a percentage of the maximum turnstile rotation speed.

Speed 2 in

This setting allows to configure the secondary speed for inward turnstile movement. This speed is typically used for specific operational phases or conditions during entry. The speed is specified as a percentage of the maximum rotation speed.

Speed 1 out

This setting allows to configure the primary speed for outward turnstile movement (exiting direction). The speed is specified as a percentage of the maximum turnstile rotation speed.

Speed 2 out

This setting allows to configure the secondary speed for outward turnstile movement. This speed is typically used for specific operational phases or conditions during exit. The speed is specified as a percentage of the maximum rotation speed.

Speed 2 angle

This setting allows to configure the angular position at which the turnstile switches from Speed 1 to Speed 2 during operation. The angle is specified in encoder units and determines when the speed transition occurs.

Sensor time

This setting allows to configure the sensor activation time in seconds. This parameter defines how long sensors must remain active before triggering turnstile operation. The value can be specified with up to two decimal places.

Detect time

Time delay for presence detection sensors. This parameter is primarily used in **HHTI (Swing)** mode for faster closing functionality.

Free pass enter

This setting enables or disables free passage in the entering direction. When enabled, the turnstile will allow passage without requiring authorization or access control validation for entry.

Free pass exit

This setting enables or disables free passage in the exiting direction. When enabled, the turnstile will allow passage without requiring authorization or access control validation for exit.

FPS enter

This setting enables or disables FPS (Fire Protection System) mode for entry direction. When enabled, the turnstile remains unlocked and does not require authorization for each passage. This feature is primarily used during emergency evacuation scenarios.

FPS exit

This setting enables or disables FPS (Fire Protection System) mode for exit direction When enabled, the turnstile remains unlocked and does not require authorization for each passage. This feature is primarily used during emergency evacuation scenarios.

Zero position

This function allows to calibrate the zero reference position of the turnstile. During calibration, the turnstile position sensors are reset to establish a new reference point for accurate position tracking.

Bolt 1 PWM

This setting allows to configure the PWM (Pulse Width Modulation) value for Bolt 1 control. The PWM value determines the power level applied to the bolt actuator, affecting the locking and unlocking speed.

Bolt 2 PWM

This setting allows to configure the PWM (Pulse Width Modulation) value for Bolt 2 control. The PWM value determines the power level applied to the bolt actuator, affecting the locking and unlocking speed.

Brake PWM

This setting allows to configure the PWM (Pulse Width Modulation) value for brake control. The PWM value determines the power level applied to the brake actuator, affecting the engagement and disengagement speed of the brake system.

Motor current limit

This setting allows to configure the maximum current limit for the turnstile motor in amperes. This protects the motor from overcurrent conditions.

Motor current limit time

This setting allows to configure the time duration in miliseconds for which the motor current limit is enforced before triggering protective actions.

Light sensor enabled

This setting enables or disables the light sensor functionality. When enabled, the **Lamp** output will be controlled based on ambient light sensor value.

Light level

This setting allows to configure the light level threshold for the light sensor. When the ambient light level falls below this threshold, the **Lamp** output will be activated.

Fan enabled

This setting enables or disables automatic fan control based on internal temperature.

Fan disable temperature

This setting allows to configure the temperature in degrees Celsius at which the fan is turned off. Range: 2.00 - 5.00 °C.

Fan enable temperature

This setting allows to configure the temperature in degrees Celsius at which the fan is turned on. Range: 2.00 - 5.00 °C.

Feedback type

This setting allows to configure the type of feedback signal for outputs configured as Feedback In or Out:

- **Standard (Std.)**: Output activates after passage completion for duration specified by **Feedback time**
- **Door**: Output activates upon authorization command and remains active until turnstile locks

Feedback time

This setting allows to configure the duration of feedback signal output in seconds when **Feedback type** is set to **Standard**. Range: 0.00 - 600.00 s (typically 0.2 - 2.0 s).

Buzzer time

This setting allows to configure the duration in seconds before the buzzer sounds during sensor detection. Typically set shorter than sensor time to provide audible warning. Range: 0.00 - 600.00 s.

Tamper time

This setting allows to configure the duration in seconds to maintain tamper alarm output. Range: 0.00 - 600.00 s.

