Australian Government
Department of Industry and Science

National Measurement Institute

Certificate of Approval

NMI 6/14H/7

Issued by the Chief Metrologist under Regulation 60
of the
National Measurement Regulations 1999

This is to certify that an approval for use for trade has been granted in respect of the instruments herein described.

Meridian Engineers Model ME-TRACKWEIGH®-1D In-motion Train Weighing Instrument

submitted by Meridian Engineers Pty Ltd
Unit 9, 50 Howe Street
Osborne Park WA 6017

NOTE: This Certificate relates to the suitability of the pattern of the instrument for use for trade only in respect of its metrological characteristics. This Certificate does not constitute or imply any guarantee of compliance by the manufacturer or any other person with any requirements regarding safety.

This approval has been granted with reference to document NMI R 106, *Automatic Rail Weighbridges*, dated July 2004.

This approval becomes subject to review on 1/11/21, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variants 1 to 11 approved (variants 8 and 9 provisionally approved), following review of 6/10B/71.	14/10/16

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI 6/14H/7' and only by persons authorised by the submittor.

It is the submittor's responsibility to ensure that all instruments marked with this approval number are constructed as described in the documentation lodged with the National Measurement Institute (NMI) and with the relevant Certificate of Approval and Technical Schedule. Failure to comply with this Condition may attract penalties under Section 19B of the National Measurement Act and may result in cancellation or withdrawal of the approval, in accordance with document NMI P 106.

Auxiliary devices used with this instrument shall comply with the requirements of General Supplementary Certificate No S1/0B.

This approval shall NOT be used in conjunction with General Certificate No 6B/0.

Special Conditions of Approval (pattern and all variants):

For this type of instrument, the ability to perform (and continue to perform) within specified maximum permissible errors can depend substantially on characteristics of the rail alignment and the stability of the material on which the rail sleepers rest (whether ballast, concrete footings or some other arrangement). However the National Measurement Institute is unable to clearly define particular requirements for material on which the rail sleepers shall rest.

It is the responsibility of the submittor to exercise control over any installation to ensure compliance with this approval and to ensure performance (and continued performance) within the appropriate maximum permissible errors.

The ability to perform within specified maximum permissible errors can also depend on characteristics of the rail vehicles being weighed (for example wagons with 'flat wheels', rubbing brakes or stiff couplings can be detrimental to performance). Consequently rail operators have a responsibility to ensure adequate maintenance of the rail vehicles (otherwise maximum permissible errors may not be able to be met).

In the event of unsatisfactory performance, allowable accuracy classes or modes of operation may need to be altered, additional conditions imposed or this approval may be withdrawn.

Special Conditions of Approval: (Provisional Approval - Variants 8 & 9)

This approval is limited to five (5) sites only, the locations of which may be obtained from the National Measurement Institute. The submittor shall advise NMI in writing of the proposed location or serial number of each instrument prior to it being initially verified.

The approval will remain provisional pending completion of satisfactory testing and evaluation.

The submittor shall provide NMI with copies of test results from the initial verification and all subsequent tests.

In the event of unsatisfactory performance the approval may be cancelled (or altered).

The submittor shall implement such modifications as required by NMI. In the event that such modifications (if any are required by NMI) are not made to the satisfaction of NMI, this approval may be withdrawn.

Signed by a person authorised by the Chief Metrologist to exercise their powers under Regulation 60 of the *National Measurement Regulations 1999*.

Dr A Rawlinson

TECHNICAL SCHEDULE No 6/14H/7

Pattern: Meridian Engineers Model ME-TRACKWEIGH®-1D
In-motion Train Weighing Instrument

Submittor: Meridian Engineers Pty Ltd
Unit 9, 50 Howe Street
Osborne Park WA 6017

1. Description of Pattern approved on 14/10/16

A Meridian Engineers model ME-TRACKWEIGH-1D weighing instrument for the determination (by measurement of axle forces) of the mass of each wagon and the total mass of a train, when weighed in motion.

The ME-TRACKWEIGH-1D system is a single point weighing system, in which the axle weight is determined at one point during its motion along the rails. To do so, one set of weighing transducers is incorporated on each rail (each rail is then known as a 'rail load cell' according to the manufacturers' terminology).

The instrument is approved for class 1 (or 2) wagon weighing and class 0.5 (or 1 or 2) train weighing. The system uses Meridian Engineers model ME-RailType-1B or ME-RailType-1EX 'rail load cells', over a speed range of 0.1 to 10 km/h.

(*) Where this is indicated below, 'Compatible and Equivalent' equipment may be used. 'Compatible and Equivalent' refers to equipment of the same or better specifications, requiring no changes to software for satisfactory operation of the complete system.

Note: TRACKWEIGH® and RAILMASTER® are registered trademarks of Meridian Engineers Pty Ltd.

