

# Operating Instructions

## Multifunctional testing device for valves and steam traps

### ARImetec®-S



## Contents

<b>1.0 General information about these Operating Instructions.....</b>	<b>2-3</b>
<b>2.0 Notes on possible dangers.....</b>	<b>2-3</b>
2.1 Meanings of the symbols used.....	2-3
2.2 Explanatory notes on safety information.....	2-3
<b>3.0 Storage and transport .....</b>	<b>2-3</b>
<b>4.0 Description.....</b>	<b>2-4</b>
4.1 Scope of supply.....	2-4
4.2 Applications (general) .....	2-4
4.3 Operating principle .....	2-5
4.4 Technical data .....	2-5
4.4.1 Connections, operating and display elements and their functions .....	2-6
4.4.1.1 ARImetec®-S .....	2-6
<b>5.0 Handling .....</b>	<b>2-7</b>
5.1 General information.....	2-7
5.2 Using the sensors .....	2-8
5.2.1 Structure-borne sound sensor for steam traps and valves L52 .....	2-8
5.2.2 Surface temperature sensor.....	2-8
<b>6.0 Start-up / operation.....</b>	<b>2-9</b>
6.1 Inserting the batteries.....	2-9
6.2 Connecting the sensors .....	2-10

6.3 Switching on the device .....	2-11
6.4 Battery charge symbol .....	2-11
6.5 Check mode .....	2-12
6.5.1 Operating elements .....	2-12
6.5.2 Adjusting the volume .....	2-12
6.5.3 Storing the measured / test value .....	2-12
6.5.4 "Max" functions .....	2-13
6.5.5 "Hold" functions .....	2-13
6.6 Main menu .....	2-13
6.6.1 Menu structure .....	2-13
6.6.2 Operation .....	2-14
6.7 Data logger.....	2-14
6.7.1 General.....	2-14
6.7.2 Long-time test.....	2-14
6.7.2.1 Creating a new long-time test .....	2-15
6.7.2.2 Starting the long-time test .....	2-16
6.7.2.3 Stopping the long-time test .....	2-17
6.7.2.4 Information about the selected long-time test .....	2-17
6.7.2.5 Starting / overwriting the selected long-time test .....	2-18
6.7.3 Single test.....	2-18
6.8 Test parameters .....	2-20
6.8.1 Note .....	2-20
6.8.2 Device reset.....	2-20
6.8.3 Averaging time.....	2-20
6.8.4 Tester.....	2-20
6.8.5 Mixer frequency .....	2-21
6.8.6 Check mode .....	2-21
6.8.7 Temperature unit.....	2-21
6.9 Options.....	2-21
6.9.1 Date / time .....	2-21
6.9.2 Auto-Power-Off.....	2-22
6.9.3 Auto-Light-Off .....	2-22
6.9.4 Contrast.....	2-22
6.9.5 Language.....	2-22
6.10 PC connection / data transfer .....	2-22
6.10.1 Directory structure on the installation CD .....	2-23
6.10.2 Installing the drivers.....	2-23
6.10.3 Installing SONAPHONE Communicator .....	2-24
6.10.4 USB power supply .....	2-25
<b>7.0 Functional testing of steam traps .....</b>	<b>2-26</b>
7.1 Test points .....	2-27
7.1.1 Steam table .....	2-30
7.1.2 Limit value curve.....	2-31
<b>8.0 Care and maintenance .....</b>	<b>2-32</b>
8.1 Testing device .....	2-32
<b>9.0 Troubleshooting .....</b>	<b>2-32</b>
<b>10.0 Troubleshooting table .....</b>	<b>2-32</b>
<b>11.0 Disposal.....</b>	<b>2-32</b>
<b>12.0 Warranty / Guarantee .....</b>	<b>2-33</b>

## 1.0 General information about these Operating Instructions

These Operating Instructions provide information on handling and maintaining the device. Please contact the supplier or the manufacturer in case of problems which cannot be solved by reference to the Operating Instructions.

They are binding for transport, storage, installation, start-up, operation, maintenance and repair.

The notes and warnings must be observed and adhered to at all times.

- Handling and all work must be carried out by expert personnel or all activities supervised and checked by a suitably trained person.

The manufacturer reserves the right to introduce technical modifications at any time.

These Operating Instructions comply with the requirements of the relevant EU Directives.

## 2.0 Notes on possible dangers

### 2.1 Meanings of the symbols used



Important or useful information.



Warning regarding a general danger.



Warning regarding dangerous voltage.

### 2.2 Explanatory notes on safety information

Dangers, risks and safety information are highlighted in these Operating and Installation Instructions to attract the reader's attention.

Information marked with the above symbol and "**ATTENTION!**" describes behaviour or procedures which – if ignored – can result in serious or fatal injury to users or third parties or in material damage to the system or the environment. The behaviour and procedures referred to must be complied with and suitable measures implemented to monitor such compliance.

All other information not specifically emphasised, such as transport, installation, operating and maintenance instructions as well as technical data (in these Operating Instructions, in the product documentation or on the device itself) must likewise be complied with in order to avoid faults which could directly or indirectly cause serious injury to persons or damage to property.

## 3.0 Storage and transport

- Store the device in a dry, dirt-free location (temperature range: -10°C to +60°C).
- Do not remove the device from the carrying case unless absolutely necessary.
- Protect against external shocks (impact, vibration, etc.).
- Do not soil or damage the rating plate.

## 4.0 Description

### 4.1 Scope of supply

Arrangement in the case



Fig. 1

ARImetec®-S	
Sensors:	<ul style="list-style-type: none"> <li>- Structure-borne sound sensor</li> <li>- Surface temperature sensor (max. 800°C)</li> </ul>
Accessories:	<ul style="list-style-type: none"> <li>- USB cable</li> <li>- Software package for data transfer to PC, incl. USB cable</li> <li>- Carrying case</li> <li>- Operating Instructions</li> </ul>
Optional:	<ul style="list-style-type: none"> <li>- Handy service/shoulder bag</li> <li>- Headphones (with excellent sound insulation)</li> <li>- Extension cable for temperature sensor</li> </ul>

All devices are tested in the factory prior to delivery and leave in perfect condition.

Please note that the scope of supply varies according to the individual order.

### 4.2 Applications (general)

Ultrasound can occur in a multitude of processes, for example:

- At steam traps
- At leaking valves, gate valves, shut-offs, taps in line systems
- At leakages in compressed air, steam or vacuum systems
- At defective roller bearings
- At pumps or compressors in case of cavitation

## 4.3 Operating principle

Ultrasound occurs due to friction in pipelines and at leakages in many flow processes involving gases, liquids or solids. These ultrasonic signals are picked up by the ARImetec®-S, which makes their intensity audible through a loudspeaker or headphones. The ultrasonic level is simultaneously displayed on an LCD or an LED scale.

The ARImetec®-S allows faults to be precisely located and their magnitude assessed.

The ARImetec®-S is a battery-powered, mobile, hand-held instrument. Ultrasound is detected by means of various sensors that can be connected either with a cable or directly to the testing device.

## 4.4 Technical data

Type	ARImetec®-S
Ultrasonic measurement frequency	40 kHz +/- 1 kHz (20 to 60 Hz in 2 kHz steps)
Temperature measurement range	Max. 800°C
Max. ambient temperature	0 to +50°C
Reading	Backlit graphic display, menu control
Batteries	5 x LR6 with 1.5 V mains voltage
Housing	Shock-proof plastic with wipe-clean membrane keyboard
Dimensions	190 x 110 x 85 mm
Weight	ARImetec®-S : 0.65 kg, total weight incl. case approx. 3.5 kg
Connections	- Structure-borne sound sensor - Surface temperature sensor - Headphones - USB interface (USB 2.0)
Special functions	- Built-in loudspeaker - Auto-Power-Off - Maximum hold mode
Scope of supply	- Software and USB cable - Structure-borne sound sensor - Surface temperature sensor (max. 800°C) - Carrying case
Options	- Headphones (with excellent sound insulation) - Extension cable for temperature sensor - Handy service/shoulder bag, with sensor holder

## 4.4.1 Connections, operating and display elements and their functions

### 4.4.1.1 ARImetec®-S

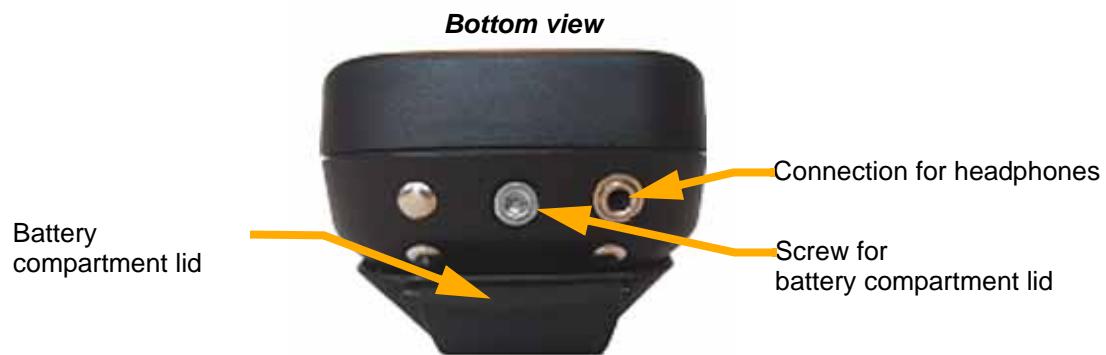


Fig. 2

## 5.0 Handling

### 5.1 General information

The ARImetec®-S and all sensors and accessories are ruggedly designed. Nevertheless, they must be protected against mechanical damage and heavy impact loads.

