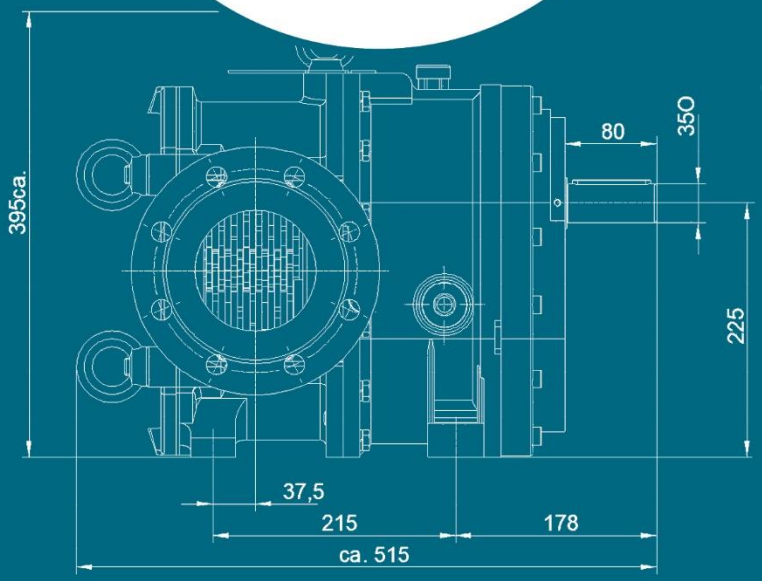
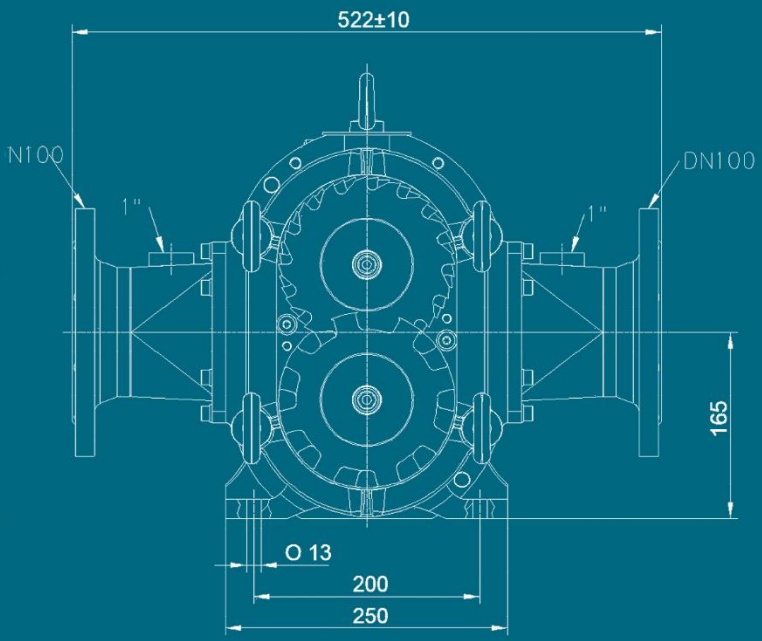
BÖRGER®

EXCELLENCE – MADE TO LAST

TECHNICAL PRODUCT INFORMATION

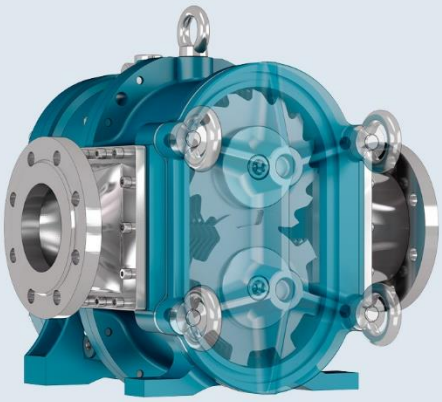




Multicrusher

Sizes

HAN 070
HPL 200, HPL 300, HPL 300 N
HCL 390, HCL 520
HFL 776, HFL 1036
HLA 1540



Status: 11/23/2023

Contents:

1.0 General Information

Solids contained in liquids can cause blockages or damage in pumps and piping systems. In order to prevent this, the Multicrusher is installed in the pipeline upstream of the pump.

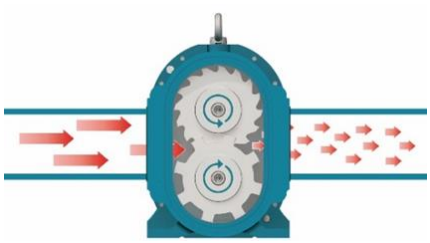
The dual-shaft macerator shreds the solids efficiently and protects the unit.

1.1 Operating principle

The basic design of the dual-shaft macerator is based on the Börger rotary lobe pump. The two shafts are equipped with blades and spacers instead of rotors.

