

CF Candle Filter

Clarification & concentration

BHS
SONTHOFEN

TRANSFORMING
MATERIALS
INTO VALUE



Administrative building of BHS-Sonthofen



TRANSFORMING MATERIALS INTO VALUE

BHS
SONTHOFEN



The company

BHS-Sonthofen, headquartered in Sonthofen, Germany, is an owner-operated group of companies in the field of machine and plant engineering. We offer technical solutions in the field of mechanical process engineering, with a focus on mixing, crushing, recycling and filtration. With over 300 employees and a number of subsidiaries, BHS-Sonthofen has a global presence.

Cake filtration

BHS has specialized in cake filtration for more than 50 years. We supply a broad range of pressure and vacuum filters for both batch and continuous operation. We have accumulated a great wealth of experience. More than a thousand applications have been implemented. A common feature of all BHS filters is that they work with a comparatively thin cake.

Plant technology

BHS has experienced project engineers at its disposal for planning and implementing filtration plants. Numerous references all over the world testify to our broad expertise and experience. We are well-versed in all customary standards, including country-specific norms such as API, CSA, ASME, etc. Even challenging requirements, in the offshore sector for example, are satisfied.

Worldwide service

BHS offers quick and reliable service worldwide with its technical customer support and a large stock of spare parts for all standard machine types and also for older machines.

www.bhs-sonthofen.com

BHS candle filter (CF)

The BHS candle filter is a batch-operated filter with candle-shaped filter elements arranged vertically inside a pressure vessel. The filter cake is formed on the outside of the filter candles while the clear filtrate is discharged from the interior of the candles through dip pipes. All the process steps are carried out under pressure.

The candle filter is used for clarifying liquids with a low solids content. It is a compact unit, operates fully automatically and allows high throughput rates, dry cake discharge and a wide range of cake treatment options.



Complete candle filter plant of type CF 24-113 with 76 m² filter area

High process versatility

A variety of options are available for treating the filter cake, enabling the individual process requirements to be met. The cake can be washed or reslurried in one or more stages. Air, nitrogen or other gases can be passed through the filter cake to achieve a greater degree of dewatering. If required, precoat filtration by means of filter aids is possible.

Fully automatic operation

The candle filter operates fully automatically. On completion of a process cycle, the filter cake is separated from the candle surface by backblowing and subsequently discharged. The next cycle then begins.

Safe pressure filtration system

The entire filtration process takes place under pressure – up to a pressure differential of 10 bar g – in a closed, gas-tight system. This enables a BHS candle filter to be implemented even where strict health and safety regulations apply. It is also possible for products to be processed in an inerted or sterile environment.

No moving parts

The BHS candle filter does not incorporate any moving parts. This increases operational reliability and reduces maintenance requirements. Where cake discharge is concerned, the special surface configuration of each candle ensures that the cake is completely removed and discharged downwards.

Alternative materials

To suit the individual application, we manufacture in various grades of stainless steel and alloys or coated designs and plastics. Depending on the requirement, ground and polished surfaces are possible.

GMP and ATEX

For applications in the pharmaceutical, food and bioprocess industries, we make specially equipped, GMP-compliant filter plants incorporating CIP equipment if necessary. We are also ATEX certified.

Modular, turnkey filtration skid packages

On the basis of the candle filters, BHS has developed a modular system of turnkey filtration skid packages. The advantages of these tried-and-tested system solutions are their short delivery times and low installation requirements on site. The modules are designed to allow cost-effective transport to the construction site and in most cases packed in ISO containers.



