

Up-to-date electronic control for blow moulding machines



precise
flexible
efficient

Overview

IPC-control based on Windows CE.NET

Function independent hardware from Beckhoff

Control CPU integrated in the operator panel

Operator panel with touch screen

Extremely fast fieldbus over EtherCAT for the connection of the I/O signals

PLC software, technology software and visualisation software on one pc

Beckhoff TwinCAT control software with hard realtime

Saving data on compact-flash, usb-stick or network server

Remote diagnostic over LAN (Internet) or modem

**precise
flexible
efficient**

Advantages at a glance

**Realtime operating system of latest generation:
Microsoft Windows CE.NET**

**Function independent hardware, all software modules
are installed in one CPU**

Powerfull IPC without fan and rotating storage drive

Exchange of programs by storage card

**Operation without UPS, low power usage, low heat
development**

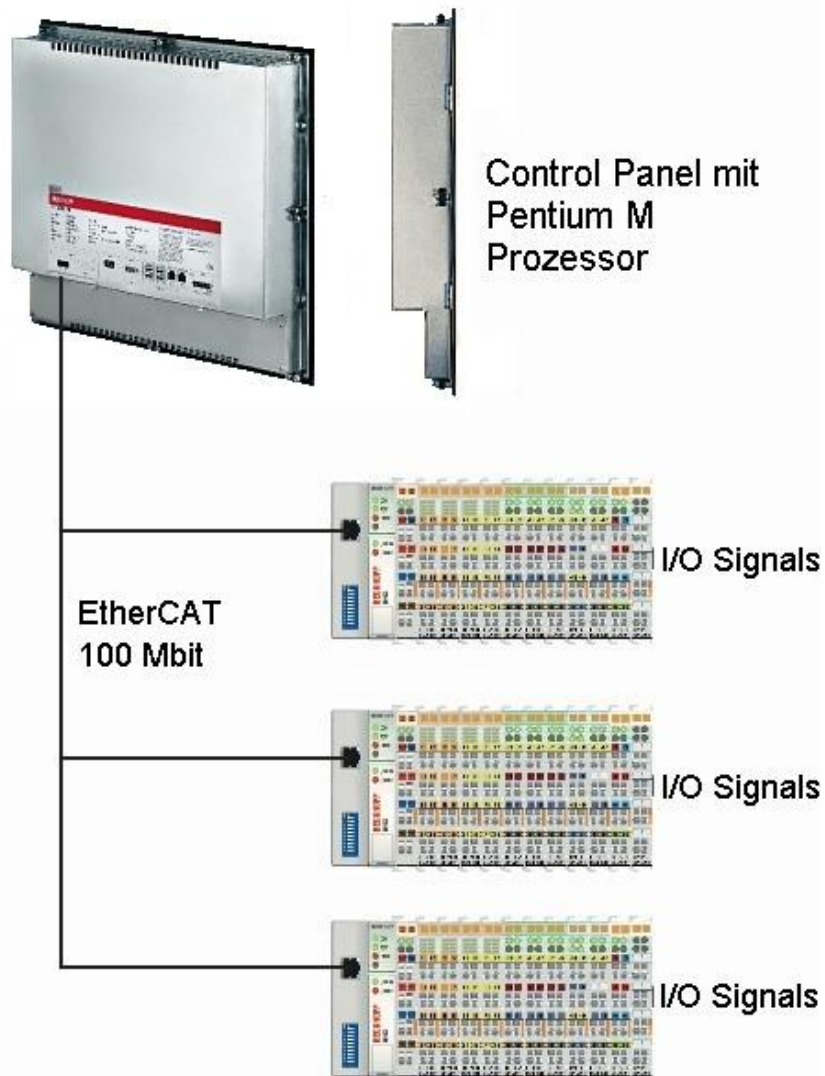
**Support of many fieldbus systems like Profibus,
CANopen, DeviceNET, SERCOS and Lightbus**

**Small measurements of the system require little space
within the switchboard or terminal box**

**User friendly and easy to handle operation on the
screens**

**precise
flexible
efficient**

Concept of control



In panel integrated IPC without fan and rotating storage drive

Powerfull Pentium Processor

100MBit EtherCAT fieldbus for the connection of the I/Os

Max. 100m distance between two I/O stations

Optional fieldbus systems (Profibus, CAN-Open, Sercos, DeviceNET, SERCOS,...)

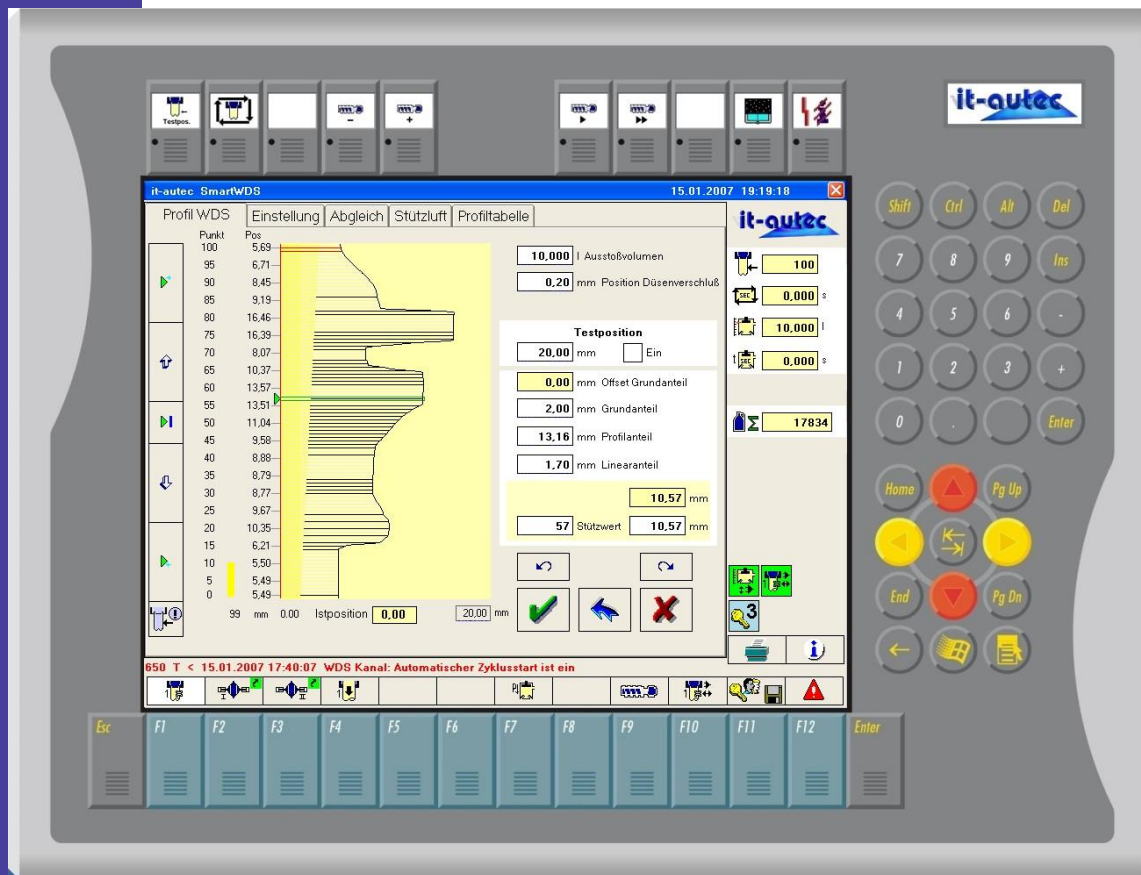
USB interface (e.g. for USB-stick, additional keyboard, ...)

Network interface: 1GBit for the connection to a server

Modem interface (RS232)

precise
flexible
efficient

Operator panel



12 inch TFT display, resolution 800 x 600 pixel

Touchscreen

12 function keys for screen selection

Numerical keyboard for input of nominal values

Cursorblock

10 PLC-keys with LED for activation of functions

Installation in the wall of the switch board or hanging panel version

Ethernet-interface 1Gbit, USB-interface, RS232, DVI

precise
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efficient

Function overview

Temperature control for extruder and head, 3- and 2 point controller, self tuning, heating power supervision

Wallthickness control up to 10 channels (hydraulic or electric control e.g. stepper or servo drive)

Accumulator head operation (constant ejection or profiled)

Extruder rpm control, synchronized adjustment when operating more than 1 extruder

Parison length control in case of continous extrusion

Filling level control and die adjustment during accumulator head operation

Distance cams for clamping unit, blowpin and mould transport

Motion control for hydraulic axis e.g.: Mould close and open, blowpin up and down, mould transport, core puller

Path-dependent switching to pressure control, position control, asynchronous mould closing , integrated scope function

Analog nominal values e.g.: blow pressure, support air, extruder lifting / lowering, core puller, ...

Display of melt temperature, melt pressure, extruder speed, extruder torque

Monitoring of process parameters as e.g. melt temperature, melt pressure, cycle time, ...

PLC – control – preselections, timers and counters shown on the display

Diagnostics, error message in plaintext and timestamp

Saving setting parameters on compact-flash, USB-stick or network server

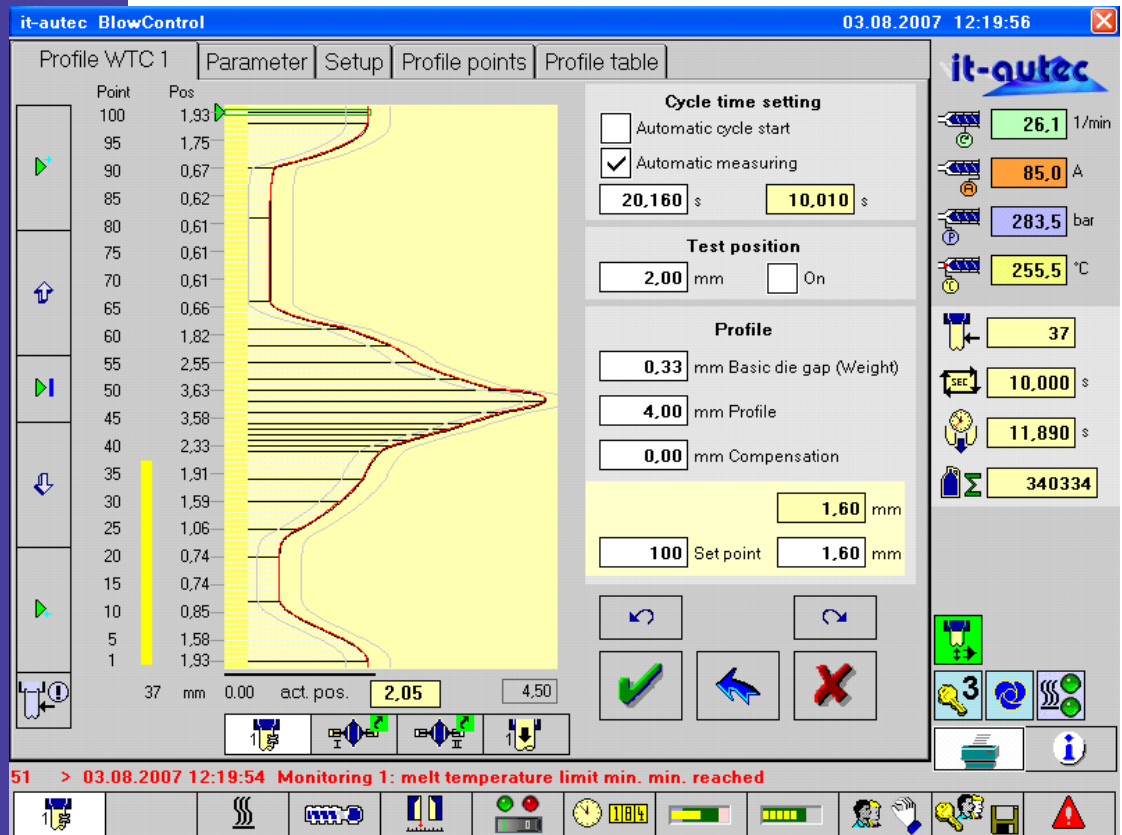
Language and character set reversal for various languages

Access control via PIN-code, 3 user levels , optionally finger print system

Process data logging up to 120 values per cycle, logged internal for one week, optionally on network server, integrated chart

precise
flexible
efficient

Wallthickness control



Continuous or discontinuous extrusion

100 points or 400 points wallthickness profile

Up to 10 channels synchron (wtc- pwtc – multiple extrusion head)

