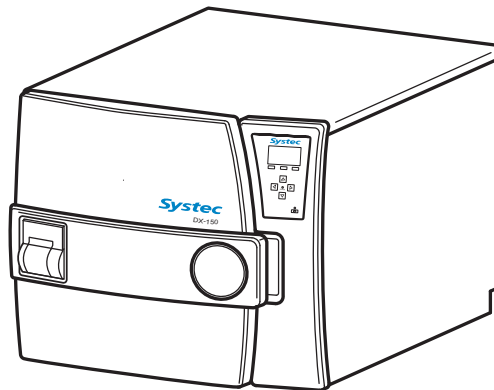
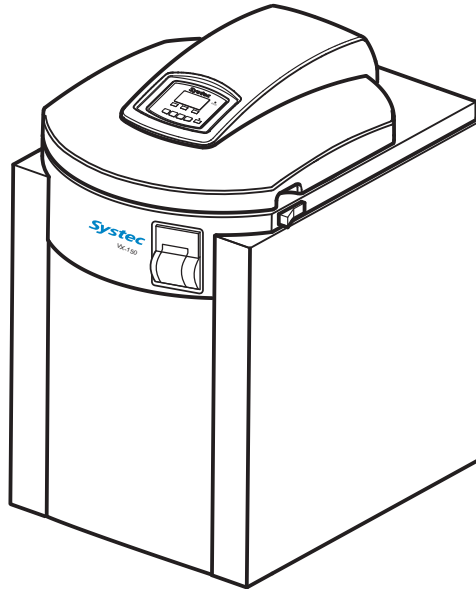


SERVICE MANUAL

SYSTEC V/D SERIES



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CONTENTS

Only for authorised service personnel!



The service and maintenance tasks described in this manual may only be carried out by authorised service personnel.

Notes on the documentation	1
Commissioning	2
Mechanical assemblies	3
Electrical assemblies	4
Regular tests and maintenance	5
Service software	6
Troubleshooting	7
Parameters	8
Appendix: Maintenance checklist	9

1 NOTES ON THE DOCUMENTATION

Aim of this chapter

This chapter contains notes on the documentation and important safety information.

Contents

1.1	Notes on the documentation.....	2
1.1.1	Associated documents.....	2
1.1.2	Type plates	2
1.1.3	Display texts	2
1.1.4	Validity of the chapters	2
1.2	Safety instructions	3
1.3	Warning instructions and safety signs	3
1.4	Supplementary instructions	3
1.5	Service notes.....	4

1.1 Notes on the documentation

1.1.1 Associated documents

The following documents apply in conjunction with this service manual:

- Records documenting installation, commissioning and instruction
- Service report
- Logbook (see operating manual, chapter 11, “Logbook”)
- Maintenance checklist
- Operating manual

1.1.2 Type plates

The type plates are factory fitted in the following locations:

	Device	Pressure chamber
V series	Right side	Front
D series	Left side	Right side
D-23	Rear, right	Rear side

1.1.3 Display texts

The display texts are shown in English in this service manual.

1.1.4 Validity of the chapters

When necessary, a table at the start of the chapter indicates for which devices the chapter applies.

Example:

V-40 – 55		V-65 – 150	X	E	B
✓		✓	✓	✓	
D-23	D-45	D-65 – 200	X		
✓	✓	✓	✓	✓	

- ✓ = valid
- ✓ = optional

Explanation of example: The information contained in this chapter applies to all V and D devices in the X series, and is optional for the E series.

1.2 Safety instructions

- Observe the safety instructions in the operating manual.
- Failure to do so can result in damage to the device, fire or other hazards.
- Components may only be serviced or replaced by authorised service engineers.
- Before any work on the device, isolate it and prevent it from being switched on again. Pay attention to all circuit breakers, as these carry dangerous high voltages.
- When working on the device, avoid contact with parts which move automatically.

1.3 Warning instructions and safety signs

In addition to the basic and specific safety instructions, risks can arise through dangerous working procedures.

These procedures are indicated as follows:

Warning



These points warn of a danger of serious or fatal injuries. Instructions on preventing the danger must be followed. A safety sign corresponding to the particular type of danger gives an additional warning.

Attention



These points refer to possible material damage. Follow the instructions exactly to prevent incorrect operation or destruction of the device.

1.4 Supplementary instructions

In addition to the basic procedures, there are possible variations which are indicated as follows:

Special instructions



These points provide information on additional or alternative procedures that are possible under certain circumstances, for example.

1.5 Service notes

Pay attention to the following points when handling Teflon hoses and screw connections:

- Do not kink the hoses.
- Avoid excess mechanical strain on the Teflon hoses.
- When reconnecting, push the hoses completely onto the fittings and tighten the lock-nuts up to the stop.
- If white stress marks can be seen on a hose, replace it – white marks on Teflon hoses indicate damages.
- When shortening hoses, cut at right angles using a sharp knife (do not pinch off or crimp using side cutters or similar tools).

2 COMMISSIONING

Aim of this chapter

This chapter describes the steps for commissioning the device at the operator's premises, from installation through staff instruction up to handover of the logbook.

Contents

2.1	Preparing for commissioning	3
2.1.1	Unpacking and setting up the device	3
	D-23, D-45	3
	D-65 – D-200	3
	V series.....	4
2.1.2	Scope of delivery	5
2.1.3	Setting up the device	5
2.1.4	Cleaning the surfaces.....	5
2.2	Device connections.....	6
2.2.1	VX/VE 40 – 150	6
2.2.2	VB 40 – 150	7
2.2.3	DX-23, DE-23 with automatic demineralised water supply option	8
2.2.4	DE-23.....	9
2.2.5	DB-23.....	10
2.2.6	DX/DE-45	11
2.2.7	DB-45.....	12
2.2.8	DX/DE-65 – 200	13
2.2.9	DB-65 – 200	14
2.3	Electrical connection.....	15
2.4	Water supply.....	15
2.4.1	Testing the water quality.....	15
2.4.2	Connecting the cooling water supply (X and E series).....	15
2.4.3	Connecting the demineralised water supply	16
2.4.4	Connecting the drain	16
2.5	Connecting the compressed air supply.....	16
2.6	Setting the normal pressure at the installation location.....	16
2.7	Switching the device on and off	17

2.8	Performing a test run	17
2.9	Setting parameters	17
2.10	Instructing the operating personnel.....	18
2.10.1	Supply connections	18
2.10.2	Loading the device	18
2.10.3	Using menus.....	18
2.10.4	Recognising error messages.....	18
2.10.5	Documentation software (optional).....	18
2.10.6	Changing the print intervals.....	19
2.11	Reference	19

Diagrams

Fig. 1:	Transport with sack truck	4
Fig. 2:	Device connections for VX/VE 40 – 150	6
Fig. 3:	Device connections for VB 40 – 150	7
Fig. 4:	Device connections on rear of DX-23, DE-23 with automatic demineralised water supply option.....	8
Fig. 5:	Device connections on rear of DE-23	9
Fig. 6:	Device connections on DB-23.....	10
Fig. 7:	Device connections on rear of DX/DE-45	11
Fig. 8:	Device connections on DB-45.....	12
Fig. 9:	Device connections on rear of DX/DE-65 – 200	13
Fig. 10:	Device connections on DB-65 – 200.....	14

Tables

Tab. 1:	Quality requirements for the water used	15
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2.1 Preparing for commissioning

2.1.1 Unpacking and setting up the device

D-23, D-45

The device should always be unpacked and set up by two people!



Because of its size and weight, we recommend that two people unpack and set up the device.

D-65 – D-200

The device should always be unpacked and set up by four people!



Because of its size and weight, we recommend that four people unpack and set up the device.

The device is delivered in its transport packaging on a pallet.

- Remove the transport packaging.

Only lift the device by its base frame! Always wear safety gloves!



Only lift the device by its base frame, not by the handles or the recessed grips in the door. Wear safety gloves to avoid injuries caused by sharp edges.

- Dispose of the pallet and the transport packaging in accordance with national regulations.

V series

The device should always be unpacked and set up by two people!



Because of its size and weight, we recommend that two people unpack and set up the device.

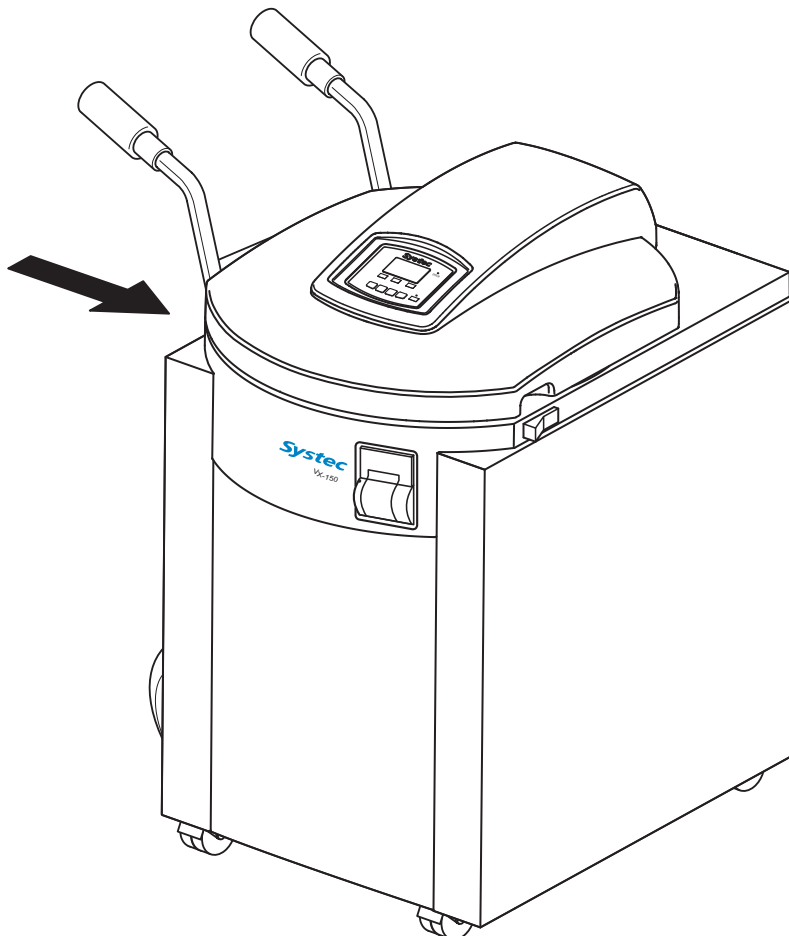


Fig. 1: Transport with sack truck

- Push the transport equipment (e.g. sack truck) under the left side of the device.

Danger of damage to hoses!



There are hoses underneath the right side of the device which may be damaged if care is not taken.

2.1.2 Scope of delivery

- Device
- Operating manual
- Hoses (according to available device connections)
- Accessories (according to delivery note)

Note



Some accessories are located in the sterilisation chamber.

- Check that the scope of delivery is complete and undamaged.

2.1.3 Setting up the device

- Set up the device at the position where it will be used and align it with a spirit level.

Separate assembly instructions for pass-through autoclaves!



Pay attention to the corresponding assembly instructions when setting up pass-through autoclaves.

2.1.4 Cleaning the surfaces

- If necessary, clean the outer surface of the housing.

2.2 Device connections

2.2.1 VX/VE 40 – 150

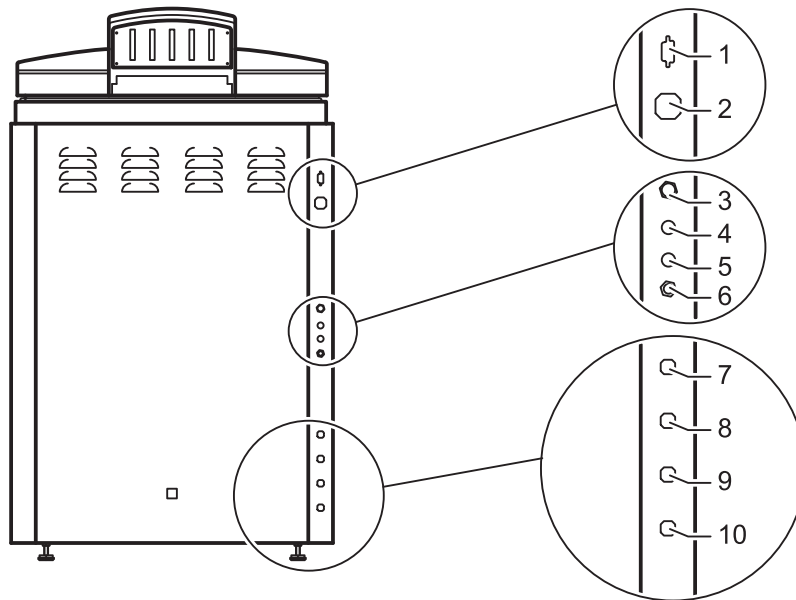


Fig. 2: Device connections for VX/VE 40 – 150

1	Serial interface (RS-232 for connection to a PC)
2	Mains connection (3 phase, 380 – 400 V + N + PE)
3	Vacuum pump fuse
4	Compressor fuse
5	Water pump fuse
6	Safety temperature limiter (STL)
7	Compressed air (7.2 mm quick release connector, optional)
8	Demineralised water (3/4") outer thread, pressure > 1 bar
9	Cooling water (3/4") outer thread, pressure > 1 bar
10	Waste water (3/4") outer thread (drain provided by customer temperature-resistant to 103 °C)

2.2.2 VB 40 – 150

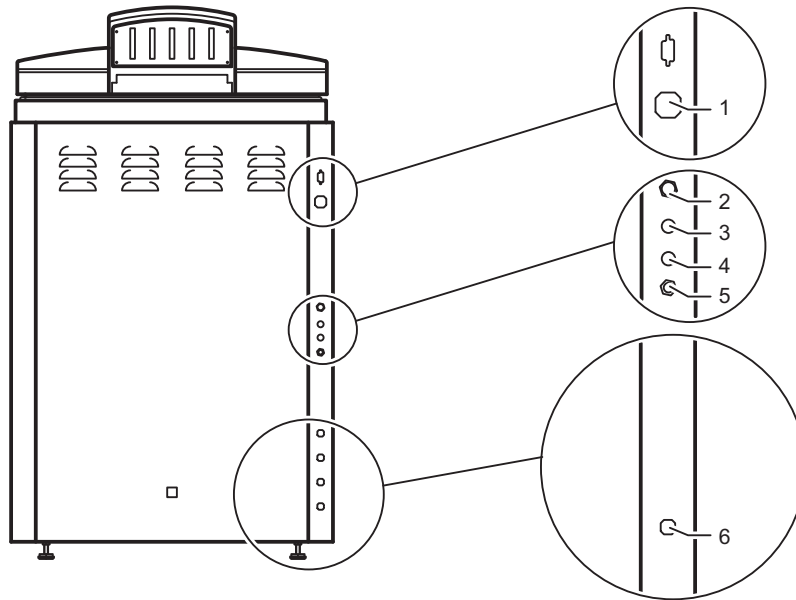


Fig. 3: Device connections for VB 40 – 150

1	Mains connection: – VB 65 – VB 150: 3 phase, 380 – 400 V + N + PE; – VB 40, VB 55: 230 V/50Hz
2	Inside-air fan fuse
3	Vacuum pump fuse
4	Compressor fuse
5	Safety temperature limiter (STL)
6	Waste water (3/4") outer thread (drain provided by customer temperature-resistant to 103 °C)

2.2.3 DX-23, DE-23 with automatic demineralised water supply option

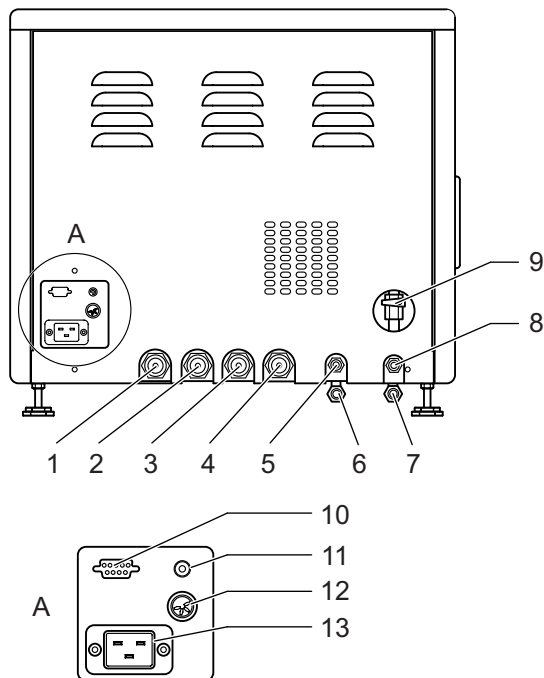


Fig. 4: Device connections on rear of DX-23, DE-23 with automatic demineralised water supply option

1	Drain connection on steam generator
2	Waste water (3/4") outer thread (drain provided by customer temperature-resistant to 103 °C)
3	Cooling water (3/4") outer thread, pressure > 1 bar
4	Demineralised water (3/4") outer thread, pressure > 1 bar, optional
5	Compressed air (7.2 mm quick release connector), optional
6	Steam generator safety valve (DX devices only)
7	Safety valve on sterilisation chamber
8	Drain on demineralised water reservoir container
9	Drainage tap for reservoir container
10	Serial interface (RS-232 for connection to a PC)
11	Safety temperature limiter (STL)
12	Connection for Aquastop
13	Mains connection (230 V, 50/60 Hz)

2.2.4 DE-23

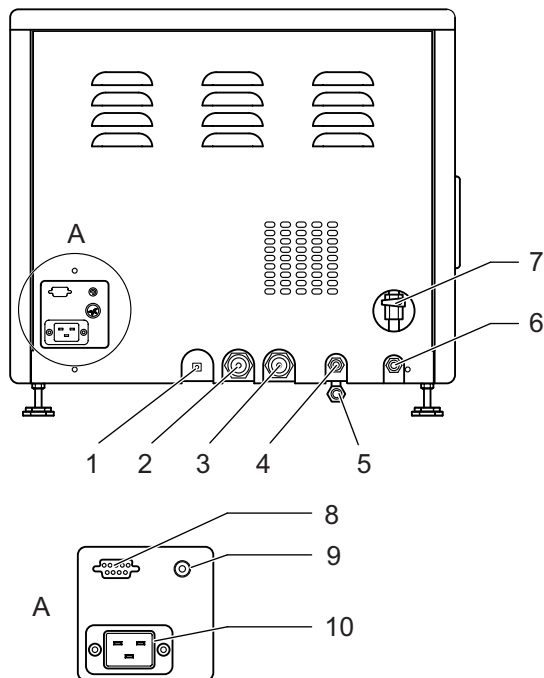


Fig. 5: Device connections on rear of DE-23

1	Change-over valve for demineralised water (recirculate or drain)
2	Cooling water (3/4") outer thread, pressure > 1 bar
3	Waste water (3/4") outer thread (drain provided by customer temperature-resistant to 103 °C)
4	Compressed air (7.2 mm quick release connector), optional
5	Safety valve on sterilisation chamber
6	Drain on demineralised water reservoir container
7	Drainage tap for reservoir container
8	Serial interface (RS-232 for connection to a PC)
9	Safety temperature limiter (STL)
10	Mains connection (230 V, 50/60 Hz)

2.2.5 DB-23

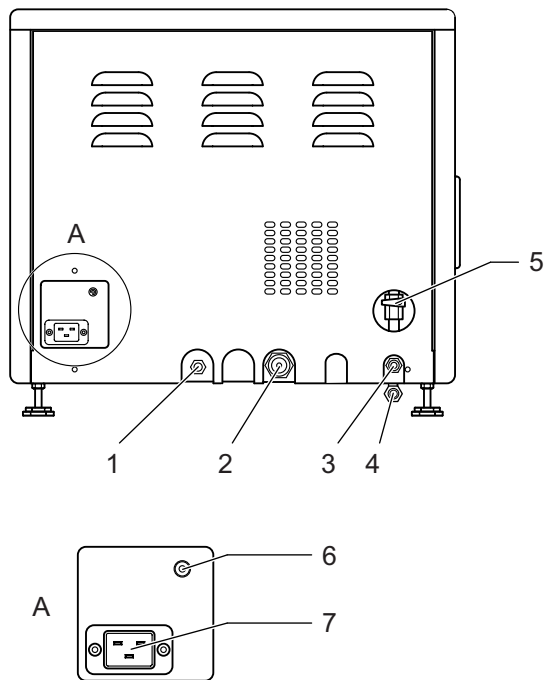


Fig. 6: Device connections on DB-23

1	Change-over valve for demineralised water (recirculate or drain)
2	Waste water (3/4") outer thread (drain provided by customer temperature-resistant to 103 °C)
3	Drain on demineralised water reservoir container
4	Safety valve on sterilisation chamber
5	Drainage tap for reservoir container
6	Safety temperature limiter (STL)
7	Mains connection (230 V, 50/60 Hz)

2.2.6 DX/DE-45

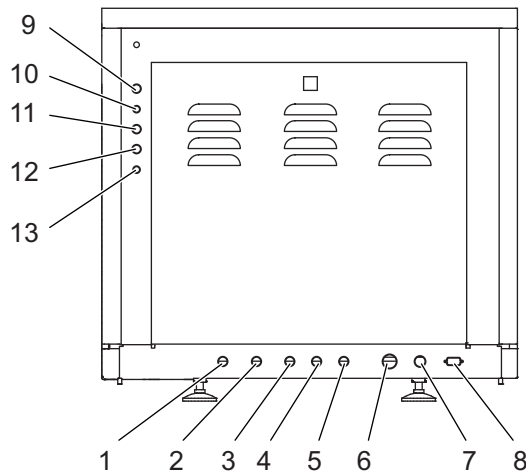


Fig. 7: Device connections on rear of DX/DE-45

1	Cooling water (3/4") outer thread, pressure > 1 bar
2	Demineralised water (3/4") outer thread, pressure > 1 bar, optional
3	Compressed air (7.2 mm quick release connector), optional
4	Drain on demineralised water reservoir container
5	Waste water (3/4") outer thread (drain provided by customer temperature-resistant to 103 °C)
6	Mains connection (230 V, 50/60 Hz)
7	Connection for Aquastop, optional
8	Serial interface (RS-232 for connection to a PC)
9	Fan fuse (optional)
10	Vacuum pump fuse (optional)
11	Demineralised water fuse
12	Compressor fuse
13	Safety temperature limiter (STL)

2.2.7 DB-45

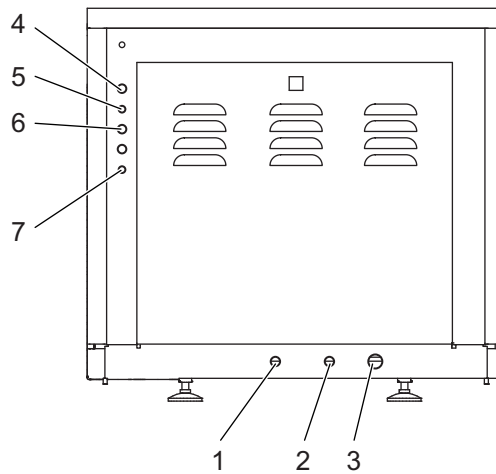


Fig. 8: Device connections on DB-45

1	Drain on demineralised water reservoir container
2	Waste water (3/4") outer thread (drain provided by customer temperature-resistant to 103 °C)
3	Mains connection (230 V, 50/60 Hz)
4	Inside-air fan fuse
5	Demineralised water fuse
6	Compressor fuse
7	Safety temperature limiter (STL)

2.2.8 DX/DE-65 – 200

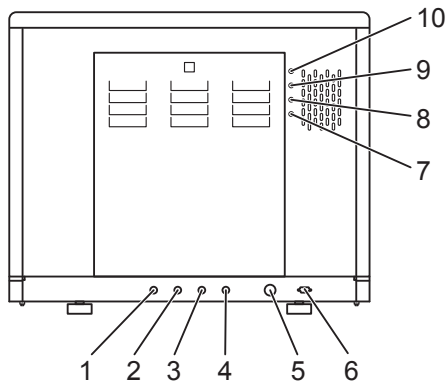


Fig. 9: Device connections on rear of DX/DE-65 – 200

1	Cooling water (3/4") outer thread, pressure > 1 bar
2	Demineralised water (3/4") outer thread, pressure > 1 bar
3	Compressed air (7.2 mm quick release connector)
4	Waste water (3/4") outer thread (drain provided by customer temperature-resistant to 103 °C)
5	Mains connection (3 phase, 380 – 400 V + N + PE)
6	Serial interface (RS-232 for connection to a PC)
7	Safety temperature limiter (STL)
8	Water feed pump fuse
9	Compressor fuse
10	Vacuum pump fuse

2.2.9 DB-65 – 200

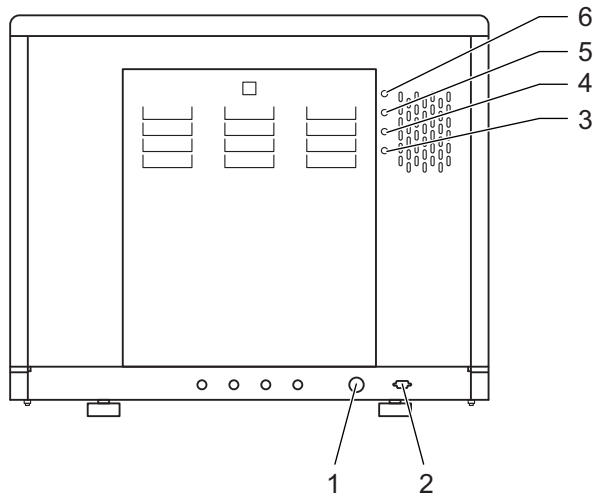


Fig. 10: Device connections on DB-65 – 200

1	Waste water (3/4") outer thread (drain provided by customer temperature-resistant to 103 °C)
2	Mains connection (3 phase, 380 – 400 V + N + PE)
3	Safety temperature limiter (STL)
4	Vacuum pump fuse
5	Compressor fuse
6	Inside-air fan fuse


2.3 Electrical connection

Checking the safety equipment:

- Check the electrical connection for the correct voltage and fuses (safety check according to VDE0701).
- Check that all safety equipment is complete and in full working order.
- Consult the operating manual for all information relating to safety (see operating manual, chapter 3, "Safety").

2.4 Water supply

2.4.1 Testing the water quality

Adhere to the water quality thresholds!	
	The quality of the cooling water (unprocessed water) and demineralised water used has a considerable influence on the performance and service life of the device.

- Unprocessed water of drinking water quality is used for cooling and for the optional vacuum fitting.
- Demineralised water is used as feed water and for generating steam.

DIN 58951-2 states that the following thresholds must be adhered to: (see operating manual, chapter 10, "Technical data")

Unprocessed water quality conductivity (at 20 °C)	< 300 μ S/cm and Σ alkaline earth ions \leq 2.0 mmol/l, corresponding to a total hardness of 11° dH
Demineralised water conductivity (at 20 °C)	< 15 μ S/cm and Σ alkaline earth ions < 0.02 mmol/l

Tab. 1: Quality requirements for the water used

- Test the water quality and contact your local water company. If the values exceed the water quality requirements specified above, you must use a water softener system to prevent scaling.

2.4.2 Connecting the cooling water supply (X and E series)

On-site conditions:

- Pressure \geq 1 bar
- Connect the cooling water supply using the hose supplied.

2.4.3 Connecting the demineralised water supply

The demineralised water is supplied through the connection on the device or by filling the sterilisation chamber / tank manually.

- Connect the demineralised water supply using the hose supplied, when necessary.

Manually filling demineralised water



Information on filling the device manually with demineralised water can be found in the operating manual, chapter 4, "Operation".

2.4.4 Connecting the drain

On-site conditions:

- Max. height of on-site drain: 40 cm above the ground
- Connect the drain using the hose supplied.

Devices with tanks (DE/DB-23, 45 only)!



On devices with tanks, you can choose between the "recirculate" or "drain" settings (with a manual change-over valve) – see operating manual, chapter 2, "Device description".

2.5 Connecting the compressed air supply

On-site conditions:

- Pressure \geq 3 bar
- Compressed air virtually oil-free

The pressure should preferably be between 6 and 7 bar in order to support the internal compressed air.

2.6 Setting the normal pressure at the installation location

Use parameter 74 (ATM Press) to set the value for the average normal pressure at the installation location (see chapter 8, "Parameters"). Ask the device operator about the normal on-site pressure.

- As the normal pressure depends on the height above sea-level at the installation location, you will have to check this and modify, when necessary.

Make sure the normal pressure is correctly set



Among other reasons, the normal pressure must be correctly set for opening the door (see chapter 3.3, "Door lock").

2.7 Switching the device on and off

The device has a main switch, which can be used to switch it on and off.

Note



Always switch off the device at the main switch when not in use.

2.8 Performing a test run

- Select a sterilisation program that takes the built-in options into account.
- Make a test run to check the functionality of the device and to check for leaks.

2.9 Setting parameters

- If necessary, set different parameters as required by the customer (see [chapter 8, "Parameters"](#)).

To do this, use the following access level and codes:

Access level	Access code
1	1000
2	0011
3	0022
4	0198

Do not give any codes for access levels to unauthorised persons!



The code for access level 4 is exclusively reserved for service technicians and must never be given to the operator.

- Use the operating manual to explain to the customer how parameters can be changed.

Detailed information can be found in the operating manual (see operating manual, chapter 4, "Operation").

2.10 Instructing the operating personnel

Safety notes



Explain the functions on the device to the operating personnel and point out the associated risks, particularly when sterilising liquids in open and closed containers.

Inform the operating personnel about the following functions and safety aspects associated with the operation of the device.

2.10.1 Supply connections

The operating personnel must open the supply connections before starting work and must close them again after finishing (see operating manual, chapter 4, "Operation").

2.10.2 Loading the device

A detailed description of loading and the program cycle can be found in the operating manual (see chapter 4, "Operation").

2.10.3 Using menus

A detailed description of using the menus can be found in the operating manual (see chapter 4, "Operation").

2.10.4 Recognising error messages

An error message can be recognised as follows:

- The display shows an error message.
- The red ERROR LED lights up.
- The (optional) printer records the error message.

Proceed as follows to acknowledge the alarm:

- Press the `Quit` button.
- Enter the access code for service level 1 (1000).
- Press the `Set` button to confirm.

More detailed information on fault messages and how to rectify them can be found in the operating manual (see chapter 8, "Troubleshooting").

2.10.5 Documentation software (optional)

- Install the Systemec Autoclave Documentation Software (SADS) on the customer PC.
- Connect the PC to the device via the interface cable supplied.
- For configuration, use the configuration program contained in the documentation software (see SADS installation manual).

2.10.6 Changing the print intervals

If the device is equipped with a printer, the print interval times (parameters 55/56) can be changed using the service code (level 4).

This function allows you to reduce paper consumption and only record important phases in detail.

The default settings are 30 seconds for the sterilisation phase and 300 seconds for all other phases.

More information on printer functions and operation can be found in the operating manual (see chapter 6, "Options").

2.11 Reference

- Please complete the following documents:
 - Service report
 - Logbook
 - Installation log
 - Commissioning log
 - Instruction log

Have the instruction log signed by the operating personnel.

3 MECHANICAL ASSEMBLIES

Aim of this chapter

This chapter introduces you to the function and position of the mechanical assemblies and describes typical maintenance and service tasks.

Contents

3.1	Removing and attaching service doors.....	8
3.1.1	V series	8
3.1.2	D-45 – 200	8
3.1.3	D-23	9
3.2	Position of the components	10
3.2.1	V-40 – 55	10
3.2.2	V-65 – 150	12
3.2.3	D-23	14
3.2.4	D-45	16
3.2.5	D-65 – 200	18
3.2.6	DX-2D	20
3.3	Door lock	22
3.3.1	V/D-65 – 200.....	22
	Principle	22
	Closing.....	22
	Opening	22
	Opening the door in an emergency	23
	Position and function.....	24
	Door hydraulics (V-65 – 150 only)	24
	Vacuum pump.....	25
	Digital inputs on the door control	25
	Ring switches.....	26
	Scissor mechanism.....	27
	Maintenance tasks.....	29
	Replacing the scissor mechanism.....	29
	Setting the reed contacts of the scissor mechanism	30
	Checking and greasing the scissor joints	30
	Locking ring maintenance.....	30
	Door seal maintenance.....	31

3.3.2	V-40 – 55, D-45	33
	Principle	33
	Closing	33
	Opening	34
	Opening the door in an emergency	34
	Position and function	36
	Digital inputs on the door control	37
	Maintenance tasks	37
	Replacing a locking cylinder	37
	Adjusting the reed contacts	38
	Door seal maintenance	38
3.3.3	D-23	39
	Principle	39
	Closing	39
	Opening	41
	Setting the safety ramp and door switch	42
	Digital inputs on the door control	43
	Door seal maintenance	43
3.4	Door cladding	44
3.4.1	Removing the door cladding	44
	V/D-65 – 200	44
	V-40 – 55, D-23 – 45	47
3.4.2	Maintenance tasks	48
	V/D-65 – 200	48
	V series	48
	Checking and replacing the door switch	48
	Checking the throttle no-return valve of the door hydraulics	49
3.4.3	Performing a test run	49
3.5	Control unit	50
3.5.1	Position and function	50
3.5.2	Maintenance tasks	50
	Replacing the control unit	50
3.6	Radial fan	51
3.6.1	Position and function	51
3.6.2	Maintenance tasks	51
	Adjusting the fan motor/rear wall	51
	Replacing the fan wheel	51

3.7	Cooling	53
3.7.1	Position and function	53
	Water cooling with support air	53
	Water cooling without support air	54
	Cooling through recirculation	54
	Ambient air cooling	54
	Spray cooling	55
	Direct softwater spray cooling.....	55
	Closed cooling circuit	55
3.7.2	Maintenance tasks.....	55
	Filling the closed cooling circuit	55
	Replacing the sterile air filter	57
	Measuring the flow.....	57
3.8	Steam generation	58
3.8.1	Steam generator (X devices).....	58
	Position and function.....	58
	Demineralised water inlet valve (Y14)	58
	Electrodes	59
	Water feed pump	59
	Flow monitor	60
3.8.2	Steam generation in the sterilisation chamber (E and B devices).....	60
	Position and function.....	60
	Electrodes	60
	Setting the operating modes.....	61
	Water feed pump	61
	Flow monitor	62
3.8.3	Maintenance tasks (all devices)	62
	Checking the water level electrodes	62
	Checking the water feed pump (M1).....	64
	Checking the functionality of the flow monitor	64
	Replacing the heating element	65
	Checking the functionality of the safety temperature limiter	66
	Manual emptying of the steam generator	66
3.9	Safety valves	66
3.9.1	Position and function	66
3.9.2	Maintenance tasks.....	67
	Testing the safety valve on the steam generator (X series only)	67
	Testing the safety valve on the sterilisation chamber	67

3.10	Internal compressed air system (not on D-23).....	68
3.10.1	Position and function of the air compressor (M3).....	68
3.10.2	Pneumatic assembly.....	69
	Position and function.....	69
3.10.3	Maintenance tasks.....	70
	Checking the pressure.....	70
3.10.4	Checking the compressed air system for leaks.....	70
	Checking for leaks on the pneumatic assembly.....	70
	Checking for leaks on the no-return valve (R6, R12).....	73
	Checking the remaining components of the compressed air system.....	73
3.11	Vacuum unit (optional).....	74
3.11.1	Position and function.....	74
3.11.2	Maintenance tasks.....	75
	Checking the flow monitor.....	75
	Checking water usage.....	75
	Checking the cavitation protection.....	75
	Descaling the pump.....	75
	Testing the sterilisation chamber for leaks – vacuum test..	76
3.12	Super Dry (optional).....	77
3.12.1	Position and function.....	77
3.13	“HoldTemp” function (optional).....	77
3.13.1	Maintenance tasks.....	77
	Checking the functionality of the heating coil.....	77
3.14	Air extraction (all devices).....	78
3.14.1	Position and function.....	78
3.14.2	Maintenance tasks.....	78
3.15	Drain cooling (X and E series).....	79
3.15.1	Position and function.....	79
3.15.2	Maintenance tasks.....	79
3.16	Exhaust filter (optional).....	80
3.16.1	Position and function.....	80
3.16.2	Maintenance tasks.....	80
	Checking the counter value.....	80
	Replacing the exhaust filter cartridge.....	81

3.17	Lift.....	82
3.17.1	Position and function	82
3.17.2	Maintenance tasks.....	82

Diagrams

Fig. 1:	V-40, V-55: Layout diagram of rear and front.....	10
Fig. 2:	V-65 – 150: Layout diagram of rear and front	12
Fig. 3:	D-23: Layout diagram of rear, right, left and top.....	14
Fig. 4:	D-45: Layout diagram of rear, right, left and top.....	16
Fig. 5:	D-65 – 200: Layout diagram of rear, right, left and top.....	18
Fig. 6:	Pneumatic assembly	23
Fig. 7:	Example: Position on pipe connection diagram	24
Fig. 8:	Position of the microswitches that monitor the door lock	26
Fig. 9:	Controlling the scissor mechanism: Position on pipe connection diagram.....	27
Fig. 10:	Function diagram of the scissor mechanism, locking ring open.....	28
Fig. 11:	Measuring the distance	31
Fig. 12:	Pulling out the door seal	32
Fig. 13:	Position of the door switch and fastening screws (door cladding removed)	33
Fig. 14:	Pneumatic assembly	35
Fig. 15:	Door lock: Position on pipe connection diagram	36
Fig. 16:	Measuring the distance	38
Fig. 17:	Closed position	40
Fig. 18:	Secured position	40
Fig. 19:	Loosening the screws on the limit switch	42
Fig. 20:	Measuring the distance	43
Fig. 21:	Loosening the fastening screws on the panel	44
Fig. 22:	Position of the spacer sleeves	45
Fig. 23:	Removing and loosening the screws	46
Fig. 24:	Loosening the screws	46
Fig. 25:	Securing the screws using nuts	47

Fig. 26: Loosening the fastening screws on the control unit (V series)	50
Fig. 27: Loosening the fastening screws on the control unit (D series)	50
Fig. 28: Loosening the fixing nut to remove the baffle	52
Fig. 29: Levering off the fan wheel.....	52
Fig. 30: Components on the “Cooling” assembly	53
Fig. 31: Filling the closed cooling circuit.....	56
Fig. 32: Position of the high and low electrodes.....	59
Fig. 33: Steam generator: Large and small heating element with immersion sleeve for safety temperature limiter	65
Fig. 34: Position of the air compressor.....	68
Fig. 35: Pneumatic assembly: Position on pipe connection diagram ...	69
Fig. 36: Pneumatic assembly	69
Fig. 37: Closing the release openings.....	70
Fig. 38: Stopping the air supply behind Y13	71
Fig. 39: Stopping the air supply behind Y10b	72
Fig. 40: Stopping the air supply behind Y11/Y8	73
Fig. 41: Position of the vacuum unit.....	74
Fig. 42: Drain cooling: Position on pipe connection diagram	79
Fig. 43: Filter replacement message.....	81
Fig. 44: Filter replacement: Unscrewing the screws	82
Fig. 45: Filter replacement: Removing the exhaust filter cartridge	82
Fig. 46: Filter replacement: Inserting the new filter cartridge	82

Tables

Tab. 1: V-40, V-55: Position in layout diagram.....	11
Tab. 2: V-65 – 150: Position in layout diagram	13
Tab. 3: D-23: Position in layout diagram.....	15
Tab. 4: D-45: Position in layout diagram.....	17
Tab. 5: D-65 – 200: Position in layout diagram.....	19
Tab. 6: DX-2D: Position in layout diagram.....	21

MECHANICAL ASSEMBLIES

Tab. 7: Status table for the digital inputs when the door is open and closed (●: Off, ●: On)..... 25

Tab. 8: Status table for the digital inputs when the door is open and closed (●: Off, ●: On)..... 37

Tab. 9: Status table for the digital inputs when the door is open and closed (●: Off, ●: On)..... 43

Tab. 10: Height and length of the water level electrodes 63

Tab. 11: Position and permissible excess operating pressure for the safety valves..... 66

3.1 Removing and attaching service doors

3.1.1 V series

The panels on the front, rear and sides (since 2010) of the device are designed as service doors which can be removed in order to carry out maintenance.

Removing the doors on the front and rear

There is a lock on the service door which can be opened with the key provided.

- Turn the key by a quarter-turn to free the lock.
- Remove the service doors from the device.

Removing the side sections

Service doors are found on the left and right side of the device, and can be removed by detaching the three screws underneath the device.

3.1.2 D-45 – 200

Removing the rear

There is a lock on the service door which can be opened with the key provided.

- Turn the key by a quarter-turn to free the lock.
- Remove the service door from the device.

Removing the side sections

- Unscrew the fastening nuts.
- Push back the side section by approx. 2 cm and remove it by pulling it downwards.

3.1.3 D-23

Removing the rear

- Unscrew the three fastening screws on the rear, then remove the rear wall.

Removing the housing

- Unscrew the two fastening screws from underneath each side of the device, push back the housing by approx. 5 cm and remove it by lifting it upwards.

3.2 Position of the components

The individual components in the devices are labelled. These labels are identical to the designations in the pipe connection diagram.

3.2.1 V-40 – 55

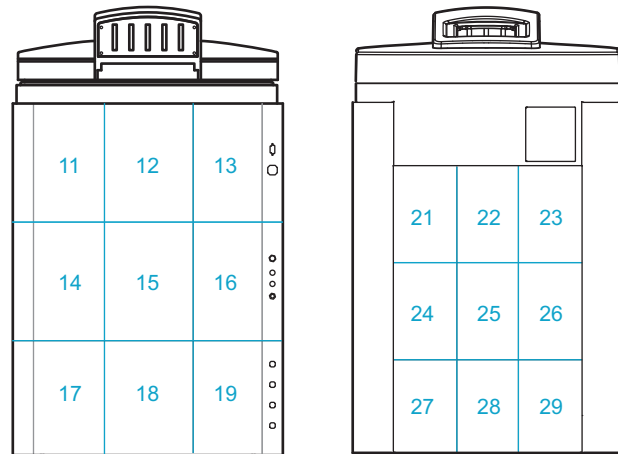


Fig. 1: V-40, V-55: Layout diagram of rear and front

Component		Position in layout diagram		
		VX	VE	VB
	Steam generator	17/18/19		
	Pneumatic assembly	13	13	13
BV1	Manual drain tap for steam generator	17		
D1	Steam air extractor for sterilisation chamber	27		27
F1	Demineralised water flow monitor	19	19 (opt.)	
F2	Vacuum flow monitor	16	16	
M1	Demineralised water feed pump	18/19	18/19 (opt.)	
M2	Vacuum pump	15	15	
M3	Air compressor	15	15	19
N1	Needle valve for air extraction	27	27	27
NR6	Needle no-return valve – “Blow out cooling coil”	13	13	
NR7	Needle no-return valve for cavitation protection	15	15	
P1	Manometer for external compressed air	19	19	
P2	Manometer for internal compressed air	29	17	17
PR1	Pressure reducer for external compressed air	19	19	
PR2	Pressure reducer for cooling water	16	16	
PS1	Pressure transducer for steam generator	12		
PV1	Compressed air reservoir	29	17	17
PV2	Exhaust filter	24	24	
R1	No-return valve for demineralised water	17	18	
R2	No-return valve on pressure transducer for steam generator	12		
R3	No-return valve for cooling water	16	16	
R4	No-return valve for compressed air inlet / vacuum breaker	11	21	21

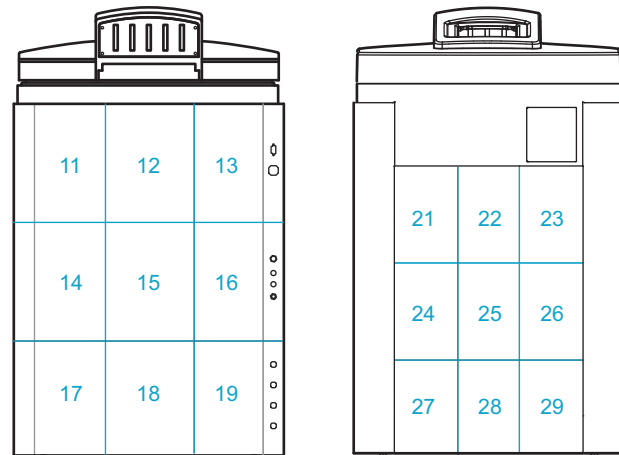


Fig. 1: V-40, V-55: Layout diagram of rear and front

Component		Position in layout diagram		
		VX	VE	VB
R5	No-return valve for drain	28	28	28
R6	No-return valve for air compressor	29	17	17
R8	No-return valve for steam inlet (exhaust filter option)	11		
R12	No-return valve for external compressed air	19	19	
R13	No-return valve for cavitation protection	15	15	
S1	Sterile air filter	14	14	18
S2	Dirt trap sieve	29	29	29
SL1	Silencer for air compressor	15	15	19
SV1	Safety valve on steam generator	17		
SV2	Safety valve for sterilisation chamber	21	21	21
Sw1	Pressure switch (7 bar)	29	17	17
Y1	Steam inlet valve	18		
Y2	Super Dry valve	18		
Y3	Cooling water valve	14	14	
Y4	Drain cooling	18	18	
Y5	Compressed air inlet valve	14	14	
Y6	Atmosphere valve	21	21	21
Y7	Drain valve	29	29	29
Y9	Air extractor valve	27	27	27
Y8	Vacuum valve	29	26	
Y11	Blow-out valve for cooling coil	13	13	
Y12	Vacuum breaker valve	14	14	18
Y14	Demineralised water inlet valve	19	18	
Y15	Pump water valve for vacuum pump	15	15	
Y16	Top exhaust valve	28	28	28

Tab. 1: V-40, V-55: Position in layout diagram

V/D SERIES

MECHANICAL ASSEMBLIES

3.2.2 V-65 – 150

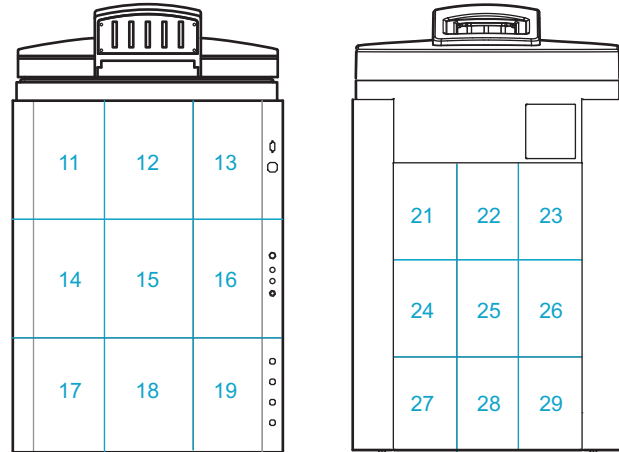


Fig. 2: V-65 – 150: Layout diagram of rear and front

Component		Position in layout diagram		
		VX	VE	VB
	Steam generator	17/18		
	Pneumatic assembly	13	13	13
BV1	Manual drain tap for steam generator	18		
D1	Steam air extractor for sterilisation chamber	27	27	27
D2	Steam air extractor (Super Dry)	19		
E1	High electrode	15		
E2	Low electrode	15		
F1	Demineralised water flow monitor	15		
F2	Vacuum flow monitor	19	19	
M1	Demineralised water feed pump	15	18 (opt.)	
M2	Vacuum pump	19	19	19
M3	Air compressor	14	18	18
N1	Needle valve for air extraction	27	27	27
NR6	Needle no-return valve – “Blow out cooling coil”	13	13	
NR7	Needle no-return valve for cavitation protection	19	19	
P1	Manometer for external compressed air	19	19	
P2	Manometer for internal compressed air	17	17	17
PR1	Pressure reducer for external compressed air	19	19	
PR2	Pressure reducer for cooling water	19	19	
PS1	Pressure transducer for steam generator	12		
PV1	Compressed air reservoir	17	17	17
PV2	Exhaust filter	24	24	
R1	No-return valve for demineralised water	18	17	
R2	No-return valve on pressure transducer for steam generator	12		
R3	No-return valve for cooling water	19	19	
R4	No-return valve for compressed air inlet	11	21	21
R5	No-return valve for drain	28	28	28
R6	No-return valve for air compressor	17	17	17

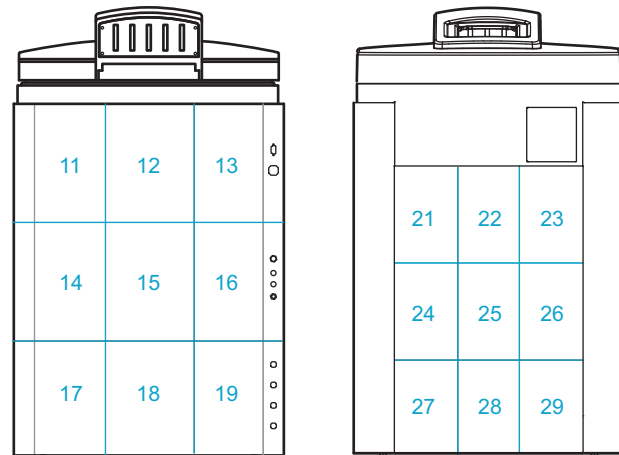


Fig. 2: V-65 – 150: Layout diagram of rear and front

Component		Position in layout diagram		
		VX	VE	VB
R7	No-return valve for vacuum	24/25 or 29	24/25 or 29	
R8	No-return valve for steam inlet (exhaust filter option)	11		
R9	No-return valve – “Blow out cooling coil”	15	18	
R12	No-return valve for external compressed air	16	16	
R13	No-return valve for cavitation protection	19	19	
S1	Sterile air filter	14	18	18
S2	Dirt trap sieve	29	29	29
SL1	Silencer for air compressor	14	18	18
SV1	Safety valve on steam generator	18		
Sw1	Pressure switch (7 bar)	17	17	17
Y1	Steam inlet valve	14		
Y2	Super Dry valve	14		
Y3	Cooling water valve	15	18	
Y4	Drain cooling	19	19	
Y5	Compressed air inlet valve	14	18	
Y7	Drain valve	28	28	28
Y8	Vacuum valve	29	24/25 or 29	24/25
Y9	Air extractor valve	27	27	27
Y11	Blow-out valve for cooling coil	13	13	
Y12	Vacuum breaker valve	14	18	18
Y13	Compressed air valve (door ring)	13	13	13
Y14	Demineralised water inlet valve	15	17	
Y15	Pump water valve for vacuum pump	19	19	
Y16	Top exhaust valve	28	28	28
Z1	Locking cylinder	13	13	13
Z2	Locking cylinder	13	13	13

Tab. 2: V-65 – 150: Position in layout diagram

3.2.3 D-23

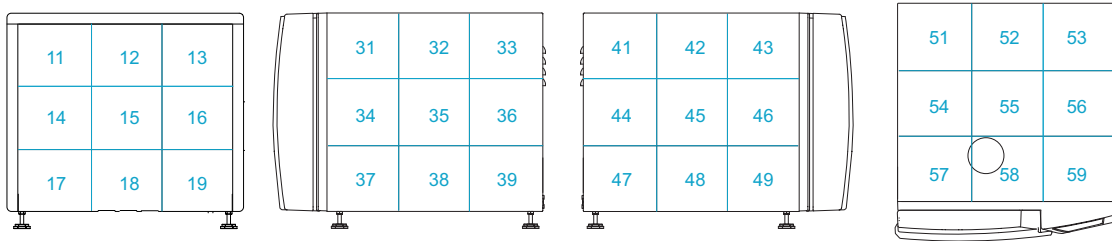


Fig. 3: D-23: Layout diagram of rear, right, left and top

Component		Position in layout diagram		
		DX	DE	DB
	Manual setting of recirculate/eject		17	17
	Steam generator	37/38		
BV1	Manual drain tap for steam generator	17		
D1	Steam air extractor for sterilisation chamber	48	47	47
D2	Steam air extractor (Super Dry)	49		
E5	Electrode for Aquastop	58	58 (opt.)	
E6	High electrode for reservoir container	58	58	58
E7	Earth plate	58	58	58
F2	Vacuum flow monitor	38	38	
FSW1	Float switch valve for demineralised water	31	31 (opt.)	
M1	Demineralised water feed pump	35	35 (opt.)	
M2	Vacuum pump	32	32	
M4	Radial fan	15	15	
N3	Needle valve for demineralised water on reservoir container	34	34 (opt.)	
NR7	Needle no-return valve for cavitation protection	31	31	
P1	Manometer for external compressed air	52	52	
PR1	Pressure reducer for external compressed air	52	52	
PR2	Pressure reducer for cooling water	38	38	
PS1	Pressure transducer for steam generator	11		
PS2	Pressure transducer for sterilisation chamber	11	11	11
R1	No-return valve for demineralised water	37	37	37
R2	No-return valve on pressure transducer for steam generator	11		
R3	No-return valve for cooling water	38	38	
R4	No-return valve for compressed air inlet	15	15	
R5	No-return valve for drain	48	18	18
R13	No-return valve for cavitation protection	31	31	
S1	Sterile air filter	52	39, 52	39
SV1	Safety valve on steam generator	19		
SV2	Safety valve for sterilisation chamber	19	19	19
Y1	Steam inlet valve	51		
Y2	Super Dry valve	51		
Y3	Cooling water valve	52	52	
Y4	Drain cooling	38	38	

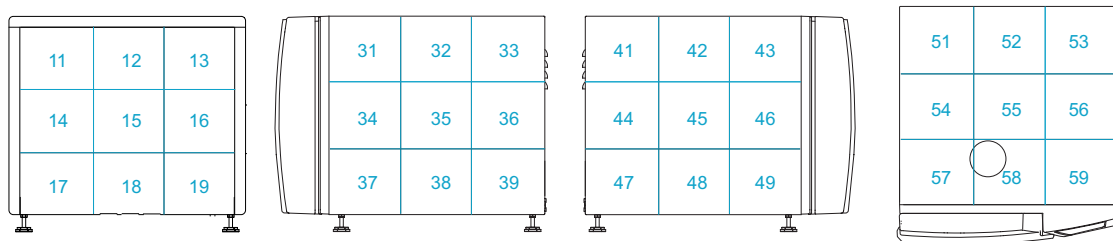


Fig. 3: D-23: Layout diagram of rear, right, left and top

Component		Position in layout diagram		
		DX	DE	DB
Y5	Compressed air inlet valve	52	52	
Y7	Fast exhaust valve	47	49	49
Y8	Vacuum valve	19	51	
Y9	Air extractor valve	48	48	48
Y11	Blow-out valve for cooling coil	52	52	
Y12	Vacuum breaker valve	52	39, 52	39
Y14	Demineralised water inlet valve		37	37
Y15	Pump water valve for vacuum pump	31	31	
Y16	Top exhaust valve	16	15	15
Y17a	Demineralised water for reservoir container	31	31 (opt.)	

