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# Motion Technology from Columbus McKinnon: Custom Solutions and Systems for the Heavy Industry

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# Motion Technology from Columbus McKinnon: Custom Solutions and Systems for the Heavy Industry

In steelmaking and other heavy industries, drive technology is expected to lift, move, and precisely position heavy loads under extremely adverse conditions, something that requires specific solutions and technical expertise.

Both are offered by Columbus McKinnon Engineered Products, which for many years has been one of the world's leading suppliers of special motion technology components for steelmaking and heavy industry under the Pfaff-silberblau brand.

- Standard screw jacks for loads ranging from 0.5 to 75 tons
- Heavy-duty screw jacks for loads ranging from 100 to 200 tons
- Special screw jacks for special solutions
- Special screw jacks for repositioning tundishes
- Complete pot lifting systems for coating lines

The highest levels of automation and productivity are required, particularly in plant construction. This in turn means more individual lifting and lowering mechanisms, feed drives and swivel actuators, together with their interfaces to electronic control systems.

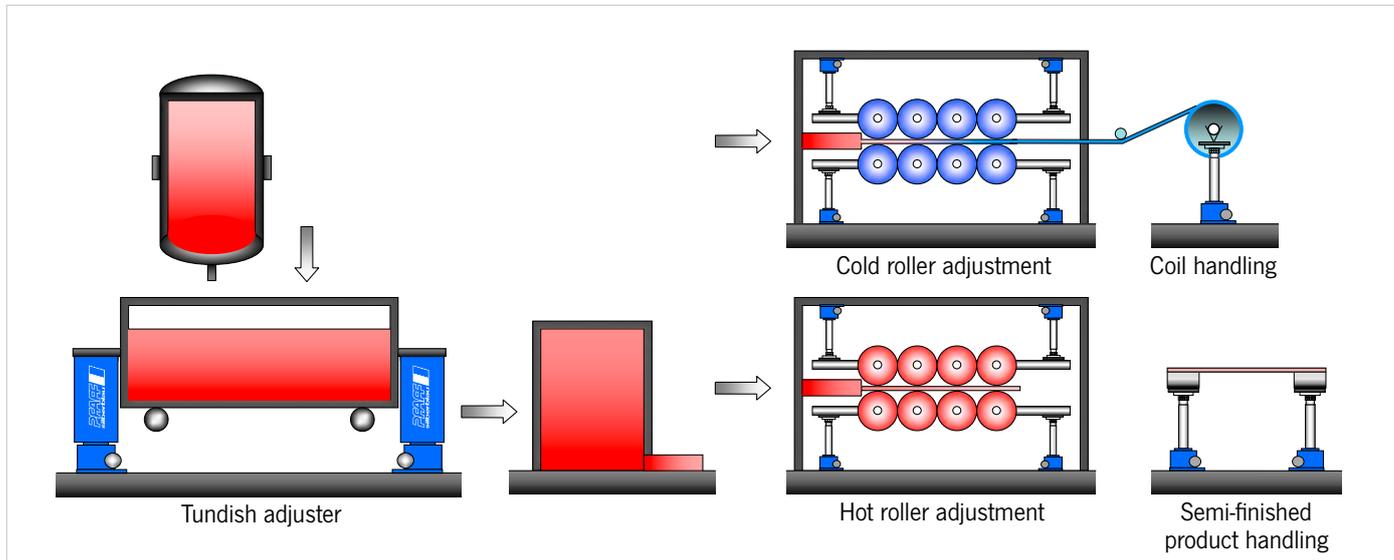
Particularly in heavy industry, the drive technology must function reliably under the harshest conditions for years and years. Pfaff-silberblau supplies individual components as well as complete solutions for lifting systems in the steel industry.

The products and services available extend from individual standard worm gear screw jacks to the development and manufacture of complete lifting systems, including the structural steel, control system, commissioning, and service. The customer benefits from the highest levels of transparency in all phases of the project, starting with the conclusion of the contract to the handover of the system.

