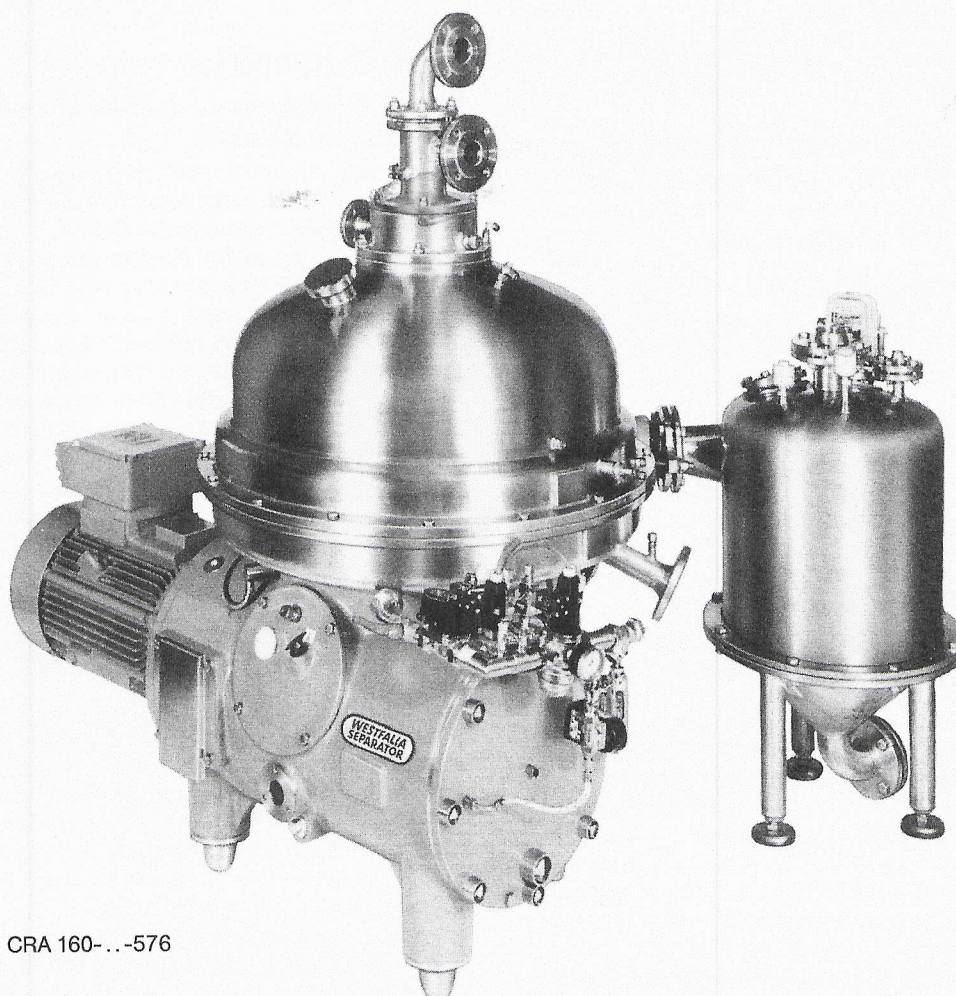


**WESTFALIA  
SEPARATOR**

Data Sheet

## **CRA 160**

# **High-performance clarifier** with self-cleaning bowl in hermetic liquid seal design



CRA 160-...-576

### **CRA 160-06-076**

Soft-stream system

### **CRA 160-96-076**

Hydrohermetic feed system

### **CRA 160-...-576**

For explosive surroundings

### **CRA 160-...-976**

Gas-tight version for  
non-explosive surroundings

### **CRA 160-...-476**

Steam-sterilizable version

### **Function**

Continuous polishing of liquids  
containing solids of yeast-like  
consistency, such as must,  
wine, beer, fruit juices,  
fermentation solutions

Removal of bacteria,  
cell fragments and yeasts under  
sterile conditions

### **Fields of application**

Food, beverage, chemical  
and pharmaceutical industries

Biotechnology,  
Genetic engineering

# Operating principles and constructional features

A combination of tried and tested and newly developed construction elements were used to produce this centrifuge:

- Enclosed feed and gentle treatment of the product due to the hermetic liquid seal or soft-stream inlet system
- Hermetic liquid seal to prevent oxidation of food or to prevent contamination of products from the biotechnological or pharmaceutical sector
- Self-cleaning of bowl and discs due to partial and total ejections by means of an hydraulically operated annular piston system
- Can be used as self-cleaning nozzle-type centrifuge for products with higher solids content
- High centrifugal acceleration
- Cooling of hood and sediment collector
- In the gas-tight version, sealing of the drive chamber is by means of sealing chamber
- Steam-sterilizable
- In the steam-sterilizable version, the drive chamber is sealed off by means of double-acting slide-ring packing

