



**Tyre technology for effective
production**
Multiplex Extrusion Lines

Engineering Value

Krauss Maffei
Berstorff



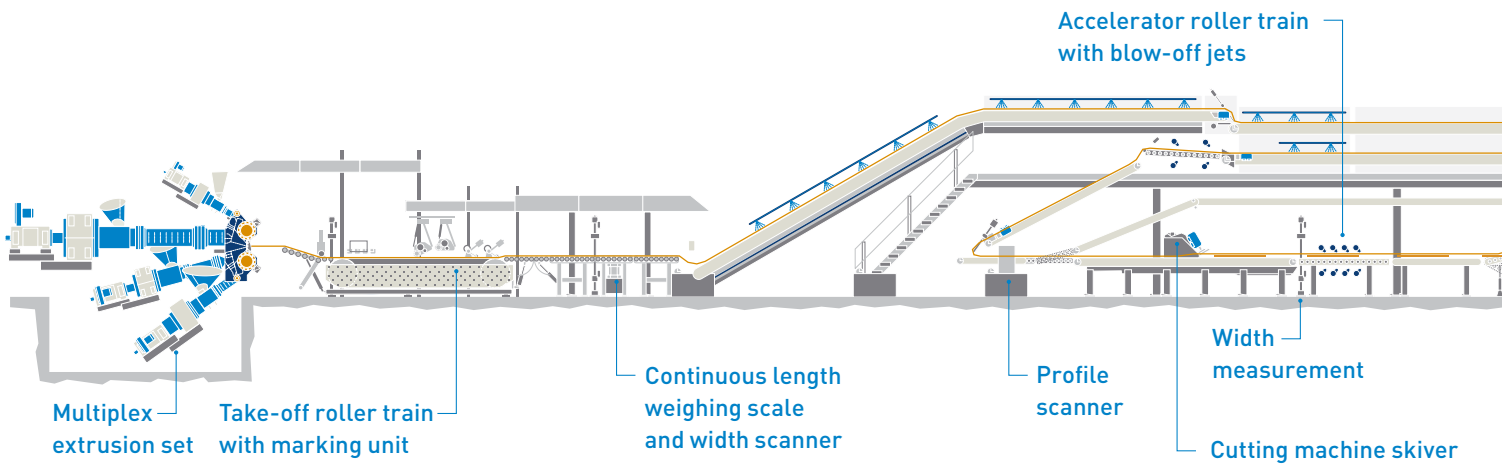
Combining excellent product quality with maximum production output – Multiplex extrusion lines

Solutions for effective production and excellent products

Tire lines from KraussMaffei Berstorff are economical solutions for continuous manufacturing of tire components at a high quality level.

Through the special machine designs, the systems stand out due to:

- High throughput at low dimension and weight tolerances and optimal homogeneity
- Short retrofitting times compound geometry change
- Low start-up waste
- Optimized screw geometry for each compound



Multiplex complete lines System technology at a stroke

The better the individual process stages fit together, the more secure is the flow of the production. KraussMaffei Berstorff designs complete line concepts to attain perfect interplay of all components under changing parameters.

Based on our wide experience, join together all elements of the production line into a systemised technological solution. From the feed units to the wind-ups – everything from one single source.

Each part mates with the next and every component of the line can be matched to the process-technical requirements of compound and dimensional changes or changes from cut piece to wind-up operation. The interface-free configuration of the machinery ensures constant product quality at maximum capacity utilisation.



Marking units for

- printing of coloured stripes
- printing of identification codes
- imprints of numbers and letters



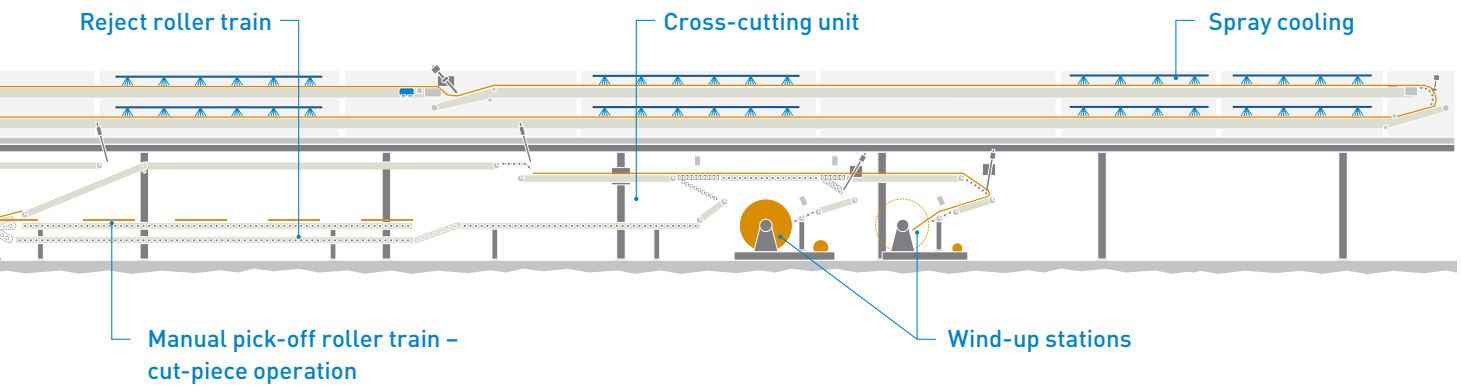
Feed units with

- metal detectors
- automatic setting of the feed rate
- simple service and maintenance



