CORTLAND®

Plasma® Rope Lifting Slings

Proper use and care of Plasma® rope lifting slings

- Plasma® synthetic fiber braided rope lifting slings are manufactured in the USA and tag certified to meet all ASME B30.9 lifting standards (other certification standards met upon request).
  - Certification on slings available upon request
- Correct choice of rope sling requires a good understanding of strength, durability, contact lifting points and other possible factors which could affect the Plasma lifting sling. Considerations include:
  - Bending fatigue or WLL rated capacity reductions due to connection point D:d ratios
  - Length tolerances
  - Temperatures greater than 149°F (65°C); alternative fibers such as LCP or Aramid should be considered for these circumstances
- Plasma rope slings can be washed in hot or cold water without damage or loss of strength. Use of "aggressive" cleansers must be avoided. Washed slings should be hang-dried; not machine dried.
- Cortland Plasma rope slings should be stored in containers or dry areas where sling damage is limited by material movement vehicles.

Plasma® 12 Strand

Plasma® 12 Strand is manufactured from Ultra High Molecular Weight Polyethylene (UHMWPE) that has been enhanced by Cortland's patented recrystallization process to significantly enhance its strength. During processing, a polyurethane coating is added to provide protection against application hazards such as abrasion. The finished Plasma is very durable, cut resistant (compared to other synthetic ropes) and has very good UV resistance. It also has excellent bending flex fatigue—far superior to wire rope. It is extremely flexible and conforms easily to surfaces.

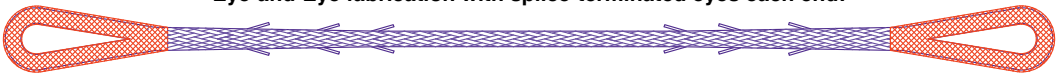
Plasma® 12x12

Plasma® 12x12 is a 12-Strand braided rope in which each of the twelve strands is, in turn, a 12-Strand rope, or braided primary strand. This patented construction addresses the most critical properties of the fibers to provide very high strength translation efficiency for larger ropes. This design allows for long lay lengths, making rope that is more flexible for bending applications, easy to inspect, and can be quickly spliced using standard 12-Strand splicing techniques. Plasma 12x12 is supplied with our standard polyurethane finish, although other coatings can be applied to suit specific applications.

General information on Cortland Plasma® braided rope lifting slings

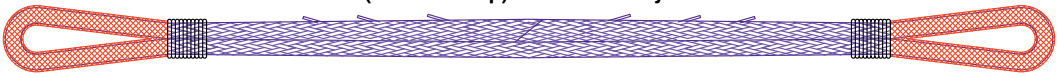
Cortland Company fabricates Plasma® 12-Strand or 12x12 braided UHMWPE synthetic fiber ropes into several lifting sling configurations. The three most popular fabrications are 1.) Eye-and-eye, 2.) Endless Loop (grommet) and 3.) Endless Loop (grommet) with formed eye terminations each end.

Eye-and-Eye fabrication with splice-terminated eyes each end:

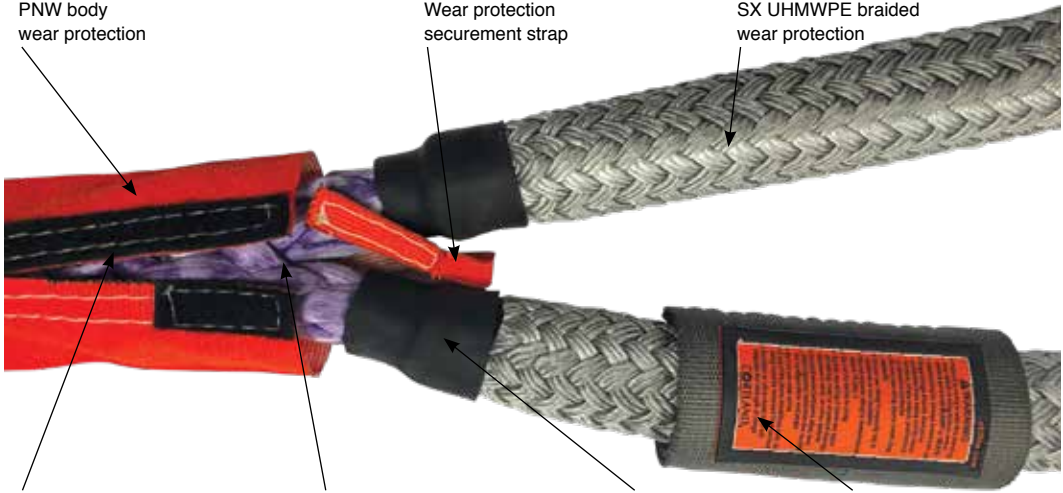


Grommet (endless loop):

