

## Appendix B

### Manufacturer's Literature

# Stationary Rock Breaker

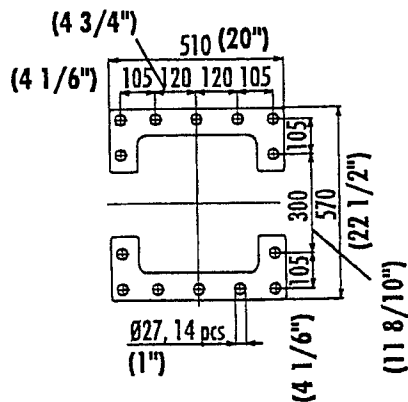
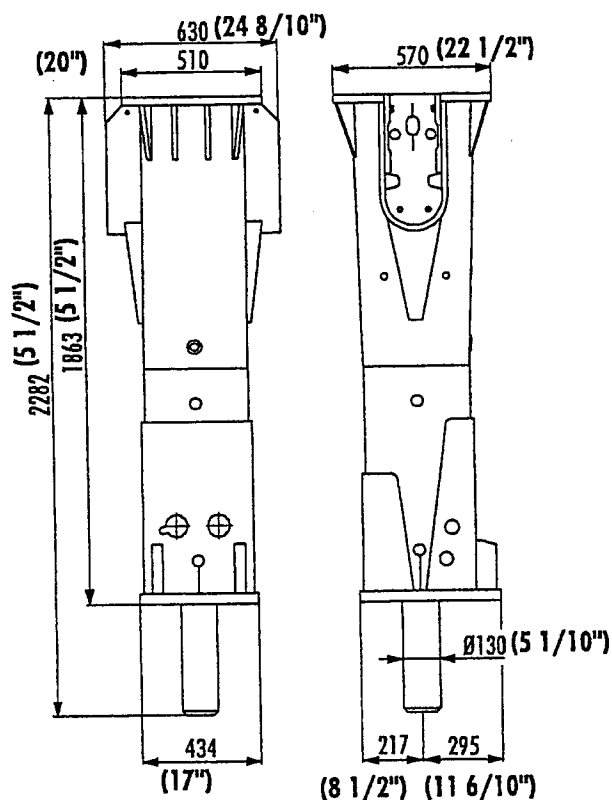
# Rammer®

## Stationary Rock Breaker

### TECHNICAL SPECIFICATIONS

#### E 68, E 68 CITY and E 68 CITY JET

#### E 68, E 68 CITY and E 68 CITY JET



Working weight <sup>(1)</sup> E 68, E 68 CITY:	3770 lbs
Impact energy (piston energy):	2944 ft lb
Impact rate <sup>(2)</sup> :	330 - 580 bpm
Operating pressure, <sup>(3)</sup> :	1960 - 2100 psi
Pressure relief min <sup>(4)</sup> :	2760 psi
Pressure relief max:	3200 psi
Oil flow range:	32 - 53 gal/min
Back pressure max:	145 psi
Max input power:	64 hp
Tool diameter:	5 1/10"

#### Connections for hoses:

■ pressure line (IN):	SAE 6000 psi BSP 1 1/4"
■ return line (OUT):	SAE 6000 psi BSP 1 1/4"
■ grease connection (G):	BSP 3/8"
■ air connection (A):	BSP 3/8"
■ JET connection:	BSP 1/2"

#### Line size minimum inner diameter:

■ pressure line:	1"
■ return line:	1 1/4"

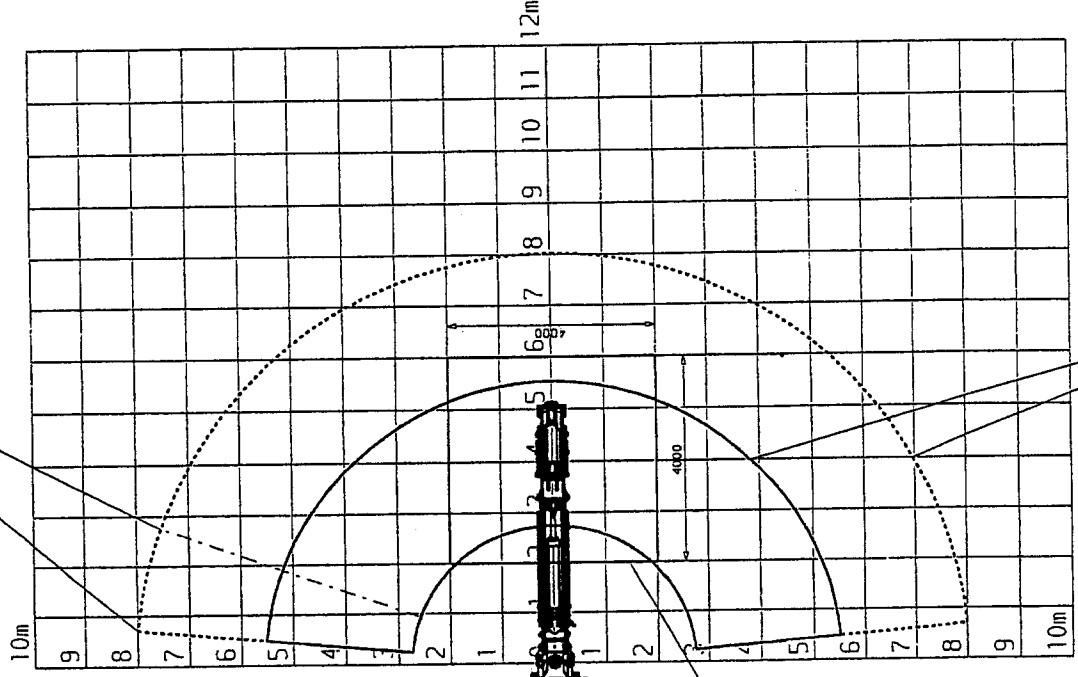
Oil viscosity at operating temperature:	30 - 60 cSt
Max. allowed oil viscosity range:	20 - 1000 cSt
Optimum oil temperature:	104 - 140°F
Max. allowed oil temperature range:	-4 - + 176°F

Carrier weight <sup>(5)</sup> :	46300 - 70500 lbs
Noise level E 68:	85 dB(A)/85 - 125 ft
Noise level E 68 CITY:	85 dB(A)/46 - 66 ft

- (1) Includes average mounting bracket and standard tool.
- (2) Actual impact frequency depends on oil flow, oil viscosity, temperature, and material to be broken.
- (3) Actual pressure depends on oil flow, oil viscosity, temperature, material to be broken and back pressure.
- (4) Minimum setting = actual operating pressure + 725 bar.
- (5) Check carrier's lifting capacity from carrier manufacturer

Max. slew angle 170°

Recommended working angle 140°



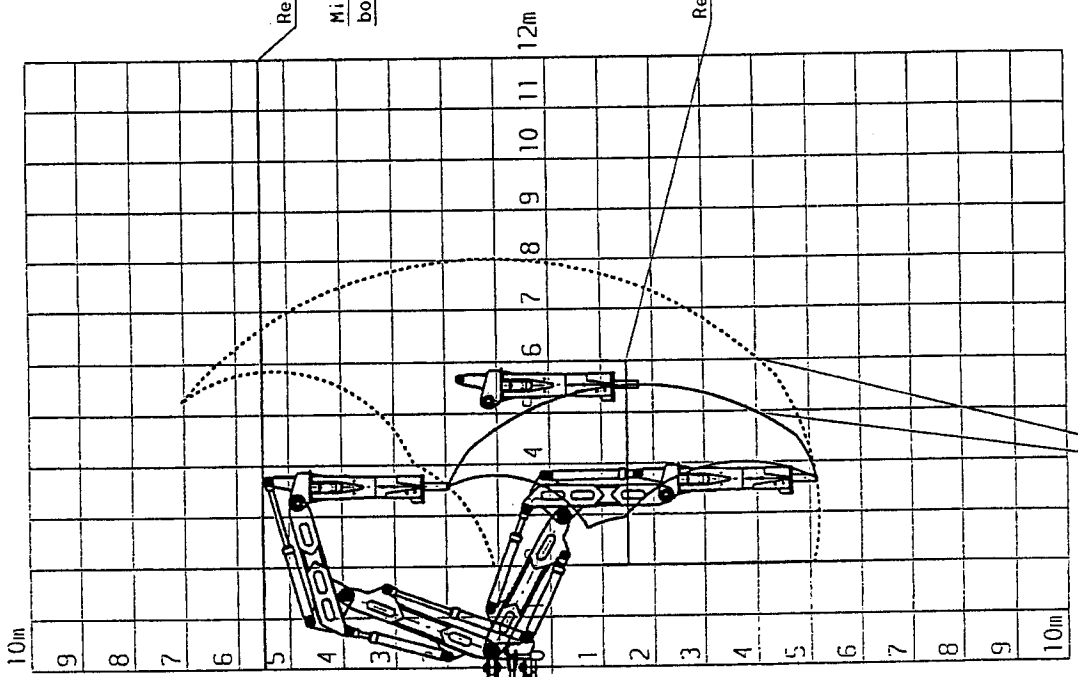
Coverage with vertical hammer

Maximum coverage

Recommended headroom (5500 mm)

Min. headroom for Full boom coverage: 5000 mm

Recommended grizzly position



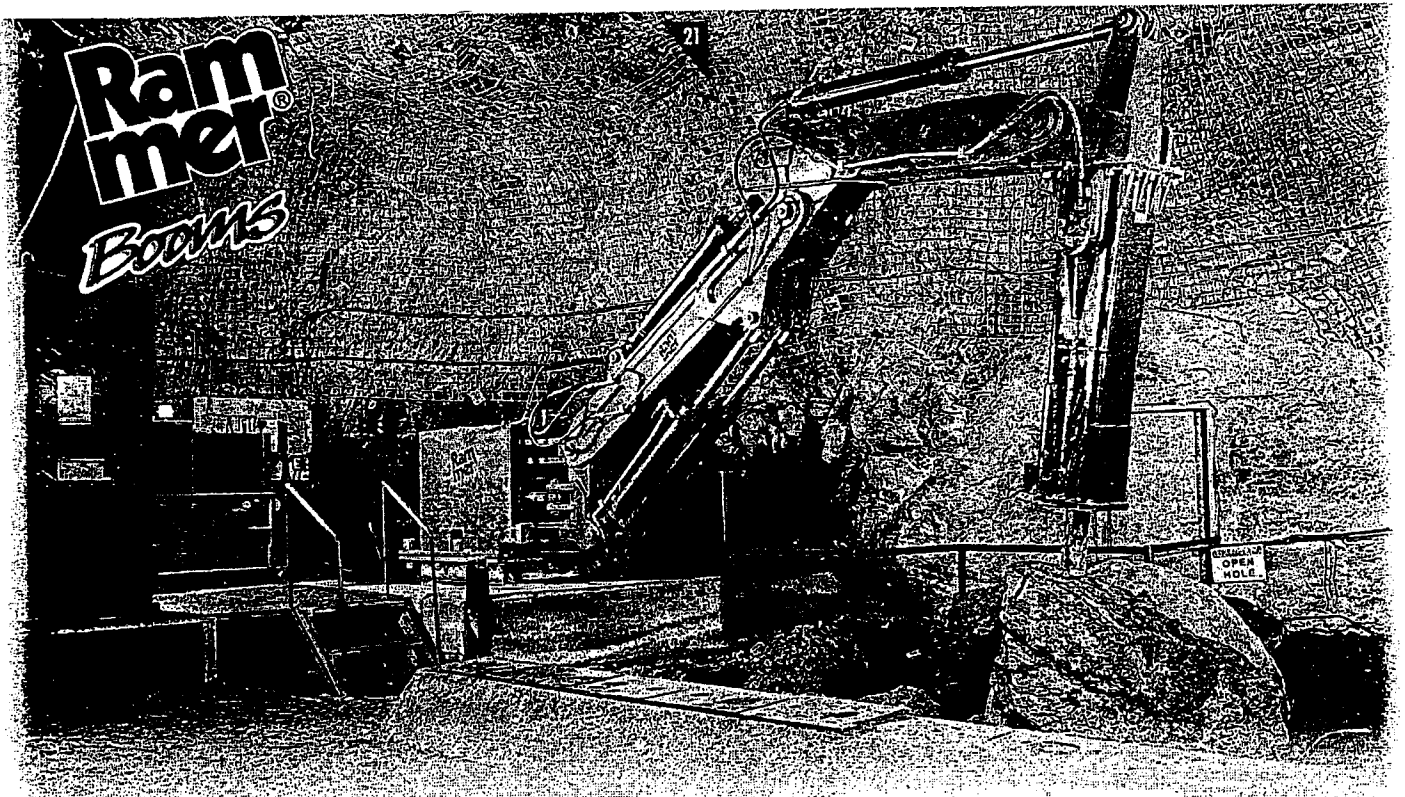
Coverage with vertical hammer

Maximum coverage

XM500HD  
680

Scale	1:50	TP#	11.02.2007
Sheet	01	Rev.	11.02.2007
Greater boom system Coverage drawing XM500HD			152138

**Rammer**  
Booms



## Manitoba Boom Time

Hudson Bay Mining & Smelting (HBMS) has boosted production of copper and zinc ore at its Ruttan Mine in Manitoba with the use of one of the world's first grizzly mounted Rammer XM Booms. HBMS is owned by Anglo American and is one of the largest mining companies in Canada. Owing and operating five mines in northern Manitoba and Saskatchewan, the company produces by smelting a variety of copper, zinc, gold and silver. In order to increase production at its Ruttan Mine site, HBMS identified the fact that the primary crusher was suffering regu-

lar downtime caused by oversize material in the feed. The solution came in the shape of a new Rammer XM Boom supplied by Hydra-Motion of Winnipeg, local dealer for sole Canadian Rammer importer Sandvik Tamrock Canada. Operated from a sound and dust-proof operator's cabin, the unit reduces boulders of up to 3.0 metres down to a more manageable 0.5 metres. "The E 68 handles this material with ease," says general manager Bob Cooper. "The XM Boom has eliminated all our production problems."

		Z 250	C 285	C 320	C 330	C 350	C 400	C 450	C 500	C 550	C 600
Weight**	kg	980	1180	1200	2200	2500	2550	2600	2650	2700	2750
Nominal horizontal reach***	m	3.9	3.2	3.5	3.8	3.9	4.3	4.6	5.6	5.8	6.2
Nominal vertical reach	m	4.3	3.3	3.7	3.6	4.2	4.6	4.9	5.0	5.1	5.6
Swing rotation	0°	360	170	170	170	170	170	170	170	170	170
Recommended hammer types		S22-S25	S23-S27	S23-S27	S27-E66	S25-E64	S25-E64	S25-E64	S25-S29	S25-S29	S25-S29

		S 440	S 550	S 630	M 440	M 550	M 630	L 750	L 850	L 940	XL 940	XL 1200
Weight**	kg	3750	4250	4400	5500	6400	6700	7100	7700	7900	15100	16500
Nominal horizontal reach***	m	4.8	5.9	6.5	4.8	5.9	6.6	7.3	8.3	9.2	9.8	12.2
Nominal vertical reach	m	3.6	4.9	5.8	3.4	5.0	5.8	5.9	6.9	7.8	9.2	10.6
Swing rotation	0°	170	170	170	170	170	170	170*	170*	170*	170*	170*
Recommended hammer types		S27-E66	S27-E66	S27-E66	E65-E68	E65-E68	E65-E68	E65-E68	E65-E68	E65-E68	E68-G90	E68

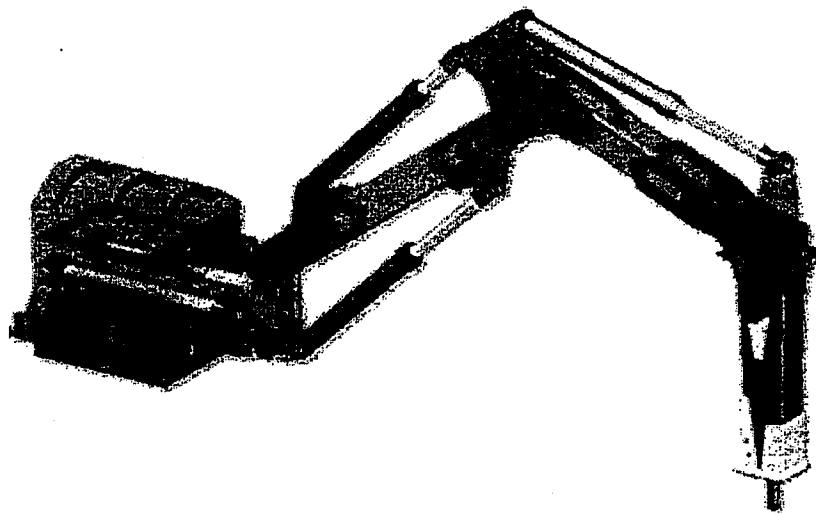
		XM 500	XM 600	XM 750	XM 700	XM 850	XM 950	XM 500 HD	XM 600 HD	XM 750 HD
Weight**	kg	6450	6650	6850	7350	7750	7950	7250	7400	7800
Nominal horizontal reach***	m	5.6	6.5	8.0	7.4	8.9	9.8	5.5	6.4	7.9
Nominal vertical reach	m	4.8	5.8	6.5	6.8	7.5	8.5	5.1	6.1	6.8
Swing rotation	0°	170	170	170	170	170	170	170	170	170
Recommended hammer types		E64-E68	E64-E68	E64-E68	E64-E68	E64-E68	E64-E68	E65-G80	E65-G80	E65-G80

\*) Optional: 360° \*\*) Excluding hammer \*\*\*) With vertical hammer



## BOOMS, SERIES XM

COMPLETE BOOM SYSTEM FOR  
GRIZZLIES AND HEAVY CRUSHERS



**METRIC UNITS**

	<b>XM 300</b>	<b>XM 500/HD</b>	<b>XM 600/HD</b>	<b>XM 700</b>
WEIGHT, KG *)	5520	6450/7250	6650/7400	7350
NOMINAL HORIZONTAL REACH, M **)	3,7	5,6/5,5	6,5/6,4	7,4
NOMINAL VERTICAL REACH, M **)	2,8	4,8/5,1	5,8/6,1	6,8
SWING, DEGREES	170	170	170	170
BASE DIMENSIONS, M	1,52x1,22	1,52x1,22	1,52x1,22	1,52x1,22
MOTOR POWER REQUIRED, KW (HP)	37 (50)	37 (50)/55 (74)	37 (50)/55 (74)	37 (50)
RECOMMENDED HAMMER TYPES	E 64-E 68	E 64-E 68/E 65-G 80	E 64-E 68/E 65-G 80	E 64-E 68

	<b>XM 750/HD</b>	<b>XM 850</b>	<b>XM 950</b>
WEIGHT, KG *)	6850/7800	7750	7950
NOMINAL HORIZONTAL REACH, M **)	8,0/7,9	8,9	9,8
NOMINAL VERTICAL REACH, M **)	6,5/6,8	7,5	8,5
SWING, DEGREES	170	170	170
BASE DIMENSIONS, M	1,52x1,22	1,52x1,22	1,52x1,22
MOTOR POWER REQUIRED, KW (HP)	37 (50)/55 (74)	37 (50)	37 (50)
RECOMMENDED HAMMER TYPES	E 64-E 68/E 65-G 80	E 64-E 68	E 64-E 68

**US UNITS**

	<b>XM 300</b>	<b>XM 500/HD</b>	<b>XM 600/HD</b>	<b>XM 700</b>
WEIGHT, LB *)	12144	14190/15950	14630/16280	16170
NOMINAL HORIZONTAL REACH, FT **)	12.2	18.5/18.2	21.5/21.1	24.4
NOMINAL VERTICAL REACH, FT **)	9.2	15.8/16.83	19.1/20.1	22.4
SWING, DEGREES	170	170	170	170
BASE DIMENSIONS, FT	5.02x4.03	5.02x4.03	5.02x4.03	5.02x4.03
MOTOR POWER REQUIRED, KW (HP)	37 (50)	37 (50)/55 (74)	37 (50)/55 (74)	37 (50)
RECOMMENDED HAMMER TYPES	E 64-E 68	E 64-E 68/E 65-G 80	E 64-E 68/E 65-G 80	E 64-E 68

	<b>XM 750/HD</b>	<b>XM 850</b>	<b>XM 950</b>
WEIGHT, LB *)	15070/17160	17050	17490
NOMINAL HORIZONTAL REACH, FT **)	26.4/26.1	29.37	32.34
NOMINAL VERTICAL REACH, FT **)	21.5/22.4	24.8	28.1
SWING, DEGREES	170	170	170
BASE DIMENSIONS, FT	5.02x4.03	5.02x4.03	5.02x4.03
MOTOR POWER REQUIRED, KW (HP)	37 (50)/55 (74)	37 (50)	37 (50)
RECOMMENDED HAMMER TYPES	E 64-E 68/E 65-G	E 64-E 68	E 64-E 68

*\*) Excluding hammer.*

*\*\*\*) With vertical hammer.*

*This technical data is indicative only and subject to change without notice.*

**PLEASE CONTACT YOUR LOCAL DEALER FOR MORE INFO!**

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**RAMMER HITS HARDER**



## Primary Crusher



New  
edition

## Nordberg C Series Jaw Crushers





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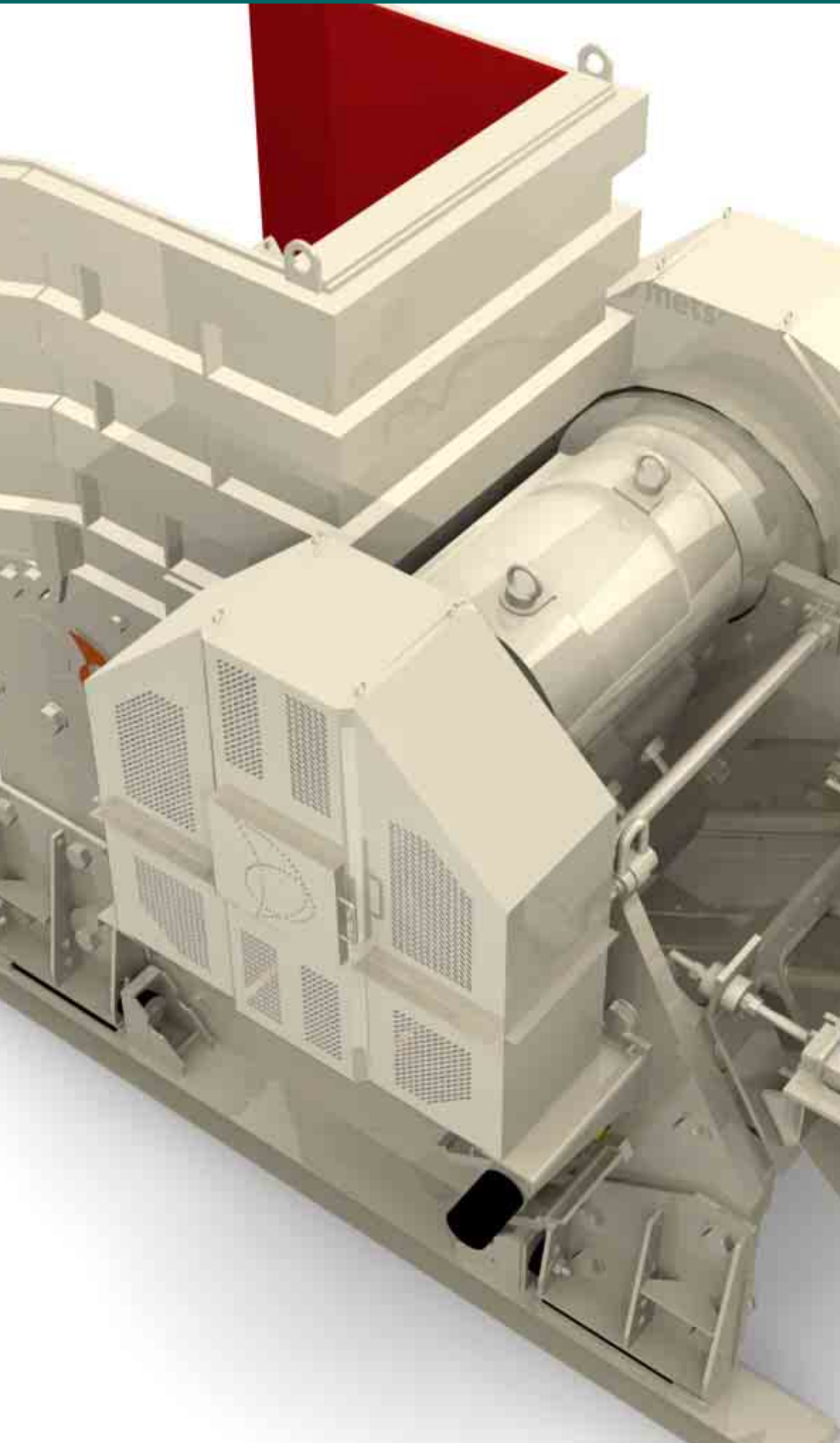
## The world's favourite jaw crusher

Metso Minerals, the world's leading rock and mineral processing group, has installed over 10 000 jaw crushers since the 1920s. Today the Nordberg C Series is indisputably the world's favourite jaw crusher. Where cost-efficient primary reduction of hard, abrasive materials is concerned, C Series crushers represent the highest technical and manufacturing knowledge.

All C Series jaw crushers are based on a revolutionary modular, non-welded frame construction. This design offers owners the highest possible fatigue strength, excellent reliability and numerous mounting possibilities. This, combined with high-quality cast steel components and premium spherical roller bearings, means exceptionally high crusher availability, cost-efficient crushing and low cost per ton.

There are now two ranges of models in the C Series range. The first is the well-known traditional jaw crusher range that is designed for stationary as well as mobile applications (C80, C100, C3054, C110, C125, C140, C145, C160, C200). The second range is designed specifically to meet the needs of small to medium size mobile crushing (C96, C106, C116). All C Series crushers are designed to crush very hard rock.

Whatever your crushing needs – from hard and abrasive rock to various recycling materials – you'll find the optimum solution with the Nordberg C Series jaw crushers. Take a closer look at the world's favourite jaw crusher!



C80

C96

C106

C116

C100

C3054

C110

C125

C140

C145

C160

C200



## World-class craftsmanship and materials

C Series crushers are premium class crushers due to their design as well as to the materials that are used to produce them. Attention has been paid to even the smallest details, so as to ensure the highest possible functionality and reliability, without any compromises. Those who have owned and operated C Series jaw crushers know that not all jaw crushers are the same!

## Modular, non-welded construction

A uniquely modular, non-welded frame construction is a state-of-the-art design with two hot-rolled steel side plates joined to high-quality cast steel frames through robust, precision machined bosses secured with bolts. The absence of stress inducers such as weld seams ensures excellent durability against shock loads.

## Durable pitman assembly

The pitman is made of high-quality cast steel and is propelled by two massive cast steel or iron flywheels. A very large eccentric shaft forging and four large spherical roller bearings that are all of the same size ensure the greatest reliability even under the most severe crushing conditions. The grease-lubricated bearings are kept free from contamination by means of well-proven labyrinth seals.

## Single piece cast steel frame bearing housings

The single piece cast steel frame bearing housings ensure a perfect fit to the crusher frame. They also prevent unnecessary loads to the frame bearings that are common with 2-piece frame bearing housings.

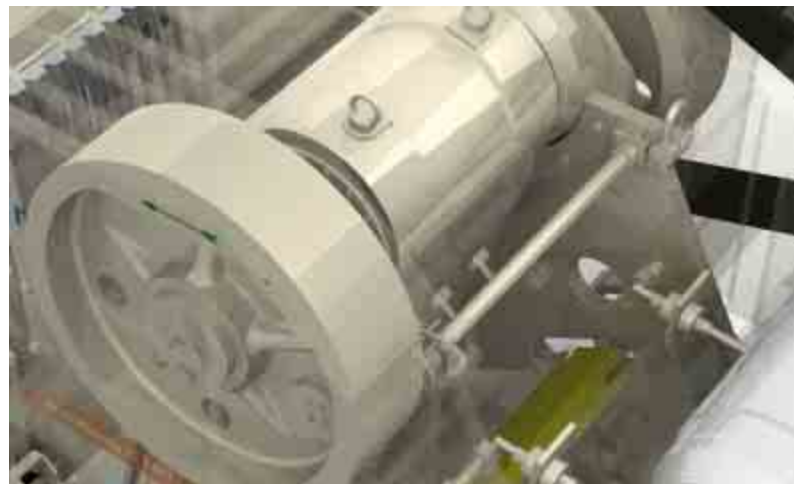
## Repairable crusher construction

C Series crushers constantly fulfill the durability expectations of their owners around the clock, but they will eventually need some care. Due to the use of cast steel components, the crusher can be economically reconditioned or rebuilt after many years of operation. Such repairs are uneconomical or impossible to carry out with crushers of alternative designs.

*The pitman, crusher frames, and bearing housings are made of high-quality cast steel.*



*The modular, non-welded frame construction ensures excellent durability.*



*The robust pitman assembly ensures the greatest reliability even under the most severe crushing conditions.*



*All C Series jaw crushers incorporate larger and sturdier eccentric shaft bearings than other crushers of comparable size.*



## The right cavity design

C Series jaw crushers are literally designed "from the inside out" because the cavity is the heart and only purpose of the jaw crusher. That is why over the years great attention has been paid to the feed opening dimensions as well as to the cavity height. The right feed opening width to depth ratio ensures minimum blockage and eliminates unnecessary height from the crusher.

## Aggressive kinematics and high power

In addition to the right cavity dimensions, the right kinematics must be applied. That is why C Series jaw crushers have a large eccentric throw coupled with a steep toggle plate angle that magnifies the effective stroke at the crusher discharge. The large stroke, combined with the right speed, flywheel inertia and high available crusher power result in truly high crusher performance. Operation at small settings as well as the method of setting measurement results in finer products in comparison to other crushers.

