Guidelines for qualitative measurement and settlement of energy

Conformity Assessment Guidelines V 2.0

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In memory of Bjørn Lysne for all his contribution to the content and figures of this booklet.

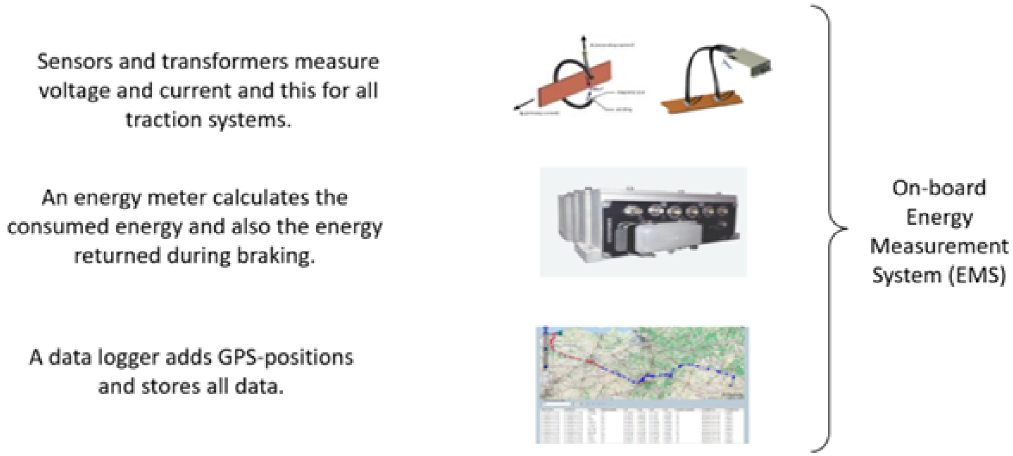
INTRODUCTION

Eress is a European partnership between Infrastructure Managers to settle the energy consumption of trains on their networks.

To enable correct defining the energy consumption of trains, the Europe Union has created a legal framework referring to a European standard defining the needed metering equipment on-board trains.

The full process is complex. With this document, Eress wants to help the sector in better understanding the process needed to enable the qualitative measurement and settlement of energy on trains running through Europe.

Figure 1: Energy Measurement Systems are installed on-board of trains



The Energy Metering Data is transmitted from an EMS to a Data Collecting System (DCS) on ground and further processed in one or more Settlement Systems.

Settlement has 3 major functions:

1. Exchange allocates consumption to the country where the consumption took place. The GPS positions in the data are used for this. Data consumed in other countries is distributed to the correct Settlement Systems.

2. The Energy Metering Data is validated by comparing it with other data (e.g. Train Run Data). Estimations are made to replace missing data.

3. The consumptions are allocated to the correct end user and distributed to the correct actors in the energy market.

After the ‘normative reference’ and the ‘terms and definitions’ pages, this document focuses on the 7 major steps in the process needed to guarantee qualitative energy measurement and energy settlement.

Please contact Eress for further questions: eress@banenor.no

Please consult the most recent version of this document on eress.eu/guidelines.

NORMATIVE REFERENCE

EC/2018/868	Commission implementing regulation introducing the most recent version of LOC&PAS TSI and ENE TSI. A TSI (Technical Specification for Interoperability) is a document that lists the essential requirements for a particular subsystem, e.g., rolling stock or infrastructure. These TSIs can be found on www.era.europa.eu The LOC&PAS TSI is the Technical Specification of Interoperability (TSI) dealing with the rolling stock subsystem. The essential requirements for an Energy Measurement System are part of this TSI. The ENE TSI deals with the energy subsystem. The essential requirements for the Data Collecting System on ground are part of this TSI. The commission implementing regulation includes the three major functions of Settlement.
EN 50463:2017	European Standard published by CENELEC. The EN 50463 has more detailed requirements: EN 50463-1: system level requirements and common device requirements; EN 50463-2: energy measurement, including voltage measurement, current measurement, and energy calculation; EN 50463-3: data handling on-board and data collecting on ground; EN 50463-4: communication between on-board and on ground; EN 50463-5: conformity assessment. You can purchase it at your national standardisation office.

IRS 90930:2020	This International Railway Solution is a document published by UIC. The IRS 90930 defines: - Roles with tasks and responsibilities - Functions: EMS, DCS (Data Collection System) and Settlement - Data: Energy Metering Data, Train Run Data, Masterdata, other data - Data transfer - Processes The IRS 90930 can be downloaded from the UIC Shop.

Please check with your Notified Body which version of the standard should be applied.

TERMS AND DEFINITIONS

Compiled Energy Billing Data (CEBD)
Data set compiled by the DHS (Data Handling System) suitable for energy billing; it is the Energy Metering Data with 5-minute time period (TSI compliant)

CEBDBlock
Data structure used to communicate CEBDs (Compiled Energy Billing Data) from EMS to DCS or between systems on ground

Conformity assessment
Process carried out to demonstrate whether specific legal and commercial requirements have been fulfilled https://www.era.europa.eu/domains/conformity-assessment_en

Data Collecting System (DCS)
On ground service collecting the CEBD from an EMS

Data Handling System (DHS)
Function combining the energy data with location data, storing, and transmitting the data to a DCS

Design review
Step of conformity assessment in which documents and plans are verified

EMS installer
Entity responsible for the installation of an EMS on a traction unit

Energy Measurement System (EMS)
Onboard system comprising the voltage measurement, current measurement, energy calculation functions and the DHS

Energy Metering Data
Commercial metering data suitable for energy billing (CEBDBlock and ReadingBlock are the permitted data structures)

Installation
Installation of an EMS on a traction unit

Integration
Integration of the devices of an EMS prior to installation. During integration, the compatibility of the devices is verified

Maintenance Plan
Document describing necessary maintenance steps to keep rolling stock operating as intended

Masterdata
Data describing the configuration of an EMS, traction unit, traction unit type and EMS test results

Reading
Metering data, like CEBD, but which can contain more types of data and can have a different measurement period (1 or 5 min)