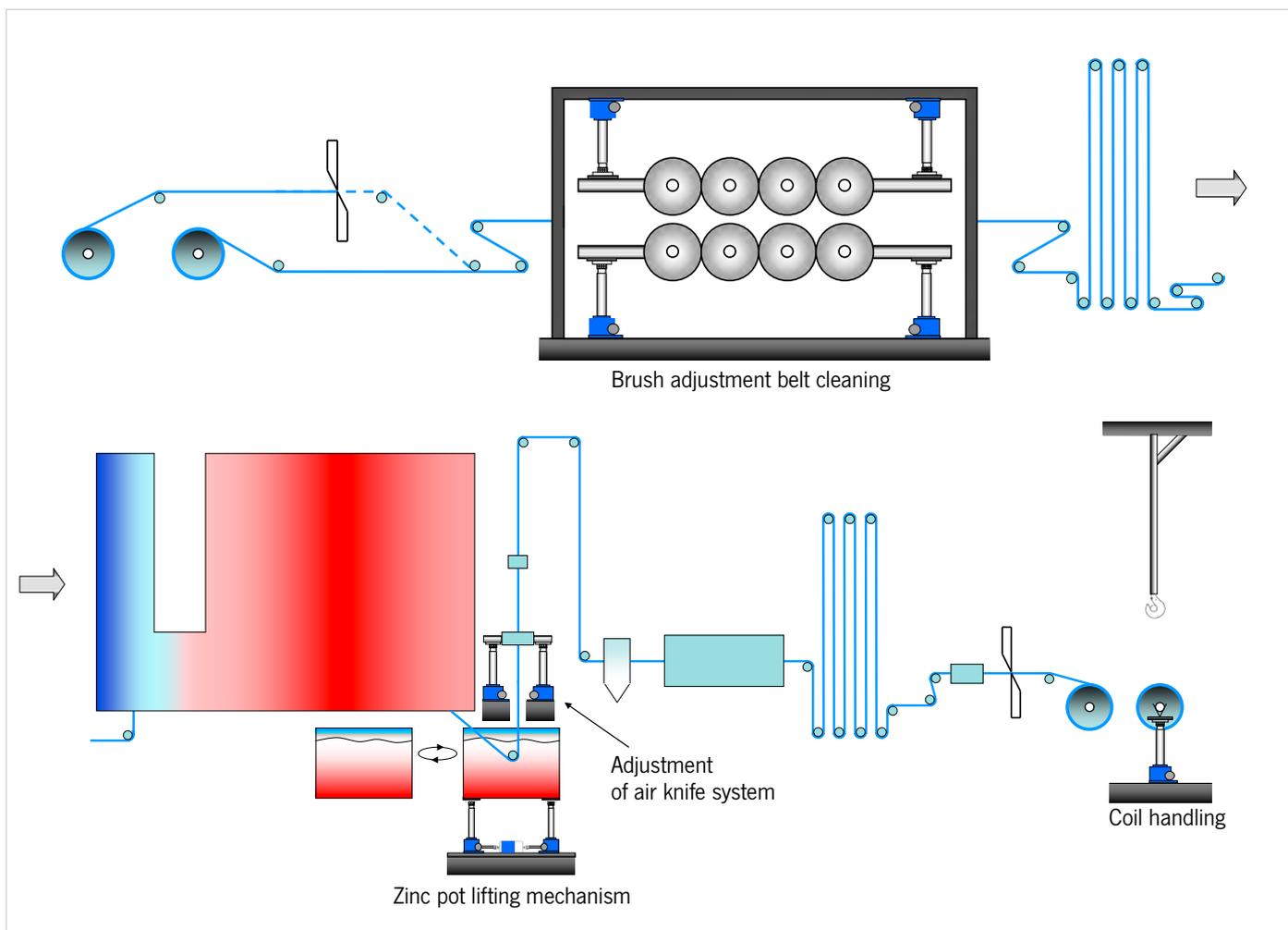


# Motion Technology for the Heavy Industry: Steel and galvanizing processes

## Pfaff components integrated in the „steel“ process



## Pfaff components in continuous galvanizing lines



# Motion Technology for the Heavy Industry: Robust and powerful lifting elements

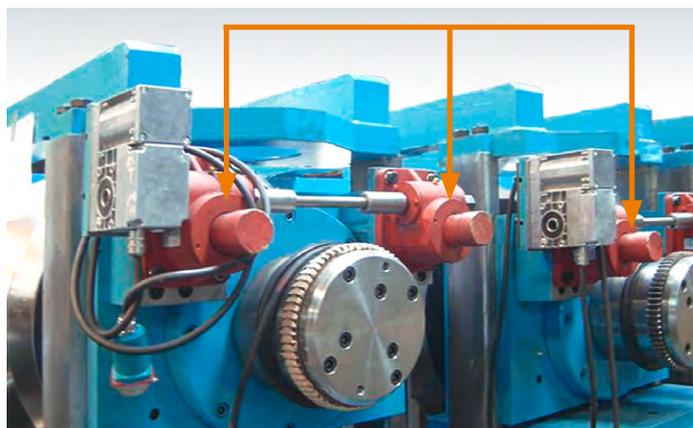
The advantages of screw jacks compared with a hydraulic solution are obvious.

- Self-locking trapezoidal screw (the load does not lower in the event of a system failure)
- High repeat and positional accuracy
- Robust and reliable
- Total synchronism in the case of multi-screw lifting systems (even if individual screws are subjected to uneven loading), no electrical synchronization control necessary
- Easy to install

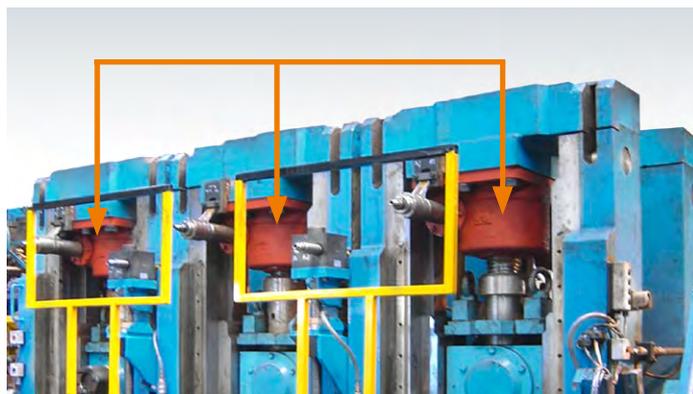
Technical data screw jacks from 35 to 100 ton					
Model size	Max. lifting load [kN]	Ratio N	Ratio L	Trapezoidal screw Tr	
SHE 35	350	10 2/3:1	32:1	100x16	
SHE 50.1	500	10 2/3:1	32:1	120x16	
SHE 75	750	12:1	36:1	140x20	

Refer to the „Compendium Screw jacks“ catalogue for the dimensions and other technical data of the 35 to 75 to screw jacks.

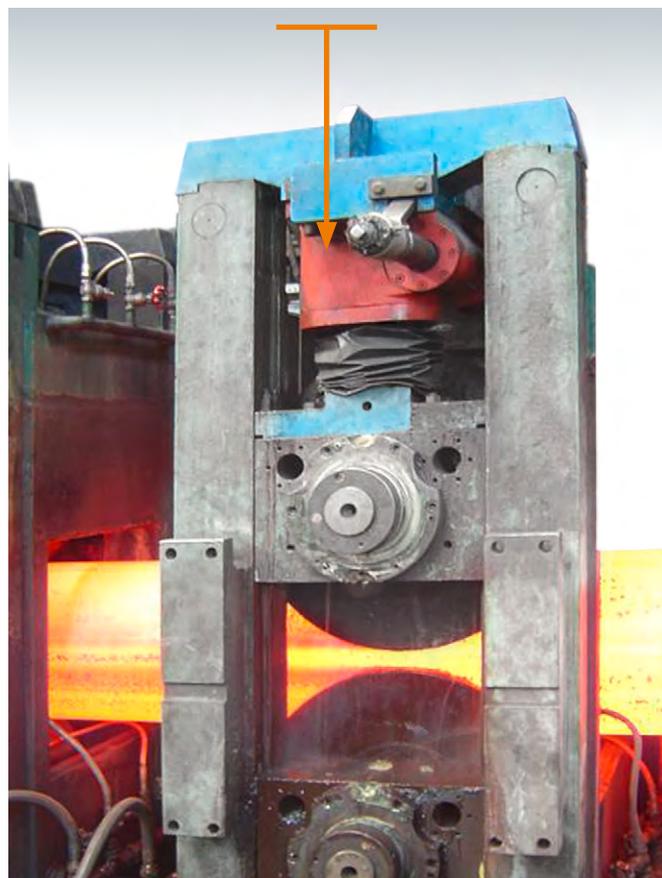
Technical data heavy-duty screw jacks >100 ton						
Model size	Max. lifting load [kN]	Ratio N	Ratio L	Trapezoidal screw Tr	Buttress-thread screw S	
SHE 100.1	1000	12:1	36:1	160x20	160x20/180x20	
SHE 150.1	1500	19:1	on request	190x24	190x24/200x24	
SHE 200.1	2000	17,5:1	on request	220x28	220x24	



