HYDAC INTERNATIONAL

HYDAC
Gas Filters GCF for Dry Gas Seal Systems.

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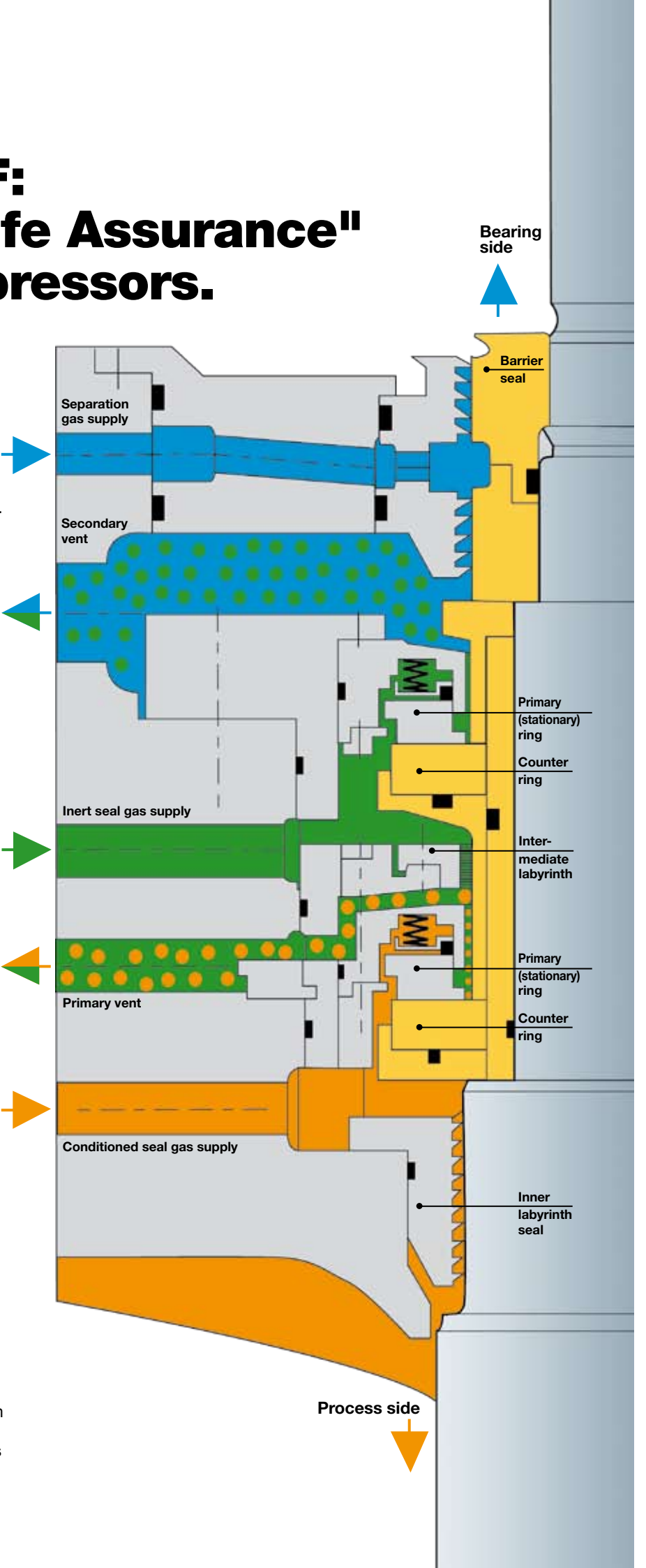
Gas Filters GCF: The "Service Life Assurance" for Turbo Compressors.

The more complex the seal system, the more rigorous the filtration technology.

Dry gas seals are used as shaft seals in turbo machines in the petrochemical industry.
The sealing gas which is pressurized externally is continually adjusted to maintain a higher pressure than that of the process medium inside the machine. This effectively seals the housing and shaft from the process gases (which are wet, contaminated with particles, toxic and often flammable) to prevent the process medium from leaking into the atmosphere.
Dry gas seals on turbo machines are very complex systems and extremely sensitive to contamination from solid particles, aerosols and condensates.
While the shaft is rotating, a tiny gap, just 3 µm wide, is formed at the seal ring, through which the seal gas flows.
To protect these seals, the seal gases must be filtered accordingly to ensure the seal has as long a service life as possible.

High level of operating reliability due to correct filter design.

