

# Manual Inverter WR 10,5



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## **1. Introduction**

Dear customer, thank you very much for your confidence and the purchase of our product.

Prior to commissioning please read all instructions and indications of this manual attentively.

For an optimal and long-term use please strictly observe the indications related to service and maintenance.

In your own interest we recommend to let perform maintenance and possible repairs by qualified personnel only.

All our machines are subject to permanent further development; thus subject to technical modifications.

## **2. Description**

The WR10,5 has been designed as a small, light-weight and powerful digital voltage supply for industrial use. The small housing dimensions and the low weight minimize transport issues and considerably facilitate set-up of the system in cramped locations.

Due to the freely adjustable maximum output voltage of 24V...65V either standard heating elements with 30V, 42V or 60V or heating elements with intermediate voltage, specially manufactured for your work piece, can be used.

The integrated program controller provides the option to memorize your heating program with up to 49 segments per program.

You can however, even in running operation, modify the program parameters at any time or switch into a manual mode in order to control the heating capacity manually.

During heat treatment process data such as nominal value, actual value, output voltage etc. are automatically recorded in the device digitally.

The maximum recording period is approx. 700 hours at a set recording interval of 5 seconds (factory setting).

The WR10.5 combines program controller, power section and data logger in an outmost compact housing.

The scope of delivery includes software and an adapter cable. The software allows for data transmission from the device to a PC for subsequent evaluation with MS-Excel, OpenOffice or similar and to print them out as spreadsheet or chart.

Prior to shipment, the device has been checked related to its electric functionality and mechanical integrity.

**Upon reception of the device please immediately check functionality and integrity.**

**Verify the flawless condition of operating elements, displays, supply lines and connectors. The device may only be used in perfect condition.**

### 3. Technical Data

<b>Output</b>	
Voltage automatic mode	Adjustable between 24V and 65V in 1V steps
Capacity manual mode	Adjustable between 0 and 100% in 1% steps
Power	Maximum 180A at 60V Maximum 160A at 65V
Output capacity	Maximum 10,8 kW
Connectable load	Resistance heating elements between 24V - 65V
<b>Electric Supply</b>	
Voltage	3~400V, 50/60Hz, $\pm 15\%$
Charging rate / phase	Maximum 23A
Internal / external fuse	25A / 32A
Cable cross-section	min. 4mm <sup>2</sup>
<b>Temperature Logging</b>	
Temperature sensor	Thermocouple Type K
Measuring range	-40...+1350°C
Cold-junction compensation	Integrated
Calibration / adjustment	Thermocouple Type K
Recognition break loop	Yes
<b>Regulation / Control</b>	
Program controller	- Easy Prog - Automatic control according to program profile - Manual setting of output capacity
No. of storable program profiles	47 program (49 segments each)
Program shortcut	No
Program LOOP function	No
Program segment	Ramp: P.End / OFF / 1...9998°K/h Nominal target value: -25...+1200°C Holding time: OFF / 1...9999min
Control range	-25...+1200°C
Control behavior	P I D
<b>Alerts</b>	
Alerts	High / low / band, system alerts
Acoustic alert	Yes, piezo
Alert parameters	High / low / band
System alerts	Program end, Recognition break loop, Internal system errors
<b>Master / Slave Mode</b>	
Maximum number WR10,5 in total	9
Master / slave function	Yes Device address 1 = Master Device address 2...9 = Slave
All devices to be operated by master	Yes, start / stop
<b>Data Logger</b>	
Data logger	Integrated
Memorized process data	SP, PV, output voltage, output current, status bit
Maximum recording period	Depending on recording interval and number of WR10,5 connected
Data secured against voltage drop	Yes
Data transmission to PC	USB adapter cable and software included
<b>Software</b>	
Data archiving as .csv file	Software for data transmission included

Other Properties	
Cooling	Forced cooling, automatic speed control
Integrated safety against	Overheat Overload and short circuit Excess and low voltage on primary side
Environment / Protection Classes	
Protection class	I
Excess voltage category	II
Degree of contamination	2
Protection category housing	IP20
Operating temperature	-20 ... +40°C
Storage temperature	-20 ... +85°C
Humidity	Max. 70% rF, noncondensing
Height	Up to 2000m
Dimensions / Weight	
Dimensions (H x W x D)	370mm x 170mm x 405mm
Weight	18,2 kg
Standards	
LVD, EMC	DIN EN 60950, DIN EN 55011
Labeling	CE

#### 4. Spare Parts and Item Numbers

Item / Identification	Item #
WR10,5	103100
WR10,5 ⇔ USB adapter cable	103900
CD with documentation and software	103901
Bus cable for multi-zone-mode for 3 Inverter WR10,5 (Option)	103902

##### Standard Scope of Delivery WR10,5

1 x Inverter WR10,5  
 1 x Manual, printed  
 1 x CD with documentation and software  
 1 x WR10,5 ⇔ USB adapter cable

#### 5. Notes on Safety



Please observe notes on safety and warnings in this manual!



##### Warning!

Negligence, incorrect installation or handling of this electric device can cause serious health damages and can even be fatal!

Warnings and notes on safety described in this document have to be observed precisely during operation, maintenance and repair of the device!

Upon non-compliance with the warnings and notes on safety described in this document the guarantee claim automatically expires and no liability for damages to persons or objects will be granted by the manufacturer and distributor of the device.

## **5.1 Working Environment**



The device complies with the following classifications:

- Safety class I
- Excess voltage category II
- Degree of contamination II (non-conductive contaminations)
- Areas with restricted access



During operations the output sockets can be energized which can imperil the operator. Make sure to prevent contact with those sockets. Therefore never connect or disconnect a load under tension!

The device may only be operated under the usage conditions indicated by the manufacturer.

**Avoid humid ground and humid or rainy environments.**

**Avoid electrically conductive and/or magnetic dusts.**

## **5.2 Connection Grounding Conductor**



This device complies with safety class I and may only be operated on appropriate connections including grounding conductor.

In any case, a disruption of the grounding conductor has to be excluded as this leads to the potential hazard of electrocution or damage of the device.

Prior to commissioning make sure that device, equipment and work piece are professionally grounded!

## **5.3 Power Connection**

The device is provided for connection to alternate voltage 3 ~ 400V, 50/60Hz and grounded neutral point (TN/TT).

The connections need to be protected.

The voltage source has to be provided with an earth leakage circuit breaker.



Caution!

The device may cause radio frequency interferences!  
In this case the user is obliged to take appropriate remedial measures.

When the device is operated on mobile electricity generation units such as 3-phase alternators, this alternator has to provide at least the 1.2-fold of the input capacity stated on the type plate.

Falling short of this value may cause destruction of the device.

## **5.4 Operating Personnel**

The operator should be qualified and familiar with the effective standards and regulations for the use of this electric device.

Furthermore the user has to strictly observe the effective standards, laws and safety regulations in order to ensure his/her safety and the safety of third parties.

**Prior to commissioning the user should attentively read this manual and make sure that he/her has understood all working steps described.**



**Caution!**

Prior to connect or disconnect a load to/from the device, implicitly switch the device off and disconnect it from power supply for safety reasons!

Prior to switching-on check all cables and the connected load for possible damages such as defective insulations.

Replace defective parts immediately. Only use admitted cables with sufficient cross section.

Make sure that the connectors are not loose-fitting.

Do not lead cables across sharp edges or hot material.

## **5.5 Periodical Checks**



The device and its connections have to be checked periodically and in compliance with the effective directives, safety regulations and standards.

