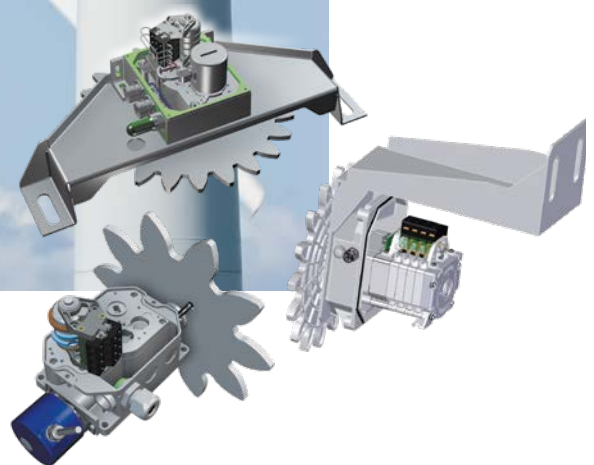


Geared Cam Limit Switches for Wind Turbines



Stromag

Founded in 1932, Stromag has grown to become a globally recognized leader in the development and manufacture of innovative power transmission components for industrial drivetrain applications. Stromag engineers utilize the latest design technologies and materials to provide creative, energy-efficient solutions that meet their customer's most challenging requirements.

Stromag's extensive product range includes flexible couplings, disc brakes, limit switches, an array of hydraulically, pneumatically, and electrically actuated brakes, and a complete line of electric, hydraulic and pneumatic clutches.

Stromag engineered solutions improve drivetrain performance in a variety of key markets including energy, off-highway, metals, marine, transportation, printing, textiles, and material handling on applications such as wind turbines, conveyor systems, rolling mills, agriculture and construction machinery, municipal vehicles, forklifts, cranes, presses, deck winches, diesel engines, gensets and stage machinery.



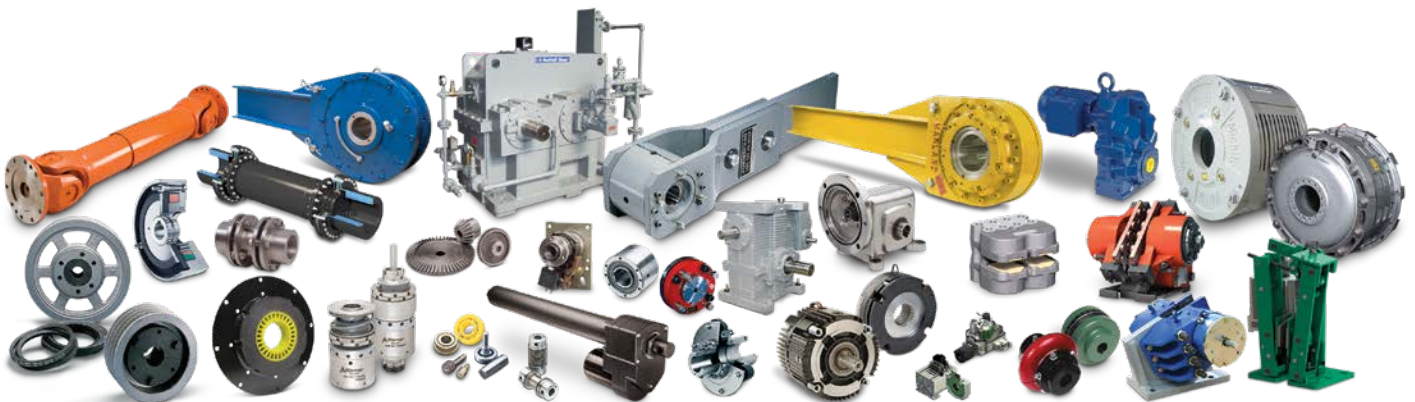
VISIT US ON THE WEB AT STROMAG.COM

Altra Industrial Motion

Altra is a leading global designer and manufacturer of quality power transmission and motion control products utilized on a wide variety of industrial drivetrain applications. Altra clutches and brakes, couplings, gearing and PT component product lines are marketed under the industries most well known manufacturing brands. Each brand is committed to the guiding principles of operational excellence, continuous improvement and customer satisfaction. Highly-engineered Altra solutions are sold in over 70 countries and utilized in a variety of major industrial markets, including food processing, material handling, packaging machinery, mining, energy, automotive, primary metals, turf and garden and many others.

