ASHWORTH ENGINEERING

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PRODUCT TECHNICAL BULLETIN

CLEATRAC® BELT AND DRIVE SYSTEM

(U.S. Patent No. 4,685,557)

A precision balanced weave wire mesh fabric consisting of alternating right and left-hand spirals joined by crimped connecting rods, with a matched positive drive system of sprockets, filler rolls, and support bearings.

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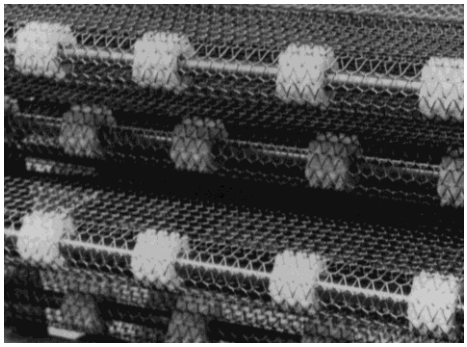


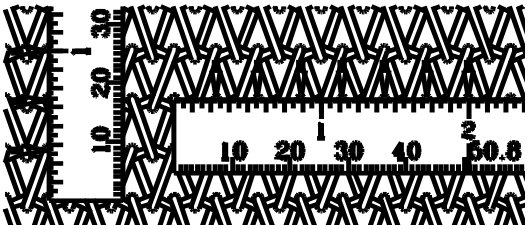
DEFINING CHARACTERISTICS

Pitch: See Cleatrac mesh chart under options.
Turn Capability: Straight run only.
Standard Belt Widths: Minimum width = sprocket width + 2 loops, Maximum width = 168 inches [4267 mm].
Maximum Allowable Tension: See chart.
Conveying Surface: Overall belt width.
Method of Drive: Positively driven by a matching minimum diameter drive system consisting of sprockets, filler rolls, and support bearings.
Basic Construction:

- Materials available in various carbon and galvanized steels, stainless steels, and high temperature alloys.
- Crimped connector rods

BELT SPECIFICATIONS

MESH DESIGNATION
CTB indicates Cleatrac Belting
First Count is # loops per foot of width
Second Count is # connectors per foot of length
Third count is the wire gauge. If the third count is four numbers (two pairs of numbers), the first is the gauge of the connector wire and the second is the gauge of the spiral wire.



CLEATRAC MESHES										
Mesh	Thickness		Lateral Pitch		Weight		Opening Size (approx.)		Working Strength per unit of Width	
	inches	mm	inches	mm	lbs/ft²	kg/m²	inches	mm	lbs/ft	kg/m
CTB 18-16-16	.301	7.65	0.667	16.94	0.67	3.3	.60 x .69	15.2 x 17.5	100	150
CTB 18-16-14	.350	8.89	0.667	16.94	1.13	5.5	.59 x .67	15.0 x 17.0	250	370
CTB 30-24-17	.287	7.29	0.400	10.16	0.88	4.3	.35 x .45	8.9 x 11.4	200	300
CTB 30-24-16	.263	6.68	0.400	10.16	1.19	5.8	.34 x .44	8.6 x 11.2	300	445
CTB 42-36-17	.235	5.97	0.286	7.26	1.35	6.6	.23 X .28	5.8 X 7.1	325	485
CTB 42-36-18	.236	5.99	0.286	7.26	1.03	5.0	.24 X .29	6.1 X 7.4	240	355
CTB 48-48-17	.240	6.10	0.250	6.35	1.57	7.7	.20 x .20	5.1 x 5.1	450	670
CTB 60-48-1820	.156	3.96	0.200	5.08	0.93	4.5	.16 x .21	4.1 x 5.3	120	180
CTB 60-48-18	.205	5.21	0.200	5.08	1.54	7.5	.15 x .20	3.8 x 5.1	350	520
CTB 60-60-18	.220	5.59	0.200	5.08	1.58	7.7	.15 x .15	3.8 x 3.8	350	520

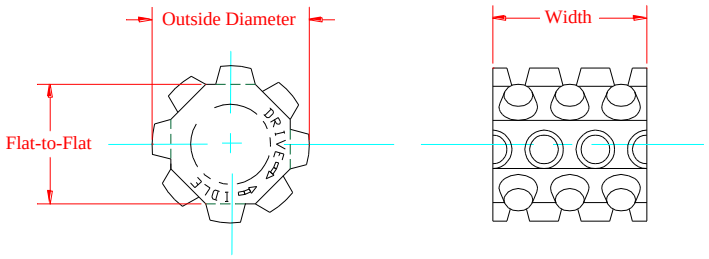
BELT OPTIONS

See "Belt Specifications".

