Metris
ANDRITZ Digital Solutions

FEED & BIOFUEL

EXTRUSION CONTROL

AUTOMATED PRODUCTION WITH RISK MONITORING

EFFORTLESS AUTOMATION.
TOTAL PEACE OF MIND

ANDRITZ

NEVER STAND STILL

At ANDRITZ, we understand the challenges the feed and biofuel industry faces today. With volatile raw material prices, emerging outbreaks, and a competitive marketplace, the need for innovative solutions has never been greater. Our Automation & Digitalization solutions, powered by the Metris Digital Platform, are designed to upgrade your operations, ensuring profitability, reducing total cost of ownership, and enhancing operational excellence.

Leveraging our 40 years of cross-sector success, our platform blends human and digital intelligence to enhance processing efficiency and support growth, while delivering 7 - 16% throughput increases.

Our solutions encompass an evolving, vendor-neutral solution supported by state-of-the-art automation and digitalization technology.

ANDRITZ will be with you every step of the way in your digitalization journey, ensuring your plant and your business **NEVER STAND STILL.**

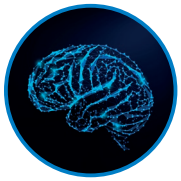
FOUR PILLARS OF SUCCESS

Through our global industry-specific expertise and deep understanding of the challenges our customers face, we deliver automation and digitalization solutions based on four key pillars.

AUTOMATION
The 'Muscle'

Achieve peak performance over the entire lifetime of your lines

The automation suite encompasses a broad spectrum of control solutions ranging from basic to fully automated systems, including production management, real-time plant simulation, condition monitoring, process optimization, and life cycle management.
These components maximize plant throughput, simplify maintenance, and optimize resource use.



DIGITALIZATION
The 'Brain'

Maximize your plant's potential while minimizing investment risk

The digitalization suite offers a holistic digital infrastructure for process optimization, asset management, operator training and knowledge management, ensuring a turnkey approach to feed and biofuel processing operations.
Our digitalization platform transforms operational data into robust, actionable analytics, maximizing your plant's potential while minimizing investment risk.

DEEP INDUSTRY EXPERTISE
The 'Heart'

Over 180 years of industry expertise and a global footprint ensure our solutions are adaptable and regionally attuned.
We preconfigure solutions based on our deep process knowledge, giving you immediate access to our know-how, our portfolio, and our service infrastructure all in one place.

AUTONOMOUS OPERATIONS
The 'Vision'

We strongly believe that the journey to autonomous operations is paved with bold steps by those who embrace every facet of automation and digitalization, turning challenges into opportunities for growth.
By taking that initial leap, you can unlock a world of possibilities. We can help you achieve a fully autonomous feed plant by 2027.

EXTRUSION CONTROL

This document is intended as a comprehensive introduction to Andritz's automation and control solutions for extrusion lines. It provides essential insights into production control and automation and the extensive capabilities of Andritz's solutions. The emphasis is on the practical features of these solutions in various pellet production scenarios.

Extrusion Control System

User-friendly solution, designed to monitor and control all the parts and processes in an extrusion line. It seamlessly integrates state-of-the-art machinery and complex processes with an intuitive, easy-to-use interface, simplifying operations and enhancing planning and decision-making capabilities.

Market-proven automated control solutions trusted worldwide

OVER 300 EXTRUSION CONTROL SYSTEMS have been installed globally

CUSTOMERS IN OVER 60 COUNTRIES, enhancing their operational efficiency and reliability with us

- Unmatched Expertise: In-depth knowledge of process automation.
- Tested Excellence: High-quality, industry-proven solutions.
- Plug & Play Preconfigured Solutions: delivering adaptable solutions for your exact needs.
- Global Support Structure: Prompt and effective assistance for any challenges.
- Secure Compliance: Upholding industry cybersecurity standards.

