TC65/TC15 Temperature Calibrator

User manual

IKM
Instrutek AS

Temperature Calibrator TC65/TC15

The TC65/TC15 is designed and manufactured by:

IKM Instrutek AS
Elveveien 28, N-3262 Larvik, Norway
Tel.: + 47 33 16 57 00
Fax.: + 47 33 16 57 10
Web.: www.IKM.com
E-mail: Instrumentsalg@IKM.no

Warranty
IKM Instrutek AS standard warranty conditions.

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All efforts have been made to ensure the accuracy of this handbook. IKM Instrutek is always striving to improve our products and handbooks. We would greatly appreciate being informed of any errors found in our product or in its manual. The above notwithstanding, IKM Instrutek cannot take responsibility for any errors in this handbook or their consequences.

Contents

Thank you for purchasing an IKM Instrutek temperature calibrator. The products are manufactured by IKM Instrutek AS in accordance with our high quality standards in design, choice of components and workmanship in order to achieve maximum customer satisfaction.

IKM Instrutek AS

EC Declaration of Conformity according EN ISO 17050-1:2010 is supplied with the product.

Nemko

EMC test and approval are performed by Nemko according to EN61326-1 (2013).

TYPE APPROVED PRODUCT DNV·GL DNVGL.COM/AF

Type approval is performed by DNV-GL. It is found to comply with DNV GL rules for classification – Ships, offshore units, and high speed and light craft. DNVGL-CG-0339:2019 (parts of).

Symbols used in the user manual

CAUTION! Electric current!
This symbol indicates danger which could arise from handling of electric current.

WARNING! / CAUTION! Risk of injury!
This symbol indicates dangers that could cause personal injuries or considerable damage to property.

CAUTION! High temperature!
This symbol indicates dangers resulting from high temperature that could cause personal Injuries or considerable damage to property.

CAUTION! Material damage!
This symbol indicates actions which could lead to possible damage to material or environmental damage.

NO DOMESTIC WASTE!
The device must not be disposed together with domestic waste.

Delivery, unpacking and scope of supply
All units have been temperature cycled, calibrated and carefully checked for their operational reliability before shipment. Upon receipt, please check packaging for damages or any signs of improper handling. Report any possible damages to the forwarder and your product supplier immediately. Damage reported at a later date will not be recognized.

Unpacking:
Carefully unpack the unit to prevent any damage. Check the contents of the delivery based on the delivery note.

IMPORTANT!
Use the labels on the front and back to check if the delivered unit corresponds to your order.

In particular, for devices with electrical components, verify that the correct power supply voltage is supplied.

Scope of standard supply:
- Temperature calibrator TC65/TC15
- Calibration Certificate
- User manual
- Mains cable
- TC65: Insert`s 6,5mm and undrilled
- TC15: Insert`s 6,5mm and 3,5mm
- Tool for insert

1 Product description

TC65/TC15 are portable dry block calibrators covering a wide temperature range. The units are compact and robust designed for marine, industrial and laboratory use, approved according to DNVGL-CG-0339:2019 (parts of). All kinds of temperature sensors, thermometers and temperature switches/thermostats can be tested and calibrated.

Model	Range	Stability
TC15	-40°C * to 150°C	± 0,05°C
TC65	30°C to 650°C	± 0,1°C

*Relative to ambient
For detailed technical information see page 16.

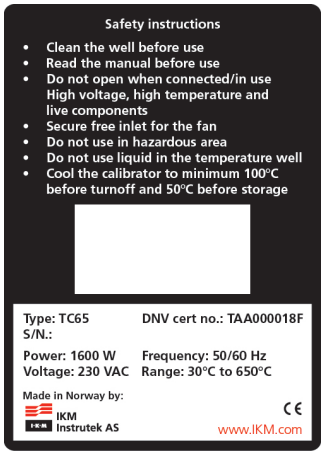
Product identification:
Please refer to the label in front for mains supply and fuse. Do not apply improper voltage!