The check has to be performed by persons qualified for this purpose.

The check intervals have to be determined to allow for timely recognition of arising defects in time.

Repairs may only be performed by qualified personnel.

Components with impact to safety may only be replaced by genuine spare parts.



**Warning!**

Prior to perform maintenance and repair works, disconnect the device from mains supply and wait at least two minutes to enable capacitive tensions inside the device to dissipate.

Do not open the device earlier!

**Never operate the device without covering!**

## **5.6 Disposal of Defective Components**



Dispose of defective components or complete devices at collecting points for electric appliances or with the manufacturer.



## **5.7 Risk of Explosion and Fire**



Caution!

For operation place the device on a noncombustible surface.

Make sure that neither supply air nor exhaust air channels are covered.



Observe the general fire protection regulations under consideration of the local conditions.

**Working in areas with inflammable or explosive substances, inflammable or explosive vapors or dusts is strictly prohibited!**

## **5.8 Electromagnetic Fields**



The device can generate magnetic fields that impact the operation of other devices.

If you are using other devices that are sensitive to magnetic fields, do not operate them close to this device.

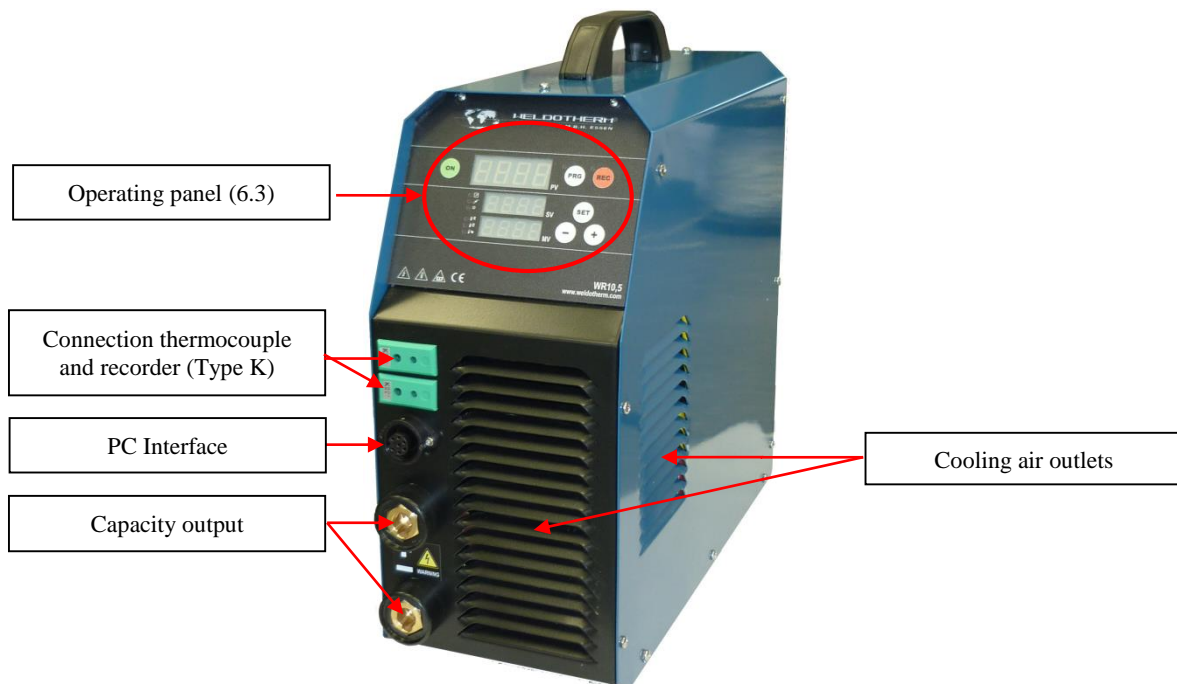


Electromagnetic fields can be hazardous for people with pacemakers, hearing aids or similar devices.

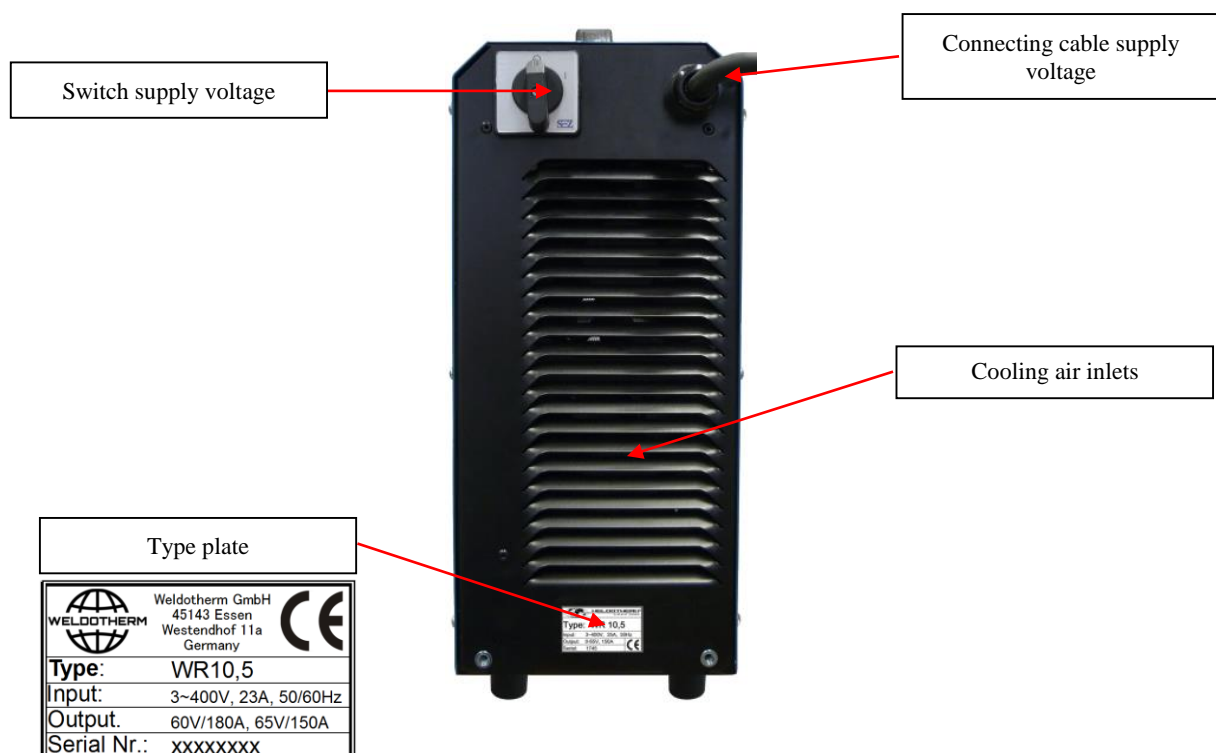
Observe the relevant safety instructions and regulations for the use of these devices.

