Australian Government

National Measurement Institute
Bradfield Road, West Lindfield NSW 2070

Certificate of Approval

No 6/9C/293

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

NORAC Model AU20L4 ONBOARD Weighing Instrument

submitted by Landmark Pty Ltd
31 McKechnie Drive
Eight Mile Plains QLD 4113.

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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 76, *Non-automatic weighing instruments, Parts 1 and 2*, dated July 2004.

CONDITIONS OF APPROVAL

This approval becomes subject to review on 1 November 2011, and then every 5 years thereafter.

Instruments purporting to comply with this approval shall be marked with approval number 'NMI 6/9C/293' 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.

…./2

The National Measurement Institute reserves the right to examine any instrument or component of an instrument purporting to comply with this approval.

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

Special Conditions of Approval

(a) The use of this instrument is limited to measurement of the net quantity of product loaded onto or delivered from the weighing platform. It is NOT to be used for the determination of gross weight values.

(b) The pattern and variants as approved herein may be used with substitute approved indicators, and may be constructed in other capacities and with differing load receptors, provided that the instrument shall comply with the calculations given in Variant 1.

The use of substitute approved load cells (i.e. through the application of General Certificate of Approval No 6B/0) is not approved.

DESCRIPTIVE ADVICE

Pattern: approved 13 October 2006

- A NORAC model AU20L4 ONBOARD self-indicating weighing instrument of 20 000 kg maximum capacity.

Variant: approved 13 October 2006

1. Various models and capacities of the ONBOARD series.

Technical Schedule No 6/9C/293 describes the pattern and variant 1.

FILING ADVICE

The documentation for this approval comprises:

Certificate of Approval No 6/9C/293 dated 8 November 2006
Technical Schedule No 6/9C/293 dated 8 November 2006 (incl. Tables 1 to 3, and Test Procedure)
Figures 1 to 4 dated 8 November 2006

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

TECHNICAL SCHEDULE No 6/9C/293

Pattern: NORAC Model AU20L4 ONBOARD Weighing Instrument

Submittor: Landmark Pty Ltd
31 McKechnie Drive
Eight Mile Plains QLD 4113

1. Description of Pattern

The NORAC model AU20L4 ONBOARD weighing instrument (Figure 1) is a vehicle mounted weighing instrument of 20 000 kg maximum capacity and approved for use with up to 3000 verification scale intervals. The instrument is intended for determination of the net quantity of product loaded onto or delivered from the weighing platform - see Special Condition of Approval (a).

Instruments may be fitted with output sockets (output interfacing capability) for the connection of peripheral and/or auxiliary devices.

1.1 Basework

The NORAC model AU20L4 ONBOARD instrument consists of weighing modules mounted on a vehicle frame/chassis. The load receptor (for example the vehicle deck or a bulk commodity container or tank) is then mounted on the weighing modules.

The weighing module consists of load cell(s), and hydraulically-activated lever mechanism(s) whereby the load receptor may be disengaged from the load cell during transport, or applied and suspended from the load cell(s) during weighing.

1.2 Load Cells

The load cells used are Revere Transducers Inc model 9363-15K-C3-20P1 load cells (Figure 2) of 6804 kg capacity - see Special Condition of Approval (b).

1.3 Control Unit/Indicator

The system is operated from a control unit (Figure 3) which contains a Rinstrum model 5100 digital indicator (the indicator is also described in the documentation of approval NSC S363) to which the load cells of the basework are connected.

The control unit may either be located on (attached to) the load receptor, or located on (attached to) the vehicle frame/chassis to which weighing modules are mounted. The control unit also contains a printer, controls for operating the system, a level sensing device and lights to indicate a level condition.

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1.4 Special Features – ONBOARD weighing system

The level sensing device and lights indicate whenever the system is level within approximately 5.5 degrees of horizontal (i.e. a slope of approximately 1 in 10.5). The system is designed such that in this condition, when engaged (in the weighing mode) the load receptor is freely suspended from the load cells.

When this allowable degree of tilt is exceeded, the level indicator lights extinguish, and (after a 10 second period) the indicator and printer are disabled so that operation cannot continue in an out-of-level condition.

The system may be powered by rechargeable battery (e.g. from the vehicle battery) or other suitable means according to the approval of the indicator.

Typical operation of the system is:

(a) The vehicle arrives at a suitable delivery location.

(b) The system is switched on (the level indicator will indicate if the system is in a sufficiently level condition) and the system is engaged (using the hydraulic mechanism) into the weighing mode.

(c) The start button is pressed – the *instrument* is tared and an initial printout (indicating a delivery identification, date & time and 0 kg Net) is produced.

(d) A quantity of material is delivered from the instrument.

(e) The stop button is pressed – the final indication (indicating 'Amount unloaded' is added to the printout).

(f) The system is disengaged from the weighing mode and switched off – the vehicle can be moved to a new location.

Note: The State and Territory Trade Measurement Authorities should be consulted regarding any special arrangements which may be necessary in regard to operation of a mobile weighing instrument of this type. Issues such as the following may need to be considered (the Trade Measurement Authority may for example require that the operator maintain a logbook and/or carry out a set procedure prior to weighing).

