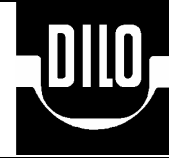


Instruction Manual

MINI Series SF₆ Gas Reclaimer



This instruction manual is written for:

Model #: D-310-R004



Serial #:

Please read this manual completely, before using this device. The more you understand about its operation, the better you will be able to utilize the MINI Series

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MINI Series SF₆ Gas Reclaimer

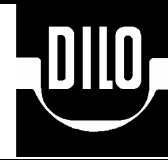
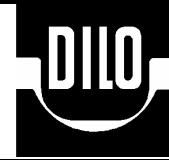


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Instruction Manual

MINI Series SF₆ Gas Reclaimer



General Information

The MINI Series is an SF₆ gas-reclaiming unit designed to perform the following basic functions:

- Recovery and liquid storage of SF₆ (Sulfurhexafluoride) gas from insulated equipment.
- Cleansing/filtering of SF₆ during the recovery/storage process
- Refilling of SF₆ into enclosed equipment containing SF₆.
- Cleansing/Filtering of SF₆ during the back-filling process

It can also perform secondary or additional functions like:

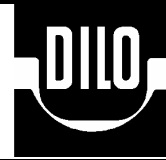
- Transfer SF₆ from one storage vessel to another
- Top off enclosed equipment containing SF₆

The listed main components are used in the MINI Series to perform the following functions:

Component	Functions involved
Oilless compressor	Pumping/compressing of SF ₆ gas
Self-sealing ports	Connect hoses to unit without gas loss
Filter/dryer cartridge	Removing moisture and gaseous decomposition products from SF ₆
Pressure regulator	Safely back-filling SF ₆ into equipment to correct operating pressure
Ball valves	Establish gas flow to equipment, storage tanks, etc.
Pressure gauges	Monitor operating conditions, i.e. breaker pressure, tank pressure, backfill pressure, etc.

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MINI Series SF₆ Gas Reclaimer

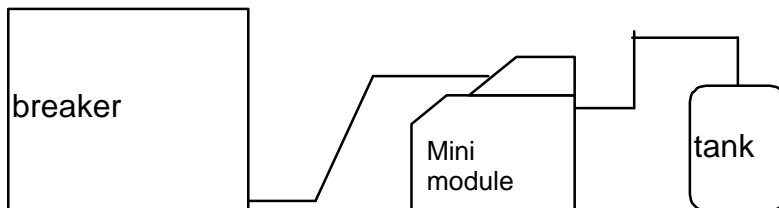


General operating procedure

The MINI Series is designed to safely perform all functions associated with SF₆ reclaiming from SF₆ insulated equipment such as circuit breakers. The heart of the MINI system is the MINI Processing module. This processing module is connected to the SF₆ equipment using a flexible hose. A storage cylinder is then connected to the storage tank valve of the processing unit.

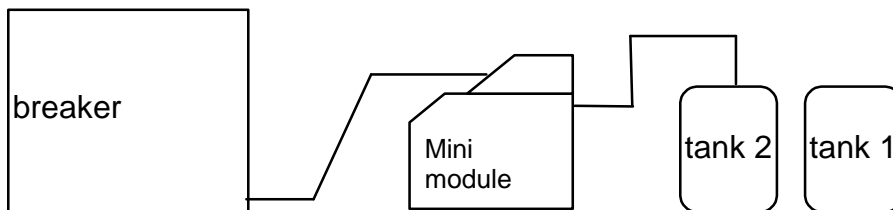
Recovery of SF₆

The SF₆ gas from the equipment is pumped into the storage vessel via the processing unit's oil-less compressor.



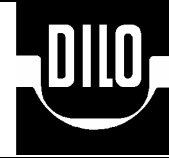
During this recovery process, the SF₆ gas passes through filters to remove foreign particles, moisture and decomposition products.

The temperature of the SF₆ gas is reduced by an air-cooled radiator before entering the storage cylinder, this allows maximum use of the storage capacity. The oil less compressor can achieve a pressure differential of 50:1. This means if the SF₆ pressure in the storage tank is 500 PSI, the final pressure of the SF₆ removed from the breaker is 10 PSI. The compressor can build up a maximum pressure of 725 PSIG. At that storage tank pressure however the breaker could only be suctioned to $725/50 = 14.5$ PSIG. To allow most of the gas to be removed from the breaker, we recommend disconnecting the first storage tank from the connecting hose (for safety, 1/4 turn ball valve is attached to the storage tank hoses) and attach an empty second tank. This easy step now allows all gas to be removed from the breaker.



