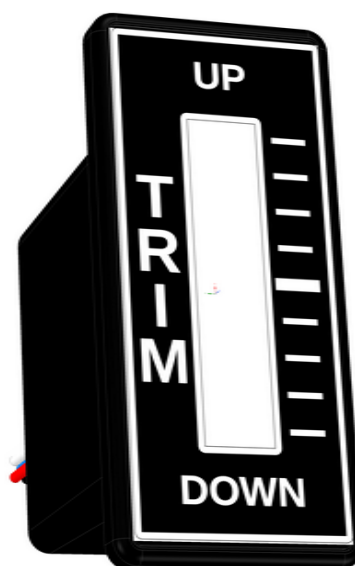
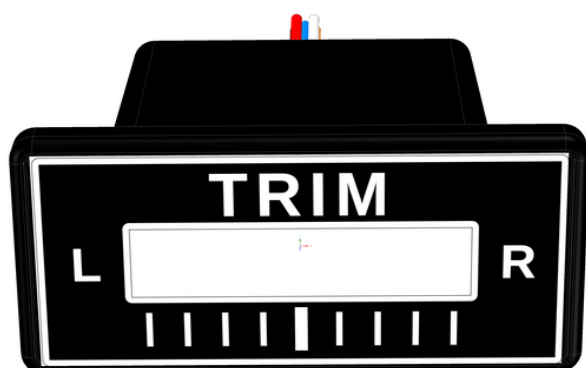


# Position Indicator PI1x

(Position Indicator for trim sensor, flaps, etc.)



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# 1 Important notes and warnings

Thank you for purchasing position Indicator PI1. For a comfortable and safe use of this product, please pay attention to THE ENTIRE MANUAL, especially the notes and warnings below.

- Although the Position Indicator PI1 has been thoroughly tested to ensure maximum safety in all conceivable situations, THE RIGHT FUNCTIONALITY DEPENDS ON THE RIGHT INSTALLATION AND SETTINGS.
- Therefore, it is **NECESSARY to READ CAREFULLY and UNDERSTAND THIS MANUAL COMPLETELY.**
- Keep this manual printed in an airplane for cases of emergency or change of ownership.
- THIS PRODUCT IS NOT APPROVED FOR INSTALLING IN CERTIFIED AIRPLANES.
- The pilot MUST UNDERSTAND the control of this product before the first flight. DO NOT use the product unless you are sure how it works!
- Do not allow unauthorized persons to handle the installed product.
- After installing the product, before the first flight, turn on ALL possible sources of electromagnetic interference on board the aircraft and ensure that the instrument is functioning properly.
- Use of the device in conflict with this manual, with bad wiring, outside the allowed operating conditions, etc., may cause the device to malfunction or damage and endanger flight safety.
- If the product repeatedly indicates an error, do not use it and turn off the power !
- AVOID contact with liquids and chemicals
- Before installation, check the mechanical integrity of the device and its accessories
- DO NOT disassemble the device!
- After installation, carefully check the functionality of the device and its installation
- The responsibility for the installation is entirely with the installer.
- Responsibility for performed control actions based on information indicated by the product is fully with the operator (pilot). The operator must be able to evaluate an incorrect indication even if the product does not indicate an error.
- If you do not agree to the notes and warnings above, do not use this product.

Company LAMBERT AERODEVICES s.r.o. reserves the right to change, improve the product or manual without prior or subsequent notice.

## 2 Product description

### 2.1 Product use

Product Position Indicator PI1 is intended for indicating the position of the trim servo, flaps and other equipment of UL aircraft, which transmits it's position using a 3-wire potentiometer.