1 channel parison ejection

Correction of parison elongation (linear proportion)

Cycle time specification manually or automatically

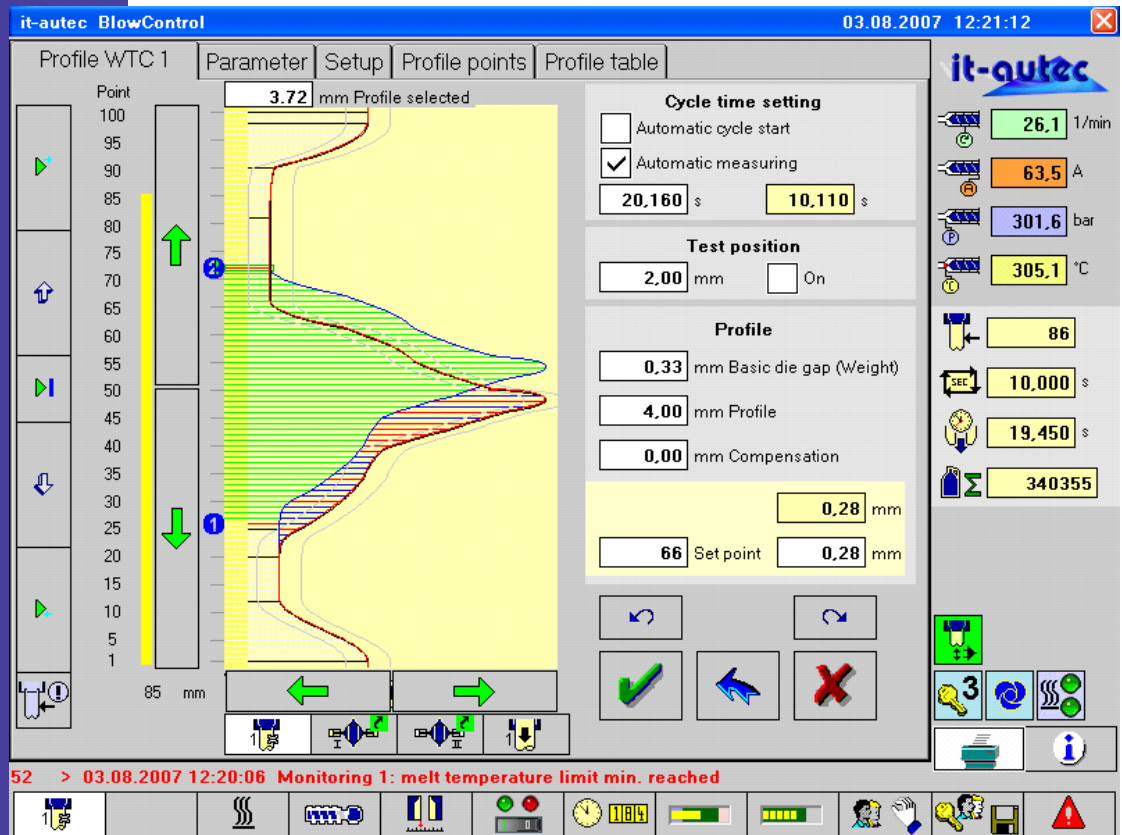
Path check marks (max. 2 at the same time) simply by setting of thick or thin places

Test position

Adjustable tolerance supervision of the actual value

precise
flexible
efficient

Wallthickness control



Single points or curve segments can be vertically or horizontally scrolled

The whole curve can be rotated

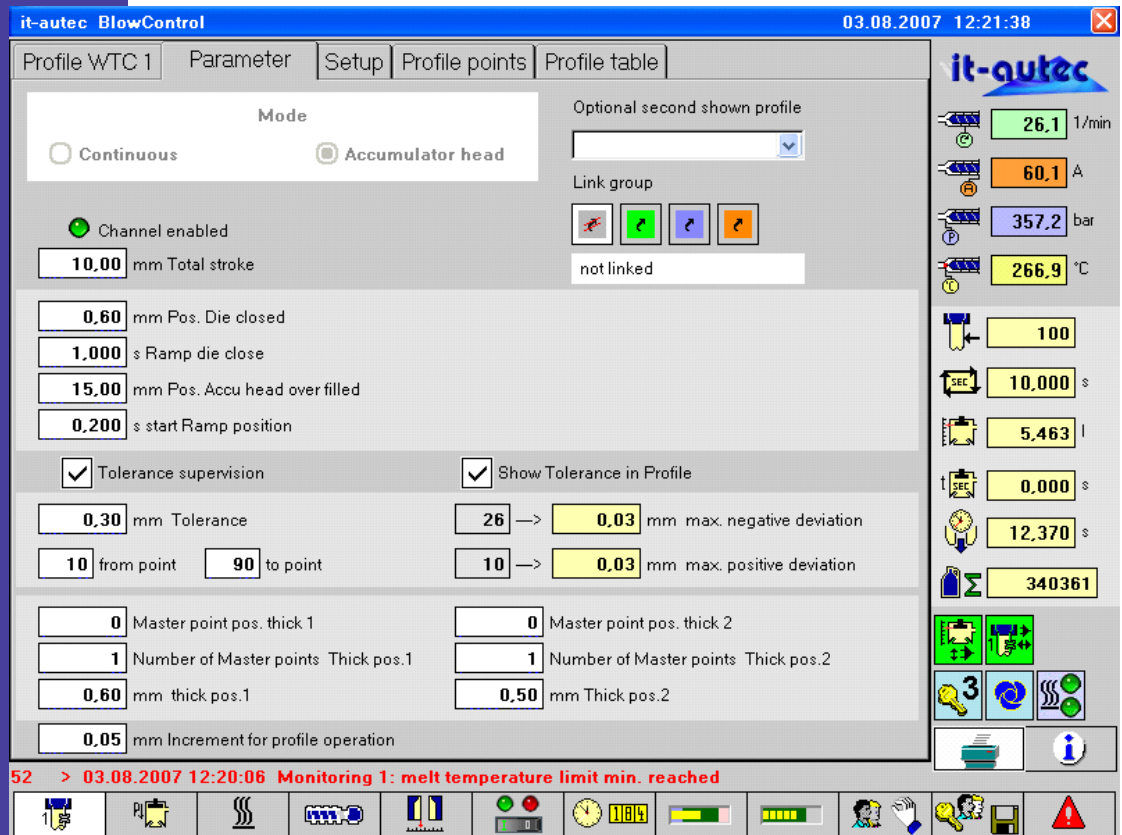
Curve memory up to 10 curves per channel (UNDO-, REDO function)

The profile part of a curve segment can be changed separately

Automatically start cycle for setup and test

precise
flexible
efficient

Wallthickness parameter



The screenshot shows the 'it-autec BlowControl' software window with the 'Parameter' tab selected. The interface includes a top menu bar with 'Profile WTC 1', 'Parameter', 'Setup', 'Profile points', and 'Profile table'. The main area contains several sections for parameter configuration:

- Mode:** Radio buttons for 'Continuous' and 'Accumulator head' (selected).
- Channel enabled:** A green indicator light is shown.
- Optional second shown profile:** A dropdown menu.
- Link group:** Four colored buttons (red, green, blue, orange) and a 'not linked' status.
- Stroke and Position Parameters:**
 - 10.00 mm Total stroke
 - 0.60 mm Pos. Die closed
 - 1.000 s Ramp die close
 - 15.00 mm Pos. Accu head over filled
 - 0.200 s start Ramp position
- Tolerance supervision:** Checkboxes for 'Tolerance supervision' and 'Show Tolerance in Profile' (both checked).
- Tolerance Values:**
 - 0.30 mm Tolerance
 - 26 → 0.03 mm max. negative deviation
 - 10 from point 90 to point 10 → 0.03 mm max. positive deviation
- Master point parameters:**
 - 0 Master point pos. thick 1
 - 1 Number of Master points Thick pos.1
 - 0.60 mm thick pos.1
 - 0 Master point pos. thick 2
 - 1 Number of Master points Thick pos.2
 - 0.50 mm Thick pos.2
 - 0.05 mm Increment for profile operation

On the right side, there is a vertical panel with various status indicators and values:

- 26.1 1/min
- 60.1 A
- 357.2 bar
- 266.9 °C
- 100
- 10.000 s
- 5.463 l
- 0.000 s
- 12.370 s
- 340361

At the bottom, a status bar shows a red warning message: '52 > 03.08.2007 12:20:06 Monitoring 1: melt temperature limit min. reached'. Below this is a toolbar with various icons for system functions.

Parameters are visible only for preselected functions

Profiles can be linked together, i.e. one profile can be diverted to several channels

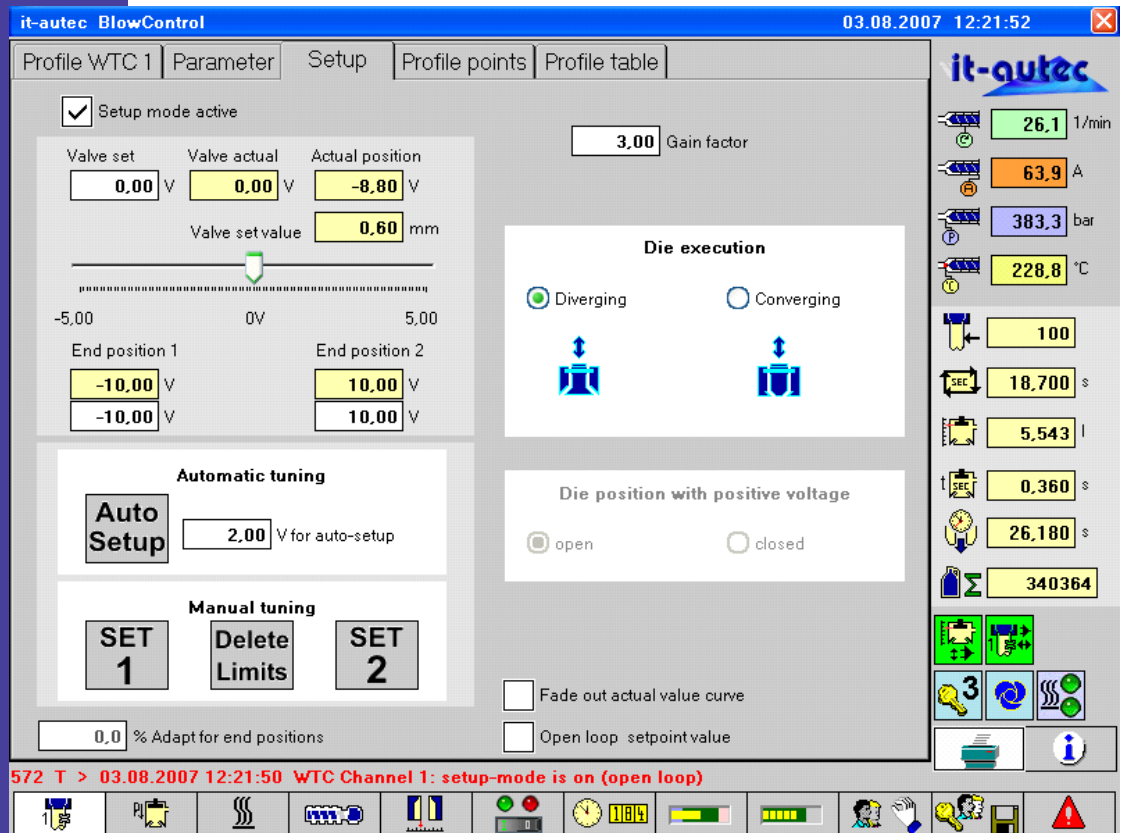
Width and length of thick places can be preselected

Increments of graphic curve adjustments can be adjusted in mm

Tolerance supervision with monitoring of minimum and maximum deviation and appendant profile points

precise
flexible
efficient

Wallthickness calibration



Automatic or manual calibration of the analog actual value transmitter (LVDT)

