Justervesenet

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MULTI-DIMENSIONAL MEASURING INSTRUMENT

Applicant: Mettler-Toledo Cargoscan AS, Oslo, Norway

Manufacturer: Dimensioner: Mettler-Toledo Cargoscan AS, Oslo, Norway
Display: Mettler-Toledo Cargoscan AS, Oslo, Norway

Make & Model: Dimensioner: Cargoscanner CNS810
Display: CS2200 (optional)

Use of Instrument: Electronic multi-dimensional measuring instrument, which measures the length (L), width (W) and height (H) of an object that is placed on a measuring table underneath the instrument.
The instrument can only measure cuboidal objects. The instrument determines the smallest rectangular box which fully encloses the object.
The instrument is used to determine freight, shipping and storage charges for objects based on their dimensions. As an option the instrument can be interfaced to a type approved and compatible scale with its own approved primary weight indicator.

Compulsory periodical revision

1. TECHNICAL DATA

OIML Accuracy Class	: MPE = 1d for H, W and L
OIML Environmental Class	: B
Scale Interval	: d = 5 mm
Minimum object size	: H = 10d, W = 10d and L = 10d
Maximum object size	: H = 900, W = 750 and L = 900 [mm] **or**
	: H = 750, W = 800 and L = 1200 [mm]
Capacity	: Placed manually on the table: depends on the operator
Operational temperature	: -10 / +40 [^{O}C]
Voltage	: 230V/ 50Hz or 115V/60Hz
Laser type	: Infrared, invisible: Class 1 (unconditional safe), or Visible red: Class 2: (not eye safe for continuous viewing.
Principle of measurement	: Optical (Infrared or Visible Laser Rangefinder)
Control system	: Linux
Database	: Proprietary

Definitions:

Length (L) is the longest side of the object independent of whether the object is oriented along or across the table.
Width (W) is the shortest side of the object independent of whether the object is oriented along or across the table.
Height (H) is the maximum measured height of the object.

Only type approved ancillary devices shall be connected to the CSN810.

Figure 1: The Cargoscanner CSN810 shown in a typical setup over a table with static scale and with monitor for displaying measurement results

2. VERIFICATION AND PERIODICAL REVERIFICATION ("JUSTERING")

Initial verification and periodical reverification of the measurement instrument shall be performed as described in the Norwegian Metrology Service, Dep. of Legal Metrology's relevant procedures (applies only to instruments installed in Norway, for other countries, see local regulations):

To ensure that the verification can be done efficiently, the owner/user shall have personnel, which are confident on operating the equipment to be verified available on site.
This person shall assist the verification officer during the measurement process.

The following manuals shall always be available for the verification officer:

CNS810 Sealing Procedure version 1.0.6 or newer versions.
CNS810 Operator Guide, version 1.4.7 or newer versions.

The verification officer shall have the possibility to check the correctness of transferred data to the connected printer.

The CNS810 shall fulfill the requirement of OIML R129: *Multi-dimensional measuring instruments.*

MPE is +/- 1d for length, height and width.

The verification officer shall check that requirement for markings, plates and necessary checking facilities are in accordance with the above-mentioned recommendation.

3. ADJUSTMENT / CALIBRATION

The instrument must be installed and calibrated according to the manufacturer's specifications before verification testing and sealing. After being sealed, any calibration or adjustment cannot be performed without breaking the seals.

4. SEALING

The instrument shall be sealed to protect current set-up data. When sealing is on, it is not possible to change any legal relevant parameters. (It is possible to perform tests and look at all parameters). Sealing of the instrument is described in details in the document "CNS810 Sealing Procedure, version 1.0.6 or newer versions".

a) Checking the sealing status:

During verification, the verification officer can confirm/check that the instrument is sealed by performing the following procedure:

- Log on using the root password (CNS810 Sealing Procedure, chapter 3. 1).
- Execute the command versioninfo and press enter.
- If the instrument is responding " Boot process protected: No", it's **NOT** sealed.

