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Date:	06 March 2010
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Module

Product Specification for Axle Counter Equipment

Endorsement and Authorisation

For endorsement and authorisation, please refer to NR/L3/SIG/30082

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Issue record

Issue	Date	Comments
01	March 2010	Initial issue

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 5th June 2010.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 4 to continue to comply with the Issue of any relevant Network Rail Standards current when GRIP Stage 4 was reached and not to comply with requirements contained herein, unless the designated Standard Owner has stipulated otherwise in the accompanying Briefing Note.

Reference documentation

See NR/L3/SIG/30082.

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1 Purpose

This standard details Network Rail's generic product specification for axle counter systems, in line with operational and safety principles. It is intended to provide generic requirements to suppliers and guide on best practice for the systems or features required by Network Rail applications, meeting the requirements of GK/RT0028. In this context the supplier may be the manufacturer or a combination of manufacturer and project contractor, e.g. signalling application designer.

A number of different system architectures are possible when using axle counters within a signalling system. This standard does not mandate a particular architecture but defines the functionality required from the overall axle counter system and the interface issues when incorporating this as part of the railway operation. The features forming the axle counter system (the product) that are defined and covered by this standard are shown within the circle in Figure 1. Some features of the required axle counter system operation may use, or require, equipment external to the product scope shown in Figure 1, e.g. certain evaluation functions such as restoration may be implemented within the interlocking equipment or via external relay circuitry.

