



Alfa Laval Culturefuge 400 B

High capacity continuously solids-discharging centrifuge for the biotech industries

Many new biological products are derived from fragile organisms. In high density fermentations, where the biomass loading cannot be handled by conventional intermittent (ejection), an alternative continuous discharge via a top disk and built-in impeller is realisable with this machine. Damage to the delicate cell wall is minimized thus enabling recovery of valuable solids intact.

The Culturefuge 400 B is a steam-sterilizable hermetic machine designed for separation of mammalian and microbial cells as well as cell debris and suspended proteins at capacities up to 25 m³/h with continuous removal of solids.

The unique hermetic design with bottom feed gives not only a gentle acceleration of shear-sensitive particles; it also avoids pick-up of oxygen. The hermetic inlet together with the special geometry of the separator leads to maximum separation efficiency. Special attention has been paid to a hygienic, CIP-able design which is a pre-requisite for successful sterilization.

Applications

The machine is designed for clarification duty, separating particles from one liquid, especially shear sensitive particles. Applications that require low oxygen pick-up can also take advantage of the hermetic features offered by this machine. The sterilizability makes the machine suitable for most biotechnological separation duties.

Standard design

The machine consists of a frame that has a horizontal drive shaft, worm gear, lubricating oil bath and a hollow vertical bowl spindle in the lower part. The bowl is mounted on top of the spindle, inside the space (bowl casing) formed by the upper part of the frame, the solids collecting cover and the frame hood. The bowl casing is double-walled for cooling and noise reduction.

The bowl is sealed off from this space by mechanical seals. There is also a mechanical seal at the bottom of the spindle, and a mechanical seal at the top of the spindle to make sterilization with steam possible.

All metal parts in contact with the process liquid are made of stainless steel.

The bowl is of the continuously solids-discharging disc type with an automated hydraulic operating system for CIP discharge. During CIP total or partial discharges are possible that take place at full speed.



Alfa Laval Culturefuge 400B complete with motor

The hydraulic/pneumatic system for the discharge is mounted on the lower part of the frame.

The centrifuge is available with main connections as sanitary clamps and all other utility connections of clamp type. The electric motor is suitable for variable frequency drive, which makes it possible to have bowl speeds down to 80% of the maximum bowl speed.

The design conforms to a number of EC directives, and the machine is made in accordance with the general directives for machinery. The machine is equipped with nozzles for flushing of the bowl top, the bowl bottom and the solids collecting chute.

Operating principle

Separation takes place inside a rotating bowl. The untreated feed is introduced to the bowl from the bottom through a hollow spindle (1) and is accelerated in the distributor (2) before entering the disc stack (3). The separation of the heavy phase particles and heavy sediment takes place in between the discs. The light phase moves towards the center and is discharged by an impeller (4). The heavy phase particles leave the bowl over the top disc (5) and are taken out by another impeller (6). At CIP, contaminants and residual solids collected at the periphery is ejected from the bowl intermittently at full operating speed. The variable volume partial discharge is achieved by a hydraulic system below the separation space. At preset intervals, this system forces the sliding bowl bottom (7) to drop down, thus opening the sediment ports (8) at the periphery.