Grommet (endless loop) with formed eyes each end:



Plasma® Eye-and-Eye rope slings



Plasma® TXE Braided Rope Sling - Eye-and-Eye Configuration - Capacity Chart

Cortland Part #	Min sling length (ft.)	Rated capacities based on 5:1 factor of safety						Sling Details		
		Vertical (VC)	Choker (Plasma rope must be covered in wear protection)	Basket @ 90° (basket capacities are based on 25:1 D:d)	Basket @ 60° (basket capacities are based on 25:1 D:d)	Basket @ 45° (basket capacities are based on 25:1 D:d)	Basket @ 30° (basket capacities are based on 25:1 D:d)	Approx. rope diameter	Min pin diameter in eye of sling (in.)	Weight per foot (lbs.)
TXE 10	5'	10,000	8,000	20,000	17,320	14,000	10,000	5/8"	5/8"	0.11
TXE 15	5'	15,000	12,000	30,000	25,980	21,000	15,000	13/16"	13/16"	0.16
TXE 20	6'	20,000	16,000	40,000	34,640	28,000	20,000	1"	1"	0.23
TXE 25	6'	25,000	20,000	50,000	43,300	35,000	25,000	1-1/16"	1-1/16"	0.28
TXE 30	6'	30,000	24,000	60,000	51,960	42,000	30,000	1-1/8"	1-1/8"	0.32
TXE 40	7'	40,000	32,000	80,000	69,280	56,000	40,000	1-5/16"	1-5/16"	0.42
TXE 50	11'	50,000	40,000	100,000	86,600	70,000	50,000	1-5/8"	1-5/8"	0.66
TXE 60	11'	60,000	48,000	120,000	103,920	84,000	60,000	1-3/4"	1-3/4"	0.78
TXE 70	12'	70,000	56,000	140,000	121,240	98,000	70,000	2"	2"	0.91
TXE 85	13'	85,000	68,000	170,000	147,220	119,000	85,000	2-1/8"	2-1/8"	1.09
TXE 100	14'	100,000	80,000	200,000	173,200	140,000	100,000	2-1/2"	2-1/2"	1.48
TXE 125	15'	125,000	100,000	250,000	216,500	175,000	125,000	2-3/4"	2-3/4"	1.87
TXE 150	16'	150,000	120,000	300,000	259,800	210,000	150,000	3"	3"	2.14
TXE 175	19'	175,000	140,000	350,000	303,100	245,000	175,000	3-1/4"	3-1/4"	2.61
TXE 200	20'	200,000	160,000	400,000	346,400	280,000	200,000	3-1/2"	3-1/2"	2.98
TXE 250	21'	250,000	200,000	500,000	433,000	350,000	250,000	3-5/8"	3-5/8"	3.24
TXE 275	21'	275,000	220,000	550,000	476,300	385,000	275,000	3-3/4"	3-3/4"	3.43
TXE 300	22'	300,000	240,000	600,000	519,600	420,000	300,000	4"	4"	3.94
TXE 400	30'	400,000	320,000	800,000	692,800	560,000	400,000	5"	5"	6.06
TXE 500	32'	500,000	400,000	1,000,000	866,000	700,000	500,000	5-1/2"	5-1/2"	7.49
TXE 600	35'	600,000	480,000	1,200,000	1,039,200	840,000	600,000	6-1/8"	6-1/8"	9.85

