

Wall-thickness and motion-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**

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

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

pc based solution

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flexible
efficient

Concept of control



Control-Panel



EtherCAT
100 Mbit



I/O Signals



In panel integrated IPC without fan and rotating storage drive

Powerfull AMD Processor

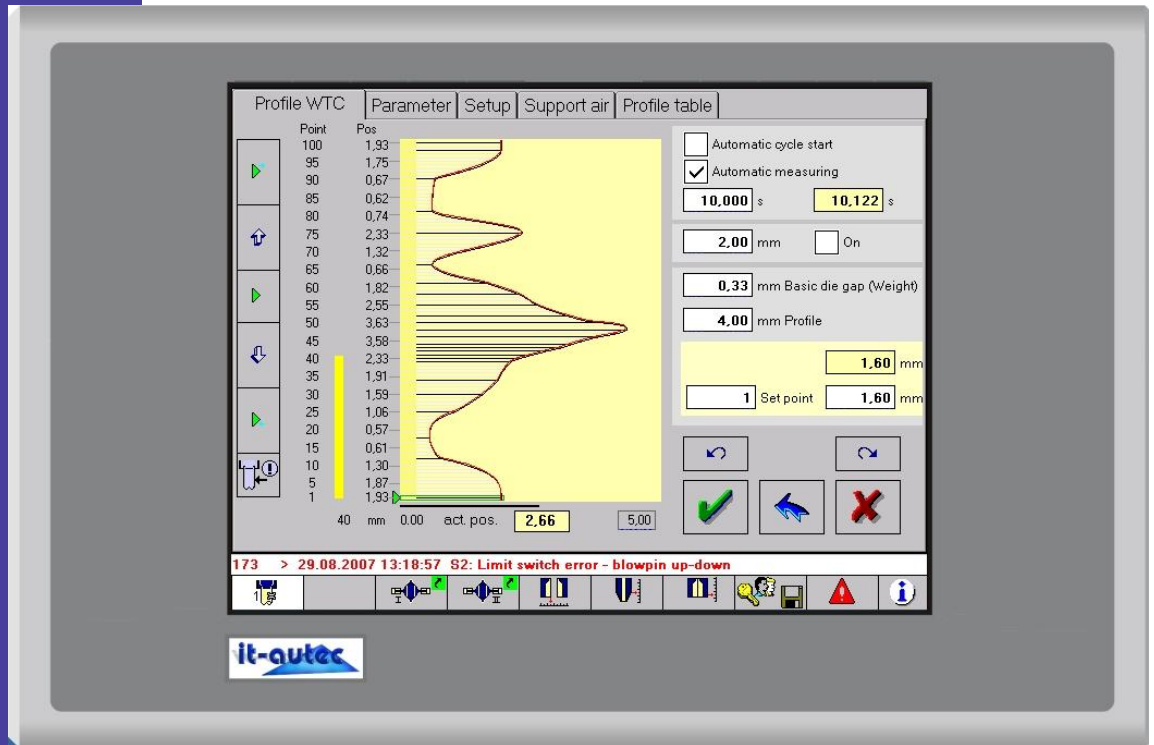
100MBit EtherCAT fieldbus for the connection of the I/Os

Max. 100m distance between two I/O stations

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

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Operator panel



6.5 inch TFT display, resolution 640 x 480 pixel

Touchscreen

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

Ethernet-interface 1GBit, USB-interface

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Function overview

Wallthickness control up to 3 channels (hydraulic or electric control e.g. stepper or servo drive)

Accumulator head operation (constant ejection or profiled)

Parison length control in case of continuous 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

Diagnostics, error message in plaintext and timestamp

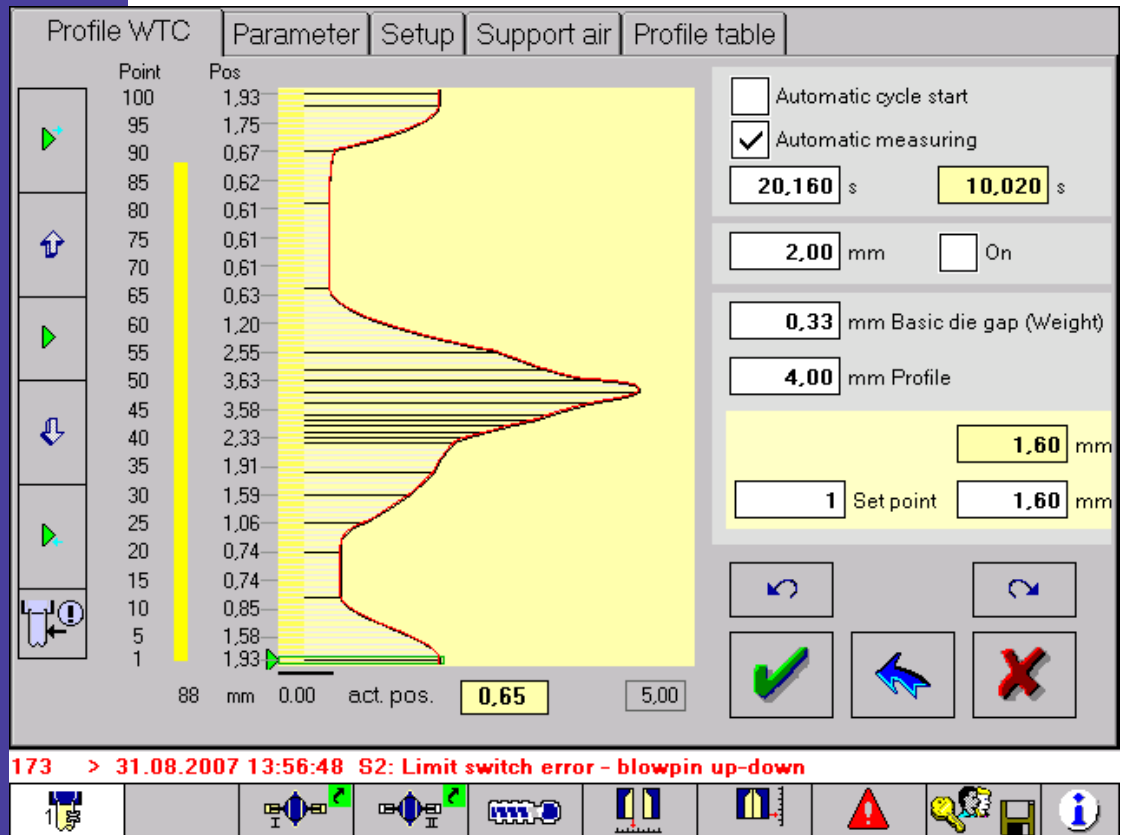
Saving setting parameters on compact-flash, USB-stick or network server

