

# Best Practices

## LAN Cable

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# Introduction

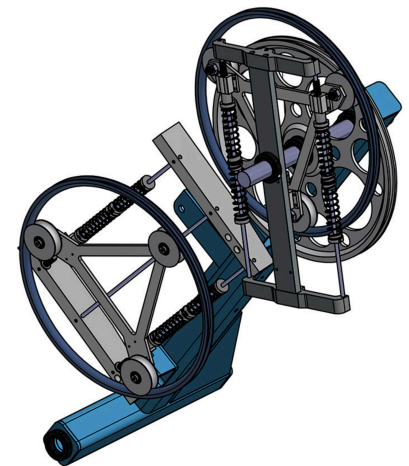
While many manufacturers have no issues packaging Category 6 (and higher) products in REELEX, some companies have reported electrical testing issues and performance degradation when using REELEX. These issues are caused by the frequency of the cross-overs in the REELEX coil leading to “dents” or deformation of the product. Over long lengths, these “dents” add up to signal errors and transmission problems.

The purpose of this document is to inform the licensee on how to mitigate the loss in signal performance when using REELEX.

## Mechanical Components

### Buffer

The performance of the buffer is essential to even tension and delicate handling of the cable. **All machines winding twisted-pair products should be equipped with high-performance 15 inch sheaves.** If your equipment is not currently equipped with the buffer type shown below, a buffer upgrade is required.



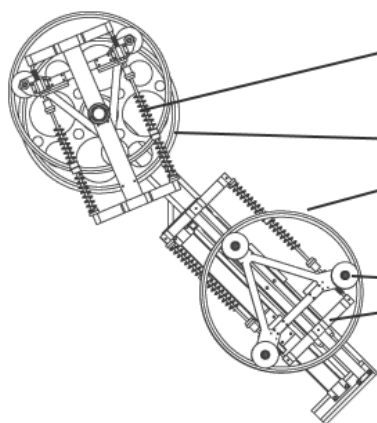
### Buffer Upgrade

This upgrade provides a lighter weight buffer assembly using two spring-mounted ring sheaves along with larger diameter (15 inches, or 380mm) buffer wheels.

On a D-1500, a retrofit mounting kit may be needed for the anti reverse mechanism as well as a revised hanging guard assembly.

To order an upgrade, call +1 845-878-7878 or email [sales@reelex.com](mailto:sales@reelex.com).

## Buffer Performance Checks



### Buffer Springs

One very common reason for LAN cable issues is worn or broken buffer springs. Non-functioning springs drastically increase stress on the cable. Inspect springs carefully and replace if worn or broken.

### 15" Lightweight Sheaves

Buffer should be equipped with lightweight 15" (38cm) diameter plastic sheaves. These sheaves reduce rotational inertia and increase the bending radius placed on the cable.

### Bearing and Wheel Lubrication

Spray roller block bearings and wheels with SILICONE SPRAY. Do not use grease or oil! Check function of bearings to ensure smooth movement. Make sure rim itself rolls smoothly.

## Buffer Replacement Kit

REELEX Offers a wearing parts replacement kit that includes commonly worn parts. Alternatively, you can order a complete refurbished buffer and swap out your worn buffer. To order a kit or replace your current buffer with a new one, call +1 845-878-7878 or email [sales@reelex.com](mailto:sales@reelex.com).

### Buffer Repair Kit - Part Number:

REPAIR-BUF/01

### Refurbished Buffer Swap:

REFURB-BUF/01

# Line Tension and Air Pressure

Tension is absolutely critical to REELEX coil formation and critical to LAN cable performance.

**NOTE:** Line tension should always be as low as possible (usually **5 to 15 psi**, or **0.3 to 1.0 bar**), but not so low as to cause whipping in the cable between the buffer and the traverse.

