

# COMPEO

The new compounder generation.  
Incredibly different.



**BUSS**

excellence in compounding

# COMPEO – future-ready!

The polymer industry's innovation and earnings potential lies in the production of extremely high-quality compounds. End products should be reinforced, scratch-resistant, flame-retardant, weather-resistant and at the same time resource-saving. This requires a compounder which easily and thoroughly mixes in significant amounts of additives. Meet COMPEO, the new state-of-the-art compounder delivering more diversity in its application, greater flexibility in process engineering, and increased value added in compound manufacturing.

The innovative COMPEO series discharge concept uses the conveying stability of the screw pump, offering ideal pressure build-up for downstream units.

To feed raw materials, the COMPEO offers the options of a feed hopper with ventilation duct and a twin-screw side feeder.





The free combination of mixing and kneading elements with two to six rows of flights creates completely new process engineering possibilities. A considerably extended process window is just one aspect of this.

The COMPEO series modular machine concept is so flexible that a specifically configured compounding line is available for each compounding application, independent of the temperature range.

Incredibly versatile.  
Incredibly different.

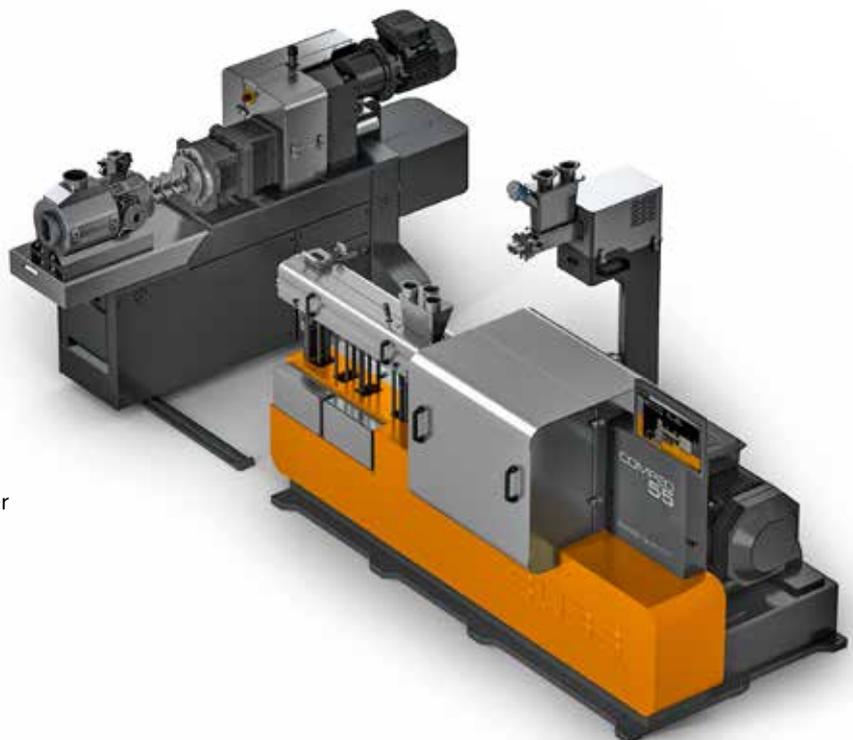


## COMPEO – the best from all series!

The products and services from BUSS carry the claim of “Excellence in Compounding”. The new compounder generation COMPEO combines the advantages of all BUSS series. The result is a compounding system that can be configured from standardized modules which can be used practically for processing the entire range of plastics.

### The all-rounder among the compounding systems.

COMPEO combines its predecessors' performance and robustness in a unique, multifunctional series. The series was developed for all temperature ranges up to 350°C. It has a process window that is unparalleled. Given the system's modular construction and novel process geometries, COMPEO can be used within an extremely diverse application spectrum, extending far beyond previous BUSS Co-Kneader applications – from temperature-sensitive thermosets to advanced engineering plastics.





Incredibly innovative.  
Incredibly different.

### Very operator-friendly and energy-efficient

When designing COMPEO, emphasis was placed on ergonomics, ease of maintenance, and energy efficiency. Pipes and lines are laid mostly inside the machine behind easy-to-clean panels. The gearbox is covered with a sound-proofing hood that also improves operational safety. To minimize energy losses, the process section is thermally insulated.

### The newly developed machine concept

Thanks to its modular structure, the COMPEO series can be precisely configured to meet the specific compounding application. Systematic standardization of the modules used results in considerable investment cost savings. Maintenance outlay is kept low by using highly resistant surface-hardened materials in the process zone. The ergonomics of the COMPEO system design simplifies operation and simultaneously reduces application errors and downtimes.

