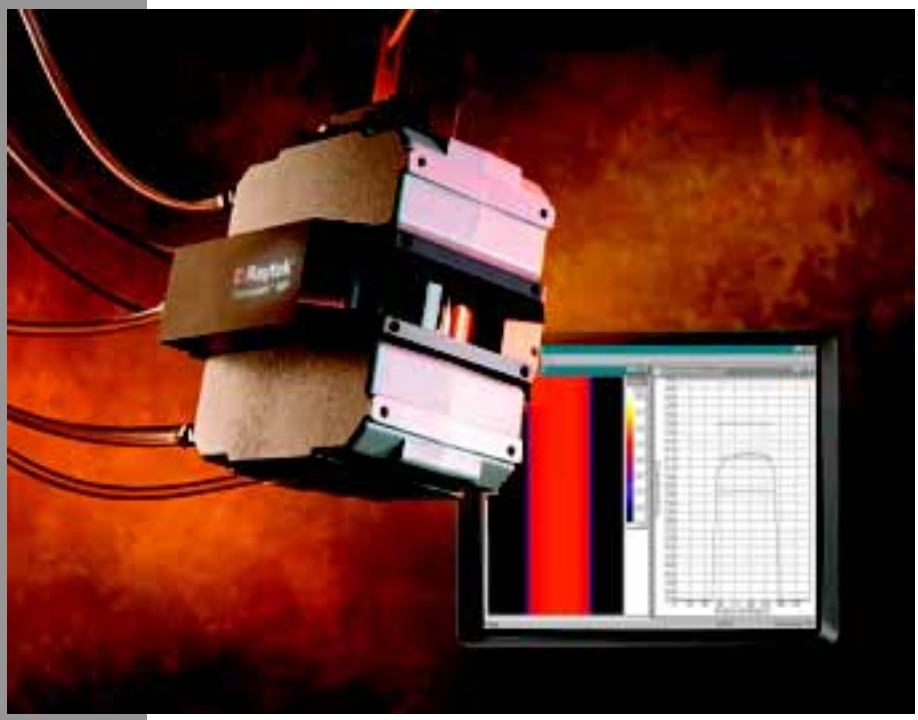
EC100
EC100

Quality Control System for
Extrusion Coating (EC100),
Extrusion Systems (ES100),
and other continuous-web processes



Operator's Manual

Raytek®

Noncontact Temperature Measurement

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54650

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1 Introduction

The infrared temperature measurement system is designed for use in industrial heating applications where the continuous monitoring and control of web temperature is critical to productivity. Typically, process temperatures are adjusted in open-loop fashion without real-time product temperature feedback. The MP50 Process Imager monitors the material's temperature distribution allowing the system to help improve product quality and part uniformity. Early detection of thermal problems results in better operating efficiency by reducing scrap rates and saving energy.

The system is used for monitoring continuous web processes. In contrast to discrete processes (e.g., flow of individual sheets or parts) web processes are characterized by a continuous material flow (e.g. coating of paper). Thus, the measurement system is operated in a continuous manner.

The system allows visualization of the temperature distribution by a temperature profile in the cross-machine direction or a color-coded 2-dimensional thermal image. It is possible to output temperature values as a current or a voltage by means of optional hardware Output Modules. In case of a thermal defect, the system triggers an alarm. The alarm time is saved in an alarm file. For later analysis, the thermal image is automatically stored in a separate file. The alarm can be output with an optional Digital Output Module.

This Manual describes the functionality and installation of the system. It is directed toward process engineers who need to know the background of the process, the capabilities of the scanner, and how to configure and use the system.

This Manual does not cover the MP50 scanner itself; for further information please refer to the "MP50 Operator's Manual".

The manual contains the following sections:

EC100 allows monitoring sheet width on every scanned line. This feature is uniquely suited for thin-film extrusion applications.

ES100 allows one to customize and configure measurement sectors for each die bolt, a feature very well-suited to flat-die extruders typically used in plastic sheet and cast film extrusion processes.

2 System Functions

2.1 System Components

The system consists of the following components:

- Standard linescanner package: MP50 Process Imager, 7,5 m RS485 cable, RS485/RS232 converter, SUB-D connector (25-pin male to 9-pin female), 7,5 m power supply cable
- Industrial power supply (100 V to 240 V AC-mains to 24 VDC, required for MP50)
- DataTemp EC100 software / DataTemp ES100 software
- Operator's Manual
- MP50 Manual
- EC100 only: laser sighting, tripod mounting plate, adjustable mounting base, alarm/trigger box

optional:

- Digital Module with 16 non isolated outputs of type ICP-7043
- Digital Module with 13 isolated outputs of type ICP-7042
- Digital Module with 7 relay outputs of type ICP-7067
- Analog Module with 4 outputs of type ICP-7024
- RS232/RS485 converter of type ICP-7520
- Industrial power supply (100 V to 240 V AC-mains to 24 VDC, required for Output Modules and type ICP-7520 converter).

A PC (meeting requirements of Windows NT) should be provided by the user with the following (minimum) requirements:

- Processor: ≥ Pentium II
- Clock speed: ≥ 200 MHz,
- Main memory: ≥ 64 MB RAM,
- Hard disk: approx. 10 MB memory for software,
- Graphic: 800 × 600 pixel,
- Interface: serial COM-Port with hardware buffer (16550 UART),
- Operating system: Windows NT/2000/XP[1]

[1] Windows 95 / 98 / ME is not recommended for running the scanner software, but can be used for demo purposes.

2.2 Hardware Structure

2.2.1 Overview

The following figure shows the principal structure of the system. It shows a solution with one scanner, one Digital Output Module and one Analog Output Module. The system can be expanded by:

- Adding more scanners: adding one COM-port and RS232/RS485-converter per added scanner
- Adding more Output Modules: adding the Module to the RS485 network, see section 8.2 RS485 Network on page 54.

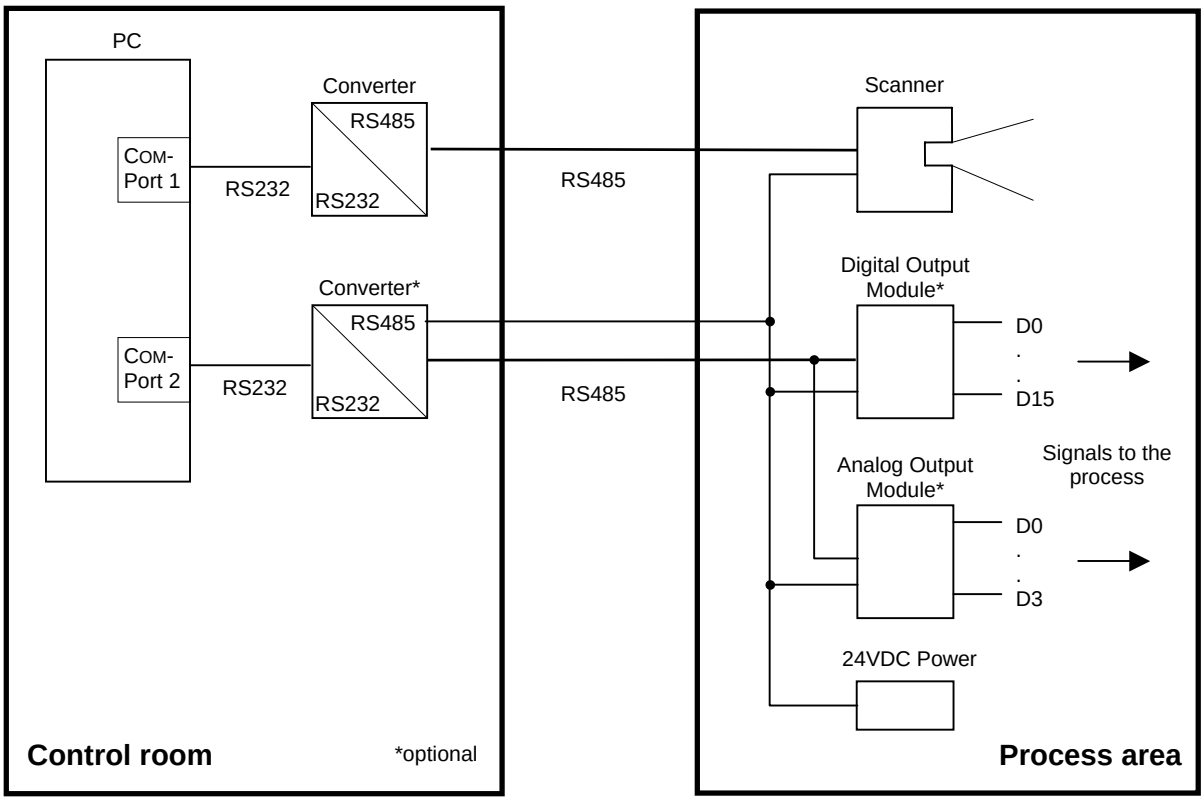


Figure 1: Principal structure of the system

Instead of outputting the temperature data by means of Output Modules also a serial communication port can be used for forwarding the data to other systems (e.g. a PLC), for more details see section 3.2.5.5 Forwarding of Results on page 23.

2.2.2 Wiring of Output Modules

- **RS485 cable:** The Output Modules can be placed close to the process area. Two wires are needed for the RS485 connection: DATA+ and DATA-, shielded twisted pair, max. length: 1000 m.
- **Power supply cable**: depends on the distance between the Output Module and the power supply (power consumption: approx. 2.0 W per Module)

2.3 System Interfaces

For interfacing to other control systems, the system provides a lot of interfaces to transfer snapshots, zone results, or alarm and system information.

Output	Interface	Remark
500 Temperature Lines	File / Network	Binary Format or ASCII-Text Format 4.2.4.2 Scroll View, p. 30
Scroll View	Intranet	http-Protocol 3.2.6 Input/Output Page, p. 24
Sector Results	File / Network	ASCII-Text Format 4.2.4.2 Scroll View, p. 30
Sector Results	Analog Output Module	Current or Voltage 3.2.6.1 Analog/Digital Module Group, p. 25
Sector Results	Serial COM-Port	ASCII Protocol 3.2.5.5 Forwarding of Results, p. 23
Sector Results	DDE Connection	8.1.1 DDE with Microsoft Excel, p. 50 8.1.2 DDE with LabVIEW, p. 51 8.1.3 DDE with DASYLab, p. 52
Sector History	File / Network	ASCII-Text Format Sector History as ASCII Text File, p. 35
Sector Alarm	Digital Output Module	0/1 Signal 3.2.6.1 Analog/Digital Module Group, p. 25
Automatic Sector Information (only EC100)	Serial COM-Port	ASCII Protocol 5.1.1.4 Forwarding of Results, p. 42
System Alarm	Alarm/Trigger Box	0/1 Signal 6.3 Alarm/Trigger Box, p. 47
Alarm and System Information	File / Network	ASCII Text-Format 4.2.5.1 Alarm File (Logbook), p. 37
Alarm: Internal Temperature of Scanner Housing	Relay Output at Scanner	0/1 Signal 3.2.6 Input/Output Page, p. 24 Terminal Box, see MP50 manual

Input	Interface	Remark
Gating the whole Measurement	Alarm/Trigger Box	0/1 Signal 3.2.6 Input/Output Page, p. 24 6.3 Alarm/Trigger Box, p. 47
Dynamic Adding a Snapshot's Description	File / Network	ASCII-Text Format <Add a Note>, p. 32

3 System Configuration

3.1 Software Installation

Complete the following steps to install the software on a PC:

- Insert the installation CD into the CD-ROM drive, the installation program is launched automatically, if not, follow the steps below:
- Click on the <Start> button on the Windows Desktop, then select <Run>.
- Type *D:\setup.exe* (assuming D is your CD-ROM drive).
- Click <OK>.

Follow the Installation Wizard's instructions on the screen. Choose the software configuration you want to install, e.g. "EC100". Afterwards select the requested language for the Configurator and the scanner software. The installation program creates a new program group in the start menu, e.g. it is called "DataTemp ES100" or "DataTemp EC100". The start menu includes the icons for the scanner software and the Configurator. Also, corresponding icons on the Windows desktop are created.

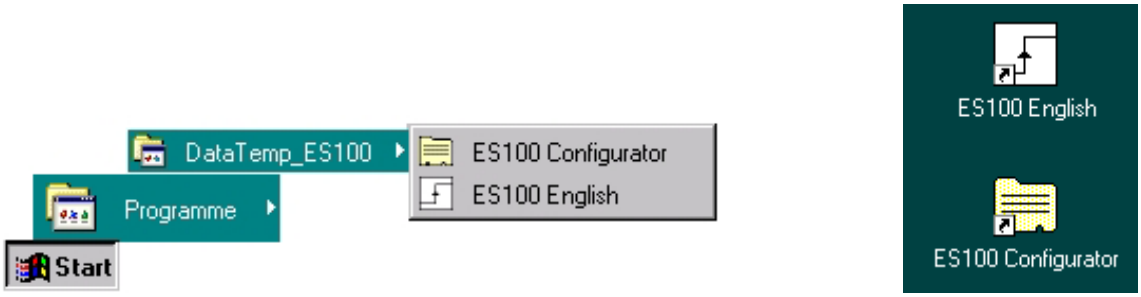


Figure 2: Access to the program via the start menu (left) and the Windows desktop (right)

Clicking on the "ES100" icon automatically starts the program with the preset initialization file.

Clicking on the "ES100 Configurator" icon opens configuration program. With the configuration program, initialization files can be edited.

3.2 Configurator

Every call-up of scanner software is connected with a particular initialization file. Each initialization file contains a parameter list corresponding to the specific requirements of an application. Use the Configurator to edit and create new initialization files.

! **All changes must be saved! This is the only way for changes to be valid for the next program startup.**

The Configurator consists of a number of pages described in detail below.

3.2.1 General Page

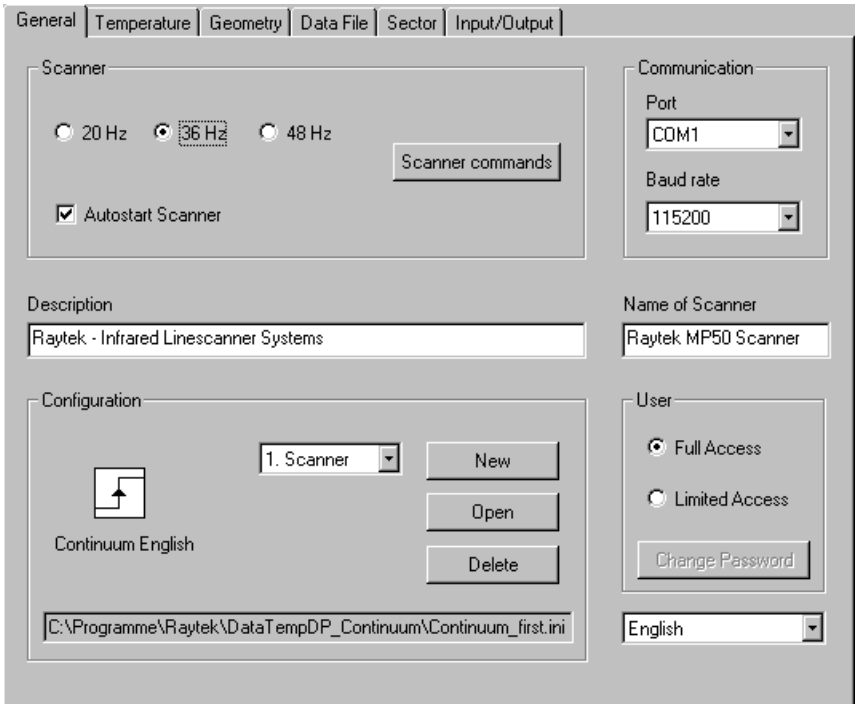


Figure 3: General Page

3.2.1.1 Scanner Group

In this parameter group, specific commands for the scanner can be defined.

Scan frequency: The scan frequency determines the number of temperature lines per second captured by the scanner. Scan frequencies of 20 Hz, 36 Hz or 48 Hz are selectable. With a scan frequency of 48 Hz the following limitations are in effect:

- The scanner's built-in analog outputs are switched "off" (**not** the optional Output Modules).
- If the scanner is operated in the continuous mode, a data transmission rate for the serial communication of at least 230400 Baud is necessary. In that case, a special high speed interface card is required.

Auto Start: after program start-up, the scanner starts operating automatically.

Scanner commands: Optional commands for additional initialization of the scanner can be set here. Normally this feature is not used, but if so, must be used with caution - **very carefully!**

! Changed command list can suspend the whole scanner system!

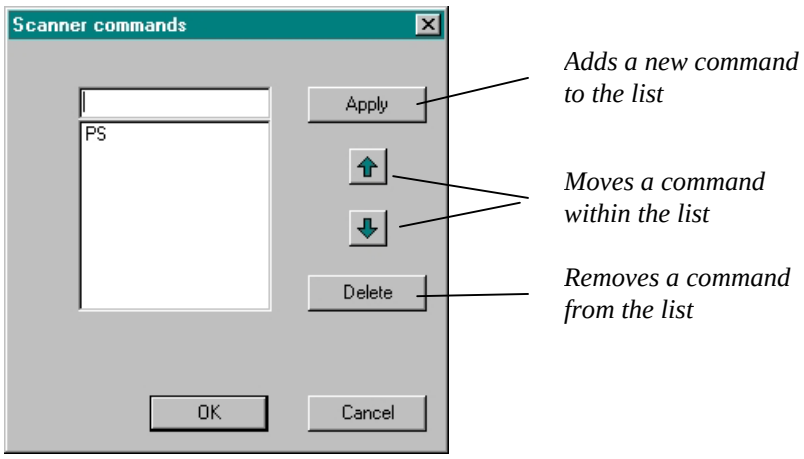


Figure 4: Dialog - Scanner commands

In the example above, the command “PS” (storing of all parameters in EEPROM) were added to the command list. The scanner’s command list will be executed before all other parameters set in the Configurator.

Further information for scanner commands is found in the *Protocol Manual* of the scanner (included on the installation CD).

3.2.1.2 Communication Group

Port: Sets the serial COM port of the PC, where the scanner is plugged in. In a multi-scanner system, every scanner needs a dedicated, free COM-port.

Baud rate: Defines the baud rate for scanner and computer. The data transmission rate of 230400 Baud is normally not supported by the PC standard interface card. For that case a special high-speed interface card is required.

3.2.1.3 Description

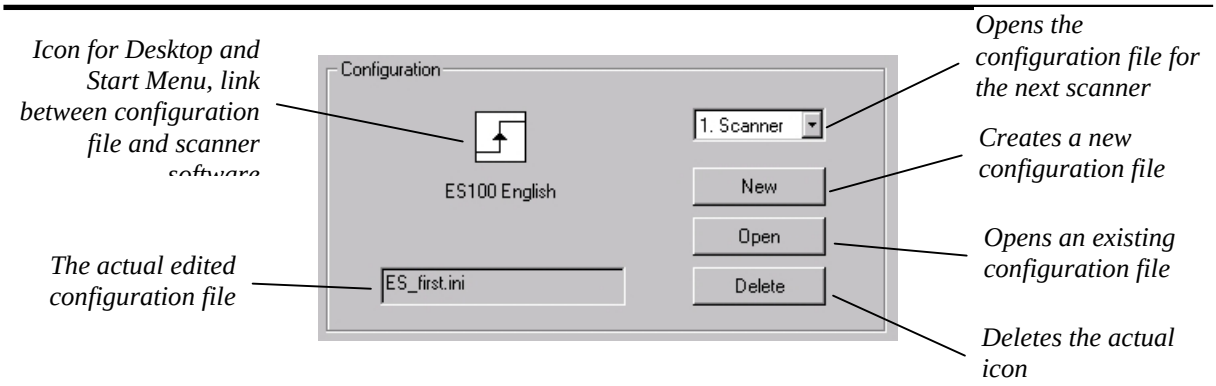
In the description, a text is definable that is stored with every saved thermogram. For the text, a maximum length of 256 characters is allowed. The description can be changed while running the scanner‘s software by means of the context menu of the Scrolling View.

3.2.1.4 Name of Scanner

Through the menu, you can add a description for each scanner. While running the scanner‘s software you can see this description in the title bar of each scanner’s window.