## 6. Survey Operating Elements and Connections

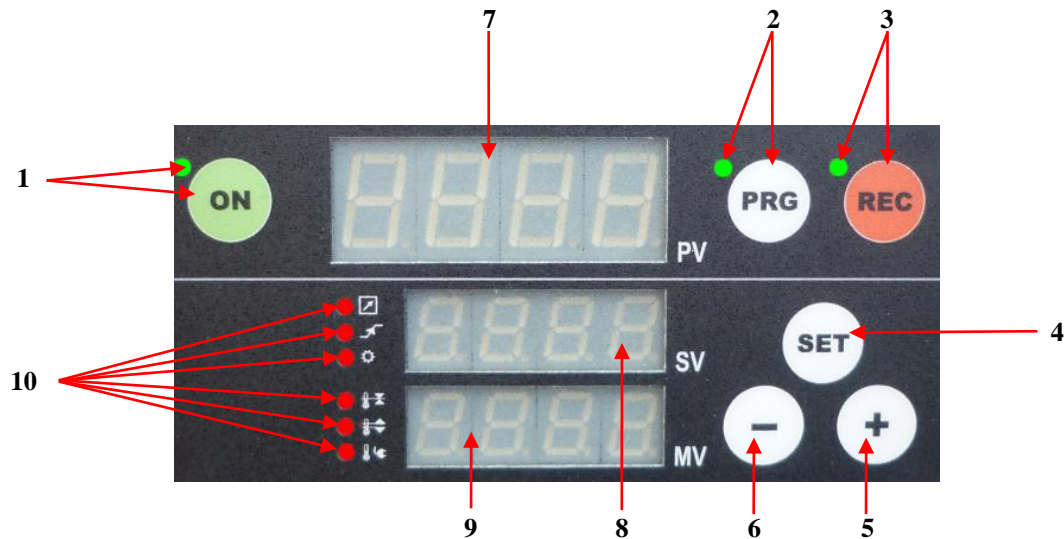
### 6.1 View Device Front (Figure 1)









### 6.2 View Device Rear (Figure 2)



### 6.3 View Operating Panel (Figure 3)



- 1 - Button  and associated LED (green)  
LED off = **Stand-by mode** (7.6). Load output is switched-off  
LED on = **Operating mode** (7.7). Load output is switched-on
- 2 - Button  and associated LED (green)  
LED off = Automatic program flow is switched-off / Manual mode.  
LED on = Automatic program flow is switched-on.  
LED flashes = The running program has been stopped.
- 3 - Button  and associated LED (green)  
LED off = Internal data recording switched-off  
LED on = Internal data recording switched-on  
LED flashes = Data are available for download in the device
- 4 - Button  = Access to menu level  
Take-over of parameter modification  
Acknowledgement of alert Alarm siren  
Display current output voltage and output power (during operation)
- 5 - Button  = Increase value  
Switch to next menu level
- 6 - Button  = Decrease value
- 7 - Display PV = Display current actual value
- 8 - Display SV = Display current nominal value or parameter name
- 9 - Display MV = Display current output capacity (in %) or parameter value

## 10 - Device status and alerts, 6 x LED (red)



- Signalization running communication / device operates in slave mode
- Signalization of a currently processed program ramp
- Signalization Power-Boost mode
- Signalization band alert
- Signalization high or low alert
- Signalization internal device temperature too high or power supply disturbed

## 7. Commissioning

**In order to commission the device it is mandatory to adhere to the order of steps described in the following scheme.**

Step	Short Description	Chapter
1	Check of device, connections and cables Observation of all notes and regulations for safe operation Observation of local conditions	5
2	Environment / Place of Installation	7.1
3	Connection of a Thermocouple	7.2
4	Connection of Output Power	7.3
5	Connection to Mains Voltage	7.4
6	Switching-on Mains Voltage	7.5
7	<b>Performing required settings in user menu Adjusting voltage of the connected heating element (ELEH)</b>	8.2
8	Selecting or entering a program	9.1 – 9.5
9	Starting a Program	9.9

### 7.1 Environment / Place of Installation

The device may only be operated in the provided vertical position.

The ground needs to be sufficiently stable and may not be inflammable.

Make sure that there is a distance of at least 30 cm to all sides in order to provide sufficient air circulation.

The device is implicitly to be protected against humidity, wet conditions and direct solar radiation.

In dusty environments, take appropriate measures in order to prevent that dust can penetrate the device.

Implicitly prevent penetration of magnetic dusts.

The ambient temperature may not exceed +40°C.

## **7.2 Connection of a Thermocouple**

The device is provided with two standard – thermocouple type K sockets that are internally connected to each other.

Connect a thermocouple to a type K socket.

If necessary, you can connect for instance an appropriate type K temperature recorder to the other socket.

For connection always use the matching appropriate plugs.

**Always fix the thermocouple on your work piece prior to inserting the plug into the socket, thus preventing electrical damage of the device by excess voltage caused for example by stud welding devices.**

## **7.3 Connection of Output Power**

The output of the device is intended for connection of resistance heating units such as heating mats, heating boxes, and magnetic preheaters or similar within a range of 24V...65V.

For this purposes it is provided with two standard output sockets.

Connect the sockets to a suitable dual cable where you can connect your heating mats.

Depending on the application of the device several heating units can be simultaneously operated in parallel.

**For this purpose, exclusively use heating elements with homogeneous connection voltage!**

**In no case use heating elements with different connection voltages for this purpose!**

**Prior to process your work piece, the maximum output voltage needs to be preset on the device (e.g. 30 V for one or more 30 V heating elements)!**

**For safety purposes, check this setting of the WR10,5 in the menu *bASI* under the menu item *EL EN* after a translocation and after each anew switching on (via power switch)!**

## **7.4 Connection to Mains Voltage**

**Prior to connect the device to the mains voltage, connect all other components! der**



The device is provided for connection to alternate voltage 3 ~ 400V, 50/60Hz and grounded neutral point (TN/TT).

The connections need to be protected.

The voltage source has to be provided with an earth leakage circuit breaker.

The phases have to be fused with 32A. Device and component have to be earthed!

**The mains voltage connection should only be performed by qualified personnel!**

**An unprofessional connection may cause electrocution or damage of the device!**

## **7.5 Switching-on Mains Voltage**

Switch-on the mains voltage on the mains voltage at the WR 10,5 (at the rear).

**Make sure the device is in stand-by mode (7.6)!**

**If not, immediately switch the device with the button "ON" in stand-by mode!**

### **Background:**

After a disruption of the automatic control or switching-off the mains voltage while a control is active, the inverter may automatically continue to operate after voltage return / mains voltage switch-on (depending on the setting of the parameter *str* in the menu *BSI* ).

**Hence you never should interrupt a running thermal treatment by switching-off mains voltage but always with the button "ON" and switch the inverter to stand-by mode!**

## **7.6 Stand-by Mode**

The LED next to the button "ON" is off



In stand-by mode the power output of the inverter is switched-off.

In this mode you can perform basic settings on your inverter and access the menu levels.

## **7.7 Operating Mode**

The LED next to the button "ON" is on.






































In operating mode the power output of the inverter is switched-on.

## 8. Menu Structure of the Integrated Program Controller (Survey)

For better survey the parameters of the WR10,5 are structured in three menu levels.

The menus and parameter displayed in gray are protected against modification by a password and should only be modified by skilled personnel!!