### Improved raw materials feed

The new COMPEO series achieves the performance of its predecessor series using lower speeds, but also due to ideal fill levels. As a standard, raw materials are metered in free fall via an enlarged inlet opening. Alternatively, side feeders can be used. Thanks to the operating principle of the twin screw and backventing, they ensure efficient feeding, even if there are high filler contents.



Backventing of the twin-screw side feeder ensures the removal of entrapped air or volatiles.

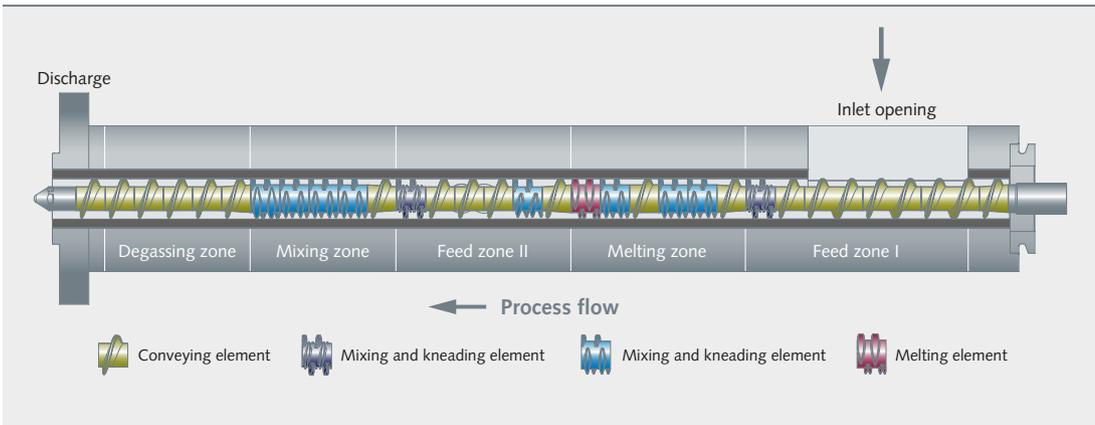


## COMPEO – new geometries for greater flexibility!

### COMPEO's innovative operating principle:

In the basic version with two inlet zones, polymers, additives and some of the fillers are fed through the first intake opening. The polymers are molten and mixed with the additives in the melting zone. In the second feed zone, further fillers are added via a side feeder and distributed homogeneously in the downstream mixing zone.

Volatiles and entrapped air are removed in the degassing zone before transfer to the discharge unit. The processing length, type and number of feeding units, temperature, degassing and process geometries are defined according to the compounding application.



The process geometry can be configured optimally by the specific arrangement of different screw elements for the respective compounding application.



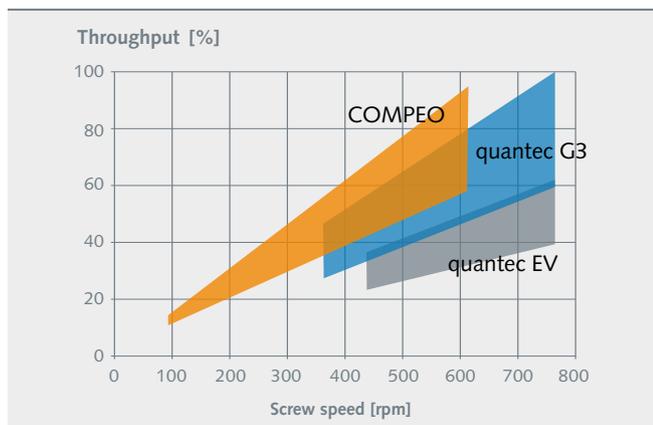
Incredibly flexible.  
Incredibly different.

The configurable process zone of the COMPEO compounder opens up completely new process engineering possibilities through the application of mixing and kneading elements with two to six rows of flights. The combination of traditional three- and four-flight elements with newly developed mixing elements allow, for one thing, achieving goals which in the past conflicted with each other, such as high specific throughput with controllable energy input. For another, the COMPEO process window is considerably larger than those of previous models. Throughput can be varied in a ratio of 1:6, increasing both system flexibility and user-friendliness. The high throughput ratio is particularly advantageous for starting up, for small lots, and for in-line processes, where the downstream unit requires consistent product quality even with greatly varying throughput rates.