3.2.1.5 Configuration Group

In the Configuration Group, some common settings for configuration files can be defined.



The scanner software allows several scanners to operate simultaneously. Each scanner needs its own configuration file. By clicking on the proper "box", the configuration file for the next scanner is opened and editable. If the file is missing, you are asked to create one. In the example above, the file name for a second scanner is determined with ES_first.ini.1, for the third scanner ES_first.ini.2, and so on. In the scanner software, the next scanner can be called up with the menu <Scanner> <New Scanner>.

3.2.1.6 User Group

You may desire to restrict access to configuration files and various operating parameters. The software allows users to restrict the permission granted to access configuration files and configuration parameters of the scanner software. Additionally, some functions of the scanner software itself can be changed using one of the following buttons:

Full Access: Defines the user as administrator with full permission to access files

Limited Access: Defines the user as the operator with limited permission to access files.

If the user is set to "Limited Access", the following functions are affected or restricted:

- The switching to other applications by means of the <Alt> <Tab> buttons is not allowed.
- The software starts always with a maximized window.
- The opening of a window is not allowed.
- The closing of the current scanner window is not possible.
- The <Terminal View> is not accessible.
- The menu <Scanner Setup> is not accessible.
- The context menu <Auto-save Conditions> for Scroll View and Snapshot View are not accessible.
- The changes of the display are not saved; the software will always start up with the same display. This allows the administrator to set up a display (including the auto-save conditions), which will be saved in a file called display.0. The program takes this file for users and administrator/operator, to build-up the display, but the operator cannot change it.

If the user is set to "Limited Access", the exiting of the scanner software can be protected by a definable password.

3.2.1.7 Language

This box allows the language of the Configurator to be defined. The corresponding vocabulary is to be found in an ASCII text file named <language>.txt, e.g. “English.txt”. The file is located in the installation folder.

Entries in the language file are structured page by page. All pages are numbered. This number is only used for software internal purposes. In the following example page 1 is the General page detectable by means of the keyword “Title_Page “=General. In the following the labels of all buttons, boxes, tool tips, and messages are to be found. To make changes in the vocabulary, open the language file with the standard Windows Editor.

! The text in the brackets and to the left of the equal sign must not be changed! Only the text to the right of the equal sign is changeable.

```
[Page1]
Title_Page=General
Label_Scanner=Scanner
Button_Scanner_Commands=Scanner commands
Label_Configurator_Settings=Configuration
…
```

3.2.2 Temperature Page

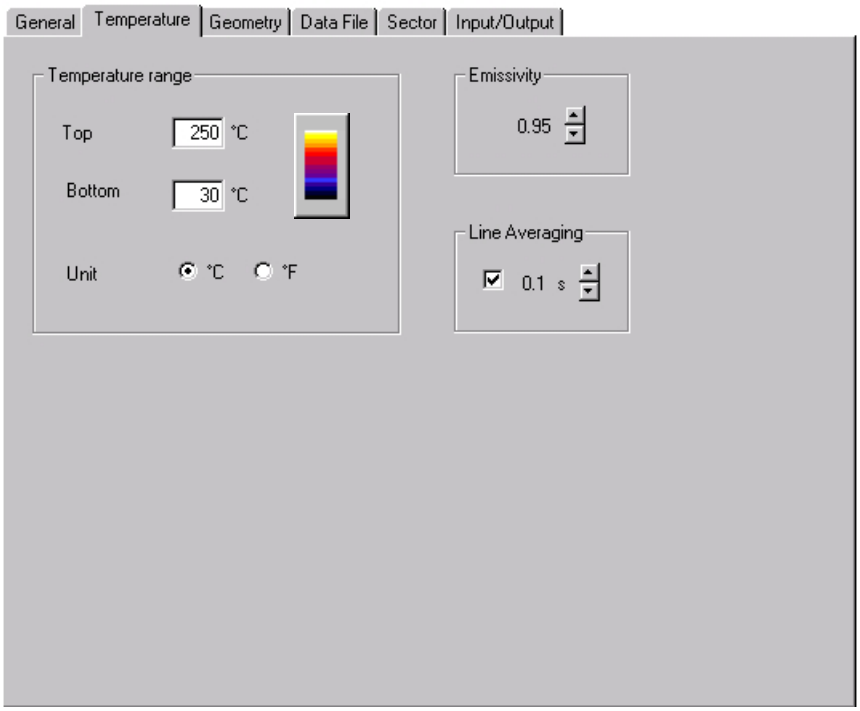


Figure 5: Temperature Page

3.2.2.1 Temperature Group

This group defines the minimum and the maximum temperature of the material to be scanned. The temperature units, Celsius or Fahrenheit, are changeable. The selected unit is valid for all other temperature parameters (e.g. background temperature, sector thresholds, etc.). The conversion from one temperature unit to the other is performed automatically.

By clicking on the colored button, the dialog for changing the color palette appears. The user may create his own individual color palette. Alternatively a predefined color palette is can be selected (iron palette, rainbow palette, gray palette, gray palette inverse).

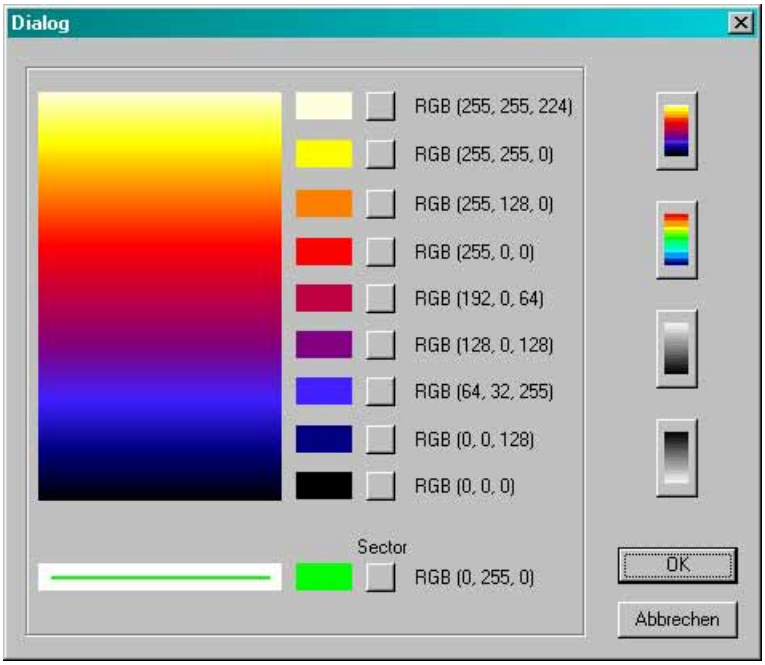


Figure 6: Defining the Color Palette and the Sector Color

3.2.2.2 Emissivity

Defines the emissivity of the scanned material.

3.2.2.3 Line Averaging

Sets the time in which all recorded lines are averaged into one line. In the given example, all lines are buffered in the scanner within 0.1 seconds. After the given time, the average is calculated. As a result, one line is transferred to the PC.

3.2.3 Geometry Page

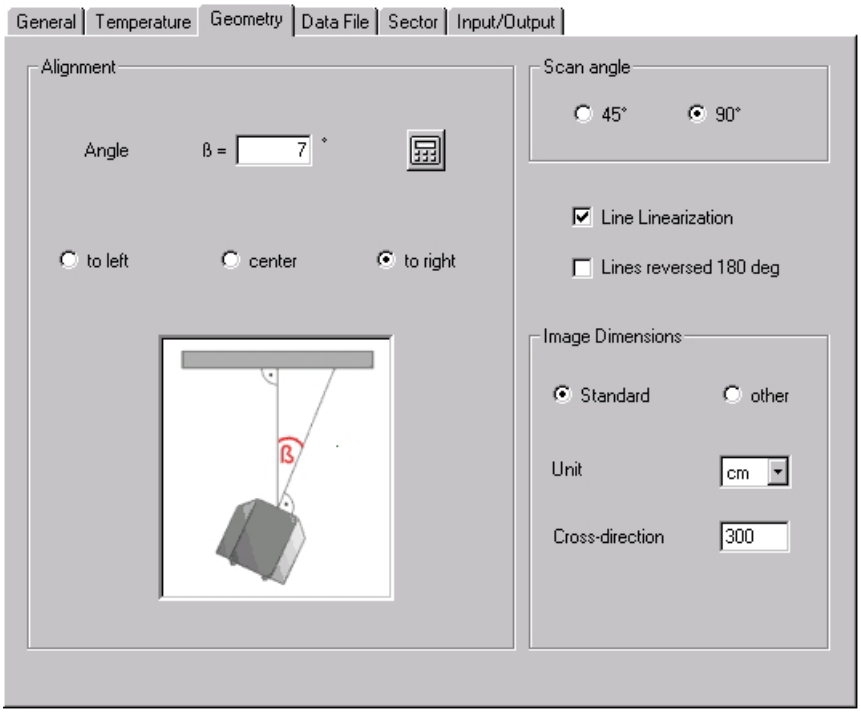


Figure 7: Geometry Page

3.2.3.1 Alignment Group

If the scanner is not mounted perpendicularly to the material being scanned, the angle ß defines the angular deviation from the perpendicular position. The input field accepts angles up to 45° but an angle greater than 25° causes high non linearities in the thermogram. In that case, a message box with a warning appears.

It is possible to turn the scanner to the right or left (always as viewed from the top of the scanner). The Alignment Group is available only if the box labeled “Line Linearization” is checked.

3.2.3.2 Scan Angle Group

Selects the scanner’s field-of-view to be 45° or 90°. A scan angle of 45° is not available at a scan frequency of 48 Hz.

3.2.3.3 Line Linearization

Most all applications require selection or activation of this feature. The scanner’s internal mirror continuously sweeps across the field-of-view (45° or 90°). As the mirror rotates, 256 temperature readings are recorded at fixed angular increments resulting in the display of a nonlinear temperature distribution (i.e., non-linear with respect to the horizontal axis of the thermogram). This nonlinear display results in the physical distance between two adjacent points at the edges or extremities of the thermal image to be larger than that in the middle of the thermal image.

To avoid this nonlinearity, click the check box for “Line Linearization”. This causes the system’s software to properly correct for measurement geometry and display measured temperatures linearly.

3.2.3.4 Lines reversed 180°

This allows the display of temperature lines to be mirrored by 180° (i.e., left-right reversal). As a result, the left-edge of the displayed screen is transformed to the right-edge, and vice versa. This option is helpful if the left-edge of the material scanned and the left-edge of the displayed image should be the same to the user even though the scanner is not mounted in the appropriate manner.

3.2.3.5 Image Dimension’s Group

Defines the dimensions of the measured object and the units of length. Changing length units causes all length-related parameters (e.g., size of sectors) to be converted automatically after user confirmation. However, the software only processes whole (integer) numbers for dimensions. Converting from a smaller length unit to a larger length unit may cause loss of dimensional data. (e.g. 850 cm → 9 m). In that case a message box appears.

By selecting the option “**other**” the axis are labeled in pixel and lines. In that mode, sectors are not supported.

3.2.4 Data File Page

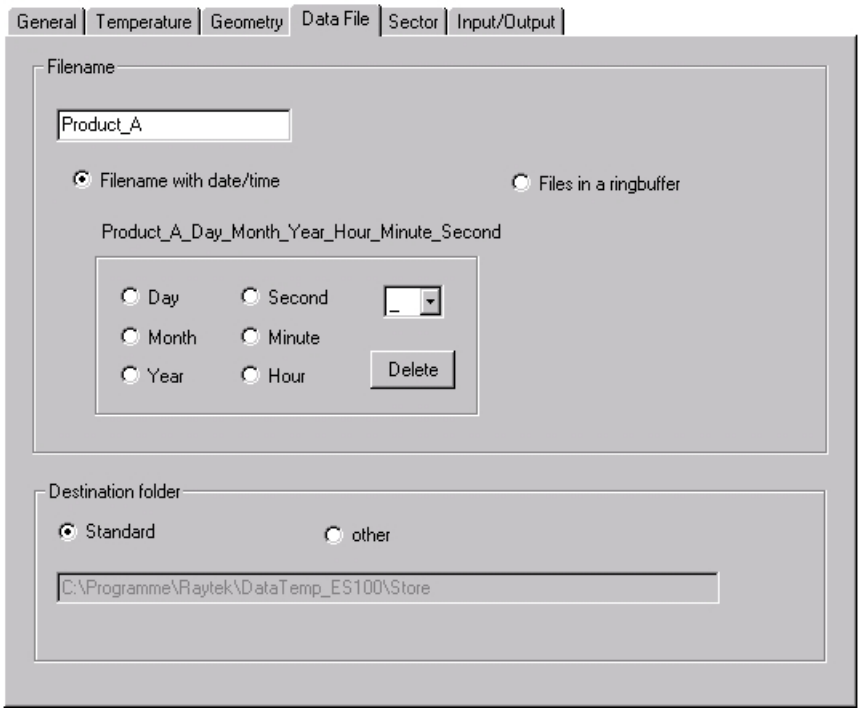


Figure 8: Data File Page

3.2.4.1 Filename Group

Defines the file format for labeling files with images automatically saved. First, a basic filename without any extension is input. Based on this basic filename, two different options are offered:

Filename with date/time: Enlarges the basic filename with a free, definable combination of a date or time. In case of an alarm, the filename will be created as the basic filename plus the actual date/time combination according to the setting of the PC. In the example given above, the created filename could be: Product_A_01_January_2001_12_00_00

Files in a ring buffer: A ring buffer provides a counter to name the files. When the last counter value is reached, the ring buffer starts again from the beginning, overwriting previous files. A ring buffer of 100 creates a ring buffer with running file names: Product_A_000, Product_A_001, ..., Product_A_099

The “save conditions” must be set in software by launching the context menu in the activated view.

3.2.4.2 Destination Folder Group

Defines the directory where the automatically saved files are stored. The standard folder is the installation folder plus the subfolder <STORE>.

3.2.5 Sector Page

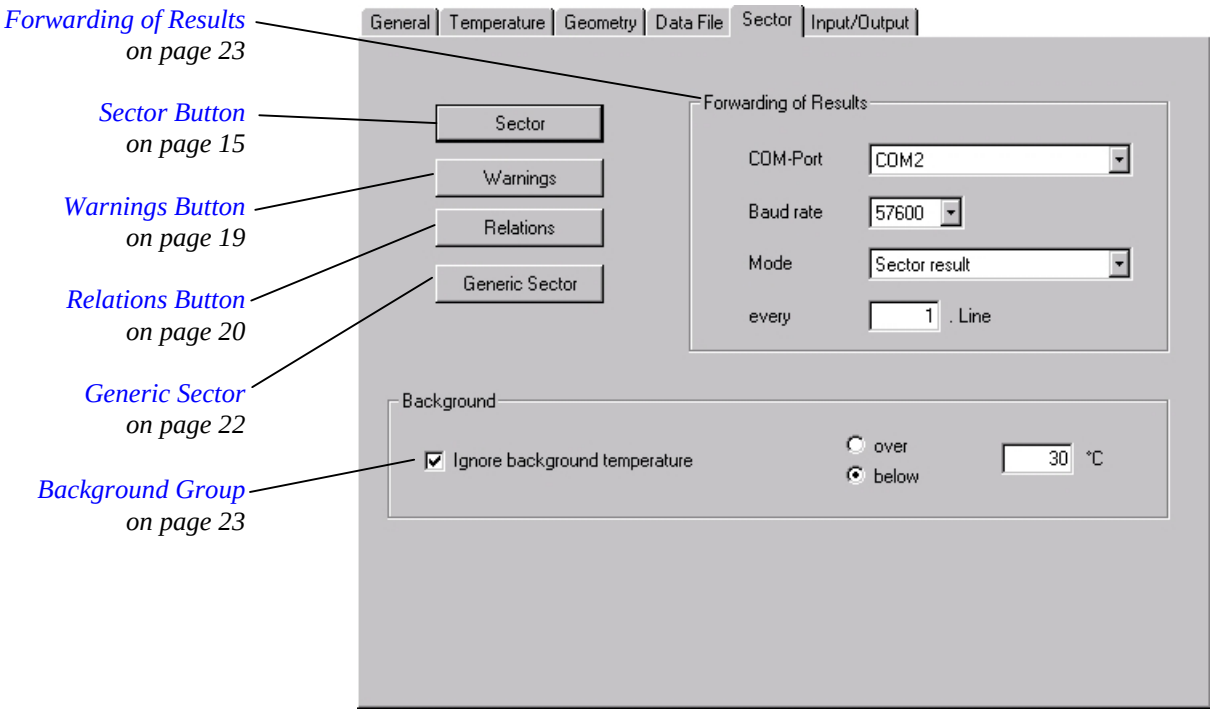


Figure 9: Sector Page

3.2.5.1 Sector Button

Defining sectors makes it possible to monitor specified areas within the continuous process. Sectors are defined with their name, their position, and their sector "result" based on available math functions (maximum, minimum, … etc.). For the sector result, one can define a lower and an upper threshold. An alarm is triggered when the threshold is exceeded or violated. Additionally, the sector result can be output as a hardware signal from an optional Output Module.

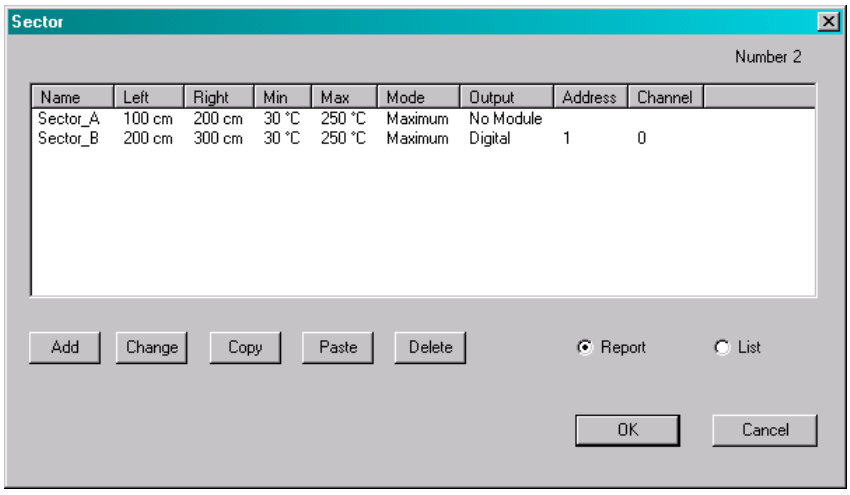


Figure 10: Sector Table

The table above indicates sectors defined for a particular configuration. For actual production operations, a meaningful sector name should be selected for each desired sector. It is possible to add additional sectors and change or edit existing sectors. Alternatively, the <Change> button allows one to “double click” on the requested sector name for changing it. For copying and deleting sectors, one can select multiple sectors. Names of sectors “pasted” into the sector table are incremented numerically with a running number.

The following shows the dialog for changing sector parameters.

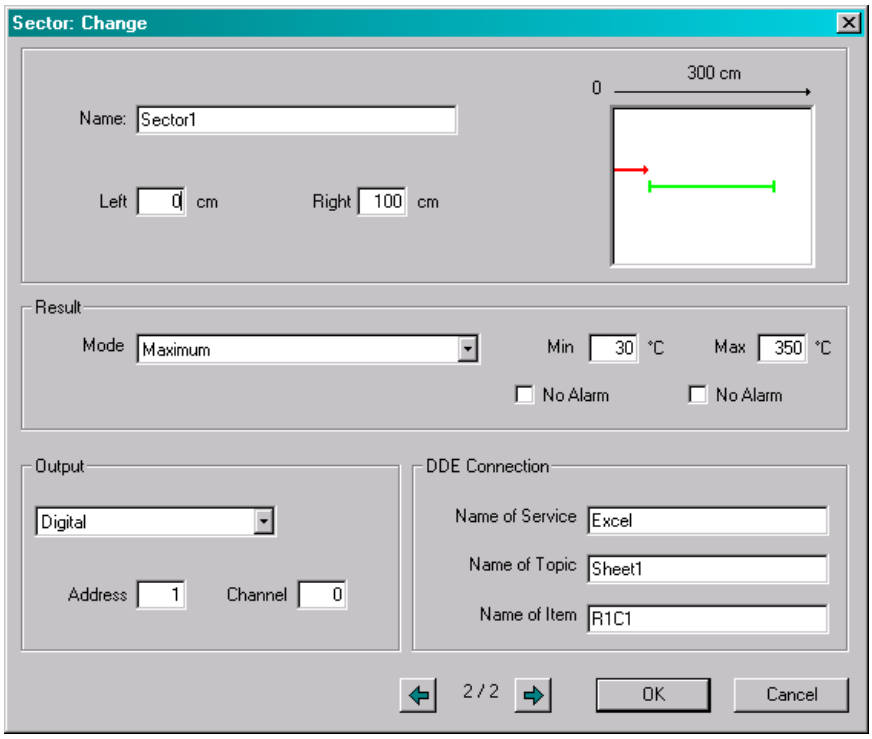


Figure 11: Setting of Sectors

Name: Input desired sector name without any spaces.

