



Australian Government

National Measurement
Institute

Bradfield Road, West Lindfield NSW 2070

Certificate of Approval

NMI 6/4C/217

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.

Marel Model M1100-C2 Weighing Instrument

submitted by Marel hf
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210 Gardabaer
Iceland

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 & 2 approved – interim certificate issued	30/05/03
1	Pattern & variants 1 & 2 approved – certificate issued	30/10/03
2	Variants 3 & 4 approved – certificate issued	18/10/06
3	Pattern & variants 1 to 4 reviewed – notification of change issued	25/02/11
4	Pattern & variants 1 to 4 reviewed and updated – variant 5 approved – certificate issued	30/06/15

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI (or NSC) 6/4C/217' and only by persons authorised by the submitter.

It is the submitter'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 Certificates No S1/0/A or 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*.



Dr A Rawlinson

TECHNICAL SCHEDULE No 6/4C/217

1. Description of Pattern **approved on 30/05/03**

A Marel model M1100-C2 class III multiple range self-indicating weighing instrument (Table 1) with a verification scale interval (e_1) of 0.001 kg for the low range which has a maximum capacity of 3 kg and with a verification scale interval (e_2) of 0.002 kg for the high range which has a maximum capacity of 6 kg.

Note: The indicator of the instrument is marked as 'M series 1100'. When power is initially applied to the instrument it indicates 'C2-3.23'. The C2 indicates that the instrument is a model M1100-C2.

The instrument may be configured so that the weighing range changes automatically with increasing load and automatically changes back to the low range when the indication comes to rest at zero. Alternatively, the weighing range may also be changed manually (see instrument users' guide). A light marked 'RANGE MAX2' illuminates whenever the instrument is in the high range.

The indicator of the instrument may be attached to the platform or may be mounted separately from the platform. The display has light emitting diode (LED) displays for the weight values, and a separate display for information relating to the additional management functions described below.

The instrument has provision for additional management functions such as the setting of target values and limits (under/accept/over facility with associated bar graph type display), and the grading of items into weight categories, and has memories associated with these functions. These functions are not approved for trade use.

The instrument face has markings for a 'lb' mode – it shall not be possible for this mode to be accessed.

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

Instruments are powered by the mains power supply.

Instruments are NOT FOR TRADING DIRECT WITH THE PUBLIC and are so marked.

1.1 Basework

The basework (known as a model PL2010, Figure 2) has the load receptor fully supported by a single Tedeo Huntleigh model 1042 load cell of 10 kg maximum capacity.

The load receptor has maximum nominal dimensions of 246 × 296 mm.

1.2 Display Check

A display check is initiated whenever power is applied.

1.3 Zero

Instruments have a zero light which illuminates whenever zero is correct within $\pm 0.25e$ (e of the weighing range in use).

The instrument has a combined semi-automatic zero-setting and tare device with a nominal range of not more than 4% of the maximum capacity of the instrument (Max_2).

Zero is automatically corrected to within $\pm 0.25e$ (e of the weighing range in use), then the zero button is pressed, whenever power is applied and whenever the instrument comes to rest within $0.5e$ (e of the weighing range in use) of zero.

The instrument also has an initial zero-setting device with a nominal range of not more than 20% of the maximum capacity of the instrument (Max_2).

1.4 Tare

The instrument has provision for a semi-automatic tare device of up to maximum capacity of the instrument.

The instrument also has provision for an automatic tare device (which may or may not be enabled). This operates such that the weight of a container which is within 10% (or 30%) of a previously set initial semi-automatic tare value will be automatically tared.

Any tare value set whilst the instrument is in the lower range will also be active in the higher range. Any tare value set whilst the instrument is in the higher range will be cancelled when the indicator is switched to the lower weighing range.

1.5 Levelling

The instrument is provided with adjustable feet and adjacent to the level indicator is a notice advising that the instrument must be level when in use.

1.6 Verification Provision

Provision is made for the application of a verification mark.

1.7 Descriptive Markings and Notices

Instruments are marked with the following data, together in one location, in the form shown at right:

Manufacturer's mark, or name written in full	Mare hf
Name or mark of manufacturer's agent
Indication of accuracy class	
Pattern approval number for the instrument	NMI (or NSC) 6/4C/217
Maximum capacity/verification scale interval/ minimum capacity (for range 1)	$Max_1./ e / Min.....$ kg #1
Maximum capacity/verification scale interval/ minimum capacity (for range 2)	$Max_1./ e / Min.....$ kg #1
Maximum subtractive tare	$T = -$ kg #2
Serial number of the instrument

For single interval instruments (see variant 2) there is only one range therefore only one value of maximum capacity and verification scale interval to be marked.