## The right jaws for a given application

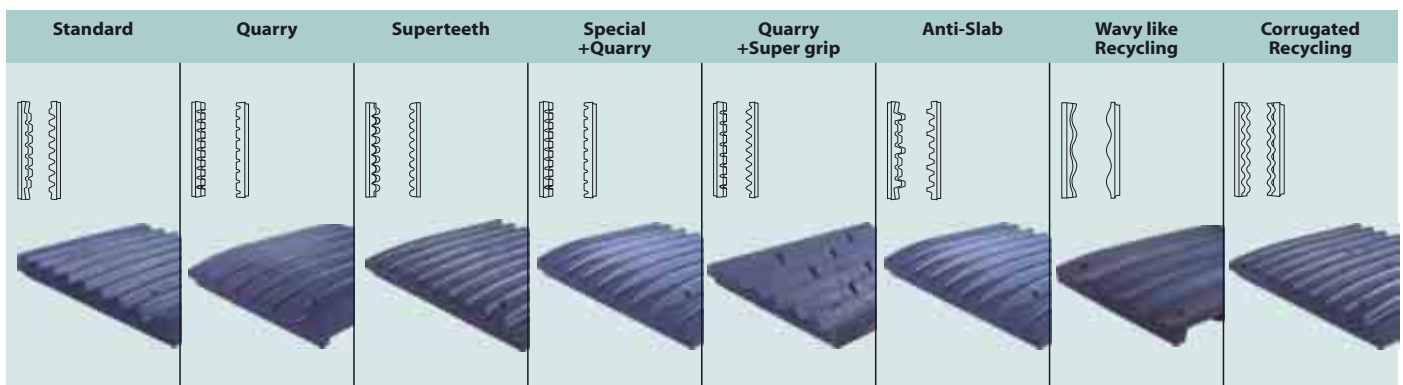
Many types of jaws have been developed over the years in order to optimize the performance of Nordberg C Series crushers in a very wide range of applications, including conventional quarries, mines, gravel pits, and recycling of demolition material and asphalt. The tooth profiles as well as the thickness of the jaws are optimized and combined with the right manganese steel alloys to maximize throughput and minimize operating costs. Metso Minerals also actively develops custom jaws for special applications. Special cheek plates are also available.



Initially developed for tough Scandinavian hard rock conditions, C Series jaw crushers crush even the hardest feed materials efficiently.



The right cavity design and kinematics are why C Series deliver high performance, time after time.



Many types of jaws are available for different applications. For recommendations concerning your specific application please contact Metso Minerals.





## Capacities & Technical specifications

	C80	C100	C96	C106	C116	C3054	C110	C125	C140	C145	C160	C200
Feed opening width mm (in)	800 (32)	1000 (40)	930 (37)	1060 (42)	1150 (45)	1375 (54)	1100 (44)	1250 (49)	1400 (55)	1400 (55)	1600 (63)	2000 (79)
Feed opening depth mm (in)	510 (20)	760 (30)	580 (23)	700 (28)	800 (32)	760 (30)	850 (34)	950 (37)	1070 (42)	1100 (43)	1200 (47)	1500 (59)
Power kW (HP)	75 (100)	110 (150)	90 (125)	110 (150)	132 (175)	160 (200)	160 (200)	160 (200)	200 (250)	200 (300)	250 (350)	400 (500)
Speed (rpm)	350	260	330	280	260	260	230	220	220	220	220	200
Product size mm (in)	Closed side setting mm (in)	Mtph (Stph)	Mtph (Stph)	Mtph (Stph)	Mtph (Stph)	Mtph (Stph)	Mtph (Stph)	Mtph (Stph)	Mtph (Stph)	Mtph (Stph)	Mtph (Stph)	Mtph (Stph)
0-30	20											
0-1 1/8	3/4											
0-35	25											
0-1 3/8	1											
0-45	30											
0-1 3/4	1 1/8											
0-60	40	55 - 75										
0-2 3/8	1 5/8	60 - 80										
0-75	50	65 - 95										
0-3	2	75 - 100										
0-90	60	80 - 110		105 - 135								
0-3 1/2	2 3/8	90 - 120		115 - 150								
0-105	70	95 - 135	125 - 175	125 - 155	150 - 185	165 - 205	210 - 270	160 - 220				
0-4 1/8	2 3/4	110 - 145	140 - 190	135 - 170	160 - 205	180 - 225	230 - 295	175 - 240				
0-120	80	110 - 150	145 - 200	140 - 180	165 - 215	180 - 235	240 - 300	175 - 245				
0-4 3/4	3 1/8	120 - 165	160 - 215	155 - 200	185 - 240	200 - 260	260 - 330	195 - 270				
0-135	90	125 - 175	160 - 220	160 - 200	190 - 235	205 - 255	260 - 330	190 - 275				
0-5 3/8	3 1/2	140 - 190	175 - 240	175 - 220	205 - 260	225 - 280	285 - 360	215 - 300				
0-150	100	140 - 190	180 - 250	175 - 225	205 - 265	225 - 285	285 - 365	215 - 295	245 - 335			
0-6	4	150 - 210	200 - 275	195 - 250	230 - 295	245 - 315	315 - 400	235 - 325	270 - 370			
0-185	125	175 - 245	220 - 310	220 - 280	255 - 325	270 - 345	345 - 435	260 - 360	295 - 405	325 - 445	335 - 465	
0-7	5	195 - 270	245 - 340	240 - 310	280 - 360	295 - 380	375 - 480	285 - 395	325 - 445	355 - 490	370 - 510	
0-225	150	210 - 290	265 - 365	265 - 335	305 - 385	320 - 405	405 - 515	310 - 430	345 - 475	380 - 530	395 - 545	430 - 610
0-9	6	230 - 320	290 - 400	290 - 370	335 - 428	350 - 450	445 - 565	340 - 470	380 - 525	420 - 580	435 - 600	475 - 670
0-260	175	245 - 335	310 - 430	310 - 390	355 - 450	370 - 465	465 - 595	350 - 490	395 - 545	435 - 605	455 - 625	495 - 695
0-10	7	270 - 370	340 - 470	340 - 430	390 - 495	405 - 515	515 - 650	390 - 540	435 - 600	480 - 665	500 - 690	545 - 765
0-300	200		355 - 490		395 - 500	410 - 520	530 - 670	405 - 555	445 - 615	495 - 685	510 - 710	560 - 790
0-12	8		390 - 535		445 - 560	460 - 580	580 - 740	445 - 610	490 - 675	545 - 750	565 - 780	615 - 870
0-340	225								495 - 685	550 - 760	570 - 790	625 - 880
0-13	9								545 - 750	605 - 835	630 - 870	685 - 965
0-375	250								545 - 755	610 - 840	630 - 870	685 - 965
0-15	10								600 - 830	670 - 925	695 - 960	755 - 1060
0-410	275										690 - 950	745 - 1055
0-16	11										760 - 1045	820 - 1160
0-450	300											815 - 1145
0-18	12											895 - 1260
												1120 - 1575

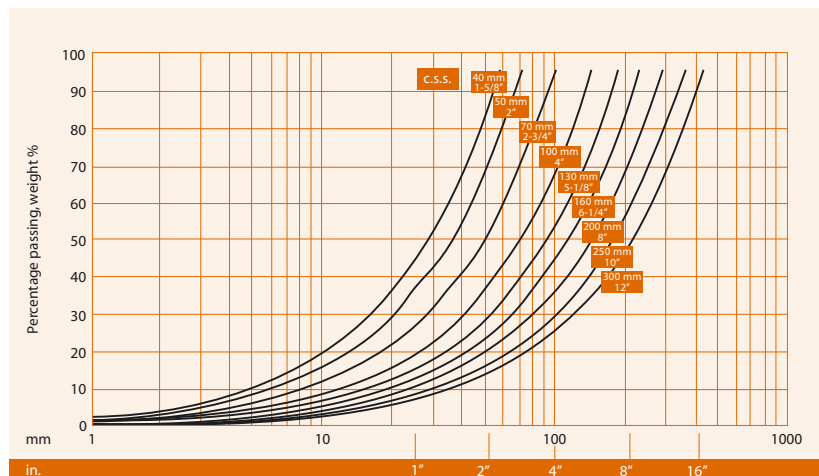
\* Smaller closed side settings can be often used depending on application and production requirements. For a performance estimation for your specific application, please contact Metso Minerals.

The above figures represent through the crusher capacities, which are based on a feed material with an average specific gravity of 2.7 t/m<sup>3</sup>, a maximum feed size that will enter the crusher without bridging and material finer than the crushers closed side setting removed. The capacities may vary depending on the feeding method and on feed characteristics such as gradation, bulk density, moisture, clay content and crushability.

Measurement of the crusher's closed side setting varies depending on the jaw profile that is being used and has an impact on the crusher's capacity and product gradation. The following factors will enhance crusher capacity and performance:

1. Proper selection of the jaws.
2. Proper feed gradation.
3. Controlled feed rate.
4. Sufficient feeder capacity and width.
5. Adequate crusher discharge area.
6. Discharge conveyor sized to convey maximum crusher capacity.

### Indicative product gradation



A Nordberg C110 jaw crusher in a stationary installation.



## Low installation and operating costs

In addition to bringing you high performance, C Series crushers are also designed to bring your total crushing costs down. Each unique feature of the C Series brings specific benefits that have a direct impact on the bottom line – which means that you will be more profitable. Those who have owned and operated C Series jaw crushers know that not all jaw crushers are the same!

## Fast and safe setting adjustment systems

All C Series crushers are equipped with a proven, rugged and fast wedge setting adjustment system. The wedge setting adjustment is simpler, much safer and faster than outdated shim adjustment systems.

The crusher's setting can be manually adjusted with tools that are supplied with the crusher in a matter of minutes, without having to handle dirty and bulky shims. Alternatively, the crusher's setting can be changed in seconds, from a remote location, even while the crusher is idling! The system is also especially effective at clearing the crusher's cavity should it stall under load due to interruptions in the supply of electric power.

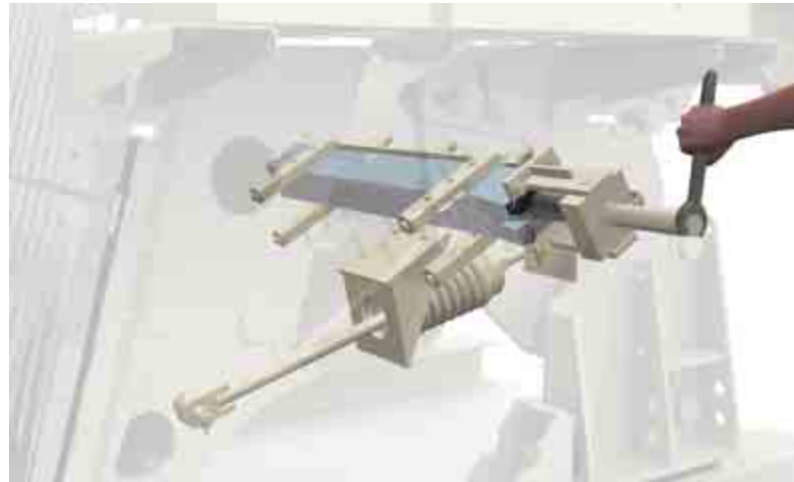
## Tired of repairing your jaw crusher's foundation?

Rubber dampers and stoppers effectively decrease crushing loads to the foundation by absorbing peak shock loads and allowing the crusher to move vertically and longitudinally. This unique and innovative system eliminates the need for anchor bolts, and is a much more desirable solution as all anchor bolts eventually damage jaw crusher foundations.

## The most durable bearings available

All C Series jaw crushers incorporate larger and sturdier eccentric shaft bearings than other crushers of comparable size. Their higher load bearing capacity and effective labyrinth seals result in considerably longer bearing lifetimes.

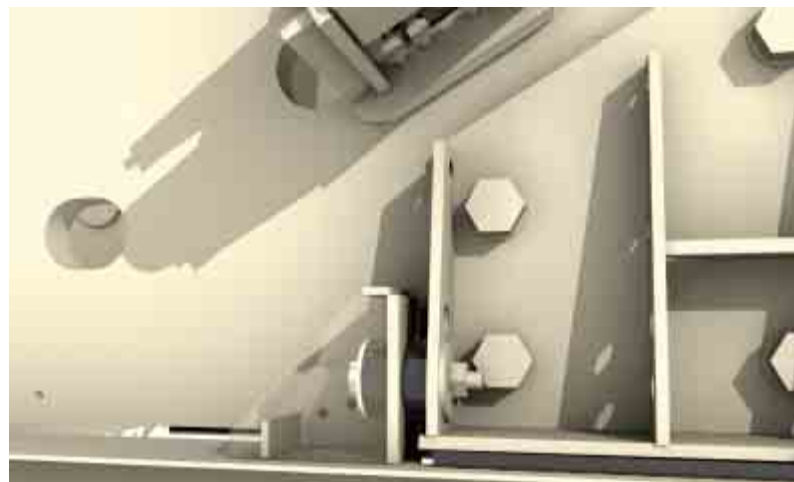
*A Nordberg C140 jaw crusher in a stationary installation.*



*The manual wedge setting adjustment is faster and safer than outdated shim setting adjustment systems.*



*The hydraulic wedge setting adjustment allows you to change the setting in seconds even while the crusher is idling.*



*Special rubber dampers and stoppers allow the crusher to move vertically and longitudinally while preventing wear and subsequent damage to the crusher's foundation.*



## Versatile integral motor base

An integral motor base is mounted on the main frame of the crusher, thereby reducing the need for space and excessively long v-belts. V-belt lifetime is prolonged because there is no differential movement between the crusher and the integral motor base, and the base pivots on the crusher in order to adjust v-belt tension. It also accommodates both IEC and NEMA electric motors.

Use of the integral motor base allows for the use of standard flywheel guards, thereby eliminating the need for local engineering and fitting.

## Compact and service friendly flywheel guards

Flywheel guards are bolted onto the crusher's side plates and effectively protect operators from the potentially dangerous moving parts. Viewing windows and access doors allow service crews to inspect and service the crusher. Their use also gives greater access to the crusher as the guards are not laying on the service platform.

## Custom feed chute

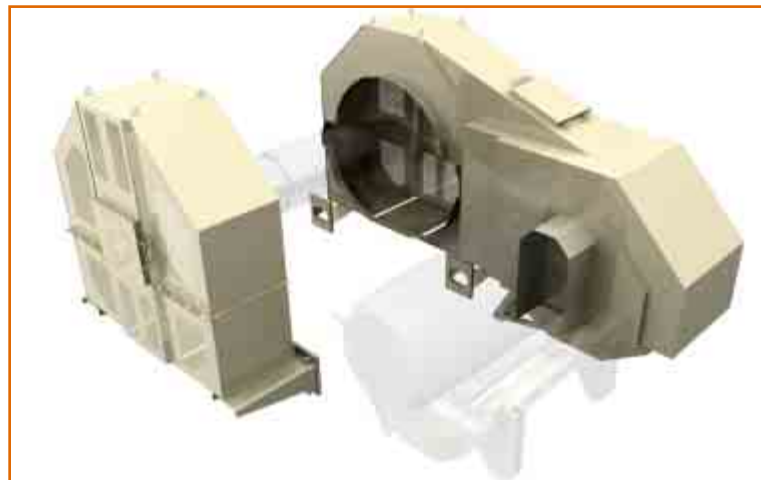
The feed chute is designed to effectively guide the feed into the crusher's cavity. Jaw and cheek plate removal and installation are carried out without having to move or remove the feed chute. The feed chute is bolted to the crusher and can be removed for other maintenance purposes.

## Other excellent cost saving features

There are several additional features that will assist you in reaching lower operating and installation costs. Amongst these features are an automatic grease lubrication system, different mounting brackets to accommodate different feeding heights, temperature and speed sensors, protection plates, and intermediate plates in order to maximize the utilization of the manganese jaws. There are even special deflection plates available in order to protect the crusher discharge conveyor belt from sharp steel bars that are often present in recycling applications.



*The integral motor base reduces space requirements and maintenance costs.*



*The flywheel guards reduce space requirements around the crusher.*



*The feed chute effectively protects the crusher and can be removed from the crusher for maintenance purposes.*



## The right choice for surface installations

Nordberg C Series jaw crushers are the right choice for stationary surface installations at quarries, mines, gravel pits and even recycling plants. Their ease of installation, serviceability and productivity make them especially suitable for existing installations or new green-field primary crushing plants.

## The excellent replacement for your existing crusher

Due to their overall space requirements, C Series crushers are an ideal choice for the replacement of existing double and single toggle jaw crushers. Foundation loads, when compared to those of older version crushers, are less and therefore modifications to the existing foundation are rarely required.

An increase in plant capacity, the ability to process a coarser feed and the ability to produce a finer product are common benefits when replacing double toggle as well as single toggle jaw crushers of comparable size.

## Comprehensive expertise in complete plants

Metso Minerals designs and supplies complete aggregate crushing and screening systems. We are globally local, and manage plant design, equipment selection, sourcing, manufacturing, installation, and commissioning.

New primary crushing plants are tailored to each customer's needs. Various types of feed arrangements, automation, serviceability and overall cost effectiveness are the trademarks of our success.



*A C125 during the installation phase at a new primary crushing plant.*



*A C145 during the installation phase at a new primary crushing plant.*



*A C200 after replacement of a double toggle jaw crusher. Plant capacity was increased without having to modify the foundations.*

*A Nordberg C145 jaw crusher in a stationary installation.*





## The right choice for underground installations

C Series jaw crushers are indisputably the most popular crushers in underground mines and quarries all around the globe. Their productivity, reliability, ease of transport and possibility to automate make them an ideal choice for operations that run 24 hours a day.

## Underground assembly

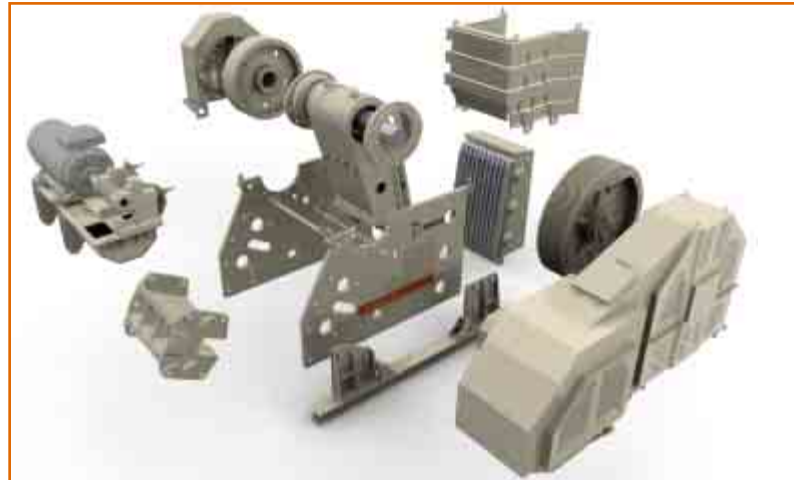
Transportation of C Series crushers to underground installations is greatly simplified as each major component can be handled individually, and final crusher assembly is done underground. This has a direct impact on mine planning that often results in considerable time and cost savings.

Final assembly underground requires typical lifting facilities and a surprisingly short amount of time.

## Easy to automate

Due to their hydraulic setting adjustment, C Series jaw crushers can be fully integrated into plant automation systems. The setting of the crusher can be changed from an electrical cabinet next to the crusher, or from the operator's room, all at the touch of a button, and even while the crusher is idling.

The lubrication of the crusher's bearings can also be automated. Bearing temperatures, crusher speed and cavity levels can all be measured and fully integrated into plant automation systems.



*C Series jaw crushers, with their pinned and bolted design, are easy to transport and maneuver even in narrow underground mines.*



*C160 at an underground gold mine.*



*A Nordberg C200 jaw crusher being assembled at an underground mine. The crusher was transported in pieces and assembled underground.*

*C200 in operation in a zinc and copper underground mine 1400 meters below ground. The crusher is monitored and operated from the surface control room.*



## The leader in primary jaw crusher mobile plants

Metso Minerals has pioneered the development of track-mounted, fully mobile crushing plants, and has also supplied wheel-mounted and semi-mobile plants for many decades. The Lokotrack (LT) and Nordberg NW mobile jaw plants are used in aggregate production, mining, recycling, cement production and tunnel crushing.

At the heart of every jaw crusher mobile plant is a Nordberg C Series jaw crusher.

## Full mobility with the Lokotrack range

The Lokotrack Series mobile crushing plant is based on the innovative idea of flexibility, by moving the equipment to the rock face in order to eliminate the need for haulage trucks. Lokotracks can be moved within and between sites, which means lowered material transport costs. Transportability can further be improved with special options like the bogie and split versions. Fully mobile crushing equipment offers considerable benefits, including less quarry traffic, less dust, noise and exhaust emissions. All this combines to create a safer and cleaner working environment.

## There's a Nordberg mobile plant for every crushing process

Whether the priority requirement is high production capacity, good process adaptability, excellent cubicity or efficient recycle crushing, the Metso Minerals mobile plant range can provide the right answer.

From contract crushing to demanding in-pit crushing applications, Metso Minerals has the right mobile plant specified for your capacity and end product needs.



*The Lokotrack LT106 in recycling operation in Germany.*

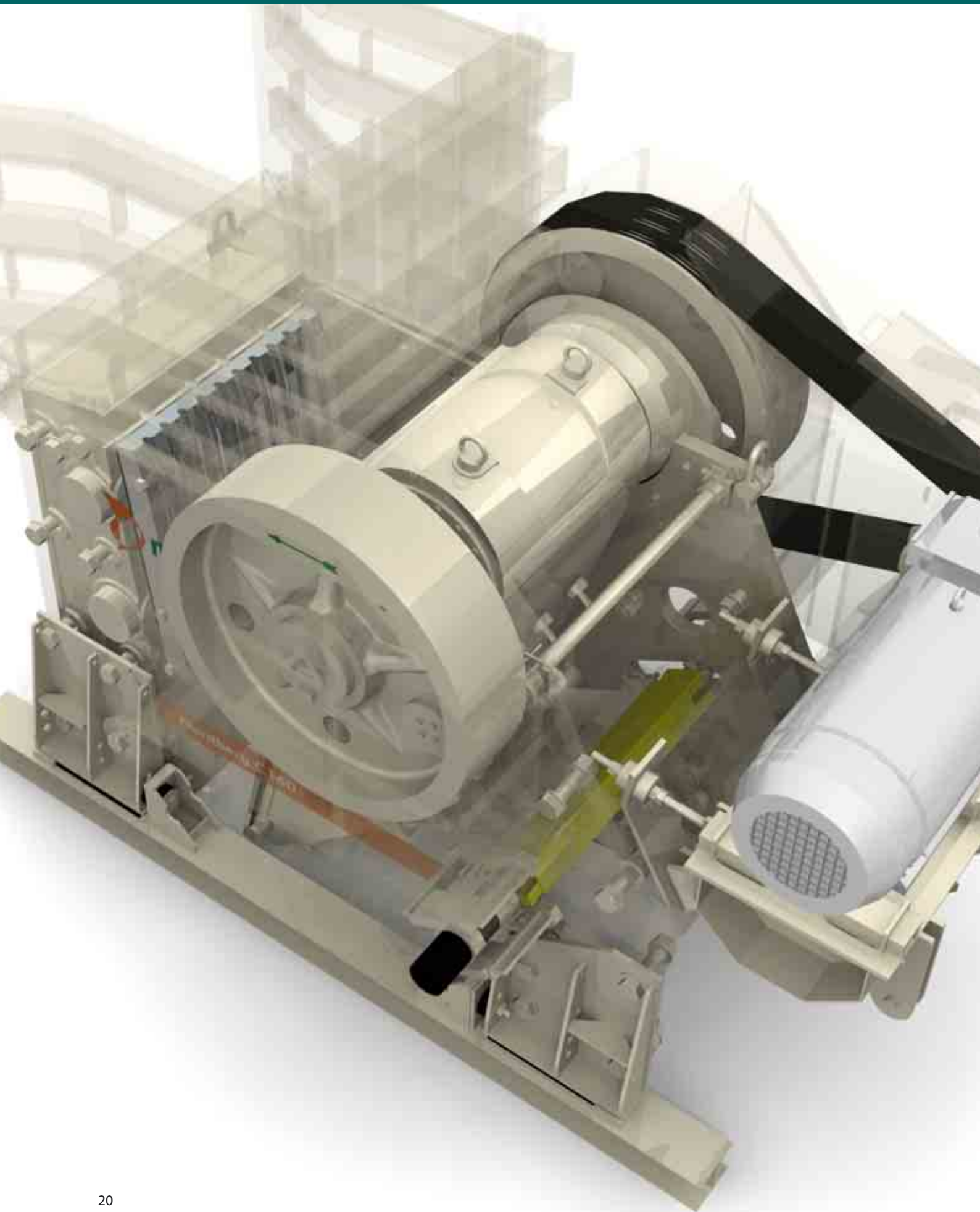


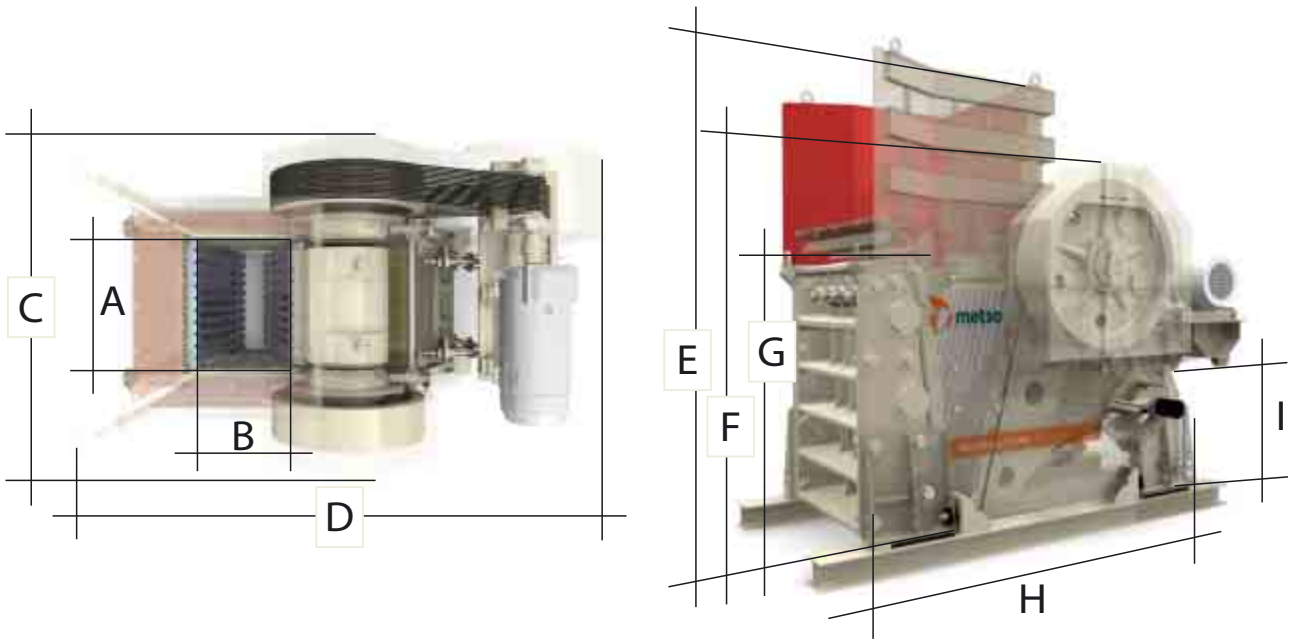
*Three stage crushing and screening process with the Lokotrack LT110, LT300GP and LT300GPB.*



*Mobile crushing with the NW125.*

*The gigantic Lokotrack LT160, coupled with Lokolink in-pit mobile conveyors, eliminates the need for haulage trucks.*





## Dimensions & Weights

		C80	C100	C96	C106	C116	C3054	C110	C125	C140	C145	C160	C200
A	mm	800	1000	930	1060	1150	1380	1100	1250	1400	1400	1600	2000
	in.	32	40	37	42	45	54	44	50	56	56	63	79
B	mm	510	760	580	700	800	760	850	950	1070	1100	1200	1500
	in.	21	30	23	28	32	30	34	38	43	44	48	60
C	mm	1526	2420	1755	2030	2400	2640	2385	2800	3010	3110	3700	4040
	in.	61	96	70	80	95	104	94	111	119	123	146	160
D	mm	2577	3670	2880	3320	3600	3540	3770	4100	4400	4600	5900	6700
	in.	102	145	114	131	144	140	149	162	174	182	233	264
E	mm	1990	2890	1610	2075	2675	2470	2890	3440	3950	4100	4580	4950
	in.	79	114	64	82	105	98	114	136	156	162	181	195
F	mm	1750	2490	1460	2005	2730	2470	2750	2980	3140	3410	3750	4465
	in.	69	99	58	79	107	98	109	118	124	135	148	176
G	mm	1200	1700	755	1135	1790	1080	1940	2100	2260	2430	2650	2800
	in.	48	67	30	45	71	43	77	83	89	96	105	111
H	mm	2100	2965	2500	2630	2885	2950	2820	3470	3755	3855	4280	4870
	in.	83	117	99	104	114	117	112	137	148	152	169	192
I	mm	625	775	465	700	1255	690	580	980	1050	1050	1300	1400
	in.	25	31	19	28	50	28	23	39	42	42	52	56
Basic crusher weight <sup>1)</sup>	kg	7 670	20 060	9 759	14 350	18 600	25 900	25 800	37 970	47 120	54 540	71 330	121 510
	lbs	16 900	44 240	21 520	31 650	40 920	57 100	56 880	83 730	103 900	120 260	157 280	267 930
Operational crusher weight <sup>2)</sup>	kg	9 520	23 300	11 870	17 050	21 500	30 300	29 500	43 910	54 010	63 190	83 300	137 160
	lbs	21 000	51 390	26 170	37 590	47 300	66 800	65 050	96 830	119 100	139 330	183 680	302 440

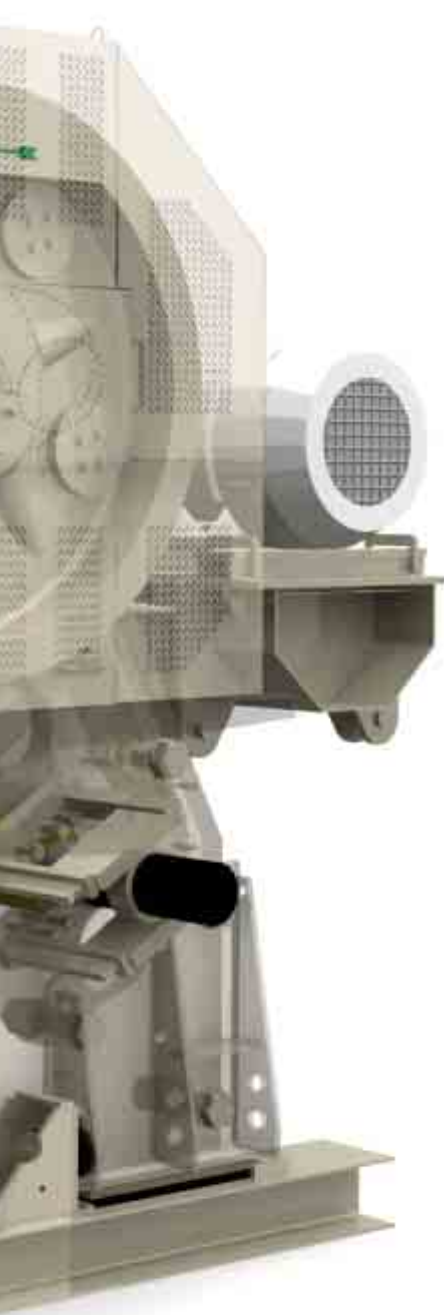
<sup>1)</sup> Crusher without options

<sup>2)</sup> Crusher, hydraulic setting adjustment, flywheel guards, integral motor support, feed chute, automatic grease lubrication system, and typical electric motor.