- Menu **bASI** = Menu for normal users
- Menu **CAli** = Menu sensor input (Menu blocked with **PAS1**)
- Menu **tunE** = Menu internal control parameters (Menu blocked with **PAS2**)



Button	Display		Button	Display		Button	Display
3 Sek 	<b>SEt</b> <b>bASI</b>	>>>	1 x 	<b>SEt</b> <b>CAli</b>	>>>	1 x 	<b>SEt</b> <b>tunE</b>
1 x 	<b>ch</b> <b>I</b>		1 x 	<b>CAli</b> <b>no</b>		1 x 	<b>CJC</b> <b>On</b>
1 x 	<b>zonE</b> <b>oFF</b>		1 x 	<b>FILt</b> <b>00</b>		1 x 	<b>FACt</b> <b>no</b>
1 x 	<b>ELEN</b> <b>24</b>		1 x 	<b>OF5</b> <b>0</b>		1 x 	<b>tunE</b> <b>no</b>
1 x 	<b>ALbA</b> <b>50</b>		1 x 	<b>PAS1</b> <b>1111</b>		1 x 	<b>Pb</b> <b>240</b>
1 x 	<b>ALHI</b> <b>1200</b>		1 x 	<b>Stand by</b>		1 x 	<b>tI</b> <b>400</b>
1 x 	<b>ALLo</b> <b>0</b>					1 x 	<b>tD</b> <b>30</b>
1 x 	<b>r5tr</b> <b>no</b>					1 x 	<b>P.FAC</b> <b>100</b>
1 x 	<b>dAtE</b> <b>12</b>					1 x 	<b>zonE</b> <b>OFF</b>
1 x 	<b>dAtE</b> <b>1207</b>					1 x 	<b>AXLd</b> <b>OFF</b>
1 x 	<b>tME</b> <b>13</b>					1 x 	<b>dI SP</b> <b>Ac.SP</b>
1 x 	<b>tME</b> <b>1347</b>					1 x 	<b>dAtE</b> <b>ddnn</b>
1 x 	<b>Stand by</b>					1 x 	<b>t.rEc</b> <b>5</b>
						1 x 	<b>PAS1</b> <b>1111</b>
						1 x 	<b>PAS2</b> <b>2222</b>
						1 x 	<b>Stand by</b>


## 8.1 Accessing the Menu Level from Stand-by Mode

To access the menu level, the device must be in **stand-by mode** (7.6).

Push and hold the button  for approx. 3 seconds.

Within the menu, switch to the next parameter with the button .

Modify parameter values with the buttons  and .

A modification is saved automatically by pushing  again after modification.

## 8.2 Parameters of User Menu *bRSI* in Detail

- Ch** - Setting the Device Address  
By using several devices in master-slave mode, each device requires an individual address.  
By using only one device, the device address always needs to be 1.  
Range: *1...9* Default: *1*  
*1* = Master, transmits the current nominal value and Start/Stop to the connected slaves.  
*2...9* = Slaves, receive the current nominal value and Start/Stop from master.
- ZonE** - Parameter to Set the Multi-Zone Mode at master device (**Ch** *1*)  
Range: *0FF*, *5P*, *Po* Default: *oFF*  
*0FF* = Device is operated individually (no multi-zone mode).  
*5P* = Device acts as master in setpoint value controlled multi-zone mode.  
*Po* = Device acts as master in power-boost mode.
- ELen** - Setting the Maximum Connected Load of the Heating Element (V).  
**Always set the connection voltage of the heating element used, e.g. 60 for a magnetic preheater with 60 V connection voltage.**  
Range: *24...65V* Factory setting: *24*
- ALbA** - Alert Band (Relative Alert)  
Monitors the actual value if it is still within the range of the nominal value +/- the set value.  
An acoustic alert is triggered when the actual value is outside the alert band.  
In addition, the appropriate LED is illuminated.  
Range: *0FF*, *5...499* (K) Default: *50*
- ALhI** - Alert High (Absolute Alert)  
An acoustic alert is triggered when the actual value exceeds the set value.  
In addition, the appropriate LED is illuminated.  
Range: *-40...+1350* (°C) Default: *1200*
- ALLo** - Alert Low (Absolute Alert)  
An acoustic alert is triggered when the actual value falls short of the set value.  
In addition, the appropriate LED is illuminated.  
Range: *-40...+1350* (°C) Default: *0*
- rStr** - Behavior after Power Failure (yes, no) Default: *no*  
*YES* = Device automatically continues operation after power return.  
*no* = Device continues operation not automatically after power return.



- DATE** - Setting Day (dd)  
This setting should be performed when the internal data logger is used.  
Range: 1...31
- DATE** - Setting Month (mm)  
This setting should be performed when the internal data logger is used.  
Range: 1...12
- TIME** - Setting Hour (hh)  
This setting should be performed when the internal data logger is used.  
Range: 0...23
- TIME** - Setting Minute (min min)  
This setting should be performed when the internal data logger is used.  
Range: 0...59

### 8.3 Parameters of the Menu **CALL** in Detail

#### **Modification of these parameters should only be performed by specially trained personnel!**

This menu provides the option to adjust the sensor input or to influence the measured value by a filter or an offset. The parameters in this menu are protected by a password (**PAS.1**) against unintentional modifications.

- CALL** - Access to the submenu for adjustment of the sensor input (Type K).  
The sensor input should be checked with an appropriate calibration device on a regular basis. Should an inaccuracy be detected at the WR10,5 sensor input that is outside the accuracy, the WR10,5 input needs to be readjusted.  
Range: **YES** / **no** Default: **no**  
Selecting the parameter **YES**, you access the submenu for adjustment of the thermocouple input.

The following display dialog appears:

Display SV = **1 nLo** (Prompt to set the lower calibration value)  
Display MV = **0** (0°C)


Now set 0°C with the calibration device (Type K) and push 1 x .

The display changes to:

Display SV = **1 nLo**  
Display MV = **CALL**

The WR10,5 automatically adjusts the lower calibration value (0°C) and the display subsequently changes to:

Display SV = **1 nHi** (Prompt to set the upper calibration value)  
Display MV = **1200** (1200°C)

Now set 1200°C with the calibration device (Type K) and push 1 x .

The display changes to:

Display SV = **1 nHi**  
Display MV = **CALL**

The WR10,5 automatically adjusts the upper calibration value (1200°C).

Thus the adjustment of the sensor input is completed and you automatically exit the submenu.  
The display shows the next parameter.

- FILT** - Filter function for the sensor input (seconds)  
Function to smooth impure measured values (e.g. caused by interfering signals on the measuring lines). The higher the selected value, the more inert the sensor inputs reacts to fast changes of the measured value.  
Range: 1...10 Default: 0
- OFFS** - Offset for sensor input (K)  
Parameter to increase or decrease (parallel offset) of the measured value .  
Range: -10...+10 Default: 0
- PAS.1** - Option to modify password 1 for access to menu **CALL** .  
**Document a password modification and keep it in a safe place!**  
**A forgotten password can only be reset by Weldotherm GmbH!**  
Range: 0...9999 Default: 1111

## 8.4 Parameter of the Menu **tunE** in Detail

**Modification of these parameters should only be performed by specially trained personnel!**

Menu to adapt control parameters or set parameter back to factory settings upon delivery.

The parameters in this menu are protected by a password (**PAS.2**) against unintentional modifications.

