

tech-info

► *B-series batch centrifugals*

Applications:

BMA's automatic batch centrifugals of the B series are suitable for handling all white and raw sugar massecuites produced in the sugar industry. They are also employed in other sectors of the food and chemical industries for separating crystalline solid/liquid mixtures, e.g. for dextrose, fructose, sodium sulphate, citric acid, monosodium glutamate.



BMA – State-of-the-art centrifugal engineering



For more than 150 years, BMA has been among the world's leading companies in the design and manufacture of continuous and batch centrifugals. Since 1947, more than 7,500 centrifugals, about 3,500 of them batch centrifugals, have been delivered to our customers.

As the market-leading manufacturer of centrifugals, BMA has always attached great importance to manufacturing centrifugals itself in order to safeguard the high quality standards right from the manufacture of the individual components up to commissioning performed by BMA engineers.

A dense network of representations and branch offices all over the world ensures proximity to our customers, so we can act quickly and reliably.

BMA's B-series batch centrifugal is a highly sophisticated machine, developed by specialists to allow safe and efficient operation. The clearly structured design of the modular B series was ground-breaking on the market and represents state-of-the-art technology. Numerous innovations are protected by patents. An easy installation and little maintenance requirements contribute to a reduction of the operating cost, as does the use of highly sophisticated technology to achieve energy savings and excellent technological results.

The recently BMA-developed control system for batch centrifugals combines BMA's technical and technological competence, offering optimized process flows, a maximum safety standard as well as high flexibility.



*Centrifugal station
with B1750s*



Applications for B-series centrifugals

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*Simple and safe
operation via BMA
control system*





The feeding system, which consists of a steplessly variable butterfly control valve, a feed duct and a charging flap, delivers the massecuite to the vertically adjustable distribution plate inside the basket, providing for uniform distribution of the massecuite.

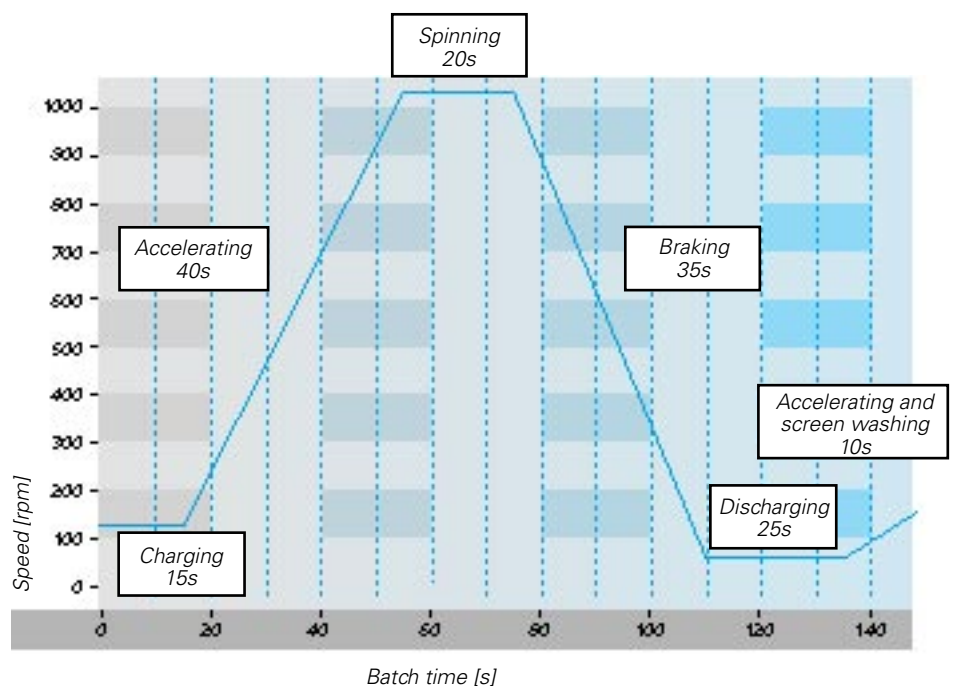
The charging speed can be varied between approx. 100 and 250 rpm to suit the properties of different massecuites. The aperture of the butterfly control valve is automatically adjusted on the operator panel. Via a check-back signal to the control unit, the layer-thickness measuring facility allows the quantity of massecuite to be measured out accurately. When the massecuite valve has closed, the basket accelerates to its spinning speed. The charging flap provided on the housing cover prevents massecuite dripping. It is closed during acceleration.