Sealing the instrument is a two-step process as described in the following:

b) Sealing of Hardware

Boot process: The boot process can be halted by console port inputs during the 3sec interval, from the power is turned on, until the boot process starts. This interval is controlled by DIP switch SW2 pos.1 on the CPU board. The switch can be set to:

ON: System is not sealed.
The 3sec delay is on. When the boot process is halted, it is possible to access the boot loader, and to give commands to start booting from external devices. This way new software can be loaded from external devices.

OFF: System is sealed (default).
There is no delay, and the boot process starts immediately from the system's internal Flash memory. This prevents intervention, and ensures that the system starts with the internally stored configuration.

Fig.2 shows SW2 location on the CPU board. The CNS810 cabinet cover must be removed to access the switch. By sealing this cover, unauthorized access to SW2 is prevented.

SW2 pos.1 is set to OFF (sealed) position when shipped from CARGOSCAN.

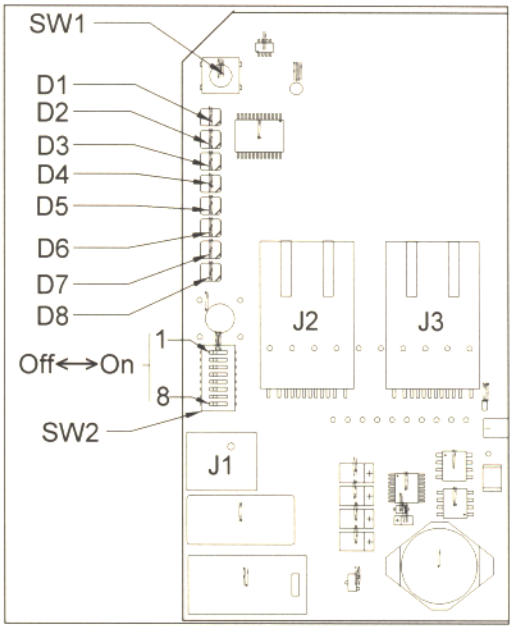

Figure 2: Detail of CPU board

c) Sealing of software

Checking the sealing status, changing password and other related functions are described in details in the document CNS810 Sealing Procedure, chapter 3.

At initial verification the root password shall be changed as described in CNS810 Sealing Procedure, chapter 3.2 and stored as described below:

The new root password is written down on a note, which is placed in an envelope
The instruments serial numbers is marked on the envelope and the verification inspector shall sign the envelope.
The envelope shall be sealed preventing unauthorized access to the password and placed on a safe place at the site of the instrument.

Once sealed the following actions are inhibited:

- Download of non-approved code
- Calibration and recalibration of the instrument
- Changing the setup parameters.
- Zeroing the instrument within +/-25mm from original settings

Download of approved software can be performed on a sealed instrument through the protected Down Load Manager interface.

5. MARKINGS

All marking shall be clearly readable:

- Certificate of Approval number
- Manufacturer
- Make and model
- Serial number
- Date manufactured
- OIML environmental class: B
- Scale interval
- Minimum object size
- Maximum object size
- Operational temperature

In addition the following information shall be available for the operator (i.e. on a plate mounted to or nearby the instrument or in an operating manual:

WARNING:

1.Cargoscanner CSN810 cannot measure the following objects/cargo:

- Non-cuboidal objects
- Objects wrapped in transparent plastic and "bubble" plastic
- Objects with mirroring surfaces and shiny metal surfaces

2. **ALWAYS** place the object with the most stable surface down to ensure correct measurement.

6. PRINCIPLE OF OPERATION FOR CNS 810

For details, see the CNS810 Operator Guide, version 1.4.7 or newer versions, which shall always be present at the site where the instrument is put into use.

6.1 Description of the instrument.

The instrument is configured with one dimensioning head (Scanner Active Units), consisting of a laser diode based range finder, a scanning polygon, a sweep mirror and a CPU.
The dimensioning head are housed in a casing mounted over the measuring table.
The dimensioning head is mounted horizontally and the measurement is done by sweeping the laser beam fan over the measuring area, see figure 3.

