Application note

FESTO

YHBP - Servo-pneumatic Balancerkit - Commissioning

Explanation of the commissioning steps of the Servo-pneumatic Balancerkit.

YHBP-...

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1 Components/Software used

Type/Name	Software/firmware version	Date of manufacture
Servo-pneumatic balancer kit	General	--
Application software YHBP (GSAY-A8-F0-Z4-1.0)	0.62.0	--
Firmware controller (CECC-D-BA)	1.4.0	--

Table 1.1: 1 Components/Software used

2 Description of the application

This application note explains the commissioning of the kit. The various steps for commissioning that are required are explained in detail.

2.1 Additional application notes

Apart from this application note, other application notes on commissioning and safety functions are also available:

Name	Contents
YHBP - Servopneumatic Balancerkit - Saving and loading of Configurations	Saving and loading a configuration file on the CECC-D-BA Balancer Controller and reading log files
YHBP - Servopneumatic Balancerkit - Operation	Explanation of the operating modes of the servo-pneumatic balancer: - Normal operation - User-specific special functions: - Monitoring functions (not safety-oriented) - Sample applications
YHBP-Servopneumatic Balancerkit - SLS-SSC-PLb-CatB	Application note for the servo-pneumatic kit for implementation of Safely Limited Speed (SLS) and Safely Stop and Close (SSC) with PL b, Category B
YHBP-Servopneumatic Balancerkit - SLS-SSC-PLd-Cat3	Application note for the servo-pneumatic kit for implementation of Safely Limited Speed (SLS) and Safely Stop and Close (SSC) with PL d, Category 3

Table 2.1: Additional application notes

3 Basic information

3.1 Access to web visualisation

Web visualisation is accessed with any web browser (Internet Explorer is recommended) via the IP address of the device in the following format: http://‹IP-Adresse›:8080/webvisu.htm.

The default address is http://192.168.2.20:8080/webvisu.htm, but it can be changed with the Festo Field Device Tool if access to multiple balancers in one network is required.

The computer used for access must have a fixed IP address (e.g. 192.168.2.1).

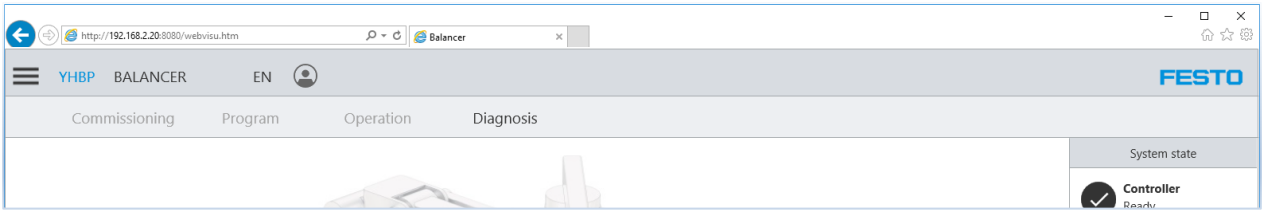


Figure 3.1: Access to web visualisation

After input of the IP address, the start screen opens with some basic information.

Information on diagnostics and the current status of the system can be viewed without having to log in.

Access to other data requires users to log in by clicking on the following symbol:  .

The log-in data for a service technician are:

- User name: Service
- Password: Service (default)

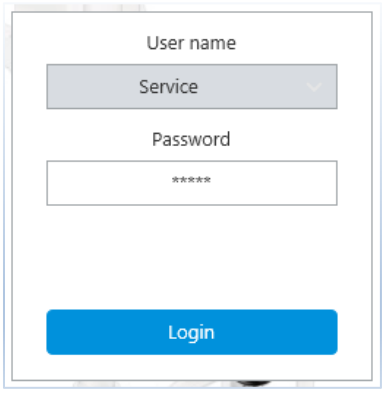


Figure 3.2: Login dialogue

4 Commissioning procedure

The balancer must be commissioned before it can be operated.

Various parameters on the cylinder size, the moving masses etc. are queried and the parameters for regulation of the pressure and position are identified.

The individual commissioning steps are as follows:

1. *Configure hardware:*
   The parameters for the installed mechanisms are queried here. They include cylinder size, transmission ratio for kinematics, stroke length, minimum and maximum mass etc.

2. *Configuring speed monitor:*
   The user can select here whether a speed monitor is present. There is also access to help with the configuration.

3. *Check valves:*
   The function of the check valves is tested here.

4. *Pressure control:*
   The pressure control is commissioned here. Parameters required for pressure control are calculated here.

5. *Limitations:*
   The software end positions and the position of the proximity switch for the reference travel are teached-in here.

6. *Position control:*
   The parameters for position control are calculated and adjusted here. This includes the friction of the system and the amplification parameters for the control.

7. *Testing speed limit:*
   The operation of the speed monitor and the speed limit of the VPCB are tested here.

The system is ready for operation once this step has been completed. Special functions such as prepositioning can be configured separately after commissioning. See the Application Note for operation and special functions.

4.1 Starting conditions

The following items should be completed before starting commissioning and switching on the system:

1. The system is fully assembled.
2. The pneumatics installation is completed.
3. The electrical installation is completed.
4. The safety concept is developed and implemented.

For information please see the instruction manual for assembly and installation (TN: 8088702) and the Application Notes for safe speed monitoring (see Festo Support Portal: www.festo.com/sp).

4.2 Reset/restart commissioning procedure

Commissioning is implemented in the web visualisation of the GSAY-A8 application software. The web visualisation is accessed as described in chapter 3.1 Access to web visualisation.

See "Commissioning" for the commissioning process and it can be conducted by a service user. Access is blocked for an operator.

If the system is being started for the first time, it must first be reset via a rising edge at the reset input. Then an interface as shown in Figure 4.1 should be displayed. If the system is still in error status, see the error information in the diagnostics and the troubleshooting information in the attachment from page 25.

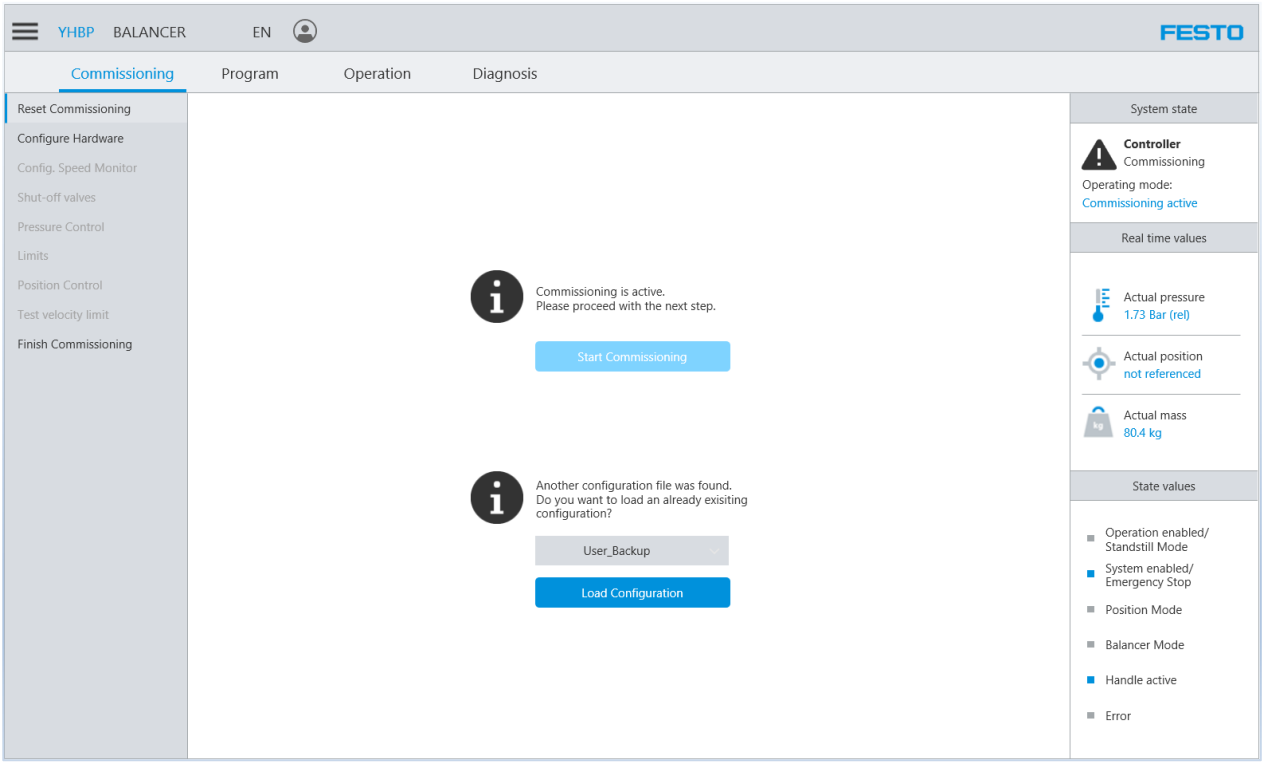


Figure 4.1: Web visualisation of commissioning

m is automatically in commissioning mode when first started. There is nothing more to do and the next step, configuration of hardware, can be started.

If changes are to be made later after completion of commissioning, use "Start commissioning" to switch to commissioning mode.

If a configuration file, possibly from a previous commissioning, is available, or because a configuration file was uploaded, it can be loaded in the bottom section.

Select the relevant files and import with "Load configuration".

Note

Loss of the configuration after restart

The commissioning needs to be finished with „Finish commissioning” after successful configuration, otherwise it has to be done again after a power cycle of the system.

4.3 Configuring the hardware

The first step in commissioning is configuration of the basic hardware parameters. This interface can be called with "Commissioning → Configure hardware".

