

TOF/Spot

Installation and Operation Manual



CEDES AG is certified according to ISO 9001:2015

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1. About this manual

This 'TOF/Spot Installation and Operation Manual', with metric and US measurements is the original version.

The version number is printed at the bottom of each page.

To make sure you have the latest version, visit www.cedes.com from where this manual and related documents can be downloaded.

1.1 Measurements

Measurements are, if not stated otherwise, given in mm (non-bracketed numbers) and inches (numbers in brackets).

1.2 Related documents

TOF/Spot datasheet en Part No. 001 206 en

Installation guide en de fr es zh, types P, C Part No. 113 495

Installation guide en de fr es zh, type T Part No. 113 502

Installation guide en, type I Part No. 115 343

Installation guide en de fr es zh, type N Part No. 116 401

1.3 CEDES headquarters

CEDESAG

Science Park CH-7302 Landquart Switzerland

2. Safety information

IMPORTANT!
READ BEFORE INSTALLATION!

The TOF/Spot was developed and manufactured using state-of-the-art systems and technologies. However, injury and damage to the sensor can still occur.

To ensure safe conditions:

- Read all enclosed instructions and information.
- Follow the instructions given in this manual carefully.
- Observe all warnings included in the documentation and attached to the sensor.
- Do not use the sensor if it is damaged in any way.
- Keep the instruction manual on site.

The TOF/Spot should only be installed by authorized and fully trained personnel! The installer or system integrator is fully responsible for the safe integration of the sensor. It is the sole responsibility of the planner and/or installer and/or buyer to ensure that this product is used according to all applicable standards, laws and regulations in order to ensure safe operation of the whole application.

Any alterations to the device by the buyer, installer or user may result in unsafe operating conditions. CEDES is not responsible for any liability or warranty claim that results from such manipulation.

Failure to follow instructions given in this manual and/or other documents related to the TOF/Spot may cause customer complaints, serious call backs, damage, injury or death.

2.1 Non-intended use

The TOF/Spot must not be used for:

- Protection of dangerous machine
- Equipment in explosive atmospheres
- Equipment in radioactive environments



Use only specific and approved safety devices for such applications, otherwise serious injury or death or damage to property may occur!

3. Symbols, safety messages

Symbol	Meaning
□	Single instruction or measures in no particular order
1. 2. 3.	Sequenced instructions
•	List, in no order of importance
→	Reference to a chapter, illustration or table within this document
Important	Important information for the correct use of the sensor

3.1 Safety messages categories

Warning of serious health risks

**WARNING**
Serious health risks

Highlights critical information for the safe use of the sensor. Disregarding these warnings can result in serious injury or death.

- Follow the measures highlighted by the triangle-shaped arrows
- Consult the safety information in Chapter 2 of this manual

Caution of possible health risk

**CAUTION**
Possible health risks

Highlights critical information for the safe use of the sensor. Disregarding these warnings can result in injury.

- Follow the measures highlighted by the triangle-shaped arrows
- Consult the safety information in Chapter 2 of this manual

Notice of damage risk

NOTICE
Risk of damage

Disregarding these notices can lead to damage to the sensor, the door controller and/or other devices.

- Follow the measures highlighted by the triangle-shaped arrows

4. Introduction

The TOF/Spot is a compact yet powerful single-spot measuring system with the widest range of application possibilities. It uses Time-of-Flight technology (TOF) to ensure ultra reliable detection and exact detection range setting, regardless of the background. This enables a detection range of up to 6 m (20 ft).

The sensor can measure the exact distance at which a person or object enters the detection area or it can simply switch the output at a predefined level. This means the potential application areas are immense: from optimizing warehouse door opening times, to providing touchless button functionality. Its small dimensions mean the TOF/Spot is ideal as a built-in solution.