Following discharge of the mother syrup from the basket, and subject to the process scheme, syrup washing can be practised in addition to regular water washing. To optimize the results, water washing can also be practised intermittently, i.e. with several short applications in succession. For further cleaning and, in particular, for pre-drying purposes, steam washing can be practised after the water washing cycle (no syrup wash).

The spinning phase is followed by braking, at the end of which the closing hood opens and the discharging cycle begins. The highly efficiently working discharger is lowered as early as during the braking process so that, when the discharging speed is reached, it just has to swing into the sugar layer.

From the basket bottom, the discharged sugar exits through the product outlet of the housing, which can be equipped with an automatic cleaning facility, and is led to downstream conveyors.

Typical batch cycle of a B1740R centrifugal



Design

The batch centrifugals of the B series are of the vertical suspended pendulum type, consistently implementing the modular design principle and allowing optional items to be retrofitted without problems.

The drive is transmitted through a flexible claw coupling, directly to the shaft carrying the basket. Frequency-controlled three-phase AC motors are used as standard; DC motors can be employed as an alternative. Appropriate adapter flanges allow different motors to be integrated.

The drive head is a ball-and-socket joint unit with bearing-metal/plastic friction pairing and two antifriction bearings to carry the shaft. The drive head also incorporates the emergency disc brake and all necessary sensors (for speed and oscillation; optional bearing temperature sensors). The oscillation-dampening system can be easily adjusted from outside the centrifugal. The drive head is fitted to the frame from below; this in turn is bolted to the basket housing.

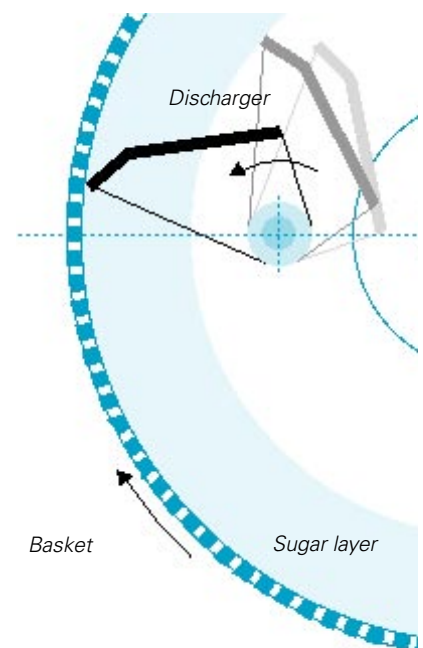
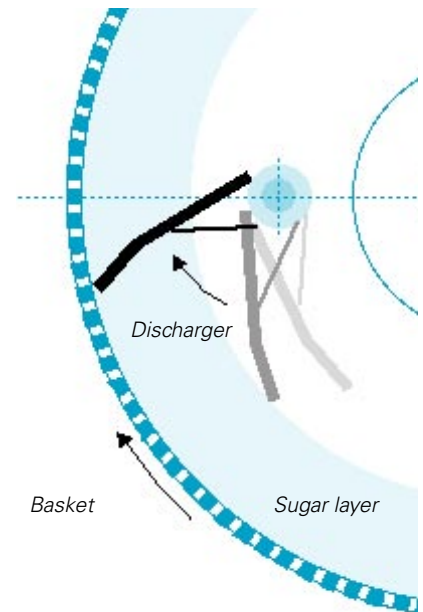
The basket housing, the syrup duct of the housing and the cover are made of stainless steel. The cover is a two-part unit accommodating the layer-thickness measuring facility, the water nozzle unit, the feeding system and the optional steam or syrup nozzle unit. In addition, it has an amply dimensioned inspection door that allows monitoring the centrifuging cycle and, if necessary, replacing screens or nozzles. The housing can optionally be clad with mild steel or stainless steel; it provides optimum access to the electro-pneumatic valves and to the intermediate terminal box.

