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|---|---|
| **OIML Member State**<br>Denmark | **OIML Certificate No.**<br>**R76/2006-A-DK2-2022.05** |

# OIML CERTIFICATE ISSUED UNDER SCHEME A

**OIML Issuing Authority**

Name: **FORCE Certification A/S**
Address: Park Allé 345, 2605 Brøndby, Denmark
Person responsible: Per Rafn Crety

**Applicant**

Name: **Marel Iceland ehf**.
Address: Austurhraun 9
210 Gardabaer
Iceland

**Manufacturer** **Marel Iceland ehf.**

**Identification of the certified type** *(the detailed characteristics will be defined in the additional pages)*

MU1

**Designation of the module** *(if applicable)*

**Analog data processing unit**

This OIML Certificate attests the conformity of the above identified type (represented by the sample(s) identified in the OIML type evaluation report) with the requirements of the following Recommendation of the International Organization of Legal Metrology (OIML):

**OIML R 76-1, Edition (year): 2006**

For accuracy class (if applicable**): III and IIII**



FORCE Certification A/S · Park Alle 345 2605 Brøndby Tel+45 43 25 01 77 info@forcecertification.com www.forcecertification.com
Task no.: 121-31618.90.10 and ID no.: FC-OIML-13115-1 forcecertification.com/en/weighing

**OIML Certificate No.**
**R76/2006-A-DK2-2022.05**

This OIML Certificate relates only to metrological and technical characteristics of the type of measuring instrument covered by the relevant OIML Recommendation identified above.

This OIML Certificate does not bestow any form of legal international approval.

The conformity was established by the results of tests and examinations provided in the associated OIML reports:

Type examination report: No. 121-31618.10, dated 22 June 2022, that includes 68 pages

Type evaluation report: No. 121-31618.90.10, dated 06 July 2022, that includes 20 pages

The technical documentation relating to the identified type is contained in documentation file:

A530949 and 121-31618

**OIML Certificate History**

| Revision No. | Date | Description of the modification |
|---|---|---|
| Initial version | 26 August 2022 | - |
| | | |
| | | |
| | | |

Identification, signature and stamp
**The OIML Issuing Authority**
FORCE Certification A/S

Date: 26 August 2022

Jens Hovgård Jensen
2022-08-26

Digitally signed by Jens Hovgård Jensen
jhje@force.dk
Certification Manager

Jens Hovgård Jensen
Certification Manager

*Important note:* Apart from the mention of the Certificate's reference number and the name of the OIML Member State in which the Certificate is issued, partial quotation of the Certificate and of the associated OIML type evaluation report(s) is not permitted, although either may be reproduced in full.

## Descriptive annex

The weighing module designated MU1 is an analog data processing device suitable to be incorporated in a non-automatic weighing instrument, class III or IIII, single-interval or multi-range.

The instrument is a class III or IIII, self-indicating weighing instrument with single-interval or dual-range. The MU1 analog data processing unit is powered from a PC by the USB connection (5 VDC).

### Characteristics

| | |
|---|---|
| Indicator type: | MU1 |
| Accuracy class: | III and IIII |
| Weighing range: | Singe-interval, multi-range |
| Maximum number of verification scale intervals (n): | 10,000 for class III, (for each range)<br>1000 for class IIII |
| Internal resolution: | ±8388608 counts |
| Maximum tare effect: | -Max |
| Fractional factor: | p'i = 0.5 |
| Excitation voltage: | ±3 Vdc bipolar |
| Minimum input voltage: | 0.25 μV/e |
| Minimum dead load ($D_{min}$): | 0 mV |
| Maximum analogue range | ±30 mV |
| Circuit for remote sense | Active, (see below) |
| Minimum input impedance | 85 ohm |
| Maximum input impedance | 1100 ohm |
| Circuit for remote sense: | Active |
| Connecting cable to load cell(s): | 6-wire system |
| Supply voltage: | 5 VDC from USB |
| Operating temperature range | -10 °C / +40 °C |
| Electromagnetic class: | E2 |

Max. cable length between MU1 and a junction box for load cells: 856 m/mm$^2$

### Software

The software is split into two parts: a metrological and an operational.
The version formats are,

- Module metrology firmware: a.bb (a = functional change, bb = bugfix)
  The approved version is 1.bb where bb=00 to 99.
- Module operation firmware: yymmdd (six digit date code)
  The approved versions are 111220, 170131, 1903143, 191021 and 210206. Only 170131 and later versions support Marel Secure Printing.

