

OPERATING INSTRUCTIONS

FOR

PULSE-JET Filters

1. General

After proper installation and start-up the PULSE-JET bag filter works automatically. The simple construction provides a maximum of operational reliability and long equipment life with a minimum of maintenance.

Careful attention to installation and operating instructions in this manual will assure proper operation.

2. Construction and function

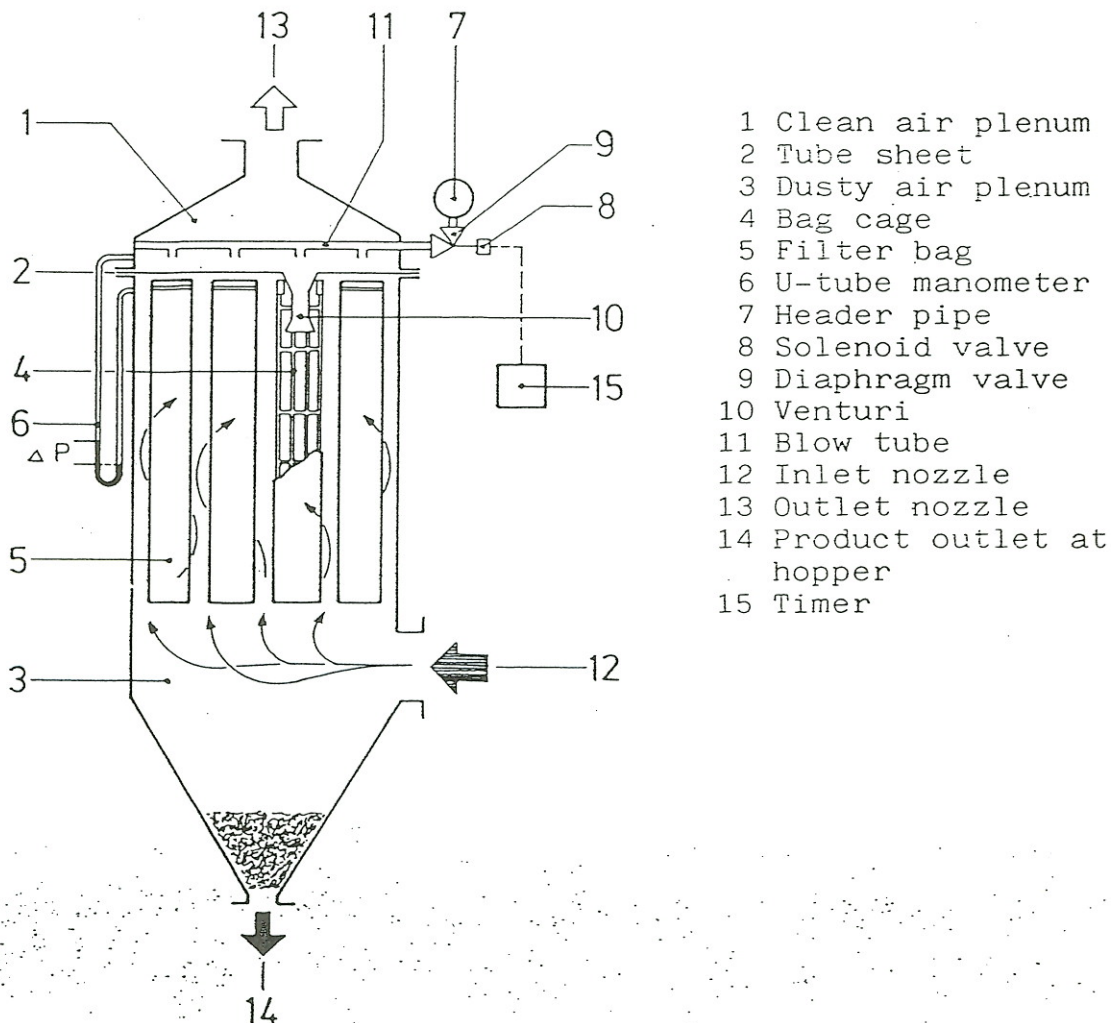
2.1 Construction

The PULSE-JET bag filter mainly consists of the clean air plenum, the dirty air plenum and hopper. All other components, as well as their function, are described below.

2.2 Functional principle

The dust laden air enters the dusty plenum below the filter bags. The dust adheres to the outside of the filter bags while the clean air flows through the filter media into the bag interior and gets into the atmosphere via the outlet nozzle.

