

DUCATI energia

BCA2002

Axle-Counter System for Railway signalling

DUCATI Energia has designed the Axle-Counter System for railway signalling automatic block system and track circuit, named BCA2002, that merges, at design and application level, many recent hardware and software innovations, constituting an indispensable warranty for the plant efficiency and safety. The Axle-Counter System has been designed to fulfil all the requested functions for a Railway control and protection system, having besides a high flexibility to reach elevated performances in railway signalling field.

Project solutions

DUCATI Energia carried out an operative procedure, according to CENELEC railway standard application.

BCA2002 has been planned with a fault-tolerant and reconfigurable architecture, derived from national and international experiences concerning the optimal project of computerized systems for critical process controlling. This architecture consists of two computers that, beyond parallel-elaborating process data and inputs/outputs, performs cross checks on their intermediate states to check that all the operation phases are rightly performed. BCA2002 assures such high selfdiagnosis and operativity that, in case of any fault, guarantees train circulation safety. The Safety level is SIL4.



Axle-Counter System architecture

Different versions of BCA2002 can be configured, allowing the easy change from a configuration to another by upgrading software and hardware of single elements in the basic system. The BCA2002 DUCATI system is composed by the following elements :

- a) PCA (detector) and CE-PED (electronic box) near the track.
- b) CE-BCA2002 Equipment, in the interlocking, for elaborating data coming from CE-PED and for information Reception/Transmission with the corresponding Station.
 - The PCA (Axles Counting Place) is composed by a two electromagnetic sensors installed on the rail, sensible to the crossing of a metallic wheel on the rail. The sensors are electrically connected to the electronic box.
 - The CE-PED (Electronic box) is the unit where the sensors signals are elaborated and afterwards transmitted via optical fibre to the CE-BCA (Axle Counter Elaboration and Automatic Block information Reception/Transmission system).
 - The CE-BCA (Logic Unit), installed in the interlocking, consists of a single rack whose physical characteristics are properly studied to be installed in any technological room.

Axle-Counter System application scheme (SBA18 e SBA20 by RFI)

The BCA2002 system performs its functions by means of:

- 1) Liberation Keys actionable from both the stations, relevant to the block section managed with BCA (Tli e Tlc);
- 2) Exchange of Block-signalling information between the stations, relevant to the block section managed with BCA, to realize the safe data transmission (TDS) to send the request of consent and the subsequent consent, from a station to the other one, in order to change the automatic block direction, using only one couple of telecommunication cable.

Maintenance and Diagnostic

The system maintenance is very easy because it doesn't need any periodic calibration. The detector is equipped with an on-line diagnostic that reveals the calibration decay by means of a yellow alarm on the monitor. The diagnostic function is fulfilled by a maintenance Central Post. On the Central Post monitor is displayed the block section status, and the conditions of sensor, Tlc and Tli keys, block relations and board faults.

Trackside Elements

Wheels detector PCA consists of two independent sensors working with two different magnetic circuits resonant at 47 and 53 kHz, incorporated in dielectric material mounted on a C40 steel support fixed to the rail. The detector is provided with an ulterior steel protection against the hanging objects. The sensors are electrically connected to the electronic box (CE-PED).

Typical Characteristics of wheels sensors:

- Quick and precise mounting on the rail, without any drilling
- Complete absence of any other electronic components
- Only one annual check need;
- Wheel sensors in accordance with protection class IP67.



Trackside electronics

The trackside electronic box is located in an alluminium container, for environmental extreme conditions - 25°C,+ 75°C, protected in stainless steel. The connection to the Head of Automatic Block section CE-BCA, standing in the interlocking, is carried out with two cables, one in optic fibre for data transmission and one in copper for feeding, to obtain high immunity to the troubles, low attenuation and electronic simplification.



Head of Automatic Block section

The Head of Automatic Block section CE-BCA consists in two computers, each processes more activities simultaneously and it is continually compared with the other. The System has the capability of managing up to eight active detectors, it performs with sampling frequency of at least 10 kHz, while the DSP section clock is at 20 MHz and the microprocessor elaboration section frequency is 16 MHz. The block information data change between two adjacent Stations is carried out via integrated modem, at 9600 bps. All the Head of Automatic Block electronics and the interfaces with the interlocking are contained in a rack cabinet 19" – 6 units.

System Characteristics

- Power consumption for each Head of Block 100 Watt;
- Power consumption for PCA and CE-PED 40 Watt ;
- Supervision of track sections with no limit of a maximum number of simultaneous counting;
- Traversing speed of 0 to 360 km/h for open line and 0 to 150 km/h for track circuit inside the station;
- Distances of 10 km between wheel sensor and electronic box.
- Easy project planning of axle counting system;
- Fail safe data transmission between two CE-BCA Head of Automatic Block in compliance with EN50159-1;
- Compliance with EN50126 EN50128 EN50129 EN50122-1
- Compliance with UIC 790 R;
- Diagnostic on-line with comfortable diagnostics tools.