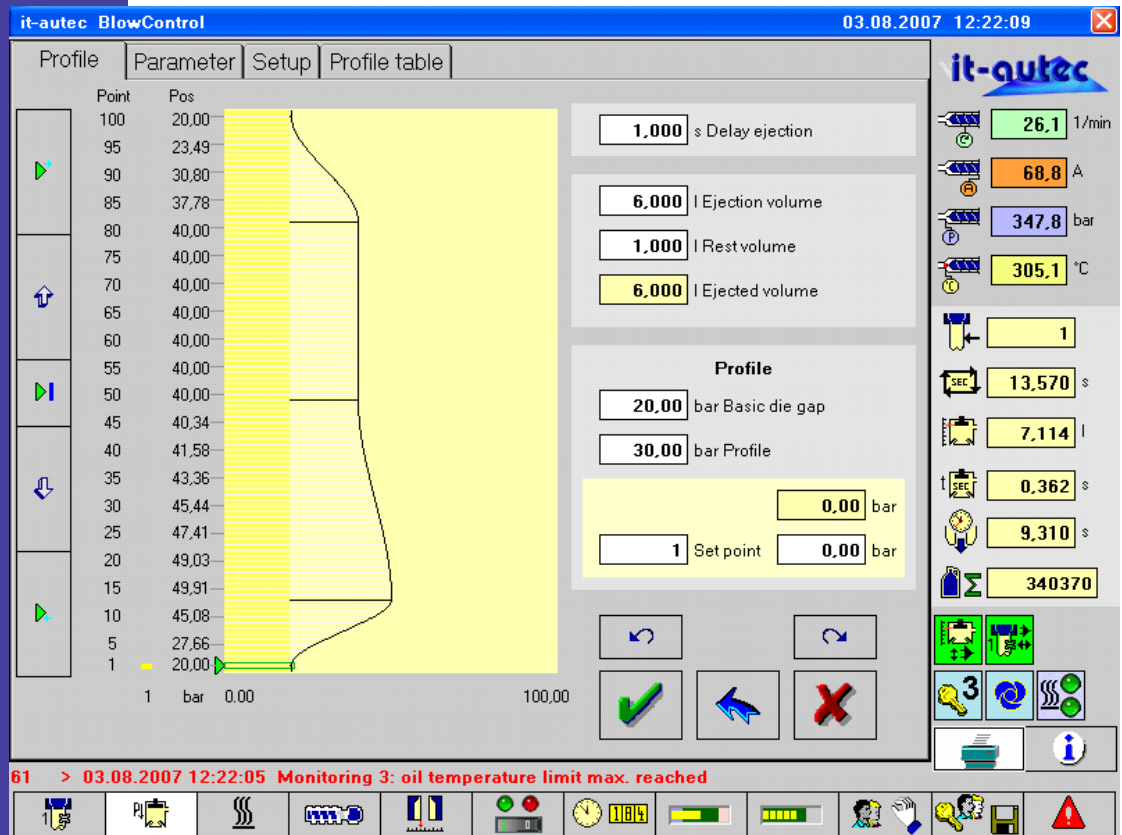
Identification of polarisation, i.e. actual- and nominal value have different directions

Distance from the mechanical stoppers can be adjusted

Switching of die geometrie (diverging, converging)

precise
flexible
efficient

Accumulator head operation



Alternatively constant ejection or push out using printed profile

Sliding route synchronisation for ejection

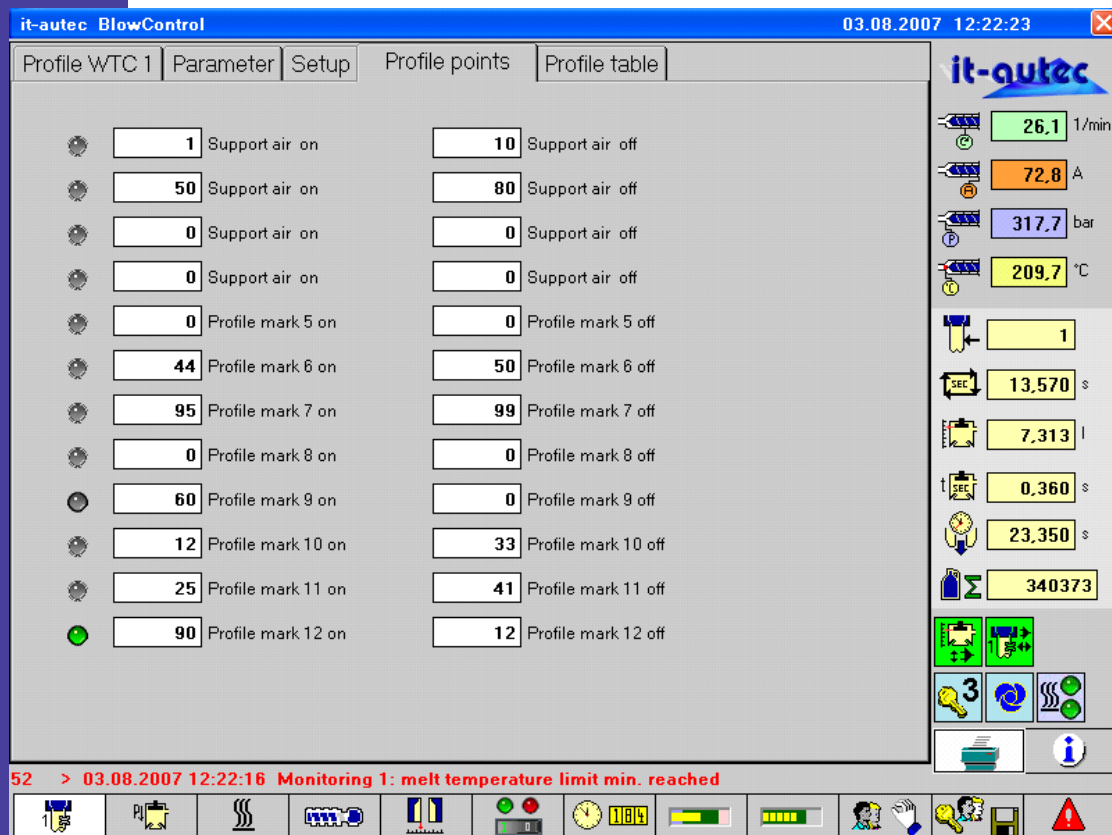
Rest volume

Measuring and monitoring of ejection time

Filling pressure default for filling procedure

precise
flexible
efficient

Profile marks parison



The screenshot displays the 'it-autec BlowControl' software window. The title bar shows the date and time: 03.08.2007 12:22:23. The interface is divided into several sections:

- Profile WTC 1**: A table of profile marks with columns for 'Parameter' and 'Setup'.
- Profile points**: A table of profile points with columns for 'Profile points' and 'Profile table'.
- Profile table**: A table of profile marks with columns for 'Profile marks' and 'Profile table'.
- Parison parameters**: A vertical list of parameters on the right side of the window, including:
 - 26.1 1/min
 - 72.8 A
 - 317.7 bar
 - 209.7 °C
 - 1
 - 13.570 s
 - 7.313 l
 - 0.360 s
 - 23.350 s
 - 340373
- Status bar**: A red message at the bottom reads: '52 > 03.08.2007 12:22:16 Monitoring 1: melt temperature limit min. reached'.

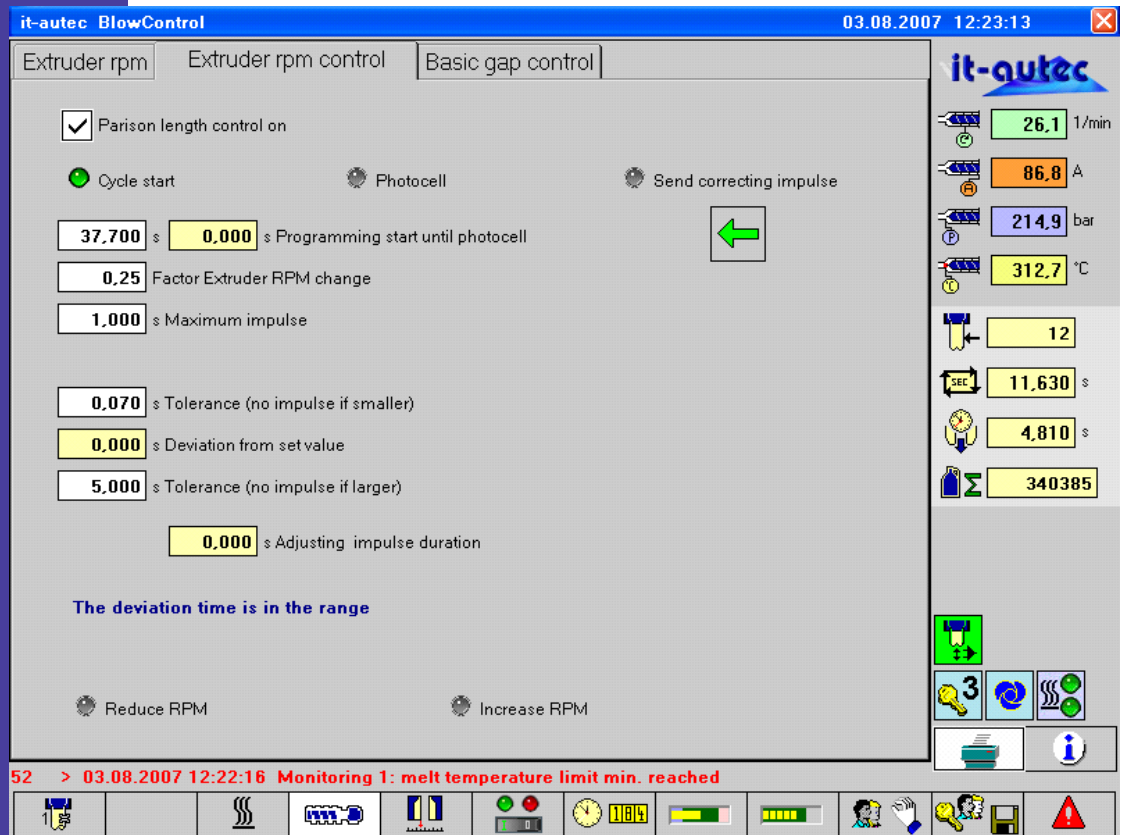
Up to 12 profile marks on the parison length

On- and off switchpoints separately adjustable

Switchpoint also possible when exceeding the cycle (e.g. from point 80 up to point 20)

precise
flexible
efficient

Extruder speed correction



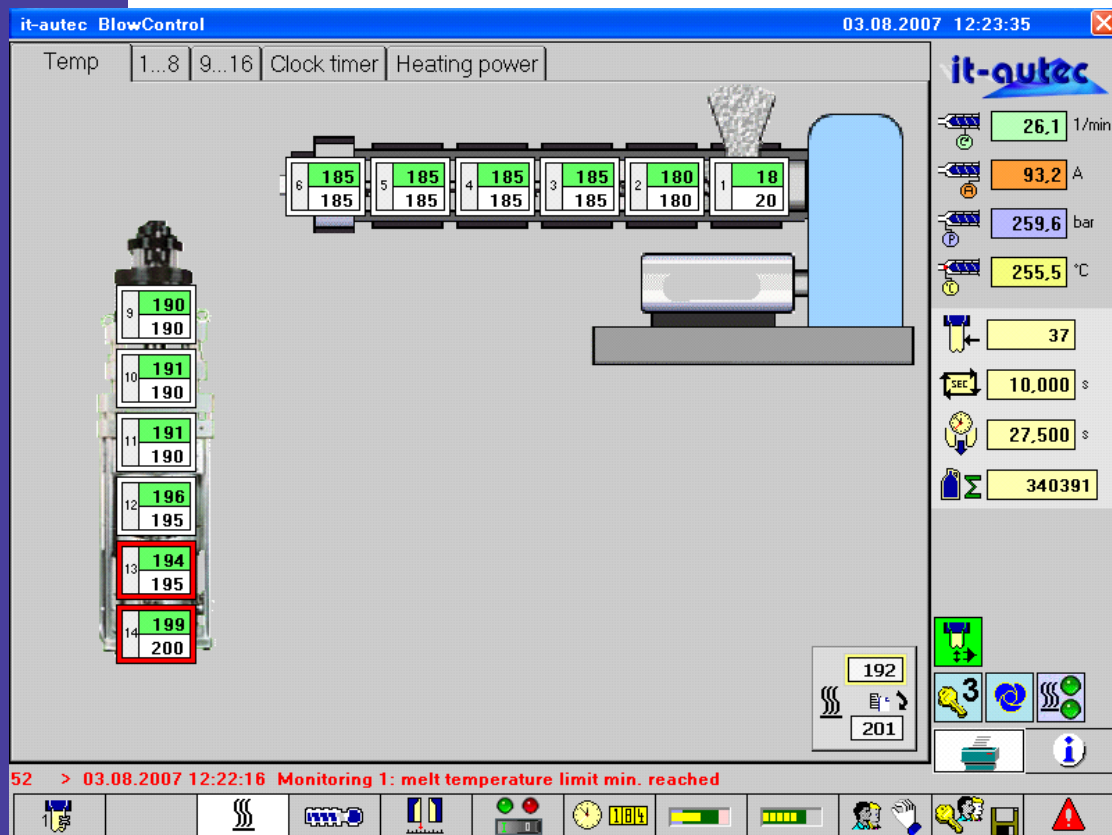
Correction of extruder speed with signal photo cell in case of continuous process

