

Wet low intensity magnetic separators

For dense media recovery

General

Metso has produced wet low intensity magnetic separators for dense media recovery since mid 1960. These separators have earned recognition in the industry for highest reliability and performance.

Models and sizes

The range of wet magnetic separators is composed of the series WS1200 with drum diameters of 1200 mm with a magnetically effective drum length up to 3678 mm, in increments of 613 mm. Two different tank designs are available: concurrent and counter rotation.

Magnetic separation theory

The magnetic separation of magnetite and other magnetic minerals is a complex process.

During the separation process, each particle is subjected to a number of forces, including gravity, drag, etc.

The simplified equation below describes the magnetic force the particles are subjected to:

Magnetic force:

$$F_{\text{mag}} \propto d^3 \cdot c \cdot B \cdot dB / dx$$

d = particle diameter

χ = relative susceptibility

B = magnetising field

dB / dx = magnetic field gradient

The magnetic system produces a magnetic flux density measured in Tesla or Gauss and a magnetic field gradient (T/mm or G/mm). Generally, smaller pole pitches produce a lower flux density but a higher gradient. The smaller pole pitch normally has a higher magnetic attraction (expressed as $B \cdot dB / dx$) close to the drum which decreases rapidly with the distance away from the drum. Hence, the smaller pole pitch (referred to as high gradient, HG) has a greater ability to pick up finer or less magnetic particles but has a lower throughput capacity when compared to a magnetic assembly with a larger pole pitch.



Magnetic drum assembly

The heart of the magnetic separator is the Magnetic Drum Assembly which is composed of a stationary magnetic array mounted inside of a non-magnetic drum. During operation, the drum revolves around the magnetic assembly thereby transporting magnetically attracted material on the drum to the area designated for discharge.

The drum heads are normally cast from non-magnetic aluminium alloy and the drum shell is manufactured from non-magnetic stainless steel. Drum shells are normally rubber or stainless steel covered against abrasion.

Magnetic systems

The magnetic system has alternating polarity and is available in two versions - High Capacity (HC) and High Gradient (HG). The HC is normally used in dense media circuits, while the HG is used for recovery of media in very dilute streams.

For more information, contact your local Metso representative. www.metso.com
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Counter-rotation design (CR)

The counter-rotation tank features:

- Feed box with feed tubes for even distribution
- Full width feed chamber directs pulp to drum
- Feed entry near magnetic concentrate discharge
- Extra long pick-up zone for highest magnetics recovery
- Drum revolving counter-currently to effluent pulp flow
- Full width effluent overflow weir for control of pulp level in tank, hence tolerating rather large fluctuations in flow
- Level control by weir bars at tailings discharge

The CR tank is designed to maximise recovery and is normally used when recovery or capacity is of highest priority.

Particle sizes up to 5 mm (4 mesh) at pulp densities of up to 50 % solids by weight can be accepted for this type of separator.

Concurrent design (DM)

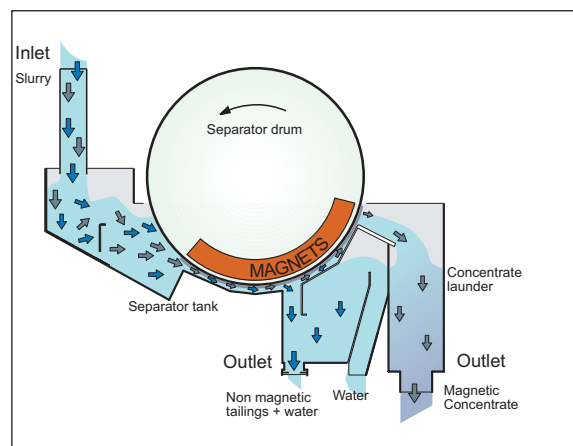
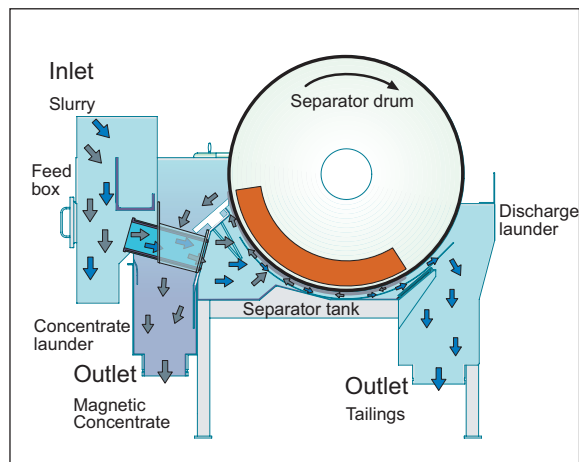
The dense media recovery tank features:

- Feed box integrated with tank
- Intermediate distribution chamber
- Long pick-up zone for highest magnetics recovery
- Drum revolving concurrently with pulp flow
- Outlet spigots located on tank bottom for non-magnetics discharge
- Selection of orifices for bottom spigots to control pulp level in tank
- Full width effluent overflow weir for pulp level control

This type of tank is generally used in heavy media circuits for recovery of media from dilute pulp. The recovery and concentrate density are excellent with proven recoveries of up to 99.98% of magnetics.