## Symptoms of Too-High Tension:

- “Dents” in the cable jacket
- Payout hole closes up during winding

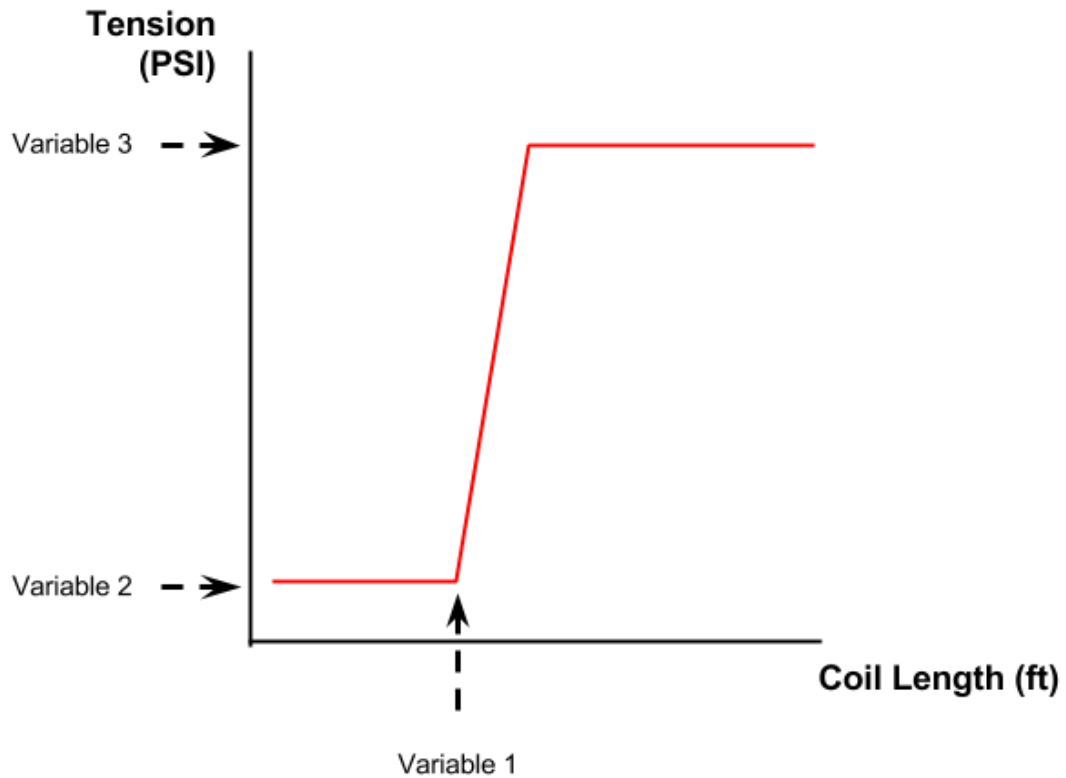
## Symptoms of Too-Low Tension:

- Coil collapses / falls apart during winding when nearing desired length
- Payout hole closes up during winding
- Coil falls apart when packing
- Line speed instability in constant line speed modes.

## Air Regulator

Be sure to use REELEX air regulators part number FRL-REG/100HR to prevent spikes in pressure. The use of alternative regulators can cause pressure spikes, as they do not exhaust as quickly as the REELEX model.

## Two-Stage Tension Control



Enabled by the [G2 or G3 control systems](#), the UDA can utilize a digital air regulator and high-flow cylinder for adjustable tension control. This means each product can have their ideal tension control map, helping to mitigate the effects of physical pressure placed on the cable at the crossover point.

