

HIGH-PERFORMANCE MACHINE TECHNOLOGY AND VERSATILE APPLICATION

DISCOVER OUR PVC PIPE PRODUCTION
SOLUTIONS



Krauss Maffei
Pioneering Plastics

AREAS OF APPLICATION OF THE 36D TWIN-SCREW PIPE SERIES



PVC foam core pipes



Highly filled PVC pipes



PVC pressure pipes



*PVC corrugated pipes**



Various PVC pipes for pressure and non-pressure applications

Other applications
 - Mining pipes (M-PVC)
 - Well pipes (U-PVC)

Technical data and dimensions of the 36D twin-screw extruder series

	KMD 75-36 E2/R	KMD 90-36 E2/R	KMD 108-36 E2/R	KMD 114-36 E2/R	KMD 133-36 E2/R
Output range [kg/h] 1550	210-540	300-770	450-1000	480-1200	600-1550
Drive power [kW]	57	76	114	117	166
Screw length [L/D]	36	36	36	36	36
Screw diameter [mm]	75	90	108	114	133
Screw heating/cooling	Internal	Internal	Internal	Internal	Internal
Extrusion height [mm]	1000	1150	1150	1150	1150

HIGH-PERFORMANCE TECHNOLOGY AND HIGH FLEXIBILITY

The parallel 36D twin-screw extruders have been engineered specifically for PVC processing. Their objective: Outstanding cost-efficiency thanks to a high output rate and excellent product quality. With a wide product portfolio, based on our modular machine concept, we can offer application-specific production solutions for pipe extrusion which are high-performance and extremely cost-effective.

Your benefits at a glance:

- Low maintenance costs thanks to internally heat-balanced screws and air-cooled barrels
- Safe degassing even with highly filled mixtures
- Wider processing range of different formulations and materials thanks to high process flexibility
- Increased cost-efficiency thanks to a longer service life of the process unit
- High output rate with perfect product quality
- Excellent price-performance ratio

IMPRESSIVE ENCOUNTER

TAKE A TOUR OF THE 36D TWIN-SCREW EXTRUDER FOR PIPE EXTRUSION

Standard dosing unit

for processing many different materials

Robust gearbox

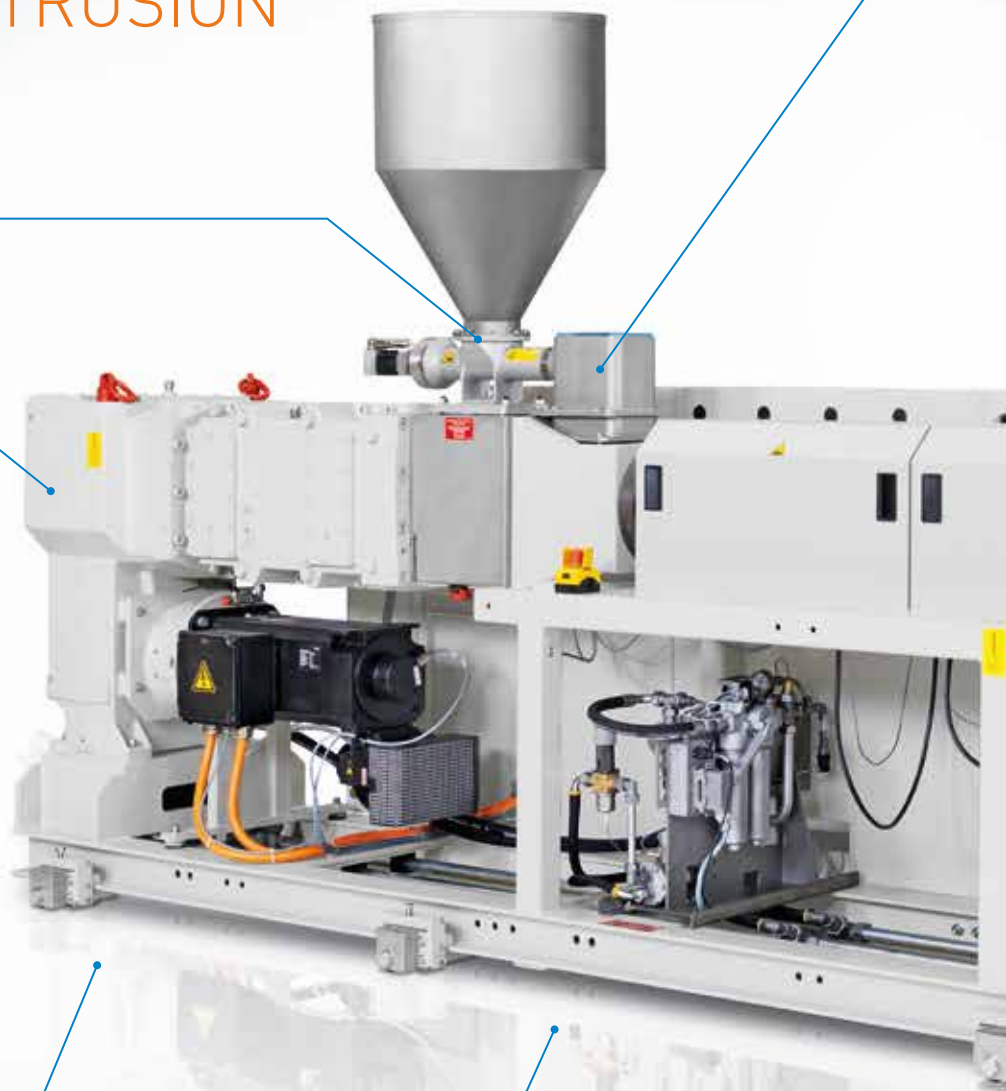
ensures low maintenance costs and a long service life