Screw jacks for roll pass system



Screw jacks for a sizing stand

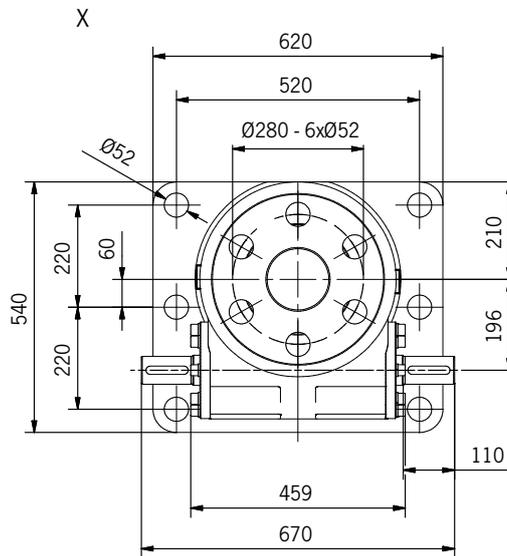
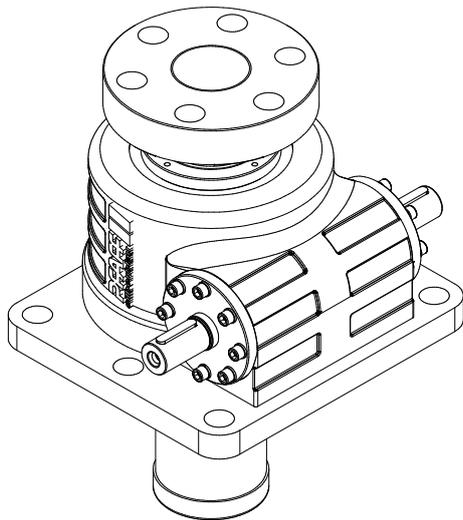
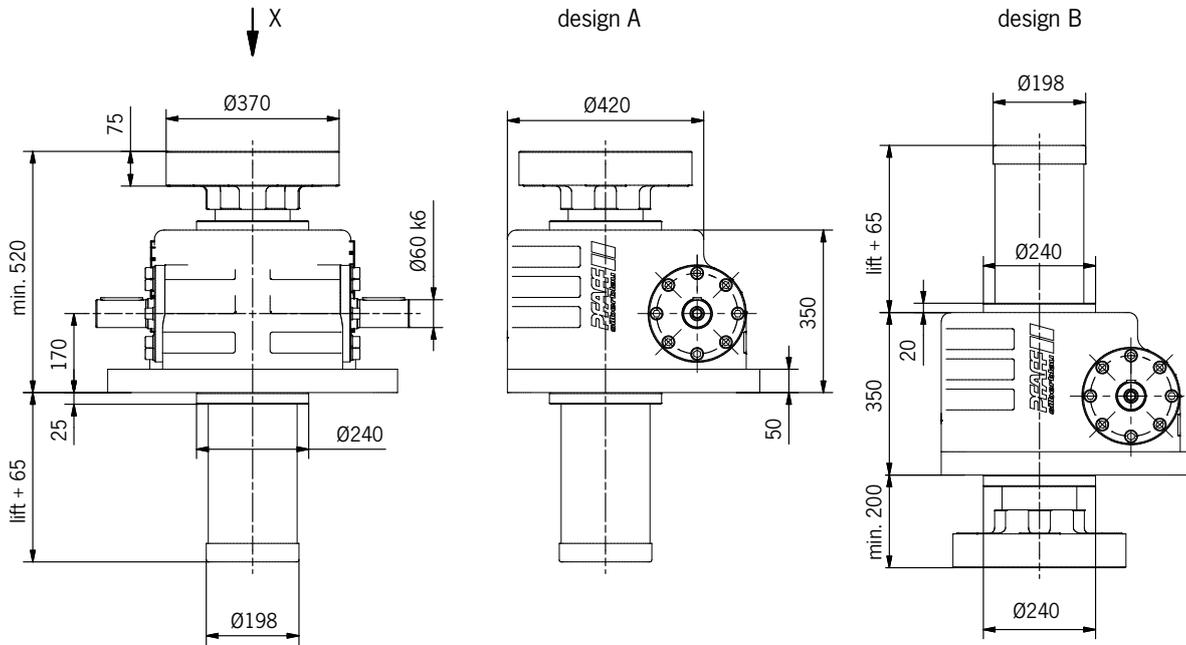


