

Magnetic separators



For
dense media
recovery





Magnetic separators for dense media recovery

Metso has produced magnetic separators for dense media recovery since the mid-1960's. Several hundred separators have been supplied since then for various operations on all continents. Although praised for their high efficiency from the outset, the separators have over the years become even more effective with higher capacity ratings.

Designs and sizes

The wet magnetic separators for dense media recovery are available in several sizes and designs to meet varying requirements from

the processing industry. This cooperation with the industry has led to some unique features and an outstanding performance.

The wet magnetic separators are today available in the WS1200 series with 1200 mm (4 ft) drum diameter with lengths up to 3,6 m (12 ft).

Three different designs of magnetic systems are available as well as three different tank styles to enable processing of the full range of magnetic media applications.

Customers and applications

The users of the equipment in this brochure are to be found mainly in the minerals industry for clean up and recovery of magnetic media in dense media plants. The dense media recovery designs also have uses in other similar industries e.g. for reduction of pyrrhotite, reduction of iron content in silica

or glass sands, clean up of effluents or as protection for WHIMS or HGMS equipment. Operators on all continents, large operations in USA, Canada, Ukraine, Russia, South Africa, Sweden, Norway, Spain, Iran, India are among Metso's customers.

Metso produces including several styles of magnetic separators for iron ore beneficiation; ask for our brochures on magnetic separators for iron ore processing

Magnetic separation theory

The magnetic separation process is complex in many respects due to varying magnetic susceptibility of the material and its particle size. The magnetic force on a specific particle depends upon these factors as well as other properties, such as magnetic flux and magnetic field gradient, created by the magnetic separator. The product of field multiplied

by gradient, also called the magnetic force index, varies between different designs and is a factor when selecting the most suitable magnetic system for a particular job. As in all applications, the magnetic force is competing with other forces like gravity and hydraulic drag; the feed volume must be balanced to a suitable level, the magnetic force for a given separator being non-adjustable.

Generally speaking, finer particles call for lower flow capacity of the equipment. By selecting a higher magnetic field strength (magnetic flux) and higher gradient the capacity can be increased considerably in many cases.

Magnetic system

The heart of the magnetic separator is the magnetic assembly. Metso provides basically two different assemblies, High Capacity, HC, and High Gradient, HG. The high capacity assembly is the standard and supplied if nothing else is mentioned. The main differences between the two assemblies are the pole pitch, pole sizes and number of poles.

The assemblies are similar in design, both having a number of main poles and in addition a number of intermediate cross poles for flux control and enhancement of the magnetic performance. The magnet poles are attached to a rigid steel yoke, which in turn is attached to the shaft.

The high capacity assembly comprises six main poles, while the HG style has twelve and fourteen main poles, depending on style of tank.

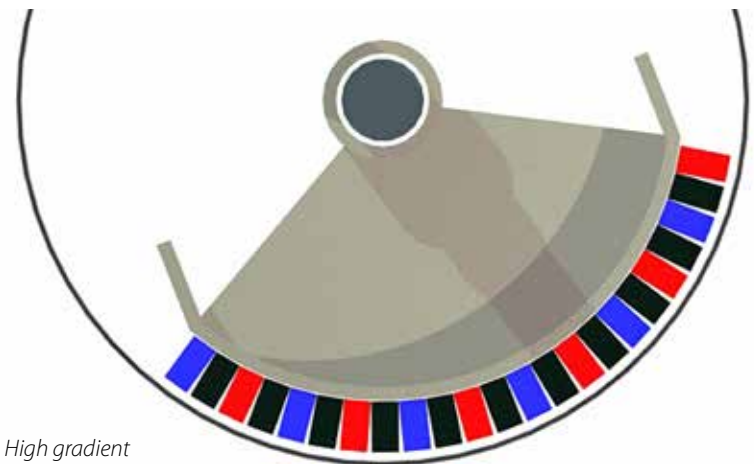
The high capacity assembly has a higher magnetic flux rating but due to its inherently lower field gradient its magnetic attraction force close to the drum is actually lower compared with the HG type. The HG version is hence more capable of recovering finer or less magnetic material, but its capacity is reduced, as its magnetic force drops off faster with the distance from the magnets.

The arc of the High Capacity magnetic system is 124° and has a rating of 120 mT at 50 mm from the magnet surface while the HG has an arc of 113° and 133° with a rating of 60 mT.