Certified general arrangement, foundation and service space requirement drawings are available from Metso Minerals.



# Not all jaw crushers are the same



Contrary to popular belief, not all jaw crushers are the same. This is certainly the case for Nordberg C Series jaw crushers, and there is no secret to this success. Take a closer look at the world's favourite jaw crusher!

## **High quality and reliability**

- World-class craftsmanship and materials
- Modular, non welded construction
- Four equal size bearings that are larger than those of most crushers of comparable size
- Cast steel pitman and crusher frames
- Single-piece cast steel frame bearing housings
- Repairable crusher construction

## **High performance**

- The right cavity design
- Large stroke, optimum speed, and high installed power
- Small crusher settings
- The right jaws and cheek plates for the widest range of applications

## **Low operating and installation costs**

- Easy to automate
- Fast and safe wedge setting adjustment system
- Protection plates behind the jaw plates
- Rubber damper crusher mounting
- Versatile integral motor base
- Compact and service friendly flywheel guards
- Custom feed chute
- Automatic grease lubrication system

## **Used in a wide range of applications, both stationary and mobile**

- Aggregate
- Mining (surface and underground)
- Recycling (concrete, asphalt, etc.)
- Industrial (slag, anodes, etc.)



## Metso Minerals Crushing Equipment

### Our ranges:

#### Unit Crushers

C Series jaw crushers  
Primary gyratory crushers  
GP Series cone crushers  
HP Series cone crushers  
MP Series cone crushers  
NP Series horizontal impact crushers  
Barmac Series vertical impact crushers  
Lindemann Series metal crushers  
Nordberg laboratory crushers  
Nordberg AC Series air classifiers

#### Mobile Equipment

LT Series mobile crushing plants  
NW Series portable plants

#### Complete Plants

Complete plants for aggregate production  
Complete plants for recycling

#### Metso Minerals Construction

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## Secondary and Tertiary Crushers



## Nordberg HP Series Cone Crushers





## High Performance for Higher Profitability

**For high productivity, low operating and wear costs, long service life, and high product yield with desired fines, there's no better choice than a cone crusher. And Metso Minerals leads this market with its high-performance HP Series cone crushers for the aggregate and mining markets.**

Nordberg HP (High Performance) Series cone crushers feature a unique combination of crusher speed, throw, and cavity design. This combination has proved revolutionary in providing higher capacity and superior product quality, and in providing a wider range of application suitability. From lime-stone to taconite, from ballast production to manufactured sand, and from small portable plants, HP cone crushers provide unbeatable performance in secondary, tertiary, and quaternary applications.

### **A history of quality**

Nordberg HP cone crushers are built on the success of our 70+ years of Symons cone experience, and 20+ years of Nordberg Omnicone experience.

The Symons cone is well known for its rugged construction and application versatility. The Symons cone has set the standard in the mining industry, where 24-hour, high-reduction applications can destroy all but the most ruggedly built machine.

The Nordberg Omnicone introduced many new innovations to reduce maintenance and operating costs, and to provide designed-in modern features such as hydraulic setting adjustment, tramp release, and cavity clearing.

The field-proven HP series combines the best of these technologies to provide the highest capacity, the best product shape, the highest on-spec yield, easy automation, and the greatest possible reliability and flexibility. All to help you achieve the highest possible levels of profitability.

# The Nordberg HP Series



HP100

HP200

HP300

HP400

HP500

HP800



## Reach New Heights with Metso Minerals

### Higher capacity

Thanks to the patented combination of higher speed and throw, which increases the machine's power rating and throughput capability, HP Series cone crushers have the highest capacities for their size in the industry.

HP technology allows you to use either fewer or smaller units to get the highest possible production out of the smallest possible space. Metso Minerals pioneered the HP technology, having developed it in 1989 through extensive pilot and full-size prototype testing. Metso Minerals has been awarded patents for these innovative efforts.

### Higher quality

The unique interparticle crushing action of HP Series cone crushers creates a higher value for your product by providing a more consistent gradation and a superior product shape (cubicity). The ability to operate at a fixed mechanical setting – instead of the head floating on a column of hydraulic oil – creates less setting drift and provides more stability throughout the circuit. The proven benefit of a threaded rotating bowl maintains a consistent setting around the entire circumference of the crushing chamber. Also, the use of a tramp release system with a fixed return point makes sure that the crusher setting is instantaneously maintained even after passing a piece of tramp iron. HP Series cone crushers also enable you to produce a finer product with fewer crushing stages, lowering your capital costs and saving energy.

### Higher yield

By operating the HP cone crusher on the lower end of its speed range, the product gradation can be shifted to produce fewer fines and a higher percentage of on-spec product. The HP cone crusher creates a higher value product with less waste.



Nordberg HP800 Cone Crusher.

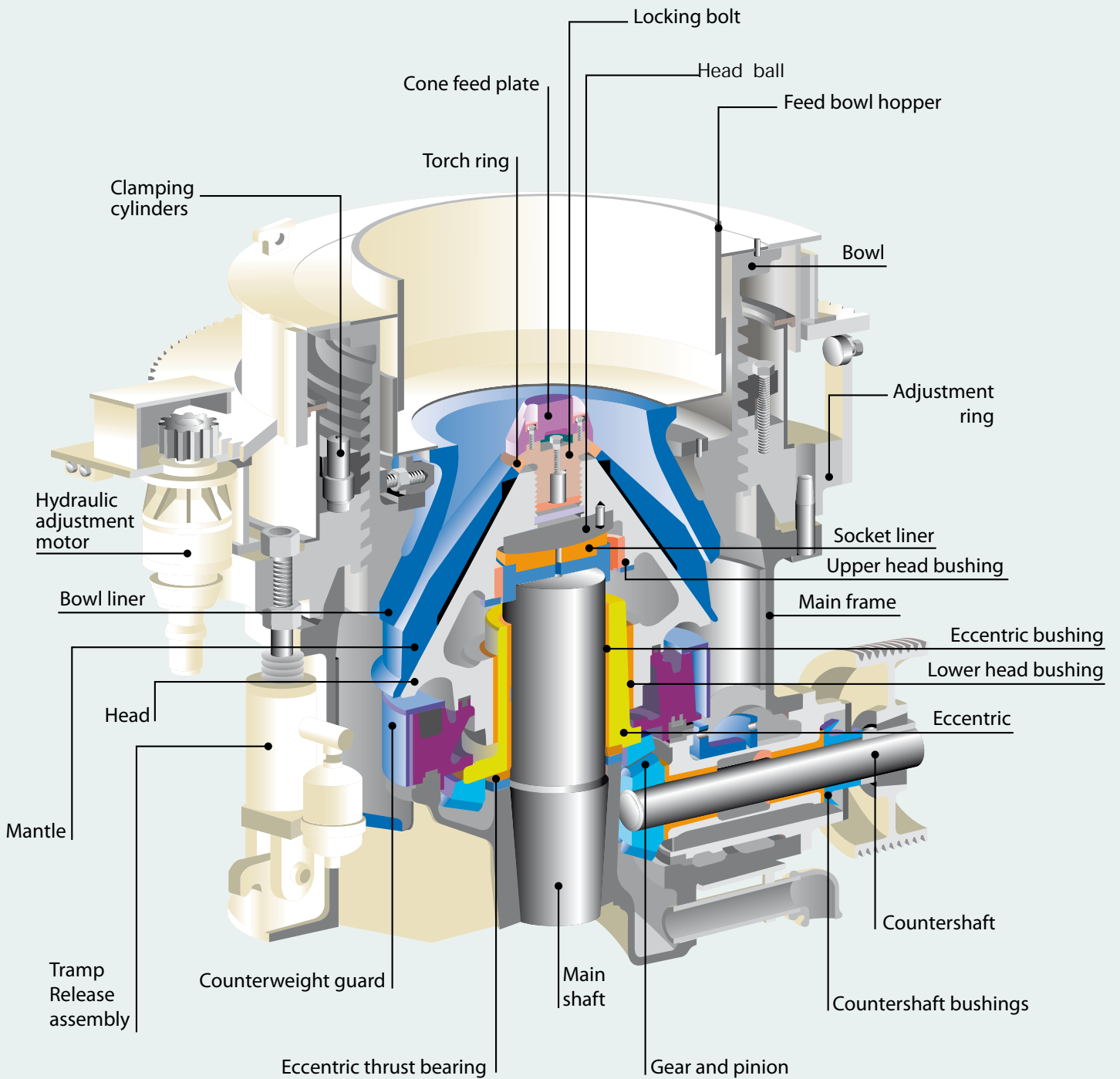


Mobile: The Nordberg NW300HP is a highly mobile, closed-circuit crushing and screening plant. Ideal for contractors, it can transform your feed stock into three finished fractions.



Stationary: One HP500, one HP300, two HP200 crushing "Amphibolite".

# Main Components





## Less downtime

Dual-acting hydraulic tramp release cylinders mean the HP cone crushers can pass tramp iron that would stall many competitors' crushers. The large clearing stroke independent of liner wear reduces the effort required to clear a stalled crusher, reducing downtime and increasing operator confidence.

Hydraulic motors rotate the bowl for fine control setting adjustments that also rotate the bowl completely out of the adjustment ring threads for liner changeout, greatly simplifying liner change.

Advanced liner retention technology increase reliability: Bowl retaining wedges engage a self-tightening helix on the upper section of the bowl liner, while a self-tightening lock-bolt retains the mantle.

## Easy to maintain

Bronze bushings used throughout provide superior load capability in the high-shock, dusty crushing environment. They're low-cost, and easy to replace in the field with normal tools. HP cone crushers are easy to disassemble. All components are accessible from the top or the side. The head and bowl can be removed without upsetting a bolted interference fit.

## Low maintenance costs

High performance non-contacting labyrinth seals provide high reliability by keeping out dust without wearing out. Their simple design means fewer moving parts come into contact with the rock and dust.

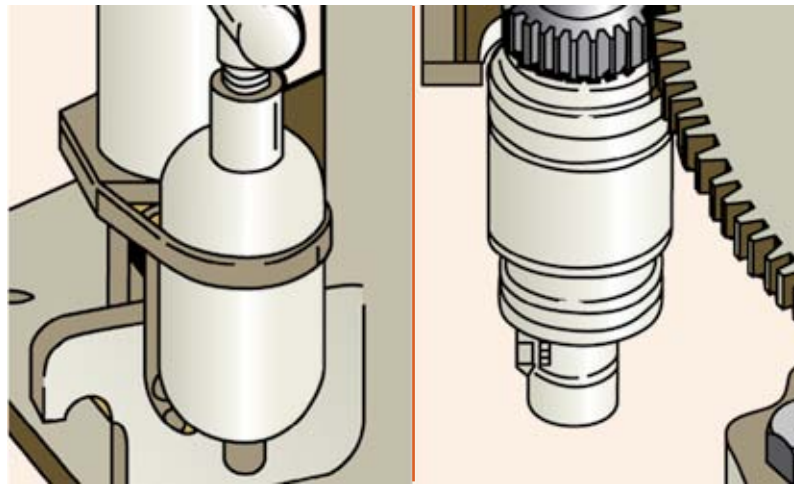
Excellent wear protection of all crusher components – including replaceable head ball, mainframe seat liners, mainframe pin bushings, countershaft box frame ring, counterweight guard, mainframe liners, and the dead-bed feed hopper – keep maintenance costs to a minimum.

## Application flexibility

HP cone crushers can be converted from the finest to the coarsest cavity simply by replacing the mantle, bowl liner, adapter ring, and wedge bolts.

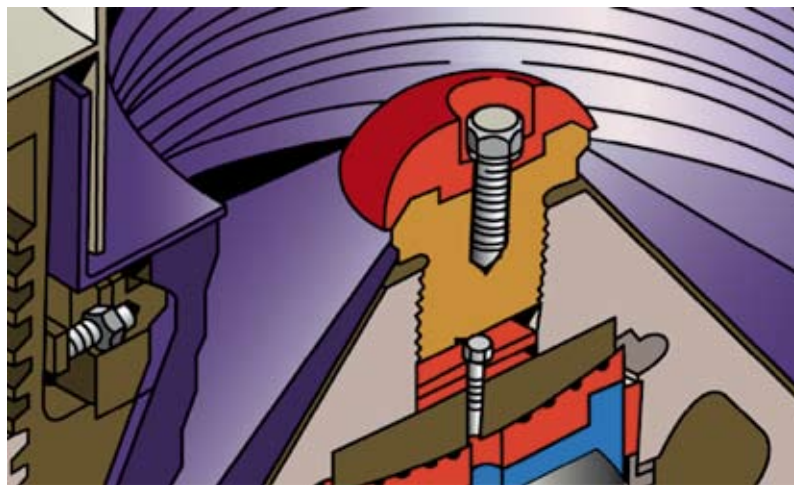
## Easy to operate

Using the hydraulic motor setting adjustment with the adjustment under load capability makes it easy to balance the crushing circuit and optimize crusher productivity. The addition of a hydraulic motor position transducer system to keep track of crusher setting is all that's required to connect the crusher to a plant DCS system for full automation applications.

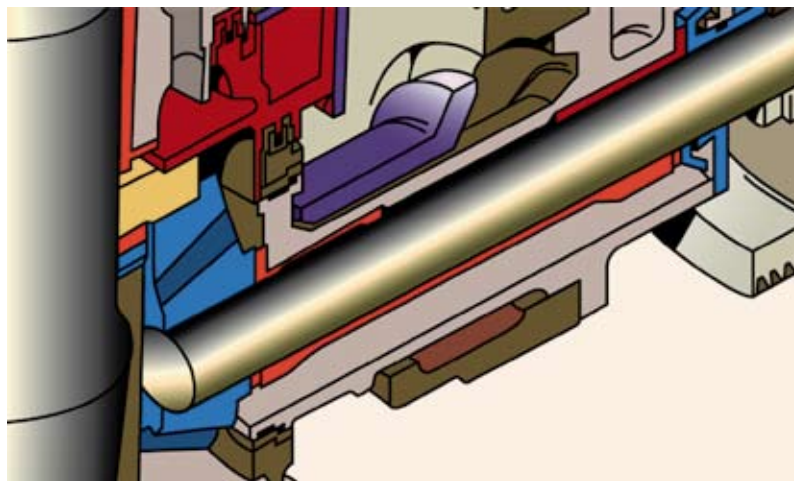


Release system

Hydraulic adjustment

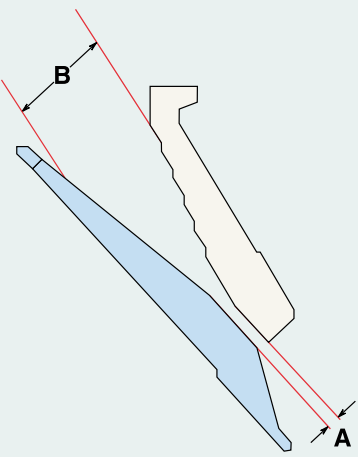


Liners fixing



Sealing system

## Crusher Cavity Selection



Crusher size	Cavity	STANDARD		SHORT HEAD	
		Minimum Setting "A" <sup>1</sup>	Feed Opening "B" <sup>2</sup>	Minimum Setting "A" <sup>1</sup>	Feed Opening "B" <sup>2</sup>
HP100	Extra Fine			6 mm (0.24")	20 mm (0.79")
	Fine			9 mm (0.35")	50 mm (1.97")
	Medium			9 mm (0.35")	70 mm (2.76")
	Coarse			13 mm (0.51")	100 mm (3.94")
	Extra Coarse			21 mm (0.83")	150 mm (5.91")
HP200	Extra Fine			6 mm (0.24")	25 mm (0.98")
	Fine	14 mm (0.55")	95 mm (3.74")	6 mm (0.24")	25 mm (0.98")
	Medium	17 mm (0.67")	125 mm (4.92")	6 mm (0.24")	54 mm (2.13")
	Coarse	19 mm (0.75")	185 mm (7.28")	10 mm (0.39")	76 mm (2.99")
	Extra Coarse				
HP300	Extra Fine			6 mm (0.24")	25 mm (0.98")
	Fine	13 mm (0.51")	107 mm (4.21")	6 mm (0.24")	25 mm (0.98")
	Medium	16 mm (0.63")	150 mm (5.91")	8 mm (0.31")	53 mm (2.09")
	Coarse	20 mm (0.79")	211 mm (8.31")	10 mm (0.39")	77 mm (3.03")
	Extra Coarse	25 mm (0.98")	233 mm (9.17")		
HP400	Extra Fine			6 mm (0.24")	30 mm (1.18")
	Fine	14 mm (0.55")	111 mm (4.37")	6 mm (0.24")	40 mm (1.57")
	Medium	20 mm (0.79")	198 mm (7.80")	8 mm (0.31")	52 mm (2.05")
	Coarse	25 mm (0.98")	252 mm (9.92")	10 mm (0.39")	92 mm (3.62")
	Extra Coarse	30 mm (1.18")	299 mm (11.77")		
HP500	Extra Fine			6 mm (0.24")	35 mm (1.38")
	Fine	16 mm (0.63")	133 mm (5.24")	8 mm (0.31")	40 mm (1.57")
	Medium	20 mm (0.79")	204 mm (8.03")	10 mm (0.39")	57 mm (2.24")
	Coarse	25 mm (0.98")	286 mm (11.26")	13 mm (0.51")	95 mm (3.74")
	Extra Coarse	30 mm (1.18")	335 mm (13.19")		
HP800	Extra Fine			5 mm (0.20")	33 mm (1.30")
	Fine	16 mm (0.63")	219 mm (8.62")	10 mm (0.39")	92 mm (3.62")
	Medium	25 mm (0.98")	267 mm (10.51")	10 mm (0.39")	92 mm (3.62")
	Coarse	32 mm (1.26")	297 mm (11.69")	13 mm (0.51")	155 mm (6.10")
	Extra Coarse	32 mm (1.26")	353 mm (13.90")		

1 The minimum setting is that at which the crusher will operate without causing ring bounce. Depending on the crusher characteristics of the rock, this setting can change.

2 Feed opening "B" is at a minimum setting "A".

3 Maximum feed size vary from 80 to 100% of "B" depending on machine size and material.

## Product Gradation Table (% passing through square mesh depending on the setting)

	6 (1/4")	8 (5/16")	10 (3/8")	13 (1/2")	16 (5/8")	19 (3/4")	22 (7/8")	25 (1")	28 (1-1/8")	32 (1-1/4")	38 (1-1/2")	45 (1-3/4")	51 (2")
100 (4")	100	100	100	100	100	100	100	100	100	100	100	100	100
75 (3")	100	100	100	100	100	100	100	100	100	100	100	100	98
63 (2-1/2")	100	100	100	100	100	100	100	100	100	100	99	95	90
51 (2")	100	100	100	100	100	100	100	100	99	98	92	82	68
38 (1-1/2")	100	100	100	100	100	100	100	98	95	90	76	62	50
32 (1-1/4")	100	100	100	100	100	100	95	90	79	69	52	42	36
25 (1")	100	100	100	100	98	94	85	74	60	49	40	33	28
22 (7/8")	100	100	100	100	95	88	76	63	51	42	34	28	25
19 (3/4")	100	100	100	98	92	82	68	57	46	37	30	26	22
16 (5/8")	100	100	99	92	80	69	55	46	36	29	24	20	18
13 (1/2")	100	99	92	78	66	55	43	36	28	22	18	16	14
10 (3/8")	100	93	81	66	55	45	34	30	23	18	15	13	11
8 (5/16")	94	82	69	55	45	37	28	24	19	15	13	11	10
6 (1/4")	82	67	55	43	36	29	22	19	16	12	9	8	7
4 (#5)	65	49	40	32	26	21	16	14	11	9	7	6	5
2 (#8)	40	28	23	17	13	11	8	7	6	4	3.5	3	2.5

## Crusher Capacities<sup>1</sup>

CLOSED SIDE SETTING													
Size	Tone/ hour	6 mm (1/4")	8 mm (5/16")	10 mm (3/8")	13 mm (1/2")	16 mm (5/8")	19 mm (3/4")	22 mm (7/8")	25 mm (1")	32 mm (1 1/4")	38 mm (1 1/2")	45 mm (1 3/4")	51 mm (2")
HP100	Mtph stph	45-55 50-60	50-60 55-65	55-70 60-75	60-80 65-90	70-90 80-100	75-95 85-105	80-100 85-110	85-110 95-120	100-140 110-155			
HP200	Mtph stph			90-120 100-130	120-150 130-165	140-180 155-200	150-190 165-210	160-200 175-220	170-220 185-240	190-235 210-260	210-250 230-275		
HP300	Mtph stph			115-140 125-155	150-185 165-205	180-220 200-240	200-240 220-265	220-260 240-285	230-280 255-310	250-320 275-355	300-380 330-420	350-440 385-485	
HP400	Mtph stph			140-175 155-195	185-230 205-255	225-280 250-310	255-320 280-355	275-345 305-380	295-370 325-410	325-430 360-475	360-490 395-545	410-560 450-625	465-630 510-700
HP500	Mtph stph			175-220 195-240	230-290 255-320	280-350 310-385	320-400 355-440	345-430 380-475	365-455 400-500	405-535 445-595	445-605 490-670	510-700 560-775	580-790 640-880
HP800	Mtph stph			260-335 285-370	325-425 360-470	385-500 425-550	435-545 480-600	470-600 520-660	495-730 545-805	545-800 600-880	600-950 550-1045	690-1050 760-1155	785-1200 865-1320

<sup>1</sup> Represents capacity through crusher based "instantaneous" product sample.

## Crusher Capacities

Cone crusher capacity charts are developed for use as an application tool to properly utilize the HP crusher's capabilities.

The capacity figures shown apply to material weighing 100 pounds per cubic foot or 1600 kg per cubic meter. The crusher is one component of the circuit. As such, its performance is in part dependent on the proper selection and operation of feeders, conveyors, screens, supporting structure, electric motors, drive component and surge bins. Where used, attention to the following factors will enhance crusher capacity and performance.

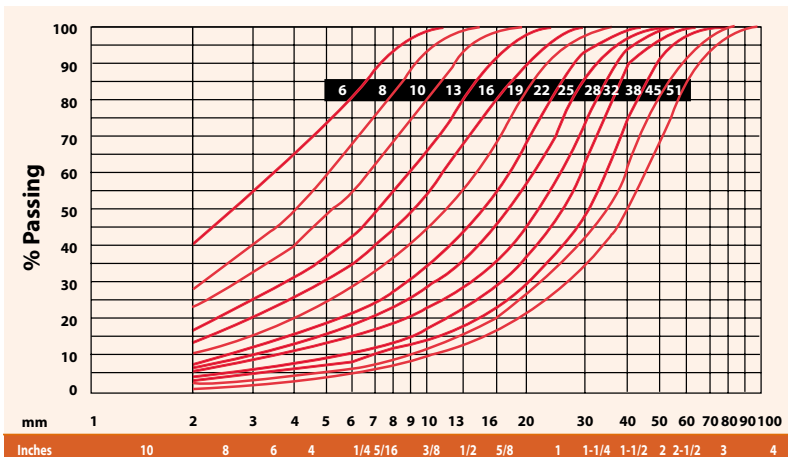
1. Proper selection of crushing chamber for material to be crushed.
2. A feed grading containing proper distribution of the particle size.
3. Controlled feed rate.
4. Proper feed distribution 360° around crushing chamber.
5. Discharge conveyor sized to carry maximum crusher capacity.
6. Properly sized scalping and closed circuit screens.
7. Automation controls.
8. Adequate crusher discharge area.

The following factors will detract from crusher capacity and performance.

1. Sticky material in crusher feed.
2. Fines in crusher feed (smaller than crusher setting) exceeding 10% of crusher capacity.
3. Excessive feed moisture.
4. Feed segregation in crusher cavity.
5. Improper feed distribution around circumference of crusher cavity.
6. Lack of feed control.
7. Inefficient use of recommended connected horsepower.
8. Insufficient conveyor capacity.
9. Insufficient scalper and closed circuit screen capacities.
10. Insufficient crusher discharge area.
11. Extremely hard or tough material.
12. Operation of crusher at less than recommended full load countershaft speed.

**For individual conditions, consult Metso Minerals.**

## Gradation Curves\*



% passing through a square mesh depending on the setting

\* The gradation and capacities shown are dependent on the feed gradation, the crushing chamber, the material density, the material cleanliness, its moisture and its crushability.

## Weights - Complete Crusher and Assemblies

Size	HP100	HP200	HP300	HP400	HP500	HP800
Crusher Complete	5 400 kg 11 900 Lbs	10 400 kg 22 960 Lbs	15 810 kg 33 490 Lbs	23 000 kg 50 600 Lbs	33 150 kg 73 000 Lbs	68 650 kg 151 200 Lbs
Bowl, Bowl Liner, Adj. Cap, Hopper	1 320 kg 2 910 Lbs	2 680 kg 5 915 Lbs	3 525 kg 7 765 Lbs	4 800 kg 10 575 Lbs	7 200 kg 15 800 Lbs	17 350 kg 38 220 Lbs
Head Mantle and Feed Plate	600 kg 1 325 Lbs	1 200 kg 2 650 Lbs	2 060 kg 4 550 Lbs	3 240 kg 7 130 Lbs	5 120 kg 11 280 Lbs	10 800 kg 23 790 Lbs
Maximum recommended Power	90 kW 125 HP	132 kW 200 HP	200 kW 300 HP	315 kW 400 HP	355 kW 500 HP	600 kW 800 HP
Countershaft Speed-rpm	750-1200	750-1200	700-1200	700-1000	700-950	700-950

## Clearance dimensions

Size	HP100	HP200	HP300	HP400	HP500	HP800
A. To bottom of oil piping	293 mm (11-9/16")	297 mm (11-11/16")	328 mm (12-15/16")	240 mm (9-1/2")	425 mm (16-3/4")	722 mm (28-7/16")
B. Adjustment ring maximum diameters	1 505 mm (59-1/4")	1 952 mm (76-7/8")	2 207 mm (86-7/8")	2 370 mm (93-3/8")	2 730 mm (107-1/2")	3 702 mm (145-3/4")
C. Clearance required for removing countershaft assembly	1 560 mm (61-7/16")	1 840 mm (72-7/76")	2 020 mm (79-1/2")	2 470 mm (97-1/4")	2 650 mm (104-3/8")	3 450 mm (135-13/16")
D. To end of countershaft	950 mm (37-3/8")	1 160 mm (45-11/16")	1 347 mm (53")	1 645 mm (64-3/4")	1 760 mm (69-1/4")	2 225 mm (85-5/8")
E. Maximum height to top	1 290 mm (50-13/16")	1 630 mm (64-3/4")	1 865 mm (73-7/16")	2 055 mm (80-7/8")	2 290 mm (90-1/8")	3 538 mm (139-1/4")
F. Inside diameter of feed hopper	694 mm (27-5/16")	914 mm (36")	1 078 mm (42-7/16")	1 308 mm (51-1/2")	1 535 mm (60-1/2")	1 863 mm (73-3/8")
Clearance required for removing bowl assembly	1 725 mm (67-15/16")	2 140 mm (84-1/4")	2 470 mm (97-1/4")	2 650 mm (104-3/8")	3 300 mm (29-7/8")	4 854 mm (191-1/8")
Clearance required for removing head assembly	1 700 mm (66-15/16")	2 165 mm (84-1/4")	2 455 mm (96-5/8")	2 715 mm (106-3/8")	3 165 mm (24-5/8")	4 634 mm (171-3/4")
J. Additional upward travel of feed hopper during clearing stroke	65 mm (2-9/16")	70 mm (2-3/4")	85 mm (3-3/8")	150 mm (4-1/8")	125 mm (4-15/16")	159 mm (6-1/4")
K. Mounting hole location	NA	545 mm (21-1/2")	660 mm (26")	830 mm (32-11/16")	882 mm (34-3/4")	1 130 mm* (44-1/2")* 1 245 mm** (49")**
Main frame discharge opening diameter	970 mm (38-3/16")	1 240 mm (48-13/16")	1 470 mm (57-7/8")	1 726 mm (68")	2 040 mm (80-1/2")	2 420 mm (95-1/4")
*5 <sup>1/2</sup> - **7'						

## A world of difference

Before, during and after the sale, you can count on the experts at Metso Minerals to provide the best service and support in the world – all over the world. Whether you're installing an entire customized system, a complete circuit, or simply replacing or updating a single piece of equipment, you can count on us to help you make sure it's the right equipment for your precise needs.

In the design stage, we look at variables such as ore characteristics and properties, physical space limitations, size of ore body – even your financial situation – just to name a few. Once you make your purchase, you'll be linked to Metso Minerals' on-line computerized parts availability system, giving you immediate access to the right parts, in stock, and delivered promptly. If you have questions, a trained service analyst is always standing by – over the phone or in person – ready to analyze your needs and recommend a complete, long-term, cost-effective solution.

We even offer training schools to help you get the most out of your system. Over the years, thousands of crushing professionals like you have benefited from the wide variety of seminars we offer. Do you have special training needs? Tell us – and we'll create a unique training session just for your company.

Nordberg HP Series cone crushers. A world of difference in technology, quality, performance, reliability, and support. To find out more, contact your nearest Metso Minerals office.



