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TEST CERTIFICATE

No. DK0199-R76-10.04 Revision 1

Instrument type	LDU 68.1 version 3
Test item device	A/D module
Issued by	DELTA Danish Electronics, Light & Acoustics EU - Notified Body No. 0199
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 Lyngø 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 or multi-range (2 ranges) Accuracy class III or IIII Verification scale interval: $e =$ Max/n Maximum number of verification scale intervals: $n =$ 10,000 (single-interval) 4,000 (multi-range) Minimum input voltage per VSI: 1.0 μ V 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-1910794.

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This test certificate cannot be quoted in an EU type approval certificate without permission from the holder of the certificate mentioned above.

The annex comprises 6 pages.

Signatory: J. Hovgård

Issued on 2010-11-19



1. Name and type of instrument

The A/D device is designated Load cell Digitizing Unit LDU 68.1 version3, suitable to be incorporated in a non-automatic weighing instruments, class III or IIII, single-interval or multi-range.

2. Description of the construction and function

2.1 Construction

The electronic device consists of a single circuit board, SMD populated 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 on each end of the device, acts as connection areas for the input header, respectively the output and power supply header.

The input header consists of 10 terminals, suitable for single row pins 2.54 mm pitch: 6 terminals for the load cell wires including sense wires and 2 terminals for connection of the cable shields.

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 open collector logic outputs, and 2 terminals are for the power supply lines.

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. An EE-PROM which holds the calibration data, an optional temperature sensor conditioning circuit, the 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 4.00 (V:4.00).

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 CExxxx. 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 68.1 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 digitising unit is power supplied with 12 - 24 VDC.

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 commands
- 2.2.9 Communication set-up
- 2.2.10 Identification number
- 2.2.11 Legal setup consecutive number
- 2.2.12 Time and date, if applied Software version
- 2.2.13 Save setup parameters

3. Technical data

3.1 A/D device

Manufacturer	Hauch & Bach ApS.
Type	LDU 68.1 Load cell Digitizing Unit.
Accuracy class	III or IIII
Weighing range	Single-interval or multi-range (2 ranges)
Maximum number of verification scale intervals (n)	10,000 for single-interval 4,000 for multi-range
Minimum input voltage per VSI	1.0 μ V
Maximum capacity of interval (Max _i):	n \times e
Verification scale interval, e =	Max/n
Internal resolution	\pm 165,000
Initial zero-setting range:	20 % of Max
Maximum tare effect:	100 % of Max
Fractional factor (p _i)	0.5
Excitation voltage	5 VDC
Minimum dead load (D _{min}):	0 mV
Maximum analogue range	\pm 12.5 mV
Circuit for remote sense	Active, (see below)
Minimum input impedance	87.5 Ohm
Nominal input-impedance:	350 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 input impedance \geq 350 Ohm 12 - 14 VDC for input impedance $<$ 350 Ohm
Operating temperature range	Min / Max = -15 °C / +55 °C
Temperature effect on no-load, confirmed:	-6.6 ppm/°K
Temperature effect on span, confirmed:	1.7 ppm/°K
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	8521 m/mm ²
Maximum resistance per wire	144 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: $E_s = 0.0043 \% / 25^{\circ}K$

Coefficient of resistance for the wires in the J-box cable: $S_x = 0.0001 \% / ohm$

$L/A_{max} = 295.86 / S_x * (emp / n - E_s) [m / mm^2]$ 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.

4. Interfaces

4.1 Load cell interface

Refer to Section 3.1.1.

Any 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

The output header located in right hand end of the device consists of 10 terminals, suitable for dual row pins 2.54 mm pitch, or for direct soldering. Four of the terminals provides bi-directional RS422 or RS485 compatible serial interface.

Logic Level Inputs and Outputs

The output header located in right hand end of the device consists of 10 terminals, suitable for dual row pins 2.54 mm pitch, or for direct soldering. Four of the terminals accepting a total of two logic level inputs and outputs.

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

5. Conditions for use

None.

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 68.1 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 and OIML D11:2004 section 12 and 13 applying severity level 3.

The tested LDU 68.1 had the following version number:

Hardware: 68.111.3.v.3.01
Software: 68.181.v.4.01

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
Short time power reductions
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

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.: A530808

9.1 Product specification

- Description
- Drawings
- Etc.

9.2 Test & Examination report

OIML R76 report no. DANAK-1910794.