BOLLFILTER
Protection Systems
Oil & Gas

Innovative solutions
for industrial gas filtration


Applications – complex requirements

Gas filters are used in a variety of industrial processes such as:
- Exploration, transportation, storage and processing of oil and gas,
- Production of chemical and petrochemical products,
- Preparation of industrial raw materials,
- Operation of fixed and mobile installations for power generation.

Gas filters are often combined with compressors or turbines, but also with reactors and fixed or mobile large engines. The mediums to be filtered are normally seal gas, fuel gas, heating and cooling gas, injection gas as well as a number of technical gases. The filtration process can include the removal of particle contamination, the separation of moisture from gas or a combination of both.


Pictures from left to right:
Seal gas panel,
Filter for cooling gas

There are high technical and safety requirements for gas filtration:

- Required degree of purity for the filtered gas,
- Specific properties of gases, which are explosive, aggressive, toxic, polluting,
- Special conditions of processes, such as extreme temperatures and pressures,
- Extreme environmental and climatic conditions,
- Exotic material specifications.

All listed aspects require the highest precision and maximum safety, which can be identified as a common denominator in the gas filtration industry. BOLLFILTER for oil and gas fulfil these comprehensively.

Pictures from left to right:
Power Plant Texas,
DF Motor Wärtsilä

The perfect product for every requirement

All BOLL gas filters are characterised by the highest precision, reliability and safety. The special feature of the BOLLFILTER product program for gas filtration is that it covers all applications.
In addition to standard filters, the product range also includes filters that are manufactured according to customers' specifications. The unique system flexibility and wide range of variants allow a precise customisation of the filter solution to the individual application requirements.

Simplex filters

BOLLFILTER Simplex Type BFB-P/-C

BOLLFILTER Simplex Type 1.12.2

BOLLFILTER Simplex Type 1.58.1/1.78.1

	BOLLFILTER Simplex Type BFB-P/-C	BOLLFILTER Simplex Type 1.12.2	BOLLFILTER Simplex Type 1.58.1/1.78.1
Nominal diameters	DN 25 – DN 200	DN 25 – DN 80	DN 25 - DN 300
Connections inline	no	yes	no
Switch-over	–	–	–
Material variations Filter housing	carbon steel, stainless steel, Duplex, Super Duplex, Inconel, non-welded	nodular cast iron, cast stainless steel (DN 25 und DN 50)	carbon steel, stainless steel, Duplex, Super Duplex, Inconel, welded
Pressure stage	max. PN 550	PN 32 / PN 40*	max. PN 250
Temperature range	from -196°C to 250 °C	from -10°C to 160°C	from -196°C to 250°C
Grade of filtration	0.1 µm - 250 µm **	10 µm – 5000 µm *	0.1 µm - 250 µm

** Dependent on the filter size*
*** With coalescer – optionally with demister and cyclone*

For each type of gas, volume of gas, required degree of purity, type of plant and all operating conditions, the BOLLFILTER portfolio offers a perfect gas filter. Available options include:

- Simplex or Duplex filter
- Forged, welded or cast construction
- Different housing sizes and connection nominal diameters
- Particle or coalescer elements
- Cyclone pre-separation/knock-out
- Demister pre-separation
- Additional reservoir sizes according to the application
- Liquid level indicator
- Differential pressure indicator/transmitter

Duplex filters

BOLLFILTER Duplex Type BFD-C

DN 20 – DN 200
no
ball valve
carbon steel, stainless steel, Duplex, Super Duplex, Inconel, non-welded
max. PN 100 / PN 550
from -196°C to 250°C
0.1 µm - 250 µm**

