

Rotation-resistant and low-torque ropes

Rotation-resistant ropes can frequently provide the best and most economical service in specific applications when you choose, handle and use them properly.

Contra-helically laid, rotation-resistant ropes are different from standard ropes because they're designed to reduce rope torque. Modes of failure and wear for rotation-resistant ropes can differ from those for standard rope constructions. The very nature of these ropes requires special handling, selection and usage. They are more susceptible to kinking, crushing and unbalancing in the form of "core pops" and "birdcages." Use extreme care to avoid operational practices that can possibly lead to these conditions.

THERE ARE DIFFERENT TYPES OF ROTATION-RESISTANT ROPES IN ASTM A1023, CATEGORIZED BY THEIR RESISTANCE TO ROTATION.

CATEGORY 1 ROTATION-RESISTANT ROPE – has at least 15 outer strands, has three layers of strands (over a center) and has little or no tendency to rotate, or, if guided, transmits little or no torque.

CATEGORY 2 ROTATION-RESISTANT ROPE – has 10 or more outer strands, has two or more layers of strands (over a center) and has a significant resistance to rotation.

CATEGORY 3 ROTATION-RESISTANT ROPE – has no more than 9 outer strands, has two layers of strands (over a center) and has limited resistance to rotation. For best performance, Category 2 and 3 rotation resistant ropes should not be used with a swivel. Category 1 rotation-resistant rope may be used with a swivel.

Because rotation-resistant ropes are special, there are separate design, maintenance, inspection and removal criteria established for them in many industry regulations and standards. Rotation-resistant ropes must be replaced when you see two randomly distributed crown wire breaks in six rope diameters – or four randomly distributed crown wire breaks in 30 rope diameters. If any significant reduction in diameter is found in a short length of a rotation-resistant rope, the rope needs to be replaced.

Rotation-resistant ropes must be used with a minimum design factor of 5.0.



USE EXTRA CARE

- > The very nature of rotation-resistant ropes requires special handling, selection and usage.

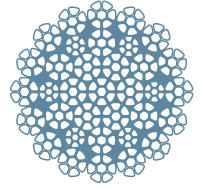
FLEX-X® 35

Flex-X 35, a Category 1 rotation-resistant rope, features a unique design that minimizes the torque and rotation of the rope at normal load ranges of zero to 20% of the rope's minimum breaking force (MBF). In addition, Flex-X 35 is engineered to give you maximum strength per diameter while also achieving superior fatigue resistance. These factors combine to give you the maximum service life when you have long block falls or load control is critical. Unlike other rotation-resistant ropes, swivels can be used in your system with Flex-X 35.

Flex-X 35 wire rope has one of the highest strength-to-diameter ratios on the market. ASME B30.5 Mobile and Locomotive Cranes requires a design

factor of 3.5 for 6-strand hoist ropes. The same standard requires a design factor of 5.0 for rotation-resistant ropes. The MBF of Flex-X 35 is such that even with the 5.0 design factor, it has lifting capacities that equal or exceed 6-strand XIP ropes utilizing a 3.5 design factor. Other ropes of similar construction do not provide this benefit.

The characteristics of Flex-X 35 enhance its performance in multiple-layer spooling as well. The lang lay design coupled with the special Flex-X features provide excellent resistance to abrasion that occurs at kickover areas in drum spooling. The rope construction combined with the compacted strand design of Flex-X 35 results in a rope cross-section of very high density. This feature provides increased resistance to crushing.



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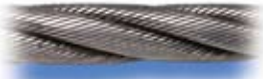
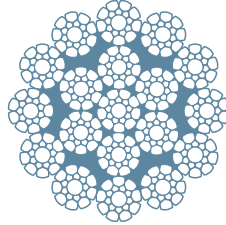
MINIMUM BREAKING FORCE AND WEIGHTS FOR FLEX-X 35

Diameter (mm)	Approximate weight/foot (lbs.)	Minimum breaking force (tons of 2,000 lbs.)
13	0.60	20.4
16	0.90	30.6
18	1.2	38.5
19	1.3	42.9
22	1.7	57.2
25.4	2.2	75.8
26	2.3	79.3
28	2.7	91.6
30	3.1	105
32	3.5	119

FLEX-X® 19 PS

Flex-X 19 PS, a Category 2 rotation-resistant rope, is made from 19 strands. Six strands are laid around a core strand in one direction, and then 12 strands are laid around this first operation in the opposite direction. Because of its tightly compacted smooth design, Flex-X 19 PS offers more crushing resistance than standard 19 x 7 rope, higher strength-to-diameter, resistance to bending fatigue, exceptional stability, reduced wear to sheaves and drums, and improved handling, operating and spooling characteristics.