The entire discharger is a new development (patented). Unlike previous versions, its plough has the same height as the basket inside; contact with the product is thus along its full height and without any strain on the screen. Moreover, the plough moves into the sugar layer in the direction of basket rotation (clockwise). Several independent interlock circuits prevent inadvertent entry to the sugar layer.

Thanks to these two innovations, the discharging cycle is substantially shorter and, at the same time, much less residual sugar is left in the basket.

At rest, the plough is approx. 200 mm away from the basket bottom to avoid collision with the basket hub. Alternatively, a plough that moves into the sugar against the direction of basket rotation (counterclockwise) is also available.

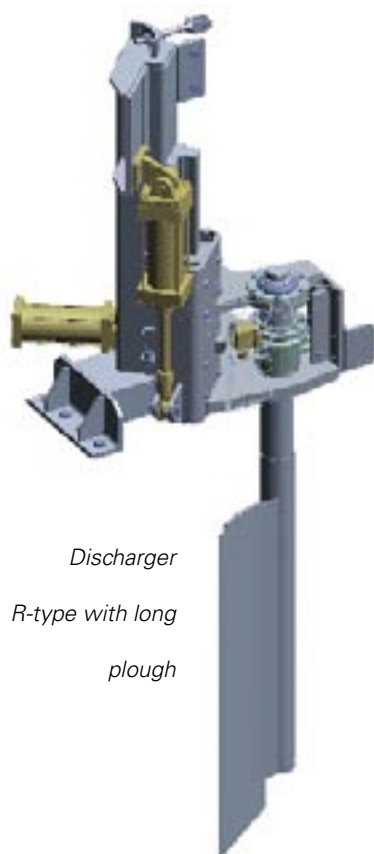
During the discharging process, the basket is centred by three rollers to prevent abrasion and, consequently, contamination of the product.



Top: Discharging in direction of basket rotation (R-type, patented);

Bottom: Discharging against direction of basket rotation

(L-type)



*Discharger
R-type with long
plough*

The basket is a tried and tested type made of high-strength stainless steel, providing a very high resistance to stress corrosion cracking and especially to chlorine ions. The basket diameter-to-height ratio is such to ensure extremely smooth running of the machine, even with difficult-to-separate massecurites.

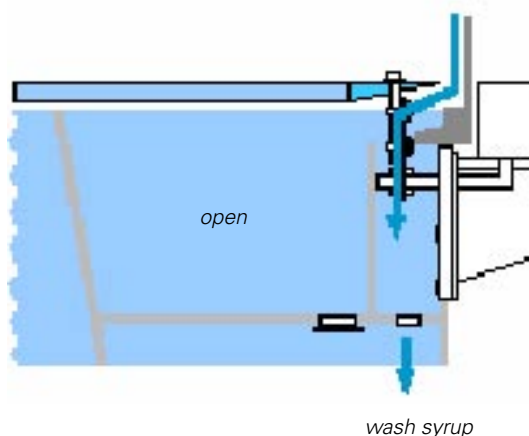
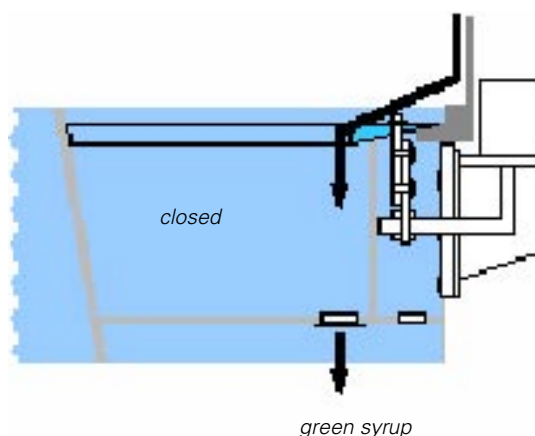
The drain holes are uniformly distributed over the complete basket shell. The cover screen, which overlaps at one point only, is held in place inside the basket by clamping rings, eliminating the need for time-consuming adaptation as required by grooved screens.

