Nordberg GP series cone crushers

Wear parts application guide

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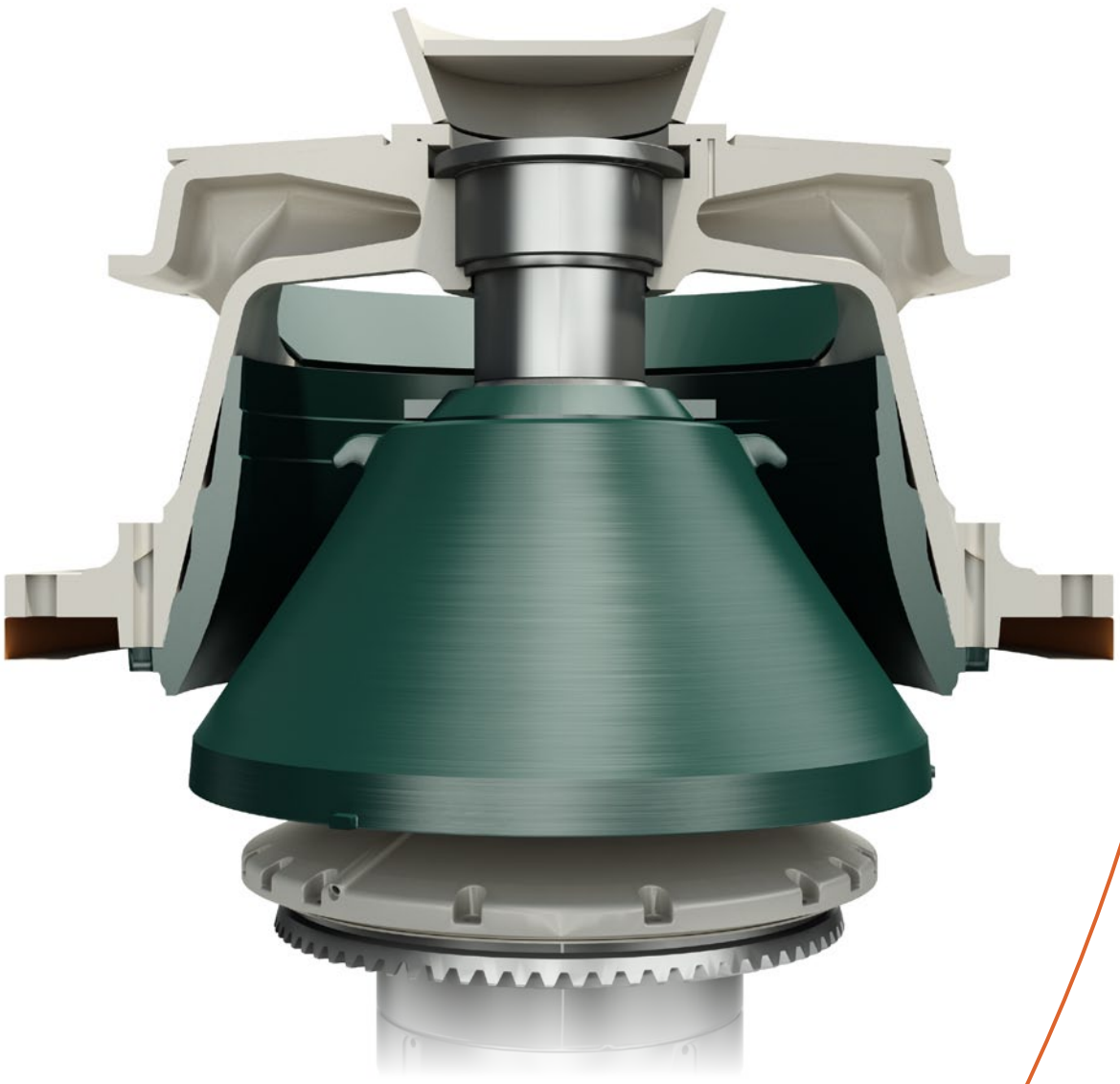
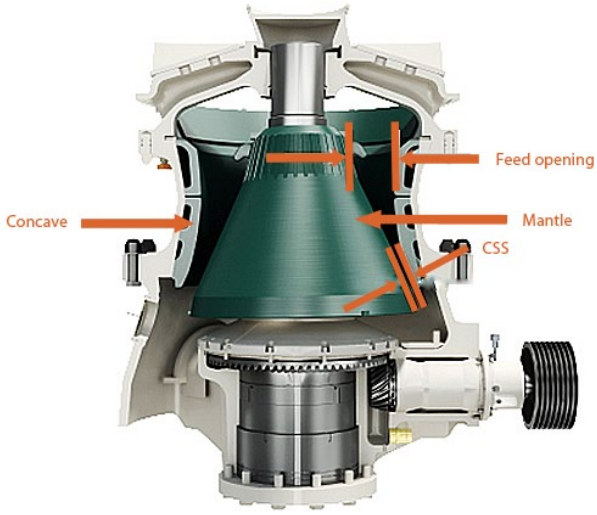
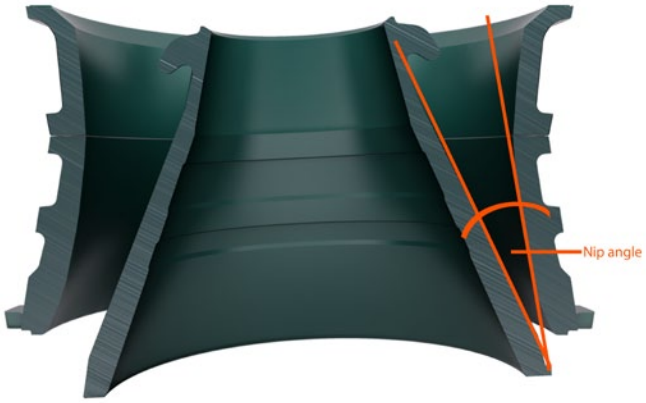
Expect results