Adjustment time

This setting allows to configure the time in seconds allowed for fine position adjustments after the turnstile stops in non-locked position. Range: 0.00 - 60.00 s.

Bicycle Go

This setting enables or disables the Bicycle Go functionality, which is a special mode for TS2 that coordinates with TS1 to allow bicycle passage. When enabled, TS2 opens only after movement has been detected on TS1. When disabled, TS2 opens immediately upon receiving signal from inputs configured as **Turnstile 1+2 In** or **Turnstile 1+2 Out**.

Reverse lock

This function enables or disables the reverse lock feature. When enabled, the turnstile will continuously engage the reverse direction bolt to prevent any backward movement.

Signal time

This setting allows to configure the duration in seconds of the entry/exit signal indication in normal mode when input is configured as **Signal IN** or **Signal OUT**. Range: 5.00 - 50.00 s.

Free pass signal time

This setting allows to configure the duration in seconds of the entry/exit signal indication in free pass mode when input is configured as **Signal IN** or **Signal OUT**. Range: 50.00 - 250.00 s.

Pictogram red enabled

This setting enables or disables control of turnstile pictogram RED LEDs. When disabled, only green pictogram indication is enabled in normal operation. Red pictogram is always off.

Screening low

This setting allows to configure the minimum number of passages before triggering a random screening check. Range: 1 - 999.

Screening high

This setting allows to configure the maximum number of passages before triggering a random screening check. Range: 1 - 999. The system generates a random counter between **Screening low** and **Screening high** values to determine when to stop a person for security screening.

CHAPTER 10

Schedule Programming

The GCU allows to configure programmable schedules for gate and turnstile operations. This feature enables users to define specific gate or turnstile actions based on time, day of the week and holiday schedule.

Following actions are supported for gates:

- Keep open
- Keep closed

Following actions are supported for turnstiles:

- Free pass (enter direction)
- Free pass (exit direction)
- Free pass (both directions)
- Enable queue
- Turn the light on

10.1 Creating New Schedule

To create a new schedule, navigate to the **Schedule** menu and select **Add schedule**. Each schedule consists of several configuration parameters that define when and how the schedule should be activated.

10.1.1 Schedule Configuration Parameters

Schedule ID

Each schedule is automatically assigned a unique identifier in the format *S001*, *S002*, etc. The ID is generated automatically when creating a new schedule and cannot be modified manually.

Open Time

This setting defines the time when the scheduled action begins. The time is entered in HH:MM format (24-hour format). For example, 08:30 means the schedule will activate at 8:30 AM.

Close Time

This setting defines the time when the scheduled action ends. The time is entered in HH:MM format (24-hour format). For example, 17:00 means the schedule will deactivate at 5:00 PM.

> **Note**
>
> If the close time is earlier than the open time (e.g., open time 22:00 and close time 06:00), the schedule will span across midnight, activating from the open time until the close time of the next day.

Weekdays

This setting allows to select which days of the week the schedule should be active. Multiple days can be selected by checking the corresponding checkboxes:

- **Sunday**
- **Monday**
- **Tuesday**
- **Wednesday**
- **Thursday**
- **Friday**
- **Saturday**

The schedule will only be active on the selected weekdays during the specified time period.

Action

This setting defines what action the schedule should perform when active. The available actions depend on the type of equipment being controlled:

Gate Actions:

- **None** - No action is performed (schedule is inactive)
- **Keep open** - Forces the gate to remain in the open position
- **Keep closed** - Forces the gate to remain in the closed position

Turnstile Actions:

- **Turnstile free pass enter** - Allows free passage in the entering direction
- **Turnstile free pass exit** - Allows free passage in the exiting direction
- **Turnstile free pass both** - Allows free passage in both directions
- **Turnstile queue on** - Enables queue management functionality
- **Turnstile light on** - Activates turnstile indicator lights

Enable

This setting enables or disables the schedule. When disabled, the schedule configuration is preserved but the schedule will not be activated according to its time and day settings.

10.2 Managing Existing Schedules

10.2.1 Viewing Schedule List

To view all configured schedules, navigate to the **Schedule** menu and select **List**. This will display all existing schedules with their unique identifiers (S001, S002, etc.).