Filling level control of accumulator head at discontinuous process

Control of parison length using a photo cell and die adjustment using accumulator head process

precise
flexible
efficient

Temperature control

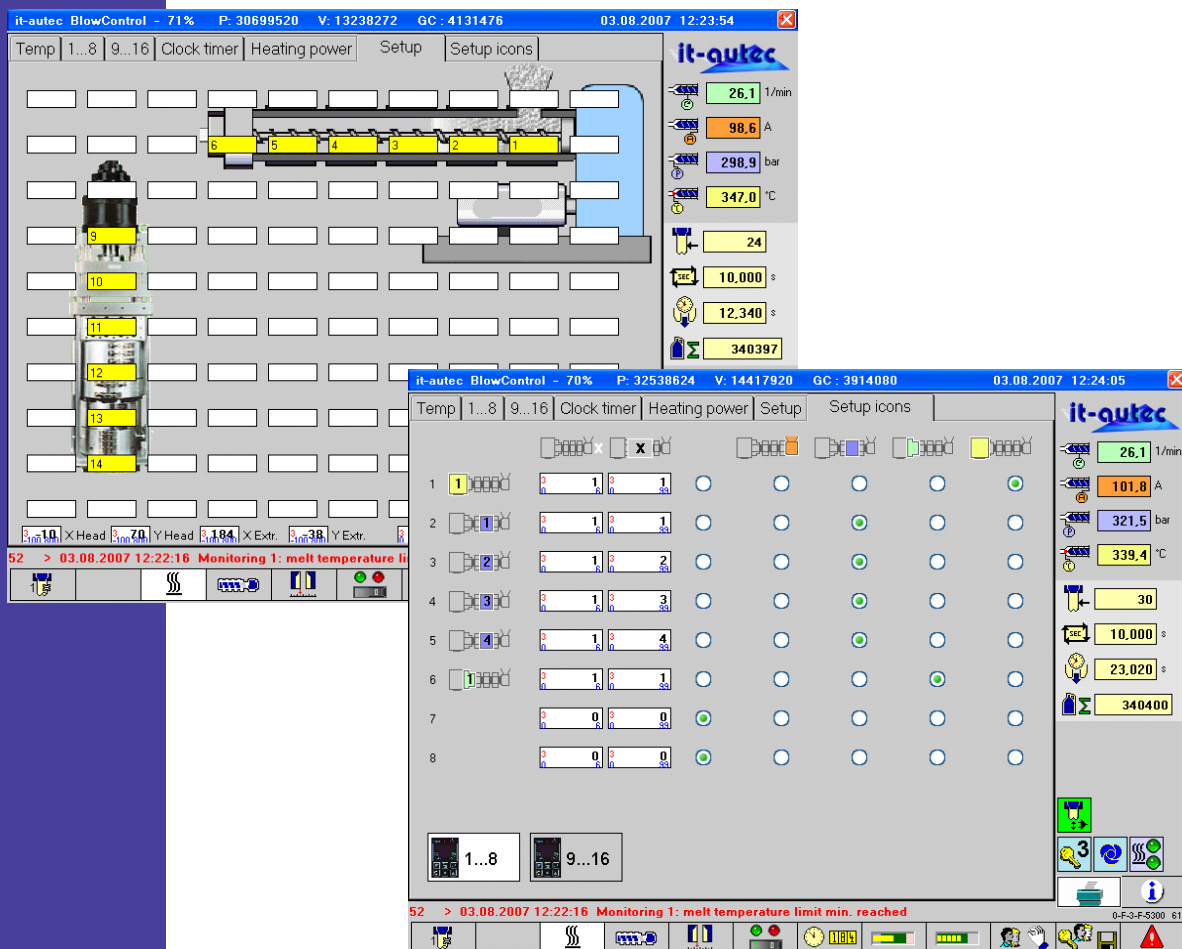


Summary page of temperature zones with operation of set point value display of:

Zone number
Operating condition (heating, cooling on or off)
Actual and nominal value
Tolerance control (excess –resp. Insufficient temperature)
Thermocouple supervision
Mode of operation (automatic or manual operation by manual setting)

precise
flexible
efficient

Temperature control



Configuration of the summary page of the temperature zones

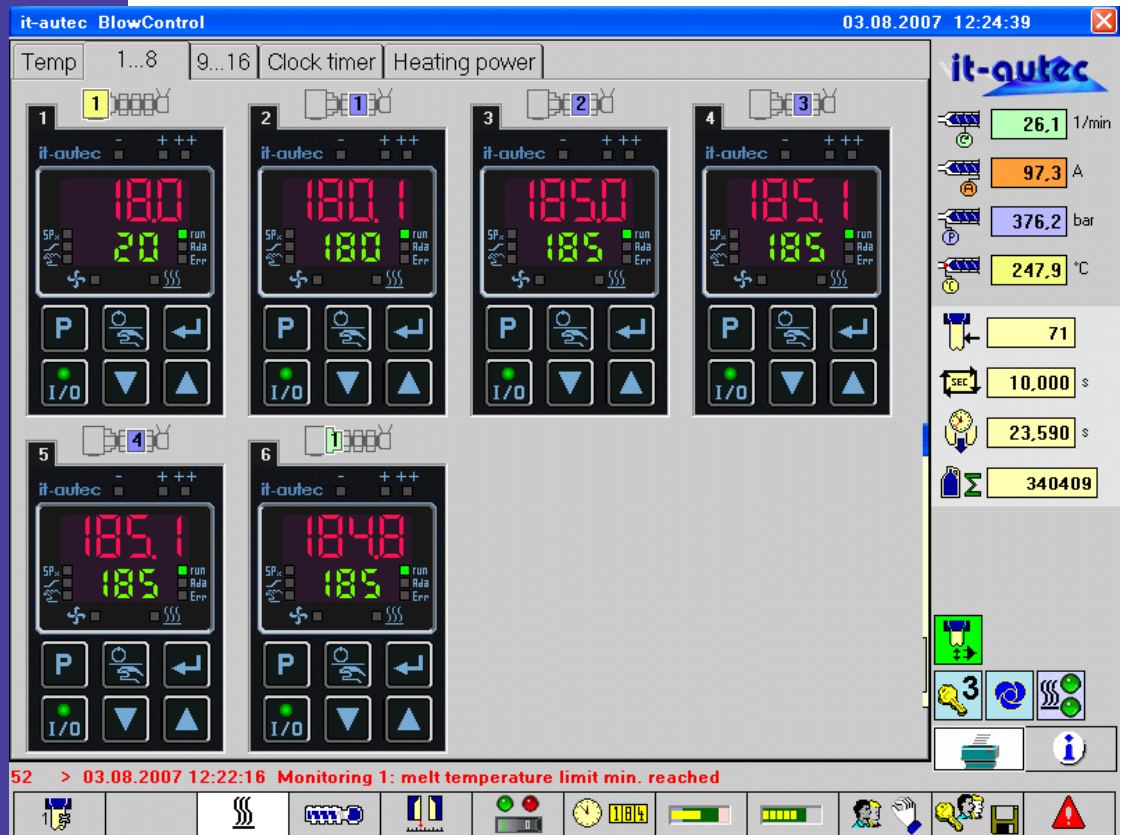
Free choice of positioning of symbols for extruder and parison head

Free choice of allocation of temperature zones to the symbols

The bitmap files for extruder and head are stored on the compact flash

precise
flexible
efficient

Temperature control



Self tuning temperature controller

Two- and three step controller (pulse width modulated)

