



# ASHWORTH ENGINEERING

Committed to on-time delivery of defect-free products and services, fit for use, exactly as promised, every time.



## PRODUCT TECHNICAL BULLETIN

### Omni-Grid<sup>360</sup> Weld 150

Patented with International Patents Pending

Heavy-duty links with larger diameter rods and 360 degree welds increase carrying capacity for your Spiral/Lotension, turn curve and straight run applications. Omni-Grid 360 Weld 150 is offered with a minimum turn ratio of 1.6 times the belt width with available shot slotted links for larger radii, make it an easy retrofit to existing systems.

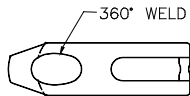
TABLE OF CONTENTS	Page
<a href="#">Defining Characteristics</a> .....	1
<a href="#">Belt Specifications</a> .....	2
<a href="#">Belt Weight</a> .....	3
<a href="#">Belt Options</a> .....	4
<a href="#">Sprockets</a> .....	4
<a href="#">Wear Strip Placement</a> .....	5
<a href="#">Engineering Calculations</a> .....	5
<a href="#">System Requirements</a> .....	6

### Omni-Grid<sup>360</sup> Weld 150

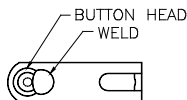


### DEFINING CHARACTERISTICS

<b>Minimum Turn Ratio:</b>	1.6:1 with available short slotted links
<b>Turn Capability:</b>	Turns both left and right
<b>Mode of Turning:</b>	Inside edge collapses in turn
<b>Width Limits:</b>	12 inch [305 mm] through 60 in. [1524 mm] in straight run applications 12 inch [305 mm] through 54 in. [1372 mm] in turn curve applications
<b>Maximum Allowable Tension:</b>	400 lbs. [181 kg] through a turn and 800 lbs. [364 kg] in straight run applications
<b>Longitudinal Pitch:</b>	1.50 inch [38.1 mm]
<b>Link Material:</b>	.590 inch x .128 inch [15.0 mm x 3.3 mm]
<b>Rod Diameter:</b>	.236 inch [6.0 mm]
<b>Material:</b>	Stainless Steel
<b>Method of Drive:</b>	Sprocket driven on links.
<b>Terminals:</b>	All terminals having 120° wrap or more should be supported by 6 inch [152 mm] minimum diameter rollers or flanged idlers.
<b>Conveying Surface:</b>	2-3/4 inch [69.8 mm] less than nominal width
<b>Mesh Overlay:</b>	Standard mesh configurations available, including Omni-Tough® Variable Loop Count



FULL 360° WELD  
MELTS ROD END  
INTO LINK



STANDARD GRID WELD  
LEAVES  
BUTTON HEAD EXPOSED

#### Improved Weld

The traditional welded construction of Grid belts fail when the weld breaks. Failure of either the inner or the outer weld allows the link to flex inward when subjected to cyclic loading. The flexing of the link causes fatigue failure at the corners of the link.

Some manufacturers have attempted to slow this process down by including additional welds. However, the weakest weld remains on the inside, the size of which is limited due to the rod size. Too large a weld on the inside will cause the rod to bend when the weld cools, which leads to collapse, tracking and tenting problems.

The Ashworth solution is to create a full 360° weld on the outside edge of the link. This prevents stress on the weld during operation even with heavier loads. The design and heavier gage of material used for the Omni-Grid 360 Weld links eliminates the need for a weld on the inside of the link.

#### Wear Resistant Feature

The next mode of failure, once weld and fatigue have been eliminated is belt elongation due to link face wear. The patented wear resistant feature in the link face, included in the Omni-Grid 360 Weld belt, now becomes more important than ever. It provides increased bearing surface to reduce belt elongation.