Drive motor

air-cooled AC motor

Gearbox lubrication unit

for filtering and adjusting the temperature of the gearbox oil



Rectangular filling opening
allows optimum screw filling

36D process unit
with molybdenum-welded screws and deep-nitrided,
air-cooled barrel

Vacuum degassing
with a stable waste pipe and a quick
connection for easy cleaning

Vacuum degassing unit
with double solids separator
(special models)

HIGH PROCESS FLEXIBILITY

OPTIMIZED SCREW DESIGN

Due to their screw concept, the 36D twin-screw extruders are ideally suited for producing U-PVC, M-PVC and foam core PVC pipes, as well as PVC-O pipes.

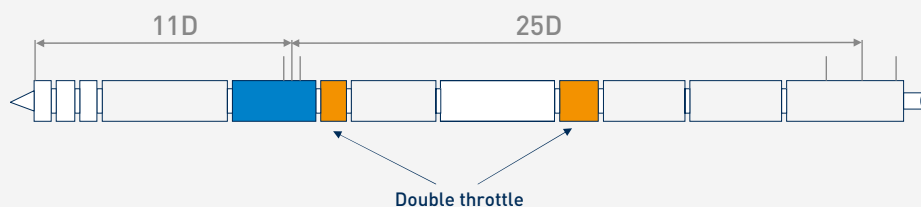
High Performance Geometry (HPG)

The HPG screw concept achieves high process flexibility thanks to the long effective pre-heating length. This results in significant benefits for the processors.

YOUR BENEFITS:

- Wider processing window when processing different formulations and materials
- Optimal incorporation of color, blowing agent, chalk and regrind
- Low compression values in the area of the throttle zones
- Excellent melt homogeneity thanks to optimal material processing
- High versatility in production from a process technology standpoint

36D single degassing extruder for pipes (current series)
HPG single degassing geometry



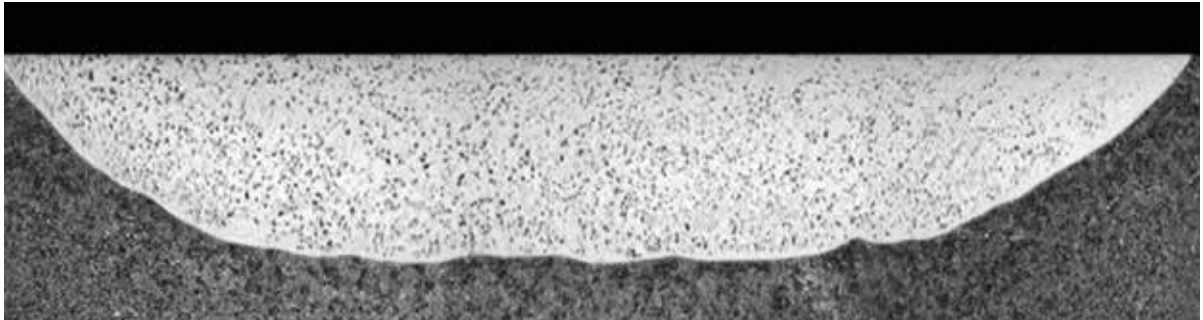
Double throttle: The longer pre-heating length of the HPG screws results in low compression values and therefore a prolonged service life. A further advantage is the outstanding material degassing.

OPTIMAL WEAR RESISTANCE OF THE MOLYBDENUM WELDED LAYER

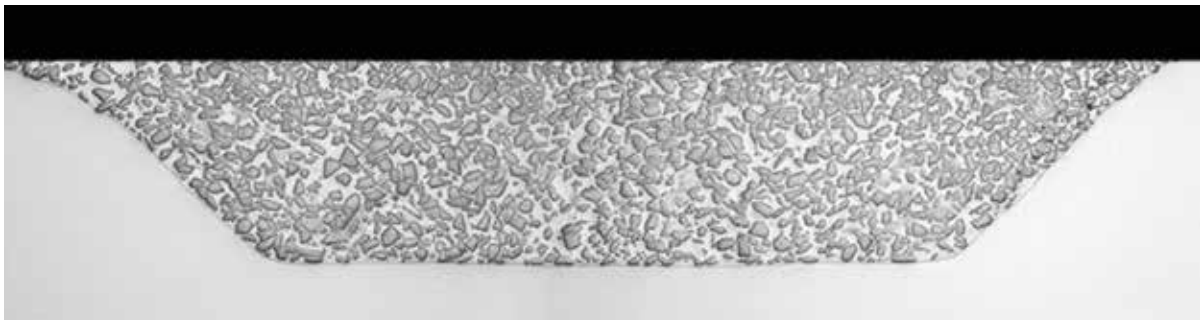
As standard, the parallel twin screws are armored on the flights with one of the KraussMaffei patented molybdenum welded layers.

All twin-screw extruders are equipped with deep-nitrided barrels. A nitriding steel is used as the construction material as it enables a particularly high surface hardness to be achieved in the barrel bores. The molybdenum wear-resistant layer on the screw flights and the deep-nitrided barrel bore surface are an ideal friction combination with excellent sliding properties and minimal wear.