The cleaning sequence is automatically controlled by a timer and the diaphragm and solenoid valves accompanying each blow tube.



- 1 Clean air plenum
- 2 Tube sheet
- 3 Dusty air plenum
- 4 Bag cage
- 5 Filter bag
- 6 U-tube manometer
- 7 Header pipe
- 8 Solenoid valve
- 9 Diaphragm valve
- 10 Venturi
- 11 Blow tube
- 12 Inlet nozzle
- 13 Outlet nozzle
- 14 Product outlet at hopper
- 15 Timer

Bag cleaning

Cleaning of the dust cake deposited on the exterior surface of the bags is accomplished by very short, intense compressed air injections. The compressed air flows from the header pipe via valves controlled by a timer; through the attached blow tubes with holes arranged along the bottom and finally into the center of the venturis, mounted above each bag.

By blowing the compressed air into the venturi - there is - because of the injection principle - a pressure wave created which builds up the counterpressure required for the cleaning of the bags. By this procedure the bag is abruptly inflated to its full volume whereby the dust particles are released from the bag surface.

The intensity and frequency of pulsing is adjusted, based on the type of dust to be filtered and the operating conditions.

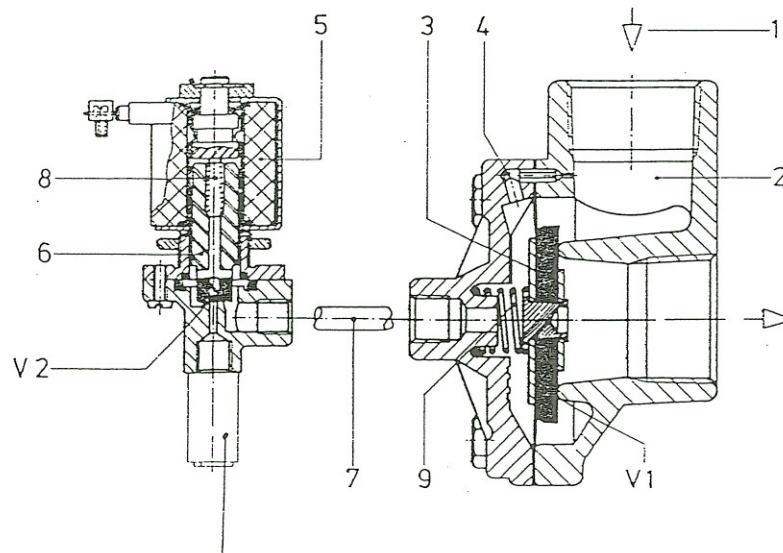
Since the cleaning of the bags installed in the filter is done sequentially, and not at the same time, the fluctuations in operating pressure are of no importance and in practice hardly perceptible.

2.3 Function of the compressed air system

From the compressed air header (1) compressed air flows into the diaphragm valve (2) and presses diaphragm (3) onto the valve seat V 1. Since compressed air can flow to the back side of the diaphragm through the hole (4) the force on the rear side of the diaphragm is higher than on the front side.

During the opening procedure the coil (5) is energized by the timer and the magnetic core (6) is pulled up.

The pilot valve is opened at V 2; the compressed air on the rear side of the diaphragm flows through the pilot valve tube (7) and the diaphragm (3) opens. When the energy at the coil is switched off the spring (8) again presses the magnetic core (6) on to the valve seat. Compressed air again flows to the rear side of the diaphragm and again presses the diaphragm on to the seat with the aid of the spring (9).

