Conveyor Belt Engineering & Selection Guide

Construction, Specifications, Manufacturing and Industrial Applications

Technical reference for conveyor belts used in mining, quarrying, aggregate crushing, screening and mineral processing systems.

Coverage:

- Belt Construction & Materials
- Technical Specifications & Standards
- Manufacturing & Quality Testing
- Wear Mechanisms & Engineering Selection



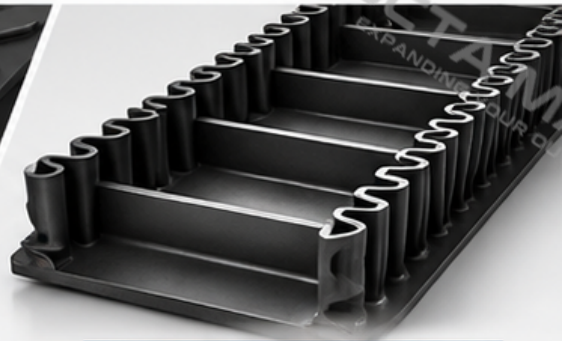
Steel Cord Belt
(with Localized Reinforcement Cutaway)



Multi-Ply Fabric Belt



Molded Chevron Belt



Corrugated Sidewall Belt
(with Transverse Cleats)

Conveyor Belt Construction & Specifications

Multi-Ply Fabric Conveyor Belt (Textile Carcass)



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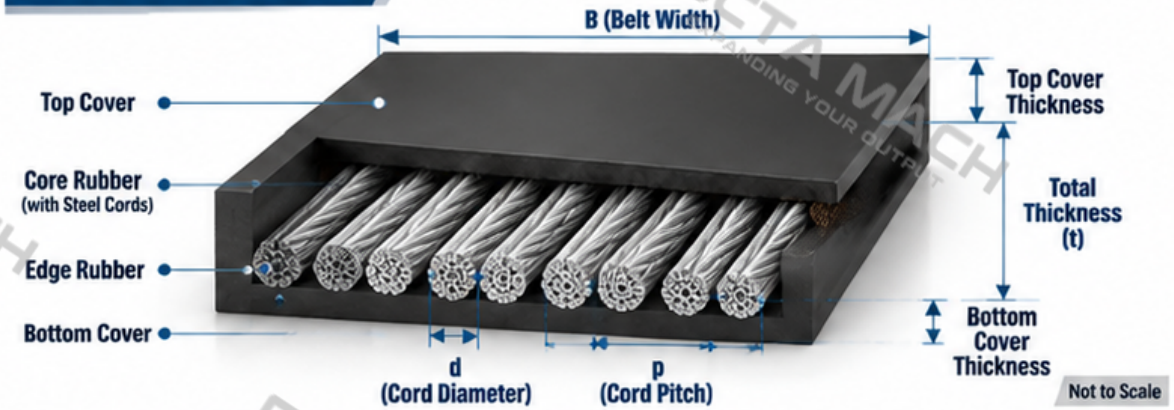
Steel Cord Conveyor Belt



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Main Specifications

Specification	Description
Belt Width	The usable width of the belt, selected according to material flow and required capacity
Belt Tensile Strength	The rated longitudinal strength of the belt carcass, expressed in N/mm
Carcass Material	Textile reinforcement such as EP, NN and EE, or longitudinal steel cord reinforcement
Number of Plies	The number of textile reinforcement layers in a multi-ply belt
Top Cover Thickness	The thickness of the material-carrying rubber cover, selected according to abrasion and impact conditions
Bottom Cover Thickness	The thickness of the pulley-side rubber cover, selected according to operating and flexing requirements
Rubber Cover Grade	The rubber compound selected for abrasion, heat, oil, chemical, flame, or other operating conditions
Belt Length	The required endless or open belt length, including the specified joint arrangement
Surface Profile	A flat surface, chevron pattern, cleats, or other profiles selected for the conveying angle and material
Minimum Pulley Diameter	The minimum pulley diameter compatible with the belt construction and operating tension