When the high gradient magnetic assembly is selected, the model is distinguished with the suffix HG.



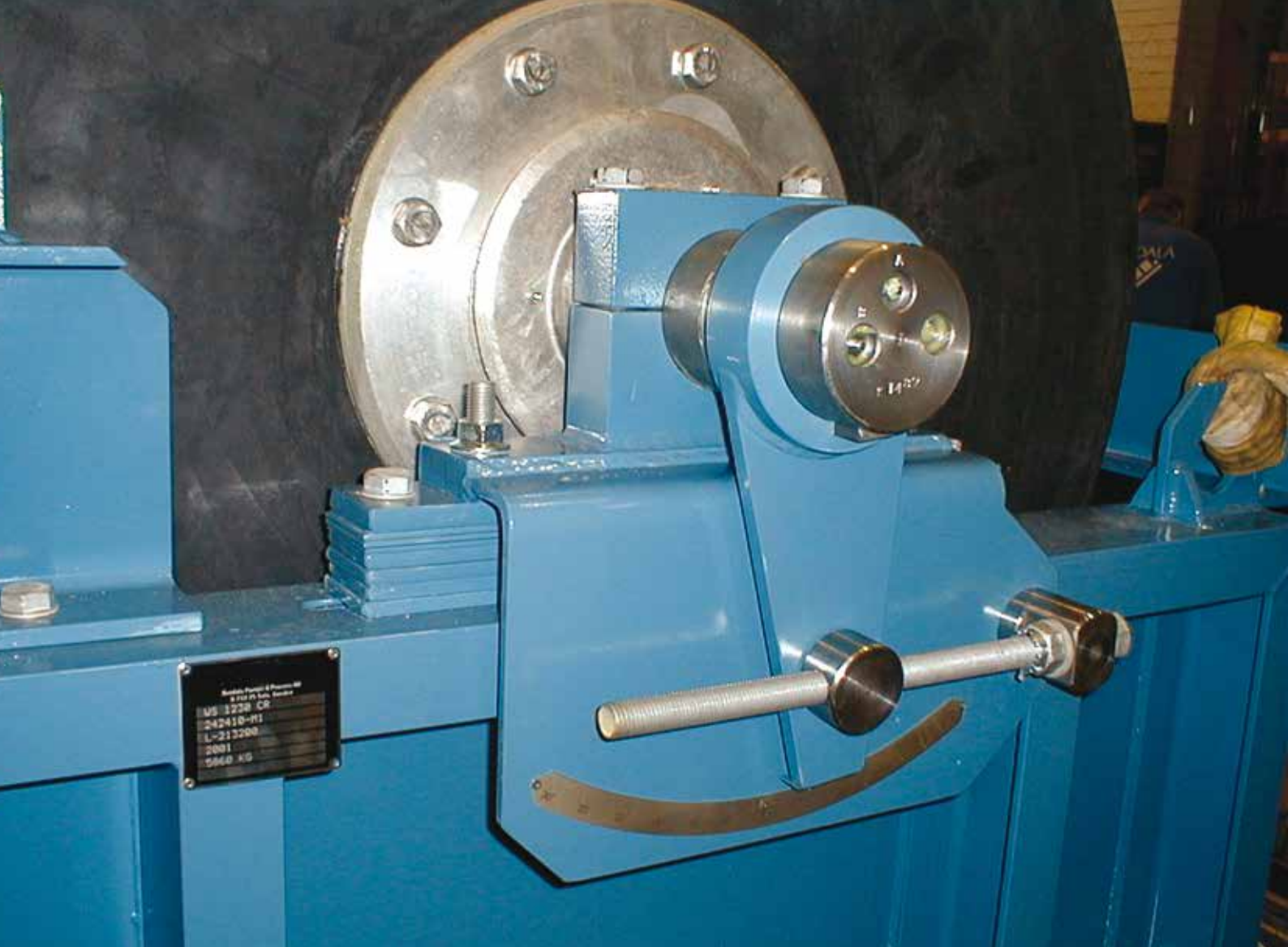
High capacity



High gradient



WS 1218 DM dual duty design



Adjustment of magnet and drum position

The position of magnetic drum and the angle of the magnetic assembly can easily be adjusted to obtain the best process performance. The adjustment possibilities include

- Magnet assembly positioning in relation to the concentrate discharge weir
- Horizontal position of the drum
- Vertical position of the drum

Feed Boxes

The system for primary distribution of the pulp to the feed boxes supplied with separators is normally not part of the supply. However, Metso can optionally supply or advise on solutions for such systems. All feed boxes are normally made from mild steel and rubber lined. Other features of the feed boxes are:

- For model DM the feed box is integrated with the tank
- The feed box for the CR and DW model discharges through a number of steel tubes into the separator tank



Magnetic separator, model WS1230 DM in stainless steel design.

