



Australian Government
Department of Industry and Science

National Measurement Institute

Certificate of Approval

NMI 6/4C/295

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.

Teraoka Model DIGI DS-166 Weighing Instrument

submitted by W W Wedderburn Pty Ltd
101 Williamson Road
Ingleburn NSW 2565

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.

This approval becomes subject to review on 1/06/20, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variants 1 to 5 approved – certificate issued	21/05/15
1	Pattern amended (sealing, etc.) – certificate issued	23/07/15

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI 6/4C/295' 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.

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



Mario Zamora

TECHNICAL SCHEDULE No 6/4C/295

1. Description of Pattern **approved on 21/05/15**

A Teraoka model DIGI DS-166 class III multi-interval self-indicating non-automatic weighing instrument (Figure 1) with a verification scale interval e_1 of 0.005 kg for up to 15 kg and then 0.01 kg for up to 30 kg. Note that this instrument may also be known as a DIGI model DS-166.

Instruments have a liquid crystal display (LCD).

Instruments are not for trading direct with the public, and are so marked.

Instruments are approved for use over a temperature range of 0°C to +40°C and must be so marked.

1.1 Basework

The Teraoka model S-QA basework (Figure 1) has the load receptor directly supported by a single load cell. The load receptor has a nominal dimension of 350 mm x 500 mm.

1.2 Load Cell

A Teraoka model PMB30kg load cell of 45 kg maximum capacity is used.

1.3 Indicator

A Teraoka model DI-166 digital indicator is used. The indicator is described in the documentation of approval NMI S679.

The indicator may be mounted on a column (as shown in Figure 1) or similarly mounted without the supporting column, in a location adjacent to the platform.

1.4 Zero

Zero is automatically corrected to within $\pm 0.25e$ whenever power is applied and whenever the instrument comes to rest within $0.5e$ of zero.

The initial zero-setting device of the pattern has a nominal range of not more than 20% of the maximum capacity of the instrument.

The instrument has a semi-automatic zero-setting device with a nominal range of not more than 4% of the maximum capacity of the instrument.

1.5 Tare

A semi-automatic subtractive tare device of up to maximum capacity may be fitted. A semi-automatic subtractive tare device of up to $1e$ less than maximum capacity may be fitted.

1.6 Display Check

A display check is initiated whenever ON power is applied.

1.7 Levelling

The instrument is provided with adjustable feet and adjacent to the level indicator is a notice advising that 'Instrument must be level when in use' (or similar wording).

1.8 Verification Provision

Provision is made for the application of a verification mark.

1.9 Sealing Provision

Provision is made for access to the calibration adjustments to be prevented by sealing the indicator housing by the application of lead and wire type seals or similar with the drilled screws or with destructive labels placed across the join between the indicator housing sections preventing access to the SPAN switch.

Provision is made for the calibration to be sealed by setting a switch on the main board within the instrument to a LOCK position, and then preventing access within the instrument housing (Figure 2). It is possible to determine that the switch status is in the 'LOCK' position as follows:

- Hold down the →0← key, and press the →T← key once and then the ← key twice in weighing mode.
- If the switch is in the 'LOCK' position, the instrument will display '**S off**'. In this case the instrument may be verified.
- Otherwise the instrument will display '**S on**' in which case the instrument should not be verified until the switch has been correctly located in the 'LOCK' position.

1.10 Descriptive Markings and Notices

Instruments carry the following markings:

Manufacturer's mark, or name written in full	Teraoka
Name or mark of manufacturer's agent	WEDDERBURN
Indication of accuracy class	Ⓜ
Pattern approval number for the instrument	NMI 6/9C/295
Maximum capacity	Max/..... g or kg #1
Minimum capacity	Min g or kg #1
Verification scale interval	e =/..... g or kg #1
Maximum subtractive tare	T = - g or kg #2
Serial number of the instrument
Special temperature limits	0°C to +40°C

#1 These markings are also shown near the display of the result if they are not already located there.

#2 This marking is required if *T* is not equal to *Max*.

In addition, instruments shall carry a notice stating NOT TO BE USED FOR TRADING DIRECT WITH THE PUBLIC, or similar wording.

2. Description of Variant 1

approved on 21/05/15

The model DIGI DS-166 as multi-interval instruments in certain capacities using certain S-QA or S-WQ baseworks as listed in Table 1 (see Figure 1 for a typical instrument).

