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1 General



Warning!

Always study the **056786 Safety** section BEFORE operating the equipment. Inadequate knowledge can cause damage on personnel and machines.

Perform recommended service and preventive maintenance to secure the correct functionality and safety level of the machine.

This section covers operation of the test station. It is important that the operator be thoroughly familiar with this section to ensure safe, proper, and efficient operation and increased operating life of the equipment. Specifically, this section covers the following subjects:

Safety Instruction

Start-Up

Running To Initial Position

Operation Modes

Sequence of Operation

Shutdown Procedures

Troubleshooting

Action After Stoppage

2 Safety Instructions for Operation



Warning!

Always study the **056786 Safety** section BEFORE operating the equipment. Inadequate knowledge can cause damage on personnel and machines.

Perform recommended service and preventive maintenance to secure the correct functionality and safety level of the machine.

3 Emergency Stop



Warning!

Only use Emergency Stop at danger. NOT for normal stops.

The Emergency Stop shall only be used to as quickly as possible stop the machine's hazardous parts.

Emergency Stop can be activated independent of operation mode or machine status. The area affected by an emergency stop is described in the document **056787 Function Description**, chapter **3 Safety**.

3.1 Placement of Emergency Stops

The Emergency Stops are placed on the:

- 1 Main Operator Panel
- 2 Door panel

3.1.1 Emergency Stop Action

When the emergency stop button is pressed the following happens in the emergency stop area:

1. Energy is disconnected from electrically triggered movements.
2. The pneumatic and hydraulic systems are discharged.
3. No movements are possible to activate in Auto, Step or Manual mode.

3.2 Reset after Emergency Stop

1. Make sure the cause for the emergency stop has been rectified.
2. Make sure no one is within the machine's safety area.
3. Make sure all protections (gates/light beams) are reset.
4. Reset the pressed emergency stop button.
5. Press the RESET ALARM button to reset the emergency stop circuit. The emergency stop circuit is reset after the button has been released. Check the functionality of the light
NOTE! This has to be performed on ALL stations.
6. Press the TO INITIAL POSITION button. The machine automatically runs to its initial position. The light in the button flashes during running to initial position. The light changes to a fixed light when initial position has been reached.
7. Start the machine according to one of the sections Automatic mode, Step mode or Manual mode

4 Safety Stops

Danger!

There are hazards in the machine's safety area inside gates, safety fence, walls and light beams/curtains.

It is prohibited to stay inside safety fences/walls or light beams/curtains during operation.

4.1 Safety Gates/Safety Doors

Gates/doors are provided with gate switches which sets part of the machine into safety stop when opened.

Gates/doors are locked during operation to avoid being unintentionally opened, which leads to stoppage.

4.2 Light Beams

If the light beam is broken during an ongoing cycle, the machine or parts of it, is set into safety stop.

4.2.1 Action at Safety Stop

A safety stop affects the equipment in the safety area accordingly:

1. Energy is disconnected from electrically triggered movements.
2. The pneumatic system is discharged.
3. No movements are possible to activate in Auto, Step or Manual mode.

4.3 Access to Safety Area

To access the safety area a manual request for admission must be made. The cycle stops as soon as possible. Some exceptions may occur, for such as power-wrenches, marking or thread cutting. In normal conditions the machine stops before gates/doors are unlocked. If a door/gate is opened or a light beam/curtain is passed during automatic operation, the safety stop is activated.

4.3.1 Request to enter the machine through gate/door or light beam/curtain

1. Press the REQUEST ENTRY on the gate or sub panel.
2. Entry to the machine is possible after the current program step has been finished and the automatic cycle is stopped. The light in the REQUEST ENTRY button now shines with a fixed light.

4.4 Exit from Safety Stop Area

1. Make sure no one is in inside the machine's work area and then close the safety gate.
2. Press the RESET ALARM button to reset safety protections (all gates/light beams must be acknowledged before restart is possible).

4.5 Restart after Safety Stop

Restart after safety stop is always made at the main operator panel.

1. Press the AUTO START button. The machine's automatic cycle restarts.

5 Start-Up



Warning!

At first start-up, study section *Start-up During Handling*. Inadequate knowledge can cause risk of damage on personnel and machine.