- CC** - Cold-Junction Compensation  
Range: 0n / 0FF Default: 0n
- FRct** - To set device back to factory settings upon delivery.  
When **FPId** is set as value, all PID control parameters are set back to factory settings.  
Range: no / **FPId** Default: no
- tunE** - Auto Tuning of Control Parameters  
Automatic adaptation of the control parameters to the control path.  
When **YES** is set as value, auto tuning is launched.  
Range: YES / no Default: no
- dout** - Change of the output power (%) to determine the step response.  
Range: 0... 100% Default: 20

Displayed Information During Auto Tuning



- Stat** - Status of auto tuning
- Ptn** - Information about internal setting of the heating output
- GAIN** - Amplification in °C / %
- tu** - Effective dead time in seconds
- tR** - Scan time in seconds
- noI** - Actual value random noise in °C
- noI,r** - Random noise distance in %

- PI dn** - Setting of PID values (normal speed)
- PI dS** - Setting of PID values (slow speed)
- PI dF** - Setting of PID values (fast speed)
- PI** - Setting of PID values for a PI controller
- undo** - Setting of the PID values effective prior to auto tuning
- Pb** - Proportional band (°C) Default: 24
- tI** - Integration time (s) Default: 400
- tD** - Differential time (s) Default: 30
- PFAc** - Proportional factor Default: 100
- ZonE** - Coefficient Default: OFF  
A typical valued would be 2,5 to 3 x PB.
- RhLd** - Automatic hold function for program flow during a ramp.  
Is this value = On, the processing of a ramp is stopped (the current nominal value will be frozen) when the actual value < (nominal value - **ALbA**)  
Range: 00 / OFF Default: OFF
- di SP** - Display Type of the SP Display  
**Ac.SP** = Displays the current nominal value.  
**tR.SP** = Displays the target nominal value.  
Range: **Ac.SP** / **tR.SP** Default: **Ac.SP**
- dAtE** - Format of Date Input  
Range: ddmm / mmdd Default: ddmm
- tREc** - Interval Time Data Logger  
Range: 1.... 10 Default: 5
- PAS.1** - Option to modify password 1 for access to menu **CAL1**.  
**Document a password modification and keep it in a safe place!**  
**A forgotten password can only be reset by Weldotherm GmbH!**  
Range: 0....9999 Default: 1111
- PAS.2** - Option to modify password 2 for access to menu **tunE**.  
**Document a password modification and keep it in a safe place!**  
**A forgotten password can only be reset by Weldotherm GmbH!**  
Range: 0....9999 Default: 2222

## 9. The Program Controller

The integrated program controller provides different options to process your work piece.

### 9.1 Manual Mode (Program No. 0)

By selecting program no. 0 the output power can be set or updated manually using the buttons  and .



The output power is shown in the display MV (0....100%).

When a sensor has been connected, the PV display shows the current actual value.

When no sensor has been connected, the PV display shows the output power in kW an.

### 9.2 Easy Prog (Program No. 1)

In this mode a ramp and a stop time can be programmed and saved.

The nominal target value can be modified during processing with the buttons  and .

The set nominal target value is shown in the SP display.

After expiry of the holding time the device switches to stand-by mode.


### 9.3 Program No. 2....49

The program positions 2...49 are adequate program positions to enter complex program profiles. Each of these programs can consist of up to 49 segments. Each segment consists of:

- **A Ramp** (rA 1-49)  
 Range: PEnd, 1....9998, oFF  
 PEnd = Program end  
 1....9998 = Heating or cooling rate in Kelvin per hour (K/h)  
 oFF = Skip (heating with 100% capacity) to the next nominal target value
- **A nominal target value** (SP 1-49)  
 Range: -25....+1200°C
- **A holding time** (hT 1-49)  
 Range: 0, 1....9999  
 0 = Skip to next ramp  
 1....9999 = Holding time in minutes (min)

## 9.4 Program Selection


In order to select a program position (0...49), the WR10,5 needs to be in stand-by mode.

Push 1 x  and subsequently  or  to select the desired program position.

## 9.5 Program Input (Program Position 2...49)



To enter a program, proceed as follows:


Select a program position as described under 9.4.

Subsequently push 1 x . The displays change and show the first parameter of the first segment.

Display SV = *rH 1* (Ramp 1)

Display MV = *xxxx* (Heating or cooling rate in K/h)

Set the desired heating or cooling speed using the buttons  or .


Push 1 x . The displays change and show the second parameter of the first segment.

Display SV = *SP 1* (Nominal target value 1)

Display MV = *xxxx* (Nominal target value in °C)



Set the desired nominal target value of the previously entered ramp with the buttons

 or .


Push 1 x 1 x . The displays change and show the third parameter of the first segment.


Display SV = *ht 1* (Holding time 1)

Display MV = *xxxx* (Holding time min)

Set the desired holding time with the buttons  or .

The programming of the first segment is completed.

Should you need further steps for your heat treatment process, push 1 x  and process with the further segments (2...49) as described above.

Shouldn't you need further steps push 1 x  anyway and set the value *End* at the next ramp (in this case *rH 2*) in order to close the program.

When the controller encounters this program step while processing the program, the program closes and the WR10,5 automatically switches to stand-by mode.

## 9.6 An Example for Program Input

The initial temperature of the work piece to be heated is 20°C.

Within one hour, the work piece is to be heated to 200°C (180K/h).

The holding time at 200°C shall be 30 minutes.

Subsequently you want to heat to 300°C (100K/h) within one hour and hold this temperature for 30 minutes.

After expiry of the holding time you want to cool-down the work piece to 100°C (200K/h) within one hour.

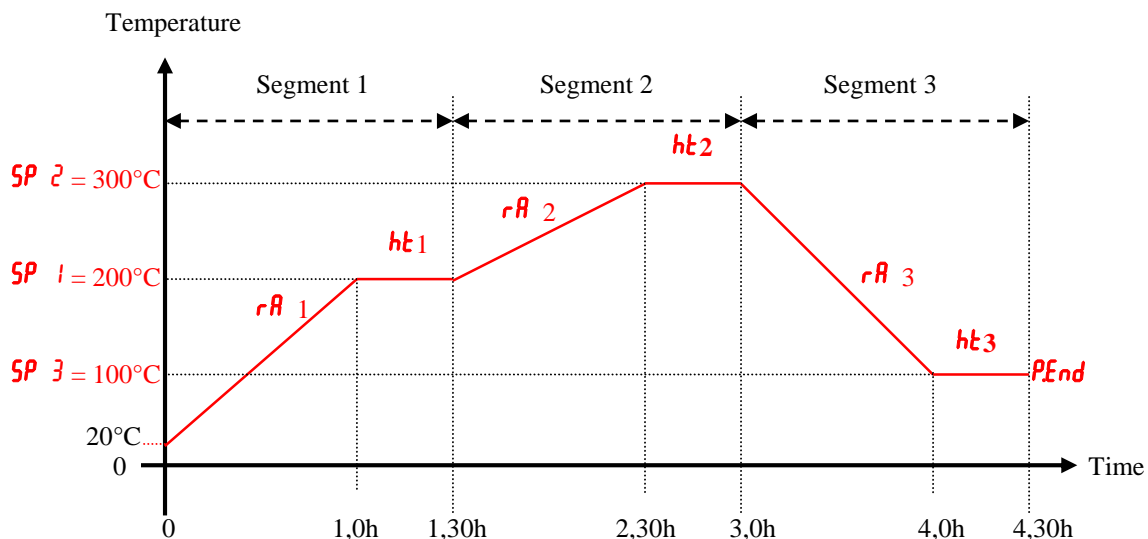
This temperature shall also be maintained 30 minutes.

After program flow the controller shall switch back to stand-by mode.

The parameter define as follows:


































A heating ramp	( <i>rA 1</i> )	von 180K/h
A setpoint	( <i>SP 1</i> )	von 200°C
A holding time	( <i>ht 1</i> )	von 30min
A heating ramp	( <i>rA 2</i> )	von 100K/h
A setpoint	( <i>SP 2</i> )	von 300°C
A holding time	( <i>ht 2</i> )	von 30min
A cooling ramp	( <i>rA 3</i> )	von 200K/h
A setpoint	( <i>SP 3</i> )	von 100°C
A holding time	( <i>ht 3</i> )	von 30min

The following graphic shows the program described above.