TABLE 1 – Baseworks

The baseworks listed below have capacity ranges, maximum platform sizes and use a single load cell of the model of the model as listed below:

Basework Model	Capacity Range (kg)	Platform size (mm)	Load Cell Models
S-WQ	6 to 30	346 x 286	PN
S-QA	30 to 300	350 x 500	PMB

Within the basework capacity ranges listed in Table 1 above, instruments are available in certain multi-interval capacities and use a load cell of the capacity as shown in Table 2 below.

TABLE 2 – Multi-Interval Capacities

Maximum Capacity (Max1 / Max2)	Verification Scale Interval (e1 / e2)	Maximum Subtractive Tare Capacity (T = -...)	Load Cell Capacity
* / 15 kg	2 / 5 g	1e less than Max 1	22.5 kg
* / 30 kg	5 / 10 g	1e less than Max 1	45 kg
* / 60 kg	10 / 20 g	1e less than Max 1	90 kg

* = Where:

Max1 (smaller interval capacity) is any multiple of the corresponding e1 as long as its interval capacity total value is less than that of Max 2, and the number of scale intervals (n) is less than or equal to 7500.

Max2 = Maximum capacity of the instrument

e = Verification scale interval

Tare = Maximum subtractive tare capacity (T = - ...)

3. Description of Variant 2 approved on 21/05/15

The model Digi DS-166 using the basework listed in Table 1 as single interval instruments in certain single capacities, shown in Table 3 below.

For single interval instruments (see variants) there is only one range therefore only one value of maximum capacity and verification scale interval need to be marked.

TABLE 3 – Single interval Instrument Capacities

Maximum Capacity (Max)	Verification Scale Interval (e)	Maximum Subtractive Tare Capacity (T = -...)	Load Cell Capacity
6 kg	2 g	Up to Max	9 kg
15 kg	2 g	Up to Max	22.5 kg
15kg	5 g	Up to Max	22.5 kg
30 kg	5 g	Up to Max	45 kg
30 kg	10 g	Up to Max	45 kg
60 kg	10 g	Up to Max	90 kg
60 kg	20 g	Up to Max	90 kg
150 kg	50 g	Up to Max	225 kg
300 kg	100 g	Up to Max	450 kg

Max = Maximum capacity of the instrument

e = Verification scale interval

Tare = Maximum subtractive tare capacity (T = - ...)

4. Description of Variant 3 **approved on 21/05/15**

Similar to the pattern and variants 1 and 2, but having an alternative model DIGI DI-166SS digital indicator. The Teraoka model DI-166SS indicator is described in approval NMI S679. The combined instrument is known as a DIGI model DS-166SS.

5. Description of Variant 4 **approved on 21/05/15**

Similar to the pattern and variants 1 and 2, but having an alternative model DIGI DI-167 digital indicator (Figure 3). The Teraoka model DI-167 indicator is described in approval NMI S679. The combined instrument is known as a DIGI model DS-167.

6. Description of Variant 5 **approved on 21/05/15**

Any model basework of this approval, used with a compatible approved (by Supplementary Certificate) indicator provided the conditions set out below are met. These baseworks and their limiting characteristics are given in Tables 1 to 3.

The resulting instrument may be single range, or multi-interval (according to the indicator used), provided that the conditions given are met.

Characteristics of the load cells used are needed to determine that the required conditions are met. These characteristics are given in Tables 4 & 5.

In addition to the markings specified in clause **1.10 Descriptive Markings and Notices**, instruments are marked with the NMI approval number for the indicator used, together in the same location. Where the resulting instrument is a multiple range instrument, appropriate markings regarding the ranges and scale intervals shall be provided in accordance with the Supplementary Certificate for the indicator.

The conditions to be met are given below, and include calculations using the following terms:

Ex = Excitation from indicator (V)

LC_Sens = Load cell sensitivity (mV/V)

Emax = Load cell maximum capacity (kg)

Indicator Sensitivity = Minimum sensitivity value per verification scale interval for the indicator (μV)

e = verification scale interval of the instrument (kg). In the case of multi-interval or multiple range instruments, any reference to 'e' refers to the smallest verification scale interval (i.e. e1).

e1, e2, ... = verification scale interval of each range for multiple range instruments (or partial weighing ranges for multi-interval instruments), e1 refers to the smallest verification interval.