The DM design is also used in the iron ore industry for special purposes such as recovery of fine particles in effluent streams.

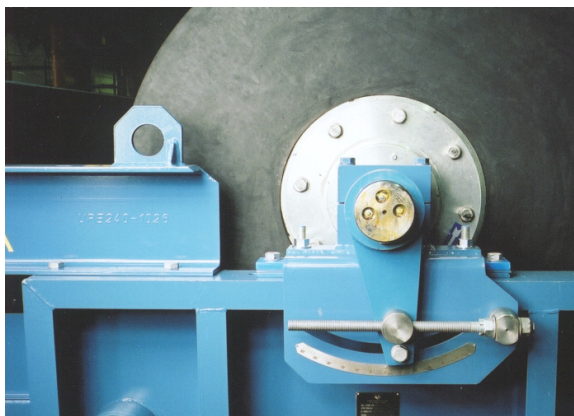
Feed with up to 5 mm particles and pulp densities up to 50 % solids can be processed.



Adjustment of magnet and drum position

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

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

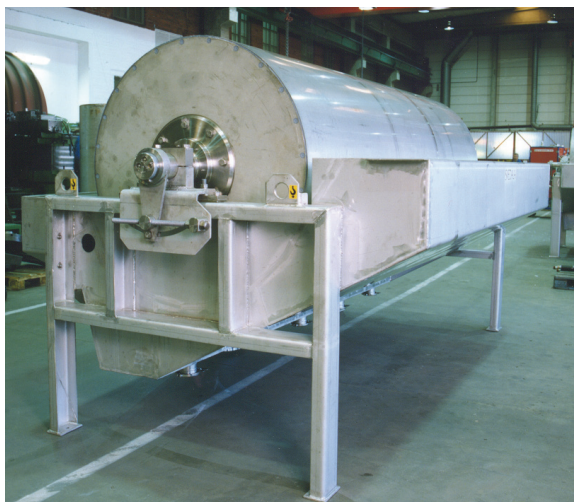


Feedboxes

The CR tank feed box discharges through a number of tubes into the feed chamber of the tank.

The feed box and tank for the DM magnetic separators are of integral construction.

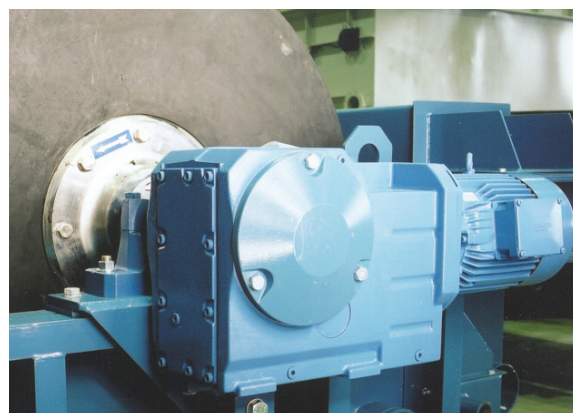
The primary distribution of the feed to the magnetic separator feed boxes is normally not included in the magnetic separator delivery.



Drive system

The standard drive system consists of a right-angled gear box with a direct-coupled electric motor. The advantage with this system is the reduced maintenance requirement, higher efficiency, lower noise and cleaner installation.

The drum peripheral speed is normally set at about 0,6 m/s.



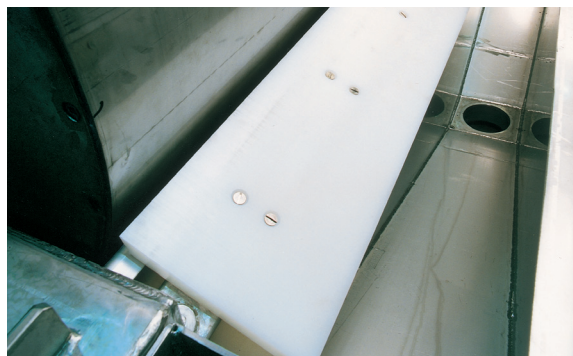
Concentrate discharge and launder arrangement

For control of the concentrate discharge an easily adjustable overflow weir in high density polyethylene (HDPE) is provided with the DM models.