Tab. 3: D-23: Position in layout diagram

3.2.4 D-45

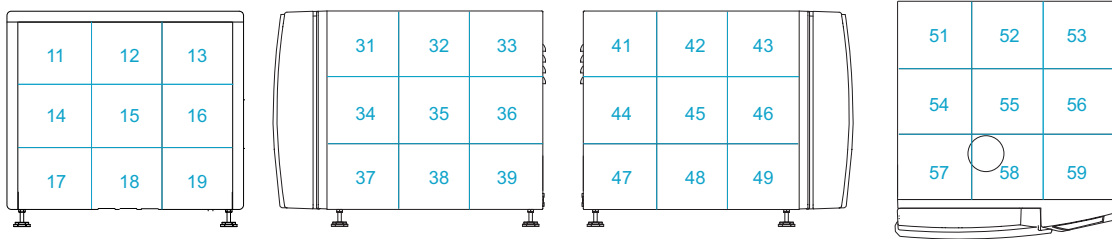


Fig. 4: D-45: Layout diagram of rear, right, left and top

Component		Position in layout diagram		
		DX	DE	DB
	Steam generator	38/39		
	Manual setting of recirculate/eject		39	39
	Pneumatic assembly	41	41	41
BV1	Manual drain tap for steam generator	38		
D1	Steam air extractor for sterilisation chamber	47	48	48
D2	Steam air extractor (Super Dry)	47		
E4/E5	Electrode for Aquastop	58	58 (opt.)	
F2	Vacuum flow monitor	38	38	
FSW1	Float switch valve for demineralised water	32	32 (opt.)	
FSW2	“Empty tank” float switch	32	32	
M1	Demineralised water feed pump	35	35 (opt.)	
M2	Vacuum pump	35	35	
M3	Air compressor	14	14	14
M4	Radial fan	15	15	
N3	Needle valve for demineralised water on reservoir container	32	32 (opt.)	
NR6	Needle no-return valve – “Blow out cooling coil”	41	41	
NR7	Needle no-return valve for cavitation protection	35	35	
P1	Manometer for external compressed air	14	14	
P2	Manometer for internal compressed air	19	19	19
PR1	Pressure reducer for external compressed air	14	14	
PR2	Pressure reducer for cooling water	39	39	
PS1	Pressure transducer for steam generator	35		
PS2	Pressure transducer for sterilisation chamber	53	53	53
PV1	Compressed air reservoir	19	19	19
PV2	Exhaust filter	57	57	
R1	No-return valve for demineralised water	37		
R2	No-return valve on pressure transducer for steam generator	35		
R3	No-return valve for cooling water	39	39	
R4	No-return valve for compressed air inlet	58	58	58
R5	No-return valve for drain	49	49	49
R6	No-return valve for air compressor	19	19	19
R8	No-return valve for steam inlet (exhaust filter option)	58		
R9	No-return valve – “Blow out cooling coil”	35	35	

MECHANICAL ASSEMBLIES

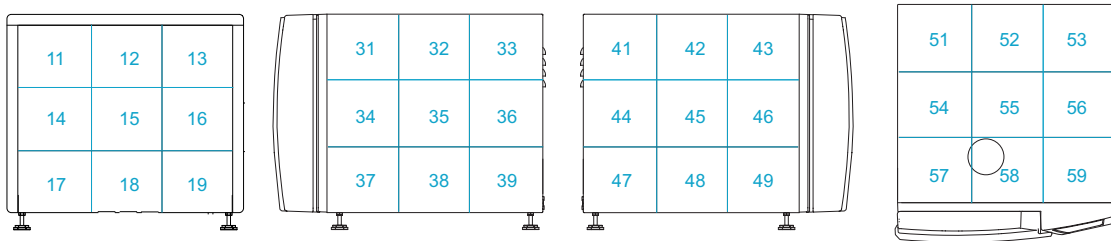


Fig. 4: D-45: Layout diagram of rear, right, left and top

Component		Position in layout diagram		
		DX	DE	DB
R12	No-return valve for external compressed air	14	14	
R13	No-return valve for cavitation protection	35	35	
S1	Sterile air filter	32	32	32
S2	Dirt trap sieve	49	49	49
SL1	Silencer for air compressor	14	14	14
SV1	Safety valve on steam generator	12		
SV2	Safety valve for sterilisation chamber	12	12	12
Sw1	Pressure switch (7 bar)	19	19	19
Sw2	40 mbar switch	53	53	53
Y1	Steam inlet valve	38		
Y2	Super Dry valve	38		
Y3	Cooling water valve	35	35	
Y4	Drain cooling valve (Cool drain)	47	47	
Y5	Compressed air inlet valve	35	35	35
Y6	Atmosphere valve	52	52	52
Y7	Fast exhaust valve	48	48	48
Y8	Vacuum valve	49/42*	58	
Y9	Air extractor valve	48	48	48
Y11	Blow-out valve for cooling coil	41	41	
Y12	Vacuum breaker valve	35	35	35
Y13	Compressed air valve	41	41	41
Y14	Demineralised water inlet valve		38	38
Y15	Pump water valve for vacuum pump	39	39	
Y16	Top exhaust valve	57	57	57
Y19	Demineralised water for reservoir container	17	17 (opt.)	

* for exhaust filters

Tab. 4: D-45: Position in layout diagram

3.2.5 D-65 – 200

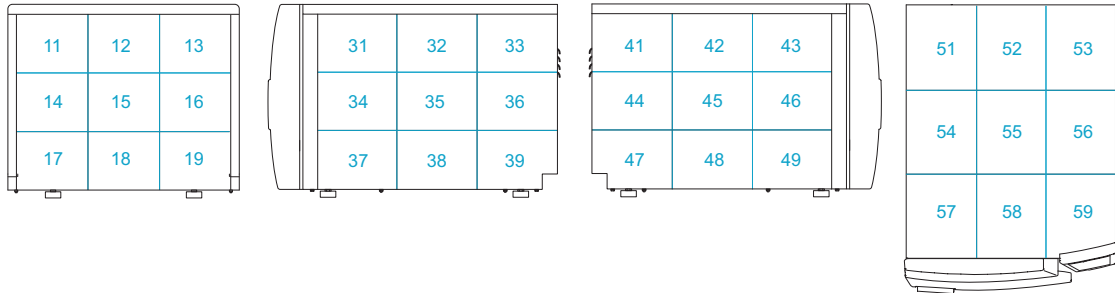


Fig. 5: D-65 – 200: Layout diagram of rear, right, left and top

Component		Position in layout diagram		
		DX	DE	DB
	Steam generator	38/39		
	Pneumatic assembly	45	45	45
BV1	Manual drain tap for steam generator	17		
D1	Steam air extractor for sterilisation chamber	48	48	48
D2	Steam air extractor (Super Dry)	48		
F1	Demineralised water flow monitor	36		
F2	Vacuum flow monitor	32	32	
M1	Demineralised water feed pump	36	36 (opt.)	
M2	Vacuum pump	34	34	
M3	Air compressor	37	37	37
N1	Needle valve for air extraction	48	48	48
NR6	Needle no-return valve – “Blow out cooling coil”	45	45	
NR7	Needle no-return valve for cavitation protection	34	34	
P1	Manometer for external compressed air	32	32	
P2	Manometer for internal compressed air	45	45	45
PR1	Pressure reducer for external compressed air	32	32	
PR2	Pressure reducer for cooling water	32	32	
PS1	Pressure transducer for steam generator	16		
PS2	Pressure transducer for sterilisation chamber	45	45	45
PV1	Compressed air reservoir	45	45	45
PV2	Exhaust filter	57	57	
R1	No-return valve for demineralised water	17	36	
R2	No-return valve on pressure transducer for steam generator	16		
R3	No-return valve for cooling water	33	33	
R4	No-return valve for compressed air inlet	52	52	52
R5	No-return valve for drain	48	48	48
R6	No-return valve for air compressor	45	45	45
R7	No-return valve for vacuum	48	48	
R8	No-return valve for steam inlet (exhaust filter option)	58		
R9	No-return valve – “Blow out cooling coil”	35	35	
R12	No-return valve for external compressed air	32	32	
R13	No-return valve for cavitation protection	34	34	
S1	Sterile air filter	35	35	35

MECHANICAL ASSEMBLIES

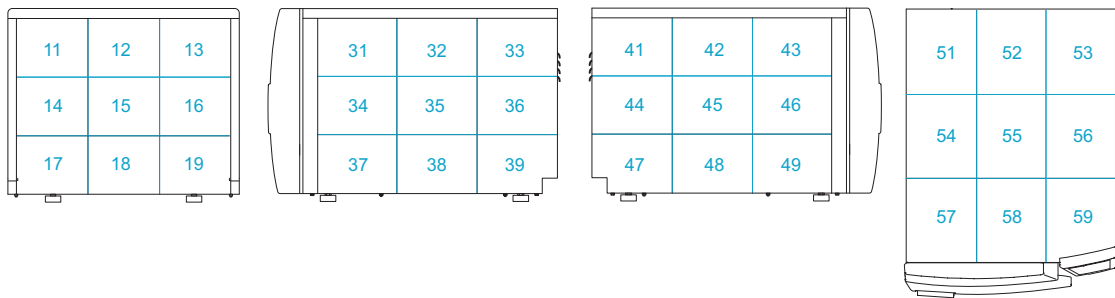


Fig. 5: D-65 – 200: Layout diagram of rear, right, left and top

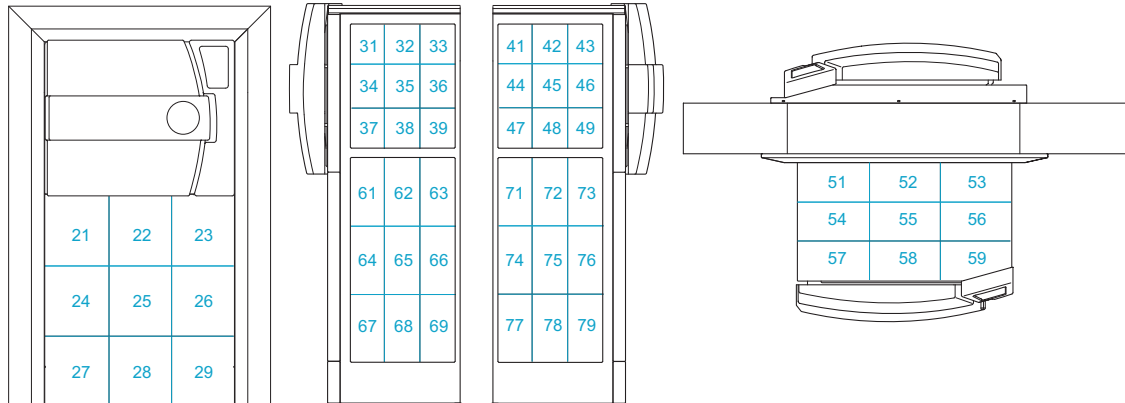
Component		Position in layout diagram		
		DX	DE	DB
S2	Dirt trap sieve	49	49	49
SL1	Silencer for air compressor	37	37	37
SV1	Safety valve on steam generator	14		
SV2	Safety valve on sterilisation chamber	52	52	52
Sw1	Pressure switch (7 bar)	45	45	45
Sw2	40 mbar switch	45	45	45
Y1	Steam inlet valve	36		
Y2	Super Dry valve	36		
Y3	Cooling water valve	35	35	
Y4	Drain cooling	33	33	
Y5	Compressed air inlet valve	35	35	35
Y6	Atmosphere valve	52	52	52
Y7	Drain valve	48	48	48
Y8	Vacuum valve	48	48	
Y9	Air extractor valve	48	48	48
Y11	Blow-out valve for cooling coil	45	45	
Y12	Vacuum breaker valve	35	35	35
Y13	Compressed air valve	45	45	45
Y14	Demineralised water inlet valve	36	36	
Y15	Pump water valve for vacuum pump	34	34	
Y16	Top exhaust valve	48	48	48

Tab. 5: D-65 – 200: Position in layout diagram

V/D SERIES

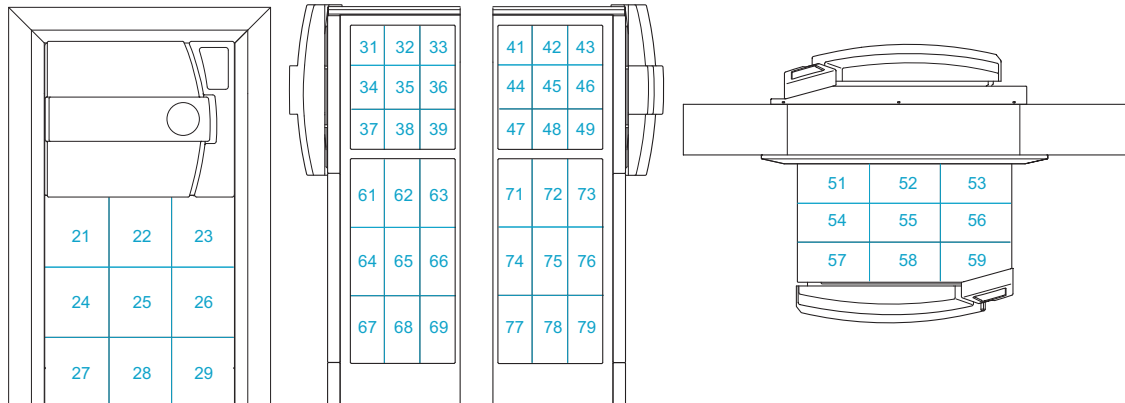
MECHANICAL ASSEMBLIES

3.2.6 DX-2D



DX-2D: Layout diagram of device side, right, left and top

Component		Position in layout diagram
		DX
	Steam generator	29
	Pneumatic assembly 1	21
	Pneumatic assembly 2	63
BV1	Manual drain tap for steam generator	28
D1	Steam air extractor for sterilisation chamber	75
D2	Steam air extractor (Super Dry)	75
F1	Demineralised water flow monitor	26
F2	Vacuum flow monitor	78
M1	Demineralised water feed pump	26
M2	Vacuum pump	27
M3	Air compressor	66
N1	Needle valve for air extraction	75
NR6	Needle no-return valve – “Blow out cooling coil”	21
NR7	Needle no-return valve for cavitation protection	27
P1	Manometer for external compressed air	78
P2	Manometer for internal compressed air	66
PR1	Pressure reducer for external compressed air	78
PR2	Pressure reducer for cooling water	78
PS1	Pressure transducer for steam generator	64
PS2	Pressure transducer for sterilisation chamber	49
PV1	Compressed air reservoir	66
PV2	Exhaust filter	57
R1	No-return valve for demineralised water	29
R2	No-return valve on pressure transducer for steam generator	64
R3	No-return valve for cooling water	78
R4	No-return valve for compressed air inlet	58
R5	No-return valve for drain	72
R6	No-return valve for air compressor	66
R7	No-return valve for vacuum	48



DX-2D: Layout diagram of device side, right, left and top

Component		Position in layout diagram
		DX
R8	No-return valve for steam inlet (exhaust filter option)	55
R9	No-return valve – “Blow out cooling coil”	65
R12	No-return valve for external compressed air	78
R13	No-return valve for cavitation protection	27
S1	Sterile air filter	65
S2	Dirt trap sieve	72
SL1	Silencer for air compressor	66
SV1	Safety valve on steam generator	29
SV2	Safety valve on sterilisation chamber	58
Sw1	Pressure switch (7 bar)	66
Sw2	40 mbar switch	49
Y1	Steam inlet valve	66
Y2	Super Dry valve	66
Y3	Cooling water valve	65
Y4	Drain cooling	75
Y5	Compressed air inlet valve	65
Y6	Atmosphere valve 1	58
Y7	Drain valve	72
Y8	Vacuum valve	48
Y9	Air extractor valve	75
Y11	Blow-out valve for cooling coil	21
Y12	Vacuum breaker valve	65
Y13	Compressed air valve 1	21
Y13/2	Compressed air valve 2	63
Y14	Demineralised water inlet valve	26
Y15	Pump water valve for vacuum pump	27
Y16	Top exhaust valve	75
Y23	Atmosphere valve 2	58

Tab. 6: DX-2D: Position in layout diagram

3.3 Door lock

3.3.1 V/D-65 – 200

Principle

The devices are equipped with an automatic door lock. A locking ring meshes with the door and locks it securely.

The controller then checks the correct procedure using a series of inputs and outputs, thus ensuring safe operation of the device.

Closing

Closing procedure



The vacuum pump for locking the door runs for no longer than 30 seconds.

If the door is not properly locked, the closing procedure is cancelled. To start the closing procedure again, open the door and close it again. Follow the instructions in the display.

Manually pressing the door down triggers a chain of events to close and lock the door:

- Gasket switch: A reed contact/microswitch tells the controller that the door has been pressed.
- The vacuum pump then generates a vacuum in the sterilisation chamber which pulls down the door fully.
- Door switch: A microswitch signals the end position of the closed door.
- Scissor lock: The pneumatic cylinder on the scissor lock moves downwards and closes the locking ring. The vacuum pump runs on for 5 seconds.
- After a slight delay, the pneumatic cylinder of the locking shoe moves up and secures the closed locking ring.
- Ring Close switches: Four microswitches query the position of the closed locking ring and a reed contact on pneumatic cylinder Z2 queries the position of the locking shoe.

Only when the process is complete does the control unit report `Ready` and the program can be started.

Opening

The door can be opened after the end of the program if the following parameters are met:

- EndTemp: The set unloading temperature has been reached (or fallen short of).
- ChamberPress: The pressure in the sterilisation chamber is in the range $ATMPressure - 12 \text{ kPa}$ to $ATMPressure + 4 \text{ kPa}$. `ATMPressure` is the preset normal pressure for the location ([parameter 74](#)).

- Atmosphere switch (SW2): An additional relative pressure switch ensures that the power to the pneumatic assembly is interrupted if the excess pressure in the sterilisation chamber is > 4 kPa. The door is prevented from opening.

If these conditions are met, the chain of events described above takes place in reverse order after the `Open` button on the display is pressed.

Opening the door in an emergency

If the door cannot be opened using the controller, then it can be opened manually using the pneumatic assembly. Prerequisite:

- The internal compressed air has a pressure of at least 4 bar (P2).
- The sterilisation chamber is depressurised.
- Remove the service door or side sections.

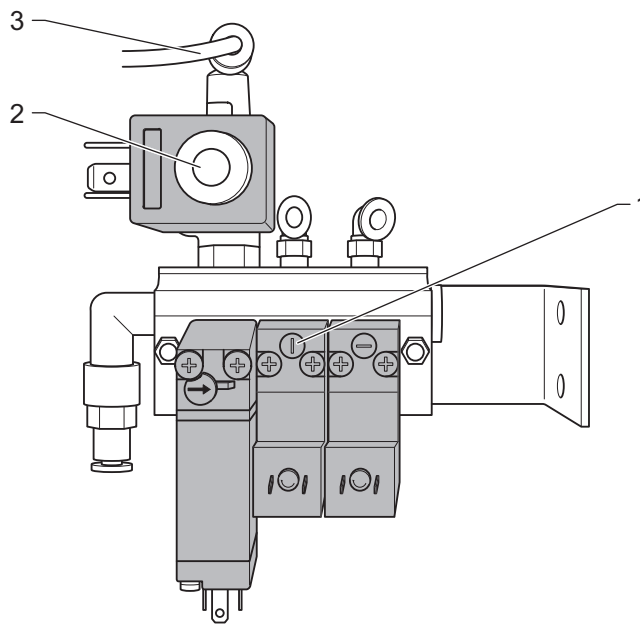


Fig. 6: Pneumatic assembly

- Remove the hose (3) from Y13 (2).
- Open the solenoid valve (1) by turning the adjusting screw clockwise by a quarter turn.

Note



After the door is opened, turn back the adjusting screws and reattach the hose to Y13.

If the emergency opening procedure detailed above does not work due to insufficient compressed air in the system or a mechanical blocking of the door, then proceed as follows.

- Remove the hoses on both locking cylinders (see Fig. 10: unterhalb) and press the locking cylinders manually.

Position and function

Door hydraulics (V-65 – 150 only)

The door hydraulics are found in the door hinge on the rear of the device and ensure that the door closes smoothly.

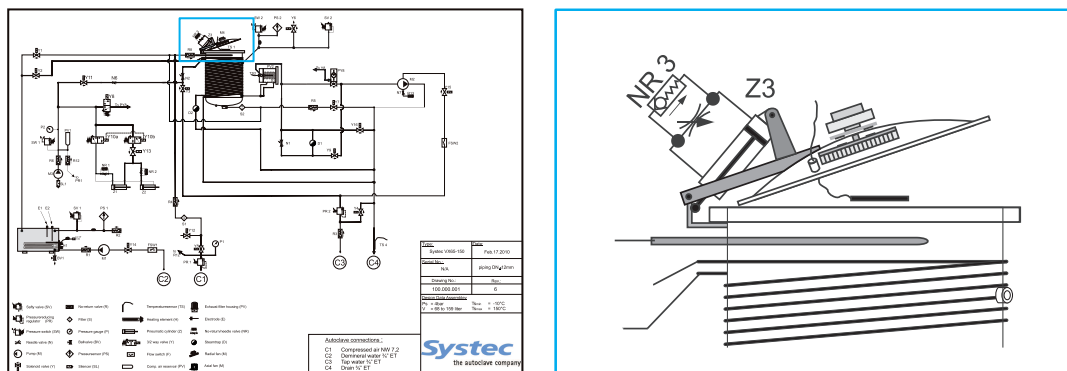


Fig. 7: Example: Position on pipe connection diagram

Z3	Hydraulic cylinder
NR3	“Close door” throttle no-return valve

The door must be pushed against the hydraulic pressure to close it.


The flow through the hydraulics can be set using the throttle no-return valve (NR3) on the hydraulic cylinder: The more the valve is opened, the less resistance there is to the door being closed.

Vacuum pump

To facilitate the locking process, a vacuum is created when closing the door. This holds the door down while it is being closed until the locking ring has mechanically locked the door.

Digital inputs on the door control

The following status table provides an overview of the digital input values when the door is open and closed:

Door Close switch	
	<p>The status of the Door Close switch is only used to trigger the closing process and is then no longer queried.</p> <p>The Door Close switch can therefore be open during the process after the door is locked.</p>

Digital inputs	Door open	Door closed
Door Close	○	○/●
Ring Open	●	○
Ring Close	○	●
Vac Flow SW	-	-
Gen Flow SW	-	-
Ring Close 2	○	●
Ring Close 3	○	●
Ring Close 4	○	●
Gasket SW	○	●

Tab. 7: Status table for the digital inputs when the door is open and closed (○: Off, ●: On)

Ring switches

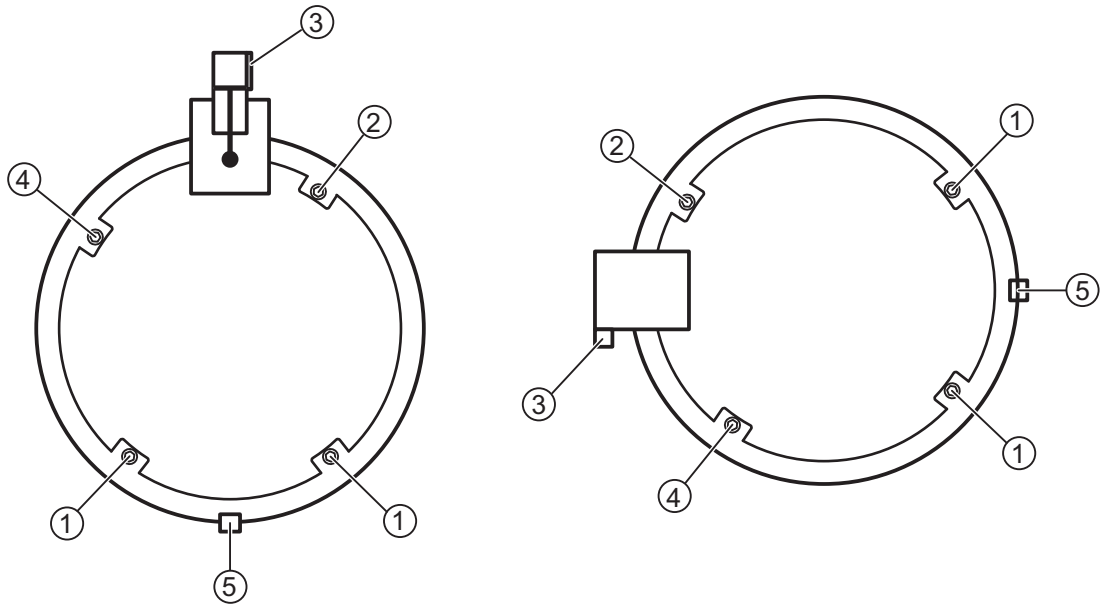


Fig. 8: Position of the microswitches that monitor the door lock

1	Ring Close 3 (both switches in series)
2	Ring Close 2
3	Gasket Switch
4	Ring Close 4
5	Door Close

The locked door is monitored using microswitches (Ring Close 2 to Ring Close 4) as well as the reed contact on the locking cylinder for the locking shoe (Z2, Ring Close, [see Fig. 9: unterhalb](#)). When the door is open, the position of the opened locking ring is only displayed via the reed contact on the locking cylinder of the scissor mechanism (Z1, Ring Open, [see Fig. 9: unterhalb](#)).

Scissor mechanism

The locking ring is opened and closed by the scissor mechanism and, when closed, is securely kept in place by a locking shoe.

The scissor mechanism (and thus the locking ring and locking shoe safeguard) is closed by two opposing pneumatic cylinders (see Fig. 9: unterhalb).

The pneumatic system of the scissor mechanism is fitted to a plate so that the entire assembly can be fitted and removed as a single component (see “Replacing the scissor mechanism”).

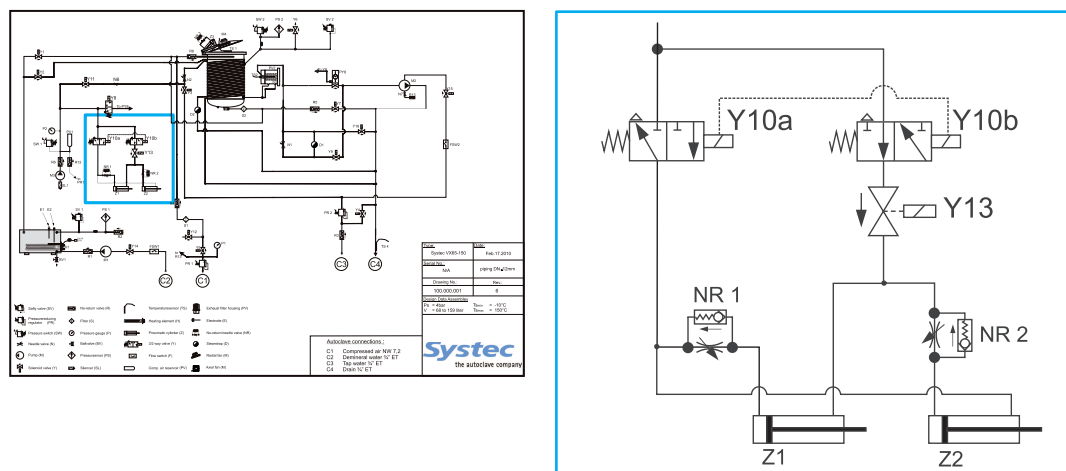


Fig. 9: Controlling the scissor mechanism: Position on pipe connection diagram

1	Y10a	Solenoid valve on locking ring
2	Y13	Solenoid valve on locking ring (230 V)
3	NR2	Throttle no-return valve for delayed extension of the cylinder for the locking shoe (Z2)
4	Z2	Locking shoe on cylinder (Ring Close)
5	Z1	Locking ring on cylinder (Ring Open)
6	NR1	Throttle no-return valve for delayed retraction of the cylinder for the locking ring (Z1)
7	Y10b	Solenoid valve on locking ring

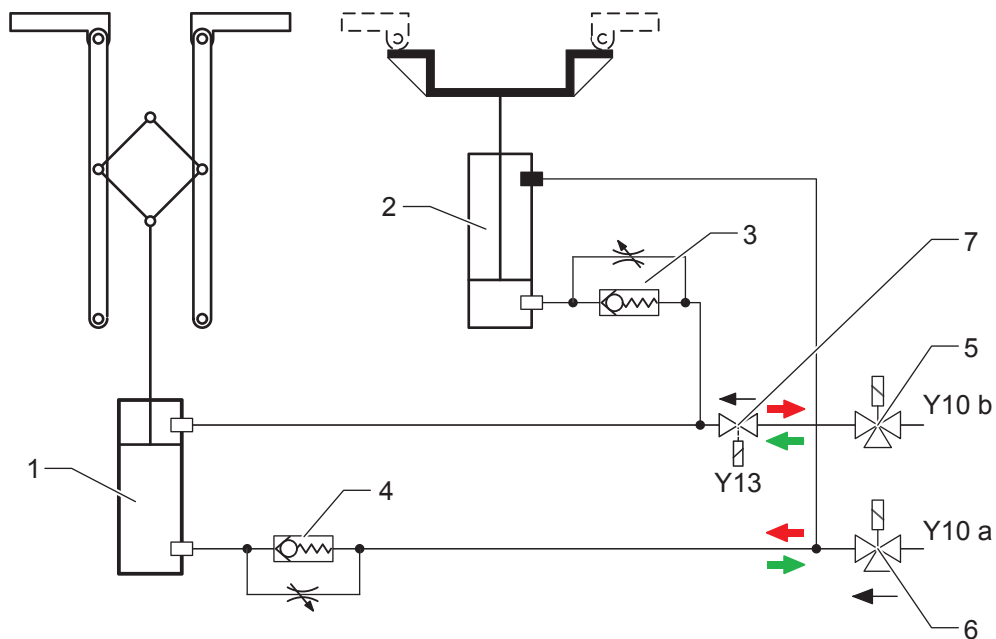


Fig. 10: Function diagram of the scissor mechanism, locking ring open
red = open, green = close

1	Locking ring on cylinder (Z1)
2	Locking shoe on cylinder (Z2)
3	Throttle no-return valve for delayed extension of the cylinder for the locking shoe (Z2)
4	Throttle no-return valve for delayed retraction of the cylinder for the locking ring (Z1)
5	3/2-way valve, normally open
6	3/2-way valve, normally closed
7	Solenoid valve on locking ring (Y13, 230 V)

Function description:

The locking cylinder Z1 opens (upper position) or closes the locking ring of the sterilisation chamber. When the locking ring is closed, the locking cylinder Z2 moves over the connection of the scissor mechanism and the locking ring and thus fixes the locked ring. Both locking cylinders are closed or opened via the opposing connections of the pneumatic assembly (see chapter 3.10.2 unterhalb). Throttle no-return valves in front of each lower connection of the locking cylinders ensure that the locking shoe moves to the locking position with a delay after the locking ring closes. The no-return valves also ensure that the scissor mechanism is only opened when the locking shoe has released the screw connection between the scissor mechanism and locking ring. The solenoid valve on the locking ring (Y13) ensures that the locking ring remains open when the device is switched off with the door open.

The end positions of the locking cylinders are queried by reed contacts (Ring Close: cylinder Z2, and Ring Open: cylinder Z1) and the information is passed to the controller.

Maintenance tasks

Replacing the scissor mechanism

Always replace the entire scissor mechanism!



For safety reasons, the scissor mechanism must only be replaced as a complete unit.

The scissor mechanism is available from Systemec as a complete spare part.

Necessary tools	10 mm spanner ¼" socket set with short extension, with 8 mm and 10 mm socket 3 mm Allen key
Have available	When necessary, chain and cable spray for greasing the scissor joints (Systemec item no. 11921)

Removing the scissor mechanism:

- Remove the pneumatic supply hoses.
- Disconnect the reed contacts.
- Manually withdraw the locking shoe.
- Position the spanner on the long nuts and loosen the grub screws with the Allen key.
- Unscrew the long nuts from the ring.
- Close the ring and push the locking shoe upwards.
- Unscrew the scissor plate with 8 mm socket.
- Withdraw the locking shoe and open the ring.
- Tilt the scissor plate slightly at the bottom and pull it off the frame.

Install the scissor mechanism in reverse order.

- Hand-tighten the long nuts and tighten the grub screws.
- Check the throttle no-return valves (cylinder Z1: 1 turn open, cylinder Z2: 1 turn open).
- The scissor plate is greased in the factory. Regrease, if necessary.
- The position of the reed switch is factory-set: Check and adjust, if necessary (see [“Setting the reed contacts of the scissor mechanism”](#)).

Set the sides of the long nuts vertically and lock in place!



The locking shoe must run smoothly over the long nuts and must have at least 4 mm of space on the left and right of the sides.

The grub screws prevent the long nuts from twisting and must be retightened after assembly.

Setting the reed contacts of the scissor mechanism

Adjust the position of the reed contacts so that the associated contact only closes in the following cases:

- When the locking shoe has been completely moved up.
- When the locking ring is completely opened.

Checking and greasing the scissor joints

Service interval	Annual maintenance
Have available	Chain and cable spray (Systec item no. 11921)

- Bearings and screws must sit firmly and have enough room
- If necessary, grease the scissor joints with chain and cable spray

Locking ring maintenance

The locking ring must move freely in the slot.

Only use Teflon dry lubricant!



Only use Teflon dry lubricant for lubricating the locking ring.

Service interval	Annual maintenance
Have available	Teflon dry lubricant (Systec item no. 11919)

Maintenance:

- Open the door.
- Close the locking ring by setting the `Ring Close` digital output manually in the `Service -> Manual output set` menu.
- Switch off the device.
- Check that the locking ring moves easily by hand.
- If necessary, clean the slot and the locking ring.
- Lubricate the ring and slot with Teflon dry lubricant.
- Switch on the device.
- Acknowledge the error message.

Door seal maintenance

The door is sealed from the sterilisation chamber by the lip seal. The seal must be kept clean to ensure correct functionality.

Note



Once the door seal has been partially pulled out, it cannot be pushed back in. In this case, proceed as described under "Replacement".

Service interval	Annual maintenance
Have available	Measuring gauge

Maintenance:

- Check that the screws of the fixing plates are correctly seated.
- Check if the seal is damaged, brittle or hardened.

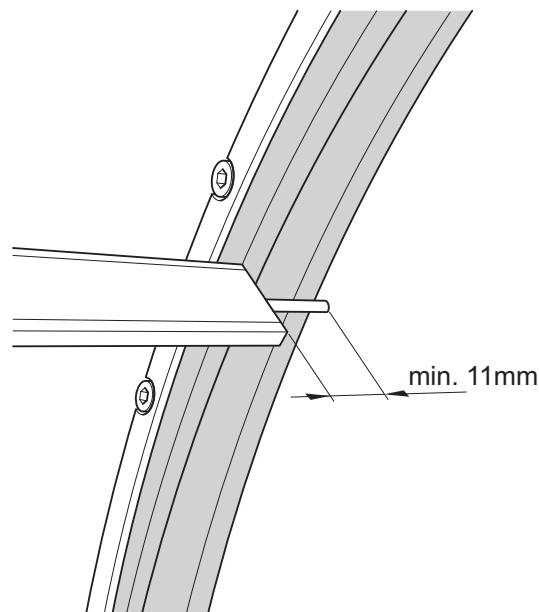


Fig. 11: Measuring the distance

- Measure the distance from the inside wall of the door to the lip. If the distance is less than 11 mm, you must replace the door seal.

Replacement:

Necessary tools	3 mm Allen key
Have available	New seal

Only tighten screws hand-tight



Both the screws and the door are made of stainless steel. To prevent jamming, the threads are treated at the factory with an aluminium paste and must only be fastened hand-tight.

- Open the door.
- Loosen the screws on the fixing plate by two to three turns (do not remove them).

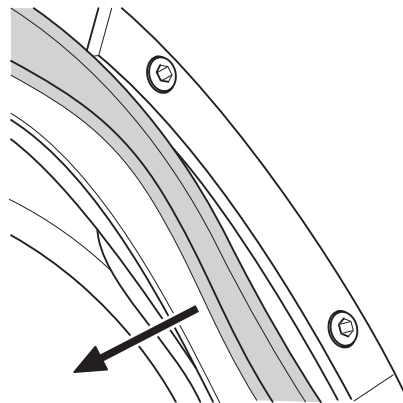


Fig. 12: Pulling out the door seal

- Pull out the door seal.
- Insert a new door seal.

Tighten the fixing plate.

3.3.2 V-40 – 55, D-45

Principle

The devices are equipped with an automatic door lock. Two locking pins mesh with the two holes on the device and lock the door securely.

The controller then checks the correct procedure using a series of inputs and outputs, thus ensuring safe operation of the device.

Closing

Closing the door triggers a chain of events to close and lock the door.

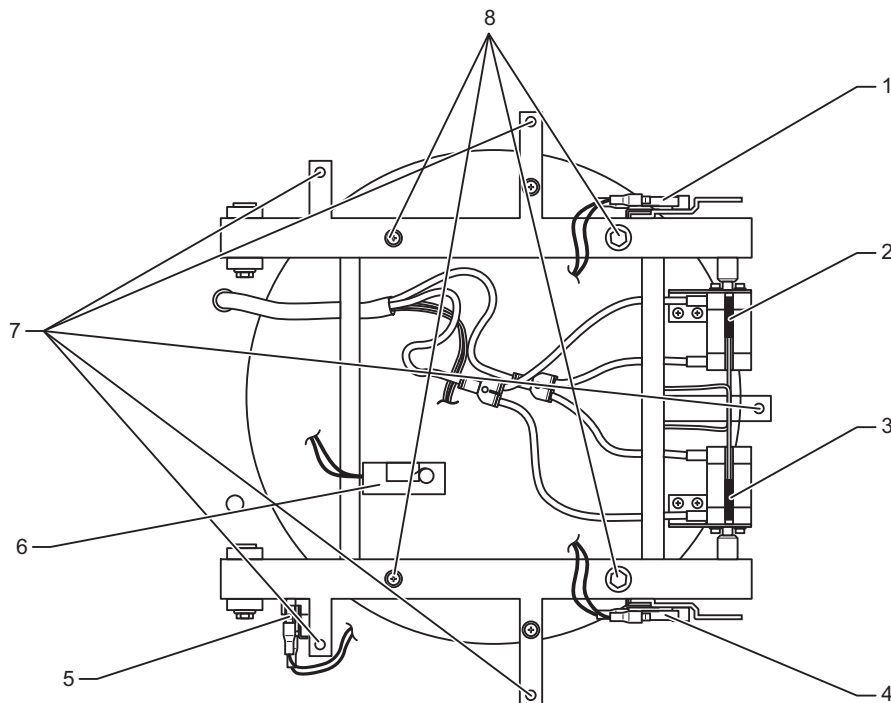


Fig. 13: Position of the door switch and fastening screws (door cladding removed)

1	Door switch (Door Close)
2	Reed contact for digital input (Ring Close 4/Gasket sw)
3	Reed contact for digital input (Ring Close 2/3)
4	Toggle switch for digital input (Ring Open/Ring Close)
5	Tilt switch (D series only)
6	Tilt switch (V series only)
7	Fastening screws for door cladding
8	Fastening screws for container door

Note



The door is suspended so that it also seals in a vacuum.

MECHANICAL ASSEMBLIES

- Door Close: A microswitch connected in series with a tilt switch signals the end position of the closed door.
- The locking cylinders Z1 and Z2 move the locking bolts into the two slots.

Note



The locking cylinders are also suspended so that the locking bolts can centre themselves.

- The reed contacts of the “Ring Close 2, 3, 4” and “Gasket sw” inputs and the switch contact of the “Ring Close” input signal that the door has been securely locked to the controller.

Only when the process is complete does the control unit report *Ready* and the program can be started.

Opening

The door can be opened after the end of the program if the following parameters are met:

- EndTemp: The set unloading temperature has been reached (or fallen short of).
- ChamberPress: The pressure in the sterilisation chamber is in the range $ATMPressure - 12 \text{ kPa}$ to $ATMPressure + 4 \text{ kPa}$. *ATMPressure* is the preset normal pressure for the location ([parameter 74](#)).
- Atmosphere switch (SW2): An additional relative pressure switch ensures that the power to the pneumatic assembly is interrupted if the excess pressure in the sterilisation chamber is $> 4 \text{ kPa}$. The door is prevented from opening.

If these requirements are met, then the door is unlocked automatically and can then be opened.

Note



If necessary, the unlocking of the locking bolts can be aided by pushing the door lightly.

Opening the door in an emergency

If the door cannot be opened using the controller, then it can be opened manually using the pneumatic assembly. Prerequisite:

- The internal compressed air has a pressure of at least 4 bar (P2).
- The sterilisation chamber is depressurised.
- Remove the service door or side sections.

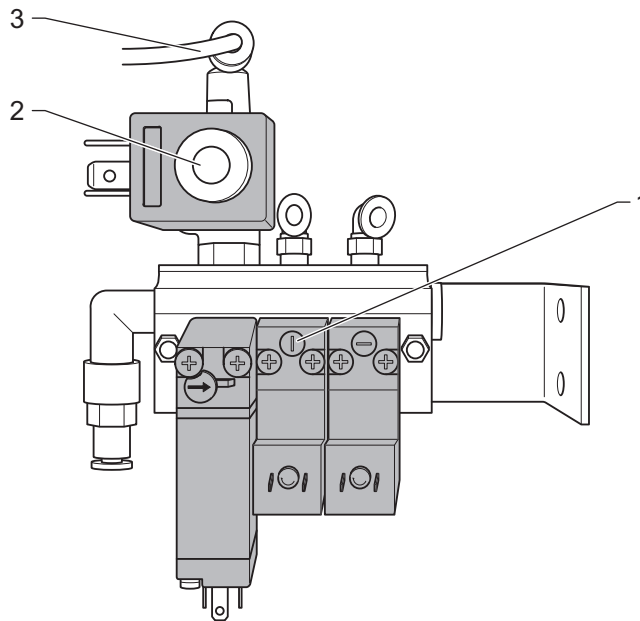


Fig. 14: Pneumatic assembly

- Remove the hose (3) from Y13 (2).
- Open the solenoid valve (1) by turning the adjusting screw clockwise by a quarter turn.

Note



After the door is opened, turn back the adjusting screws and reattach the hose to Y13.

Position and function

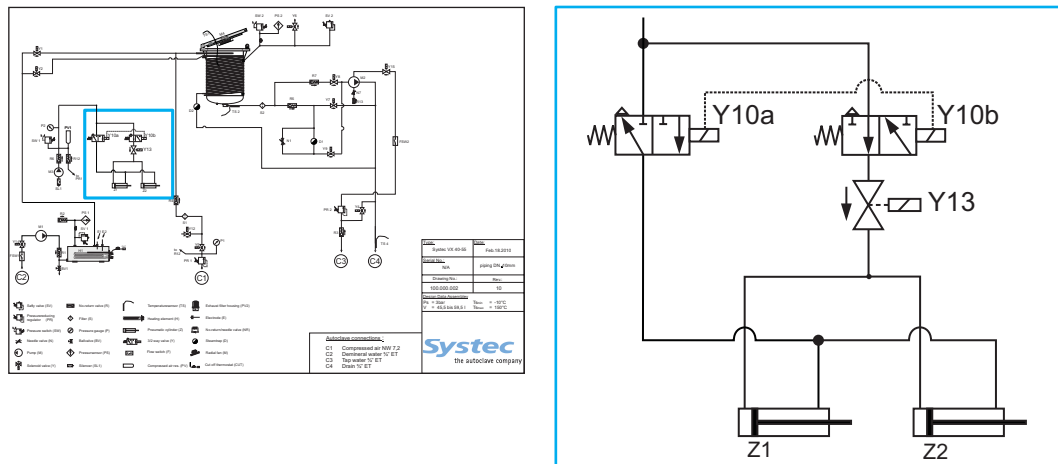


Fig. 15: Door lock: Position on pipe connection diagram

Y10a	Solenoid valve on locking cylinder
Y10b	Solenoid valve on locking cylinder
Y13	Solenoid valve on locking cylinder (230 V)
Z1, Z2	Locking cylinder with locking bolts

Note



The solenoid valve Y13 ensures that the locking bolts remain retracted when the door is opened and the device is switched off.

