Operation Manual

Western Toilet

QVT-H-C-W0-ICF

Part-No. 108598

Part No. 109430 – Rev.: 01 – 2022-06-08

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1. SAFETY ADVICE

Read this manual carefully!
Keep this manual for future reference!
The western toilet assembly is designed to transport human waste from the toilet bowl to a waste tank or sewage pipe!

DANGER	**Risk of electric shock on control board!** **Shut down the power supply!**
WARNING	**Risk of fecal infection!** **Refer to Safety at Work!**

Safety at work

During work on toilets and sanitary systems note the national employment protection provisions (in Germany Biostoffverordnung, BGR 145)!
Wear protective clothing, do not eat, drink or smoke!
Immediately change and disinfect contaminated clothing!
Thoroughly clean yourself with soap and water after working in a sewage handling area or coming in contact with sewage handling equipment. This precaution is an absolute requirement before eating, drinking, smoking or performing any hand-to-mouth functions!
Skin abrasions, punctures or any other wounds require immediate and appropriate medical attention!
After coming in contact with sewage, do not handle potable water hoses or work on potable water systems until thoroughly washed!
Sewage spills are to be cleaned up immediately, before they dry. Rinse the contaminated area with water and non-scented disinfectant!

Maintenance work

Only trained personnel knowing the contents of this manual may perform maintenance work on this toilet assembly!
Never clean or operate this western toilet assembly with aggressive acids or cleaning agents which contain chlorine!
Avoid injury: Make sure that exit valves are not operated manually at the same time during maintenance work!

Repair work

Disconnect system from all supplies!
Components which are part of the safety or control system (i.e. pressure switch, safety valve) should not be repaired - this may lead to serious malfunction - they must be replaced with new components!

Breakdown

Disconnect system - main switch OFF - in case of excessive heat or fire!
Switch off and lock toilet system!

Danger of frost

Empty fresh and waste water tank!

Fresh water tank refilling

Do not refill in case of frost or frost danger!
Pipes must not be blocked or frozen!

Waste water tank emptying

Empty in case of frost or frost danger!
Empty if tank is full!

NOTICE ***Unexpected escape of fluids from the system!***

Property damage to the rail car:

- ► **The rail car manufacturer has to take appropriate measures to prevent possible damage due to escaping fluids.**
- ► **Rubber elbows and elastic adapters have to be secured against sliding off in axial direction. The piping is subjected to severe pressure surges during evacuation of the intermediate tank.**
- ► **Compressed air, exhaust air, fresh and waste water piping has to be laid with an even slope!**
- ► **Bends and curves in the piping have to be avoided, accumulated water or fecal matter could block and damage piping during frost!**

2. PUBLISHING INFORMATION

2.1 Producer and Publisher

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Only staff trained by Evac service is permitted to perform any kind of maintenance on the Evac western toilet system.
We recommend to have Evac service perform any kind of maintenance work.

2.2 Record of Revisions

Issue	Description	Date	Pages
01	First version	2022-06-08	All

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3.3 List of Abbreviations

Abbreviation	Denotation
QVT	Pinch Valve Toilet
SoS	Scope of Supply
ILC	Integrated Logic Controller
RS-Box	Backflush Unit
FWT	Fresh Water Tank
WWT	Waste Water Tank
FR	Freeze Drain

Table 1: List of abbreviations

4. GENERAL SAFETY ADVICE

4.1 About this Manual

Please keep this manual for future reference.

Please read the instructions in this manual carefully before installing and operating this assembly.

Safety precautions should always be made according to the general safety advice in this manual, chapter General safety advice.

All personnel working on this assembly should be adequately vaccinated to minimize risk of infection.

4.2 Safety Symbols – User Guide

The following signifies property damage:

NOTICE

The following signifies severe property damage:

CAUTION

The following signifies minor injuries:

⚠ CAUTION

The following signifies possible serious injury or death:

⚠ WARNING

The following signifies serious injury or death:

⚠ DANGER

The following signifies important information:

Important information

The following signifies extra information:

Extra information

5. INTRODUCTION

5.1 Intended Use

NOTICE

Western toilet assembly is designed to transport human waste from the toilet bowl to a waste tank or sewage pipe!
Any other use of the toilet system does not comply with the intended design.

Resulting damage is the sole responsibility of the operator.

5.2 Transport and Storage Information

EVAC components shall transported be in accordance with the GGVSEB (Gefahrgutverordnung Straße, Eisenbahn und Binnenschifffahrt) ordinance on the national and international carriage of dangerous goods by road, rail, and inland waterways or an equivalent guideline consistent with local regulations.

6. SCOPE OF SUPPLY

Pos.	Description	Quantity
1	Western Toilet – QVT-H-C-W0-ICF	1
2	Control Board – KB I Train 18 - Western System	1
3	Connection set – KB I Train 18 - Western System	1
4	SoS - Train 18 Button <Flush> and Connection Cable	1
5	SoS - Train 18 Indicator <Out of Order> and Connection Cable	1
6	SoS – Train 18 Additional Items for Installation	1
7	Filter Pressure Regulator	1

Table 2: Scope of supply – Article No.: 108598

6.1 Corresponding Documentation

The documentation for the sanitary system includes the following documents:

- 109430 Operation Manual – Western Toilet QVT-H-C-W0-ICF
- 109431 Installation Manual - Western Toilet QVT-H-C-W0-ICF
- 109432 Maintenance Manual - Western Toilet QVT-H-C-W0-ICF
- 109433 Appendix Manuals - Western Toilet QVT-H-C-W0-ICF
- 109438 Spare Part Catalog - Western Toilet QVT-H-C-W0-ICF & Squatting Toilette HT-PV-India-ICF

6.2 Required Tools

Evac recommended for professional maintenance and repair the use of commercial tools like screwdrivers, torque spanner etc.

6.2.1 List of Special Tools

Evac propose the use of the following special tools for maintenance or repair:

- 10531 Service terminal HT-793-English HT793E

or

- 69833 Serviceterminal PC version
- 23474 Tool for pan head screw
- 79017 Cleaning tool for EVAC flush nozzles

6.3 List of Consumables

- Metallic threads locked with article no: 11161 Thread locking AN302-43.
- Metal threads with non-metallic threads locked with article no: 17271 Thread seal Loctite 5331.
- Non-metallic threads locked with article no: 17271 Thread seal Loctite 5331.
- Metallic and non-metallic threads that may undergo small readjustments before use locked with article no: 39399 Thread sealing tape - Loctite 55
- For WC-seat greasing article no: 21446 Grease - Aerosol 400ml

6.4 Approved Toilet Paper

Do not use wet wipes, handkerchief and paper towels!

Use only commercially available toilet paper which does not contain any toxic substances, skin-irritating contents or allergy-causing substances.

6.5 Approved Cleaner

Do not use cleaner which contains chlorine, particles or other abrasives! Follow the instructions of the manufacturer data sheet!

- Neutral cleaning agent and warm water
- Cleaner approved for rolling stock with following composition:
  - Citric acid <15% weight/volume
  - Amidosulfuric acid <15% weight/volume
  - Phosphoric acid < 5% weight/volume

Example:
- Into-Top from Ecolab
- Nepurin from Saniclean
- Retirol from Deutsche Hahnerol

Before using a differed cleaner please contact Evac.

6.6 Approved Disinfectant –Fresh Water Tank only

Follow the instructions of the manufacturer data sheet!

The following disinfectants show no incompatibility to the materials up to the specific concentration limit stated below:
- Hydrogen peroxide 5% ready to use solution
- Chlorine dioxide 5% ready to use solution

Example:
- Herlisil (hydrogen peroxide, commercially available concentration 50%) from Herlisil GmbH
- Duozon (chloroxide, commercially available concentration (finished product) 0.3%)

Before using a differed disinfectant please contact Evac.

6.7 Approved Decalcifier

Follow the instructions of the manufacturer data sheet!

- Decalcifier approved for rolling stock with following composition:
  - Citric acid <4% weight/volume