Gauging instruments

- continuous weight per meter and weight per piece for precise weight measurement
- width measurement before and after the cooling unit
- profile scanning for continuous monitoring of the geometry
- length measuring units for monitoring the cut profile lengths



Cutting units (Skiver)

- flying cut or start/stop cut for cut-piece operation with the highest cut quality, length precision and maximum cut rates per minute, rotary cutting for wind-up operation



Cementing station

- to increase adhesion of the splice surfaces



Cooling systems

- units for spray or immersion cooling



Cut-piece operation

- manual pick-up roller train
- automatic booking system



Wind-up operation

- cassette winders
- spool winders

Multiplex Lines Quality and performance without compromise

All tyre makers are seeking ever-tighter manufacturing tolerances, whilst throughput rates are steadily rising.

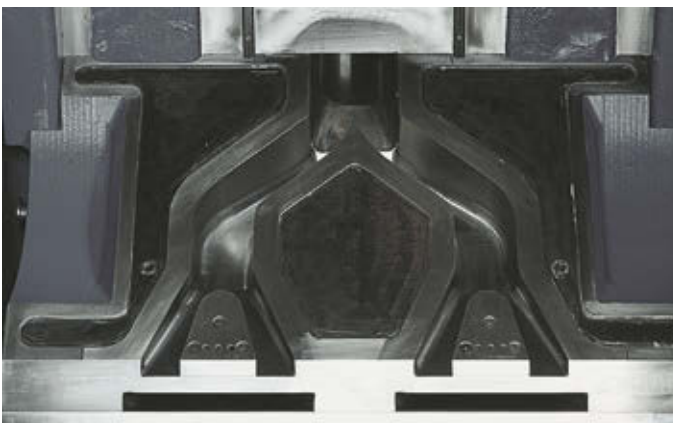
KraussMaffei Berstorff extrusion lines are conceived for high product quality and maximum output and are equipped with extruders of different types (GE-SC or GE-KS) and sizes.

The modular design makes for rapid reconfiguration to suit the mode of operation – Mono, Duplex, Triplex, Quadroplex or Quintoplex.

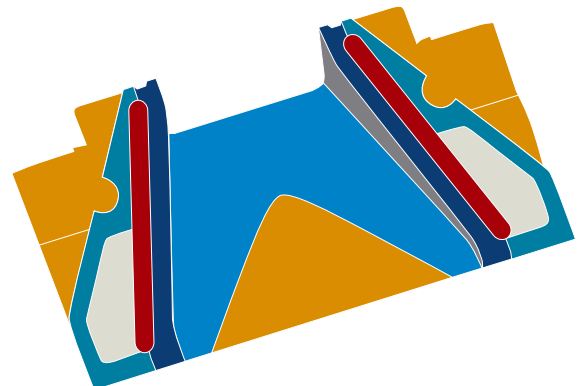
KraussMaffei Berstorff Multiplex extrusion sets are designed in a piggy-back arrangement to achieve the highest product quality through symmetrical material flow in the head. In addition, the compact design makes for real space savings. A further feature to satisfy the quality requirements is the special design of the flow channels in the extrusion head. These ensure a very gentle, even material transfer from the round section at the extruder outlet to the rectangular flat form of the profile. In addition, the changes in direction of the material flow in the flow channel are kept to a minimum.

