ECOCONTROL 2000

User Manual
ECOCONTROL 2000 USB

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V3.04 USB

Device Number

SIKORA AG
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Contents

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Introduction

The ECOCONTROL 2000 is a precision measuring and controlling device made by

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Contents of delivery:

1   Display Unit ECOCONTROL 2000 with TFT Color Monitor and Touch Panel, desk-top version (optionally for 19" rack assembly)

Measuring Head(s) / Measuring Device(s):

_   Measuring Head CENTERVIEW 2000

_   Measuring Head LASER 2000 XY   with / without stand (Option)

_   Measuring Head LUMP 2000 XY   with / without stand (Option)

_   Measuring Device CAPACITANCE 2000

_   Testing Device SPARK 2000   with / without stand (Option)

1   Rotary Pulse Generator

1   Set of Plugs

1   Connection Cable, ready made, _____ m

Technical Documentation

Options:

o   Analog Output : Deviation

o   Multifunction Control Unit Hot/Cold

o   Serial Interface/s

o   Report Printer

o   Remote Display

o   Extreme Value Detection

o   Correction for Straight Sector Conductors

o   Profibus DP

o   FFT / SRL Analysis Functions

The ECOCONTROL 2000 is a processor–based measuring and control system for the exact measurement and control of the wall thickness/diameter of cables in extrusion lines, offering a varied number of applications in combination with other *SIKORA* measuring devices like CENTERVIEW 2000, LASER 2000 XY etc. Its TFT color monitor with touch screen offers a brilliant display together with easy operation.

The cables produced may be one of the following types:
- round conductor cable
- prespiralled sector cable
- straight sector cable.

Up to six measuring and / or testing devices can be used, so the object to be measured can be supervised on a non-contact base before and behind the extrusion and at the end of the line.

The measuring data are evaluated by an integrated industrial PC and displayed on the TFT monitor, which is also used for system operation.

Desk Version of ECOCONTROL 2000

The device has several interfaces for transfering measuring and operational data to and from the ECOCONTROL 2000. Its serial interfaces can be used to connect the ECOCONTROL 2000 to one or more of the *SIKORA* measuring heads like the CENTERVIEW 2000, LASER 2000 XY etc. or *SIKORA* devices like the CAPACITANCE 2000 or the SPARK 2000, or to an external computer. Its parallel interface can be used to connect a printer (Option).
Also, there is a digital input which is used to connect the Rotary Pulse Generator.
The ECOCONTROL relay contacts can be used to supply customer line equipment like for instance external signalling devices.
There are up to two controller output for either line or extruder automatic control.

Valuable information for production control and optimization can be gained by applying the analysis functions offering Fast-Fourier-Transformation and prediction of Structural Return Loss, which are included optionally.
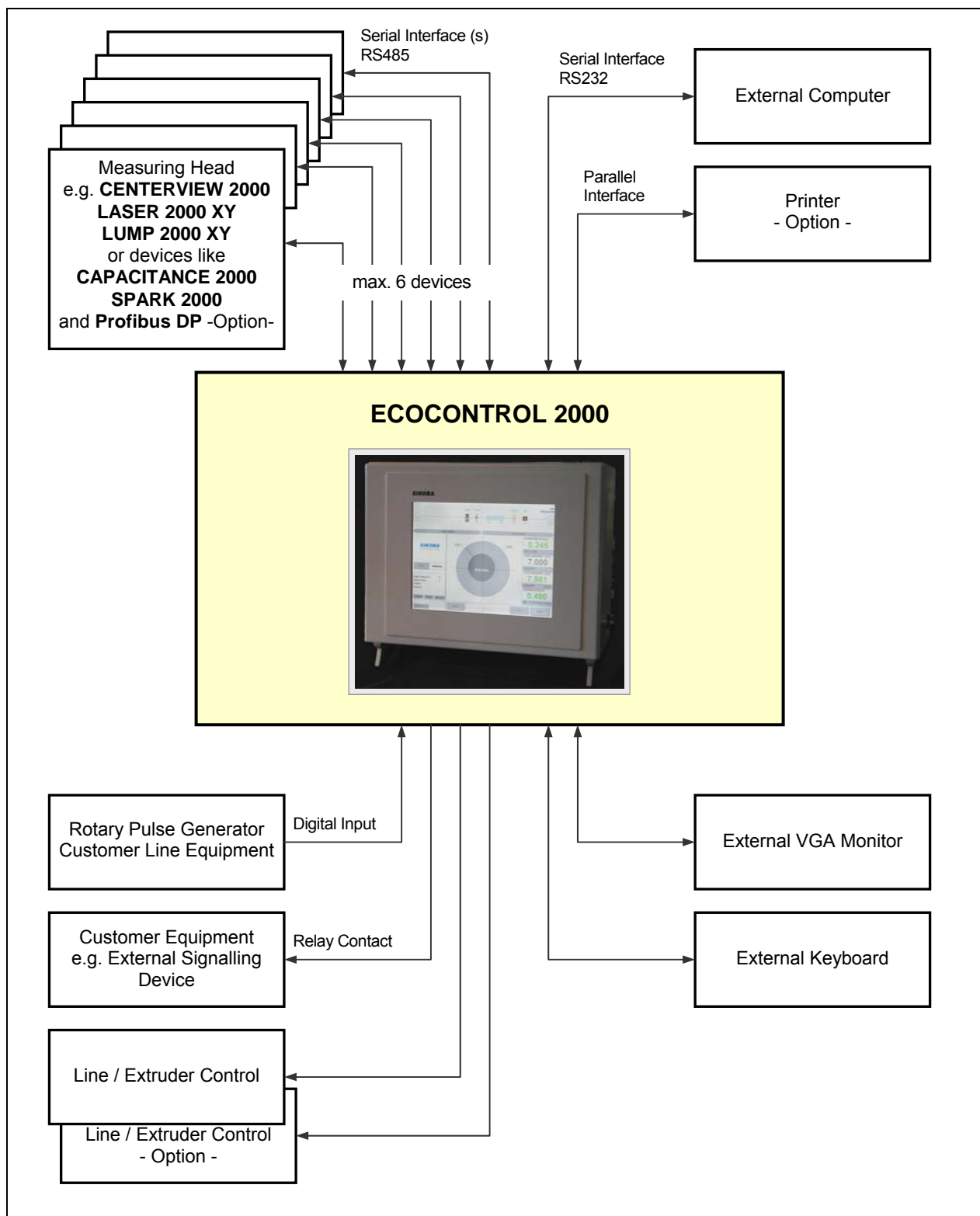
ECOCONTROL 2000 / External Connections Overview

1.   Installation and Start-Up

1.1   Requirements for Device Installation

1.1.1   Place of Installation

At the installation site, temperature should be kept in a range from +5°C - +50°C (+40 °F - +125 °F), maximum air humidity for the ECOCONTROL 2000 is 95% (without condensation).

1.1.2   Voltage Supply and Grounding

The ECOCONTROL 2000 can be supplied with either 230 or 115 V AC ± 15%, 50...60 Hz. The power consumption amounts to approximately 200 VA.

When designing the device, special attention has been laid on preventing power-line interferencess. Additionally, when installing the device we recommend that you use only those power lines which correspond to radio interference regulations.

If in doubt, you better provide a separate power line from your main distributes directly to the device and do not connect any other loads to it. Only the additional grounding of the cabinet of the device can prevent disturbances on the non-fused earthed conductor of your power line. Use at least 10 mm² copper wire and connect them as short as possible with your collecting ground bar. The ground is considered good when the resistance is less than 1 Ω.

1.1.3   Signal Lines

When installing the signal lines, please note they can pick up interferences that can influence device performance. A separate installation away from power lines and at sufficient distance to magnetic stray fields will guarantee reliable device performance.

Please note that the reference potential of the electronics (GND*) is insulated from the protective earthing (earth, grounding, housing) and is connected to it in the right place.

1.2   Mounting

1.2.1   Ecocontrol Display Unit

Check carefully after unpacking. Install the display unit at its place as delivered, i.e. complete with housing.

Make sure the device is placed correctly and cannot tilt over when its door is being opened !

There is a special mounting frame available (Option) if you want to install the display unit in a 19″ rack, see Fig. 3. Mounting in a desk or cabinet is only recommended, when there are units without radiation interferences (e.g. printer, lump detector). Interferences may arise from Spark testers, as well as from motors, relais, contactors or magnetic valves.

1.2.2   Mounting the Measuring Head(s) / Testing Devices

Check carefully all parts after unpacking them. Refer to the manuals of the respective devices.

Please observe that a measuring head to be used for measuring the core diameter or hot diameter should be mounted just behind the extruder (about 300 mm). Measuring heads used for measuring the wall thickness should be placed about one to two meters apart from each other. For measuring heads at the end of the line, please take care that the cable is dry, because water drops may lead to faulty values.

For correct installation of LASER 2000 measuring heads, see separate manual *LASER 2000 XY*. However, for those lines with sector measurement, the measuring heads have to be placed differently at a 45° angle as illustrated below using the measuring head stand shown in Fig. 6.

Direction of Production

UP
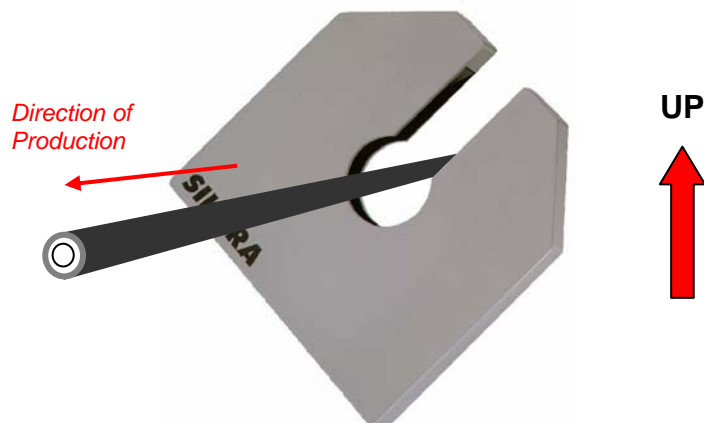
LASER 2100 XY Measuring Head Alignment for Sector Measurement

1.2.3   Connection of Cables and Signal Lines

We deliver ready made connecting cables, standard length 6 m. These are used for connecting the display unit to up to six measuring heads, measuring devices and / or testers.

These cables carry data at a high transmission rate. Therefore the camera cables can be laid next to each other but should not be laid parallel to other cables which for instance are used for power supply. If however you decide upon a common path, keep a distance of at least 20 cm to other cables and avoid placing them near switched inductive loads (relay coils, motors, transformers, spark testers etc.) as far as their stray magnetic field is of importance.
Other signal and measuring conductors which carry no inductive loads are not dangerous.

Note that with a longer cable the effect of the interference which affects the connection cable will increase.

The outer sheath of these cables should be connected to the cabinet (earth, safety earth) at one end.
Inner shields, which serve as signal return lines must be connected according to our guide lines, usually with the reference potential of the electronic (GND*).
Clamp the shielding under the cable grip and always take care to connect the cable shielding completely as shown in the sketch below.

cable wires

cable shielding
do not cut, do not twist, do not extend!

connector strain relief
must be made of metal or be metallized and
connected to the connector case!

cable
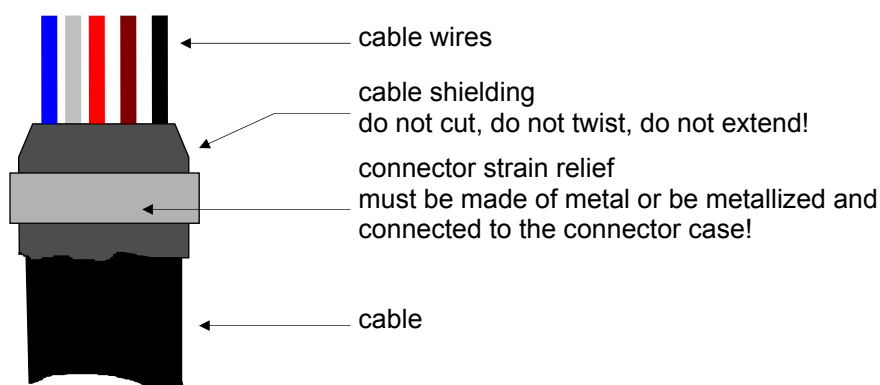
Do not
- cut the shielding
- connect it only partly
- extend it.
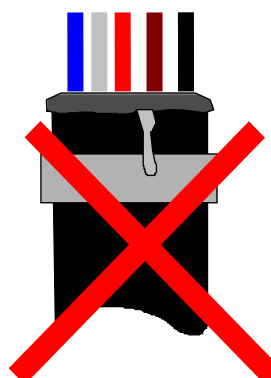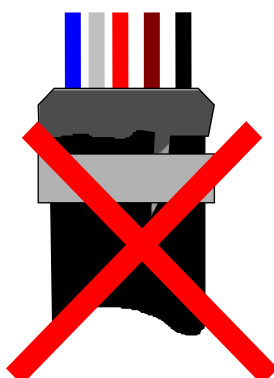
Install the connections as required for your application. Refer also to Fig. 7 *External Wiring* for pin assignment and Fig. 2 where to find the respective connectors.

The digital inputs computer control mode (15 V*≙ only computer active), and the external start/stop signals (for functions TREND/STATISTICS) has to be connected to St5.

The automatic control is connected to plug St6 and plug St12 (also refer to Fig. 12 *Automatic Control*). The nominal value voltage U1 at the slider of the drive potentiometer must not exceed ±10 V with maximum pull-off speed.

1.2.4   Rotary Pulse Generator

The speed information of the rotary pulse generator is used for the display of page TREND, the delay time memory and if the control is to work with consideration of line speed (very slow lines refer also to Chapter 2.2.2 *Automatic Control*).
Install the rotary pulse generator at a meter wheel or a separate measuring wheel, which may be mounted on the caterpillar-ribbon. As the mechanical connection is critical we recommend to use a flexible coupling for perfect and permanent hold.
The output of the delivered rotary pulse generator is 25 pulses per revolution.

Refer to Fig. 7 *External Wiring* for pin assignment.

1.3 Configuration

1.3.1 General

Before starting ECOCONTROL 2000 operation the application has to be configured as described below to adapt it to your production line. This should be done by an experienced **SIKORA** technician.

Use the configuration section of your ECOCONTROL 2000 software to set the specific parameters of your line. This is usually done once during the initial set-up and does not have to be changed later on. If however this becomes necessary, please contact our Service Department first.

Proceed as follows:

Switch on the device. On the monitor screen, the measuring software presents the Standard Monitor Page.
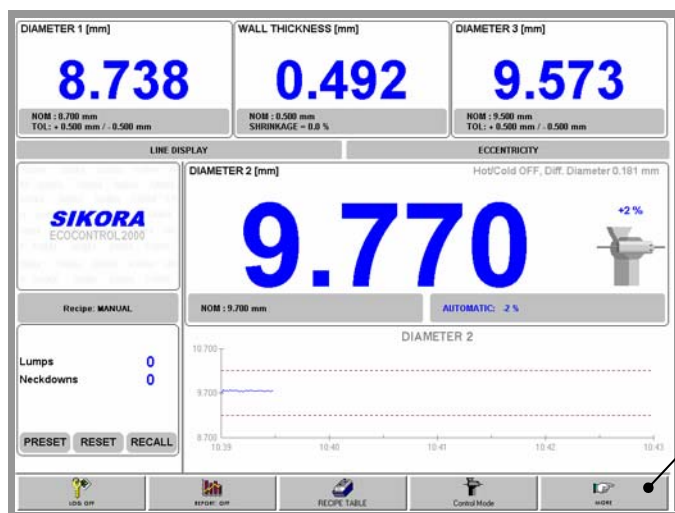
First, on the Standard Monitor Page, touch **MORE**.
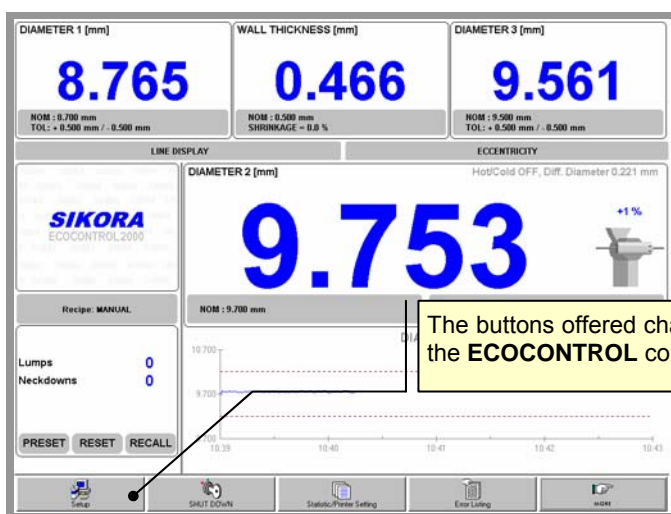
The buttons offered change, touch **Setup** to access the **ECOCONTROL** configuration program.

Then the configuration program main menu will appear.
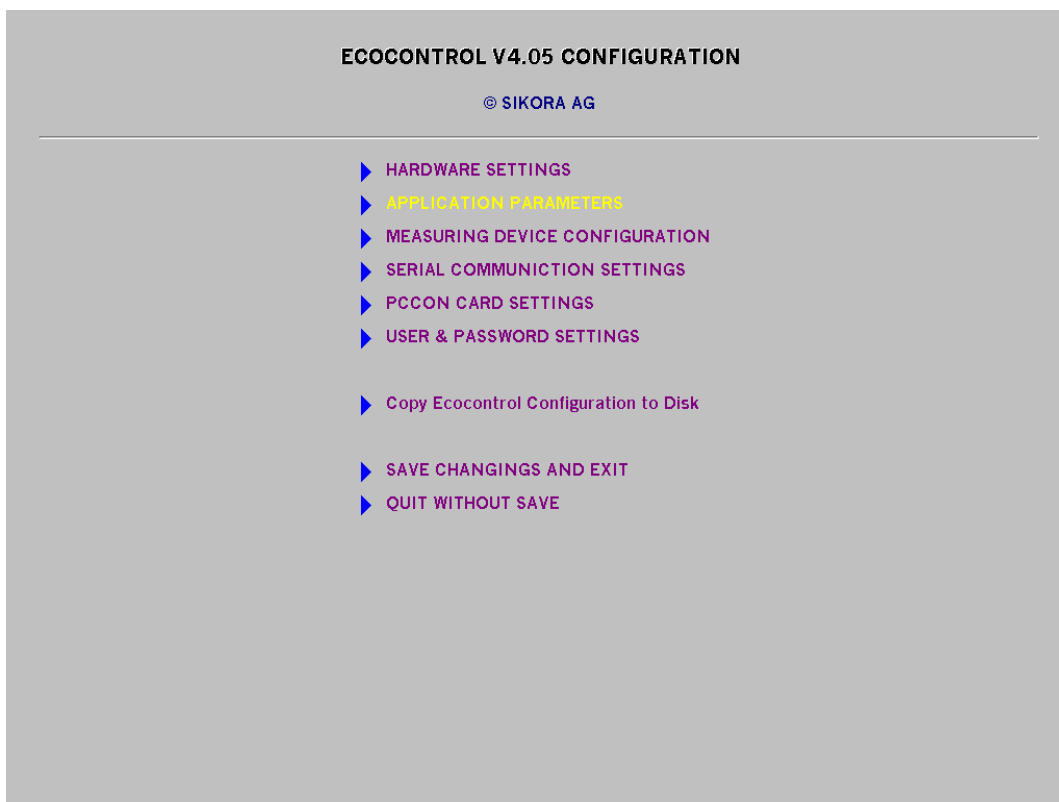
Choose from the menu and set your configuration parameters accordingly (see description and examples below).
Setting is done by touching the respective parameter text box and either selecting from the alternatives being offered or entering a value via a numeric keypad being presented.
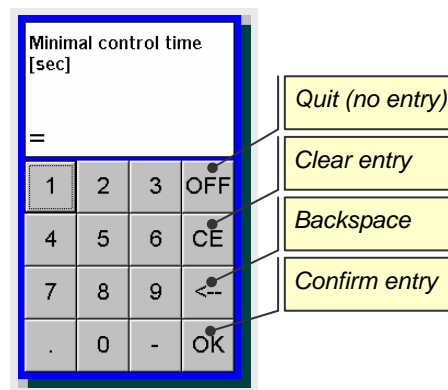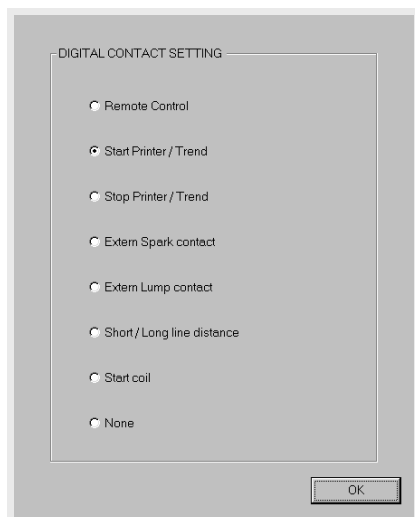
Leave the configuration program with **SAVE ... AND EXIT** when you want the entries to become valid, otherwise use **QUIT WITHOUT SAVE**.

HARDWARE SETTINGS

Device interfaces: Controller: Data Processing:

APPLICATION PARAMETERS

MEASURING DEVICE CONFIGURATION

ECOCONTROL V4.05 CONFIGURATION

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▶ HARDWARE SETTINGS
▶ APPLICATION PARAMETERS
▶ MEASURING DEVICE CONFIGURATION
▶ SERIAL COMMUNICTION SETTINGS
▶ PCCON CARD SETTINGS
▶ USER & PASSWORD SETTINGS

▶ Copy Ecocontrol Configuration to Disk

▶ SAVE CHANGINGS AND EXIT
▶ QUIT WITHOUT SAVE

ECOCONTROL V4.05 CONFIGURATION

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▶ HARDWARE SETTINGS
▶ APPLICATION PARAMETERS
▶ MEASURING DEVICE CONFIGURATION
▶ SERIAL COMMUNICTION SETTINGS

COMMUNICATION PARAMETER SETTING

Baud Rate
Data Bits
Stop Bits
Parity

PCCON CARD SETTINGS

Analog Output 1   Analog Output 2

Digital Output   Speed Measuring

USER & PASSWORD SETTINGS

User   Password   Level

ECOCONTROL V4.05 CONFIGURATION

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▶ HARDWARE SETTINGS
▶ APPLICATION PARAMETERS
▶ MEASURING DEVICE CONFIGURATION
▶ SERIAL COMMUNICTION SETTINGS
▶ PCCON CARD SETTINGS
▶ USER & PASSWORD SETTINGS

ECOCONTROL Configuration Program Structure

1.3.2   Configuration Menu HARDWARE SETTINGS

The three sections of this page define
- the interfaces used for communication between the ECOCONTROL and the devices connected, such as LASER, CENTERVIEW, CAPACITANCE etc.
- the PC-CON address
- parameters used for data processing, such as measuring unit used and limit values.

The values for all parameters have been set at our factory and should not be changed. Please contact our Service Department first if modifications become necessary.

Example:

HARDWARE SETTINGS

Device interfaces:

Device No:	COM Port:
Device 1	COM 3
Device 2	COM 5
Device 3	COM 6
Device 4	COM 7
Device 5	Not used
Device 6	Not used
Device 7	Not used
Device 8	Not used

Controller:

	Address:	Function:
PC-CON	0X308	☑ Speed ☑ CH 0 ☐ CH 1

Data Processing:

Data Request Intervall	200 ms
Measuring Unit	mm
Diameter Display Precision	3
Test Display	Disabled
Max Spark Voltage	25 KV
Average HC-Shrinkage	
Average Diameter	1 s
Average Wallthickness	1 values
DM-Error Message after	1 errors

Here, COM-Ports 3, 5, 6 and 7 are used to connect the four devices LASER, CENTERVIEW, CAPACITANCE and LASER to the ECOCONTROL. Compare with Configuration Menu **Measuring Devices Configuration** *shown on page 12 and see Fig. 1 and 2 as well.*

See explanation below.

OK

HARDWARE SETTINGS

Device interfaces:

Device No: COM Port:

Device
Device
Device
Device
Device
Device
Device
Device

Controller:

Address: Function:

Data Processing:

Data Request Intervall	200 ms
Measuring Unit	mm
Diameter Display Precision	3
Test Display	Disabled
Max Spark Voltage	15 KV
Average HC-Shrinkage	20 m
Average Diameter	1 s
Average Wallthickness	1 values
DM-Error Message after	1 errors

Measuring Head Request Rate

mm / inch / mil , default setting is mm

Number of digits following decimal point

Additional measuring value display to be shown on request (for service only)

15 kV / 25 kV / 30 kV , specify according to device installed

Length interval for calculating the shrinkage average value

Time interval for displaying the diameter average value

Time interval for calculating the wall thickness average value

Number of errors to be tolerated before displaying the next average value

OK

1.3.3   Configuration Menu APPLICATION PARAMETERS

This menu defines certain application parameter. Return to the main menu page with button EXIT.
The values for all parameters have been set at our factory and should not be changed. Please contact our Service Department if necessary.

Example:

Parameter	Value	Description
Machine Number	0	*Machine Number for Printer Protocol*
Measuring Values' Color		*Color which is used to display the measuring values*
General Network Drive	H	*Used if connected to customer network*
General Network Directory	DATA	*Used if connected to customer network*
Motor Stop (CenterView)	No access	*For the CENTERVIEW automatic motor stop at line stand-still*
HV Sparktester OFF	No access	*For switching off the SPARK automatically at line stand-still*
Control Diameter with wallthickness	Yes	*Control Mode: Diameter or Diameter with Wall Thickness*
Line direction	Right	*Line Display shown with line running to the right or to the left*
Product table	Yes	*Enable / Disable Product Table*
Color Printer	No	*Used by function FFT for diagram printing*
Maximal measuring value	10.000	*Set limit for maximum diameter measuring value possible*
Print Screen orientation	No Print Screen	*Enable / Disable Button Print Screen and choose screen orientation (Portrait / Landscape)*
Max lines per printer page	70	*Define max. number of lines per page (only with Option Printer)*
Reset Lump/Spark with Start Trend	Yes	*Lump / Spark Counter reset at Start Trend*
Display Controller Influence	Display / Button	*Can be shown as Button, Icon or both*
Actual Production Format	No setting	*For the printer report headline*
Auto LOG ON	Yes : Sam	*User named Sam is logged in automatically at application start-up*
Time Display	24h / Europe	*00:00 - 24:00 or 00:00 - 12:00 a.m. / p.m.*

Example:
Parameter **Machine Number**

Touch the respective text box and enter the machine number via the numeric keypad appearing to the right of the page. This number is used for the printer report.

1.3.4   Configuration Menu MEASURING DEVICES CONFIGURATION

This menu is used for specifying which devices are being used in your application and at which position in your line they are to be found.

○ **Please note:** For your specific application, **all** measuring device configuration **parameters have been set** at our factory **and should not be changed**. However, if there are any changes to be made in your configuration, for example if a device is to be replaced or a new device is to be integrated into your line, always contact our Service Department first.

Example:

Port	Device Type	Measuring Position	Standard Display	Diameter Correction	Distance to 0-setting [short]	[long]
Device 1	Laser (USSC)	Before main extruder (D 1)	1. LED	No	21.00 m	21.00 m
Device 2	Laser (USSC)	After main extruder (D hot)	2. LED	No	20.00 m	20.00 m
Device 3	CenterView(USSC)	After cooling through (D cold)	3. LED	No	5.00 m	5.00 m
Device 4	Lump Detector				3.00 m	3.00 m
	Wallthickness	Before/after main extruder				

Defines in which text box on the main monitor page the respective measuring values are to be displayed:

1. LED   2. LED   3. LED

*In this example there are four devices: 2 LASER, 1 CENTERVIEW, 1 LUMP. Compare with Configuration Menu **Hardware Setting** and see Fig. 1 and 2 as well. The Line Display looks like this:*

Example:
Parameter **Device Type**

Select the device to be defined by touching the appropriate text box. In the submenu appearing, assign the device type as desired.

Select the device to be defined ....

... and assign the device type.
Exit with **OK**.

Device Type

- ○ Laser (internal)
- ⦿ Laser (USSC)
- ○ CenterView (Internal)
- ○ CenterView (USSC)
- ○ MHD 4xxx
- ○ Single Axis MHD
- ○ Capacitance
- ○ Spark Tester UL
- ○ Spark Tester BS
- ○ Lump Detector
- ○ 4 axis Lump Detector
- ○ Remote Display

Cancel   OK
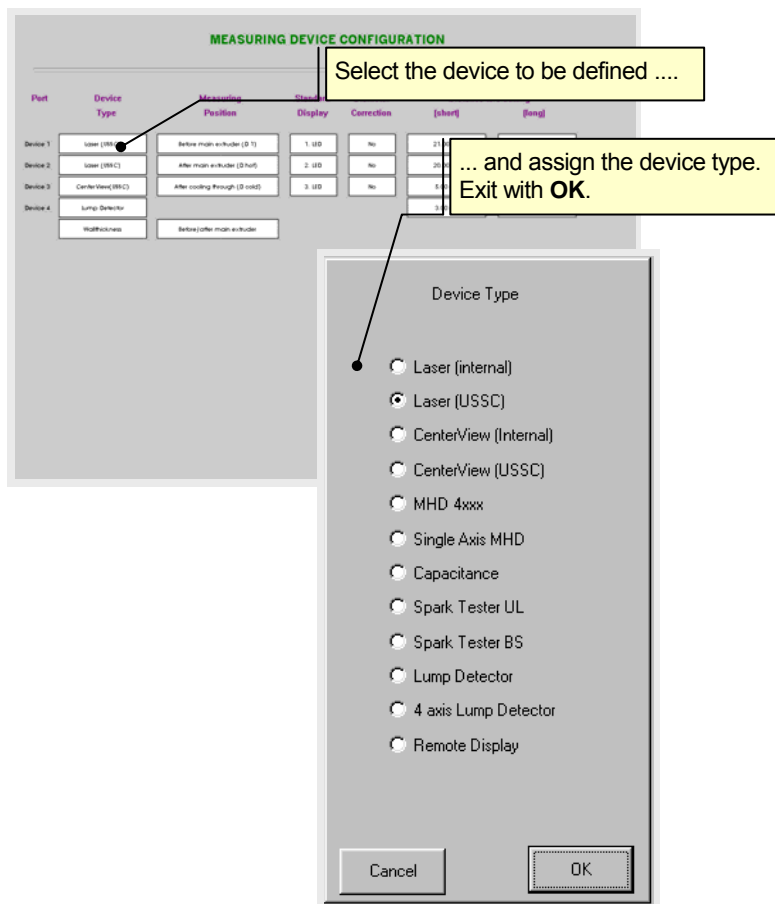
Example:
Parameter **Standard Display**

Touch the appropriate text box. In the submenu appearing, assign the main monitor page text box as desired.
BIG LED means the measuring value display in the middle of the main monitor page, which is usually reserved for displaying the controlled value (wall thickness or diameter).