The ARImetec®-S corresponds to the state of the art and all relevant safety regulations. The manufacturer has done everything possible to guarantee safe working. The user must take appropriate steps to ensure that safe use is not impaired.

**ATTENTION !**

- If ultrasonic signals are detected on electrical installations, always maintain a sufficient safe distance to avoid electrical flash-overs.
- Never work with the sensors or the telescopic rod in the vicinity of non-insulated live parts or without eye contact in areas with which you are not familiar.
- Particular caution is required when using the sensor holder because the clamping spring force can lead to injuries if your hands become trapped.

- The ARImetec®-S is only allowed to be used with or connected to the supplied accessories, namely the headphones, the structure-borne sound sensor and the surface temperature sensor.
- The device is only allowed to be operated by suitably trained persons. All users must read these Operating Instructions carefully prior to working with the device.
- The ARImetec®-S must be protected against moisture in order to prevent damage.

**ATTENTION !**

- The ARImetec®-S and all accessories must not be opened (except battery compartment) or otherwise tampered with for the purpose of carrying out unauthorised repairs. The device must always be sent in to the manufacturer for repair.

- The ARImetec®-S and the connected sensors are suitable for use in the temperature range from 0 to +50°C.
- The structure-borne sound sensor must always be used and handled with appropriate care to prevent injury to persons from the sensor tip. Use the sensor holder provided on the shoulder strap of the leather bag if you need to carry the sensor around with you or whenever it is not in use.
- In the interests of accident prevention, you should also use the leather bag and shoulder strap to climb stairs or ladders, mount platforms, etc.
- Avoid using the ARImetec®-S in strong electromagnetic fields.
- **ARI-Armaturen GmbH & Co. KG** accepts no liability for damages caused to third parties by the improper use of the device. All warranty claims will be refused.

## 5.2 Using the sensors

### 5.2.1 Structure-borne sound sensor for steam traps and valves L52

**ATTENTION !**

- Use the sensor holder provided on the shoulder strap of the leather bag if you need to carry the sensor around with you or whenever it is not in use.
- In the interests of accident prevention, you should also use the leather bag and shoulder strap to climb stairs or ladders, mount platforms, etc.



Fig. 3

Structure-borne sound sensors L52 are used to detect ultrasound on solid bodies.

They must be pressed softly against the test point by hand. To ensure reproducible results, the pressure force and direction must be constant.

The sensor is designed for measurements in a temperature range from -20°C to +60°C. It can be used to measure hot surfaces up to 550°C for short periods (approx. 1 minute).

**Note !**

- The test procedure can be optimised by varying the device's mixer frequency (refer to section "6.8 Test parameters") between 20 and 60 kHz in steps of 2 kHz. Changing the mixer frequency directly influences the test values displayed. To ensure reproducibility, you must perform comparative tests with the same mixer frequency.

### 5.2.2 Surface temperature sensor



Fig. 4

The surface temperature sensor is designed to measure temperatures from 0°C to 800°C.



Fig. 5

The temperature sensor can be connected to the ARImetec®-S either directly or by means of the hand grip and extension cable.

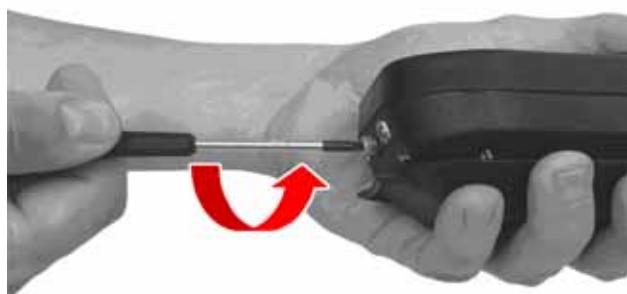
If no sensor is connected to the device, you see the words "No sensor" instead of the ultrasonic level.

## 6.0 Start-up / operation

### 6.1 Inserting the batteries

**ATTENTION !**

- *LR batteries with 1.5 V rated voltage are required to operate the ARImetec®-S .*
- *There must be no USB connection to a PC when you open the lid of the battery compartment.*
- *Note the polarity engraved on the battery block when you insert the batteries.*
- *Follow the instructions described below!*



a) Detach the shoulder strap from the lid of the battery compartment.

b) Unscrew the locking screw of the battery compartment as far as it will go. The battery block moves in the same direction as the screw. It is important to keep a tight grip on both the battery and the device.



c) Open the battery compartment downwards and pull it out of the device back.



d) Remove the batteries from the battery block.

e) Insert new batteries in the block, taking care to fit them the right way round (polarity).

f) The correct battery position is engraved on the top of the block.



- g) Re-insert the battery compartment in the housing.
- h) Tighten the locking screw of the battery compartment again.
- i) Fasten the shoulder strap to the lid of the battery compartment.

## 6.2 Connecting the sensors

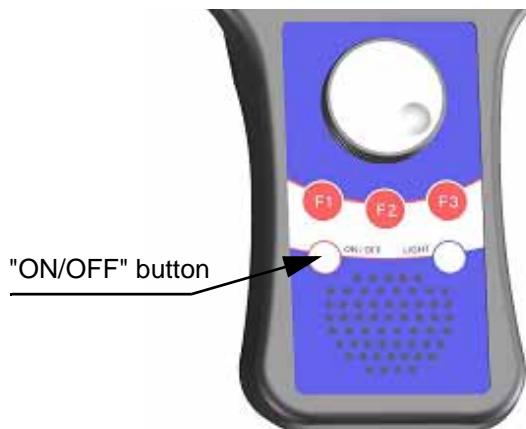
Connect the required sensor to the ARImetec®-S , depending on the application (refer to section "5.2 Using the sensors").

Steam traps can be tested with the structure-borne sound sensor and the surface temperature sensor.

Sound-insulated headphones are recommended for leakage detection, especially if loud ambient noise levels are likely. Make sure the headphones are plugged securely into the socket.



## 6.3 Switching on the device



- You switch on the device by pressing the "ON/OFF" button. After displaying the welcome screen, the automatically launches check mode. The display shows the following:



- 1: Battery or USB mode, battery charge symbol
- 2: Temperature
- 3: Check mode / mixer frequency
- 4: Sensor type
- 5: Tester
- 6: Functions currently active for buttons F1-F3
- 7: Intensity scale for ultrasonic level
- 8: Ultrasonic level
- 9: Date / time

If no sensor is connected to the device, you see the words "No sensor" instead of the ultrasonic level.

