

Speed sensor



- Doppler radar based sensor
- Direction of motion identification
- Narrow beam pattern
- Presence or motion detection

Rotary switch programming

- Sensitivity by rotary switch 'gain'
- 14 speed thresholds by rotary switch 'prog'

Serial communication bus (1)

only if rotary switch 'prog' on C

| Type | Color | Designation | Characteristics |
|----------------|--------|----------------|-------------------------------|
| RS232 standard | Black | 0V | Negative logic +12V / -12V |
| | Red | +Vsupply | |
| | Brown | Rx on sensor | |
| | Yellow | Tx on sensor | |
| RS485 option | Black | 0V | Positive logic +3.3V / 0V |
| | Red | +Vsupply | |
| | Brown | Rx + on sensor | |
| | Orange | Rx - | |
| | Yellow | Tx + on sensor | |
| UART option | Black | 0V | Positive logic +3.3V / 0V |
| | Red | +Vsupply | |
| | Brown | Rx on sensor | |
| | Yellow | Tx on sensor | |

3 ON/OFF outputs (1)

| Type | Color | Désignation | Caractéristiques |
|------|--------|--------------|------------------|
| TOR | Yellow | Coming dir. | Open drain |
| | Brown | Leaving dir. | Open drain |
| | Orange | Overspeed | Open drain |

(1) : RS232 is the standard in addition with the TOR outputs.
RS485 or UART are available on request

Wiring

- Without enclosure (OEM), locking screw terminal blocks
- With enclosure, the sensor is delivered with a 2m cable

Specifications

RF specifications

| | |
|-------------------|--------------------------|
| Frequency | 24.15 to 24.25 GHz |
| Output power | 1mW (EIRP<20dBm) |
| Antenna beamwidth | Horiz : 7° / Verti : 32° |
| Compliant with | EN300440 |

Performance

| | |
|-----------------------|-------------------|
| Velocity range | 5km/h to 255km/h |
| Turn on time | 200ms |
| Meas. refreshing time | 35ms |
| Accuracy | ± 1km/h |
| Sensitivity | Programmable gain |

DC specifications

| | |
|-----------------------------|----------------------|
| Supply voltage | from 9 to 30V |
| Supply current (typ. @ 12V) | 13mA typ. (16mA max) |

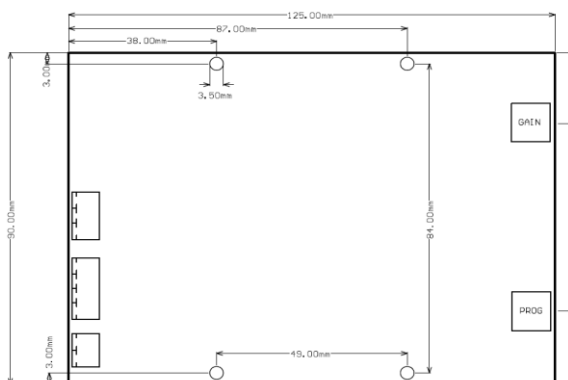
Mechanical specifications

| | |
|-----------|---------------------|
| Length | 125mm |
| Thickness | 22mm with connector |
| Width | 90mm |
| Weight | 80gr |

Environmental conditions

| | |
|-----------------------|--------------|
| Operating temperature | -20°C..+60°C |
| Storing temperature | -40°C..+70°C |

Mechanical drawing (mm)



TOR outputs (activ low)

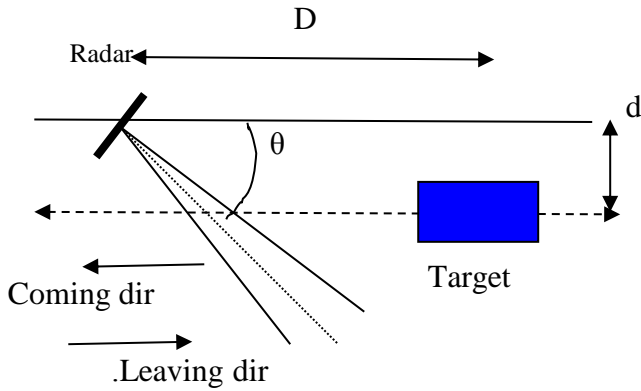
- Cd1 / coming dir. / blue led
- Cd2 / leaving dir. / yellow led
- Cd3 / overspeed / red led

- Operating defaults are reported by a simultaneous leds flash .
- A pull up resistance or a relais must be connected to the TOR



Serial port
Supply

Velocity measurement based on Doppler



The speed is obtained by the difference of the radar radiated frequency and the target reflected frequency.

$$\text{Velocity} = \text{FDoppler} \lambda / (2 \cos \theta)$$

if $\theta < 10$ deg. error measurement is less than à 2% (see Diag. 1)
if $\theta > 45$ deg. accuracy is poor.