1.1. Weighing Transducers ('Rail Load Cells')

The ME-RailType-1B and ME-RailType-1EX series of 'rail load cells' consist of a single set of transducers (with strain gauges bonded to them) which are bolted on to a length of rail (in accordance with the manufacturer's procedures), hence resulting in the rail becoming a 'rail load cell'. Provision is also made for measurement of the rail temperature. The transducers (Figure 2) are encapsulated to provide protection from the environment.

The transducers used on the ME-RailType-1EX 'rail load cells' are identical to those used on the ME-RailType-1B 'rail load cells', but are intended for use in explosive atmospheres, and hence are uniquely identified.

The 'rail load cells' are designed to be welded or bolted (using 'fish plates') into the rail line into which the system is installed and rest on sleepers or other supports (as shown in Figure 1).

Typical 'Rail Load Cell' models are shown in Table 1.

TABLE 1

'Rail Load Cell' ME-RailType-1B or ME-RailType-1EX	Capacity of 'Rail load cell'	Minimum capacity
ME-AS41-1B or ME-AS41-1EX	20.5 t	1.25 t
ME-AS50-1B or ME-AS50-1EX	18 t	1.25 t
ME-AS60-1B or ME-AS60-1EX	20 t	1.25 t
ME-AS68-1B or ME-AS68-1EX	22.5 t	1.25 t
ME-UIC60-1B or ME-UIC60-1EX	20	1.25 t

Note 1: The "RailType" part of the model number refers to the rail cross section.

Note 2: The above table contains a listing of models with rail sections commonly used in Australia. Other rail sections may be used.

Instrument specifications vary according to the capacity of the 'rail load cell' as shown in Table 2.

TABLE 2

Maximum capacity of instrument (per axle)	2 x capacity of 'rail load cell'
Minimum capacity (per axle)	2 x minimum capacity of 'rail load cell' (from Table 1 above)
Maximum wagon weight	No. of axles x maximum capacity of instrument (or less)
Minimum wagon weight	No. of axles x minimum capacity (or more)

The value of scale interval shall be 20, 50, 100, 200 or 500 kg and shall be chosen to satisfy the requirements of NMI R 106, Automatic Rail Weighbridges, dated July 2004 – in particular clauses 2.3 and 2.5.

1.2. Track Switches

Meridian Engineers' model ME-TS-LS or ME-TS-HS (*) track switches are provided and are mounted as shown in Figure 1 to sense the position of wheels of the rail vehicles. The track switches provide the ME-TRACKWEIGH-1D control system with logic signals to initiate the system, identify and distinguish locomotives from wagons, monitor train speed, and determine train roll-back.

1.3. Load Cell Protection Devices

The system is fitted with approved load cell protection devices as per Table 3:

TABLE 3

Manufacturer	NMI approval	Model Number(s)
Novaris	S366	SL6-LCP-18/PCB
Transient Controls Australia	S675	TC-LC18 TC-LC18D TC-LC32 TC-LC32D

1.4. Data Acquisition Modules

The system uses Meridian Engineers' ME-CANAMP-1 or ME-CANAMP-4 (Figure 3) modules to convert analogue signals from the 'rail load cells' to digital signals for communication to the Meridian Engineers RAILMASTER software. Communication is by means such as RS-232/422 interface, CAN ('controller area network'), or a wireless networking connection.

1.5. Trackside System Box

A Meridian Engineers model ME-TSB trackside system box is used (Figure 4), which contains:

- A computing system 'master controller' (Programmable Automation Controller (PAC), Programmable Logic Controller (PLC) or Embedded Controller) such as the National Instruments ME-cRIO series, ME-cFP2xxx series or the ME-EPCxxxx series (*);
- ME-CANAMP-1 or ME-CANAMP-4 data acquisition module(s) to acquire data from the weighing transducers;
- A Phoenix Contact model QUINT-UPS/24DC/24DC/20-2320238(*) uninterruptible power supply unit (with appropriate battery);
- An LM35 semi-conductor type temperature sensor to provide information to the system regarding the internal box temperature;
- A power control relay unit to provide capacity to remotely control power to the system components;
- Load cell protection devices and other equipment as necessary (e.g. for communications and interfacing to track-switch sensors).

The trackside system box receives input signals from the weighing transducers, temperature sensors, track switches, and automatic vehicle identification systems (tag readers) if used.

1.6. Power Supply

The trackside system box operates with 12 – 24 V DC, which may be supplied by a solar power system (solar panel recharging 12 V battery), or from mains AC power via an AC/DC adaptor.

1.7. Software

The computing system 'master controller' of the Trackside System Box uses Meridian Engineers' RAILMASTER (version 6 or later) software (installed on the master controller) to determine wagon weights, total train weights and to determine unweighed vehicles (e.g. locomotives).

This RAILMASTER software operates in fully automatic mode, unless operated in semi-automatic mode via RAILMASTER Graphical User Interface software (see below) or external system control.