ReadingBlock
Data structure used to communicate Readings from EMS to DCS or between systems on ground

Routine test
Reduced set of tests performed on each device and on each EMS installed onboard of a traction unit

Traction unit
Vehicle or group of vehicles in fixed formation, for which the energy taken from, and/or returned to the contact line is measured by an EMS

Train run
Movement of a train of a given composition of railway vehicles over a trajectory and at a specific date and time

Train Run Data

Data describing train runs that can be used to validate Energy Metering Data, estimate missing data, and allocate it to the correct consumer

Type test

Extensive set of tests performed on one device of a specific type, on the integration of the devices into an EMS and on the installation of this EMS on-board of a traction unit of a specific type

SUMMARY

	**1. Use certified equipment** - Each component shall be able to be certified and callibrated - Regulation is on European level	- Which EN applies? - Who delivers certificates? - How do we know that the equipment proposed by Train manufacturer is proper? More...
	**2. Start with a plan** - Supplier makes a plan - NotIfied Body verifies this plan	- What should be in the different plans? - What is a Notified Body? - Why do we need to involve a Notified Body? - Where can I find them? More...
	**3. Notified body checks first installation** - Notified Body checks the first installation - You may use existing onboard equipment	- What is delived by a Notified Body in this check? - Why is that needed? - Can we reuse existing sensors? More...
	**4. Install it in a certified workshop** - Workshops need proper certificates - Workshop issues installation reports	- Which certification is adequate for a workshop? - Is any certified railway workshop proper for energy meter and data handling installation? - How should an installation report look like? More...
	**5. Choose a Data Collecting System** - The provider collescts all data from the traction unit - Data is sent to a settlement system	- What is a Data Collecting System? - Why should I chose one? - Which one should I choose? - Is it provided by my home Infrastructure Manager? More...
	**6. Settlement** - Settlement prepares an energy bill for a geographical area - You will get an invoice for your energy consumption	- Who is your Settlement system provider? - What do you have to do? How will data from energy meters be handled? - Where can you find extra information? - What do you have to do? More...
	**7. Maintain your Energy Measurement System** - The equipment onboard must be regularly monitored - Some equipment needs to be recallibrated	- Who should I call when I do not get data from an energy meter? - Who can fix broken energy meters or sensors? - Should I report it? - When do we have to recalibrate equipment? More...

1. USE CERTIFIED EQUIPMENT

An Energy Measurement System (EMS) needs to have the following functions:

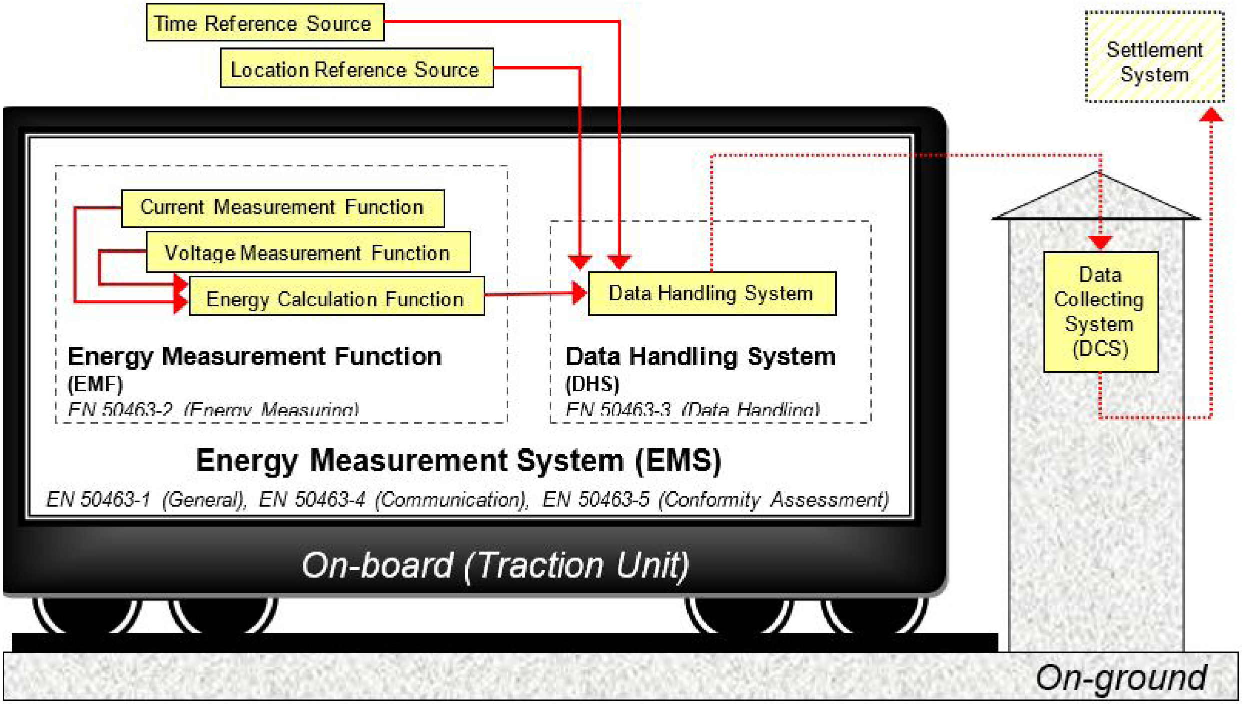
- Voltage Measurement Function (VMF),
- Current Measurement Function (CMF),
- Energy Calculation Function (ECF),
- Data Handling System (DHS).

These functions are usually implemented as current and voltage sensors plus an energy meter.

Equipment providers will typically test all devices having these functions of an Energy Measurement System. These tests also check the metrological performance. This means that the tests verify how accurate the meter and sensor are. All these test reports are submitted to a Notified Body during Assessment.

The energy meter and sensors must be accompanied by routine test reports proving that each part has been verified and calibrated. They are variously named, such as Inspection or Calibration Certificate.