### New screw geometries extend the process window

The new COMPEO series screw geometries ensure high throughput with up to 20% lower RPM. Increasing the volume-related torque by 15% enables the configuration of longer mixing zones. That results in more stable process conditions without a higher energy input.

The systematic free-form surface design of the screw flights ensures evenly intense shearing of the product and eliminates local overheating.



The COMPEO process window with a throughput ratio of 1:6, here using PVC as an example, is considerably larger than those of previous Kneader series machines.



Novel melting elements, e.g. for cable applications, replace the restriction ring in the compounder barrel.



The innovative COMPEO series twin-screw discharge unit is used for all compounding applications.

## COMPEO – efficient down to the last detail!

### Innovative discharge concept

Pressure build-up at the end of the production process is at least just as important for perfect pellet quality as fully homogeneous mixing of the various raw materials in the compounding step. The discharge unit is decisive for this. It ensures optimum and reliable pressure build-up required for downstream units such as screen changers and pelletizers, independent of the compounder. The innovative COMPEO also enables the realization of hybrid systems for processing widely differing products.



### Efficiency, quality and user-friendliness

The new COMPEO discharge unit, based on the principle of a conical twin screw, is designed to run in a metred method. As a result, the entire pressure build-up takes place in the slowly rotating twin screw, thus reducing temperature increases at the transition from compounder to discharge unit. The operating principle of the screw pump also guarantees maximum conveying efficiency in case of higher back pressure, enabling minimization of the speed and potential temperature increase. The COMPEO discharge unit has a wide range of application possibilities and is exceedingly user-friendly. The retractable housing gives full access to the conveying screws for cleaning and maintenance.

Incredibly efficient.  
Incredibly different.



# COMPEO – system control 4.0

The COMPEO system controller is operated intuitively, featuring a system HMI that shows the most important process parameters even when idle.

## Intuitive operation of control panel, Industry 4.0 connectivity

The touchscreen-equipped control system is based on a state-of-the-art controller (Siemens or Allen Bradley) and has an OPC-UA interface for connection to higher-level IT architectures. This interface makes the system fully Industry 4.0-compliant. The modular software is structured according to the system configuration and can be operated intuitively.

The control system works with stored formulation parameter sets, which makes it possible to switch between formulations with the push of a button. All essential system parameters such as fill levels, flow rates or quantities, pressures, temperatures and outputs are visualized, recorded and archived. Defined process parameters such as temperatures, power consumption or specific energy input, and thus the efficiency of the system, are continuously monitored by the control system. Optionally, the system can also be maintained via remote diagnosis and remote maintenance.



The entire system can be operated and monitored from the start screen.



Clear arrangement of display and operation fields on the metering details page.

## COMPEO – the modular all-rounder!

The COMPEO series offers exactly the right compounder for a wide variety of applications and throughput ranges. Because COMPEO is composed of standardized modules, it is easier than ever to configure specifically optimized compounding lines for a wide range of demanding processing tasks.





Incredibly versatile.  
Incredibly different.



# BUSS CAMPUS

## Comprehensive application knowledge for demanding compounding tasks

Increasing demands on modern compounds are giving rise to an ever higher complexity of development and production. At the same time, the time span from a concept to mass production is becoming ever shorter. A wide breadth of knowledge about applications and processing technologies is needed.

At BUSS, we have dealt with processing future-oriented compounds for over 70 years. We apply these many years of broad experience to continually optimizing established processes and developing solutions to new challenges. The innovative COMPEO technology supports us in a very special way to develop economic solutions within a short time. Process support, the test and development possibilities at the BUSS Campus, and training and knowledge sharing make an important contribution towards solving challenges together.

