



Culturefuge 400

High-capacity solids-ejecting centrifuge for the biotechnological industries



Culturefuge 400 complete with motor.

Many new biological products are derived from fragile organisms. Although relatively easy to separate the trick is accomplishing the separation in a gentle manner without destroying the shear sensitive cell wall membranes that isolate the complex intracellular proteins from the extracellular target proteins. If this can be avoided, downstream purification of the target proteins becomes much easier.

The Culturefuge 400 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 20 m³/h. 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 solids-ejecting disc type with an automated hydraulic operating system for discharging. It is a so-called timer triggered discharge system, meaning that the bowl content is emptied at pre-set discharge intervals. In production normally only part of the bowl content is emptied, whereas during CIP total discharges are possible. The partial discharge takes place at full speed without any interruption of the feed. The hydraulic/pneumatic system for 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 principles

The feed is introduced to the rotating centrifuge bowl from the bottom via the hollow bowl spindle (1), and is accelerated in a distributor (2) before entering the disc stack (3). It is between the discs that the separation takes place.

The liquid phase moves towards the centre of the bowl, from where it is pumped out under pressure by means of a built-in pump disc (4).

The heavier solids phase is collected at the bowl periphery, from where it is discharged intermittently. The solids discharge is achieved by a hydraulic system below the separation space in the bowl, which at certain intervals forces the sliding bowl bottom (5) to drop down, thus opening the solids ports (6) at the bowl periphery.

The bowl is mounted on a vertical spindle (7).

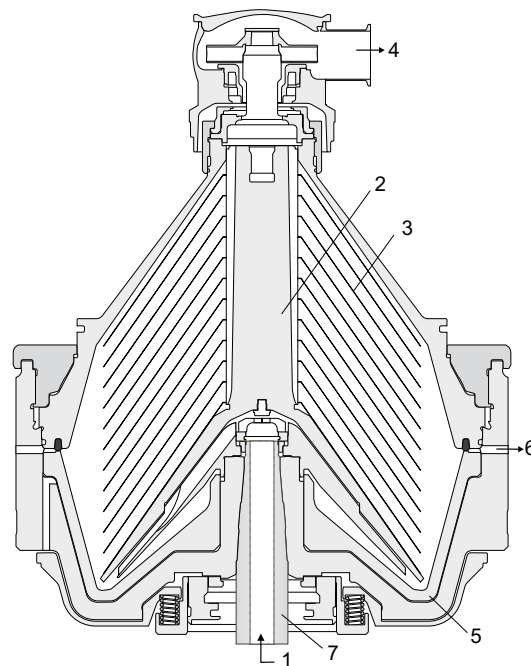
Design features

- Designed for easy cleaning-in-place (CIP)
- Fully hermetic design for minimal shear stress and absence of oxygen.
- 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 solids-ejecting hermetic centrifuge. 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 pressures	20 kg 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 20 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	s.s. 1.4462 UNS S 31803
Frame top part (ASME)	s.s. ASME S 31603
Frame top part (PED)	Stainless steel 1.4404 (for pressurised equipment)
Frame bottom part	Cast iron Clad with s.s. 1.4301 UNS S 30400
Outlet parts	s.s. 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

Process (inlet and two outlets)	Clamp type, 63.5 mm ¹⁾
Utilities	Clamp type, various dimensions ¹⁾

¹⁾ According to ISO 2852.

Technical specifications

Throughput capacity	max. 20 m ³ /h ¹⁾
Solids handling capacity	max. 600 l/h ²⁾
Bowl volume	30 l
Sludge space volume	10 l
Discharge volume	3–30 l
Bowl speed, separation	max. 5,119 rpm
Bowl speed, sterilization	max. 120 rpm
G-force	max. 7,425
Motor speed synchronous 60Hz	1,800 rpm
Installed motor power	22 kW (30 HP)
Starting time min/max	8/10 mins
Stopping time with motor brake	10 mins
Feed temperature range	0–100°C
Feed inlet pressure required at inlet flange	max. 200 kPa
Liquid outlet pressure at outlet flange	200 kPa ³⁾
Sound pressure	73 dB(A) ⁴⁾
Overhead hoist lifting capacity	min. 1,000 kg

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

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

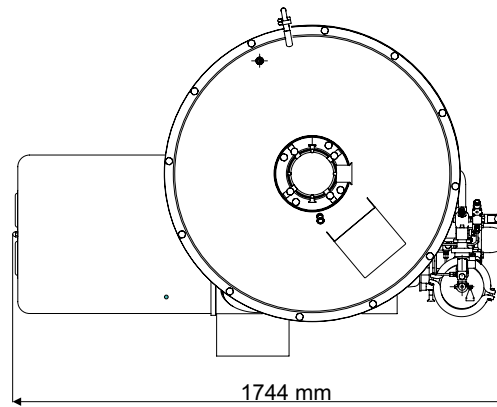
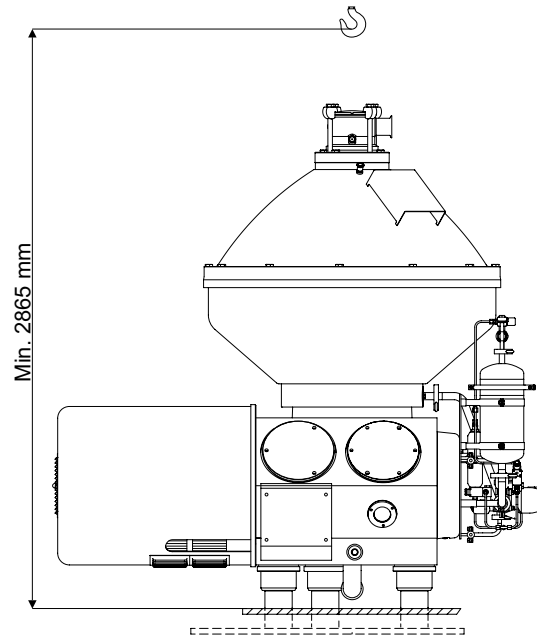
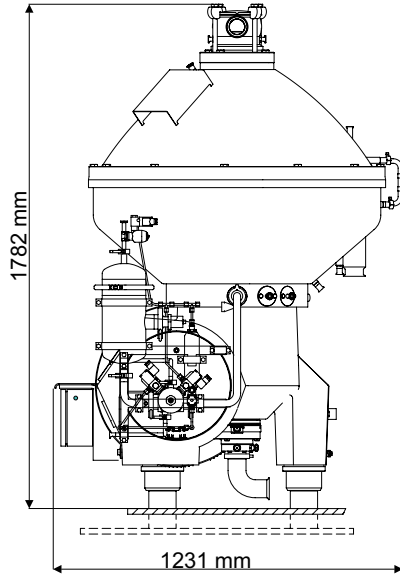
³⁾ At 20 m³/h and with medium sized outlet pump. Increasing with decreasing flow rate.

⁴⁾ According to ISO 3744.

Shipping data (approximate)

Centrifuge incl. bowl and motor	1,850 kg
Bowl	600 kg
Gross weight	2,150 kg
Volume	5.0 m ³

Dimensions



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