

User Manual



Th3-s

Soil Temperature Profile Probe



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1 Th3 soil temperature profile probe

1.1 Safety instructions and warnings

Electrical installations must comply with the safety and EMC requirements of the country in which the system is to be used.

Please note that any damages caused by handling errors are out of our control and therefore are not covered by guarantee.

Please pay attention to the following possible causes of risk:

Lightning: Long cables act as antennas and might conduct surge voltage in case of lightning stroke – this might damage sensors and instruments.

Electronic installation: Any electrical installations should only be executed by qualified personnel.

1.2 Scope of supply

The delivery of a **Th3-sdi12** includes:

- Soil temperature profile probe with attached cable (1.5 m with 4-pin plug M12/IP67 with protective cap) and cable protection tube.

4-pin connecting or extension cables need to be ordered separately.

1.3 General notes

1.3.1 Intended use

The intended use of the Th3 temperature profile probe is to measure the temperature profile in soils in six fixed depths.

2 Sensor description

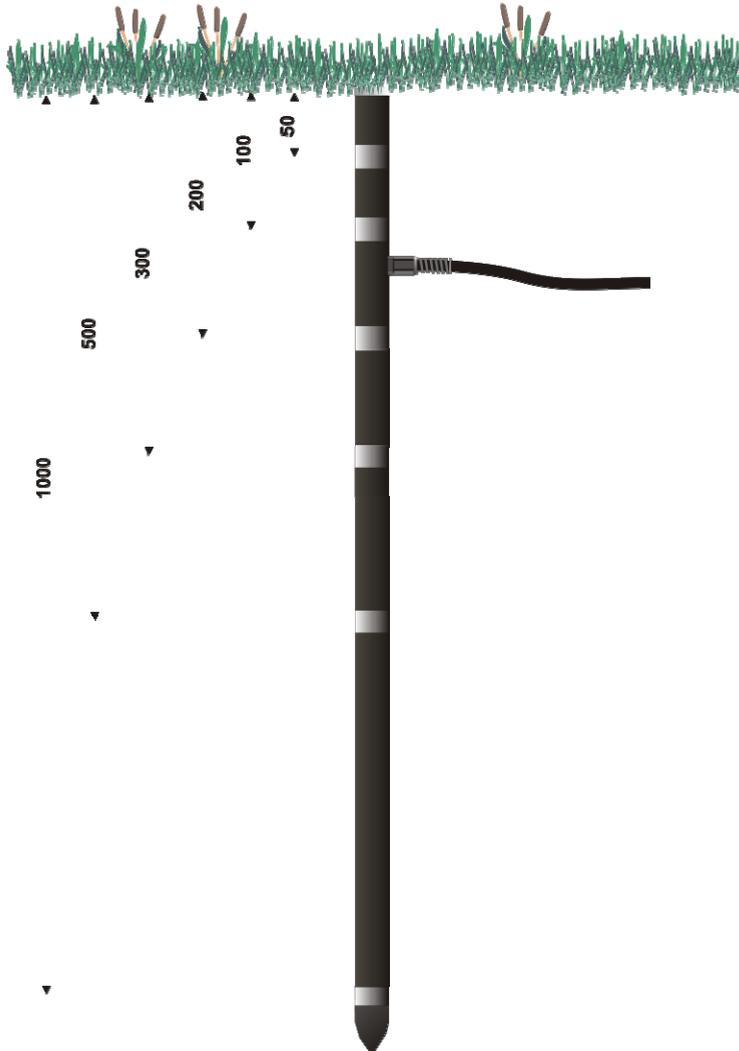


Fig. 1: The temperature profile probe Th3

2.1 Design of the probe

Inside a tube made of glass-fibre reinforced plastic (GRP) 6 temperature sensor elements are placed in different depths (see figure 1). Each sensor element has direct contact to a 1 cm high stainless steel ring which is embedded into the tube. This ensures that each sensor has direct contact to the soil.

The depths of the profile probe are fixed and not changeable. The 6 sensors are placed in the depths 5, 10, 20, 30, 50 and 100 cm.

When installed, the sensor cable is buried in a depth of about 8 cm.