**BELT SPECIFICATIONS**

**MESH OVERLAY:**

**Designation:**

B X-Y-Z and U X-Y-Z  
**First Digit:** B = Balanced Weave; U = Unilateral Weave  
**X:** First Number: No. of Loops per Foot of Width  
**Y:** Second Number: No. of Spirals per Foot of Length (8 for 1.5 in. pitch)



**OMNI-TOUGH®:**

- Provides a flatter mesh surface with a high resilience to impact.
- Not available in all mesh configurations or for all belt widths.
- Available in 16 ga. (.062 inch [1.6 mm]) and 17 ga. (.054 inch [1.4 mm]).

**Examples:**

B30-8-17  
 U42-8-16

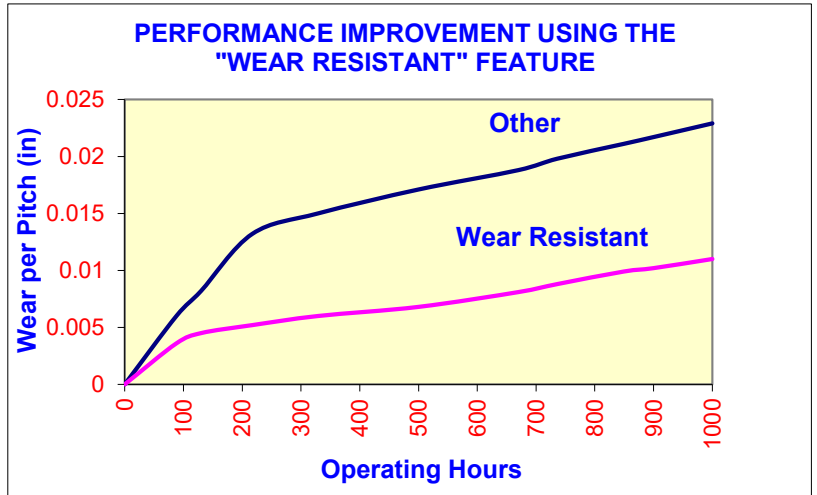
**Wire Sizes:** 16 and 17 ga.

**Material:** Stainless Steel high tensile spring wire (Omni-Tough®)

**Z:** Third Number: Wire gauge of overlay

**PATENTED "WEAR RESISTANT" FEATURE**

- ♦ Standard on all tension bearing links.
- ♦ Increases belt life by reducing belt elongation.



**BELT WEIGHT**

Omni-Grid 360 Weld (1.5" Nominal Pitch)							
OA Belt Width		1.6:1 Turn Radius		2.2:1 Turn Radius		Base Belt Weight	
inch	mm	inch	mm	inch	mm	lb/ft	kg/m
12	305	19.2	488	26.4	671	2.30	3.43
14	356	22.4	567	30.8	782	2.49	3.71
16	406	25.6	650	35.2	894	2.69	4.01
18	457	28.8	732	39.6	1006	2.88	4.29
20	508	32.0	813	44.0	1118	3.08	4.59
22	559	35.2	894	48.4	1229	3.28	4.89
24	610	38.4	975	52.8	1341	3.47	5.17
26	660	41.6	1057	57.2	1453	3.67	5.47
28	711	44.8	1138	61.6	1565	3.86	5.76
30	762	48.0	1219	66.0	1676	4.06	6.05
32	813	51.2	1300	70.4	1788	4.26	6.35
34	864	54.4	1382	74.8	1900	4.45	6.63
36	914	57.6	1463	79.2	2012	4.65	6.93
38	965	60.8	1544	83.6	2123	4.84	7.22
40	1016	64.0	1626	88.0	2235	5.04	7.51
42	1067	67.2	1707	92.4	2347	5.24	7.81
44	1118	70.4	1788	96.8	2459	5.43	8.10
46	1168	73.6	1869	101.2	2570	5.63	8.39
48	1219	76.8	1951	105.6	2682	5.82	8.68
50	1270	80.0	2032	110.0	2794	6.02	8.98
52	1321	83.2	2113	114.4	2906	6.22	9.27
54	1372	86.4	2195	118.8	3018	6.41	9.56
56	1422	**	**	**	**	6.61	9.86
58	1473	**	**	**	**	6.80	10.14
60	1524	**	**	**	**	7.00	10.44