Select ....

Please select LED from Led1 up to Led 4.
If no wallthickness displayed, select one diameter to BIG LED !

- ○ No Led
- ○ Big Led
- ⦿ Led 1
- ○ Led 2
- ○ Led 3
- ○ Led 4

... and assign.
Exit with **OK**.

OK

1.3.5   Configuration Menu SERIAL COMMUNICATION

This menu defines the communication interface parameter specific for your application.
The values for all parameters have been set at our factory and should not be changed. Please contact our Service Department if necessary.

Example:

1.3.6   Configuration Menu PCCON CARD SETTINGS

This menu defines the input and output signals as well as the control parameter specific for your application. The values for all parameters have been set at our factory and should not be changed. Please contact our Service Department if necessary.

Example:

PCCON CARD SETTINGS

Analog Output 1		Analog Output 2	
Kind of output	CON		
Control Value	Wallthickness / Diameter		
Distance Extruder -- Measuring Head	0.5 m		
Minimal control time [sec]	20.00		
Fall time AUTO to MANUAL [sec]	20.00		
Consider line speed	No		
Control mode	Extruder		
Extruder mark / term			

Digital Output		Speed Measuring	
Digital output 0	active	Pulses per rotation	25
Digital output 1	active	Circumference measuring wheel	0.500 m
Digital output 2	not active		
Digital output 3	not active		

Digital Input		Kind of Digital Output Contact	
Digital input 0	Remote control	Status contact	Alarm
Digital input 1	Start Printer / Trend		
Digital input 2	Stop Printer / Trend		
Digital input 3	None		OK

Input is done by selecting the respective text box and choosing from the drop down menu unfolding or entering a value via the keypad appearing.

PCCON CARD SETTINGS

Analog Output 1   ### Analog Output 2

Kind of output	CON
Control Value	Wallthickness / Diameter
Distance Extruder -- Measuring Head	0.5 m
Minimal control time [sec]	20.00
Fall time AUTO to MANUAL [sec]	20.00
Consider line speed	No
Control mode	Extruder
Extruder mark / term	

Output value: **CON** *Controller,* **ACT** *absolute value or* **DEVI** *deviation*

Controlled value, can be Diameter *or* Capacitance *(Option)*

Used for dead-time correction

Default value is 20.0 seconds.

Time needed by control to return from operation mode AUTO to operation mode MANUAL.

Tells if line speed is to be taken into consideration for control.

Extruder: *control of extruder screw speed*
Line: *control of line speed*
Defines a name for the extruder shown in the line display

Digital Output   ### Speed Measuring

Digital output 0	active
Digital output 1	active
Digital output 2	not active
Digital output 3	not active

Defines output contact signals

Pulses per rotation	25
Circumference measuring wheel	0.500 m

Digital Input   ### Kind of Digital Output Contact

Digital input 0	Remote control
Digital input 1	Start Printer / Trend
Digital input 2	Stop Printer / Trend
Digital input 3	None

Defines input contact signals

Status contact	Alarm

Defines output contact function
READY: *opening contact*
ALARM: *closing contact*

Example:
Parameter **Distance Extruder - Measuring Head**

The distance between the extruder and the measuring head is one of the control parameters. Select the parameter by touching its text box and enter the value of distance via the numeric keypad appearing.

Select the parameter to be set ...
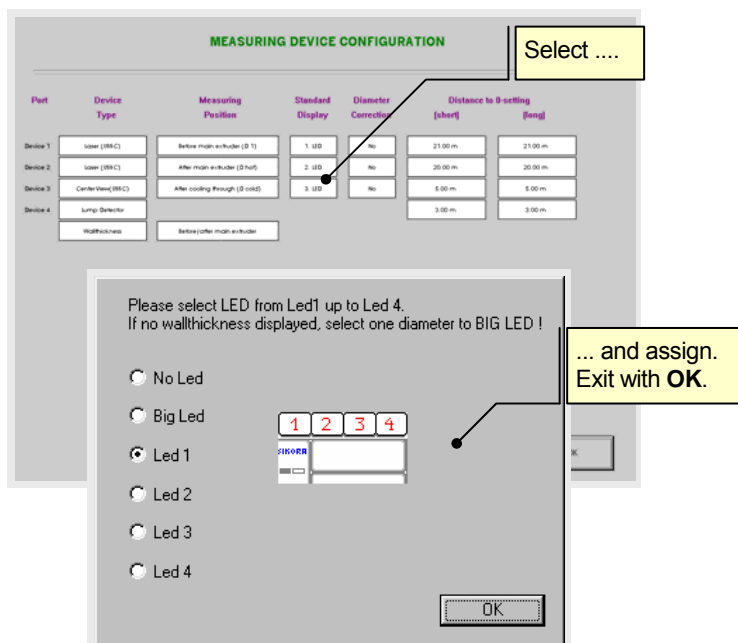
... and enter its value. Confirm and exit with **OK**.

Example:
Parameter **Digital Output**

Select the output to be defined by touching the appropriate text box. In the submenu appearing, assign the digital output signal as desired.

Select the output to be defined ....

... and set.
Exit with **OK**.

DIGITAL OUTPUT FUNCTION

- Device Alarm
- + / - Tolerance wallthickness
- + / - Tolerance Core-Diameter
- + / - Tolerance Hot-Diameter
- + / - Tolerance Cold-Diameter
- Tolerance Eccentricity
- + / - Tolerance Capacitance hot
- + / - Tolerance Capacitance cold
- Lump Signal
- Spark Signal
- No Speed
- SRL Alarm
- None

OK
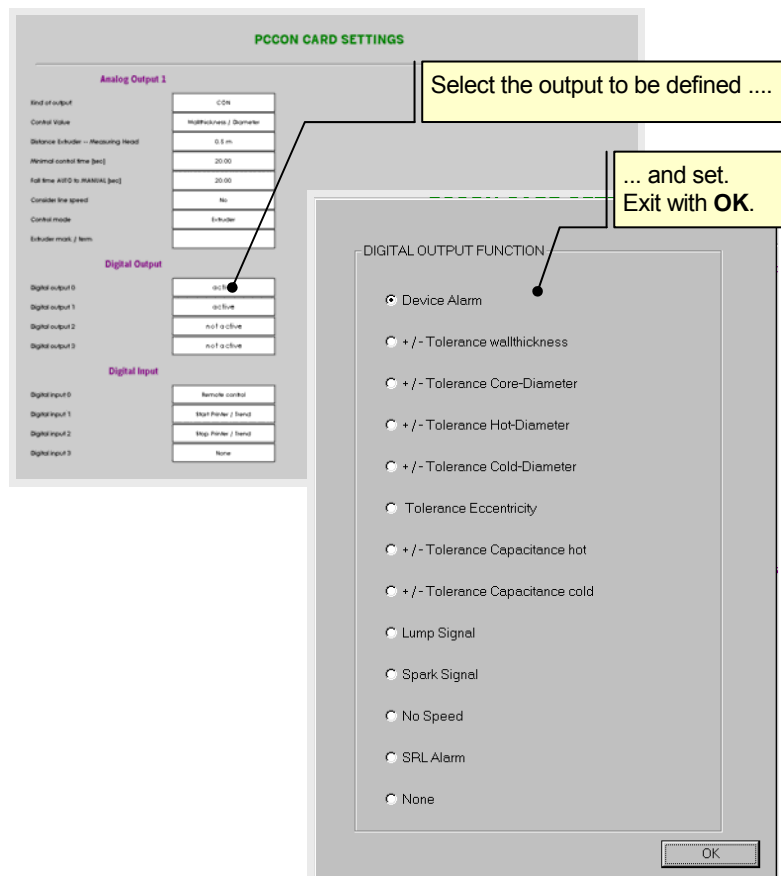
Example:
Parameter **Digital Input**

Select the input to be defined by touching the appropriate text box. In the submenu appearing, assign the digital input signal as desired.

Select the input to be defined ....

... and set.
Exit with **OK**.

DIGITAL CONTACT SETTING

- Remote Control
- Start Printer / Trend
- Stop Printer / Trend
- Extern Spark contact
- Extern Lump contact
- Short / Long line distance
- Start coil
- None

OK
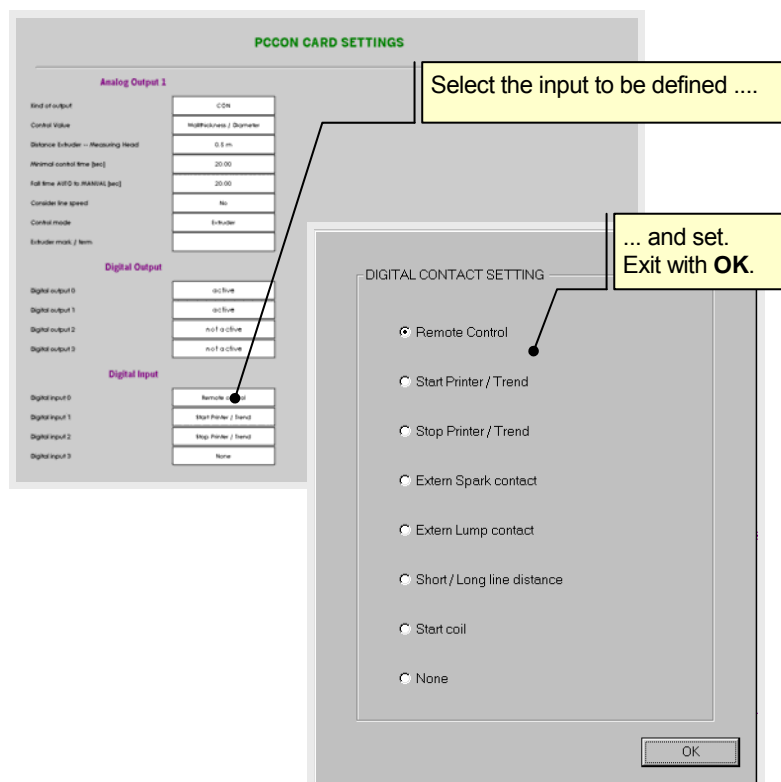
1.3.7   Configuration Menu USER LEVEL & PASSWORD

Among the three existing user levels Operator / System Configurator / Administrator, the access to this table is limited to users registered with level **Administrator**. The table is preset at our factory as shown below.

Example: The illustration shows the default setting. Passwords have been omitted, which means you just confirm the according request during your logon procedure by striking the ENTER key.

Access authorization is as follows:

Level	Access to ...		
	Operating Functions with Recipe Selecting and Manual Setting	System Configuration Recipe Setting and Modification	System Configuration including User & Password Setting
Administrator	✓	✓	✓
System Configurator	✓	✓	-
Operator	✓	-	-

If however your Administrator Access Entry has accidentally got lost and you are no longer able to log in to your ECOCONTROL measuring software please proceed as described below.

Repairing Administrator Access Registration

First, terminate the measuring software:
Connect a keyboard and close down the ECOCONTROL *application with keys* ALT F4 *.*

Start the ECOCONTROL *application as follows:*
Open **Start** *Menu and select* **Run**... *. In the* **Run** *submenu opening next, select* **Browse**.*Open the folder called* \ECOCONTROL*, and select the file named* Ecocontrol.exe*. In the* **Run** *submenu, complete the instruction by adding* [blank]-Administrator *and confirm with* **OK***.*

Check the User and Password Settings:
Access the configuration program with buttons MORE *and* Setup *, and select* **USER & PASSWORD SETTINGS***. Check the table and, if necessary, restore your settings.*

1.3.8   Configuration Menu SAVE AND EXIT

Use **SAVE AND EXIT** to terminate the configuration program. In certain cases (e.g. modification of device configuration), the ECOCONTROL application must be restarted and the message shown below will appear.

Example:

ECOCONTROL V4.05 CONFIGURATION

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▶ HARDWARE SETTINGS
▶ APPLICATION PARAMETERS
▶ MEASURING DEVICE CONFIGURATION
▶ SERIAL COMMUNICTION SETTINGS
▶ PCCON CARD SETTINGS
▶ USER & PASSWORD SETTINGS

Programm Info!
? You must restart your computer before the new settings will take effect.
Do you want to restart your computer now?
[Yes] [No]

---
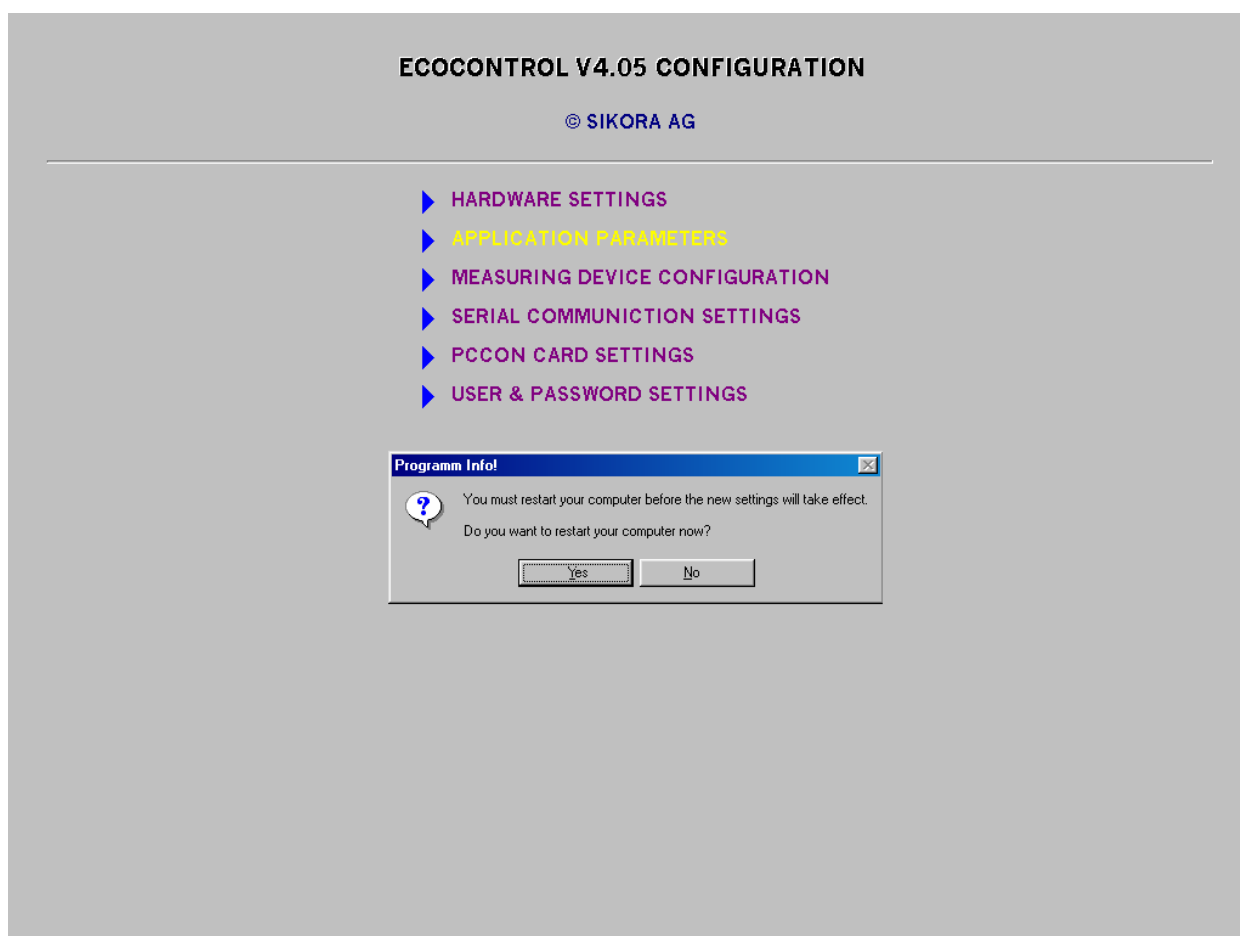
2.   Operation

2.1   General

Switch the device on by connecting the supply voltage.

All operator input is done directly on the touch screen. The elements used for operation are Windows-like components like buttons, text boxes, drop-down menus etc. Input is done by slightly touching the monitor glass surface with the finger at the position where the appropriate input element is shown.

Before starting ECOCONTROL 2000 operation the device has to be configured using the Configuration Software described in Chapter 1.3 (page 5 ff.) of this manual to adapt it to your production line. This should be done by an experienced **SIKORA** technician.

ECOCONTROL Operation Mode:
The ECOCONTROL 2000 can be operated
- using the monitor touch screen
- via a communication link by an external line computer

The ECOCONTROL operation mode can be as follows:
- **external control only** :
  Variables can only be changed via the communication link, i.e. display input is disabled.
- **external/internal control** :
  Variables can be changed via touch panel or communication link, both have the same priority

The operation mode is set by the external computer with an according telegram, default setting is external/internal control.

Monitor Operation:
Different pages are presented. The standard monitor page displays the diameter measuring values and the wall thickness, together with nominal value and deviation, as well as information about automatic control influence. Additional pages show the measuring value in graphical display, with a diagram of the measuring value, in relation to the nominal value, vs. length, or statistical information about the measuring values after the end of production.
The operator can set or modify the nominal values, tolerance limits etc. Additionally, the operator can create and manage a Recipe Table containing the settings for various types of cables in production.
All operator input is done using the Touch Panel.

Operation by External Computer:
An external computer communicates with the ECOCONTROL 2000 by sending telegrams which are used to request or set values like nominal values, tolerance limits, control mode etc. For a description of the telegrams and their meanings refer to Chapter 3.2 and Fig. 52 *Serial Interface*.

Wall Thickness Measuring:
The insulation wall thickness is calculated by subtraction of the diameter values under consideration of the measured shrinkage and then displayed digitally. The values of the measured diameters are displayed as well. The calculated wall thickness is compared with the pre-set nominal value. Deviations of the wall thickness are sent to the analog output.
Tolerance limits can be set, separately for positive and negative deviations, any exceeding will be indicated by dry contacts switching over.

Each device is equipped with an internal validity check of measured values. It signalizes invalid values, which arise from a wrong position of the object to be measured or faulty exposure.

Diameter Measuring:
The diameters are measured optically. A light source (laser diode) serves as light background in relation to the dark cable. The cable covers the light beam partially, thus producing a shadow proportional to the diameter. Light and shadow are projected to the photodiode array of an electronic CCD-camera.
A delay time memory guarantees the evaluation of measured values at the same place. Then the wall thickness is calculated by subtraction, and under consideration of the shrinkage.

This actual value is compared with the pre-set nominal value. The difference between actual and nominal value is changed by a D/A-converter to an analog value from ±10 V DC and sent to the analog output.

The actual value of wall thickness is compared with the tolerance limits. An exceeding causes a failure message by means of dry contacts.

2.2   Setting the Automatic Control

The multifunction control unit is a component for precise, automatic control of wall thickness. Either line speed or extruder screw r.p.m. can be controlled. The module is switched into the line of the drive (refer to Figure *Automatic*).

The control works with both diameter values, the warm and the cold one to calculate and consider the shrinkage. If a deviation occurs, the control changes infinitely variable the nominal value for the line speed or screw r.p.m. until the actual value is in accordance with the nominal value, the control display indicates the influence of the control signal.
The core diameter and filler diameter can also be controlled.

If the automatic control is switched off, the nominal value of the line is connected through, thus enabling manual control.

The control module allows a continuous control of the line speed or of the extruder screw speed (rpm). In case of a deviation between the measuring value and the selected nominal value, the controller continuously increases or decreases the line speed or extruder rpm, till the deviation is zero.
To optimize the control, the line should run with the most common cable type and line speed. Start the line and set the nominal value of the wall thickness and the shrinkage. At first the control works with the warm value, the cold value is used when the cable ran the line once completely, then the shrinkage is calculated.

The operator should now run the line with 3% oversize, before going in automatic mode. Switch the automatic "ON", within 20 seconds the control module reduces the oversize down to 1%, and within 1 minute down to zero. The control influence is shown on the monitor.

Select in the configuration program a shorter time for more control influence, i.e. the deviation is levelled out faster. Watch the display, if the influence is too fast the line starts to oscillate.
A longer time causes a slower influence, the time for levelling out is lengthen.

Very slow lines (speed less 10 times distance extruder - measuring head) or lines where the measuring head is mounted behind the cooling-trough require the additional SPEED influence function, the control works under consideration of line speed.

The speed of the line is automatically calculated using the pulses of the rotary pulse generator.

Run the line with a speed 10 times distance.

Example: Distance extruder - measuring head = 15 m
                  line speed = 150 m/min

The minimal control time constant must be adjusted to 20 seconds as done at delivery.
When the line runs with a speed higher 10 times distance, the control time constant is 20 seconds, as pre-adjusted. With a lower speed the control time constant is enlarged proportional to prevent an oscillation.

The signal "control deviation" shows the difference between pre-set nominal value and displayed actual value.
±10 V DC voltage correspond to ±0.250 mm deviation.

After connection of a line recorder you can observe and recognize the effects of the AUTOMATIC mode upon your line under different speeds (e.g. start-up, acceleration, production, delay) and which deviations arise, particularly during acceleration and delay. Analyze the recorded values and check if everything functions as expected.

2.3   Determination of Nominal Values

After adjusting the control you should take some samples. While production runs and AUTOMATIC is switched ON you mark the cable as soon as it leaves the measuring head. At the same time you mark the deviation which was written by the line printer and note the pre-set nominal value.

You need:
- for cables up to 8 mm Ø resp. line speed faster than 300 m/min: 5 samples à 20 m
- for cables from 8 up to 15 mm Ø resp. speed from 150 - 300 m/min: 4 samples à 10 m
- for cables bigger than 15 mm Ø resp. speed slower than 150 m/min: 3 samples à 5 m

Measure the diameter / wall thickness of the samples at regular intervals so that you will obtain at least 20 values. Enter the measured values in a diagram. Now you can make out which deviations depending on the system occur with the different types of cable.

These deviations may not and cannot be controlled by the AUTOMATIC of the measuring device. The average value of the samples (shrinkage added) shall correspond with the displayed values.

The diagram shows you, how to set the nominal value to obtain the smallest permissible diameter/wall thickness value under consideration of line system deviations.

2.4   Sector Conductor Measurement
- to be implemented yet -

When performing sector measurement, observe the following parameter definitions for entering your recipe table data (see description **Monitor Page RECIPE TABLE** ff.)
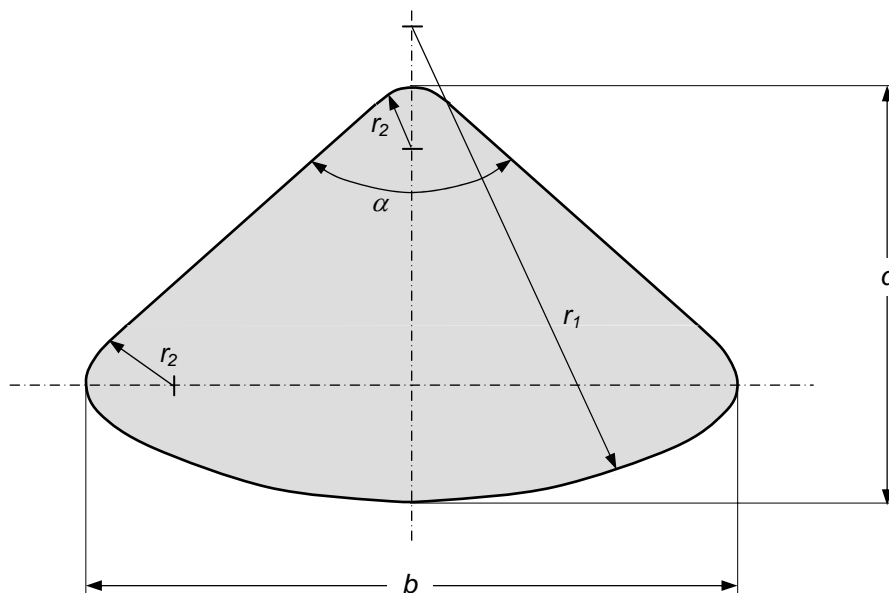
Sector Conductor

Parameter	Name of Recipe Table Element
α	Angle
b	Thickness (b)
d	Height (d)
r_1	Radius (r_1)
r_2	Radius (r_2)

2.5 Monitor Operation

Switch the device on by connecting the supply voltage. First, the standard monitor display page appears, other pages can be accessed by touching the respective button. Remember that you have to log in first by entering your user name and -if specified- your password, as defined by the USER LEVEL & PASSWORD SETTINGS table described on page 17, unless your application has been configured to execute an automatic log in for a specified user (see description of configuration menu **APPLICATION PARAMETERS** on page 10).
Make sure all application settings are correct, see page 45 ff. for a description of monitor page **APPLICATION SETTINGS** and its functions.

User Log In / Log Off

At the bottom left of the monitor page appearing after starting the system, there is a button which is used for logging in to the ECOCONTROL Measuring Program resp. logging off from it.

Example:
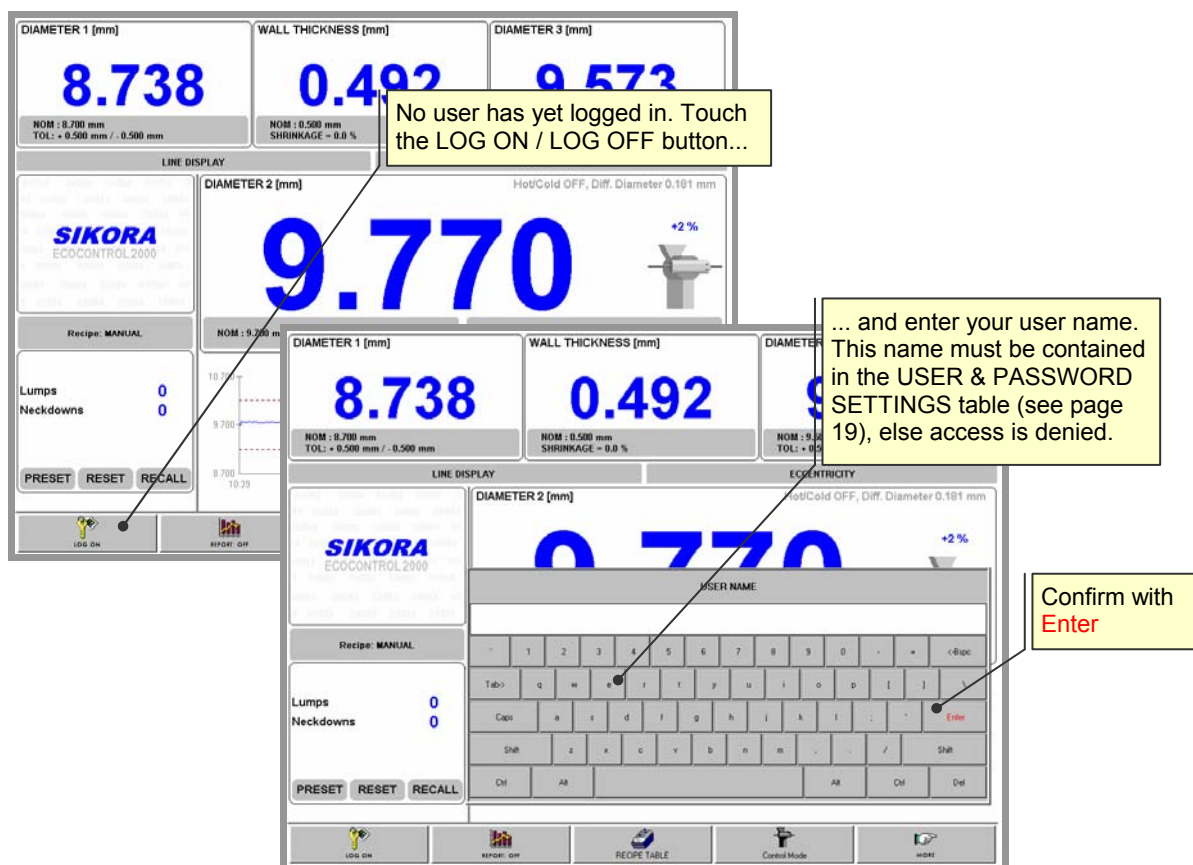
Enter your password in the same way.

If your log in is successful, you will be able to access the application according to your user level. The inscription on the log in button changes to LOG OFF.