**THIS PRODUCT IS NOT APPROVED FOR INSTALLING IN CERTIFIED AIRPLANES.**

### 2.2 Main product functionalities

Basic list of main product functionalities:

- indication of the servo position by means of an LED diode scale
- error status indication
- dimming of the indication (LED) elements of the device
- initialization sequence for checking the functionality of all indication (LED) elements

### 2.3 Inputs

The Position Indicator PI1 has the following inputs:

- power supply inputs (dashboard electricity from the airplane)
- 3-wire input for position sensor connection
- dimmer signal input

### 2.4 Indication

The Position Indicator PI1 has the following indication elements:

- indication scale consisting of 9 green LEDs with high brightness for good visibility even in direct sunlight

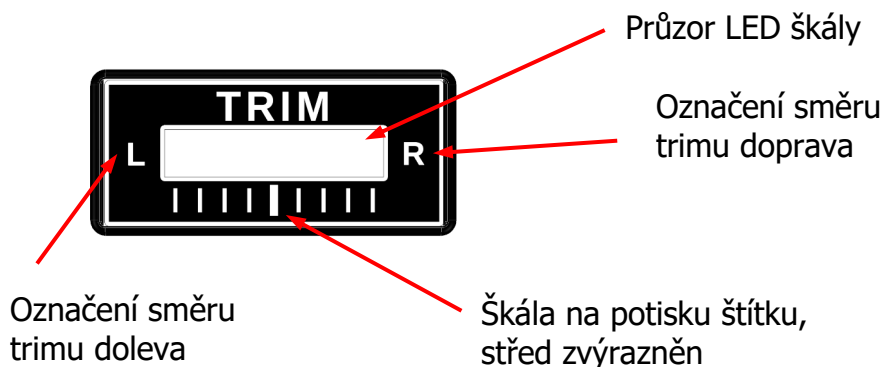
## 2.5 Protections

The Position Indicator PI1 has the following protections:

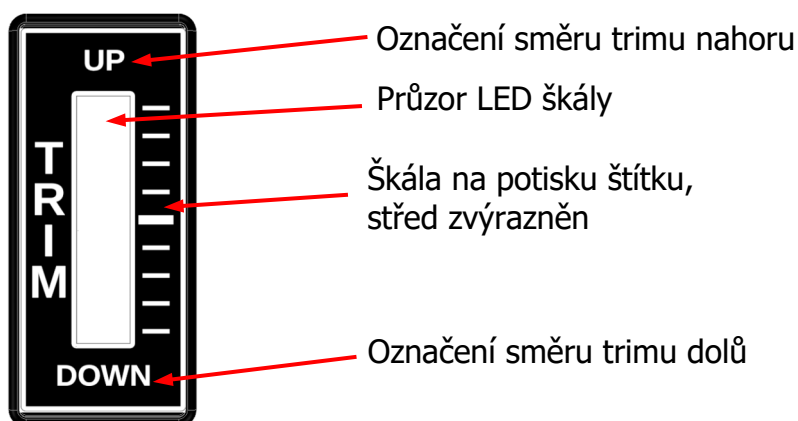
- reverse polarity protection
- protection against overvoltage spikes of both polarities
- protection against interference and short circuit at the potentiometer input (short circuit between the potentiometer signals and GND ground)
- Undervoltage protection

## 2.6 Device's panel description

### 2.6.1 Horizontal TRIM panel



### 2.6.2 Vertical TRIM panel



### **2.6.3 Usage for other plane's equipment**

Usage is not limited to trim. Contact the manufacturer or distributor to verify the availability of other label variants - with different descriptions for a different type of indicated equipment.

## 3 Specifications

### 3.1 Electrical characteristics

Parameter	Value	Unit	Notes
Power supply voltage $V_{in}$	10 ÷ 30	V	
Power consumption (typ)	2.8	mA	@12V power supply, 25°C, idle state (indication running) without any errors, LED brightness 100%
the dimming voltage range	4.5 ÷ 30	V	50÷150Hz
Position sensor resistance	5 or 10 nominal	kΩ	resistive ratiometric sensor type (passive potentiometer)

### 3.2 Mechanical specifications

Parameter	Value	Unit	Notes
product weight (approximately)	20	g	Bez montážního materiálu (šroubky, matice atd.)
product dimensions (max)	44x20x35	mm	The longest dimensions w x h x d

### 3.3 Allowed operating conditions

parametr	hodnota	jednotka	poznámka
Operating temperature	-30 ÷ +75	°C	
Operating humidity	10 ÷ 90	%RH	non-condensing
Operating atmospheric pressure	800 ÷ 1100	hPa	
IP protection	IP40	-	

### 3.4 Lifetime and warranty

The product is designed with regard to its intended use, for a long service life, higher than the intended service life (see below).

