Installation and operation manual

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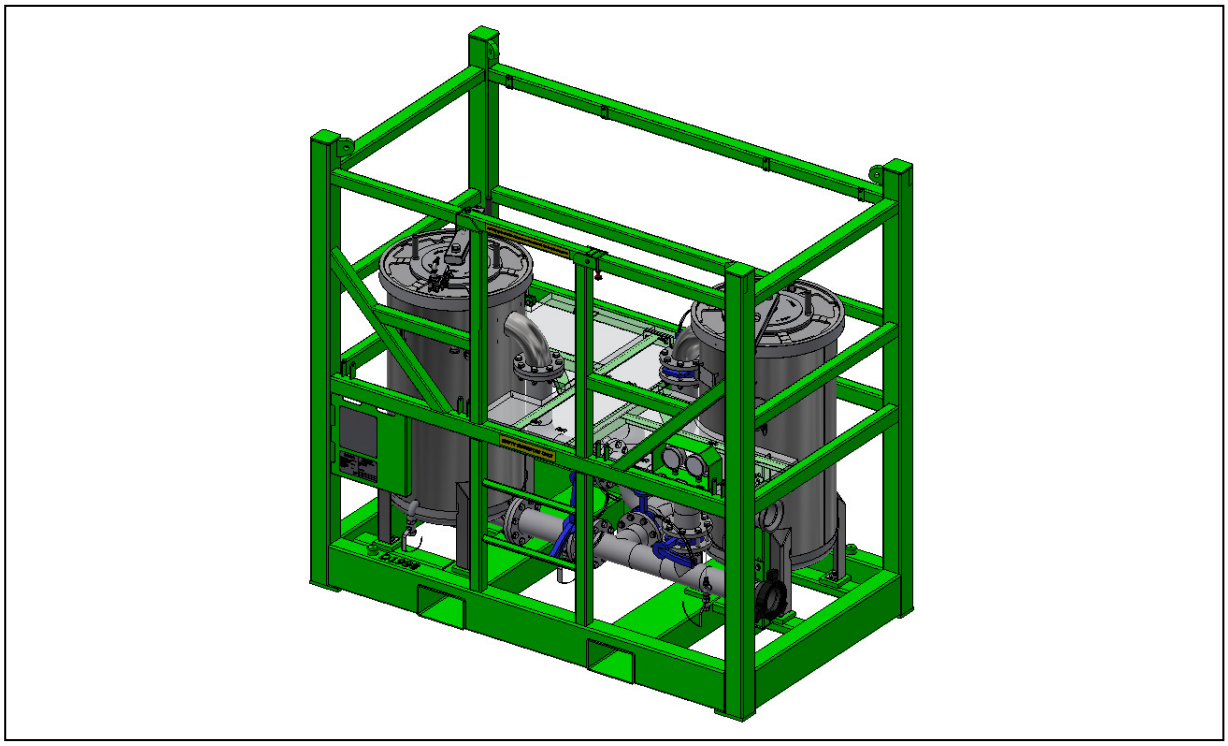
Dual Vessel Combi Filter Unit
Type: DFCB24-50/40-4B-4-R2-DNV



EG DECLARATION OF CONFORMITY

CE

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Hereby we declare that the results of the examinations submitted to the Pressure Equipment mentioned below, fulfil the requirements of the following Directives:

Subject	Dual Vessel Combi Filter Unit
Type	DFCB24-50/40-4B-4-R2-DNV
Serial no	D1110
Module	A Cat 1. Fluid group 1

- Pressure Equipment Directive 2014/68/EU
- Machinery Directive 2006/42/EC IIB

and furthermore, declares that it is not allowed to put the machinery into service until machinery into which it is to be incorporated or of which it is to be a component has been found and declared to be in conformity with the provisions of Directive PED 2014/68/EU and with national implementing legislation, i.e. as a whole, including the machinery referred to in this declaration.

Wormerveer,
October 2023

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GECERTIFICEERD NCI ISO 9001

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First read the instructions for installation, use and maintenance carefully before installing the filter unit.

Keep the instructions for installation, use and maintenance.

Dutch Filtration will not accept any damage to the filter unit due to wrong usage. In chapter 7 "trouble shooting" is described how to find solutions to any upcoming problems. During the guaranty period you are entitled to free service – despite handling, according to specific regulations – if you are not able to solve the problems yourself.