TC65 – 230VAC

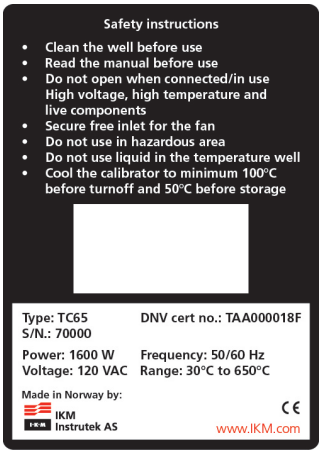
TC65 – 120VAC

TC15 120-240VAC

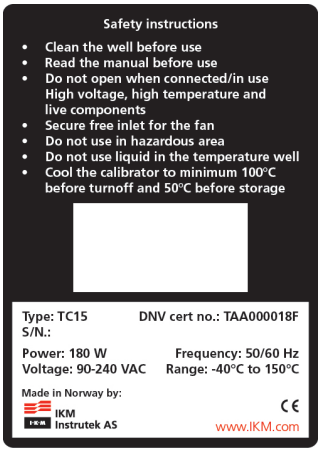
Please refer to label at the back for type, range, serial number, DNV-GL type approval, calibration information and safety instructions.



TC65 – 230VAC



TC65 – 120VAC



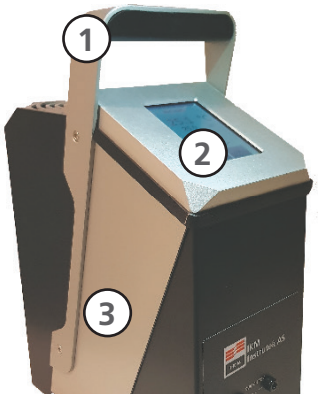
TC15 120-240VAC

Product description

1 Carrying handle

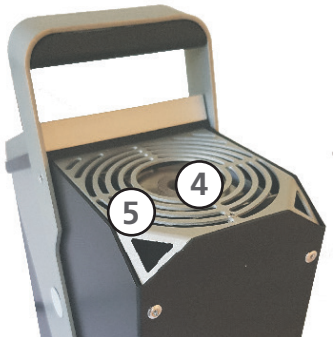
2 Color touch display

3 USB service interface



4 Temperature well

5 Ventilation for airflow



6 Switch test input

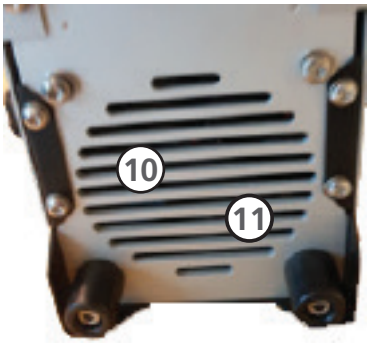
7 AC power

8 Fuse

9 On/Off switch

10 Fan

11 Ventilation for airflow



Inserts

TC65/TC15 are calibrated using a 6,5mm insert. For TC65 new inserts should be temperature cycled to 650°C 3 times (burn in) before use.

Standard inserts TC65
- Ø 6,5 mm (1/4")
- Undrilled

Optional inserts TC65
- Ø 5mm (3/16")
- Ø 7,5mm
- Ø 8mm (5/16")
- Ø 8,5mm
- Ø 9,5mm
- Ø 10mm
- Ø 10,5mm (3/8")
- Ø 12,5mm
- Ø 13mm (1/2")
- Ø 14,5mm
- Ø 15,5mm
- Ø 16mm
- Ø 16,5mm
- Ø 6,5mm + Ø 3,5mm (1/4" + 1/8")
- Ø 6,5mm + Ø 4,5mm
- Ø 6,5mm + Ø 6,5mm (1/4" + 1/4")
- Ø 3mm + Ø 10mm
- Ø 4,5mm + Ø 13,5mm
- Ø 5mm + Ø 13,5mm
- Ø 5,5mm + Ø 13mm
- Ø 6,5mm + Ø 14,5mm
- Ø 7mm + Ø 10mm
- Ø 7mm + Ø 12mm
- Ø 8mm + Ø 12mm
- 3 x Ø 6,5mm (3 x 1/4")
- 6 x Ø 6,5mm (6 x 1/4")

