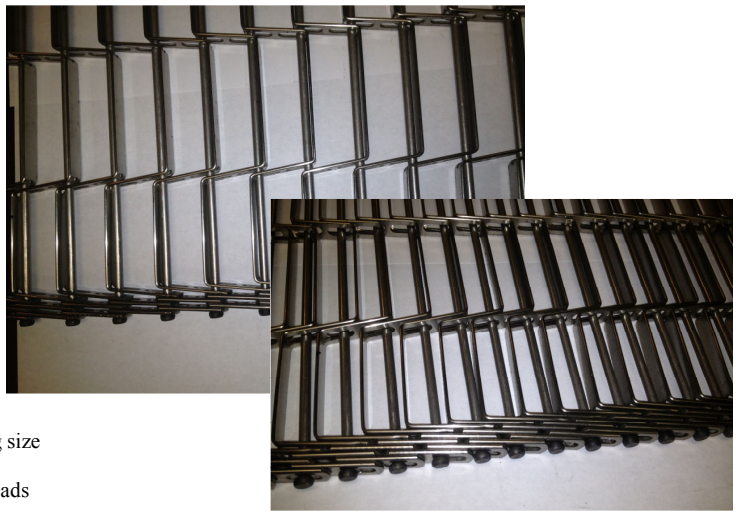
PRODUCT TECHNICAL BULLETIN

OMNI-FLEX® 3 X 1

FLAT WIRE TURN CURVE BELTING

TABLE OF CONTENTS	Page



DEFINING CHARACTERISTICS

Flat wire strip is:
- Punched with slotted openings
- Formed into pickets with nominal designated opening size
- Pickets are assembled together with connector rods
- Assembly is finished with smooth hot upset button heads
- Capable of both left and right turns

- **Designation:** Omni-Flex 3 x 1 (OFE5)
- **Longitudinal Pitch:** 1.084 inches [27.53 mm]
- **Minimum Inside Turn Radius:** with heavy duty double bar links on both edges 2.0 x belt
- **Belt Widths:** 18 inches through 48 inches [457 mm through 1219 mm] in 2 inch increments, for turn curve applications OFE5 is available for straight run applications up to 60 inches [1524 mm]. Consult our Product Engineers for approval of wider belt widths and concerns regarding belt strength.
- **Conveying Surface:** Overall belt width minus 1/4 inch [6.4 mm]
- **Basic Construction:** Stainless Steel construction
  Rods: 6 gauge (.192 in [4.9 mm]) high tensile
  Bar Links: double heavy duty collapsing .090 inch [2.3 mm] thick on inside and outside edge
  Pickets: 1/2 [12.7 mm] x .062 [1.58 mm] flat wire strip.

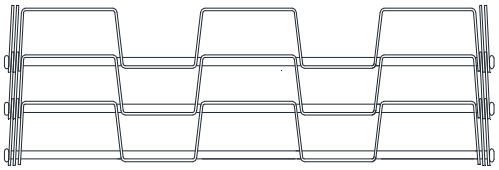
BELT SPECIFICATIONS

- **Maximum Allowable Tension:** 300 lbs [1330 Newtons] entering and exiting a turn and 600 lbs [2660 Newtons] in a straight run. For all Omni-Flex 3 x 1 belts (OFE5) the belt tension is concentrated at the outer edge of the belt through a turn. Reinforcing bar links are standard to provide for higher tension. The bar links carry the belt tension, relieving the pickets of stress.
  When sprocket drive is used, the number of sprockets and other factors must be considered in the determination of the maximum allowable tension, consult our Engineering Department.

  NOTE: Maximum allowable tension is only one factor influencing expected useful life of all Flex belting. Field experience shows that the most common cause of failure in Flex belts is caused by repeatedly applying tension onto the belt pickets creating wear and generating material fatigue. **The rate of wear is dependent upon the environment (cleanliness, temperature, etc.), speed of the conveyor, and the belt tension.**

- **Method of Drive:** For OFE5 positive drive with matching sprocket pairs spaced in every odd opening.
- **Edge Support:** Because of the large openings in the belt the drive sprockets are located farther from the belt edge than other flex style belts, Ashworth recommends flanged or flat faced pulleys be installed under the belt edges on all shafts.
- **Swing Wide:** Allow 1 inch [25.4 mm] per foot of width for OFE5 entering or exiting a turn.