Figure 2: Created by Bjorn Lysne, published in EN 50463-1



FAQ

1.1. Where can I find the requirements for an onboard EMS?
The EMS is installed on a train. All regulation for trains can be found in the TSI LOC&PAS. A TSI is a Technical Specification for Interoperability. TSI LOC&PAS deals with locomotives and passenger vehicles.

A TSI is published via a document of the European Commission. Once published it is legally binding in all EU Member States, but also in other countries like Norway and Switzerland.

The TSI only includes the essential requirements. It refers to some clauses of the EN 50463. These clauses are mandatory. The other clauses of EN 50463 are not mandatory.

The most recent TSI was published in 2018 and referred to the EN 50463 of 2017.

1.2. Is it sufficient to use an EMS compliant with EN 50463?
Yes, EN 50463 is a harmonised standard cited in the Official Journal of European Union and mandatory to use for TSI compliance of the EMS.

You will also need a certification by a Notified Body for the installation of that already compliant EMS on your traction unit type and for the quality process of the installation of each individual EMS (see next chapters)

1.3. Is an EMS a box?
No. The requirements are describing functions. Functions can be split over different devices. Functions or parts of functions can be grouped in devices. (See Figure 2)

Some functions can be shared with other applications onboard. The output of a sensor can be used to detect the voltage on the contact line or in protection devices. The EMS can use the location data available onboard. Also, a joint communication gateway can be used.

The certification is given to the functions of the EMS embedded in the different devices available onboard.

1.4. Is each device tested?
Yes, each device is subject to routine tests, typically performed by the device manufacturer. The laboratory of the EMS supplier must have a permission to perform metrological tests. This can be an EN 17025-accreditation or following an alternative procedure agreed by the Notified Bodies.

These tests are also described in EN 50463-2 and EN 50463-3. These tests result in routine test reports or in calibration certificates. See also in chapter 4 of these Guidelines.

2. MAKE A PLAN

The installer of the Energy Measurement System (EMS) starts with a plan:
- describing how different devices will work together and create an EMS,
- proving that the EMS is suitable for the intended traction unit,
- explaining all the steps needed to ensure quality of each individual device,
- including steps needed to keep the EMS accurate during its lifetime.

The EMS installer is the entity responsible for the installation of an EMS on a Traction Unit Type. The EMS installer can be the Vehicle Keeper, the Train Manufacturer, or the EMS Manufacturer.

The EMS installer creates a plan.
The Notified Body checks the compliance of the design with the requirements of the TSI.

The plan also includes:
- Design Review documentation for all devices, the integration, and the installation.
- Procedures for type test approval of devices and of the installation.
- Procedures for the production of the components of the EMS and procedures for installation (check of quality management system).
- A Maintenance Plan to keep the EMS measuring accurate.

FAQ

2.1. What is a Design Review?
In a Design Review the documentation is verified. It starts with the documentation of all devices.

During integration, the different devices are put together. Are they compatible? Are the cables suited? Do they create an EMS?

During installation, these components are installed on-board of a Traction Unit. Is the EMS able to measure all energy consumed or regenerated? Can it measure accurately for all traction systems (like 3 kV DC and 15 kV AC)? Is the functionality of the EMS maintained when installed on-board? Is it installed on a suitable location taking into account e.g. temperature and electromagnetic compatibility (EMC).

2.2. How can we be sure each device measures correctly?
The first installation is thoroughly tested. The results of this are verified by a Notified Body (see chapter 3).

The production method ensures all devices of a series also comply. Device routine tests (calibration test, inspection document, etc.) prove that the individual differences are in between the permitted tolerances.

2.3. What should be included in the Maintenance Plan?
Many components of an EMS will not be able to keep their performance over long periods of time. Their accuracy will decrease due to ageing. Methods shall be defined to keep the EMS sufficiently accurate.

A typical method is a periodic re-verification. Aim is to ensure the initial conformity assessment of the installed EMS remains valid. It can be that some components can get recalibrated. This means they are adjusted to measure again accurately.

This Maintenance Plan of the vehicle also includes the requirements to be followed while replacing devices by devices of the same type.

2.4. Why do we need an independent body verifying these plans?
Energy meters on trains are not part of the regulations for private and industrial applications. The conformity assessment to the EN 50463 by an independent test body provides an objective confirmation that the energy billing data delivered by the EMS meets an acceptable quality level (in terms of completeness, correctness, and accuracy).

2.5 What is a Notified Body?

A Notified Body (NoBo) is an organisation that has been designated by a member state to assess the conformity of certain products with the applicable essential technical requirements. For an EMS this means that it fits the requirements of the TSI (see 1.1).

The Notified Body carries out the conformity assessment. This includes inspection and examination of a product, its design, and the manufacturing environment and processes associated with it. For an EMS, all the above-mentioned plans also need to be agreed with a Notified Body.

Different Notified Bodies can be used for e.g., the approval of EMS and the installation of EMS on a Traction Unit Type.

You can find the accredited Notified Bodies here https://eradis.era.europa.eu/

3. NOTIFIED BODY CHECKS FIRST INSTALLATION (Type Test)

The first installation of an EMS is thoroughly verified.
It includes:
- all devices and functions,
- the integration of the devices into an EMS,
- the installation of the EMS on a traction unit of a certain type.

