

UNITEST

TEMPERATURE MONITORING SYSTEM

SAFEVENT

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1. CABLE

The hanging cable is a standard duty cable with cast-in steel wires and a smooth environmental PE outer sheet.

The cable is designed for hanging in steel silos with a max. height of 24 metres (cylindrical height) and with a max. diameter of 30 m. The SD-cable is not suitable for use in storage facilities where tensile loads are above 1000 kg.

Cables are connected to the read-out unit by cables using moisture resistant butt connectors.

1.1 SPECIFICATIONS

SD-CABLE CONSTRUCTION

Inner tube	7.0 mm +/- 0.2
Tensile strength	Max 1000 kg
Type of extrusion	Tube extrusion
Flexible tube (galvanized)	Type ISE
Reinforced steel wire	Ø 11.0 +/- 0.2 mm
Sheet LD-PE black	Ø 13 mm +/- 0.2 mm

SENSOR CABLE

No. of wires	8 pcs.
Diameter "Without sensors"	Ø 3.5 mm +/- 0.15 mm
Sheet	Teflon coated
Retractable	Yes (bin must be empty)
Colour code	See manual

SENSOR TYPE

Sensor	NTC with diode
Nom. Value	3000 ohm / 25°C
Working range	-20°C to 85°C

SENSOR CABLE

CUT2011	Max. no. of sensors: 7 pcs.
CUT2017	Max. no. of sensors: 12 pcs.
CUT2018	Max. no. of sensors: 15 pcs.

1.2 ATEX – CERTIFICATE

The cables are considered as "simple apparatus". This means, that if the measuring cables are installed within a system with ATEX-certified address board(s), normally no further approval is to be obtained in order to comply with the ATEX regulations.

ATEX certificate no. DTI 16 ATEX 0050X.

1.3 COMPATIBLE SYSTEMS

The standard duty cable may only be used/installed together with the following Unitest system: UNITEST@PROTECTOR.



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ATEX DATA

Ui: 15 VDC **Li** $\approx 0 \mu\text{H}$

Ii: 130 mA **Ci:** $\approx 0 \text{pF}$

Pi: 1,1W

1.4 CONNECTORS

The system is constructed so that only butt connectors (Scotchlocks) on any suitable moist resistant connector may be used when extending the sensor cables.

1.5 SUSPENSION

THE SD-cable must be suspended either on the end of a 1" hollow tube or on a special hanger. Please see [2. HANGER FOR STAND DUTY CABLES](#).



Plenty of room for connectors and extension cable.

2. HANGER FOR STANDARD DUTY CABLES

Hanger for suspension of standard duty cables under roof construction; suitable for steel silos and warehouses. The measuring cable is extended and protected by a flexible conduit connected to a junction box in a convenient place on top of the silo.

DIMENSIONS

Plate	120 x 80 mm
Strap	340 mm high
Weight	approx. 2 kg.



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3. NO. OF CABLES PER BIN

3.1 CABLES

The number of cables suspended in a silo depends on the diameter of the silo, the stored commodity and the climatic conditions.

There is no mathematic formula to calculate the necessary number of cables per silo, but the table below shows our recommendations.

Our recommendations are based on our experience in the market.

3.2 SENSORS

The number of sensors in a cable is mainly depending on the length of the cable.

By experience we have learned that the maximum length between sensors is 5 meters. However, the best result is achieved if the distance between the sensors is kept around 3-4 meters.

The final decision on the number of cables and sensors in a silo is always made in close co-operation with the customer.

TABLE 1 – SUSPENSION

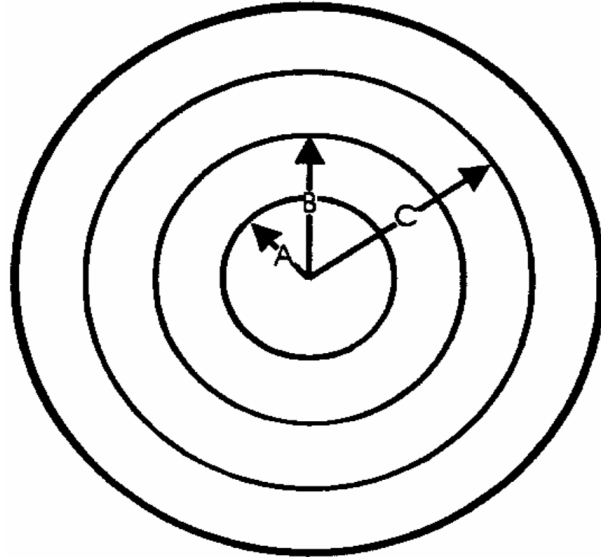


TABLE 2 – NUMBER OF CABLES

Silo diameter in meters	6	8	10	12	14	16	18	20	22	24	26	28	30	35	40
Total number of cables	1	3	3	4	6	7	8	11	12	16	17	19	22	29	34