\*\*Straight run only

**Belt Weight with Mesh Overlay= (Weight of Base Belt) + (Weight of Mesh Overlay)**

**Steps of Calculation:**

- ◆ Determine weight of Base Belt in lb/foot or kg/meter.
- ◆ Calculate Conveying Surface and convert to units of feet or meters. (Conveying Surface = Belt Width – 2-3/4inch [69.8 mm])
- ◆ Calculate sq. feet [sq. meter] of mesh/foot [meter] of belt length.
- ◆ Use the Conveying Surface and Mesh Type to determine weight of mesh in lb/foot or kg/meter.
- ◆ Add Weight of Base Belt to Weight of Mesh Overlay, lb/foot or kg/meter.

Multiply calculated value by belt length (feet or meter) for total belt weight in units of lb or kg.

**Mesh weights**

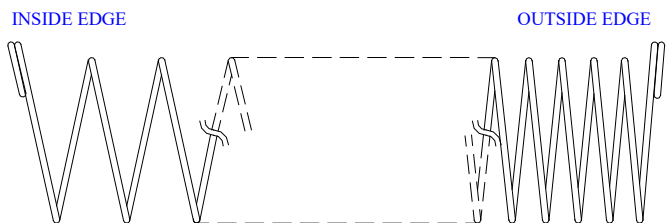
Mesh Lateral Count	16 ga.		17 ga.	
	lb/ft <sup>2</sup>	kg/m <sup>2</sup>	lb/ft <sup>2</sup>	kg/m <sup>2</sup>
18	.53	2.59		
24	.69	3.38		
30	.86	4.21		
36	1.03	5.04	.78	3.82
42	1.20	5.87	.91	4.45
48	1.37	6.70	1.03	5.04
54	1.54	7.53	1.16	5.67

**BELT OPTIONS**

**VARIABLE LOOP COUNT OVERLAY (Patent No. 6,129,205)**

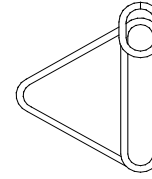
Overlay which has varied loop spacing across the width of the belt so that the loops get progressively closer together as the spiral goes from the inside of the belt to the outside of the belt (inside and outside are with respect to a turn).

- Variable Loop Count Overlay is available in 16-gage and 17-gage spring wire.
- The tightest mesh available is a B42 or a U54 at the outside edge. This can progress down to a B18 or a U36 at the inside edge.
- Direction of turn must be specified on the manufacturing order.
- Mesh will be designated, i.e., B42/36-8-17 (balanced 42 mesh spacing outside edge progressing to 36 mesh spacing inside edge); or U48/36-8-16 (unilateral 48 mesh spacing outside edge progressing to 36 mesh spacing inside edge).



**SPECIAL SPIRALS (PATENTED)**

- Available in Omni-Tough<sup>®</sup> only.
- Available in 16 ga. and 17 ga. only.
- One or more spirals on conveying surface are raised.
- Used as guard edges, lane dividers and flights.
- Maximum height 1 inch [25.4 mm].
- Available Options: height, spacing, location, shape, and number of lanes in belt.



Isosceles Triangle

**SPROCKETS**

#8-17 tooth sprockets recommended with 7-5/8 inch [193.7 mm] diameter filler rolls.

**UHMW-PE sprockets**

No. of Teeth	Overall Diameter		Pitch Diameter		Hub Width		Hub Diameter		Bore			
	inch	mm	inch	mm	inch	mm	inch	mm	Minimum	Maximum*	inch	Mm
17	8.50	216.0	8.16	207.3	2.00	51.0	7.43	188.7	.75	19.05	3.00	76.2

**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.

**FILLER ROLLS**

It is recommended that filler rolls be used to support the belt between sprockets. The maximum diameter for filler rolls depends on the size of the sprockets being used. The diameter can be calculated knowing the pitch diameter of the chosen sprocket.