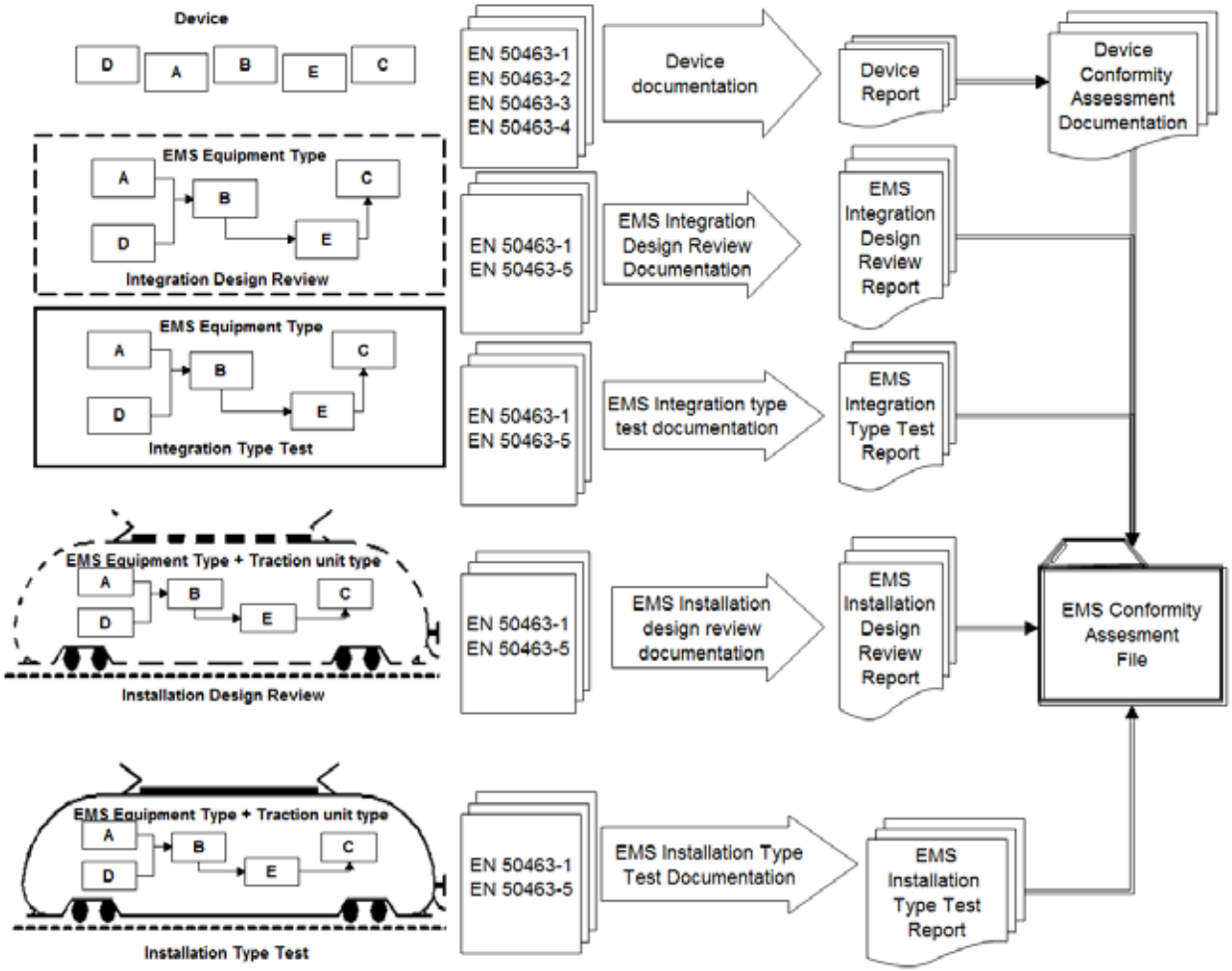
It is permitted to reuse suitable existing on-board components.

The device manufacturer might perform the type tests on the individual devices (like sensors). Accredited laboratories able to make metrological tests are needed.

The Notified Body verifies the results of the installation type test.

This results in the EMS Conformity Assessment Folder, containing many files, including the EMS Conformity Assessment Certificate.

Figure 3: ©Created by Andrea Gatti, published in EN 50463-1



FAQ

3.1. What is a Type Test?
EN 50463-2, EN 50463-3 and EN 50463-4 have very detailed type tests. Such tests are only done once on one device of a specific series.

After Design Review (see 2.1) and Type Test all EMS of this verified design and passing the routine test regime can be installed on Traction Units of the same type. EN 50463-5 describes the Installation and Integration Type Tests.

3.2. What is difference between tests on device level, on integration and on installation?
A Type Test is performed on all the individual devices. Tests on devices with metrological performance (like current sensor, voltage sensor and meter) shall be made by an accredited laboratory. This can be the test lab of the EMS supplier. But the EMS supplier might not be able to do all tests and might need a more specialised laboratory for the Type Tests.

In an Integration Type Test all devices are put together. Basic functionalities are tested a first time. Is the EMS able to keep working while having a traction system change? Is it able to send data to a Data Collecting System?

The Installation Type Test verifies that the EMS still works correctly after installation onboard of a Traction Unit.

3.3. What is the role of the Notified Body?
Typically, all Type Tests are done by the EMS supplier or by specialised laboratories on request of the EMS supplier. Installation Type Test can be done by e.g., the train builder or by a third party for him.

All documents of Design Review and of Type Tests go to the Notified Body as an EMS Conformity Assessment File. The Notified Body verifies this and issues a Conformity Assessment Certificate.
All EMS having the same components can be installed on all Traction Units of the same type.

It is permitted to make a simplified assessment for EMS with only one different component. It is also possible to group installation in nearly identical Traction Unit Types in a single assessment.

The Notified Body also checks that the EMS has no electromagnetic impact (EMC) on the train detection on ground (requirement from Control Command and Signalling TSI).

Results are stored on https://eradis.era.europa.eu/. Full documentation is only given to the specific entity that has asked **for** the verification.

3.4. Can existing sensors or transformers already installed in the vehicles be reused?

Yes, if you are able to test the quality of them. Existing transformers are tested according to other standards. The first version of EN 50463 describing sensors was published in 2012. So older trains typically have transformers tested e.g., in accordance with EN 60044-1 (current transformers).

