Modular Gold Cup Probe 300/1300C

USER GUIDE

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See degrees differently.

IMPORTANT INFORMATION - PLEASE READ

Health and Safety Information

Read all of the instructions in this booklet - including all the WARNINGS and CAUTIONS - *before* using this product. If there is any instruction which you do not understand, DO NOT USE THE PRODUCT.

Safety Signs

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or personal injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to the user or users, or result in damage to the product or to property.

NOTE

Indicates a potentially hazardous situation which, if not avoided, could result in damage or loss of data.

Signs and Symbols used on equipment and Documentation

Caution, risk of electric shock.

Caution, attention to possibility of risk of damage to the product, process or surroundings. Refer to instruction manual.

Caution, hot surface.

Protective Conductor Terminal.

Observe precautions for handling electrostatic discharge sensitive devices.

Equipment Operation

Use of this instrument in a manner not specified by LAND may be hazardous. Read **and understand** the user documentation supplied **before** installing and operating the equipment.

The safety of any system incorporating this equipment is the responsibility of the assembler.

Protective Clothing, Face and Eye Protection

It is possible that this equipment is to be installed on, or near to, machinery or equipment operating at high temperatures and high pressures. Suitable protective clothing, along with face and eye protection must be worn. Refer to the health and safety guidelines for the machinery/equipment before installing this product. If in doubt, contact LAND.

Wear Protective Gloves

Wear Protective Clothing

Wear Eye Protection

Wear Ear Protection

Wear Safety Boots

Wear Face Protection

Electrical Power Supply

Before working on the electrical connections, all of the electrical power lines to the equipment must be isolated. All the electrical cables and signal cables must be connected exactly as indicated in these operating instructions. If in doubt, contact LAND.

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For further details on all AMETEK Land offices, distributors and representatives, please visit our website.

Storage

The instrument should be stored in its packaging, in a dry sheltered area.

The maximum storage temperature is 10 °C (18 °F) higher than the maximum operating temperature.

The minimum storage temperature is 10 °C (18 °F) lower than the minimum operating temperature.

Refer to the Technical Specification for details of the operating temperature limits.

Unpacking

Check all packages for external signs of damage. Check the contents against the packing note.

Lifting Instructions

Where items are too heavy to be lifted manually, use suitably rated lifting equipment. Refer to the Technical Specification for weights. All lifting should be carried out in accordance with local and national regulations.

Return of Damaged Goods

IMPORTANT If any item has been damaged in transit, this should be reported to the carrier and to the supplier immediately. Damage caused in transit is the responsibility of the carrier not the supplier.

DO NOT RETURN a damaged instrument to the sender as the carrier will not then consider a claim. Save the packing with the damaged article for inspection by the carrier.

Return of Goods for Repair

If you need to return goods for repair please contact our Customer Service Department for details of the correct returns procedure.

Any item returned to LAND should be adequately packaged to prevent damage during transit.

You must include a written report of the problem together with your own name and contact information, address, telephone number, email address etc.

Design and Manufacturing Standards

The Quality Management System of Land Instruments International is approved to BS EN ISO 9001 for the design, manufacture and on-site servicing of combustion, environmental monitoring and non-contact temperature measuring instrumentation.

Registered ISO 9001 Management System approvals apply in the USA.

UK Calibration Laboratory: UKAS 0034.

USA Calibration Laboratory: ANAB Accredited ISO/IEC 17025.

National Accreditation Board for Testing and Calibration Laboratories approvals apply in India.

Operation of radio transmitters, telephones or other electrical/electronic devices in close proximity to the equipment while the enclosure doors of the instrument or its peripherals are open, may cause interference and possible failure where the radiated emissions exceed the EMC directive.

The protection provided by this product may be invalidated if alterations or additions are made to the structural, electrical, mechanical, pneumatic, software or firmware components of this system. Such changes may also invalidate the standard terms of warranty.

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1 INTRODUCTION

1.1 General Introduction

This publication gives you the information required to use a **Modular Gold Cup Probe** reference thermometer.

It is important to check all equipment with which you have been supplied, and read all the literature provided with the Modular Gold Cup Probe before using the thermometer for the first time. Additionally, keep all supplied literature readily available for reference when the equipment is in general use.

The equipment must only be used and maintained by suitably trained personnel, capable of following the procedures and guidelines given in this User Guide.

This guide covers both the Modular Gold Cup 300/1300C - Straight and the Modular Gold Cup 300/1300C - 90/180.

1.2 Nomenclature

The instrument detail label is on the right-hand side of the **Modular Gold Cup Probe** casing.

The **Instrument Type** specifies the thermometer variant and the **Serial Number** includes the manufacture date code.

Make a note of your **Instrument Type** and **Serial Number** in the spaces provided below.

Instrument Type:

Serial Number:

The two label displayed on the Modular Gold Cup Probe and the Hand Held Display Unit **must match**, as the two items are instrument specific and cannot be interchanged.

1.3 About Modular Gold Cup Probe

The Gold Cup Probe is a portable infrared reference thermometer, designed for making accurate temperature measurements on hot tubes in fired heaters, boilers and similar furnaces.

The target temperature is measured and displayed continuously on the display screen on the hand-held display unit.

1.4 Why use a Gold Cup Thermometer?

In tube measurement applications, the gold cup thermometer removes the errors arising from reflections of the hot walls of the furnace by creating a small black-body enclosure over the surface.

This black-body cavity is formed by multiple reflections between the gold hemisphere and the surface it is placed over. Gold is chosen for the reflector surface because it is a highly-efficient reflector of infra-red radiation and is not easily tarnished.

The hemispherical reflector has a diameter of 25 mm and operates at its highest efficiency if the hot surface is flat, but on most industrial surfaces a considerable curvature can be tolerated without introducing serious errors. Measurement can be taken on surfaces with diameters down to twice that of the hemisphere.

