

HI-RES RADAR SENSOR FOR RAIL APPLICATIONS



High-resolution 76 GHz radar sensors

- Scanning radar SDM-76S
- Fixed beam radar SDM-76

76 GHz RAIL RADARS KEY HIGHLIGHTS:

Long Range

The max measurement distance:

- 1000 m for scanning radar
- 500 m for track dead-end radar
- 300 m for shunting locomotive radar

15 cm Positioning Accuracy

ELVA-1's radar sensor offers reliable and high-precision 15 cm measurement of distance and speed with 0.5 km/h accuracy. For industrial rail applications, up to ± 5 mm distance measurement is available with an active responder.

Works at Harsh Conditions

All ELVA-1 rail radars have been designed to withstand the typical conditions of rail applications, including:

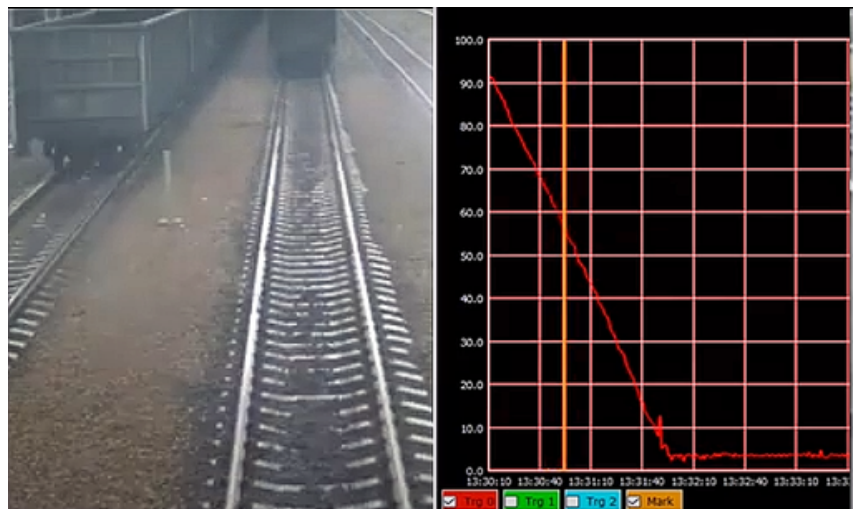
- Dust, smoke, vapor,
- Low visibility, poor lighting,
- High/low temperature, vibration.

General Description

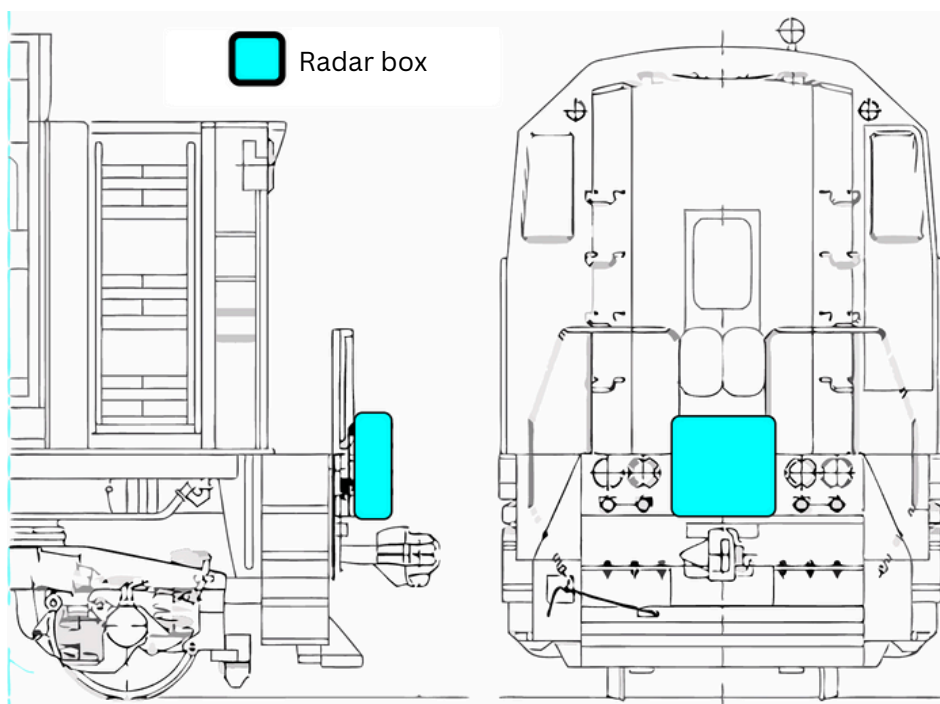
The ELVA-1 rail radar sensors are intended for various rail applications.

