



ZSK twin screw extruders. The benchmark for maximum throughput and highest product quality.

Continuous
Success
Story

Mc¹⁸

»» Why three letters define the market. Every single component of the ZSK twin screw extruder is an example of top class high technology. With the know-how and experience of the pioneers in the development of the co-rotating twin screw extruder we design every single process step of the extrusion system to meet your individual product requirements. As a result, you benefit from maximum throughput rates and highest product quality. More than 15,000 twin screw extrusion systems installed worldwide provide the daily proof.

The continuous research and development work of Coperion, formerly Werner & Pfleiderer, has made the ZSK co-rotating twin screw extruder into what it is today: A top-quality product at the highest technical level. It is the high-end, high-tech heart of our processing plants and is continuously setting new standards in the plastics, chemical, pharmaceutical and food industries.

The quality of the end product is the decisive factor in complex processes such as the processing of viscous materials. From

raw materials feeding through conveying, melting, dispersing, homogenizing, devolatilizing, pressure build-up, filtering and pelletizing, we use our decades of experience and extensive know-how to adapt every process step exactly to your application.

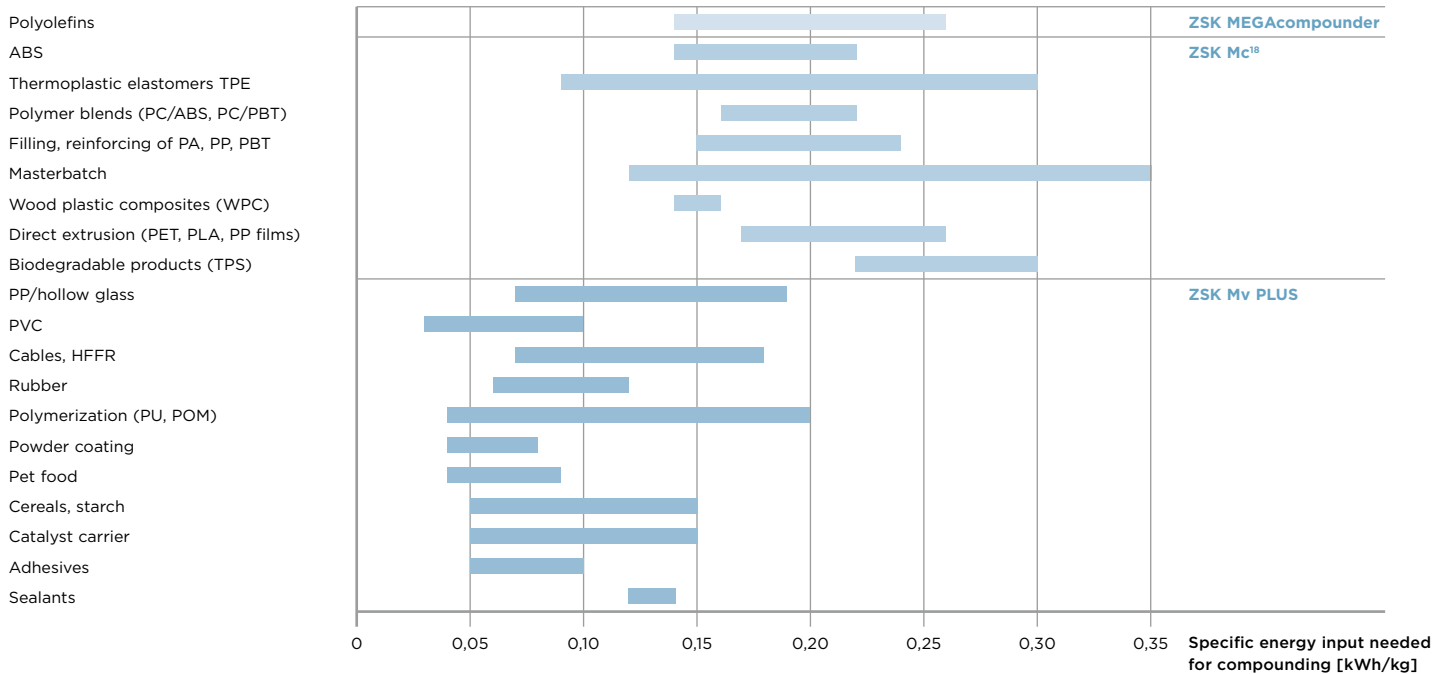
The ZSK twin screw extruder gives you a processing plant featuring maximum throughput rates, gentle handling of the product, optimum economy and highest reliability.

The right ZSK twin screw extruder for every application

ZSK Mc¹⁸	Extruder for products with high torque requirement such as engineering plastics
ZSK Mv PLUS	Extruder for processes with high volume requirement such as products from the chemical and food industries
ZSK MEGAcoupler	High capacity extruder for homogenization and pelletizing of polyolefins downstream of the polymerization reactor
Kombiplast	ZSK with a single screw discharge for gently building up pressure for temperature and shear sensitive products such as PVC
ZSK MEGAlab	Laboratory extruder for recipe development and basic scientific research
Compounding plants	Turnkey compounding systems with all components from raw material feeding to downstream periphery



The areas of application of the ZSK twin screw extruder



➤ Minor details with a major effect. With the extensive knowledge of the technology leader for the design of processing plants, we continuously develop and optimize every single detail of the ZSK. It is demonstrated by countless technical achievements and innovations which are all perfectly adapted to each other. They make the ZSK the ideal compounder for maximum flexibility, reliability and economy at maximum quality and throughput requirements.

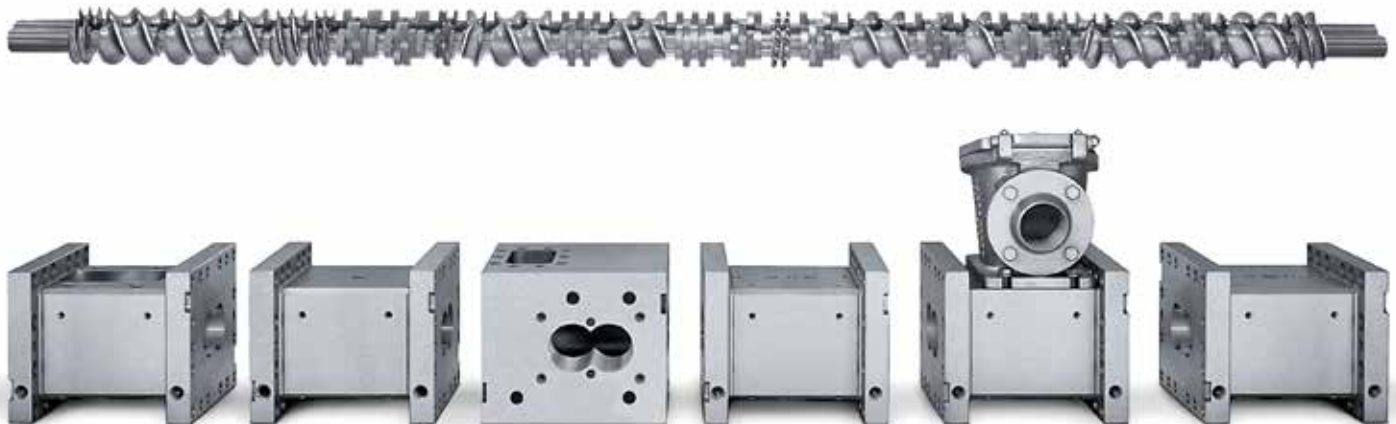
Modular design

The process section of all ZSK series is designed as a modular system. It consists of several barrels in which the co-rotating screws operate. The advantage of this modular principle is its maximum flexibility in compounding and extrusion.

Our process engineers configure the barrels and screw elements individually to your applications. Different process zones are created alternately as required for conveying, plasticizing, mixing and shearing, homogenizing, devolatilizing and pressure build-up to benefit from highest product quality and maximum throughput rates.

The temperature of every barrel can be controlled separately. The heating is usually electric by means of heater cartridges and heater shells, the cooling is achieved by water. In addition, barrels can also be tempered with liquid or steam heating.

Standard barrels and screw elements are made of nitrided steel or in the enhanced wear and corrosion protected version of appropriate materials.



