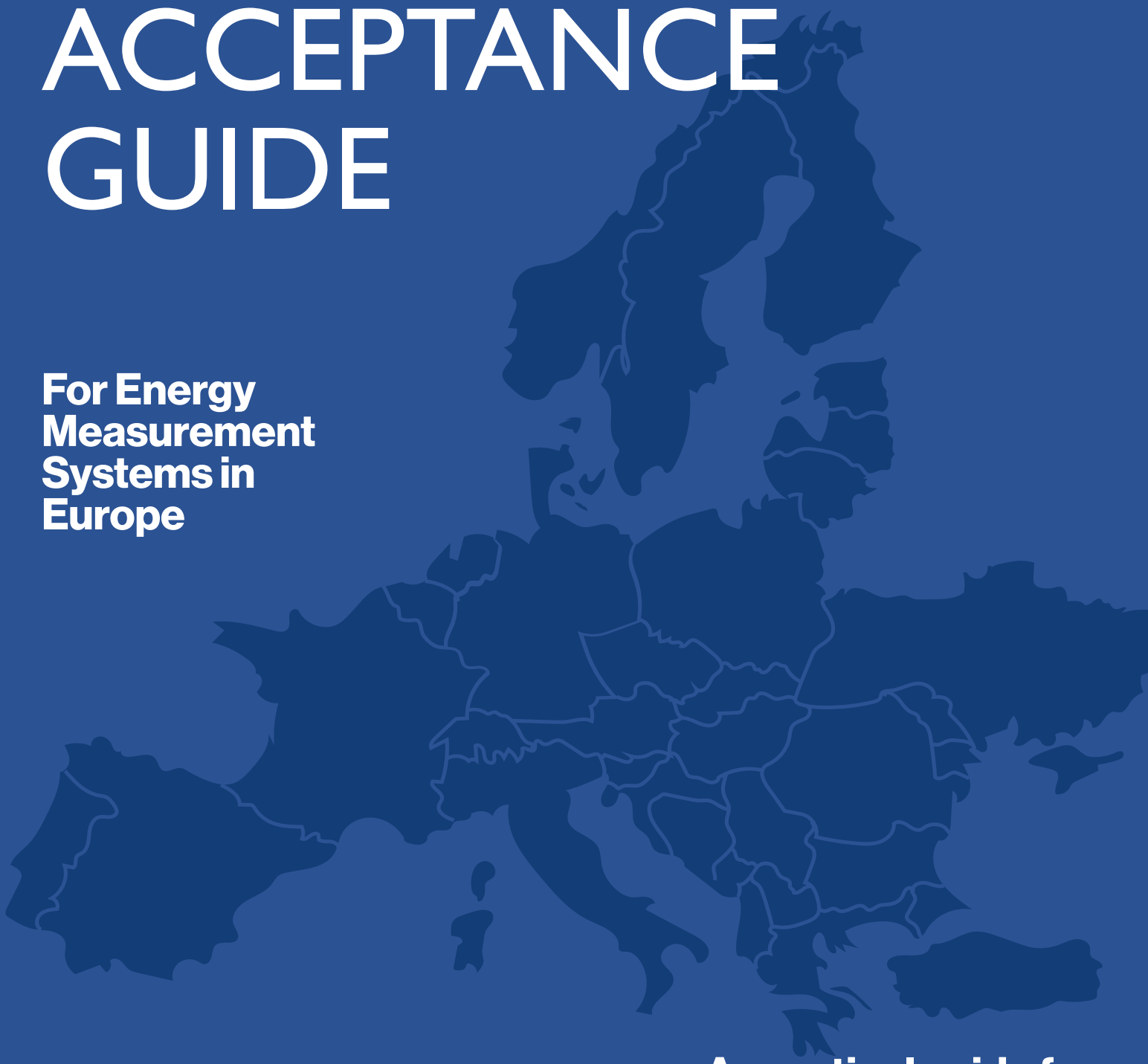
JUNE 2026

CROSS ACCEPTANCE GUIDE

For Energy Measurement Systems in Europe



A practical guide for Railway Undertakings, Infrastructure Managers and Vehicle Keepers

Foreword

This document is based on the work of the UIC IRS 90930 working group and the cross acceptance working group in Eress.