Selected Nominal Textile Belt Widths

300, 400, 500, 600, 650, 800, 1,000, 1,200, 1,400, 1,600, 1,800, 2,000, 2,200, 2,400 mm

Representative Steel Cord Strength Classes

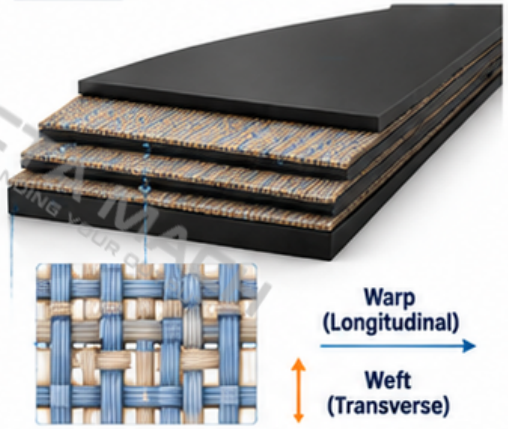
ST630, ST800, ST1000, ST1250, ST1600, ST2000, ST2500, ST3150, ST3500, ST4000, ST4500, ST5000, ST5400, ST6300, ST7000, ST7500

The ST designation represents nominal longitudinal tensile strength in N/mm of belt width, not allowable operating tension. Final construction and strength must match the conveyor duty and splice design.

Carcass Materials & Rubber Cover Properties

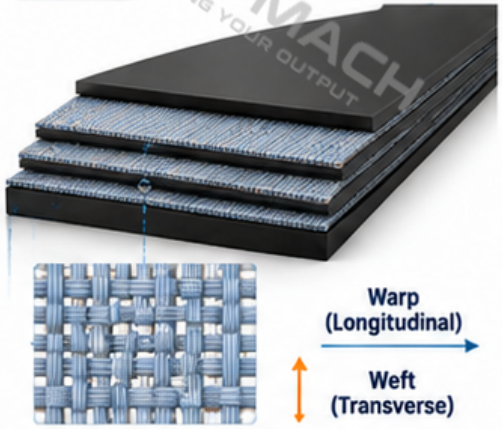
Carcass Materials (Belt Reinfercement)

EP — Polyester Warp / Nylon Weft



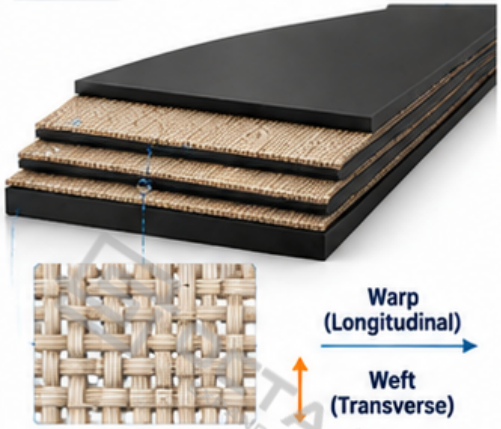
- **EP:** Polyester in the warp direction and polyamide (nylon) in the weft direction.

NN — Nylon Warp / Nylon Weft



- **NN:** Polyamide (nylon) in both the warp and weft directions.

EE — Polyester Warp / Polyester Weft



- **EE:** Polyester in both the warp and weft directions.

Steel Cord — Longitudinal Steel Cords



- **Steel Cord:** Longitudinal stranded steel cords bonded within rubber.

Rubber Cover Properties (Typical Applications)



Abrasion Resistant	Heat Resistant	Oil Resistant	Chemical Resistant	Flame Resistant	Cold Resistant	Anti-Static
For rock, ore, sand and gravel with high abrasion.	For hot materials such as clinker, sinter and coke.	For materials containing oil or petroleum products.	For service with specified chemical exposure.	For applications with defined fire-safety requirements.	For low-temperature operating environments.	For applications with specified electrical resistance requirements.

