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TEST CERTIFICATE

No. DK0199-R76-10.08 Revision 1

Instrument type	**LDU 78.1 version 3**
Test item device	A/D module
Issued by	**DELTA, Danish Electronics, Light & Acoustics**
In accordance with	Paragraph 8.1 of the international recommendation on metrological aspects of non-automatic weighing instruments OIML R76-1:2006.
Fractional factor (p_i)	0.5 (refer to 3.10.2.1 of the recommendation).
Issued to	**Hauch & Bach ApS** Femstykket 6 DK-3540 Lynge Denmark
Manufacturer	Hauch & Bach ApS
In respect of	The model of an A/D device tested as a module of a weighing instrument.
Characteristics	Suitable as a non-automatic weighing instruments with the following characteristics: Weighing range: single-interval, multi-range or multi-interval Accuracy class III or IIII Verification scale interval: e = Max/n Maximum number of verification scale intervals: n = 10,000 Minimum input voltage per VSI: 0.3 µV The essential characteristics are described in the annex.
Description and documentation	The A/D device is described and documented in the annex to this certificate.
Remarks	Summary of tests involved: See test report no. DANAK-1911008.

This test certificate can not be quoted in an EC type approval certificate without permission from the holder of the certificate mentioned above.

The annex comprises 6 pages.

Issued on 2010-10-28 Signatory: J. Hovgård

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1. Name and type of instrument

The A/D device is designated Load cell Digitizing Unit LDU 78.1 version 3, suitable to be incorporated in a non-automatic weighing instrument, class III or IIII, with single-interval, multi-range or multi-interval.

2. Description of the construction and function

2.1 Construction

The electronic device consists of a single circuit board, SMD populated at one side and housed in a tinned mild steel shielding enclosure.

The front of the enclosure carries a non-detachable overlay where the metrological data etc. are printed. Small sections of the circuit board, one in each end of the device, act as connection areas for the input header, respectively output and power supply wires.

The input header consists of 10 terminals, as a single row pins 2.54 mm pitch: 6 terminals for the load cell wires, 2 terminals for the cable shield and 2 terminals not connected.

The output header consists of 10 terminals, suitable for two row pins 2.54 mm pitch: 4 terminals are for the full duplex interface ports, 4 terminals are for two protected logic inputs and two protected logic outputs, and 2 terminals are for the power supply lines.

All the non ground I/O terminals are supplied with T-filter barriers.

The electronic sections are the quality dc input instrumentation amplifier, the 20 bit A/D-converter and the 16 bit microprocessor which include the UART for the RS422/485 interface, the RAM and the Flash-type EPROM for the program memory. On board is further found an EE-PROM which holds the calibration data, an interface receiver / driver, the logic input and output conditioning circuit and the non-isolated power conditioning regulator and power watch makes further parts of the circuitry.

All instrument calibration and metrological setup data are held in the non-volatile EE-PROM memory.

Software

The software version may be viewed by sending “IV” to the unit, which responds with V:x.yy.
The tested software version is 2.46 (V:2.46) for single-interval and software version 2.47 (V:2.47) for single-interval / multi-range / multi-interval.

Access to metrological characteristics and span adjustment

Access to the configuration and calibration facility is achieved by sending a Traceable Access Code (TAC), which is a non-volatile number, which is automatically incremented each time the calibration modus is left by the operator. The TAC may be reviewed by sending CE to the unit, which responds the status code as CExxxxx. The code increments up to 65535.

Securing of metrological characteristics and span adjustment

Access to the configuration and calibration facility is secured by the TAC.

2.2 Function

The LDU 78.1 is a microprocessor based electronic digitising unit for a load cell signal, which enables the production of a weight indicating instrument that requires the external connection of strain gauge load cells and a weight display unit. Furthermore, the weight information may be transmitted to peripheral equipment for recording, processing, or display. The LDU 78.1 digitising unit is available for operation from a coarsely regulated DC-supply 12 - 24 VDC. If the impedance of the connected load cell(s) is below 350 ohm, the LDU 78.1 should only be supplied with 12 – 14 VDC in order to avoid inappropriate heating of the unit.

The primary groups of functions provided are as follows,

2.2.1 Power monitoring

2.2.2 System Diagnostics

2.2.3 Calibration functions

2.2.4 Motion detection functions

2.2.5 Filter settings

2.2.6 Output configuring

2.2.7 Auto transmit

2.2.8 Remote input/output commands

2.2.9 Communication set-up

2.2.10 Identification number

2.2.11 Legal setup consecutive number

2.2.12 Save setup parameters

3. Technical data

3.1 A/D device

Manufacturer	Hauch & Bach ApS.
Type	LDU 78.1 version 3 Load cell Digitizing Unit.
Accuracy class	III or IIII
Weighing range	Single-interval, multi-range or multi-interval
Maximum number of verification scale intervals (n)	10,000
Minimum input voltage per VSI (e_i)	0.3 µV
Maximum capacity of interval (Max_i):	$n_i \times e_i$
Internal resolution	± 260,000
Initial zero-setting range:	20 % of Max
Maximum tare effect:	100 % of Max
Fractional factor (p_i)	0.5
Excitation voltage	5 VDC
Maximum analogue range	±11 mV
Circuit for remote sense	Active, (see below)
Minimum input impedance	87.5 Ohm
Maximum input impedance	1150 Ohm
Load cell linearization feature:	None
Connecting cable to load cell(s):	See Section 3.1.1
Supply voltage:	12 - 24 VDC for load cell input impedance ≥ 350 Ohm 12 – 14 VDC for load cell input impedance < 350 Ohm
Operating temperature range	Min / Max = -15 °C / +55 °C
Max. allowed power consumption (excl. load cells)	1.3 W
Temperature effect on span (E_s/25), confirmed:	0.2 ppm/°K
Span change (S_x), confirmed:	6.1 ppm/Ohm
Peripheral interface(s)	See Section 4