(i) Levelling Arrangements and Stability of Ground

The site chosen for weighing should be level and firm – clearly the level sensing device imposes limits on the level condition, however the stability of the ground surface should also be considered as subsidence or compaction may affect accuracy (as well as introducing safety concerns).

(ii) Gravity Variation

Where the instrument is certified/verified in one location and subsequently moved to another location, the effects of differences in the acceleration of gravity at each location may need to be considered.

(iii) Provisions for Verification

Suitable means shall be provided for application of test masses.

See additional notes in the Test Procedure.

Provision is made for the application of a verification/certification mark.

1.5 Sealing Provision

Provision is made for the calibration adjustments to be sealed as described in the approval documentation for the indicator.

1.6 Markings

Instruments carry the following markings:

Manufacturer's mark, or name written in full	.....
Name or mark of manufacturer's agent	.....
Indication of accuracy class	(III)
Maximum capacity	*Max* ..... kg *
Minimum capacity	*Min* ..... kg *
Verification scale interval	*e* = ... kg *
Tare capacity (if less then *Max)*	*T* = - ..... kg
Serial number of the instrument	.....
Pattern approval mark for the instrument	6/9C/293
Pattern approval mark for the indicator	S.....
Pattern approval mark for the load cells	S.....

* These markings shall also be shown near the display of the result if they are not already located there.

2. Description of Variant 1

NORAC ONBOARD series weighing instruments of various models and capacities as shown in Table 1.

The model numbers are in the form AUxxLn where xx is the instrument maximum capacity in tonnes, and n is the number of load cells used (3 or 4).

The instrument has similar special features (ONBOARD weighing system) described for the pattern.

…./4

TABLE 1

Model	Max (kg)	e (kg)
AU1Ln	1000	0.5
AU2Ln	2000	1
AU3Ln	3000	1
AU4Ln	4000	2
AU5Ln	5000	2
AU6Ln	6000	2
AU8Ln	8000	5
AU10Ln	10000	5
AU12Ln	12000	5
AU15Ln	15000	5
AU20Ln	20000	10
AU25Ln	25000	10
AU30Ln	30000	10
AU35Ln	35000	20

The systems utilise two of the following weighing modules (Figure 4) which have the characteristics and use the number and model of load cells as shown in Tables 2 and 3 below. Note that it is acceptable for two different modules to be used in the one instrument.

TABLE 2

Weighing Module	Module Capacity (kg)	Load Cell Model	Load cell Emax (kg)	Number of load cells	Module Dead Load (kg)
OB5-SGL5	2268	9363-5K-C3-**P1	2268	1	79
OB10-SGL10	4536	9363-10K-C3-**P1	4536	1	79
OB15-SGL15	6804	9363-15K-C3-**P1	6804	1	97
OB10-DBL5	4536	9363-5K-C3-**P1	2268	2	125
OB20-DBL10	9072	9363-10K-C3-**P1	4536	2	125
OB30-DBL15	13608	9363-15K-C3-**P1	6804	2	163
OB30-TAN15	13608	9363-15K-C3-**P1	6804	2	152

Parameters for the load cells used are shown in Table 3.

TABLE 3

Type: Revere Transducers Inc	9363-xxK-C3-**P1		
Capacity marking (-xxK-)	-5K-	-10K-	-15K-
Maximum capacity, *Emax* kg	2268	4536	6804
Accuracy class	C	C	C
Maximum number of verification intervals	3000	3000	3000
Minimum value of verification interval, *Vmin* kg	0.278	0.556	0.833
Output rating (nominal) mV/V	3.3	3.3	3.3
Input impedance (nominal) Ω	430	430	430
Supply voltage (AC/DC) V	15 max.	15 max.	15 max.
Cable length (±0.1 m) m	4	4	4
Number of leads (plus shield)	4	4	4

Instruments shall satisfy basic calculations in regard to the instrument, load cell and indicator parameters.

The parameters to be used in the calculations shall be as shown in the Supplementary Certificate of Approval for the indicator, and in Table 3 above in relation to the load cells.

The calculations shall include the following:

(i) Load cell capacity

The maximum capacity of the instrument, plus the mass of the load receptor, plus the module dead loads for the weighing modules used must be less than the sum of the module capacities for the weighing modules used (as shown in Table 2).

$$Max + DL_{receptor} + DL_{module1} + DL_{module2} \leq CAP_{module1} + CAP_{module2}$$

Note: Additional calculations and recommendations of the manufacturer may need to satisfied in selecting suitable modules for any particular vehicle and instrument configuration, in particular where the modules used have differing numbers of load cells.

(ii) Number of verification scale intervals

The number of verification scale intervals (Max / e) shall be less than the number approved for the indicator and the number indicated for the load cells (i.e. in Table 3), and in any case shall not exceed 3000.

(iii) Minimum value of verification interval for the load cell

The minimum value of the verification interval for the load cell (see Table 3 above), shall satisfy the following:

$$v_{\min} \leq \frac{e}{\sqrt{N}}$$

where N = the number of load cells used,

e = the verification scale interval of the instrument

v_{min} = the minimum value of verification scale interval (the larger value where two load cells of different capacity are used).