The advantages of the ZSK twin screw extruder at a glance

Maximum power density	Reliable scale-up
Gentle product handling for maximum quality	Very wide range of wear protection solutions
Maximum screw speed	Comprehensive process engineering support
Maximum productivity	Flexible solutions for control system
Maximum conservation of resources by high efficiency	High reliability and proven technology of the machines
Maximum flexibility in product changes and machine modifications	Comprehensive after-sales services by worldwide Coperion service network
Optimum graduation of the machine sizes	Large number of application-specific solutions to increase throughput and productivity, e.g. quick-release features, side devolatilization ZS-EG, Feed Enhancement Technology (FET)
Excellent mixing behaviour	

Optimum diameter ratio

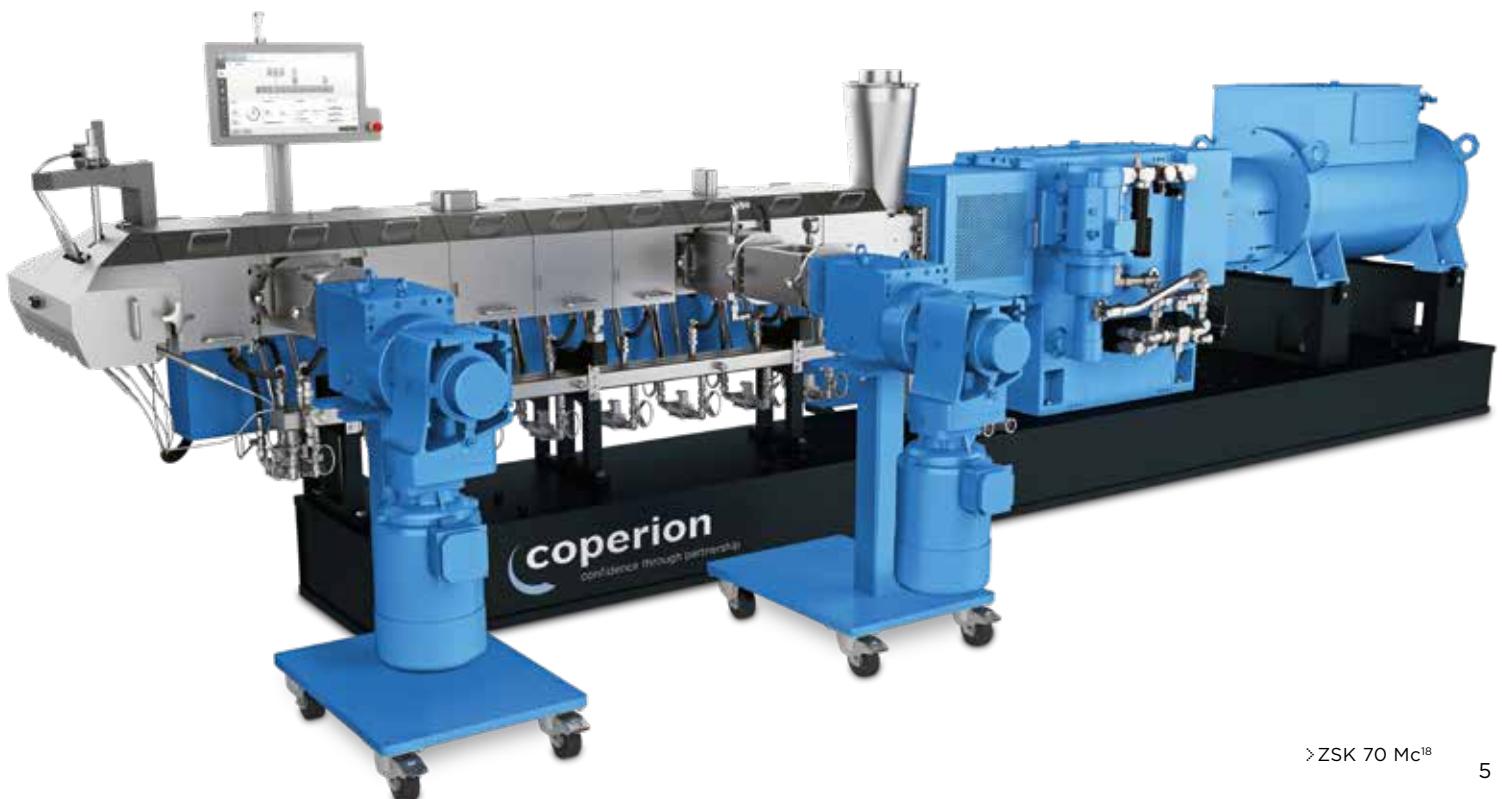
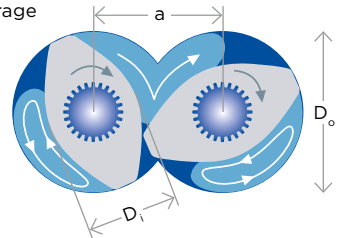
The diameter ratio D_o/D_i , which determines the free volume of the twin screws in the process section is constant over all sizes of the respective ZSK series. In this way we ensure the reliable scale-up from the knowledge gained in the laboratory to full-scale production plants. Important parameters such as screw configurations or product recipe contents can therefore be transferred from small to large ZSK sizes.

Self-cleaning screw profile

The closely intermeshing twin screws of the ZSK series eliminate with their tight, self-wiping profile stagnant zones over the whole length of the process section. The effect is a constantly high degree of process reliability and optimum self-cleaning in the process section.

Cross-section of the two co-rotating screws

D_o/D_i = diameter ratio, determines average shearing, devolatilization and powder intake
 Md/a^3 = specific torque, determines power density and degree of fill
 n = screw speed, determines shearing and mixing
 D_o = outer diameter
 D_i = inner diameter
 a = centerline distance



»» The ZSK Mc¹⁸ is a success story. With its specific torque of 18 Nm/cm³, it is the most powerful ZSK ever. It impresses with its extremely high throughput rates, optimum product quality and maximum economic efficiency.

The ZSK Mc¹⁸ high performance extruder is a superlative product. With its torque of 18 Nm/cm³, it has made a name for itself on the market as a throughput champion. The 30 % increase in torque compared to the predecessor model ZSK Mc PLUS leads to increases in throughput of up to 100 %. Therefore the ZSK Mc¹⁸ ensures production with maximum economic efficiency. The optimum price/performance ratio, the extremely energy-efficient operation, the reliability, the wide range of applications, and the associated high level of flexibility of the machine are additional advantages of the ZSK Mc¹⁸. With its D_o/D_i of 1.55,

the ZSK Mc¹⁸ strikes just the right balance. It has proven itself in the processing of products with high torque requirements and enables reliable scale-up within the entire Mc¹⁸ series. In addition, it is possible to scale-up and modernize the ZSK Mc PLUS series to the Mc¹⁸ series. Together with a range of application-specific special solutions such as the Feed Enhancement Technology (FET) or the ZS-EG side devolatilization, the ZSK Mc¹⁸ fulfills its promise in guaranteeing the highest levels of productivity.

Typical areas of application of the ZSK Mc¹⁸

- › Continuous processes with high energy consumption
- › Processing of all previously torque-limited products such as polyamide with glass, PBT with glass, glass fiber-reinforced polypropylene
- › Mixing and dispersing of pigments and additives
- › Reinforcement with glass, carbon and other fiber materials
- › Degassing of volatile components
- › Filling with talcum, calcium carbonate, sawdust or other fillers
- › Alloying
- › Reactive extrusion
- › Chemical reactions such as polymerization, polycondensation and polyaddition
- › Direct extrusion

Mc¹⁸

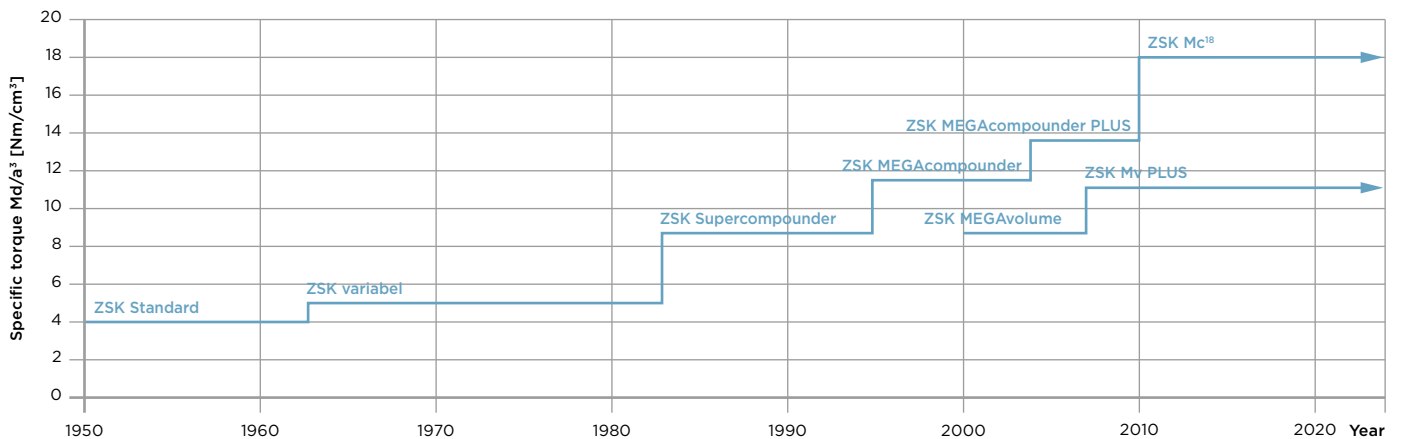
MAXIMUM TORQUE
FOR HIGHEST
THROUGHPUT

Advantages of the ZSK Mc¹⁸ at a glance*

More than 30 % increase of specific torque	Improved compounding quality by gentle processing with a higher filling degree
Up to 100 % increase in the throughput rate	Reduced compound temperature at much greater throughput rates
Increased energy efficiency by reduced specific energy input	Flexible, wide area of applications
Greatly improved productivity	Proven high ZSK safety enabled by new designs and developments

* In comparison with the predecessor model ZSK Mc PLUS

Development of the ZSK series



➤ Why is the ZSK Mc¹⁸ such a success? The ZSK Mc¹⁸ represents the interaction of numerous innovative developments that all serve a collective requirement: achieving the highest throughput rates with optimum product quality and maximum economic efficiency. From the gearbox and the process section through to the discharge, each individual detail of the machine is in line with this demand. This enables you to fully profit from the guiding technological principle of the ZSK Mc¹⁸.