SPROCKETS

Cleatrac Sprockets (CTS) - minimum diameter sprockets to positively drive mesh. Positive drive provides true belt travel and minimum terminal diameters allow close transfer of product onto and off belt.

- Special size sprockets not listed on chart may be manufactured upon customer request by contacting Ashworth Engineering.
- All sprockets can be manufactured in UHMW polyethylene and machined T303 stainless. Those marked with a ▲ are available in cast T303 stainless steel.
- Molded acetal sprockets are available as CTS18-12, minimum bore diameter 15/16" and maximum bore of 1-1/8" and CTS60-24, minimum bore diameter of ½" and maximum bore of 1".
- Designation is CTS followed by number of flats around the sprocket
- American Standard keyways provided unless otherwise specified by the customer. Metric sizes are available.
- Minimum bore for all cast stainless sprockets is 11/16".
- Maximum bore sizes listed are with keyway. For sprockets without keyway, add American Standard keyway depth to listed values.
- ***Plastic Cleatrac sprockets are bored oversize to allow lateral movement on the shaft compensating for changes in belt width due to temperature. If tight bore tolerances are required they must be specified at time of order.***
- Set Screws are available upon request.



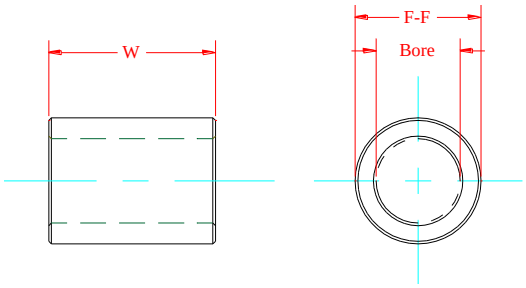
CLEATRAC SPROCKETS											
Sprocket Number	**No. of Teeth**	**Outside Diameter**		**Flat-to-Flat**		**Sprocket Width**		**Minimum Bore**		**Maximum Bore**	
		inches	**mm**	**inches**	**mm**	**inches**	**mm**	**inches**	**mm**	**inches**	**mm**
CTS 18-8	8	1.987	50.47	1.511	38.38	2.00	50.8	1/2	12.7	1	22.0
CTS 18-12 ▲	12	2.976	75.59	2.500	63.50	2.00	50.8	5/8▲	15.9▲	1-3/4	44.0
CTS 18-14	14	3.462	87.93	2.952	74.98	2.00	50.8	1/2	12.7	1-15/16	54.0
CTS 18-18	18	4.430	112.52	3.954	100.43	2.00	50.8	1/2	12.7	2-3/4	70.0
CTS 30-8*	8	1.369	34.77	0.937	23.80	1.20	30.5	1/2	12.7	1/2	12.7
CTS 30-12 ▲	12	2.028	51.51	1.596	40.54	1.20	30.5	3/4▲	19.1▲	1	24.0
CTS 30-14	14	2.347	59.61	1.912	48.56	1.58	40.0	1/2	12.7	1-1/4	30.0
CTS 30-16	16	2.670	67.82	2.234	56.74	1.20	30.5	1/2	12.7	1-3/8	35.0
CTS 30-18	18	3.008	76.40	2.576	65.43	1.20	30.5	1/2	12.7	1-11/16	43.0
CTS 30-20 ▲	20	3.333	84.66	2.887	73.33	1.20	30.5	3/4▲	19.1▲	1-7/8	50.0
CTS 30-24	24	3.966	100.74	3.524	89.51	1.20	30.5	1/2	12.7	2-1/4	60.0
CTS 30-26 ▲	26	4.286	108.86	3.844	97.64	1.20	30.5	3/4▲	19.1▲	2 -1/2	65.0
CTS 42-12*	12	1.379	35.03	1.013	25.73	1.14	29.0	1/2	12.7	1/2	12.7
CTS 42-20	20	2.220	56.39	1.880	47.75	1.14	29.0	3/4	19.1	1-1/4	30.0
CTS 42-24 ▲	24	2.666	67.72	2.300	58.42	1.14	29.0	5/8▲	15.9▲	1-1/2	39.0
CTS 42-30	30	3.301	83.85	2.929	74.40	1.14	29.0	1/2	12.7	1-7/8	50.0
CTS 42-32 ▲	32	3.517	89.33	3.145	79.88	1.14	29.0	1/2	12.7	2-1/8	55.0
CTS 42-40	40	4.368	110.95	3.996	101.50	1.14	29.0	1/2	12.7	2½	65.0
CTS 42-56	56	6.058	153.87	5.696	144.68	1.14	29.0	1/2	12.7	4	105.0
CTS 48-20	20	1.711	43.46	1.339	34.01	1.50	38.1	1/2	12.7	5/8	16.0
CTS 48-24	24	2.031	51.59	1.659	42.14	1.50	38.1	3/4	19.1	1	25.0
CTS 48-32 ▲	32	2.655	67.44	2.310	58.67	1.50	38.1	15/16▲	23.8▲	1-1/2	40.0
CTS 60-8**	8	0.684	17.37	0.434	11.02	1.00	25.4	.200	5.08	1/4	6.4
CTS 60-12	12	1.023	25.98	0.773	19.63	1.00	25.4	1/2	12.7	1/2	12.7
CTS 60-24 ▲	24	1.989	50.52	1.739	44.17	1.00	25.4	3/4▲	19.1▲	1	25.0
CTS 60-42 ▲	42	3.418	86.82	3.162	80.31	1.00	25.4	1▲	25.4▲	2-1/8	55.0
CTS 60-54 ▲	54	4.397	111.68	4.093	103.96	1.00	25.4	1▲	25.4▲	2-3/4	70.0
CTS 60-82	82	6.627	168.33	6.323	160.60	1.00	25.4	1	25.4	4-1/2	115.0
CTS 6060-28 ▲	28	1.883	47.83	1.573	39.95	1.0	25	1/2▲	12.7▲	3/4	20.0
CTS 6060-40 ▲	40	2.645	67.18	2.339	59.41	1.4	36	3/4▲	19.1▲	1-5/8	42.0
CTS 6060-92 ▲	92	5.980	151.89	5.636	143.15	1.40	35.6	1/2▲	12.7▲	4	102.0