10.2.2 Editing a Schedule

To modify an existing schedule:

1. Navigate to **Schedule** → **List**
2. Select the schedule you want to edit (e.g., S001)
3. Modify the desired parameters
4. The changes are automatically saved when you exit the schedule configuration

> **Note**
>
> Changes to existing schedules take effect immediately. If a schedule is currently active, the modifications will be applied right away.

10.2.3 Removing a Schedule

To delete a schedule:

1. Navigate to **Schedule** → **List**
2. Select the schedule you want to delete
3. Use the **Remove** action to delete the schedule

10.3 Holiday Configuration

The GCU supports holiday scheduling that can override regular weekly schedules. Holidays are configured separately and can affect schedule behavior during specific time periods.

10.3.1 Configuring Holidays

To configure holidays:

1. Navigate to **Schedule** → **Holidays**
2. Select the month and year for which you want to configure holidays
3. Use the calendar interface to mark specific dates as holidays

Holiday calendar allows you to:

- Mark specific dates as holidays
- Configure holiday periods that span multiple days

- Override regular schedule behavior during holidays

> **Note**
>
> Holiday configurations are organized by month and year. Each month/year combination appears as a separate entry in the holidays list.

10.4 Schedule Priority and Conflicts

When multiple schedules are configured, the following priority rules apply:

1. **Holiday schedules** have the highest priority and will override regular schedules
2. **Individual schedule conflicts** are resolved by schedule ID (lower ID numbers have priority)
3. **Disabled schedules** are ignored regardless of their time and day settings

> **Important**
>
> If conflicting actions are scheduled for the same time period (e.g., one schedule says "keep open" and another says "keep closed"), the schedule with the lower ID number will take precedence.

10.5 Schedule Examples

10.5.1 Example 1: Weekday Business Hours

To keep a gate open during business hours on weekdays:

- **Open Time:** 08:00
- **Close Time:** 18:00
- **Weekdays:** Monday, Tuesday, Wednesday, Thursday, Friday
- **Action:** Keep open
- **Enable:** Yes

10.5.2 Example 2: Weekend Free Access

To allow free turnstile access on weekends:

- **Open Time:** 00:00
- **Close Time:** 23:59
- **Weekdays:** Saturday, Sunday
- **Action:** Turnstile free pass both
- **Enable:** Yes

10.5.3 Example 3: Night Security Mode

To keep gates closed during night hours:

- **Open Time:** 22:00
- **Close Time:** 06:00
- **Weekdays:** Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday
- **Action:** Keep closed
- **Enable:** Yes

10.6 Troubleshooting

10.6.1 Schedule Not Activating

If a schedule is not working as expected, check the following:

1. Verify the schedule is **enabled**
2. Check that the current time falls within the **Open Time** and **Close Time**
3. Confirm that today's weekday is selected in the **Weekdays** setting
4. Ensure there are no conflicting schedules with higher priority
5. Verify that the system date and time are set correctly

10.6.2 Schedule Conflicts

If you experience unexpected behavior due to schedule conflicts:

1. Review all active schedules in the schedule list
2. Check for overlapping time periods with conflicting actions
3. Consider disabling conflicting schedules or adjusting their time periods
4. Remember that schedules with lower ID numbers have priority

Tip

Use descriptive actions and carefully plan your schedule times to avoid conflicts. Consider creating a schedule planning document before configuring multiple schedules.

CHAPTER 11

Diagnostic features

11.1 Gate tests

The gate tests submenu provides a comprehensive testing interface for validating gate functionality and performance. This feature allows operators to run automated test sequences to verify proper gate operation.

11.1.1 Test Selection and Configuration

- **Current test** - Select from available predefined tests using a dropdown menu. Tests are dynamically loaded from the system configuration and can include various gate movement, sensor validation, and performance tests.
- **Stop on first error** - Configure whether the test sequence should halt immediately when the first error is encountered, or continue executing remaining test steps for comprehensive diagnostics.
- **Continue after reset** - Control test behavior in case of system reset during test execution. When enabled, tests will resume after system recovery.
- **Configured cycle count** - Set the number of test cycles to execute (up to 999,999 cycles). This allows for endurance testing and statistical analysis of gate performance over extended periods.

11.1.2 Test Monitoring and Control

- **Test state** - Real-time display of current test status showing *not running*, *running*, or *stopping* states to provide immediate feedback on test execution.
- **Executed cycle count** - Live counter showing the number of completed test cycles, allowing operators to monitor test progress.
- **Stop test** - Manual control to abort currently running tests at any time, providing immediate test termination when needed.