BOLLFILTER Duplex Type 2.58.2/2.78.2

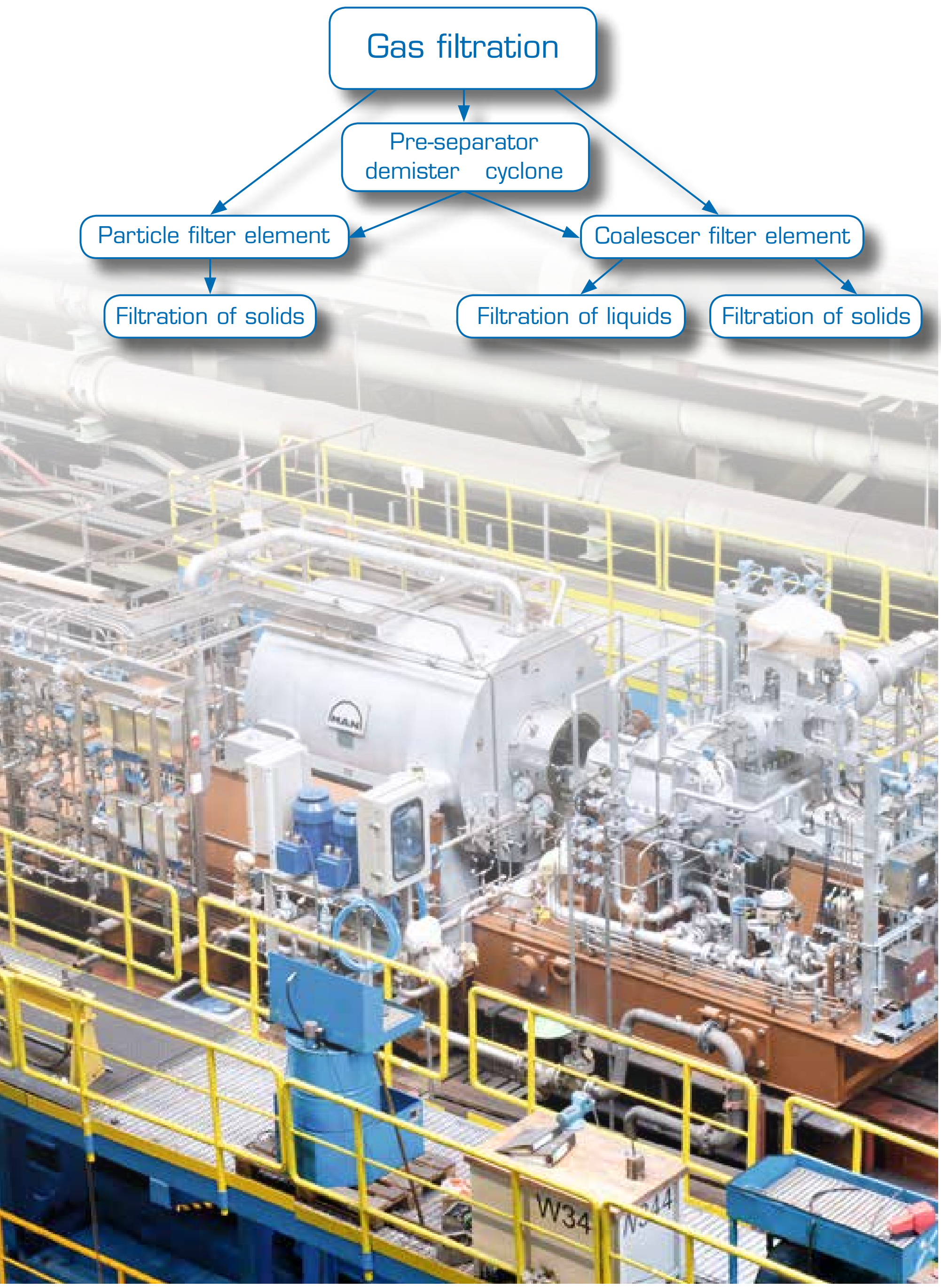
DN 25 - DN 200
no
ball valve
carbon steel, stainless steel, Duplex, Super Duplex, Inconel, welded
max. PN 250
from -196°C to 250°C
0.1 µm - 250 µm

BOLLFILTER Duplex Type BFD-P DBB/BFD-C DBB

DN 20 – DN 200
no
ball valve
carbon steel, stainless steel, Duplex, Super Duplex, Inconel, non-welded
max. PN 550
from -196°C to 250°C
0.1 µm - 250 µm

Gas filtration: An overview

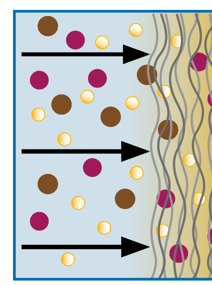
Gas filtration is a very complex task. Depending on the contamination of the untreated gas and the nature of the entrained particles, different methods are applied. This can involve filtration of solid particles, liquids and a combination of both. The quality of the filtration result is dependent on the filter medium used, type of filter element and the pre-treatment if applicable.



