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WETZLAR

Data Logger DALO
and
Evaluation Software
for the
Respicon TM / Respicon 2 TM

Operating Instructions

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General Remarks

Congratulations on your decision for a high-quality product of the Helmut Hund GmbH, Wetzlar. Our name represents long-time experience and excellence in the development and production of dust monitors and their accessories.

Please compare the delivery carefully with the delivery note, the packing note or the invoice. Please keep a copy of these documents together with this manual for future reference regarding additional information, available accessories, or service works. This will give you quick access to the date and the extent of delivery.

Please make sure that no small parts remain in the packing material!

Please be informed that our systems are adjusted and centred in the factory. They are ready-for-use immediately after installation.

Please read this manual carefully before you set the instrument in operation. We recommend that you keep this manual together with the instrument for quick reference.

Symbols used throughout this manual

Special remarks in this manual are indicated by one of the following symbols:

⚠	Safety remark
ⓘ	Caution! Faulty operation may lead to damage of the device and/or its accessories!
⚡	Danger! Hazardous voltages!
!	Explaining remark

1. Data logger DALO: Overview

1 Connectors   **4** LED: status

2 Touchscreen display   **5** LED: charging

3 'On' switch

2. Setup and installation

The data logger DALO is shipped in a secure packing. Please make sure that the delivery is complete and that no transport damage has occurred.

In case of complaints, please contact the Helmut Hund GmbH, Wetzlar, Germany, or the supplier immediately.

!	The data logger is **shipped** with a **fully charged battery**.

!	During shipment, the display of the data logger is protected with an adhesive foil. Please remove this foil before you set the DALO in operation.

!	**Please do not connect the data logger with your PC yet! Please note that the device can only be operated in a Microsoft Windows™ environment. We do not guarantee operation with other operating systems or in virtual machines!**

- Insert the software CD into the CD/DVD drive of your PC. Start the Windows Explorer, switch to the CD/DVD drive and start the installation of the transfer and evaluation software by clicking 'setup.exe'. Simply follow the on-screen instructions, all drivers and software components are installed automatically.

!	**You need administrator rights on your PC to install the software drivers!**

- Now, connect the four-pin connector of the DALO via the supplied USB cable with your PC (Fig. 1). Please make sure that the cable is firmly screwed into the connector.

!	Do not cant the **USB cable** in the connector! This may result in **damage** to both **cable and connector threads**!

!	The DALO comes with a **USB power and charging unit**, with which the battery can be charged without a PC.
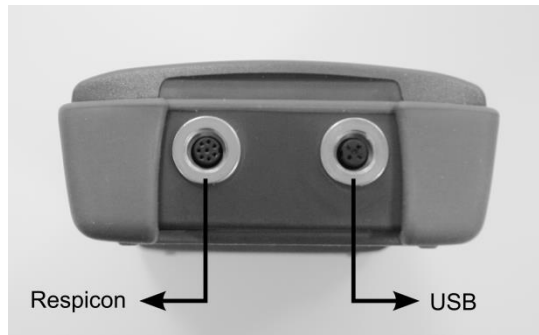
Fig. 1: DALO connectors. Left: connector for Respicon head, right: USB connector.

- The DALO does not automatically switch on after it has been connected to the PC. However, the charging LED on the front panel lights up.

!	The **charging LED** glows **green** as long as the battery is being charged. It goes out when the battery is fully charged.

- Switch the DALO on by pressing the 'On' switch.

- During initialization, the status LED lights up in red while the PC automatically connects to the DALO via USB. When the connection has been established, the status LED will switch to green.

!	In case your PC is not connected to the Internet, the drivers for the setup of the virtual COM ports can also be installed from the software CD.

- In your Windows environment, open the control panel and click ‚Device Manager'. Select 'Ports (COM & LPT)'. This will display a list which contains the entry „USB Serial Port (COM XX)" with XX as a one- or two-digit number. Please write this number down. Figure 2 shows an example in which the DALO was found on COM3, this number can be different for your system!

Fig. 2: Example: entry of the virtual COM port (in this example COM3) in the Windows Device Manager of a PC named 'orifice'.

- Launch the transfer and evaluation software 'Respicon2 TM Dust Analysis Software'.
- In the menu bar, click 'Dalo – Settings' or the symbol 'Settings' in the tool bar. The 'Settings' window opens (Fig. 3).

