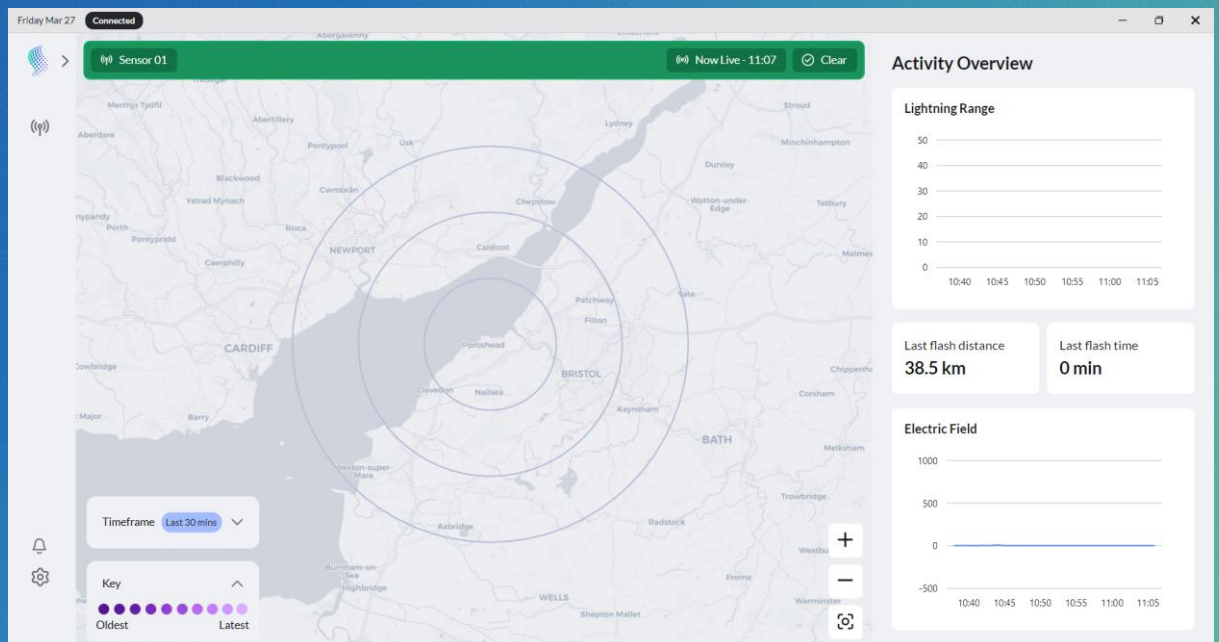


OPERATING MANUAL

Lightning Eye

Lightning Warning System

User Interface



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General Information

Lightning Eye Description

The BTD-1 Lightning Warning System detects the presence of lightning flashes within 83km (53 miles) of the sensor and warns of the potential for overhead lightning even before the first lightning flash occurs. The Lightning Eye software provides a User Interface for displaying information and operating the sensor. A server directly interacts with the sensor, connecting to clients via IP based communications. A client may be run local to the server, or remotely if a network connection exists. Use of internet connectivity allows for BTD systems to be observed around the globe.

Prerequisites

The following is required for operation of the Lightning Eye Software:

- BTD-1 connected to a workstation
- A workstation running Windows 10/11
- Lightning Eye Full Install.zip
- Lightning Eye Licence (stored on BTD-1)



NOTE:

The Lightning Eye Software is not compatible with 32-bit computers.

Customer Satisfaction

At Senseca we set our standards high and only your complete satisfaction is acceptable to us. If you believe your experience has not met these standards, we would be grateful if you would contact us, so we can discuss any issues you may have. We are also pleased to hear of any positive experience.

Lightning Eye Licence

The Lightning Eye software remains the property of Senseca and is protected by appropriate copyright law and international treaty provisions. The Licensee is granted the right to use the software, but not to de-compile or to in anyway alter the composition of the software. The software contains information of commercial value and worth to Senseca.

Data Privacy

The Lightning Eye software has no data privacy implications. Users are responsible for managing their own data regarding custom user creation.

1 Lightning Eye Software

1.1 Introduction

The Lightning Eye software allows users to interact with the BTD.

The Lightning Eye software has three parts, a server which runs in the background to communicate with the BTD, a server UI to configure server, and a client to view or control the system. The client can be run on any computer connected to the server computer via a network, this includes over the internet.

The information provided in this manual describes how to install and operate the software.