For particularly abrasive filler materials and mixtures that contain a high proportion of filler, KraussMaffei offers specially protected tungsten carbide screws in combination with bimetal barrels.



Finely dispersed, isotropic joint of a molybdenum hardfacing



Homogeneous, isotropic carbide distribution of a tungsten-carbide hardfacing

FORMULA FOR SUCCESS FOR COST-EFFECTIVE AND CUSTOMER-SPECIFIC SOLUTIONS – MODULAR EXTRUDER CONCEPT

Like all the extruders built by KraussMaffei, the twin-screw extruders in the 36D series are engineered to an intelligent modular design.

The screw concept

The screws are internally heat-balanced as standard. The internal screw heating/cooling contributes significantly to energy savings and an optimum melt homogeneity. The system is self-regulating and completely maintenance-free. A regulated metering unit with metering spirals enables a constant specific melt throughput, even when using different formulations.

Air-cooled barrels

The air cooling unit is part of our standard system. The system uses aluminum half shells with cast-in heating coils and integrated cooling fins. The temperature sensors are fitted to the sides of the barrel between each pair of cooling blocks so as to keep control circuits as short as possible. The system is completely maintenance-free. There is no risk of scaling, which can occur with copper fins, so that a constant high heat transfer is always guaranteed.



Aluminum cooling blocks with cast-in heating coils



Cooling fan

CUTTING MATERIAL COSTS

HIGHLY FILLED PIPES OF UP TO 60 PHR CHALK IN THE MAIN COMPONENT

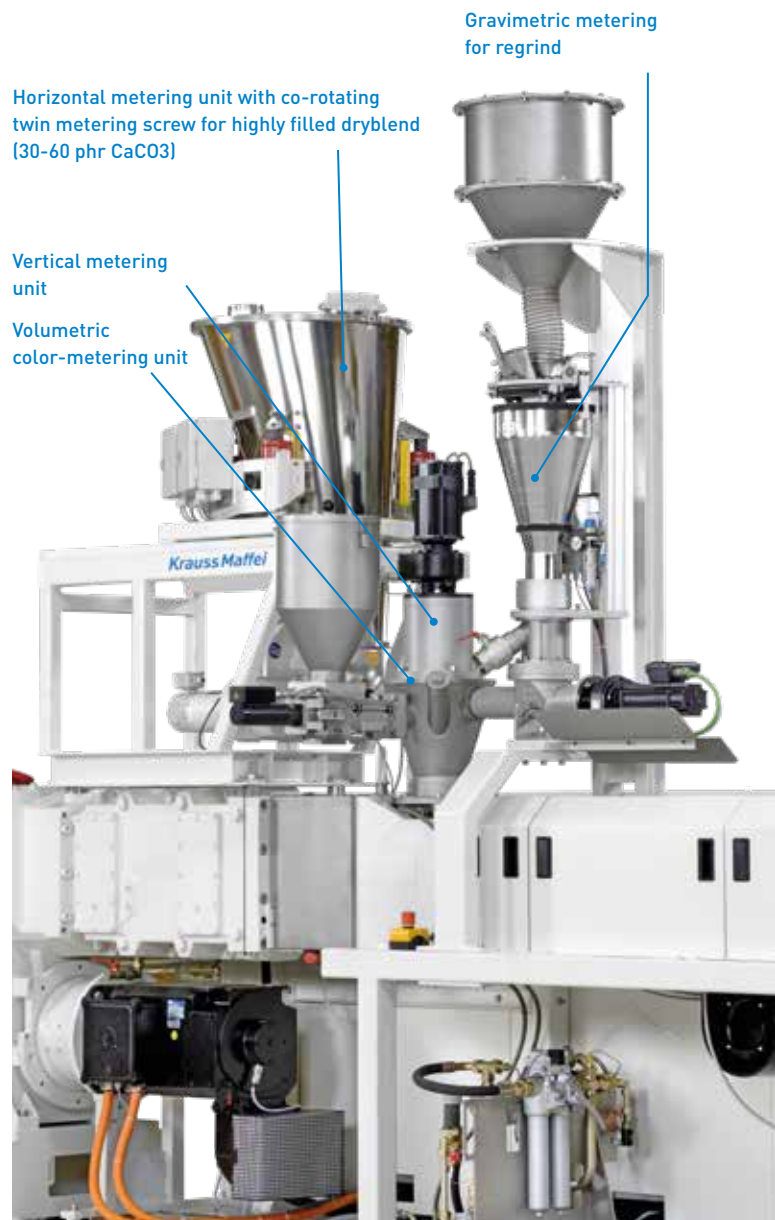
Higher filler content significantly reduces costs during the production of compact PVC pipes – however, this should not be at the expense of product quality.

Special metering unit for highly filled material

In the highly competitive PVC pipe market, in which the producers are now subjected to constantly increasing price pressures, the trend is moving towards use of the highest possible percentage of fillers, particularly for drainpipes. In parallel with this, however, higher outputs are also required while maintaining perfect product quality.

Formulations with a high proportion of chalk (up to 60 phr in the main component) require a significantly higher energy input, which is optimally achieved by the larger effective preheating length. The twin-screw extruder of the 36D series excellently masters this process-technology challenge.

The extruder has a horizontal-vertical metering unit in order to process formulations with a high proportion of chalk (more than 30 phr). There is also the option of integrating a regenerative metering unit, as the figure shows. The 36D concept guarantees absolutely safe material degassing for normally filled as well as for highly filled PVC compounds.