Only the infrared radiation from the surface passes through a small aperture in the hemisphere and is detected by a photodiode in the thermometer module. The thermometer module converts the infrared energy in to an electrical signal for transmission to the display unit.

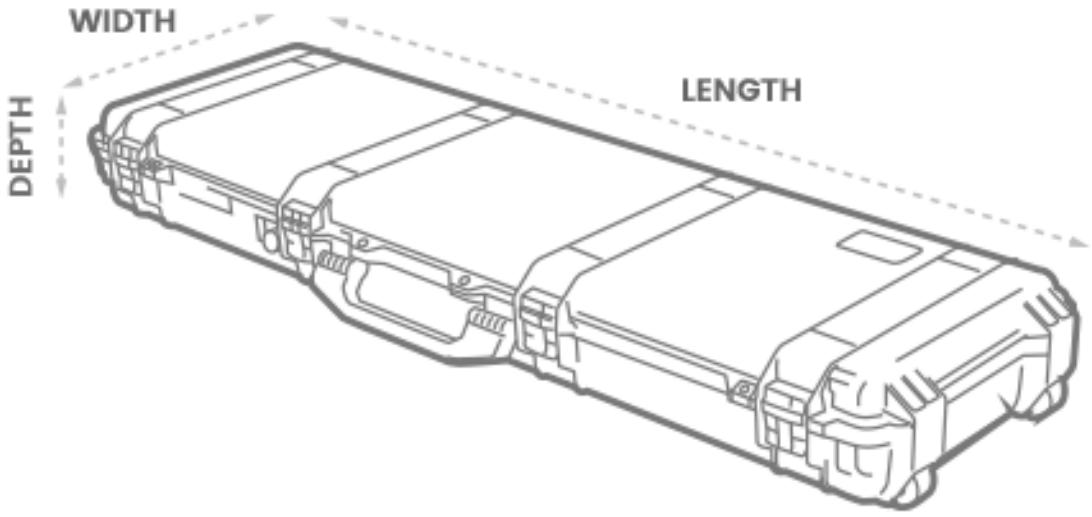
The display unit provides power to the thermometer head and converts the nonlinear signal from the thermometer in to an output signal. The output ranges from 300 to 1300 °C to reflect the temperature range of the thermometer. Due to the gold plated hemispherical reflector, the output is virtually independent of surface emissivity.

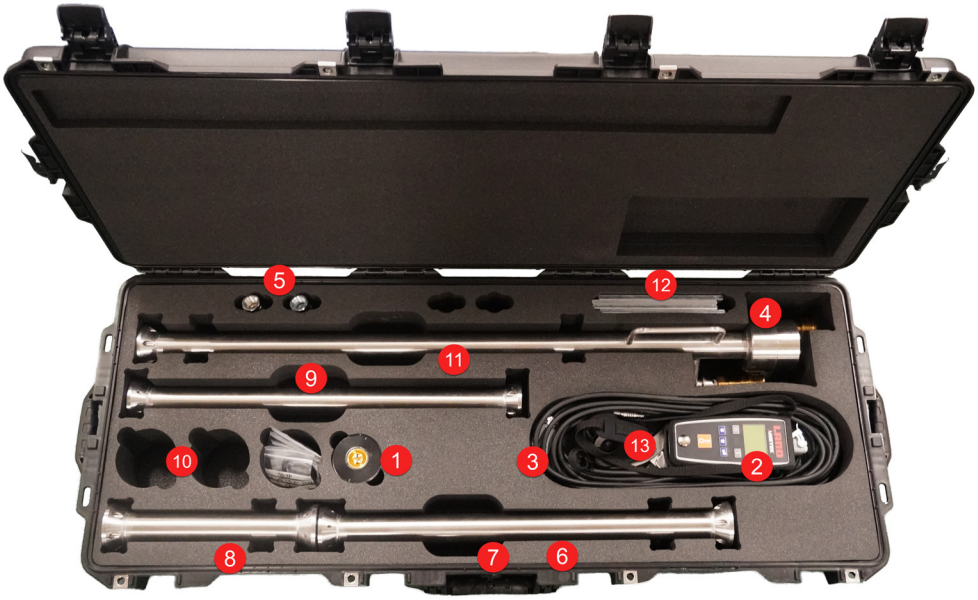
2

SYSTEM COMPONENTS

Modular Gold Cup Probe is supplied within a protective tough case

Length 1118 mm / 44”
Width 426 mm / 16.8”
Depth 202 mm / 7.9”
Weight 28.5 Kg/62 lbs (Modular gold cup 90/180) 31 Kg/ 68 lbs (Modular gold cup Straight)



