

ITSDETECTOR 24N-4 (TSC224)

# Product Manual

Precision in speed control that  
**transforms enforcement**

**Pumatronix Equipamentos Eletrônicos Ltda.**

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## Change History

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Date	Revision	Content updated
01/15/2025	1.0	Initial Edition
02/28/2025	1.1	Operating frequency update (SAD-729)
03/10/2025	1.2	Updated connections description and debugging method (SAD-736)
04/28/2025	1.3	Updating product nomenclature
04/09/2025	1.4.0	WimRadar identity update (SAD-905)
10/24/2025	1.4.1	Inclusion of Equipment Sealing (SAD-946)

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**Resolution 680 – ATO 14448**

**This equipment is not entitled to protection against harmful interference and may not cause interference in duly authorized systems. For more information, see the ANATEL website <https://www.gov.br/anatel/pt-br>.**

## 1. Product Introduction

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ITSDETECTOR 24N-4 (TSC224) is known as a multi-lane speedometer, which can measure the distance, speed and direction of multiple vehicles in multiple lanes in real time. It can capture certain vehicles such as high-speed vehicles and retrograde vehicles by driving an image capture device. The product is easy to use and the output data is highly reliable. Ultra-low power consumption, can adapt to rain, snow, fog and other bad weather, supporting all-weather work.

ITSDETECTOR 24N-4 (TSC224) is used for 4-lane detection. It adopts FMCW (Frequency Modulated Continuous Wave) radar system, which can achieve high-precision measurement of the distance and speed of moving targets by analyzing the difference between transmitted radio waves and received echoes.

The appearance of the product is shown in Figure 1.



*Figure 1*

The size of the radar is shown in figure 2.

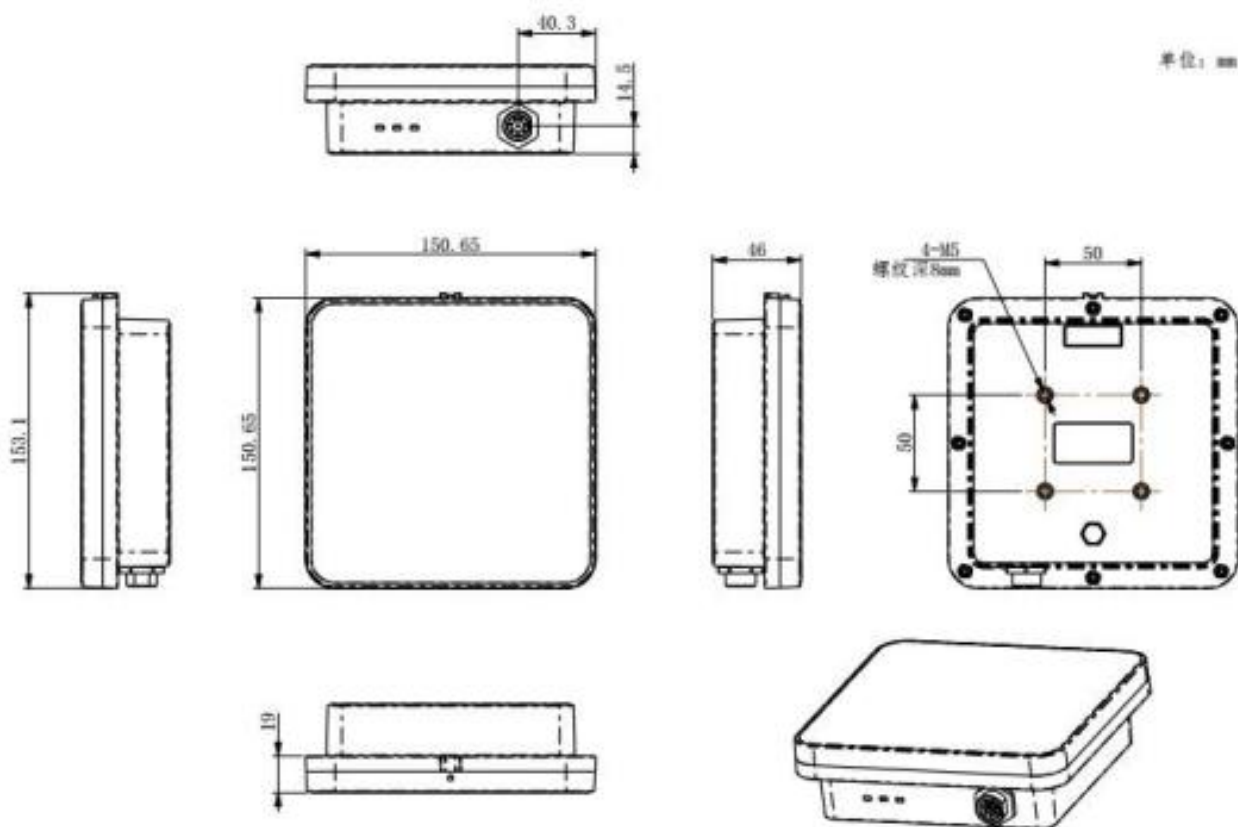


Figure 2

- Length: 150 mm
- Width: 48 mm (Chassis diameter)
- Height: 150 mm

## 2. Product Specifications

<b>Performance</b>	Modulation	FMCW
	Operating frequency	24000 a 24125 MHz
	Deviation error	$\leq \pm 45$ MHz
	Transmit power (EIRP)	10 dBm
	Response time	50 ms
	Trigger consistency	$\leq \pm 0.5$ m
	Capture rate	> 99%
	Snap distance	1-50 m
	Speed range	5~250 km/h
	Speed measurement	(-2~0) km/h

