Unwinding/Rewinding and their Effect on Process Tension

PROCESS Unwind followed by pull rolls

EFFECT Pull rolls, either nip type or “S” wrap, provide a tension differential between the unwind and process thereby reducing the unwind web tension (PLI) requirement.

PROCESS Center winder

EFFECT Process tension similar to values listed. If a rider roll or lay-on roll is used in conjunction with center winding, the web tension required may be lower than listed values. Increased loading of rider roll on winding roll produces a tighter wound roll but reduces the required web tension (PLI).

PROCESS Surface winder or single-drum winder

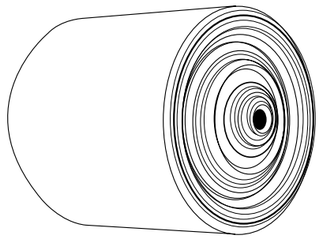
EFFECT Process tension similar to values listed. Roll density greatly dependent on loading between winding roll and drum. Increased nip loading will produce a harder roll without increasing required web tension.

PROCESS Two-drum slitter rewinder

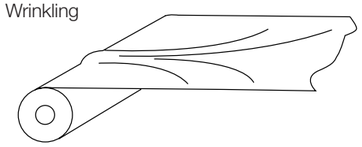
EFFECT Required tensions are usually higher due to the requirements for tight, hard rolls capable of withstanding rough treatment during handling and shipping.

Two examples of problems caused by poor tension control are shown below:

Telescoped Roll



Wrinkling

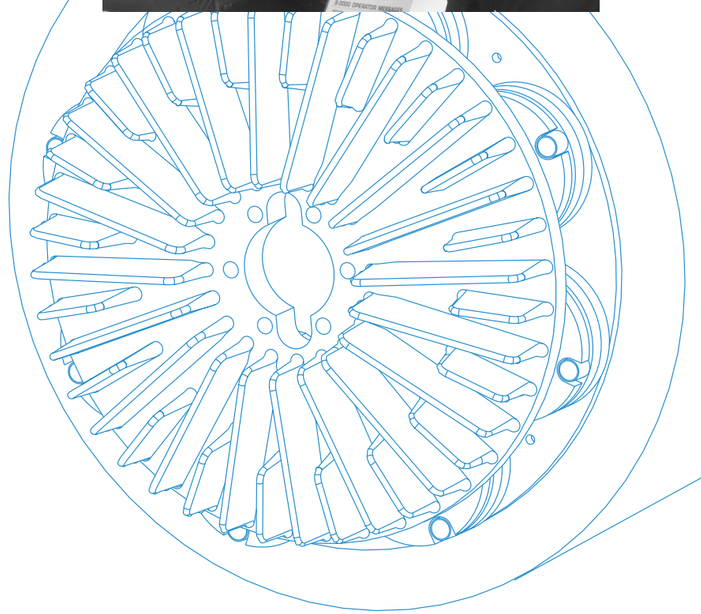


For Improved Performance, use Montalvo Tension Control Systems

your tension value guide

Choosing the Right tension value

for your application



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Tension Data for Typical Converting Applications

The adjacent table is a listing of recommended operation tensions for various materials and their corresponding basis weights and thicknesses. Tensions for materials manufactured on other than a 3000 sq. ft. per ream basis weight can be calculated by dividing 3000 by various weights and multiplying the result by the tabular listing.

EXAMPLE

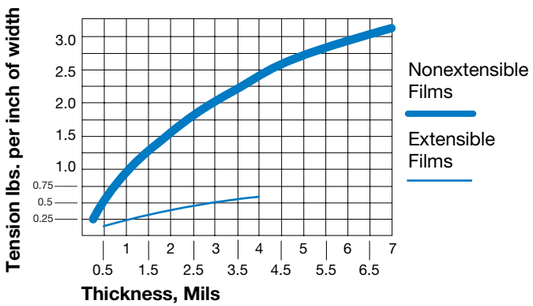
60 lb./1000 sq. ft.: 3000/1000 = 3; 3 x 60 = 180, therefore 180 lb./3000 sq. ft.. One point (0.001"/0.0254mm) = 8 lbs. on a 3000 sq. ft. basis. Tensions for lamination can be found by adding the tensions of the separate materials. For coating operations add 0.12 PLI (0.021 kg./cm.) for every 0.001" (0.0254 mm) coating thickness.

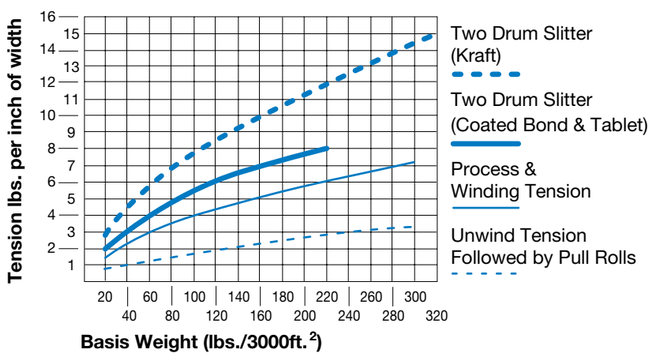
NOTE

This is a guideline only. Actual tensions may vary depending upon the type of operation. (For example, slitting tension may be slightly lower, while coating and laminating tensions may be slightly higher than the values listed in the adjacent table.) When these substrates are coated with polyethylene, nylon, polypropylene, EVA, EAA, and EEA, add the following tension values to the values listed here for the substrate only.