Gas filtration

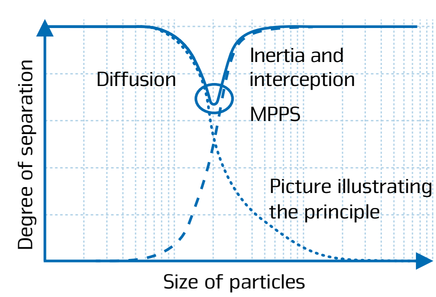
During the filtration of gases, there
separation mechanisms: *surface area*
field of gas filtration the *depth filtrat*
In *depth filtration*, three types of phy
the particle: inertia, interception and
solids as well as liquids.

Depth filtration

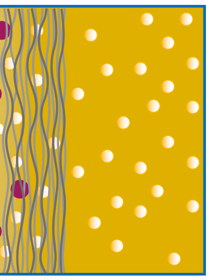


During inertia separation, the partic
own mass. As a consequence, it coll
filter element before getting separat
important for larger particles. The int
able to follow the flow, but then wh
with the filter fleece. The Browniar
movement of the particle and theref
to strike a fibre and get separated.
diffusion and occurs with very small
All of the above-mentioned mechan
particles. Due to the different influe
degree of separation curve arises, sh
particle size), which is the point of the

Fractional separation efficiency curve – principle

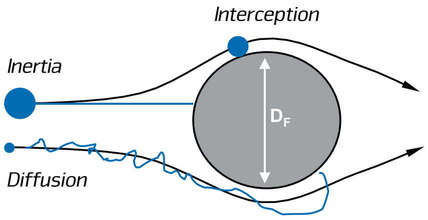


are basically two different types of *a filtration* and *depth filtration*. In the *ion* is almost exclusively used.
ysical mechanisms have an effect on diffusion. The particle can consist of



le cannot follow the flow, due to its lides with the fibre and sticks to the ed. Consequently, this mechanism is erception occurs, when the particle is hen expanding it comes into contact molecular forces cause a constant ore raises the chance for the particle This effect causes the separation by particles.
isms apply for both solid and liquid nces on the particle size, the typical owing the "MPPS" (Most penetrating lowest (finest) degree of separation.