2.2 Features

The Th3 temperature profile probe has the following features:

- Measurement of 6 different depths with one probe only
- Minimised soil disturbance
- Punctiform temperature pick-up
- Robust and maintenance free design
- Strain-relieved cable with 4-pin connection cable
- Best thermal contact of the sensor elements to the stainless steel rings
- Buried cable reduces thermal conductions

The PA66GF30 tube is a high-grade plastic material with the following features:

- Very high firmness and durability
- Flexible
- Dimension stability
- Low water assimilation
- Low flow properties

2.3 Serial interface

On the Th3-sdi12 two serial interfaces: tensioLINK[®] which is based on RS485, and SDI12.

To use tensioLINK[®] the tensioLINK[®] USB converter with Windows software tensioVIEW[®] is required.

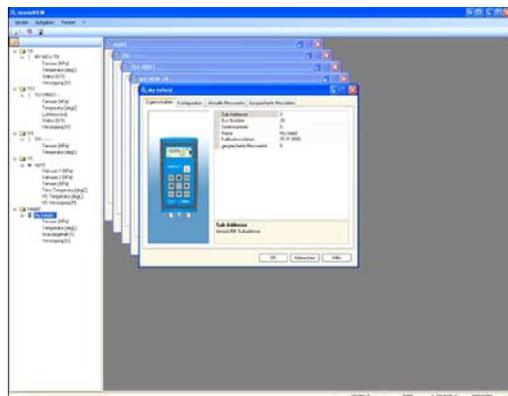


tensioLINK[®] is used for all functions, for taking online readings, for uploading stored data and for configuration of the T8.

RS485 allows a robust and cost effective bus linkage of sensors with cables of up to a few kilometers. Data loggers with RS485 interface can directly read sensors. Please contact UMS for a description of the data protocol.

2.3.1 SDI12

Additionally SDI12 interface is integrated for connection to SDI12 systems. The SDI12 interface has to be activated via tensioVIEW[®].



Actual values can be read out via SDI12. (SDI-12 Version 1.3.) Additional information you will find at www.sdi-12.org

2.3.2 tensioVIEW

The Windows software tensioVIEW[®] (supplied with the tensioLINK-USB converter) automatically detects all tensioLINK devices linked within a bus network. The software is used for the configuration of these devices and for displaying data.

tensioVIEW[®] shows for example the settings of a VS vacuum station or T8 readings from the recent days.

When used in a laboratory no other device is required beside tensioLINK, tensioVIEW and PC to have a complete data acquisition system. Readings are displayed and stored by the PC directly.

2.3.3 Specific feature on the serial interface

On the Th3-sdi12 one data line (pin 2, white) is used for both interfaces RS485 and SDI12. Both interfaces have an integrated specific bus driver, but as the protocol as well as the signal level is different only one interface can be used at a time.

Once the Th3-sdi12 probe receives a SDI12 command the tensioLINK interface is deactivated for a certain time. This enhances the communication performance. In return, a tensioLINK command de-activates the SDI12 interface. After the timeout or after the power supply is toggled both interfaces are available again.

If the SDI12 interface is used it is recommendable to connect the not used data line RS485-B (pin 4, black) to GND.

3 Installation

3.1 Probe installation

The probe is installed vertically. Drill a hole with a diameter of 20 mm and a depth of 1 meter. Augers are available as an accessory. Then make a narrow groove of about 8 cm depth to insert the sensor cable.

Push the probe into the hole without force.

- It is very important, that there are no gaps between the soil and the probe. Good soil contact is obligatory.

Insert the probe until the top of the probe tube is in-plane with the ground surface. Then, bury the cable.

3.2 Cable installation

A cable lying on the ground will pick up the ambient temperature, conduct it to the probe and falsify the readings. Therefore, the Th3 cable inside the protecting tube is installed 8 to 10 cm below the ground surface.

Also the extension or connecting cables should be protected against rodent bites. Lead the cables through plastic pipes or use the plastic protection tubes which are available as an accessory.

Put the protection cap onto the plug whenever the plug is not connected as dirt will reduce the water tightness of the plug.

4 Configuration with tensioVIEW®

4.1 tensioLINK® USB converter

The power supply of the tensioLINK® converter is galvanically isolated from the PC or Laptop and can be used to power connected sensors. The 8-pin plug has the standard tensioLINK® plug configuration and can be directly connected to the converter without the need of any further items.

Bus distribution modules are available to link numerous sensors. Any custom made cables require 4 wires for a parallel connection of all sensors.