## 6.4 Battery charge symbol

The symbol in the top right of the display ("1" in the picture above) indicates the current battery charge as well as the power supply mode:

Battery mode (approx. 60%)

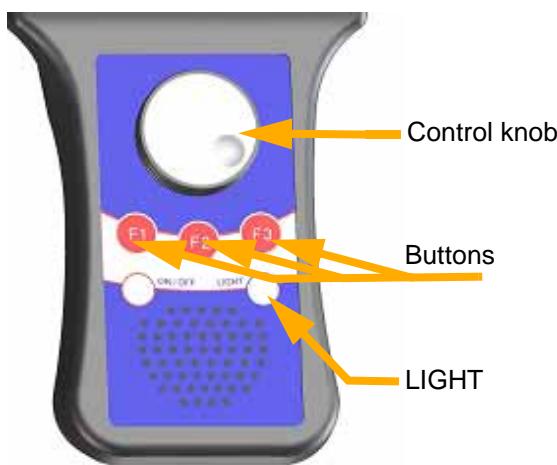


USB mode



## 6.5 Check mode

### 6.5.1 Operating elements



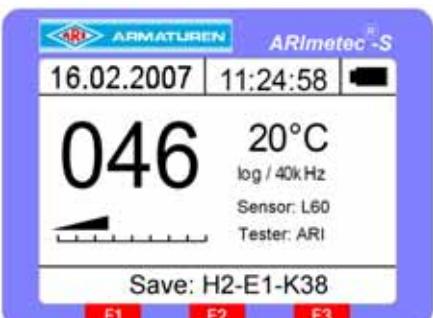
- **Turning the control knob:** Adjusts the volume
- **Pressing the control knob:** Stores test values (refer to section 6.7.3 Single test)
- **F1 (Max):** Selects the "Max" function
- **F2 (Hold):** Selects the "Hold" function
- **F3 (Menu):** Opens the Options menu, in which you can change the device configuration
- **"LIGHT":** Controls the backlighting (Off - Level I - Level II - Level I - Off)

### 6.5.2 Adjusting the volume



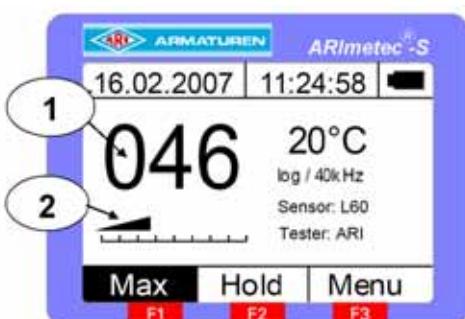
- When you turn the control knob, a volume bar and an intensity value appear for approximately 2 seconds as shown in the picture opposite.
- Turn the knob clockwise to increase the volume or anticlockwise to reduce it.

### 6.5.3 Storing the measured / test value



- By pressing this button in check mode (assuming at least one **single test** has been parameterised), you store the ultrasonic level and the current temperature in the single test selected as "Active". The word "Save" appears on the display for a few seconds while the values are being stored, together with the name of the single test.

### 6.5.4 "Max" functions



Button F1 activates the "Max" function. The numerical value that appears on the display corresponds to the maximum ultrasonic level, while the intensity scale shows the current level. The button name is highlighted to indicate that the "Max" function is active:

1: Maximum ultrasonic level

2: Current ultrasonic level

By pressing the control knob, you store the **currently displayed value**, i.e. the maximum value, in the active single test. By pressing button "F1" again, you cancel the "Max" function.

### 6.5.5 "Hold" functions



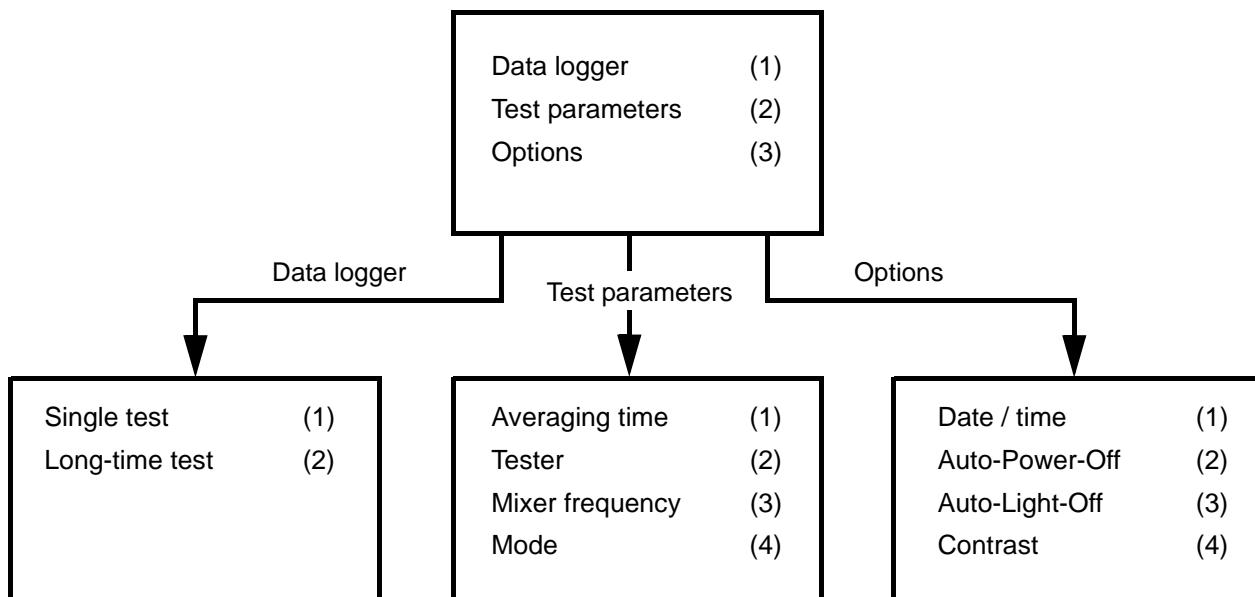
Button F2 activates the "Hold" function. This function can be used to record ultrasonic levels. It is useful, for example, if the display is not visible when the test is carried out. By pressing button "F2", you store the ultrasonic level that is measured at that instant on the display.

By pressing the control knob, you store the **currently displayed value**, i.e. the "Hold" value, in the active single test.

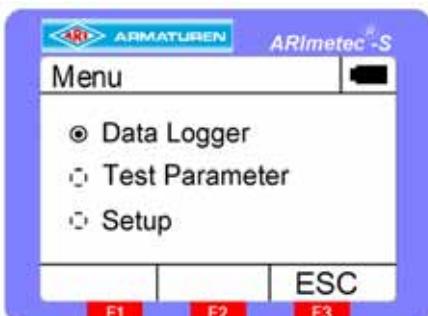
By pressing button "F2" again, you cancel the "Hold" function.

## 6.6 Main menu

### 6.6.1 Menu structure



## 6.6.2 Operation



The main menu contains three sub-menus:

**1. Data logger:**

Store measured and test values

**2. Test parameters:**

Change all test-specific parameters

**3. Options:**

Change the device parameters

You select a menu by turning the control knob and open it by pressing the knob. By pressing button "F3", you return to check mode. The currently selected menu is indicated by a solid circle with a dot (radio button).

## 6.7 Data logger

### 6.7.1 General

The built-in data logger allows you to store ultrasonic levels and measured temperature values. Each stored data set comprises the date, time, tester's name (max. 8 characters), test point (max. 8 characters), sensor type, ultrasonic level and temperature value. There are two possible test types:

- **Long-time test:**

Ultrasonic level and temperature values are stored at regular intervals over a long period of time. Up to 250 long-time tests with 75 data sets or 1 long-time test with 21,000 data sets can be recorded. Each data set consists of an ultrasonic level and a measured temperature value.

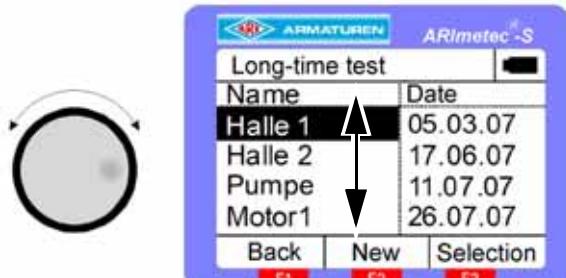
- **Single test:**

The current ultrasonic level and temperature value are stored in a data set. Up to 250 single tests with 23 data sets or 1 single test with 6300 data sets can be recorded.

Use "SONAPHONE Communicator" (PC software available as an accessory) to archive the measurement data.

### 6.7.2 Long-time test

When you select the "Long-time test" function, you see an overview of all long-time tests created so far, together with their respective test points and creation dates:



You can choose between four possible actions in this menu:

- **Pressing the control knob:**

Display more information about the selected long-time test

- **F1 (Back):**

Return to the "Data logger" menu

- **F2 (New):**

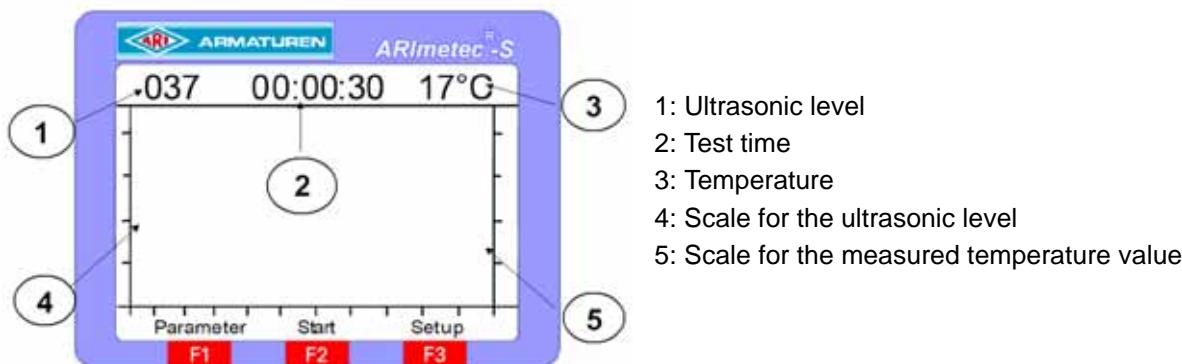
Create a new long-time test

- **F3 (Select):**

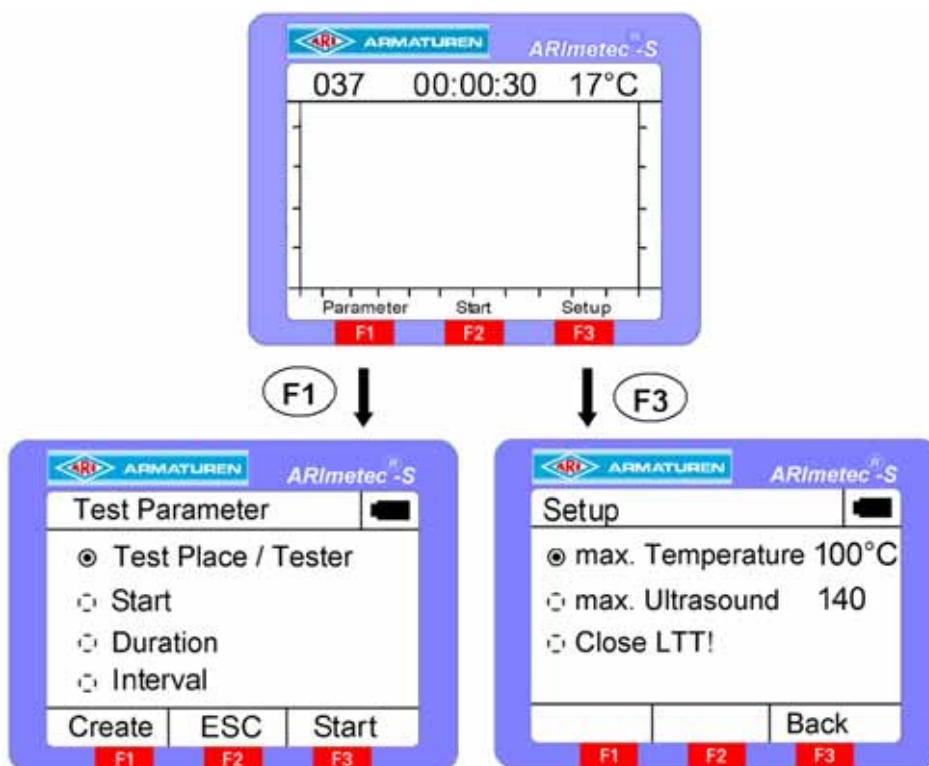
Record test values for the selected long-time test

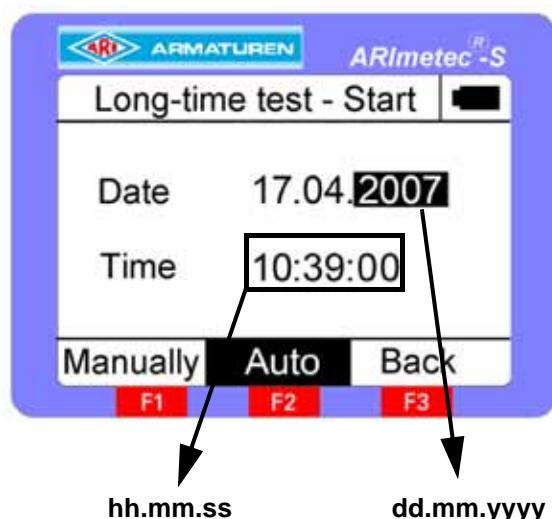
### 6.7.2.1 Creating a new long-time test

By pressing button "F2", you open a screen in which you can create a new long-time test:



You specify the test parameters in the "Parameters" menu, which is opened by pressing button "F1". To change the display settings for the long-time test or stop the test, you must open the "Setup" menu by pressing button "F3":





When this menu is opened, the start time for the long-time test is set to "Auto".

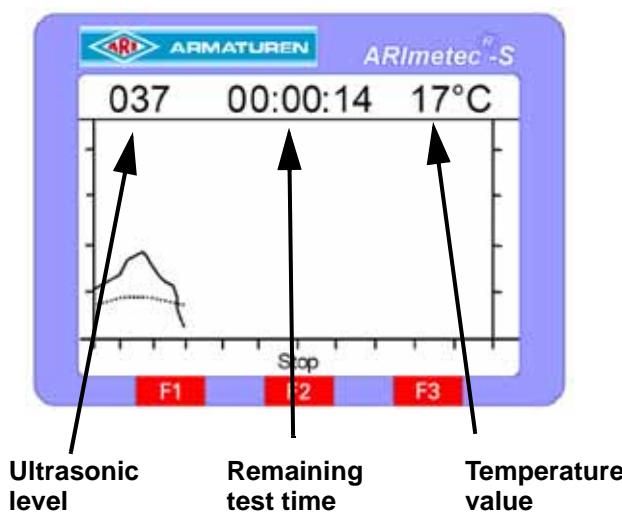
In other words, the ARImetec®-S starts the test automatically at the set time. If the set time is before the current time, the test starts immediately.

By pressing "Manual" instead, you can start the long-time test manually. The "AutoStart" mode can only be selected for one long-time test at a time. All other long-time tests are automatically set to "Manual". You select the element you want to change by pressing the control knob and set it by turning the knob.

By pressing button "F3", you store the start time for the selected long-time test. The scales for the ultrasonic level and temperature values are defined according to the limits specified in the "Setup" menu for the maximum temperature and maximum ultrasonic level.

### 6.7.2.2 Starting the long-time test

You start the long-time test manually by pressing button "F2" on the measurement screen:

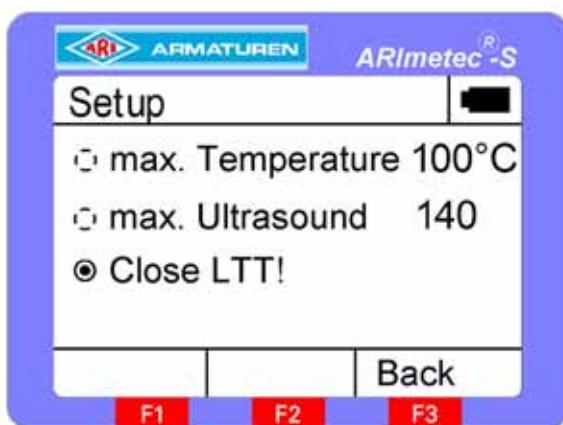


Ultrasonic levels are represented by a solid line and temperature values by a dotted line.

The remaining test time is shown in the centre of the header line. However, you can cancel the long-term test at any time by pressing button "F2".

In this case, all values recorded so far are stored and the remaining test time is updated.

### 6.7.2.3 Stopping the long-time test

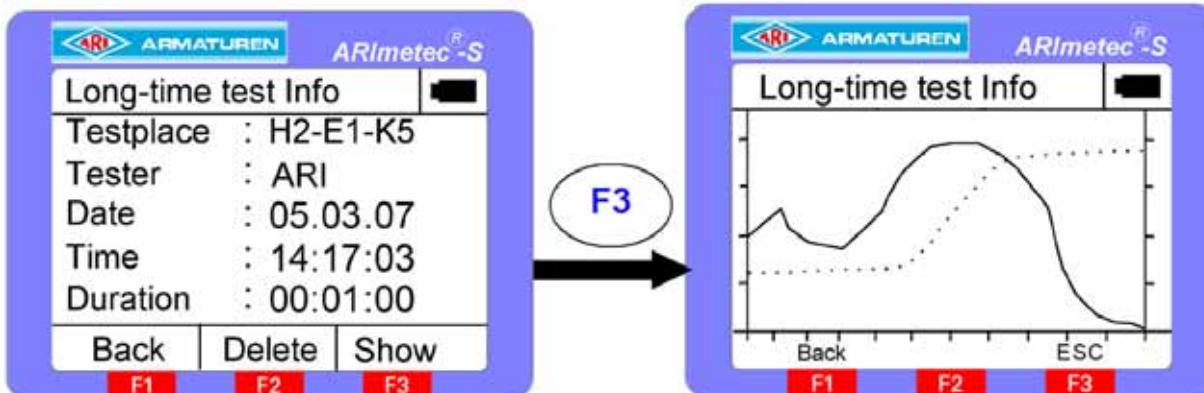


To stop recording values for the long-time test and return to check mode, you must select "Stop long-time test" in the Setup menu.