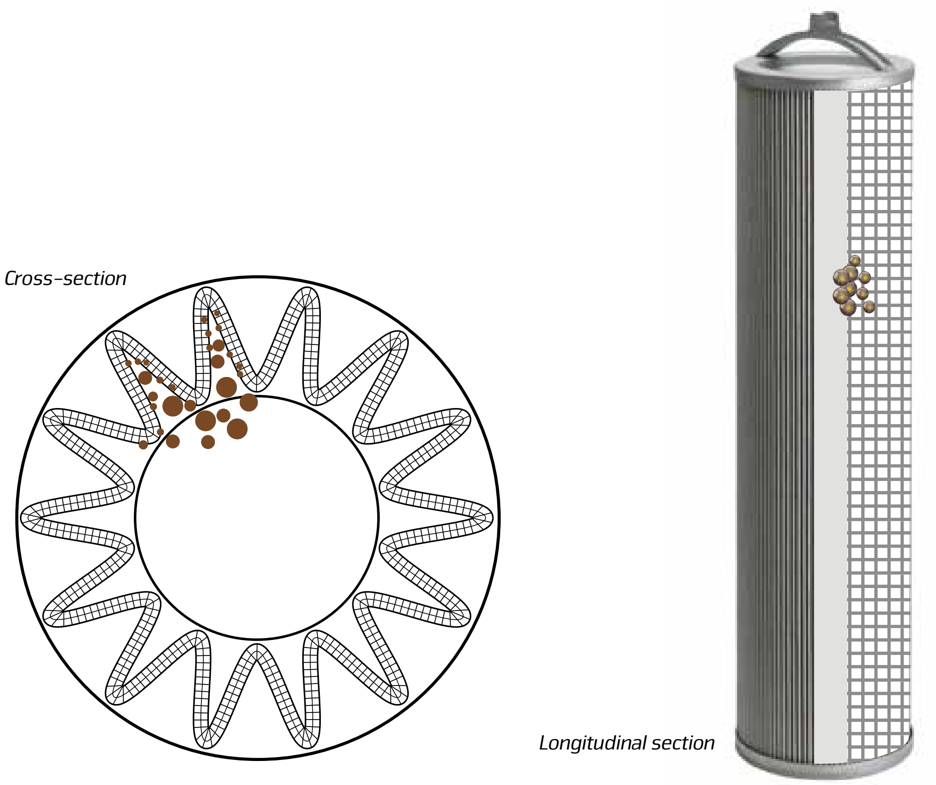
Particle separation mechanism for gases



The particle filter element

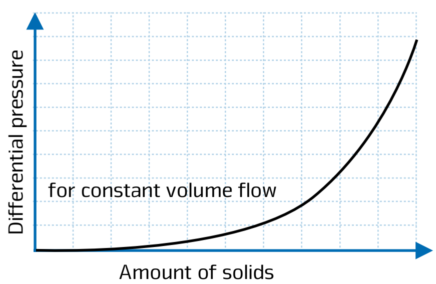
During the filtration of solid particles from gas, the particles flow into the filter fabric. Due to the separation mechanism, the particles get stuck as soon as they touch the fibres of the filter element fabric. Depending on the consistency of the filter fabric and the size of the particles, they penetrate into the depth of the fabric. The result is that the pores become blocked and as a consequence, the differential pressure increases.

Inner setup particle filter element

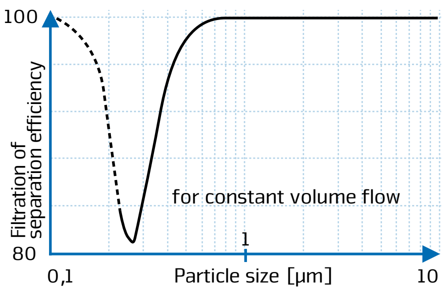


As the particle separation occurs deep in the fibers, a cleaning of the particles from the fabric is not possible. Consequently, all filter elements have to be replaced at a certain differential pressure. Design criteria include not only the gas components, but the operational parameters such as volume flow, pressure, temperature, separation efficiency, differential pressure and expected amount of particles.

Differential pressure curve – principle



Fractional separation efficiency curve – principle

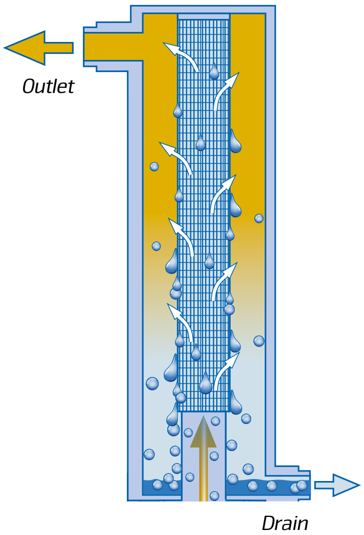


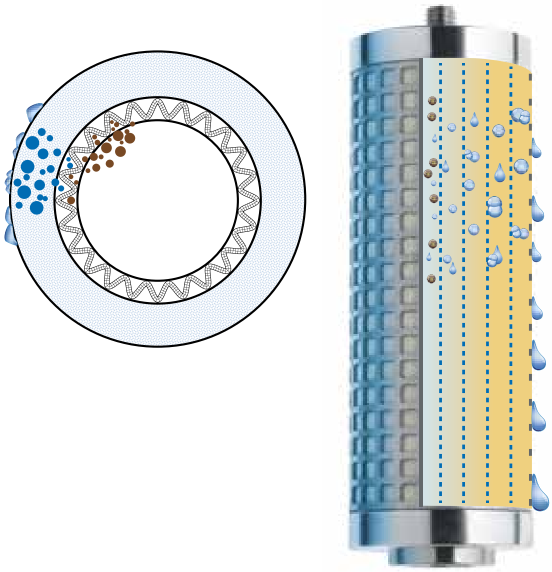
Combination

The coalescer element

The coalescer element manufactured by BOLL & KIRCH contains two stages. The first stage filters the solid particles out of the gas flow and the second stage separates the liquid particles. Normally, the liquid particles penetrate deeper into the fabric. When the liquid particles are deposited, they amalgamate and form larger drops that are separated by gravity.