The test interface automatically refreshes every second to provide real-time updates on test progress and system status. This ensures operators have current information about ongoing test execution and can make informed decisions about test management.

11.2 Input and output tests

The input and output tests submenu provides a diagnostic interface for monitoring live signal values and manually controlling outputs. This is particularly useful for verifying the correct operation of connected sensors, actuators, and other peripheral devices during installation and commissioning.

11.2.1 Signal Monitoring

The following input signals can be monitored in real time:

- **SIN/SE/IN/AIN inputs** - Print actual state of inputs
- **Encoder** - Current position value reported by the encoder
- **Light/wind/oil sensor** - Current reading from the sensors (if connected)

11.2.2 Output Control

Each output can be manually activated or deactivated regardless of the current system state. This allows operators to verify the correct wiring and operation of connected devices such as:

- Relays, locks, and bolt actuators
- Indicators and signal lamps
- Buzzers and other actuators

> **Note**
>
> Manual output control is intended for diagnostic purposes only. Normal system operation resumes once the diagnostic mode is exited.

11.3 Input resistance measurement

The input resistance measurement submenu provides a diagnostic tool for measuring the resistance of connected input devices such as photocells, safety edges, and other sensors. This feature helps verify proper sensor operation and can assist in troubleshooting wiring issues.

In the input parameters menu, select the input for which you want to measure the resistance. The GCU will then perform a measurement and display the result in ohms and volts.

11.4 Nodes

The nodes submenu provides a management interface for the CAN devices connected to the GCU. It allows you to view the status of each node, change node functions, update node firmware and remove nodes from the network.

For each node, the following information is available:

- **Firmware version** - Software version currently running on the node
- **Uptime** - Time elapsed since the node was last powered on or restarted
- **Unique ID** - Hardware unique identifier of the node

The following actions can be performed on each node:

- **Identify** - Triggers the node's status LED to blink green and red alternately, making it easy to physically locate the device in the installation

- **Function Index** - Assign a function index number to the node, which determines its role in the system (e.g. TS1, TS2) and index in the input or output list.
- **Update firmware** - Initiate a firmware update for the selected node
- **Update status** - Display the current state of a firmware update in progress
- **Reboot** - Restart the node
- **Remove** - Remove the node from the network

11.5 CAN devices

The CAN devices submenu lists all devices currently connected and recognised by the GCU on the CAN bus. Selecting a specific device opens a detail view with the following information:

- **Name** - Device name as reported by the node
- **Unique ID** - Hardware unique identifier of the device
- **Vendor ID** - Identifier of the device manufacturer
- **Product ID** - Identifier of the specific product type

From the detail view it is also possible to check whether the device is currently alive and responding on the CAN bus.

11.6 Turnstile status

The turnstile status submenu provides real-time monitoring of the current state of each configured turnstile. This diagnostic tool allows operators to view detailed information about turnstile operation, including movement status, sensor states, and fault conditions.

For each turnstile, the following information is displayed:

- **Mode** - Current operational mode of the turnstile
- **State** - Current state in the turnstile operation sequence
- **Phase** - Current movement phase
- **Action** - Action currently being executed by the turnstile
- **Direction** - Active movement direction (entry or exit)
- **Fault message** - Any active fault or error condition
- **Current position** - Real-time position reading from the encoder
- **Current speed** - Instantaneous speed of turnstile movement
- **Enter queue** - Number of entry passages currently queued
- **Exit queue** - Number of exit passages currently queued

11.7 Gate status

The gate status submenu provides a detailed overview of the current state of each gate wing including its position, speed, current state, movement phase, latch state, motor driver status and fault message (if any).

The interface presents a dynamic list of all configured gate wings, with each wing displayed as a separate menu entry labeled as *Wx status*. When a specific wing is selected, a detailed status window opens showing comprehensive real-time information about that gate wing.