If your log in procedure fails, contact your administrator.
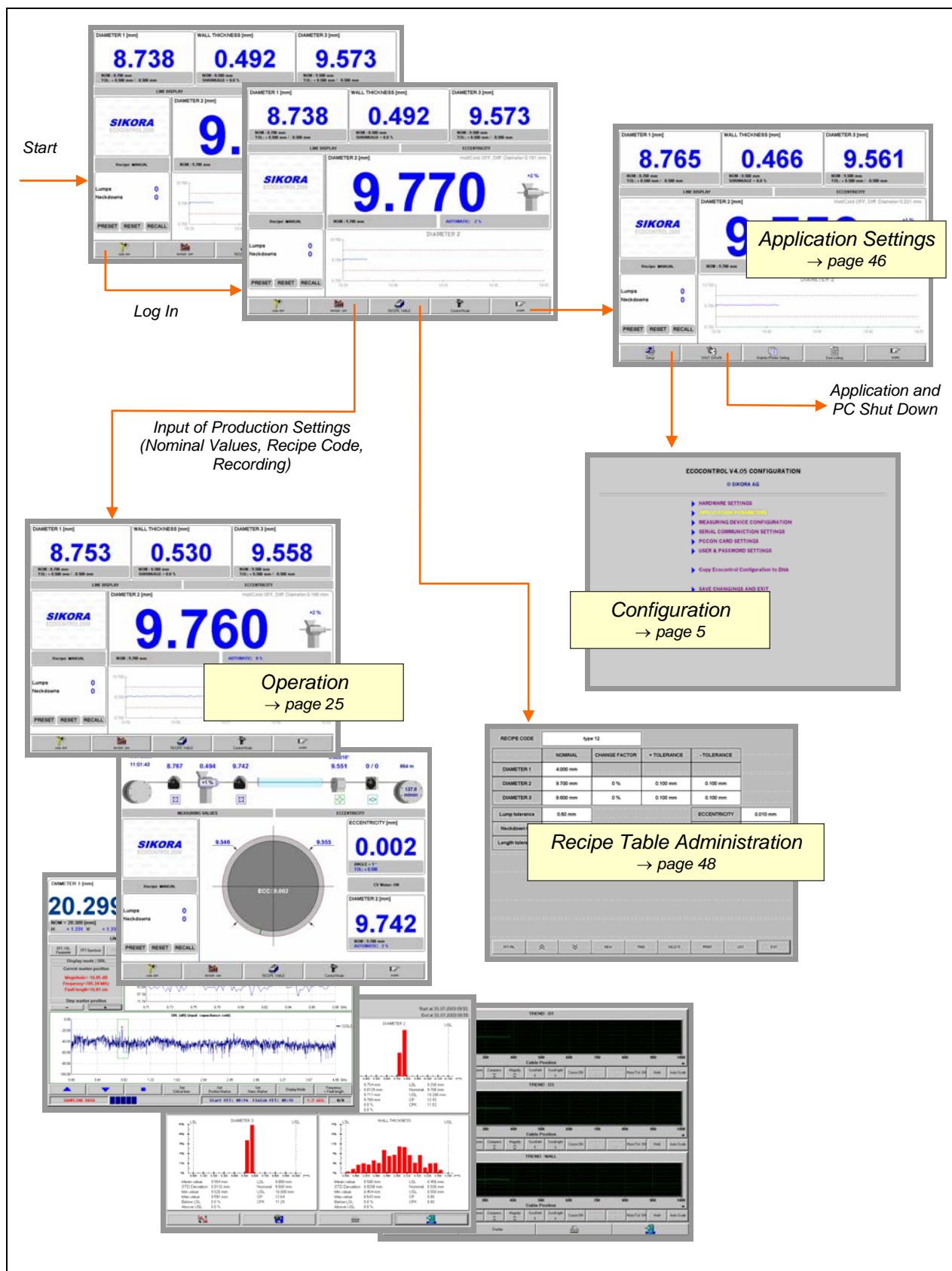
ECOCONTROL 2000 Application Structure

Structure of Standard Monitor Page

This page is split into several areas containing various elements like text boxes, text buttons, function buttons, toggle bars and a diagram viewport.

Example:

Text Box
for displaying the measuring values. Those exceeding their tolerance limit will be shown in red

Toggle Bar
for toggling between display of diameter measuring values and line diagram or eccentricity display

Text Bar
for combined display / operation Parameter shown can be selected by touching

Diagram Viewport
showing the Short Time Trend Diagram

Function Button
for operating

Operation is done by touching the buttons and bars presented as well as by touching the short-time diagram area.

When striking the toggle bar **LINE DISPLAY**, the text boxes containing the diameter values **Diameter 1** etc. will be replaced by the line diagram and vice versa.

When striking the toggle bar **ECCENTRICITY**, the text box in the middle and the short-time trend diagram will be replaced by the cable eccentricity display and vice versa.

The parameters being displayed in the text bars can be selected and their nominal values can be set by striking the respective bar and choosing from the submenu unfolding. To enter a nominal value, use the numerical keyboard appearing accordingly. See the examples given below.

Standard Monitor Page / Measuring Value Display

This is the standard measuring value display, which may vary in certain aspects according to your line configuration.

Example: Explanation of Measuring Values Displayed

Here, the line is equipped with two LASER 2000 XY diameter measuring heads, one CAPACITANCE 2000 capacitance measuring device and one CENTERVIEW 2000 gauge head for measurement of eccentricity, diameter and ovality. Various values concerning the parameter wall thickness, diameters 1, 2 and 3 and the short-time trend diagram are shown.
Information coming from lump and spark detectors (if installed) is displayed in a separate window.

Diameter value
red: tolerance value exceeded
else: ok

Nominal value, tolerance values diameter 1
touch to set or to select other parameters to be displayed here

Measuring value of wall thickness is only shown when the line is running (pulses coming from the rotary pulse generator)

Text box used for displaying the measuring value which is used for control

Touch to set control parameter

Amount of control influence Touch to select other parameters to be displayed here

Nominal value Touch to set or to select other parameters to be displayed here

Touch this area to select the short-time trend parameter to be displayed (example below)

LUMP / SPARK Info Text Box
PRESET *Set SPARK Nominal HV or LUMP tolerance values,*
RESET *Clear LUMP and/or SPARK fault counter*
RECALL *Call table with detailed fault information*

Example: General Operation

Call submenu for entering a production recipe code (see page 25)
Text to the right shows name of recipe currently being used in production if a code has been selected, else MANUAL (see explanation below).

Text Bar: touch to set a nominal value, to change parameters shown, to call special functions (see separate description below)

Toggle Bar: touch to switch to display of line diagram (toggle bar operation examples: see page 19)

Toggle Bar: touch to switch to eccentricity display (toggle bar: see page 19)

DIAMETER 1 [mm]	WALL THICKNESS [mm]	DIAMETER 3 [mm]
8.753	0.530	9.558
NOM : 8.700 mm TOL: + 0.500 mm / - 0.500 mm	NOM: 0.500 mm SHRINKAGE = 0.0 %	NOM : 9.500 mm TOL: + 0.500 mm / - 0.500 mm

LINE DISPLAY | ECCENTRICITY

SIKORA
ECOCONTROL 2000

DIAMETER 2 [mm]   Hot/Cold OFF, Diff. Diameter 0.189 mm

9.760   +2 %

Recipe: MANUAL

NOM : 9.700 mm   AUTOMATIC: 0 %

Lumps   0
Neckdowns   0

DIAMETER 2

10.700
9.700
0.700
10:55   10:56   10:57   10:58

PRESET   RESET   RECALL

Call additional buttons for application setting (see p. 47) like control mode setting, language selection etc., to access the configuration program and to terminate the ECOCONTROL Measuring Software

LOG OFF | REPORT: ON | RECIPE TABLE | Control Mode | MORE

User LOG ON or LOG OFF

Call submenu concerning functions Trend/Statistics (see page 26)

Call production recipe table

Touch to set control parameter

Explanation concerning **Recipe** function:
For different cables in production, their production parameters like nominal values of diameters and wall thickness and cable type can be kept as a set of data in a so-called recipe table. Each set of data is identified by its name, the recipe code. The desired recipe code is called by entering the appropriate name. If a recipe code has been selected, its parameters become valid for the production running immediately. They cannot be modified by operator entries on the standard monitor page, i.e. by manual input. This remains disabled until you leave the recipe mode by entering MANUAL instead of a recipe code.

Standard Monitor Page / Measuring Value Display / Text Bar Operation

Upon touching one of the mesuring value text bars, a submenu will unfold offering a selection of various functions, such as
- choosing the parameter whose value is to be shown in the text bar besides the nominal value
- setting the nominal value and tolerance values for the measuring value selected
- call device information
- start the calculation for functions FFT / RL Prediction (Option)
- switching the automatic mode

Depending on which measuring value has been chosen, and which options are contained in your application, the range of functions offered will be different. The following illustrations show some examples.

Strike the text bar and its submenu will unfold
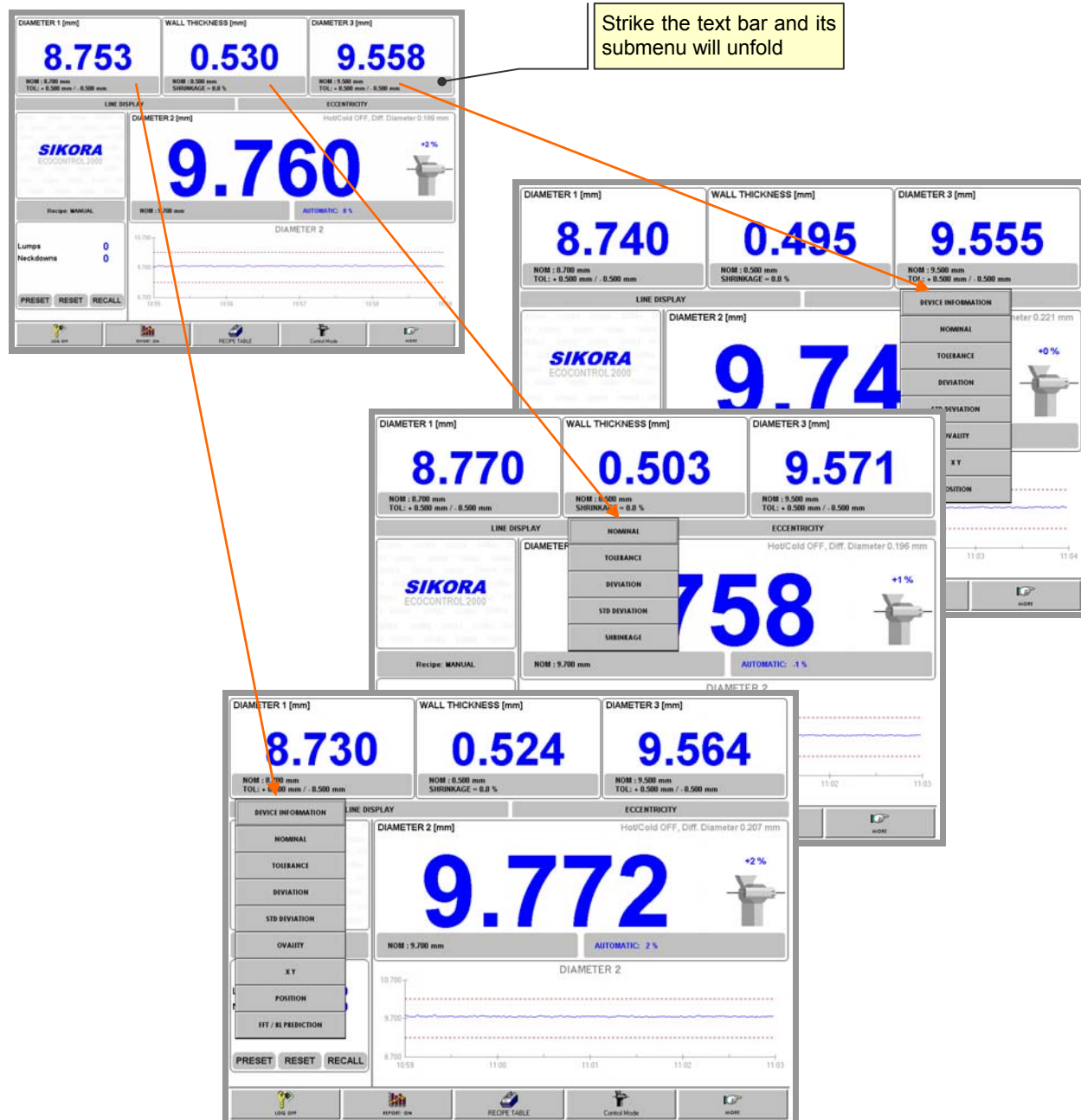
Example: Using the text bar contained in the **DIAMETER 1** text box to set the nominal value

Strike the **DIAMETER 1** text bar...

and select **NOMINAL** from the submenu unfolding

Via the numerical keypad appearing next, enter the value as described below and confirm with **OK**. The new value becomes valid immediately for the production running.

Use the keypad to enter your value: touch the according numbers and confirm with **OK**.

Quit without changing the existing value

Clear entry

Backspace

Confirm entry and close

Explanation of submenu concerning the **Diameter 1** text bar:

DEVICE INFORMATION	*Display* Diameter 1 *Measuring Device Information, see example below.*
NOMINAL	*Set* Diameter 1 *Nominal Value, enter via numerical keypad appearing. The actual nominal value is always displayed in upper half of text bar.*
TOLERANCE	*Set upper and lower tolerance limit for* Diameter 1*, enter values via numerical keypad appearing. Parameter is selected for display in text bar.*
DEVIATION	*Select this parameter for display in text bar.*
STD Deviation	*Select Standard Deviation* Diameter 1 *for display in bar (for this function, recording of production data must have been started, see pages 43ff).*
OVALITY	*Select Ovality* Diameter 1 *for display in text bar.*
X Y	*Select* Diameter 1 *Value X /* Diameter 1 *Value Y for display in text bar.*
POSITION	*Select Horizontal/Vertical Pos. (only with sector measurement)* Diameter 1 *for display in text bar.*
FFT / RL PREDICTION	*Call functions FFT / RL Prediction (Option), see p. 61ff.*

Example
of Measuring Device Information shown:

Click here to access the Diagnosis Program of the respective device.
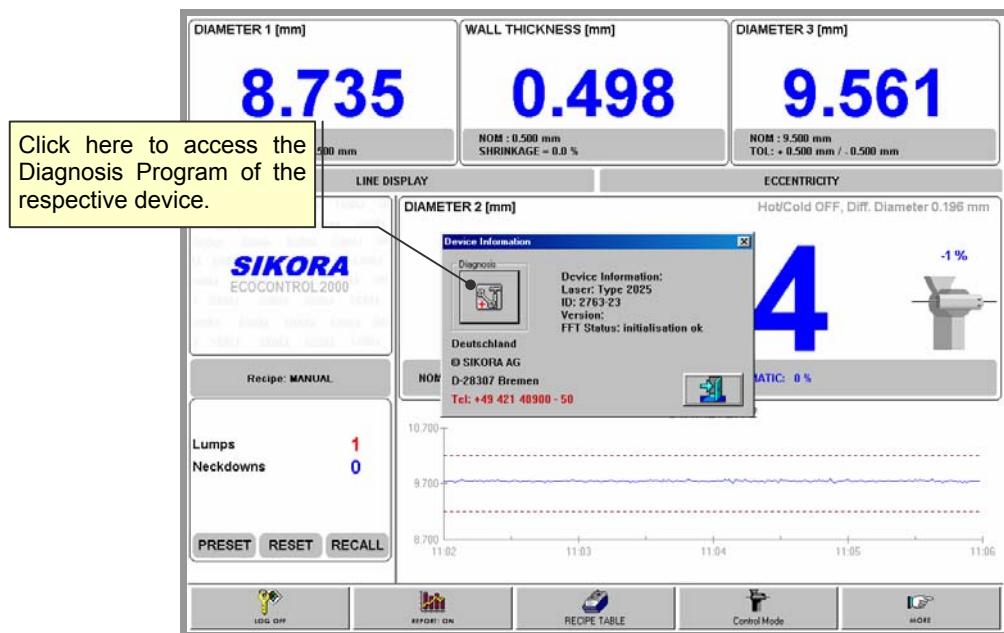
Example: Using the text bars contained in the big measuring value text box

Use the text bars to choose the parameter to be displayed in the right bar and / or to set various nominal values for certain parameters. The left text bar will always display the nominal value, however this can be used for selecting and setting as well.

Strike one of the text bars and choose from the submenu unfolding

Explanation of submenu:

Menu item	Description
DEVICE INFORMATION	*Display* Diameter 2 *Measuring Device Information, see example below.*
NOMINAL	*Set* Diameter 2 *Nominal Value, enter via numerical keypad appearing. The actual nominal value is always displayed in upper half of text bar.*
TOLERANCE	*Set upper and lower tolerance limit for* Diameter 2*, enter values via numerical keypad appearing. Parameter is selected for display in text bar.*
DEVIATION	*Select this parameter for display in text bar.*
STD DEVIATION	*Select Standard Deviation* Diameter 2 *for display in bar (for this function, recording of production data must have been started, see pages 43ff).*
OVALITY	*Select Ovality* Diameter 2 *for display in text bar.*
X Y	*Select* Diameter 2 *Value X /* Diameter 2 *Value Y for display in text bar.*
POSITION	*Select Horizontal/Vertical Pos. (only with sector measurement)* Diameter 2 *for display in text bar.*
FFT / RL PREDICTION	*Call functions FFT/RL (Option)*
AUTOMATIC	*Access additional dialog box for switching the automatic mode*

ON Switch AUTOMATIC on
OFF Switch AUTOMATIC off
HOLD AUTOMATIC mode is "frozen", i.e. the control operates using the last valid value. Prompt accordingly.

Explanation concerning switching the AUTOMATIC mode:

Check set nominal value wall thickness, the shrinkage for the cable type and the control mode. Touch

button **AUTOMATIC**, and confirm switching **AUTOMATIC** `ON` or `OFF`. At first the control works with the warm value, the cold value is used when the cable has run the line once completely, then the shrinkage is calculated and shown above the wall thickness value.

The deviation between automatic control and manual adjustment (in percent) can be seen in the respective text bar, if selected (see description of text bar operation above). When the value becomes negative, the manual adjustment of wall thickness has been too big. When the value becomes positive, a switch-over to manual operation would lead to a wall thickness which is too thin. Note : control influence is limited (±50%), the drive should be corrected before the value of deviation increases too much.

When the device or the automatic is switched off the nominal value of the line is connected through to the output. (CAUTION, if the device is switched off during automatic control, there might be an undefined state during switch-over which may lead to lumps.)

If the camera supervision finds a fault, the automatic is "frozen", i.e. the control works with the last valid value.

Standard Monitor Page / Measuring Value Display / Diagram Viewport Operation

Example: Choosing of Short-Time Trend Parameter

Open the respective submenu by touching the short-time trend diagram area

From the submenu, choose the parameter which is to be shown in the short-time trend diagram.

DIAMETER 1	*Show short-time trend diagram of parameter* Diameter 1.
DIAMETER 2	*Show short-time trend diagram of parameter* Diameter 2.
DIAMETER 3	*Show short-time trend diagram of parameter* Diameter 3.
WALL THICKNESS	*Show short-time trend diagram of parameter* Wall Thickness.
ECCENTRICITY	*Show short-time trend diagram of parameter* Eccentricity.
CONCENTRICITY	*Show short-time trend diagram of parameter* Concentricity.
SHRINKAGE	*Show short-time trend diagram of parameter* Shrinkage.
Log file	*Select log file (only if* **Test Display** **Enabled** *, see p. 8)*

Standard Monitor Page / Using the Toggle Bars

There are two toggle bars. Use the
- left one to toggle between the display of diameter measuring values (**DIAMETER 1** etc.) and the line diagram in the upper part of the standard monitor page and the
- right one to toggle between the measuring value display with trend window and the eccentricity display.

Example: Calling the Line Display
(Line Display is explained on page 37)

Strike the left toggle bar.

Instead of the diameter text boxes, the line display appears.

The toggle bar inscription has changed. Strike bar to return to the diameter measuring values display.
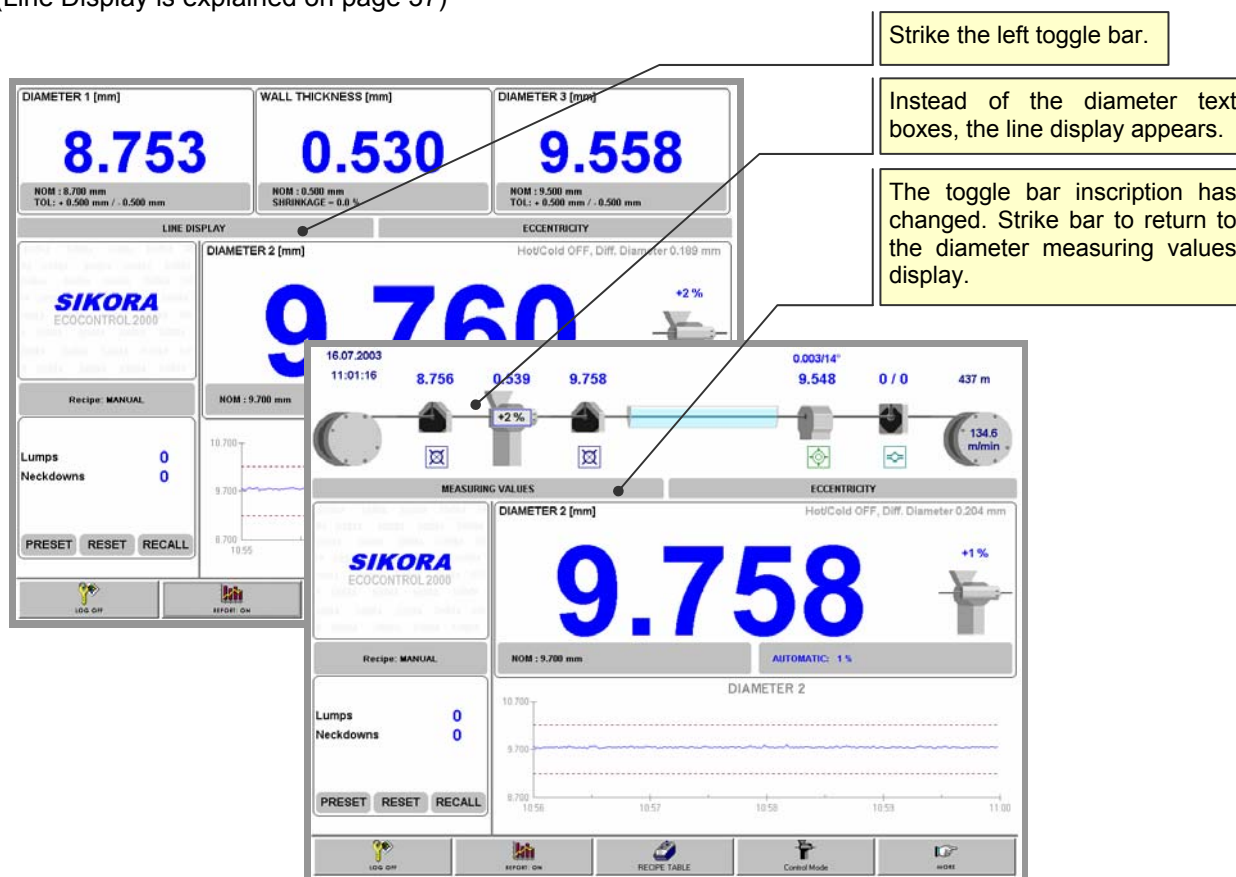
Example: Calling the Eccentricity Display
(Eccentricity Display is explained on page 36)

Strike the right toggle bar.

Now, the cable eccentricity is shown in graphical representation.

The toggle bar inscription has changed. Strike bar to return to the measuring values display / short-time trend diagram.
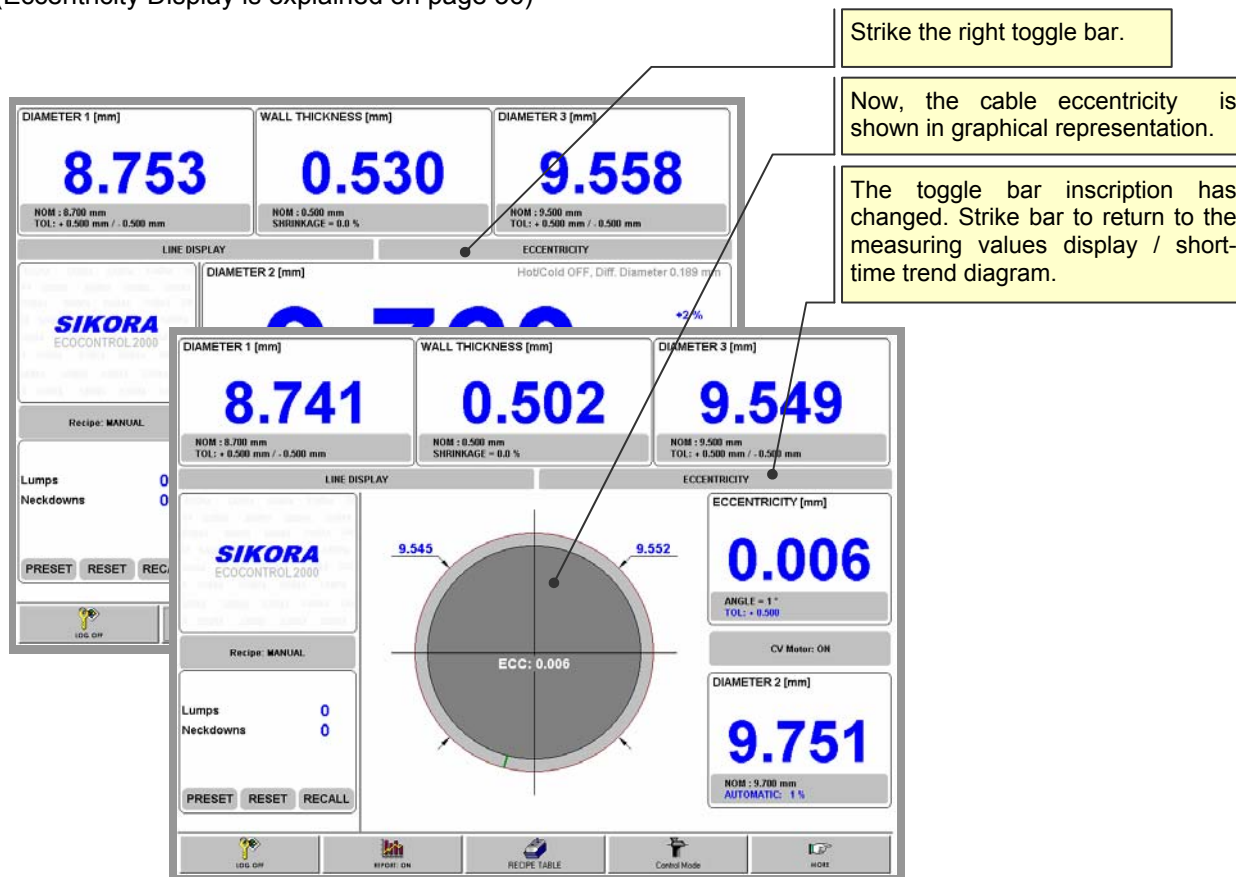
You may also use the left toggle bar to call the line representation.

Switching the display:
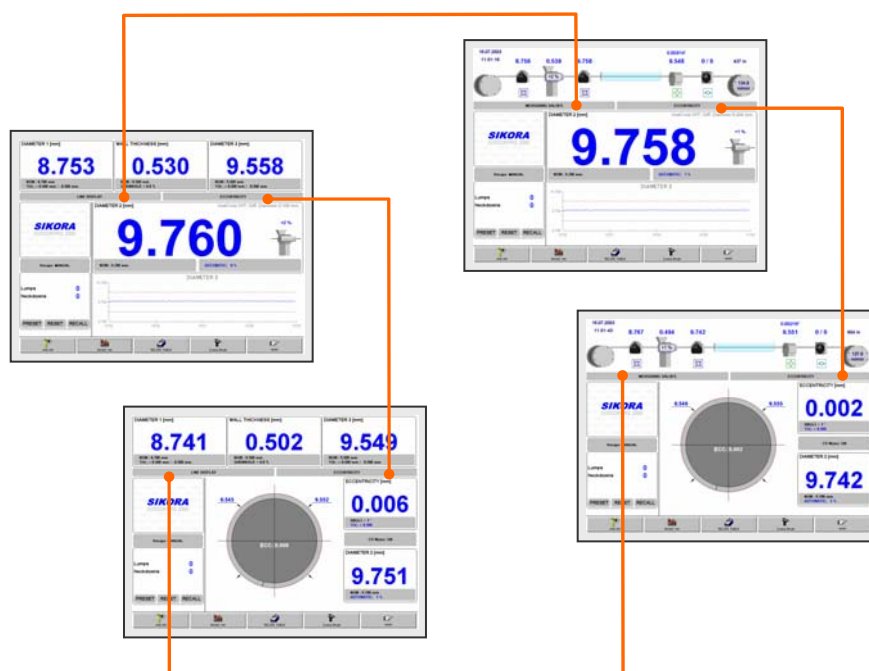
Standard Monitor Page / Eccentricity Display

This page shows the cable eccentricity in graphical representation and as numerical value.

Example: Explanation of Eccentricity Display
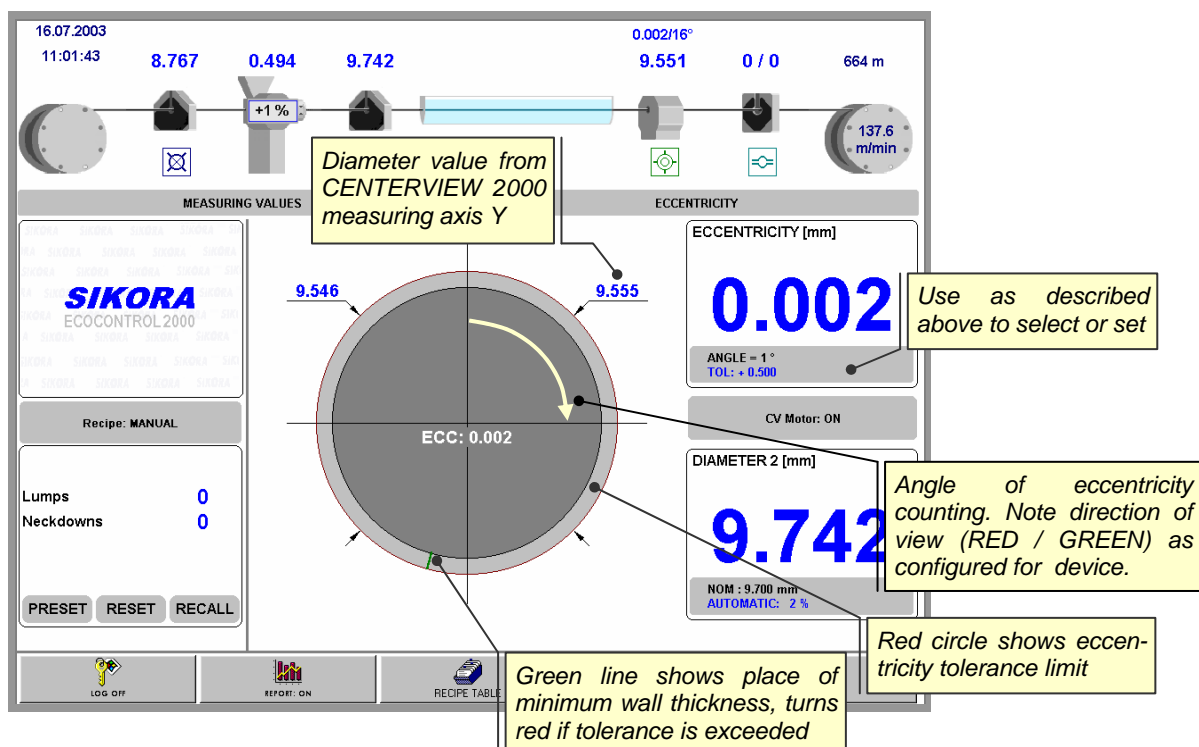
Standard Monitor Page / Line Display

Please remember, the line configuration shown here serves as an example. As each line is configured individually, this may look different according to your line equipment.
Above the illustrations representing the line equipment their respective measuring or test result or status information is displayed.

