

# ARABELT<sup>®</sup>



## Conveyor Belting

DEP inside: ARAMID STRAIGHT WARP CONSTRUCTION



**Steel cord and textile belt advantages  
in only one product**

## INTRODUCTION

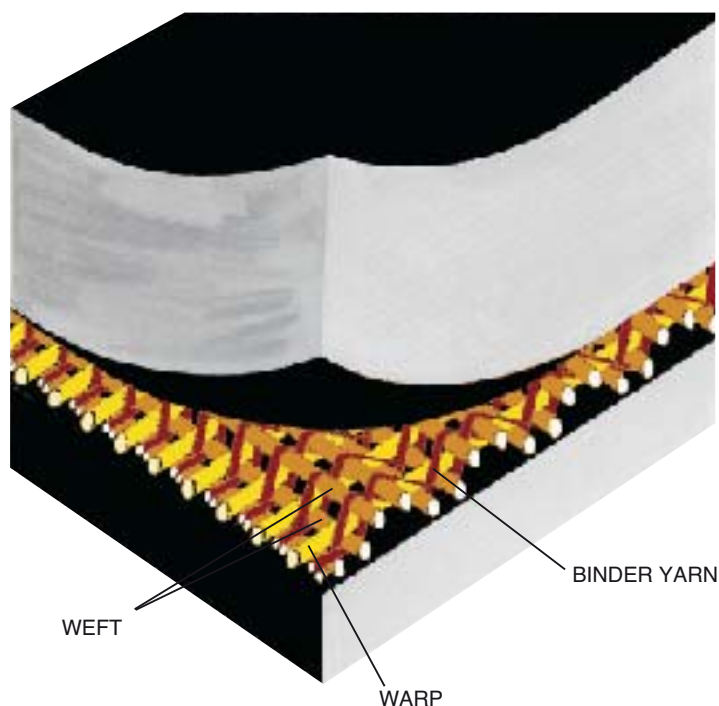
As shown in the drawing of this page, ARABELT® is a conveyor belt characterized by only one ply with a special construction named “straight warp”. This is a special weaving where the longitudinal filaments (warp) are not braided with the transversal ones (weft); furthermore, the connection between warp and weft is assured by a special nylon binder. In this way, both warp

and weft are straight, with two main advantages: no elongation due to the weaving of fibres and possibility to connect big warp and weft filaments with each other. This second aspect guarantees high tensile strength and superior cutting, tearing and impact resistance thanks to the presence of a double weft realized with high tensile nylon filaments.

## THE ARAMID FIBER

The advantages of straight warp construction are emphasized by the aramid fiber forming the longitudinal filaments. Aramid is a sintetic fibre whose molecule is a combination between the rigid aromatic structure of polyester and the chain links of polyamide; the result is an aromatic polyamide with higher strength and very low elongation. These two

characteristics are so stunning for a sintetic fibre that aramid is comparable to steel, but with a very important difference: a density more than five times lower. Two other properties make aramid similar to steel: high heat and flame resistance. Further considerations on the differences between aramid and steel can be found at section “comparative graphics”.



## PHYSICAL AND CHEMICAL PROPERTIES OF INDUSTRIAL FIBRES

	Aramid	Polyester	Polyamide	Steel
Density g/cm <sup>2</sup>	<b>1,44</b>	1,38	1,14	<b>7,85</b>
Melting point °C	<b>&gt;500</b>	<b>260</b>	255	1600
Tenacity mN/tex	<b>1950</b>	820	820	<b>330</b>
Tensile strenght N/mm <sup>2</sup>	<b>2800</b>	1130	935	<b>2550</b>
Elongation at break %	<b>3,3</b>	13	20	<b>2,5</b>
Max stretching at working tension %	<b>0,5</b>	1,5	2,5	<b>0,3</b>
Heat degradation % (after 48h, 200 °C)	<b>90</b>	<b>55</b>	45	100