The prerequisites for start-up of the machine. Make sure:

1. EMERGENCY STOP button is pulled out. If it is depressed, make sure the conditions are safe before proceeding.
2. MAIN CIRCUIT BREAKER is activated
3. MAIN PNEUMATIC VALVE is open
4. SA3000 computer and Operator screen are on
5. No personnel are in the machine work area
6. Safety gates/doors are closed

5.1 Start-Up of Machine

1. Press the CONTROL VOLTAGE ON button on the operator panel to initiate start-up of the machine.
2. After 3 seconds, when the entire machine is powered up, the pneumatics shall be pressurized.
3. The light in the CONTROL VOLTAGE ON button flashes when start-up is performed and changes to a fixed light when:
 - Control voltage is on
 - Pneumatics are pressurized
4. The machine is ready to operate.

5.1.1 Selection of Operating Mode

Operating mode is selected with the the OPERATING MODE selector. The selection is unconditional. Selected operating mode is displayed in the operator panel image header.

1. Turn the OPERATING MODE selector to desired mode (AUTO – MAN –STEP).



Important!

When switching the selector between AUTO and STEP mode the machine sequences are not affected, but the machine is set in machine stop. The machine is possible to restart after this manoeuvre.

When switching to or from manual mode all sequences in the machine are reset.

If manual mode is selected the automatic cycle is immediately stopped and the machine has to be run to its initial position before it can be restarted.

6 Running to Initial Position

This function can also be run in Step mode, where each step has to be initiated by pushing the button.

To activate running to initial position the following prerequisites have to be fulfilled:

1. Machine started up, see paragraph **5.1 Start-Up of Machine**.
2. Safety gates/doors have to be closed and reset.
3. Light beams/curtains have to be reset.
4. No active alarms.
5. Auto or Manual operation mode selected.
6. Auto cycle not active

6.1 Start Running to Initial Position

1. Press the TO INITIAL POSITION button.
The machine automatically runs to its initial position. The light in the button flashes during running to initial position. The light changes to fixed light when initial position is reached.

7 Automatic Mode

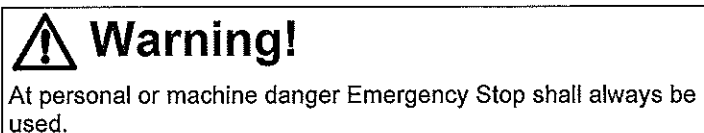
To activate automatic mode the following prerequisites have to be fulfilled:

1. Machine has to be started up, see section **5.1 Start-Up of Machine**.
2. Safety gates/doors have to be closed and reset.
3. Light beams/curtains have to be reset.
4. No active alarms.
5. Auto mode selected.
6. The machine must be in its initial position.
7. The light in the AUTO START button is flashing.

7.1 Start of Automatic Cycle

1. Make sure no personnel are inside the machine's safety area.
2. Press the AUTO START button to start the automatic cycle. The light in the button illuminates with a fixed light when the automatic cycle is in progress.

7.2 Pause/Halt Automatic Cycle



This function pauses/stops the automatic cycle immediately even if the machine has started a movement.

1. Press the AUTO STOP button to stop all motions. The automatic sequence is paused.

7.3 Stop Automatic Cycle

The function stops ongoing automatic cycle in the initial position. At activation during transport, this will finish before the automatic cycle stops.

1. Press the CYCLE STOP button.
The light in the pushbutton flashes when stop is requested and changes to fixed light when the automatic cycle has stopped.

7.4 Restart of Automatic Cycle (After Pause/Halt or Stop of Automatic Cycle)

1. Press the AUTO START button.
The light in the push button flashes when start of automatic cycle is possible and changes to fixed light when automatic cycle is in progress.

8 Running in Step Mode

Step Mode is similar to Auto Mode, but the operator has to press the AUTO START button to activate each movement/function.

9 Manual Operation

Movements/functions in automatic mode are also possible to run/activate as a single movement/function. Start and stop of complex functions are also made in this operation mode.

The available movements/functions are displayed in the screen images. Examples of functions:

1. Control of movements: for example rotating turntable, lifting unit up/down
2. Medium functions: Pneumatics on/off

To activate functions in manual mode the following prerequisites have to be fulfilled:

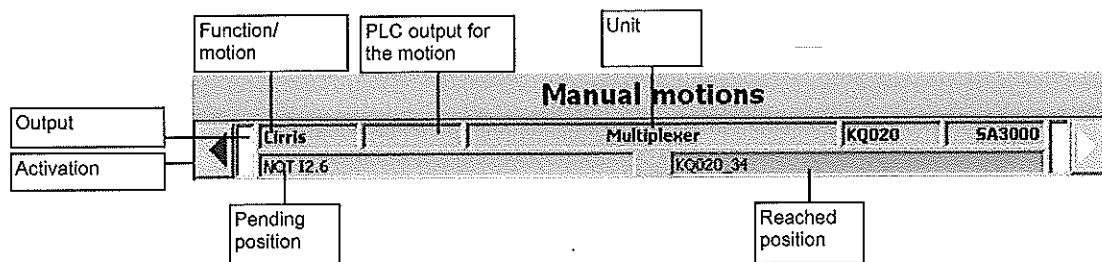
1. Machine started, see chapter **5.1 Start-Up of Machine**.
2. Any safety doors/gates must be closed and reset
3. Any light curtains must be reset
4. No active alarms
5. Manual operation mode must be selected

9.1 Activation of Movement/Function

1. Turn the OPERATING MODE switch to MAN.
2. Select image group [K3], MANUAL on the operator panel.
3. Select desired manual image on the operator panel by using image buttons [F13] - [F20]. More pages are available by pressing [F13/F20].
4. To activate a movement/function, press the desired function button [F1] – [F12] on the left/right side of the screen. The movement stops immediately or finishes when the button is released.

If a certain movement is not available/possible, the reason will be displayed in the message field.

9.1.1 Indications in the Manual Motions Image



Examples of messages

Indications	Functions
Blue triangle	Possible to activate
White triangle	Not possible to activate
White flashing rectangle	Output is on
Grey indication	Motion pending
Green indication	Final position has been reached.

9.2 Restart in Automatic Mode

If manual mode is selected the machine has to run to its initial position before it can be restarted in automatic mode.

10 Sequence of Operation

This section covers normal operation of the WEST test station in automatic mode. It is important that the operator be thoroughly familiar with this section to ensure safe, proper, and efficient operation and increased operating life of the equipment.

10.1 Operator Instructions (General)

The starting position assumes that one engine is being tested in the station, one engine has been tested and is in the post-WEST position.

A new engine arrives at the station in-position.

The build tag is automatically scanned and the data transmitted to MONT.

1. Follow the instructions that are displayed on the HMI.
2. Disconnect all connections on the tested engine and bring them to the new engine.
3. Attach fuel supply connector.
4. Attach fuel return connector.
5. Attach steering connector #1.
6. Attach steering connector #2.
7. Attach A/C inhibit air line
8. Attach Intake manifold connector.
9. Attach EI electrical connector (green). Move to the other side of the engine.
10. Attach Turbo outlet connector.
11. Attach Turbo inlet air connector.
12. Attach crankcase breather connector.
13. Attach oil pressure line connector.
14. Attach exhaust connector.
15. Attach pos/neg starter cables.
16. Press the RESET SAFETY button.
17. Press the AUTO START button to initiate the automatic cycle. The table rotates the engine into the test station and automatically performs the starter tests.
18. When the test is finished and the engine has state: Pass, the table turns 180 degrees and the engine is transported to the post-WEST position and a new engine enters the station.
Note! If the engine has state: Fail. Press TO INITIAL POSITION and do the test over again.
19. Repeat from step 1.

NOTE! Operator should also check for oil and fluid leakage and level of servo oil container. Check quick couplings for leakage.

11 Shut Down of the Machine

11.1 Normal Shut Down

1. To stop the automatic cycle, press the CYCLE STOP button on the operator panel. The light in the button shines with a fixed light when the cycle has stopped.
2. To turn off the machine, press the CONTROL VOLTAGE OFF button. The machine's manoeuver circuits are disengaged and the medium discharged.

At longer shut downs or at maintenance, please continue in the next paragraph, **12.2 Long Term Shut Down/Maintenance**.

11.2 Long Term Shut Down/Maintenance

Warning!

Residue current can occur in, for example, frequency converters and servo equipment when the machine is shut off. Please note all warning signs on and in electrical cabinets.

Please refer to instructions for discharge in the *Maintenance* section or in the component manufacturer's instructions.

1. Shut off the PNEUMATIC ELECTRIC MAIN VALVE (on the electrical cabinet inside – make: Festo)
2. Shut off the PNEUMATIC MAIN VALVE (on the electrical cabinet outside – make: Ross)
3. Shut off the MAIN CIRCUIT BREAKER on the electrical cabinet by the machine.
4. Make sure the equipment is pressureless.
5. Lock the MAIN CIRCUIT BREAKER and PNEUMATIC MAIN VALVES.