KMD 90-36 E/R equipped to process highly filled PVC compounds

LOWER MATERIAL COSTS AND INCREASED VERSATILITY

HIGHLY FILLED PIPES UP TO 100 PHR CHALK THROUGH DIRECT EXTRUSION

The KraussMaffei concept for high filler content reduces material costs enormously.

The innovative machine concept can be equipped with multi-component gravimetrics with up to six components, three of which can be added gravimetrically or volumetrically. This offers enormous material cost savings because it enables maximum metering of cost-cutting material mixtures. This means that, with gravimetric weighing and highly filled dryblends (up to 60 phr chalk in

the main component), regrinds and regranulates (up to 20 phr) and even pure chalk can be added. Thanks to the direct extrusion of chalk, the total chalk content in the mixture can be increased to 100 phr. Using secondary component metering, processing aids, color and blowing agent can be added.

YOUR BENEFITS:

- Energy savings
- Increased mixing capacity
- No material segregation during transport
- Optimal product quality thanks to good dispersion of the filler

PVC FOAM CORE PIPE PRODUCTION WITH TWIN-SCREW EXTRUDERS FROM THE 36D SERIES

Reduce material costs by up to a third by using foam core pipes.

Material costs when producing PVC foam core pipes can be significantly reduced by using 36D twin-screw extruders combined with the PVC three-layer pipeheads developed by KraussMaffei. In doing so, the 36D twin-screw extruder guarantees peak product quality. The extruders can be used as main extruders as well as coextruders. The foaming decreases the density of the pipe-core layer to up to 0.6 kilograms per cubic decimeter.

The density of the entire pipe can therefore be reduced by up to 30 percent in comparison to compact PVC pipes. PVC foam core pipes are being used more and more for non-pressure applications, such as drain-pipes.

Extruder combination for the production of PVC foam core pipe consisting of: A KMD 90-36 E/R for the outer and inner layers and a KMD 75-36 E/R to produce the foam layer





NEU WIE EINEN BLICK
AUF DIE
FAKULTÄTSPATENTANLAGE

C7 CONTROL SYSTEM – SUCCESS MOVING TO THE NEXT ROUND

The functions of both of the proven KraussMaffei “BPC Touch” (compounders) and “C6” (PO and PVC lines) control systems are now combined in the new C7 extruder control system. As part of this fusion, the user-friendly interface has additionally been upgraded and updated to a more modern appearance.

One Extrusion – One Control

The blending of the two control systems creates tremendous potential in terms of new flexible system configurations and groundbreaking plastics applications. Using the C7 control system, the machine operator keeps complete control over the entire extrusion line with direct and fast access to the individual units in the higher-level systems network. The numerous monitoring, control and automation functions create the basis for optimum product quality and high process reliability.

One look at the essentials

With the redesign of the user interface, we have succeeded in enhancing the focus on the essentials with the same clear information content. The familiar clear screen layout paired with a pleasing and intuitive color scheme provides a comprehensive process overview for the user at all times, as well as the foundation for fast intervention options.

With the C7 control system, KraussMaffei is also placing particular focus on continuing the ongoing, proven and trusted operating principle and functionality.

Various operating versions



Swivel-mounted on switching cabinet (standard)



Boom-mounted version (option)



Mounted on switching cabinet door (option)



Mobile version (option)

YOUR BENEFITS:

- One control system – diverse applications
- State-of-the-art, attractive design
- Proven, intuitive operating philosophy
- Versatile data handling for the digital factory
- Flexible solution for total system concepts and individual machines

Connection to the digital future

With its many interfaces, the C7 control system is ideally equipped for the data world of tomorrow. Alongside the proven conventional paths (USB, PDF export), there are various network-based data interfaces (e.g. OPC-UA, Euromap84) available for accessing machine and operating data. Internal and external data recorders provide support in analyzing and optimizing processes.

The possibility to carry out remote diagnostics via the Internet, as well as to gain secure access to the machine control system through non-contact identification by use of a RFID reader, rounds off the digital portfolio.

AREAS OF APPLICATION OF THE PVC PIPEHEADS



PVC foam core pipes



Highly filled PVC pipes



PVC pressure pipes



*PVC corrugated pipes**



Various PVC pipes for pressure and non-pressure applications

Other applications

- Mining pipes (M-PVC)
- Biaxially oriented pipes (PVC-O)

High-quality, cost-competitive and flexible PVC pipe production:

KraussMaffei offers a range of ten pipehead sizes, covering a broad spectrum of diameters and applications in PVC pipe manufacturing. There is a growing trend to multilayer foam core PVC pipe, which offers the prospect of sharply

reduced material costs. Here we offer three pipehead models for combination with twin-screw extruders. Our PVC pipeheads are engineered to support your drive for extremely flexible and profitable production.