Standard inserts TC15
- Ø 6,5 mm (1/4")
- Ø 3,5 mm (1/8")

Optional inserts TC15
- Undrilled
- Ø 4,5mm
- Ø 5mm (3/16")
- Ø 8mm (5/16")
- Ø 9,5mm
- Ø 10mm
- Ø 10,5mm (3/8")
- Ø 11mm
- Ø 12mm
- Ø 15,5mm
- Ø 6,5mm + Ø 3,5mm (1/4" + 1/8")
- Ø 4,5mm + Ø 4,5mm
- Ø 6,5mm + Ø 6,5mm (1/4" + 1/4")
- Ø 4,5mm + Ø 3,5mm

Please contact your supplier for details if other dimensions are required.

2 Getting started

Please read the user manual carefully for your own, and the environments safety. Please pay special attention to chapter 3 safety.

1 Make sure the supply voltage is in accordance with the description on the label.

2 Make sure the calibrator well and the probe being calibrated is clean.
3 Place the probe in an appropriate hole in the insert*.
4 Turn on the calibrator.
5 The calibrator display will show the actual well temperature, and the set point. Default value is 25°C. Temperature unit is set to °C. See chapter 6 for switching the display to °F.

6 Press the up and down buttons multiple times in order to set the desired calibration temperature (set point). Press and hold one of the buttons to count up or down. If the buttons are held continuously, the counting speed will increase. The set point is active immediately after button is released.

7 Let the temperature reach and stabilize at the set point. Check both the calibrator and calibration object to determine if the temperature is stable.

8 When both the calibrator and calibration object is stable, note both readings.
9 Proceed to the next calibration point with the up/down buttons and repeat point 5 to 8.
10 When all desired calibration points are completed, set the set point to 25°C and let the well temperature decrease to a temperature below 50°C before storing the calibrator.
11 File the calibration data.

*If your probe has another diameter than those supplied, use an insert adapter, drilled to the correct diameter.

Please refer to chapter 6 "How to use the calibrator" for more information..

3 Safety

Incorrect use of dry well calibrators like the TC65/TC15 can be hazardous. Severe burns or fire may easily be the result of incorrect use. Make sure that the assigned operator has the required skills to operate the calibrator. Local fire and safety instructions may apply to the use of instruments like the TC65/TC15.

The well can reach up to 650°C for TC65 and 150°C for TC15. This temperature will certainly cause burns and fire if something gets into the well. Ensure that the workspace around and above the TC65/ TC15 is free from loose materials that can catch fire. There should be at least 1m of clearance to a non-flammable material above the well. Do not use liquid in the inserts.

NEVER REMOVE HOT PROBES OR INSERTS FROM THE WELL. Allow time to cool down the probe and insert before removing and storing.

Never remove the cover of the calibrator unless you are a qualified service technician. High voltages and temperatures will be exposed.

Always ensure that the air inlet in the bottom of the TC65/TC15 is free and not clogged by dust. Ensure that the fan is running. If not, do not use the TC65/TC15 as it will over-heat and create a potential danger. Return the TC65/TC15 for repair. Ensure that the TC65/TC15 and especially the well, is clean and free for dust before use.

Do not use oil in the well to get better thermal contact. If your unit has been filled with oil, thoroughly clean the well for all traces of oil. Fumes from heated oil can be dangerous. Health damages, fire and explosion could be the result. Oil remains can also create a carbon buildup in the well (at high temperatures) that is nearly impossible to remove. This will also affect the measurement.

WARNING!
If a wet object is inserted into a heated well, the TC65/TC15 may explode! The well can act as a launching tube for the probe and insert if undesired liquids or materials gets into the well.

Never leave a powered calibrator. Always work with the calibrator on a sturdy workspace. In addition to the listed safety concerns, always add a good portion of common sense to catch up unpredictable safety risks.

4 Why calibrate?

The definition of the term "calibration" is:

To determine the difference between the object being calibrated with a known reference and knowing the uncertainty in the process.