The access control of MU1 can be configured to either Locked, Normal or Open.
In Locked mode the configuration and calibration data can only be modified if the sealable hardware button is pushed.

The two audit trail event counters CON and CAL will be incremented in any access control mode if the configuration data, respectively the calibration data, are changed. The event counters are non-resettable and increment up to 999.

The Open mode must not be used for legal applications.

In normal mode, access to the configuration and calibration facility is available via a password.

The identification of the MU1 firmware can be observed on command from the PC user interface to which the MU1 is connected via the USB interface.

**Devices**

- Initial zero setting device (≤ 20% of Max)
- Semi-automatic zero setting device (≤ 4% of Max)
- Zero tracking device (≤ 4% of Max)
- Semi-automatic subtractive tare balancing device
- Automatic tare device (can be disabled when unit is set for direct sale to the public)
- Preset tare device
- High resolution (protected by sealing)
- Gravity compensation device
- Internal alibi storage device
- Stable equilibrium, Zero and Net indicators.

**Interfaces**

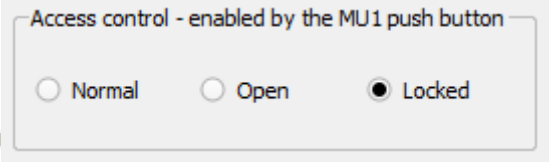
USB – USB mini B connector. Cable must be double screened

**Sealing or securing**

The instrument can either be sealed or secured. In both cases one of the enclosure screws of the MU1 module shall be sealed with a brittle sticker.

**Sealing**

It is sealed by setting the access control in Locked mode and cover the push button of the MU1 module with a brittle plastic sticker.

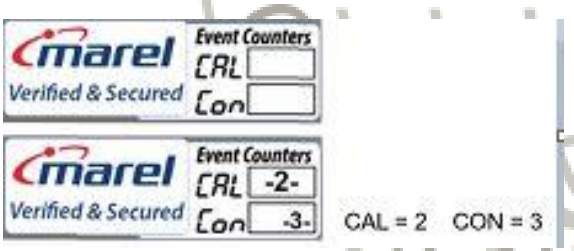



**Securing by event counters CAL and CON**

The Instrument is secured by two event counters, CAL and CON, which are incremented each time the calibration or sealed configuration parameters are changed. The maximum count of both event counters is 999, starting from 001. The event counters can be read from the PC user interface to which the MU1 is connected via the USB interface.

At verification the value of the two event counters is written on a brittle plastic sticker - sealed with a verification mark - next to it.

If the value of the CAL or CON differs from the one written at verification time, the seal is broken.




The seal is placed on the outside of the enclosure containing the MU1 weighing module.

A complete MU1 NAWI instrument consists of a load receiver with strain gauge load cells, the MU1 module, and a general-purpose PC computer.

The MU1 module is a single chip microprocessor based unit, which runs on USB bus power and uses the USB bus to communicate with a PC computer. To be able to weigh, the MU1 module is also connected to a suitable load receptor. It can drive load receptors having up to four 350 Ohm strain gage load cells.

The MU1 user interface, controls, and primary indications are presented on the screen of the PC computer connected to the USB bus and running the user interface software.

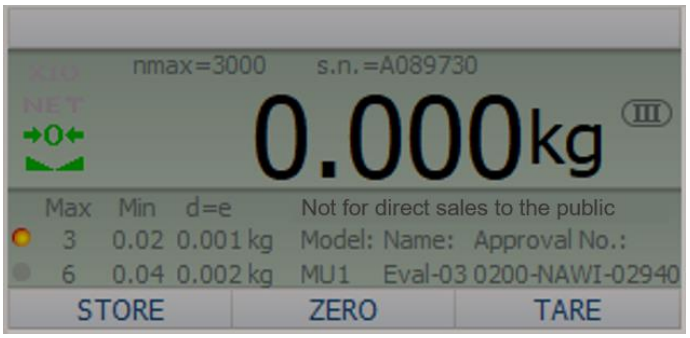
The firmware in the MU1 module does all legally relevant signal processing, functions and error detection of a NAWI instrument. A stream of weighing data is sent over to the PC user interface software for displaying. The firmware will not stop sending data, even if an error has been detected. The PC user interface software will, however, act on error codes and stop presenting weight values on certain errors. It will also control annunciators like Stable and Net, based on codes received from the MU1 firmware.