Screw jacks for roll pass system in a rolling mill

# Heavy-duty screw jack SHE 100.1

## Dimension drawing

### Dimension drawing



### Options heavy-duty screw jack SHE 100.1



Anti-turn device



Ball screw,  
planetary roller screw



Long safety nut  
with speed monitoring



Buttress-thread screw

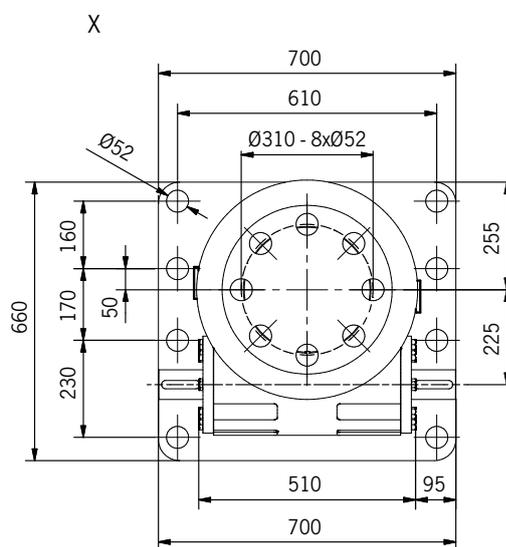
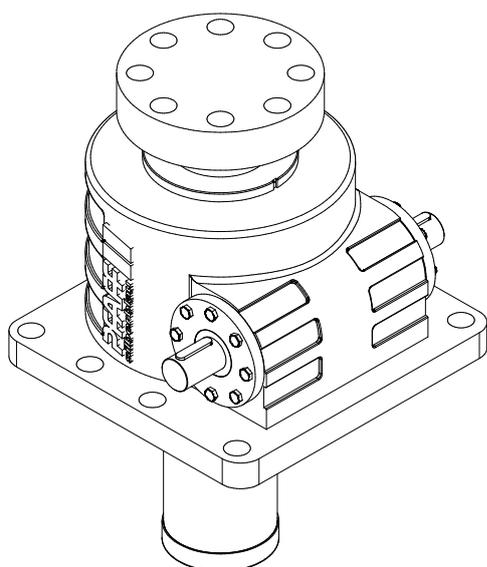
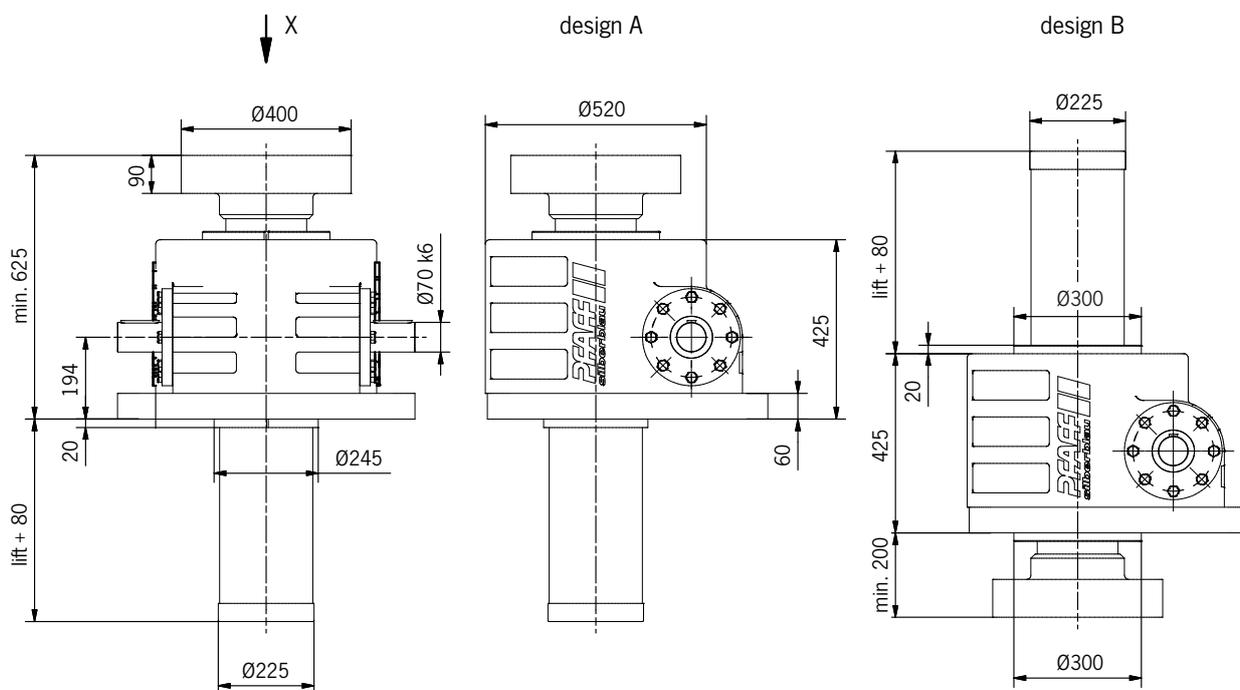
CAD & go