Max = the maximum capacity of the instrument. This refers to the maximum capacity of the highest range (i.e. Maxr for multiple range instruments).

Maxr = the maximum capacity of the instrument for a multiple range instrument, i.e. the maximum capacity of the highest range.

Max1 Max2 ... = the maximum capacity of the various ranges for a multiple range instrument. Max1 refers to the maximum capacity of the smallest range.

n_{LC} = the maximum number of verification intervals for which the load cell or basework is approved (e.g. 3000 for a 'class C3' load cell).

DR = dead load return value for the load cell. Note: Many load cells do not have a specified DR value.

The conditions are:

- The excitation voltage used is within the range of the load cell used in the approved baseworks.
- The maximum load applied to the basework (live load plus any dead load) does not exceed the load cell maximum capacity.
- The verification scale interval is not less than the minimum value specified. In the case of multi-interval or multiple range instruments, the verification scale interval refers to the smallest verification scale interval (i.e. e_1).
- The number of verification scale intervals is less than or equal to the n_{max} value specified for the load cell and also for the approved indicator. In the case of multi-interval instruments, the number of verification scale intervals refers to the largest number in any weighing range or partial weighing range (i.e. the largest of Max_1/e_1 , Max_2/e_2 , etc).
- The signal voltage per verification scale interval is not less than the minimum sensitivity value per verification scale interval for the indicator (as specified in the approval documentation for the indicator), i.e.

$$\text{Indicator Sensitivity} \leq 1000 \times E_x \times LC_Sens \times e / E_{max}$$

Additional requirements for multi-interval operation:

In the case of indicators which are configured to form a multi-interval weighing instrument the instrument shall comply with one of the following conditions:

- (i) The smallest verification scale interval (e_1) shall satisfy the following:

$$e_1 \geq Max/n_{LC}$$

- (ii) Or, the smallest verification scale interval (e_1) shall satisfy the following:

$$e_1 \geq 2 \cdot DR \cdot Max/E_{max}$$

Of course (ii) cannot apply where a value of 'Deadload return' DR is not given.

Additional requirements for multiple range operation:

In the case of indicators which are configured to form a multiple range weighing instrument the instrument shall comply with one of the following conditions:

- (i) The smallest verification scale interval (e_1) shall satisfy the following:

$$e_1 \geq 0.4 Max_r/n_{LC}$$

- (ii) Or, the smallest verification scale interval (e_1) shall satisfy the following:

$$e_1 \geq DR \cdot Max_r/E_{max}$$

Of course (ii) cannot apply where a value of 'Deadload return' DR is not given.

TABLE 4 – PN Load Cell Data (used in S-WQ basework)

Load cell model	PN6kg	PN15kg	PN30kg
Load cell max capacity, E _{max}	9 kg	22.5	45 kg
Max number of verification scale intervals (nLC)	3000	7500	7500
Min value of verification scale interval (V _{min} of load cell) (kg)	0.002	0.002	0.002
Dead load return (kg)	0.0009	0.0015	0.003
Load cell sensitivity at E _{max}	1.5 mV/V	1.5 mV/V	1.5 mV/V
Input impedance	1100 Ω	1100 Ω	1100 Ω
Excitation voltage (max.)	12 V	12 V	12 V
Load cell cable length (approx.) (*)	3 metres	3 metres	3 metres
Number of leads (plus shield)	4	4	4

TABLE 5 – PMB Load Cell Data (used in S-QA basework)

Load cell used	PMB30kg	PMB60kg	PMB150kg	PMB300kg
Load cell max capacity, E _{max}	45 kg	90 kg	225 kg	450 kg
Max number of verification scale intervals (nLC)	7500	7500	3000	3000
Min value of verification scale interval (V _{min} of load cell) (kg)	0.004	0.008	0.05	0.1
Dead load return (kg)	0.003	0.006	0.025	0.05
Load cell sensitivity at E _{max}	1.5 mV/V	1.5 mV/V	1.5 mV/V	1.5 mV/V
Input impedance	1100 Ω	1100 Ω	1100 Ω	1100 Ω
Excitation voltage (max.)	12 V	12 V	12 V	12 V
Load cell cable length (approx.) (*)	3 metres	3 metres	3 metres	3 metres
Number of leads (plus shield)	4	4	4	4

(*) Cable length attached to the load cell supplied with the basework shall not be lengthened or shortened.