Adjusting the calibrated object in order to remove the error is of secondary importance as long as the error is either within acceptable limits or the error is used to calculate the real value.

Calibration is an important part of any quality insurance routines. When a calibration routine is created, all aspects are taken into consideration by qualified personal so when an operator is making calibrations later, the process is done the same way every time and ensuring that the results are comparable and reliable.

By documenting the process and results, you are making the whole process traceable. This way a lot of human errors can be eliminated.

Good quality is to achieve the accuracy you need and not far beyond. If your demand is to keep the temperature in you process within e.g. 300 to 310°C, define your accuracy to 305 +/-5°C. The example applies for TC65.

Your calibration process should now ensure that your temperature instrument is within these limits and not necessarily the peak performance of the specifications of the instrument. A good rule of thumb is to double the accuracy demand for your calibration compared to the process accuracy demand. This leaves the accuracy demand for your calibration in the range of +/-2,5°C.

The whole chain of elements involved in the calibration process creates errors in the final reading. In this matter's errors are expressed as uncertainty.

Take the following elements into account when considering the total uncertainty:

- Temperature drift in the calibrator
- Temperature drift in the calibrated instrument
- Temperature gradients in the calibrator well
- Differences in gradients caused by variance in probe mass (calibration object)
- Inaccuracy in the calibrator
- Inaccuracy in the calibration object
- Variance in thermal contact between the probe being calibrated and the calibrator well
- Reading error (if analog scale on the calibrating object)

Remember all these elements are NOT added to calculate final uncertainty. In real life there is not likely that all uncertainty elements will be at the maximum and in the same direction simultaneously! Therefore, another way of calculation is used.

5 How often do I calibrate?

Depending on the importance of the accuracy in the process and the use of the measuring equipment, the calibration intervals will vary. The calibration should take place in intervals no longer than what you can handle if the process becomes out of specified limits.

If a calibration suddenly reveals a large deviation compared to the previous calibration, you can trace back and identify the time span where errors may have occurred and take actions thereafter. The shorter the calibration interval, the shorter time span with possible errors.

A normal interval for calibrating a thermometer in a process should be about 1-3 months.

If it`s important to ensure the consistency of the accuracy, make simplified calibrations between scheduled calibrations with less calibration points (maybe only one) and simplified documentation.

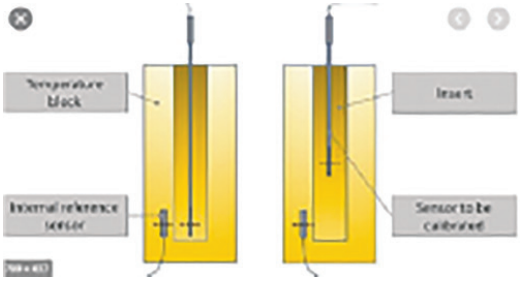
The user must define appropriate intervals and test plans, which should be implemented QA system accordingly.

6 How to use the calibrators

The user's manual is aimed for semi-skilled personnel and specialist. Relevant information and advice should be read and followed step by step.

6.1 Make sure the calibrator well, insert and probe being calibrated, is clean.
This is important in order to remove unnecessary uncertainty in the process created by built up carbon (above 500°C for TC65) and excessive pollution. Polluted well and probe can also create poisonous gases. If calibrating an electronic instrument, make sure that the contacts between the probe and readout device is clean. Dirty contacts can create resistance that affects the reading.

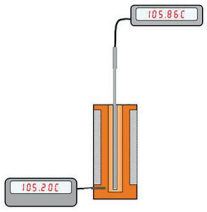
6.2 Place the probe in an appropriate insert in the well.
Use a hole in insert that is 0,2 to 0,6mm larger than the probe you are calibrating. Insert adapters are available with a large number of dimensions. It is also important that the probe reaches the bottom of the well. If not, the reading will be very inaccurate.



6.3 Turn on the calibrator.
Self-explanatory.

6.4 Choose unit °C or °F.
The default setting is °C. Press the button to toggle. After 10 seconds the unit will proceed to the screen for normal operation. Change of unit is only available when calibrator is switched on.