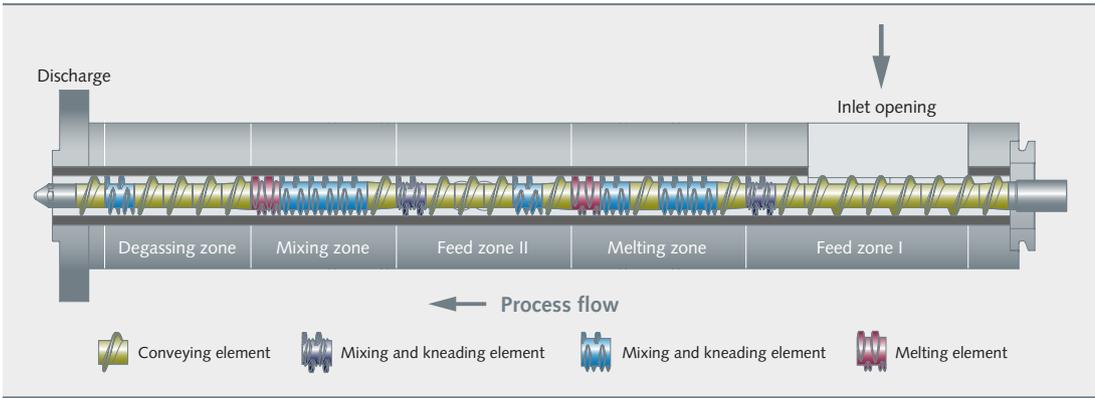


## NFC (Natural Fiber Composites)

Natural fiber composites (NFC) are based mostly on renewable raw materials and, owing to their excellent mechanical properties and low weights, are enjoying rising demand. NFC are modern materials on account of their advantageous CO<sub>2</sub> footprint, excellent energy balance, and good recyclability, and can be found applied in the automobile, furniture, and construction industries, but also in articles of daily use. NFC receive their mechanical properties by mixing in up to 70% natural fibers, thereby experiencing a similar reinforcing effect to that of glass fibers. The introduced natural fibers and natural fillers have a moisture content of up to 10%. They are also temperature-sensitive and may not be subjected to mechanical stress. The processing zone of the compounders of the COMPEO range may be customized specifically to this special requirements. Optimally configured screw geometries with adapted shear gaps enable gentle incorporation of the fibers and optimum mixing at low temperatures in conjunction with uniform, moderate shear rates. The moisture introduced with the fibers is reliably removed by multiple vacuum degassing.

### COMPEO offers these advantages for processing natural fiber composites:

- Optimize compounding and pressure build-up independently of one another
- Uniform shear rates enable processing at low temperatures
- High filler levels through optimal venting and vacuum degassing
- Intensive mixing at a low specific energy input
- Precise temperature control by thermosensors at desired positions in the processing section



Typical screw configuration for natural fiber composites.

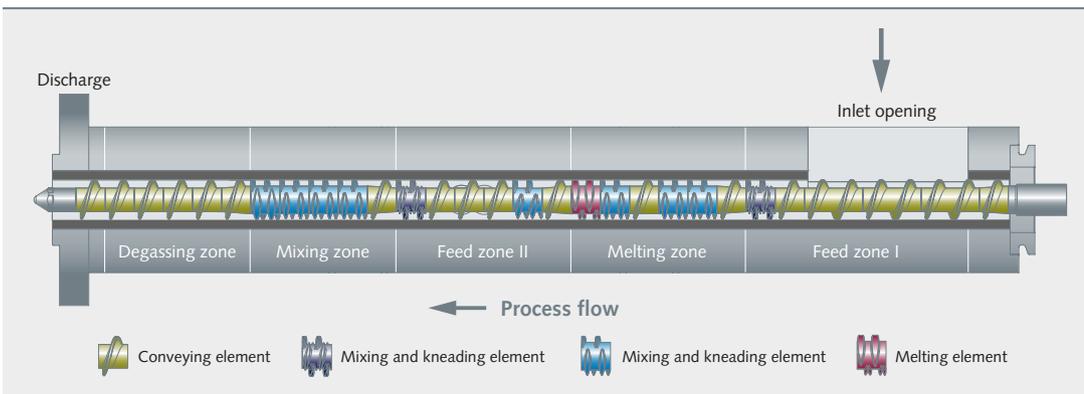


## Black masterbatch

Masterbatch is a concentrate of pigments, additives, or fillers with which particular properties can be achieved in the final application simply and cleanly. The concentration of the additive in masterbatch is many times higher than that in the final application. The dilution of the masterbatch usually takes place in the final processing stage. Black masterbatch obtains its black colour by mixing in carbon black. Industrial carbon blacks have a high surface area, low bulk densities, and a certain amount of moisture contents and tend to form aggregates. When processing black masterbatch, it is particularly important to disaggregate these aggregates in the compounding process and to optimally distribute the carbon black particles without overloading the polymer or the carbon black. The option of feeding carbon black at several positions into the COMPEO compounder permits very high filling rates. Optimally configured screw geometries with adapted shear gaps enable the carbon black to be worked in gently without peak pressures. Moderate shear rates and optimized mixing zones provide homogeneous distributive mixing, ensuring a high-quality end product without secondary agglomerates.