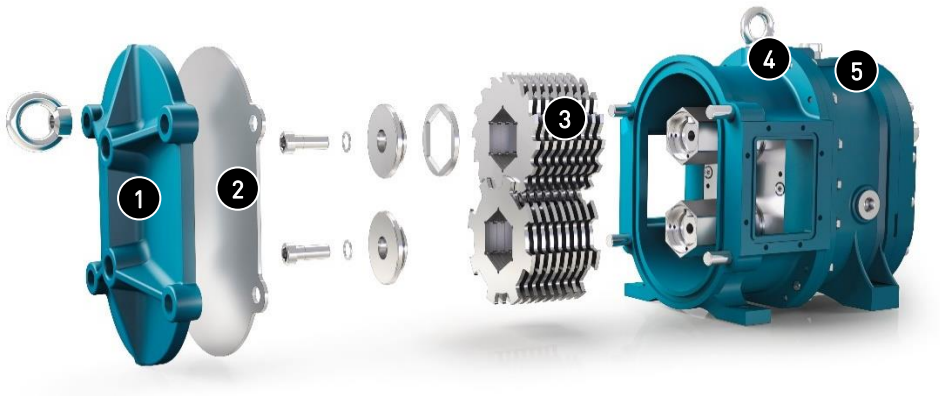
The solids-laden medium passes through the counter-rotating blade configuration and the solids are macerated in the process.

Reversing operation is possible.



1.2 Construction of the Multicrusher

1. Quick-release cover
2. Casing protection plate
3. Blades
4. Intermediate chamber
5. Gear unit / gear casing



Quick-release cover
The casing is closed off by a quick-release cover, which is fastened with four ring nuts.
This permits fast and easy access to the interior of the Multicrusher. Maintenance work, such as e.g. the replacement of the cutting blades, can be performed once the quick-release cover has been removed. Removing the Multicrusher from the pipeline is not required. At Börger, we call this principle MIP (Maintenance in Place), since the macerator can be maintained locally.

Casing protection
An axial casing protection protects the Multicrusher from wear. The casing protection is available in various materials (see chapter 2.1).

Blades
The blades are available in various designs and thicknesses. You can determine the maceration degree by selecting the blade configuration, the tooth profiles, the blade widths, the blade arrangement and the speed of the Multicrusher. In case of wear, the blades can be replaced individually.

Intermediate chamber
The macerating chamber and the gear unit are separated by an open intermediate chamber. The intermediate chamber is filled with oil that lubricates and cools the seals.

Mechanical seals
The large seal chamber permits installation of different sealing systems (see chapter 3.2).
For maximum safety, every Börger seal contains an integrated quench or barrier fluid reservoir.

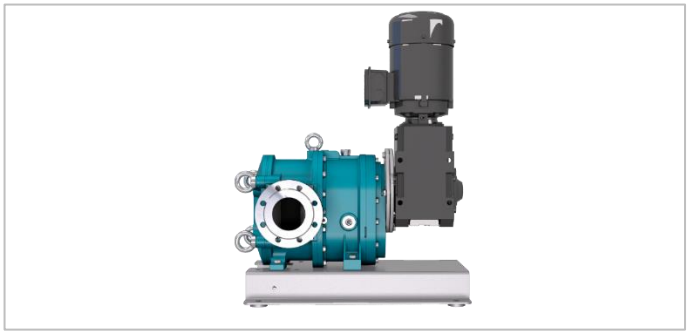
Casing
The casing is available in various high-quality materials or with surfaces finished by means of thin-layer techniques (see chapter 2).

Gear reducer
The Multicrusher is equipped with a high-quality and maintenance-free gear reducer. Disassembly of the gear unit for maintenance work inside the macerator chamber is not required.

1.3 Special features of the Multicrusher

Blades can be replaced individually
Various blade geometries are available for the Multicrusher so that it can be perfectly adjusted to the solids to be macerated.

In case of wear, the blades can be replaced individually.



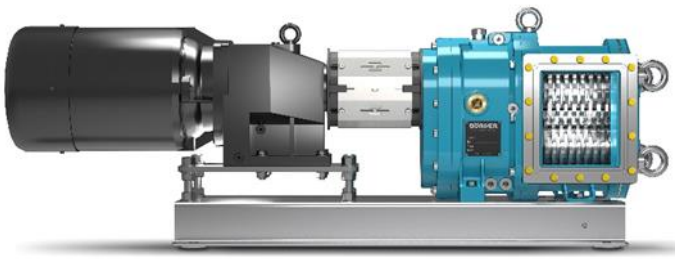
Space-saving design
The Multicrusher has a compact design and is thus ideally suited for use in confined spaces.

With a directly flanged motor, it has a footprint of 630 x 420 mm.

Almost wear-free maceration of solids
Due to a contactless cutting principle, the Multicrusher operates almost without wear.

1.4 Multicrusher with larger inlet and outlet openings

For very demanding macerating tasks, the Multicrusher HPL 300 N with larger inlet and outlet openings is available. In the liquid flow, the solids are directed to the cutting surfaces of the blade blocks. The sharp blade edges capture the solids and break them down into tiny particles with little energy input.