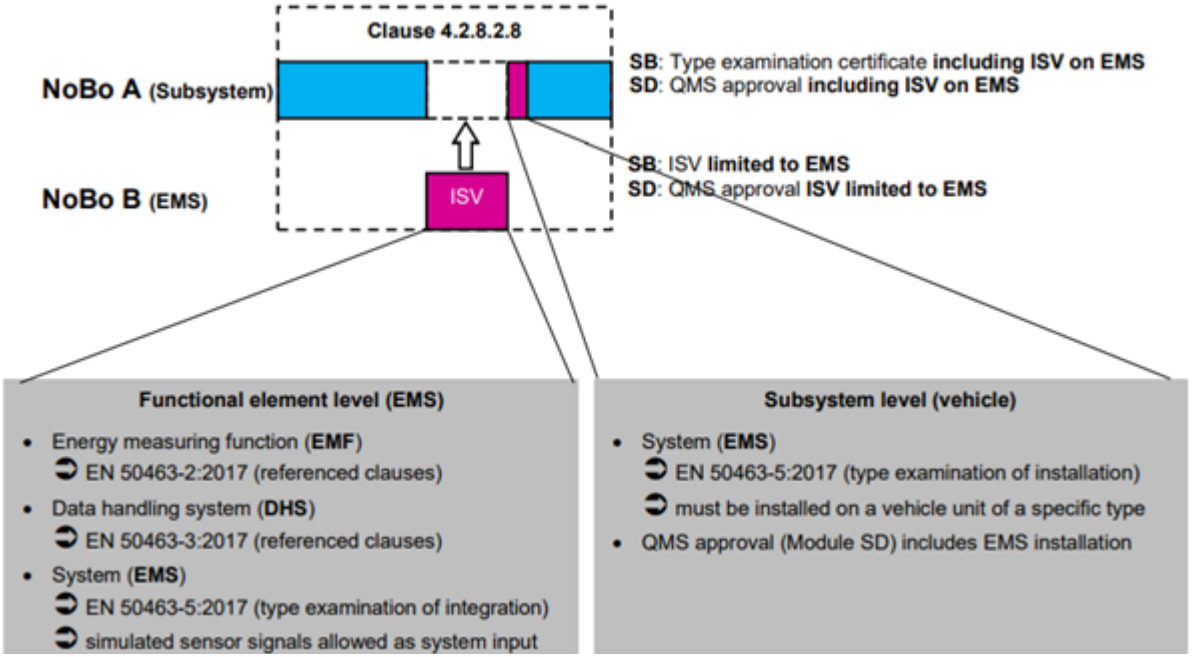
A new version of TSI to be published in 2023 permits to reuse such components. Compliance shall only be verified according to existing test reports at rated temperature and for the range of 20% to 120% of rated current. Earlier version of TSI only permit fully compliant EMS (wider temperature and current ranges). Technical documentation shall record this.

It is also permitted to update an existing EMS and only upgrade to the standardised communication as published in 2017 in EN 50463-4 without changing the energy measurement function.

3.5. Does EMS have to be assessed together with the vehicle it is installed on?

The EMS can be verified separately from the vehicle. An Intermediate Statement of Verification (ISV) is used for verification by a Notified Body of the TSI requirements. They will be considered when on a later stage the full vehicle is assessed. See also http://nb-rail.eu/co/nbrail/RFU/RFU-RST-301%20EMS%20assessment.pdf

Figure 4: © Created by NB-Rail



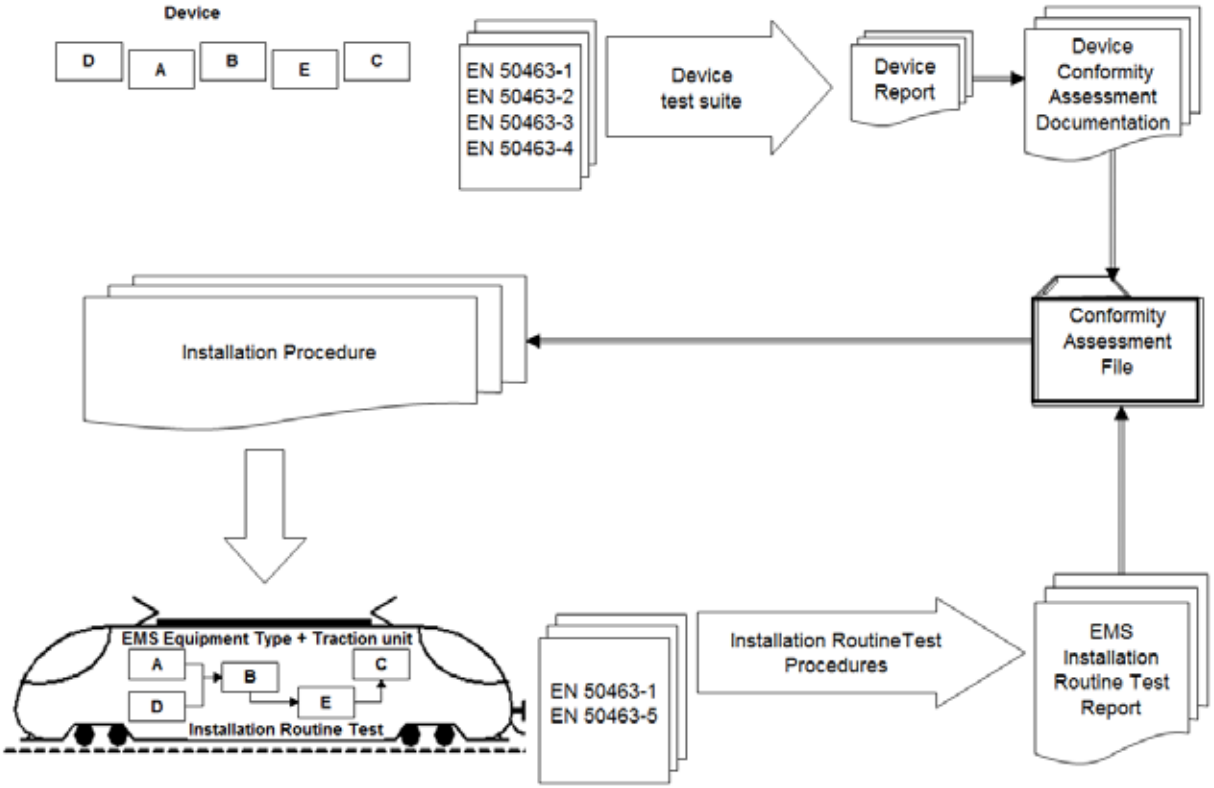
4. INSTALL IT IN A CERTIFIED WORKSHOP (Routine test)

EMS are installed on-board of a Traction Unit inside a workshop, certified for this installation.
This can be the workshop of a Railway Undertaking.