Drum drive system

The drum of a Metso magnetic separator has a drive shaft, which can be adapted to any type of drive. The position of the drive components is favourable, located outside of the tank away from pulp splashes and water. Experience shows that the drum speed is very seldom altered and Metso has delivered most its separators with direct drive gear boxes. This system has proven to be safe, efficient, clean and quiet and requires very little maintenance.

The older system with an integrated V-belt drive is also available and is recommended for users who want maintain the possibility to modify the drum speed by shifting sheaves.

The normal peripheral speed of drum is 0,6 m/s unless anything has been agreed upon.

Concentrate discharge and collection

An overflow weir is provided for the magnetic concentrate discharge. The weir, made in HDPE or optionally in polyurethane, is adjustable to obtain optimum discharge conditions.

The launders for collection of the concentrate discharged over the weir are made in rubber lined mild and stainless steel combination and bolted on to the separator tank frame. Depending on the installation situation standard launders or, optionally, custom tailored launders are provided.

Effluent (tailings) discharge and collection

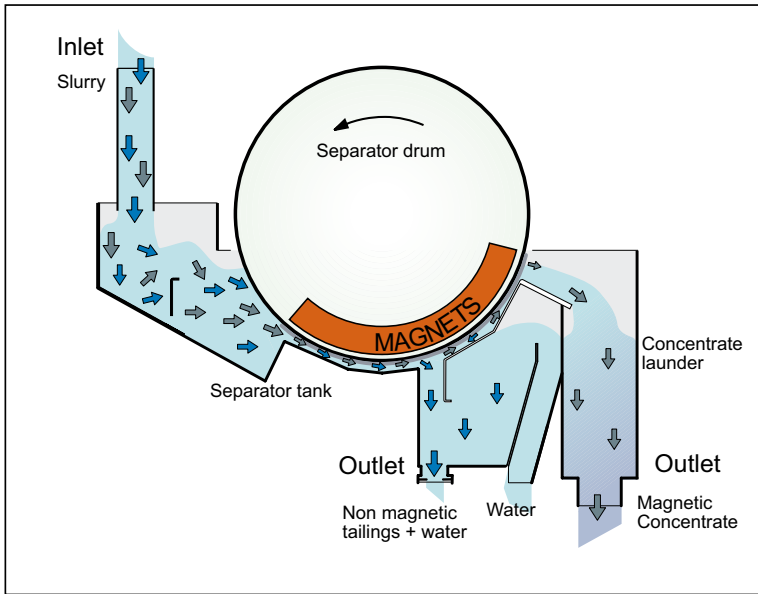
The effluent stream is normally discharged into a trough underneath the separators. This trough is not part of the delivery but is designed and provided for by others. Metso will assist with engineering if required. The separators may if so ordered be directly connected via e.g. steel pipes or rubber slurry hoses to the effluent system thus eliminating the need of troughs under the tanks. This is possible with the CR and DW models only.



Standard drive system consists of a right angle gear motor



The separator is equipped with adjustable concentrate overflow weir.