7. SYSTEM DIAGRAM

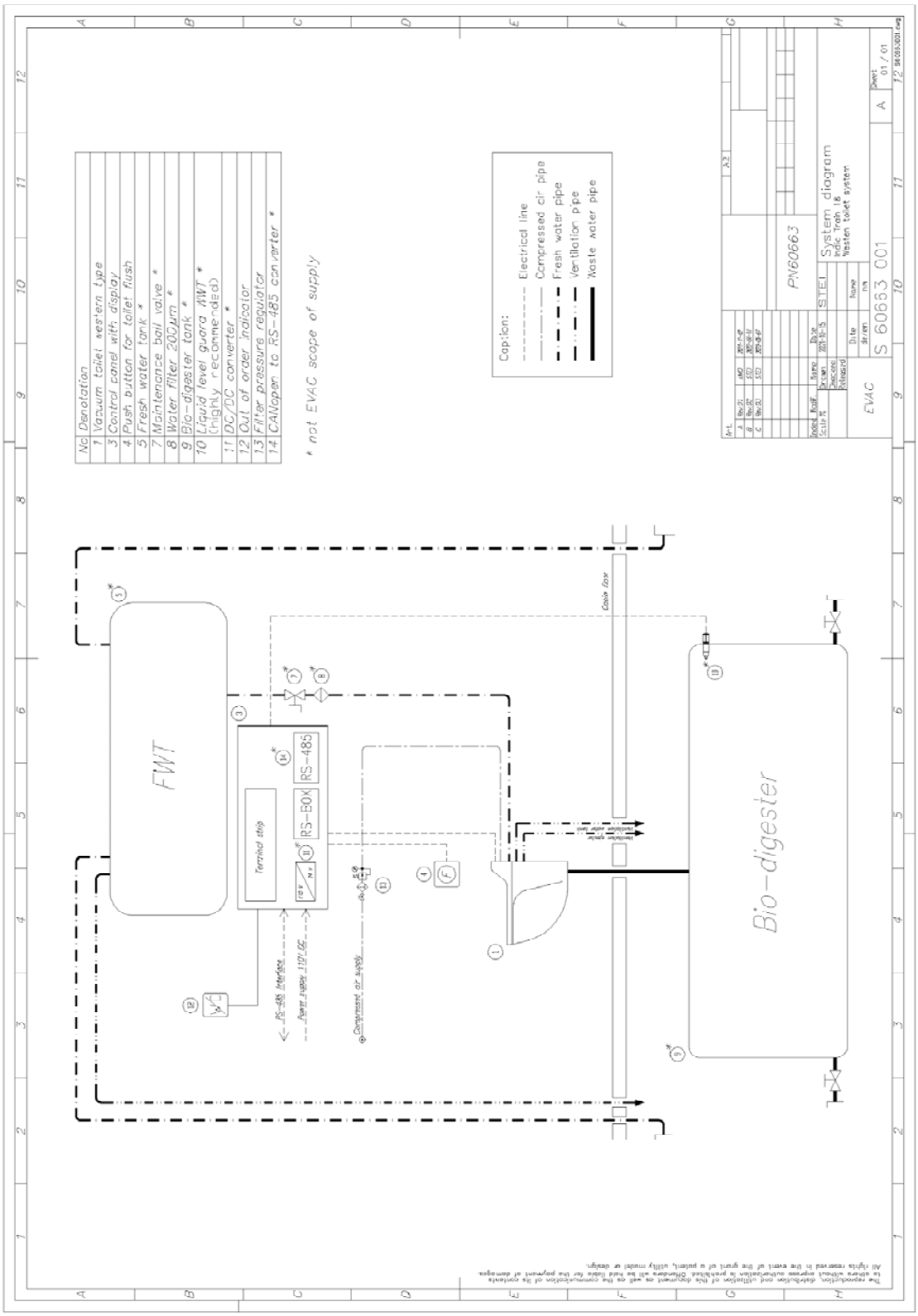


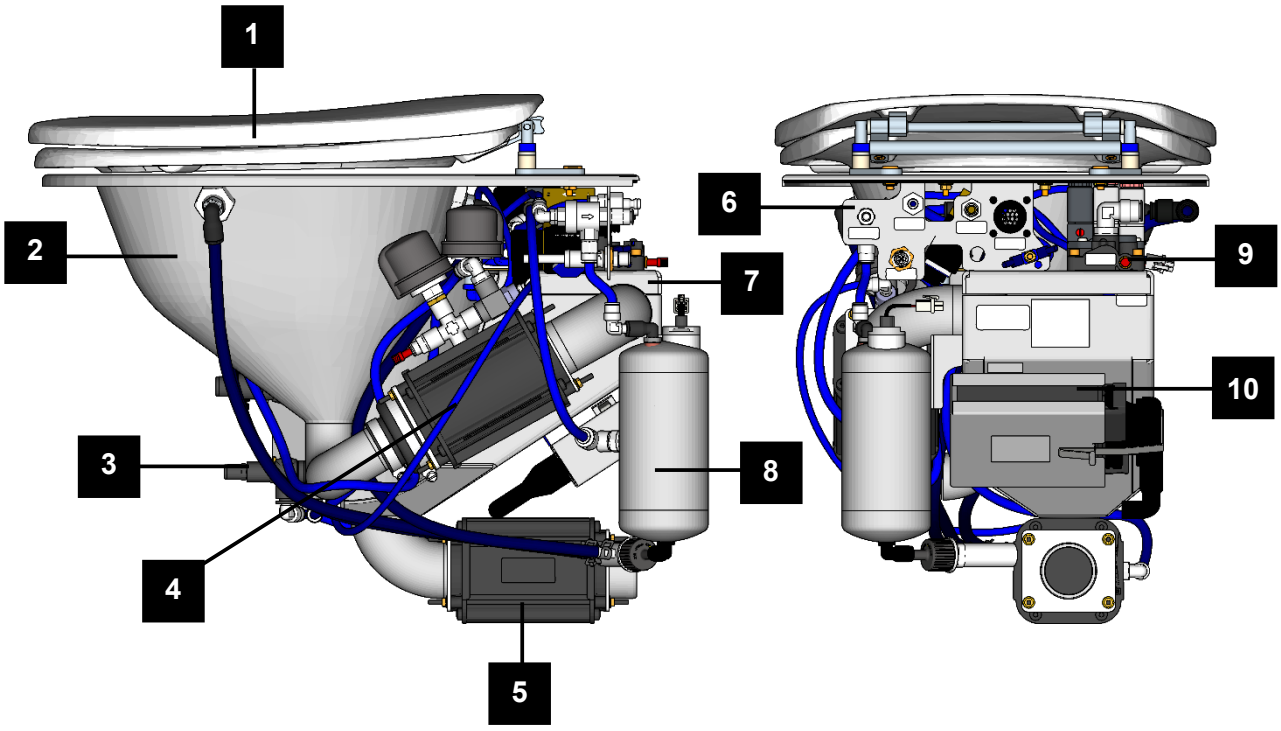
Figure 1: System Diagram – Western toilet system (for reference only)

8. COMPONENT DESCRIPTION

8.1 Western Toilet

The EVAC western toilet QVT-H-C-W0-ICF combines the following main features:

- Compact and space saving design. All vacuum components are placed inside the toilet mounting construction.
- Quick and easy installation.
- High reliability.
- Highest standards in hygiene.
- Only 0.5 liters of water per flush. The bowl is efficiently flushed with high pressure water.
- Sturdy sliding gate valves which open the whole diameter. No restriction, even bulky waste is passed.
- The western toilet is vandalism proof. There are no rubber parts that could be damaged by foreign objects (i.e. bottle caps or needles).
- The system is micro-processor controlled. Fault detection and error correction is integrated.
- Blockages are prevented by using compressed air to move waste material.
- Standard sanitary piping is sufficient. No special vacuum tight seals or valves are needed.



1	WC seat and cover	2	Toilet bowl with flush nozzles
3	Ejector	4	Inlet pinch valve
5	Outlet pinch valve	6	Connection panel
7	Intermediate tank	8	Flush water tank
9	Vacuum pump	10	Control unit

Figure 2: Western toilet – QVT-H-C-W0-ICF (for reference only)

8.2 Technical Data

Material		
	Intermediate tank	Stainless steel
	Bowl	Stainless steel
Dimensions		
	Weight	Approx. 20 kg
	L x W x H	580 mm x 377 mm x 452 mm
Supply values		
	Compressed air	6.2 bar (6 bar to 10 bar) Filter 5 µm max. grain size
	Water	Pressure: 0.1 bar to 1.0 bar Filter: 250 µm max. grain size min. flow capacity: 2 l/min
	Operating voltage	24 V DC (- 30 %...+ 25 %)
External connections		
	Mechanical fixation	Pan head screws M6 (2x)
	Compressed air	Quick-connect coupling DN 5
	Water	Quick-connect coupling DN 7.2
	Test connection	Quick-connect coupling Ø 6 mm
	Electrical connection	CPC-coupling 16 pol
	CAN connection	M12, 5 pole
Power Consumption (standard settings)		
	constant	2.2 W (90 mA at 24 V)
	during flush	12 W (500 mA at 24 V)
Consumption values (standard settings)		
	Compressed air	approx. 25 l expanded air at 6.2 bar
	Water	0.4 l to 0.5 l per flush cycle (depending on tank filling level)
Protection type		
Toilet with shroud	IP 54	
ILC STC/Junior Power Timer	IP 67	
Certification		
	CE certification	

Table 3: Technical data – Western toilet

8.2.1 Interfaces

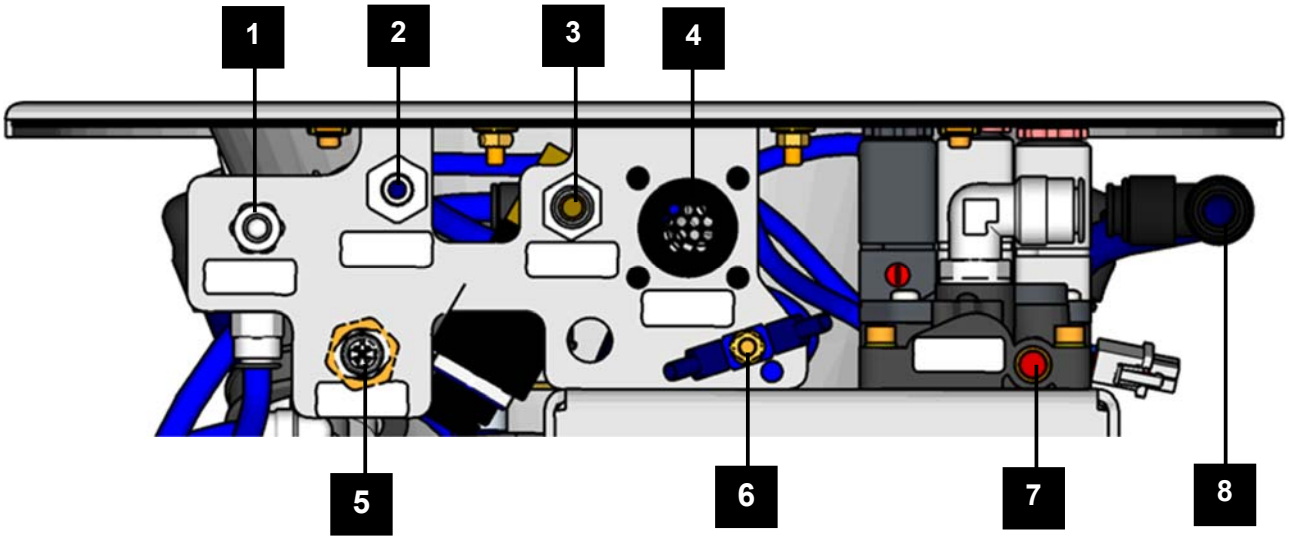
NOTICE ***Unexpected escape of fluids from the system.***

Potential risk of damage to the rail car:

- **The rail car manufacturer has to take appropriate measures to prevent possible damage due to escaping fluids.**
- **Rubber elbows and elastic adapters have to be secured against sliding off in axial direction. The piping is subjected to severe pressure surges during evacuation of the intermediate tank.**
- **Compressed air, fresh and waste water piping has to be laid with an even slope!**
- **Bends and curves in the piping have to be avoided, accumulated water or fecal matter could block and damage piping during frost!**

Further information see:
109433 Appendix Manuals - Western Toilet QVT-H-C-W0-ICF
Drawing: M109250 001

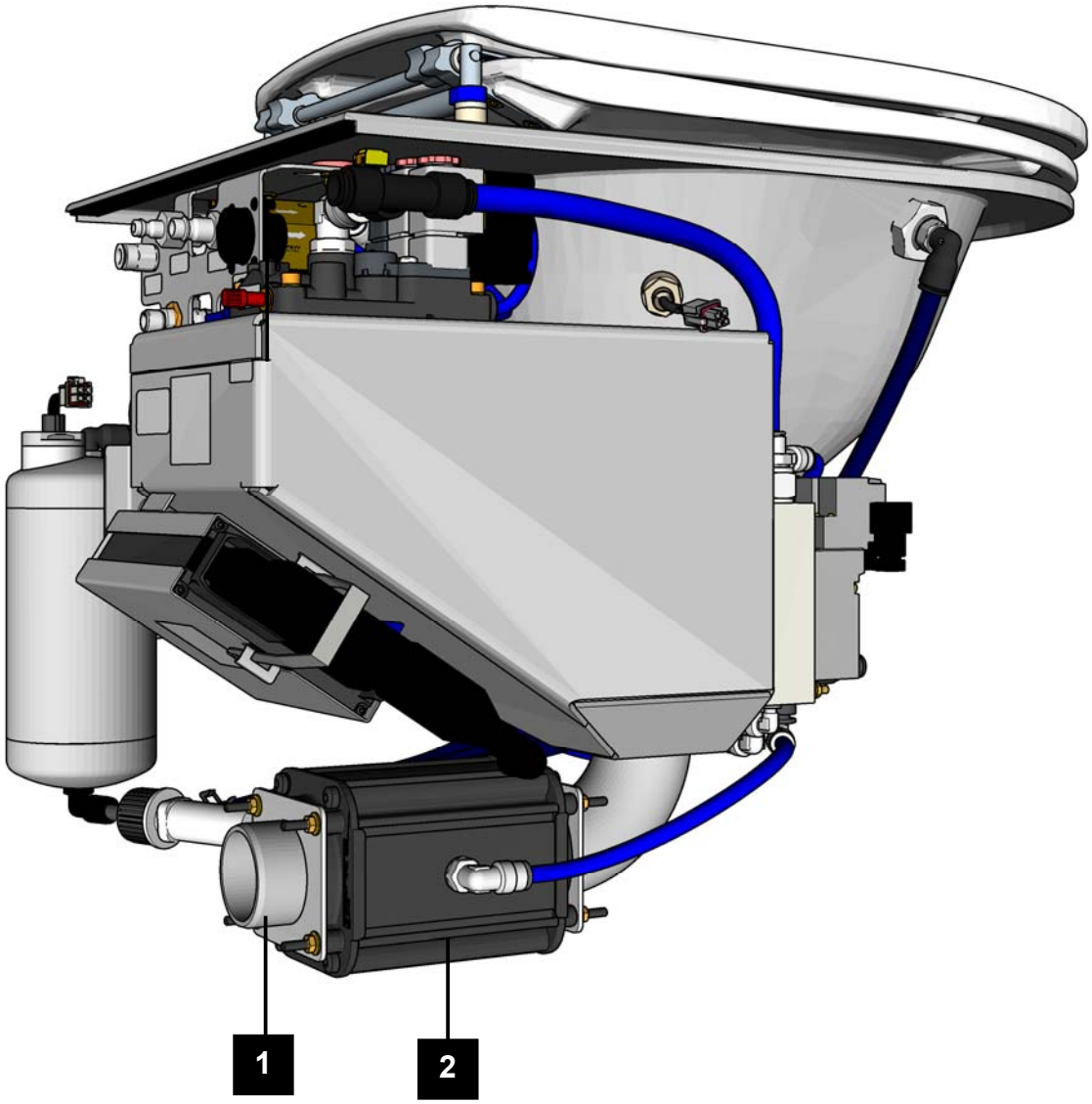
8.2.1.1. Interfaces – Compressed Air, Water and Electrics



1	Compressed air output Ø 8 mm	2	Compressed air input DN5
3	Water input DN7.2	4	Electrical connection 16 pole
5	CAN connection M12 5 pole	6	Grounding M5
7	Test connection Ø 6 mm	8	Compressed air Ø 12 mm

Figure 3: Interfaces – Compressed air, water and eletrics (for reference only)