- In the dropdown menu „Port name", select – unless not already set automatically – the DALO COM port. If it is not listed yet, click 'Update' first.
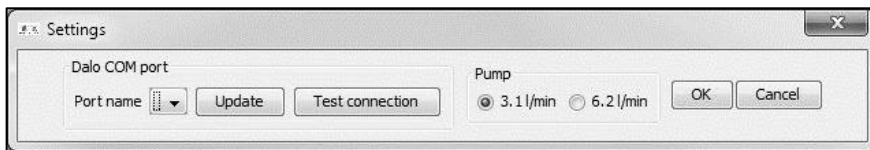
Fig. 3: Window 'Settings'.

- Click 'Test connection'. If operational, the system responds as in Fig. 4. Confirm by clicking 'OK'.

Fig. 4: Software response after positive test connection to DALO, in the example with serial number 10005 and for firmware version 1.3.

The transfer and evaluation software is now installed and operational.

3. Using the DALO

After the short boot sequence is finished, the screen shows the main menu (Fig. 5). From here, the operator can parameterize the DALO or start and stop measurements.

Abb. 5: DALO main menu.

The upper section of the display shows the current date and time and also a battery symbol for the charging state of the battery. In case the DALO is powered via a USB cable, the battery symbol will contain a jagged line (Fig. 6). The following section gives the number of stored measurements and the remaining memory in the format [days].[hours]:[minutes]:[seconds] for a measurement rate of 1 s. For technical reasons, this display value is limited to a maximum value of 9.23:59:59 (almost 10 days).

3.1 Submenu „Start measurement"

Selection of 'Start measurement' switches to a submenu that reminds the user in yellow writing that the sampling pump of the Respicon has to be started prior to the measurement. The button 'Start now' starts the measurement, 'Main menu' returns to the previous screen.

3.1.1 „Start measurement"-„Start now"

Besides the status message 'Meas. active' or 'Meas. finished', this screen shows the selected measurement period and the remaining storage capacity (Fig. 6).
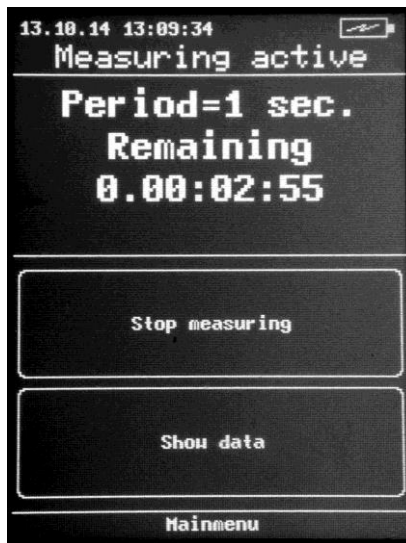

Fig. 6: Menu „Start measurement"–„Start now".

'Stop measurement' finishes the measurement immediately, 'Show data' displays the measurement values. When a measurement is finished before the first measurement interval has passed, an empty file will be displayed in the download dialog of the evaluation software.

3.1.1.1 „Start measurement"-„Start now"-„Show Data"

If the user sets the mode of operation in 'Extras'-'Config 1'-'Mode' to 'TM3F', the screen shown in Fig. 7 is displayed. Here, the measurement values can be displayed either as the raw output voltages of the three photometers ('Voltage') or the mass concentrations ('Concentration') as calculated with the chosen calibration factors. It is also possible to display curves instead of numerical values, e. g. to find contamination sources. (Fig. 8).

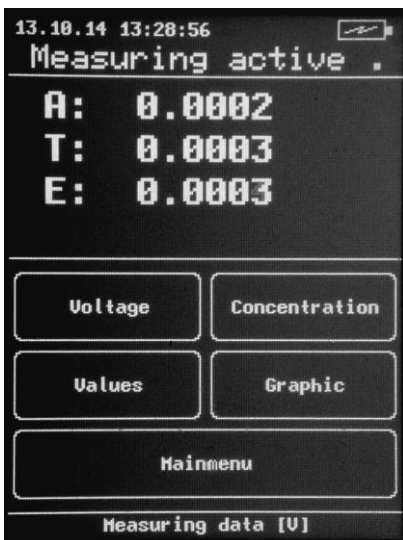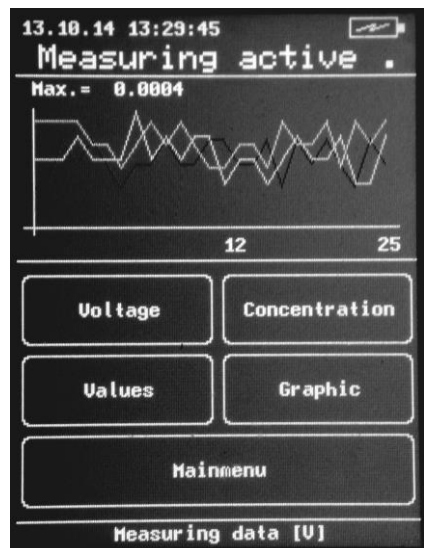**Fig. 7:** Submenu 'Show data': numerical values.