Nominal value-, lowered nominal value

Manual mode via manual set value

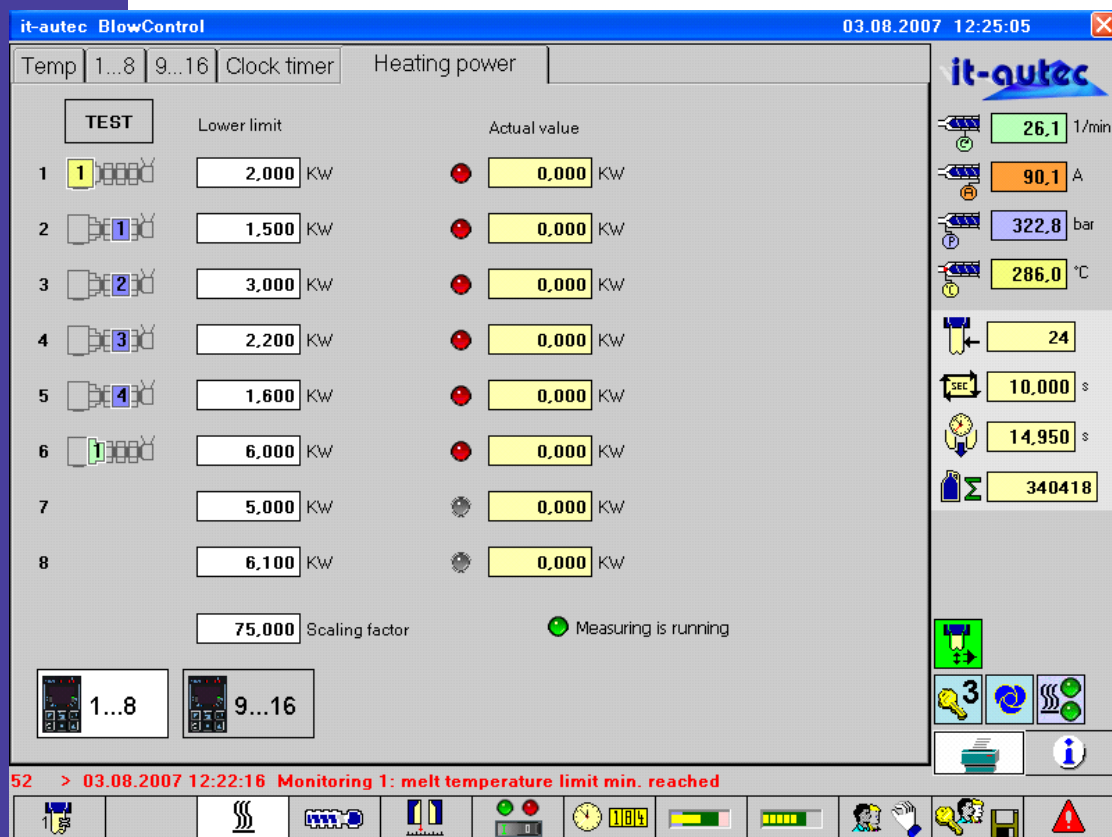
Tolerance supervision

Absolute value supervision

Thermocouple supervision

precise
flexible
efficient

Heating power



Supervision of the heating power

Display of the heating power per zone

Test mode

Clock timer



Alternately one or three clock timer for one week

Post heating time and minimum temperature to prevent cold starts

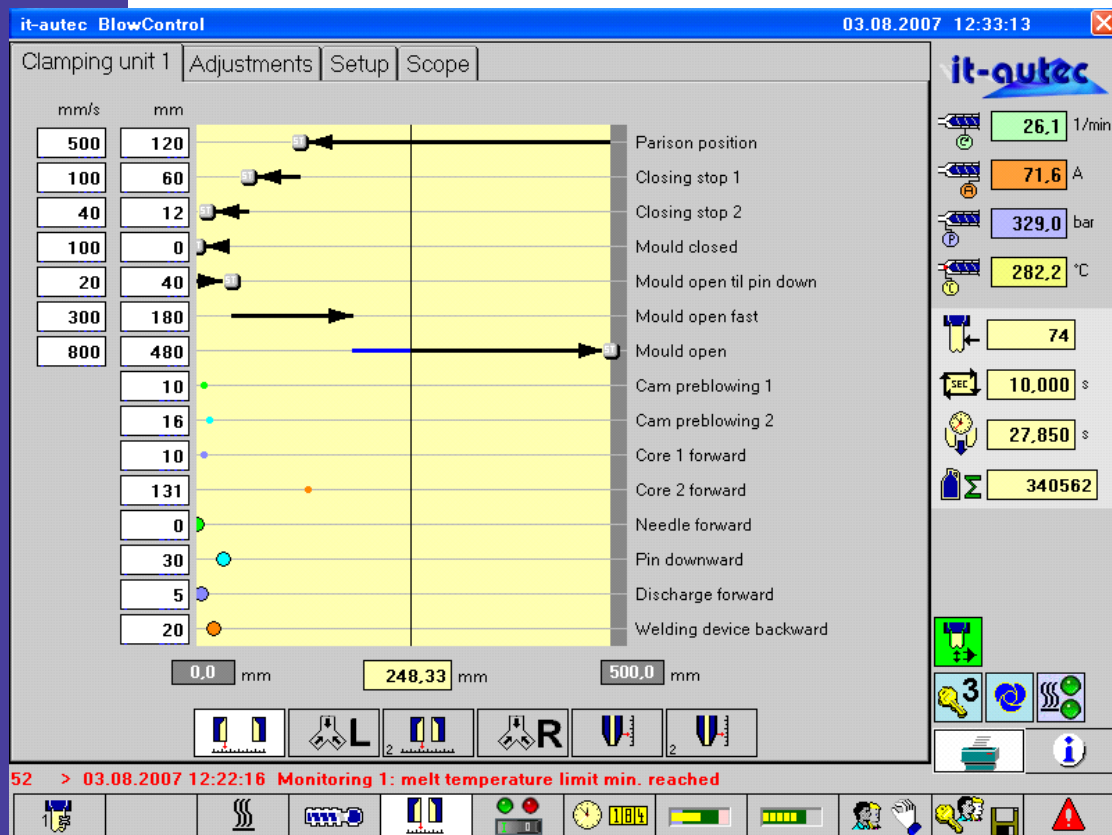
Lowering temperature without fans

Synchronous heating up of the temperature zones

Adjustable controller cycle time to prevent mechanical contactors

precise
flexible
efficient

Motion control



Up to 16 channels motion control e.g. for mould open/close, blowpin up/down, mould transport, core puller, article discharge, ...

Up to 8 speed reshift, movement arrows can be adjusted independent by direction

Up to 8 cams for route dependant control of machine functions

A stop can be parameterised for each movement arrow

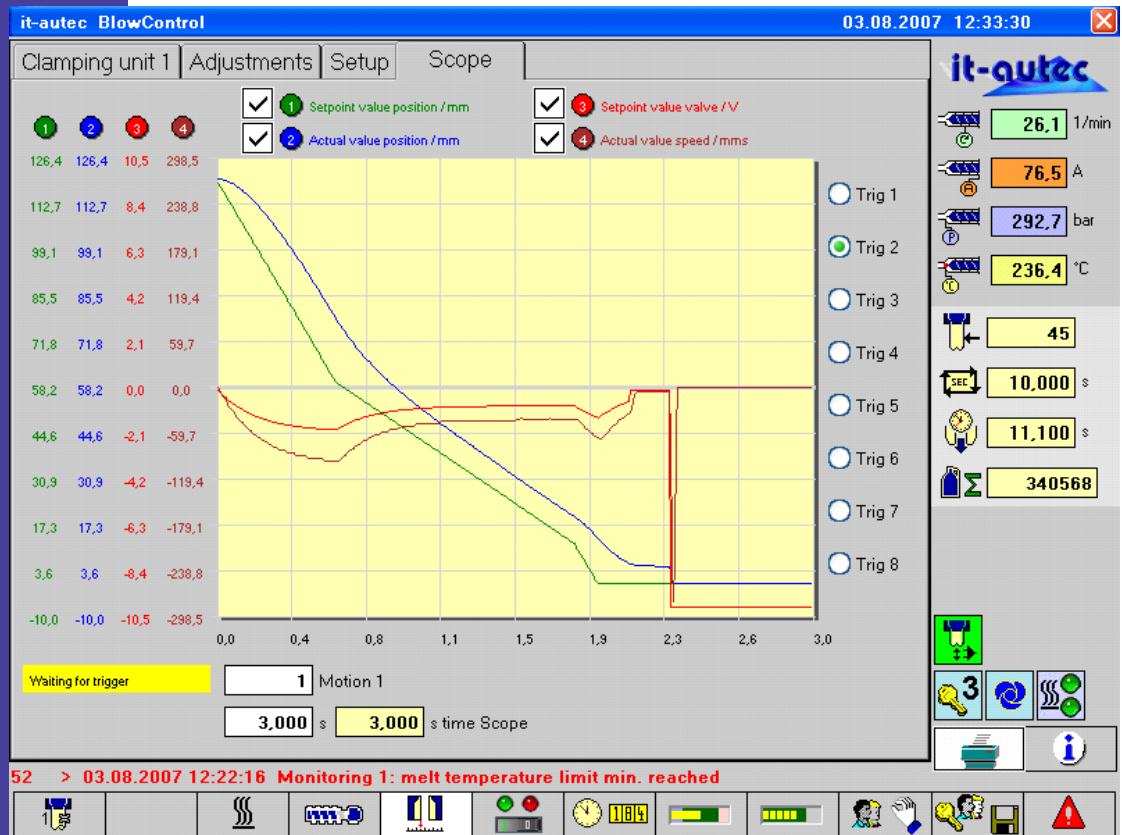
Controlled setpoint at the final positions can be parameterised

Closed loop linear pressure acceleration in the final positions

Path dependant switching to closed loop pressure control

precise
flexible
efficient

Scope function



Scope functions for aid to set up the motion control axis

Measurement of path in (actual and nominal value), actual speed in mm/s and valve output in V

Trigger point adjustable for each movement arrow

Time of measurement adjustable

Automatically scaling of measured values

Not used values can be hide out

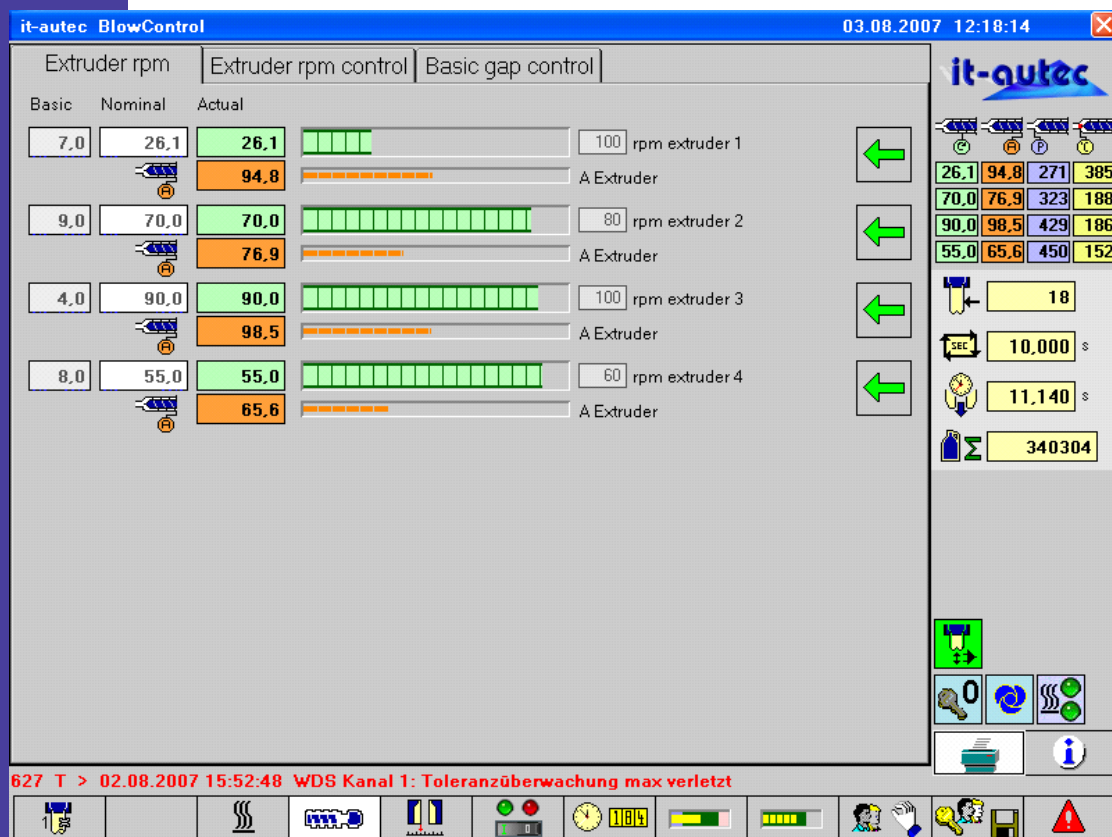
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flexible
efficient

Proportional blowing



Display of blowing devolution in a diagram

Extruder speed control



Extruder speed control for 1 to 8 extruder

Analog set point revolution

Display of revolution actual value and torque (electric current)

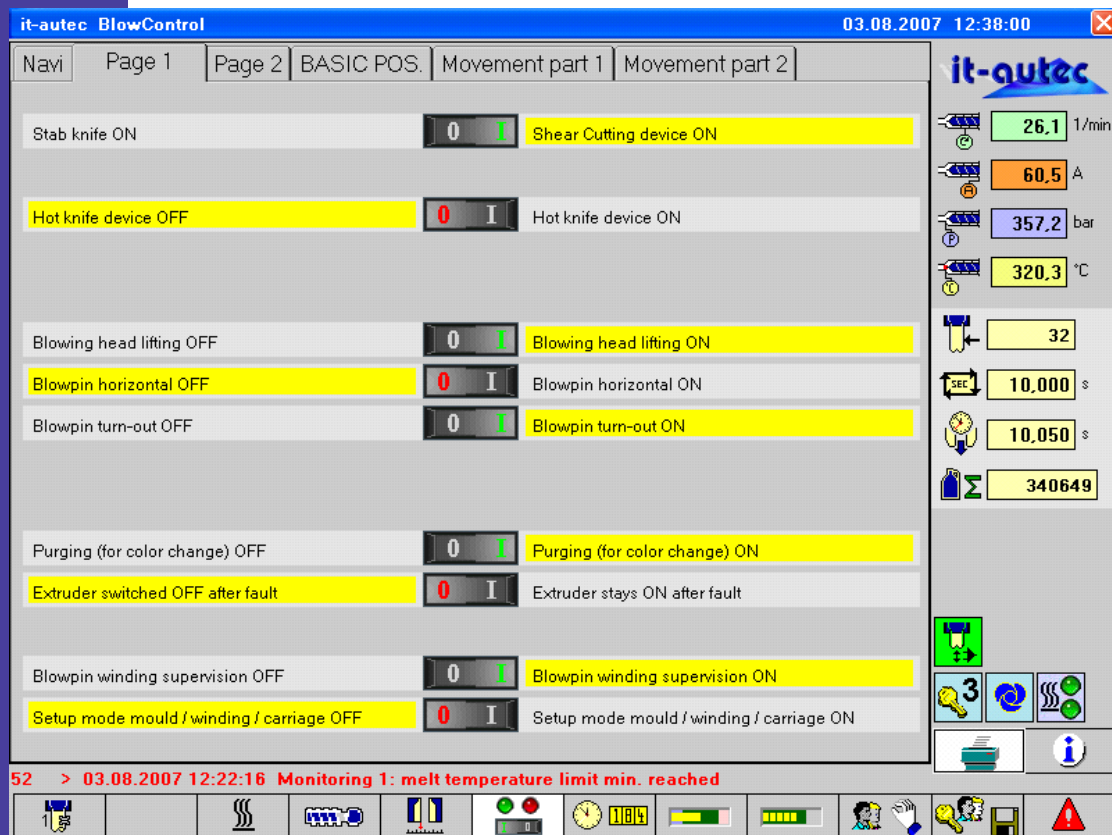
Synchronized adjustment when using more than 1 extruder