Wear parts application guide - Nordberg GP series cone crusher

GP cone crusher and basic concepts

GP cone crusher is a compressive crusher where feed material is crushed between a fixed concave and a movable mantle. Bigger rock particles are crushed against the mantle and concave. This is called single-layer crushing. Smaller rock particles are crushed between other rock particles, which is called multi-layer crushing. Multi-layer crushing plays a significant role in the GP cavity. This improves the end product shape and reduces wear in wear parts.

Feed opening

The feed opening defines the maximum feed size to the crusher. In GP cone, the closed side feed opening is measured from the top of the concave to the top of the mantle when the mantle is at the closed side setting position.

The maximum feed size in GP cone is the same as closed side feed opening. Maximum feed sizes are also stated in cavity configuration tables later in the guide.

Closed side setting (CSS)

The closed side setting defines the reduction ratio in GP cone crusher and has significant bearing on product gradation, capacity and power draw.

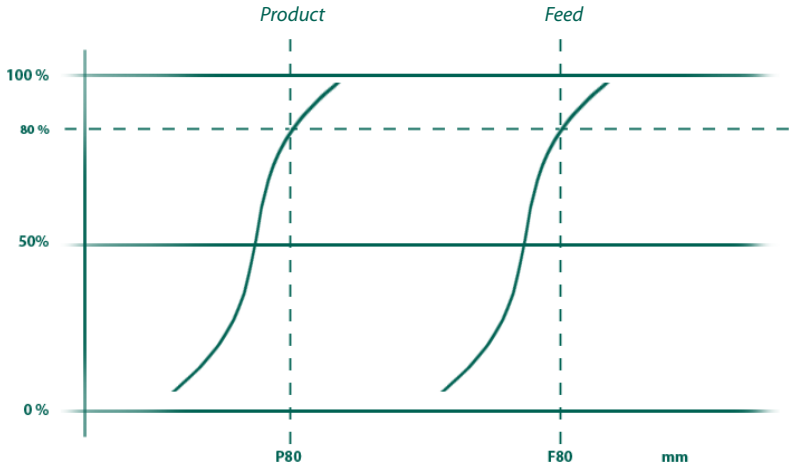
The closed side setting is measured from the bottom of the mantle to the bottom of the concave at their closest coincidence during the gyrating cycle.