8.2.1.2. Interfaces – Outlet



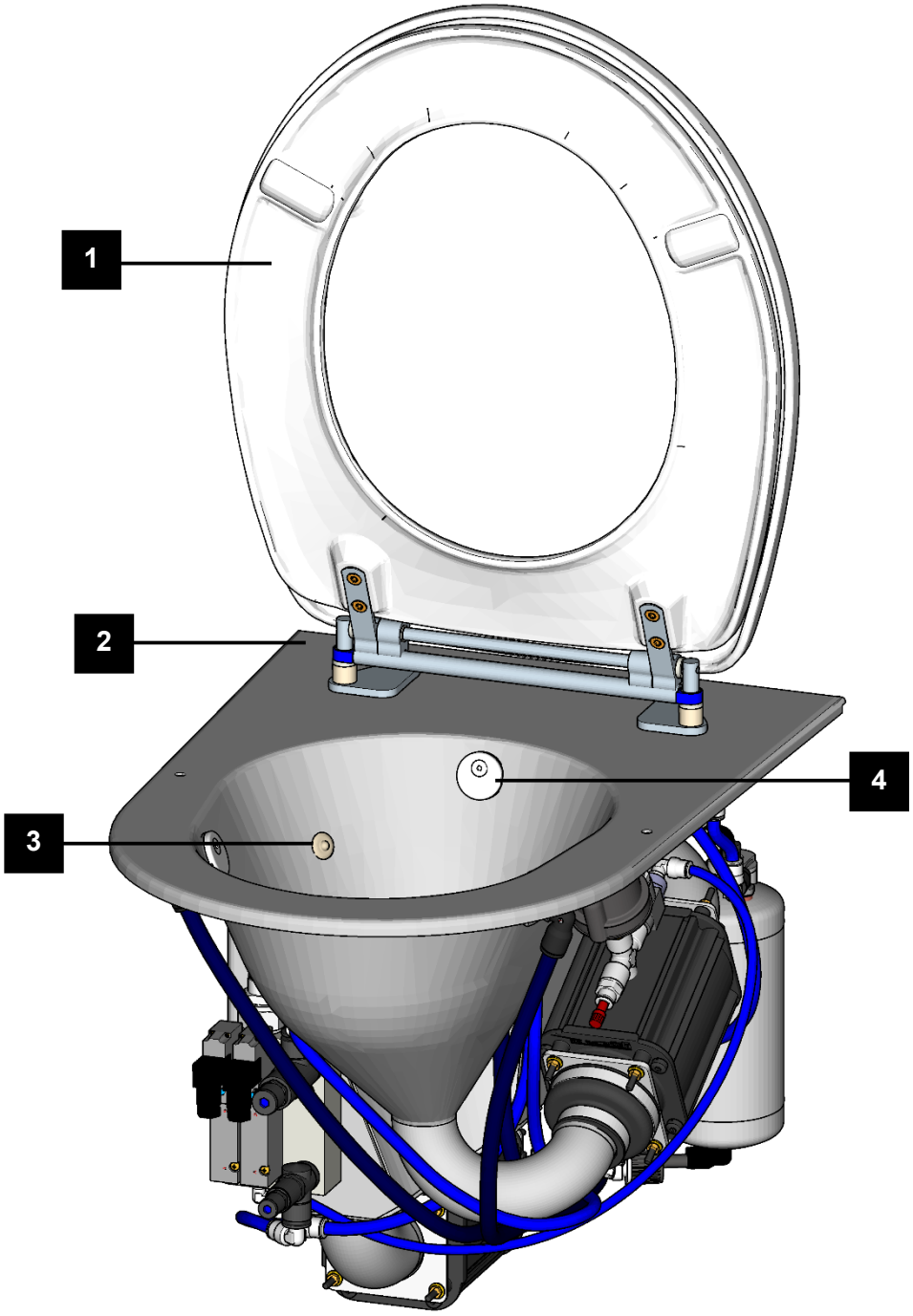
1	Outlet nozzle Ø 48 mm	2	Outlet pinch valve

Figure 4: Interfaces – Outlet (for reference only)

8.2.2 Toilet Bowl

The western toilet has a stainless steel bowl assembly with three stainless steel flush nozzles and a bowl sensor.

Seat and cover are fixed to the bowl with sturdy hinges to ensure easy and reliable operation. The WC-seat is locked in open position to avoid an undesired closure during speed-up.



1	Toilet seat with hinge	2	Toilet Bowl
3	Liquid level guard	4	Flush nozzles (3x)

Figure 5: Toilet bowl (for reference only)

8.2.3 Flush Nozzle

The western toilet is equipped with stainless steel flush nozzles (3x).

The flush nozzles are detachable to provide easy access for cleaning.

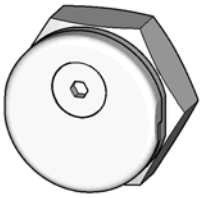


Figure 6: Flush nozzle (for reference only)

8.2.4 Liquid Level Guard

The western toilet is equipped with a liquid level guard to monitor the filling level of the western toilet.
The liquid level guard must be submerged in water for at least 10 seconds before the bowl full routine is started.
The 10 second delay prevents accidental activation during cleaning.

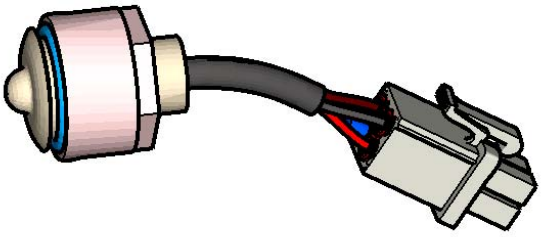


Figure 7: Liquid level guard – optical (for reference only)

8.2.5 Pinch Valves

The inlet pinch valve opens and closes the connection between toilet bowl and intermediate tank.

The outlet pinch valve opens the connection between intermediate tank and waste water tank.

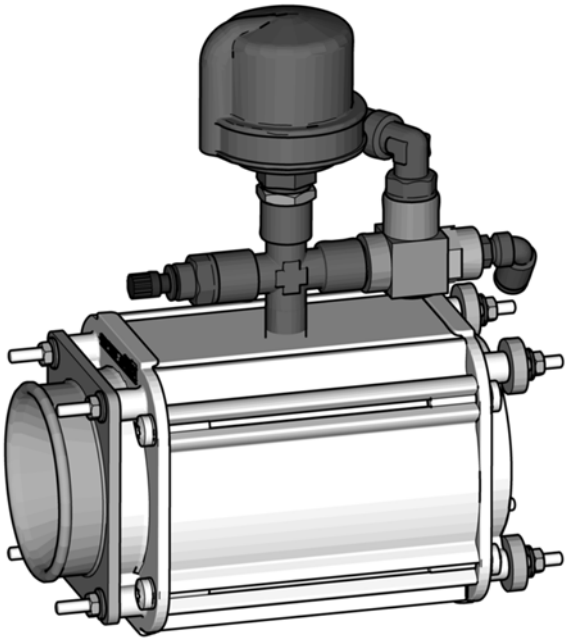


Figure 8: Inlet pinch valve with pressure guard (for reference only)

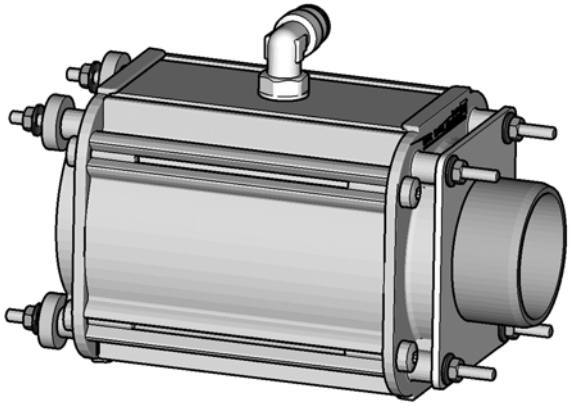
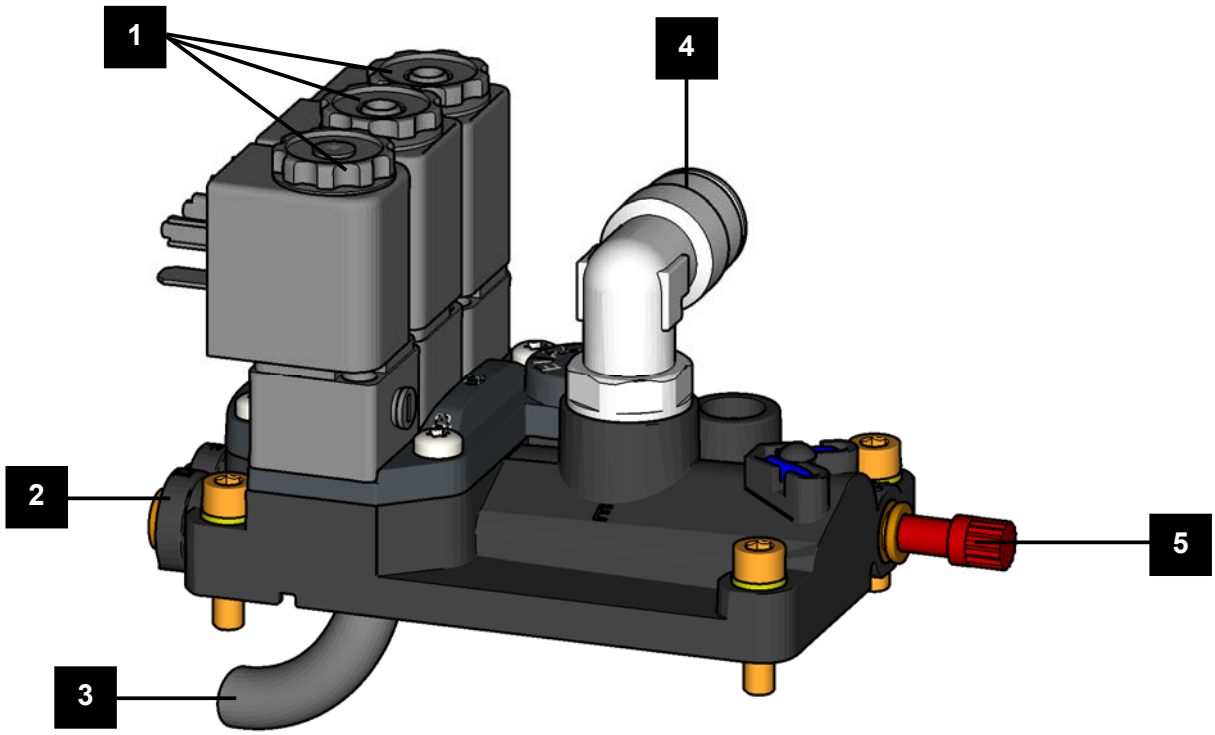


Figure 9: Outlet pinch valve (for reference only)

8.2.6 Vacuum Pump

The vacuum pump charges the intermediate tank with pressure and vacuum.



1	Solenoid valves (3x)	2	Housing
3	Ejector bush	4	Compressed air output Ø 12 mm
5	Test connection Ø 6 mm		

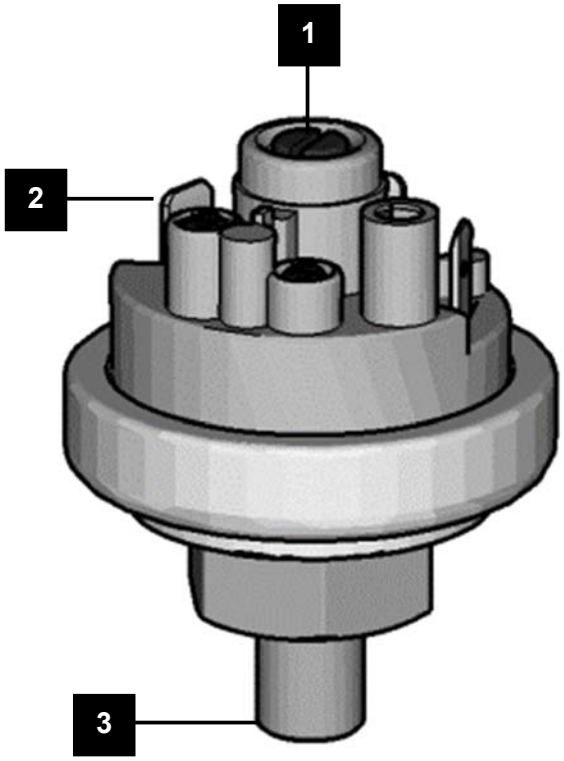
Figure 10: Vacuum pump (for reference only)

8.2.7 Pressure Guards

Two pressure guards are installed on the western toilet.

Pre-set pressure guard to monitor over pressure inside the intermediate tank:
- Switching points 20/17 kPa.

Pre-set pressure guard to monitor the function of the inlet pinch valve:
- Switching points 300/250 kPa.