If sensors should be supplied by another power source take notice to avoid potential differences. This can be achieved by connecting the GND of both power sources. The V+ line of the USB converter then is not used.

4.2 Work with tensioVIEW

4.2.1 Menu

tensioVIEW® has a simple menu for mostly self-explaining read-out and configuration of tensioLINK devices.

After starting tensioVIEW the display is more or less blank, most functions are inactivated.

Search devices



If one or more sensors are connected via the USB-converter they can be searched by pressing the “magnifier” button. tensioVIEW® offers two options for searching:

Single device mode



tensioVIEW® expects that only one device is connected which will be found very quick. This mode is not functional if more than one device is connected!

Multiplex device modes



tensioVIEW® is able to detect up to 256 devices connected to the bus within 8 seconds, but only if each device is already personalized with an individual bus identification address. If two or more devices have an identical address, none of them will be found.

All devices found will be displayed in the left section as a directory tree. Same types of devices will be grouped in one directory.

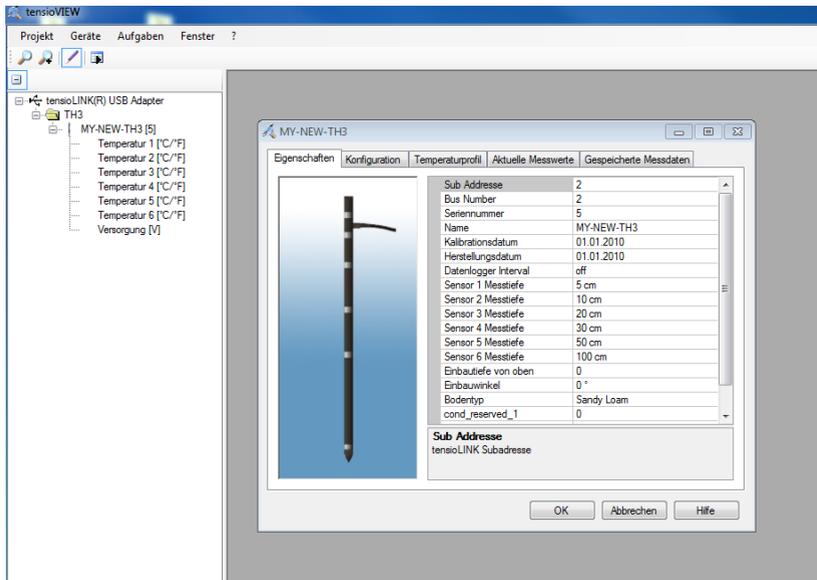


Fig. 4.1: Found devices in tensioVIEW

Detected devices will be displayed with their programmed names. Press the + symbol to see what readings the device can offer. Double-click on the name to open a menu window where all specifications and functions of this device are displayed. Depending on the type different registries are available. The first shows an overview of the current settings and information about address number or error messages.

4.2.2 Properties of the probe

The register "Properties" shows typical settings which cannot be changed in this register.

4.2.3 Configuration of a device

Select the register "Configuration" for viewing and changing the programmed settings of the device.

Depending on the authorization status, only parameters that can be edited are shown. To store it in the device a changed parameter has to be sent to the device by pressing the "Upload" button. A message notifying about the successful configuration will be displayed.

Configuration changes are effective immediately. Tensiometers for example will re-start just as if they were connected to power.

4.2.4 Temperature profile

In this sub menu the current temperature readings for each depth are displayed graphically. Readings are updated every 5 seconds.