## Bowl

The clarifier is equipped with a disc-type bowl at the periphery or which nozzles (19) are fitted for the discharge of the concentrate. In addition to the continuous discharge through nozzles, partial or total ejections can be carried out at periodic intervals by means of the hydraulic ejection system. The ejection processes are initiated by the control unit (14). The product enters the bowl through inlet (1), is accelerated and passes uniformly through the rising channels into the disc stack (4), where separation takes place under the influence of centrifugal force. The disc stack consists of a number of conical discs placed one above the other. The narrow disc interspaces split the liquid into thin layers, thus reducing the settling distance for the solids particles. The latter settle on the underside of the disc above and slide down into the sediment holding space (5).

The clarified liquid flows towards the centre of the bowl from where it flows up into the centripetal pump chamber and is discharged foamfree and under pressure through outlet (2) by centripetal pump (3). The separated solids (concentrate) are continuously discharged through nozzles into the concentrate collector. The solids concentration depends on the throughput capacity, the solids concentration in the feed and the nozzle diameter.

The desired concentration can be adjusted by changing the nozzles and regulating the throughput.

## Automatic solids ejection

Bowl ejections are controlled automatically by control unit (14):

- partial or total ejections,

- a combination of partial and total ejections,
- product displacement before each total ejection,
- flushing after each total ejection

## Control systems

The following systems are available for controlling the fully automatic bowl ejections:

- Time-dependent control  
Recommended for use with products in which the solids content remains constant.
- Monitoring the clarified liquid by means of photoelectric sensor or turbidity meter (15).  
This self-thinker control system can be used alternatively. If a pre-set turbidity level is exceeded, a signal is passed to the control unit (14), which then initiates the solids ejection process. Recommended for use with translucent liquids in which the solids content is not constant or if the throughput capacity varies.

## Partial ejection/Total ejection

In addition to the continuous discharge through nozzles, partial and total ejections can be carried out at periodic intervals which has the effect of cleaning the bowl and the discs, thus ensuring constantly good separation efficiency. The operating liquid (normally water) fed into the hydraulic system of the bowl and rotating with it, develops a high centrifugal pressure. This pressure is used to operate the axially movable annular piston (12).

The annular piston (12) is in the closed position (left side of fig.) when the closing chamber (11) is full of operating water. If operating water is fed into the opening chamber (10) via valve (13), then the pressure which builds up in this chamber forces the annular piston (12) downwards.

The bowl opens and the solids are ejected through the annular gap (7) instantaneously. Once the operating-water valve (13) has been closed, the opening chamber (10) empties through the discharge hole (9) and the annular piston (12) returns to the closed position.

The bowl is emptied via the control unit.

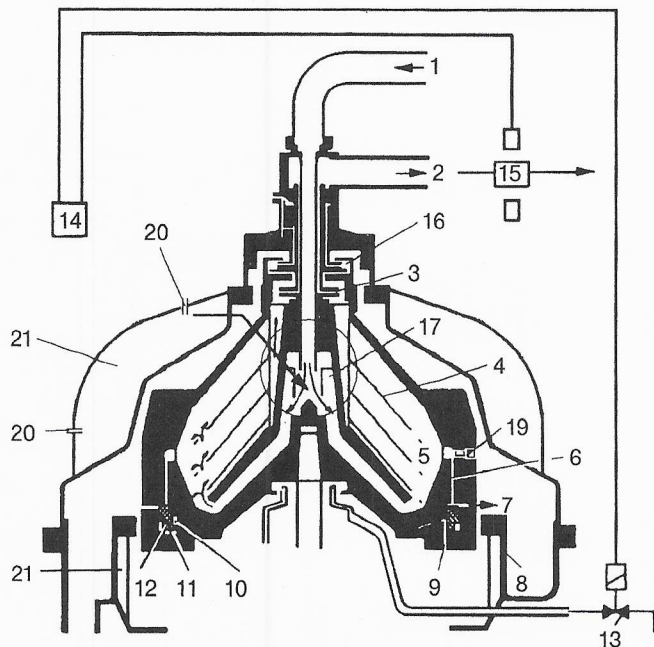
With the partial ejection the feed remains open and only the solids are ejected. The liquid remains in the bowl. This is only possible for smooth fibre-free solids such as yeast or similar products.

With the total ejection the feed is closed and the whole contents of the bowl ejected. It is possible to avoid losing valuable liquid by feeding a suitable medium into the centrifuge in order to displace the liquid from the bowl.