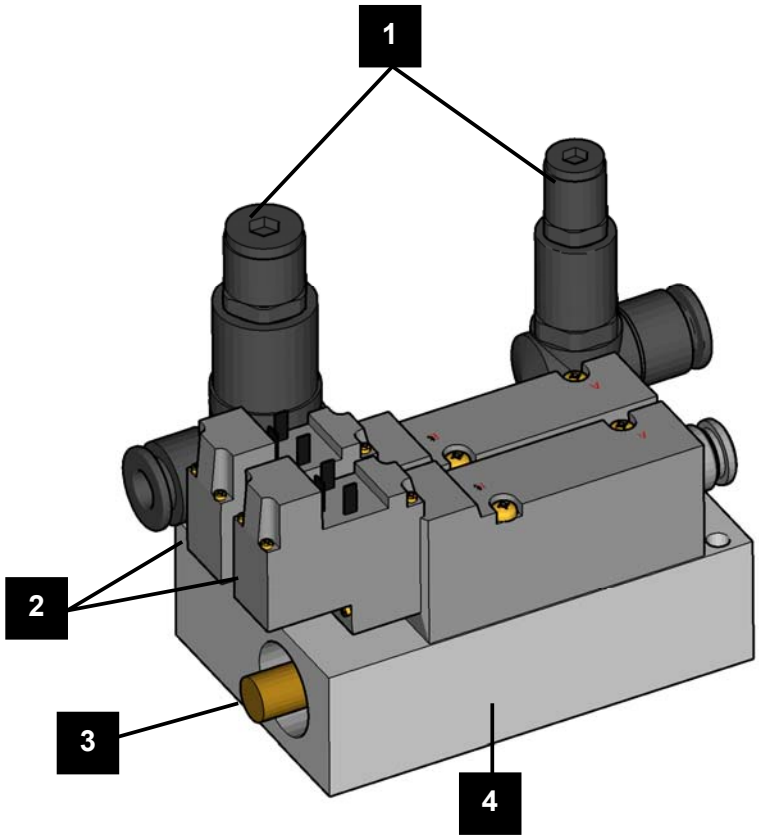


1	Pressure guard	2	Electrical connections
3	Pressure connection G1/8“a		

Figure 11: Pressure guard (without cap)

8.2.8 Ejector

The ejector controls both pinch valves:



1	Solenoid valve (2x)	2	Pressure regulator valve (2x)
3	Silencer	4	Ejector housing

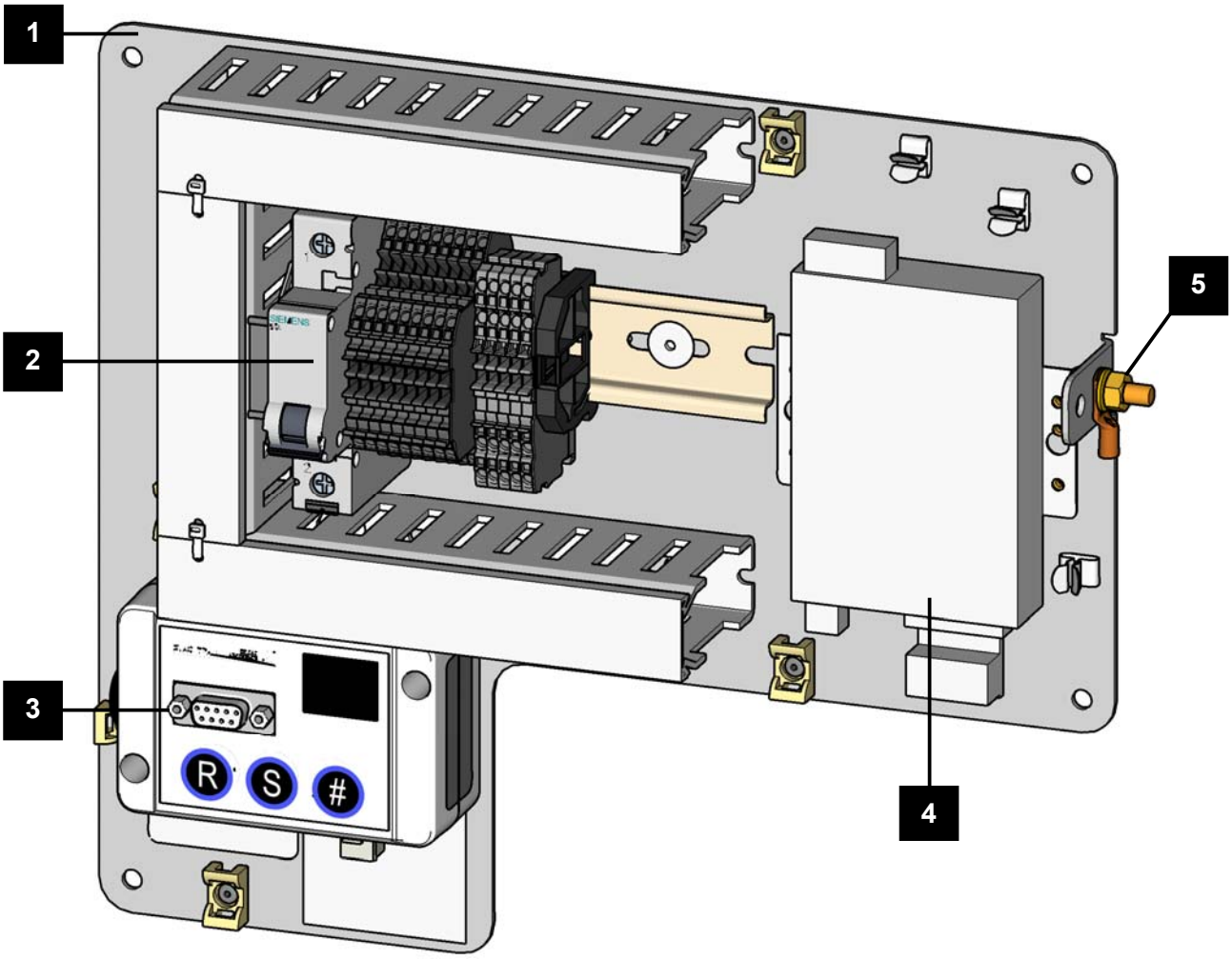
Figure 12: Ejector (for reference only)

8.3 Control Board

The control board controls and monitors the functionality of the Evac western toilet system. The control board is equipped with an RS Box to monitor the immediate system status.

Mounting space for a KBI CAN to RS485 converter is provided (not EVAC scope).

The control panel will be installed to a small box (not Evac scope) which also includes an DC/DC converter (not Evac scope).



1	Base plate	2	Miniature circuit breaker
3	RS-Box	4	KBI CAN to RS485 converter
5	Grounding M5		

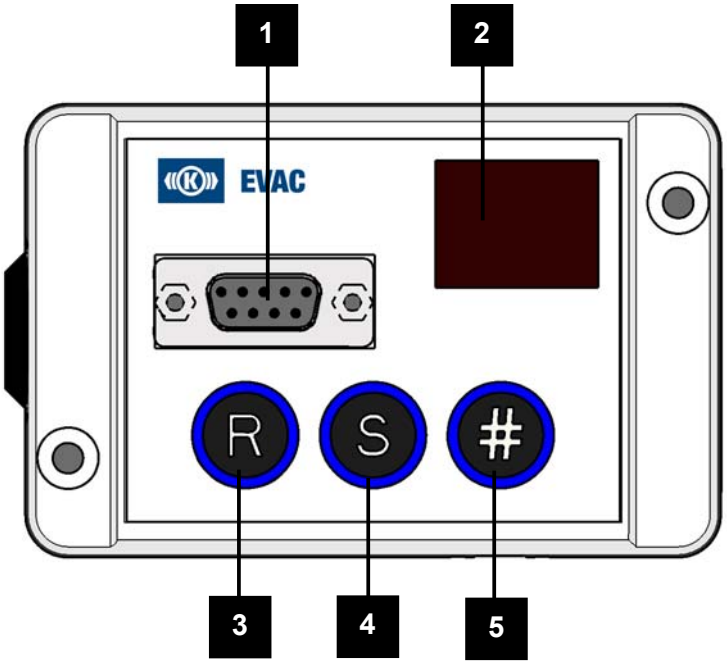
Figure 13: Control board (for reference only)

8.3.1 RS-Box

If the EVAC service terminal or service terminal on PC is connected the functionalities of the RS-Box are unavailable.

The Backflush unit provides an immediate status of system working conditions. The status is displayed on a double-digit 7-segment display.

Obstructions can be cleared by pressing buttons ***R*** or ***S***.



1	Sub-D interface (9-pol)	2	System status indication
3	Button «R»	4	Button «S»
5	Button «#»		

Figure 14: RS-Box (for reference only)

The Backflush unit has the following features:

- System status report.
- Back-flush button ***R***.
- Service-flush button ***S*** (Flush without water).
- Button ***#*** (communication mode and error quit).
- Sub-D connector (9-pole) for EVAC service terminal or service terminal on PC.

After system conditions are detected (exception: 01 Waste water tank full) the control unit will perform automatic error correction routines. During the routines the code will be displayed constantly. If the error cannot be corrected the toilet will switch to out of order and the code display will start blinking.

Display	Description	Indication mode
00	System healthy	Constant
01	Waste tank full	Blinking
02	Pressure rise	Constant → Blinking
03	Pressure@Vacuum	Constant → Blinking
03	Pressure detected	Constant → Blinking
05	Bowl full	Constant → Blinking
06	No water	Constant → Blinking
09	Inlet valve can't open	Constant → Blinking
10	Inlet valve can't close	Constant → Blinking
87	Freeze drain active	Constant → Blinking
88	Initial startup/reset	All LED segments active for 5 s
90	Terminal (PC) connected	constant
92	Service terminal HT793 connection	constant

Table 4: Code overview - RS-Box

8.3.1.1. Connecting a PC (Service terminal PC-version)

Connect a PC to the RS-Box as follows:

- Push button **«#»** for a minimum of 0.7 seconds
- 00 blinks
- Push button **«#»** for a minimum of 0.7 seconds
- 00 and 90 are displayed alternating
- If no button is pushed for 5 seconds the display will continuously display 90
- Use Service terminal PC-Version as described in the respective manual

Disconnect the PC as follows:

- Push button **«#»** for a minimum of 0.7 seconds
- 90 blinks
- Push button **«#»** for a minimum of 0.7 seconds
- 90 and 00 are displayed alternating
- If no button is pushed for 5 seconds the display will continuously display 90

8.3.1.2. Connecting the Service terminal HT793

Do not connect a PC to the RS-Box if service terminal mode is activated – 92 displayed on RS-Box! 24 V are present at the RS232 interface after pressing button «S»!

Connect the Service terminal HT793 to the RS-Box as follows:

- Connect the service terminal to the RS-232-interface of the RS-Box
- Push button **«S»** for 10 Seconds

NOTICE: DO NOT connect a PC to the RS232 interface!