The filter unit has been built exclusively for usage as described in paragraph 1.2 Dutch Filtration is under no circumstances responsible for any damage and/or injuries caused by any usage of the equipment other than described.

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1 Product information

1.1 Introduction

This manual describes the working procedures for the Dual Vessel Filter Unit.

The Dual Vessel filter unit (also known as Duplex unit or Dual pod) is the most used cartridge filter unit within the oilfield industry. This offshore proof skid-mounted filter unit is equipped with all necessary valves and safety features. The filter cartridge offers the most cost-effective way to clean-up a wide range of fluids, it allows you to filter with one vessel and change out easily the dirty cartridges of the other vessels at the same time.

1.2 Field of application

1.2.1 General

The filter unit is designed to remove particles and/or absorb hydrocarbons from liquids with consumable filter elements. The maximum allowed flow rate depends on the dirt load, type of fluid and pollution. This unit is especially designed and manufactured for temporary usage. The heavy-duty construction allows transportation and installation on a regularly bases.

To deviate from the original specifications, always contact Dutch Filtration BV to determine if the filter unit can be used for your application.

1.2.2 Safety

The filter is designed for on- and offshore purposes. Always make sure that the earth lug (M10) is connected to the main earth lug on site.

1.2.3 Purpose of the filter unit

The purpose of the filter unit is to separate solid particles and/or hydrocarbons pollution from liquids. The filter media “traps” the pollution and holds it. When the holding capacity is at its maximum, the filter media must be replaced by new original ‘Dutch Filtration’ filter media.

1.2.4 Fluid discharge after filtering

Take notice of the local environmental regulations for disposal of the fluids without further treatment.

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1.3 Filter media

1.3.1 Cartridges

Filter cartridges can be used in our Dual Vessel Unit as well as in our Dual Vessel Combi Unit. The filter cartridges are the plug-in type of 40" length. The plug side has an end cap with 2pcs O-ring for maximum sealing and the other side of the cartridge can be a flat end cap or a spear end cap. Depending on the field of application, the filter cartridges can vary in length, media and micron rates.

1.3.2 Disposal of polluted filter material

Take notice that the polluted filter cartridges are being disposed of according to the current environmental laws.

In case you want to use the filter for other purposes then described in this paragraph, always contact Dutch Filtration BV.

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1.4 Technical specifications

Type	DFC24-50/40-4-R-DNV
Number of cartridges / bags per vessel	50 cartridges / 4 bags
Max. recommended flow	175 m^3/hr
Max. working pressure	10 bar
Max. working temperature	100 °C
Safety valve set point	10 bar
Cartridge length	40” plug in type
Vessel diameter	24” (600 mm)
Pipe size	4”
Material of vessel and piping	SS 316 (all wetted parts)
Material frame	Carbon steel, epoxy powder coated
Main Valves	4” BFV – Cast iron body, NBR seat and SS316 disc
Instruments	2 manometers; in/outlet pressure gauges (0-10 bar)
Seals	NBR
Lifting	Hoisting slings (certified) and forklift pockets
Easy to handle vessel lid	Mechanically operated
In-/outlet	4” union fig.100 or camlock inch on 4" NPT-M
Drain	1” SS316 ball valve with 1"BSP-F
Vent	1” SS316 ball valve with 1"BSP-F
Pressure relief valve	1” bronze, set point 10 bar
Weight (empty)	1400 kg
Dimensions (L x W x H)	2.4 x 1.3 x 2.18 m

1.5 Client services

To order spare parts, for questions, remarks and/or complaints please feel free to contact us:

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2 Safety regulations cartridge filter vessels

2.1 Health hazardous substances

If the filter unit is used for the filtration of health hazardous substances, please make sure that all safety precautions are met on inspections and maintenance by using the proper means for personal safety. Also make sure you have connected all the outlets of the pressure safety, vent and/or drain valves to a dump.

2.2 Personnel

Always use qualified personnel to install & operate the filter unit and filter media to avoid accidents and/ or damage to the filter unit.

2.3 Feed pressure to unit

Check if the discharge pressure of the pump cannot reach the maximum working pressure of 150 psi (10 bar).