#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.

1.8 Sealing Provision

Provision is made for the calibration adjustments to be sealed by means of two event counters which increment whenever the calibration or configuration parameters are altered. Additional security is provided by means of a password which restricts access to calibration and configuration settings.

When power is initially applied to the instrument it indicates 'CAL Events xxx' and 'CON Events yyy' as part of the power-on sequence. At verification the xxx and yyy values shall be recorded and marked on the instrument.

It is therefore possible at any time to determine whether the calibration or configuration has been altered by comparing the CAL and CON values with those recorded at the time of verification.

2. Description of Variant 1

approved 30/05/03

Certain other capacities of multiple range instruments with baseworks as listed in Table 1 below. All instruments are fitted with a Tedeo Huntleigh model 1042 Class C3 load cell.

TABLE 1 – Basework Specifications for Approved Multiple Range Instruments

Basework Model	$Max_1 / e_1 =$	$Max_2 / e_2 =$	Min_1 / Min_2	Maximum Platform Dimensions (mm x mm)	Load Cell E_{max}
PL2010-6kg	3 kg/1 g	6 kg/2 g	20/40 g	246 x 296	10 kg
PL2010-15kg	6 kg/2 g	15 kg/5 g	40/100 g	246 x 296	20 kg
PL2060-6kg	3 kg/1 g	6 kg/2 g	20/40 g	251 x 301	10 kg
PL2060-15kg	6 kg/2 g	15 kg/5 g	40/100 g	251 x 301	20 kg
PL3000-30kg	15 kg/5 g	30 kg/10 g	100/200 g	296 x 396	50 kg

3. Description of Variant 2

approved 30/05/03

Certain other capacities of single interval instruments with baseworks as listed in Table 2 below. All instruments are fitted with a Tedeo Huntleigh model 1042 Class C3 load cell.

TABLE 2 – Basework Specifications for Approved Single Interval Instruments

Basework Model	$Max =$	$e =$	Min	Maximum Platform Dimensions (mm x mm)	Load Cell E_{max}
PL2010-6kg	6 kg	2 g	40 g	246 x 296	10 kg
PL2010-15kg	15 kg	5 g	100 g	246 x 296	20 kg
PL2060-6kg	6 kg	2 g	40 g	251 x 301	10 kg
PL2060-15kg	15 kg	5 g	100 g	251 x 301	20 kg
PL3000-30kg	30 kg	10 g	200 g	296 x 396	50 kg

4. Description of Variant 3

approved on 17/10/06

With certain models of the Marel PL series baseworks, similar to the model PL2010 basework described for the pattern but with different models of Tedeo Huntleigh load cell. The parameters of the approved baseworks are listed below in Table 3.

TABLE 3 – Approved Multiple Range (*) Instruments using M1100 Indicator

Basework Model-Capacity	Max ₁ /e ₁	Max ₂ /e ₂	Min ₁ /Min ₂	Maximum Platform Dimensions mm x mm	Load Cell Maximum Capacity, E _{max}	Load Cell Model (#)
PL4000-30 kg	15 kg/5 g	30 kg/10 g	0.1 kg/0.2 kg	400 x 550	50 kg	A
PL4000-60 kg	30 kg/10 g	60 kg/20 g	0.2 kg/0.4 kg	400 x 550	100 kg	A
PL4000-60 kg	30 kg/10 g	60 kg/20 g	0.2 kg/0.4 kg	400 x 550	100 kg	B
PL4000-150 kg	60 kg/20 g	150 kg/50 g	0.4 kg/1 kg	400 x 550	200 kg	A
PL6050-60 kg	30 kg/10 g	60 kg/20 g	0.2 kg/0.4 kg	516 x 616	100 kg	A
PL6050-60 kg	30 kg/10 g	60 kg/20 g	0.2 kg/0.4 kg	516 x 616	100 kg	B
PL6050-150 kg	60 kg/20 g	150 kg/50 g	0.4 kg/1 kg	516 x 616	200 kg	A
PL6050-300 kg	150 kg/50 g	300 kg/100 g	1 kg/2 kg	516 x 616	500 kg	A
PL6050-300 kg	150 kg/50 g	300 kg/100 g	1 kg/2 kg	516 x 616	500 kg	B