12 Warnings, Alarms and Conditions

When an alarm occurs during the automatic cycle the guiding system, depending on degree of seriousness, acts in the following way:

12.1 Warning

A warning means the machine does not stop immediately, but it calls upon the attention of the operator for, for example, refill of details, check up etc.

If the warning is not attended to the machine may stop shortly after.

Warnings are indicated in the following ways:

1. Warning text in the screen image header
2. Yellow alarm icon in the screen image header
3. The yellow light in the stack light flashes

12.2 Alarm

An alarm is a more serious level, where there are risks of machine, detail or personal injury. The machine stops for action to be taken.

An alarm is indicated in the following ways:

1. Alarm text with information on alarm part, functions group, what caused the alarm and type of error is displayed in the screen image alarm text field.
2. Red alarm icon in the screen image header.
3. The red light in the stack light flashes.

The alarms are active until the cause for alarm has been remedied or the alarm has been reset.

12.2.1 Acknowledgement of Alarms and Warnings

Alarms and warnings are acknowledged by pressing the RESET ALARM button.

When the alarm has been acknowledged the indication changes from flashing to fixed light. This remains until the cause for the alarm has been eliminated.

12.2.2 Restart After Alarm

1. Press RESET ALARM
2. If TO INITIAL POSITION/AUTO START is flashing, press the button

12.2.3 Messages in Explanatory Text

The latest alarm is displayed in the alarm field in the operator screen image.

All active alarms are displayed in the [K5]-[F13] image.

Trouble shooting guidance is available via messages in the HMI.

12.2.4 Show Alarm History

The Alarm can be viewed in the screen image [K5]-[F14]

13 Troubleshooting

For some units the troubleshooting guides can be found in the respective supplier's manual. Some of these are intended for the operator.

13.1 Message, Cause and Action – Displayed on the HMI

Guiding text on the operator screen.

Below there are explanations for some messages that may not be thoroughly explained in the operator screen.

Message	Cause	Suggestion for action
11. Airpressure not OK.	Airpressure missing.	Contact maintenance personnel. Take measures. Re-start according to chapter <i>Re-start After Pressure Air Breakdown..</i>

13.2 Symptom, Cause and Action – General

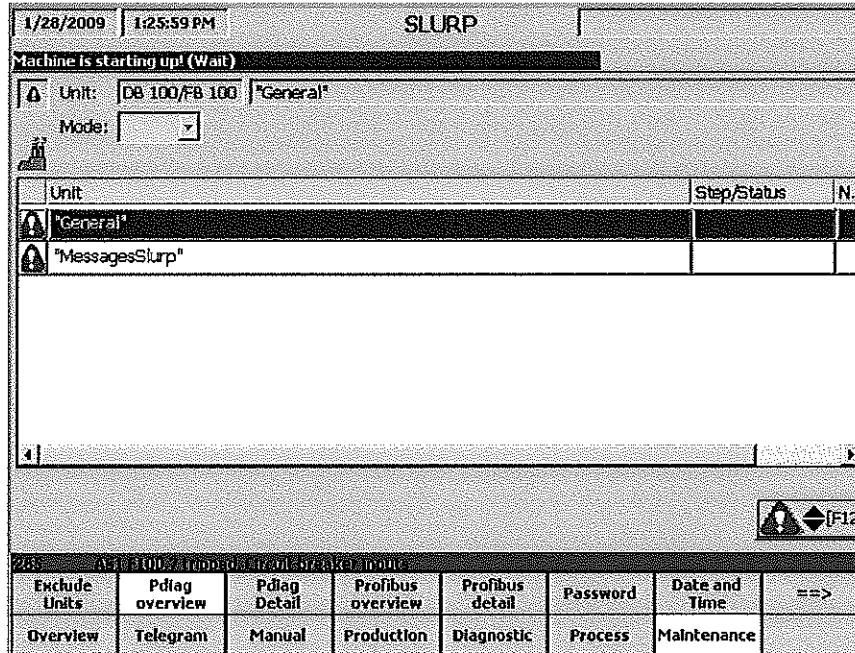
Symptom	Cause	Suggestion for action
Deviating test results. For example Fail on IPV 3000 screen.	Faulty sensor if the deviation repeats	Contact maintenance personnel. Can be incorrect output voltage. Make an end-to-end calibration.
		Change rotation speed
Abnormal measurements		Check seals
		Adjust measurements parameters

13.3 Alarm Diagnostics

The panel can diagnose occurring alarms and show the conditions which triggers the alarm.