Basic rpm / production rpm

Take over the actual rpm to production rpm by pushing a button

precise
flexible
efficient

Preselectors



Preselectors for selection and deselection of machine functions

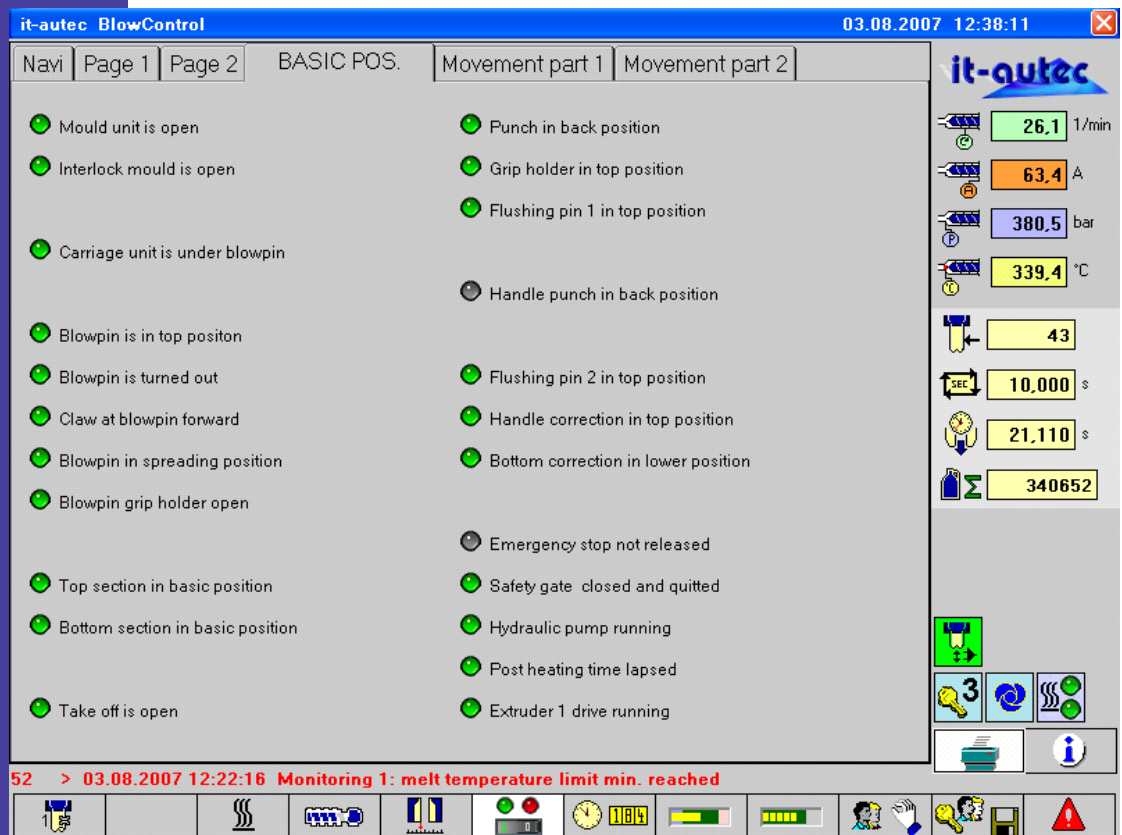
Display for on- and off functions in clear text

Not used selectors can be hide out

Preselector for 1 from n selections can be linked to a group

precise
flexible
efficient

Status of the machine

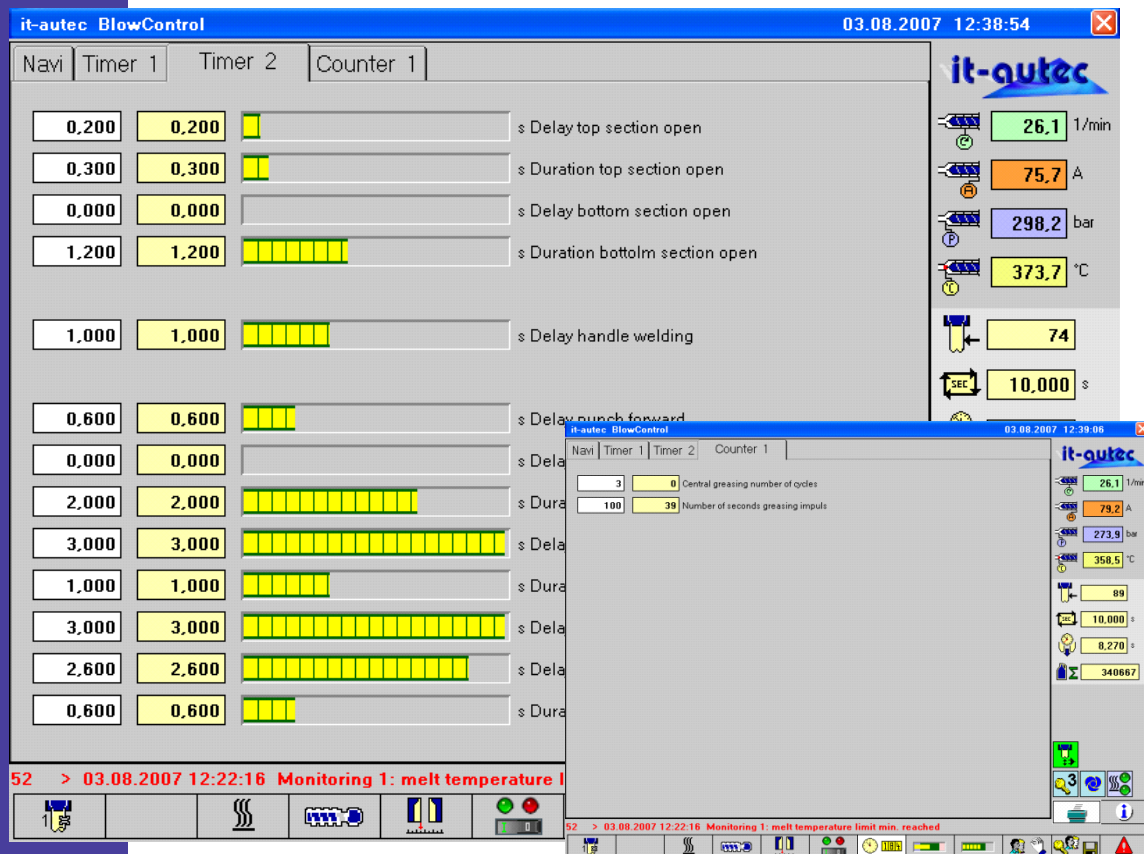


Displays of machine situations (e.g. display of limit positions)

Not used elements can be hide out

precise
flexible
efficient

Timer and counter



Time nominal values for adjusting the machine sequence

Display of time actual values

Time measurements of the main movements

Cycle time supervision

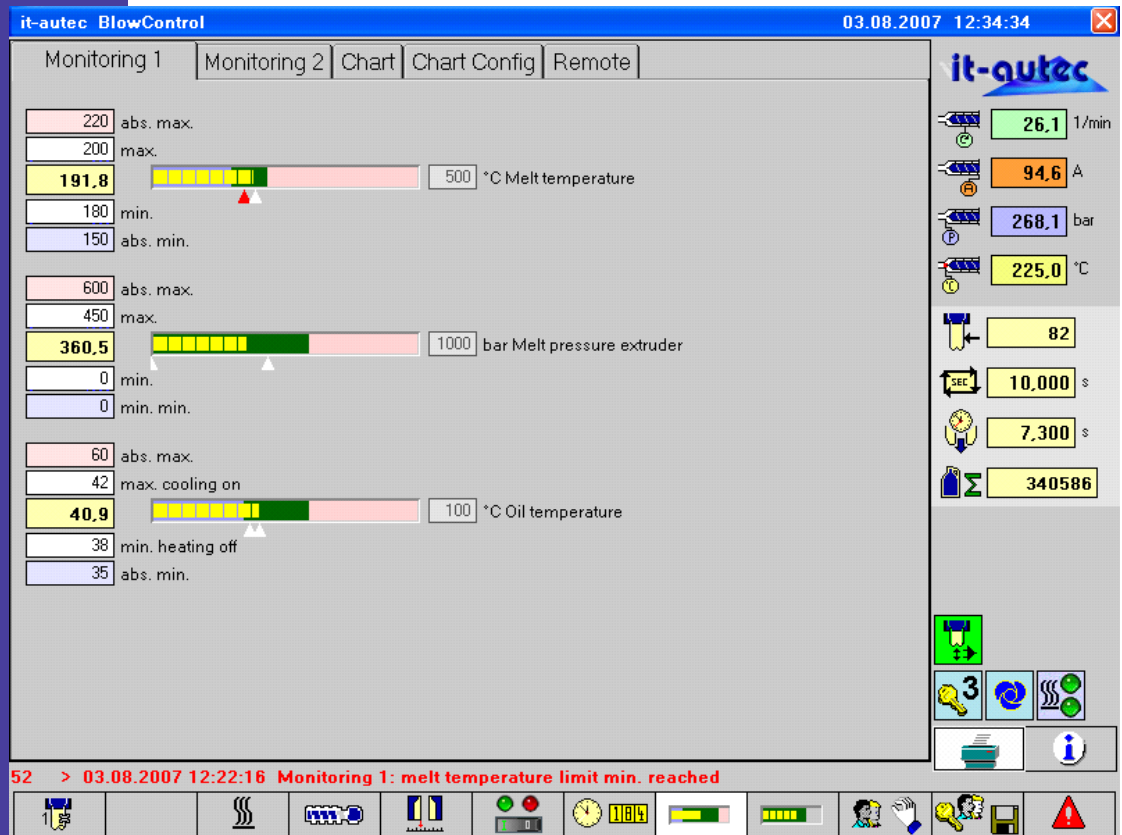
Counter nominal values

Display of counter actual values

Not used timers or counters can be hide out

precise
flexible
efficient

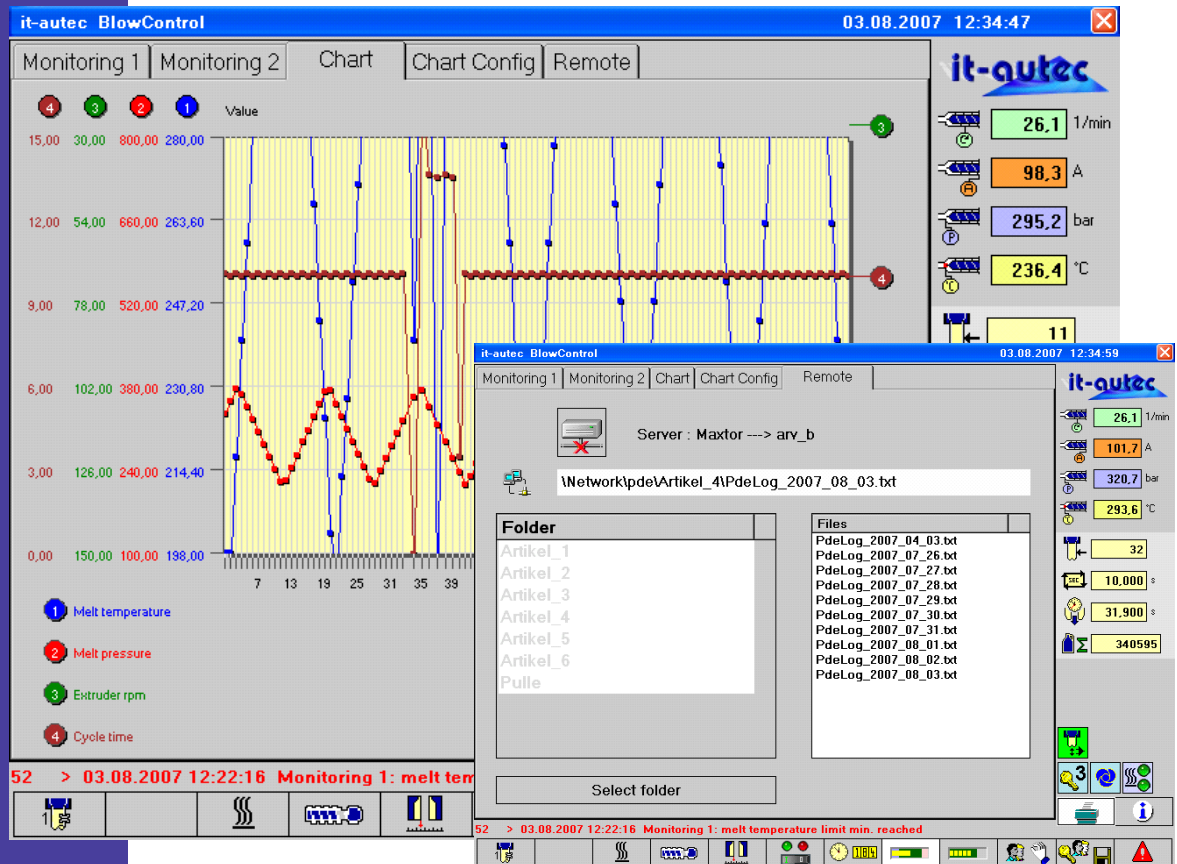
Monitoring of process parameters



Display of process parameters for e.g. melt temperature, melt pressure, oil temperature, oil pressure