A thinner beamwidth in the target moving plan, results in a more accurate speed measurement.
To ensure greater accuracy, place the wide side of the sensor horizontally for measurements on the side of the road. For measurement from above, place the wide side of the sensor vertically.

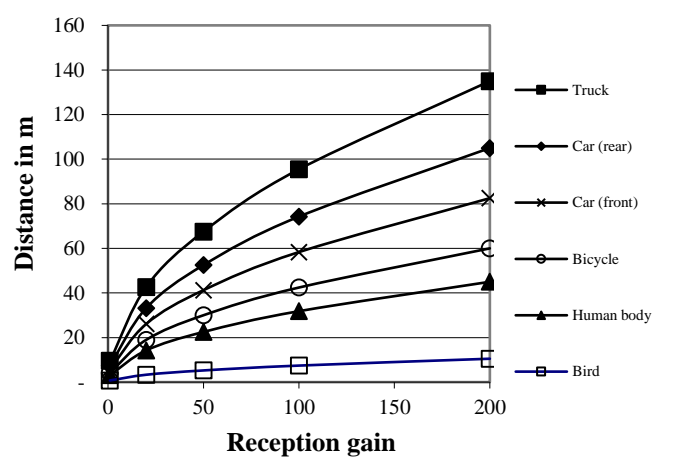
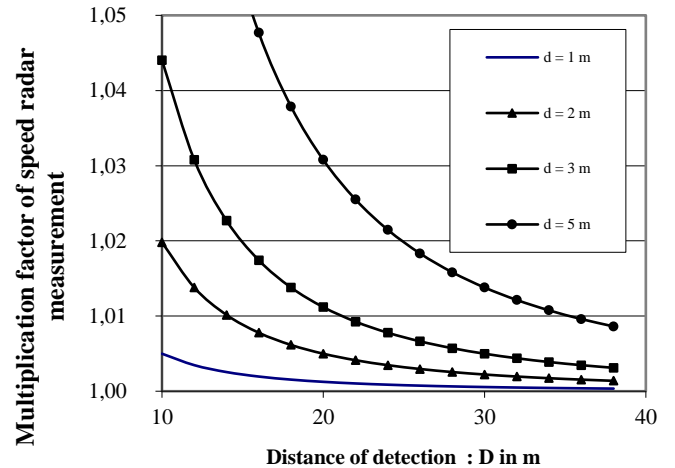
Auto test

Communication bus : frame transmitted by the radar

| | |
|---------|---|
| Byte 1 | 0xAA |
| Byte 2 | 0x55 |
| Byte 3 | NTR : frame N° |
| Byte 4 | Cf/St <ul style="list-style-type: none"> o Bit 0 : 0 no filtering / 1 filtering o Bit 1 : 0 = coming dir. - 1 = leaving dir. o Bits 2 à 7 : free. |
| Byte 5 | VPE : Velocity integer part |
| Byte 6 | VPD : Velocity Decimal Part |
| Byte 7 | OK <ul style="list-style-type: none"> >0 : the radar is OK - 0 the radar is down |
| Byte 8 | o Bits 0 et 1 : Not used. <ul style="list-style-type: none"> o Bit 2 : 1 signal degradation o Bit 3 : 1 signal is missing on way 2 o Bit 4 : 1 signal is missing on way 1 o Bits 5 à 7 : Not used. |
| Byte 9 | 255 gain |
| Byte 10 | SV : speed threshold, programmed value copy |

RS232 : 9600 bps / 8 bits / 1 stop / no parity / no control

Diag 1. Correction factor



Sensitivity

- The target reflectivity depends of its surface size and composition.
- Metallic surfaces are greatly reflective.
- The target shape can degrade its detection.
- Radar waves do not cross water films and metallic sheets, but can cross some walls or plastic sheets.
- Radar waves are slightly weakened by the rain and the dirt.
- Only the waves reflected by moving target are detected by Doppler radar.
- Thin antenna beamwidth are more sensitive.

Communication bus : frame received by the radar

| | |
|--------|---|
| Byte 1 | 0xAA |
| Byte 2 | 0X55 |
| Byte 3 | Cf/St <ul style="list-style-type: none"> o Bit 0 : 0 no filtering / 1 filtering o Bit 1 and 2 : 1 = Comm. dir. - 2 = leav. dir. 3 - double dir o Bits 3 à 7 : free. |
| Byte 4 | SV : speed threshold, TOR output = 1 if speed meas. is less than SV |
| Byte 5 | GAIN : 255 gain step from 1 to 255 |

