

Metso

1st edition

En-masse conveyors handbook:

Aftermarket care for lasting reliability

October 2026



Preface to the First edition

Welcome to the Metso En-masse conveyors handbook: Aftermarket care for lasting reliability.

This handbook is a practical reference for Metso en-masse conveyors and elevators. It is written for equipment owners, plant operators, maintenance teams and engineers responsible for selecting, operating and maintaining en-masse conveying systems in demanding industrial environments. It is intended to support day-to-day decisions in the field, providing clear, practical guidance to support safe, efficient and reliable operation across the full equipment lifecycle.

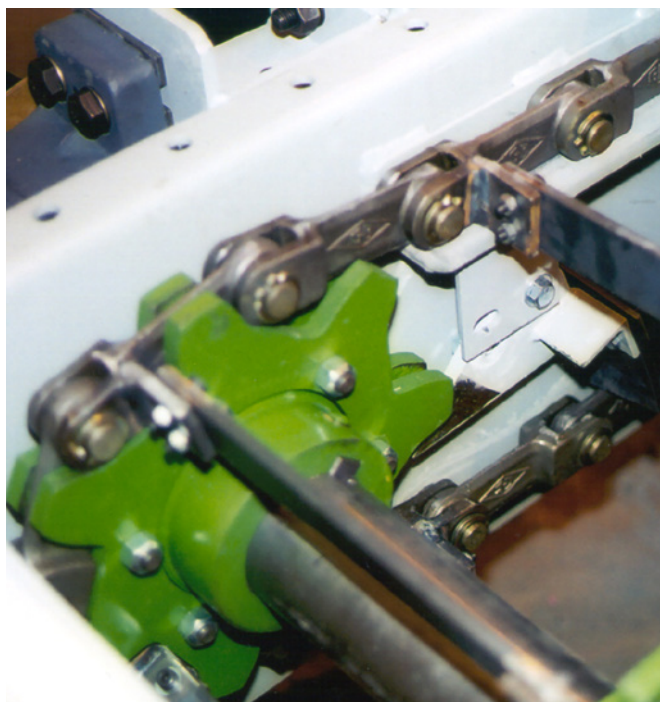
This handbook covers equipment fundamentals and operating principles of Metso Series 1000, 1300 and 2000 conveyors, including application sizing and selection considerations for equipment and components. It presents installation, commissioning and maintenance best practices and how, with the support of our global network of bulk handling engineers, you can optimize your equipment performance for extended service in the toughest of operations.

This first edition is a working document. As technologies and conveyor configurations continue to evolve, the handbook will be updated to reflect the latest bulk handling equipment and best practice. We welcome feedback to help ensure this resource continues to meet the needs of the bulk material handling community.

The information contained herein is general in nature and is not intended for specific construction, installation or application purposes. Predictions of actual performance of a given piece of equipment should take into account many variable field factors the machine is liable to encounter. Because of those factors, no warranty of any kind, expressed or implied, is extended by presenting the generalized data herein.

We reserve the right to make changes in specifications shown herein or add improvements at any time without notice or obligation.





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Decades of proven
performance in thousands
of industry applications to
fit plant
operations.

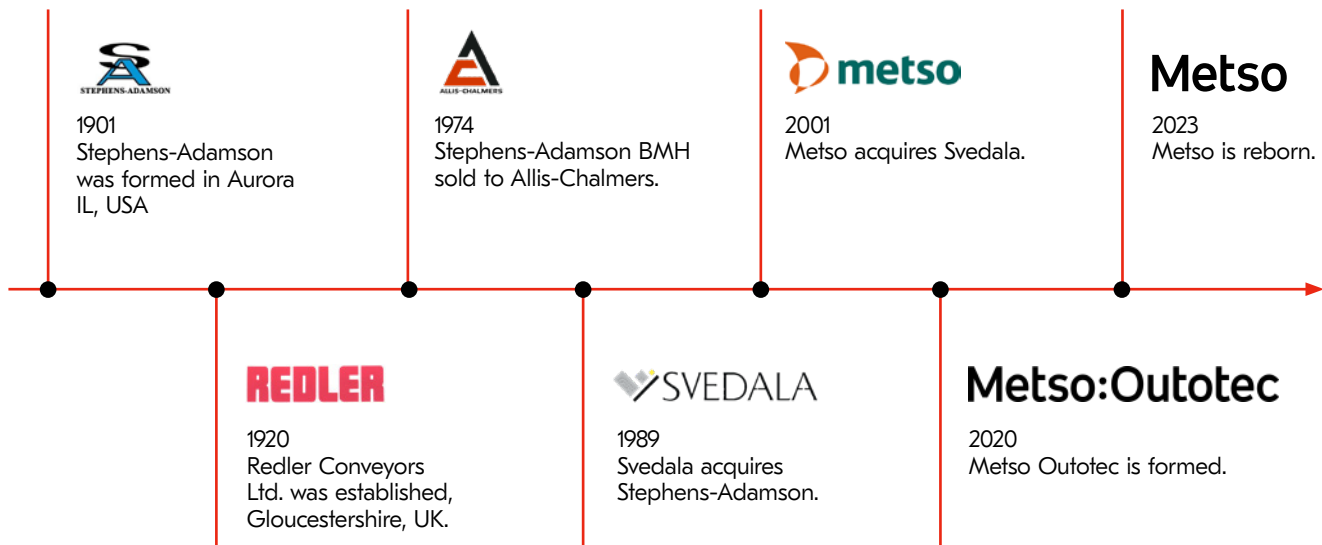


Metso en-masse conveyors and elevators are designed for dependable performance in demanding operating conditions. Their compact, enclosed design supports horizontal, vertical and inclined bulk material transport, helping operators move material with control and consistency across plant operations.

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En-masse conveyors

Metso brand timeline



Today, industries such as mining, power generation, chemicals and fertilizers rely on en-masse conveyors and elevators for dependable material flow. Wherever large volumes of raw or processed materials need to be handled, Metso equipment helps keep operations running safely, reliably and efficiently.

Metso en-masse conveyors and elevators are designed for dependable performance in demanding operating conditions. Their compact, enclosed design supports horizontal, vertical and inclined bulk material transport, helping operators move material with control and consistency across plant operations.

Pioneering bulk material handling

The history of mechanized bulk material handling began in 1918 with the pioneering work of British engineer and inventor, Arnold Redler.

The mechanical genius of Arnold Redler, a miller living in Gloucester, England, was discovered when he contrived a way to store five days' supply of flour in a large storage silo and successfully move the oldest flour out from the bottom. The resulting device, and the new principle of moving bulk material which it represented, was the forerunner of the en-masse conveying equipment of today.

Following the successful invention of the conveyor-elevator, Redler left the milling business and began manufacturing the new machine in limited volumes for industries based in the British Isles. He later granted production licenses to manufacturers in Europe, South Africa and Australia.

Meanwhile, in the United States, Stephens-Adamson had established a strong position in the belt conveyor industry. Founded in Aurora, Illinois, at the turn of the twentieth century, the company manufactured belt conveyor elevators, pulleys, clutches, plain bearings, sprockets and power transmission components, and introduced the first anti-friction belt conveyor idler in 1911.

When Stephens-Adamson engineers saw a demonstration of an experimental version of Redler's conveyor-elevator machine in the 1920s, they recognized its potential to move materials "by a string of hooks connected to a cable." The company soon secured an exclusive license to manufacture and sell the technology across North America.

The principles and designs of bulk material conveying continued to develop in both the United States and England through the work of Stephens-Adamson and Redler Conveyors Ltd., sometimes independently and sometimes in collaboration.



Figure 1: Assembly of a Series 2000 en-masse conveyor

In 1969, Stephens-Adamson was acquired by Borg-Warner, and its bulk material handling operations were sold to Allis-Chalmers in 1974. Over the following decades, the business and its technologies continued to develop through several ownership changes. In 1998, the operations became part of the Svedala Conveying Division, which later became part of Metso.

Arnold Redler's original engineering insight and en-masse conveyor technology are a foundational part of Metso's product portfolio. Today, Redler's legacy continues in Metso's bulk handling equipment, providing one of the best solutions for conveying a wide range of free-flowing bulk materials in both vertical and horizontal applications.



A single conveyor can reliably manage capacities at over 550 metric tons per hour, at material temperatures up to 482 °C.

En-masse conveyor basics

En-masse conveying is a method of moving bulk materials as a single, compact mass inside a totally enclosed casing. Instead of dragging free-flowing bulk material along a surface, the material is self-fed into the conveyor casing and moved together in a dust-tight column, propelled by a slow-moving chain fitted with flights. This process creates a smooth, controlled flow of material with minimal internal turbulence.

This highly flexible design, originally developed through early Redler technology, allows one machine to handle horizontal conveying, inclines and even vertical elevations in a continuous process. In many cases, a single en-masse conveyor can replace several conventional units, enabling flexible layouts with fewer transfer points that support simplified, compact plant design.

By gently moving material as a solid mass in an enclosed and dust-tight column, en-masse conveyors achieve high capacities with lower chain speeds. This reduces machine wear and maintenance demands as well as energy consumption. A single conveyor can reliably manage capacities at over 550 metric tons per hour (600 short tons per hour), at material temperatures up to 482 °C (900 °F). The result is a dependable, efficient transference solution that supports safe and consistent material flow across the plant.

En-masse conveyors are suited to handling a wide range of free-flowing materials - from fine powders to larger granular products - under demanding operating conditions. As a result, these machines are widely applied across industries where consistent, controlled bulk material handling is critical. These include mining, power generation, cement, chemical and fertilizer production and other industrial processing facilities.

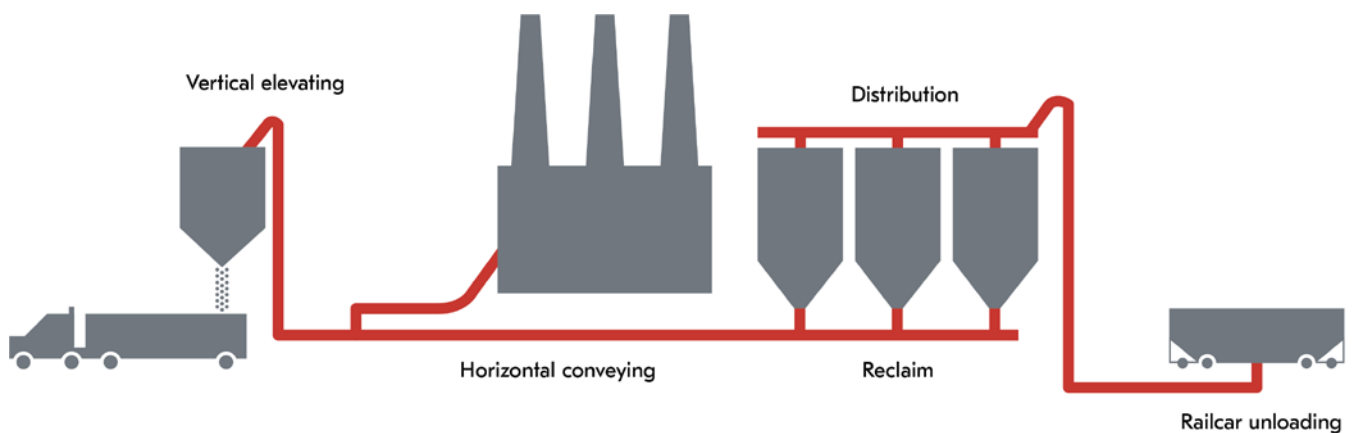
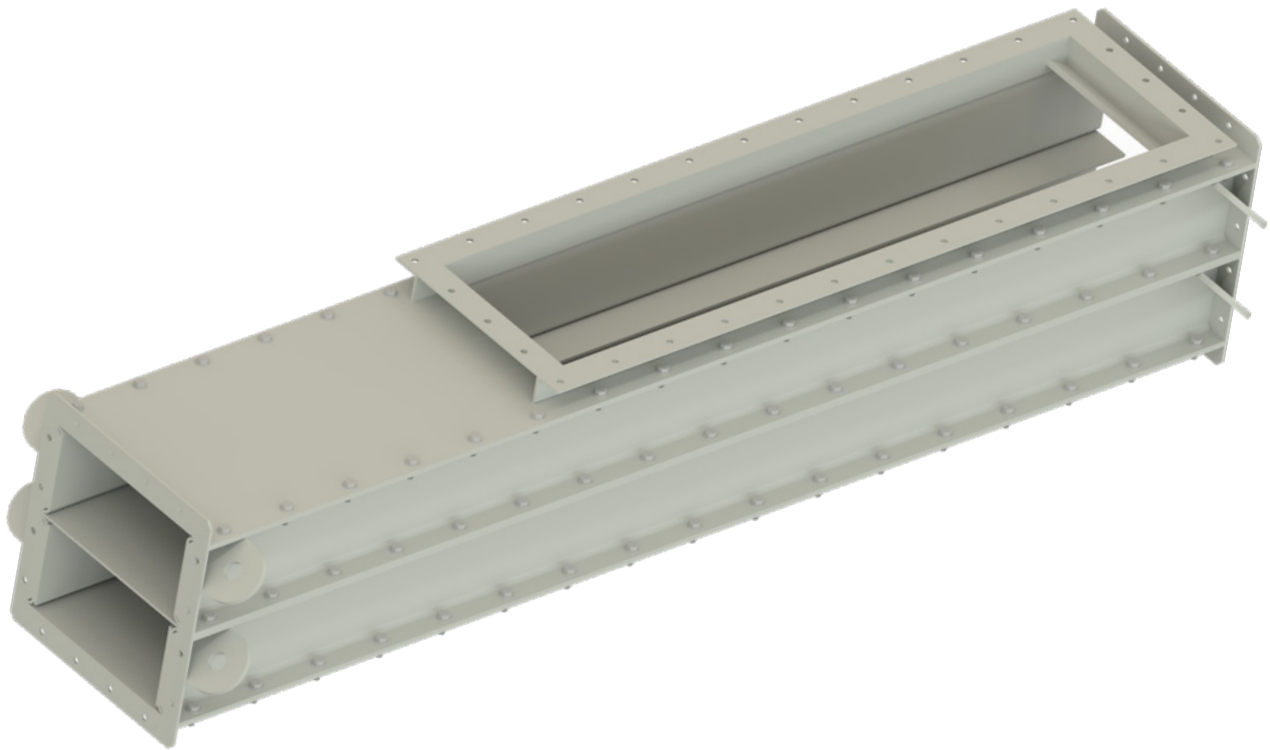


Figure 2: Types of material conveying accomplished by en-masse conveyors

En-masse conveyor benefits

Metso en-masse conveyors are designed to deliver a dependable and economical approach to bulk material handling. By combining conveying and elevating in a single system, they simplify plant design, reduce equipment needs and support efficient operation. The following benefits highlight how this approach translates into safer, more compact and reliable material handling across the operation.