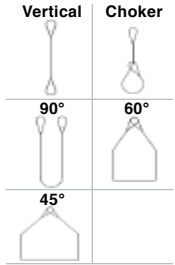


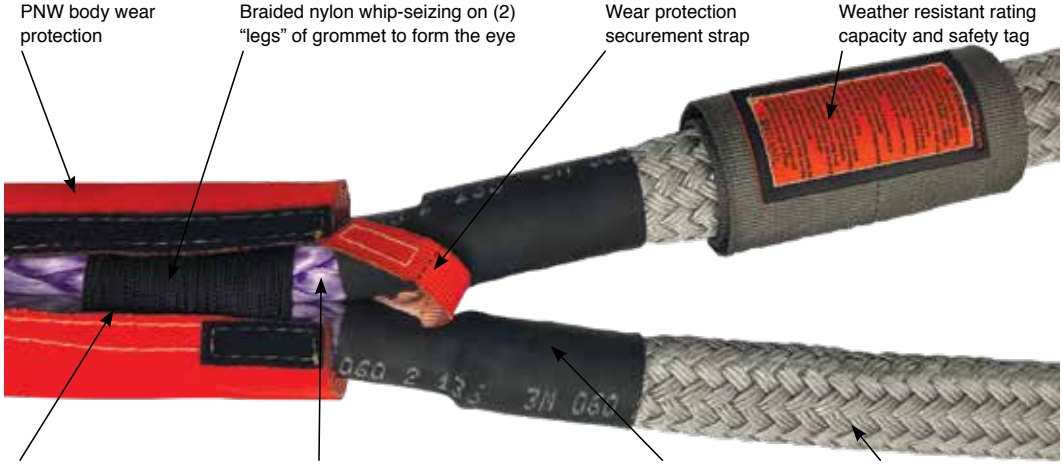
Table #1

Eye-and-eye sling D:d Basket Efficiencies	
25:1	100.0%
8:1	82.5%
5:1	80.0%
3:1	75.0%
2:1	72.5%
1:1	65.0%

To calculate basket reduction:
BC (basket capacity) = basket capacity at 25:1 D:d x BE (basket efficiency)

Plasma® Endless Loop (Grommet) rope slings with formed eyes

Also available without formed eyes



Plasma® TXG Braided Rope Sling - Endless Loop (Grommet) Fabrication - Capacity Chart

Cortland Part #	Min sling length (ft.)	Rated capacities based on 5:1 factor of safety						Sling Details		
		Vertical (VC)	Choker (Plasma rope must be covered in wear protection)	Basket @ 90° (basket capacities are based on 25:1 D:d)	Basket @ 60° (basket capacities are based on 25:1 D:d)	Basket @ 45° (basket capacities are based on 25:1 D:d)	Basket @ 30° (basket capacities are based on 25:1 D:d)	Approx. rope diameter	Vertical hitch min pin diameter in eye of sling (in.)	Weight per foot (lbs.)
TXG 10	1'	10,000	5,000	20,000	17,320	14,000	10,000	9/16	1.41	0.16
TXG 15	2'	15,000	7,500	30,000	25,980	21,000	15,000	5/8	1.56	0.21
TXG 20	2'	20,000	10,000	40,000	34,640	28,000	20,000	3/4	1.88	0.27
TXG 25	2'	25,000	12,500	50,000	43,300	35,000	25,000	7/8	2.19	0.40
TXG 30	2'	30,000	15,000	60,000	51,960	42,000	30,000	1	2.50	0.47
TXG 40	3'	40,000	20,000	80,000	69,280	56,000	40,000	1-1/4	3.13	0.74
TXG 50	3'	50,000	25,000	100,000	86,600	70,000	50,000	1-5/16	3.28	0.83
TXG 65	3'	65,000	32,500	130,000	112,580	91,000	65,000	1-1/2	3.75	1.03
TXG 85	4'	85,000	42,500	170,000	147,220	119,000	85,000	1-5/8	4.06	1.32
TXG 100	4'	100,000	50,000	200,000	173,200	140,000	100,000	2	5.00	1.56
TXG 125	5'	125,000	62,500	250,000	216,500	175,000	125,000	2-1/8	5.31	2.18
TXG 150	5'	150,000	75,000	300,000	259,800	210,000	150,000	2-1/2	6.25	2.96
TXG 175	6'	175,000	87,500	350,000	303,100	245,000	175,000	2-5/8	6.56	3.74
TXG 200	6'	200,000	100,000	400,000	346,400	280,000	200,000	2-3/4	6.88	3.74
TXG 250	7'	250,000	125,000	500,000	433,000	350,000	250,000	3-1/8	7.81	4.75
TXG 275	7'	275,000	137,500	550,000	476,300	385,000	275,000	3-1/4	8.13	5.22
TXG 300	7'	300,000	150,000	600,000	519,600	420,000	300,000	3-1/2	8.75	5.96
TXG 400	8'	400,000	200,000	800,000	692,800	560,000	400,000	3-3/4	9.06	6.86
TXG 500	9'	500,000	250,000	1,000,000	866,000	700,000	500,000	4-1/2	11.25	10.00
TXG 600	10'	600,000	300,000	1,200,000	1,039,200	840,000	600,000	4-3/4	11.88	11.74