**Non-Standard keyway (1/8 square [3mm]) used on 30-8, 42-12 sprockets w/5/8" [16mm] bore.*

***This is a non-driving component and is not available with a keyway.*

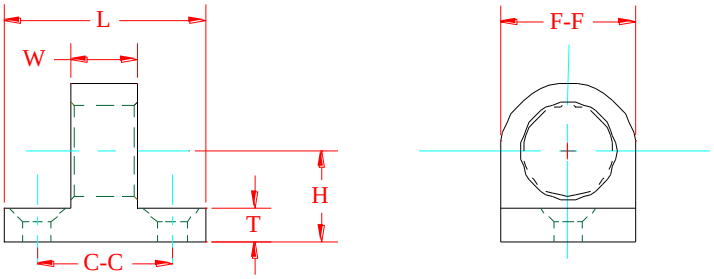
▲Also available in stainless steel with 11/16 inch [17.5m)] unfinished, pilot bore. Minimum bores shown are for UHMW sprockets.

Cleatrac Filler Rolls (CTFR) - provide mesh support between the sprockets.
Available in UHMW polyethylene.
Designation is CTFR followed by the same numeric designation of the sprockets.
Outside diameter is equal to dimension F-F of the sprocket. Bore must match that of the sprockets.
Width is the same as the selected sprocket.
There is no keyway or set screw in filler rolls unless requested.



Reference Cleatrac Sprocket chart for dimensions.

Cleatrac Support Bearings (CTSB) - for intermediate shaft support when excessive shaft deflection will occur without their presence.
Available in UHMW polyethylene only
Bore must match that of the sprockets
Designation is CTSB followed by the same numeric designation of the sprockets