Digital inputs on the door control

The following status table provides an overview of the digital input values when the door is open and closed:

As the same device software is used on 40 – 55 I devices as on > 65 devices, the switch settings on the digital inputs are shown as ring positions (see Fig. 13: oben).

Door Close switch



The status of the Door Close switch is only used to trigger the closing process and is then no longer queried. The Door Close switch can therefore be open during the process after the door is locked.

Digital inputs	Door open	Door closed
Door Close	○	○/●
Ring Open	●	○
Ring Close	○	●
Gasket SW	○	●
Ring Close 2	○	●
Ring Close 3	○	●
Ring Close 4	○	●

Tab. 8: Status table for the digital inputs when the door is open and closed (○: Off, ●: On)

Maintenance tasks

Replacing a locking cylinder

Necessary tools	– 7 mm spanner – Suitable pliers and a cloth to protect the surface, when necessary
Have available	– White adhesive, Systemec item no. 11920

- Remove the door cladding (see chapter 3.4.1 unterhalb).
- Secure the piston rod of the cylinder with the spanner and turn the locking bolt anti-clockwise with the pliers to remove it.

Do not scratch the locking bolt!



Do not scratch the surface of the locking bolt. If it becomes scratched, grind it smooth and polish it.

- Unscrew the holder of the locking cylinder from the door.
- Loosen the reed contact.
- Remove the compressed air hoses from the push-in fittings of the cylinder.
- If necessary, place the push-in fittings on the new cylinder.
- Insert the reed contact into the new cylinder.
- Position the cylinder.
- Insert the compressed air hoses 15 mm into the push-in fitting.
- Apply white adhesive to the thread of the piston rod.
- Fit the locking bolt.
- Mount the cylinder holder on the door.

Adjusting the reed contacts

Adjust the position of the reed contacts so that the associated contact does not close until the locking cylinder reaches the end position.

Door seal maintenance

The door is sealed from the sterilisation chamber by the lip seal. The seal must be kept clean to ensure correct functionality.

Service interval	Annual maintenance
Have available	Measuring gauge

- Check if the seal is damaged, brittle or hardened.

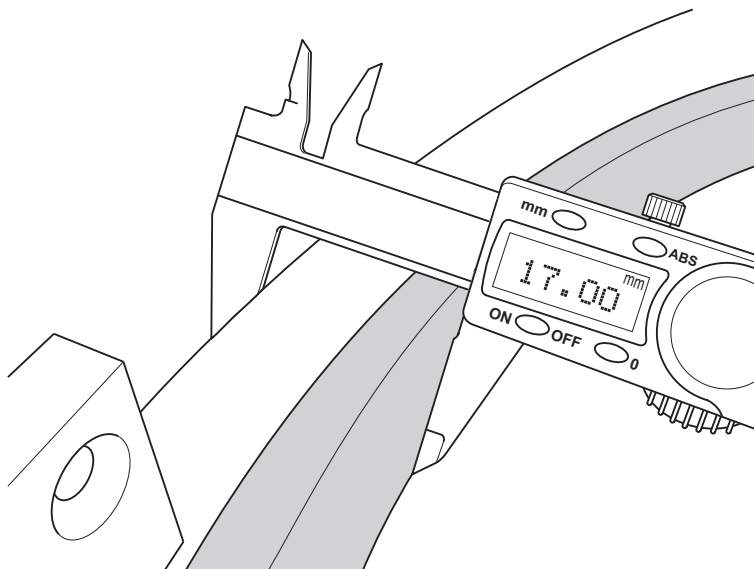


Fig. 16: Measuring the distance

- Measure the distance from the outer edge of the door to the lip. If the distance is less than 17 mm, you must replace the door seal.
- Pull out the door seal.
- Insert a new door seal.

3.3.3 D-23

Principle

The devices are equipped with an automatic door lock. By locking the door, two lock catches mesh with each other: The door is now in the closed position.

After starting the program, the lock catches are moved into the locked end position by a gear motor. The pressure tightness is only guaranteed in the locked end position.

The controller then checks the correct procedure using a series of inputs and outputs, thus ensuring safe operation of the device.

Closing

Door Open is shown in the display when the door is open.

- Close the door so that the lock catches mesh with each other. The “Door Closed” reed contact is closed and the Door Open message no longer appears: The door is now in the closed position.

Starting the program triggers a chain of events to lock the door securely.

The gear motor is started and moves both lock catches via a spindle into the locked end position, which is defined by the “Door Locked” switch.

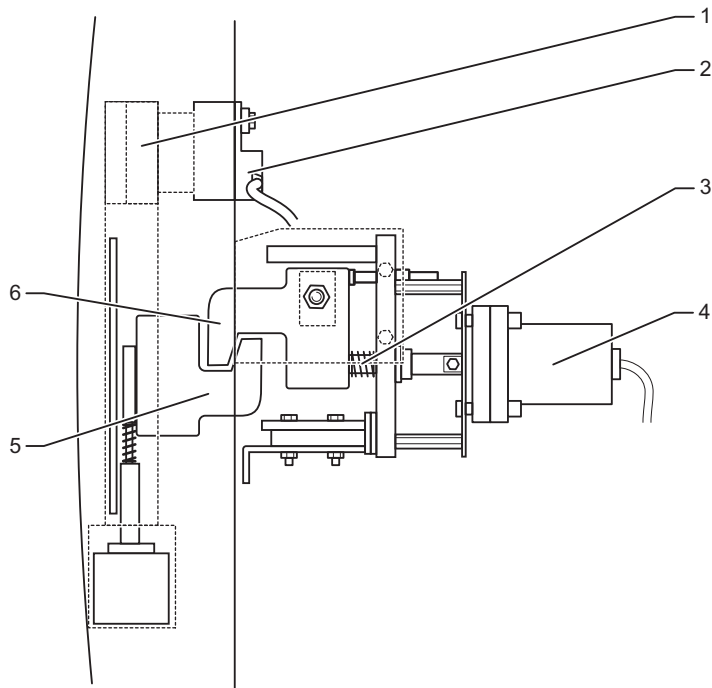


Fig. 17: Closed position

1	Magnet
2	Reed contact
3	Spindle

4	Gear motor
5	Lower lock catch
6	Upper lock catch

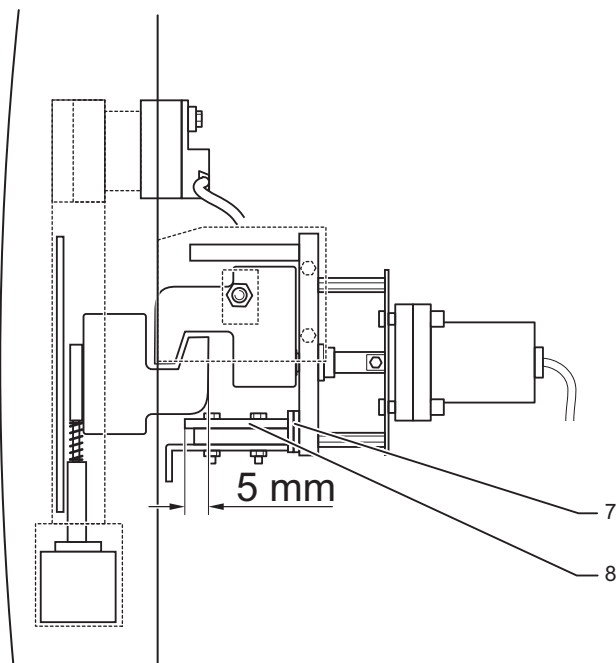


Fig. 18: Secured position

7	Locking plate
8	Safety ramp

In the locked end position, the lock catches are positioned on the safety ramp to prevent the door from unlocking on its own.

The door does not unlock on its own!



The lock catches must protrude 5 mm onto the safety ramp. The locking plates prevent movement of the safety ramp.

Opening

The door is unlocked after the end of the program if the following parameters are met:

- EndTemp: The set unloading temperature has been reached (or fallen short of).
- ChamberPress: The pressure in the sterilisation chamber is in the range $ATMPressure - 12 \text{ kPa}$ to $ATMPressure + 4 \text{ kPa}$. *ATMPressure* is the preset normal pressure for the location ([parameter 74](#)).

If these conditions are met, the following takes place:

- The message `Access denied` appears in the display.
- The gear motor moves the lock catches out of the locked end position until the `Door Unlocked` digital input is set.
- The door can be opened by pressing the `Open` button. The door lock is pulled downwards by the lifting magnet and the door is opened. The lifting magnet is switched off after 5 seconds, or when the reed contact is opened.

Setting the safety ramp and door switch

The safety ramp and door switch must be set together.

- Close the door.

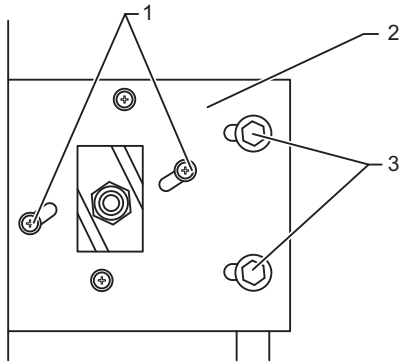


Fig. 19: Loosening the screws on the limit switch

- Loosen the screws on the limit switch (1).
- Trigger the `Close door` digital output in the `Service` -> `Output set` display until the vacuum lip of the door seal lays flat on the collar of the sterilisation chamber.
- Position the “Door Locked” limit switch.

The position of the support plate (2) can be set using the slotted holes (3), when necessary.

- Tighten the limit switch: The lock catch of the door must now protrude 5 mm over the safety ramp.
- When necessary, correct the position of the safety ramp and secure it in place using the required locking plates.
- Move the motor to the unlocked position using the `Open door` digital output: The lock catch must now be positioned 2 mm away from the safety ramp.
- Position the “Door Unlock” limit switch and screw it tight.

Digital inputs on the door control

The following status table provides an overview of the digital input values when the door is open and closed:

Digital inputs	Door open	Door in closed position	Door in locked end position
Door Closed	○	●	●
Door Locked	○	○	●
Door Unlock	●	●	○

Tab. 9: Status table for the digital inputs when the door is open and closed (○: Off, ●: On)

Door seal maintenance

The door is sealed from the sterilisation chamber by the lip seal. The seal must be kept clean to ensure correct functionality.

Service interval	Annual maintenance
Have available	Measuring gauge

Maintenance:

- Check if the seal is damaged, brittle or hardened.

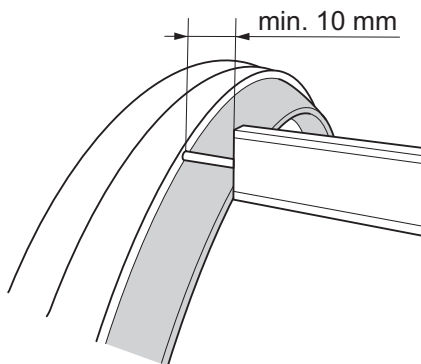


Fig. 20: Measuring the distance

- Measure the distance from the door edge to the upper edge of the lip. If the distance is less than 10 mm, you must replace the door seal.
- Pull out the door seal.
- Insert a new door seal.

3.4 Door cladding

In order to access the microswitches on the door lock, the control panel (V series only) and the motor on the radial fan, the door cladding must be removed.

3.4.1 Removing the door cladding

V/D-65 – 200

Necessary tools	- 3 mm Allen key - Phillips screwdriver for M6 screws - Slotted screwdriver
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- Open the door.

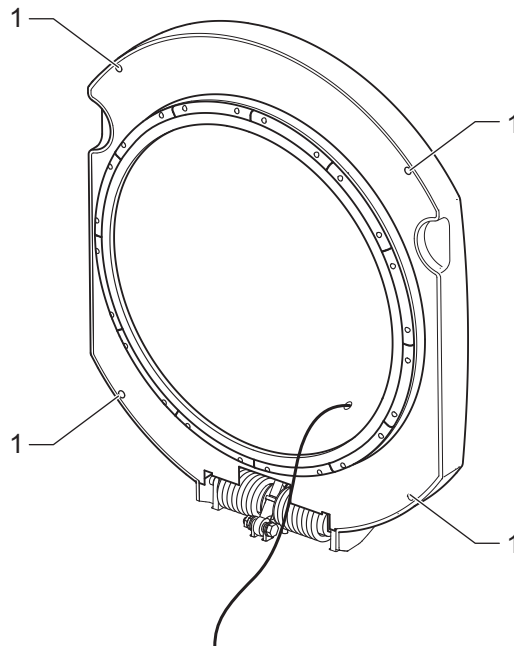


Fig. 21: Loosening the fastening screws on the panel

- Loosen the fastening screws (1) on the panel, then remove the panel.

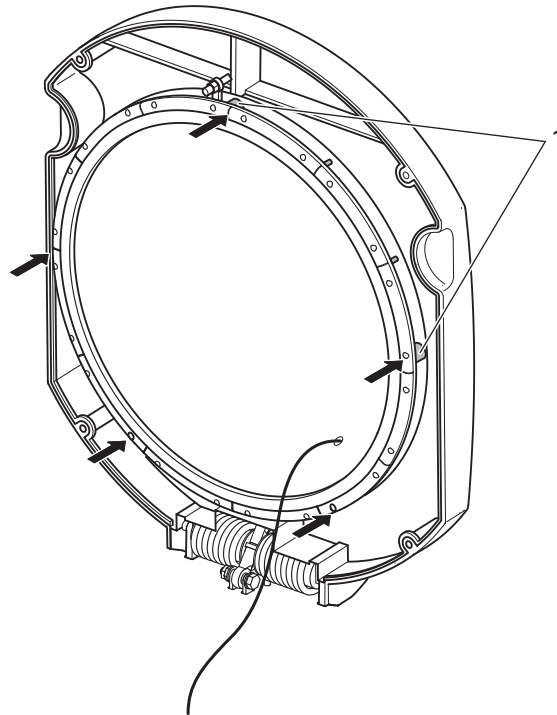


Fig. 22: Position of the spacer sleeves

Make sure the spacer sleeves are correctly positioned!



The diameters of the spacer sleeves may be different, which means they must always be inserted in the same position. The spacer sleeves are therefore colour-coded.

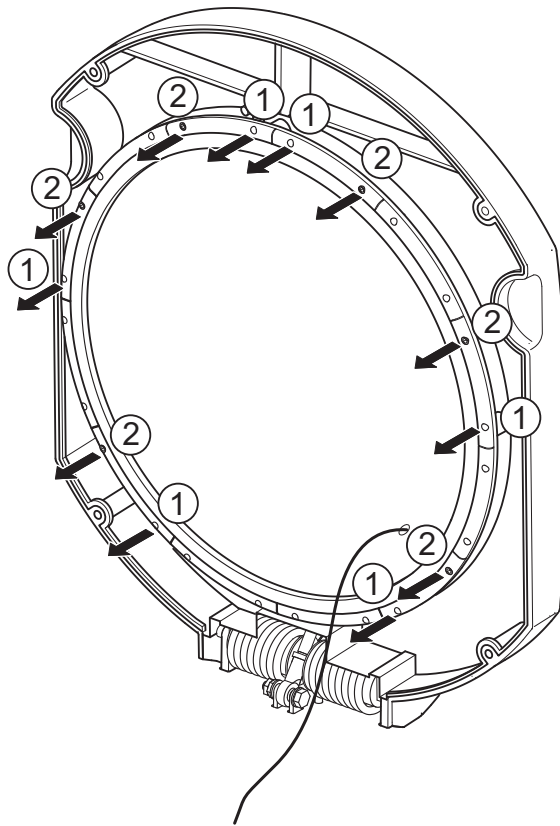


Fig. 23: Removing and loosening the screws

- Remove the 6 fastening screws (1) on the fixing plate, which are positioned above the spacer sleeves.
- Loosen the fastening screws (2) on the opposite side of the same fixing plate by two to three turns.

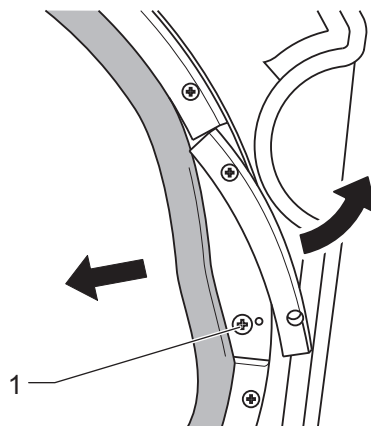


Fig. 24: Loosening the screws

- Push the seals and plates apart above the spacer sleeves and completely loosen the exposed screws (1), but do not take them out.
- Lift up the door cladding.
- Disconnect the cable to the control unit or printer, when necessary.
- Remove the door cladding.

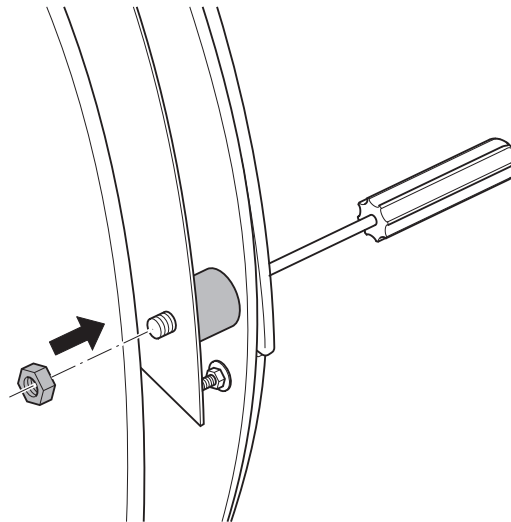


Fig. 25: Securing the screws using nuts

- Secure the 5 screws (M6) on the rear with nuts, when necessary.
- Tighten the fastening screws on the fixing plate again (see Fig. 23: oben, pos. 1 and 2). Pay attention to the position of the door seal while doing this.

V-40 – 55, D-23 – 45

V 40 – 55, D-45:

Necessary tools	– 5 mm Allen key – Slotted screwdriver
-----------------	---

D-23:

Necessary tools	– Phillips screwdriver – Slotted screwdriver
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- Remove the screen panel.
- Remove the fastening screws on the door cladding. Pay attention to the position of the spacer sleeves while doing this.
- Remove the door cladding and disconnect any cables, when necessary.

V/D SERIES

MECHANICAL ASSEMBLIES

3.4.2 Maintenance tasks

V/D-65 – 200

- Check the door switch and replace, if necessary (see “Checking and replacing the door switch”).

V series

- Replace or adjust the throttle no-return valve for the door hydraulics (see “Checking the throttle no-return valve of the door hydraulics”).
- Check the hydraulic cylinder for leaks and replace, if necessary.
- Adjust the door hinge.

Checking and replacing the door switch

Make sure the door switch correctly indicates the position of the locking ring.

Necessary tools	Measuring gauge
Have available	Microswitches, if necessary

- Switch on the device.
- Close the door.
- Make a visual inspection to see if the ring is correctly positioned.
- Check the door switch. Measure the distance from the edge of the door to the roller on the microswitch:
 - Up to 2.5 mm: The contact must not be closed.
 - 3.0 mm or more: The contact must be closed.
- In the Service -> Digital Inputs menu, check the status of the microswitches when the ring is open and closed. Readjust or replace the microswitches, if necessary.

Checking the throttle no-return valve of the door hydraulics

Make sure that the door cannot fall down in an uncontrolled fashion.

The flow of the door hydraulics can be changed by adjusting the throttle no-return valve.

Necessary tools	Slotted screwdriver
-----------------	---------------------

The viscosity of the door hydraulic oil depends on the temperature!



At low temperatures, the viscosity is higher than at high temperatures (e.g. after a program cycle). When warm, the door closes more easily and opens further than when cold.

3.4.3 Performing a test run

- Close the door (no products in the sterilisation chamber).
- Select the customer's preferred program and start it.
- Check the door for leaks.
- Observe the digital inputs of the door switch.
- Make a visual inspection of the entire device.

The door cladding can be reattached after a successful test run.

3.5 Control unit

3.5.1 Position and function

The control unit is located in the door cladding or front cladding. It contains an individual microprocessor controller with its own software.

The control unit has a rubber cover underneath to protect it. This is spot-fixed to the aluminium board of the control unit using commercially available superglue to prevent it from slipping during assembly.

3.5.2 Maintenance tasks

Necessary tools	5.5 mm Allen key
Have available	Superglue

Replacing the control unit

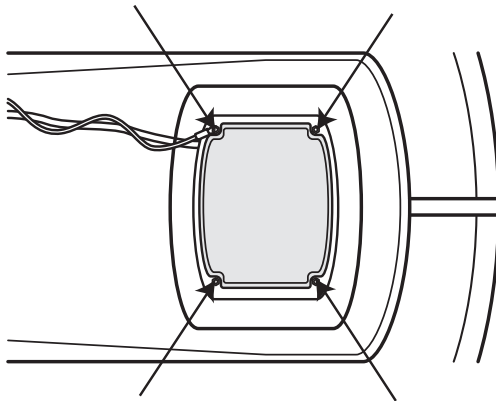


Fig. 26: Loosening the fastening screws on the control unit (V series)

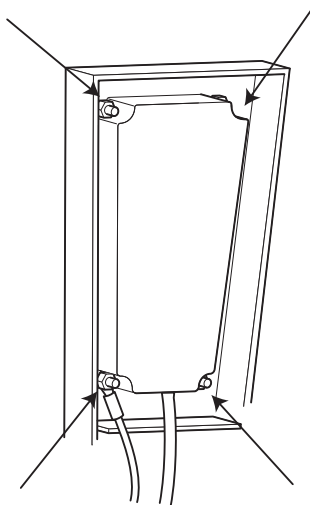


Fig. 27: Loosening the fastening screws on the control unit (D series)

- Remove the 4 fastening screws.
- Take out the control unit.

- Carefully loosen and remove the rubber cover.
- Pull out the pin connectors.
- Plug the pin connectors into the new control unit.
- Pull the rubber cover over the new control unit.
- Spot-fix the rubber cover using superglue.
- Reinstall the control unit in reverse order.

3.6 Radial fan

3.6.1 Position and function

The optional radial fan is used to support cooling and the optimum distribution of the steam-air mixture in the sterilisation chamber.

The motor is located on the outside of the door or the rear of the sterilisation chamber.

It drives the fan wheel on the inside through a magnetic coupling. To ensure that it runs smoothly, the motor must be carefully centred.

The fan wheel is press-fitted on the shaft. When required, only the complete fan wheel with bearing can be replaced.

3.6.2 Maintenance tasks

Necessary tools	8 mm spanner, long-nosed pliers
Have available	Two screwdrivers Pipe extension, if necessary

Adjusting the fan motor/rear wall

- Remove the door cladding.
- Slightly loosen the fastening screws on the motor.
- Switch on the autoclave.
- In the Service -> Manual output set menu, set the CircPump output to switch on the fan.
- Centre the motor (thus keeping the vibration as low as possible).
- Tighten the fastening screws.

Replacing the fan wheel

- Open the door.
- Pull the flexible temperature sensor out of its mounting and secure it.

- Loosen the holding nut for the distributor baffle and remove the baffle (see Fig. 28: unterhalb).

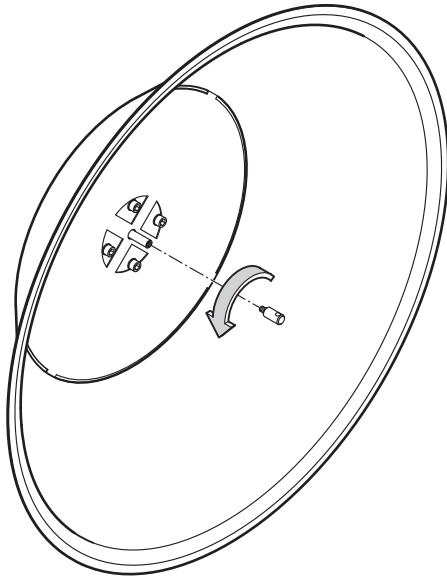


Fig. 28: Loosening the fixing nut to remove the baffle

- Remove the snap ring from the fan wheel shaft.

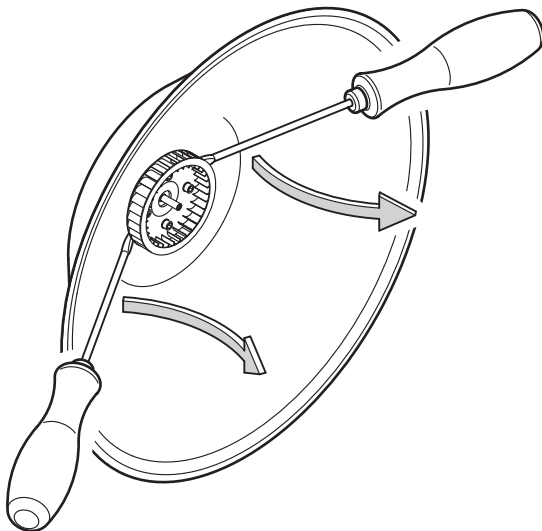


Fig. 29: Levering off the fan wheel

- Place both screwdrivers underneath the fan wheel and lever it off.
- Place the new fan wheel onto the shaft and push into the press fitting, using the pipe extension if necessary.
- Attach the snap ring.
- The rest of the assembly is made in reverse order.

3.7 Cooling

3.7.1 Position and function

Water cooling with support air

Operating principle:

After the sterilisation phase has ended, the steam in the sterilisation chamber is replaced with sterile, filtered, compressed air (support air) and the cooling coil is flooded with cooling water. After the unloading temperature is reached, the support air is vented and atmospheric conditions are established.

The pressure reducer on the input for support air is factory set to 6 – 7 bar and can be read from the manometer on the pressure reducer.

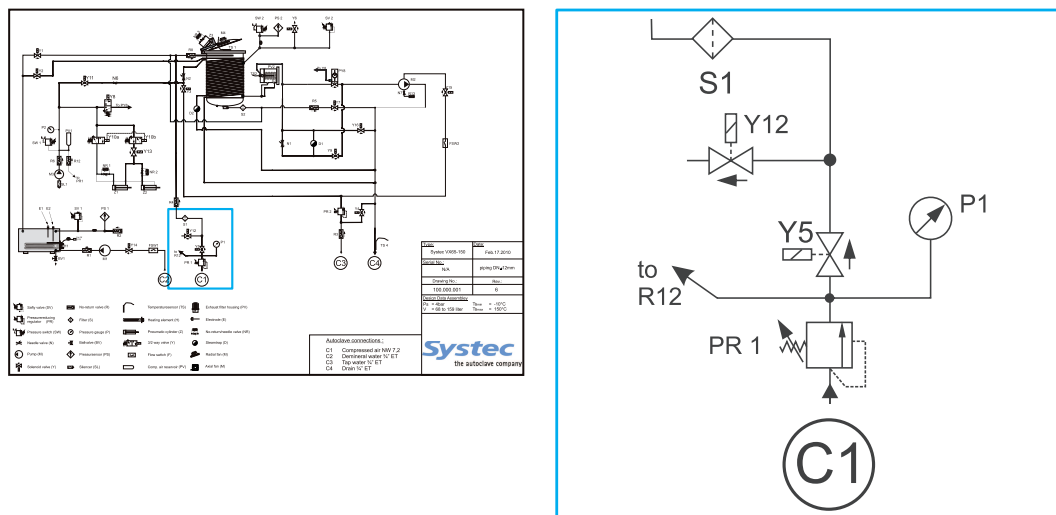


Fig. 30: Components on the “Cooling” assembly

P1	Manometer
PR1	Pressure reducer for support air
Y5	Support air valve
Y12	Vacuum breaker
S1	Sterile air filter

Water cooling:

The temperature of the unprocessed, cooling water in the cooling coil is checked using [parameter 40](#) (SaveWaterTemp). If the temperature measured is greater than 40 °C, the cooling coil is supplied at the maximum flow rate. If a lower temperature is measured, this is a sign that the cooling water is no longer removing much energy. Pulsing the water flow will then reduce the water usage, thus saving energy.

When using a separate cooling water circuit, set the SaveWaterTemp parameter to the minimum value!



When using a separate cooling water circuit, the cooling water supply and return flow have their own connections. In this case, the water saving function is not needed and must be switched off (by setting [parameter 40](#) (SaveWaterTemp) to 10 °C).

Water cooling without support air

After the sterilisation phase has ended, the steam is released in a controlled fashion until the atmospheric conditions are reached. The speed of the steam release is controlled via [parameter 16](#) (ExShootOn) and [parameter 17](#) (ExShootOff) (see chapter 8, “Parameters”).

When a temperature of 101 °C and a pressure of approx. 100 kPa is reached, the cooling coil in the sterilisation chamber is flooded with cooling water and the sterilisation chamber is flushed with sterile, filtered air through the vacuum breaker until the unloading temperature has been reached.

The water cooling function is detailed under “[Water cooling with support air](#)”.

Cooling through recirculation

Cooling purely through recirculation is an option when no water connection is available. The cooling water is then taken from and returned to a separate canister.

The function here is similar to water cooling without support air. However, a pump is required to circulate the water.

Ambient air cooling

Ambient air cooling is installed on all devices without cooling options, including VB series and DB series devices.

After the sterilisation phase has ended, the steam is released in a controlled fashion until the atmospheric conditions are reached. The speed of the steam release is controlled via [parameter 16](#) (ExShootOn) and [parameter 17](#) (ExShootOff) (see chapter 8, “Parameters”).

When a pressure of approx. 115 kPa has been reached, the chamber is cooled with ambient air via a fan installed at the bottom of the equipment frame. This will cause a vacuum in the sterilisation chamber (the vacuum breaker is not open during this process). When the unloading temperature has been reached, the sterilisation chamber is flushed with sterile, filtered air and the atmospheric conditions are established.

Spray cooling

After the sterilisation phase, the steam in the sterilisation chamber is replaced by compressed air.

The water introduced when the program is started and then sterilised with this option is pumped through a heat exchanger to be water-cooled and is then sprayed through nozzles onto the sterilised items.

Direct softwater spray cooling

After the sterilisation phase, the steam in the sterilisation chamber is replaced by compressed air.

The on-site demineralised water is sprayed onto the sterilised items through a booster pump and nozzles.

Closed cooling circuit

Water is fed in a closed circuit via the cooling coil and through a heat exchanger in order to cool the sterilisation chamber. Otherwise, the cooling is similar to cooling with and without support air.

3.7.2 Maintenance tasks

Filling the closed cooling circuit

After a repair to a closed cooling circuit, it must be refilled with unprocessed water after the fault has been fixed (see [chapter 2.4.1, "Testing the water quality"](#)).

The necessary pre-pressure in the system measures 1.5 bar (cold).

Have available	Water in a canister
----------------	---------------------

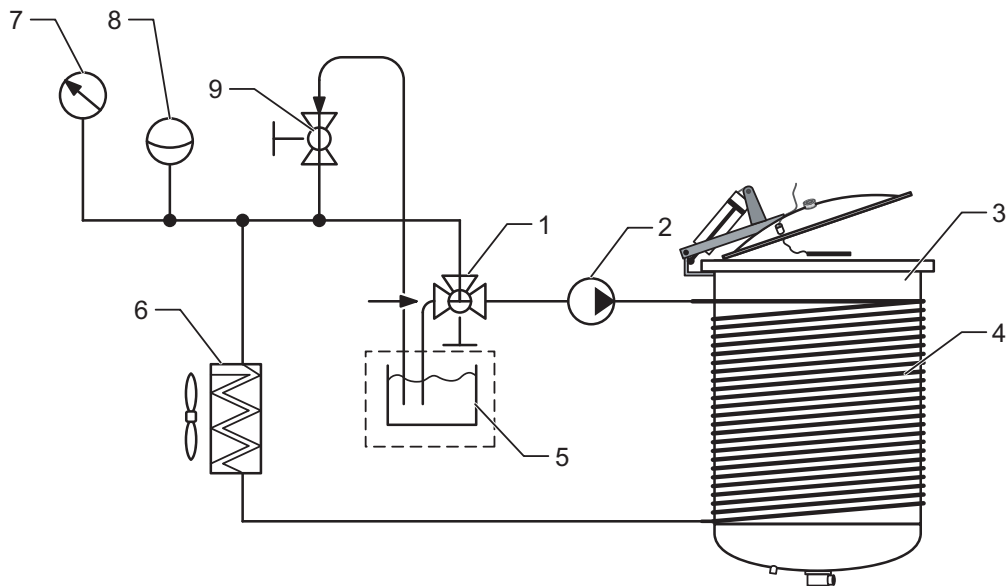


Fig. 31: Filling the closed cooling circuit

1	3-way ball valve (BV3)
2	Pump (M6)
3	Sterilisation chamber
4	Cooling coil
5	Canister with water
6	Cooling panel (HE)
7	Manometer (P3)
8	Surge tank (PV3)
9	2-way ball valve (BV2)

- Connect the free connections from the 3-way and 2-way ball valves (BV3 and BV2) with the canister using the appropriate hoses (i.e. immerse the loose hose ends in the water).
- Open the 3-way and 2-way ball valves and control the pump in the Service -> Manual output set -> CircPUMP menu until the system is filled.
- Stop the pump when gas formation is no longer visible. Close the valves and disconnect the hoses.
- Connect the 2-way ball valve to the water supply and slowly open the valve until the required system pressure is reached (approx. 1.5 bar when cold, see the manometer).
- Close the valve and remove the water hose.
- After some time, observe the manometer reading and check whether the pressure has fallen (this may indicate a leak).

Replacing the sterile air filter

Service interval	Annual maintenance
Necessary tools	17 mm spanner
Have available	Teflon tape or white adhesive for plastic threads (item no. 11920)

- Replace the sterile air filter and seal the new filter with Teflon tape or white adhesive.

Measuring the flow

(Only for water cooling with or without support air, [see chapter 3.7.1 oben.](#))

Have available	Flask marked in litres
----------------	------------------------

The water flow should measure approx. 2 litres/min. This measurement should only be made when the cooling coil is completely filled with water, which may take several minutes.

- In the `Service -> Manual output set` menu, activate the `WaterToCoil` output.
- Feed the hose from the drain into the flask.
- Determine the flow rate.

If the flow rate is less than 2 litres/min., then this may be caused by the following:

- Untreated water pressure on-site is too low.
- Pressure reducer (PR2) not working correctly.
- Scaling on the cooling coil.

Remedy:

- Check the untreated water pressure on-site and take remedial action, when necessary.
- Check the pressure according to the pressure reducer (PR2) and readjust or replace it, if necessary.
- After points 1 and 2 have been ruled out as the cause, the flow rate can be set to the correct value by readjusting the needle valve (N2).

The cooling coils can only be replaced at the factory!



If the needle valve has to be opened further, then this indicates scaling on the cooling coil. Descale the cooling coil (instead of opening the needle valve repeatedly) in order to avoid costly repairs at the factory.

- Suggest the installation of a water softener system to the operator, as this prevents scaling on the cooling coil.

The pressure reducer for the cooling water should be set to 1 bar +/- 0.2 bar.

On devices with vacuum pumps, the pressure reducer must not be set to a value greater than 1.2 bar!



This pressure is applied to the vacuum pump. If necessary, check the setting of the pressure reducer with a manometer and always control the flow of cooling water solely via the needle valve (N2).

3.8 Steam generation

There are two ways of generating steam:

1. Using the installed steam generator (on X devices)
2. Directly in the sterilisation chamber (on E and B devices)

3.8.1 Steam generator (X devices)

Position and function

The installed pressure generator provides steam when the device is switched on. The pressure in the steam generator can be read from the display on the control panel, for example, "G210" \triangleq 210 kPa (see operating manual, chapter 4, "Operation").

After the device is switched on, the level of demineralised water in the steam generator is detected using the electrodes. As long as the high electrode (E1) does not detect water, the water feed pump is switched on together with the demineralised water inlet valve (Y14).

The steam generator is filled with demineralised water, and the heating can be operated as soon as the low electrode (E2) detects water.

When the demineralised water level reaches the high electrode (E1), the water feed pump is switched off together with the demineralised water inlet valve (Y14).

The steam generator is now ready for operation.

Demineralised water inlet valve (Y14)

The demineralised water inlet valve (Y14) is switched in parallel to an optional water feed pump, and regulates the intake of demineralised water in the steam generator.

Valve does not close correctly

If the valve does not close correctly, then the full line pressure is present (with on-site demineralised water connection) and the steam generator is flooded.



As the pressure on the steam generator is regulated, the heating may not be switched on in some circumstances. If the line pressure exceeds the permitted excess operating pressure of the safety valve (SV1 – see Tab. 11: unterhalb) then demineralised water escapes from the device.

Electrodes

The low electrode (E2) protects the heating (H1) and the high electrode (E1) switches the water feed pump (M1). This regulates the level of water in the steam generator.

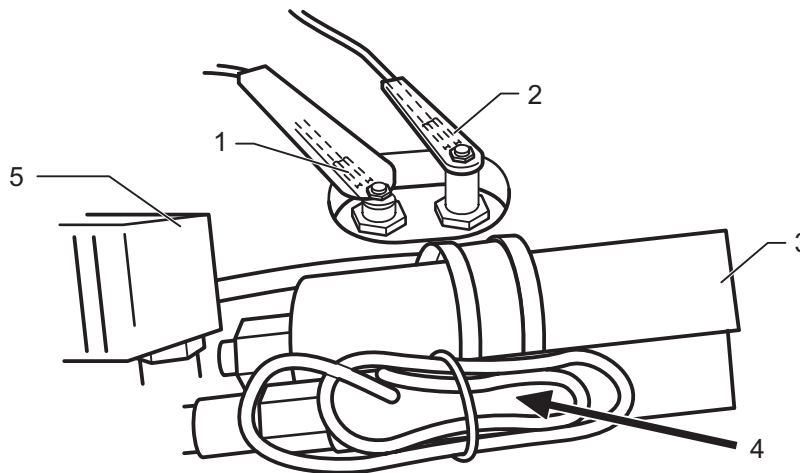


Fig. 32: Position of the high and low electrodes

1	Low electrode (E2)
2	High electrode (E1)
3	Water feed pump (M1)
4	Flow monitor (F1)
5	Demineralised water inlet valve (Y14)

Water feed pump

V-40 – 55		V-65 – 150		X	E	B
✓		✓		✓	✓	
D-23	D-45	D-65 – 200		X	E	B
✓	✓	✓		✓	✓	

The water feed pump (M1) is a vibration pump with impeller.

Flow monitor

V-40 – 55		V-65 – 150	X	E	B
✓		✓	✓	✓	
D-23	D-45	D-65 – 200	X	E	B
		✓	✓	✓	

The flow monitor (F1) monitors the water supply on the water feed pump (M1), and thus prevents the impeller from running dry. The flow monitor must detect a flow eight seconds after switching the water feed pump on, otherwise the pump switches off with the error message `No demin water`.

This process can only be repeated twice, after waiting 30 seconds each time!



In this way, the operator has the opportunity of opening a tap which may have been closed.

The pump can then only be restarted by switching the main switch on the device off and then back on again.

3.8.2 Steam generation in the sterilisation chamber (E and B devices)

Position and function

The heating elements in the sterilisation chamber are used for steam generation. The design of the elements can be found in the device-specific operating manual.

After the program is started, the demineralised water level in the sterilisation chamber is regulated for heating according to the `WaterTime` operating mode.

The sterilisation chamber is heated with a regulated pressure. The phase is switched to the sterilisation phase after the sterilisation temperature and pressure is reached at the end of the heating phase.

Electrodes

The low electrode (E2) protects the heating (H1) and the chamber electrode (E3) regulates the water level in the sterilisation chamber.

Setting the operating modes

The following operating modes can be set using [parameter 93](#) (WaterTime):

WaterTime = 0

The demineralised water is pumped into the sterilisation chamber via a water feed pump when the program is started and during the sterilisation phase (optional).

The demineralised water is drained out of the sterilisation chamber after the end of the program.

WaterTime = 1

The sterilisation chamber must be filled manually with demineralised water before the program is started.

The demineralised water is drained out of the sterilisation chamber after the end of the program.

WaterTime = 2

The sterilisation chamber must be filled manually with demineralised water before the program is started.

After the end of the program, the demineralised water remains in the sterilisation chamber when the end temperature ([parameter 5](#), EndTemp) measures ≤ 80 °C. Otherwise, the demineralised water is also drained out of the sterilisation chamber.

WaterTime > 2

This is the run-on time in seconds for the intake of demineralised water after the chamber electrode (E3) has detected water.

The demineralised water is drained out of the sterilisation chamber after the end of the program.

Water feed pump

V-40 – 55		V-65 – 150	X	E	B
✓		✓	✓	✓	
D-23	D-45	D-65 – 200	X	E	B
✓	✓	✓	✓	✓	

The water feed pump (M1) is a vibration pump (see [Fig. 32: oben, pos. 3](#)) with impeller.

Flow monitor

(only with installed water feed pump)

V-40 – 55		V-65 – 150	X	E	B
✓		✓	✓	✓	
D-23	D-45	D-65 – 200	X	E	B
		✓	✓	✓	

The flow monitor (F1) monitors the water supply on the water feed pump (M1), and thus prevents the impeller from running dry. The flow monitor must detect a flow eight seconds after switching the water feed pump on, otherwise the pump switches off with the error message `No demin water`.

This process can only be repeated twice, after waiting 30 seconds each time!



In this way, the operator has the opportunity of opening a tap which may have been closed.

The pump can then only be restarted by switching the main switch on the device off and then back on again.

3.8.3 Maintenance tasks (all devices)

- Check the heating flange for leaks and seal it, when necessary.

Checking the water level electrodes

- Check the water level electrodes E1, E2 and E3 for leaks:
 - Check the electrode seals during a test run. If condensation forms in the silicone hoses on the electrodes, then this indicates a leak.
- Check the conductivity of the water level electrodes (Menu -> Service -> Analog inputs -> ElectHigh, ElectLow, ElectChamb):
 - If the water level electrodes are **not** submerged, the value displayed must be 999.
If the value is lower, clean the electrodes with a soft cloth soaked in alcohol.
 - If the water level electrodes are submerged, the value displayed must be less than 714 (X series) or 850 (E and B series) – [parameter 75](#) (ElectrLeve).
If the value is higher, then the oxide layer must be removed or the electrodes must be replaced.

Height and length of the water level electrodes:

	Height of H electrode*	Height of L electrode*	Length	Height measurement
DX-23/45 VX-40/55	75 mm	65 mm	100 mm	From top edge of water level electrode to top edge of steam generator
DX-65 – 200 VX-65 – 150	65 mm	45 mm	145 mm	
DE/DB-23	32 mm	25 mm	100 mm	From top edge of water level electrode to top edge of sterilisation chamber
DE/DB-45	40 mm	35 mm	100 mm	
DE/DB-65/90/150	48 mm	38 mm	100 mm	
VE/VB-45/55	35 mm	30 mm	100 mm	
VE/VB-65 – 200	47 mm	37 mm	100 mm	

Tab. 10: Height and length of the water level electrodes

Checking the water feed pump (M1)

- Check that the impeller works correctly, and for unusual noises and correct conveying.

The impeller is available as a separate spare part.

- Check the pump capacity (only for external water supply):

If the external water supply comes from a water container (e.g. a canister), then the pump may suck in air.

Pay attention to the level of water in the container!



Ensure that the container is always filled with enough water.

When the water feed pump (M1) has sucked in air, then water is no longer conveyed: The pump switches off as the flow monitor no longer registers any water flow. The `NoDemInWater` error message appears.

Air extraction:

- Unclip the hose between the water feed pump (M1) and no-return valve (R1) at the no-return valve, then feed it into a container.
- Switch the equipment on at the main switch.
- Let the air bleed out of the water feed pump until water flows.
- Switch off the device and reattach the hose.

Checking the functionality of the flow monitor

V-40 – 55		V-65 – 150	X	E	B
✓		✓	✓	✓	
D-23	D-45	D-65 – 200	X	E	B
		✓	✓	✓	

- Check `GenFlowSw`: Whilst the steam generator is being filled by the water feed pump, you can check `GenFlowSw` to see that it switches on and off in the `Service -> Digital inputs` menu.

Replacing the heating element

Necessary tools	<p>All X series devices:</p> <ul style="list-style-type: none"> – Small steam generator: 42 mm spanner, Teflon tape – Large steam generator: 8 mm spanner – Water pump pliers, when needed <ul style="list-style-type: none"> – DE/DB-23: 19 mm spanner – DE/DB ≥ 40: 30 mm spanner – VE/VB: 19 mm spanner
Have available	<ul style="list-style-type: none"> – New heating element – White adhesive (item no. 11920)

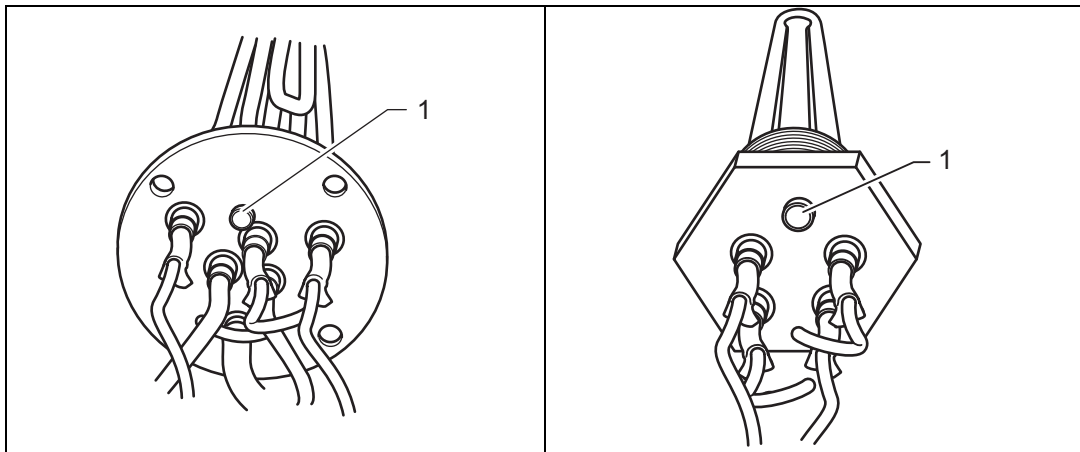


Fig. 33: Steam generator: Large and small heating element with immersion sleeve for safety temperature limiter

1	Immersion sleeve for safety temperature limiter
---	---

- Drain the water.
- Pull out the mains plug.
- Move the device into a fully-serviceable position (remove hoses if necessary or remove the steam generator – depending on the device type).
- Disconnect the electrical connections.
- Remove the sensor element on the safety temperature limiter.
- Remove the heating element.
- Replace the seals.

Position of immersion sleeve on X devices



On X devices, ensure that the immersion sleeve (1) is always positioned at the top.

- Insert the new heating element.

- Connect the sensor element of the safety temperature limiter with the heating element.
- Reconnect the electrical connections.
- Measure the current during a test run in order to check the power consumption of the heating.

Checking the functionality of the safety temperature limiter

The switching point is approx. 170 °C. It is not necessary to measure the temperature.

- Pull out the safety temperature limiter and heat it to ensure that it triggers (e.g. with a hot air gun).

Manual emptying of the steam generator

- Switch off the device.
- Open the manual drain tap (BV1) with a maximum pressure of 120 kPa in the steam generator.
- When the steam generator has cooled down and is depressurised, disconnect the hose connections to the pressure transducer (PS1).
- After emptying: Close the drain tap again and reattach the hose connection to the pressure transducer.

3.9 Safety valves

3.9.1 Position and function

Both the steam generator (X series only) and the sterilisation chamber are protected from overloading by safety valves.

Model	Safety valve on sterilisation chamber	Pmax	Steam generator safety valve (X series only)
V-40/V-55	3 bar	400 kPa	3 bar
V-65 – V-150	4 bar	500 kPa	5 bar
D-23	2.7 bar	370 kPa	2.7 bar
D-45	3 bar	400 kPa	3 bar
D-65 – D-200	4 bar	500 kPa	5 bar

Tab. 11: Position and permissible excess operating pressure for the safety valves

3.9.2 Maintenance tasks

Testing the safety valve on the steam generator (X series only)

- Connect the PC.
- Open the Systec service software (see chapter 6, “Systec service software”).
- Call up the window for setting outputs via “I/O”.
- Click on `Go` to manual mode.
- Activate the `WaterPump` output.

The steam generator is now flooded.

- Check the steam generator pressure in the control panel display:

The safety valve must open when P_{\max} is exceeded.

Testing the safety valve on the sterilisation chamber

The functionality of the safety valve must be safeguarded with external aids.

The safety valve must open when P_{\max} is exceeded.

Alternative procedure for devices with steam generators:

- Unscrew the safety valve on the sterilisation chamber and replace it with the safety valve on the steam generator.
- Follow the same procedure as used to check the safety valve of the steam generator (see “Testing the safety valve on the steam generator (X series only)”). Now observe the P_{\max} of the sterilisation chamber.
- After the test, move the safety valves back to their original position.

Alternative procedure (only for devices with support air supply):
Prerequisite: The compressed air supply is able to generate the necessary pressure.

- Attach an external manometer to the sterilisation chamber as a reference.
- Bridge the pressure reducer for the compressed air.
- Activate the output in the `Service -> Manual output set` menu to allow compressed air to flow.
- Check the reference pressure display:

The safety valve must open when P_{\max} is exceeded.

