ANNEX A

Version	Date	Author	Rational
1.0	31.1.2026	Gregor Hribar	First version

Introduction

In 2020 the the rules were issued. Although there have been several changes in the area of metering which have a significant impact on the accuracy of metering, the reliability of operation and the maintenance of the metering system installed on the traction vehicles, the requirements given by latest version of Vivens guidance remain:

1. Energy metering system (EMS) with all devices compliancy with TSI LOC&PAS.
2. Proven quality of installation
3. Proper ongoing preventive and corrective maintenance, including replacement of equipment in accordance with manufacturers' recommendations

All traction units shall meet the above requirements.

TSI LOC&PAS describes the requirements that measuring equipment and maintenance methods must meet to ensure the required accuracy level of the on-board energy measurement system during its lifetime.

In the last years the community has developed a better understanding of how the various processes of operation, maintenance, and interoperability are intertwined and how documents from other processes can be used in the vehicle approval process.

We have therefore added these options to the unchanged Rules 2.0, which enable a smoother approval and maintenance process.

Due to the different documents available for different vehicles, we have developed different procedures. These allow all parties involved to maximize usage of existing certificates and procedures:

A. TSI compliant traction unit and an adequate maintenance plan
B. TSI compliant traction unit and without adequate maintenance plan
C. NON TSI compliant traction unit with an adequate maintenance plan
D. NON TSI compliant traction unit without an adequate maintenance plan

Methods B is a temporary solution for up to 1. January 2028 for TSI compliant vehicles that do not yet have maintenance plans aligned with the requirements of the TSI LOC&PAS.

For help choosing the best procedure and all other info, contact CP admin (cpadmin@eastvision.nl).

Cross-acceptance package*

Due to different national laws, especially in the field of energy measurement, some IMs require additional information about the equipment that is installed. Therefore, we have prepared documents (*Installation routine test summary* and *Installation type test summary)*, aligned with several IMs, where you can fill in all the necessary additional information for most EEA countries.

If you supplement the chosen method with two documents, attached to those rules, and update and send them to CP admin at each change of equipment, cross-border EMS acceptance is also largely guaranteed with the aim that each vehicle will be approved once and that this will be valid throughout the EEA.

If your vehicle will only be driven in the Netherlands, these documents are generally not required**.

If you have already registered your vehicle elsewhere in the EEA and have attached two documents, we will obtain them from the relevant authority, and you will not need to send them again. Please inform us CP about this.

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* The process of cross - acceptance is still in the coordination phase, so the documents and forms are still subject to change. Please ask CP admin for the latest version.

** We also use *Installation routine test summary* to collect information about vehicles that do not have a maintenance plan (methods B and D), even if the vehicles will only be used in the Netherlands.