Abb. 8: Submenu 'Show data': curves.

If the user sets the mode of operation in 'Extras'-'Config 1'-'Mode' to 'Data logging', the DALO displays the four voltages recorded in the input channels 1 – 4.

!	When a measurement is finished, the display stops at the last measured value. From here, you can only return to the main menu.

!	Touching the "Curves" button during a measurement will stop the display, but not the measurement itself. Typing "Curves" again will continue the curve.

3.2 Menu „Show data"

Selecting this option jumps to the same screen as described in Section. 3.1.1.1.

3.3 Menu „Meas. zero value"

Prior to any measurement, the zero value has to be determined. The Respicon must be equipped with the zero-measurement adapter by which clean air is pumped into the instrument.

The display of the DALO reminds the user to start the sampling pump. After a 120-second cleaning phase, the 60-second zero measurement is carried out.

The zero measurement can be finished with 'Cancel', old zero values can be deleted with 'Clear offset values'.

3.4 Menu „Extras"

!	**The DALO is switched off via the menu entry 'Shut down', NOT by pressing the 'On' switch! This prevents the DALO from being unintentionally switched off during a measurement.** **However, it is possible to restart the DALO in case of a system crash by keeping the 'On' switch pressed for about 15 s.**

The submenu 'Extras' branches out into three menus that allow different configuration settings.

3.4.1 Submenu „Config 1"

Bluetooth:
- Activate Bluetooth
- Deactivate Bluetooth

!	In order to transfer the measurement results via Bluetooth, a desktop PC requires an external USB Bluetooth adapter while notebook PCs usually come with an internal Bluetooth adapter. Install the external adapter (not part of the scope of delivery) according to the manufacturer's instructions. When this installation is accomplished, you will find the Bluetooth symbol in the Windows system tray (on the bottom right of the Windows task bar). Activate Bluetooth in the DALO menu and click on the Bluetooth symbol in the system tray. Select "Add Bluetooth Device" and subsequently, the respective DALO. Connect the device by typing the pairing code "1234". Then, start the PC software and proceed as with a USB cable connection, i.e., by choosing a valid COM port.

Mode of operation:
- Data logging
- TM3F mode

Logging:
- Log single values
- Log average values

Brightness:
Sets the display brightness to a value between 10 % and 100 %. The numerical value must be confirmed with 'OK'.

!	All submenus display the actually set value in the top portion of the screen. At the bottom of the screen, the allowable range of values is shown.

3.4.2 Submenu „Config 2"

Date:
Sets the date in the format dd:mm:yy. Must be confirmed with 'Ok'.

Time:
Sets the time in the 24-hour format hh:mm:ss. Must be confirmed with 'Ok'.

Auto off:
Sets the time (in minutes) after which the DALO switches off when idle. A value of '0' switches this function off. Must be confirmed with 'Ok'.

Backlight off:
Sets the time (in seconds) after which the DALO switches the display off when idle. A value of '0' deactivates this function. Must be confirmed with 'Ok'. The screen is reactivated by pressing the 'On' switch.

!	When the backlight is switched off, the touchscreen is locked. In order to avoid unintentional inputs during a measurement, the time should be set to a very short interval.

Language:
Switches the display language from German to English or vice versa.

!	All submenus display the actually set value in the top portion of the screen. At the bottom of the screen, the allowable range of values is shown.

!	**In case of an input error, the status LED blinks red.**

3.4.3 Submenu „Config 3"

Clear flash:
Deletes all measurement values.

Cal. A / Cal. T / Cal. E:
Input of a known calibration factor (in mV/mg/m³) for the respirable (A), thoracic (T) and inhalable (E) dust fractions. The user may store one set of calibration factors for each of the two Respicon models (flow rate 3.1 l/min. or 6.2 l/min, respectively).