PERFECT PIPE EXTRUSION PIPEHEADS FOR PVC PROCESSING

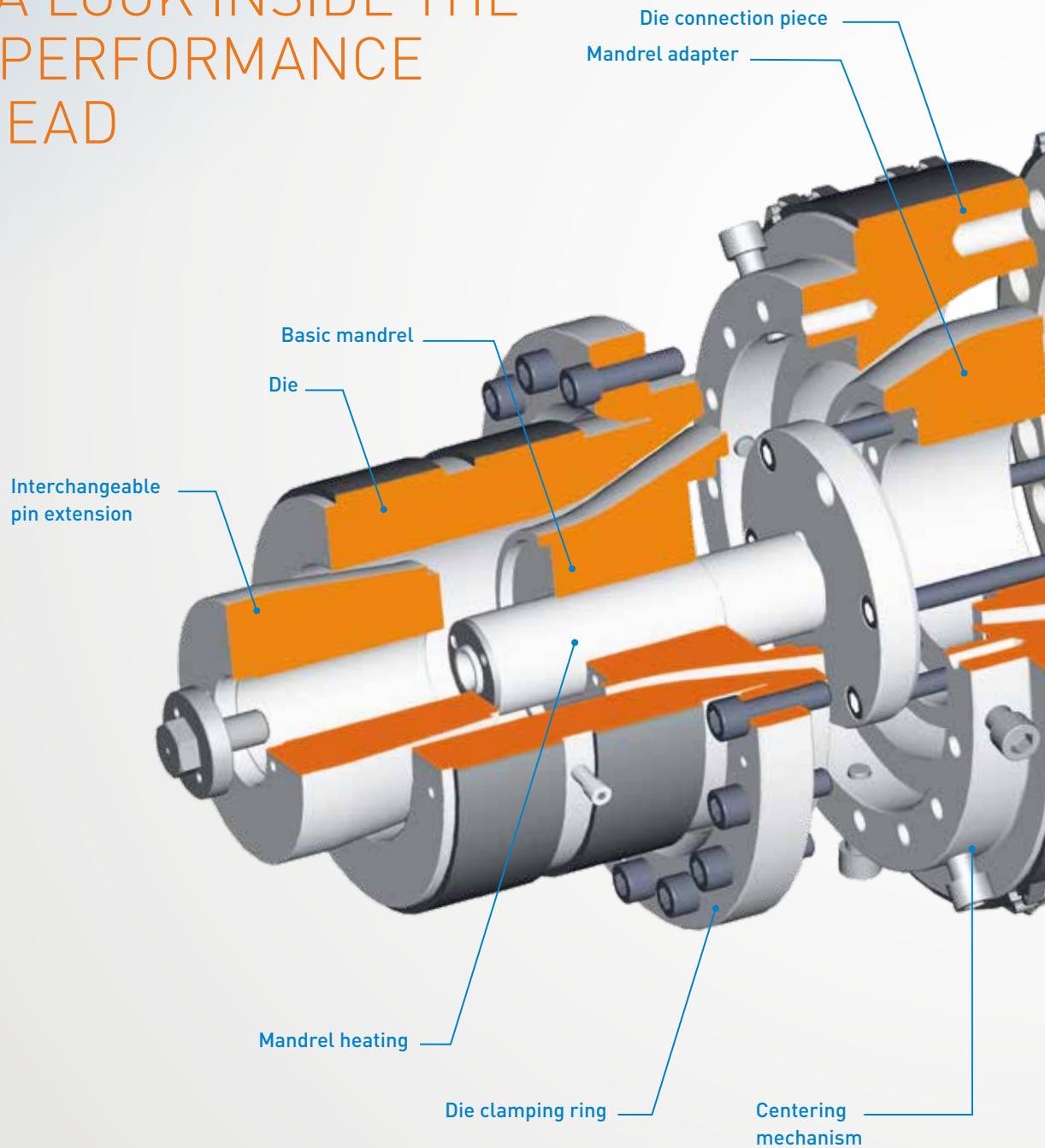
High production outputs coupled with consistently outstanding pipe quality are decisive factors in ensuring cost-effective pipe extrusion. In addition, the use of system components that are free of defects and are optimally tailored to their intended purpose enables a targeted approach to be taken to reduce costs and achieve a high level of flexibility.