E5 DOUBLE BAR LINKS BOTH EDGE

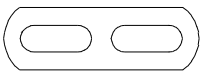
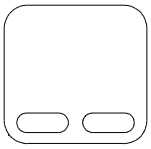
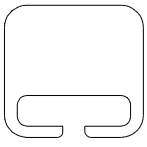
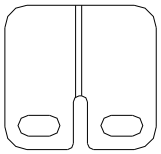


BELT WEIGHT

Standard construction w/double bar links on both edges						
Nominal Width		**Weight per unit of length (OFE5)**		**Drive Sprockets**	**Inside Turn Radius (OFE5)**	
Inches	***mm***	**lb/ft**	***kg/m***	**each**	**Inches**	***mm***
18	*457*	2.85	*4.25*	4	36	*882*
20	*508*	3.04	*4.53*	4	40	*980*
22	*559*	3.47	*5.17*	5	44	*1078*
24	*610*	3.67	*5.47*	5	48	*1176*
26	*660*	3.86	*5.76*	5	52	*1274*
28	*711*	4.29	*6.40*	6	56	*1372*
30	*762*	4.48	*6.68*	6	60	*1470*
32	*813*	4.68	*6.98*	6	64	*1568*
34	*864*	5.10	*7.60*	7	68	*1666*
36	*914*	5.30	*7.90*	7	72	*1764*
38	*965*	5.50	*8.20*	7	76	*1862*
40	*1016*	5.92	*8.83*	8	80	*2032*
42	*1067*	6.11	*9.11*	8	84	*2058*
44	*1118*	6.31	*9.41*	8	88	*2156*
46	*1168*	6.73	*10.03*	9	92	*2254*
48	*1219*	6.93	*10.33*	9	96	*2352*
50	*1270*	7.13	*10.63*	9	100	*2540*
52	*1321*	7.55	*11.26*	10	*Straight Run Only*	
54	*1372*	7.75	*11.56*	10		
56	*1422*	7.94	*11.84*	10		
58	*1473*	8.37	*12.48*	11		
60	*1524*	8.56	*12.76*	11		

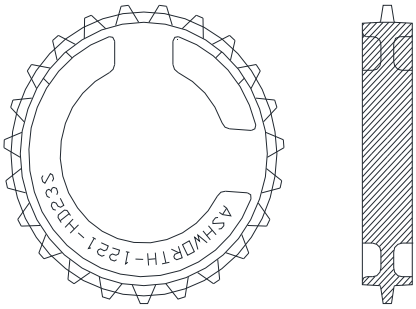
Consult our Product Engineers for approval of wider belt widths and concerns regarding belt or turn ratio

BELT OPTIONS

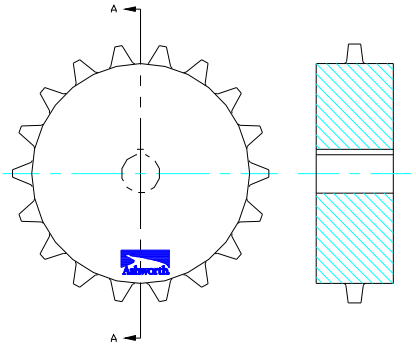
DESCRIPTION	**PURPOSE**	**AVAILABILITY**
BAR LINKS 	Assembled onto belt edges to carry belt tension. Reduce picket breakage and increase belt life. STANDARD for the Omni-Flex 3 x 1	◆ Heavy duty ◆ Double row ◆ Both edges of belt
GUARD EDGES 	Plates assembled onto belt edges to prevent product from falling off. Replaces one bar link.	Height above conveying surface: 0.50 inch [12.7 mm] 0.75 inch [19.1 mm] 1.00 inch [25.4 mm] - stocked 1.50 inch [38.1 mm] 2.00 inch [50.8 mm]
LANE DIVIDERS   	Detachable plates assembled onto belt's width to locate product. Non-detachable plates assembled into the belt Before final welding.	Height above conveying surface: 0.50 inch [12.7 mm] 0.75 inch [19.1 mm] 1.00 inch [25.4 mm] - stocked 1.50 inch [38.1 mm] 2.00 inch [50.8 mm] Maximum number of lane dividers = Belt Width/9 inches [228 mm]. *Consult our Product Engineers for approval of more lane dividers.* Height above conveying surface: 0.50 inch [12.7 mm] - stocked 1.00 inch [25.4 mm] - stocked Maximum number of lane dividers = Belt Width/9 inches [228 mm]. *Consult our Product Engineers for approval of more lane dividers.*