All test values recorded so far are stored and the test is added to the overview of long-time tests stored in the device.

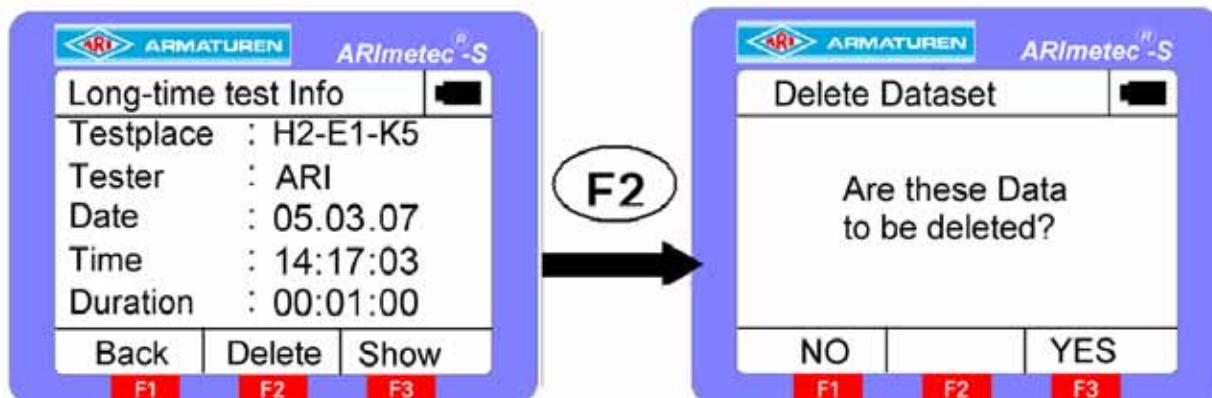
### 6.7.2.4 Information about the selected long-time test

By pressing the control knob in the long-time test overview, you can display information about the tester, test point, date and time, test time and test interval. You also have the option of deleting the test or of showing the test values in the form of a graph.



Ultrasonic levels are represented on the graph by a solid line and temperature values by a dotted line. The maximum visible time window is 60 s. If the test time is longer than 60 s, you can shift the time window by turning the control knob. The ultrasonic level is displayed on a logarithmic scale graduated from 0 to 140 or on a linear scale graduated from 0 to 240. The temperature is displayed on a scale from 0 to 800°C or from 0 to 1472°F.

To delete the current data set, you must press button "F2" on the information screen. You then see a confirmation prompt asking whether you are sure you want to delete this data:



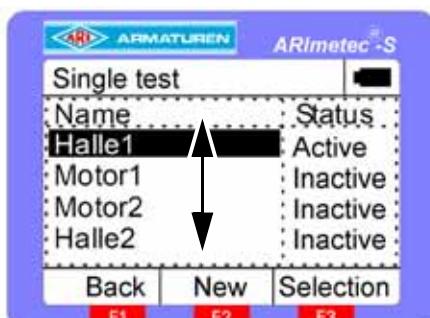
Press button "F3" to confirm the prompt or "F1" to cancel the deletion.

### **6.7.2.5 Starting / overwriting the selected long-time test**

The final option in the "Long-time test" menu allows you to start a long-time test that has already been parameterised or overwrite an existing test. To do this, you press button "F3".

### **6.7.3 Single test**

When you select the "Single test" function, you see an overview of all single tests created so far, together with their respective test points and statuses: The test values to be stored are saved in the single test selected as "Active".

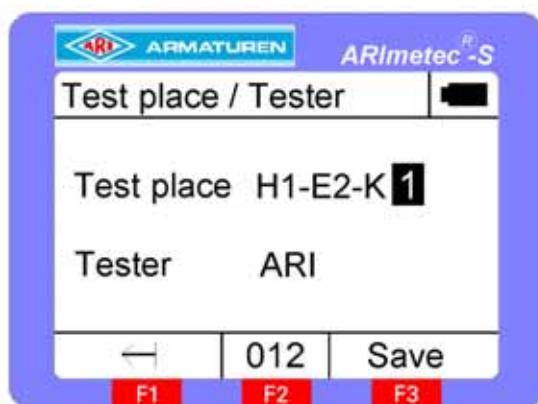


You can create a new single test by pressing button "F2", change the current test by pressing the control knob or activate the selected single test with "F3".

By activating a single test, you cause all test values stored in check mode to be stored in this test.

The "Active" status can only be selected for one single test at a time. You cannot activate several single tests simultaneously.

You create a new single test or change an existing test in the menu below:



You select the character you want to change by pressing the control knob and set it by turning the knob. By pressing button "F1", you go back to the character that was changed previously.

To change the character set (ABC --> abc --> 012 --> ;;<), you press button "F2".

By pressing button "F3", you store both the name of the tester and the test point for the selected single test.

You store the test values and measurement data in check mode by pressing the control knob.

The following information is stored for each test:

- Date / time
- Sensor type
- Check mode / mixer frequency
- Ultrasonic level
- Temperature value

You can only archive single tests using "SONAPHONE Communicator", the PC software available as an accessory.

## 6.8 Test parameters

### 6.8.1 Note

Changing all test parameters directly influences the test values displayed. To ensure reproducibility, you must perform comparative tests with the same test parameters.

### 6.8.2 Device reset

By pressing button "F1" while the welcome screen is displayed, you reset all test parameters to the default settings.

Averaging time: 4 s  
Tester: ARI  
Mixer frequency: 40 kHz  
Check mode: Logarithmic  
Temperature unit: °C

**NOTE !**

- The test data stored in the device is neither changed nor deleted if you press the reset button. Only the test parameters are reset!

### 6.8.3 Averaging time

The ARImetec®-S allows you to average the recorded test values over a variable period of time. You can set a period between 1 s and 10 s in steps of 1 s in the "Averaging time" menu. You change the settings and store them in the device by turning the control knob. Press button "F1" to return to the "Test parameters" menu or "F3" to save your settings and return to the test screen.

### 6.8.4 Tester



You can enter the name of the tester (max. 8 characters) in this menu.

To change the character set (ABC --> abc --> 012 --> ;;<), you press button "F2".

You select the character you want to change by pressing the control knob and set it by turning the knob.

By pressing button "F3", you store the name of the tester in the device.

### 6.8.5 Mixer frequency

The ARImetec®-S transforms the ultrasonic signals to an audible frequency by mixing. You can set the operating frequency by varying the mixer frequency. The frequency range can be adjusted between 20 and 60 kHz in steps of 2 kHz (default: 40 kHz). You change the settings and store them in the device by turning the control knob. Press button "F1" to return to the "Test parameters" menu or "F3" to save your settings and return to the test screen.

**NOTE !**

- *It only makes sense to change the mixer frequency if you are using L52 sensors because only they provide the required broadband.*

### 6.8.6 Check mode

The ARImetec®-S has two display modes for ultrasonic levels, namely linear (linear scale: 0 to 240) and logarithmic (logarithmic scale: 0 to 140). The display mode is selected in the "Mode" menu. You change the settings and store them in the device by turning the control knob. Press button "F1" to return to the "Test parameters" menu or "F3" to save your settings and return to the test screen.

### 6.8.7 Temperature unit

The ARImetec®-S allows you to display the temperature in °C or °F. The required unit is selected in this menu. You change the settings and store them in the device by turning the control knob. Press button "F1" to return to the "Test parameters" menu or "F3" to save your settings and return to the test screen.

## 6.9 Options

### 6.9.1 Date / time



The date and time are set in this menu. You select the element you want to change by pressing the control knob and set it to the required value by turning the knob.

The seconds value cannot be changed. It is reset to "00" when the menu is opened.

By pressing button "F1", you go back to the character that was changed previously.

Press "F2" to store the set time as the current time or "F3" to cancel your changes and return to the previous menu.

### 6.9.2 Auto-Power-Off

The Auto-Power-Off function allows you to switch off the ARImetec®-S again automatically after a set time. You can set a time between 1 and 25 min in steps of 1 minute by turning the control knob. Press button "F1" to return to the previous menu or "F3" to return to check mode.

### 6.9.3 Auto-Light-Off

The Auto-Light-Off function allows you to switch off the display backlighting again automatically after a set time. You can set a time between 0 and 2 min in steps of 30 seconds by turning the control knob. Press button "F1" to return to the previous menu or "F3" to return to check mode.

### 6.9.4 Contrast

You can adjust the display contrast in the "Contrast" menu by turning the control knob in order to ease legibility in poor lighting conditions. The new contrast setting takes effect on the screen immediately. Press button "F1" to return to the previous menu or "F3" to return to check mode.