The employees of the workshop follow the installation procedure.

This procedure also results in an Installation Routine Test Report.
Now you have all the information to create the technical documentation and the Masterdata.

FIGURE 5: © Created by Andrea Gatti, published in EN 50463-5



FAQ

4.1. Who will perform the Routine Tests on the individual devices?
The Conformity Assessment starts with Design Review (see chapter 2) and Type Tests (see chapter 3). After approval of an EMS of a specific type, the production of a series of devices of the same type can start.

EN 50463-2 and EN 50463-3 have simplified routine tests. Such tests are made on all devices.

These tests are typically done in the test laboratory of the EMS supplier.

4.2. Who will install the EMS on the Traction Unit?
The EMS can be installed in a workshop of the train builder (typical for new train series) or in a workshop of a Railway Undertaking (typical for adding EMS on existing trains).

This is only permitted in workshops that have a specific certification to ensure the quality of the installation of EMSs on Traction Unit Types.

The Notified Body checks the Installation Routine Test Procedure.

4.3. Who will perform the Installation Routine Tests?
This will be done by employees of this workshop based on the Installation Routine Test Procedure approved by the Notified Body. This results in an Installation Routine Test Report.

4.4. How should an installation report look like?
This report should refer to the tested EMS (ID used in communication to DCS and individual IDs of all the devices part of that EMS) and to the Traction Unit it is installed on (Country, Vehicle Keeper Marking and EVN). The EVN or European Vehicle Number is a 12-digit number uniquely identifying each vehicle.

The checklist includes some basic steps as written in EN 50463-5, like visual inspection, power-up, power-down, traction system change, insulation, protection from non-authorised access and indicators.

The EMS is checked to be able to communicate data towards the intended Data Collecting System (see next chapter).

Extra checks can be added to the Installation Routine Test Procedure. These can be added e.g., to prove that the EMS has been installed in accordance with the installation design and installation procedures.

Such extra checks can also verify correct wiring to avoid negative voltages or currents causing EMS to measure more regeneration than consumption.

4.5. What should you do when first data from the EMS is not acceptable?

It is possible that something went wrong during installation and was not detected during the Installation Routine Test Procedure.

The installation shall get verified.

It is recommended to add extra checks to the installation procedure and/or to the Installation Routine Test Procedure.

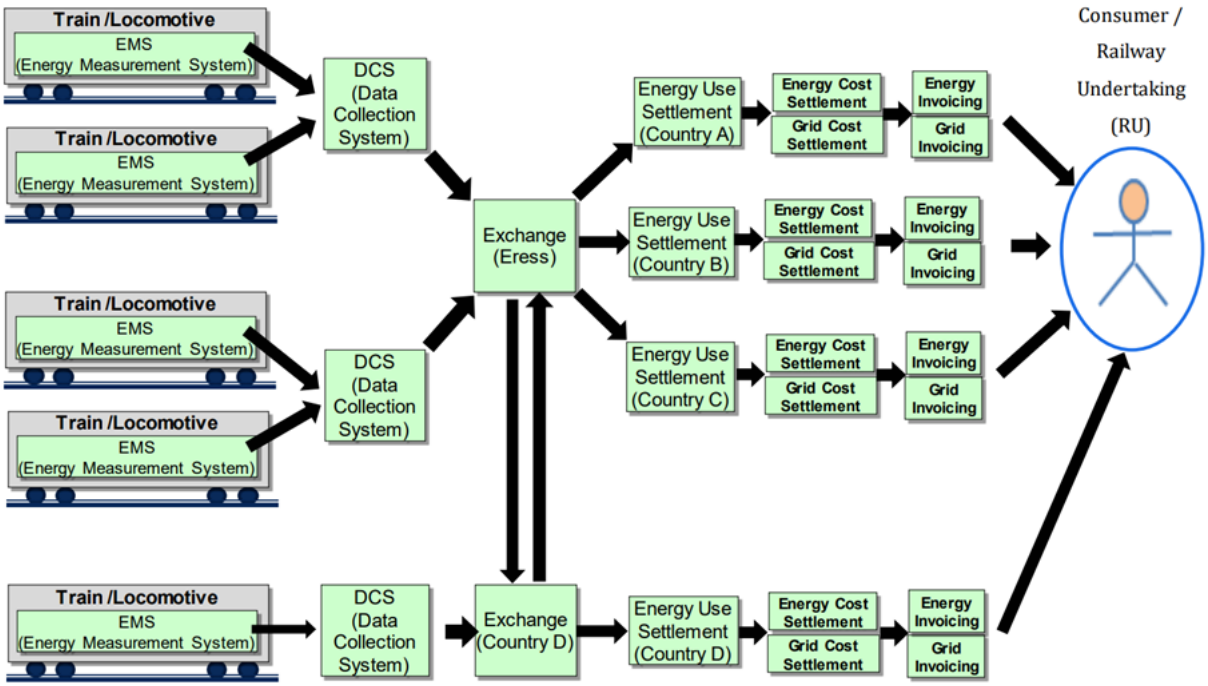
5. CHOOSE A DATA COLLECTING SYSTEM (DCS)

Each EMS will send all its Energy Metering data towards one chosen Data Collecting System (DCS) on ground. This DCS transfers the data to a Settlement System.

Each Member State shall ensure the service to collect the data on ground is offered. But third parties can still have their own DCS.

A DCS has a test report and other certifications.

Figure 6: Created by Bjørn Lysne



FAQ

5.1. What is a Data Collecting System (DCS)?
A DCS is a ground system able to receive, store and export the energy data coming from the EMS without corrupting it.

The TSI Energy refers for the DCS to clause 4.12 of EN 50463-3:2017. For the communication protocol between EMS and DCS both TSI LOC & PAS and TSI Energy refer to EN 50463-4:2017.