## Metso Minerals Crushing Equipment

### Our ranges: Unit Crushers

C Series jaw crushers  
Primary gyratory crushers  
GP Series cone crushers  
HP Series cone crushers  
MP Series cone crushers  
NP Series horizontal impact crushers  
Barmac Series vertical impact crushers  
Lindemann Series metal crushers  
Nordberg Laboratory crushers  
Nordberg AC Series air classifiers

### Mobile Equipment

LT Series mobile crushing plants  
NW Series portable plants

### Complete Plants

Complete plants for aggregate production  
Complete plants for recycling

### Metso Minerals Construction

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## Secondary Crusher Screen



## North American Region Vibrating Equipment







## Providing the Right Solution..

Metso Minerals is more than an industry specialist in crushing and complete rock processing solutions, Metso Minerals is a world-renowned leader in the development of vibrating equipment. Our screens, feeders and scalpers can be found operating in thousands of the most demanding applications from multi-stage plants to extremely complex mobile installations.

Metso Minerals offers numerous brands that the industry has grown to respect and trust - Hewitt Robins, Tyler, Seco, Nordberg and Svedala. Equipped with over 400 years of combined vibrating equipment experience, the North American Vibrating Equipment Group is continuously developing new and improved products to keep up with the ever-changing demands of both the aggregate and mining industries.

At Metso, our professionals are committed to providing our users with equipment that makes sense. From dependable feeders and scalpers to reliable screens and shakers - Metso Minerals' has the right solution, no matter what your equipment needs may be.

**Active Products:** These products are the core of our current product line and enjoy a shorter lead time.

## Inclined Screens

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**Classic Products:** These products are available upon request. Lead times may be longer than for Active products.

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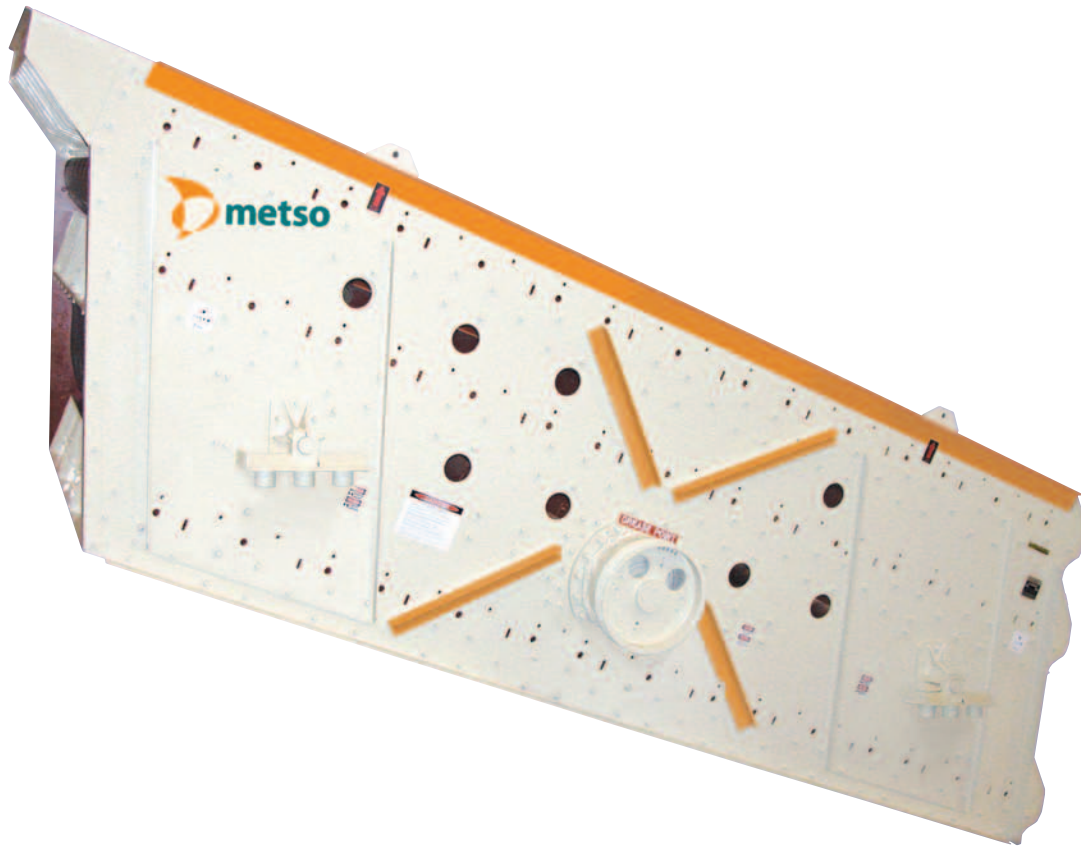
## SH-INCLINE (SVSH)

The circular motion characteristic of the Ripl-Flo mechanism makes this screen well suited for high efficiency, large capacity size separations. Metso **SH-Incline (SVSH)** screens not only deliver precise products but are built to last like no other. They provide a long-lasting screening solution for consistent performance in high tonnage operations.



## RIPL-FLO XH SCALPER (SVXH)

The **Ripl-Flo XH Scalper (SVXH)** is designed for consistent performance in any scalping application. This scalper shares many design elements with the SVSH but is built to handle high tonnage operation, large lump size and heavy impact loading.



## INCLINE SERIES (IS)

The Metso **Incline Series (IS)** is designed for precise, high-capacity screening of any particle size, wet or dry applications and the washing and rinsing of materials. The IS Series utilizes a unique MV vibrator assembly that consists of two self-contained modular vibrators bolted to the side plates for additional re-enforcement. Huck bolts and tubular cross members provide high torsional strength. Deck frames accommodate a variety of media. Look to the Metso Incline Series for a long-lasting reliable design, lower operational costs and precise sizing.

## INCLINE SERIES (ISXH)

Our Metso **Incline Series Scalper (ISXH)** shares the design and construction elements of the IS but adds a rugged grizzly for scalping applications.



## HR-VIBREX (HRV)

The **HR-Vibrex (HRV)** provides full width screening - the nominal width plus an extra 4" provides more open area than any other screen in its class. This screen also offers a "balanced" design. Each component is conservatively loaded and stressed in proportion to every other component. Therefore, this screen has no outstanding weak links or "over designed elements". The Metso HR-Vibrex offers a wide selection of standard models and options - ideal for processing aggregates, ores and minerals.

## HR-VIBREX SCALPER (HRVX)

One of the best machines available for the heaviest scalping jobs is the **HR-Vibrex Scalper (HRVX)**. Its "nominal + 4 inch" width provides more scalping area than any other screen in its class. When an application has large material, heavy impact loading and high tonnage rates, the Metso HR-Vibrex Scalper offers a reliable and capable solution.

## HR-VIBREX SCALPER (HRVXX)

For the toughest scalping applications choose the **HR-Vibrex Scalper (HRVXX)**. It shares many design elements with the HRVX but has a rugged grizzly deck to survive rigorous primary scalping duty, day after day, year after year.

## FLAT SERIES (FS)



The Metso **Flat Series (FS) Horizontal** is built to be both simple and durable providing exceptional performance for a wide range of conditions. Because most components (such as cloth support bars and cross members) are completely bolted, replacing parts is simplified. This screen operates at a high acceleration force, "G-force", to keep the media openings clear and provide accurate sizing for high tonnage rates of material.

Ask about the Metso Flat Series Screens when your application requires high "G-forces", low installation height or high tonnage rates.

## HR-ELIPTEX HORIZONTAL (HREH)

The **HR-Eliptex Horizontal (HREH)** offers the advantage of three-way motion - horizontal, vertical and elliptical - resulting in higher capacity, faster conveying and sharper sizing of materials.

The motion of the Metso Eliptex Horizontal quickly stratifies and turns materials so that all sides of each particle are exposed to deck openings. If spacious headroom and the installation of taller storage bins, machinery or extra conveyors is required, check out the Metso HR-Eliptex Horizontal.



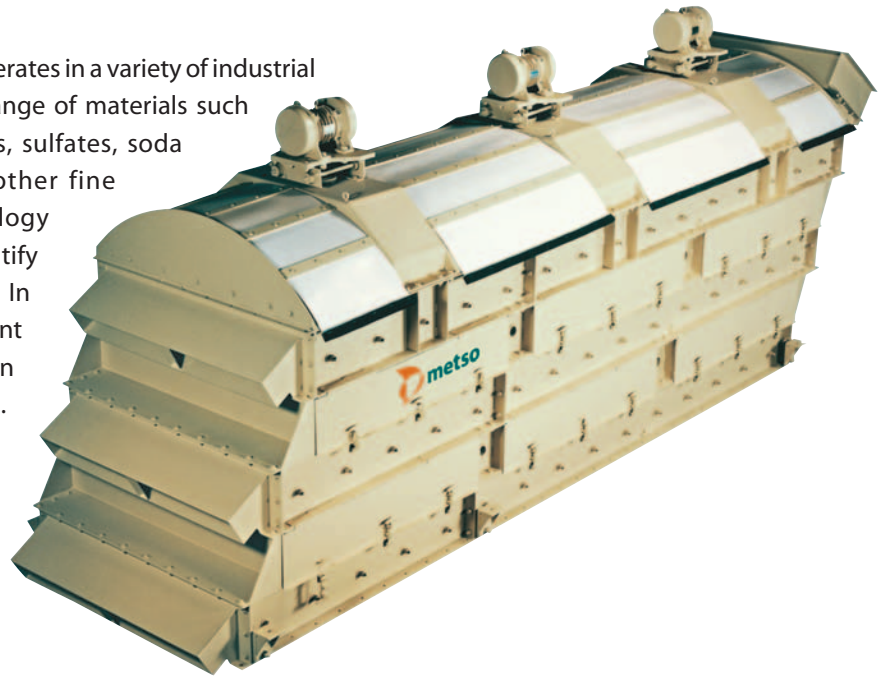
## LOW HEAD HORIZONTAL



The **Low Head Horizontal (SVLH)** screen was first introduced in the 1930's and has remained an icon in the screening world for decades. Thousands of Low-Head screens have been supplied for processing raw coal, pre-wet, deslime, dewatering, and heavy media drain and rinse. When reliability and robust construction are instrumental in your success look to the Metso Low Head Horizontal screen.

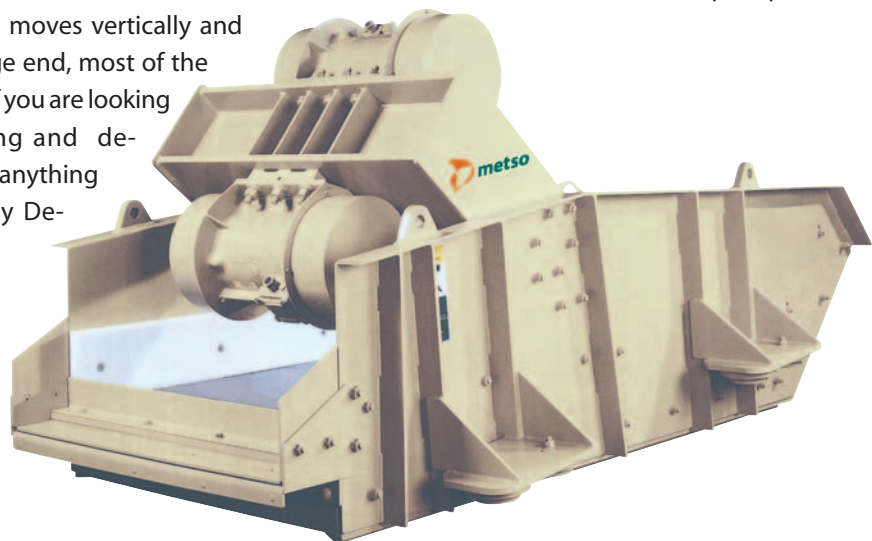
## HUMMER (TYHM)

The **Hummer (TYHM)** effectively operates in a variety of industrial applications to separate a broad range of materials such as carbon black, metallic powders, sulfates, soda ash, foundry sands, sugar and other fine materials. Its specialized technology uses direct media vibration to stratify and maximize particle separation. In fact, its screening ability is so efficient that the acceleration of the screen media virtually eliminates plugging. When you are looking for fines separation, the technology in the Metso Hummer is unmatched.

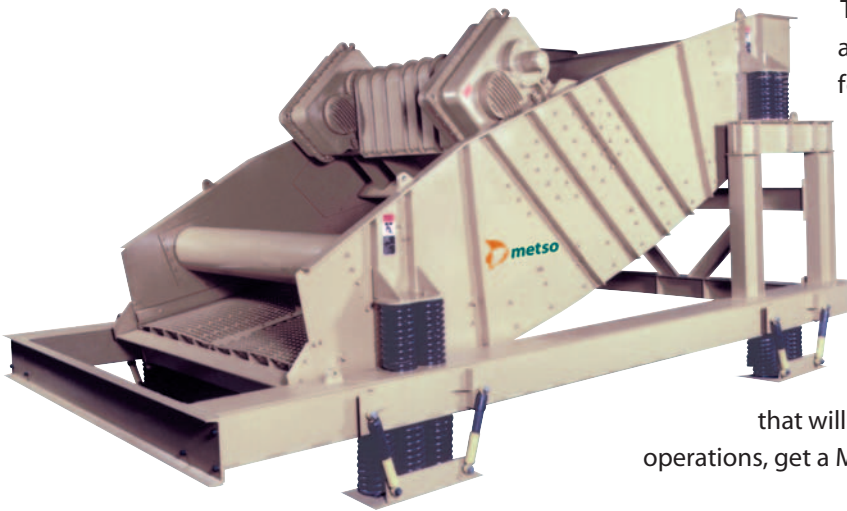


## HI-FREQUENCY DE-WATERING (SVHFD)

Reaching new levels of productivity is effortless with the unique **Hi-Frequency De-watering (SVHFD)** screen. The first section is constructed with a sharp 45° slope to remove a high percentage of water during the initial screening process. The remaining sections are mounted at a reversed incline to retain material and compact particles into a “filter cake”. As the “filter cake” moves vertically and horizontally toward the discharge end, most of the remaining moisture is removed. If you are looking for a high capacity de-watering and de-sliming solution, do not accept anything less than a Metso Hi-Frequency De-watering screen.



## MULTI-FLO (SVMF)

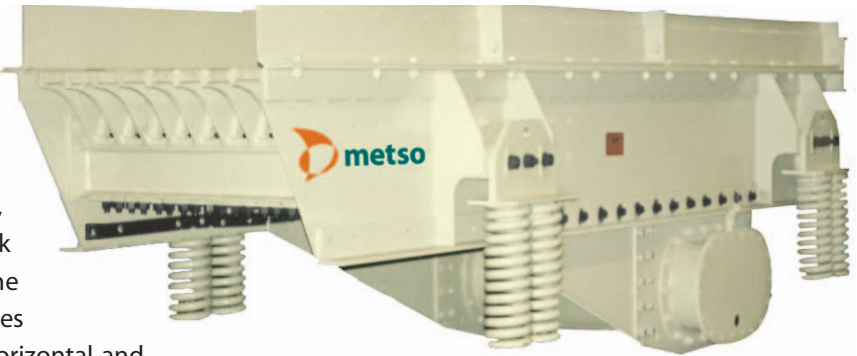


The **Mutli-Flo (SVMF)** vibrating screens, also known as “the banana”, are constructed for use in a large range of applications - from scalping to dewatering. The Multi-Flo screens have various angles of inclination, decreasing every four feet from the feed end to the discharge end. The units are manufactured to efficiently handle large volumes of material at high capacities. If you want a flexible and dependable screen

that will handle high tonnage rates for continuous operations, get a Metso Multi-flo.

## HR-ELIPTEX FEEDER (HREF)

The **HR-Eliptex Feeder (HREF)** is built for long lasting durability while offering a great deal of application flexibility. Adjustable grizzly openings and deck slope make this feeder great for field adjustments. Heavy duty tubular beams, an egg crate construction and extra thick deck plates help resist twisting and the impact of large rocks. This vibrator produces a unique, elliptical motion with both horizontal and vertical components. For flexibility, reliability and high capacity at an economical price, check into the Metso HR-Eliptex Feeder.



## RAIL CAR SHAKEOUT (HRHDV)

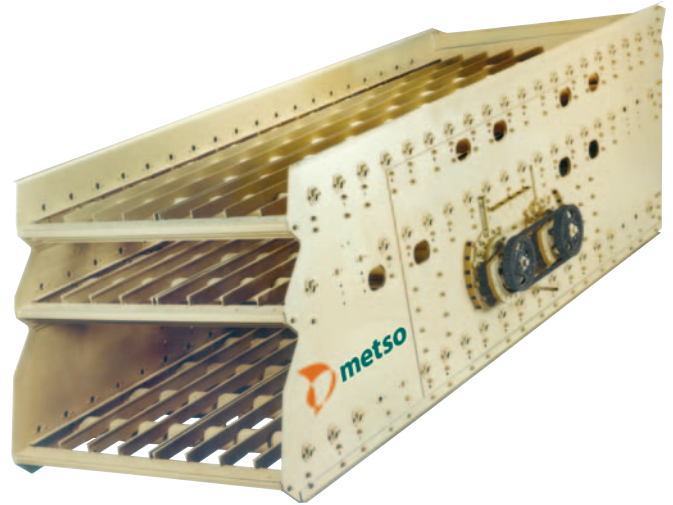
The **Rail Car Shakeout (HRHDV)** exceeds all previous standard railcar shakers with greater working weight, more intense shaking, and faster more efficient unloading. This heavy duty design will provide years of efficient operation. “Clean-up” with the Metso Car Shaker.





## TY-ROCKET SE (TYSE)

Known for its rugged construction and dependability, the **Ty-Rocket SE (TYSE)** is used in a wide variety of screening applications. This two bearing circle throw screen is easy to maintain because of its readily replaceable parts and solid Huck bolted construction. If your application requires efficient operation, low maintenance and fast accurate sizing of a variety of materials, the Ty-Rocket SE is your next screen.



## TY-ROCKET CH (TYCH)



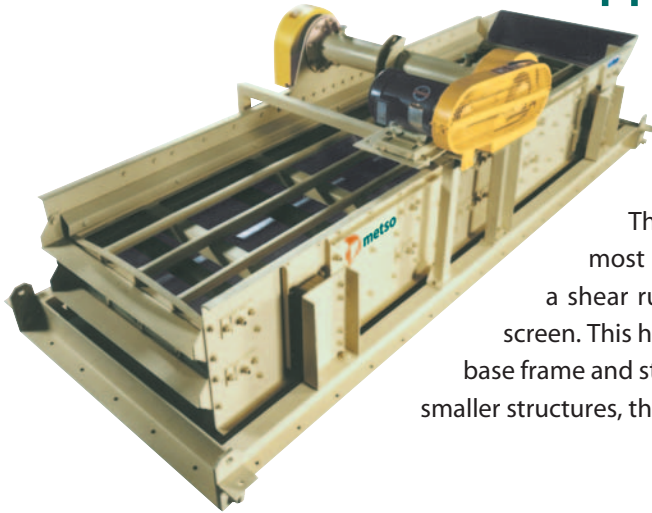
The Metso **Ty-Rocket CH** offers an efficient solution to some of the most difficult applications. Designed with dual screening surfaces, the top deck utilizes standard side tensioning. The bottom deck features our unique end tensioned, harp-type screen section. Ideal for separating dry, damp, sticky or wet materials such as sand, gravel, limestone, granite, shale, coke, coal and a broad range of industrial materials - the Metso Ty-Rocket CH (TYCH) delivers.

## TY-ROCKET CS (TYCS)

Field-proven features such as the support frame and side plates, make the **Ty-Rocket CS (TYCS)** perform best in medium duty applications. The counter-balanced shaft assembly creates a circle throw movement that is installed at a fixed angle of 20° to provide fast accurate sizing of all materials. The modular design, rugged construction and standard components result in a great value. If you are looking for flexibility, efficiency and an easy to maintain screen, try the Metso Ty-Rocket CS.



## TY-SPEED (TYSP)

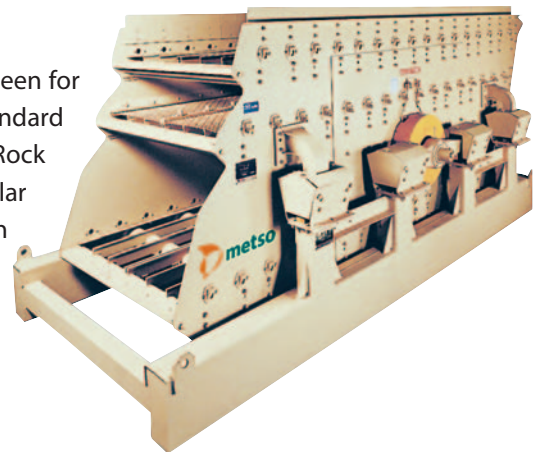


With a versatile high speed circle throw, the **Ty-Speed (TYSP)** is specifically constructed for medium and fine screening of the most difficult wet or dry materials including sands, gravel, stone, coal, chemicals, phosphates, fertilizers and carbon black - to name a few.

This tough unit gives the flexibility you need to meet the most demanding product requirements. Each model contains a shear rubber mounting system which isolates the body of the screen. This helps minimize the vibration transferred to the supporting base frame and structure. If you need an aggressive screen that works with smaller structures, the Metso Ty-Speed is your solution.

## TY-ROCK (TYRK)

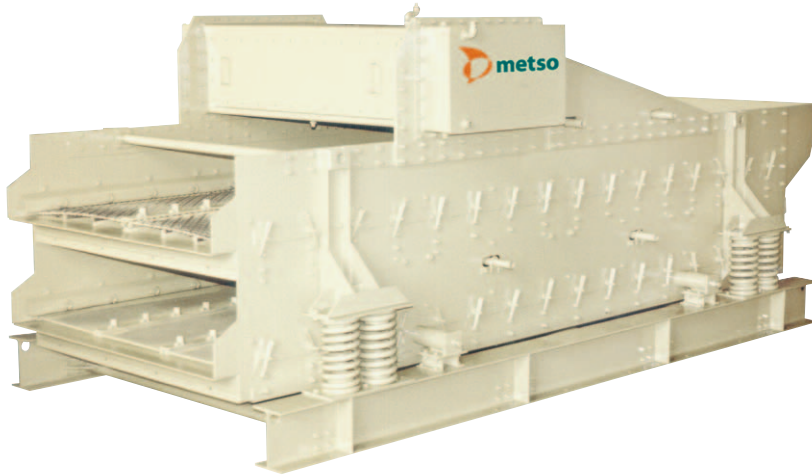
The **Ty-Rock (TYRK)** has been rated as the number one vibrating screen for the heavy mining industries. This model is constructed with many standard features that are provided as options with other products. The Ty-Rock efficiently operates with minimal maintenance and the massive tubular base frame substantially lowers installation costs. When your application demands a heavy duty screen and your budget doesn't include a structural engineer, ask for a Ty-Rock!



## TRIPLE SLOPE (TS)

The Metso **Triple Slope (TS)** increases capacity and efficiency through multi-slope separation technology and variable elliptical motion. Each deck section has its own angle, throw and travel rate. The Metso Triple Slope offers engineering at its finest.

## SC-HORIZONTAL (SCFS)



When maximum material retention time or low headroom is required the **SC-Horizontal (SCFS)** is a great solution! To avoid costly structural changes, this model is ideal in low clearance areas and minimizes overall plant height to meet underpass restrictions in mobile plants. The SC model features an innovative extra heavy-duty vibrator shaft assembly, which is also used on the rugged world class grizzly feeders. For power, performance and durability

## SC-INCLINE (SC)

The **SC-Incline (SC)** meets the need for accurate, high volume separation of a wide variety of materials. Its innovative vibrator shaft assembly and all bolted construction require a minimal amount of maintenance, delivering many years of trouble free service. If you are looking for a proven design and superior dependability, the Metso SC-Incline screens can accommodate any application.



## SC-SCALPER (SCX)

The **SC-Scalper (SCX)** is built to provide consistent performance in difficult scalping applications where high tonnage, large lump size and heavy impact loading are the norm. The modular design means that, when individual parts are damaged or wear out, they are simple to replace. For performance and economy, inquire about our Metso SC-Scalper.

## RIPL-FLO XXH SCALPER (SVXXH)

The **Ripl-Flo XXH Scalper (SVXXH)** is designed to provide a long-lasting screening solution and consistent performance in high tonnage scalping operations. This scalper shares design elements with the versatile SVSH and SVXH but is equipped with a heavy duty grizzly deck to handle high tonnage operation, large lump size and heavy impact loading. The circular motion characteristic of the Ripl-Flo mechanism makes the scalper well suited for high efficiency, large capacity size separations.



## FOUNDRY SHAKEOUT (HRMF)

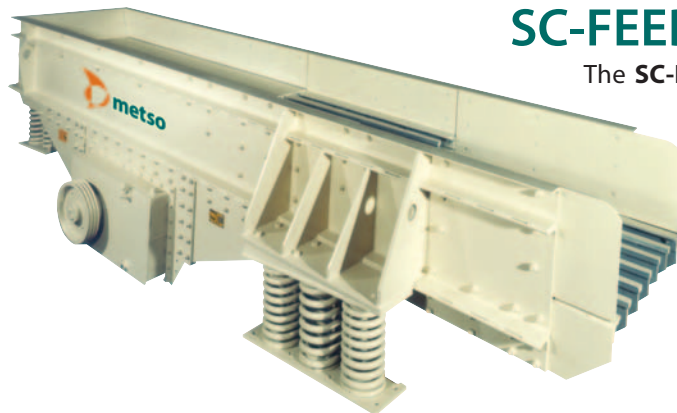
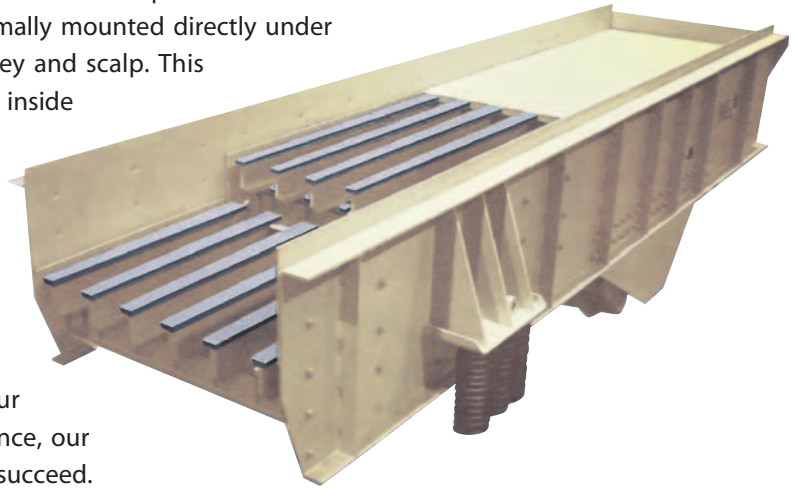


The Metso **Foundry Shakeout (HRMF)** is specially designed for the shakeout of castings, heavy and mixed flask sizes, making it ideal for use in foundries. This particular model also works well in primary reduction of sand lumps where chemically bonded molds are used. Talk

to us about Metso's Foundry Shakers, when you are "stuck" with your current system.

## SV-LOW HEAD FEEDER (SVLHF)

The **SV-Low Head Feeder (SVLHF)** is built to provide long-lasting dependable operation with very little maintenance. These feeders provide a uniform continuous controlled flow of material. Normally mounted directly under hoppers or bins, these units will feed, convey and scalp. This combination prevents material from bridging inside the hopper and reduces the amount of surges going to the crusher. The body has heavy steel beams for sturdy mechanism support and integrity. The side members have reinforcing bars on both the top and bottom. The self contained Low-Head mechanism, can be easily swapped out as a unit for quick bearing changes. If your application demands dependable performance, our time-proven Metso SV-Low Head Feeder will succeed.



## SC-FEEDER (SCFD)

The **SC-Feeder (SCFD)** is engineered with the ultimate vibrator and a unique grid style frame of rectangular tubing. The vibrator produces a straight line adjustable motion and utilizes counterweights to allow quick and simple throw adjustments. This flexibility eliminates the need to switch shafts or change to the next vibrator assembly when application changes are required. Thousands of applications around the world have chosen the flexible design of the Metso SC-Feeder.

## The Right Part for Your Screen

**Nordberg, Svedala, Hewitt-Robins, Seco, Tyler . . .**

Metso Minerals has brought together the most trusted names in the industry into one company. That means when you need replacement parts for your vibrating equipment, you can call on one trusted source. With more than 40 authorized stocking distributors across the country, Metso Minerals offers:

- Local part availability and emergency service
- Highest quality materials
- The most current and correct part
- On-site technical assistance

### **Value**

Genuine Metso OEM replacement parts provide you with the most value for the price as their use will help to extend operating life and lower operating costs. We are committed to supplying premium parts at competitive prices.

### **Availability**

Your local Metso Minerals distributor has thousands of parts in stock and ready to ship.

### **Rebuild Capabilities**

Metso Minerals offers a comprehensive machine rebuild program for your vibrating equipment. Cost-effective rebuilds and a wide range of other machine enhancements are available. We also have a rebuild program for the new MV mechanisms, making future maintenance of the new machine lines the easiest in the industry.

### **Field Service**

Metso Minerals and our authorized distributors have field service technicians who are trained to handle your toughest machine maintenance problems. On-site training and preventative maintenance services are available to help you obtain the most efficient operation from your equipment. And the support of our highly qualified factory engineers and service technicians is just a phone call away.