Concentrate collection launders are available in several designs with and without interior rubber lining.

Effluent collection

The separator effluent is normally discharged into a suitably designed trough under the machine. The trough, in steel or concrete, is not supplied with the separator.



Application guide lines

Absolute guide lines for sizing of the equipment are not available; thus the machine size selected by the use of the tables below needs to be verified by testing, preferably by using full size machines. Sizing of equipment based on results from tests using a Davis Tube Tester or small diameter laboratory magnetic separator is not recommended.

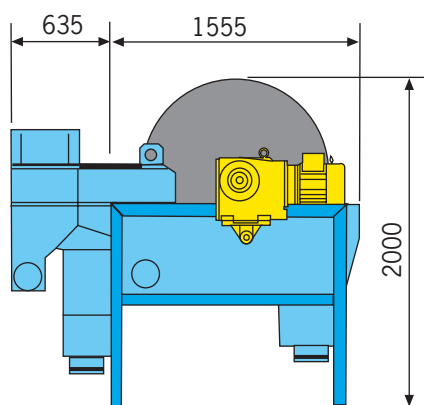
Application	Medium	Feed rate, tph/m drum width, up to		Feed rate, m ³ /h /m drum width, up to		Recommended Design for	
Separator series		CR	DM	CR	DM	Grade/recovery	Capacity/recovery
Dense media recovery	Magnetite	60	50	150	125	DM	CR
Dense media recovery	Ferro silicon	60	50	150	125	DM	CR

Dimensions, weights, etc.

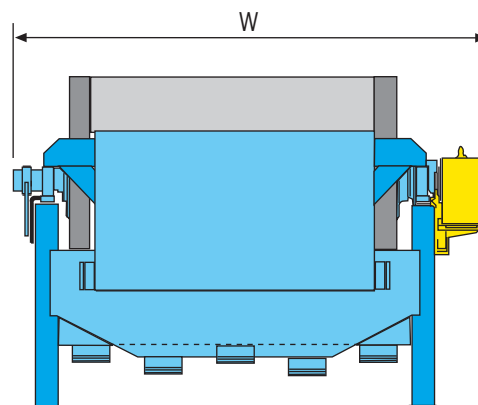
Dimensions and weights of the machines in the tables below are approximate only; hence all dimensions and weights must be confirmed.

Type WS1200CR and WS1200CR HG

Model number	Drum effective magnet length mm	Motor size kW	Dimension W mm	Machine weight kg
WS 1206	610	1,5	1771	2400
WS 1212	1220	2,2	2371	3300
WS 1218	1830	3,0	2971	4000
WS 1224	2440	3,0	3571	4800
WS 1230	3050	4,0	4218	5700
WS 1236	3660	4,0	4818	6600



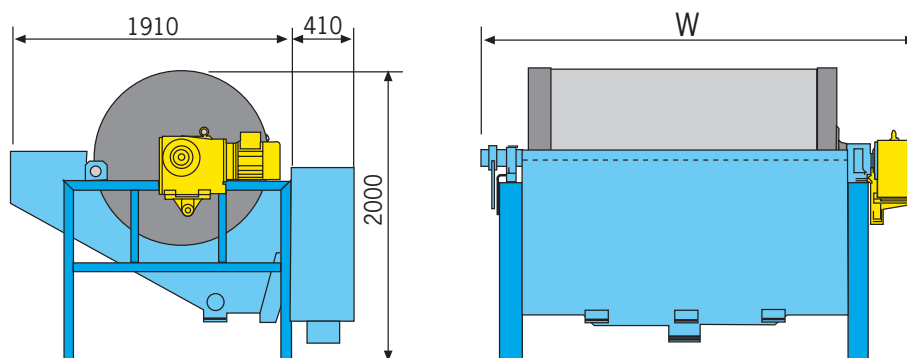
WS 1200CR



Type WS1200DM and WS1200DM HG

Model number	Drum effective magnet length mm	Motor* size kW	Dimensions W mm	Machine weight kg
WS 1206	610	1,5	1771	2100
WS 1212	1220	2,2	2371	2800
WS 1218	1830	3,0	2971	3600
WS 1224	2440	3,0	3618	4300
WS 1230	3050	4,0	4218	5000
WS 1236	3660	4,0	4818	5800

* for 0.6 m/s peripheral speed



WS 1200DM