Left, Right: These are coordinates that define position of each sector relative to object dimensions defined in section 3.2.3.5 Image Dimension’s Group above.

When defining multiple sectors, it may be helpful to first draw a sketch of the desired location of each sector on graph paper. It is also possible to define over-laying sectors or sectors at the same position but with different sector results.

Result: calculation modes for the sector result, the following modes are available:

Maximum:	sector result is the pixel with the highest temperature.
Average:	sector result is the temperature average of all pixels.
Minimum:	sector result is the pixel with the lowest temperature.
Maximum-Average:	sector result is the difference between sector maximum and temperature average.
Average-Minimum:	sector result is the difference between temperature average and sector minimum.

Max-Avg-Min:	In this mode the „Average-Minimum“ and the „Maximum-Average“ is calculated. The sector result is the greater value of both.
Standard Deviation:	The sector result is the standard deviation over all pixels in a sector.
Covered Area:	The sector result is a percentage of all pixels which are warmer than the background temperature. The background temperature can be defined on the Configurator’s page “Sector”. By means of that function the capacity of heating ovens can be monitored.
Gradient:	Sector result is the maximum gradient (rising or falling).
Rising Gradient:	Sector result is the maximum rising gradient (rising: in direction from left to right).
Falling Gradient:	Sector result is the maximum falling gradient (falling: in direction from left to right).
Max of Area:	Sector result is the temperature of the pixel with the highest temperature. Two thresholds are given to check this result: – an upper temperature threshold – an count of adjacent pixels (in the line and the previous lines!) which must have a temperature greater than the upper temperature threshold. An alarm is generated if more than the given count of pixels has a temperature greater than the upper temperature threshold, see the following example:

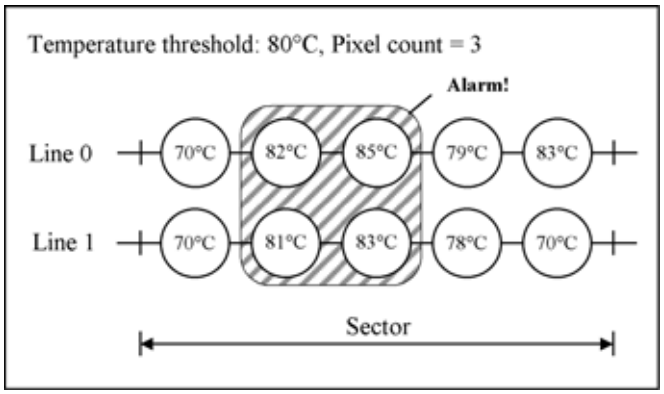


Figure 12: Alarm generated by the “Max of Area” - function

Min, Max: defines the thresholds for the sector result.

No Alarm: sector and sector result are displayed on the screen, but the alarm generating for that sector is switched off.

Output: defines a hardware output for the sector result. Analog Output Modules output the sector result as a current or a voltage in a certain range. Digital Output Modules set an output in case of a sector alarm caused of a threshold violation. The connection of a sector to a module is given by setting of the module’s address and channel, see also section 3.2.6 Input/Output Page on page 24.

DDE Connection: The DDE connection provides a continuous transfer of sector results to another target application. In the target application, further analyses can be realized.

Attention: For establishing a DDE connection, the target application must be started before the scanner software!

Service: Name of the target application, which is able to communicate via a DDE connection. Normally, *Service* is the name of an executable application file (without the extension .EXE) based on Microsoft Windows.

Topic: Specific parameter according to the target application.

Item: Specific parameter according to the target application.

Hint: The actual use of the parameters *Service*, *Topic*, and *Item* is described in the documentation material of the target application. Some examples are to be found in the appendix:

8.1.1 DDE with Microsoft Excel, p. 50
8.1.2 DDE with LabVIEW, p. 51
8.1.3 DDE with DASYLab, p. 52

3.2.5.2 Warnings Button

Based on sectors already defined, it is possible to create warning thresholds for the result of a particular sector (in addition to the alarm thresholds of the sector). A warning causes a warning message on the screen before a the actual sector alarm is triggered. Warnings are defined with their name, a lower warning, and an upper warning. It is not possible to output a warning as a hardware signal.

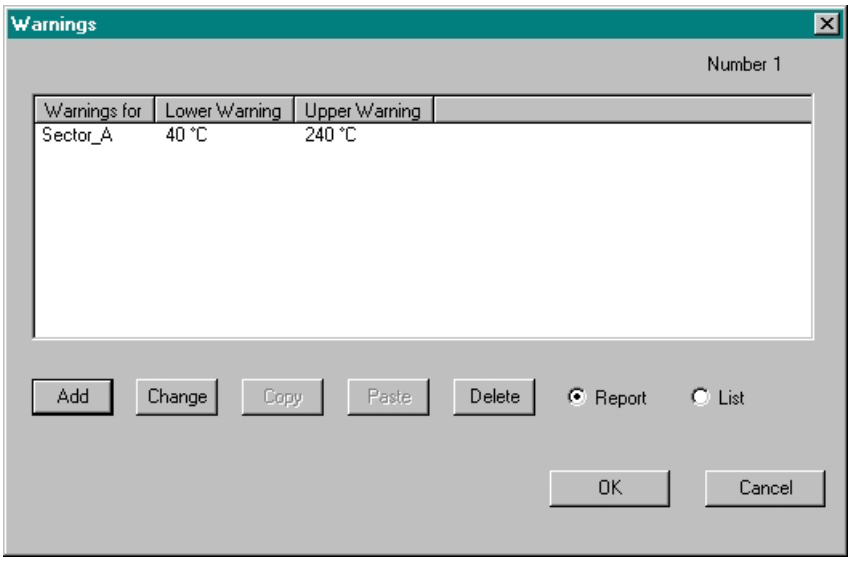


Figure 13: Warning Table

The following shows the dialog for changing parameters for warnings. The warnings must be within the range of the alarm thresholds.

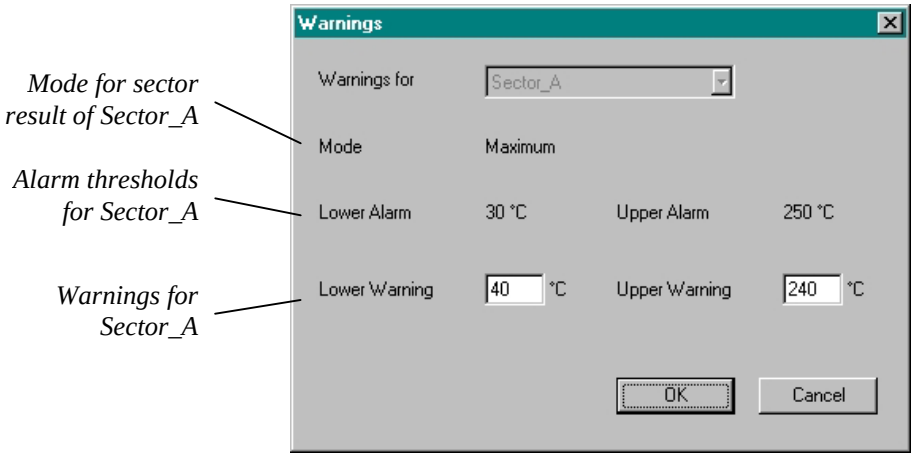


Figure 14: Configuring a Warning

3.2.5.3 Relations Button

Based on sectors already defined, it is possible to create “relations” between them. The “result” of the first sector can be compared with the “result” of the second sector, whereby a “relation” is the difference between these two sector results. Every “relation” is managed like a common sector:

- it has a name,
- it contains the names of the two sectors to be compared,
- it can be observed with alarm thresholds,
- it will be displayed on the screen like a sector result,
- it can drive a channel of an Output Module.

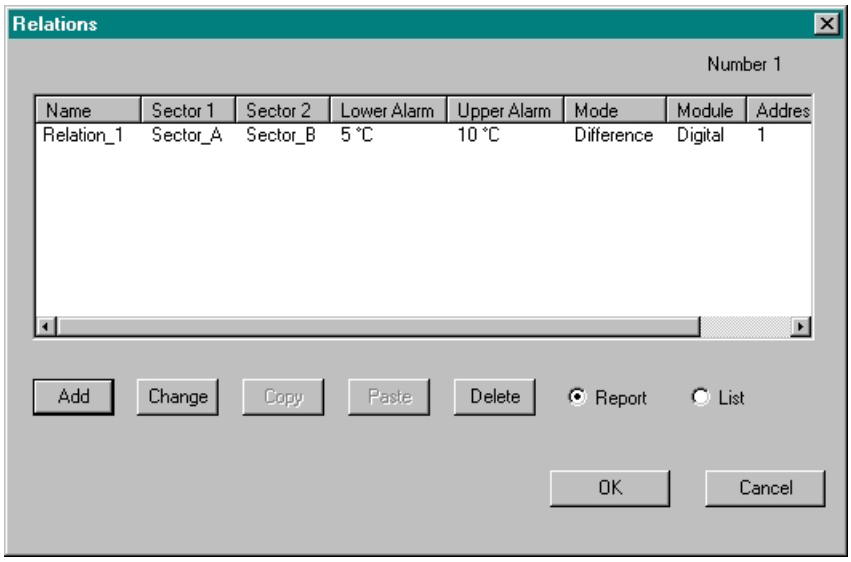


Figure 15: Relations Table

The following shows the dialog for changing parameters for relations. In the given example, the name of the relation is “Relation_1”. The result of that relation is the difference between the sector result of “Sector_A” (Maximum) and the sector result of “Sector_B” (Maximum). An alarm is generated if the difference is less than 5 °C (Lower Alarm) or greater than 10 °C (Upper Alarm). If you want to suppress an alarm, the check box “No Alarm” can be enabled. In that case, the relation is only displayed on the screen. In the given example, the result of the relation is output as hardware signal at channel 0 of the Digital Output Module addressed with address 1.

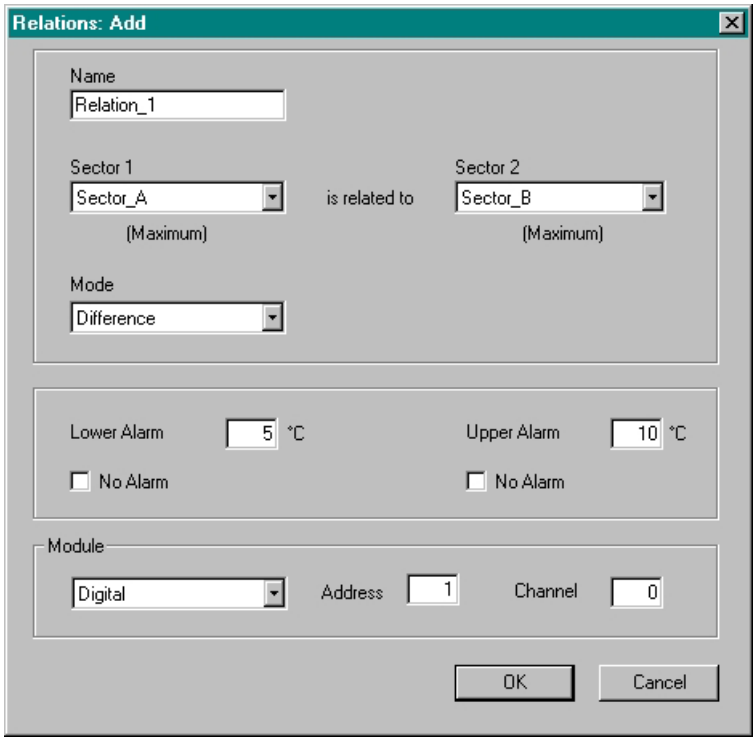


Figure 16: Specifying Relations

3.2.5.4 Generic Sector

The need for a “generic sector” arises from “stripe” coating applications that have a temperature profile with at least one plateau (i.e., stripe) characterized by comparatively sharp edges. Stripe coating is generally defined as alternating adhesive-coated stripes with non-adhesive stripes (coated in the web’s machine-direction). Strip coating also includes stripe coating of silicone, emulsions and primers in addition to adhesives. The temperature information within the plateau (i.e., stripe) or plateaus (if there is more than one) is of interest and can be evaluated with the math functions of the standard common sector.

To meet this requirement, the generic sector extends the standard sector:

- its position can flow or extend within the edges of the plateau
- the count of sectors equals the count of plateaus and is allowed to vary at runtime.

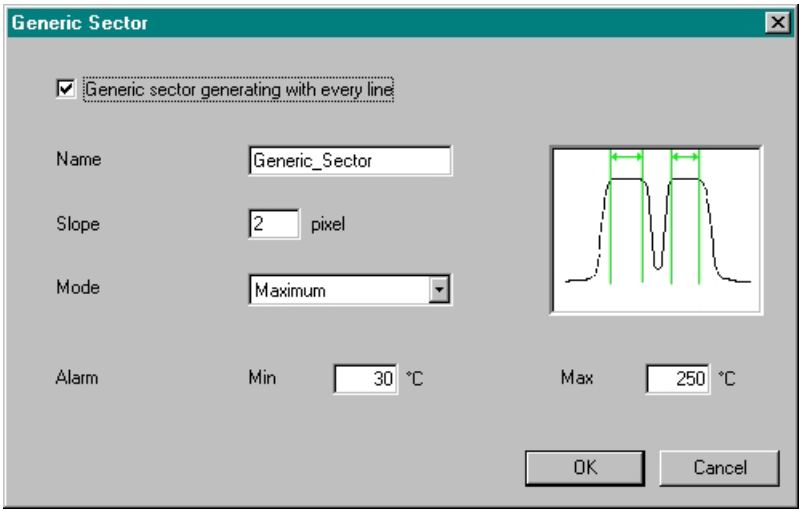


Figure 17: Setting of the Generic Sector

With the Configurator, the generic sector is defined as a rule to create sectors. Using the dialog box above, the following characteristics have to be defined:

Name: defines the basic name for all sectors. According to the number of generated sectors, the basic name will be extended by a running number during run time.

Slope: the width of the edges of a plateau to search the sector position

Mode: the math function for the pixels of the sector. All functions of a standard sector are available, see section 3.2.5.1 Sector Button on page 15.
One extra function was added: as the width of the sector is not fixed it can be calculated and used as a raw measurement of the width. **Width** increases the set of operations and determines the width of a sector relative to the dimension given in on the Configurator’s Geometry Page, see page 12.

Alarm: the minimum and the maximum threshold set to generate an alarm if the calculated value is out of limits.

3.2.5.5 Forwarding of Results

It is possible to send the information from the sector calculation via a serial port to another device. This makes it easy to get the temperature information to a PLC for controlling heaters or any other system to post-process the data.

The protocol sends only ASCII text characters in the following form:

```
STX
Scanner tab <Nummer> \n
<name of first sector> tab <result of first sector> \n
...
<name of last sector> tab <result of last sector> \n
checksum tab <value of checksum (hexadecimal)> \n
ETX
```

In multi scanner systems the results can be forwarded to a separate COM-port or a common used COM-port. Every sector list is marked with preceding specific scanner number. The <name of sector> is the name given by the user. If it is longer than 8 characters it will be truncated to 8 characters. The checksum is the sum of all characters but the ETX.

The output rate is decreased by limiting the forwarding of the results to every e.g. second line.

3.2.5.6 Background Group

Ignore Background Temperature: Checking this box allows the measured object's temperature to be distinguished from that of the "background". The user can determine a temperature threshold. A value outside of this temperature threshold (above or below) is considered "background". Warm or cold backgrounds are definable.

If a sector contains temperature values of the background, these values are ignored for the calculation of the sector result. If all temperature values of a sector are pixels of the background, then the sector is marked on the screen with the character „X".

3.2.6 Input/Output Page

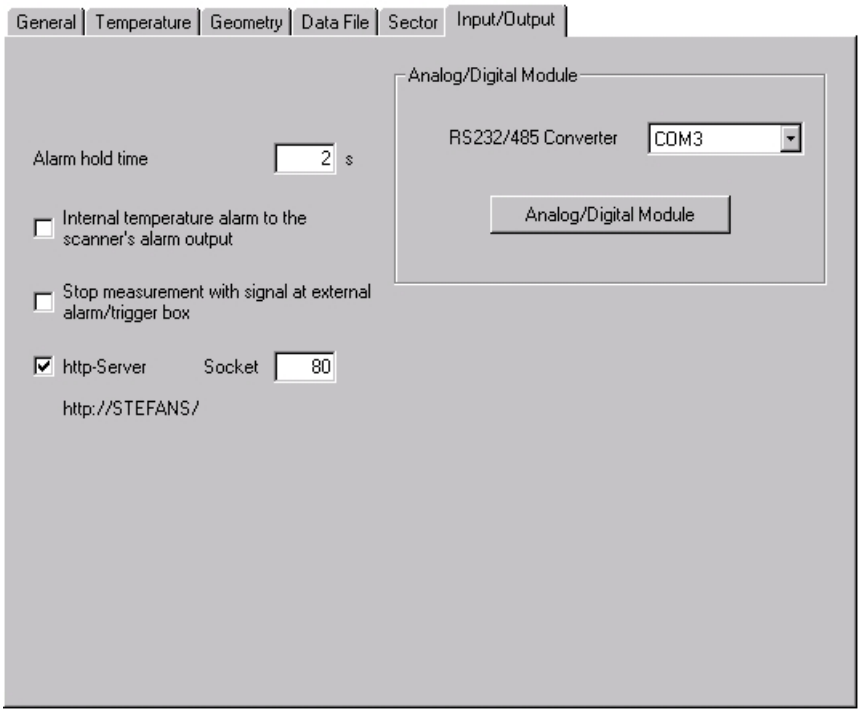


Figure 18: Input/Output Page

Alarm hold time: Determines the hold time of the alarm signal of the Alarm/Trigger Box.

Internal temperature alarm to the scanner's alarm output: The software monitors the internal temperature of the scanner. In case of violation a certain temperature range, the software generates an alarm message on the screen. By activating the check box it is possible, to output an alarm signal to the alarm/trigger connector at the scanner's housing (closing contact between pin 1 and 2 in case of alarm). To avoid a condensation in the inner of the scanner the lower temperature threshold is actual set to 10°C (50°F), to avoid an overheating of the scanner the upper temperature threshold is actual set to 55°C (131°F).

Stop measurement with signal at external alarm/trigger box: Determines the external trigger of the Alarm/Trigger Box as a measurement gate. If the input is connected to ground, data acquisition proceeds (closed contact between pin 6 and 7 of the terminal block of the Alarm/Trigger Box, see section 6.3 Alarm/Trigger Box on page 47). If not, data acquisition stops. This is helpful for machine down-time/maintenance to prevent alarms or to shut down the program.

> **!** **The external trigger of the Alarm/Trigger Box (gating the whole measurement) is not identically to the external trigger of the scanner (starting/stopping a single snapshot).**

http-Server: By activating the check box, the scanner software runs as a server for one or more remote computers based on a http-protocol within an Intranet. The intranet address built from the server's computer name and the socket number is to use as address information for the client's explorer.

Netscape-Navigator (version 4.5 or higher) or Windows Internet Explorer (version 5.0 or higher) has to be installed on the remote computer. Additionally the Java-Runtime-Environment (version 1.3 or higher) must be available on the remote computer (a suited Java-Runtime-Environment installation is to be found on the installation CD). In case of running more than one server on the computer, the standard socket number of 80 must be changed.