Table #2

Grommet D:d Efficiency factor	
2:1 D:d	98%
1.5:1 D:d	93%
1:1 D:d	88%

Table #3

Grommet D:d Basket Efficiencies	
25:1	100.0%
8:1	90.0%
5:1	87.0%
3:1	82.0%
2:1	79.0%
1:1	71.0%

To calculate basket reduction:
BC (basket capacity) = basket capacity at 25:1 D:d x BE (basket efficiency)

D:d vertical hitch efficiencies

The D:d bending efficiencies mentioned in this document are only to be used for TXE and TXG slings. Please consult your sling manufacturer to obtain bending efficiency ratings for any other slings.

Determining Reduced Basket Capacity Sling Rating in Eye and Eye Slings (TXE)

1. Determine the D:d ratio by dividing the diameter of the contact curvature to which the sling will be basketed, (e.g. shackle bow or pin), by the approximate diameter of the sling that it will interface.
    a. Example – using a TXE100 (Eye and Eye), in a 90° basket hitch around a 4.25" diameter trunnion.
    (Contact curvature/Nominal rope diameter) = 4.25/2.5 = D:d Ratio = **1.7**
2. Find closest D:d efficiency factor from table 1 on panel 5, by rounding down the actual D:d ratio previously calculated to the closest whole integer.
    a. Example (1.7: rounds down to 1:1), 1:1 Basket efficiency factor = 65%
3. Multiply eye and eye basket efficiency factor previously found **(65%)**, by the slings 90° basket capacity found in column 5 of panel 6 **(200,000 lbs.).** Reduced basket rated capacity = 200,000 lbs. x 65% = **130,000 lbs**

Determining Reduced Vertical Capacity Sling Rating in Endless Grommets (TXG)

1. Determine the D:d ratio by dividing the diameter of the contact curvature (e.g. shackle bow or pin) by the approximate diameter of the sling that it will interface.
    a. Example – using a TXG100 (Grommet), in a vertical hitch on two 4.25" diameter trunnions.
    (Contact curvature/Nominal rope diameter) = 4.25/2 = D:d ratio = **2.125**
2. Find closest D:d efficiency factor from table 2 on panel 7, by rounding down the actual D:d ratio previously calculated to the closest whole integer.
    a. Example (2.125 = 2:1), 2:1 Efficiency factor = 98%
3. Multiply grommet efficiency factor previously found **98%**, by the slings vertical capacity (VC) found in column 3 of panel 8 **(100,000 lbs.).** Reduced rated capacity = 100,000 lbs. x 98% = **98,000 lbs.**

Determining Reduced Basket Capacity Sling Rating in Endless Grommets (TXG)

4. Determine the D:d ratio by dividing the diameter of the contact curvature, e.g. (shackle bow or pin) by the approximate diameter of the sling that it will interface.
    a. Example – using a TXG100 (grommet), in a 90° basket hitch around a 4.25" diameter trunnion.
    (Contact curvature/Nominal rope diameter) = 4.25/2 = D:d ratio = **2.125**
5. Find closest D:d efficiency factor from table 3 on panel 7, by rounding down the actual D:d ratio previously calculated to the closest whole integer.
    a. Example (2.125 = 2:1), 2:1 Basket efficiency factor = 79%
6. Multiply grommet basket efficiency factor previously found **79%**, by the slings 90° basket capacity found in column 5 of panel 8 **(200,000 lbs.).** Reduced basket rated capacity = 200,000 lbs. x 79% = 158,000 lbs.