	Covering lanes	4 faixas
	Beam width (azimuth)	64°
	Beam width (elevation)	16°
<b>Power supply</b>	Operating voltage	9~32 VDC
	Power consumption	≤4W
<b>Material</b>	Face Cover	PC+ABS
	Bottom cover	ADC12
<b>Interface</b>	Interface	RS485/ Wi-Fi/ Porta Ethernet
	Indicator Lights	Three (red for power light, yellow-green for detection light, blue for network port/WIFI)
<b>Protection</b>	Protection level	IP67
	Corrosion resistance	IEC 60068-2-1
	Operating temperature	-40°~85°C
	Operating humidity	5%RH~95%RH
<b>Certification</b>	Certification	CE/ROHS
<b>Install</b>	Installation method	Top loading, side loading
	Installation height	Standard 6m (4-10 m)

### 3. Installation Guide

The radar is usually installed on a gantry or crossbar in a straight manner or on the side post of the road using the side installation method.

Radar installation site requirements: no obstacles (such as cameras, lights, etc.) at least 30 cm on both sides of the radar, which will affect the performance of the radar and cause instability.



Figure 3 - Typical installation of ITSDETECTOR 24N-4 (TSC224)

### 3.1. Montagem Frontal

#### 1) Fixing the Radar Base and Bracket

Use at least 4 M5 bolts to pass through the radar base and fix the radar base to the crossbar connecting bracket, as shown in the figure 4.

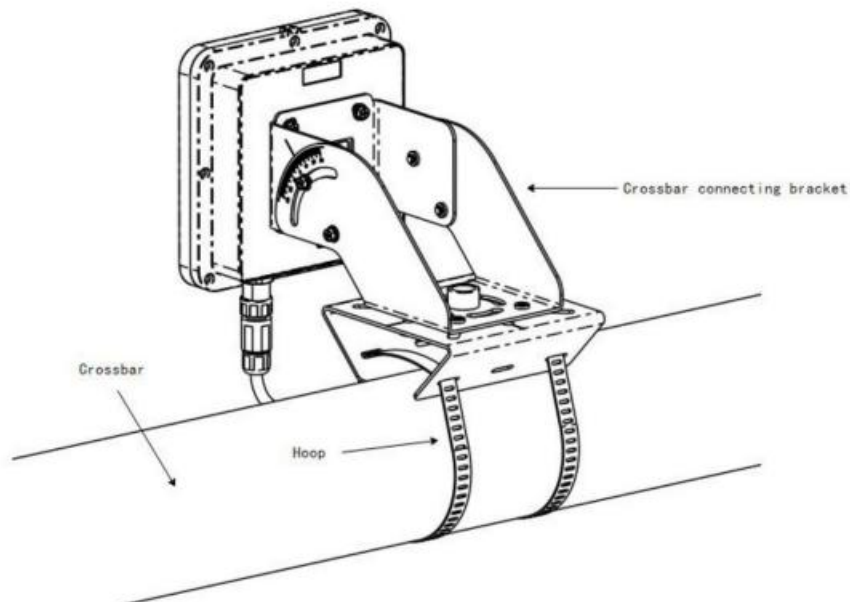


Figure 4

#### 2) Adjusting the radar using the radar sight

Appropriately loosen the bolts between the radar bottom bracket and the crossbar connecting bracket, and according to different installation methods, make the lane aimer overlap or parallel with the lane line.

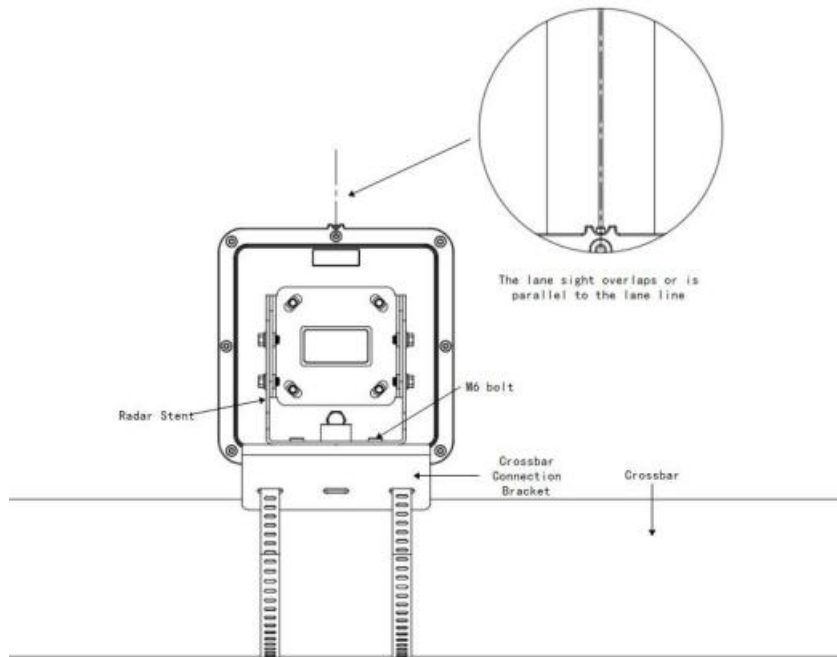


Figure 5

### 3) Adjusting the Bubble Level

Properly adjust the radar bracket so that the bubble of the bubble level is in the center. At this moment, the radar is in a horizontal state. Tighten the bolts at the junction of the crossbar bracket and the base.