Coating Thickness = approximate tension lbs./in.:
0.0005" to 0.001"= 0.12 lb./in.
0.0011" to 0.002"= 0.25 lb./in.

Suggested Tension Values for Specific Materials and Applications





Material or Substrate	Thickness (inches)	Tension (PLI)	Tension (kg/cm)	Paper & Lamination
Aluminum foils	0.001	0.5-1.5	0.089-.268	20#/R-32.54 gm/m²
Cellophane	0.001	0.5-1.0	0.089-.179	40#/R-65.08 gm/m²
Acetate	0.001	0.5	0.089	60#/R-97.62 gm/m²
Mylar (polyester)	0.001	0.5-1.0	0.089-.179	80#/R-130.1 gm/m²
Polyethylene	0.001	0.25-.30	0.045-.054	
Polypropylene	0.001	0.25-.30	0.045-.054	
Polystyrene	0.001	1.0	0.179	
Saran	0.001	0.05-.20	0.009-.036	
Vinyl	0.001	0.05-.20	0.009-.036	
Gauze (Cotton)	N/A	0.25-0.50	0.045-.089	

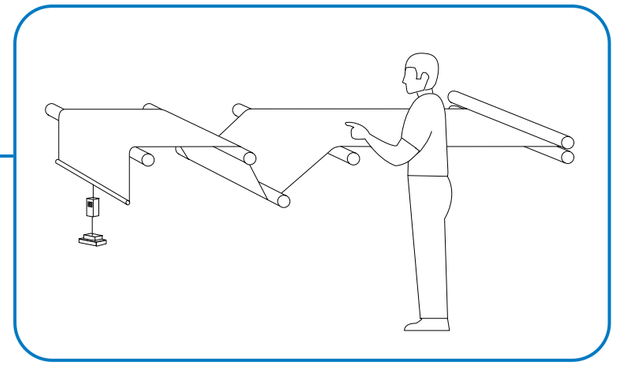
Material or Substrate	Basis Wgt (lbs/3000 ft²)	Tension (PLI)	Basis Wgt. (GSM)	Tension (kg/cm)
Paper	10	0.25	16.28	0.045
	15	0.50	24.41	0.089
	20	0.75	32.55	0.134
	30	1.00	48.83	0.179
	40	1.50	65.10	0.268
	50	1.75	81.38	0.313
	60	2.00	97.65	0.357
	70	2.25	113.93	0.402
	80	2.50	130.20	0.446
	90	2.75	146.48	0.491
	100	3.00	162.75	0.536
	120	3.50	195.30	0.625
	140	4.00	227.85	0.714
	160	4.50	260.40	0.804
	180	5.00	292.95	0.893
	200	5.50	325.50	0.982
	220	6.00	358.05	1.071
	240	6.50	390.60	1.161
	260	7.00	423.15	1.250
	280	7.50	455.70	1.339
	300	8.00	488.25	1.429

Material or Substrate	Thickness (inches)	Tension (PLI)	Basis Wgt. (GSM)	Tension (kg/cm)
Paperboard	0.008	3.00	104.16	0.536
	0.010	3.50	130.20	0.625
	0.012	4.00	156.24	0.714
	0.014	4.50	182.28	0.804
	0.016	5.00	208.32	0.893
	0.018	5.50	234.36	0.982
	0.020	7.00	260.40	1.250
	0.022	8.00	286.44	1.429
	0.024	9.00	312.48	1.607
	0.026	10.00	338.52	1.786
	0.028	11.00	364.56	1.964
	0.030	12.00	390.60	2.143
	0.035	13.00	455.70	2.322
	0.040	14.00	520.80	2.500
	0.045	15.00	585.90	2.679
	0.050	16.00	651.00	2.857
	0.055	17.00	716.10	3.036
	0.060	18.00	781.20	3.214
	0.065	19.00	846.30	3.393
	0.070	20.00	911.40	3.572

Material or Substrate	Thickness (inches)	Tension (PLI)
Mylar & Oriented Propylene	0.0005	0.25
	0.0010	0.50
	0.0020	1.00
Cellophane	0.00075	0.50
	0.00100	0.75
	0.00200	1.00
Nylon & Cast Propylene (Non-Oriented)	0.00075	0.15
	0.00100	0.25
	0.00200	0.50

Alternative Method for Obtaining Accurate Tension Specifications for Your Application

Many applications not currently utilizing tension indication equipment are typically controlled manually by an operator who "feels" the tension in the web. The operator usually accomplishes this by resting a hand on the web during operation to measure the tightness in the web. When preparing to specify a closed loop tension system for these applications, tension values may not be typical of the values listed in the tables adjacent. To obtain more realistic values for your operation of web tension, you may want to utilize your operator's experience by using the following technique:



STEP 1

Find a section of web between two idlers within the tension zone where the operator checks the tension when he controls it manually. Then using the entire web, feed it through the normal wrapping configuration and secure one end using the nip rolls. Allow the other end to hang free. (Set up as shown in the illustration above.)

STEP 2

Now, attaching weights or using a spring scale, apply a force on the web while the operator feels the web for proper tension. Spin all idlers in the direction of the weight. When the proper tension is achieved, record the force. This value can now be used by The Montalvo Corporation to ensure proper sizing of our tension controlling and indicating products.

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