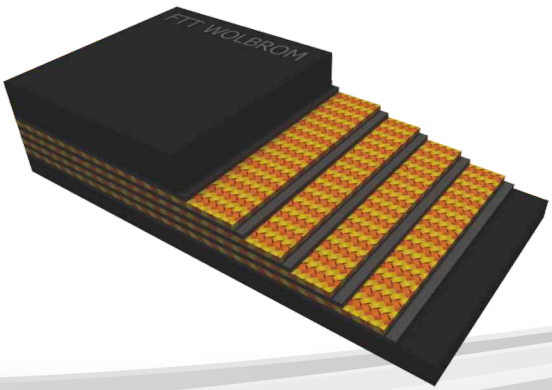
Heat resistant rubber fabric conveyor belts

Application

Heat resistant rubber fabric conveyor belts are intended for transport of hot materials with maximum temperature +280 [°C], within the range of ambient temperatures from -40 [°C] to +60 [°C]. Types of heat resistant rubber fabric conveyor belts are listed in **Table 1.**

Construction

Heat resistant rubber fabric conveyor belts consists of textile-rubber carcass, with 2-5 plies, rubber covers: carrying and running as well as rubber edges. Layer of interlayer rubber is located between textile plies.
Within the structure, dimensions of the belt, its individual elements and tolerances of these dimensions, connections of rubber- fabric plies and strength parameters, the belts are in accordance with standard PN- EN ISO 14890.



Heat resistant rubber fabric conveyor belts fulfil the requirements for safety class 1 acc. to the standard PN- EN 12882.
To protect carcass against high temperature, belts T120, T150 and T200 are manufactured with rubber covers of minimum recommended thickness 4+2 mm, while belt T280 with covers of minimum recommended thickness 6+2 mm.
Heat resistant rubber fabric conveyor belts are manufactured on the basis of WT-13.

Types

The following types of **heat resistant rubber fabric conveyor belts** are manufactured:
T120 - for materials with temperature to +120 [°C],
T150 - for materials with temperature to +150 [°C],
T200 - for materials with temperature to +200 [°C],
T280 - for materials with temperature to +280 [°C].
Heat resistant rubber fabric conveyor belts are manufactured on the basis of fabric:
PP - polyamide-polyamide,
EP - polyester-polyamide.

Belt designation used for orders

WT-13/... | 450 | 1000 | EP | 800 | 4 | 6+2 | T200

where:
- completion acc. to (Technical conditions FTT)
- length of the belt in [m]
- width of the belt in [mm]
- material of plies
- tensile strength (belt type) in [N/mm]
- number of plies in carcass
- thickness of rubber covers: carrying (S_1) and running (S_2) in [mm]
- type of heat resistant belt

Cover Thickness

Minimum thickness of carrying cover (S_1) for belts T120, T150 and T200 is 4[mm]
Minimum thickness of carrying cover (S_1) for belts T280 is 6[mm]
Minimum thickness of running cover (S_2) for all types of heat resistant belts is 2[mm]
Maximum thickness of carrying cover (S_1) is:
- for types 400/3; 500/3- 8[mm]
- for types 500/4; 630/3; 800/3; 800/4; 800/5; 1000/3 – 10 [mm]
- for higher types- 12[mm]

Recommended maximal thickness of running cover (S_2) is- 6[mm]

Belts thickness

Approximated thickness of carcass of heat resistant rubber fabric conveyor belts is presented in the **table 2**.
Approx. total thickness of the belt with any thickness of the covers can be calculated using 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]

Belt weight

Approximated weight of carcass of heat resistant rubber fabric conveyor belts are presented in the **table 2**. Approximated weight of belts with covers of any thickness can be obtained from the formula:

$$M = m_1 + X^*(S_1 + S_2)$$

where:
M – approximated weight of the belt [kg/m²]
m_1 – weight of belt carcass taken from the **Table 2** for the given type of belt [kg/m²]
S_1 – thickness of carrying cover [mm]
S_2 – thickness of running cover [mm]
X – value depending on heat resistant belt type:
- for type T120 - 1,15 [g/cm³]
- for type T150 - 1,14 [g/cm³]
- for type T200 - 1,08 [g/cm³]
- for type T280 - 1,08 [g/cm³]

Minimum diameters of drums

Table 4 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°)

Marking of belt

Typically on the cover at the distance of about 1÷3 [m] from the beginning and the end of the belt and approx. every 20 [m] there will be made permanent mark in form of relief impression in rubber containing: name of the manufacturer, marking according to the above mentioned belt designation pattern (without giving length, width and thickness of covers), belt serial number, last two digits of manufacturing year.

Packing

Typically, the belt is rolled up on wooden coil with diameter 450 [mm] which has an internal square hole with side 230 [mm]. Rolled up belts are protected against unwinding during transport by wrapping with polypropylene tape.