Nip angle

The nip angle is the the angle between the mantle and the concave. Too large nip angle reduces the capacity and increases the wear due to feed material is bouncing upwards in the cavity.

Reduction ratio

The reduction ratio means the reduction factor between feed and a product. This ratio is usually taken from the 80% point of the feed and product curve. A typical reduction ratio for the GP secondary crusher is 3-5 and, for the GP fine crusher, 1.5-3.



Reduction ratio = F80 / P80

Good feed level and distribution

How to operate a GP cone crusher

In order to get optimum capacity and maximum lifetime of wear parts, consider the following points:

1. Check the feed arrangement:

• The crusher should be choke fed so that the crushing chamber is full all the time. This is important, especially in fine crushing. Choke feeding maximizes the amount of multi-layer crushing, and improves wear shape and crushing efficiency.

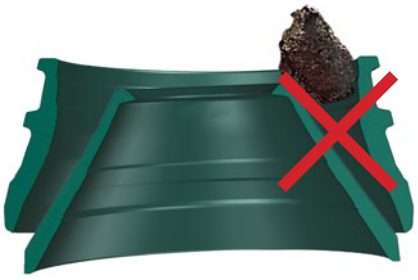
1. Choke feed level for GP secondary crusher is at the level of the mantle fixing nut
2. Choke feed level for GP fine crusher is max 1 meter above the top bearing arrangement

• The feed must be distributed evenly 360° across the crushing chamber. Uneven feed distribution may cause unbalanced crushing forces and uneven wearing in the GP concave.

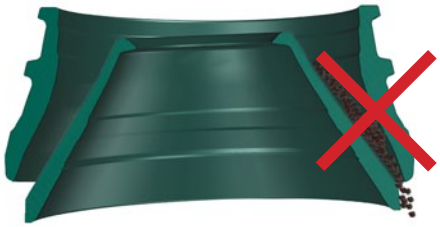
• Feed should not be segregated (for example finer material in other side of cavity).

• The flow of the feed should be stable and continuous. (However GP cone crusher can be used in pulse fed applications as the head spin is minimized.)

• Circulation is needed when producing high quality products.



Too big feed material



Too small feed material

2. Check the feed size and gradation:

• Oversize feed material decreases capacity and can cause unnecessary loads to the crusher.

• Too small feed size for the cavity increases wearing at the bottom part of liners and may cause poor utilization rate of wear parts.

• Fines (0-4) should be screened away before the crusher as they may cause packing. (GP secondary is not sensitive to fines)

• Feed gradation should be stable (no gaps in feed).

Note: Feed material characteristics such as gradation, bulk density, moisture, clay content and crushability have significant impact on crusher capacity.

	Feed material characteristics		Operating parameters			
	Easy crushability	High specific gravity	Stroke increase	Setting increase	Speed increase	Choke feed
Shape of < C.S.S. in product	↑		↑		↑	↑
Capacity		↑	↑	↑		↑
Cubicity of product	↑		↑		↑	↑
Power consumption			↑	↓		↑
Energy consumption kWh/ton		↓	↓	↓		↑

Indicative table

3. Check the setting. It should be close to required product

- Setting increases -> Product size increases
- Setting increases -> Capacity increases
- Setting increases -> Power draw decreases

4. Check the stroke

- Stroke increases -> Capacity increases
- Stroke increases -> Power draw increases

5. Check the cavity in use

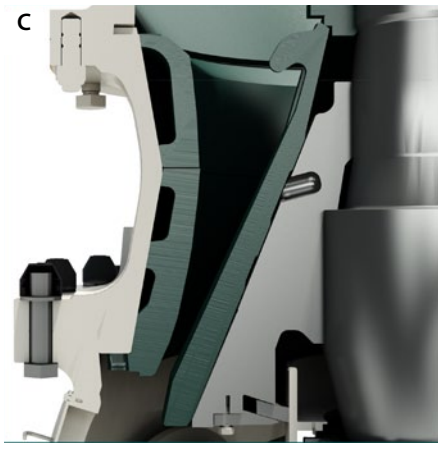
- Based on feed size
- Based on required end product size which gives required setting range
- Check the crushing ratio.

6. Check the wear profile of the liners: A distorted wear profile may decrease capacity, increase wearing and increase crushing forces

Example of bad wearing. Cupping has occurred.