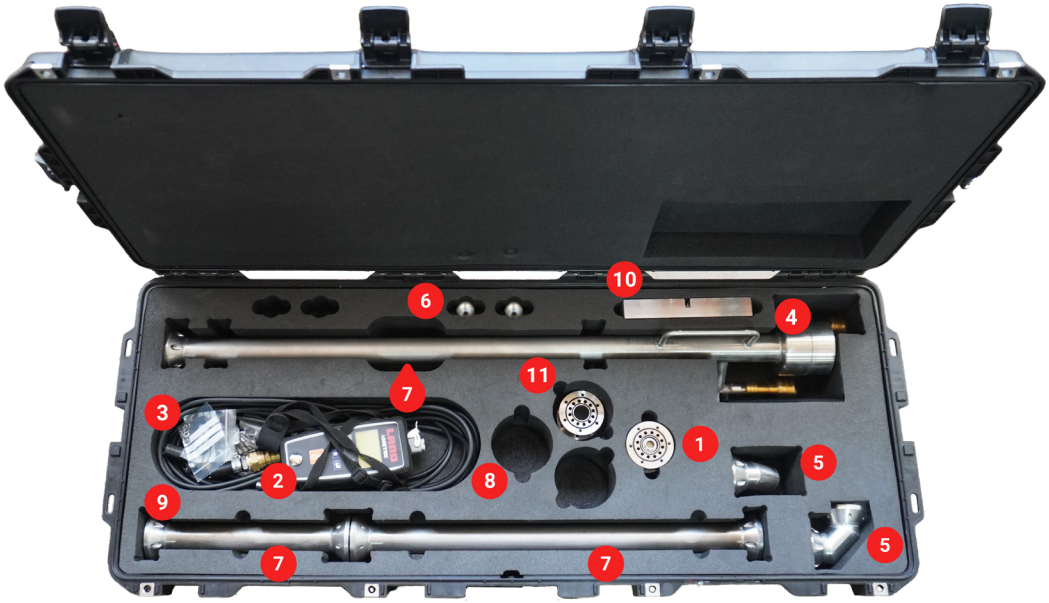


Modular Gold Cup -Straight

1. Head & Thermometer Module
2. Handheld Display unit (HDU)
3. Data cable (10 m / 33 ft total)
4. Cold End Section
5. Inlet fittings
6. Straight section (600 mm/2 ft)
7. Straight section (600 mm/2ft) (Underneath)
8. Straight section (300 mm/1ft)
9. Straight section (600 mm/2 ft)
10. Cutouts for shrouds (purchased separately)
11. Straight section (600 mm/2ft) (Underneath)
12. Assembly Stands
13. Hot end removal pliers (under HDU and Data cable cutout)

Modular Gold Cup - Straight

Cold End Section, Straight Sections (4x 600 mm/2 ft, 1x 300 mm/1 ft nom)



Modular Gold Cup - 90/180

1. Head & Thermometer Module
2. Handheld Display unit (HDU)
3. Data cable (10 m / 33 ft total)
4. Cold End Section
5. 90° Sections
6. Inlet fittings
7. Straight sections (2x 600 mm/2 ft, 1x 300 mm/1 ft)
8. Cutouts for shrouds (purchased separately)
9. Hot end removal pliers (under HDU and Data cable cutout)
10. Assembly Stands
11. 47mm straight extender section

Modular Gold Cup - 90/180

Cold End Section, Angled & Straight Sections (2x 600 mm/2 ft, 1x 300 mm/1 ft nom)

Head & Thermometer Module

1. Gold Cup
2. Flange
3. Head
4. Thermometer module

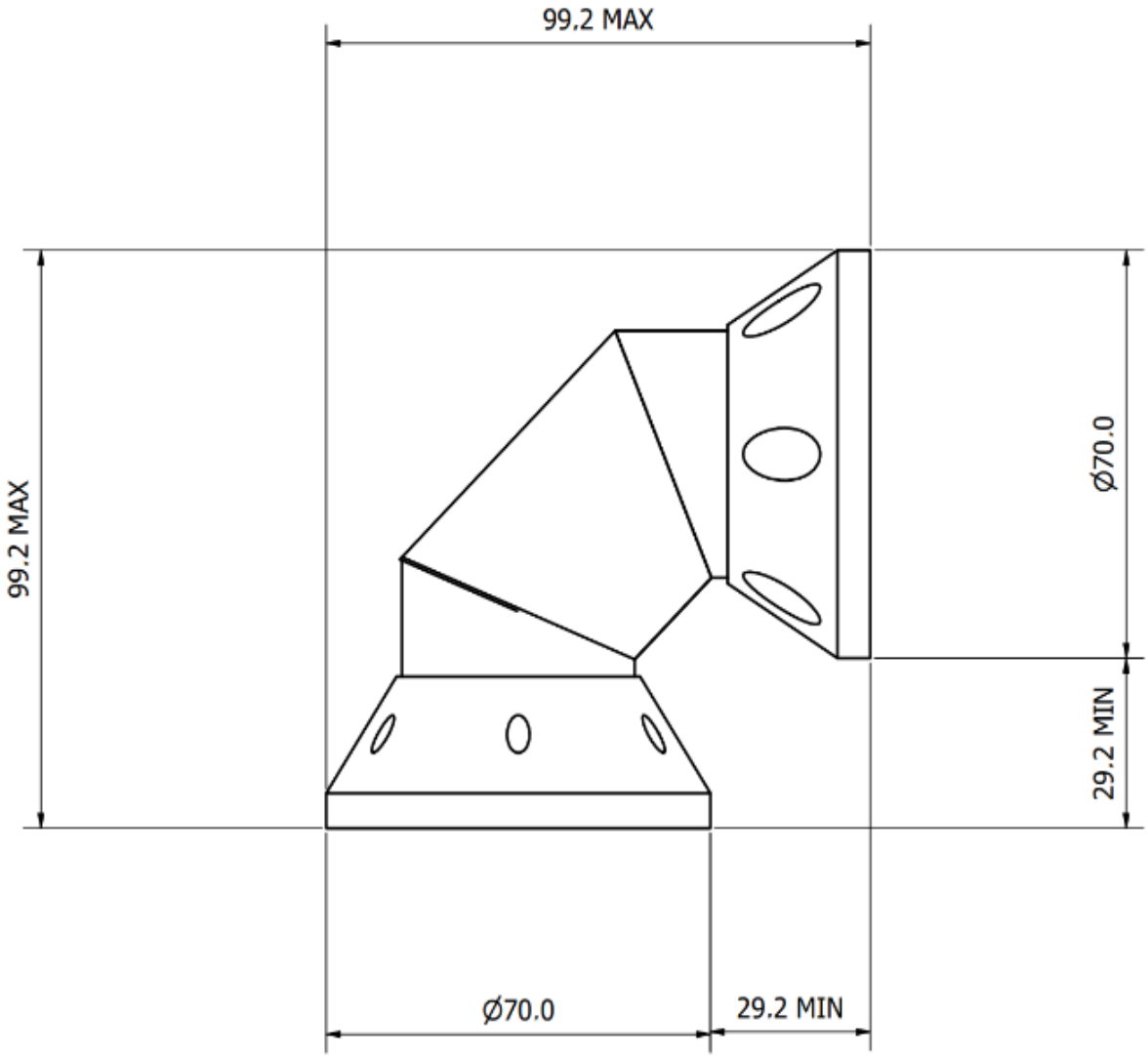
Handheld Display Unit and data cable

Inlet Fittings

½" BSP shutoff brass plugs with additional ½" BSP to ½" NPT M-F adaptor.