4.1 Application examples

- Pull string replacement
- Loading dock stations
- Car barrier detection



Figure 1: Car barrier detection

4.2 Features of the TOF/Spot

- Exact distance setting, independent of background
- Excellent detection capability
- Insensitive to ambient light
- Easy mounting
- Compact and sleek design
- Operating range of up to 6 m

4.3 Type description

TOF/Spot - a- bb - c - d - e,ff,range

TOF/Spot version

a : - Standard

Spot sizeat 2 m range

bb : 40<20 mm x 20 mm

TOF/Spot type

c : N Potentiometer
P Preset (value in m)
C Automatic calibration
T Teach-in
I Initialized

Output

d : U<Universal (relay, PNP, NPN)
D Dynamic universal

Housing

e : Y<Snap-in

Supplypower

ff : DC 10 ... 30 VDC

,max.detection range

xx Value in m

xx (xx) Value in m (tolerance setting in mm)

Figure 2: TOF/Spot type description

4.4 Delivery package

A delivery package contains:

- 1 × TOF/Spot sensor with pigtail
- 1 × Connection cable (2 m)
- 1 × Installation guide (depends on the type ordered)



Figure 3: TOF/Spot delivery package

4.5 TOF/Spot product overview

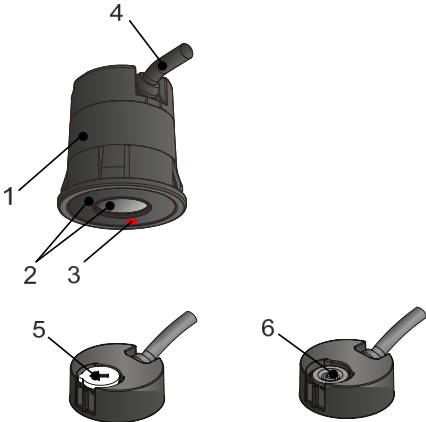


Figure 4: TOF/Spot overview

1. Snap-in housing
2. Optical window
3. Status LED
4. Connection cable with pigtail
5. Potentiometer
6. Teach-in button and cap

5. Overview

Based on Time-of-Flight technology (TOF), the TOF/Spot consists of an active infrared emitter and receiver combined in the same housing. There is one size of spot- like detection area available which reflects an exact picture of the safeguarded area. One output signals the detection of an object within the detection area.

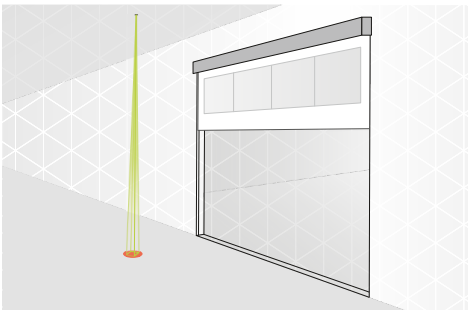


Figure 5: Replaces 'pull-string' door opening

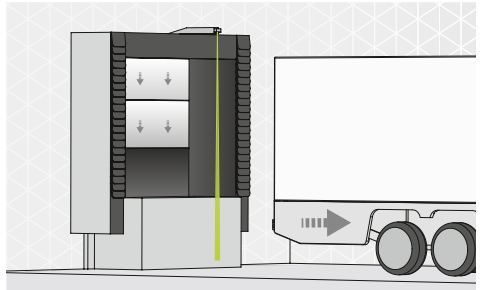


Figure 6: Warehouse doors

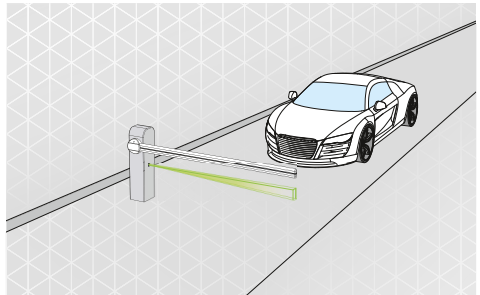


Figure 7: Car park barriers

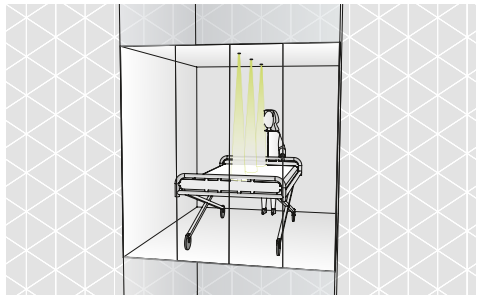


Figure 8: Bed detection

5.1 Detection area dimensions

The maximum detection range is 6 m (20 ft). Object detection at a range less than 0.2 m (0.7 ft) cannot be guaranteed. The TOF/Spot features a detection area of 20 mm × 20 mm at 2 m (0.79 in × 0.79 in at 6.5 ft) range. It reads the correct distance and switches the output reliably for objects covering the full beam size (detection area). For objects being only partially in the detection area, a correct distance evaluation cannot be guaranteed.