The Lightning Eye software requires a licence which can be purchased from Senseca UK.

1.2 Installation

The installation of the Lightning Eye software is split into two parts:

- Server Installation
- Client Installation

Each of the installers are located in the Lightning Eye Full Install.zip folder found on the BTD-1 product page. Download the zip file and extract the contents.

Prior to installation ensure any previous versions have been uninstalled.

1.2.1 Installing Lightning Eye Server Software

The server must be installed on the computer that is connected to the BTD.

To install the Lightning Eye Server software, follow the steps below:

1. Double click on the **Lightning Eye Server Setup** application to start installation.
2. To install the server software, you must accept the End User licence terms and conditions. Please read the licence terms and check the agree box to proceed with installation.
3. When the software has successfully installed you will see the following window. The software is now running and will start automatically whenever the computer is started.

Note, the server starts as a Windows Service.

1.2.1.1 Uninstalling the Lightning Eye Server Software

To remove the Lightning Eye Server software, select Programs and Features in your computers Control Panel. Locate the Lightning Eye Server entry in the list and click on it. Use the Uninstall option at the top of the list to remove the server software.



Note:

Uninstalling the Lightning Eye Server will permanently delete all saved thunderstorm data.

1.2.2 Installing the Lightning Eye Client Software

The Lightning Eye Client may be installed on the same computer as the server, or a computer which is connected to the server computer over the network. This may be a local network or can be over the internet provided both computers have internet connectivity. To install the Lightning Eye Client software, follow the steps below:

1. Double click on the **Lightning Eye Client Setup** application to start installation.
2. To install the client software, you must accept the End User licence terms and conditions. Please read the licence terms and check the agree box to proceed with installation.
3. When the software has successfully installed you will see the following window and the Lightning Eye Client program icon will be added to the desktop and start menu.

The software is now ready to use.

1.2.2.1 Uninstalling the Lightning Eye Client Software

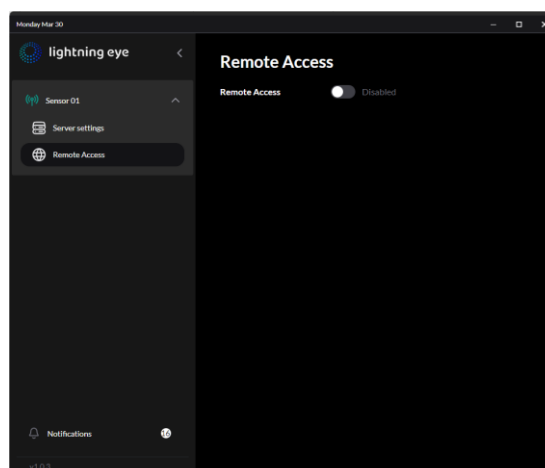
To remove the Lightning Eye software, select Programs and Features in your computers Control Panel. Locate the Lightning Eye Client entry in the list and click on it. Use the Uninstall option at the top of the list to remove the client software.

1.3 Operation

The Lightning Eye software package can be used both as a standalone system and as a remote monitoring system. When used on a local desktop or within a local network, the software shall startup and seamlessly open on the main page by default. Remote connections from the client to the server require a login, see section 1.3.6. Note, a remote subscription is required for remote connections, contact Senseca for details.