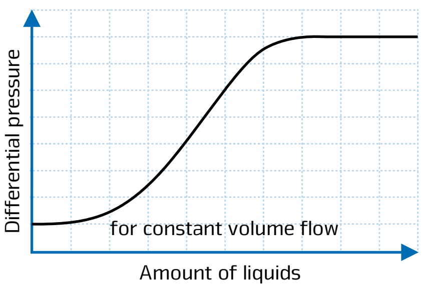
Inner setup coalescer element



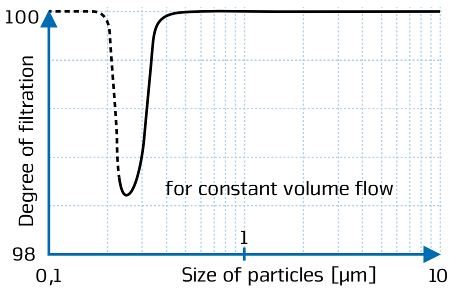


At a certain size, the drops will run down on the fibres in compliance with the law of gravity. When the drops reach the bottom of the filter element, they fall out and are retained in the drain reservoir. The differential pressure also rises with the increasing soiling of the filter element, however, in a coalescer element, this may also occur, when the succeeding fluid stream does not exceed the amount of liquid being able to be drained and solid particles cannot be found in the gas flow.

Differential pressure curve – principle



Fractional separation efficiency curve – principle

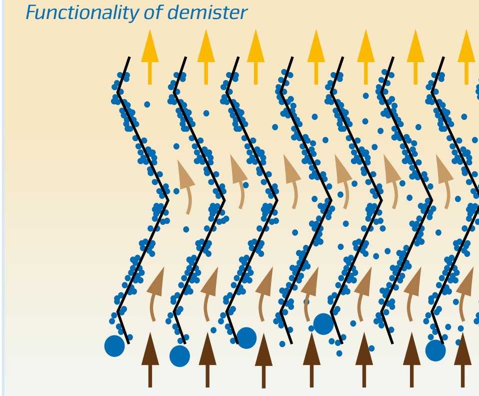


The demister as a p

The demister is used as a pre-separato
ed to be highly contaminated. Solid p
fluid up to a certain amount. Therefore
and a demister should only be used in a
the demister is less vulnerable to chang
or volume flow.

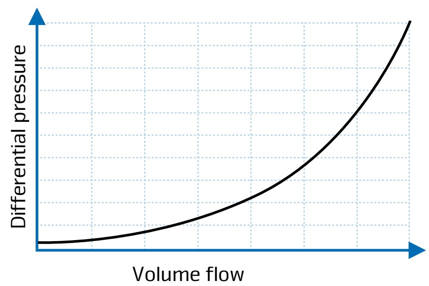
Demister

Functionality of demister



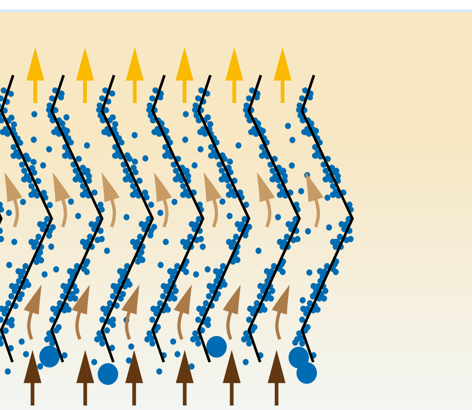
In a demister, the inertia effect is the m
ration efficiency is achieved by a repe
demister. The particles are deposited o
via gravity. The design of the demist
conditions like volume flow, but also on
and the required separation efficiency.

Differential pressure curve – principle



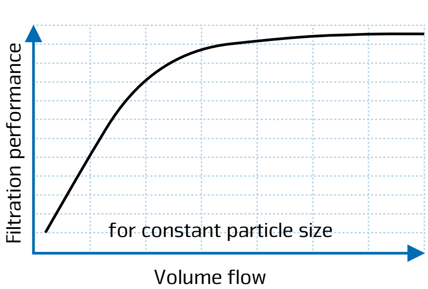
pre-separator

r when the gas in liquid form is expect- articles can only be separated from a e, an interlock of the canals is possible duplex filter. In opposite to the cyclone, es by operation conditions like pressure



ain separation mechanism. Good sepa- eated deflection of the gas flow in the on the surface of the wire and run down er depends not only on the operating the type of particle, the filtered medium