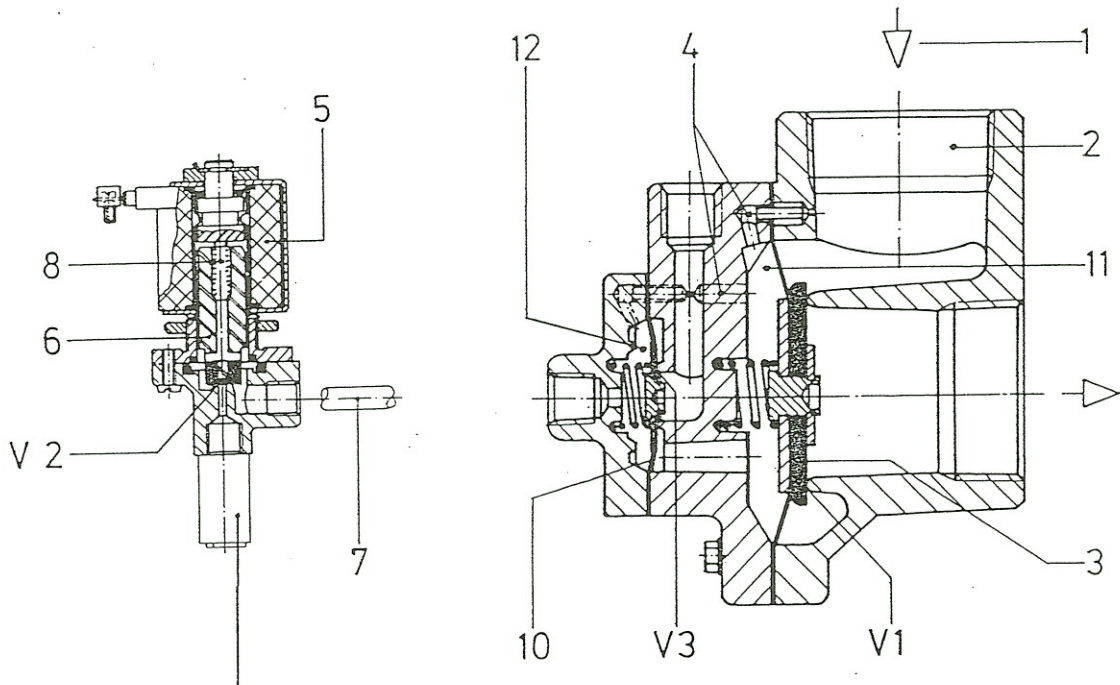


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2.4 Function of compressed air system 1 1/2" large diaphragm valve

The 1 1/2" large diaphragm valve system is in principle similar to that described under 2.3.

Using the same solenoid valve the bigger diaphragm (3) is controlled by a superposed diaphragm (10) so that - the solenoid valve is open - from chamber 12 and equally from chamber 11 via the vent pipe air escapes. The valve is open.



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3. Method of shipment

Should in case of transport or other reasons filters not be delivered premounted, delivery to site will be effected in the following main constructional elements:

- support construction
- hopper or hopper elements
- side wall plates
- head plates (in most cases together with pre-mounted top parts)
- compressed air system
- installations and accessories

4. Packing

Generally the packing is omitted for support construction and filter. Sheet and profile plates (housing wall plates, doors etc.) are tied up with band irons. Small parts are delivered in boxes or in pallets.

5. Storage of filter parts

Proper receiving procedure would be to pay special attention to possible damages, deteriorations etc. when off-loading.

Should any damage be discovered immediately notify in writing the carrier and Research-Cottrell Deutschland GmbH.

All parts of the bag filter should be stored in dry, secure rooms until just before start of erection. When off-loading, special care has to be taken that no damage occurs to the parts.

- 5.1 The bag cages are susceptible to deflection and distortion. Later repair is difficult and time consuming.

Therefore, transport (loading-on and off) these parts should be done carefully.

6. Installing

Separate assembly instructions are applicable for panelized filters, which are not delivered to site in preassembled elements.

6.1 Filter bag mounting from clean air side (TBR)

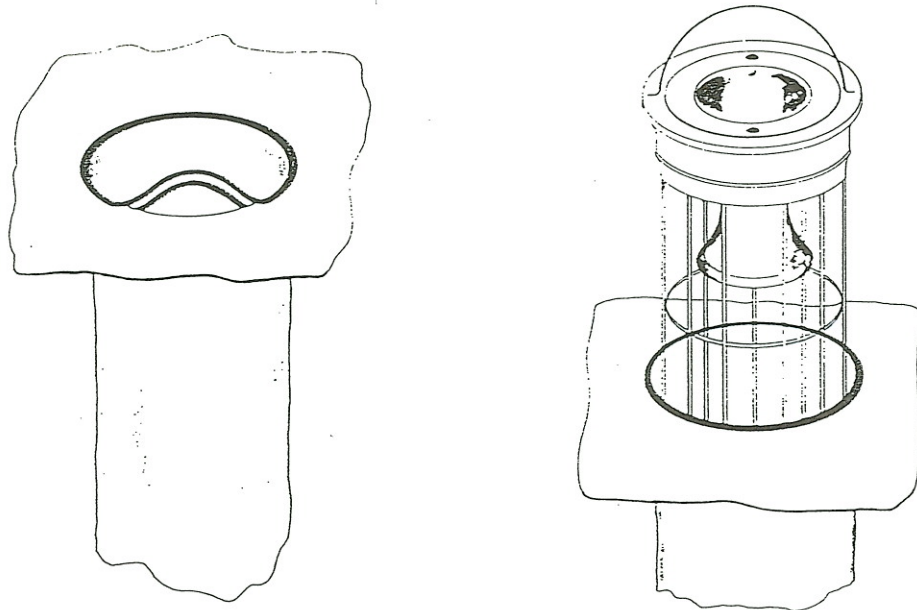
At first the filter bag is let through the tube sheet from above and into the dust plenum up to the snapping. After that the snapping is manually bent into a crescent shape and its groove inserted into the tube sheet. When released it snaps back such that it completely seals around the tube sheet hole.