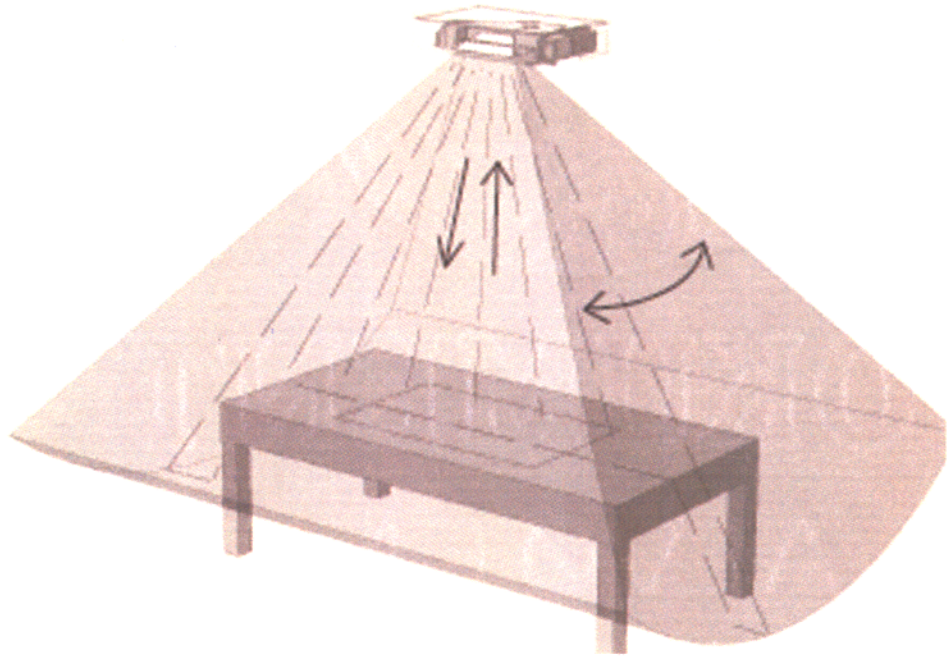

Figure 3: Laser beam fan

The range finder measures the amount of time the light uses for travelling down to the object and back again to the range finder.

The laser diode sends a beam of light to a spinning polygon mirror which generates a horizontal fan of infrared / red beam array of light. The laser beam fan hit **the sweeping mirror** along its rotation axis, and is directed down onto the measuring table.
The reflected light is sent back up to the photo-detector in the range finder.

The CPU compares the light ray travel time information and creates an intensity image and a three dimensional image by mapping the individual light ray information. To measure the dimensions of the packages on the measuring table, the CPU analyzes these images
The dimensions and additional data for each package are sent to the host and the display ports.

6.2.Calculation of the result:

Length, with and height are the measured values to the smallest rectangular box which the object can be placed inside:

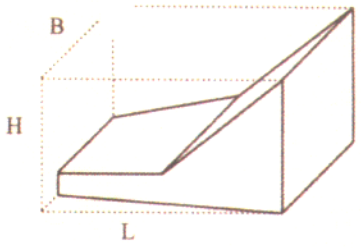

Figure 4

It is therefore important that the object is placed with the most stable surface down so the measuring frame (dimensioner) can see the minimum right-angled parallelepiped, which encloses the object.

Figure 5 indicates how the measurement result is influenced by the orientation of the object.

Figure 5

Note: The CNS 810 can only measure rectangular objects. Figure 4 and 5 are only illustrating the principle.

6.3 Requirements of the object

The CNS810 measures only cuboidal objects of any colour. However, the following restrictions applies:

- Maximum and minimum measurement sizes of object
- The instrument can measure only one by one parcel.
- A stable positioning of the object is essential for a correct measurement. Therefore, the objects must be placed with its largest and most stable side down. Also, the measurement table must be stable and horizontal.
- The object to be measured must be placed roughly under the centre of the CNS810 bottom window. If the instrument does not accept centring, the dimensions will be reported together with a status code.
- Garment bags, sacks and other soft, flexible objects with non-cuboidal shape are not suited for measurement by CNS810.
- Solid packages like wood-and cardboard boxes will cause no measurement problems.
- Transparent objects packed in transparent plastic or objects packed in "bubble" plastic are not suited for this type of measuring. This also applies to reflecting surfaces like

mirrors and shiny metal surfaces. Ordinary, non-shiny metal surfaces cause no problems.
- The instrument can measure objects covered with shiny sealing tape and mirroring wrapping on the top surface.
- The entire object has to be within the scan area. Then, if any part of the object is outside the measuring area, an error message is generated.