The closing hood actuated from underneath is located under the basket hub. Its design and construction make the actuating system maintenance-free so that it can be expected to work for years without requiring any repairs.

Proximity switches monitoring centrifugal oscillation, as well as an integrated vibration monitoring system are fitted as standard. Emergency braking starts once oscillations and vibrations become too strong.

Two independent speed monitoring systems provide for extra protection against malfunctioning of the electrical system.

The patented internal syrup separator, where pneumatic cylinders move a ring-shaped horizontal disc between two positions, is one of the most efficient devices for the separation of green and wash syrups. The great advantage of this syrup separation method is that it reduces the recirculation of colour and nonsugars in the wash syrup and allows selective adjustment of the required green syrup purity. This, in turn, considerably reduces the quantity of massecurite in the subsequent crystallization stage.



Overview of optional equipment and additional components

Thanks to its modular design, the centrifugal can be customized to suit local conditions and meet requirements set by our customers.

Functional adaptations:

- Use of different baskets with varying product-layer thicknesses and maximum speeds (gravity factor)
- Syrup washing system
- Steam washing system
- Automatic product outlet cleaning facility (preventing product deposits)
- Vapour exhaust connections
- Patented internal syrup separator or conventional syrup separation with two flaps

Material, design and quality adaptations:

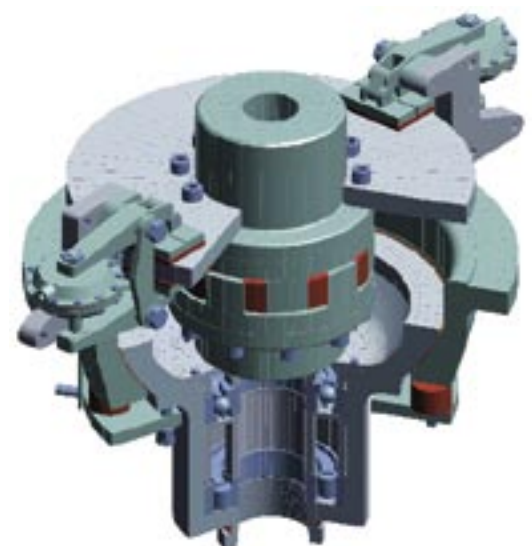
- Basket housing and syrup duct made of stainless steel
- Housing cover in stainless steel
- Basket hub in cast stainless steel
- Basket acc. to ZBG test recommendation
- Housing clad with stainless steel
- Visible mild steel parts lacquer-coated
- Drive head equipped with bearing-temperature sensors
- Charging flap on cover made completely of stainless steel
- Housing equipped with additional rinsing/steaming-out line
- Special materials for guiding and sealing parts to prevent black abrasion

Additional components:

- Special tools incl. tool box
- Product outlet box/hopper
- Locking arrangement for horizontal transportation of the centrifugal

*Schematic view
of the patented
syrup separator*

*Drive head with
disc brakes*





Drive

In its drive and control concept, BMA has also implemented the modular design principle. In addition to the motors and frequency converters used as BMA standard, products of other renowned manufacturers can also be incorporated.

The three-phase AC motors are equipped with separately driven fans in order to fully utilize the motor output.