This is what the ZSK Mc¹⁸ offers

- › Highest throughputs
- › Maximum product quality
- › Comfortable handling
- › Minimal downtimes for screw changes, cleaning, and maintenance
- › Highest operational safety
- › Maximum efficiency for processes, costs, energy, and other resources

Technical data

ZSK	Max. torque per shaft [Nm]	Spec. torque Md/a ³ [Nm/cm ³]	Max. screw speed [min ⁻¹]	Max. drive power N [kW]	Screw diameter [mm]
18 MEGAlab*	38	11.3	1,200	10	18
26 Mc ¹⁸	140	15	1,200	37	25
32 Mc ¹⁸	315	18	1,200	83	32
45 Mc ¹⁸	930	18	1,200	245	45
58 Mc ¹⁸	2,000	18	1,200	528	58
70 Mc ¹⁸	3,500	18	1,200	924	70
82 Mc ¹⁸	5,700	18	1,200	1,504	83
92 Mc ¹⁸	7,500	17	1,000	1,649	92
119 Mc ¹⁸	15,300	17	1,000	3,364	118
133 Mc PLUS	20,000	15	1,000	4,398	133

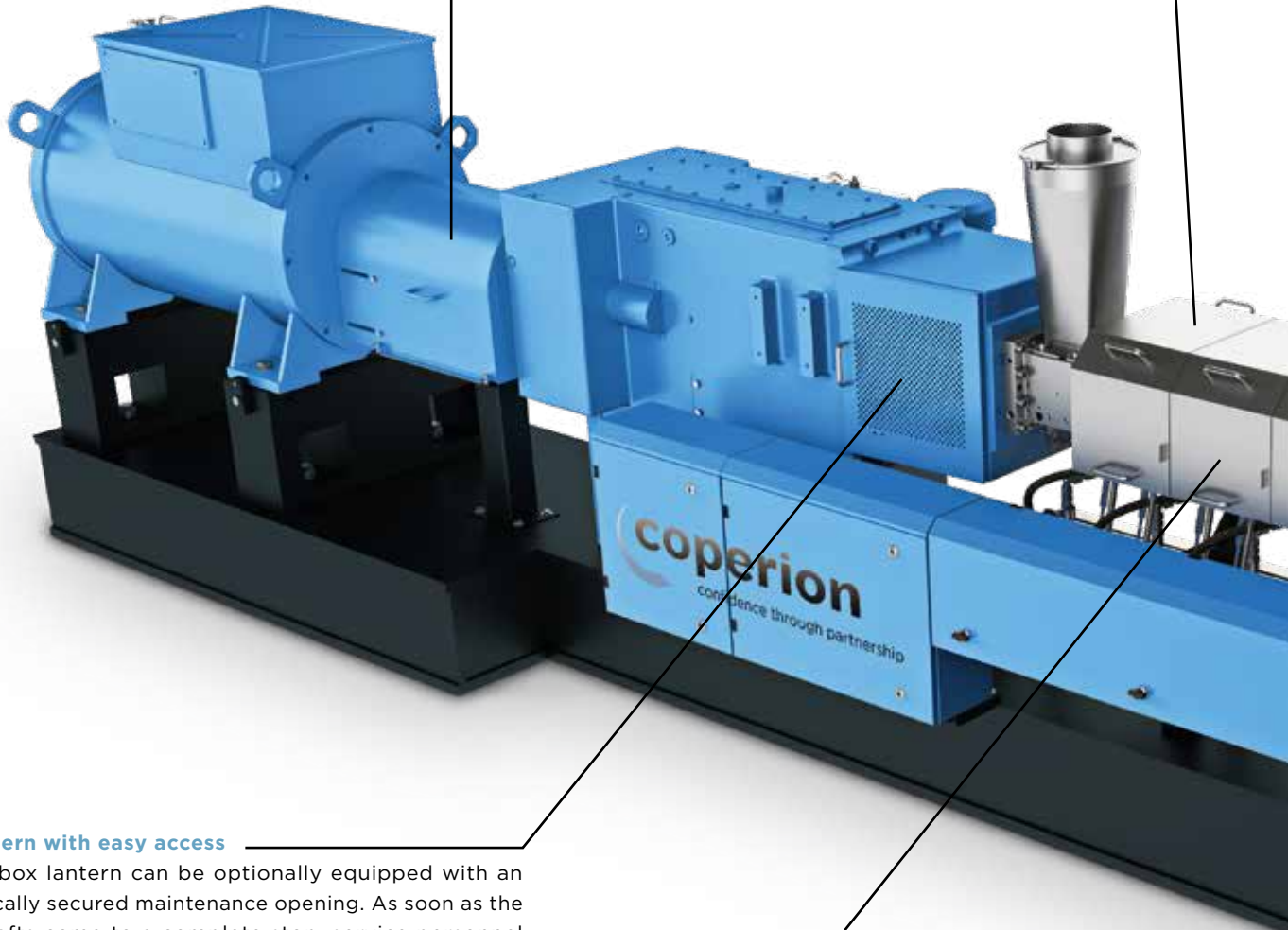
* Laboratory extruder.

Specific torque of 18 Nm/cm³

With its 18 Nm/cm³ torque, the ZSK Mc¹⁸ is the most powerful ZSK of all time, achieving highest throughputs.

Optimum D_o/D_i of 1.55 for compounding products with high torque requirement

With a D_o/D_i of 1.55, the ZSK Mc¹⁸ provides optimum free volume and low shearing stresses – with absolute mechanical safety and reliability. You benefit from the highest throughputs, maximum product quality, and a reliable scale-up.



Gear lantern with easy access

The gearbox lantern can be optionally equipped with an electronically secured maintenance opening. As soon as the screw shafts come to a complete stop, service personnel can open the gearbox lantern without tools, guaranteeing secure, easier access to the screw shaft coupling during maintenance.

Innovative materials and screw designs

Revolutionary material solutions for extraordinarily long operating times, as well as a selection of new screw configurations, provide the highest throughputs and maximum product quality.

Controls with user-friendly interface

Coperion offers control solutions that are individually modified for your requirements and that can be seamlessly integrated into your Industry 4.0 environments. The modern user interface meets the most current operating standard and, along with numerous comfortable functions and smart Industry 4.0 features, enables intuitive operation.

Feed Enhancement Technology (FET) at product intake

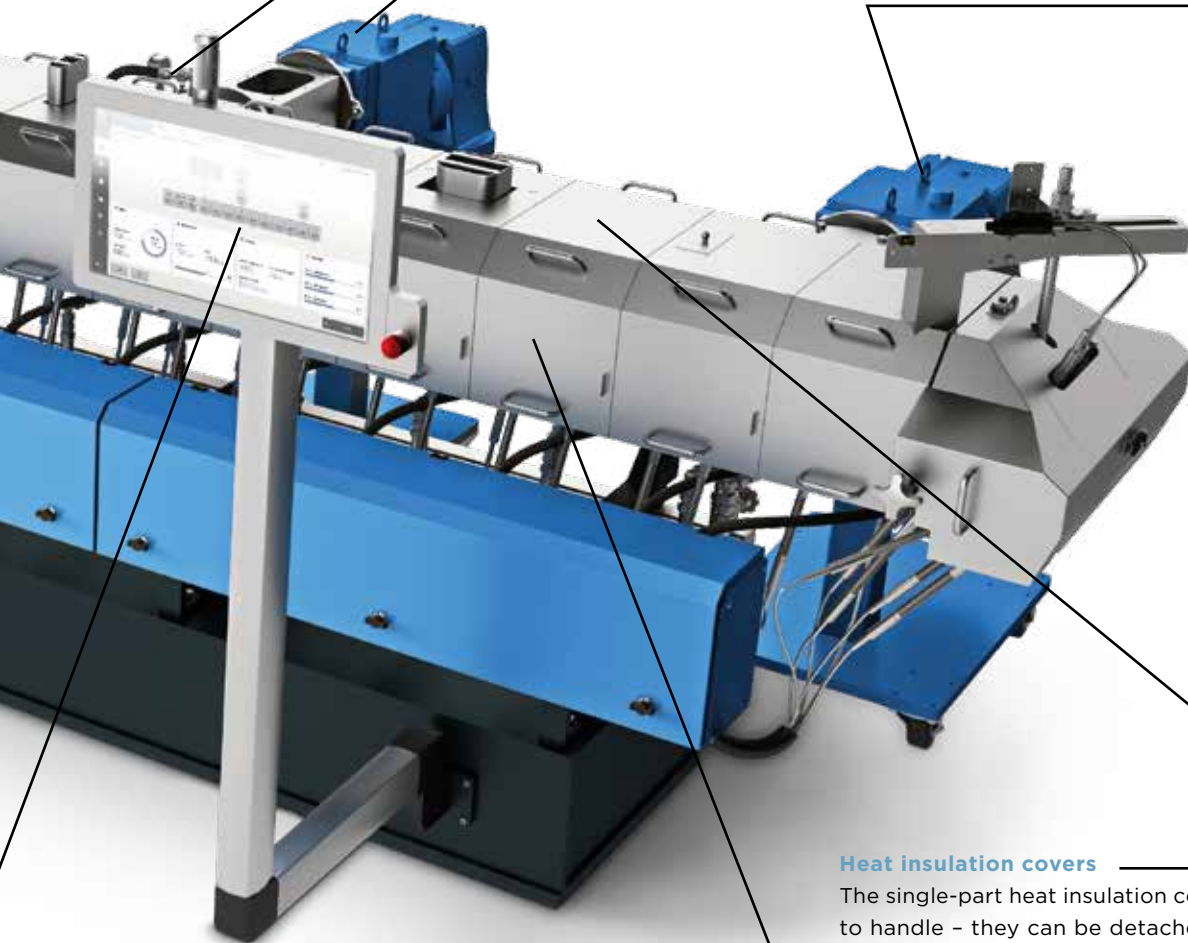
With the patented FET equipment, it is possible to optimize the product feed such that you benefit from the full available drive power of the ZSK Mc¹⁸ even when processing powder bulk materials. The result: 200 to 300% throughput increases at maximum productivity, the greatest operational safety, and the highest energy efficiency.