**However manufacturer LAMBERT AERODEVICES s.r.o. HIGHLY RECOMMENDS to replace the product with a new one when it reaches its planned service life (any of the parameters below), or at the latest 10 years after purchase.**

parametr	životnost	poznámka
Device flight hours	20000 h	



*Note: The above parameters are valid when the prescribed operating parameters (supply voltage, operating temperature, etc.) are observed. These parameters are recorded in the device and evaluated in the event of the warranty complaint.*

The manufacturer grants a **24-month warranty** from the date of purchase. Exceeding any of the above durability parameters will void the warranty if this occurs before the warranty period has elapsed since the product was purchased.

**The warranty also void in case of using the product in violation of this manual!**

### 3.5 Tests according to DO-160G

**THIS PRODUCT IS NOT APPROVED FOR INSTALLING IN CERTIFIED AIRPLANES.**

The following tests according to DO-160G were performed on the device in an accredited testing laboratory, and met the criteria:

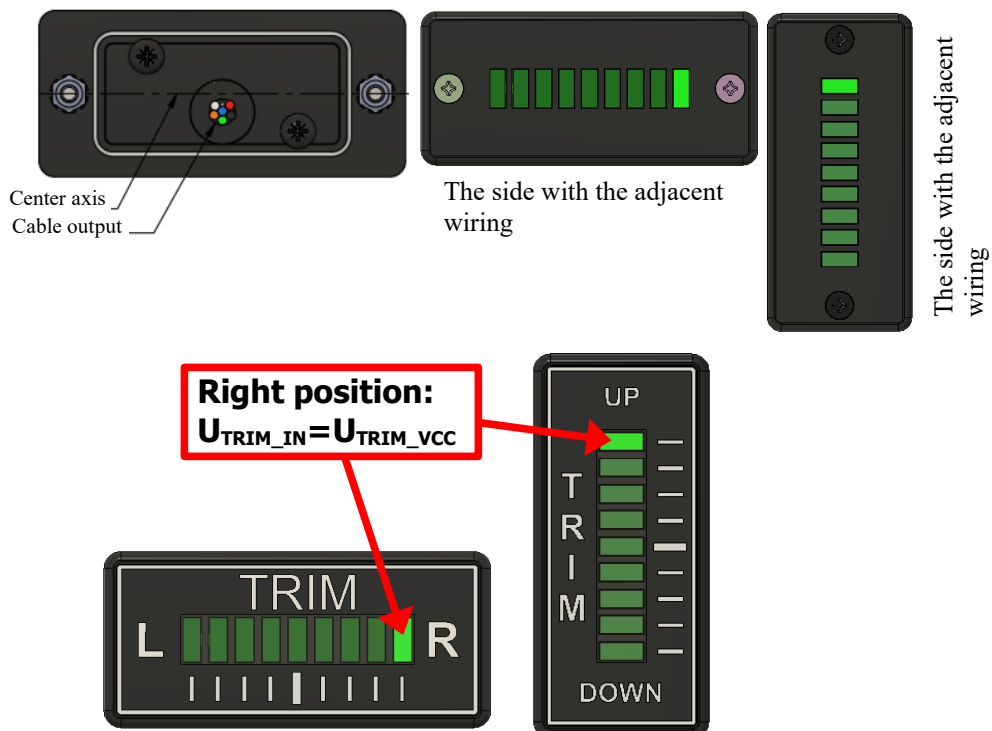
Name of the test	Chapter	Criterion	Notes
RF Susceptibility	20	TT	
RF emission	21	H	

## 4 Installation in an airplane

Please pay special attention to the installation and wiring of the Position Indicator PI1 when installing in an aircraft. This is important for the proper operation of the equipment and the safety of the aircraft.