Language and character set reversal for various languages

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

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Wallthickness control



Continuous or discontinuous extrusion

100 points wallthickness profile

Up to 3 channels synchron (wtc- pwtc – multiple extrusion head)

1 channel parison ejection

Correction of parison elongation (linear proportion)

Cycle time specification manually or automatically

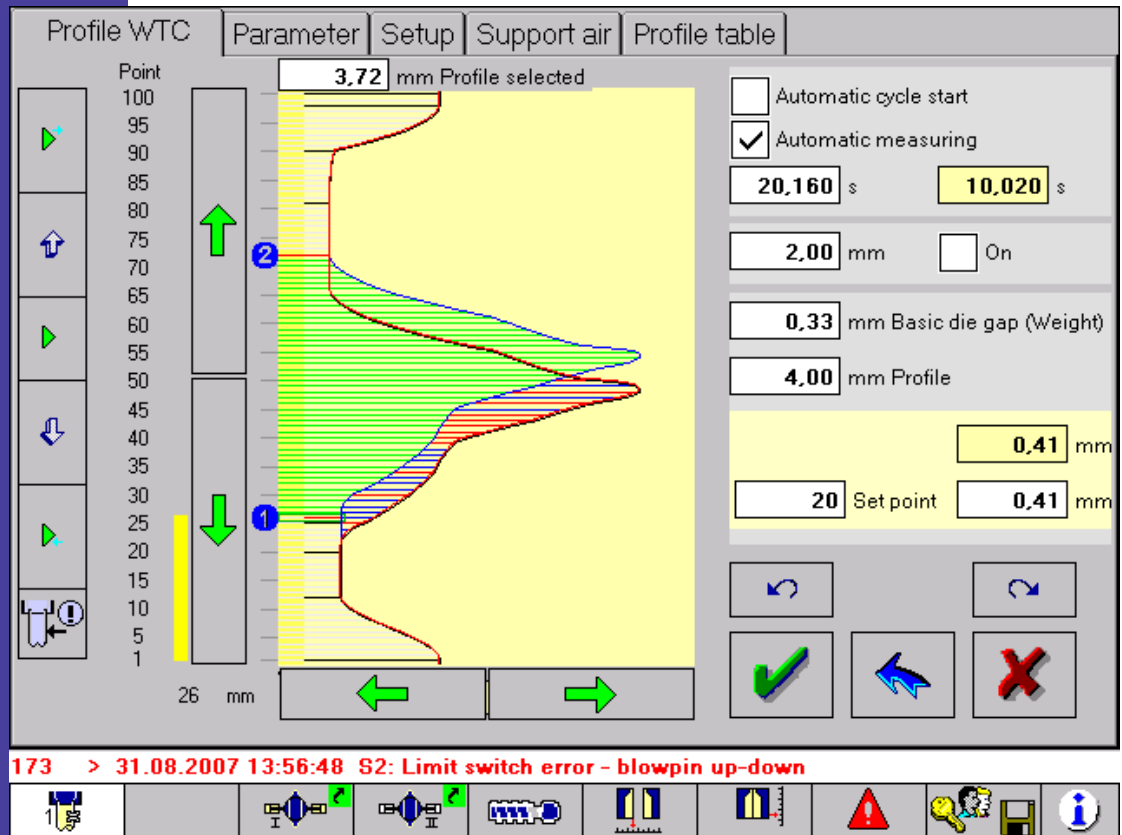
Path check marks (max. 2 at the same time) simply by setting of thick or thin places

Test position (for die cleaning)

Adjustable tolerance supervision of the actual value

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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

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Wallthickness parameter

Profile WTC | Parameter | Setup | Support air | Profile table

Mode

☒ Continuous ☐ Accumulator head

☒ Channel enabled

10,00 mm Total stroke

☐ Tolerance supervision

Optional second shown profile
[Dropdown menu]