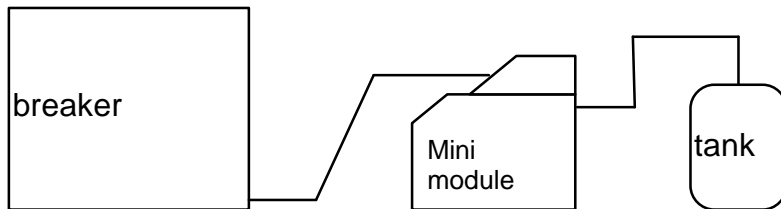
Instruction Manual

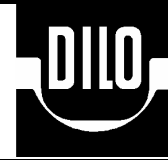
MINI Series SF₆ Gas Reclaimer



Charging of SF₆

The MINI can also fill from a storage vessel into the enclosed equipment. The function “filling” allows SF₆ gas from the storage tank to be filled through a self-contained pressure regulator into any enclosed equipment. If the equipment is not under vacuum before filling, it is essential to evacuate the equipment of air and moisture using a separate vacuum pump module (DILLO vacuum pump module D-331-R001 recommended).





IMPORTANT GENERAL SAFETY PROCEDURES

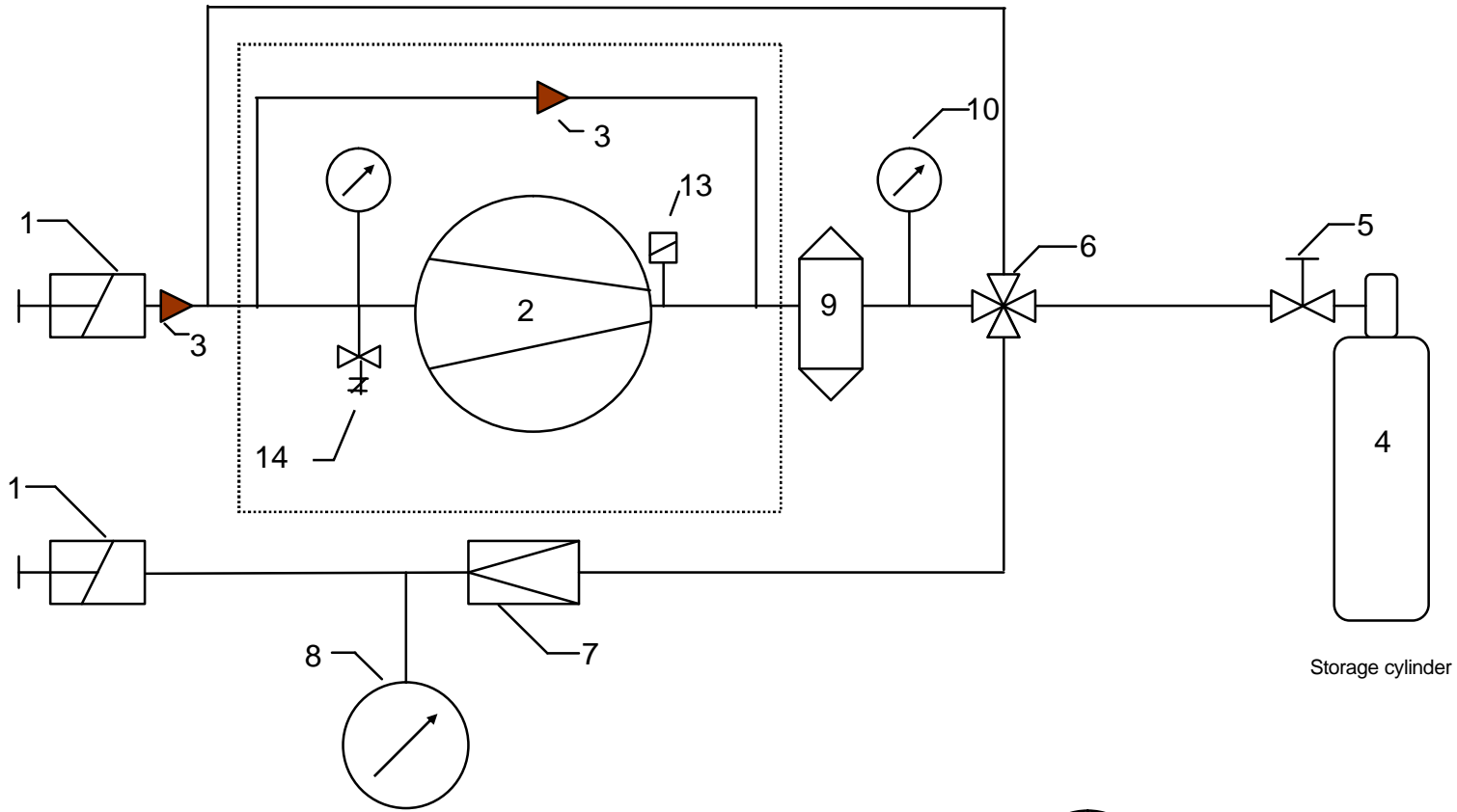
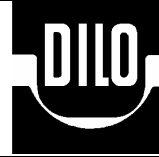
- All hoses may contain gases under high pressure. Disconnect hoses with extreme caution and replace damaged or worn parts immediately.
- Always open ball valves slowly
- Do not overfill the recovery tank. It should not exceed 1kg SF₆ per 1 liter volume (8.3 lbs. per gallon)
- Do not recover SF₆ into a non-refillable tank. All recovery tanks must be designed for at least 725 PSIG (50 bar) with DOT or ASME approved design (i.e. DOT 3AA 1800).
- Disconnect power supply before servicing. Replace frayed, worn, or damaged power cords immediately.
- Do not use the MINI Series or any of its components for any functions other than those described in this manual.