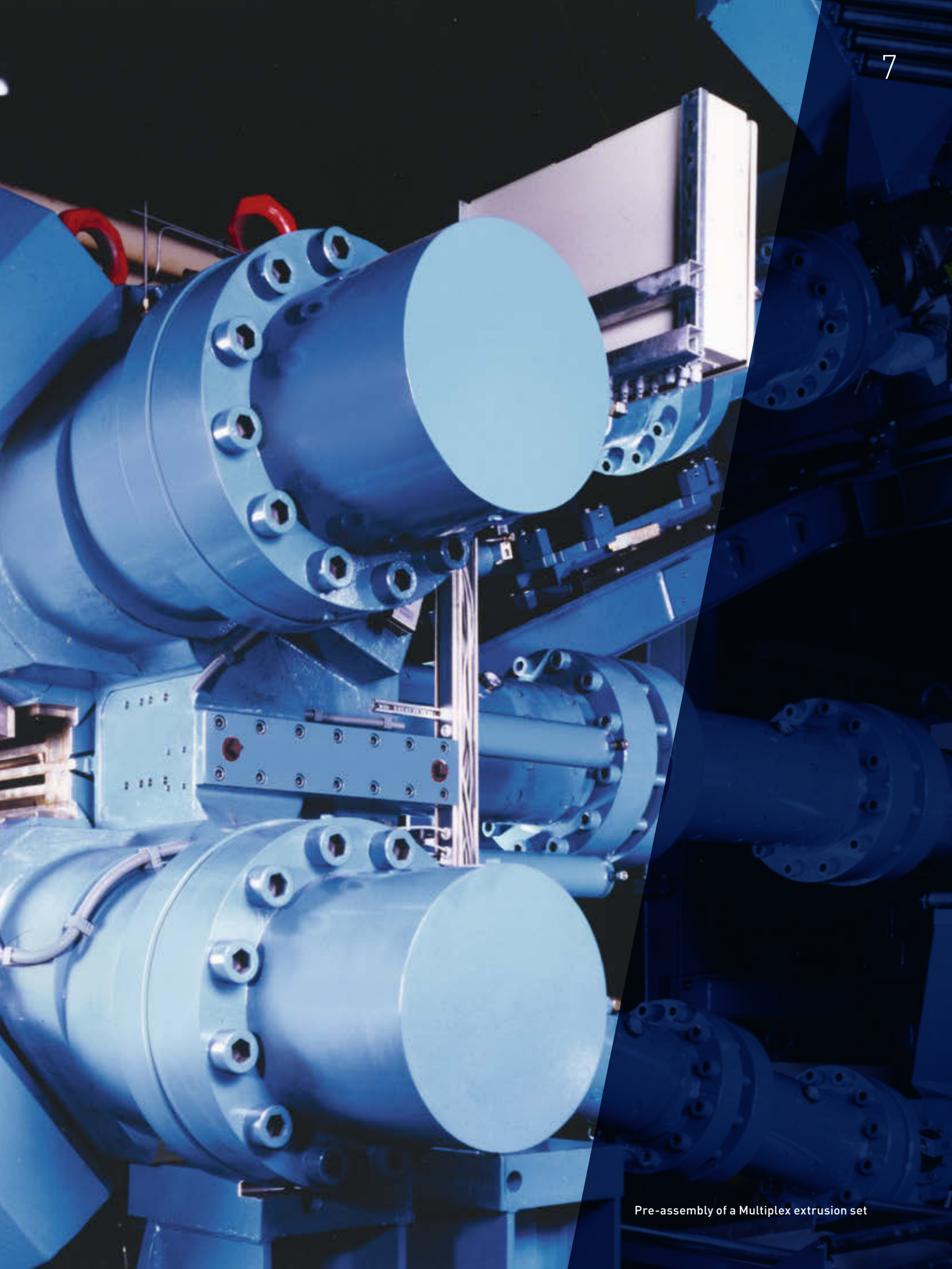
All stages of the process are controlled by a monitoring system, thus ensuring operational security.

Throughput rates of up to 10,000 kg/h or about 30,000 passenger car treads per day are achieved with these modern extrusion lines.



Flow channels in the Multiplex extrusion head





Pre-assembly of a Multiplex extrusion set

Multiplex extrusion heads and tools

Versatile and efficient: systemised head operation

The range of different tyres dictates the requirements for changing the compound, dimensions and programs run on any production line, whilst the extrusion head determines the quality and efficiency of the tyre production.

Multiplex extrusion heads from KraussMaffei Berstorff represent the state of the art with

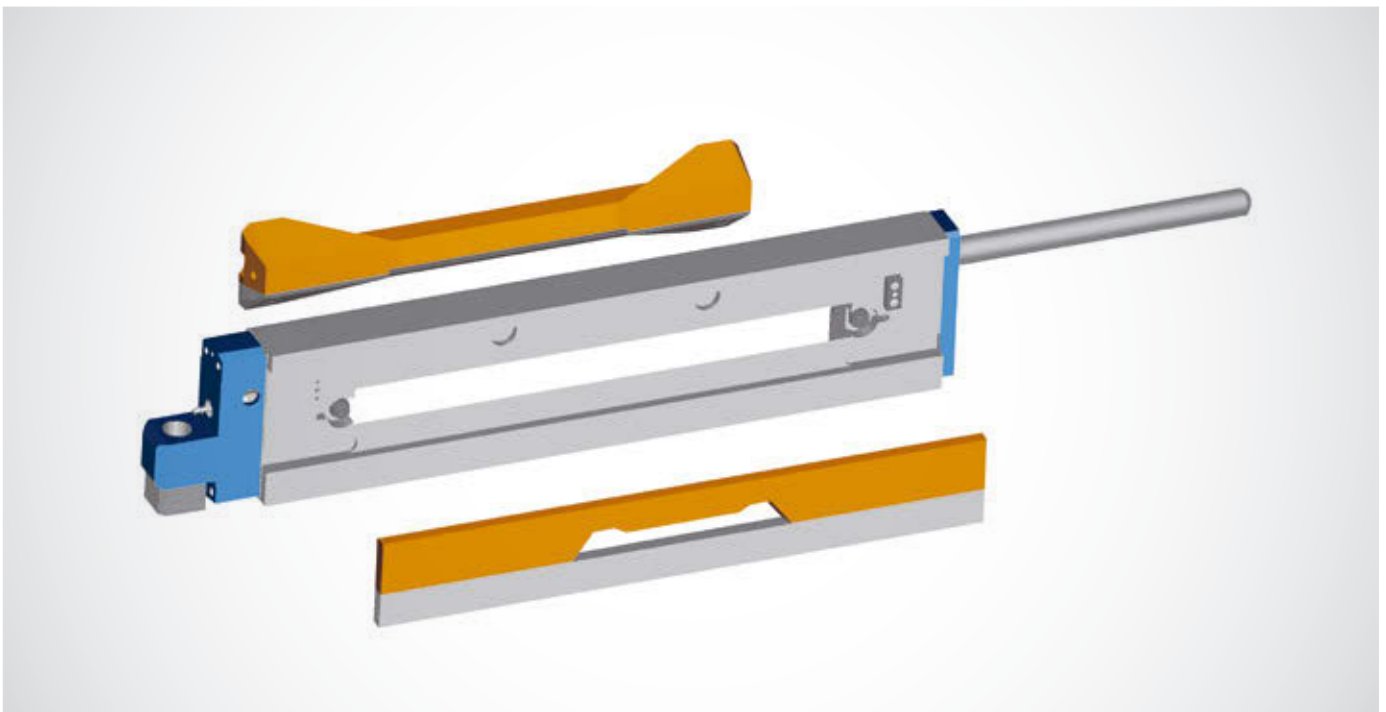
- working widths up to 850 mm for up to 2 treads in one production pass
- locking forces up to 10,000 kN
- connection of up to four extruders of different types and sizes