Totally enclosed casings

En-masse conveyors are built around a fully enclosed casing that keeps material contained from inlet to discharge. This dust-tight design protects both the product and the surrounding environment, helping maintain clean and controlled plant conditions. It also supports consistent material flow without the loss or contamination risks often associated with open conveying systems.

Enclosed construction withstands demanding applications. Casings can be engineered to withstand internal pressures, enabling operation under inert gas conditions when handling hazardous or explosive dusts. This added layer of control helps reduce the risk of fire or explosion, supporting safer handling of challenging materials.

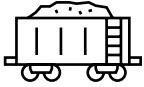
Safety is built into the enclosed en-masse conveyor design. All moving components are housed within the casing or protected by guards, minimizing exposure to rotating parts and reducing risks for plant personnel. The result is a conveying solution that supports safe, clean and reliable operation.

Self-feeding capacity

Metso en-masse conveyors can be designed to draw material directly from hoppers, bins and surge chutes without the need for additional feeding equipment. The material is pulled into the casing and moves as a continuous column, supporting a steady and controlled flow. By eliminating separate feeders or rotary valves, this approach simplifies system design, reduces equipment count and helps improve overall reliability while lowering installation and operating costs.



Enclosed casings support consistent material flow without the loss or contamination risks often associated with open conveying systems.



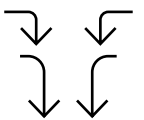
Gentle material handling

En-masse conveying moves material as a solid, controlled column, traveling together with the chain rather than being dragged or agitated. This creates a flow similar to that of a fluid - steady, controlled and with minimal internal turbulence. As a result, degradation is significantly reduced, making the system well suited for handling friable or sensitive materials such as coal, cement, clinker, chemicals and food products.



The design of the conveying flights plays an important role. Metso en-masse conveyors use flight configurations that allow the material column to move smoothly through bends and directional changes without trapping or compressing the product. This avoids the compaction and excess energy demand often seen with solid flight designs, especially when handling incompressible materials.

By reducing agitation and maintaining material integrity throughout the process, en-masse conveying supports consistent product quality while helping lower wear and operating costs across the system.



Multiple inlets and outlets

A single en-masse conveyor can be configured with multiple inlets and discharge points along its length, allowing material to be fed and distributed at several locations within one continuous system. This reduces the need for intermediate equipment and transfer points, helping limit material degradation. It also supports more flexible plant layouts, efficient distribution, reclaim and process integration within a compact footprint.

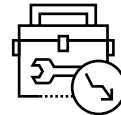


Figure 3: Casing section with multiple discharge points



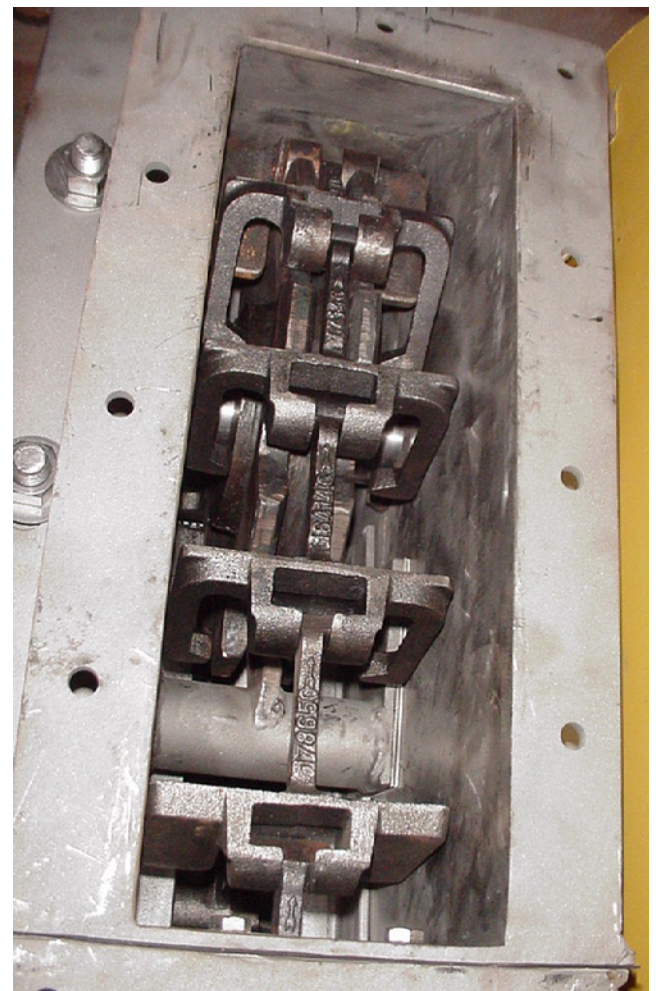
Rugged machine construction

Metso en-masse conveyors are built with robust, long-wearing components designed to perform in demanding environments. Heavy-duty casings, durable chains and engineered flight designs work together to handle abrasive, high-temperature and high-capacity applications. Material options can be selected to suit specific conditions, helping address wear, corrosion or thermal stress. The result is reliable operation over time, with lower operating costs and fewer unexpected interruptions.

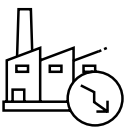
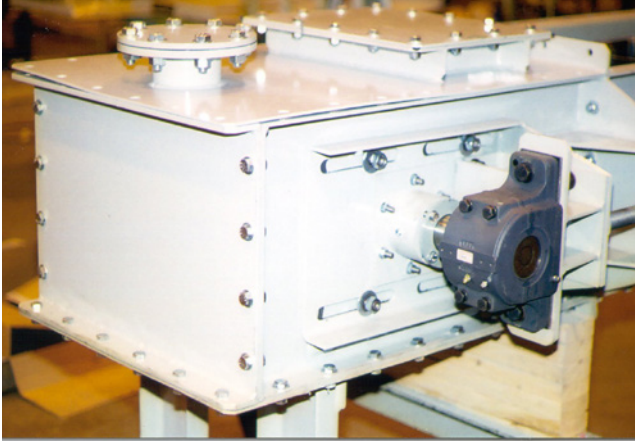


Low maintenance demands

En-masse conveyors are designed for steady operation with minimal maintenance requirements. Slow chain speeds and deep material loading reduce wear on key components, helping extend service life. Maintenance tasks are straightforward and predictable, allowing inspections and part replacements to be planned well in advance. This supports consistent uptime while reducing the need for specialized skills and unplanned maintenance interventions.



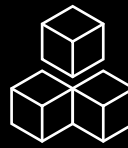
En-masse conveyor benefits



Minimal space and installation requirements

En-masse conveyors are designed to deliver high capacity within a compact footprint. By combining conveying and elevating functions in a single machine, they reduce the need for multiple units, transfer points and associated equipment. Multiple inlets and discharge points can be integrated along the conveyor, helping streamline layouts and reduce structural steel, chutes and dust collection systems.

Installation is straightforward and efficient. Casing sections are supplied pre-assembled with key internal components already fitted and are match-marked for quick alignment on site. With minimal supporting steel and shallow pit requirements, erection costs are reduced and site work is simplified. Access is typically required only at the terminals, supporting faster installation and easier plant integration.



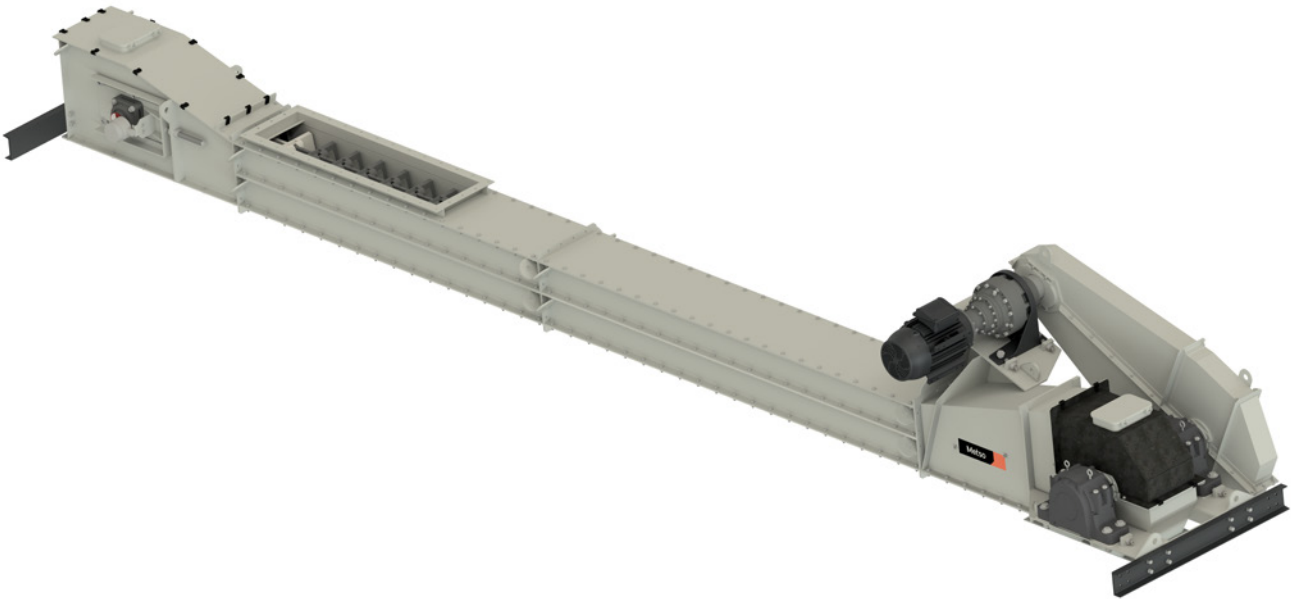
Standard modular design

Metso en-masse conveyors are built from a standard set of modular components; casing sections, transition and boot sections, chain assemblies, flights, drive units and sealing arrangements that combine into a configuration matched to each application. Because the building blocks are standardized and proven, engineering effort focuses on selecting and arranging modules to suit the duty, layout and material, rather than developing a new machine for every project. This shortens engineering and delivery lead times, reduces design risk and draws on components with a documented service history across thousands of installations.

Modularity also carries through the equipment lifecycle. Casing sections are supplied pre-assembled with internal components fitted and match-marked for alignment on site, and individual sections, chain assemblies and wear components can later be replaced to original specification without redesign of the surrounding system.



Figure 4: Match-marked casing sections

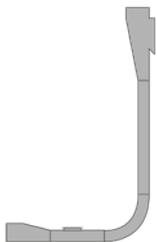


Metso Series 1000

Conveyor/elevators

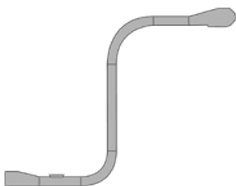
Metso Series 1000 en-masse conveyors and elevators feature a range of configurations. This flexible design optimizes material feeding, conveying and elevating for different spatial constraints and handling requirements for a wide range of materials.

A single Series 1000 machine can replace several conventional conveyors or transfer systems across diverse industrial production processes. Some of the available configurations include:



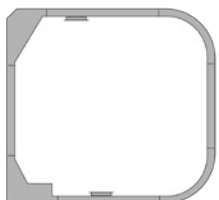
L-type

Combining horizontal feeding with vertical elevation, the L-type is the most widely used configuration which feeds, conveys and elevates in one compact piece of equipment.



Z-type

Designed for installations where headroom is limited, therefore preventing L-type configuration, the Z-type enables efficient conveying for some materials or controlled conditions due to sealing at the transfer points.



Vertical closed circuit

Conveying and elevating on a vertical plane, this configuration enables power-efficient distribution and reclaim from a series of bins, minimizing handling, breakage and dust.



Loop boot

Engineered for choke-fed operation, this configuration delivers the lowest possible feed, gently moving materials to discharge point with no feeder, sprockets or bearings required at the lower end.



Double leg loop boot

Also designed for choke-fed operation, this unit efficiently handles bulky, fibrous or lumpy materials, feeding and discharging from the open side for smooth flow and reduced material stress.

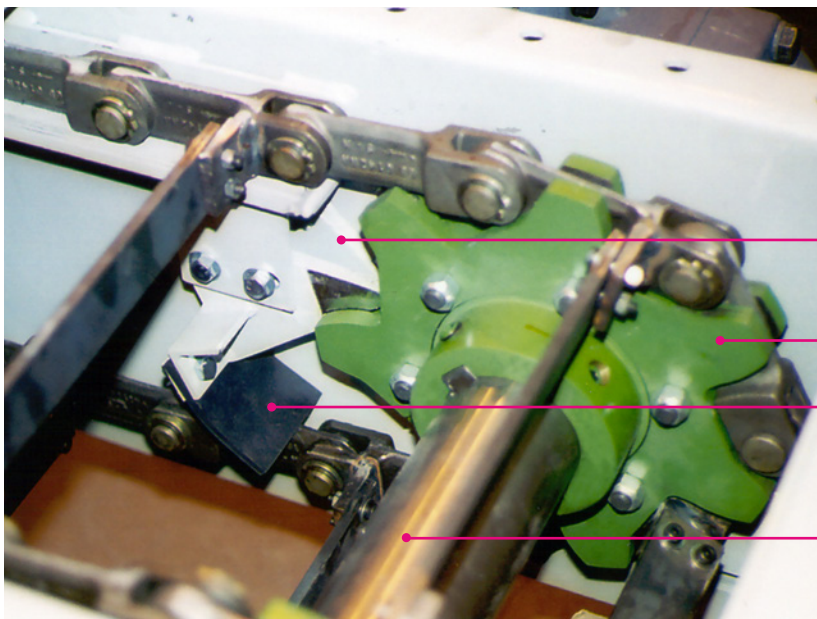


Metso Series 1300

Horizontal conveyors

Built for tough service, Metso Series 1300 en-masse conveyors deliver reliable horizontal and inclined conveying, even in the most demanding of applications.