The IRS 90930 has more detailed requirements for a DCS in its clause 3.2 and defines the communication protocols between DCS and further systems on ground.

A DCS exports the energy data to a Settlement System (see chapter 6).

5.2. Can you choose your DCS?
This service should be offered in each Member State. If you are only running in one country, you can send all data of your EMSs to the DCS of your country. Typically, the DCS will be offered by your Infrastructure Manager. Eress offers a joint DCS for all its partners.

When you are running through multiple countries, you can choose a DCS operational in any of these countries. You shall only send the data to one DCS. Data consumed in other countries will be transferred between Settlement Systems.

It is not mandatory to send data to such a DCS offered by your country. Older EMS may not have the correct protocol to communicate to the DCS of your country. Older EMS typically communicate with a DCS of the supplier. This DCS can then communicate with a Settlement System (see next chapter).

5.3. How do you make a binding of an EMS to a DCS?
It is recommended to already make such a binding on the Integration Type Test level. So, when a first EMS is ready, connecting to a chosen DCS can already be tested. This can result in tests included in the Installation Routine Test Procedure (see also EN 50463-5:2017 clause 5.6.3.10).

Aim is to be sure each EMS will be able to send data every 1 to 4 hours after measuring the energy consumption and preferably also before shutting down the intended EMS. The DCS must know from which EMS the data is coming and must have some extra Masterdata of this EMS, the Traction Unit, and the Traction Unit Type.

5.4. What data can you handle in a DCS?

Most important is obviously the Energy Metering Data, usually referred to as either CEBDBlock or ReadingBlock. CEBD is required in the TSI. CEBDs contain the energy consumed and regenerated during a 5-minute time period. In a DCS you can also handle ReadingBlocks. Readings typically contain the energy during a 1-minute time period. Both also contain the location at the end of each time period. Readings can have many other data (like temperatures and minimum voltage).

Other data structures defined in clause 4.2.4 of EN 50463-4:2017 are:

- EventSet: events logged in the EMS,
- Heartbeat: compact message used to build the communication from EMS to DCS,
- CommunicationConfig: configuration of all the layers of the communication,
- ChangeCommunicationConfig: request to change some parameters in this CommunicationConfig
- AssetData: full description of the assets part of the EMS,
- State: gives the actual state of all devices part of the EMS.

Verify first the capabilities of the DCS you want to use for collecting and exporting the Energy Metering Data towards Settlement. It might be that you need another data collector on ground of your EMS supplier for other services related to the other data structures.

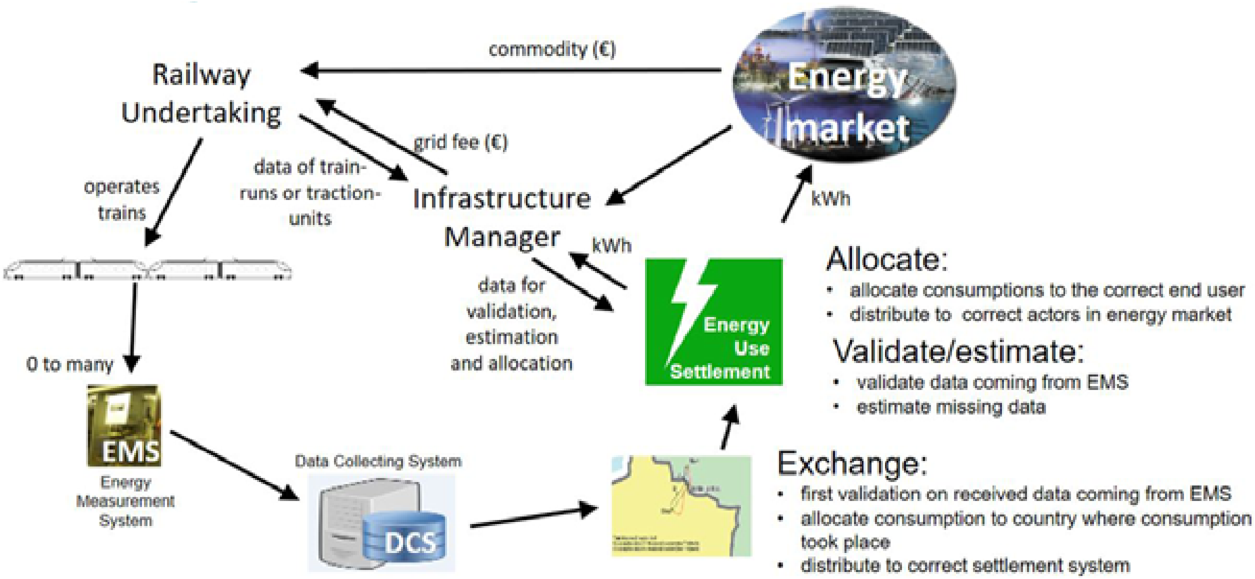
6. SETTLEMENT

Settlement allocates the consumption to the country where the consumption took place and distributes the data to the correct Settlement Systems. Settlement then validates the Energy Metering Data, estimates missing data, and allocates it to the correct end consumer. It distributes the data to the correct actors in the energy market.

Each country shall have an entity responsible for Settlement. This is typically the Infrastructure Manager.

Settlement creates the invoices and all reports needed to validate the correct functioning of the system.

Figure 7: © Created by Bart Van der Spiegel, published in the EU railway sector declaration



FAQ

6.1. Who is your Settlement System provider?
The European Commission requires each Member State to have a Settlement System since July 2020. In most countries the Infrastructure Manager is providing the services of Settlement.

Settlement shall be able to receive Energy Metering Data from the DCS, exchange it with other Settlement Systems, validate it and allocate the consumption data to the correct parties. This shall be done by considering the relevant legislation concerning the energy market.

6.2. How is your energy consumption allocated to different countries?
The Settlement System of a country typically receives the Energy Metering Data coming from its own DCS. But it might also be able to collect data from other DCSs operated by third parties, like an EMS supplier.