For each gate wing, the following detailed status information is displayed:

11.7.1 Operational Status

- **Mode** - Current operational mode of the gate wing
- **State** - Current state in the gate operation sequence
- **Latch state** - Status of the gate latch mechanism
- **Phase** - Current movement phase of the gate operation
- **Fault message** - Any active fault or error messages

11.7.2 Position and Movement

- **Current position** - Real-time position of the gate wing (in encoder units)
- **Current speed** - Instantaneous speed of gate movement (percentage)
- **Reported speed** - Speed value reported by the motor driver (percentage)

11.7.3 Motor Driver Information

- **Motor voltage** - Current voltage supplied to the motor (in volts)
- **Motor current** - Current draw of the motor (in amperes)
- **Driver online** - Connection status of the motor driver (yes/no)
- **Driver ready** - Ready state of the motor driver (yes/no)
- **Driver running** - Running state of the motor driver (yes/no)
- **Driver fault** - Fault condition status of the motor driver (yes/no)

11.7.4 Real-time Updates

The gate status information is automatically refreshed every 100 milliseconds to provide near real-time monitoring of gate operations. This high refresh rate ensures operators have immediate visibility into gate performance and can quickly identify any operational issues.

11.8 Virtual encoder status

The virtual encoder status submenu provides detailed monitoring and diagnostic information for all configured virtual encoders in the gate system. Virtual encoders are software-based position tracking systems that provide precise gate position information by combining data from multiple sources.

The interface presents a dynamic list of all configured virtual encoders, with each encoder displayed as a separate menu entry labeled as "[Encoder Name] status". When a specific virtual encoder is selected, a detailed status window opens showing comprehensive real-time information about that encoder's operation.

For each virtual encoder, the following detailed status information is displayed:

11.8.1 Configuration and Associations

- **Gate** - The gate wing associated with this virtual encoder, or "None" if not currently assigned to any gate
- **Gate driver** - The motor driver associated with this virtual encoder, or "None" if not currently linked to a driver
- **Enabled** - Whether the virtual encoder is currently enabled and active (Yes/No)

11.8.2 Position Information

- **Minimum position** - The configured minimum position limit (4-digit format)
- **Maximum position** - The configured maximum position limit (4-digit format)
- **Current position** - Real-time position reading from the virtual encoder (4-digit format)
- **Position is valid** - Indicates whether the current position reading is considered valid and reliable (Yes/No)

11.8.3 Operational Status

- **State** - Current operational state of the virtual encoder system
- **Conversion factor** - The scaling factor used to convert between different position units (displayed with 2 decimal places)

11.8.4 Real-time Updates

The virtual encoder status information is automatically refreshed every 100 milliseconds to provide near real-time monitoring of encoder operations. This high refresh rate ensures operators have immediate visibility into position tracking accuracy and can quickly identify any calibration or operational issues.

11.9 Remote test

The remote test submenu provides a diagnostic interface for validating the functionality of remote controls connected to the gate system. This tool allows operators to verify that remote control signals are being correctly received and processed by the GCU.

When a button on a remote control is pressed, the GCU receives the signal and displays diagnostic information about the remote in this submenu. This allows operators to confirm that the remote is recognized by the system and to inspect the details of the received signal.

11.10 Photocell test

The photocell test submenu provides a specialized testing interface for validating the functionality of photocell sensors connected to the gate system. This diagnostic tool helps operators verify that all photocell inputs are working correctly and can detect obstructions properly.

11.10.1 Test Interface

- **Start test** - Initiates the photocell validation sequence. When activated, the system performs automated testing of all configured photocell inputs to verify their operational status.
- **Test state** - Real-time status indicator showing the current state of the photocell test execution:
  - *Waiting for start* - Test is ready to begin but not yet initiated
  - *Running...* - Test is currently in progress

- *OK* - Test completed successfully with all photocells functioning properly
- *Error* - Test encountered issues during execution

11.10.2 Test Operation

When the photocell test is started, the system automatically scans all configured photocell inputs and evaluates their functionality. The test runs as a background process to avoid blocking the user interface during execution.

Upon completion, the system displays detailed results in a popup window showing the status of each individual photocell input. For each tested photocell, the results indicate either "OK" for properly functioning sensors or "Error" for sensors that failed validation.

The interface automatically refreshes every second to provide real-time updates on test progress, ensuring operators have immediate feedback on the testing status without manual intervention.

If an internal error occurs during test execution, the system displays an appropriate error message to inform the operator of the issue.

11.11 Statistics and counters

The statistics and counters submenu displays operational data collected during device operation. This information is useful for monitoring device health, diagnosing recurring issues, and assessing installation performance over time.