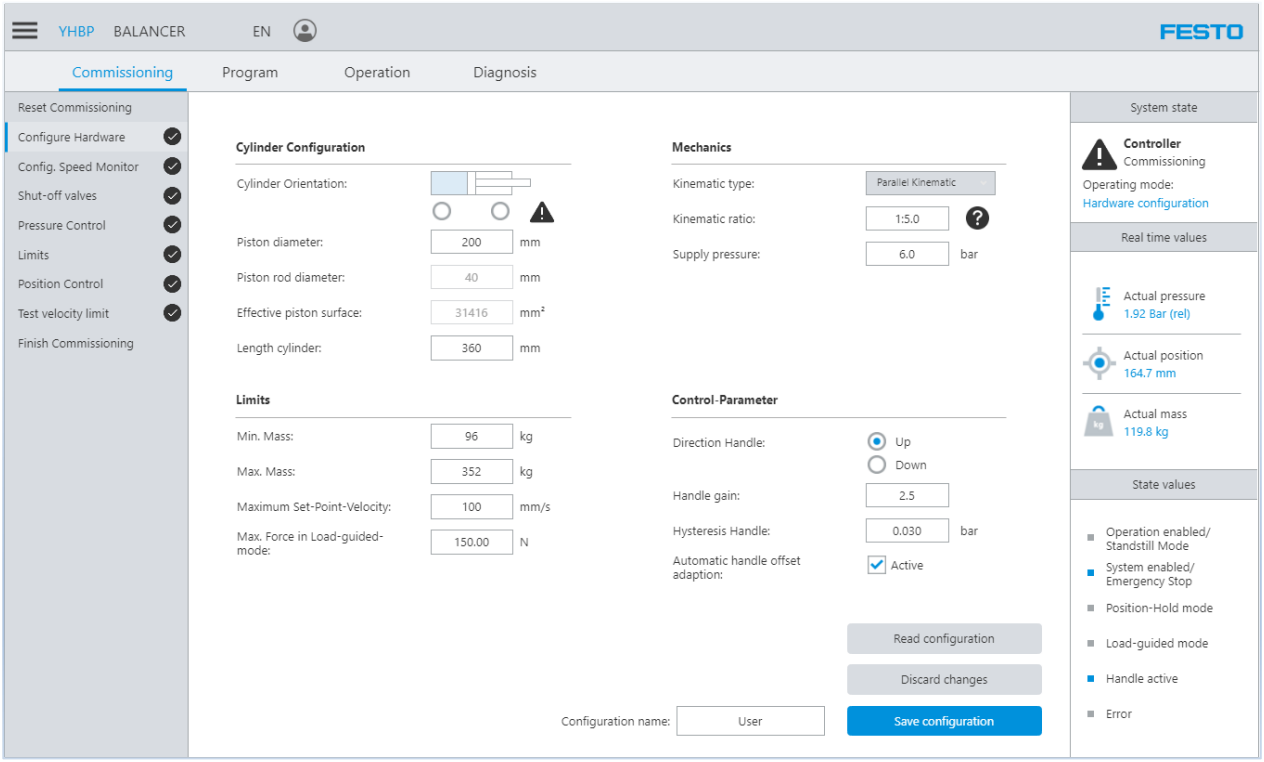


Figure 4.2: Web visualisation of the "Configure hardware" step

The required parameters are explained below.

Information

If one of the parameters for piston diameter, transmission ratio or minimum mass is changed, depending on the configuration a message will be displayed if the minimum mass is below the minimum approved mass (see 4.3.3 Limitations - Minimum mass)

4.3.1 Cylinder configuration

Cylinder orientation: *(value range: left/right, default: right)*

Alignment and supply at the cylinder. The user can select here whether the cylinder is supplied on the piston rod side or the end cap side. A value must always be selected.

Piston diameter: *(value range: 80 … 200 mm, default: 80 mm)*

Diameter of the cylinder piston (e.g.: DSBG-80-500-… has a piston diameter of 80 mm).

Piston rod diameter: *(value range: 0 … 80 mm, default: 25 mm)*

Diameter of the piston rod. Relevant only if the supply is to the piston rod side. The values here for the standard sizes are already saved (e.g.: DSBG-80-500-… with piston rod diameter of 25 mm).

Effective piston surface: *(value range: 4400 … 31415 mm², default: 4536 mm²)*

Automatically calculated piston surface.

Cylinder length: *(value range: 100 … 1000 mm, default: 360 mm)*

Length of cylinder (e.g.: DSBG-80-500-… has a length of 500 mm).

4.3.2 Mechanics

Type of kinematics: *(value range: lifting column/parallel kinematics/other, default: lifting column)*

Select whether it is a lifting column, parallel kinematics or other.

Transmission ratio: *(value range: 1:1 ... 1:5, default: 1:1)*

Transmission ratio of kinematics. For the lifting column this is always 1:1. It varies with parallel kinematics and others. It depends on the length of the mass arm to the length of cylinder arm. The help can be shown with the following symbol: .

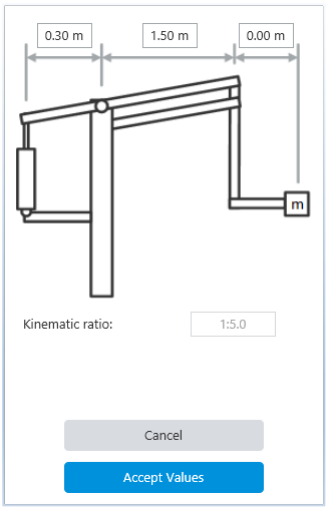


Figure 4.3: Help for calculation of the transmission ratio.

Supply pressure: *(value range: 4 ... 8 bar, default: 6 bar)*

Supply pressure at the VPCB valve. Note that in the case of long hoses and many consumers the supply pressure at the vale is not equal to the pressure set at the service unit.

4.3.3 Limitations

Minimum mass: *(value range: 1 ... max. mass kg, default: 70 kg)*

Minimum mass moved with balancer system. This is generally the unladen mass, such as the gripper unit.

If a mass for which the cylinder pressure is set to less than 1.5 bar is configured, a warning is displayed. The warning can be ignored but note that correct function can only be guaranteed at pressure greater than 1.5 bar.

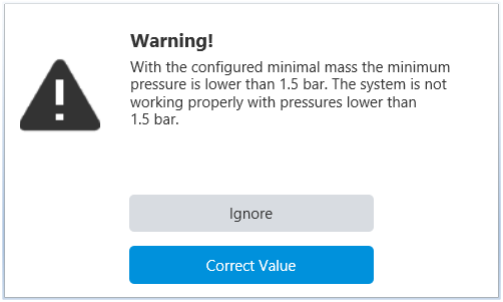


Figure 4.4: Warning message for a minimum mass that is too low

Maximum mass: *(value range: min mass ... 999 kg, default: 282 kg)*

Maximum mass that is to be moved with the balancer system. This refers to the unladen mass plus the mass of heaviest workpiece that is to be moved.

Maximum setpoint speed: *(value range: 0 … [1000/transmission ratio] mm/s, default: 250 mm/s)*

Maximum setpoint speed value that is generated by the closed-loop control of the balancer controller. This refers to the speed at the cylinder. The actual speed at the workpiece is greater by the transmission ratio, depending on the actual transmission ratio.
If this parameter is changed, the parameterised monitored speed at the speed monitor (if set) should also be changed.

Maximum force in load-guided mode: *(value range: 0 … 2000 N, default: 150 N)*

Maximum force that is generated with the handle in load-guided mode. For example, this value comes into play if a load in load-guided mode is traversed against a resistance. The maximum force applied is the force set here.

4.3.4 Regulation parameters

Direction of the handle: *(value range: Up/Down, default: Up)*

Selection whether the handle is aligned up or down.

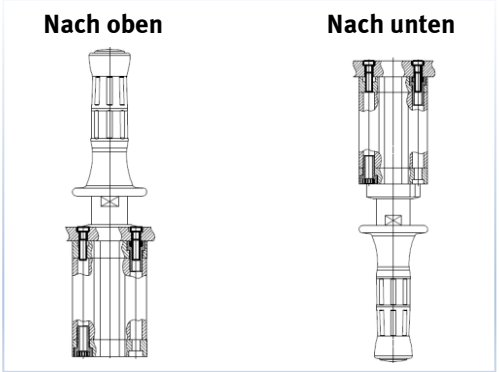


Figure 4.5: Alignment of the handle

Handle amplification: *(value range: 0.1 … 5, default: 2.5)*

Amplification of the handle. This value can be adjusted depending on the tube length and the desired sensitivity of the handle. The value can also be adjusted again later during commissioning of the position closed-loop control.

Hysteresis of handle: *(value range: 0.02 … 0.1 bar, default: 0.03 bar)*

A value for the hysteresis of the handle can be input here. Due to the friction of the handle a small hysteresis range is necessary for the return to mid-position. It can be adjusted with this value. For example, it is necessary if a slow movement up or down is occurring although the handle is not actively moved from the mid-position.

Automatic offset adaption: *(value range: on/off, default: on)*

This option enables or disables the automatic offset adaption of the handle. By default the offset of the handle is adapted on a rising edge at operation enable. This might lead to problems when, f. e. operation enable is set after the handle is already used and it is not in the middle position. In this case the adaption should be disabled.

4.3.5 Saving parameters

Once all parameters have been configured, the values can be saved with "Save configuration". The parameters are automatically sent to the connected VPCB valve.

Figure 4.6: Saving the parameters

If the configuration has been successfully sent, proceed with the next commissioning step.

4.4 Configuring speed monitor

In this step of the commissioning select whether a speed monitor is present or not. This interface cab called with "Commissioning → Speed mon. config.".