The IRS 90930 leaflet provides a concise overview of the documentation required to obtain authorisation for a new Energy Measurement System (as defined in EN 50463) to be used for energy billing.

It covers four approval methods (A–D), determined by TSI compliance status and maintenance plan availability, and recommends usage of the cross acceptance documentation package for each approval method (A-D).

Target Audience
- Railway Undertakings (RUs)
- Infrastructure Managers (IMs)
- Vehicle Keepers (VKs)
- Entities in Charge of Maintenance (ECMs)

DISCLAIMER
THIS DOCUMENT HAS BEEN PREPARED BY ERESS FOR INFORMATIONAL AND REFERENCE PURPOSES ONLY. IT SHOULD NOT BE INTERPRETED AS BINDING GUIDANCE OR AS ESTABLISHING ANY ADDITIONAL OBLIGATIONS.

TABLE OF CONTENTS

CHAPTERS

1. Purpose & Scope 4

2. Abbreviations 8

3. Requirements 10

4. Regulation 12

5. Decision Tree 14

6. Methods 15

7. Cross Acceptance Package 16

8. Assurance of Quality Design and Installation 18

9. FAQ 19

REFERENCES 20

SCOPE & PURPOSE

This guide outlines the documentation required to obtain authorisation for an energy measurement system (EMS) installed on a traction unit (TU) to be used for energy billing. Approval happens in two stages:

First, a Notified Body (NoBo) assesses the EMS for conformity with the applicable TSI requirements, and the National Safety Authority (NSA) issues the vehicle authorisation. It is also possible that on older non-TSI compliant vehicles the conformity assessment body verifies the compliance only towards EN 50463. Deviations shall be explicitly mentioned.

Second, the Infrastructure Manager (IM) or settlement body of each network accepts the EMS for billing on that network, confirming that its measured data may be used as the basis for energy settlement.

This guide also explains the structure and use of the cross-acceptance document package, which supports reuse of this evidence across IM's so that an EMS already accepted on one network can be accepted on others without full reassessment.

It applies to all traction units seeking such authorisation, whether they are TSI-compliant or operated under national rules, and is intended for Railway Undertakings (RU), Infrastructure Managers (IM), Vehicle Keepers (VK) and Entities in Charge of Maintenance (ECM).