$$n = PD \times \cosine (180/\#) - MT$$

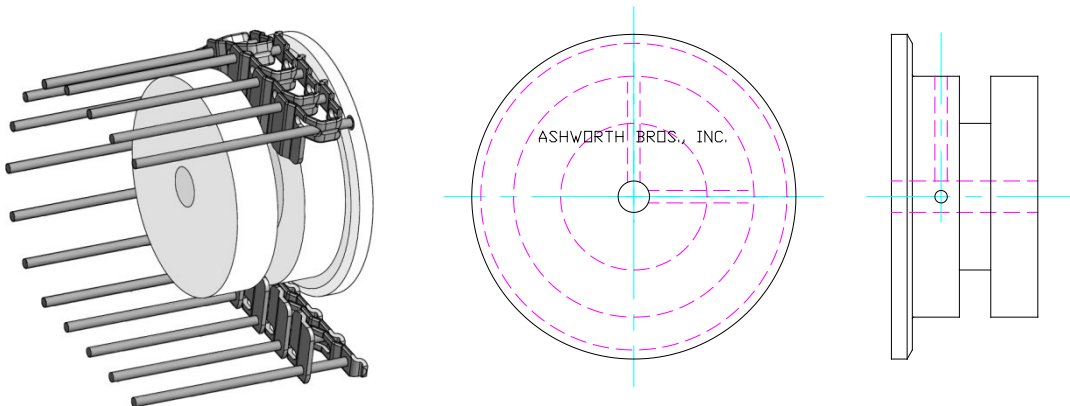
- n = Maximum Filler Roll Diameter
- PD = Pitch Diameter of Sprocket
- # = Number of Teeth on Sprocket
- MT = Mesh Thickness
  - 15 gage mesh thickness is .435 inches
  - 16 gage mesh thickness is .417 inches
  - 17 gage mesh thickness is .401 inches
  - For rod only use .236 inches

Example:  
 Filler roll diameter for use with 17 tooth sprocket (mesh overlay B36-8-16)  
 PD = 8.16 inches  
 # = 17 teeth  
 MT = .417 inches  

$$n = 8.16 \times \cosine (180/17) - .417 = 7.604 \text{ inches}$$

**TERMINAL ROLLS**

It is recommended rollers be used under the links at all terminal rolls not utilizing sprockets. At no time should the belt only be supported under the mesh without supporting the links as well. Mesh damage and wire breakage is probable if the links are not supported. This may pose a challenge on belts having guard edges and operating in a reverse bend, in this situation the belt must be supported on the top product surface – see illustration below. In these circumstances a flanged idler with a notch or relief should be used to support the outside edges of the belting.



Support rollers are still recommended between flanged idlers. To calculate the maximum diameter of the support rolls, use the formula in the previous section substituting the sum of the hub diameter of the chosen flanged idler + .590 inches (one link height) for the PD (pitch diameter).

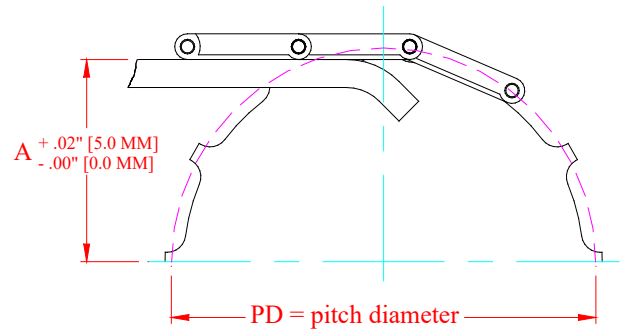
**SUPPORT RAILS**

As a rule, support rails are required on a maximum of 18 inches apart on load side and 24 inches maximum on return side. Rollers may also be used. For light loads, support rails may be placed further apart – consult Ashworth Engineering for your particular application.