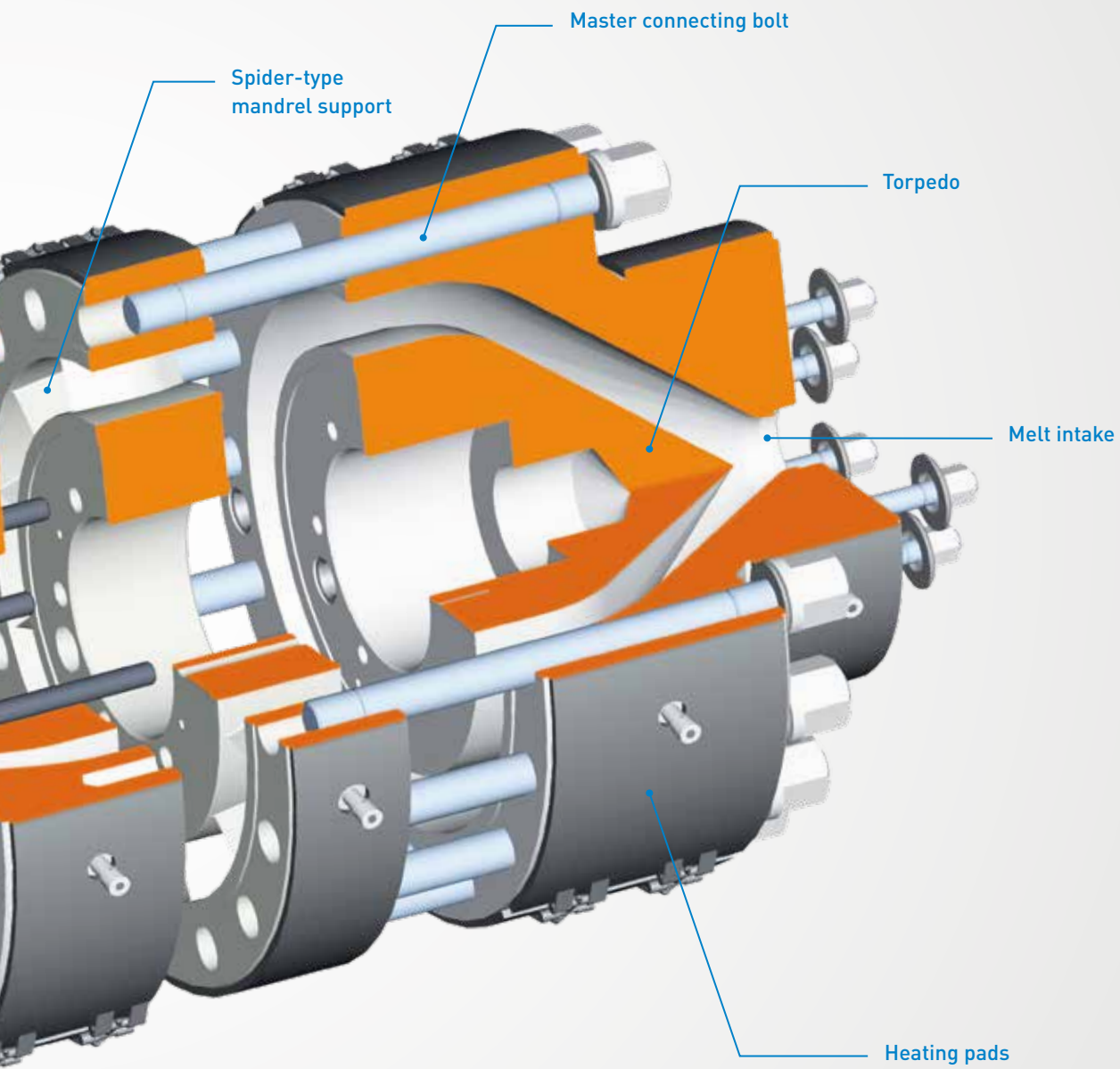
Your benefits at a glance:

- Perfect pipe quality and a stable, reliable process
- Wide processing window
- Tight wall-thickness tolerances thanks to perfect melt distribution
- Wide range of pipe dimensions
- Quick and easy production start-up with a pipehead that is simple to assemble and disassemble
- Optimal layer thicknesses for multilayer pipes
- Compact, space-saving unit
- High return on investment

IMPRESSIVE ENCOUNTER

TAKE A LOOK INSIDE THE HIGH-PERFORMANCE PIPEHEAD





FLEXIBLE AND COST-COMPETITIVE PIPE PRODUCTION PRECISION PIPEHEAD SYSTEMS

KraussMaffei offers a range of nine different pipehead sizes in total, covering a broad spectrum of diameters in PVC pipe manufacturing.

Producing outstanding pipe quality

KraussMaffei pipeheads are optimally engineered for processing the many different U-PVC formulations. We offer special pipehead versions for C-PVC pipe production. All our pipeheads are thermally and rheologically designed to produce very high pipe quality. We employ a spider-type-mandrel-support design in pipeheads for PVC processing, and this has proven to be very well suited in particular to processing thermally sensitive materials.

Complete range of pipeheads for all pressure classes

A total of ten pipehead types cover the pipe diameter range from 16 to 800 mm. Reducing adapters are available for each pipehead in order to extend its diameter range to cover the majority of the diameter range for the next smallest pipehead.

Twin-strand extrusion makes best use of extruder performance

We offer a twin-strand extrusion head, the KM-RKD 200, that makes extrusion of small diameter pipes (16 to 63 mm) cost-effective by using the extruder's full output capacity. Another standard approach to twin-strand extrusion is to split the melt by connecting a manifold block upstream of two standard pipeheads (KM-RK 21 – 24) and configure the downstream components as two parallel production lines placed close together.

YOUR BENEFITS:

- Greater versatility
- Significant cost savings



Efficient pipe production with high-performance systems in the twin-strand

THE BENEFITS FOR YOUR PVC PIPE PRODUCTION ARE IN THE DETAIL

A great many factors contribute to making KraussMaffei pipeheads the right choice for cost-effective PVC pipe production and premium pipe quality.

Materials specially selected to suit the operating conditions lower costs

We predominantly use quenched and tempered chrome steel for the pipehead and die set components that come into contact with the melt.

Simple handling for faster die changes and production start

In order to achieve economical production, the lines must attain a stable and continuous production state following a short start-up time. Our pipeheads are therefore characterized by their ease of handling and a design that is suited to the operating conditions.

- Locating bolts ensure that the pipehead segments are fitted in the correct position
- A hydraulic pretensioning unit ensures that large pipeheads are screwed on evenly and that this fitting is able to withstand the tensile forces that it will encounter in operation
- Mounting carriages allow precise pipehead alignment

Optimized temperature control and flow conditions

The flow of KraussMaffei's pipeheads for PVC is engineered to ensure the quality and dimensional accuracy of the pipes.