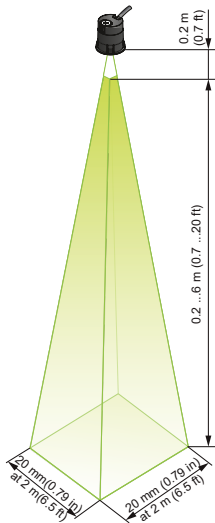


Figure 9: Dimensions of the detection area

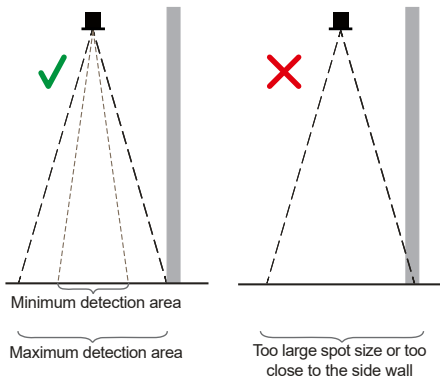
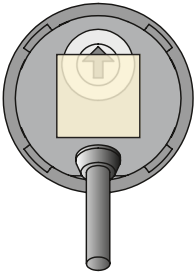


Figure 10: Illumination size of the TOF/Spot

As the illumination size is bigger than the detection size, at 2 m (6.5 ft) range, the TOF/Spot needs at least 20 cm (7.87 in) space to the next sensor to avoid interference.

5.2 Alignment

As the detection area of the TOF/Spot looks like a square, it is important to know where the flat borders and where the edges are:



Important:

- For proper functionality, the remission range of the background or the object has to be between 2 ... 90%.
- Do not use high reflective, retro-reflective or mirroring backgrounds or objects. They can lead to malfunction of the sensor due to the emitted beam not being directly remitted back to the sensor, which leads to measurements out of the operating range.

6. Configuration and operation

There are different TOF/Spot types available. Some of them need to be set manually, others are factory set.

IMPORTANT

The sensor uses a ± 40 mm (± 1.57 in) hysteresis. The hysteresis is the difference between the switching points changing the status from “free field” to “object detected” and back from “object detected” to “free field” compared to the nominal limit.

6.1 P type (Preset)

The P type needs no configuration; a specific detection range is factory set according customer request. Due to the preset value, the P type is a pure plug-and-play sensor.

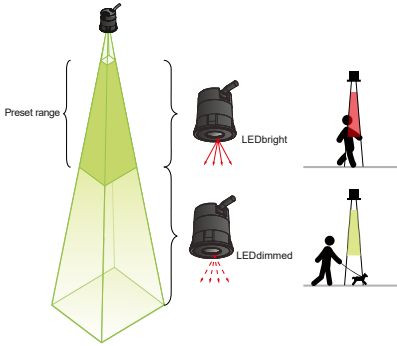


Figure 11: Configuration - P type

6.2 Ctype (Automatic calibration)

The C type cannot be manually calibrated. The sensor calibrates the background every time it starts up. The C type has to be fully installed and implemented into the application before connecting it to the controller.

Functionality:

Every time the sensor starts up (power-up), the TOF/Spot learns the background information anew during the first 30 s after start-up (the start-up time increases by 30 s). If the sensor has no background (e.g. it doesn't "see" anything) at start-up, the switching distance is set to 6 m (20 ft).

Important:

- When there is a background, be aware that the set switching distance is always set about 150 mm (5.9 in) less than the distance to the background or the object used for calibration.
- A background is used to calibrate the sensor. If there is none, an object has to be used for simulating the background during the distance setting or the sensor calibrates to the maximal range.

6.3 N type (Potentiometer)

The detection range can be individually set to between 0.2 m and 3 m (0.7 ft and 10 ft) using the potentiometer located at the rear of the sensor.

Important:

When setting with the potentiometer, use Figure 12 as the settings are not printed on the sensor. Take a small screw driver and turn the potentiometer to the required position.

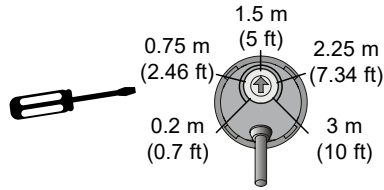


Figure 12: Example of an adjustment between 0.2 m and 3 m

Preset:

- Set the potentiometer to the limit value before the sensor is mounted.