3.10 Internal compressed air system (not on D-23)

3.10.1 Position and function of the air compressor (M3)

The air compressor generates a supply of compressed air at about 7 bar in the compressed air reservoir (PV1). If the pressure falls below approx. 6 bar, the compressor starts in order to refill the reservoir.

The air compressor supports the following functions:

- Door lock controller
- Blowing out the cooling coil (optional)
- Pilot valve controller (optional)
- Condensate drainage (Drain condense) from the sterilisation chamber (DX and DE series only)

Compressor does not start!



If the compressor only starts at 1.5 – 2 bar and is very hot, then the no-return valve R6 must be checked.

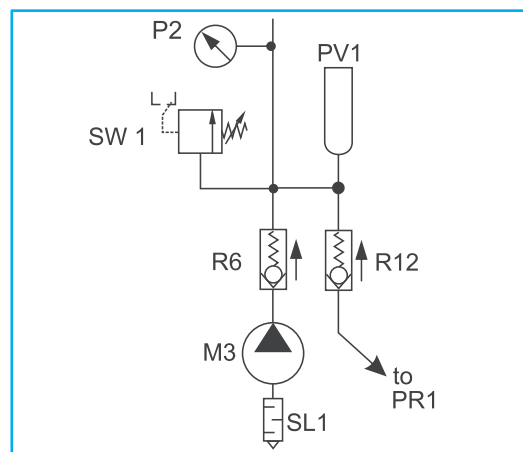
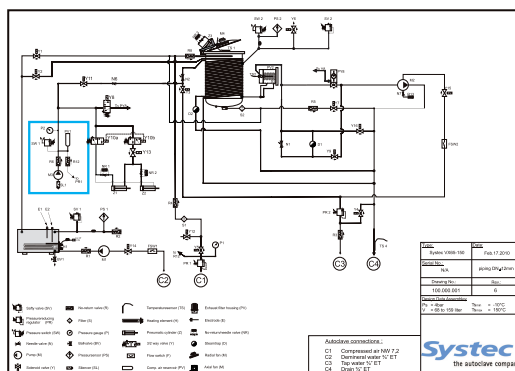


Fig. 34: Position of the air compressor

SL1	Silencer for air compressor
M3	Air compressor
R6	No-return valve for air compressor
Sw1	Pressure switch (7 bar)
P2	Manometer for internal compressed air
PV1	Compressed air reservoir
R12	No-return valve for external compressed air
PR1	Pressure reducer for external compressed air

3.10.2 Pneumatic assembly

Position and function

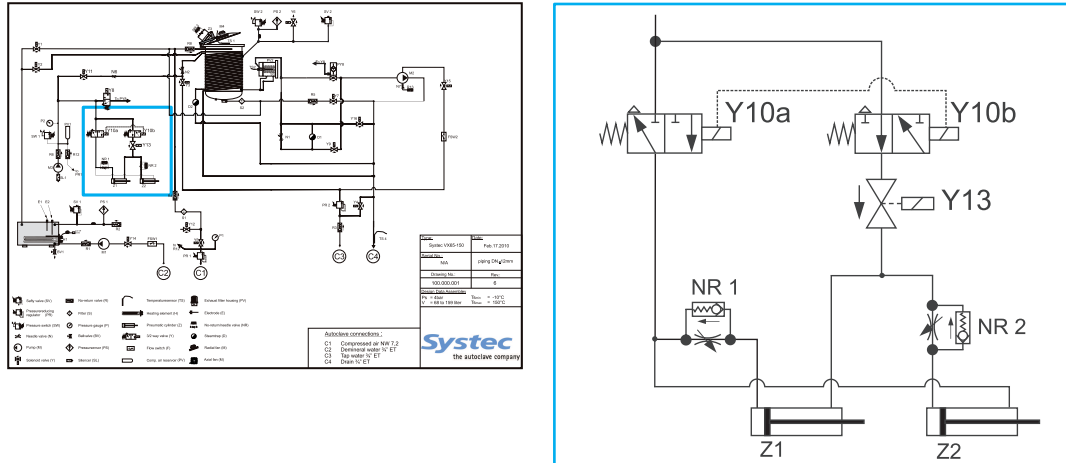


Fig. 35: Pneumatic assembly: Position on pipe connection diagram

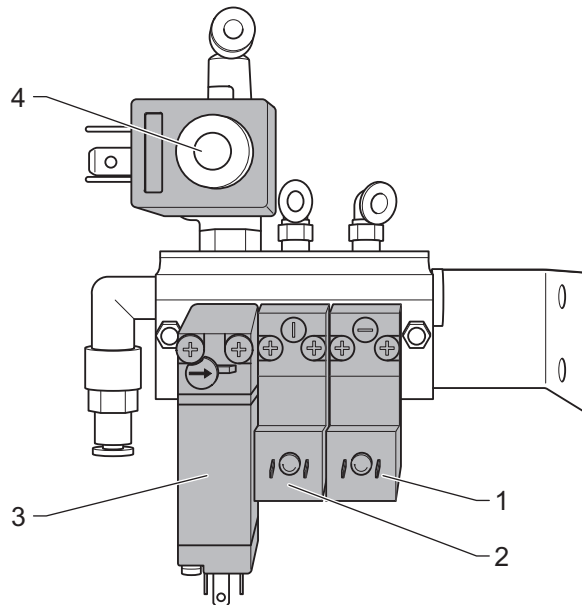


Fig. 36: Pneumatic assembly

1	Y11/Y8	Blow out cooling coil solenoid valve / vacuum pilot valve
2	Y10a	Solenoid valve on door lock
3	Y10b	Solenoid valve on door lock
4	Y13	Solenoid valve on door lock (230 V)

The Y10 (locking ring), Y11/Y8 (blow out cooling coil/vacuum pilot valve) and Y13 (locking ring) connections are combined in the pneumatic assembly.

The connections Y10a (normally closed) and Y10b (normally open) are controlled in parallel, but open and close in the opposing sense. This

results in the opposing movements of the scissor mechanism and the locking shoe (see “Scissor mechanism”).

3.10.3 Maintenance tasks

Checking the pressure

Check that the pressure is set to 7 bar \pm 1.

3.10.4 Checking the compressed air system for leaks

Compressor does not start!



If the compressor only starts at 1.5 – 2 bar and is very hot, then the no-return valve R6 must be checked.

If the compressor starts running more frequently than every 5 minutes after the pressure has been built up, check the compressed air system for leaks in the following order:

Checking for leaks on the pneumatic assembly

Necessary tools	Adapter for shutting off the compressed air connections Sample adapter:
Have available	4 mm Teflon hose (Systemec item no. 10977) T-connector (Systemec item no. 11010) Leak detection spray (Systemec item no. 11922)

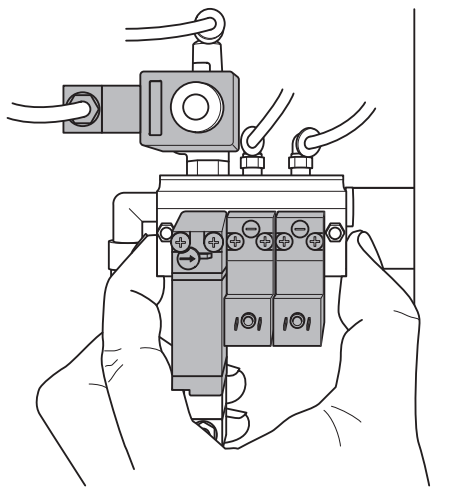
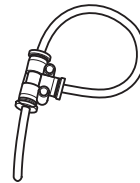


Fig. 37: Closing the release openings

Leak test

- Close the release openings of the pneumatic assembly by hand and check if pressure accumulates there.

If no pressure accumulates, the following components do not have any leaks:

- Pneumatic assembly
- Pneumatic cylinder of the door lock

If pressure accumulates:

Test 1: Testing the pneumatic cylinder on the door

a: With the door open:

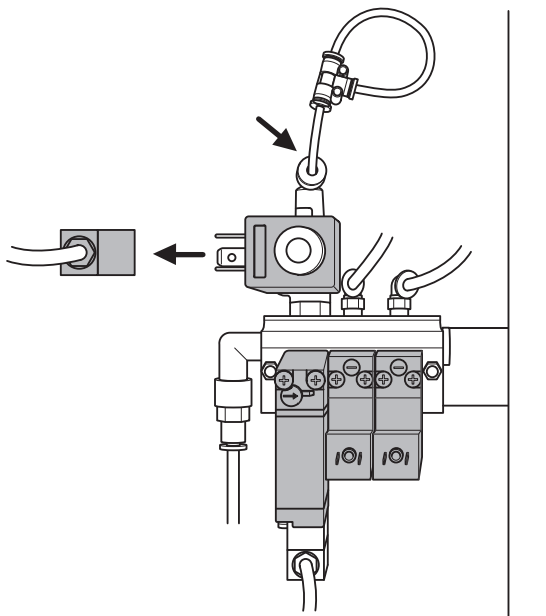


Fig. 38: Stopping the air supply behind Y13

- Stop the air supply behind the solenoid valve (Y13) as shown in Fig. 38:, or pull out the electric plug.
- Perform the leak test again.

b: With the door closed:

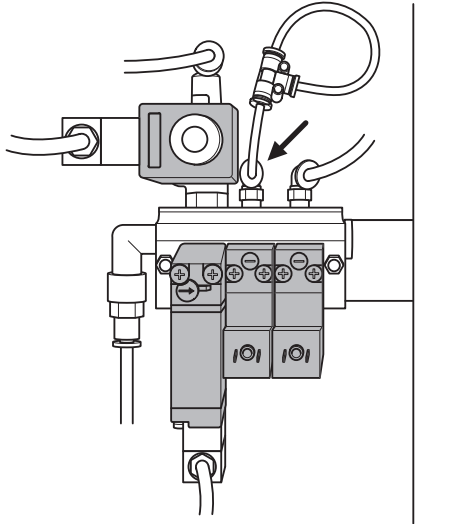


Fig. 39: Stopping the air supply behind Y10b

- Stop the air supply behind the solenoid valve (Y10b), as shown in Fig. 39:.
- Perform the leak test again.

If pressure accumulates in one of these two cases, then at least one cylinder of the door lock is leaking.

Devices \geq V/D-65:

- Replace the scissor mechanism.
- Perform the leak test again.

Devices V/D-40 – 55:

- Replace the locking cylinder.
- Perform the leak test again.

If pressure accumulates in both cases, one of the three valves (Y10a, Y10b, Y11/Y8) is leaking.

- Change each solenoid valve in succession, and perform the leak test again after each replacement.

Test 2: Testing solenoid valve Y11/Y8

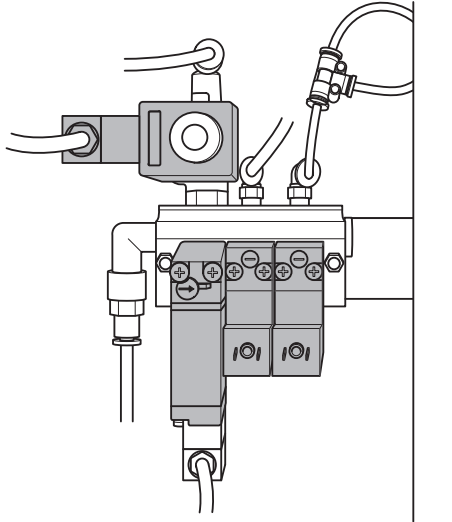


Fig. 40: Stopping the air supply behind Y11/Y8

- Shut off the compressed air supply on the pneumatic assembly, as shown in Fig. 40:.

If pressure does not accumulate at this point, then the pilot valve is leaking:

- Replace the Y11/Y8 solenoid valve.

If pressure accumulates in all three cases, one of the three valves (Y10a, Y10b, Y11/Y8) is leaking.

- Change each solenoid valve in succession, and perform the leak test again after each replacement.

Checking for leaks on the no-return valve (R6, R12)

- Disconnect the compressed air hose from the no-return valve.
- Check whether air escapes from the no-return valve.

If air escapes:

- Replace the no-return valve.

Checking the remaining components of the compressed air system

- Test all other components on the compressed air system for leaks using leak detection spray.
- Eliminate any leaks that you find.

3.11 Vacuum unit (optional)

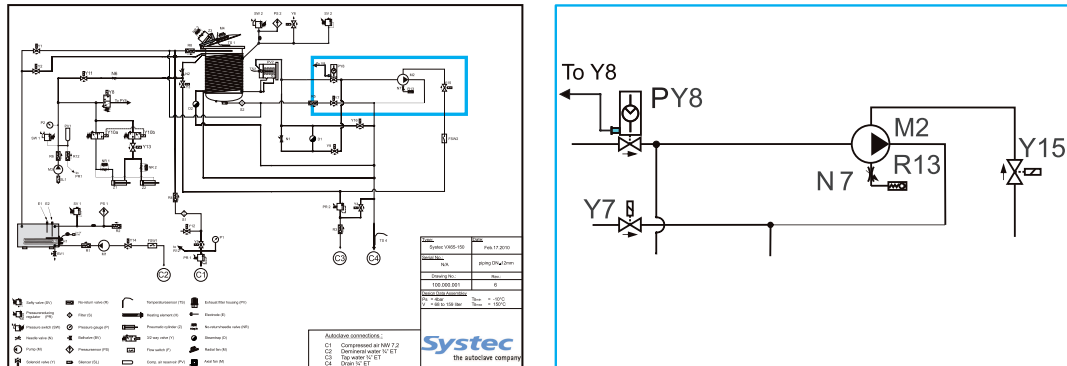


Fig. 41: Position of the vacuum unit

M2	Vacuum pump
R13	No-return valve for cavitation protection
N7	Needle valve for cavitation protection
Y7	Drain valve
Y8	Vacuum pilot valve
Y15	Pump water valve for vacuum pump
PY8	Vacuum valve

3.11.1 Position and function

A pre-vacuum is created before the heating phase starts, which evacuates air from the items to be sterilised. This ensures that steam completely penetrates any cavities, and prevents the formation of air pockets. A triple pre-vacuum is set as standard.

Once the atmospheric conditions have been reached after the sterilisation phase is complete, a post-vacuum is generated to dry the sterilised items. The build-up of odours during the sterilisation of waste is also minimised.

Sample parameterisation:

Code for access level 3, parameter 4 (“Pulses”):

- No pre-vacuum = 0
- Triple pre-vacuum = 3

3.11.2 Maintenance tasks

Checking the flow monitor

Check the flow monitor as detailed in [chapter “3.8.3 Flow monitor”](#).

Checking water usage

Water volume:

- *Speck* pumps: 0.6 – 0.8 litres/min. at a pressure < 50 kPa
- Other pump manufacturers, e.g. *Nash Elmo*, *Gardener Denver*: 0.8 – 1.2 litres/min. at a pressure < 50 kPa

Current consumption:

- Devices ≥ 65 l: Approx. 1.8 – 2.9 A (depending on manufacturer)
- Devices up to 55 l: Approx. 1 A

The water volume is checked as follows:

- In the `Service -> Manual output set` menu, activate the vacuum pump and leave the vacuum valve closed.
- Measure the water volume.

Checking the cavitation protection

The cavitation protection ensures that the water is not heated to boiling point if the pressure of the cooling water falls.

Cavitation



Listen for noises – a loud screeching noise is emitted in the event of a malfunction. Brief cavitation at the start of the drying phase is normal.

Possible causes of errors:

- Faulty no-return valve
- Faulty needle valve
- Pump is scaled up

Descaling the pump

Necessary tools	5 mm Allen key 8 mm spanner
Have available	Scale remover (e.g. Systec autoclave cleaner) Dirt trap (sieve or filter)

Proceed as follows to identify scaling of the pump:

- Remove the pump cover – remove the four screws and remove the cover from the pump housing.
- Open the pump head and check if any scale deposits are visible.

- Reattach the pump cover.

Attaching the pump cover:



Ensure that the O-ring is seated properly in the groove.

Proceed as follows to remove scaling:

- Prepare a container with a scale remover solution (scale remover and warm water at approx. 50 °C).
- Dip the two hoses into the solution and connect to the pump inlet and outlet.
- Fix the dirt trap (sieve or filter) to the hose end used for solution intake.
- Let the pump run for about 30 minutes.
- Repeat the process several times.

Testing the sterilisation chamber for leaks – vacuum test

Have available	Leak detection spray (Systec item no. 11922)
----------------	--

Vacuum test



Only carry out a vacuum test when the sterilisation chamber is cold.

During the vacuum test program, you can check PumpFlowSw to see that it switches on and off in the `Service -> Digital inputs` menu.

A leak test is made as follows:

1. Either use program 13 ("Vacuum test"), or
2. Carry out a vacuum test on the sterilisation chamber as follows:
 - Evacuate the sterilisation chamber.
 - Close all valves.
 - Check the pressure.

If the pressure is constant, the autoclave has passed the vacuum test.

If the pressure is not constant, there is a leak. Common sources of leaks are as follows:

- Temperature sensor in the sterilisation chamber (TS1)
- Sterile air filter
- Slanted filter

Search for the leak as follows:

- Admit cold compressed air into the sterilisation chamber, for example via the validation port or the support air connection, when available (use the `"CompAirChamb"` output in the `Service -> "Manual output set"` menu).

- Using leak detection spray, check all ports and other areas of the equipment which come into question for leaks.
- Block off individual ports to rule out certain assemblies and localise the area of the problem.

3.12 Super Dry (optional)

3.12.1 Position and function

This is used to efficiently dry solid objects, hollow objects and porous sterilised goods such as filters or textiles. Steam is applied to the heating coil in the sterilisation chamber using the steam generator, which then heats up the condensation. This has a drying effect. If a vacuum unit is fitted, this can support the drying process through vacuum deep-drying.

3.13 “HoldTemp” function (optional)

This function is used for maintaining the temperature in the sterilisation chamber after the end of the program. The hold temperature can be set using parameter 18 (HoldTemp).

On **X devices**, the temperature is maintained by the heating coil. On **E devices**, the residual demineralised water is heated.

In order to activate the function, **parameter 19** (HoldTime) must be set as follows:

- 0 = Function inactive
- 1 = Unlimited time
- 2 = Hold function via steam valve, max. 24 hours (**X devices only**)
- >2 = Time in minutes

Special feature on X devices:



On X devices, the temperature can be maintained via a steam inlet (max. 24 hours). The product will become wet in this case.

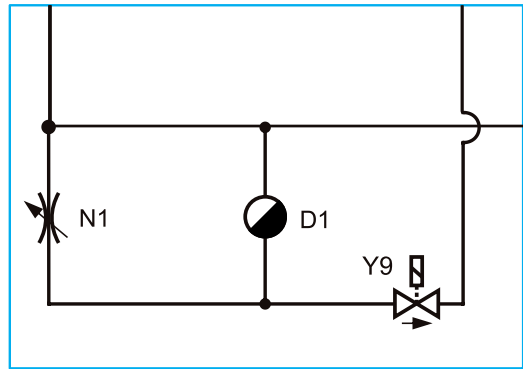
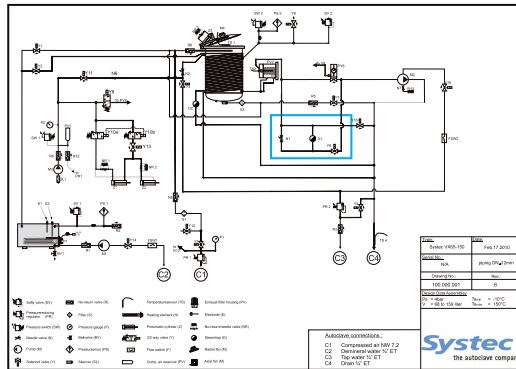
3.13.1 Maintenance tasks

Checking the functionality of the heating coil

The heating coil is maintenance-free – only the correct working of the valve is checked, including the steam air extractor.

3.14 Air extraction (all devices)

3.14.1 Position and function



Air extraction is made through the steam air extractor (D1) on the sterilisation chamber, the air extractor valve (Y9) and the needle valve (N1, when necessary).

When the steam in the sterilisation chamber is saturated, the steam air extractor closes. The air now flows out easily via the needle valve to allow any residual air pockets to escape.

Position of the needle valve (N1):



The needle valve is opened by $\frac{1}{4}$ to $\frac{1}{3}$ of a turn.

3.14.2 Maintenance tasks

The steam air extractor is maintenance-free.

Steam air extractor



If the steam air extractor does not close, then the capsule may not be properly centred (e.g. due to transport). The capsule can be realigned in the central position by gently tapping the steam air extractor (e.g. using a screwdriver).

3.15 Drain cooling (X and E series)

3.15.1 Position and function

The temperature sensor (TS4) in the autoclave drain monitors the temperature of the waste water or the escaping steam.

If the measured drain temperature exceeds the set temperature in [parameter 52](#) (DrnCoolTemp), then cooling water is mixed with the drain through the valve (Y4).

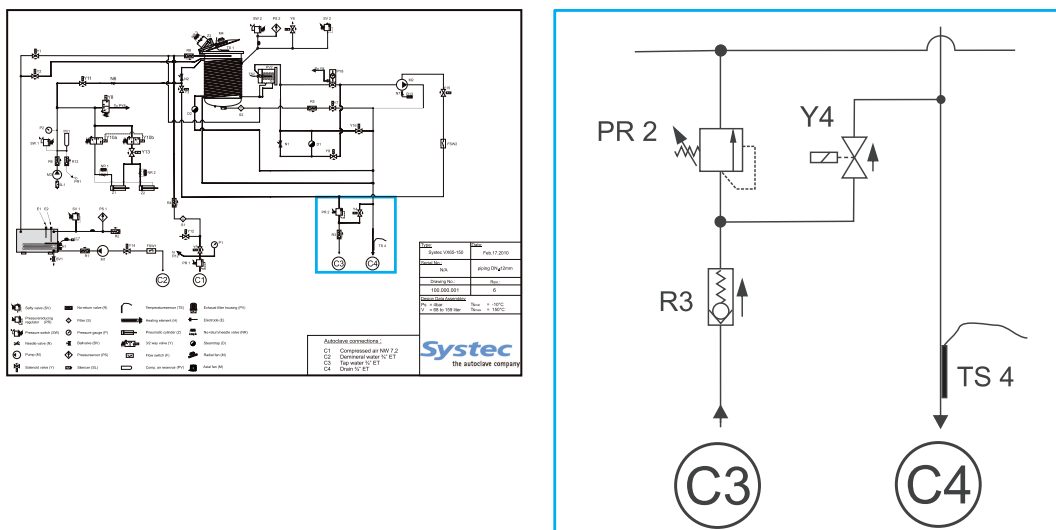


Fig. 42: Drain cooling: Position on pipe connection diagram

Y4	Drain cooling valve (solenoid valve)
TS 4	Drain temperature sensor
R 3	No-return valve for cooling water
PR2	Pressure reducer for cooling water
C3	Cooling water
C4	Waste water

3.15.2 Maintenance tasks

Check that the drain cooling is working properly to avoid damages to the customer's drain pipes:

- Connect the PT-100 simulator to the E-Box instead of the temperature sensor (TS4).
- Use the simulator to switch above and below the switching point for the cooling water mixture (default = 70 °C, see [parameter 52](#) (DrnCoolTemp)).
- Test the function of the drain cooling valve (Y4).
- Check the temperature sensor (TS4).

3.16 Exhaust filter (optional)

This system is required when sterilising infectious material.

Make sure the exhaust filter cartridges used are sterile!



We recommend replacing the exhaust filter cartridges after approx. 150 cycles.

After they are replaced, used exhaust filter cartridges must be sterilised separately.

3.16.1 Position and function

Air leaving the autoclave during the heating and sterilisation phases is passed through an exhaust filter cartridge and thus filtered. The exhaust filter cartridge is also sterilised during the sterilisation phase.

The exhaust filter cartridge is located in a filter housing at the front left of the device and is sealed by a white plastic cover (**not on D-23**).

D-23: The exhaust filter cartridge is screwed into the rear of the sterilisation chamber.

In this ventilation system, the flow sensor (TS2) is found in the filter housing, not on the floor vent.

3.16.2 Maintenance tasks

Checking the counter value

- Go to Service -> Systeminfo -> Filter.

If it is necessary to reset the counter value to zero, then consult the Systemec service software ([chapter 6.2.9, "System"](#)).

Replacing the exhaust filter cartridge

The exhaust filter cartridge should be replaced after approx. 150 sterilisation cycles.

The `Repl. Filter` message appears in the display at the appropriate time.

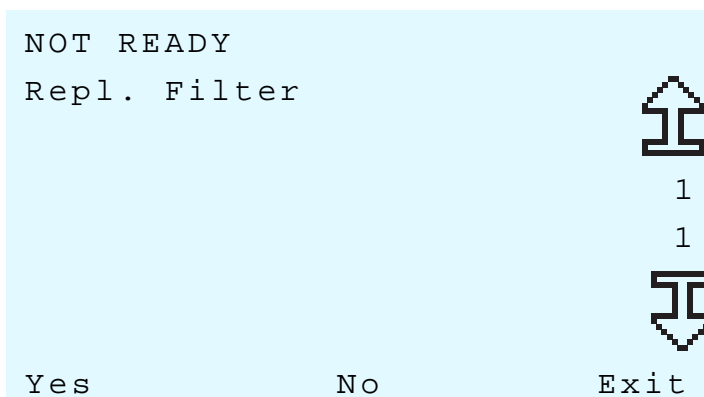


Fig. 43: Filter replacement message

- Press the `No` button. The selected program starts and the cycle counter continues counting. The message `Repl. Filter` now appears every time a cycle is started.
- Press the `Yes` button: The exhaust filter cartridge is replaced as described below. The cycle counter is reset to 0. Confirm the filter change by entering the code for access level 1.

Replacement (not on D-23)

The exhaust filter cartridge is located in a filter housing at the front left and is sealed by a white plastic cover.

Safety measures during replacement



Wear protective clothing and dispose of the exhaust filter cartridge in accordance with the applicable on-site health and safety regulations.

- To replace the filter cartridge, unscrew the three screws on the cover and remove it.
- Remove the filter cartridge from the housing using the tool (pliers) supplied and insert the new filter cartridge.
- Screw the cover back on.

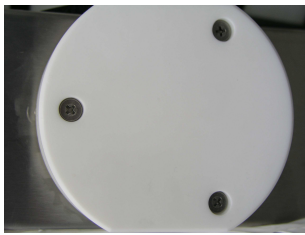


Fig. 44: Filter replacement: Unscrewing the screws

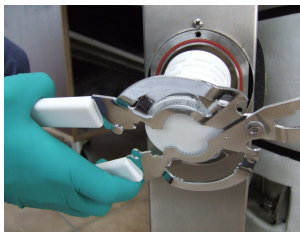


Fig. 45: Filter replacement: Removing the exhaust filter cartridge

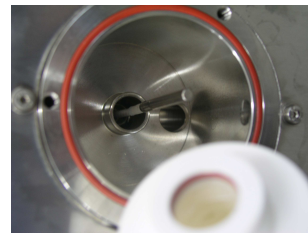


Fig. 46: Filter replacement: Inserting the new filter cartridge

Replacement on D-23

- Unscrew the exhaust filter cartridge located in the sterilisation chamber and attach the new cartridge.

3.17 Lift

V-40 – 55	V-65 – 150	X	E	B
	✓	✓	✓	✓

3.17.1 Position and function

The electromotive lift with swivel arm eases the loading and unloading of the autoclave. The lifting column is fixed to the side of the autoclave.

3.17.2 Maintenance tasks

- Check that the components are seated properly and firmly.
- Carry out a function test.

4 ELECTRICAL ASSEMBLIES

Aim of this chapter

This chapter introduces you to the function and position of the electrical assemblies.

Contents

4.1	Overview – Electrical assemblies V/D-40 – 200	3
4.1.1	Electronics box on V-40 – 55/D-45 devices.....	3
4.1.2	Electronics box on V/D 65 – 200 devices	5
4.1.3	Analogue circuit board AS1002	7
4.1.4	Extension board AES1002 (optional)	8
4.1.5	Digital circuit board DS1002	9
4.1.6	Motor control board for radial fan	10
4.1.7	230 V circuit board ACT1.....	12
4.1.8	SD card circuit board	13
4.1.9	Voltage stabiliser for the LM1085 analogue circuit board	14
4.1.10	Power transistor VNP5N07 8 (V/D – 65 only).....	14
4.1.11	Toroidal transformer	15
4.1.12	Power supply	15
4.1.13	Solid state relay (SSR)	16
4.1.14	Heater contactor	16
4.1.15	Fuses	17
4.2	Overview – Electrical assemblies on D-23.....	18
4.2.1	Electronics box	18
4.2.2	Analogue circuit board	20
4.2.3	Digital circuit board	21
4.2.4	Power supply circuit board.....	22
4.2.5	Relay board for motor control	23
4.2.6	Motor control board for radial fan	23
4.2.7	Fuses on the back of the device	23
4.2.8	SD card circuit board	24
4.2.9	Toroidal transformer	24
4.3	Control unit Pan1002	24
4.3.1	V/D-40 – 200.....	24

4.3.2	D-23	24
4.4	Replacing or upgrading the printer.....	25

Diagrams

Fig. 1:	Front of the E-Box V/D-40 – 55.....	3
Fig. 2:	Underside of the E-Box V-40 – 55, D-45.....	4
Fig. 3:	Front of the E-Box (V/D 65 I – 200 I)	5
Fig. 4:	Underside of the E-Box (V/D 65 I – 200 I)	6
Fig. 5:	Top of the analogue circuit board AS1002.....	7
Fig. 6:	Underside of the analogue circuit board AS1002.....	7
Fig. 7:	AES1002 extension board	8
Fig. 8:	Digital circuit board DS1002	9
Fig. 9:	Motor control board for radial fan	10
Fig. 10:	Special circuit board for motor control on the radial fan (D-23).....	11
Fig. 11:	ACT1 circuit board, top and underside.....	12
Fig. 12:	SD card circuit board	13
Fig. 13:	Analogue circuit board LM1085: Position in the circuit diagram.....	14
Fig. 14:	Power transistors VNP5N07: Position in the circuit diagram... ..	14
Fig. 15:	Power supply	15
Fig. 16:	Solid state relay: Position in the circuit diagram.....	16
Fig. 17:	Fuse block: Position in the circuit diagram.....	17
Fig. 18:	Front of the E-Box (D-23).....	18
Fig. 19:	Underside of the E-Box (D-23).....	19
Fig. 20:	Analogue circuit board on the D-23.....	20
Fig. 21:	Digital circuit board on the D-23.....	21
Fig. 22:	Power supply circuit board on the D-23	22
Fig. 23:	Relay board for motor control on the D-23.....	23
Fig. 24:	Fuse block: Position in the circuit diagram.....	23
Fig. 25:	Opening the cover.....	25
Fig. 26:	Loosening the screws	25
Fig. 27:	Connecting the printer to the E-Box.....	26

Observe the electrical safety regulations when performing maintenance work on the electrical system!



Remove the power to the equipment
 Earth and short-circuit
 Cover or isolate adjacent or live components
 Isolate the equipment
 Secure the equipment against accidental restart

4.1 Overview – Electrical assemblies V/D-40 – 200

4.1.1 Electronics box on V-40 – 55/D-45 devices

- The electronics box (E-Box) contains most of the electrical assemblies. It is located on the rear of the device behind the service door.

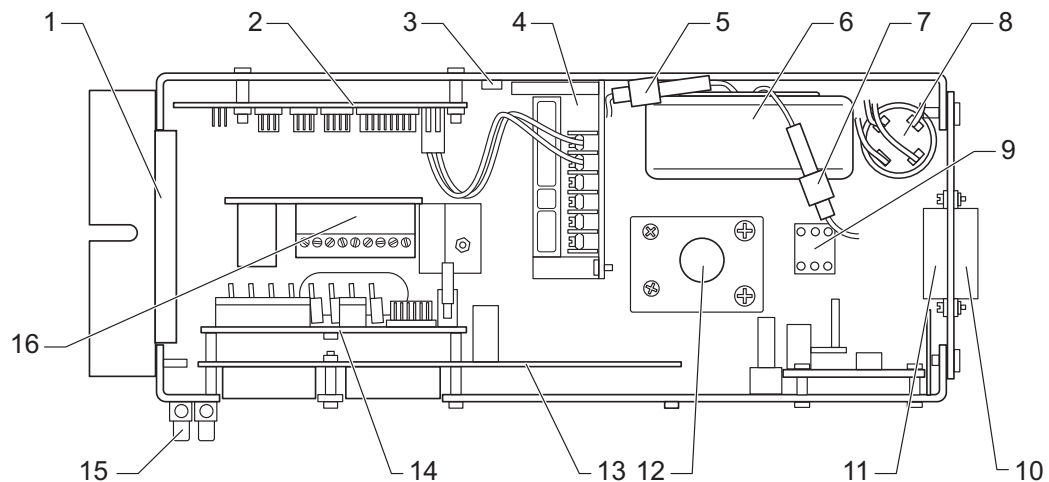


Fig. 1: Front of the E-Box V/D-40 – 55

1	Fan
2	Digital circuit board DS1002 (see chapter 4.1.5 unterhalb)
3	5 V fixed voltage controller, LM1085 (see chapter 4.1.9 unterhalb)
4	Power supply RD35A (see chapter 4.1.12 unterhalb)
5	800 mA primary fuse for toroidal transformer (F5, 4 x 20 mm)
6	Toroidal transformer (see chapter 4.1.11 unterhalb)
7	5 A secondary fuse for toroidal transformer (F6, 4 x 20 mm)
8	Anti-interference capacitor (main filter)
9	Neutral terminal (N)
10	Solid state relay for top exhaust valve (Y16)
11	Solid state relay for air compressor
12	Solid state relay for heater (5 V DC)
13	Analogue circuit board AS1002 (see chapter 4.1.3 unterhalb)
14	Extension board (see chapter 4.1.4 unterhalb)
15	12 V DC terminal strip
16	Motor control board for radial fan (see chapter 4.1.6 unterhalb)

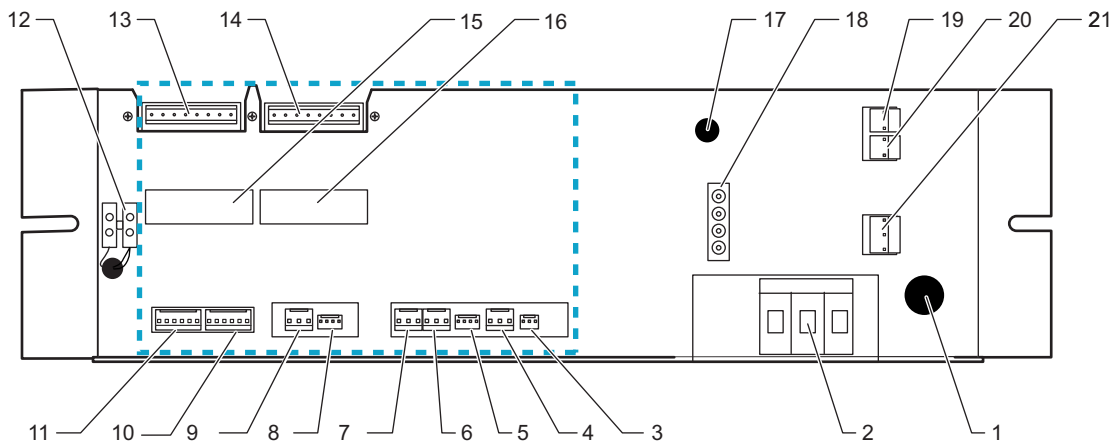


Fig. 2: Underside of the E-Box V-40 – 55, D-45

1		10 A control fuse (F4)
2		Neutral terminal (N)
		Connections on analogue circuit board AS1002 (see chapter Fig. 6: unterhalb)
3	JP14	Electrodes (E1 – E3)
4	JP6	Drain temperature sensor (TS4, drain temp)
5	JP4	Pressure transducer on steam generator (PS1, gen press)
6	JP5	Temperature sensor 2 on sterilisation chamber (TS3, chamber temp 2)
7	JP3	Flow sensor (TS2, condense temp)
8	JP1	Pressure transducer on sterilisation chamber (PS2, chamber press)
9	JP2	Temperature sensor 1 on sterilisation chamber (TS1, chamber temp)
10	JP11	Digital inputs
11	JP10	Digital inputs
12		12 V DC terminal strip
13	JP9	Digital outputs
14	JP7	Digital outputs
15	JP16	Test points
16	JP17	Test points
17		Radial fan circuit-breaker (F11)
18		AC-1 connector
19	JP7	AC_T1, 230 V output for water feed pump
20	JP4	AC_T1, 230 V output for vacuum pump (M2)
21	JP3	AC_T1, 230 V AC input

4.1.2 Electronics box on V/D 65 – 200 devices

- The E-Box contains most of the electrical assemblies. It is located on the rear of the device behind the service door.

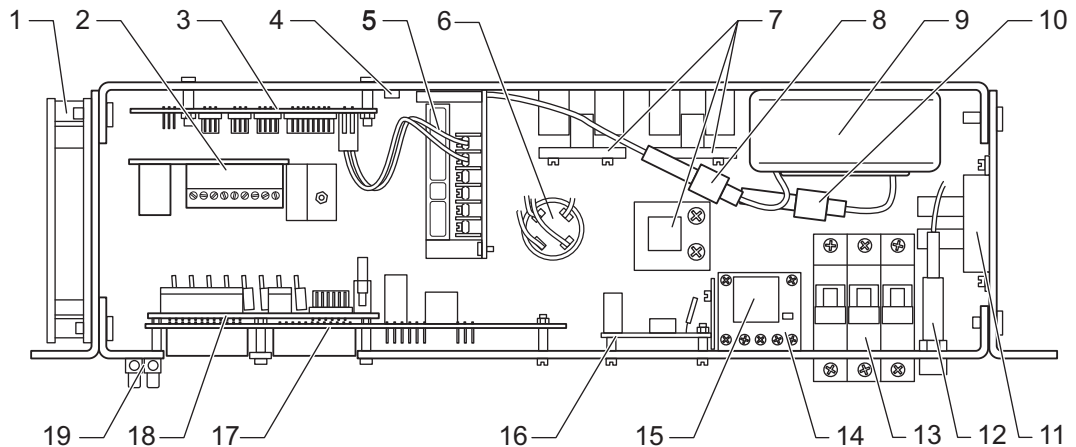


Fig. 3: Front of the E-Box (V/D 65 I – 200 I)

1	Fan
2	Motor control board for radial fan (see chapter 4.1.6 unterhalb)
3	Digital circuit board DS1002 (see chapter 4.1.5 unterhalb)
4	5 V fixed voltage controller, LM1085 (see chapter 4.1.9 unterhalb)
5	Power supply RD35A (see chapter 4.1.12 unterhalb)
6	Anti-interference capacitor (main filter)
7	Solid state relay for heater (SSR 1 – 3)
8	5 A secondary fuse for toroidal transformer (F6, 4 x 20 mm)
9	Toroidal transformer (see chapter 4.1.11 unterhalb)
10	800 mA primary fuse for toroidal transformer (F5, 4 x 20 mm)
11	Solid state relay for top exhaust valve (Y16)
12	10 A control fuse (F4)
13	Circuit breaker (F1 – F3)
14	Heater contactor (K1) (see chapter 4.1.14 unterhalb)
15	Noise filter for K1
16	AC-T1 board (see chapter 4.1.7 unterhalb)
17	Analogue circuit board AS1002 (see chapter 4.1.3 unterhalb)
18	Extension board (see chapter 4.1.4 unterhalb)
19	Terminal strip

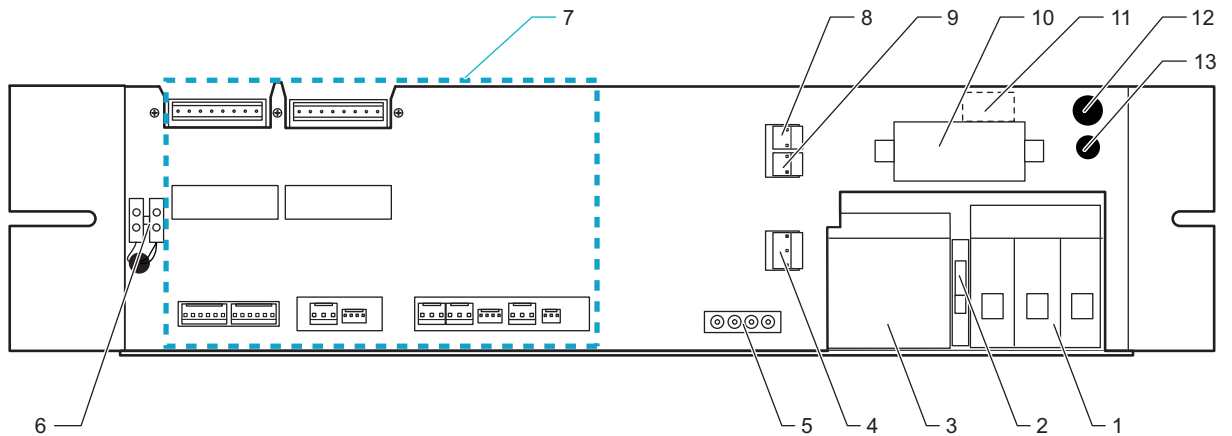



Fig. 4: Underside of the E-Box (V/D 65 I – 200 I)

1		Circuit breaker (F1 – F3)
2		Neutral terminal (N)
3		Heater contactor (K1)
4	JP3	AC_T1, 230 V AC input
5		AC-1 connector
6		12 V DC terminal strip
7		Connections on analogue circuit board AS1002 (see Fig. 6: unterhalb)
8	JP7	AC_T1, 230 V output for water feed pump / AC_T1, 230 V output for air compressor
9	JP4	Vacuum pump (M2)
10		Solid state relay for circulation pump
11		Switching transistor for air compressor output
12		10 A control fuse (F4)
13		Radial fan circuit-breaker (F11)

4.1.3 Analogue circuit board AS1002

The analogue circuit board AS1002 connects all analogue and digital inputs and all outputs to the digital circuit board DS1002 via the 40-pin ribbon cable. The gain and offset values from the calibration process are stored here.

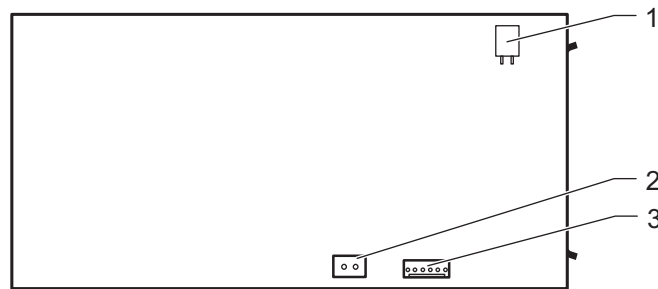


Fig. 5: Top of the analogue circuit board AS1002

1	JP12	5 V DC for analogue inputs
2	JP13	24 V AC for digital outputs
3	JP15	5 V DC for digital outputs

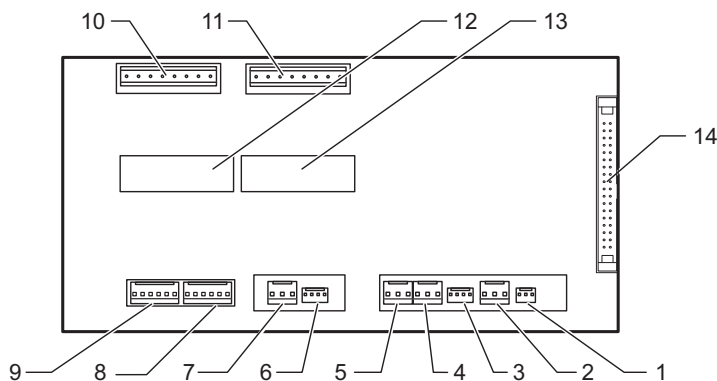


Fig. 6: Underside of the analogue circuit board AS1002

1	JP14	Electrodes (E1 – E3)
2	JP6	Drain temperature sensor (TS4, drain temp)
3	JP4	Pressure transducer on steam generator (PS1, gen press)
4	JP5	Temperature sensor 2 on sterilisation chamber (TS3, chamber temp 2)
5	JP3	Flow sensor (TS2, condense temp)
6	JP1	Pressure transducer on sterilisation chamber (PS2, chamber press)
7	JP2	Temperature sensor 1 on sterilisation chamber (TS1, chamber temp)
8	JP11	Digital inputs
9	JP10	Digital inputs
10	JP9	Digital outputs
11	JP7	Digital outputs
12	JP16	Test points
13	JP17	Test points
14	JP8	Connection for 40-pin ribbon cable to digital circuit board DS1002

4.1.4 Extension board AES1002 (optional)

The extension board is installed in pass-through autoclaves (D series – 2D), where it then takes over the control of the second door.

The extension board can also be installed in all autoclaves (except D-23) in order to connect additional analogue pressure / temperature inputs or special outputs (e.g. as a trigger for external recorders or in-house error messages). This is connected via an additional connector on the ribbon cable between the analogue and digital circuit boards.

Storing the gain and offset values



If an extension board is installed, the gain and offset values for the sensors are stored on the board.

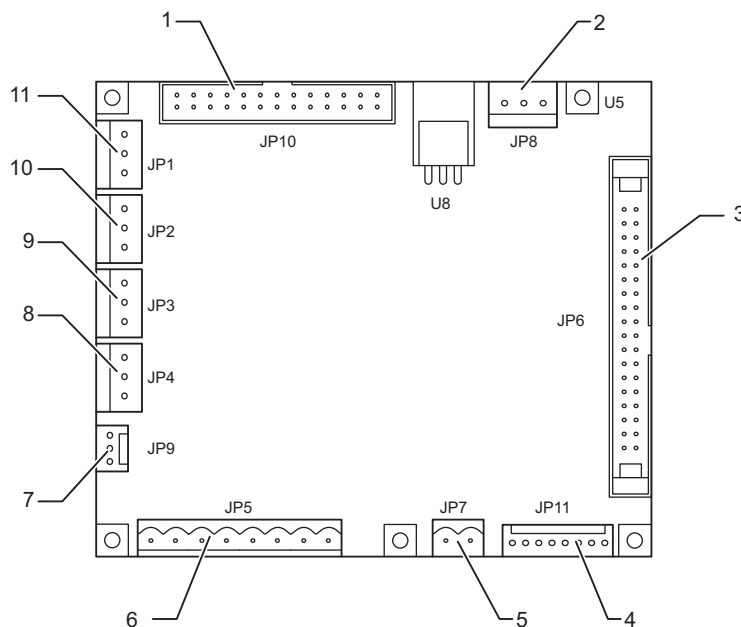


Fig. 7: AES1002 extension board

1	JP10	Test points
2	JP8	Power supply RD35A (12 V / 5 V)
3	JP6	Connection for 40-pin ribbon cable to digital circuit board DS1002
4	JP11	Digital inputs for door 2 (pass-through autoclaves)
5	JP7	24 V AC input
6	JP5	Digital outputs
7	JP9	ChamberPress2, ChamberPress3
8	JP4	ChamberTemp6
9	JP3	ChamberTemp5
10	JP2	ChamberTemp4
11	JP1	ChamberTemp3

Tab. 1: Connections on the AES1002 extension board

4.1.5 Digital circuit board DS1002

The main controller (processor) is located on the digital circuit board. The device software is stored here.

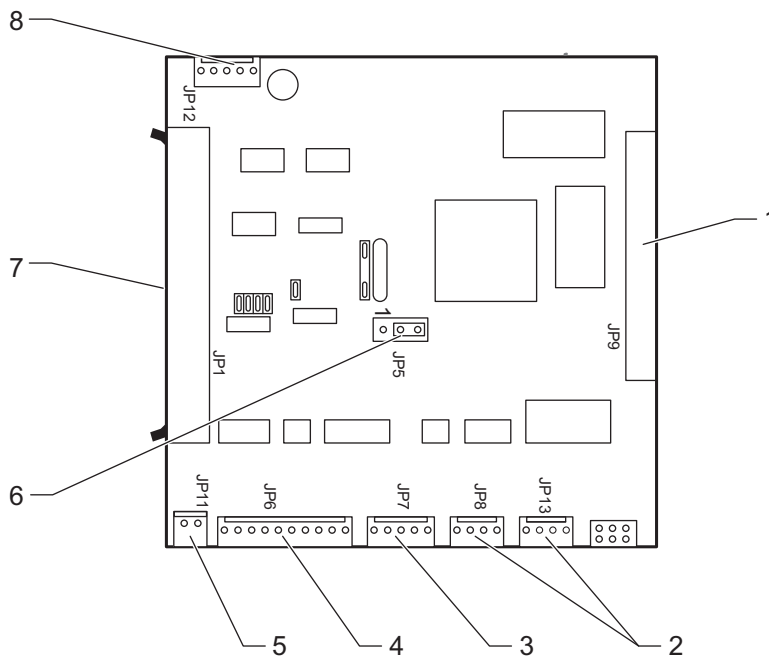


Fig. 8: Digital circuit board DS1002

1	JP9	Test points
2	JP8/JP13	Connection for control unit (can be plugged into JP8 or JP13 – the function is identical)
3	JP7	Interface connector (RS-232 / RS-485)
4	JP6	Connection for printer
5	JP11	Power supply (5 V DC)
6	JP5	Selector for interface protocol RS-232 or RS-485 (RS-232 2–3 connected, RS-485 1–2 connected)
7	JP1	Connection for 40-pin ribbon cable to analogue circuit board AS1002
8	JP12	Digital outputs (5 V DC)

4.1.6 Motor control board for radial fan

The circuit board is used to control the motor of the radial fan.