Designed for direct loading with minimal controls, it supports multiple inlets and discharges while integrating seamlessly into fully enclosed, dust-free systems. Robust construction features abrasion-resistant casings, high-temperature chain materials and expansion provisions for thermal growth. Using flat T-type or forged flights with single or double strand chains, it handles a wide range of materials - from fine powders to large, abrasive lumps. Deep material loads, slow speeds and self-feeding operation ensure consistent performance and long service life in the toughest environments.



Sprocket cleaner

Head sprocket

Chain wiper

Head shaft



Metso Series 2000

Horizontal closed-circuit conveyors

Operating in a horizontal closed circuit, the Metso Series 2000 enables continuous en-masse conveying around bends without transfer points or loss of headroom.

Side-pull flights mounted on bushed sidebar chains move material efficiently while allowing it to recirculate, preventing overfilling and ensuring smooth, controlled flow.

Designed for flexibility, the system can receive material from multiple inlets and discharge at numerous points, making it ideal for storage, reclaim and distribution applications. With the conveying elements isolated from the material, product purity is maintained, while robust construction supports reliable performance across a wide range of demanding industrial processes.

Bulk material handling
across thousands of
industry applications to
fit each
operation.



En-masse conveyors are widely used across mining, minerals processing, power generation and bulk material handling applications where dependable, enclosed material transport is essential. They are well suited for handling materials such as coal, clinker, biomass, grain and other bulk solids that require controlled flow with minimal dust, spillage or material degradation.

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Application and process requirements

Application and process requirements

Correct sizing and selection start with a clear understanding of the application and operating conditions. Accurate process data helps define the conveyor specification and ensures the equipment is matched to the required duty, layout, and material characteristics. This helps reduce unnecessary energy consumption, excessive wear, and operational bottlenecks.

Key application data includes material type, density and size and required capacity. Operating hours, duty cycle and feed arrangement (fed-load or self-feeding conditions) also influence conveyor selection. Conveyors are designed around peak plant capacities to support stable operation during maximum production demand.

Layout and environmental requirements are equally important. Conveyor length, elevation changes, inlet and discharge locations, sealing requirements, liners, and electrical specifications all influence configuration, reliability, maintenance requirements, and long-term operating performance.

Selecting the right en-masse conveyor is a collaborative process; contact the Metso engineering team for help. Providing complete application information early in the project will ensure the selected solution delivers reliable performance, efficient operation, and long service for the business.



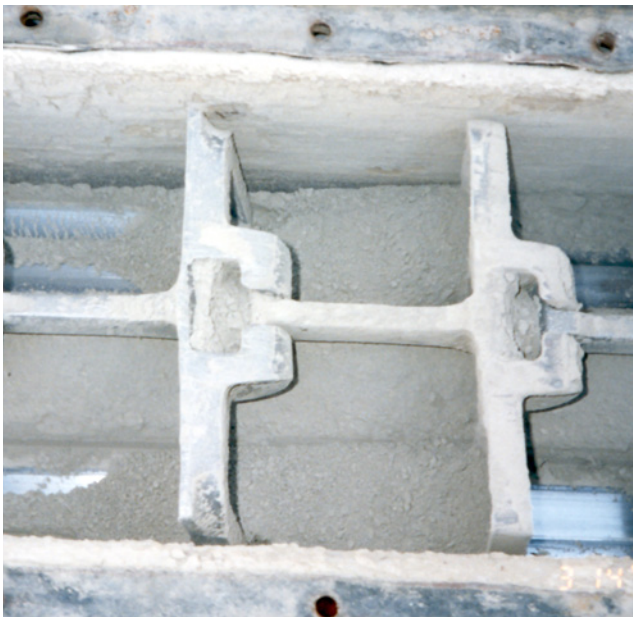
Category	Application data	Why this matters
Material	Material, bulk density range, lump size, moisture and abrasiveness	Determines capacity, wear protection, and chain selection
Capacity	Capacity required for normal and peak throughput and surge condition	Conveyors are selected based on peak plant capacity
Feed and discharge	Fed-load or self-feeding, inlet and outlet locations and chute arrangements	Influences conveyor configuration and loading conditions
Layout	Conveyor shape, horizontal and vertical distances and routing constraints	Defines overall conveyor arrangement
Operating duty	Operating hours per day, week and year and start/stop duty cycle	Impacts drive sizing and wear considerations
Construction	Casing material, liners and sealing requirements	Supports reliability and environmental control
Chain and internals	Chain material, flight type, special boot or sealing arrangements	Selected according to material characteristics
Electrical and motor	Voltage, frequency, hazardous and severe service conditions	Defines motor and drive requirements

Material characteristics

Identifying the material being conveyed is essential for correct conveyor sizing and component selection. Key material properties include bulk density, lump size, moisture content, abrasiveness and temperature. These characteristics influence conveyor capacity, chain and flight selection, wear protection and sealing requirements.

En-masse conveyors can accommodate a wide range of bulk solids. Conveyors are best suited for dry, free-flowing materials where gentle, enclosed handling is important. Typical applications include biomass, coal, chemicals, clinker, fertilizer, grain and dry powders requiring effective dust control. Materials that flow easily and benefit from minimal degradation tend to be well suited to en-masse conveying.

More abrasive materials may require heavier-duty chains, wear liners or special construction materials to support long-term reliability. Special configurations can also be provided for aeratable or difficult-to-handle materials. Large-lump or high-moisture sticky materials are typically less suitable for en-masse conveying.





Conveyor capacity and layout

Conveyor capacity is an essential input when sizing equipment.

Calculations are based on material volume and bulk density. The principle is simple: the conveyor must move enough material at the right speed to run smoothly and consistently. In practice, this means understanding material density, how freely it flows and the resulting conveyor capacity requirements during normal and peak operating conditions. Too little and the conveyor is underutilized; too much and spillage occurs.

Conveyor cross-section dimensions and chain speed are also critical conveyor design factors. Deeper material loading depth combined with lower chain speeds are typically preferred as this helps to maximize material throughput and flow and minimize power consumption and wear. Combined this enhances both reliability and equipment life.

Typical operating ranges

Metso en-masse conveyors are sized to each application. The ranges below are general guidance for early project scoping. Capacity depends on casing size, chain speed, loading depth and the bulk density and flow behavior of the material. Single conveyors range from small process duties of a few tons per hour to more than 550 t/h (600 short tph). Material temperature limits depend on the chain, flight, casing, seal and lubricant materials selected. Standard construction suits ambient and moderately elevated temperatures. High-temperature designs with alloy chain and thermal-expansion provisions handle material up to 482 °C (900 °F).

Chain speed

Chain speed and material loading depth are the two most important factors in en-masse conveyor design. The best practice is to run slow and well filled. A low chain speed reduces wear and power consumption, while a deeper load increases throughput and keeps the material moving as a stable plug. Over-speeding the chain is one of the most common design mistakes. It causes accelerated chain and sprocket wear, material degradation and unstable flow.

Indicative chain speed ranges

Duty - Abrasive or friable materials (e.g. clinker, coal) - 20-50 fps range - Lowest speeds to limit wear and degradation

Duty - Elevating sections (Series 1000 L-type, Z-type, loop boot) - 30-50 fps range - Vertical legs generally run slower than horizontal runs

Duty - Horizontal and inclined conveying, free-flowing non-abrasive materials - up to 150 fps range - Higher speeds only where material and wear allow

Conveyor configuration

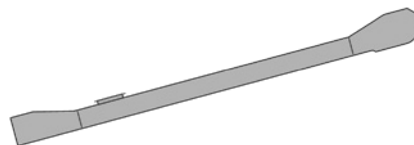
Layout requirements strongly influence conveyor configuration, routing and machine selection. En-masse conveyors can be arranged in horizontal, inclined, vertical and closed-circuit configurations to suit a wide range of plant layouts while minimizing transfer points and simplifying material flow.

Standard conveyor configurations include:



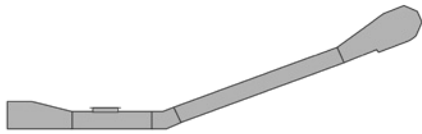
Horizontal conveyor

Straight run between process steps with enclosed transfer.

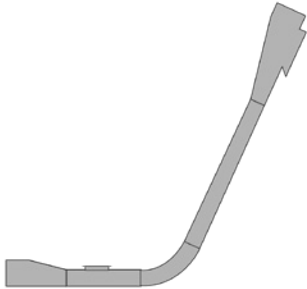


Inclined conveyor

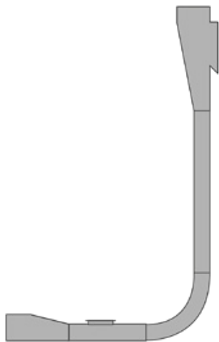
Elevation changes where a gentle incline is feasible.



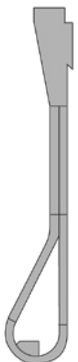
Horizontal to inclined conveyor
Single unit for combined horizontal run and incline.



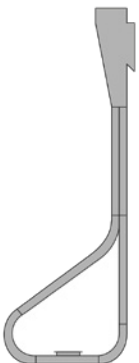
L-type conveyor elevator (less than 90 degrees)
Combined conveying and elevating with offset routing.



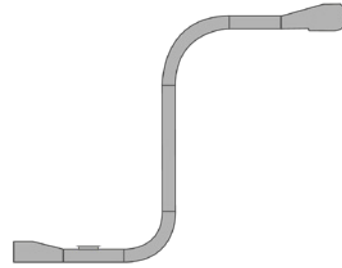
L-type conveyor elevator (90 degrees)
Elevating with a 90-degree transition.



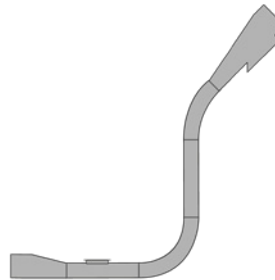
Loop boot elevator
Elevator with loop boot section.



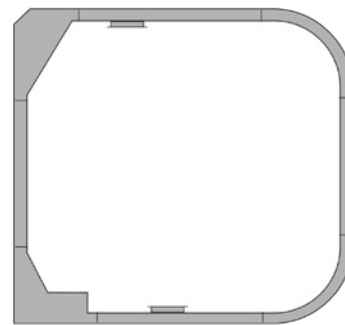
Extended loop boot elevator
Elevator with extended boot for special feed or longer loop.



Z-type conveyor elevator
When routing requires two direction changes due to space constraints.



Z-type conveyor elevator (swan neck)
Z-type variant where clearance or offset is required.



Vertical closed circuit conveyor elevator
Distribution and reclaim from multiple in-line bins.



Horizontal closed circuit conveyor (180 degrees)
Horizontal routing around a 180-degree bend without transfer.



Horizontal closed circuit conveyor (90 degrees)
Horizontal routing around a 90-degree bend without transfer.



Conveyor and component selection

Selecting the right en-masse conveyor series starts with understanding the application, layout requirements and constraints and operating duty.

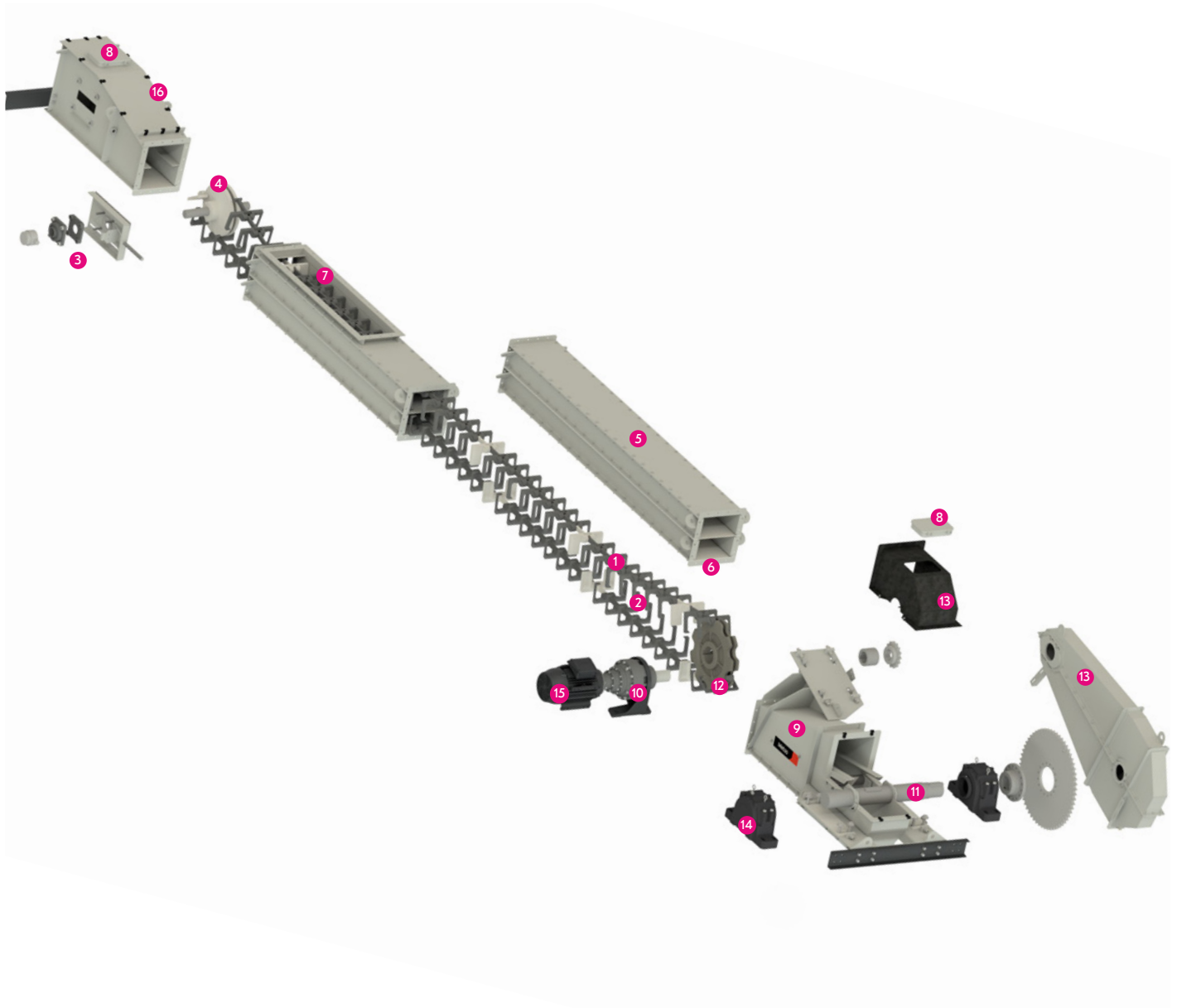
Metso Series 1000 conveyors combine conveying and elevating in one enclosed system, making them well suited to compact layouts. Metso Series 1300 conveyors are designed for heavier-duty horizontal and inclined applications where multiple feed and discharge points, higher capacities or abrasive materials are involved. Metso Series 2000 conveyors support horizontal closed-circuit conveying, allowing material to move around bends without transfer points while helping to maintain material integrity.

