

SIL 3 and SIL 4 Fail Safe LC Obstacle Detector

This new Fail safe Level Crossing Obstacle Detection System is one of the first LCOD in the World that will **meet the Safety Integrity Requirements of SIL3 and SIL4** Level according to EN 50126, EN50128 and EN50129. This Obstacle Detection System have also an EU Patent Application EP 06113200.7 of GGRailAB.

The System consist of a 2 out of 2 (2oo2) Radar System or a high Available 2 out of 3 (2oo3) Radar System, mounted directly on the LC Barriers.

When the LC is closed the Barrier place the Radars with its supervision field in the middle of the road, over the Hazardous Area. When the LC is open, the Barrier place the Radar Fields in a Test position. The Testing is carried out by means of a Fixed Radar Target in the Radar Fields, every time the Barrier is in the upright Position.

The Radar System together with a UIC 736i, type C, Relay evaluation unit from GGRail AB, works also as a Supervision System of broken Barriers as well as a supervision unit of all the Radars on the Barrier and of the Function of the Relay unit.

Radar from Eaton® Corporation

Eaton® Corporation is one of the largest US Automobile Organisations with \$9, 8 Billon in Turnover 2004 and 58.000 employees. Eaton® Vorad® is a Pulse Radar System, Originally Developed to warn a Truck driver of Objects in the "Blind Spot" area. Vorad® is a well proven high Volume Product with over 70.000 Systems in use on Trucks and Buses world wide.

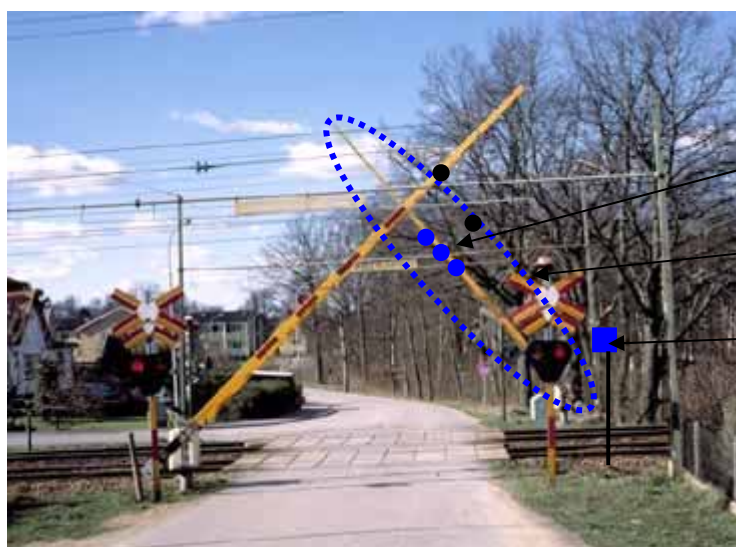
Eaton® Corp. Produce **Vorad®LC** Exclusive for GGRail AB in a Version with a lager sensing Area.

Vorad® LC from GGRail AB detects all Type of Objects lager than approximate 25 x25cm in a limited Area of maximum 8m x 14m, during **all Light and Weather Conditions**.

Vorad® LC can in the Supervised Area detect:

- Human and big Animal Objects (Not small Animals as Cats and Dogs and not small Children)
- All type of Road Vehicles.
- Obstacles as Rocks, Metal Objects, Wooden Objects greater than 25x25cm

Vorad®LC Radar Installation in an LC



Vorad®LC Radars on a Barrier

Radar Field 8m deep x14m wide

Test Object in upright Radar Field

Adress
GG Rail AB
Äspö 375
SE-231 99 Klagstorp

Telefon/Fax
+46-410-260 24
+46-70-576 66 00

Org-nr.
556662-3079
Internet
www.ggrail.se

Bank
SEB Malmö
E-post
gg@ggrail.se

Bankgiro
5760-2674

The Vorad®LC Radar



Specification of Vorad® LC Radar

- **Radar:** Maintenance free Pulsed RF Transmitter at 5.8 GHz, with EU approval
- **Power Supply:** 9-33V DC, 0.14A
- **Working Temperature Range:** From -40 deg C up to +85 grader C
- **Vorad® Radar:** Moulded Electronic, IP67, Size Ø133mm x 32mm, Weight 0.8kg
- **GGRail interface:** Moulded Electronic, IP67, Size 30x40mm, DIN Rail mounting
- **Output:** Failsafe Open (by Obstacle and Failure) Electronic DC Output of max 60V DC, 3A
- **Self Test:** Open Output during 5s after Power up if everything is OK.
- **Supervised Area:** 3 x 5 m, 120° Angle, or 8 x 14 m, 120° Angle.

Hazard Rates of Vorad®LC in 2oo2 and 2oo3 Configurations

2oo2

The Failure Rate of Hazardous Failure in a 2oo2 configuration were both fails at the same time is:

$\lambda_{2oo2} = 2 \lambda^2 * MTTR$ with $\lambda = 1.0E-6$ failure/hr and $MTTR = 50$ hrs **$\lambda_{2oo2} = 1E-10$ Failure/hr**

The disadvantage of 2oo2 is that the LC is not safe during the MTTR time of 50 hrs.

2oo3

The Failure Rate of hazardous Failure in a 2oo3 configuration were more than one fails at the same time is:

$\lambda_{2oo3} = 6 \lambda^2 * MTTR$ with $\lambda = 1.0E-6$ failure/hr and $MTTR = 50$ hrs **$\lambda_{2oo3} = 3E-10$ Failure/hr**

The advantage of the 2oo3 is that the LC is available at full safety even during the MTTR time.

Address

GG Rail AB
Äspö 375
SE-231 99 Klagstorp

Telefon/Fax

+46-410-260 24
+46-70-576 66 00

Org-nr.

556662-3079

Internet

www.ggrail.se

Bank

SEB Malmö

E-post

gg@ggrail.se

Bankgiro

5760-2674