An error message code will appear if measuring fails, indicating a reason for the failure.

6.4 Requirements of the table

- The measurement table must be stable and horizontal.
- An exact and stable relative positioning between the CNS810 and the table is essential for correct measuring: The underside of the CNS810 must be fairly level with table (±2-3 deg. parallelity error is acceptable)
- Type of table allowed (Surface must be flat): Flat table, Bench scale table and Roller table.
- Steel rollers are not recommended and beam stoppers under the rollers are required.
- Matte (non-glossy) surfaces are recommended. High gloss surfaces are not recommended.

6.5 Start up

- Turn the instrument on with the on/off switch. The CNS810 will power up and start a self test.
- After the self-test is finished successfully, the scanning will start and the instrument is ready for measurement.

6.6 Measurement

- Place the object to be measured on the measuring table. Always place the most stable surface down at the table.
- No other items than the objects to be measured shall be in the area of measurement (Such as the arm of the operator).
- The results of measurements are output on the host port and/or the display port. The display port is the serial port marked D1. Host port can be one of the other RS-232 serial lines or one of the NET ports.

6.7 Verification Testing

The following methods for displaying the test results during verification testing can be used:

6.7.1 CS2200 Display

Connect the CS2200 display to D1 and turn ON the power to the CNS810. Follow the instructions in the Operator Guide for measuring.

6.7.2 PC with terminal emulator

Connect the computer to the Host connector (NET or Host Serial Line as configured).
Start HyperTerminal or equivalent terminal emulator software.
Start measurement with the command: Ctrl-B D Ctrl-C.

6.7.3 Host System Display

If the CNS810 is used in a Host system such as Cargoscan CSS310 or other, with a display, the display of this system can be used for verification testing. Follow the instructions of the Host system for measuring the test objects.

6.8 Error messages

If the measurement is not successful, an error message will show up on the screen together with the measurement result, to indicate that the result may be incorrect. The numerical error code of the error message indicates why the measurement failed and possible causes of the failure, such as:

- The object is outside the area of measurement.
- The object is reflecting too much or too little light.
- The object outside minimum and maximum dimensions set for the instrument.
- Non-rectangular shape of object.
- Data missing.

Some packaging materials are difficult to measure correctly. For limitations, see paragraph 6.3. Object requirements of this certificate.

7. SOFTWARE AND DATA COMMUNICATION

Version information

SW Name: CS800-1160, Revision 1.6.0 or newer.
Linux kernel version: 2.4.18 or newer.

The software name and version information are displayed with the "versioninfo" command during sealing of the instrument (see chapter 4, Sealing, or the document "CNS810 Sealing Procedure ".

For any updating of legal relevant parts of the software, the body having issued the Certificate of Approval shall be notified. Assess the changes the issuing body will, if found necessary, issue an amendment to N -12/2006.

Data communication:

D1	RS232: Console port of the CPU
SER.1	RS232
NET 1&2:	10/100Mbs Ethernet. TCP/IP:
Net 1:	Host communication and
Net 2:	Communication between CNS810 and other devices, for example bar code reader.

With VGA (optional):

SER3&4:	RS232
USB 1-2:	

Processor

Cargoscan CS0045 CPU/RF Board

Service Interface

See the CNS810 Configuration Manual.

SW description

The software consists of several modules. The Dimensioning module is CS800-xxxx, where xxxx is a 4 digit number representing the revision of the Dimensioning software. The software is installed as a package containing both Legal Relevant (Dimensioning software) and Non-legal Relevant software (web server etc). This package has a version number in the format v.w.z. Valid version numbers are 1.6.0 and newer.

Kjeller, 28.04.2006
Legal Metrology

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