Supervision of process parameters like melt temperature, melt pressure, oil temperature, oil pressure for upper limit, upper warning, lower limit and lower warning

Process data logging



Up to 120 actual process values can be logged each cycle on internal flash card or directly to a network server

Data protocol: ASCII file (can be imported in EXCEL), optionally xml-file or connection to SQL-server database

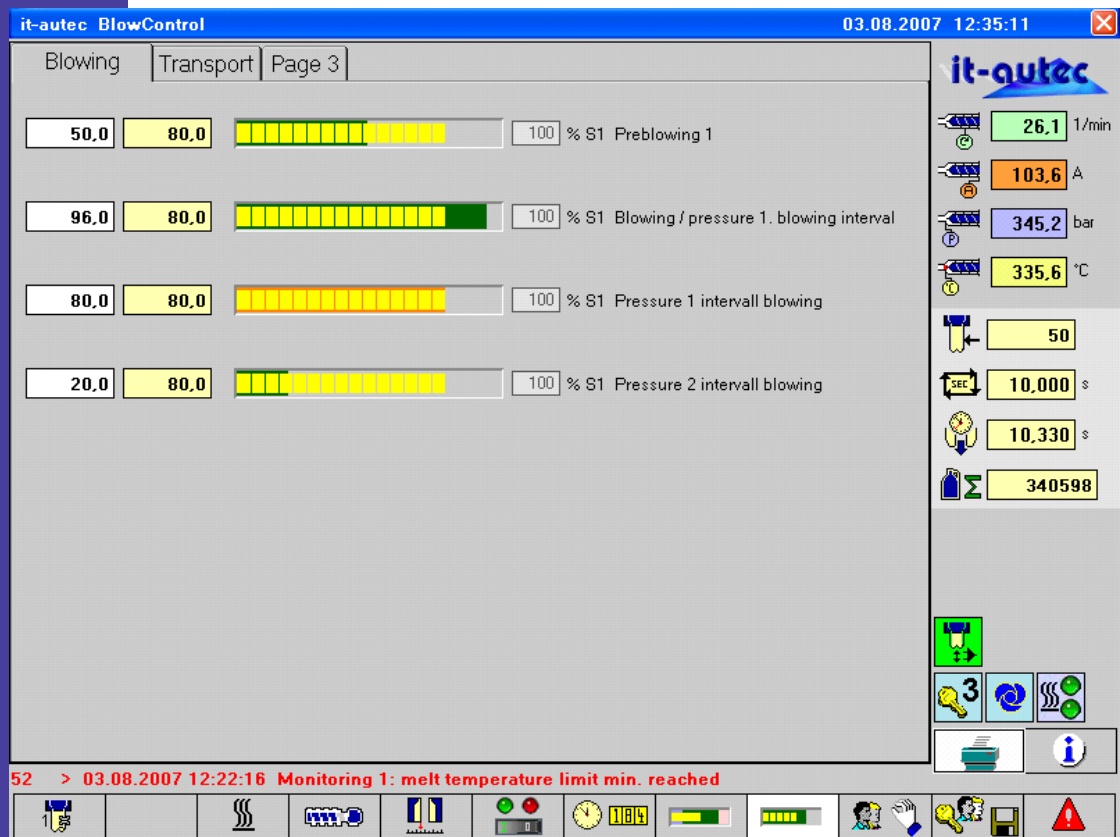
A selection of 4 of the 120 values can be displayed in a chart

The internal logged values are stored for one week

The values on the server are logged in daily reports

precise
flexible
efficient

Setpoint values



Analog nominal values width adjustable ramps and positiv / negativ output values as well configurable positioning of channels e.g. :

Blow pressure via proportional valve

Support air via proportional valve

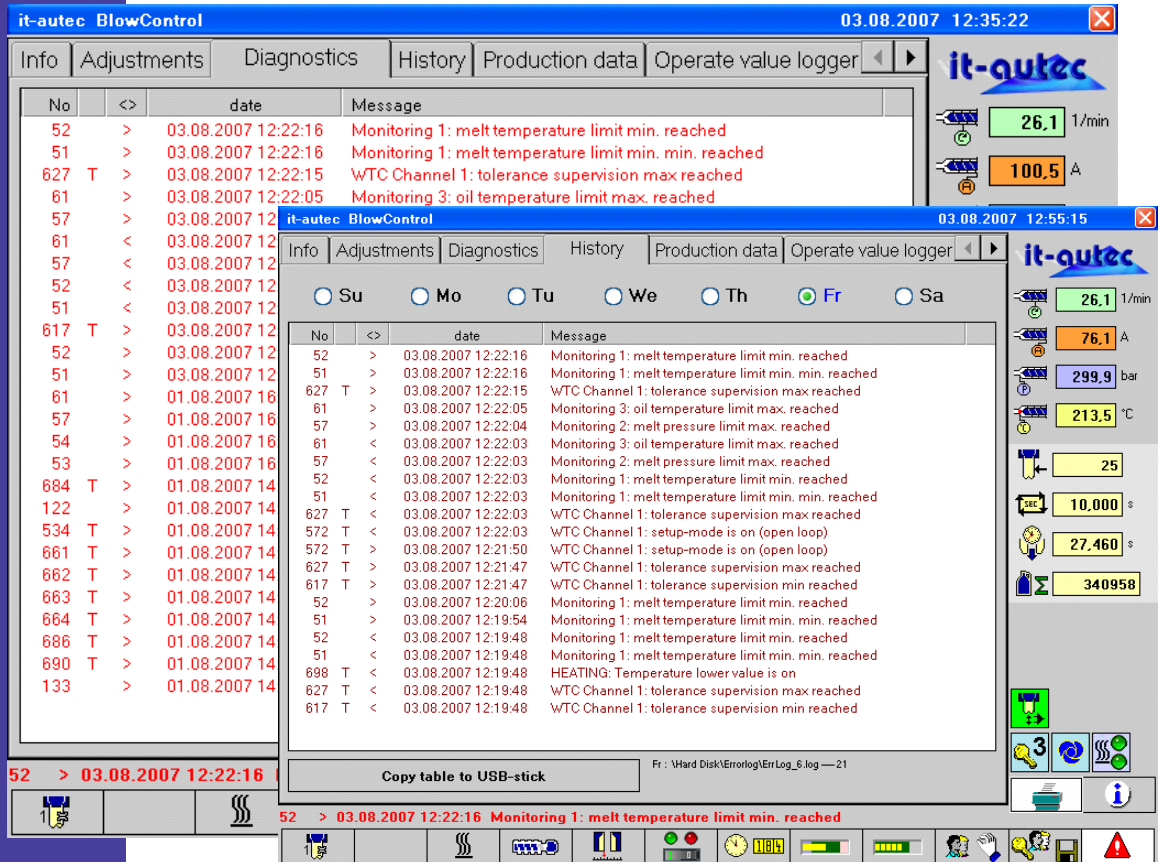
Exruder lifting / lowering

Set value for oil pressure

Open loop core puller via proportional valve

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flexible
efficient

Diagnostics



it-autec BlowControl 03.08.2007 12:35:22

Info Adjustments Diagnostics History Production data Operate value logger

No	<>	date	Message
52	>	03.08.2007 12:22:16	Monitoring 1: melt temperature limit min. reached
51	>	03.08.2007 12:22:16	Monitoring 1: melt temperature limit min. min. reached
627	T	03.08.2007 12:22:15	WTC Channel 1: tolerance supervision max reached
61	>	03.08.2007 12:22:05	Monitoring 3: oil temperature limit max. reached
57	>	03.08.2007 12:22:03	Monitoring 2: melt pressure limit max. reached
61	<	03.08.2007 12:22:03	Monitoring 1: melt temperature limit min. min. reached
57	<	03.08.2007 12:22:03	Monitoring 1: melt temperature limit min. min. reached
52	<	03.08.2007 12:22:03	Monitoring 1: melt temperature limit min. min. reached
51	<	03.08.2007 12:22:03	Monitoring 1: melt temperature limit min. min. reached
617	T	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision min reached
52	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
57	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
54	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
53	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
52	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
51	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
50	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
49	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
48	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
47	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
46	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
45	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
44	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
43	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
42	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
41	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
40	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
39	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
38	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
37	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
36	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
35	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
34	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
33	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
32	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
31	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
30	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
29	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
28	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
27	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
26	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
25	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
24	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
23	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
22	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
21	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
20	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
19	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
18	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
17	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
16	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
15	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
14	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
13	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
12	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
11	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
10	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
9	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
8	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
7	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
6	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
5	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
4	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
3	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
2	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached
1	>	03.08.2007 12:21:47	WTC Channel 1: tolerance supervision max reached

Copy table to USB-stick

Fr : \\Hard Disk\\ErrorLog\\ErrLog_6.log — 21

52 > 03.08.2007 12:22:16 Monitoring 1: melt temperature limit min. reached

Error message and status message are shown in clear text

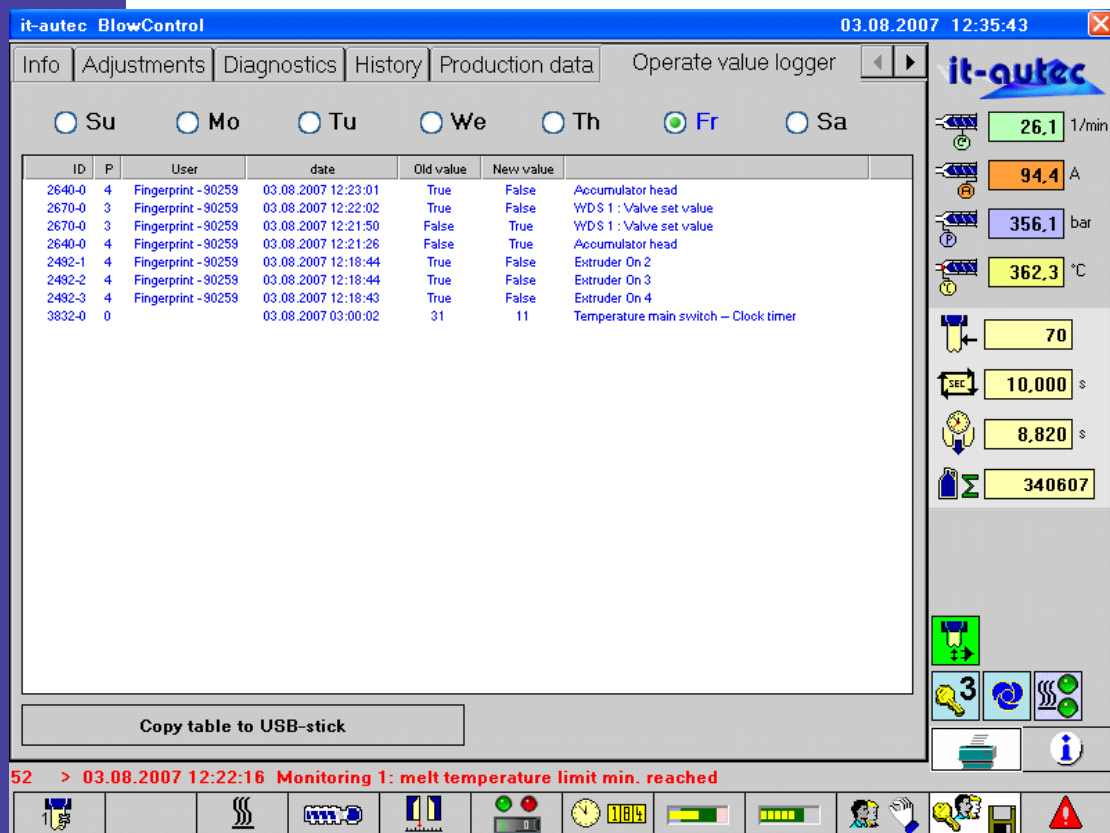
Timestamp for message „appear“ and message „disappear“