The PC user interface software has the ability to authenticate the connection to a given MU1 module, and the MU1 module will only communicate with one instance of the PC user interface software at a time. The MU1 module does not communicate with a PC user interface it cannot authenticate. The authentication is based on a secret data known to both parties. On manual command, the PC user interface software has the ability to display the MU1 identification data.

There can be more than one MU1 module connected to each PC computer.

Because of different requirements, the look of the PC user interface can vary substantially, depending on the PC computer operating system and closed shell touch panel software requirements.

Example of stand alone MU1 PC user interface on a Windows computer




Example of MU1 PC user interface - Innova closed shell look

The MU1 NAWI weighing instrument is formed based on a compatibility of modules calculation according to OIML R76:2006, Annex F. An example is shown below:

## COMPATIBILITY OF MODULES

**Ref.: WELMEC 2**

**Non-Automatic Weighing Instrument, multi-range.**

**Certificate of EU Type-Approval N°:** TAC: 0200-NAWI-02940

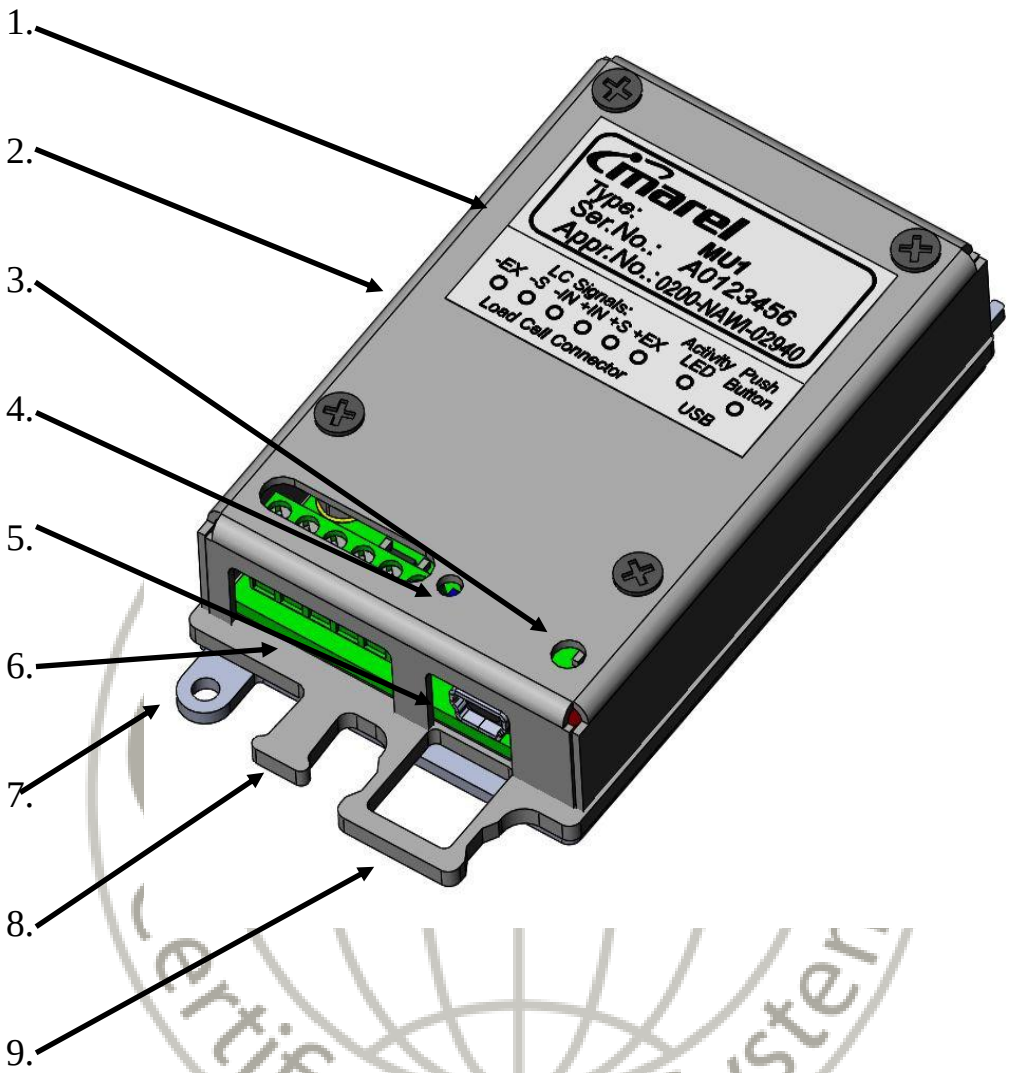
| | | | | | | |
|---|---|---|---|---|---|---|
| **INDICATOR** | A/D (Module 1) | Type: | MU1 | | | |
| Accuracy class according to EN 45501 and OIML R76: | | $Class_{ind}$ ( I, II, III or IIII ) | | III | | |
| Maximum number of verification scale intervals ($n_{max}$ or lower): | | $n_{ind}$ | | 10000 | | |
| Fraction of maximum permissible error (mpe): | | $p_1$ | | 0,5 | | |
| Load cell excitation voltage: | | $U_{exc}$ | [ Vdc ] | 6 | | |
| Minimum input-voltage per verification scale interval: | | $\Delta u_{min}$ | [ µV ] | 0,25 | | |
| Minimum load cell impedance: | | $R_{Lmin}$ | [ Ω ] | 85 | | |
| Coefficient of temperature of the span error: | | Es | [ % / 25°C ] | | | 0,0002 |
| Coefficient of resistance for the wires in the J-box cable: | | Sx | [ % / Ω ] | | | 0,0016 |
| Specific J-box cable-Length to the junction box for load cells: | | $(L/A)_{max}$ | [ m / mm² ] | | | 1350 |
| Load cell interface: | | | | 6-wire (remote sense) | | |
| Additive tare, if available: | | $T^+$ | [ % of Max ] | 0 | | |
| Initial zero setting range: | | IZSR | [ % of Max ] | -10 | / | 10 |
| Temperature range: | | $T_{min}$ / $T_{max}$ | [ °C ] | -10 | / | 40 |
| Test report (TR), Test Certificate (TC) or OIML Certificate of Conformity: | | | | | | |
| **LOAD RECEPTOR** | (Module 2) | Type: | | | | |
| Construction: | | | | Platform | | |