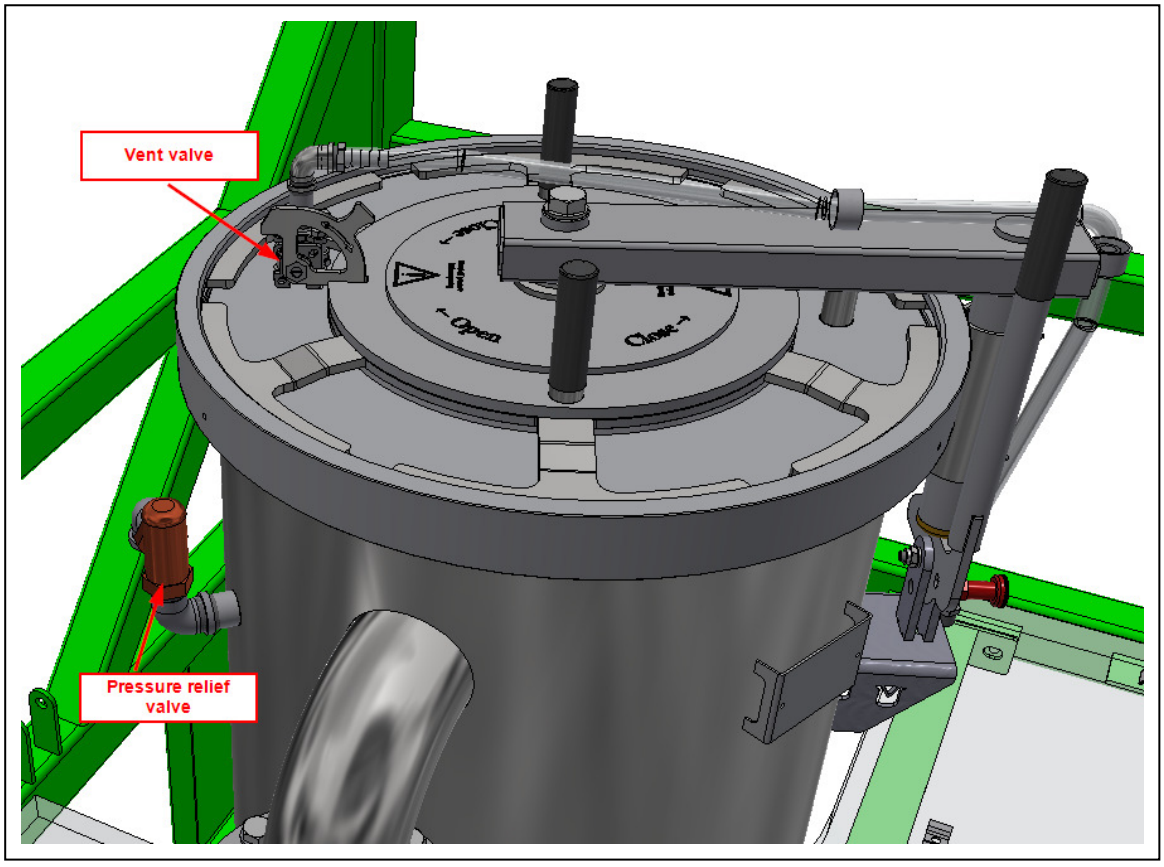

Figure 2.1 Pressure relief valve

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3 Prior to use filter unit

3.1 Personnel

Only qualified personnel can install the filter unit and filter media, to avoid accidents and/or damage to the filter unit.

3.2 Equipment hooking up

- Connect the earth lug.
- Before connecting the filter unit, make sure that all the valves of the unit are closed.
- Connect suitable hoses (chemicals compatibility, pressure, connections) hoses or piping to the in- and outlet of the filter unit. These are labelled with stickers.
- Make sure that new filter cartridges are installed. See chapter 4.2.1 and 4.2.2 for opening/closing the filter vessels.
- Start filtering by opening the valves as described in chapter 4 of this operation manual.

3.3 Equipment hooking off

- Stop filtering by closing all valves as described in chapter 4 of this operation manual.
- Bleed off the pressure of vessels, hoses and/or piping.
- Drain complete unit.
- Remove filter cartridges from the vessels.
- Disconnect all hoses and/or piping.
- Flush the complete unit with fresh water.
- Drain the complete unit by opening all valves.
- Disconnect the earth lug!