A first validation checks the consistency of the location data. This contains the geo-coordinates (longitude and latitude) at the end of each time period. This is used to allocate consumptions to a country. The IRS 90930 has an appendix B with the polygons and the exact border crossing points of all European countries.

The consumption in the time period starting in one country and ending in another country is split considering both locations and the location of the border crossing point.

6.3. How is your energy consumption validated, estimated, and allocated to an end consumer?
The Infrastructure Manager should collect other data to validate the Energy Metering Data and to estimate consumptions for which no Energy Metering Data was available.

Data that can be used are e.g.:
- the measurements of the energy delivered to the overhead contact lines,
- historical data,
- Train-Run Data (defining consumer, composition, mass, and trajectory).

This Train-Run Data is partially coming from the Railway Undertaking that shall be able to deliver the EVNs of all Traction Units of each train-run. This EVN is the link with the EMS.

With this information, Settlement is also able to allocate the consumptions to the correct consumer.

6.4. Where can you find extra information?

Check Network Statement. Contact your Infrastructure Manager for additional information.

All relevant information is publicly available. This includes:
- requirements to be able to use traction energy,
- methods applied for validation, estimation, and allocation,
- tariffs for grid fee and if applicable energy,
- method and conditions to be able to choose energy supplier,
- method on how energy losses are defined, allocated and invoiced,
- incentives for installation of EMS.

7. MAINTAIN YOUR EMS

The equipment on-board might be subject to ageing. So, you will need some periodic reverification. This might also result in recalibrating some devices.
It should also be possible to replace devices that have major problems or are not no longer able to measure accurately.

The Entity in Charge of Maintenance shall follow the requirements of the Maintenance Plan.

This will result in a new calibration report, including updated Technical Documentation and new Masterdata.

FAQ

7.1. Help, my EMS is not functioning anymore?
You might be able to receive automatic reports from DCS or Settlement telling you for which EMS data has been missing for a longer period (generally has been rejected in transfer, e.g. location missing, or due to bad quality of data). This might be normal because that Traction Unit was not in use. But it might also show you that there were problems with the EMS.

If the DCS is not getting data from an EMS that should be in operation, you will have to request a check onboard by qualified persons. Parts of the EMS are in the high voltage part of the vehicle or on the roof. In both cases access is only permitted when voltage has been switched off.

If the problem cannot be solved by this first intervention, the Traction Unit should go to a workshop able to maintain it.

7.2. Why do we need maintenance on an EMS?
This can be caused by problems with the EMS (see previous question).

But even without significant issues, maintenance is required (see question 2.3).
Some components lose their accuracy over time. A reverification or a recalibration every 6 to 15 years can then be part of the Maintenance Plan.

TSI LOC&PAS requires a periodic verification procedure, to ensure the required accuracy level of the onboard EMS during its lifetime.

EN 50463-2 clause 4.2.5 requires the EMS supplier to provide a plan with the intended re-verification activities (testing and surveillance). Supporting evidence is needed. EN 50463-5 clause 5.7 includes some minimum information for the periodic re-verification procedure. The supplier shall state the metrological validity of the devices.

7.3. Is maintenance mandatory?
Yes, the permission to operate trains depends on fulfilling all activities of the Maintenance Plan.
The National Safety Authority has to verify that measures of the Maintenance Plan are followed by the Entity in Charge of Maintenance.

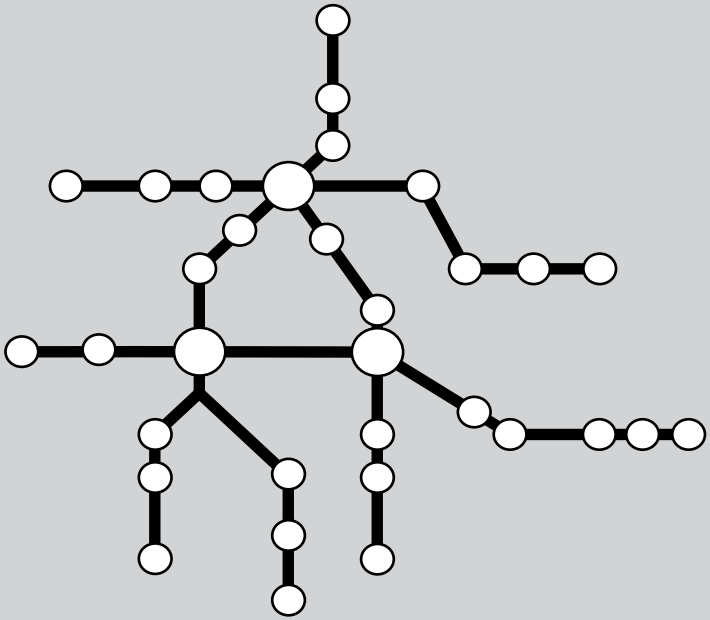
See also https://www.era.europa.eu/domains/trains/certification-entities-charge-maintenance_en

7.4. What do you have to do while replacing some devices as part of an EMS?

When you replace a device by a new device of the same type, you only need to have the routine test of the device (performed by the supplier) and make a new installation routine test after replacing that device. The conditions to replace devices should be documented and agreed in front of the first installation by the Notified Body.

When you replace a device by a device of a new type, a full review is needed. The device itself shall have a Design Review, Type Test and Routine Test. The integration tests and installation tests are also necessary. It is permitted to keep existing components (see question 3.4).

Any replacement of devices must be reported in the Conformity Assessment Folder. All entities using data coming from an adjusted EMS shall get informed.



DISCLAIMER

Please note that this is a non-mandatory document that will continue to evolve into new versions.
This document has been written, aiming to provide help and a useful set of Guidelines in the process of understanding and ensuring a qualitative energy measurement and settlement.

This final document is version 2.0 of the “Conformity Assessment Guidelines” issued by Eress. This document is the result of a series of workshops made with experts from the following organisations: SBB, Infrabel, Trafikverket, Prorail/Eastvision, HaslerRail, Arsenal Race and VDS Rail.

Eress plans to organize further workshops to gather the most relevant experts to discuss, understand, clarify and share new information and conclusions relevant for the railway energy industry.

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