The following are examples of the statistics available:

- **Supply voltage** - Minimum, maximum and mean supply voltage recorded during operation
- **Board temperature** - Minimum, maximum and mean temperature of the GCU circuit board
- **Gate cycles** - Total number of gate open/close cycles performed
- **Turnstile entry count** - Total number of passages in the entry direction
- **Turnstile exit count** - Total number of passages in the exit direction
- etc.

11.12 Oil temperature sensor

This submenu displays the current oil temperature reading from the sensor connected to the **Gate IO module**. It also allows configuration of the oil temperature map, which defines motor overcurrent protection thresholds at different temperature levels. Since motor load varies with oil viscosity, different current limits can be assigned for different temperature ranges.

The oil temperature map can be configured for each value starting from -40°C up to 60°C. For each temperature value, a corresponding motor current limit factor in range from 0.1 to 5.0 can be set. When configured, the actual motor current limit is calculated by multiplying the base current limit by the factor corresponding to the current oil temperature.

11.13 TEST button

The **TEST** button is a dedicated hardware button on the GCU keypad. When pressed, it activates a full-screen diagnostic view that displays real-time operational data across four rotating screens. Pressing the **TEST** button again advances to the next screen. All values are updated continuously in real time.

11.13.1 Screen 1 — Inputs

Displays the current state of all inputs. Active inputs are highlighted in white, inactive inputs are shown in grey. Alongside each input, its current value is displayed. Additional sensor readings are shown numerically where applicable — for example encoder positions, temperature sensor values, and light sensor readings.

11.13.2 Screen 2 — Outputs

Lists all outputs along with their current states. Active outputs are highlighted in white, inactive outputs are shown in grey, allowing quick verification of which outputs are currently energised.

11.13.3 Screen 3 — Gate / Turnstile parameters

Displays the current operational parameters of the configured gate wings or turnstiles, depending on the GCU configuration. This provides a quick overview of the device state during diagnostics or commissioning.

11.13.4 Screen 4 — GCU status

Displays GCU-level diagnostic data including supply voltage and board temperature. Also shows the state of the keypad buttons which allows the operator to verify that all keyboard buttons are functioning correctly.

CHAPTER 12

Firmware update

12.1 Checking the current firmware version

To check the current firmware version of the GCU, navigate to the **Service and tests** menu and select the **System info** option. This will display the current firmware version running on the GCU in the **Firmware version** field.

12.2 Updating the firmware

Firmware can be updated using the USB-C port. To do so, connect the GCU to a computer using a USB-C cable and then enable the USB mass storage mode by using the **USB mass storage** option in the **System settings** menu.

Once the GCU is connected in mass storage mode, it will appear as a removable drive on the computer. You can then copy the new firmware file to the */boot* directory of the drive. The firmware file should be named *boot0.elf*.

After copying the firmware file, safely eject the drive from the computer and then press **OK** in the GCU interface to reboot.

12.3 Updating CAN device firmware (IO boards)

The GCU supports over-the-air firmware updates for all CAN-connected IO boards, including the **GATE IO** module, **BLDC motor driver** boards, and **Turnstile** controller boards. Updates are performed directly from the GCU menu.

12.3.1 Preparing the firmware file

Before starting the update:

1. Obtain the correct firmware file (`.bin`) for the board you want to update.
2. Connect the GCU to a computer via USB-C and enable **USB mass storage** mode (see *above*).
3. Copy the firmware file to the `/firmware` directory on the GCU drive.

4. Safely eject the drive and return to the GCU menu.

> **Note**
>
> Make sure to use the firmware file intended for the specific board type. Flashing an incorrect firmware file may render the board inoperable.

12.3.2 Performing the update

1. Navigate to **Service and tests** → **Nodes**.
2. The list shows all CAN devices currently connected and recognised by the GCU. Each entry displays the board type, serial number, and current firmware version.
3. Select the board you want to update.
4. Choose the **Update firmware** option. A **Select update file** window will appear, listing all `.bin` files available in the `/firmware` directory.
5. Carefully select the correct firmware file for the board being updated. Selecting a file intended for a different board type may render it inoperable.
6. After selecting the file, the GCU will display a confirmation prompt: **"Press OK to confirm load update"**. Press **OK** to start the transfer.
7. The transfer progress is shown in the **Upgrade status** field in the node's main menu. The field displays the percentage of completion and changes to **DONE** when the update finishes successfully. If an error occurs, the field will show **ERROR**.
8. Once the transfer is complete, the board will automatically reboot and apply the new firmware.
9. After the reboot, verify the update was successful by checking the firmware version displayed next to the board in the **Nodes** list.