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4 Working procedures

4.1 Working principle of the filter unit

An external pump will pump the dirty fluid through the filter unit. The solids larger than the pores in the filter media will be caught and hold, while the smaller particles partial will pass the filter media. When using filter media to remove oil and/or other chemical pollution the media will absorb or adsorb the pollution. To change out the filter media in time, check the pressure gauges placed on the in- and outlet of the filter unit. When the pressure differential is higher than 40 PSI (2.5 bar), the filter media must be replaced by new original Dutch Filtration filter consumables. This is described in chapter 5 of this operation manual.

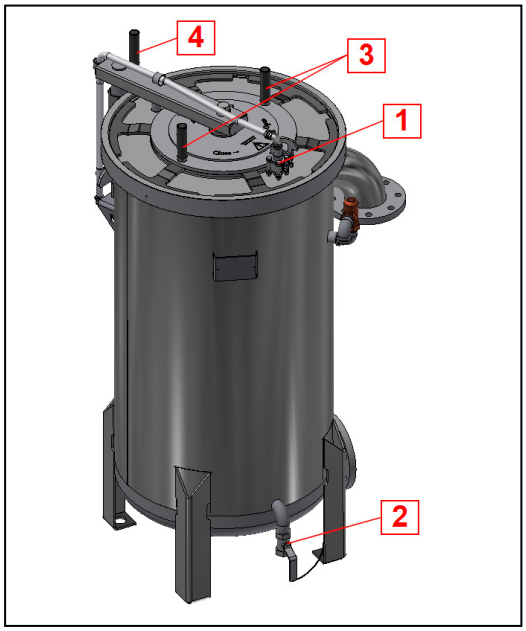
4.2 Opening and closing filter vessel

4.2.1 Opening the filter vessel

First isolate the vessel you want to open by closing the in- and outlet valves as shown in chapter 4 of this operation manual.

Before opening the filter vessel, bleed off the pressure by slowly opening the vent valve placed under the pressure safety valve.

1. Open small safety vent (1/2inch) valve on top of the lid.
2. Open the drain valves to empty the vessel.
3. Rotate the topplate of the QOC clockwise by using both handles.
4. Lift the filter lid with the jack.
5. Lock the lifting jack with pin.
6. Swing the filter lid away to get access to the filter vessel.
7. You are now able to inspect or change out the filter cartridges as described in chapter 5 of this operating and maintenance manual.



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4.2.2 Closing the filter vessel

After you have changed out the filter cartridges or inspected the vessel, always make sure that the lid seal O-ring is placed in the right way and is still in good condition, otherwise the filter vessel may leak.

- Swing the filter lid back over the filter vessel and centre the lid.
- Lower the filter lid with the jack, keep both hands on the two levers, mind your fingers.
- Close the horizontal top lever so the lid rotates. Close the safety vent valve.
- Check if all drain valves are closed before start filtering again.

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4.3 Filtering options

The Dutch Filtration filter unit is designed for continuous filtration, filtration with two vessels or filtration with one vessel and at the same time change-out filter media in the other.