Example: Line Display

Explanation:

Extruder / Values Wall Thickness, Control Influence	*CENTERVIEW 2000 Measuring Head / Measuring Values* Eccentricity (Absolute and Angle), Diameter 3

LASER 2000 XY Measuring Head / Value Diameter 1

LASER 2000 XY Measuring Head / Value Diameter 2

LUMP 2000 Measuring Head / Info Lump / Neckdown

Pay-Off / Value Date, Time

Cooling Trough

Take-Up / Values Length, Line Speed
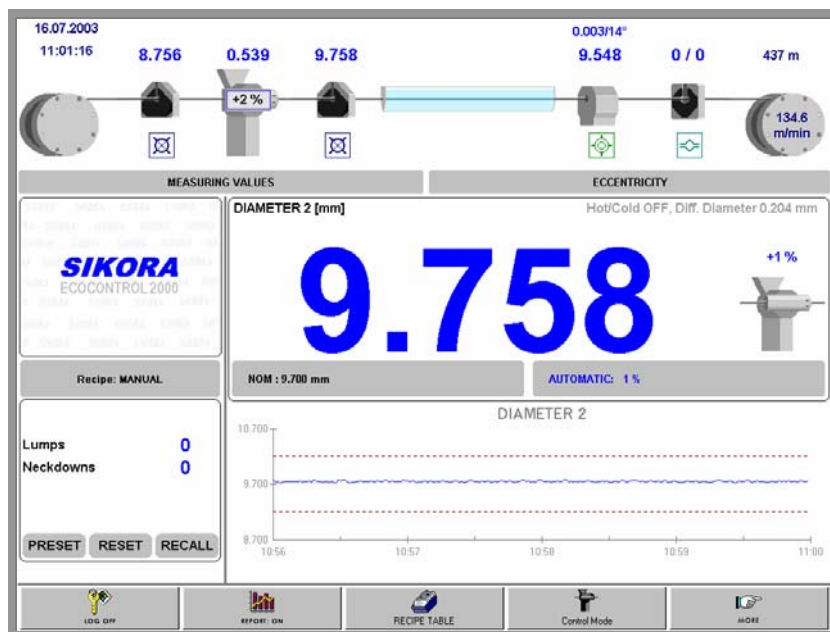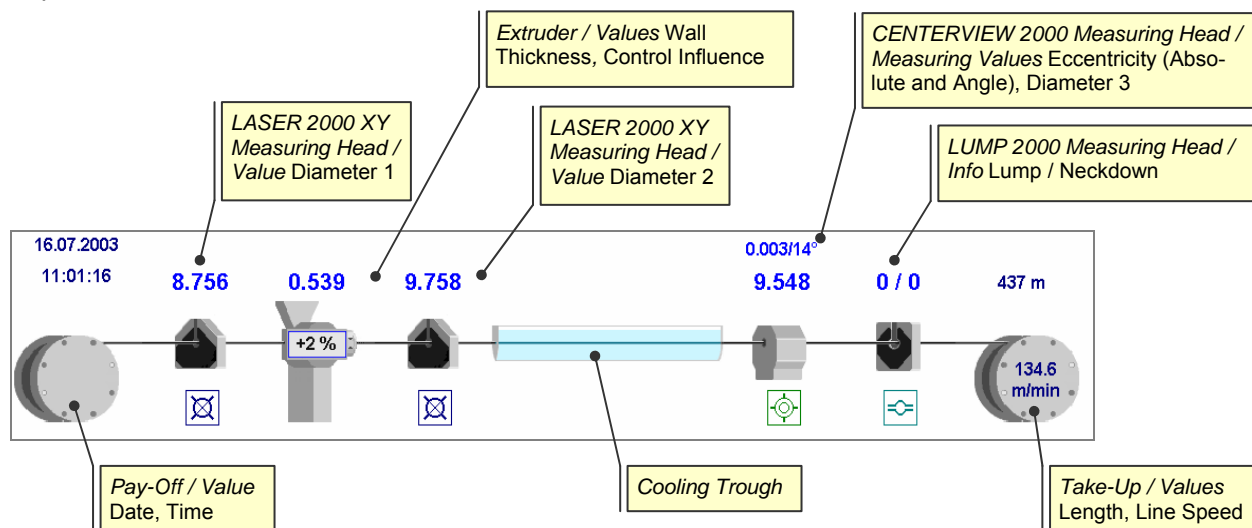
Standard Monitor Page / Button RECIPE CODE

A recipe code is a name for a set of data containing specific values like nominal and tolerance values as well as other specific cable parameters used for the production of a certain cable. You can keep several of these in a recipe table (this is described on pages 47ff). If you want to apply a certain recipe during production, enter its name using button **RECIPE**.

Example: Calling a recipe code

As indicated by the text string shown, at this moment there is no recipe being used but manual settings. To call a recipe, strike button **RECIPE** to open the alphanumeric keypad for entering its code.

Enter recipe code and confirm with **OK**. The data of the recipe code chosen will become valid immediately for the production running. Of course, there must exist an entry corresponding to the code entered in your recipe table. If not, an error message will appear.

Standard Monitor Page / Button REPORT

With button **REPORT,** open the submenu to
- start and terminate the recording of production data which are evaluated and displayed by functions TREND, STATISTICS and the printer report, and
- call the monitor pages for functions TREND and STATISTICS.

The inscription shown on button **REPORT** indicates if recording is ON or OFF.

The data of one production can be saved to observe the trend of certain selectable parameters and to evaluate them statistically. However, production data can only be recorded if this activity has been started with **REPORT** / **START**, which is usually done at the beginning of a production.

As long as recording is **ON**, functions TREND and ONLINE STATISTICS can be called using the respective buttons. At the end of a production, data recording is stopped with **REPORT** / **STOP**. Now, the production data recorded are evaluated statistically and you can call function STATISTICS with **REPORT** / **STATISTICS**. In case a new production is to follow immediately, you can also proceed with **REPORT** / **START** which will be interpreted as **REPORT** / **STOP** followed directly by **REPORT** / **START**.

Example: At the beginning of production, start data recording with **REPORT** and **START**

REPORT is **OFF**. Strike here to open submenu ...

...and **START** data recording

Now the inscription on the button shows **ON***. Functions* TREND *and* ONLINE STATISTICS *can be called via the submenu opened by striking the button (see detailed description below).*
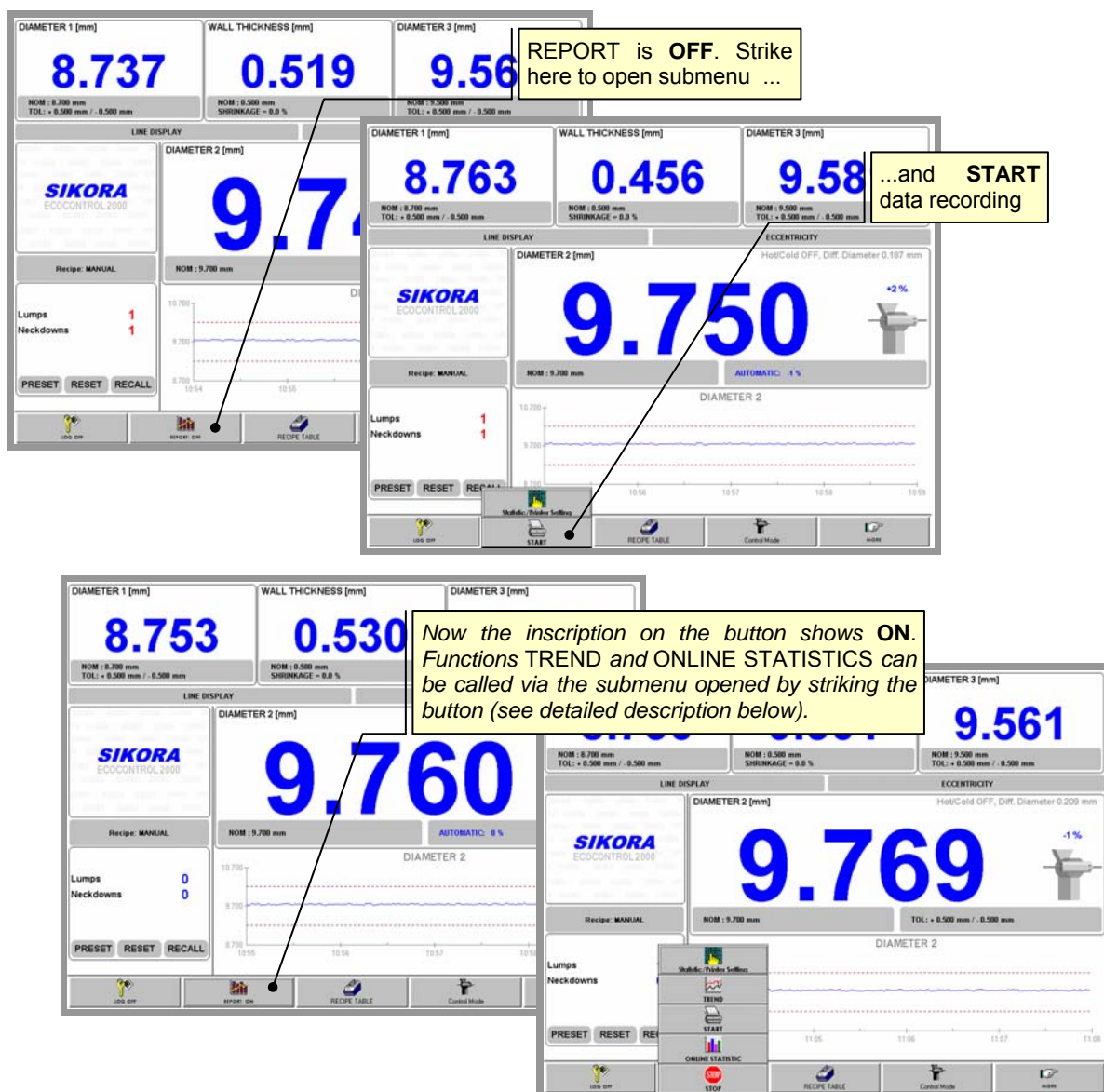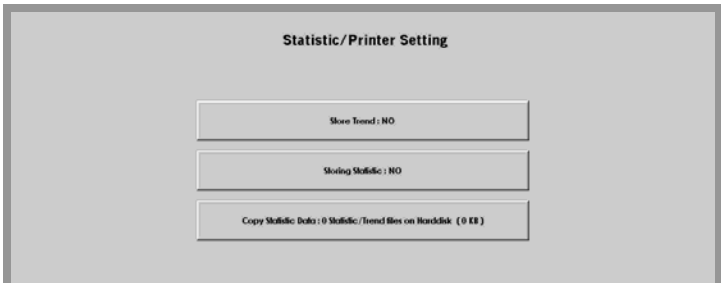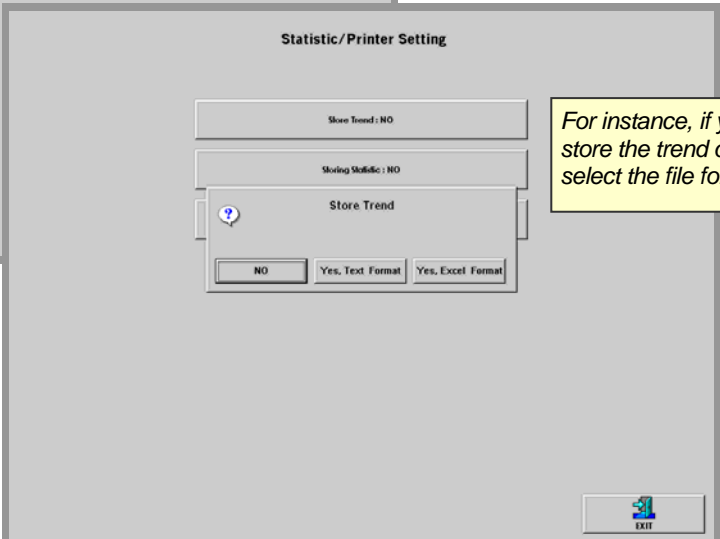
As long as **REPORT** is **ON**, the submenu bar contains these buttons .

Set additional parameters for data recording (see below).

Strike button to call monitor page TREND (see p. 43). Only enabled if recording of production data has been started.

Use at beginning of production to start data recording for functions TREND / STATISTICS and to start the printer report (Option). Button REPORT *indicates* **ON**.

Show online statistical diagram on monitor page STATISTICS. Only enabled if recording of production data has been started.

Use at production stop to close production data recording. These are evaluated, see p. 45. The printer report (Option) is terminated. Button REPORT *indicates* **OFF**.

Once a production has been completed and data recording has been stopped (**REPORT** / **STOP**), the button for calling the production statistics appears as well.

Explanation concerning button   **Statistic/Printer Setting**
Touching this button opens a page used for setting data recording parameters. Choose if you want to store the trend data or the statistical data in a file or on hard disk.

For instance, if you decide to store the trend data, you can select the file format.

Monitor Page TREND

Access this page with buttons **REPORT**, **TREND** on the main monitor page. It shows the process of various measuring values according to the length.
Please note that for this function data recording must have been started before by using buttons **REPORT** and **START** (button REPORT indicates ON), see page 39.

Example:
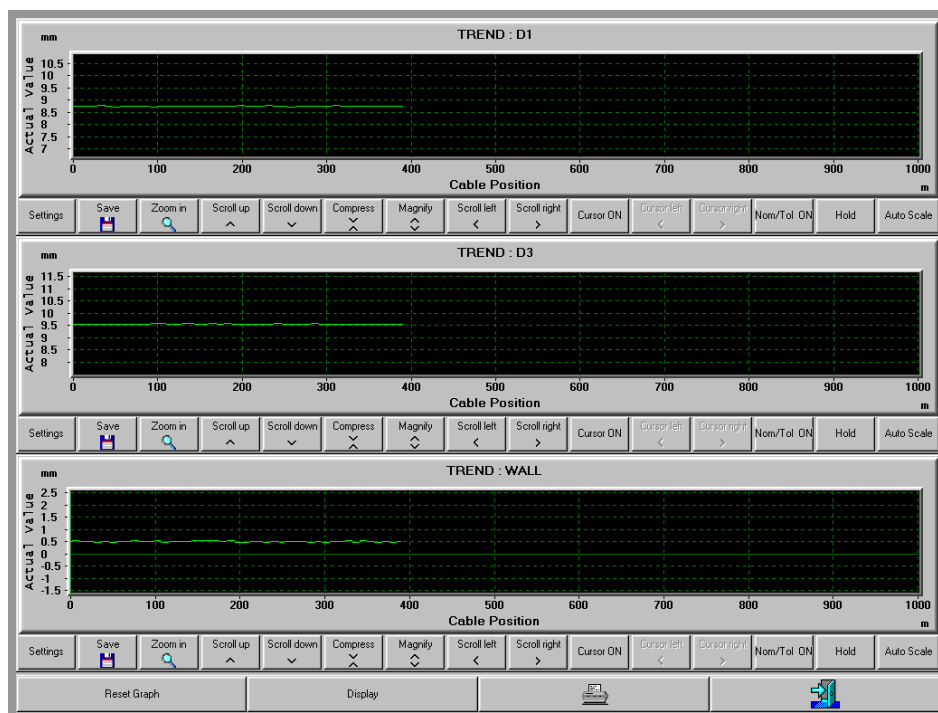
Example: Selecting a parameter for the Trend Diagram
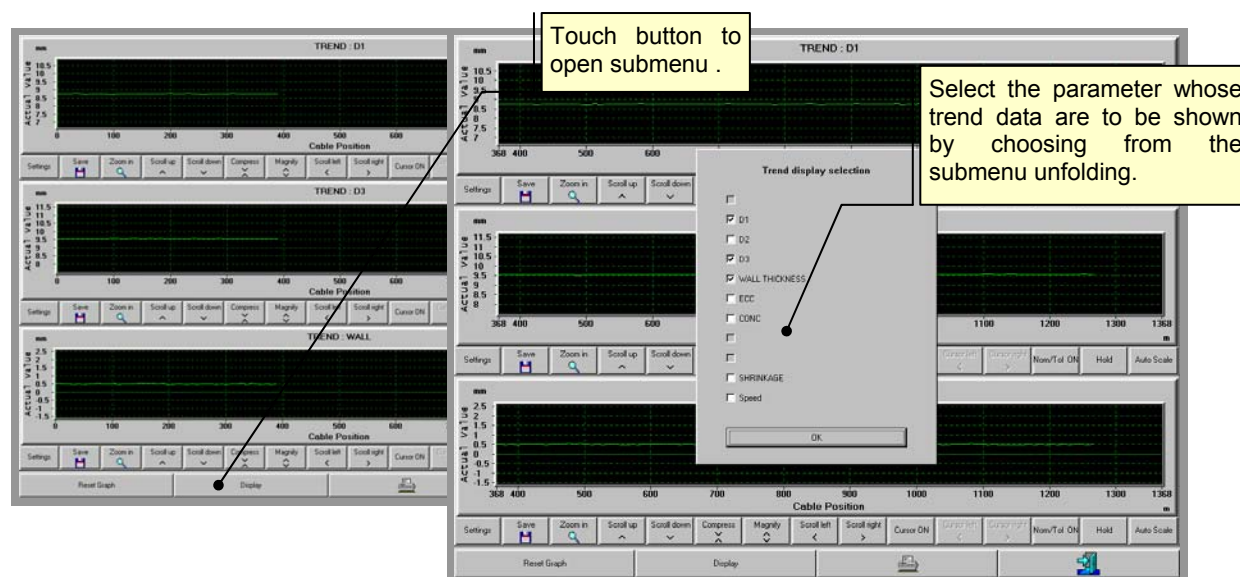
Example: Trend Display Buttons

Use the buttons below each trend display for modifiying the axis resolution, for scrolling and to mark the upper and lower tolerance limit. Also, you may save the data displayed on diskette.

In the example shown here, the trend display has been set to show the two parameter **Diameter 3** and **Wall Thickness**. For each parameter, the upper and lower tolerance limit are displayed as well.
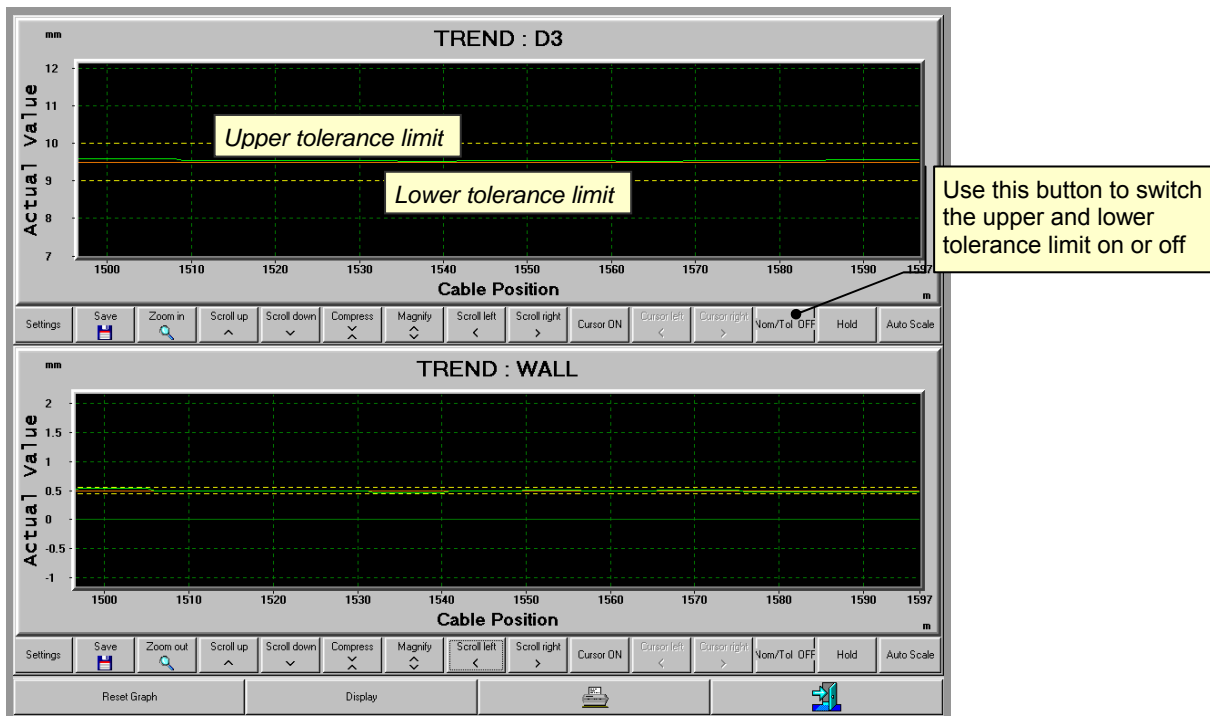
Example: Scaling the Trend Display
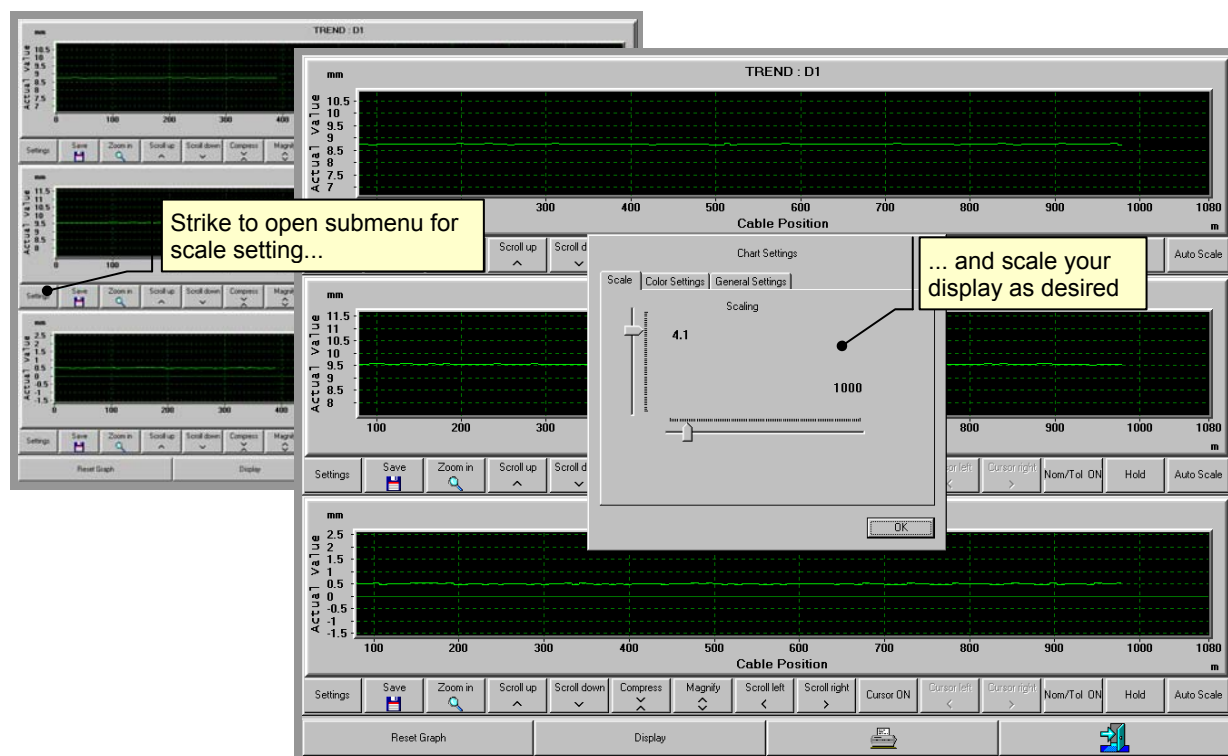
Monitor Page STATISTICS

After a production has been closed or also during production (ONLINE STATISTICS) use this function for statistical evaluation and display of the production data recorded. The parameter to be shown here can be selected by the operator.
A bar diagram shows the deviation classified in up to 12 percentual parts, e.g. 97% of all values differed between -0.45 and 0.45 mm from the nominal value, or 3% of all values exceeded the tolerance.
Please note that for this function data recording must have been started with buttons **REPORT / START** (refer to description of button **REPORT** on page 39).

Example:
Below the diagram, the evaluated data of the last production are listed, e.g. mean value, smallest value, the indices CP, CPK, etc.
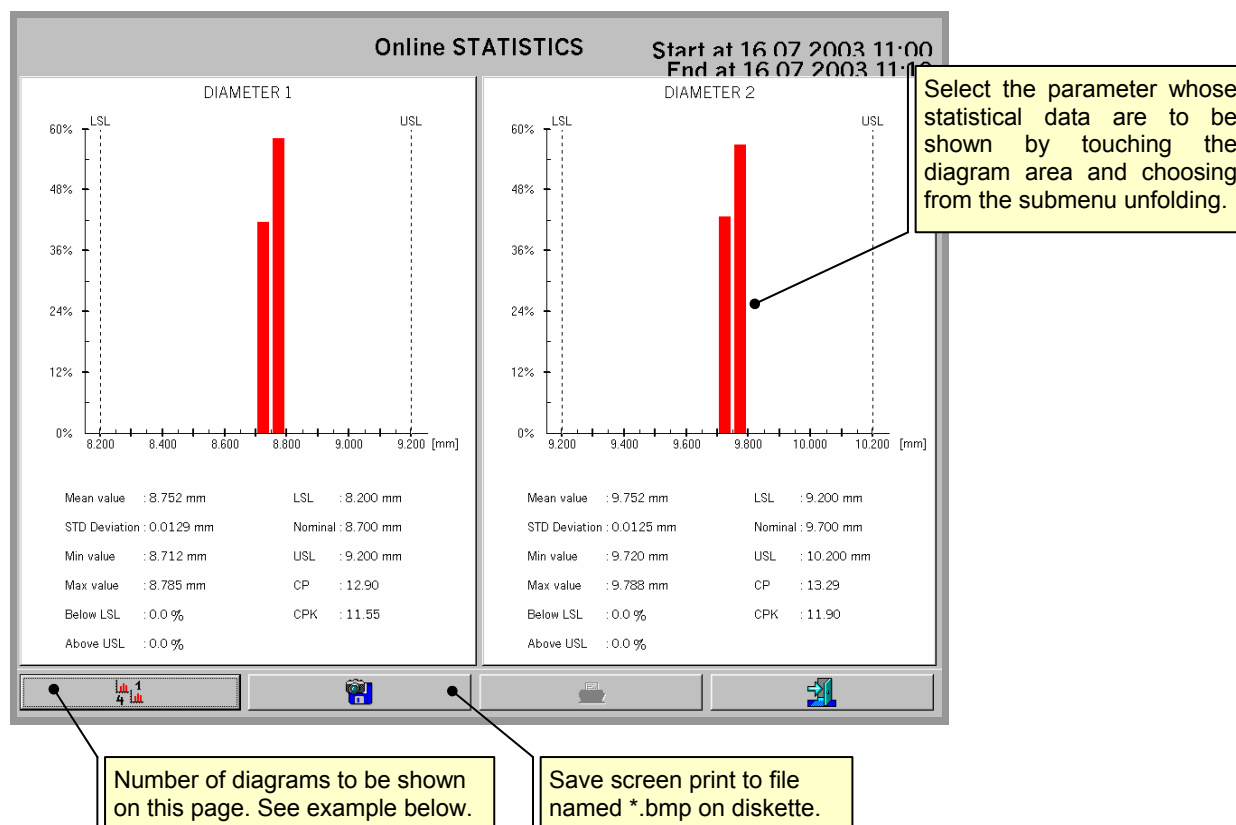
Abbreviations:
LSL   lower specification limit
USL   upper specification limit
CP   process capability
CPK   critical process capability

Example: Setting the number of diagrams to be shown

Strike button ....

... and prompt the request appearing.

In this example, 2 Graph has been chosen and the statistical representation now looks like this.
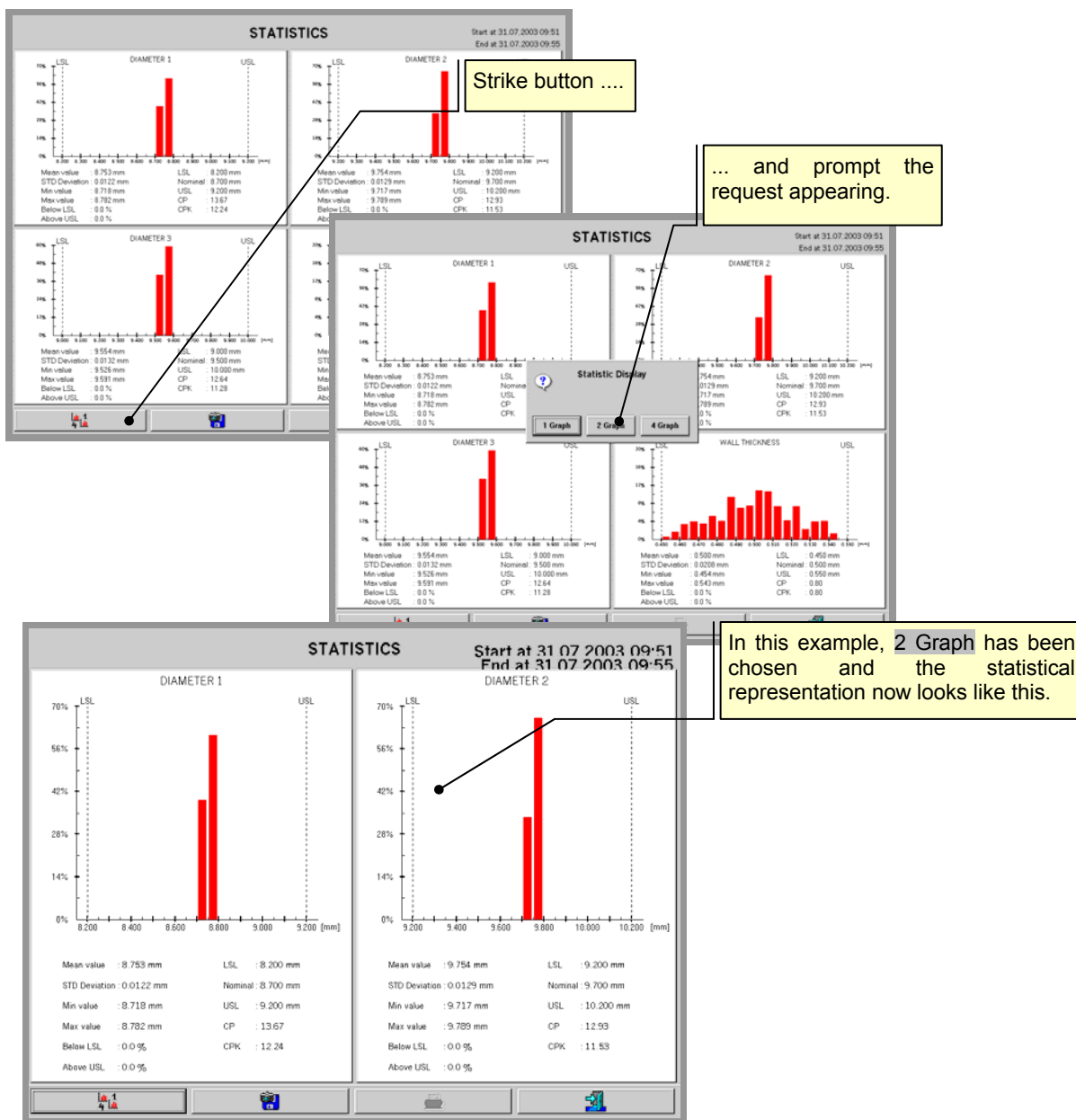
Additional Application Settings

Access with button **MORE** on the standard monitor page.