### COMPEO offers these advantages for processing black masterbatch:

- Intensive mixing and dispersion at a low specific energy input
- Low stress on the polymer and carbon black through low shear rates
- Variably adjustable, intensive distributive mixing
- High filler levels through split feeding and active degassing
- A wide range of formulas with a single screw configuration



Typical screw configuration for black masterbatch.



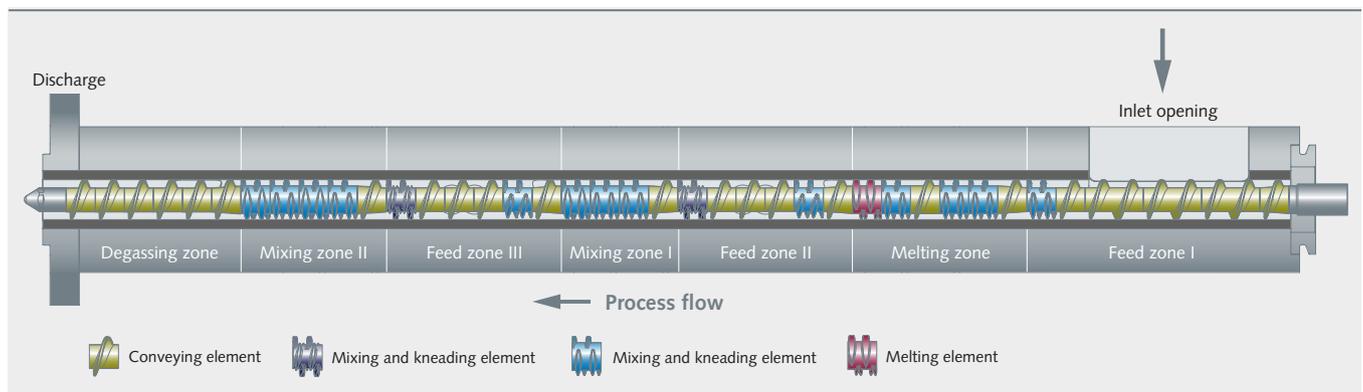
## Semiconductive cable compounds

The insulation of medium and high voltage cables is covered inside and outside by a semiconducting layer, which serves to homogenize the electric field. To achieve semiconducting properties, conductive materials such as carbon black, graphite, or carbon nanotubes are added to the ethylene-based polymers. The conductive additives are added to the base polymer in proportions of up to 40%. The highly structured carbon blacks have a high surface area, low bulk densities, and typical moisture contents and tend to form widely branched aggregates. The challenge in compounding semiconductive compounds is to separate these aggregates in the compounding process and to optimally distribute the carbon black particles – without damaging the structure of the carbon black. In addition to the base polymer and the type of carbon black used, the compounding process also has a decisive influence on the mechanical and electrical properties of the compound. The modularly designed processing zone of the COMPEO compounder permits optimally configured screw geometries with