3.5 Menu „Settings"

Sampling time:
Sets the sampling time in the format d.hh:mm.ss. Must be confirmed with 'Ok'.

Period:
Sets the measuring period (in seconds). Must be confirmed with 'Ok'.

User:
Input of the name of the user/measurement technician. As the screen does not display a complete keyboard, the input ranges must be switched with the 'Right Arrow' button.

Location:
Input of the measurement location. As the screen does not display a complete keyboard, the input ranges must be switched with the 'Right Arrow' button.

Remark:
Input of a remark. As the screen does not display a complete keyboard, the input ranges must be switched with the 'Right Arrow' button.

Pump:
Input of the total volume flow of the sampling pump. For the Respicon TM, the option '3.1 liters pump', for the Respicon 2 TM, the option '6.2 liters pump' must be selected. The numerical values on the buttons correspond to the volume flows in l/min.

!	All submenus display the actually set value in the top portion of the screen. At the bottom of the screen, the allowable range of values is shown.

4. Transfer and evaluation software

After the installation of the software, the main window opens (Fig. 9).

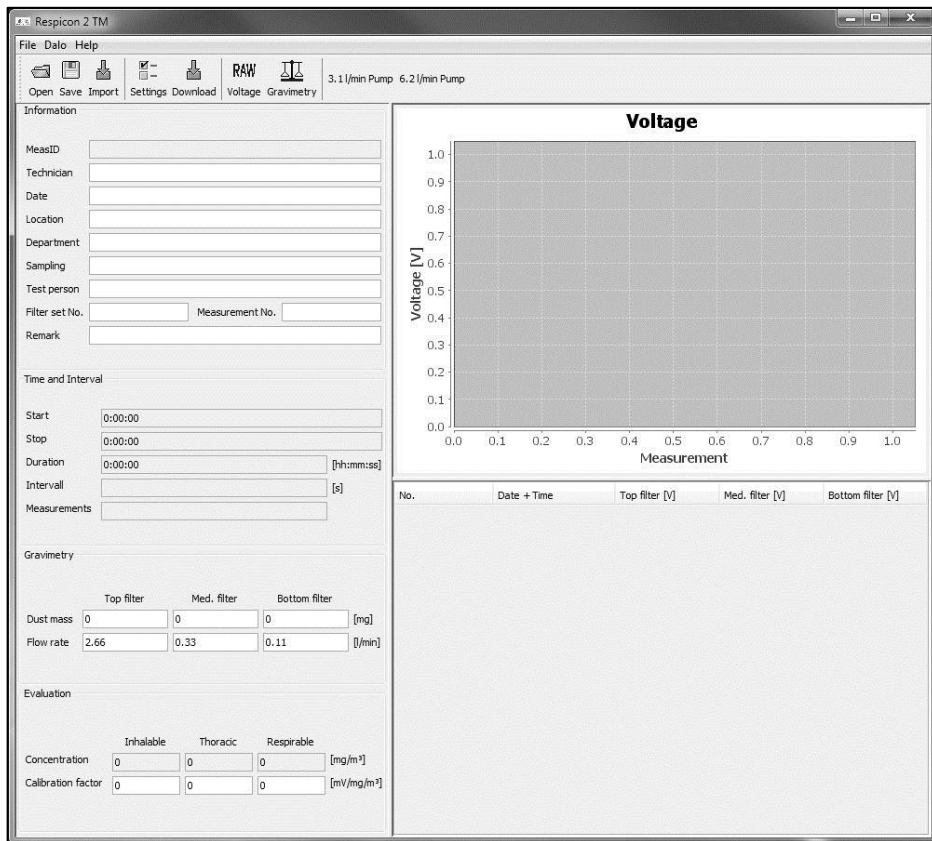**Fig. 9:** Main window of transfer and evaluation software.

The software transfers RES files from the DALO to a PC and allows the user to store them, e. g., on a hard drive. This file format contains both the output voltages and the mass concentrations after the gravimetric evaluation has been performed. The data is basically stored in an ASCII format and may also be imported into Microsoft Excel™.

4.1 Menu bar

File – Open…:
Opens a RES file.

File – Save…:
Saves a RES file.

File – Import…:
Imports a VOL file (old Respicon file format). When a second file is to be imported while another file is still open, the software prompts the question if these new data shall be appended to those already open. This function allows the user to combine several measurements in the case of small dust concentrations.