Use the additional buttons to set the control mode, select the cable type and to access the recipe table (see page 38ff.). The actual settings are displayed in the according text boxes.

Please note that the monitor pages shown here are merely examples used for explanation. They may vary according to your line configuration and the setting chosen.

Touch to switch to additional buttons for access...

Switch back

Show application log files, such as error log file or pre-printout (Option Printer)

Terminate ECOCON-TROL application and close down PC

Set additional parameter for trend/statistics data recording (see description on p. 39 ff.)

Call Configuration Program (see page 5 ff.)

Example: Checking the Log File

Touch to open **Fail Report**...

The file named Fail.log contains application messages like the ones shown in this example.
You can store this file on diskette, print it out or discard it, see icons on bottom of page.

Touch to exit from this page.

Monitor Page RECIPE TABLE

Access this page with button **RECIPE TABLE** on the bottom of monitor page **Application Settings**.

The recipe table is a list containing data sets of the nominal and tolerance values as well as other specific cable parameters for various cable products. Each data set is identified by its RECIPE CODE. You may define new recipe codes by entering their specific data, search for existing recipe codes or delete them. A LIST function shows a table of all existing recipe codes.

The recipe code being used in production is indicated on the standard monitor page on button **RECIPE**.

Example:

See explanation below

RECIPE CODE	type 12			
	NOMINAL	**CHANGE FACTOR**	**+ TOLERANCE**	**- TOLERANCE**
DIAMETER 1	4.000 mm			
DIAMETER 2	9.700 mm	0 %	0.100 mm	0.100 mm
DIAMETER 3	9.600 mm	0 %	0.100 mm	0.100 mm

Lump tolerance	0.50 mm		ECCENTRICITY	0.010 mm
Neckdown tol.	0.50 mm		CONCENTRICITY	95.0 %
Length tolerance	0.0 mm		Spark Tester	12.0 kV

Call additional table containing FFT/RL settings (Option FFT/RL Analysis

FFT/RL	≪	≫	NEW	FIND	DELETE	PRINT	LIST	EXIT

Scroll through existing recipes

Search for recipe code. Enter code via keyboard appearing.

Define new recipe code

Delete recipe shown

Print list of existing recipe codes

Show list of existing recipe codes

Explanation concerning parameter **CHANGE FACTOR**:
This factor defines to which amount the diameter nominal settings given here can be varied manually when this recipe is used for the production running.
For instance, in the example given above, a **CHANGE FACTOR** set to 10 % for parameter **DIAMETER 2** allows the nominal settings for **DIAMETER 2** to be modified manually during production in a range of 8.730 mm to 10.670 mm. A value of 0 % means that no changes are allowed.

Monitor Page RECIPE TABLE / Button NEW

A keyboard is presented for entering the new recipe code.

Example: A new recipe with code **type 101** is to be created

type 101
` 1 2 3 4 5 6 7 8 9 0 - = <-Bspc
Tab-> q w e r t y u i o p [ ] \
Caps a s d f g h j k l ; ' Enter
Shift z x c v b n m , . / Shift
Ctrl Alt Alt Ctrl Del
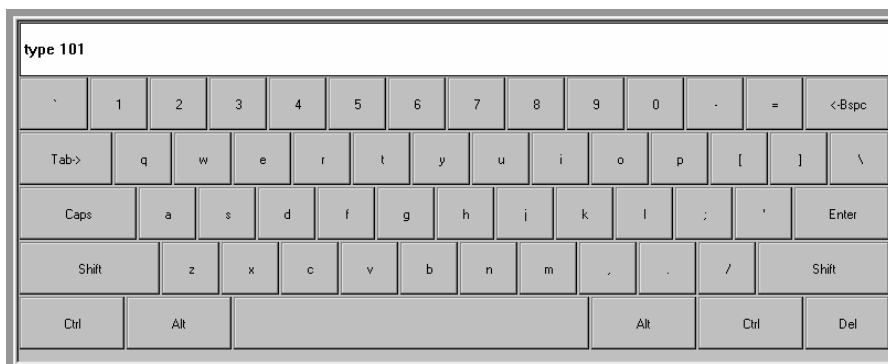
Enter the new recipe code and confirm with ENTER. The keyboard disappears. Then, define the new set of data for this code: select the respective parameter by touching one of the text boxes shown white and enter its value via the keyboard appearing. Characters shown in red mark mandatory values.

Example: Parameter Setting for the new recipe code named **type 101**

RECIPE CODE	type 101			
	NOMINAL	CHANGE FACTOR	+ TOLERANCE	- TOLERANCE
DIAMETER 1	0.000 mm			
DIAMETER 2	0.000 mm	0 %	0.000 mm	0.000 mm
DIAMETER 3	0.000 mm	0 %	0.000 mm	0.000 mm

Lump tolerance	0.00 mm
Neckdown tol.	0.00 mm
Length tolerance	0.0 mm

ECCENTRICITY	0.000 mm
CONCENTRICITY	0.0 %
Spark Tester	0.0 kV

ECCENTRICITY

=

1	2	3	OFF
4	5	6	CE
7	8	9	<--
.	0	-	OK

FFT/RL   ⟰   ⟱   NEW   FIND   DELETE   PRINT

Touch text box, in this example the one representing the setting for **ECCENTRICITY**. A numerical keypad appears for input.

Enter the nominal value of **ECCENTRICITY** for the data set of new recipe code **type 101** via the numerical keyboard. Confirm with **OK**.

Example: Parameter Setting for new recipe code, button **FFT/RL**

RECIPE CODE	type 101			
	NOMINAL	CHANGE FACTOR	+ TOLERANCE	- TOLERANCE
DIAMETER 1	0.000 mm			
DIAMETER 2	0.000 mm	0 %	0.000 mm	0.000 mm
DIAMETER 3	0.000 mm	0 %	0.000 mm	0.000 mm

Lump tolerance	0.00 mm	ECCENTRICITY	0.000 mm
Neckdown tol.	0.00 mm	CONCENTRICITY	0.0 %
Length tolerance	0.0 mm	Spark Tester	0.0 kV

FFT/RL

> Touch button FFT/RL to open the setting page for the FFT/RL parameter...

RECIPE CODE	type

FFT Frequency Range [Hz]	0...2.6	FFT Length	512
Operating Freq.Range [MHz]	0 ... 0.0	Rel.Propagation Velocity [%]	0
Nominal Line Speed [m/min]	0.0	Cable Length [m]	0.00
Conductor Attenuation [dB/100m]	0.0	at Frequency [MHz]	0.0
Dielectric Attenuation [dB/100m]	0.0	at Frequency [MHz]	0.0
Cable Construction	Coax Solid Outer Conductor	FFT Average	0
Nom.DM Insul.Core [mm]	0.000	Nom.DM Conductor [mm]	0.000
Expected Sampling Time	4.1 min		

> ... and enter the values.

> Additionally, critical lines for the RL diagram can be set. Touch this button ...

Critical RL Levels   EXIT

RECIPE CODE	type												
F [MHz]	0-200	200-400	400-600	600-800	800-1000	1000-1200	1200-1400	1400-1600	1600-1800	1800-2000	2000-2200	2200-2400	2400-2600
R[%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SRL[dB]	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞
|SRL|[dB]	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞
VSWR	1	1	1	1	1	1	1	1	1	1	1	1	1

F [MHz]	2600-2800	2800-3000	3000-3200	3200-3400	3400-3600	3600-3800	3800-4000	4000-4200	4200-4400	4400-4600	4600-4800	4800-5000	5000-5200
R[%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SRL[dB]	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞	− ∞
|SRL|[dB]	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞	+ ∞
VSWR	1	1	1	1	1	1	1	1	1	1	1	1	1

EXIT

> ...and open the page used for entering the values.

Monitor Page RECIPE TABLE / Button LIST

This function displays a list of the existing recipe codes and their parameters. The blue bar marks the recipe code which has been chosen for the production running.

Example:

Monitor Page FFT/SRL Parameter - Option -

Use this page to set the parameters used for executing the analysis functions FFT (FFT : Fast Fourier Transformation) and SRL (SRL : Structural Return Loss) . Access to this page is limited to user level **System Configurator**.

How to get there:

If your system includes the Option FFT / SRL Analysis Functions*, the according button for accessing them will appear in the submenus described earlier in this manual, see page 19ff.*
Striking this button will open Monitor Page FFT Spectrum (see below). There, use button FFT/RL Parameter *to open Monitor Page* **FFT/SRL Parameter***.*

| DEVICE INFORMATION |
| NOMINAL |
| TOLERANCE |
| DEVIATION |
| STD Deviation |
| OVALITY |
| X Y |
| POSITION |
| FFT / RL PREDICTION |

> **General Remarks**
> **Concerning the Application of Analysis Functions FFT / SRL:**
> *Use these functions to directly obtain information for optimizing your production process.*
>
> *During the production of high quality cable production, continuous controlling of cable parameter in regard to periodic irregularities is mandatory. By analysing for instance the diameter measuring values from a LASER 2000 XY measuring head with the Fast-Fourier-Transformation (FFT), periodically occuring irregularities during cable extrusion can be detected early. Periodic variations of the cable diameter value may be caused for instance by such irregularities as the so-called extruder pumping, imbalances of rotating parts, cyclic fluctuations of line speed or degree of foaming and/or periodic preheat non-uniformites.*
>
> *While periodic fluctuations are, in general, hard to observe from the course of measured diameter vs. time, an analysis of these data in the frequency domain allows for early detection of periodically reoccuring fluctuations. These influences will show in the spectrum as peaks, whose height indicates the periodic diameter fluctuations amplitude in µm/m resp. mm/m. Moreover, the computed FFT spectrum provides helpful information for identifying the causes of cyclic irregularities during cable production, especially when changing any of the production parameter like for example line speed.*
>
> *FFT spectrum analysis and structural return loss (SRL) predictions are helpful tools for detecting periodic cable diameter fluctuations and estimating their effects on the transmission quality of the finished cable.*

Use this monitor page to set all parameter needed before executing the analysis functions. Parameter settings are done by touching the respective buttons, most of which are self-explanatory. As the button is touched, values are stepped up or down, if preset, or a numerical keypad is offered for entering the desired value. Acknowledge the entered value with **OK**. See the example below for explanation.

After all values have been set, transmit them using button **Send Data** to the measuring device.

Example: FFT Parameter Set-Up for CAPACITANCE

Frequency range for FFT spectrum calculation resp. SRL prediction.
FFT and SRL range (see parameter Operating Frequ. Range*) setting is coupled, i.e. when setting a range the other one will be adapted automatically. Thus set only one range at a time . The number of ranges offerd for selection may vary according to setting of parameter* Line Speed *and* Rel. Propagation Velocity *.*
The frequency range is limited -caused by the physical dimensions- by the electrode low pass characteristics , i.e. selectable frequency ranges are below the Cut-Off Frequency.

Number of capacitance measuring values to be used for FFT execution. Higher values : higher frequency resolution of FFT Spectrum resp. SRL Diagram, however also increasing time period needed for data collection.

Info Text Box, shows name of recipe currently being used in production if a code has been selected, else MANUAL.

SRL Prediction Range

Info Text: type of measuring device, ID number and version no. of measuring software

Shows time needed for data collection, depending on parameter settings

Send values displayed to measuring device specified above or to all measuring devices connected

Capacitance: Type 2010

Version: V4-03   ID: 5568-17

Cable :

MANUAL

FFT Range
0..2.6 Hz

FFT Length
512

Operating Freq. Range
0.. 0.0 MHz

Line speed
50.0 m/min

Cable length
100.0 m

Rel. propagation vel.
80 %

Expected sampling time
1.6 min

Cable Construction
Coax:
Solid Cond.

FFT / SRL Average

Cable length for which SRL is to be predicted

Send Data to
Capa

Cond. Attenuation
1.50 dB/100m

at Frequency
600 MHz

Send Data to
All Devices

Dielectric Attenuation
1.50 dB/100m

at Frequency
600 MHz

Exit

Save Data
and Exit

Cable Type
(TP:Twisted Pair)

Signal propagation velocity at the produced cable type, relative to the speed of light. Typically 66% for solid PE insulation, higher values for foam-insulated cables.

Conductor Attenuation [dB/100m]
That component of the forward attenuation of the cable produced, which is due to losses in the conductor. Its value rises with the square root of frequency.
Dielectric Attenuation [dB/100m]
That component of the forward attenuation of the cable produced, which is due to dielectric losses. Its value rises proportionally with frequency.
Both parameter should be set for cable operating frequencies lying inside the SRL frequency range selected, preferably in the center of that range.

Monitor Page FFT Spectrum - Option -

Before executing this analysis function, the parameter needed must have been set accordingly on Monitor Page **FFT/SRL Parameter** . Please also note the explanations concerning the FFT analysis given on page 51 ff.

Example: Structure of Monitor Page, General

Button to control spectrum display update. Function changes according to operation (Start / Hold / Continue)*, meaning spectrum display update is started, frozen, or continued to show latest result.*

Set to Interim *(continuous averaging) or* Average *(averaging over n spectra).*

Reset function.

Store spectrum data. Follow instructions given in text box.

Change display area : Full Screen/Split Screen

Print spectrum diagrams.

Call Monitor Page **FFT/SRL Parameter**

Call Monitor Page **SRL Diagram**

Screen Print.

Return to calling monitor page

Marker data

Detail view of spectrum

General view of spectrum

Select X-axis parameter: Frequency or Fault Length

Use these 3 buttons for zooming in/out resp. zooming automatically to standard scaling

Select data representation: linear (Y-axis scaling in length unit) or logarithmic (Y-axis scaling in dB) -see separate description below-

Set harmonic markers

Set postion markers

Note concerning button **Display Mode** :
Use this button to specify the Y-axis unit, i.e. the spectrum representation of the measured quantity. This may be shown as

- FFT Spectrum (Linear)
  meaning the linear spectral amplitude of the measured quantity (diameter, capacitance etc.) is displayed, Y-axis scaling is linear in such units as µm or fF/m.
- FFT Spectrum (Log) in dB
  meaning the FFT spectrum is displayed in logarithmic units, Y-axis scaling is logarithmic.

The according calculation formulas are as follows:

Display Title	FFT Diagram shows...	Calculation Formula
FFT (linear)	FFT Spectrum (linear)	Δs
FFT (log)	FFT Spectrum (Log) in dB	$20 \log \dfrac{\Delta s}{\bar{s}}$

s : measured quantity (diameter, capacitance etc.)
Δs : linear spectral amplitude (output of FFT algorithm)
$\bar{s}$: mean value of measured quantity

Example: Spectrum Diagram, General View/Detail View

Display of FFT spectrum over frequency range as defined by parameter FFT Range, general view

Detail view of spectrum as selected in window of general view (click and drag the mouse to open resp. modify desired area)

Identification of area selected for detail view, to change area (position, size) modify rectangle with the mouse
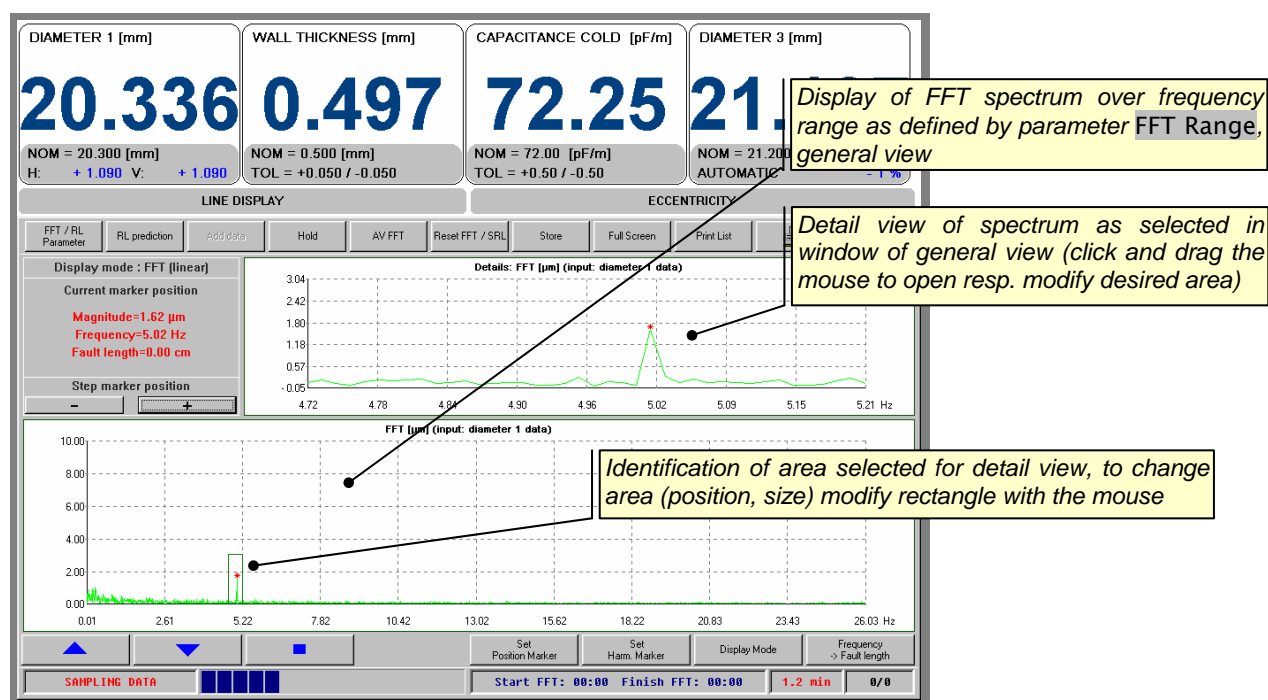
Example: Using the Marker, Diagram Area Scaling

By setting a so-called marker you can read out the exact values of diameter amplitude and fault length at a certain selectable frequency. You may also use the marker as an identifier within the frequency range, e.g. as a reference point when observing certain frequencies.

Position the marker on the frequency curve shown in either the detail view or the general view using the mouse or the respective positioning keys.

Keys for stepwise positioning of marker within the frequency range

Display of values at actual position of marker

Red asterisk shows actual position of marker. Click on asterisk and drag to move marker within the frequency spectrum, either in detail view or in general view of spectrum

DIAMETER 1 [mm]

20.336 **0.497** **72.25** **21**

NOM = 20.300 [mm]
H: + 1.090 V: + 1.090

NOM = 0.500 [mm]
TOL = +0.050 / -0.050

ITANCE COLD [pF/m]

NOM = 72.00 [pF/m]
TOL = +0.50 / -0.50

DIAMETER 3 [mm]

NOM =
AUTOM

LINE DISPLAY

ECCENTRICITY

| FFT / RL Parameter | RL prediction | Add data | Hold | AV FFT | Reset FFT / SRL | Store | Full Screen | Print list | | Exit |

Display mode : FFT (linear)

Current marker position

Magnitude=1.62 µm
Frequency=5.02 Hz
Fault length=0.00 cm

Step marker position

−   +

Details: FFT [µm] (input: diameter 1 data)

3.04
2.42
1.80
1.18
0.57
- 0.05

4.72   4.78   4.84   4.90   4.96   5.02   5.09   5.15   5.21 Hz

─ D1

FFT [µm] (input: diameter 1 data)

10.00
8.00
6.00
4.00
2.00
0.00

0.01   2.61   5.22   7.82   10.42   13.02   18.22   20.83   23.43   26.03 Hz

─ D1

▲   ▼   ■

| Set Position Marker | Set Harm. Marker | Display Mode | Frequency -> Fault length |

SAMPLING DATA

Start FFT: 00:00   Finish FFT: 00

Frequency [Hz] or Fault Length axis, as selected
Touch to modify scaling

Amplitude axis, unit is as selected with button Display Mode, here: [µm]
Touch to modify scaling

Note concerning Fault Length Axis: Values shown on this axis (= fault length on the cable) are calculated from the frequency axis values using the value of line speed as set on Monitor Page **FFT/SRL Parameter** under Line Speed . In the configuration menu, specify if Line Speed Information is to be used for FFT/SRL calculation.

Monitor Page SRL Diagram - Option -

The most common method used for checking the quality of data and RF cables is the measurement of structural return loss of a length of cable as a function of frequency within the range of operating frequencies the cable is specified for. Structural return loss (SRL) is the ratio - expressed in dB - between the fraction of input signal strength reflected by structural fluctuations along the entire cable length and the input signal strength.

In order to optimize cable quality and minimize the number of rejects, it is highly desirable to detect problems due to periodic irregularities as soon as possible in the manufacturing process. The online SRL prediction from short-time cable capacitance values supplies according information.

For the execution of this analysis function the respective parameter settings must have been done on Monitor Page **FFT/SRL Parameter** (page 51) . Please note the explanations given there concerning the FFT analysis as well.

Settings for the spectrum detail view are identical to those on Monitor Page **FFT Spectrum**. To avoid repeating please refer to page 53 .

Example: Structure of Monitor Page
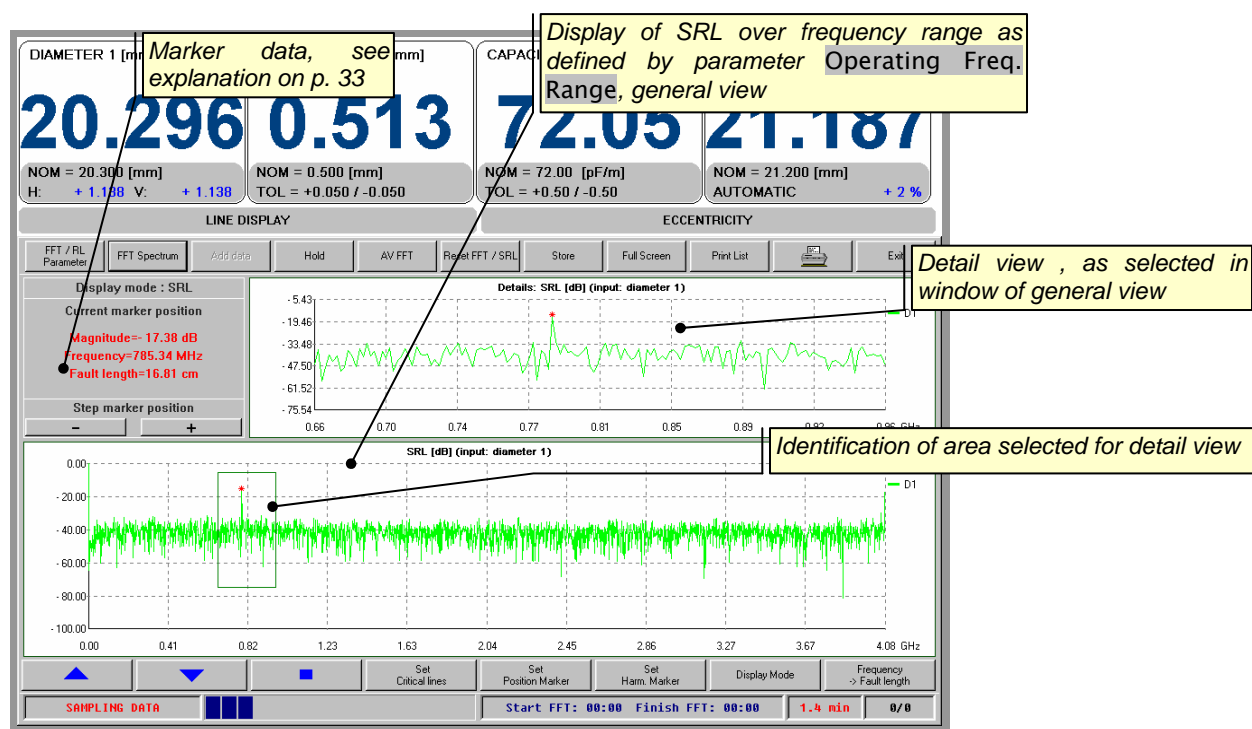
Note concerning button **Display Mode** :
Use this button to specify the Y-axis unit, i.e. representation of the reflection coefficient *R*. There are different forms in use to represent this basic ratio. The different quantities and how to calculate them from *R* are given in the table below.

You can select one of these representations

- Reflection Coefficient R [%]
  Y-axis scaling is linear, range is 0...100 %.
- SRL in dB
  Y-axis scaling is logarithmic.
- |SRL| in dB
  Y-axis scaling is logarithmic.
- VSWR (Voltage Standing Wave Ratio)

The according calculation formulas are as follows:

Display Title	SRL Diagram shows...	Calculation Formula	Typical Range
Reflection Coefficient	Reflection Coefficient R	$R = 100[\%] \cdot R$	0 ... 100 %
SRL	SRL in dB	$SRL = 20 \cdot \log R$	-100 ... 0 dB
|SRL|	SRL, absolute value, in dB	$\|SRL\| = \|20 \cdot \log R\|$	0 ... 100 dB
VSWR	Voltage Standing Wave Ratio	$VSWR = \dfrac{1 + R}{1 - R}$	$1 ... \infty$

2.6　　　　　　Maintenance and Trouble Shooting

2.6.1　　　　　Maintenance

Ecocontrol Monitor:
Clean the outer glass screen of the monitor with a soft cloth and use a mild detergent as often as necessary. However, always switch OFF the device first to prevent faulty operation.

Measuring Head(s) LASER 2000 XY / LUMP 2000 XY:
The measuring head does not need any maintenance. What we recommend is that you take care the openings for the light are kept clean and free of any kind of dirt. To make sure, check the openings regularly, for instance after each production.
Refer to the respective manual supplied and proceed as described.

2.6.2　　　　　Trouble Shooting

If the self diagnostic system detects a malfunction, the display will indicate an information about the type of fault, the diameter display shows HELP and additionally the dry contact ALARM switches over (closes).

The following alarm messages may appear:

GLASS DIRTY	The device cannot clearly recognize a measuring object, because f.e. dirt or similar is interrupting the light beam and the device makes out several objects. **NOTE:** Please contact our service if the cleaning of the glasses is not successful, i.e the message will not disappear.
CABLE TOO LOW	The wire leaves the measuring range towards the bottom. Check the height adjustment.
CABLE TOO HIGH	The wire leaves the measuring range towards the top. Check the height adjustment.
UNDEREXPOSED	The light is not sufficient for measurement, clean the lenses.
COMMUNICATION ERROR	A fault on the interface card to the measuring head or no measuring values, interface to measuring head interrupted, i.e. interface connection cable defect or pulled off.
Time Out	Device cannot be accessed. Check device interface, or check Program Version of LASER or ECOCONTROL application software, check error log file
Initialization	Communication to device is being started.

These messages are shown at the diameter display, the corresponding measuring head or device has to be checked. The wall thickness display always shows HELP when a fault is indicated.

Errors concerning the Profibus System Connection (Option) are indicated on the monitor page by a red flashing text box Profibus ERROR appearing at the bottom of the page (just over button SHUTDOWN). Check the connection cable or your bus system.

There is a three-coloured diode in the cover of most measuring heads (light source side, accessible without opening the measuring head!) which can be used for diagnosis:

Example: LASER 2010 XY Measuring Head LED signals

green light :	measuring value is valid
red light :	camera fault
yellow light :	when the device is switched on
yellow light, flashing :	no measuring value, standby or cable disconnected
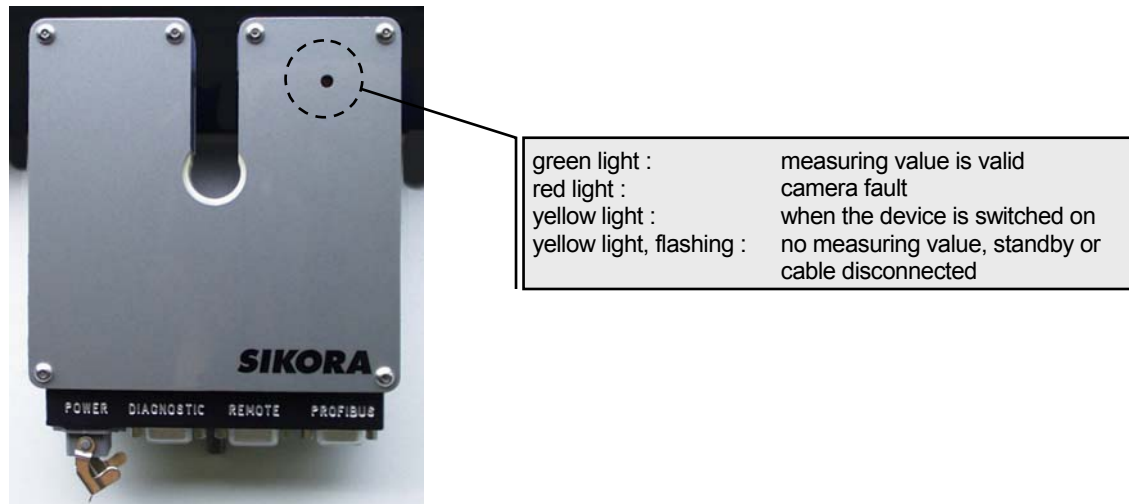
The monitor display shows HELP, when the validity check of the camera supervision detects a fault, text information is displayed in the corresponding diameter window, the contact ALARM switches.