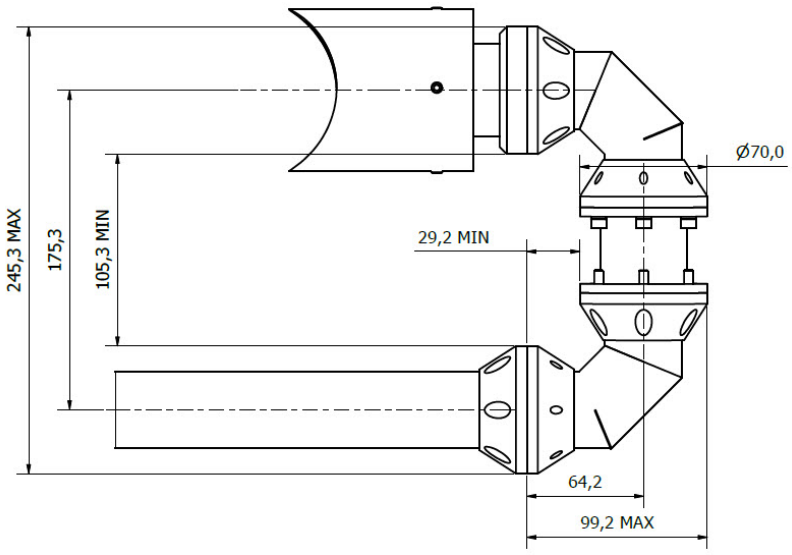
90° section

Only applicable to Modular Gold Cup - 90/180



180° section

Only applicable to Modular Gold Cup - 90/180



3

SPECIFICATION

Spectral Response:	1.6 µm
Output:	LCD Display 300 to 1300 °C (572-2372'F)
Response time Accuracy:	0.5 s
Resolution:	0.1°C/1 °F
Repeatability:	<1°C / 2 °F
Absolute accuracy :	<0.25% °C + 2 °C
Ambient temp limits (HDU):	0 to 50 °C/32 to 122 °F
Thermo module temp limits:	0 to 55 °C/32 to 131 °F
As displayed on HDU (note: this is only updated on HDU when trigger button is pressed)	
Power Requirement:	1 x 9 V PP3 battery
Maximum cooling air pressure:	8 bar (g)
Cooling connections:	1/2" BSP/NPT Inlet connections
Air flow rate (Continuous):	1000 l/min at STP
Additional airflow for rapid cooling when the probe is outside the process:	500 l/min at STP
Sealing:	IP54
Included Accessories:	Rubberised Handheld Display Unit Case
Options	
Cooling control panel inc hoses:	Contact LAND for Details
UKAS Calibration:	Contact LAND for Details
Max Straight operating length Modular Gold Cup - 90/180:	1.8 m
Max Straight operating length Modular Gold Cup - Straight:	3.0 m

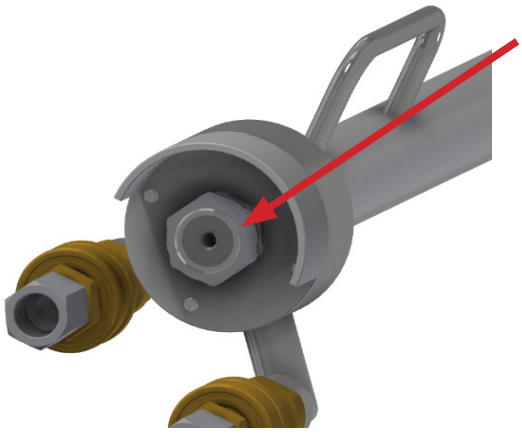
CAUTION

The display unit is not interchangeable between gold cup probes.

4 CONNECTING THE SYSTEM

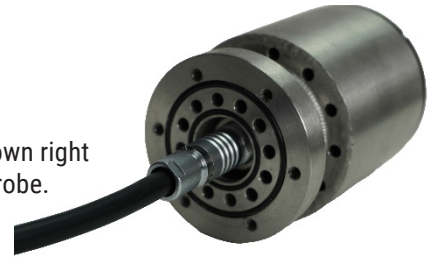
The Gold Cup Probe requires the following connections:

- Cooling Air input to probe x2
- Data Cable connection to Display Unit
- Desired length and angled sections

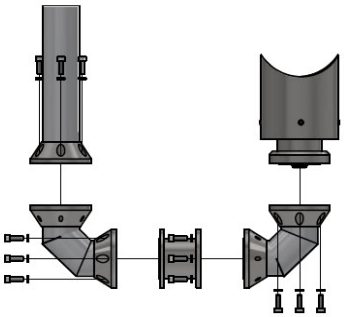


1. Remove the split gland from the rear of the cold end section and pass the data cable (circular connector) through the gland and the body of the probe. Ensure the cable is passed through the gland nut & washer.

2. Taking care not to damage the O-rings install each section of the probe together using the M5x16 screws and spring washers provided. Tighten with 4 mm Allen key. Push the cable through each section once installed.