# Metso Minerals - Other Equipment

## Unit Crushers

C Series jaw crushers  
Primary gyratory crushers  
GP Series cone crushers  
HP Series cone crushers  
MP Series cone crushers  
NP Series horizontal shaft impactor crushers  
VI Series vertical impact crushers  
Barmac Series vertical impact crushers  
Lindemann Series metal crushers

## Mobile Equipment

LT Series mobile crushing plants  
NW Series portable plants

## Complete Plants

Complete plants for aggregate production  
Complete plants for recycling

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Telephone: 1-800-643-4321

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Telephone: 1-800-558-6818

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Suite 315

Englewood, CO 80112

Telephone: 1-303-792-0393  
Telephone: 1-800-558-6818

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Costa Rica

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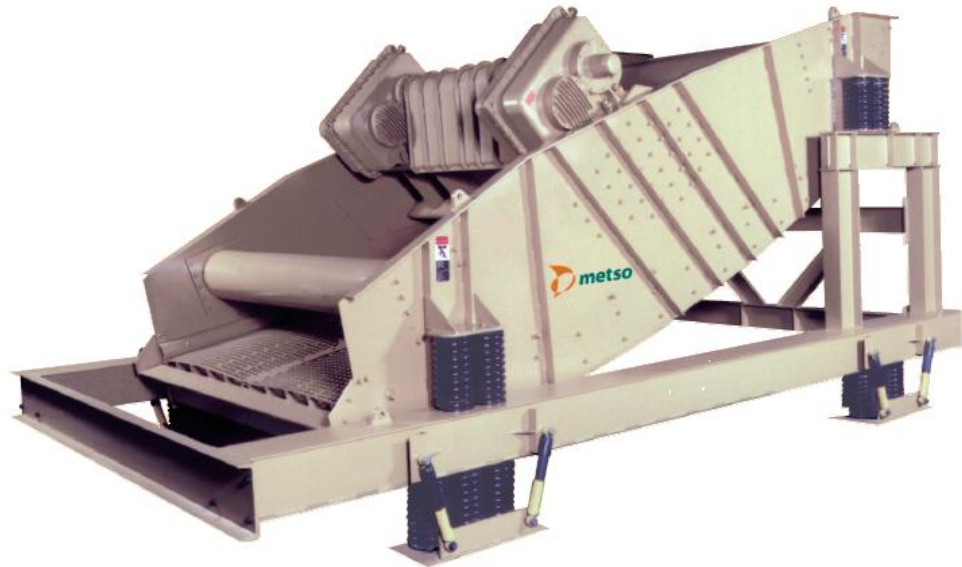


## Tertiary Crusher Screen



# BUDGETARY QUOTATION

## 10' x 24' SD BANANA MINING SCREEN



(FOR REFERENCE ONLY)

PROPOSAL TO:  
**M3 ENGINEERING**  
**KENNECOTT MINERALS**  
**COMPANY/EAGLE NICKEL PROJECT**

PROPOSAL NO:  
**MM13089-1**

DATE:  
**MAY 2, 2008**

[www.metsominerals.com](http://www.metsominerals.com)

M3 Engineering

**Attention:** Allen Hutchinson

**Metso Contact:** Vladimir Novak

**Reference:** Kennecott Minerals Company / Eagle Nickel Project, Revised Quotation

Dear Mr. Hutchinson,

We thank you for your quotation request for the Metso screen. We had to change the size of the screen to accommodate the increase in tonnage to the screen.

We trust you will find the enclosed submission satisfactory for present planning purposes. Should you require any further information or have questions, please feel free to contact us.

Sincerely,

**METSO MINERALS INDUSTRIES, INC.**

**Steven Kann**

**Application Support Engineer**

Tel: 1-803-699-4157

Fax: 1-803-699-4201

Email: [steven.kann@metso.com](mailto:steven.kann@metso.com)

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## PROPOSAL VALIDITY

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**METSO MINERALS INDUSTRIES INC.** (Seller) agrees to sell to Purchaser and Purchaser agrees to purchase from Seller the Product(s) described below, subject to the terms and conditions set forth hereinafter.

**PROPOSAL EXPIRATION AND NOTICE:** This proposal will be deemed accepted only if signed purchase order is issued by Purchaser and received by Seller within thirty (30) days after the date shown above; otherwise, it shall have no effect.

The prices quoted in this proposal are firm based on acceptance of this proposal within thirty (30) days. However, due to the current volatility of steel cost and its availability, the equipment offered herein is subject to any applicable raw material surcharge(s) and would apply in addition to the prices offered. The raw material surcharge(s) may include, but are not limited to, increases in energy costs and metallic costs such as scrap steel, coke, and Ferro-alloys. In addition, Metso Minerals Industries, Inc. shall not be held liable for any equipment delivery delays resulting from delays in receipt of those raw materials needed for manufacture.

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## 1.0 SCOPE OF SUPPLY AND PRICING

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### 1.1 SCREEN w/o OPTIONS

Qty. 1      **METSO MINERALS 10'x24' SD Banana Screen** as described below

Includes:

- V-Belt drive suitable for required 1800 RPM T-frame high torque motor
- V-Belt drive guards
- Flywheel guards
- Twin cartridge mechanism with roller bearings in oil splash lubrication
- Machined stress relieved mechanism beam
- Heavy duty feed box
- Heavy duty discharge spout
- Support frame prepared for modular media
- Steel coil springs
- Deck angles varies
- Standard Metso beige color paint
- English identification plates
- 3 Copies of the operation and maintenance manuals in English

APPROXIMATE SHIPPING WEIGHT

36,100 lbs

*PRICE,*  
***PER SCREEN***



**SOURCE OF MANUFACTURING**

▪ SCREEN	USA
▪ MEDIA	MEXICO
▪ LINERS	MEXICO/USA
▪ MECHANISMS	USA

## 1.2 ESTIMATED FREIGHT

Qty. 1      Consolidation, Packing and Delivery Not Included in this quote

## 1.3 FIELD SERVICE

Qty. 1      Field Service Engineer for one trip only including air and living expenses, to provide advice during screen erection and start up for five (5) ten (10) hour days, not including Sundays.

Any additional time or trips will be invoiced and based on the attached Metso Minerals' Engineering Services rate sheet (FORM E155-A) and terms and conditions.

*PRICE,*  
*PER SCREEN*

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## 2.0 OPTIONAL ITEMS

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### 2.1 SCREEN DRIVE MOTOR

Qty. 1 40 HP - 1800RPM Motor

*PRICE,  
PER UNIT*

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[REDACTED]

### 2.2 SCREEN MEDIA PACKAGE

Qty. 1-lot Trellex Rubber snap-in media and liners

*PRICE,  
PER UNIT*

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[REDACTED]

### 2.3 SCREEN SIDE LINERS

Qty. 1-lot Side liners

*PRICE,  
PER UNIT*

---

[REDACTED]

### 2.4 ISOLATION BASE FRAME KIT

Qty. 1 Isolation base frame kit

*PRICE,  
PER UNIT*

---

[REDACTED]

### 2.5 DUST/ NOISE ENCLOSURE KIT

Qty. 1 Dust/ Noise Enclosure Kit

*PRICE,  
PER UNIT*

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[REDACTED]

### 3.0 SCREEN MONITORING OPTIONS

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#### 3.1 NEW SCREEN EVALUATION

Qty. 1 Evaluation report consists of:

- Orbits
- Structural evaluation
- Bearings operating condition

Evaluation is conducted as installed, loaded and with final media at normal operational speed.

*PRICE,*  
*PER SCREEN*

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## 4.0 PROPOSAL TERMS AND CONDITIONS

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### 4.1 PRICE

The purchase price for equipment only is as stated above.

**Unless otherwise noted, the price does not include any costs for performance letters of credit, warranty letters or any other securities. The cost of any and all securities is to be added to the sell price of the equipment.**

### 4.2 TAXES

Any applicable duties and sales, use, excise, value-added, and/or similar taxes will be added to the price and invoiced separately unless an acceptable exemption certificate is furnished.

### 4.3 PAYMENT TERMS

- 15% upon submission of Approval Drawings (typically 3 weeks from PO)
- 15% upon completion of the Vibrators/Mechanisms (typically 6 weeks from Approvals)
- 25% upon completion of the Main body Components (typically 8 weeks from Approvals)
- 15% upon completion of the Run Test of unit (typically 12 weeks from Approvals)
- 30% Balance due upon shipment (typically 13 weeks from Approvals)

All payments due net 30 days.

Unless otherwise stated, all payments shall be in United States dollars on or before the date of delivery and if partial shipments occur, each such partial shipment shall be considered delivery, and a pro rated payment shall become due as each such partial shipment is made. If shipment is delayed by the Purchaser, the date of readiness for shipment shall be deemed to be the date of delivery for payment purposes. On late payments, the contract price shall, without prejudice to Seller's right to immediate payment, be increased by 1.5% per month on the unpaid balance, but not to exceed the maximum permitted by law.

### 4.4 WARRANTY

Twelve (12) months from start-up/commissioning or eighteen (18) months from date of notification of readiness for shipment, whichever occurs first. This warranty is **VOID** if Purchaser does not have a Metso Minerals Global Field Service Engineer supervise and approve the Screen start up/commissioning.

## PROPOSAL TERMS AND CONDITIONS (Cont'd)

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### 4.5 DELIVERY TERMS AND MANUFACTURING TIME

Delivery terms shall be FCA Points of Manufacture (INCOTERMS 2000), unless otherwise agreed. Screen will be manufactured in **approximately 16-18 weeks**, subject to prior sale, from the date of receipt of Purchaser's acceptance of this Agreement and or information required of Purchaser to commence manufacture.

### 4.6 SHIPMENT

When Purchaser is responsible for shipment, shipment of equipment shall take place within thirty (30) days of the readiness to ship notification provided by Metso Minerals. If shipment is delayed beyond thirty (30) days, then storage charges in the amount equal to 1.5% of the total Contract Price shall be added to the Contract Price for each week beyond the thirty (30) days no-charge storage allowance.

### 4.7 QUALITY ASSURANCE

Metso Minerals Quality Plan shall govern the processing, manufacturing, and documentation of the purchase order / contract arising from this proposal. Price and delivery offered in this proposal is based on components and assemblies that may already be in the "work in progress" / manufacturing process. Upon request, Metso Minerals will repeat non-destructive testing (testing shall be performed in accordance with Metso Minerals requirements) that has already been carried out. However, the Purchaser shall be responsible for any cost and delivery implications arising from such request.

Any additional project or contract specific quality requirements must be mutually agreed upon and any additional expenses related to those QA requirements shall be borne by the Purchaser. If the delivery date of the equipment is affected by the additional QA requirements, then the final delivery shall be adjusted accordingly.

### 4.8 SPARE PARTS

Spare parts prices, if provided, are budgetary estimates only. Prices are based on FCA Points of Manufacture (INCOTERMS 2000) basis. Spare parts prices do not include any export packaging; add 5% to the spare parts price for export packaging. Spare parts prices are based on earliest availability to ship.

#### 4.9 DRAWING SUBMISSION SCHEDULE

Approval drawings are to be submitted within two (2) weeks at the earliest after receipt of order, if requested. Certified drawings are to follow after release of order to production. Schedule for drawing submission is dependent on resource utilization at time of order placement and is to be confirmed after receipt of order.

#### 4.10 DRAWING: FORMAT AND TAGGING OF EQUIPMENT

All drawings and documents required to be submitted in electronic format shall be in Adobe Acrobat **PDF** file format regardless of the original file type. Drawing templates which are deemed helpful, by Metso Minerals, to the Purchaser for use in plant and site layout shall be submitted in AutoCAD **DWG** file format.

Project / contract specified equipment tag numbers shall be incorporated into Metso Minerals' Approval drawings only, if requested. Project / contract specified equipment tag numbers will not be incorporated into any other drawings supplied by Metso Minerals. If the project / contract specified equipment tag numbers are required to be incorporated into other drawings supplied by Metso Minerals, then additional time required to update drawings shall be charged at Metso Minerals' standard engineering rate of USD \$100/hr.

#### 4.11 EXPORT CONTROL

Metso Minerals' performance under any contract is contingent upon the issuance of any required export license or other necessary government authorization. Metso Minerals has the right to terminate without liability any proposal, order or contract if Metso Minerals determines such sale, export or delivery violates applicable law. Termination will not affect the right of Metso Minerals to recover the contract price for any unpaid goods already delivered. Buyer shall not export or re-export any Screen including all accessories in violation of applicable law.

## 5.0 STANDARD TERMS AND CONDITIONS OF SALE

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1. **METSO AGREES TO SELL THE EQUIPMENT AND SPARE PARTS ("PRODUCTS") AT THE AGREED UPON PRICES CONDITIONED UPON BUYER'S ACCEPTANCE OF THESE TERMS AND CONDITIONS. THESE TERMS AND CONDITIONS GOVERN ALL SALES INCLUDING THOSE ORDERS PLACED ELECTRONICALLY. IF THIS DOCUMENT IS CONSTRUED AS AN ACCEPTANCE OR AS A CONFIRMATION OF AN EXISTING CONTRACT, SUCH ACCEPTANCE OR CONFIRMATION IS EXPRESSLY CONDITIONED ON THE BUYER'S ASSENT TO ANY ADDITIONAL OR DIFFERENT TERMS CONTAINED HEREIN.**
2. **SCOPE.** The scope of Products sold by Metso is exclusively described in Metso's proposal, Metso's acknowledgement of Buyer's order and by any specification or drawings referred to therein (the "Agreement"). Prices do not include the services of any representative of Metso including, but not limited to the assistance in the installation, inspection or startup of the Products.
3. **PRICE.** Prices do not include any sales, use or excise taxes, customs duties or similar charges or fees. Unless otherwise stated in the Agreement, all payments shall be in United States dollars and paid within 30 days of the date of invoice. Partial and transshipment are permitted. Each partial shipment shall be considered delivery, and a pro rata payment shall become due as each partial shipment is made. If shipment is delayed by Buyer, the date the shipment is ready shall be deemed to be the date of delivery for payment term purposes and Metso reserves the right to store the Products at Buyer's risk and expense. If Buyer fails to pay by the due date, Metso shall be entitled to interest at a rate of 1% per month not to exceed the maximum permitted by law. THE AGREEMENT IS SUBJECT TO CREDIT APPROVAL.
4. **DELIVERY.** Delivery term shall be EXW (INCOTERMS 2000). All delivery dates are approximate and Metso shall have no liability to Buyer for delays in delivery.
5. **LIMITED WARRANTY.** Except as noted below with respect to spare parts and items not of Metso's manufacture and subject to the EXCLUSIONS below, Metso warrants that the Product(s) will be free of defects in workmanship and material for one year from the date of delivery. Metso spare parts (not including replacement parts furnished under this warranty) are warranted to be free from defects in workmanship and material for 6 months from date of delivery. This warranty covers the Buyer only and is not transferable.
6. **EXCLUSIONS TO WARRANTY.** Metso and its suppliers shall have no obligation under the limited warranty as to any Product which has been improperly stored or handled, or which has not been installed, operated or maintained according to Metso or supplier furnished manuals or other written instructions or is operated during the warranty period with other than genuine Metso parts. This limited warranty excludes wear parts or consumables which wear out or are consumed in accordance with industry standards
7. **REMEDY:** If within one year from date of delivery, but not more than eighteen months from date that Buyer is advised by Metso or its distributor that the Product(s) are ready for shipment, Buyer discovers that such item was not as warranted above and promptly notifies Metso in writing thereof, Metso directly or through its distributor shall repair or replace the defective item. Buyer shall assume all responsibility and expense for removal, reinstallation, and freight in connection with the foregoing remedies. These obligations and conditions of the Buyer also extend to replacement parts furnished by Metso hereunder. Buyer's entitlement to warranty remedies is contingent upon Buyer's cooperation in permitting Metso to investigate the defect and in returning replaced parts to Metso, if requested, at Metso's expense. The warranty period shall not be extended by the repair or replacement of a Product or a component of a Product, nor shall

**EXCEPT FOR WARRANTY OF TITLE, THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR ANY PARTICULAR PURPOSE, AND CONSTITUTES THE ONLY WARRANTY OF METSO WITH RESPECT TO THE PRODUCT(S). FURTHER METSO MAKES NO WARRANTIES AS TO PERFORMANCE OR PRODUCTION, NOR AS TO WEAR PARTS OR CONSUMABLES, NOR AS TO ANY SEPARATELY LISTED ITEM OF THE PRODUCT(S) WHICH IS NOT MANUFACTURED BY METSO.** The latter shall be covered only by the express warranty, if any, of the manufacturer thereof.

## 5.0 STANDARD TERMS AND CONDITIONS OF SALE (Cont'd)

there be a separate remedy period for any replacement Product or component.

If, after a reasonable number of repeated efforts, Metso determines that it is unable to repair or replace a defective or nonconforming Product, Buyer shall, at Metso's option, return the Product to Metso (or part thereof, if such does not substantially impair the value of the Product) at Buyer's expense and Metso shall return the purchase price as Buyer's entire and exclusive remedy.

SECTIONS 7 AND 9 STATE BUYER'S EXCLUSIVE REMEDY AGAINST METSO AND ITS SUPPLIERS UNDER THE AGREEMENT, WHETHER IN CONTRACT OR IN TORT OR UNDER ANY OTHER LEGAL THEORY, AND WHETHER ARISING OUT OF WARRANTIES, REPRESENTATIONS, INSTRUCTIONS, INSTALLATIONS OR DEFECTS FROM ANY CAUSE.

If the foregoing disclaimer of additional warranties is not given full force and effect, any resulting additional warranty shall be limited in duration to the express warranties and be otherwise subject to and limited by these terms and conditions.

8. **RELIEF.** If Metso is hindered or suffers delay in performance due to any cause beyond its reasonable control, including but not limited to act of God, war or hostilities, act or failure to act of government, act or omission of Buyer, fire, flood, earthquake, landslide, strike or labor trouble, sabotage, or delay in obtaining from others suitable services, utilities, materials, components, equipment or transportation, the time of performance shall be extended a period of time equal to the period of the resulting inability to perform and its consequences. Metso will give to Buyer notice in writing within a reasonable time after Metso becomes aware of any such delay. In no event shall Metso have liability to Buyer arising out of any such delays. If the delay arising under this section is more than 180 days, Metso has the right to terminate the Agreement and the parties' respective obligations shall be equitably adjusted. Metso shall be reimbursed for any additional costs it incurs as a direct result of delays caused by the Buyer's act or failure to act.
9. **INTELLECTUAL PROPERTY.** (a) Metso shall pay costs and damages finally awarded by a court or

in an arbitration proceeding suit against Buyer to the extent based upon a finding that the design or construction of the Product(s) as furnished infringes a United States patent or copyright (except infringement occurring as a result of incorporating a design or modification at Buyer's request or Buyer's use of the Products in a manner contrary to the Agreement or Metso's manuals or instructions) provided that Buyer promptly notifies Metso in writing of any charge of such infringement, and Metso is given the right at its expense to settle such charge and to defend and control the defense of any suit based upon such charge. THIS SECTION SETS FORTH METSO'S EXCLUSIVE LIABILITY WITH RESPECT TO INFRINGEMENT OF INTELLECTUAL PROPERTY. (b) All drawings, specifications, data, software, firmware, manuals, instructions, documentation or other works of authorship furnished by Metso to Buyer are copyrighted property of Metso or its suppliers, and are to be used by Buyer only for the purpose of installing, operating, maintaining and repairing the Product(s). Such works and data may not be otherwise used or reproduced or disclosed. (c) Metso or its suppliers retain all right, title and interest in and to its and their inventions, discoveries, concepts, ideas or other intellectual property embodied in or related to its Product(s).

10. **LIMITATION OF LIABILITY. NEITHER METSO NOR ITS SUPPLIERS SHALL BE LIABLE, WHETHER IN CONTRACT (INCLUDING BREACH OF REPRESENTATION OR WARRANTY) OR IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY), OR FOR INFRINGEMENT OR UNDER ANY OTHER LEGAL THEORY, FOR LOSS OF USE, PRODUCTION, REVENUE OR PROFIT, OR FOR COST OF CAPITAL, OR OF SUBSTITUTE USE OR PERFORMANCE, OR INCREASED COSTS OF OPERATION OR MAINTENANCE, OR FOR INCIDENTAL, INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES, OR FOR ANY OTHER LOSS OR COST OF SIMILAR TYPE.**

The limitation of liability contained in this section shall be effective without regard to Metso's performance or failure or delay of performance under any other term or condition of this Agreement, including those contained in any warranty. IF ANY LIMITATION, EXCLUSION OR DISCLAIMER IS DEEMED TO BE UNENFORCEABLE, METSO'S MAXIMUM LIABILITY UNDER THIS AGREEMENT FOR ANY AND ALL REASONS SHALL BE LIMITED TO

## 5.0 STANDARD TERMS AND CONDITIONS OF SALE (Cont'd)

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THE PURCHASE PRICE FOR THE PRODUCTS SOLD TO AND PAID BY BUYER.

11. **BUYER'S PERMITS, APPROVALS, and DATA:** Buyer shall provide and pay for all permits and licenses required for the installation and operation of the Products. Timely performance by Metso is contingent upon Buyer's supplying to Metso, when needed, all required technical information and data, including drawing approval, and all required commercial documentation.
12. **SECURITY INTEREST AND INSURANCE:** Metso retains and Buyer grants to Metso a security interest in the Product(s) and proceeds and any replacement regardless of mode of attachment to realty or other property to secure payment of all amounts due to Metso. Buyer agrees to do all acts necessary to perfect and maintain said security interest, and to protect Metso's interest by adequately insuring the Product(s) against loss or damage from any external cause with Metso named as insured or additionally insured.
13. **REJECTION OF GOODS:** All claims giving rise to the rejection of Products must be made by the Buyer in writing within a period of 7 business days after the Products are delivered. Failure to make such claim within the stated period shall constitute an irrevocable acceptance of the Products.
14. **FOUNDATIONS:** Buyer shall be solely responsible for foundations and their construction. Any plans furnished by Metso shall be considered examples only, and Metso assumes no responsibility for foundation adequacy or for any direct or indirect damages whatsoever incurred as a result of inadequate foundations or reactions to foundations of Products.
15. **COMPLIANCE.** Compliance with OSHA or similar federal, state or local laws during any installation, operation, or use of the Product(s) is the sole responsibility of Buyer.
16. **DISPUTE RESOLUTION.** Except as otherwise agreed upon in writing, any and all disputes shall be first submitted to JAMS or its successor for mediation by in Chicago, Illinois according to JAMS except that if the parties cannot agree on the selection of the mediator within 30 days, JAMS shall appoint a mediator who shall begin the mediation within 60 days of such appointment. Each party shall mediate in good faith.

If the parties are unable to resolve the dispute in mediation, then the dispute shall be submitted for final settlement by arbitration conducted in Chicago, Illinois pursuant to the JAMS Comprehensive Arbitration Rules, except that and the arbitrator shall apply Delaware law and base his or her decision solely on presentations by the parties and not by independent review. The arbitration procedure and enforcement of the arbitration award shall be governed by the United States Arbitration Act and judgment upon the award by the arbitrator may be entered by any court of competent jurisdiction. Any award of punitive damages shall be limited to twice the amount of direct actual damages.

Secondary Crusher Building Dust Collector  
Mill Building Dust Collector No. 1

Donaldson  
Torit®

## Modular Baghouse Dust Collectors

Now with

**DURA-LIFE™**  
Twice The Life Filter Bags

Award-Winning  
Filter Media





# Modular Baghouse

## Compact, Modular Design

The enhanced Donaldson® Torit® Modular Baghouse (MB) delivers reliable, efficient, continuous-duty, pulse-jet operation. The MB advantage is found in the breakthrough technology of Dura-Life™ filter bags. Dura-Life bags offer longer bag life and reduced emissions. When it does come time to replace the filter bags, Quick-Release Filter Bag Cages have been added to the collector to make replacing filter bags easier. The MB provides reliable service with easy maintenance. Computer designed inlets and deflector plates, coupled with maximized bag spacing, result in optimal airflow with minimal abrasion. Advanced valves, providing 50% more cleaning air, result in a more efficient operation. Over the life of the collector, no other baghouse can provide this much value.

### MB Offers:

- **New models with high body inlets allow higher air-to-media ratios on lighter dusts**
- **New square models help minimize ducting and accessory costs**
- **Dura-Life Twice the Life Filter Bags**
- **Clean-air side bag access for easier bag service**
- **Welded design increases durability**
- **Integral fan option reduces space requirements**
- **Tool-free installation of filter bags & cages**
- **10-year warranty**

*Efficient &  
Reliable*  
*with*  
*Dura-Life™*  
*Twice The Life Filter Bags*

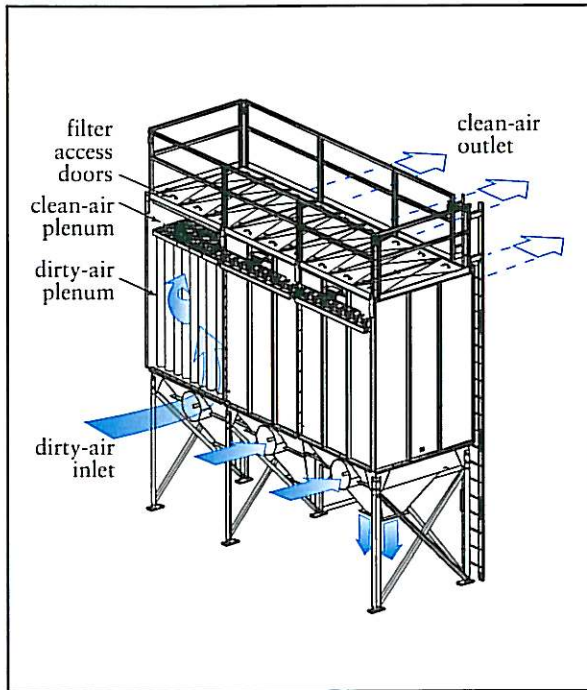


405MBW10

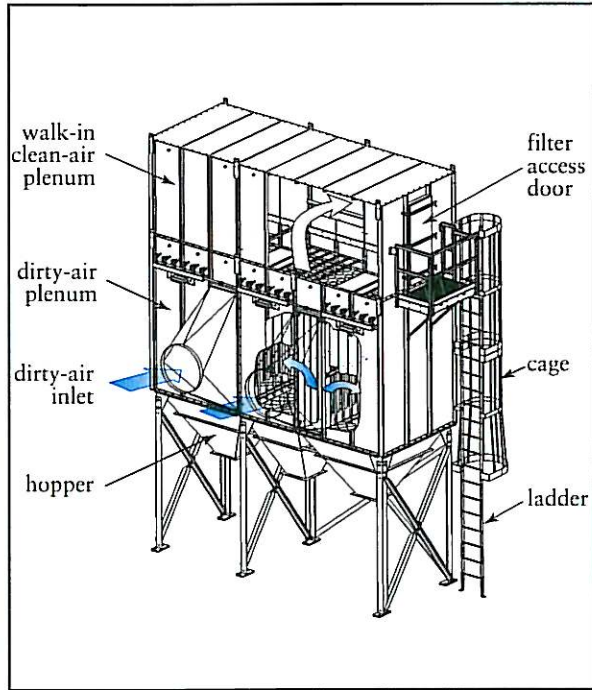
# Modular Baghouse

## Operations & Features

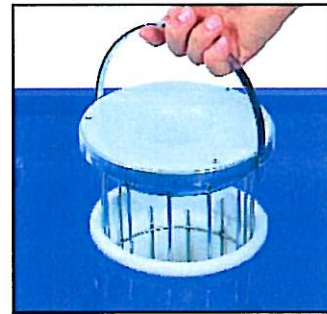
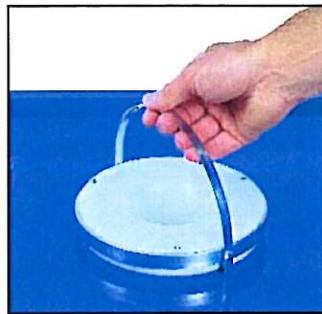
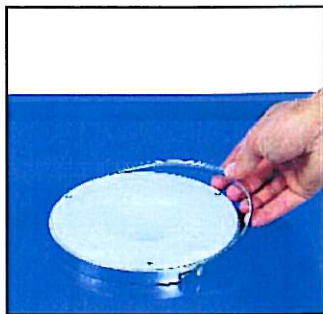
MBT Normal Operation



MBW High Inlet Normal Operation



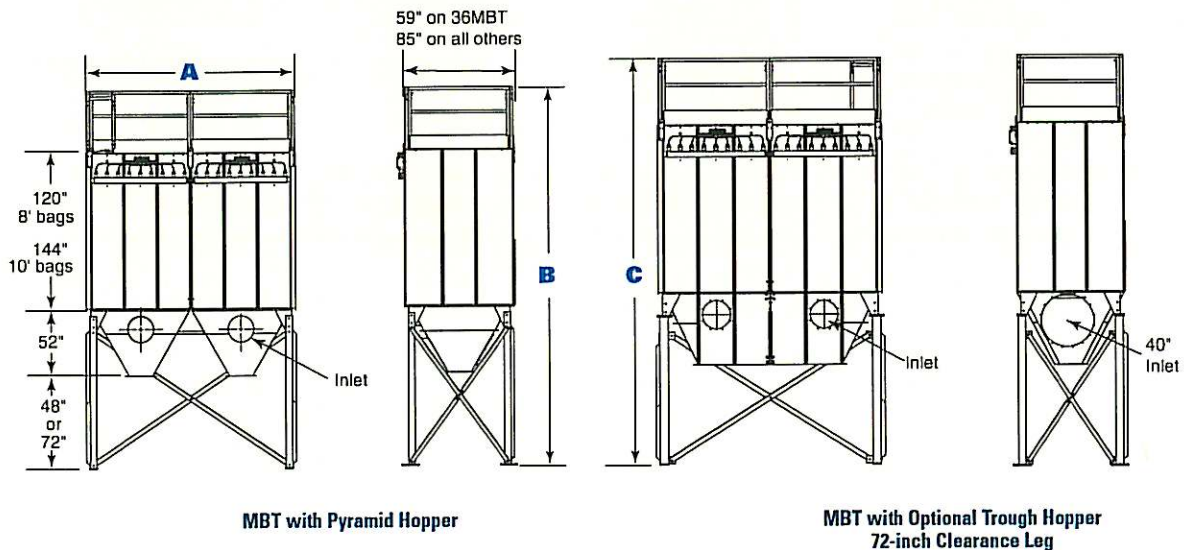
**Easy Maintenance** Quick-Release Filter Bag Cages (patent pending) make filter bag removal extremely easy. When swung into position, the handle serves as a lever to remove the cage from the tubesheet. The Quick-Release Filter Bag Cage requires only 6 pounds of force to remove compared to other cages that require 50 pounds.