Series	Best application	Key strengths
1000	Combined conveying and elevating	Compact layouts, integrated L-type and Z-type configurations. One-piece cast links with integral flights available in multiple material options.
1300	Horizontal and inclined conveying	Multiple feed/discharge points, heavy-duty and abrasive applications. Drop-forged chain with welded or bolted flights.
2000	Horizontal closed-circuit conveying	Conveying around bends without transfer points, improved product purity

Component configuration and selection will vary by the conveyor series and by specific application requirements. Chain type, flight design, casing construction and optional wear liners should be selected to match material characteristics, durability requirements and long-term operating performance.

Refer to the general arrangement illustrations for each series on pages 23, 27 and 30 for standard component configurations.

Metso Series 1000



1. Chain assembly
2. Flights
3. Take-up assembly
4. Tail wheel
5. Intermediate casing
6. Flange seal
7. Feed inlet
8. Inspection panel
9. Drive unit assembly
10. Gearbox
11. Head shaft

12. Head sprocket
13. Guards and covers
14. Bearing housing
15. Motor
16. Tail unit assembly

Not pictured

Zero speed switch (located on head/tail shaft)
 Lubrication system (optional)
 Chain tensioner (part of take up assembly)

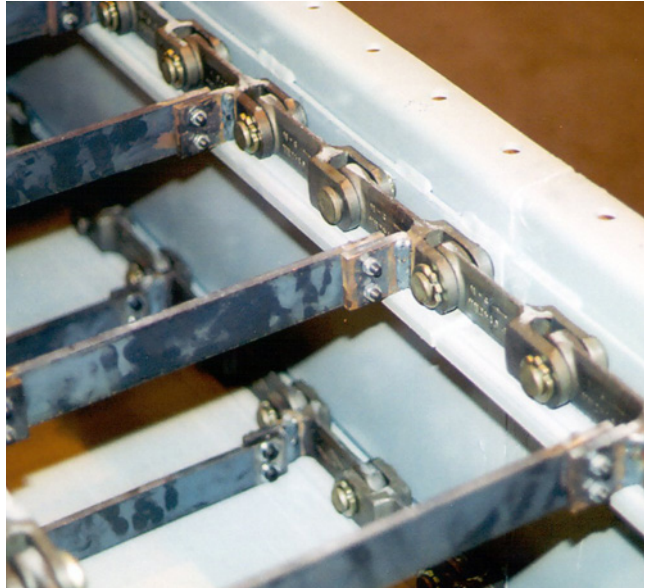
Conveying elements

Chain assembly

The chain assembly forms the continuous conveying element that carries flights and moves material from inlet to discharge. Single-strand chains are typically used for lighter duties, while double-strand, forged and drop-forged designs support higher capacities and abrasive materials. Chain selection is based on duty, capacity, material characteristics, operating temperature and conveyor configuration.

Technical description

- Alloy steel standard, with option of stainless steel or manganese bronze
- Floating chain available for long conveyors or special applications
- Hard surfacing available on high water surfaces



Flights

Flights are attached knuckle to barrel to form the conveyor's chain at regular intervals and engage the material column, moving it through the conveyor casing. Several flight designs are available to match material characteristics, capacity and casing cleaning requirements. Ductile iron flights are supplied as standard, with alternative materials such as UHMW available for specific applications.

U-flights are the standard choice for most materials and conveying duties.

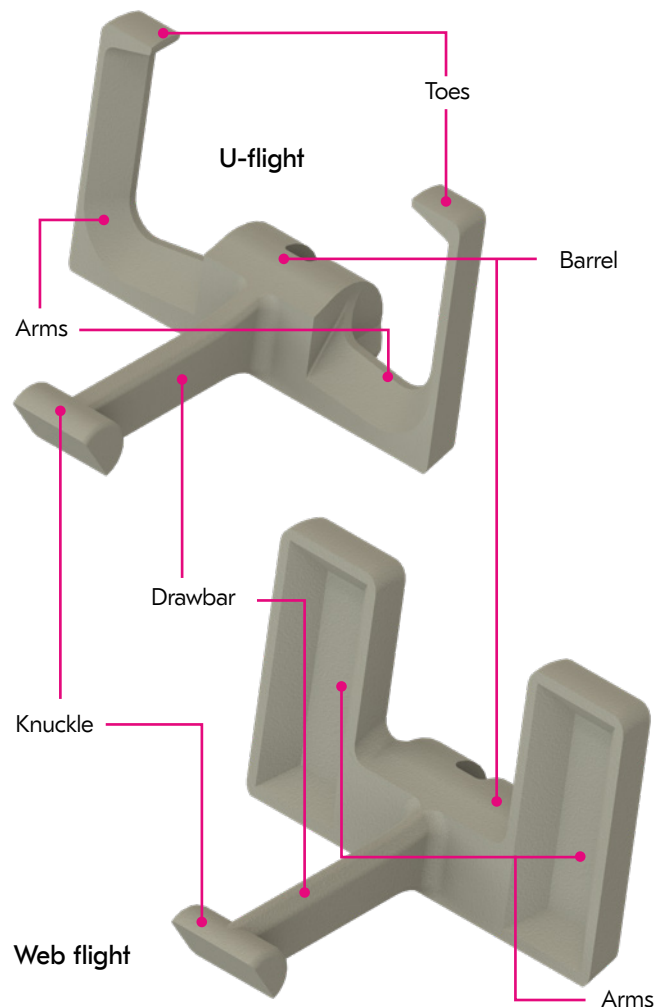
I-flights provide additional strength for bulky materials, wider conveyors and demanding applications.

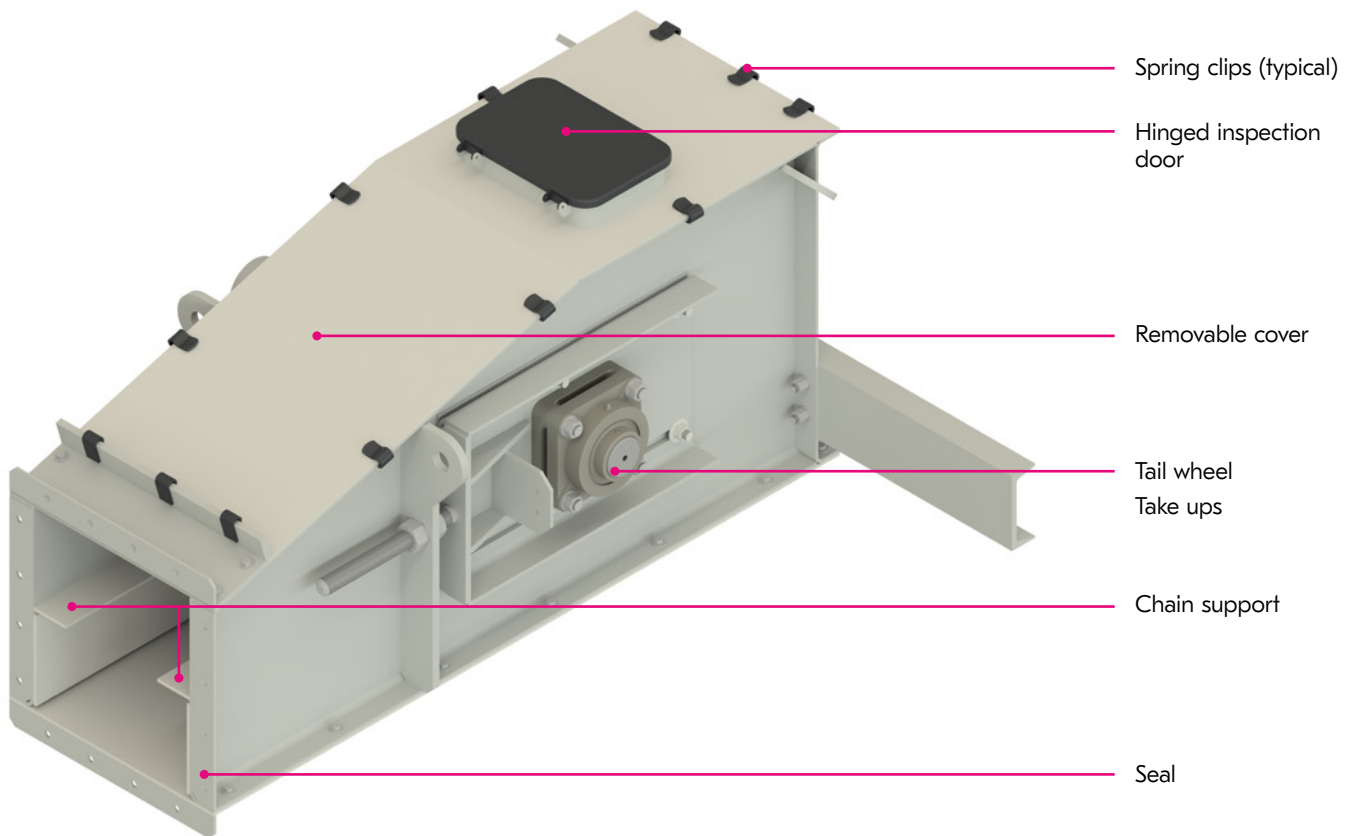
Web flights are suited to fine materials and applications where improved casing cleanout is required.

Wiper flights incorporate cleaning strips to help remove residual material and maintain a cleaner casing interior.

Technical description

- Alloy steel standard, with option of stainless steel or manganese bronze





Take-up assembly

The take-up assembly maintains correct chain tension throughout conveyor operation. Proper tension ensures reliable sprocket engagement, minimizes chain slack and reduces component wear. Typically located at the tail end of the conveyor, take-up assemblies use screw-type or spring-loaded mechanisms and should be inspected regularly to support reliable performance.

Chain tensioner

The chain tensioner maintains correct chain tension throughout conveyor operation, compensating for chain elongation caused by wear and temperature changes. Working together with the take-up assembly, it supports reliable chain tracking and sprocket engagement.

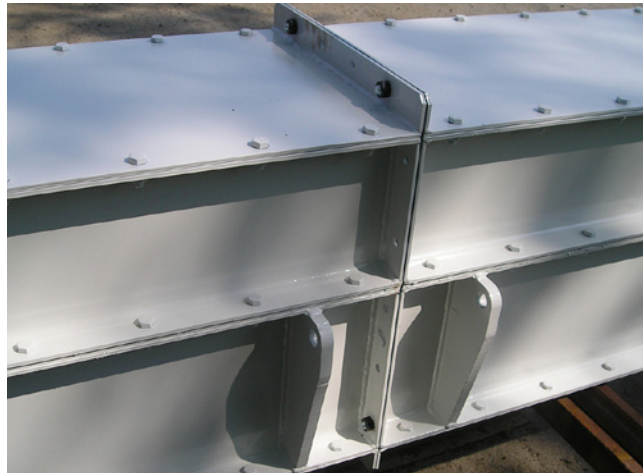
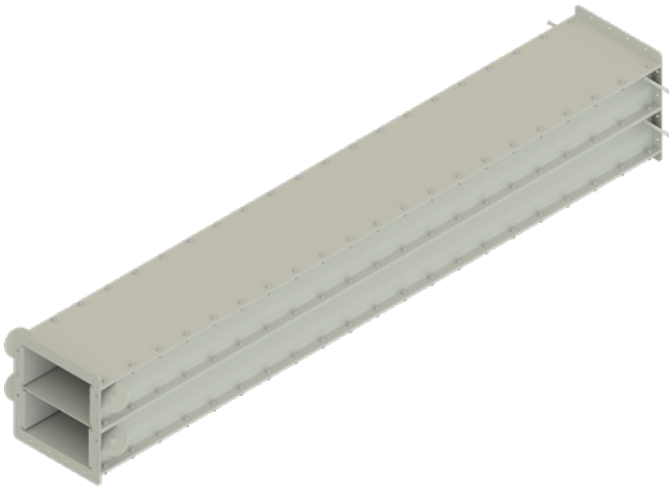
Tail shaft assembly

The tail shaft assembly, or idler wheel, guides the chain at the feed end or lower return section of the conveyor, ensuring the chain travels freely around the return path. The assembly also supports the take-up mechanism, enabling accurate chain tension adjustment and reliable operation.