File - Exit:
Terminates the software.

DALO - Settings:
Sets the correct COM port (Fig. 3) and the total volume flow for the calculation of the mass concentration.

DALO - Download:
Downloads measurement files stored on the DALO. This option opens a dialogue to select the relevant files (Fig. 10). To select a file, click on the respective line in the table and confirm it with 'OK'.
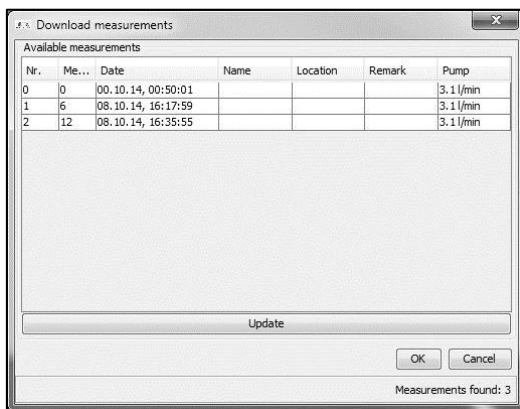

Fig. 10: Dialogue „DALO – Download".

Help - Help:
Displays a short help file (PDF).

Help - About:
Shows Copyright information.

Help - Language:
Selects menu language (German or English).

!	A **change in the menu language** requires a **restart** of the software to become effective!

4.2 Toolbar

File – Open…:
Opens a RES file.

File – Save…:
Saves a RES file.

File – Import…:
Imports a VOL file (old Respicon file format).

Settings:
As in DALO – Settings in the menu bar.

Download:
As in DALO – Download in the menu bar.

Buttons 'Voltage', 'Gravimetry':
Switch fields 'Gravimetry' and 'Evaluation' between the display of photometer voltages or mass concentrations (by employing calculated or preset calibration factors), respectively. The numerical measurement values and the diagramme are switched accordingly.

Buttons total volume flow:
Sets the total volume flow for the correct calculation of the mass concentrations.

4.3 Box „Information"

After a download, the „Information" box displays all information that was typed into the respective fields of the DALO input masks. These data can be edited and/or modified. There are also additional data fields to be freely used for documentation purposes.

4.4 Box „Time and Interval"

The contents of these fields are taken from the data downloaded from the DALO. They cannot be edited or modified.

4.5 Box „Gravimetry"

After the filters from the three Respicon stages have been weighed, the respective masses are typed into the fields 'Dust mass'. Please make sure that the values are given in mg (milligram)!

!	Due to its principle of operation, the Respicon defines a **plausibility criterion for the dust masses**. This criterion is verified while the dust masses are typed and, whenever necessary, the system makes suggests for correct entries. For the plausibility critierion, please refer to the Respicon manual.

The fields 'Flow rate' show the nominal volume flow rates through the three single stages of the Respicon. They can be edited when a flow check results in different values.

4.6 Box „Evaluation"

From the dust masses, the partial volume flow rates and the duration of the measurement, the software calculates the mass concentrations of the inhalable, thoracic and respirable dust fractions. With the average photometer voltages, the calibration factors are determined. As an alternative, predetermined calibration factors (in mV/mg/m³) can be typed into the three fields.

4.7 Diagramme measurement curves

The diagramme shows the time-domain curves of the measurement results. The abscissa, however, is not scaled in time units, but in the sequence of the measurement values. For the option 'Voltage' in the toolbar, the ordinate shows the time-resolved voltages of the three Respicon photometers, for the option 'Gravimetry' the time-resolved mass concentrations of the three dust fractions.

!	**As the mass concentrations of the thoracic and inhalable fractions are calculated from two or three photometer signals, respectively, the trends of concentration and voltage are in general not proportional to each other.**

The legend of the diagramme changes from 'Top/Med./Bottom filter' to 'Respirable/Thoracic/Inhalable' when the the 'Gravimetry' option is activated instead of the 'Voltage' option.

For the evaluation of interesting details of the diagramme, the zoom function can be activated by clicking into the diagramme with the left mouse button, and drawing a frame around this position (Fig. 11). Zooming out is achieved by clicking with the left mouse button into the diagramme and moving the mouse pointer from bottom right to top left.

Clicking with the right mouse button into the diagramme area opens the context menu. The menu items are:

Properties:
Customization of diagramme properties like title, axes and outline. Also, an smoothing option for the measurement curves can be activated/deactivated.