### 6.9.5 Language

You can display the menus on the ARImetec®-S in either English or German.

You set the language in the "Language" menu by turning the control knob. Press button "F1" to return to the previous menu or "F3" to return to check mode.

## 6.10 PC connection / data transfer



### ATTENTION !

- The ARImetec®-S must not be connected to the PC if the lid of the battery compartment is open! If you open the lid while the ARImetec®-S is connected to the PC, you could damage the device!

The ARImetec®-S has a USB interface that allows it to be connected to a PC.

"SONAPHONE Communicator", the PC software available as an accessory, is required to communicate with the PC. This software includes all the drivers you need to log your ARImetec®-S into the operating system and supply it with power from the PC. The device cannot be operated from a PC without these drivers. "SONAPHONE Communicator" provides the following functionality:

- Analysis and management of single tests
- Pre-parameterisation of single tests
- Analysis and management of long-time tests
- Pre-parameterisation of long-time tests
- Archival of test data
- Online testing
- Setting device parameters
- Memory management

### 6.10.1 Directory structure on the installation CD



### 6.10.2 Installing the drivers

The first time you connect the ARImetec®-S to a PC, you see a dialogue prompting you to install the required device drivers:

#### Step 1:



#### Connection to Windows Update

Choose "No, not this time" in this dialogue, then click "Next >" to proceed to the next installation step.

## Step 2:



All the drivers required to operate the ARImetec®-S are contained in the following directory: "CD drive:\Driver\". If they are not found automatically (as described in step 2), you can select the appropriate drivers manually from the CD by choosing "Install from a list or specific location".

## Step 3:



### Insert the driver CD

When you insert the SONAPHONE Communicator installation CD, the installation should continue automatically after a few seconds. If not, click "Next >".

### Windows Logo testing

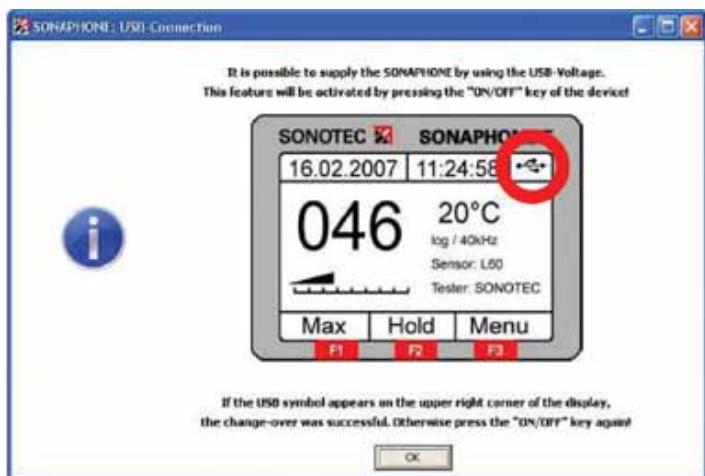
Click "Continue anyway" to install all the required drivers on the PC. After installing the drivers successfully, you see a new window in which you should click "Finish" to complete the installation.

### 6.10.3 Installing SONAPHONE Communicator

The installer for the "SONAPHONE Communicator" PC software is launched automatically when you insert the installation CD. If not, please launch it manually by double clicking "setup.exe" on the installation CD. Then follow the instructions provided on your PC screen.

#### 6.10.4 USB power supply

The ARImetec®-S can be supplied with power via the USB interface of the connected PC (depending on the PC). If this is not possible, you see the tip window below when you launch SONAPHONE Communicator:



This window prompts you to switch off the ARImetec®-S .

If the USB symbol appears in the top right corner after you press the "ON/OFF" button, the power supply has been switched over to the PC successfully.

If not, you must press the "ON/OFF" button again.

If the device is switched off when you press the "ON/OFF" button, it cannot be supplied with power via the USB interface.



#### NOTE !

- If the tip window above does not appear when you launch SONAPHONE Communicator, either the ARImetec®-S is not connected to the PC or your PC is unable to supply power to the ARImetec®-S .

## 7.0 Functional testing of steam traps

Steam traps can be tested with the structure-borne sound sensor and the surface temperature sensor.

You must select logarithmic mode in order to test a steam trap with the ARImetec®-S . Refer to section 6.8.6 Check mode" for a description of the possible settings.

Averaging time: 4 s  
Mixer frequency: 40 kHz  
Check mode: Logarithmic



### **NOTE !**

#### **General:**

- *The multifunctional testing device can only be used to test valves and steam traps that are operating at the normal working temperature.*

#### **Ultrasound:**

- *Any sound-emitting components in the system under test must be switched off prior to testing.*
- *It is important that the ultrasonic sensor should always be positioned at the same test point on the body of steam traps of the same type, to enable these steam traps to be compared and any changes ascertained in repeat tests! Refer to the Operating Instructions for further details.*
- Steam traps operate on a number of different principles, each with unique characteristics.*
- *A steam trap is evaluated using a limit curve. The operating pressure of the system must be known for this purpose. If the system pressure is not known, it can also be determined from the steam table below by taking the boiling temperature. Please read the notes on temperature measurement!*

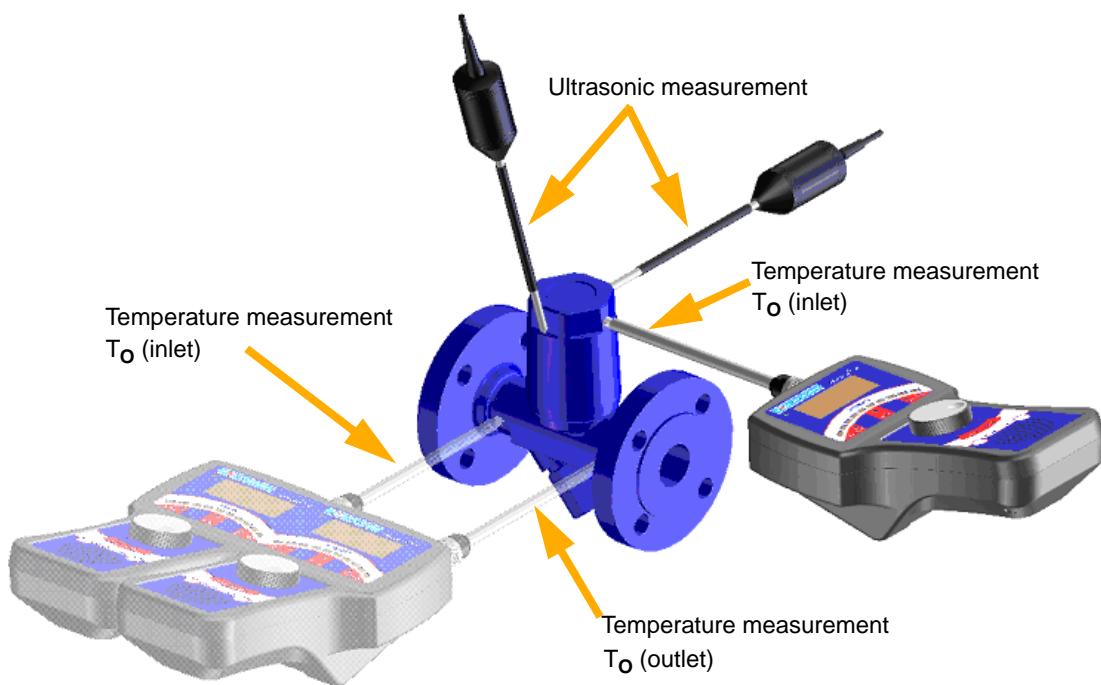
#### **Temperature:**

- *Since the "ARImetec®-S " measures temperatures on the outside of the pipeline or steam trap, the temperature loss due to heat transfer through the pipe or steam trap must be taken into account.*
- As a rough guide:  $T_{(internal)} = T_{(external)} \times 1.1$*
- *The boiling temperature can be read off from the steam table if the system pressure is known.*
  - *If the operating pressure of the system is not known, the boiling temperature can be determined by measuring the surface temperature of the pipeline well upstream of the steam trap. The test point must be upstream of all sections where condensate could accumulate and sub-cool.*