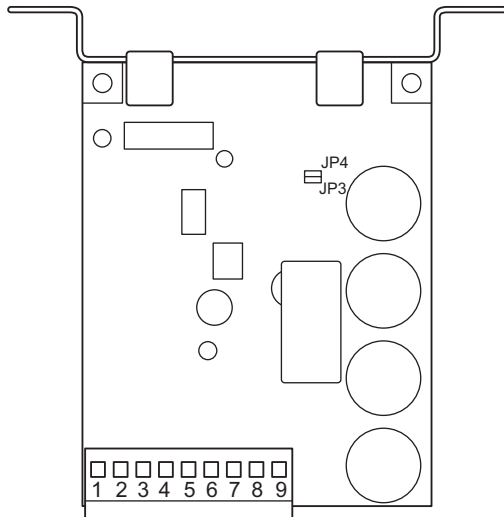


Fig. 9: Motor control board for radial fan

Pin 4	Analogue circuit board AS1002 (JP15, circ pump)
Pin 6, 7	Radial fan (M4, optional M5)
Pin 8, 9	Power supply (24 V AC)

The circuit boards for controlling the motor of the radial fan can be configured for 1 or 2 fans using the JP3/JP4 jumpers:

- 1 radial fan: Both always open
- 2 radial fans: JP3 closed

Special circuit board for motor control on the radial fan for D-23!



The circuit board is a modification that interrupts the earth connection (1, see [Fig. 10: unterhalb](#)) between the board and the mounting plate. You can make this interruption yourself using a suitable tool.

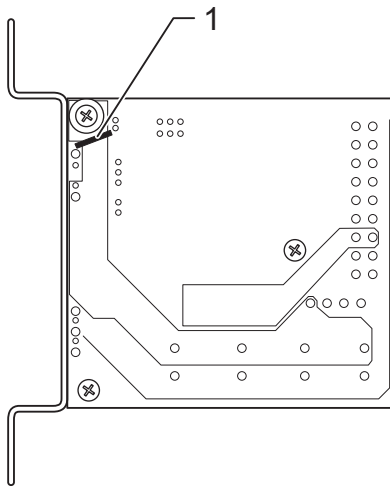


Fig. 10: Special circuit board for motor control on the radial fan (D-23)

4.1.7 230 V circuit board ACT1

The ACT-1 circuit board contains the input filters for the mains voltage on the power supply and the 230 V AC outputs (e.g. for the pumps).

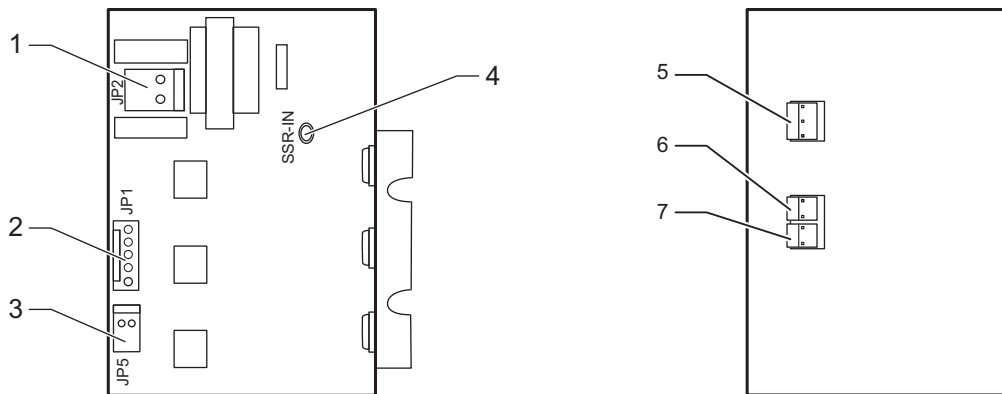


Fig. 11: ACT1 circuit board, top and underside

1	JP2	Output (230 V) for power supply
2	JP1	Connection for digital outputs on AS1002
3	JP5	Output for heater solid state relay (5 V DC)
4	SSR-IN	Power supply for toroidal transformer
5	JP3	AC_T1, 230 V AC input
6	JP4	AC_T1, 230 V output for vacuum pump (M2)
7	JP7	AC_T1, 230 V output for water feed pump

The circuit board also has three switched 230 V outputs (via optocoupler, TRIACs – see Fig. 4: oben pos. 7, 8, 9) for the following:

- Vacuum pump (JP4)
- Water feed pump (JP7/1)
- Air compressor (JP7/2)

The following are also switched via output JP7/2, when necessary:

- Heater contactor
- Y13 valve

Special features on V-40/55 and D-45



On the V-40/55 and D-45, the air compressor is switched directly via the mains switch.

4.1.8 SD card circuit board

This circuit board is used for saving data on an SD card.

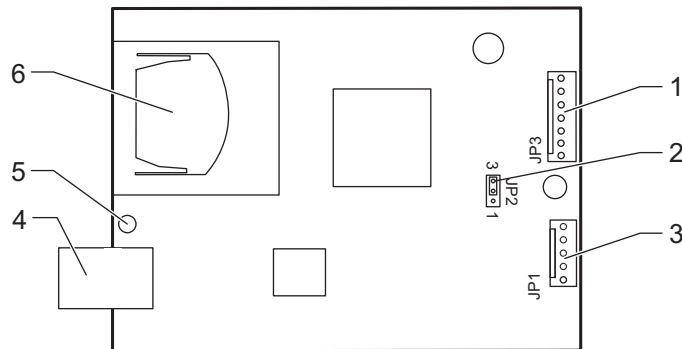


Fig. 12: SD card circuit board

1	JP3	Serial interface connection from digital circuit board DS1002
2	JP2	Selector for interface protocol RS-232 or RS-485 (RS-232 2–3 short, RS-485 1–2 short)
3	JP1	Serial interface output
4		USB port for service
5	LED	– Red: Error – Yellow: Writing – Green: Ready – SD card can be inserted or removed
6	SD card	Slot for SD card

SD card specification:

- Standard, max. 2 GB (SD 1.1)
- Formatted in FAT file system

4.1.9 Voltage stabiliser for the LM1085 analogue circuit board

The LM1085 taps 12 V from the power supply and sends a stabilised voltage of $5.00\text{ V} \pm 0.01\text{ V}$ for the measuring circuits of the analogue circuit board AS1002.

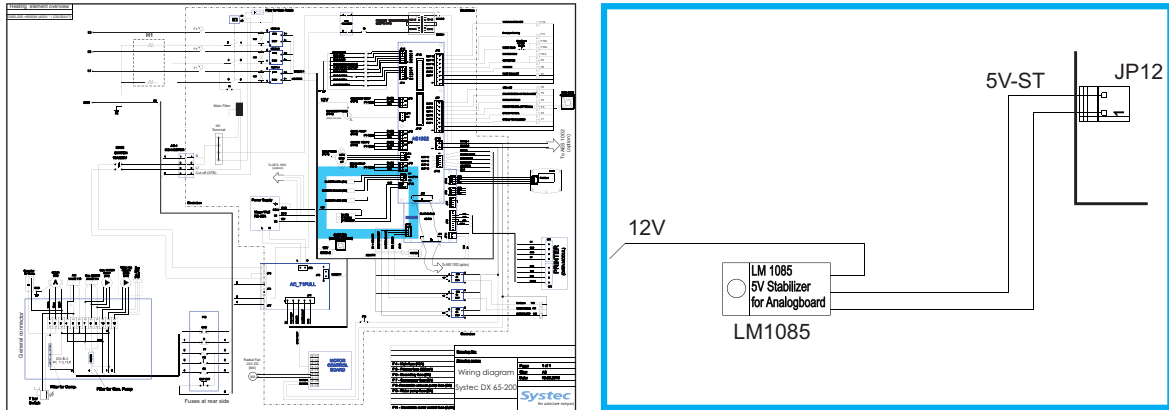


Fig. 13: Analogue circuit board LM1085: Position in the circuit diagram

4.1.10 Power transistor VNP5N07 8 (V/D – 65 only)

The air compressor transistor inverts the positive signal from JP12 (DS1002) and uses an optocoupler to switch the TRIAC for the air compressor on the circuit board ACT1.

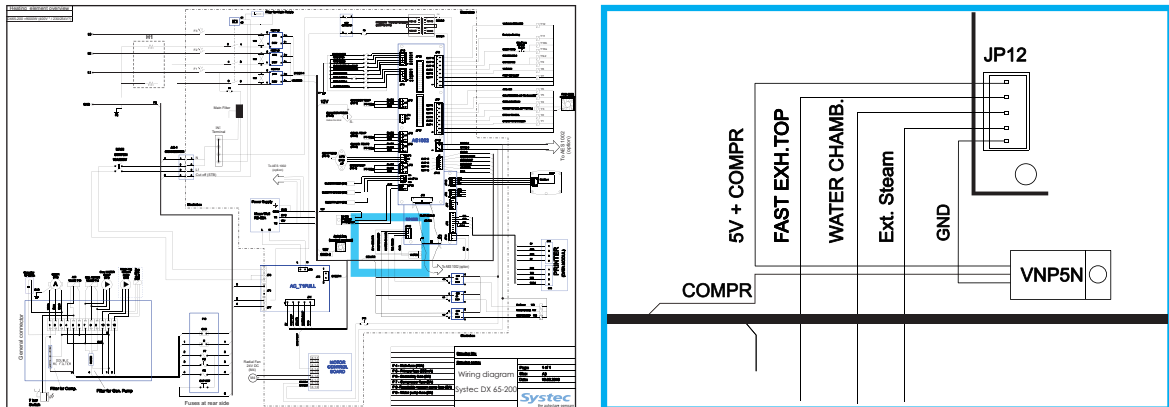


Fig. 14: Power transistors VNP5N07: Position in the circuit diagram

4.1.11 Toroidal transformer

The toroidal transformer supplies 24 V for the valves and the circuit board for motor control on the radial fan. It is fused as follows in the E-Box:

- Primary fuse 800 mA
- Secondary fuse 5 A

4.1.12 Power supply

The power supply receives the supply voltage of 230 V from the ACT1 circuit board.

It supplies the following output voltages:

- 12 V for the E-Box cooler fan
- 12 V for the LM1085 fixed voltage controller
- 12 V via terminal strip 27 for:
 - Pressure transducer on sterilisation chamber
 - Pressure transducer on steam generator, when necessary
- 5 V to power the digital circuit board DS1002
- 5 V for the printer (optional)

The output voltage on V1 must not fall below 5 V!



This voltage is factory set to approx. 5.2 V.

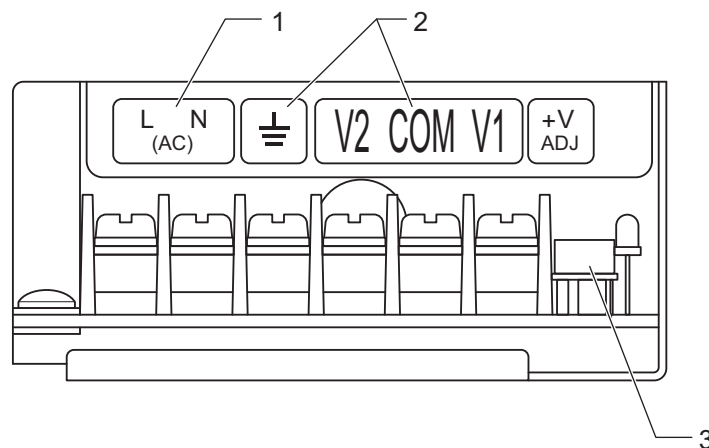


Fig. 15: Power supply

1	100 – 240 V AC input
2	Ground, V2: 12 V, V1: 5 V
3	Potentiometer for V1 (5V, factory setting: 5.1 V – 5.2 V)

4.1.13 Solid state relay (SSR)

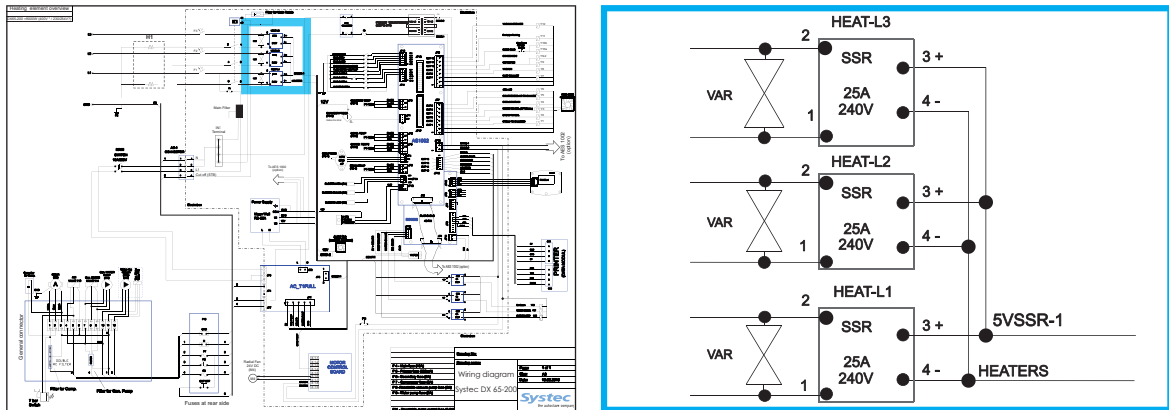


Fig. 16: Solid state relay: Position in the circuit diagram

The heating elements are switched via three solid state relays (25 A each). The solid state relays are earthed and +5 V DC is present at all times.

The SSRs must be configured for inductive loads



In the event of replacement, ensure that the new SSR is suitable for inductive loads.

In the event of a short-circuit, also check the corresponding heating element



The SSR is often short-circuited when a faulty heating element is replaced: A fault in the heating element usually leads to a failure of the corresponding solid state relay, not the other way round.

4.1.14 Heater contactor

The heater is directly connected to the contactor K1. The heater contactor is switched via the safety temperature limiter (STL). If the STL triggers due to overheating, the contactor is deactivated and the power is disconnected from the heaters.

4.1.15 Fuses

The following safety elements and fuses (see chapter 2.2 above) are located on the back of the device (or behind the front service door on pass-through autoclaves):

- Safety temperature limiter (STL)
- Circuit breaker for vacuum pump (2.5 A, 3 A (VI8), 1.8 A (VI2), F8)
- Fuse for water feed pump (2 A, F9)
- Fuse for ambient air cooling fan (2 A, F10)
- Fuse for air compressor (2 A, F7)

The safety temperature limiter monitors the heating element and triggers if the temperature exceeds 170 °C. The heater contactor K1 switches off and cuts the power to the solid state relays (SSR).

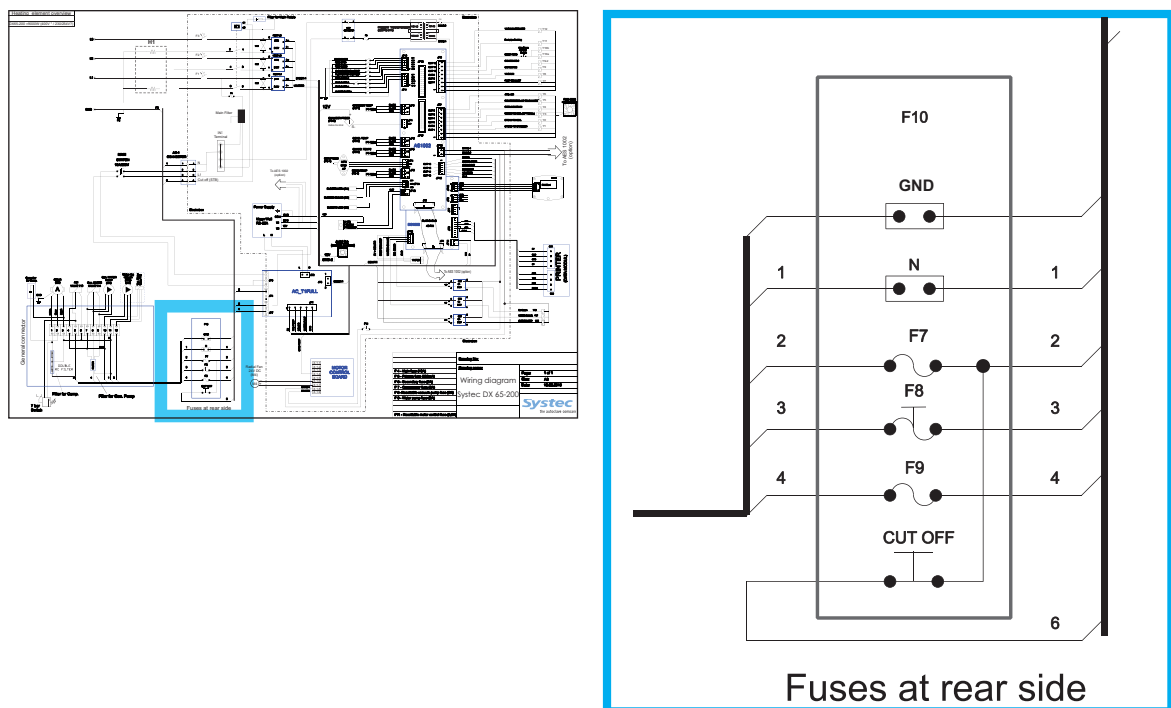


Fig. 17: Fuse block: Position in the circuit diagram

4.2 Overview – Electrical assemblies on D-23

4.2.1 Electronics box

The electronics box (E-Box) contains most of the electrical assemblies. It is located on the rear of the device behind the service door.

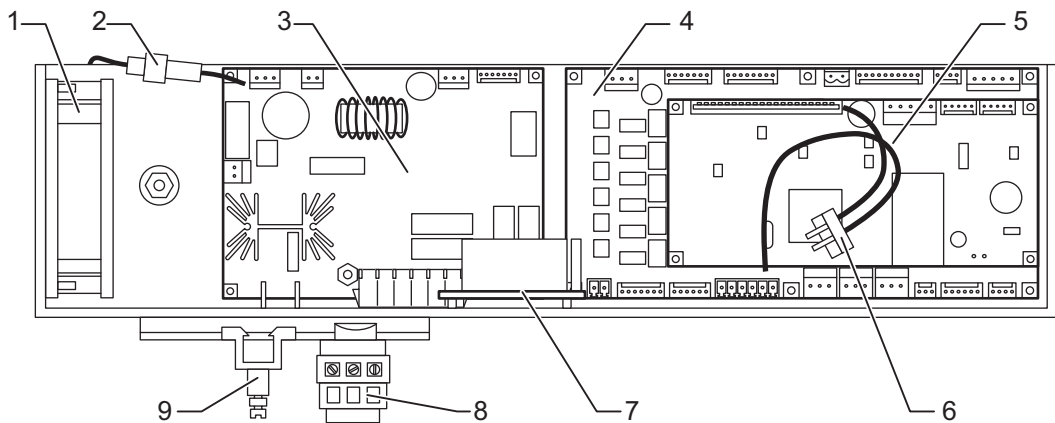


Fig. 18: Front of the E-Box (D-23)

1	Fan
2	5 A secondary fuse for toroidal transformer (F6, 4 x 20 mm)
3	Power supply circuit board
4	Analogue circuit board D-23 (see chapter 4.1.4 oben)
5	Digital circuit board D-23
6	Drain temperature sensor (TS4, drain temp)
7	Relay board for motor control (Systemec D-23)
8	Neutral terminal (N)
9	GND terminal

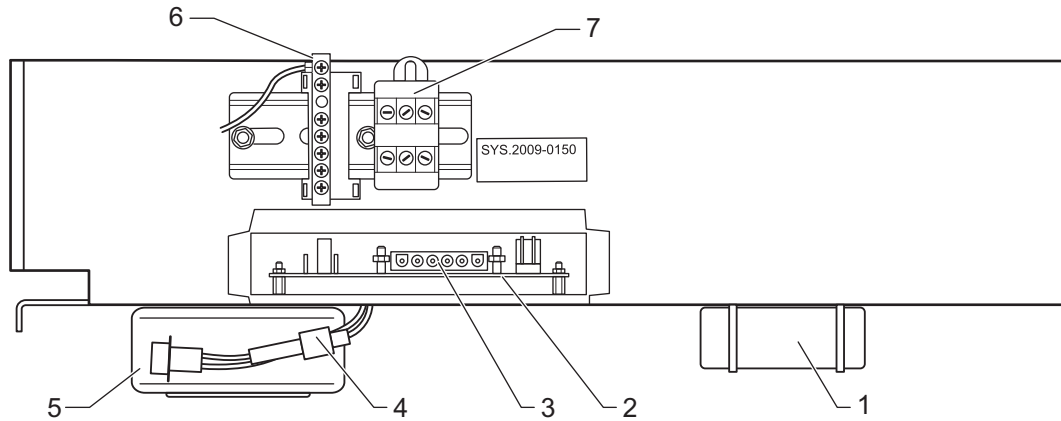


Fig. 19: Underside of the E-Box (D-23)

1	Power supply (not in all device versions)
2	Power supply circuit board
3	JP6 Pin connections (from right to left): Pin 1 = Vacuum pump Pin 2 = Not used Pin 3 to 6 = Heating
4	800 mA primary fuse for toroidal transformer (F5, 4 x 20 mm)
5	Toroidal transformer (see chapter 4.2.9 unterhalb)
6	GND terminal
7	Neutral terminal (N)

4.2.2 Analogue circuit board

The analogue circuit board on the D-23 connects all analogue and digital inputs and outputs with the digital circuit board of the D-23. The connection is made from the JP6 connection on the analogue circuit board to the JP8 connection on the digital circuit board.

The analogue circuit board on the D-23 is equipped with its own microprocessor, which stores the gain and offset values from the calibration process.

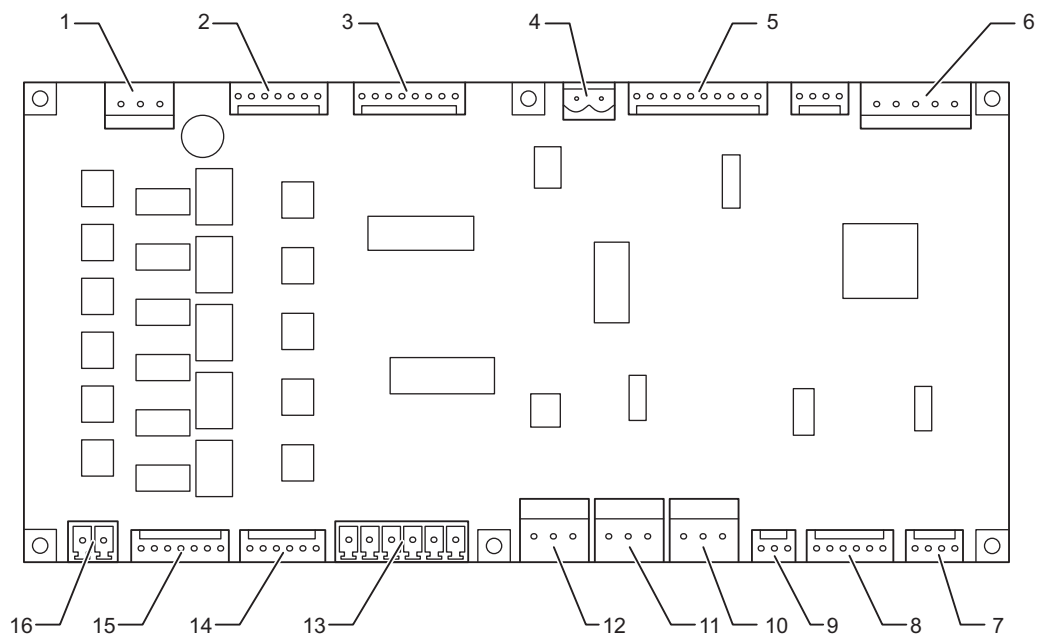


Fig. 20: Analogue circuit board on the D-23

1	JP7	Power supply for the analogue circuit board (5 V/13 V)
2	JP15	Power supply digital outputs
3	JP12	Digital inputs
4	JP11	Digital output for motor control (door)
5	JP10	Printer
6	JP6	Power supply and communication to digital circuit board
7	JP1	Drain temperature sensor (TS4, drain temp)
8	JP17	Pressure transducer on sterilisation chamber (PS2, chamber press)
9	JP2	Pressure transducer on steam generator (PS1, gen press)
10	JP3	Temperature sensor 1 on sterilisation chamber (TS1, chamber temp)
11	JP5	Flow sensor (TS2, condense temp)
12	JP18	Temperature sensor 2 on sterilisation chamber (TS3, chamber temp 2)
13	JP4	Analogue inputs E1 – E3, Res. High elect. (B6), E6, TS4.2
14	JP16	Digital outputs
15	JP13	Digital outputs
16	JP14	24 V AC for digital outputs

4.2.3 Digital circuit board

The main controller (processor) is located on the digital circuit board. The device software is stored here.

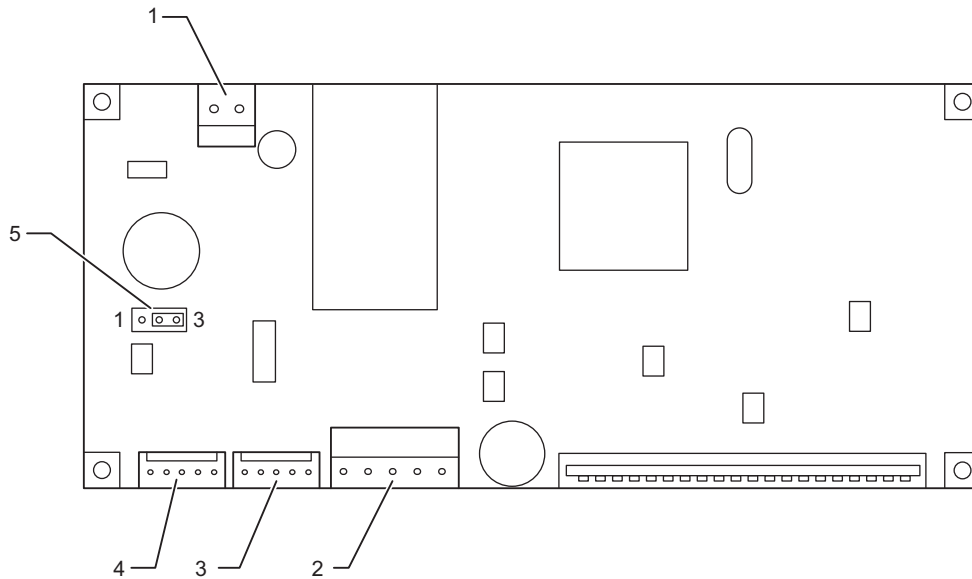


Fig. 21: Digital circuit board on the D-23

1	JP1	Power supply for control unit
2	JP8	Power supply and communication to analogue circuit board (D-23)
3	JP2	Interface connector
4	JP9	Control unit
5	JP3	Selector for interface protocol RS-232 or RS-485 (RS-232 2-3 connected, RS-485 1-2 connected)

4.2.4 Power supply circuit board

The power supply circuit board contains the power supply for the 12 V and 24 V outputs and 230 V outputs (e.g. for the pumps).

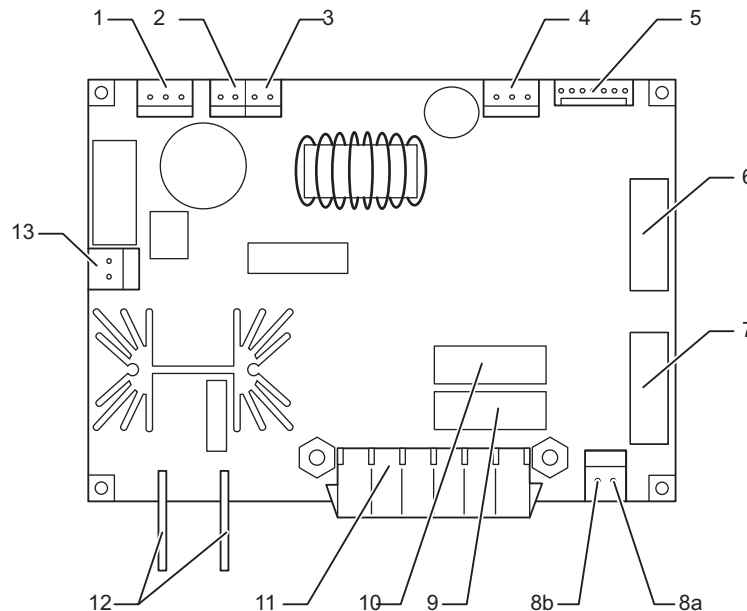


Fig. 22: Power supply circuit board on the D-23

1	JP14	Power supply for toroidal transformer
2	JP15	24 V AC output
3	JP12	5 V DC for the printer
4	JP13	12 V DC – 5 V output
5	JP5	Digital inputs on analogue circuit board
6	F3	Lifting magnet fuse for door lock (1.5 A, 5 x 20 mm)
7	F4	Fuse for water feed pump (1.5 A, 5 x 20 mm)
8a	JP7	Water feed pump
8b		Lifting magnet
9	F2	Fuse for vacuum pump (3.15 A, 5 x 20 mm)
10	F1	Not used
11	JP6	JP6 Pin connections (from right to left): Pin 1 = Vacuum pump Pin 2 = Not used Pin 3 to 6 = Heating
12		Power supply (230 V AC)
13	JP16	12 V DC fan and power supply to relay board for motor control

4.2.5 Relay board for motor control

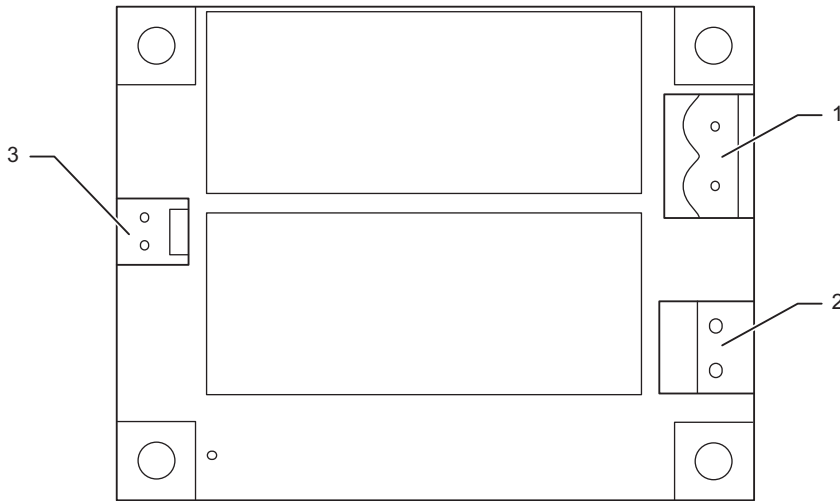


Fig. 23: Relay board for motor control on the D-23

1	JP3	Gear motor
2	JP1	Power supply
3	JP2	Digital input for motor control

4.2.6 Motor control board for radial fan

- See chapter 4.1.6 oben.

4.2.7 Fuses on the back of the device

The following safety elements and fuses (see chapter 2.2 above) are located on the back of the device:

- Safety temperature limiter (STL)

The safety temperature limiter monitors the heating element and triggers if the temperature exceeds 170 °C. The heater contactor K1 switches off and cuts the power to the solid state relays (SSR).

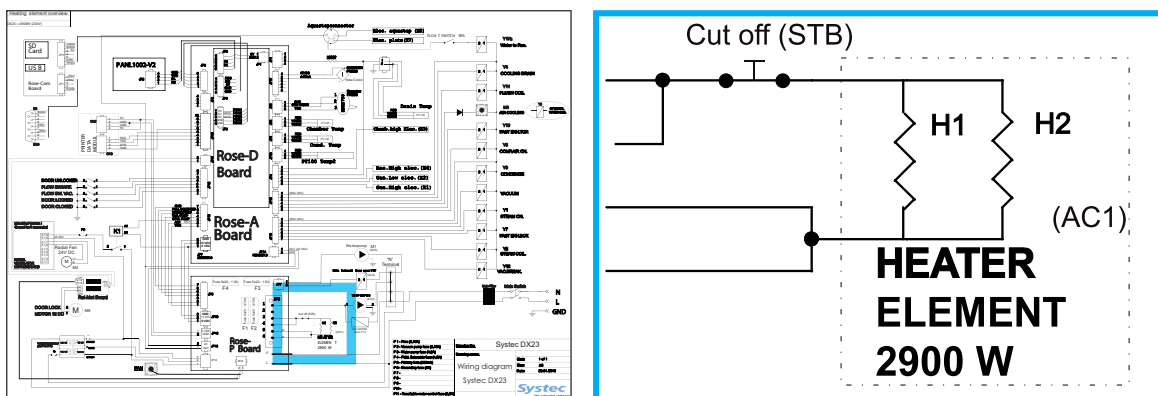


Fig. 24: Fuse block: Position in the circuit diagram

V/D SERIES

ELECTRICAL ASSEMBLIES

4.2.8 SD card circuit board

- See chapter 4.1.8 oben.

4.2.9 Toroidal transformer

- See chapter 4.1.11 oben.

4.3 Control unit Pan1002

4.3.1 V/D-40 – 200

A 4-pin connector connects JP4 on the control unit to JP13 or JP8 on the digital circuit board DS1002.

It has its own CPU with its own software.

The control unit can only be replaced as a complete unit (see chapter 3.5.2 above)

Make sure that the messages are displayed correctly on the control unit!



After replacing the control unit, the language must be set again in the *Service* menu.

On pass-through autoclaves (D-2D), the side on which the control unit is located is defined under *ChangeAddress*:

Front = On device side

Back = On clean room side

4.3.2 D-23

A 4-pin connector connects JP4 on the control unit to JP2/JP1 on the D-23 digital circuit board.

It has its own CPU with its own software.

The control unit can only be replaced as a complete unit (see chapter 3.5.2 above)

Make sure that the messages are displayed correctly on the control unit!



After replacing the control unit, the language must be set again in the *Service* menu.

4.4 Replacing or upgrading the printer

Removing the printer

- Remove the service doors or door cladding.
- Disconnect the cable to the E-Box.

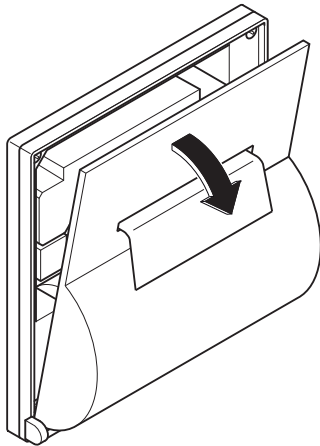


Fig. 25: Opening the cover

- Open the cover of the printer.

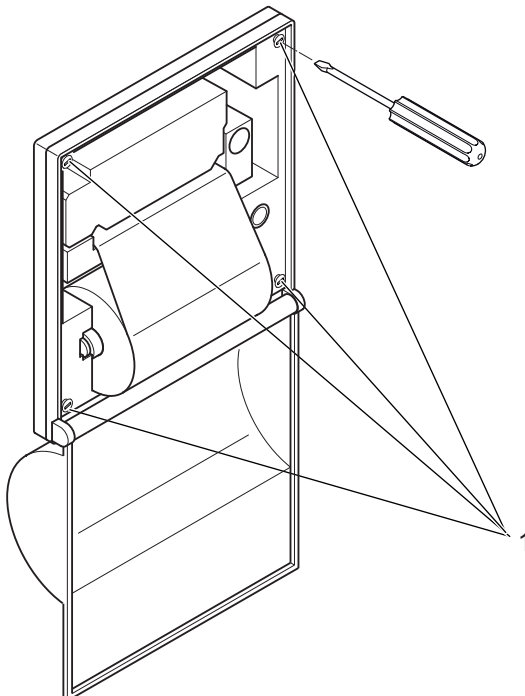


Fig. 26: Loosening the screws

- Loosen the 4 screws (1), but do not remove them.
- Push the printer downwards and remove it.

Installing the printer

- Remove the service doors or door cladding, when necessary.
- Open the cover of the printer.
- Insert the printer into the housing.
- Position the threaded bolt horizontally from behind.
- Tighten the 4 screws.
- Insert the printer paper.
- Close the cover.
- Connect the printer to the E-Box.
- Reattach the service door.
- Switch on the device and check the printout.

Connecting the printer to the E-Box

- Connect the earth cable with eyelet to the housing.
- Connect the power supply cable.

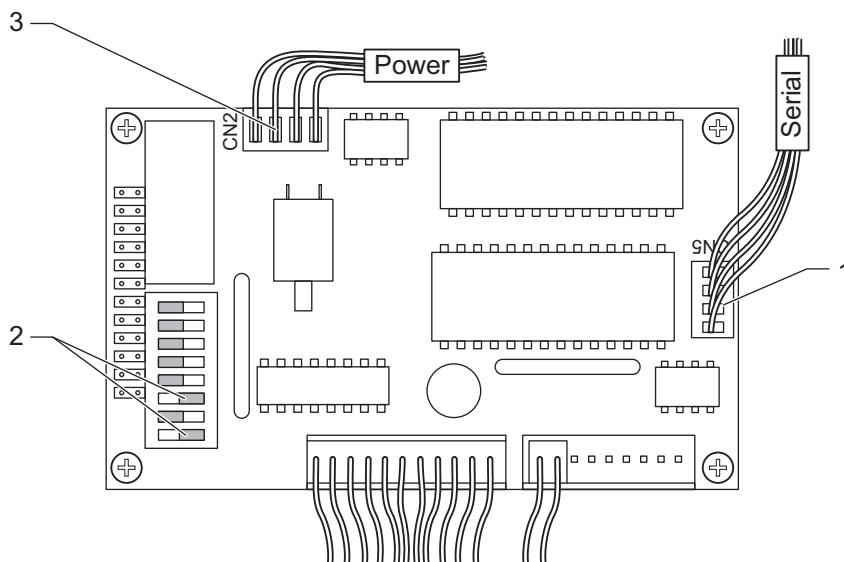


Fig. 27: Connecting the printer to the E-Box

- Plug the connector into the digital circuit board.

Do not confuse CN2 and CN5!



Make sure that CN2 (3) and CN5 (1) are not confused, as wrong connections will damage the printer.

DIP switches 1 and 3 (2) must be set to “Off”, all others must be set to “On”.

5 REGULAR TESTS AND MAINTENANCE

Aim of this chapter

This chapter contains information on the regular maintenance tasks in table form. In these tables, you will find references to the detailed chapters of this service manual, where you can find more precise information about the individual maintenance tasks.

Service tasks that cannot be allocated to any particular assembly (calibration) can be found after the overview.

Contents

5.1	Regular tests and maintenance	3
5.1.1	General inspections	3
5.1.2	Options.....	6
5.2	Calibration and adjustment	9

Diagrams

Fig. 1: Calibration: Navigating to the Service menu item	10
Fig. 2: Calibration: Navigating to the Calibration menu item	10
Fig. 3: Calibration: Entering the service code	11
Fig. 4: Calibration: Selecting a parameter.....	11
Fig. 5: Calibration: Selecting the calibration type for gain and offset values.....	12
Fig. 6: Calibration: Manual entry of the gain and offset values	13
Fig. 7: Calibration: Calculation of the gain and offset values using the high and low values from a reference measurement produced with external test equipment.....	14
Fig. 8: Calibration: Restoring the last saved gain and offset values...	15

Tables

Tab. 1: Maintenance tasks on the control unit	4
Tab. 2: Maintenance tasks on the door lock	4
Tab. 3: Maintenance tasks on the pressure chamber, hose connections and filter	4
Tab. 4: Maintenance tasks on the steam generator.....	5
Tab. 5: Other maintenance tasks.....	5
Tab. 6: Maintenance tasks for the test run and calibration.....	5
Tab. 7: Maintenance tasks for the water supply.....	5
Tab. 8: Maintenance work for water cooling	6
Tab. 9: Maintenance work on the radial fan	6
Tab. 10: Maintenance work for spray cooling	6
Tab. 11: Maintenance work on the closed cooling circuit.....	6
Tab. 12: Maintenance work on the lift	7
Tab. 13: Maintenance work on vacuum unit	7
Tab. 14: Maintenance work on the exhaust filter	7
Tab. 15: Maintenance tasks on the printer.....	8

5.1 Regular tests and maintenance

The regular maintenance tasks are described below.

Aside from a brief description of the maintenance tasks, you may find a reference in the table for more detailed information elsewhere in this service manual.

You will find overview drawings of the open device showing the positions of the mechanical components in [chapter 3.2, "Position of the components"](#) and drawings of the electrical assemblies in [chapter 4.1 Overview – Electrical assemblies](#) and [chapter 4.2 "Overview – Electrical assemblies on D-23"](#).

The following list is based on the maintenance checklist



Log your work here, mark the corresponding field and send the maintenance checklist to Systec GmbH.

5.1.1 General inspections

Handling Teflon hoses and connections

Pay attention to the following points when handling Teflon hoses:



- Do not kink the hoses.
 - Avoid excess mechanical strain on the Teflon hoses.
 - When reconnecting, push the connections completely onto the fittings and tighten the lock-nuts up to the stop.
 - If white stress marks can be seen on a hose, replace it – white marks on Teflon hoses indicate damages.
 - When shortening hoses, cut at right angles using a sharp knife (do not pinch off or crimp using side cutters or similar tools).
-

Perform a test run after service and maintenance



After service or maintenance you must always perform a test run and check the equipment for anything unusual (e.g. leaks, noises).

User survey

- Ask the user about faults

Control unit

Function, display	Check	Chapter 3.5, "Control panel"
-------------------	-------	------------------------------

Tab. 1: Maintenance tasks on the control unit

Door lock

The function of the door lock is described in detail in [chapter 3.3, "Door lock"](#).

Door – Lock – Hinge – Mechanism	Check, lubricate the hinge and mechanism	Chapter 3.3
Door seal	Check for wear and cleanliness	Chapter 3.3
Ring switch, door switch	Check switching point and function The ring switch and door switch must be replaced after 4 years or 2000 cycles.	Chapter 3.3
Pneumatic door opener	Check function, check for leaks	Chapter 3.3
Drive for locking ring	Check	Chapter 3.3
Locking ring	Check and lubricate	Chapter 3.3

Tab. 2: Maintenance tasks on the door lock

Pressure chamber, hose connections and filter

Pressure chamber	– Corrosion, dirt – Internal check conforming to German Ordinance on Industrial Safety and Health (BetrSichV)	
Safety valve on sterilisation chamber	Check and start up	Chapter 3.9.2
Safety valve on steam generator	Check and start up	Chapter 3.9.2
Temperature sensor	Check for damage	
Strainer	Clean	
Sieve	Clean	
Internal compressed air	Check function, check for leaks	Chapter 3.10
Pipes and screw connections	Check seating, check for leaks	
Steam air extractor	Check function	Chapter 3.14
Water level electrodes	Check function, cleanliness, leaks	Chapter 3.8.3

Tab. 3: Maintenance tasks on the pressure chamber, hose connections and filter

Steam generation

Heater	Power consumption	
Heater contactor	Check	Chapter 4.1.14
Heater element duct	Check for leaks	Chapter 3.8
Safety temperature limiter (STL)	Check function, check seating	Chapter 3.8
Electrical screw connections on load circuit (heating flow circuit)	Tighten	

Tab. 4: Maintenance tasks on the steam generator

Other maintenance tasks

Flow monitor	Check function	Chapter 3.8.3
Wiring, earth connection	Check and test	
Parameter settings	Check	Chapter 8
Pressure transducer	Check function and display	
No-return valve	Check function, check for leaks	
E-Box fan	Check for smooth running	
Aquastop	Check function, replace battery	

Tab. 5: Other maintenance tasks

Test run and calibration

Test run	Perform standard run under typical operating conditions for the customer Check function, check for leaks	Chapter 3.4.3
Temperature/pressure display	Compare with external test equipment and calibrate, when necessary	- With Systemec service software: Chapter 6.2.7 - Using the display: Chapter 5.2

Tab. 6: Maintenance tasks for the test run and calibration

Water supply

Carbonate hardness of unprocessed water	Check	Chapter 2.4.1
Cooling water	Check pressure	Chapter 2.4.2
Water supply hoses, sieve	Check for firm seating	
Drain hose	Check layout	
Water feed pump	Check function, noise	Chapter 3.8.3
Demineralised water inlet valve	Check function	Chapter 3.8.1
Pressure reducer	Check function and setting	Chapter 3.7.2

Tab. 7: Maintenance tasks for the water supply

5.1.2 Options

Water cooling

The function of the water cooling is described in detail in [chapter 3.7](#), “Cooling”.

Solenoid valve for cooling water	Check function	Chapter 3.7
Solenoid valve for support air	Check function	Chapter 3.7
Sterile air filter	Check and replace, if necessary	Chapter 3.7.2
Pressure reducer for cooling water	Check setting and function	Chapter 3.7.2
Pressure reducer for support air	Check setting and function	Chapter 3.7.1

Tab. 8: Maintenance work for water cooling

Radial fan option

The function of the radial fan is described in detail in [chapter 3.6](#), “Radial fan”.

Motor	Check for quiet running, check function	Chapter 3.6 Chapter 4.1.6
Fan wheel	Check for cleanliness and free running	Chapter 3.6

Tab. 9: Maintenance work on the radial fan

Spray cooling option

Heat exchanger	Check for scaling and free-flowing, clean if necessary	Chapter 3.11.2 , “Descaling the pump”
Circulation pump	Check function, check for leaks	
Metal hose to the spray nozzle	Check for leaks, ageing and damage	

Tab. 10: Maintenance work for spray cooling

Closed cooling circuit option

The function of the closed cooling circuit is described in [chapter 3.7.1](#), “Closed cooling circuit”.

Heat exchanger	Check for scaling and free-flowing, clean if necessary	Chapter 3.11.2 , “Descaling the pump”
Circulation pump	Check function, check for leaks	
Cooling circuit	Check fill level	Chapter 3.7.2 , “Filling a closed cooling circuit”

Tab. 11: Maintenance work on the closed cooling circuit

Lift option

The function of the lift is described in [chapter 3.17, "Lift"](#).

Column	Check for firm seating	Chapter 3.17
Function	Pay attention to the travel direction	Chapter 3.17
Arm and basket support	Check for firm seating	Chapter 3.17

Tab. 12: Maintenance work on the lift

Vacuum unit option

The function of the vacuum unit is described in detail in [chapter 3.11, "Vacuum unit \(optional\)"](#).

Vacuum pump	Check performance and build-up of noises, fill using a container marked in litres	Chapter 3.11.2, "Checking water usage"
Sterile air filter	Check and replace, if necessary	Chapter 3.7.2, "Replacing the sterile air filter"
Vacuum valve	Check function, check for leaks	Chapter 3.11 Chapter 6.2.8
Pump water valve for vacuum pump	Check	Chapter 3.11.2, "Checking water usage"
Vacuum test	Execute	Chapter 3.11.2 Testing the sterilisation chamber for leaks – vacuum test

Tab. 13: Maintenance work on vacuum unit

Exhaust filter option

The function of the exhaust filter is described in detail in [chapter 3.16, "Exhaust filter"](#).

Counter value on exhaust filter	Check If necessary, replace filter earlier	Chapter 3.16.2, "Checking the counter value"
When replacing filter	Reset counter	Chapter 3.16.2, "Replacing the exhaust filter cartridge"

Tab. 14: Maintenance work on the exhaust filter

Printer option

The function of the printer is described in detail in the operating manual (chapter 6.1, "Printer").

Printer ribbon	Check	Operating manual, chapter 6.1, "Printer"
Paper supply	Check	Operating manual, chapter 6.1, "Printer"

Tab. 15: Maintenance tasks on the printer

5.2 Calibration and adjustment

The analogue inputs on the autoclave can be calibrated either via a connected PC using the Systemec service software (see chapter 6.2.7, “Calibration”) or using the menu of the control unit.

Do not give any codes for access levels to unauthorised persons!



The code for access level 4 is required for calibration (service technician, see chapter 8.1, “Access level”). This code is exclusively reserved for service technicians and must never be given to the operator.

The measurement range during the calibration must correspond to the conditions of use!



Temperature sensors do not measure in a completely linear manner. This means that the calibration is more exact the closer the calibration measurement comes to the actual subsequent use.

Systemec references:

- Pressure between 100 and 300 kPa
- Temperature between 80 °C and 130 °C
- Drain temperature between 20 °C and 80 °C

Only adjust if the temperature and pressure deviate!



Only make adjustments if the temperature deviates by more than 0.3 K and the pressure deviates by more than 3 kPa.

A two-point calibration is used:

Two reference measurements are taken at the lower (low value) and upper (high value) end of the required measurement range. These are compared with current measurements from the autoclave and are aligned to the straight line interpolation by recalculating the gain and offset values.

The electrodes should not be calibrated



The service dialogue also shows the measured values for the electrodes (Elect. High, Elect. Low, Elect. Chamb.). These values are for information only.

Proceed as follows:

- Press the MENU button on the basic display to access the main menu.