6.5 The display will show the actual temperature and setpoint.
Default temperature when powering up is 25°C. The temperature reading will be blue below 0°C, red above 0°C and green when stable. Not ready/Stable state will also be in text at top of the screen.



There will always be a difference in the actual well temperature and the display reading. This is due to temperature gradients in the well. This difference is largest during temperature increase and decrease. The TC65/TC15 internal reference sensor is located, close to the bottom of the well so the correct calibration depth is 1 to 2 cm from the bottom of the well. TC65/TC15 is calibrated with a 6mm SPRT reference probe placed at the bottom of the insert with 6,5mm hole. Also take into consideration the load the calibration object will employ to the well. A large and heavy probe will extract more heat from the well and change the gradient lines differently compared with a small and light probe.

6.6 Press the up and down buttons to set the desired calibration temperature (setpoint).
Press and hold one of the buttons to count up or down. If the buttons are held continuously, the counting speed will increase. The setpoint is active immediately after button is released.

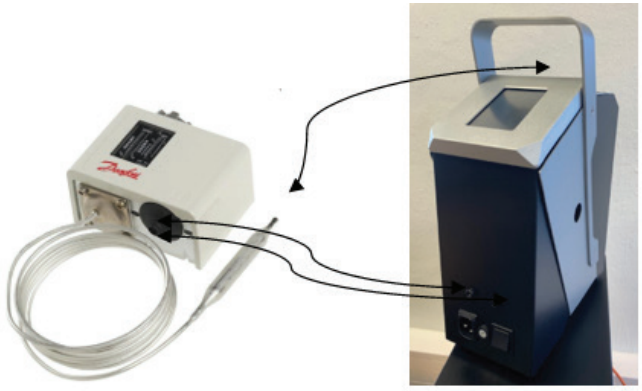
6.7 Let the temperature reach and stabilize at the setpoint. Check both the calibrator and calibration object to determine if the temperature is stable.
During setpoint change there will be a large difference in the well temperature displayed, and the actual well temperature. There will also be a large difference in the actual well temperature and the temperature displayed on the calibration object (UUT). Therefore, the temperature has to equalize. After the built-in stabilization criteria is reached, there is a 5 minutes delay before the "stable state" is shown in the display. Additional time must be added if the reading of the UUT is not stable. This is normally caused by large mass/size of the UUT. When UUT is stable, take the reading and proceed to the next point.

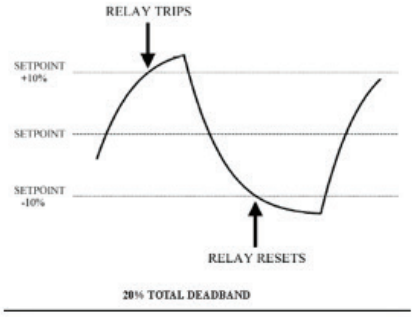
6.8 When both the calibrator and calibration object is stable, note both readings.
When the process is stabile as described in the previous point, note the reading of both the calibrator and the calibrating object. Make calculations for each point that will give you the factor for calculating a more accurate value than the reading of the calibrated object. Refer to the provided example for a calibration certificate with report (page 18).

6.9 Set the next calibration point with the up/down buttons and repeat point 6.5 to 6.8.
To give the best repeatability always start with the lowest calibration point and work your way upward. Select calibration points that are relevant. If your target area is 130 to 200°C in the process, logical calibration points would be 100, 175 and 250°C. A simplified process would be only 150°C that may be used as a control calibration between scheduled calibrations. The example applies for TC65.

6.10 Test of thermostats.

The TC65/TC15 have a built-in test function for thermostats. Connect test leads with alligator clips to the calibrator inputs. Please pay attention to the fact that thermostats react slowly to temperature changes. Switch open or Switch closed will be shown in the display





6.11 Switch off and storage.

NEVER REMOVE HOT PROBES OR INSERTS FROM THE WELL. Cool the calibrator to 100°C before switch off, and below 50°C before removing probe and insert for storage.