2.0 Material Selection and Performance Data

2.1 Material selection

The wetted parts of the Multicrusher are available in a range of material qualities:

Component	Material variants	HAN 070	HPL 200	HPL 300	HPL 300N	HCL 390	HCL 520	HFL 776	HFL 1036	HFL 1540
Shafts	Stainless steel 1.4404 (DIN EN 10027) (AISI 316L)	x	x	x	x	x	x	x	x	
	Steel for quenching and tempering 1.7225 (DIN EN 10027) (AISI 4140)	x	x	x	x	x	x	x	x	x
	Steel for quenching and tempering 1.7225 (DIN EN 10027) (AISI 4140) Black Protection		x	x	x			x	x	
Gear casing	Gray cast iron 0.6025 (DIN EN 10027) (ASTM A48-40B)	x	x	x	x	x	x	x	x	x
	Gray cast iron 0.6025 (ASTM A48-40B) Black Protection	x	x	x	x	x	x	x	x	x
Casing	Duplex 1.4517 (DIN EN 10027) (ASTM A890)	x	x	x		x		x	x	x
	Stainless steel 1.4409 (DIN EN 10027) (ASTM A743)	x	x	x		x		x	x	
	Stainless steel 1.4571 (DIN EN 10027) (AISI 316Ti)	x	x	x	x	x	x	x	x	x
	Gray cast iron 0.6025 (DIN EN 10027) (ASTM A48-40B)	x	x	x		x	x	x	x	x
	Gray cast iron 0.6025 (ASTM A48-40B) Black Protection	x	x							
	Gray cast iron 0.7060 (ASTM A536 80-55-06)	x	x	x				x	x	
	Hastelloy®		x							
	Steel 1.0038 (ASTM A252)	x	x	x	x	x	x	x	x	x
	Steel casting 1.6220 (DIN EN 10027) (ASTM A356)		x	x		x		x	x	
O-rings	EPDM (ethylene-propylene-diene rubber)	x	x	x	x	x	x	x	x	x
	FEPM (tetrafluoroethylene/propylene rubber)	x	x	x	x	x	x	x	x	x
	FFKM (perfluorinated rubber)	x	x	x	x	x	x	x	x	x
	FKM (fluorinated rubber)	x	x	x	x	x	x	x	x	x
	NBR (nitrile butadiene rubber)	x	x	x	x	x	x	x	x	x
Pipe connectors	Duplex 1.4462 (DIN EN 10088) (AISI 318 LN)	x	x	x	x	x	x	x	x	x
	Stainless steel 1.4404 (DIN EN 10027) (AISI 316L)	x	x	x	x	x	x	x	x	x
	Steel 1.0038 (ASTM A252) black	x	x	x	x	x	x	x	x	x
	Steel 1.0038 (ASTM A252) galvanized	x	x	x	x	x	x	x	x	x
	Steel 1.0038 (ASTM A252) painted	x	x	x	x	x	x	x	x	x
Blades	Duplex 1.4462 (DIN EN 10088) (AISI 318 LN)	x						x	x	x
	Stainless steel 1.4571 (DIN EN 10027) (AISI 316Ti)	x	x	x	x	x	x	x	x	x
	Cold work tool steel 1.2379 (DIN EN 4957) (AISI D2/ASTM A681)	x	x	x	x	x	x	x	x	x
	Steel for quenching and tempering 1.7218 (DIN EN 10027)	x	x	x	x	x	x	x	x	x
Hexagon shaft	Duplex 1.4462 (DIN EN 10088) (AISI 318 LN)								x	
	Stainless steel 1.4571 (DIN EN 10027) (AISI 316Ti)	x	x	x	x	x	x	x	x	x
	Steel for quenching and tempering 1.7225 (DIN EN 10027) (AISI 4140)	x	x	x	x	x	x	x	x	x
Seal - sealing washers	EPDM (ethylene-propylene-diene rubber)	x	x	x	x	x	x	x	x	x
	EPDM (ethylene-propylene-diene rubber) (FDA)	x	x	x	x	x	x	x	x	x
	FEPM (tetrafluoroethylene/propylene rubber)	x	x	x	x	x	x	x	x	x
	FFKM (perfluorinated rubber)	x	x	x	x	x	x	x	x	x
	FKM (fluorinated rubber)	x	x	x	x	x	x	x	x	x
	FKM (fluorinated rubber) (FDA)	x	x	x	x	x	x	x	x	x
	NBR (nitrile butadiene rubber)	x	x	x	x	x	x	x	x	x
Seals - seal faces	Duronit	x	x	x	x	x	x	x	x	x
	Silicon carbide (SiSiC)	x	x	x	x	x	x	x	x	x
	Tungsten carbide (TC)	x	x	x	x	x	x	x	x	x

Further material variants available upon request.

2.2 Surface treatment

For conveying sticky and adhering fluids, the wetted parts such as the Multicrusher casing, the casing protection, rotating seal holding bushes or pipe connectors can be mechanically ground and polished. Alternatively or additionally, the wetted parts are electropolished. In this process, roughness values of up to Ra = 0.8 µm can be achieved. The surface treatment reduces the roughness of the surface and medium deposits are minimized. In addition, the Multicrusher is easier to clean.