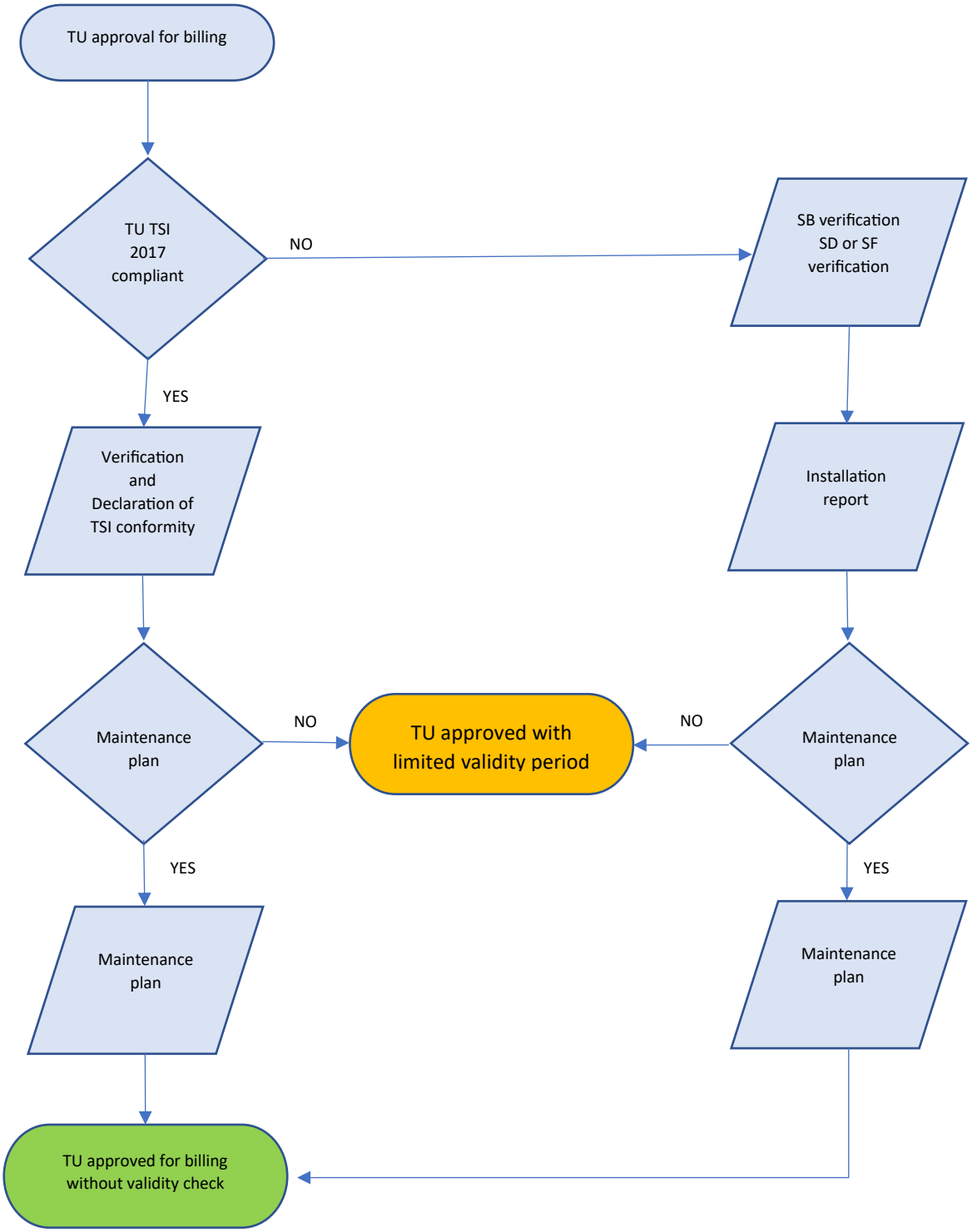
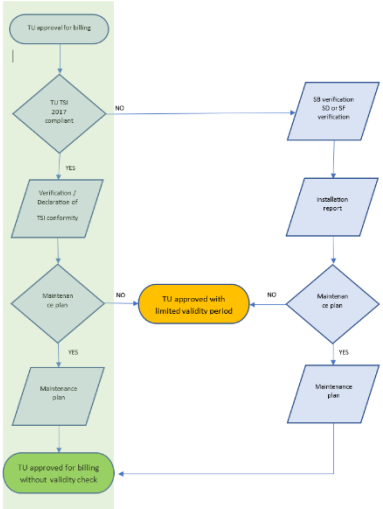


Diagram 1. Process diagram of vehicle approval

Method A. TSI compliant traction unit and an adequate maintenance plan

A.1. When to use this method

- factory-installed EMS,
- TU complies with the TSI,
- is newer than 2015
- an adequate maintenance plan in place



A.2. *Documents required*

- ✓ EC Verification of conformity and EC Declaration of conformity
- ✓ proof of an adequate maintenance plan (paragraphs with description of the procedure).

Optional: Cross-acceptance package

- ✓ Installation routine test summary
- ✓ Installation type test summary

A.3. Validity period

🕑 an **unlimited** period

Which maintenance plan is adequate? See detailed guide in the last part of this document.

Remarks:

If proof is available that the traction unit complies with the TSI and is newer than 2015, it is reasonable to assume that it has the appropriate measuring equipment installed.

ECM is responsible for ensuring that the maintenance plan is correct and carried out completely and on time.

CP Admin reserves the right to request evidence of the implementation of the metering equipment maintenance from the maintenance logs.

Cross-acceptance If you would like to apply for approval in other EEA countries, these two documents will increase the likelihood that you will not need to resubmit all documents to other IMs.