Effortlessly integrates into existing systems

Easy-to-use, intuitive interface

Simplifies operations

Enhances planning and decision-making capabilities

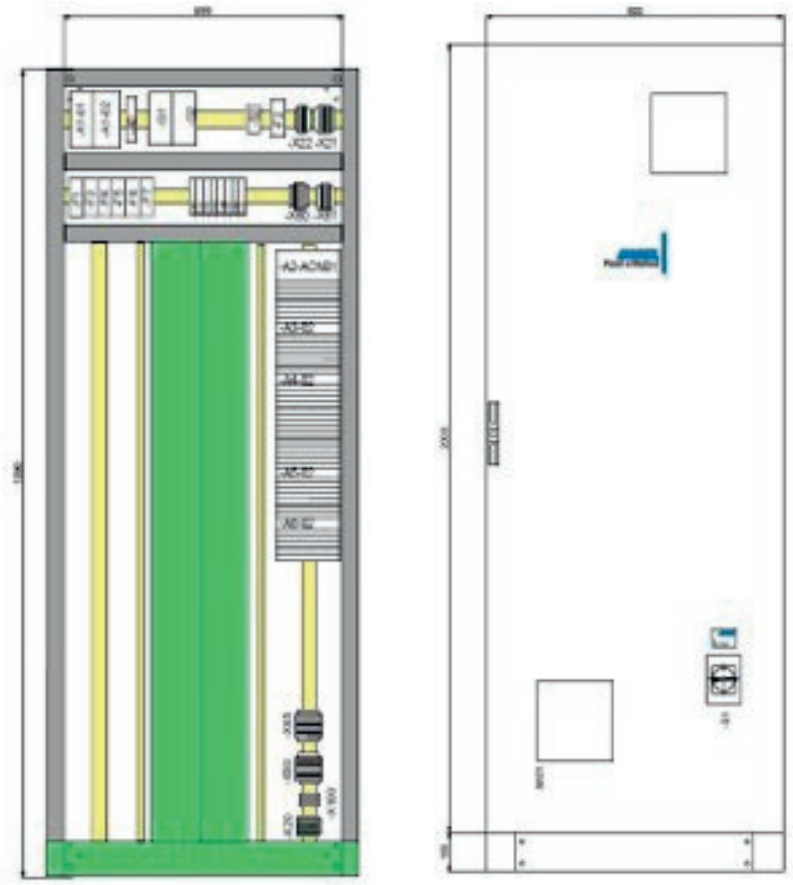
Control Options

Two distinct control systems are available to meet diverse needs: Management System and Panel System.

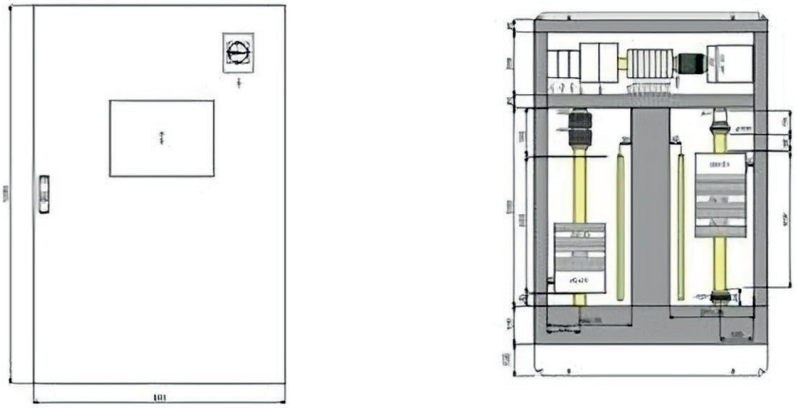
Management System is a network-based, modular solution capable of controlling up to four processes.
It supports multiple control stations, offering enhanced operational flexibility, and is designed with future scalability in mind.

Alternatively, **Panel System** is a cost-effective choice that provides an optimal balance between performance and expenditure. It includes an ergonomic user interface that displays relevant information, enabling direct monitoring and control of manufacturing operations. It also supports add-ons, offering flexibility to adapt to evolving needs.

Both systems are designed with a focus on operational success, offering control, flexibility, and growth potential.



