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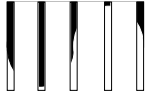
Øresund Railway System
EMC Specification for Rolling Stock
ØSK Document No. 95-R.0008-AC0637

rev. 3

This specification defines the administrative procedures and the technical requirements that are applicable when new types of rail vehicles are introduced on the Øresund Railway System, in order to maintain Electromagnetic Compatibility (EMC).

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1. Introduction

This specification defines the administrative procedures and the technical requirements applicable when new types of rail vehicles are introduced on the Øresund Railway System, in order to maintain Electromagnetic Compatibility (EMC).

The administrative procedures are outlined in section 3, Demonstration of Compliance. This section specifies how the Operator shall demonstrate and document that his vehicle meets the technical requirements.

The technical requirements are given in section 4, Interference Limits. This section specifies the maximum permissible levels of Electromagnetic Interference (EMI) emitted from the rail vehicles.

If a vehicle cannot meet some or all of these interference limits, then the requirements of section 5, Exceptions From This Specification, shall apply. A number of vehicles which were specified and designed before the issuance of this specification have a permission for operation based on a general exception in accordance with section 5. Please refer to Appendix 1.

2. Scope

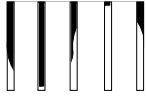
Vehicles

This specification, or the applicable parts thereof, applies to any type of rail vehicle intended for operation on the Øresund Railway System, including:

- Electrically powered locomotives and multiple units
- Diesel powered locomotives, multiple units, and service vehicles
- Passenger coaches, freight waggons, and service vehicles

Infrastructure

This specification applies to the complete electrically interconnected Øresund Railway System, i. e., from the neutral section in Lernacken in the east to the neutral section in Tårnby in the west, including the turn-around and service tracks at Kastrup.



3. Demonstration of Compliance

An Operator may base his Demonstration of Compliance with this specification on any combination of the following:

- Specific testing according to this specification
- References to previous testing performed elsewhere
- Calculations, simulations, and other theoretical work

3.1. Requirements on Testing

As a minimum, the following limit requirements shall be tested for, or references be made to previous tests:

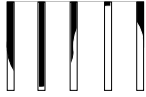
- DC currents, Normal Levels and Transformer Inrush Levels
- 77 Hz currents
- High frequency emissions according to EN 50 121
- Co-operation with other vehicles operating on the railway system, as defined in the standard QN 903 Q nr 0779 from the Danish National Railway Agency (Banestyrelsen)

3.2. Documentation

The Operator shall document his Demonstration of Compliance in a Compliance Report. All applicable requirements 4.1 to 4.3 in section 4 of this specification (Interference Limits) shall be addressed by the report.

3.3. Independent Assessment

All parts of the documentation which is not written specifically for the actual Compliance Report (e. g., in the case of re-use of already existing material), must be assessed by a competent assessor. The assessors report must be included in the Compliance Report.



4. Interference Limits

4.1. International Standards

The vehicle must comply with all relevant legislation and international standards, such as EN (ENV), IEC, and UIC.

Additionally, compliancy with relevant prEN standards should be aimed for.

4.2. Danish Standards for 50 Hz Operation

The vehicle must comply fully with the standard QN 903 Q nr 0779 from the Danish National Railway Agency (Banestyrelsen), however with the following modifications:

<i>Maximum line current harmonics</i>				
Section in QN 903 Q nr 0779	Frequency and time duration	Per train, consisting of 2 locomotives or 3 or more trainsets in multiple operation	Per individual locomotive, or 2 trainsets in multiple operation	Per individual trainset
D	150 Hz, > 1 s	10 A	5 A	3.5 A
G2	250 Hz, > 1 s	6 A	3 A	2 A
H	350 Hz, > 1 s	4 A	2 A	1.5 A
	450 Hz, > 1 s	3 A	1.5 A	1 A
	550 Hz, > 1 s	2 A	1 A	0.7 A
	650 Hz, > 1 s	2 A	1 A	0.7 A



4.3. ATC Systems

The following ATC systems are installed within the Øresund Railway System:

- Type Adtranz EBICAB 700 from Peberholm to Lernacken.
- Type Siemens ZUB 123 from Tårnby to Peberholm

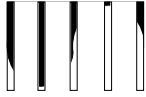
Conditions

The requirements on compatibility with the ATC systems apply at the following conditions:

- At any location of the vehicle
- At any number of other vehicles within the system. It can be assumed that all other vehicles meet the requirements.
- At any time
- At any operation mode, including Transformer Inrush, opening of the main circuit breaker, and other transient events

Requirements

The vehicle must not cause the ATC systems to malfunction in any way.



5. Exceptions From This Specification.

If a vehicle is demonstrated to meet the requirements of this specification, it is considered to be electromagnetically compatible with the infrastructure on and around the Øresund Railway System, and with the vehicles which already have a permission to operate.

However, it is acknowledged that it might also be possible to demonstrate total system compatibility even with a vehicle which does not meet this specification. In such a case, it is the responsibility of the Operator to demonstrate total system compatibility.

It can also be possible to obtain a limited permission to operate non-compliant vehicles in the case of specific events, e. g., test-runs or exhibitions. In such a case, it is the responsibility of the Operator to take the necessary procedural and other actions in order to minimize the risks.



6. Appendix 1. General Exceptions, Already Existing Vehicles

The following already existing types of vehicles were specified and designed in accordance with EMC specifications from DSB and Banestyrelsen, i. e., before the present specification was issued. Consequently, it cannot be formally guaranteed that these vehicles meet all parts of the present specification.

However, analysis and testing during the design and commissioning of the Øresund Link have demonstrated that these vehicles are compatible with the electrical systems on and around the link.

In accordance with this, these vehicles have a general permission for operation on the Øresund Link, in accordance with section 5 of the present specification.

Operator	Vehicle type	Comments
DSB	MF diesel multiple unit (a. k. a. IC3)	
SJ	Y2K diesel multiple unit	
DSB	EA, electric locomotive	Not allowed for operation on the Coast-Coast section.
DSB	ER, electrical multiple unit (a. k. a. IR4)	Not allowed for operation on the Coast-Coast section
DSB	MY, diesel locomotive	Operation on the Coast-Coast section is restricted
DSB	ME, diesel locomotive	Operation on the Coast-Coast section is restricted
DSB	EG, dual-system electric locomotive	
DSB/SJ	ET, dual-system electrical multiple unit (a. k. a. OTU)	
DSB/SJ	X2K, dual-system electric locomotive	