



NIBA-The Belting Association
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Tech Note

Technical Notes from the Technical Committee, NIBA – The Belting Association

#21 PIW, EP, ST: What’s the Difference:

Introduction

You are busy at your desk when the call comes in asking for your equivalent of a 4 ply EP 3800 conveyor belt. Your response is of course "NO PROBLEM, I'LL MAKE A QUICK CONVERSION AND GET RIGHT BACK TO YOU." After hanging up you realize the problem is deeper than it first appeared. Should your answer be given in PIW, EP, or ST rating? Does the Safety factor need to be taken into consideration? Questions, questions, questions!

To resolve this common problem we must be aware that most of the world (excluding the USA) classifies belts with the metric system and ultimate breaking strength. Sometimes the metric system is identified by (SI) which stands for the International System of Units. To further complicate matters, fabric belting is referred to in letters such as EP, PP or other combinations of steel cord belts as ST.

So let's begin simplifying this discussion by referring to Table 1 for definitions of the yarns used in most belt carcasses for either system.

Definition	USA	Metric
Fabric:		
Polyester	P	E
Nylon	N	P
Carcass:		
Poly-nylon	PN	EP
Nylon-nylon	NN	PP
Poly-poly	PP	EE

Table 1. Fabric Designations

As you can see, we must be careful when using letters to designate the yarns. The reason for the apparent conflict in acronyms can be explained as follows:

In the USA "P" stands for Polyester and "N" for Nylon. In the metric countries Polyester (E) comes from Ethylene glycol and Nylon from Polyamide (P). So if you wanted an equivalent to a Metric EP belt you would select Poly-Nylon in USA terms or P-N. Metric fabric belts are sometimes incorrectly referred to as EP class belts even when they are all nylon or some other fabric combination.

Besides defining the carcass yarn, the EP designation is different from PIW in two other important ways:

1. EP means breaking strength (Not rating).
2. EP means metric units (N/mm).

Carcass Tension Rating

In the USA, the term carcass tension has many definitions but the NIBA version is probably the most appropriate.

NIBA: "Maximum safe working tension recommended by the manufacturer."

This means the belt manufacturer determines the maximum tension that can be applied to the belt after reviewing the physical properties of the carcass. The tension units are PIW or Lb/In-width when they are all nylon or some other fabric combination.



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In the metric system all tension values are in **BREAKING STRENGTH** not operating tension. For example, an EP 800 construction is 800 N/mm breaking strength. The operating tension, after converting to metric (assuming a 10:1 safety factor) would be 80 N/mm or 457 PIW.

In the USA a steel cord belt is in rated PIW just like a fabric belt. In the metric world the steel cord belt is designated ST (Steel) and like the EP designations is in breaking strength (N/mm). See Table 2

Item	Units	Description	System
PIW	LB/In-Width	Max. Oper. Strength	USA
EP	N/mm or Kn/m	Breaking Strength	Metric
ST	N/mm or Kn/m	Breaking Strength	Metric

Table 2. Carcass Designations

Method for Conversion

To convert from EP to PIW, multiply by 5.71 to give breaking strength. This number must then be divided by the Safety Factor (SF) to give the rated belt PIW. This formula can be used for both fabric and steel cord belts.

Example: Convert EP1000 to PIW (Assuming 10 SF)

$$\frac{(1000 \text{ N/mm} \times 5.71)}{10 \text{ SF}} = 571 \text{ PIW}$$

Likewise to convert from PIW to EP, do the reverse:

$$\frac{(571 \text{ PIW} \times 10 \text{ SF})}{5.71} = 1000 \text{ N/mm}$$

Safety Factors

One last point for reference. Safety factors generally vary per Table 3.

Item	Safety Factor
PIW	8 to 12
EP	10
ST	5 to 8

Table 3. Generally accepted safety factors

Summary

For you speed readers that find the above discussion too tedious to wade through, just clip out table 4 and place it in your planner for reference.

It will provide an easy method for quickly converting back and forth with the metric System. Simply locate the safety factor of the belt in question, move horizontally to the column description you wish to convert, and multiply by the indicated number.



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Safety Factor	EP to PIW	PIW to EP	St to PIW	PIW to ST
	<i>Multiply by</i>	<i>Multiply by</i>	<i>Multiply by</i>	<i>Multiply by</i>
12		2.10		
11		1.93		
10	0.571	1.75		
9		1.58		
8		1.40	0.714	1.40
7			0.816	1.23
6.67			0.856	1.17
6			0.952	1.05
5			1.14	0.876

Table 4. Conversation between English and Metric.

Notice that 6.67 was included since it is the most common SF for steel cord belts around the world.

Good luck on your conversions!