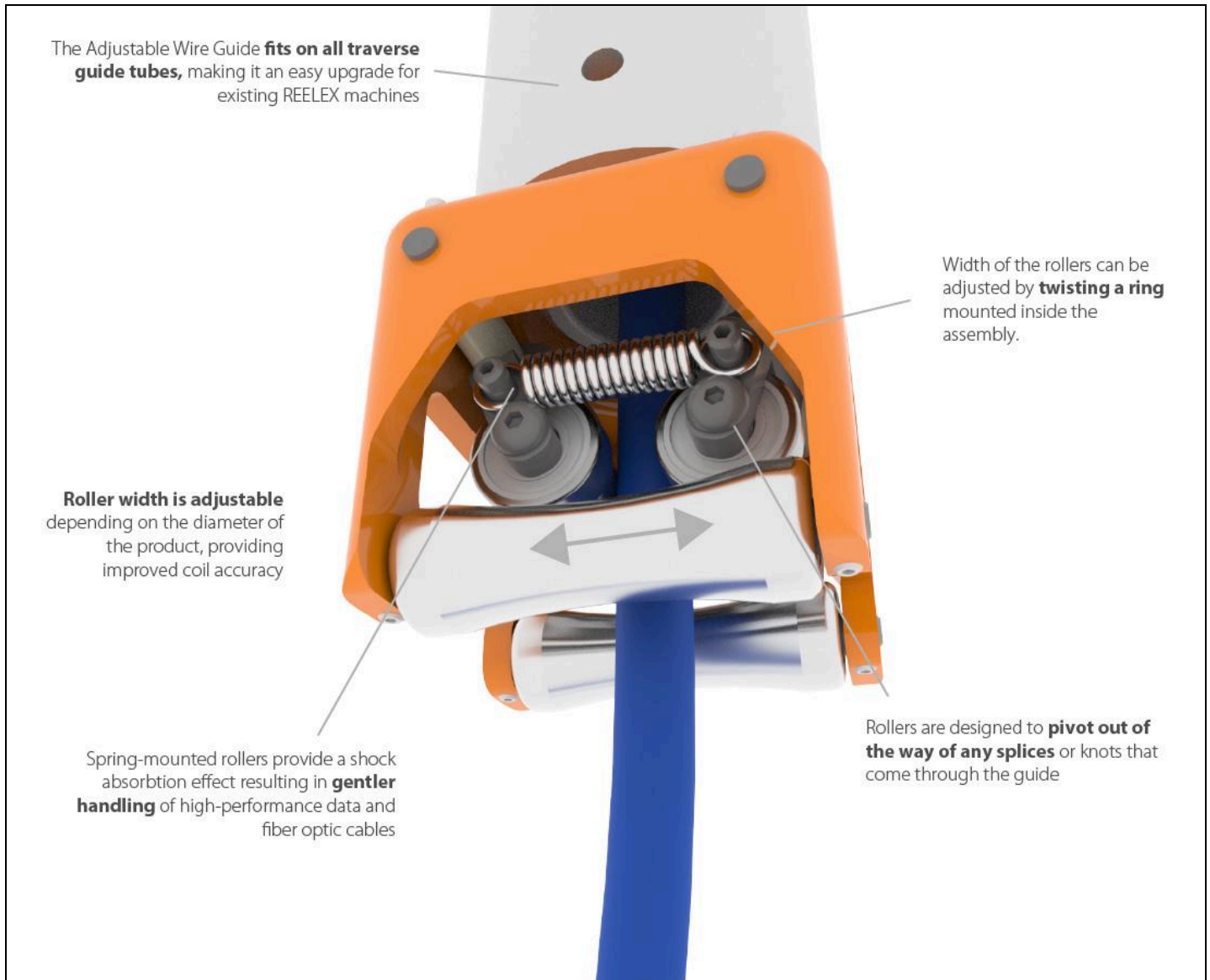
This feature is available on all G2 and G3 REELEX machines equipped with HMI when used in conjunction with a dancer equipped with a digital air regulator.

**For more information:** [www.reelex.com/machines/dancers/](http://www.reelex.com/machines/dancers/)

# Adjustable Wire Guide

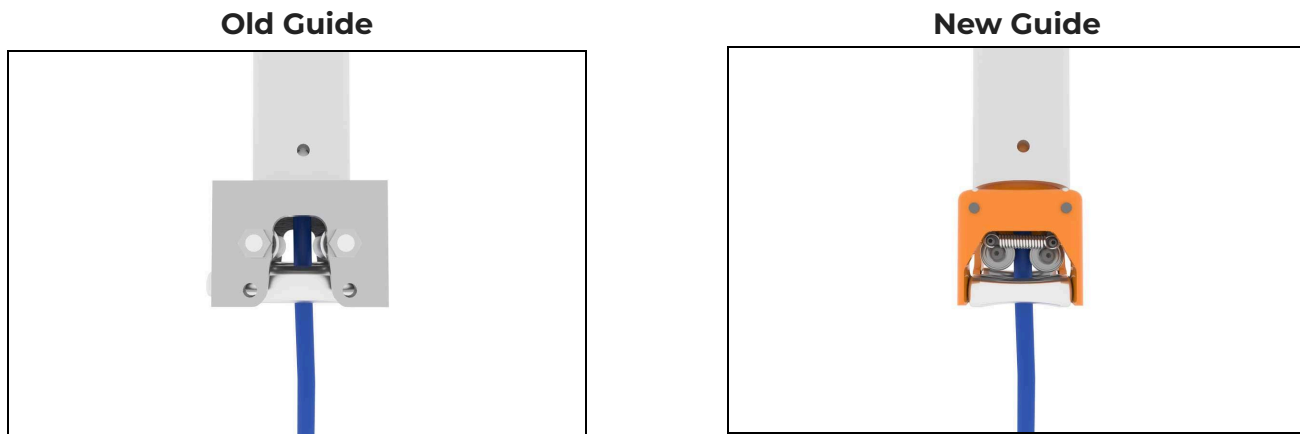
The Wire Guide assembly is a set of rollers mounted to the exit end of the traverse guide tube. The guide's purpose is to precisely deliver the product to the mandrel in a controlled manner in order to ensure the REELEX® coil is well-formed. As the last point of contact the product makes with the machine, the Wire Guide must precisely control the product, yet do so without causing product deformation or damage.