Candle filter with 10 m² filter area

STRUCTURE OF A CANDLE FILTER

Pressure vessel **A**

Suspension feed **B**

Filtrate outlet **C**

Vent **D**

Compressed gas feed **E**

Solid discharge **F**

Residual volume discharge **G**

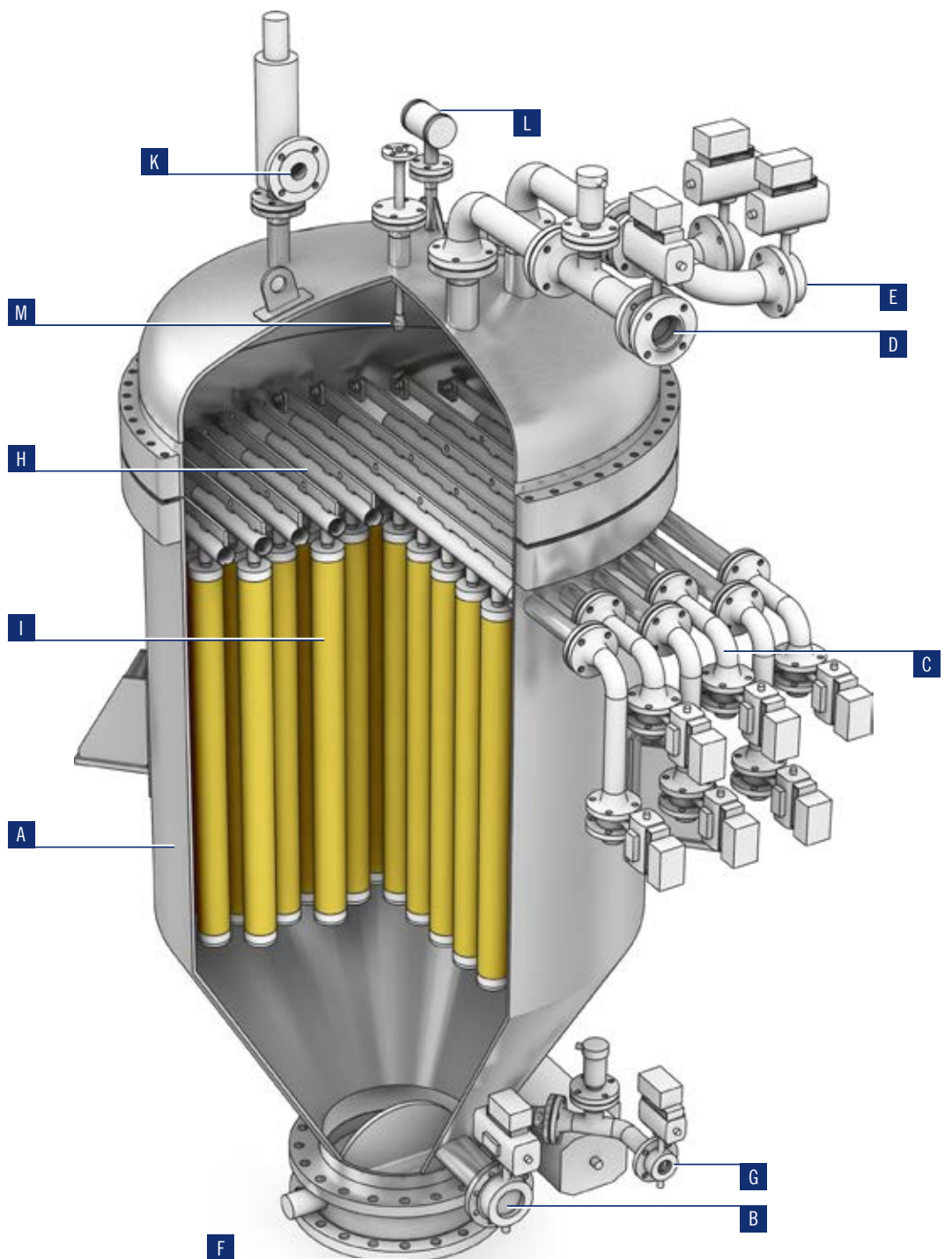
Register pipes **H**

Filter candle **I**

Safety valve **K**

Pressure transducer **L**

CIP device **M**



STRUCTURE OF A CANDLE

Central pipe 1

Designed as a dip pipe, the central pipe allows complete residual discharge of the filtrate.