To program the example shown proceed as follows:

The controller is in stand-by mode (7.6).

Segment	Button	Display SV	Display MV	
	1 x 	<b>PrG</b> <b>2</b>		Select program no. with  or 
1	1 x 	<b>rA 1</b> <b>180</b>		<b>1<sup>st</sup> Ramp</b> Set value 180 with  or 
1	1 x 	<b>SP 1</b> <b>200</b>		<b>1<sup>st</sup> Nominal value</b> Set value 200 with  or 
1	1 x 	<b>ht 1</b> <b>30</b>		<b>1<sup>st</sup> Holding time</b> Set value 30 with  or 
2	1 x 	<b>rA 2</b> <b>100</b>		<b>2<sup>nd</sup> Ramp</b> Set value 100 with  or 
2	1 x 	<b>SP 2</b> <b>300</b>		<b>2<sup>nd</sup> Nominal value</b> Set value 300 with  or 
2	1 x 	<b>ht 2</b> <b>30</b>		<b>2<sup>nd</sup> Holding time</b> Set value 30 with  or 
3	1 x 	<b>rA 3</b> <b>200</b>		<b>3<sup>rd</sup> Ramp</b> Set value 200 with  or 
3	1 x 	<b>SP 3</b> <b>100</b>		<b>3<sup>rd</sup> Nominal value</b> Set value 100 with  or 
3	1 x 	<b>ht 3</b> <b>30</b>		<b>3<sup>rd</sup> Holding time</b> Set value 30 with  or 
4	1 x 	<b>rA 4</b> <b>PEnd</b>		<b>4<sup>th</sup> Ramp</b> Set value <b>PEnd</b> (program end) with 
	1 x 	<b>Actual value</b> <b>Nominal value</b>		<b>End program input</b> You are back in stand-by mode.

The entered values are saved automatically.

Saved programs are maintained in case of power failure.

## 9.7 Changing a Running Program

The integrated program controller provides the option to modify a running program.

Push 1 x .

The displays change and show program number and number of the currently running segment, e.g.:

Display SV = *P<sub>r</sub>*





Display MV = *201* (Program number 2, segment number 01)

Push 1 x .

The currently running program step is displayed, e.g.:

Display SV = *r<sub>1</sub>* (Ramp 1)



Display MV = *180* (180 K/h)

Now you can modify the gradient with the buttons  or  or switch to the next parameter in this program with . To exit this mode push  again.

## 9.8 Copying Programs

Programs that are stored in the program positions 2...49 can be copied to another program position. First select the program to be copied (9.4).

Push and hold the button  until the display shows *Copy*.


Now select the program position the program shall be copied to with the buttons  or .

Now push 1 x  to complete copying.

## 9.9 Starting a Program


Select the program to be started as described under 9.1 – 9.3.


**For safety purposes always check the maximum output voltage set (*ELEN*) in the user menu *bASI*.**

For this purpose push and hold the button  for approx. 3 seconds.

Completely pass through the user menu *bASI* and perform the required settings.

**The maximum output voltage set (*ELEN*) may not exceed the connected load of the connected heating element!**

Subsequently start the selected program by pushing the button .


The LED next to this button signalizes the operating mode  and the devices processes the selected program.




### Special Feature:

When neither date nor time are set in the user menu **bASI**, you will be prompted to do so after activating .

The data logger requires the inputs of date and time for chronological recording of the measured values.

Now enter date and time and push 1 x  again.



The inverter starts after these inputs.

You can skip the input of date and time by immediately pushing  again.

The inverter now starts the previously selected program; the data logging however starts with the time 00:00.


### 9.10 Ending / Aborting a Program

A running program can be ended or aborted at any time.

For this purpose push the button . The device switches to stand-by mode .


### 9.11 Stopping a Running Program

A running program can be stopped at any time.

Push 1 x .


The displays change and show the program number and the number of the currently running segment such as:

Display SV = **Pr**  
 Display MV = **201** (Program number 2 . Segment number 1)

Push 1 x .

The displays change and show:

Display SV = **Pr**  
 Display MV = **hold** (Program flow stopped)

The LED next to the button  flashes.

The program flow has been stopped.

## 9.12 Continuing a Stopped Program

Push 1 x  .

The displays change and show:

Display SV = *Pr*  
Display MV = *hold* (Program flow stopped)

Push 1 x  .

The displays change and show the program number and the number of the currently running segment such as:

Display SV = *Pr*  
Display MV = *203* (Program number 2. Segment number 03)

The LED next to the button  is continuously illuminated.

The program flow continues.


## 9.13 Switching into Manual Mode from a Running Program

You can switch to manual mode (9.1) from a running program at any time.

Push 1 x  .

The displays change and show the program number and the number of the currently running segment such as:

Display SV = *Pr*  
Display MV = *201* (Program number 2. Segment number 01)

Push 2 x  .

The LED next to the button  extinguishes.

The displays change and show:

Display SV = *Pr*  
Display MV = *Manu* (Manual mode)

You now have the option to set the output capacity manually as described under 9.1.

## 9.14 Switching Back from Manual Mode to the Previously Running Program


If it was necessary to switch to manual mode as described under 9.13, you can subsequently switch back to the interrupted program flow.

Push 1 x .

The displays change and show:

Display SV =  $P_r$

Display MV =  $MANU$  (Manual mode)

Push 2 x .

The LED next to the button  is illuminated.


The displays change and show the program number and the number of the currently running segment such as:

Display SV =  $P_r$

Display MV =  $201$  (Program number 2. Segment number 01)


## 9.15 Display of Output Voltage and Output Current While a Program is Running

While a program is running, you can display the voltage currently applied at the output and the power currently circulating through the heating elements.

For this purpose push 1 x .


The displays change to:

Display SV	=	$41V$	(41 Volt)
Display MV	=	$5A$	( 5 Ampere)

To switch back to the normal operating mode push 1 x  again.


## 9.16 Display the remaining holding time

While a program is running a holding time, you can display the time remaining until the end of this holding period.

For this purpose push 1 x .

The displays change to:

Display SV	=	$P_r$
Display MV	=	$302$ (Program number 3. Segment number 02)

Push 3 x .

The displays change to:

Display SV	=	$ht2$ (holding time number 2)
Display MV	=	$31$ (time until ending this holding time = 31min)

## 10. Working with multiple WR10,5 simultaneously

If the performance of a single WR10, 5 will not be sufficient for your device, you can connect multiple WR10, 5 together. For this purpose, the device offers two options.

### 1. Setpoint Value controlled Multi Zone Mode (10.1)

Each WR10, 5 controls and monitors its own zone.

The program entered on the master.

The slaves receive the current setpoint value from the master and controls and monitors their own zone.

### 2. Power Boost Mode (10.2)

The master controls and monitors a zone.

The program entered on the master.

The slaves receive the current control value from the master and controls and steer their own zones.

**For safety purposes always check the maximum output voltage set (EL EN) in the user menu bRSI of all connected devices!**

Note: In multi zone or boost mode the data of all connected devices are centrally logged by the master.

### 10.1 Setpoint value controlled Multi Zone Mode

Each WR10,5 requires an individual address (Parameter  $\ell h$  in the menu *bRSI* ).

The surface to be heated is divided into zones.