Here you will find

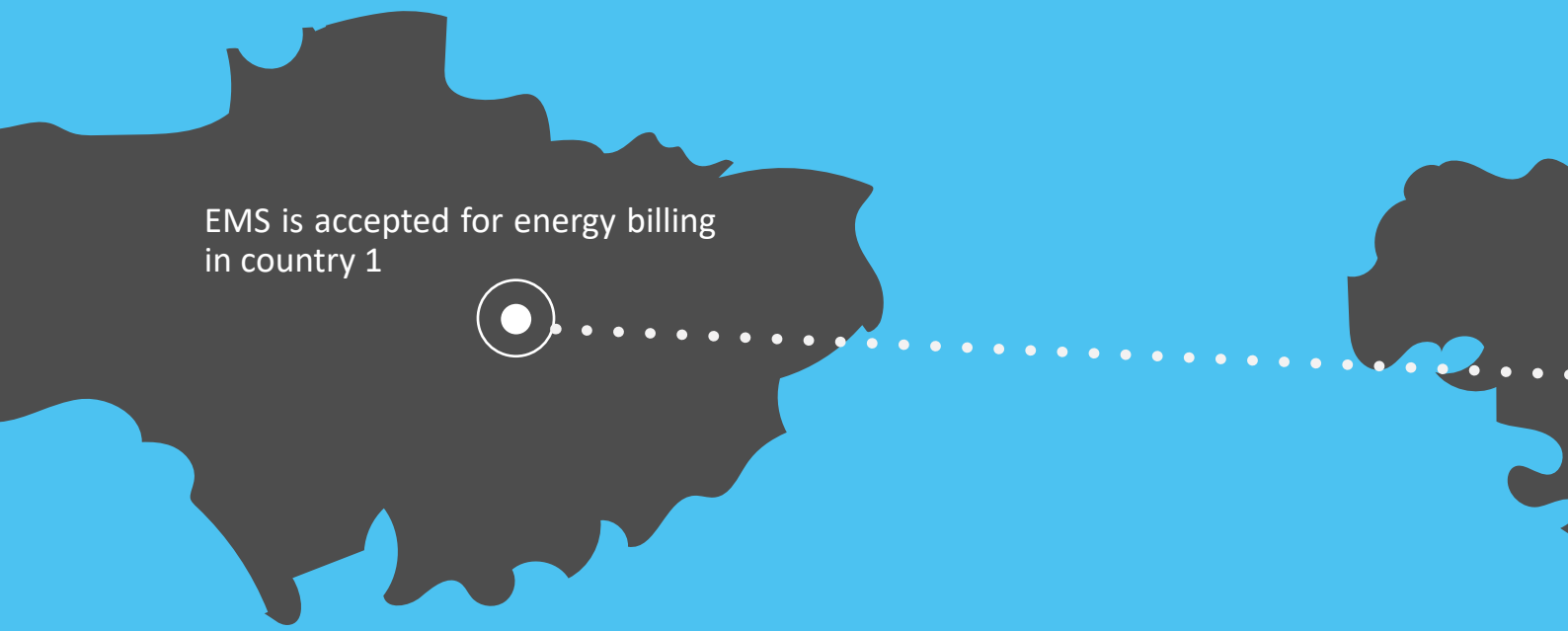
How an approval for an energy measurement is granted

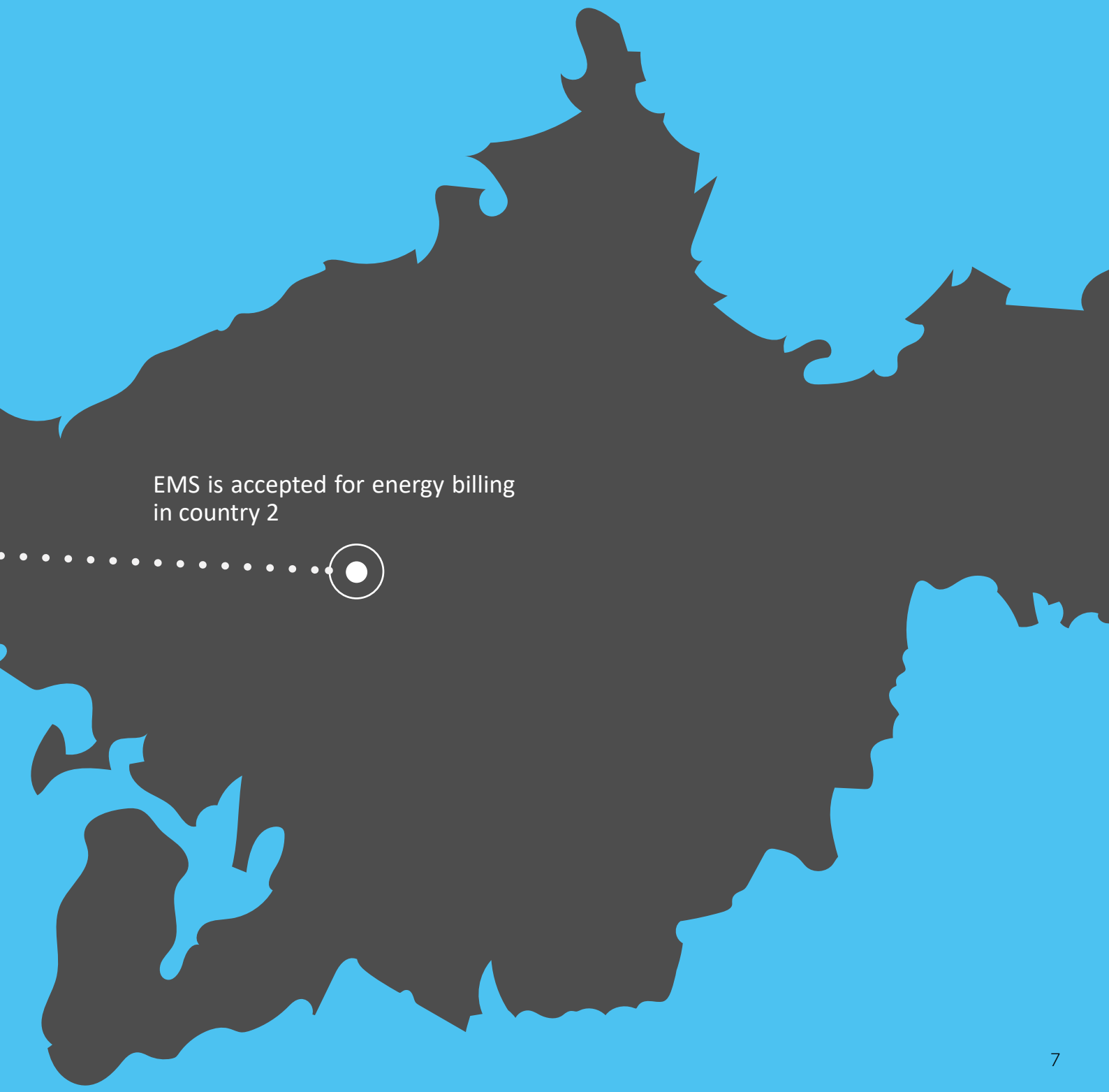
How an infrastructure manager validates and accepts an Energy Measurement System (EMS) for billing