> **Warning**
>
> Do not power off the GCU or the board being updated during the firmware transfer. Interrupting the update may corrupt the board firmware.

CHAPTER 13

Error Code Reference

This document provides a comprehensive reference for all error codes that may be encountered in the system.

13.1 Error codes

13.1.1 System Errors (0x0001-0x00FF)

Code	Severity	Description
0x0001	Fatal	**UNKNOWN** Unknown error has occurred.
0x0002	Fatal	**SYSTEM** Unknown system error has occurred. Please reach out to your distributor.
0x0003	Warning	**SYSTEM_RESET** System has experienced an unexpected reset.
0x0004	Fatal	**GCU_UNDERVOLTAGE** One of the voltage rails on the GCU board has encountered a voltage drop below the acceptable level.
0x0005	Fatal	**GCU_OVERVOLTAGE** One of the voltage rails on the GCU board has encountered a voltage rise above the acceptable level.
0x0006	Warning	**CAN_COMMUNICATION_ERROR** Communication with the CAN bus has failed. Please check the connections, ensure all devices on the bus are powered on, and verify the bus termination.
0x0007	Warning	**RS485_COMMUNICATION_ERROR** Communication with the RS485 interface to the inverter has failed. Please check the connection and ensure the inverter is powered on.
0x0008	Warning	**SIMULATED_ERROR** This is not a real error, it's an error simulated by the user using console interface.

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Code	Severity	Description
0x0009	Warning	**CABINET_OPEN** The cabinet door is open. Please close the cabinet door to continue.
0x000a	Warning	**POWER_FAIL** A power failure has been detected. Please check the power supply and ensure it is stable.
0x000b	Warning	**SERVICE_NEEDED** The system requires maintenance. Please schedule a service visit.

13.1.2 Gate Errors (0x0100-0x01FF)

Code	Severity	Description
0x0100	Warning	**GATE_UNKNOWN** An uknown gate error has occurred.
0x0101	Warning	**GATE_DISABLED** Gate wing has been disabled by the user.
0x0102	Warning	**GATE_STALL_RISK** Gate wing is at risk of stalling. Please check the gate mechanism and ensure it is not obstructed.
0x0103	Fatal	**GATE_STALL** Gate wing has stalled. Please check the gate mechanism and ensure it is not obstructed.
0x0104	Fatal	**GATE_WRONG_DIRECTION** Motor is running in the wrong direction. Please check the motor and encoder directions.
0x0105	Fatal	**GATE_ENCODER_ERROR** Encoder signal has been lost. Please check the encoder connections.
0x0106	Fatal	**GATE_DRIVER_ERROR** Gate driver error has occurred.
0x0107	Fatal	**GATE_ELOCK_ERROR** E-Lock didn't release on time. Please check the E-Lock connections and ensure the E-Lock is functioning properly.
0x0108	Fatal	**GATE_LATCH_ERROR** Latch feedback signal is missing. Please check the latch connections and ensure the latch is functioning properly.
0x0109	Fatal	**GATE_MOTOR_TIMEOUT** Motor operation has timed out. Please check the motor and gate mechanism for obstructions or issues.
0x010a	Fatal	**GATE_CONFIG_ERROR** Failed to load gate configuration. Please check the configuration file and ensure it is valid.
0x010b	Fatal	**GATE_PHOTOCELL_ALARM** Photocell alarm has been triggered. Please check the photocell connections and ensure the photocell is functioning properly.
0x010c	Fatal	**GATE_DRIVE_DECOUPLED** Decoupling input has been activated. Operating the gate is not possible.
0x010d	Fatal	**GATE_DRIVER_OVERLOAD** Gate driver has experienced an overcurrent condition.