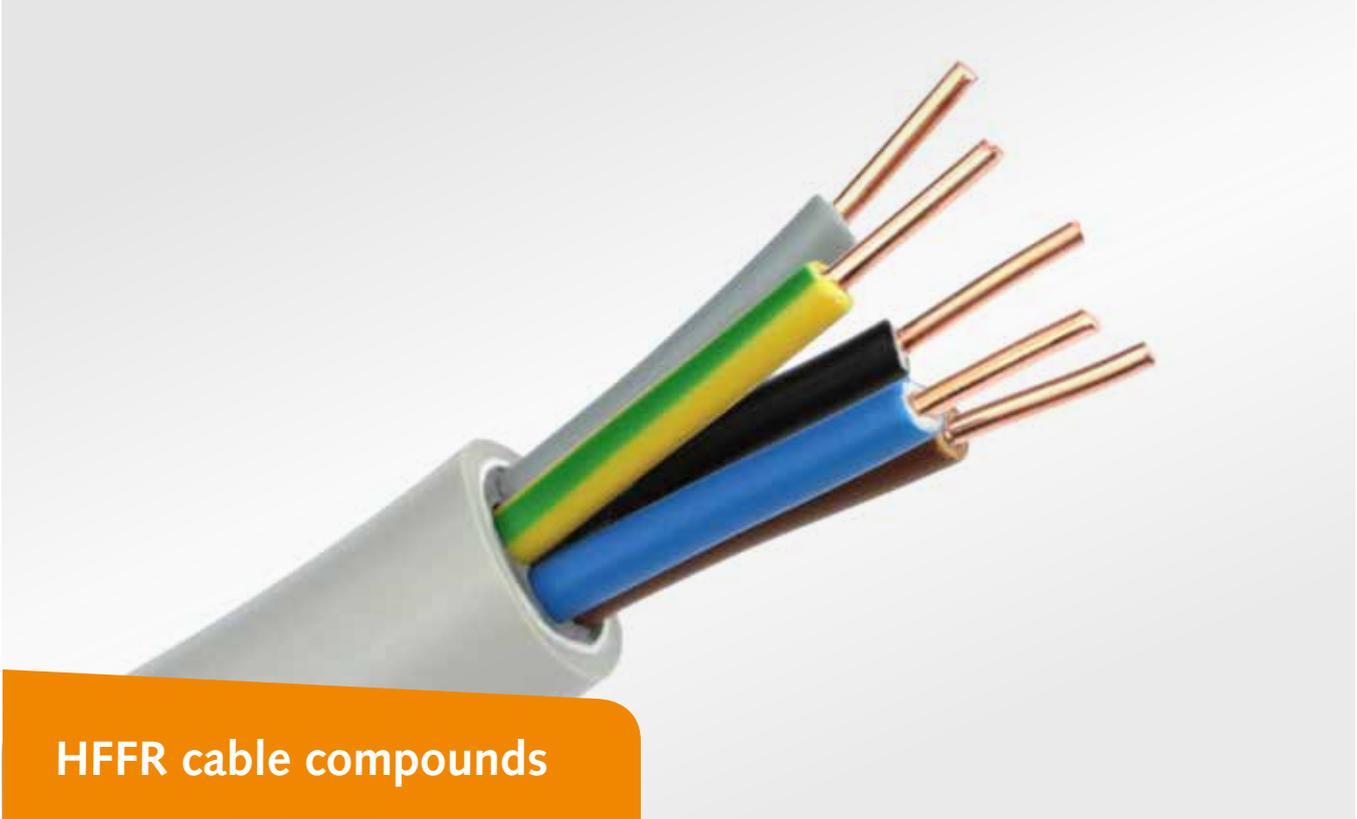
### COMPEO offers these advantages for processing semiconductive cable compounds:

- Intensive mixing and dispersion at a low specific energy input
- Uniform, moderate shear rates
- Low stress on the polymer and carbon black structure
- High filler levels through split feeding and active degassing
- Variably adjustable, intensive distributive mixing

adapted shear gaps, allowing the gentle incorporation of additives without peak pressures. Moderate shear rates and optimized mixing zones provide homogeneous distributive mixing, ensuring a high-quality end product without secondary agglomerates.



Typical screw configuration for semiconductive cable compounds.

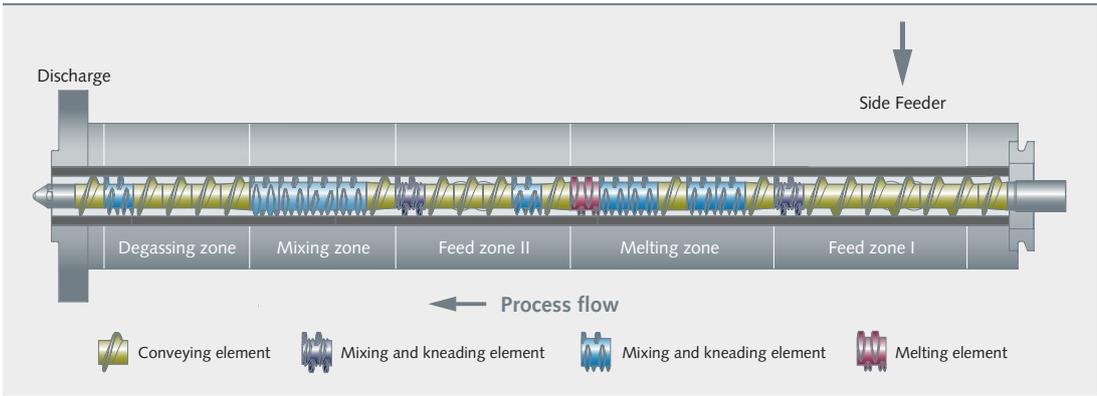


## HFFR cable compounds

Polyolefins possess excellent insulating properties but are also highly flammable. Therefore, they must be treated to be flame-retardant for use as cable insulation. The flame retardancy properties of HFFR compounds require the addition of 50 to 80% additives. These are often metal hydroxides (ATH, MDH) supplemented by milled minerals and nano fillers as synergists. In addition, coupling and crosslinking systems are integrated to achieve mechanical and other properties relevant to the application. To be able to incorporate the high proportions of flame retardants and additives as required, optimum dispersive and distributive mixing is required in the compounding process – at low product temperatures. The modularly designed processing zone of the COMPEO compounder enables flexibly tailoring the configuration of the mixing and kneading screw to the high demands of processing HFFR compounds. Optimally configured process geometries with adapted shear gaps and moderate shear rates without temperature peaks provide optimal distributive mixing, enabling gentle incorporation of the reactive additives. Liquid reactants may be injected through injection bolts located at desired positions along the processing section.