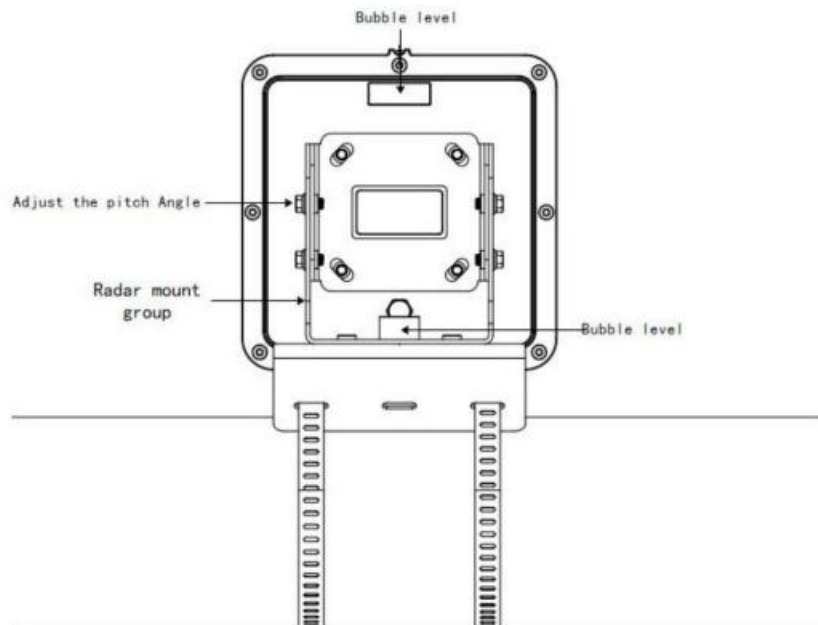


Figure 6

### 4) Adjust radar pitch angle

Loosen the radar tilt angle screws appropriately and adjust according to the installation.

The tilt angle of the radar mount needs to be adjusted according to different installation heights. As shown in Figure 7, the variable  $\alpha$  is the radar tilt angle.

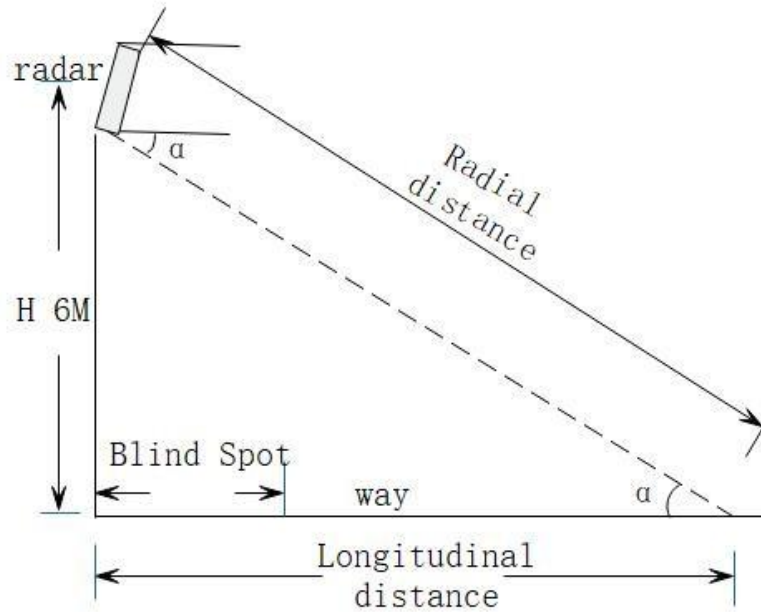


Figure 7 - Schematic diagram of radar adjusting tilt angle

The tilt angle  $\alpha$  is adjusted according to the radar mounting height as shown in Table 1.

Table 1 - Relationship between installation height and tilt angle

Radar installation height (from the ground)	Pitch angle $\alpha$
4m	6°
5m	10°
6m	13°
7m	16°
8m	19°
9m	22°
10m	25°

### 3.2. Side-mounted

When side-mounted, in addition to adjusting the pitch angle, the radar's horizontal deflection angle also needs to be considered.

