ASHWORTH ENGINEERING

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PRODUCT TECHNICAL BULLETIN

¾" PITCH SMALL RADIUS OMNI-PRO®

Belt consists of an assembly of rods and links. A center row of heavy duty non-collapsing links form two product lanes; 3/4" pitch Omni-Pro 075 links on inside and 1"pitch Omni-Pro 100 links on outside belt edge. The Small Radius Omni-Pro belt is suited for turn radii between 1.0 and 2.0 for freezing, cooling and proofing applications.

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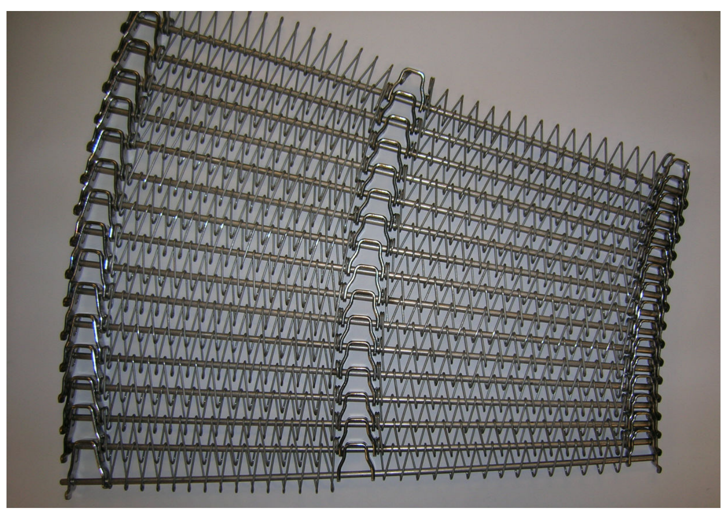
DEFINING CHARACTERISTICS

- **Turn Ratio:** 1.0 to 1 or greater not to exceed 2.0 to 1
- **Longitudinal Pitch:** 3/4" pitch =.75 in [19.1mm]
- **Turn Capability:** Uni-directional
- **Standard Belt Widths:** 12 inch [305 mm] through 48 inch [1219 mm]
- **Maximum Allowable Tension:** 150 lb [667 N] entering and exiting a turn
- **Conveying Surface:** inside conveying surface = center link location -1.62 in [41.3 mm], outside conveying surface = width - center link location - 1.87 in [47.6 mm] overall belt.
- **Method of Drive:** sprocket driven on inside and center links only

BELT SPECIFICATIONS

SMALL RADIUS OMNI-GRID			
Belt Width		Inside Turn Radius (1.1:1)	
inch	*mm*	inch	*mm*
12	*305*	13.2	*335*
14	*356*	15.4	*391*
16	*406*	17.6	*447*
18	*457*	19.8	*503*
20	*508*	22.0	*559*
22	*559*	24.2	*615*
24	*610*	26.4	*671*
26	*660*	28.6	*726*
28	*711*	30.8	*782*
30	*762*	33.0	*838*
32	*813*	35.2	*894*
34	*864*	37.4	*950*
36	*914*	39.6	*1006*
38	*965*	41.8	*1062*
40	*1016*	44.0	*1118*
42	*1067*	46.2	*1173*
44	*1118*	48.4	*1229*
46	*1168*	50.6	*1285*
48	*1219*	52.8	*1341*
Consult our Product Engineers for approval of wider belt widths and concerns regarding belt strength.			

Basic Construction: T304 Stainless Steel Construction; 6 gauge (.192 in [4.9 mm]) Connector Rod; Wear Resistant® links; ¾" pitch Omni-Pro 075 Links on Inside and 1" pitch Omni-Pro 100 Links on Outside Edge, Heavy Duty Non-Collapsing Links, Center link divides conveying surface into two product lanes. Omni-Tough® Mesh for Overlay.