Flex-X 19 PS has also demonstrated greater fatigue resistance to substantially cut rope expense and extend service life. It's ideal for multi-part hoist lines wherever you encounter spooling problems, drum crushing, block twisting or have fast line speeds.



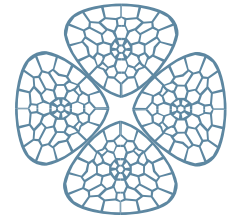
> With its unique design, XLT⁴ brings more high-tensile steel into the rope's diameter, resulting in one of the highest strength-to-diameter ratios.

XLT⁴

Behind every rope, Union uses the global leadership of WireCo WorldGroup's in-house metallurgists, designers and engineers. Our XLT⁴ is no exception to our world-renown rigorous testing, tracking and expert service. We call this rope "XLT⁴" because it has extremely low torque, plus it has the minimum breaking force of a 6-strand XXXXIP (4X) IWRC rope.

MORE LIFT – LESS TORQUE – LOWER COST

What sets XLT⁴ apart is its unique design. Double compacted XLT⁴ packs more high-tensile steel wire into the rope's diameter, resulting in one of the highest strength-to-diameter ratios ever achieved – with a minimum breaking force 33% higher than standard 6-strand XIP ropes.



Under load, XLT⁴ generates near-zero torque, matching or surpassing the stability of Category 1 35 x 7 class rotation-resistant ropes. Yet, thanks to its unique design, XLT⁴ is not classified as a "rotation-resistant" rope. You can use it with or without a swivel as a mobile crane hoist rope at design factors as low as 3.5 to 1.

As with any rope, proper installation is key – particularly for the base layers and all layers that do not come off the drum during normal operation. To maximize performance and avoid "pull-in," the rope must be spooled on the drum under load, ensuring that the rope is both tight against adjacent wraps and tight around the drum. As with any rope, XLT⁴ will perform better on a grooved drum.

MINIMUM BREAKING FORCE AND WEIGHTS FOR ROTATION-RESISTANT AND LOW TORQUE CRANE ROPES

Diameter (in.)	FLEX-X® 19 PS		XLT4™		19 X 7 XIP®		8 X 25 XIP®	
	Approx. wt./ft. (lbs.)	Minimum breaking force (tons of 2,000 lbs.)*	Approx. wt./ft. (lbs.)	Minimum breaking force (tons of 2,000 lbs.)	Approx. wt./ft. (lbs.)	Minimum breaking force (tons of 2,000 lbs.)*	Approx. wt./ft. (lbs.)	Minimum breaking force (tons of 2,000 lbs.)*
3/16					0.064	1.57		
1/4					0.113	2.77		
5/16					0.177	4.30	0.18	4.63
3/8					0.25	6.15	0.26	6.63
7/16	0.43	11.8			0.35	8.33	0.36	8.97
1/2	0.49	15.4	0.51	17.7	0.45	10.8	0.47	11.6
9/16	0.65	19.4	0.65	22.3	0.58	13.6	0.60	14.7
5/8	0.78	23.8	0.79	27.4	0.71	16.8	0.73	18.1
3/4	1.16	34.0	1.1	39.2	1.02	24.0	1.06	25.9
7/8	1.58	46.0	1.5	53	1.39	32.5	1.44	35.0
1	2.05	59.8	2.1	68.9	1.82	42.2	1.88	45.5
1 1/8	2.57	75.2	2.6	86.7	2.30	53.1	2.39	57.3
1 1/4					2.83	65.1	2.94	70.5
1 3/8					3.43	78.4	3.56	84.9
1 1/2					4.08	92.8	4.24	100

* The minimum breaking force applies only when a test is conducted with both ends fixed. When in use, the minimum breaking force of these ropes may be significantly reduced if one end is free to rotate.