Connection of the candle to the register 2

The candle is connected to the register by means of a thread at the end of the central pipe.

Support grid for filter medium 3

The support grid for the filter cloth is a perforated body and allows a high filtrate throughput.

Evenly spaced welded rods 4

The evenly spaced welded rods cause a wave-like configuration of the filter medium and corresponding build-up of the filter cake. Stable, reliable cake formation is the result.

Filtrate collection chamber 5

Inside the support grid, the filtrate runs downwards to the filtrate collection chamber, from where it exits the candle upwards through the central pipe.

Filter medium 6

During filtration, the filter medium assumes a convex-concave wave shape on account of the operating pressure applied and the evenly spaced welded rods.

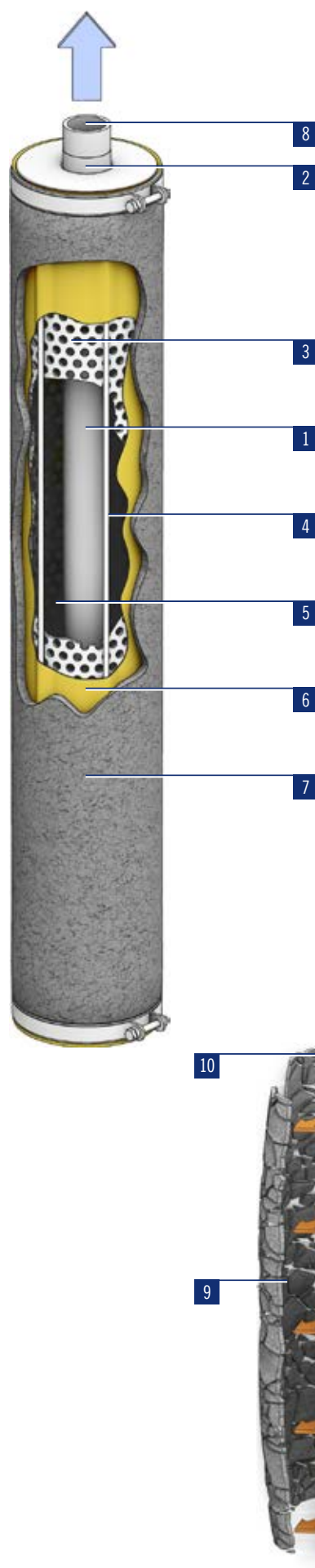
CAKE FORMATION AND CAKE DISCHARGE

Cake formation

During the filtration cycle, the filter cake 7 builds up on the filter medium. The clear filtrate 8 (blue arrow) flows upwards through the central pipe and is discharged through the register pipes.

Cake discharge

At the end of the filtration cycle, the vessel is no longer under pressure and the discharge valve opens. For discharging the filter cake 9, a backblow 10 (orange arrow) causes the filter cloth to expand into a circular cross-section. The filter cake is released from the filter medium, breaks into pieces and falls through the discharge valve.



BHS manufactures candle filter plants for diverse applications. These are based on a range of standardized modules for plants from 1 m² to 50 m² filter area. BHS also makes individually engineered candle filter plants to customer specifications.

The BHS candle filter plant consists of the following four main components:

- » Candle filter
- » Piping with fittings and measuring instruments
- » Steel structure
- » PLC controls

The skid can be supplemented and expanded with further accessories.

Process solution

Besides the machinery itself, BHS also offers complete process solutions in the area of solid-liquid separation. Upstream and downstream process steps can be planned and integrated in addition to the actual filtration.

Modularization

All BHS candle filter plants are of modular design. This reduces the planning effort and allows preassembly at the factory as well as comprehensive testing prior to shipment (FAT). On-site installation time is thus reduced and short overall delivery periods are possible. The modules can be combined to meet the individual process requirements.