- **92** is displayed and the serviceterminal is active

Disconnecting the Service terminal HT793:

- Push button **«S»** for 10 Seconds
- **00** is displayed

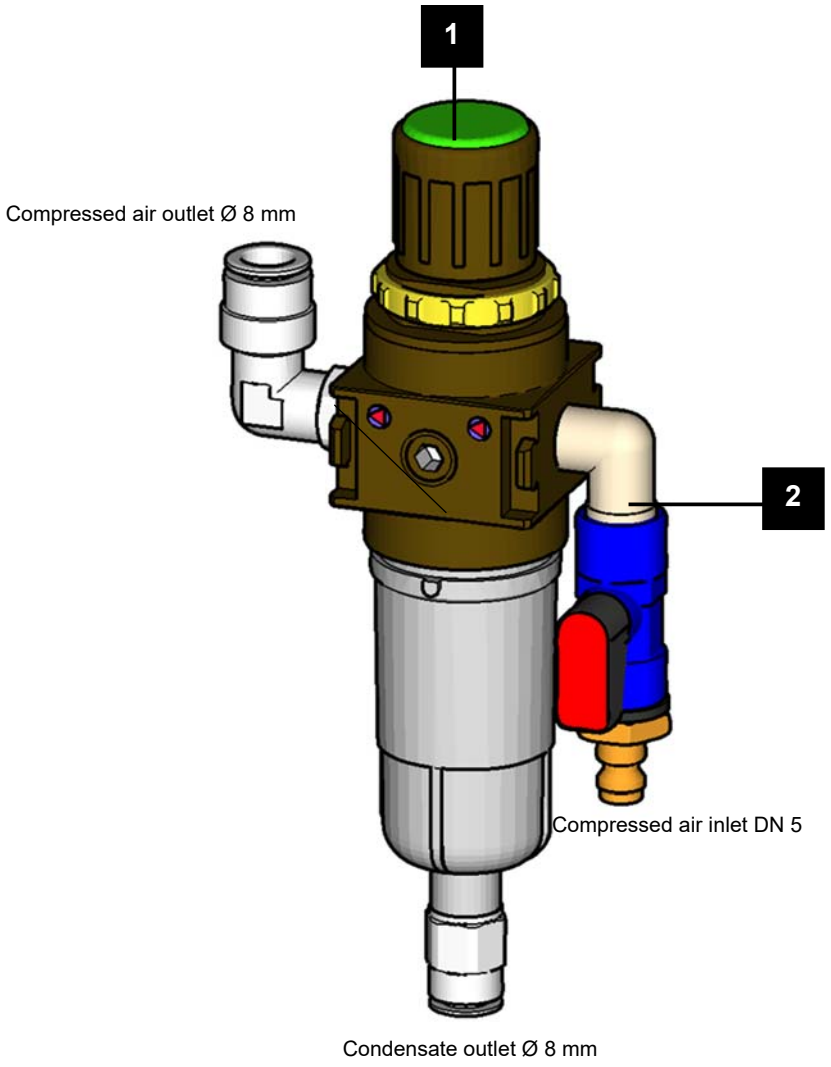
8.4 Filter Pressure Regulator

The filter pressure regulator serves as interface between the air supply from the train and the western toilet system. The air supply will be reduced via filter pressure regulator down to the 6.4 bar required by the vacuum system.

A ball valve is mounted on the inlet side of the filter pressure regulator to shut-off the compressed air supply to the system if necessary.

The condensate trap cleans the compressed air and the collected liquid is discharged via a connected hose.

The filter pressure regulator controls will be installed to the exterior control board box.



1	Filter pressure regulator	2	Ball valve

Figure 15: Filter pressure regulator, equipped (for reference only)

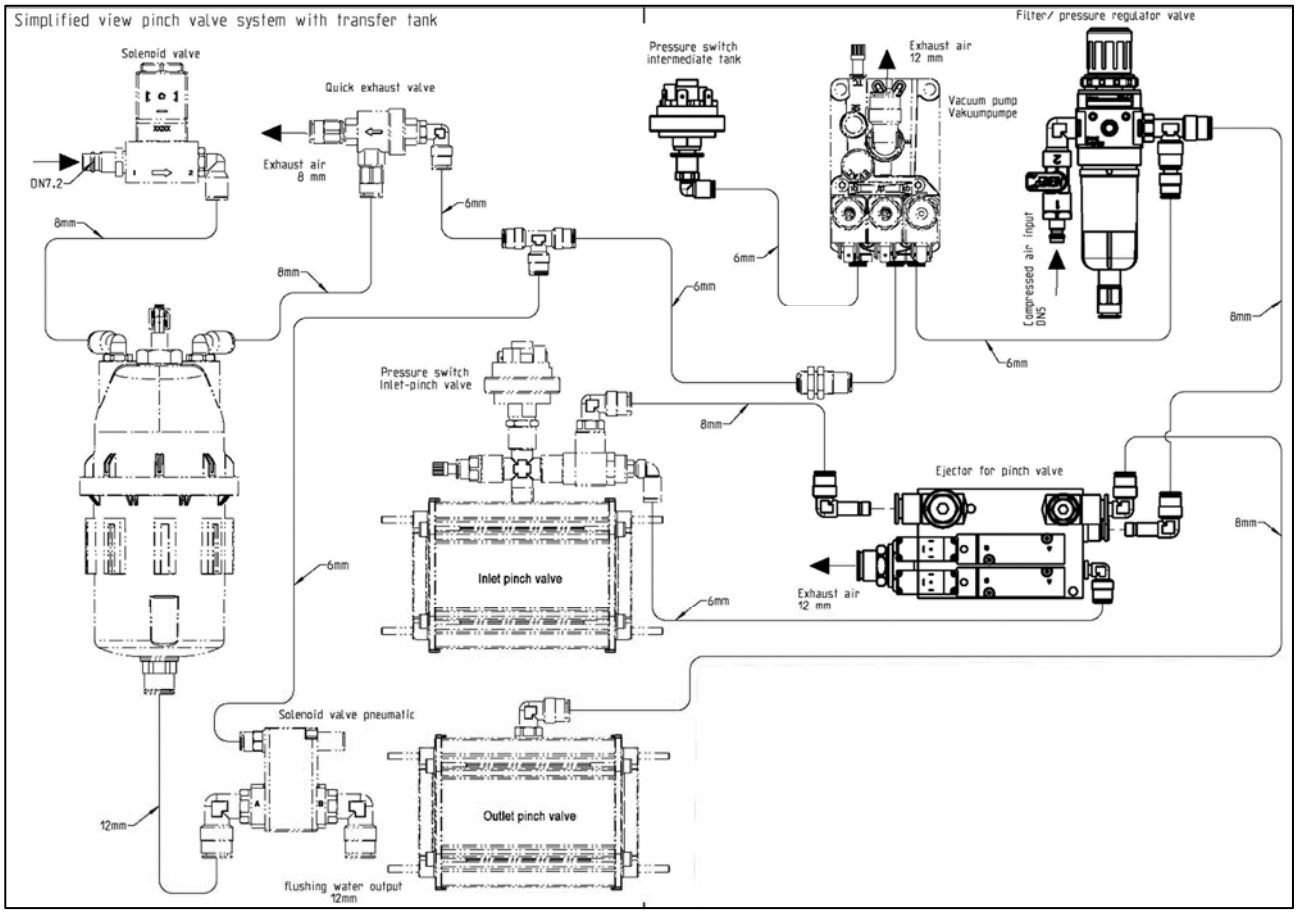


Figure 16: Schematic view – Western system (for reference only

8.5 Control Board Box (not Evac scope)

The control board box will include the Evac control board, the KBI CAN to RS485 converter and the DC/DC converter (both not Evac scope). The Evac filter pressure regulator will be installed in a holder on the exterior of the box. The RS-box will be placed behind a screwable transparency cover:

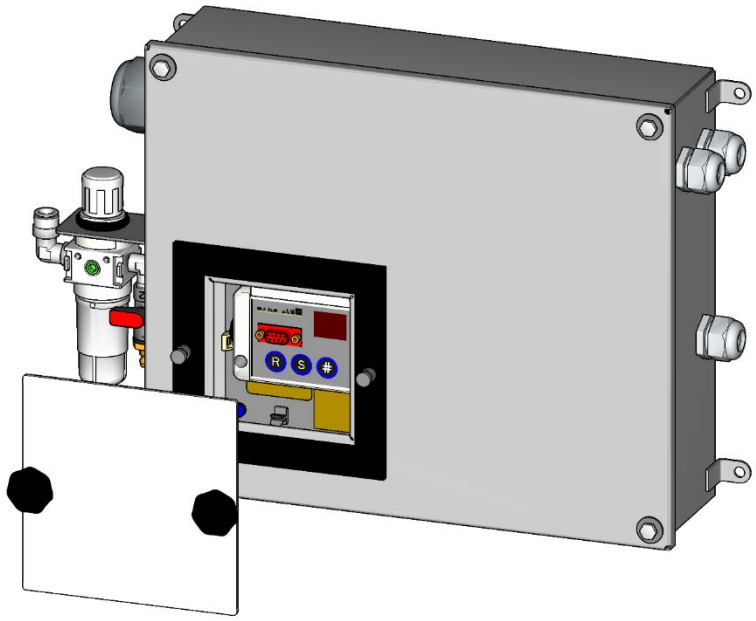


Figure 17: Control board box (for reference only)

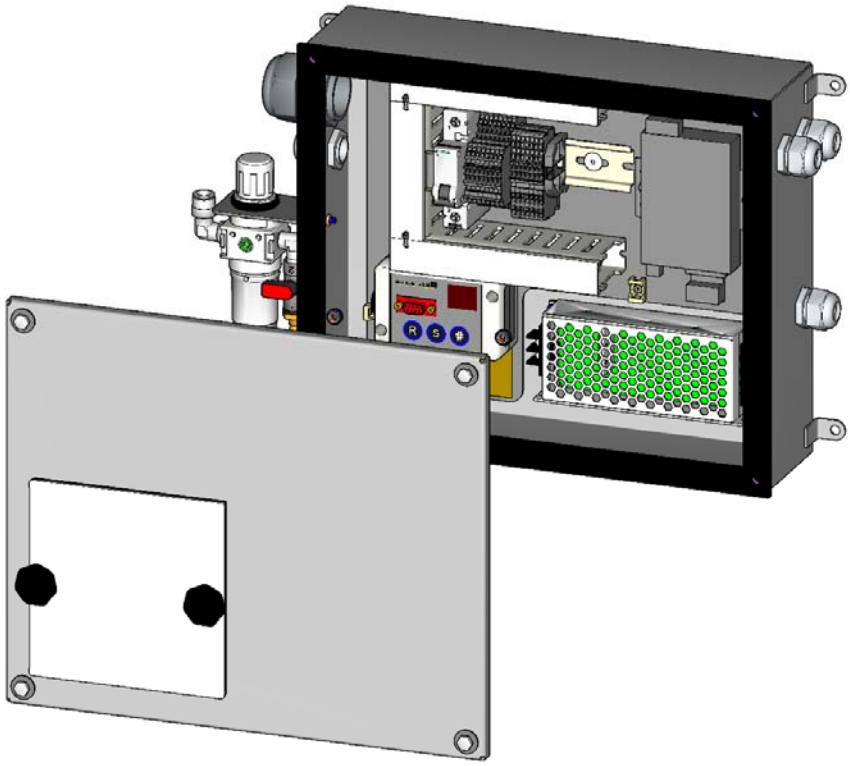


Figure 18: Control board box – open (for reference only)

8.6 Connection Set

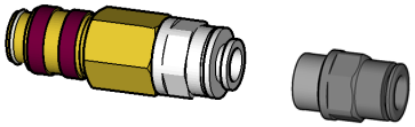
For additional information see
109433 Appendix Manuals - Western Toilet QVT-H-C-W0-ICF

The connection set contains the additional materials necessary to install and connect the western toilet and the label for RS-Box function explanation:

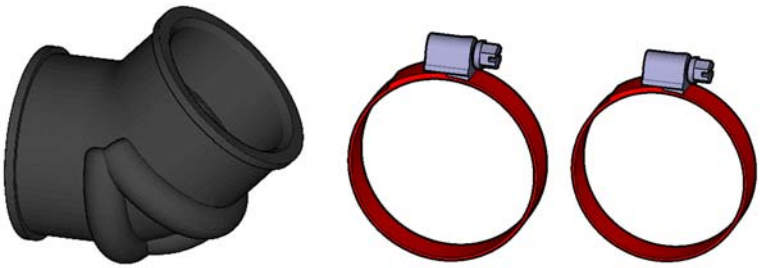
- Connection cable -W14 VT CAN
- Connection cable -W15 VT

- Installation material western toilet to frame

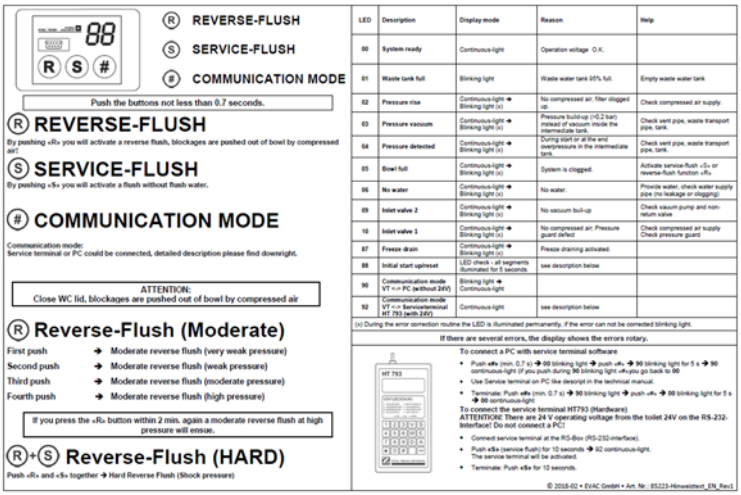
- Connection material air/water



- Connection material outlet



- Label, self-adhesive - RS-Box V3.0 QV English



Ⓡ REVERSE-FLUSH

Ⓢ SERVICE-FLUSH

COMMUNICATION MODE

Push the buttons not less than 0.7 seconds.