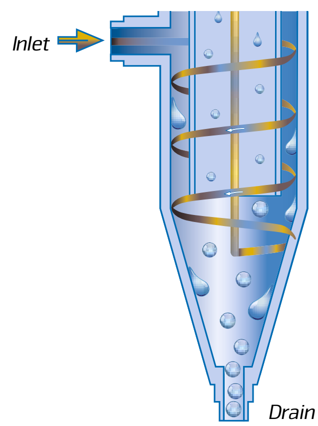
Separation efficiency curve – principle

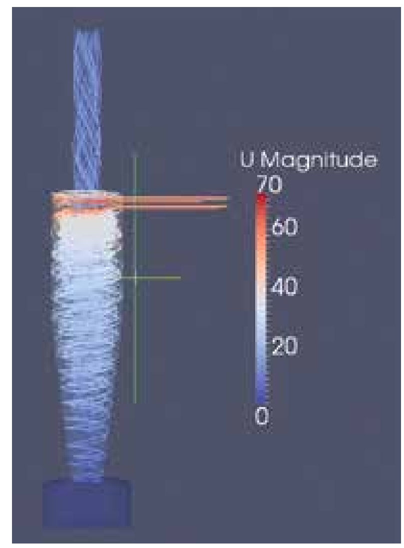


The cyclone as a pre-separator

The cyclone, like the demister, is used as pre-separator when the gas is expected to be highly contaminated by liquid and solid particles. The cyclone separates high solids content as well as high moisture content. The separation efficiency is based on centrifugal force, which carries the particles to the outer wall of the cyclone.

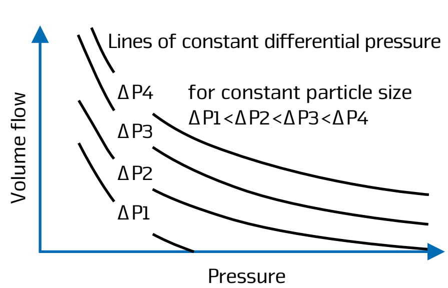
Cyclone



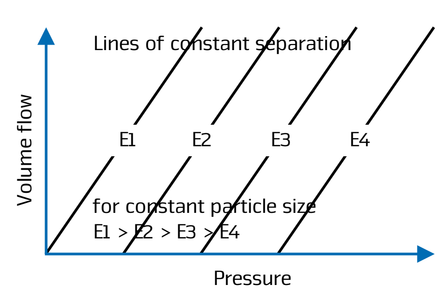


To separate even the smallest and lightest particles, a fast rotating gas flow is necessary. This is supplied by the special introduction of the gas into the cyclone. Once separated by centrifugal force, the particles run down the inner wall of the cyclone into a collection zone. Because of the separation principle, the separation efficiency of the cyclone depends on the operating conditions. Widely varying operating conditions lead to varying separation efficiencies. Due to the required high gas velocity, a relatively high pressure loss has to be accepted.

ISO – differential pressure curve – principle



ISO – separation efficiency curve – principle



BOLL & KIRCH:
The expert for gas filtration

BOLL & KIRCH research centre including test laboratory

For more than 60 years, we are focusing on the filtration of liquids and gases. Today, the brand BOLLFILTER is a guarantee for high performance, precise function, best material, best processing, reliability and freedom from maintenance. This is based on a quality management system, which is designed according to international standards and certified according to ISO 9001 and ISO 14001.

Product test

As part of Research and Development as well as in the course of regular production control, product tests and quality tests play an equally important role at BOLL & KIRCH. This ensures that all manufactured products fulfil the legal and customer-specific requirements and that only qualitatively flawless products leave the production. Gas filter elements for example, go through a rigorous test of efficiency, capacity and safety, facilitated by the following measures:

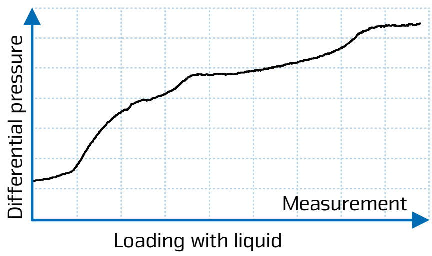
- Fractional separation efficiency measurements according to ISO 12500-3
- Differential pressure measurements
- Loading measurements
- Bubble Point Test according to ISO 2942

All test installations are in-house and therefore always available. A highly sophisticated, special software is used for the automatic control of the test runs and to document the results.