Bolt values show the main advantages of aramid in comparison with other fibers:

- **Superior strength/weight ratio**
- **High working temperature**
- **Density similar to textile fibres**
- **Tensile and elongation similar to steel cord**
- **Superior flame resistance**

## COMPARATIVE TABLE

	Aramid	Polyester	Polyamide	Steel
Tensile strength (load/section)	★★★★	★	★	★★★★
Tenacity (load/weight)	★★★★	★★	★★	★
Modulus	★★★★	★★	★	★★★★
Temperature resistance	★★	★	★	★★★★
Flammability	★★	★	★	★★★★
Longitudinal flexibility	★★★★	★★	★★	★
Troughability	★★★★	★	★★	★★★★
Impact	★★	★★★★	★★★★	★
Low belt weight	★★★★	★★	★★	★
Low belt thickness	★★★★	★	★	★★
Corrosion	★★★★	★★★★	★★★★	★
Amagnetic properties	★★★★	★★★★	★★★★	★

★ Fair      ★★ Good      ★★★ Excellent

## ARABELT® TECHNICAL DATA

Fabric style	KN/m	630	800	1000	1250	1400	1600	1800	2000	2500
<b>Belt style</b>	<b>KN/m</b>	<b>630</b>	<b>800</b>	<b>1000</b>	<b>1250</b>	<b>1400</b>	<b>1600</b>	<b>1800</b>	<b>2000</b>	<b>2500</b>
Working tension	KN/m	80	100	125	160	175	200	225	250	315
Carcass weight	Kg/m <sup>2</sup>	2,3	2,4	2,9	3,4	3,5	3,6	4,1	4,3	4,7
Carcass thickness	mm	1,90	2,10	2,60	2,90	3,35	3,35	3,40	3,45	3,50



## DESIGN VALUES AND SAFETY FACTORS

	ARABELT®	Steel cord	EP belt
Tensile strength (%)	100	100	100
Working tension (%)	12,5	12,5	10
Peak tension (starting) (%)	16,7	16,7	12,5
Safety factor in ordinary use	8	8	10
Safety factor at starting	6	6	8

Safety factors similar to steel cord belts are acceptable thanks to the monople straight warp construction of ARABELT®, more similar to steel cord than textile construction.





## MINIMUM RECOMMENDED PULLEY DIAMETER mm

Belt style KN/m	100% - 60% of RMBT		60% - 30% of RMBT	
	Drive pulley	Tail & Snub pulleys	Drive pulley	Tail & Snub pulleys
630	315	250	250	250
800	500	315	315	250
1000	500	400	400	315
1250	630	500	500	400
1400	800	630	630	500
1600	800	630	630	500
1800	800	630	630	500
2000	1000	800	800	630
2500	1250	1000	1000	800