Altra's leading brands include **Ameridrives**, **Bauer** Gear Motor, **Bibby** Turboflex, **Boston** Gear, **Delroyd** Worm Gear, **Formsprag** Clutch, **Guardian** Couplings, **Huco**, **Industrial** Clutch, **Inertia** Dynamics, **Kilian**, **Lamiflex** Couplings, **Marland** Clutch, **Matrix**, **Nuttall** Gear, **Stieber**, **Stromag**, **Svendborg** Brakes, **TB Wood's**, **Twiflex**, **Warner** Electric, **Warner** Linear and **Wichita** Clutch.

VISIT US ON THE WEB AT ALTRAMOTION.COM



CONTROLS AND SENSORS FOR PITCH AND YAW DRIVES IN WIND TURBINES

Safe – Precise – Reliable

For decades, the Stromag has been a sought-after partner in the mechanical drive engineering sector. Attractive, tailor-made and cost-effective solutions combined with products of a high standard of quality guarantee optimum customer benefits.

Stromag has been producing gear-type and spindle operated limit switches for over 50 years and has been active in this market globally since the introduction of wind power technology.

With a wide range of different types of gear systems, switching contacts and metal and polycarbonate housings, Stromag offers customised solutions for every application and is an indispensable partner for geared cam limit switches in the wind turbine market.

The various combinations of gear-type limit switches with analogue or digital position feedback systems are integrated into flexible housing constructions for precise operation of PITCH and YAW drives.

Safety for every Application

Assembly at wind turbine manufacturers must be highly effective and efficient and the employed sequences must be uncomplicated and fast. For this purpose, compact, pre-adjusted components are used as far as possible which can be assembled quickly and easily.

Stromag geared cam limit switches are especially designed to meet these requirements. These mechanical switches for reliable travel limitation and highly precise position feedback systems for exacting position control of the blades or nacelle are integrated in one housing. Supplying pre-adjusted components ensures that mechanical assembly is reduced to a few screws and electrical connection is quick and uses easy identification for plug connection.

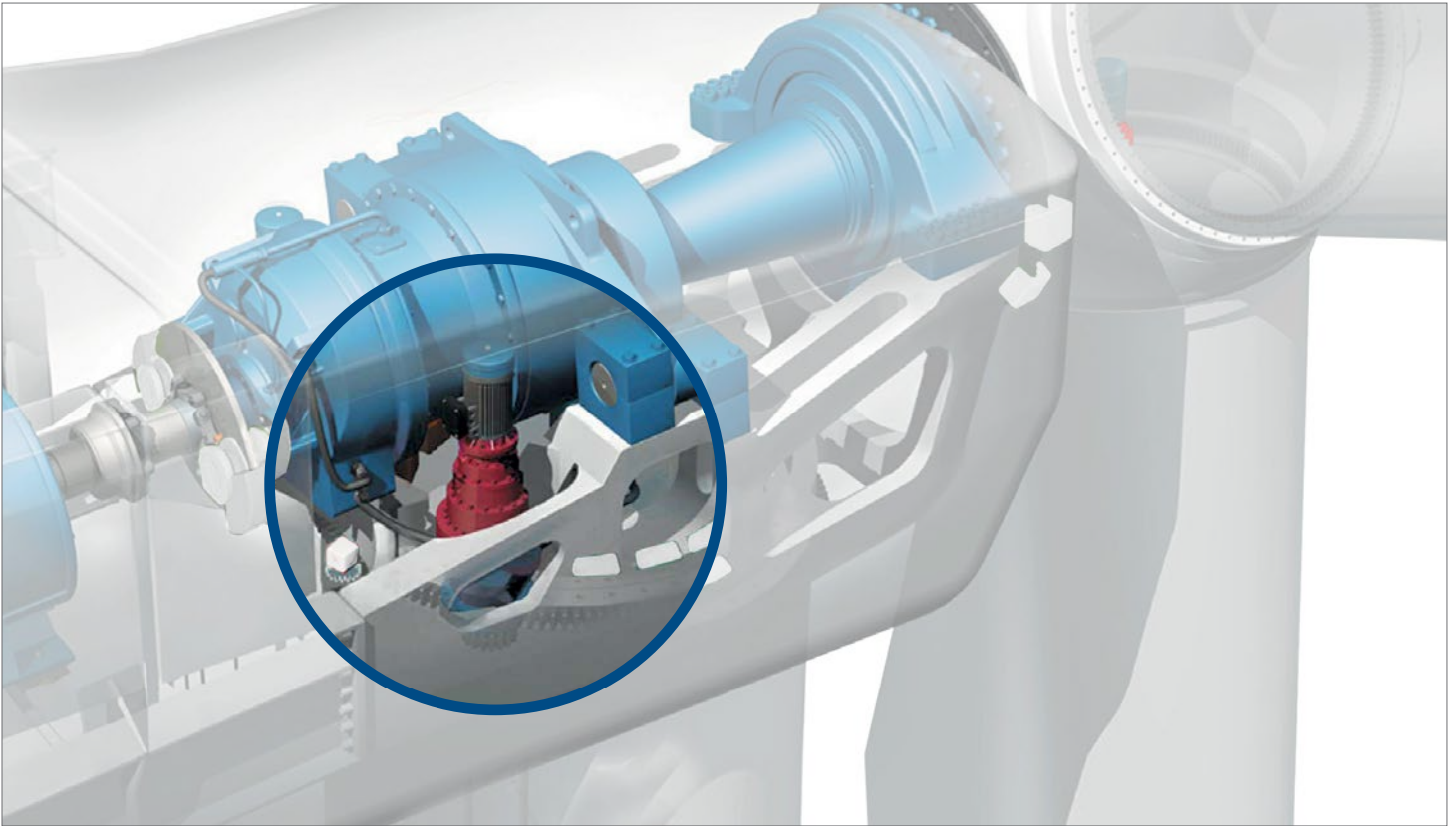
The mechanical mounting options and electrical connections are developed and optimised in close co-operation with the design departments of wind turbine manufacturers.