13.3.1 Diagnostics Overview

- 1 Select image group DIAGNOSTIC, by pressing the [K7] key on the operator panel.
1. Select image PDIAG OVERVIEW, by pressing the [F14] key.



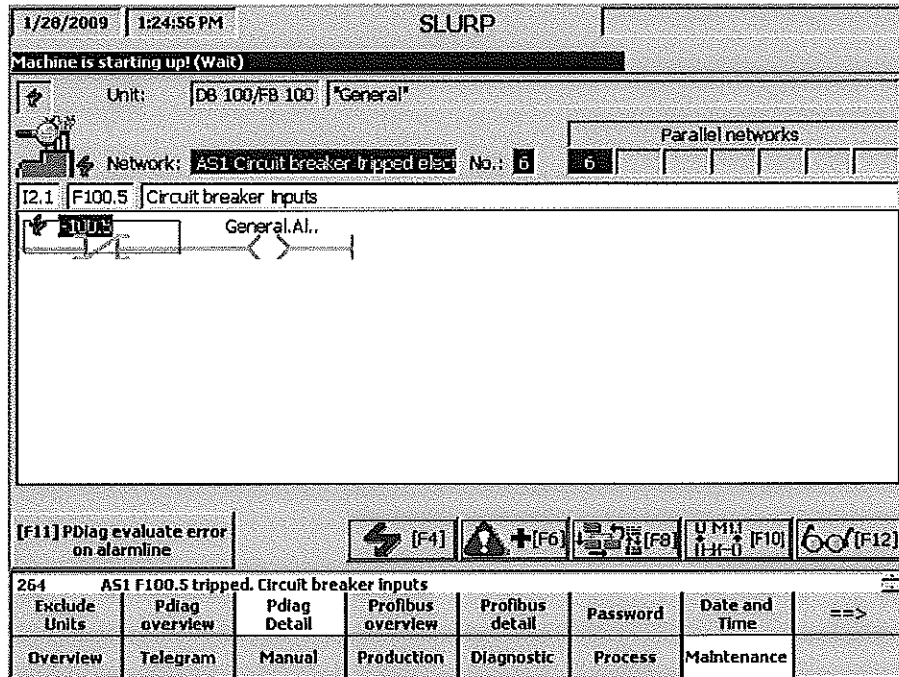
Press the filter button, F12, (depicted below) to switch between display of all blocks and blocks only containing alarms.



13.3.2 Detailed Diagnosis Image

To access the Pdiag Detail image:

- 1 Select image group [K7], DIAGNOSTIC and image [F15], PDIAG DETAIL on the operator panel.
- 2 Use the cursor mark the selected block in the overview.



The screen image displays a symbolic view of the first active alarm in the selected program block after [F11] PDIAG EVALUATE ERROR ON ALARMLINE has been pressed. Use the TAB to jump between alarms.



Press the filter button, [F4], (depicted below) to switch between display of all conditions for the alarm and only conditions that are not fulfilled.



Press the "next alarm" button (depicted below), F6, to go to the next alarm in the selected program block.



Press the "switch diagnosis" button, F8, (depicted below) to switch between inter-locking conditions and transition conditions when the alarm has been generated by a machine sequence.



Press the "switch display" button, **F10**, (depicted below) to switch between display of the symbol list, display of conditions in the instructions list and display of conditions in relay form.



Press the "status" button, **F12**, (depicted below) to switch between display of current conditions status or status of the conditions at the time of the error.



14 Actions after Stoppage

Conditions, Actions and Check before restart after power/pneumatic failure:

1. Make sure the cause for the power/pneumatic failure has been eliminated/fixed.
2. Make sure no one is inside the machine's safety area.
3. Make sure all, if any, doors/gates are closed.

14.1 Restart after Power Failure

1. First shut off and then turn on the MAIN CIRCUIT BREAKER on the main electrical enclosure.
2. Start up the machine according to the section **5.1 Start Up of Machine**.
3. Run the machine to its initial position by pressing the TO INITIAL POSITION button.
4. Select operation mode according to one of the sections *Automatic Mode*, *Step Mode* or *Manual Mode*.

14.2 Restart after Pneumatic Failure

1. Reset the alarm.
2. Press CONTROL VOLTAGE ON
3. Run the machine to its initial position by pressing the TO INITIAL POSITION button.
4. Select operation mode according to one of the sections *Automatic Mode*, *Step Mode* or *Manual Mode*.