For the shaft seal to operate reliably over several years' continuous operation, not only is elaborate measuring and control technology of the seal gas flow required, but above all, efficient and correctly sized duplex filters.
The gas filters and all the measuring technology is integrated into the seal gas panel that ensures the shaft seal is always operated under constant pressure and flow conditions.
Since the seal is also subject to natural wear over the years, an increase in the flow of gas through the seal and also through the filter is unavoidable on many systems over time. It is for this reason that the gas seal filters – when correctly sized according to API 614-5 – are sized according to the flow rate to be expected after several years continuous use.
This can sometimes be two or three times higher than the flow rate at the time of commissioning.
In addition to data on the typical operating conditions (pre-charge pressure, gas flow, temperature …), in order to select the filter correctly, a meaningful gas analysis is also required.



HYDAC Gas Filters GCF:

Area of application and design.

HYDAC Gas Filters GCF are high-performance change-over duplex coalescing filters in stainless steel which have been specially developed for use in dry gas seals in turbo compressors.

All the filter components, including the filter housings are made of stainless steel machined parts without weld connections and comply with the requirements of API 614-5.

There are basically two different standard versions of the Gas Filter GCF:

- A simple coalescer version preferably for "dry" gases
- A coalescer version with integrated cyclone pre-separator for applications using wet gases which may also contain aerosols, oil mists and / or condensates.

The modular filter design means that a cyclone pre-separator can also be retrofitted to an existing standard filter – by replacing individual filter housing parts.

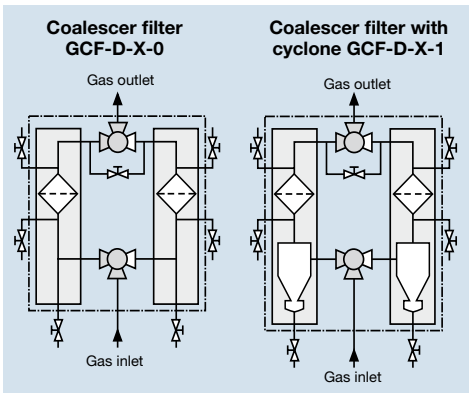
For special high pressure applications or those using hazardous gases, filters are also available in a "Double Block & Bleed" version.

HYDAC Gas Filter GCF double block & bleed

The materials of the seals and housing can be adapted individually to the process conditions.
FKM and NBR are used as standard and are also suitable for high decompression rates.

All seals on the filter are without exception duplex seals. The housing material is as standard stainless steel.

HYDAC Gas Filter GCF-D-25-1 with integrated cyclone pre-separator, HYDAC Gas Filter GCF-D-25-0 without cyclone



Features.

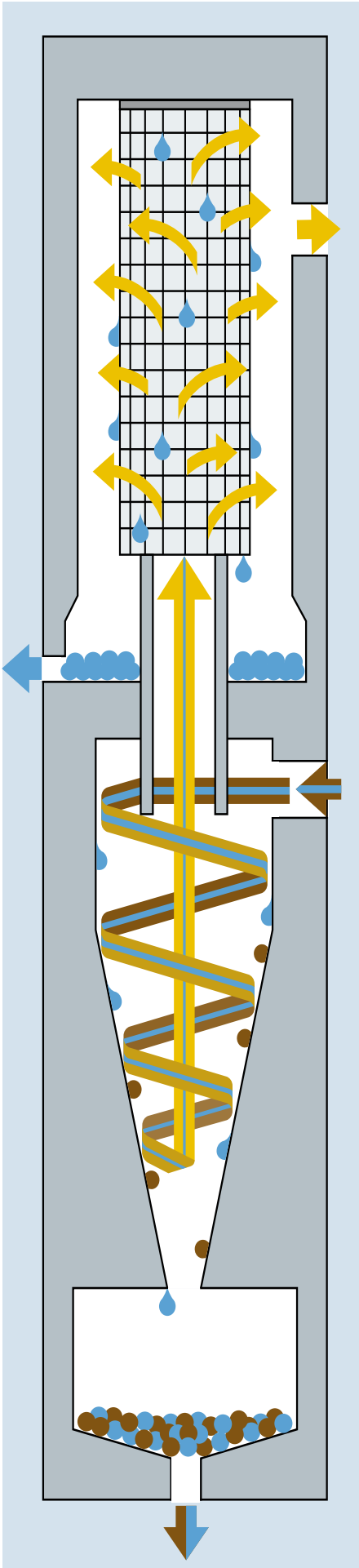
- Modular filter – cyclone pre-separator is available as an option
- Compact filter design, optimized for pressure and flow
- Duplex seals without exception throughout the whole filter
- All flow paths throughout the filter are "fullport" – no cross-sections in the filter are restricted relative to the inlet cross-section
- Efficient pre-separation of liquids and particles through the use of integrated cyclone – even under increased flow rates
- Redundant, patented pre-separator, tailored to the particular process and the filter stage downstream
- Sufficiently large chambers for collecting fluids, can be adapted to customer requirements
- High quality ball change-over valve which is easy-to-operate, with maximum negative overlap, gas-tight in all port directions, spindle has an anti blow-out device and encapsulated springs

