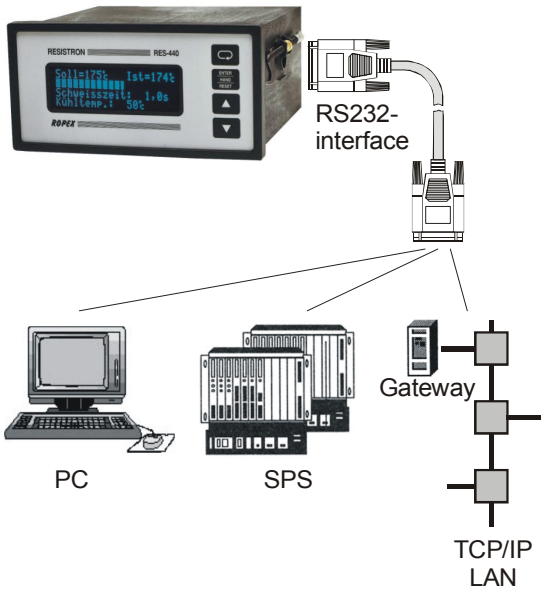
RESISTRON

MOD 33 RES-420/-44x (GB)

Operating Instructions



Important features

- Output of the ACTUAL temperature during the heatsealing cycle
- Output with a time mark on controllers with active timer function
- Output of the controller configuration at the end of the heatsealing cycle
- Available for RES-420/-440/-445 and UPT/LPT-640 controllers

29.9.05

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Contents

1 General

Process data acquisition and verification play an increasingly important role in modern production processes and workflows. Process data today frequently has to be read out via a digital data interface and transferred to a higher-level process control system for archiving. A serial interface (MOD 33) specifically for this purpose is available for RESISTRON/CIRUS RES-420/-440/-445 and UPT/LPT-640 temperature controllers.

This interface allows a data connection to be set up to the higher-level PC, a PLC or the corporate network. The ACTUAL temperature of the heatsealing band measured by the controller is transferred cyclically during the heatsealing process. Key configuration data is transferred at the end of the heatsealing process or cycle, to permit the current settings of the temperature controller to be verified.
The technical data and the software protocol of this interface are described below.

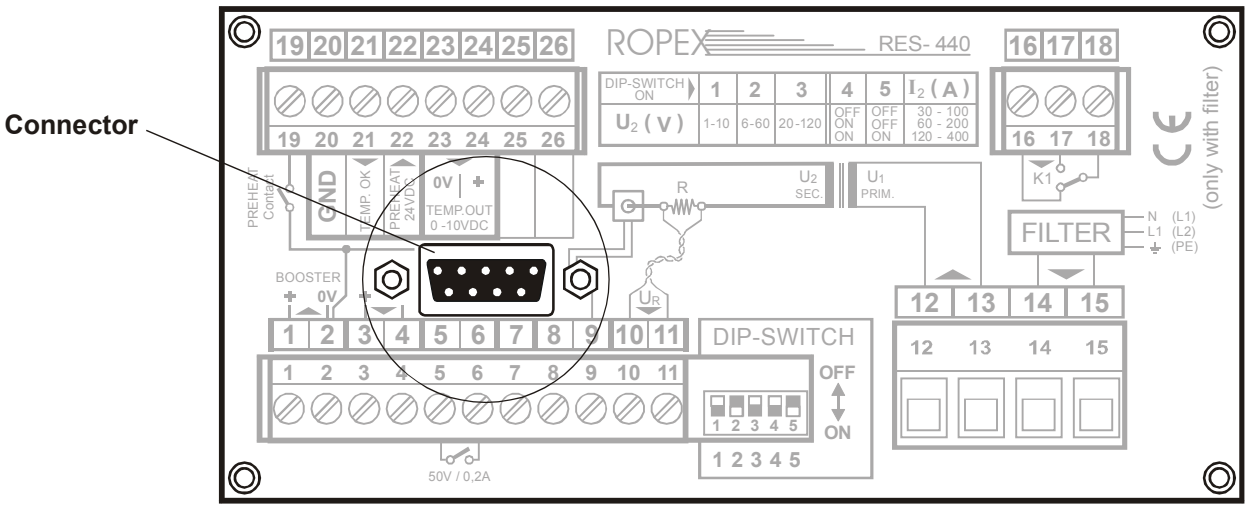
2 Electrical connection

2.1 Technical data

Interface type	RS232 interface, electrically isolated
Transfer parameters	Baud rate: 19200 Bd Data bits: 8 Parity: None Stop bits: 1
Data rate	Measured value output: every 20 ms (50/s)
Connector	9-pole sub-D socket on rear of controller

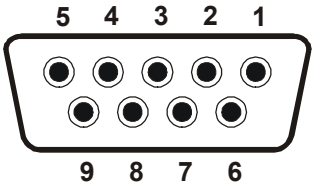
2.2 Connector position

Rear view of the controller (example: RES-440)



2.3 Connector

External view of the sub-D socket:



Pin assignment:

Pin	Signal
1	n.c.
2	TxD (to PC/PLC)
3	RxD (from PC/PLC)
5	GND
4	DTR + DSR Jumpered internally
6	
7	RTS + CTS Jumpered internally
8	

2.4 Installation steps

1. Refer to the "Installation" section in the latest version of the controller documentation for details of the controller electrical connections. All national and international installation regulations must be complied with.
2. Connect the controller to the terminal device (e.g. PC, PLC, network gateway) using the sub-D cable.
3. Set the required transfer parameters in the terminal device (↳ section 2.1 "Technical data" on page 3). Special visualization software (↳ section 4 "Visualization software" on page 12) has been developed by ROPEX for data display in Microsoft Windows XP.
4. Start up the controller and make sure that data is output correctly via the serial interface.

