Cocoa.
Innovative processing solutions.
Manufacturers of gourmet cocoa are intuitively skilled in selecting raw materials, in particular those that will be beneficial for converting flavors into the desired taste profile during roasting. They distinguish themselves with their skill at reading what is special in the raw material and accentuating and influencing the tastes they want to achieve during the process.

Care is taken regarding the precise balance between the flavors that are dispersed and those that are retained in order to maintain or accentuate the special feature and character of the raw cocoa. This is why a production line that offers maximum flexibility for recipe management is required. Here, the best choice is batch operation with the most accurate process management possible and reproducible process control.

Bühler offers various systems that are especially designed for gourmet and craft roasting. For cocoa, the drum roaster Barth Tornado RS/RSX, and for cocoa bean roasting, the gourmet batch roaster Solano CBR or the new Zonda RS roaster with batch sizes of 70 kg up to 100 kg.

The Tornado RS/RSX combines the positive characteristics of a bean roaster with those of a cocoa nib roaster, including cocoa solvent treatment. The use of flexible process technology for conductive and convective roasting extends the scope for process management. In this way, very different recipes can be produced which had been technically impossible to implement until now.

Another feature is the new drum design, which supports the polycyclic relaxation process (PCRP) and homogenous flavor development. A HydroKen™ online moisture monitoring system helps to control one of the most important parameters of taste development and therefore brings about completely new recipe management during cocoa production.

The royal cocoa fruit grows around the equator, where Caribbean islands, sunny African plantations and the exotic climes of Asia can be found. It is not possible to compare the significance of chocolate products such as filled chocolates, the bitter taste of dark chocolate and milk chocolate with its soft, creamy taste with other foodstuffs. Chocolate is a unique product.
Bühler continually invests in scientific research of the cocoa fruit, its genotypes and the fermentation process in order to continuously improve the quality of its process solutions. The knowledge gained regarding the raw material allows the company to develop improved or new processes. These are then tested on the market and, if successful, implemented commercially.
Sustainability is important when it comes to cocoa, in particular for optimizing yield and production costs and also in relation to the quality standards of the goods produced.

Processes that minimize yield and energy losses are needed to satisfy these demands. Bühler has developed two different equipment concepts for this, each setting benchmarks for processing cocoa. Bühler’s roasting line for the continuous processing of whole cocoa beans is suitable for high throughput whilst maintaining the same recipe management.

The Barth RoaStar™ vertical roaster features zones that can be controlled separately, allowing precise temperature management, and is impressive because of its low maintenance requirements as well as minimal energy consumption achieved thanks to its energy recovery system.

Bühler’s second roasting line is well-known under the name NARS system (Nib-Alkalization-Roasting-Sterilizing). Here, the core process works using the batch system with the Barth Tornado RS or Barth Tornado RS/RSX drum roasters, including alkalization and solvent treatment, which makes it possible to influence certain color reactions and/or taste options.

This system has established itself as standard on the market and, with its robust design, is excellent for three-shift operation and is very well suited for complex recipe management. In combination with improved process control, the system reduces production costs, increases throughput and yield, and optimizes quality parameters such as color and taste.

Based on the successful high-throughput product lines, the new Zonda RS roaster allows small-scale producers to run batches from 70 kg up to 100 kg safely, consistently and with high quality – ideal for the needs of small and medium-sized companies.
All Bühler’s process optimizations are characterized by reduced energy consumption, higher throughput and yield or greater flexibility when managing recipes, with the aim of giving customers more options to differentiate their products.
Bean roasting line.  
**From entrance up to the finished product.**

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**Cleaning and transportation**

Bühler offers tailor-made, reliable and efficient solutions for cleaning and transportation within the system. A choice of a large number of solutions for separating undesirable elements and pneumatic or mechanical conveyors is available.

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**Barth RoaStar™**

This continuous bean roaster handles a high throughput and impresses with its temperature zone control, which allows targeted flavor development. Minimal maintenance outlay, simple recipe management and a low energy requirement are features of this solution. The hot air for the roaster can be generated via a steam heat exchanger or a gas burner system.
Debacterization

The Barth Debac™ features a highly efficient debacterization process, which protects flavor and has been designed for a continuous bean roaster. The relatively high pressure of the saturated steam of up to 5 bars makes for efficient separation of cocoa and cocoa shells.