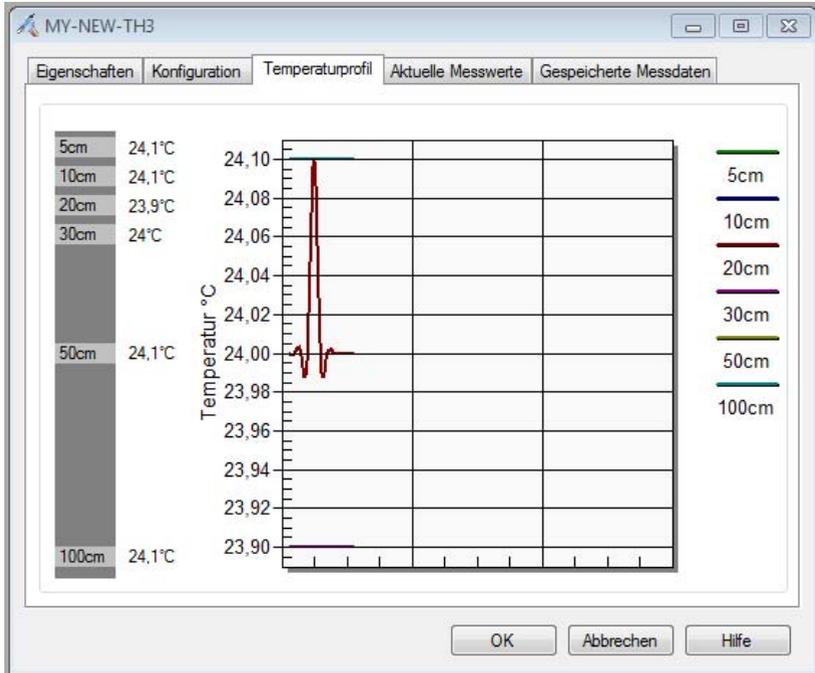


Fig 4.2: Temperature profile

4.2.5 Current readings

Enter the interval parameters and press "Start" to display the current readings.

4.2.6 Stored readings

Open the menu "Stored readings" to upload the data from a Th3 (if logging had been activated in the logger menu)

4.3 Configuration settings for T8

Those settings which are editable only for *Power* users are marked with an asterisk *.

Parameters with related functions are bundled in one folder.

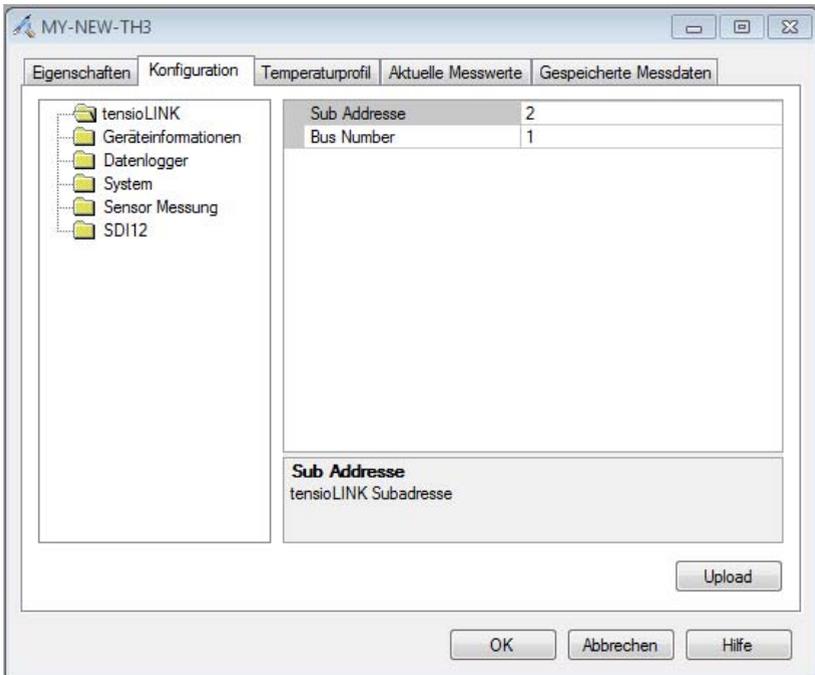


Fig. 4.2: tensioLINK® configuration menu

tensioLINK

Bus number

tensioLINK bus number of the device

Sub address

tensioLINK sub address of the device

Explanation:

tensioLINK uses two types of address for each device, the bus address and the sub address. The reason for this is that there might be sensors installed at the same spot, but with different

measuring depths (for example multi-level probes). In this case, the sub address defines the depth starting with 1 for the highest sensor. Furthermore, the sub address could be used to combine groups of sensors, for example of one measuring site.

In general the required identification for a device is always the bus number. If more than 32 devices are connected to the bus the sub address is counted up. The allowed numbers for the bus address are 1 to 32 and for the sub address 1 to 8.

The default value for both bus and sub address is 0. With more than one device connected individual addresses have to be declared.

Serial interface activated during power down*

Serial reception possible in sleep mode. When data are received thorough the RS485 interface the TH3 is wakened, With an activated reception the TH3 consumes approximately an additional 0.3 mA.