Management system



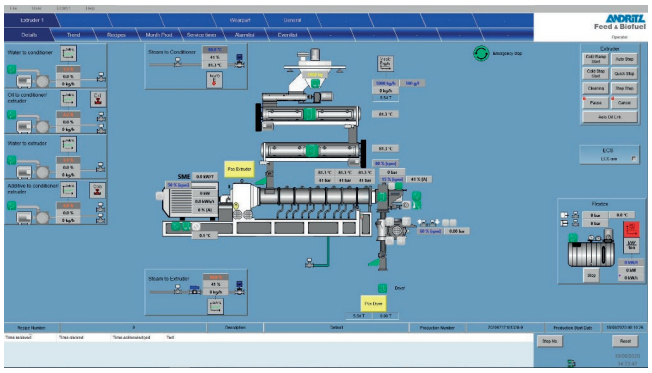
Panel system

Management System

Management System is a modular system specifically designed to manage ANDRITZ Feed & Biofuel production machines or parts of a production line. It can also be configured to interface with third-party machines. This system enables remote monitoring and control of the entire process from a control room. Furthermore, it provides additional control options and configurable parameters directly from the interface. This makes it an excellent choice for comprehensive operation and maintenance insights.

SYSTEM DESCRIPTION

Management system, centered around a PLC based system, manages all machine electrical signals, and communicates with a computer running the Scada system via Ethernet. Scada allows process monitoring, management, and data storage for future access. It's network-based, allowing multiple clients to connect to the same server, enabling multiple control stations.



FEATURES

1. Extensive Human-Machine Interface: The Management System's Overview tab offers an intuitive, comprehensive graphical interface. It provides a color-coded visual representation of the entire installation and all its components, allowing for real-time status monitoring. The interface is designed for direct, real-time control, with fields for adjusting Recipe parameters and displaying current values.

2. Efficient Control: Auto Start and Auto Stop execute preprogrammed steps to make sure the machines start in the correct order. Step Start and Step Stop offer granular control, initiating or halting individual steps as needed.

3. Flexible Management Options: The system provides three user levels - Operator, Maintenance, and Programmer, each with unique access for efficient operation, configuration, and testing.

4. Real-Time Connection Monitoring: The system provides instant visual feedback on the PLC connection, ensuring seamless operation and immediate fault detection.

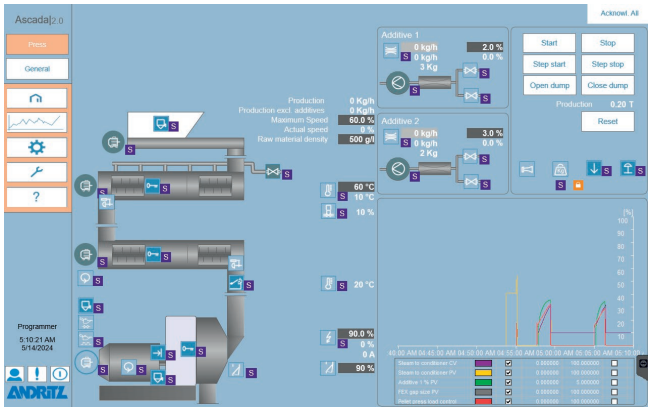
5. Detailed Component Insights: Clickable objects on the overview screen open pop-up windows, providing in-depth information about motors, valves, and controllers. This feature allows for manual control of the individual components.

6. Dynamic Trend Analysis: Management System provides configurable trend curves and graphs for numerous variables, offering insights like temperature, speed, and retention time. This feature aids in monitoring system performance and making informed decisions.

7. Event Logger: The system logs its events, enabling backtracking and comparison of current process parameters with past ones for comprehensive process review and analysis. The historical data is also valuable for demonstrating compliance with various standards.

Panel System

Panel System is a standalone, cost-effective solution that is installed in the field near the machines. The system includes a PLC, a panel PC and this approach reduces costs and complexity. It doesn't offer remote control, but instead prioritizes direct, localized control. The system is adaptable, allowing for future additions. It's designed for smaller operations, providing real-time control and data collection from process functions.