Diameter of the roll

Approximate diameter of the roll D [m] with length L [m], and thickness S [mm] may be calculated from the following equation:

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

Table 1. Types of heat resistant rubber fabric conveyor belts

Type of belt	Maximum temperature of transported material up to [°C]	Allowable maximum temperature of the belt surface up to [°C]
T120	120	100
T150	150	130
T200	200	180
T280	280	200

Table 2. Physical and mechanical properties of cover rubber of heat resistant rubber fabric conveyor belts

Parameter			Unit	Requirements for cover rubber of heat resistant belts				Method of testing acc. to[1]
				T120	T150	T200	T280	
Tensile strength, min.		TS	[MPa]	15	15	12	12	PN-ISO 37 (sample type 2)
Elongation at break, min.		E_b	[%]	350	350	400	400	PN-ISO 37 (sample type 2)
Abrasion resistance, max.		-	[mm³]	150	150	150	150	PN-ISO 4649 (metoda A)
Resistance to heat, in air, in condition, max.	+100 [°C] x 72 [h], max	Δ TS Δ E_b	[%] [%]	±40 ±60	- -	- -	- -	PN-ISO 188 (method B) PN-ISO 37 (sample type 2)
	+125 [°C] x 72 [h], max.	Δ TS Δ E_b	[%] [%]	- -	±45 ±65	- -	- -	
	+125 [°C] x 168 [h], min.	TS E_b	[MPa] [%]	- -	- -	10 300	- -	
	+175 [°C] x 168 [h], min.	TS E_b	MPa] [%]	- -	- -	- -	4 150	

[1] Testing acc. to current standards.

Table 3. Range of manufactured types of belt, basic widths, weights and thicknesses of carcass of heat resistant rubber fabric conveyor belts.

Belt type/ number of plies		Basic width of belts [mm] [1]									Approx. thickness of carcass S_3 [mm]		Approx. weight of carcass [kg/m²]							
													T120		T150		T200		T280	
		500	600	650	800	1000	1200	1400	1600	1800	EP	PP	EP	PP	EP	PP	EP	PP	EP	PP
400	/3	X	X	X	X	X	X	-	-	-	3,6	-	5,0	-	5,0	-	4,9	-	-	-
500	/3	X	X	X	X	X	X	X	X	-	4,2	-	5,3	-	5,2	-	5,2	-	5,0	-
630	/3	X	X	X	X	X	X	X	X	X	4,8	4,8	5,6	5,6	5,6	5,4	5,6	5,5	5,4	5,4
500	/4	X	X	X	X	X	X	-	-	-	4,8	-	6,7	-	8,8	-	6,6	-	6,4	-
630	/4	X	X	X	X	X	X	X	X	-	5,6	-	7,1	-	7,0	-	6,9	-	6,7	-
800	/3	X	X	X	X	X	X	X	X	X	5,1	5,4	6,2	-	6,1	6,0	6,1	6,1	5,9	5,9
800	/4	X	X	X	X	X	X	X	X	X	6,4	6,4	7,5	-	7,5	7,2	7,4	7,4	7,2	7,0
800	/5	X	X	X	X	X	X	X	X	X	8,0	-	9,4	-	9,3	-	9,3	-	9,0	-
1000	/3	-	-	X	X	X	X	X	X	X	5,4	5,7	6,4	-	6,3	6,5	6,3	6,5	6,2	6,3
1000	/4	-	-	X	X	X	X	X	X	X	6,8	6,8	8,2	-	8,1	7,7	8,1	7,7	7,9	7,4
1000	/5	-	-	X	X	X	X	X	X	X	8,0	8,0	9,4	9,4	9,3	9,0	9,3	9,2	9,0	9,0
1250	/3	-	-	X	X	X	X	X	X	X	6,6	6,3	7,8	-	7,7	7,2	7,7	7,3	7,5	7,2
1250	/4	-	-	X	X	X	X	X	X	X	7,2	7,2	8,5	-	8,5	8,0	8,4	8,1	8,2	7,7
1250	/5	-	-	X	X	X	X	X	X	X	8,5	8,5	10,3	-	10,3	9,7	10,1	9,5	9,9	9,2
1400	/4	-	-	-	X	X	X	X	X	X	8,0	7,6	10,0	-	9,9	8,6	9,9	8,6	9,6	8,4
1600	/4	-	-	-	-	X	X	X	X	X	8,8	8,4	10,3	-	10,3	9,6	10,2	9,8	9,9	9,6
1600	/5	-	-	-	-	X	X	X	X	X	9,0	-	10,6	-	10,6	-	10,5	10,8	10,1	10,5
1800	/4	-	-	-	-	-	X	X	X	X	10	10,5	11,3	-	11,5	11,1	11,4	10,9	10,9	10,7
1800	/5	-	-	-	-	-	X	X	X	X	10	10,5	12,4	-	12,4	12,0	12,3	11,0	11,9	11,9
2000	/4	-	-	-	-	-	X	X	X	X	10	10,4	11,8	-	11,5	11,1	11,4	10,9	11,4	10,7
2000	/5	-	-	-	-	-	X	X	X	X	11	-	12,9	-	12,8	-	12,8	12,2	12,4	11,9
2500	/4	-	-	-	-	-	X	X	X	X	12,8	11,2	14,6	-	13,3	12,3	13,3	12,2	13,1	11,9
2500	/5	-	-	-	-	-	X	X	X	X	12,5	13,0	14,7	-	12,8	13,8	14,3	13,7	14,2	13,4