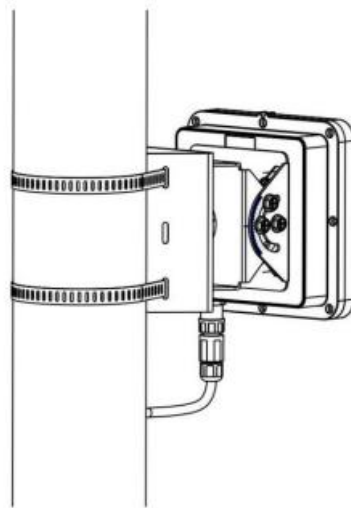


Figure 8

## 4. Equipment Sealing

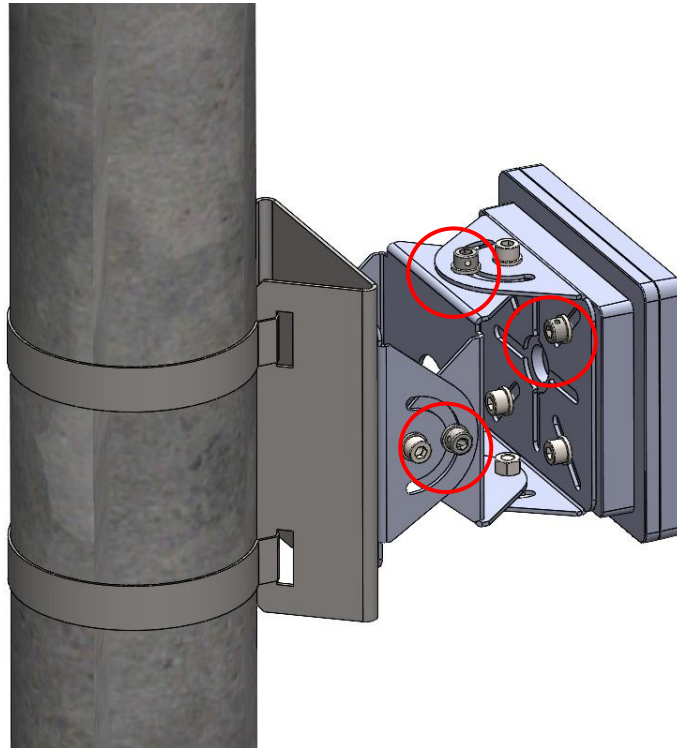
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The sealing system of the Doppler Sensor is designed to ensure the equipment's integrity, preventing any unauthorized intervention in the adjustment and fastening points, in accordance with Inmetro standards.

### 4.1. Characteristics of the Sealing System

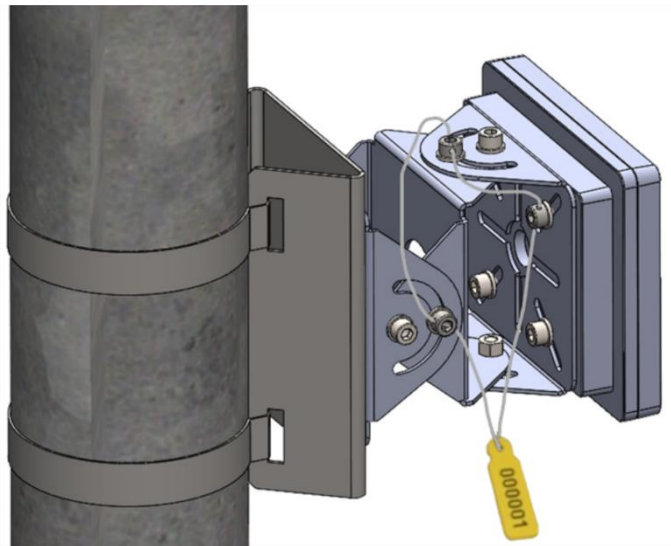
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- 1) Mounting screws with through holes
  - The sensor's mounting bracket is equipped with three screws featuring through holes, arranged to allow the passage of a sealing wire.
  - These screws correspond to the critical adjustment points for the equipment's angle and fastening.



### 2) Application of the security seal

- The sealing wire is inserted sequentially through the three screws, forming a continuous path that prevents their removal or retightening.
- The ends of the wire are joined by a numbered security seal, in compliance with Inmetro requirements.



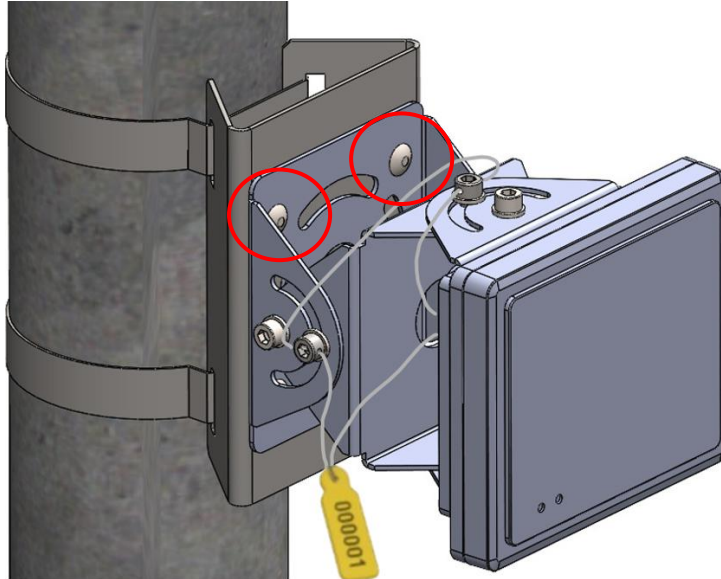
### 3) Fastening integrity

- With the wire tightened and the seal properly applied, it is impossible to adjust, remove, or replace the sensor without breaking the seal.
- Breaking the seal constitutes a violation of the equipment, allowing the tracking of maintenance history or possible tampering.