ISO containerization

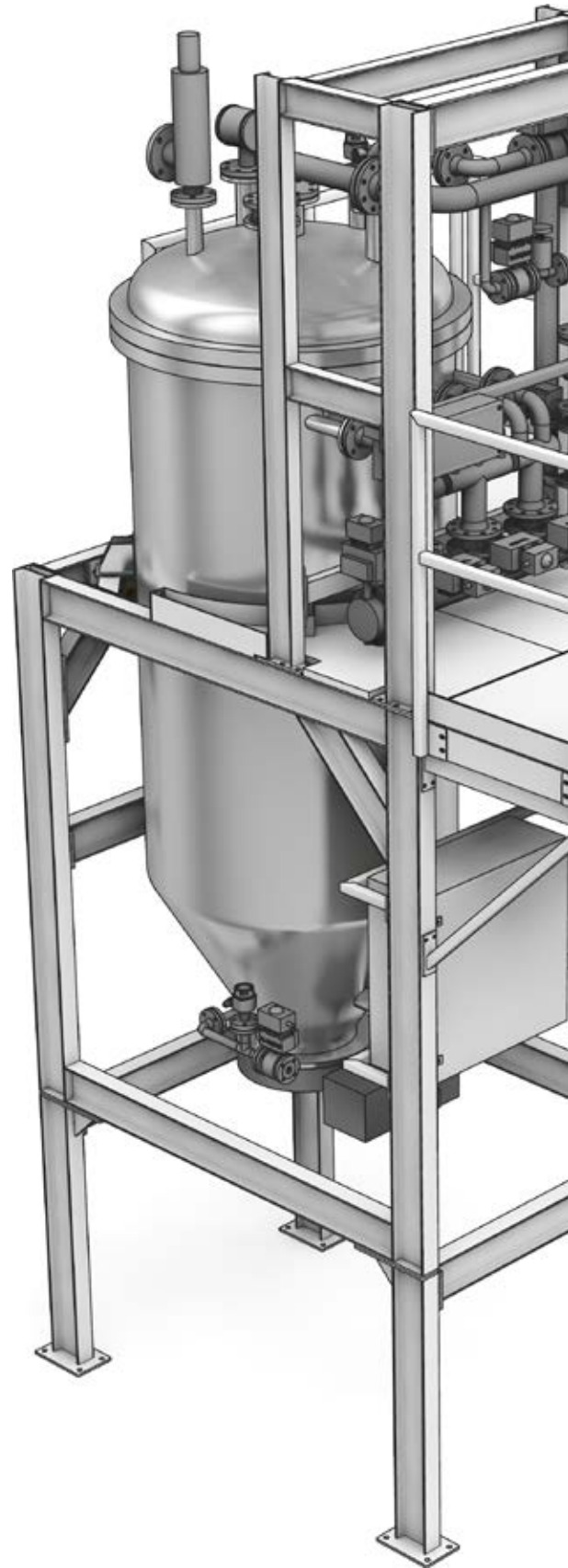
The modules installed in the plants can be shipped in ISO containers. This permits cost-effective and uncomplicated transport worldwide.