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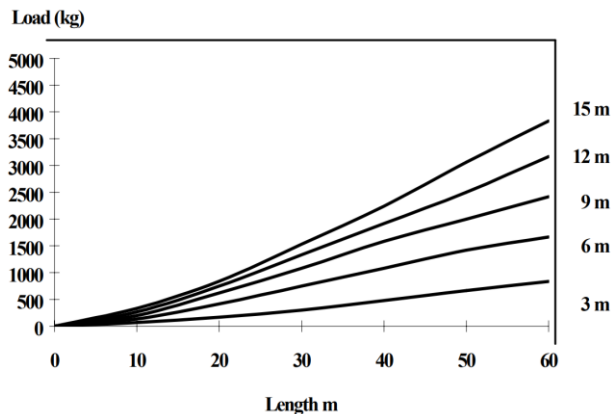
TABLE 3 – PLACEMENT OF CABLES

	Number of cables placed in centre	1	0	0	1	1	1	1	0	0	0	1	1	0	0	1
Suspension point	Distance from centre in meter		2.2	2.5	3.2	4.7	5.6	6.0	2.4	2.7	3.0	5.2	5.5	2.5	2.8	5.6
	Number of cables		3	3	3	5	6	7	3	3	6	6	6	3	3	5
Radius A	Angle degree between two cables		120	120	120	72	60	51	120	120	120	60	60	120	120	72
Suspension point	Distance from centre in meters								7.5	8.2	9.0	10.5	10.5	7.6	8.6	11.3
	Number of cables								8	9	10	10	12	7	10	10
Radius B	Angle degree between two cables								45	40	36	36	30	51	36	36
Suspension point	Distance from centre in meters													12.8	14.5	17.0
	Number of cables													12	16	18
Radius C	Angle degree between two cables													30	22.5	20



4. CABLE SUSPENSION AND ANCHORING

4.1 TENSILE LOAD IN CABLES SUSPENDED IN A CONCRETE SILO



The suspension of the measuring cable(s) in the bin depends on the silo structure and the strength of the roof (ceiling).

⚠ Do not fit a cable in an area where it can be destroyed by an incoming grain stream!!

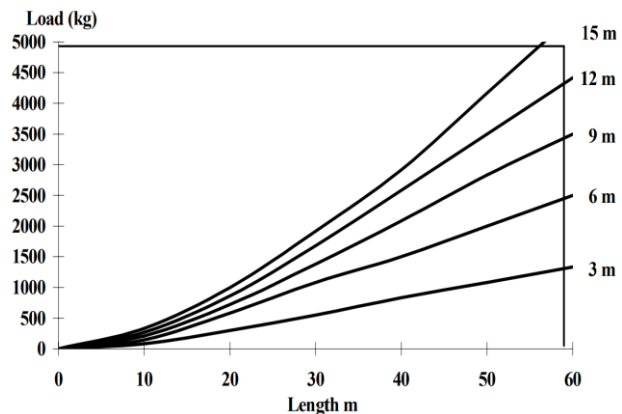
Keep the cable-end clear of the silo cone in order to avoid damage from grain rotation and pressure during unloading.

The above graphs show the tensile load in a concrete bin and a steel/wooden bin.

The tensile load P (kg) in a heavy-duty measuring cable is based on the following parameters:

- Cable length immersed in the stored material
- Diameter of the silo
- Density of the stored material
- Discharge coefficient in the silo.

4.2 TENSILE LOAD IN CABLES SUSPENDED IN A STEEL SILO



The graphs show the values for wheat with a specific weight of 760 kg/m^3 and friction angles grain-grain = 20° , grain-concrete = 25° , grain-steel = 15° , grain-measuring cable = 11° , and only one centrally suspended and free hanging measuring cable in the bin.

The graphs are only intended as a guide. In any specific case the tensile load must be evaluated (calculated).

⚠ Consult the civil engineer for the silo regarding the resulting load on the silo roof.

The graphs comprise a dynamic safety factor of + 40%.

4.3 ANCHORING THE CABLE

In some cases, it may be desirable to anchor the measuring cable to the bottom of the bin. This can easily be done, as the cables are provided with anchoring bushing at the bottom of the cable.

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5. SOFTWARE

The Unitest® 3000 W software is a software working in the MS Windows environment. All system and process data are saved in a database configured for each individual storage plant. The database structure makes it easy to organize, operate and maintain the data as well as dynamic data exchange with other computer systems are available.

The software contains the following facilities:

ACTUAL TEMPERATURE

The software will produce a read out of the actual temperature of each individual sensor.

TEMPERATURE CHANGE

Every hour the delta temperature is calculated in order to give the user a clear view of the temperature development in the grain.

SETTING OF ALARM VALUES

The user has the option of setting alarm values for both actual temperature and temperature changes. The alarm values can be set on the entire silo, cable or the individual sensor.

