

# PRODUCT BULLETIN



A WireCo® WorldGroup Brand

## Use of active, in-line, anti-friction swivels with wire rope

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Using an active, in-line, anti-friction swivel with the majority of types and classes of wire ropes is detrimental to their service life and can lead to unpredictable conditions during operation. The use of an active in-line swivel with a wire rope, other than a category 1 rotation-resistant wire rope, as defined by ASTM A 1023, is not recommended and can:

- Result in a reduction in the breaking strength of the wire rope
- Have an adverse effect on wire rope performance & service life
- Result in wire rope deformations and contribute to accelerate fatigue

Under load, the helically shaped strands of a wire rope want to straighten in an effort to release the resulting torque. Both the internal and external strands in a standard, or non-rotation-resistant, wire rope are helically laid in the same direction. Operational loading and unloading of the wire rope shifts the load balance back and forth between the inside and outside strands. This contributes to accelerate internal wear and fatigue. Testing has shown that non-rotation-resistant (standard) wire ropes loaded with one end free to rotate using a swivel have failed between 40% and 60% of their minimum breaking forces (MBF). While under load, the rope's core takes on a larger part of the load than to what it was designed. In operation, various wire rope deformations and damage can also occur.

Rotation-resistant wire ropes are designed with the external strands laid in the opposite direction to their internal strands. This reduces the load induced torque within the wire rope. There are different levels of rotation-resistance. The different levels are defined in ASTM A 1023 and are as follows:

- Category 1 – Little or no tendency to rotate
- Category 2 – Significant resistance to rotation
- Category 3 – Limited resistance to rotation

Category 1 rotation-resistant wire ropes would include, but are not limited to, 34X7 and 35X7 class wire ropes. Category 2 rotation-resistant wire ropes would include, but are not limited to, 18X7 and 19X7 class wire ropes. Category 3 rotation-resistant wire ropes would include, but are not limited to, 8X19 class wire ropes.

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## Use of active, in-line, anti-friction swivels with wire rope (continued)

The balancing between the internal torque and the external torque in category 1 rotation-resistant wire ropes occurs very early in the process when the wire rope is subjected to loading. When allowed to rotate under load via an active, in-line swivel, category 2 and category 3 rotation-resistant wire ropes also work to reach a point where the internal and external torques balance. However, in the process, these wire ropes' cores take on excessive twist and load. This leads to accelerated internal degradation and overloading of the core. Other deformations and damage to these wire ropes can occur as well.

With one end of test samples free to rotate via an active, in-line swivel, testing has shown that category 2 rotation-resistant wire ropes can fail at loads between 60% and 80% of their MBFs and category 3 rotation-resistant wire ropes can fail at loads between 40% and 70% of their MBFs. Category 1 rotation-resistant wire ropes tested with active, in-line swivels showed little to no loss in strength.

The use of an active, in-line, anti-friction swivel with any wire rope type and class that is not designed to exhibit the same rotational characteristics as that of a category 1 rotation-resistant wire rope is not recommended.

In applications where the use of an active, in-line, anti-friction swivel is desired, the use of a category 1 rotation-resistant wire rope is recommended and can actually be beneficial to the wire rope's performance during operation.