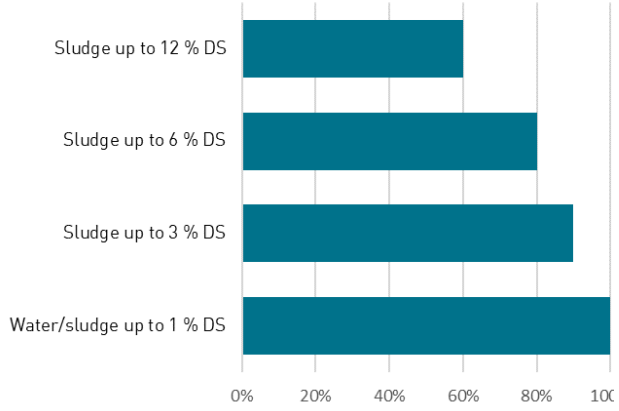
2.3 Performance data

Multicrusher	Max. drive output [kW]	Max. flow rate* [m³/h]	[gpm]	Speed [rpm]	Operating pressure [bar]	[psi]
HAN 070	7.5	30	132.1	40 - 350	12	174
HPL 200	11.0	50	220.1	40 - 250	12	174
HPL 300	11.0	80	352.2	40 - 250	12	174
HPL 300 N	11.0	150	660.4	40 - 250	12	174
HCL 390	15.0	120	528.3	40 - 180	12	174
HCL 520	15.0	160	704.5	40 - 180	12	174
HFL 776	22.0	200	880.6	40 - 160	12	174
HFL 1036	22.0	260	1144.7	40 - 160	12	174
HFLA 1540	30.0	320	1,408.9	40 - 160	12	174

*for water

Multicrusher	Max. temperature [°C]	[°F]	Ambient temp. [°C]	[°F]	Free ball passage [mm]	[inch]
HAN 070	150	302	0 - 40	0 - 104	5 - 13	0.20 – 0.51
HPL 200	150	302	0 - 40	0 - 104	6 - 17	0.24 – 0.67
HPL 300	150	302	0 - 40	0 - 104	6 - 17	0.24 – 0.67
HPL 300 N	150	302	0 - 40	0 - 104	6 - 17	0.24 – 0.67
HCL 390	150	302	0 - 40	0 - 104	6 - 17	0.24 – 0.67
HCL 520	150	302	0 - 40	0 - 104	6 - 17	0.24 – 0.67
HFL 776	150	302	0 - 40	0 - 104	6 - 17	0.24 – 0.67
HFL 1036	150	302	0 - 40	0 - 104	6 - 17	0.24 – 0.67
HFLA 1540	150	302	0 - 40	0 - 104	6 - 17	0.24 – 0.67

2.4 SIDE NOTE: Maximum flow rate depending on the DS contents (selection)



3.0 Multicrusher Details

3.1 Cutting blade geometries

Various blades can be used in the Multicrusher. With the selection of the blades, you can influence the cutting result.

In case of wear, you can replace the blades individually.

10 cutting teeth

- Coarse cutting output
- Type G

16 cutting teeth

- Fine cutting output
- Type F
- Börger standard top shaft (code B)

16 cutting teeth

- Very fine cutting output
- Type S

8 double cutting teeth

- Coarse cutting output
- Type R
- Börger standard bottom shaft (code B)

3.2 Cutting blade material thicknesses

The cutting blades are available in different thicknesses.
The blade thickness influences the cutting result.

Multicrusher	Blade thickness				
	4 mm (0.16 inch)	5 mm (0.20 inch)	6 mm (0.24 inch)	8 mm (0.31 inch)	Special thicknesses
HAN 070	X			X	X
HPL 200		X		X	X
HPL 300		X		X	X
HPL 300 N		X		X	X
HCL 390		X		X	X
HCL 520		X		X	X
HFL 776			X	X	X
HFL 1036			X	X	X
HFLA 1540			X	X	X

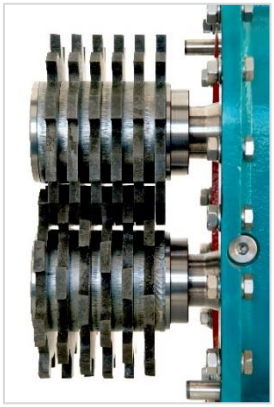
The cutting blades are available in a range of materials. A list of the materials available can be found in chapter 2.1.

3.3 Cutting blade arrangement

The cutting blades can be arranged on the shafts in a variety of ways. The arrangement of the blades depends on the properties of the solids to be macerated and the desired cutting performance. Spacer rings are arranged between the individual blades or blocks of blades. The number of spacer rings between the blades / blade blocks corresponds to the number of blades in this position on the second shaft.