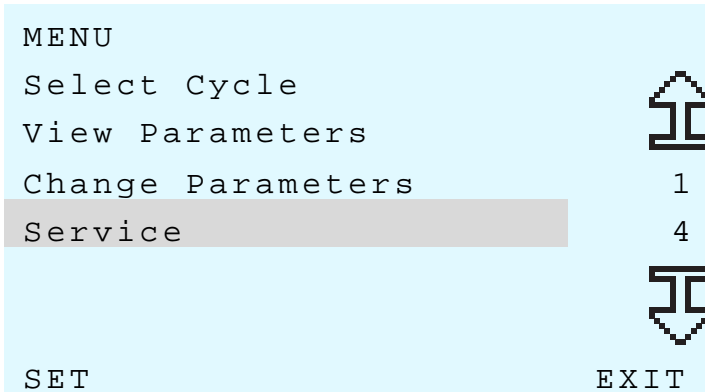



Fig. 1: Calibration: Navigating to the Service menu item

- Use the  button to navigate to the Service menu item.
- Press the SET button.

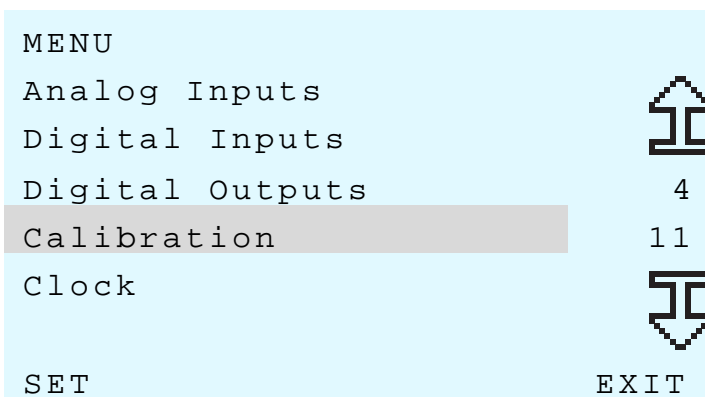



Fig. 2: Calibration: Navigating to the Calibration menu item

- Press the  button to navigate to the Calibration menu item.
- Press the SET button.

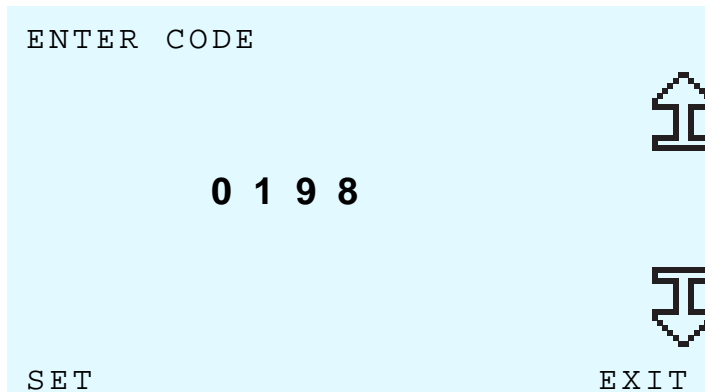


Fig. 3: Calibration: Entering the service code

- You are asked to enter the service code. Enter the code for access level 4 (service technician).
- Press the SET button to confirm.

The Analog Inputs submenu appears.

The current values for the electrodes and analogue inputs are displayed.

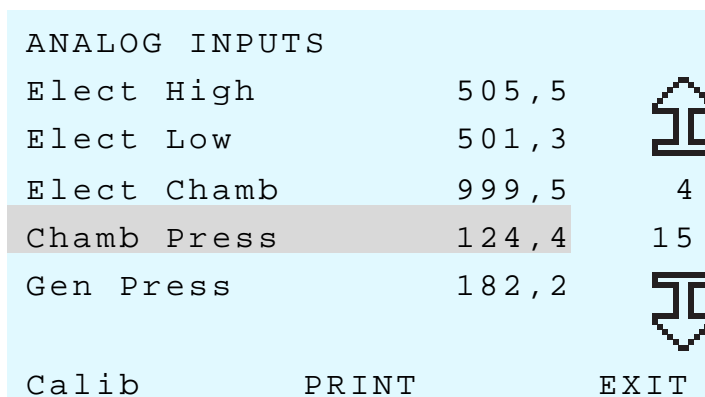


Fig. 4: Calibration: Selecting a parameter

- Select the analogue input to be calibrated (for example: Chamb Press).

- Press the Calib button on the display to start calibration.

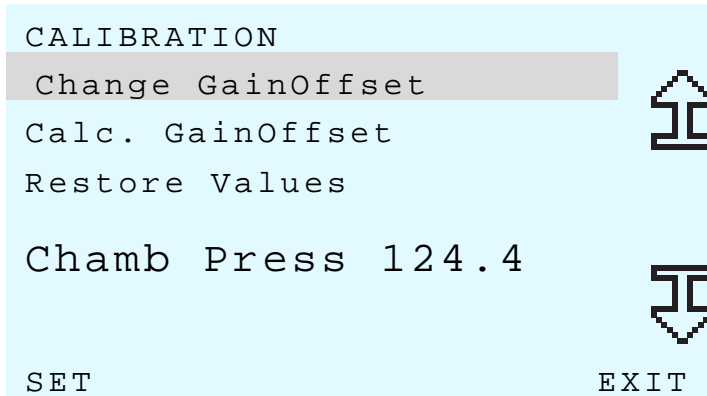


Fig. 5: Calibration: Selecting the calibration type for gain and offset values

You now have the following options:

1. Manual entry of the gain and offset values for the selected input (Change GainOffset menu item).
2. Calculation of the gain and offset values for the selected input using a reference measurement from external test equipment (Calc. GainOffset).
3. Restoration of the last saved gain and offset values (Restore Values menu item).

1. Manual entry of the gain and offset values

Only modify the gain and offset values manually according to the specifications from Systemec!



Manual modification of the gain and offset values has a direct effect on the control of the autoclave. Incorrect values can endanger users of the equipment.

- Navigate to the Change GainOffset menu item and press the SET button to enter the gain and offset values manually.

The current gain and offset values are displayed with eight signed significant digits.

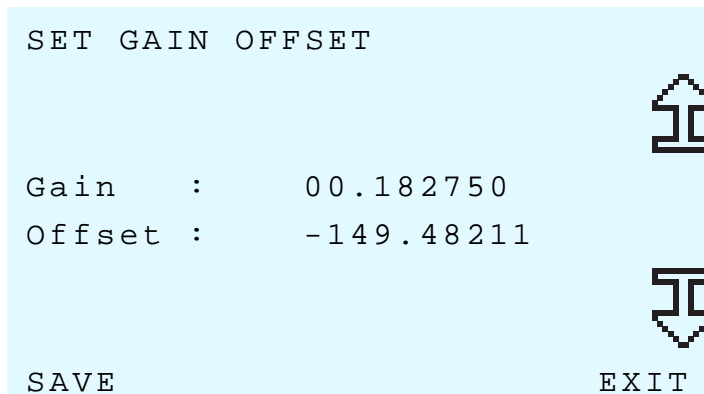






Fig. 6: Calibration: Manual entry of the gain and offset values

- Enter the required gain and offset values:
 - Use the  or  button to navigate to the part that you would like to change (digit, sign, change between gain and offset value).
 - Change the value at the selected location with the  or  buttons.
- Save the changed gain and offset values with the `SAVE` button. The `DONE` confirmation message appears in the control unit display.
- Press the `EXIT` button to quit manual entry mode.





Changes can be discarded without saving them!



You can exit the mode for manual entry directly without previously saving the values using the `EXIT` button. In this case, any changes that you have made will be discarded.

2. Calculation of the gain and offset values using a reference measurement from external test equipment
 - Navigate to the `Calc. GainOffset` menu item and press the `SET` button to calculate the gain and offset values.

The current high and low values for the selected input are displayed:

- RH: Current autoclave value during the high measurement.
 - AH: Reference value of the high measurement using external test equipment.
 - RL: Current autoclave value during the low measurement.
 - AL: Reference value of the low measurement using external test equipment.
- Modify the values according to your reference measurements.
 - Use the  or  button to navigate to the part that you would like to change (digit of a value or change between the selected values).
 - Use the  and  buttons to change the value.
 - Press the `Read` button on the display to apply the current measured value.

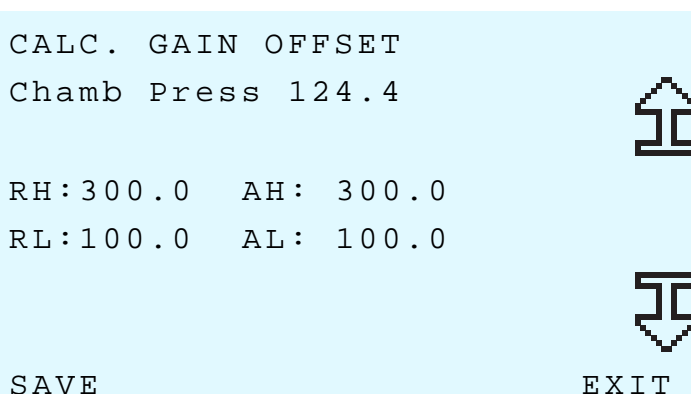


Fig. 7: Calibration: Calculation of the gain and offset values using the high and low values from a reference measurement produced with external test equipment

- Press the `SAVE` button to save the changed high and low values. The `DONE` confirmation message appears in the display.

Pressing the `SAVE` button recalculates the calibration!



If you press the `SAVE` button, the calibration is recalculated according to the values in the display. The display is then updated. Pressing the `SAVE` button repeatedly thus leads to incorrect calibration.

- Press the `EXIT` button to quit manual entry mode.

Changes can be discarded without saving them!



You can exit the mode for manual entry directly without previously saving the values using the `EXIT` button. In this case, any changes that you have made will be discarded.

Restoring the last saved gain and offset values for the selected input.

Undoing a failed calibration!



Changes to the gain and offset values are only saved finally once the menu has been exited. The last saved calibration can be restored as long as you have not yet left the menu.

- Navigate to the `Restore Values` menu item and press the `SET` button to restore the last saved gain and offset values.
- The `DONE` confirmation message appears in the display.

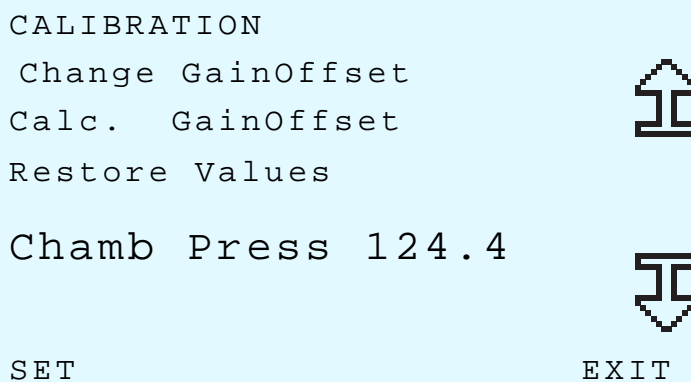


Fig. 8: Calibration: Restoring the last saved gain and offset values

- Press the `EXIT` button to exit the menu.
- Select another analogue input to be calibrated, or exit the calibration menu and return to the basic display by repeatedly pushing the `EXIT` button.

The `SAVE . . .` message is displayed and the calibration of the selected value is stored.

V/D SERIES

REGULAR TESTS AND MAINTENANCE

6 SERVICE SOFTWARE

Aim of this chapter

This chapter provides information on the service software available for Systemec V/D series autoclaves.

Contents

6.1	Available service software	3
6.1.1	System requirements	3
6.1.2	Installation	4
6.1.3	Updating an existing installation	6
6.1.4	Uninstalling	7
6.2	Systemec service software	8
6.2.1	Starting the program	8
6.2.2	Setting the communication parameters	9
6.2.3	Establishing a connection	10
6.2.4	Main window	11
6.2.5	Download Main	12
6.2.6	Download Analog (only for D-23)	15
6.2.7	Calibration	15
6.2.8	I/O	19
6.2.9	System	20
6.2.10	Parameters	28

Illustrations

Fig. 1: Installation wizard: Start.....	4
Fig. 2: Installation wizard: Selecting the target folder.....	5
Fig. 3: Installation wizard: Selecting the program group in the Start menu	5
Fig. 4: Installation wizard: Installing the files	6
Fig. 5: Installation wizard: Completing the installation	6
Fig. 6: Installation wizard: Overwriting existing files.....	6
Fig. 7: Systemec service software start window	8
Fig. 8: Systemec service software: Settings	9
Fig. 9: Error message “No communication with the target device!”....	10
Fig. 10: Systemec service software main window.....	11
Fig. 11: Systemec service software: Download Main.....	12
Fig. 12: Systemec service software: Download progress bar	14
Fig. 13: Error message “Wrong download module. Action aborted”	15
Fig. 14: Systemec service software: Calibration	16
Fig. 15: Systemec service software: I/O	19
Fig. 16: Systemec service software: Clock	21
Fig. 17: Systemec service software: Hardware.....	22
Fig. 18: Systemec service software: Errors.....	24
Fig. 19: Systemec service software: Programs.....	25
Fig. 20: Systemec service software: Programs, language-specific table of program names	26
Fig. 21: Systemec service software: Parameters.....	29
Fig. 22: Systemec service software: Parameters, cycle view (short display)	30
Fig. 23: Systemec service software: Parameters, cycle view (long display)	30
Fig. 24: Systemec service software: Parameters, global view (short display)	31
Fig. 25: Systemec service software: Parameters, global view (long display)	31

6.1 Available service software

The devices are equipped with a serial interface. On B devices, the serial interface is located in the E-Box.

By connecting to a Windows PC, the set-up and use of the device can be easily controlled via the user interface of the service software.

The following service software is available:

- Systemec service software
This software is used for the basic set-up and configuration of the device. Functions are available for updating the firmware, modifying the parameters and for calibration.
- SADS
This software is used for the documentation of autoclave procedures. A description of the SADS software is not part of the service manual.

6.1.1 System requirements

The connection is made via a direct serial interface between the device and PC.

The following components are required:

- Windows PC with serial interface (Windows 98 to XP)
- RS-232 extension cable (9-pin D-sub connector, male / female)

Possible causes of errors!

No virtual COM ports:

In order to service the device, you must use a PC with a serial interface (RS-232: 9-pin D-sub connector, male).

Although it is possible in principle to use USB adapters for this interface, this has repeatedly led to problems in the past.

Crossed cables:

Cables with crossed connections are not suitable for the connection between the PC and the device. Unfortunately, these hardly differ in appearance from the type of cables that should be used. Therefore, ask specifically for a suitable connection cable when purchasing.



6.1.2 Installation

The software is installed as normal in Windows by launching the set-up program.

An installation wizard then guides you through each step of the installation.

Aborting the installation!



The installation can be aborted during steps 1 to 5. To do this, click “Exit Setup”.

- Start the installation by running the “Setup.exe” file in the directory on the installation CD.

The installation wizard appears:



Fig. 1: Installation wizard: Start

- Click “OK”.



Fig. 2: Installation wizard: Selecting the target folder

- Click “Change Directory” to change the target folder as required.
- Click the installation button.

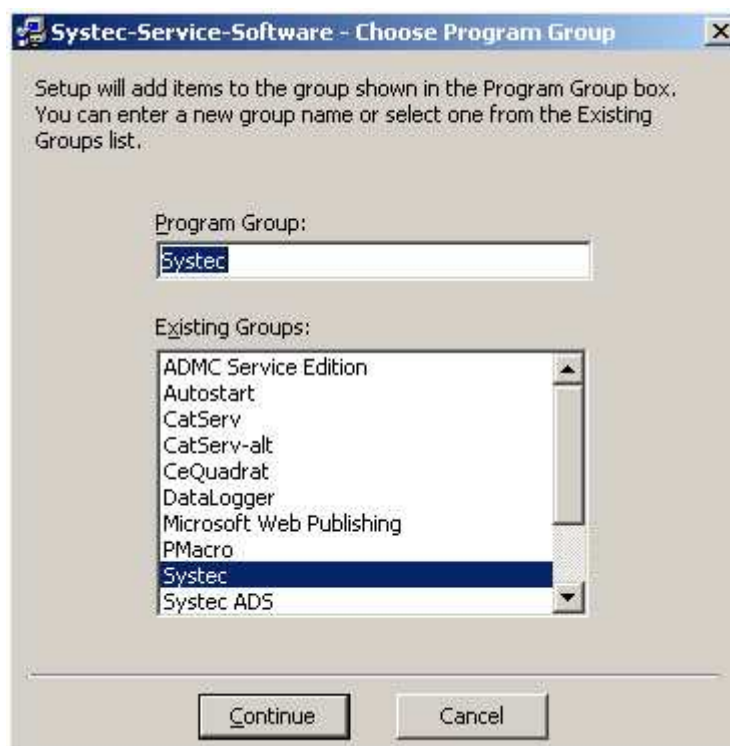


Fig. 3: Installation wizard: Selecting the program group in the Start menu

- Select the program group in the Start menu.
- Click “Continue”.

The files are installed and the registry is updated:



Fig. 4: Installation wizard: Installing the files



Fig. 5: Installation wizard: Completing the installation

- Click "OK" to complete the installation.

6.1.3 Updating an existing installation

The current version of the Systemec service software includes all the standard functions from earlier versions.

Recommended procedure:

- Uninstall the old version as described below.
- Install the new version.

Existing files may be overwritten in this case:

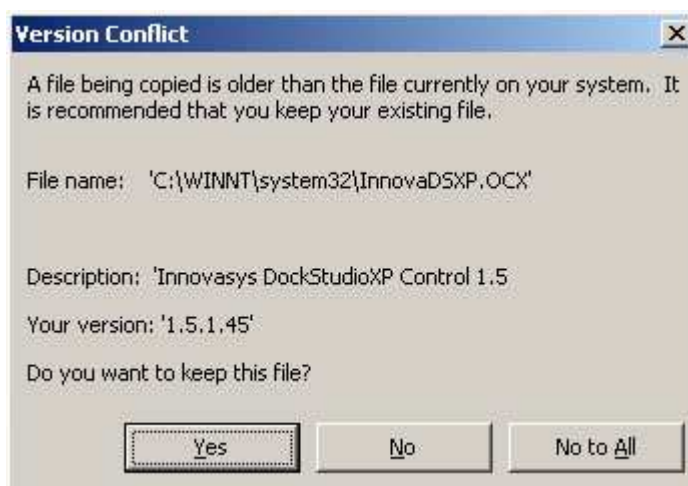


Fig. 6: Installation wizard: Overwriting existing files

- Click "Yes" if you want to keep the old files.

6.1.4 Uninstalling

Before updating the software, uninstall the old version using the standard Windows procedure!



The uninstall routine will not delete existing data files – these files can still be used afterwards.

- Uninstall the Systemec service software using the “Uninstall” program in the Start menu.

6.2 Systemec service software

6.2.1 Starting the program

- Call up the Systemec service software from the Start menu.

The start window of the Systemec service software opens.



Fig. 7: Systemec service software start window

You can click on the following options:

- “Connect”, to establish a connection to the device
- “Settings”, to set the communication parameters to the device
- “About”, to view version information
- “Exit”, to quit the program

6.2.2 Setting the communication parameters

- Click “Settings” to check and set the communication parameters.

The “Settings” dialogue appears.

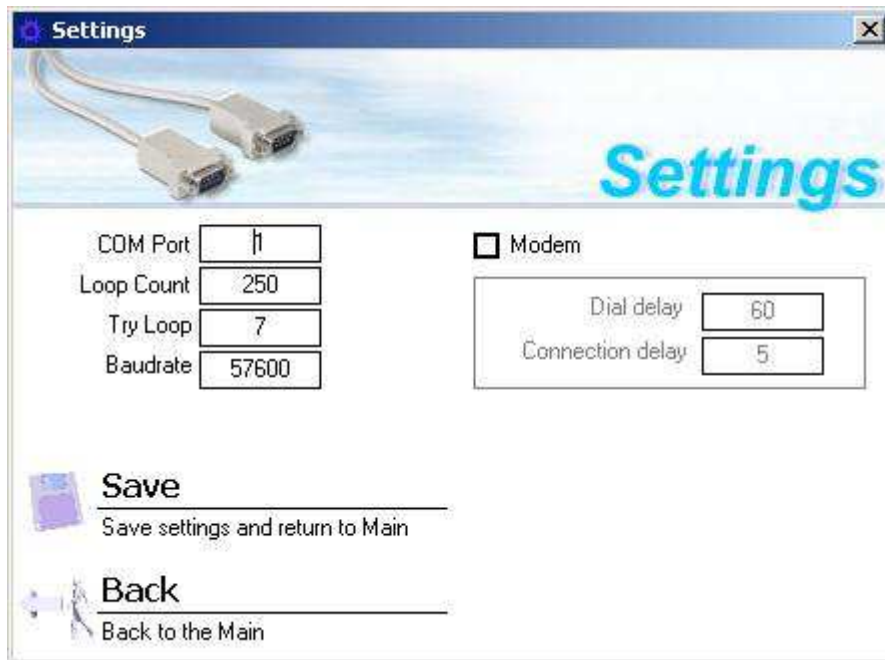


Fig. 8: Systemec service software: Settings

Communication parameters to be checked in normal cases:



From the connection options offered, you normally only need to adjust the “**Com Port**” and the “**Loop Count**” (value = 150) parameters.

The following options are available:

COM Port	Specifies which COM port is used on the PC (usually 1 or 2)
Loop Count	Delay until another attempt is made to establish a connection, should an attempt fail [ms]. This value must be set to 150.
Try Loop	The maximum number of attempts to establish a connection. This value does not normally need to be changed.
Baudrate	The data transfer speed [baud]. This value does not normally need to be changed.
Modem check box	This is a special case. If a connection is to be established via a modem, you must activate this check box.

- | | |
|-------------------------|--|
| Dial delay | For modem connections only.
This is the delay time [s] before redialling if a connection attempt fails. |
| Connection delay | For modem connections only.
The maximum number of attempts to establish a connection. |

Proceed as follows:

- Check the communication parameters and change them as necessary.
- Click “Save” to save the changes.
- Click “Back” to quit the dialogue.

You will return to the Systemec service software start window.

6.2.3 Establishing a connection

- Click “Connect” to establish the connection to the device using the configured communication parameters.

If no connection can be established, an error message appears:



Fig. 9: Error message “No communication with the target device!”

- Click “OK”.
- Check the communication parameters as described above.

6.2.4 Main window

The functions to be executed using the Systemec service software can be selected in the main window.

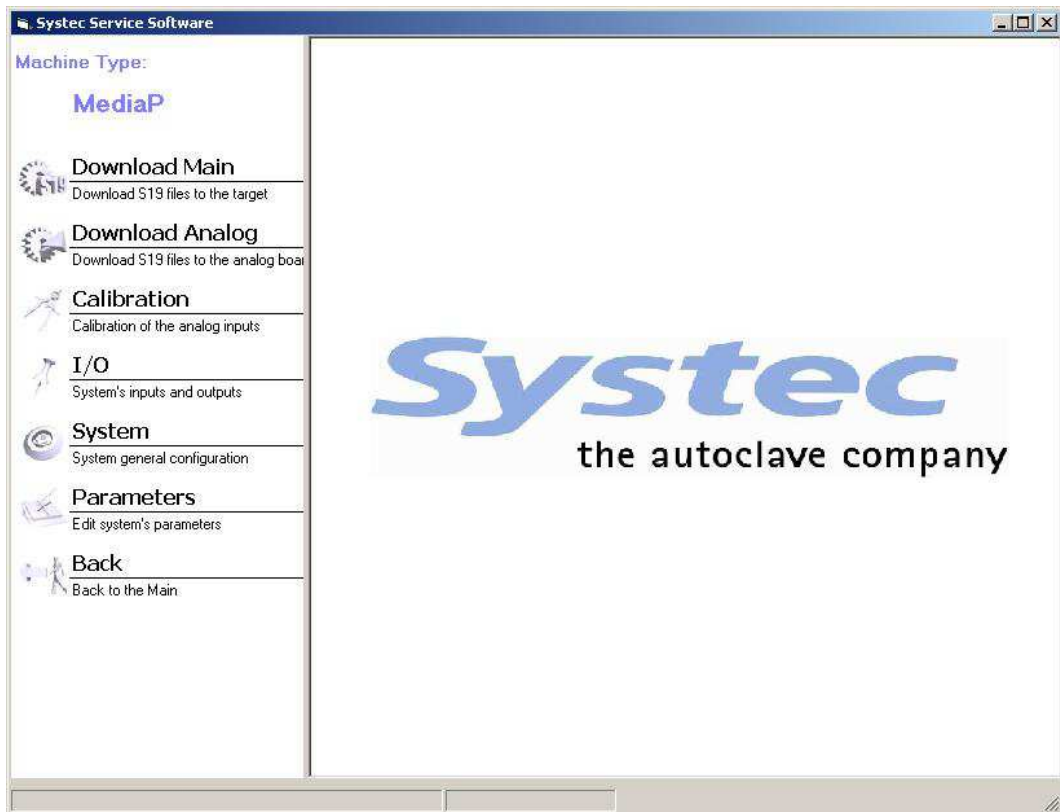


Fig. 10: Systemec service software main window

The Systemec device connected to the service software can be seen under “Machine Type”:

MediaP	Systemec MediaPrep 10 – 30
MediaPD	Systemec MediaPrep 45 – 120
SYSTEC	Systemec V/D series 40 – 200 (14 programs)
Rose-D	Systemec D-23

The following functions can be accessed by clicking the corresponding buttons:

- “Download Main”: Used to update the firmware on the digital circuit board
- “Download Analog”: Used to update the firmware on the analogue circuit board (D-23 autoclaves only)
- “Calibration”: Used to calibrate the analogue inputs
- “I/O”: Used to view and change the digital outputs, and view the analogue inputs

- “System”: Used to set the time and machine-specific parameters, view error logs and change the program names and access level in various languages
- “Parameters”: Used to view and alter the program parameters and global parameters
- “Back”: Used to return to the start window

6.2.5 Download Main

You can completely or partially overwrite the firmware on the digital circuit board. The following components can be changed:

- “Download Code”: Current software version
- “Download Parameters”: Program parameters
- “Download Text Strings”: Control unit texts

S19 files



To overwrite the firmware on the digital circuit board, you need corresponding data with new contents as a file. This has the suffix S19 and is supplied by Systemec (example: “MediaPD1002.S19”).

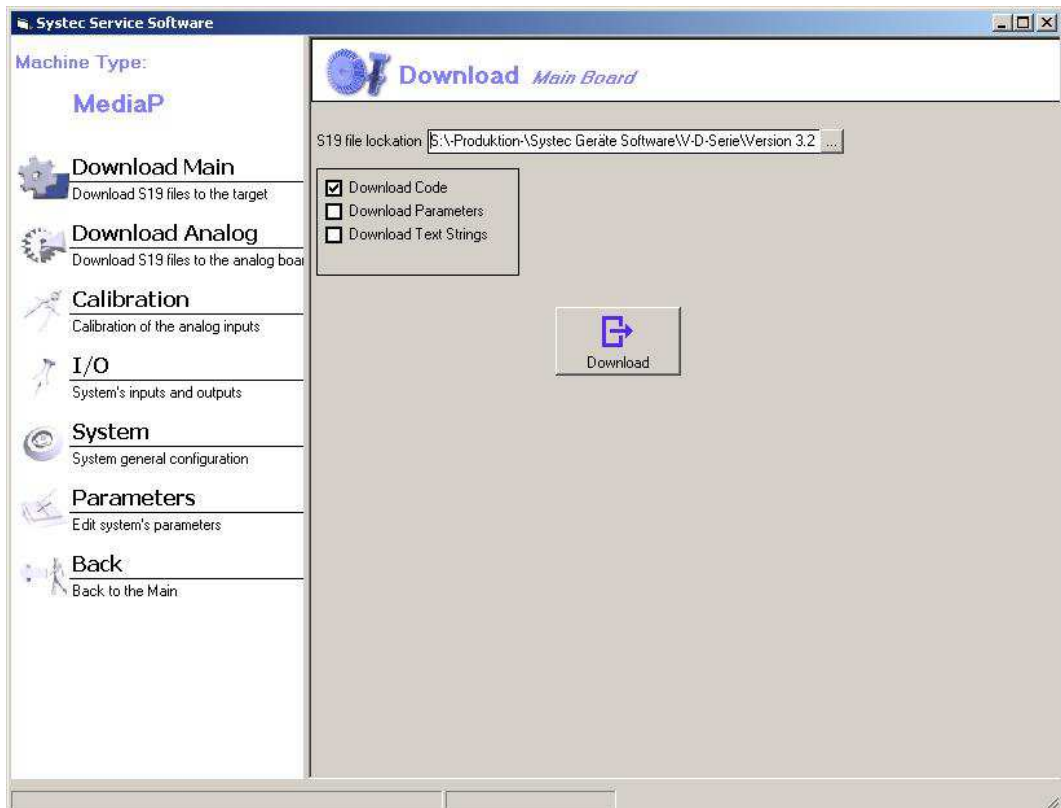


Fig. 11: Systemec service software: Download Main

Note the direction of communication



In the Systemec service software, **download** always means transmission from the PC to the device. The original data on the device is overwritten.

The following options are available:

S19 file location	Select the S19 file to be used. Click the associated button “...” to open a standard Windows file selection dialogue.
Download Code check box	If activated, the current software version is updated. If the code is updated without text strings, then the software version number is not changed. You may have to do this manually afterwards (see Hardware)!
Download Parameters check box	If activated, the entire current set of parameters is overwritten.
Download Text Strings check box	If activated, the control unit texts are replaced.

Proceed as follows:

- Select the S19 file.
- Select the parts of the firmware you want to update.
- Click “Download” to execute the update.

A progress bar appears where you can follow the progress of the download.

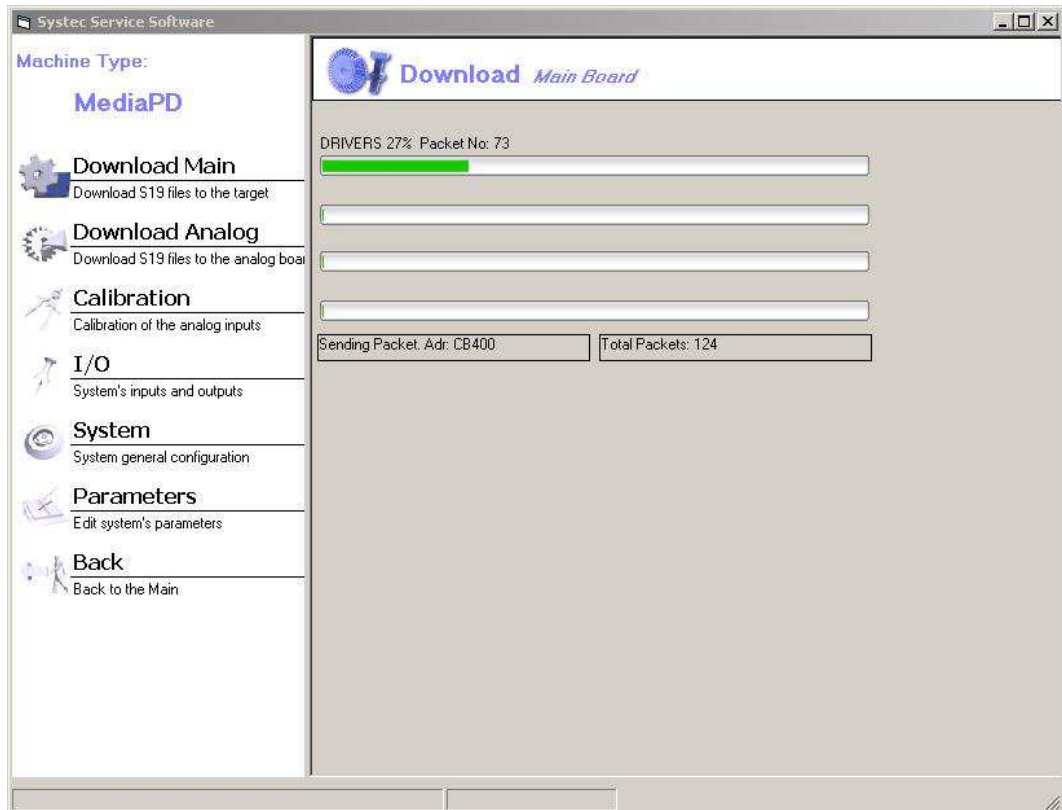


Fig. 12: Systemec service software: Download progress bar

Make sure that the messages are displayed correctly on the control unit!



After downloading new firmware, the language must be set again on the control unit in the *Service* menu. This ensures that all text messages are displayed correctly.

6.2.6 Download Analog (only for D-23)

On type D-23 autoclaves, you can overwrite the firmware on the analogue circuit board. An error message appears if this function is attempted on a different type of autoclave:

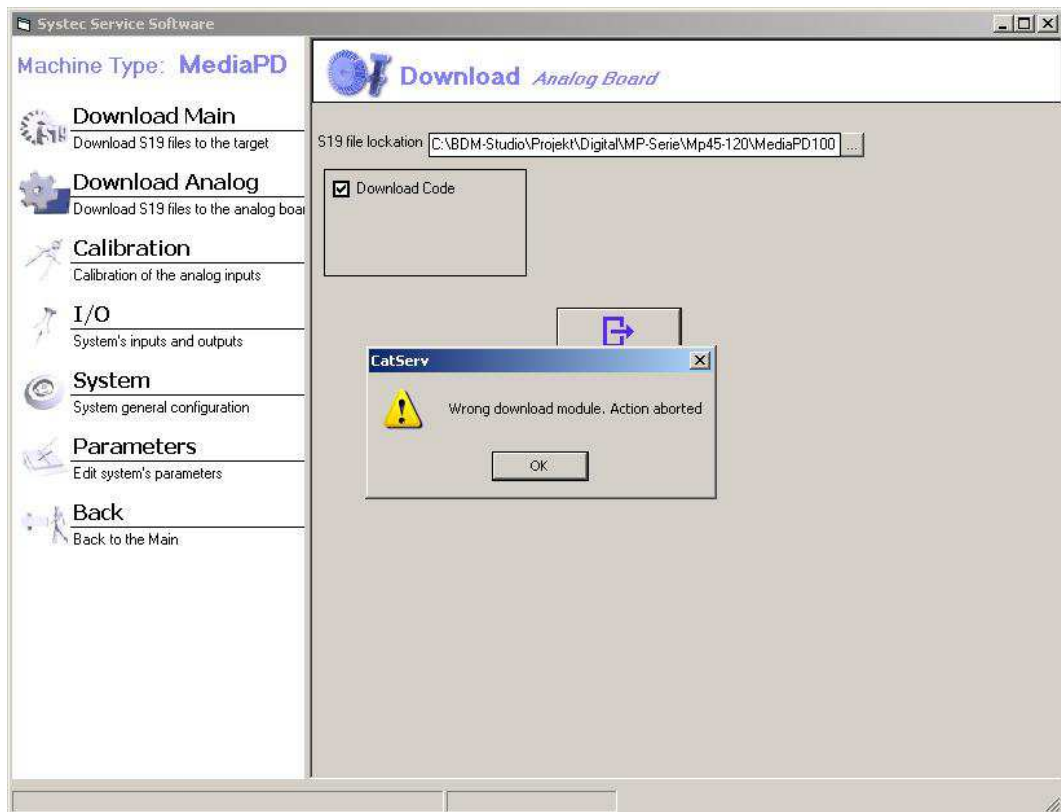


Fig. 13: Error message “Wrong download module. Action aborted”

6.2.7 Calibration

You can modify the calibration of the analogue device inputs.

The measurement range during the calibration must correspond to the conditions of use!

Temperature sensors do not measure in a completely linear manner. This means that the calibration is more exact the closer the calibration measurement comes to the actual subsequent use.



Systemec references:

- Pressure between 100 and 300 kPa
- Temperature between 80 °C and 130 °C
- Drain temperature between 20 °C and 80 °C

A two-point calibration is used:

Two reference measurements are taken at the lower (low value) and upper (high value) end of the required measurement range. These are compared with current measurements from the device and are aligned to the straight line interpolation by recalculating the gain and offset values.

The electrodes should not be calibrated!



The service dialogue also shows the measured values for the electrodes (Elect High, Elect Low). These values are for information only.

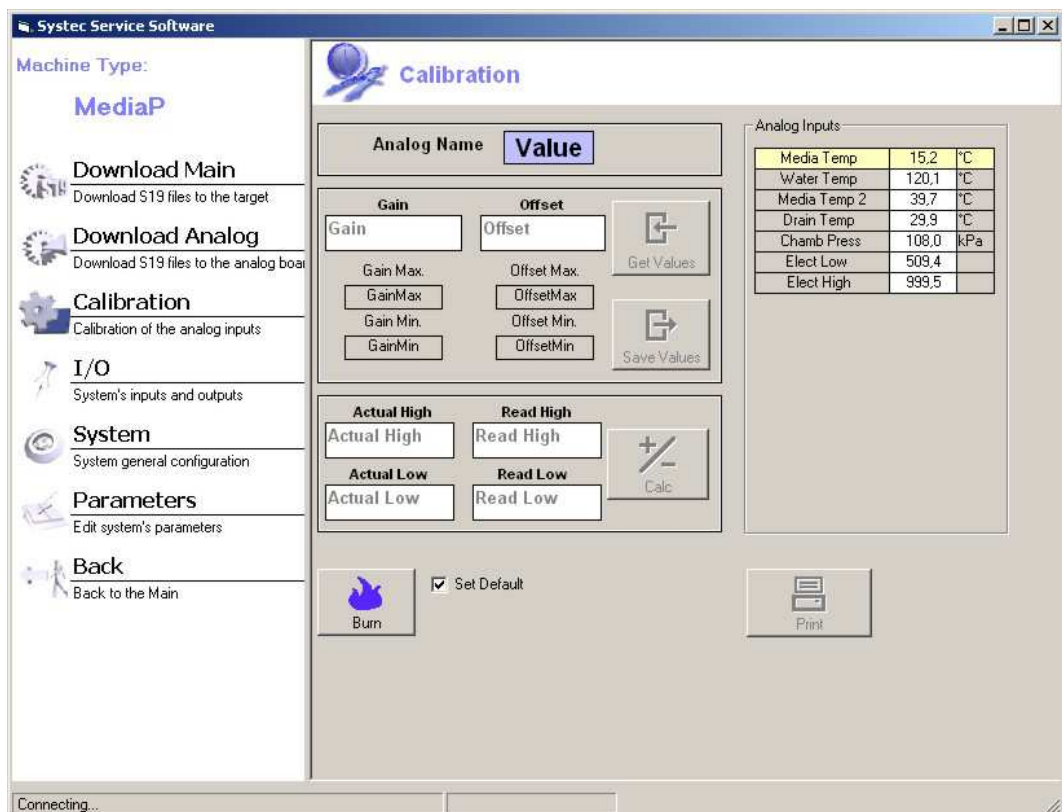


Fig. 14: Systemec service software: Calibration

The following options are available:

Analog Inputs table

Displays all sensors which can be selected for calibration by a double-click.

Do not calibrate the electrodes.

Gain

Current gain value of the selected sensor.

Offset

Current offset value of the selected sensor.

Get Values button	Transfers the gain and offset values of the selected sensor from the device to the PC.
Save Values button	Transfers the gain and offset values of the selected sensor from the PC to the device and stores them temporarily. The success of the calibration can be checked using the displayed value of the current measurement.
Gain Max.	Maximum gain value.
Gain Min.	Minimum gain value.
Offset Max.	Maximum offset value.
Offset Min.	Minimum offset value.
Actual High	Reference value of the high measurement using external test equipment.
Actual Low	Reference value of the low measurement using external test equipment.
Read High	Device value during the high measurement.
Read Low	Device value during the low measurement.
Calc button	Calculates the gain and offset values using the entered / displayed high and low values. Do not double-click the “Calc” button!
Burn button	Transfers all gain and offset values from the calibration into the non-volatile memory of the device.
Set Default check box	Unused (future use).
Print button	Prints the table of gain and offset values on the standard printer connected to the PC.

Carry out the calibration as follows:

- Select the sensor (analogue input) to be calibrated from the “Analog Inputs” table.

The current values for the gain and offset as well as the current device display value are shown.

Only change the gain and offset settings manually according to the specifications from Systemec!



The calibration of a sensor can be changed manually using the “Gain” and “Offset” fields.

- Click the “Get Values” button to load the gain and offset values for the selected sensor onto the PC.
- Enter the high and low values into the corresponding fields:
 - “Actual High”: Reference value of the high measurement using external test equipment.
 - “Read High”: Current device value during the high measurement. Double-click the field to accept the currently displayed value.
 - “Actual Low”: Reference value of the low measurement using external test equipment.
 - “Read Low”: Current device value during the low measurement. Double-click the field to accept the currently displayed value.
- Click the “Calc” button.

Do not double-click!

The calculation is carried out with a single click on the “Calc” button.

Double-clicking the button will lead to an incorrect calibration as the calculation is then carried out twice.

The newly calculated gain and offset values are displayed.

- Click the “Save Values” button to transfer the new gain and offset values into the temporary memory of the device.

The current measured value on the device is updated to match the new straight line interpolation. You can check the success of the calibration using the displayed value.

- Calibrate the next sensor as described above.
- After all sensors have been calibrated, click the “Burn” button.

The new calibration is written to the device's non-volatile memory and is then available for use.

6.2.8 I/O

You can view the digital outputs of the device (“go to auto mode”, see Fig. 15:) and temporarily set them (“go to manual mode”, see Fig. 15:).

Manually setting digital outputs in the device is applied immediately, and bypasses all safety mechanisms otherwise used!



Carelessness when making changes can lead to material damage and serious injuries. Ensure that any alterations will not pose any hazards.

For example, the safety mechanisms for protecting the heating elements and pumps are switched off.

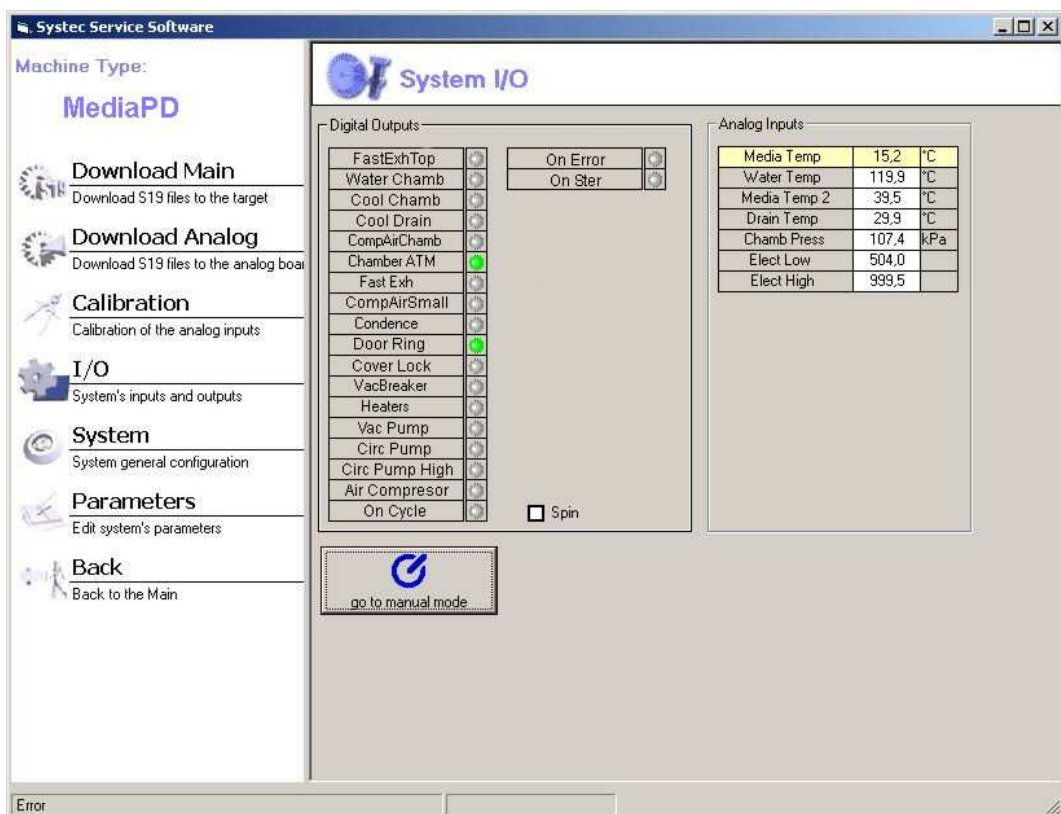


Fig. 15: Systemec service software: I/O

Make sure that auto mode is activated before exiting this dialogue



The device controller only monitors the outputs after the device is returned to auto mode, thus guaranteeing safe operation.

Auto mode is automatically activated!



Auto mode is activated automatically when the device is switched on and off.

The following options are available:

Digital Outputs table

Displays the state of each digital output (●: Off (grey), ●: On (green)).

In manual mode, double-click the status display to switch the corresponding output on or off.

Analog Inputs table

Displays the current values of the analogue inputs.

Go to manual mode / go to auto mode button

Switches between auto mode (digital outputs correspond to the program status of the device) and manual mode.

Always reactivate auto mode before exiting the dialogue in order to return control to the device controller!

Spin check box

Switches all digital outputs on and off in succession for testing purposes.

6.2.9 System

You can select individual device data parameters and change them manually. These are:

- “Clock”, to set the time
- “Hardware”, to set the machine-specific parameters
- “Errors”, to view and print out the last ten errors
- “Programs”, to view and edit the program names and access level

Clock

Click “Clock” to synchronise the time on the device with the time on the PC.

A dialogue appears with the following options.

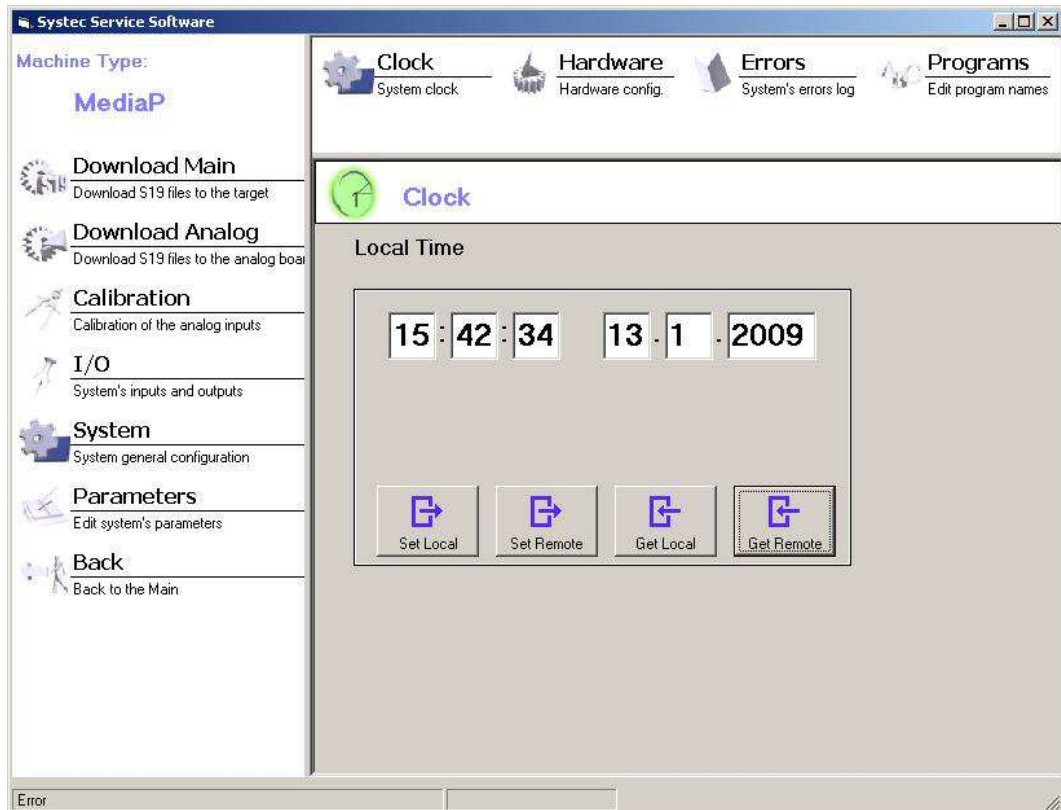


Fig. 16: Systemec service software: Clock

The following options are available:

- | | |
|--------------------------|---|
| Local Time | The current time and date are displayed. When the dialogue is called up, this is the current system time on the PC. You can change the values manually. |
| Set Local button | The values shown in the “Local Time” fields overwrite the current system time from the connected PC. |
| Set Remote button | The values shown in the “Local Time” fields overwrite the current system time of the device. |
| Get Local button | The values shown in the “Local Time” fields are overwritten by the current system time from the connected PC. |
| Get Remote button | The values shown in the “Local Time” fields are overwritten by the current system time of the device. |

Hardware

Click “Hardware” to check and modify the serial number, the firmware version number, the batch number and the filter counter value, as well as to test the communication hardware.