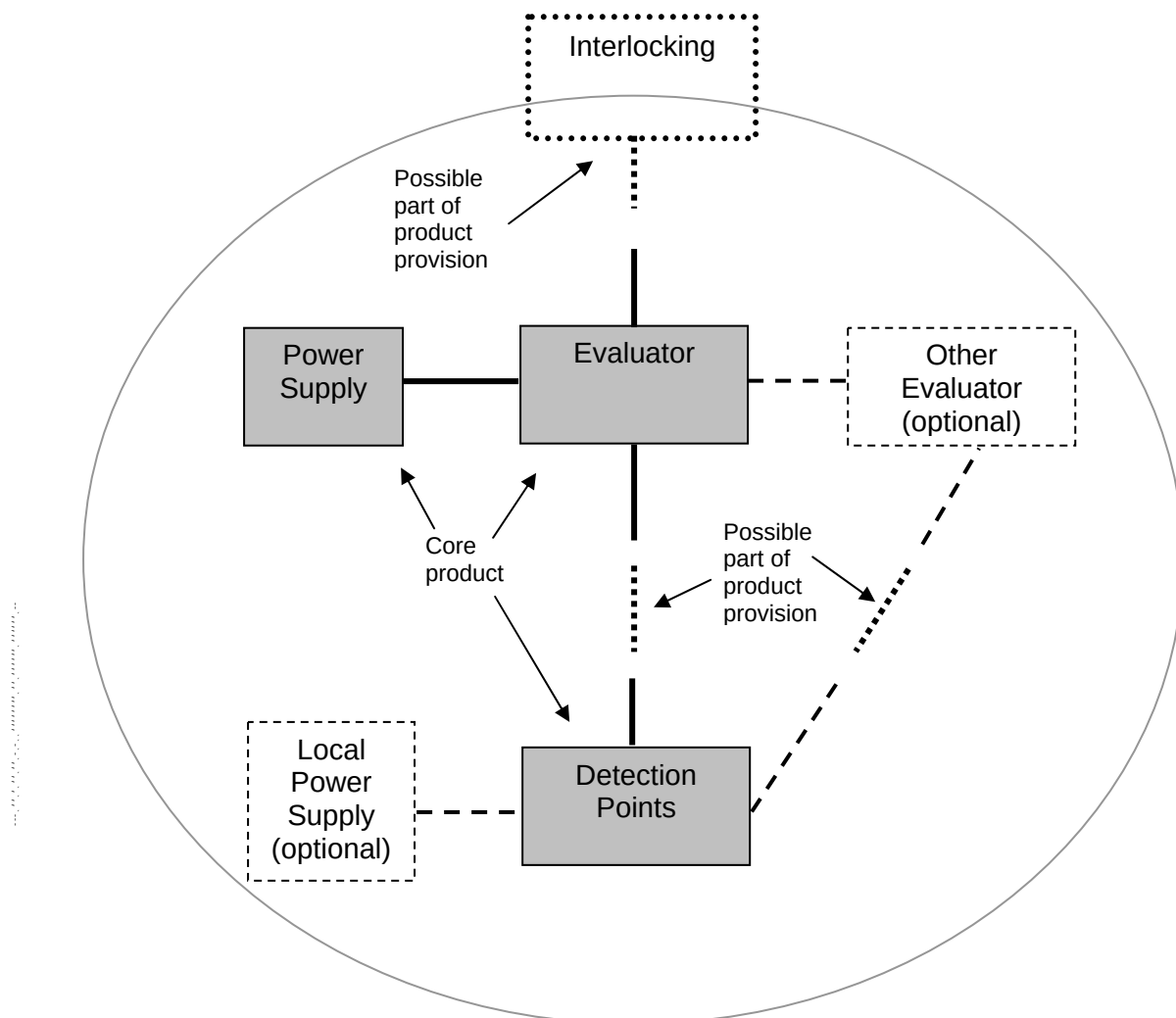


Figure 1 – Product Scope Covered By This Standard

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2 Product Functional Requirements

2.1 System Safety Performance

Any axle counter system shall meet the requirements of GK/RT0011 (or GK/RT0028 when published) and shall be able to replace the train detection functionality provided by an existing train detection system within an existing interlocking system.

2.1.1

The axle counter system is safety-critical and shall be designed to avoid failure modes that give rise to unsafe conditions (such as loss of train detection), including common mode failures. This shall apply to:

- Detection heads and other trackside equipment;
- Data transmission links;
- Evaluator equipment;
- Power supplies.

2.1.2

The Safety Integrity Level applied to the entire train detection system shall be SIL 4, as defined in BS EN 50129.

2.1.3

The frequency of wrong side failure per axle counter section shall be less than 0.001 failures per million hours, where wrong side failure is defined as a failure that causes the section occupancy status output to be 'Clear' when it should be 'Occupied' or 'Disturbed'.

2.1.4

Only axle counter systems with Network Rail product acceptance shall be used on Network Rail's managed infrastructure.

2.2 Health and Safety Issues

The design of the axle counter system and its components shall be such as to prevent contact with parts energised at 60V or above during normal installation, testing or maintenance operations.

NOTE The degree of protection afforded may take into account the training such personnel would have received and the duties they are generally required to perform.

2.2.1

Appropriate warnings shall be displayed where a door or access panel allows access to parts energised at 60V or above and no voltages higher than 110V shall be present on any accessible parts.

2.2.2

The design of the axle counter system shall prevent the build up of induced voltages or facilitate the safe removal of such voltages prior to maintenance.

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2.2.3

The design of the axle counter system shall minimise the risk of injury to staff from sharp edges or similar features.

2.2.4

The design of the axle counter system shall minimise the risk of injury to staff from tripping hazards.

2.2.5

The materials of which the axle counter system is constructed shall wherever practicable be fire retardant.

2.2.6

The materials of which the axle counter system is constructed shall be chosen so that if they are subjected to heat and flame they shall not emit any toxic products and the emission of smoke and fumes shall be minimised.

2.2.7

The axle counter system shall be designed to minimise the need for personnel to go on or near the line during installation, testing, commissioning, maintenance and fault finding.

2.2.8

Any equipment at the trackside shall not appear similar to any form of signalling indication to drivers of approaching trains.

2.2.9

No part of the axle counter system shall encroach upon the design kinematic envelope of rolling stock operating on Network Rail managed infrastructure.

2.3 Reliability, Availability & Maintainability

The axle counter system shall achieve a reliability of the track occupancy status at the interface with the interlocking function of no more than one failure per axle counter section per 100,000 hours.

NOTE This is for all failures, including electrical and mechanical failures, e.g. failure of rail fixings.