Bearing Number CTSB -	F-F		H		W		Base T		Base L		Flat Head Fasteners C-C (Size)	
	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
18-8	1.511	38.38	1.005	25.53	3/4	19.1	3/8	9.5	2.25	57.2	1.5 (5/16)	38.1(M8)
18-12	2.500	63.50	1.500	38.10	3/4	19.1	1/2	12.7	2.25	57.2	1.5 (5/16)	38.1 (M8)
30-8	0.936	23.77	0.725	18.42	1/2	12.7	3/8	9.5	1.50	38.1	1 (1/4)	25 (M6)
30-12	1.610	40.89	1.055	26.80	3/4	19.1	3/8	9.5	2.25	57.2	1.5 (5/16)	38.1 (M8)
30-20	1.444	36.66	1.885	47.88	3/4	19.1	3/8	9.5	2.25	57.2	1.5 (5/16)	38.1 (M8)
42-12	1.013	25.73	0.760	19.30	1/2	12.7	3/8	9.5	1.50	38.1	1 (1/4)	25 (M6)
42-20	1.880	47.75	1.227	31.17	3/4	19.1	3/8	9.5	2.25	57.2	1.5 (5/16)	38.1 (M8)
42-24	2.300	58.42	1.450	36.83	3/4	19.1	3/8	9.5	2.25	57.2	1.5 (5/16)	38.1 (M8)
48-20	1.339	34.01	0.920	23.37	3/4	19.1	3/8	9.5	2.25	57.2	1.5 (5/16)	38.1 (M8)
48-32	2.300	58.42	1.450	36.83	3/4	19.1	3/8	9.5	2.25	57.2	1.5 (5/16)	38.1 (M8)
60-8	0.434	11.02	0.842	21.39	1/2	12.7	3/8	9.5	1.50	38.1	1 (No.10)	25 (M5)
60-12	0.773	19.63	0.700	17.78	1/2	12.7	3/8	9.5	1.50	38.1	1 (1/4)	25 (M6)
60-24	1.739	44.17	1.130	28.70	3/4	19.1	3/8	9.5	2.25	57.2	1.5 (5/16)	38.1 (M8)
6060-28	1.573	39.95	0.910	23.11	3/4	19.1	3/8	9.5	2.25	57.2	1.5 (5/16)	38.1 (M8)
6060-40	2.339	59.41	1.440	36.58	3/4	19.1	3/8	9.5	2.25	57.2	1.5 (5/16)	38.1 (M8)

ENGINEERING CALCULATIONS

BELT TENSION

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

where
- T Belt Tension lbs./ft of belt width [Newtons/m of belt width]
- W Total Weight = Belt Weight + Product Weight lbs./sq.ft [kg/sq.m]
- L Conveyor Length feet [meters]
- w Belt Weight lbs./sq.ft. [kg/sq.m]
- H Rise of incline Conveyor (+ if incline, - if decline) feet [meters]
- f_r Coefficient of Friction Between Belt and Supporting Bed [dimensionless]
- C Force Conversion Factor
  - Imperial: 1.0
  - Metric: 9.8

Typical fr values:

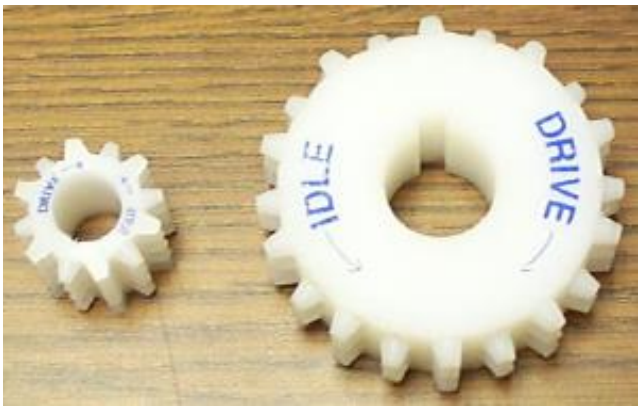
Type of Belt Support	f_r
UHMW	
with clean or packaged product	0.20
with breaded or flour based product	0.27
with greasy, fried product	0.30
with sticky, glazed, sugar based product	0.35
Stainless Steel	0.40
Free Turning Rollers	0.10

NUMBER OF DRIVE SPROCKETS

Minimum number of Sprockets per shaft = Belt Width/(A + B)

where A = Maximum allowable spacing between sprockets
B = Overall Sprocket Width
Reference table for sprocket widths

Round Calculated number to next whole number.



Mesh Type	Spacing Between Sprockets			
	Maximum		Minimum	
	inches	mm	inches	mm
CTB 18	5	127	.67	17.0
CTB 30	3-1/4	82.6	.40	10.2
CTB 42	3-1/2	88.9	.28	7.1
CTB 48	3-1/4	82.6	.25	6.4
CTB 60	3	76	.20	5.1
CTB 6060	3	76	.20	5.1

NUMBER OF IDLE SPROCKETS

Filler rolls can be used in place of sprocket on idle shafts only. Filler rolls must be positioned along the idle shaft in the same manner as sprockets on the drive shaft. Spacing between filler rolls must not exceed the minimum spacing between sprockets as noted in the chart above. Ashworth recommends at the least a sprocket should be located in the outer most openings on either belt edge with one or two sprockets at the center of the belt to maintain optimal tracking. Filler rolls would fill in the gaps between the idle sprockets spaced as noted above.