Rotary switch use



Rotary switch for software selection

Rotary switch for gain adjustment

Software configuration

| Rotary switch value | Overspeed threshold | Gain | Operation mode |
|---------------------|-------------------------|-------------------------|---|
| 0 | 0 km/h | Rotary switch | Vehicles detection, sensitivity and overspeed threshold set by rotary switch |
| 1 | 10 km/h | | |
| 2 | 20 km/h | | |
| 3 | 30 km/h | | |
| 4 | 40 km/h | | |
| 5 | 50 km/h | | |
| 6 | 60 km/h | | |
| 7 | 70 km/h | | |
| 8 | 80 km/h | | |
| 9 | 90 km/h | | |
| A | 100 km/h | RS232 config. | Vehicles detection, sensitivity and overspeed threshold set by RS232. All parameters are stored in |
| B | 110 km/h | | |
| C | RS232 config. | | |
| D | 120Km/h | Rotary switch | Vehicles detection, sensitivity and overspeed threshold set by rotary switch |
| E | 140Km/h | | |
| F | Factory test | Factory test | TOR outputs are all at 0, "Coming dir.", "Leaving dir" and "Overspeed" are all lit. This operating mode is reserved for factory tests. |

Gain configuration

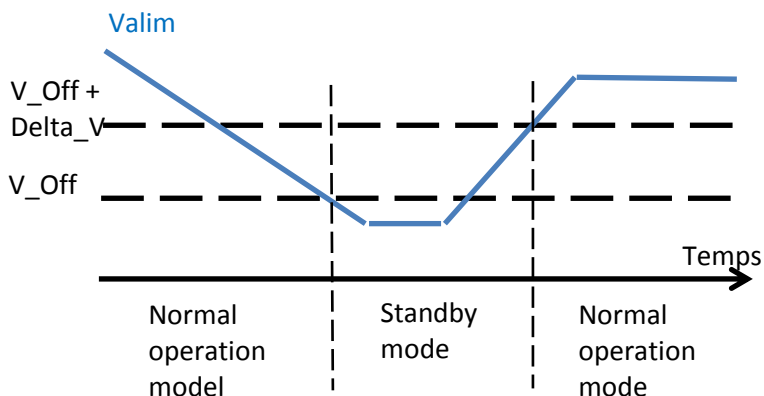
| Rotary switch value | Gain prog. | in m (1) | Rotary switch value | Gain prog. | in m (1) |
|---------------------|------------|----------|---------------------|------------|----------|
| 0 | 1 | 40 | 8 | 81 | 124 |
| 1 | 4 | 57 | 9 | 100 | 128 |
| 2 | 9 | 72 | A | 121 | 135 |
| 3 | 16 | 81 | B | 144 | 143 |
| 4 | 25 | 90 | C | 169 | 152 |
| 5 | 36 | 96 | D | 196 | 156 |
| 6 | 49 | 114 | E | 225 | 161 |
| 7 | 64 | 120 | F | 256 | 170 |

(1) : approximate distance detection for a car.

Supply voltage operation

The radar is fit to manage the voltage supply

When this function is active, the radar measures the voltage supply and compares it to the threshold voltage programmed inside the radar. If the voltage is lower than the threshold, the radar goes in standby mode. The radar leaves the standby mode only if the supply voltage passes over the threshold $V_{Off} + \Delta V$.



$V_{Off} + \Delta V$ are programmed through RS232, with the following instructions.

The radar can only be programmed if the rotary switch "prog" is on C position.

When it receives a frame, the radar returns a frame with the programmed parameters (to verify the configuration).

| Communication bus : frame received by the radar | |
|---|---|
| Byte 1 | 0xE8 |
| Byte 2 | 0x17 |
| Byte 3 | 0xE8 |
| Byte 4 | 0x17 |
| Byte 5 | Enable : 0 : Supply management inactive 1 : Supply management active |
| Byte 6 | V_Off : Standby voltage threshold * 10 Example : V_Off=100 : Voltage threshold=10Volts Example : V_Off=75 : Voltage threshold=7.5Volts |
| Byte 7 | Delta_V : Voltage difference to get out of standby mode Example : Byte7=10 : Delta_V=1Volt |

| Communication bus : frame transmitted by the radar | |
|--|---|
| Byte 1 | 0xE8 |
| Byte 2 | 0x17 |
| Byte 3 | Enable : 0 : Supply management inactive 1 : Supply management active |
| Byte 4 | V_Off : Standby voltage threshold * 10 Example : V_Off=100 : Voltage threshold=10Volts Example : V_Off=75 : Voltage threshold=7.5Volts |
| Byte 5 | Delta_V : Voltage difference to get out of standby mode Example : Byte7=10 : Delta_V=1Volt |

RS232 : 9600 bps / 8 bits / 1 stop / no parity / no control

| Voltage supply | Current supply in standby mode |
|----------------|--------------------------------|
| 10V | 4.7mA |
| 9V | 4.9mA |
| 8V | 5.4mA |
| 7V | 5.8mA |

Disclaimer

Different technical specifications are possible upon request. AMG Microwave reserves the right to make modifications to the design and characteristics of the product at any time and without prior notice.