Example: Message during Start-Up
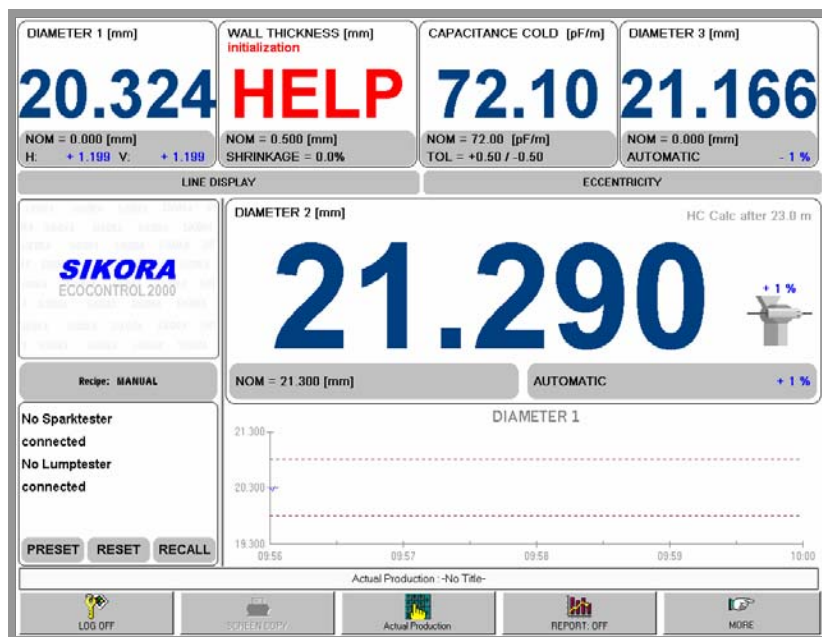
Example: Error Messages
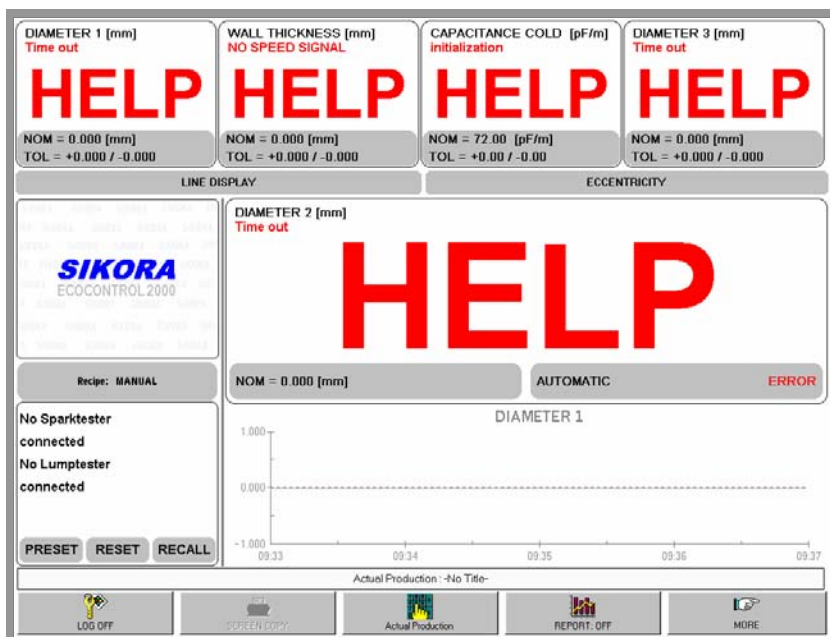
3.   Technical Information

3.1   Specification

	ECOCONTROL 2000
Dimensions Display Unit	400 x 520 x 254 mm (*16 x 20 7/8 x 10 2/8"*)
Dimensions Mounting Frame	355 x 483 mm (*14 3/16 x 19 5/16"*) for 19" rack assembly
Voltage Supply	230 / 115 V AC ± 15%, 50...60 Hz (selectable)
Power Consumption	200 VA
Temperature Range	+5...+50 °C (+40...+125 °F)
Air Humidity	max. 90 % (without condensation)
Weight	approximately 13.5 kg
Interfaces	2 Serial Interfaces RS485 (optionally up to 4 additional interfaces) Serial Interface RS232 Parallel Interface (Printer Connection) - Option - Digital Input Analog Output DEVIATION (max. load 5 mA) Relay Contacts ALARM, ±TOL (max. load 24 V DC, 0.5A) 2 Extruder/Line Control Interfaces (1 standard, 2 optionally) Profibus DP Connection - Option - External VGA Connector*) External Keyboard Connector*)

*) for service only

SIKORA	St 1	Serial Interface RS 485	Data Telegrams
	St 2	(Option)	
	St 3	(Option)	
	St 4	(Option)	
	St 13	(Option)	
	St 14	(Option)	
ECOCONTROL 2000	St 5	Digital Input	Int.+Ext. Computer Control / Ext. C.Control Start/Stop TREND Diagram Pulses from Rotary Pulse Generator
	St 6	Analog Output	Deviation
	St 6	Automatic Control	Nominal Values
	St 12	Automatic Control (Option)	Nominal Values
	St 7	Dry Contacts	Tolerance Information Alarm Information
	St 8	Serial Interface RS 232	Data Telegrams ($\rightarrow$ Chapter 3.2) → External Computer
	St 9		→ External VGA [*]
	St 10		→ External Keyboard [*]
	St 11	Parallel Interface (Option)	→ Printer EPSON LQ 580

Measuring Head(s) (CENTERVIEW/LASER/ LUMP) or Meas. Device(s) like CAPACITANCE or SPARK Profibus-System (Option)

[*] for service only

3.2   Serial Interface for Communication with External Computer/PC

Use the bidirectional serial interface RS232 (Plug / St. 8) to connect the ECOCONTROL 2000 to a computer / SPC. The computer can then set nominal values, tolerances, shrinkage, control mode etc, and read the actual values. For a description of the telegrams refer to Fig. 52 *Serial Interface*.

Transmission Mode	START-STOP asynchronous without Hardware-Handshake				
Transmission Range	RS232 : max. 15 m				
Connection Cable	DUE 4503 Li2Y(St)+CY or LIFYCY				
Access	MASTER-SLAVE (ECOCONTROL acting as SLAVE)				
Data Security	Parity Bit, Checksum Sign				
Format	ASCII Code	1	2 .... n	x	z
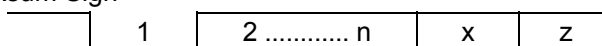
1 = Start Bit
2 = 1st Data Bit LSB
n = last Data Bit MSB
x = Parity Bit
z = Stop Bit

Number of Data Bit	7
Parity Bit	ODD
Stop Bit	1
Transmission Speed	2400 Baud (bit/s)

Description of Telegrams see Fig. 52 *Serial Interface*.

3.3   **Profibus DP** - Option -

The device interface supplies the voltage needed for the profibus load resistance. The load resistance itself is not integrated. In order to keep a reliable system we recommend installing a terminating element, like for instance the Siemens "Abschlußelement für Profibus" Order No. 6ES7972-0DA00-AA0. If an *actor* or *sensor* is used as terminating element for the bus system, removing this element will not remain without consequences.

Transmission Mode	L2-Bus (RS485) according to EN 50170
Transmission Speed	up to 12 Mbaud with autodetection
Access	MASTER-SLAVE
Data Format	refer to PROFIBUS DIN 19245 Part 3

The measuring device acts as SLAVE. Its address is set to 5, this value can be changed using the program named COMPRO which is supplied together with the ECOCONTROL software. You can find COMPRO on your desktop or you may start the program with **Hilscher_Profibus/compro.exe /a:D0000**. However, before starting COMPRO, first terminate the application software with keys ALT, F4.
For Ecocontrol devices with the operating system Windows 2000 the Com2 interface of the Ecocontrol will be connected with the Profibus diagnostic interface. For this connection the delivered Profibus diagnostic contact has to be used.

Setting the Profibus Address with Program COMPRO

- Terminate the application software with keys **ALT F4**.

- Start COMPRO, either from your desktop or by using the **Start** button and entering **Hilscher_Profibus/compro.exe /a:D0000**.

- Acknowledge the opening COMPRO Text Box ECO with key **ENTER**.

- From the COMPRO menu bar, choose as follows:
  → **DATENBANK**
  　　→ **Editieren**
  　　　　→ **Setup**
  　　　　　In the text box appearing, enter the new bus address and strike key **F10**.
  　　　　　Strike key **ENTER**.
  　　　　Strike **Esc**.
  　　→ **Speichern**
  　　　　→ **In ECO**
  　　　　Strike **Esc**.
  　　Strike **Esc**.
  Strike **Esc**.

- From the COMPRO menu bar, choose as follows:
  → **ONLINE**
  　　→ **Datenbank**
  　　　　→ **Download**
  　　　　　Strike key **ENTER**.
  　　　　Strike **Esc**.
  　　Strike **Esc**.
  Strike **Esc**.

- From the COMPRO menu bar, choose **ENDE** to terminate COMPRO.

- Restart the device so the new bus address becomes valid.

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LSAP's and DSAP's can be used from 0 ... 62.

A projecting file named HIL_7504.GSD is supplied together with your software.
Orientation of data with length > 1 byte is : MSB ... LSB.

Measuring Value Representation:
For the parameter listed below, data resolution and/or measuring unit are according to device configuration (see chapter 1.3 Configuration)! For all others, resolution and unit are listed in the table of telegrams below.

Parameter	Data Range	Resolution	Unit according to configuration		
Nominal, Actual and Tolerance Values of Diameter, Eccentricity, Wall Thickness	0...65535	according to configuration　xx.xxx　xxx.xx	[mm]	or	[inch]
Nominal, Actual and Tolerance Values of Capacitance	0...65535	fixed　xxx.xx	[pF/m]	or	[pF/ft]
Tolerance Values Lump/Neck	0...65535	fixed　xxx.xx	[mm]	or	[inch]

MASTER

Telegrams:
-Request to Send Nominal Values
-Request to Send Actual Values
-Setting of Nominal Values

→

SLAVE

ECOCONTROL

Telegrams:
-Reaction on Request to Send Nominal Values
-Reaction on Request to Send Actual Values

←
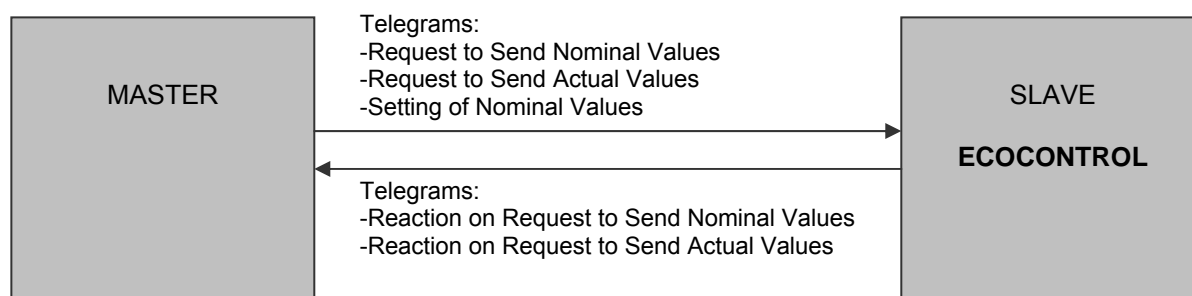
Data to ECOCONTROL 2000 (Output to SLAVE)

Master to ECOCONTROL General Structure	DB0 Device Type Identifier	DB1.7..1.6 Void	DB1.5 Telegram Type Identifier	DB1.4 Data Type Identifier	DB1.3..1.0 Device Value Identifier	DB2 Data	DB3 ...	DB4 ...	DB5	...	...	DB11 Data
Explanation	00 Diameter 01 Capacitance 02 Eccentricity 03 Lump/Neck 04 Spark 05 Wall Thickness 06 Controller 07 General Settings 1		0 request 1 setting	0 Nominal Values DB2...DB11 contain nominal values 1 Actual Values ignore contents of DB2...DB11	0 Value 1 from device, numbers the value supplied by device specified in DB0 (see Fig. 1 Page 3) ... 15 Value 16	Nominal and Tolerance Values, Control Commands etc.						
Request to Send Nominal Values	00 ... 07	0	0	0 ... 15	-	-	-	-	-	-	-	-
Request to Send Actual Values	00 ... 07	0	1	0 ... 15	-	-	-	-	-	-	-	-
Setting of Nominal Values	00 ... 07	1	0	0 ... 15	Nominal Value	...	...				...	Nominal Value

Examples

Request to Send Nominal Values Diameter 0	00 Diam. Meas. Device 00	0 	0 00	0 Value 1 from Dev. 	- 00	- 00	- 00	- 00	- 00	- 00	- 00	- 00	- 00
Request to Send Actual Values Diameter 0	00 Diam. Meas. Device 00	0	1 10	0 Value 1 from Dev. 	- 00	- 00	- 00	- 00	- 00	- 00	- 00	- 00
Setting of Nominal Values Diameter 0	00 Diam. Meas. Device 00	1	0 20	0 Value 1 from Dev. 	Nominal Value e.g. 04.369 11	Diameter 0 [mm] 11	+ Tolerance Val. e.g. 00.100 00	Diameter 0 [mm] 64	- Tolerance Val. e.g. 00.099 00	Diameter 0 [mm] 63	- 00	- 00	- 00

-continued-

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Request to Send Nominal Values — Diameter 1

00 Diam. Meas. Device	0	0	1 Value 2 from Dev.	-	-	-	-	-	-	-	-	-	-
00			01	00	00	00	00	00	00	00	00	00	00

Request to Send Actual Values — Diameter 1

00 Diam. Meas. Device	0	1	1 Value 2 from Dev.	-	-	-	-	-	-	-	-	-	-
00			11	00	00	00	00	00	00	00	00	00	00

Setting of Nominal Values — Diameter 1

00 Diam. Meas. Device	1	0	1 Value 2 from Dev.	Nominal Value e.g. 04.369 Diameter 1 [mm]		+ Tolerance Val. e.g. 00.100 Diameter 1 [mm]		- Tolerance Val. e.g. 00.099 Diameter 1 [mm]		-	-	-	-
00			21	11	11	00	64	00	63	00	00	00	00

Request to Send Nominal Values — Diameter 2 (hot)

00 Diam. Meas. Device	0	0	2 Value 3 from Dev.	-	-	-	-	-	-	-	-	-	-
00			02	00	00	00	00	00	00	00	00	00	00

Request to Send Actual Values — Diameter 2 (hot)

00 Diam. Meas. Device	0	1	2 Value 3 from Dev.	-	-	-	-	-	-	-	-	-	-
00			12	00	00	00	00	00	00	00	00	00	00

Setting of Nominal Values — Diameter 2 (hot)

00 Diam. Meas. Device	1	0	2 Value 3 from Dev.	Nominal Value e.g. 04.369 Diameter 2 [mm]		+ Tolerance Val. e.g. 00.100 Diameter 2 [mm]		- Tolerance Val. e.g. 00.099 Diameter 2 [mm]		-	-	-	-
00			22	11	11	00	64	00	63	00	00	00	00

Request to Send Nominal Values — Diameter 3 (cold)

00 Diam. Meas. Device	0	0	3 Value 4 from Dev.	-	-	-	-	-	-	-	-	-	-
00			03	00	00	00	00	00	00	00	00	00	00

Request to Send Actual Values — Diameter 3 (cold)

00 Diam. Meas. Device	0	1	3 Value 4 from Dev.	-	-	-	-	-	-	-	-	-	-
00			13	00	00	00	00	00	00	00	00	00	00

Setting of Nominal Values — Diameter 3 (cold)

00 Diam. Meas. Device	1	0	3 Value 4 from Dev.	Nominal Value e.g. 04.369 Diameter 3 [mm]		+ Tolerance Val. e.g. 00.100 Diameter 3 [mm]		- Tolerance Val. e.g. 00.099 Diameter 3 [mm]		-	-	-	-
00			23	11	11	00	64	00	63	00	00	00	00

Request to Send Nominal Values — Capacitance (hot)

01 Cap. Meas. Device	0	0	0 Value 1 from Cap. Meas. Dev.	-	-	-	-	-	-	-	-	-	-
01			00	00	00	00	00	00	00	00	00	00	00

Request to Send Actual Values — Capacitance (hot)

01 Cap. Meas. Device	0	1	0 Value 1 from Dev.	-	-	-	-	-	-	-	-	-	-
01			10	00	00	00	00	00	00	00	00	00	00

Setting of Nominal Values — Capacitance (hot)

01 Cap. Meas. Device	1	0	0 Value 1 from Dev.	Nominal Value e.g. 043.69 Capacitance hot [pF/m]		+ Tolerance Val. e.g. 001.00 Capacitance hot [pF/m]		- Tolerance Val. e.g. 000.99 Capacitance hot [pF/m]		-	-	-	-
01			20	11	11	00	64	00	63	00	00	00	00

-continued-

Request to Send Nominal Values — Capacitance (cold)

01 Cap. Meas. Device	0	0	1 Value 2 from Dev.	-	-	-	-	-	-	-	-	-	-
01		01		00	00	00	00	00	00	00	00	00	00

Request to Send Actual Values — Capacitance (cold)

01 Cap. Meas. Device	0	1	1 Value 2 from Dev.	-	-	-	-	-	-	-	-	-	-
01		11		00	00	00	00	00	00	00	00	00	00

Setting of Nominal Values — Capacitance (cold)

01 Cap. Meas. Device	1	0	1 Value 2 from Dev.	Nominal Value e.g. 043.69	Cap. cold [pF/m]	+ Tolerance Val. e.g. 001.00	Cap. cold [pF/m]	- Tolerance Val. e.g. 000.99	Cap. cold [pF/m]	-	-	-	-
01		21		11	11	00	64	00	63	00	00	00	00

Request to Send Nominal Values — Eccentricity

02 Ecc. Meas. Device	0	0	0 Value 1 from Dev.	-	-	-	-	-	-	-	-	-	-
02		00		00	00	00	00	00	00	00	00	00	00

Request to Send Actual Values — Eccentricity

02 Ecc. Meas. Device	0	1	0 Value 1 from Dev.	-	-	-	-	-	-	-	-	-	-
02		10		00	00	00	00	00	00	00	00	00	00

Setting of Nominal Values — Eccentricity

02 Ecc. Meas. Device	1	0	0 Value 1 from Dev.	Nominal Value e.g. ...	Eccentricity [mm]	Tolerance Val. e.g. 00.100	Eccentricity [mm]	Nominal Value e.g. 04.660	Core Diameter [mm]	Ecc/Conc Mode 0 Eccentricity 1 Concentricity	-	-	-
02		20		00	00	00	64	12	34	00	00	00	00

Request to Send Nominal Values — Lump

03 Lump Detector	0	0	0 Value 1 from Dev.	-	-	-	-	-	-	-	-	-	-
03		00		00	00	00	00	00	00	00	00	00	00

Request to Send Actual Values — Lump

03 Lump Detector	0	1	0 Value 1 from Dev.	-	-	-	-	-	-	-	-	-	-
03		10		00	00	00	00	00	00	00	00	00	00

Setting of Nominal Values — Lump

03 Lump Detector	1	0	0 Value 1 from Dev.	Tolerance Val. e.g. 001.85	Lump [mm]	Tolerance Val. e.g. 001.23	Neck [mm]	Tolerance Val. e.g. 011.5	Length [mm]	Fault Counter 0 no reset 1 reset	-	-	-
03		20		00	B9	00	7B	00	73	00	00	00	00

-continued-

Request to Send Nominal Values Spark

	04 Spark Tester	0	0	0 Value 1 from Dev.	-	-	-	-	-	-	-	-	-	-
	04			00	00	00	00	00	00	00	00	00	00	00

Request to Send Actual Values Spark

	04 Spark Tester	0	1	0 Value 1 from Dev.	-	-	-	-	-	-	-	-	-	-
	04			10	00	00	00	00	00	00	00	00	00	00

Setting of Nominal Values Spark

	04 Spark Tester	1	0	0 Value 1 from Dev.	Nominal Value e.g. 07.6	Test Voltage [kV]	Fault Counter 0 no reset 1 reset				-	-	-
	04			20	00	4C	7B	00	73	00	00	00	00

Request to Send Nominal Values Controller (Main)

	06 Controller	0	0	2 Main Extruder	-	-	-	-	-	-	-	-	-	-
	06			02	00	00	00	00	00	00	00	00	00	00

Request to Send Actual Values Controller (Main)

	06 Controller	0	1	2 Main Extruder	-	-	-	-	-	-	-	-	-	-
	06			12	00	00	00	00	00	00	00	00	00	00

Setting of Nominal Values Controller (Main)

	06 Controller	1	0	2 Main Extruder	Control Commd. 0 OFF 1 ON 2 HOLD	Control Mode 0 Diameter 1 W.Thickness					-	-	-
	06			22	01	00	00	00	00	00	00	00	00

Request to Send Nominal Values Controller (J. Extr.)

	06 Controller	0	0	1 Jacketing Extr.	-	-	-	-	-	-	-	-	-	-
	06			01	00	00	00	00	00	00	00	00	00	00

Request to Send Actual Values Controller (J. Extr.)

	06 Controller	0	1	1 Jacketing Extr.	-	-	-	-	-	-	-	-	-	-
	06			11	00	00	00	00	00	00	00	00	00	00

Setting of Nominal Values Controller (Jacketing Extruder)

	06 Controller	1	0	1 Jacketing Extr.	Control Commd. 0 OFF 1 ON 2 HOLD	Control Mode 0 Diameter 1 W.Thickness					-	-	-
	06			21	01	00	00	00	00	00	00	00	00

-continued-

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Request to Send Nominal Values Controller (F. Extr.)

06 Controller	0	0	0 Filling Extruder	-	-	-	-	-	-	-	-	-	-
06		00		00	00	00	00	00	00	00	00	00	00

Request to Send Actual Values Controller (F. Extr.)

06 Controller	0	1	0 Filling Extruder	-	-	-	-	-	-	-	-	-	-
06		10		00	00	00	00	00	00	00	00	00	00

Setting of Nominal Values Controller (Filling Extruder)

06 Controller	1	0	0 Filling Extruder	Control Commd. 0 OFF 1 ON 2 HOLD	Control Mode 0 Diameter 1 W.Thickness						-	-	-
06		20		01	00	00	00	00	00	00	00	00	00

Request to Send Nominal Values Gen. Settings 1

07 General Settings	0	0	0	-	-	-	-	-	-	-	-	-	-
07		00		00	00	00	00	00	00	00	00	00	00

Request to Send Actual Values Gen. Settings 1

07 General Settings	0	1	0	-	-	-	-	-	-	-	-	-	-
07		10		00	00	00	00	00	00	00	00	00	00

Setting of Nominal Values Gen. Settings 1

07 General Settings	1	0	0	Product Code for Product Table Access								HC Ctrl Mode 0 HOT 1 HOT/COLD	Conductor Type 0 Round 1 Sector, pre-spiralled 2 Sector, straight
07		20		00	00	00	00	00	00	00	00	00	00

Data from ECOCONTROL 2000 (Input from SLAVE)

ECOCONTROL to Master / General Structure	DB0 Device Type Identifier	DB1.7..1.6 Void	DB1.5	DB1.4 Data Type Identifier	DB1.3..1.0 Device Value Identifier	DB2 / DB3 / DB4 / DB5 ... ... DB11 Data ... ... Data
Explanation	00 Diameter 01 Capacitance 02 Eccentricity 03 Lump/Neck 04 Spark 05 Wall Thickness 06 Controller 07 General Settings 1			0 Nominal Values DB2...DB11 contain nominal values 1 Actual Values DB2...DB11 contain actual values	0 Value 1 from device, numbers the value supplied by device specified in DB0 (see Fig. 1 Page 3) ... 15 Value 16	Nominal Values or Actual Values, according to DB1.4
Reaction on Request to Send Nominal Values	00 ... 07	0	0	0 ... 15		Nominal Values ... ... Nominal Values
Reaction on Request to Send Actual Values	00 ... 07	0	1	0 ... 15		Actual Values ... ... Actual Values

Examples

Reaction on Request to Send Nominal Values	00 Diam. Meas. Device	0	0	1 Value 2 from Dev.	Nominal Value e.g. 04.369 Diameter 1 [mm]	+ Tolerance Val. e.g. 00.100 Diameter 1 [mm]	- Tolerance Val. e.g. 00.099 Diameter 1 [mm]	-	-	-	-
Diameter 1	00		01		11	11	00	64	00	63	00	00	00	00

Reaction on Request to Send Actual Values	00 Diam. Meas. Device	0	1	1 Value 2 from Dev.	Status Diam. X 0 valid ≠0 invalid	Status Diam. Y 0: valid ≠0 invalid	Act. Value e.g. 04.369 Diameter X [mm]	Act. Value e.g. 04.369 Diameter Y [mm]	-	-	-	-
Diameter 1	00		11		00	00	11	11	11	11	00	00	00	00

-continued-

Reaction on Request to Send Nominal Values — Capacitance (hot)

Device													
01 Cap. Meas. Device	0	0	0 Value 1 from Dev.	Nominal Value e.g. 043.69	Capacitance hot [pF/m]	+ Tolerance Val. e.g. 001.00	Capacitance hot [pF/m]	- Tolerance Val. e.g. 000.99	Capacitance hot [pF/m]	-	-	-	-
01		00		11	11	00	64	00	63	00	00	00	00

Reaction on Request to Send Actual Values — Capacitance (hot)

Device													
01 Cap. Meas. Device	0	1	0 Value 1 from Dev.	Status Capacit. 0 valid ≠0 invalid	Void	Act. Value e.g. 043.69	Capacitance hot [pF/m]			-	-	-	-
01		10		00	00	11	11	00	00	00	00	00	00

Reaction on Request to Send Nominal Values — Eccentricity

Device													
02 Ecc. Meas. Device	0	0	0 Value 1 from Dev.	Void	Void	Tolerance Val. e.g. 00.100	Eccentricity [mm]	Nominal Value e.g. 04.660	Core Diameter [mm]	Ecc/Conc Mode 0 Eccentricity 1 Concentricity	-	-	-
02		00		00	00	00	64	12	34	00	00	00	00

Reaction on Request to Send Actual Values — Eccentricity

Device													
02 Ecc. Meas. Device	0	1	0 Value 1 from Dev.	Status Ecc. 0 valid ≠0 invalid	Ecc/Conc Mode 0 Eccentricity 1 Concentricity	Eccentricity,	Absolute [unit as configd.]	Eccentricity, 0...	Angle 360 [°]	-	-	-	-
02		10		00	00	00	00	00	00	00	00	00	00

Reaction on Request to Send Nominal Values — Lump

Device													
03 Lump Detector	0	0	0 Value 1 from Dev.	Tolerance Val. e.g. 001.85	Lump [mm]	Tolerance Val. e.g. 001.23	Neck [mm]	Tolerance Val. e.g. 011.50	Length [mm]	-	-	-	-
03		00		00	B9	00	7B	00	73	00	00	00	00

Reaction on Request to Send Actual Values — Lump

Device													
03 Lump Detector	0	1	0 Value 1 from Dev.	Status Lump/N. 0 valid ≠0 invalid	Void	Lump 0...	Counter 9999	Neck 0...	Counter 9999	-	-	-	-
03		10		00	00	00	00	00	00	00	00	00	00

Reaction on Request to Send Nominal Values — Spark

Device													
04 Spark Tester	0	0	0 Value 1 from Dev.	Nominal Value e.g. 07.6	Test Voltage [kV]					-	-	-	-
04		00		00	4C	00	00	00	00	00	00	00	00

Reaction on Request to Send Actual Values — Spark

Device													
04 Spark Tester	0	1	0 Value 1 from Dev.	Status Spark 0 valid ≠0 invalid	Void	Spark 0...	Counter 65535	Test	Voltage [V]	-	-	-	-
04		10		00	00	00	00	00	00	00	00	00	00

-continued-

Reaction on Request to Send Nominal Values Wall Thickness	05 Wall Thickness	0	0	0 Value 1 from Dev.	Nominal Value	Wall Thickness [unit as configd.]	+ Tolerance Val.	Wall Thickness [unit as configd.]	- Tolerance Val.	Wall Thickness [unit as configd.]	Nominal Value	Shrinkage [%]	-	-
	05		00		00	00	00	00	00	00	00	00	00	00

Reaction on Request to Send Actual Values Wall Thickness	05 Wall Thickness	0	1	0 Value 1 from Dev.	Status WT 0 valid ≠0 invalid	Status Shrinkg. 0 valid 1 invalid	Wall Thickness [unit as configd.]		Shrinkage [%]		-	-	-	-
	05		10		00	00	00	00	00	00	00	00	00	00

Reaction on Request to Send Nominal Values Controller	06 Controller	0	0	2 Main Extruder	Control Commd. 0 OFF 1 ON 2 HOLD	Control Mode 0 Diameter 1 W.Thickness					-	-		-
	06		02		01	00	00	00	00	00	00	00	00	00

Reaction on Request to Send Actual Values Controller	06 Controller	0	1	2 Main Extruder	Status Contrl. 0 OFF 1 ON 2 HOLD	Status IOCON 0 valid ≠0 invalid	Control e.g. -12	Influence [%]			-	-	-	-
	06		12		01	00	FF	88	00	00	00	00	00	00

Reaction on Request to Send Nominal Values General Settings 1	07 General Settings	0	0	0 Value 1 from Dev.	Product Code						HC Ctrl Mode 0 HOT 1 HOT/COLD	Conductor Type 0 Round 1 Sector, pre-spiralled 2 Sector, straight
	07		00		00	00	00	00	00	00	00	00	00	00

Reaction on Request to Send Actual Values General Settings 1	07 General Settings	0	1	0 Value 1 from Dev.	Product Code						HC Ctrl Mode 0 HOT 1 HOT/COLD	Conductor Type 0 Round 1 Sector, pre-spiralled 2 Sector, straight
	07		10		00	00	00	00	00	00	00	00	00	00

Index

Figures

ECOCONTROL 2000

	Connection
St 1	
St 2	
St 3	
St 4	
St 13	
St 14	
St 6	Automatic Control
St 12	Automatic Control –*Option-*
St 5	Pulse Generator
St 5	Digital Inputs
St 7	Dry Contacts
St 8	Serial Interface
St 6	Analog Output
St 9	External VGA
St 10	External Keyboard

Power Supply 230 V AC

Power Supply 230 V AC — *Power*

SIKORA AG

Bruchweide 2 · D-28307 Bremen · Germany

19.03.2001

ECOCONTROL 2000
Übersicht der Anschlüsse
General View External Connections

Bild / Fig. 1
Blatt / Page 1/3

SPARK 2000 UL to ECOCONTROL 2000 Connection

```
┌─────────────────┐
│ SPARK 2000 UL   │         Connection Cable    ┌──────────────┐    Connection Cable    ┌──────────────────┐
│        RS 485   │────────── KSREM ───────────▶│ Optoisolator │────── KSMOLA ─────────▶│ St               │
└─────────────────┘                             │   F0161      │                        │                  │
                                                └──────┬───────┘                        │                  │
                                                       │                                │   ECOCONTROL     │
                  Power Supply 115 / 230 V AC ─────────┘                                │      2000         │
                                                                                        └──────────────────┘
```