3 Software protocol

3.1 Data format

The software protocol uses only 7 bit ASCII characters. In the protocol description below, all control characters are enclosed in parentheses.

e.g.
<CR>: carriage return 13 dec (0x0D hex)

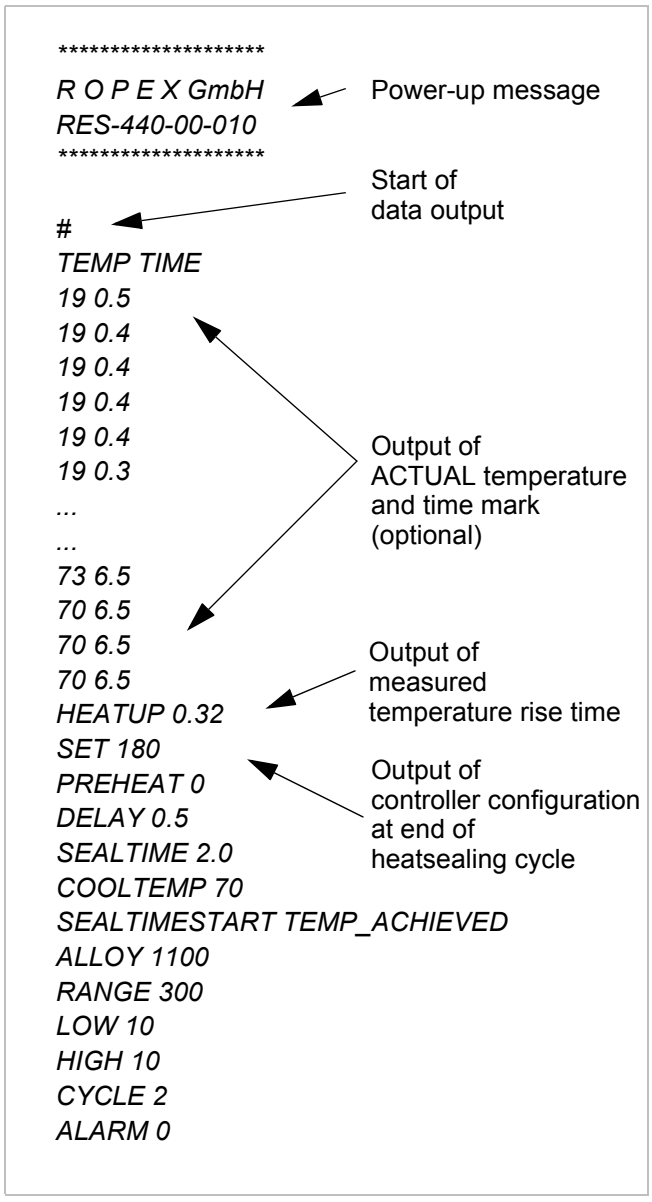
3.2 Data output

3.2.1 Overview

The software protocol is subdivided into five parts:

1. Power-up message
2. Output of a START character ("#") at the start of the data output (the START signal is activated on the controller)
3. Output of the ACTUAL temperature, a time mark (optional) and the SET temperature (optional) during the heatsealing cycle
4. Output of the temperature rise time measured by the controller at the start of the heatsealing cycle
5. Output of the controller configuration at the end of the heatsealing cycle

A typical data output is shown below (the control characters are omitted for the sake of clarity).



3.2.2 Power-up message

A power-up message (identical to the power-up message of the controller) appears when the controller is switched on or when an alarm is reset. This message shows the company name, the controller type and the software version number.

```
<CR>
**********<CR>          Company name
R O P E X GmbH<CR>
RES-440-00-010<CR>      Controller type &
**********<CR>          software version
```

3.2.3 START character

The output of the ACTUAL temperature and the time mark (optional) via the serial interface begins when the START signal is activated on the controller.
The "#" character identifies the start of the data output.

```
<CR>
#<CR>
```

3.2.4 Output of the ACTUAL temperature (controller without timer function)

RES-420
RES-440/UPT-640 with timer function off:
The output of the ACTUAL temperature via the serial interface begins when the START signal is activated on the controller. The output rate is fixed (refer to section 2.1 "Technical data" on page 3).
ONLY the ACTUAL temperature is output during the heatsealing cycle. No other data is output. The data output continues until the START signal is deactivated on the controller.

```
TEMP<CR>        <-- Identifies
19<CR>              output values:
19<CR>              TEMP: ACTUAL temp.
19<CR>
19<CR>
19<CR>
19<CR>
...
...
73<CR>
70<CR>
70<CR>
70<CR>
```

The ACTUAL temperature is output with a maximum of three digits (range: -10…500°C) and no decimal places.