REELEX's adjustable wire guide increases the precision placement of the wire on the surface of the coil while offering both a "cushioning effect" on the cable as well as reducing the impact the cable incurs during high-speed traversing. This device has shown measurable improvements to the performance of certain cable constructions.

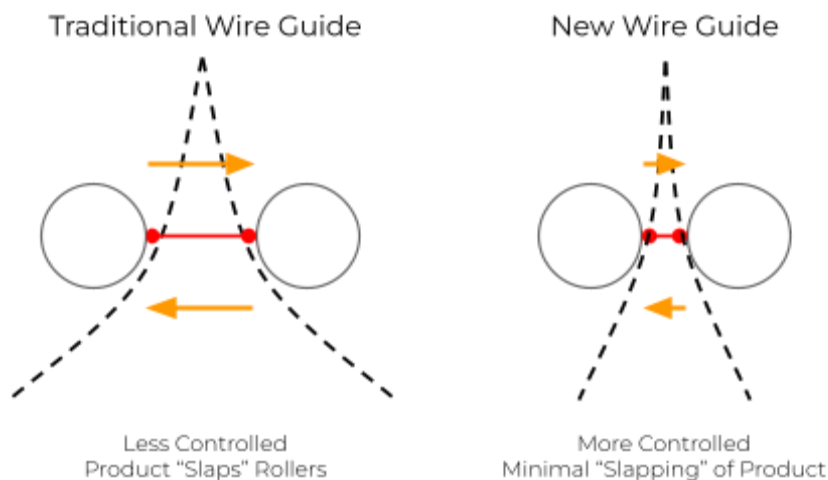


The distance between rollers is adjustable by twisting the mounting collar. By moving the rollers closer to the product, the cable is handled more precisely, leading to greater coil accuracy and gentler handling. This is particularly important on high-performance twisted-pair LAN cables, as the "slapping" encountered as the product moves back and forth between rollers can now be mitigated. The increase in accuracy also means improved coil formation, particularly for products with slippery jackets or inherent twist.

## Features



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- **Durability** has increased dramatically by selecting hardened materials. Rollers are made from titanium. These high-grade materials nearly eliminate wear, meaning a single wire guide may last several years before requiring replacement.
- **Lightweight materials and improved design reduces traverse wear and reduces errors.** Weighing in at under 5.3oz, the new Wire Guide features a weight reduction of nearly 25% compared to older wire guide designs. This results in less inertia and reduced wear on the high-speed traverse. At high speed, the change in speed at the end of the traverse stroke can exceed 60g. By reducing the mass at the end of this stroke, traverse errors are reduced, leading to improved coil formation.
- **Spring-mounted rollers** allow for knots and jacket deformities to pass through the rollers harmlessly without getting hung up and without moving the rollers out of their set position.
- **Plug-and-play** compatibility means the new Wire Guide assembly can be used on nearly any REELEX machine and is easily field-retrofitable. Simply install and adjust to your product's diameter (rollers should



be adjusted so that the product can easily slide between rollers without pressure placed on the jacket.)

## Counter Wheel

If equipped with a wheeled length counter, the counter wheel pressure could be set too high causing excessive friction in the cable. **Air regulator should be set to 5 psi (0.3 bar).**

Where possible, use a non-contact (laser) length counter.

## 10-Inch (25cm) Mandrel

Standard REELEX mandrel sizes are 6, 8 and 10 inches in diameter. A larger mandrel can significantly reduce the bend radius required for the cable to exit the package, lessening stress on the cable and improving payout performance and smoothness.

The 10-inch mandrel's larger circumference also distributes any deformations made in the cable during winding - reducing their effect. To determine the effect a 10-inch mandrel may have on your package size, please use the REELEX packaging calculator located here: <http://www.reelex.com/support/packaging-calculator/>

To quote an upgrade, email [sales@reelex.com](mailto:sales@reelex.com).

## Coil sizes on 8-inch versus 10-inch Mandrels

It should be noted that coil sizes do not increase by 2 inches in diameter when switching from an 8-inch to a 10-inch mandrel. Interestingly, increasing the inside diameter of the coil by 20% does not translate to a 20% increase in overall coil diameter, and for larger cables the difference in overall diameter can reach almost zero.

## Coil Size Example

In the example below, two identical fiber optic cables measuring 0.20 inches OD (5mm) were wound using the same coil parameters. Each coil is 500m.

