# Rubber conveyor belt with steel cords ST for general purpose, non- inflammable T- ST, flame resistant GTP-ST

## Application

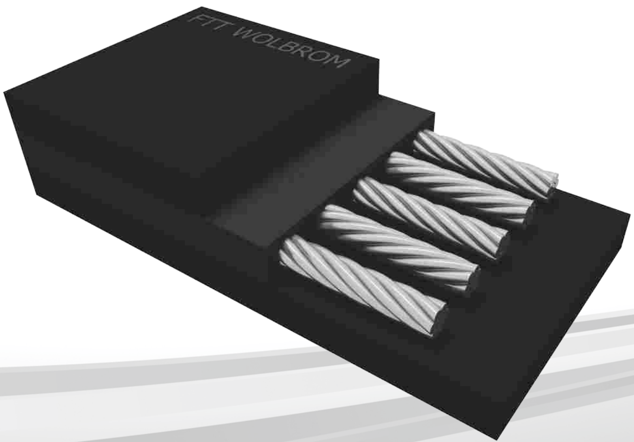
Rubber conveyor belt with steel cords are intended for transport of loose materials of any granulation and can be operated (depending on type of the belt) within the ambient temperatures range from –40[°C] to +60[°C]. Taking into account properties of steel-rubber carcass, this type of belt is recommended for use on long and inclined routes, where exceptional low elongation percentage and high lifetime are required.

## Construction

These belts as a standard are constructed of carcass consisting of lengthwise arranged hot-dip galvanized steel cords (fig. 1 presents the most often used constructions), vulcanized in special carcass and rubber covers. Additionally rubber covers can have crosswise reinforcement in form of textile or steel breaker. FTT also offers the possibility of installing longitudinal cut sensors in all types of belts with standard widths.

These belts are in accordance with standards EN ISO 15236-1, -2 or DIN 22131 in respect of construction, dimensions and individual elements as well as tolerances of these dimensions and belt strength parameters.

Rubber conveyor belts with steel cords ST for general purpose and non-inflammable T-ST belts are manufactured in accordance with standards EN ISO 15236-1, -2 or DIN 22131 while flame resistant GTP-ST belts are manufactured in accordance with Internal Technical Standard WT-3/11.




## Types and kinds

Three types of rubber conveyor belt with steel cords are manufactured:

**ST -** general purpose rubber conveyor belts with steel cords are intended for transport of loose materials in conditions where there are no special requirements connected with operation, environment and properties of the conveyed material. They can be used in all industry branches in case when fire hazards are not present.

**T-ST -** non-inflammable rubber conveyor belts with steel cords are intended for transport of loose materials in conditions of increased fire hazards during operation on the surface - e.g. coal transport in power plants, coke plants, coal processing plants, harbours.

**GTP-ST -** flame resistant rubber conveyor belts with steel cords are intended for transport of loose materials in the underground excavations of mining enterprises extracting combustible minerals (e.g. coal) and non-combustible minerals (e.g. metal ores, salt, aggregates). Properties of rubber mixtures used enable fulfilment by the GTP-ST belt harsh requirements within the scope of electric-fire safety.

Depending on type of belt's construction, according to the standard EN ISO 15236-2, the following types of belt can be distinguished: type A1 or type A2 (X for GTP-ST belt), differing between each other with number of steel cords in belt's cross-section and physical-mechanical parameters as well as scale of the cords.

Depending on longitudinal tensile strength of belt the following standard types of belt are manufactured:

ST 1000, ST 1250, ST 1600, ST 2000, ST 2500, ST3150, ST3500, ST 4000, ST 4500, ST 5000, ST 5400.

## Marking of belt during ordering according to the standard EN ISO 15236-1

**450 | ISO 15236-1 | 1000 | ST | 2500 | 6+2 | H + A1**

where:
- length of the belt in [m]
- execution according to the standard
- belt width in [mm]
- material of carcass
- nominal belt strength in [N/mm]
- thickness of rubber covers: carrying ($S_1$) and running ($S_2$) in [mm]
- cover class
- belt type acc. to ISO 15236-2

## Marking of belt during ordering according to the standard DIN 22131

**250 | DIN 22131 | 2000 | ST | 3150 | 10/7 | Y**

where:
- length of the belt in [m]
- execution according to the standard
- belt width in [mm]
- material of carcass
- nominal belt strength in [N/mm]
- thickness of rubber covers: carrying ($S_1$) and running ($S_2$) in [mm]
- cover class