RES-445/LPT-640 with timer function off:
The preheating temperature and the SET temperature can also be set on these controllers by means of an analog control input as well as in the software menu. The currently valid SET temperature is therefore output in addition to the ACTUAL temperature.

```
TEMP SET<CR>    <-- Identifies
19 180<CR>          output values:
19 180<CR>          TEMP: ACTUAL temp.
19 180<CR>          SET: SET temperature
19 180<CR>
19 180<CR>
19 180<CR>
...                 Example:
...                 SET temperature: 180°C
73 180<CR>
70 180<CR>
70 180<CR>
70 180<CR>
```

3.2.5 Output of the ACTUAL temperature (controller with timer function)

RES-440/UPT-640 with timer function on:

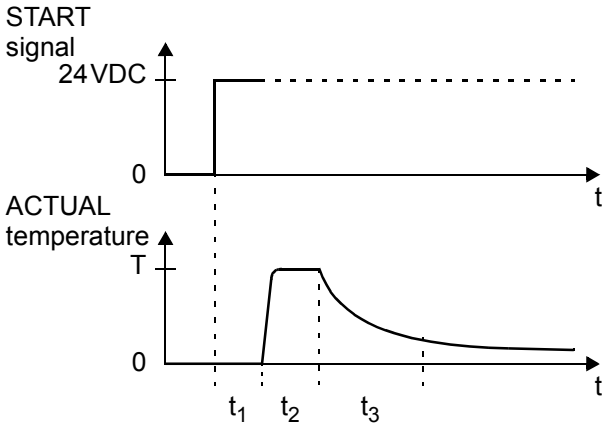
If the timer function (time control) is activated on these controllers, a time mark is output during the heatsealing cycle in addition to the ACTUAL temperature. Once again, the output rate is fixed (refer to section 2.1 "Technical data" on page 3). The time mark indicates the status of the timer function. The data output continues until the parameterized time elapses, i.e. until the end of the cooling phase.

```
TEMP TIME<CR>   <- Identifies output values: TEMP: ACTUAL temp- TIME: Time mark
19 0.5<CR>
19 0.4<CR>
19 0.4<CR>
19 0.4<CR>
19 0.4<CR>
19 0.3<CR>
...
...
73 6.5<CR>
70 6.5<CR>
70 6.5<CR>
70 6.5<CR>
```

The output time mark is updated once every 100 ms. Smaller time units are not output. The time mark is output with one decimal place.

The internal time control sequence is subdivided into the following phases (↳ "Time control" in the latest version of the controller documentation):

- Starting delay (delay at the start of the heating phase)
- Heating phase (heating and control process)
- Cooling phase



t_1 = Starting delay
t_2 = Heating phase
t_3 = Cooling phase

The time mark is output as follows:

1. Starting delay (if parameterized)
   The first time mark value corresponds to the length of the starting delay. The time mark values are decremented according to the elapsed time until the end of the starting delay.
2. Heating phase
   If a heatsealing time in seconds is parameterized, the first time mark value is the heatsealing time. Once again, the time mark values are decremented according to the elapsed time.
   If the heatsealing time is parameterized to start when the SET temperature is reached, the time mark is output with the value "0.0" during the heating process, i.e. until the start of the heatsealing time.

   If the heatsealing time parameter is set to "EXT" (heatsealing time selected externally, available from SW Revision 013), the first time mark value is "0.0". The time mark values are incremented according to the elapsed time (set with the timer function). The final time mark value at the end of the heatsealing time corresponds to the duration of the heating phase.
   The time mark is only incremented up to a value of 99.9 s. If the heatsealing phase is longer, the value does not change after it reaches 99.9 s.
3. Cooling phase
   If a cooling time is parameterized (cooling mode: "time"), the first time mark value corresponds to the parameterized cooling time. The time mark values are decremented according to the elapsed time.

If a cooling temperature is parameterized (cooling mode: "absolute" or "relative"), the first time mark value is "0.0". The time mark values are incremented according to the elapsed time (set with the timer function). The final time mark value at the end of the cooling phase corresponds to the duration of the cooling phase.
Once again, the time mark is only incremented up to a value of 99.9s. If the cooling phase is longer, the value does not change after it reaches 99.9s.

RES-445/LPT-640 with timer function on:

The currently valid SET temperature is output for these controllers in addition to the ACTUAL temperature and the time mark, because the preheating temperature and the SET temperature can optionally be set by means of an analog control input.

TEMP TIME SET<CR>
19 0.5 180<CR>
19 0.4 180<CR>
19 0.4 180<CR>
19 0.4 180<CR>
19 0.4 180<CR>
19 0.3 180<CR>
...
...
73 6.5 180<CR>
70 6.5 180<CR>
70 6.5 180<CR>
70 6.5 180<CR>

Identifies output values:
TEMP: ACTUAL temp.
TIME: Time mark
SET: SET temperature

Example:
SET temperature: 180 °C

3.2.6 Output of the temperature rise time

The measured temperature rise time is output by the controller initially at the end of the heatsealing cycle until the SET temperature is reached..

HEATUP 0.32<CR>

The temperature rise time is measured once every 10ms and output with two decimal places.

The temperature rise time is calculated as follows:

- RES-420
  Time from activation of the START signal on the controller until the switching threshold is reached SET temperature – 10K.
- RES-440/-445, UPT/LPT-640
  Time from activation of the START signal on the controller or - if parameterized - from the end of the starting delay until the switching threshold is reached
  SET temperature – "SET reached" threshold.

A temperature rise time is also output if the heatsealing cycle ends before the switching threshold is reached. In this case, the output value no longer corresponds to the temperature rise time up until the threshold.

3.2.7 Output of the controller configuration

Key controller configuration data is output at the end of the heatsealing cycle. This data can be used to verify the current controller settings.

The output of the controller configuration data can take up to 250ms. If a new heatsealing cycle starts, this data output is aborted, i.e. some of the data may not be output. The output of the ACTUAL temperature takes priority.