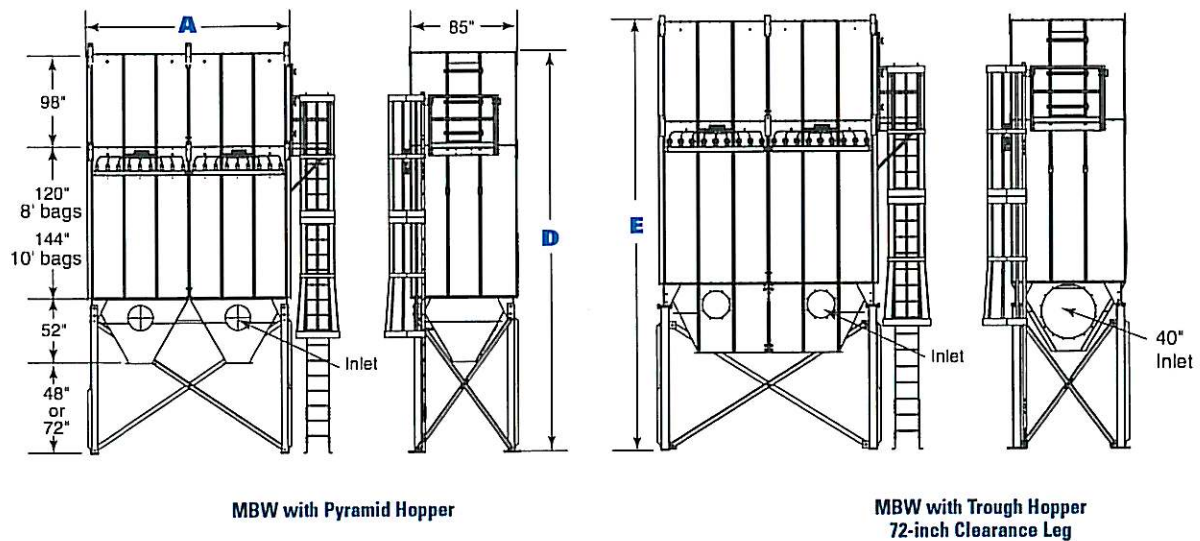
# Modular Baghouse

## Dimensions & Specifications

### MODEL 162MBT8 SHOWN



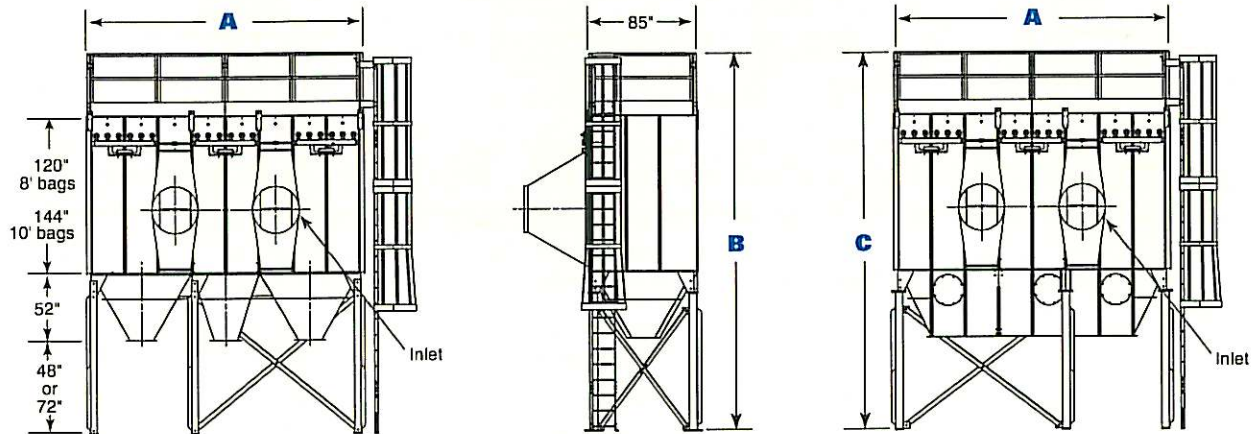
### MODEL 162MBW8 SHOWN



# Modular Baghouse

## Dimensions & Specifications

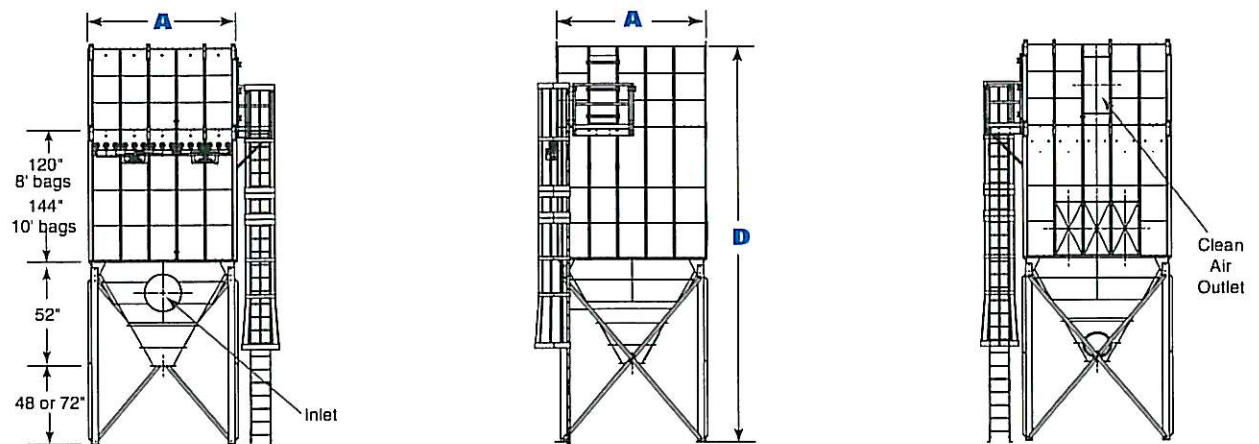
### MODEL 162MBTH8 (Modular Baghouse High Inlet ) SHOWN



MBTH with Pyramid Hopper

MBTH with Trough Hopper

### MODEL 162MBWS8 (Modular Baghouse Square) SHOWN



MBWS with Pyramid Hopper

MBWS with Pyramid Hopper Side View

MBWS with Pyramid Hopper Rear View

# Modular Baghouse

## Dimensions & Specifications

Model	Dimensions (inches)						
	A	B		C	D		E MBW
		MBT 48-in	MBT 72-in	MBT	MBW 48-in	MBW 72-in	
36 MBT5	57.5	209.7	-	-	-	-	-
36 MBT6	57.5	221.7	-	-	-	-	-
36 MBT8	57.5	245.7	-	-	-	-	-
54 MBT6	57.5	244.2	-	-	-	-	-
54 MBT8	57.5	268.2	-	-	-	-	-
54 MBT10	57.5	292.2	-	-	-	-	-
54 MBT(W)H8	85.0	268.1	292.1	-	294.1	318.1	-
54 MBT(W)H10	85.0	292.1	316.1	-	342.1	366.1	-
81 MBT(W)8	85.0	268.2	292.2	-	294.1	318.1	-
81 MBT(W)10	85.0	292.2	316.2	-	342.1	366.1	-
81 MBT(W)H8	111.0	290.8	314.8	-	316.7	340.7	-
81 MBT(W)H10	111.0	314.8	338.8	-	364.7	388.7	-
108 MBT(W)8	111.0	290.8	314.8	-	316.7	340.7	-
108 MBT(W)10	111.0	314.8	338.8	-	364.7	388.7	-
108 MBT(W)H8	137.0	268.2*	292.2*	-	294.1	318.1	-
108 MBT(W)H10	137.0	292.2*	316.2*	-	342.1	366.1	-
144 MBWS8	111.0	-	-	-	316.6	340.6	-
144 MBWS10	111.0	-	-	-	364.6	388.6	-
162 MBT(W)8	163.0	268.2	292.2	292.3	294.1	318.1	318.4
162 MBT(W)10	163.0	292.2	316.2	316.2	342.1	366.1	366.1
162 MBT(W)H8	215.0	268.3	292.3	292.3	294.1	318.1	318.1
162 MBT(W)H10	215.0	292.3	316.3	316.3	342.1	366.1	366.1
189 MBT(W)H8	241.0	268.2	292.2	292.3	294.1	318.1	318.1
189 MBT(W)H10	241.0	292.2	316.2	316.2	342.1	366.1	366.1
225 MBWS8	137.0	-	-	-	339.1	363.1	-
225 MBWS10	137.0	-	-	-	387.1	411.1	-
243 MBT(W)8	241.0	268.2	292.2	292.2	294.1	318.1	318.1
243 MBT(W)10	241.0	292.2	316.2	316.2	342.1	366.1	366.1
297 MBT(W)H8	371.0	268.3	292.3	292.3	294.1	318.1	318.1
297 MBT(W)H10	371.0	292.3	316.3	316.3	342.1	366.1	366.1
324 MBT(W) 8	319.0	268.2	292.2	292.2	294.1	318.1	318.1
324 MBT(W) 10	319.0	292.2	316.2	316.2	342.1	366.1	366.1
324 MBT(W)H8	395.5	268.1	292.1	292.1	294.1	318.1	318.1
324 MBT(W)H10	395.5	292.1	316.1	316.1	342.1	366.1	366.1
324 MBWS8	163.0	-	-	-	320.6	344.6	-
324 MBWS10	163.0	-	-	-	417.3	441.3	-
405 MBT(W)8	397.0	268.2	292.2	292.2	294.1	318.1	318.1
405 MBT(W)10	397.0	292.2	316.2	316.2	342.1	366.1	366.1

\* Two pyramid hoppers. Single outlet hopper also available.

# Modular Baghouse

## Dimensions & Specifications

Model	Nominal Airflow Range* (cfm)	Cloth Area (ft <sup>2</sup> )	No. of Bags	No. of Valves	Shipping Weight (lbs)	
					MBT	MBW
36 MBT5	1,150-2,880	288	36	6	2500	—
36 MBT6	1,380-3,450	345	36	6	2850	—
36 MBT8	1,840-4,600	460	36	6	3200	—
54 MBT6	2,070-5,180	518	54	6	3800	—
54 MBT8	2,760-6,910	691	54	6	4200	—
54 MBT10	3,460-8,660	866	54	6	5000	—
54 MBT(W)H8	2,760-8,290	691	54	6	5890	6870
54 MBT(W)H10	3,460-10,390	866	54	6	6565	7710
81 MBT(W)8	4,150-10,390	1039	81	9	3900	6100
81 MBT(W)10	5,190-12,990	1299	81	9	5509	7222
81 MBT(W)H8	4,150-12,460	1039	81	9	7085	8145
81 MBT(W)H10	5,190-15,580	1299	81	9	7690	9172
108 MBT(W)8	5,530-13,830	1383	108	12	6800	7800
108 MBT(W)10	6,920-17,300	1730	108	12	7700	9000
108 MBT(W)H8	5,530-16,590	1383	108	12	8480**	9555**
108 MBT(W)H10	6,920-20,760	1730	108	12	9320**	10,580**
144 MBWS8	7,380-18,450	1845	144	12	—	10,088
144 MBWS10	9,220-23,070	2307	144	12	—	10,559
162 MBT(W)8	8,310-20,780	2078	162	18	6600	9500
162 MBT(W)10	10,390-25,980	2598	162	18	9131	11,087
162 MBT(W)H8	8,310-24,930	2078	162	18	12,538	13,672
162 MBT(W)H10	10,390-31,170	2598	162	18	13,725	15,302
189 MBT(W)H8	9,690-29,070	2423	189	21	13,532	14,565
189 MBT(W)H10	12,110-36,340	3029	189	21	14,910	16,508
225 MBWS8	11,530-28,840	2884	225	15	—	14,460
225 MBWS10	14,420-36,060	3606	225	15	—	15,481
243 MBT(W)8	12,460-31,170	3117	243	27	8400	12,800
243 MBT(W)10	15,580-38,970	3897	243	27	12,605	14,687
297 MBT(W)H8	15,230-45,960	3808	297	33	20,173	21,390
297 MBT(W)H10	19,040-57,120	4760	297	33	21,924	24,172
324 MBT(W) 8	16,620-41,560	4156	324	36	11,600	16,800
324 MBT(W) 10	20,780-51,960	5196	324	36	16,034	19,467
324 MBT(W)H8	16,620-49,870	4156	324	36	21,570	21,755
324 MBT(W)H10	20,780-62,352	5196	324	36	23,215	25,495
324 MBWS8	16,620-41,560	4156	324	36	—	20,076
324 MBWS10	20,780-51,960	5196	324	36	—	20,154
405 MBT(W)8	20,780-51,950	5195	405	45	14,500	20,800
405 MBT(W)10	25,980-64,950	6495	405	45	19,201	23,985

\* Based on clean filters.

\*\* Two pyramid hoppers. Single outlet hopper also available.

# Modular Baghouse

## Dura-Life™ Filter Bag Technology

*Standard in All Donaldson Torit  
Modular Baghouse Collectors*

**Dura-Life — A breakthrough for bag users.** Polyester bags are woven with a needling process that creates larger pores where dust can embed into the fabric, inhibiting cleaning and reducing bag life. Dura-Life\* bags are engineered with a unique hydroentanglement process that uses water to blend the fibers. This process provides a more uniform material with smaller pores, better surface loading, and better cleaning. These advantages provide twice the operating life before bags need to be replaced due to pressure drop. Longer life from Dura-Life bags lowers maintenance costs and raises baghouse dust collection to a whole new level.



*These photos were taken with a scanning electron microscope of bag media used in a collector that was filtering fly ash. The bags were removed after 2,700 hours of use. Air-to-media ratio was 4.5 to 1. Pressure drop was 6 in. on polyester bags and 2 in. on Dura-Life.*

### **Dura-Life bags provide big benefits!**

Dura-Life technology provides better surface loading and better pulse cleaning, resulting in:

- **Two to three times longer bag life**
- **Reduced replacement bag costs due to fewer bag changeouts**
- **Reduced maintenance costs due to fewer bag changeouts**
- **30% fewer emissions based on EPA tests**
- **Reduced energy costs** (when used with damper or variable speed drive motor)



\* Dura-Life bags are made with Durapex™ (patent pending) media manufactured by Polymer Group, Inc.

# Modular Baghouse

## Standard Features & Equipment Options

	Standard	Optional		Standard	Optional
<b>Collector Design</b>			<b>Hopper Discharge</b>		
Clean Air Plenum with Top-Bag Removal	X		Slide Gate Pack		X
Heavy-Duty Ribbed Housing Construction	X		55-Gallon Drum Pack		X
All-Welded, Carbon Steel Design - 12 Gauge Minimum	X		AN Rotary Valves and Transitions		X
Heavy-Duty 10-Gauge Tubesheet	X		<b>Support Structure</b>		
Filter Cleaning System	X		48" Clearance Leg Pack (pyramid hoppers)	X	
Service Railing with Kickplate per OSHA Specs (MBT)	X		Stub Legs (trough hopper)	X	
Bottom Bag Removal		X	72" Clearance Leg Pack		X
High Temperature Construction		X	48" Clearance Ladder Pack		X
Stainless Steel Construction		X	72" Clearance Ladder Pack (with cages)		X
Direct Drive Fans		X	<b>Electrical Controls, Gauges and Enclosures</b>		
Power Pack Transition for TBI Fans		X	Solenoid Valves in NEMA 4 Enclosure	X	
Chamber and Exhaust Silencers		X	Magnehelic <sup>®*</sup> Gauge	X	
Damper Pack		X	Control Timer in NEMA 4 Enclosure	X	
Service Platform (MBW)		X	Solenoid Enclosure in NEMA 7 or 9		X
<b>Bags &amp; Cages</b>			Photohelic <sup>®</sup> Gauge		X
Dura-Life Twice the Life Polyester Felt Snap-In Bags	X		Delta P Control Panel		X
Galvanized Quick-Release Bag Cages	X		<b>Safety Features</b>		
Variety of Bag Media Options		X	Sprinkler Access Ports	X	
Articulated Cages		X	Sprinkler Pack Assembly (wet or dry)		X
<b>Hopper Design</b>			Explosion Vents		X
60° Pyramid Hoppers	X		<b>Paint System</b>		
Inlets with Deflector	X		Prime Coated Interior	X	
Trough Hopper with Multiple or Single Inlets	X		Blue Exterior Finish Coating Meets 250-Hour Salt Spray Corrosion Protection Test	X	
Hopper Access Covers	X		Hostile Environment Paint		X
Inlet Transitions		X	Custom Colors		X
Pyramid Hopper Cover with Flood Valve		X	<b>Warranty</b>		
			10-Year Warranty	X	

\* Magnehelic and Photohelic are registered trademarks of Dwyer Instruments, Inc.

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# RF Baghouse Collectors

Models 48RF8-484RF12

## Simple design and energy-efficient filtration for high-volume dust collection applications.

- Handles extremely heavy dust loads of up to 70–100 grains per cubic foot in a variety of applications including woodworking, cement, grain, chemicals, and food.
- High filtration efficiencies of 99.9%+ by weight with minimal pressure drop.
- Even-Air™ Flow Straightener eliminates bag sway and extends bag life by straightening airflow.
- Bag service from the clean-air side of collector makes filter changeout safer, easier, and faster.
- Single hopper uses only one rotary valve resulting in lower system and installation costs.
- Conical hopper prevents product build-up.

## The RF Cleaning System reduces operations costs.

- Each bag is cleaned within four minutes, yet never cleans adjacent bags thus reducing re-entrainment issues.
- Cleans by using its own air supply, eliminating the need for costly compressed air.
- Small horsepower cleaning motor saves energy costs.



RF Baghouse Collector

The Donaldson Torit RF cleaning system requires a significantly smaller motor when compared to competitive units. The chart below illustrates the average energy savings for a variety of annual operating scenarios.

5 Days/Week Hours/Day	Annual Operating Hours	Annual 5 HP Operating Costs	Annual 25 HP Operating Costs	Annual Savings
8	2080	\$618	\$2986	\$2,368
16	4160	\$1,235	\$5971	\$4,736
24	6240	\$1,853	\$8957	\$7,104

Assumes U.S. Energy Average Cost of 6.68 cents per kilowatt hour with the motor operating at full-load amps. Savings will vary based on costs per kilowatt hour.

## RF Baghouse Collectors

### All-Welded Construction

Solid, durable one-piece body makes it easier and less costly to install the dust collector. Heavy duty 1/4" tubesheet and up to 3/16" body wall thickness resists warping.

### Standard Round Outlet on Walk-In Units

(Rectangular optional)

### Rotating Cleaning Air Manifold

Needs only one solenoid and diaphragm valve because the manifold rotates into position over the bag openings. Makes troubleshooting and maintenance much easier.

### RF Cleaning System

### Involute Scroll Inlet

Directs dirty air into a cyclonic pattern, causing heavy dust particles to fall into the hopper before the air passes to the filter bag section. This eliminates the need for a cyclone precleaner used on other baghouses.

### Optional Explosion Vents

### Positive-Seal Boltsafe™ Cages

Provide electrical grounding, easy bag changeout, reduced bag sway, and an airtight seal to the tubesheet. Cages will not rise out of position once they are installed.

### Oval Bags

Provide more radial bag movement during the cleaning cycle, resulting in longer bag life and lower pressure drop.

### Even-Air Flow Straightener

### Optional Legs and Caged Ladders

### Compact Design

Round unit has one hopper in base; there is usually no need for screw conveyors or multiple discharge devices.

### Medium-Pressure Air Pump

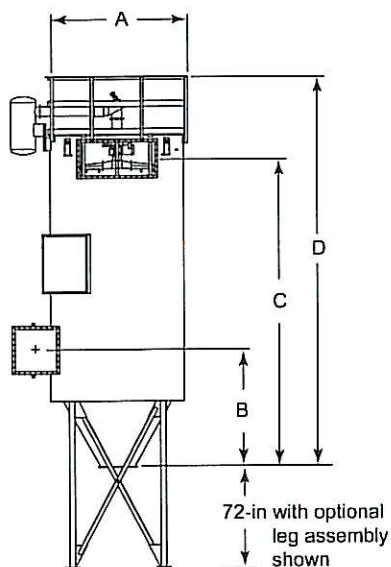
(not shown)

Eliminates need for plant compressed air, which can be susceptible to condensation, oil and freezing problems. The medium-pressure air pulse cleans efficiently to extend bag life.

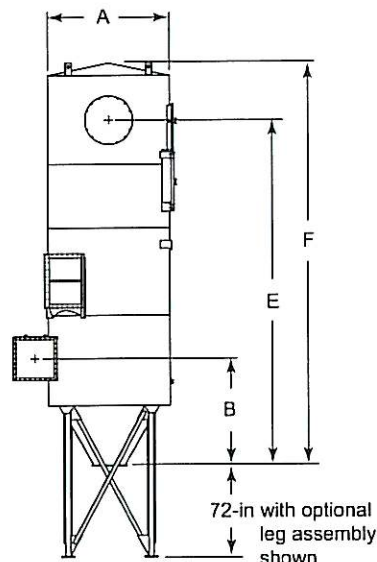
**Easy to install—built to last.**

# RF Baghouse Collectors

## Dimensions & Specifications



Model RFT



Model RFW

Model	No. of Bags	Bag Length (ft)	Cloth Area (ft <sup>2</sup> )	Air-to-Media ratio (cfm)			Air Pump (hp)	Approximate Dimensions (inches)						Shipping Weight (lbs)
				5:1	10:1	15:1		A	B	C	D	E	F	
48RF8	48	8	499	2,495	4,990	7,485	2	68.0	54.8	186.3	231.9	236.6	293.5	7,388
48RF10	48	10	624	3,120	6,240	9,360	2	68.0	54.8	210.3	255.9	260.6	341.5	8,105
72RF8	72	8	749	3,745	7,490	11,235	2	68.0	54.8	186.3	231.9	236.6	293.5	7,554
72RF10	72	10	937	4,685	9,370	14,055	2	68.0	54.8	210.3	255.9	260.6	341.5	8,306
124RF8	124	8	1290	6,450	12,900	19,350	2	96.0	84.0	220.5	266.4	271.0	316.0	10,048
124RF10	124	10	1613	8,065	16,130	24,195	3	96.0	84.0	244.5	290.4	295.0	364.0	10,910
156RF8	156	8	1622	8,110	16,220	24,330	3	96.0	84.0	220.5	266.4	271.0	316.0	10,298
156RF10	156	10	2030	10,150	20,300	30,450	3	96.0	84.0	244.5	290.4	295.0	364.0	11,217
232RF8	232	8	2413	12,065	24,130	36,195	3	123.0	113.4	261.9	314.9	306.4	357.1	15,304
232RF10	232	10	3018	15,090	30,180	45,270	5	123.0	113.4	285.9	338.9	330.4	405.1	16,591
232RF12	232	12*	3622	18,110	36,220	54,330	5	123.0	113.4	309.9	362.9	354.4	453.1	17,825
276RF8	276	8	2870	14,350	28,700	43,050	3	123.0	113.4	261.9	314.9	306.4	357.1	15,614
276RF10	276	10	3591	17,955	35,910	53,865	5	123.0	113.4	285.9	338.9	330.4	405.1	16,975
276RF12	276	12*	4308	21,540	43,080	64,620	5	123.0	113.4	309.9	362.9	354.4	453.1	18,290
376RF8	376	8	3910	19,550	39,100	58,650	7.5	139.6	130.8	285.3	339.9	326.8	381.1	19,617
376RF10	376	10	4892	24,460	48,920	73,380	7.5	139.6	130.8	309.3	363.9	350.8	429.1	21,248
376RF12	376	12*	5869	29,345	58,690	88,035	7.5	139.6	130.8	333.3	387.9	374.8	477.1	22,868
484RF8	484	8	5034	25,170	50,340	75,510	7.5	157.6	149.8	309.9	383.9	348.4	405.1	25,458
484RF10	484	10	6297	31,485	62,970	94,455	7.5	157.6	149.8	333.9	425.8	372.4	453.1	27,796
484RF12	484	12*	7555	37,775	75,550	113,325	7.5	157.6	149.8	357.9	431.8	396.4	501.1	30,115

\* Boltsafe only

# RF Baghouse Collectors

## Standard Features

- All-welded or knock-down construction:
  - 48-376 models - 10 gauge, minimum
  - 484 models - 3/16" dirty air plenum and 10 gauge clean air plenum
  - Heavy-duty 1/4" plate steel tubesheet
- Air pump (TEFC motor drive)
- 1/3 hp TEFC motor for manifold drive
- NEMA 9 pulse valve solenoid
- Involute scroll inlet with airflow straightener
- 60° hopper
- Grounded bag and cage system
- ±20 "wg housing rating
- Hopper manhole
- NEMA 4 pulse timer
- Magnehelic®\* gauge
- 16 oz. polyester felt bags
- Galvanized bag cages
- Top handrail (RFT)
- Positive seal Boltsafe™ hardware
- Prime coated interior
- Blue exterior finish coating passes 250-hour salt spray corrosion performance test
- Round outlet (RFW)
- Rectangular outlet (RFT)

## Equipment Options

- Explosion vents
- Tubular square steel support legs
- Caged ladder and platform per OSHA specifications
- Variety of special filter medias, including Tetratex®\*\*
- Stainless steel construction
- Sprinkler taps
- Internal service light
- Photohelic®\* gauge
- Finish coating for hostile environments
- Rectangular outlet (RFW)
- Round outlet (RFT)
- Snap-in bags (8' and 10' only)
- Custom paint colors
- Electrical control panels
- Hopper level indicator
- Hopper service port
- 3" hopper water overflow check valve
- Hopper outlet transitions
  - 2'-0" to 1'-8" dia. x 4 1/8" high
  - 2'-0" dia. to 1'-4" dia. x 7 5/8" high
  - 2'-0" dia. to 1' 0" dia. x 11" high
  - 2'-0" dia. to 10" dia. x 12 3/4" high
  - 2'-0" dia. to 8" dia. x 14 1/2" high
  - 2'-0" dia. to 1'-6" x 2'-0" rectangle x 5 5/16" high

\* Magnehelic and Photohelic are registered trademarks of Dwyer Instruments, Inc.

\*\* Tetratex is a registered trademark of Tetratex Corporation, a Donaldson Company.



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Data Sheet RF (06/03)

# Torit® Backward Inclined Fans

**TBI-3, 5, 7.5, 10, 15, 20 and 30 (60 and 50 Cycle)**

**Torit Backward Inclined (TBI) Fans provide a convenient, cost-effective method of integrating a high efficiency fan with a Donaldson® Torit® dust collector.**

- Mounts directly to the clean-air plenum of the dust collector.
  - Eliminating costly transition ducting
  - Reducing footprint of system
- Sizes range from 3 to 30 hp.
- Backward inclined fan wheel provides high efficiency operation.
- Direct-drive operation eliminates maintenance of fan bearings and belts.
- Computer balanced fan and motor assembly ensures vibration-free operation.
- All necessary hardware for quick and easy installation is included.
- Standard paint finish is blue.



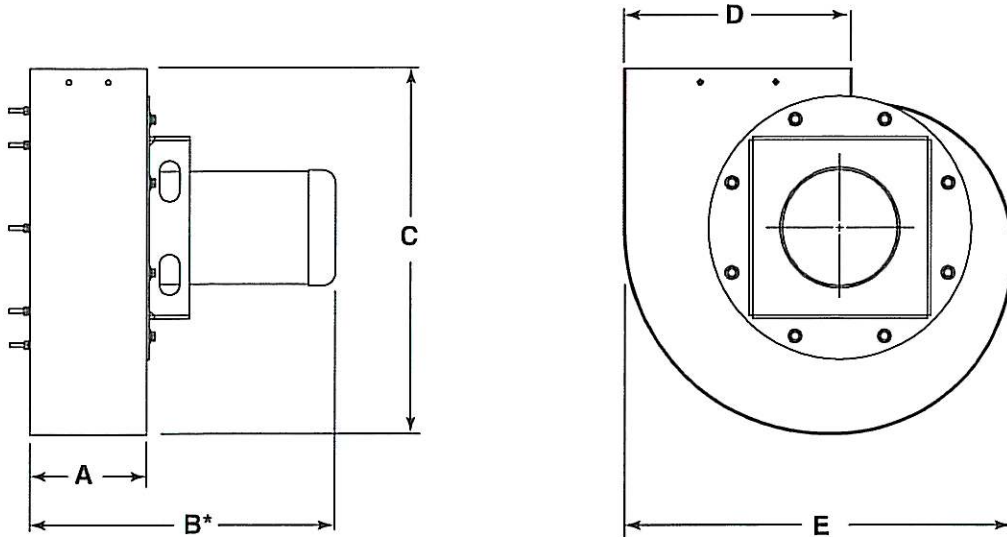
**TBI-15 (60 Cycle)**

## Equipment Options

- Aluminum fan wheel
- Explosion-proof motors - NEMA
- Outlet dampers
- High temperature version available
- Exhaust silencers
- 50 cycle/IEC motor configurations
- Flanges for exhaust ductwork

# Torit Backward Inclined Fans

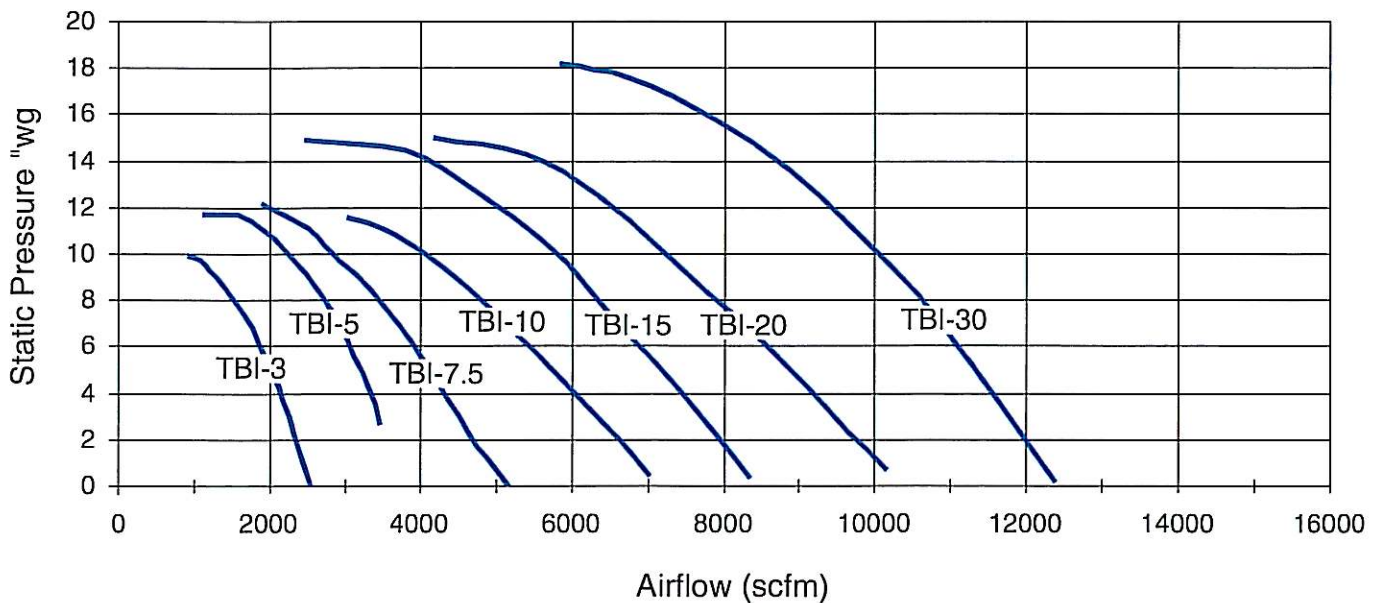
## Dimensions & Specifications for 60 Cycle TBI Fan



60 Cycle Fans	Dimensions										Shipping Weight	
	A		B*		C		D		E		(lbs)	(kg)
	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)		
TBI-3	7.9	20.1	19.8	50.3	26.9	68.3	16.8	42.7	28.7	72.9	155	70
TBI-5	8.7	22.1	22.7	57.6	26.9	68.3	16.8	42.7	28.7	72.9	178	81
TBI-7.5	10.1	25.6	25.8	65.5	26.9	68.3	16.8	42.7	28.7	72.9	211	96
TBI-10	11.4	28.9	27.1	68.8	26.9	68.3	16.8	42.7	28.7	72.9	242	110
TBI-15	11.9	30.2	28.8	73.2	32.2	81.8	20.4	51.8	34.8	88.4	387	176
TBI-20	13.6	34.4	30.2	76.7	35.5	90.2	20.4	51.8	34.8	88.4	431	196
TBI-30	14.8	37.5	38.4	97.5	37.3	94.7	22.4	56.9	38.3	97.3	640	290

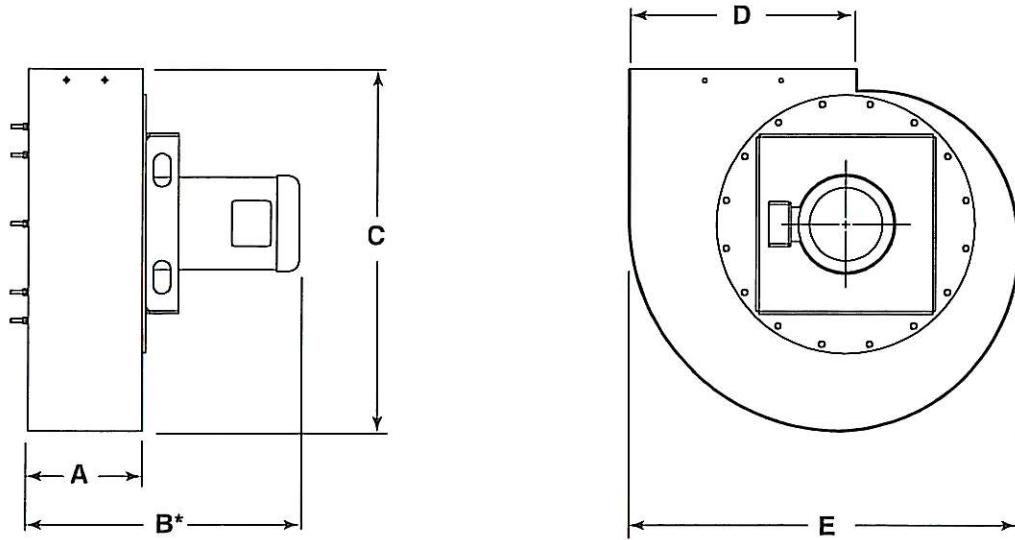
\* This dimension is subject to change based on the motor manufacturer chosen and on the motor enclosure type (TEFC or EP). If this dimension is critical, you should verify the information with your sales representative.

