



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 150°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 manufacturing 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 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.



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.

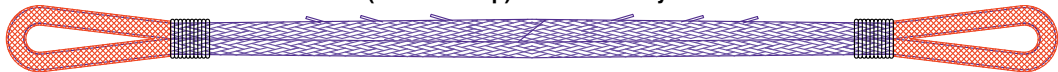
Eye-and-Eye fabrication with splice-terminated eyes each end:



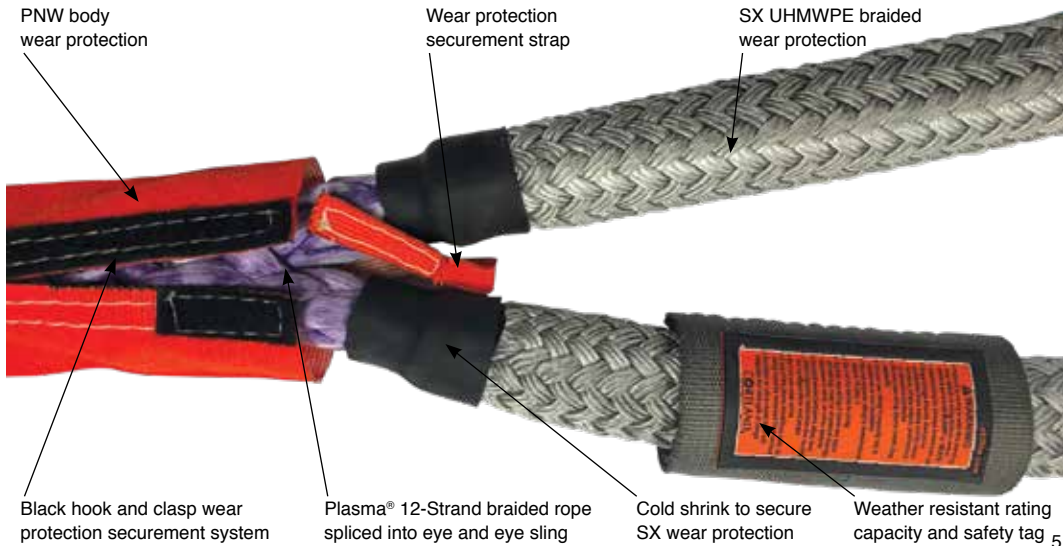
Grommet (endless loop):



Grommet (endless loop) with formed eyes each end:



Plasma® Eye-and-Eye rope slings



Plasma® Braided Rope Slings – Eye-and-Eye Configuration – LBS Vertical, choker and basket hitches

Ratings based on Design Factor of 5:1

Nominal Size			Minimum Sling Length Ft/Inch	Vertical	Choker	Basket at 90°	Basket at 60°	Basket at 45°	Basket at 30°
Dia. inch	Dia. mm	Circ. inch		Sling Capacity Ratings at Work Load Limits (WLL) in Pounds Do Not Exceed WLL					
Plasma® 12-Strand									
5/8	16	2	3' 10"	10,200	7,190	20,500	17,800	14,500	10,200
13/16	20	2-1/2	4' 7"	14,800	10,300	29,600	25,600	20,900	14,800
1	24	3	5' 5"	22,000	15,400	44,000	38,100	31,100	22,000
1-1/16	26	3-1/4	5' 8"	25,800	18,000	51,600	44,700	36,500	25,800
1-1/8	28	3-1/2	5' 11"	29,400	20,500	58,800	50,900	41,500	29,400
1-5/16	32	4	6' 10"	39,200	27,400	78,400	67,800	55,400	39,200
Plasma® 12x12									
1-5/8	40	5	9' 1"	58,200	40,700	116,400	100,800	82,300	58,200
1-3/4	44	5-1/2	9' 10"	62,800	43,900	125,600	108,700	88,800	62,800
2	48	6	11' 0"	71,000	49,700	142,000	122,900	100,400	71,000
2-1/8	52	6-1/2	11' 7"	85,600	59,900	171,200	148,200	121,000	85,600
2-1/2	60	7-1/2	13' 6"	106,000	74,200	212,000	183,500	149,900	106,000
2-3/4	68	8-1/2	14' 8"	132,000	92,400	264,000	228,600	186,600	132,000
3	72	9	16' 0"	156,000	109,200	312,000	270,100	220,600	156,000
3-1/4	80	10	17' 2"	188,000	131,600	376,000	325,600	265,800	188,000
3-1/2	84	10-1/2	18' 6"	221,600	155,100	443,200	383,800	313,300	221,600
3-5/8	88	11	19' 1"	250,000	175,000	500,000	433,000	353,500	250,000
3-3/4	92	11-1/2	19' 8"	263,400	184,300	526,000	456,200	372,500	263,400
4	96	12	21' 0"	304,000	212,800	608,000	526,000	429,900	304,000
5	120	15	25' 11"	413,900	289,700	827,000	716,000	585,000	413,900
5-1/2	132	16-1/2	28' 5"	499,500	349,600	999,000	865,000	706,000	499,500
6-1/8	148	18-1/2	31' 6"	613,000	429,000	1,227,000	1,062,000	867,000	613,000

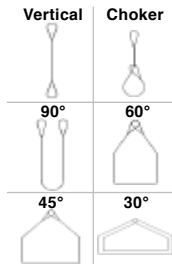


Table #1

Basketed eye-and-eye bending efficiency factor	
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 reduced basket capacity for bending:
 C (basket capacity) = B (rated basket capacity) x e (basket efficiency %)

Plasma® Braided Rope Slings – Endless Loop (Grommet) – LBS Vertical, choker and basket hitches