TEMPERATURE TRENDS

The Unitest® 3000W generates temperature trends for 24 hours, 1 week, 2 weeks, and for 1 month.

STORAGE PLANT VIEW

A complete view of the silos gives the user the possibility of choosing the specific silo to be displayed.

DISPLAY OF GRAIN LEVEL

The grain level in the silo can with a manual function be displayed in the set-up menu. The grain level indicates which sensors are in the grain and which are not.

ALARMS ACCORDING TO LEVEL

This feature has the effect that no alarms are generated on sensor outside the grain.

SILO INFORMATION

For each silo there are two lines on which the operator can write different information regarding the content of the silo.

PROGRAM LANGUAGE

The Unitest® 3000W software is available in all alphabets and languages supported by MS Windows.

ADDITIONAL ALARMS

Alarms for communication errors are also generated.

COMMUNICATION

The software is prepared for modem and network communication.

HELP FUNCTION

The Unitest® 3000W contains an on-line user's manual. Giving instant help to the operator.

PRINT OUT

A print out of all data is available.

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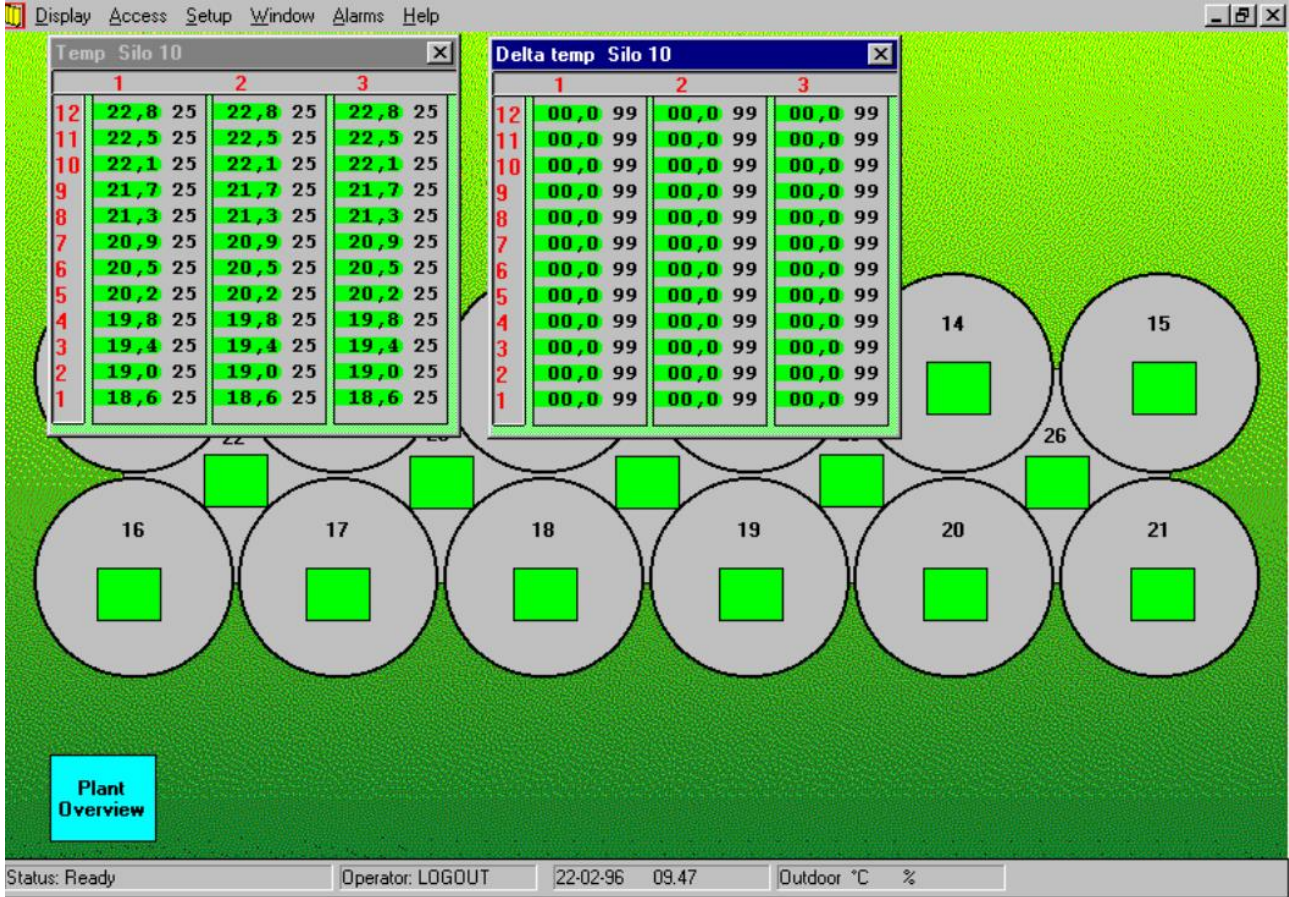
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SCREENSHOT OF THE SOFTWARE DISPLAYED ON A PC

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6. INTERFACE PROTECTOR - CUT3002



INTERFACE CABINET

(IP 66) dimensions: Length 400 MM, Height; 200 MM, Depth 155 MM, Weight 7.5 kg.