ZS-B easy twin screw side feeder

For side feeding of fillers and additives in powder or pellet form or cut glass fibers the ZS-B in easy design can be removed quickly from the process section, significantly reducing the time needed for screw changes, cleaning, or maintenance.

ZS-EG twin screw side devolatilization

Using a ZS-EG achieves throughput increases of up to 30% with improved product quality. A machine's availability and profitability are markedly increased. For cleaning and maintenance purposes the ZS-EG in easy design can be removed from the process section in shortest time.



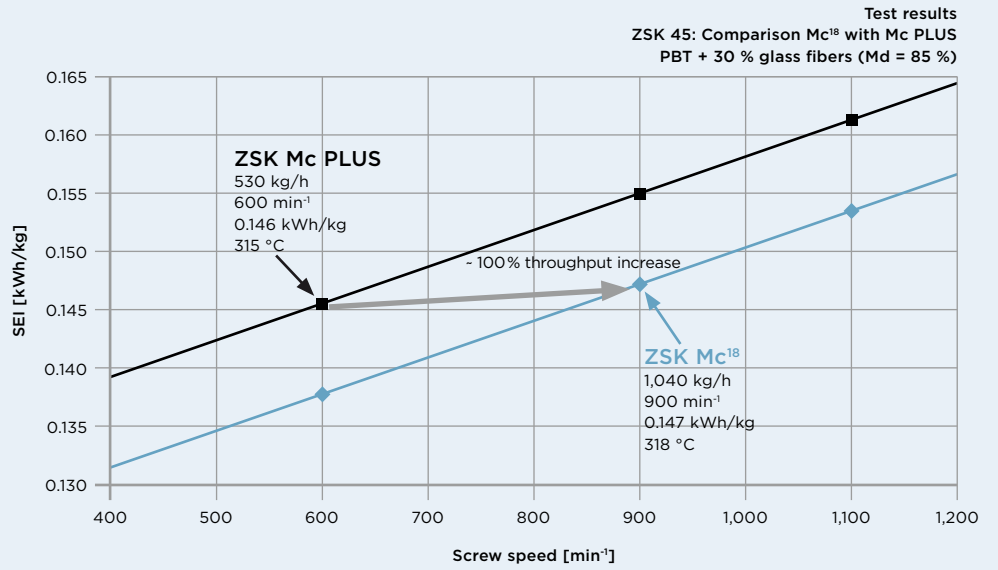
Heat insulation covers

The single-part heat insulation covers are very easy to handle - they can be detached without removing the cartridge heaters. They insulate the process section completely. You profit from maximum energy efficiency.

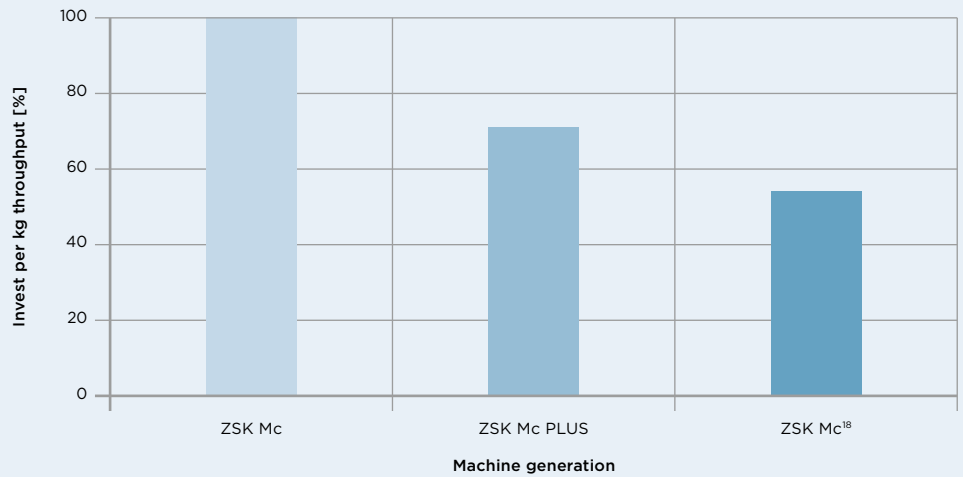
Pluggable cartridge heaters

Cartridge heaters enable efficient individual tempering within the interior of each barrel. They are individually connected using IP67 plugs and can be removed for maintenance in no time, no electrician needed.

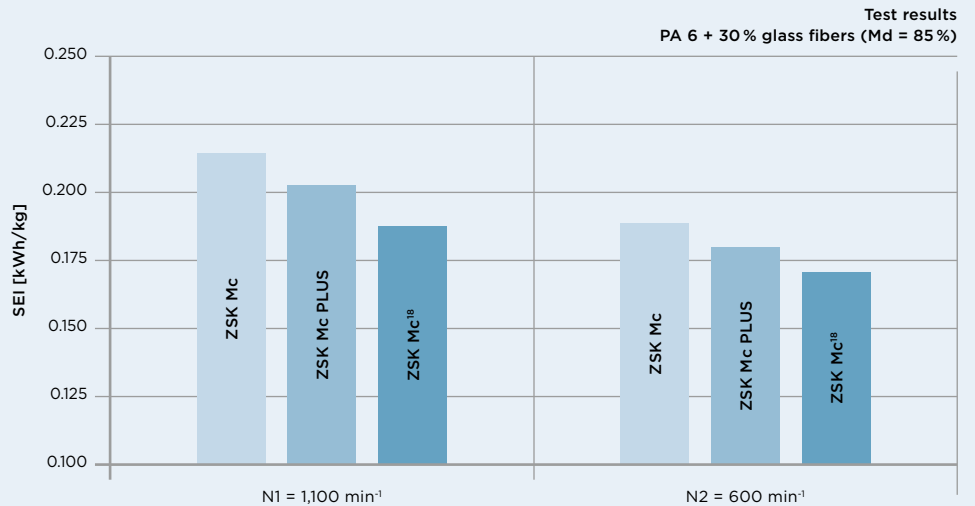
Up to 100% increase in throughput rate



Optimum price-performance ratio



Considerably reduced energy consumption with increased throughput



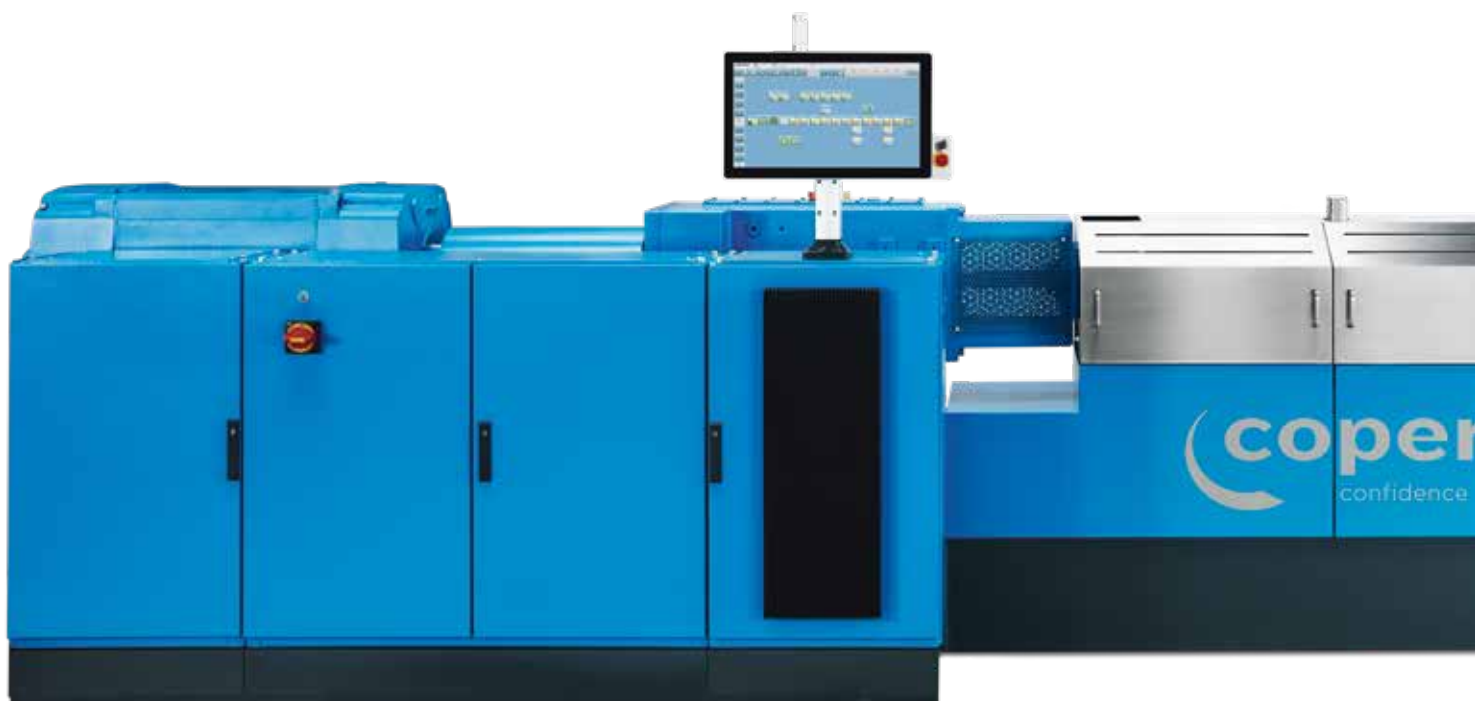
»» The ZSK Mv PLUS. With its ratio of very high drive power to large screw volume this series ensures you maximum throughputs especially in processes with high volume requirement.