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MINI Series SF₆ Gas Reclaimer



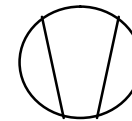
Storage cylinder



Filter Unit
containing
molecular sieve
activated alumina
fiberglass filter



Ball Valve



Oil less
compressor



4-way Valve



DILO DN08
SF₆ Valve



Check Valve



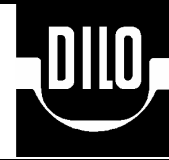
Pressure gauge



Regulator

Instruction Manual

MINI Series SF₆ Gas Reclaimer



Gas flow diagram - Familiarize yourself with the MINI

The MINI processing unit has been engineered to be a self-contained unit. It contains all equipment and features needed for safe, easy and successful SF₆ recycling.

Like all machinery it is essential for the operator to familiarize themselves with the various components and their functions.

- The D-310-R004 processing unit utilizes self-sealing couplings for hose connections and one ¼ turn ball valve for storage cylinder connection. If the ball valve handle is in the 90° position the ball valve is closed. If the handle is in line with the ball valve, flow is established.
- This manual assumes that all ball valves are closed when initializing any described working procedure.
- All connections are male DILO DN08 self-sealing coupling connections. In order to establish flow, they must be connected to the mating DILO DN 08 female self-sealing couplings.
- The coupling designated “Inlet Valve” is the connection to the breaker when removing and storing gas.
- The coupling designated “Filling Outlet Valve” is the connection to the breaker when refilling the breaker with SF₆.
- The 4-way ball valve designated “Suctioning” and “Filling of SF₆” is used to divert the compressor output to either the storage tank or the output regulator (breaker).
- The electrical switch located on the front panel of the compressor unit will start and stop the compressor
- There is a red light labeled “high pressure cutout” that illuminates when the pressure sensor, located right after the compressor, has been tripped. This happens when the pressure at the compressor output has exceeded 725 PSIG. The unit will be locked-out until this pressure has been relieved