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Code	Severity	Description
0x010e	Fatal	**GATE_DRIVER_OVERVOLTAGE** Gate driver has experienced an overvoltage condition. Please check the gate configuration and ensure all voltage levels are within the acceptable range.
0x010f	Warning	**GATE_EMERGENCY_STOP** Gate has been stopped due to a emergency stop. Please check the gate configuration and ensure all safety conditions are met.
0x0110	Warning	**GATE_SAFE_MODE** Gate is in safe mode. Please check the gate configuration and ensure all safety conditions are met.
0x0111	Fatal	**GATE_UNAVAILABLE** Gate is unavailable. Please check the gate configuration and ensure all safety conditions are met.
0x0112	Fatal	**GATE_ENCODER_CONFIGURATION** Encoder positions are not configured correctly. Closing position should be larger than the opening position.
0x0113	Fatal	**GATE_SE_OPEN_INVALID** Safety edge open input is invalid. Please check the safety edge connections and ensure the safety edge is functioning properly.
0x0114	Fatal	**GATE_SE_CLOSE_INVALID** Safety edge close input is invalid. Please check the safety edge connections and ensure the safety edge is functioning properly.

13.1.3 Node Errors (0x0200-0x02FF)

Code	Severity	Description
0x0200	Fatal	**NODE_OFFLINE** One of the nodes is offline. Please check the connections and ensure all nodes are powered on.
0x0201	Fatal	**NODE_COMMUNICATION_ERROR** Communication with the node has failed. Please check the connections and ensure the node is powered on.

13.1.4 VENC Errors (0x0300-0x03FF)

Code	Severity	Description
0x0300	Warning	**VENC_UNDERSHOOT** VENC has encountered an undershoot error. It could happen when the limit switch magnets are moved after VENC has learned the limit switch positions.
0x0301	Warning	**VENC_OVERSHOOT** VENC has encountered an overshoot error. It could happen when the limit switch magnets are moved after VENC has learned the limit switch positions.
0x0302	Fatal	**VENC_LIMIT_SWITCH_INVALID** VENC has encountered an invalid limit switch error. Please verify limit switch connections to the GateIO board.

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Code	Severity	Description
0x0303	Warning	**VENC_LIMIT_SWITCH_ROGUE_CHANGE** VENC has detected a change in the limit switch state while the motor was idle. This could indicate a malfunction or an unexpected change in the limit switch state.

13.1.5 Input Errors (0x0400-0x04FF)

Code	Severity	Description
0x0400	Fatal	**INPUT_INVALID_IO** An invalid input has been detected. Please check the input connection and the configured resistor values.
0x0401	Fatal	**INPUT_INVALID_ENCODER** An invalid encoder input has been detected. Please check the encoder connections and ensure the encoder is functioning properly.

13.1.6 Output Errors (0x0500-0x05FF)

Code	Severity	Description
0x0500	Fatal	**OUTPUT_INVALID_IO** An invalid output has been detected. Please check the output connection.

13.1.7 Test Errors (0x0600-0x06FF)

Code	Severity	Description
0x0600	Warning	**TEST_INTERRUPTED** An ongoing test has been interrupted by an error. Please check the other reported errors and resolve them before retrying the test.

13.1.8 Turnstile Errors (0x0700-0x07FF)

Code	Severity	Description
0x0700	Fatal	**TURNSTILE_MOTOR_FAULT** Turnstile motor driver has reported a fault. Please check the motor and driver connections.
0x0701	Fatal	**TURNSTILE_MOTOR_TIMEOUT** Turnstile motor has timed out.
0x0702	Fatal	**TURNSTILE_MOTOR_OVERLOAD** Turnstile motor has experienced an overload condition. Please check the turnstile mechanism for obstructions or issues.
0x0703	Fatal	**TURNSTILE_LAMP_OVERCURRENT** Turnstile lamp output has experienced an overcurrent condition. Please check the lamp connections and ensure the lamp is functioning properly.

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Code	Severity	Description
0x0704	Fatal	**TURNSTILE_CAN_PICT_1_OVERCURRENT** Turnstile CAN PICT 1 power connector has experienced an overcurrent condition. Please check the connections and ensure the device is functioning properly.
0x0705	Fatal	**TURNSTILE_CAN_PICT_2_OVERCURRENT** Turnstile CAN PICT 2 power connector has experienced an overcurrent condition. Please check the connections and ensure the device is functioning properly.

Revision history

Table 1: Revision history

Version	Date	Description
1.0	2025-07-05	Initial issue of the document.

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