Ratings based on Design Factor of 5:1, and D:d of 8:1

Nominal Size			Minimum Sling Length Ft/Inch	Vertical	Choker	Basket at 90°	Basket at 60°	Basket at 45°	Basket at 30°
Dia. inch	Dia. mm	Circ. inch		Sling Capacity Ratings at Work Load Limits (WLL) in Pounds Do Not Exceed WLL					
Plasma® 12-Strand									
9/16	14	1-3/4	1' 2"	12,500	5,300	22,500	19,400	15,900	11,200
5/8	16	2	1' 4"	16,900	7,190	30,500	26,400	21,500	15,200
3/4	18	2-1/4	1' 6"	22,600	9,590	40,600	35,200	28,700	20,300
7/8	22	2-3/4	1' 10"	30,500	12,900	55,000	47,600	38,800	27,500
1	24	3	2' 0"	36,300	15,400	65,300	56,500	46,200	32,600
1-1/4	30	3-3/4	2' 6"	54,400	23,100	98,000	84,800	69,300	49,000
1-5/16	32	4	2' 8"	64,600	27,400	116,400	100,800	82,300	58,200
1-1/2	36	4-1/2	3' 0"	72,900	30,900	131,200	113,600	92,800	65,600
Plasma® 12x12									
1-5/8	40	5	3' 4"	96,000	40,700	172,800	149,600	122,200	86,400
2	48	6	4' 0"	117,100	49,700	210,800	182,600	149,100	105,400
2-1/8	52	6-1/2	4' 4"	141,200	59,900	254,200	220,100	179,700	127,100
2-1/2	60	7-1/2	5' 0"	174,900	74,200	314,800	272,600	222,600	157,400
2-5/8	64	8	5' 4"	196,600	83,400	354,000	306,500	250,300	177,000
2-3/4	68	8-1/2	5' 6"	217,800	92,400	392,000	339,500	277,200	196,000
3-1/8	76	9-1/2	6' 4"	280,500	119,000	504,000	437,200	357,000	252,400
3-1/4	80	10	6' 6"	310,200	131,600	558,000	483,500	394,800	279,100
3-1/2	84	10-1/2	7' 0"	365,600	155,100	658,000	569,000	465,300	329,000
3-3/4	92	11-1/2	7' 6"	434,600	184,300	782,000	677,000	553,000	391,100
4-1/2	108	13-1/2	9' 0"	602,000	255,700	1,085,000	939,000	767,000	542,000
4-3/4	116	14-1/2	9' 6"	635,000	269,700	1,144,000	991,000	809,000	572,000

Table #2

Vertical grommet bending efficiency factor	
2:1	98%
1.5:1	93%
1:1	88%

Table #3

Basketed grommet bending efficiency factor	
8:1	100.0%
5:1	97.0%
3:1	91.0%
2:1	88.0%
1:1	79.0%

To calculate reduced basket capacity for bending:
 C (basket capacity) = B (rated basket capacity) x e (basket efficiency %)

Calculating Vertical Hitch Bending Efficiency

The D:d bending efficiencies mentioned in this document are only to be used for Plasma® eye-and-eye or grommet 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

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 2-1/2" Eye-and-Eye Sling, in a 90° basket hitch around a 4.25" diameter trunnion.
(Contact curvature/Nominal rope diameter) = $4.25/2.5 = D:d \text{ Ratio} = 1.7$
2. Find closest D:d efficiency factor from table 1 on panel 6, 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 (**212,000 lbs.**). Reduced basket rated capacity = $212,000 \text{ lbs.} \times 65\% = \mathbf{137,800 \text{ lbs}}$

Determining Reduced Vertical Capacity Sling Rating in Endless Grommets

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 2" Grommet Sling, in a vertical hitch on two 4.25" diameter trunnions.
(Contact curvature/Nominal rope diameter) = $4.25/2 = D:d \text{ ratio} = \mathbf{2.125}$
2. Find closest D:d efficiency factor from table 2 on panel 8, 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 **98%**, by the slings vertical capacity (VC) found in column 5 of panel 8 (**117,100 lbs.**). Reduced rated capacity = $117,100 \text{ lbs.} \times 98\% = \mathbf{114,785 \text{ lbs.}}$

Determining Reduced Basket Capacity Sling Rating in Endless Grommets

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 2" Grommet Sling, in a 90° basket hitch around a 4.25" diameter trunnion.
(Contact curvature/Nominal rope diameter) = $4.25/2 = D:d \text{ ratio} = \mathbf{2.125}$
5. Find closest D:d efficiency factor from table 3 on panel 8, 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 = **88%**
6. Multiply grommet basket efficiency factor **88%**, by the slings 90° basket capacity found in column 5 of panel 8 (**210,800 lbs.**). Reduced basket rated capacity = $210,800 \text{ lbs.} \times 88\% = 185,504 \text{ lbs.}$

Ordering and proper use of Plasma® rope lifting slings

Ordering

- Using the rated capacity charts on panels 6 and 8 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 150°F (65°C) then slings made of a different material should be considered. Plasma slings should not be stored or exposed to temperatures above 160°F (70°C) for periods longer than 2 hours even when not under load. Plasma slings should never be exposed to temperatures higher than 265°F (130°C) even for brief periods of time. Plasma rope slings exhibit no loss of strength in cold environments. 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 replacement 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 – Inspect the tag

- Make sure the tag is in place and the mandatory information on the tag is legible







Step # 2 – Inspect the wear protection

- Begin at the bearing surface of the eye, and work your way down the rope sling
- Inspect the sling protection for cuts, snags, compression, abrasion and/or other damage
 - If damage is detected on the protection, further inspection of the fiber 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 or pulls in strands
 - Overall abrasion of rope—see chart 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 (remove sling from service)		

Quick inspection chart

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





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