D-310-R004 Parts List

Pos.	Qty.	Description	Part #
01	02	DILO coupling groove part DN 08 (self-sealing ports at bottom of control panel)	VK/BG-03/8 2.0401
01a	02	Covering caps DN 08 (for self-sealing ports)	VK/KN-04/8 Alu
02	01	Oil-less compressor unit 0 - 725 psig (0-50 bar) 120V/60Hz	MPC-04-A
		Oil-less compressor unit 0 - 725 psig (0-50 bar) 230V/50-60Hz	MPC-04-B
03	02	One way valve	B-4C-1/3
04	01	SF ₆ cylinder (storage vessel)	
05	01	¼ turn ball valve with CGA 590 connection (valve at cylinder manifold)	
06	01	2 position 4 way valve, (Main function valve)	B-45YTF8-BKD
07	01	Output pressure regulator for filling equipment (adjustable 0-160 PSIG / 0-11 bar)	44-2213-241
08	01	2.5" gauge 0 – 160 psig (0-11 bar) CBM/FF, SS 213.53 (Regulator Output Pressure)	7217 2.5 ¼ 0-160
09	01	SF ₆ Filter Dryer	162
10	01	2.5" gauge 0-1000 psi CBM/FF,SS, 213.53 (Compressor Outlet Pressure)	7214 2.5 ¼ 0-1000
13	01	High-pressure cut-off switch	
14	01	Purge pressure relief valve (160 psig / 11 bar)	

Internal components (not shown on flow diagram)

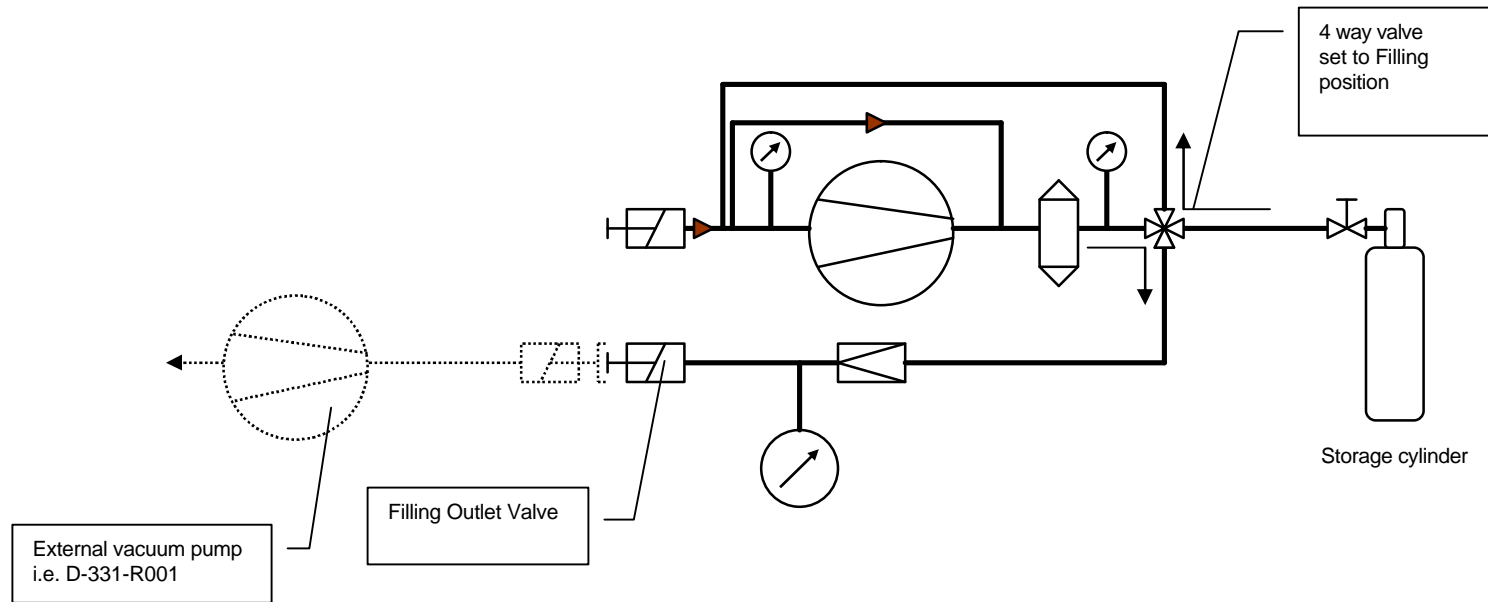
A	04	Rubber feet (for compressors)	9378116
B	01	160 psig (11 bar) safety relief valve	5A714
C	01	Inlet by-pass pressure switch 100 psig	PDAH-3-4M-C-40°FL-2
D	01	Inlet by-pass regulator (set to 100 psig)	R-83-200-NNNA
E	01	Inlet by-pass solenoid valve 120V/60Hz	2823A-2NB-ECF1
		Inlet by-pass solenoid valve 230V/50-60Hz	2823A-2NB-ECF3