ECOCONTROL 2000
Übersicht der Anschlüsse
General View External Connections

Bild / Fig.   1
Blatt / Page 2/3

Measuring Source / Features	Device Number	Selected for this Application
Diameter 0 (Core Diameter)	0	
Diameter 1 (Filling Extruder)	1	
Diameter 2 (Hot Diameter)	2	
Diameter 3 (Cold Diameter)	3	
Capacitance	0	
Eccentricity	0	
Lump Detector	0	
Spark Tester	0	
Wall Thickness 0 (Filling Extruder)	0	
Wall Thickness 1 (Main Extruder)	1	
Controller 0 (at core)	0	
Controller 1 (at Filling Extruder)	1	
Controller 2 (at Main Extruder)	2	
Cable Type Round		
Cable Type Pre-Spiralled Sector		
Cable Type Stretched Sector		
Controller Mode Hot	2	
Controller Mode Hot-Cold	2	
Mode Eccentricity	0	
Mode Concentricity	0	

SSCOM1

Plug / St. 1

SSCOM2

Plug / St. 2

SSCOM5

Plug / St. 13
Conn. Profibus
-Option-

SSCOM6

Plug / St. 14
Diagn. Profibus
-Option-

SSCOM3

Plug / St. 3

SSCOM4

Plug / St. 4

VGA

Plug / St. 9
Monitor

COM2

Plug / St. 8

Keyboard

Plug / St. 10

Dig. Input

Plug / St. 5

Controller

Plug / St. 6

Dry Contact

Plug / St. 7

LPT1

Plug / St. 11
Printer / Drucker

ECOCONTROL 2000
Ansicht Geräterückseite
Display Unit Rear View

Bild / Fig. 2
Blatt / Page 1/1

SSCOM1

Plug / St. 1

SSCOM2

Plug / St. 2

SSCOM3

Plug / St. 3

SSCOM4

Plug / St. 4

SSCOM5

Plug / St. 13
Conn. Profibus
-Option-

SSCOM6

Plug / St. 14
Diagn. Profibus
-Option-

VGA

Plug / St. 9
Monitor

COM2

Plug / St. 8

Keyboard

Plug / St. 10

Dig. Input

Plug / St. 5

Controller

Plug / St. 6

Dry Contact

Plug / St. 7

LPT1

Plug / St. 11
Printer / Drucker

ECOCONTROL 2000
Ansicht Geräterückseite
Display Unit Rear View

Bild / Fig. 2
Blatt / Page 1/1

PANEL PC
Abmessungen / Dimensions
Bild / Fig. 3

Maßstab 1:5

SIKORA
Industrieelektronik GmbH
Bruchweide 2 D28147 Bremen

	Datum	Name
Bearb.	05.03.01	Dröge
Gepr.	05.03.01	Seidel
Norm		

530
74
104
74
Ø12.5

250
410

440
400
40
Ø12.5

520
122
78
20
Ø12.5

483mm
19.32"

39.5mm
1.58"

443.5mm
17.74"

Ø10.4XSW7 (4x)

355mm
14.2"

325mm
13"

317.2mm
12.7"

15mm/0.6"

37.8mm/1.5"

474mm
18.96"

9
0.36"

SIKORA AG
Bruchweide 2 · D-28307 Bremen · Germany
12.03.2001

ECOCONTROL 2000
Montageplatte für Panel PC / Befestigungsbohrungen
Mounting Frame for Panel PC / Fastening Holes

Bild / Fig. 3
Blatt / Page 2/2

Stecker connectors

Linienhöhe 1000 +100 / -50

180
140
40
13
150
270

45°
54.7
550
671
120
280
550
12

M6

LASRE 2050XY / 2100XY + Ständer

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Bild / Fig. 6

External Wiring ECOCONTROL 2000

Plug/St1 Serial Interface RS485	9-pol D-Sub Connector (Interface to Measuring Head / Measuring Device / Tester)
	not connected / connected to

Plug/St2 Serial Interface RS485	9-pol D-Sub Connector (Interface to Measuring Head / Measuring Device / Tester)
	not connected / connected to

Plug/St3 Serial Interface RS485 (Option)	9-pol D-Sub Connector (Interface to Measuring Head / Measuring Device / Tester)
	not connected / connected to

Plug/St4 Serial Interface RS485 (Option)	9-pol D-Sub Connector (Interface to Measuring Head / Measuring Device / Tester)
	not connected / connected to

Plug/St13 Serial Interface RS485 (Option)	9-pol D-Sub Connector (Interface to Measuring Head / Measuring Device / Tester / Profibus System)
	not connected / connected to

Plug/St14 Serial Interface RS485 (Option)	9-pol D-Sub Connector (Interface to Measuring Head / Measuring Device / Tester / Diagnostic Profibus System)
	not connected / connected to

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ECOCONTROL 2000
Steckeranschlussplan
External Wiring

Bild / Fig. 7
Blatt / Page 1/6

Plug/St8 Serial Interface RS232	9-pol D-Sub Connector (COM2 to External Computer) Note: Clamp cable shield under cable grip!	
	2 3 5	RxD TxD GND

Plug/St9 VGA Interface	15-pol D-Sub Connector (Interface to external VGA monitor)

Plug/St10 Keyboard Interface	PS/2 Plug (Interface to external keyboard)

Plug/St11 Printer (Option)	25-pol Connector (Interface to parallel port printer EPSON LQ 590)

POWER SUPPLY	Device Connector (Mains Supply 230 / 115 V AC –selectable or automatic, can be set at the device power unit)

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ECOCONTROL 2000
Steckeranschlussplan
External Wiring

Bild / Fig. 7
Blatt / Page 2/6

External Wiring SETUP - 05
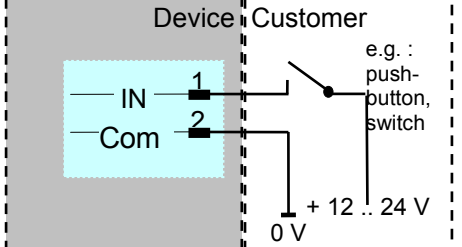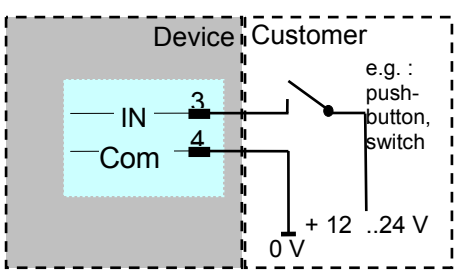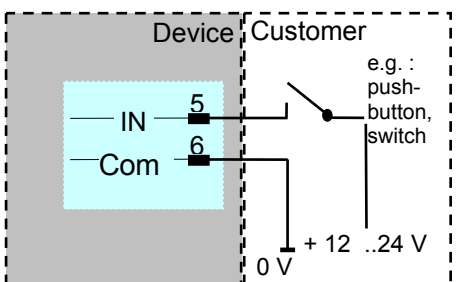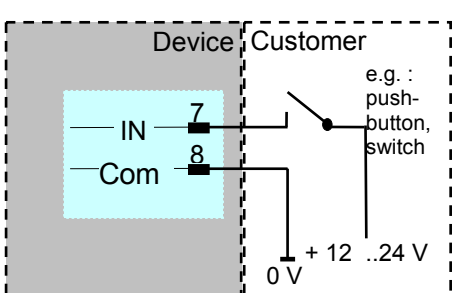
Plug/St1 Power Supply	3 – pol. Screw terminal (Voltage feed)		
	1 AC – L 2 AC – N 3 PE	115 / 230 V Long-Range-Input	

Plug/St2 External Power Supply (Option)	4 – pol. Screw terminal (external voltage feed)		
	1 2 } + 5 V	5 V external voltage feed	
	3 4 } GND	External ground	

Plug/St3 USB – Interface	USB (Interface to Ecocontrol / Panel PC)

Plug/St4 Ser. Interface RS 232 (Option)	9 –pol. D-Sub Connector (Programming Interface)
	2 R x D 3 T x D 5 GND

Plug/St5 Digital Output (Relay Contact)	8 – pol. Screw terminal (4 Digital outputs - programmable / potential-free contacts, max. contact load 24 V DC and 0,5 A)		
	1 2 } OUT 1	Digital Output 1	Preset e.g.: Contact closed: ALARM, error of the camera
	3 4 } OUT 2	Digital Output 2	Preset e.g.: Tolerance limit exceeded
	5 6 } OUT 3	Digital Output 3	Preset e.g.: Tolerance limit exceeded
	7 8 } OUT 4	Digital Output 4	Preset e.g.: Tolerance limit exceeded

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ECOCONTROL 2000
Steckeranschlussplan
External Wiring

Bild / Fig.   7
Blatt / Page 3/6

Plug/St6 Digital Input	8 – pol. Screw terminal (4 Digital inputs - programmable)	

Device | Customer		
IN — 1 Com — 2 e.g. : push-button, switch + 12 .. 24 V 0 V	Digital Input 1	Preset e.g.: Contact closed: External computer control only Contact open: Internal and external computer control
IN — 3 Com — 4 e.g. : push-button, switch + 12 ..24 V 0 V	Digital Input 2	Preset e.g.: Contact closed for minimum 1 second: Start TREND diagram
IN — 5 Com — 6 e.g. : push-button, switch + 12 ..24 V 0 V	Digital Input 3	Preset e.g.: Contact closed for minimum 1 second: Stop TREND diagram
IN — 7 Com — 8 e.g. : push-button, switch + 12 ..24 V 0 V	Digital Input 4	Not preset

Plug/St7 SPEED	4 – pol. Screw terminal Potential-free Input for Pulses from the Rotary Pulse Generator Note: Clamp cable shield under cable grip!
	1 + 15 V Supply for Rotary Pulse Generator
	2 Pulse from the Rotary Pulse Generator
	3 4 } GND Ground Rotary Pulse Generator

Plug/St8 Automatic Control Analog Output	4 – pol. Screw terminal (Automatic Control System 1)
	Automatic Control Influence: ± 50 % 2　　Input Nominal Value　　　　max. ± 10 V, R_j ≥ 100 kΩ 3　　GND Ground Input Nominal Value 1　　Output Nominal Value　　　　max. ± 15 V, max. 5 mA 4　　GND Output Nominal Value

External Wiring CON – 05 (Option)

Plug/St1 Automatic Control System 2	3 – pol. Screw terminal (Automatic Control System 2)
	Automatic Control Influence: ± 50 % 2　　Input Nominal Value　　　　max. ± 10 V, R_j ≥ 100 kΩ 3　　GND Ground Input Nominal Value 1　　Output Nominal Value　　　　max. ± 15 V, max. 5 mA 4　　GND Output Nominal Value

Plug/St2 Automatic Control System 3	3 – pol. Screw terminal (Automatic Control System 3)
	Automatic Control Influence: ± 50 % 2　　Input Nominal Value　　　　max. ± 10 V, R_j ≥ 100 kΩ 3　　GND Ground Input Nominal Value 1　　Output Nominal Value　　　　max. ± 15 V, max. 5 mA 4　　GND Output Nominal Value

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ECOCONTROL 2000
Steckeranschlussplan
External Wiring

Bild / Fig.　7
Blatt / Page　5/6

Kundenschnittstellen SETUP-05

	Datum	Name
Bearb	21.02.06	HOL
Gepr		
Norm		

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	Bild Figure
	Blatt von

Zust | Aenderung | Datum | Name

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06.04.2006

ECOCONTROL 2000
Steckeranschlussplan
External Wiring

Bild / Fig. 7
Blatt / Page 6/6
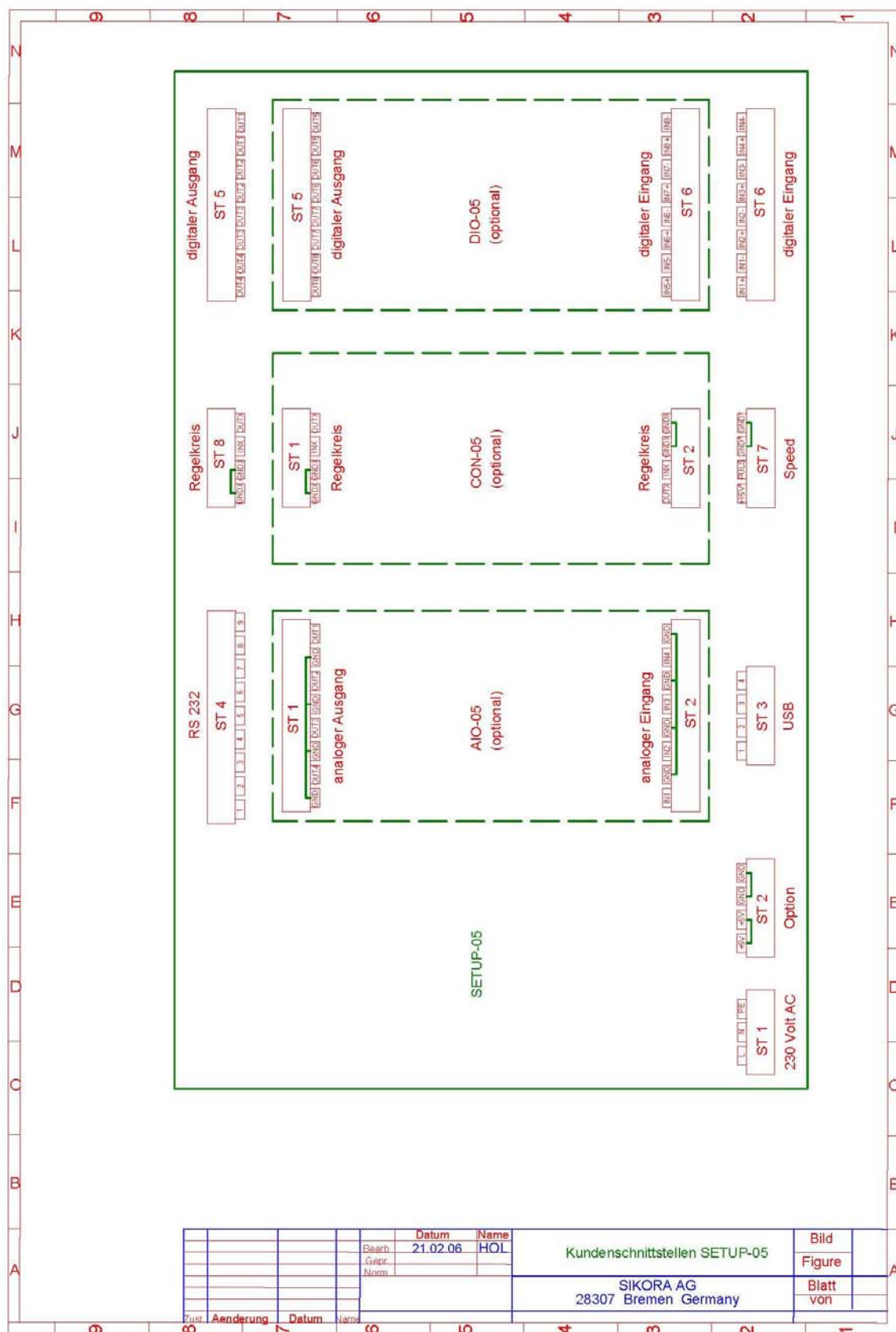
KSMOLA - _____

LASER 2000 XY
9 pol. D-Sub
Buchse / Socket

Kabeltyp / Cable Type:
LI2Y (St)+CY 1x2x0.08
Art.Nr. K3814001

ECOCONTROL/MOXA
9 pol. D-Sub
Buchse / Socket

8 br/brown — TxD-(A) — 1,4

2 ws/white — TxD+(B) — 2,3

6 — 5

Beilaufdraht   Schirm unter Zugentlastung klemmen
Tracer   Clamp shielding under cable grip
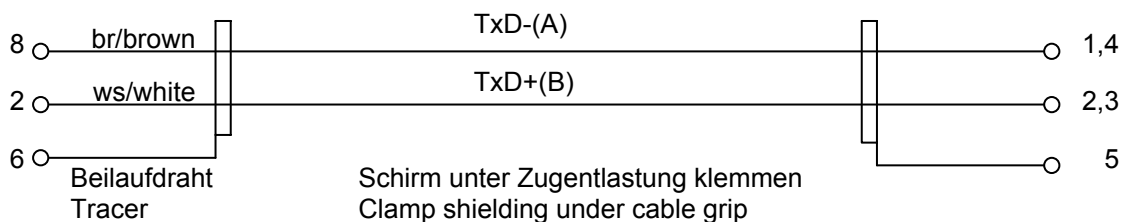
KSMOMHD - _____

MHD 4000
25 pol. D-Sub
Buchse / Socket

Kabeltyp / Cable Type:
LI2Y (St)+CY 1x2x0.08
Art.Nr. K3814001

ECOCONTROL/MOXA
9 pol. D-Sub
Buchse / Socket

14 br/brown — TxD-(A) — 1,4

1   ws/white — TxD+(B) — 2,3

2   — 5

Beilaufdraht   Schirm unter Zugentlastung klemmen
Tracer   Clamp shielding under cable grip

9 pol D-Sub Buchse/Socket   Art Nr. V76020
9 pol D-Sub Haube/Cap   Art Nr. V76022
25 pol D-Sub Buchse/Socket   Art Nr. V7601
25 pol D-Sub Haube/Cap   Art Nr. V7602
LI2Y (St) +CY 1x2x0.08   Art Nr. KS3814001

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19.04.2001

ECOCONTROL 2000
Verbindungskabel / Connection Cable
LASER/MHD - ECOCONTROL
Bild / Fig. 8
Blatt / Page 1/1

SIKORA AG
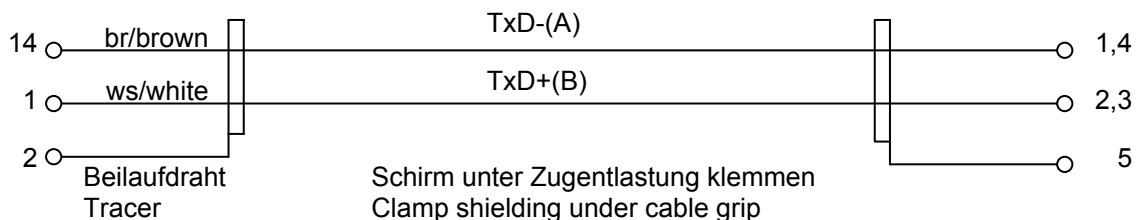
ECOCONTROL 2000
St. 5 / Plug 5

Drehimpulsgeber
Rotary Pulse Generator

6 0V*

2 +15 V*

Impulse
Pulses

1

9 pol. plug

1 1   -

2 2   +

3 3

4 4

5 5

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Bruchweide 2 · D-28307 Bremen · Germany
20.03.2001

ECOCONTROL 2000
Anschluß Drehimpulsgeber
Connection Rotary Pulse Generator

Bild / Fig.   9
Blatt / Page   1/1
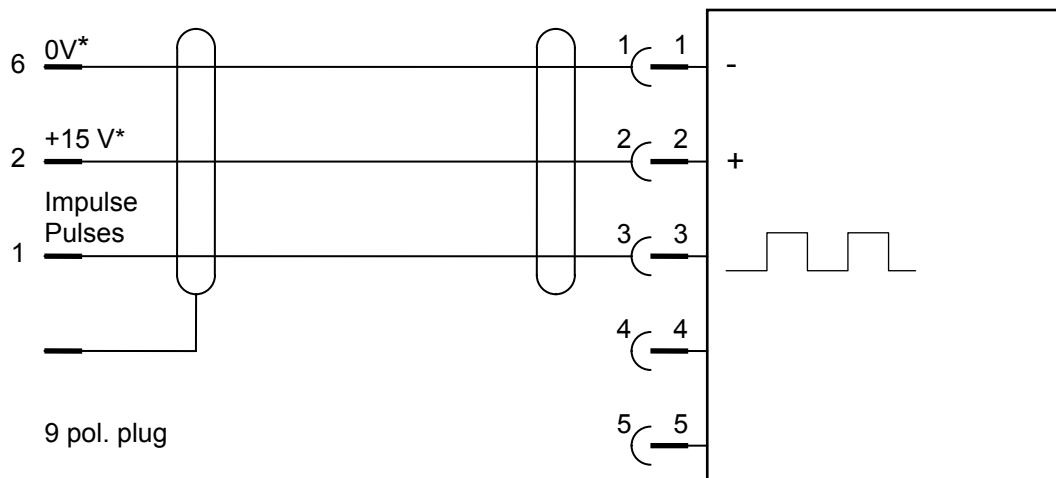
TECHNISCHE INFORMATION
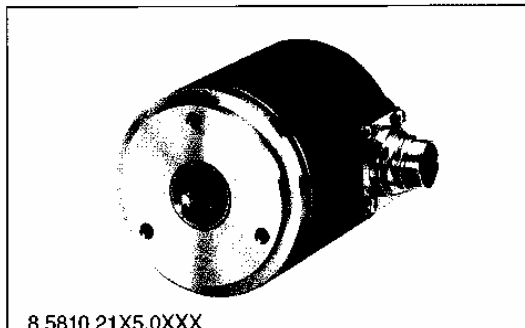
8.5810.21X5.0XXX

Spezifikation:

– preisgünstig
– kuzschlußfeste Ausgänge
– in vielen Varianten lieferbar
– robuste Ausführung nach Industriestandard
– hohe mechanische Schutzart
– niedriger Stromverbrauch
– Kunststoff- bzw. Metallteilung mit hoher
  Schockfestigkeit

Mechanische Kennwerte:

Drehzahl:	max. 6000 U/min.
Trägheitsmoment des Rotors:	$0,6 \times 10^{-6}$ kgm^2
Drehmoment:	< 0,01 Nm
Wellenbelastbarkeit radial:	20 N (am Wellenende)
Wellenbelastbarkeit axial:	10 N
Gewicht:	ca. 0,4 kg
Schutzart nach DIN 40.050:	Welle IP 64, Deckel (IP 67 mit Kabel, IP 50 mit Stecker)
Arbeitstemperaturbereich:	0°C bis + 50°C
Welle:	nichtrostender Stahl

Elektrische Kennwerte:

Ausgangsschaltung:	Gegentaktschaltung
Versorgungsspannung U_B:	10 – 30 VDC
Stromaufnahme:	max. 80 mA
Zul. Last / Kanal:	max. +/– 30 mA
Impulsfrequenz:	max. 20 kHz
Signalpegel high:	min. $U_B - 2,5$ V
Signalpegel low:	max. 1,5 V
Anstiegszeit t_r:	max. 1 μs
Abfallzeit t_f:	max. 1 μs
Kurzschlußfeste Ausgänge bei korrekter Spannungsversorgung:	ja
Verpolschutz der Spannungsversorgung:	ja

Kurzfristig lieferbare Impulszahlen:

1, 2, 4, 5, 6, 10, 15, 20, 25, 30, 35, 36, 40, 50, 57, 60, 70, 80, 86, 90, 96, 100, 120, 125, 127, 142, 150, 180, 200, 216, 220, 240, 250, 254, 256, 280, 300, 314, 360, 377, 393, 400, 420, 450, 500, 512.

Andere Impulszahlen auf Anfrage.

Impulsbild:

Drehsinn:

CW
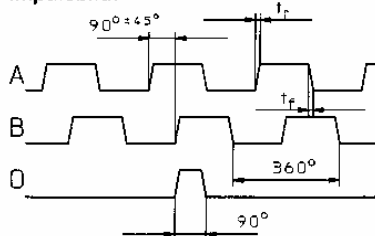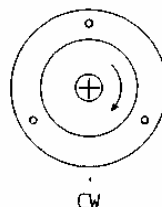
Ausgangsschaltung:

Gegentakt
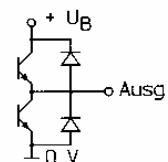
– Welle im Uhrzeigersinn drehend, mit Blick auf die Welle.
– Invertiertes Nullsignal optional erhältlich.
– Der 0-Impuls ist mit den Kanälen A und B UND-verknüpft.

– Änderungen vorbehalten –

Maßbilder:

Flansch 1: Klemmflansch

Ansicht auf Steckseite
Stiftkontakteinsatz

Flansch 2: Synchroflansch

* feste Verlegung (nicht für Dauer-schleppbetrieb geeignet)
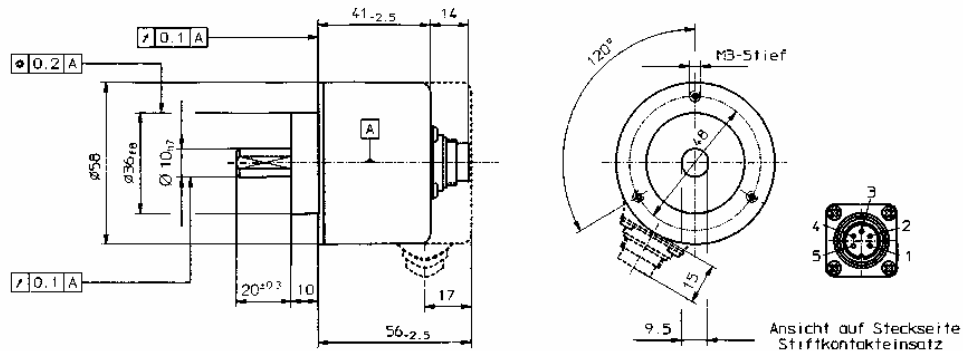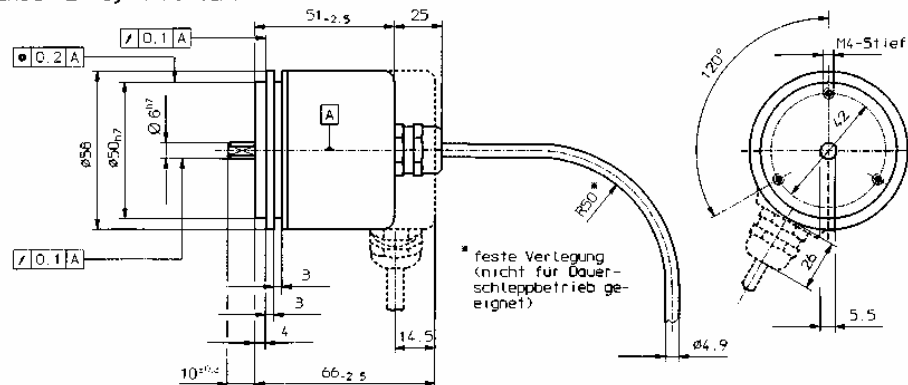
Anschlußbelegung:

Signal:	0 V	+ U$_B$	A	B	O bzw. $\overline{O}$	Schirm
Pin:	1	2	3	4	5	*
Farbe:	weiß	braun	grün	gelb	grau	schwarz

* Schirm liegt am Steckergehäuse an.
– Unbenutzte Ausgänge sind vor Inbetriebnahme zu isolieren

Bestellschlüssel:

8.5810.X X X X.0XXX

Baureihe

Flansch

   1 = Klemmflansch
   2 = Synchroflansch

Welle (D x L)

   1 = Ø 6 mm x 10 mm
   2 = Ø 10 mm x 20 mm

Ausführung:

   1 = Kanal A
   2 = Kanäle A + O
   3 = Kanäle A + B
   4 = Kanäle A + B + O
   5 = Kanäle A + $\overline{O}$
   6 = Kanäle A + B + $\overline{O}$

Impulszahl
(z. B. 250 Impulse => 0250)

Anschlußart:

   1 = Kabel axial (1 m)
   2 = Kabel radial (1 m)
   3 = Stecker axial ohne Gegenstecker
   4 = Stecker axial mit Gegenstecker
   5 = Stecker radial ohne Gegenstecker
   6 = Stecker radial mit Gegenstecker

– Zubehörteile siehe Technische
   Information Zubehör
– Andere Ausführungen auf Anfrage

Montageanleitung Drehgeber

Instructions for installing rotary transducer

Wichtig!

Vor Inbetriebnahme des Gebers unbedingt lesen.

Mit diesem Geber haben Sie ein Präzisionsmeßgerät erworben. Beachten Sie stets die Angaben und Hinweise des Datenblattes, um eine problemlose Funktion des Gebers zu gewährleisten und um die Garantieleistung aufrecht zu erhalten. Falls im Datenblatt nichts anderes angegeben ist, bitte folgendes unbedingt beachten:

Important!

It is imperative that you read these instructions before putting the transducer into service.

The transducer is a precision measuring instrument. Always comply with the information and instructions on the data sheet to ensure trouble-free transducer function and to maintain the guarantee. Barring instructions to the contrary on the data sheet, compliance with the following is imperative:

Mechanisch:

– Der Drehgeber darf weder teilweise noch ganz zerlegt oder modifiziert werden.

– Die Welle nicht nachträglich bearbeiten (schleifen, sägen, bohren, usw.). Die Genauigkeit des Gebers und die Zuverlässigkeit von Lager und Dichtung nehmen sonst Schaden. Wir sind gerne bereit, auf Ihre Kundenwünsche einzugehen.

– Das Gerät niemals mit dem Hammer ausrichten.

– Schlagbelastungen unbedingt vermeiden.

– Drehgeberwelle nicht über die im Datenblatt angegebenen Werte belasten (weder axial noch radial).

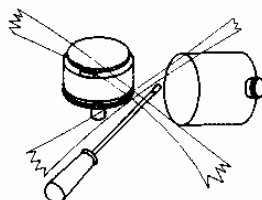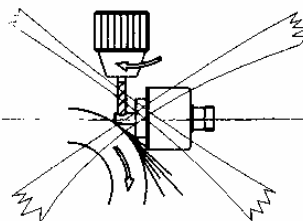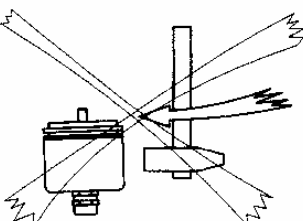– Drehgeber und Antriebsgerät nicht an Wellen <u>und</u> Flanschen starr miteinander verbinden. Benützen Sie grundsätzlich eine Kupplung (zwischen Antriebswelle und Geberwelle, bzw. zwischen Hohlwellen-Geber-Flansch und Antriebsflansch).
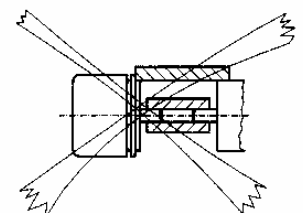
Für die Gebermontage empfehlen wir Ihnen den Einsatz unserer Montagehilfen und Kupplungen (siehe Zubehör-Datenblätter).