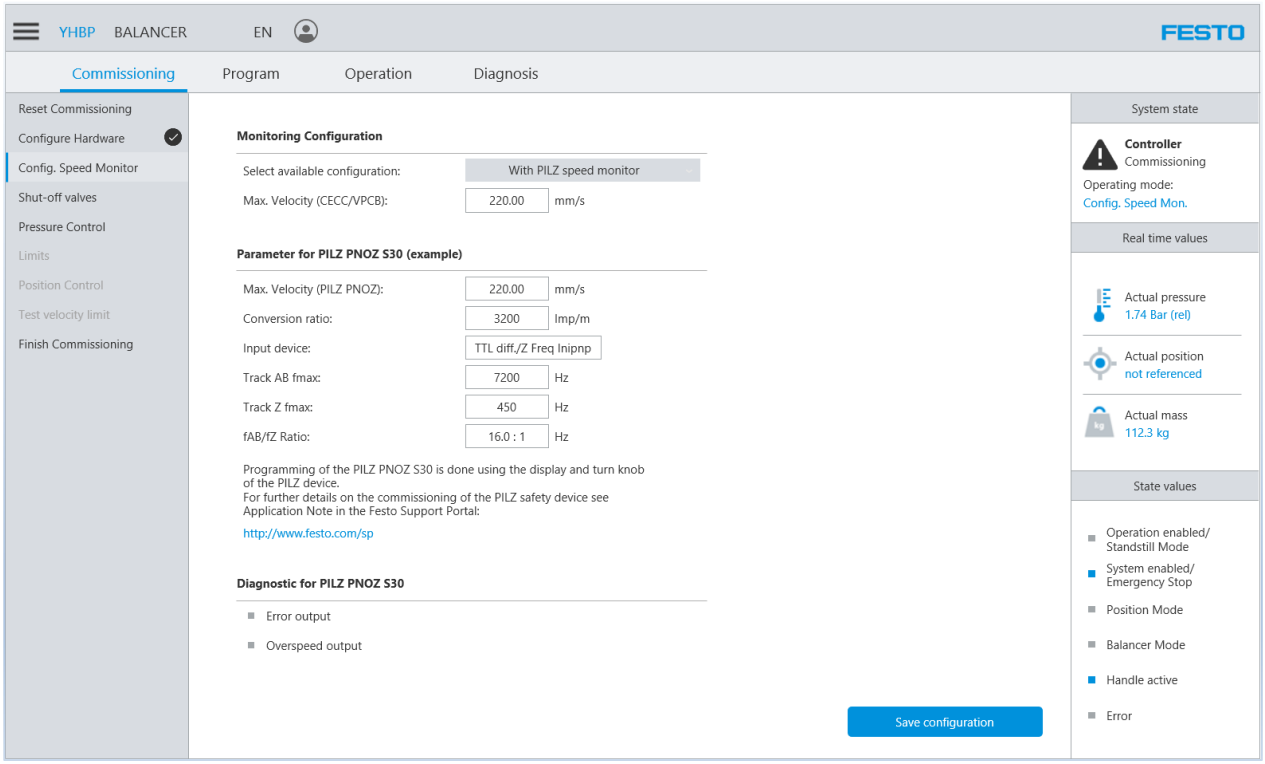


Figure 4.7: Web visualisation of the "Configure speed monitor" step - with speed monitor

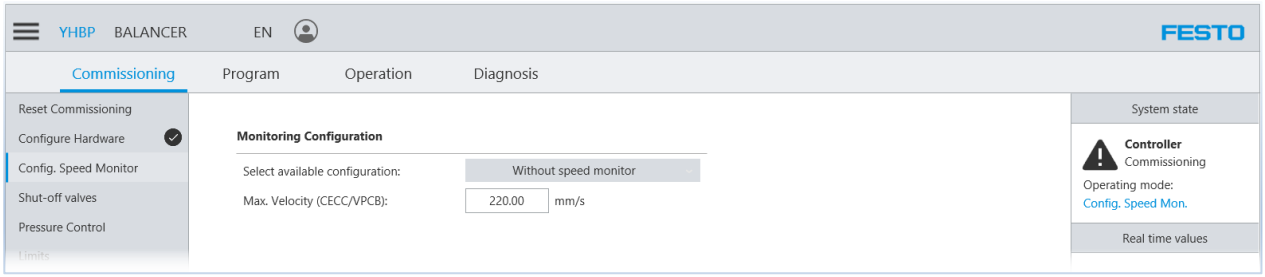


Figure 4.8: Web visualisation of the "Configure speed monitor" step - without speed monitor

First, the current configuration of the system can be selected with "Select available configuration" -
The selection options are:

Without speed monitor:

In this case a speed monitor is not connected. The speed is monitored solely in the CECC-D-BA controller and the VPCB valve. The limit value for monitoring the speed in the VPCB valve is automatically sent when saved. For more information on this variant see the Application Note for PLb.

With PILZ speed monitor:

In this case the included Pilz PNOZ S30 is connected. Some parameters for configuring the Pilz device as displayed as assistance. However, configuration is not automatically but must be performed manually using the display of the Pilz PNOZ S30.

The configuration parameters can also be found in the applicable data sheet or manual. For more information on this variant see the Application Note for PLd.

Other speed monitors:

Select this configuration if a safety relay unit other than the Pilz PNOZ S30 is used. It is important to check that the safety relay unit is suitable for this application.

The next step is to set the maximum speed. The default is 10% above the maximum setpoint speed. However, it can be adjusted higher or lower. The value should in principle be compatible with the safety requirements of the application.

Information

If the value is changed here, it must always be changed in the speed monitor (e.g. Pilz PNOZ S30). It is not configured automatically. For more information see the Application Note for PLd and the user manual for the speed monitor or safety relay unit.

The configuration can only be saved if the safety relay unit is correctly configured and no longer outputs errors. Otherwise the button is disabled.

4.5 Shut-off valves

The correct function of the check valves is tested in this step of the commissioning. This interface is called with "Commissioning → Shut-off valves".

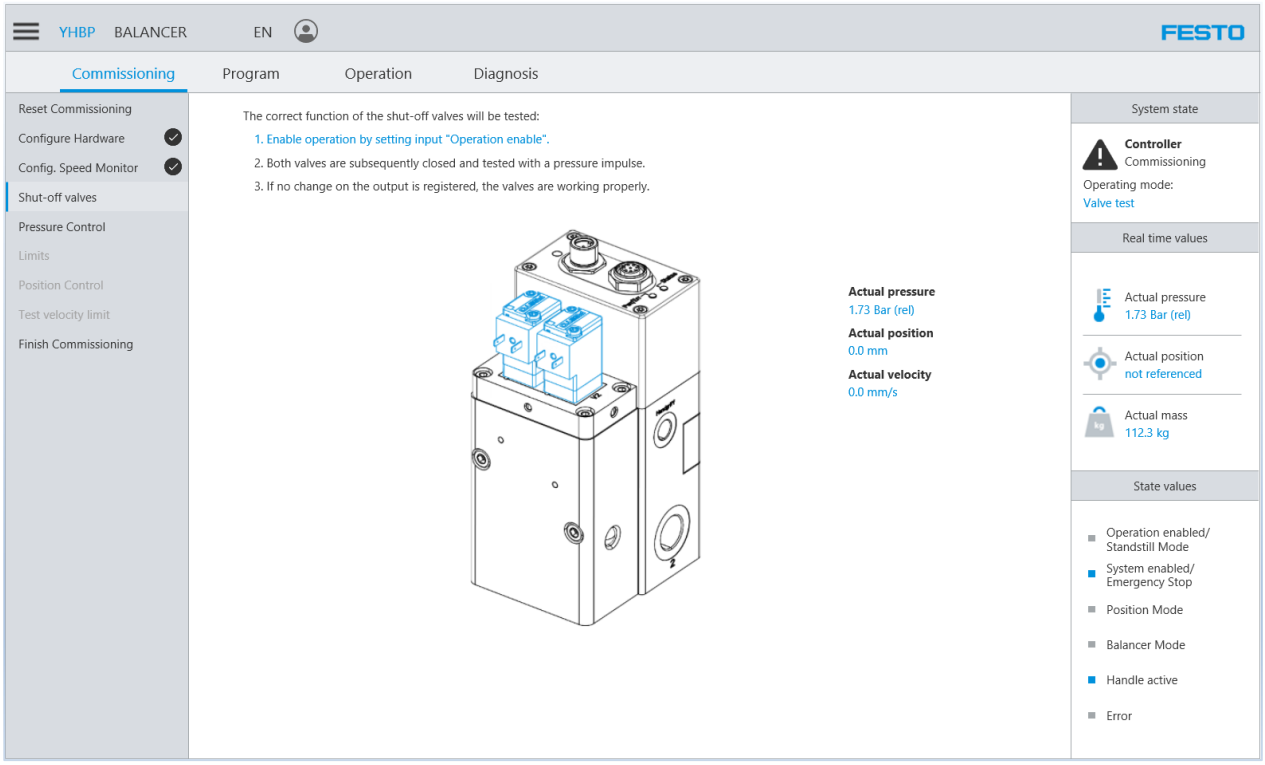
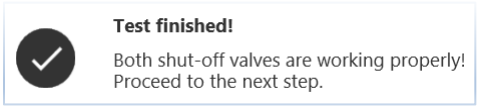


Figure 4.9: Web visualisation of the "Shut-off valve" step

The sequence is as follows:

1. Set a rising edge at operation enable. This starts the test.
2. Carrying out test:
   a. Test that supply pressure is available.
   b. Test of shut-off valves. Every valve is switched separately and tested by a pressure pulse.
3. If the test was successful, it is displayed in the web visualisation:



If an error occurs, test the supply pressure and the connect connection of the two shut-off valves with the corresponding outputs.

If the error still occurs after multiple tests, see the error information in the diagnostics and the troubleshooting information in the attachment from page 24.

4.6 Pressure control

In this commissioning step the pressure control in the valve is put into operation and the correct parameters are set. This interface is called with "Commissioning → Pressure control".