Conveyor and component selection

Conveyor structure



Conveyor casing

The casing forms the main enclosure of the en-masse conveyor, containing the material and chain assembly along the conveying path. It is typically fabricated from mild steel, with stainless steel or other material options available for corrosive or contamination-sensitive applications. The fully enclosed, dust-tight design helps contain material from inlet to discharge and can be engineered for pressure-tight applications where required.

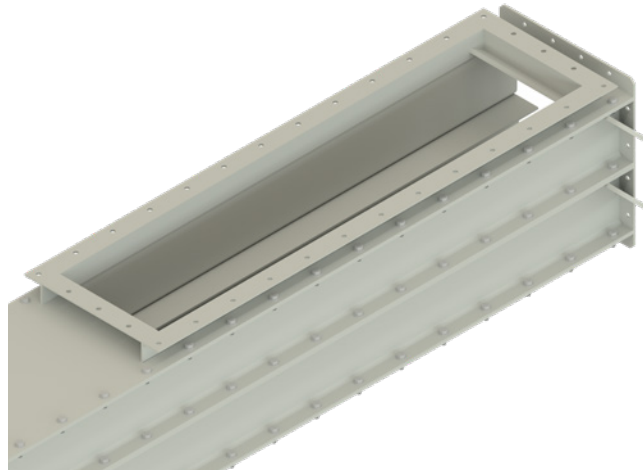
Sealing system

The sealing system maintains a controlled conveying environment throughout the conveyor. Gaskets, seals and precision joint designs reduce material leakage, dust emissions and the ingress of external contaminants. Sealing options range from standard arrangements to dust-tight and pressure-tight configurations, supporting reliable operation in demanding and safety-critical applications.



Transition section

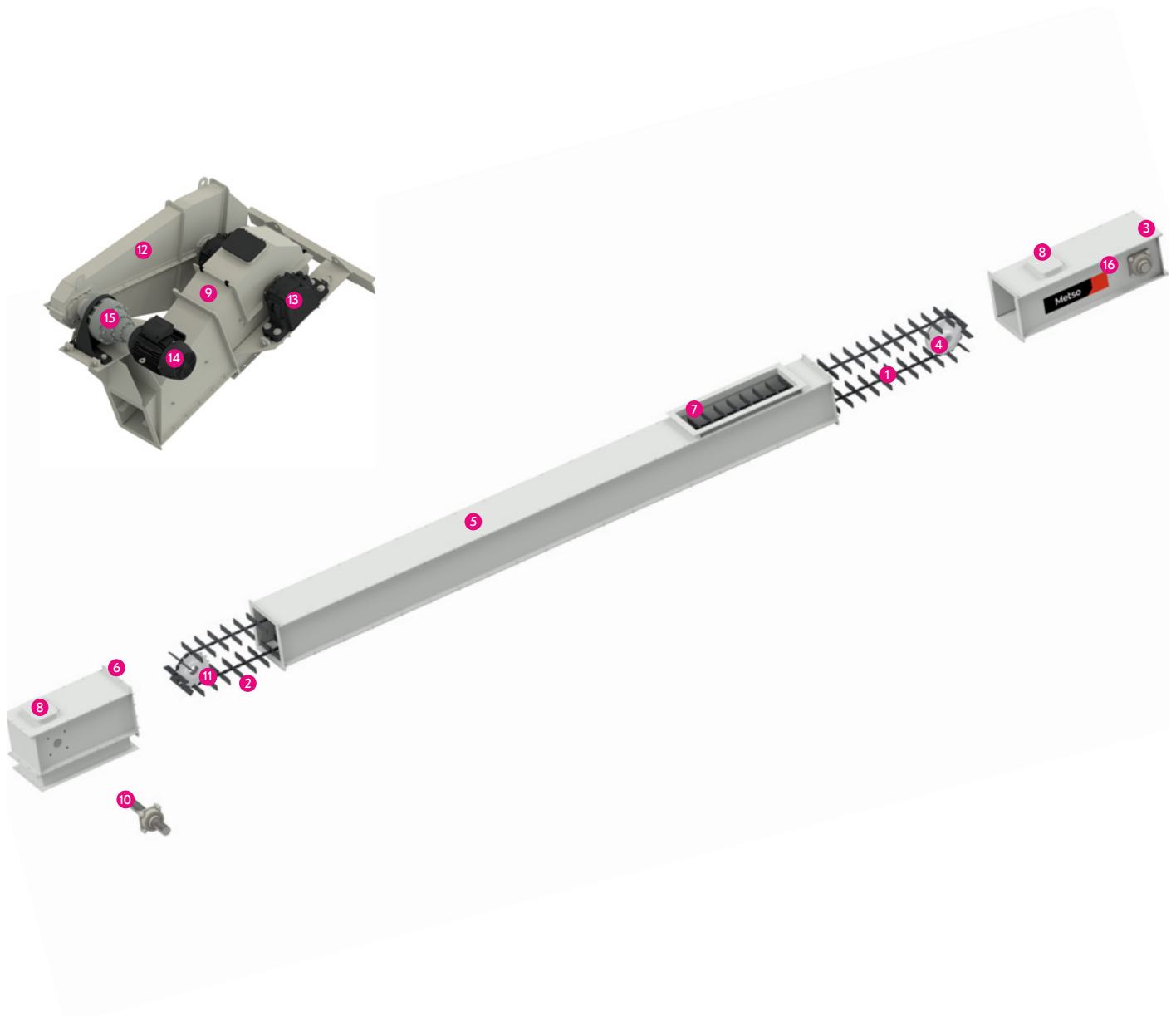
Transition or bend sections allow the conveyor to change direction while maintaining continuous material flow. Used in L-type and Z-type configurations, these curved casing sections guide the chain smoothly through horizontal and vertical transitions. Careful engineering assists in minimizing material buildup, reducing energy demand and supporting reliable conveyor operation.



Feed port

The feed port is the entry point where material enters the conveyor. Feed ports can be positioned at multiple locations along the casing, providing flexibility for plant layout and process integration. Their design is matched to material flow characteristics, feed rate and operating conditions, whether the conveyor is self-feeding or supplied by upstream equipment.

Metso Series 1300



1. Chain assembly
2. Flights
3. Take-up assembly
4. Tail wheel
5. Intermediate casing
6. Flange seal
7. Feed inlet
8. Inspection panel
9. Drive unit assembly
10. Head shaft
11. Head sprocket

12. Guards and covers
13. Bearing housing
14. Motor
15. Gearbox
16. Tail unit assembly

Not pictured

Zero speed switch (located on head/tail shaft)
Lubrication system (optional)
Chain tensioner (part of take up assembly)



Boot section

The boot section guides the chain from the return strand back into the carrying strand. In loop boot and extended loop boot configurations, no lower-end sprockets or bearings are required, simplifying the design and reducing maintenance. The design promotes smooth chain travel while aiding in the prevention of material accumulation.



Discharge port

The discharge port is the outlet where material exits the conveyor and transfers to the next stage of the process. Discharge locations can be positioned to suit plant layout and flow requirements, supporting controlled material release while maintaining system containment and operational efficiency.



Inspection panel

Inspection panels provide access to key conveyor components for routine maintenance. Located at strategic points along the casing, these removable or hinged panels allow safe access to the chain, flights and wear surfaces. Sealed designs help maintain the dust-tight integrity of the conveyor during operation.

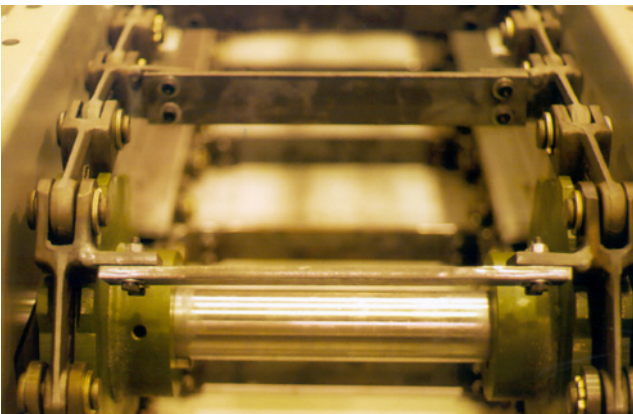


Supporting framework

The supporting framework carries the weight of the conveyor, conveyed material and operating loads. Consisting of structural steel supports, legs, hangers and brackets, it is designed to suit the conveyor configuration and installation environment. Proper alignment and installation help maintain casing integrity, support reliable operation and minimize unnecessary stresses.

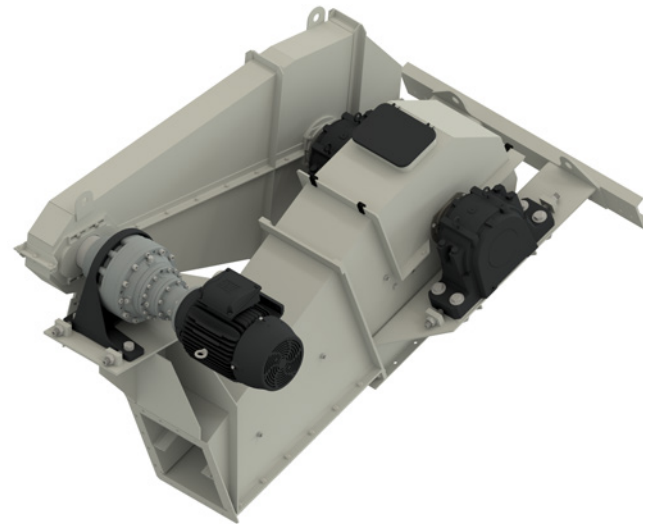
Wear liners

Wear liners help protect the conveyor casing in areas exposed to abrasive material flow. Installed at high-wear locations such as the bottom run and transition sections, these replaceable liners are available in a range of abrasion-resistant steel grades and thicknesses. Regular inspection of wear liners helps extend casing service life.



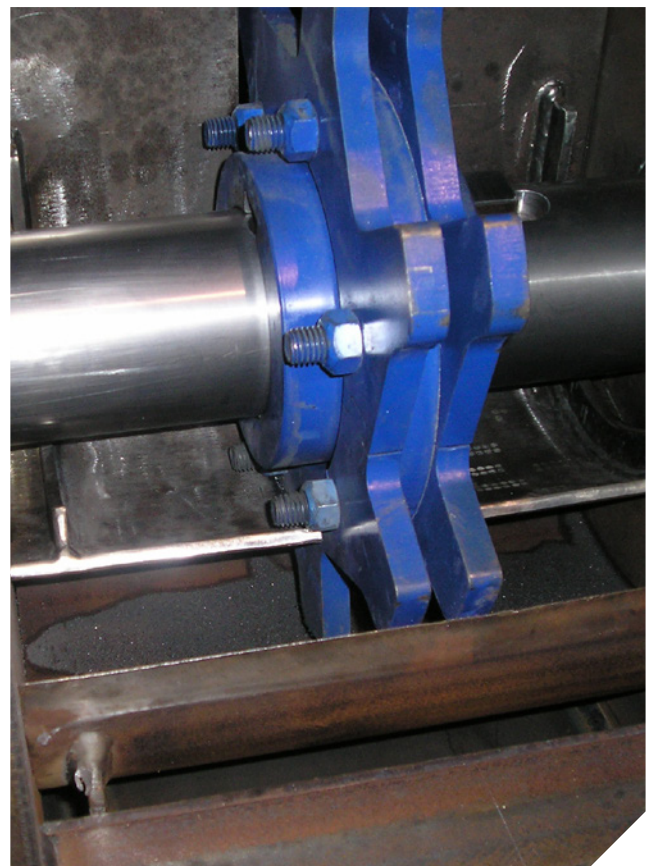
Double strand chain assembly

The double-strand chain is a heavy-duty conveying element designed to move bulk materials efficiently through horizontal or inclined conveyor sections. High-capacity applications typically use a double-strand forged chain with attached flights, making it well suited for demanding duties involving higher throughput, multiple feed and discharge points, and abrasive materials. Regular preventive maintenance will support reliable operation and maximize service life.