## Marking of belt during ordering according to the standard EN ISO 15236-3

**1400 | ISO 15236-3 | 1200 | GPT | ST | 1250 | 14+7 | V | C2**

where:
- length of the belt in [m]
- execution according to the standard
- belt width in [mm]
- Mining Conveyor Belt
- material of carcass
- nominal belt strength in [N/mm]
- thickness of rubber covers: carrying (S1) and running (S2) [mm]
- cover class
- safety category according to PN-EN 14973

## Belt thickness

Approximated maximal carcass thicknesses of belts with steel cords are presented in **table 2**. Approximale total thickness of belt with any cover thicknesses can be obtained from the formula:

$$S = S_3 + (S_1 + S_2)$$

where:
- S – approximated total thickness of belt [mm]
- $S_3$ – thickness of belt carcass taken from Table 2 [mm]
- $S_1$ – thickness of carrying cover [mm]
- $S_2$ – thickness of running cover [mm]

Recommended acc. to EN ISO 15236-1 or DIN 22131 the minimum value $S^2$ results from the specified type (strength) of belt and is within the range from 4[mm] to 8[mm]. In the case of belts with a longitudinal cut identification sensor, the minimum thickness of the running cover is $S_2$=D+4[mm], where G is the thickness of the sensor used.

## Belt weight

Approximated weights [kg/m2] of normal belt with steel cords are presented in the **table 2**. Approximated weight [kg/rms] of belt of any width can be obtained from the formula:

$$M = m_1 \times B$$

where:
- M – approximated weight of the belt [kg/rms]
- $m_1$ – weight of belt taken from the Table 2 for the given type of belt [kg/m²]
- B – belt width in [m]

## MINIMUM DIAMETER OF DRUMS -

**acc. to table 3**

**Table 3** shows recommended minimum diameters of drums [mm] for belts, for the load range of 60 - 100%, determined according to DIN 22101:
- A – driving drums and other drums located in the area of high belt tension
- B – tail (return) drums and other drums located in the area of low belt tension
- C – snub (deflecting) drums (change of belt running direction ≤30°)

## Permanent marking of belt

To be agreed with the Customer or as a standard on carrying cover of the belt, about ~5 [m] from the beginning of the belt, 50÷100[mm] from sides of the belt, every 10÷20 [m] on one or both edges of belt (depending on width of belt) - permanent mark will be made in form of relief impression in rubber, containing, at least, the name of the manufacturer, belt type, thickness of covers, number of belt, two last digits of manufacturing year.

## Packing

Belt is winded up on metal winding reel with diameter 500 [mm], with square opening in the centre, with length of the opening's side 190 [mm]. Winded up belt is protected against unwinding during transport by clamping using polypropylene strip.

## Diameter of wound

Approximated diameter of belt reel  D [m] of length L [m], thickness S [mm] can be obtained using the formula:

$$D = \sqrt{0{,}25 + \frac{1{,}27\ x\ L\ x\ S}{1000}}$$

**Table 1.** **Mechanical and physical properties of cover rubber**

| Parameter | | Unit | Requirements for cover rubber | | | | | | | | | | | Method of testing acc. to[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DIN 22131 | | | | | PN-EN ISO 15236-1 | | | | | PN-EN ISO 15236-3 | |
| | | | ST | | | | T-ST | ST | | | | T-ST | GTP-ST | |
| | | | X | Y | Y60[2] | W | K | H | D60[2] | D | L | K | V | |
| a/ Tensile strength, min. | TS | [MPa] | 25 | 20 | 20 | 18 | 20 | 24 | 20 | 18 | 15 | 15 | 17 | PN-ISO 37 (sample type2) |
| b/ Elongation at break, min. | $E_b$ | [%] | 450 | 400 | 450 | 400 | 400 | 450 | 450 | 400 | 400 | 350 | 350 | PN-ISO 37 (sample type 2) |
| c/ Abrasion resistance, max. | - | [mm³] | 120 | 150 | 60 | 90 | 200 | 120 | 60 | 100 | 90 | 200 | 175 | PN-ISO 4649 (method A) |
| d/ Thermal ageing, max. (70[°C]/ 168[h]) | Δ TS<br>Δ $E_b$ | [%] | -25<br>-25 | | | | | | | | | | | PN-ISO 188 (method B)<br>PN-ISO 37<br>(sample type 2) |

¹ Tests carried out according to the current issues of the standards
² D60; Y60 - cover with increased abrasion resistance parameter