In the fully automatic mode, track switches before the weighbridge, are used to arm the system (alert it to prepare for weighing) as a new train approaches. The system is disarmed automatically once the last wagon has crossed the weighbridge. Optional Light signals may be provided for the train driver to indicate the weighbridge readiness to receive a train and any error conditions such as roll-back.

When a weighing sequence is commenced (i.e. track switch activation occurs) the instrument is zeroed automatically prior to weighing beginning.

1.8. Graphical User Interface

The progress and results of weighing operations may be viewed on a personal computer connected on the same network as the trackside system box. The personal computer uses Meridian Engineers' RAILMASTER Graphical User Interface software (version 6 or later) to access and display weighing operations and results.

Note: A personal computer for viewing weighbridge operations shall be available as part of the system, and shall be locally available at the time of verification.

An installation may operate in a semi-automatic mode. In semi-automatic mode an operator is required. The operator uses the RAILMASTER Graphical User Interface software to arm the weighbridge and end a train weighing sequence. The RAILMASTER Graphical User Interface software also provides the operator with a system status page to indicate if any faults develop.

1.9. Web Server

The computing system 'master controller' of the Trackside System Box can act as a web server so that a graphical user interface of the weighing system may be viewed and/or controlled on any PC connected to the same network as the trackside system junction box via a standard internet browser.

All wagon and train weight information displayed on the web server shall comply with General Supplementary Certificate No S1/0B (in particular in regard to the data and its format).

1.10. Printout / Record

The system shall provide a printout/record of measurement results. This may be provided by the trackside system box, a personal computer (running RAILMASTER Graphical User Interface software), or other networked computer system (e.g. via web server, see ***1.9 Web Server*** above).

The printout or equivalent electronic record includes wagon identification, information to identify the particular weighing (e.g. date and time of weighing, or date and sequence number), speed, individual wagon mass and total train mass, and other error messages such as over-speed.

Additional information may also be provided, however locomotive masses will not be provided, or shall be clearly identified as being not for trade use. Where an error has occurred in the weighing, a total train weight may be provided, but shall exclude any incorrectly weighed wagons and shall be provided with a message such as "TOTAL (Excluding incorrectly weighed wagons)".

Note: Where an instrument is approved or verified for total train weighing only, the record should include a note "Instrument for total train weighing only", or similar. In this case individual wagon mass values are not required to be included in the weighing report. However access to wagon weight values should be available for testing purposes.

1.11. Interfaces

The instrument may be fitted with interfaces (including wireless) for the connection of auxiliary and/or peripheral devices. Any interfaces shall comply with clause 5.3.6 of document NMI R76 (the basic intent of which is that it shall not be possible to alter weighing results via the interfaces).

Any measurement data output from the instrument or its interfaces shall only be used in compliance with General Supplementary Certificate No S1/0B (in particular in regard to the data and its format).

Indications other than the indications of measured mass (i.e. wagon and train weight information) displayed either on the indicator or on an auxiliary or peripheral device, are not considered to be approved under this certificate.

1.12. Roll-back Detection

The system will stop registering weights when a roll-back of rail wagons occurs. The RAILMASTER software maintains a count of the last axle number to cross the weighbridge. The system will recommence weighing when the train is back to the original position where the roll-back commenced. A wagon weight will not be displayed if any axle in the wagon was outside the acceptable speed range during the weighing process. In this case, to obtain an approved wagon weight, it will be necessary for the wagon to be reweighed completely.

Once a weight has been determined for a wagon (in the acceptable speed range), it cannot be reweighed during the train weighing. This is the case even if the wagon is completely reversed over the weighbridge, then rolled forward over it again.

1.13. Specifications

In-situ performance of the instrument will depend on site conditions and train configuration. It may therefore be necessary following in-situ testing (and in the light of results obtained) to restrict the range of operation in ways such as:

- Limiting the maximum or minimum wagon weights;
- Limiting the allowable speed range(s);
- A combination of both of the above.

Such restrictions shall be marked on the nameplate of the instrument and where operation occurs outside the acceptable range(s), weight values should not be shown and an error message should appear (similar to an over-speed message as mentioned in ***1.10. Printout / Record*** above).

Instruments may have differing specifications as described above, but shall be within the limits shown below:

Accuracy class Train weighing	0.5, 1 or 2
Accuracy class Wagon weighing	1 or 2
Maximum capacity	45 t per axle
Minimum capacity	2.5 t per axle
Scale interval	20, 50, 100, 200 or 500 kg
Maximum wagon weight	No. of axles x 45 t (or less)
Minimum wagon weight	No. of axles x 2.5 t (or more)
Maximum operating speed	10 km/h or less
Minimum operating speed	0.1 km/h or more

Note 1: The above has been based on the ME-AS68-1B or ME-AS68-1EX type 'rail load cells' which have a capacity of 22.5 t (see Table 1). Specifications will be dependent on 'rail load cells' used (see Table 2).