RMBT: Recommended Maximum Belt Tension

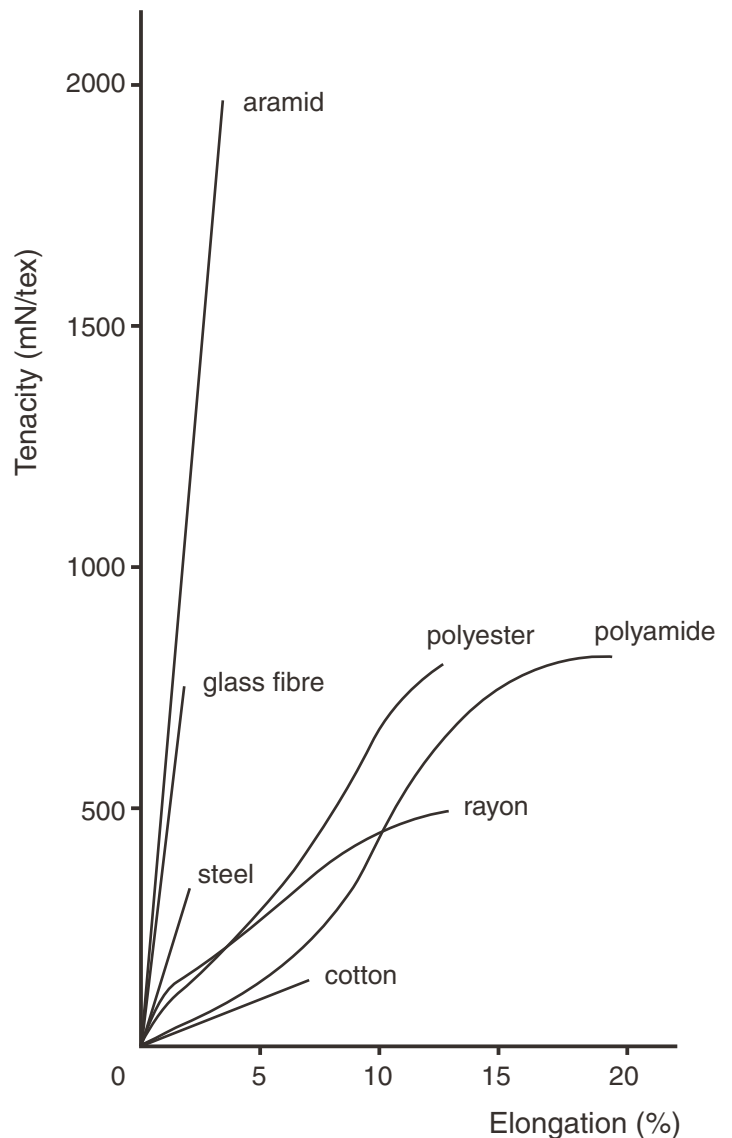
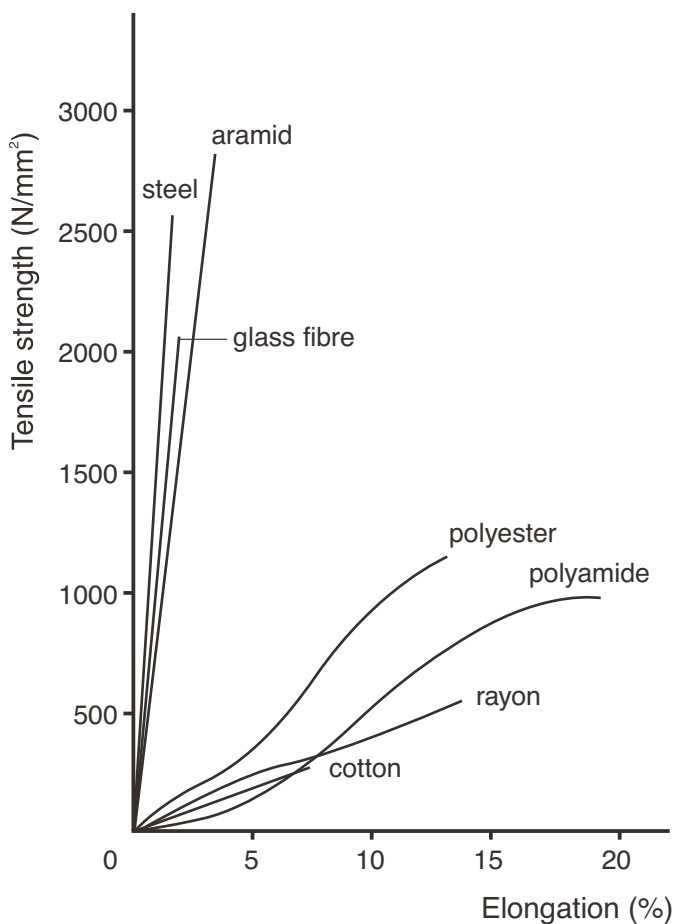


## COMPARATIVE GRAPHICS

Graphics show the difference of elastic characteristics between aramid and other fibres, commonly used in conveyor belt production.