| Fraction of mpe: | | $p_2$ | | 0,5 | | |
| Number of load cells: | | N | | 1 | | |
| Reduction ratio of the load transmitting device: | | $R=F_M / F_L$ | | 1 | | |
| Dead load of load receptor: | | DL | [ % of Max ] | 10 | | |
| Non uniform distribution of the load: | (NUD = 0 is acceptable) | NUD | [ % of Max ] | 0 | | |
| Correction factor: | $Q = 1 + (DL + T^+ + IZSR^+ + NUD) / 100$ | | | 1,2 | | |
| **LOAD CELL** | ANALOG (Module 3) | Type: | Vishay 1130 | | | |
| Accuracy class according to OIML R60: | | $Class_{LC}$ ( A, B, C or D ) | | C | | |
| Maximum number of load cell intervals: | | $n_{Lc}$ | | 6000 | | |
| Fraction of mpe: | | $p_3$ | | 0,7 | | |
| Rated output (sensitivity): | | C | [ mV / V ] | 2 | | |
| Input resistance of single load cell: | | $R_{LC}$ | [ Ω ] | 385 | | |
| Minimum load cell verification interval: | ($v_{min\%}$ = 100 / Y) | $v_{min\%}$ | [ % of Emax ] | 0,0066 | | |
| Rated capacity: | | $E_{max}$ | [ kg ] | 30 | | |
| Minimum dead load, relative: | | $(E_{min} / E_{max}) * 100$ | [ % ] | 1 | | |
| Minimum dead load output return: | ($DR_{\%}$ = 50 / Z) | $DR_{\%}$ | [ % of Emax ] | 0,0083 | | |
| Temperature range: | | $T_{min}$ / $T_{max}$ | [ °C ] | -10 | / | 40 |
| Test report (TR) or Test Certificate (TC/OIML) as appropriate: | | | | | | |
| **COMPLETE WEIGHING INSTRUMENT** | | | Multi-range | | | |
| Manufacturer: | Marel | Type: | MU1 platform scale | | | |
| Accuracy class according to EN 45501 and OIML R76: | | $Class_{WI}$ ( I, II, III or IIII ) | | III | | |
| Fractions: $p_i = p_1^2 + p_2^2 + p_3^2$: | | $p_i$ | | 1,0 | | |
| Maximum capacity: | | Max | [ kg ] | >>>>>>>>>>>>>>>>> | | 25 |
| Maximum capacity for each partial weighing range: | | $Max_1$ / $Max_2$ | [ kg ] | 12 | | 25 |
| Number of verification scale intervals for each weighing range: | | $n_1$ / $n_2$ | | 6000 | | 5000 |
| Verification scale interval for each weighing range: | | $e_1$ / $e_2$ | [ kg ] | 0,002 | | 0,005 |
| Utilisation ratio of the load cell: | | $\alpha = (Max_i / E_{max}) * (R / N)$ | | 0,40 | | 0,83 |
| Input voltage (from the load cells): | | $\Delta_u = C * U_{exc} * \alpha * 1000 / n$ | [ µV / e ] | 0,80 | | 2,00 |
| Cross-section of each wire in the J-box cable: | | A | [ mm² ] | >>>>>>>>>>>>>>>>> | | 0,22 |
| J-box cable-Length to the junction box for load cells: | | L | [ m ] | >>>>>>>>>>>>>>>>> | | 5 |
| Temperature range to be marked on the instrument: | Not required | $T_{min}$ / $T_{max}$ | [ °C ] | | | |
| Peripheral Equipment subject to legal control: | | | | | | |