## Performance Curves for 60 Cycle TBI Fan



# Torit Backward Inclined Fans

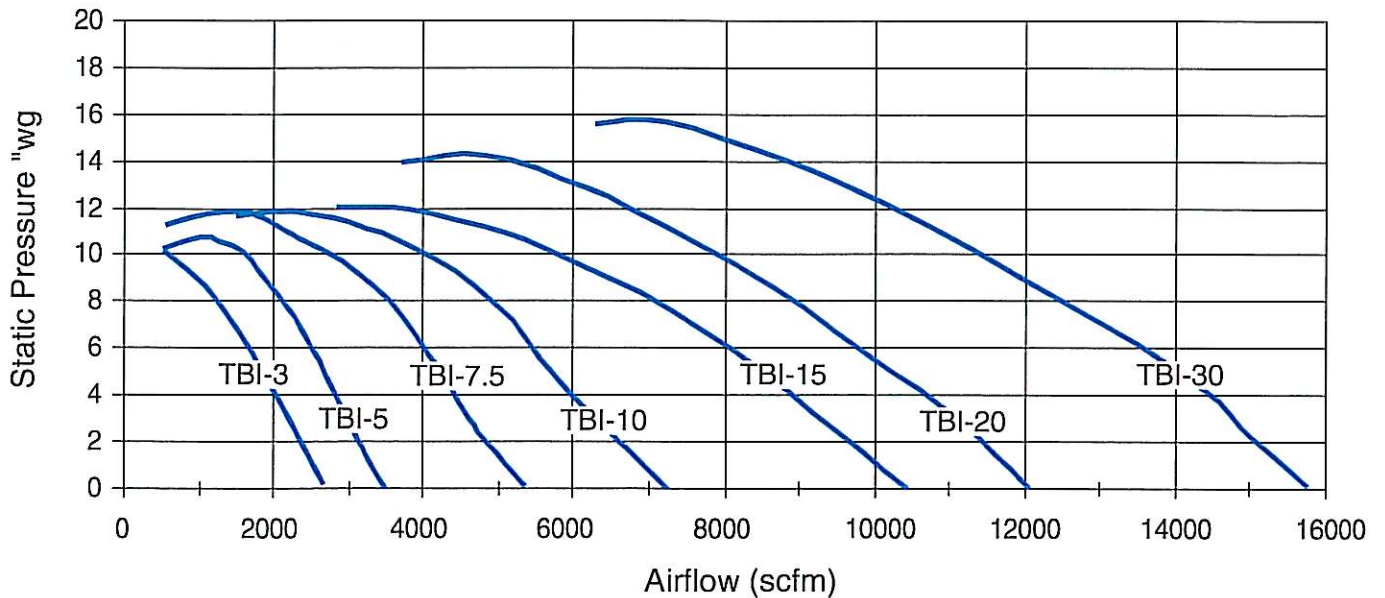
## Dimensions & Specifications for 50 Cycle TBI Fan



50 Cycle Fans	Dimensions										Shipping Weight	
	A		B*		C		D		E		(lbs)	(kg)
	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)		
TBI-3	8.8	22.5	20.8	52.8	32.2	81.8	20.4	51.8	34.8	88.4	207	94
TBI-5	10.3	26.0	24.3	61.7	32.2	81.8	20.4	51.8	34.8	88.4	233	106
TBI-7.5	11.9	30.2	27.6	70.1	32.2	81.8	20.4	51.8	34.8	88.4	272	123
TBI-10	13.6	34.4	29.3	74.4	32.2	81.8	20.4	51.8	34.8	88.4	303	137
TBI-15	13.9	35.3	30.7	78.0	32.2	81.8	20.4	51.8	34.8	88.4	388	176
TBI-20	15.4	39.2	32.3	82.0	37.4	95.0	22.4	56.9	38.3	97.3	482	219
TBI-30	16.3	41.4	40.0	101.6	40.5	102.9	24.9	63.2	42.5	108.0	683	310

\* This dimension is subject to change based on the motor manufacturer chosen and on the motor enclosure type (TEFC or EP). If this dimension is critical, you should verify the information with your sales representative.

## Performance Curves for 50 Cycle TBI Fan





# Torit Backward Inclined Fans

## 60 Cycle TBI Fan Sound Data\*

Model	Overall Assembly Sound <sup>1</sup>
TBI-3	97
TBI-5	99
TBI-7.5	104
TBI-10	100
TBI-15	104
TBI-20	106
TBI-30	107

## 50 Cycle TBI Fan Sound Data\*

Model	Overall Assembly Sound <sup>1</sup>
TBI-3	93
TBI-5	96
TBI-7.5	99
TBI-10	100
TBI-15	103
TBI-20	105
TBI-30	106

\* dB(A) sound levels are an average of measurements made in a laboratory environment. Installed sound levels will vary depending on the measurement location, operating conditions, and installation.

<sup>1</sup> Sound ratings shown are taken at fan peak efficiency at an operating speed of 3500 rpm on the 60 cycle TBI fans and 2920 rpm on the 50 cycle TBI fans. They are the result of laboratory tests based on reverberant room techniques as described in AMCA bulletin 300 and processed by the procedures shown in AMCA 301. The ratings include an open inlet and ducted outlet.



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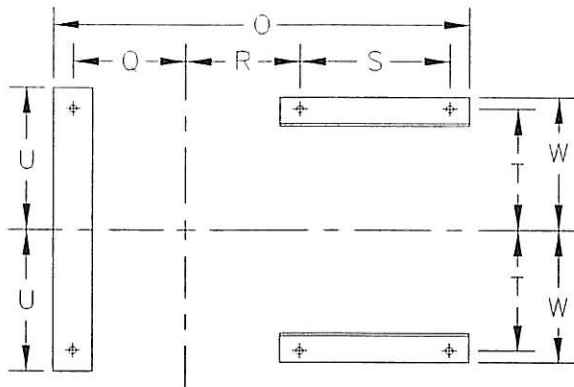
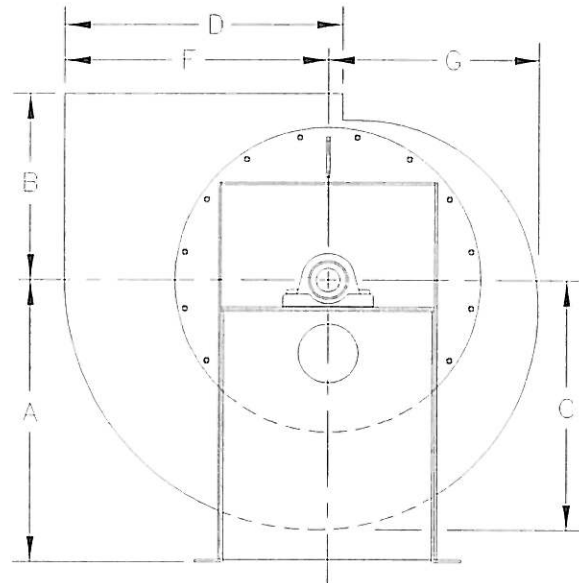
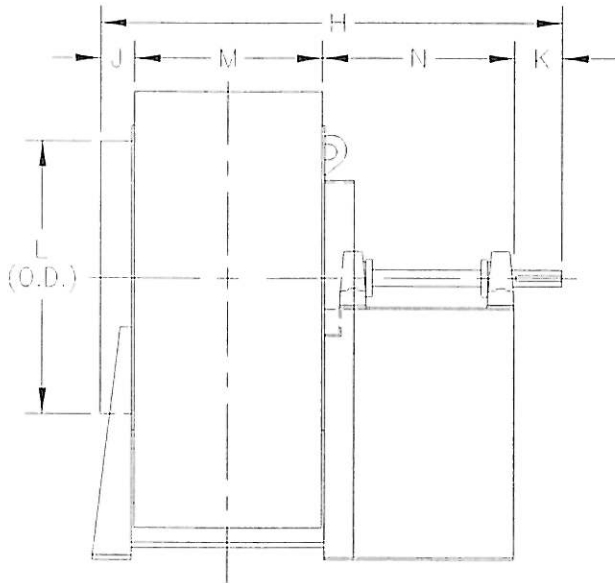


Information in this document is subject to change without notice.

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Data Sheet TBI Fans (03/05)

FOR SALES PURPOSES ONLY - This drawing has NOT been certified.



L, M, AND D ARE OUTSIDE DIMENSIONS.

FAN IS ROTATABLE IN THE FIELD BY 22 1/2° INCREMENTS.

MAXIMUM TEMPERATURE 300°F (149°C)

ITEM	DIMENSIONS	
	in	mm
A	21 3/4	552
B	14	356
C	18 1/2	470
D	20 1/2	521
F	19 3/8	492
G	15 1/2	394
H	37 1/2	953
J	3 1/8	79
K	4	102
L	20 3/4	527
M	13 7/8	352
N	16 1/2	419
O	33 5/8	854

ITEM	DIMENSIONS	
	in	mm
Q	8 3/4	222
R	8 1/2	216
S	13 3/8	340
T	9 3/8	238
U	10 7/8	276
W	10 1/4	260
HOLE DIA.	9/16	14
SHAFT DIA.	1 11/16	-

Estimated unitary base dimensions:  
65" x 45" x 8" high

TOLERANCE: ±1/8" (±3mm)

**nyb** The  
New York Blower  
Company

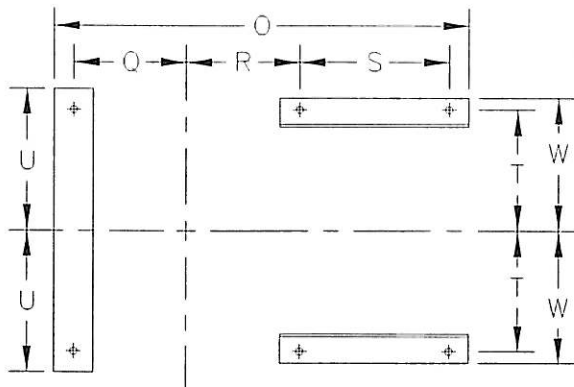
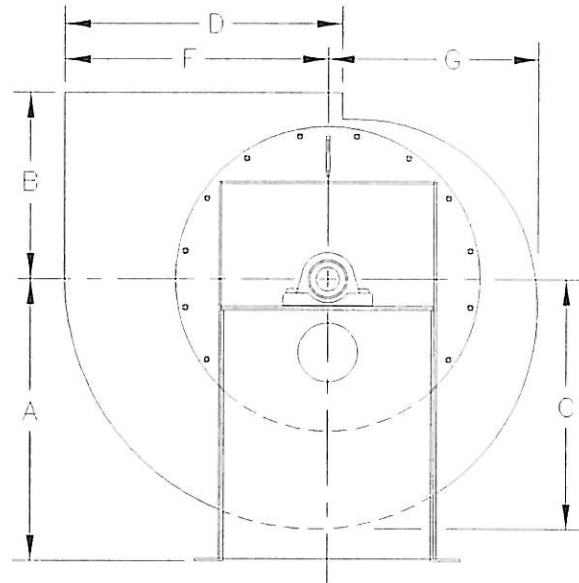
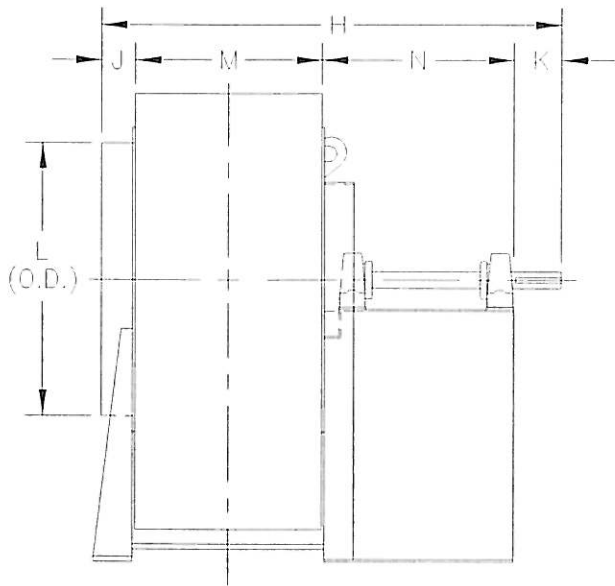
7660 Quincy Street, Willowbrook, IL 60521

**SINGLE-WIDTH PLR CLASS III  
SIZE 18 CW UB**

Date 08-25-97

Drawing No. CDV-100-2 Rev.

FOR SALES PURPOSES ONLY - This drawing has NOT been certified.



L, M, AND D ARE OUTSIDE DIMENSIONS.

FAN IS ROTATABLE IN THE FIELD BY 22 1/2° INCREMENTS.

MAXIMUM TEMPERATURE 300°F (149°C)

ITEM	DIMENSIONS	
	in	mm
A	28 5/8	727
B	19	483
C	24 3/4	629
D	27 3/8	695
F	26	660
G	20 3/4	527
H	49 7/8	1267
J	4 1/8	105
K	5	127
L	27 5/8	702
M	18 1/2	470
N	22 1/4	565
O	45	1143

ITEM	DIMENSIONS	
	in	mm
Q	11 1/2	292
R	11 3/8	289
S	18 1/8	460
T	12 1/4	311
U	14 3/8	365
W	13 1/2	343
HOLE DIA.	3/4	19
SHAFT DIA.	2 3/16	-

Estimated unitary base dimensions:  
80" x 55" x 8" high

TOLERANCE: ±1/8" (±3mm)

**nyb** The  
New York Blower  
Company

7660 Quincy Street, Willowbrook, IL 60521

SINGLE-WIDTH PLR CLASS III  
SIZE 24 CW UB

Date 08-25-97

Drawing No. CDV-100-2 Rev. \_\_\_\_\_

Conveyor Load Out Dust Collector  
Auxiliary Load Out Dust Collector

## RF Baghouse Dust Collectors



Now with

**DURA-LIFE™**  
Twice The Life Filter Bags

Award-Winning  
Filter Media

# RF Baghouse

## Energy Efficient, High Volume Dust Collector

The rugged Donaldson® Torit® RF baghouse collector handles heavy dust loads and large volumes of air more effectively than any collector on the market.

The small footprint of the RF combines a cyclone precleaner and a baghouse into one unit. It features a powerful yet energy-efficient cleaning system, eliminating the need for compressed air to clean the bags. Combined with the revolutionary Dura-Life™ “*Twice the Life*” filter bags, the award-winning RF gets the job done while using much less energy than competitor collectors.

Side by side, no other baghouse provides more performance than the Donaldson Torit RF baghouse collector.

### RF Offers:

- **New high-body inlet for abrasive or lighter dust**
- **Even-Air™ Flow Straightener reduces wear on filter bags**
- **Award winning Dura-Life™ “Twice the Life” Filter bags**
- **Oval shaped bags provide better snap for better bag cleaning**
- **Clean-air bag access for easier bag service**
- **Single inlet, outlet and hopper reduces duct and hopper outlet costs**
- **60° conical hopper reduces dust build-up**
- **Requires less energy than comparable sized units**
- **RF cleaning system requires no compressed air**
- **10-year warranty**

*High-Volume  
Performance*

*with*

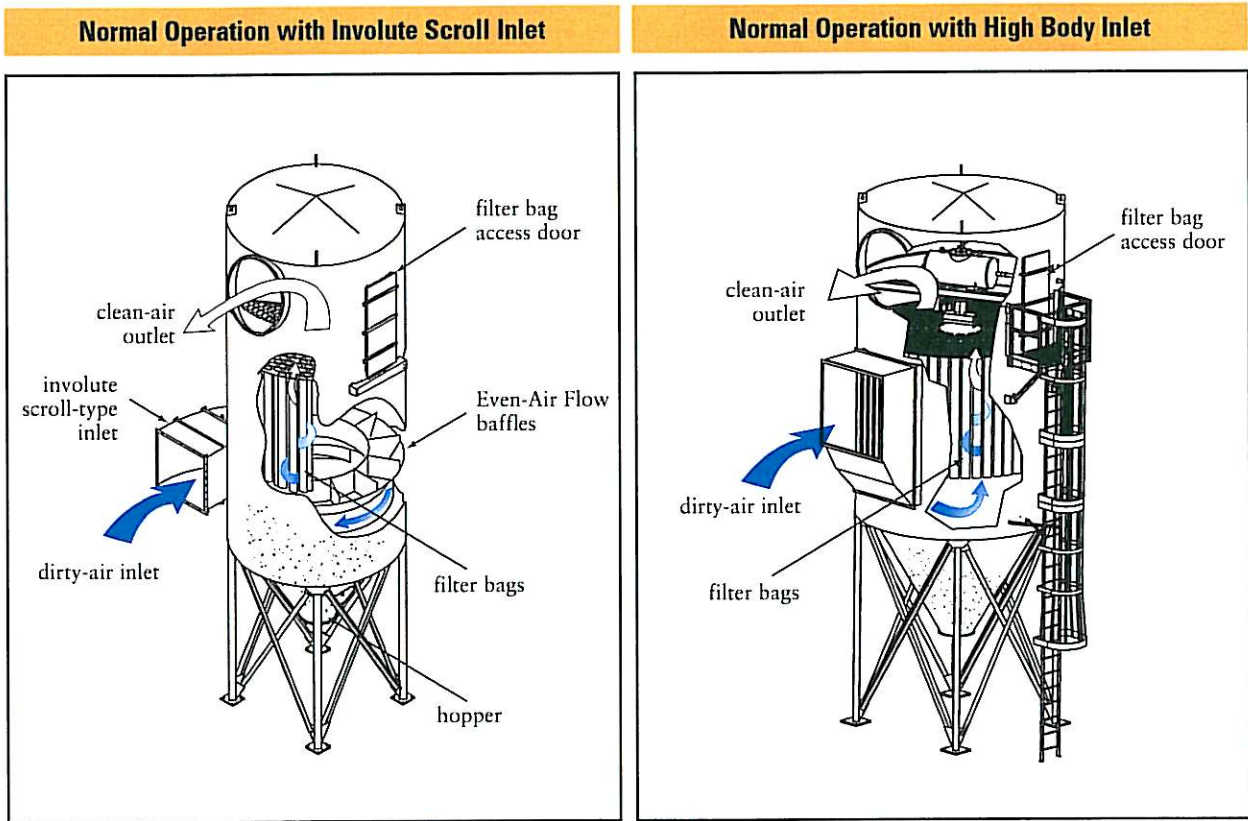
Dura-Life “*Twice The Life*” Filter Bags



156RFW8

# RF Baghouse

## Operations & Features



**The RF collector** works so well that many competitors strive to copy its award winning design, but no one has been able to duplicate the RF's performance.

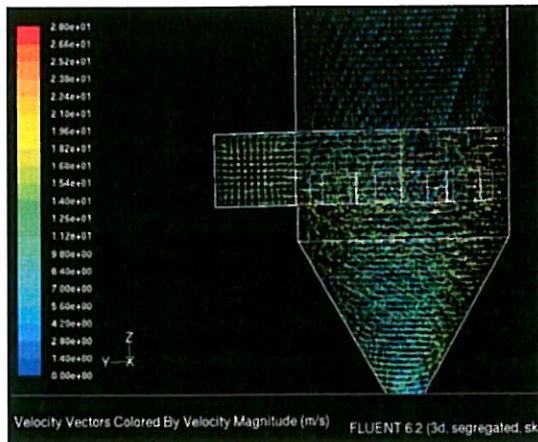
An involute scroll inlet puts dust into a cyclonic spin allowing for heavier particles to fall into the hopper, thus eliminating the need for a cyclone precleaner (for some applications with abrasive or light, fluffy dusts, the optional high body inlet may be preferred). The remaining dust is then collected on oval shaped bags that provide *greater snap* during pulsing resulting in better bag cleaning. Rather than using expensive compressed air, the RF comes complete with a pump that provides a medium pressure/high volume pulse of air to a rotating cleaning arm timed to clean non-adjacent bags, thus reducing dust re-entrainment.

Donaldson®

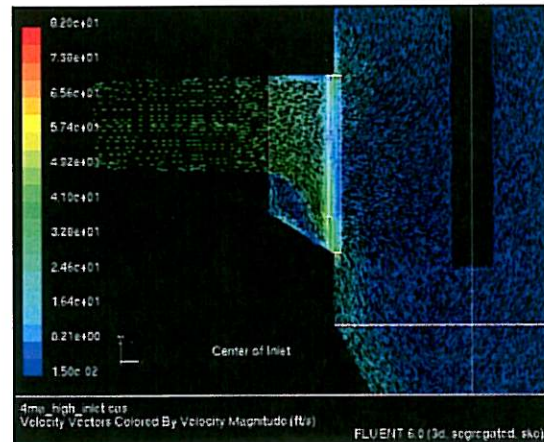
# RF Baghouse

## Operations & Features

**Even Airflow Distribution** To prevent filter bag wear and abrasion that can occur in other collectors, the RF baghouse collector comes standard with our proprietary Even-Air™ Flow Straightener or high body inlet. Designed using sophisticated FLUENT®\* computer airflow analysis, the RF provides the most uniform airflow possible resulting in reduced bag abrasion, longer bag life and lower maintenance costs.



FLUENT computer airflow analysis showing airflow with involute scroll inlet and Even-Air Flow Straightener.



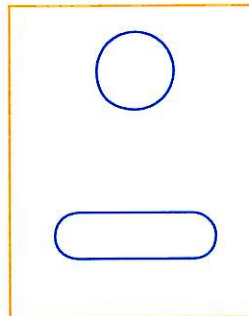
FLUENT computer airflow analysis showing airflow with high body inlet.

## Benefits of the Oval-Shaped Bag

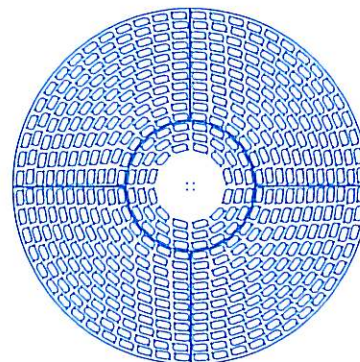
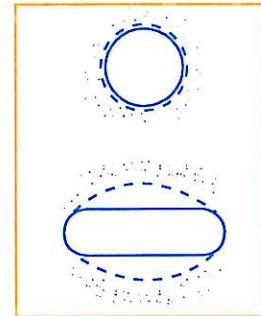
Oval shaped bags provide better snap during cleaning as compared to round bags—allowing the dust to be more easily knocked off the bags. This results in lower pressure drop and longer bag life.

Oval shaped bags increase the amount of bag material that can fit in a given area, thus increasing collector capacity.

### Normal Operation



### Pulse Bag Operation



\* FLUENT is a registered trademark of Fluent, Inc.



# RF Baghouse

## Operating Advantages

The RF cleaning system uses much less energy when compared to compressed air cleaning systems. The charts below illustrate the energy savings that can be realized for various annual operation scenarios.

### RF cleaning system uses less energy than compressed air cleaning systems



Weekly Operation	Annual Cleaning System vs. Compressed Air System Costs				
	Operating Hours	RF Cleaning System Operating Costs	Competitor Compressed Air Operating Costs	Savings with RF	Annual Savings
8 HRS. PER DAY 5 DAYS PER WEEK	2080	\$885	\$2,342	\$1,457	62%
16 HRS. PER DAY 5 DAYS PER WEEK	4160	\$1,771	\$4,685	\$2,914	62%
24 HRS. PER DAY 5 DAYS PER WEEK	6240	\$2,656	\$7,027	\$4,371	62%

Assumes the use of a 484 RF compared to a similar size collector with compressed air cleaning system.  
 Assumes U.S. Energy Average Cost of 6.68 cents per kilowatt hour and a Baldor motor that is operating at full-load amps.  
 Your savings may vary based on your costs per kilowatt hour and the efficiency of your motor.

### RF with Dura-Life filter bags runs at a lower pressure drop saving fan energy



Weekly Operation	Annual RF Fan vs. Competitor Fan Operating Costs				
	Operating Hours	RF Fan Operating Costs	Competitor Fan Operating Costs	Savings with RF	Annual Savings
8 HRS. PER DAY 5 DAYS PER WEEK	2080	\$2,237	\$4,474	\$2,237	50%
16 HRS. PER DAY 5 DAYS PER WEEK	4160	\$4,474	\$8,984	\$4,474	50%
24 HRS. PER DAY 5 DAYS PER WEEK	6240	\$6,711	\$13,442	\$6,711	50%

Assumes the use of a 484 RF running 50,000 cfm at a 2" pressure drop versus a competitor collector running at a 4" pressure drop.  
 Assumes the use of a variable frequency drive, a fan efficiency of 81%, 0.746 watts of energy per horsepower and a 90% electrical transmission efficiency.  
 Assumes U.S. Energy Average Cost of 6.68 cents per kilowatt hour and a Baldor motor that is operating at full-load amps.  
 Your savings may vary based on your costs per kilowatt hour and the efficiency of your motor.



Donaldson®

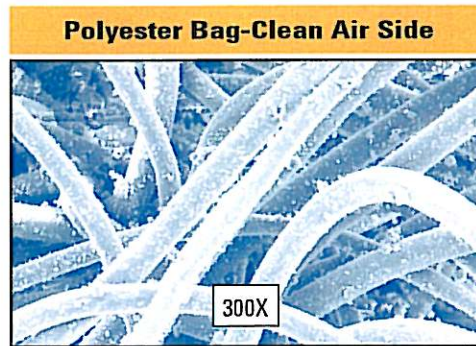
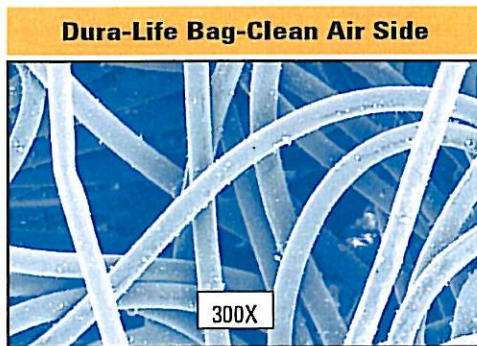
# RF Baghouse

## Dura-Life™ Filter Bag Technology

*Standard in All Donaldson Torit  
RF Baghouse Collectors*

### **Dura-Life — A technology breakthrough for bag users.**

Polyester bags are produced with a needling process that creates larger pores where dust can embed into the fabric, inhibiting cleaning and reducing bag life. Dura-Life\* bags are engineered with a unique hydroentanglement process that uses water to blend the fibers. This process provides a more uniform material with smaller pores, better surface loading, and better cleaning. These advantages provide twice the operating life before bags need to be replaced due to high pressure drop. Longer life from Dura-Life bags lowers maintenance and operating costs and raises baghouse dust collection to a whole new level.