How this acceptance can be reused by other infrastructure managers without requiring a full reassessment

Cross-accepting Energy Measurement Systems in diverse countries in Europe

AN EMS USED FOR BILLING IN COUNTRY 1, COULD BE USED IN COUNTRY 2




EMS is accepted for energy billing
in country 2

2. ABBREVIATIONS

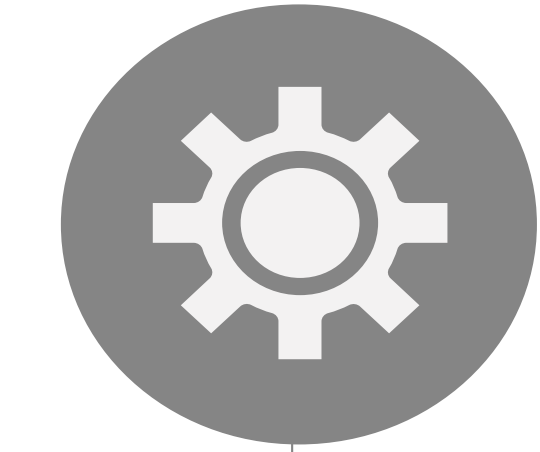
EMS	Energy measurement system – the onboard system measuring traction energy consumption
TU	Traction unit – locomotive, motor coach or train-unit
TSI LOC&PAS	Technical Specification for Interoperability – Locomotives & Passenger Rolling Stock
NoBo	Notified Body — independent organisation designated to perform conformity assessment under EU regulation
NSA	National Safety Authority — issues vehicle authorisations
DCS	Data Collecting System — ground side system that collects energy data from EMS
EMF	Energy Measurement Function (EN 50463 Part 2)
DHS	Data Handling System (EN 50463 Part 3) — onboard data handling and communication
ECF	Energy Calculation Function — derives energy from current and voltage measurements
ECM	Entity in Charge of Maintenance – a designated body responsible for vehicle maintenance