Coperion sets standards with the ZSK Mv PLUS: This extruder series unites an optimally adapted large free screw volume with high screw speeds and a high specific torque. This particularly allows production of products with a specific energy

requirement <0.13 kWh/kg with very high throughput rates. The system excels maximum recipe flexibility and maximum productivity.

Typical areas of application of the ZSK Mv PLUS

- › Processes with high volume requirement, e.g. for products with low bulk density, poor intake properties or high filler content
- › Devolatilization processes, e.g. in substances containing solvents
- › Processes with low energy consumption
- › Shear sensitive products (e.g. effect-pigment masterbatch)
- › Carbon black masterbatch
- › PET masterbatch
- › HFFR (ATH, $Mg(OH)_2$)
- › Cross linkable cable compounds
- › PVC
- › Rubber
- › Polymerization (PU, POM)
- › Powder coating
- › Catalyst carrier
- › Adhesives, sealants
- › PP/hollow glass
- › Food
- › Pet food
- › Cereals, starch



› ZSK 54 Mv PLUS

Special features of the ZSK Mv PLUS

<p>Screw volume</p> <p>The deeply cut screw flights with a diameter ratio D_o/D_i of 1.8 result in a very large free screw volume.</p>	<p>The advantages</p> <ul style="list-style-type: none"> › Improved feed intake of additives with a low bulk density such as flours, starches, pigments, fillers, additives › Lower shearing › Reduced thermal stress on the raw materials › Longer residence time for reaction processes › Safe devolatilization
<p>Screw speed</p> <p>The ZSK Mv PLUS series is designed for speeds up to 1,800 min⁻¹.</p>	<p>The advantages</p> <ul style="list-style-type: none"> › Increase in the throughput by up to 3 or 4 times in comparison to the predecessor model ZSK Mv › Lower investment and operating costs due to smaller machine sizes at the given throughput rate › Favorable price-performance ratio
<p>Torque</p> <p>The specific torque of the ZSK Mv PLUS is 11.3 Nm/cm³. It has been increased by 30 % in comparison to the predecessor model ZSK Mv.</p>	<p>The advantages</p> <ul style="list-style-type: none"> › Another increase in throughput of up to 40 % in comparison to the predecessor series › Extended operating window › Greater recipe flexibility

Technical data

ZSK	Max. torque per shaft [Nm]	Spec. torque Md/a^3 [Nm/cm ³]	Max. screw speed [min ⁻¹]	Max. drive power N [kW]	Screw diameter [mm]
27 Mv PLUS	100	10.6	1,800	40	27
34 Mv PLUS	205	11.3	1,800	81	34
43 Mv PLUS	420	11.3	1,800	166	43
54 Mv PLUS	815	11.3	1,800	323	54
62 Mv PLUS	1,250	11.3	1,800	495	62
76 Mv PLUS	2,250	11.3	1,800	900	76
98 Mv PLUS	5,000	11.3	1,500	1,649	98
125 Mv PLUS	10,300	11.3	1,500	3,397	125
248/250 Mv PLUS	44,000	6.0	300*	2,800	248

* Higher screw speeds upon request.



➤ The Kombiplast. This two-stage processing system with the ZSK twin screw extruder and the ES-A single screw discharge ensures optimum product quality and maximum economy in the processing of PVC, cables and special compounds.

PVC, cables and special compounds can only be processed in top quality and at the same time economically with reliable compounding and pelletizing technology. Our Kombiplast two-stage processing system fully meets this requirement. Coperion has designed the compounding system especially for the production of temperature and shear sensitive plastics - so that you benefit from maximum product quality, maximum economy and flexibility.

Advantages of the Kombiplast

Excellent feeding properties, even for powders that are difficult to feed and hot premixes
Short, defined residence time
Precise temperature control
Effective devolatilization of volatile ingredients
Fast, convenient cleaning
Gentle materials handling, especially in the pressure build-up zone before the die plate
Uniform product flow through the die plate
Low, specific energy input
Easily adaptable to new requirements
Wide range of application

Typical areas of application of the Kombiplast

Soft PVC

- › PVC cables: insulation material, sheathing and bedding compounds
- › Materials for shoes and shoe soles (also PVC-P with foaming agent)
- › Materials for the extrusion of profiles and hoses (including medical applications)
- › Injection molding compounds
- › Films and sheets for flooring

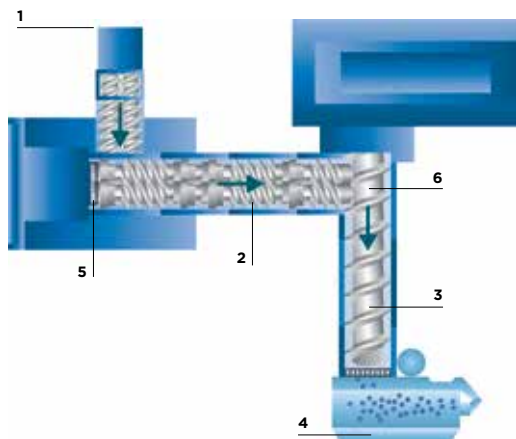
Rigid PVC

- › Materials for the extrusion of profiles for interior and exterior uses
- › Injection molding grades for fittings, etc.
- › Blow molding grades for bottles, containers, etc.
- › Alloys and blends
- › Films (calender feeding)

Special compounds

- › Halogen-free, self-extinguishing formulations for cables (HFFR)
- › Elastomer-based compounds for low, medium and high voltage cables
- › Peroxide cross linkable PE
- › Silane cross linkable flame retardant compounds





The raw materials are fed to the process section of the ZSK twin screw extruder by the ZS-B twin screw side feeder. They are conveyed, plasticized, mixed and homogenized in the process section. The product is discharged through the ES-A single screw discharge, which gently builds up sufficient pressure for the eccentric pelletizing.

Principle of the two-stage Kombiplast (ZS-B + ZSK + ES-A + EGR)

- 1 ZS-B twin screw side feeder
- 2 ZSK twin screw extruder
- 3 ES-A single screw discharge
- 4 EGR eccentric pelletizer
- 5 Atmospheric degassing
- 6 Vacuum degassing



New knife rotor for EGR

A new type of knife rotor of Coperion's eccentric pelletizing systems EGR makes it possible to produce extremely low-dust PVC pellets. Rotating directly on the die plate, the rotor permits particularly smooth and gentle cutting of temperature and shear-sensitive plastics. This greatly improves the quality and further processability of the pellets produced.

Technical data of the Kombiplast with ZSK Mv PLUS

Kombiplast ZSK/ES-A	Max. torque per shaft [Nm]	Spec. torque Md/a^3 [Nm/cm ³]	Max. screw speed [min ⁻¹]	Max. drive power N [kW]	Screw diameter [mm]
27 Mv PLUS/60	100/260	10.6	600/115	13/3	27/60
34 Mv PLUS/100	205/1,200	11.3	600/100	27/13	34/100
43 Mv PLUS/150	420/4,050	11.3	600/75	55/33	43/150
54 Mv PLUS/150	815/4,050	11.3	600/75	108/33	54/150
62 Mv PLUS/200	1,250/9,600	11.3	600/75	165/79	62/200
76 Mv PLUS/250	2,275/18,750	11.3	600/60	300/124	76/250
98 Mv PLUS/300	5,000/32,390	11.3	400/50	440/178	98/300
125 Mv PLUS/350	10,300/51,470	11.3	400/50	906/283	125/350

Technical data of the Kombiplast with ZSK Mc¹⁸

Kombiplast ZSK/ES-A	Max. torque per shaft [Nm]	Spec. torque Md/a^3 [Nm/cm ³]	Max. screw speed [min ⁻¹]	Max. drive power N [kW]	Screw diameter [mm]
26 Mc ¹⁸ /60	140/260	15	600/115	18/3	25/60
32 Mc ¹⁸ /100	315/1,200	18	600/100	42/13	32/100
45 Mc ¹⁸ /100	930/1,200	18	600/100	123/13	45/100
58 Mc ¹⁸ /150	2,000/4,050	18	600/75	264/33	58/150
70 Mc ¹⁸ /200	3,500/9,600	18	600/75	462/79	70/200
92 Mc ¹⁸ /250	7,500/18,750	17	600/60	990/124	92/250
92 Mc ¹⁸ /300	7,500/32,390	17	600/50	990/178	92/300
119 Mc ¹⁸ /300	15,300/32,390	17	400/50	1,346/178	118/300
133 Mc PLUS/350	20,000/51,470	15	400/50	1,759/283	133/350

➤ The ZSK 18 MEGAlab. This laboratory extruder offers high performances even for smallest batch sizes.