## Product feed through soft-stream inlet system CRA 160-06-.76

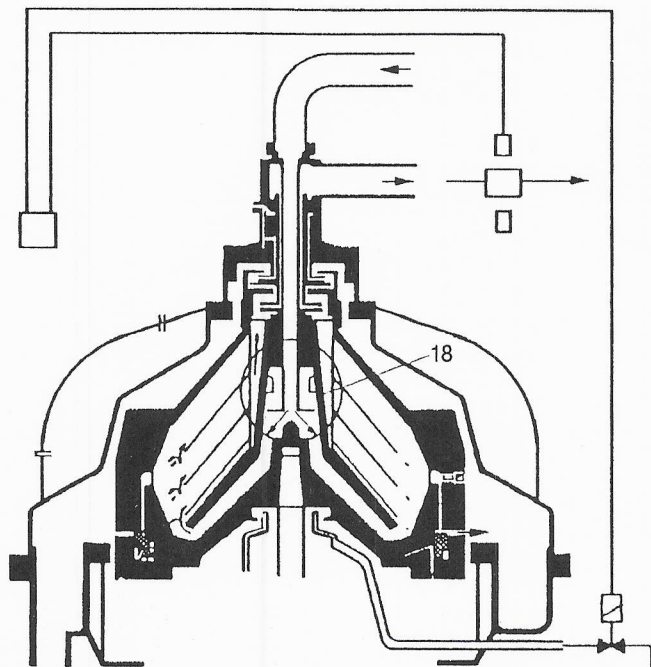
The centrifuges of this series are equipped with a soft-stream inlet system for the product. The product is gently accelerated in an inlet sleeve before it enters the distributor channels.

This type of inlet reduces the shearing forces occurring when the product enters the bowl and prevents unduly high feed pressures at high throughput capacities.

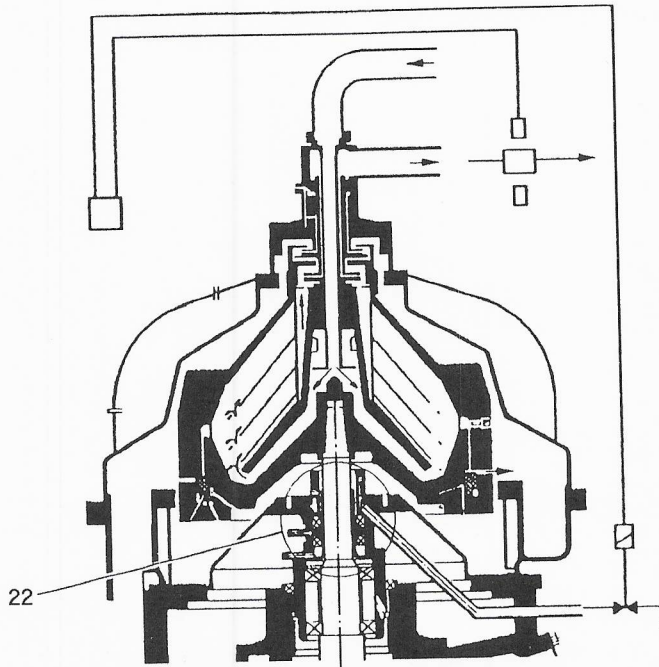


## Product feed (hermetic liquid seal version) CRA 160-96-.76

In this version, the clarifier is equipped with a hydrohermetic product feed. This new system prevents any shearing forces occurring when the product enters the bowl. Similar as in a fully hermetic version, the product stream is accelerated by the product contained in the filled bowl, thereby achieving smooth treatment and an optimum clarification effect, especially for process liquids which are particularly sensitive to shearing and at low capacities.