1. Loco scanning radar SDM-76S with a narrow view for a locomotive's collision warning system against foreign objects.
2. Fixed beam radar SDM-76 (loco version) to assist in shunting operations, which can also be installed on driverless autonomous locomotives.
3. Fixed beam radar SDM-76 (track version) to enhance the safety of trains arriving at the dead end of the track.

The radar sensors provide data on speed and distance via the Ethernet interface, including wireless connection.



#1 SCANNING RAIL RADAR SDM-76S FOR A COLLISION WARNING SYSTEM FOR UNEXPECTED FOREIGN OBJECTS



The ELVA-1 SDM-76S scanning radar system provides a working distance of 0.5 to 1000 meters with a high range resolution of 0.5 meters and a high angular resolution equivalent to 12.5 cm at 1000 meters. This detection works at speeds up to 200 km/h.

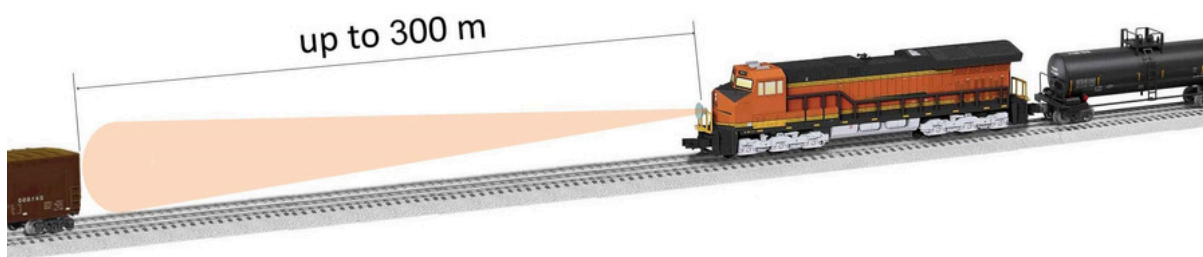
A typical task is to determine whether a foreign object (human, car, large animal, etc.) is within the loading gauge or is in a safe zone on the side of the tracks. In the case of a tunnel, the scanning radar's angular resolution allows the detection of a minimum gap of 12.5 cm between the sides of the train and the tunnel wall.

The system scans the railroad ahead within the angular sector of 0.4 degrees with a resolution of less than 0.01 degrees to distinguish objects on the loading gauge from those outside it.

SCANNING RADAR SENSORS SDM-76S KEY PARAMETERS

Parameter	Value
Distance measurement range	1000 m for a 1 m ² RCS target
Distance resolution	0.5 m for a 1 m ² RCS target
Operating frequency	76.5 ±0.5 GHz
Modulation	FMCW
Antenna scanning principle	Electronic
Field of view	0.4 degree
Angular resolution	0.01 degree
Output Interface	Ethernet, UDP