SPROCKETS

23 TOOTH STAINLESS STEEL SPROCKET



18 TOOTH UHMW PE SPROCKET



NOTES:

- *Maximum bores listed provide adequate material thickness for standard Keyway. Specify special sizes to be used when necessary.*

Cast iron and cast stainless steel sprockets for heavy duty Omni-Flex (OFE5) belts.

No. of Teeth	Overall Diameter		Pitch Diameter		Flange Diameter		Flange Width		Hub Width		Hub Diameter & Type		Bore Minimum		Bore Maximum	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Inch	mm	inch	mm	inch	mm
13	5.03	127.8	4.53	115.1	3.90	99.1	1.50	38.1	1.50	38.1	--	--	.75	19.1	2.50	63.5
18	6.65	168.9	6.24	158.6	5.64	143.3	1.50	38.1	1.50	38.1	4.00 – A	101.6	.75	19.1	3.50	88.9
23	8.39	213.1	7.97	202.4	7.39	187.7	1.50	38.1	1.50	38.1	5.00 – A	127.0	1.00	25.4	4.50	114.3

UHMW-PE sprockets for Omni-Flex (OFE5) belts.

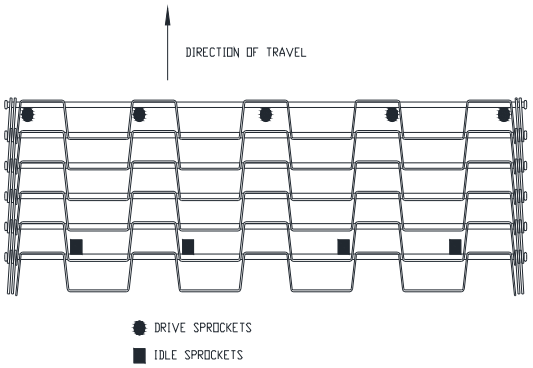
No. of Teeth	Overall Diameter		Pitch Diameter		Flange Diameter		Flange Width		Hub Width		Hub Diameter & Type		Bore Minimum		Bore Maximum	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
13	4.90	124.5	4.53	115.1	3.90	99.1	2.00	50.8	--	--	--	--	1.00	25.4	2.19	55.6
18	6.65	168.9	6.24	158.5	5.65	143.5	2.00	50.8	--	--	--	--	1.00	25.4	3.75	95.3
23	8.39	213.0	7.96	202.2	7.39	187.6	2.00	50.8	--	--	--	--	1.00	25.4	4.94	125.4
31	11.16	283.5	10.72	272.3	10.16	258.1	2.00	50.8	--	--	--	--	1.00	25.4	7.13	183.0
37	12.97	329.4	12.68	322.1	12.22	310.4	2.00	50.8	--	--	--	--	1.00	25.4	8.94	277.0

NOTES:

- *UHMWPE material type components have a 150°F [66°C] maximum operating temperature..*
- *Maximum bore sizes listed for UHMW material is based on 1/2 inch [12.7 mm] of material above keyway.*

LOCATION OF DRIVE AND IDLER SPROCKETS

Proper location and placement of the sprockets is important as it results in smoother belt operation, reduced wear on the sprockets and better distribution of belt wear. Space sprockets evenly along drive and idler shafts insuring that the outside drive sprockets are located in the first opening nearest the links on each belt edge. (Assists belt in resisting fatigue fractures by supporting the links.) Drive sprockets are located in every odd numbered mesh openings. Idler sprockets are located in even numbered mesh openings insuring outside sprockets are located in the second openings from each belt edge. The hubs of all sprockets should be facing in the same direction on the same shaft. Teeth of the sprockets should always drive against the round connector. This will insure that each drive sprocket tooth will be contacting the round connecting wire and sharing in its part of the load.