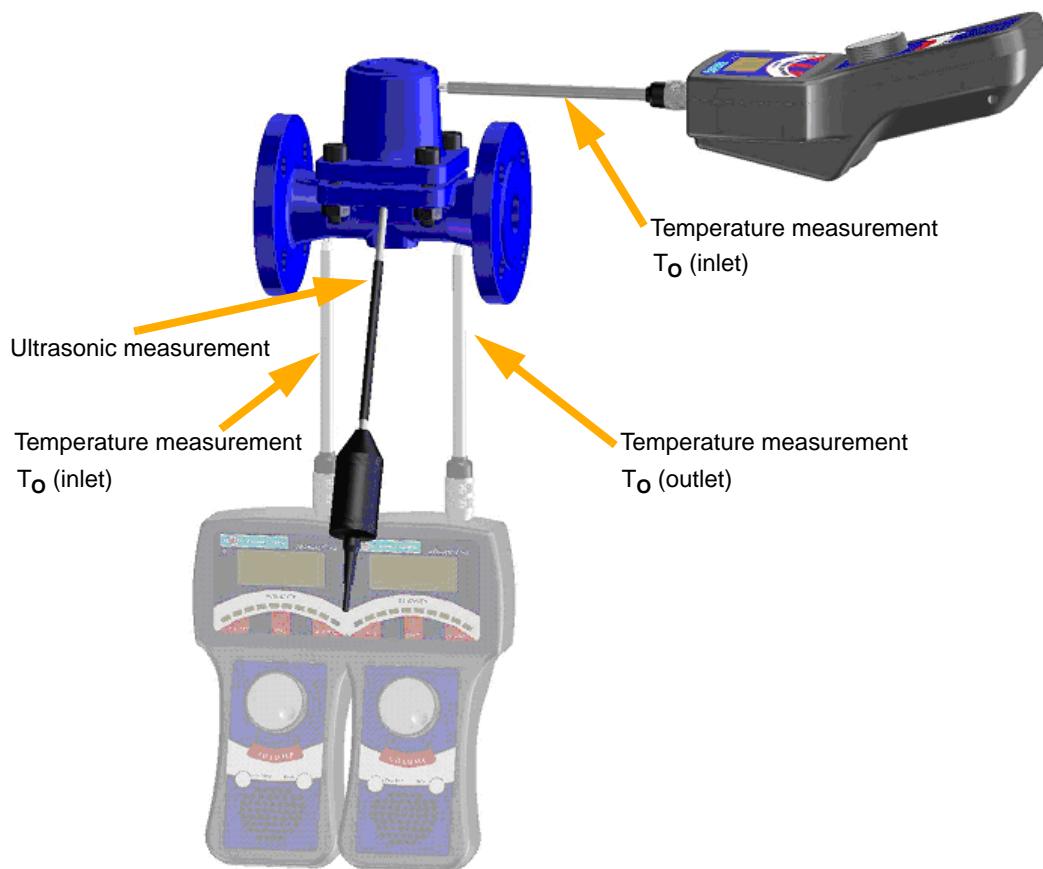
Temperature and ultrasonic measurements can be taken in parallel. The surface temperature sensor is rigidly mounted on the testing device housing, so that the device can be held in one hand and the ultrasonic sensor in the other.

The temperature measurement can be carried out separately if the test points are difficult to access.

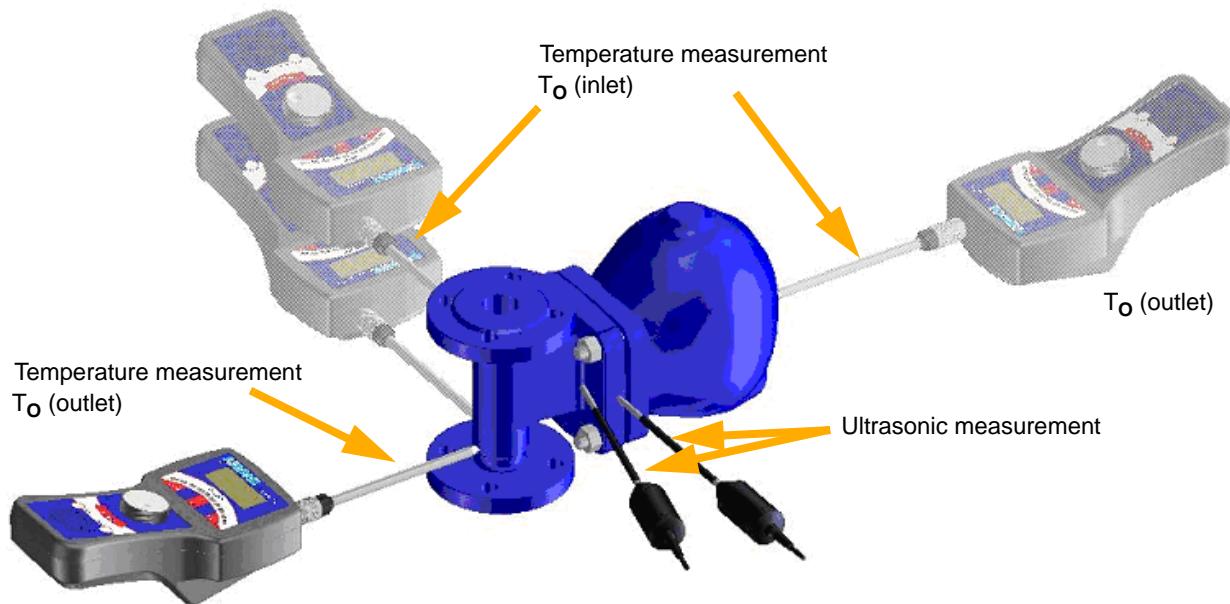
## 7.1 Test points



**CONA® B / M / TD / liquid return temperature limiter / condensate discharge temperature limiter**



Liquid drainer



## **CONA® S / SC**

As shown in the diagram above, the temperature sensor should if possible be positioned on a flat surface at the steam trap inlet "T<sub>0</sub> (inlet)". The connected ultrasonic sensor should be fitted vertically with gentle pressure onto the housing or onto the hood, cap or cover:

### **- Stable ultrasonic value below the limit curve:**

If a stable ultrasonic value is measured and can be plotted below the limit curve shown here, the steam trap is steam-tight. By taking a temperature measurement (refer to the note on temperature measurement), you can determine whether the steam trap is operating at the normal working temperature:

If a thermostatic (bimetallic, balanced pressure or thermodynamic) steam trap is functioning correctly, the working temperature T<sub>(internal)</sub> should be between 5 and 30 K less than the boiling temperature, depending on the type, or approximately equal to the boiling temperature in the case of float-type steam traps. If the temperature is significantly more than 30 K below the boiling temperature, either the sub-cooling setting of the steam trap is too high or the steam trap is blocked or defective (assuming the system is operating).

### **- Periodically fluctuating ultrasonic value:**

Periodic fluctuation of the ultrasonic reading between a maximum and minimum value indicates intermittent operation of the steam trap. The steam trap is opening and closing, in other words it is functioning correctly.

Once again, the working temperature T<sub>(internal)</sub> of a thermostatic (bimetallic, balanced pressure or thermodynamic) steam trap should be between 5 and 30 K less than the boiling temperature, depending on the type, or approximately equal to the boiling temperature in the case of float-type steam traps.

### **- Stable ultrasonic value above the limit curve:**

If the value is above the limit curve, the steam trap must be isolated from other sound sources to confirm that the ultrasonic signal is only being produced by the steam trap under test. This can be verified by taking an ultrasonic reading on the pipe upstream and downstream of the steam trap.

If the ultrasonic readings at the steam trap are higher than at the pipe, ultrasound is being produced by a flow in the steam trap. If the ultrasonic readings at the steam trap

are lower than at one or more pipelines, an external sound source is influencing the ultrasonic measurement.

In both instances a temperature measurement must be carried out to facilitate a reliable and unequivocal evaluation, as it is necessary to determine whether the flow is of steam or condensate and whether the steam trap is working correctly.

**a) Thermostatic steam traps (CONA® B / M / TD):**

A thermostatic steam trap is evaluated further by measuring the surface temperature, as shown in the graph below, and comparing it with the boiling temperature:

- i. If  $T(\text{internal})$  is more than 5... 10 K below the boiling temperature, this indicates a condensate flow. The steam trap is functioning correctly.
- ii. If  $T(\text{internal})$  is approximately equal to the boiling temperature, this indicates a steam flow. The steam trap is defective.
- iii. If the reading is higher than the boiling temperature (superheated steam), the steam trap is also defective.

**b) Float-type steam traps (CONA® S / SC):**

A float-type steam trap is evaluated by measuring the temperature difference between the inlet and outlet.

- i. If the steam trap is working correctly, a significant temperature drop must be measured from the inlet to the outlet.
- ii. If the temperature measured at the outlet is just as high as the temperature at the inlet, there is a steam flow. The float-type steam trap is defective.