Note 2: Configurations of any particular instrument shall be in accordance with the requirements of NMI R106 (e.g. in regard to the relationship between the above specifications).

1.14. Markings

Instruments bear the following basic markings at each location having a weight indication or printing device (the values given are provided as an example only):

Manufacturer's name or mark	…..
Importer's name or mark	…..
Model designation	…..
Serial number of the instrument	…..
Pattern approval mark	NSC No 6/14H/7
Accuracy class	
Train weighing	0.5
Wagon weighing	1
Maximum capacity	Max (axle) 45 t
Minimum capacity	Min (axle) 2.5 t
Scale interval	d = 200 kg
Maximum wagon weight	No. of axles x 45 t
Minimum wagon weight	No. of axles x 2.5 t
Maximum operating speed	v max = 10 km/h
Minimum operating speed	v min = 0.1 km/h
Maximum number of wagons per train (If less than 60 wagons)	n max …..

Note 1: The markings shall reflect details for which the particular installation has been verified. The maximum and minimum wagon weights and maximum and minimum operating speeds may vary from those shown in the specifications (***1.13 Specifications***) but shall be within the limits specified there, and will be dependent on the 'rail load cell' capacity specifications. For example, the maximum wagon weight will be related to the heaviest reference wagon used in verification testing.

Note 2: It is acceptable for more complex sets of markings to be provided. This may be necessary where (for example) it was necessary following in-situ testing to restrict operation to one speed range for wagon weighing and another speed range for train weighing. Such arrangements shall be clearly set out in the markings provided.

Note 3: Where an installation is only to be used with wagons of a particular configuration (e.g. all with 8 wheels) the maximum and minimum wagon weight values may be expressed as a value rather than the formula shown in the example.

1.15. Verification Mark

Provision is made for the application of a verification mark.

1.16. Sealing Provision

Provision is made for calibration and set-up menus of the instrument to be secured with a passcode, without which alteration of these items is not possible.

In addition a non-resettable 'calibration counter' is incremented whenever any calibration adjustment or set-up parameter is altered. The value of this calibration counter is shown in the master controller configuration file. The value of the 'calibration counter' at the time of verification shall be recorded on a destructible adhesive label attached to the instrument (so that any subsequent alteration to the calibration or parameters will be evident as the recorded value and the current calibration counter value will differ).

Note: There is provision for details regarding each alteration to be manually recorded as a comment by service personnel in the master controller configuration file.

2. Description of Variant 1 approved on 14/10/16

The Meridian Engineers model ME-TRACKWEIGH-nD weighing instrument (where n represents a number from 2 to 8 indicating the number of weighing points). This instrument is similar to the ME-TRACKWEIGH-1D described as the pattern, however these instruments have additional weighing points, so that the axle weight is determined at a number of points during its motion along the rails (with the values being combined to arrive at the weight value). To achieve this, a number of sets of weighing transducers are incorporated on each rail (each rail is still known as a 'rail load cell' although it incorporates a number of weighing points).

The additional weighing points (allowing averaging of weight data from a number of weighing points) may be necessary to achieve higher accuracy and/or higher speed ranges.

For example, ME-TRACKWEIGH-8D has 8 weighing points (i.e. with 8 sets of weighing transducers on each 'rail load cell').

Instruments may have differing accuracy class and speed range specifications within the limits shown below.

Accuracy class Train weighing	0.2, 0.5, 1 or 2
Accuracy class Wagon weighing	0.5, 1 or 2
Maximum operating speed	110 km/h or less
Minimum operating speed	0.1 km/h or more

Performance will be dependent on site specific conditions and it is the responsibility of the submittor (in consultation with the rail system operator) to determine the number of weighing points necessary to meet the accuracy requirements.

Note: Although instruments with specifications mentioned above are approved, the acceptability for use for trade is dependent on satisfactory performance at verification testing.

2.1. Weighing Transducers ('Rail Load Cells')

The Meridian Engineers model ME-TRACKWEIGH-nD using 'rail load cells' with additional weighing points as shown in Table 4.

TABLE 4

'Rail Load Cell' ME-RailType-nB or ME-RailType-nEX	Capacity of 'Rail load cell' weighing point	Minimum capacity
ME-AS41-nB or ME-AS41-nEX	20.5 t	1.25 t
ME-AS50-nB or ME-AS50-nEX	18 t	1.25 t
ME-AS60-nB or ME-AS60-nEX	20 t	1.25 t
ME-AS68-nB or ME-AS68-nEX	22.5 t	1.25 t
ME-UIC60-nB or ME-UIC60-nEX	20	1.25 t

Note 1: In the above "n" represents a number from 1 to 8 indicating the number of weighing points (sets of weighing transducers) installed on the 'rail load cell', corresponding to "n" in variant 1 (e.g. n=8 indicates eight weighing points)

Note 2: The "RailType" part of the model number refers to the rail cross section.