The client's explorer shows only temperature data. Zone and alarm information are not displayed. A remote configuration of the system from the client's computer is not possible.

In case of connection problems, see section 7.2 Connection problems with the http-protocol on page 49 for more details.

3.2.6.1 Analog/Digital Module Group

RS232/485 Converter: Determines the serial port for the RS232/485 converter of the Analog/Digital Output Modules. Clicking the <Analog/Digital Module> button the following dialog appears:

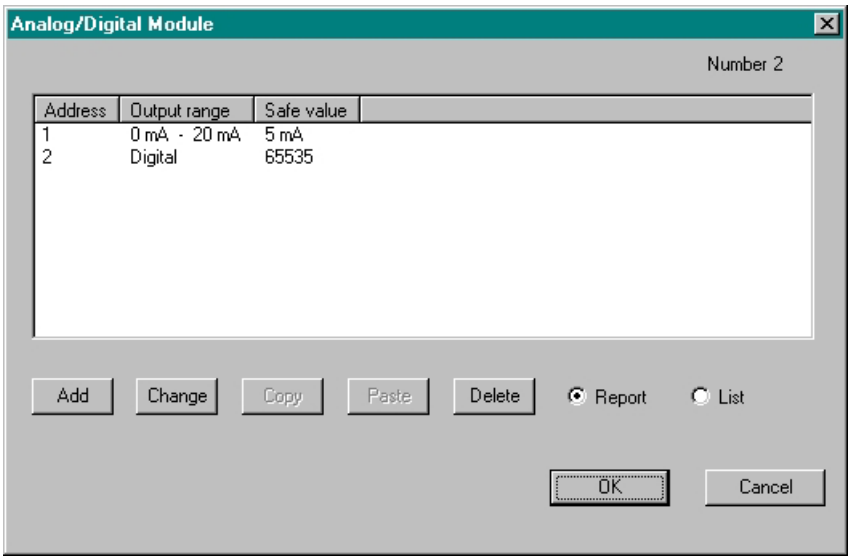


Figure 19: Analog/Digital Modules Table

Clicking the <Add> button the following dialog for setting the modules appears:

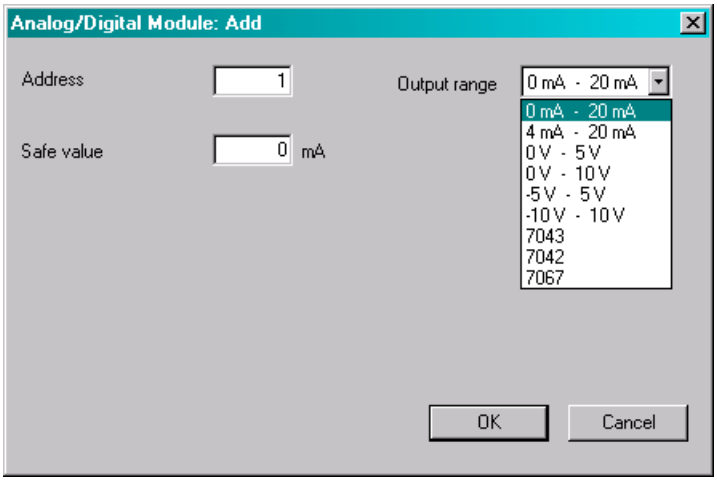


Figure 20: Setting of Analog/Digital Modules

Address: Defines the address of the Analog or Digital Output Module. The address is programmed in the module. See section 8.3.6 Address Configuration on page 60 for physical address programming.

Output range: Defines the output range for an Analog Module. Current and voltage ranges are available also with negative values. The following digital modules are available:

7043: Digital Module with 16 non isolated outputs

7042: Digital Module with 13 isolated outputs

7067: Digital Module with 7 relay outputs

Safe value: To increase the system reliability, the analog and Digital Output Modules monitor the status of the host computer: if the host is down or the network is open, all Output Modules will default to their predefined safe value. This function is realized by a watchdog timer, which is built in to every Output Module. These watchdogs are initialised by launching the program and must be updated (by the program) at least every 25 seconds. After 25 seconds without update, they will go to their safe state. The safe value can be evaluated by the following network to send an error message to a central processing unit.

4 System Operation

4.1 Software Start

The scanner software is started by means of the Start Menu or by double-clicking on the desktop symbol icon .

In the case that no scanner was connected, the dialog box <Port Parameter> appears after the program start. The option <No Scanner> can be chosen. The scanner software runs in the offline mode. In the offline mode, only viewing of saved thermograms is allowed. This mode may be useful for demonstrating some features of the software.

4.2 Software Functionality

For monitoring of continuous processes the scanner has to record temperature lines permanently. The recording is performed according to the scanner's scan frequency. All recorded temperature lines are transferred to the PC immediately via the serial interface. These lines can be viewed assembled to a scrolling temperature image or as profile line by line.

Sectors can be used to split the continuous process in several areas. All pixels within a sector contribute to a single calculated value (the sector "result"), which can be output to a channel of an (optional) Output Module.

Different "Views" are implemented to extract and display the temperature lines of interest:

- Display as a colored thermographic image (temperature variation over all lines)
- Display as a horizontal diagram (temperature variation over one line)

These views are described in the following sections.

4.2.1 Main Screen

After the successful starting the program, the main screen appears, see Figure 21. The contents of the main screen depend on the number and the position of opened windows during the last program exit.

In the top bar of the main screen, the menu items for the main menus appear. The items <Scanner> <Option> <Window> <?> are available.

The number of the visible windows can be matched to individual preferences. The desired size of the windows are adjustable from minimum to maximum. The arrangement of the opened windows is adjustable by means of the item <Window> and the options <Overlap>, <Tile Horizontal> or <Tile Vertical>.

In the bottom bar of the main screen the status line is arranged. This line contains information about the program status and the scanner's internal temperature.

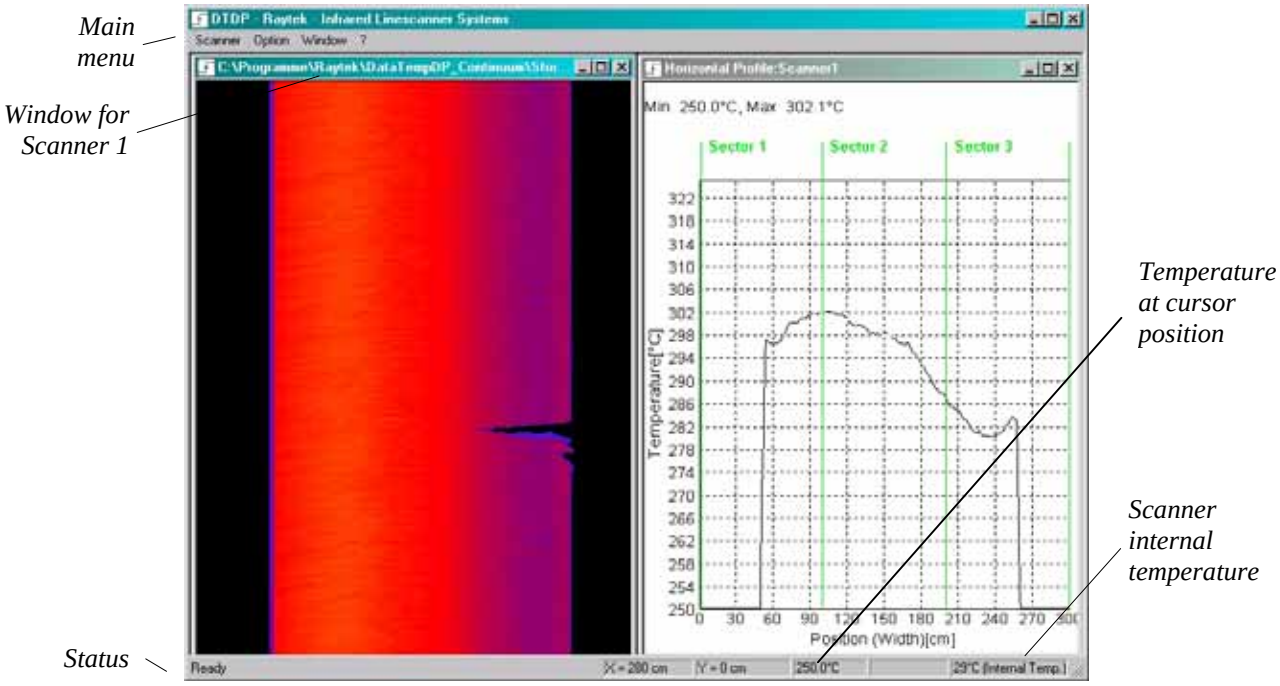


Figure 21: Main screen after program start

4.2.2 Menu Overview

The table shows an overview of all available menus. All menus are described later in this manual.

Scanner		Option	Window	?
New Scanner		✓Status Bar	Terminal	Info
✓Start/Stop			Scroll View	
Scanner Setup			Snapshot View	
Save as ...	F2		Horizontal Profile	
Change Configuration	Ctrl O		Vertical Profile	
Close			Snapshot History	F3
Exit			Reference	F5
			Zone History	
			Zones in a Table	
			Overlap	
			Tile Horizontal	
			Tile Vertical	
			✓1 Scroll View:Scanner1	
			2 Horizontal Profile:Scanner1	

Figure 22: Menu overview

4.2.3 Scanner Menu

Menu <Scanner> <New Scanner>

It is possible to run two or more scanners simultaneously. To choose an additional scanner, the menu <Scanner> <New Scanner> must be selected. For each additional scanner, a separate initialization file is necessary. This additional initialization file must be created in the Configurator before the scanner software starts. An attempt to activate another scanner without a corresponding initialization file creates an error message. The menu <Scanner> <New Scanner> can also be used to open an initialization file of a closed scanner without exiting the program.

Menu <Scanner> <Start/Stop>

By means of this menu, the scanner's data transmission can be started or stopped. An existing communication between scanner and program is marked through the ✓ symbol in the menu line. It is necessary to stop the scanner when using the terminal.

Menu <Scanner> <Scanner Setup>

This menu activates a dialog box to specify the requested temperature range and the emissivity. The bottom (minimum) and the top (maximum) temperature are defined to the temperature range of the plugged scanner. The field for editing the line count is always disabled.

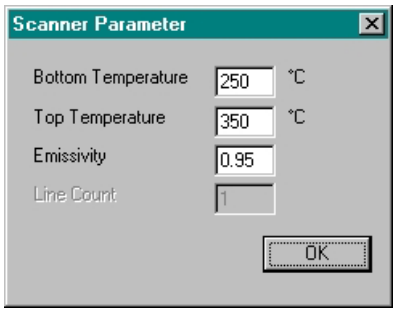


Figure 23: Dialog for setting of scanner parameters

Menu <Scanner> <Save as ... >

This menu opens the <Save as> dialog for saving the current 500 temperature lines.

Menu <Scanner> <Change Configuration>

This menu opens the <File open> dialog for selecting another configuration file.

Menu <Scanner> <Close>

This menu closes the active scanner with all corresponding windows.

Menu <Scanner> <Exit>

This menu allows the program to be ended. Prior to this, the size and the position of all opened windows are saved and subsequently recalled during the next program start.

4.2.4 Window Menu

4.2.4.1 Terminal

Menu <Window> <Terminal>

The terminal gives direct access to the scanner via its command interface. The terminal function is only activated if the data transmission between scanner and program is stopped. The scanner software does not monitor commands sent with the terminal - thus settings effected in this way may conflict with set-up settings of the scanner software. Access to the scanner via the terminal window is only possible with specific commands. These commands are described in detail in the *Protocol Manual*, which is included with system shipment.

4.2.4.2 Scroll View

Menu <Window> <Scroll View>

The Scroll View shows all recorded temperature lines continuously. The thermogram is built up line by line. If the last line of the window is reached, the whole content of the window is scrolled one line at a time.

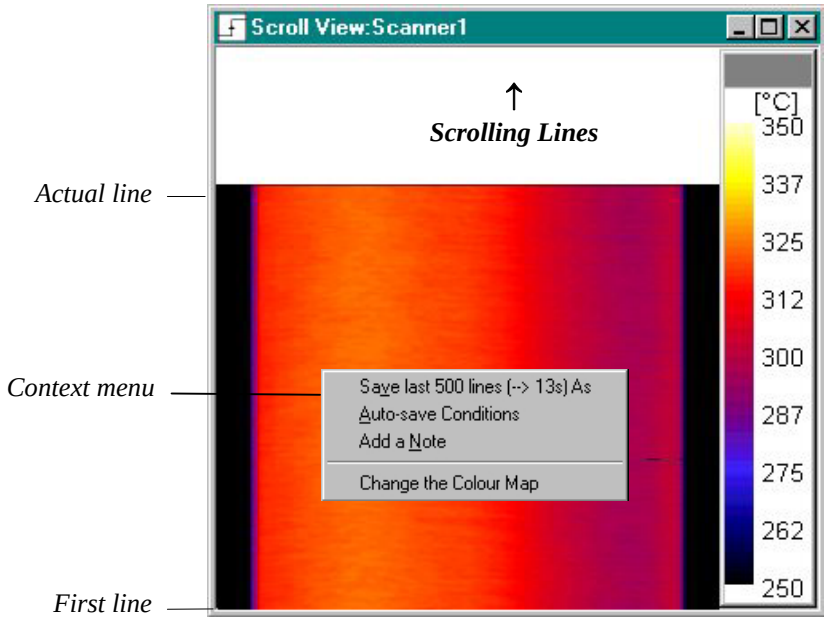


Figure 24: Example for a Scroll View

In the menu <Scroll View> a context menu is available. It is activated by clicking the right mouse button or by pushing the buttons <Shift> and <F10>:

<Save last 500 lines As> Saves the last 500 temperature lines as binary file or as ASCII file. The duration in time of 500 lines is determined by the scan speed and the averaging time of the scanner. Both are set with the Configurator. The resulting time is shown in the menu entry in brackets (e.g. → 13s).

<Auto-Save-Conditions> If the monitoring of a sector triggers an alarm, then the 500 temperature lines are automatically saved in case of setting <Save on alarm> to "ON". With <PostAlarmLines>, the number of lines which are saved after an alarm, is adjustable. The total number of lines before and after the alarm is limited to 500 lines.

With the <Time> function it is possible to save 500 temperature lines periodically without any alarm. The timer can be set in a range of seconds to days.

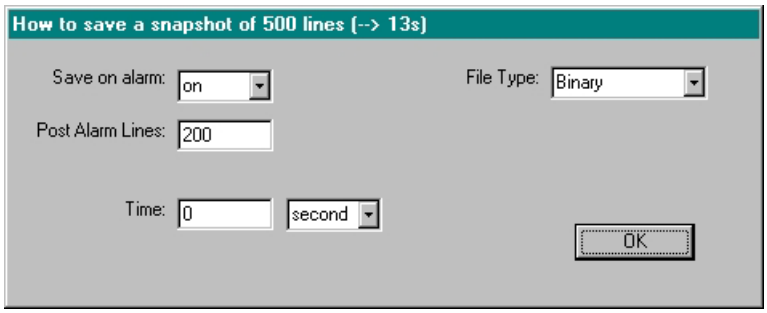


Figure 25: Setting of Auto-Save-Conditions

The following saving formats are available:

Binary Format

The binary format may be selected to save the alarm image for later analysis. The binary format is connected to the program specific to the software. The benefit of the binary format is the small storage requirement. A disadvantage is the difficulty to interface to other programs.

! **Only snapshots stored in a binary format can be recalled by means of the menu <Snapshot History>!**

ASCII-Text format

The ASCII-Text format is used to interface to other programs (for example Excel or MathCad). This advantage offsets the possible disadvantage that files saved in ASCII-Text format require more storage space than files saved in binary format.

The ASCII-Text format is composed of a header containing information (the used program version, a note, the number of lines and pixels, the scanner's internal temperature and the temperature unit) and a body containing the lines of temperature points.
To get the first line of the temperature matrix, check `StartOfDataAtLine`. This allows one to add further information to the header without reprogramming.
Temperature values are given in tenths of degrees to avoid any trouble resulting from different decimal formats using commas or dot in different countries.

Example:

```
StartOfDataAtLine 9
Version 1.00
Note:
NumberOfLines 100
NumberOfPixels 256
InternalTemperature 40
Temperature in mC (°C * 10)
Orientation: row --> line
260 260 260 253 253 250 ... 247 250 250 250 250 250
260 260 260 260 260 253 ... 250 250 250 250 253 253
```

<Add a Note> This menu opens a dialog box to enter a note. The note length of the note is limited to a maximum of 500 characters. In contrary to a static note it is also possible to add a note dynamically during the program's runtime. A text file can be used to add to every saved 500 temperature lines some information from an external system automatically (for example a product number). If a file with the name `note.0` will be found in the programme path this file will be considered as a ASCII text file and read in as note to the 500 temperature lines.

<Change Color Map> Opens a dialog box for setting the displayed colors:

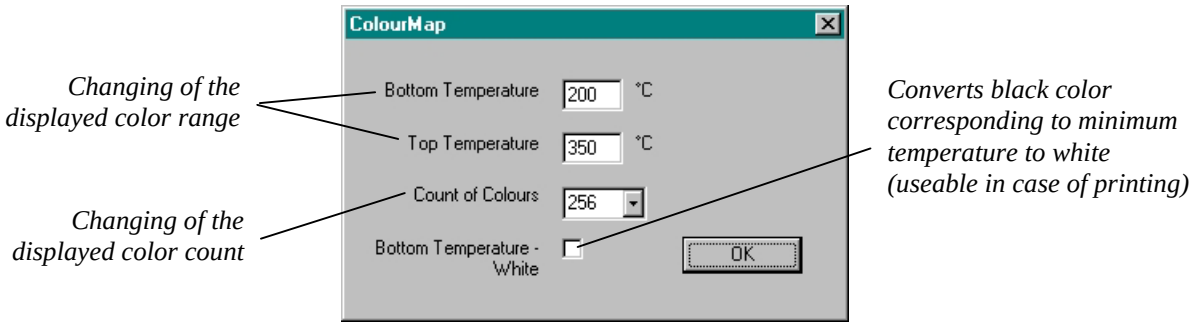


Figure 26: Changing colors

4.2.4.3 Horizontal Profile

Menu <Window> <Horizontal Profile>

The menu <Horizontal Profile> allows the temperature variation across one line to be displayed. The displayed line is always the actual line.

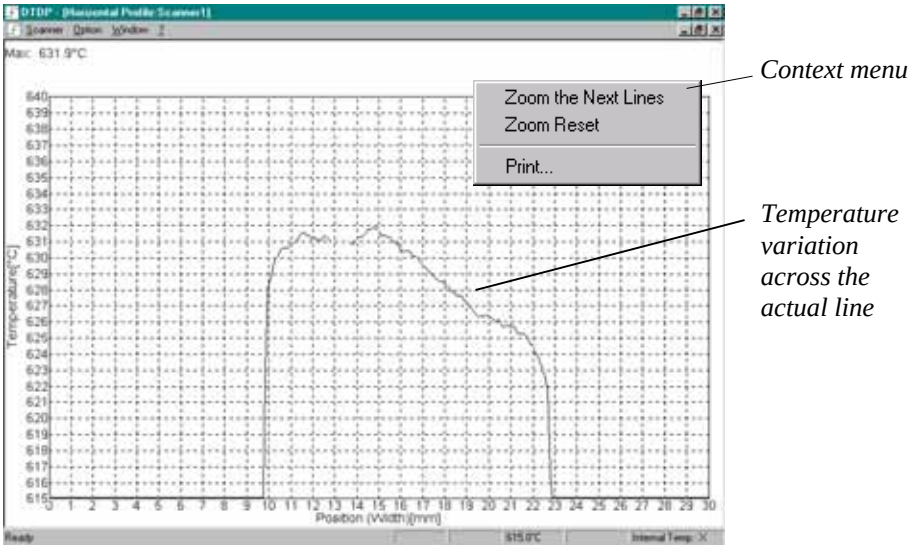


Figure 27: Horizontal Profile

In the <Horizontal Profile> menu, a context menu is available. It is activated by clicking the right mouse button or by pushing the keyboard buttons <Shift> and <F10>:

<Zoom the Next Lines>	Select the requested part of a temperature line by setting the left and the right zoom edge. The new edge position is fixed by a double click of the left mouse button. The zoom will affect every view. Each renewed zoom is based on the original line. The zoom function is helpful to match the displayed screen to the width of the measured object. However, the resolution of the system is not increased by zooming. That is why the x-axis (position) remains unchanged.
<Zoom Reset>	Displays original (un-zoomed) line.
<Print …>	Opens a dialog for printing the actual view.