SET 180<CR>
PREHEAT 0<CR>
DELAY 0.5<CR>
SEALTIME 2.0<CR>
COOLTEMP 70C<CR>
SEALTIMESTART TEMP_ACHIEVED<CR>
ALLOY 1100<CR>
RANGE 300<CR>
LOW 10<CR>
HIGH 10<CR>
CYCLE 2<CR>
ALARM 0<CR>

The following data values are output (**values printed in bold type are only output for the RES-440/-445 and UPT/LPT-640**):

Data output (xxx: corresponds to parameter in controller software menu)	**Description**	**Example**
HEATUP x.xx	Temperature rise time required to reach 95% of the SET temperature.	HEATUP 0.32
SET xxx	SET temperature selected in the software menu (in °C)	SET 180
PREHEAT xxx	**Preheating temperature (PREHEAT) selected in the software menu (in °C)**	**PREHEAT 0**
DELAY xx.x	**Starting delay (in s)**	**DELAY 0.5**
SEALTIME x.x	**Parameterized heatsealing time:** **In seconds: x.x (in s)** **Externally selected (from SW Revision 013): EXTERNAL**	**SEALTIME 2.0**
COOLABS xxx **or** **COOLREL xx** **or** **COOLTIME xx.x**	**Cooling mode:** **"Absolute": COOLABS (in °C)** **"Relative": COOLREL (in %)** **"Time" COOLTIME (in s)**	**COOLABS 70**
SEALTIMESTART xxxxxxxxxxxxx	**Start of heatsealing time:** **Immediately: START_SIGNAL** **When SET temp. reached: TEMP_ACHIEVED**	**SEALTIMESTART TEMP_ACHIEVED**
ALLOY xxxx	Heatsealing band alloy (in ppm): Alloy 20: 1100 Norex: 3500 CIRUS: 1700	ALLOY 1100
RANGE xxx	Temperature range (in °C):	RANGE 300
LOW xx	**Low monitoring temperature "Set point reached" (in K)**	**LOW 10**
HIGH xx	**High monitoring temperature "Set point exceeded" (in K)**	**HIGH 10**
MEASURE_IMPULSE x.x	Long measuring impulse: As of SW revision 020: Value is only output with MOD 01 As of SW revision 026: Value is always output	MEASURE_IMPULSE 1.7
CYCLE xxxxxxxx	Cycle counter (actual value)	CYCLE 2
ALARM xxx	Error message (alarm) displayed during the heatsealing cycle: No alarm: 0 Alarm: xxx (corresponds to error code)	ALARM 0

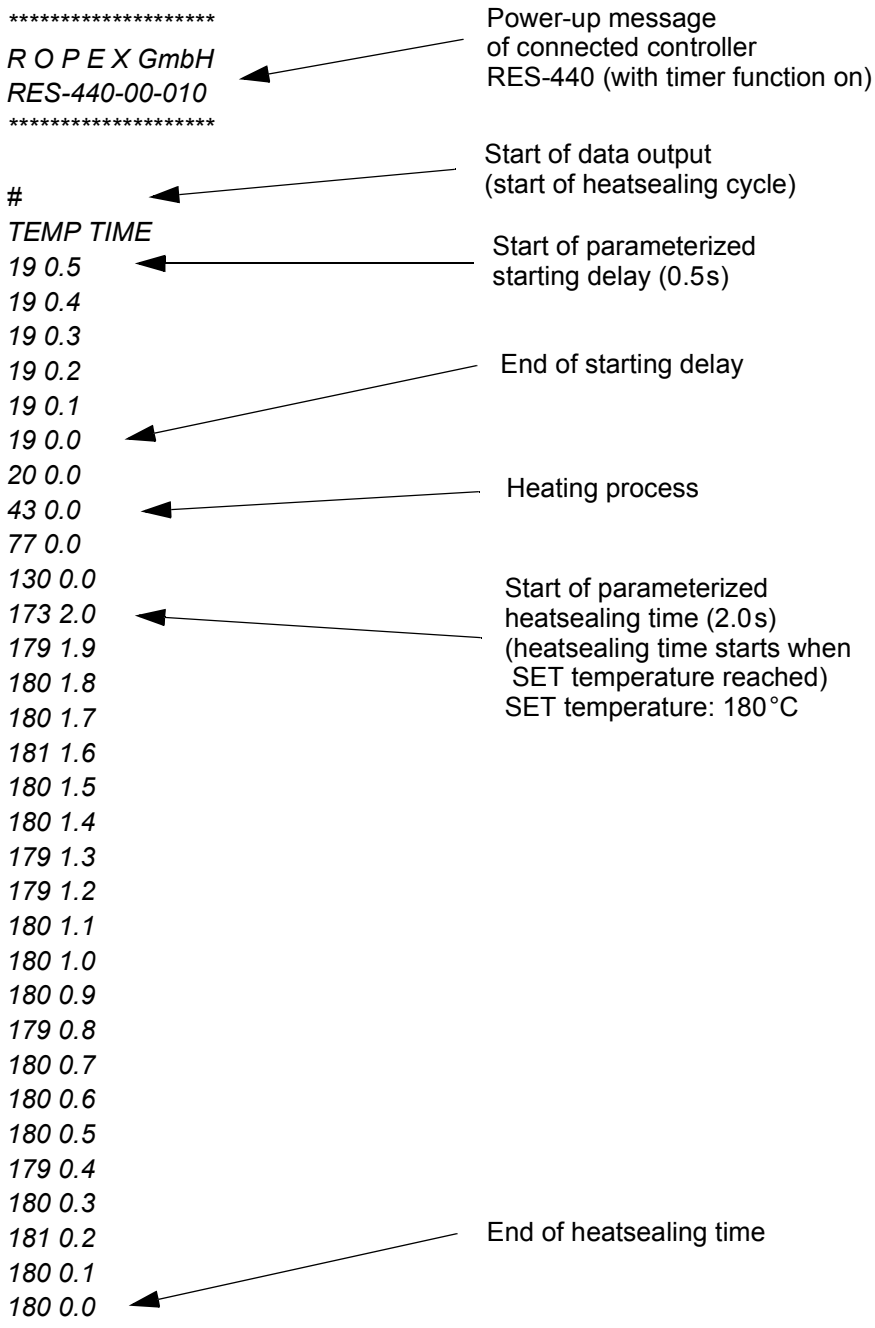
The data output shown above is based on the configuration of the controller software menu. It does not include special controller functions, such as PREHEAT (RES-440/-445) or temperature preselection by means of the analog control input (RES-445/LPT-640).