Change-over does not interrupt filtration.

Filtration is either via the left or the right hand filter housing, and there is no pressure drop and no interruption to filtration during change-over of the duplex filter.

To achieve this, the adjacent filter housing is first pressurized via the pressure equalization valve. The equalization valve which is flanged onto the change-over valve or fitted in a separate line, connects both filter housings on the clean side. Once the pressure has equalized, then the filter can be switched over using the duplex change-over valve. This new ball change-over valve design – specially developed for this application by HYDAC Accessories GmbH – guarantees that there is almost no pressure drop during manual change-over of the duplex filter, even at high flow rates. This is due to the maximum negative overlap in the change-over ball used.

Optimum fluid pre-separation, highly



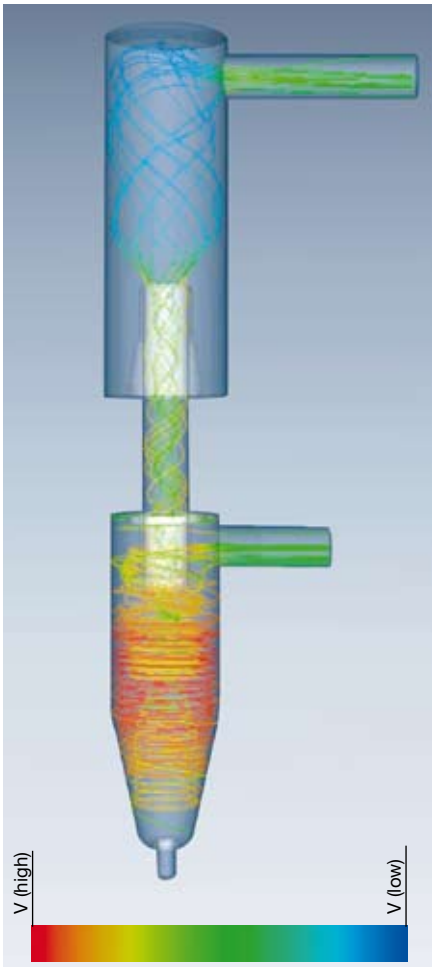


Fig. 1: Flow simulation

The advantages of the patented cyclone

compared to other pre-separators:

- The cyclone is self-cleaning because the flow continually directs the contamination into the trap.
- The separated fluids do not flow against the main gas flow which rules out any re-intrainment.
- Even when volumes are increased, separation in the cyclone is assured.
- The cyclone is practically wearfree and cannot release material which could damage the filter element downstream.
- Redundant pre-separator perfectly matched to the downstream filter system.

Function and operation.

The gas being filtered enters the relevant filter housing through the filter inlet on the lower change-over valve. The flow direction through the elements is from in to out.
Particle contamination is removed and retained in the filter element.
In addition liquid phases (aerosols / oil mists) are coalesced by the filter element (Fig. 2).

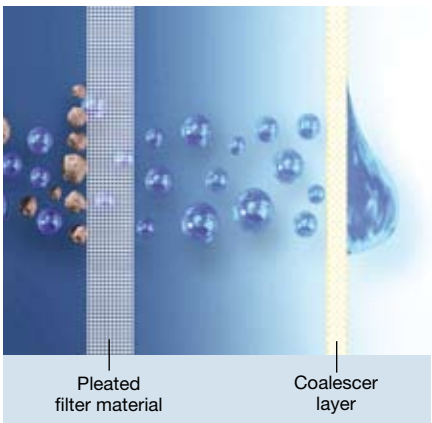


Fig. 2: Coalescer principle

If the proportion of liquid phase in the gas being filtered is too high, i.e. complete coalescence by the filter element is not possible at the usual filtration speeds, a pre-separator must be used.