BELT WEIGHT

BELT WEIGHT

Grid Frame Weight			
Belt Width		**Weight**	
Inch	**mm**	**Lb/ft**	**kg/m**
12	305	2.76	4.1
14	356	3.03	4.5
16	406	3.30	4.9
18	457	3.57	5.3
20	508	3.84	5.7
22	559	4.11	6.1
24	610	4.38	6.5
26	660	4.65	6.9
28	711	4.92	7.3
30	762	5.19	7.7
32	813	5.46	8.1
34	864	5.73	8.5
36	914	6.00	8.9
38	965	6.27	9.3
40	1016	6.54	9.7
42	1067	6.81	10.1
44	1118	7.08	10.5
46	1168	7.35	10.9
48	1219	7.62	11.3

Belt Weight = (Weight of Grid Frame) + (Weight of Mesh Overlay)

- Calculate in units of weight per unit length – lb/foot or kg/meter.
- Determine weight of base belt from chart at left. If belt has a mesh overlay, calculate conveying surfaces of inside and outside sections. Convert to units of feet or meters.
- If applicable, determine weight of mesh on inside and outside sections (see mesh chart under options.)
- Sum the above weights to obtain the total belt weight.
- Multiply calculated value by belt length for total belt weight.

Sample Calculation:

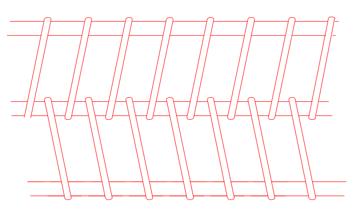
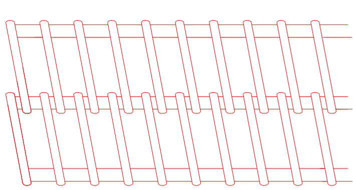
For a 3/4" Pitch, 36" wide belt with center link position at 18" and an overlay of B36-12/12-16 (reference above calculations for conveying surface),

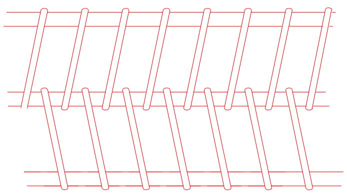
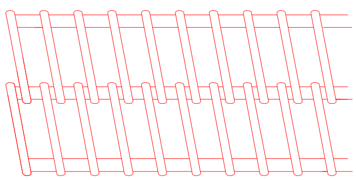
Belt Weight = 4.64 lb/ft + (16.215 in)(1 ft/12 in)(0.59 lb/sq ft) + (16.195 in)(1 ft/12 in)(0.79 lb/sq ft)

Belt Weight = 6.51 lb/ft.

BELT OPTIONS

MESH OVERLAYS AVAILABLE

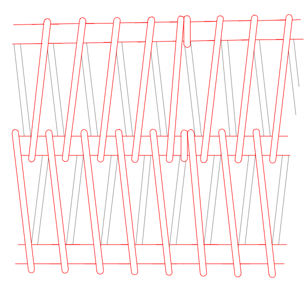
Overlay Type	Mesh Designation	Minimum Belt Width in [mm]	Maximum Belt Width in [mm]	Mesh Weight (lb/sq ft [kg/sq m]) Inside	Outside
OMNI-TOUGH®	**3/4 INCH PITCH SMALL RADIUS OMNI-PRO**				
BALANCED WEAVE 	B24-12/16-16	20 [508]	48 [1219]	0.83 [4.1]	1.00 [4.9]
	B30-12/16-16	20 [508]	48 [1219]	1.03 [5.0]	1.27 [6.2]
	B30-12/16-17	20 [508]	48 [1219]	0.77 [3.8]	0.94 [4.6]
	B36-12/16-16	28 [711]	48 [1219]	1.23 [6.0]	1.51 [7.4]
	B36-12/16-17	28 [711]	48 [1219]	0.92 [4.5]	1.12 [5.5]
	B42-12/16-16	28 [711]	48 [1219]	1.43 [7.0]	1.77 [8.6]
	B42-12-16-17	28 [711]	48 [1219]	1.07 [5.2]	1.31 [6.4]
UNILATERAL WEAVE 	U36-12/16-16	20 [508]	48 [1219]	1.23 [6.0]	1.51 [7.4]
	U36-12/16-17	20 [508]	48 [1219]	0.92 [4.5]	1.12 [5.5]
	U42-12/16-16	28 [711]	48 [1219]	1.43 [7.0]	1.77 [8.6]
	U42-12/16-17	28 [711]	48 [1219]	1.07 [5.2]	1.31 [6.4]
	U48-12/16-16	28 [711]	48 [1219]	1.63 [8.0]	2.02 [9.9]
	U48-12/16-17	28 [711]	48 [1219]	1.22 [6.0]	1.51 [7.4]
	U54-12/16-17	34 [864]	48 [1219]	1.37 [6.7]	1.58 [7.7]

