(2971) V(6)g

Pursuant to section 12 of the Weights and Measures Act 1985 Certificate No 2971

issued by the:

National Measurement Office

In accordance with the provisions of section 12 of the Weights and Measures Act 1985, the Secretary of State for Business, Innovation & Skills has issued this UK national type-approval certificate to:

WheelRight Ltd
Begbroke CIE
Begbroke Science Park
Begbroke Hill
Woodstock Road
Begbroke, OX5 1PF
United Kingdom

and hereby certifies as suitable for use for trade the following pattern of an automatic road-weighbridge, for measuring the gross weight of road vehicles in-motion as described in the descriptive annex to this Certificate, and having the following characteristics.

A weighbridge, fitted with a minimum of sixteen strain gauge load cells, connected to an indicating device. The manufacturer's designation for the system is "WheelRight Weight and Pressure in motion WR100 or WheelRight Weight in motion WR120".

Maximum capacity	Max ≤ 50 000 kg
Minimum capacity	Min ≥ 10 d
Scale interval	50 kg ≤ d ≤ 200 kg
Maximum number of scale intervals	n ≤ 1000
Accuracy Class	10

Note: This certificate relates to the suitability of the equipment for use for trade only in respect of its metrological characteristics. It does not constitute or imply any guarantee as to the safety of the equipment in use for trade or otherwise.

Issue Date: **23 December 2013**
Reference No: **TS0107/0003**

Signatory: **P R Dixon**
for **Chief Executive**

National Measurement Office | Stanton Avenue | Teddington | TW11 0JZ | United Kingdom
Tel +44 (0)20 8943 7272 | Fax +44 (0)20 8943 7270 | Web www.bis.gov.uk/nmo
NMO is an Executive Agency of the Department for Business Innovation & Skills

National Measurement Office

CONTENTS

CERTIFICATION No. 2971

Descriptive Annex

1 INTRODUCTION

This pattern of an automatic in-motion road-weighbridge comprises either a WR100 or WR120 system incorporating the indicating device and two load receptors. Along with the basic system it can comprise any of the following: a printer, a remote display, a vehicle detection system and vehicle identification. The system is for gross vehicle weighing only for vehicles having a maximum of six axles. A schematic diagram is shown in Figure 1. This instrument is a mains powered 240 V / 50 Hz digital weight-indicating device

2 CONSTRUCTION

2.1 Mechanical

2.1.1 Weigh zone

The weigh zone comprises two load receptors positioned parallel to each other with aprons on both sides.

2.1.2 Load receptor

2.1.2.1 Fixed system WR100 or WR120

The load receptor comprises two flush mounted weigh platforms, each fitted with eight load cells. The maximum capacity of each weigh platform is dependent upon the number of load cells multiplied by the maximum capacity of the load cells. The platforms are embedded in the ground using a concrete foundation and having the following technical characteristics.

Platform Model	Maximum axle capacity of single platform (kg)	Dimensions (mm)
WR100, WR120 Individual platform– Permanently fixed system	15 000	960 x 470
WR100, WR120 installation size – Permanently fixed system	15 000	3000 x 600

2.1.3 Aprons

Aprons extend 4 m either side of the load receptor and are level to within +/- 3 mm. Irregularities of up to +/- 9 mm may be tolerated provided they are confined in areas of less than 150 mm in diameter and do not lie at right angles to the direction of travel. A line or marker is used to indicate the start of the approach apron.

2.1.4 Vehicle guide device

Traffic Management (for instance barriers, kerbing, signage or traffic lights) shall be put in place to ensure the axles pass completely over the platform and to restrict the direction if the instrument is for single direction use.

2.2 Electrical/electronic

2.2.1 Digital Weight indicator

The WheelRight system determines weight in two stages. The load cell data is digitised by the Sensor interface boards (022-EL-0014). This data is transmitted to a central processing unit that applies the load cell calibration data and combines the values to determine the weight. As standard no display is present on the system. The optional external display needs to be added to display results locally for tare operation.