Service-friendly pre-set configured switch-off points by adjustable pinion wheels



STROMAG GEARED CAM LIMIT SWITCHES FOR YAW DRIVES ARE ESPECIALLY DESIGNED TO STOP THE ROTARY MOTION OF WIND TURBINES SAFELY



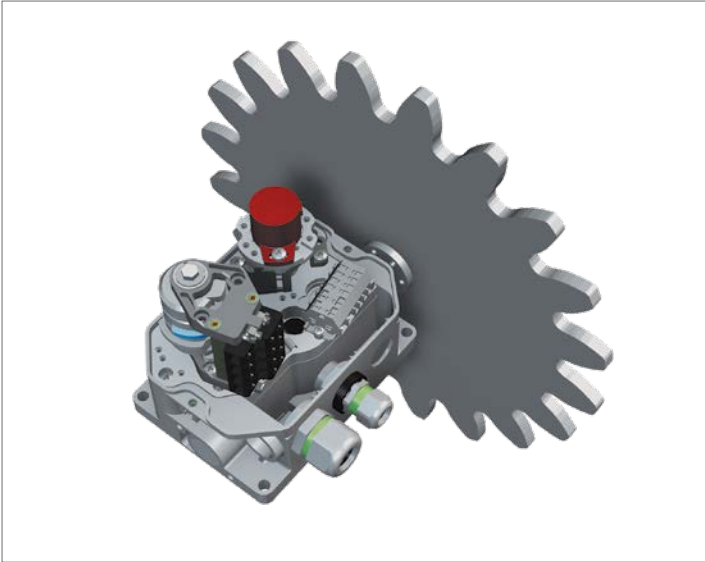
LIMIT SWITCHES FOR YAW DRIVES

The mechanical switching contacts for stopping the rotary motion of the nacelle by means of predefined end positions in form of cable anti-twist protection and diverse position feedback systems with analogue (e.g. potentiometers, shaft encoders or similar) or digital (e.g. absolute encoders, incremental encoders or similar) sensors for YAW drives are integrated in one housing. Customised pluggable solutions ensure quick and easy installation. We are happy to develop together with our customers special cam configurations for Gray code binary systems, for example.

We support our customers in every stage of development with modern 3D design techniques in order to offer the benefit of our extensive expertise in the applications of our geared cam limit switches for wind turbines at an early stage. This also extends to making recommendations for possible mounting variants or supporting bracket solutions or to include them in our scope of supply.