Overlay Type	Mesh Designation	Minimum Belt Width in [mm]	Maximum Belt Width in [mm]	Mesh Weight (lb/sq ft [k/sq m]) Inside	Outside
SOFT ANNEALED OVERLAY	**3/4 INCH PITCH SMALL RADIUS OMNI-PRO**				
BALANCED WEAVE 	B18-12/16-14	12 [152]	48 [1219]	1.08 [5.3]	1.38 [6.7]
	B18-12/16-16	12 [152]	48 [1219]	0.63 [3.1]	0.84 [4.1]
	B24-12/16-14	12 [152]	48 [1219]	1.41 [6.9]	1.81 [8.8]
	B24-12/16-16	12 [152]	48 [1219]	0.83 [4.1]	1.00 [4.9]
	B24-12/16-17	12 [152]	48 [1219]	0.62 [3.0]	0.84 [4.1]
	B30-12/16-16	12 [152]	48 [1219]	1.03 [5.0]	1.27 [6.2]
	B30-12/16-17	12 [152]	48 [1219]	0.77 [3.8]	0.94 [4.6]
	B36-12/16-14	12 [152]	48 [1219]	2.09 [10.2]	2.68 [13.1]
	B36-12/16-16	12 [152]	48 [1219]	1.23 [6.0]	1.51 [7.4]
	B36-12/16-17	12 [152]	48 [1219]	0.92 [4.5]	1.12 [5.5]
	B42-12/16-16	12 [152]	48 [1219]	1.43 [7.0]	1.77 [8.6]
	B42-12/16-17	12 [152]	48 [1219]	1.07 [5.2]	1.31 [6.4]
UNILATERAL WEAVE 	U36-12/16-14	12 [152]	48 [1219]	2.09 [10.2]	2.68 [13.1]
	U36-12/16-16	12 [152]	48 [1219]	1.23 [6.0]	1.51 [7.4]
	U36-12/16-17	12 [152]	48 [1219]	0.92 [4.5]	1.12 [5.5]
	U48-12/16-14	12 [152]	48 [1219]	2.78 [13.6]	3.55 [17.2]
	U48-12/16-16	12 [152]	48 [1219]	1.63 [8.0]	2.02 [9.9]
	U48-12/16-17	12 [152]	48 [1219]	1.22 [6.0]	1.66 [8.1]
	U48-12/16-18	12 [152]	48 [1219]	0.92 [4.5]	1.19 [5.8]
	U60-12/16-16	12 [152]	48 [1219]	2.03 [9.9]	2.44 [11.9]
	U60-12/16-17	12 [152]	48 [1219]	1.53 [7.5]	2.09 [10.1]
	U60-12/16-18	12 [152]	48 [1219]	1.15 [5.6]	1.48 [7.2]

NOTES:

- The first set of numbers in the mesh designation indicates the number of spiral loops per foot of width.
- The second number specifies the number of pitches per linear foot. The inside mesh section and the outside mesh section each have 16 pitches per linear foot [305 mm] of belt and are combined on the same belt.
- The last number is the wire gauge of the mesh.
- Spirals for unilateral mesh overlays are woven left hand (/////) for the inside section and right hand (\\\\\) for the outside section of the belt.

- **Internal Pigtails** (optional feature) secure the rod position within the overlay spirals, which is particularly helpful for applications with a soft or wet product. Internal pigtails may be manufactured into any Omni-Tough spiral overlay.



SPROCKETS

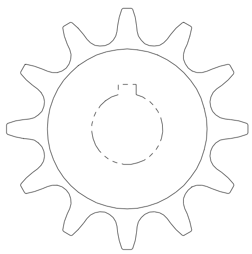
Steel sprockets for 3/4 inch pitch belts.