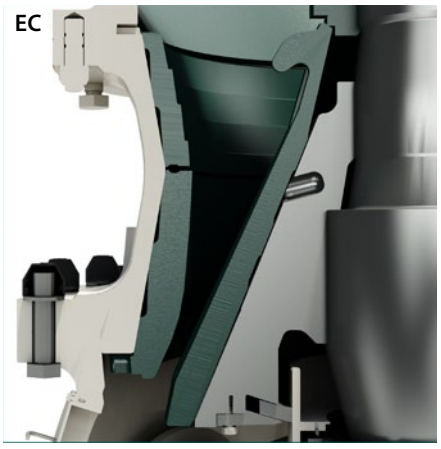
Example of normal wear. Obtained with correct feed arrangements, feed gradation and parameters for the cavity.

C



GP100S M / GP200S C / GP300S C / GP500S C

EC



GP100S C / GP200S EC / GP300S EC / GP500S EC

GP secondary cone crusher cavity selection

Each GP secondary cone crusher has two cavity options with different feed openings and setting ranges. The correct cavity can be selected based on feed size and setting.

GP Secondary	Difficult and abrasive rock	Difficult and non abrasive rock	Medium and abrasive rock	Medium and non abrasive rock	Easy and abrasive rock	Easy and non abrasive rock
XT510 / XT610				●●●	●●	●●●
XT710	●●●	●●●	●●●	●●●	●●●	●●●
XT720 / XT810	●●●	●●	●●●		●●	

● Can be used ●● Good choice ●●● Recommended

Definitions for different rock types are presented in Wear and materials application guide, page 4.

Maximum feed size and setting ranges min-max, mm (in)

	GP100S		GP200S		GP300S		GF500S	
	M	C	C	EC	C	EC	C	EC
Max Feed size	199 (7.83)	236 (9.29)	212 (8.35)	288 (11.3)	237 (9.33)	320 (12.6)	312 (12.3)	392 (15.4)
16 mm (0.63 in) stroke	20-43 (0.79-1.69)	24-48 (0.94-1.89)						
18 mm (0.71 in) stroke			24-46 (0.94-1.81)	26-52 (1.02-2.05)	24-47 (0.94-1.85)	28-53 (1.10-2.09)	30-67 (1.18-2.64)	35-77 (1.38-3.03)
20 mm (0.79 in) stroke	24-41 (0.94-1.61)	29-46 (1.14-1.81)						
25 mm (0.98 in) stroke	28-39 (1.10-1.54)	34-44 (1.34-1.73)	27-43 (1.06-1.69)	29-49 (1.14-1.93)	29-44 (1.14-1.73)	32-50 (1.26-1.97)	35-63 (1.38-2.48)	40-74 (1.57-2.91)
28 mm (1.10 in) stroke			28.5-41 (1.12-1.61)	30.5-47 (1.20-1.85)	31-42 (1.22-1.65)	34-48 (1.34-1.89)	37-62 (1.46-2.44)	42-74 (1.65-2.83)
32 mm (1.26 in) stroke			30-39 (1.18-1.54)	32-45 (1.26-1.77)	33-40 (1.30-1.57)	36-46 (1.42-1.81)	40-60 (1.57-2.36)	45-70 (1.77-2.76)
36 mm (1.42 in) stroke			31.5-37 (1.24-1.46)	33.5-43 (1.32-1.69)	35-38 (1.38-1.5)	38-44 (1.5-1.73)	43-57 (1.69-2.24)	48-67 (1.89-2.64)
40 mm (1.57 in) stroke							45-55 (1.77-2.17)	50-65 (1.97-2.56)