After that the bag cage is inserted into the filter bag and pressed down until it stops.

The filter bags can be taken out in reverse sequence.

The blow pipes situated above the bags are fixed on the suspension angle and put into the connection sleeves at the opposite end. Special attention

has to be paid that the blow pipe holes face down in the direction of the filter bags. After mounting all filter bags with bag cages and blow pipes the access doors are locked.

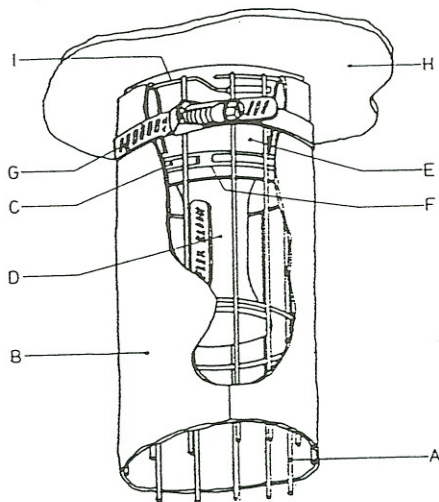


6.2 Filter bag mounting from dusty air plenum (BBR)

First the filter bag is drawn over the bag cage. It is important that the longitudinal seam of the bag runs along the opening of the top cage support ring.

After that the bag is stretched and its top end folded down into the support element. Cage and bag are mutually pushed over the bag cup under the tube sheet until the second support ring of the cage latches in the bead of the bag cup. After this procedure the bag is at a distance of only few mm from the tube sheet. Locking is

effected with a bag clamp, which is situated approx. 3 cm below the head plate around the bag and firmly tightened. Removing the bag is done by reversing the sequence.



- A Cage
- B Bag
- C Annular
- D Venturi
- E Bag cup
- F Bag cup groove
- G Bag clamp
- H Tube sheet
- I Seal ring

7. Examination before start-up

Before the filter is put into operation a preliminary test should be made. All additional systems should be checked for their individual function.

7.1 PULSE-JET filter

7.1.1 Control

Checking of the electrical connections as well as adjustment of the fully automatic timer according to the separate timer description.

In case of application of filters in especially hazardous location there is, besides the electrical

control, an all pneumatic control available.
Connection and operating information can be found in separate documents.

7.1.2. Valves

Control of all solenoid valves and diaphragm valves occurs when the timer is switched on. No compressed air may leave the system when the timer is not switched on. Operating control should best be checked at the individual solenoid valves, where the compressed air impulses can be felt on the exhaust side. Normally, the valves are controlled according to their position in the series. In case two valves are switched to one outlet of the timer, the respective bag rows should not be situated adjacently. A defect is present at the valves if these blow constantly or do not blow at all.

7.1.3 Differential pressure gauge

U-pipe-manometer

Measuring capacity: 0 - 2500 Pa

Before filter start-up the U-pipe-manometer has to be filled with measurement liquid ($\gamma = 1 \text{ kg/dm}^3$) up to about its centre. During operation a refill may become necessary from time to time depending on condensation.