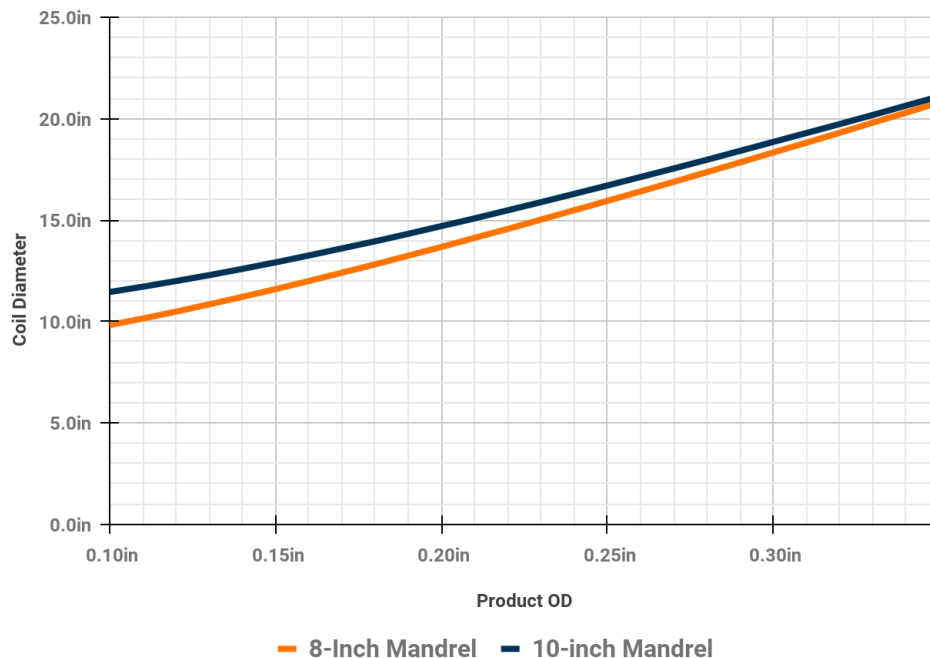
The coil on the left was wound on a 10-inch mandrel and measures just under 18.25 inches (460mm) diameter.

The coil on the right was wound on an 8-inch mandrel and measures 17.75 inches (450mm) diameter.



As a result, we can see that a 2-inch change in mandrel diameter does not result in a 2-inch change in overall diameter. In fact, for products above 0.25 inches OD, the difference can be nearly imperceptible.

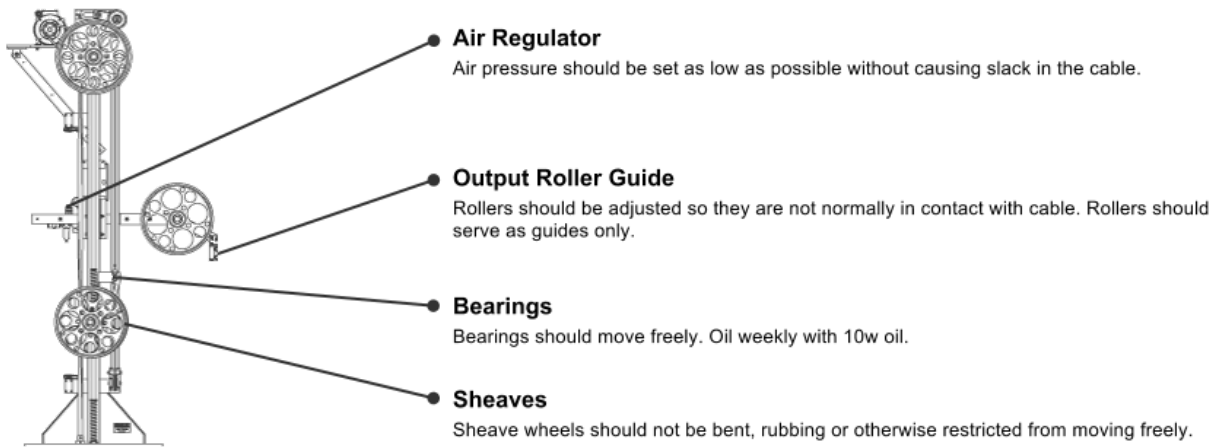
Coil Diameter (1,000ft/305m) by Product OD and Mandrel Size



**REELEX recommends all products over 0.25 inches (6.3mm) diameter to use 10 inch mandrels.**

# Dancer (UDA or BDA)

## Performance Checks and Maintenance



### 15-Inch Sheave Upgrade for Dancer/Accumulators

As with the buffer system, the dancer/accumulator should also be equipped with 15-inch high-performance sheaves. To order an upgrade, call +1 845-878-7878 or email [sales@reelex.com](mailto:sales@reelex.com).