The ZSK 18 MEGAlab laboratory extruder is also based on the successful ZSK technology. It was developed especially for the processing of smallest batch sizes. The reliable scale-up to larger ZSK extruders makes it the ideal compounding system for recipe development and basic scientific research.

> ZSK 18 MEGAlab IN HYGIENIC DESIGN

Special features

- > Throughput rates of up to 40 kg/h
- > Small batches from 200 g
- > Fast plug & play commissioning
- > Reliable, low noise drive concept
- > Modular structure with exchangeable 4D barrels and all standard screw elements
- > Easy to operate by PLC and touch screen
- > Easy handling and fast product change by using quick-release connections
- > Compact design - mobile baseframe with integrated controls, water cooling and vacuum unit
- > Reliable scale-up due to ZSK features

Technical data

Centerline distance [mm]	15
D_o/D_i	1.55
Outer screw diameter D_o [mm]	18
Barrel length [mm]	72
Centerline height [mm]	1,100
Nm/shaft [Nm]	38
Specific torque M_d/a^3 [Nm/cm ³]	11.3
Max. output speed [min ⁻¹]	1,200
Drive power [kW]	11.7
Heating capacity/barrel [W]	800
Overall dimensions (L x W x H) [mm]	1,660 x 600 x 1,850

> DIE HEAD OF THE ZSK MEGAlab



> TWIN SCREW SIDE FEEDER ZS-B



> ZSK MEGAlab IN GMP-DESIGN



»» The ZSK MEGAcocompounder. This processing system is a milestone in the development of high capacity compounding systems.

Because of its exceedingly high productivity, this twin screw extruder is ideal for high capacity processing of polyolefins. It constantly achieves the maximum product quality especially in continuous processes with high energy requirements.

The current series features a specific torque of 12.5 Nm/cm³. This brings polyolefin processing to the throughput rate of 135 t/h and beyond.

Technical data of the ZSK MEGAcocompounder

ZSK	Max. torque per shaft [Nm]	Spec. torque Md/a ³ [Nm/cm ³]	Max. screw speed [min ⁻¹]	Max. drive power N [kW]	Screw diameter [mm]
177 Mc	39,000	12.5	550	4,500	177
250 Mc	107,000	12.5	500	11,200	248
320 Mc	222,000	12.5	400	18,600	315
350 Mc	311,000	12.5	350	22,800	352
380 Mc	394,000	12.5	320	26,400	380
420 Mc	394,000	Increased drive power upon request			420

Combination possibilities of process section and gearbox

ZSK process section	Possible gearboxes [max. Nm]	
177 Mc	39,000	
250 Mc	39,000	107,000
320 Mc		107,000
350 Mc		107,000
380 Mc		222,000
420 Mc		222,000



➤ Complete compounding systems. Coperion provides total solutions from a single source.

Coperion's compounding systems have proved successful in the market for many years. The provision of these complete solutions – either using a conventional or modular turnkey design – allows you to benefit from our unique expertise in the entire compounding process chain.

All key components for the main process steps are developed and produced in-house – from raw material handling, feeding, extrusion, pelletizing, sifting, drying and cooling, right through to gentle conveying and bagging of the finished products. You

will receive a complete, ready-to-use system from a single source, in which all sub-processes have been optimally combined into an overall process – in no time at all and at fixed conditions.

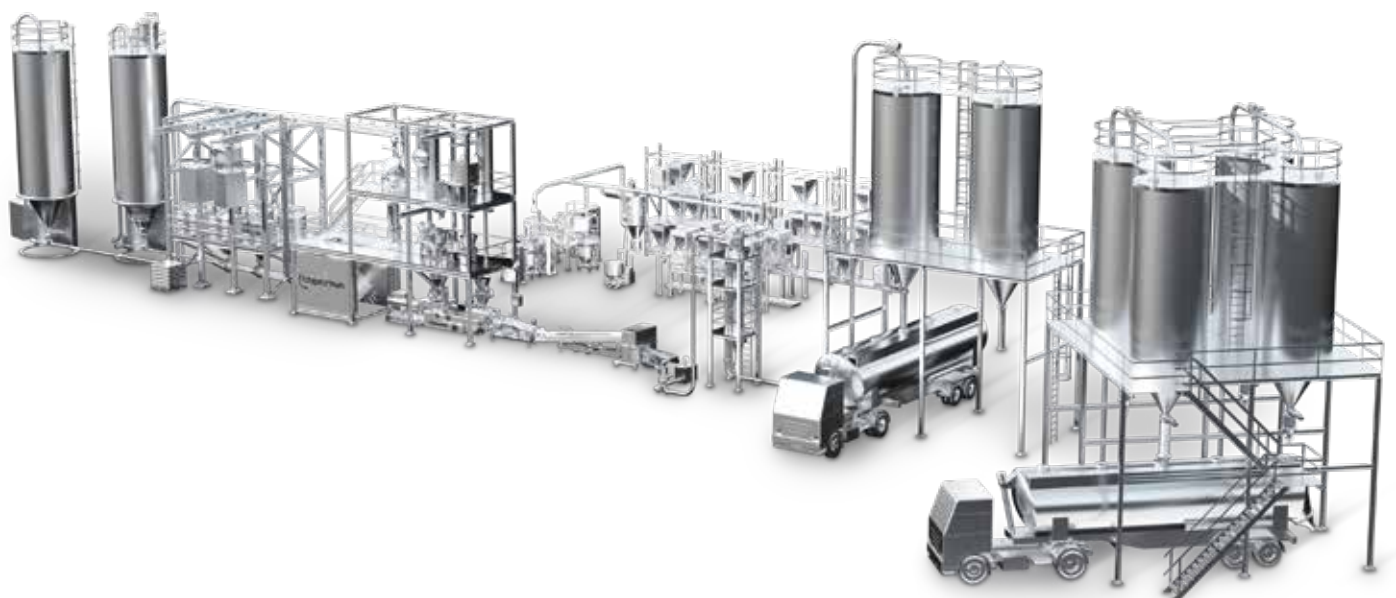
We will send a team of experienced experts to your premises to install and commission the system on site. Once the system has been handed over ready for production, our experienced and motivated service team provides worldwide support and assistance.

Your advantages

One contact and supplier – from engineering and production of key components to commissioning of the plant	Fast assembly and commissioning on site, supported by the worldwide service network of Coperion
Optimum design of the plant to meet your individual product requirements	Easy plant control by a uniform operating philosophy
Efficient, professional project execution and maximum security in costs, schedule and product quality	Numerous solutions for fast product changes in production
Short project schedules	High operating safety
Optimum linking of all process steps	Digital solutions for optimum compounding system operation
	Service for the entire compounding system from one supplier

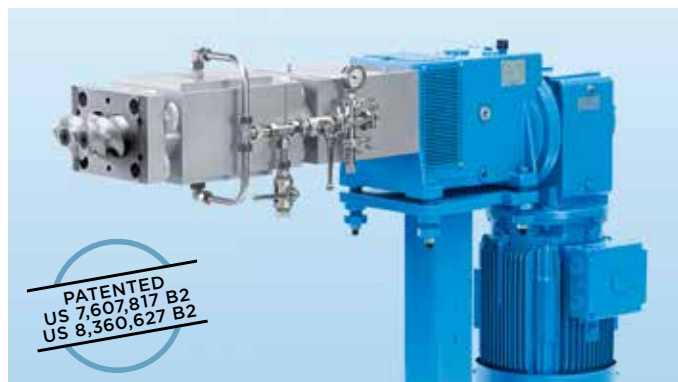
Compounding plants in modular design – additional advantages

Commissioning of the plants at Coperion prior to delivery
Sampling prior to delivery
Training of the operating personnel already before delivery
Fast assembly and disassembly due to modular design
Easy transport by road and ship

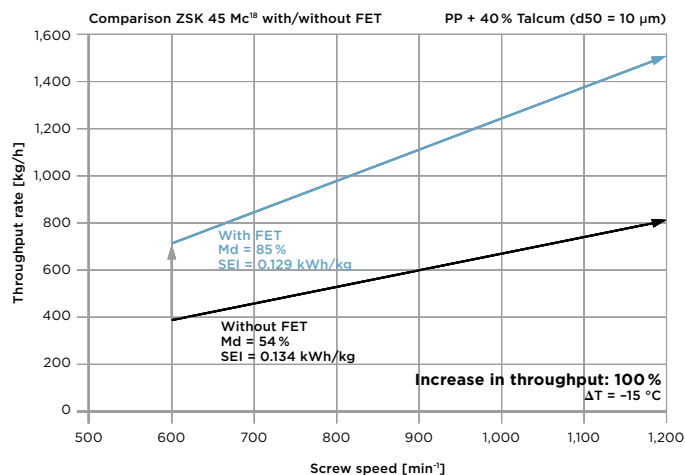




➤ The knowledge from our continuous research flows directly into the development of new parts. That's the way our customers' processes can be efficiently improved over the long-term.