Indicating pointer instrument

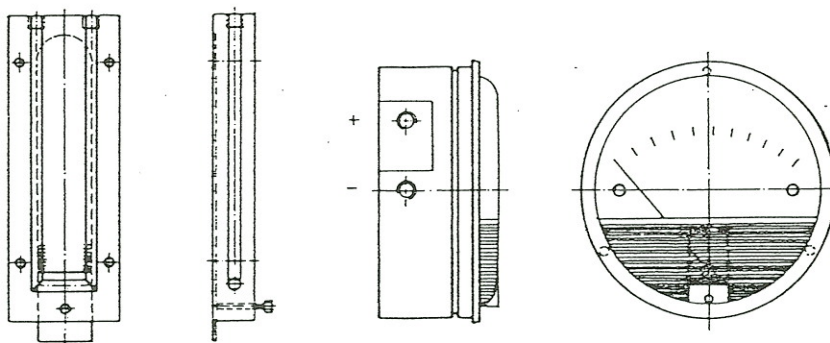
Differential pressure gauge without mechanical coupling between measuring system and needle.
Measuring exactness: $\pm 2\%$ of full scale (20° Cels.)

Linear scale setting to 0 - 2500 Pa.

For start-up set the indicating pointer exactly on the zero mark, using the adjust screw.

U-pipe-manometer

Indicating pointer instrum.



Linear scale setting 0 - 2500 Pa

7.1.4 Bags

Control of bags for exact arrangement and correct mounting.

7.2 Additional systems

Compressor, air dryer, fan and dust discharge devices are to be examined and to be operated according to their individual operating instructions.

8. Start-up

During start-up the following sequence has to be observed:

8.1 Switch on compressor and/or open the respective compressed air valve at the supply system. Care has to be taken that the operation pressure necessary for the cleaning is achieved according to the specifications (normally 6 - 7 bar).

8.2 Switch on screw conveyor

According to operating instructions

8.3 Switch on fan against closed damper in order to keep power consumption low. This especially applies to larger units. The damper valve must then be opened slowly - not abruptly - since otherwise permanent deteriorations at the filter housing could occur.

8.4 Switching on of filter control (timer)

Impulse and interval time

Length of impulse should be adjusted to 50 or 60 ms. The interval time should first be adjusted to a rotation period of approx. 2 min, in order to provide the filter media with a filter aid layer at the beginning of the operation. After achievement of the differential pressure of 600 to 800 Pa the interval time can be modestly reduced. Increasing this cleaning sequence is only appropriate in order to keep the differential pressure constant

and not reduced further (economical compressed air consumption).

Differential pressures in continuous operation up to 1500 Pa are admissable.

9. Important hints for operation

9.1 Differential pressure

In the beginning of the operation the differential pressure - caused by the filter bags - is very small and only increases in the course of time up to a constant value which is about 80 - 150 mm WG (800 - 1500 Pa). In special cases, even higher. By changing of cleaning frequency and impulse intensity the differential air pressure can be influenced. This should be done when starting-up so that the new or washed bags are cleaned more carefully in order to achieve the normal pressure drop as soon as possible.

9.2 Clean gas dust contents

In order to achieve an optimal cleaning efficiency it is important that a filter aid layer is built up on the filter bag and its pores. This normally happens at the pressure drop of 600 Pa. This process is influenced by the cleaning interval periods. The longer the interval periods and the shorter the impulse periods the quicker the filter aid layer will build up and the pressure drop increase. Accordingly also the clean gas dust contents will act. With increasing the filter aid layer the dust contents drops in clean gas.

Normally the optimal operating point is between 800 - 1500 Pa, the pressure drop depends on dust characteristics.

After some time of operation the pressure drop may increase due to the closing pores in the fabric. Washing of the filter bags may become necessary.

9.3 Maintenance of filter bags

If differential pressures of 200 mm WG (approx. 2000 Pa) or more occur, the bags should be replaced by new or washed ones. When washing the used bags care has to be taken of the lees and intensity of washing process are selected according to the type of felt and type of dust.

9.4 Maintenance intervals

The whole filter plant with all additional systems should be checked for its function in regular periods according to its application and requirements

9.5 Temperature

For the proper operation of the filters special attention has to be paid that the temperature of the air is within the specified limits. In case of excess temperatures the lifetime of the needled felt bags is affected. Further, excess temperature can also lead to an immediate damage of the bags and moreover make the sealing materials at the filter housing ineffective. Therefore, installation of a temperature adjustment and/or

control is recommended.

9.6 Erection

Due to the sealing material it is absolutely essential to tighten the screws and nuts after approx. 2 weeks due to the sealing material yielding.

Should you have any further questions at start-up, please contact our office. Our engineering staff will give you any necessary information.

You request the services of our commissioning engineer. This is essential in cases with required guarantee.