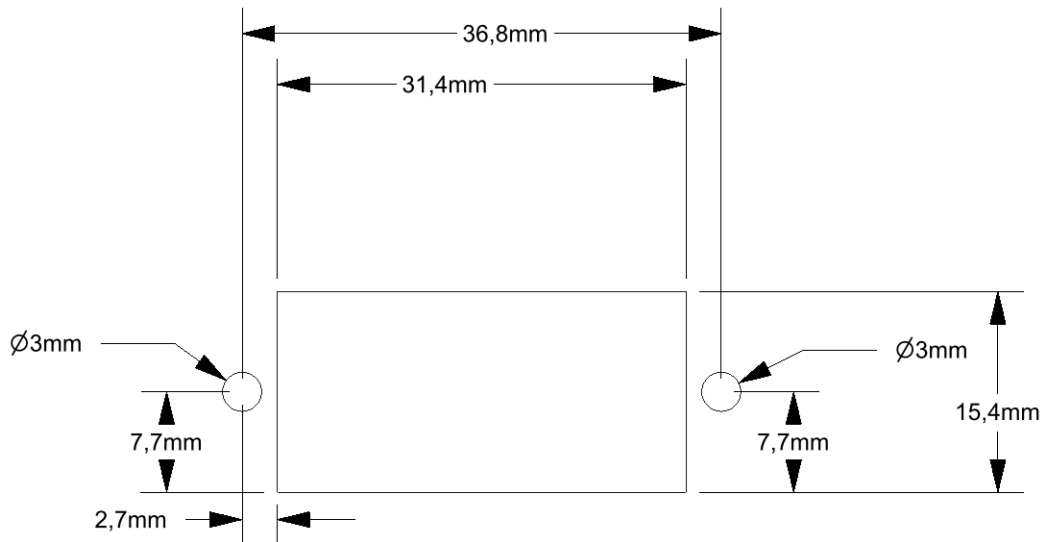
### 4.1 Correct rotation of the adhesive label

Since there is no product orientation mark on the front of the product, it is recommended to follow the asymmetrical placement of the cabling output. The recommended orientation of the product is to turn with the cables output side downwards (for horizontal installation) or to the right (for vertical installation). This rule ensures that the correct R position and UP position are reached when the voltage on the TRIM\_IN sense wire approaches TRIM\_VCC. It is good to follow this rule especially in the case of serial production. Due to the variety of types of indicated equipment and their mechanical installation, this rule may be violated. Therefore, before sticking the label, check that the product indication in the given installation really works in the intended direction. Otherwise, it is necessary to swap the wires TRIM\_VCC with TRIM\_GND, or turn the product by 180°. After verifying the correct signalization and proper fixing, the front label of the product can be glued.

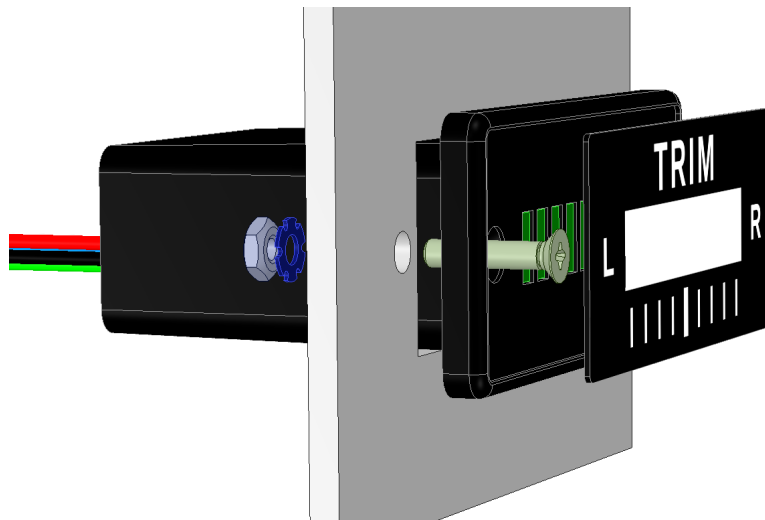


## 4.2 Mechanical installation

The sketch below shows the dimensions of the holes needed to mount the Position Indicator PI1 to the aircraft's dashboard.



### ***Dashboard mounting detail:***



### 4.3 Sticking the label

The product comes with a set of labels for horizontal and vertical trim. Alternatively with other or additional labels.