- The flow channel volumes are coordinated to maximum throughput
- Flow-optimized mandrel support ribs ensure smoother and more uniform melt flow
- The die set design enhances pressure balancing in the pipehead

This design ensures that the melt flows together seamlessly downstream of the ribs at all working points.

Precise melt temperature control

Individually controlled resistance-heating pads ensure that all essential pipehead components are heated to the right temperature. The number of heating pads depends on pipehead size. We also offer a mandrel temperature-control option, which is beneficial particularly in processing temperature-sensitive materials.

Automation components cut both material consumption and costs

Continuous gravimetric melt throughput measurement and meter-weight adjustment, along with thermal pipehead centering, permit reduced material consumption. Thermal pipehead centering is especially effective in processing resins with temperature-dependent wall-slipping characteristics. The system allows the temperature of different die zones to be individually regulated to minimize wall-thickness fluctuations.

The dies are separated into heating zones for the purpose of thermal centering; slits are provided to thermally separate these heating zones. The heating zones can be regulated individually – either manually, or automatically in conjunction with ultrasonic wall-thickness measurement.

Pipehead	Dimension range	Throughput
KM-RKD 200 ¹⁾	16 x 1.2 mm - 63 x 3.0 mm	max. 520 kg/h
KM-RK 21-75 ²⁾	16 x 1.5 mm - 75 x 3.6 mm	max. 250 kg/h
KM-RK 22-110 ²⁾	25 x 2.6 mm - 110 x 5.3 mm	max. 350 kg/h
KM-RK 22-125 ²⁾	25 x 2.6 mm - 125 x 6.0 mm	max. 450 kg/h
KM-RK 23-160 ²⁾	50 x 3.0 mm - 160 x 7.7 mm	max. 700 kg/h
KM-RK 23-250 ²⁾	75 x 1.8 mm - 250 x 7.3 mm	max. 1000 kg/h
KM-RK 24-280 ²⁾	90 x 3.5 mm - 280 x 8.6 mm	max. 1050 kg/h
KM-RK 25-450	125 x 4.8 mm - 450 x 13.8 mm	max. 1400 kg/h
KM-RK 26-710	200 x 4.9 mm - 710 x 17.4 mm	max. 1900 kg/h
KM-RK 27-800	315 x 6.2 mm - 800 x 23.3 mm	max. 2500 kg/h

¹⁾ Twin-strand pipehead

²⁾ Can be used with a Y piece as a twin-strand pipehead

FIELD OF APPLICATIONS OF THE PVC PIPEHEADS IN ACCORDANCE WITH EN 1452

PVC pipeheads – dimension ranges and maximum output rates

Pipe Ø/mm	Nominal pipe wall thickness EN 1452								Pipehead type KM-RK											
	S 20 SDR 41	S 16.7 SDR 34.4	S 16 SDR 33	S 12.5 SDR 26	S 10 SDR 21	S 8 SDR 17	S 6.3 SDR 13.6	S 5 SDR 11	PHT 200	PH 21-75	22-110	22-125	23-160	23-250	24-280	25-450	26-710	27-800		
	Rated pressure PN based on a total operating coefficient (calculated) C = 2.5																			
			PN 6	PN 6	PN 8	PN 10	PN 12.5	PN 16	PN 20											
16									1.5											
20								1.5	1.9											
25							1.5	1.9	2.3											
32				1.5	1.6	1.9	2.4	2.9												
40			1.5	1.6	1.9	2.4	3.0	3.7												
50	1.5	1.6	2.0	2.4	3.0	3.7	4.6													
63	1.9	2.0	2.5	3.0	3.8	4.7	5.8													
75	2.2	2.3	2.9	3.6	4.5	5.6	6.8													
90	2.7	2.8	3.5	4.3	5.4	6.7	8.2													
	Rated pressure PN based on a total operating coefficient (calculated) C = 2.0																			
		PN 6	PN 7.5	PN 8	PN 10	PN 12.5	PN 16	PN 20	PN 25											
110	2.7	3.2	3.4	4.2	5.3	6.6	8.1	10.0												
125	3.1	3.7	3.9	4.8	6.0	7.4	9.2	11.4												
140	3.5	4.1	4.3	5.4	6.7	8.3	10.3	12.7												
160	4.0	4.7	4.9	6.2	7.7	9.5	11.8	14.6												
180	4.4	5.3	5.5	6.9	8.6	10.7	13.3	16.4												
200	4.9	5.9	6.2	7.7	9.6	11.9	14.7	18.2												
225	5.5	6.6	6.9	8.6	10.8	13.4	16.6													
250	6.2	7.3	7.7	9.6	11.9	14.8	18.4													
280	6.9	8.2	8.6	10.7	13.4	16.6	20.6													
315	7.7	9.2	9.7	12.1	15.0	18.7	23.2													
355	8.7	10.4	10.9	13.6	16.9	21.1	26.1													
400	9.8	11.7	12.3	15.3	19.1	23.7	29.4													
450	11.0	13.2	13.8	17.2	21.5	26.7	33.1													
500	12.3	14.6	15.3	19.1	23.9	29.7	36.8													
560	13.7	16.4	17.2	21.4	26.7															
630	15.4	18.4	19.3	24.1	30.0															
710	17.4	20.7	21.8	27.2																
800	19.6	23.3																		

Reducing adapter

REDUCING COSTS THROUGH PVC MULTILAYER PIPE PRODUCTION

The trend in PVC pipes for non-pressure applications is increasingly toward multilayer pipes. Their core layer, which may be compact or foamed, may consist of the following materials:

- Dry blend with up to 20 phr filler
- Highly filled dry blends with up to 100 phr filler
- Regrind (recycled materials or post-consumer plastics) in proportions of 10-100%

In a KraussMaffei pipehead, the three melt layers are not split by ribs once they have converged. The following pipehead models are available:

KM -3 LRK 41

for the dimension of 32 × 2.0 – 90 × 3.0 mm
with output of max. 500 kg/h

KM -3 LRK 42

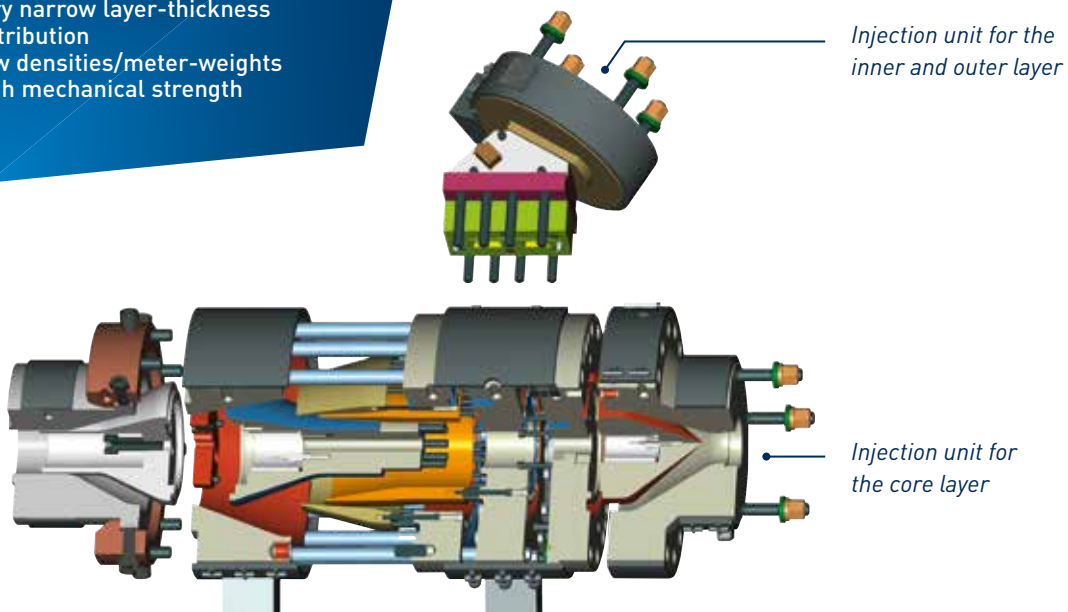
for the dimension of 75 × 3.0 – 200 × 5.9 mm
with output of max. 800 kg/h

KM -3 LRK 43

for the dimension of 200 × 3.9 – 500 × 14.6 mm
with output of max. 1,200 kg/h

YOUR BENEFITS:

- Excellent layer adhesion
- Very narrow layer-thickness distribution
- Low densities/meter-weights
- High mechanical strength





OUR WORLDWIDE EXPERTISE IS YOUR ADVANTAGE DIGITAL & SERVICE SOLUTIONS

With your KraussMaffei machine, you have chosen a product that delivers the highest levels of productivity and reliability. In addition to our range of machinery, KraussMaffei focuses on comprehensive and future-oriented solutions, innovative business models and an innovative portfolio of digital products.

Customer service at the touch of a button

The process of digital transformation is becoming faster and easier than ever for the customer. Our Digital & Service Solutions unit makes your production chain even more flexible and efficient with future-oriented solutions. KraussMaffei thus globally provides an all-inclusive customer service package and networks machines and processes with each other. Our global support offers a sound basis for your local long-term success.

Individual challenges in mechanical engineering call for intelligent solutions

With our services portfolio, we support you throughout your machine's lifecycle with a strong focus on your specific needs. In order to satisfy your wishes, we offer you a wide range of solutions in order to ensure maximum availability and optimum productivity of your machines.

Technology³ as a unique selling proposition

KraussMaffei is the only supplier in the world with a product range comprising the most important machine technologies for plastic and rubber processing: injection molding machinery, automation, reaction process machinery and extrusion technology. KraussMaffei is represented worldwide with more than 30 subsidiaries and over 10 production plants as well as about 570 commercial and service partners. Working together with our customers and partners, we are thus in a position to offer vast and unique expertise in the industry.

You can find further information at:
www.kraussmaffei.com

KRAUSSMAFFEI – PIONEERING PLASTICS



Extensive expertise from a single supplier

KraussMaffei is one of the world's leading manufacturers of machinery and systems for producing and processing plastics and rubber. Our brand has been synonymous with cutting-edge technology for over 180 years. Our product range includes all technologies in injection molding, extrusion and reaction process machinery. KraussMaffei has a unique selling proposition in the industry as a result. By drawing on our proven innovative capacity, we can guarantee our customers sustained additional value over their entire value-adding chain through our standardized and individual product, process, digital and service solutions. The range of our products and services allows us to serve customers in

many sectors including the automotive, packaging, medical and construction industries. We also supply manufacturers of electrical and electronic products and household appliances.

At your service all over the world

KraussMaffei is represented all over the world. Subsidiaries provide you with support in the countries shown in light blue. Our sales and service partners take care of you in the regions shown in white.

You can find all contact information at
www.kraussmaffei.com

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