1.3.1 Sever Setup

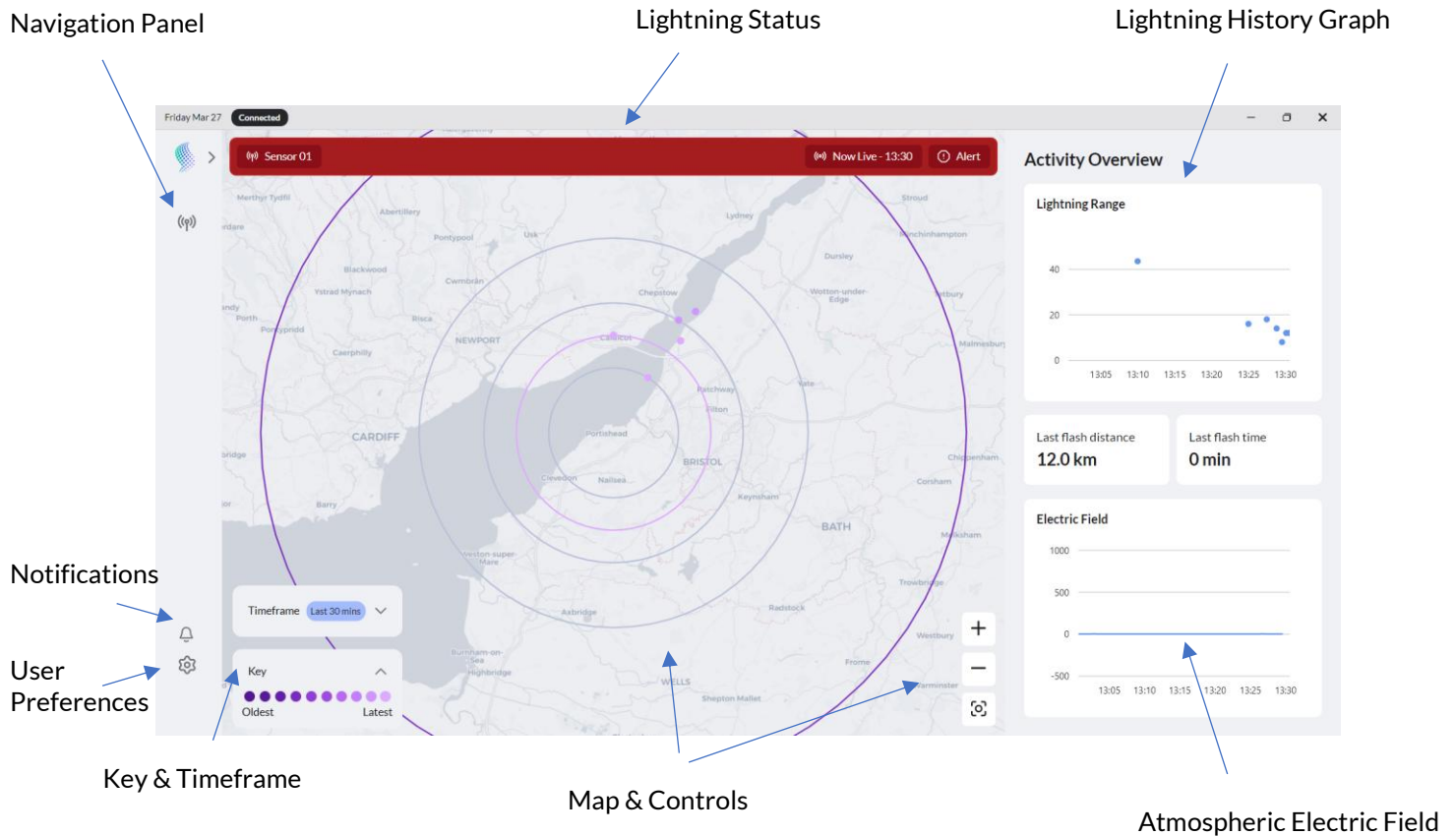
If using a local setup, the server shall run automatically in the background as a service. Running the Lightning Eye application loads the UI for the server. If a remote subscription has been purchased, it is possible to enable remote access through the UI:



Note, a BTD-1 must be connected for this page to be visible.

1.3.2 Main screen

By default, a standalone or local system shall navigate to the home page automatically unless the admin/local user password has been changed. For remote connections, the sensor serial number, username and password must be provided prior to accessing the main screen.



1.3.2.1 Lightning status

The Lightning Status bar is easily visible from the main page. There are four levels of activity:

- All clear (Green)
- Caution (Blue)
- Warning (Amber)
- Alert (Red)

The levels of perceived risk are in descending order, alerting being the highest level of risk. The alert levels are tied to various features of thunderstorm activity. For further information on configuring the perceived risk level see section 1.3.2.1.

1.3.2.2 Lightning Map

The Lightning Map displays the lightning activity in the area. The location is automatically updated from the location of the BTD. Where a direction finder is fitted to a BTD and identifies a bearing, a dot will be placed on the map. For flashes without a direction, a circular band shall be drawn at the relative range. The configured range bands correlating to the Lightning Status are shown by faint circles.

It is possible to change the Timeframe in which the flashes are shown on the screen, with the colour change between old and new flashes indicated by the Key.

For sensors with the extended range module licenced, lightning shall be shown up to 83km, for default sensors, lightning shall be shown up to 35km. The user can zoom in/out using the map controls.

Note, for a map to be displayed, an internet connection is required.