**Table 2.** **Range of manufactured types of belt, basic widths, weights and thickness of belt carcass.**

| Basic types of belt[1] | Basic widths of belt B [mm][2] | | | | | | | | Thickness [mm] | | | Approx. weight [kg/m²] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | Max. thickness of carcass S3 | Carrying cover S[1] | Running cover S[2] | ST | T-ST | GTP-ST |
| 1000 | X | X | X | X | X | X | X | X | 4,1 | 6 | 4 | 20,0 | 22,0 | 25,0 |
| 1250 | X | X | X | X | X | X | X | X | 4,9 | 6 | 4 | 22,0 | 24,0 | 27,0 |
| 1600 | X | X | X | X | X | X | X | X | 5,6 | 8 | 6 | 28,0 | 31,0 | 35,0 |
| 2000 | X | X | X | X | X | X | X | X | 5,6 | 8 | 6 | 30,0 | 32,0 | 36,0 |
| 2500 | X | X | X | X | X | X | X | X | 7,2 | 10 | 8 | 38,0 | 41,0 | 46,0 |
| 3150 | X | X | X | X | X | X | X | X | 8,1 | 10 | 8 | 41,0 | 44,0 | 49,0 |
| 3500[3] | X | X | X | X | X | X | X | X | 8,6 | 10 | 8 | 43,0 | 47,0 | 50,0 |
| 4000 | X | X | X | X | X | X | X | X | 8,9 | 12 | 8 | 48,0 | 52,0 | 57,0 |
| 4500[3] | X | X | X | X | X | X | X | X | 9,7 | 12 | 8 | 49,0 | 53,0 | 58,0 |
| 5000[3] | X | X | X | X | X | X | X | X | 10,9 | 12 | 10 | 54,0 | 59,0 | 63,0 |

¹ Belt types not specified in Table 2 to be agreed with the manufacturer
² Belt widths other than specified in Table 2 to be agreed with the manufacturer

**Table 3.** Minimum drum diameters

| Belt type | Maximum thickness of carcass [mm] | A | B | C | Belt type | Maximum thickness of carcass [mm] | A | B | C |
|---|---|---|---|---|---|---|---|---|---|
| 1000 | 4,1 | 630 | 500 | 400 | 3150 | 8,1 | 1250 | 1000 | 800 |
| 1250 | 4,9 | 800 | 630 | 500 | 3500 | 8,6 | 1250 | 1000 | 800 |
| 1600 | 5,6 | 800 | 630 | 500 | 4000 | 8,9 | 1400 | 1250 | 1000 |
| 2000 | 5,6 | 800 | 630 | 500 | 4500 | 9,7 | 1400 | 1250 | 1000 |
| 2500 | 7,2 | 1000 | 800 | 630 | 5000 | 10,9 | 1600 | 1250 | 1000 |

**Table 4.** Physical and mechanical parameters for belts

| Parameter | Unit of measure | Requirements Belt type | | | | | | | | | | | Method of Testing acc. to[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 3500 | 4000 | 4500 | 5000 | 5400 | |
| a/ Minimum tensile strength $K_N$ | [N/mm] | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 3500 | 4000 | 4500 | 5000 | 5400 | DIN 22131/ISO 15236-2 |
| b/ Maximum diameter of cord $d_{max}$ | [mm] | 4,1 | 4,9 | 5,6 | 5,6 | 7,2 | 8,1 | 8,6 | 8,9 | 9,7 | 10,9 | 11,3 | DIN 22131/ISO 15236-2 |
| c/ Minimum tensile strength of the cord $F_{bs}$ | [kN] | 12,9 | 18,4 | 26,2 | 25,5 | 39,7 | 50,0 | 55,5 | 63,5 | 75,0 | 90,3 | 96,0 | ISO 7622-2 |
| d/ Minimum cord pull-out forces: | | | | | | | | | | | | | |
| - as-delivered state $F_a$ | [N/mm] | 80 | 95 | 105 | 105 | 130 | 140 | 145 | 150 | 165 | 175 | 180 | ISO 7623 |
| - after thermal treatment $F_V$ (145 ±5[°C] x 150±1 [min] | | 75 | 90 | 95 | 95 | 120 | 130 | 140 | 145 | 160 | 170 | 175 | |
| e/ Minimum adhesion strength: - between covers and carcass rubber | [N/mm] | 12 | | | | | | | | | | | ISO 8094 |
| f/ Electric resistance of belts, max. | [Ω] | $3 \times 10^8$ | | | | | | | | | | | PN-EN ISO 284 |

## PROCEDURE OF WORN-OUT PRODUCTS

Liquidation of worn-out product by recovery, e.g. by incineration. If recovery is not possible, it is acceptable to neutralize, e.g. by storing non-hazardous or inert waste in a landfill.

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