[1] Belt widths and types other than specified in Table 2 shall be agreed with the manufacturer

Table 4. Minimum drum diameters [mm]

Belt type/number of plies	EP carcass			PP carcass		
	A	B	C	A	B	C
400/3	400	315	250	-	-	-
500/3	400	315	250	-	-	-
630/3	500	400	315	400	315	250
500/4	500	400	315	-	-	-
630/4	630	500	400	-	-	-
800/3	500	400	315	500	400	315
800/4	630	500	400	630	500	400
800/5	800	630	500	-	-	-
1000/3	630	500	400	500	400	315
1000/4	800	630	500	630	500	400
1000/5	800	630	500	800	630	500

Table 4. Minimum drum diameters [mm]

Belt type/number of plies	EP carcass			PP carcass		
	A	B	C	A	B	C
1250/3	800	630	500	630	500	400
1250/4	800	630	500	630	500	400
1250/5	1000	800	630	800	630	500
1400/4	800	630	500	630	500	400
1600/4	1000	800	630	800	630	500
1600/5	1000	800	630	1000	800	630
1800/4	1250	1000	800	1000	800	630
1800/5	1250	1000	800	1000	800	630
2000/4	1250	1000	800	1000	800	630
2000/5	1250	1000	800	1000	800	630
2500/4	1400	1250	1000	1000	800	630
2500/5	1400	1250	1000	1250	1000	800

Table 5. Physical and mechanical parameters of heat resistant rubber fabric conveyor belts

Parameter		Unit of measure	Type of heat resistant belt				Requirements accordingly to belt tensile strength (type)											Method of Testing acc. to[1]
							400	500	630	800	1000	1250	1400	1600	1800	2000	2500	
Longitudinal tensile strength, min.		[N/mm]	T120	T150	T200	T280	400	500	630	800	1000	1250	1400	1600	1800	2000	2500	PN-EN ISO 283
Belt elongation at load equal to 10 [%] of nominal strength of the belt, max.	EP	[%]	T120	T150	T200	T280	1,5		2,5				3,0					PN-EN ISO 283
	PP						4											PN-EN ISO 283
Belt elongation at break, min.		[%]	T120	T150	T200	T280	10											PN-EN ISO 283
Belt adhesion strength: - average value of test results between textile plies, min. - average value of test results between covers and carcass, min.		[N/mm]	T120	T150	T200	T280	4,5 3,5											PN-EN ISO 252 (method A)
Change of average adhesion strength of belt after accelerated thermal ageing, in air, in conditions: - 100 [°C] x 72 [h]: - between plies, max. - between covers and carcass, max.		[%]	T120	-	-	-	±30 ±50											PN-ISO 188 (method B) PN-EN ISO 252 (method A)
Change of average adhesion strength of belt after accelerated thermal ageing, in air, in conditions: - 125 [°C] x 72 [h]: - between plies, max. - between covers and carcass, max.		[%]	-	T150			±30 ±50											PN-ISO 188 (method B) PN-EN ISO 252 (method A)
Average adhesion strength of belt after accelerated thermal ageing, in air, in conditions: - 125 [°C] x 168 [h]: - between plies, min. - between covers and carcass, min.		[N/mm]	-	-	T200	-	3,5 2,5											PN-ISO 188 (method B) PN-EN ISO 252 (method A)
Average adhesion strength of belt after accelerated thermal ageing, in air, in conditions: - 175 [°C] x 168 [h]: - between plies, min. - between covers and carcass, min.		[N/mm]	-	-	-	T280	3,5 2,5											PN-ISO 188 (method B) PN-EN ISO 252 (method A)
Electric resistance of belt, max.		[Ω]	T120	T150	T200	T280	3×10^8											PN-EN ISO 284
Low temperature resistance		[°C]	T120	T150	T200	T280	-40											PN-72/C-05011.06

[1]Testing acc. to current standards.

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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