No. of Teeth	Overall Diameter		Pitch Diameter		Flange Diameter		Flange Width		Hub Width		Hub Diameter		Bore Minimum		Bore Maximum*	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	Mm
12*	3.40	86.4	2.90	73.6	--	--	--	--	1.00	25.4	2.25	57.2	1.00	25.4	1.44	36.5

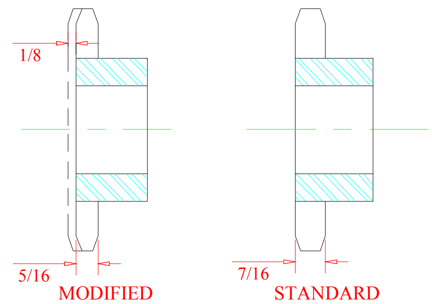
*Material: T303 stainless steel or C1141 hardened steel

NOTE: 3/4 Inch Pitch SROG can use #60 roller chain sprockets modified as follows:

1. Face off sprocket such that the overall tooth width is 5/16 inch [7.94 mm].
2. Chamfer corners of the newly machined teeth.



#3, 12 TOOTH for 3/4 inch Pitch



NOTES:

- UHMWPE material type components have a 150°F [66°C] maximum operating temperature.
- Maximum bore sizes listed for UHMWPE material is based on 1/2 inch [12.7 mm] of material above keyway.
- One sprocket will engage the inside row of links and one sprocket will engage the middle row of links. One toothless flanged idler support roll supports the outside row of links.

SUPPORT:

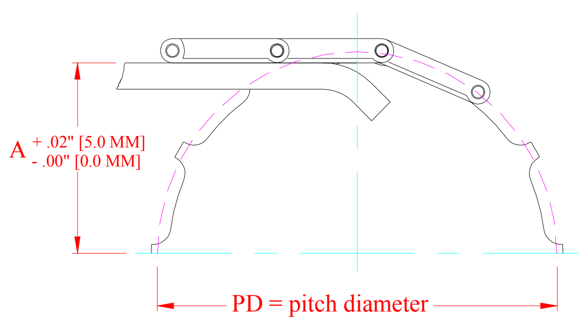
Supports are recommended on a maximum of 6 inches apart on load side and 12 inches maximum on return side. Rollers may also be used.

NOTE: For heavier load applications, additional support rollers may be required.

WEARSTRIP PLACEMENT

A = ½ X PD – Belt Thickness

- This is only a guideline; it does not take into account the influence of speed.
- At speeds above 75 ft/min [23 m/min], Ashworth recommends increasing the distance A and shortening the wear strips as much as one belt pitch in length. (Belt Thickness for 3/4 inch pitch is .4375 [11.1mm])



ENGINEERING CALCULATIONS

- **Inside Turn Radius** - turn radius measured to the inside edge of the belt
- **Turn Ratio** - ratio of inside turn radius to the belt width. For this belt: 1.1 to 1.
- **Center Link Position** - distance between inside edge of belt and centerline of center link.

- **In order to accommodate a turn,** the inside row of links collapses while the outside row expands. The center link carries the full belt tension. Maximum allowable tension is 150 lbs. [667 N].
- **In a straight run condition,** the inside and center rows of links are under tension. Maximum allowable tension is 300 lbs. [1334 N].

TURN RATIO

Turn Ratio = Inside Turn Radius ÷ Belt Width

Turn Ratio is dimensionless. Inside Turn Radius and Belt Width must both be in same unit of measure.

Sample Calculation:

For Inside Turn Radius = 39.6”, Belt Width = 36”

Turn Ratio = 39.6” ÷ 36”= 1.1

CENTER LINK POSITION

Center Link Position = Inside Turn Radius(inches) ÷ 2.2

Calculate Center Link Position in units of inches; convert to millimeters if necessary.

Sample Calculation:

For Inside Turn Radius = 39.6”, Belt Width = 36”

Center Link Position = 39.6” ÷ 2.2= 18”

BELT LENGTH

Belt Length calculation will depend on system layout. In calculating belt length for Small Radius Omni-Grid, use the radius to the middle of the center row of links.