M = Medium
C = Coarse
EC = Extra coarse

The minimum setting is limited by either the power requirement or adjusting pressure. Depending on rock characteristics, the minimum closed side setting can change.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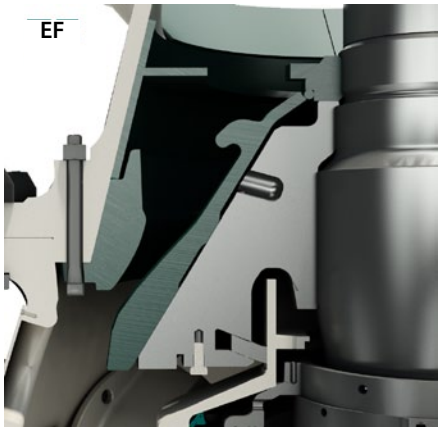
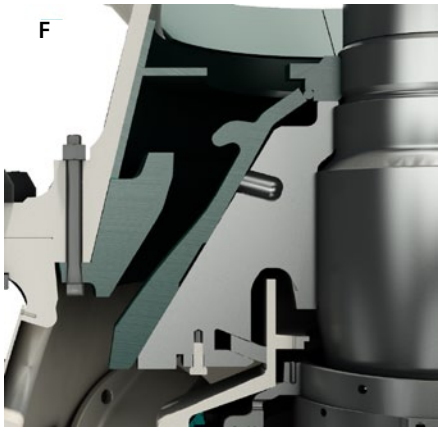
Lokotrack LT200GP

GP fine cone crusher cavity selection

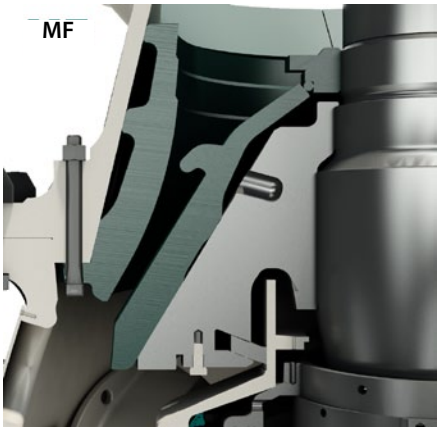
Each GP fine cone crusher has several cavity options with different feed openings and setting ranges. The correct cavity can be selected based on feed size and setting.



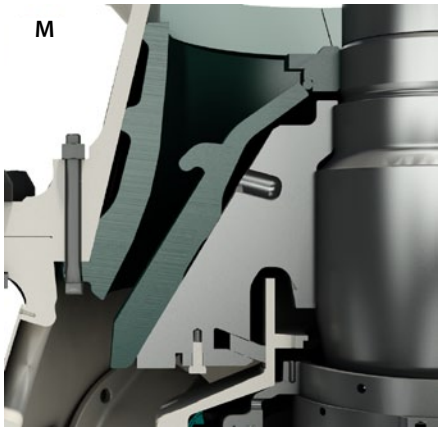
GP100 EF, GP11F EF, GP200 EF, GP300 EF, GP550 EF



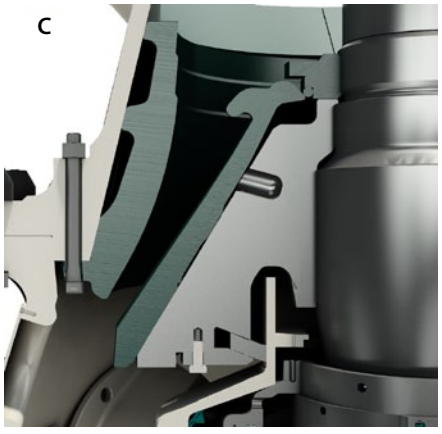
GP100F, GP11FF, GP200F, GP300F, GP550F



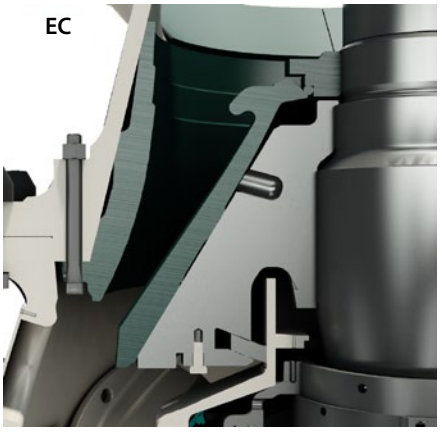
GP100MF, GP300MF, GP550MF



GP100M, GP11FM, GP200M, GP300M, GP550M



GP100C, GP11FC, GP11MC, GP200MC, GP300C, GP550C



GP11M EC, GP200EC, GP300EC, GP550EC

GP Fine	Difficult and abrasive rock	Difficult and non abrasive rock	Medium and abrasive rock	Medium and non abrasive rock	Easy and abrasive rock	Easy and non abrasive rock
XT510 / XT610				●●●	●●	●●●
XT710	●●●	●●●	●●●	●●●	●●●	●●●
XT720 / XT810	●●●*	●●*	●●*		●●*	

● Can be used ●● Good choice ●●● Recommended

*coarse feed

Definitions for different rock types are presented in Wear and materials application guide, page 4.