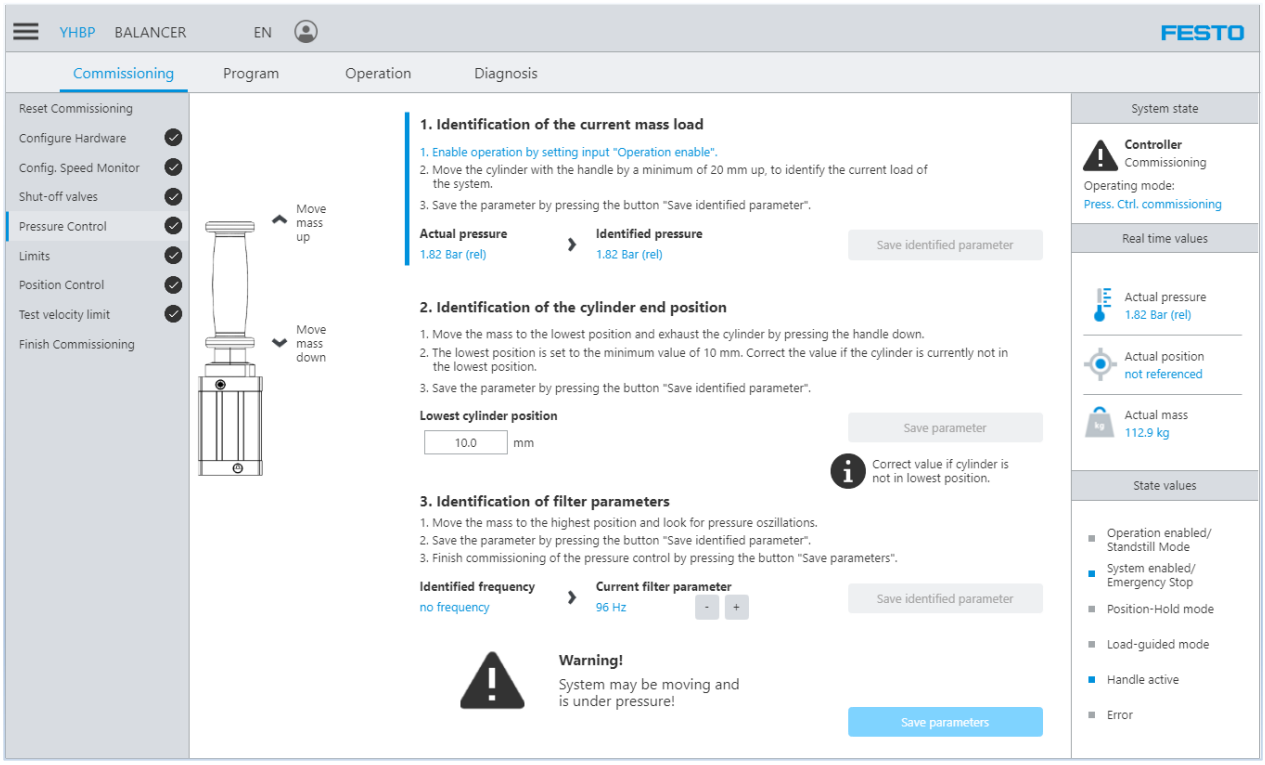


Figure 4.10: Web visualisation of the "Pressure control" step

Several steps are required for commissioning. These are described in more detail as follows.

Information

The following points should be noted during commissioning of the pressure regulator:

- The "Handle active" input must be set to activate the handle. Otherwise travel with the handle is not possible.
- If the operation enable is not set, movement is also not possible.
- Speed control is not active. In some cases, the speed monitoring activates. In this case restart commissioning of the pressure control.

Note

Runaway with operation enable set

If the system is left stationary with operation enable set, it may happen that it slowly runs away up or down, because pressure control is not active yet and there is no active regulation.

- On interruption of the process reset the operation enable.

If the identification cannot be performed, please check the following item in "Configure hardware":

- Check that the cylinders are correctly aligned.
- Check that the handle is correctly aligned.

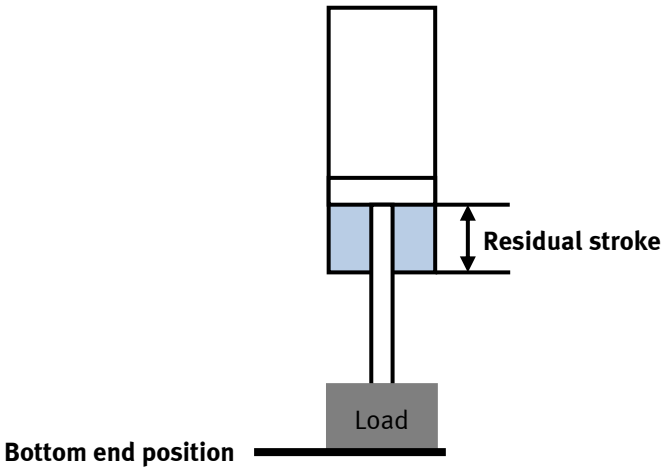
4.6.1 Identification of the current load mass

The current load of the system is determined here. The sequence is as follows:

1. Set a rising edge at operation enable. This starts the identification.
2. Lift the mass slowly by 20 mm with the handle so it is freely suspended. The mass should remain stationary. If this is not possible using the handle, the load can be stopped by resetting the operation enable. However, potential leakage between cylinder and valve may cause the load to drop.
3. Save the parameter by pressing the "Save identified parameter" button.

4.6.2 Identifying the cylinder end position

The current position of the cylinder piston is determined here. Because the cylinder may not be in the bottom end position due to the mounting position, an identification process is also applied here. Therefore the Balancer is moved to the bottom end position. In the bottom end position a possible residual stroke can be manually adjusted.



The process is as follows:

1. If the operation enable is no longer set, reset it.
2. Move the mass as far down as possible with the handle and thus vent the cylinder.
3. Measure and write the residual stroke of the cylinder. By default the value is 10 mm.
4. Save the parameter.

Information

A rough estimate of the residual stroke is enough for the system to work. If the value is too high there might be more pressure oscillations in the next step. If the value is too low, the pressure control might be too slow and the system gets harder to move.

4.6.3 Identifying the filter parameters

A different filter parameter for the pressure control is required depending on the tube length between the VPCB valve and the cylinder. This parameter is determined in this commissioning step:

1. If the operation enable is no longer set, reset it. he cylinder is moved slowly to the previously identified pressure. The pressure control is now active.
2. Move the load to the top position with the handle or manually.
3. "No frequency" will be displayed at the identified frequency so long as there is no vibration. As soon as a vibration occurs, the frequency will be displayed and can be imported using "Save identified parameter". As soon as the parameter has been imported, the vibration should be perceptibly reduced (the system is perceptibly quieter). However, if vibrations are still present, move the balancer slightly and import the parameter again.
4. Complete the commissioning of the pressure control by clicking on "Save parameter".

If the configuration has been successfully sent, proceed with the next commissioning step.

Information

In some cases, the cylinder will move slightly downwards in this step. This is due to a slightly incorrect identification of the load mass in the "Identification of the current load mass" step. If this leads to problems, repeat this step.

4.7 Limits

In this step of commissioning the software end positions and the position of the proximity switch for the reference travel are teached-in. This interface can be called with "Commissioning → Limits".

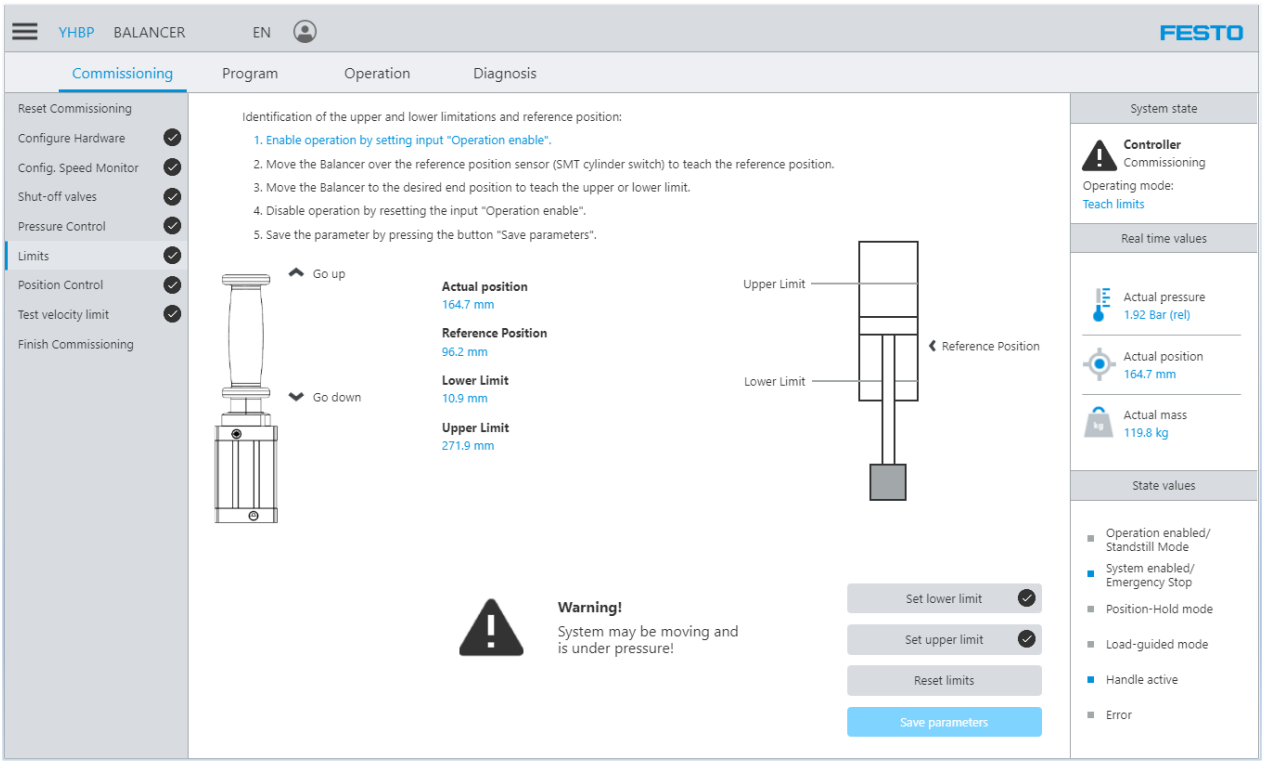


Figure 4.11: Web visualisation of setting the limitations

The sequence is as follows:

1. Set a rising edge at operation enable. This starts the test. The cylinder is moved slowly to the previously identified pressure. The pressure control is now active.
2. Move the load over the reference proximity switch with the handle or manually. As soon as it is over the switch, the reference position is saved. In this step the proximity switch can also be moved to another position and teached-in again.
3. Move the balancer to the top and bottom end positions and set the values. The original values can be reset with "Reset limits" (bottom limit: 0 mm; top limit: stroke length).
4. Accept values. If the "Save parameter" button is not active, the reference position was not successfully teached-in. In that case move the proximity switch to a different position and try again. The proximity switch should be installed in a position where it is completely passed over.
5. Accept parameter by clicking on "Save parameter".