Rubber cover grades are functional compound specifications and cannot be identified reliably by appearance alone.
Select the compound according to actual material exposure and operating requirements.

Conveyor Belt Types & Structural Designs

1. Steel Cord Conveyor Belt



Structural Feature: Longitudinal steel cords with high tensile reinforcement.

Typical Duty: Long-distance and high-tension bulk material conveying.

2. Fabric Conveyor Belt



Structural Feature: Woven textile reinforcement with multiple plies.

Typical Duty: General-purpose conveying in mining and aggregate plants.

3. Corrugated Sidewall Conveyor Belt



Structural Feature: Flexible corrugated sidewalls and transverse cleats on a reinforced base belt.

Typical Duty: Steep-angle conveying and vertical lifting of bulk materials.

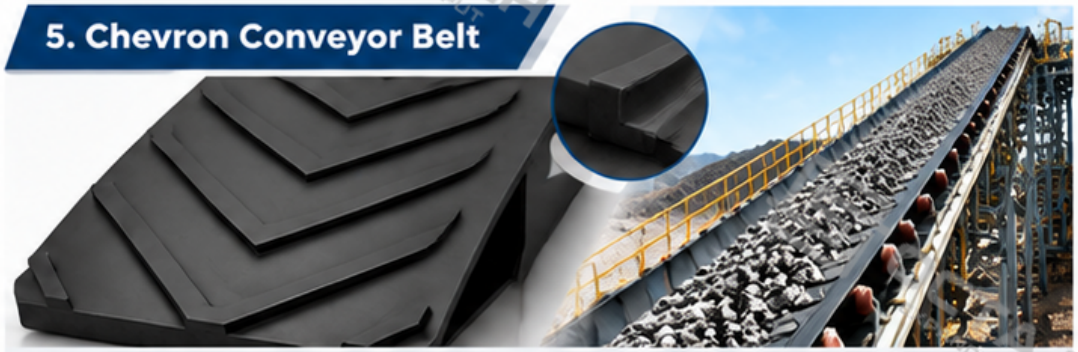
4. Pipe Conveyor Belt



Structural Feature: Flat belt formed into a closed tube with overlapping edges, supported by external idlers.

Typical Duty: Enclosed bulk material transport (e.g., ore, coal, concentrate) with reduced spillage and environmental impact.

5. Chevron Conveyor Belt



Structural Feature: Molded raised chevron (V-shaped) patterns on the carrying surface.

Typical Duty: Inclined conveying of loose or granular materials to improve material retention.

Note: Belt types classified by reinforcement, profile and application may overlap.

Specialized Conveyor Belts

1. Heat Resistant Conveyor Belt



Design: Rubber cover compound for elevated-temperature service conditions.

Application: Handling hot solid materials such as clinker, sinter and coke in cement and metallurgical plants.

2. Vacuum Filter Belt



Design: Rubber belt with transverse drainage grooves and openings, used together with a filter cloth.

Application: Continuous filtration and dewatering of mineral concentrates, tailings and industrial slurries.

3. Bucket Elevator Belt



Design: Reinforced rubber belt with mechanically fastened buckets at regular intervals.

Application: Vertical lifting of bulk materials such as ore, cement, grain and aggregates.

4. Anti-Adhesion Conveyor Belt



Design: Rubber cover with reduced material adhesion to limit carryback on the return side.

Application: Conveying sticky and moist materials such as clay, wet ore and fine concentrates.

5. Extra-Wide Conveyor Belt



Design: Increased belt width construction for high-capacity material transportation with stable running performance.

Application: Large-scale conveying in mines, quarries, ports and bulk material handling systems.

Note: The above are common specialized conveyor belt designs. The specific construction, rubber cover and configuration should be selected according to the actual material characteristics and operating conditions.

Conveyor Belt Manufacturing Process

01. Rubber Compounding



Process: Mixing natural and synthetic rubber with specified additives to prepare the belt compound.

Purpose: Achieve the required performance for cover and skim rubber.