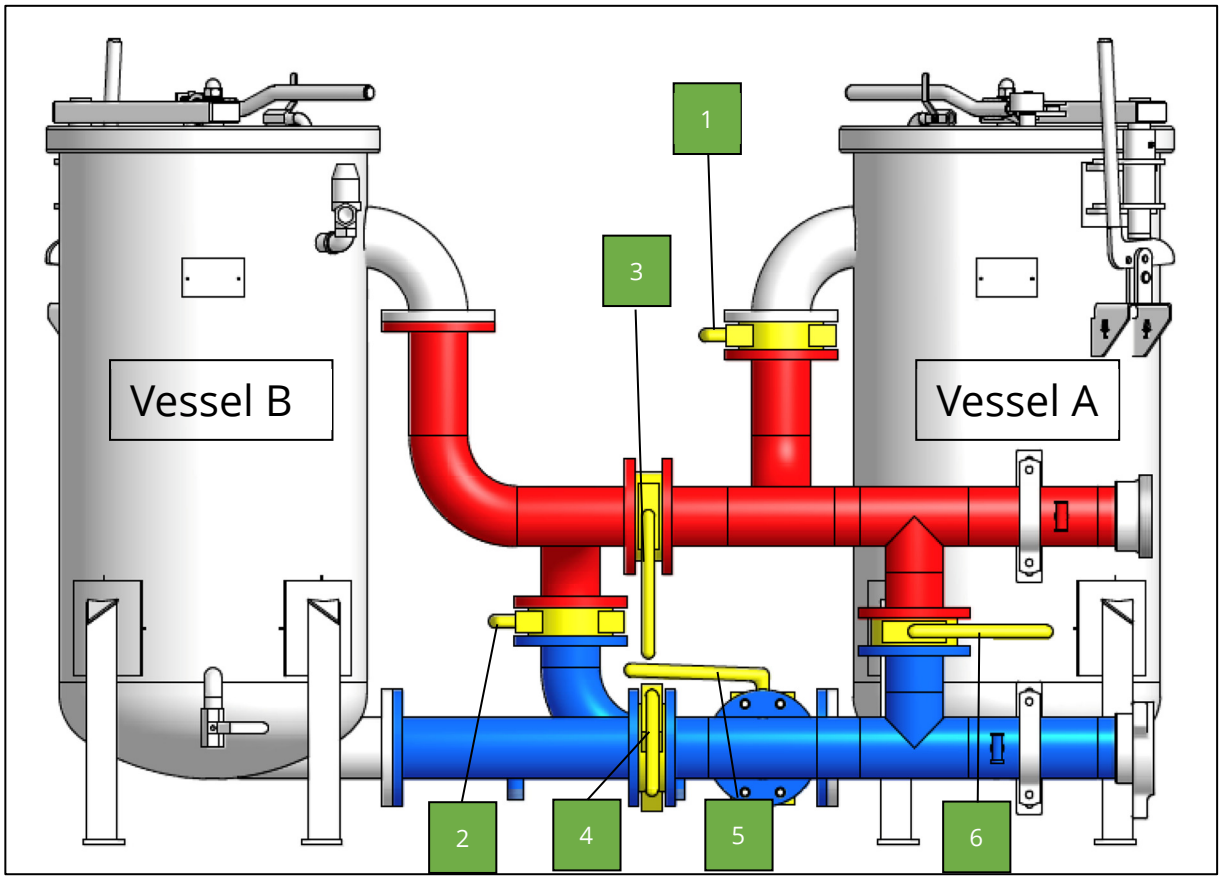

Figure 4.1 Valves and vessels on the DFC Unit

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The filter unit has the following operational possibilities:

1. Filtering in series (NON-continuous filtration) (§ 4.3.1).
   (only when a series / parallel valve is installed)
2. Parallel filtering (NON-continuous filtration) (§ 4.3.2).
3. Vessel A filtering (first start up and vessel B stand by) (continuous filtration) (§ 4.3.3).
4. Vessel B filtering (change out filter cartridges in vessel A) (§ 4.3.4).
5. Vessel A filtering (change out filter cartridges in vessel B) (§ 4.3.5).
6. Total bypass of filter and change filter cartridges of vessel A & B (§ 4.3.6).
7. Total stop of filtration and change filter cartridges of vessel A & B (§ 4.3.7).

The next table shows the position of the valves for parallel or in series filtration:

	Parallel		**Serial**
Valve	**Position valve**	**Valve**	**Position valve**
1	Open	1	Open
2	Closed	2	Open
3	Open	3	Closed
4	Open	4	Open
5	Open	5	Closed
6	Closed	6	Closed

Maximum allowed differential pressure over the filter media is 40 psi (2.5 bar). When the max. allowed DP has been reached, the filter media must be replaced.

NOTE: Before start filtration job, close all valves properly.

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4.3.1 Filtering in series (non-continuous filtration)

1. Close all valves.
2. Open valves 1 and 2.
3. Bleed off air the vessels by opening the vent valves slowly 1 by 1.
4. Close vent valves when liquid comes out.
5. Open outlet valve 4.
6. Unit is now filtering.

4.3.2 Parallel Filtering (non-continuous filtration)

1. Close all valves.
2. Open valves 1 and 3.
3. Bleed off air the vessels by opening the vent valves slowly 1 by 1.
4. Close vent valve when liquid comes out.
5. Open outlet valves 4 and 5.
6. Unit is now filtering.