3.1.1 Connecting cable between the indicator and the junction box for load cell(s), if any

3.1.1.1 4-wire system

Maximum length	The certified cable length for the load cell.
Line	4 wires, shielded

3.1.1.2 6-wire system

Line	6 wires, shielded

Option 1:

Maximum length	2243 m/mm^2
Maximum resistance per wire	37.9 Ohm

In case the (n) for the weighing instrument is less than (n_{max}) mentioned above, the following applies:

Option 2:

Coefficient of temperature of the span error of the indicator: Es = 0.0004 % / 25°K

Coefficient of resistance for the wires in the J-box cable: Sx = 0.0006 % / ohm

L/A_{max} = 295.86 / Sx * (emp / n - Es) [m / mm²] in which emp = p'i * mpe * 100 / e

From this, the maximum cable length for the weighing instrument may be calculated with regard to (n) for the actual configuration of the instrument.

Reference: WELMEC 2.1, annex 5.

The calculation program is obtainable by downloading at www.delta.dk/weighing.

3.2 Documents

The documents filed at DELTA (reference No. A530895) are valid for the weighing module described here.

4. Interfaces

4.1 Load cell interface

Refer to Section 3.1.

Any analog load cell(s) can be used for instruments under this certificate provided the following conditions are met:

- There is a respective test certificate (EN 45501) or an OIML Certificate of Conformity (R60) issued for the load cell by a Notified Body responsible for type examination under the 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 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 performed.
- 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 2 document, or the like, at the time of EC verification or declaration of EC conformity of type.
- The load transmission must conform to one of the examples shown in the WELMEC 2.4 Guide for load cells.

4.2 Peripheral interfaces

Serial I/O interface

Of the dual row 10 pin header located in the right hand end of the device, does the 4 terminals provide bi-directional RS422 or RS485 compatible serial interface.

Logic Level Inputs and Outputs

Of the dual row 10 pin header located in the right hand end of the device, does the 4 terminals provide two logic level inputs and two logic level outputs.

The peripheral interfaces are characterised "Protective interfaces" according to paragraph 8.4 in the Directive.

5. Conditions for use

The use of the A/D module LDU 78.1 revision 3 in an automatic weighing instrument is not covered by this Test certificate.

The module ID (returned by command ID) shall be 781n, where $0 \leq n \leq 9$.

The software version (returned by command IV) shall be 2.xx, where $xx \geq 46$.

Depending on the size of the calibrated verification scale interval the warm-up time for the module shall not be set (by the parameter WT) to a value less than,

$0.3 \leq e_1 < 0.4$	$0.4 \leq e_1 < 0.5$	$0.5 \leq e_1 < 0.6$	$0.6 \leq e_1 < 0.8$	$0.8 \leq e_1 < 1.4$	$1.4 \leq e_1$
360 seconds	240 seconds	180 seconds	120 seconds	60 seconds	0 seconds

6. Location of seals and inscriptions

Seals shall bear the verification mark of a notified body or alternative mark of the manufacturer according to ANNEX II, section 2.3 of the Directive 2009/23/EC.

Access to the configuration and calibration facilities is achieved by sending a Traceable Access Code (TAC) which is a non-volatile number which is automatically incremented each time the calibration modus is left by the operator. The audit trail may be reviewed by sending CE to the unit, which responds the status code as CExxxxx. The code increments up to 65535.

7. Location of CE mark of conformity and inscriptions

The CE mark of conformity is a part of the overlay located on the side of the device. Test certificate No., n_{max}, temperature range, manufacturer's mark, and the type designation is in addition located on the overlay. The serial number can be read out of the unit using the serial port. Further markings as Max, Min, e=, should be found on a label placed on the indicator, in which the digitising unit is to be situated.

8. Tests

The LDU 78.1 version 3 Load cell Digitising Unit has been tested according to OIML R76-1:2006, EN 45501:1992/AC:1993, WELMEC 2.1:2001 Guide for testing of indicators, WELMEC Guide 7.2:2009 Software Guide as type P with risk class C and OIML D11:2004 section 12 and 13 with severity level 3.

The tested LDU 78.1 had the following version number:

Hardware: 78.111.3.v.3.00
Software: 78.183.v.2.46 and 78.183.v.2.47

Examination / tests
Temperature tests: 20/55/-15/5/20 (tested at minimum input-voltage sensitivity)
Temperature effect on no-load indication
Temperature effect on span
Repeatability
Warm-up time
Voltage variations
Electrical bursts
Surge
Electrostatic discharges
Immunity to radiated electromagnetic fields
Immunity to conducted electromagnetic fields
Damp heat, steady state
Span stability
Examination of construction
Maximum load cell cable length and impedance of cable to load cell
Load cell interface measurements with interruptions of the sense circuit
Software examination

The test item fulfilled the maximum permissible errors at all tests.

9. Documentation

Contents of the technical documentation is held by DELTA filed under No.: A530895

9.1 Product specification

- Description
- Drawings
- Etc.

9.2 Test & Examination report

OIML R76 report no. DANAK-1911008.

WELMEC 7.2 report no. DANAK-1911079