THE INTERFACE

The basic version converts RS232 signals to RS485 signals and supply 24 VDC to the Address Board(s). In the more sophisticated versions, the interface may be connected to the network in the plant. These models also convert the signals to RS485, but the PC that is used for temperature measurement can be almost anywhere on the network in the plant.

SPECIFICATIONS

Supply voltage	230 VAC – 50 Hz.
Power consumption	Max 30 VA
Communication	RS232 on PC. RS485 on address board
Protocol	Transparency
Protocol characters	ASCII
Baud rate	9600, 8 Databit, 1 startbit, 1 Stop bit, No parity.
Number of busses	1-4
Number of address Boards per bus line	Max 32
Over voltage protection	Available

BUS CABLES

The bus cables required a 4-wire-line for communications and supply. Recommendation: 2 x 2 x 0.5. Twisted pair shielded cable



CONNECTION CABLE

The standard connection cable from PC to Interface is 5 m long

SENSOR CABLES

The length and number of sensors in one sensor cable are custom specified.

SPECIFICATIONS

Sensor	NTC with diode
Norm values	3000 ohm / 25°C
Range	-20°C to +85°C
No. of sensors	Max 24

ADDRESS BOARDS: CUT1007 (CUT3001)

Only one type of address board is available.

The address boards can be connected to max 8 cables.

Working conditions: -8 to +50°C.

For further information about the address board see [7. ADDRESS BOARD PROTECTOR CUT1007/CUT3001](#).

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7. ADDRESS BOARD PROTECTOR – CUT1007/CUT3001

7.1 CUT1007 – CABINET & ADDRESS BOARD



Address board (incl. cabinet – IP66)
dimensions: Length 500 mm, Height 300 mm,
Depth 155 mm, Weight 9 kg.

ADDRESS BOARDS

In principle there is only one type of address board. The address board is available with cabinet CUT1007 and without cabinet CUT3001 (spare part).

SPECIFICATIONS

MEASURING RANGE	-8° to 50° Celsius.
OPERATING VOLTAGE	24 VDC
CURRENT CONSUMPTION	approximate 10 mA (stand by)
COMMUNICATION	RS48
PROTOCOL	Cimbria CUT3001
PROTOCOL CHARACTERS	ASCII
BAUD RATE	9600, 8 Databit, 1 Startbit, 1 Stop bit, No parity.
MAXIMUM NUMBER OF ADDRESS BOARDS PER BUS	32.
BUS CABLE	2 x 2 x 0.5. Twisted pair shielded cable
ADDRESS SETTING	1 – 250 (Dip switch)
PROCESSOR	Flash type. Software up-grade possible.

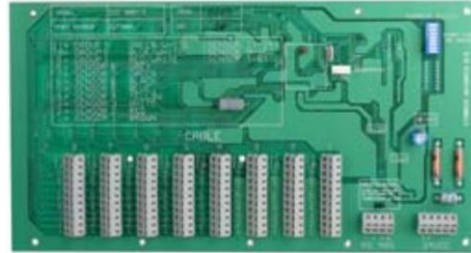
BUS CABLE

The bus cable (from interface to / through each address board) requires a 4-wire-line for communications and supply.

RECOMMENDATION:

2 x 2 x 0.5. Twisted pair shielded cable

7.2 CUT1007 – CABINET & ADDRESS BOARD



Address board (without cabinet) dimensions:
Length 325 mm, Height 175 mm, Weight 0.4 kg.

EXTENSION CABLES (F 164285)

The extension cable (from Heavy-duty cables to address boards) required a 12-wire-line.

RECOMMENDATION:

6 x 2 x 0,6. Twisted pair cable

SENSOR CABLES:

The length and number of sensors in one sensor cable are custom specified.

SPECIFICATIONS

Sensor	NTC with diode
Norm values	3000 ohm / 25°C
Range	-20°C to +85°C
No of sensors	Max 24

INTERFACE TYPE:

As a standard, 2 different interfaces are available. Each type of interface may hold 1-4 bus lines.

SPECIFICATIONS

Communication	RS232 on PC. RS485 on address board
Number of busses	1-4
Number of address Boards per bus line	Max 32
Max number of cables	1024
Max no of sensors	24576
Over voltage protection	Available

Further information about the Interfaces can be obtained from [6. INTERFACE PROTECTOR - CUT3002](#)