# Dancer Upgrade

The two-block dancer upgrade by REELEX provides the user with flexibility of operation depending on product robustness and sensitivity to tension. Consult REELEX for expert assistance if you are unsure of which type you currently have.

Advantages of the two block system upgrade include the following:

1. Since the block with sheaves can drop independently of the cylinder, the system will exhibit:
  - a. Faster slack take-up from the payoff if very low tension pressures are being run (~<10lbs).
  - b. Faster stop response in case of loss of string up if running very low tensions.
2. As a result of having a spring located between the cylinder and the sheaves you may see lower line tension spikes as a result of higher pressures in the cylinder during sudden emptying of the accumulator.

**Reference:** [Drawing 15188](#)

If Drawing 15188 is **installed**, the user is provided with the String-Up Assist that brings the bottom sheaves up close to the top sheaves. This allows the user to string up the dancer without having to reach a long distance between the two sets of sheaves which potentially includes mounting and dismounting a step or ladder. REELEX recommends this configuration for most applications.

If Drawing 15188 is **removed**, the user is provided with superior tension control for very delicate products through the function of the 2 block buffer system. REELEX recommends this configuration for very delicate products in which normal tensions cannot be run as a result of either product damage, or the effect tension has on the REELEX coil itself.

# Traverse Best Practices

## Traverse Guide Tube

**Distance:** The guide tube should always be set as close as possible to the endforms without the guide or the product striking them. This ensures precise control over the cable during winding. If the guide tube is too far away, the product can fall over the ends of the coil and cause excessive denting. The guide tube stroke should also be centered between the endforms.

**NOTE:** The product should never “bend” over the endforms during winding. If it does, confirm that the mandrel is centered to the traverse and that the guide tube is not set too low. The product should barely contact the endforms during winding.

Example of product bending over endforms:



Incorrect



Correct

**Orientation:** Roller guides with box roller outputs should have the guides controlling the left-right motion closest to the endform. If this is not the case, rotate the guide 90 degrees.

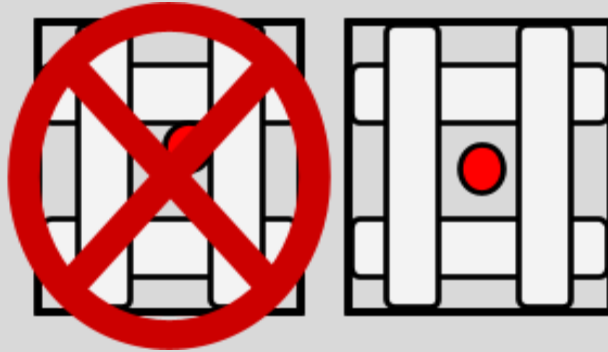
**Type:** Four-roller type guides should be used.

**Reference:** [Drawings 99511](#) - Wire Guide Types

## Wire Guides Within REELEX Line

All wire guides on the REELEX line (dancer, accumulator, footage counters, etc.) are potential points of contact for the cable. Wire guides are not intended to be rollers and thus should be aligned so that the cable passes through the guide with minimal (or no) contact.

**NOTE:** Please pay particular attention to line alignment and spacing per the line layout. Ensure that the cable comes into contact as little as possible with components like guides, box rollers, etc. Not doing so could have electrical performance impacts on twisted-pair products.



Example of incorrect alignment:



# Motorized Payoff

Use of a motorized payoff is required in offline (rewind) setups. Non-motorized, drag-type payoffs increase line tension and are incompatible with winding LAN cables.

## Can I use a non-REELEX payoff with my REELEX machine?

Yes, however you will likely be unable to achieve maximum performance from your REELEX machine. This is because underpowered payoffs spend more time accelerating or decelerating than running at full speed. To achieve the specified rate of production from the REELEX machine, a payoff must be used that is capable of rapidly accelerating and decelerating a supply reel and keep it under control.

Mis-matched or underpowered payoffs can also create spikes in line tension.

If you plan to use a non-REELEX payoff with REELEX coiling machines, the payoff must:

- Have a four-quadrant regenerative DC drive.
- Accept inputs from a 1K to 5K Ohm potentiometer signal from the dancer ([UDA](#)).
- Be designed for rapid acceleration and deceleration from stop to full speed approximately 30 times per hour.
- Have adequate power to accelerate a full supply reel from stop to full speed in approximately 10 seconds.

# Electrical Components

## Density Program

If your machine is not equipped with the variable density program, it is strongly recommended that you take advantage of his free software upgrade.