The frequency converters used are equipped with network filters and AFE, achieving a total power factor of $\cos \varphi=1$ and only the slightest disturbances with nearly sinusoidal currents and voltages. Moreover, there is no shoot-through with fuse tripped during generator operation thanks to active disconnection in case of supply voltage failure.

Control

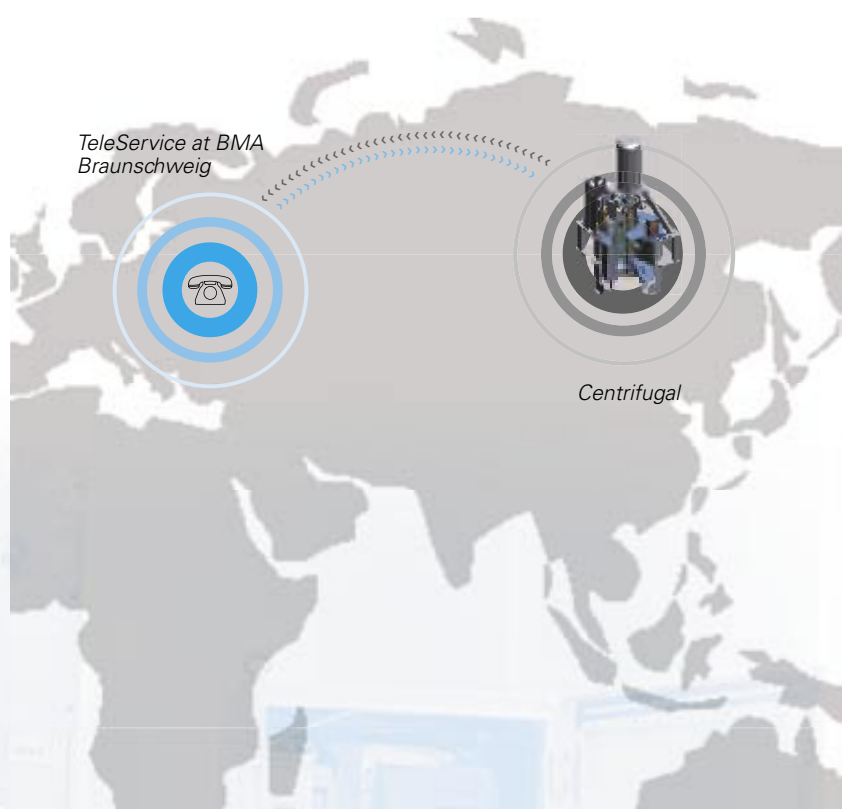
The control hardware consists of the standard programme of the programmable controller S7-300 including decentralized input and output cards for the sensors and actuators of the centrifugal. Thanks to the use of decentralized inputs and outputs, the multi-core cable connection between centrifugal and control cabinet is no longer necessary.

The new automation concept makes use of the open Profibus DP, which allows integrating frequency converters of different manufacturers, depending on the customer's requirements.

The operator panel consists of a multi-function panel with a 12" touch screen, accommodated in a stainless steel casing that is mounted on a tilt-and-swivel bracket, which allows moving it into the optimum position for the operator. High-level IP55 protection provides for both the necessary protection of the electronic system and easy cleaning.

The operator panel with decentralized input and output cards, and the multi-function panel are installed as early as during manufacture at the BMA workshops, where the cabling of all sensors and actuators directly mounted on the centrifugal is also carried out. This allows performing a comprehensive functional test prior to shipment and reduces the time for commissioning.

The interlocks required between the centrifugals for parallel operation are realized by means of an MPI bus, which is standard in S7-300 control units. So, no further cable connections are needed that could be sources of interference.



The bright 12" colour display provides a clearly structured and easily understandable user interface. One particularly useful feature: Sequences of machine operations and functions are graphically shown together with important characteristics (speed, motor current, motor temperature, vibrations), thus guaranteeing an optimum machine operation and monitoring.