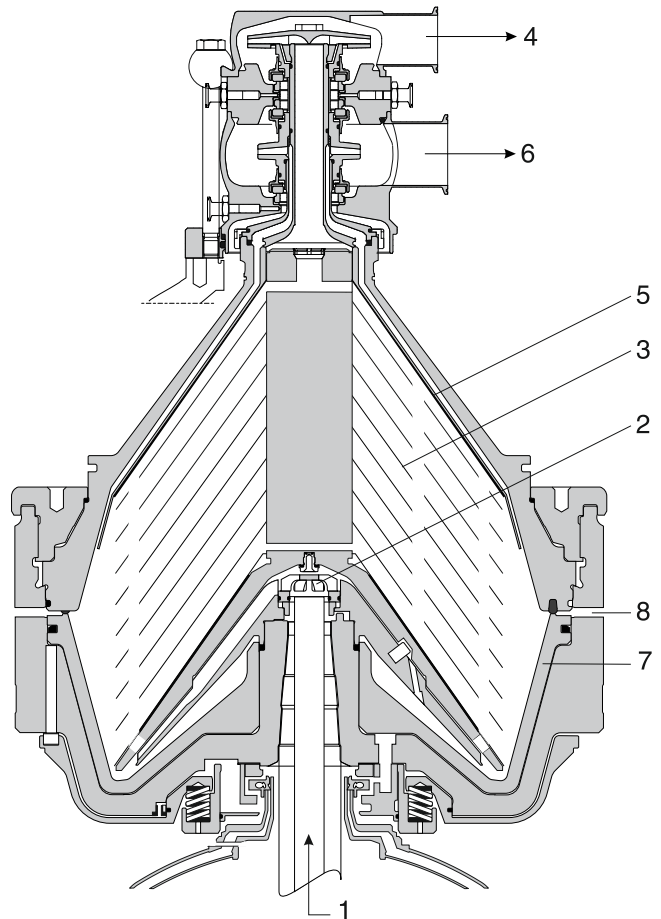
Design features

- Designed for easy cleaning-in-place (CIP)
- Fully hermetic design for minimal shear stress and absence of oxygen
- Continuous removal of solids
- Design pressure of the bowl casing 300 kPa
- Design pressure for the cooling jacket 300 kPa for connection to centralized cooling circuit
- Bowl casing and cooling jacket designed according to ASME or PED
- Sterilizable (SIP) with 210 kPa steam in a 30 min cycle, including discharge system
- Most parts in contact with the process liquids available with two alternative surface finishes
- Product wetted parts passivated (optional)
- All product wetted polymers and seal rings compliant with FDA regulation

Available models

These different surface finish executions are available:

	Ra 0,8	Ra 0,5 El.-polished
- Inlet device	X	X
- Bowl spindle	X	X
- Separator bowl inside	X	X
- Discharge housing	X	X
- Outlet device	X	X
- Frame top part inside incl. solids collecting ring	X	
- Frame hood inside	X	
- Separator bowl outside	X	



Typical bowl drawing for a hermetic centrifuge with continuous flow of separated solids and intermittent discharge of contaminants and residual solids. Drawing details do not necessarily correspond to the centrifuge described.

Utilities consumption

Electric power	max. 20 kW ¹⁾
Flushing liquid per discharge	0–16 l
Operating liquid	2,5 l per discharge
Steam at 210 kPa pressure	20 kg (44 lbs) per sterilization
Cooling liquid for frame parts ²⁾	max. 550 l/h
Cooling liquid for oil cooler ²⁾	max. 180 l/h
Cooling water for seals	min. 280 l/h

¹⁾ At feed flow 25 m³/h. Power consumption increases with the flow rate.

²⁾ The oil cooling and the frame cooling may be connected in series.

Material data

Bowl body, hood and lock ring	Stainless steel 1.4462 UNS S 31803
Frame top part and hood (ASME)	Stainless steel ASME S 31603
Frame top part and hood (PED)	Stainless steel 1.4404 (for pressurised equipment)
Frame bottom part	Cast iron, clad with Stainless steel 1.4301 UNS S 30400
Outlet parts	Stainless steel 1.4462 UNS S 31803
Gaskets and O-rings product-wetted	EPDM rubber and PTFE acc. to FDA ¹⁾
Bowl seal ring	Amid polymer 66 acc. to FDA ²⁾
Seal rings in- and outlet	Resin impregn. Carbon Graphite acc. to FDA ³⁾
Wear ring in- and outlet	FDA approved self-sintered Silicon Carbide

¹⁾ CFR 21§177.2600/1550 USP Class VI

²⁾ CFR 21§177.1500 USP Class VI

³⁾ CFR 21§177.2410

Connections

Inlet, heavy phase and solids outlets	Clamp type, 63,5 mm ¹⁾
Light phase outlet	Clamp type, 48,3 mm ¹⁾
Utilities	Clamp type, various dimensions ¹⁾