4.2.4.4 Snapshot History

Menu <Window> <Snapshot History>

The menu allows the running through the history of thermograms previously saved in binary format. This option is ideal when following process changes over a long time and having hundreds or thousands of thermograms. A specific thermogram can be displayed by selecting the corresponding saving date. Additionally it is possible to run through the history step by step or continuously like the running of a video.

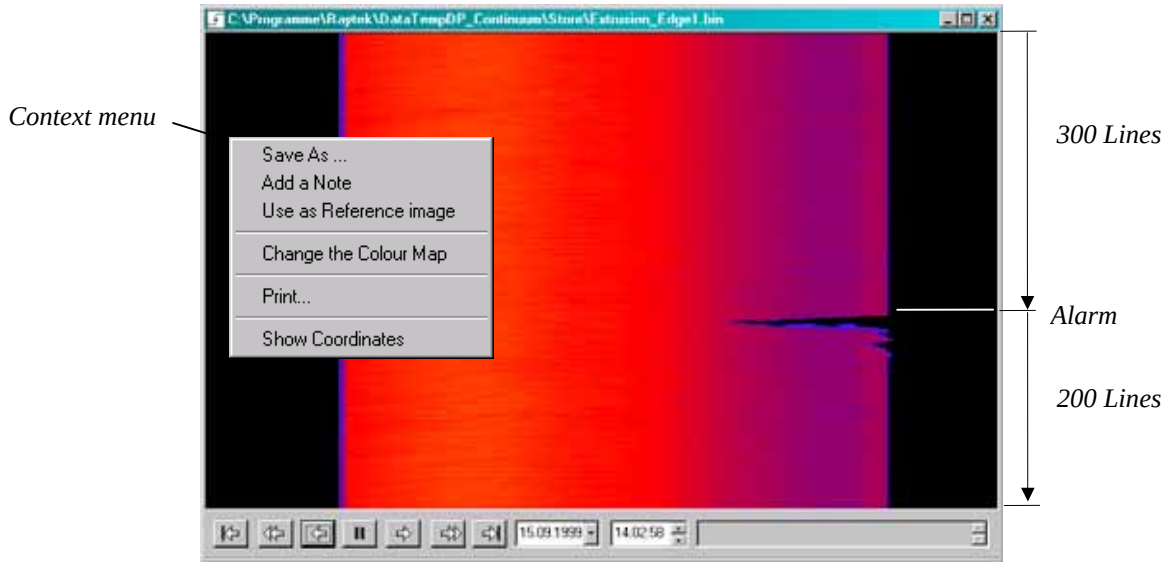


Figure 28: Recall of a thermogram by means of the menu <Snapshot History>

! In dependency of the number of stored thermograms and the power of the used computer system, the loading of the history can take several minutes!

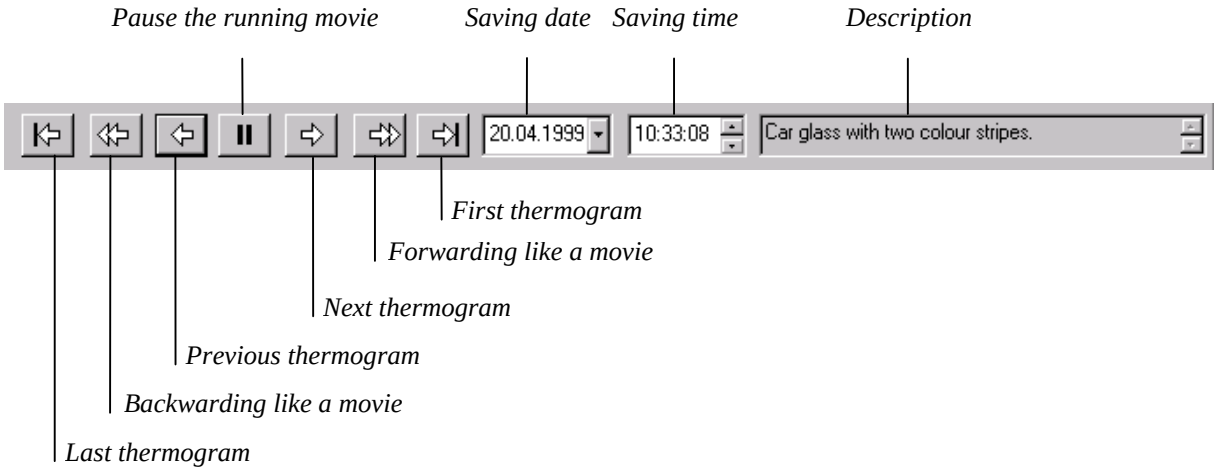


Figure 29: Task bar of the Snapshot History

In the <Snapshot History> a context menu is available. It is activated by clicking the right mouse button or by pushing the buttons <Shift> and <F10>:

<Save As>	Saves a snapshot into another file format or under another file name.
<Add a Note>	Adding or changing of the note of a snapshot.
<Use as Reference image>	Sets the current snapshot (or alternative the hot key F6) to the reference snapshot. The reference snapshot is stored under the file name „reference.bin“ in the subfolder STORE. Only one snapshot can be set as a reference. The reference snapshot provides comparative analyses with current snapshots of the running measurement. The reference snapshot can be displayed or hidden by means of the menu <Window> <Reference> or the hot key F5.
<Change the Color Map>	Opens a dialog box for setting the displayed colors.
<Print …>	Opens a dialog for printing the actual view.
<Show Coordinates>	Activating or deactivating the coordinates.

4.2.4.5 Reference

Menu <Window> <Reference>

By means of this menu (or alternative the hot key F5) the reference snapshot can be displayed or hidden.

4.2.4.6 Zone History

Menu <Window> <Zone-History>

The window <Zone History> provides a graphical view of sectors results over a certain time. The displayed time interval is adjustable by using the sliders.

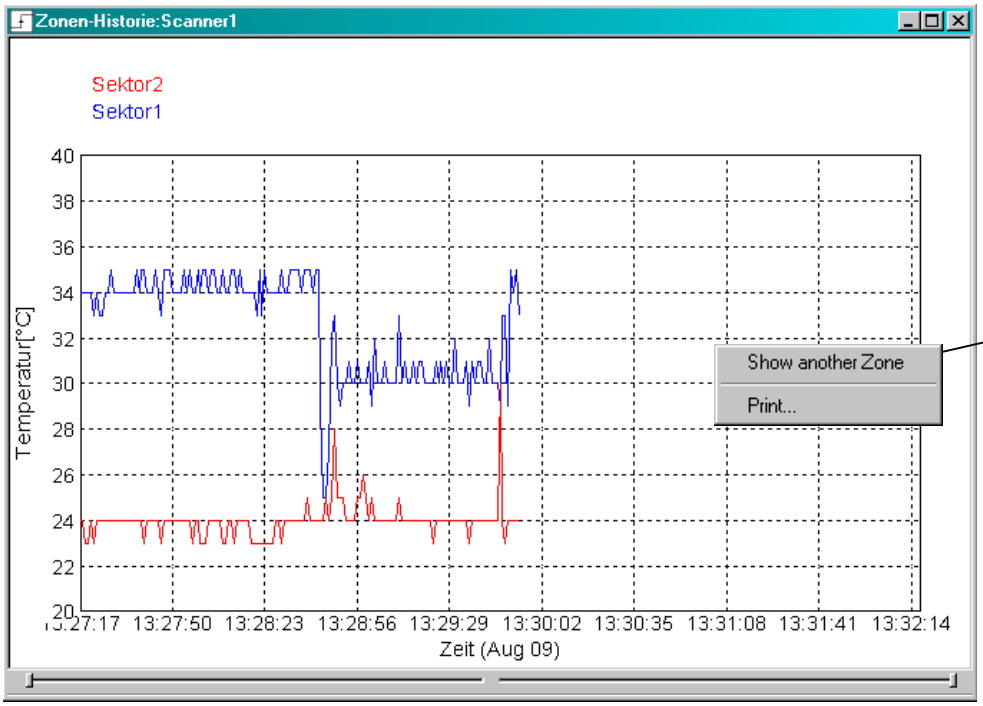


Figure 30: Displaying of sector results in the <Zone History>

In the <Zone History> a context menu is available. It is activated by clicking the right mouse button or by pushing the buttons <Shift> and <F10>:

<**Show another Zone**>	Selects a sector for graphical displaying.
<**Print ...**>	Opens the <Print> dialog for printing the current window.

Sector History as ASCII Text File

The history is also available by accessing an ASCII file stored in the subfolder <Store> to be found in the installation directory. For every sector one file for the history is being used. The filename is created by using the sector name plus the extension ".zon".

```
<Number if seconds since 1.1.1970>    <sector result>   <date and time>
```

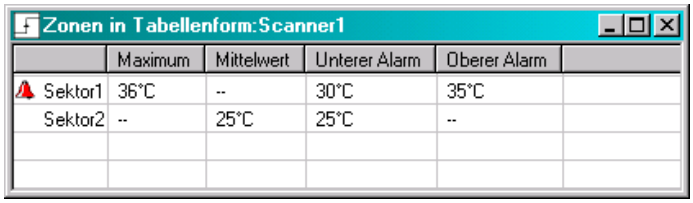
example for "Sector1.zon":

```
1045560325     28     Tue Feb 18 10:25:25 2003
```

4.2.4.7 Zones in a Table

Menu <Window> <Zones in a Table>

The window <Zones in a Table> provides the display of sector results in a table. With every new temperature line, all sector results in the table are actualized automatically. A little red bell indicates the violation of the upper alarm threshold, a little blue bell indicates the violation of the lower alarm threshold.



	Maximum	Mittelwert	Unterer Alarm	Oberer Alarm	
Sektor1	36°C	--	30°C	35°C	
Sektor2	--	25°C	25°C	--	

Figure 31: Displaying of sector results in a table

4.2.5 Alarms

Alarms are triggered by monitoring sector results. In case of violation, of the predefined sector thresholds the software responds with the following actions:

- Output of an alarm message on the screen
- Entry of the alarm time in the alarm file (logbook)
- Saving of an alarm image (auto-save-condition in the Scrolling View's context menu must be true)

To avoid a permanent alarm, a new alarm is only triggered if the recorded temperature data are within the given thresholds within a short period of time. A new alarm is also triggered if the previous alarm message on the screen is not acknowledged.

The software monitors also the internal temperature of the scanner. The threshold for triggering an alarm is at 55°C (131°F). In case of a more critical temperature the operator is informed by a screen message. To avoid a destroying of the scanner, the operator has to take appropriate corrective action.

4.2.5.1 Alarm File (Logbook)

The software contains a function to log program information automatically. For that the alarm file ***DTDP.0.log*** is made, it is found in the work directory. The number is used for the work with multiple scanners. Every line of this file contains a message with date and time of the entry. The following information is stored:

- beginning, end, and acknowledgement of alarms,
- beginning and end of the program.

Example:

```
Start: Wed Apr 14 12:12:31 2001
Alarm Begin: Wed Apr 14 12:12:49 2001
Alarm End: Wed Apr 14 12:13:00 2001
Alarm Acknowledge: Wed Apr 14 12:13:03 2001
End: Wed Apr 14 12:13:05 2001
```

4.2.6 Demo Mode

In case no scanner is connected to the communication port, it is possible to run the software in a "demo" mode. To avoid searching for a scanner, in the Configurator's General Page the communication port should be set to "No scanner". In demo mode previous stored snapshots may be recalled. Analysis of the snapshot is supported by moving the mouse over the snapshot, whereby the actual position and the corresponding temperature value is to be seen in status line. Additionally, the horizontal profile view is available to display the temperature variation of the actual line.

5 EC100 System

Consistent product temperature profiles are critical in continuous web applications such as plastic film extrusion, lamination, or extrusion coating. Typically, process temperatures are adjusted in open-loop fashion without real-time product temperature feedback. But, infrared linescanners can provide edge-to-edge temperature measurement feedback on extrusion processes.

The EC100 System is an automated system that detects and measures thermal defects on products manufactured in extrusion processes. With continuous process control, the early detection of extrusion defects (e.g., waving or running edges, temperature gaps) allows users to improve their extrusion processes and minimize scrap to approach a zero defect standard of quality.

To monitor the temperature of the plastic-coated product and ensure precise temperature control, the MP50 Process Imager linescanner is positioned immediately after the extruder, but before the chill rolls. Proper web temperature at this location is critical for strong plastic-to-paper-substrate adhesion. Cross-web temperature variation, a key determinant of coating thickness uniformity, can also be controlled by information from by the MP50 at the extruder's die zone heaters. Maintaining a consistent temperature profile improves the product's finished appearance, dimensional stability, and folding endurance. DataTemp EC100 software generates real-time process images for enhanced monitoring and control during start-up and operation. In case of extrusion defects, an alarm is triggered. Alarm time and alarm position are automatically saved in a log file. For later analysis temperature data is recorded in a separate file.

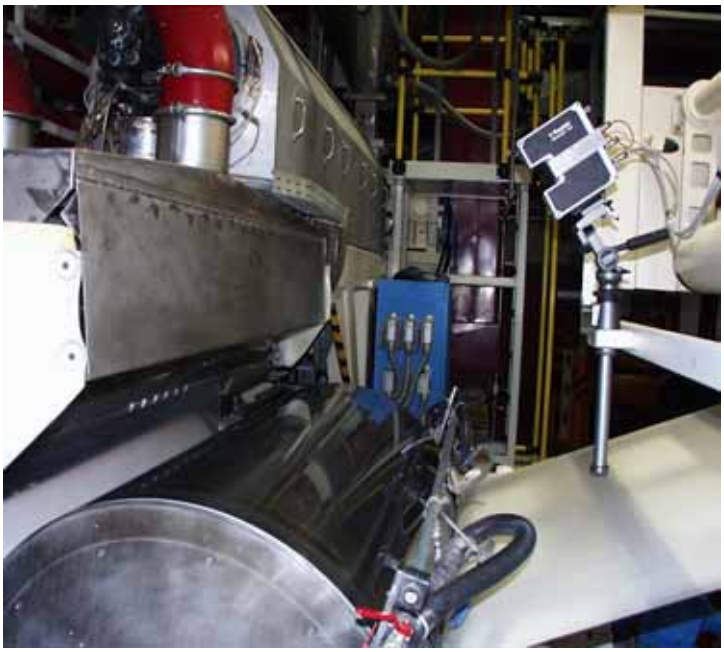


Figure 32: Monitoring of Extrusion Processes

(Photo: Courtesy of SIG Combibloc GmbH, Wittenberg, Germany)

5.1 EC100 Structure

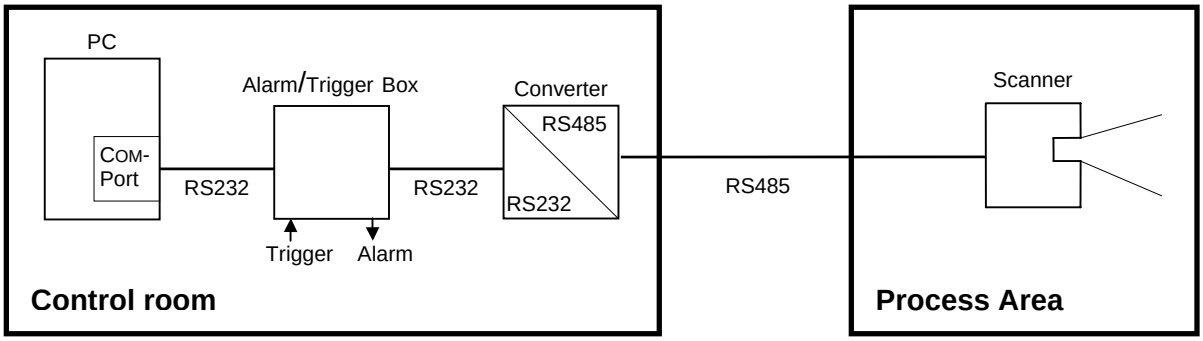


Figure 33: Configuration of an EC100 System

The communication between scanner and PC is based on a serial data transmission. The interface type of the scanner is RS485 communication. With this communication error-free data transmission can be effected over long distances. The converter changes the RS485-interface to a common RS232-interface.

The EC100 System is completed by an Alarm/Trigger Box. That box allows the input of an external trigger (e.g. for machine down-time/maintenance to prevent alarms) and the output of a digital alarm signal (to interface to other control systems). Further information about the wiring of the Alarm/Trigger Box is given in appendix 6.3 Alarm/Trigger Box on page 47.

5.1.1 Automatic Sector

The “automatic sector” feature is very useful for monitoring the melt curtain coming from the extruder’s die. Temperature gaps or unacceptable “waving” or “edge running” is detected automatically. Within the “automatic sector”, temperature deviations are calculated. Unacceptable “edge waving” or “edge running” from one scanned temperature line to the next line can be detected. An alarm is triggered if a fault occurs. Alarm time and alarm position are automatically saved in an alarm file. For subsequent analysis, 500 temperature lines are stored in a separate file. Hardware alarm outputs are available using the Digital Output Modules discussed below. Hardware alarm outputs enable marking the machine-direction locations of the web corresponding to alarm occurrences. This feature is particularly useful in preventing use of off-spec packaging materials in food and beverage applications.

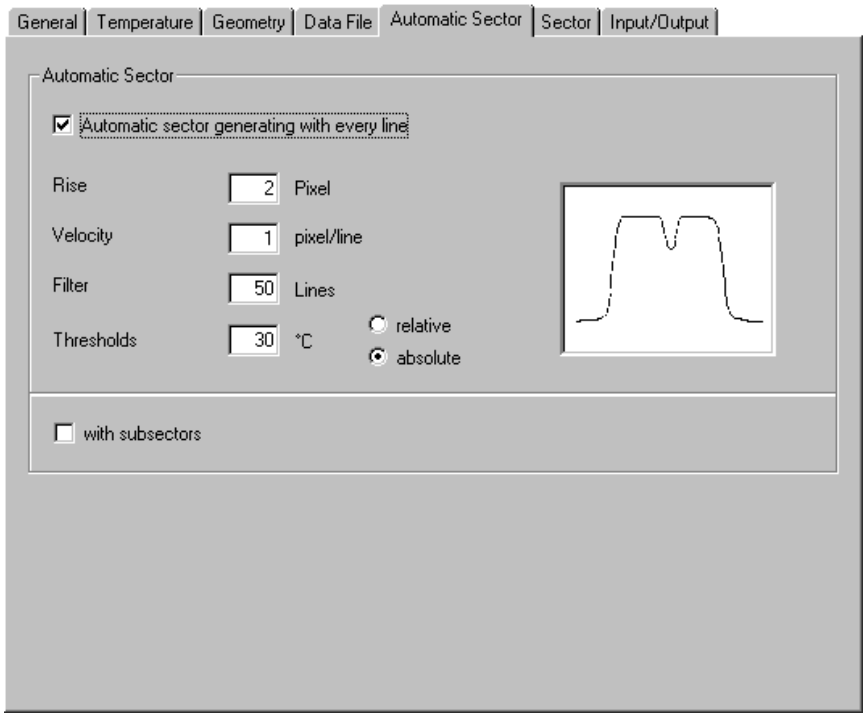


Figure 34: Setting the Automatic Sector

5.1.1.1 Automatic Sector Generating

A "sector" is defined as a specified portion of a temperature line. The sector's starting-point and the end-point are calculated dynamically based on the actual measured temperature line. The criteria for setting these two points are the rising temperature edge (left edge of the sector) and the falling temperature edge (right edge of the sector). The edges of the sector are calculated concurrently with every new-recorded temperature line.

For setting specific parameters of the Automatic Sector, please refer to Figure 34.