(*) In addition to the multiple range instrument parameters shown in Table 3, instruments may alternatively be configured as single interval instruments using either:

$$\begin{aligned} \text{Max} &= \text{Max}_1, e = e_1 \text{ and } \text{Min} = \text{Min}_1; \text{ or} \\ \text{Max} &= \text{Max}_2, e = e_2 \text{ and } \text{Min} = \text{Min}_2 \end{aligned}$$

(#) Load Cells used:

- A - Tedeo Huntleigh Model 1250 Class C3
- B - Tedeo Huntleigh Model 1510 Class C3

5. Description of Variant 4

approved on 17/10/06

Certain baseworks of this approval used with a compatible NMI approved (by Supplementary Certificate) indicator provided the conditions set out below are met.

In addition to the markings specified in clause **1.7 Markings and Notices**, instruments are marked with the NMI approval number for the indicator used, together in the same location.

The approved baseworks and their limiting characteristics are given in Table 4.

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)

E_{max} = 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. e_1).***

e_1, e_2, \dots = verification scale interval of each range for multiple range instruments (or partial weighing ranges for multi-interval instruments), e_1 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. Max_r for multiple range instruments).

Max_r = 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. Max_1 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 approved for the 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. ***In the case of multi-interval or multiple range 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.

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

Additional requirement 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.

The instrument shall also comply with the following condition:

$$Max_i / e_{i+1} \geq 500 \text{ (e.g. } Max_1/e_2 \geq 500 \text{ and } Max_2/e_3 \geq 500 \text{)}$$

Additional requirement 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:

$$e_1 \geq 0.4 \text{ Max}_r / n_{LC}$$

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

$$e_1 \geq DR. \text{Max}_r / E_{max}$$

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

TABLE 4 – Baseworks and Their Limiting Characteristics (Variant 4)

Approved multiple range baseworks Instrument model	PL4000-30kg	PL4000-60kg	PL4000-60kg*	PL4000-150kg	PL6050-60kg	PL6050-60kg*	PL6050-150kg	PL6050-300kg	PL6050-300kg*
	Capacity (kg), Max ₁ / Max ₂	15 / 30	30 / 60	30 / 60	60 / 150	30 / 60	30 / 60	60 / 150	150 / 300
Max platform size (mm x mm)	400 x 550	400 x 550	400 x 550	400 x 550	516 x 616				
Material	S/S	S/S	S/S	S/S	S/S	S/S	S/S	S/S	S/S
Typical VSI (kg), e_1 / e_2	0.005 / 0.01	0.01 / 0.02	0.01 / 0.02	0.02 / 0.05	0.01 / 0.02	0.01 / 0.02	0.02 / 0.05	0.05 / 0.1	0.05 / 0.1
Mini Cap (kg) multiple range, Min ₁ /Min ₂	0.1 / 0.2	0.2 / 0.4	0.2 / 0.4	0.4 / 1	0.2 / 0.4	0.2 / 0.4	0.4 / 1	1 / 2	1 / 2
Max no of VSI, n_1 / n_2	3000 / 3000	3000 / 3000	3000 / 3000	3000 / 3000	3000 / 3000	3000 / 3000	3000 / 3000	3000 / 3000	3000 / 3000
Load cell make	Tedea Huntleigh	Tedea Huntleigh	Tedea Huntleigh	Tedea Huntleigh	Tedea Huntleigh	Tedea Huntleigh	Tedea Huntleigh	Tedea Huntleigh	Tedea Huntleigh
Load cell model	1250	1250	1510	1250	1250	1510	1250	1250	1510
Load cell classification	C3	C3	C3	C3	C3	C3	C3	C3	C3
No of load cells	1	1	1	1	1	1	1	1	1
Load cell Max cap (E _{max}) (kg)	50	100	100	200	100	100	200	500	500
V _{min} of load cell (kg)	0.005	0.01	0.0083	0.02	0.01	0.0083	0.02	0.05	0.0417
Load cell sensitivity (mV/V)	2	2	2	2	2	2	2	2	2
Input impedance (ohm)	415	415	380	415	415	380	415	415	380
Excitation voltage (max) (V)	15	15	15	15	15	15	15	15	15
Cable length (m)	3	3	3	3	3	3	3	3	3
No of leads (plus shield)	6	6	6	6	6	6	6	6	6

The load cell cable length supplied with the basework shall not be shortened.