For service purposes, there are clearly arranged pages for commissioning on the multi-function panel, which are also accessible to the customer. This allows a monitoring of all inputs and outputs in the programmable controller as well as machine testing in manual operation, e.g. at the beginning of a campaign.

For error analysis, there is a detailed alarm library with extensive help directories to simplify the tracing of errors. And there is, of course, the customized multi-level password-protected change of technological figures. Technological parameters are entered in tabular form, for ease of use by the operator.

In addition, each S7-300 control unit can be supplemented by a communication assembly, e.g. for Profibus DP, for linking to a higher-ranking control system. All variables required for monitoring the centrifugals and the modification of parameters are already stored as standard in the data blocks.

Another feature of the control unit is the monitoring and evaluation of vibrations from the compact vibration sensor which is part of the safety equipment.

As an alternative to the S7-300 Siemens control unit, the Allen Bradley SLC-5000 control unit can be supplied.

TeleService

As an option, the overall centrifugal programme of the BMA control unit can be equipped with a teleservice system which allows checking the centrifugals and finding any irregularities from our Braunschweig plant.

The teleservice system reproduces the image from the centrifugal display. It is also possible to read out the fault storage of the frequency converter, which allows subsequently analyzing past problems.

For reasons of safety, such a teleservice connection is only established following a prior written request by the customer. BMA is then in a position to call and analyze information. If required, immediate measures can be agreed with the operating personnel and the results can be checked directly at the monitor.

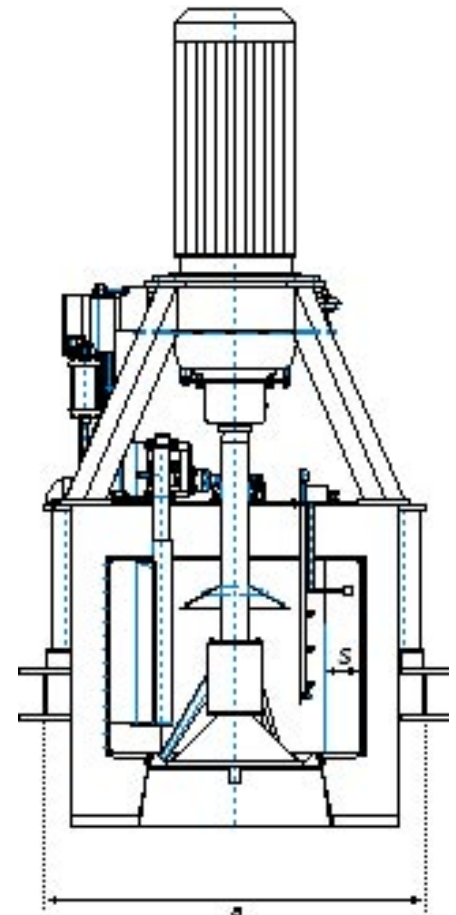
When the teleservice has been completed, the customer terminates the connection. This ensures that BMA cannot obtain further information without his consent. The customer then receives a report of the actions performed.

Technical aspects:

- Centrifugal design adaptable to product and capacity requirements thanks to modular design principle; simple retrofitting of plant components
- Extremely short discharge times with novel discharger, hence capacity increase of one or two cycles per hour
- Smooth and gentle discharge as spindle (basket) is held in place during discharging, and exact and clearance-free guidance of the discharger
- Oscillation-dampening system adjustable from outside the centrifugal
- Baskets made of highest-quality stainless steel, with highest safety factor, without reinforcing rings
- Extremely smooth operation thanks to ideal basket height-to-diameter ratio
- High operational reliability achieved by design and construction complying with the world's most stringent safety regulations
- Easy-to-operate BMA control unit integrated into the machine concept, with the option for future developments concerning centrifugal control and instrumentation
- High loads with a low layer thickness (230 mm for refined and white sugar), giving excellent technological results
- Enclosed emergency brake, antifric-tion bearings for basket centering and discharger guidance to reduce contamination of product, machine and environment
- Individual or side-by-side installation
- Actuation of all functions by electro-pneumatic valves; simple compressed-air connection $\geq 5\text{bar}$