Teach:

- Mount the sensor at its final position.
- Place an object (or person) at the limit distance.
- Turn the potentiometer clockwise, starting at the left, until the LED shines bright.
- Turn it back slowly until the LED dims.
- Now the limit is set to the correct distance.

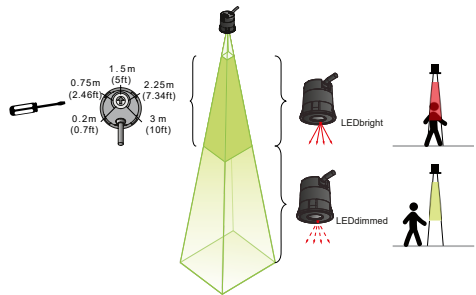


Figure 13: Configuration - N type

6.4 T type (Teach-in)

The T type features a teach-in function that can be initiated in two ways:

1. Exchange of the polarity of the supply voltage (brown wire to GND and blue wire to USP)

With the exchanged connection of GND and USP, the sensor is put into a setting mode and learns the distance to the background. The status LED starts to blink. To indicate that the calibration is finished, the sensor stops blinking and stays red for about 30 s. Now the wiring of the TOF/Spot has to be adjusted according to the electrical connections (brown wire to USP and blue wire to GND).

The mode is an endless loop of 30 s setting time (blinking LED) followed by a 30 s break (red LED). In this mode, the sensor cannot work.

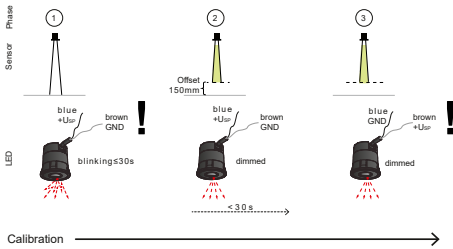


Figure 14: Configuration T type - exchange of the polarity

2. Setting with the teach-in button

There is a button located at the back of the sensor. When the teach-in button is pressed for at least 2 s, the LED blinks for 30 s; the detection area (distance to the background minus 150 mm (5.9 in) is saved and the LED dims. As soon as a person or object enters the detection area, the sensor switches the output.

The set switching distance can only be changed by pressing the teach-in button again.

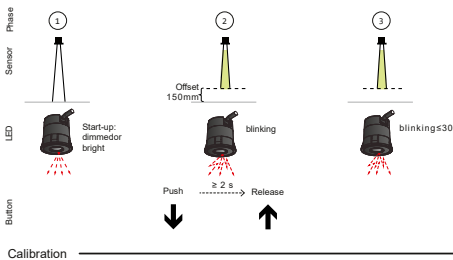


Figure 15: Configuration T type with the teach-in button

Important:

- Be aware that the set switching level is always about 150 mm (5.9 in) above the background.
- A background within the maximal detection range is used to calibrate the sensor. If there is none, an object has to be used for simulating a background. A calibration into nothingness does not work.
- When the power is switched off the sensor remembers the last setting as the switching distance. This distance can only be changed by doing the setting process again.

6.5 I type (Initialized)

The I type has a specific detection range setting by factory according customer request. Due to the potentiometer at the rear of the sensor, a small adjustment of the operating range is possible.

Important:

When setting with the potentiometer, use Figure 16 as the settings are not printed on the sensor. Take a small screw driver and turn the potentiometer to the required position.

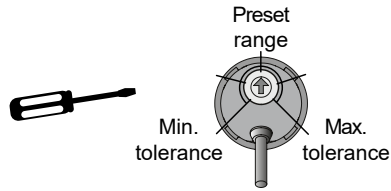


Figure 16: Tolerance adjustment (+/-) according sensor naming

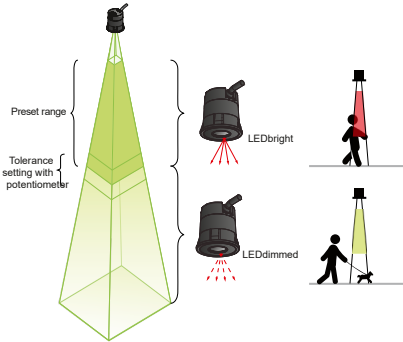


Figure 17: Configuration - I type

7. In- / Output description

There are different possibilities of in- and outputs. Please be aware that not all variants can be used with every type.

7.1 Universal output (relays output)

The TOF/Spot features a universal (relays) output. With the help of the logic selector, the output signal can be configured according to the controller requirements for "normally open" or "normally closed" operation.