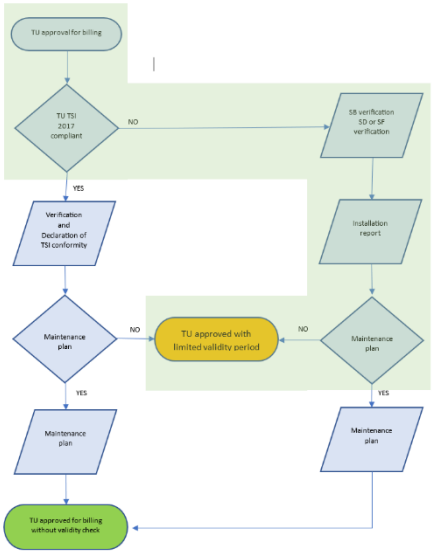
The documents are attached in Appendix A to this document and are available from CP Admin.

What is ECM? Entity in charge of Maintenance. See detailed guide in the last part of this document.

Method B. TSI compliant traction unit and without adequate maintenance plan

B.1. When to use this method

- factory-installed EMS to TSI compliant traction unit
- TU is newer than 2015 and
- TU has not adequate maintenance plan yet



B.2. *Documents required*

- ✓ EC Verification of conformity and EC Declaration of conformity
- ✓ Installation routine test summary

Optional: Cross-acceptance package

- ✓ Installation type test summary

B.3. Validity period

- 🕑 Until the calibration expires for any metrology device according to manufacturer recommendations

Remarks:

If proof is available that the entire traction unit complies with the TSI and is newer than 2016, it is reasonable to assume that it has the appropriate measuring equipment installed.

Since a maintenance plan that would also cover metering equipment is not available, other evidence that the equipment is regularly replaced in accordance with the equipment manufacturers' instructions is required.

This proof is usually in the form of the installation report, produced in the workshop. It shall include the type of equipment replaced and the serial numbers of the replaced equipment.

Calibration documents for sensors and meters are also required.

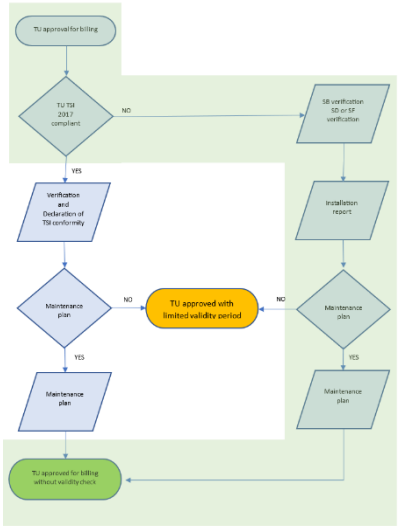
If the same type of equipment is used when replacing equipment and the NoBo does not require otherwise, the workshop does not need to obtain an SD module for this combination of equipment and traction vehicle.

What is SD module? See detailed guide in the last part of this document.

Method C. NON TSI Compliant traction unit with an adequate maintenance plan or when changing EMS devices

C.1. When to use this method

- For any TU that has an appropriate maintenance plan but does not meet the other conditions of Method A or
- When installing EMS for the first time on a used vehicle or changing the EMS type



C.2. *Documents required*

✓ SB verification of conformity for a subsystem
✓ SD (or SF) verification of conformity for a subsystem
✓ Installation report according to EN50463 with all serial numbers of all metrology devices to be installed at the time when the version of the maintenance plan that includes all metrology devices was already in force

Optional: Cross-acceptance package

✓ Installation routine test summary
✓ Installation type test summary

C.3. Validity period

🕑 an **unlimited** period of time.

Remarks: If the equipment was installed before the relevant TSIs were introduced, evidence of the EMS's compliance with EN50463 and of its correct installation is required.

In absence of TSI Statement of verification for the complete traction unit SB and SD or SF module of verification procedure are requested.

When replacing the EMS that was installed in the vehicle (TSI or non-TSI compliant) with another one, it is necessary to obtain a new verification of conformity for the newly created EMS-TU subsystem for both modules, SB and SD or SF.

Method D. NON TSI Compliant traction unit without an adequate maintenance plan

D.1. When to use this method

- Any unit for which Methods A, B, or C cannot be selected

D.2. *Documents required*

- ✓ SB verification of conformity for a subsystem
- ✓ SD (or SF) verification of conformity for a subsystem
- ✓ Installation report according to EN50463 with all serial numbers of metrology devices for the current installation
- ✓ Calibration reports for all metrology devices for the current installation

Optional: Cross-acceptance package

- ✓ Installation routine test summary
- ✓ Installation type test summary

D.3. Validity period

- 🕑 Until the calibration expires for any metrology device according to manufacturer recommendations

Remarks: If the equipment was installed before the relevant TSIs were introduced, evidence of the EMS's compliance with EN50463 and of its correct installation is required.