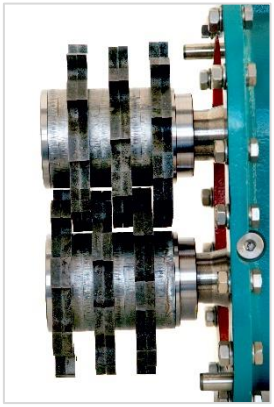
Individually arranged blades

- The cutting blades are arranged individually
- Maximum fine cutting result
- Code E

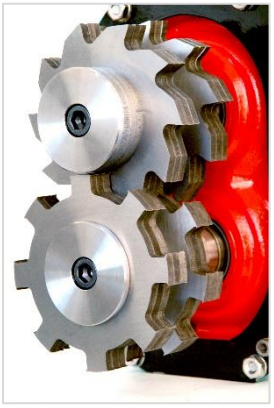


Cutting blades arranged in blocks of two

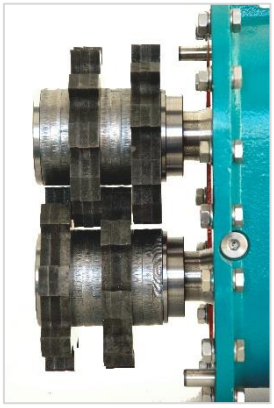
- The cutting blades are arranged in blocks of two
- Coarser cutting result
- Code B



Cutting blades arranged in blocks of three



- The cutting blades are arranged in blocks of three
- Very coarse cutting result
- Only useful in exceptional cases
- Code T



Additional blade arrangements on request.

3.4 Shaft seal to the macerator chamber

The Multicrusher has a large seal chamber which permits installation of different sealing systems. The seals are accessible and easy to maintain through the macerator chamber without the need to remove the piping of the Multicrusher.

LW Classic

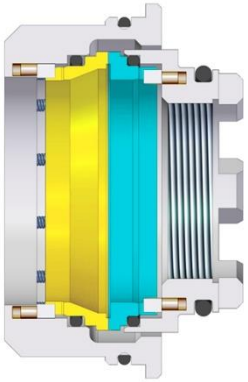
- Single-acting mechanical seal
- Classic and Select
- Max. differential pressure: 12 bar
- Suitable for the Select version of the HPL, HCL and HFL series

Availability:

Multicrusher	Seal faces			Sealing washers				
	Duronit	Silicon carbide	Tungsten carbide	NBR	FKM	EPDM	EPDM (FDA)	FKM (FDA)
HAN 70	X	X	X	X	X	X	X	X
HPL 200	X	X	X	X	X	X	X	X
HPL 300	X	X	X	X	X	X	X	X
HPL 300 N	X	X	X	X	X	X	X	X
HCL 390	X	X	X	X	X	X	X	X
HCL 520	X	X	X	X	X	X	X	X
HFL 776	X	X	X	X	X	X	X	X
HFL 1540	X	X	X	X	X	X	X	X

FC Classic

- Single-acting mechanical seal
- Classic
- Defined contact pressing force due to axially arranged springs
- Non-wetted springs
- Rotation lock by means of pins
- Independent of the direction of rotation
- Static O-rings
- Cartridge unit
- Without pressure
- Max. differential pressure: 12 bar

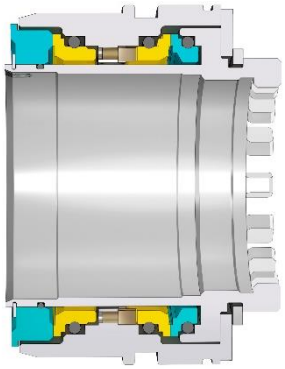


Availability:

Multicrusher	Seal faces		Sealing washers						
	SiSiC	Tungsten carbide	NBR	FKM	FEPM	FFKM	EPDM	EPDM (FDA)	FKM (FDA)
HAN 70	X	X	X	X	X	X	X	X	X
HPL 200	X	X	X	X	X	X	X	X	X
HPL 300	X	X	X	X	X	X	X	X	X
HPL 300 N	X	X	X	X	X	X	X	X	X
HCL 390	X	X	X	X	X	X	X	X	X
HCL 520	X	X	X	X	X	X	X	X	X
HFL 776	X	X	X	X	X	X	X	X	X
HFL 1540	X	X	X	X	X	X	X	X	X

DA Protect

- Double-acting mechanical seal
- Protect
- Cartridge unit
- Integrated barrier chamber
- Defined contact pressing force due to axially arranged springs
- Non-wetted springs
- Independent of the direction of rotation
- Rotation lock via driving pin
- Knife edge available
- Static O-rings
- Max. differential pressure: 12 bar



Availability:

Multicrusher	Seal faces		Sealing washers						
	SiSiC	Tungsten carbide	NBR	FKM	FEPM	FFKM	EPDM	EPDM (FDA)	FKM (FDA)
HAN 70	X	X	X	X	X	X	X	X	X
HPL 200	X	X	X	X	X	X	X	X	X
HPL 300	X	X	X	X	X	X	X	X	X
HFL 776	X	X	X	X	X	X	X	X	X
HFL 1540	X	X	X	X	X	X	X	X	X

4.0 Guideline-Compliant Design

4.1 ATEX-compliant design

Upon request, the Multicrusher can be supplied with an ATEX-compliant design.

Possible ATEX zones

EX marking
II -/2G Ex h IIB T4 -/Gb

Additional options on request.