The extreme differences between aramid and standard textile fibres, natural or syntetic are evident. The history of conveyor belts is represented by these curves starting from cotton with very poor mechanical characteristics, soon after from rayon, polyamide and polyester with always better performances. Aramid, a sintetic fibre with same origin of polyester and polyamide, shows total different characteristics, with very low elongation, high elastic modulus (curve slope) and superior specific tensile strength.

Two similar graphics are represented in order to explain one of the most important properties of aramid: density. In the left graphic, we observe that aramid and steel seem to have similar characteristics. In mechanical terms, this is true but for conveyor belts the weight is a fundamental parameter as it defines the power necessary to assure the movement. So, looking the graphic on the right, we notice big differences between aramid and steel: this is due to their weight ratio (more than 5:1). This very low density of aramid assures a very high tenacity (ratio strength/weight): being equal the tensile strength, the weight of aramid resistant fabric is lower than steel cord carcass.



## SPECIFIC SERVICE COVER COMPOUNDS

### ABRASION SERVICE

**CL** (L grade ISO 10247) **Standard wear resistant compound.** CL is a cover rubber recommended for all ground applications and for the majority of materials, where resistance to abrasion is required. Conveyor belts with CL compound are suitable to handle heavy and/or abrasive materials such as gravel, stone, coal, cement.

**EC** (D grade ISO 10247) **Extra wear resistant compound.** EC is a superior quality cover rubber, especially designed where maximum resistance to abrasion is required. The characteristics of resistance to cut, tear and ozone cracking, together with long duration, improve the quality of this cover. EC is expressly designed for steel works and iron minings; however, it is also recommended for heavy lump ore, coke, salt, limestone.

**SC** (H grade ISO 10247) **Superior cutting resistant compound.** SC is a cover rubber designed for specific use when the resistance to cut and tear is the most important requirement. SC also guarantees high abrasion resistance. Main applications are quartz and cullet conveyance.

### SELF EXTINGUISH

**BS** **Autoextinguish compound.** BS is a cover rubber designed to service both underground and above ground application where safety is fundamental and fire risk is high. It is recommended in particular for coal and potash applications. as auto estinguish and antistatic compound, BS is designed according ISO 340 and ISO 284 or equivalent.

**AG** **Autoextinguish and oil resistant compound.** AG is a nitrile compound suitable for conveyor belts and bucket elevator systems of cereal terminals and silos. AG cover rubber provides superior resistances to vegetable oils and animal fats; it is also autoextinguish and

antistatic according to ISO 340 and ISO 284 or equivalent in order to guarantee high safety to the conveyor plant.

### OIL SERVICE

**OH** **High oil resistance compound.** OH is a premium quality cover rubber with maximum resistance to oils and characterized by low volume variations after immersion in highly aggressive mineral oils. OH is expressly realized for belts conveying materials sodden by mineral oils, as for example the mechanical manufacturing rejects.

**OM** **Vegetable oil resistance compound.** OM is a cover rubber that guarantees a good belt resistance against the chemically aggressive effects due to the transport of materials with moderate oil presence, like corn, fertilizers and general vegetable oily materials. OM is expressly designed to resist the terpene of wooden chips and to convey solid urban waste materials.

### HEAT SERVICE

**CX** **High temperature resistance.** CX is a rubber compound assuring a medium degree of abrasion resistance; it is formulated for continuous service at temperature of 130 °C with peacks of 150 °C

**TX** **Superior temperature resistance.** TX is a cover rubber that assures the maximum heat resistance for a rubber compound. It is designed to resist at maximum working temperature of 200 °C with peack of 300 °C.