If the configuration has been successfully sent, proceed with the next commissioning step.

Information

In some cases, the cylinder will move slightly downwards in this step. This is due to a slightly incorrect identification of the load mass in the "Identification of the current load mass" step. If this leads to problems, repeat the previous step.

Information

The reference proximity switch should be placed in a position, where it is accessible at all times, ideally close to the parking position. Therefore the system can be referenced faster after restart.
For successful homing the reference sensor has to be passed completely while the system is moving.

4.8 Position control

In this commissioning step the parameters for position control are calculated and adjusted. This includes the friction of the system and the amplification parameters for the control. This interface is called with "Commissioning → Pressure control".

Two commissioning steps are required here:

4.8.1 Friction identification

The friction of the system is determined here. The load is lifted slightly to suspend it and the motion behaviour is evaluated.

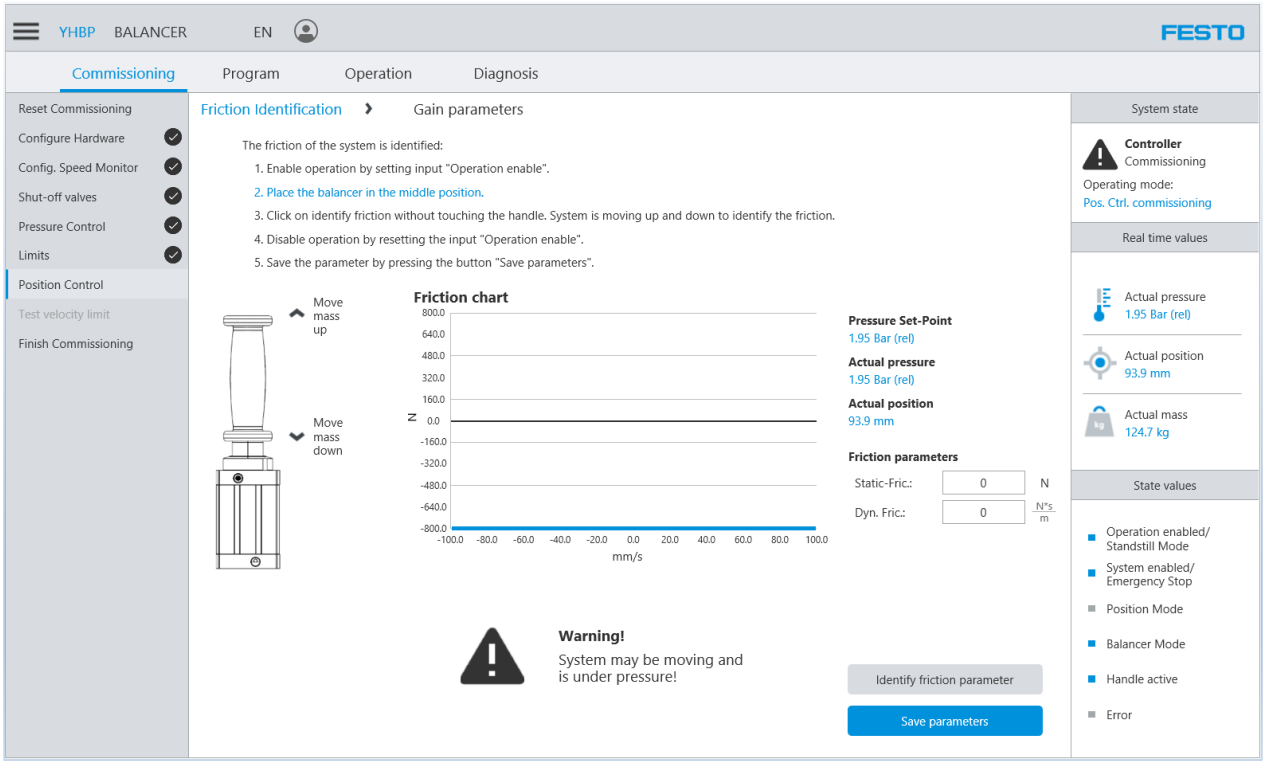


Figure 4.12: Web visualisation of identification of friction

The process for identification of friction is as follows:

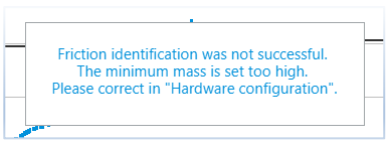
1. Set a rising edge at the operation enable. This starts the test. The cylinder is moved slowly to the previously identified pressure. The pressure control is now active.

2. Move the load approximately to the centre of the stroke range with the handle or manually. If the load does not remain stationary, reset the operation enable briefly and set it again. The shut-off valve will then be closed and the mass recalculated.

3. Start the identification by clicking on "Identify friction parameter". The balancer moves slightly up and down on its own.

Possible errors:

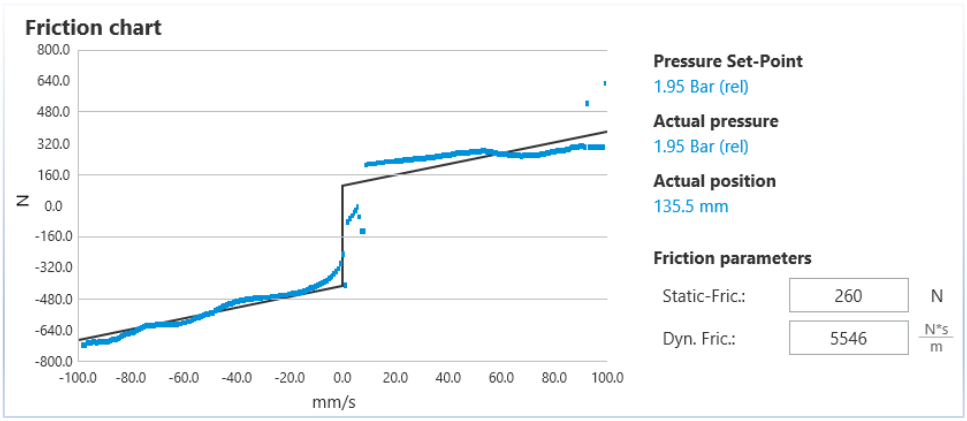
The following message is appearing:



The minimal mass in step „Configure Hardware“ was configured too low and does not fit the actual mass load. Therefore the friction identification cannot be done successfully. Furthermore this could lead to wrong behavior in the next step (drift of the balancer).

The calculated curve appears slightly different depending on kinematics and friction, but it should appear similar to this:

Parallel kinematics:



Lifting column:

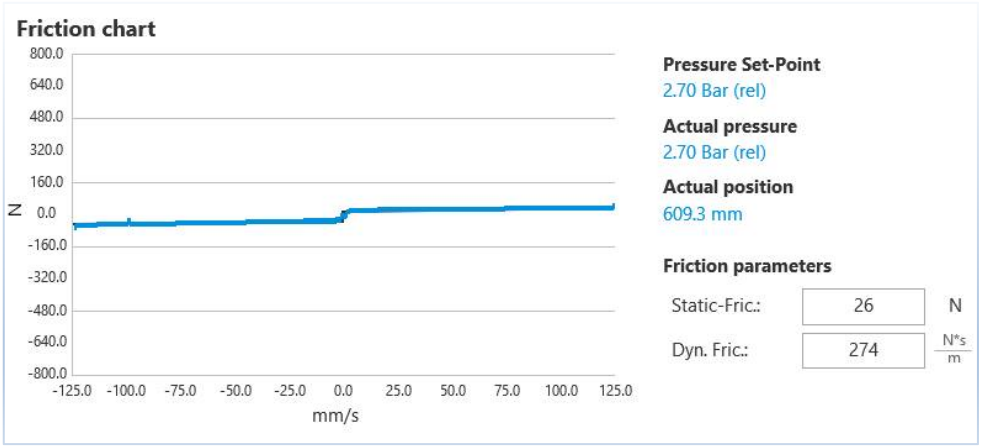


Figure 4.13: Sample curves of the identification of the friction of a parallel kinematics and a lifting column

If a plausible friction curve similar to the above examples is not shown, set 20 as the parameter for static and dynamic friction.

4. Deactivate the operation by reset of the "Operation enable" input.
5. Accept parameter by clicking on "Save parameter".

If the configuration has been successfully sent, the next commissioning step automatically starts.

4.8.2 Gain parameter

The gain parameters for position control are calculated. Various parameters can be adjusted in this step.