2.3.1

The axle counter system shall achieve an availability of the track occupancy status at the interface with the interlocking function in excess of 99.996% per axle counter section, excluding planned maintenance.

2.3.2

Equipment and systems shall be configured so as to optimise maintenance and fault finding, with due regard to safety of the system and staff working on or near the line and minimise disruption to normal working.

2.3.3

The Mean Active Repair Time (ARTMEAN) shall be no more than 1 hour from the maintainer commencing repair work (including diagnosing the cause of the fault) and the Maximum Active Repair Time (ARTMAX) shall be no more than 5 hours.

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2.3.4

The time required for maintenance of track-mounted equipment and the frequency of maintenance attention shall be minimised.

2.3.5

It shall be possible to monitor the condition of the axle counter system remotely.

2.3.6

The supplier shall specify and agree with Network Rail the methods to be adopted for the recording of axle counter system performance to enable assessment against the safety requirements and the reliability, availability and maintainability targets.

2.4 Lifecycle Features

The operational life of the axle counter system shall be no less than 20 years.

2.4.1

The supplier shall provide product support, including spares, for a period of 35 years from supply of the equipment and demonstrate to Network Rail how this is to be achieved.

2.4.2

The supplier shall produce a whole-life product strategy for Network Rail acceptance. This shall cover the supply and support of the axle counter system, including the maintenance philosophy, configuration control and the handling of hardware and software obsolescence.

NOTE The strategy should embody the requirements of GK/RT0210, mitigating all foreseeable failure modes. This may be supplemented by Network Rail and the supplier agreeing a suitable supply, maintenance or lifetime support contract to underpin the strategy.

2.4.3

The supplier shall provide an estimate of the whole life cost for the provision and operation of the axle counter system.

2.4.4

The operation of the axle counter system shall not be affected by the occurrence of any particular time or date.

2.5 Wheel Detection

Monitoring of the rail contacts associated with each axle counter section shall be continuous (and any interruption to the continuous monitoring shall cause that section to adopt the 'Disturbed' state until completion of the reset process).

NOTE The 'Disturbed' state should be internal to the axle counter system.

2.5.1

Once an affected axle counter section or sections have been set to 'Disturbed', they shall remain 'Disturbed' until successfully reset to 'Clear'.

2.5.2

The axle counter system shall detect all types of traction and rolling stock wheels as permitted by GM/RT2466.

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2.5.3

The axle counter system shall detect wheels of 350mm or more in diameter with a minimum distance between centres of 700mm travelling at speeds from 0 km/h to 300 km/h.

2.5.4

The axle counter system shall detect wheels moving in either direction past a detection point and determine their direction.

2.5.5

The axle counter system shall permit detection of wheels at each detection point to be performed at either rail.

2.5.6

The axle counter system shall detect a wheel stopped over the detection point, or if there is any movement about the detection point this shall not cause a miscount / failure.

NOTE If a system is unable to meet this requirement then siting of the detection point, as defined in NR/L2/SIG/30081, may be used as mitigation to minimise the likelihood of trains stopping over the detection point.

2.5.7

The axle counter system shall detect any misalignment of detection equipment in relation to the rail that compromises the integrity of wheel detection, placing the axle counter in the 'Disturbed' state until it is re-aligned and a reset is successfully completed.

2.5.8

The axle counter system shall detect either rail contact becoming completely detached from its mounting and adopt the 'Disturbed' state until the rail contact is correctly reinstated and a reset is successfully completed.

NOTE Possible reasons for the equipment becoming detached are:

- *Route crime (especially vandalism);*
- *Removal during rail replacement;*
- *Removal during the use of mechanised plant and machinery;*
- *Derailed vehicles;*
- *Failed detection point fixings.*

2.5.9

The axle counter system shall enter a 'Disturbed' state (and remain 'Disturbed' until a reset is successfully completed) whenever any anomalous, contradictory or indeterminate inputs are received preventing it from determining the actual state of a section or sections.

2.5.10

The axle counter system shall be designed to reduce, as far as practicable, susceptibility to invalid detection of objects other than wheels, e.g. maintainer's equipment.