

Flexible force transmission for machine operation

Whether it's the railway, aviation or motorsports industry – numerous manufacturers from a wide range of industries place their trust in the bi-directional push/pull cable systems of RINGSPANN RCS. At this year's Hannover Messe in Hall 25, the company from the RINGSPANN Group will be showcasing how these user-friendly control, actuation and operation elements can be used as a mechanical alternative for flexible force transmission. A current example of this is the use of these remote control systems in the new saws of a tool machine manufacturer.



When it comes to the flexible transmission of forces from a fixed starting point to a remote or even mobile component, design engineers primarily think of pneumatic, hydraulic and electrotechnical solutions or mechanical joint rod systems, which are however technically oversized or much too expensive. At Booth D13 in Hall 25 at this year's Hannover Messe, product developers and design engineers can see how it can work more easily and cost-effectively. Because it is here – at the trade fair booth of the RINGSPANN Group – that the subsidiary RINGSPANN RCS will also be on display, a specialist for modern push/pull cable systems. These actuation and operating elements, which are congeneric to the classic Bowden cable in terms of the way they function, are purely mechanical user-friendly remote control systems with which high forces can be transferred over winding metre-long distances. RINGSPANN RCS products meet high quality standards, have technically sophisticated inner workings and are convincing and reliable endurance runners even in safety-relevant applications.

Evaluate, dimension, realise

An important prerequisite for the successful use of bi-directional push/pull cables is their application-specific dimensioning. An accurate evaluation of the installation situation and a precise calculation of the forces at work play a central role here. This was reflected for example when the renowned circular saw manufacturer Avola was looking for a simple, effective and low-maintenance operating solution for a saw blade of their new undertable chop saw that could be positioned in different axes. This variability makes the circular saw a very flexible separating tool that offers the possibility of realising seven different cutting variations and performing double mitre cuts accurately. The height-adjustable saw blade

1. In this new undertable chop saw by Avola, a push/pull cable system from RINGSPANN RCS ensures the simple vertical adjustment of the mobile saw blade. (Image: Avola)

2. Owing to its application-specific design calculation, the push/pull cable from RINGSPANN RCS is neither affected by the weight of the three-phase motor nor by the inclination of the saw blade – it follows all movements, meaning that positioning the height by lever is never any trouble. (Image: Avola)

is hereby borne in a 150° turntable and inclinable over 60°. What proved to be a particular challenge during the development phase was finding the best vertical adjustment method for the chop cut. In order to make precise and safe raising and lowering of the saw blade possible for the user with a scaled hand lever, the manufacturer needs a dependable and smooth adjustment solution. The issue: since the drive and saw blade form a functional unit, it is not only the saw blade (Ø 450 mm) that has to be moved to the desired height position by operating the lever, but the 20 kg electric motor underneath it must always be moved with it as well. A further requirement is for this complete unit to also remain easily and quickly adjustable when swivelling and turning.

And so the key issue here is: How can the necessary pushing and pulling forces for height adjustment be taken from the hand lever at the front side of the circular table saw to the mobile action unit of saw blade and drive via the rather winding undertable landscape? Pneumatic, hydraulic or electrical systems were ruled out from the beginning, since they would have substantially increased the price of the saw and would have thus jeopardised its competitiveness. Which is why a solution from the area of Bowden cable systems was favoured – however, the hitherto tested Bowden cables fulfilled neither the quality standards of the manufacturer nor the dependability requirements of the application.

Smooth and functionally reliable

Only when Avola got in contact with the experts of RINGSPANN RCS did a solution come about for the operation problem of the mobile saw blade. The company, based in Oberursel, is one of the world's leading manufacturers of push/pull cable and lever systems. It not only places great importance on a high product quality, but particularly on a detailed analysis of the application cases. Following a detailed on-site analysis, RINGSPANN RCS technicians determined the dimensioning of the required cable system taking numerous factors into consideration (forces, installation layout, bending radii, vertical travel and much more besides) and presented the developer team of the saw manufacturer with a 270 cm long, maintenance-free push/pull cable from the RINGSPANN RCS series 283 as a solution to the problem.

It quickly became clear: This Bowden cable working in push and pull direction outshone all previous ideas in terms of smoothness of movement and functional reliability. Owing to its application-specific calculation, it is neither affected by the weight of the three-phase motor nor by the inclination of the saw blade. It follows all movements, meaning that positioning the height by lever is never any trouble – even at high loads and in any position. The operation elements of the series 283 from RINGSPANN RCS can transfer pulling forces of up to 4500 N and pushing forces of up to 3150 N. As well as the lifetime lubrication, the PTFE coating of the steel inner-member also makes an important contribution to the low-loss force transmission. For it ensures that the inner-member always remains freely movable and slidable in its guide sleeve even with small bending radii and complicated installation of the conduit.



Maintenance-free push/pull cable from RINGSPANN RCS series 283. These operation elements can transfer pulling forces of up to 4500 N and pushing forces of up to 3150 N. (Image: RINGSPANN RCS)

Force transmission in two directions

While the traditional Bowden cable (push-pull cable in accordance with DIN 71986) serves purely for the transmission of pulling forces as a mobile mechanical component, the push/pull cable systems of RINGSPANN RCS work bi-directionally. Which, as the name suggests, means that they transfer forces in both directions. In mere terms of design, a flat wire-reinforced inner-member is located in a conduit, which is formed by an inner tube and specially arranged longitudinal wires. The longitudinal wires are supported and fixed by a support wire winding in most executions. These are protected from dirt and moisture by an extruded plastic covering. For the universal fixing of the core and conduit, zinc-coated or rust-free connection parts are pressed on.

An important aspect of the cable design is also the dimensioning of the guiding elements for the stainless-steel rod ends. RINGSPANN RCS generally offers two possibilities here: rigid design for exact linear movements or a swivel design with articulated end parts. For the circular saw of Avola, this had the great advantage that the cable mounting at the hand lever – so at the input side of the force – could be implemented as a swivel articulated joint. The several centimetre long connecting piece can swing 8° around the longitudinal axis of the cable and thus follow the tangential movement of the lever without any problems during the adjustment procedure. Since this makes it possible to guide the inner-member, which is a central element of force transmission, more linearly and with very low friction, our push/pull cable achieves an optimal efficiency. The user ultimately notices this in the smoothness of operation.

Solutions for many cases

Thanks to its precise design calculation and application-specific configuration, RINGSPANN RCS push/pull cable offers machine and plant construction sectors an important engineering element for realising cost-effective operating, adjustment and remote unlocking solutions. The case of Avola hereby stands as a prime example of many other dynamic and mobile applications where these bi-directional cable systems for the mechanical transmission of forces are the best solutions both economically and in terms of design engineering. Details of the possibilities offered to product developers and design engineers are given by the RINGSPANN RCS' experts at Hannover Messe in Hall 25 (Booth 13). Anyone who would like to form their own first-hand impression of the functionality of push/pull cables prior to the trade fair we recommend this YouTube video. ■

Optimal force transmission for mechanical vertical adjustment: The RINGSPANN RCS push/pull cable has been guided from the hand lever at the front side of the circular table saw to the mobile action unit of saw blade and drive via the rather winding undertable landscape. (Image: Avola/ RINGSPANN RCS)