1.3.2.3 Lightning Activity Graphs

On the right-hand side of the display, there is a Lightning History graph, and a background Electric Field graph. Both graphs adhere to the Timeframe selected. The Lightning History graph provides a quick visual indication of approaching storm cells. The background Electric Field graph provides a unitless display which relates to the amount of atmospheric charge activity nearby the sensor. For example, if a cumulonimbus cloud is overhead the activity will increase.

1.3.2.4 Notifications

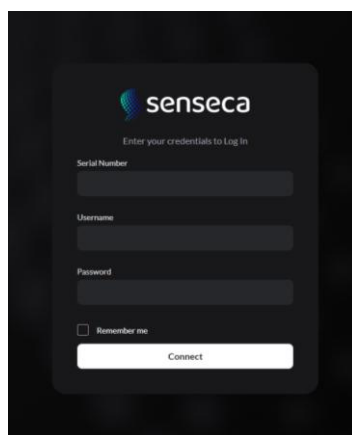
Notifications shall be visible to the user in the main page. Notifications detail system issues, for example, if a site calibration is failing due to an incorrect siting/ground of the sensor. Refer to the BTD-1 user manual for further information regarding any notifications.

1.3.2.5 User Preferences

The user preferences section allows for individual preferences of the Lightning Eye Client and has no effect on the sensor configuration.

1.3.3 Remote Users/Login Credentials

The Lightning Eye Client may request login credentials. This is for either remote users, or if the default username/password configuration has been changed. Details of the login can be found from the system owner.



If the “remember me” is selected, the system will attempt to log back in automatically next time the client is started. To change to a different sensor, you can Log Out from the Client.

1.3.4 Lightning Setting

The lightning settings tab allows for the user to customise the behaviour of the BTD-1 from default. This page is only available to administrators.

Lightning settings Sensor 01

Fine-tune system response and alert thresholds for lightning detection.

Range Settings Pre-Warnings Severe Storm Settings System Levels Relays

Lightning Range Severity
Define distance zones for lightning detection sensitivity.

Range	Status	Radius
Range 1	Alert	8 km
Range 2	Warning	16 km
Range 3	Caution	24 km
Range 4	Clear	83 km

Ranges Preview

Diagram showing concentric circles representing the detection ranges, labeled 1, 2, 3, and 4.

Buttons: Cancel Save

1.3.4.1 Range Settings

This page allows the user to adjust the Lightning Status response to lightning in the vicinity of the BTD-1. The four levels are selectable, and the range for each level is adjustable. Note, the range bands are not allowed to overlap.

1.3.4.2 Pre-warnings

The BTD-1 can pre-warn of lightning activity as it monitors the background electric field variance. It is possible to tune the sensitivity of the BTD-1 to tailor the response to risk. For example, a site which cannot tolerate any lightning risk may choose to assign the pre-warnings to a higher risk state (e.g. Warning). Adjusting the electric field threshold to a lower value increases the sensitivity of the BTD-1.

1.3.4.3 Severe Storm

The detection efficiency of the BTD-1 allows for the sensor to be used to monitor for severe storms. Severe storms may include damaging hail and strong downdrafts. It can be used as an indicator to take preventative measures. The severity, range, and flash rate of the severe storm feature is adjustable.

1.3.4.4 System Levels

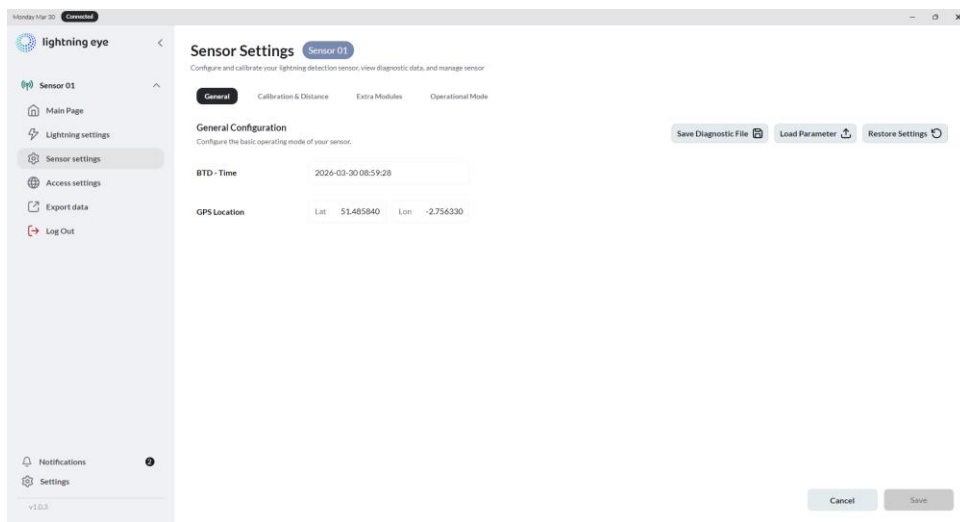
It is possible to adjust the sensitivity and longevity of the Lightning Status levels. Each level can be tuned for the persistence time, and how many triggers are required to active the level. An individual flash counts as a trigger, or each 2 second data broadcast where a related feature is active.

