

■ The innovative Gas Filtration for Biomass Gasifiers



Fig.: Herding® ALPHA filter unit

■ General

The Herding® ALPHA filter is a dry filter system designed for a maximum operating temperature of 450° C.

The aim of the application is to carry out a reliable dust removal out of the process gas at temperatures above dew point of the long-chained hydrocarbons contained.

The automated addition of a filtering layer made of limestone powder (precoating) prevents the filter elements from clogging in the long term. The cleaning of the filter is carried out elements is done by reverse jet pulsing with an inert gas, preferably N₂.

The dust problem is thereby eliminated for the downstream gas treatment stages. The achievable clean gas concentration is < 2mg/Am³.

Herding® ALPHA Filter for high Temperatures

Filter Media

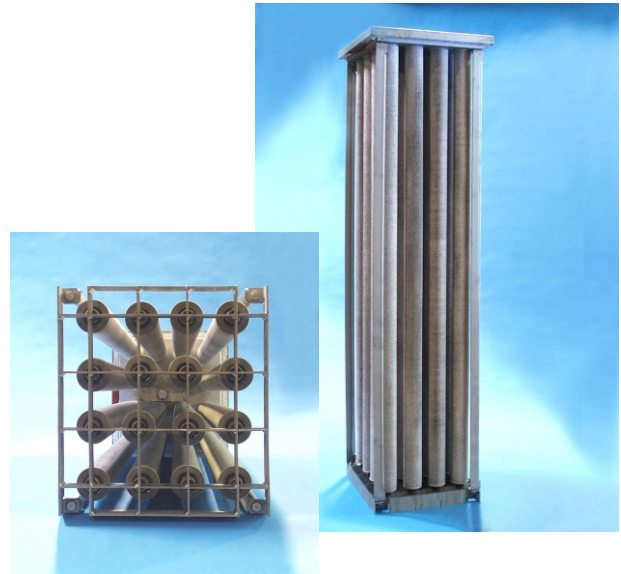
The Herding® ALPHA filter element consists of filter candles arranged in clusters of 16 pieces with an appropriate seal arranged in a stainless steel frame. The filter candles and the gaskets consist of inorganic materials only. In order to compensate the different heat expansion coefficients of the separate parts during operation, springs, made from a special nickel-based material, are used for the gasket compression.

The filter candles themselves are made from a porous, ceramic composite material and have a coated surface.

In addition to their excellent chemical and fire-proof properties, they also have a high temperature shock resistance.

The equally inorganic surface coating guarantees pure surface filtration during operation. A constant pressure drop and a long life cycle of the filter candles is thereby achieved. The dust is separated on the surface. The pores of the base material remain unblocked.

The filter candles preassembled in the clusters are inserted into the header plate clean gas side mounted



Filter Unit

The Herding® ALPHA filter unit is a round filter with a welded design, suitable for an operating pressure of +/- 250 mbar. Alternative operating pressures and a pressure vessel design are possible upon request. The filter unit is always gastight, and has a certified factory approval.

The standard housing material is boiler steel; special materials are also available on request. The gasket material for flange connections is graphite with a tin insert.

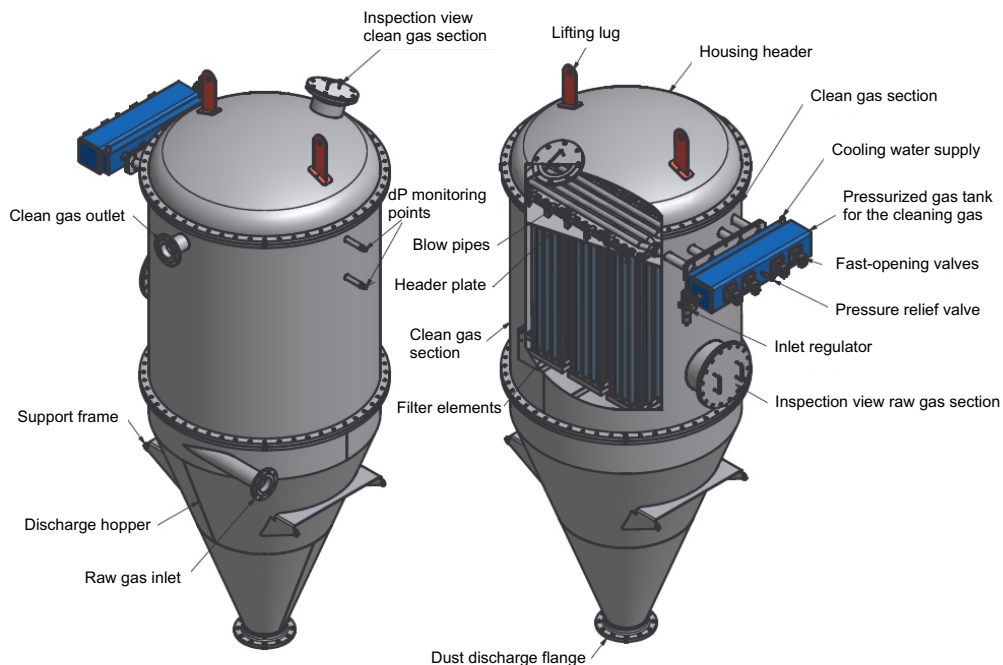
The length of the nozzles, support lugs, etc. are designed to have a 100 mm thermal insulation layer to be attached to the entire filter unit.