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MINI Series SF₆ Gas Reclaimer

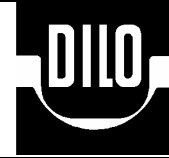


EVACUATION



Instruction Manual

MINI Series SF₆ Gas Reclaimer



Evacuation of Unit

This procedure allows the operator to evacuate the contents of the processing unit, all attached hoses & equipment, to atmosphere.

This procedure is necessary for:

- Initial startup (MINI unit is shipped with a slight positive pressure of SF₆).
- After repairs, maintenance and filter changes (remove air from unit).
- If the contents of hoses and Mini unit are unknown (prevents contamination of gas that is being recycled).

Follow these steps

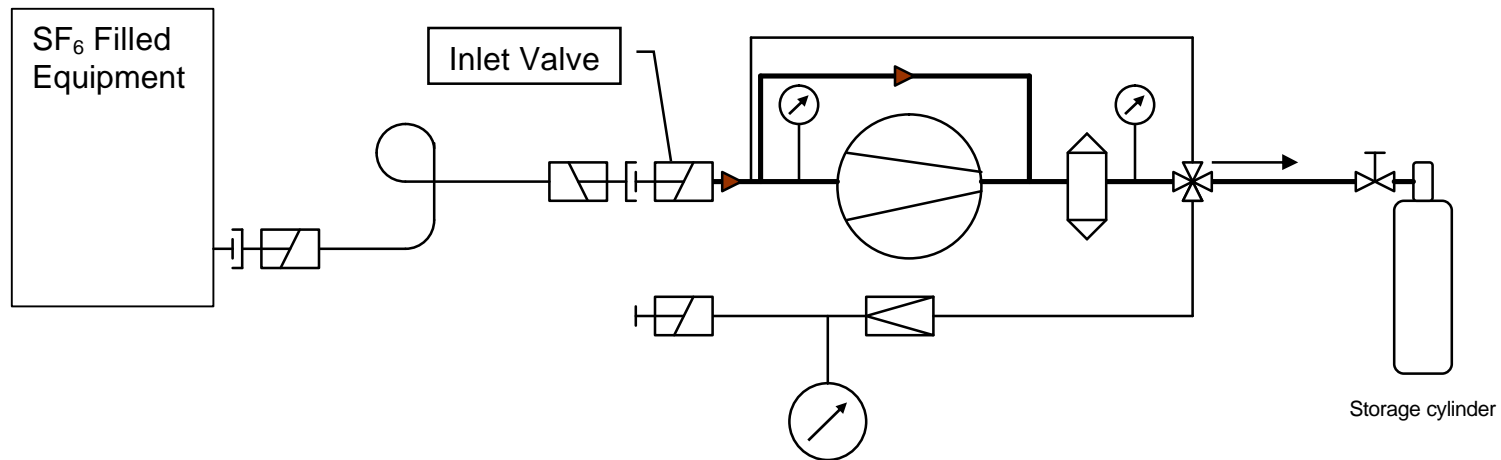
- A. Set 4-way valve to “Filling” position.
- B. Connect external vacuum pump to the “Filling Outlet” coupling.
- C. Open the regulator all the way by turning the black handle clockwise until arrested.
- D. Make sure the SF₆ fill pressure gauge does not indicate pressure. This could damage the vacuum pump.
- E. Turn on the vacuum pump and the MPC-04 compressor unit. (The compressor should not be left running under vacuum for more than two minutes).
- F. After 10 minutes, remove the external vacuum pump from the “SF₆ Filling” port

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MINI Series SF₆ Gas Reclaimer



RECOVERY & STORAGE of SF₆



Instruction Manual

MINI Series SF₆ Gas Reclaimer



Recovery and storage of SF₆

This procedure removes SF₆ from insulated equipment and stores it in the connected storage bottle. As the gas is removed, it will also be filtered.