Benefits include

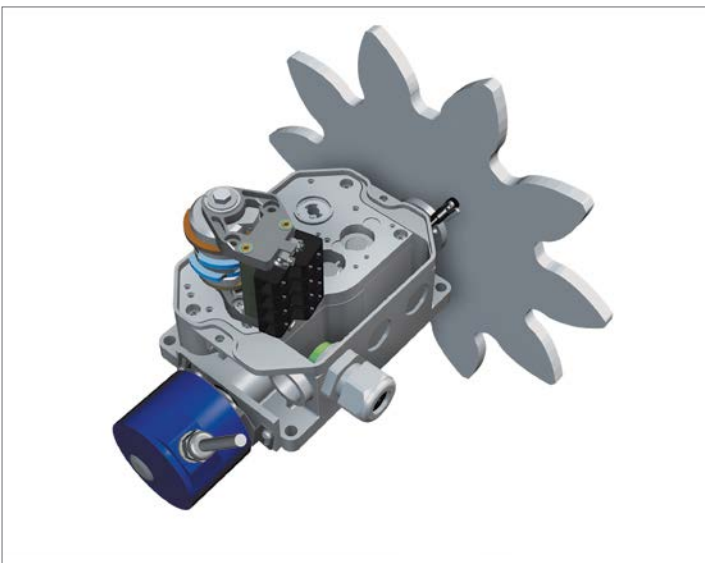
- Quick and safe integration of encoder elements for positioning detection
- Housing with high degree of protection up to IP 65
- Analogue signal with potentiometer (0-10V DC or 4-20mA), rotating synchronous with cam discs
- Incremental encoder solutions (pure count signal with channels A B, 0, as well as inverted channels) 1:1 via bevel gear stage from switch input shaft
- High-end solution with directly driven absolute encoders, integrated in housing or mounted externally on extended shaft
- Customised cam disc angle (e.g. detection of rotation direction, Gray code system, software limit switches for normal switch off and hardware switches for EMERGENCY shutdown)
- Up to 8 switching contacts in one housing
- Increased safety with positive opening NC contacts
- Retrofit solutions with universal adapter plates for replacing existing systems
- 3D design support for customised mounting solutions



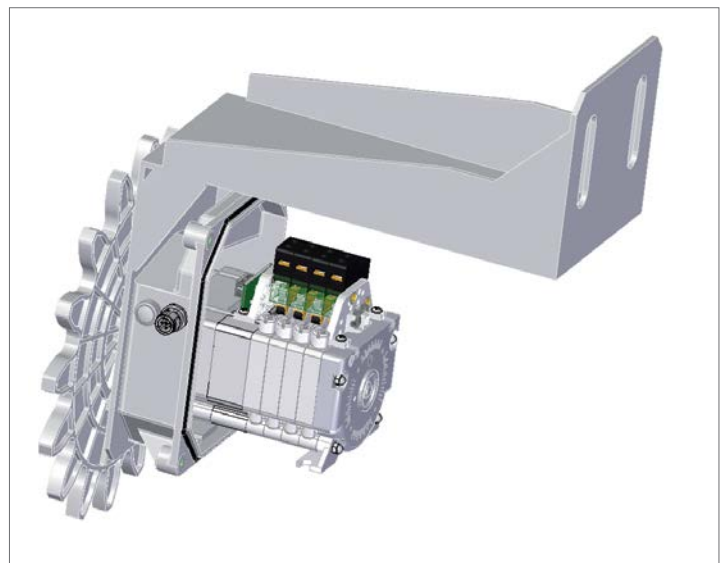
Stromag Light Cam® with integrated potentiometer



Stromag Light Cam® with directly driven incremental encoder and easy identification for plug connection