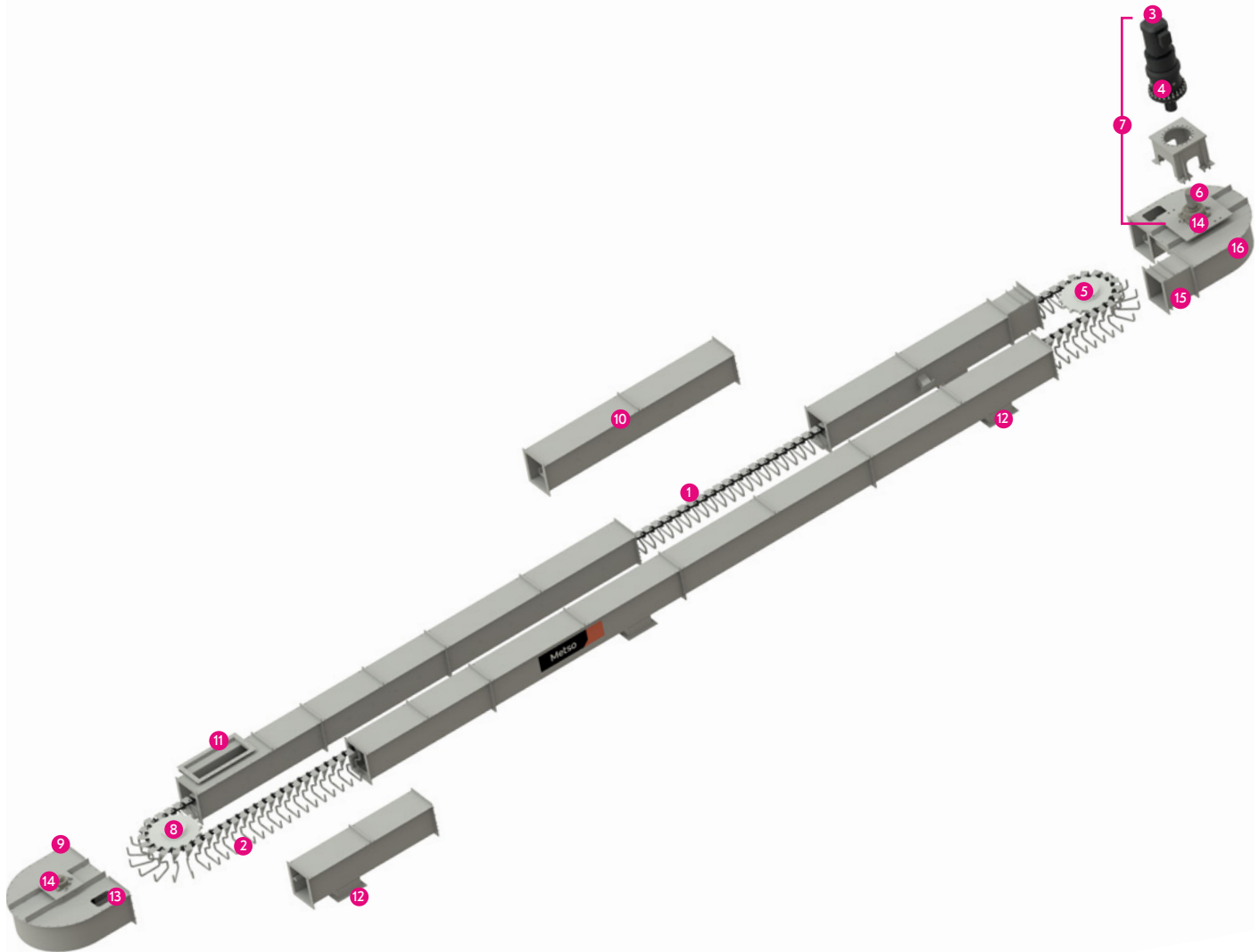


Drive section

The drive section provides the power needed to move the chain and flights, enabling horizontal or inclined bulk material conveying. It is used in heavy-duty applications that may involve high capacities, multiple feed and discharge points, and abrasive materials. To maintain peak performance, regularly inspect the motor, gearbox, couplings, bearings, and drive sprockets for wear, alignment, lubrication, vibration, and other signs of developing issues.



Metso Series 2000

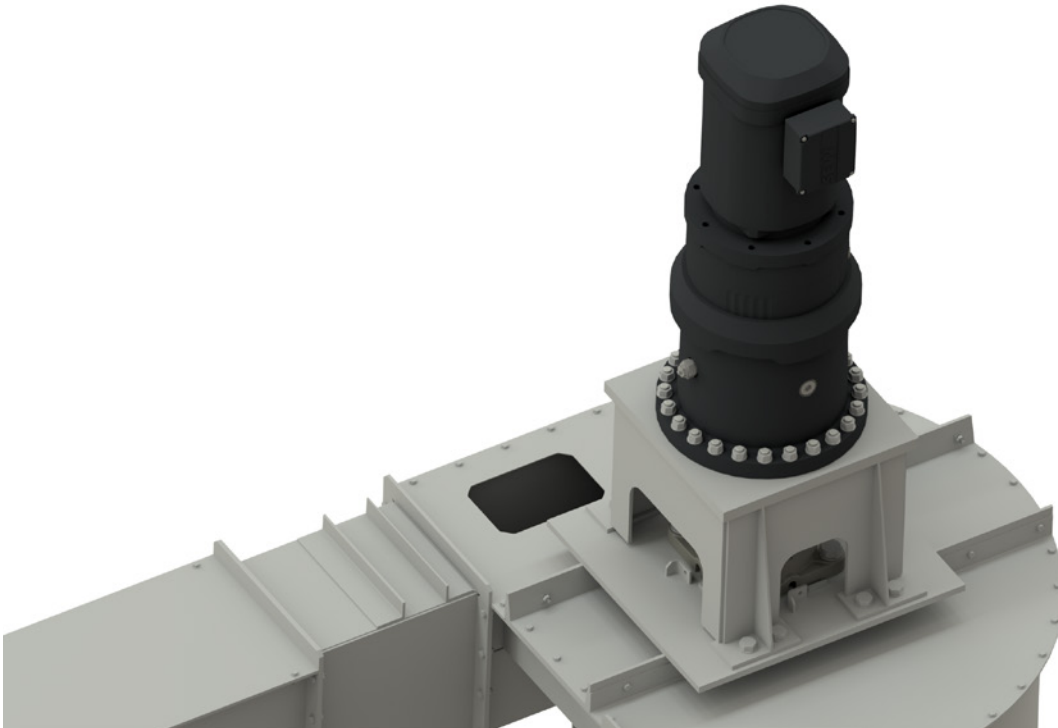


- 1. Chain assembly
- 2. Flights
- 3. Motor
- 4. Gearbox
- 5. Head sprocket
- 6. Head shaft
- 7. Drive unit assembly/drive corner
- 8. Idler wheel
- 9. Tail casing
- 10. Intermediate casing

- 11. Feed inlet
- 12. Discharge outlet
- 13. Inspection door
- 14. Anti-friction bearings
- 15. Take-up section
- 16. Drive casing

Not pictured

Zero speed switch (located on head/tail shaft)
Lubrication system (optional)
Chain tensioner (part of take up assembly)



Drive system and power

Drive system selection begins with understanding the operating duty, conveyor layout and material characteristics. Key inputs include conveyor length and elevation, chain speed, material bulk density, flow rate, incline angle, inlet and discharge arrangement and expected operating cycles. These factors determine the required drive size and power demand during detailed engineering.

The preferred arrangement for en-masse conveyors is a head-end drive positioned at the discharge end. This configuration pulls the chain through the material load, keeping the chain in tension across the loaded section to improve sprocket engagement while reducing slack and wear.

Power requirements are typically estimated from frictional resistance, material lift and acceleration, with service factors applied for starts, stops and operating conditions. Shaft-mounted gearboxes combined with inverter-duty motors and variable frequency drives (VFDs) are commonly used to deliver efficient speed control, soft starts and dependable operation in demanding environments.

Drive unit

The drive unit is the electric motor that provides the motive power for the conveyor. Typically inverter-duty rated, it supports variable frequency drive operation for soft starts, speed control and efficient performance. Motor selection is based on conveyor duty, capacity, material characteristics and operating conditions.



Gearbox

The gearbox converts high motor speed into the low-speed, high-torque output required for en-masse conveying. Commonly mounted between the motor and head shaft, it provides efficient power transmission and reliable operation. Gearbox selection is based on torque requirements, duty cycle and operating environment.

Conveyor and component selection



Head shaft

Head shaft

The head shaft is the primary drive shaft located at the discharge end of the conveyor. It transfers torque from the drive system to the head sprocket, pulling the chain through the loaded conveying section. Supported by heavy-duty bearings, the head shaft is designed to withstand the conveyor's operating loads and duty requirements.



Side pull flight

The design of the chain and side pull flights allow for changes in horizontal direction without the need for transfer points and without loss of head room. Alloy steel is standard, but there are optional materials available.



Head sprocket

The head sprocket is mounted on the head shaft and drives the chain through the conveyor. Manufactured from wear-resistant materials, it is designed to match the selected chain type and operating duty. Proper sprocket-to-chain engagement supports efficient power transmission, reliable chain tracking and long component life.



Lubrication system

Lubrication can be provided through centralized systems or manual service points, depending on the application. Following recommended lubrication intervals and specifications helps protect bearings, shafts and other rotating components, maximize component service life and support reliable operation.

Safety control components

Guards and covers

Guards and covers must be correctly fitted and secured before the conveyor is operated. They help protect personnel from exposed moving components such as sprockets, shafts, couplings and drive equipment. Installed at accessible locations throughout the conveyor, they form an important part of the machine safety system.

Zero speed switch

A zero speed switch monitors conveyor operation and detects chain stoppage or under-speed conditions. If the chain stops moving while the drive remains energized, the device can trigger an alarm or automatic shutdown. This helps protect equipment from damage and supports safer operation during fault conditions.

Overload protection device

This device helps protect the conveyor from excessive loads, blockages and abnormal operating conditions. Using a shear pin, torque limiter or electronic monitoring system, it responds when preset load limits are exceeded. This helps prevent damage to the chain, sprockets, drive components and other critical conveyor equipment.

Proper sizing and selection of en-masse conveyor equipment and components for your industry application and operating conditions will lay the foundation for reliable, efficient bulk material handling.



Equally important is ensuring the conveyor is installed, commissioned, operated and maintained correctly to support safe, dependable performance throughout its service life. The Metso bulk material handling engineering team is available to help at each stage.

Robust equipment
engineered for extended
service in
the toughest
operations.



Metso en-masse conveyors are designed for dependable operation in demanding industrial environments. From engineering, installation and commissioning through maintenance and repair, reliability is built into every part of the equipment. In collaboration with Metso's dedicated bulk material handling engineering teams, businesses can expect extended service across a long equipment lifecycle.

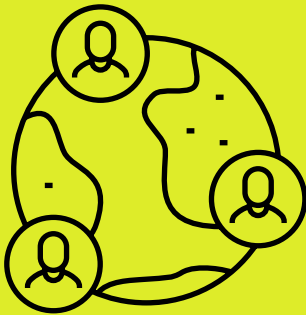
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Engineered for extended service

Metso en-masse conveyors have delivered decades of proven performance across thousands of installations. In mining, power generation, cement, chemical, fertilizer and food processing plants, conveyors are constantly delivering worldwide. This extensive installed base provides a continuous source of operational data, which Metso engineers use to enhance machine performance and ensure extended service life in continuous-duty industrial applications.

The design of Metso's range of en-masse conveyors is built on robust construction, conservative operating speeds and deep material loading, which maximizes throughput while minimizing component stress and equipment wear. Components are selected for durability and designed to deliver predictable service intervals, supporting planned maintenance and reducing the risk of unplanned downtime.

Beyond proven engineering and robust design, reliability depends on correct application, installation and maintenance. The following pages provide guidance on installation best practice and maintenance strategies to help maximize the performance and equipment lifecycle of the equipment.



Global service network

We provide a comprehensive range of professional services to help operators install, commission, inspect and maintain en-masse conveyors.

Delivered by dedicated bulk material handling engineers with deep knowledge of en-masse conveyor design and application, our global service network ensures operators maximize equipment performance, reliability and return on their investment.

Expert installation and monitoring

Services include conveyor sizing and selection, layout optimization and installation and commissioning supervision for new applications. Our engineers also provide structural and thermal analysis and component consultation as well as capacity analysis and maintenance support for existing installations.

Whether a new plant is being designed or an existing process is being modified or maintained, Metso field service engineers can help ensure the conveyor is correctly matched to the application and expertly maintained. Remote monitoring and support services also allow for performance tracking, early fault detection, data-driven maintenance planning and parts inventory management and supply.

Operator and maintenance training

Once the en-masse conveyor is installed, our engineers work alongside the customer's team, transferring knowledge and building local capability for ongoing equipment care. Operator and maintenance training programs are available on-site or at Metso facilities.

Training programs cover en-masse conveyor operating principles, routine inspection and maintenance procedures, troubleshooting techniques and safety best practice. Customized training programs can also be offered to address site-specific equipment configurations and operating conditions.



Installation and commissioning

Proper installation and commissioning are the foundation of reliable conveyor performance. Careful alignment, good access for maintenance and thorough commissioning checks help ensure safe, efficient and dependable operation.

Conveyor alignment and support

Accurate alignment of the conveyor casing, head shaft, tail shaft assembly and supporting framework is essential for smooth chain assembly travel, reliable operation and even wear distribution. Install the conveyor on a level, rigid foundation capable of supporting the combined weight of the equipment and material operating loads. Position foundation bolts and anchor points in accordance with the certified general arrangement drawing provided with the equipment.

The conveyor casing is supplied in pre-assembled, match-marked sections to simplify installation on site. During assembly, align all casing joints within the specified tolerances to maintain smooth chain travel, protect the sealing system and minimize material leakage. Before installing the chain assembly, inspect the casing interior for damage, debris or other obstructions. Support spacing should follow our recommendations to limit casing deflection during operation.

Managing thermal expansion

For high-temperature applications, the supporting framework must allow for thermal expansion to prevent casing distortion, sealing system damage and premature component wear. Sliding supports, expansion joints and flexible connections at feed and discharge ports allow the conveyor casing to expand and contract without placing excessive stress on the equipment or connected systems.

Access and maintainability

Plant layout and maintenance access should be considered during conveyor installation. Inspection panels are positioned along the conveyor casing and at key locations, including the head and tail shaft assembly, transition section, feed and discharge ports. Maintain sufficient clearance around these access points to allow safe inspection, maintenance and component replacement.

Where conveyors are installed at elevation or in confined spaces, provide access platforms, walkways and handrails in accordance with safety standards. Lifting provisions such as overhead cranes, davit arms or monorail systems should also be provided where required. These support the safe removal and installation of heavy components, including the head shaft, head sprocket, drive unit and gearbox.

Designing for maintainability helps reduce downtime and supports efficient planned maintenance. Components subject to routine wear, including wear liners, flights, sections of the chain assembly and the sealing system, should be accessible without removing major structural elements. Metso field service engineers can provide guidance on access provision during the project engineering phase.

Conveyor commissioning checks

Metso field service engineers will work with the customer's team to prepare en-masse conveyors for service. Before first operation, or following major maintenance, comprehensive commissioning checks and a baseline assessment should be carried out.

These checks verify that the conveyor has been correctly installed, aligned, connected and adjusted, and that all safety systems are operating as intended.