4.2 Guidelines for use in the food sector

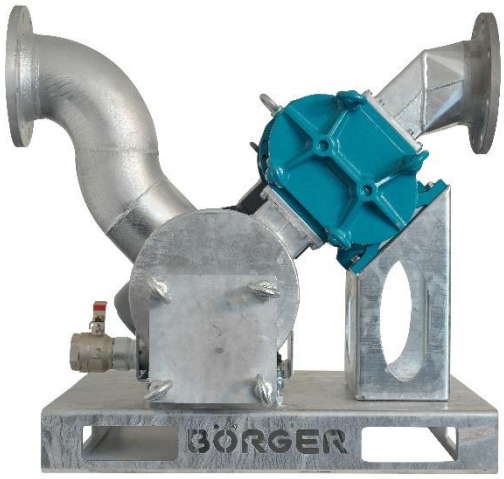
For use in the food industry, the Multicrusher can be manufactured in accordance with **FDA §177.2600 (US Food and Drug Administration)** or **EU 1935 /2 004** on request.

A design compliant with other guidelines is possible upon request.

5.0 Accessories

5.1 Multicrusher plus – Multicrusher with stone trap

If the flow medium contains impurities such as stones or metal parts that cannot be shredded, these objects should be separated before entering the Multicrusher. To this end, the Multicrusher plus version can be equipped with a debris collector. Here, objects that cannot be shredded are collected and can be separated..

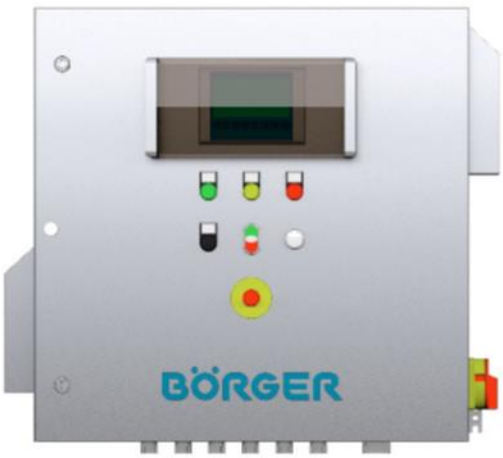


5.2 Control technology

Upon request, Börger delivers the suitable control technology for the Multicrusher. The control unit is manufactured and programmed by us. This way, customized wishes can be implemented

Please find a small selection of options here:

- Reversing control (load- and/or time-dependent reversing – e. g. in case of blockages or when a defined motor output is reached)
- Adjustable reversing parameters
- External monitoring by operator possible via smartphone, WLAN, DSL (remote maintenance possible as well)
- Production data acquisition
- Simple entry and user administration via touch display
- Module or control cabinet solutions
- Integration via bus system (Profinet, Profibus, etc.)
- Change of direction of rotation at each startup (e. g. 5 seconds backwards, then change to the original direction of rotation)
- Heavy and extremely heavy duty starting possible
- Fault message e. g. when threshold values are reached or in case of overload
- Counter which runs in the background to record the number of load-dependent reversals
- Also for use in potentially explosive atmospheres



6.0 Designs

6.1 Installation options

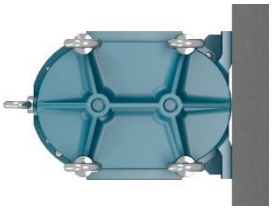
Depending on the mounting position, the positions of the oil sight glass, the fill hole and the drain hole for the gear unit can vary.

M1
Multicrusher upright, feet at bottom, horizontal shafts

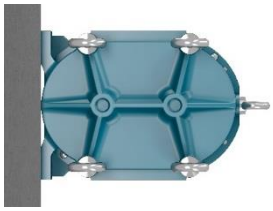
M2
Multicrusher vertical, Multicrusher cover at bottom, feet at side, vertical shafts, drive shaft pointing upwards

M3
Multicrusher upside-down, feet upwards, horizontal shafts

M5
Multicrusher turned 90° to the left, feet to the right, horizontal shafts



M6
Multicrusher turned 90° to the right, feet to the left, horizontal shafts



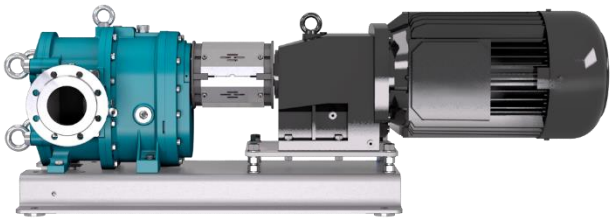
6.2 Drive options

Different motors can be used for driving the Multicrusher.

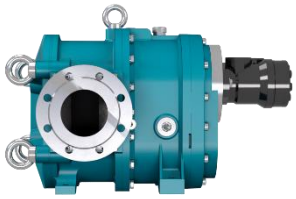
- Electric motor
- Combustion engine
- Hydraulic motor
- PTO shaft
- Compressed air motor

6.3 Models

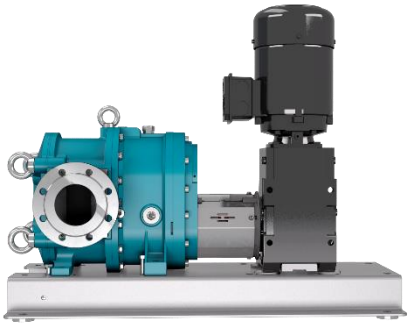
The design of the Multicrusher is adapted to the requirements and the space conditions.