> ZS-B WITH FEED ENHANCEMENT TECHNOLOGY (FET)



Feed Enhancement Technology (FET)

In the Feed Enhancement Technology (FET) developed by Coperion the feeding zone of the ZSK is equipped with a porous, gas permeable wall and a vacuum is applied exter-

nally. The results of the FET equipment are considerably improved feed and throughput rates in the processing of feed limited products.



> ZS-EG SIDE DEVOLATILIZATION

ZS-EG side devolatilization

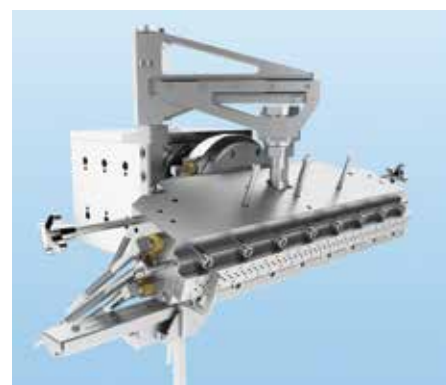
With its large free cross section for the devolatilization, the ZS-EG keeps the melt reliably in the process section even at maximum specific torque. Throughput increases of up to 30 % and considerably improved product quality are possible. The ZS-EG in easy design permits fast dismantling from the ZSK process section.



> QUICK-RELEASE SCREW SHAFT COUPLING

Quick-release screw shaft coupling

For ZSK 26 Mc¹⁸ extruders Coperion has developed a patented quick-release screw shaft coupling that enables screw changes to be performed as quickly as possible. Cleaning times are reduced to a minimum when changing colors and recipes.



> DIE HEAD

Die head

The die head for ZSK systems features optimum flow geometry. It ensures highest throughputs with gentle product handling and maximum heat transfer.



> ZS-B easy, MOBILE



> ZS-B SIDE FEEDER, PIVOTING



> COPERION SERVICEBOX

ZS-B side feeder

Our ZS-B twin screw side feeder enables the feeding of powder or pellet fillers and additives or cut glass fibers into the process section of the twin screw extruder. It features the self-wiping profile of the twin screws and eliminates stagnant zones in the screw flights of the extruder. It requires very little space due to its compact design. It can be mounted anywhere on the extruder's process section with a side feed or combi barrel. In easy design the ZS-B permits much faster dismantling from the ZSK process section and the twin screws can be changed very simple.

Coperion ServiceBox

The Coperion ServiceBox is an integrated system for the online monitoring and logging of faults in your plant and components, ensuring trouble-free compounding with stable product quality. Our active start-up assistance and rapid expert support are the ideal solution for efficient production with reliable quality control.



> FEED HOPPER WITH QUICK-RELEASE INSERT



> QUICK CLOSURES ON THE DEGASSING DOME

Quick-release clamps at feed hopper, degassing dome and atmospheric venting

The ZSK feed hopper is only clamped to the process section with bolts. It can be removed very quickly by simply loosening these bolts. Then the quick-release insert which protects the barrel wall from contamination can very easily be changed. For quick and easy cleaning, the degassing dome and the atmo-

spheric venting are also equipped with quick-release clamps. The units can be removed by loosening just four bolts. In addition, the connection of the vacuum line on the degassing dome is equipped with a quick-release c-clamp.

» Coperion control systems. Highly sophisticated solutions for the control of extrusion lines.

Coperion provides control solutions for twin screw extruder systems individually tailored to customers' requirements ranging from standardized control systems to customized open control systems for complete compounding plants.

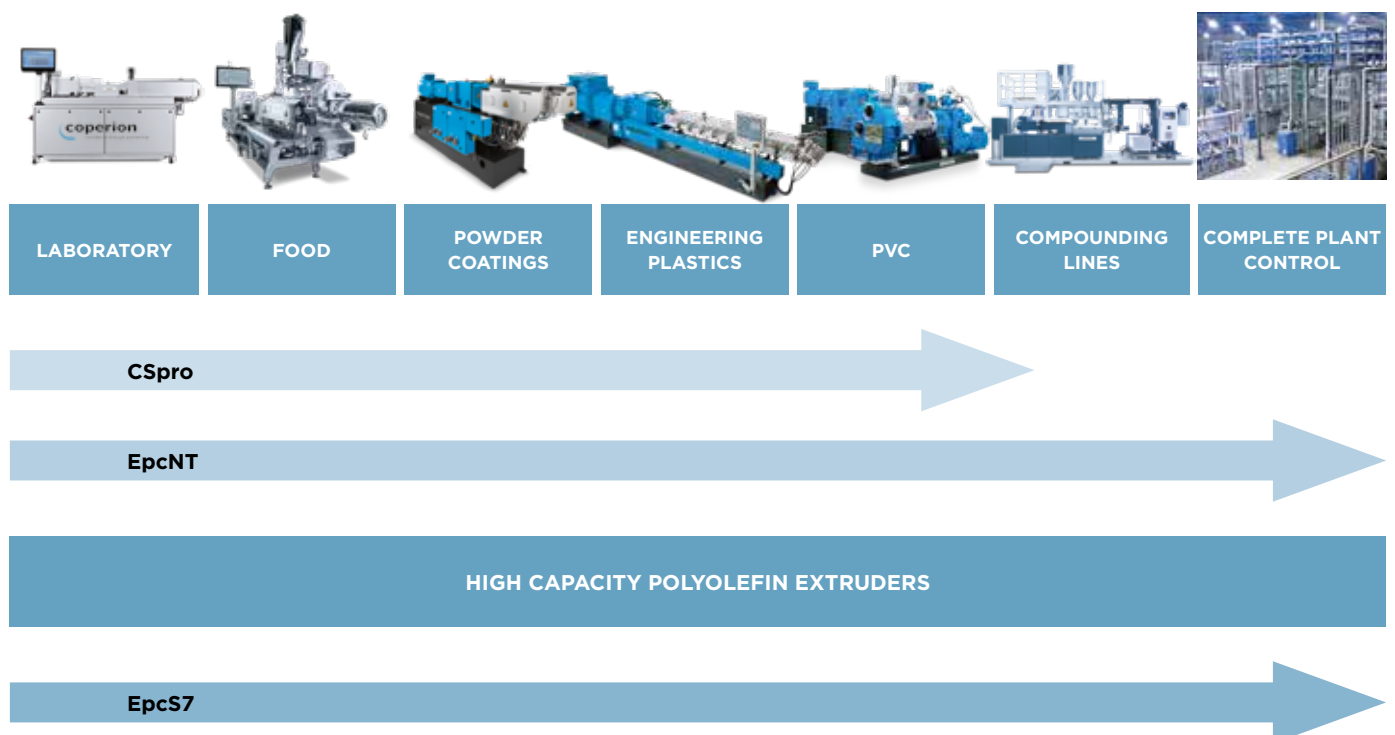
The control systems can be easily integrated into customers' Industry 4.0 environments and offer a large number of functions

such as the full recording of production data, reporting, recipe management and much more. The clearly designed, user-friendly interface of the control systems increases the operational availability of Coperion processing plants.

ADVANTAGES

- › Highly standardized and pretested control software
- › Sophisticated software functions such as recipe management and historical data evaluation available
- › Based on newest PLC technology from Siemens (S7-1500, ET200SP)
- › Display of HMI screens on external devices like tablet PCs, smartphones or office PCs via web access
- › Integration into I4.0 environments via standard protocol OPC-UA and more
- › Integration of Coperion ServiceBox for remote service

CONTROL SYSTEMS' AREAS OF APPLICATIONS



CSpro

The CSpro is based on the latest Siemens control components. With its clean design and attractive appearance it is simple and intuitive to operate. A variety of evaluation options of the production process are available and trend values can be exported to text files or network devices. It offers a clear overview of the complete plant on one simple and intuitive touch screen. An alarm system and a large capacity archive for data storage and evaluation are integrated. The recipe management tool stores an unlimited number of recipes which can easily be displayed, edited and filtered. Additional functionalities provided include the possibility to switch between different machine configurations among others. The CSpro allows for the completely integrated operation of up to 12 feeders.