Ordering and proper use of Plasma® rope lifting slings

Ordering

- Using the rated capacity charts on panels 4 and 6 and mindful of bending diameter or hardware used with each Plasma® sling, (D:d ratio), select the proper sling strength and fabrication configuration; e.g. eye-and-eye or endless loop (grommet).
- Take into consideration wear protection needed; e.g. abrasion or “rubbing” against surfaces during lift. Cortland wear protection can cover both the eye terminations and body (or portions of sling body).
- Notify Cortland or Cortland Master Fabricating Distributor of necessary length tolerances needed for slings. All Plasma rope slings are proof-loaded to 2x rated capacity.

Proper usage

- ***Do NOT use Plasma rope slings with connections less than D:d ratio of 1:1***
- Inspect Plasma rope slings before and after each use/lift. Make sure tagging is intact.
- ***If using Plasma rope slings in Choker Hitch configurations, wear protection on eye termination and body of rope sling must be used.***
- When ambient or contact surface temperatures are expected to exceed 149°F (65°C) then slings made of a different material should be considered. Plasma TXE and TXG slings should not be stored or exposed to temperatures above 158°F (70°C) for periods longer than 2 hours even when not under load. Plasma TXE and TXG slings should never be exposed to temperatures higher than 266°F (130°C) even for brief periods of time. Low temperatures are generally not a concern. Ice should be removed from the slings before usage.

Wear protection

Wear protection on Plasma® slings is designed to protect the Plasma rope load bearing core.

Four main types of wear protection offered by Cortland:

- **PNW with tubular or hook-and-clasp**
- **SX Wear Protection**—lightweight braided UHMWPE sleeve that is designed for the most demanding applications.
- **Asgard Wear Protection**—a low profile, durable woven blend of UHMWPE and nylon. Asgard is available in hook-and-clasp or tubular form making it easy to remove for inspection and replace in the field.
- **DXC Wear Protection**—an economical alternative of a tightly braided tubular polyester wear protection with proprietary marine polyurethane coating.

Standard Plasma® Braided Rope Lifting Slings Feature:

1. Sling Body Coverage—Hook-and-clasp PNW (orange color)
2. Eye Termination Coverage—Cortland tubular SX braided UHMWPE wear protection coated
   with polyurethane

Inspection/removal from service of Plasma® rope lifting slings

For questions regarding inspection and removal from service procedures contact your local Cortland technical representative.

Step # 1 – Identify the lifting sling
- Make sure the tag is in place and the product information on the tag is legible

Step # 2 – Inspect wear protection on the sling
- Begin at the bearing surface of eye terminations and work your way down the rope sling
- Inspect the wear protection for integrity, cuts, snags, compression, abrasion
  - If damage is noticed on the wear protection, further inspection of the Plasma® rope strength member is required

Step # 3 – Inspect the Plasma® rope strength member
- **Splice termination** – refer to Cortland splice procedure to verify compliance
- **Rope**
  - Visible cuts in strands
  - Overall abrasion of rope—see charts on following page
  - Areas of heat or severe compression damage
  - Braided rope diameter size inconsistencies
  - Glazed or heat-damaged (melted) fiber

Visual inspection chart on Plasma® rope		
Rating	Visual Example - External	Visual Example - Internal
1 **Like New** (good to use)		
2 **Light** (good to use)		
3 **Moderate to Severe** (in this condition rope must be removed from service)		

Quick inspection chart

	Condition	Remove from service
1	**Tagging illegible or missing**	√
2	**Rope splice integrity damaged; e.g. tucks pulled out**	√
3	**Distortion of construction/Diameter inconsistency**	√
4	**Internal abrasion** Melted or fused yarns and strands Powdery or brittle fibers	√
5	**Cuts (fiber, yarn and strands)** 12x12 construction: Two (2) or more cut adjacent yarns in a strand, or 1/2-cut strand or more 12x1 construction: 1/2-cut strand or more	√
6	**Reduction in overall diameter of rope** Localized diameter area reduction Stiff and flat areas on rope unable to be flexed back into shape	√
7	**Heat damage** Localized areas of fused and melted fibers	√
8	**Discoloration caused by unknown source** Localized areas that "cleaning" cannot repair	√

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