3.3 Data input

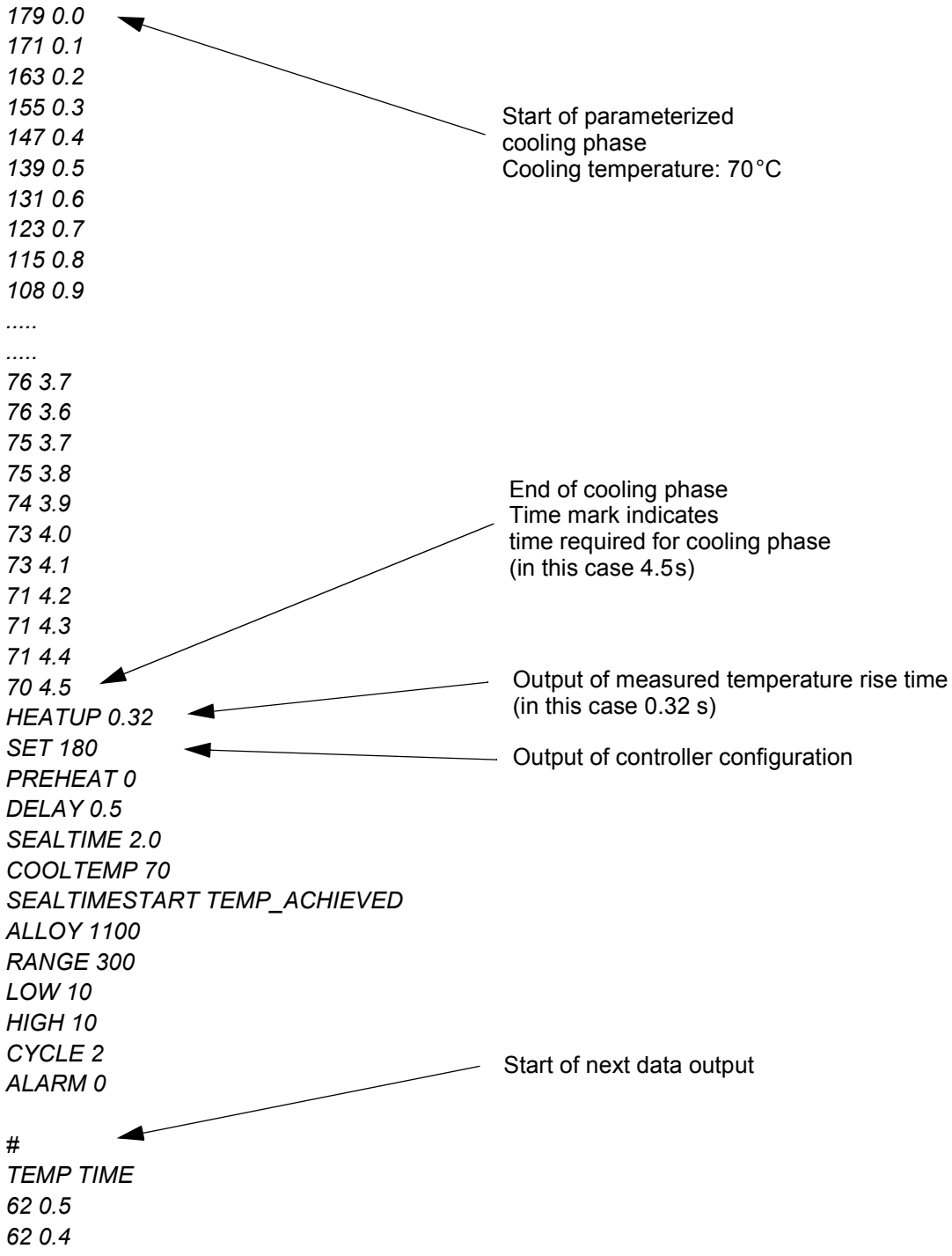
It is not possible to transfer data to the controller. If you attempt to transfer characters, they are not evaluated.

3.4 Typical data output

In the example shown below, only every 5th data value is output during the heatsealing cycle for the sake of clarity. Once again, no control characters are shown.



Typical data output (continued):



4 Visualization software

Special visualization software has been developed by ROPEX for displaying the output data. This software can be used to visualize the ACTUAL temperature, the SET temperature, the time mark (depending on the controller type) and the controller configuration.