Link group
[Icons: red, green, blue, orange] not linked

1 Number of Master points Thick pos.1 **1** Number of Master points Thick pos.2
0,60 mm thick pos.1 **0,50** mm Thick pos.2
0,05 mm Increment for profile operation

173 > 31.08.2007 13:56:48 S2: Limit switch error - blowpin up-down

[Icons: 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th]

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

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Wallthickness calibration

Profile WTC | Parameter | **Setup** | Support air | Profile table

☐ Setup mode active 5.00 Gain factor

Valve actual	Actual position
0.19 V	-0.79 V
	2.64 mm

End position 1	End position 2
-1.75 V	1.89 V
-1.75 V	1.89 V

☒ Diverging


☐ Converging


Die position with positive voltage

☒ open ☐ closed

☐ Fade out actual value curve

☐ Open loop setpoint value

0.0 % Adapt for end positions

173 > 31.08.2007 13:56:48 S2: Limit switch error - blowpin up-down



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

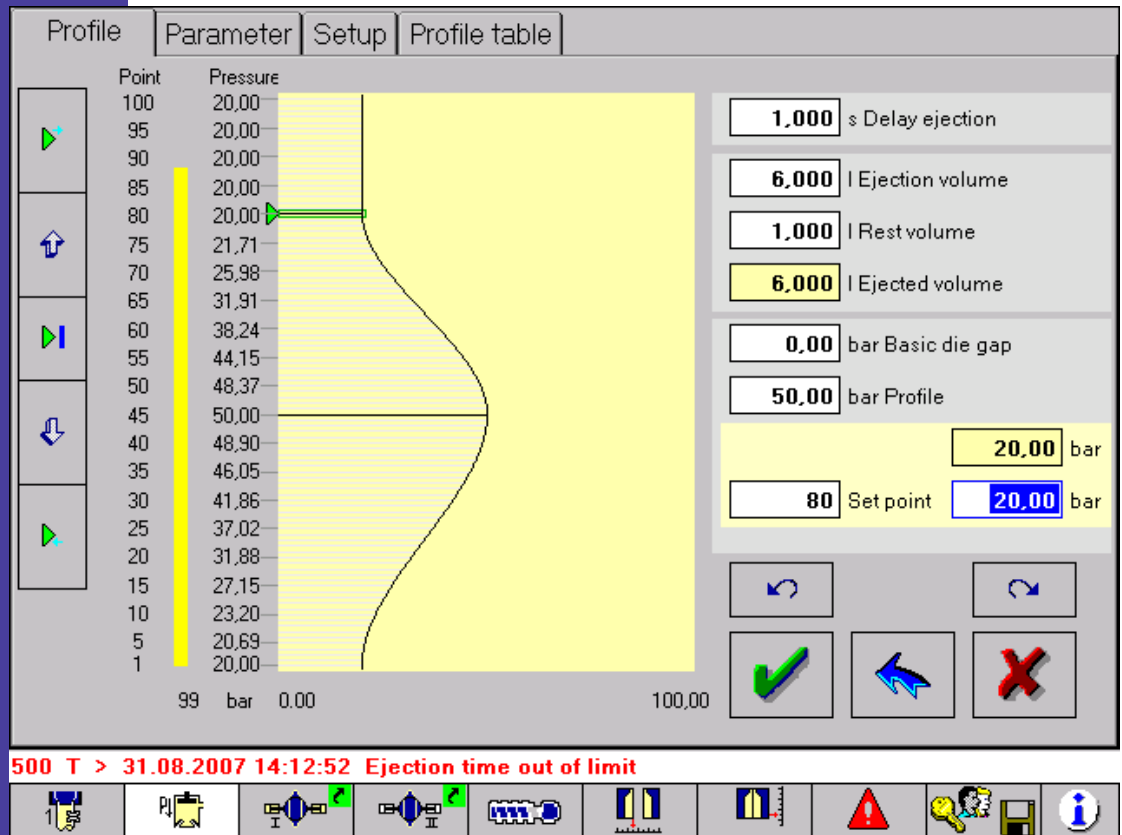
Identification of polarisation, i.e. actual- and nominal value have different directions

Distance from the mechanical stoppers can be adjusted

Switching of die geometrie (diverging, converging)

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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

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Profile marks parison

Profile WTC	Parameter	Setup	Support air	Profile table
	0	Support air on	0	Support air off
	0	Support air on	0	Support air off
	0	Support air on	0	Support air off
	0	Support air on	0	Support air off
	0	Profile mark 5 on	0	Profile mark 5 off
	44	Profile mark 6 on	50	Profile mark 6 off
	95	Profile mark 7 on	99	Profile mark 7 off
	0	Profile mark 8 on	0	Profile mark 8 off