02. Reinforcement Preparation



Process: Calendering and coating woven textile fabrics, or preparing and aligning steel cords.

Purpose: Produce reinforcement materials for textile belts or steel cord belts.

03. Belt Building



Process: Assembling reinforcement layers (fabric plies or steel cords) with uncured rubber covers and skim layers.

Purpose: Form the belt structure with the required plies, cover thickness and dimensions.

04. Profile Formation



Process: Molding surface profiles (e.g., chevron) or attaching components (e.g., sidewalls, cleats).

Purpose: Provide the required material grip, conveying angle and application function.

(Design-dependent: the timing may differ according to the curing and attachment method.)

05. Vulcanization



Process: Curing the assembled belt under controlled heat and pressure in a vulcanizing press.

Purpose: Crosslink the rubber and form a strong, durable bond between all belt components.

06. Finishing & Inspection



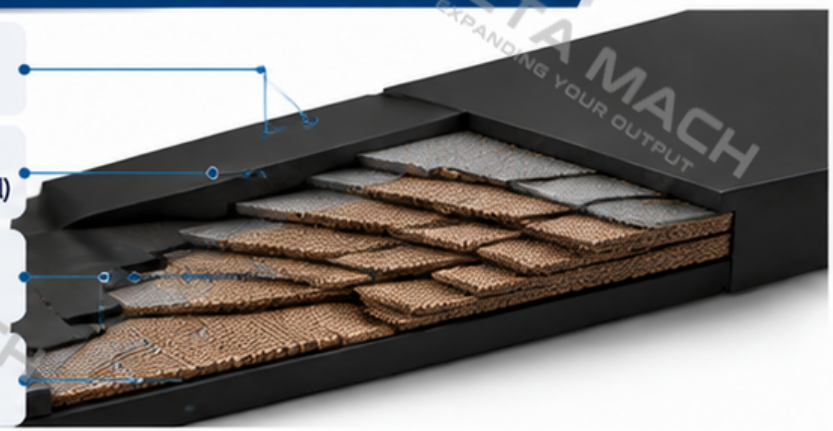
Process: Trimming edges, dimensional checks and quality inspection (e.g., thickness, width, surface, splice).

Purpose: Ensure the finished belt meets the specified requirements and is ready for delivery.

Note: Process sequence and curing conditions vary with belt construction, compound formulation and profile design.

Conveyor Belt Splicing & Joint Construction

Textile Belt – Hot-Vulcanized Splice (Stepped Type)



Application: Multi-ply textile conveyor belt splice using a stepped overlap and hot-vulcanization to restore the belt structure.

Steel Cord Belt – Vulcanized Splice (Staggered Type)



Application: Vulcanized splice for steel cord conveyor belts with staggered cord arrangement and full rubber encapsulation.

A. Hot Vulcanizing Press (Field Splice)



B. Cold-Bonded Joint (Textile Belt)



C. Mechanical Fastener Joint



Key Notes

- Use a splice design compatible with the belt construction (textile or steel cord) and service duty.
- Prepare a clean, dry and contaminant-free surface before splicing.
- Ensure correct alignment of plies or steel cords and maintain the designed overlap/stagger layout.
- Apply controlled vulcanization (pressure and heat) according to the approved splice design.
- Inspect the finished splice for dimensions, surface quality and integrity before return to service.

Reference Standard:
ISO 15236-4:2004 — Vulcanized belt joints for steel cord conveyor belts.

Representative splice illustrations only. Actual splice geometry, step lengths, cord spacing, curing conditions and installation procedures must follow the approved belt-specific splice design.

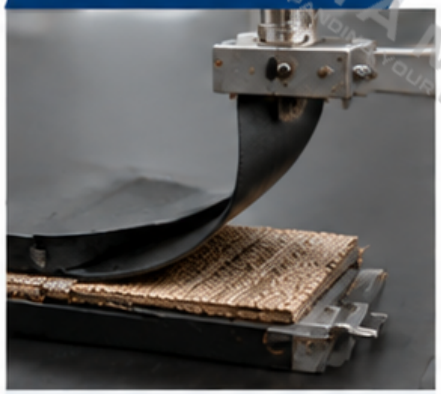
International Standards & Quality Testing

01. Tensile Strength Testing



Determines the tensile strength of the conveyor belt.