4.3.3 Vessel a filtering (first start up and vessel B: stand by (continuous filtration)

1. Close all valves.
2. Open valve 1.
3. Bleed off air the vessel by opening the vent valve slowly.
4. Close vent valve when liquid comes out.
5. Open outlet valve 5.
6. The unit is now filtering over vessel A.

4.3.4 Vessel B filtering (vessel A: stand by or change out filter cartridges)

Switching from vessel A to B when the DP over vessel B exceeds 40 psi (2,5 bar).

1. Open vent valve of vessel B, situated at the top of the vessel.
2. Slowly open inlet valve 3 to fill up vessel B.
3. Close vent valve when liquid comes out.
4. Open outlet valve 4 of vessel B.
5. Close inlet valve 1 of vessel A.
6. Close outlet vessel A, valve 5.
7. The unit is now filtering over vessel B.
8. To open/close vessel A and change out the filter media we refer to chapters 4.2 and 5 of this operating and maintenance manual and the “suggestion to safe liquid” at the end of this chapter.

After having the filter media in vessel A changed out and the DP over vessel B exceeds 40 psi (2.5 bar), follow the next steps:

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4.3.5 Vessel A filtering (vessel B: change out filter cartridges)

Switching from vessel B to A

1. Open vent valve of vessel A, situated at the top of the vessel.
2. Slowly open inlet valve 1 to fill up vessel A.
3. Close vent valve when liquid comes out.
4. Open outlet valve 5 of vessel A.
5. Close inlet valve 3 of vessel B.
6. Close outlet valve 4.
7. The unit is now filtering over vessel A again.
8. To open/close vessel B and change out the filter media we refer to chapters 4.2 and 5 of this operating and maintenance manual.

4.3.6 Total bypass of filter unit and change out filter cartridges A & B

9. Open bypass valve 6.
10. Close inlet valves 1 & 3 of vessel A & B.
11. Close outlet valves 5 & 4 of vessel A & B.
12. To open/close vessels and change out the filter media we refer to chapters 4.2 and 5 of this operating and maintenance manual.

4.3.7 Total Stop of filtration and change out filter cartridges A & B

1. Close all inlet valves when applicable.
2. Close all outlet valves when applicable.
3. Close bypass valve 6 and series valve 5 when applicable.
4. To open/close vessels and change out the filter media we refer to chapters 4.2 and 5 of this operating and maintenance manual.

<u>Suggestion to save liquid</u>

Before bleeding off the pressure of the filter vessel(s), the following steps can be done:

- Connect air supply to the 1” vent valve at the top of the vessel.
- Note: air supply must not exceed process pressure or 90 dpi (6 bar).
- Slowly open the vent valve.
- Slowly open the outlet valve vessel (No. 5 or 4).
- Flow level in vessel can be checked by carefully opening drain valve situated at the bottom of the vessel. When air comes out, close vessel outlet valve (No. 5 or 4).
- Close vent valve.
- Continue with the procedure as described in chapters 4.2 and 5 of this operating manual.

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5 Placing and changing out cartridges

When the maximum DP of 40 PSI (2.5 bar) over the filter cartridges (check datasheet of filter cartridge) has been reached, the filter media must be changed out. To open and close the filter vessel please read chapters 4.2 and 5 of this operation manual.

- Before opening the vessel lid, please follow the steps as described in chapter 3 and 4.
- Always wear protecting gloves to replace plugged cartridges.
- Always wear protecting safety goggles to replace plugged cartridges.
- Always take notice of the local environmental regulations to discharge used cartridges.
- On the next page you will find supporting pictures with the following instructions:

5.1 Filter cartridges

If you are already filtering with cartridges, please follow the next procedures:

1. Remove plugged cartridge by taking hold of them with both hands.
   One hand close to the bottom and one on in the middle.
2. Twist and pull at the same time to loosen the cartridges the easiest way. When installing new cartridges, we advise to dip the bottom of the O-rings in clean water to make installation easier.
3. Place one hand on top of the new original Dutch Filtration cartridge and one as low as possible near the plug-in end cap.
4. Twist and push at the same time is the easiest way to place the cartridges in the filter separation plate. Close the vessels.

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6 Inspection & maintenance

For optimal operation of the filter unit, it must be inspected and maintained frequently.