500 T > 31.08.2007 14:12:52 Ejection time out of limit

Up to 8 profile marks on the parison length

On- and off switchpoints separatly adjustable

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

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Extruder speed correction

Extruder rpm control

Basic gap control

☒ Parison length control on

☒ Cycle start
 ☐ Photocell
 ☐ Send correcting impulse

37,700

0,000

Programming start until photocell

←

0,25

Factor Extruder RPM change

1,000

Maximum impulse

0,070

< no impulse

0,000

Deviation

5,000

> no impulse

0,000

Adjusting impulse duration

RPM correction is active

☐ Reduce RPM
 ☐ Increase RPM

173 > 31.08.2007 13:56:48 S2: Limit switch error - blowpin up-down









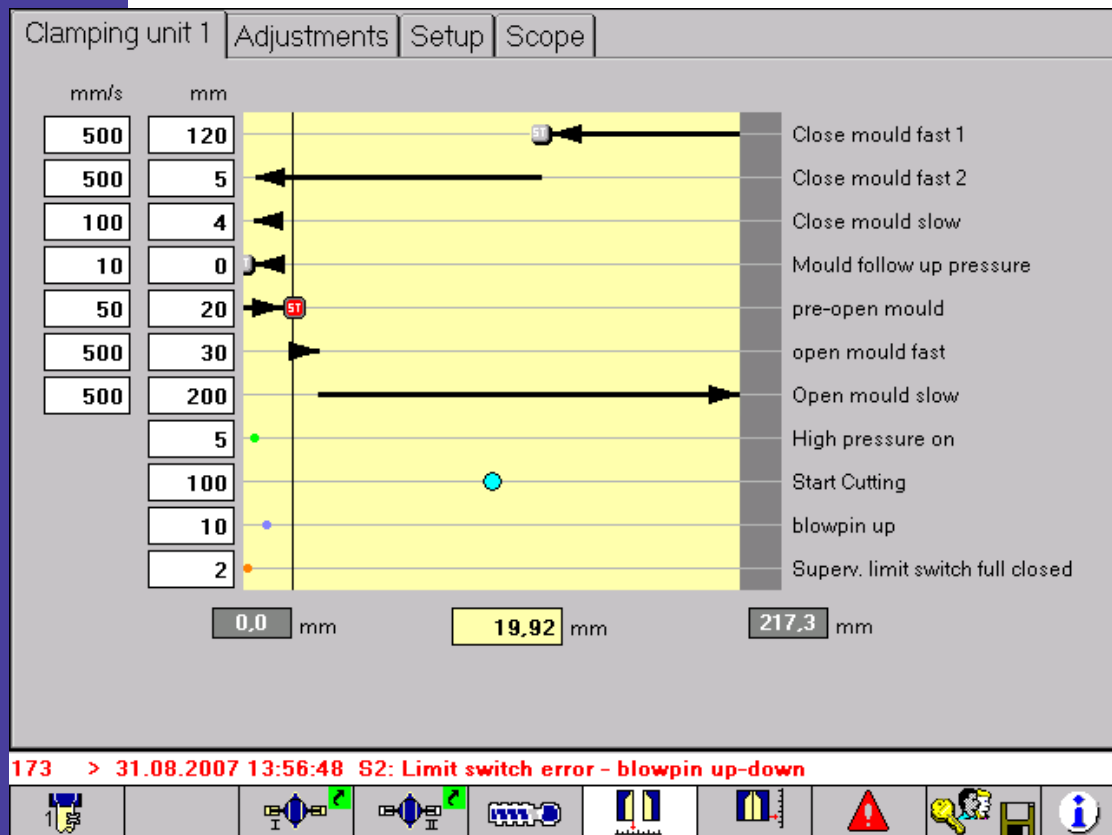



Correction of extruder speed with signal photo cell in case of continuous process

Filling level control of accumulator head at discontinuous process

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

Motion control



Up to 3 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

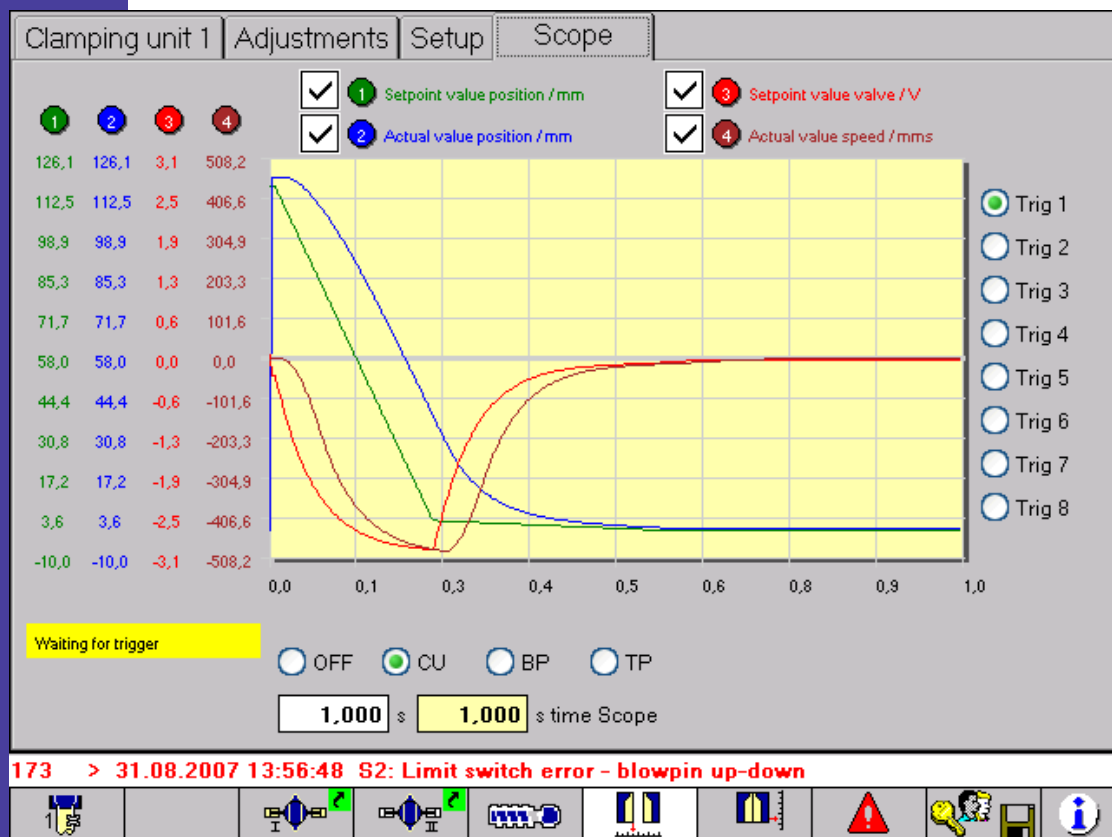
Controlled setpoint at the final positions can be parameterised