Maximum feed size and setting ranges min-max, mm (in)

	GP100					GP200				GP11F			
	EF	F	MF	M	C	EF	F	M	EC	EF	F	M	C
Max Feed size	32 (1.26)	46 (1.81)	87 (3.43)	133 (5.24)	135 (5.31)	35 (1.38)	64 (2.52)	104 (4.09)	168 (6.61)	35 (1.38)	70 (2.76)	113 (4.45)	152 (5.98)
16 mm (0.63 in) stroke	5-18 (0.20-0.71)	5-17 (0.20-0.67)	7-20 (0.28-0.79)	10-20 (0.39-0.79)	13-24 (0.51-0.94)								
18 mm (0.71 in) stroke						8-27 (0.31-1.06)	7-29 (0.28-1.14)	10-29 (0.39-1.14)	12-35 (0.47-1.38)				
20 mm (0.79 in) stroke	6-16 (0.24-0.63)	6-15 (0.24-0.59)	9-18 (0.35-0.71)	11-18 (0.43-0.71)	15-22 (0.59-0.87)					5-23 (0.20-0.91)	7-24 (0.28-0.94)	14-28 (0.55-1.10)	15-29 (0.59-1.14)
25 mm (0.98 in) stroke	7-14 (0.28-0.55)	7-12 (0.28-0.47)	11-15 (0.43-0.59)	12-15 (0.47-0.59)	17-19 (0.67-0.75)	11-24 (0.43-0.94)	10-26 (0.39-1.02)	13-26 (0.51-1.02)	17-32 (0.67-1.26)	7-21 (0.28-0.83)	9-21 (0.35-0.83)	16-26 (0.63-1.02)	17-27 (0.67-1.06)
28 mm (1.10 in) stroke						12.5-22 (0.49-0.87)	11.5-24 (0.45-0.94)	14-24 (0.55-0.94)	20-30 (0.79-1.18)				
30 mm (1.18 in) stroke										9-18 (0.35-0.71)	11-19 (0.43-0.75)	18-23 (0.71-0.91)	19-24 (0.75-0.94)
32 mm (1.26 in) stroke						14-20 (0.55-0.79)	13-22 (0.51-0.87)	15-22 (0.59-0.87)	24-28 (0.94-1.10)				
36 mm (1.42 in) stroke						15.5-18 (0.61-0.71)	14.5-20 (0.57-0.79)	16.5-20 (0.65-0.79)					

