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Railway Application - Command, Control and Signalling - Signalling Relays



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Foreword

An International Railway Solution (IRS) is a document drawn up by consensus and applied on a voluntary basis which aims to facilitate and harmonise railway operation.

IRSs are gradually replacing UIC leaflets.

Members of the International Union of Railways (UIC) participate in the creation of IRSs, of which they benefit in full. Furthermore, marketing to railway stakeholders contributes to the sharing and harmonisation of good practices, in accordance with UIC's primary goal.

While IRSs do not have the force of law, they are created and published in a professional manner and with technical approval on the basis of UIC procedures, and have full technical legitimacy in the railway sector.

The "General application" section constitutes the heart of the IRS and contains the working group's expertise applicable in the broadest manner. The addition of a "Specific application" aims to cover factors specific to a region, a type of service, etc.

Some provisions shall be implemented in all cases to ensure correct application and maintain the system's cohesiveness. Certain operational circumstances require that specific provisions be systematically applied by all users of the document.

For the purposes of understanding, the user acknowledges that the expression of:

- obligation indicates requirements to be respected in order to comply with the expertise expressed in the document (usually "shall");
- recommendation indicates options that are favourable but not essential (usually "should");
- permission indicates options that are recognised but without consequence (usually "may");
- capacity indicates possibilities from a technical standpoint and not permissions or probabilities (usually "can").

Obligation, recommendation and capacity can be expressed in the negative to indicate prohibiting, non-recommendation and incapacity.

If applicable, notably for the purposes of compliance with a UIC approval, passages that are recommended or mandatory for the cohesiveness of the system will be accompanied by the letters "R" and "MCS" respectively.

This IRS reflects the following UIC working group expertise:

UIC Signalling Expert Group (SEG), a permanent expert group of the UIC RSF Telecom & Signalling sector

It integrates in full or in part the following UIC leaflets:

- UIC Leaflet 736

It complements the following standards:

- none

The following IRSs constitute a complementary series:

- none

Executive summary

Relay based installations represent today the backbone of most railway signalling assets. Many experts believe that relay-based signalling installations will be in operation in most countries for much longer than 2030.

The use of relays in circuits with requirements regarding 'functional safety' demands an analysis of the associated risks. This includes faults or incidents to be considered using relays, possible consequences and potential hazards. A proven measure, that eliminates hazards or reduces them significantly, is the use of relays which comply with the functional requirements of *IRS 70736*. Another aspect to be considered is life cycle related recommendations provided by *IRS 70736*.

UIC Signalling Expert Group (SEG), a permanent expert group of the UIC RSF Telecom & Signalling sector, oversees *IRS 70736*. However, *IRS 70736* was written in a close collaboration with signalling experts of several railways & infrastructure managers.

Note: The UIC Technical Report "Use of Signalling relays" [2] provides information about hazards to be considered using relays which are effectively mitigated by the requirements defined and recommendations made in *IRS 70736*.

Field of application

IRS 70736 defines a set of requirements for direct current relays intended for functional safety related applications in railway signalling installations. The requirements focus on relay characteristics, their construction, the magnetic system, contacts and isolation matters.

IRS 70736 is applicable to monostable relays of type N and type C. However, it can also be used as a guide for other relay types such as bistable relays.

Note: *IRS 70736* does not define specific requirements for so-called "spring type relays", which are defined by *IEC 62912-2* [\[14\]](#).

Reference documents

The following documents are cited in this IRS or strongly support its requirements and recommendations:

1. UIC Leaflets

International Union of Railways (UIC)

- [1] *UIC Leaflet 736: Signalling relays*, 4th edition, 2004

2. Technical reports

International Union of Railways (UIC)

- [2] *UIC technical report: Use of Signalling Relays*, 1st Edition, 2018

Office for Research and Experiments (ORE)

- [3] *ORE Report A31: Study of signalling relay with a view to obtaining the longest life in service having regard to their physical dimensions*, Utrecht, 1962

3. European Standards

European Committee for Electrotechnical Standardization (CENELEC)

- [4] *EN 50124-1: Railway applications - Insulation coordination - Part 1: Basic requirements - Clearances and creepage distances for all electrical and electronic equipment*, 2017
- [5] *EN 50125-3: Railway applications - Environmental conditions for equipment Part 3: Equipment for signalling and telecommunications*, 2003
- [6] *EN 50578: Railways applications - Direct current signalling relays*, 2013

4. International Standards

International Electrotechnical Commission (IEC)

- [7] *IEC 60050: International Electrotechnical Vocabulary, Part 444: Elementary relays*, 2002
- [8] *IEC 60664-1: Insulation coordination for equipment within low-voltage supply systems - Part 1: Principles, requirements and tests*, 2020
- [9] *IEC 61508-x: Electronic functional safety package*, 2010
- [10] *IEC 61912-2: Low-voltage switchgear and controlgear - Over-current protective devices - Part 2: Selectivity under over-current conditions*, 2009
- [11] *IEC 62497-1: Railway applications - Insulation coordination - Part 1: Basic requirements - Clearances and creepage distances for all electrical and electronic equipment*, 2010
- [12] *IEC 62498-3: Railway applications - Environmental conditions for equipment - Part 3: Equipment for signalling and telecommunications*, 2010

- [13] *IEC 62912: Railway applications - Direct current signalling monostable relays of type N and type C*, 2015 - **Important: The existing IEC 62912 will be renumbered as IEC 62912-1 on the occasion of its next revision**
- [14] *IEC 62912-2: Railway applications - Direct current signalling monostable relays - Part 2: Spring type relays*, 2019

5. Miscellaneous

Book in German

- [15] *Bahnsicherungstechnik*, W. Fenner, P. Naumann, J. Trinkauf, 2004

Abbreviations and Symbols

EN	Europäische Norm / European Standard
IEC	International Electrotechnical Commission
IRS	International Railway Solution
NC	Normally Closed
NO	Normally Open
RSF	Rail System Forum
SEG	Signalling Expert Group

Concepts, terms and definitions

The subject of the glossary below is: vocabulary to describe IRSs

1. Armature

Moveable part of a relay that controls contact members.

2. Bounce time

For a contact which is closing/opening its circuit, time interval between the instant when the contact circuit first closes/opens and the instant when the circuit is finally closed/opened.

3. Break contact

Contact which is open when the relay is in its operate condition and which is closed when the relay is in its release condition.

4. Change-over contact

Combination of two contact circuits with three contact members, one of which is common to the two contact circuits; such that when one of these contact circuits is open, the other is closed.

5. Coil

A number of turns of insulated conductors connected in series and surrounded by common insulation, arranged to link or produce magnetic flux. Usually equipped with a soft-iron core.

6. Contact blade

Non-flexible part of the contact system, designed to operate the associated contact points.

7. Contact(s)

Agreement of contacts members, with their insulation, which close / open their contact circuit by their relative movement.

8. Contact force

Force which two contact members exert against each other at their contact points in the closed position.