Closed loop linear pressure acceleration in the final positions

Path dependant switching to closed loop pressure control

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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

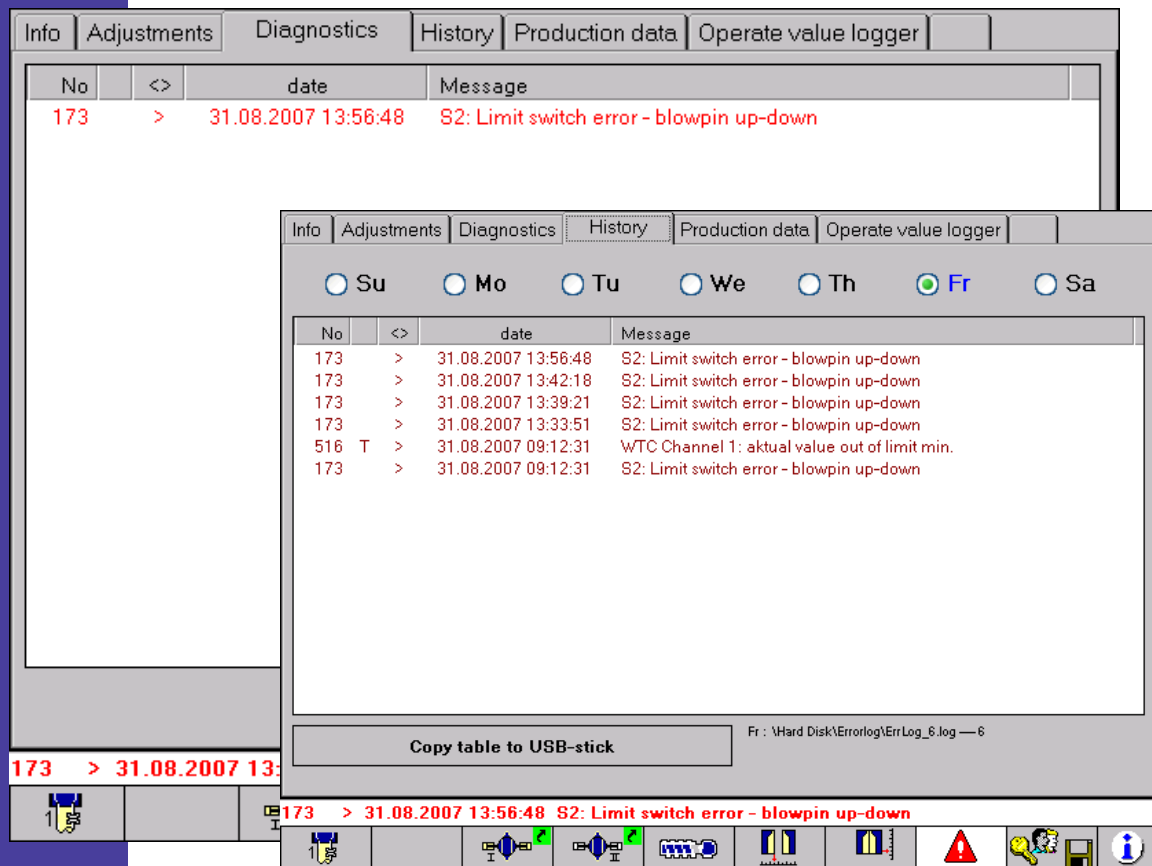
Time of measurement adjustable

Automatically scaling of measured values

Not used values can be hidden

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Diagnostics



The screenshot displays the 'Diagnostics' tab of the BlowMotion software. It features a table with columns for 'No', '<>', 'date', and 'Message'. The table lists several error messages, including 'S2: Limit switch error - blowpin up-down' and 'WTC Channel 1: aktuel value out of limit min.'. A smaller window is overlaid on the main interface, showing a similar table with more detailed error information. The interface also includes a 'Copy table to USB-stick' button and a file path 'Fr : \Hard Disk\Errorlog\ErrLog_6.log — 6'.