# Heavy-duty screw jack SHE 150.1

## Dimension drawing

### Dimension drawing



### Options heavy-duty screw jack SHE 150.1



Anti-turn device



Ball screw,  
planetary roller screw



Long safety nut  
with speed monitoring



Buttress-thread screw

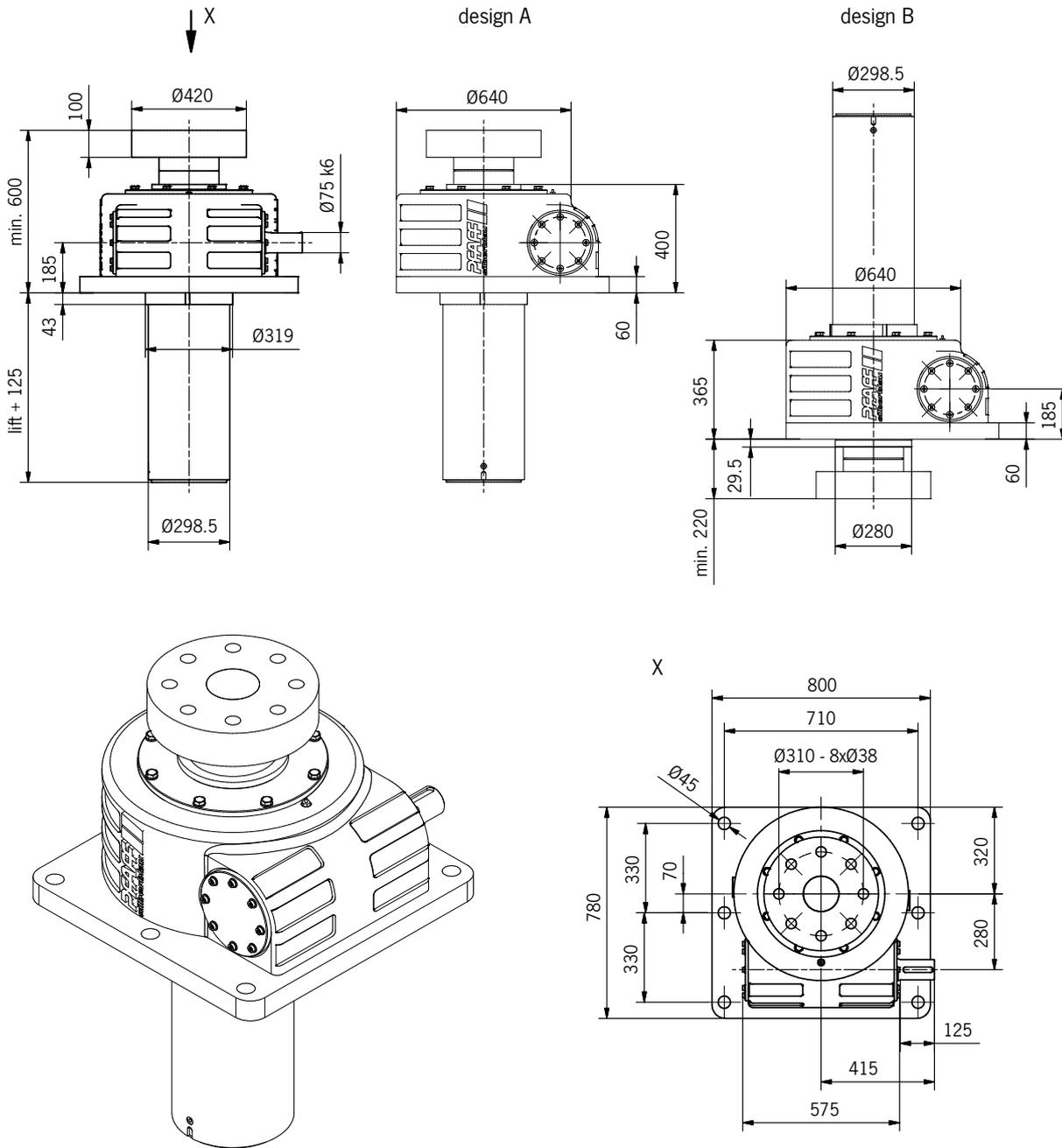
CAD & go



# Heavy-duty screw jack SHE 200.1

## Dimension drawing

### Dimension drawing



### Options heavy-duty screw jack SHE 200.1



Anti-turn device



Ball screw,  
planetary roller screw



Long safety nut  
with speed monitoring



Buttress-thread screw

CAD & go



# Motion Technology for the Heavy Industry: Complete system solutions

Companies in the mechanical and plant engineering sector are increasingly seldom ordering only individual components from their suppliers. Increasingly, they are ordering entire assemblies that are assembled and commissioned by the contractors. The advantages for the OEM in ordering complete systems are:

- They can concentrate on their core activities: less pressure on internal departments
- Systems are coordinated
- Everything comes from a single source, fewer interfaces
- Best possible assembly solution results in best possible overall solution
- One point of contact
- Simpler guarantee handling
- Fast response times in the event of a stoppage
- Responsibilities clearly defined

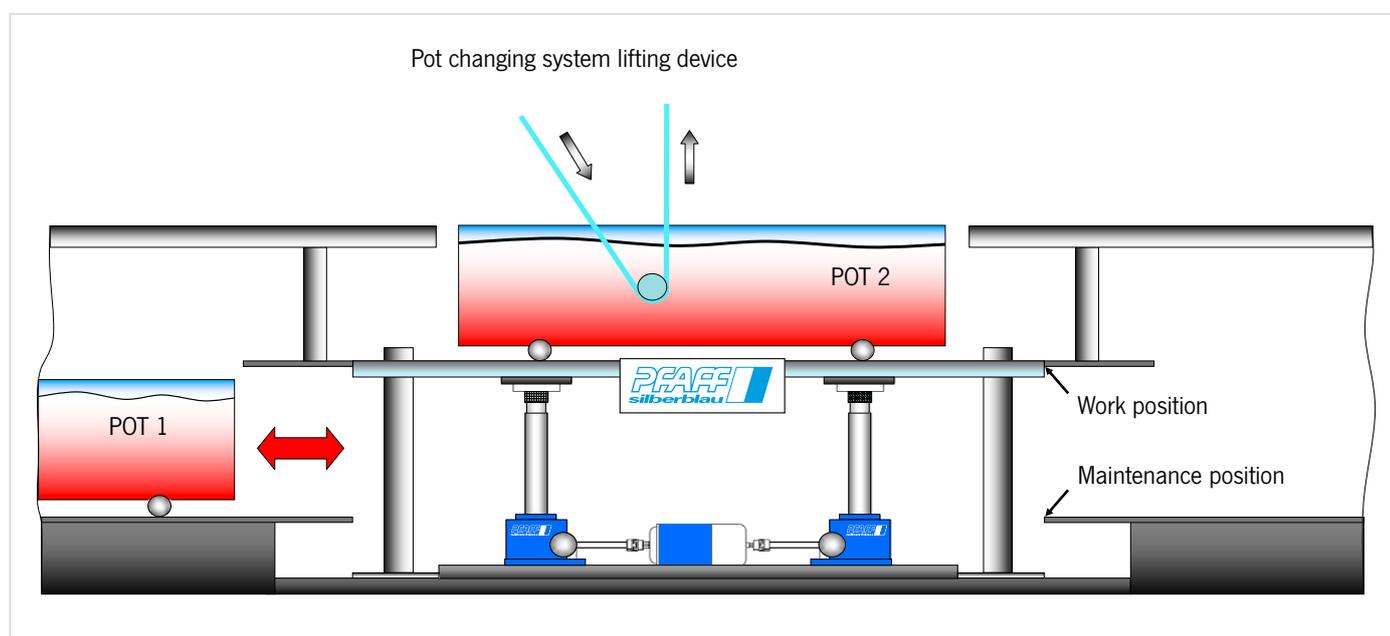
## Zinc pot adjustment

For steelmaking and heavy industry, Pfaff-silberblau has joined forces with an OEM to develop a furnace lifting system capable of handling furnaces filled with liquid zinc and weighing up to 750 ton.