2.2.1.1 Sensor Interface Board

This instrument utilises the following digital indicating devices designated the WheelRight Sensor Interface Board. The above named indicator has the following features:

The technical data for the weight indicators is as follows:

Maximum number of scale intervals	1000
Load cell excitation voltage	3.3 V DC
Minimum load cell impedance	650 Ω
Maximum load cell impedance	10 kΩ
Minimum input voltage per verification scale interval	33 µV/div
Measuring range minimum voltage	-3.3 mV
Measuring range maximum voltage	6.6 mV
Fraction of maximum permissible error	0.5
Operating temperature range	-10 / + 40 °C
Load cell connection	4 wire
Load cell cable length (junction box to indicator)	5 m

2.2.2 Metrological characteristics

Accuracy class	10
Maximum number of axles	≤ 6
Maximum capacity	≤ 50 000 kg
Scale interval (d)	50 kg ≤ d ≤ 200 kg
Minimum capacity	≥ 10 d
Number of scale intervals	≤ 1000
Maximum speed	≤ 16 km/hr
Direction of travel	Single or Dual direction
Compensating axle groups	Yes (Pneumatic)
Operating temperature range	- 10 °C / + 40 °C
Power supply	100-240 V AC (50/60 Hz)
Load cells	Compatible OIML R60

2.2.3 Devices

The WheelRight Ltd digital indicator can comprise of the following devices:

- Zero tracking (≤ 4% Max)
- Printing
- LCD or LED external display
- Vehicle Identification (ANPR or RFID)

2.3 Load cell

2.3.1 Any load cell(s) may be used for instruments under this Type-Approval Certificate provided the following conditions are met:

- There is a respective OIML Certificate of Conformity (R60) or an EC Test Certificate (EN: 45501) issued for the load cell by a Notified Body responsible for type examination under Directive 2009/23/EC.
- The certificate contains the load cell types and the necessary load cell data required for the manufacturer's declaration of compatibility of modules (WELMEC Guide 2, Issue 5, 2009, section 11), and any particular installation requirements. A load cell marked NH is allowed only if humidity testing to EN: 45501 has been conducted on this load cell.
- The compatibility of load cells and indicator is established by the manufacturer by means of the compatibility of modules form, contained in the above WELMEC Guide 2 document, at the time of verification.
- The load transmission must conform to one of the examples shown in WELMEC Guide 2.4, "Guide for load cells".

2.4 Remote display

2.4.1 A remote display model designated DM640; incorporating a 640 x 480 pixel TFT display may be fitted to the indicator unit via a protected interface listed in Section 2.7.2.

2.5 Legends and markings

The manufacturer's name is located on the front cover of the indicating device. The following inscriptions are on a data plate which cannot be removed without being destroyed:

Manufacturer
Certificate number
Accuracy Class
Serial number
Minimum capacity
Maximum capacity
Maximum operating speed
Maximum number of axles
Scale interval
Direction of travel
Audit trail number (see 4.1.3)

2.6 Securing and stamping

2.6.1 The data plate is affixed to the front of the cabinet housing the control unit. The tamperproof label is destroyed when removed.

2.6.2 Components that may not be dismantled or adjusted by the user must be secured. Common serial numbers, a wire and seal solution or a suitable mark may be used. The securing mark may be either:

- a mark of the manufacturer and/or manufacturer's representative, or
- an official mark of a verification officer.

2.6.3 A stamping plug is provided, securely fixed to the cabinet housing of the control unit.

2.7 Peripheral devices and interfaces

2.7.1 Peripherals

2.7.1.1 The following peripheral devices may be connected to the interfaces provided:

- Peripheral devices that have been issued with a test certificate by a Notified Body responsible for type approval under Directive 2009/23/EC; or

- Peripheral devices without a test certificate under the following conditions:
  - it bears the CE marking for conformity to the EMC Directive;
  - it is not capable of transmitting any data or instruction into the weighing instrument, other than to release a printout, checking for correct data transmission or validation;
  - it prints weighing results and other data as received from the weighing instrument without any modification or further processing;
  - it complies with the applicable requirements of EN45501, i.e. 4.2, 4.4, 4.6 and 4.7.

2.7.1.2 Upon completion of a weighing cycle, information is sent from the indicator to the printer. An example printout is shown in figure 3.

The printout shall include, as a minimum, the following information:

- Total vehicle mass with unit
- Date and time
- Operating speed or warning message ("Too fast") if applicable
- "Axle Weights and Wheel Weights Not Permitted to be used for Trade Purposes" or similar wording if these weight values are printed

2.7.1.3 The printer may be used as a tally roll printer when the indicator is connected to a computer. It shall not be possible to initiate a second printout for the same weighing operation, except where the second ticket is clearly a duplicate of the first ticket e.g. multi-leaf with different colours / headings, or marked duplicate or copy. One copy shall be retained as a tally record for a period of not less than 90 days.