CONVEYING SURFACE

Sample Calculation (¾” pitch belt):

For a 36” wide, Center Link Position = 18”

Conveying Surface of
Inside Section = (18” – 1.63”) = 16.37”
Outside Section = (36 – 18)” – 1.90” = 16.10”

BELT TENSION

Estimated belt tension in a straight run:

$$\mathbf{T} = [\mathbf{wLf_r} + \mathbf{WLf_l} + \mathbf{WH}] \times \mathbf{C}$$

where:

T = Belt Tension in pounds force (Newtons)
w = Weight of belt in pounds per linear foot (kg/linear meter)
L = Length of conveyor – center to center of terminals – in feet (meters)
$\mathbf{f_r}$ = friction factor between belt and support rails, return side
W = weight of belt AND payload in pounds per linear foot (kilograms per linear meter)
$\mathbf{f_l}$ = friction factor between belt and support rails, load side
H = rise of an incline conveyor (+ if incline; - if decline) in feet (meters)
C = Conversion factor – Imperial 1.0; Metric 9.8

FRICTION FACTORS for Stainless Belt on UHMW Rails	
Friction Factor	Type of Product
0.20	clean, packaged
0.27	breaded, flour based
0.30	greasy, fried at < 32 ºF
0.35	sticky, glazed sugar based

CONVERSION FACTORS	
TO CONVERT:	**MULTIPLY BY:**
inch to meter	0.0254
lb to kg	0.4536
lb/ft to kg/meter	1.488
lb/sq ft to kg/sq m	4.882
lb-force to newton	4.448

SYSTEM REQUIREMENTS

Ashworth does not recommend using Small Radius Omni-Pro in spiral ovens or other applications that use a metal cage surface or inside rail. We still recommend using Small Radius Omni-Grid for these applications.

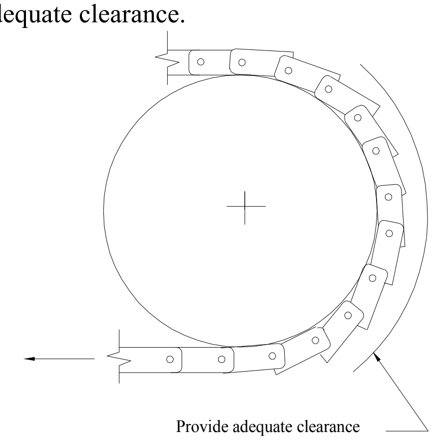
Center Link Positioning:
Center link location is based on turn radius and determined by formula specified previously. Failure to properly position the center row of links will result in an unfavorable operating condition.

- If the center row of links is positioned too close to the inside edge of the belt, the links along the inside edge will tent (/\). The center link position will be too short to collapse to the inside turn radius.
- If the center link is positioned too far from the inside edge there is incomplete collapse of the inside edge. This condition allows excessive movement of the connector rod in the link slot, which may disturb product orientation.

Sprocket drive:
Locate sprockets only in the inside and center link rows. Do not set the sprockets in the outside row of links. Use a simple idler roll of a matching flange diameter under the outside row of links.

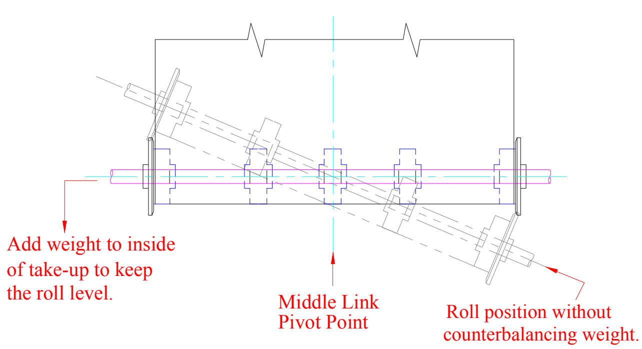
Transfers:
Because the outside section has a longer pitch than the inside section and the links in the outside row are in a collapsed position in straight runs, the forward corners of the links protrude above the belt surface at the terminals.