As part of this process, Pfaff-silberblau has designed an extremely reliable mechanical lifting device that is used in continuous galvanizing lines (CGL) all over the world. The advantages of this furnace lifting system with screw jacks compared with hydraulic solutions are as follows:

- Total mechanical synchronism
- No forced synchronization necessary
- Optional oil cooling extends duty ratio
- Long-life due to oil lubrication in worm gear
- Self-locking buttress-thread screw
- Low vibrations and oscillation, therefore no damage to the furnace insulation
- High levels of safety thanks to nut breakage and synchronism monitoring
- Can be customized to suit individual requirements
- Comprehensive sensor system available as option
- Trialed extensively

## Functional diagram of pot lifting system



# Motion Technology for the Heavy Industry: Complete system solutions

Columbus McKinnon Engineered Products sees one of its strengths in offering complete solutions. In the linear lifting system, the high-precision and proven screw jacks from Pfaff-silberblau are at the heart of the system: Four screw jacks with a special thread are used to lift and lower the zinc furnaces.

These are mechanically attached and synchronized using a bevel gear system and connecting shafts. The low twisting angle of just ¼ degrees per linear meter in the drive and connecting shafts, coupled with the gear ratio reduction in the worm gear, results in extremely accurate synchronization within the lifting system – deviation is less than 0.1 mm.

The component parts are subject to the highest quality standards during manufacturing, a prerequisite for achieving this level of precision. The entire production process of the screw jacks is logged and is completely traceable. At the end of the production

line, each gear mechanism receives an acceptance certificate that documents dimensions and functional parameters.

The reliable and high-precise worm gear screw jacks in the modular drive systems form the basis for customized solutions. Pfaff-silberblau uses them to implement complete lifting systems capable with lifting forces of up to 7500 kN. Special requirements and individual installation situations can also be catered for.

Regarding to safety, the worm gear screw jacks comply with national and international regulations according to EN 280. This is achieved by using safety nuts and speed monitoring.

Numerous options are also available, such as an electric oil cooling feature that permits temperature-control operation, thus increasing duty ratios.

## Technical data pot lifting system

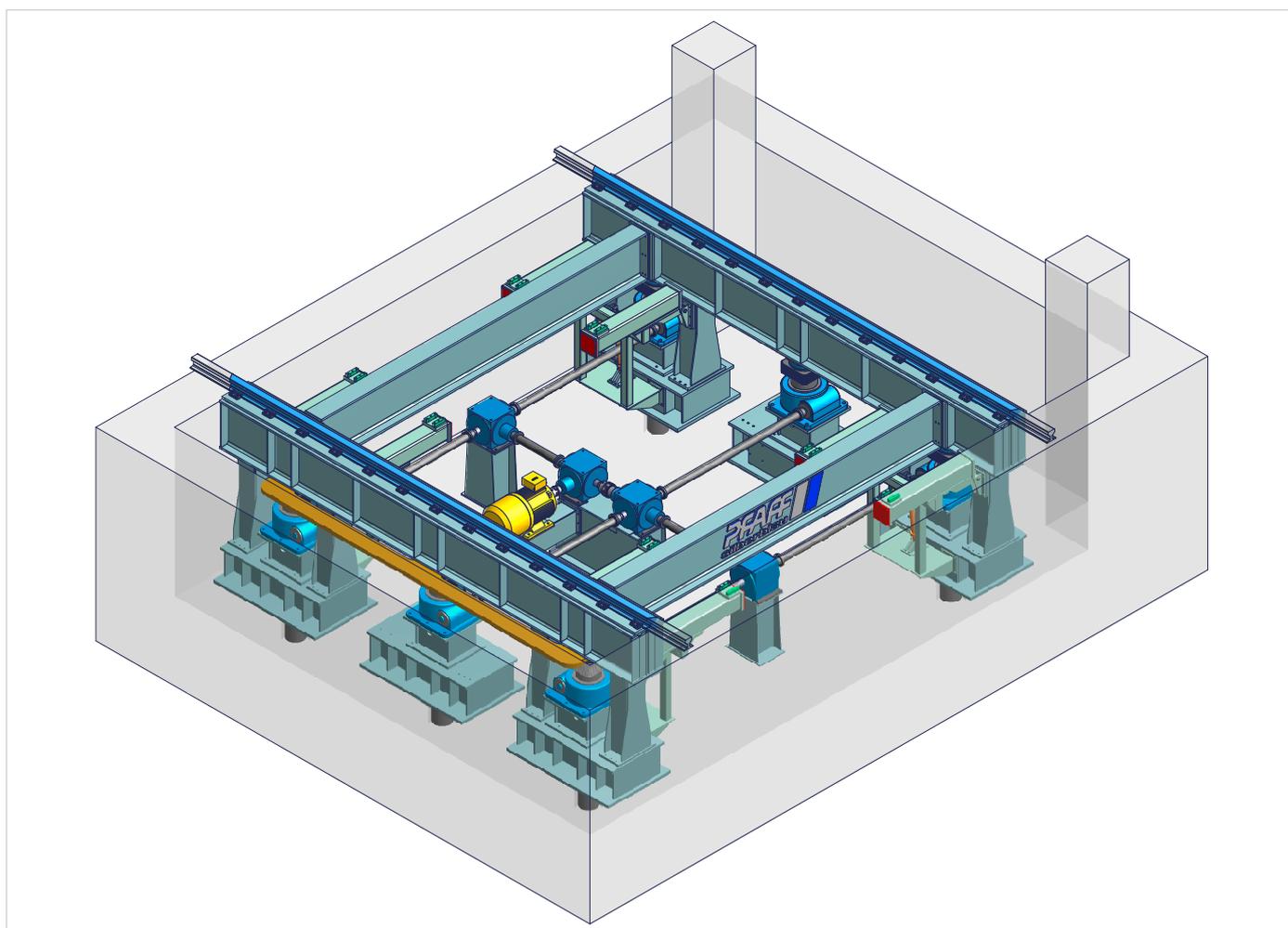
Max. lifting load	Motor speed	Total ratio	Lifting speed	Lifting height	Duty ratio
[kN]	[1/min]		[m/min]	[m]	[%]
up to 7500	1500	25:1	0.01	up to 2.2	> 60