**ATTENTION! Always stick the label AFTER THE FINAL INSTALLATION!**

**ATTENTION! The label is intended for SINGLE ADHESION only! (with repeated attempts it may no longer hold well)**

**ATTENTION! If the surface for affixing the label is greasy, it must first be degreased with a plastic-degreaser (suitable for ABS).**

## 4.4 Electrical connections

At the back of the device there is a cable gland, through which 6 wires of different colors are led out. A description of the wires and their connections is given below in this chapter and in the following subsections.

### **Wire table:**

Wire Color	Signal name	Description	Notes
black	<b>GND</b>	Power supply (negative)	
red	<b>V+</b>	Power supply (positive)	use suitable fuse !
orange	<b>TRIM_VCC</b>	Position sensor supply (+)	
green	<b>TRIM_IN</b>	Position sensor feedback signal	
blue	<b>TRIM_GND</b>	Position sensor supply (-)	
white	<b>DIM</b>	Dimming input	

**ATTENTION! Use a suitably sized fuse in the positive power supply.**

**ATTENTION! Never combine GND and TRIM\_GND !!!**

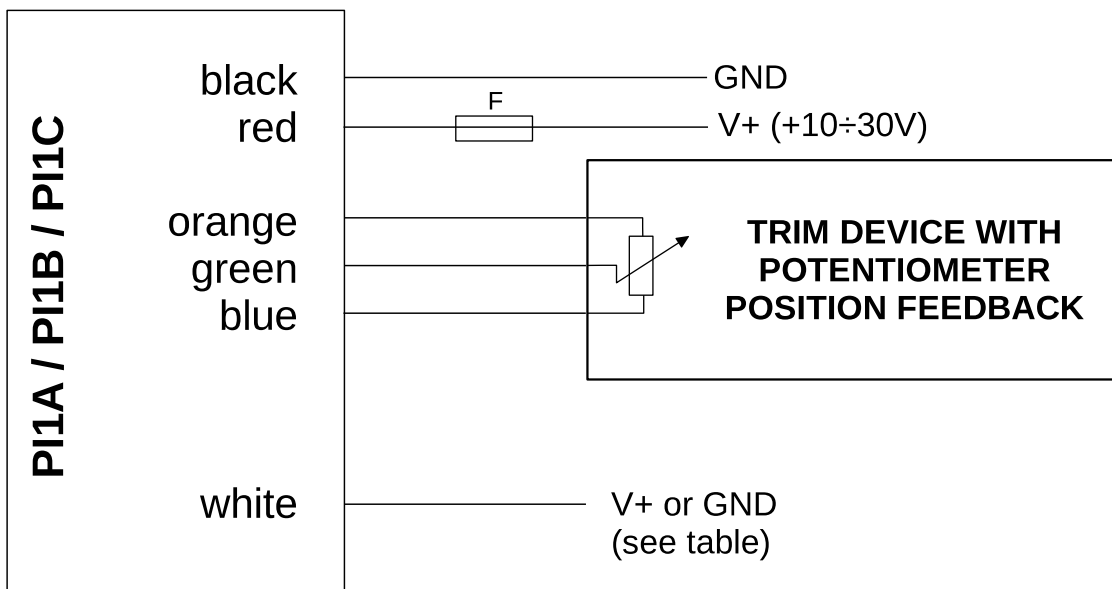


*photo of unassembled product, without affixed label*

### 4.4.1 Electrical connection without the use of dimming

If you do not use the dimming function, it is NECESSARY to permanently connect the DIM wire to V + or GND - depending on the type (PI1A, PI1B, PI1C) according to the following table:

product variant	To gain full brightness, connect DIM wire to :	Note
<b>PI1A</b>	V+	
<b>PI1B</b>	V+	
<b>PI1C</b>	GND	