	GP11M			GP300						GP550					
	C	EC	ECLS	EF	F	MF	M	C	EC	EF	F	MF	M	C	EC
Max Feed size	112	194	206	32	50	106	126	150	192	50	73	94	137	177	235
20 mm (0.79 in) stroke	15-29 (0.59-1.14)	18-32 (0.71-1.26)	20-51 (0.79-2.01)												
25 mm (0.98 in) stroke	17-27 (0.67-1.06)	20-30 (0.79-1.18)	25-49 (0.98-1.93)	6-22 (0.24-0.87)	8-28 (0.31-1.10)	13-24 (0.51-0.94)	15-29 (0.59-1.14)	18-32 (0.71-1.26)	22-41 (0.87-1.61)	8-29 (0.31-1.14)	11-35 (0.43-1.38)	12-38 (0.47-1.50)	16-41 (0.63-1.61)	18-43 (0.71-1.69)	22-46 (0.87-1.81)
28 mm (1.10 in) stroke				7-21 (0.28-0.83)	9.5-27 (0.37-1.06)	14-23 (0.55-0.91)	16-28 (0.63-1.10)	19.5-31 (0.77-1.22)	23.5-39 (0.93-1.54)	9-28 (0.35-1.10)	12-34 (0.47-1.34)	13.5-37 (0.53-1.46)	18-40 (0.71-1.57)	20-41 (0.79-1.61)	23.5-45 (0.93-1.77)
30 mm (1.18 in) stroke	19-24 (0.75-0.94)	22-27 (0.87-1.06)	30-46 (1.18-1.81)												
32 mm (1.26 in) stroke				8-19 (0.31-0.75)	11-25 (0.43-0.98)	15-21 (0.59-0.83)	17-26 (0.67-1.02)	21-29 (0.83-1.14)	26-37 (1.02-1.46)	10-26 (0.39-1.02)	13-32 (0.51-1.26)	15-35 (0.59-1.38)	20-38 (0.79-1.50)	22-39 (0.87-1.54)	25-43 (0.98-1.69)
36 mm (1.42 in) stroke				9-17 (0.35-0.67)	12.5-23 (0.49-0.91)	16-19 (0.63-0.75)	18-24 (0.71-0.94)	22.5-27 (0.89-1.06)	28-35 (1.10-1.38)	11-24 (0.43-0.94)	14-29 (0.55-1.14)	16.5-32 (0.65-1.26)	22-35 (0.87-1.38)	23.5-37 (0.93-1.46)	26.5-41 (1.04-1.61)
40 mm (1.57 in) stroke				10-15 (0.39-0.59)	14-21 (0.55-0.83)		19-22 (0.75-0.87)	24-25 (0.94-0.98)	30-33 (1.18-1.30)	12-22 (0.47-0.87)	15-26 (0.59-1.02)	18-29 (0.71-1.14)	24-32 (0.94-1.26)	25-35 (0.98-1.38)	28-39 (1.10-1.54)
45 mm (1.77 in) stroke										13.5-19 (0.53-0.75)	16.5-23 (0.65-0.91)	19.5-26 (0.77-1.02)	25.5-29 (1.00-1.14)	26.5-32 (1.04-1.26)	29.5-36 (1.16-1.42)

EF = Extra fine
F = Fine
MF = Medium fine
M = Medium
C = Coarse
EC = Extra coarse
ECLS = Extra coarse large setting

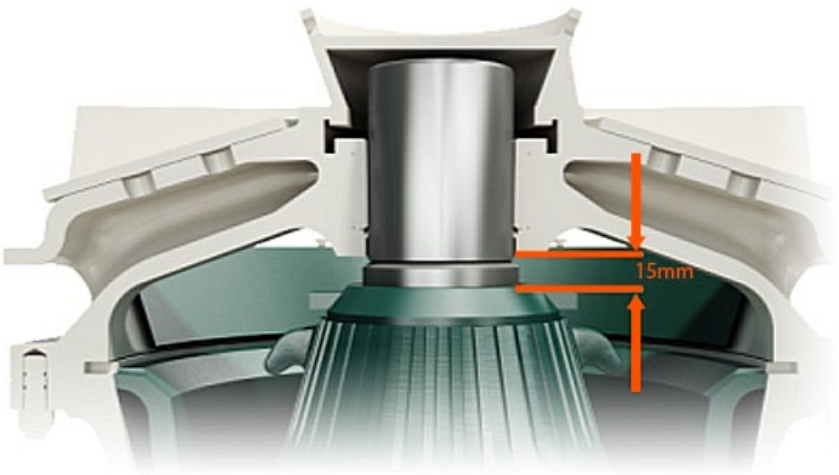
The minimum setting is limited by either the power requirement or adjusting pressure. Depending on rock characteristics, the minimum closed side setting can change.

When to change liners

Liners must be changed before they are worn through in order to prevent damage to frame or head. Liners should be changed no later than when the A dimension is 10-15 mm depending on crusher model.

Production aspects may sometimes favour changing of wear parts before they are fully utilized. Hourly capacity or product quality may decrease towards the end of liner lifetime and it may be economical to change the liner before the end of its lifetime.

A distorted wear profile typically causes a reduction in capacity. Other symptoms of distorted wear profiles are high power and pressure and short lifetime of wear parts. A distorted wear profile may lead to liners having to be replaced before they are fully worn.



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