#2 FIXED BEAM RADAR SENSOR SDM-76 FOR ASSISTANCE IN SHUNTING OPERATIONS

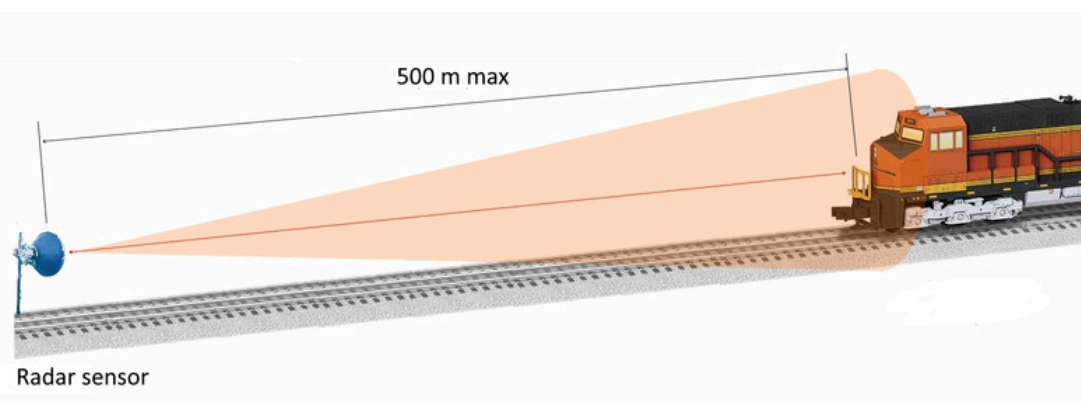


This loco-based SDM-76 radar (sensor) emits a high-frequency radio wave signal (e.g., at 76 GHz) in the direction the locomotive is moving. The radio wave signal travels through the air and reflects off any objects in its path, such as another locomotive, railcar, or any obstacle on the track. The reflected radio wave signal is detected by the radar, which then passes it to the onboard computer unit to calculate the distance from the locomotive to the obstacle.

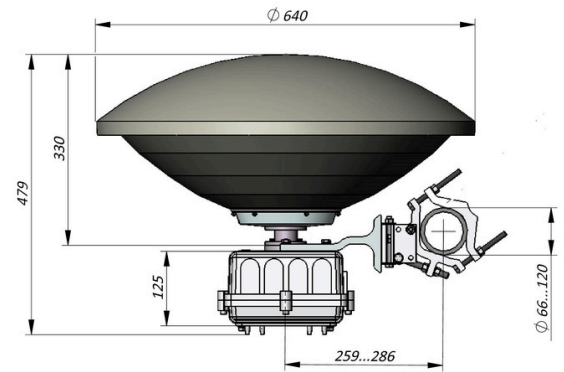
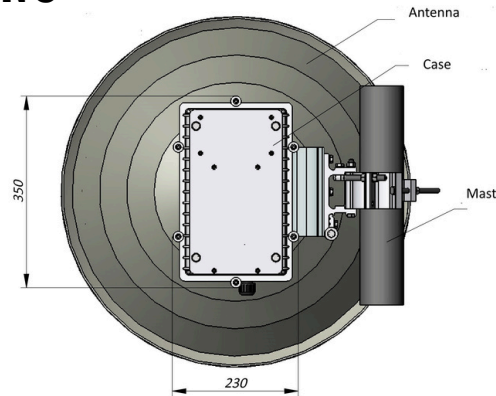
The locomotive's computer system uses this information independently or transmits data to the traffic control center to make braking decisions to avoid collisions and safely control the shunting operation.

#3 FIXED BEAM RADAR SENSOR SDM-76 FOR SUPPORTING TRAIN SAFETY AT THE DEAD END

- This SDM-76 radar is equipped with 60 cm diameter antenna. This ensures that the required radiation pattern of the antenna has a spot with a diameter of only 4.3 m at a distance of 500 m.
- The radar beam propagates strictly along the railway track and does not have false reflections from various objects in the rail infrastructure or other trains/cars located near the track.
- The SDM-76 radar sensor has update time of 200 ms. This is customizable parameter by request.
- The radar management software offers Ethernet interface, providing real-time speed and distance data to rail operator's control room or data center.
- The automatic braking procedure can be implemented if a train moves too fast toward the dead end.



FIXED BEAM RADAR SENSORS SDM-76 SPECIFICATIONS



Parameter

Distance measurement range
 The max distance measurement accuracy
 Detecting speed accuracy within 0-100 km/h
 Operating frequency
 Modulation
 Output power at sweep frequency modulation
 Antenna diameter
 Beam width
 - With Cassegrain antenna 600 mm
 - With Cassegrain antenna 300 mm
 Output Interface
 Measurements update time
 Consumed electrical power
 Management
 Environment protection
 Operational temperature
 Humidity

Value

1.5 – 500 m (dead end), 1.5 – 300 m (loco)
 ± 15 cm typical, ± 5 mm with responder
 0.5 km/h
 76.5 ± 0.5 GHz
 FMCW
 5 mW
 300 mm (for loco) or 600 mm (for dead end)
 0.42 degree
 0.9 degree
 Ethernet, UDP
 200 ms or TBR
 2×20 W / 24VDC
 SNMP v.2; ELVA Enterprise MIB; WEB
 IP-65
 -50 to $+60$ C / -58 to 140 F
 Up to 99%