History for one week in internal memory

Optionally history on network server in daily reports

precise
flexible
efficient

Operator protocol



The screenshot shows the 'it-autec BlowControl' software interface. At the top, there are tabs for 'Info', 'Adjustments', 'Diagnostics', 'History', 'Production data', and 'Operate value logger'. Below these are radio buttons for days of the week (Su, Mo, Tu, We, Th, **Fr**, Sa). The main area contains a table with the following data:

ID	P	User	date	Old value	New value	
2640-0	4	Fingerprint - 90259	03.08.2007 12:23:01	True	False	Accumulator head
2670-0	3	Fingerprint - 90259	03.08.2007 12:22:02	True	False	WDS 1 : Valve set value
2670-0	3	Fingerprint - 90259	03.08.2007 12:21:50	False	True	WDS 1 : Valve set value
2640-0	4	Fingerprint - 90259	03.08.2007 12:21:26	False	True	Accumulator head
2492-1	4	Fingerprint - 90259	03.08.2007 12:18:44	True	False	Extruder On 2
2492-2	4	Fingerprint - 90259	03.08.2007 12:18:44	True	False	Extruder On 3
2492-3	4	Fingerprint - 90259	03.08.2007 12:18:43	True	False	Extruder On 4
3832-0	0		03.08.2007 03:00:02	31	11	Temperature main switch - Clock timer

Below the table is a button labeled 'Copy table to USB-stick'. On the right side of the interface, there are several process parameters displayed with their current values: 26.1 1/min, 94.4 A, 356.1 bar, 362.3 °C, 70, 10,000 s, 8,820 s, and 340607. At the bottom, there is a status bar showing '52 > 03.08.2007 12:22:16 Monitoring 1: melt temperature limit min. reached' and a row of icons representing different system components and status indicators.

Each change of value by the user is logged in the operator protocol (with following information: timestamp, user, level, old value, new value)

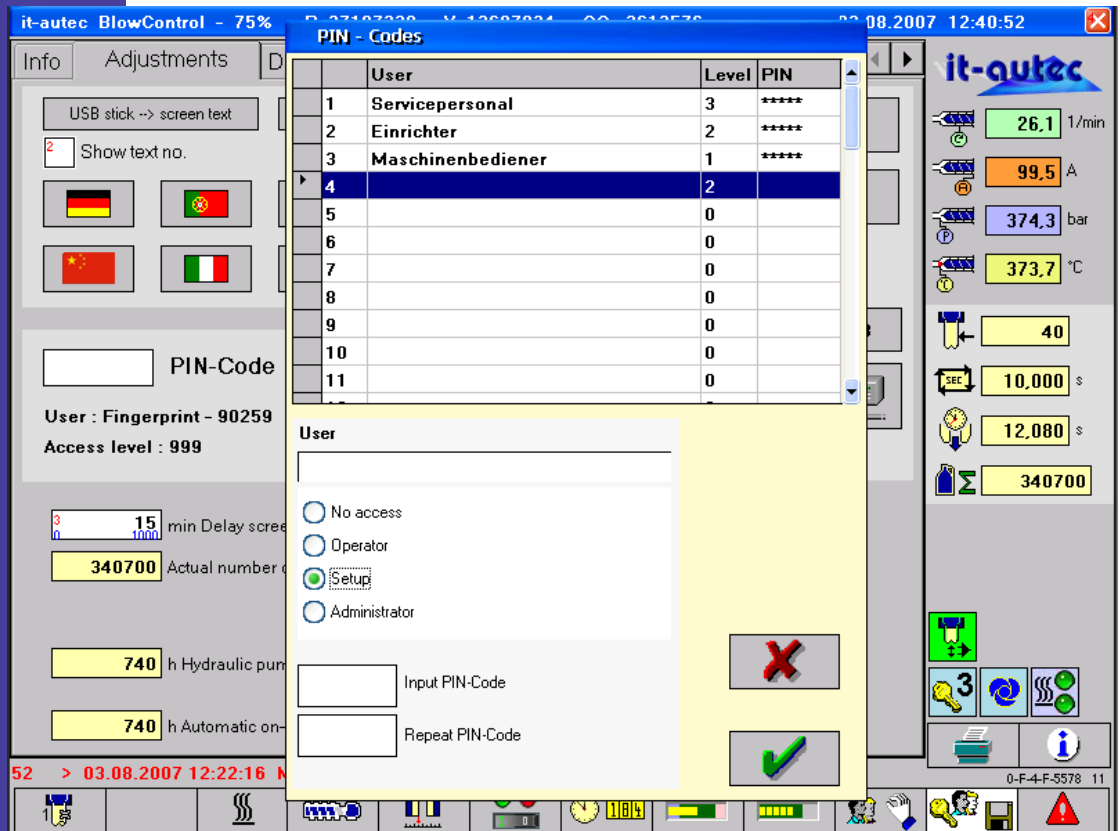
This protocol is stored on the internal flash card for one week

If process data logging to network is activated, this protocol will also be stored on the server as daily report

Herewith down time by faulty operation can be proved

precise
flexible
efficient

User management



User access by PIN-Code

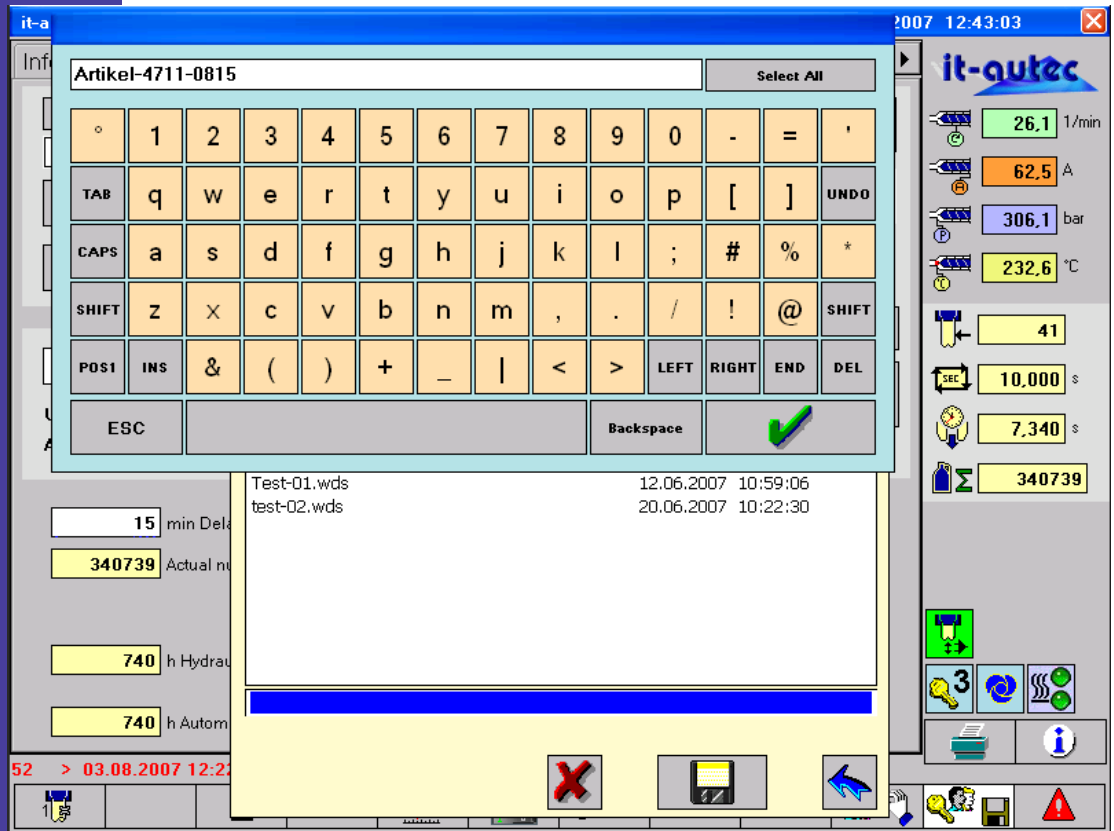
3 different levels (machien operatorm setter, service people) + system administrator

Optionally user access by finger print system

The user lvl for each set value, preselector and button on the screen is adjustable by the system administrator

precise
flexible
efficient

Management of recipes



All set parameters can be stored and reloaded in an internal memory or on an USB.stick

Optionally the recipes can be stored and reloaded on a network server

The whole set of parameters can be stored or set of parameters like Wallthickness, Temperatures, ...

To use the parameters in another machine it is possible to reload the parameters without the machine specific parameter from a data set

To each data set can be added a description in clear text

precise
flexible
efficient

Screen copy



The actual screen or all screen can be print out to USB-stick or network server

Miscellaneous



Reversal of language for user interface

The text files for screen- and error text can be updated by USB-stick

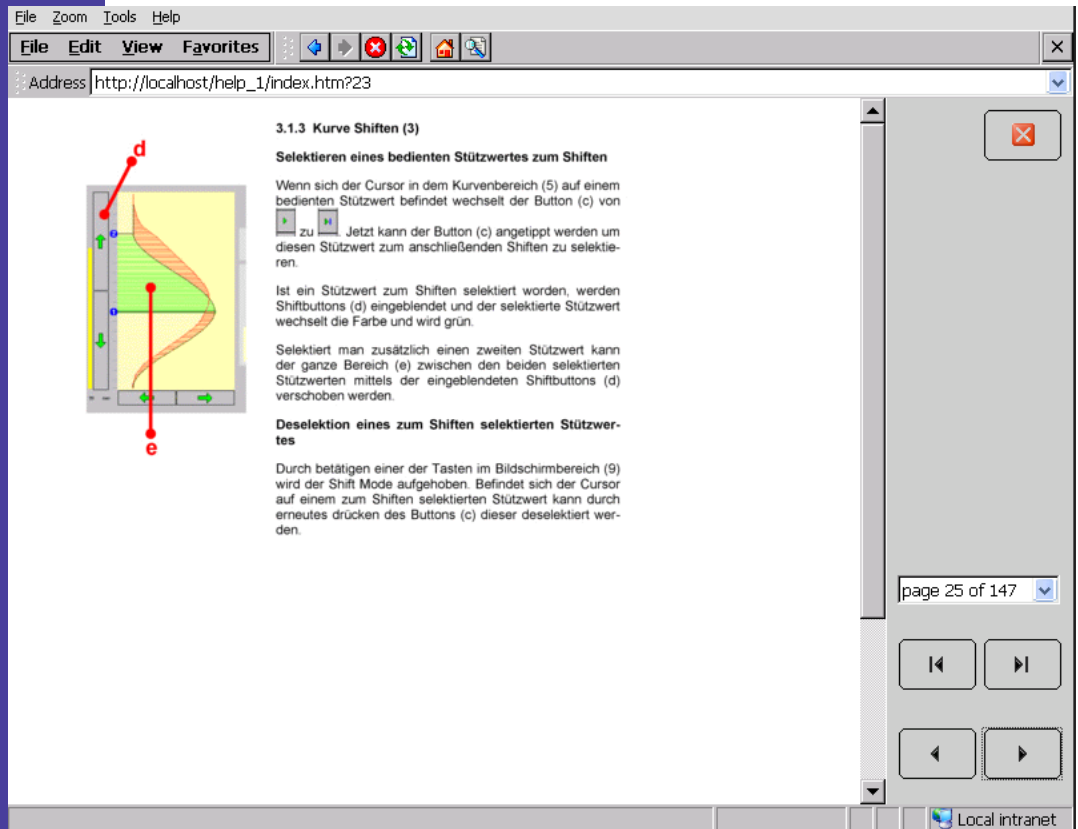
Screen saver

Hydraulic pump on time

Automatic mode on time

precise
flexible
efficient

HTML Online Help System



Help button: At each page the help button display the html online help system in the local browser.

The complete manual is disposed in html files