7 Safety, troubleshooting and maintenance

Safety
The heating element will automatically be switched off in case set temperature of 400°C or higher has been in stable state for approximately 75 minutes. The display will in this case show "Setpoint reset" and a new set point must be selected to proceed.

Trouble shooting
Instability may occur if the mains supply voltage varies. This could happen if the stability seems to be erratic for no reason.

Insulation measurement:
If the unit has been stored for a long time humidity can have an influence of the ceramic insulation in the heating elements. For some vessels this may give an alarm condition if insulation measurement is below 5Mohm. To obtain normal working condition turn the unit on and leave it at about 100°C for at least one hour. After one hour the insulation measurement should be 10-15Mohm (or higher). When the humidity in the ceramic of the heating elements are "dried out" you will measure higher values (e.g.1300Mohms).

Maintenance
The calibration interval must not exceed 36 months. The user must define appropriate intervals and test plans, which should be implemented QA system accordingly. Make sure the calibrator is stored and handled such a way that it is likely not to suffer from misuse. Keep the calibrator clean and dry at all times. Polluted well will decrease accuracy. Clean the holes with a small wire brush or sand paper on a piece of wire. Remove dust from the well and internals with compressed air. This is important in order to avoid fire.
Also regularly compare the latest calibration with earlier in order to monitor if there is a trend going in a certain direction. If a trend is accelerated or radically altered, it may be wise to keep a closer eye at the calibrator and maybe calibrate it more often or have it examined. This also applies to your calibration objects.

TC65/TC15 is a dry well calibrator. Do not use oil or other liquids in the well or inserts.

There are no user serviceable parts inside the calibrator. However, there is a main fuse next to the power switch that may breake due to internal failure. A qualified service person should be able to determine if the fuse can be replaced with no other actions or if the calibrator needs to be repaired.

8 Technical information

The calibrators have touch display and a calibration interval up to 3 years. TC65/15 meets the market requirements to save cost by extending the calibration interval.

TC65/15 are better, more cost effective and up to date compared to the predecessor.

Model	Range	Stability	Accuracy	Accuracy
			1 year	3 year
TC15	-40°C* to 150°C	± 0,05°C	± 0,3°C	± 1,2°C
TC65	30°C to 650°C	± 0,1°C	± 1,5°C	± 3,5°C

*Relative to ambient

Technical information	**TC65**	**TC15**
Axial gradients (Euramet/cg-13/v.3.0)	±3°C	±0,4°C
Heating time to max	14 min.	50 min.
Cooling time	40 min. (650°C to 100°C)	20 min. (150°C to -40°C*)
Thermostat test	Yes	Yes
USB	Yes	Yes
Well depth	155 mm	110 mm
Well diameter	26 mm	19 mm
Power supply	230 VAC, Fuse 10AT, 50/60 Hz 120 VAC, Fuse 15AT, 50/60 Hz	120-240 VAC, Fuse 3AT, 50/60 Hz
Power consumption	1600 Watt	180 Watt
Operating temp.	0 to 40°C	0 to 40°C
Dimension	122 x 345 x 240 mm	122 x 345 x 240 mm
Weight	Approx. 5,5 kgs	Approx. 5,5 kgs
		* Relative to ambient.

9 Appendix

The calibration certificate template may be used in most cases for your calibration objects. Make copies of the page and fill in your own calibration results.

This is an explanation to the suggested points in the template: (most are self-explanatory and are not further described).

The "Certificate number" shall be a unique notification for the certificate making it possible to separate certificates even if they cover the same calibration object. Note this number on a small sticker on the calibration object making it possible to trace the calibration.