Ⓡ REVERSE-FLUSH

By pushing «Ⓡ» you will activate a reverse flush, blockages are pushed out of bowl by compressed air!

Ⓢ SERVICE-FLUSH

By pushing «Ⓢ» you will activate a flush without flush water.

COMMUNICATION MODE

Communication mode:
Service terminal or PC could be connected, detailed description please find downright.

ATTENTION:
Close WC lid, blockages are pushed out of bowl by compressed air

Ⓡ Reverse-Flush (Moderate)

First push → Moderate reverse flush (very weak pressure)
Second push → Moderate reverse flush (weak pressure)
Third push → Moderate reverse flush (moderate pressure)
Fourth push → Moderate reverse flush (high pressure)

If you press the «Ⓡ» button within 2 min. again a moderate reverse flush at high pressure will ensue.

Ⓡ+Ⓢ Reverse-Flush (HARD)

Push «Ⓡ» and «Ⓢ» together → Hard Reverse Flush (Shock pressure)

LED	Description	Display mode	Reason	Help
00	System ready	Continuous-light	Operation voltage O.K.	
01	Waste tank full	Blinking light	Waste water tank 95% full.	Empty waste water tank
02	Pressure rise	Continuous-light → Blinking light (x)	No compressed air, filter clogged up.	Check compressed air supply.
03	Pressure vacuum	Continuous-light → Blinking light (x)	Pressure build-up (>0.2 bar) instead of vacuum inside the intermediate tank.	Check vent pipe, waste transport pipe, tank.
04	Pressure detected	Continuous-light → Blinking light (x)	During start or at the end overpressure in the intermediate tank.	Check vent pipe, waste transport pipe, tank.
05	Bowl full	Continuous-light → Blinking light (x)	System is clogged.	Activate service-flush «Ⓢ» or reverse-flush function «Ⓡ»
06	No water	Continuous-light → Blinking light (x)	No water.	Provide water, check water supply pipe (no leakage or clogging)
09	Inlet valve 2	Continuous-light → Blinking light (x)	No vacuum buil-up	Check vacuum pump and non-return valve
10	Inlet valve 1	Continuous-light → Blinking light (x)	No compressed air. Pressure guard defect	Check compressed air supply Check pressure guard
87	Freeze drain	Continuous-light → Blinking light (x)	Freeze draining activated.	
88	Initial start up/reset	LED check - all segments illuminated for 5 seconds	see description below	
90	Communication mode VT <-> PC (without 24V)	Blinking light → Continuous-light		
92	Communication mode VT <-> Serviceterminal HT 793 (with 24V)	Continuous-light	see description below	

(x) During the error correction routine the LED is illuminated permanently, if the error can not be corrected blinking light.

If there are several errors, the display shows the errors rotary.

To connect a PC with service terminal software

- Push «Ⓡ» (min. 0,7 s) → 00 blinking light → push «Ⓡ» → 90 blinking light for 5 s → 90 continuous-light (if you push during 90 blinking light «Ⓡ»you go back to 00
- Use Service terminal on PC like descript in the technical manual.
- Terminate: Push «Ⓡ» (min. 0,7 s) → 90 blinking light → push «Ⓡ» → 00 blinking light for 5 s → 00 continuous-light

To connect the service terminal HT793 (Hardware)
ATTENTION! There are 24 V operating voltage from the toilet 24V on the RS-232-Interface! Do not connect a PC!

- Connect service terminal at the RS-Box (RS-232-interface).
- Push «Ⓢ» (service flush) for 10 seconds → 92 continuous-light. The service terminal will be activated.
- Terminate: Push «Ⓢ» for 10 seconds.

8.7 Scope of Supply – Button <Flush> and Connection Cable

This scope of supply includes the following components:

- Push button - 82 - 22 – Green
- Connection cable - W06 flush button (Western)

Figure 19: Button <Flush> (for reference only)

8.8 Scope of Supply – Indicator <Out of order> and Connection Cable

This scope of supply includes the following components:

- Indicator - 82 - 22 – red
- Connection cable - W05 Out of Order Indicator (Western)

Figure 20: Indicator <Out of Order> (for reference only)

8.9 Scope of Supply – Additional Items for Installation

This scope of supply includes the following components:

- Ball valve G ¼”
- Male connector Ø 8 mm
- Polyurethan tube Ø 8 mm
- Reduction G ¾” to Rp ½”
- Male connector Ø 10 mm
- Polyurethan tube Ø 10 mm

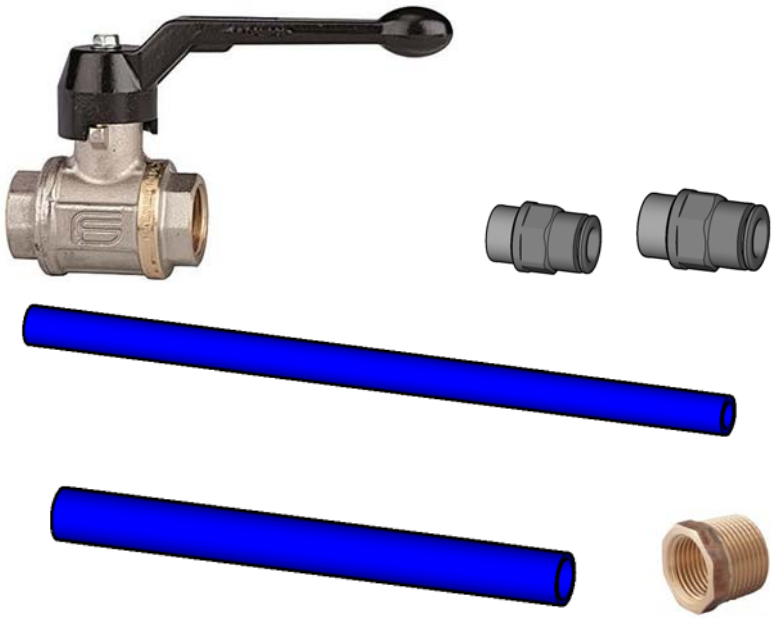


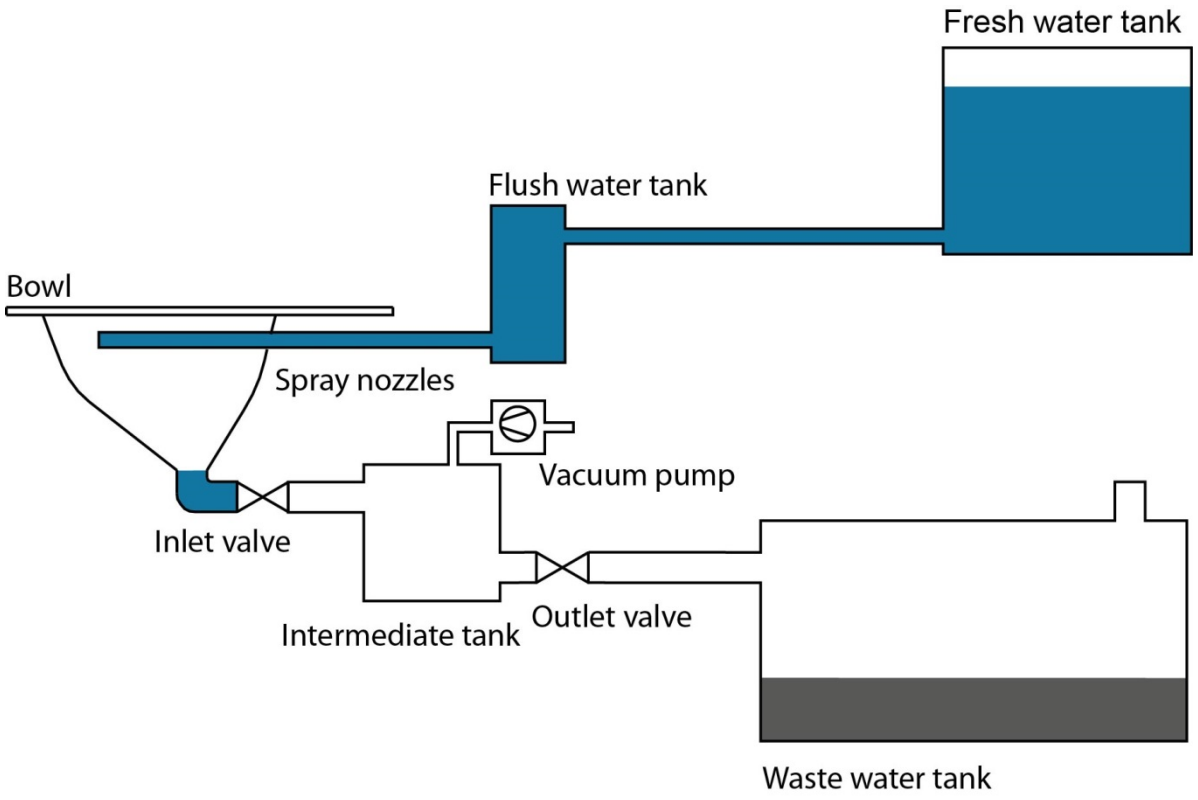
Figure 21: Scope of Supply – Additional Items for Installation (for reference only)

9. OPERATING DESCRIPTION

9.1 Normal operation

The western toilet assembly is designed to transport human waste from the toilet bowl to a waste tank or Bio-digester!
Any other use of the toilet system does not comply with the intended design.

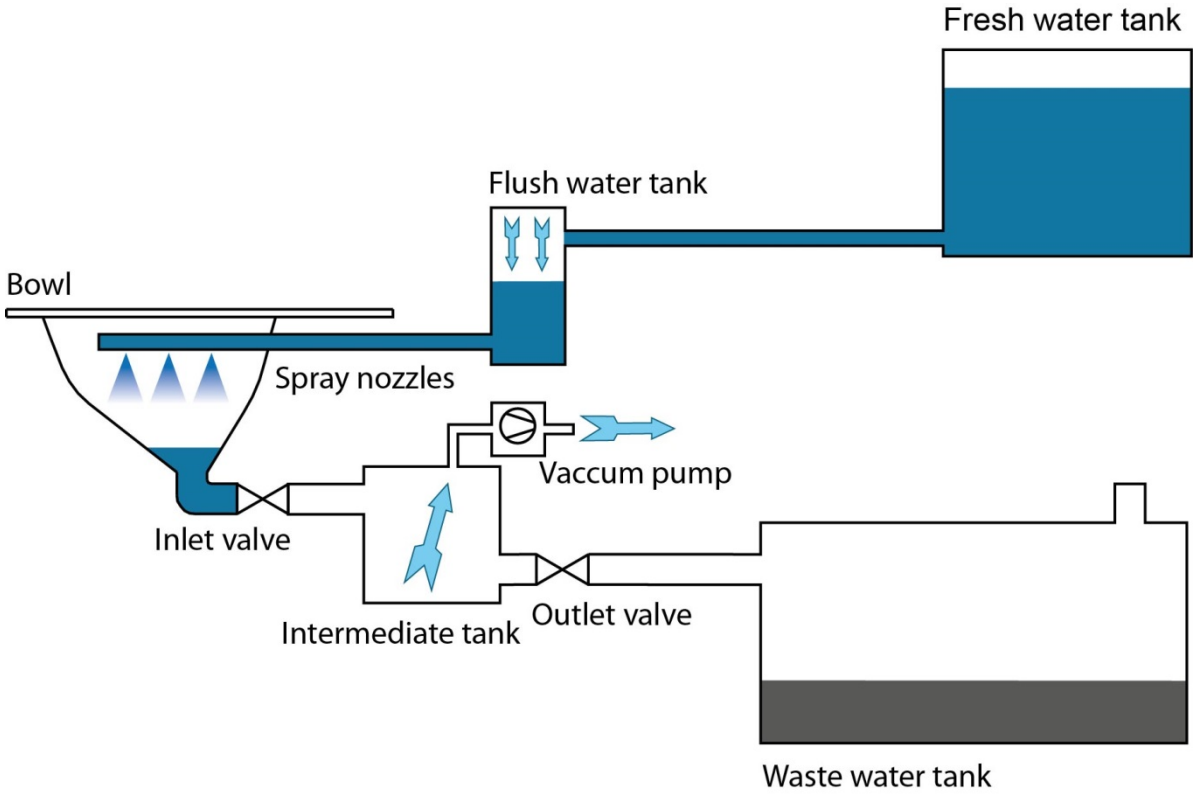
During normal operation the western toilet will be in standby mode until a flush cycle is initiated. The western toilet will perform a flush cycle and revert to standby mode afterwards.