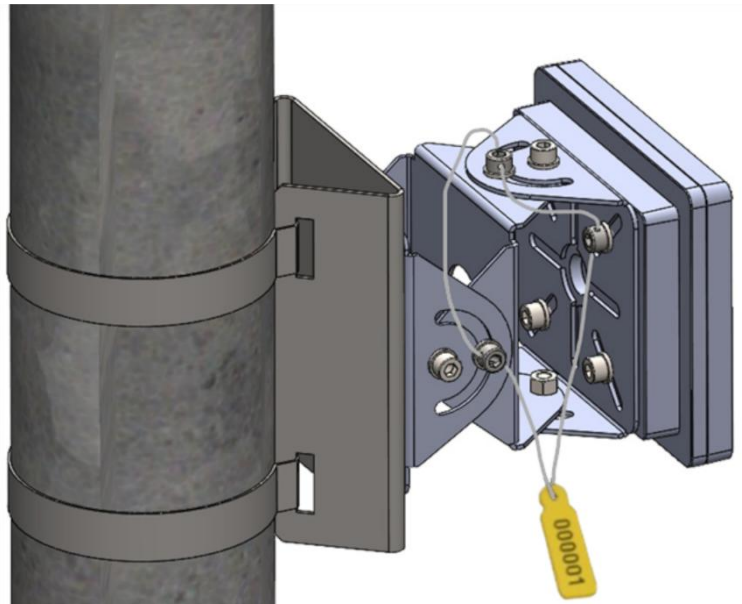
### 4) Seal identification

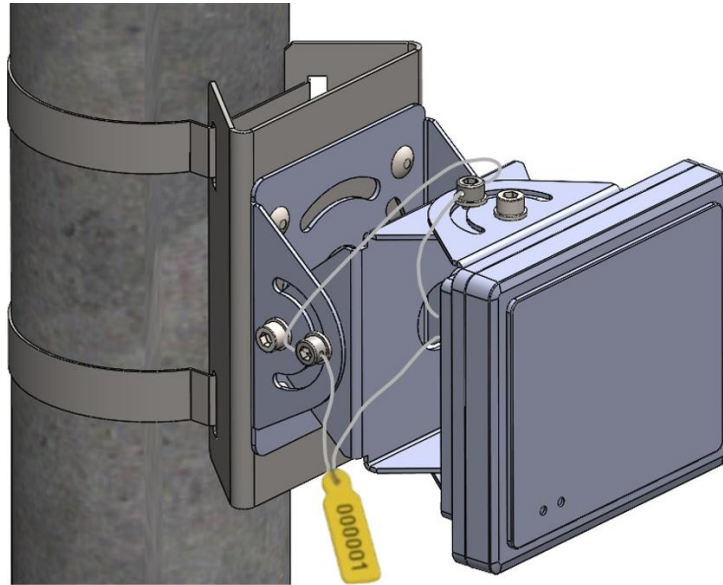
- The seal used has a unique and sequential number linked to a serial number provided by Inmetro.

- This number is recorded in the approval and inspection process, ensuring traceability and compliance with Inmetro's legal metrology standards.
  - 5) Reinforced attachment to the pole clamp
- The assembly of the Doppler sensor to the pole clamp is secured by metal rivets, providing greater strength and making any attempt at removal more difficult.
- This method ensures that the equipment remains firmly installed on the pole, requiring the rivets to be broken for any removal, further reinforcing the system's inviolability.

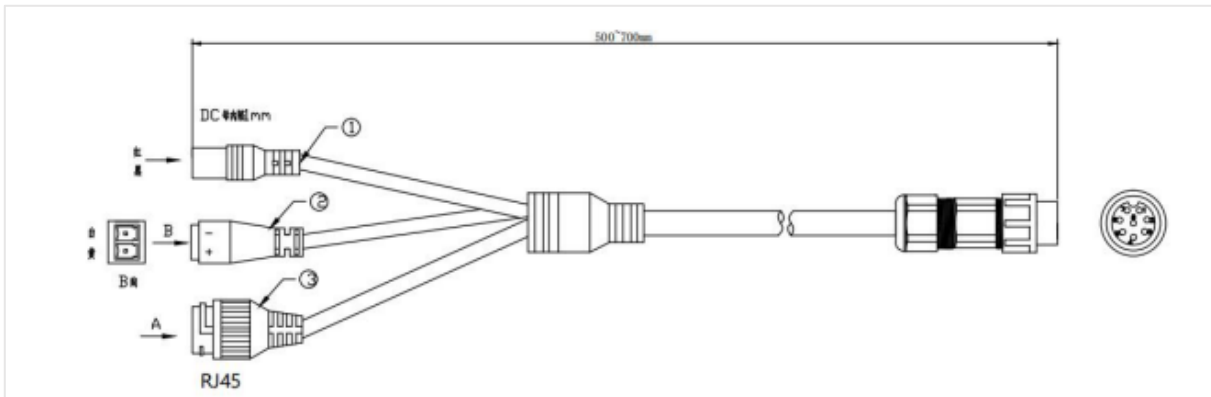


## 4.2. Sealing Plan





## 5. Connections



Interface	Description	LED Status	Description
12 Vdc	Power supply	Red	After connecting to the power supply, the red light is always on
RS-485	Receiving and Transmitting differential signals	Yellow-Green	The yellow-greenlight turns on after the targetis detected
RJ-45	Network connection	Blue	After connecting the network cable, the blue light will be on after successful communication

## 6. Debugging Method

### 6.1. System Connection

- Default network configuration: Radar default IP address: 192.168.10.123 Port number: 50000
- Computer network settings: Please make sure that your computer does not use the same IP address as the radar (192.168.10.123). Set the computer's IP address to 192.168.10.x (where x is any number between 2 and 254, but not 123). If communication cannot be established, please check and add the gateway address, which is usually 192.168.10.1.

After completing the above network settings, click the "Connect" button in the radar host software to successfully connect. The connection status icon in the software interface will change from "x" to "√". After the connection is successful, the current firmware/algorithm version and frame rate information will be displayed in the lower left corner, indicating that all functions have been turned on normally.

## 6.2. System Debugging

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### 1) Radar mode

Select "Continuous Mode" in the radar mode settings , and then click the "Set".

### 2) Lane parameters

- Cycling lanes: negative on the left and positive on the right of the left edge of the lane relative to the radar (origin). Enter the lane width (the standard lane width is 3.75 meters) and adjust it according to the actual lane conditions.
- Multiple lanes: Set the width of multiple lanes according to site conditions. The width of each lane should be filled in according to the actual measurement value.