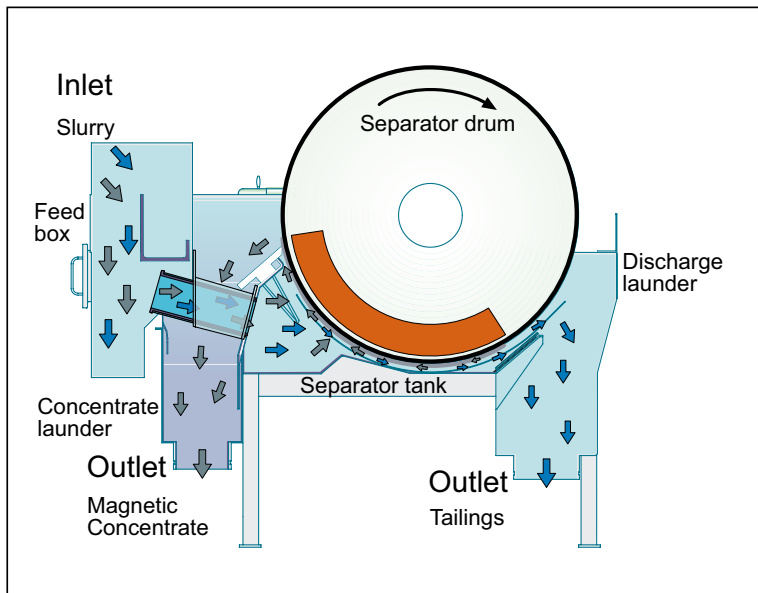


DM - Concurrent

The concurrent tank features

- Feed box integrated with the tank
- Feed entry section to improve on feed pulp distribution ensuring full width feed to drum
- Long pick up zone for extended retention time for recovery of fine material
- Exchangeable outlet spigots in tank bottom to allow coarse material trouble free discharge
- Full width overflow weir for pulp level control

The DM tank is intended mainly for normal media feed. The media cleaning and recovery are extremely good. The media magnetic content recommended for this type of tank ranges from less than 10 g/l to over 350 g/l.

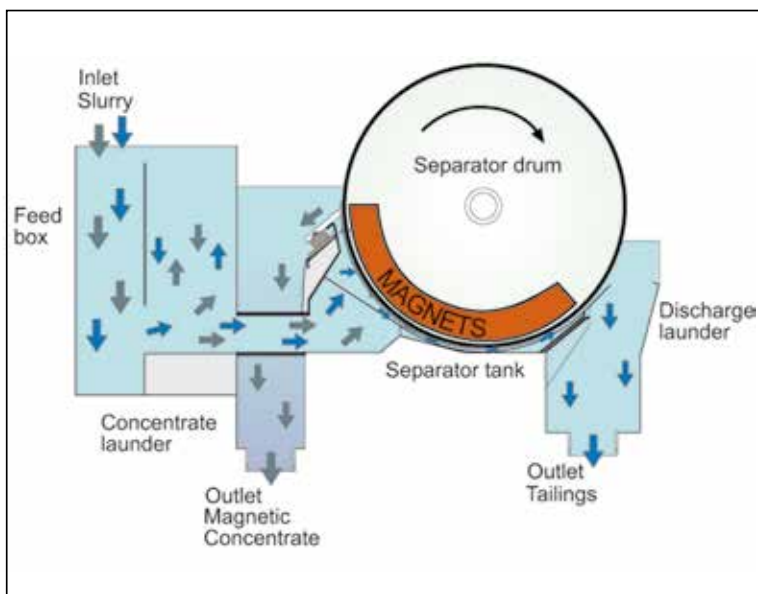


CR - Counter-rotation

The counter-rotation style of magnetic separator features

- Feed box with feed tubes
- Feed entry section to improve on feed pulp distribution with full width feed to drum
- Long pick up zone
- Spigot-less, full width weir adjustable overflow discharge of the effluent for pulp level control (manual) allowing surges in feed flow

Suited for processing media, up to 5 mm (4 mesh) at medium to high densities (30 to 50% solids) the CR features extremely high recoveries. It generally has a higher capacity than the DM style. Due to its short dewatering zone this style of tank does not have as good ability to produce a clean media. The S.G. of media recovered by the CR is often slightly lower than that produced by the DM tank.



DW - Counter-rotation

The DW features

- Basically counter rotation tank design
- Extremely long pick up zone
- Entry chamber designed to allow entrapped air to escape and improve concentrate drainage
- Magnet assembly arc larger to compensate for disturbances by entrapped air in the pulp
- High gradient style magnetic assembly for recovery of fine to extremely fine magnetic material
- Full width adjustable overflow weir for the effluent for pulp level control (manual) allowing surges in feed flow

This design is especially intended for recovery of magnetic matter from e.g. diluted media with entrapped air. Particle size limits depend on flow rate but material with a minor amount of up to 5 mm material should normally not cause any concern.

Application guidelines

Absolute guidelines for model selection and dimensions are not available due to the widely varying nature of the media. Hence the data in the table below are only indicative. When in doubt of

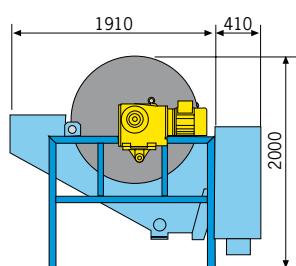
the properties of a specific ore use the lower part of the feed rates. Testing in laboratory, followed by on site testing is sometimes advisable especially when planning for larger installations.