No	<>	date	Message
173	>	31.08.2007 13:56:48	S2: Limit switch error - blowpin up-down
173	>	31.08.2007 13:42:18	S2: Limit switch error - blowpin up-down
173	>	31.08.2007 13:39:21	S2: Limit switch error - blowpin up-down
173	>	31.08.2007 13:33:51	S2: Limit switch error - blowpin up-down
516 T	>	31.08.2007 09:12:31	WTC Channel 1: aktuel value out of limit min.
173	>	31.08.2007 09:12:31	S2: Limit switch error - blowpin up-down

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

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Operator protocol

Info | Adjustments | Diagnostics | History | Production data | Operate value logger

☐ Su ☐ Mo ☐ Tu ☐ We ☒ Th ☐ Fr ☐ Sa

ID	P	User	date	Old value	New value	
2604-0	3	Servicepersonal	30.08.2007 13:41:37	4,00	4,00	WDS 1 : mm Profile
2601-60	3	Servicepersonal	30.08.2007 13:41:37	1,61	0,00	WDS 1 : Set point : 60
2601-57	3	Servicepersonal	30.08.2007 13:41:37	2,21	0,00	WDS 1 : Set point : 57
2860-0	3	Servicepersonal	30.08.2007 12:57:10	-	-	WDS 3 : Link 1
2760-0	3	Servicepersonal	30.08.2007 12:57:04	-	-	WDS 2 : Link 1
2660-0	3	Servicepersonal	30.08.2007 12:56:58	-	-	WDS 1 : Link off
30-0	3	Servicepersonal	30.08.2007 12:56:29	-	-	\\Hard Disk\\Archiv\\DEMO_EINFACH_TE...
2640-0	4	it-autec	30.08.2007 12:55:57	True	False	Accumulator head
3606-0	3	Servicepersonal	30.08.2007 12:19:59	0	40	bar Profile - A1
3608-51	3	Servicepersonal	30.08.2007 12:19:59	0	40	Set point - A1
3608-21	3	Servicepersonal	30.08.2007 12:19:59	0	10	Set point - A1
3630-0	3	Servicepersonal	30.08.2007 12:19:08	True	False	Constant pressure
2640-0	4	it-autec	30.08.2007 12:18:42	False	True	Accumulator head
2604-0	3	Servicepersonal	30.08.2007 09:39:41	4,30	4,00	WDS 1 : mm Profile
2601-49	3	Servicepersonal	30.08.2007 09:39:41	3,93	3,63	WDS 1 : Set point : 49
2601-47	3	Servicepersonal	30.08.2007 09:39:41	4,63	4,33	WDS 1 : Set point : 47
2601-45	3	Servicepersonal	30.08.2007 09:39:41	4,13	3,83	WDS 1 : Set point : 45
2601-43	3	Servicepersonal	30.08.2007 09:39:41	3,63	3,33	WDS 1 : Set point : 43
2601-42	3	Servicepersonal	30.08.2007 09:39:41	3,43	3,13	WDS 1 : Set point : 42
2604-0	3	Servicepersonal	30.08.2007 09:39:37	4,00	4,30	WDS 1 : mm Profile
2601-49	3	Servicepersonal	30.08.2007 09:39:37	3,63	3,93	WDS 1 : Set point : 49

Copy table to USB-stick

173 > 31.08.2007 13:56:48 S2: Limit switch error - blowpin up-down











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

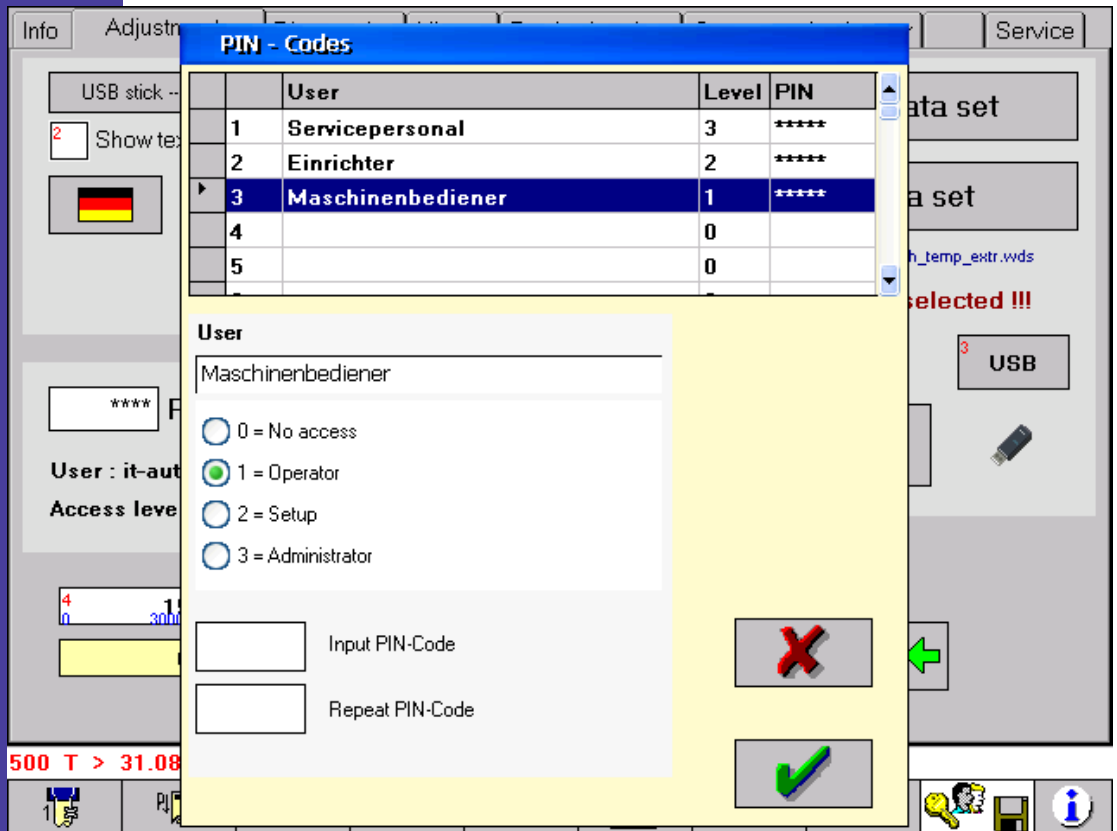
This protocol is stored on the internal flash card for one week