Operator Panel

- › Panel in IP65 with separate high performance industrial PC and UPS
- › Multitouch 21" full HD widescreen display in 16:9 format
- › Integrated emergency stop button and signal lamp in the panel
- › Data storage via SSD (Solid State Disk)
- › Windows operating system
- › Operating text available in nearly all languages
- › Display possible on external devices such as tablet PCs
- › OPC UA as standard data interface

SPS

- › Latest Siemens PLC generation S7-1500
- › Compact ET200SP peripheral modules via Profinet connection

EpcNT

The EpcNT is particularly suitable for customer-specific plant configurations and for controlling entire extrusion and compounding lines from raw material feeding through to finish product discharge. It also allows for the integration of several compounding lines. EpcNT is Coperion's control system with most extended scope of functions which includes but is not limited to recipe management, along with trend display, reproducibility and traceability of the production parameters, feeding calculation and analysis of production data. The EpcNT is highly flexible and adaptable to all customer-defined needs and uses self-explanatory symbols for user-friendly and intuitive operation.

Software

- › Integration of nearly any unit, including units from third parties suppliers
- › Latest Siemens SPS generation S7-1500 and TIA portal
- › Windows 10 (IoT for industrial applications)
- › Integration and data exchange in master networks (MES, ERP) via the standardized OPC-UA protocol, as well as direct database access

SPS

- › Latest Siemens PLC generation S7-1500
- › Compact ET200SP peripheral modules via Profinet connection

EPCS7

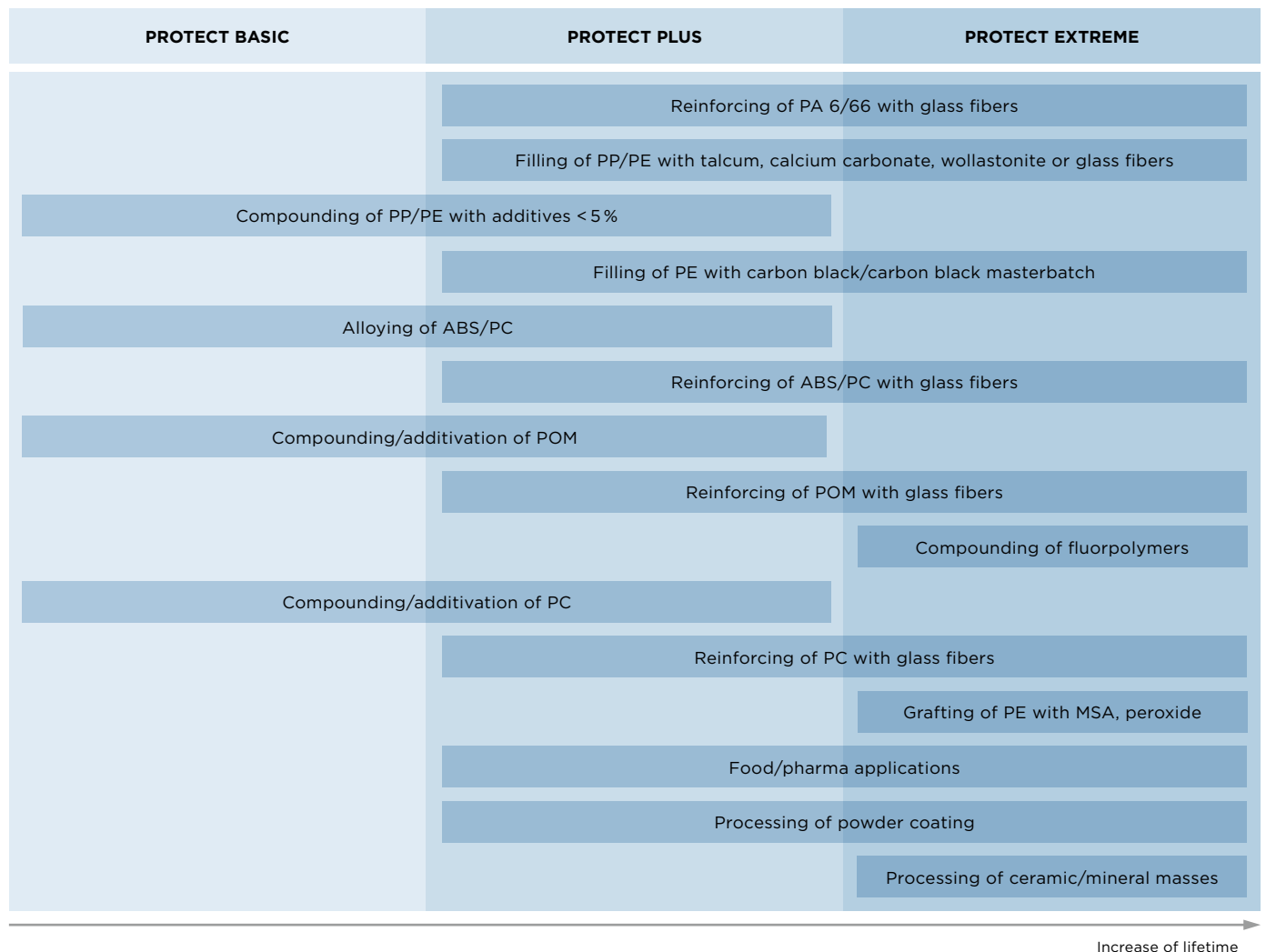
The EPCS7 is the optimum control system for all high capacity polyolefin extruders. It can be individually geared to meet any requirement. It is based on the fully integrated PCS7 software system and on control components from Siemens. The PLC hardware S7-400HF ensures maximum performance and the control of safety functions. The easy to read graphic visualization of the EPCS7 on a 24" touchscreen panel simplifies operation, enables signal monitoring down to an individual sensor and enables problems to be localized quickly. Further advantages include the quick start-up and high level of availability of polyolefin extruders.

➤ Individual wear and corrosion resistant material solutions. From standard materials to extremely wear and corrosion resistant materials, Coperion offers the full range.

ZSK twin screw extruders can be highly productive even in difficult applications with aggressive products. We provide the proof of our extensive experience in the development and application of extremely wear and corrosion resistant material solutions: Considering your individual requirements, our experts help you to determine the exact combination out of more than 150 materials to ensure highest durability and reliability of the wear parts especially with economical considerations. This applies to all parts when purchasing a new ZSK extruder as well as to our comprehensive spare parts service.

For the selection of suitable material solutions our first step is to have a look at the technical aspects of your application. The wear stress is determined depending on the product and application so that we can select suitable materials in the appropriate version. These range from PROTECT BASIC solutions for applications less susceptible to wear and corrosion to PROTECT EXTREME materials for maximum lifetime. In a second step we choose the most efficient material combination with you.

Abstract of the material solutions for extruder barrels and screw elements - individually adapted to every area of application



> WEAR AND CORROSION
RESISTANT SCREW ELEMENTS



> DIRECT COATED BARREL



> BARREL WITH OVAL LINER



Material portfolio of extruder barrels*

Barrels	Material code	Material	Design	Hardness max. (HRC)	Area of application**	
					Wear	Corrosion
PROTECT BASIC	WP 015-001	Nitriding steel (standard), nitrided	Solid	> 700 HV	..	.
PROTECT PLUS	WP 095	Fe-based PM material (10V)	Oval liner	65	....	.
PROTECT PLUS	WP 030	Martensitic (Cr-Mo) stainless steel	Oval liner	50	..	...
PROTECT PLUS	WP 043	Cr hard cast alloy	Oval liner	62	...	..
PROTECT PLUS	WP 043+	Fe-Cr-based PM material	Oval liner	60	...	...
PROTECT PLUS	WP 005-043+	Barrel: martensitic stainless steel, liner: Fe-Cr-based PM material	Oval liner	60	...	...
PROTECT PLUS	WP 098	Ni-based PM material	Oval liner	56	..	....
PROTECT PLUS	WP 099.6	Ni-based PM material	Oval liner	62	...	....
PROTECT PLUS	WP 072-099.6	Barrel: Ni-based, liner: Ni-based PM material	Oval liner	62	...	....
PROTECT PLUS	WP 015-016	Barrel: standard, coating: WC braze cladding	Direct coating of the 8-bore	67	.....	...
PROTECT PLUS	WP 015-023	Barrel: standard, coating: Co-based PM material	Direct coating of the 8-bore	35	..	....
PROTECT EXTREME	WP 015-99.8	Barrel: standard, liner: WC-Ni-based PM material	Oval liner	66	.....	....
PROTECT EXTREME	WP 015-29.2	Barrel: standard, coating: WC-Ni-based PM material	Direct coating of the 8-bore	66	.....	....

Material portfolio of screw elements*

Screw elements	Material code	Material	Design	Hardness max. (HRC)	Area of application**	
					Wear	Corrosion
PROTECT BASIC	WP 00	Nitriding steel (standard), nitrided	Solid	> 700 HV	..	.
PROTECT PLUS	WP 40	Standard	Ni-based crest welding	45	...	..
PROTECT PLUS	WP 05	Martensitic (Cr-Mo) stainless steel	Solid	50	..	...
PROTECT PLUS	WP 15	Fe-based PM material	Composite material	65	....	.
PROTECT PLUS	WP 25	Fe-Cr-based PM material	Composite material	60	...	...
PROTECT PLUS	WP 28	Cr-Ni stainless steel	Ni-based crest welding	45	.	....
PROTECT EXTREME	E 60	High speed tool steel PM material	Composite material	65	.....	.
PROTECT EXTREME	E 12	High speed tool steel PM material	Composite material with CVD coating	65	.....	.
PROTECT EXTREME	WP 16	Ni-based material	Ni-based crest welding	45

* Further material upon request.

** . = Low, = High

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