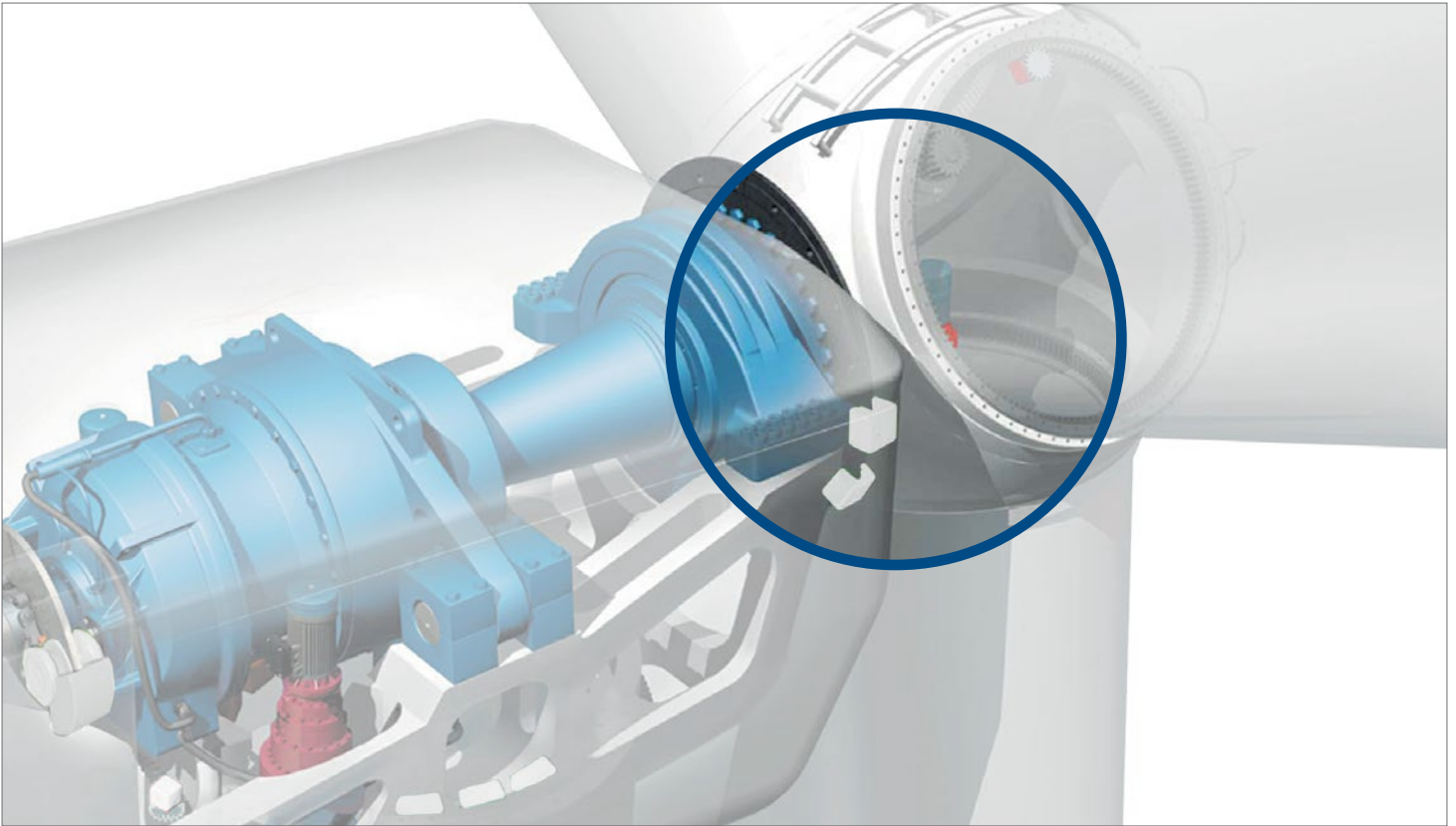


Stromag Light Cam® with directly externally driven absolute encoder



Stromag Smart Cam®

STROMAG GEARED CAM LIMIT SWITCHES FOR YAW DRIVES ARE ESPECIALLY DESIGNED TO STOP THE ROTARY MOTION OF WIND TURBINES SAFELY



LIMIT SWITCHES FOR PITCH DRIVES

The mechanical switching contacts and high-precision single-turn or multi-turn absolute encoders for pitch drives are integrated in one housing. In addition to safe switch-off in the limit positions, the absolute blade position in wind operation is signalled to the control via 1:1 driven encoders. The use of pretensioned, also in combination with Wheel adjustments, ensures a backlash-free rotary motion from the ball joint to the input shaft of the encoder. Customised easy to use plug solutions can also be provided for pitch switches for quick and easy installation.

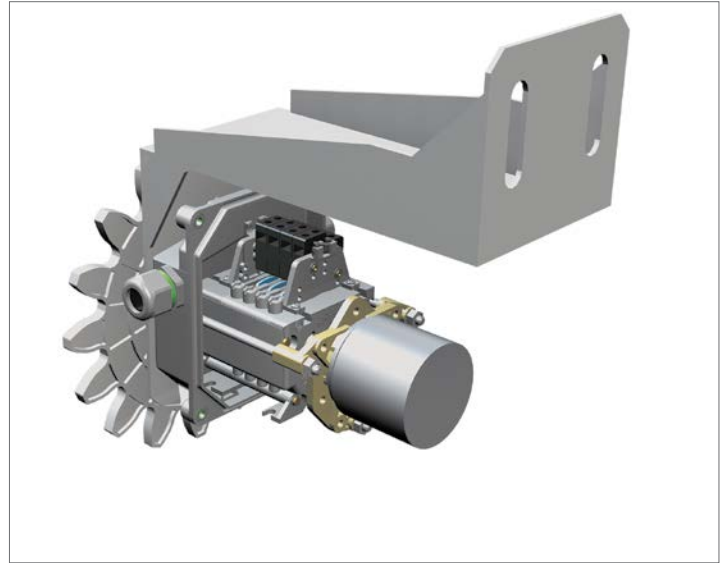
We support our customers in every stage of development with modern 3D design techniques in order to offer the benefit of our extensive expertise in the applications of our geared cam limit switches for wind turbines at an early stage. This also extends to making recommendations for possible mounting variants or supporting bracket solutions or to include them in our scope of supply.