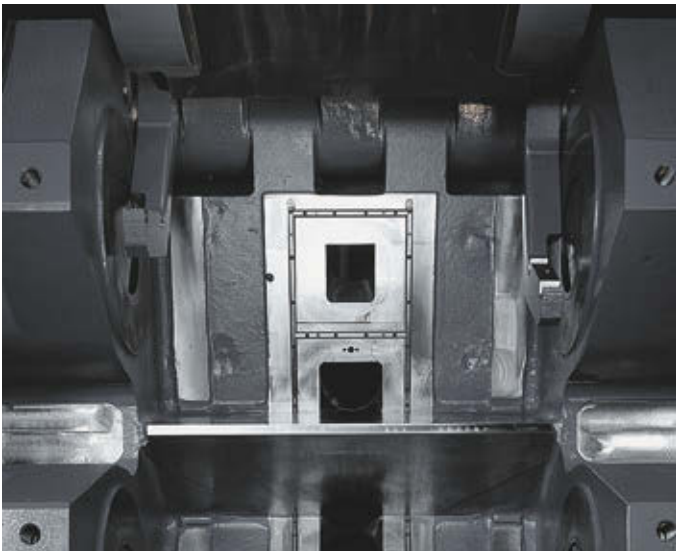
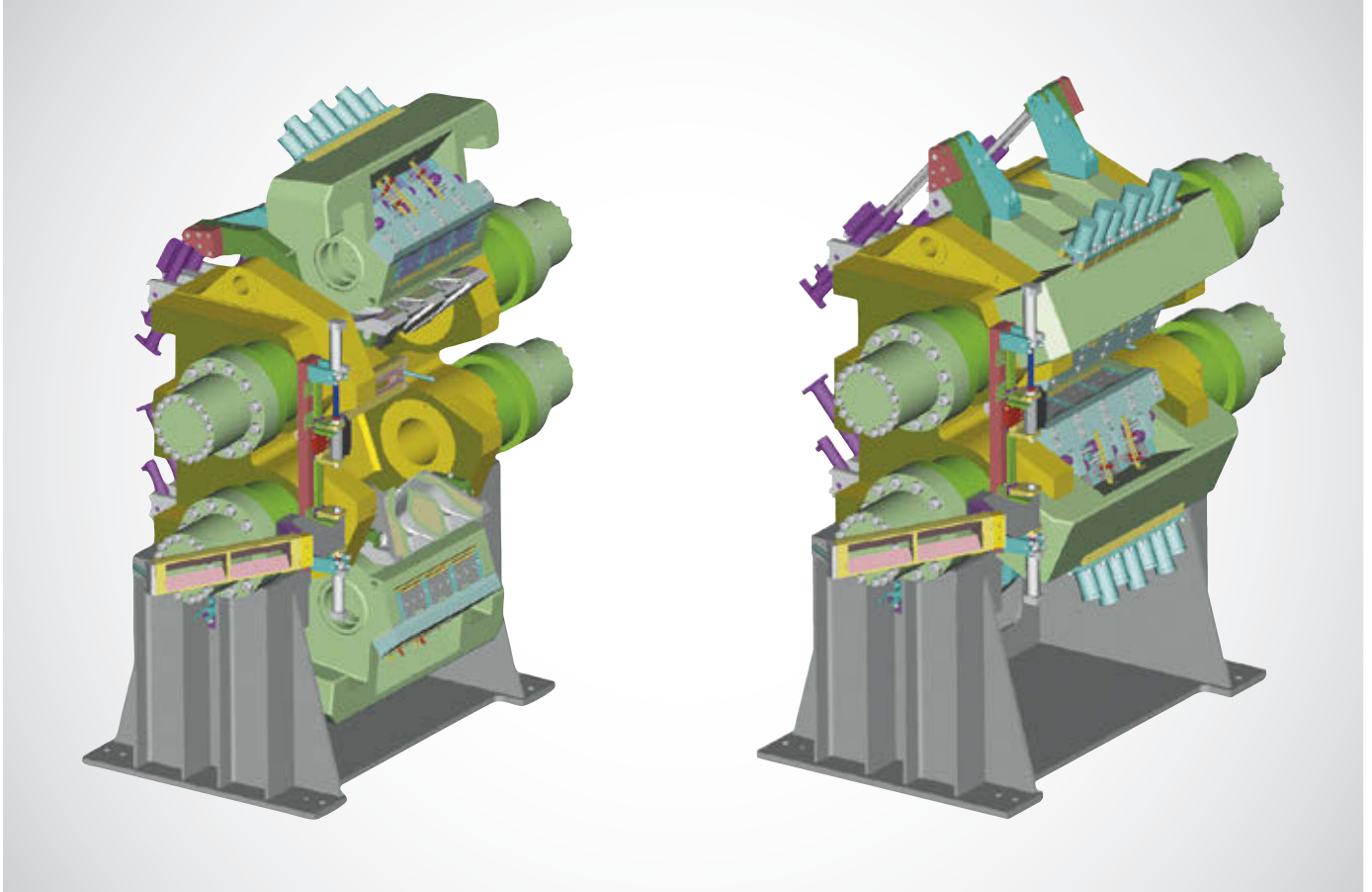
To achieve rapid change times for different profile dimensions, KraussMaffei Berstorff have two solutions:

- Cassette changer unit on the operator side, consisting of a housing and a vertical sliding unit on either cassette. One housing is in production, whilst the other is in the preparation position.
- Double wedge comb to shorten change of the final die without changing the splice bar. While the outer wedge comb is opened, the inner one holds the housing and splice bar closed against the head.

This minimises scrap and allows rapid restart of production.

The upper and lower parts of the head can be opened separately to facilitate cleaning when changing the compound and to accelerate the changeover.

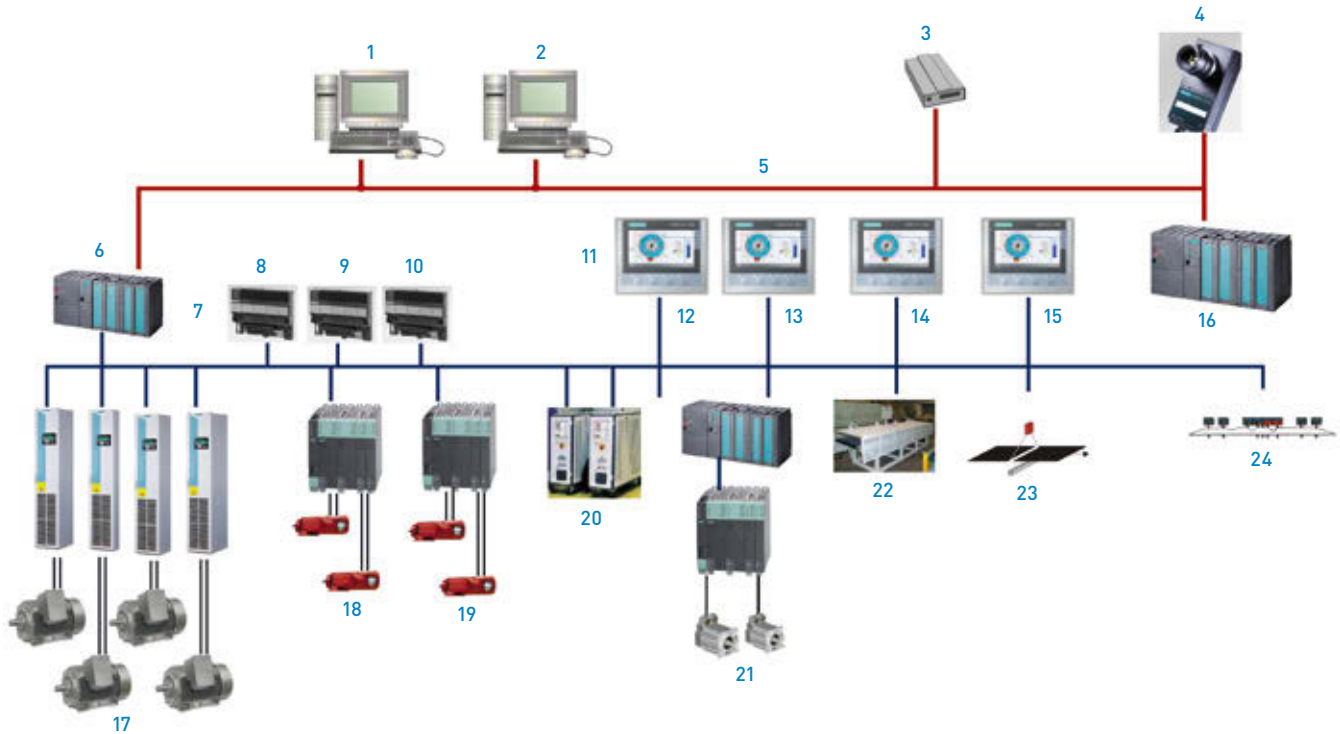




Easy to clean: extrusion head in opened position



Multiplex extrusion head with cassette changer unit



Control and automation Multiplex Extrusion Lines

Planning and construction of the electro-technical equipment for the extrusion lines are carried out in modular form to the latest standards. Customised configurations can be quickly created without problems.