Application	Type of media	Typical feed rate, dry basis, g/l	Typical slurry feed rate, m ³ per hour per meter of drum width	Suitable tank design	Suitable magnetic design
Dense media recovery	Magnetite	More than 25	110 - 135 135 - 175	DM CR	Standard
Dense Media recovery	Magnetite	Less than 25	90 - 125	DM	High gradient
Dense Media recovery	Ferro silicon	More than 20	110 - 135 135 - 175	DM CR	Standard
Dense Media recovery	Ferro silicon	Less than 20	100 - 150	DW, CR DM	High gradient

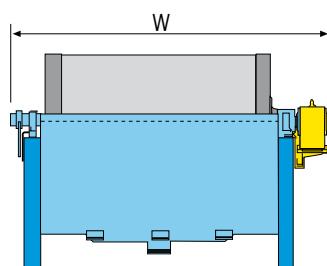
Dimensions and weights

Dimensions and weights of the equipment, shown in the table below, are approximate only and will be confirmed at order.

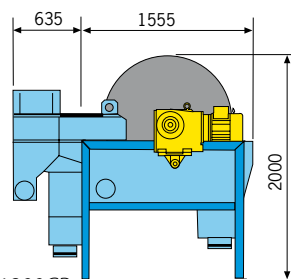
Model and size	Drum, effective magnet length, mm	Motor size, KW	Dimension W, mm	Machine unit weight, kg	
				DM	CR / DW
WS1206	600	1,5	1771	2100	2400
WS1212	1200	2,2	2371	2900	3300
WS1218	1800	3,0	2971	3600	4000
WS1224	2400	3,0	3571	4300	4800
WS1230	3000	4,0	4218	5000	5700
WS1236	3600	4,0	4818	5800	6600



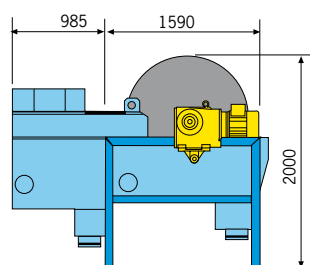
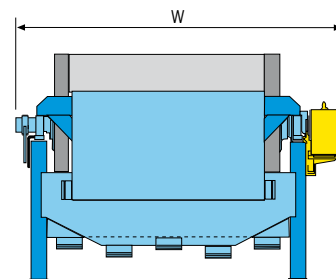
WS 1200DM



WS 1200CR



WS 1200DWHG



- **Metso Sweden AB**
Norrängsgatan 2, SE-733 38 Sala, Sweden, Phone: +46 224 570 00, Fax: +46 224 169 50
- **Metso Minerals Industries, Inc.**
2715 Pleasant Valley Road, York, PA 17402, USA, Phone: +1 717 843 8671
- **Metso Minerals (South Africa) (Pty) Ltd.**
Private Bag X2006, Isando, Johannesburg, 1600, South Africa, Phone: +27 11 961 4000, Fax: +27 11 397 2050
- **Metso Minerals (Australia) Ltd.**
Level 2, 1110 Hay Street, West Perth, WA 6005, Australia, Phone: +61 8 9420 5555, Fax: +61 8 9320 2500
- **Metso Minerals (India) Pvt Ltd**
1th floor, DLF Building No. 10, Tower A, DLF Cyber City, Phase - III, Gurgaon - 122 002, India, Phone: +91 124 235 1541, Fax: +91 124 235 1601
- **Metso Perú S.A.**
Calle 5 Nro. 144, Urb. Industrial Vulcano, Ate, Lima 03, Peru, Phone: +51 1 313 4366, Fax: +51 1 349 0913
- **Metso Minerals (Chile) S.A.**
Av. Los Conquistadores 2758, Piso 3, Providencia, Santiago, Chile, Phone: +56 2 370 2000, Fax: +56 2 370 2039
- **Metso Brasil Indústria e Comércio Ltda.**
Av. Independência, 2500 Éden, 18087-101 Sorocaba-SP - Brazil, Phone: +55 15 2102 1300



www.metso.com
E-mail: minerals.info@metso.com