Copy:
Copies the diagramme to the clipboard.

Save as:
Saves the diagramme as PNG, SVG or PDF file.

Print:
Prints the diagramme.

Fig. 11: Zooming into the diagramme by drawing a frame.

Zoom In/Zoom Out:
Customizes the display detail manually, either for both axes or for domain and range axis.

Auto Range:
Automatically sets the display range, either for both or for single axes (domain/range axis).

4.8 Table measurement values

Depending on the option chosen in the toolbar, the table contains the photo-meter voltages or the calculated mass concentrations.

When the user clicks one particular point in the diagramm with the left mouse button, the corresponding line in the table is highlighted.

5. Maintenance

	Danger! Hazardous voltages! The DALO does not contain user-serviceable parts. In case of damages or technical problems, please contact our **Technical Service**!

6. How to keep the DALO clean

External contaminations can be removed with a soft cloth, slightly moistened with water or alcohol.

Technical data, environmental conditions

USB power supply:	100 V … 240 V AC (1 A max.), 50 … 60 Hz, Output: 5 V / 2.1 A (10.5 W max.), adapter set for connectors EU/GB/ US/CN
Input channels:	Mode TM3F (Respicon): 3, Mode data logger: 4
Interfaces:	USB, Bluetooth
Display:	Touchscreen 8.1 cm- (3.2"), resistive
Storage capacity:	about 6 days (meas. period 1 s), max. 9 days (for longer periods)
Charging time:	about 6 h
Operating time (fully charged):	about 8 h
Min. system requirements:	PC with Windows 7 or Windows 8.1, dual-core processor, 2 GB RAM, hard drive with 200 MB free memory, 1 free USB or Bluetooth interface
Dimensions (L x W x H):	185 mm x 100 mm x 40 mm
Accessories:	Leather carrying case
Temperatur range:	5 °C ... 40 °C
Rel. humidity:	max. 80 % up to 31 °C, lin. decreasing, max. 50 % at 40°C
Allowable supply voltage fluctuations:	max. $\pm$10 %

Safety remarks

The data logger DALO including its power supply conforms with the safety regulations for electrical measurement devices and was supplied to the customer in technically flawless condition.

To assure proper function of the device, the user is obliged to follow the instructions and recommendations contained in this manual.

The DALO must only be employed according to the determination as given in this manual.

All maintenance and repair must only be carried out by qualified personnel authorized by the Helmut Hund GmbH or by the manufacturer's Technical Service Department.

All spare parts delivered for and accessories to be employed with the device must be approved by the Helmut Hund GmbH.

Prior to every use of the DALO, check the power supply cable for possible damages. In case of any obvious defect to the cable, it must be replaced immediately.

In case of doubt, please contact our nearest representative or the Helmut Hund GmbH directly.

⊘	In case of disregard of the safety remarks, proper function and device safety cannot be guaranteed any more. Should such disregard lead to any damage of the device and its accessories and/or to further damage to property or persons, the Helmut Hund GmbH **cannot be held liable**. **This will also void all warranty claims against the Helmut Hund GmbH, Wetzlar, Germany**!

Device tests

The DALO is tested according to DIN EN 55022.

Declaration of Conformity/CE sign

The CE sign confirms that this instrument complies with the standard DIN EN 55022.

This statement becomes void if the device is modified by unauthorized personnel.

Warranty

The warranty period for HUND dust measuring instruments shall be 12 months from passing of risk.

Parts proven as defective shall be repaired (HUND has three attempts) or replaced by HUND at his discretion and at its own expense. HUND shall not be liable for consequential, indirect or incidental damages, including without limitation loss of profit and production.

The Buyer shall notify HUND in writing immediately on occurrence of a defect informing HUND in detail of the nature and the probable cause of the defect.

Parts subjected to wear and tear, improper use and external factors are excluded.

The warranty period for goods not produced by HUND (goods of trade) will be the period provided by the original manufacturer of these goods.

Waste Disposal Remark

European Union (EU) Waste of Electrical and Electronic Equipment (WEEE) directive

The European Union's WEEE directive requires that products sold into EU countries must have the crossed-out trashbin label on the product (or the package in some cases). As defined by the WEEE directive, this crossed-out trashbin label means that customers and end-users in EU countries should not dispose of electronic and electrical equipment or accessories in household waste. Customers or end-users in EU countries should contact their local equipment supplier representative or service center for information about the waste collection system in their country.