### 7.1.1 Steam table

Overpressure	Absolute pressure	Boiling temperature	Body / surface temperature
<b>p</b>	<b>p</b>	<b>t<sub>s</sub></b>	<b>t<sub>external</sub></b>
<b>bar(ü)</b>	<b>bar</b>	<b>°C</b>	<b>°C</b>
-0.99	0.01	6.92	6.29
-0.98	0.02	17.51	15.91
-0.97	0.03	24.1	21.90
-0.95	0.05	33	30
-0.92	0.08	41.5	37.72
-0.9	0.1	45.8	41.63
-0.8	0.2	60.1	54.63
-0.6	0.4	76	69.09
-0.4	0.6	86	78.18
-0.2	0.8	93.5	85
0	1	99.6	90.54
0.2	1.2	104.8	95.27
0.4	1.4	109.3	99.36
0.6	1.6	113.3	103
0.8	1.8	117	106.36
1	2	120.2	109.27
1.4	2.4	126.1	114.63
1.8	2.8	131.2	119.27
2	3	133.5	121.36
2.4	3.4	138	125.45
2.8	3.8	141.8	128.90
3	4	143.6	130.54
3.5	4.5	148	134.54
4	5	151.8	138
5	6	158.8	144.36
7	8	170.4	154.90
9	10	180	163.63
11	12	188	170.90
13	14	195	177.27
15	16	201.4	183.09

Overpressure	Absolute pressure	Boiling temperature	Body / surface temperature
<b>p</b>	<b>p</b>	<b>t<sub>s</sub></b>	<b>t<sub>external</sub></b>
<b>bar(ü)</b>	<b>bar</b>	<b>°C</b>	<b>°C</b>
17	18	207.1	188.27
19	20	212.4	193.09
23	24	221.8	201.63
27	28	230	209.09
29	30	234	212.72
33	34	241	219.09
37	38	247.3	224.81
39	40	250.3	227.54
44	45	257.4	234
49	50	264	240
54	55	270	245.45
59	60	275.6	250.54
64	65	281	255.45
69	70	286	260
74	75	290.5	264.09
79	80	295	268.18
84	85	299.2	272
89	90	303.3	275.72
94	95	307.2	279.27
99	100	311	282.72
109	110	318	289.09
119	120	325	295.45
129	130	331	300.90
139	140	336.6	306
149	150	342	310.90
159	160	347.3	315.72
179	180	357	324.54
199	200	365.7	332.45
220.3	221.3	374.15	340.134

### 7.1.2 Limit value curve

Evaluation of steam trap surface temperatures:

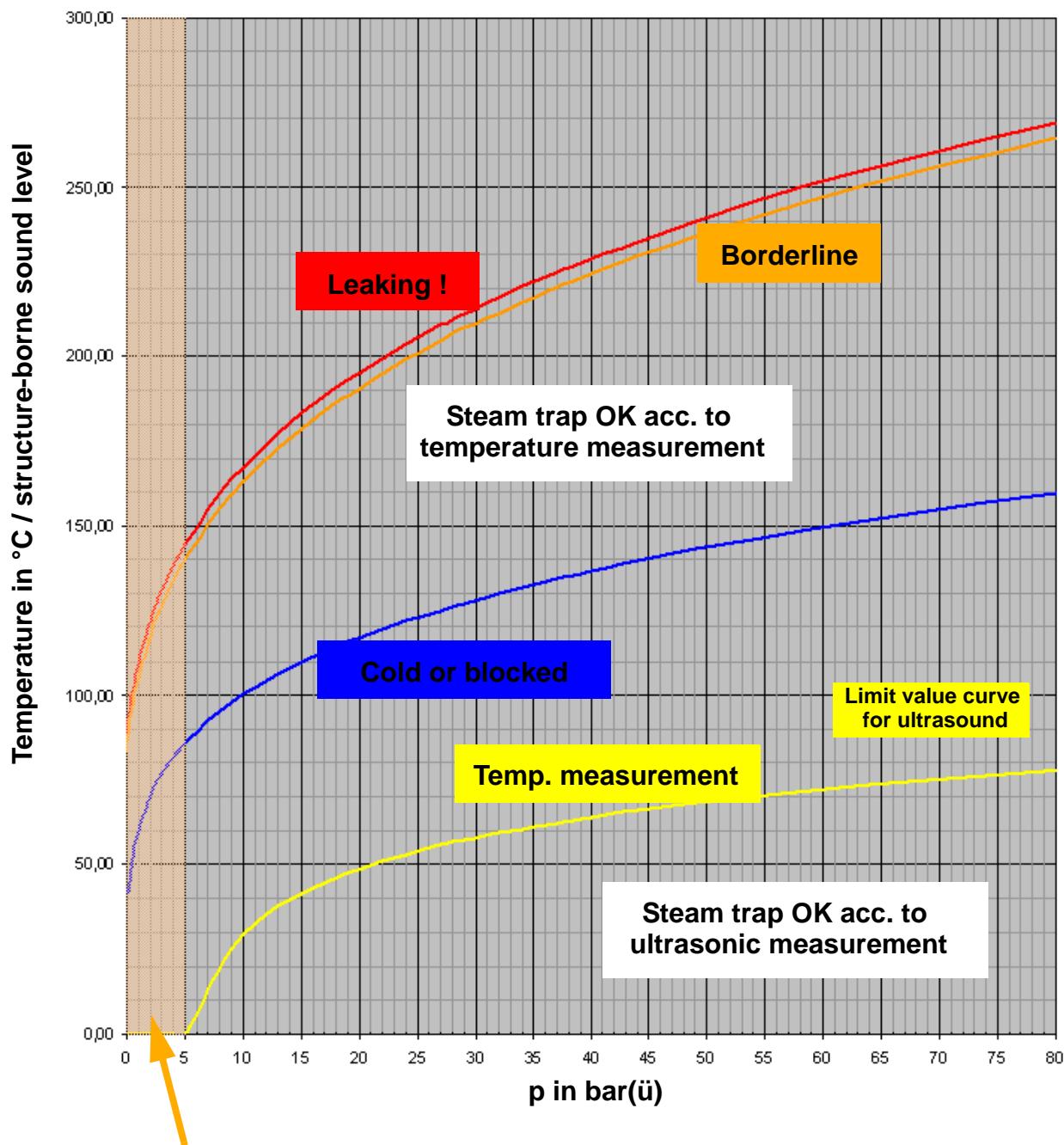


Fig. 6

## 8.0 Care and maintenance

### 8.1 Testing device

Never use cleaners containing solvents.

The device and all accessories can be cleaned with a damp cloth. Aggressive detergents may attack the plastic housing and impair the mechanical stability of the ARImetec®-S .

The ARImetec®-S must be protected against moisture, in order to prevent damage.

## 9.0 Troubleshooting

Not every fault necessarily means a defect in the device. You can save time and money by checking for and correcting a few simple faults yourself.

If you cannot correct the fault with the help of the table in section "**10.0 Troubleshooting table**", please consult the supplier or manufacturer.

## 10.0 Troubleshooting table

Fault	Possible cause	Corrective measure
Device cannot be switched on	Batteries are discharged	Recharge batteries
No acoustic signal detected	Volume too low	Increase volume
	Sensor not securely connected	Connect plug securely
	Headphones not securely connected	Connect headphones securely
	Device switched off automatically	Switch device on again
	Sensor defective	Test with another sensor
Red charge LED blinks	Internal batteries or charging circuit defective	Send in ARImetec®-S for inspection

## 11.0 Disposal

ARImetec®-S testing devices are **B2B products** that are only intended for use in commercial or industrial applications to assess valves and steam traps. Public waste disposal authorities are not responsible for disposing of them. The devices contain batteries that are not allowed to be disposed of as domestic refuse!

**Old devices can be returned to the manufacturer.**

**The cost of shipping the equipment must be borne by the customer.**

## 12.0 Warranty / Guarantee

The extent and period of warranty cover are specified in the "Standard Terms and Conditions of Albert Richter GmbH & Co. KG" valid at the time of delivery or, by way of departure, in the contract of sale itself.

We guarantee freedom of faults in compliance with state-of-the-art technology and the confirmed application.

No warranty claims can be made for any damage caused as the result of incorrect handling or disregard of operating and installation instructions, datasheets and relevant regulations.

This warranty also does not cover any damage which occurs during operation under conditions deviating from those laid down by specifications or other agreements.

Justified complaints will be eliminated by repair carried out by us or by a specialist appointed by us.

No claims will be accepted beyond the scope of this warranty. The right to replacement delivery is excluded.

The warranty shall not cover maintenance work, installation of external parts, design modifications or natural wear.

Any damage incurred during transport should not be reported to us but *rather* to the competent cargo-handling depot, the railway company or carrier company immediately or else claims for replacements from these companies will be invalidated.



### **Technology for the Future. GERMAN QUALITY VALVES**

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