A dialogue opens with the following options:

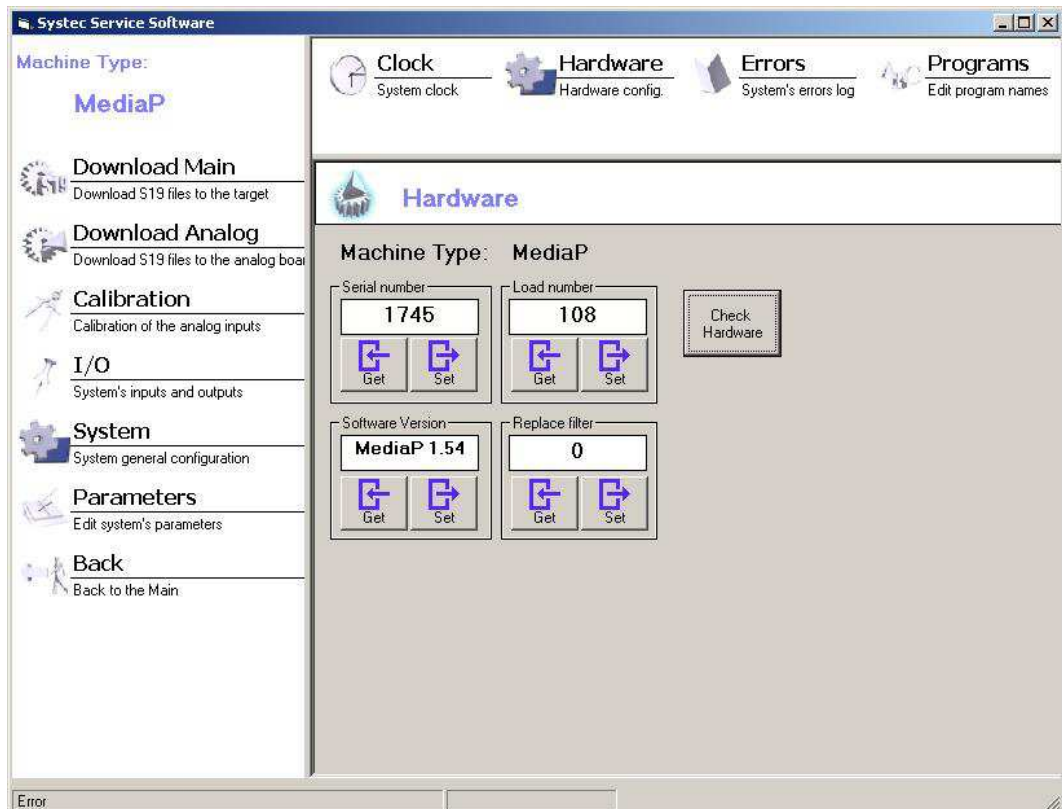


Fig. 17: Systemec service software: Hardware

The following options are available:

- | | |
|-------------------------|---|
| Serial number | The serial number of the device is displayed. You can change the value manually. |
| Get button | The value stored in the device overwrites the displayed serial number. |
| Set button | The displayed value overwrites the serial number stored in the device. |
| Software Version | The firmware version of the device is displayed. You can change the value manually. |
| | If you have updated the software version (see “Download Main”), then you may have to manually change this value. |
| Get button | The value stored in the device overwrites the displayed software version number. |

Set button	The displayed value overwrites the software version number stored in the device.
Load number	The batch number of the device is displayed. You can change the value manually.
Get button	The value stored in the device overwrites the displayed batch number.
Set button	The displayed value overwrites the software batch number stored in the device.
Replace filter	The filter counter value (the number of sterilisation cycles with this filter) is displayed. You can change the value manually.
Get button	The value stored in the device overwrites the displayed number of sterilisation cycles with this filter.
Set button	The displayed value overwrites the number of sterilisation cycles with this filter stored in this device.
Check Hardware button	The function of all memory devices attached to the internal bus is tested.

If the hardware check fails, this may be due to the following:

- EEPROM of the analogue circuit board
- EEPROM of the extension board (if present)
- Ribbon cable between the two boards

Errors

Select "Errors" to see a list to the ten most recent errors. You can save this as an rtf file and print it out.

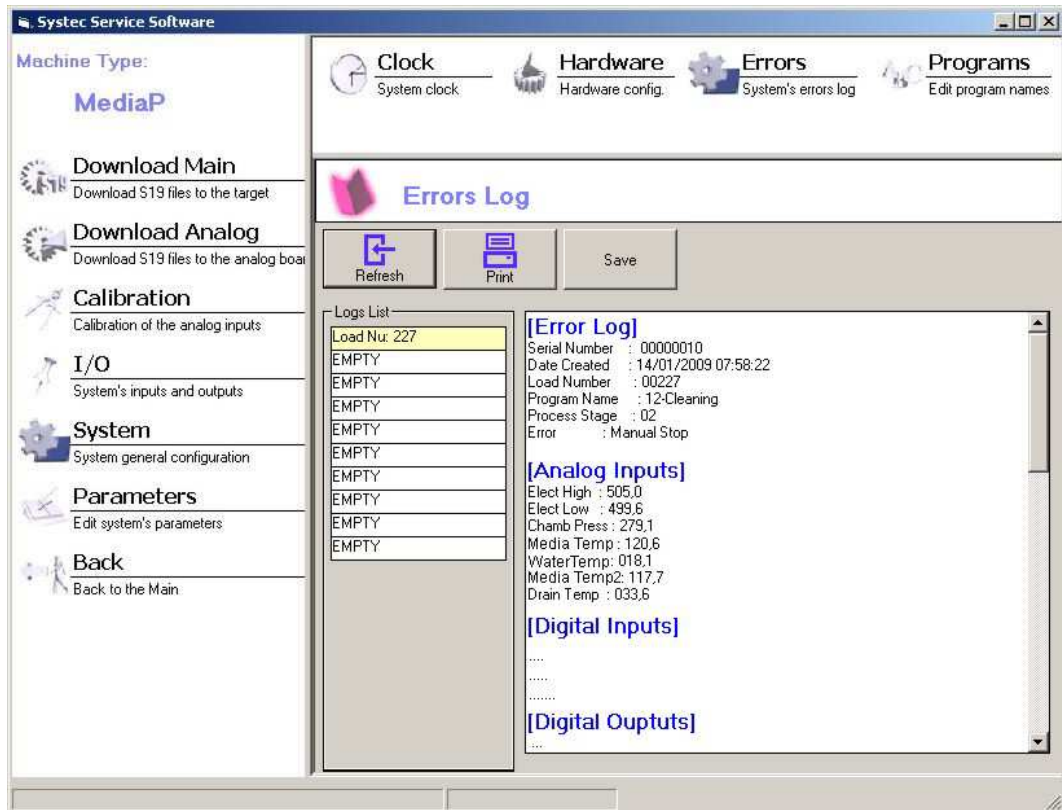


Fig. 18: Systemec service software: Errors

The following options are available:

- | | |
|-----------------------|---|
| Refresh button | Refreshes the error list. |
| Print button | Prints out the error log of the selected error. |
| Save button | Saves the error log as an rtf file. |
| Logs List | Shows the batch numbers of the last ten errors. Select an error here to see the corresponding error log in the field beside it. |

Programs

The program names can be displayed and modified. The following options are available:

- Select the language.
- Display and modify the program names for a selected language.
- Display and change the access level for each program.

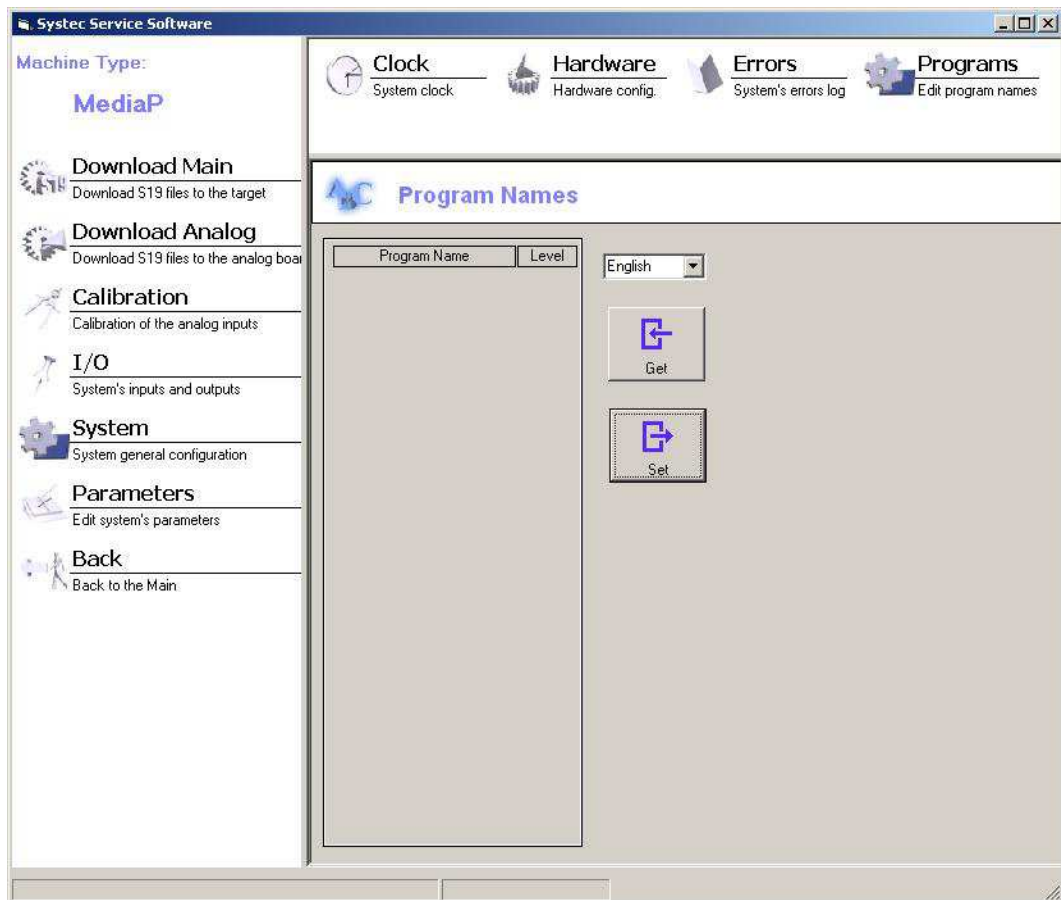


Fig. 19: Systemec service software: Programs

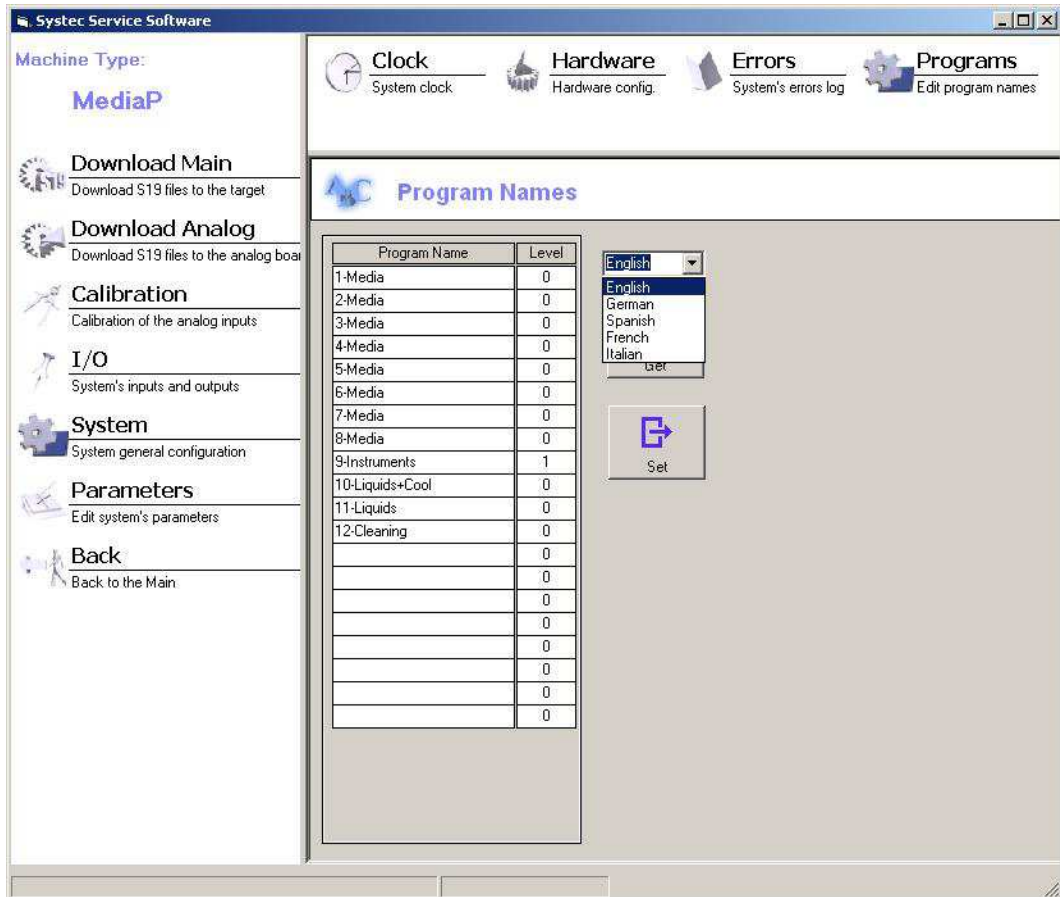


Fig. 20: Systemec service software: Programs, language-specific table of program names

The following options are available:

- Language list box** Selects the language in which the table of program names should be displayed.
- Program Name column** Displays and changes the name of the selected program.
- Level column** Displays and changes the access level of the selected program in the selected language.
- Get button** Imports the list of program names from the device.
- Set button** Overwrites the list of program names in the device with the table of program names in its volatile memory.

Proceed as follows to change the program names and access level:

- Select the language for which you want to make changes.
- Click “Get” to transfer the values for the selected language from the device to the PC.
- Make the required changes.

Do not use any special characters!



When naming programs, only use the English ASCII character set without umlauts, points or colons.

The access level of the programs can be individually configured for every language!



Therefore, ensure that the change is made for all languages when changing an access level for a program.

- Click “Set” to apply the changes to the selected language.

Your changes to the selected language are now available for use.

Make sure that the messages are displayed correctly on the control unit!



The control unit uses a copy of the text messages in the language selected for display. These messages are obtained from the memory on the digital circuit board when selecting the language.

The display will not match the new firmware after the download. This can lead to operation errors with serious consequences. Always reload the desired display language after the download.

- Carry out the required changes as described above for the next language.

6.2.10 Parameters

You can view a list of all device parameters to check and modify individual parameter values specifically (for the meaning of the parameters, see chapter 8).

The following views are available:

- Program parameters (“Cycle”, see Fig. 22:)
- Global parameters (“Global”, see Fig. 24:)

For each view, you can choose between a short and a long view of the parameter tables. In the long view, the minimum, maximum and default values are displayed in addition to the value itself (see Fig. 23: or Fig. 25:). The default values are planned for future use and are currently not used.

You can manually change the value of every parameter in the table and then download them to the device.

All parameters are overwritten in each case!



Therefore, note the following sequence for modifying individual parameters:

- Firstly, upload the set of parameters from the device
- Make any changes required
- Finally, download the changed set of parameters back to the device

You can also save complete parameter sets as mdb files on the PC for subsequent reuse.

mdb files



The file type for the parameter sets corresponds to the data format for Microsoft Access. These have the suffix mdb and should only be used with the Systemec service software.

Note the direction of communication!



In the Systemec service software, **download** always means transmission from the PC to the device. The original data on the device is overwritten.

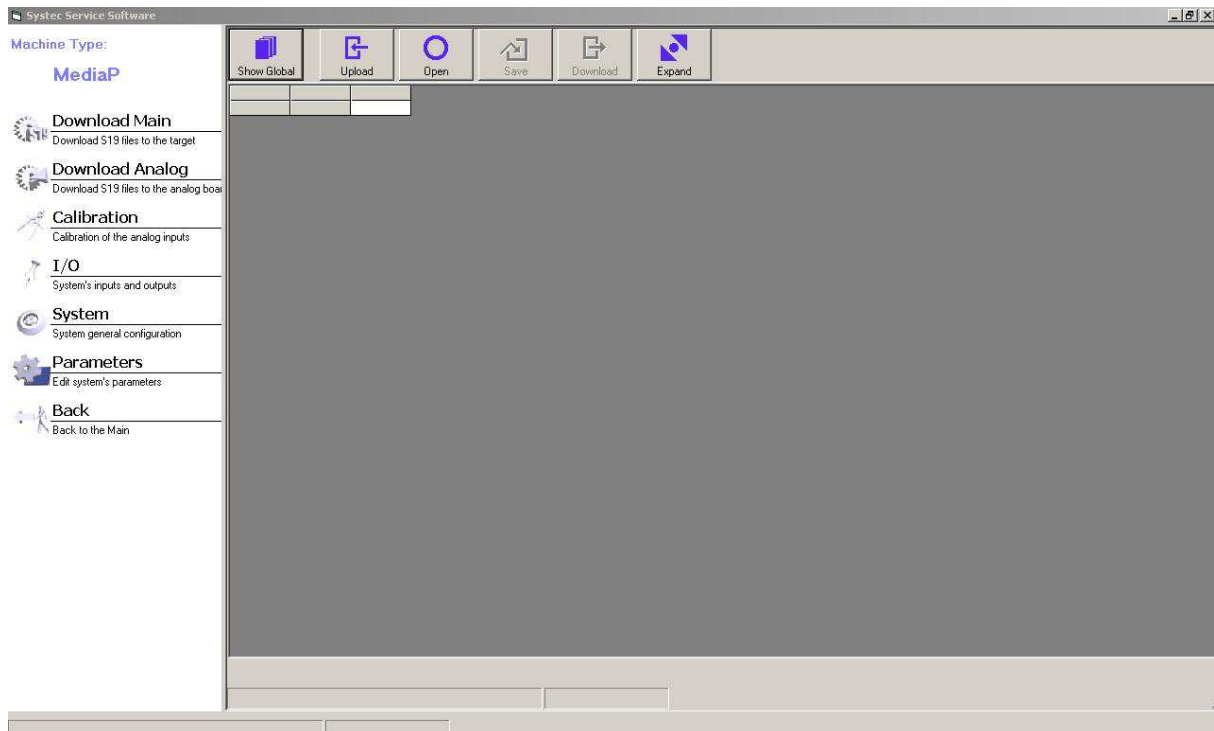


Fig. 21: Systemec service software: Parameters

The following options are available:

Show Global/ Show Cycle button	Switches the view between cycle and global.
Upload button	Loads the current set of parameters from the device to the PC.
Open button	Loads a set of parameters stored on the PC (mdb file).
Save button	Saves the current set of parameters on the PC (mdb file).
Download button	Writes the current set of parameters to the device memory.
Expand / Shrink button	Switches between the short and long view.
Parameter table	The displayed parameters can be changed manually.

		1-Media	2-Media	3-Media	4-Media	5-Media	6-Media	7-Media	8-Media
HeatTime1	Value	0	1500	5	0	0	0	900	7
StayTime1	Value	0	0	1500	5	0	0	0	5
StayTemp1	Value	30	0	0	1500	5	0	0	0
StayPrsAdd1	Value	400	30	0	0	1500	5	0	0
HeatTime2	Value	0	400	30	0	0	1500	5	0
StayTime2	Value	0	0	400	30	0	0	1500	0
StayTemp2	Value	30	0	0	400	30	0	0	15
StayPrsAdd2	Value	150	30	0	0	400	30	0	0
HeatSterTime	Value	0	150	30	0	0	400	30	0
PrintTime	Value	300	0	150	30	0	0	400	0
N/A	Value	7	300	0	150	30	0	0	4
HeatTimeOut	Value	300	7	300	0	150	30	0	0
HighTempLim	Value	1400	300	7	300	0	150	30	0
SterTemp	Value	1210	1400	300	7	300	0	150	0
SterTime	Value	15	1210	1400	300	7	300	0	1
LimPrsAdd	Value	200	15	1210	1400	300	7	300	0
LimTempAdd	Value	10	200	1	1210	1400	300	7	3
N/A	Value	5	10	200	15	1210	1400	300	0
SterPrintT	Value	30	5	10	200	15	1210	1400	3
WaterEledC	Value	0	30	5	10	200	15	1210	14
N/A	Value	0	0	30	5	10	200	15	12
N/A	Value	100	0	0	30	5	10	200	2
N/A	Value	2	100	0	0	30	5	10	0
N/A	Value	50	2	100	0	0	30	5	0
TempMaxErr	Value	35	50	2	100	0	0	30	0
TempMinErr	Value	10	35	50	2	100	0	0	0
PressMaxErr	Value	500	10	35	50	2	100	0	0
PressMinErr	Value	100	500	10	35	50	2	100	0
TempMaxTime	Value	20	100	500	10	35	50	2	1
TempMinTime	Value	20	20	100	500	10	35	50	0
PressMaxTime	Value	20	20	20	100	500	10	35	0
PressMinTime	Value	20	20	20	20	100	500	10	0
SterPressAdd	Value	20	20	20	20	20	100	500	0
ExhMode	Value	5	20	20	20	20	20	100	5
EndTemp	Value	460	5	20	20	20	20	20	1
CryPrsAddF	Value	110	460	5	20	20	20	20	0

Fig. 22: Systemec service software: Parameters, cycle view (short display)

		1-Media	2-Media	3-Media	4-Media	5-Media	6-Media	7-Media	8-Media
HeatTime1	Value	0	1500	5	0	0	0	900	7
HeatTime1	Min	0	0	0	0	0	0	0	0
HeatTime1	Max	9999	3000	300	3	1	9999	950	0
HeatTime1	Default	360	1500	5	0	0	0	450	7
StayTime1	Value	0	0	1500	5	0	0	0	5
StayTime1	Min	0	0	0	0	0	0	0	0
StayTime1	Max	9999	9999	3000	300	3	1	9999	5
StayTime1	Default	30	360	1500	5	0	0	0	4
StayTemp1	Value	30	0	0	1500	5	0	0	0
StayTemp1	Min	30	0	0	0	0	0	0	0
StayTemp1	Max	1300	9999	9999	3000	300	3	1	95
StayTemp1	Default	1100	30	360	1500	5	0	0	0
StayPrsAdd1	Value	400	30	0	0	1500	5	0	0
StayPrsAdd1	Min	0	30	0	0	0	0	0	0
StayPrsAdd1	Max	2000	1300	9999	9999	3000	300	3	0
StayPrsAdd1	Default	400	1100	30	360	1500	5	0	0
HeatTime2	Value	0	400	30	0	0	1500	5	0
HeatTime2	Min	0	0	30	0	0	0	0	0
HeatTime2	Max	9999	2000	1300	9999	9999	3000	300	0
HeatTime2	Default	240	400	1100	30	360	1500	5	0
StayTime2	Value	0	0	400	30	0	0	1500	0
StayTime2	Min	0	0	0	30	0	0	0	0
StayTime2	Max	9999	9999	2000	1300	9999	9999	3000	3
StayTime2	Default	120	240	400	1100	30	360	1500	0
StayTemp2	Value	30	0	0	400	30	0	0	15
StayTemp2	Min	30	0	0	0	30	0	0	0
StayTemp2	Max	1300	9999	9999	2000	1300	9999	9999	30
StayTemp2	Default	1150	120	240	400	1100	30	360	15
StayPrsAdd2	Value	150	30	0	0	400	30	0	0
StayPrsAdd2	Min	0	30	0	0	0	30	0	0
StayPrsAdd2	Max	2000	1300	9999	9999	2000	1300	9999	95
StayPrsAdd2	Default	400	1150	120	240	400	1100	30	3
HeatSterTime	Value	0	150	30	0	0	400	30	0
HeatSterTime	Min	0	0	30	0	0	0	30	0
HeatSterTime	Max	9900	2000	1300	9999	9999	2000	1300	95
HeatSterTime	Default	360	400	1150	120	240	400	1100	0

Fig. 23: Systemec service software: Parameters, cycle view (long display)

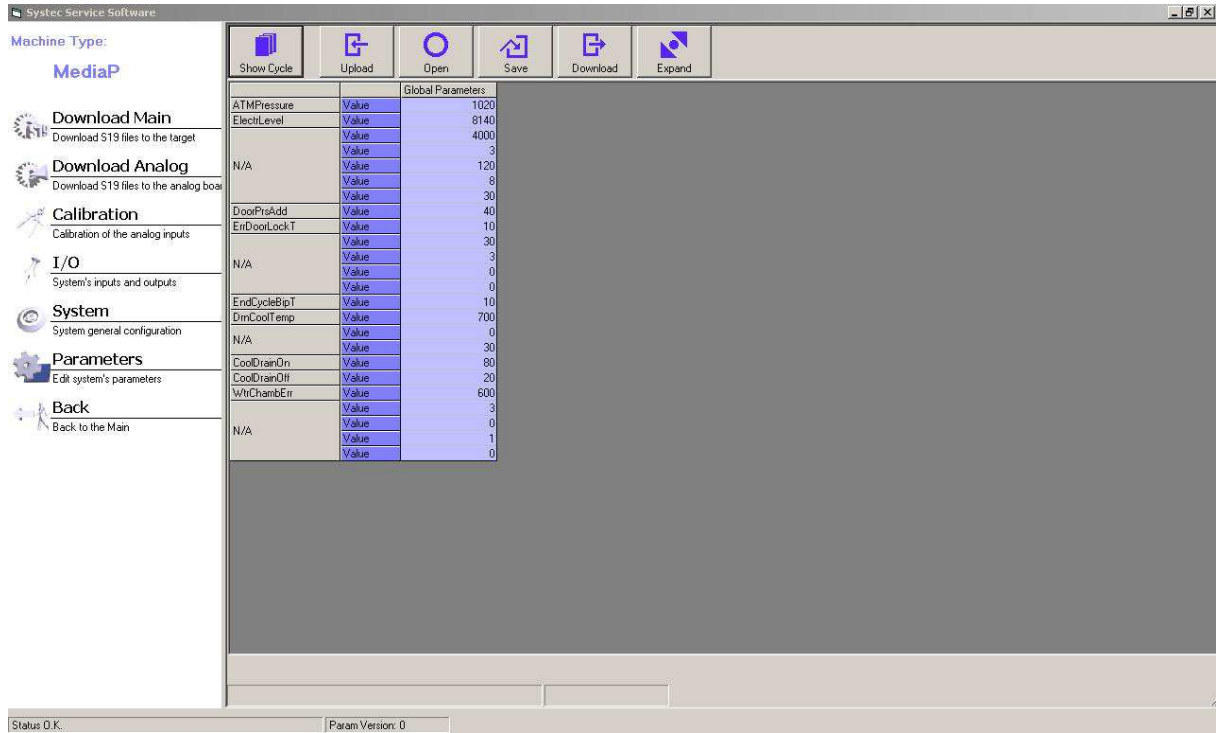


Fig. 24: Systemec service software: Parameters, global view (short display)

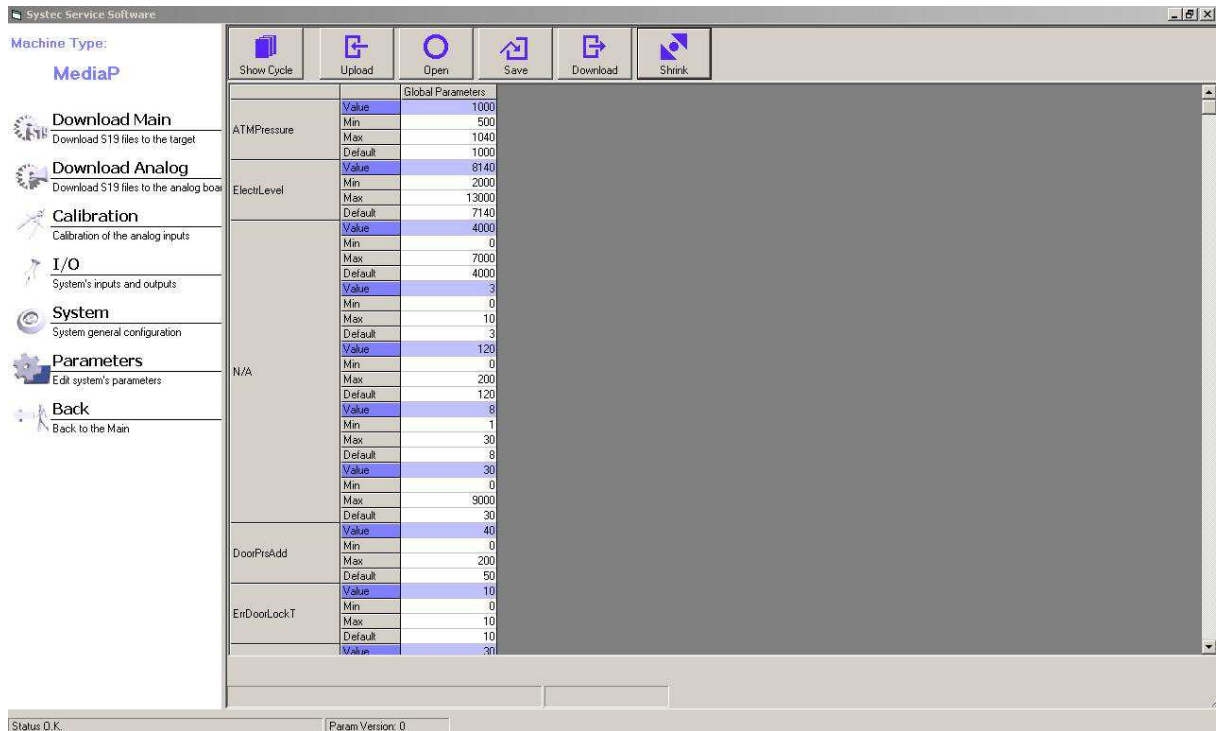


Fig. 25: Systemec service software: Parameters, global view (long display)

7 TROUBLESHOOTING

Aim of this chapter

This chapter is a guide to troubleshooting. It contains troubleshooting diagrams to help you locate the source of the error step-by-step.

Contents

7.1 Reset 2

7.2 Logs..... 3

7.3 Troubleshooting..... 4

7.3.1 System start 1 4

7.3.2 System start 2..... 5

7.3.3 Error message: High Gen.Press..... 6

7.3.4 Error message: Water pump error 7

7.3.5 Error message: No chamb water 7

7.3.6 Error message: No Demin.Water 8

7.3.7 Error message: Low steam..... 9

7.3.8 Error message: No Gen.Water 10

7.3.9 Error message: No Tap Water..... 10

7.3.10 Error message: Low vacuum 11

7.3.11 Error message: Comp.air error 12

7.3.12 Error message: Ring sw. error..... 13

7.3.13 Error message: Door sw. error 14

7.3.14 Error message: Sensor Error..... 15

7.3.15 Error message on D-23: Door lock error 16

7.3.16 Error message on D-23: Door unlock error 16

7.3.17 Error message on D-23: Door switch error..... 17

7.1 Reset

Only carry out a reset at atmospheric chamber pressure!



The reset function may only be used when at atmospheric chamber pressure (max. 10 kPa above atmospheric pressure).

If the program sequence falters, the controller software can be reset:

- The control unit is returned to its basic state.
- Program 1 is selected.
- In the event of excess pressure, the atmosphere valve is opened.
- If there is a vacuum, the vacuum breaker is activated.
- The cover can be opened once atmospheric conditions are reached, regardless of the temperature measured inside the device.

There is a risk of explosion if there is fluid in the device at temperatures above 80 °C!



Do not perform a reset if there are hot fluids in the device – let the device cool down gradually first.

Hint



If there is excess pressure in the device, go to `Menu > Service > Manual output > Set` before resetting and activate the fast exhaust valve to let out the excess pressure.

Procedure:

- Turn off the device using the main switch.
- Press and hold the right display button.
- Turn on the device using the main switch.
- The display first shows the message `Systemec Autoclaves`, followed by `Reset!!!`.
- Release the right display button within one second.

7.2 Logs

The process log and error log can be viewed as follows:

- Press the `Menu` button in the basic state to access the main menu.

Use the arrow buttons to select the desired menu item and press `Set` to confirm.

- Select `Service -> Memory -> Logs`.

The following submenus are available here:

Process Log: Shows a list of the last ten sterilisation cycles.

- Select the batch number.
- Press `Set` to print this batch.

Error Log: Shows a list of the stored error messages.

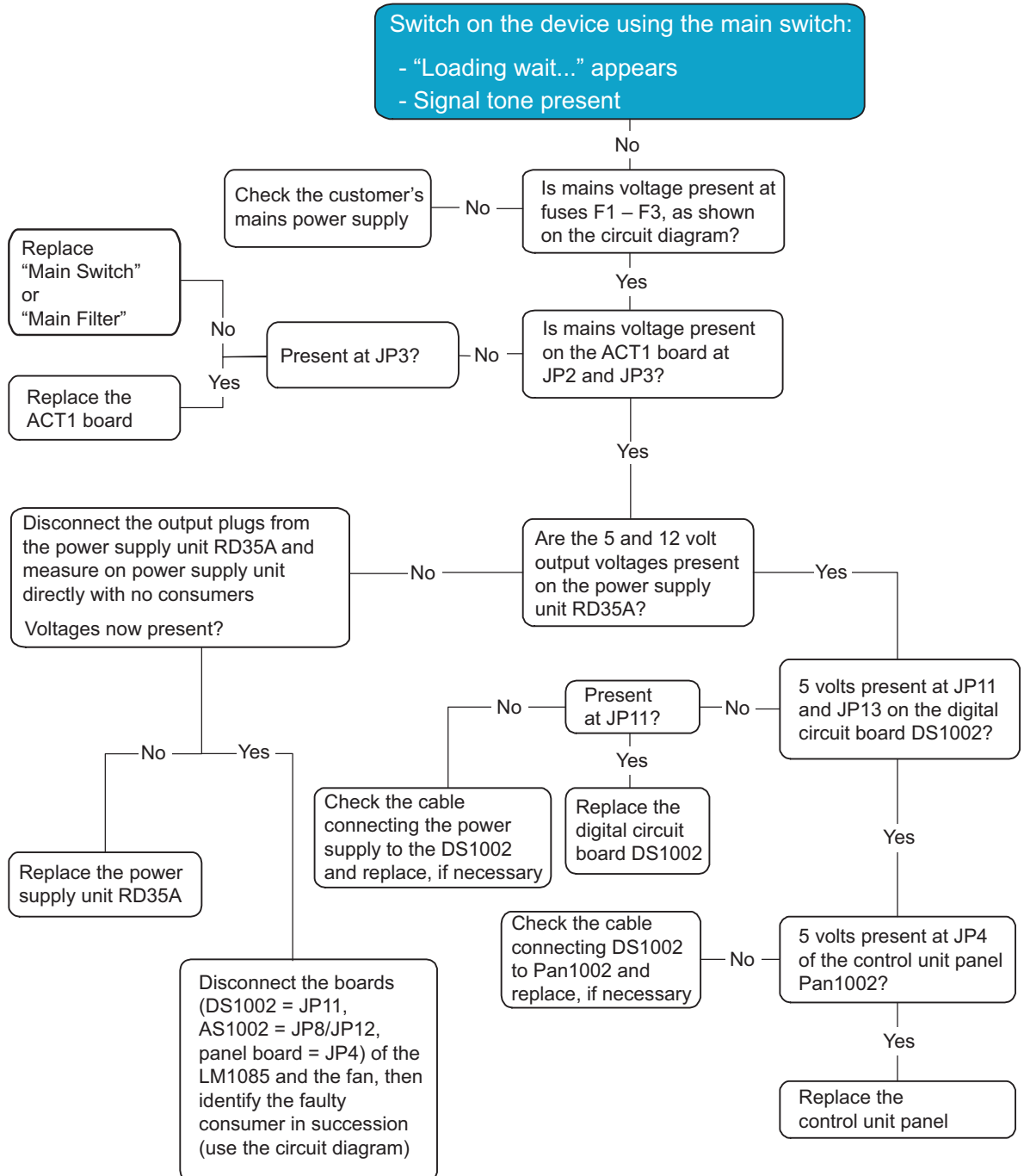
- Select an error message.

The following menu items appear, showing the state at the time of the error:

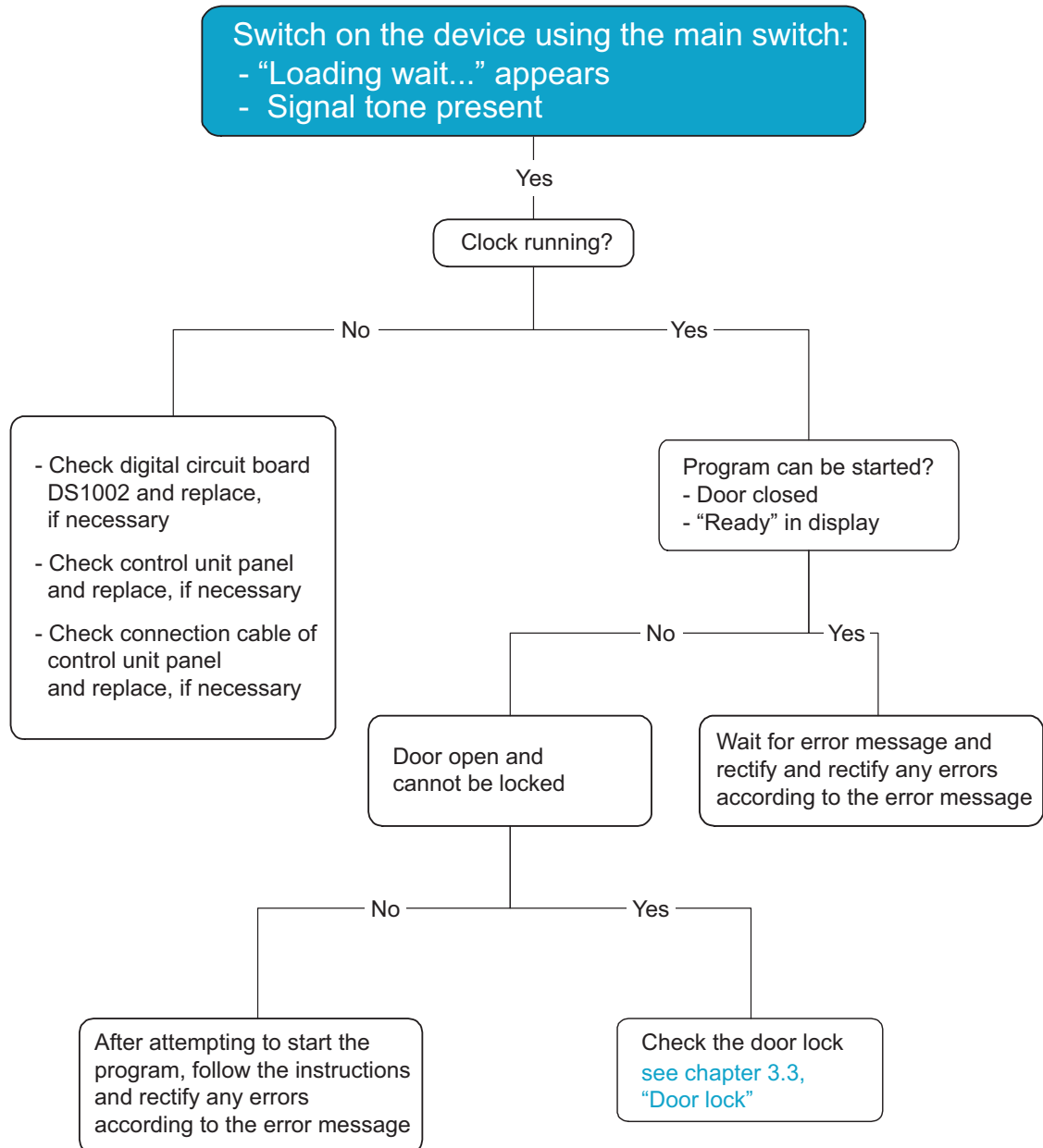
- General info
- Analog inputs
- Digital inputs
- Digital outputs

7.3 Troubleshooting

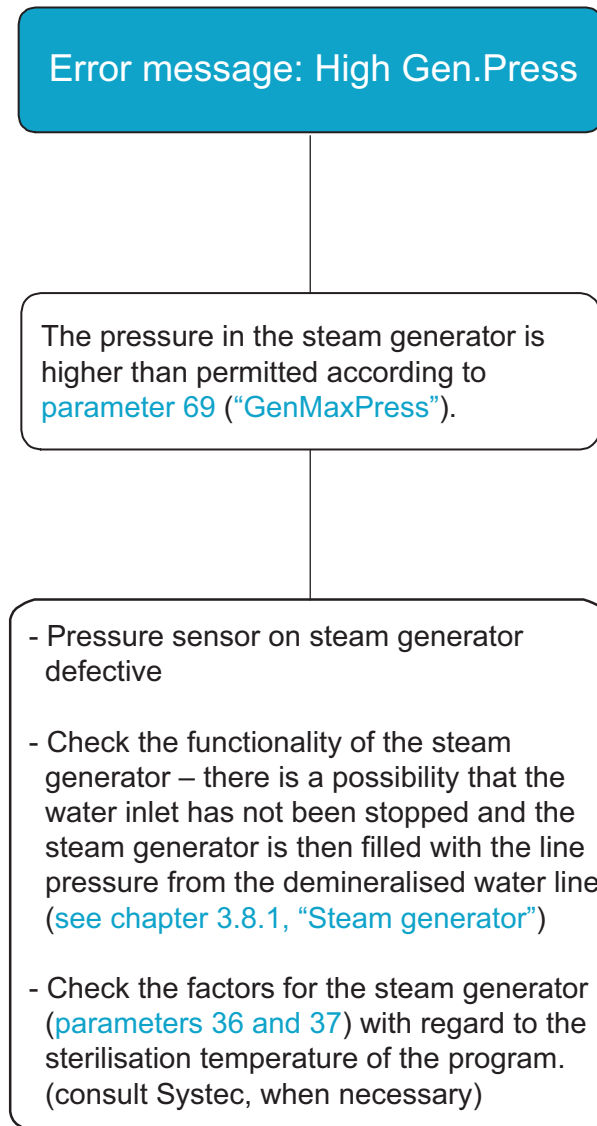
7.3.1 System start 1



7.3.2 System start 2



7.3.3 Error message: High Gen.Press



7.3.4 Error message: Water pump error

Error message: Water pump error

No water detected at the high electrode of the generator after approx. 2 minutes (parameter 70, "GenWtrErrT")

- Defective electrode
- Check the steam generator (see chapter 3.8.1, "Steam generator")

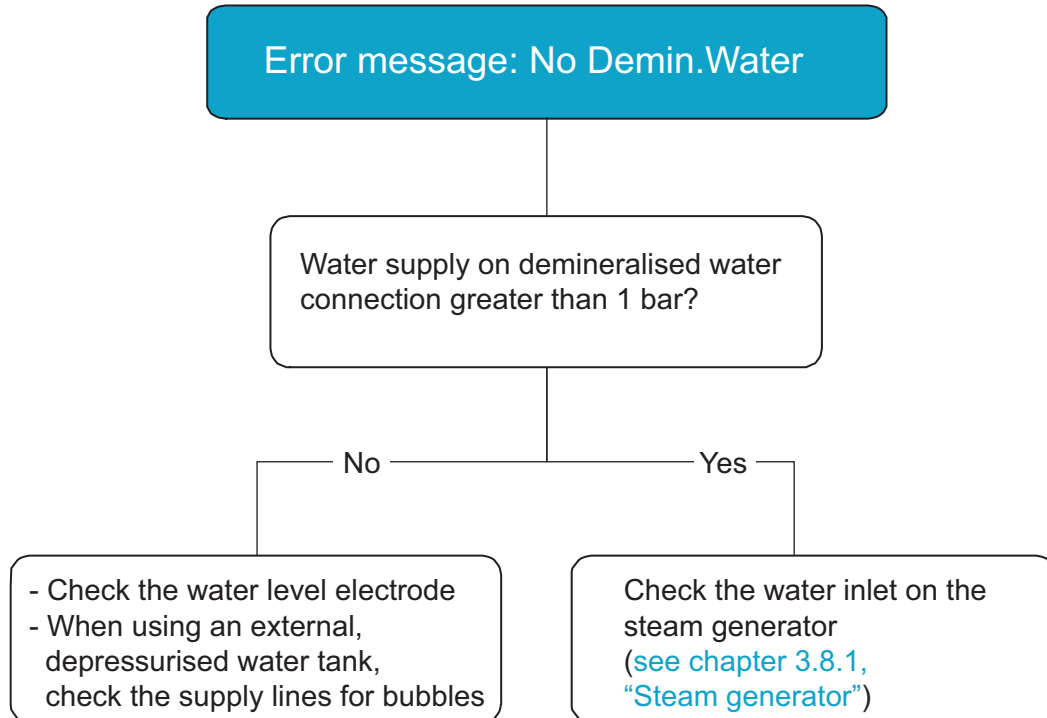
7.3.5 Error message: No chamb water

Error message: No chamb water

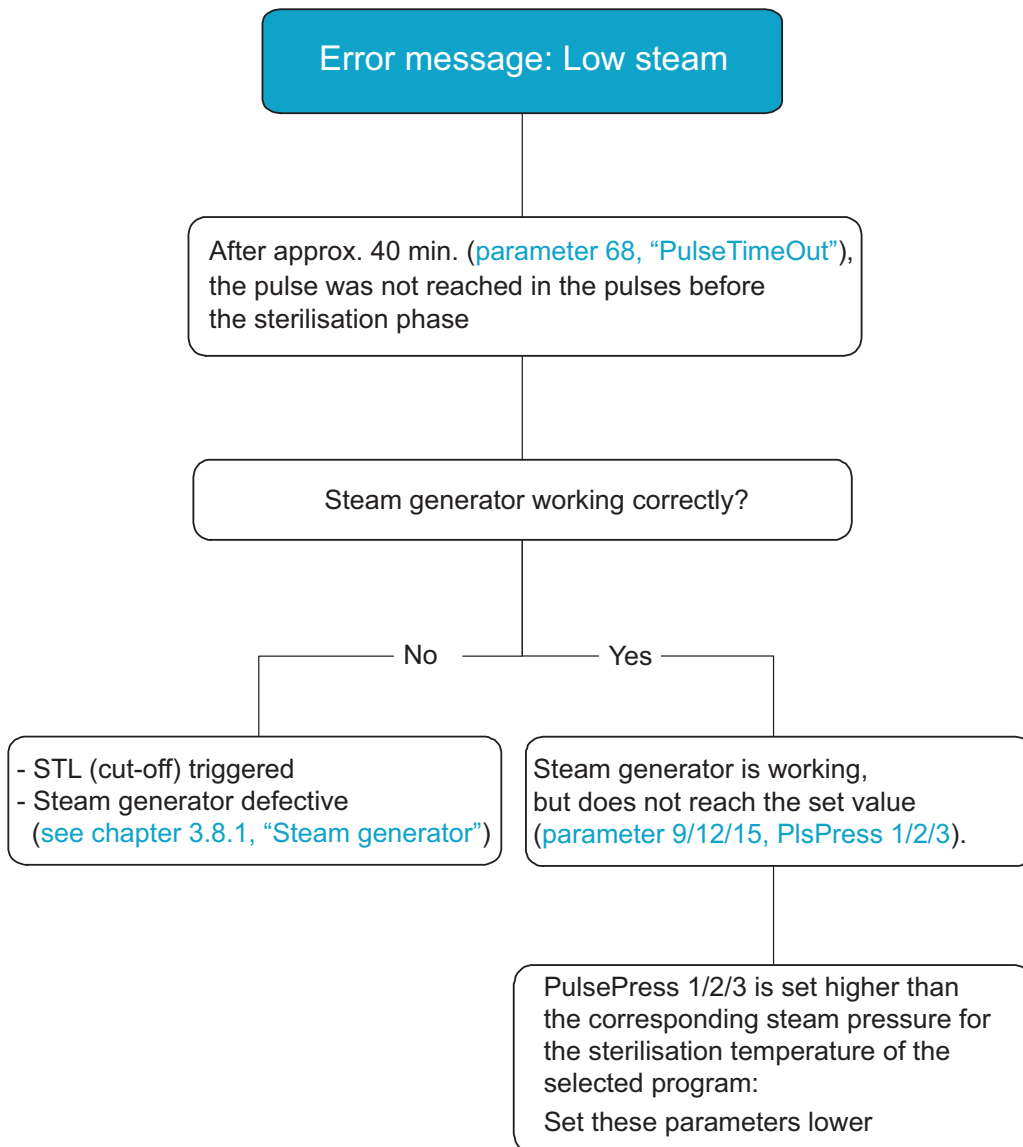
No water has been measured at the water level electrode (E3) of the sterilisation chamber approx. 5 minutes (parameter 94, "WtrChambErr") after the program starts

- Check function and cleanliness of water inlet valve
- Check and clean the strainer
- Check the water level electrode