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

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User management



User access by PIN-Code

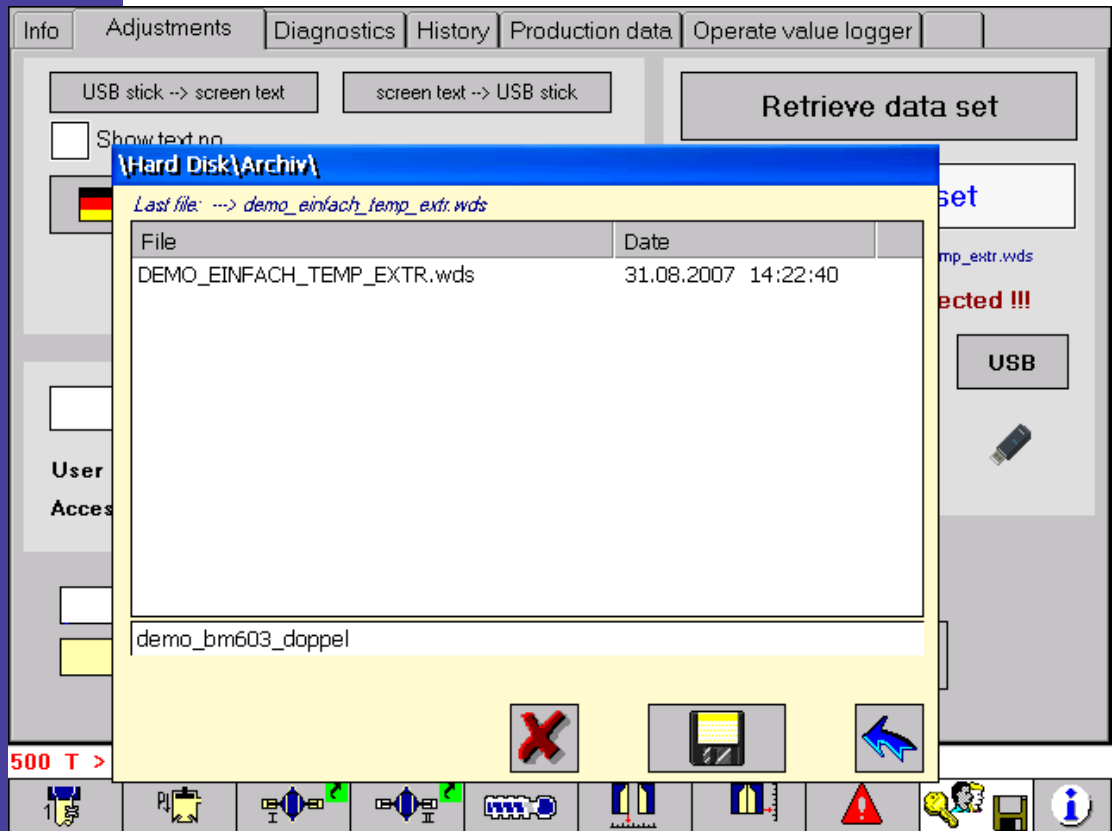
3 different levels (machien operatorm setter, service people) + system administrator

Optionally user access by finger print system

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

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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