- Inspection and maintenance should always be carried out by qualified personnel.
- Take the necessary precautions when working with health hazardous substances.
- Before starting, first read chapter 2 & 4 of this operating manual carefully.

NOTE: damaged parts should be replaced by original Dutch Filtration spare parts.
(See the spare parts list elsewhere in the manufacturing data book)

Please contact our client services mentioned in chapter 1.5 of this operating manual.

6.1 Inspection & maintenance schedule

What	How	Frequency	
		Before Start up	After Every Job
Butterfly valves, drains and vent valves	Open and close the valves manually. Movement must go smoothly.	*	*
Seals and gaskets	Open filter vessels and inspect lid seal, The seals and gaskets must be in a good condition to function properly.	*	* Keep seals and gaskets lubricated! Do not let them dry out.
Pressure safety valves	Inspect if set point of the P.S.V. is set at 105 psi (7 bar). See chapter '*Technical Specification*' of the *Manufacturing Data Book* how to do this.	*	
4" Unions on the in- and outlet	Inspect visually	*	
Cleaning the unit internally	Rinse the unit with clean fresh water		*
Filter media*	Open the vessel lid and inspect the filter media visually	*	

* Always use new filter media before starting filtration.

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7 Trouble shooting

- Inspection and actions should always be carried out by qualified personnel.
- Take the necessary precautions when working with health hazardous substances.
- Before starting, first read chapter 2 & 4 of this operating manual carefully.

NOTE: damaged parts should be replaced by original Dutch Filtration spare parts.
(See the spare parts list elsewhere in the manufacturing data book)

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7.1 TROUBLE SHOOTING SCHEDULE

Problem	Possible cause	Action
Minimum flow or no flow over the filter unit	• 1 or more valves not opened • blockage in piping • Filter media plugged	• Open valves as described in chapter • Stop process and check piping and vessel by disassembling the valves and opening the vessel lid • Change out filter media.
High dirt load after the filter	• Filter media not installed or not installed properly • Filter media ruptured • By-pass valve not closed properly • Disc by-pass valve damaged • Unit not properly cleaned before use	• Check media and install properly • Open vessel lid and install lid seal properly • Replace seal by a new one • Open vessel lid and install basket seal properly • Replace gasket by a new one • Change out ruptured filter media • Close by-pass valve • Replace disc by a new one • Rinse the unit with clean fresh water
DP rises rapidly above 2,5 bar	• Plugged cartridges • Vessel not vented	• Check and change out media • Vent vessel. See **Fout! Verwijzingsbron niet gevonden.**
Flow after the filter while valves are closed	• Valves not closed properly • Valve seats worn out • Valve disc blocked or dirty	• Check valves and close properly • Check and change out seats • Check and clean disc by disassembly of the valve
Pressure loss/leakage during filtering process Pressure loss/leakage during filtering process	• Vessel lid not properly closed • Lid seal not installed or installed properly • Lid seal damaged • Pressure safety valve set point to low (<145 psi) (< 10bar) • Vent valve not closed or not closed properly • Valves not properly re-installed	• Fasten eye nuts on the swing bolts • Open vessel lid and install lid seal properly • Change out lid seal • Put set point on 145 psi (10 bar) • Check vent valve and close properly. • Re-install leaking valves

When the problems are not being solved after you have been carrying out the proper actions, please contact our client services mentioned in chapter 1.5 of this operating manual.
Always name the unit type and serial number on the tag plate.

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8 Transport, storage and hoisting regulations

8.1 Transport regulations

The frame covers (when applicable) of the unit must be closed during transport. Filter elements should be securely stacked on pallets to avoid damage during transport.

8.2 Storage regulations

Always store the Filter unit, filter Cartridges in a dry place, so the unit, cartridges and/or boxes will not be damaged by weather influences.

8.3 Hoisting regulations

- Always use approved hoisting equipment.
- Always check the hoisting slings or chains and compare the certificate with the tag on the sling or chain to ensure that they are approved.
- Use all the lifting eyes and the lifting eyes only to hoist the unit.
- Check local authorities for regulations on MPI eye-pads.

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9 Order form

Client :

Address :

Zip code / City :

E-mail :

Date :

Unit type :

Serial number :

Order number :

Quantity	Part number	Description	Fast delivery Yes / No