Rise: For evaluation of sector edges, the entire temperature line is analyzed point-by-point. To set a valid sector edge, the rising or falling edge needs some minimum increase or change. The parameter is specified in "pixels". To understand the approximate physical length corresponding to 1 pixel, if the scanner's entire field-of-view views the entire web width, there are 256 pixels spanning the width of the web. For example, a web of width 60 inches corresponds roughly to about 4 pixels per inch. To detect a very sharp edge, the parameter should have a small value (e.g., 2 pixels).

5.1.1.2 Edge Monitoring

Velocity: With edge monitoring, it is possible to detect whether the "running" or variation of the temperature edges from one scanned line to the next occurs too rapidly. For that, the edge position of the actual line is compared with the edge position of the previous line. The user determines the acceptable "velocity" of edge variation.

Filter: The smallest selectable "velocity" is 1 pixel/line. This value is not adequate for monitoring edge velocities smaller than 1 pixel/line. That is why the comparison of one line to the next can be enlarged to a number of lines called "filter". The following table demonstrates the

function of the “filter”. In the example, the acceptable velocity of the edge positions is set to 1 pixel/line.

	Filter = 1	Filter = 3
Edge positions of the lines	Line $_{t-1}$: 10	Line $_{t-3}$: 12 Line $_{t-2}$: 11 Line $_{t-1}$: 10
Averaged edge positions	10	11
Edge positions of the actual line	9,5	9,5
Result	NO ALARM	ALARM

5.1.1.3 Temperature Monitoring

The Automatic Sector’s temperature monitoring function provides a capability for checking the violation of definable temperature thresholds. All temperature values outside of the Automatic Sector are automatically ignored.

Thresholds: Alarm levels are based on the upper and the lower temperature threshold. Temperature thresholds are calculated from the temperature average—increased or decreased by an **absolute** or **relative** (referring to the average) temperature value. An alarm is always triggered with every violation of the top or bottom temperature threshold.

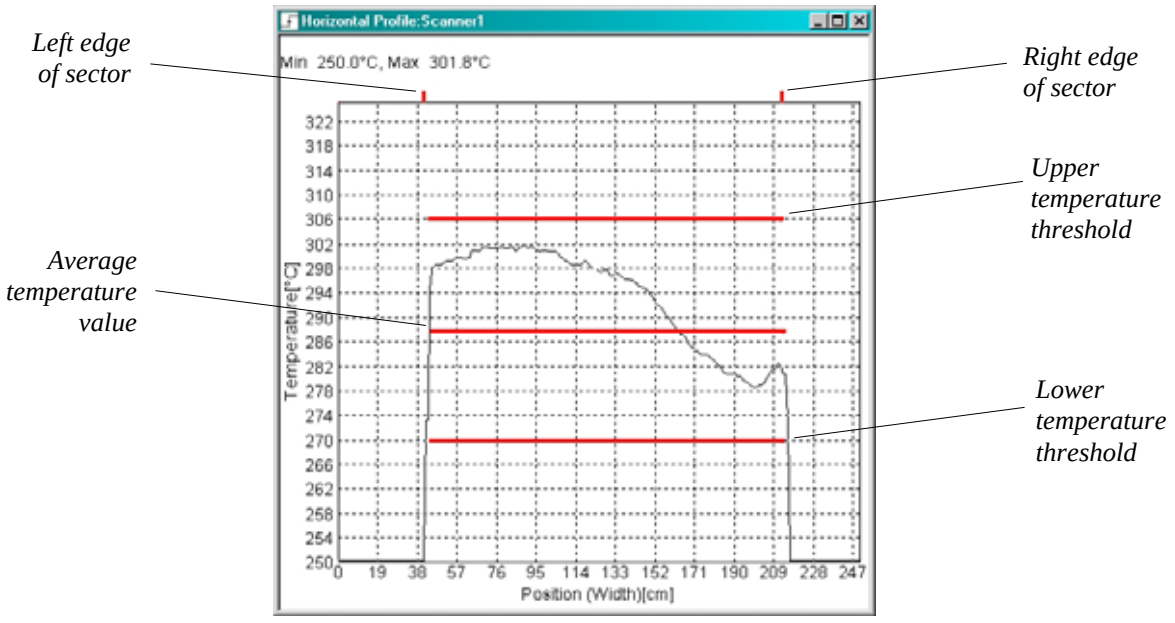


Figure 35: Horizontal Profile with Temperature Monitoring within the Automatic Sector

5.1.1.4 Forwarding of Results

The scanner program can forward the information of the Automatic Sector with every line to a serial COM-Port for processing the information in PLC's or other systems. The option must be activated on the Sector Page of the Configurator.
The following ASCII format is used:

STX<scanner no><space><left edge><space><right edge><space><alarm><space><checksum>\r

- the ASCII character STX (ASCII code 2) indicates the begin of a frame
- <**scanner no**>: In multi scanner systems the results can be forwarded to a separate COM-port or a common COM-port – every result line gives the scanner number (in two digits beginning with 1).
- <**left edge**> 4 digits are giving the position of the left edge in relation to the defined (in the Configurator) width
- <**right edge**> 4 digits are giving the position of the right edge in relation to the defined (in the Configurator) width
- <**alarm**> [0|1] indicates if the Automatic Sector has detected an alarm
- <**checksum**> is the sum of the characters of <scanner no>, <left edge>, <right edge> and <alarm> without the spaces. It is given in two hexadecimal digits.
- the **r** indicates the end of a frame

Example:

```
01   0100 0200 1    27
```

The actual position of the Automatic Sector of scanner 1 is 100 for the left edge and 200 for the right edge. The Automatic Sector has generated an alarm.

To localize the error, the following table should be used.

	Position of left edge	Position of right edge	Alarm	Description
Previous line Actual line	100 105	200 200	0 1	Error detection on the left edge
Previous line Actual line	100 100	200 205	0 1	Error detection on the right edge
Previous line Actual line	100 100	200 200	0 1	Error detection in the middle of the film

Figure 36: Localization of an Error with the Automatic Sector

5.1.2 Automatic Sector with Subsectors

The Automatic Sector is only able to detect an error on the „Left edge“, on the „Right edge“ and an error „In the middle” of the film, see Figure 36 on page 42. For the last error, the Automatic Sector generates an alarm, but the position of the detected error is not output. The subdivision of the Automatic Sector by subsectors allows the exact localization of a possible error.

The number of subsectors is freely definable. In the case of a change in the width of the Automatic Sector, all subsectors will change their width accordingly. The subsectors come with the same functionalities as the standard sectors (calculation of a sector result and the output on output modules, DDE, ...)

For subdividing the Automatic Sector, the option <with subsectors> must be activated, see Figure 34 on page 40. The configuration of subsectors is the same as the configuring of the standard sectors, see section 3.2.5.1 Sector Button on page 15.

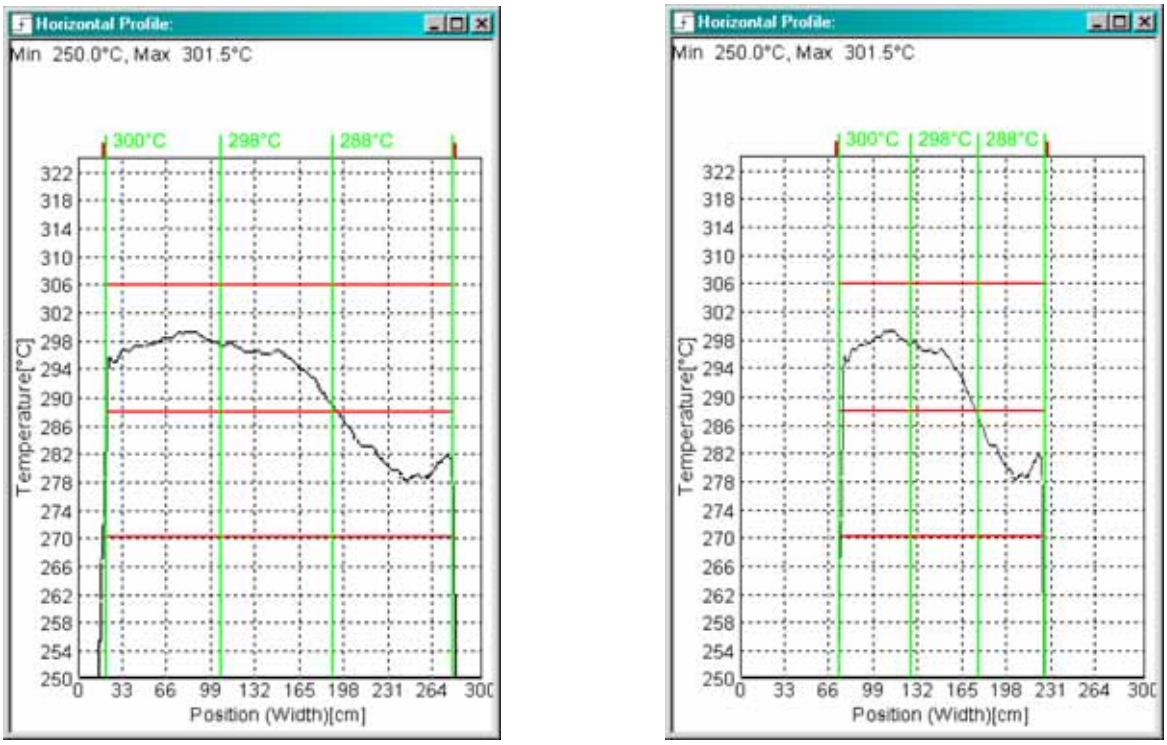
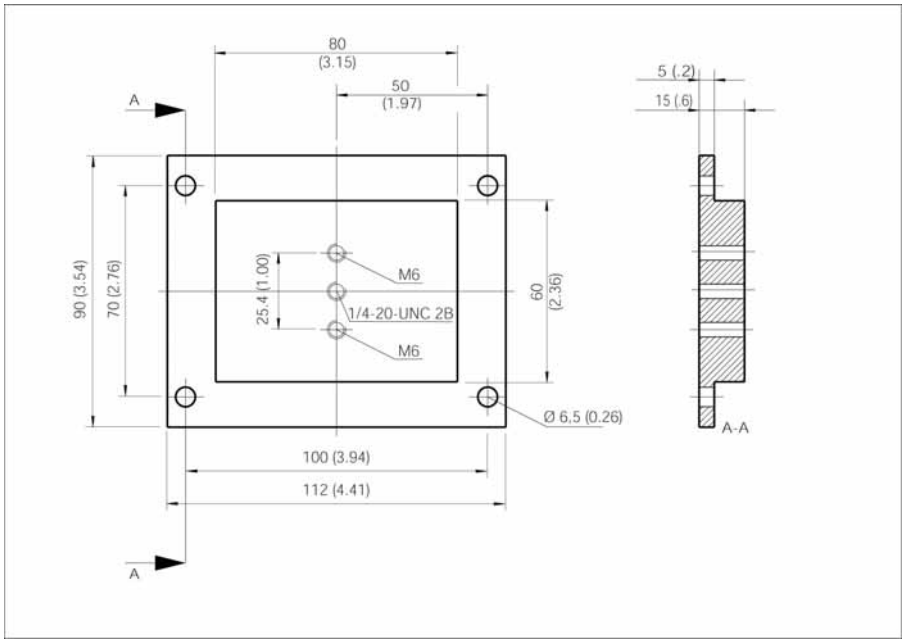


Figure 37: Automatic Sector with 3 Subsectors

5.2 Mounting Plate



mm (in.)

Figure 38: Mounting plate for tripod (1/4" thread) (XXXTMP50ACMP)

5.3 Adjustable Mounting Base

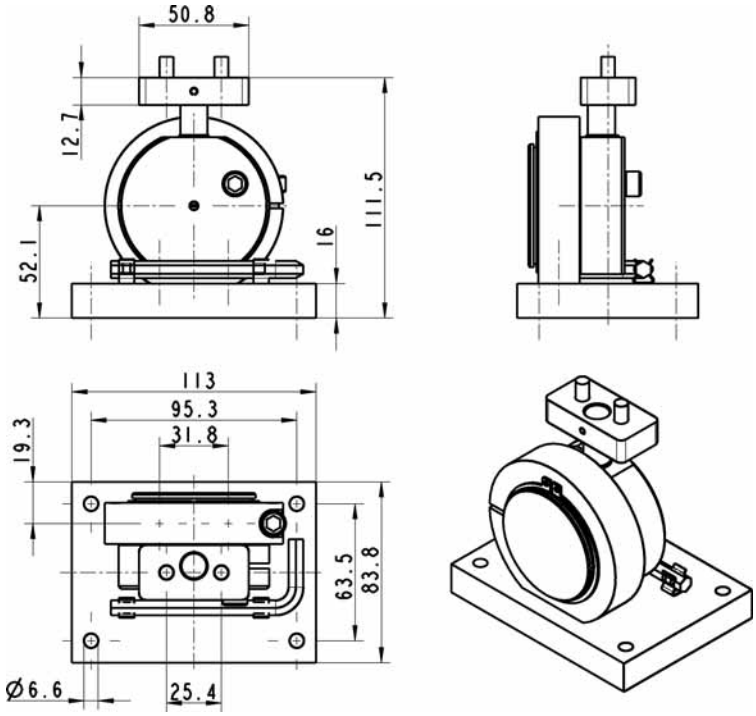


Figure 39: Adjustable mounting base (XXXTMP50ACMB) fits with XXXTMP50ACMP only

6 Accessories

6.1 Part Numbers

The following accessories are available for the system:

DESCRIPTION	PART NO.
Line laser sighting for use in dark environments, max. 50°C (122°F)	XXXTMP50LS
ISO Calibration Certificate based on NIST/DKD certified probes	XXXTMP50CERT
Output Module 7043 with 16 digital outputs	XXXSYS16DA
Output Module 7067 with 7 digital relay outputs	XXXSYS7RA
Output Module 7024 with 4 analog outputs	XXXSYS4AA
RS232/RS485 Converter for output modules	XXXSYS485CV
Wall Mount Power Supply 24V/0.6A with US /EU plug adapter	XXXSYSPSWM
Alarm/Trigger Box	XXXTMP50DPB

6.2 Output Modules

Common Features:	dual watchdog:	power-on start value and safe value for host failure
	operating temperature:	-10 to + 70 °C (14 to 158 °F)
	storage temperature:	-25 to + 80 °C (-13 to 176 °F)
	humility:	5 to 95%, non-condensing
Analog Module 7024:	channels:	4, isolated 3000 VDC max.
	ranges:	0 to 20 mA, 4 to 20 mA 0 to 10 V, -10 to 10 V, 0 to 5 V, -5 to 5 V
	voltage output:	5 mA max.
	current load resistor:	1050 Ω max. (for external 24 V)
	power input:	+10 to +30 V
	power consumption:	2.3 W
Digital Module 7042:	channels:	13, isolated 3750 V max.
	type:	open collector output up to 30 V, 100 mA max.
	power input:	+10 to +30 V
	power consumption:	1.7 W
Digital Module 7043:	channels:	16, non isolated
	type:	open collector output up to 30 V, 100 mA max.
	power input:	+10 to +30 V
	power consumption:	1.1 W
Digital Module 7067:	channels:	7 relay outputs
	contact rating:	0,5 A @ 120 VAC, 1 A @ 24 VDC
	operate time:	5 ms
	power input:	+10 to +30 V
	power consumption:	2.2 W
RS232/485 converter	programmed for half-duplex mode, 9600 baud	
	3000 V isolated at RS232 side	
Power supply[2]:	input:	100 to 240 V AC
	output:	24 V DC, 0.6 A

For further information see section8.3 Output Modules – Technical Data, page 55.

[2] If multiple Output Modules are to be used, adequate 24 VDC power must be provided accordingly to the power consumption of all driven modules.

6.3 Alarm/Trigger Box

The system can accommodate an Alarm/Trigger Box to allow the output of one digital alarm signal and the input of a “trigger” signal to inhibit or stop the measurement, see also section 3.2.6 Input/Output Page on page 24. This box cannot trigger snapshots.