Commissioning checklist

- ✓ Conveyor casing alignment and joint integrity
- ✓ Correct head shaft and tail shaft assembly alignment
- ✓ Chain assembly tension adjustment to Metso specifications
- ✓ Gearbox oil levels
- ✓ Correct lubrication points and lubricant specifications
- ✓ Correct motor rotation and coupling alignment
- ✓ Installation of guards and covers on all exposed rotating components
- ✓ Zero speed switch, overload protection device and emergency stop system functionality
- ✓ Feed port and discharge port gate operation

Following successful commissioning checks, the conveyor should be operated without material to verify smooth chain assembly travel, correct engagement with the head sprocket and the absence of abnormal noise or vibration.

Once satisfactory no-load operation has been confirmed, material should be added gradually until the conveyor reaches normal operating capacity while monitoring motor current, chain tension and material flow. Investigate and correct any abnormal conditions before placing the conveyor into continuous service.



Expert equipment inspections

Metso field service engineers provide on-site installation and commissioning support and major maintenance and replacement activities, helping ensure safe installation, reliable startup and long-term equipment performance.

Conveyor baseline assessment

Baseline inspections are recommended after installation, major maintenance or refurbishment. They establish reference measurements for chain elongation, wear liner thickness, head sprocket tooth profile and the overall condition of key components. These baseline values provide a benchmark for future inspections, helping identify wear trends and define replacement intervals based on the operating conditions.

Conveyor condition assessment

Condition assessments are performed annually or semi-annually to evaluate overall conveyor condition. Inspections include the conveyor casing, chain assembly, flights, wear liners, drive unit, gearbox, head shaft, tail shaft assembly, supporting framework and functional checks of all safety devices. A detailed report documents conveyor and component wear measurements and recommended maintenance actions.



Inspection and maintenance

A structured maintenance inspection schedule helps maximize conveyor reliability, extend component life and reduce unplanned downtime. The recommended inspection intervals that follow should be adjusted to suit operating conditions, material characteristics, duty cycle and site experience. Record inspection findings to support trend analysis and planned maintenance.

Wear management strategy

The chain assembly, flights, head sprocket and wear liners are the primary wear components and should be inspected at regular intervals. Worn components should be replaced before they affect the conveyor casing, chain engagement or material flow.

Chain elongation is one of the clearest indicators of chain assembly wear. From the first conveyor baseline assessment, continue to measure and record chain length at scheduled intervals to establish wear trends. Replace the chain assembly when elongation reaches the specified tolerance in the equipment manual. Continuing to operate with an excessively worn chain assembly increases the risk of chain failure, accelerated head sprocket wear and unplanned shutdowns.

Inspect the flights through the inspection panels during scheduled maintenance. Worn, cracked or missing flights can reduce bulk handling performance and contribute to material

buildup within the conveyor casing. Inspect wear liners for thickness loss and replace them before conveyed material contacts the casing.

Maintaining a documented wear history helps plan maintenance, manage spare parts inventory and supports the reliable long-term operation of the equipment.



Recommended maintenance inspection schedule

Daily inspection	
Chain assembly and zero speed switch	Confirm chain movement when drive is engaged and verify switch indicator is active.
Conveyor length and drive system	Investigate unusual noises, vibration, grinding or knocking promptly.
Conveyor casing, sealing, feed and discharge ports	Walk around inspecting for leaks or dust emissions and correct as required.
Discharge ports	Verify consistent material flow and investigate any restrictions or blockages.
Drive unit	Verify the motor temperature remains within normal operating range.
Lubrication system	If a centralized system is fitted, confirm operation and adequate lubricant reservoir level.

Weekly inspection	
Take-up assembly and chain tensioner	Verify chain tension is within specification and adjust if required.
Conveyor casing and sealing system	Inspect casing flanges, gaskets and sealing strips for wear and replace damaged components.
Feed and discharge ports	Remove material buildup and investigate the root cause of accumulation.
Guards and covers	Verify all guards remain secure, undamaged and correctly installed.
Emergency stop system	Test emergency stops and confirm prompt conveyor shutdown response.

Monthly inspection	
Chain assembly and flights	Look for wear, cracking, deformation or missing flights via inspection panels and record condition.
Casing bottom and transition section	Measure wear liner thickness at high-wear zones and plan replacement before minimum limits reached.
Supporting framework	Inspect supports, hangers and brackets for cracks, loose bolts or structural movement.
Gearbox	Check gearbox to verify oil level and inspect for oil contamination or degradation.
Head sprocket and tail shaft assembly	Inspect head sprocket and tail wheel for tooth wear and compare against original profile.
Head shaft and tail shaft assembly bearings	Measure bearing temperatures and investigate abnormal readings.

Quarterly inspection	
Chain assembly	Measure chain elongation over a standard number of links, record and replace when limit is reached.
Transition section	Inspect bend sections internally for buildup, wear and chain tracking and clean if required.
Sealing system	Verify performance of all seals and expansion joints and replace worn elements.
Drive unit	Review variable frequency drive fault logs, current draw and operating parameters.
Overload protection device	Test shear pin and torque limiter for trip function and verify correct activation threshold.

Semi-annual inspection	
Chain assembly and conveyor casing	Perform a comprehensive internal inspection of casing chain, flights and wear liners and record wear.
Gearbox	Sample gearbox oil and run analysis of wear metals contamination and viscosity.
Head shaft and tail shaft assembly bearings	Purge old grease and re-grease head and tail shaft and idler bearings and inspect seal condition.
Safety systems	Check guards and covers and test zero speed switch and overload protection device correcting defects.

Annual inspection	
Full conveyor system	Complete a comprehensive condition assessment and compare to baseline and previous assessment.
Chain assembly	Review chain elongation trends and prepare for replacement at wear limits.
Full drive system	Inspect motor and gearbox (including internals) insulation, alignment and coupling condition.
Head sprocket and tail shaft assembly	Measure tooth wear and plan for replacement once wear profile tolerance is reached.
Maintenance records and schedule	Adjust inspection intervals based on operating experience, wear trends and site conditions.

Note: This inspection schedule is a guideline. Always follow the operation and maintenance manual for the equipment and site safety procedures, adjusting inspection intervals to suit operating conditions.

Lubrication specifications

Correct lubrication is essential for the reliable operation of the head shaft and tail shaft assemblies, gearbox and other rotating conveyor components. Identify all lubrication points during commissioning and include them in the site maintenance schedule. Lubricant type, grade and quantity specifications are provided in the operation and maintenance manual provided with the equipment.

Lubrication intervals will depend on the operating conditions, including speed, load, temperature and the surrounding environment. Re-grease the head shaft assembly and tail shaft assembly bearings at the recommended intervals. Avoid over-greasing, which can damage seals and cause overheating. Check gearbox oil regularly and replace it according to the manufacturer's recommendations or when oil analysis indicates degradation.

High temperature applications

For high-temperature applications, use lubricants suitable for elevated operating temperatures. In dusty or wet environments, an effective sealing system helps prevent contamination and extend bearing life. Where access is limited or multiple lubrication points are present, a centralized lubrication system can help reduce maintenance time while delivering consistent lubrication.

Refurbishment and repair

Over time, en-masse conveyor components are exposed to continuous wear and will eventually require refurbishment or replacement to maintain reliable operation. Metso provides refurbishment and repair services that restore equipment performance, extend service life and reduce unplanned downtime.

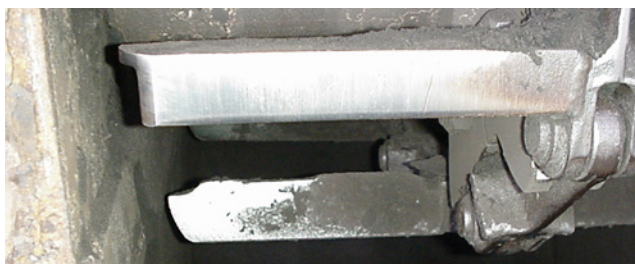


Figure 5, from top: Worn flight tip; Worn head sprocket

Chain assembly

Chain assembly replacement is the most common major maintenance activity. Metso supplies replacement chain assemblies manufactured to original specifications, including chain material, dimensions and flight attachment details. Replacement can be planned using chain wear and elongation measurements collected during routine inspections. Our field service engineers can manage or supervise on-site replacement, ensuring correct installation, alignment and chain tension.

Conveyor casing

Conveyor casing repairs may be required if wear, corrosion or impact damage affects structural integrity or sealing performance. Metso supplies replacement casing sections manufactured to original drawings, complete with pre-installed wear liners, internal components and match-marked flanges to simplify installation. Where damage is localized, on-site welding and structural repairs can be completed under guidance from our field service engineers.

Other conveyor components

Other major components, including the head sprocket, head shaft, tail shaft assembly, drive unit, gearbox, bearings and take-up assembly can also be refurbished or replaced as part of a planned maintenance program. Components are inspected against original specifications and, where suitable, reconditioned and returned to service. When refurbishment is not practical, genuine Metso replacement components provide a direct fit and restore original equipment performance.

Our refurbishment programs follow documented inspection, repair and testing procedures to help return equipment to reliable operating condition while supporting long-term performance and lower lifecycle costs.



Figure 6: Knuckle broken off from the drawbar of a flight

Critical component inventory

Maintaining an appropriate inventory of critical components helps minimize downtime when planned or unplanned maintenance is required.

Parts supply inventory management services are offered to ensure the timely availability of genuine Metso replacement parts. Global parts distribution centers and regional stocking locations support rapid delivery. We can also work with the site team to develop an optimized component inventory plan based on specific equipment operating conditions and required service levels.

The following table lists recommended inventory levels for critical en-masse conveyor components. Adjust quantities for the number of conveyors on site, operating duty, material abrasiveness and lead times for replacement parts. Contact Metso for application-specific recommendations and current part numbers.

Component	Inventory	Notes
Chain assembly	1 set per conveyor	Replace chains quickly and minimize planned shutdown time.
Flights – U-type or as fitted (set)	10 to 20% of installed quantity	Replace worn flights progressively to maintain reliable conveying performance.
Head sprocket	1 per conveyor	Maintains reliable chain engagement and drive performance.
Tail shaft assembly (tail sprocket)	1 per conveyor	Supports accurate chain tracking and consistent tension.
Wear liners (set per high-wear zone)	1 set per conveyor	Protects casing and extends service life in high-wear areas.
Sealing system (casing joint set)	1 complete set	Maintains dust-tight sealing and reduces material loss.
Inspection panel seals and hardware	1 set per conveyor	Maintains dust-tight access after repeated inspections.
Pillow block bearings (head and tail)	1 set (2 to 4 bearings)	Minimizes downtime from unexpected bearing failures.
Lubrication system (gearbox oil)	1 full charge quantity	Supports scheduled oil changes and lubricant top-ups.
Coupling element	1 unit	Sacrificial component protecting higher-value drive equipment.
Overload protection device (shear pins/overload elements)	5 to 10 units	Replace after overload events to restore safe operation.
Zero speed switch	1 unit	Restores critical safety interlocks without unnecessary downtime.

Safety and environment

Safety is built into every Metso en-masse conveyor. The fully enclosed conveyor casing contains material, controls dust and isolates moving components, helping create a safer, cleaner working environment while supporting reliable plant operation.

The chain assembly, flights, head sprocket, head shaft, tail shaft assembly and drive unit are enclosed within the conveyor casing or protected by guards and covers, minimizing operator exposure to moving equipment.

Guards and covers must be securely installed before operation and only removed after the equipment has been isolated using approved lock out tag out (LOTO) procedures. Maintenance teams should be trained in site safety practices before working on the conveyor.

To protect the team and equipment, Metso en-masse conveyors are equipped with a zero speed switch and overload protection device. This switch monitors the chain assembly, detecting chain stoppage or under-speed operation while the drive unit is engaged, initiating an alarm or automatic shutdown to prevent equipment damage.

Overload protection devices, including shear pins, torque limiters and electronic monitoring systems, disconnect the drive unit when excessive loads are detected. Emergency stop devices should be installed at operator stations and other accessible locations to meet applicable safety standards.

En-masse conveyors can be engineered to operate under inert gas conditions for applications handling hazardous, combustible or explosive dusts. Pressure-tight conveyor casing and sealing systems maintain a controlled conveying environment, reducing the risk of combustion. Explosion venting or suppression systems can also be incorporated to meet site and operation risk assessments.