*These photos were taken with a scanning electron microscope of bag media used in a collector that was filtering fly ash. The bags were removed after 2,700 hours of use. Air-to-media ratio was 4.5 to 1. Pressure drop was 6 in. on polyester bags and 2 in. on Dura-Life.*

### **Dura-Life bags provide big benefits!**

Dura-Life technology provides better surface loading and better pulse cleaning, offering:

- **Two to three times longer bag life**
- **Energy savings due to lower pressure drop**
- **Reduced replacement bag costs due to fewer bag changeouts**
- **Reduced maintenance and operating costs due to fewer bag changeouts**
- **30% fewer emissions based on EPA tests**



\* Dura-Life bags are made with Durapex® filter media manufactured by Polymer Group, Inc.

# RF Baghouse

**Proven Performance on Hundreds of Applications**



**376RF**  
*on wood dust*



**124RF**  
*on quarrying*



**156RF**  
*on grain processing*



**484RF**  
*four RF collectors on wood dust*



**484RF**  
*on wood dust*

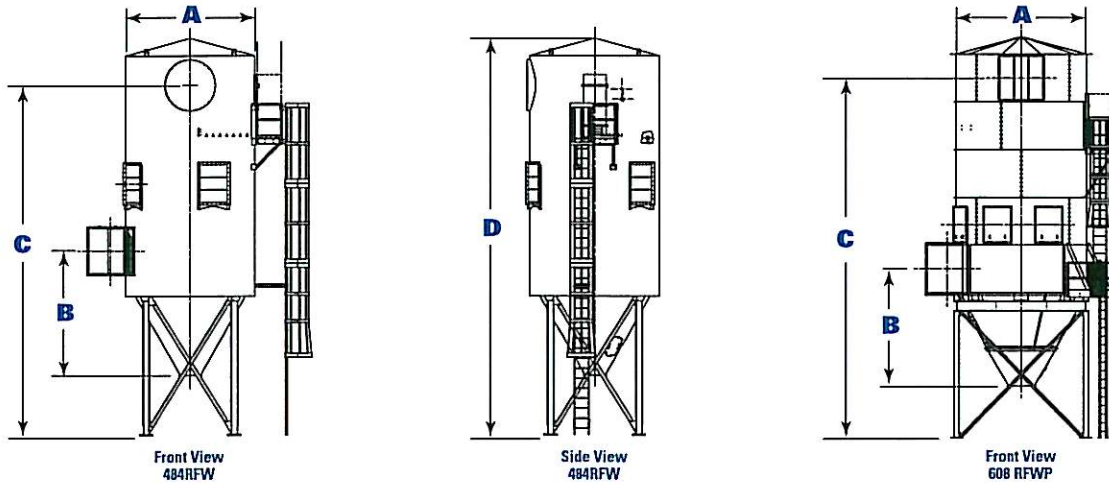


**484RF**  
*two high temperature collectors  
on secondary aluminum processing*

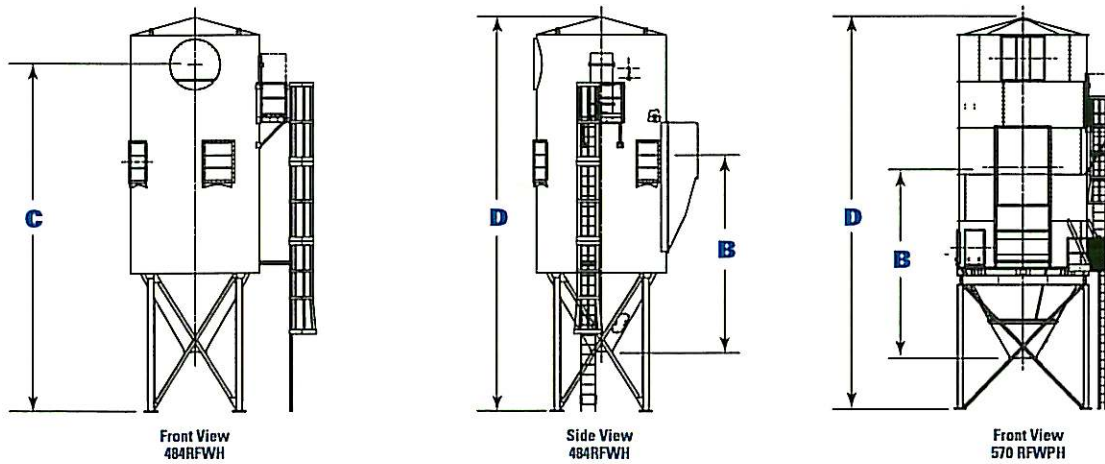
# RF Baghouse

## Dimensions & Specifications

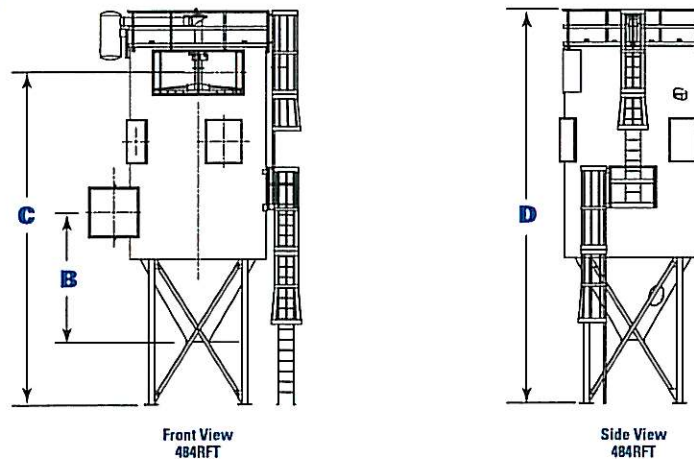
### Model 484RFW & 608RFPW (Walk-In)



### Model 484RFWH & 570RFPWH (Walk-In with High Body Inlet)



### Model 484RFT (Walk-On)



**RF Model Nomenclature:** First number denotes the number of bags and last number denotes the bag length in feet. **W** = walk-in plenum for sheltered bag removal; **T** = walk-on the top of the collector to replace bags; **H** = high body inlet; **P** = panelized construction for field assembly.

# RF Baghouse

## Dimensions & Specifications

Model*	Dimensions (inches)				RFT		RFW	
	A	B	C	D	C	D	C	D
48RF8	68.0	54.8	258.3	308.8	316.8	365.5		
48RF10	68.0	54.8	282.3	332.8	340.8	413.5		
48RFWH8	68.0	95.8	—	—	295.8	352.5		
48RFWH10	68.0	126.9	—	—	326.8	407.5		
72RF8	68.0	54.8	258.3	308.8	316.8	365.5		
72RF10	68.0	54.8	282.3	332.8	340.8	413.5		
72RFWH8	68.0	95.8	—	—	295.8	352.5		
72RFWH10	68.0	126.9	—	—	326.8	407.5		
124RF8	96.0	84.0	292.5	343.0	351.0	388.0		
124RF10	96.0	84.0	316.5	367.0	375.5	436.0		
124RFWH8	96.0	123.1	—	—	321.0	366.0		
124RFWH10	96.0	141.1	—	—	351.0	420.0		
156RF8	96.0	84.0	292.5	343.0	351.0	388.0		
156RF10	96.0	84.0	316.5	367.0	375.0	436.0		
156RFWH8	96.0	123.1	—	—	321.0	366.0		
156RFWH10	96.0	141.1	—	—	351.0	420.0		
232RF8	123.0	113.4	333.9	378.4	398.4	429.1		
232RF10	123.0	113.4	357.9	402.4	422.4	477.1		
232RF12	123.0	113.4	381.9	426.4	446.4	525.1		
232RFWH8	123.0	153.8	—	—	344.4	395.1		
232RFWH10	123.0	172.2	—	—	374.4	449.1		
232RFWH12	123.0	189.8	—	—	404.4	503.1		
276RF8	123.0	113.4	353.9	378.4	398.4	429.1		
276RF10	123.0	113.4	357.9	402.4	422.4	477.1		
276RF12	123.0	113.4	381.9	426.4	446.4	525.1		
276RFWH8	123.0	153.7	—	—	344.4	395.1		
276RFWH10	123.0	172.2	—	—	374.4	449.1		
276RFWH12	123.0	189.8	—	—	404.4	503.1		
376RF8	139.6	130.8	357.3	398.8	424.8	453.1		
376RF10	139.6	130.8	381.3	422.8	448.8	501.1		
376RF2	139.6	130.8	405.3	446.8	472.8	549.1		
376RFWH8	139.6	176.6	—	—	358.8	413.1		
376RFWH10	139.6	194.3	—	—	388.8	467.1		
376RFWH12	139.6	212.6	—	—	418.8	521.1		
484RF8	157.6	149.4	381.9	420.4	452.4	477.1		
484RF10	157.6	149.4	405.9	444.4	476.4	525.1		
484RF12	157.6	149.4	429.9	468.4	500.4	573.1		
484RFWH8	157.6	176.6	—	—	358.8	431.4		
484RFWH10	157.6	194.3	—	—	388.8	485.1		
484RFWH12	157.6	212.6	—	—	418.8	539.1		
570RFWPH10	188.0	273.0	—	—	498.5	556.3		
570RFWPH12	188.0	273.0	—	—	498.5	580.3		
608RFWP10	188.0	162.2	—	—	498.5	556.3		
608RFWP12	188.0	162.2	—	—	522.5	604.3		
776RFWPH10	228.5	308.4	—	—	533.8	596.9		
776RFWPH12	228.5	308.4	—	—	533.8	620.9		
825RFWP10	228.5	197.6	—	—	533.8	596.9		
825RFWP12	228.5	197.6	—	—	557.8	644.9		
851RFWPH10	228.5	308.4	—	—	533.8	596.9		
851RFWPH12	228.5	308.4	—	—	533.8	620.9		
905RFWP10	228.5	197.6	—	—	533.8	596.9		
905RFWP12	228.5	197.6	—	—	557.8	644.9		

\* All units 570 and larger are of panelized construction and dimension "B" is from center of the inlet to bottom of the 36-in. hopper outlet.

# RF Baghouse

## Dimensions & Specifications

Model*	Nominal Airflow Range** (cfm)	Cloth Area (ft <sup>2</sup> )	No. of Bags	Air Pump (hp)	Shipping Weight (lbs)	
					RFT	RFW
48RF8	2495 - 7485	499	48	2.0	6109	7388
48RF10	3120 - 9360	624	48	2.0	6434	8105
48RFWH8	2340 - 7020	468	45	2.0	—	7300
48RFWH10	2925 - 8775	585	45	2.0	—	8100
72RF8	3745 - 11,235	749	72	2.0	6302	7554
72RF10	4685 - 14,055	937	72	2.0	6668	8306
72RFWH8	3485 - 10,455	697	67	2.0	—	7500
72RFWH10	4360 - 13,080	872	67	2.0	—	8300
124RF8	6450 - 19,350	1290	124	2.0	8677	10,048
124RF10	8065 - 24,195	1613	124	3.0	9214	10,910
124RFWH8	6295 - 18,885	1259	121	3.0	—	10,000
124RFWH10	7870 - 23,610	1574	121	3.0	—	10,900
156RF8	8110 - 24,330	1622	156	3.0	8933	10,298
156RF10	10,150 - 30,450	2030	156	3.0	9527	11,217
156RFWH8	7695 - 23,085	1539	148	3.0	—	10,300
156RFWH10	9630 - 28,890	1926	148	3.0	—	11,200
232RF8	12,065 - 36,195	2413	232	3.0	13,656	15,304
232RF10	15,090 - 45,270	3018	232	5.0	14,577	16,591
232RF12	18,110 - 54,330	3622	232	5.0	15,395	17,825
232RFWH8	11,805 - 35,415	2361	227	5.0	—	15,300
232RFWH10	14,765 - 44,295	2953	227	5.0	—	16,600
232RFWH12	17,720 - 53,160	3544	227	5.0	14,014	17,800
276RF8	14,350 - 43,050	2870	276	5.0	15,010	15,614
276RF10	17,955 - 53,865	3591	276	5.0	15,908	16,975
276RF12	21,540 - 64,620	4308	276	5.0	—	18,290
276RFWH8	13,830 - 41,490	2766	266	5.0	—	15,600
276RFWH10	17,305 - 51,915	3461	266	5.0	—	17,000
276RFWH12	20,760 - 62,280	4152	266	5.0	—	18,300
376RF8	19,550 - 58,650	3910	376	7.5	18,341	19,617
376RF10	24,460 - 73,380	4892	376	7.5	19,463	21,248
376RF12	29,345 - 88,035	5869	376	7.5	20,610	22,868
376RFWH8	18,405 - 55,215	3681	354	7.5	—	19,600
376RFWH10	23,030 - 69,090	4606	354	7.5	—	21,200
376RFWH12	27,630 - 82,890	5526	354	7.5	—	22,900
484RF8	25,170 - 75,510	5034	484	7.5	23,273	25,458
484RF10	31,485 - 94,455	6297	484	7.5	24,830	27,796
484RF12	37,775 - 113,325	7555	484	7.5	26,425	30,115
484RFWH8	24,495 - 73,485	4899	471	7.5	—	25,400
484RFWH10	30,640 - 91,920	6128	471	7.5	—	27,800
484RFWH12	36,760 - 110,280	7352	471	7.5	—	30,100
570RFWPH10	37,000 - 111,150	7410	570	20.0	—	40,049
570RFWPH12	44,460 - 133,380	8892	570	20.0	—	42,029
608RFWP10	39,520 - 118,560	7904	608	20.0	—	41,505
608RFWP12	47,420 - 142,270	9485	608	20.0	—	44,278
776RFWPH10	50,440 - 151,320	10,088	776	20.0	—	50,792
776RFWPH12	60,520 - 181,580	12,106	776	20.0	—	53,220
825RFWP10	53,620 - 160,870	10,725	825	20.0	—	53,446
825RFWP12	64,350 - 193,050	12,870	825	20.0	—	56,969
851RFWPH10	55,310 - 165,940	11,063	851	20.0	—	51,544
851RFWPH12	66,370 - 199,130	13,276	851	20.0	—	54,095
905RFWP10	58,820 - 176,470	11,765	905	20.0	—	54,255
905RFWP12	70,590 - 211,770	14,118	905	20.0	—	57,909

\* All units 570 and larger are of panelized construction.

\*\* Based on clean filters.

# RF Baghouse

## Standard Features & Equipment Options

	Standard	Optional		Standard	Optional
<b>Collector Design</b>			<b>Support Structure</b>		
All-Welded, Knock-Down or Panelized Construction	X		Steel Support Legs		X
Heavy-Duty 1/4-in Tubesheet Construction	X		<b>Electrical Controls, Gauges and Enclosures</b>		
Air Pump (TEFC Motor Drive) for Cleaning System	X		Magnehelic®* Gauge	X	
1/3 HP TEFC Motor for Manifold Drive	X		Pulse Solenoid Valve in NEMA 9 Enclosure	X	
Involute Scroll Inlet	X		Solid-State Timer in Type (NEMA/UL) 4 Enclosure	X	
Round Outlet for RFW	X		Photohelic®* Gauge		X
Rectangular Outlet for RFT and RFP	X		RF Electrical Control Panel		X
Round Outlet for RFT		X	<b>Safety Features</b>		
Rectangular Outlet for RFW		X	Top Handrail for RFT	X	
High Body Inlet		X	Sprinkler Taps		X
Ladders, Cages & Platform Assemblies (OSHA Compliant)		X	Explosion Vents		X
Stainless Steel Construction		X	<b>Paint System</b>		
Internal Service Light		X	Prime Coated Interior	X	
<b>Bags &amp; Cages</b>			Blue Exterior Finish Coating Meets 250-Hour Salt Spray Corrosion Protection Test	X	
Dura-Life Twice the Life Polyester Felt Oval-Shaped Bags	X		Hostile Environment Paint		X
Galvanized Bag Cages	X		Custom Colors		X
Positive Seal Boltsafe™ Hardware	X		Ceramic Insulation Finish		X
Grounded Bag and Cage System	X		<b>Warranty</b>		
Snap-In Bags (8' & 10' Only)		X	10-Year Warranty	X	
Variety of Bag Media Options		X			
<b>Hopper Design</b>					
60° Conical Hoppers	X				
Hopper Manhole	X				
Outlet Transitions		X			
Hopper Service Port		X			
Hopper Level Indicators		X			
3" Hopper Water Overflow Check Valve		X			

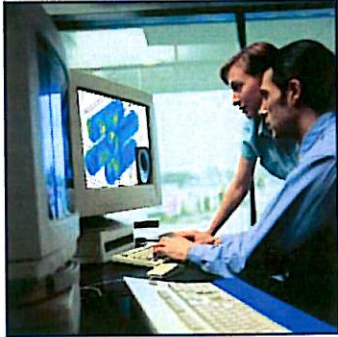
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U.S. Patent No. 7,015,158

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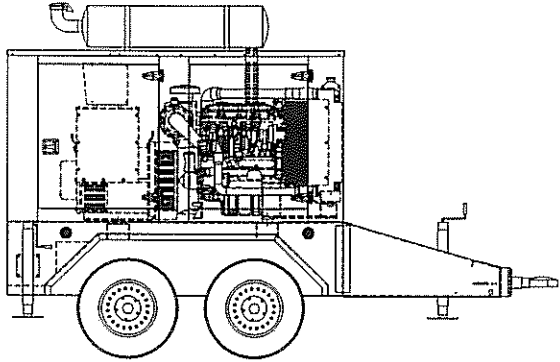
# Emergency Generator

# TAYLOR<sup>®</sup>

## POWER SYSTEMS

Model: **TM100**

Ratings Range:



### Features

- Single source responsibility for the generator set and accessories.
- Prototype and production tested to insure one step load acceptance per NFPA 110.
- Two year limited warranty on generator sets and accessories.
- Unit conforms to CSA, NEMA, EGSA, ANSI and other standards.
- Analog control system with an ECU-9988 providing metering and monitoring.
- Heavy duty 4 cycle industrial engine for reliability and fuel efficiency.
- Brushless rotating field generator with class H insulation.
- Integral vibration isolators
- EPA Tier 3 certified engine
- Trailer with integral fuel tank and storage trunk
- Full Output Circuit Breaker

	50Hz	60Hz
Standby: kw	74 - 80	82 - 100
kva	93 - 100	103 - 125
Prime: kw	62 - 72	71 - 90
kva	78 - 90	89 - 113

Generator	Voltage	PH	Hz	125°C Rise		105°C Rise	
				Standby Rating	Prime Rating	Standby Rating	Prime Rating
				kW/kVA	Amps	kW/kVA	Amps
UCI274C311	277/480	3	60	100/125	150	90/113	136
	139/240	3	60	100/125	301	90/113	272
	254/440	3	60	94/118	155	85/106	139
	127/220	3	60	94/118	310	85/106	278
	240/416	3	60	90/113	157	78/98	136
	120/208	3	60	90/113	314	78/98	272
	120/240	3	60	90/113	272	78/98	236
	219/380	3	60	82/103	156	71/89	135
	120/240	1	60	68/68	283	59/59	246
	254/440	3	50	74/93	122	62/78	102
	127/220	3	50	74/93	244	62/78	204
	120/208	3	50	80/100	278	67/84	233
	240/415	3	50	80/100	139	67/84	117
	219/380	3	50	80/100	152	67/84	128
	110/190	3	50	80/100	304	67/84	255
110/220	1	50	60/60	273	50/50	227	
UCI274D311	277/480	3	60	100/125	150	90/113	136
	139/240	3	60	100/125	301	90/113	272
	254/440	3	60	100/125	164	90/113	148
	127/220	3	60	100/125	328	90/113	297
	240/416	3	60	100/125	173	90/113	157
	120/208	3	60	100/125	347	90/113	314
	120/240	3	60	100/125	301	90/113	272
	219/380	3	60	96/120	182	88/110	167
	120/240	1	60	79/79	329	72/72	300
	254/440	3	50	80/100	131	72/90	118
	127/220	3	50	80/100	262	72/90	236
	120/208	3	50	80/100	278	72/90	250
	240/415	3	50	80/100	139	72/90	125
	219/380	3	50	80/100	152	72/90	137
	110/190	3	50	80/100	304	72/90	273
110/220	1	50	68/68	309	60/60	273	
UCI274C06	120/240	1	60	90/90	375	75/75	313
UCI274D06	120/240	1	60	100/100	417	88/88	367
DUAL VOLTAGE	277/480	3	60	100/125	151		
	120/208	3	60	100/125	347		

RATINGS: All three-phase units are rated at 0.8 power factor. All single-phase units are rated at 1.0 power factor.

STANDBY RATINGS: Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Ratings are in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271.

PRIME POWER RATINGS: Prime power ratings apply to installations where utility power is unavailable or unreliable. At varying load the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings in accordance with ISO-8528/1, overload power in accordance with ISO-3046/1, BS5514, AS2789, and DIN 6271. For limited running time and base load ratings consult the factory. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever.

GENERAL GUIDELINES FOR DERATION: Altitude: Derate 0.5% per 100m (328 ft.) elevation above 1000m (3279 ft.)

Temperature: Derate 1.0% per 10°C (18°F) temperature above 40°C (104°F).

Engine Specifications	Standby Ratings 60Hz (1800 rpm)
Manufacturer	Perkins
Engine, model, type	1104D-E44TAG2
Cylinder arrangement	4 Vertical in-line
Induction System	turbocharged, air to air charge cooled
Cycle	four stroke
Displacement, cu. in. (L)	269 (4.4)
Bore and stroke, in. (mm)	4.13 (105) x 5 (127)
Compression ratio	16.2:1
Firing Order	1,3,4,2
Rated rpm	1800
Gross Engine Power, hp (kw)	156.9 (117)
Electropak net engine power hp (kw)	148.9 (111)
Brake mean effective pressure, kPa	1771
Combustion Air Flow m <sup>3</sup> /min.	8.5
Typical Genset Electrical Output	100

Exhaust System	Standby Ratings 60Hz (1800 rpm)
Exhaust Gas Flow (max.) m <sup>3</sup> /min.	20
Exhaust Gas Temperature in Manifold °C (°F)	506 (942.8)
Maximum allowable back pressure, (kPa)	15 kPa
Exhaust outlet size at hookup, in. (mm)	2.5" (64)

Engine Electrical System	Standby Ratings 60Hz (1800 rpm)
type	12 Volt negative earth
Alternator Type	Denso A115i
Alternator Voltage	12V
Alternator Output	65A
Starter Motor Type	Denso P95
Starter Motor Voltage	12V
Number of teeth on flywheel	115
Quantity of batteries	1
Battery voltage (DC)	12V

Fuel System	Standby Ratings 60Hz (1800 rpm)
Type of Injection	Direct
Fuel Injection Pump	Common Rail
Fuel atomiser	Unit injector / multi-hole
Nozzle opening pressure	18 MPa
Governor type	control by ECM
Max. Suction Head	17 kPa
Max. flow through customer filter	130 litres/hour

Fuel Consumption	Standby Ratings 60Hz (1800 rpm)
<b>Diesel, gph (Lph) at % of load</b>	
100%	7.3 (27.77)
75%	5.8 (22.04)
50%	4.2 (16.07)

Cooling System	Standby Ratings 60Hz (1800 rpm)
Coolant Capacity (Total System)	17 litres (4.49 gallons)
Fan Diameter	559mm (22 in.)
Fan Drive Ratio	1.25:1
Fan Material	Composite
Fan Type	Pusher
Radiator Pressure Cap Setting	100 kPa
Thermostat Operation Range	85-95°C (185-203°F)
Max. Top Tank Temperature	112°C (233.6°F)
Coolant Pump Drive	Gear Driven
Engine Coolant Flow litres/min.	169
Cooling Fan Air Flow m <sup>3</sup> /min.	224.4

Lubricating System	Standby Ratings 60Hz (1800 rpm)
Total System Capacity	8.0 litres (2.1 gallons)
Max. Sump Capacity	7.0 litres (1.85 gallons)
Oil Temperature (continuous operation)	125°C (257°F)
Oil Pressure at Max. No Load Speed	40.6 - 49.3

## ANALOG CONTROL PANEL

- Taylor Power Systems Analog Auto Start Control Panel. The panel is equipped with AC Voltmeter, AC Frequency Meter, Percent of Load Meter, Running Time Meter, Control Toggle Switch with Off/Auto/Manual positions, and ECU-9988 engine control with specific safety shutdown lights.
- Oil Pressure Gauge, Water Temperature Gauge, Battery Voltmeter, Fuel Level Gauge, and Hourmeter

## ECU-9988 FEATURES

- Engine Started LED
- Overspeed Shutdown LED
- Overcrank Shutdown LED
- High Water Temperature Shutdown LED
- Low Oil Pressure Shutdown LED

The ECU automatically cranks, starts, and monitors the engine for Overcrank, Overspeed, High Water Temperature, and Low Oil Pressure. A built in speed switch uses a magnetic pickup to monitor engine speed for crank disconnect and overspeed. The bypass timer/logic assures Low Oil Pressure and High Water Temperature override during the crank period and an additional adjustable period after crank disconnect. The ECU monitors the Magnetic Pickup signal for problems during both cranking and running. If a problem is detected the engine will shutdown and Overcrank and Overspeed LED's will both turn on.

## STANDARDS

UC224 and UC274 industrial generators meet the requirements of BS5000, VDE0530, UTE5100, NEMA MG1-22, CEMA, IEC34-1, CSA22.2 AND AS1359.

## EXCITATION SYSTEMS

### **SX440 & SX460 AVRs**

With these self-excited systems the main stator provides power via the automatic voltage regulator (AVR) to the exciter stator. The high efficiency semiconductors of the (AVR) ensure positive build up from initial low levels of residual voltage.

The exciter rotor output is fed to the main rotor through a three phase full wave bridge rectifier. The rectifier is protected by a surge suppressor against surges caused, for example, by short circuit or out of phase paralleling. The SX440 will support a range of electronic accessories, including a 'droop' Current Transformer (CT) to permit parallel operation with other ac generators.

### **MX341 AVR**

This sophisticated AVR is incorporated into the permanent magnet generator (PMG) system, and is fitted as an option on industrial generators.

The PMG provides power via the AVR to the main exciter, giving a source of constant excitation power independent of generator output. The main exciter output is then fed to the main rotor, through a full wave bridge, protected by a surge suppressor. The AVR has built-in protection against sustained over-excitation, caused by internal or external faults. This de-excites the machine after a minimum of 5 seconds.

The two phase average voltage sensed MX341 provides voltage regulation of  $\pm 1.0\%$ . If three phase sensing is required with the PMG system the MX321 AVR must be used. We recommend three phase sensing for applications with greatly unbalanced or highly non-linear loads. An engine relief load acceptance feature can enable full load to be applied to the generator in a single step.

### **MX321 AVR**

The most sophisticated of all our AVRs combines all the features of the MX341 with, additionally, three phase rms sensing, for improved regulation ( $\pm 0.5\%$ ) and performance. Over voltage protection is built-in and short circuit current level adjustment is an optional facility.

## INSULATION / IMPREGNATION

The insulation system is Class 'H'.

All wound components are impregnated with materials and processes designed specifically to provide protection against the harsh environments encountered in generator applications. Varnishes and resins are selected and developed to provide the high build required for static windings and the high mechanical strength required for rotating components.

## WINDINGS & ELECTRICAL PERFORMANCE

All generator stators are wound to 2/3 pitch. This eliminates triplen (3rd, 9th, 15th...) harmonics on the voltage waveform and is found to be the optimum design for trouble-free supply of non linear loads. The 2/3 pitch design avoids excessive neutral currents, sometimes seen with higher winding pitches, when in parallel with the mains.

A fully connected damper winding reduces oscillations during paralleling. This winding, with 2/3 pitch and carefully selected pole and tooth designs, ensures very low waveform distortion.

## TELEPHONE INTERFERENCE

THF (as defined by BS4999 Part 40) is better than 2%. TIF (as defined by ASA C50.12) is better than 50.

## RADIO INTERFERENCE

The absence of brushgear and the high quality AVR ensure low levels of interference with radio transmissions.

Additional RFI suppression may be supplied if required.

## ENCLOSURE

IP22 (NEMA 1) is standard for all industrial generators. Protection to IP23 (60 degrees from vertical) is available as an option at reduced ratings (5% derate).

Inlet air filters are available as an option on all generators, at reduced ratings (5% derate).

## SHAFT

All generator rotors are dynamically balanced to better than BS6861: Part 1 Grade 2.5 for minimum vibration in operation.

## QUALITY ASSURANCE

Generators are manufactured using production procedures having a quality assurance level to BS EN (ISO9001).

# STANDARD FEATURES AND ACCESSORIES

## Standard Features

- ▶ Trailer with integral fuel tank
- ▶ Weather enclosure
- ▶ Vibration isolators
- ▶ Oil drain valve with extension
- ▶ Battery
- ▶ Battery rack
- ▶ Battery cables
- ▶ Exhaust silencer
- ▶ Flex exhaust connector
- ▶ Analog Control Panel
- ▶ Owners manual
- ▶ Flexible fuel lines
- ▶ Glowplug cold weather starting aid
- ▶ Line circuit breaker
- ▶ Electronic Isochronous Governor
- ▶ 15 amp GFI duplex receptacle

## Optional Accessories

- Sound attenuated enclosure
- Block Heater
- Battery charger
- PMG exciter
- Output Power Cable
- Multi-voltage selector switch
- Dual Voltage Generator

## Detailed Description of Trailer

Trailer equipped with tandem 3500 pound axles, integral DOT rated 150 gallon fuel tank, electric brakes with safety disconnect and 7 wire connector, torsion axle, front tongue jack, two rear stabilizer jacks, ICC lighting, and license plate bracket. These trailers also come with a lockable storage trunk at front of trailer and cable storage in the rear.

### WEIGHTS AND DIMENSIONS

TM100

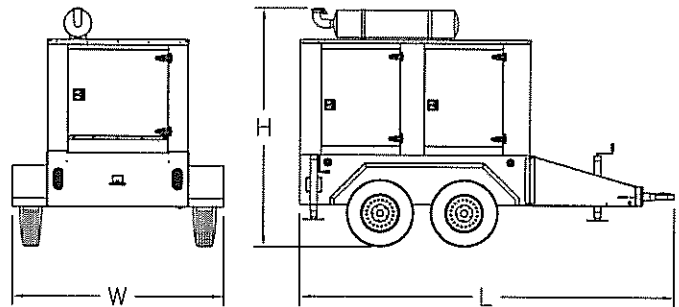
Overall Size Standard Unit,  
L x W x H, in.: (148" x 72" x 95")

Overall Size Sound Attenuated Unit,  
L x W x H, in.: (171.5" x 72" x 85")

Standard unit dry weight: 4025 pounds

Sound attenuated unit dry weight: 4350 pounds

GVWR: 7000 pounds



Note: This drawing is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

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