Pot lifting system

# Motion Technology for the Heavy Industry: Complete system solutions

Designs and options:		
	Standard	Option
Buttress-thread screw	■	-
Safety trap nut	■	-
Nut breakage monitoring	■	-
Wear monitoring	■	-
Oil lubrication (wet sump)	■	-
Oil temperature monitoring	■	-
Spindle temperature monitoring	-	■
Electric oil level monitoring	-	■
Electric speed monitoring	-	■
Central lubricant sensor	-	■
Electric oil cooling	-	■
Control system	-	■
Structural steel incl. rails	-	■
Complete lifting system construction	-	■
Commissioning	-	■



700 t pot lifting system

# Motion Technology for the Heavy Industry: Complete system solutions

## References:

525 tons pot lifting system in Jiangyin/China

400 tons pot lifting system in South Korea

520 tons pot lifting system in Caofeidan/China

520 tons pot lifting system in Mexico

200 tons repositioning of tundishes in Germany

500 tons pot lifting system in Brazil

480 tons pot lifting system in Finnentrop/Germany

480 tons pot lifting system in Beijing/China

400 tons pot lifting system in Belgium

500 tons pot lifting system in Hirohata/Japan

520 tons pot lifting system in Hunan/China

400 tons pot lifting system in Salzgitter/Germany

300 tons pot lifting system in Austria

510 tons pot lifting system in Tenegal/Mexico

510 tons pot lifting system in Thailand

550 tons pot lifting system in Tangshan/China

550 tons pot lifting system in China

450 tons pot lifting system in USA

## Other system and special solutions

640 tons and 1600 tons Tensioner on ship

400 tons Barrier net for load securing systems in Germany

230 tons Lifting device for lock gate in Romania

150 tons Vehicle lifting unit in United Kingdom

480 tons Bridge adjustment in Kazakhstan

Columbus McKinnon supplies field-proven complete solutions for many areas of plant engineering, such as

- Maintenance systems for trains and buses
- Stage Technology
- Petrochemical Industry



Test configuration for trialling a 200 tons screw jacks type SHE 200.1 before use in a pot lifting system

# Motion Technology for the Heavy Industry: Screw jacks in customized special design

Columbus McKinnon Engineered Products lives for customer proximity and customized special solutions. The special solutions around screw jacks are required where standard designs cannot be used for plant-specific considerations (installation space, lubrication, dirt, high temperatures, etc.).

These special solutions can, up to a point, be realized at relatively low cost using the modular system from Pfaff-silberblau. For some of these solutions, however, all components - except for a few components - must be custom-made. To produce a screw jack that is perfectly matched to the respective application, Pfaff-silberblau designs and manufactures these special screw jacks in close cooperation with the customer's own development department

## Screw jacks for tundish adjuster

The lifting gear mechanisms that were developed and constructed by Pfaff-silberblau in close collaboration with a renowned German steelmaker for use in a foundry comprise a transport unit that conveys molten steel from the smelter to the casting plant. Four lifting cylinders lift a 150 ton casting gutter filled with molten steel by two meters in just one minute - reliably and safely even under the harshest production conditions.

The tundish is first lifted into its highest position and then positioned over the ceramic pipe, through which the molten material flows from the furnace into the buggy. The rolling steel container is then lowered, and the liquid steel is moved to the continuous casting molds.



# Motion Technology for the Heavy Industry: Screw jacks in customized special design

This lifting device required a special design based on a modified version of the modular system. In addition to reinforced bearings and guide systems, extremely robust planetary roller screws are used to achieve maximum lifting speeds of 2 m/min. At 82 %, the degree of efficiency of this lifting mechanism is extremely high, allowing the input power from the drive motors to be reduced. The completely sealed construction ensures complete safety, even the extreme conditions in a steel works.

## Features:

- Planetary roller screw
- Totally encapsulated
- Visual lifting position display
- Oil-lubricated worm gear
- Integrated anti-turn device

### Technical data tundish adjuster

Max. lifting load per screw jacks	Motor speed	Total ratio	Lifting speed	Lifting height	Duty ratio
[kN]	[rpm]		[m/min]	[m]	[%]
up to 500	1500	18.5:1	2.03	0.7	up to 40

