

LxGuard-Level Crossing Protection System (LxPS)

Engineered for safety and Reliability

Kernex Microsystems (India) Limited developed a Level Crossing Protection System characterized by innovative design, an intelligent mix of modern technology, and safe working principles. Our Product, LxGuard is a Level crossing Protection system (LxPS) that is ideal for preventing Rail, Road Vehicle and pedestrian collisions at level crossings. It provides for fail-safe control and monitoring of level crossings. The system combines low installation and maintenance costs with high levels of flexibility, integrity, and reliability. Our fail-safe micro controller based Lx Control system is a highly-availability, modular system which can be easily adapted to the conditions of individual level crossings and customer specific requirements. It can be readily interfaced with existing infrastructure and signaling systems.

The system has been designed for crossings with low, medium, and high traffic volumes; it is also suitable for progressive onsite enhancements to suit virtually all levels of utilization of the rail and road corridors.



Salient Features

- State of the Art Intelligent Electronic Safety System
- Redundant Fail Safe Architecture with 2 out of 3 configuration .
- Modular structure for Hardware and Software
- High RAMS as per CENELEC STANDARDS
- Easy Interface with Existing Signaling and Interlocking systems.
- Does Not Interfere with Signal Cabin's Functioning
- Suitable for all types of Level Crossings
- Health status indicators
- Handheld remote configuration facility
- Self diagnostic features
- Low installation and maintenance costs
- Powerful Central monitoring system
- Train detection speeds of up to 250kmph

- Track occupation status can be taken from various types of inputs. (Wheel Sensor, Track Circuit inputs etc.)

Fully Automatic Lx Control System

Train approach and departure at the gate is automatically detected by Wheel Sensors connected to a Multi section Digital Axle Counter. When train approach is detected with the help of the Wheel Sensors placed at about 2kms distance from the Level crossing, the sensing system gives a control to the Electronic Control Module (ECM). Similarly, train departure is detected automatically and this information is also sent to the ECM. The ECM in turn provides the commands to perform Gate Closing & Opening sequences.

Gate Opening Sequence:

- a. Turns ON Advance Yellow Flashing Lights for Roads users
- b. Turns ON Red Flashing Lights, Bells, Train direction indicators for road users
- c. Lowering of the Electrical Barriers and Interlocking with the Track side Distant and Lx Protection signals to inform train driver

about Lx status.

Gate Closing Sequence:

- a. Turn OFF the Track side Distant and Lx Protection signals
- b. Lowering of the Electrical Barriers
- c. Turns OFF Advance Yellow Flashing Lights Red Flashing Lights, Bells, Train direction indicators for road users

The system will check its own health status to ensure its correct functioning. Status of the units will be continuously monitored and displayed on Control Panel. Information about the Open and Close status of the barriers, health status of the equipment, batteries and all the other field components are available on the Control Panel.

LxPS can be operated in three modes, viz.

- Full Automatic Mode
- Semi Auto Mode
- Manual Mode

In full automatic mode, all operations starting from train approach detection, gate closing sequence,

train exit detection and gate opening sequence are performed automatically.

In semi automatic mode, train approach and exit inputs are given manually by Signal Operator and the gate closing and opening sequences are performed automatically.

In Manual mode, each step in the gate opening and closing sequences can be activated by manual commands. In the rarest situation of total failure or non availability of power, the barriers can be lowered or raised manually, using a crank handle.

All major events shall be logged with date and timestamp.

Major Sub-modules of LxGuard

- **Electronic Control Module (ECM)**

Electronic Control Module is the heart of the LxPS consisting of triple redundant Micro controllers with '2 out of 3' voting logic to achieve high degree of safety, without sacrificing availability.

Upon receiving Train arrival information from Wheel Sensing System, ECM will initiate control output signals to perform gate closing sequence and gate opening sequence, In each state of the sequence, it performs interlocking function to ensure safety. In addition, it also interlocks with track side Distant and Lx Protection signals. ECM logs all the operational and Health status events with date and time stamp., which can be downloaded through HHU for analysis.

- **Multi Section Digital Axle Counter (MSDAC)**

The MSDAC comprises **double wheel sensors (DSS) mounted on the tracks and the amplifier and evaluating System installed in the Lx Cabin, inter connected through cables. MSDAC detects train approach and departure and pass on this information to ECM. As MSDAC can handle 4 / 6 / 8 / 10 sections simultaneously, same LxPS can handle twin LXs close by or LXs concatenated with stations.**

Double Wheel Sensors

The DSS consists of two galvanically isolated sensor systems that are independent of one another. The Double Wheel Sensors (DSS) well tried in thousands of applications are used in the MSDAC. The DSS enables direction dependent detection of rail wheels at the given point.

The DSS is connected to the assessment device (Evaluation equipment).

Beside the DSS no additional equipment is necessary on the track which makes the system maintenance friendly.

- **Control Panel**

The Control Panel gives the status of all important devices (viz. Red flashing lights, Advanced Yellow flashing lights, Main and supervisory signals, barriers) and status of other field equipment.

This unit also comprises of push buttons mounted on the panel for giving manual commands, which are controlled through a key-lock switch. Usage of the manual key to operate lights or barriers is possible only by the authorized personnel.

- **Motor operated Barriers**

These barriers are electro mechanical, made of Aluminum / FRP, robust and light in construction. The system consists of the following units

Pedestal: Consisting of Drive Mechanism, DC Series Motor, and Chain Drive etc.

Boom: Made of aluminum sheets in multiples of 2 meters length. The maximum length could be 12 meters.

Boom Resting Post: It is the place where the end of the boom rests.

- **Major Features:**

Modular design features with fewer movable parts. Each unit can be easily accessed and replaced if necessary. Each barrier has a weak point that is broken in case of crashing by a vehicle, thus preventing any damage to the barrier drive equipment. Counter weight suitable for each barrier boom length. The barrier drive is equipped with crank handle for manual operation. The boom barrier takes the horizontal position in case of disturbance in electrical circuits, or power supply interruption, automatically. Barrier boom lighting with flashing/steady lights.

Flasher Lights

Highly reliable LED based Twin Red flashing lights and Yellow Flashing light indicators provided at appropriate distance from the gate. These signals are placed on either side of the gate along the road side, to warn the road users regarding train approach.

Electronic Bell

Programmable Audio Alarm bell sound with a range of 200m with optional volume reduction during night time.

Hand Held Unit

Rugged Hand Held Unit (HHU) is provided to download the diagnostics data and wireless configuration of the Lx system parameters in the ECM via Bluetooth interface.

Remote Monitoring System (Lx Monitor)

Remote Monitoring System includes MIS reports, customized site and area maps, and others specified features.

Solar Panels

As an alternate power source, solar panels can be used to meet the needs of the Lx operation.

System Safety Specifications

MSDAC : SIL-4 and **ECM:** SIL₃ (In accordance with CENELEC Safety Standards)



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