SPROCKET DRIVE

Sprockets provide positive drive of the flat wire belt design. Sprockets will, to some extent, tend to keep the belt properly aligned; however, sprocket drive should not be selected as a "cure all" for belt control problems. True belt travel for all belt designs is a combination of belt manufacture to close tolerances plus correct conveyor design and proper belt installation.

#6, 18 tooth for Omniflex

QUANTITY OF DRIVE SPROCKETS

A single drive sprocket is required in every odd opening of the belt. The outermost drive sprocket should be located to the belt edges such that they will support the bar links on the belt edges. Refer to the weight chart on the previous page for required quantity based on belt width.

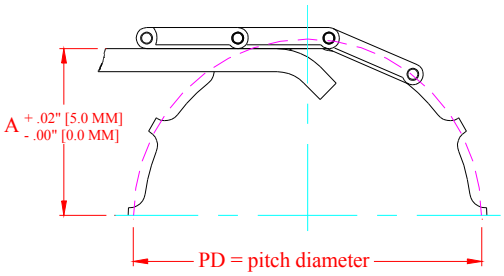
QUANTITY OF TAKE UP AND IDLER SPROCKETS

Ashworth recommends the use of flanged idlers on the belt edges and intermediate rollers at least 1-1/2-inches wide spaced no further than 6-inches apart between the flanged idlers.

If idle sprockets are used they are to be located in every even opening across the belt width. The quantity required would be one less than the number of drive sprockets required. If idle sprockets are used the belt edges still must be supported with flanged idlers.

WEARSTRIP PLACEMENT

A = ½ X PD –.250 inch [6.4 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 = 1.084 inches [27.5 mm] for Omni-Flex

ENGINEERING CALCULATIONS

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.

TURN RATIO

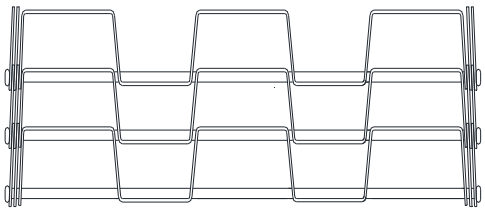
Turn Ratio = Inside Turn Radius ÷ Belt Width

RADIUS WEIGHT – Spiral Applications only (Belt Tension)

RW = R(WB+WL)(fr / fc)

where:

RW	= Radius Weight or Belt Tension
R	= system radius (i.e. radius to tension link)
WB	= weight of belt per unit of length
WL	= weight of product per unit of length
fr	= friction between belt and support rails
fc	= friction between belt and cage bars



E1 WITH DOUBLE BAR LINKS BOTH EDGES

Steps of Calculation: (Calculate in units of lb-force or Newtons)

- Measure Inside Turn Radius. Convert to units of feet or meters.
- Note Belt Weight. Unit of measure is lb/ft or kgs/meter.
- Measure Product Weight. Unit of measure is lb./ft or kgs/meter.
- Determine friction between belt and support rails.
- Determine friction between belt and cage bars.
- Substitute values into equation and calculate.

Friction Factors By Product Type and UHMW Wear Strips	
PRODUCT	***fr***
Clean and/or Packaged Product	0.20
Breaded or Flour Based Product	0.27
Greasy, Fried Product below 32°F	0.30
Sticky, Glazed, Sugar Based Product	0.35
• Coefficient of Friction (*fr*) with Stainless Steel Belt Supports = 0.40 • Coefficient of Friction (*fr*) with Free Turning Rollers Belt Supports = 0.10	
Friction Factors By Temperature and Mild Steel Belt Supports	
TEMPERATURE °F [°C]	***fr***
Up to 1000 [538]	0.35
1001 to 1200 [538 to 649]	0.37
1201 to 1400 [649 to 760]	0.40

1401 to 1600 [760 to 871]	0.44

SYSTEM REQUIREMENTS

To Reduce Belt Tension and Wear:

- 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 belts inside edge. (This applies to spirals not fixed turns.)
- Replace worn wear strips on supports and on inside edge of turns.
- Remove weight from take-up loop. Align sprockets properly and insure that they do not migrate on shaft.
- Load belt so that belt weight, product loading, friction factors, and belt path does not cause belt tension to exceed maximum allowable limit.
- Decrease belt speed.