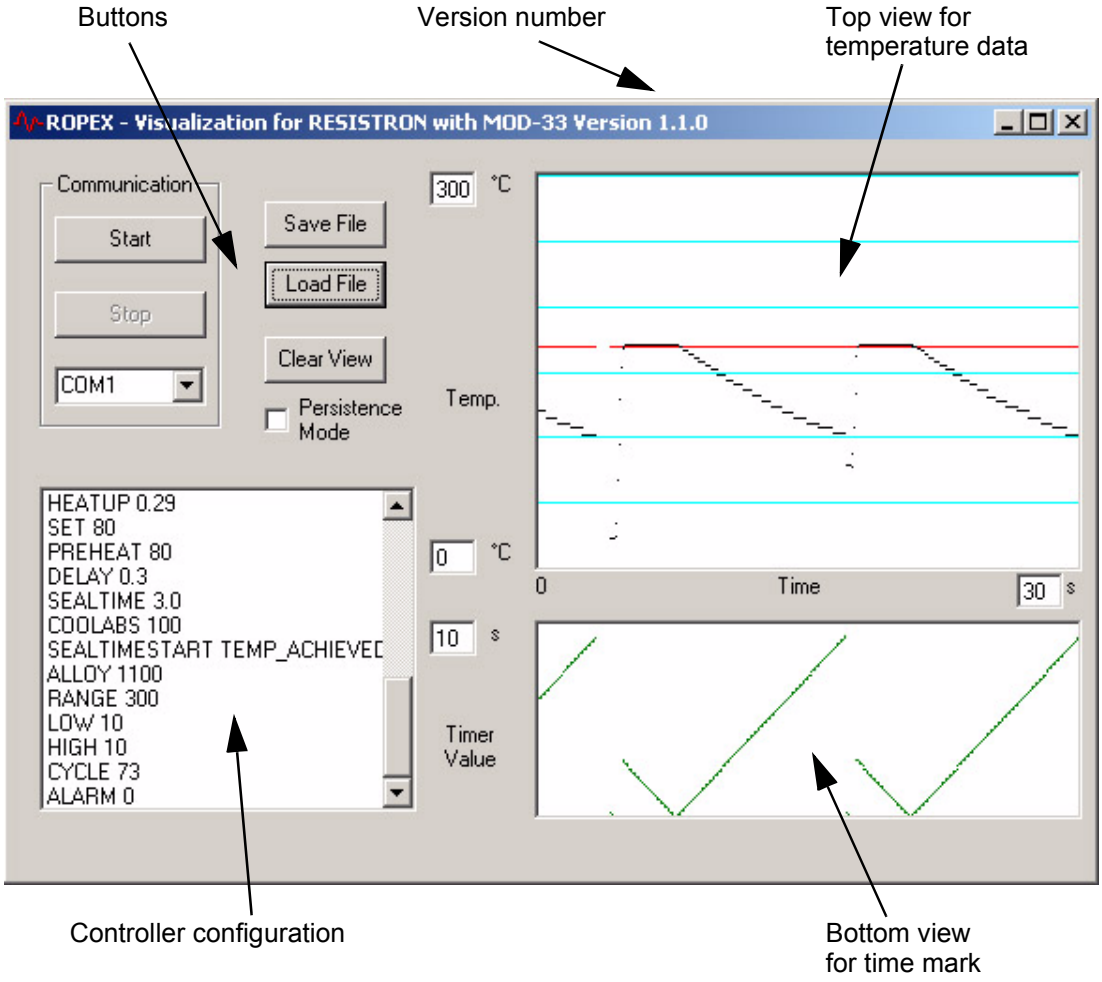
4.1 Installing the software

The visualization software is supplied as an executable Setup file. It is installed on your PC by this file. During the installation procedure, the Setup routine prompts you to confirm the license agreement, select an installation folder and create a desktop icon. The specified installation folder (default directory: C:\Programs\Ropex\Vis\MOD-33) includes a sample file (Sample1.txt) as well as the documentation for MOD 33.

The visualization software is designed for use with Microsoft Windows XP. If you work with a different operating system, no functional guarantee can be provided by ROPEX.

4.2 Screen layout

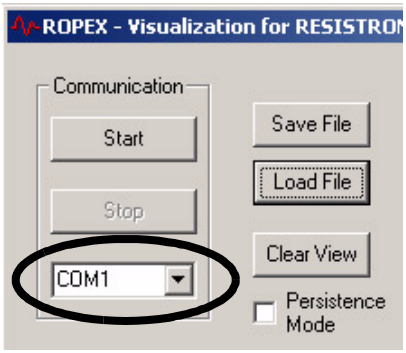
The screen below appears when you start the visualization software:



4.3 Software functions

4.3.1 Transfer parameters/ serial interface

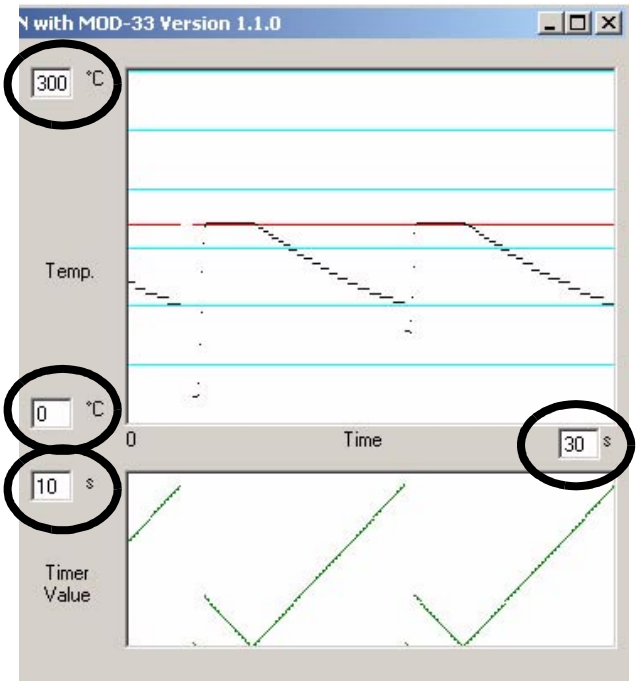
The transfer parameters (↳ section 2.1 "Technical data" on page 3) are fixed in the visualization software. The serial interface setting depends on the port that is used on your PC.



4.3.2 Scaling in the views

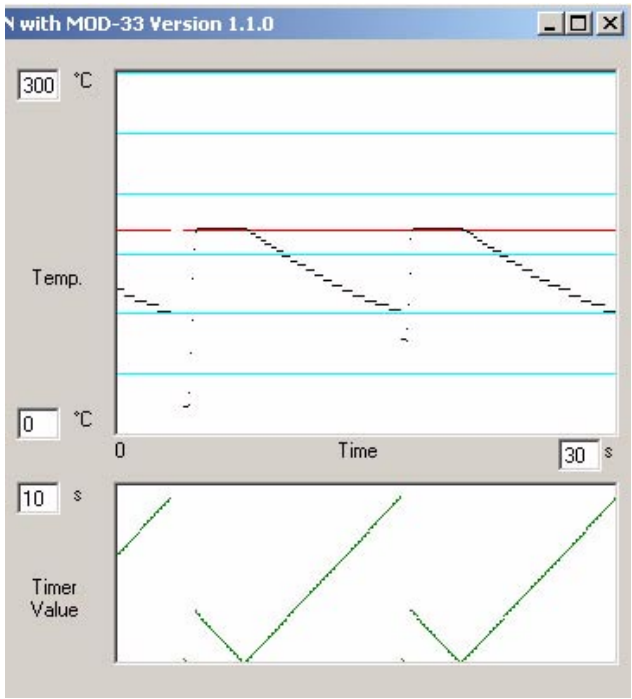
The top view shows the ACTUAL and SET temperatures (depending on the controller type). The bottom view shows the time mark that is output in conjunction with a RES-440/-445 controller or a UPT/LPT-640.

- **Time scale (X-axis)**
  This time scale refers to both the top and bottom views (min: 1 s, max: 99 s).
- **Temperature range (Y-axis, top view)**
  The minimum and maximum values that can be displayed in the view can be entered here (min: 0 °C, max: 500 °C).
- **Time mark (Y-axis, bottom view)**
  The maximum time mark that can be displayed in the bottom view can be entered here (min: 1 s, max: 99 s).

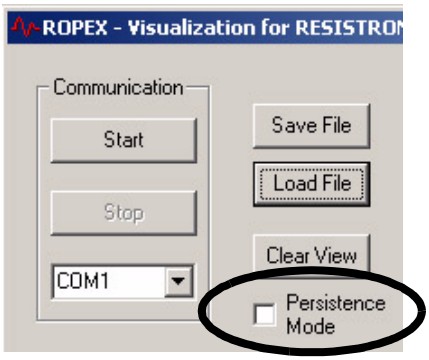


4.3.3 Display modes in the views

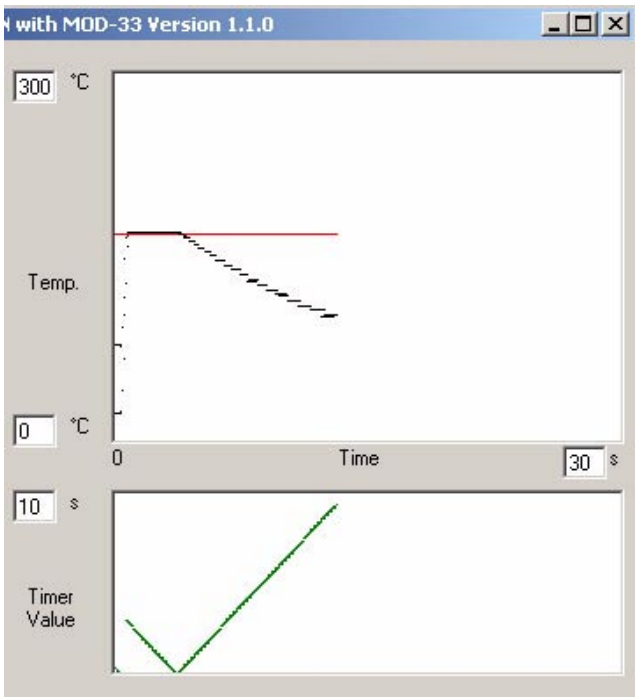
The recorded data is displayed in a scroll mode as default. Heatsealing cycles that are recorded consecutively are also output consecutively. The newest data appears on the right.



The data can be displayed in an overwrite mode by activating the "Persistence Mode" field.