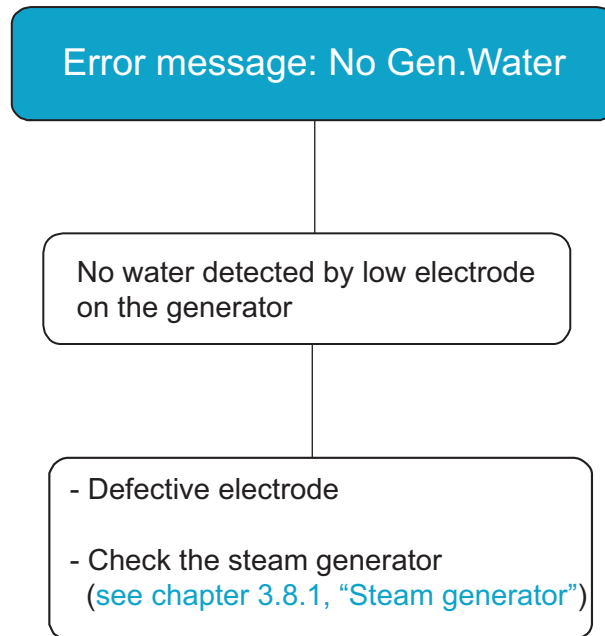
7.3.6 Error message: No Demin.Water



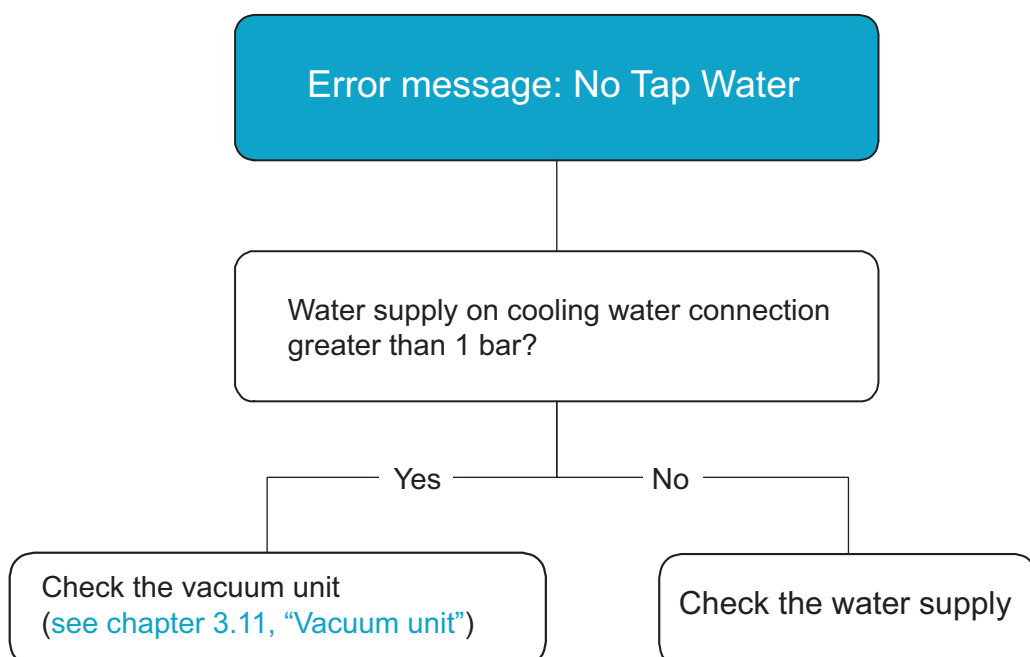
7.3.7 Error message: Low steam



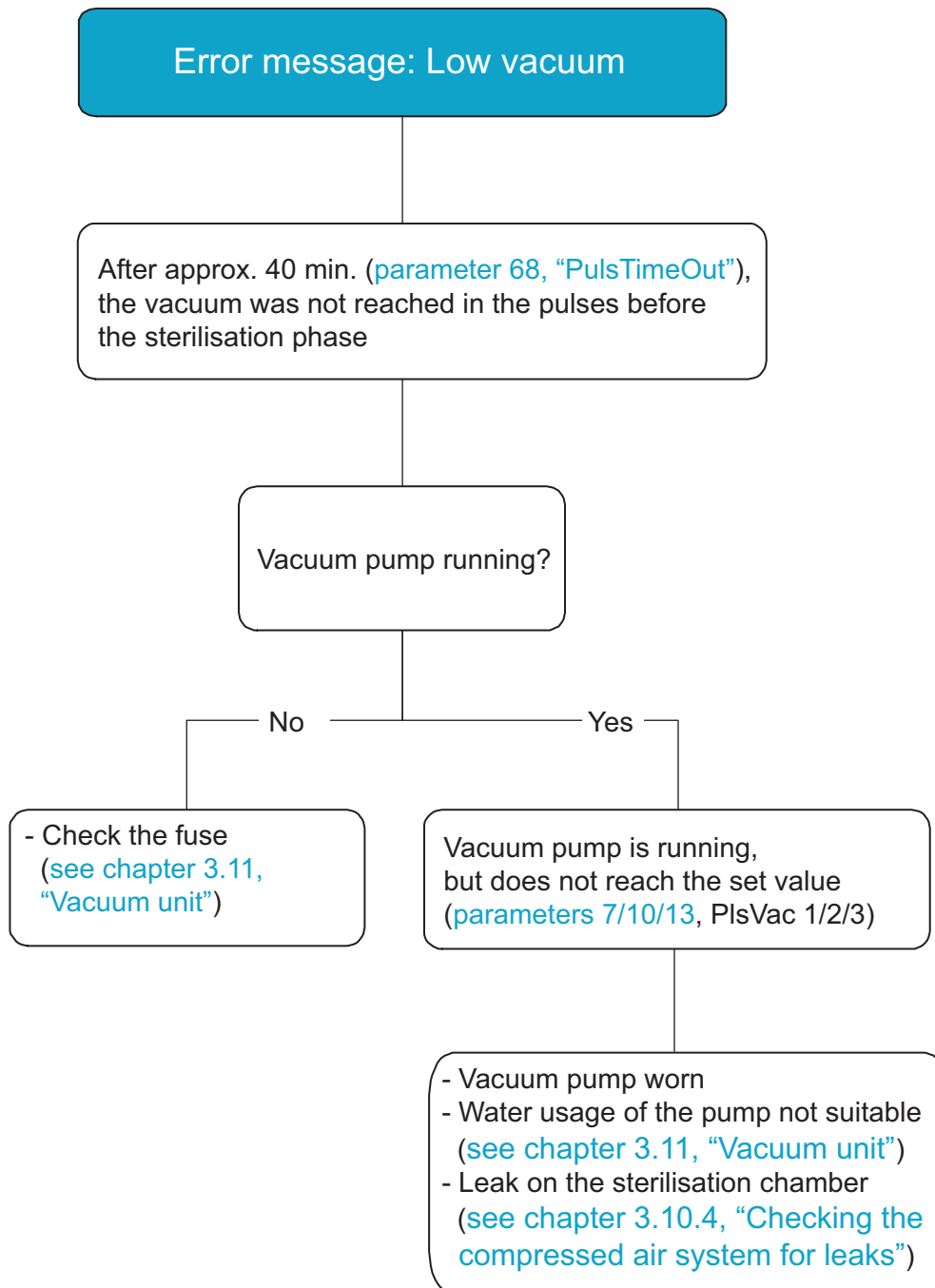
7.3.8 Error message: No Gen.Water



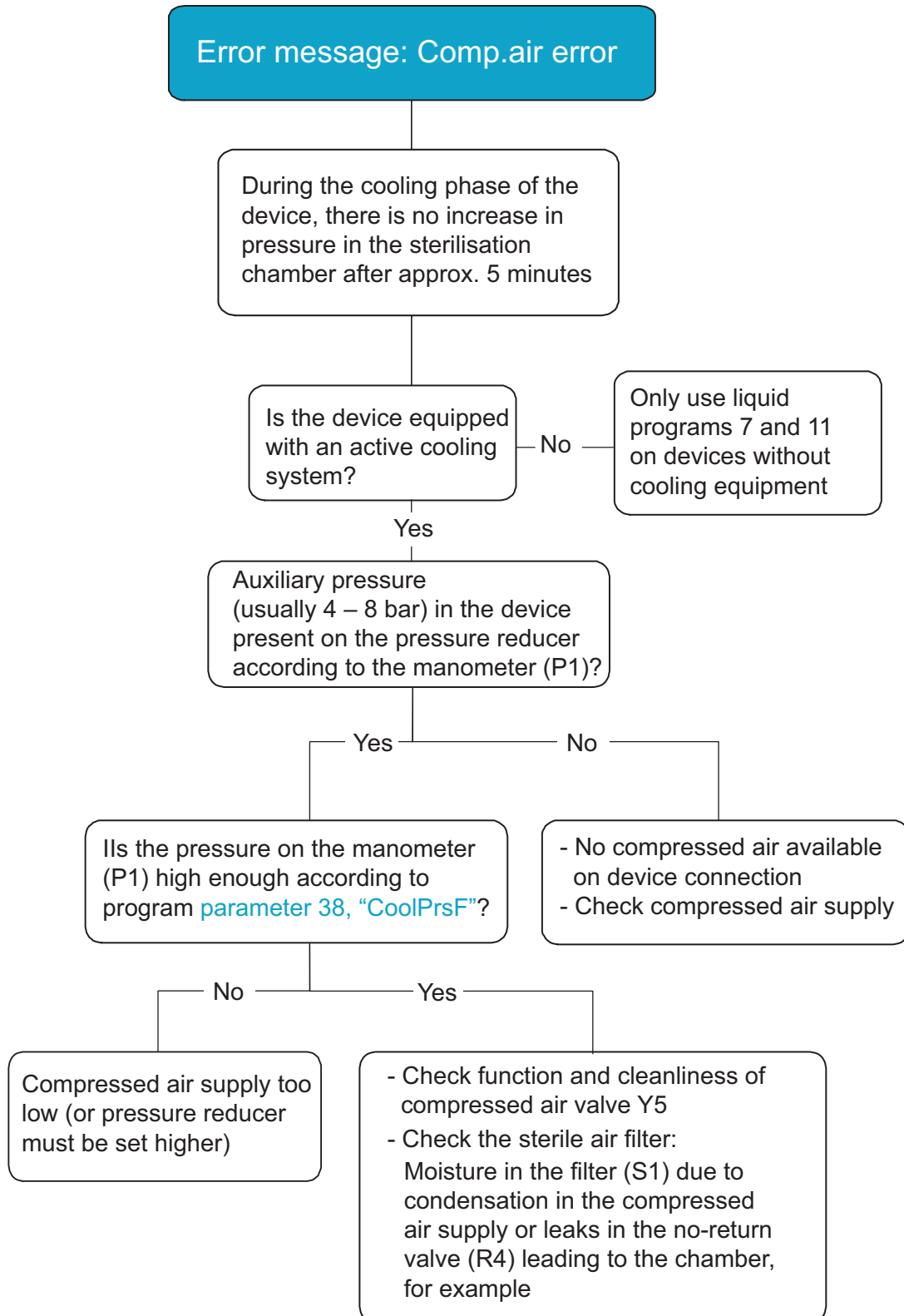
7.3.9 Error message: No Tap Water



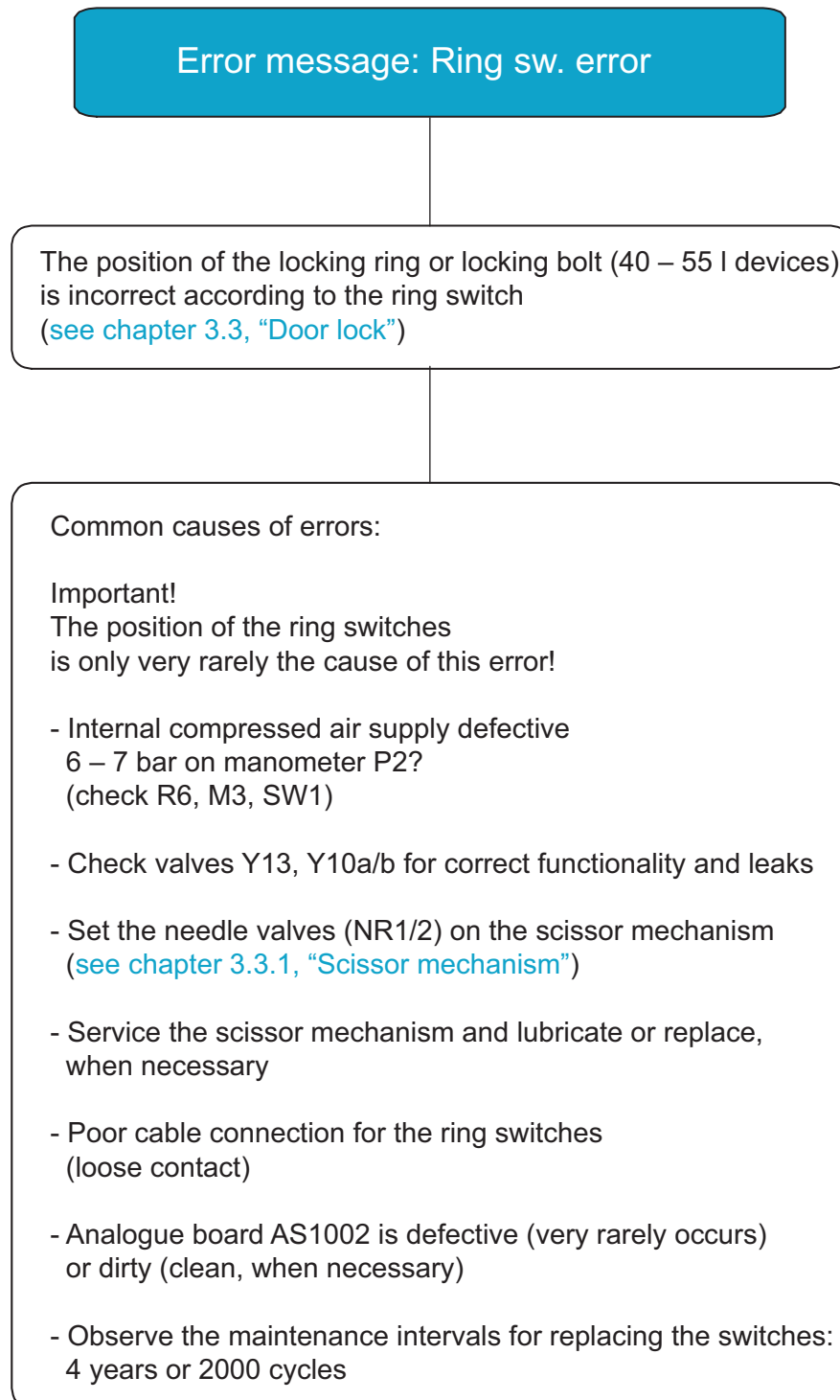
7.3.10 Error message: Low vacuum



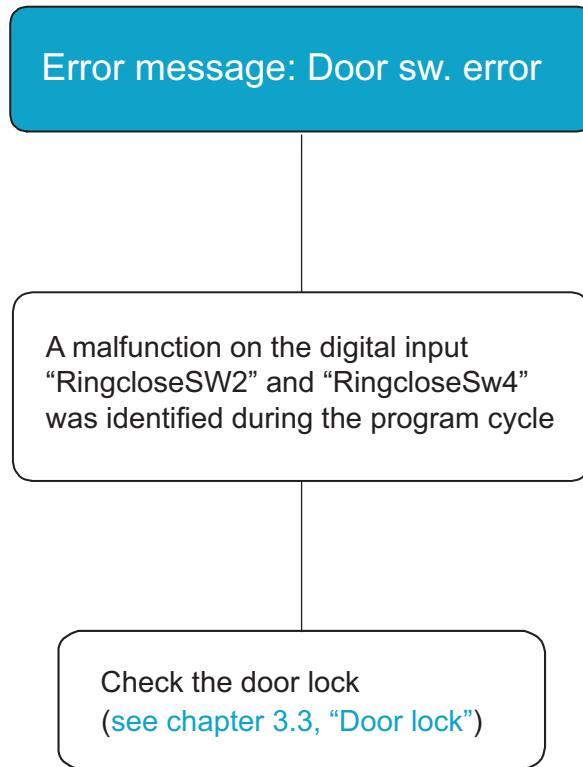
7.3.11 Error message: Comp.air error



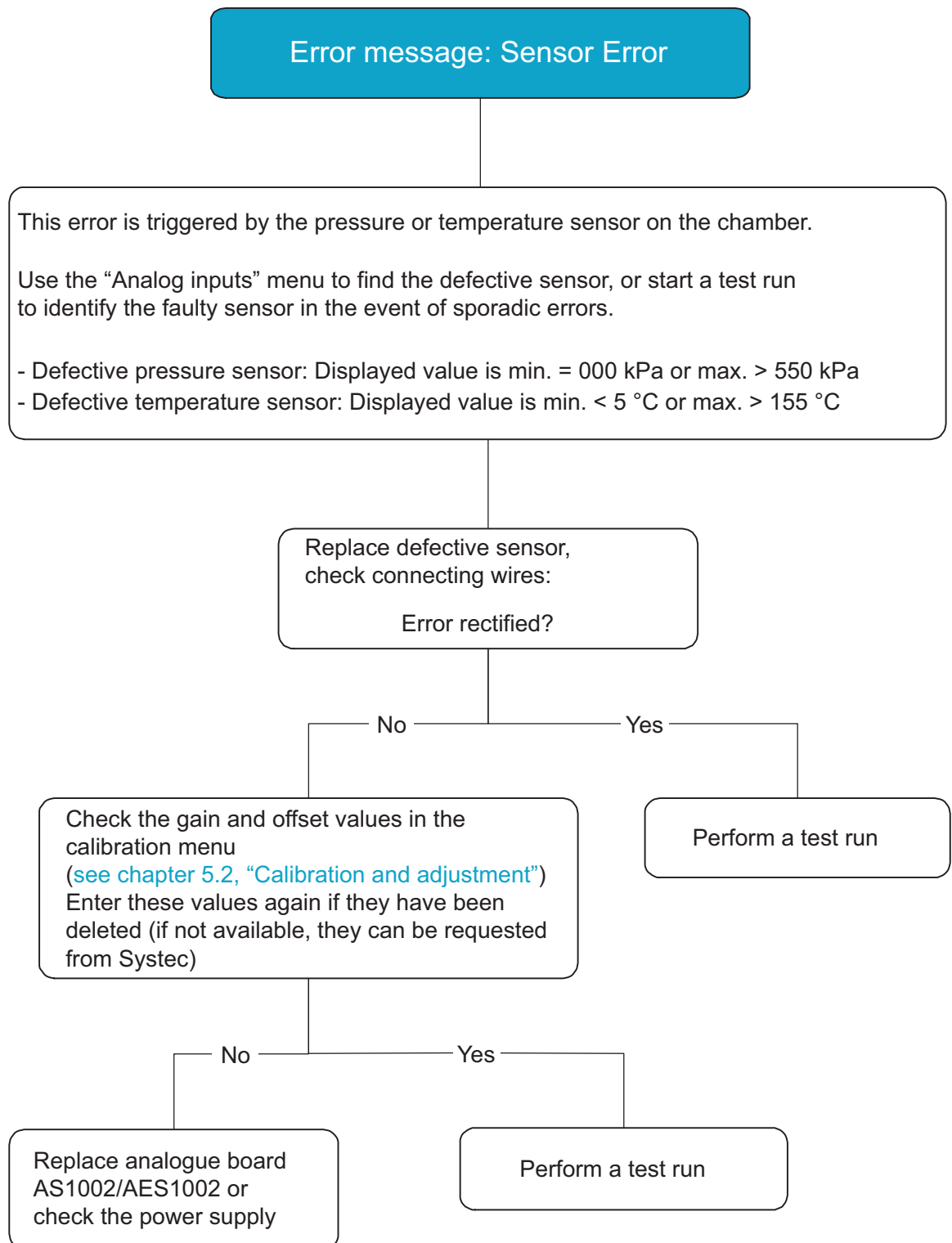
7.3.12 Error message: Ring sw. error



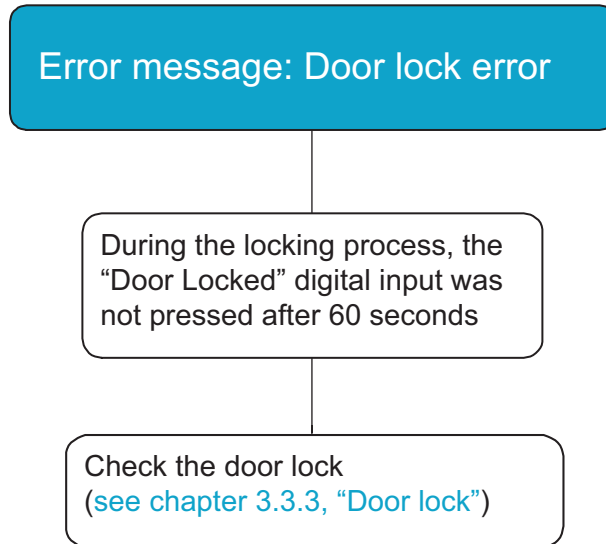
7.3.13 Error message: Door sw. error



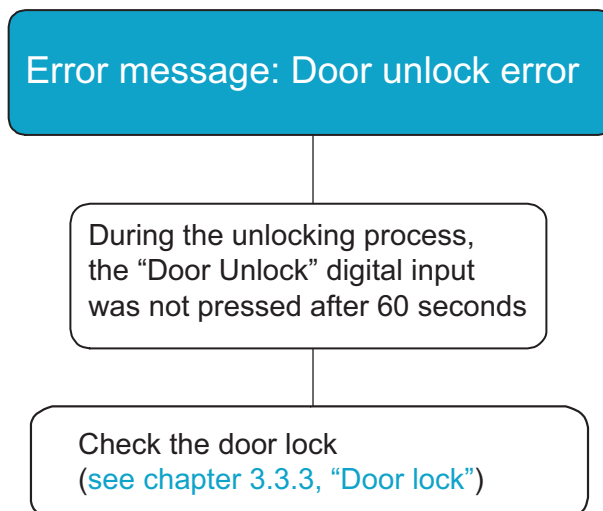
7.3.14 Error message: Sensor Error



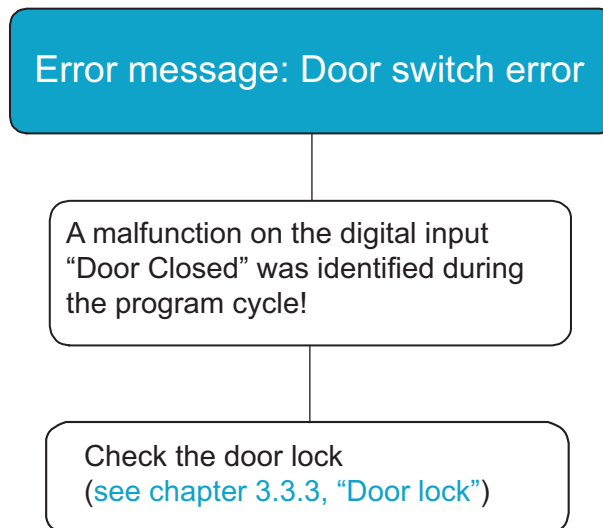
7.3.15 Error message on D-23: Door lock error



7.3.16 Error message on D-23: Door unlock error



7.3.17 Error message on D-23: Door switch error



8 PARAMETERS

Aim of this chapter

This chapter describes the functions, the access level necessary to make changes and the range of values for all control parameters.

Contents

8.1 Access level..... 2
8.2 List of parameters..... 2

Tables

Tab. 1: Access level..... 2
Tab. 2: List of parameters for Systec V and D series autoclaves..... 12

8.1 Access level

Do not give any codes for access levels to unauthorised persons!



In particular, the code for access level 4 is exclusively reserved for service technicians and must never be passed on to the operator.

Parameter settings are made after entering the code for the necessary access level. The following access levels are available.

Access level	Code	Target group
1	1000	Users
2	0011	Option for the operator to offer different levels of access (e.g. head of laboratory)
3	0022	
4	0198	Service technicians

Tab. 1: Access level

8.2 List of parameters

No.	Parameter	Description	Access level	Range of values	Factory setting
1	SterTemp (Cycle 13)	Sterilisation temperature	1	30.0 – 140.0 °C (opt. 150.0)	Depends on program
2	SterTime (Cycle 14)	Sterilisation time	1	1 – 9999 min	Depends on program
3	DryTime (Cycle 55)	Drying time	1	1 – 9999 min	Depends on program
4	Pulses (Cycle 42)	No. of steam/vacuum pulses in the pre-vacuum phase: Setting of number of steam pulses for segmented heating	3	0 – 9999	Depends on program
5	EndTemp (Cycle 34)	Unloading temperature As long as the temperature on “CoolPT100” is higher than the set value, the cover will stay locked.	2	Liq.: 30.0 – 80.0 °C Drop: 99.0 °C Solids: 120.0 °C	Depends on program
6	SterTimeDays (Cycle 75)	Sterilisation time in days (optional)	3	0 – 99 days	0 days
7	PulseVac1 (Cycle 45)	Vacuum value of first vacuum pulse	3	With vacuum: 0.0 – 150.0 kPa Without vacuum: 120.0 – 150.0 kPa	Depends on program
8	PulseVacT1 (Cycle 46)	Run-on time of first vacuum pulse	3	0 – 9999 sec.	Depends on program

PARAMETERS

No.	Parameter	Description	Access level	Range of values	Factory setting
9	PulsePress1 (Cycle 47)	Steam pressure for the first steam pulse	3	With vacuum: 90.0 – 999.0 kPa Without vacuum: 120.0 – 999.0 kPa	Depends on program
10	PulseVac2 (Cycle 48)	Vacuum value of the second and subsequent vacuum pulses	3	With vacuum: 0.0 – 150.0 kPa Without vacuum: 120.0 – 150.0 kPa	Depends on program
11	PulseVacT2 (Cycle 49)	Run-on time for the second and subsequent vacuum pulses	3	0 – 9999 sec.	Depends on program
12	PulsePress2 (Cycle 50)	Steam pressure for the second and subsequent steam pulses	3	With vacuum: 90.0 – 999.0 kPa Without vacuum: 120.0 – 999.0 kPa	Depends on program
13	PulseVac3 (Cycle 51)	Vacuum value of last vacuum pulse	3	With vacuum: 0.0 – 150.0 kPa Without vacuum: 120.0 – 150.0 kPa	Depends on program
14	PulseVacT3 (Cycle 52)	Run-on time of last vacuum pulse	3	0 – 9999 sec.	Depends on program
15	PulsePress3 (Cycle 53)	Steam pressure for the last steam pulse	3	With vacuum: 90.0 – 999.0 kPa Without vacuum: 120.0 – 999.0 kPa	Depends on program
16	ExShootOn (Cycle 39)	This parameter allows the steam release through the drain valve to be pulsed if ExhMode (parameter 26) is set from 1 to 3, or is set to 4 and no compressed air is connected	3	0 – 100 x 0.1 sec.	Depends on program
17	ExShootOff (Cycle 40)		3	0 – 100 x 0.1 sec.	Depends on program
18	HoldTemp (Cycle 57)	Hold temperature to be maintained in the pressure chamber after the sterilisation cycle (only for liquid programs) if HoldTime > 0	3	40.0 – 100.0 °C	80 °C
19	HoldTime (Cycle 76)	Time for which the product is held at the HoldTemp after reaching the EndTemp: 0 = Function inactive 1 = Time is infinite (until the "STOP" button is pushed with the door open) 2 = Hold function using steam valve, max. 24 hours (X devices only) > 2 = Hold time in minutes	3	0 – 9999 min.	0
20	AutoOpenDoor (Cycle 68)	Defines whether the cover should open automatically after the end of the program (if no fault has occurred): 0 = Cover stays closed 1 = Cover opens automatically	3	0.1	0

V/D SERIES

PARAMETERS

No.	Parameter	Description	Access level	Range of values	Factory setting
21	Cycle Count (Cycle 71)	Number of repeating program cycles (e.g. material tests) (optional)	3	0 – 255	0
22	CycleCtrTime (Cycle 74)	Pause between program cycles if "CycleCounter" > 1 (optional)	3	0 – 9999 min.	10
23	Extern Steam (Cycle 77)	Determines whether or not the autoclave is heated with external steam: 0 = Internal steam generator 1 = External steam	3	0.1	0
24	StartByTime (Cycle 70)	Allows a time to be pre-programmed (including date) at which a selected sterilisation program should be started	3	0.1	0
25	F0 Enable (Cycle 78)	At the end of the program, the sterilisation effect of the heating and cooling phases calculated using the F0 formula can be printed out. This sterilisation time can be deducted from the actual sterilisation time during a program cycle: 0 = Inactive 1 = Values printed out only 2 = SterTime – heating phase 3 = SterTime – heating/cooling phase	3	0 – 3	0
26	ExhMode (Cycle 33)	Defines the steam release after the sterilisation phase: 0 = Quick steam release 1 = Slow steam release 2 = Ambient air cooling from 101 °C, chamber is blown from outside 3 = Durham (controlled steam release to 101 °C, then normal cooling with or without support air) 4 = Cooling with or without support air 5 = Cooling with controlled support air (as the temperature sinks, the auxiliary pressure also sinks up to "CoolMinPress") 6 = As 5, but with nitrogen instead of compressed air 7 = Special glass test (ExhTime runs to 100 °C, then cooling is made up to EndTemp) 8 = As 5, but excess pressure is reduced via Y7 instead of Y9 (necessary for softwater spray cooling, for example) 9 = Not used 10 = Vacuum test program	4	0 – 10	Depends on program

PARAMETERS

No.	Parameter	Description	Access level	Range of values	Factory setting
27	SelPT100 (Cycle 17)	Determines which sensor is used as the control sensor during the heating and sterilisation phases: 5 = Chamber = chamber sensor (flexible Pt100) 6 = Condense = sensor in the flow line or exhaust filter 7 = Other chamber sensors, for example (optionally available)	4	5 – 10	Depends on program
28	CoolPT100 (Cycle 37)	Determines which sensor is used as the control sensor after the sterilisation phase: 5 = Chamber = chamber sensor (flexible Pt100) 6 = Condense = sensor in the flow line or exhaust filter 7 = Other chamber sensors, for example (optionally available)	4	5 – 10	5
29	SelSensor2 (Cycle 19)	Defines whether a second sensor should be used for control: 5 = Chamber = chamber sensor (flexible Pt100) 6 = Condense = sensor in the flow line or exhaust filter 7 = Other chamber sensors, for example (optionally available)	4	5 – 10	Depends on program
30	Temp2LimMode (Cycle 20)	Determines the permissible positive temperature difference between SelSensor2 and SelSensor in the heating and sterilisation phases: 0 = Not active 1 = SelSensor2 must not be warmer than SelSensor by more than Temp2Val 2 = SelSensor2 must not be warmer than the configured sterilisation temperature by more than Temp2Val	4	0, 1.2	0
31	Temp2Val (Cycle 21)	Maximum positive temperature difference between SelSensor2 and the main control sensor or the sterilisation temperature according to Temp2LimMode.	4	0.1 – 50.0 °C	1.0 °C

V/D SERIES

PARAMETERS

No.	Parameter	Description	Access level	Range of values	Factory setting
32	Heat2SterMod (Cycle 22)	Defines the transition from the heating phase to the sterilisation phase: 0 = Transition to sterilisation phase when the set temperature is measured on SelSensor 1 = Transition to sterilisation phase when the set temperature is measured on SelSensor and (set temperature – Sensor2Dif) is measured on SelSensor2 2 = Transition to sterilisation phase when the set temperature is measured on SelSensor and the associated steam pressure is measured 3 = Transition to sterilisation phase when the set temperature is measured on SelSensor, (set temperature – Sensor2Dif) is measured on SelSensor2 and the associated steam pressure is measured	4	0, 1, 2, 3	2
33	Sensor2Dif (Cycle 23)	Permissible deviation between SelSensor and SelSensor2 when both are active during control (Heat2SterMod 1 or 3)	4	0.1 – 50.0 °C	0.5 °C
34	SterPressAdd (Cycle 32)	Additional pressure on the corresponding steam pressure according to the sterilisation temperature in the sterilisation phase	4	0.0 – 100.0 kPa	5.0 kPa
35	LimPrsAdd (Cycle 15)	Maximum additional pressure: When this value is reached, the steam supply from the internal generator stops. With external steam, HeatGenPrsF is the limiting factor used to stop the steam supply (“Steam to chamber” valve is closed).	4	0.0 – 100.0 kPa	30.0 kPa
36	HeatGenPrsF (Cycle 10)	Factor for increased steam pressure in the steam generator. Ensures that the steam temperature is adequate.	4	0 – 50%	Depends on program
37	SterGenPrsF (Cycle 16)	Factor for increased steam pressure in the steam generator during the sterilisation phase. Ensures that the steam temperature is adequate.	4	0 – 50%	Depends on program
38	CoolPressF (Cycle 35)	Auxiliary pressure regulated during the cooling phase according to the set sterilisation temperature if ExhMode is 3, 4, 5, 6 or 8 and compressed air is connected.	4	100 – 200%	Depends on program

PARAMETERS

No.	Parameter	Description	Access level	Range of values	Factory setting
39	CoolMinPress (Cycle 38)	Defines whether a minimal amount of auxiliary pressure should remain in the sterilisation chamber until the end of the program. This function is only possible if ExhMode is set to 5, 6 or 8.	4	0.0 – 300.0 kPa	Depends on program
40	SaveWtrTemp (Cycle 61)	Optimises the cooling water usage during the cooling phase. As long as the temperature of the draining liquid measured is higher than that set, the cooling water valve stays open.	4	10.0 – 110.0 °C	40 °C
41	SaveWtrRate1 (Cycle 62)	If the temperature in the drain is less than SaveWtrTemp and the product temperature is higher than 100 °C, the cooling water valve is pulsed according to the set parameter.	4	0 – 100%	50%
42	SaveWtrRate2 (Cycle 63)	If the temperature in the drain is less than SaveWtrTemp and the product temperature is between 90 and 100 °C, the cooling water valve is pulsed according to the set parameter.	4	0 – 100%	40%
43	SaveWtrRate3 (Cycle 64)	If the temperature in the drain is less than SaveWtrTemp and the product temperature is less than 90 °C, the cooling water valve is pulsed according to the set parameters.	4	0 – 100%	30%
44	CoolTime (Cycle 36)	Defines the minimum cooling time if the temperature sinks at more than the "CoolRateTemp" per minute during cooling (ExhMode 3 to 6.8). (reference container broken?)	4	0 – 9999 min.	10 min.
45	CoolRateTemp (Cycle 65)	Describes the maximum temperature drop per minute at the control sensor during the cooling phase if "ExhMode" is set to 3 – 6 or 8: If the temperature drops by more than the set value per minute then the cooling phase is only ended after the "CoolTime" has expired, regardless of the measured temperature.	4	1.0 – 100.0 °C	30.0 °C

V/D SERIES

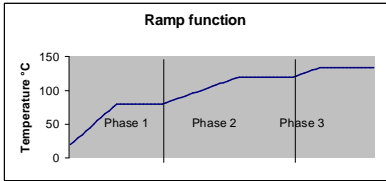
PARAMETERS

No.	Parameter	Description	Access level	Range of values	Factory setting
46	DryMode (Cycle 56)	Drying mode: 0 = Evacuation of the chamber during the drying time, the coil is heated at the same time. 1 = Pulsed evacuation, the coil is heated at the same time. Evacuate until the pressure is less than "DryVac", then break the vacuum with sterile, filtered air and restart the evacuation, etc. 2 = Evacuation to the set value "DryVac", coil is not heated (e.g. autoclaving waste). 3 = Drying with compressed air, the coil is heated at the same time.	4	0, 1, 2, 3	Depends on program
47	DryVac (Cycle 67)	Value of the vacuum to be reached in the drying phase.	4	5.0 – 150.0 kPa	Depends on program
48	BioHazard (Global 11)	Only for exhaust filters: The accrued condensation is collected in the sterilisation chamber and also sterilised. It is only drained off after the sterilisation phase if no fault occurs. After 150 cycles, the message "Replace filter" will appear in the display. 0 = Function inactive 1 = Function active	4	0, 1	Depends on device
49	VacuumRate (Cycle 58)	Defines the rate of evacuation. Used if the chamber is evacuated and sterilised using filters.	4	0 – 100%	100%
50	VBreak Rate (Cycle 59)	Defines the rate of breaking the vacuum. Used if the chamber is evacuated and sterilised using filters.	4	0 – 100%	100%
51	ExhaustRate (Cycle 60)	Defines the rate at which steam is vented after a steam pulse. Used if the chamber is evacuated and sterilised using filters.	4	0 – 100%	100%
52	DrnCoolTemp (Global 14)	Defines the maximum permissible temperature in the drain.	4	2.0 – 140.0 °C	70 °C
53	CoolDrainOn (Global 17)	Pulsing interval for the valve to add cooling water if the temperature set in "DrnCoolTemp" is exceeded.	4	0 – 100 x 0.1 sec.	80
54	CoolDrainOff (Global 18)		4	0 – 100 x 0.1 sec.	20
55	SterPrintT (Cycle 18)	Print interval time for the printer in the sterilisation phase.	4	0 – 3600 sec.	30 sec.
56	PrintTimer (Cycle 9)	Print interval time for the printer outside the sterilisation process.	4	0 – 600 sec.	120 sec.
57	EndCycleBipT (Global 13)	Defines the length of the audible signal at the end of the entire process.	4	0 – 9999 sec.	10 sec.
58	HighTempLim (Cycle 12)	Permissible maximum temperature in the pressure chamber. If a higher temperature is measured, the program will abort.	4	30.0 – 150.0 °C (optionally up to 152 °C)	145 °C (optionally up to 150 °C)

No.	Parameter	Description	Access level	Range of values	Factory setting
59	HeatTimeOut (Cycle 11)	Maximum time for the heating phase before the sterilisation temperature is reached.	4	0 – 9999 min.	300 min.
60	TempMaxErr (Cycle 24)	The maximum value by which the set sterilisation temperature may be exceeded.	4	0.0 – 20.0 °C	3.5 °C
61	TempMinErr (Cycle 25)	The maximum value by which the set sterilisation temperature may be fallen short of.	4	0.0 – 20.0 °C	1.0 °C
62	PressMaxErr (Cycle 26)	The maximum value by which the steam pressure belonging to the set sterilisation temperature may be exceeded.	4	0.0 – 100.0 kPa	50.0 kPa
63	PressMinErr (Cycle 27)	The maximum value by which the steam pressure belonging to the set sterilisation temperature may be fallen short of.	4	0.0 – 20.0 kPa	10.0 kPa
64	TempMaxTime (Cycle 28)	Time after which an alarm is triggered when the set maximum temperature is exceeded.	4	0 – 60 sec.	20 sec.
65	TempMinTime (Cycle 29)	Time after which an alarm is triggered when the set minimum temperature is fallen short of.	4	0 – 60 sec.	20 sec.
66	PressMaxTime (Cycle 30)	Time after which an alarm is triggered when the set maximum steam pressure is exceeded.	4	0 – 60 sec.	20 sec.
67	PressMinTime (Cycle 31)	Time after which an alarm is triggered when the set minimum steam pressure is fallen short of.	4	0 – 60 sec.	20 sec.
68	PulseTimeOut (Cycle 54)	Maximum time for a pre-vacuum pulse or steam pulse.	4	0 – 9999 sec.	2400 sec.
69	GenMaxPress (Global 2)	Permissible maximum pressure in the steam generator.	4	0 – 700 kPa	400 kPa
70	GenWtrErrT (Global 4)	Time within which water must be detected by the top electrode in the steam generator after the start of water intake.	4	0 – 200 sec.	120 sec.
71	ErrRingOpenT (Global 8)	Time within which the RingCloseSw switch must be activated after the signal to open or close the door is given.	4	0 – 10 sec.	10 sec.
72	RingPrsAdd (Global 7)	The value in excess of the atmospheric pressure (ATMPressure) within which the cover can be opened.	4	0.0 – 20.0 kPa	4.0 kPa
73	OpenDoorTime (Global 9)	Time in which the cooling coil is blown out with compressed air whilst the door is opening.	4	0 – 200 sec.	30 sec.
74	ATMPressure (Global 0)	Entry of the atmospheric pressure at the installation position of the autoclave.	4	50.0 – 104.0 kPa	102.0 kPa

V/D SERIES

PARAMETERS

No.	Parameter	Description	Access level	Range of values	Factory setting
75	ElectrLevel (Global 1)	Switching value for water level electrodes: 999 = Insulation = no water 0 = Short-circuit = water	4	0 – 999	714 or 850 (for Eco/Basic)
76	WaterTimeAdd (Global 3)	Run-on time for the water feed pump. Prevents the pump from constantly starting and stopping when the electrode detects water.	4	0 – 10 sec.	3 sec. (on devices of < 65 litres 0 sec.)
77	FlowSwChckT (Global 5)	Time after which the water feed pump or vacuum pump switches off if no water is detected by the flow sensor.	4	1 – 30 sec.	8 sec.
78	FlowTryTime (Global 6)	Time period until the water feed pump or vacuum pump will restart after detecting a water shortage.	4	0 – 9000 sec.	30 sec.
79	VacuumPump (Global 10)	This parameter is set to 3 in all devices and should not be viewed in connection with a vacuum unit. Exception: The value is set to 10: The vacuum unit pumps out the accrued condensation during the sterilisation phase at temperatures under 100 °C SterTemp. This prevents the sterilisation chamber from filling up completely.	4	0 – 9999	3
80	HeatTime1 (Cycle 0)	Ramp function: Heating time until the first ramp (or the temperature selected in phase 1) is reached. 	4	0 – 9999 min.	0 min.
81	StayTime1 (Cycle 1)	Ramp function: Time for which the temperature set for phase 1 is held.	4	0 – 9999 sec.	0 sec.
82	StayTemp1 (Cycle 2)	Ramp function: “Hold temperature” for the 1st ramp.	4	3.0 – 130.0 °C	3.0 °C
83	StayPrsAdd1 (Cycle 3)	Ramp function: Additional pressure to the corresponding steam pressure according to “StayTemp1”	4	0.0 – 200.0 kPa	40.0 kPa
84	HeatTime2 (Cycle 4)	Ramp function: Heating time until the 2nd ramp (or the temperature selected in phase 2) is reached.	4	0 – 9999 min.	0 min.
85	StayTime2 (Cycle 5)	Ramp function: Time for which the temperature set for phase 2 is held.	4	0 – 9999 sec.	0 sec.

PARAMETERS

No.	Parameter	Description	Access level	Range of values	Factory setting
86	StayTemp2 (Cycle 6)	Ramp function: "Hold temperature" for the 2nd ramp.	4	3.0 – 130.0 °C	3.0 °C
87	StayPrsAdd2 (Cycle 7)	Ramp function: Additional pressure to the corresponding steam pressure according to "StayTemp2".	4	0.0 – 200.0 kPa	40.0 kPa
88	HeatSterTime (Cycle 8)	Ramp function: Heating time until the sterilisation temperature is reached (phase 3 = sterilisation phase).	4	0 – 3600 min.	0 min.
89	RemoveWaterT (Cycle 41)	For spray cooling or Eco/Basic devices, for example: Run-on time at the end of the program for the drain valve after the water level electrode can no longer detect water in the chamber.	4	0 – 9999 sec.	30 sec.
90	VacDelay (Cycle 43)	Run-on time before the vacuum valve opens after the vacuum pump starts.	4	0 – 60 sec.	1 sec.
91	VacWaitTime (Cycle 44)	For solids cycles with quick steam release: Run-on time before the vacuum pump starts after reaching 115 kPa.	4	0 – 9999 sec.	5 sec.
92	Hot Water (Cycle 69)	Hot water: 0 = Steam sterilisation 1 = Steam air mixture or hot water sprinkling	4	0, 1	0
93	Water Time (Cycle 72)	X devices: 0 = No water in the sterilisation chamber > 0 = Run-on time where the water inlet valve stays open after the water level electrode has detected water in the sterilisation chamber (e.g. spray cooling) Eco/Basic devices: 0 = Automatic filling – also during the sterilisation phase (long-term sterilisation, material tester) 1 = Manual filling with water disposal after the end of the program (demineralised water is drained out of the sterilisation chamber) 2 = Manual filling without water disposal after the end of the program when the EndTemp ≤ 80 °C. (demineralised water is retained in the sterilisation chamber for the next program cycle) > 2 = Run-on time where the water inlet valve stays open after the water level electrode (E3) has detected water in the sterilisation chamber	4	0 – 300 sec.	0 sec.

V/D SERIES

PARAMETERS

No.	Parameter	Description	Access level	Range of values	Factory setting
94	WtrChambErr (Global 19)	For spray cooling or Eco/Basic devices, for example: Maximum water intake time for the sterilisation chamber.	4	50 – 1500 sec.	300 sec.
95	Exh.Time (Cycle 73)	Parameter e.g. for glass test program: Defines the exhaust time from the sterilisation temperature up to EndTemp “ExhMode” must be set to 1.	4	0 – 1000 min.	0 min.
96	Sleep Power (Global 20)	Time after which the device will go into sleep mode if no program is started. The steam generator is switched off. 0 = Function inactive	4	0 – 999 hours	3 hours
97	PrintAnaBits (Global 21)	Defines which sensors are printed out by the integrated printer. 0 = Chamber pressure and temperature control sensor. If more sensors should be printed out, please contact Systec GmbH	4	0 – 9999	0
98	Com Address (Global 22)	Defines the address of the autoclave in the RS-485 data bus: 1 = Address undefined > 1 = Defined address	4	1 – 255	2
99	DoorMode (Global 25)	Defines whether the door should be opened after the end of the program (and which door) on pass-through autoclaves. 0 = Device is not a pass-through autoclave. 1 = Only one door can be opened at a time. 2 = Clean room side (back panel): Can only be opened when the sterilisation chamber was sterilised again after the door is opened on the device side. 3 = Device side (front panel): Can only be opened when the sterilisation chamber was sterilised again after the door is opened on the clean room side. 4 = If one of the doors was opened, then the other cannot be opened until the sterilisation chamber has been sterilised again.	4	0 – 4	Depends on the device

Tab. 2: List of parameters for Systec V and D series autoclaves

9 APPENDIX

Aim of this chapter

The maintenance checklist is found in this chapter.

- Log your work according to the maintenance checklist, then send it to Systemec GmbH.

MAINTENANCE CHECKLIST

Please tick off:

<input type="checkbox"/>	Standard device
<input type="checkbox"/>	User asked about faults

- 1: OK
 2: Not OK
 3: Repaired/replaced

1 OK	2 Not OK	3 Repaired Replaced	Components	Inspect/service
Control unit				
			Control unit	Function, display
Door lock				
			Door	Lock, hinge, mechanism
			Door seal	Wear, cleanliness
			Ring switch, door switch	Switching point, function The ring switch and door switch must be replaced after 4 years or 2000 cycles.
			Pneumatic door opener	Function, leaks
			Locking ring	- Drive - Check and lubricate with Teflon
Pressure chamber, hose connections and filter				
			Pressure chamber	- Corrosion, dirt - Internal check conforming to German Ordinance on Industrial Safety and Health (BetrSichV)
			Safety valve on sterilisation chamber	- Run up to activation pressure The tolerance is $\pm 10\%$ Sterilisation chamber activation pressure SV: _____ bar
			Safety valve on steam generator	Steam generator activation pressure SV: _____ bar
			Temperature sensor	Damage
			Strainer, sieve	Clean
			Internal compressed air	Function, leaks
			Pipes and screw connections	Seating, leaks
			Steam air extractor	Function, leaks
			Water level electrodes	Function, cleanliness (clean when necessary)

1 OK	2 Not OK	3 Repaired Replaced	Components	Inspect/service
Steam generation				
			Heater	Power consumption
			Heater contactor	Check
			Heater element duct	Leaks
			Safety temperature limiter (STL)	Function, seating
			Electrical screw connections on load circuit (heating flow circuit)	Tighten
Other maintenance tasks				
			Flow monitor	Check
			Wiring, earth connection	Check, test
			Parameter settings	Check
			Pressure transducer	Function, display
			No-return valve	Function, leaks
			E-Box fan	Noise
			Aquastop	Function, replace battery
Test run and calibration				
			Test run	Function, leaks
			Temperature/pressure display	Calibrate, adjust if necessary (see calibration log)
Water supply				
			Carbonate hardness of unprocessed water	Value: _____ (< 300 µS/cm; ≤ 11° DH)
			Demineralised water quality	Value: _____ (< 15 µS/cm)
			Cooling water	Pressure: _____ (≥ 1 bar)
			Water supply hoses, sieve	Firm seating
			Drain hose	Layout
			Water feed pump	Check function, noise
			Demineralised water inlet valve	Function check
			Pressure reducer	Setting, function
Water cooling option				
			Solenoid valve for cooling water	Function
			Solenoid valve for support air	Function
			Sterile air filter	Check
			Pressure reducer for cooling water	Setting, function
			Pressure reducer for support air	Setting, function

1 OK	2 Not OK	3 Repaired Replaced	Components	Inspect/service
Radial fan option				
			Motor	Function, noise
			Fan wheel	Dirt, free-running
Spray cooling option				
			Heat exchanger	Flow, scaling
			Circulation pump	Function, noise
			Metal hose	Leaks, wear
Closed cooling circuit option				
			Heat exchanger	Scaling and free-flowing, clean if necessary
			Circulation pump	Function, leaks
			Cooling circuit	Filling
Lift option				
			Column	Firm seating
			Function	Travel direction
			Arm and basket support	Firm seating
Vacuum unit option				
			Vacuum pump	Performance, noise
			Sterile air filter	Condition, moisture
			Vacuum valve	Leaks
			Pump water valve for vacuum pump	Function, leaks
			Vacuum test	Execute
Exhaust filter option				
			Counter value on exhaust filter	Check If necessary, replace filter earlier
			When replacing filter	Reset counter
Printer option				
			Printer ribbon	Check
			Paper supply	Check

Model: Systemec	SN:
Date	Signature
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