**Each zone requires its own thermocouple, heating element and WR10,5.**

All WR10,5 are connected to each other by a special multi zone cable (option) in master/slave mode.



The input of the program profile is only performed on the master.

The master is the program provider for the connected slaves and controls them accordingly.

The master provides the slaves with the setpoint value and control the temperature for their zone accordingly.

The advantage of this kind of control is a more homogeneous heating compared to individual heating zones with proper WR10,5.

Activation of the multi zone mode:

- Connect the required WR10,5 to each other using the appropriate bus cable.
- Connect the thermocouples and heating elements to each WR10,5.
- Push and hold  until the menu *bRSI* opens.
- Push 1 x  to access the menu *bRSI* .
- Perform the following modifications:

Set  $\ell h = 1$  (master) at the first device of the chain.

For  $\ell h$  set a value between 2 and 9 (slave) on all other devices.

(Never set the same value for  $\ell h$  on two devices!)

In addition, set the parameter  $zonE = SP$  at the master and the parameter  $zonE = OFF$  at the slaves.

## **10.2 Power Boost Mode**



The power boost mode is a multiple zone control.

For this purpose the device requires an individual address (Parameter  $\mathcal{L}h$  in the menu  $bRSI$  ).  
The surface to be heated is divided into several zones.

**Each zone requires its own heating units and WR10,5.  
Only the master needs a connected thermocouple.**

All WR10,5 are connected to each other by a special multi zone cable (option) in master/slave mode.  
Now the thermocouple is connected to the master.  
The slaves do not require a thermocouple.  
All WR10,5 are connected to each other in master/slave mode.  
The input of the program profile is only performed on the master.  
The master controls the output capacity of all connected WR10,5.

Activation of the power boost mode:

- Connect the required WR10,5 to each other using the appropriate bus cable
- Connect the thermocouples and heating units for each WR10,5.
- Push and hold  until the menu  $bRSI$  opens.
- Push 1 x  to access the menu  $bRSI$  .
- Perform the following modifications:

Set  $\mathcal{C}h = 1$  (master) on one device.

For  $\mathcal{L}h$  set a value between 2 and 9 (slave) on all other devices.


(Never set the same value for  $\mathcal{L}h$  on two devices!)

In addition, set the parameter  $zonE = P0$  at the master and the parameter  $zonE = OFF$  at the slaves.

## **11. Alerts**

The WR10.5 is provided with 3 alerts to be adjusted by the user and different system alerts.

When an alert is activated, an acoustic alert is emitted and the operating panel shows the type of the alert.

The acoustic alert signal can be acknowledged with the button .

### **11.1 Band Alert ( *ALbA* )**

The band alert monitors if the actual value is situated within a defined range around the current nominal value.


An example:

The band alert is set to 50K.

The current nominal value is 600°C.

Thus an alert is actuated when the actual value exceeds 650°C or falls short of 550°C.

The band alert can be switched-on or off in the menu *bASi* (8.2).


 The band alert is signalized on the operating panel by a red LED (6.3/10) and an acoustic alert is triggered in addition.

### **11.2 Min / Max Alert ( *ALLo* / *ALHi* )**

Min alert (*ALLo*) and max alert (*ALHi*) define the absolute limits for the actual value.

An alert is actuated when the actual value falls short of the Min alert or exceeds the Max alert.

Bothe alerts can be set in the menu *bASi* (8.2).


 The alert is signalized on the operating panel by a red LED (6.3/10) and an acoustic alert is actuated in addition.

### **11.3 Alert by End of Program**


When your heat treatment program has expired (*PEnd*) the acoustic alert sounds for approx.. 2 seconds.

### **11.4 Alert Communication Error**

The alert signalizes a occurred communication error occurred in multi zone mode or boost mode.

 The alert is signalized on the operating panel by a red LED (6.3/10) and an acoustic alert is actuated in addition.

### **11.5 Alert Internal Device Temperature too High or Mains Supply Disturbed**

 The alert is signalized on the operating panel by a red LED (6.3/10) and an acoustic alert is actuated in addition.

In case the internal temperature is too high the message *Err -tE-* is displayed in addition.

In case the mains supply is disturbed the message *Err -PL-* is displayed in addition.

## 11.6 Output Short Circuit

When an output is short circuited the message *Err -5h-* is displayed.

## 11.7 System Error

All system errors are displayed by LEDs (6.3/10) on the front of the device.

## 12. Function Data Logger

The WR10,5 is provided with an internal data logger to record the relevant data.

Recorded data:

Nominal value, actual value, output voltage, output current, status messages and date and time if set in the user menu ( *bA5i* ).

The logging process is launched automatically as soon as the WR10,5 is switched to operating mode.

The logging interval is 5 seconds. It can be adapted with the parameter *trEc* in the menu *tunE*.  
The following table represents the maximum recording length as a function of logging interval and number of WR10,5.

Number WR10,5	Function Logging Interval to Recording Length			
	1s	2s	5s	10s
1	140h	280h	705h	1400h
9	19h	39h	99h	198h

Factory setting

Using the software and adapter cable included in the scope of delivery, the logged data can be read-out with a PC (USB slot) and are subsequently available as .csv file for further processing in MS-Excel, OpenOffice or similar. The name of the .csv file is composed by a consecutive number, date and time (if set by the operator). The consecutive number is increased by 1 upon each switching of the WR10,5 into operating mode. In multi zone or boost mode the data of all connected devices are centrally logged by the master.

### 12.1 File Number Display of the Recording File

#### - From Stand-by Mode:

Push 1 x .

The displays change to:

Display SV = *FILE*

Display MV = *xxxx* (Consecutive number of the file where the data of the next treatment will be saved)

#### - From Operating Mode:



Push 1 x .

The displays change to:

Display SV = *FILE*

Display MV = *xxxx* (Consecutive number of the file where the data of the previous treatment have been saved)

## 12.2 Display Recorder Status

Push 1 x  and subsequently 1 x 

The displays change to:

Display SV = **Full**  
 Display MV = **xxx.x** (Display free memory in %)

Push 1 x  again

The displays change to:

Display SV = **rENR**  
 Display MV = **xxxx** (Display of the remaining recording time in minutes)

## 12.3 Deleting Recorded Datasets in the WR10,5

The time frame for data logging varies depending on recording interval and number of the used WR10,5.

### **Caution!**


**In principle the memory of the data logger is completely deleted!**

**It is not possible to delete individual datasets!**


**Therefore it has absolutely to be made sure that all important datasets have been saved externally prior to the deleting process!**

Data can be deleted using the included software or directly with the buttons in the operating panel of the device.

In order to delete the recorded data directly at the WR10,5 proceed as follows:


Push and hold  until the displays change to:

Display SV = **dEL**  
 Display MV = **no**

Push 1 x 

The displays change to:

Display SV = **dEL**  
 Display MV = **YES**

Confirm delete process with  .



## **13. Data Readout via PC**

Data that have been recorded by the data logger function of the WR10,5 can be transferred to a PC using the included software.

Subsequently the data are available as.csv file for further processing in Excel, OpenOffice or similar.

A data transfer to the PC can only be realized when the WR10,5 is not operated in multi zone or boost mode.

Data can be readout when the WR10,5 is operating.