7.2 Logic selector

Output logic is set using the gray wire. The logic will be defined by the power-up sequence. After the power-up the logic will not change until the next power-up is made.

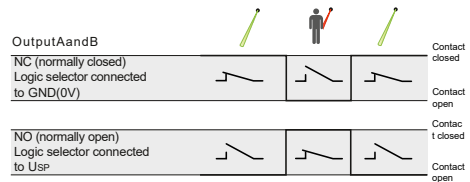


Figure 18: Logic selector

7.3 Dynamic universal output

The TOF/Spot features a universal (relay) output. In case of the dynamic universal output this relay will switch with a frequency of 1kHz. With the logic selector the signal can be change to a frequency by object detected (logic selector connected to Usp, Figure 24)



Figure 19: Output signal if sensor connected according to diagram in Chapter 9, Figure 23

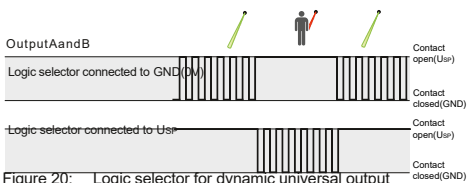


Figure 20: Logic selector for dynamic universal output

8. Installation

It is recommended to carry out the system installation according to the following steps:

1. Check if the scope of delivery is complete.
2. Mark clearly that the modifying system is out of service and switch off main power and door control unit.
3. The installation place needs to fulfill the criteria detailed in Chapter 5.1.
4. Drill a hole at the required position (see drilling template for flush and surface mounting).
5. If needed, mount the mounting bracket.
6. Snap in the sensor at the defined position.
7. Connect the TOF/Spot with the controller.

8.1 Mounting of snap-in housing

The mounting hole recommended for flush mounting is 30 to 31 mm. The sheet thickness cannot be greater 3 mm.

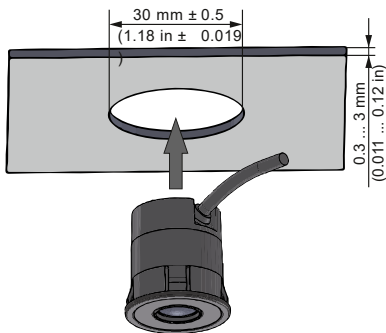


Figure 21: Mounting of snap-in housing

9. Electrical connection

There are different possibilities according to supply power and output chosen.

Relay output

TOF/Spot	Usp (10 ... 30 VDC)	brown	Controller
	Output A	black	
	Output B	green	
	GND (0 V)	blue	
	Not used	white	
	Logic selector	gray	

Figure 22: Solid-state relay output

Important:

- The Output A and Output B are interchangeable.
- Any unconnected (n.c.) wires have to be separated and isolated.

Dynamic universal output

TOF/Spot	Usp (10 ... 30 VDC)	brown	Controller
	Output A	black	
	Output B	green	
	GND (0 V)	blue	
	Not used	white	
	Logic selector	gray	

Figure 23: Dynamic universal output

Important:

- The Output A and Output B are interchangeable.
- Any unconnected (n.c.) wires have to be separated and isolated.

10. Start-up

1. Switch on mains and power up the door control unit.
2. Check if LED lights up.
3. Check the distance setting and the reaction of the sensor, including the status LED, by placing a hand into the detection area at different heights.

11. Timing diagram

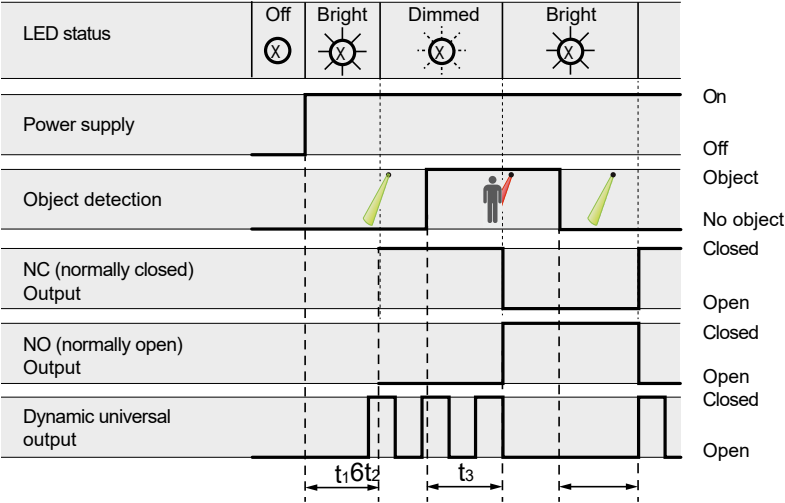


Figure 24: Timing diagram for relay output

	Time	Value
Power-on time	t_1	1,000 ms
Response time	t_2	≤ 60 ms
Release time	t_3	≤ 60 ms