**WEARSTRIP PLACEMENT**

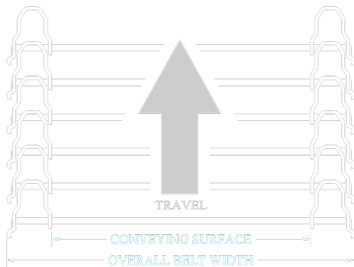
$A = \frac{1}{2} \times PD - 0.295 \text{ inch [7.5 mm]}$

- 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. (Nominal Belt Pitch = 1.50 inches [38.1 mm])



**ENGINEERING CALCULATIONS**

FRICTION FACTORS For Stainless Belt on UHMW Rails	
Friction Factor	Type of Product
0.20	Cleaned, packaged
0.27	Breaded, flour based
0.30	Greasy, fried at <32°F
0.35	Sticky, glazed sugar based



**CONVEYING SURFACE**

**Total Conveying Surface** = Belt Width less 2-3/4 inch [69.8 mm]

Sample Calculation:

- For a 36 inch wide belt  
Total Conveying Surface = 36" – 2-3/4" = 33-1/4"
- For a 920 mm wide belt  
Total Conveying Surface = 920 – 69.8 = 850.2 mm

**BELT TENSION**

$$T = (WLf_i + wLf_r + WH) \times C$$

where	T	Belt Tension in lbs. [kg]
	W	Total Weight = Belt Weight + Product Weight in lbs./linear ft. [kg/linear m]
	L	Conveyor Length in feet [meter]
	w	Belt Weight in lbs./linear ft. [kg/linear m]
	f <sub>i</sub>	Coefficient of Friction Between Belt and Belt Supports, Load Side <i>dimensionless</i>
	f <sub>r</sub>	Coefficient of Friction Between Belt and Belt Supports, Return Side <i>dimensionless</i>
	H	Rise of incline Conveyor (+ if incline, - if decline) in feet [meter]
	C	Force Conversion Factor
		Imperial: 1.0
		Metric: 9.8

Belt life is affected not only by tension, but is also affected by the speed and number of cycles it is exposed.

**TURN RATIO:**

$$TR = ITR \div BW$$

where ITR = Inside Turn Radius  
 BW = Belt Width

Turn Ratio is dimensionless. Inside Turn Radius and Belt Width must both be in same unit of measurement, either both in units of inches or both in units of millimeters.

$$INSIDE TURN RADIUS = (Turn Ratio) \times (Belt Width)$$

**SYSTEM REQUIREMENTS**

**Cage bar spacing for Lo-tension Spiral Systems:**

Omni-Grid 360 belting has an extended pitch of 1.5" [38.1 mm]. To prevent the inside edge of Omni-Grid 360Weld 150 from straddling cage bars Ashworth recommends that cage bars have a minimum width of 1.5" [38 mm] and be spaced no more than 6" [150 mm] apart. Cage bars should also, have a minimum edge chamfer or radius of ¼" [6 mm].

Smooth faced cage bar caps are recommended. **DO NOT use grooved, ridged or beveled cage bar caps with Omni-Grid 360 belting.**

**PRODUCT LOADING REQUIREMENTS**

All Omni-Grid 360 belts accommodate a turn by collapsing along the inside edge. Product loading must be adjusted accordingly. The allowable loading per length of belt is determined by the ratio of the inside turn radius and the radius to the tension link.

**STANDARD LOADING RECOMMENDATIONS**

Allowable loading per length of belt is determined by the ratio of the radius to the tension link to the inside turn radius.

$$\text{Allowable Loading per length of belt} = \text{Radius to Tension Link} / \text{Inside Turn Radius}$$

Sample Calculation:

$$\text{Let } BW = \text{Belt Width} = 30 \text{ inch [762 mm]}$$

$$\text{Let } IR = \text{Inside Turn Radius} = 66 \text{ inch [1676 mm]}$$

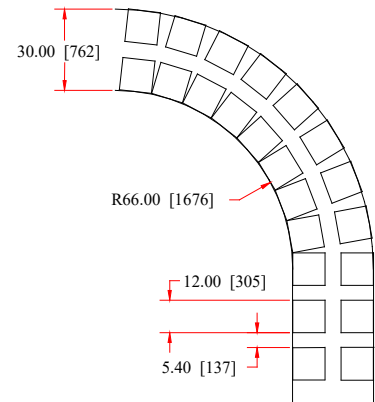
$$\text{Radius to Tension Link} = BW + IR$$

$$= 30 \text{ inch [762 mm]} + 66 \text{ inch [1676 mm]}$$

$$= 96 \text{ inch [2438 mm]}$$

$$\text{Allowable Loading} = 96/66 = 1.45$$

Which means a minimum space of 45% of the product length is required between products.