The filter is cleaned by applying the online jet pulse system. The pressurized gas tank for the cleaning gas is external. In order to avoid uncontrolled heating up when the jet pulse system is not in use, it has been fitted with a water cooling jacket. In addition to this, the pressure accumulator is thermally decoupled from the filter housing.

The fast-opening valves are integrated into the pressure accumulator. The pressure accumulator is classified under the pressure unit guideline 97/23/EG Category I Module A and thereby not liable for inspection. For extra protection, there is a safety valve and the supply connection is utilized with a pressure regulator.

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Filter Unit



The header of the filter housing is removable and allows complete access to the clean gas section and header plate. An inspection nozzle is also attached to the housing header.

The blow pipes are flanged and completely removable, thereby allowing the clusters to be inserted and removed from above. The clusters themselves are placed on the header plate sealed by ceramic fibre material and kept in place by fasteners.

The clean gas outlet is at the side and attached according to the customer's specifications with regards to location and design. The cylindrical raw gas housing has a large inspection view through which one can see the built-in clusters.

The discharge hopper is flanged onto the bottom side of the raw gas housing. The upper, cylindrical part contains the tangential raw gas inlet. This assures a good particle preseparation particularly when the raw gas contains a high dust load. The position and design are also according to the customer's specifications. The discharge of dust also takes place via a flange. Nominal width and design are according to the customer's specifications and the installed discharge systems.

Support lugs or support ring for mounting in the customer's steel support can be attached to the raw gas housing or to the discharge hopper, if required. It is also possible to fit the unit with a built-in support construction for ground level installation.

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■ Precoating

The Herding® MultiCoater is a pneumatically-operated feeding device for quantity-controlled additives to the filtration process. Usually, limestone powder is used, which mixes with the precipitated dust and prevents the filter elements from a sticky dust cake formation.

Additionally, the separation of the very fine particles is also facilitated by means of the precoating material.

The multi-coater has to be operated by inert gas (e.g. N₂). The injection is made into the raw gas duct upstream the filter. During the pre-coater downtime, the re-entry of process gas into the conveying line has to be safely prevented by means of an appropriate shut-off valve provided by the customer.

The multi-coater consists of a compact receiver tank including control and conveying technology and is mostly used as an adjoining unit on four steering rolls. Filling is carried out via a loading hatch on the housing header.

Automatic filling is also possible by means of a flange nozzle at the supply opening. The filling capacity is 55 or 250 litres.



Fig.: Herding® MultiCoater MC55

The feeding device is an injector pressure pump with a flow rate of 1.3 kg/min. Several filter units can be served by one multi-coater. The multi-coater has an internal control which automatically surveys the fluidisation, conveying and purging sequence. External control is possible by means of a Herding® filter control as well as by the customer's own control system.

■ Control of Filter Cleaning

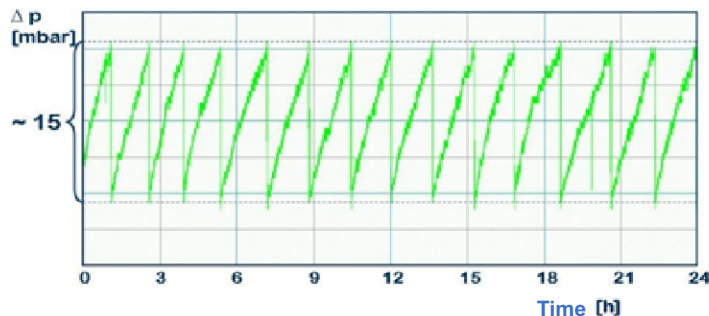
Operating experience has shown that the so-called cycle cleaning with sequential precoating is the best cleaning method for the Herding®ALPHA Filter.

The filter must be initially precoated before first use. This is carried out with atmospheric air in order to achieve a sufficient precoat layer of the filter surface. The fixed quantity of precoating material to be injected is preset and determined according to the installed filter area. After inertisation with N₂, the equipment can be started up.

In order to speed up the passing through of the dew point, the pyrolysis reactor first should be started up by bypassing the filter on the gas flare. The filter is only switched over after reaching a stable operating temperature and a gas temperature of >300° C. If the differential pressure at the filter exceeds the preset maximum limit, it is cleaned down. Practice has shown that it is sufficient to actuate each valve once at 20-second intervals. Immediately after this, precoating takes place. The quantity of injected material and thereby the duration of the precoating process depends on the installed filter area.

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Control of Filter Cleaning



The diagram shows the pressure drop trend over time.

The upper limit depends on the gas flow and the dust loading. A common value of the pressure drop is 20 - 25 mbar, but should not exceed 30 mbar.

This cycle cleaning can be monitored and operated by a separate Herding® Control System type VMP12. This is a digital control device (microprocessor- driven), which operates with an interface to the customer's control system.

The parameters can be set according to the respective requirements. These are entered via three keys and is protected against input errors. Also parameter configuration can be done by serial data transfer from a PC.

A two-line display on the front panel shows status information and incidents. The signal of the internal pressure sensor, which records the pressure drop of the filter elements, can be forwarded to external systems.

The control system is equipped with data storage (history), which can also be transferred by data cable to a PC. A remote diagnosis and BUS capability are optional. The design of the control system fulfils VDE guidelines, EN norms and the EMV law in accordance with the EMV 89/336/EWG guideline.

Also the filter unit can be operated by a customer's PLC. In this case, the pressure drop sensor will be supplied by the customer as well. All solenoid valves of the jet pulse cleaning system and the electrical signals from and to the MultiCoater are operated at 24V DC.

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