Economic aspects:

- Maximum throughput of up to 2200kg/charge and up to 25 charges/hour
- Attractive price/performance ratio
- High service life thanks to the use of stainless steel for parts in contact with product and syrup
- Time and cost savings for installation through complete assembly of the control unit at the manufacturer's workshops
- Quick and safe commissioning by BMA specialists
- Minimized maintenance costs thanks to low maintenance and repair requirements
- Expert after-sales service by BMA assistance
- Teleservice option for reducing maintenance costs and for quick help from BMA



Range of models



Series for easy-to-separate crystalline suspensions (beet/cane sugar industry)

Product, e.g.		Refined sugar, white sugar				
Centrifugal type		B1300L	B1750L	B1750R	B2200L	B2200R
Qty per charge	kg	1,300	1,750	1,750	2,200	2,200
Basket volume V	l	830	1,107	1,107	1,370	1,370
Max. massecuite layer thickness S	mm	230	230	230	230	230
Max. speed n	rpm	1,200	1,080	1,080	1,030	1,030
Max. gravity factor Z		1,087	1,004	1,004	1,008	1,008
Centre distance a	mm	1,750	2,300	2,300	2,300	2,300
Qty of charges*	approx. ch/h	23	23	25	23	25
Massecuite throughput*	approx. t/h	30	40	44	51	55
Drive motor (400V/460V) power	approx. kW	184/211	287/331	287/331	408/469	408/469

Series for medium-separable crystalline suspensions (beet/cane sugar industry)

Product, e.g.		Raw sugar				
Centrifugal type		B1100L	B1500L	B1500R	B1900L	B1900R
Qty per charge	kg	1,100	1,500	1,500	1,900	1,900
Basket volume V	l	725	964	964	1189	1189
Max. massecuite layer thickness S	mm	195	195	195	195	195
Max. speed n	rpm	1,250	1,133	1,133	1,075	1,075
Max. gravity factor Z		1,179	1,105	1,105	1,098	1,098
Centre distance a	mm	1,750	2,300	2,300	2,300	2,300
Qty of charges*	approx. ch/h	22	22	24	22	24
Massecuite throughput*	approx. t/h	24	33	36	42	46
Drive motor (400V/460V) power	approx. kW	184/211	287/331	287/331	408/469	408/469

Series for difficult-to-separate crystalline suspensions

Product, e.g.		Dextrose			Fructose		
Centrifugal type		B1300LD	B1750LD	B2200LD	B1300LS	B1750LS	B2200LS
Qty per charge	kg	1,051	1,401	1,838	796	1,054	1,296
Basket volume V	l	756	1,008	1,322	549	727	894
Max. massecuite layer thickness S	mm	215	215	230	150	150	150
Max. speed n	rpm	1,300	1,217	1,158	1,410	1,316	1,252
Max. gravity factor Z		1,275	1,275	1,275	1,500	1,490	1,490
Centre distance a	mm	1,750	2,300	2,300	1,750	2,300	2,300
Qty of charges*	approx. ch/h	6	6	6	3.5	3.5	3.5
Massecuite throughput*	approx. t/h	6.3	8.4	11.0	2.8	3.7	4.5
Drive motor (400V/460V) power	approx. kW	90 - 150	110 - 250	150 - 300	90 - 150	110 - 250	150 - 300

* depending on the product

Explanations of centrifugal type letters:

Type R: Discharging in direction of basket rotation, long plough

Type L: Discharging against direction of basket rotation, short plough

Type LD: Gravity factor 1275 (e.g. for dextrose)

Type LS: Gravity factor 1490 – 1500 (e.g. for fructose)



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