2.7.2 Interfaces

2.7.2.1 The instrument may be fitted with the following protected interfaces:

- RS-232
- RS-485
- USB
- Ethernet
- Bluetooth
- WiFi

3 OPERATION

3.1 All weighing operations shall be started with the vehicle stationary at a minimum distance of 4 m in front of the load receptor. A suitable forward gear shall be selected to ensure the vehicle crosses the load receptor in a smooth manner. Weighing operations are not permitted using reverse gear.

3.2 If the bridge has no weight on it and any previous weigh cycle has been completed, the display will show either "System Ready" or the previous result. Automatic zero-tracking will occur if within range. This means that any weight which appears on the weighbridge below 1 scale interval will be zeroed out.

3.3 The vehicle identification number will be automatically recorded either by the use of number plate recognition or RFID tags.

3.4 When a vehicle is detected approaching the system, the display will indicate the system is acquiring data. Each axle will be measured as it passes over the system. Whilst the vehicle is still detected as present all additional axles will be measured and the weight of the new axle summed with the previous axle weight. This sequence continues for up to a maximum of 6 axles.

3.5 As an axle passes over the bridge a number of samples are taken from the load cells to determine the axle weight. If there is any problem that results in an inaccurate measurement the message "WheelRight were unable to determine your tyre pressures or vehicle weight on this occasion" will be displayed.

3.6 If the vehicle speed exceeds the maximum supported speed the message "WheelRight were unable to measure your tyre pressures as you were going faster than the maximum supported speed (16 km/h)**"** will be displayed and printed on the ticket (no other printing will be possible). The maximum speed is 16 kph.

3.7 If the vehicle is off the bridge the message "WheelRight were unable to measure your weight / tyre pressures as you were off the pressure mat**"** will be displayed and printed on the ticket (no other printing will be possible).

3.8 If a weight greater than the maximum capacity is recorded, the message "WheelRight were unable to determine your tyre pressures or vehicle weight on this occasion" will be displayed and not print at all. If a weight less than the minimum capacity is recorded, the same fault message will be reported, and printing will not be possible.

3.7 When the vehicle is no longer detected as present the display will show the results including the time, date, vehicle identifier, axle weights and gross weight. The printout will display the gross vehicle weight up to a maximum of 50 000 kg. A new weighing cycle may be started when the printer has printed the ticket.

3.8 The measurement data is stored on the internal hard drive, and shall include the information listed in section 2.4.2. The data is also stored on an external database via the internet. The requirement of section 2.4.2 also applies to data stored on an external PC complying with section 2.8.1.1 when no printer is connected to the instrument.

4 SECURING

4.1.1 Physical

Physical securing is provided by the roadside cabinet. The roadside PC that runs the control framework, the digital IO module and 3G router/switch are locked in the roadside cabinet, preventing access to all but WheelRight personnel. A security seal shall be applied after any maintenance inside the cabinet to prevent unauthorised access by the user.

4.1.2 Network

An internet connection is a mandatory requirement for the operation of the system, and as such this connection must be secured. This is achieved via the following measures:

4.1.2.1 Remote Access

Remote access is provided to each roadside PC to allow authorised personnel to log in to systems and diagnose problems, update the Control Framework software and perform other maintenance functions.

This access is provided via a secure, encrypted, VPN connection utilising the L2TP/IPsec protocol and password protection.

4.1.2.2 Anti-Virus

Anti-virus software forms part of the OS installation image installed during the manufacture of each system.

4.1.2.3 Web Server

The outgoing web server connection, where results are uploaded, is secured via SSL encryption. A firewall is used to filter the IP addresses from which results can be posted to those of the roadside PCs and to the type of traffic that can be sent.

4.1.3 Software

At present updates to the Control Framework software require a manual update via VPN. This ensures that only authorised WheelRight personnel can access roadside PCs and perform updates.

The software version number is 1.0.11.61, (where m.n.o.p refers to the identification of the software as described in 4.2.1.2 below). The calibration and legally relevant parameters are protected via software means (password and audit counter).

4.2 Verification information

4.2.1 Software identification

4.2.1.1 Sensor Interface Board Firmware

The SIB firmware is identified by a two digit increasing integer value. The firmware features an ID command that allows this revision to be queried.

4.2.1.2 Control Framework identification

Each release of the Control Framework will be labelled with an m.n.o.p release number where:

m – Major release
n – Minor release
o – Build release
p – Revision release

Along with the binaries that comprise the software, a release also includes all of the requisite runtime collateral, such as the mat, system and calibration configuration files.

The m number will be incremented for major software releases with many, large-scale, feature changes that may or may not include changes to the legally applicable software components.

