

CHOOSING THE RIGHT CABLE FOR YOUR SERVO APPLICATION

WHITE PAPER

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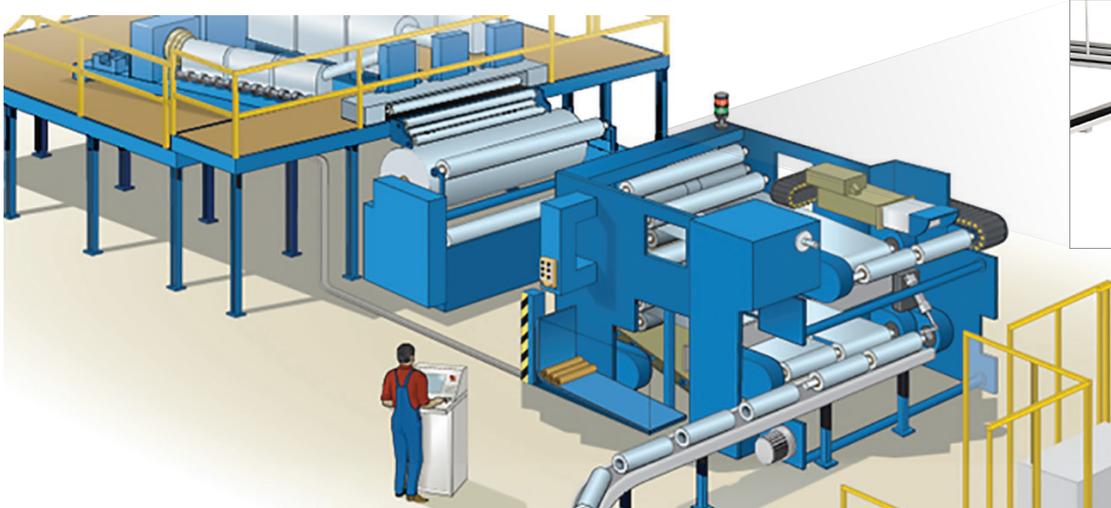
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In many servo applications the motor and drive are located a distance away from each other. This is often the case with large production systems utilizing several machining/operation stations. This situation presents three primary challenges: running the servo cable from the drive to the equipment that is flexing, maintaining connectivity over the distance, and installing cable to code.

One method of running cable from drive to equipment is through conduit within the factory infrastructure and then to the cable track. This method is up to code, but it is also labor and material intensive. The other option is to run tray-rated (TC or TC-ER) cable from the drive to equipment. Tray-rated cables are now more commonplace and can be routed within the plant infrastructure to factory floor equipment without conduit. However, that's where these cables hit a dead end. Unfortunately, they are not designed for continuous flexing within a cable track. To resolve this problem, the tray-rated

cable must be terminated at the end of the tray with a connector, and another cable that is continuous flex rated with its own connector must be assembled to connect to the tray-rated cable. A typical tray-rated cable in the above example can be a Variable Frequency Drive (VFD) cable. These cables are generally larger and heavier than servo cables with limited flexibility. The cables are terminated at the tray with a connector, and then connected to a continuous flex servo power cable. But like other TC cable, the VFD fails to meet the DESINA standard; often the cable diameter is too large for the appropriate connector and having multiple connection points often degrades the signal.

The new ÖLFLEX® SERVO FD 7TCE overcomes these challenges and additional costs by eliminating conduit, and the need for multiple cables and connection points. This is a single cable solution for the power connection to the servo motor.



One cable from tray to track.

TC-ER: DO IT WITHOUT CONDUIT

One way to avoid compliance problems in your servo installation is to use cables that have a Tray Cable-Exposed Run (TC-ER) rating. Per the National Electrical Code (NEC), TC-ER cables can run between the tray and machine without conduit provided certain parameters are met. For example, the cable:

- Must be continuously supported and protected against physical damage using mechanical protection, such as struts or angles.
- Must be secured at six-foot intervals.
- Must include an equipment grounding conductor within the cable.
- Must pass crush and impact tests.