Note 3: The above table contains a listing of models with rail sections commonly used in Australia. Other rail sections may be used.

The ME-RailType-nB and ME-RailType-nEX series of 'rail load cells' consist of "n" sets of transducers (with strain gauges bonded to them) which are bolted on to a length of rail (in accordance with the manufacturer's procedures), hence resulting in the rail becoming a 'rail load cell'. Provision is also made for measurement of the rail temperature. The transducers (Figure 2) are encapsulated to provide protection from the environment.

The transducers used on the ME-RailType-nEX 'rail load cells' are identical to those used on the ME-RailType-nB 'rail load cells', but are intended for use in explosive atmospheres, and hence are uniquely identified.

The 'rail load cells' are designed to be welded or bolted (using 'fish plates') into the rail line into which the system is installed and rest on sleepers or other supports (as shown in Figure 5).

Instrument specifications vary according to the capacity of the 'rail load cell' as shown in Table 5.

TABLE 5

Maximum capacity of instrument (per axle)	2 x capacity of 'rail load cell'
Minimum capacity (per axle)	2 x minimum capacity of 'rail load cell' weighing point
Maximum wagon weight	No. of axles x maximum capacity of instrument (or less)
Minimum wagon weight	No. of axles x minimum capacity (or more)

The value of scale interval shall be 20, 50, 100, 200 or 500 kg and shall be chosen to satisfy the requirements of NMI R 106, Automatic Rail Weighbridges, dated July 2004 – in particular clauses 2.3 and 2.5.

2.2. Trackside System Box

Multiple ME-TSB trackside system boxes are used (depending on the number of

weighing points on the weighing instrument). There is only one master controller, which may reside in one of the trackside system boxes, or may be housed in a separate box or cabinet on its own or with other equipment such as the uninterruptible power supply unit (with appropriate battery).

3. Description of Variant 2 approved on 14/10/16

The pattern or variants with ME-RailType-nB and ME-RailType-nEX 'rail load cells' that are created by bolting sets of transducers onto lengths of rail in-situ. This results in the length of existing rail becoming a 'rail load cell'.

4. Description of Variant 3 approved on 14/10/16

The pattern or variants with alternate covering/encapsulating systems for the weighing transducers that are bolted to the rail (Figure 6). This may be to provide additional protection from the environment or site hazards.

5. Description of Variant 4 approved on 14/10/16

The pattern with the master controller located separately to the trackside system box, in a box or cabinet on its own or with other equipment such as the uninterruptible power supply unit (with appropriate battery).

6. Description of Variant 5 approved on 14/10/16

The pattern or variants having a single computing system 'master controller' (using Meridian Engineers RAILMASTER software) as the controller for two weighing locations. The single 'master controller' may be located within the trackside system box of either weighing location, or may be located separately (see Variant 4 above).

Such an arrangement may typically occur for situations in which tare (empty train) and gross (loaded train) weighing occurs at two different locations. In such an arrangement the system may be capable of producing net weight reports.

7. Description of Variant 6 approved on 14/10/16

The pattern or variants with the ME-TRACKWEIGH system operating under the supervision of a plant control computer system (e.g. a Citect Plant control system). The plant control system shall be able to initiate the start and end of a train weighing sequence, and take appropriate action in the case of error conditions such as roll-back. This mode of operation is site specific and customised to the particular installation.

8. Description of Variant 7 approved on 14/10/16

The Meridian Engineers model ME-TRACKWEIGH-8 weighing instrument for the determination (by measurement of axle forces) of the mass of each wagon and the total mass of a train, when weighed in motion.

The ME-TRACKWEIGH-8 system is an eight (8) weighing point weighing system that uses Meridian Engineers model ME-RailType-8A or ME-RailType-8B 'rail load cells'.

The ME-RailType-8B 'rail load cells' are described in ***2.1 Weighing Transducers*** for Variant 1 above and shown in Figure 7(b). The ME-RailType-8A 'rail load cells' are described in 8***.1 Weighing Transducers*** below and shown in Figure 7(a).

The instrument is approved for class 1 (or 2) wagon weighing and class 0.5 (or 1 or 2) train weighing, over a speed range of 0.1 to 80 km/h.

8.1. Weighing Transducers (ME-RailType-8A 'Rail Load Cells')

The ME-RailType-8A series of 'rail load cells' consist of a length of rail to which eight sets of weighing transducers (i.e. a number of strain gauges) have been bonded (in accordance with the manufacturer's procedures). Each rail is then known as a 'rail load cell' according to the manufacturers' terminology. Provision is also made for measurement of the rail temperature.