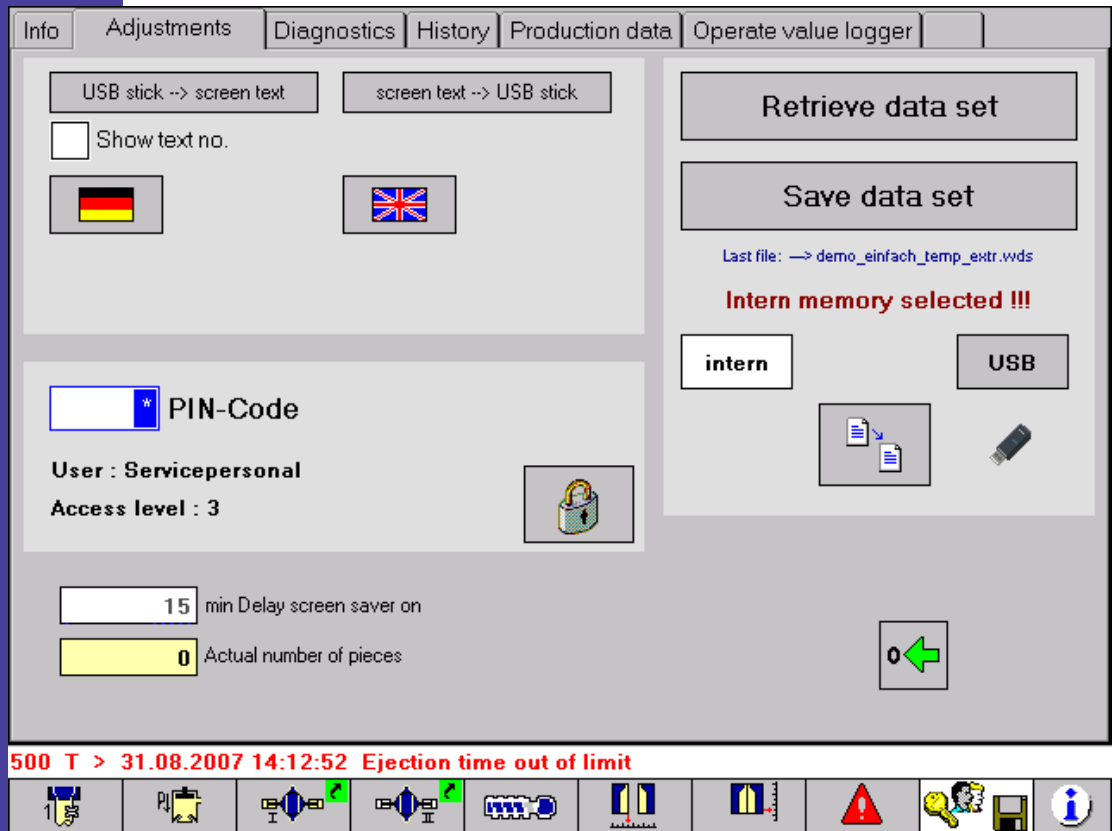
The whole set of parameters can be stored or set of parameters like Wallthickness, Motion, ...

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

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Miscellaneous



Reversal of language for user interface

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

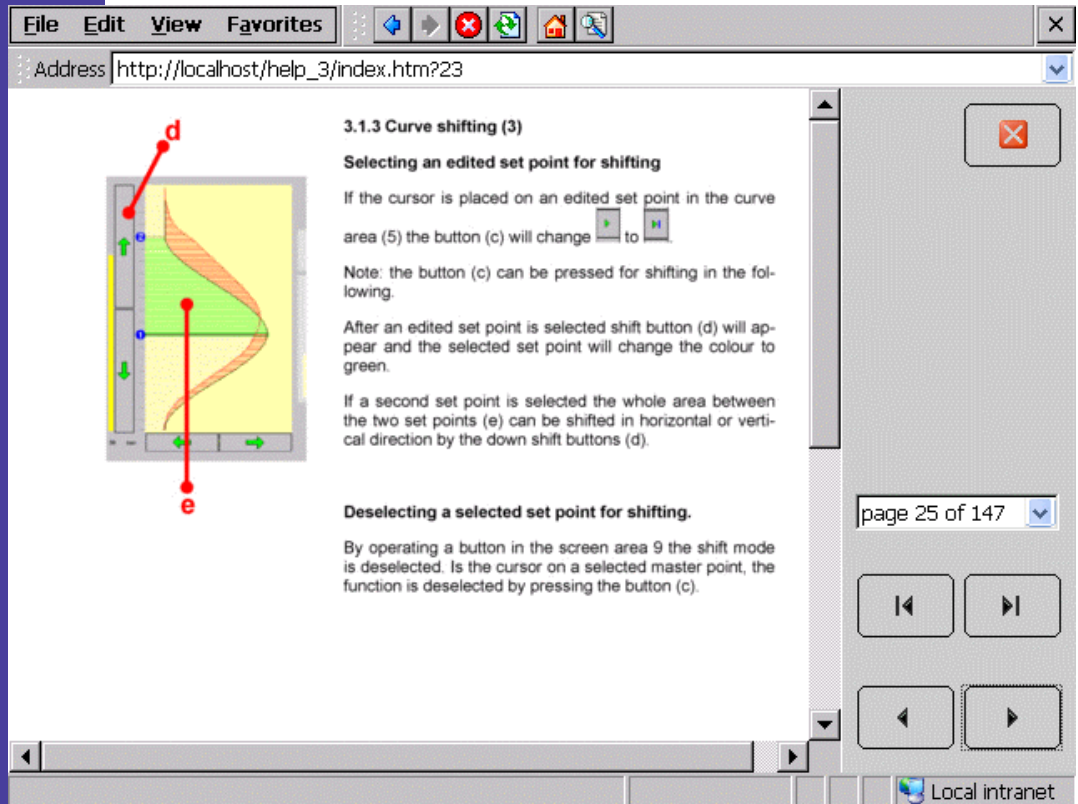
Screen saver

Hydraulic pump on time

Automatic mode on time

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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

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