Consult our Product Engineers for other options specific for your application and system design.

PRODUCT LOADING REQUIREMENTS

All Omni-Flex 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.

POSITIVE DRIVE – TYPICAL

- **SPROCKETS**
- **SIZE** - Overall diameters range from 4-1/8 in. [104.8 mm] to 14-11/16 [373.1 mm].
- **HUBS** - Must be oriented in the same direction to keep teeth perfectly lined up and distribute stress evenly across belt width.
- **QUANTITY** - Determined by belt tension, but always a maximum spacing of 6 inches. [152 mm] or one sprocket for every odd opening.
  Sprockets for heavy duty belts are rated for 50 lbs [222 N] maximum pull each.

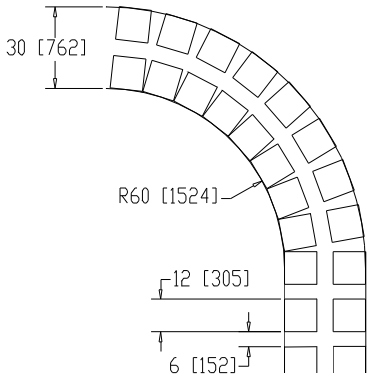
  Example:

  Heavy duty sprockets for 36 inch [914 mm] wide belt, having a calculated tension of 450 lbs [2002 N].
  450/50 = 9 or 36 /6 maximum spacing = 6
  Use the larger of the two.
  ∴ 9 sprockets recommended

Omni-Flex Belts

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.



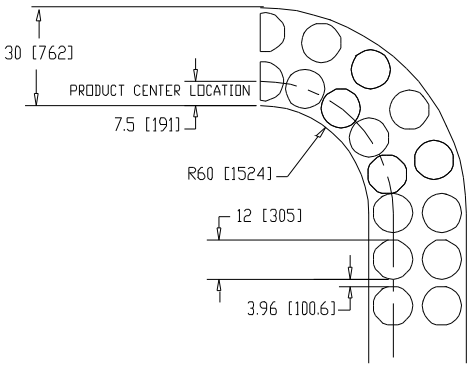
Allowable Loading per length of belt = Radius to Tension Link/Inside Turn Radius
Sample Calculation:
Let BW = Belt Width = 30 in. [762 mm]
Let IR = Inside Turn Radius = 60 in [1524mm]

Radius to Tension Link = IR + BW
= 30[762 mm] + 60[1524]
= 90 in [2286 mm]

Allowable Loading = 90 in/60 in [2286/1524] = 1.50
meaning, one product length per 1.50 lengths of belt

ADJUSTMENT FOR ROUND PRODUCT

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



Allowable Loading per length of belt = Radius to Tension Link/Radius to Product Center
Sample Calculation:
Let BW = Belt Width = 30 in. [762 mm]
Let IR = Inside Turn Radius = 60 inches [1524 mm]
Let PC = Product Center = 7.5 inches [191 mm]
Radius to Tension Link = IR + BW
= 30 [762] + 60 [1524]
= 90 in [2286 mm]
Radius to Product Center = IR + PC
= 60 [1524] + 7.5 [191]
= 67.5 in [1715 mm]

Allowable Loading = 90 in/67.5 in [2286/1715] = 1.33

meaning, one product length per 1.33 lengths of belt.

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

Ashworth Belts 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

Ashworth Europe Ltd.
West Midlands, United Kingdom
Tel: +44-1384-355000
Fax: +44-1384-355001
Email: ashworth.europe@ukgateway.net