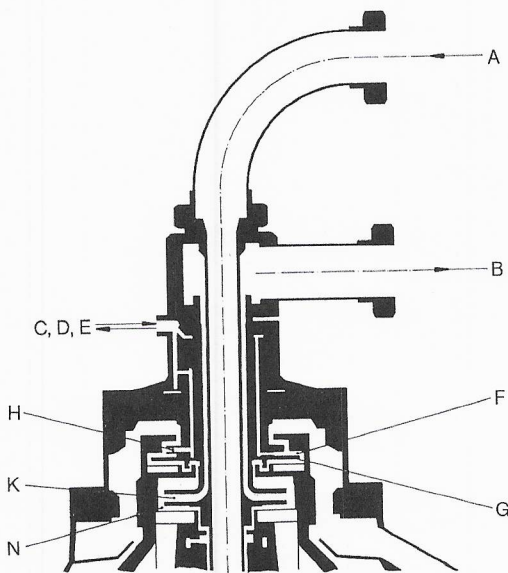
- |                               |   |
|-------------------------------|---|
| 1 Feed                        | 14 Control unit                                       |
| 2 Discharge, clarified liquid | 15 Photoelectric sensor or turbidity meter            |
| 3 Centripetal pump            | 16 Hermetic liquid seal by means of a sealing chamber |
| 4 Disc stack                  | 17 Soft-stream supply system                          |
| 5 Sediment holding space      | 18 Hydrohermetic supply system                        |
| 6 Sediment ejection ports     | 19 Plug or nozzle                                     |
| 7 Sediment discharge          | 20 Coolant connection                                 |
| 8 Sediment collector          | 21 Cooling chamber                                    |
| 9 Discharge hole              | 22 Double-acting slide-ring packing                   |
| 10 Opening chamber            |   |
| 11 Closing chamber            |   |
| 12 Annular piston             |   |
| 13 Operating-water valve      |   |



## Steam-sterilizable version with double-acting slide-ring packing CRA 160-..-476

The complete centrifuge is steam-sterilizable. While at rest the machine is sterilized with hot steam (121 °C) at an excess pressure of 1.0 bar. The period of sterilization depends on the type of bacteria and the bacteria count. From experience the time is 90–120 minutes.

The condensate is drained into a common line on the floor and conveyed to a killing system. After sterilization the machine is cooled and blanketed using sterile air until the next product run. The fermentation tanks can then be connected aseptically to the centrifuge.



## Hermetic liquid seal

In order to prevent the surrounding air from contaminating the product, the hermetic liquid seal clarifiers have been fitted with an additional sealing chamber (F) above the product pump chamber (N).

A stationary disc (G) above the centripetal pump (K) is immersed in sealing liquid in the sealing chamber. In this way the inner part of the bowl is sealed off from contact with the outside air without any seals which might be subject to wear.

The heat due to friction, which is produced at the stationary disc must be removed by means of a gentle flow of the sealing liquid. For this reason the liquid is discharged under normal pressure via the centripetal pump (H). If necessary, the space between the sealing disc and the centripetal pump for the product can be filled with a gas (CO<sub>2</sub> or N<sub>2</sub>).

- |                            |                            |
|----------------------------|----------------------------|
| A Feed, product            | F Sealing chamber          |
| B Discharge, product       | G Sealing disc             |
| C Sealing liquid discharge | H Sealing liquid pump      |
| D Sealing liquid feed      | K Product centripetal pump |
| E Inert gas blanketing     | N Product chamber          |

## Chemical cleaning (CIP)

Once the clarification process has been completed, the machine can be cleaned in place. For this purpose the cleaning agent is circulated through the centrifuge and the connected system.

After each cleaning step the ejection mechanism is actuated in order to eject the solids remaining in the bowl. The complete cleaning program can be automated.

## Cooling

The double-walled hood and sediment collector are designed for cooling. Ice water is used as cooling agent. By this means the solids do not become baked on the walls, especially at high levels of concentration.

## Frame and drive

The cast iron frame is fitted with a water-cooled pneumatic brake, speed sensor for standstill monitoring and speed indication. The machine is driven by a flange-mounted three-phase AC motor.

Power is transmitted to the bowl spindle via a fluid clutch and a worm wheel gear.

All bearings and the gear are splash lubricated from a central oil bath which can be checked through a sight glass.

The steam-sterilizable version -476 has a double-acting slide-ring packing outside the sterile space and a pressurized sealing chamber which hermetically seals the product space from the gear chamber.

The -576 version of this clarifier is fitted with an explosion-proof motor, protection EEx de IIC T4. The hood, neck bearing and gear chamber are fitted with connections for inert gas. The gear chamber is sealed by special shaft sealing rings. Non-contact monitoring of the temperature of the clutch. The brake chamber is pressure-tight.

The gas-tight version -976 is used for non-explosive areas.

## Materials

All parts coming into contact with the product and with the ejected solids are made of stainless steel.

Highly stressed parts such as bowl top, bowl bottom, lock ring and annular valve are made of specially developed materials.

## Assembly and dismantling

Special tools for assembling and dismantling the bowl are supplied with the machine. A hoist or crane with a minimum lifting capacity of 1500 kg must be available for installing or removing the bowl or bowl parts.