1.3.4.5 Relay Settings

The relays inside if the BTD-1 can be adjusted to suit the users need. Each relay can be configured to follow a set trigger, and it is possible to prevent the relays from switching during unsociable hours using the inhibit relays function.

1.3.5 Sensor Settings

The sensors settings tab details any other sensor information that is not relevant to the lightning activity. The sensor settings are only available to administrative accounts.



1.3.5.1 General

The BTD-1 time and date as well as GPS location is provided in this section.

It should be noted that the following options should only be used when instructed by Senseca:

- Save Diagnostic File
- Load Parameter
- Restore Settings

1.3.5.2 Calibration and Distance

The calibration and distance tab allows the user to adjust the flash correction factor of the BTD. See section 2 for more details.

1.3.5.3 Extra Modules

Where extra modules have been activated, they are listed under the extra modules tab. If additional modules are purchased after the initial BTD-1 purchase, the licence code may be entered here. For a full list of extra modules, please contact Senseca.

1.3.5.4 Operation Mode

The BTD-1 may be placed into a maintenance mode for cleaning. The maintenance mode temporarily (5 minutes) prevents flashes from causing alarms. Note, the sensor is not operational during the maintenance mode period.

Where a flash signal generator has been installed into the BTD-1, the FSG command shall begin a sequence of flashes to check the hardware is functioning correctly.

1.3.6 Access Settings

The access settings page details the connection to the Lightning Eye Server, as well as the status of the BTD-1 connection to the server. The User Management tab allows for user credentials to be created/modified. This page is only visible to administrators.

The screenshot displays the 'Access Settings' page for 'Sensor 01'. The left sidebar contains navigation links: Main Page, Lightning settings, Sensor settings, Access settings (selected), Export data, and Log Out. The main content area is titled 'Access Settings' and includes a 'User Management' tab. Below this, there are sections for 'Default Accounts' (Pre-configured System Accounts) and 'Custom Accounts' (User-created Accounts for Remote Access). The 'Default Accounts' section shows two accounts: 'Admin' (Username: Admin, Password: [masked], Type: ADMIN, Access: Local) and 'Local' (Username: Local, Password: [masked], Type: USER, Access: Local). The 'Custom Accounts' section shows one account: 'Sue' (Username: Sue, Password: [masked], Type: ADMIN, Access: Both). A search bar is present above the custom accounts, and an 'Add' button is in the top right corner of the custom accounts section. The bottom of the page shows 'Notifications' and 'Settings' icons, along with the version number 'v1.0.3'.

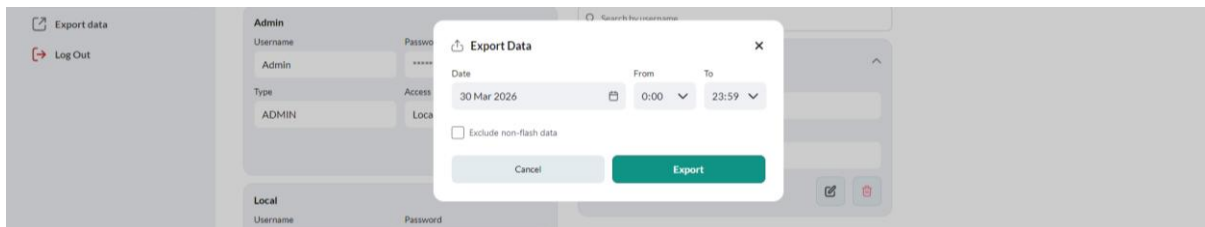
By default, there are two preconfigured user accounts, the Admin and Local accounts.

The client attempts to automatically log in under the Admin account before retrying under the Local account. If the default password has been changed the login page is shown to the user.

Additional accounts can be created to manage separate users/groups. Note, where remote access has been enabled on the Server, the access group can be specified as remote only, local only, or both.