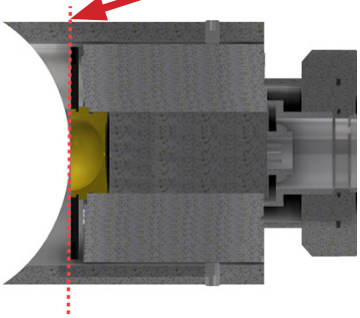


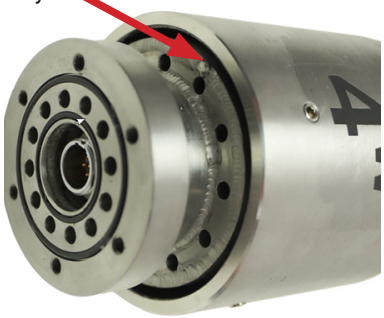
3. Engage the connector within the thermometer module as shown right (note the red dot keyway). Tighten the head module onto the probe.



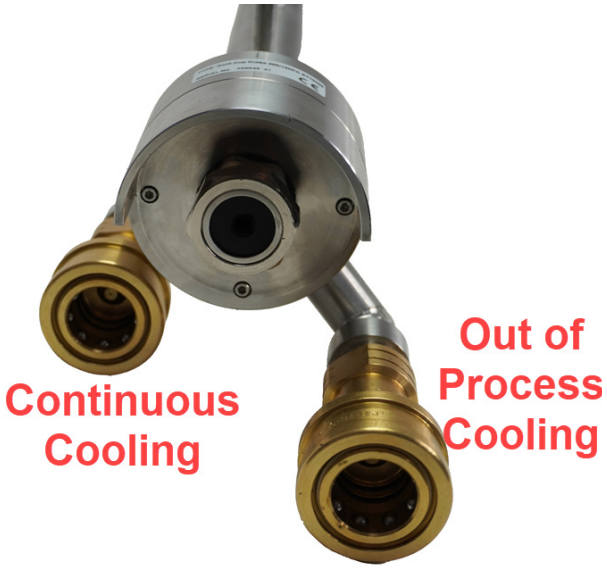
4. Once all sections required are connected, feed the split gland over the cable and lock into place (finger tight and 1 complete turn).

5. If required attach the location shroud (Location shrouds sold separately) ensuring both that that the curved section is tangential to the flange and a uniform gap around the head. Lock in place with M6x8 grub screws using 5 mm Alen key.





6. Connect the cooling air via the two supplied fittings.
7. Connect the free end of the Data Cable to the socket on the HDU



CAUTION

Always ensure that the cooling air supply is turned on and circulating through the system when using the Gold Cup Probe.

The right-hand connection labeled "Out of process cooling" is used to provide rapid cooling when the probe has been removed from the process, so that it can be handled safely. Do not use this connection when the probe is in the process as it will cool the target and give incorrect readings.

5 USING THE PROBE SAFELY

When assembling the probe, consider the distance to the target and ensure there is sufficient probe length outside of the furnace to give good control of the probe.

When taking a measurement, you only need to touch the target. Do not use excessive force

When removing the probe from the furnace

- Two people are required to support the probe
- Withdraw most of the probe from the furnace
- One person supports the rear of the probe using the handle.
- The second person uses the hot end removal pliers to support the measurement end.
- Withdraw the probe from the process and place on the walkway, ensuring it does not contact any flammable materials.
- Connect the out-of-process cooling air and open the valve

Once the last measurement has been taken, ensure to leave the probe to cool completely with both air lines connected before disconnecting the air and disassembling the probe.

CAUTION

The probe can be very hot once a measurement has been taken, handle with extreme care

6

EXAMPLE USAGE

1. Assemble the probe, ensure the air is connected correctly and the flow/pressure are sufficient

2. Using a single spot pyrometer such as the Cyclops 390L using instantaneous reading and an emissivity of 1.00 conduct a peep door cooling test to confirm the cooling effect of having the peep door open over time, typically taking readings of the same spot every 15 to 30 seconds.

3. Close the peep door and let the furnace temperature stabilise before taking any gold cup measurements

4. Open the peep door

5. Insert the probe, resting it on the bottom of the peep door

6. Move the probe towards the tube you wish to measure, ensuring you keep the probe level. Keep the trigger depressed throughout. Ensure to keep the tip temperature within the specified limits of operation details of temperatures can be seen in section 3.

If tip temperature reaches limit, remove probe immediately and leave to cool.

7. Make good contact with the tube and release the trigger to 'freeze' the reading

8. Remove the probe from the furnace until only the head is resting on the peep door

9. Using the hot end removal pliers, grip the probes hot end and carefully lower onto the walkway

10. Close the peep door

11. Apply the out-of-process cooling air

12.Wait for the probe to cool and the furnace to equalise before taking another measurement.

7 HAND HELD DISPLAY UNIT

7.1.Initial Setup

The LCD display panel has two basic modes of operation:

• Measure Mode

• Menu Mode

When the thermometer is switched on, an introduction screen is displayed. This screen times-out automatically and is replaced by the Measure Mode display.

To access the Menu Mode, press the (Enter/select) key on the keypad.

> Note
>
> In the event of a fault causing loss of on-board memory, an error message will be displayed near the bottom of the screen. For a list of error codes and their meanings, see Appendix 2