The extruder motors are equipped with microprocessor drives, digital actual value access and bus connector set point provision. This technology ensures a high degree of repeatability, exact regulation and dynamic screw speed control. All this has a direct influence on the quality of the extruded profile. KraussMaffei Berstorff developed control software that minimises start-up scrap and keeps the extruded profile within the prescribed dimensional and weight tolerances during production. The system continuously reads the weight and the dimensions of the profile as well as the screw speed and the stock pressure and temperature in each extruder. If the actual process values deviate from the set points, the process parameters are corrected individually or, depending on their

proportion of influence on the profile components, of all extruders. Auxiliary drives are equipped with low-maintenance three-phase standard motors and vector-controlled frequency converters. Non-contact sensing systems such as CCD cameras and ultra sonic sensors and special digital dancer-type regulators provide tension-free material transport. Each system is provided with a digital software control, which guarantees optimal speed matching with its adjacent downstream drive. The PLC automation units of the individual machines are networked via TCP/IP with each other and with the visual display. Operator-friendly visualisation and easy-to-use recipe management facilitate flexible production planning, high product quality, minimal start-up scrap and rapid changeovers.

- | | |
|---|---|
| 1 Monitor,
PC Visualization,
Recipe | 12 Operator box head |
| 2 Monitor, PC Camera | 13 Operator box winder |
| 3 Switch | 14 Operator box Mini RH |
| 4 Camera | 15 Operator box skiver |
| 5 Ethernet TCP/IP | 16 PLC customer
communication |
| 6 Extruder control | 17 AC Drive Extruder 1-4 |
| 7 Terminal- and
operator-boxes | 18 AC Vectordrive with
pulse generator
Downstream 1...n |
| 8 Feeding for
extruder 1-4 | 19 Mini Rollerhead |
| 9 Feeding for Mini RH | 20 Heating controller |
| 10 Head | 21 Skiver with PLC |
| 11 Terminal- and
operator-boxes | 22 Scale |
| | 23 Width measurement |
| | 24 Profile scanner |

Roller-Head lines Tandem operation for maximum precision

Roller-Head technology from KraussMaffei Berstorff combines precision and economy into one: close-tolerance work for the production of innerliners and filler strips. The rubber compound is plastified in the extruder and fed directly to the roll gap of the two-roll calender via a wide-slot extrusion die. The calender calibrates the web exactly to the preset final thickness. This process avoids the formation of a rolling ball in the calender and thus the risk of air inclusions. The narrowest of tolerances over the entire web width and optimal homogeneity of the compound ensure the perfect tyre innerliner and filler strip.

Both profiles are doubled with the highest centricity and absolutely blister-free.



Multiplex Extrusion Lines

High technology, high quality, high output

The automotive vehicle tyre is a high-performance precision unit. The requirements of safety, comfort, economy and environmental compatibility demand a high level of quality in every single tyre component.

For the manufacturer, this means the application of technologies, which combine excellent quality with high output.

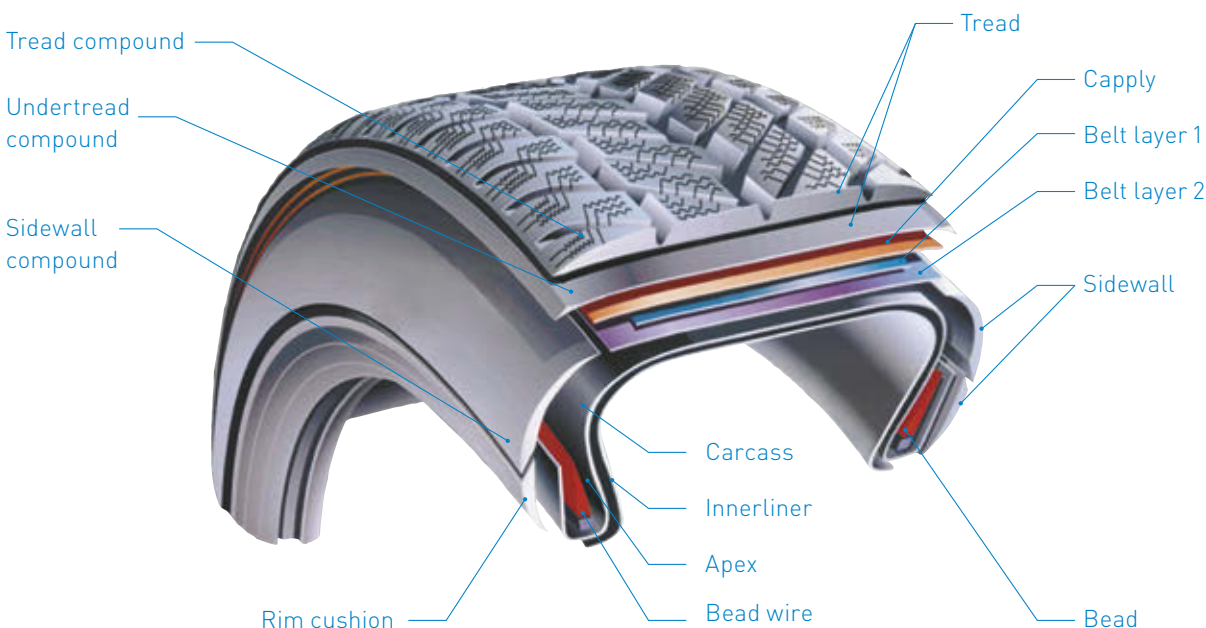
KraussMaffei Berstorff's response to this challenge is the delivery of complete high-tech extrusion lines for the production of tyre components.