6. Description of Variant 5

approved on 30/06/15

With certain models of the Marel PL series baseworks, similar to the model PL2010 basework described for the pattern but with different models of load cell. The parameters of the approved baseworks are listed below in Table 5.

TABLE 5 – Approved Multiple Range (*) Instruments using M1100 indicator

Basework Model/Capacity	Max ₁ /e ₁	Max ₂ /e ₂	Min ₁ /Min ₂	Maximum Platform Dimensions mm x mm	Load Cell Maximum Capacity, E _{max}	Load Cell Model (#)
PL2020-3 kg	1.5 kg/0.5 g	3 kg/1 g	0.01 kg/0.02 kg	250 x 300	7 kg	A
PL2020-6 kg	3 kg/1 g	6 kg/2 g	0.02 kg/0.04 kg	250 x 300	10 kg	A
PL2020-6 kg	3 kg/1 g	6 kg/2 g	0.02 kg/0.04 kg	250 x 300	15 kg	A
PL2020-6 kg	3 kg/1 g	6 kg/2 g	0.02 kg/0.04 kg	250 x 300	10 kg	C
PL2020-6 kg	3 kg/1 g	6 kg/2 g	0.02 kg/0.04 kg	250 x 300	15 kg	C/D
PL2020-15 kg	6 kg/2 g	15 kg/5 g	0.04 kg/0.1 kg	250 x 300	20 kg	A
PL2020-15 kg	6 kg/2 g	15 kg/5 g	0.04 kg/0.1 kg	250 x 300	30 kg	A
PL2020-15 kg	6 kg/2 g	15 kg/5 g	0.04 kg/0.1 kg	250 x 300	20 kg	C
PL2020-15 kg	6 kg/2 g	15 kg/5 g	0.04 kg/0.1 kg	250 x 300	30 kg	C/D
PL3020-15 kg	6 kg/2 g	15 kg/5 g	0.04 kg/0.1 kg	290 x 390	20 kg	A
PL3020-15 kg	6 kg/2 g	15 kg/5 g	0.04 kg/0.1 kg	290 x 390	30 kg	A
PL3020-15 kg	6 kg/2 g	15 kg/5 g	0.04 kg/0.1 kg	290 x 390	20 kg	C
PL3020-15 kg	6 kg/2 g	15 kg/5 g	0.04 kg/0.1 kg	290 x 390	30 kg	C/D
PL3020-30 kg	15 kg/5 g	30 kg/10 g	0.1 kg/0.2 kg	290 x 390	50 kg	A
PL3020-30 kg	15 kg/5 g	30 kg/10 g	0.1 kg/0.2 kg	290 x 390	75 kg	A
PL3020-30 kg	15 kg/5 g	30 kg/10 g	0.1 kg/0.2 kg	290 x 390	50 kg	C
PL4020-60 kg	30 kg/10 g	60 kg/20 g	0.2 kg/0.4 kg	396 x 546	100 kg	B
PL4020-60 kg	30 kg/10 g	60 kg/20 g	0.2 kg/0.4 kg	396 x 546	100 kg	E

(*) In addition to the multiple range instrument parameters shown in Table 5, instruments may alternatively be configured as single interval instruments using either:

$$\begin{aligned} &Max = Max_1, e = e_1 \text{ and } Min = Min_1; \text{ or} \\ &Max = Max_2, e = e_2 \text{ and } Min = Min_2 \end{aligned}$$

(#) Load Cells used:

- A - Teda Huntleigh Model 1130 Class C3
- B - Teda Huntleigh Model 1510 Class C3
- C - Flintec Model PC30 Class C3 (To be used in a single interval instrument)
- D - Flintec Model PC30 Class C3, Y=15000 (To be used in a multiple range instrument)
- E - Flintec Model PC7 Class C3

TEST PROCEDURE No 6/4C/217

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 6/4C/217 – 1



Marel Model M1100-C2 Weighing Instrument

FIGURE 6/4C/217 – 2



Marel Model PL2010 Basework

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