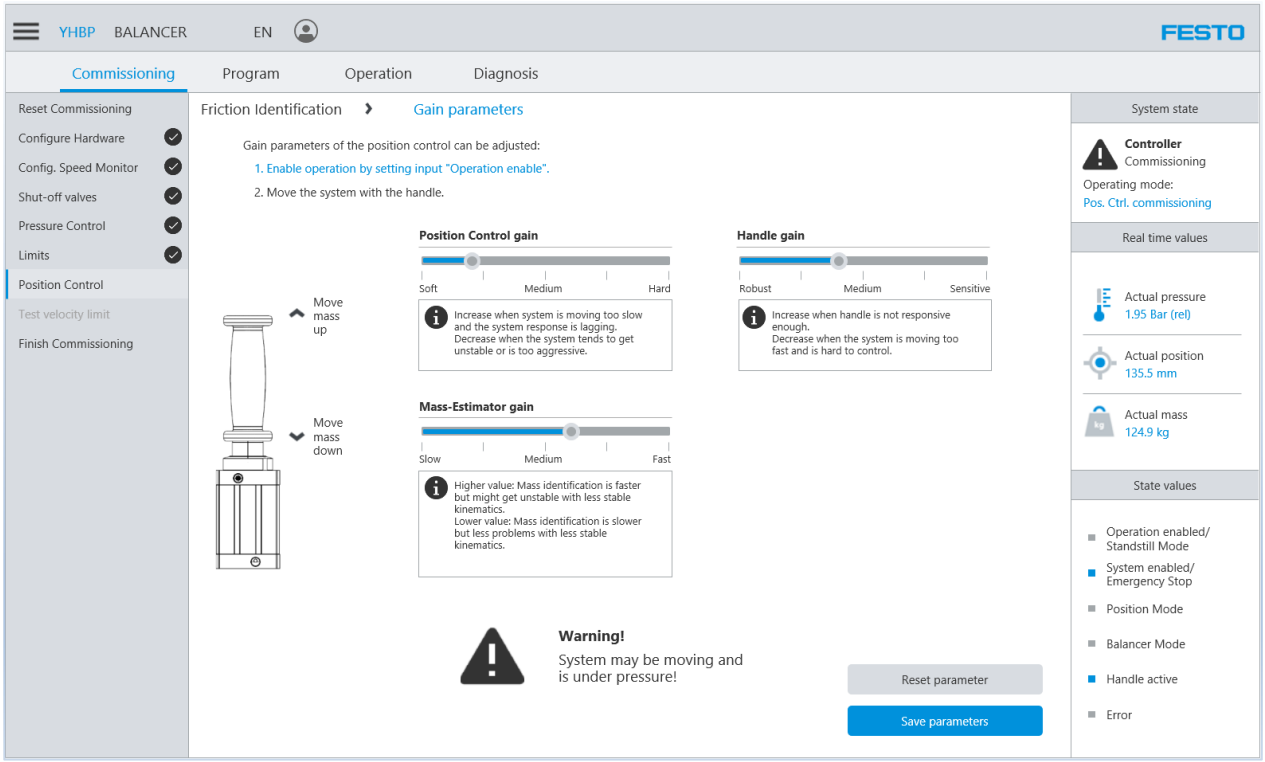


Figure 4.14: Web visualisation of the gain parameters for position control

The various gain parameters have different effects on the closed-loop control. Every parameter can be adjusted and is applied immediately.

Note

Incorrect configuration may result in unstable control behaviour.

Adjust the gain parameters only in small steps and test the behaviour after every adjustment.

If parameter values are too high, the control behaviour may be unstable depending on the system.

Position control gain:

The position control gain is relevant for the stiffness of the system.

If the system moves too slowly or trails, it can be increased. If the system becomes unstable or the control behaviour is aggressive, the value should be reduced.

Handle amplification:

The handle amplification controls the response of the handle. If the value is high, the maximum setpoint speed value will be output from a small movement of the handle.

The value should be increased if the response of the handle is too slow. It should be reduced if the system moves too fast and is uncontrollable.

Gain of the mass estimator:

The gain for the mass estimator controls the speed with which a new mass is detected. A lower value ensures a slower adaptation of the mass, a higher value a faster adaptation.

With less stable kinematics a high value may result in unstable behaviour in some cases.

A faster mass estimator results in more rigid behaviour with mass changes, but may also result in unwanted positioning, for example on interference contours or similar. If such behaviour occurs, controllability may be improved by slower mass adaptation.

4.9 Testing speed limit

In this commissioning step the correct configuration of the speed monitor or the integrated speed limits is tested. An overspeed must be deliberately generated and monitored to see whether the speed monitor trips. This interface can be called with "Commissioning → Test speed limit".

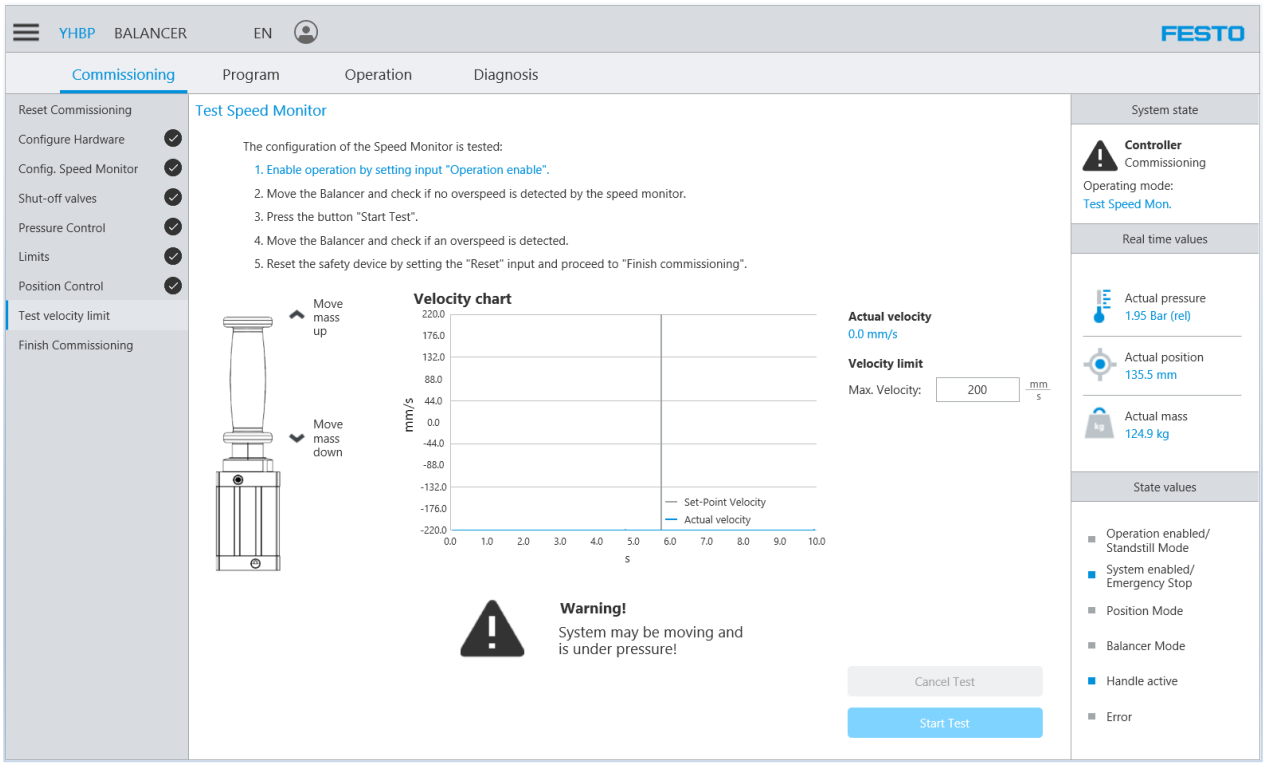


Figure 4.15: Web visualisation for "Testing speed limit"

The sequence is as follows:

1. Set a rising edge at operation enable. This starts the test. The system switches to the position-holding mode
2. Move the system and check whether **no** overspeed occurs. If the speed was exceeded here, the monitor is incorrectly configured or an excessive setpoint speed value was set in the "Configure hardware" step.
3. Start the test with "Start test". A higher maximum setpoint speed value is set (see max. speed field).
4. Move the system again and deliberately generated a higher motion speed. The monitor should trip.
5. Once the monitor has tripped, check the safety relay unit. Both safe outputs (rel. 1 and rel. 2) should be shut off.
   Reset them with the reset input and terminate the commissioning.

Information

For more information on the safety relay unit see the applicable manufacturer's documentation and the Application Note for PLd.

Note

Faster movement than parameterised is possible

When testing the safety function movements faster than the parameterised setpoint speed may occur.

5 Other options

The options menu can be called with the following symbol in the top left corner:  .

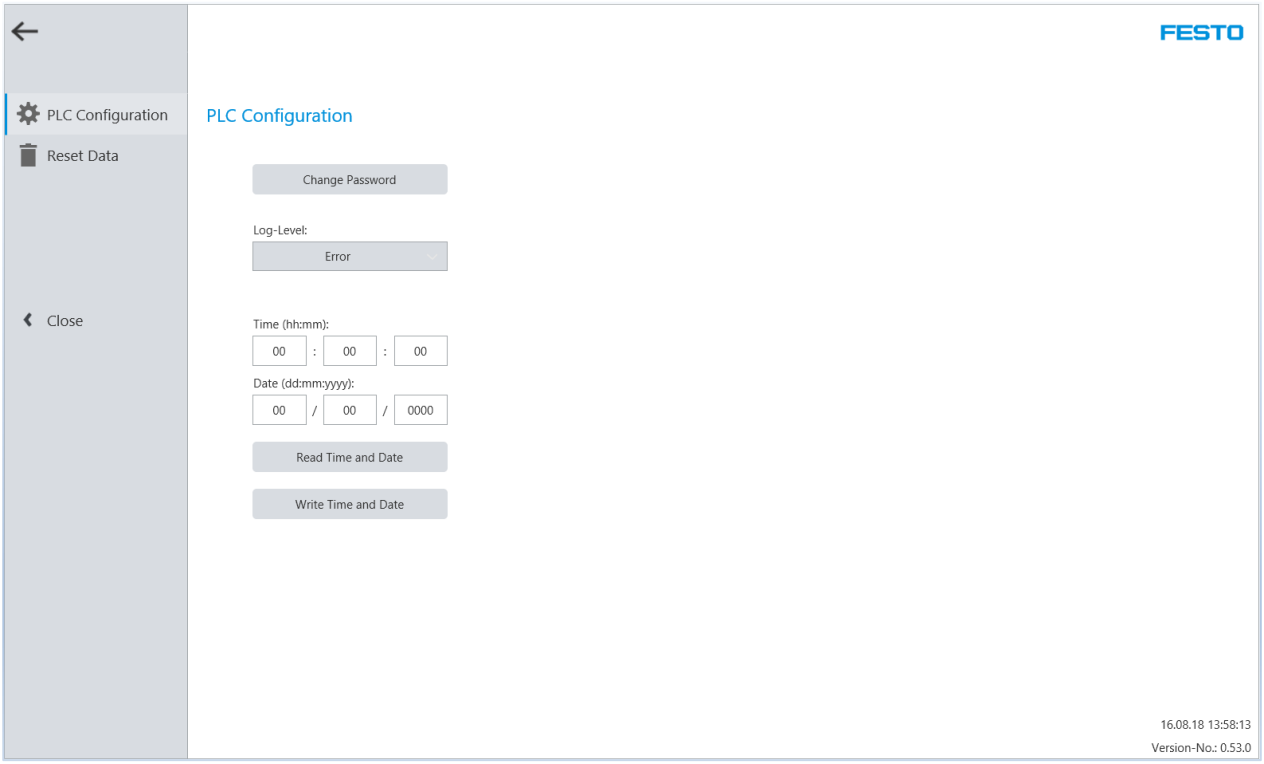


Figure 5.1: Options menu

The following settings can be changed in the options menu:

Change password:

Change the password for the current user.