7.2 When the unit is in Measure Mode, the display indicates Continuous temperature value.

Fig. 7-1 Typical Measure Mode display

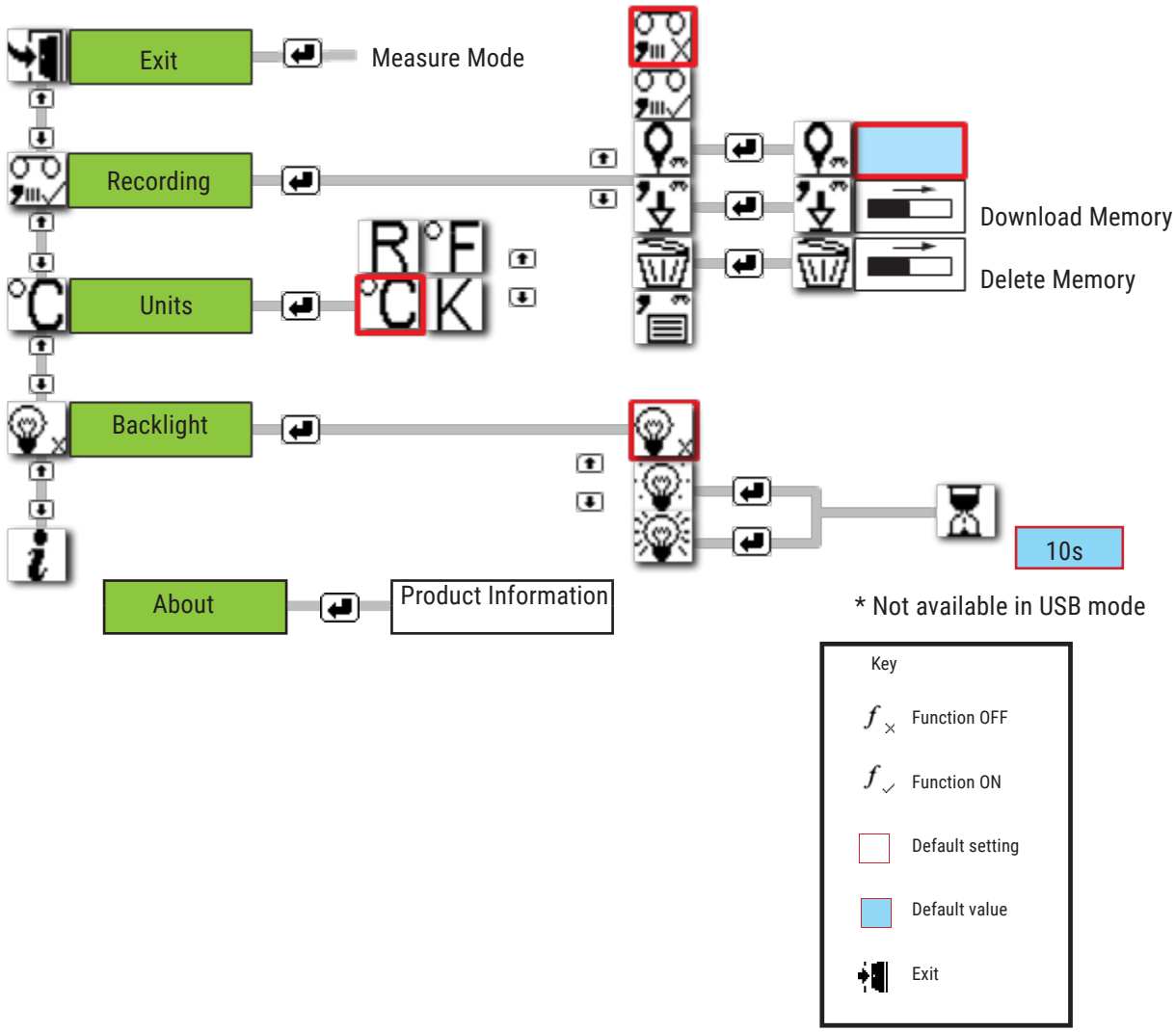


Fig Maintenance. 7-2 Gold Cup Probe menu structure

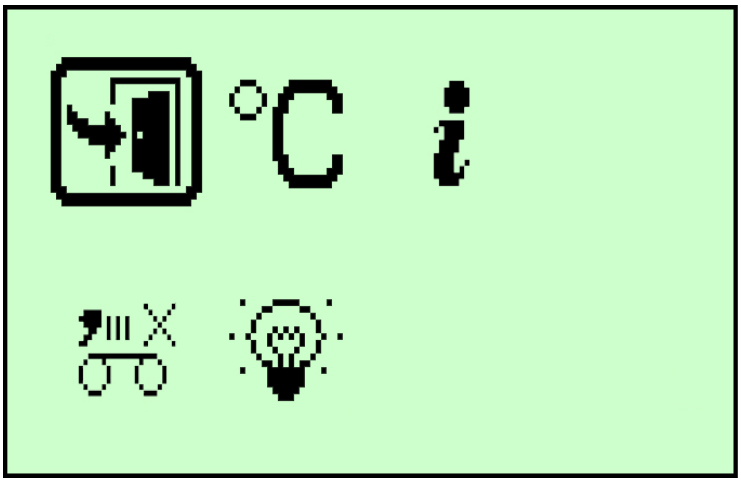


Fig. 7-3 Gold Cup Probe (ZT10085) main menu icons Menu Mode

7.3 Menu Mode

When the thermometer is in Menu Mode, the menu options available in the Gold Cup Probe thermometer can be accessed. This allows you to view and configure the setup of the thermometer and select the options that best suit your temperature measurement requirements.

1)To access Menu Mode press the key.

The main menu options are displayed as icons (See Fig. 3-3).

2)Use the and keys to scroll through the menu options. The currently selectable menu item is highlighted by a 'flashing' frame.

3)To select a menu option, press the key.

When a main menu option is selected, the available sub-options are displayed.

4)Use the and keys to highlight the required sub-option in the menu. Press the key to select it.

5)For sub-options where a numeric value is required, use the scroll keys to select the required numeric value, then click on the key to set this value.

When changing numeric values, a key accelerator is used. The longer an arrow key is held down, the bigger the size of step change becomes. On the display panel, the digit being incremented is highlighted to indicate the size of step being made.

6)When you have set a required parameter value, press the key to return to the main menu options.

7.4 Menu Mode - Icon Descriptions

The information in this chapter should be used in conjunction with the navigational flow chart (Fig. 3-2, Page 4).

Exit

When in Menu Mode, clicking on the exit icon will return you from any sub-menu.