Grinding

PreGrind™ impact beater blade mills and FineGrind™ bead mills impress with their high quality and consistency of the end product. Downtimes are low, thanks to their durability and short maintenance and cleaning times.
NARS line sets standard for nib-processing. 
From entrance up to the finished product.

Infrared treatment

This process allows the cocoa beans and shells to be separated effectively in the downstream Barth Winnower. Targeted infrared treatment in the Barth IR system processes cocoa beans that are difficult to shell. Production of small parts during crushing is prevented, thus increasing yield.

Treatment/alkalisation of cocoa nibs

Tried and tested treatment of cocoa nibs permits the color and taste of cocoa to be controlled. A modern automation solution is used here for reproducibility and control, which also allows monitoring of possible debacterization.

Batch roaster

Batch roasting technology of the Barth Tornado RS/RSX allows aromatic and physical characteristics of the cocoa. The new moisture-based roasting brings profile roasting to the next level. Enhanced process control systems ensure that the quality of the roasted beans remains uniform. In addition, these processes provide flexibility in respect of process management, combined with energy efficiency, a high throughput and flexibility with regard to product characteristics such as color and taste.
Grinding

PreGrind™ impact beater blade mills and FineGrind™ bead mills impress with their high quality and consistency of the end product. Downtimes are low, thanks to their durability and short maintenance and cleaning times.

Pressing

The hydraulic presses for cocoa liquor are designed by our partner GSR in Italy. With machine sizes of up to 18 pots, the presses cover a wide range of production capacities. The pressing lines are equipped with an intelligent automation system for efficient processes, enabling production of larger quantities of butter and cake in the shortest possible time.

Powder milling/
stabilization

The well-established Hosokawa air classifier mill impresses with its efficiency and durability. Subsequent cooling and stabilization guarantee powder with a crimson color and long storage stability.

The Bühler NARS line is popular because of its flexible recipe management, which can also deal with liquid for color and taste optimization. The robust design of the equipment is also a point in its favor, allowing up to 8,300 hours of operation per year. This line design is used for the production of chocolate mass and for flexible cocoa powder production.
Tailor made roasting systems made by Bühler. 
**For every demand the optimal solution.**

Bühler offers different roasting systems for cocoa: The Barth RoaStar™ vertical roaster for continuous bean roasting as well as the Barth Tornado RS drum roaster for NARS lines and finally the gourmet-batch roaster for cocoa beans Solano CBR.

**Barth Tornado RS/RSX for nib processing**

Bühler solutions ensure that more than 500 precious flavor substances can unfold in the cocoa bean during the roasting process. In particular, the central aspects of the NARS line have been extensively revised and a host of new features have been added. Particular attention was paid to optimizing sustainability and throughput.

Flexible hot air routing: The hot air can be routed through the Barth Tornado RS/RSX conductively in the traditional way as well as convectively. Recipe optimizations during the roasting process increase the throughput rates by +/- 20% and reduce energy consumption.

A new drum design improves energy input (+/- 20%) for the convective method and selective use of the polycyclic relaxation process (PCRP), which permits more intensive cocoa flavors or reduced holding times.

HydroKen™: Online moisture sensor that measures and records moisture in the roasting chamber during the roasting process. This provides measuring parameters for the Maillard reaction and measuring parameters for switching over from conductive to convective roasting.

Monitoring the addition of water – “Critical Control Point” for sterilization.
Barth RoaStar™ for cost-effective roasting of cocoa beans

The tailor-made roasting solution for whole beans is the Barth RoaStar™ vertical roaster. This system allows the option of using steam as the source of heat for roasting air and is an attractive system for high throughputs with a recipe that does not change. The Barth RoaStar™ also has the following advantages:

- Product temperature management: Roasting profile control can be used for the product temperature thanks to the new automation.
- Improved roasting quality through the control of energy input via the air temperature and volume. This is of particular interest when the raw material conditions vary – for instance, input temperature or moisture – which may cause the taste of the product to change if a traditional control is used.
- Fire protection via a functional unit with integrated testing of water pressure and extinguisher nozzles.