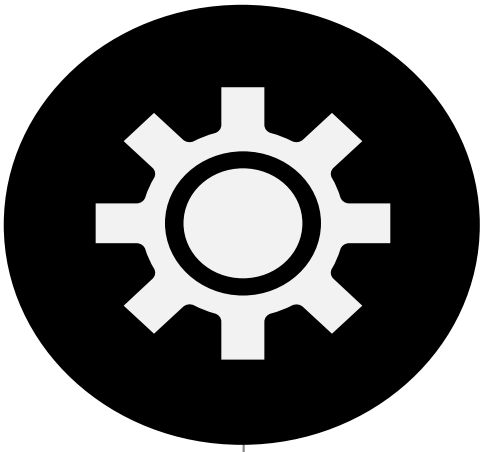
CPID	Consumption Point Identification – unique identifier for billing
SB SD SF	Verification modules defined in TSIs and applied by Notified Bodies (NoBos) to assess conformity with EU regulation:
	SB — EC type examination (design phase; NoBo reviews technical design)
	SD — Conformity based on QM (Quality Management) of the production process (ISO 9001-type production QMS (Quality Management System))
	SF — Conformity based on product verification (NoBo tests each product or statistical sample)
	For EMS, the typical combination is SB + SD
IRS 90930	UIC International Railway Solution defining the framework for exchanging traction energy consumption data

3. REQUIREMENTS FOR

Every approval is built on these 3 fundamental pillars or requirements.

These apply regardless of the approval method chosen:





Pillar 1

EMS COMPLIANCE
With TSI LOC&PAS

The Energy Measurement System on the traction unit must meet TSI LOC&PAS requirements.

Verified by the EC Verification of Conformity on the type and EC Declaration of Conformity on each Vehicle.

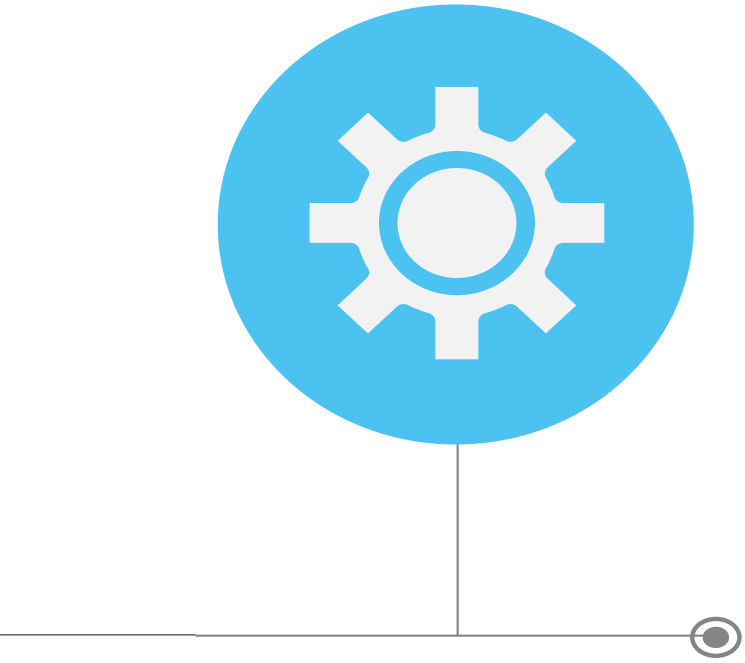
Pillar 2

QUALITY OF INSTALLATION
Certified Workshop

Installation and commissioning performed under an approved quality system.

Evidence by installation type test and routine test reports.

APPROVAL



Pillar 3

PROPER MAINTENANCE
Adequate Plan

An Entity in Charge of Maintenance keeps the EMS within required accuracy over its lifetime.

Periodic verification procedures ensure calibration stays valid throughout operation.

TSI LOC&PAS (all versions since 2018), point 4.2.8.2.8.1 (9), requires that maintenance documentation includes periodic verification procedures to ensure the required accuracy level of the EMS during its lifetime.

4. REGULATION

The following timeline summarises the main regulations and standards relevant to EMS approval and the cross-acceptance document package.

It shows their role in defining technical, conformity-assessment, and maintenance requirements for traction units used for energy billing.

2012

EN 50463:2012

Legacy EMS standard

First standard for EMS installed on board of traction units. Introduced energy measurement but lacked data transmission specifications. Still valid for pre-2018 installations.

2014

Reg. (EU) 1301/2014

ENE TSI base regulation

Base regulation for energy. This TSI defines the DCS, the data collecting system on ground. Initial version had an open point for EMS communication protocols.