- **To provide a close transfer for the product to the adjacent equipment**, modify the transfer plate or blade in the area of the outside links to provide adequate clearance.



Small Radius belts usually will not hang squarely in a take-up loop because the collapsed outside edge extends due to gravity. The belt will pivot about the center link, causing the inside edge to collapse. This causes the take-up roll to hang at an angle and bind in the take-up frame.

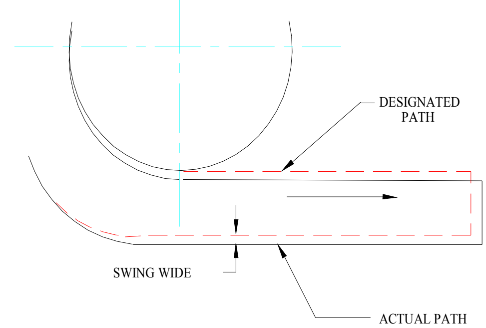
Solution:
To keep the take-up level, add weight to the inside end to counter-balance the weight of the belt's outside section. Use a take-up that exerts minimum force on the belt. For spiral systems, a free-floating take-up system as shown is typical.



All Small Radius belts have a tendency to "swing wide" to the outside at the exit of turns. Two factors are known to cause this:

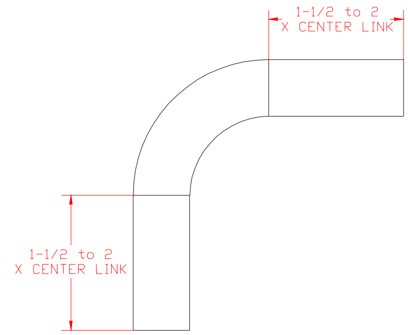
1. In a turn, the tension is concentrated in the middle row of links. This stretches this row of links making it longer than the inside edge. This forces the belt into a "banana" shape.
2. The other cause is permanent elongation due to internal wear of the links.

Solution:
Provide extra clearance between the belt and any exterior framework. We suggest one inch per foot of belt width, or 25 mm per 300 mm of width.



- **The inside belt section must be fully extended** before encountering any sprocket teeth. To insure this, provide a straight run of at least 1-1/2 x (Center Link Position) before and after turns.

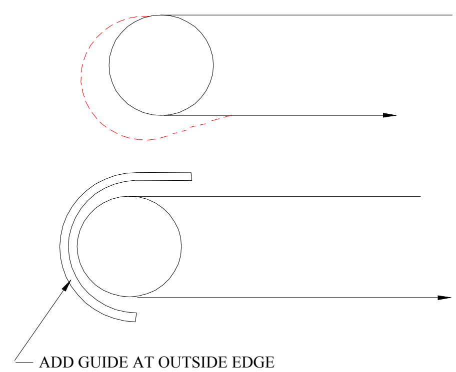
  For speeds of 60 fpm [18 m/min] and greater, increase straight run to at least 2 x (Center Link Position).



For wider belts at more than modest speeds, typically 60 fpm [18 m/min] and greater, two problems may occur at the terminal ends:

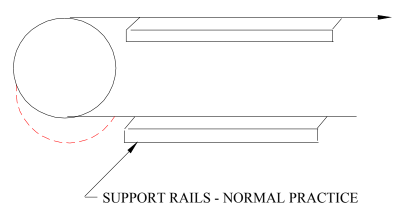
- The outside half of the belt may be affected by centrifugal force, causing it to **flare out**.

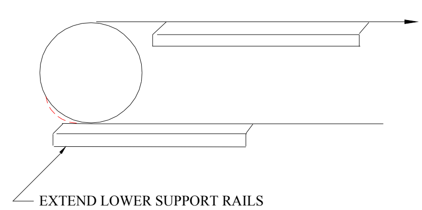
  If this occurs, add a guide over the outside edge to limit the flare out.



- Also, the weight of the outside half of the belt causes the **outside links to droop** at the terminals. While this drooping is not an operating problem, it does not present a good appearance and may interfere with other equipment.

  A simple correction is to extend the return support rails beyond the terminal centerline.





Reference: *Product Technical Bulletin "Conveyor Design Guidelines".*

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