1.3.7 Export Data

The export data feature allows the user to export a complete Data Log from the sensor. To prevent an overload of non-flash information, it is possible to restrict the output to include only flash related information.



Refer to the BT-D-1 user manual to decode the exported data.

2 Adjusting the Flash Correction Factor

If the BTM is installed at a different height than recommended, on the roof of a building or close to tall objects, the lightning distance reported by the detector may be inaccurate. If you notice a systematic difference between actual distance to a storm and distance reported by your BTM, you will need to re-calibrate the detector by entering the actual and reported distances to lightning in the Calibration & Distance section of the Sensor Settings tab.

2.1 Finding the Actual Lightning Distance

There are several options to independently find the actual distance to lightning, some of the best are detailed below. You can find the lightning distance reported by the BTM for each flash in the Activity Log section of the Main tab or in the data export.

For all the methods discussed below, to increase confidence of the comparison distances, it is best to compare many flashes and find a typical distance reported by the BTM and the independent method. Always make sure that you are comparing lightning flashes detected by the BTM and an independent method which occurred at the same time.

Note, lightning can and typically does occur over many kilometres for a single flash. Due to differing methods of detection between the BTM and radio-based systems it is not expected the data will precisely match between these two systems. The BTM sensors are known to pick up low strength activity such as upstreamers from large structures which can be mistaken for false-positives against less sensitive networks. Therefore it is vital to select data where the thunderstorm is detected by both methods.

2.1.1 National Lightning Location Network

Lightning detection by a national lightning location network is usually the best option for locating lightning flashes as you can see individual flashes in near real-time. This service can normally be found on your national weather service website or good quality lightning data sites such as www.lightningmaps.org.

Identify individual flashes that are shown by both the BTM and the lightning location network and record the distance reported by the BTM and the distance from the BTM to the flash as shown on the lightning location network. For best results choose a small, localised storm and average the BTM distance and lightning network distance for several flashes.

2.1.2 Visible Lightning

When using this method ensure you are adequately protected from lightning.

If lightning is within about 10 km you should be able to see the lightning flash and hear the thunder, especially at night. To determine the distance to the lightning flash, measure the time between seeing the flash and arrival of thunder, in seconds. Divide this time by 3 to find the distance to lightning in kilometres (divide by 5 for miles). For each measured flash record the distance reported by the BTM. As before average the distances you calculated and those reported by the BTM over several flashes for best results.

You will find this process easier if you choose a storm that is not too active, so that you do not confuse individual lightning flashes. Avoid using nearby flashes, closer than 5km, as it is hard to accurately measure the time in such cases.

2.2 Entering the Site Correction Factor

In the Calibration & Distance tab, enter the actual distance of lightning as found by one of the methods described above. In the Reported Distance box, enter the distance reported by the BTD for the same lightning activity, using the same units as for the actual distance (e.g. kilometres). Click on the Calculate button to complete the process. Check the value in the Flash Distance Correction box has changed. The BTD has now been re-calibrated to measure the correct distance for your site.

NOTES

WARRANTY

The manufacturer is required to respond to the "factory warranty" only in those cases provided by the Consumer Rights Act 2015. Each instrument is sold after rigorous inspections; if any manufacturing defect is found, it is necessary to contact the distributor where the instrument was purchased from. During the warranty period (12 months from the date of invoice) any manufacturing defects found will be repaired free of charge. Misuse, wear, neglect, lack or inefficient maintenance as well as theft and damage during transport are excluded. Warranty does not apply if changes, tampering or unauthorized repairs are made on the product.

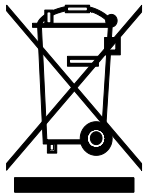
The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product.

TECHNICAL INFORMATION

The quality level of our instruments is the result of the continuous product development. This may lead to differences between the information reported in the manual and the instrument you have purchased.

We reserve the right to change technical specifications and dimensions to fit the product requirements without prior notice.

DISPOSAL INFORMATION



Electrical and electronic equipment marked with specific symbol in compliance with 2012/19/EU Directive must be disposed of separately from household waste. European users can hand them over to the dealer or to the manufacturer when purchasing a new electrical and electronic equipment, or to a WEEE collection point designated by local authorities. Illegal disposal is punished by law.

Disposing of electrical and electronic equipment separately from normal waste helps to preserve natural resources and allows materials to be recycled in an environmentally friendly way without risks to human health.



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