In this situation, the HYDAC GCF with its integrated cyclone is ideal, since sudden surges in fluid, and larger quantities of aerosols and coarse particles, can easily be pre-separated by the cyclone (Fig. 1).

Depending on the operating conditions (i.e. the type of gas, pressure, temperature and velocity), the integrated cyclone separates aerosols and particles of up to 5 µm. This reduces contamination loading the filter elements downstream, extending their service life considerably.

The separated liquids are collected inside the filter housing in large collection chambers (contaminated side: cyclone trap / clean side: chamber beneath the filter element) and they can then be drained via appropriate valves.

The capacity of these collection chambers areas is generous in order to always ensure sufficient drainage from the filter to cope with sudden surges in the flow of fluid.

efficient element technology, reliable

Standard filter specifications.

Housing material:
Stainless steel (ASME SA 316L or ASTM A 316L, 1.4401, 1.4404, 1.4435, 1.4436)

Design code:
- ASME Code Design
- AD 2000 / PED 97/23/EC

Pressure ranges:
Standard up to 250 bar (3625 psig)

Design temperature:
Standard range –29 °C to +200 °C

Connections:
- ANSI flanges
- DIN flanges
- Pipe thread, NPT thread
- SAE flange
- Butt weld

Nominal widths:
ANSI ½'' (DN15) up to ANSI 2'' (DN50)

Filter element materials:
Hardware (core/end-caps):
- Stainless steel 1.4571

Filter media:
- Stainless steel 1.4401, 1.4404
- Glass fibre (only for temperatures in the range –30 °C to +100 °C)

Filtration ratings (coalescer):
1, 3, 25 µm

Seal materials:
FKM, NBR

Documentation:
- Operating and Maintenance Manual
- Manufacturer's test certificates
- Material certificates 3.1 (DIN EN 10204)
- NACE MR 0175 (optional)
- U-Stamp (optional)

Other models with alternative materials, designs, certificates, pressure ranges, connections, filtrating ratings, seal materials and documentation are available on request.

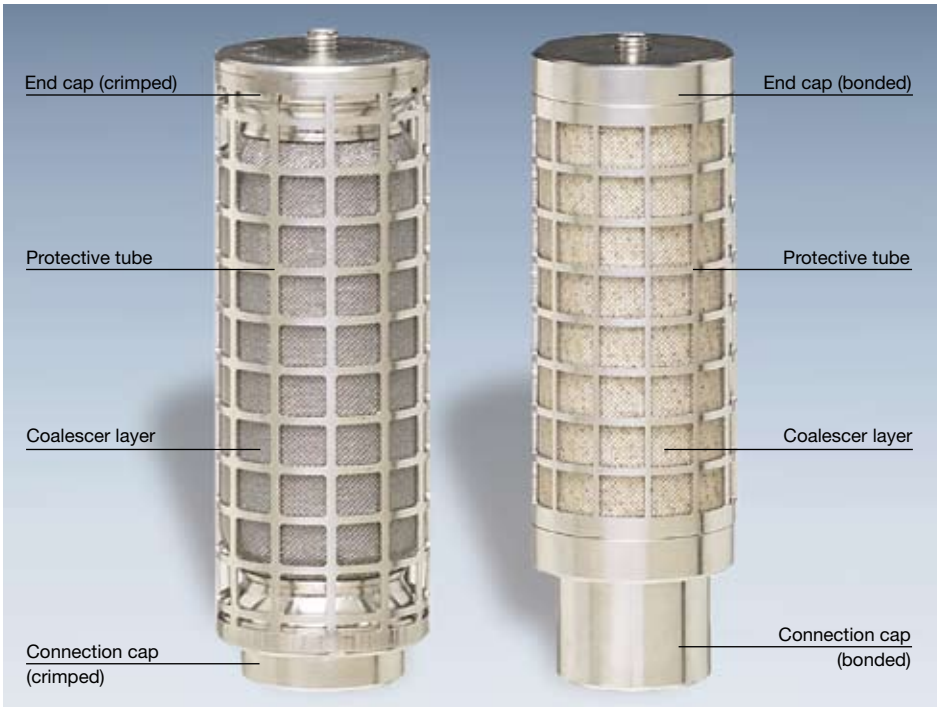
Note:

The information in this brochure relates to the operating conditions and applications described.