Record Mode

Readings taken can be stored within the Gold Cup Probe for later download.The recording facility can be switched on or off by selecting the icons (i) On or (ii) Off.

Readings are stored against current time or date set on the clock.

The readings are also stored against a 4-character alpha-numeric location ID, which can be set by selecting the ID icon (iii).

The stored readings can be downloaded by selecting the Download icon (iv)*. The data is streamed to both the Bluetooth and USB outputs. The protocol of the streamed data is given in Appendix 1.

The stored readings can be deleted by selecting the Delete icon (v)*. To prevent accidental deletion, this icon requires a double entry.

The stored readings can be reviewed by selecting the Review icon (vi).

*Download and delete can also be selected from the external software

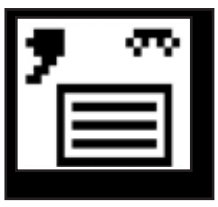
(i)

(ii)

(iii)

(iv)

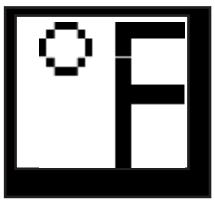
(v)

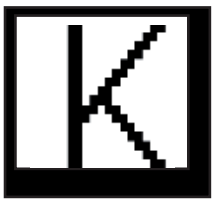
(vi) 

Units

Select °C, °F, K (Kelvin) or °R (Rankine).

(i)

(ii) 

(iii) 

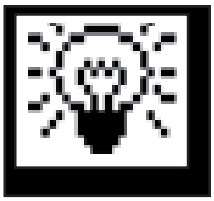
(vi)

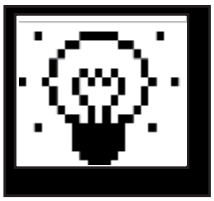
Backlight

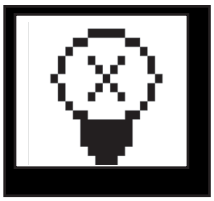
This setting controls the brightness of the side display backlight. There are three backlight options available: High (i), Low (ii) and Off (iii). When High or Low are selected, a sub-menu appears in which you can specify a time limit (in seconds) after which the backlight turns off if the thermometer is inactive. The default setting is Off.

Note: Use of the backlight will reduce the life of the battery. It is recommended that the backlight is switched off when not required.

Note: Backlight is not available when powered from USB.

(i) 

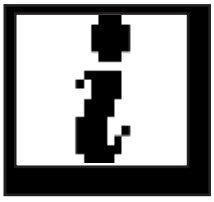
(ii) 

(iii) 

About

This function accesses general information about the product. The details displayed include: calibration information, thermometer serial number, software version, Tmax and Tmin ambient temperature readings since last calibration and a link to the website, www.landinst.com.

Use the arrow keys to scroll up and down the screen to see the full list of information available.



8 TEMPERATURE MEASUREMENT & RECORDING

8.1. Temperature Measurement

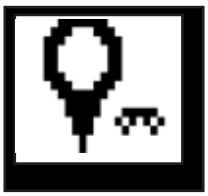
The temperature measured by the probe is displayed on the screen of the hand- held display unit. The probe tip temperature is also displayed.

8.2. Recording

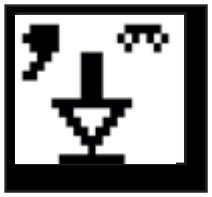
To enable recording for any 'measurement mode' trigger operation, enter the menu and select the recording icon. In the recording sub-menu, the recording can be enabled.

Recording Mode

When enabled, the temperature values are stored for later downloading, along with the time, date, emissivity, window transmission and a user-specifiable location ID.



With the recording mode is active, the user-settable Location ID and the percentage of memory used are displayed on the side LCD screen. To change the location ID, select the icon the in the recording menu.



To download the stored readings via the USB, click on the download icon. The readings that have previously been recorded will be sent from the Gold Cup Probe via USB, along with the extra data associated with each reading.

In order to receive the data sent, the user will need to run software that can accept the ASCII stream from the PC communications port associated with the Bluetooth/USB connector. Alternatively, the external Cyclops Logger software can provide this functionality

To review the stored readings, select the Review icon.

To clear the internal memory, select the Erase icon.

When the memory is 100% full (displayed on the side LCD screen), recording mode will be disabled automatically and the memory will need to be erased before any further measurements can be recorded. Any operation that is currently in progress, e.g. running latched mode, will continue but no readings will be stored.

9 THERMOMETER OPERATION

This section gives some sample scenarios in which the Gold Cup Probe may be used.

Prior to temperature measurement, the thermometer must be set up as required by the chosen scenario.

The setup procedure can be split into three different setup groups:

- Data Output Setup
- Measurement Setup
- Recording Setup
- User Interface Setup

The following list details the setup groups and the available selections.

Setup Group	Function	Selection Options
Data Output Setup	Trigger Mode	Classic
Measurement Setup	Units High Resolution	°C / °F / K / °R 0.1°C
Recording Setup	Enable Clock Location ID	On / Off Time & Date 4-digit alphanumeric
User Interface Setup	Backlight	High (enter timer value Low (enter timer value) Off

10 COMMUNICATION

Communication with the Gold Cup Probe, from the external software by unscrewing the protection cap and inserting an appropriate USB cable.

10.1. USB

USB communications are detected automatically by the host computer when the cable is connected.

11 MAINTENANCE

11.1. Hemispherical Reflector

Check the condition of the reflector before and after each use. If the reflector requires cleaning it is preferable to do so without removing it from the probe. Clean the reflector with a soft cloth and a little alcohol if necessary. Take care not to scratch the surface. If the reflector becomes dull a replacement must be fitted to ensure high emissivity conditions.

Take care not to allow dirt to enter the radiation aperture as it may obstruct the glass rod that couples the fibre-optic to the reflector. This should be cleaned.