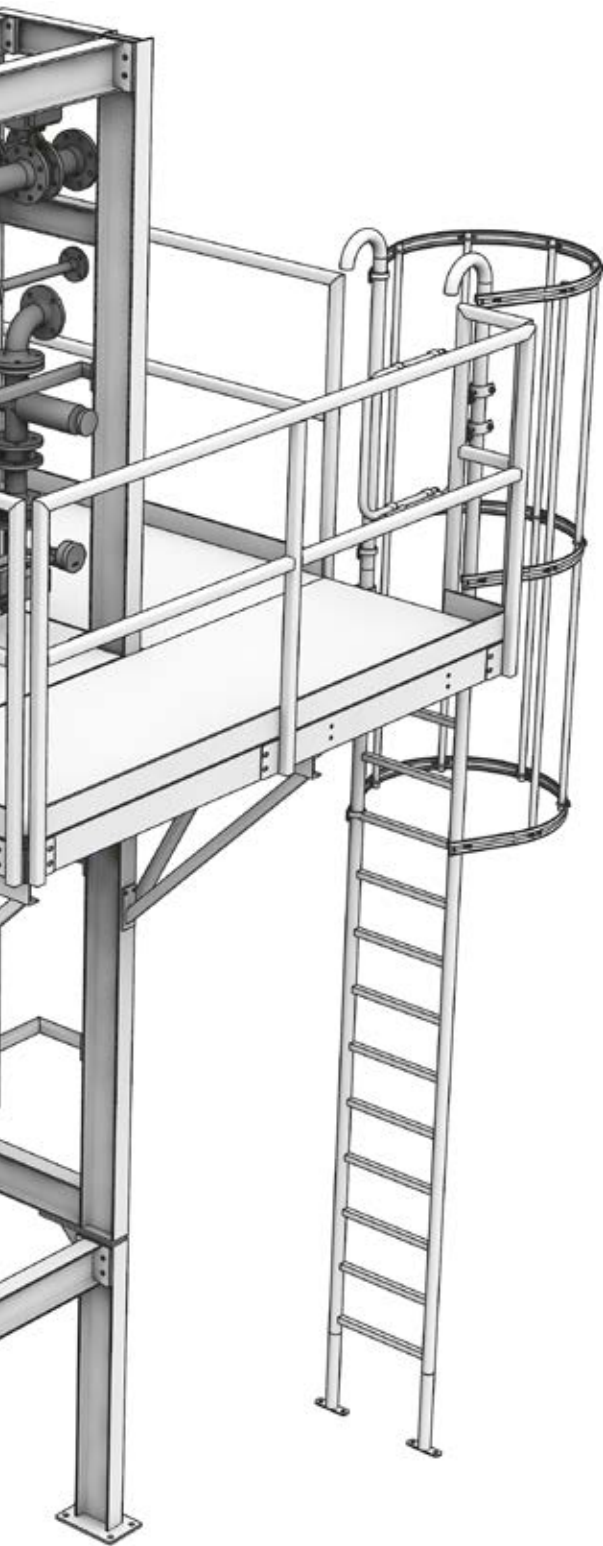
Engineering

Timely and complete engineering is an integral part of our project planning. We create foundation plans and detailed isometric drawings for the piping. All connection points are precisely defined.

Documentation

BHS has extensive experience in the production of package documentation conforming to international standards.





Candle filter plant of type CF 18-049 with 25 m² filter area

Heel filtration device

The heel filtration device enables the residual volume to be processed on completion of the filtration cycle by means of an internally filtering candle at the vessel cone. This ensures complete heel filtration with a minimum of compressed gas.

CIP system

A CIP system is available for cleaning the filter interior, the register pipes and the filter candles. A special design of the candle filter with appropriate surfaces allows dependable cleaning of all parts in contact with the product.

Precoat or body feed

A precoat or a body feed plant is used to suspend powdery filter aid. The precoat plant operates in batch mode, whereas the body feed plant runs continuously. They are of modular design and comprise a storage tank, agitator, piping, fittings, measuring instruments, steel structure and pumps.

Tube sheet design for slurry discharge

In the case of slurry discharge, the candles are mounted on a tube sheet that separates the filtrate and suspension chambers. The filter cake is discharged by backflush with filtrate. Under specific conditions, the tube sheet design represents a cost-effective solution.

Further accessories

BHS has the experience to integrate additional accessories into the candle filter packages as required by the application, e.g. polishing filters or activated carbon filters.



A BHS candle filter plant is installed at the South Ýolöten natural gas field in Turkmenistan. It is used for desulfurizing the natural gas in the amine sweetening process. It consists of two units, each featuring a type CF 24-113 candle filter with 76 m² filter area. Each unit is also equipped with a precoat station, two activated carbon adsorbers and a polishing filter.



A two-stage process with a combined BHS candle and pressure plate filter plant is implemented for the purpose of filtering an amine solution in the removal of sulfur dioxide from power station flue gases. The first stage involves clarification of the solution by means of two type CF 18-40 candle filters operating in parallel, with 20 m² filter area each and a common body feed plant. In the second stage, the BHS pressure plate filter of type PF 0710 with 4 m² filter area separates, washes and pre-dries the thickened solids to a degree suitable for landfill disposal.