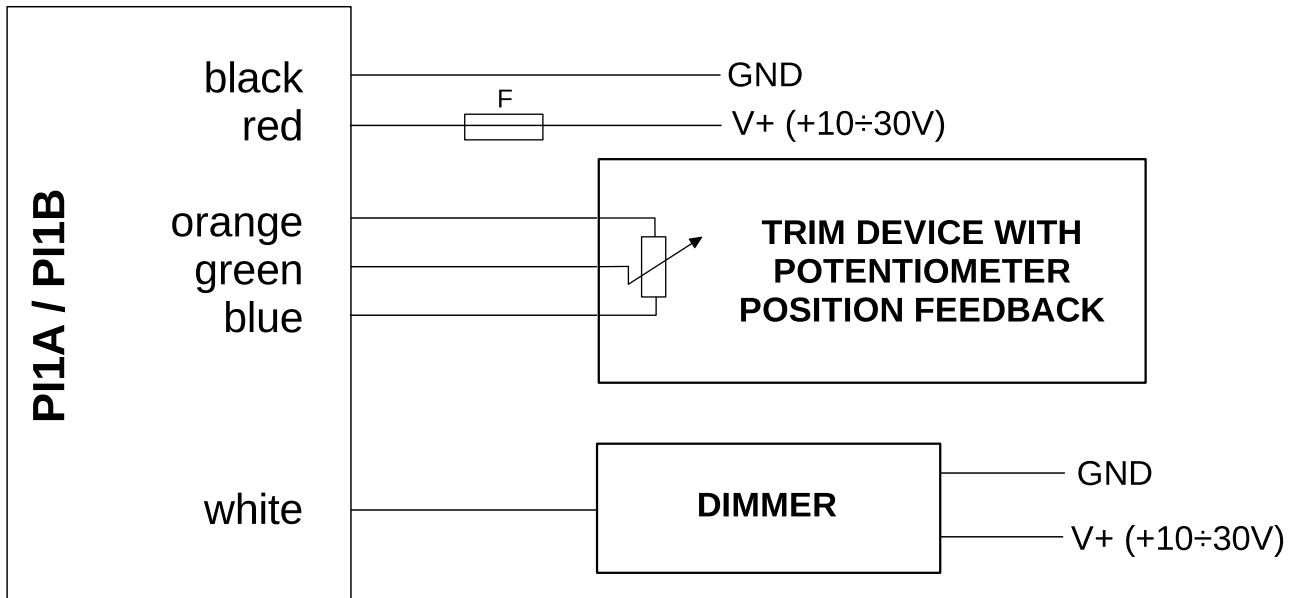


**ATTENTION! Never combine GND and TRIM\_GND !!!**

**NOTE!** After completing the connection, always check the functionality before closing the dashboard.

#### 4.4.2 Electrical connection with electronic dimmer

This chapter describes the wiring for variants PI1A and PI1B. Variants A, B, C differ only in the dimming function of the indication elements. See more information in the chapter [5.3 Dimming of indication elements](#).