The 'rail load cells' are designed to be welded or bolted (using 'fish plates') into the rail line into which the system is installed and rest on sleepers or other supports (as shown in Figure 7).

TABLE 6

'Rail Load Cell' ME-RailType-8A	Capacity of 'Rail load cell' weighing point	Minimum capacity
ME-AS41-8A	20.5 t	1.25 t
ME-AS50-8A	18 t	1.25 t
ME-AS60-8A	20 t	1.25 t
ME-AS68-8A	22.5 t	1.25 t
ME-UIC60-8A	20	1.25 t

Note 1: The "RailType" part of the model number refers to the rail cross section.

Note 3: The above table contains a listing of models with rail sections commonly used in Australia. Other rail sections may be used.

Instrument specifications vary according to the capacity of the 'rail load cell' as shown in Table 7.

TABLE 7

Maximum capacity of instrument (per axle)	2 x capacity of 'rail load cell'
Minimum capacity (per axle)	2 x minimum capacity of 'rail load cell' weighing point
Maximum wagon weight	No. of axles x maximum capacity of instrument (or less)
Minimum wagon weight	No. of axles x minimum capacity (or more)

The value of scale interval shall be 20, 50, 100, 200 or 500 kg and shall be chosen to satisfy the requirements of NMI R 106, Automatic Rail Weighbridges, dated July 2004 – in particular clauses 2.3 and 2.5.

8.2. Data Acquisition

The system uses one (or more) of the following analog data acquisition modules to convert analogue signals from the 'rail load cells' to digital signals for communication to the Meridian Engineers RAILMASTER software:

- National Instruments module SCXI 1520;
- National Instruments module SCXI 1314;
- National Instruments module PXI 6289;
- National Instruments module PXI 6280;

- National Instruments module PXIe 4330.

8.3. Electronics Cabinet

A Meridian Engineers model ME-ECHS (Figure 8) electronics cabinet is used, which contains:

- A computing system ‘master controller’ such as the National Instruments PXI-1052 or PXI-1042 with PXI-88xx real time controller (*);
- One (or more) of the analog data acquisition modules specified in 8***.2 Data Acquisition*** to acquire data from the weighing transducers;
- An Eaton model PW9130G1500R-XL2UAU(*) uninterruptible power supply unit (with appropriate battery);
- An LM35 semi-conductor type temperature sensor to provide information to the system regarding the cabinet temperature;
- Load cell protection devices and other equipment as necessary (e.g. for communications and interfacing to track-switch sensors).

The electronics cabinet receives input signals from the weighing transducers, temperature sensors, track switches, and automatic vehicle identification systems (tag readers) if used.

8.4. Software

The system processes the information received by the electronics cabinet using Meridian Engineers RAILMASTER (version 4) software (installed on the computing system ‘master controller’) to determine wagon weights, total train weights and to determine unweighed vehicles (e.g. locomotives).

9. Description of Variant 8 provisionally approved on 14/10/16

[See Special Conditions of Approval: (Provisional Approval)]

The TRACKWEIGH model ME-TRACKWEIGH-nD-DG system, which is similar to the ME-TRACKWEIGH-nD system (Variant 1), but is intended for use on a dual gauge rail system. In such a system 3 ’rail load cells’ are provided, one for each rail.

Note: An ME-TRACKWEIGH-nD-DG system shall be verified individually for each set of two ‘rail load cells’ (e.g. for standard and narrow gauge trains).

10. Description of Variant 9 provisionally approved on 14/10/16

[See Special Conditions of Approval: (Provisional Approval)]

The TRACKWEIGH model ME-TRACKWEIGH-nD-split system, which is similar to the ME-TRACKWEIGH-nD system (Variant 1), but forms a system in which the ‘rail load cells’ are installed offset, such that the wheels on the left of an axle are weighed prior to those on the right of an axle (or vice versa).

This arrangement is intended to remove the need for sleeper spacing adjustment so that the system may be installed without disturbing existing track conditions.

11. Description of Variant 10 approved on 14/10/16

The TRACKWEIGH system (pattern or variants) for which only the Total Train Weight is approved for trade use.

The instrument markings and reports shall include a clear indication that wagon

weight values are not approved for trade use.

For some installations wagon weight values may only be approved for trade use in particular conditions (e.g. for weighing in one direction) – in such cases the instrument markings shall reflect this.

12. Description of Variant 11 approved on 14/10/16

The pattern or variants operating in a mode in which the train stops and starts during the train weighing event (e.g. whilst wagons prior to the weighing point are loaded). This is referred to by the manufacturer as ‘index weighing’.

Rollback detection as per ***1.12 Roll-back Detection*** applies and once a weight has been determined for a wagon (in the acceptable speed range), it cannot be reweighed during the train weighing. This is the case even if the wagon is completely reversed over the weighbridge, then rolled forward over it again.