**All type of conveyor belts produced by SIG SpA are realized according to ISO standard; furthermore they meet also the requirements of equivalent UNI, DIN, BS, NF, ASTM and RMA standards.**



## COVERS QUALITY SELECTION TABLE

Service & resistance	Abrasion resistant			Self-extinguish		Oil resistant		Heat resistant	
	CL	EC	SC	BS	AG	OM	OH	CX	TX
Abrasion	XXX	XXXX	XXX	XX	X	X	X	XX	XXX
Cut & tear	XX	XXX	XXXX	XX	XX	XX	XX	XX	XX
Fire	N.A.	N.A.	N.A.	XXXX	XXXX	N.A.	N.A.	N.A.	N.A.
Conductivity	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
Animal & vegetable oils	N.A.	N.A.	N.A.	N.A.	XXXX	XXXX	XXXX	N.A.	N.A.
Mineral oils	N.A.	N.A.	N.A.	N.A.	XXXX	XX	XXXX	N.A.	N.A.
Heat	XX	XX	XX	XX	XX	XX	XX	XXX	XXXX

N.A. Not applicable; X fair; XX good; XXX very good; XXXX excellent.

## TEMPERATURE RESISTANCE °C

Service & resistance	Abrasion resistant			Self-extinguish		Oil resistant		Heat resistant	
	CL	EC	SC	BS	AG	OM	OH	CX	TX
High temp. (fines)	70	70	70	70	80	70	80	130	180
High temp. (coarse)	90	90	90	90	100	90	100	150	200
Low temperature	-40	-40	-40	-30	-25	-40	-25	-30	-30

## TRANSITION DISTANCE

The transition distance is the length of the section between head or tail pulley and the first troughing idler. In some cases, intermediate idlers are placed along the transition distance to favour the passage of the belt from the flat to the trough shape.

These conveyor sections are the most critical points of the whole plant as the elastic performances of the belt during the time depend on them.

If the transition distance is not correctly designed, high over tensions on the edges and abnormal compressions along the central axis of the belt are generated. Such phenomenons are the cause of unexpected defects, sometimes attributed by mistake to the belt as wave on the edges and longitudinal fold of the belt carcass.

These considerations are extremely important for ARABELT® because of its elastic modulus,

much higher than the one of other syntetic products (polyester and nylon), but quite similar to the values of steel. In this case, the application of ARABELT® on plant designed for standard EP belts could result in a early damaging, expecially of the edges.

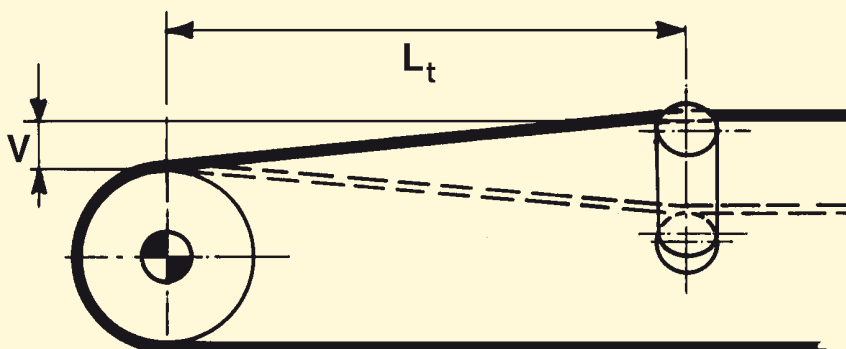
According to the recommendation of the international standard ISO 5293/81, the calculation of the transition distance is performed in order to prevent belt centre from buckling and edge tension from exceeding 130% of the maximum recommended belt tension (RMBT).

These conditions can be respected adopting the following formula:

$$L_t = 18,71 \times V$$

When the belt is not used at 100% of RMBT, the transition distance can be reduced according to the following table:

%RMBT	90%	80%	70%	< 60%
$L_t$ multiplier factor	0,93	0,82	0,74	0,71



## SPLICING METHOD

One of the advantages of ARABELT® is the easy system of splicing and repair: only ordinary equipments used for textile belts are necessary and the required time is less than the one for steel cord belts.