¹⁾ According to ISO 2852

Technical specifications

Throughput capacity	max. 25 m ³ /h ¹⁾
Solids handling capacity	max. 600 l/h ²⁾
Bowl volume	30 l
Sludge space volume	10 l
Discharge volume at CIP	5-17 l
Bowl speed, separation	max. 5119 rpm
Bowl speed, sterilization	max. 120 rpm
G-force	max. 7,425
Motor speed synchronous 60Hz	1800 rpm
Installed motor power, ABB/NEMA	21/22 kW (28/30 HP)
Starting time min/max	8/10 min
Stopping time with motor brake	10 min
Feed temperature range	0–100°C
Feed inlet pressure required at inlet flange	min. 200 kPa
Liquid outlet pressure at outlet flange	400-500 kPa ³⁾
Sound pressure	73 dB(A) ⁴⁾
Overhead hoist lifting capacity	min. 1000 kg (2200 lbs)

¹⁾ Actual throughput depends on amount and type of solids in the feed, viscosity and required degree of clarification and inlet pressure.

²⁾ Wet solids. Actual volume depends on discharge volume and application.

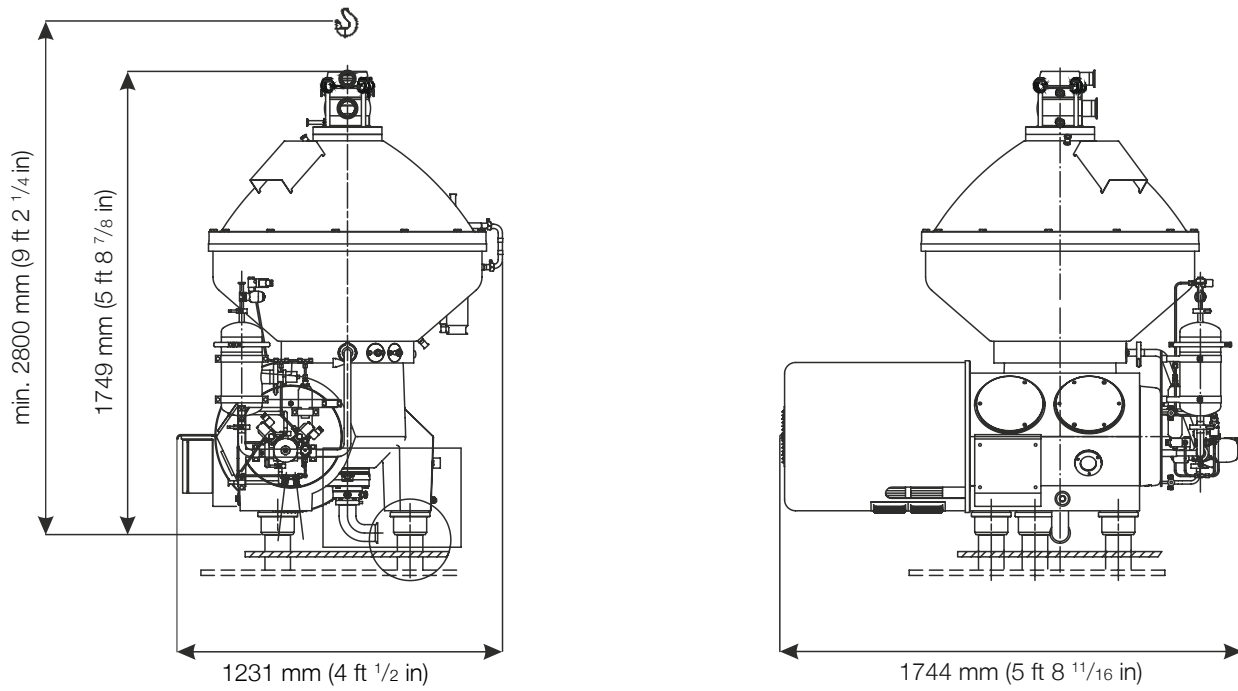
³⁾ At light phase flow rate of 15 m³/h and with medium sized outlet pump. Increasing with decreasing flow rate.

⁴⁾ According to ISO 3744.

Shipping data (approximate)

Centrifuge weight (without motor)	1710 kg (3770 lbs)
Bowl weight	600 kg (1320 lbs)
Motor weight, ABB/NEMA	164/211 kg (362/465 lbs)
Gross weight	2150 kg (4740 lbs)
Volume	5 m ³

Dimensions



Alfa Laval reserves the right to change specifications without prior notification.

How to contact Alfa Laval

Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com