- Nozzle cleaning function: Automatic nozzle cleaning is available as an option, thus keeping clogging by grease to a minimum. This reduces cleaning work and thus system downtime.

Solano CBR for gourmet roasting of whole cocoa beans

As a compact batch system, the Solano CBR offers enormous flexibility for all users who want to produce cocoa specialties in small batches. Temperature, roasting time and other process parameters can be freely selected, creating practically unlimited options for processing cocoa beans of all origins. This enables the beans to optimally develop their individual flavor in the roasting process. The partial fluid-bed process achieves an extremely even transfer of heat to each individual cocoa bean for targeted and consistent flavor development in every batch. The air volume, air temperature, pressure inside the roasting chamber and roasting time can be precisely adjusted. Roasting profiles enable reproducible roasting results and consistent product quality for the cocoa batches produced.
Barth Debac™ and Barth CCP sterilization solutions that are especially designed for cocoa ensure that customers can meet their responsibility to supply foodstuffs with high safety standards.

It is also advisable to conduct a standard microbial validation of the germ-control system. This provides state-of-the-art process reliability. ProValid microbial validation is superior to taking samples. This system checks and validates whether a process achieves the required log reduction of microorganisms in a proven manner and in compliance with the defined conditions. The process conditions are documented and can be used as proof for audits.

For foods with a low moisture content, Bühler provides a number of sophisticated solutions for effective pasteurization and sterilization. The techniques deployed are characterized by ease of use, reproducible processes and high effectiveness.

### Elements of the validation

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<tr>
<th>Consulting</th>
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<td>Definition of the requirements and creation of a validation plan</td>
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<td>Definition of the surrogate as microbiological indicator</td>
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<td>Initial validation trials: Worst-case tests to define validation parameters</td>
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<td>Comparative analysis of the pathogenic germ with a surrogate in the laboratory</td>
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<td>Validation</td>
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<td>Acceptance evaluation/IQ: check on equipment installation</td>
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<td>Inoculation of the product sample with the previously defined surrogate and evaluation of this</td>
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* = Included in package, – = Not included
Furthermore, Bühler also supports its customers with the development of new taste and color recipes, deploying decades of process experience. Professional tests and analyses enable accurate evaluation of the different process steps and their results.

Many very different processes can be tested and optimized at the company’s own test facilities in Europe, Asia and the USA. Experienced process engineers carry out pilot trials and test series with the customer prior to a decision on whether to buy.

Pilot plants enable trials to be carried out on a small industrial scale to optimize products or processes. These trials also provide an insight into the required dimensioning of the potential plant.

The Bühler central laboratory in Uzwil is the ideal point of contact for demanding analysis tasks and also offers services such as consulting, training and method development.

Bühler operates its own test facilities and laboratories for the food industry worldwide and offers support to optimize cocoa lines in respect of yield, throughput and reduction of the energy required.
Customized maintenance, retrofitting and reconditioning packages ensure that machines are always state of the art. The advantage: customers can produce their articles profitably and safely even with older plants. Bühler is represented in more than 140 countries, maintains its own production, development and service locations worldwide and is quickly on site when customers need support. Technicians procure spare parts quickly and install them professionally. Specialized Bühler service locations carry out extensive retrofits for existing systems in the industry.

Specially tailored training options enable smooth operation of the machines, allowing you to produce excellent product quality with optimum throughput. The training courses help improve plant output and keep operating staff abreast of current technologies and safety standards – for labor law regulations as well as food safety.

Focus areas of the Bühler service range:
- Food safety
- Operator protection
- Operational reliability and quality consistency
- Overall equipment effectiveness (OEE)

24 hours, 7 days the week, worldwide.

Service to increase productivity and safety.
Bühler is the leading technology partner worldwide when it comes to manufacturing cocoa creations. The tried and tested production systems combine products of first-class quality and a high level of efficiency.