**COMPEO offers these advantages for processing HFFR cable compounds:**

- Optimize compounding and pressure build-up independently of one another
- Uniform shear rates enable processing at low temperatures
- High filler levels through split feeding, optimal venting, and vacuum degassing
- Intensive mixing at a low specific energy input
- Precise temperature control by thermosensors at desired positions in the processing section



Typical screw configuration for HFFR cable compounds.

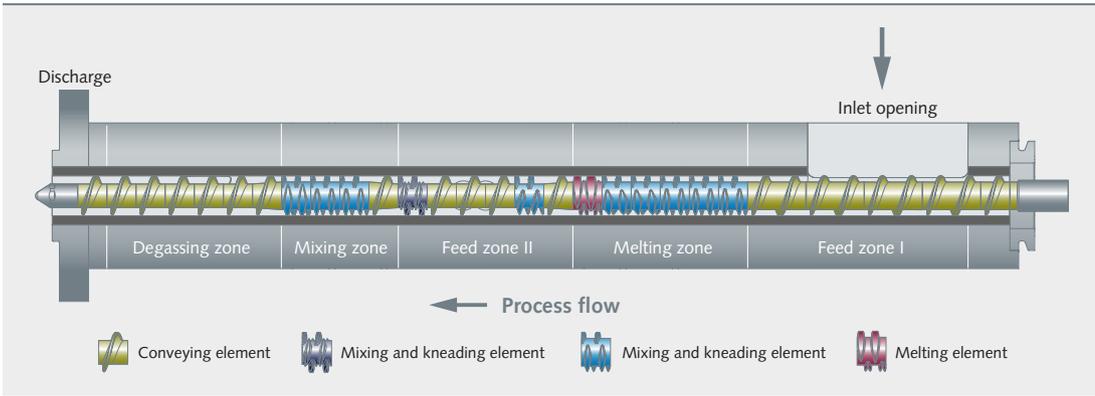


## Polycarbonate compounds

Polycarbonate compounds are engineering plastics with excellent mechanical properties, good electrical insulation, sterilizability, and flame retardancy. Their ability to be combined with other plastics such as ABS or PBT enables tailor-made blends. The processing of polycarbonates is correspondingly demanding. The powdery or chip-shaped raw materials are processed into pellets in the compounding process while reinforcing fibers, flame retardants, pigments, or blend partners are added. The aim is to gently melt the polymer components and distribute the additives so perfectly that the desired property profiles are achieved. The COMPEO compounding technology can be flexibly adapted to these high demands. Specially designed mixing zones provide optimal distributive mixing in combination with uniform and moderate shear rates. Because COMPEO compounders are able to process materials with a wide range of viscosities, polycarbonate blends, reinforced, flame-retardant, or highly viscous formulations, and combinations of these can be processed with one and the same screw geometry.

**COMPEO offers these advantages for processing polycarbonates:**

- Processing in a narrow range of temperatures through uniform shear rates
- Achieving of high filler levels through adapted process control
- Intensive mixing at a low specific energy input
- Effective removal of volatile components
- Precise temperature control by thermosensors at desired positions in the processing section



Typical screw configuration for polycarbonate compounds.

## Technical data

	BUSS Compounder			Discharge units*			
	Screw diameter [mm]	Process length* [L/D]	Screw speed max* [rpm]	CDP Screw dia. [mm]	CSS-F Screw dia. [mm]	CSS-C Screw dia. [mm]	Process length* [L/D]
COMPEO 55	55	14/18/25	600	70/2	110	110	4/6
COMPEO 88	88	14/18/25	600	100/2	160	200	4/6
COMPEO 110	110	14/18/25	600	140/2	200	250	4/6
COMPEO 137	137	14/18/25	600	200/2	250	300	4/6
COMPEO 176	176	14/18/25	600	---	300	320	4/6