Figure 7: Zero speed switch

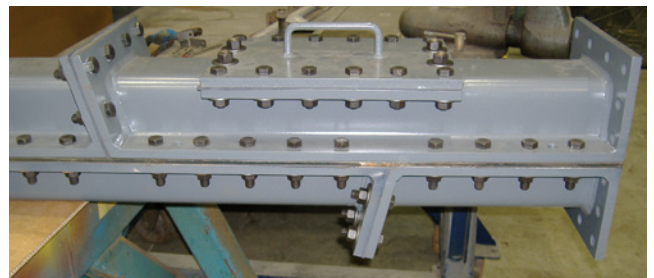


Figure 8: Pressure-tight casing

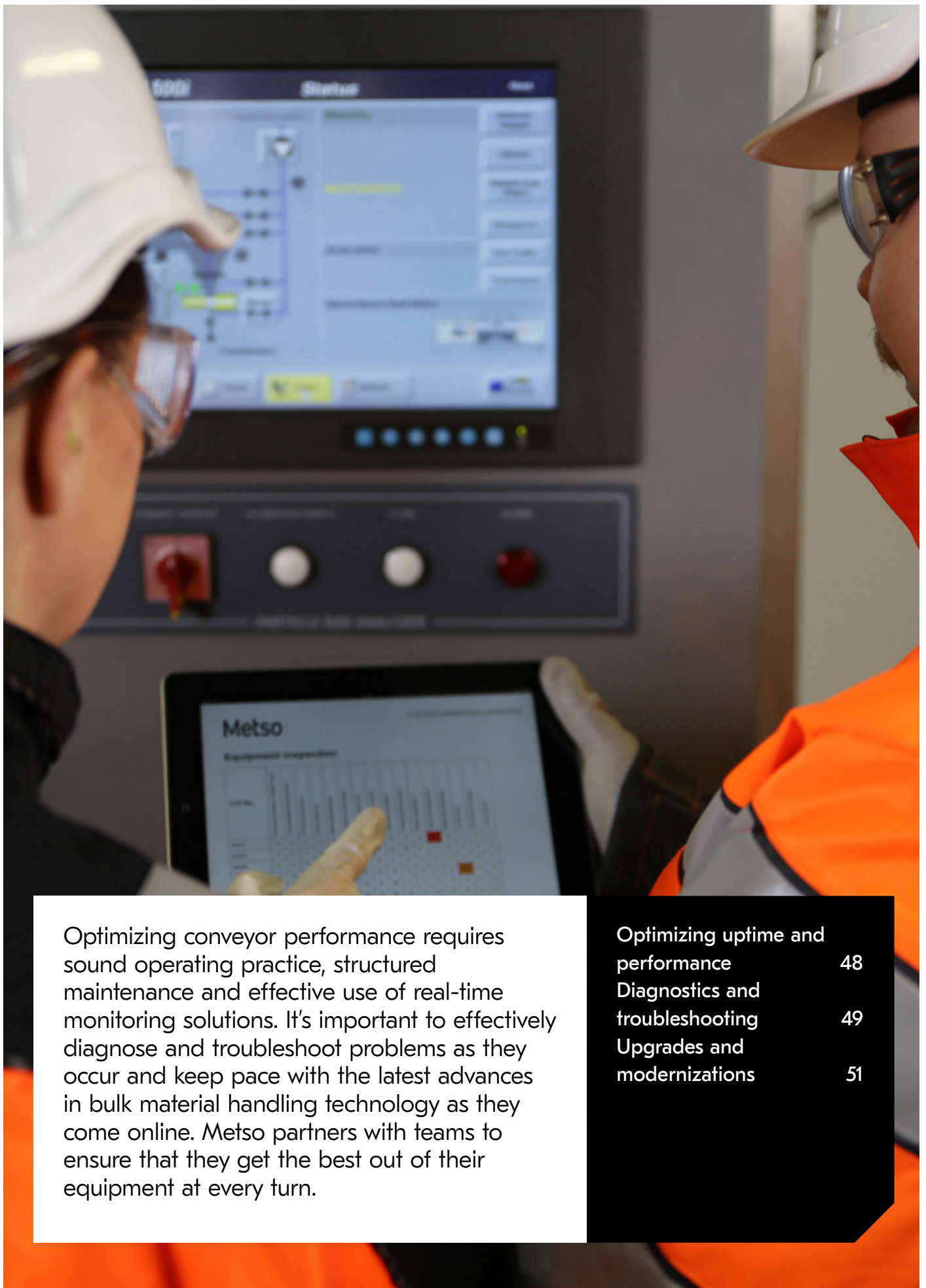


Figure 9: Emergency stop station



Figure 10: Guards

Partnering with operators
to maximize uptime and
optimize
equipment
performance.



Optimizing conveyor performance requires sound operating practice, structured maintenance and effective use of real-time monitoring solutions. It's important to effectively diagnose and troubleshoot problems as they occur and keep pace with the latest advances in bulk material handling technology as they come online. Metso partners with teams to ensure that they get the best out of their equipment at every turn.

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Maximizing conveyor uptime

Maximizing uptime starts with preventive maintenance. Regular inspections, critical component inventory management and accurate maintenance records help reduce the risk of unexpected failures. Consistent conveyor operating practices will also help optimize conveyor performance. Maintaining steady feed rates within the conveyor's design capacity, for example, will reduce stress on the chain assembly and flights.

Real-time performance data

Monitoring wear and wear tolerances in key components allows maintenance to be planned before performance is affected, reducing unplanned downtime and extending component life. Look out for changing material conditions and signs of abnormal noise, vibration or inconsistent discharge that signal buildup and blockages. These can diminish performance and produce unnecessary wear to the equipment.

The latest condition monitoring systems can provide real-time insight into conveyor performance. Sensors constantly monitor vibration, temperature, load, speed and lubrication, helping to identify developing faults before they lead to unplanned downtime. This data aids in driving decisions on the timing and scope of maintenance resource allocation.

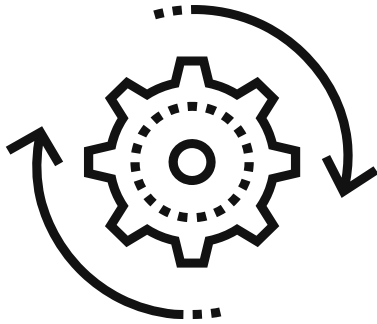
Troubleshooting

Effective diagnostics and timely troubleshooting help minimize downtime and prevent secondary damage. The following table outlines common operating symptoms, their likely causes and recommended corrective actions. If a problem persists or the root cause cannot be identified, inspection by Metso field service engineers is a solution.

Problem	Possible causes	Corrective actions
Excessive chain assembly wear or elongation	- Chain speed too high - Abrasive material beyond conveyor design tolerances - Incorrect chain specification - Misaligned head shaft or tail shaft assembly	- Reduce chain speed where possible - Verify material properties and upgrade the chain assembly if required - Check and correct shaft alignment - Consult Metso for application review
Unusual noise or grinding	- Chain assembly or flights contacting the conveyor casing - Worn head sprocket - Foreign material inside the conveyor casing - Bearing or lubrication issue	- Inspect casing alignment and clearances - Replace the worn head sprocket - Remove debris via the inspection panel - Inspect bearings and service the lubrication system
Material buildup inside the conveyor casing	- Sticky or high-moisture content material - Chain speed too low - Worn or damaged flights - Excessive feed rate	- Confirm material is suitable for en-masse conveying - Adjust chain speed within design limits - Replace damaged flights - Reduce the feed rate or improve feed control
Frequent overload trips	- Excessive feed rate - Material compacting in the transition section - Chain tension too high - Material blockage	- Reduce feed rate to design capacity - Inspect the transition section - Adjust chain tension using the take-up assembly - Remove the material and identify the root cause of the blockage
Uneven material discharge	- Inconsistent feed - Worn flights - Restricted discharge port - Incorrect discharge configuration	- Stabilize material feed - Replace worn flights - Inspect and clear discharge port - Review discharge arrangement and sequencing
Excessive dust emissions	- Worn sealing system - Damaged casing seals - Negative pressure from connected equipment - Damaged conveyor casing	- Replace sealing components - Restore sealing at joints and inspection panels - Review the dust collection system - Repair or replace damaged conveyor casing sections
Drive unit overheating	- Drive unit undersized - Incorrect VFD settings - Excessive material load - High ambient temperature	- Verify drive sizing - Review VFD settings - Reduce material load - Improve ventilation or upgrade cooling if required

Problem	Possible causes	Corrective actions
Excessive vibration	• Misaligned drive unit, gearbox or head shaft • Worn head sprocket • Loose supporting framework • Damaged chain assembly	• Check drive alignment • Replace the worn head sprocket • Tighten the supporting framework • Inspect and replace damaged chain assembly sections
Chain assembly jumping on the head sprocket	• Excessive chain elongation • Worn head sprocket • Incorrect chain tension • Debris lodged around the head sprocket	• Measure chain wear and replace the chain if required • Replace the head sprocket • Adjust the chain tension using the take-up assembly • Remove debris from the head section
Material degradation	• Chain speed too high • Incorrect flight design • Excessive transfer points • Material unsuitable for en-masse conveying	• Reduce chain speed • Review the flight design • Minimize unnecessary transfer points • Consult Metso to confirm application suitability
Chain assembly fails to start or stalls	• Drive unit fault • Excessive material load • Seized chain assembly • Overload protection device activated	• Inspect drive and electrical supply • Reduce material load and restart • Free or replace seized chain assembly components • Reset the overload protection device after correcting the fault
Premature head sprocket wear	• Misaligned chain assembly • Incorrect chain tension • Abrasive material entering the head section • Incorrect head sprocket specification	• Correct chain alignment • Adjust chain tension • Improve sealing around the head section • Consult Metso on head sprocket selection

Note: This troubleshooting grid is a guideline. For symptoms not listed above or persistent problems, contact Metso field service engineers to arrange an inspection and technical support.



Upgrades and modernizations

Continuous improvement is a core Metso principle. As new materials and technologies become available and engineering standards evolve, these are incorporated into our equipment as they are validated. Each generation of en-masse conveyor benefits from the latest advances in bulk material handling technology.

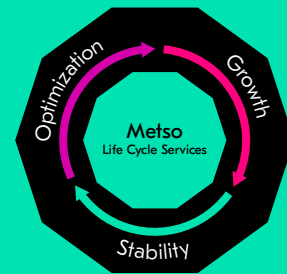
As processes evolve or capacity requirements change, existing en-masse conveyors can be upgraded to improve performance, efficiency and reliability. Metso offers a range of upgrade and modernization options that can be implemented during planned maintenance shutdowns or as part of broader plant improvement programs.

Drive system and components

Drive system upgrades can improve conveyor performance, reliability and operating efficiency. Replacing older drive units with modern inverter-duty motors and variable frequency drives provides soft starting, precise speed control and improved motor protection. Upgrading the gearbox can increase torque capacity, reduce maintenance demands and help extend conveyor service life.

Upgrading flights and wear liners can also enhance conveyor performance. UHMW flights offer lower weight, quieter operation and improved cleaning performance for sticky or fine materials, while specialty alloy flights are suited to high-temperature or abrasive applications. Upgraded wear liners can extend service life and reduce replacement frequency in high-wear operating conditions.

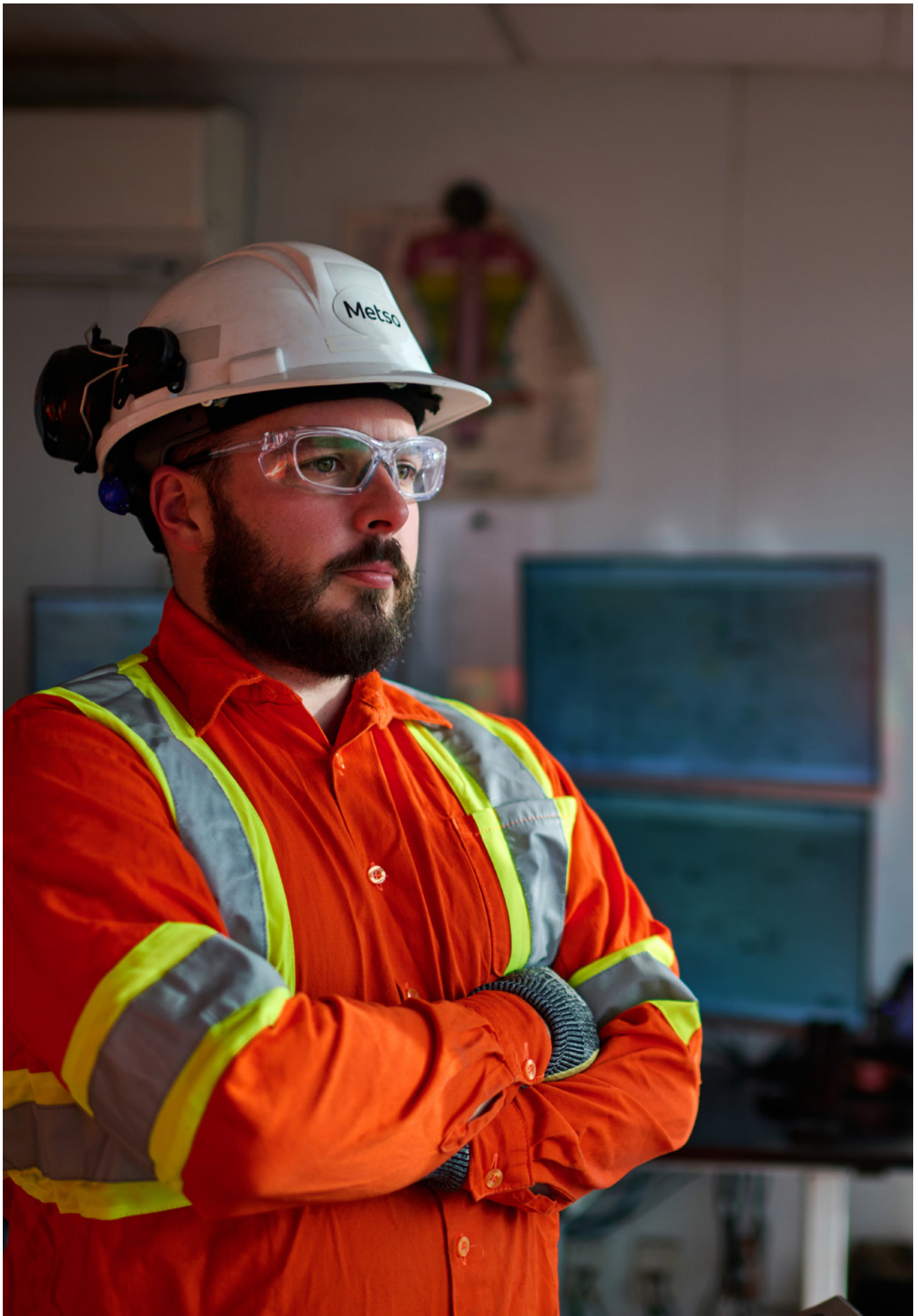
For broader modernization projects, Metso can evaluate existing installations and recommend upgrades to optimize capacity, reliability and operating efficiency.



Metso Life Cycle Services

We partner with you to optimize conveyor performance throughout the equipment lifecycle. To support maintenance and maximize uptime we offer planned service agreements, performance reviews, operator training and access to our global engineering and field service expert help. Support can be tailored to each operation, from scheduled site visits to comprehensive performance management programs.





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