

RoboFeed WireManager

Efficient Wire Feeding in Modern Welding Systems

In automated welding processes—especially arc and beam welding—reliable wire feeding is a key challenge. Increasingly, welding wire is transported from logistically favorable wire drums to the main wire feeder mounted on a robotic arm. The feed path often exceeds 20 to 30 meters and includes numerous bends. These bends cause significant friction within the wire conduit, hindering or even blocking wire movement. Each bend adds friction, and according to the Euler-Eytelwein rope friction formula

$$F_2 = F_1 \cdot e^{\mu\beta}$$

the pulling force required to draw wire through a conduit increases exponentially with the total wrap angle.

Symbol	Meaning
F_1	Pulling force on the slack side (e.g., at the wire drum)
F_2	Pulling force on the tight side (e.g., at the entry into the wire feeder)
μ	Coefficient of friction between the wire and the conduit/surface
β	Wrap angle in radians (not degrees!)
e	Euler's number $\approx 2,718$

The coefficient of friction also enters this equation exponentially. It is a dimensionless value that expresses how much force is needed to move two materials against each other, relative to the normal force pressing them together. This is where modern wire conduits with rolling elements (e.g. Rolliner) outperform traditional plastic or steel spiral liners. Thanks to reduced rolling friction, the coefficient of friction drops significantly—and since it enters the equation exponentially, the resulting effect is substantial. In large robotic systems with wrap angles exceeding 1000 degrees (e.g., wire routing through several energy chains), even Rolliner systems may not suffice to ensure process-stable wire feeding.

WORKING PRINCIPLE OF THE ROBOFEED WIREMANAGER

The RoboFeed WireManager was developed to overcome this issue. By applying a steplessly adjustable, constant push force, it presses the wire electrode against the outer wall of the conduit. This shifts the friction from the inner to the outer wall and prevents the wire from “sticking” to the inner liner. This method works with both conventional gliding-friction-based liners and with Rolliner systems. Wrap angles of over 2000 degrees and conduit lengths of more than 50 meters become manageable.

When optimally adjusted, the wire can be pulled from the end of the conduit with minimal force (two fingers). As a result, the robot's wire feeder needs little

to no effort to pull the wire through the upstream conduit.

Sensitivity is key to such a drive system. The force pushing the wire into the conduit must be finely tunable to avoid disengagement, and the response to changes in the main feeder's speed must be extremely fast.

AUTONOMOUS OPERATION WITHOUT ELECTRICAL COUPLING



A key feature of the system is its autonomous operation. RoboFeed requires no electrical connection to the robot or welding power source. It autonomously detects whether the main drive is running or stationary and adapts wire feeding accordingly. Whether the main feeder is



idle or running at full speed, RoboFeed provides a constant assistive force from behind. A 24-volt interface is available for optional start/stop control.

SMART WIRE INSERTION

The length of the wire conduit can either be learned during setup or entered manually. During insertion, the system feeds in exactly the predefined length at the push of a button and then stops automatically. If a blockage occurs during insertion (e.g., due to a tight bend), the system retracts the wire by a defined length and retries until the full preset distance is reached or the operator cancels the process.

FILL LEVEL MONITORING - PREVENTING DOWNTIME

Using the specific weight and diameter of the wire, the amount transported by RoboFeed can be calculated. This enables monitoring of the drum or spool fill level and triggers a warning if the level falls

below a set threshold—via screen alert, electrical signal, or email. This ensures the operator is informed in time to prepare for a wire drum change.

PREVENTING MATERIAL MIX-UPS

A barcode scanner can be connected to the RoboFeed WireManager's USB interface. This allows reading of the wire label (e.g., MIGAL.CO label) and comparing the wire's article number with a preconfigured value. If the numbers match, the wire change is accepted and the drum weight is saved. If not, the change is rejected.

MEASURING ARC TIME AND WIRE CONSUMPTION

Insérer : unnamed.jpg

The built-in stopwatch function enables component-specific wire consumption tracking. Total welding time and arc-on time can also be recorded for any given period.

INDUSTRY 4.0 FEATURES

The RoboFeed WireManager i4 version includes an Ethernet interface. It can send emails when the fill level drops below a threshold and transmit data such as wire speed, wire batch number, and system utilization via MQTT protocol to higher-level systems at second intervals.

CONCLUSION

The RoboFeed WireManager is an innovative solution for wire feeding in modern welding environments. It reduces the load on the main drive, improves wire transport reliability, and enhances process stability. With its flexible mounting options, intuitive operation, and extensive features, it is a future-oriented component for automated welding technology.