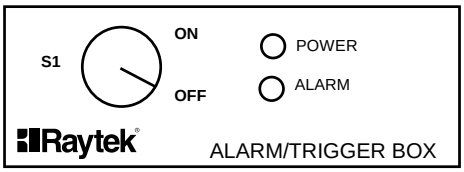


Figure 40: Front view

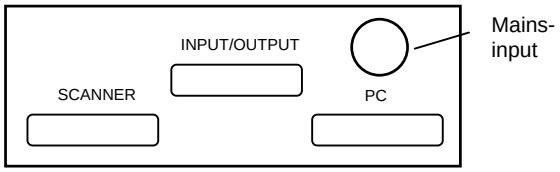


Figure 41: Rear view

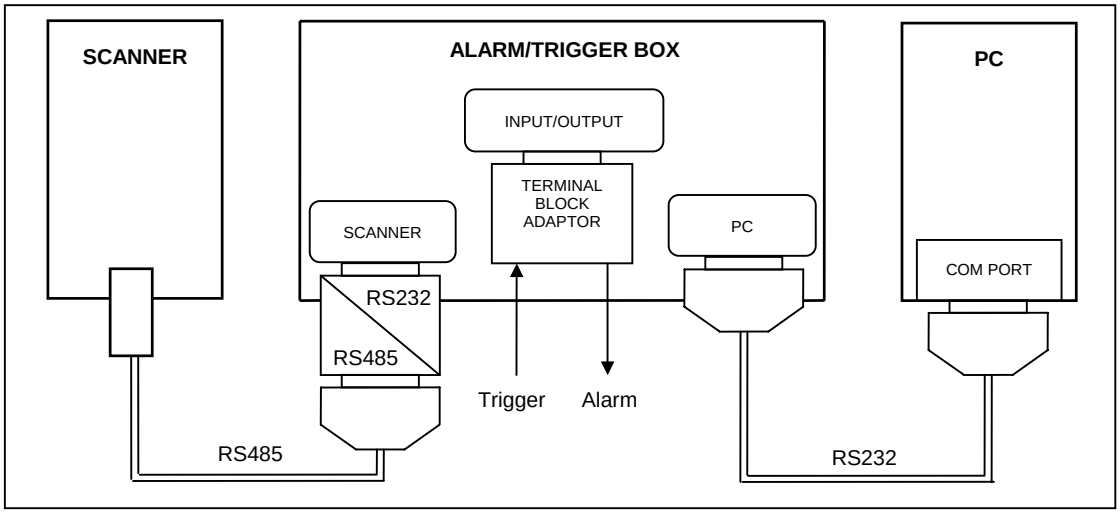


Figure 42: Connection between Scanner, Alarm/Trigger Box and PC via RS232/RS485

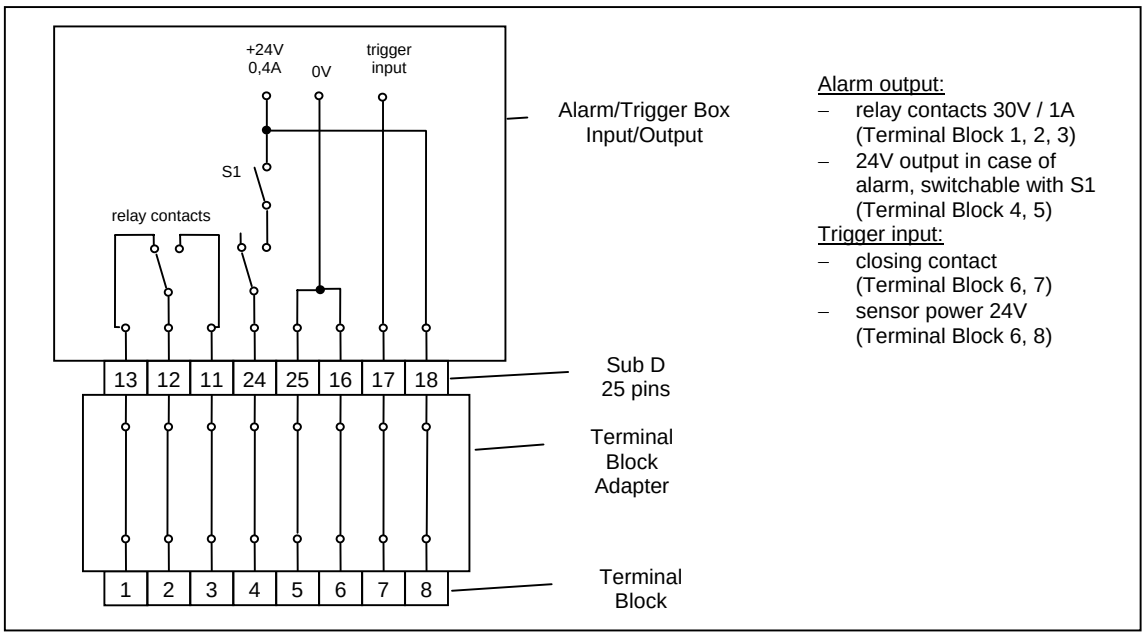


Figure 43: Wiring of the Terminal Block

7 Troubleshooting

7.1 Common System Errors

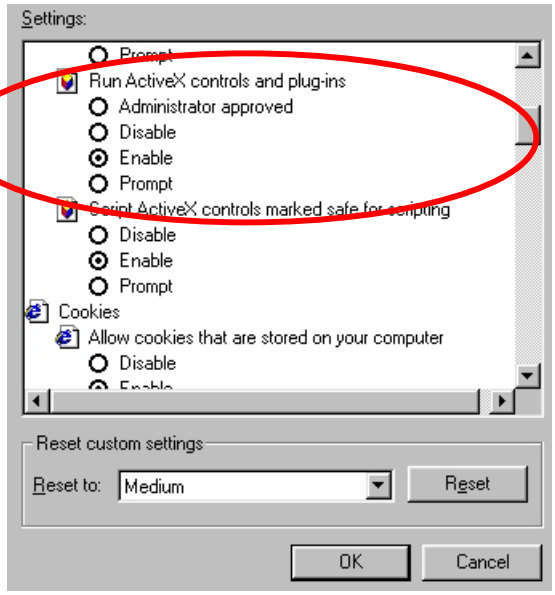
Symptom	Possible Cause / Solution
A scanner was connected, but the communication between scanner and program could not be established.	• Verify correct COM port. Function of COM port can be tested by using another serial device (e.g. a mouse). • Check the wiring of the whole system (correctly fitted connectors, cable damage, ensuring the RS485/232 adapter is close to the PC). • Check the power for the scanner (red LED on scanner's backside is "on"). • Check the rotation of the internal scanner mirror assuming the power is on (viewing or hearing test). • The main power for scanner and PC should be provided at the same location. • Software is not to be launched during the initialization time of the scanner (about 30 s). • Avoiding scanner overheating. Maximum internal housing temperature: 60°C (140°F). The internal housing temperature is displayed in the status bar of the scanner software. • In case of the scanner's cooling, check for condensation in the scanner's housing → condensation can cause the total outage of the unit. To avoid condensation see the according section in the MP50 manual.
In the thermogram of the running software black or moved temperature lines can be detected.	The reason is due to communication errors during the transfer of temperature lines. Possible solutions are: • The baud rate should be reduced step by step. • In some cases, the graphic card of the computer can interrupt serial communications for too long a time. S3-graphic cards are known to exhibit this problem. The only solution is to exchange the S3-graphic card. • To avoid communication problems the properties of all used COM ports must be changed as follows: Windows 2000 Systems: <Start> <Settings> <Control Panel> <System> <Hardware> <Device Manager> <Ports (COM & LPT)> <Communications Port COM1> <Ports Settings> <Advanced> <Receive Buffer>: Low
The software generates the error message „Time out during communication".	• Mount the scanner and the cables away from motors or heaters that produce strong electrical fields. • Communication errors, see above
The performance speed of the software is too slow.	• On some computers, the performance of the software can be increased dramatically by switching off the hardware graphic acceleration: Windows 2000 Systems: <Start> <Settings> <Control Panel> <Display> <Settings> <Advanced> <Troubleshooting> <Hardware acceleration>: None • A too high display resolution can cause problems. The recommended setting is 800x600 pixel at high color (16 bit). • For several reasons the PC can be overloaded. This can be checked (WIN 2000) by running the scanner software and pushing CTRL+ALT+DEL at the same time. In the task manager a window for the system performance can be selected. The value must be every time much below 100%.
Erroneous temperature values are displayed.	• Wrong emissivity setting • Dirty measurement window • Field of view obstructed

7.2 Connection problems with the http-protocol

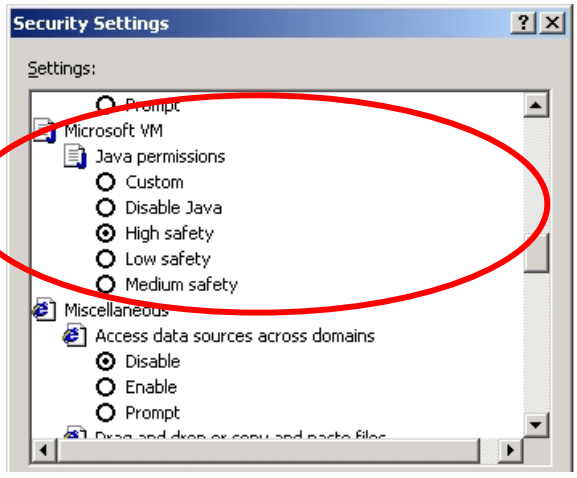
In case of connection problems with the http-protocol, the following settings of the client explorer are to be checked:

Menu: <Tool> <Internet Options> <Security Settings> <…>

a) <Run ActiveX- controls and plug-ins> must be activated.



b) <Microsoft VM> (Microsoft Virtual Machine) must be installed. In this case, a corresponding entry must be in the same setting list. The following options for the <Microsoft VM>, such as <custom settings, medium ...> are not to be changed. The <Microsoft VM> can be installed during the installation procedure of the explorer.



Note: In case of any connection problems try to switch off the possible existing fire wall!

8 Appendix

8.1 DDE Connections - Examples

The following examples describe the use of a DDE connection to another target application. It is shown how the DDE specific parameters *Service*, *Topic*, and *Item* are applied.

8.1.1 DDE with Microsoft Excel

Service: To initiate a DDE connection with Microsoft Excel, "**Excel**" must be input as argument for *Service*.

Topic: *Topic* stands for the name of an already opened Excel file. To initiate a DDE connection with the Excel file „Sheet1.xls“, "**Sheet1**" must be input as argument for *Topic*. In case of DDE connection errors try to input the name of the Excel file with the file extension, e.g. "**Sheet1.xls**"

Item: *Item* is the parameter to indicate a certain cell according to the row and column reference style in Microsoft Excel. The R1C1 reference style for cell addressing must be used. To initiate a DDE connection with the upper left cell of an Excel datasheet, "**R1C1**" must be input as argument for *Item*. Alternatively, a free defined cell name can also be used for the *Item*.

Tip: Microsoft Excel has set the A1 reference style for cell addressing as standard. A switching to the R1C1 reference style is possible (but not necessary) by means of the menu <Tools> <Options> <General> <Settings> and activating the checkbox <R1C1 reference style>.

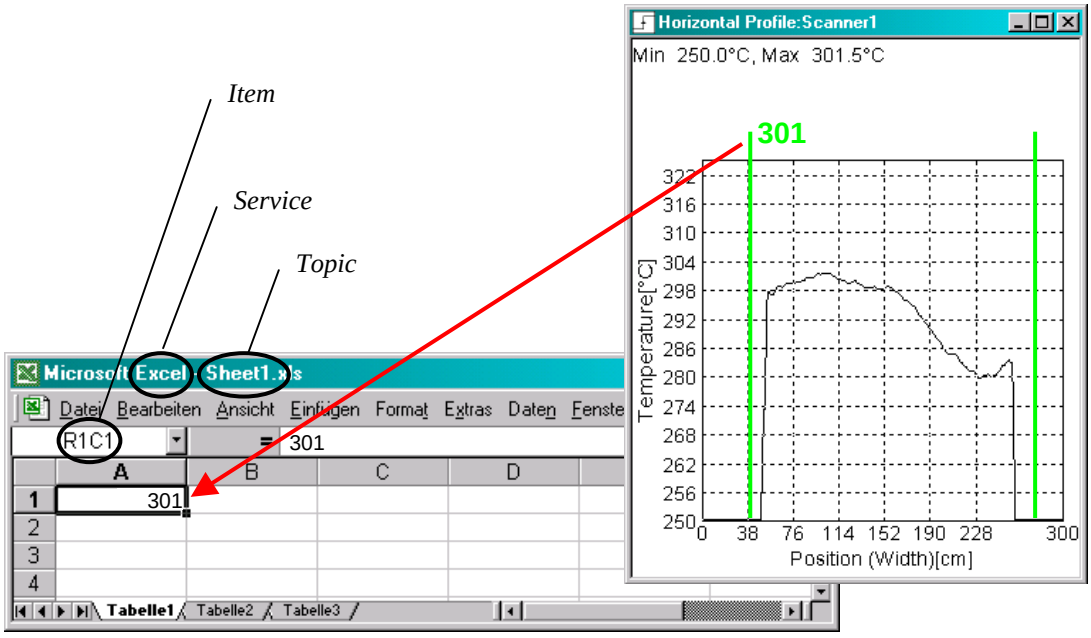


Figure 44: Automatic Transfer of Sector Results to Microsoft Excel via DDE

8.1.2 DDE with LabVIEW[3]

On the installation CD, there is the LabVIEW example libary „LabView Server.llb“. The library illustrates the DDE connection to the scanner software. After opening the library file (double click with the left mouse button), the file „LabView Server.vi“ must be selected in the launched file dialog. See following figure.

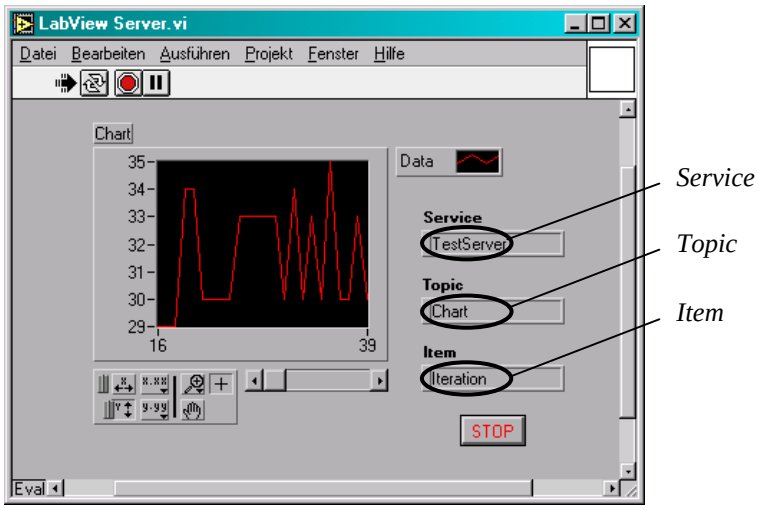


Figure 45: Automatic Transfer of Sector Results to LabVIEW via DDE

The DDE specific parameters *Service*, *Topic*, and *Item* are to be seen in the LabVIEW worksheet directly. If requested, the parameters are changeable in the according edit field.

[3] LabVIEW is a product of DATATLOG, a National Instruments Company

8.1.3 DDE with DASYLab[4]

On the installation CD, there is the DASYLab example file „DasyLab_Server.dsb“. The file illustrates the DDE connection to the scanner software. The worksheet contains only two modules: the DDE Input Module and a Display Module, see following figure.

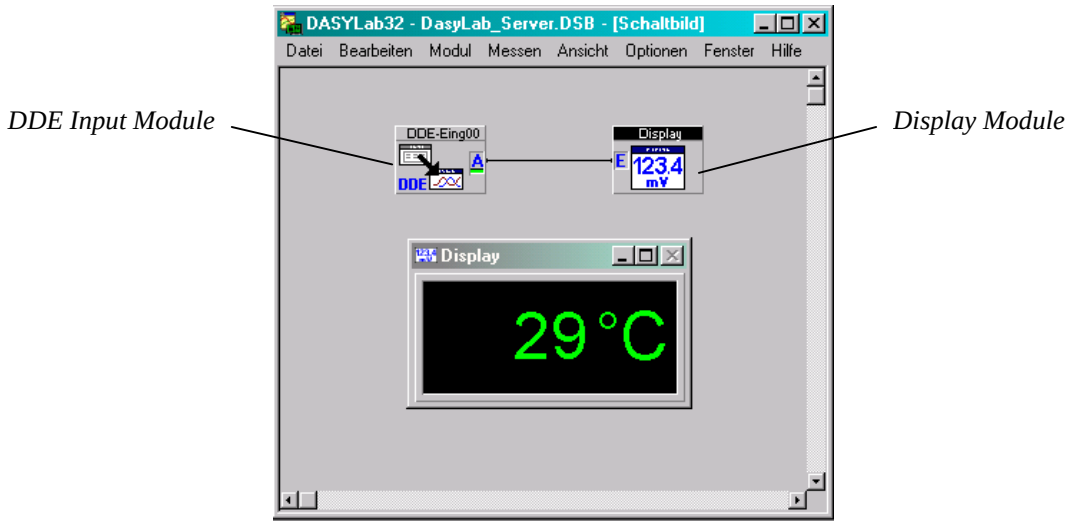


Figure 46: DASYLab Worksheet for a DDE Connection with the Scanner Software

The DDE specific parameters *Service*, *Topic*, and *Item* are to be seen in the property dialog of the DDE Input Module (double click with the left mouse button on the module). It must be ensured that in the parameter group <DDE Connection> the option <Server> is activated. See following figure.

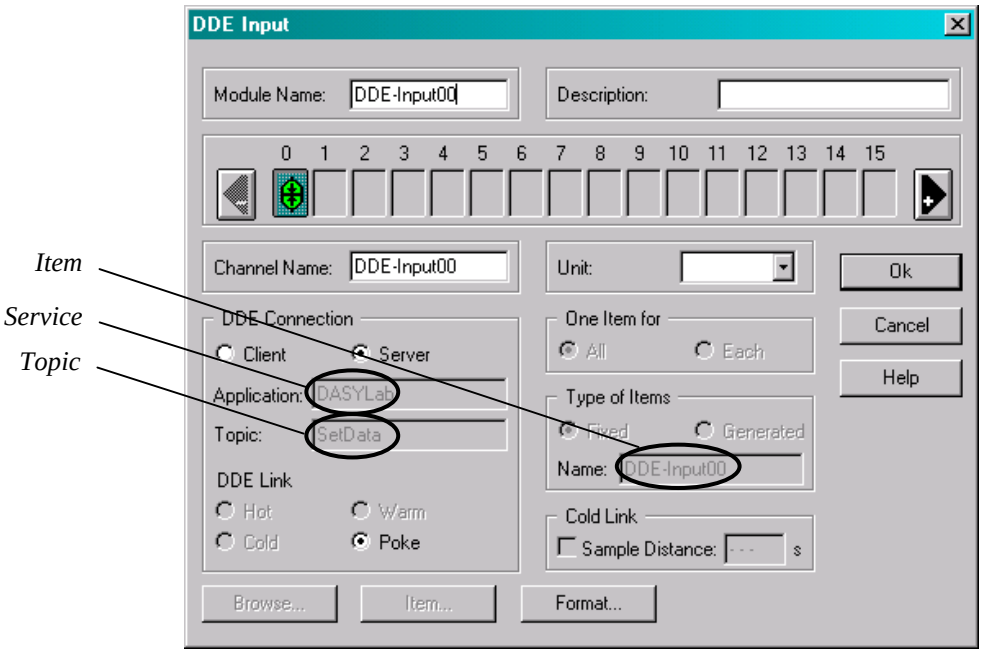


Figure 47: Property Dialog of DDE Input Module

[4] DASYLab is a product of National Instruments

Service: To initiate a DDE connection with the DASYLab, "**DASYLab**" must be input as argument for *Service*.

Topic: "**SetData**" must be input as argument for *Topic*.

Item: *Item* is the parameter to distinguish between more than one DDE Input Module in a worksheet. In the given example, "**DDE-Input00**" must be input as argument for *Item*, whereby the last two numbers stand for the number of the current DDE Input Module.

8.1.4 DDE with Microsoft Access

A DDE connection with Microsoft Access is not supported by the scanner software.

8.1.5 DDE with Mathcad[5]

The DDE functionality is supported by Mathcad only in Version 5 and 6.

[5] Mathcad is a product of MathSoft

8.2 RS485 Network

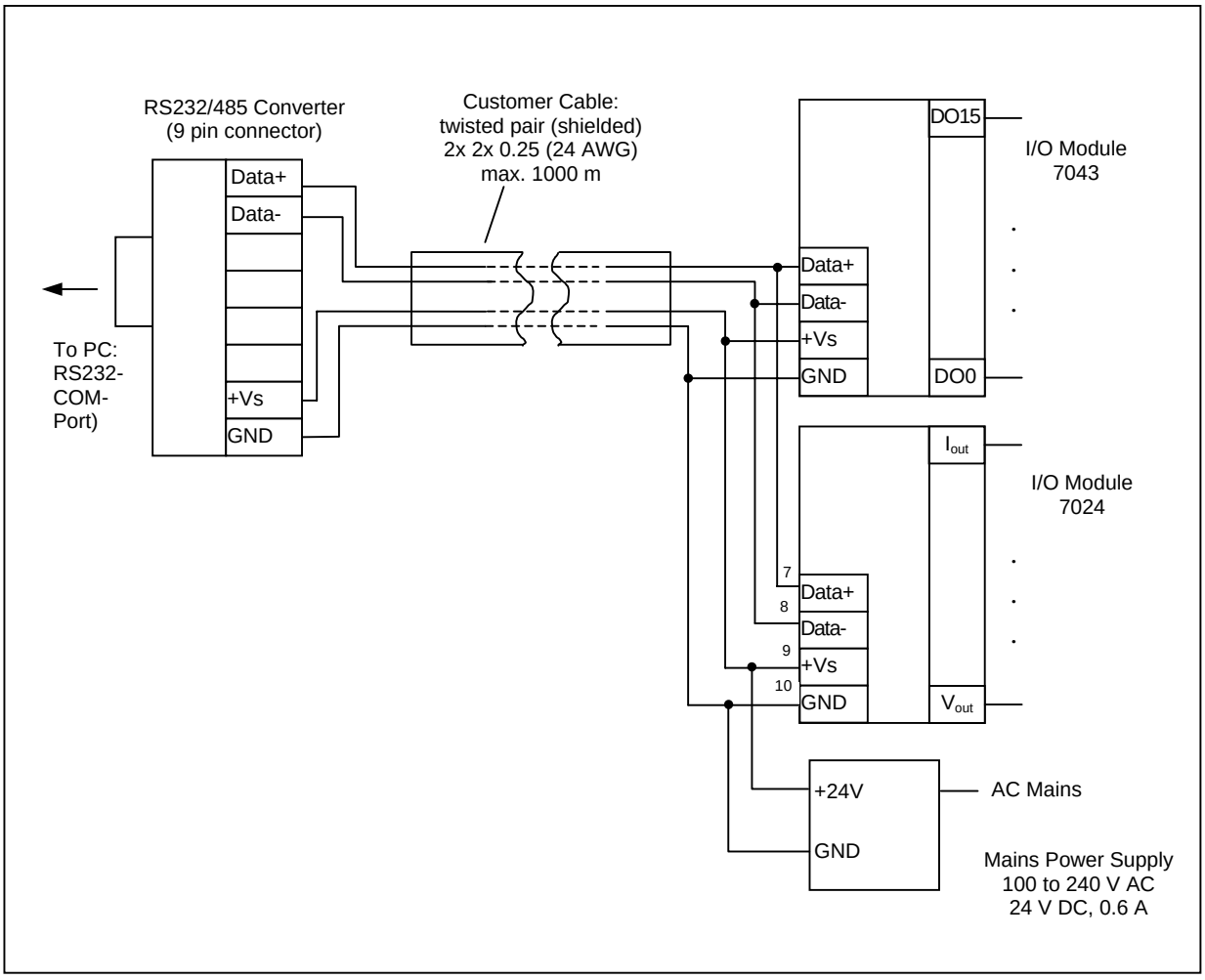


Figure 48: Example network with RS232/485 converter and two (optional) different Output Modules