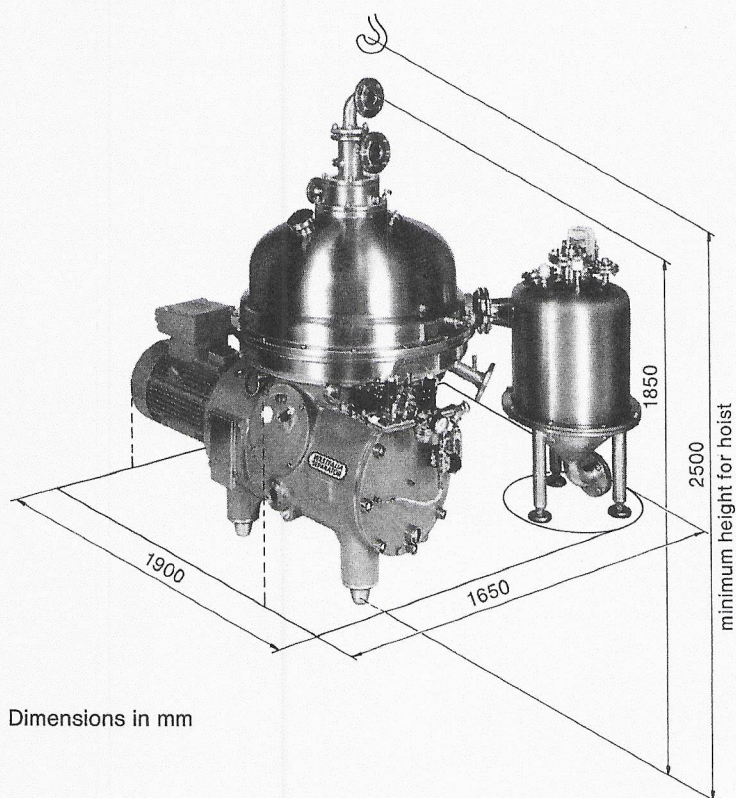
## Monitoring

- Lube oil level
- Operating-water pressure
- Motor\*
- Speed\*
- Bowl ejection\*
- Vibration\*
- Clear phase\*
- Level in solids tank\*

## Additional equipment (available at extra cost\*)

- Control unit for automatic program control
- Motor control
- Speed measuring device
- Ejection monitoring system
- Vibration monitoring system  
This system monitors the level of vibration. If a certain pre-set level is exceeded, an alarm is given or an emergency-off program is initiated and the machine is shut off according to a pre-set program.
- Photoelectric sensor or turbidity meter for monitoring the clear phase
- Solids pump for enclosed solids discharge
- Solids pump control
- Valve assembly DN 40/65  
Included are:
  - automatic valves with feedback
  - illuminated sight glasses in feed and discharge
  - feed control valve
  - flowmeter (IDM) in discharge
  - pressure gauge in feed and discharge
  - constant-pressure valve in discharge
  - valve cabinetThis cabinet contains solenoid valves, pressure reducer, pressure gauge, pneumatic remote control, compressed-air control unit.
- Solids tank  
for enclosed solids discharge
- Three-phase AC motor  
of standard or explosion-proof design
- Rotary brush strainer
- Control unit for inert gas
- Assembly jig  
for assembling and dismantling the bowl. This facilitates swivelling the complete bowl for servicing and maintenance operations on the annular valve. Assembling and dismantling the bowl can be carried out at a convenient height.
- Set of special spare parts.

# Technical data



## Technical data

Bowl	
Speed*	6800 min <sup>-1</sup>
Volume of sediment holding space	10-13 litres
Max. discharge pressure	6 bar
Three-phase AC motor	
Motor power	22-37 kW
Speed at 50 Hz	1500 min <sup>-1</sup>
Speed at 60 Hz	1800 min <sup>-1</sup>
Type	IM B5
Protection	IP 55

\* depending on materials used and specific gravity of the product.

## Weights and shipping data

Weight	
Centrifuge with motor, without bowl	net 1425 kg
	gross 1650 kg
Bowl	net 575 kg
	gross 625 kg
Case dimensions (L x W x H)	
Frame with motor	1800 x 1360 x 1420 mm
Bowl	700 x 700 x 800 mm
Shipping volume	3.5 m <sup>3</sup>

## Capacity

Rated capacity	40 000 l/h
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The rated capacity is the max. throughput capacity of the bowl.  
The effective capacity is generally lower. It depends on the product and the required level of clarification.

Subject to modification

**WESTFALIA  
SEPARATOR**

**Westfalia Separator AG**

Werner-Habig-Straße 1 · D-59302 Oelde (F.R. Germany)  
(until 30.06.1993 D-4740 Oelde)

Phone (0 25 22) 77-0 · Telefax (0 25 22) 77-24 88 · Telex 8 9 474