Benefit includes

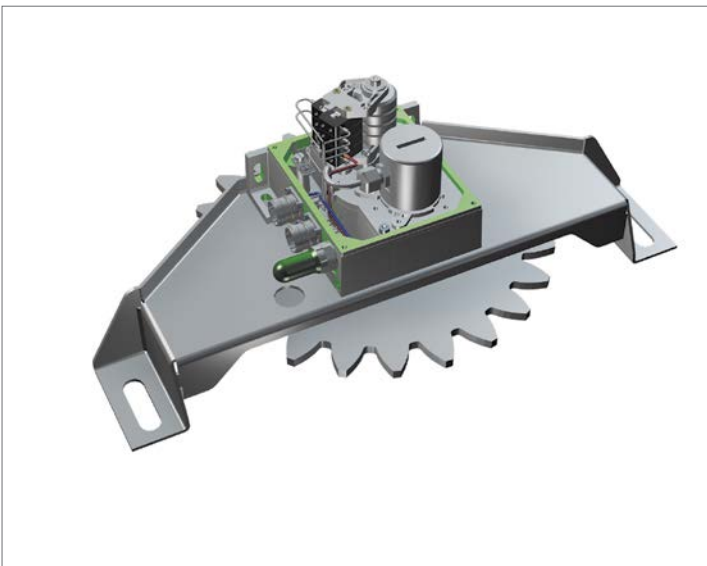
- Service-friendly, cost-optimised and safe installation
- Preconfigured plug and run connections
- Preadjustable configured switch off points in conjunction with pinion wheels with the option of precise switching point gear adjustment available on request
- Repeatable switching points
- Maximum precision with easy and safe adjustment
- Easy, backlash-free integration of directly driven encoders
- Excellent ergonomics and easy handling on mounting and commissioning
- Easy alignment during installation
- Geared cam limit switch GL compliant in pitch operation (redundant safety switch available on request)
- Use of pre-tensioned pinion wheels for backlash-free drive of absolute encoders
- Especially developed gear ratios suitable for all ball joints for highly precise and efficient rotor blade adjustment
- Housing with high degree of protection up to IP 66



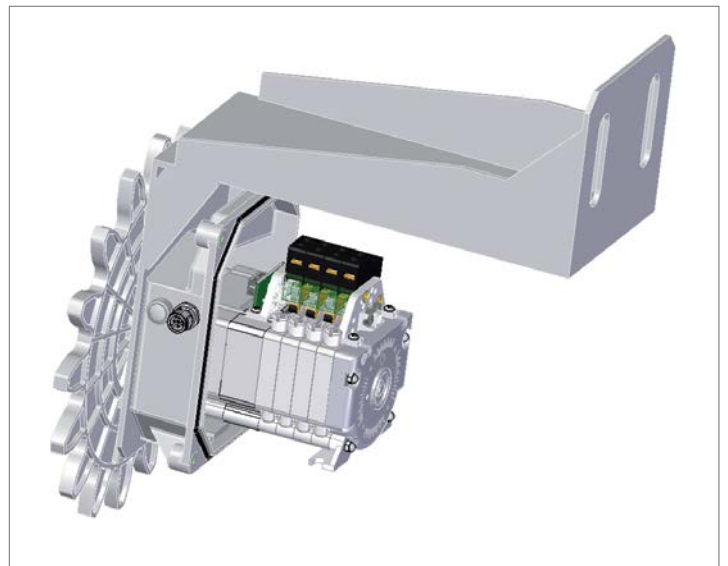
*Stromag Light Cam®
with one switching contact for safe stopping*



*51 series with directly driven absolute encoder
alternatively as MT or ST solution*



WKA with absolute encoders and LED signalling



Stromag Smart Cam®

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Wind Brakes*

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Caliper & Drum Brakes, Discs, Geared
Cam Limit Switches, Wind Brakes*

The Brands of Altra Industrial Motion

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www.ameridrives.com

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Huco
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Lamiflex Couplings
www.lamiflexcouplings.com

Stromag
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TB Wood's
www.tbwoods.com

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Nuttall Gear
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