02. Adhesion Testing



Evaluates the bonding strength between rubber and reinforcement layers.

03. Abrasion Resistance Testing



Assesses the wear resistance of the rubber cover using a rotating drum method.

04. Heat Resistance Testing



Evaluates the change in rubber properties after controlled heat ageing.

05. Dimensional Inspection



Checks key dimensions such as belt width, thickness and profile size.

06. Splice Inspection



Verifies the splice construction, appearance and workmanship.

Reference Standards

Standard	Scope / Application
ISO 14890:2026	General-use textile construction conveyor belts.
ISO 251:2024	Textile conveyor belt widths and lengths (including belt width and related tolerances; the nominal length is not standardized).
ISO 15236-1:2016	General-purpose steel cord belt requirements (construction, performance and testing).
ISO 15236-2:2017	Preferred steel cord belt types (e.g., ST630 to ST7500).
ISO 15236-4:2004	Vulcanized steel cord belt joints (current edition).
ISO 4195:2026	Heat resistance of rubber covers (applicable to belts with a carrying-side cover thickness of at least 4 mm).
ISO 252:2023	Adhesion test methods (e.g., rubber-to-fabric and between rubber layers; excludes belts reinforced with steel cords and textile belts with a full thickness tensile strength below 160 N/mm).
ISO 4649:2024	Rubber abrasion resistance testing (rotating drum method).

Key Notes

- ISO 4195:2026 applies to belts with a carrying-side cover thickness of at least 4 mm.
- ISO 252:2023 excludes belts reinforced with steel cords.
- Acceptance criteria and inspection frequency must follow the applicable product standard and agreed technical specification.

Reference:
ISO 15236-4:2004 — Vulcanized belt joints for steel cord conveyor belts.

Representative splice illustrations only. Actual splice geometry, step lengths, cord spacing, curing conditions and installation procedures must follow the approved belt-specific splice design.

Conveyor Belt Wear & Failure Mechanisms

1. Surface Abrasion



Failure Mode: Gradual loss of the carrying-side rubber cover due to abrasion.

Common Contributing Factors: Abrasive material, high bulk density, elevated conveying speed.

Inspection Focus: Cover wear condition, remaining cover thickness and wear uniformity.

2. Impact Damage



Failure Mode: Localized cuts, gouges or punctures caused by falling or trapped material.

Common Contributing Factors: Large lump size, sharp-edged material, high drop height.

Inspection Focus: Surface cuts, punctures and areas with abnormal impact marks.

3. Longitudinal Tearing



Failure Mode: Continuous tear along the belt longtudinal direction.

Common Contributing Factors: Trapped sharp object, severe impact, local damage extension.

Inspection Focus: Longitudinal cuts or tears, extent of propagation and associated damage.

4. Belt Mistracking



Failure Mode: Belt running off-center, causing edge wear and damage from contact with structure.

Common Contributing Factors: Misaligned idlers, uneven loading, material build-up, frame deviation.

Inspection Focus: Belt tracking, edge wear condition and alignment of idlers and pulleys.

5. Delamination & Splice Failure



Failure Mode: Separation between rubber layers (delamination) or damage at the splice (e.g., separation, cracking).

Common Contributing Factors: Inadequate bonding or curing, repeated flexing, high belt tension, impact.

Inspection Focus: Layer adhesion, splice condition, seam integrity and signs of separation.

6. Material Carryback



Failure Mode: Material adhering to the return belt and accumulating on rollers and structure.

Common Contributing Factors: Wet or cohesive material, inadequate cleaning, unsuitable rubber surface.

Inspection Focus: Residual material on the return belt, cleaner performance and idler condition.

Note: Representative engineering illustrations, not documented field failure photographs.