Note: Testing may be required to demonstrate that any loading operation does not adversely affect weighing results (e.g. if the loading point is not sufficiently distant from the weighing point).

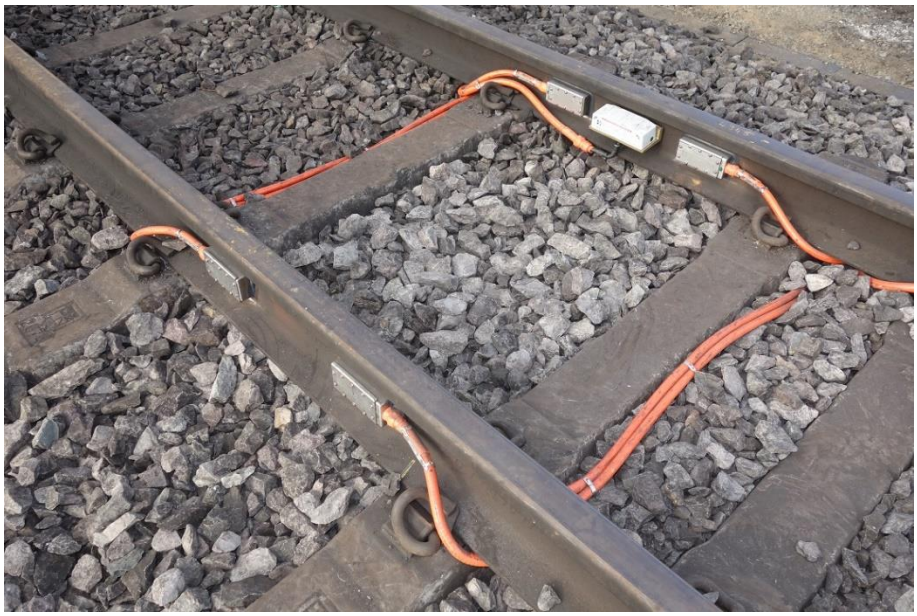
Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures.

The instrument shall not be adjusted to anything other than as close as practical to zero error, even when these values are within the maximum permissible errors.

Maximum Permissible Errors

The maximum permissible errors are specified in Schedule 1 of the *National Trade Measurement Regulations 2009*.

FIGURE 6/14H/7 - 1

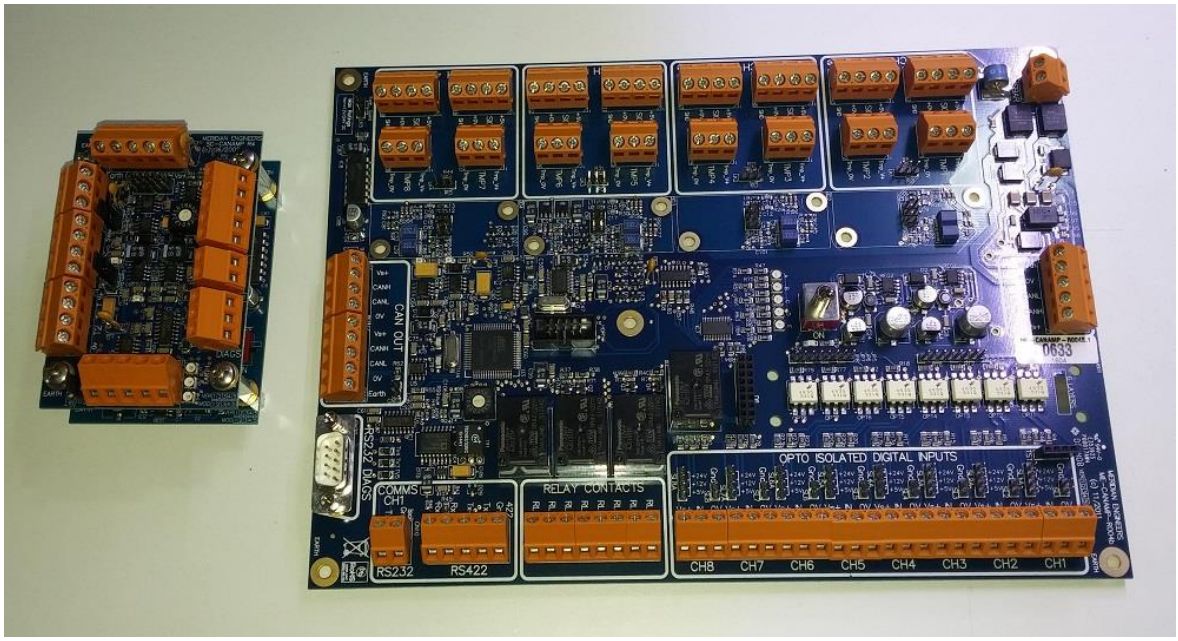


ME-AS60-1B ‘rail load cells’, showing their location on sleepers and track switch mounting.