8.3 Output Modules – Technical Data

8.3.1 Analog Output Module 7024

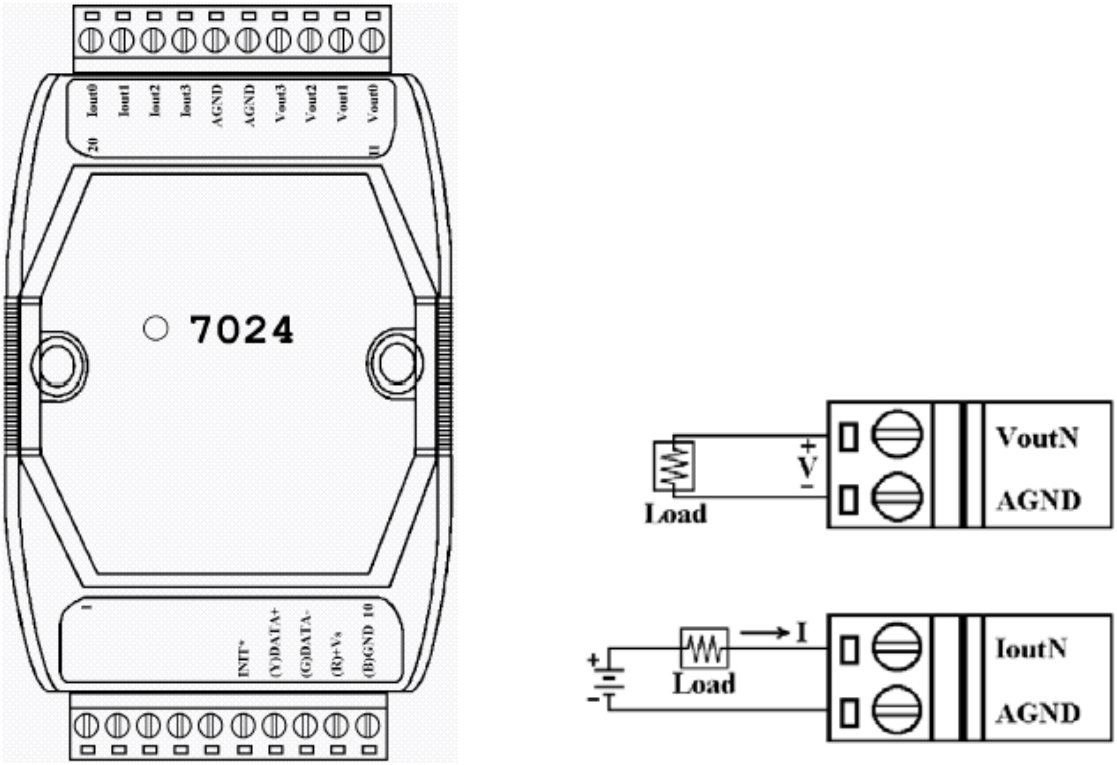


Figure 49: Pin Assignment (left), Wire Connection for 7024 (right)

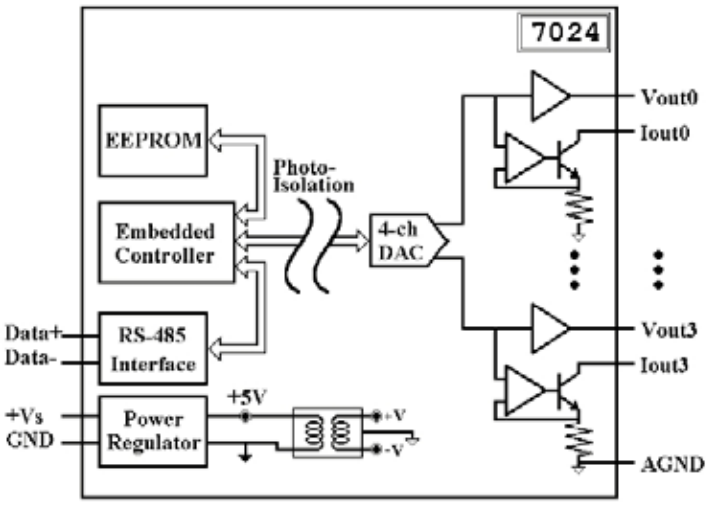


Figure 50: Block Diagram for 7024

8.3.2 Digital Output Module 7042 (13 channels)

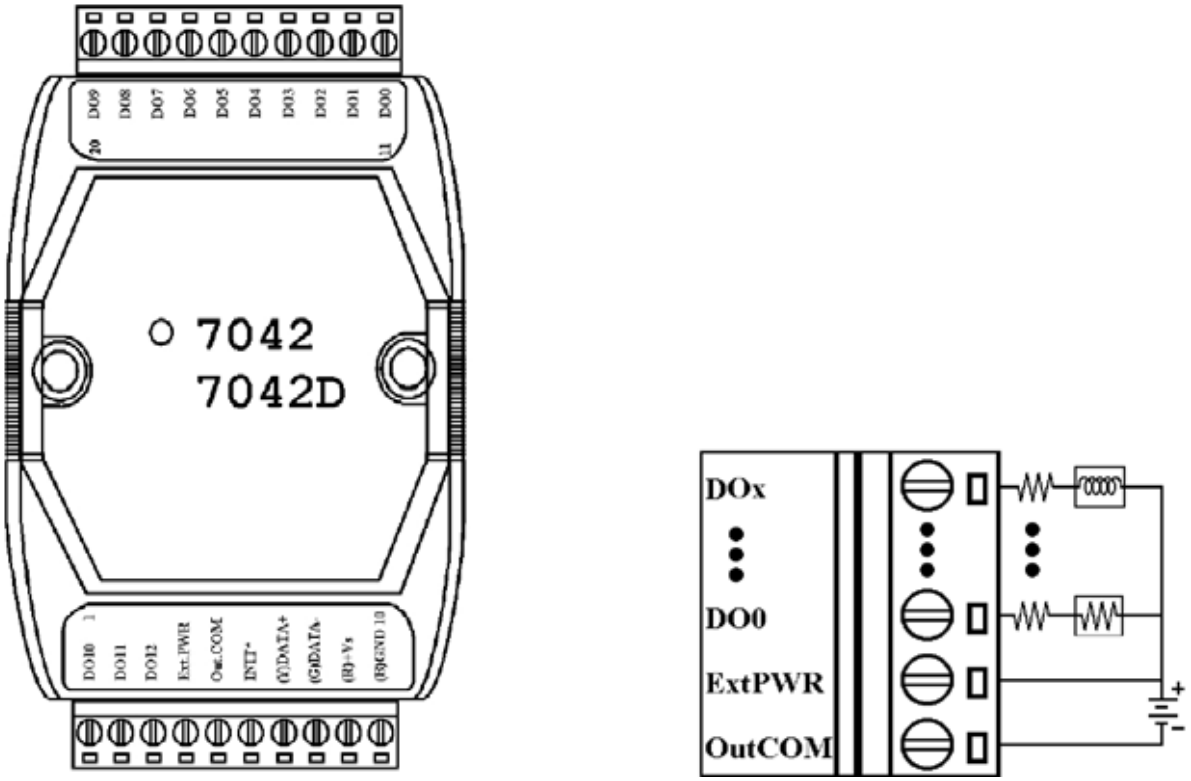


Figure 51: Pin Assignment (left), Wire connection for 7043D (right)

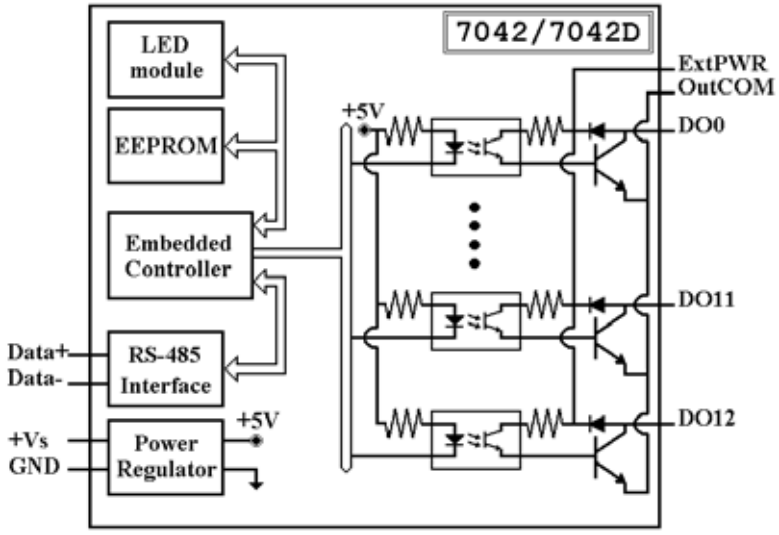


Figure 52: Block Diagram for 7042

8.3.3 Digital Output Module 7043 (16 channels)

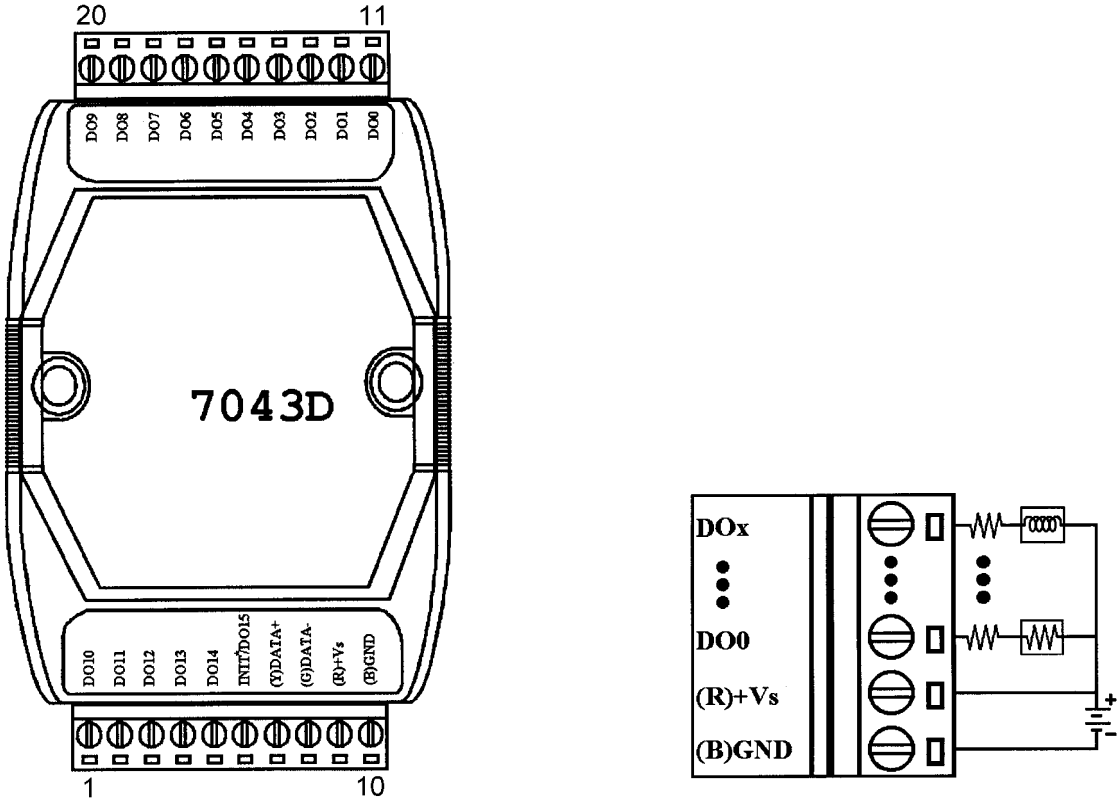


Figure 53: Pin Assignment (left), Wire connection for 7043D (right)

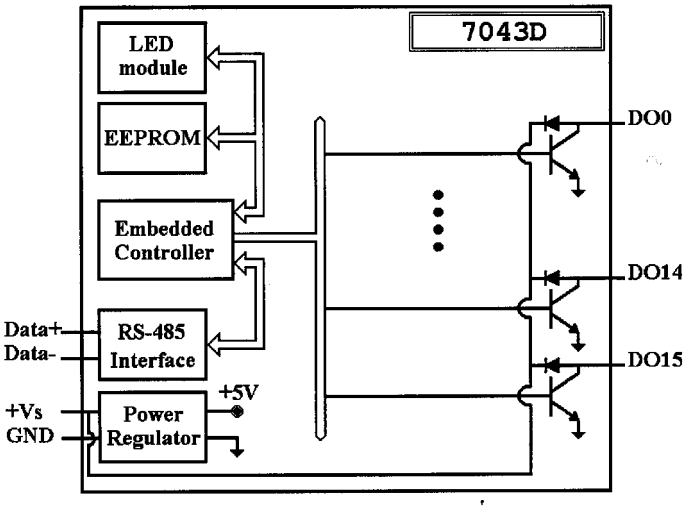


Figure 54: Block Diagram for 7043

8.3.4 Digital Output Module 7067 (7 channels)

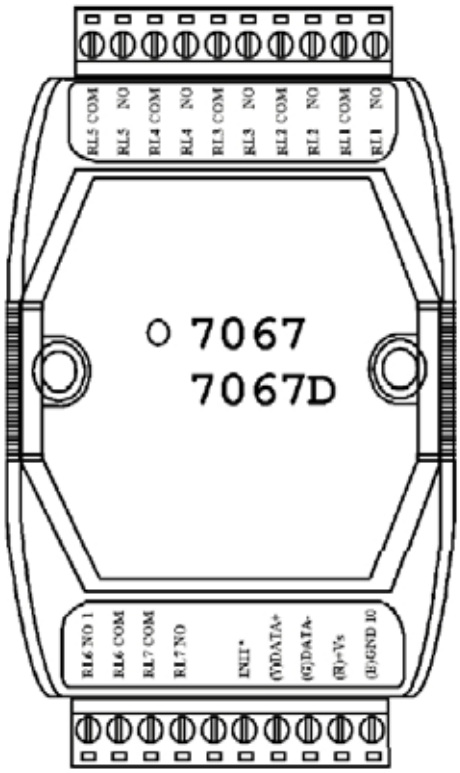


Figure 55: Pin Assignment for 7067

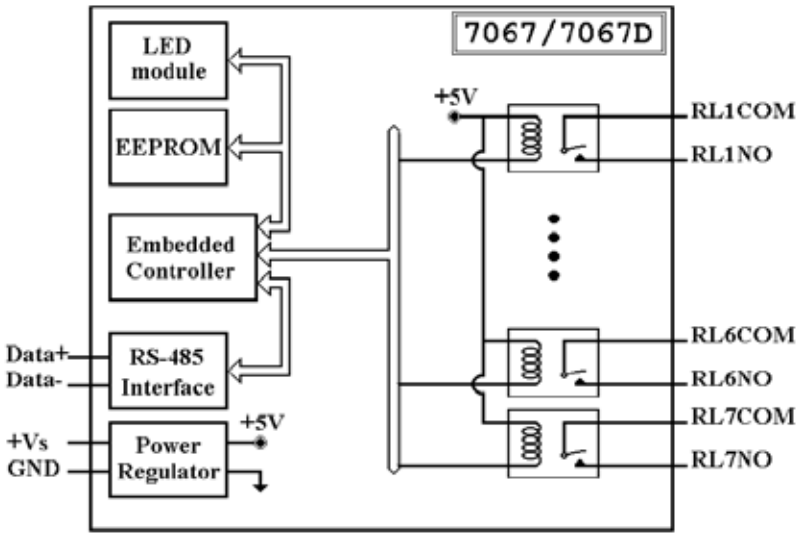


Figure 56: Block Diagram for 7067

8.3.5 Dimensions

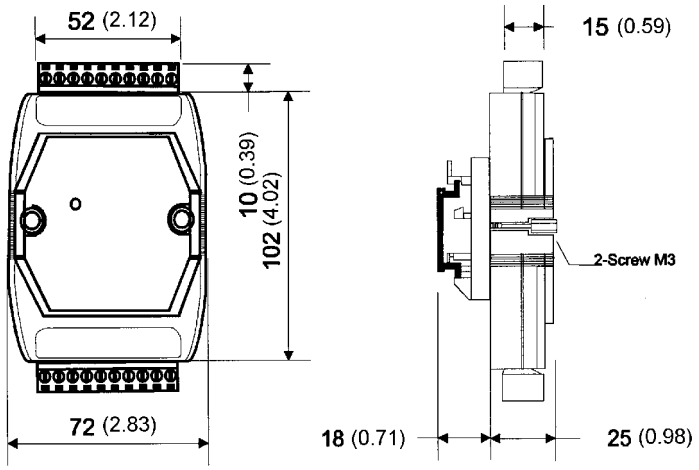


Figure 57: Dimensions

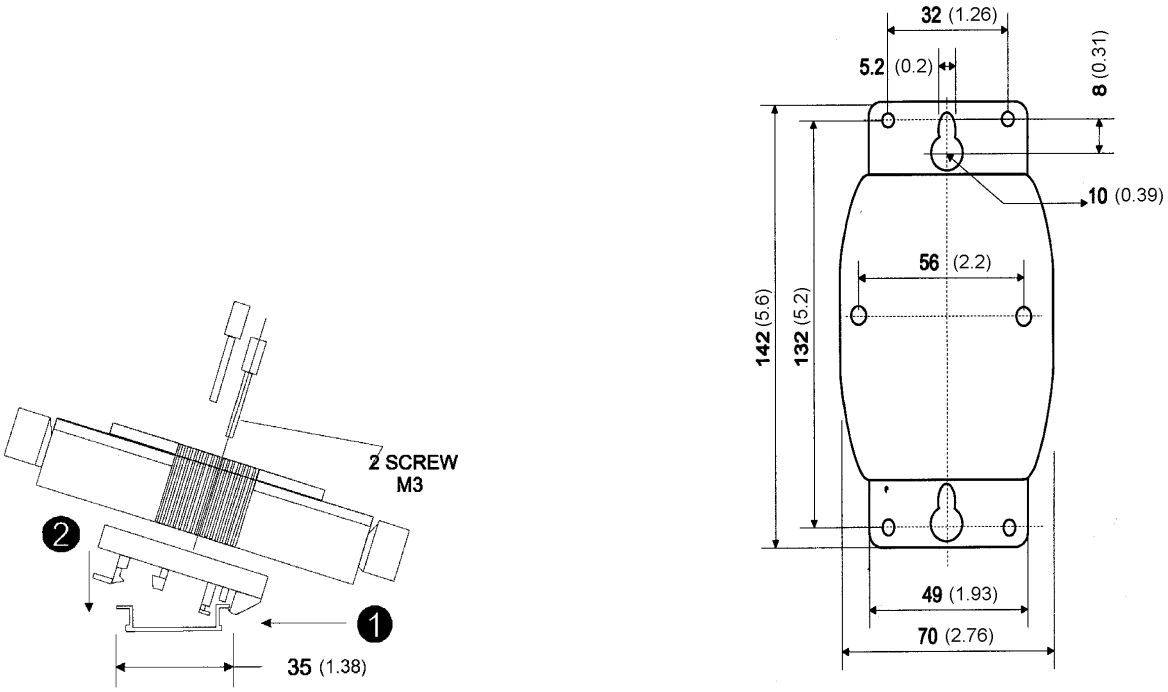


Figure 58: DIN-Rail Mounting (left), Plastic Part (right) for Panel Mount (included in the delivery)

8.3.6 Address Configuration

If more than one Output Module is used, every Module must be assigned a unique address. The default factory setting is address 1. The first Module does not need configuration. To configure a Module successfully, please follow these steps:

1. Connect the **first** Module to the network and start the software to check its operation.
2. Stop the software and power off the Output Module.
3. Open the **second** Module and set jumper **J3** (DO15/INIT*) to **INIT***. (Not necessary for the Analog Output Module ICP-7024)
4. Add the **second** Module to the network (in addition to the first module, now the first and the second module are in the network).
5. Connect the INIT* pin with the GND pin.
6. Power “on”.
7. Start the software: It should initialise with the message “Module configured successfully to address 2”. If it was unsuccessful, check the cabling.
8. Stop the software and power off the Output Module.
9. Set jumper **J3** (DO15/INIT*) to **DO15**. (Not necessary for the Analog Output Module ICP-7024!)
10. Repeat steps 3 to 9 to configure the remaining Modules. It is not possible to configure more than one Module at the same time. The maximum number of Modules for one network is limited to 256.