Bitte beachten Sie die umseitig stehenden Montagehinweise!

Mechanical:

– It ist not permissible to dismantle the transducer entirely or in part or to modify it.

– Do not alter the shaft (by grinding, sawing, drilling, etc.), otherwise the accuracy of the transducer and the dependability of bearing and gasket will suffer. We are always happy to take your wishes into account.

– Never align the instrument with a hammer.

– It is imperative to avoid impact loads.

– Never subject the shaft of the transcuder to loads higher than those indicated on the data sheet (axially or radially).

– Do not connect tranducer and drive rigidly to one another at shafts <u>and</u> flanges. Always use a coupling (between drive shaft and transducer shaft, or between hollow-shaft transducer flange and drive flange).

We recommend that you use our assembly aids and couplings to install the transducer (see accessory data sheets).

Please read the installation instructions on the back of this page.

Montagehinweise für Geber mit Welle:

① Wellen auf Versatz überprüfen.

Axialversatz / *Axial offset*

Radialversatz / *Radial offset*

Winkelfehler / *Angle error*

Entnehmen Sie die Werte x1, x2 und x3 dem Datenblatt der Kupplungen.

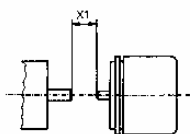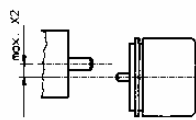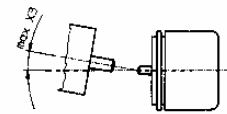② Kupplung während der Montage vor zu starker Biegung sowie Beschädigung schützen.

③ Kupplung auf den Wellen ausrichten.

④ Spann- oder Klemmschrauben vorsichtig anziehen.

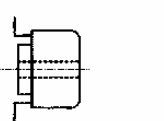## Installation instructions for tranducer with shaft:

① Check shafts for offset.

Refer to the coupling data sheet for the values x1, x2 and x3.

② During assembly, protect coupling against excessive bending or damage.

③ Align coupling on the shafts.

④ Carefully tighten pulling or clamping bolts.

Montagehinweise für Hohlwellengeber mit Kupplung:
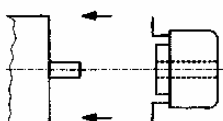
Geber mit Kupplung auf Welle montieren.

Mount transducer with coupling on shaft.
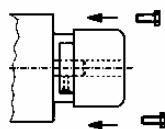
Kupplung mit Antriebflansch verschrauben.

Bolt coupling to drive flange.
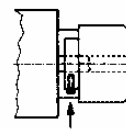
Klemmnabe vorsichtig anziehen.

Carefully tighten clamping hub.

Instructions for installation of hollow-shaft transducer with coupling:

Elektrisch:

– Vor Inbetriebnahme sind alle benötigten Kabeladern laut Datenblatt anzuschließen! Isolieren Sie alle nicht benötigten Enden sauber, um Kurzschlüsse zu vermeiden.

– Bei der Konfektionierung des Gegensteckers ist eine, evtl. dem Stecker beigelegte, Anleitung zu beachten.

– Das Anschlußkabel des Gebers möglichst nicht parallel zu einem Netzkabel verlegen, um Störungen zu vermeiden.

– An Leitungslängen empfehlen wir:
  • bei asymmetrischer Übertragung, d.h. invertierte Signale werden nicht verwendet, max. 10 m Leitungslänge.
  • bei symmetrischer Übertragung (z.B. nach RS 422) max. 50 m Leitungslänge.

– Achten Sie auf eine gute Schirmung.

– Gegenstecker am Geber nur im spannungslosen Zustand ziehen oder stecken.

– Die richtige Betriebsspannung und den maximal zulässigen Ausgangsstrom berücksichtigen (siehe Datenblatt)!

– Ein- bzw. Ausschalten der Betriebsspannung für den Geber und das Folgegerät muß gemeinsam erfolgen.

Electrical:

– Before putting into service, connect all required strands as per data sheet. To prevent short-circuits, neatly insulate the ends of all strands which are not required.

– When preassembling the mating connector, comply with any instructions accompanying the connector.

– To avoid interference, do not lay the cable set for the transducer parallel to a mains cable if at all possible.

– Our recommendations regarding cable lengths:
  • in case of asymmetrical transmission, i.e. inverted signals are not used, cable length max. 10 m
  • in case of symmetrical transmission (e.g. to RS 422), cable length max. 50 m

– Make certain that shielding is good.

– Plug in or pull out mating connector on the transducer only when transducer is de-energized.

– Make certain that the operating voltage is correct and the max. permissible output current is not exceeded (see data sheet).

– The operating voltage for transducer and succeeding device must be turned on and off together.

Sicherheitshinweise:

1. Wenn anzunehmen ist, daß ein gefahrloser Betrieb nicht mehr gewährleistet ist, muß das Gerät außer Betrieb gesetzt und gegen unbeabsichtigtes Einschalten gesichert werden.

2. Wenn durch den Ausfall oder eine Fehlfunktion des Gebers eine Gefährdung von Menschen oder eine Beschädigung von Betriebseinrichtungen nicht auszuschließen ist, so muß dies durch geeignete Sicherheitsmaßnahmen wie Schutzvorrichtungen oder Endschalter usw. verhindert werden.

Bei Mißachtung der obigen Richtlinien können wir keine Garantie gewähren. Wir bitten um Verständnis.

Safety precautions:

1. If operation without danger can no longer be assured at some point, the unit must be shut down and secured against accidental activation.

2. If personal injury or damage to equipment is possible should the transducer fail or malfunction, this must be prevented by suitable safety precautions such as protective devices or limit switches, etc.

We can assume no guarantee if the above directives are disregarded. We ask for your understanding.

TECHNISCHE INFORMATION

Zubehör für Drehgeber
Meßräder

11.91.2

Beschreibung und Anwendung

Meßräder dienen, in Verbindung mit Impulsgebern, zur Längenmessung von laufendem Meßgut in der Holz-, Papier-, Metall-, Textil- oder Kunststoffindustrie. Bei der Auswahl eines Meßrades ist zunächst die Art der zu messenden Ware zu berücksichtigen, um danach die Oberfläche bzw. den Belag des Meßrades zu bestimmen.
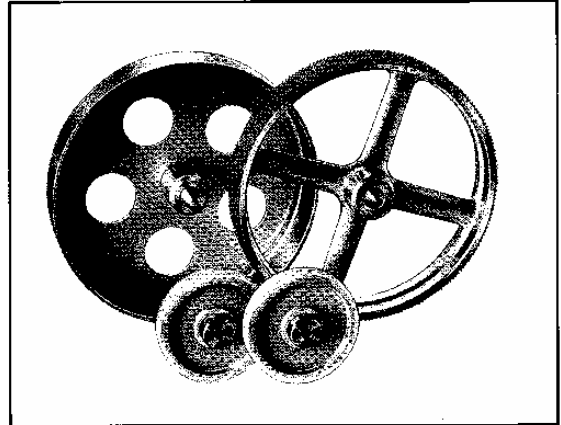
Ausführungen:

Meßrad Umfang	Profil-Nr.	Belag	Belaghärte Shore A	Standard-bohrung mm [1]	Meßbreite mm	Werkstoff Radkörper	Gewicht (ca.) g	Meßrad Nr.
Meßräder für metrisches Maßsystem:								
0,2 Meter	1	Kreuzrändel		6	12	Aluminium	40	211
	3	flache Nut mit Querrändel		6	10	Aluminium	50	231
	3	flache Nut mit Querrändel		6	4	Aluminium	25	234
	4	Kunststoff (Hytrel) glatt	85...90	6	12	Kunststoff	35	241
	9	Kunststoff (Hytrel) geriffelt	85...90	6	12	Kunststoff	35	291
0,5 Meter	1	Kreuzrändel		10	25	Aluminium	350	512
	3	flache Nut mit Querrändel		10	16	Aluminium	350	536
	4	Kunststoff (Hytrel) glatt	85...90	10	25	Kunststoff	260	542
	5	Kunststoff (Vulkollan) glatt	90...95	10	25	Aluminium	320	552
	6	Noppengummi		10	25	Aluminium	320	562
	9	Kunststoff (Hytrel) geriffelt	85...90	10	25	Kunststoff	260	592
1 Meter	5	Gummi glatt	70...75	10	25	Aluminium	780	052
Meßräder für englisches Maßsystem								
1 Fuß	1	Kreuzrändel		6	13	Aluminium	110	711
	1	Gummi glatt	70...75	6	13	Aluminium	100	751

[1] = Andere Bohrungsdurchmesser auf Anfrage

Bestellschlüssel:

8.0000.3 XXX.00XX

            Bohrungsdurchmesser

            Meßrad-Nr.

Bitte beachten Sie:
Wird ein Meßrad direkt auf der Drehgeberwelle befestigt, darf die Andruckkraft zwischen Meßrad und Meßgut die im Datenblatt des Drehgebers angegebene, radiale Wellenbelastung nicht überschreiten.

Wir weisen außerdem darauf hin, daß die Meßräder nur für innerbetriebliche Zwecke verwendet werden können, die nicht den Bestimmungen des Eichgesetzes unterliegen.

– Änderungen vorbehalten –

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40

10

40

30

7 H7

140

150

15.9, 154.9

M4

Material: AlMgSi 0,5

Drehimpulsgeber
Rotary Pulse Generator
Vorschlag Meßrad
Example Metering Wheel

Bild / Fig.   11
Blatt / Page   1/1

Master Potentiometer

Extruder-Drehzahl
Extruder r.p.m.

$I_{1(Extr)}$

$U_{1(Extr)}$

Sollwert Drehzahl
Nominal Value Speed

Thyristor-Steuersatz
Thyristor Drive Unit

Extruder

Istwert Drehzahl
Actual Value Speed

Motor

M   TG

*Drehzahlgeber
Tachogenerator*

Abzugsgeschwindigkeit
Line Speed

$I_{1(LSpd)}$

$U_{1(LSpd)}$

Sollwert Drehzahl
Nominal Value Speed

Thyristor-Steuersatz
Thyristor Drive Unit

*Zugraupe
Caterpillar*

Istwert Drehzahl
Actual Value Speed

Motor

M   TG

*Drehzahlgeber
Tachogenerator*

Sollwert Drehzahl
Nominal Value Speed

Thyristor-Steuersatz
Thyristor Drive Unit

*Aufwickler
Take-Up Reel*

Istwert Drehzahl
Actual Value Speed

Motor

M   TG

*Drehzahlgeber
Tachogenerator*

AUTOMATISCHE REGELUNG / AUTOMATIC CONTROL
Beispiel: Anlagensteuerung vor Einbau der Automatischen Regelung
Example: Line Control before Installation of Automatic Control

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Bild / Fig.   12
Blatt / Page   1/3

Extruder-Drehzahl
Extruder r.p.m.

Master
Potentiometer

Sollwert Drehzahl
Nominal Value Speed

Istwert Drehzahl
Actual Value Speed

Thyristor-Steuersatz
Thyristor Drive Unit

Extruder

Motor

Drehzahlgeber
Tachogenerator

M — TG

Abzugsgeschwindigkeit
Line Speed

U_1

U_2

Sollwert Drehzahl
Nominal Value Speed

Istwert Drehzahl
Actual Value Speed

Thyristor-Steuersatz
Thyristor Drive Unit

Zugraupe
Caterpillar

Motor

Drehzahlgeber
Tachogenerator

M — TG

GND IN OUT GND
Stn [1]

Controller

Sollwert Drehzahl
Nominal Value Speed

Istwert Drehzahl
Actual Value Speed

Thyristor-Steuersatz
Thyristor Drive Unit

Aufwickler
Take-Up Reel

Motor

Drehzahlgeber
Tachogenerator

M — TG

[1]

Gerätetyp Device Type	Stn
ECOCONTROL	St6
REMOTE	St2

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AUTOMATISCHE REGELUNG / AUTOMATIC CONTROL
Beispiel: Regelung der Abzugsgeschwindigkeit
Example: Automatic Control of Line Speed

Bild / Fig. 12
Blatt / Page 2/3

Extruder-Drehzahl
Extruder r.p.m.

U_1

U_2

Sollwert Drehzahl
Nominal Value Speed

Istwert Drehzahl
Actual Value Speed

Thyristor-Steuersatz
Thyristor Drive Unit

Extruder

Motor

Drehzahlgeber
Tachogenerator

M — TG

Master
Potentiometer

GND IN OUT GND
Stn [1)]

Controller

Abzugsgeschwindigkeit
Line Speed

Sollwert Drehzahl
Nominal Value Speed

Istwert Drehzahl
Actual Value Speed

Thyristor-Steuersatz
Thyristor Drive Unit

Zugraupe
Caterpillar

Motor

Drehzahlgeber
Tachogenerator

M — TG

Sollwert Drehzahl
Nominal Value Speed

Istwert Drehzahl
Actual Value Speed

Thyristor-Steuersatz
Thyristor Drive Unit

Aufwickler
Take-Up Reel

Motor

Drehzahlgeber
Tachogenerator

M — TG

[1)]

Gerätetyp Device Type	Stn
ECOCONTROL	St6
REMOTE	St2

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AUTOMATISCHE REGELUNG / AUTOMATIC CONTROL
Beispiel: Regelung der Extruderdrehzahl
Example: Automatic Extruder Control

Bild / Fig. 12
Blatt / Page 3/3

J4 Channel 0
1-3,4-6 Controller

J5 Channel 1
2-4,3-5 Deviation

Jumper **J1**
Board address 308H

Platine PCCON   Regelung Wanddicke / Kalt-Durchmesser
Controller Board PCCON   Wall Thickness / Diameter-Cold Control

J4 Channel 0
1-3,4-6 Controller

J5 Channel 1
1-3,4-6 Controller

Jumper J1
Board address 310H

Platine PCCON   Regelung Durchmesser 1 / Extruder
Controller Board PCCON   Diameter 1 / Filling Extruder- Control

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ECOCONTROL 2000 / PCCON
Jumper auf Controller Platine
Jumper Location Controller Board

Bild / Fig. **13**
Blatt / Page **1/1**

Description of Serial Interface

An external device communicates with the ECOCONTROL using this protocol, the external device acts as master sending telegrams with requests to the ECOCONTROL. The ECOCONTROL sends telegrams to the master only as reaction on the requests. The contents of the telegrams may vary according to application.

Specifications

Operation:	full-duplex, asynchronous
Transmission range:	max. 15 m
Data cable:	[Li2Y(St)+CY] Typ DUE4503
Transmission Speed[1]:	115 kBaud (Bit/s) Default Setting
Data format[1]:	ASCII, 7 data bit, 1 stop bit, parity = ODD Default Setting

[1]can be set using the Configuration Program (Chapter 1.3)

Description of Telegrams

The link operates like a record transmission. The format of all transmitted and received telegrams is :

ESC	DB1	...	DBn	CR	LF	BCC

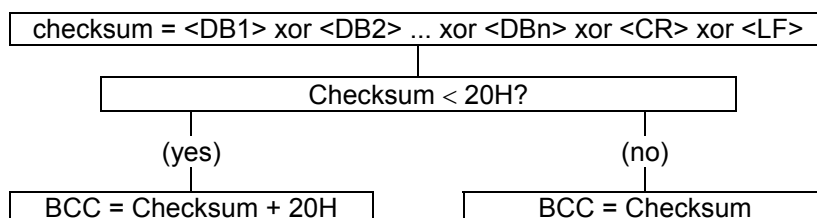|		
<ESC>	ESCAPE	1BH
<DBx>	data byte	$\geq$ 20H
<CR>	CARRIAGE RETURN	0DH
<LF>	LINE FEED	0AH
<BCC>	checksum byte	$\geq$ 20H

The checksum byte is calculated as follows :

checksum = <DB1> xor <DB2> ... xor <DBn> xor <CR> xor <LF>

Checksum $<$ 20H?

(yes)	(no)
BCC = Checksum + 20H	BCC = Checksum

with "xor" = exclusive or.

Transfer Time / Handshake

a.) Transmitting and receiving or exchanging telegrams does not happen synchronously. There is no handshake. The theoretical possible data transfer is only limited by the Baud rate.

b.) The data transfer is supervised by two time-out criteria.

 1. maximum allowed time of delay between two characters within a telegram : 200 ms

 2. maximum allowed time of delay between the arrival of the last character of the request telegram and the transmission of the first character of the answer telegram (only at bidirectional data communication) : 500 ms

If the first time-out criterion (1.) occurs, the receiver expects a new start of telegram (ESCAPE). In the

second case the transmitter reacts with a new request telegram.

The dead-time control can be switched off: Switch off the device and open the front panel. On print FPI, board place 20, is the 8-pol switch S3. Switch No. 2 (second from bottom) to position "ON" (refer to layout FPI). Close front panel and switch on the device.

Operation Mode

The variables (nominal values, tolerances) of the measuring device can be changed per telegram by the communication partner:

a.) Operation Mode "external control only" :
Variables can only be changed by the communication link. User-inputs at the display unit (keyboard) are disabled. Therefore the digital input signal (plug St4, Pin3) must be supplied with 15 V* DC. The display shows the state with an "E" = external.

b.) Operation Mode "external/internal control" :
Variables can be changed by means of the keyboard or by communication partner, both have the same priority. Therefore the digital input remains not connected.

Format of the actual and nominal values in the telegrams:

Value	Resolution	Unit	Range
Actual/Nominal Value Wall Thickness	1/RES	mm or inch or mil[1]	00000 - 99999
Actual/Nominal Value Diameter	1/RES	mm or inch or mil[1]	00000 - 99999
Tolerance Value Diameter	1/RES	mm or inch or mil[1]	00000 - 99999
Tolerance Value Wall Thickness	1/RES	mm or inch or mil[1]	00000 - 99999
Nominal Value Shrinkage	1/10	%	00000 - 00999
Nominal Value Spark HV	1/10	KV	00000 - 00150
Lump/Neck Tolerance Value	1/100	mm or mil[1]	00000 - 65535
Length Tolerance Value	1/10	mm or mil[1]	00000 - 65535
Actual Tolerance Value Eccentricity	1/RES	mm or inch or mil[1]	00000 - 99999
Actual Tolerance Value Concentricity	1/10	%	00000 - 01000
Actual Value Angle of Eccentricity	1/10	°	00000 - 03600

[1] according to application
RES value depending on display precision used in application. RES= 10 power precision.

The device concerned acts as master sending telegrams with requests to the ECOCONTROL. The ECOCONTROL sends telegrams to the master only as reaction on the requests.

Received telegrams ECOCONTROL 2000 (requests from the master) MASTER → SLAVE:

ESC	DB1	...	DBn	CR	LF	BCC

DB = Data (n byte)

DB		Contents / Meaning:	Remark
DB1	= 0	Identifier: Send actual settings	
DB1	= 1	Identifier: Send actual values	
DB1	= 2	Identifier: Take over nominal value diameter 0	1)
DB2...DB6	= xxxxx	Nominal Value Diameter 0	
DB1	= 3	Identifier: Take over +tolerance value diameter 0	1)
DB2...DB6	= xxxxx	+Tolerance Value Diameter 0	
DB1	= 4	Identifier: Take over tolerance value diameter 0	1)
DB2...DB6	= xxxxx	-Tolerance Value Diameter 0	
DB1	= 5	Identifier: Take over nominal value diameter 1	1)
DB2...DB6	= xxxxx	Nominal Value Diameter 1	
DB1	= 6	Identifier: Take over +tolerance value diameter 1	1)
DB2...DB6	= xxxxx	+Tolerance Value Diameter 1	
DB1	= 7	Identifier: Take over tolerance value diameter 1	1)
DB2...DB6	= xxxxx	-Tolerance Value Diameter 1	
DB1	= 8	Identifier: Take over nominal value diameter 2	1)
DB2...DB6	= xxxxx	Nominal Value Diameter 2	
DB1	= 9	Identifier: Take over +tolerance value diameter 2	1)
DB2...DB6	= xxxxx	+Tolerance Value Diameter 2	
DB1	= A	Identifier: Take over tolerance value diameter 2	1)
DB2...DB6	= xxxxx	-Tolerance Value Diameter 2	
DB1	= B	Identifier: Take over nominal value diameter 3	1)
DB2...DB6	= xxxxx	Nominal Value Diameter 3	
DB1	= C	Identifier: Take over +tolerance value diameter 3	1)
DB2...DB6	= xxxxx	+Tolerance Value Diameter 3	
DB1	= D	Identifier: Take over tolerance value diameter 3	1)
DB2...DB6	= xxxxx	-Tolerance Value Diameter 3	
DB1	= E	Identifier: Take over nominal value WT	2)
DB2...DB6	= xxxxx	Nominal Value Wall Thickness	
DB1	= F	Identifier: Take over tolerance value WT	2)
DB2...DB6	= xxxxx	+Tolerance Value Wall Thickness	
DB1	= G	Identifier: Take over tolerance value WT	2)
DB2...DB6	= xxxxx	-Tolerance Value Wall Thickness	
DB1	= H	Identifier: Take over nominal value shrinkage	2)
DB2...DB6	= xxxxx	Nominal Value Shrinkage	
DB1	= I	Identifier: Take over control mode diameter/WT	
DB2...DB6	= xxxxx	0 : control mode diameter	
		1 : control mode wall thickness	
DB1	= J	Identifier: Take over control mode HOT/COLD or HOT	2)
DB2...DB6	= xxxxx	0 : control mode HOT	
		1 : control mode HOT/COLD	
DB1	= K	Identifier: Take over conductor type	2)
DB2...DB6	= xxxxx	0 : conductor type = ROUND	
		1 : conductor type = SECTOR, PRESPIRALLED	
		2 : conductor type = SECTOR, STRAIGHT	
DB1	= L	Identifier: Take over automatic mode select of diameter 0	1)
DB2...DB6	= xxxxx	0 : automatic mode OFF	
		1 : automatic mode ON	
		2 : automatic mode HOLD	

- continued -

- continued -

DB1	= M	Identifier: Take over automatic mode select of diameter 1	1)
DB2...DB6	= xxxxx	0 : automatic mode OFF 1 : automatic mode ON 2 : automatic mode HOLD	
DB1	= N	Identifier: Take over automatic mode select of outer diameter/ WT	
DB2...DB6	= xxxxx	0 : automatic mode OFF 1 : automatic mode ON 2 : automatic mode HOLD	
DB1	= O	Identifier: *RESERVED*	
DB2...DB6	= xxxxx	Reserved, do not use	
DB1	= P	Identifier: Take over nominal value SPARK HV	1)
DB2...DB6	= xxxxx	Nominal Value SPARK HV	
DB1	= Q	Identifier: Take over tolerance value lump	1)
DB2...DB6	= xxxxx	Tolerance Value Lump	
DB1	= R	Identifier: Take over tolerance value neckdown	1)
DB2...DB6	= xxxxx	Tolerance Value neckdown	
DB1	= S	Identifier: Take over tolerance value length	1)
DB2...DB6	= xxxxx	Tolerance Value Length	
DB1	= T	Identifier: Take over sector R1	3)
DB2...DB6	= xxxxx	Sector R1	
DB1	= U	Identifier: Take over sector R2	3)
DB2...DB6	= xxxxx	Sector R2	
DB1	= V	Identifier: Take over tolerance value eccentricity	4)
DB2...DB6	= xxxxx	Tolerance Value Eccentricity	
DB1	= W	Identifier: Take over tolerance value concentricity	4)
DB2...DB6	= xxxxx	Tolerance Value Concentricity	
DB1	= a	Identifier: Take over nominal value capacitance (hot)	
DB2...DB6	= xxxxx	Nominal Value Capacitance (Hot)	
DB1	= b	Identifier: Take over +tolerance value capacitance (hot)	
DB2...DB6	= xxxxx	+Tolerance Value Capacitance (Hot)	
DB1	= c	Identifier: Take over -tolerance value capacitance (hot)	
DB2...DB6	= xxxxx	-Tolerance Value Capacitance (Hot)	
DB1	= d	Identifier: Take over nominal value capacitance (cold)	
DB2...DB6	= xxxxx	Nominal Value Capacitance (Cold)	
DB1	= e	Identifier: Take over +tolerance value capacitance (cold)	
DB2...DB6	= xxxxx	+Tolerance Value Capacitance (Cold)	
DB1	= f	Identifier: Take over -tolerance value capacitance (cold)	
DB2...DB6	= xxxxx	-Tolerance Value Capacitance (Cold)	

1) only if installed
2) only if enabled
3) only if conductor type = SECTOR
4) only if CENTERVIEW

Transmission telegrams ECOCONTROL 2000 (reactions on request) SLAVE → MASTER:

Reaction on incorrect received telegrams

ESC	DB1	CR	LF	BCC

DB1	= 0	request is not understood (received telegram is invalid)

Reaction on received telegrams, which are triggered (<ESC>... <CR>...) and include errors (number of <DBx> may be wrong, <LF> may be missing, <BCC> may be wrong). If <ESC> or <CR> is missing, the device recognizes time-out.

Reaction on MASTER telegram with identifier DB1 = 0

ESC	DB1	...	DBn	CR	LF	BCC

	DB = Data (n byte)

DB		Contents:	Remark
DB...	= xxxxx	Nominal Value Capacitance (Hot)	1)
DB...	= xxxxx	+Tolerance Value Capacitance (Hot)	1)
DB...	= xxxxx	-Tolerance Value Capacitance (Hot)	1)
DB...	= xxxxx	Nominal Value Capacitance (Cold)	1)
DB...	= xxxxx	+Tolerance Value Capacitance (Cold)	1)
DB...	= xxxxx	-Tolerance Value Capacitance (Cold)	1)
DB...	= xxxxx	Nominal Value Diameter 0	1)
DB...	= xxxxx	+Tolerance Value Diameter 0	1)
DB...	= xxxxx	-Tolerance Value Diameter 0	1)
DB...	= xxxxx	Nominal Value Diameter 1	1)
DB...	= xxxxx	+Tolerance Value Diameter 1	1)
DB...	= xxxxx	-Tolerance Value Diameter 1	1)
DB...	= xxxxx	Nominal Value Diameter 2	1)
DB...	= xxxxx	+Tolerance Value Diameter 2	1)
DB...	= xxxxx	-Tolerance Value Diameter 2	1)
DB...	= xxxxx	Nominal Value Diameter 3	1)
DB...	= xxxxx	+Tolerance Value Diameter 3	1)
DB...	= xxxxx	-Tolerance Value Diameter 3	1)
DB...	= xxxxx	Nominal Value Wall Thickness	2)
DB...	= xxxxx	+Tolerance Value Wall Thickness	2)
DB...	= xxxxx	-Tolerance Value Wall Thickness	2)
DB...	= xxxxx	Nominal Value Shrinkage	2)
DB...	= x	0 : control outer diameter 1 : control wall thickness	
DB...	= x	0 : control mode HOT 1 : control mode HOT/COLD	
DB...	= x	0 : automatic control (diameter 0) OFF 1 : automatic control (diameter 0) ON 2 : automatic control (diameter 0) HOLD	1)
DB...	= x	0 : automatic control (diameter 1) OFF 1 : automatic control (diameter 1) ON 2 : automatic control (diameter 1) HOLD	1)
DB...	= x	0 : automatic control (outer diam./wall thickness) OFF 1 : automatic control (outer diam./wall thickness) ON 2 : automatic control (outer diam./wall thickness) HOLD	
DB...	= xxxx	Nominal Value SPARK HV	1)
DB...	= xxxx	Tolerance Value Lump	1)
DB...	= xxxx	Tolerance Value Neckdown	1)
DB...	= xxxx	Tolerance Value Length	1)
DB...	= x	Conductor Type 0 : conductor type = ROUND 1 : conductor type = SECTOR, PRESPIRALLED 2 : conductor type = SECTOR, STRAIGHT	2)
DB...	= xxxxx	Sector R1	2)
DB...	= xxxxx	Sector R2	2)
DB...	= xxxxx	Tolerance Value Eccentricity	2)
DB...	= xxxx	Tolerance Value Concentricity	2)

1) only if installed
2) only if enabled

Reaction on MASTER telegram with identifier DB1 = 1

ESC	DB1	...	DBn	CR	LF	BCC

DB = Data (n byte)

DB		Contents:	Remark
DB...	= xxxxx	Actual Value Capacitance (Hot)	1)
DB...	= x	Status Capacitance (Hot)	1)
DB...	= xxxxx	Actual Value Capacitance (Cold)	1)
DB...	= x	Status Capacitance (Cold)	1)
DB...	= xxxxx	Actual Value Diameter 0	1)
DB...	= x	Status Diameter 0	1)
DB...	= xxxxx	Actual Value Diameter 1	1)
DB...	= x	Status Diameter 1	1)
DB...	= xxxxx	Actual Value Diameter 2	1)
DB...	= x	Status Diameter 2	1)
DB...	= xxxxx	Actual Value Diameter 3	1)
DB...	= x	Status Diameter 3	1)
DB...	= xxxxx	Actual Value Wall Thickness	2)
DB...	= x	Status Wall Thickness	2)
DB...	= x	0 : device in internal/external mode 1 : device in external mode	
DB...	= xxx	Actual Spark Fault Counter	1)
DB...	= xxx	Actual Lump Counter	1)
DB...	= xxx	Actual Neckdown Counter	1)
DB...	= xxxxx	Actual Value Eccentricity	2)
DB...	= x	Status Eccentricity	2)
DB...	= xxxxx	Actual Value Angle	2)

1) only if installed
2) only if enabled

Reaction on MASTER telegrams with identifier DB1 = 2, 3 etc.

ESC	DB1	CR	LF	BCC

DB1	= 1	request is understood (received telegram is valid)

Status Value	Meaning			
	Status Diameter	Status Wall Thickness	Status Eccentricity / Concentricity	Status Capacitance
0	actual value is valid	actual value is valid	actual value is valid	actual value is valid
1	actual value is valid	actual value is valid +tol. limit exceeded	actual value is valid	actual value is valid +tol. limit exceeded
2	actual value is valid	actual value is valid -tol. limit exceeded	actual value is valid	actual value is valid -tol. limit exceeded
3	actual value is invalid, cable is missing	actual value is invalid	actual value is invalid, cable out of range	actual value is invalid, cable is missing
4	actual value is invalid, cable too low	-	-	actual value is invalid, generator voltage too low
5	actual value is invalid, cable too high	-	-	actual value is invalid, meas. range (upper limit) exceeded
6	actual value is invalid, glasses dirty	-	-	actual value is invalid, bare wire
7	actual value is invalid, camera underexposed	-	-	actual value is invalid, meas. electronics not OK
8	communication fault	-	-	communication fault
9	-	-	actual value is invalid, inductivity failure	-