For applications and operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

To obtain an authoritative calculation for the HYDAC Gas Coalescer Filter GCF please contact our Headquarters.



Stainless steel / glass fibre elements.

Filter elements CF-15 to CF-50.

Multipass test rig and **analysis**

Analysis in the HYDAC laboratory at company headquarters.

Filter element technology.

Filter elements with a coalescing action (coalescer elements) are always used in all seal gas filters. All the elements consist of a pleated filter material which defines the micron rating and the contamination retention capacity, and a special coalescer material which causes aerosols / liquids fluid phase to coalesce.

Crimped filter elements in 100% stainless steel are used in preference, or as an alternative there are bonded elements in a composite glass fibre with stainless steel hardware.

For applications with aggressive gases and higher temperatures in particular, however, we recommend that only the coalescer elements in stainless steel are used.

Element technology based on scientific findings.

When developing filters and filter elements for a specific application, HYDAC leaves nothing to chance. Computer-aided design is a given but, in addition, HYDAC invests significant resources in modern research and test laboratories.

Tensiometers, Karl Fischer titration equipment, rinsing cabinets to determine component cleanliness, test rigs for multipass tests and water removal efficiency are in use on a daily basis. This results in products tested to the highest possible level – as required for gas filtration.

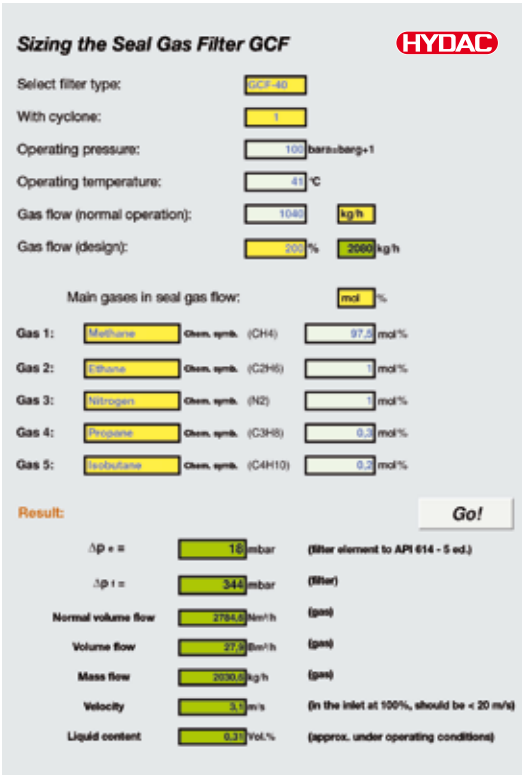
over extended operating periods.

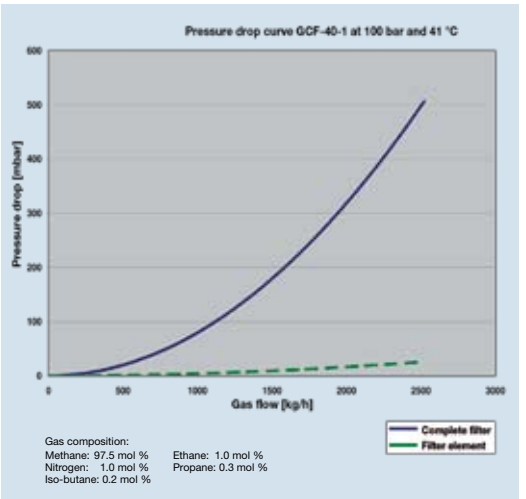
Sizing software.

The sizing program is used to calculate the pressure drop curve for the particular GCF filter subject to the specified process conditions (pressure, temperature, gas composition). Calculation of the pressure drop also takes into consideration the actual filter geometry and real gas behavior. Here, a mixture of up to five gases can be selected as the medium. If one or several of the gases are in liquid form, these will be identified and their per cent volume will be calculated. The result is also given in graph form.

The program has been validated based on live field measurements using nitrogen, as well as different theoretical simulations (CFD).