Table 1: General timing table

		Value
Output A and B (relay)	Voltage pin to GND	-30 ... +30 V
	Voltage between pins	-60 ... +60 V
	Current	$< \pm 150$ mA

Table 2: General value table

12. LED signal

LED status	Description
LED off	No power
LED dimmed red	No object detected
LED bright red	Object detected
LED blinking (C and T type only)	Distance setting active

13. Trouble shooting

Status	Action
LED off	Check supply power Check electrical connections
Object in the safeguarded area and LED dimmed red	Check distance setting Check alignment
No object in the safeguarded area and LED bright red	Check electrical connections Check distance setting Check alignment

If the problem persists, please contact your local CEDES representative (www.cedes.com).

14. Maintenance

Although the TOF/Spot does not need regular maintenance, a periodical functional check is strongly recommended as follows:

- Check the mounting position and detection area of the sensor
- Clean the optical window with a soft towel and a little soapy water

NOTICE

Damage to the optical window

Never use any solvents, cleaners or mechanically abrasive towels or highpressure water to clean the sensors.

15. Disposal

The TOF/Spot should onlybe replaced if a similar protection device is installed. Disposal should be done using the most up-to-date recycling technology according to local regulations and laws. There are no harmful materials used in the design and manufacture of the sensor. Traces of such dangerous materials may be found in the electronic components but not in the quantities that are harmful.

16. Product Label

Each TOF/Spot is labelled as below.

It contains following information:



Figure 25: Product label - TOF/Spot (standard version)

Lot No.:
yymmdd: year (2 digits), month, day
mmmmmmmm: manufacturing job number
eeeeee: employee number responsible for final test
cccccc: incremental number

17. Technical data

Optical	
Operating range	
- Types P, C, T and I	0.2 ... 6 m (0.7 ... 20 ft)
- Type N	0.2 ... 3 m (0.7 ... 10 ft)
Active light spot at 2 m distance	20 mm × 20 mm (0.79 in × 0.79 in at 6.5 ft)
Switching level	
- Types C and T	0.15 m (5.9 in) from background
Measurement precision	±5% at 2 m (at 6.5 ft) ±10 cm (3.93 in) over the whole range
Max. ambient light	100,000 Lux
Mechanical	
Dimensions	Ø 29.5 × 35.8 mm (1.16 × 1.41 in)
Housing material	Polycarbonate
Housing color	Black
Enclosure rating	IP65
Operating temperature range	-40 °C... +60 °C
Relative humidity (non-condensing)	0 ... 95%
Electrical	
Supply voltage Usp	10 ... 30 VDC
Current consumption at 24 VDC	50 mA
Peak current consumption during power-up at 24 VDC	500 mA
Outputs	Solid-state relay or dynamic universal
Max. switching voltage	60 V
Max. switching current	150 mA
Max power-up time	1 s
Max. response time	60 ms
Connection cable and electrical connection	
Sensor	
Length	0.25 m
Connection	Screwable, M8, 6-pin
Diameter	Ø 4.2 mm
Material	PVC, black
Plug color	Blue

Connection cable	
Length	2 m (other lengths on request)
Connection	Screwable, M8, 6-pin
Diameter	Ø 4.2 mm
Material	PVC, black
Plug color	Blue
Wires	AWG26
• brown	+Usp
• black	Output A
• green	Output B
• blue	GND (0 V)
• white	Not used
• gray	Logic selector
General	
EMC emission	EN 61000-6-3:2007, +A1:2011 EN 12015:2014
EMC immunity	EN 61000-6-2:2019, EN 12016:2013
Vibration	EN 60068-2-6:2008
Shock	EN 60068-2-27:2009
Change of temperature	EN 60068-2-14:2009
RoHS	2011/65/ EU
Certificate	CE

18. Dimensions

All dimensions in mm (inches)