Since the measuring equipment in such cases has already expired and needs to be replaced or reverified, proof of this is required.

A detailed guide to conformity assessment

Design phase

The subsystem and all devices within must comply with standard EN 50463, and the equipment that is part of the *metrological chain* must be suitable for calibration and also calibrated.

When we refer to the metrological chain of energy measurement devices on traction vehicles, this means two or more sensors (the so-called energy measurement function – EMF) and a meter (energy calculating function – ECF).

Cables, modems, and other equipment are not part of the metrological chain, although they are necessary for proper operation and must be appropriately selected, but they do not need to be calibrated or regularly maintained.

EC-type examination (module SB) is a first part of an EC verification procedure that covers the design phase.

A **module** is one **building block (procedure)** in the EU's system for verifying that a product, subsystem, or component complies with essential requirements (for example, safety, reliability, or environmental performance).

Each module describes **who does what**:

- Whether a **Notified Body (NoBo)** needs to be involved.
- Whether **only the design (type)** or also **each manufactured item** is checked.
- Whether conformity is ensured through **testing**, **inspection**, or **a quality assurance system**.

Think of modules as **different verification "paths"** a manufacturer can choose — depending on the type of product and production system.
For example:

- **Module B** = the NoBo checks the **design (type)** of the product.
- **Module D** = the manufacturer uses a **certified quality system** to ensure all products match the approved design.
- **Module F** = every individual product is **physically verified**.
- **Module SB/SD/SF** (for railways) = specialized versions for **subsystems**.

The appropriate devices are already planned by the designer and checked by NoBo.

Calibration is required for **each** installed item belonging to the metrology chain. For AC and DC the sensors are usually separate, the meter one calibration certificate.

The VK must have documentation proving that the part installed on the vehicle has been calibrated.

TSI Compliant vehicles

During the verification process, NoBo checks whether the vehicle also complies with TSI LOC&PAS, i.e. with the requirements relating to measuring equipment. Therefore, no additional verification of this is required for TSI-compliant vehicles.

Compliance is demonstrated by *EC Declaration of* verification for the entire vehicle type (issued by a Notified Body) and an *EC declaration of conformity*, which proves that a specific vehicle complies with the vehicle type.

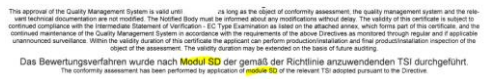
Quality of installation

When installing equipment, errors can occur that can lead to measurement failures or, even worse, inaccurate measurements that are not easily detectable.

It is therefore important that this is carried out in a qualified workshop. This is proven by the so-called SD module - EC verification based on quality management system of the production process. The **SD module** is issued for each individual workshop and proves that the workshop can install specific equipment (e.g., measuring equipment) on a traction vehicle. The certificate is issued by NoBo and has a limited duration.

How do we know what kind of document we have

Each certificate indicates what module has been implemented


This approval of the Quality Management System is valid until as long as the object of conformity assessment, the quality management system and the relevant technical documentation are not modified. The Notified Body must be informed about any modifications without delay. The validity of this certificate is subject to continued compliance with the Intermediate Statement of Verification - EC Type Examination as listed on the attached annex, which forms part of this certificate, and the continued maintenance of the Quality Management System in accordance with the requirements of the above Directives as monitored through regular and if applicable unannounced surveillance. Within the validity duration of this certificate the applicant can perform production/installation and final product/installation inspection of the object of the assessment. The validity duration may be extended on the basis of future auditing.

Das Bewertungsverfahren wurde nach Modul SD der gemäß der Richtlinie anzuwendenden TSI durchgeführt.
The conformity assessment has been performed by application of module SD of the relevant TSI adopted pursuant to the Directive

We note that more often than SB certificate the SD certificate is missing.
This is especially more common in retrofitting, where the workshop does not have the SD certificate to fit a particular EMS to the selected vehicle.

Another option is the SF module (every individual product is physically verified), but this is rarely used for this equipment and will not be described in detail here.

EC verification based on the quality management system of the production process (module SD) follows on module SB (see above).