9.2 Flushing the toilet bowl and evacuating the intermediate tank

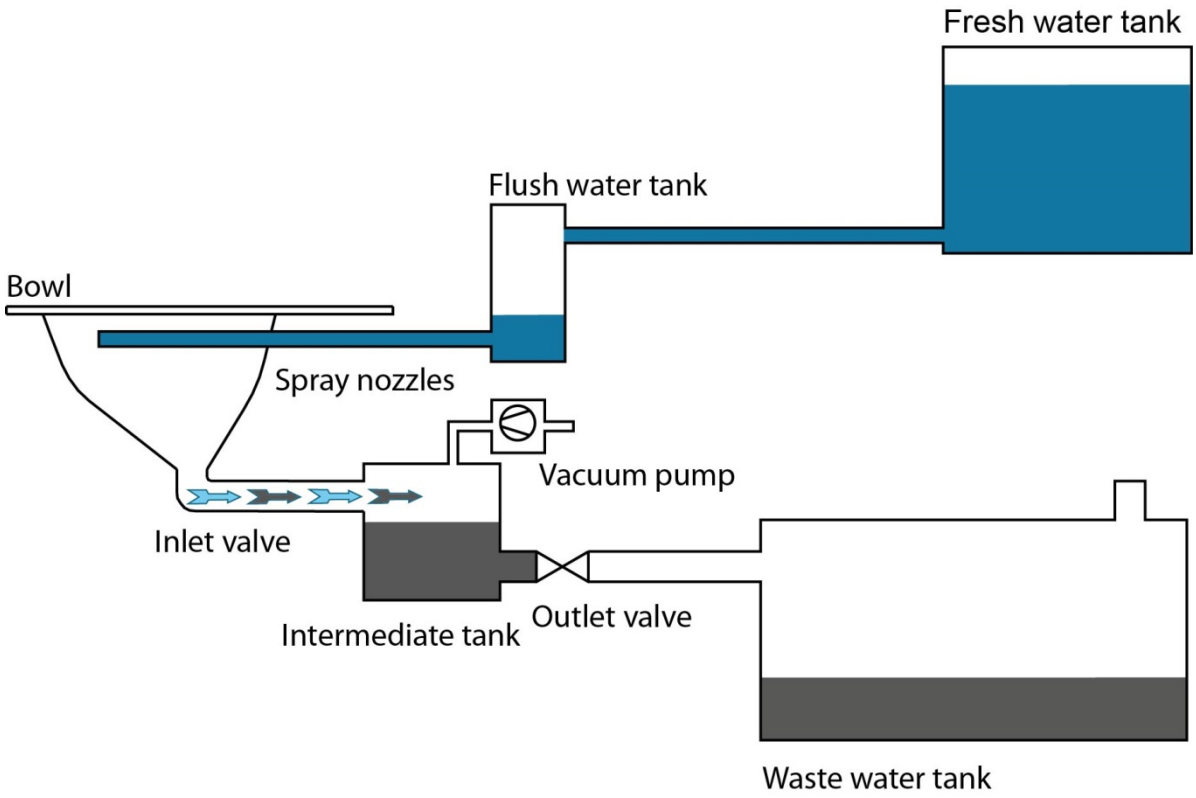
Pressing the flush push button will start the flush sequence. It lasts max. 25 seconds but if the water tank of the western toilet is not filled within this time an additional opening time of 60 seconds will be given. The water tank of the western toilet will be pressurized by the supplied compressed air to rinse the water through the spray nozzles into the bowl.

In parallel with the rinsing activity the intermediate tank evacuation starts. It will be evacuated by the vacuum pump down to a level of -0.5 to -0.6 bar. After end of the rinsing activity the water tank will be refilled by opening the water inlet valve.



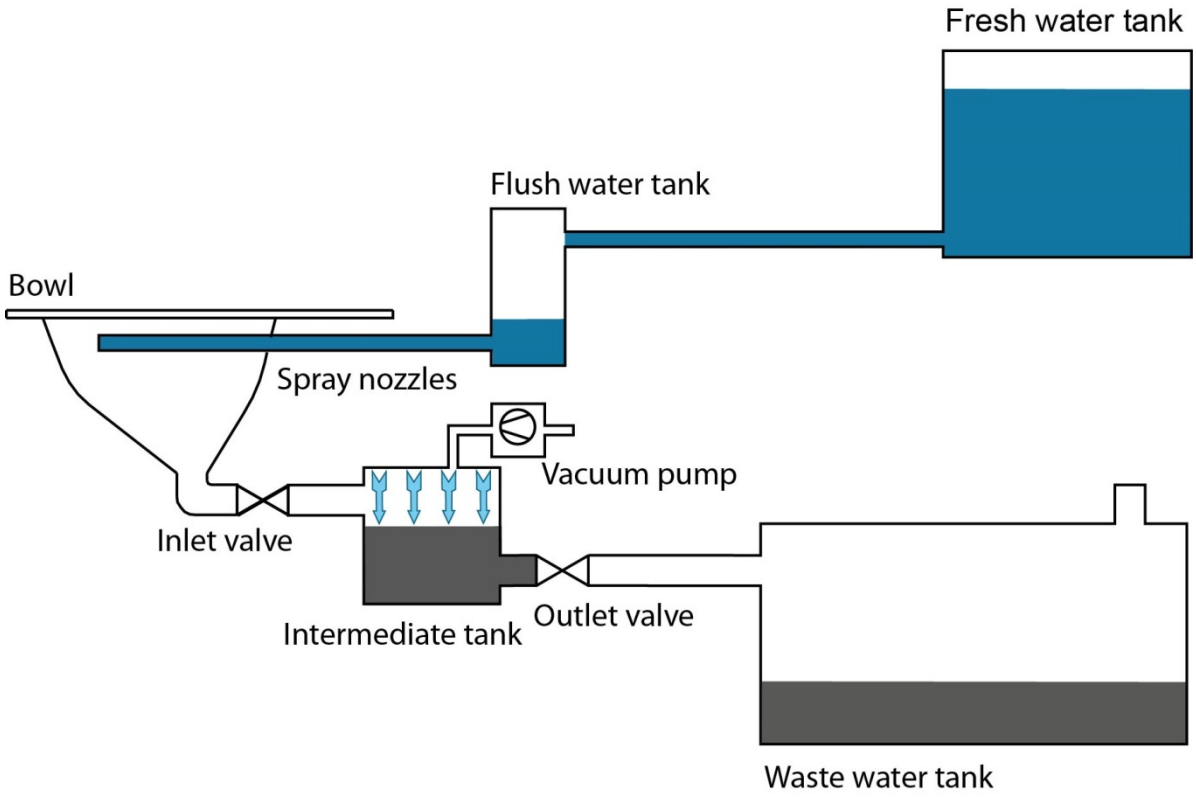
9.3 Emptying the bowl

The solenoid valve of the inlet valve will be activated and the inlet valve opens the direction bowl – intermediate tank. The vacuum of the intermediate tank sucks the content of the bowl into it.



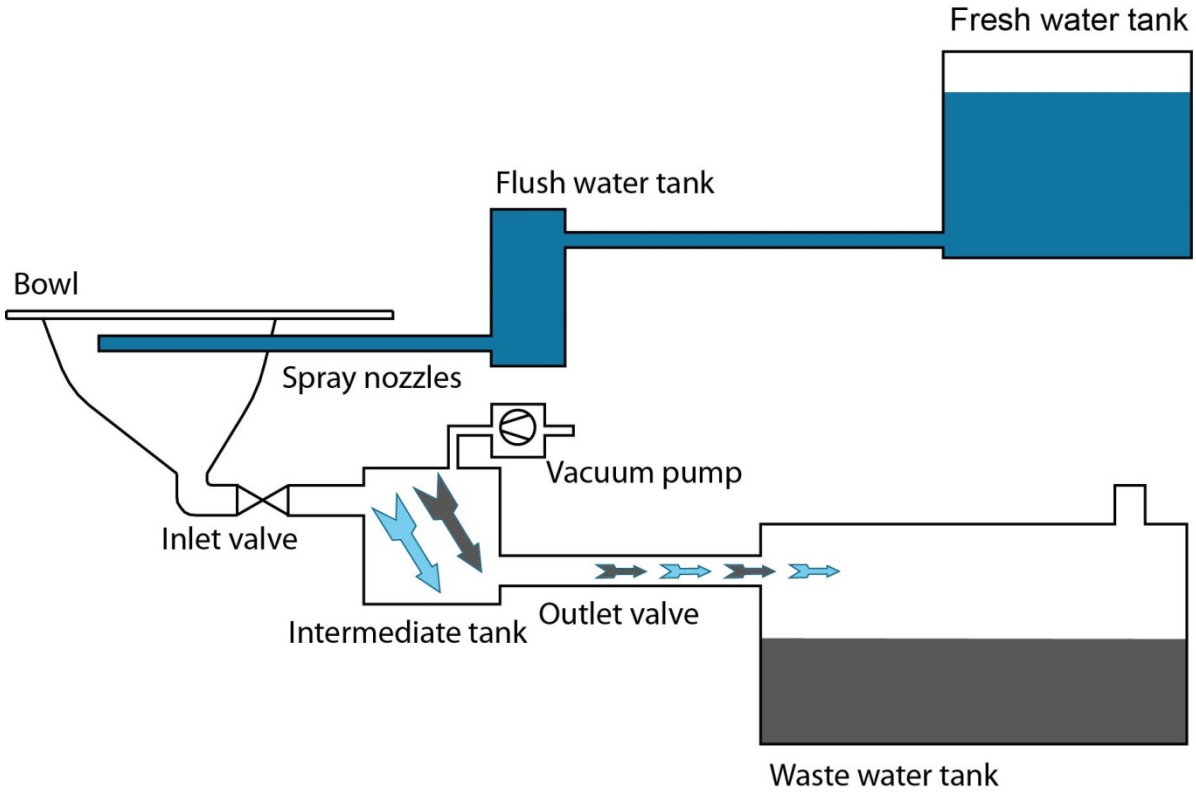
9.4 Pressure built-up

The solenoid valve for leading pressured air into the intermediate tank will be opened to pressurize it up to +0.6 bar.



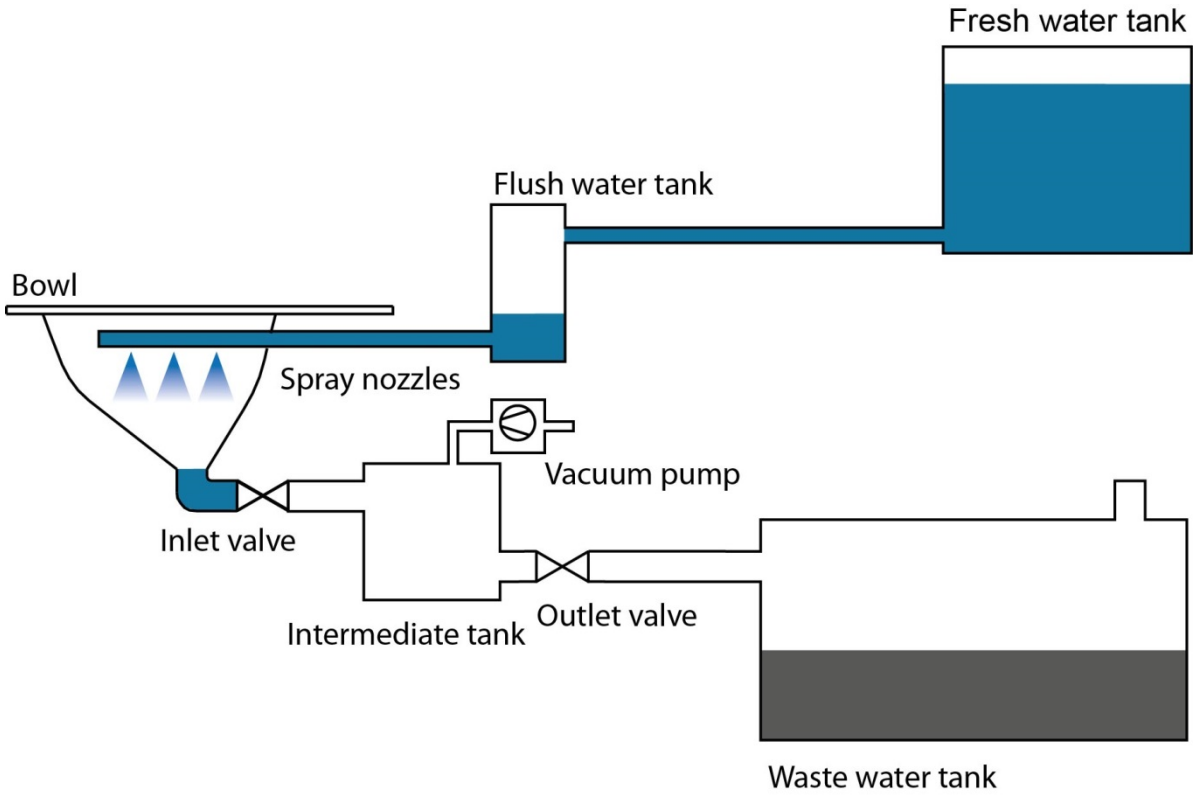
9.5 Emptying the intermediate tank

Afterwards the corresponding solenoid valve for the outlet valve will be activated to deliver the content of the intermediate tank through the pipe into the waste water tank or Bio-digester. The cycle will be finished by refilling the water tank. Therefore the water inlet valve will be opened until water is detected again.