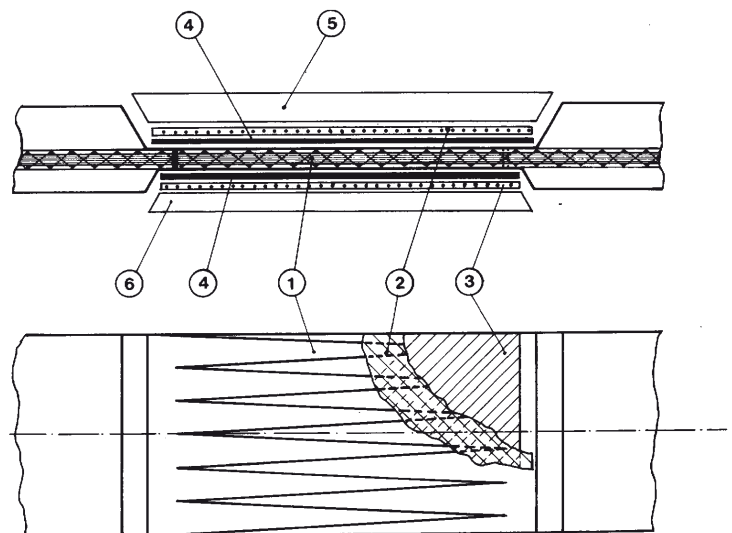
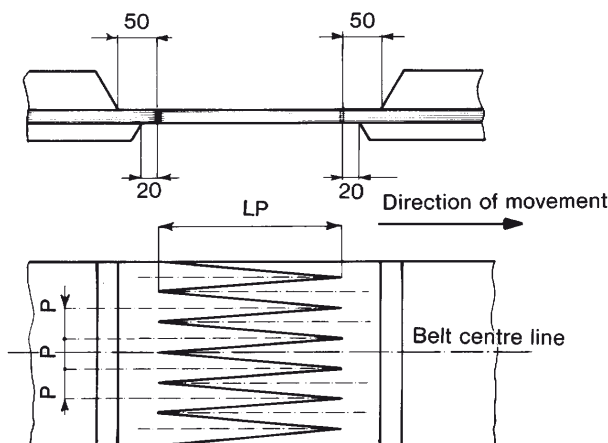
We recommend the finger method shown in this page to avoid any transversal and lengthwise stiffening. This is fundamental to allow the running with small pulley diameter and sets of idlers with high inclination (up to 45°) without any dangerous overstress on the splice.

The first step for the preparation of the joint is the removal of both the covers of the two ends of the belt. - Refere to the table and the drawings for the dimension of these areas. - Then it is necessary to draw and cut the fingers that will realize the joint.

The belt must then be lined up and the splice elements coupled. This operation needs to fix the belt ends, turn the fingers over to put in position rubber sheet for bottom cover, bottom insertion fabric and skim rubber. All these elements must be treated with rubber solution and rolled together to obtain the best adhesion. Then fingers must be positioned in the final position, starting from the centre towards the edges. The splice is completed with the application of skim rubber, top insertion fabric and bottom cover.

The vulcanization process follows the same procedure used for standard fabric belts.

As the final strength of the splice depends on the tearing resistance and adhesion of the skim rubber placed between fingers and insert fabric, we strongly recommend the use of our products.



- 1 - ARABELT® carcass
- 2 - Top insertion fabric
- 3 - Bottom insertion fabric
- 4 - Skim rubber
- 5 - Top cover
- 6 - Bottom cover



Belt style	Finger length LP	Finger width P
630	800	60
800	1000	60
1000	1200	60
1250	1500	60
1400	1700	70
1600	2000	70
1800	2200	70
2000	2400	70
2500	3000	70





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#### ISO 9002 QUALITY SYSTEM CERTIFICATION



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