The Density Program staggers the location of the crossovers so they occur at irregular intervals. In addition to allowing for increased coil density, the shifting of the crossovers have a significantly positive effect on the electrical performance of data cables such as Category 6, Category 6A and more. This means products that previously performed marginally in electrical testing can now be packaged in REELEX with little or no degradation in performance.

## Use G2 or Later Controls

The G2 and G3 Control Systems are a completely new operating system, hardware, cabinet and interface for all REELEX coiling machines. Integrating equipment control with troubleshooting, on-screen manual, packaging calculator, multi-language support, product storage, networking capability and more, these new control systems are designed for 21st century industrial environments.

The G2 and G3 Control Systems also incorporate unique software features that can assist with improving LAN cable performance. These features include:

- **Two-Stage Tension Control:** When used in conjunction with a digital air regulator, this feature allows tension to be extremely low in the crucial first few layers of the coil and increase as the coil grows. This can reduce or even eliminate crossover issues.
- **Two-Stage Speed Control:** Allows the first “x” number of feet of the coil to be wound slower than the rest of the coil. Can further reduce tension placed on the product.
- **Hole Taper:** Changes the angles of the payout hole walls which can eliminate “lumps” in the coil and precisely define the payout hole.

**For more information:** <http://www.reelex.com/machines/control-systems/>



# Coil Parameters

## Use Density

The use of the Density parameter staggers the occurrence of the crossovers, effective LAN cable performance.

## Use High Gains, High Density

Set your REELEX machine to use very high gains (example upper: 85 lower: 80) and a high density setting (example: 45 or 4.5 on G2 Machines).

This causes the first layers of the coil to be very loose, while the coil tightens significantly by the end. The variation in the crossovers from the beginning to the end of the coil can improve LAN cable performance.

## Use Widely Staggered Upper/Lower Gains

Use a very high Upper Gain (example: 80) and a low Lower Gain (example: 20). This has the effect of radically changing the number of crossovers in each layer.

Note that using Density in conjunction with a low average Gain could cause undesirable effects. Do not use a low gain with high density.

# Packaging

## Payout Tubes



**Small Payout Tube**



**Large Payout Tube**

REELEX II payout tubes were developed specifically for LAN cable in order to improve payout performance, reduce the bending radius placed on the cable during payout and reduce tension built up by the inherent twist in the cable.

- For more information on **REELEX II**, please visit: <https://www.reelex.com/packaging/reelex-ii/>
- For more information on **REELEX AIR**, please visit: <http://www.reelex.com/packaging/reelexair/>
- For more information on **EcoCore**, please visit: <http://www.reelex.com/packaging/ecocore/>.

# Correct Tube Depth

Reference: See [Payout Tube Selection Chart](#) document.

## Box Size

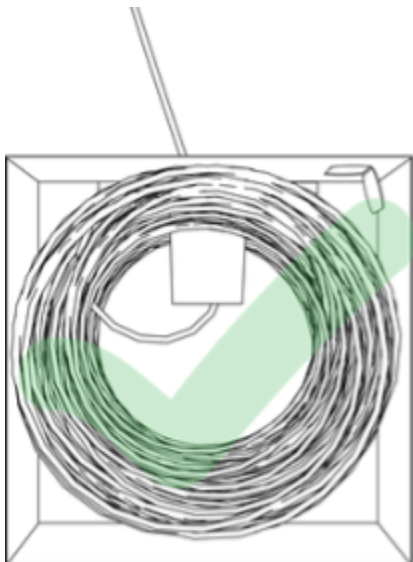
The dimensions of the coil should fit the inside dimensions of the box. The box should always fit the finished REELEX coil snugly.

- If the box is too **small** for the coil, the box will bulge and either cause problems stacking, or threaten the structural integrity of the box itself.
- If the box is too **big** for the coil, the coil could slide or rotate within the package and cause unraveling and tangling issues. Many tangling problems in the field are caused by too large a box. In addition, a coil that has fallen to the bottom of the box means the payout tube is not deep enough into the package, requiring the cable to make a sharp bend before exiting.