(iv) Minimum sensitivity of the digital indicator

The approved minimum sensitivity of the digital indicator (as indicated in its Supplementary Certificate of Approval) shall satisfy the following

$$Minimum\_sensitivity \leq \frac{excitation\_voltage \times load\_cell\_sensitivity \times e}{N \times load\_cell\_maximum\_capacity}$$

where N = the number of load cells used,

e = the verification scale interval of the instrument

$excitation\_voltage$ = as specified in Supplementary Certificate of Approval of the digital indicator

$load\_cell\_sensitivity$ = Output rating, mV/V

$load\_cell\_maximum\_capacity$ = Maximum capacity, Emax from Table 3.

Note: Take care to ensure that the units used for minimum sensitivity of the indicator and load cell sensitivity correspond, i.e. either mV or μV

(v) Load cell impedance / Excitation current of the digital indicator

For the digital indicator used, the Supplementary Certificate of Approval gives, a specification for the maximum excitation current, and/or a specification for the minimum load impedance to the indicator. These values shall satisfy the following:

$$Minimum\_load\_impedance\_to\_the\_indicator \leq \frac{Load\_cell\_impedance}{N}$$, and/or

$$Maximum\_excitation\_current \geq \frac{excitation\_voltage \times N}{Load\_cell\_impedance}$$

where N = the number of load cells used,

$excitation\_voltage$ = as specified in Supplementary Certificate of Approval of the digital indicator

$Load\_cell\_impedance$ = Load cell input impedance, from Table 3.

…./7

TEST PROCEDURE

Instruments should be tested in accordance with any relevant tests specified in the Uniform Test Procedures, taking into account the following notes.

Notes: Details of testing and the suitability of provisions for application of test masses shall be at the discretion of State/Territory Trade Measurement Authorities. The following aspects may need to be considered:

(i) Safety requirements should be a major consideration in testing.

(ii) In situations where the instrument is used for delivery from the weighing platform, the weight determination will involve the taking of measurements with a decreasing load. The testing carried out should likewise involve decreasing loads.

(iii) Special provisions may need to be made, and equipment supplied to facilitate loading of test masses to the instrument. Lugs for attaching test masses are provided adjacent to each load cell location, however the suitability of these may need to be assessed for each installation, and may depend on the form of the load receptor.

(iv) Where the vehicle has a vessel (e.g. tank/hopper) which forms the load receptor, it may be appropriate for testing to be carried out using substitution loads. The use of substitution loads may also be appropriate for platform type load receptors.

(v) Where the material to be weighed is fluid, the tilting of the system may result in increased loading at the ends or sides of the load receptor – this may result in a need for eccentricity testing with loads greater than the 1/10 Max generally applied in the case of tanks/hoppers. However it may be appropriate that eccentricity testing be carried out with less than the 1/3 Max generally applied for platform type load receptors.

(vi) It may be appropriate for any tank/hopper to be removed and for testing to be carried out with loads applied to a platform type load receptor (with the dead load of the tank/hopper replaced by equivalent masses).

(vii) A test may be carried out to check that operation of the special features is in accordance with clause **1.4 Special Features – ONBOARD weighing system** of the Technical Schedule (in particular regarding operation of the level sensing device and operation where the allowable degree of tilt is exceeded).

…./8

The design of this instrument is intended to allow its use at various locations without re-verification/certification at each new location. The acceptability of this method of operation is at the discretion of the applicable State/Territory authorities, particularly giving regard to the items mentioned in clause **1.4 Special Features – ONBOARD weighing system** of the Technical Schedule.

Maximum Permissible Errors at Verification/Certification

For single range instruments, the maximum permissible errors for increasing and decreasing loads on initial verification/certification for loads, *m*, expressed in verification scale intervals, *e*, are:

±0.5*e* for loads $0 \leq m \leq 500$;
±1.0*e* for loads $500 < m \leq 2\,000$; and
±1.5*e* for loads $2\,000 < m \leq 10\,000$.

As the use of this instrument is limited to measurement of the net quantity of product loaded onto or delivered from the weighing platform (i.e. it is not to be used for the determination of gross weight values), the maximum permissible errors should be applied to the net values – for example if a load of 15 000 kg is removed from the instrument the maximum permissible error should apply to the net value (i.e. difference between loaded and unloaded value). One approach to application of this in practice could be to tare the instrument with the instrument fully loaded and apply the maximum permissible errors to the net loads as loads are removed from the load receptor.

FIGURE 6/9C/293 – 1

NORAC Model AU20L4 ONBOARD Weighing Instrument

FIGURE 6/9C/293 – 2

Revere Transducers Inc model 9363-15K-C3-20P1

FIGURE 6/9C/293 – 3

NORAC Control Unit/Indicator

FIGURE 6/9C/293 – 4

Showing Typical SGL Weighing Module

Showing Typical TAN Weighing Module

Various NORAC Weighing Modules