Device informationen

Device name

Individually editable name of the Tensiometer in ASCII. Maximum length 12 digits

Installation depth

Here the installation depth can be entered. This is for your information only and has no further functions.

Soil type

Type of soil at the installation site: Only for information, does not influence the Tensiometer readings.

Data logger

[Interval](#)

Logging interval of the internal logger

[Ring buffer memory](#)

With ring buffer activated the oldest readings are overwritten when the memory space is full.

System

The Power Save Mode puts the Tensiometer to sleep when inactive. Analog outputs are then switched off and the current consumption is significantly reduced. If data is read out only serially, or the internal data logger is used, activate this option without reducing the Tensiometer operation. Possibly the Tensiometer will react a little bit slower to serial commands.

Sensor readings

[Continuous measurements](#)

Activate the quick updating of readings to receive the Tensiometer readings instantly, for example during a refilling procedure. Measurements are taken in intervals of 50 ms. Note the rise in power consumption and that the reaction to serial commands might be slowed down. The setting "Measuring interval" is deactivated during this mode..

[Measuring interval](#)

This is the standard interval in which sensor measurements are refreshed and available on the analog lines.

Temperature unit

The unit for temperature can be switched here between Celsius and Fahrenheit.

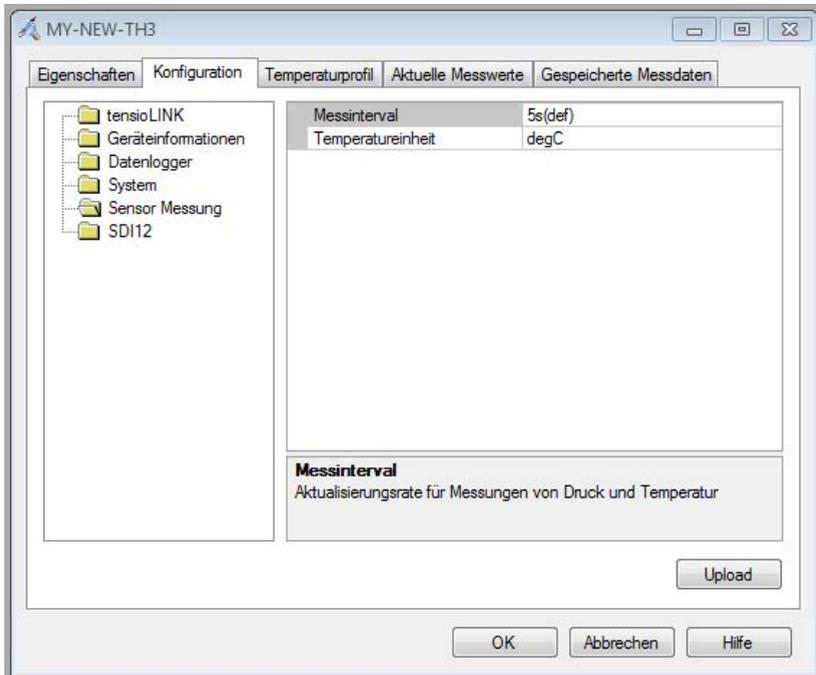


Abbildung 4.4: Konfigurationsfenster: Sensormessung

SDI12

SDI12 Interface active
SDI12 Switch the bus interface on/off
SDI12 Interface sensor address

Pre-set the SDI12 address here. The SDI12 typical ASCII characters 1...9 can be entered. Higher values can be entered, for example "17" is entered as „A“ (Byte 65="A"=17-48)

4.4 SDI-12 Data query

4.4.1 Data register

The sensor preferentially supports the synchronous data query according to SDI-12 specifications 1.3.

All readings of the temperature profile are displayed in the first register set (Command !M or !D0 and !R)

Registerset 1 (!M, !D0, !R)

Reading Number	Type	Depth
1	Temperature	5 cm
2	Temperature	10 cm
3	Temperature	20 cm
4	Temperature	30 cm
5	Temperature	50 cm
6	Temperature	100 cm

4.4.2 Sensor address

Probes always have the sensor address "0" when delivered.

Thus, the probe reacts to a command like:

„0!“

The address can be changed with the command A.