Log level:

Setting the log level. The user can select the events that are to be recorded in the system log. The selection options are:

- None:
  no logging.
- Info:
  warnings and errors are logged. Specific events such as switching on and off, switching the mode of operation etc. will also be logged.
- Warning:
  warnings and errors are logged. Info messages are ignored. Which messages will be output as Info, Warning or Error can be selected in Commissioning → Monitoring.
- Error:
  only error messages will be logged. This is the default.

Note that only the last 40 messages will be saved. This limit will be reached relatively quickly at the "Info" log level.

Time:

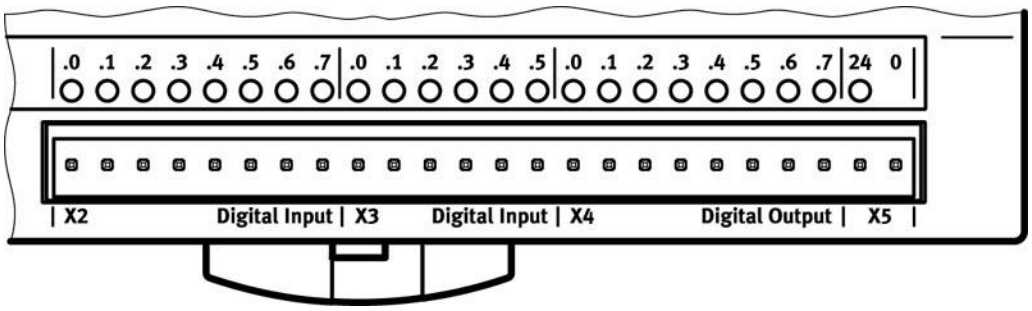
The current date and time can be set.

Resetting data:

The factory settings are restored. All data will be reset to the default configuration. The current configuration will be saved as "User_Backup".

A Technical appendix

A.1 Inputs and outputs



Clamp	Connection	Usage	Control
X2.0	8 digital inputs	Operation enable	**After restart:** Rising edge: operation enabled **Normal operation:** High-level: operation enabled Low-level: operation disabled
X2.1		Handle active	High-level: handle enabled Low-level: handle disabled
X2.2		Error input safety monitor (PLd)	High-level: error at safety monitor Low-Level: no error at safety monitor
X2.3		Reference cylinder switch	**During homing:** Rising/ falling edge: apply reference position
X2.4		Error reset	**In case of error:** Rising edge: error reset
X2.5		Switch operating mode	**In operation:** High-level: load-guided mode Low-level: position-hold mode
X2.6		Feedback input safety monitor (PLd)	High-level: overspeed registered at safety monitor Low-level: normal operation
X2.7		Not connected	--
X3.0	1 digital input	System enable / (emergency stop)	**Normal operation:** High-level: system enabled/no emergency stop Low-level: system disabled / emergency stop
X3.1 ... X3.5	5 digital inputs	User specific input configuration	--

Table 5.1: Inputs of CECC-D-BA controller

Clamp	Connection	Usage	Output
X4.0	8 digital outputs	Operation enabled	**Homing:** Output is triggering with 1 Hz **Normal operation:** High-level: operation enabled Low-level: operation disabled
X4.1		Safety monitor active	**Normal operation:** Output active **Error state:** Output is reset for 1 sec
X4.2		Shutoff-valve 1	**Normal operation:** Output active **Error state:** Output inactive
X4.3		Shutoff-valve 2	**Normal operation:** Output active **Error state:** Output inactive
X4.4		Error	**Normal operation:** Output active **Error state:** Output inactive
X4.5		Load-guided mode active	**Load-guided mode active:** Output active **Load-guided mode inactive:** Output inactive
X4.6		Position-hold mode active	**Position-hold mode active:** Output active **Position-hold mode inactive:** Output inactive
X4.7		System ready and operational	**Normal operation:** Output active **Error state:** Output inactive

Table 5.2: Outputs of CECC-D-BA controller

A.2 Error messages

A.2.1 CAN connection

Error ID	Error message	Error description	Possible causes
192, 200, 201, 202, 203, 204, 205, 206, 207, 208	Different. E.g.: Error in receiving CAN-Process-Data. Check CAN-Connection and restart! / Timeout of the VPCB-Valve. Check CAN-Connection and restart!	Error in the CAN connection between VPCB proportional rule valve and CECC-D-BA.	-VPCB valve is not supplied with voltage (emergency press, false wiring) → Check status LEDs from the VPCB -CAN connection erroneous → Closing resistance at CECC-D-BA not activated, false wiring, screen not properly laid out -VPCB and control are not grounded → to connect grounding connections -ensure EMC-appropriate wiring

Table 5.3: Error table CAN connection

A.2.2 Initialization routine

Error ID	Error message	Error description	Possible causes
213, 214	Error in sending CI-Parameter during Initialization. / Error in receiving CI-Parameter during Initialization.	Errors in parameter transfer to the valve during Initialization.	-Short-term error in communication between valve and controller → Please restart -Incorrect parameter values → commissioning again. -If the error occurs permanently, e.g. after a restart: Possibly incorrect valve software → exchange
215	Timeout in the reset of the VPCB-Valve.	Timeout in the reset of the VPCB-Valve.	-Error in the valve. Are there more error messages? → Please restart -If the error occurs permanently, e.g. after a restart: Possibly incorrect valve software → exchange

Table 5.4: Error table Initialization routine

A.2.3 Balancer state machine

Error ID	Error message	Error description	Possible causes
224	Timeout in the state change of the VPCB-Valve (Balancer-State-Machine).	Timeout in the state change of the VPCB-Valve (Balancer-State-Machine).	-Error in the valve. Are there more error messages? ⇢ Please restart -If the error occurs permanently, e.g. after a restart: Possibly incorrect valve software ⇢ exchange
512	Emergency Break (No System Enable).	Emergency stop is active. There is no voltage at input X3.1 (system enable).	-Emergency stop is pressed -System enable is not connected -No load power supply → terminal X5 with voltage

Table 5.5: Error table Balancer state machine

A.2.4 Closing valves

Error ID	Error message	Error description	Possible causes
240	Safety-Valve 1 Test failed.	Safety valve 1 test failed. During the test, a short pressure pulse is given to the closed valve. There must be no change in the output of the pressure/position.	-During the test, the balancer was moved. -No supply pressure. -Too high leakage on the working cylinder. Does the cylinder or pressure slowly drop when the closing valves are locked? ⇢ Check interconnectors and bolts -If the test fails repeatedly, there may be a defect in the lock valve. → Exchange.
241	Safety-Valve 2 Test failed.	Safety valve 2 test failed. During the test, a short pressure pulse is given to the closed valve. There must be no change in the output of the pressure/position.	see error ID 240
242	Safety-Valve-Test failed. No Supply pressure or valves not opening.	Safety valve test failed. At the beginning, it is tested for existing supply pressure.	- No supply pressure. - Closing valves do not open → check wiring

Table 5.6: Error table closing valves

A.2.5 Monitoring functions

Error ID	Error message	Error description	Possible causes
272	Maximum Velocity-Deviation exceeded (Balancer-Controller).	Maximum speed deviation between setpoint velocity and actual velocity exceeded. Monitoring by CECC-D-BA.	--
273	Maximum critical velocity exceeded (Balancer-Controller).	Parametric critical speed limit was exceeded. Monitoring by CECC-D-BA.	- Jerky movement by the operator. - In load-guided mode, the workpiece was pulled too hard. - Load was detached abruptly. - In position-hold mode the load has gotten stuck at a pinch-point and has detached abruptly. - Other error.
274	Maximum position-deviation exceeded (Balancer-Controller).	In position hold mode the load was deflected too much from its set position.	-Load was loaded or unloaded and the control could not adjust quickly enough -Limit value is too narrow → Select higher limit under program → monitoring configuration → position deviation -Supply pressure failure
275	Maximum mass exceeded (Balancer-Controller).	The maximum mass parameterized in the web-visualization has been exceeded. The mass is determined internally on the base of the movement behaviour of the balancer.	- It was attempted to lift too much weight - Too much load has been added - A disturbance contour is present, and the balancer was moved against the disturbance contour with the maximum force - A maximum mass limit that is too low has been configured