The plant pictured here is used for cleaning the electrolyte of a coating plant in a German cold rolling mill. The candle filter plant comprises three type CF 21-049 candle filters, each with a filter area of 29.4 m².

The illustrated BHS candle filter skid is used for cleaning the amine solution from a gas scrubber at a refinery in the USA. The plant comprises two BHS type CF 18-19 candle filters, each with a filter area of 10 m².





The BHS candle filter plant of type CF 179-66 consists of three identical candle filters, each with 66 m² filter area, and is used for gray-water regeneration in a coal-to-gas plant.



In a North American refinery, catalyst particles are extracted by a gas scrubber and cleaned by means of two BHS candle filter plants operating in parallel. Each plant contains two BHS candle filters of type CF 24-147, each with 100 m² filter area, and a precoat plant.

Tests give certainty

We perform initial tests with our pocket leaf filters. These tests can be performed quickly and easily at your location or in our well-equipped laboratory in Sonthofen. Basic data can thus be obtained about the filterability of a suspension and the general design of a production filter.

For more extensive tests, even spanning several weeks, we can rent out pilot and lab filters for all BHS filter types. Filters made of different materials are also available. If necessary, the filters can be equipped to meet specific customer requirements.

These filters can be used to examine filter behavior methodically and reliably. Machine parameters can be varied and alternative materials can be explored. The test results provide a sound basis for the layout of a production machine and for determining the ideal mode of operation. Your investment decision is thus placed on a secure footing.



Pilot candle filter plant with 1 m² filter area for customer-specific testing on site

Performance data and dimensions

Type	Candle length	Candle area	Number of candles	Active filter area (total)	Vessel diameter	Vessel length
CF 12	1,200 mm	0.34 m ²	3	1 m ²	419 mm	1.6 m
			7	2.4 m ²	508 mm	2 m
			19	6.5 m ²	800 mm	2.5 m
CF 18	1,800 mm	0.51 m ²	7	3.6 m ²	508 mm	2.3 m
			19	9.7 m ²	800 mm	2.8 m
			37	18.9 m ²	1,100 mm	3.5 m
			49	25 m ²	1,300 mm	3.7 m
			61	31.1 m ²	1,500 mm	3.9 m
CF 21	2,100 mm	0.6 m ²	49	29.4 m ²	1,300 mm	4 m
			61	36.6 m ²	1,500 mm	4.2 m
			77	46.2 m ²	1,600 mm	4.3 m
			91	54.6 m ²	1,800 mm	4.5 m
			112	67.2 m ²	2,000 mm	4.7 m
			144	86.4 m ²	2,200 mm	4.9 m
			221	132.6 m ²	2,600 mm	5.6 m
CF 24	2,400 mm	0.68 m ²	49	33.3 m ²	1,300 mm	4.3 m
			61	41.5 m ²	1,500 mm	4.5 m
			77	52.4 m ²	1,600 mm	4.6 m
			91	61.9 m ²	1,800 mm	4.8 m
			112	76.2 m ²	2,000 mm	5 m
			144	97.9 m ²	2,200 mm	5.2 m
			221	150.3 m ²	2,600 mm	5.9 m

Process criteria


Mode of operation	batch
Operating pressure	up to 10 bar (g)
Operating temperature	up to 250 °C
Solids content (suspension)	up to 10% (weight)
Cake thickness	up to 30 mm
Particle size	starting from 0.5 µm
Filtration capacity – suspension	0.1 - 10 m ³ /m ² h
Filtration capacity – dry solid	–
Active filter area (total)	1 - 150 m ²

All specifications apply to the standard design.
 Technical data for customized designs may differ from the specified data.
 All technical data may change due to development.
 Subject to modification without notice.

BHS FIELDS OF COMPETENCE



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