| Acceptance criteria for compatibility | | | | Passed, provided no result below is < 0 | | |
|---|---|---|---|---|---|---|
| $Class_{WI}$ | <= | $Class_{ind}$ & $Class_{LC}$ | (WELMEC 2: 1) | $Class_{WI}$ : | PASSED | |
| $p_i$ | <= | 1 | (R76: 3.5.4.1) | $1 - p_i$ = | >>>>>>>>>>>>>>>>> | 0,0 |
| $n_i$ | <= | $n_{max}$ for the class | (R76: 3.2) | $n_{max}$ for the class - $n_i$ = | 4000 | 5000 |
| $n_i$ | <= | $n_{ind}$ | (WELMEC 2: 4) | $n_{ind} - n_i$ = | 4000 | 5000 |
| $n_i$ | <= | $n_{LC}$ | (R76: 4.12.2) | $n_{LC} - n_i$ = | 0 | 1000 |
| $E_{min}$ | <= | DL * R / N | (WELMEC 2: 6d) | (DL * R / N) - $E_{min}$ = | 2,2 | <<<<<<<<<<<<<<<< |
| $v_{min} \cdot \sqrt{N} / R$ or (if $v_{min}$ is not given) | <= | $e_i$ | (R76: 4.12.3) | $e_i - (v_{min} * \sqrt{N} / R)$ = | 0,000 | 0,003 |
| | | | | Alternative solutions: | ↑ ↓ | |
| $(E_{max} / n_{LC}) \cdot (\sqrt{N} / R)$ | <= | $e_i$ | (WELMEC 2: 7) | $e_i - ((E_{max} / n_{LC}) * (\sqrt{N} / R))$ = | | |
| $\Delta u_{min}$ | <= | $\Delta u$ | (WELMEC 2: 8) | $\Delta u - \Delta u_{min}$ = | 0,55 | 1,75 |
| $R_{Lmin}$ | <= | $R_{LC} / N$ | (WELMEC 2: 9) | $(R_{LC} / N) - R_{Lmin}$ = | >>>>>>>>>>>>>>>>> | 300 |
| L / A | <= | $(L / A)_{max}^{WI}$ | (WELMEC 2: 10) | $(L / A)_{max}^{WI} - (L / A)$ = | >>>>>>>> | 2252 |
| $T_{range}$ | <= | $T_{max} - T_{min}$ | (R76: 3.9.2.2) | $(T_{max} - T_{min}) - T_{range}$ = | | 20 |
| Q * Max * R / N | <= | $E_{max}$ | (R76: 4.12.1) | $E_{max} - (Q * Max * R / N)$ = | >>>>>>>>>>>>>>>>> | 0,0 |
| $DR_{\%}$ or (if DR% is not given) | <= | 125 * $e_1$ / Max | (WELMEC 2: 6c) | $(125 * e_1 / Max) - DR_{\%}$ = | 0,0017 | <<<<<<<<<<<<<<<< |
| | | | | Alternative solutions: | ↑ ↓ | |
| 0.4 * Max / $e_1$ | <= | $n_{Lc}$ | (WELMEC 2: 6c) | $n_{LC} - (0.4 * Max / e_1)$ = | | |