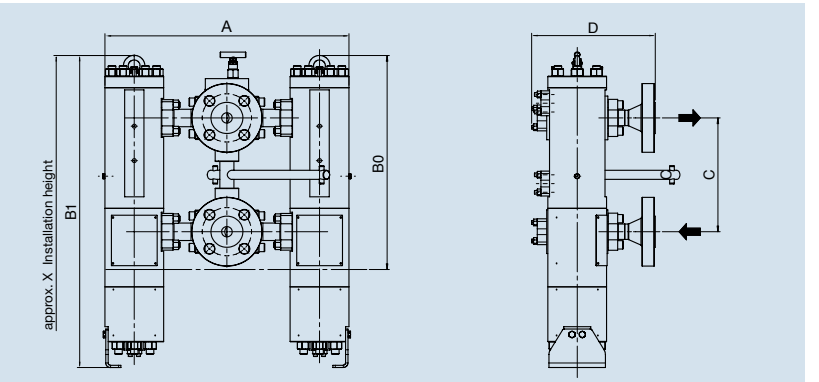
Currently, the customized sizing of the coalescer filter is only available at HYDAC Headquarters on request.



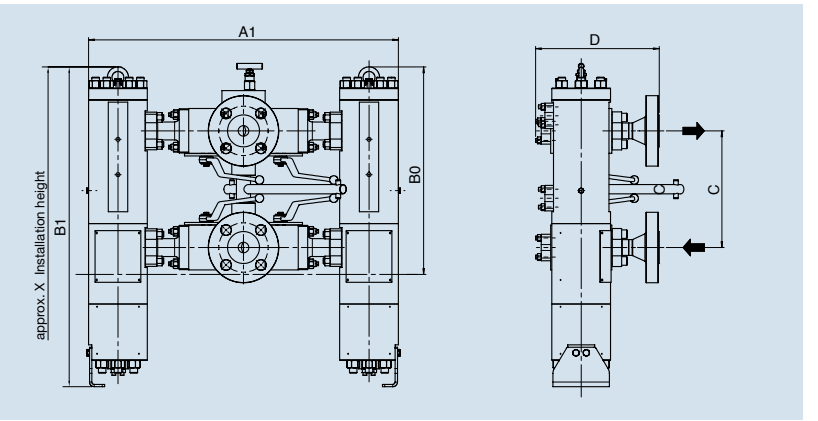


Dimensions of the GCF filter.

HYDAC Gas Filter GCF-D-Series with single block valve



HYDAC Gas Filter GCF-B-Series with double block valve



Dimensions of the GxF filter

Size	A	B0 (without cyclone)	B1 (with cyclone)	C	D	X	Size (DBB)	A1
GxF-D-15	360	380	---	135	230	180	GxF-B-15	---
GxF-D-20	495	485	640	244	263	220	GxF-B-20	639
GxF-D-25	526	502	666	248	263	300	GxF-B-25	680
GxF-D-32	670	640	960	340	309	420	GxF-B-32	1.084
GxF-D-40	775	778	1158	400	309	500	GxF-B-40	1.110
GxF-D-50	820	905	1250	495	380	600	GxF-B-50	---

D = Single block valve (standard valve), B = Double block & bleed valve

The only difference in the dimensions of the HYDAC GCF standard filter and HYDAC GCF filters with integrated cyclone pre-separator is the overall height.

The advantages ...	... and how you benefit
Rigorously validated filter system	High level operating reliability
Integrated pre-separator compact and available as an option	Increased operating reliability, space-saving design and retrofitting if required
Coalescer and particle filter elements from HYDAC, in either stainless steel or glass fibre	Low pressure drops, superb coalescence and optimum service life
Sizing software based on real measurements	High level of design certainty
Worldwide service and availability of spare parts	Rapid help and support

Absolute Quality: From Production to Service. And in Operation.

Service worldwide.

As a systems and seal gas specialist, HYDAC SERVICENTER offers individual plans from seal gas cleaning to system optimization measures.
Our concern is to improve the operational availability and productivity of machines.
The HYDAC TrainingCenter provides comprehensive, experience-based training in all aspects of hydraulics, measuring technology and maintenance.
We also conduct training sessions at customers' own premises.

Worldwide specifications.

Accumulators D 30.000

Filter Range D 70.000

Filters for Ind. Processing D 77.000

Fluid Systems D 79.000

Compact Hydraulics E 53.000

Accessories D 61.000

Electronics D 180.000

Cooling Systems DEF 57.000

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HYDAC INTERNATIONAL

HYDAC PROCESS TECHNOLOGY GMBH

Industriegebiet
Am Wrangelflöz 1
66538 Neunkirchen
Germany

Tel.:
+49 6897 509-1241

Fax:
+49 6897 509-1278

E-Mail: prozess-technik@hydac.com
Internet: www.hydac.com

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