The n number will be incremented for software releases where the legally applicable, accredited, components have been modified in some way; i.e. those that affect the results reported to users.

The o number will be incremented for software releases that are shipped to users that do not affect the legally applicable software components.

The p number will be incremented for software releases that are created internally for testing purposes.

Each assembly comprising a software release also has its own m.n.o.p version, and the version of each assembly comprising a release can be found in the build log generated by the build system.

Each time the software is started or stopped, and each time a new log file is generated (1 per day), the current version is appended to the log file.

4.2.2 Calibration and programming

The system uses certified OIML R60 load cells. The calibration data for each load cell is stored on the PC hard drive and replicated on the central server.

Each load cell has a zero balance of ± 1%, the amplifier chain is set up so that 0 mV/V is nominally measured at ¼ scale of the analogue to digital convertor (ADC).

Before calibration, each load cell has the readings centred on a nominal zero, and a linear calibration coefficient is applied to calculate a load cell output in kg, based on the load cells certified output, and its resistance.

Once each load cell has been calibrated, the results from all of the load cells in one load receptor are brought together in one place, and any initial zero setting and zero-tracking can be applied.

In case of error the instrument's functioning is blocked.

5 AUTHORISED ALTERNATIVES

There are no current authorised alternatives.

6 ILLUSTRATIONS

Figure 1 Schematic diagram of weighing system
Figure 2 Digital weight indicator schematic
Figure 3 Typical ticket printout
Figure 4 Ground installation of the weighing system