2014

Reg. (EU) 1302/2014

LOC&PAS TSI base regulation

Base regulation for locomotives & passenger rolling stock. This TSI defines the EMS requirements and refers to EN 50463. Initial version had an open point for EMS communication protocols.

2017

EN 50463:2017

Current EMS standard

Closed open point on communication. Defines EMF, DHS, communication protocols and conformity assessment (Parts 1–5). Required for TSI compliance since 2018. Harmonised standard cited in the Official Journal of the EU.

Timeline: EN 50463:2012 → TSI 1302/2014 → EN 50463:2017 → Reg. 2018/868 (makes EN 50463:2017 mandatory) → IRS 90930 (handling of energy data

2018

Reg. (EU) 2018/868

EMS amendment to LOC&PAS

Closed the open point on communication between LOC&PAS TSI and ENE TSI. Mandates EMS on all new, renewed and upgraded rolling stock. Text is revised, including explicit requiring maintenance documentation. References EN 50463:2017. Introduced the CPID requirement. Transition period for DCS ended 1 January 2022.

2019

Implementing Regulation (EU) 2019/779

Establishes the ECM certification framework relevant to maintenance responsibilities.

2020

UIC IRS 90930

DCS specification

Detailed requirements for Data Collecting Systems (DCS). Defines communication protocols between exchange functions of settlement systems in different countries. Basis for CP approval process described in this IRS.

2023

Reg. (EU) 2023/1694

LOC&PAS revision

Amendment to LOC&PAS TSI that permits to keep existing sensors on retrofitting as part of EMS.

2025

Reg. (EU) 2025/675

Latest LOC&PAS revision

Current consolidated LOC&PAS TSI.

on ground, Oct 2020) → Reg. 2023/1694 (adds retrofitting) → Reg. 2025/675 (current consolidated LOC&PAS TSI)

5. DECISION TREE

Which Method Applies?

This section provides a decision tree for determining the applicable method for EMS billing approval. It is based on EMS compliance and the adequacy of the maintenance plan and shows when a cross-acceptance package is recommended.

* You can find the Installation routine test summary at https://eress.eu/library/library/

6. METHODS

Method A – TSI-compliant TU with adequate maintenance plan

This is the preferred and most straightforward path. The traction unit has full TSI conformity and the ECM provides an adequate maintenance plan for the EMS.

- **Validity:** Unlimited (no periodic re-submission required)
- **Documents:** EC Verification of Conformity (per type), EC Declaration of Conformity (per vehicle), proof of maintenance plan that all EMS components always have a valid calibration
- **Cross-acceptance package:** Installation type test report and installation routine test report (Page 1 required)

Method B – TSI-compliant TU without adequate maintenance plan

The TU meets TSI requirements, but no adequate maintenance plan is available. Approval is temporary and linked to the calibration period of the EMS.

- **Validity:** Temporary – until calibration expires (EMS components shall have a valid calibration)
- **Documents:** EC Verification of Conformity (per type), EC Declaration of Conformity (per vehicle), installation type test report, installation routine test summary (on first installation and on every reverification)
- **Cross-acceptance package:** Installation type test report and installation routine test report (Page 1 and 5 required)

Method C – Non-TSI TU with adequate maintenance plan

The traction unit is not TSI-compliant (e.g., legacy vehicle or national-only approval). However, the ECM has established a proper maintenance plan for the EMS.

- **Validity:** Unlimited (no periodic re-submission required, provided maintenance plan is followed)
- **Documents:** Assurance of Quality Design and Installation (see Chapter 8), installation type test report, installation routine test summary, proof of maintenance plan ensuring that all EMS components always have a valid calibration
- **Cross-acceptance package:** Installation type test report and installation routine test report (Page 1 required)

Method D – Non-TSI TU without adequate maintenance plan

The TU is neither TSI-compliant nor covered by a maintenance plan. Approval is temporary with the most documentation requirements.