NUMBER OF FILLER ROLLS ON DRIVE SHAFT

In applications where belt tension is approaching the maximum limit for the belt filler rollers should be used between the drive sprockets

A = number of gaps between sprockets
B = number of sprockets per shaft
C = overall belt width
D = overall sprocket width
E = open space
F = available space per gap
G = number of filler rolls per gap
H = total number of filler rolls required per shaft

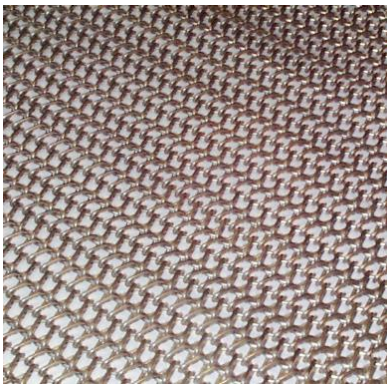
Step 1: A = B - 1
Step 2: E = C - (B x D)
Step 3: F = E/A
Step 4: G = F/D
Step 5: G x A

NUMBER OF SUPPORT BEARINGS

Number of Support Bearings = *f (shaft length, shaft diameter)*

The number of support bearings is a function of the shaft length and shaft diameter. It is determined by iteration starting with an assumed shaft diameter, typically the maximum bore of the subject sprockets. If the calculated shaft diameter is larger than the assumed diameter, the belt width is divided by two (2) to mimic the insertion of a support bearing. If the calculated diameter is still larger than the assumed diameter, the belt width is divided by three (3) to mimic the insertion of two (2) support bearings. This procedure is continued until the assumed diameter is larger than the calculated diameter.

$$d = B \times \{5.1/P \times [(C_b \times M)^2 + [(C_t \times T)^2]^{1/2}\}^{1/3}$$



B = 1 for solid shafts
P = 6000 for a shaft with keyway
= 8000 for a shaft without keyway

C_b = Service Factor in Bending
C_t = Service Factor in Torsion
T = Torque in units of inch-lbs.
= Belt Tension x ½ (Pitch Diameter of Sprockets)
M = $(W_r \times L)/8$

where W_r = resultant weight in pounds of shaft, sprockets, belt, and belt tension
$W_r = [R^2 + (BT)^2]\ ½$
R = Weight in lbs. of (Shaft + One Linear Foot of Belt + Load/Linear Foot)
L = Length of shaft between bearings in inches

C_b	C_t	Type Loading
1.5	1.0	gradually applied on steady load
1.5-2.0	1.0-1.5	suddenly applied minor shock load
2.0-3.0	1.5-3.0	suddenly applied heavy shock load

SYSTEM REQUIREMENTS

APPLICATION NOTES
UHMWPE material type components have a 150° F [66°C] maximum operating temperature.
Molded Acetal material type components have a 190° F [88°C] maximum operating temperature.

TUNNEL FREEZERS
Use with caution as ice and snow accumulates in mesh openings or on the drive components prohibiting sprocket teeth engagement. Install a rotary brush, or similar cleaning method, near sprocket locations to minimize debris.

SOFT DOUGH PRODUCTS
Use with caution as debris may accumulate in mesh openings or on the drive components prohibiting sprocket teeth engagement. Install a rotary brush, or similar cleaning method, near sprocket locations to minimize debris.

ELEVATED TEMPERATURES
Thermal expansion of the belt width may adversely affect sprocket engagement with the belt openings. If this is evident when belt reaches application temperature, lock only the middle third of the sprockets onto the shaft so the outer sprockets can "float" along the shaft allowing for thermal expansion and contraction of the belt. Keep in mind that shaft will have to be kept clean to allow sprockets to "float". For flour based products in elevated temperatures arrange the drive configuration such that a shield prevents debris from accumulating on the shaft and drive components.

MULTIPLE BELTS DRIVEN BY COMMON DRIVE SHAFT
When two or more belts are driven on a common drive shaft and product alignment is critical, Ashworth Bros., Inc. must be notified at time of purchase order so that the belts will be matched. Slight differences in belt pitch can affect the alignment of product over longer conveyor runs (typically 10 feet or greater). Replacement belts for these applications require that the order reference the previous order.

NOSE ROLL SIZING
The minimum recommended nose roll diameter for the Cleatrac belts is 5/8" [15.9 mm] for the CTB 30, 42, 48 and 60 mesh belts. Generally, use of nose rolls is not recommended with CTB 18 mesh belts. Exception: If the application has a conveyor end-to-end distance of 10 feet [3 meters] or less and the belt fits loosely around the conveyor, the minimum nose roll diameter may be decreased as follows:

	Minimum Diameter	
Mesh	**inch**	**mm**
CTB 18-16	1	25.4
CTB 30-24	½	12.7
CTB 42-36	3/8	9.5
CTB 48-48	¼	6.4
CTB 60-48	¼	6.4
CTB 60-60	0.20	5.1

Reference: *Product Technical Bulletin "021 Conveyor Design Guidelines".*

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