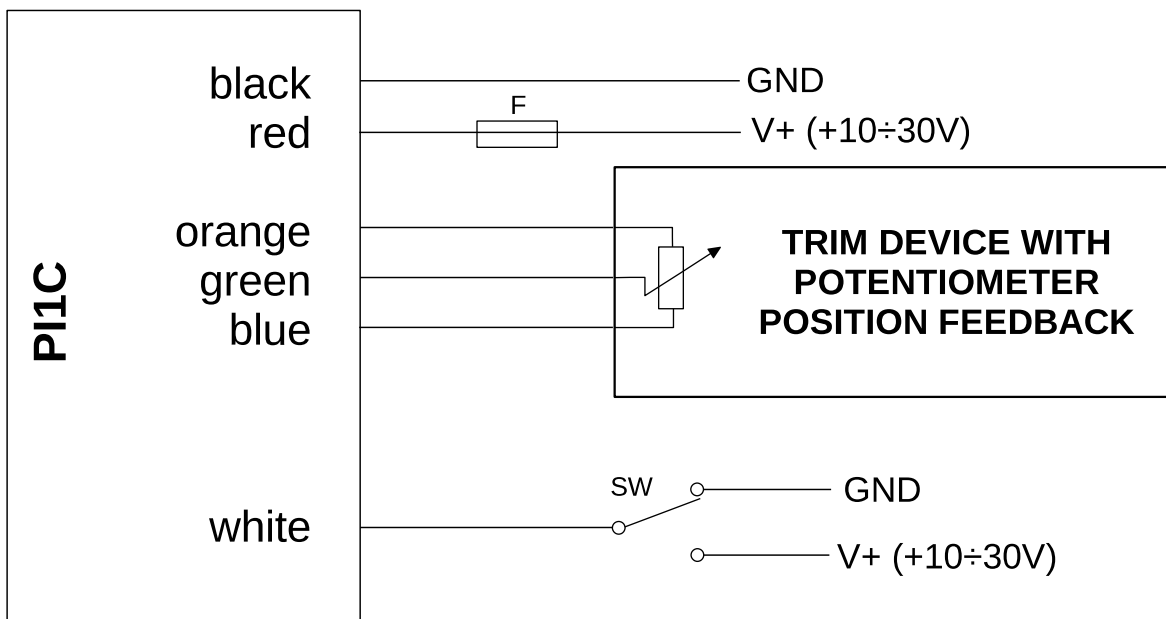


**ATTENTION! Never combine GND and TRIM\_GND !!!**

**NOTE!** After completing the connection, always check the functionality before closing the dashboard.

### 4.4.3 Electrical connection with a simple switch to reduce brightness

This chapter describes the wiring for variant PI1C. Variants A, B, C differ only in the dimming function of the indication elements. See more information in the chapter [5.3 Dimming of indication elements](#).



**ATTENTION! Never combine GND and TRIM\_GND !!!**

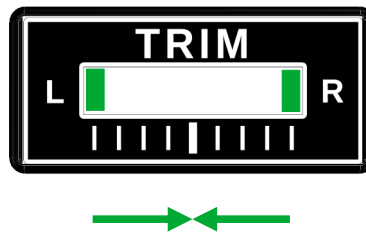
**NOTE!** After completing the connection, always check the functionality before closing the dashboard.



## 5 Description of functions

### 5.1 Initialization sequence

After switching on the device, an initialization sequence always takes place first to check the functionality of all display elements. Gradually, the LED diodes light up symmetrically in pairs, starting with the extreme side ones, up to the center (odd) itself, the lighting of which ends the initialization sequence.



At the end of the initialization sequence, the device switches to normal mode and the LED corresponding to the indicated position lights up.

### 5.2 Normal position indication mode



Position – i.e. the ratio of the output from the sensor (potentiometer) is indicated by the corresponding LED from the scale (1 of 9).

### 5.3 Dimming of indication elements

The product Position Indicator PI1 is supplied in three variants (PI1A, PI1B, PI1C) differing in the SW settings and dimming behavior of the indication elements.

The following table describes the dimming behavior for each product variant:

product variant	dimming function description	dimming function parameters
<b>PI1A</b>	continuous dimming, maximum dim brightness when dim is switched off (100%)	cont. 5-100% at off: 100%
<b>PI1B</b>	continuous dimming, minimum dim brightness when dim is switched off (5%)	cont. 5-100% at off: 5%
<b>PI1C</b>	2-state dimming - maximum brightness or dimmed	DIM=0V : 100% DIM=12V : 30%

## 6 Errors and faults, troubleshooting

### 6.1 Indicated errors and faults

The Position Indicator PI1 indicates only one general (associative) error. This error indication can be caused by a sensor fault, voltage or operating temperature out of range, etc.

The error indication is realized by alternating flashing of the extreme side LEDs in the indication scale - they alternate quickly after approx. 250ms.

### 6.2 Troubleshooting

The following table lists some of the possible faults that may often occur due to poor installation, etc .:

Fault description	Possible causes	Solutions
<b>The extreme side LEDs flash quickly</b>	<ul style="list-style-type: none"> <li>incorrectly connected sensor</li> <li>sensor wiring short circuit</li> <li>low power supply voltage</li> </ul>	<ul style="list-style-type: none"> <li>check sensor connections</li> <li>eliminate shortcircuits</li> <li>check supply voltage being in proper range</li> </ul>
<b>The product does not respond, does not indicate / light up anything</b>	<ul style="list-style-type: none"> <li>incorrect wiring</li> <li>blown external fuse</li> </ul>	<ul style="list-style-type: none"> <li>check the connection according to this manual</li> <li>check fuse</li> </ul>

**NOTE** This chapter is gradually supplemented based on product experience and customer inquiries.

**Document change table:**

Rev.	Date	Author	Description
0	20.1.2021	ATAMAN	Initial version
1	19.08.2022	NEPOR	LA, Graphical correction
2	17.02.2023	NEPOR	Correct rotation of the adhesive label



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