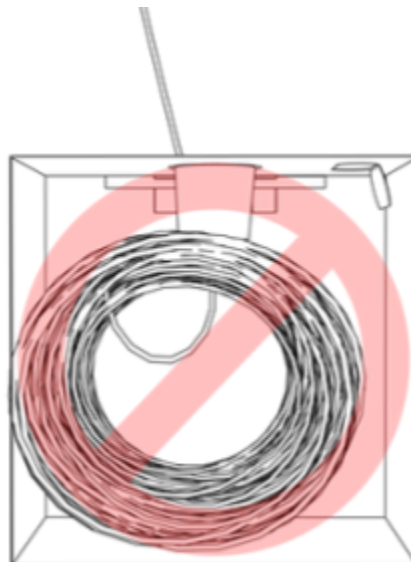
## Tube Size:

Whether using standard EZ-Tubes, EcoCore or REELEX II, the payout tube should always **protrude as close as possible into the center of the coil** for proper payout, or at least 1.00-inch (25mm) beyond the inside wall of the coil.

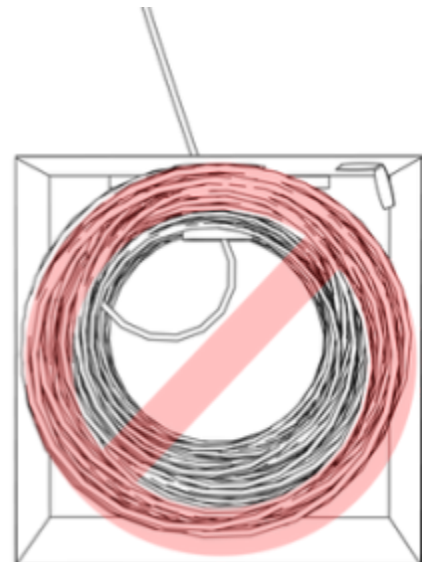
Using a tube that is too long or too short can cause tangling, kinking or other undesirable payout effects, and put added pressure on the wire by reducing its bend radius.



**Coil Fits Box  
Tube Correct Depth**



**Coil Does NOT FIT Box  
Tube Cannot Function Properly**



**Coil Fits Box  
Tube INCORRECT Depth**

# Tube and Coil Types

Coil Type	REELEX I	EcoCore and REELEX 1.5	REELEX II and REELEX AIR
<b>Payout Hole Size</b>	40 to 60 Degrees	60 to 90 Degrees	70 Degrees and Higher
<b>Payout Tube</b>	Two-piece plastic tube comprised of a payout tube and a snap-on locking ring with wire clip.  <b>Length:</b> 2in to 6in length (5cm to 15cm) <b>Diameter:</b> ø 0.75in (2cm)	Two-piece tube systems use either plastic or combines readily available paper “cores” with unique plastic locking ring.  <b>Length:</b> 2in to 8in length (5cm to 20cm) <b>Diameter:</b> ø 2in (5cm)	Single-piece funnel-shaped payout tube that “drops in” to the coil. Uses box design to capture payout tube (no locking ring).  <b>Length:</b> 6in length (15cm) <b>Diameter:</b> ø 2.50in (6.35cm) at product entry
<b>Product Diameter Range</b>	<b>Minimum:</b> ø 0.01in(0.25mm) <b>Maximum:</b> ø 0.15in (4mm)	<b>Minimum:</b> ø 0.05in (1mm) <b>Maximum:</b> ø 0.20in (5mm)	<b>Minimum:</b> ø 0.15in (4mm) <b>Maximum:</b> ø 0.40in (10mm)
<b>Coil Diameters</b>	ø 9in to ø 16in (23cm to 41cm)	ø 9in to ø 22in (23cm to 56cm)	ø 12in to ø 22in (30.5cm to 56cm)
<b>Typical Product Examples</b>	Security/alarm wire, audio cables, THHN, small single-conductor building wires, small fiber optic cables, hookup wires, plastic tubing.	With the exception of very small products, most products from building wire to twisted-pair cables are supported by EcoCore.	High-performance structured cabling (Cat 5e, Cat 6 and up), shielded cables including coaxial cables, less flexible products such as some drop wires.

REELEX I EZ-Tubes are recommended for highly flexible products that do not have memory and have relatively small diameters. Every product is different, so some experimentation is recommended.

REELEX II tubes and REELEX AIR are recommended for most communications cable products including Cat 5e, Cat 6 and Fiber Optics. Products that have poor payout performance with EZ-Tubes will likely perform well when packaged using REELEX II tubes. EcoCore and REELEX 1.5 payout tubes can be used for most security/alarm products.

## Tube Supply

REELEX has partnered with well-known spool supplier Axjo AB to manufacture and supply genuine REELEX payout tubes throughout the globe. With operations in North America, EU and China, Axjo is well positioned to support REELEX licensees globally.

### Contact information for Axjo:



Axjo AB

[www.axjo.com](http://www.axjo.com)

Customer Service Email: [sales@axjo.com](mailto:sales@axjo.com)