Multicrusher with electric motor mounted on a base frame

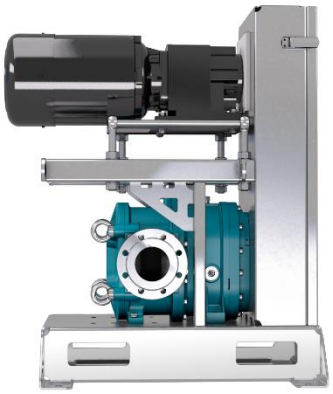


Multicrusher with hydraulic motor

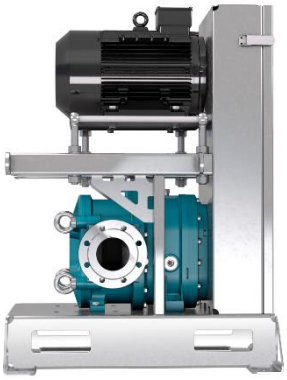


Multicrusher with helical bevel geared motor

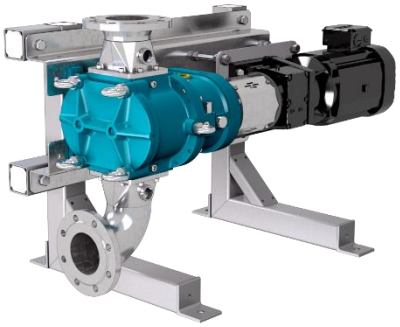
Multicrusher with directly flanged helical bevel geared motor



Multicrusher with overhead mounted gear motor



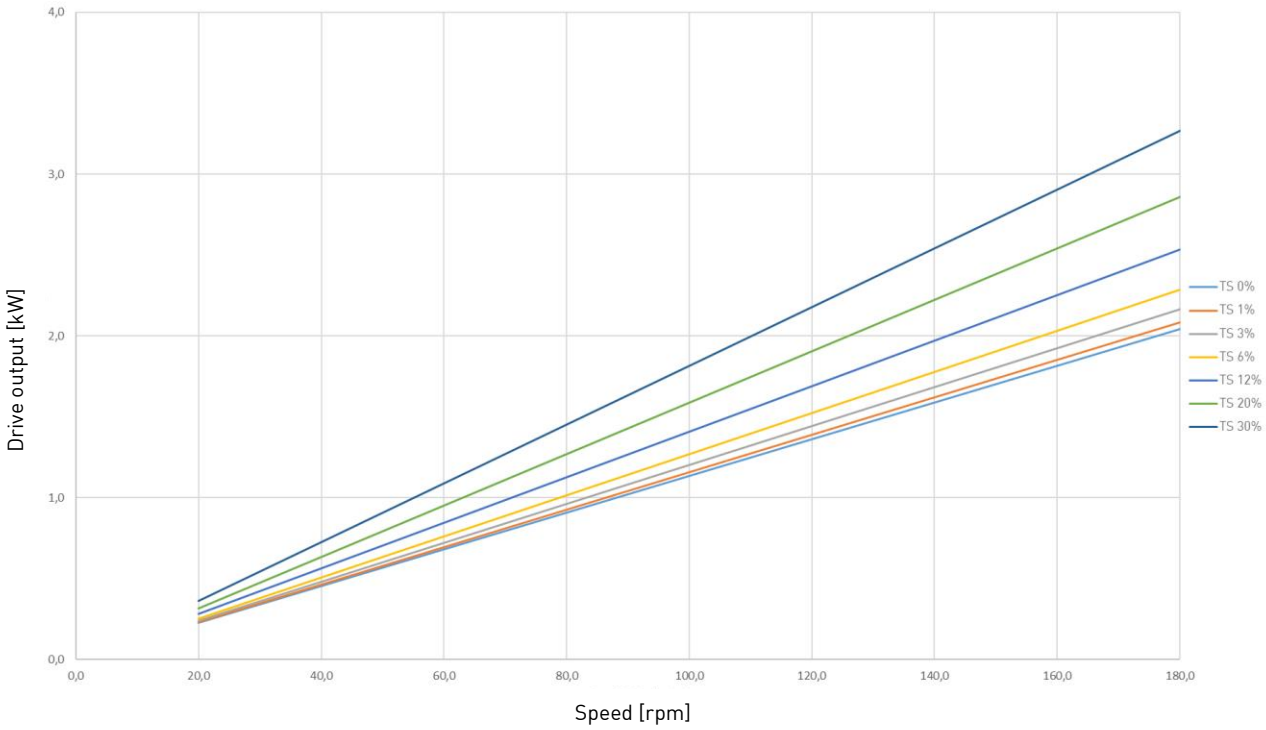
Multicrusher with overhead mounted three-phase motor