Our know-how matured over decades, our own patented developments and our active participation in the innovative processes of the tyre manufacturers all go to make us an expert partner for the industry.

The demands and expectations of our customers are met with closely-targeted advice, highly-developed project management methods, computer-aided component design and state-of-the-art manufacturing and application-specific commissioning.

Our Technical Centres offer practical pre-contract support with production-scale machinery and laboratories with inspection and testing facilities. Trials are conducted under real conditions to secure the basis for each investment. The result is customer satisfaction right from the outset.

High-tech extrusion lines with the highest output rates confirm our position as the world leader in this technology as all the significant manufacturers produce their tyres on KraussMaffei Berstorff machinery.

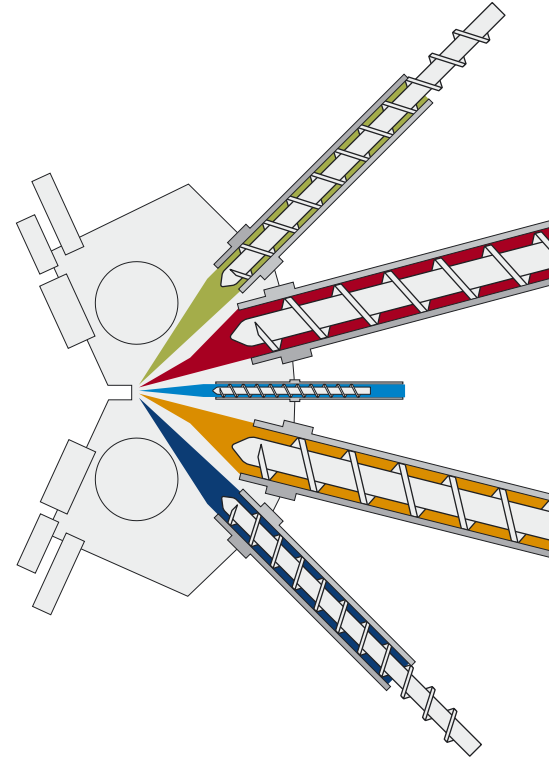


Multiplex configurations

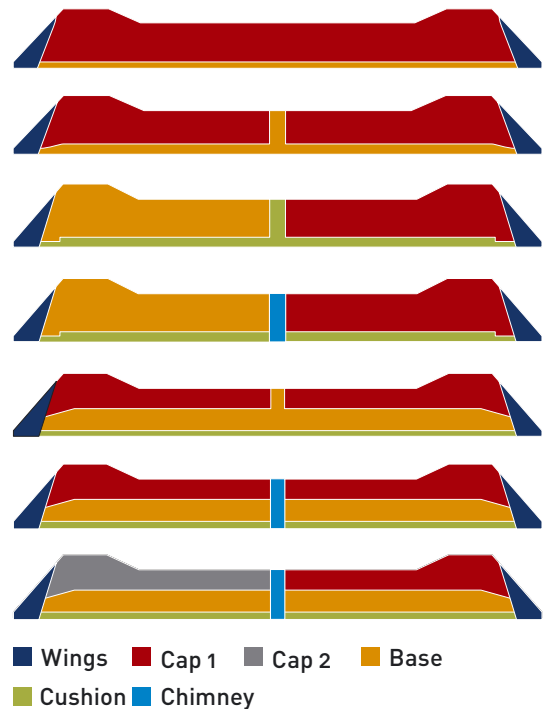
Precision in detail

Pre-assembly defines the level of the production technology. This is because pre-assembly of passenger car and truck tyres utilises all the reserves of rationalisation, whilst simultaneously raising the tyre component quality to a high level.

KraussMaffei Berstorff machines are designed in concept to meet the special demands of the manufacture of semi-finished components. Duplex, Triplex, Quadroplex and Quintoplex extrusion sets guarantee precise combination of the different components, totally free of air inclusions. The end result is always more than the sum of the individual parts – here is component technology in perfection, allowing significant rationalisation by reducing the number of working stages on the tyre building machines.