Example:

„0A5!“

This command sets the sensor address from 0 to 5. The address setting is non-volatile and is retained in the probe even if the power supply is disconnected

5 Appendix

5.1 Technical specifications

Material and dimensions

Housing	PA66GF30
Sensor elements	High accuracy temperature sensors, connected to stainless steel ring
Length	1020 mm
Diameter	20 mm
Protection	IP68

Cable (standard)

Material	PUR
Plug	Male 4-pin, thread M12, IP67
Length	4,5 m

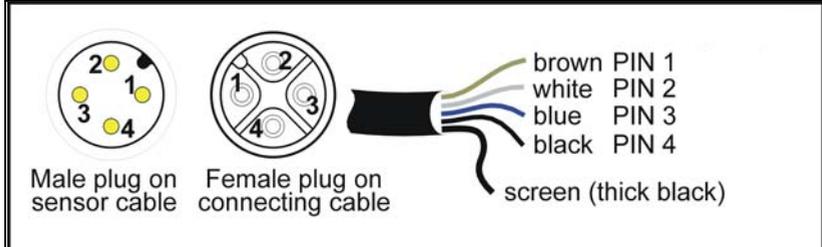
Sensor specifications

Accuracy	$\pm 0,1^{\circ}\text{C}$
Measuring range	-20°C to $+50^{\circ}\text{C}$
Resolution	0,034 $^{\circ}\text{C}$
Output signal	0 to 1 V
Power supply	6 to 18 VDC

5.2 Wiring configuration

5.2.1 Connecting and extension cables

Wiring connections



Male plug on sensor cable Female plug on connecting cable

brown PIN 1
 white PIN 2
 blue PIN 3
 black PIN 4
 screen (thick black)

Pin and wire configuration for UMS connecting cable CC-4

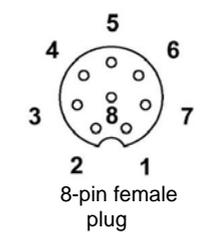
Signal	Wire	Pin	Function
V_{in}	brown	1	Supply +6...+18 V _{DC}
RS485-A	white	2	RS485-A / SDI12
GND	blue	3	Signal minus
RS485-B	black	4	RS485-B

If the SDI12 interface is used it is recommendable to connect the not used data line RS485-B (pin 4, black) to GND.

5.2.2 Configuration of the USB converter

USB converter plug configuration

Signal	Pin	Function
V_{out}	1	Supply +7...+10 V _{DC}
GND	2	Supply minus
n.c.	3	-
n.c.	4	-
n.c.	5	-
RS485-A	6	RS485-A 2-wire
RS485-B	7	RS485-B 2-wire
n.c.	8	-



8-pin female plug

Note: to connect the Th3-sdi12 to the tenioLINK USB converter a 4-pin to 8-pin adapter cable is required!.

5.3 Accessories

5.3.1 Connecting and extension cables

⚠ Cables must be ordered additionally for each TH3.

4-wire connecting cables CC-4/... are fitted with a female plug M12/IP67 and 12 cm wire end sleeves.

Extension cables EC-4/... have one each male and female plug M12/IP67. Plugs are supplied with protective caps.

Item	Art. no.
4-pin connection cables	
Length 5 m	CC-4/5
Length 10 m	CC-4/10
Length 20 m	CC-4/20
4-pin extension cables	
Length 5 m	EC-4/5
Length 10 m	EC-4/10
Length 20 m	EC-4/20

Additional items	Art. no.
Clip-on cable markers, 30 times numbers 0 ... 9	KMT

Protection tube (for cable)

Plastic protection tube for cables are available with several diameters, also dividable slotted tubes for easy re-fitting.



5.3.2 Other Accessories

Art No.

Item

tL-8/USB



tensioLINK USB converter for configuration or data readout of T8-2005, TS1, SISC8, VS vacuum stations, Infield7 via PC or laptop USB port, sensor power supply from USB port, incl. Windows PC software tensioVIEW

Adapterkabel für den Anschluß des USB Konverters an den 4 poligen Stecker des TH3

tL-8/X6

tensioLINK junction box with 6 inputs for e.g. T8, TS1 or SIS-C8 sensors

Auger and Accessories

Stechbohrer, Unterteil, Arb.länge 50 cm, konisches Gewinde, Durchmesser 20mm

04020120C



011011C

Oberteil, kurz, 10 cm, m. Schlagkopf, konisches Gewinde.

011012C

Verlängerung, 100 cm, konisches Gewinde

011013C

Verlängerung, 50 cm, konisches Gewinde

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