TEST PROCEDURE

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.

A suitable Test Procedure may be obtained from NMI

Maximum Permissible Errors

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

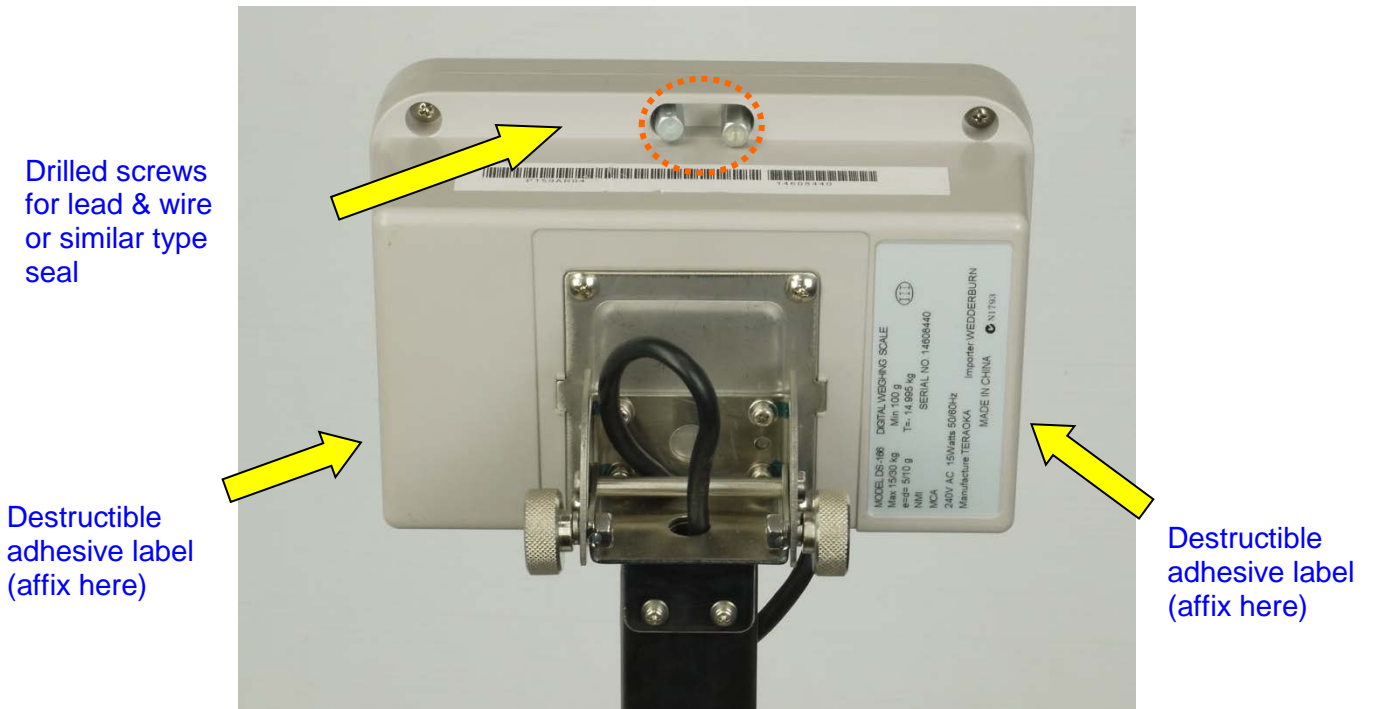
For multi-interval instruments with verification scale intervals of $e_1, e_2 \dots$, apply e_1 for zero adjustment, and maximum permissible errors apply $e_1, e_2 \dots$, as applicable for the load.

FIGURE 6/4C/295 – 1



Teraoka Model DIGI DS-166 Weighing Instrument
(with a model S-QA basework and a column-mounted indicator)

FIGURE 6/4C/295 – 2



Teraoka Model DIGI DS-166 Weighing Instrument Sealing Methods

FIGURE 6/4C/295 – 3



Teraoka Model DIGI DS-167 weighing Instrument
(with a model S-WQ basework and a column-mounted indicator)