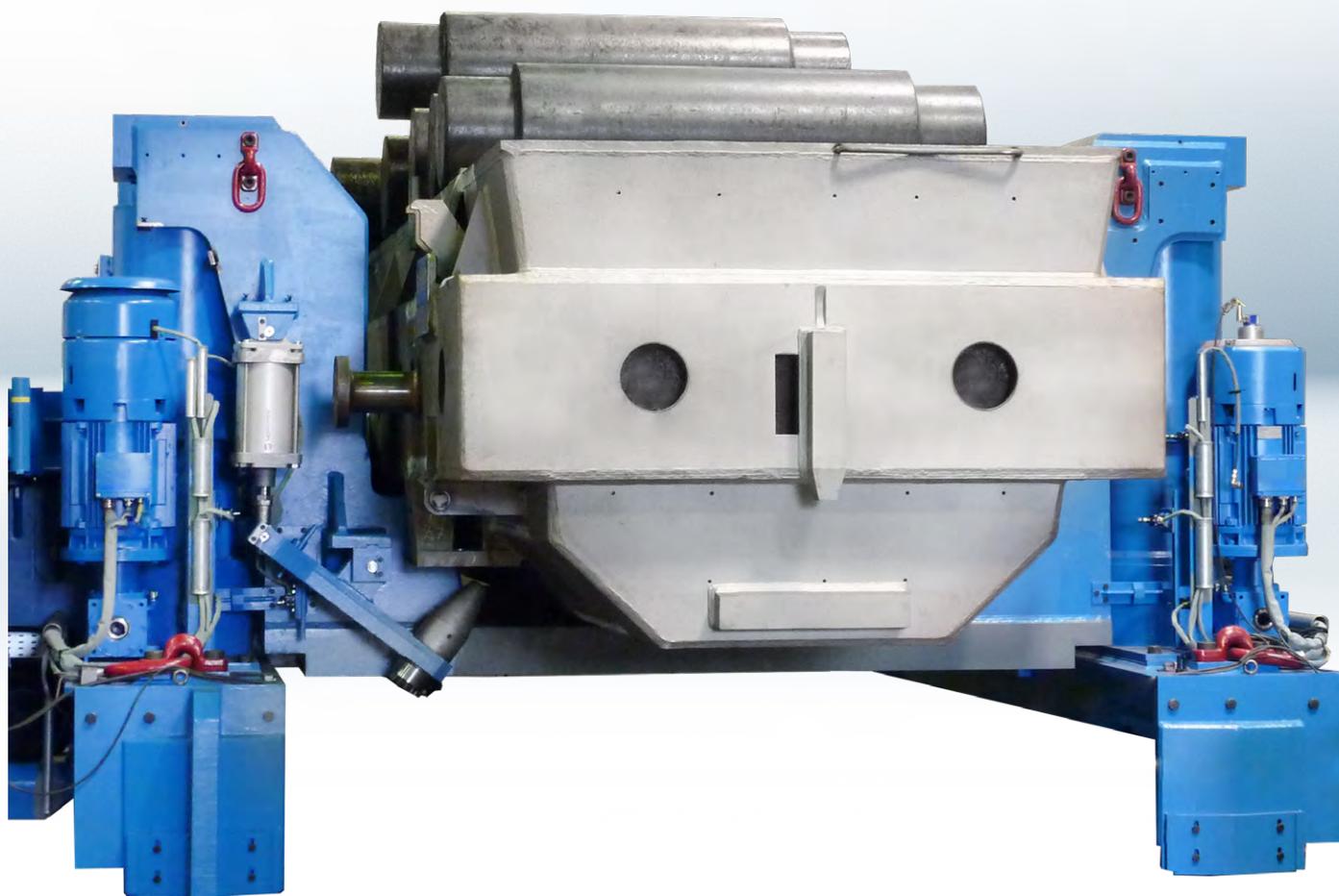


Image source: Thyssen-Krupp – Adjuster with tundish

# Motion Technology for the Heavy Industry: Screw jacks in customized special design

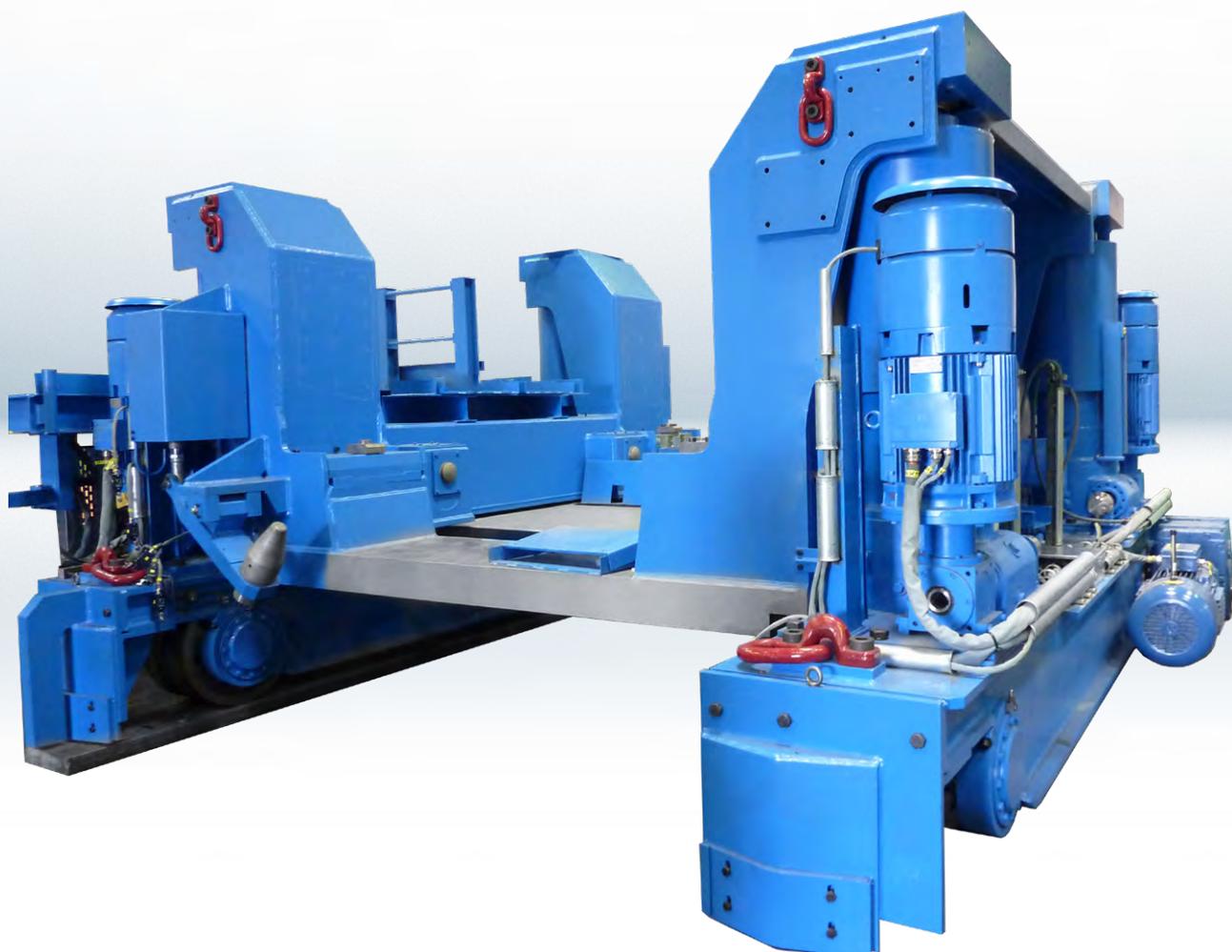


Image source: Thyssen-Krupp

# Columbus McKinnon Catalog overview

## Catalog overview

The force is not enough to move loads? Solutions by Columbus McKinnon Engineered Products GmbH come into play. They move, lift and position various goods perfectly reliable, safe and efficient.

Experience pays off. For more than 150 years, products from Pfaff-silberblau have been developed further and adjusted to the current market and customer requirements. You will also find your suitable product in our catalogs

### Lifting technology:

The manual and electric rope winches are perfect for work in industry and the event sector. Lifting tables are used in many industrial sectors and support production, logistics and enable ergonomic work.

### Motion technology:

The motion technology products are characterized by diversity. You will find the right technical solution for any application among them.

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**Motion technology**  
**Lifting technology**  
Product overview by Pfaff-silberblau

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Compendium  
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