Follow these steps

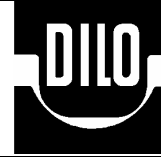
- A. Using the supplied hose, connect between equipment to be serviced (breaker) and the “Inlet Valve”.
- B. Connect storage tank with the outlet hose on the back of the unit.
- C. If there is neither SF₆ nor a vacuum in the tank, MINI processing module, nor hoses, go to Section 5 "Evacuation".
- D. Open the valve on the breaker.
- E. Set the 4-way valve to the “Suctioning” position.
- F. Open the cylinder valve and the ¼ turn valve on the output hose. Gas will flow from the attached breaker into the cylinder if the pressure is greater in the breaker.
- G. Turn on the compressor by setting the electrical switch to “ON”.
- H. Monitor the compressor inlet pressure and the compressor discharge pressure gauges. The former should show decreasing pressure; the latter should show increasing pressure.
- I. Let the system run until no movement is detected in either gauge..
- J. If you would like to recover to a lower pressure change to an empty storage cylinder:

Cylinder change procedure:

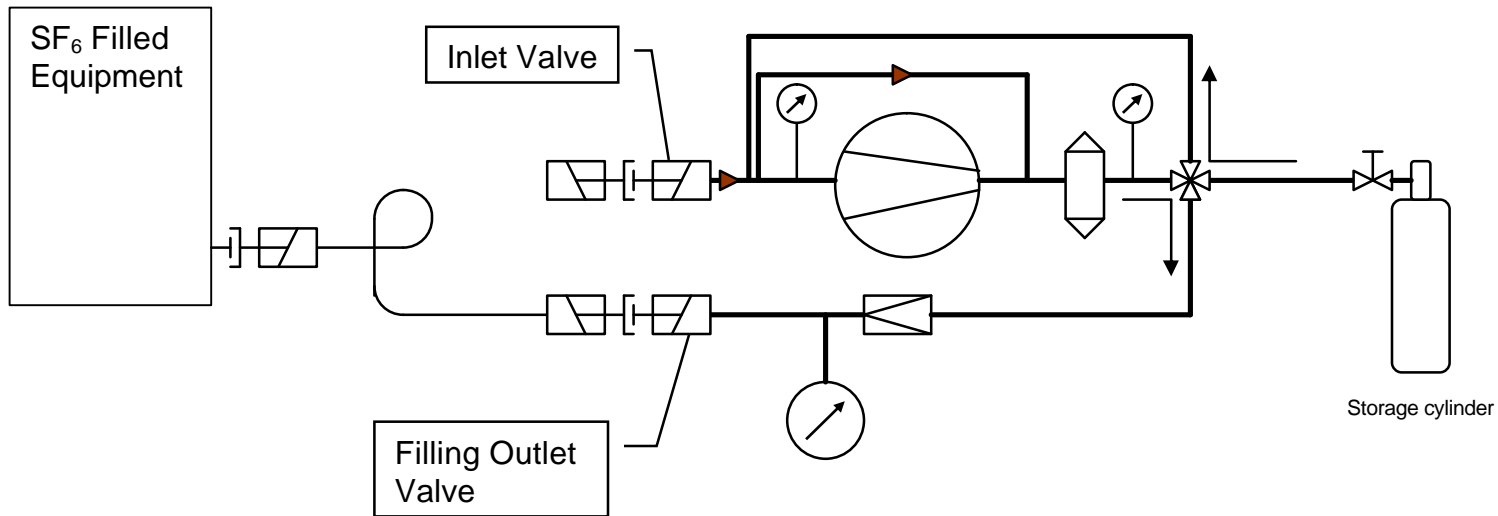
- Close output hose ¼ turn valve, and the valve at the cylinder.
 - Disconnect the hose at the cylinder.
 - Connect empty cylinder.
 - Open ball valve of the output hose and the valve at the cylinder.
 - Proceed with step K
- K. Set the electrical switch to the “OFF” position.
 - L. Close all other valves.

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MINI Series SF₆ Gas Reclaimer

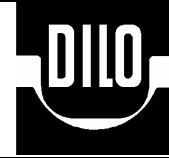


FILLING with SF₆



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MINI Series SF₆ Gas Reclaimer



Filling of SF₆

This procedure is used to fill SF₆ from the storage cylinder to insulated equipment (i.e. breaker). SF₆ exiting the storage cylinder passes through an adjustable regulator in order to protect the equipment being charged from over pressurization.