- **Validity:** Temporary – until calibration expires (EMS components shall have a valid calibration)
- **Documents:** Assurance of quality design and installation (see Chapter 8), installation type test report, installation routine test summary (on first installation and on every reverification
- **Cross-acceptance package:** Installation type test report and installation routine test report (Page 1 and 5 required)

7. CROSS ACCEPTANCE

The Cross-Acceptance Package is a set of documents designed to facilitate the mutual recognition of EMS approvals across different railway networks and countries. When a traction unit operates on multiple networks (e.g., cross-border services), each network typically requires its own verification of the EMS. The Cross-Acceptance Package eliminates the need for full re-assessment by providing a standardised set of evidence that demonstrates compliance.

Why Cross-Acceptance Matters

- Reduces administrative burden when registering traction units on additional networks
- Avoids costly and time-consuming duplicate testing campaigns
- Provides a standardised evidence format that all participating networks can evaluate
- Supports the European goal of interoperable rail transport and seamless cross-border energy billing
- Applicable to all four methods (A–D)

7.1 Installation Type Test Summary

The Installation Type Test Summary is a comprehensive technical report that documents the results of type-level testing performed on the EMS installation design. It is created once for a given installation type and serves as the foundational evidence that the EMS design meets all applicable requirements.

Key Contents of the Type Test Summary:

- **General information on type test:** Who performed test? When? Based on what requirement? Are there deviations created once for a given installation type and serves as the foundational evidence that the EMS design meets all applicable requirements. found? Is there a Maintenance Plan? Also, the contacts of all relevant parties are added.
- **EMS equipment type:** Description of most relevant data on EMS, sensors, ECF and DHS. This also includes the reverification requirements.
- **Traction Unit Type:** Description of most relevant data on the Traction Unit Type.
- **Type Test Certificate:** A summary certificate issued by the testing body confirming that the installation type meets all requirements. This certificate references the detailed test reports.

7.2 Installation Routine Test Summary

The Installation Routine Test Summary is a per-vehicle report that confirms the specific EMS installation on an individual

Documents in the Cross-Acceptance Package

Document	Scope	Frequency
Installation Type Test Summary *	Per installation design / EMS type	Once per type (covers all vehicles of same design with EMS of same equipment type)
Installation Routine Test Summary *	Per individual vehicle	After physical installation of an EMS, reverification or component replacement

* You can find the Installation Type Test and Routine Test Summaries and at https://eress.eu/library/library/

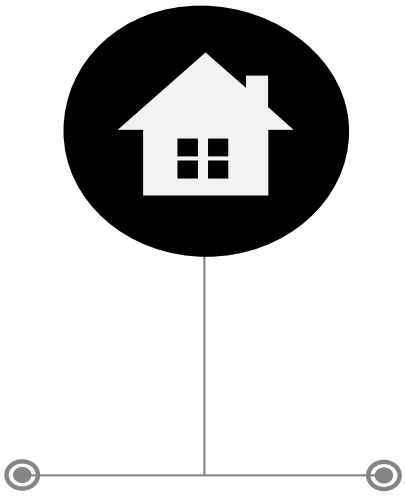
PACKAGE

traction unit has been correctly performed and meets the required standards. Unlike the type test (which validates the design), the routine test validates each physical installation.

Key Contents of the Installation Routine Test, Summary:

- **Identification:** Defining CPID (identification of the consumption point), the EMS equipment (manufacturer, EMS equipment type, serial number and calibration date) and the report type (e.g. first installation or component replacement).
- **Installation Verification:** Is the EMS equipment type defined in the Type Test installed? (no deviation allowed). Includes checks on wiring cross-section and laying, sensor placement, and mechanical fixation.
- **Commissioning Tests:** On-vehicle functional tests performed after installation to verify that the EMS powers up, establishes communication with all subsystems, and begins recording correct energy data in the right direction.
- **Communication Interface Check:** Verification that data transmission between the EMS and external systems (e.g., data collection systems, ground infrastructure) functions correctly and data can be processed by the DCS.
- **Detailed information:** Manufacture, type, serial number and calibration date for sensors (only needed for EMS not included in ECM maintenance plan).