11.2. Battery charging replacement

The Gold Cup Probe thermometer is powered by a 9V dry cell PP3 battery, or via the USB cable if it is connected to a PC (where available). The active power source is indicated on the LCD display. When USB power is connected, no power is drawn from the PP3 battery.

Switch the thermometer off before changing the battery or inserting the USB lead. There is also a small internal cell (Lithium Metal) which maintains the clock whilst the battery is being changed. A Duracell PP3 6LR61/ MN1604 (or equivalent) battery is supplied with the thermometer.

1) Before inserting or changing the battery, switch the thermometer OFF.

2) The battery cover is on the bottom surface of the hand-held display unit

3) Remove the hand-held display unit from its rubber cover to reveal four blanking plugs.

4) Remove the two blanking plugs on the centre line of the unit to reveal two M4 x 10 Allen Cap screws.

5) Remove the two M4 x 10 Allen Cap screws and lift the lid to reveal the battery compartment. The PP3 battery must be fitted

into the terminals nearest the 'top' (i.e. cable connector end) of the unit. There is space for another PP3 battery in the battery compartment: this can be used to keep a spare battery.

6) Ensure that the battery terminals correspond with the label in the battery compartment.

7) Insert the battery, ensuring that the contact springs engage centrally into the battery terminals. Replace the battery cover and insert and tighten the two M4 x 10 Allen Cap screws.

8) Replace the two blanking plugs over the Allen Cap crew heads and replace the rubber cover over the Hand-held display unit.

9) With the battery fitted, switch the instrument on and check for correct operation. When switched on, a battery power indicator appears in the LCD display.

When the battery needs replacing, the battery indicator on the LCD display panel will flash. To prolong battery life, switch off the display backlight. Change the battery as soon as possible in order to ensure that the readings from the instrument remain within specification. To preserve battery lifetime, the thermometer has the following power saving features:

- If the thermometer is in Menu Mode for over 1 minute without any key being pressed, the display returns to Measure Mode.

- If the thermometer is in Measure Mode for over 2 hours without any key being pressed, the instrument switches off.

11.3. Removal of the Thermometer module

The Gold Cup Probe included the facility to remove the thermometer module for transport or return to LAND. The thermometer module should only be removed when necessary and should not be disconnected and reconnected repeatedly.

> Note
>
> Keep a fully charged spare battery with the thermometer at all times.

1. Remove the flange by screwing anticlockwise.

2. Unscrew the 2x M3x16 pozidriv screws and slide out the thermometer module.

3. If the unit is to be returned to LAND, it must be returned with the associated cable and HDU.

11.4. Periodic calibration

The calibration of the probe can be checked by momentarily inserting the probe in to a suitable black body furnace and comparing the output with the furnace temperature.

11.5. Spare Parts

Part Number	Description
815950	Gold Cup with thread for flange
815959	Gold Cup flange
816975	Modular GCP Assembly stand *Two pieces required to make one stand*
813646	½ BSP shut off plug brass B4KP26-BS
817117	Modular Gold Cup Spares Kit *Contains: 1x Cable Seal Washer* *1x Cable Seal* *75x M5 Fixing screws* *75x M5 Fixing washers* *10x Inner O rings* *10x Outer O ring*

11.6. Accessories

Location shrouds are available to help make locating the gold cup on a tube of a known size easier other sizes are available on request other sizes are available on request.

Part Number	Description
815897	4" Location shroud *Suitable for a process tube of 4" (101.6mm)*
815898	6" Location shroud *Suitable for a process tube of 6" (152.4mm)*
815899	8" Location shroud *Suitable for a process tube of 8" (203.2mm)*

PRODUCT WARRANTY

This AMETEK Land manufacturer's 'back-to-base' warranty covers AMETEK Land products ("Product") to be free from defects in material and workmanship. The warranty period commences on the date the Product is delivered from AMETEK Land. AMETEK Land shall at its option repair or replace the defective part of the Product.

36 Months Warranty

- 4500 MkIII (Transmissometer and AFU-APS-I/O only)
- Application-dedicated processors based on LANDMARK® Graphic
- DTT
- FLT5/B
- FTS
- LWIR Thermal Imager
- NIR-B / MWIR-Borescope thermal Imagers
- SPOT+ thermometers, accessories and mountings and special instruments based on SPOT+
- System 4 thermometers, processors, accessories and mountings and special instruments based on System 4
- UNO thermometers, accessories and mountings and special instruments based on UNO
- VDT/S and VDT/U

24 Months Warranty

- LSP-HD Linescanners
- MWIR, NIR Thermal Imagers
- SDS-640

12 Months Warranty

All other AMETEK Land Product including NIR-B Camera Retraction and Mounting Systems, Water Cooled Housings & Accessories, SPOT+ Actuator, and Air Purge Equipment.

EXCLUSIONS FROM WARRANTY

AMETEK Land reserve the right to charge for service/calibration undertaken during the warranty period if the cause is deemed to fall outside the terms of the warranty.

The foregoing warranty shall not apply to defects resulting from:

- Improper or inadequate maintenance by customer
- Customer-supplied hardware, software or interfacing
- Improper installation
- Misuse of the Product
- Unauthorised alteration
- Inappropriate routing, support, physical shock & strain protection, etc. of the fibre-optic lightguide (where fitted)
- Operation outside of the temperature specifications of the Product
- Environmental conditions exceeding the IP / NEMA rating of the Product
- Inappropriate recalibration which results in Product calibration being taken outside specification
- Improper resealing of thermometer following parameter adjustment (UNO, FLT5/A, etc.)
- Damage caused by an unauthorised repair

RETURNS PROCEDURE

All items returned to AMETEK Land under warranty must have a Return Merchandise Authorisation (RMA). Please contact AMETEK Land Customer Service for the necessary authorisation.

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