Follow these steps

- A. **Do not** connect the hose to either port of the MINI processing unit.
- B. Turn the handle on the pressure regulator counter clockwise, all the way, to close it.
- C. If there is neither SF₆ nor a vacuum in the cylinder, unit, or hoses, proceed to “self-evacuation of unit” section of this manual
- D. Open the ball valve at the storage cylinder
- E. Open the valve at the storage cylinder.
- F. Set the 4-way valve to the “Filling of SF₆” position.
- G. Slowly turn the handle of the regulator clockwise and watch the regulator outlet gauge. Stop when the desired filling pressure is achieved.
- H. Connect the breaker to the Filling Outlet port.
- I. Open the breaker valve. Gas will now transfer between the storage cylinder and the equipment by means of overpressure.
- J. Should it be necessary, the compressor can be turned on to aid the transfer of gas.
- K. After you have achieved the desired filling pressure, turn the compressor off.
- L. Close all valves.

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MINI Series SF₆ Gas Reclaimer



Troubleshooting

Symptom	Cause	Cure
The compressor starts first but after a few seconds, it stops and the red light "high pressure cutout" lights up	If you are trying to recover SF ₆ gas, you have either forgotten to open the output hose ball valve or the tank valve	Open valve

Maintenance:

Filter:

The filter needs to be replaced at least once per year or sooner, if the gas quality cannot be improved. The cartridge has the order number 162

1. Put main 4 way valve in position "suctioning and storing of SF₆"
2. Connect to an empty, evacuated, SF₆ storage cylinder at the storage outlet port
3. Open the relevant ball valve and let pressure relieve into the cylinder
4. Close that ball valve. Check "compressor outlet pressure" gauge and verify that 0 psig is indicated.
5. Remove both quick disconnect fittings from either side of the filter housing.
6. Remove the bolts from the top of the green filter bracket.
7. Remove both the top plate, and the top portion of the bracket.
8. Take note of the direction the arrow on the filter is pointing.
9. Now remove the entire filter, and dispose of it.
10. Place new filter in the bottom portion of the bracket, with the arrow pointing in the same direction as the original.
11. Replace the top of the bracket, and the top plate.
12. Retighten the bolts.
13. Retighten both quick disconnect fittings to the filter
14. Evacuate the gas reclaimer

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MINI Series SF₆ Gas Reclaimer

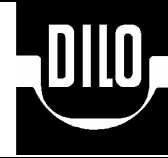


Compressors:

The D-310-R004 has been designed for minimal maintenance. The compressors should be evaluated for wear after 500 hours of use. Call DILO for explanations. For a minimal cost, you can trade your used compressors for remanufactured units, which are covered by the same warranty as new compressors. Remanufactured compressors are tested to new compressor specifications before shipment to our customers.

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MINI Series SF₆ Gas Reclaimer



Limited Warranty:

The D-310-R004 is warranted to be free from defects in workmanship, materials, and components for a period of one year from date of purchase. All parts and labor required to repair defective products covered under warranty will be at no charge. The following restrictions apply:

1. The warranty applies to the original purchaser only.
2. The warranty applies to the product in normal usage situations only, as described in this manual. The product must also be serviced and maintained as specified.
3. If the product fails, it will be repaired or replaced at the discretion of DILLO Company, Inc.
4. Warranty service claims are subject to factory inspection. The factory personnel are the sole determiners of warranty coverage.
5. DILLO Company, Inc. shall not be liable for any additional costs associated with a product failure, including, but not limited to, loss of work time, loss of SF₆, and any shipping or unauthorized labor charges.
6. All warranty service claims must be made within the specified warranty period. Proof-of-purchase date must be supplied.
7. Use of this product with unauthorized gases/liquids will void this warranty. SF₆ is the only gas authorized for use in the D-310-R004.

This Limited Warranty does not apply if:

- The product, or part, is broken by accident.
- The product is misused, tampered with, or modified.
- The product is used for recovering any substance other than SF₆.

Please see other warranty terms and conditions supplied the original invoice for further warranty details.