### 3) Installation parameters of radar:

- Enter the actual installation height of the radar.
- Installation Angle:
  - Front-mounted: If the radar is installed in Front-mounted, set the installation angle to 0°.
  - Side-mounted: If the radar is installed sideways, adjust the horizontal angle (negative on the left and positive on the right) according to the actual situation.

### 4) Radar parameters

- Sensitivity: Radar detection sensitivity
- Speed limit: No output below this speed (unit: km/h)
- Speed limit: No output above this speed (unit: km/h)



Figure 9 - Parameter settings for the 0-degree approaching continuous mode



**O ITSDETECTOR 24N-4 (TSC224) is used for 4-lane detection.**

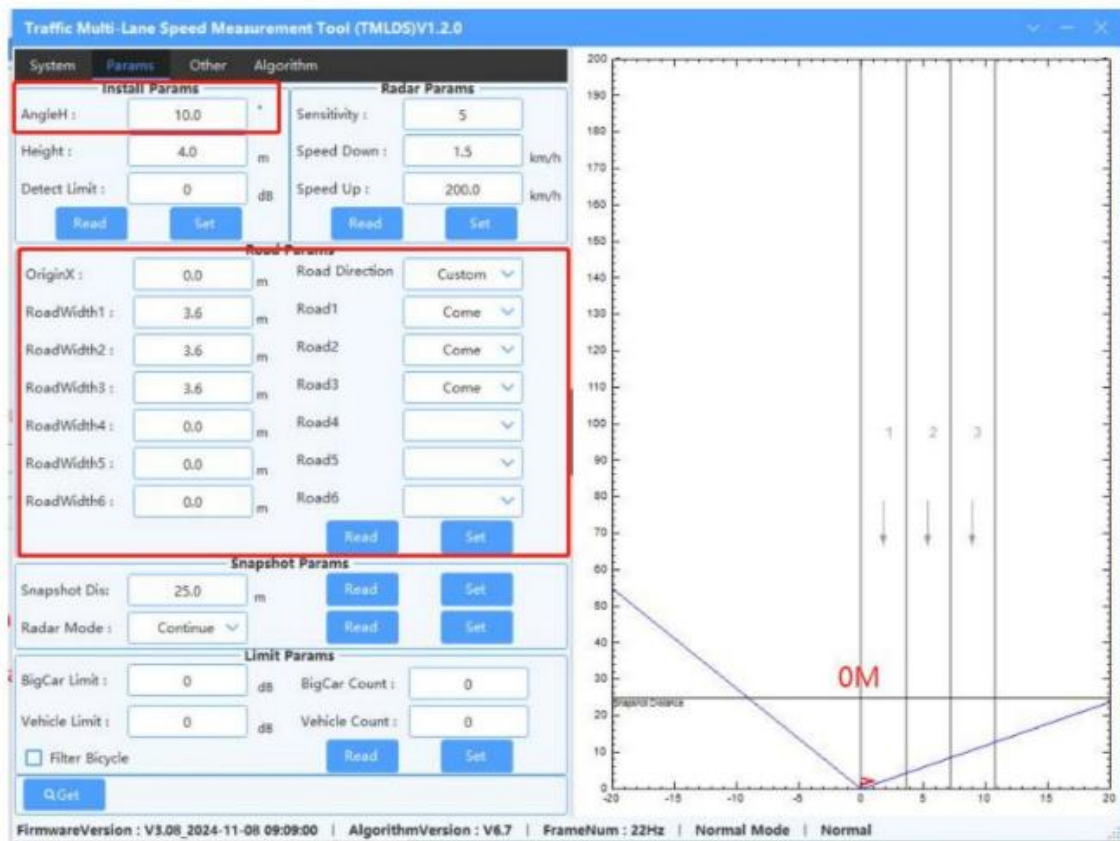


Figure 10 - Parameter setting for the left-side side-mounted 20° four-lane oncoming continuous mode (modify the starting horizontal coordinate according to the side-mounted position)

#### 5) Observe vehicle trajectory

- Observe the track: In the track display interface of the host computer, observe whether the track of the passing vehicles is straight. Start tracking from the farthest point and make sure the track stays within the set lane.
- Adjust the pitch angle: If you find that the tracking track is too short, this usually means that the pitch angle of the radar is set too large. At this time, you need to tilt the radar upward to increase the detection range.
- Adjust the horizontal angle: If the tracking track is not straight, this may be because the horizontal angle of the radar in the previous step is not set accurately. Please adjust the horizontal angle of the radar according to the actual situation (negative on the left and positive on the right) until the track becomes straight.