7 CERTIFICATE HISTORY

Issue №.	Date	Description
2971	23 December 2013	Certificate first issued.
-	-	-

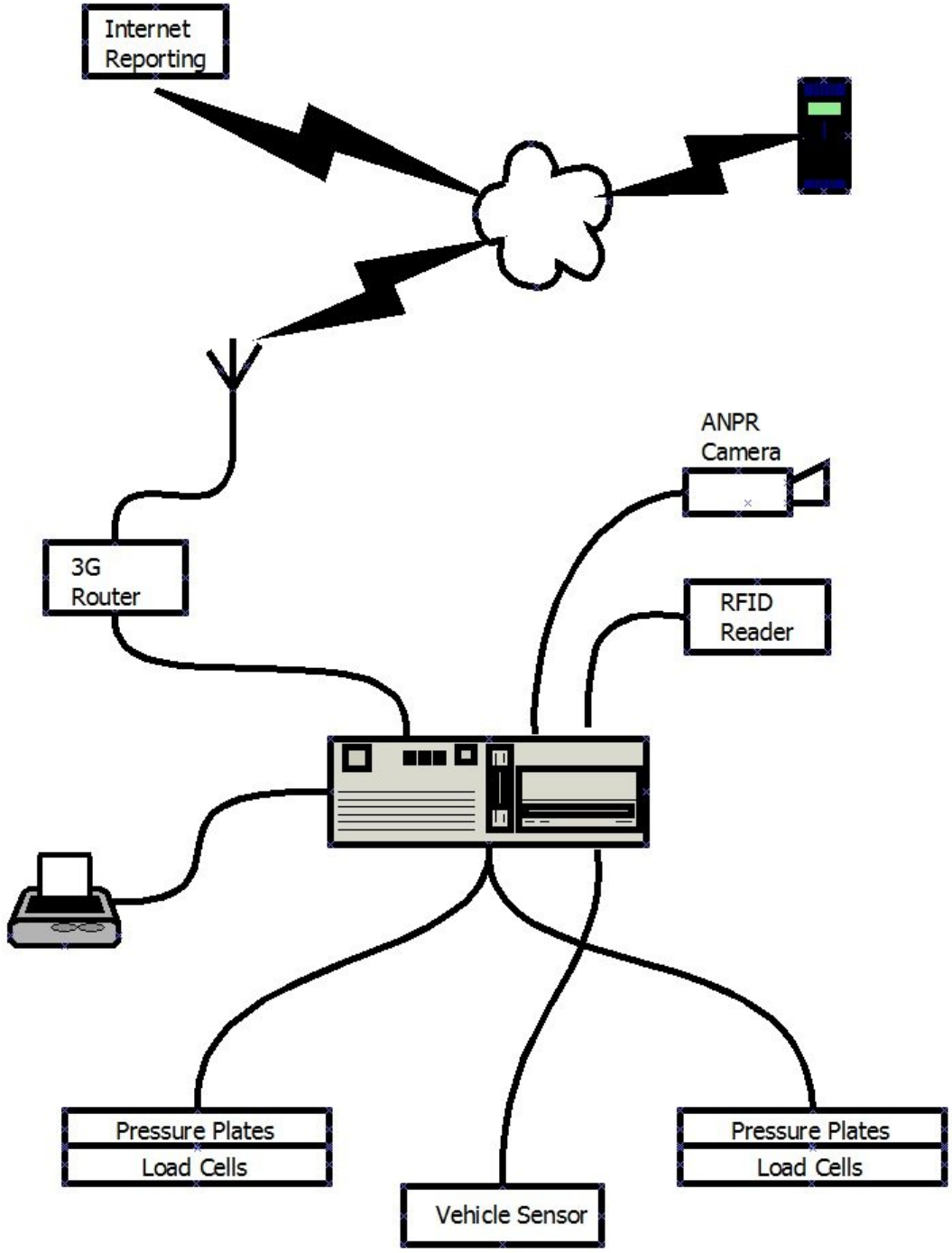

Figure 1 Schematic diagram of weighing system

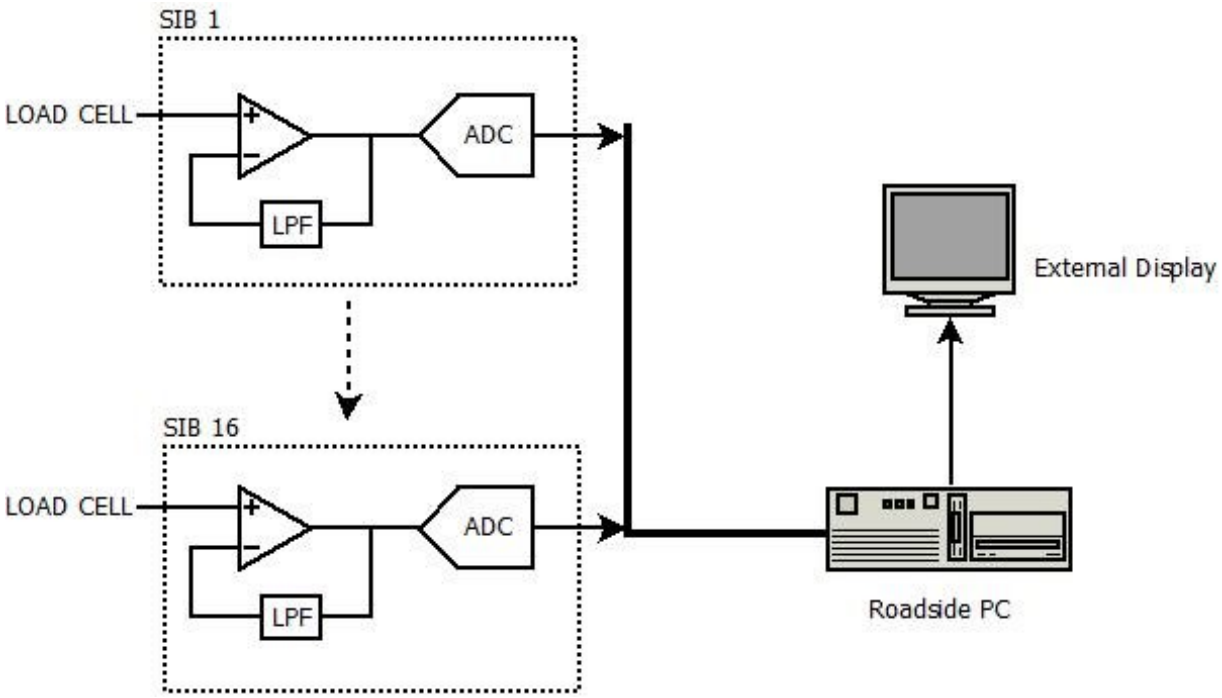

Figure 2 Digital weight indicator schematic

WheelRight Ltd
CIE, Begbroke Science Park
Begbroke, Oxford
OX5 1PF

Tues 20-Nov-12 10:23:25

Tractor ID HX58AVZ Trailer ID 134/03

AXLE 1	121			127 PSI	6400 kg
AXLE 2	111			115 PSI	4950 kg
AXLE 3	92	87	85	95 PSI	7250 kg
AXLE 4	120			118 PSI	6650 kg
AXLE 5	124			121 PSI	6600 kg
AXLE 6	90			127 PSI	6750 kg
Gross weight					38600 kg

Axle Weights Not Permitted to be used for Trade Purposes.
1.0.11.60

Figure 3 Typical ticket printout

Figure 4 Typical Installation of the weighing system