FIGURE 6/14H/7 - 2

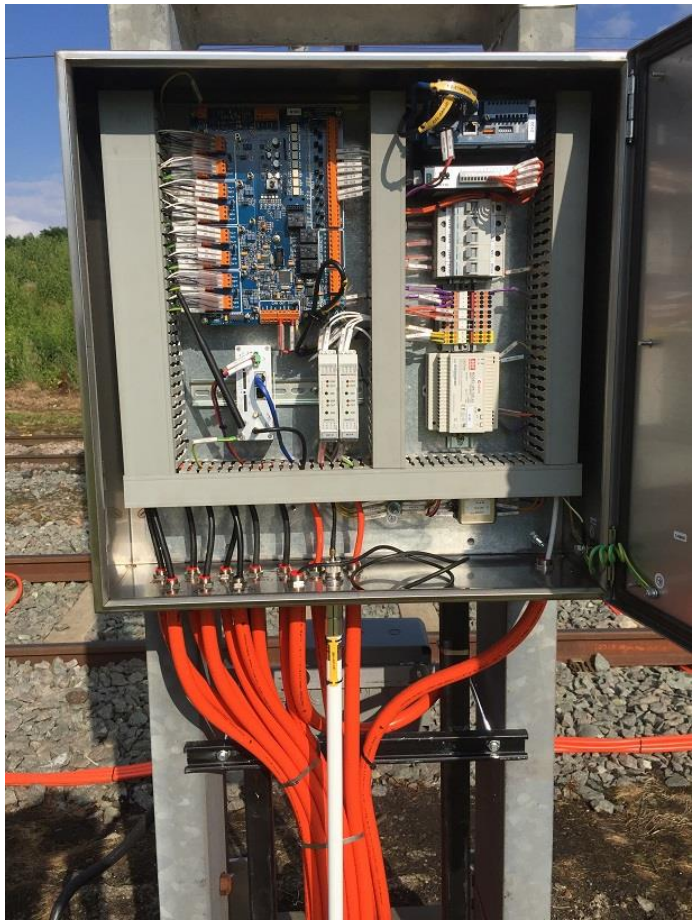
Transducers used in ME-RailType-nB and ME-RailType-nEX ‘rail load cells’

FIGURE 6/14H/7 - 3



ME-CANAMP-1 (left) and ME-CANAMP-4 (right) data acquisition boards

FIGURE 6/14H/7 – 4



Trackside System Box containing an ME-CANAMP-4 module

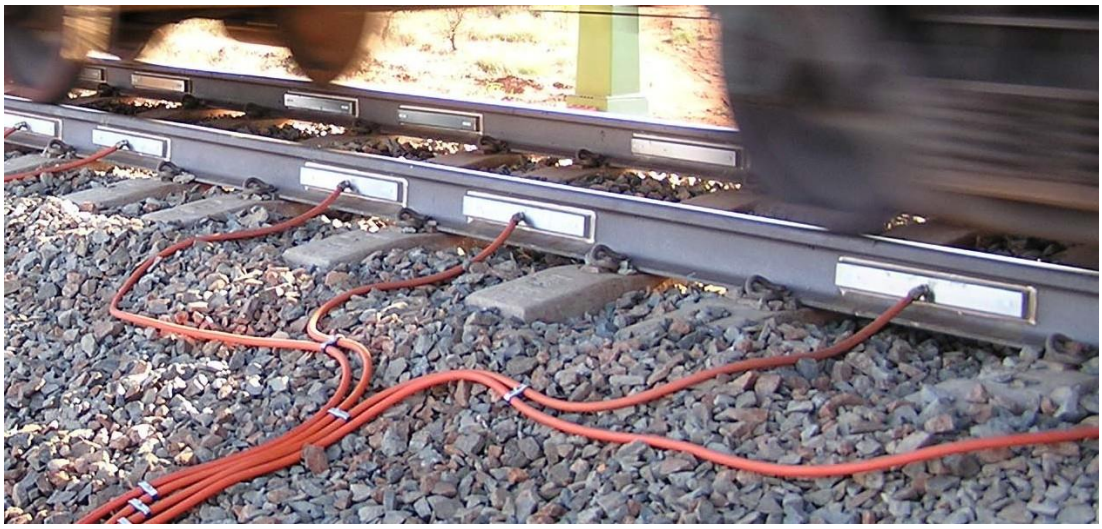
FIGURE 6/14H/7 - 5

ME-AS60-2B ‘rail load cells’, showing their location on sleepers and track switch mounting.

FIGURE 6/14H/7 - 6

Examples of transducers with different encapsulating covers

FIGURE 6/14H/7 - 7(a)



ME-AS68-8A ‘rail load cells’

FIGURE 6/14H/7 - 7(b)

ME-AS68-8B ‘rail load cells’

FIGURE 6/14H/7 - 8

ME-ECHS electronics cabinet