- In the first table note the data about the object you are calibrating.
- "Calibration conditions" notes the temperature in the room during calibration. This may in extreme cases inflict the results.
- The "Statement" in the template states that the calibrator has a traceable calibration. In order to use this statement, make sure your calibrator really do have a valid traceable calibration. Better yet, also a written instruction describing how to maintain the calibrator.
- In the column "Standard used" note the serial number for your TC65/TC15 unit. Also note the number at the certificate for the latest calibration of your TC65/TC15 calibrator and the name of the company or organization that performed the calibration. This way you will maintain the traceability all the way from your calibration object to the international standard on top of the reference chain. Remember to update this number when your TC65/TC15 has been calibrated.
- In the "Measuring report" table there is a column "TC65/TC15 correction" that may be filled in if you have a calibration certificate for your TC65/TC15 stating measuring errors. By calculating the "TC65/TC15 real value" you will achieve better accuracy.
- The "Measuring report" will at the last column state the error for the calibration object. This error should be considered if it is within acceptable limits and can be ignored, or if the value must be used to calculate a more accurate value.
- The operator must sign the certificate at the bottom. The person responsible for the correctness of the process and calculations must also sign the certificate.

Certificate of Calibration

Statement
The instrument described below has been calibrated using the below described standard that is calibrated with traceability to international standards.

This calibration certificate is issued with a measuring report, and shall only be fully reproduced.

Certificate number:		
Unit under test:		
Serial number:		
Calibration result:	Passed:	Failed:
Department:		
Calibration Date:		
Calibration due date:		
Calibration conditions:	Temperature:	RH:

Standard used:

Instrument:	Model:	Serial No:	Cert No:	Traceability:
Temp. calibrator	TC65/TC15			

Measuring report:

TC65/TC15 reading:	TC65/TC15 correction:	TC65/TC15 real value:	Test object reading:	Test object deviation:

Remarks:
"Test object deviation" is calculated by subtracting "TC65/TC15 real value" from "Test object reading".
The value "Test object deviation" tells how much the reading of the test object is off. A positive figure tells how much the reading is above the actual value. A negative figure tells how much below

Calibration performed by:

Certified by:

DNV·GL

TYPE APPROVAL CERTIFICATE

Certificate No:
A-14332
File No:
890.90
Job Id:
262.1-007032-4

This is to certify:
That the Test and Calibration Equipment

with type designation(s)
Temperature calibrators TC15M and TC65M

Issued to
IKM Instrutek AS
LARVIK, Norway

is found to comply with
Det Norske Veritas' Rules for Classification of Ships and High Speed and Light Craft
Det Norske Veritas' Offshore Standards

Application :
The instruments are only approved as portable temperature test- and calibration instruments.

This Certificate is valid until 2017-06-30.
Issued at Høvik on 2015-05-29

DNV GL local station: Sandefjord

Approval Engineer: Nils Jarem

for DNV GL
Digitally signed By: Green, Ilike
Location: DNV GL Høvik, Norway
Signing Date: 2015-06-03, on behalf of

Odd Magne Nesvåg
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Form code: TA 1411a Revision: 2014-11 www.dnvgl.com Page 1 of 2
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Nemko Test Report
Electromagnetic Compatibility

Radiated RF Disturbance Immunity
EN 61326-1:2013
DNVGL-CG-0339:2019
EN 61000-4-3:2010, Ed.3.2

Observations show that the temperature control is disturbed outside the specifications when subject to a field strength of 10V/m in the frequency range 80-1000 MHz. The performance returns to normal when the field is switched off and the controller has re-estabilshed stable conditions. This behaviour is within Performance Criteria B, but not Performance Criteria A which is required by the standard.

IKM Instrutek AS

EC Declaration of Conformity according EN ISO 17050-1:2010 is supplied with the product.

CE

The products meet the requirements of the EU technical regulations

TYPE APPROVED PRODUCT
DNV·GL
DNVGL.COM/AF

Type approval is performed by DNV-GL. It is found to comply with DNV GL rules for classification – Ships, offshore units, and high speed and light craft. DNVGL-CG-0339:2019 (parts of).

IKM Instrutek AS, Main office
Elveveien 28
3262 Larvik, Norway
T: +47 33 16 57 00
F: +47 33 16 57 01
E: Instrumentsalg@IKM.no

www.IKM.com/ikm-instrutek

kiwa certified
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ISO 45001
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