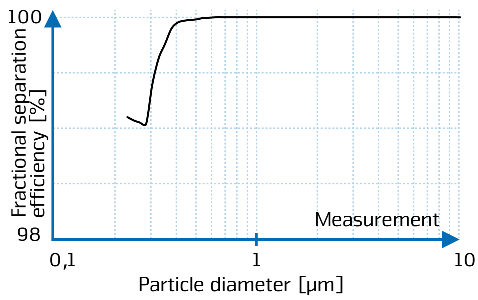
Quality test

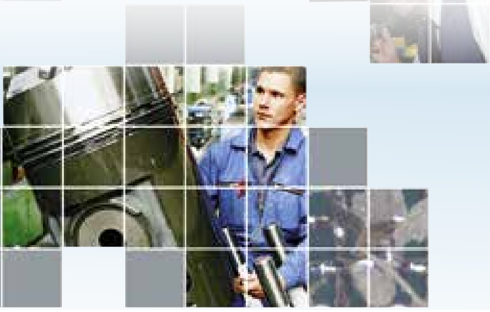
BOLL & KIRCH gas test-bench

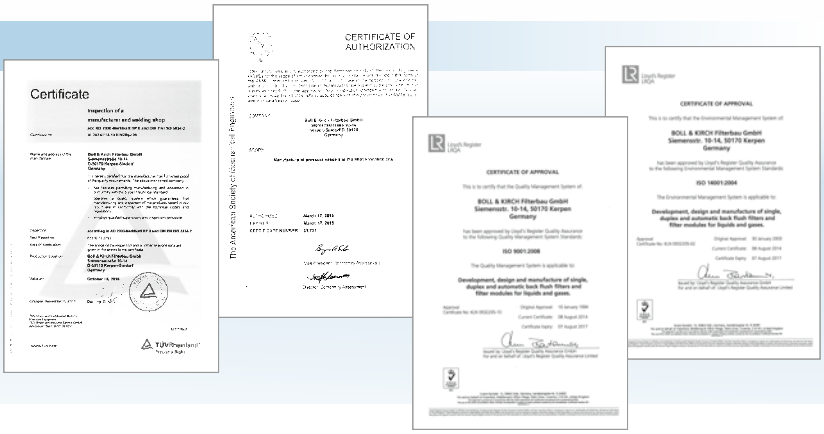
Loading measurement



Fractional separation efficiency







Individual filtration systems for special requirements

Gas filtration on an industrial scale demands highly sophisticated filter systems for most different tasks, plant and operating conditions. In addition to adapting our core group of standard products, BOLL also strategises with our customers to develop specialised technically optimal solutions for individual applications. Within Customised Engineering, we accompany our customers through all project sub-processes from the definition of the requirements to the realisation and the commissioning of the systems.

All BOLLFILTER models, whether standard or special executions, are top-quality products. In their competitive environment, they set quality standards for gas and liquid filter systems. This is confirmed by 80 national and international authorisations and certificates.

Authorisation/ regulations/ set of rules
API 610 / 614 / 618 / 692 (international)
DIN ISO 10438-1 (international)
U-Stamp (international)
NACE MR 0175/ISO 15156-3/ NACE MR 0103
Atex Directive 94/9/EC (international)
PED 97/23/EC & CE-marking (Pressure Equipment Directive/ European)
Manufacturing License Republic of China (China)
Dosh (Malaysia)
ARH/DPP (Algeria)
CRN (Canada)
NR-13 (Brazil)
EAC (TR CU)
MOM (Singapore)
UDT (Poland)
NORSOK (Norway)

Construction design
ASME Section VIII, Division 1 (USA/international)
AD-2000 (Germany/Europe)
DIN EN 13445 (Europe)
Codap (France)
Stoomwezen (Netherlands)
PD 5500 (UK/Europe)
AS 1210 (Australia)
NZ 1210 (New Zealand)

Inspections & tests
PMI (Positive Material Identification)
X-ray inspection
Ultrasonic inspection
Dye penetrant testing
NACE MR 0175/ISO 15156-3/ NACE MR 0103

Maximum customer orientation for maximum satisfaction

BOLL & KIRCH continues to prove its strengths as a manufacturer and supplier long after the product has been delivered. As a leading international supplier of marine and industrial filters for filter systems with a global network of sales and service centres, BOLL & KIRCH has at its fingertips the ideal logistical basis for providing perfect customer support. Naturally, users of the different BOLL gas filters also benefit from the advantages this worldwide network provides – swift delivery, faster availability of technical support and a trouble-free supply of BOLLFILTER Genuine Parts.

BOLLFILTER Protection Systems
Oil & Gas

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