*Signature and date:*

*Conclusion . . . . .* *PASSED*

This is an authentic document made from the program: "Compatibility of NAWI-modules version 3.2".




| | |
|---|---|
| 1. | Nameplate |
| 2. | Enclosure |
| 3. | The MU1 push button |
| 4. | Activity light |
| 5. | Mini-USB type B connector |
| 6. | Load cell connector with sense (6 wire) |
| 7. | Fastening lug (3mm hole) |
| 8. | Tie point for the screen of the load cell cable |
| 9. | Tie point for USB connector |

**Fig. 1** MU1 analog data processing unit (MU1 module).

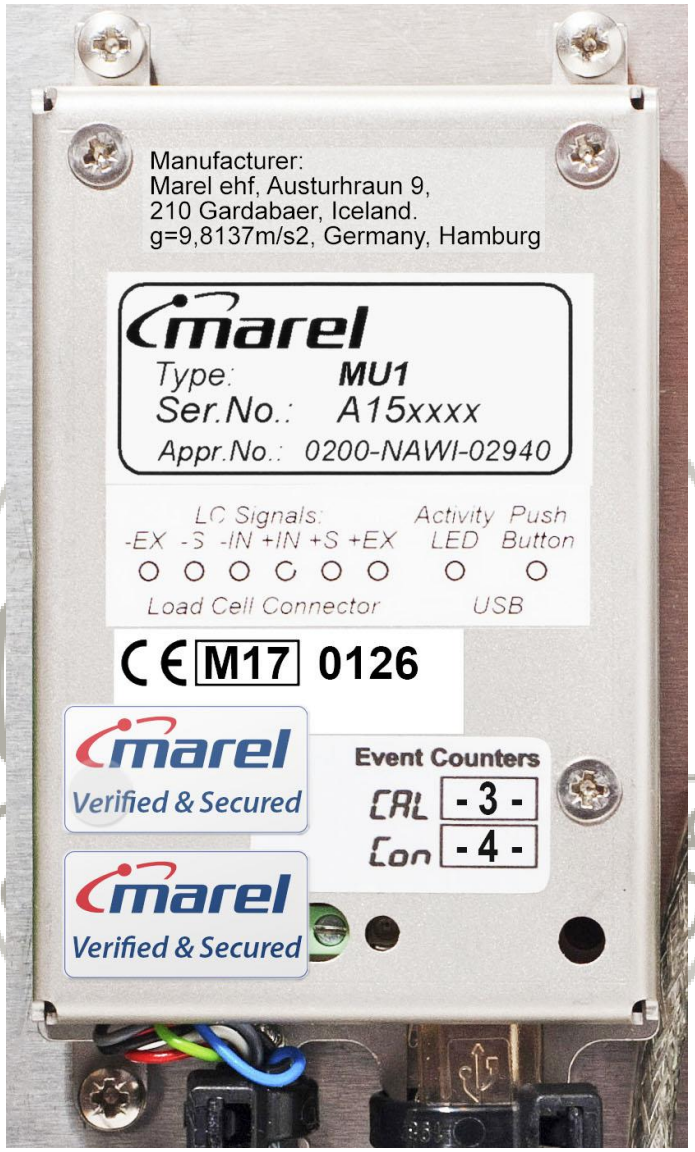



**Fig. 2** Sealing of MU1 module.