Error ID	Error message	Error description	Possible causes
276	Maximum pressure deviation error (Balancer-Controller).	Maximum pressure deviation between set-point pressure and actual pressure in the working cylinder exceeded.	- Supply pressure failure - Can sometimes occur with rapid changes of direction - Control error in the proportional valve
277	Maximum mass deviation exceeded (Balancer-Controller).	The deviation between the real mass and the currently set mass has exceeded the limits that are parameterized in the webvisualization. The monitoring is only active in load guided mode or during positioning.	- Jerky movement by the operator. - In load-guided mode, the workpiece was pulled too hard. - Load was detached abruptly. - In load guided mode, an attempt was made to set a wrong mass via a special function - While positioning, the mass has changed → If desired, choose higher limit below "Program → Monitoring configuration → Mass deviation" - Limits are parameterized too narrow and are triggered, for example, by excessive friction
278, 279	Upper position limit exceeded (Balancer-Controller). or Lower position limit exceeded (Balancer-Controller).	Upper/Lower parametric software end position have been run over.	- The buffer zone before the end positions was set too low. This makes it possible to pass over the end positions at high speeds - Limits can be in run over in load-guided mode by hand - Other error
280	Maximum pressure deviation in load-guided mode error (Balancer-Controller).	In load-guided mode, the actual pressure has left the pressure range that can be adjusted via the handle. (Parameters for setting the pressure range: "Max force in Last-guided mode")	- Error in the proportional valve - Supply pressure failure - Range is configured too narrow - Other control error
281	Position-Value equals zero. Position sensor is referenced to the wrong value. Check homing position.	Position value is zero. Displacement sensor is referenced to the wrong position. Check reference position and teach the new position.	- Cylinder switch for the reference position is in the wrong position → teach the position again in commissioning - Wrong value for final position entered in step pressure control-commissioning → do commissioning again

Table 5.7: Error table monitoring functions

A.2.6 Commissioning

Error ID	Error message	Error description	Possible causes
288, 289, 290	Timeout in Parameter transmission to VCPB during Commissioning. / Error in sending CI-Parameter during Commissioning. / Wrong CI-Answer from the VPCB-Valve during Commissioning.	Errors in the parameter transfer to the valve during Commissioning.	- Short-term disturbance in the communication between the valve and the controller. Redo the commissioning step. In the event of repeated occurrence of the error: - Check the parameter values ⇢ Possibly wrong parameters, try resetting factory condition and restart commissioning - Exchange the valve

Error ID	Error message	Error description	Possible causes
291	Error in the recipe management.	Error in storing the variables in the internal memory of CECC-D-BA.	- Special characters included in the configuration name - Invalid configuration has been loaded or memory of the control is full → reset to factory settings and try again - Other error
292	Timeout in the state change of the VPCB-Valve (Commissioning-State-Machine).	Timeout in the state change of the VPCB-Valve (Commissioning-State-Machine).	- Error in the valve. Are there other error messages? - Error keeps coming repeatedly. Software errors in the valve. Exchange the valve.

Table 5.8: Error table commissioning

A.2.7 Proportional control valve

Error ID	Error message	Error description	Possible causes
336	General Error in the VPCB-Valve.	General Error in the VPCB-Valve.	Different, see the following errors
337	Low voltage at the VPCB-Valve ‹ 21,6 Volt.	Low voltage at the VPCB-Valve ‹ 21,6 Volt.	- Supply voltage is too low. Increase voltage levels or reduce line length.
338	Control deviation of the piston position control of the VPCB-Valve is too high.	Control deviation of the piston position control of the VPCB-Valve is too high.	- Valve may be stuck - Check friction of the valve - Use filtered compressed air
339	High voltage at the VPCB-Valve › 28 Volt.	High voltage at the VPCB-Valve › 28 Volt.	- Supply voltage is too high → reduce voltage levels.
340	Control deviation of the pressure control of the VPCB-Valve is too high.	Control deviation of the pressure control of the VPCB-Valve is too high.	- Locking valves are closed while the pressure control is active → Check wiring - Filter parameters are incorrectly set → Check commissioning step "Pressure Control" again. - The balancer is often charged alternately in succession
341	Temperature of the piston actuator coil of the VPCB-Valve › 100°C.	Temperature of the piston actuator coil of the VPCB-Valve › 100°C.	- Too high temperature at the coil. Valve is stuck or is operated at too high temperatures.
342	Error in the CAN-Communication of the VPCB-Valve.	Error in the CAN-Communication of the VPCB-Valve.	- CAN connection erroneous → Termination resistance at CECC-D-BA not activated, false wiring, shield not connected properly - VPCB and control are not grounded → connect grounding connections - Ensure EMC-appropriate wiring
343	Error in the supply pressure of the VPCB-Valve.	Error in the supply pressure of the VPCB-Valve.	- No supply pressure. - Locking valves are closed while the pressure control is active → Check wiring

Error ID	Error message	Error description	Possible causes
344	Timeout of the Balancer-Controller (Watchdog of the VPCB-Valve).	Watchdog of the VPCB valve has struck. The time gap between two CAN messages was too great.	- Check CAN connection. - Overload of the balance controller
345	Error in the E2PROM of the VPCB-Valve.	Error in the E2PROM of the VPCB-Valve.	- Internal error of the VPCB valve. Restart. - If the error persists → Exchange
346	Control-Interrupt-Structure of the VPCB-Valve could not be activated.	Control-Interrupt-Structure of the VPCB-Valve could not be activated.	- Internal error of the VPCB valve. Restart. - If the error persists → Exchange
363	Hardware-circuitry of the actuator of the VPCB-Valve is defective.	Hardware-circuitry of the actuator of the VPCB-Valve is defective.	- Internal error of the VPCB valve. Restart. - If the error persists → Exchange
364	Error in the external displacement encoder connected to the VPCB-Valve.	Error in the external displacement encoder connected to the VPCB-Valve.	- Check the connection between the displacement sensor and the VPCB valve
366	Maximum Velocity exceeded (VPCB-Valve).	Parameterized critical speed limit was exceeded. Monitoring by the VPCB valve.	- Jerky movement by the operator. - In load-guided mode, the workpiece was pulled too hard. - Load was detached abruptly. - In position-hold mode the load has gotten stuck at a pinch-point and has detached abruptly. - Other error.

Table 5.9: Error table proportional control valve

A.2.8 Safety relay

Error ID	Error message	Error description	Possible causes
368	Maximum velocity exceeded (Safety Speed-Monitor).	Parameterized critical speed limit was exceeded. Monitoring by the safety relay.	- Jerky movement by the operator. - In load-guided mode, the workpiece was pulled too hard. - Load was detached abruptly. - In position-hold mode the load has gotten stuck at a pinch-point and has detached abruptly. - Other error.
369	Other Error: Encoder error, Reset Error (Safety Speed-Monitor).	Other error at the safety relay.	- Check the error display on the safety relay. - Possible error causes: - Operation enable switch in middle position, no signal on the inputs Y31-34 - Position measuring system connected incorrectly Further information: see Application Note - SSC / SLS PLd.

Error ID	Error message	Error description	Possible causes
370	Wrong maximum velocity parameterized (Safety Speed-Monitor).	Wrong maximum velocity parameterized (Safety Speed-Monitor).	- Safety relay reports error, although the speed is still within the parameterized control range → Check parameterized limits: either change setpoint speed under "Hardware configuration" or check the speed limit of the safety relay.

Table 5.10: Error table safety relay

A.2.9 Controller

Error ID	Error message	Error description	Possible causes
378	Error on one of the outputs (possible short circuit/cross circuit).	Error on one of the outputs (possible short circuit/cross circuit).	- Short circuit / cross-circuit at one of the outputs - Overload of the outputs
379	Low voltage at the power supply (clamp X1) of the CECC.	Low voltage at the power supply (clamp X1) of the CECC.	- Power supply set too low - Power supply designed too small - Too many consumers on a power supply - Cable cross-section too small, cables too long
380	Missing load voltage supply (clamp X5) at the CECC.	Missing load voltage supply (clamp X5) at the CECC.	- Missing load voltage supply - Emergency stop pressed

Table 5.11: Error table controller

A.2.10 Handle

Error ID	Error message	Error description	Possible causes
385	Handle is under pressure, while resting in middle position. Maybe leakage is appearing.	If the operation enable or the handle active input are not set, it is checked if there is no pressure on the handle. If there is pressure this could indicate leakage.	- Handle was deflected from the middle position while the operation was not enabled. - There is leakage between the handle and the valve. Check the connections and seals. - Hysteresis of the handle parameterized too small.

Table 5.12: Error table handle

A.2.11 Info messages (only if PLC-log level Info)

Info ID	Info message	Info description
768	Info: CAN Initialisation done.	Info message is generated after the CAN is successfully initialized after power-on.
769	Info: Configuration file has been loaded.	Info message is generated after the configuration is loaded.

Info ID	Info message	Info description
770	Info: Initialisation successfully finished. System is ready.	Info message is generated after initialization is complete.

Table 5.13: Info messages initialisation

Info ID	Info message	Info description
771	Info: Test of the safety valve successfully finished during first start.	Info message is generated when the closing valves are successfully tested after the first startup.
772	Info: Homing successfully finished during first start.	Info message is generated when the homing has been successfully performed after first startup.
773	Info: Switched to load-guided mode.	Info message is generated each time the system is switched to load-guided mode.
774	Info: Switched to position-hold mode.	Info message is generated each time the system is switched to position hold mode.
775	Info: Exhaust function activated.	Info message is generated each time the exhaust function is used.

Table 5.14: Info messages state machine

Info ID	Info message	Info description
784	Info: Hardware configuration is done (Commissioning).	Info message is generated when the hardware configuration has been completed during commissioning.
785	Info: Safety monitor configuration is done (Commissioning).	Info message is generated when the safety switching device has been configured during commissioning.
786	Info: Pressure control configuration is done (Commissioning).	Info message is generated when the pressure control has been configured during commissioning.
787	Info: Position control configuration is done (Commissioning).	Info message is generated when the position control has been configured during commissioning.
788	Info: Limits configuration is done (Commissioning).	Info message is generated when the software limits have been configured during commissioning.
789	Info: Safety valve test is done (Commissioning).	Info message is generated when the closing valves have been tested during commissioning.

Table 5.15: Info messages commissioning