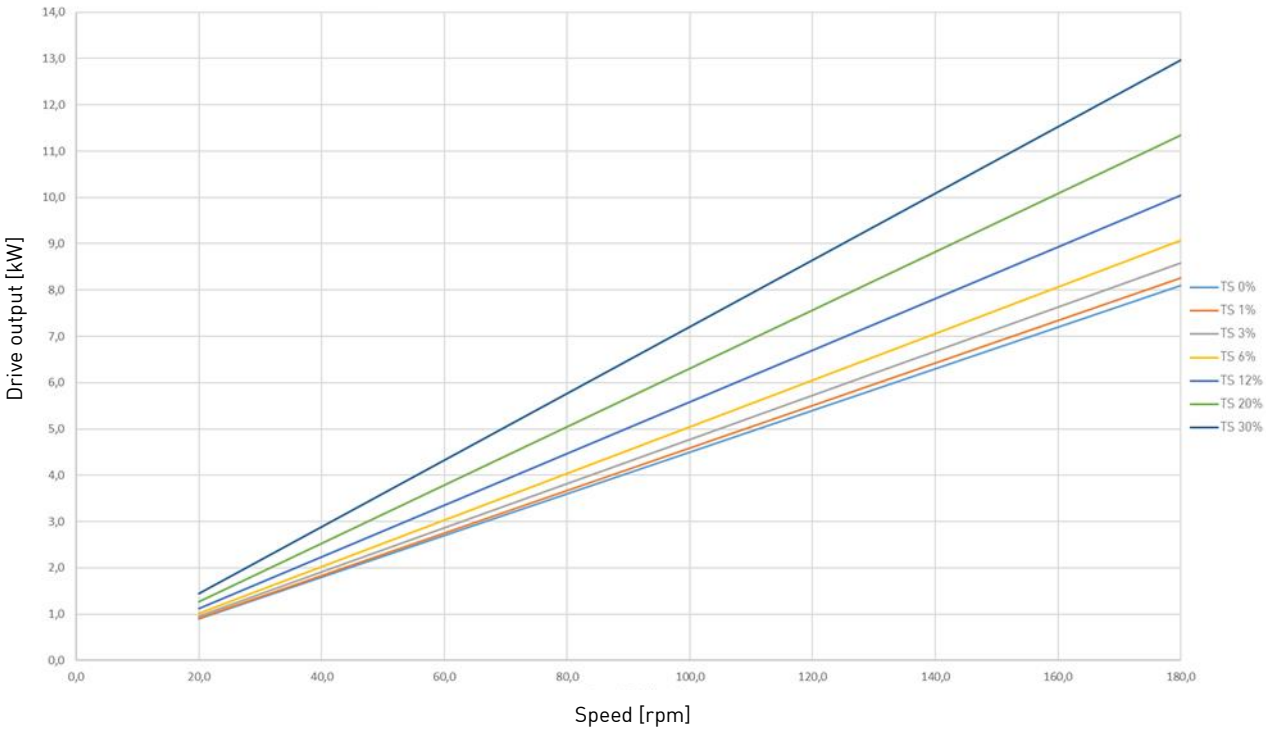
Multicrusher turned 90°

7. Performance Diagrams

Performance diagram HAN 070



Performance diagram HFL 776



All performance diagrams are available upon request.

8. Knife arrangement code

	Drive shaft blade type	Direction of rotation	Short shaft blade type	Direction of rotation	Blade thickness	Material	Arrangement	Alignment
Coarse, 10 teeth 	G		G					
Fine, 16 teeth 	F		F					
Very fine, 16 teeth 	S		S					
Coarse, 8 double teeth 	R		R					
Special geometry	X		X					
Shaft rotates counter-clockwise		-L		-L				
Shaft rotates clockwise		-R		-R				
Independent of the direction of rotation (bi-directional) (only type R)		-U		-U				
8 mm (.31'') thick (for HPL, HCL, HFL series)					8			
6 mm (.24'') thick (for HFL series)					6			
5 mm (.20'') thick (for HPL, HCL series)					5			
4 mm (.16'') thick (for HAL series)					4			
Special thickness					X			
Standard material for common applications						A		
Corrosion-dependent special version						B		
Special material						X		
Individually arranged blades 							E	
Blades arranged in blocks of two 							B	
Block of three (special version) 							T	
Other special combinations							X	
Blades / blocks parallel to each other								p
Blades / blocks offset to each other								v
Special combination								x
Example code:	G	-L	R	-L	8	A	E	p

9. SIDE NOTE: Average dry solids contents in media

Medium	Dry solids content [%]
Wastewater	1 - 4
Thickened sludge	25
Paint	16 - 19
Fish remains	20
Flotation sludge	2
Liquid waste	5
Poultry manure	12
Lime milk	5 - 10
Diatomite	20
Sewage sludge	4
Corn silage	30 - 35
RRM substrate	7
RRM substrate (secondary fermenter)	6 - 12
Oil sludge	10 - 20
Paper sludge	3 - 8
Primary sludge	2 - 8
Rake material	10 - 30
Cattle manure	9
Sludge	1 - 5
Pig manure	6
Food waste	25
Starch	17

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