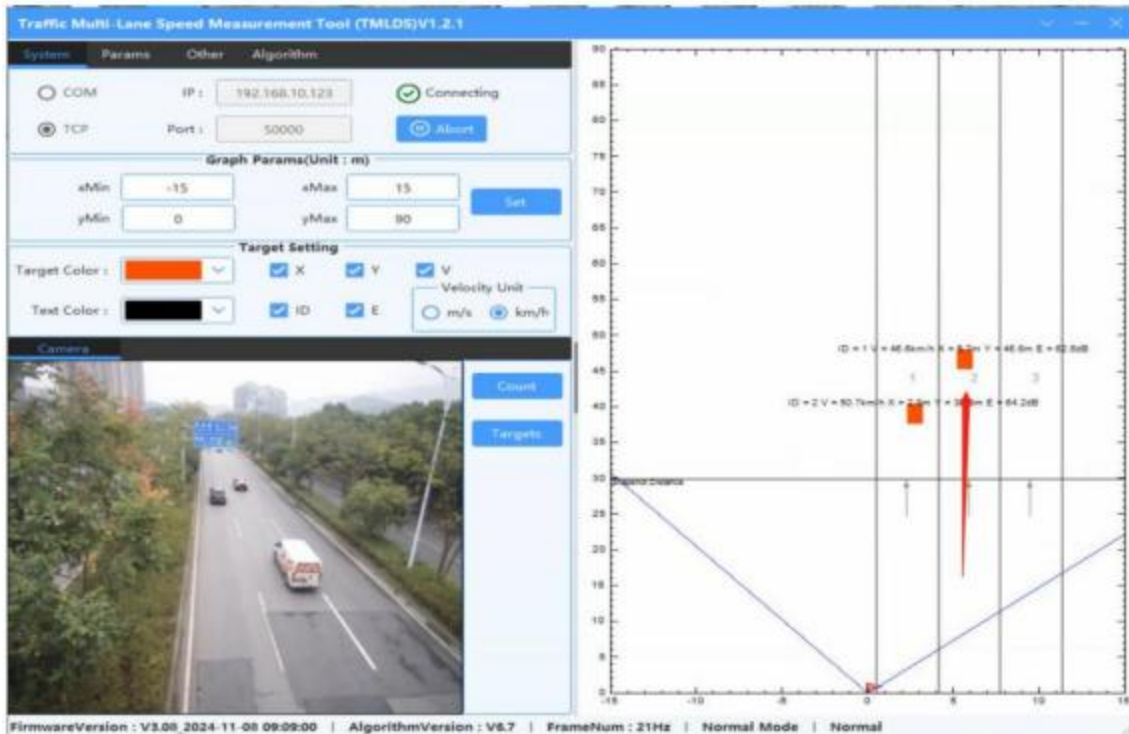


Figure 11

6) Set the capture mode

- Radar mode:
  - Continuous mode: The radar outputs all tracks of vehicles within the detection range
  - Trigger mode: The radar output only outputs the vehicle data that has passed the capture line.

**After the continuous mode debugging is completed, change the radar working mode to "trigger mode".**

- Shooting direction:
  - Coming direction - detecting the direction of the vehicle's head;
  - going direction - detecting the direction of the vehicle's tail.

Select the appropriate capture direction from the drop-down list based on the actual usage scenario.

- Capture distance: In continuous mode, the optimal detection range area is determined based on the test results. Select the appropriate capture distance based on the optimal focusing distance of the multi-lane capture camera. Make sure the radar is installed at the recommended angle to ensure the best detection effect.

7) Check the capture effect

Every time a car passes by, the target information statistics box will show the snapshot information. If there are multiple snapshots of large cars, adjust the entire vehicle type recognition setting lowers the large vehicle threshold.