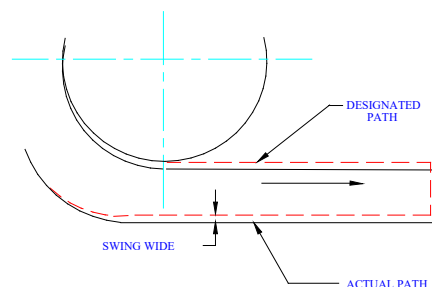
Product along inside edge moves closer together; no effect is observed on the product along outside edge. Loading: 1 in 1.45 product lengths

**SWING WIDE**

The belt tends to "swing wide" as it exits the spiral cage or turn curve, following a path that is offset but parallel to the normal tangent line to the cage. This phenomena itself does no damage, but often the belt edge contacts framework that does not leave sufficient clearance for this to occur. The usual reaction of the builders or users is to restrict the path of the belt from swinging wide, typically by use of rollers or shoe guides.

Restraining the belt path can have several adverse effects on belt life:

- ◆ The belt can wear through a shoe guide, allowing the edge to snag. This will eventually cause an increase in belt tension and damage the belt edge.
- ◆ Outside edge restraints can push individual rods inward. The rods can be held in this inward position by belt tension. There is then a potential for the projecting rods to catch on the vertical cage bar capping, causing damage to the belt, damage to the cage bar capping, and high belt tension.



- ◆ If the belt is pushed into a straight tangent path, the tension carried in the outside edge of the belt is shifted to the inside edge of the belt, resulting in a pronounced tendency for one edge of the belt to lead the other.

**Ashworth recommends a minimum swing wide clearance of 1 inch per foot of width [75 mm per meter of width] be built into all conveyors where the belt enters or exits a turn.**

**To Reduce Belt Tension and Wear (in Lotension Spiral Systems):**

Belt tension increases as the friction between belt and support rails increases. Belt tension decreases as the tension between inside edge of the belt and cage of spiral system increases.

- Clean product debris from support rails.
- Clean ice and product debris from belt, sprockets, and filler rolls to prevent belt damage.
- Observe effect of temperature on coefficient of friction between the supports and the belt. Products may leave a slick residue at room temperature that turns into a tar-like substance as temperature decreases. At freezing temperatures, the debris may become slick again or leave a rough surface depending upon its consistency.
- Lubricate support rails to reduce friction between rails and belt.
- Clean lubricants off inside edge of the belt.
- Replace worn wear strips on supports and inside edge of turns.
- Remove weight from take-up. Use minimum weight necessary to maintain take-up loop.
- Align sprockets properly and insure that they do not walk on shaft.
- Load belt so that belt weight, product loading, friction factors, and belt path do not cause belt tension to exceed maximum allowable limit.
- Decrease belt speed.
- **Reference:** Product Technical Bulletin “Conveyor Design Guidelines”.

*Copyright © Ashworth Bros., Inc. - All rights reserved. This document may not be reproduced in whole or in part without the express written consent of Ashworth Bros., Inc.*

*Ashworth Bros., Inc. provides this information only as a service to our customers and does not warrant the accuracy or applicability of the information contained herein.*

Ashworth BV  
Amsterdam, The Netherlands  
Tel: +31.20.581.3220  
Fax: +31.20.581.3229  
Email: ashworth@ashworth.nl

Ashworth Bros., Inc.  
Winchester, VA U.S.A.  
Phone: 540-662-3494  
Fax: 800-532-1730  
Email: ashworth@ashworth.com  
Website: [www.ashworth.com](http://www.ashworth.com)

Ashworth Europe Ltd.  
West Midlands, United Kingdom  
Tel: +44.1384.355000  
Fax: +44.1384.355001  
Email: ashworth@ashwortheurope.co.uk