The quality management system shall ensure by means of QMS documentation that the subsystem is in conformity with the type described in the EC-type examination certificate and therefore complies with the requirements of the relevant TSI(s).

The notified body shall assess the quality management system for production to determine whether it assures conformity with the type and issue a QMS approval certificate. Application of this module combination fits well for subsystems that are reproduced identically in large numbers, but it is limited to the specific type that has been approved. If there are changes or variations of the type, then a new type examination has to be performed.

If the manufacturer of a part of the subsystem or the whole subsystem is changed during the project than a new assessment of the quality management system for production of this manufacturer has to be carried out. If projects have a short time schedule and if experiences.

Ongoing maintenance, including replacement of equipment in accordance with manufacturers' recommendations

Timely repair of defective equipment

The equipment on the traction unit is subject to high stress, partly due to temperature fluctuations, vibrations, and electromagnetic waves, which is why malfunctions occur quite frequently.

Failures result in measurements not being taken or not being transmitted from the vehicle, or in measurements that are obviously incorrect and are eliminated during the validation process on the server at the latest. The vehicle's consumption is then estimated.

In such cases, maintenance must be organized so that the equipment is replaced within an acceptable time frame. Some IMs stipulate that it must be corrected within 30 days, otherwise contractual penalties will be charged. To achieve this, the ECM4 must have an adequate stock of devices.

Change or recalibrate at regular time intervals

TSI LOC&PAS (2025) in point 4.2.8.2.8.1 (9):

The maintenance documentation described in clause 4.2.12.3 of this TSI shall include any periodic verification procedure to ensure the required accuracy level of the EMS during its lifetime.

Due to the physical principles of operation, some equipment is subject to aging, which causes a decline in operational accuracy (typically known as drift). These changes cannot be accurately predicted, and, after a certain period, which depends on the equipment and the conditions in which it operates, become so significant that they are no longer acceptable for billing.

Since these inaccuracies are not so great that such measurements would fail data validation on servers, we cannot detect them in this way. It is therefore necessary to replace, recalibrate, or discard such equipment after a certain period.

Since we do not know whether the equipment is measuring too much or too little, replacing the equipment and thus ensuring the accuracy of measurements is always in the interest of the carrier as well as other consumers.

What is Entitiy in charge of maintenance

The **Entity in Charge of Maintenance (ECM)** is the **organization responsible for ensuring that railway vehicles are safely maintained** and remain fit for service throughout their lifecycle. Every railway vehicle operating on the EU network must have **one** designated ECM.
ECM is also responsible for ensuring that the maintenance plan includes the timely replacement of devices that ensure accurate measurement (sensors and meters).

Maintenance documentation

ECM ensures that all key components and the entire rail vehicle are maintained in a timely and proper manner. Each rail vehicle must have a maintenance documentation (*The Maintenance description file* and *The maintenance design justification file*, both documents together commonly referred to as a Maintenance Plan*)*. In accordance with the TSI, energy consumption measurement equipment must also be included in this maintenance plan.

As these requirements are relatively new, existing vehicles do not yet have all the measuring equipment included in the maintenance plan. Therefore, we require proof that all measuring equipment is included (e.g., a copy of the relevant part of the Maintenance Plan). It is also important that the Maintenance Plan is consistent with the recommendations of equipment manufacturers or that any deviations are justified.

	Method A **TSI Compliant TU with maintenance plan**	**Method B** **TSI Compliant TU without maintenance plan**	**Method C** **NON - TSI Compliant TU with maintenance plan or Change of EMS type**	**Method D** **NON - TSI Compliant TU without maintenance plan or Change of EMS type**
Equipment and design compliance with TSI Loc&Pas	TSI verification of conformity for TU	TSI verification of conformity for TU Installation of type test summary	SB verification of conformity for a subsystem	SB verification of conformity for a subsystem Installation of type test summary
Quality of installation			SD / SF verification of conformity for a subsystem	SD / SF verification of conformity for a subsystem
Ongoing preventive and corrective maintenance	Adequate maintenance plan	Installation report according to EN50463 with all serial numbers of replaced metrology devices Calibration reports for all metrology devices	Adequate maintenance plan	Installation report according to EN50463 with all serial numbers of replaced metrology devices Calibration reports for all metrology devices
Validity period	Unlimited	Until the calibration expires	Unlimited	Until the calibration expires