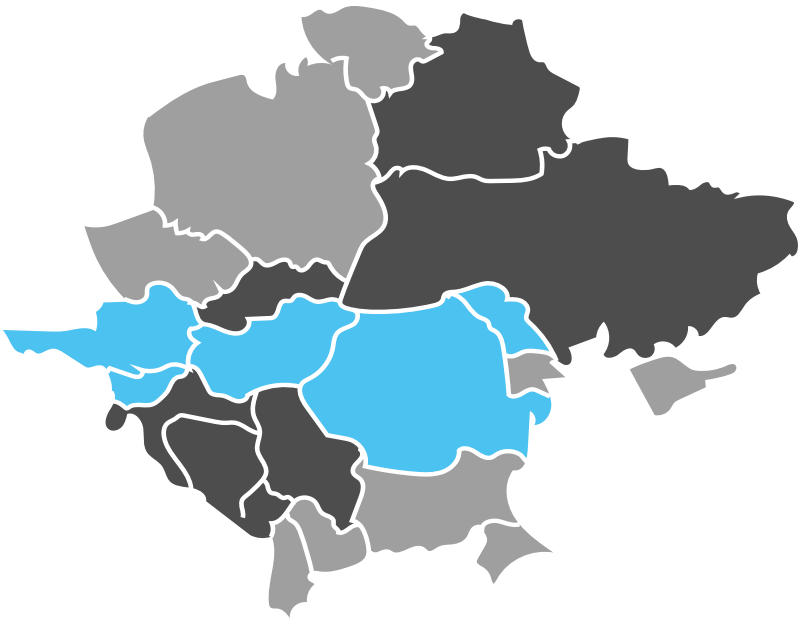
8. ASSURANCE OF QUALITY DESIGN AND INSTALLATION



Quality of Design and Installation is assured through conformity assessment procedures. Those procedures are composed of one or two sub procedures, called conformity assessment modules. A conformity assessment procedure covers both design and production phases; while a module may cover either one of these two phases (in this case a conformity assessment procedure is composed of two modules) or both (in this case a conformity assessment procedure is composed of one module).

In the approval process for measuring equipment, the most common combination used is the SB module (design examination) and the SD module (quality management); for smaller production runs, the SB (design examination) and SF (product verification) modules are also used. Other modules are also possible.

A certificate is issued by an authorized organization, such as a Notified Body.



9. FAQ

Can I upgrade from Method B to Method A?

Yes. Once an adequate maintenance plan is established and submitted, the approval can be upgraded to Method A with unlimited validity.

Is the Cross-Acceptance Package mandatory?

No, it is optional. However, it is strongly recommended for traction units operating across multiple networks, as it significantly reduces administrative effort for re-approval of all documents in different countries.

What happens if my calibration expires under Method B or D?

The EMS approval lapses. You must recalibrate the EMS and resubmit the relevant documentation to maintain billing authorisation.

Who is responsible for providing the maintenance plan?

The Entity in Charge of Maintenance (ECM) is responsible for establishing and providing the maintenance plan for the EMS.

REFERENCES

UIC IRS 90930:2020 – Traction Energy Settlement and Data Exchange

Commission Regulation (EU) No 1301/2014 – ENE TSI

Commission Regulation (EU) No 1302/2014 – LOC&PAS TSI

Commission Implementing Regulation (EU) 2018/868

Commission Implementing Regulation (EU) 2019/779

Commission Implementing Regulation (EU) 2023/1694

Commission Implementing Regulation (EU) 2025/675

EN 50463-1 to 5:2017

We would like to thank Eress Technical Experts for the content of this 2026 edition.

Content

Bart Van der Spiegel (Infrabel, Belgium),
Daniel Widmer (SBB, Switzerland) and
Gregor Hribar (Prorail/Eastvision, The Netherlands)

Edition

Adrian Peter (Visionite, Switzerland)

Design

Ina Wiik and Claudia van Diermen Jacobsen
(Eress, Norway)

For more information visit www.eress.eu

eress

Partners
Switzerland
Finland
Belgium
Denmark
Sweden
Norway
The Netherlands
Spain
Luxembourg
Portugal