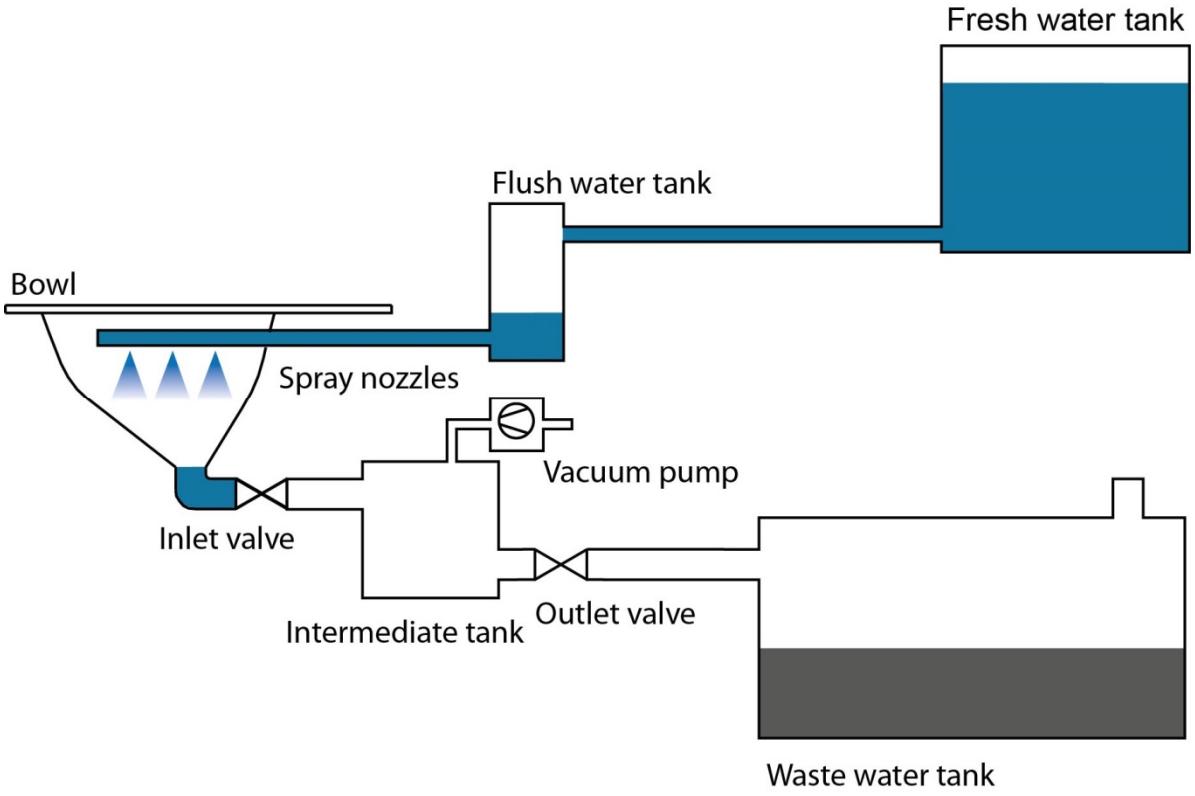
9.6 Initial water supply

The water tank of the VT will be pressurized by the supplied compressed air to rinse the water through the spray nozzles into the bowl as an initial water supply.



9.7 Refilling of flush water tank

Concluding the flush water tank is refilled and the system is gain in stand-by.



10. TROUBLESHOOTING

10.1 General information

⚠ WARNING ***Fecal matter!***

Risk of infection:

- ► **Do not eat, drink or smoke.**
- ► **Wear PPE**

This chapter described diagnostics and actions for different error scenarios. Qualified personnel is able to recognize the error causes and start the needful actions.

Detailed maintenance description see:

- 109432 Maintenance Manual - Western Toilet QVT-H-C-W0-ICF

10.2 Error correction routines

After detecting error conditions (except: waste tank full) the control unit initiates an error correction routine.
Should the error correction routine be unsuccessful, the control unit will switch off the western toilet.

The error detection of the western toilet will be carried out by the following sensors:

- Pressure sensor intermediate tank.
- Bowl sensor.
- Level sensor flush water tank.

10.3 Troubleshooting

NOTICE

If water flows continuously into the toilet bowl, interrupt fresh water supply immediately to prevent damage.

► **It is mandatory to install a manometer to the test conduit of the western toilet to avoid accidental back flushes before it is allowed to open the gates valves manually.**

10.3.1 Troubleshooting during commissioning

Cause	Action
No power supply	Check power supply
No fresh water	Check FWT and fill up
WWT full	Empty WWT (Bio-Digester)
No compressed air	Check compressed air supply

Table 5: Troubleshooting during commissioning

10.3.2 Troubleshooting and actions

Code 01: WWT full	
Possible cause	**Action**
WWT full	Empty WWT (Bio-Digester)
Float switch clogged	Clean component
Float switch defect	Replace component

Code 02: Pressure rise	
Possible cause	**Action**
No compressed air available	Check compressed air supply
Test conduit untight	Check test conduit, must be closed with a blind plug.
Inlet or outlet pinch valve leaky	Replace component
Pressure switch defect	Replace component
Wrong supply connections	Check compressed air connection

Code 03: Pressure Vacuum	
Possible cause	**Action**
Overpressure instead of vacuum; waste water piping clogged	Remove clogging in the waste water piping
WWT full	Empty WWT (Bio-Digester)
Vacuum pump defect	Replace component

Code 04: F: Pressure detected	
Possible cause	**Action**
Blockage in the waste pipe or tank. Pressure cannot be reduced, waste water tank is full, frozen or cannot be vented.	Remove clogging in the waste water piping
Pressure switch defect	Replace component
Outlet pinch valve does not open	Connect service terminal and activate maintenance mode: manually control outlet pinch valves **⚠ WARNING** ***Do not open the inlet pinch valve!***

Code 05: Bowl full	
Possible cause	**Action**
Bowl level to high	Activate service flush or reverse flush (low pressure) or reverse flush (hard) on the RS-Box
Bowl sensor defect	Replace component
Exhaust piping clogged	Clean the exhaust piping

Code 06: no water	
Possible cause	**Action**
FWT empty	Fill FWT
Water filter clogged	Clean component
Water inlet valve defect	Replace component

Code 09: Inlet can`t open	
Possible cause	**Action**
Interrupted air supply to valve	Check pipe for blockages Check if pipe is connected right

Code 10: Inlet can`t close	
Possible cause	**Action**
Inlet pinch valve clogged/defect	Check/Clean valve; replace if necessary.

Table 6: Troubleshooting and actions

10.3.3 Service flush

The buttons must be pressed for at least 0.7 seconds.

After pushing the Service-flush button the toilet system will perform a flush cycle without adding fresh water. If the disturbance could be cleared the toilet is automatically ready for operation and can be newly started by pushing the start key. In case the Service-flush could not clear the disturbance the control unit of the toilet will signal «error».

10.3.4 Back flush function

Empty the bowl as far as possible.
Complete opening of the bowl must be covered!
Blockages are pushed out of the bowl by compressed air
Button Back flush must be pressed for at least 0.7 seconds.
4 Pressure levels:

- **pressure VERY WEAK**
- **pressure WEAK**
- **pressure MODERATE**
- **pressure HIGH**

- The moderate reverse flush may be incrementally increased in intensity by repeated pressing the back flush button.
- An intense reverse flush may be activated by pressing back flush and service flush buttons simultaneously.

10.3.4.1. Reverse flush

⚠ WARNING ***Fecal matter!***

Risk of infection

- ► **Use personal protective equipment**
- ► **Do not eat, drink or smoke**
- ► **Cover bowl opening completely**
- ► **Refer to safety at work**

CAUTION ***Moveable WC-seat!***

Crushing:

- ► **Fix WC seat!**

Empty the bowl as far as possible.
Complete opening of the bowl must be covered!
Blockages are pushed out of bowl by compressed air.
Button «Back flush» must be pressed for at least 0.7 seconds.

First pushing → shock pressure **(very weak pressure).**

Press the back flush button for 0.7 seconds.

- Automatic valve actuation.
- The pressure in the intermediate tank is scanned. If excess pressure is detected, the sequence will be interrupted.
- 1. shock pressure **(very weak pressure).**

If the back flush button was pressed during the DTC indicates an error code the program returns to this error code indication.

When the blockage is loosened it should be removed from the bowl. The toilet is now operational and the flush button could be pressed.
Second push → shock pressure **(weak pressure)**

If the unit is still blocked press the back flush button within 2 minutes a **second time**.

- Automatic valve actuation.
- Pressure release as described above.
- 2. shock pressure **(weak pressure)**

When the blockage is loosened it should be removed. The toilet is now operational and the flush button could be pressed.

Third push → shock pressure **(moderate pressure).**

If the unit is still blocked press the back flush button within 2 minutes a **third time**.

- Automatic valve actuation.
- Pressure release as described above.
- 3. shock pressure **(moderate pressure).**

When the blockage is loosened it should be removed. The toilet is now operational and the flush button could be pressed.

Fourth push → shock pressure **(high pressure).**

Unit still blocked press the back flush button within 2 minutes a **fourth time**.

- Automatic valve actuation.
- Pressure release as described above.
- 4. shock pressure **(high pressure).**

When the blockage is loosened it should be removed. The toilet is now operational and the flush button could be pressed.

If within 2 minutes no button was pressed the back flush function starts after new activation with the very weak pressure step.

10.3.4.2. Hard reverse flush

⚠ WARNING ***Fecal matter!***

Risk of infection

- **Use personal protective equipment**
- **Do not eat, drink or smoke**
- **Cover bowl opening completely**
- **Refer to safety at work**

CAUTION ***Moveable WC-seat!***

Crushing:

- **Fix WC seat!**

Empty the bowl as far as possible.
Complete opening of the bowl must be covered!
Hard reverse flush only possible with simultaneous pressing of R + S
R + S must be pressed for at least 0.7 seconds.
Blockages are pushed out of the bowl by compressed air.

Press the back flush and service flush buttons for 0.7 seconds simultaneously. The following program ensues:

- Automatic valve actuation.
- Pressure release as described above.
- Hard reverse flush **(high pressure)**.

When the blockage is loosened it shall be removed. The toilet is now operational. Press flush button.

If the blockage is not removed:

Activate a second hard reverse flush (high pressure) by pressing buttons back flush and service flush again!

11. INITIAL TEST

Make sure all connections are correct and tight!
Fresh water tank must be filled up, water inflow pipe (water filter) should be neither leaking nor clogged or frozen up.

The western toilet will run an initial cycle every time the western toilet is supplied with power.
The initial cycle consists of one complete flush cycle.

Procedure:

- Switch **OFF** western toilet power supply.
- Switch **ON** western toilet power supply.
- RS-Box display 88 and the western toilet starts an initial cycle.
- Has the flush cycle proceeded completely without problems?
- Is water pressed through the flush nozzles strongly and evenly?

After the initial cycle is completed, press the flush button and check the flush cycle again.

When the system switches to standby the RS-Box displays 00.

12. ADDITIONAL INFORMATION

12.1.1 Recycling and disposal

Defect components send back to:

EVAC GmbH
Servicewerkstatt
Feldstr. 124
22880 WEDEL
GERMANY

Phone: 04103 9168 28
Fax: 04103 9168-8533 or –57

evac.info@evac-train.com