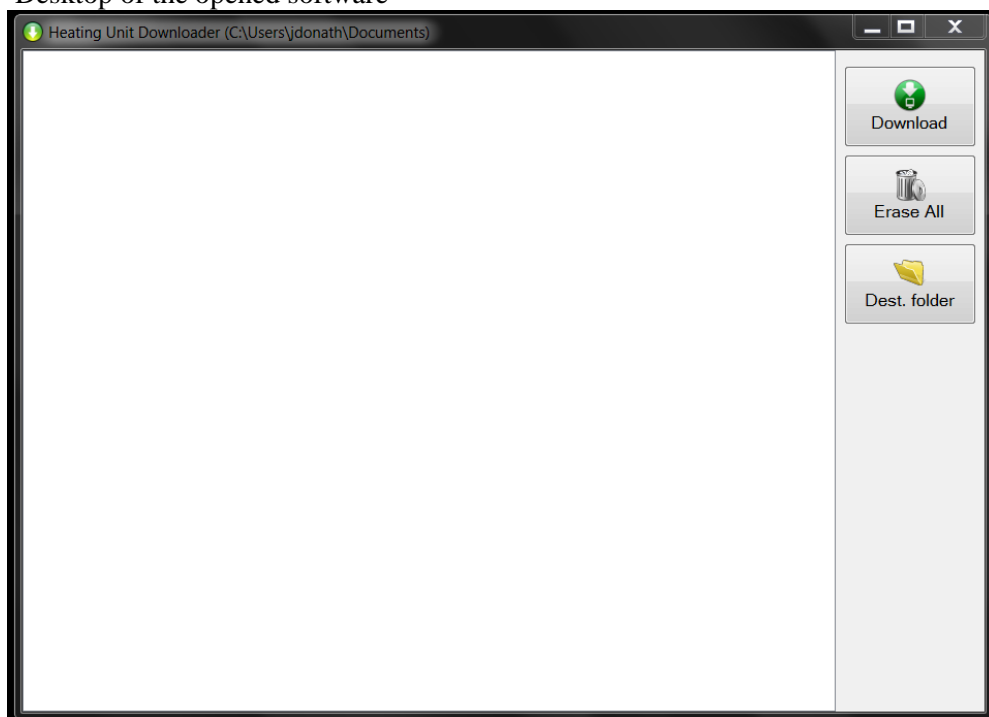
**We recommend transferring the data as recently as the treatment of your work piece has been completed.**

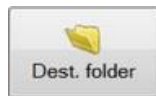
### **13.1 Software Installation (Downloader)**

In order to use the included software proceed as follows:

- Insert the included CD into your CD/DVD drive.
- Connect WR10,5 and PC with the included adapter cable and install the cable driver.  
If the driver is not installed automatically, please observe the further information on the CD related to driver installation under different operating systems (Windows XP, Windows Vista and Windows 7).
- Subsequently install the file with "Setup.exe" call up.
- Subsequently an icon to open the software appears on the PC desktop.
- Start the software by double-click on the icon.

Desktop of the opened software





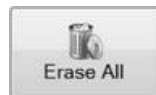
### Destination Folder

By a mouse click on this button, a window to select an appropriate destination to save the data opens.



### Download

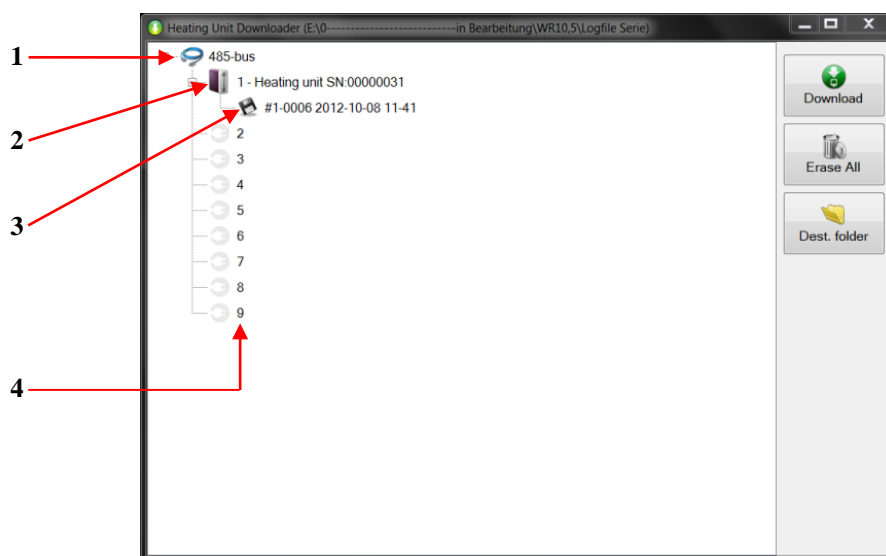
By a mouse click on this button the WR10,5 used and their log files are displayed and all logged data will be saved in the destination folder.



### Erase All

By a mouse click on this button and confirmation of the following security query, all data logged in the WR10,5 will be deleted!

## 13.2 Software (Figure 4)



### 1 - Detected Interface of the WR10,5 RS-485

Serial interface RS485

### 2 - Detected Connected Device 1 - Heating unit SN:00000031

Device address

WR10,5 serial number

### 3 - Detected Data File #1-0006 2012-10-08 11-41

File from Device address

Current file number

Year

Month

Day

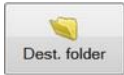

Hour

Minute

### 4 - No recorded data files of the device addresses 2...9 available.

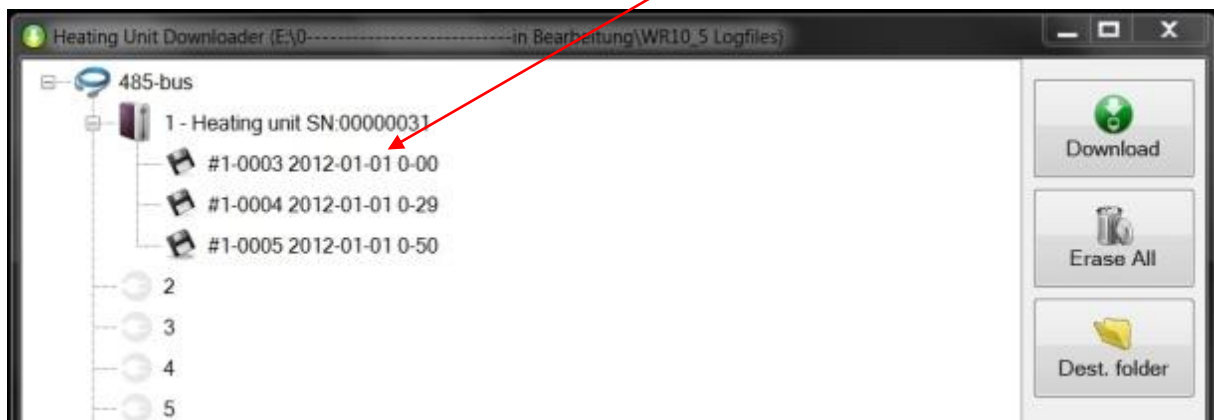
### 13.3 Transmitting all Datasets to the PC

In order to transmit a dataset from WR10,5 to the PC for further processing, proceed as described in the following:

- Connect the PC with the WR10,5 by exclusively using the supplied USB interface adapter
- Switch devices on
- Start the software
- Click on the button  and select an appropriate directory to save the dataset.
- Click on the button  to display and save all datasets in the destination folder.

#### Note:

- Click twice quickly with the left mouse button on a single record e.g.



The selected dataset is automatically saved on the PC.

This single record will be opened directly into some preinstalled spreadsheet (Excel, OpenOffice, etc.) for immediate processing.



## Notes

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.