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# TEST CERTIFICATE

## No. DK0199-R76-03.01 Revision 3

**Instrument type** LDU 69.1

**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 European Standard on metrological aspects of non-automatic weighing instruments EN 45501:1992.

**Fractional factor (p<sub>i</sub>)** 0.5 (refer to 3.5.4 of the standard).

**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:

|   |  |                 |
|---|--|-----------------|
| Self indicating with                                | single-interval or multi-range or multi-interval | single-interval |
| Accuracy class                                      | III  | II              |
| Verification scale interval: e =                    | Max <sub>i</sub> /n                              | Max/n           |
| Maximum number of verification scale intervals: n = | 10,000   | 11,000          |
| Minimum input voltage per VSI:                      | 0.1 μV   | 0.2 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-196975 and DANAK-1910230.

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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 2010-12-21



PROD Reg. nr 7026

## 1. Name and type of instrument

The A/D device is designated Load cell Digitising Unit LDU 69.1, suitable to be incorporated in a non-automatic weighing instruments, class III single- or multi-interval, or class II single-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 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 and 2 terminals are for the power supply lines.

All the non-ground I/O terminals are supplied with filter barriers to provide the EMC.

The electronic sections are the quality ac input instrumentation amplifier with analogue filter, the excitation voltage conditioning circuit, the bipolar 20 bit A/D-converter and the 16 bit microprocessor which include the UART for the RS422/485 interface, the EE-PROM which holds the calibration data, the RAM and the Flash-type EPROM for the programme memory.

The temperature sensor conditioning circuit, the interface receiver / drivers, the protection circuit for the logic input and the transistors for the open collector outputs makes further parts of the circuitry.

A non-isolated power conditioning regulator, filters and power watch circuitry also make parts of the complete device.

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

### Software

The software version may be viewed by sending 'IV' to the unit, which responds with V:x.yz.

### 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 audit trail 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 available via a password.

## CE mark and inscriptions

The CE mark of conformity is a part of the overlay located on the top side of the device. Certificate no., accuracy class,  $n_{\max}$  or minimum input-voltage per verification scale interval ( $\Delta u_{\min}$ ), manufacturer's name, and the type designation is in addition located on the overlay. The 8-digit serial number, visible at a separate label, makes the year of manufacturing traceable and can be read directly or via a barcode reader. 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.

## 2.2 Function

The device 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 - coarsely regulated or < 2 % ripple.

### Setting devices:

|                      |  |
|----------------------|--|
| Zero-setting device: | Initial zero-setting range: 4 % max<br>Semi-automatic zero-setting |
| Tare device(s):      | Subtractive tare   |
| Tare range:          | 100 % of max   |

## 3. Technical data

### 3.1 A/D device

|  |  |
|--|--|
| Manufacturer   | Hauch & Bach ApS.  |
| Type   | LDU 69.1 Load cell Digitising Unit.  |
| Accuracy class   | III or II  |
| Weighing range (for hardware version 1.0)<br>(for hardware version 1.2x) | Single-interval<br>Single-interval or multi-range (2 or 3 ranges) or<br>multi-interval (2 or 3 intervals) [only class III] |
| Maximum number of verification scale intervals (n)                       | 10,000 for class III<br>11,000 for class II  |
| Minimum input voltage per VSI  | 0.1 $\mu$ V for class III<br>0.2 $\mu$ V for class II  |
| Maximum capacity of interval ( $Max_i$ ):                                | $n \times e$   |
| Verification scale interval, e =   | $Max_i/n$  |
| Internal resolution  | $\geq \pm 1,000,000$   |
| Initial zero-setting range:  | 4 % of Max   |
| Maximum tare effect:   | 100 % of Max   |
| Fractional factor ( $p_i$ )  | 0.5  |
| Excitation voltage   | 5 VDC, switched polarity   |
| Minimum dead load ( $D_{\min}$ ):  | 0 mV   |

|   |                             |
|---|-----------------------------|
| Maximum analogue range                    | ±11 mV                      |
| Circuit for remote sense                  | Active, (see below)         |
| Minimum input impedance                   | 250 ohm                     |
| Nominal input-impedance:                  | 350 ohm                     |
| Maximum input impedance                   | 1200 ohm                    |
| Load cell linearization feature:          | None                        |
| Connecting cable to load cell(s):         | See Section 3.1.1           |
| Supply voltage:                           | 12 - 24 VDC                 |
| Operating temperature range               | Min / Max = -15 °C / +50 °C |
| Temperature effect on no-load, confirmed: | 1 ppm/°K                    |
| Temperature effect on span, confirmed:    | 0.8 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              | 450 m/mm <sup>2</sup> |
| Maximum resistance per wire | 7.6 ohm               |

In case the (n) for the weighing instrument is less than (n<sub>max</sub>) mentioned above, the following applies:

Option 2:

Coefficient of temperature of the span error of the indicator:  $E_s = 0.0032 \% / 25^\circ\text{K}$

Coefficient of resistance for the wires in the J-box cable:  $S_x = 0.0028 \% / \text{ohm}$

$L/A_{\text{max}} = 295.86 / S_x * (\text{emp} / n - E_s) [\text{m} / \text{mm}^2]$  in which  $\text{emp} = \rho_i * mpe * 100 / e$

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](http://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.

Location of CE mark of conformity:

The CE mark of conformity is placed on the overlay on the top side of the device.

Inscription on the overlay:

Type, accuracy class,  $\Delta u_{\min}$ , Temp. -15 °C / +50 °C, Certificate No. DK0199-R76-03.01.

Other inscriptions on the overlay:

H&B and part No.

Other inscriptions:

None

## 7. Tests

The A/D device type Load cell Digitising Unit LDU 69.1 has been tested according to EN 45501 and WELMEC 2.1 Guide for testing of indicators.

### Examination / tests

|   |
|---|
| Temperature tests: 20/50/-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   |
| Electrostatic discharges  |
| Immunity to radiated 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.**

## **8. Documentation**

Contents of the technical documentation held by the notified body:

### **8.1 Product specification**

- Description
- Drawings
- Etc.

### **8.2 Examination report**

OIML R76 reports no. DANAK-196975 and DANAK-1910230.

### **8.3 Test results**

Reports no. DANAK-196975 and DANAK-1910230.