Extrusion Head	Product	Passenger car tyres	Truck tyres
Duplex	Sidewall + rim strip		
	Cap + base		
	2-component apex		
Triplex	Cap, base, wings		
	Cap, base, cushion		
	Black sidewall, rim strip, shoulder pad		
Quadroplex	Cap, base, wings cushion, chimney		
	2 x cap, base, wings		
	White sidewall, rim strip, shoulder pad		
Quintoplex	Cap, base, wings, cushion, chimney		



OEE Plus Boosting cost-efficiency for you



High overall equipment efficiency (OEE) is a fundamental prerequisite for your company's success. KraussMaffei Berstorff's product portfolio comprises tailored machines and lines along with perfectly matched services that increase the economic efficiency and the sustainability of your production. Benefit from our proven know-how of extrusion technology in any application.



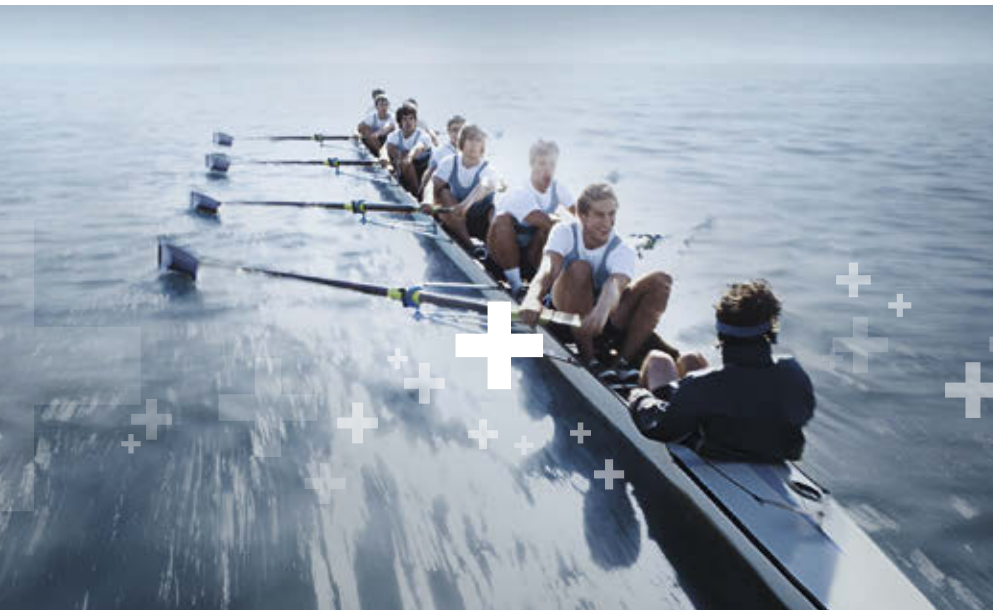
Availability



Performance



Quality



For more information about OEE Plus, visit:
www.kraussmaffeiberstorff.com/oeplus

KraussMaffei Berstorff

A strong brand in a unique global group

Value-proven Extrusion Technology solutions

Around the world, KraussMaffei Berstorff stands for reliable and value-proven solutions in Extrusion Technology. These range from using individual extruders for degassing in polymerization, compounding, pipe, profile, film and sheet extrusion, physical foaming and the manufacture of technical rubber articles and intermediates for tire production up to complete extrusion lines. All machines and systems from KraussMaffei Berstorff are custom-configured, for example for the chemical, automotive, construction, packaging or pharmaceutical industry.

There for you around the world

KraussMaffei Berstorff is your partner – from the first planning meeting through development of the best possible technical and business solution up through commissioning, servicing and production of your system. We guarantee high-quality advice, solution expertise, reliable spare parts logistics and fast-reacting service during each phase. Our goal is increasing your success.

Individualized service

Benefit from KraussMaffei Berstorff's reliable service. Our customer service team and experienced fitters, technicians and engineers are there for you as quickly as possible and even help on location to optimize your systems and processes and to minimize downtime as much as possible. Rely on our highly skilled repair and spare parts service

You can find additional information about KraussMaffei Berstorff at:
www.kraussmaffeiberstorff.com

KraussMaffei Group

Comprehensive expertise

Unique selling proposition Technology³

The KraussMaffei Group is the only provider in the world to possess the essential machine technologies for plastics and rubber processing with its KraussMaffei, KraussMaffei Berstorff and Netstal brands: Injection Molding Machinery, Automation, Reaction Process Machinery and Extrusion Technology.

The group is represented internationally with more than 30 subsidiaries and over ten production plants as well as about 570 commercial and service partners. This is what makes us your highly skilled and integrated partner. Use our comprehensive and unique expertise in the industry.

You can find additional information at:
www.kraussmaffeigroup.com



The KraussMaffei Group has a global presence. Countries with subsidiaries are marked in light blue. In the white-colored regions, the Group is represented by over 570 sales and service partners.

Tyre technology for effective production

Multiplex Extrusion Lines

As an expert partner for the tyre manufacturing industry; KraussMaffei Berstorff delivers complete leading-edge systems for the production of tyre components. Our goal is to offer the made-to-measure solutions you need to succeed in today's fast moving competition. In our product portfolio you find Multiplex extrusion lines with the highest output-rates in the market. Proven engineering power, numerous patented developments and active participation in the innovative processes of the tyre manufacturers testify to the innovative character of our machinery and made us what we are today: the world leader in this technology.