There are many advantages to deploying TC-ER cables like the 7TCE. For one, eliminating conduit saves on material, lubrication, and labor costs. Running the cables in cable trays, rather than pulling them through conduit, also saves on installation time. Additionally, while standard tray cables cannot run more than six feet outside a tray without the required protection of cable armor or a raceway, TC-ER cables can run in unlimited lengths from the tray if properly



Along with being tray-rated, the ÖLFLEX SERVO FD 7TCE bend radius makes it ideal for tight corners.

SAY GOODBYE TO MULTIPLE CONNECTION POINTS

Deploying TC-ER cables eliminates the need to run intermediate cables between the tray and servo motor, reducing the number of connection points, and resulting in fewer points of weakness within the system. Improper seating of the connector contacts, for example, can increase the resistance, causing the temperature within the connector to rise and an increase in voltage drop. In turn, this can lower the voltage or even damage the equipment. The resulting increase in heat can also cause dangerous fires at high enough ampere loads.

supported. And finally, installers won't have to run any intermediate cables between the tray and servo motor, reducing the number of cables and connection points.

MECHANICAL DURABILITY

The ÖLFLEX SERVO FD 7TCE is designed to meet the stringent UL standards for tray cables, and its combination of mechanical and electrical properties makes it a durable, highly flexible servo cable for use in motor connections between drive, tray, cable track, and final connection to motor. This solution has applications across numerous industries including material handling, food and beverage, automotive, and many others.

The ÖLFLEX SERVO 7TCE features a specially formulated thermoplastic elastomer (TPE) jacket, and cross-linked XLPE insulation that can withstand high temperatures up to 105°C. In addition to being UV- and oil-resistant, the 7TCE is highly flame retardant and can even resist harsh cleaning solutions. Despite being so durable, the 7TCE is surprisingly thin compared to traditional XLPE tray cables, resulting in outer diameters as low as 9.78 mm and an overall lighter cable. At the same time, the strength of the cable is never compromised; the 7TCE passed all required cold and crush impact tests and is compliant with North American and European standards, including UL TC-ER, C(UL) CIC, CE, and RoHS.

The ÖLFLEX FD 7TCE has also been mechanically tested to hold up to moderate continuous flexing for several million cycles.

ECOLAB®

The special TPE insulation is resistant to a wide range of disinfecting solutions used in the food and beverage, chemical, and related industries as per ECOLAB PM 40-1 test requirements.



Cable tray requires cable tested for continuous flex. ÖLFLEX SERVO FD 7TCE is rated for continuous flex and can be installed in cable trays.

SUPERIOR ELECTRICAL PERFORMANCE

In addition to its mechanical durability, the ÖLFLEX SERVO 7TCE's electrical properties enable long-distance runs, and limit potential insulation breakdown. Installers tend to run TC-ER cables when sources of power, signal, or data transmissions are generated at a central distribution cabinet located some distance away. In servo applications the drive is typically located in a cabinet to centralize equipment monitoring. Oftentimes, these longer cable runs result in greater resistance and capacitance in the line—a combination that can lead to voltage drops or the unintentional energization of switching devices.

A FLEXIBLE CABLE FOR VARIABLE SPEED APPLICATIONS

Conductors with lower quality insulation can inadvertently energize switch devices. Magnetic fields generated by insulation with high dielectric constants can also trigger switch devices. This can be amplified with longer cable runs. The combination of higher charge capacity in long runs and poor insulation material can be detrimental to switches and other devices and equipment.

The 7TCE reduces these risks. Compared to other materials like PVC, the cable's XLPE and EPR insulation has excellent electrical properties—one being a low dielectric constant, the measurement of a material's ability to hold charge. The higher the constant, the more the material can hold charge. Material with a high dielectric constant will break down more easily than material with a low constant, resulting in current leakage.

The XLPE insulation in the ÖLFLEX SERVO 7TCE and EPR insulation in the ÖLFLEX SERVO FD 7TCE are beneficial in a number of ways:

- **Reduced insulation thickness.** Lighter cable with smaller ODs without compromising the strength needed for low temperature, crush, and impact tests required for TC-ER.
- **Low impedance.** Impedance in cabling is impacted by two types of occurrences: the current-induced magnetic field through the conductor, and the buildup of charge between conductors.
- **Longer cable runs.** Superior electrical properties maintain signal quality over longer distances.