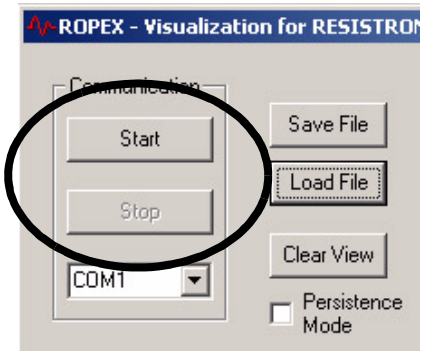


In this case, all the recorded heatsealing cycles are written over one another. This permits the reproducibility of the heatsealing process to be verified, for instance.



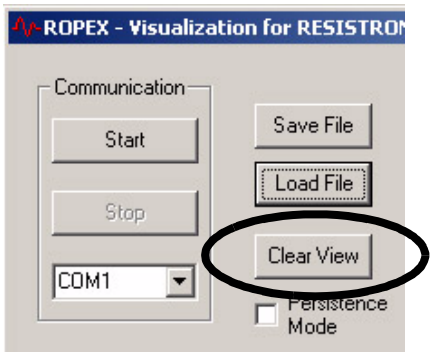
4.3.4 Starting/stopping data recording

You start data recording by clicking the "Start" button. The data transferred by the controller is then displayed on the screen. You stop the data recording by clicking the "Stop" button.



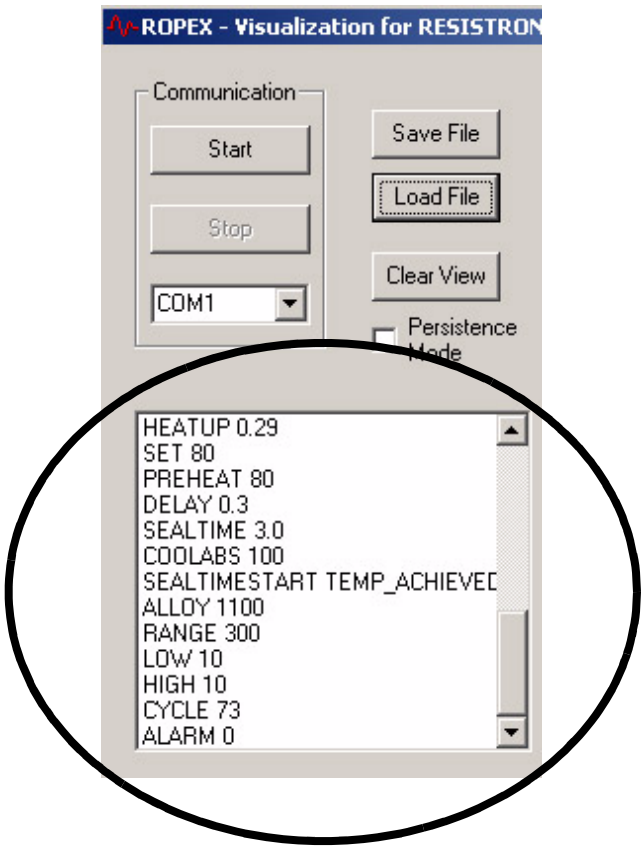
4.3.5 Clearing the views

You can clear the two views in order to start a new data recording by clicking the "Clear View" button.



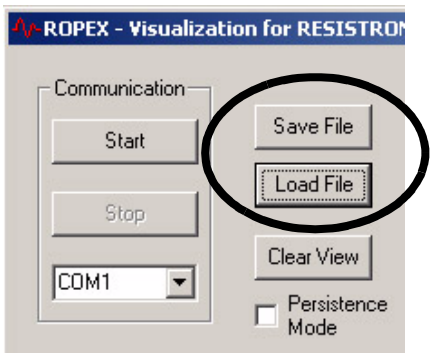
4.3.6 Controller configuration

The configuration transferred by the controller is displayed in the left window when you start a data recording. You can then check the controller configuration.



4.3.7 Saving/loading the recorded data

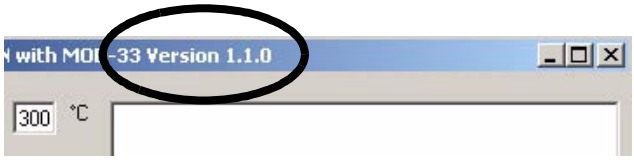
You can save the recorded data in an new ASCII file or attach it to an exisiting ASCII file by clicking the "Save File" button. You must specify a file name and directory first in the list box. When selecting a existing file the recorded data will be attached to this file. When selecting a new file name the recorded data will be saved in the specified new file.
This data can then be imported into another analysis or spreadsheet program (e.g. EXCEL) for further processing.



You can also reload stored data into the visualization software and display it again by clicking the "Load File" button.

4.3.8 Software version number

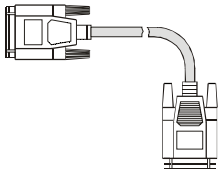
The software version number is shown in the screen header.



4.3.9 Copyright/trademarks

The visualization software described in this document is made available to customers in accordance with the terms and conditions of the License Agreement, which must be consented to as a prerequisite of use.
Microsoft, Windows and the Windows logo are registered trade or service marks of the Microsoft Corporation.

5 How to order

MOD 33	**Modification 33 (serial RS232 interface)** Art. No. 800033 Can only be ordered in conjunction with a temperature controller Please indicate the article numbers of the controller and the required modifications in all orders, e.g. RES-440-L/400VAC + MOD 33 (controller with timer function for 400VAC line voltage and serial RS232 interface) Art. Nos. 744013 + 800033 must be ordered
	**Sub-D connecting cable** Length 2m: Art. No. 884202 Length 5m: Art. No. 884205 Length 10m: Art. No. 884210

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