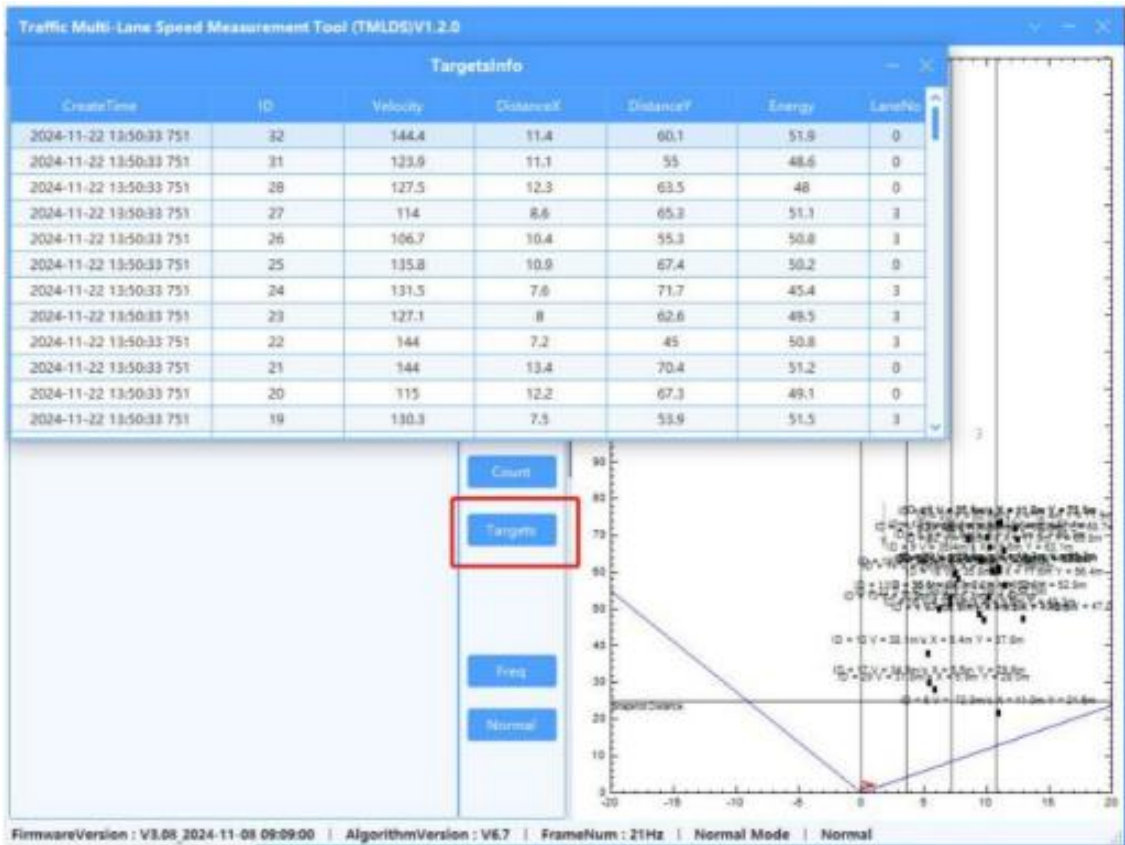


Figure 12

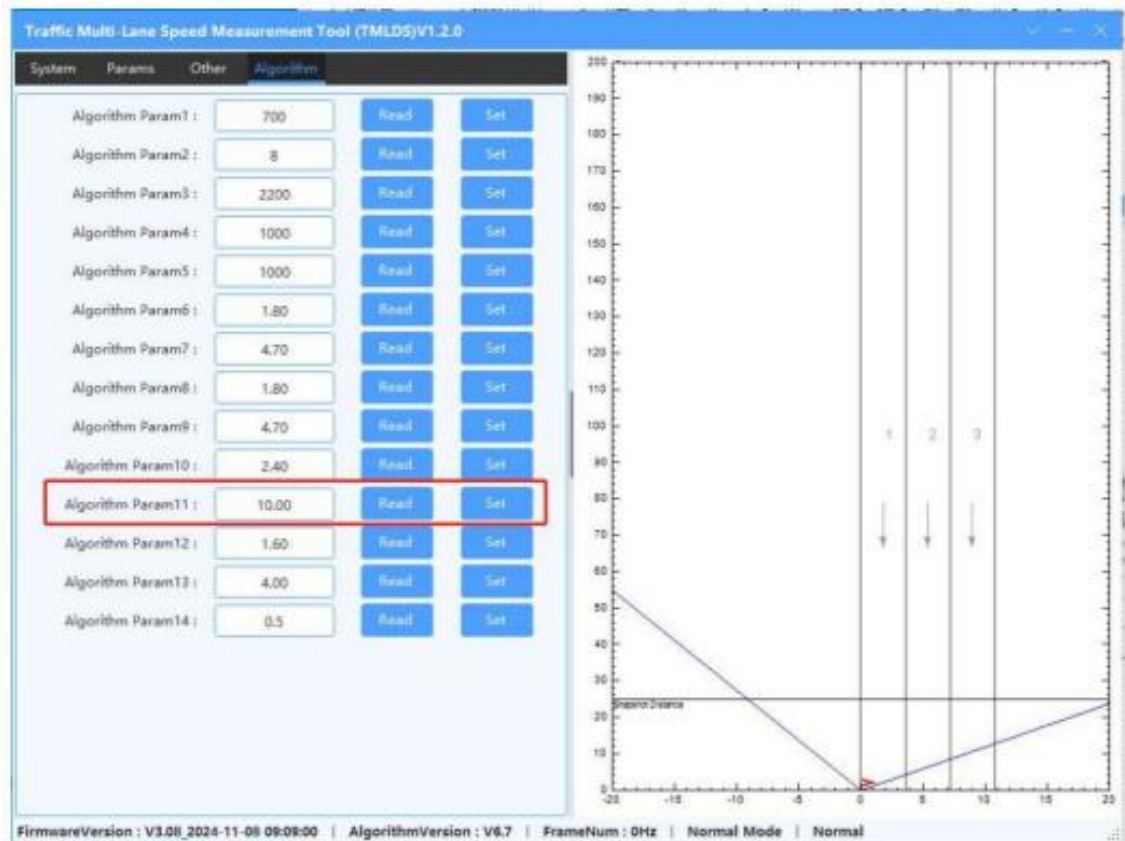


Figure 13

## 7. General warranty conditions

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Pumatronix guarantees the product against any defect in the material or manufacturing process for a period of 1 year from the date of issuance of the invoice, provided that, at the discretion of its authorized technicians, a defect is found under normal conditions of use.

The replacement of defective parts and execution of services arising from this Warranty will only be carried out in the Authorized Technical Assistance of Pumatronix or a third party expressly indicated by it, where the product must be delivered for repair.

This Warranty will only be valid if the product is accompanied by a Maintenance Form duly completed and without erasures and accompanied by an Invoice.

### 7.1. Situations in which the Product loses its warranty

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- 1) Use of software/hardware not compatible with the specifications of the Manual;
- 2) Connection of the product to the mains outside the standards established in the product manual and installations that present excessive voltage variation;
- 3) Infiltration of liquids from the opening/closing of the product;
- 4) Damage caused by natural agents (electric discharge, flood, sea spray, excessive exposure to climatic variations, among other factors) or excessive exposure to heat (beyond the limits established in the Manual);
- 5) Use of the product in environments subject to corrosive gases, with excessive moisture and/or dust;
- 6) Show signs of tampering with security seals;
- 7) Present opening and modification signals made by the Customer in product locations not authorized by Pumatronix;
- 8) Damage caused by accidents/falls/vandalism;
- 9) Display tampered and/or removed serial number;
- 10) Damage arising from the transport and packaging of the product by the Customer under conditions incompatible with it;
- 11) Misuse and in disagreement with the Instruction Manual.

## 8. Privacy Policy

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Under the General Data Protection Law (LGPD) - Law No. 13.709, of August 14, 2018, this product has programmable functions for the capture and processing of images that may infringe the LGPD when used, together with other equipment, to capture personal data.

The equipment does not collect, use or store personal information, whether sensitive or not, for its operation.

Pumatronix is not responsible for the purposes, use, and treatment of the images captured, and the control of the information and forms of operation of the product are the sole decision of the user or purchaser of the product.