\*Dependent on raw materials and formulation

## Throughput rates in kg/h<sup>1</sup>

	COMPEO 55	COMPEO 88	COMPEO 110	COMPEO 137	COMPEO 176
PVC Pelletizing – Unfilled	150–400	600–1600	1200–3200	2400–6000	4800–11000
PVC Pelletizing – Filled	200–500	800–2000	1600–4000	3200–7400	6400–13200
PVC-Calendering – Sheet, film	---	450–1400	900–2700	1700–5100	3000–9000
PVC-Calendering – Flooring, LVT	---	800–2000	1600–4000	3200–7400	6400–13200
Cable – HFFR	150–250	600–850	1200–1700	2400–3500	4800–7000
Cable – Semiconductives	150–250	600–850	1200–1700	2400–3500	4800–7000
Cable – Silane Crosslinkable	175–225	600–850	1300–1700	2500–3500	5500–7000
Cable – Peroxide Crosslinkable <sup>2</sup>	---	---	600–800	1200–1600	2800–3200
Black Masterbatch	150–250	600–850	1200–1700	2400–3500	4800–7000
Filled & Reinforced Thermoplastics	150–250	600–850	1200–1700	2400–3500	4800–7000
Natural Fiber Composites	150–250	600–850	1200–1700	2400–3500	4800–7000
Polyamide	150–200	600–800	1200–1600	2400–3200	4800–6400
Polycarbonate	150–200	600–800	1200–1600	2400–3200	4800–6400
PBT, PET	150–200	600–800	1200–1600	2400–3200	4800–6400
Thermosets <sup>2</sup>	50–150	200–500	400–1000	800–2000	1600–4000
Bioplastics	75–150	300–600	600–1200	1200–2400	2400–4800
Thermoplastic Elastomers	100–225	400–850	800–1700	1600–3500	3200–7000
Rubber Compounds <sup>2</sup>	40–100	150–400	300–800	600–1600	1200–3200
Hotmelt	100–150	350–500	750–1000	1500–2000	3000–4000

<sup>1</sup> Expected maximum throughputs dependent on raw materials and formulation

<sup>2</sup> Expected maximum throughputs at 300 rpm



## Unique features

With its unique functions, COMPEO offers new, convincing advantages and benefits for a highly varied scope of application:

- Extremely wide range of applications
- Novel screw geometries
- Considerably extended process window
- High output at lower speeds
- High robustness and operational safety
- Improved energy efficiency
- Innovative discharge concept



## Future-proof system

BUSS has developed the new COMPEO compounder generation to meet current and future plastics industry requirements. Owing to its high flexibility, improved process stability, operational and operator safety, energy efficiency, and reduced operating costs, COMPEO can be applied to many applications and a wide array of product ranges.

## Strong service concept

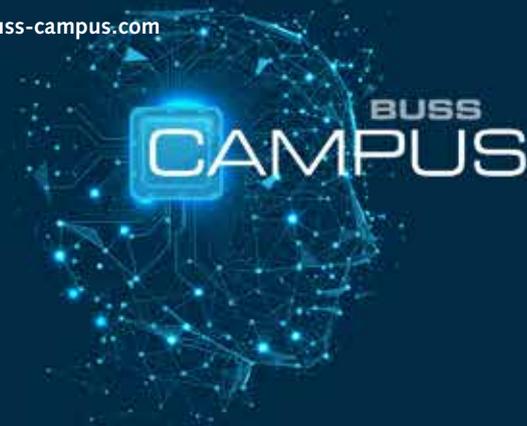
The BUSS service team is available to you world-wide for professional support in taking care of your compounding systems. From project engineering, process-related support, installation, and commissioning to training and unparalleled service, we are your partner to protect your investment for the long term. This also includes retooling or revamping the systems later, moving or modernizing compounding systems.

## BUSS Campus

The BUSS Campus is our technology center at BUSS headquarters in Switzerland, in which we advance process development and process optimization. The BUSS Campus is also our knowledge platform for compounding experts.

Visit the online version of the BUSS Campus. Just sign up and be kept informed:

[www.buss-campus.com](http://www.buss-campus.com)



BUSS  
CAMPUS

## **BUSS. Excellence in Compounding.**

BUSS is 70 years of knowledge, innovative strength and experience in the development of compounding systems. It all stems from our highly experienced employees, who bring maximum quality and professionalism to all our services. BUSS' core competence is customer- and product-specific solutions of processing tasks. Always analogous to the high demands on process technology and product quality as well as the constantly increasing technological market needs. The performance strength and investment security in our systems can be summarized in two words: Swiss quality. All of this makes us a leading supplier of high-quality compounding technology.

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