SYSTEM DESCRIPTION

Panel System consists of a wall mounted panel with a 12" touchscreen computer and a PLC with input and outputs. It is Ethernet-based and has a 5-port switch where all network units are connected.

FEATURES

1. Interactive Display: This feature offers a graphical representation of your setup. It includes a control section for line operation and an alarm bar. It allows access to pop-ups for adjustments via touchscreen inputs. The display aligns with your system configuration, mirroring the actual installation managed by the Panel System.

2. Function-Based Control System: The system utilizes a function block-based approach, enhancing process visibility and allowing more granular control. It supports various functions and allows simulations, for testing the functionality of the program.

3. Interactive Function Pop-ups: Clickable functions open configurable pop-ups, providing detailed information and allowing parameter adjustments. Color coding offers immediate visual feedback, enhancing user control and system understanding.

4. Trend Displays: The system features trend displays, showing parameter development over time. This powerful tool aids in tuning PID controllers and analyzing process issues, enabling efficient problem-solving and system optimization.

5. Historic Alarm List: Tracks all past alarms, aiding in process analysis and understanding system behavior.

6. Analytics Indicator: Showcases key metrics such as work hours, production quantity, and software version.

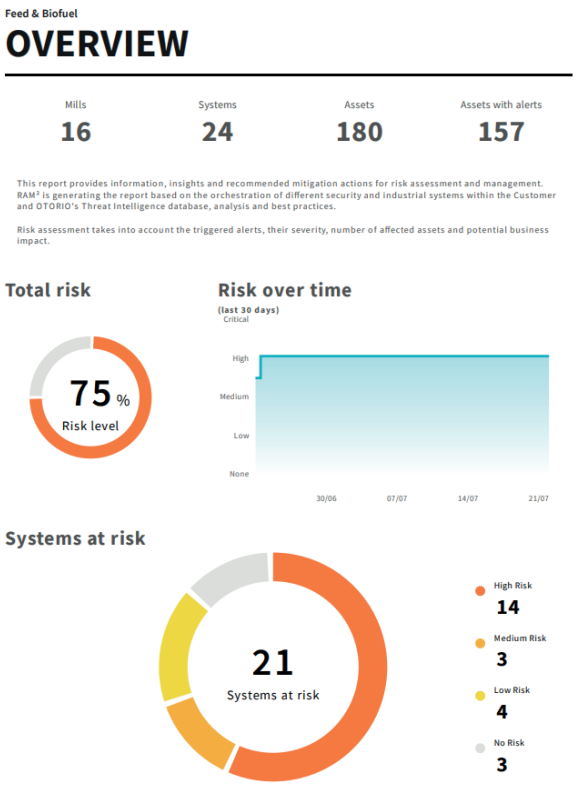
Cybersecurity Offerings

THE CYBERSECURITY PROBLEM

The digital revolution has boosted operational efficiency but also heightened cyber-attack risks. Such attacks, now common across sectors including feed and biofuel, pose significant threats.

IMPACT OF CYBERATTACKS

Cyberattacks are highly destructive. These attacks disrupt supply chains, halt production, and affect operations, leading to significant losses. On average, a cyber-attack causes a 5-day production halt, costing approximately $4.47 million.



OUR SOLUTION

ANDRITZ helps its global customers minimize digital and cyber risks through its partnership with leading OT security provider OTORIO. ANDRITZ provides combined, advanced cybersecurity and automation options integrated into its systems, safeguarding operations against cyber threats and disruptions, ensuring smooth, uninterrupted production.

STANDARD PLATFORM - OTORIO spOT™

ANDRITZ utilizes spOT™, a unique technology developed by its OT security partner OTORIO. spOT™ is an integral part of the machine delivery and quality procedures, supporting system hardening. By checking the full machine against the relevant IEC62443 / NIST / NERC standards or additional standards required by customers, spOT creates a cyber security "machine fingerprint" and automatically generates machine-specific IEC compliance letters.

FEATURES

1. ANDRITZ conducts factory acceptance tests for all equipment. With Otorio spOT integration, these processes become less time-consuming and more cost-effective, ensuring that products meet all required standards before shipment.
2. All equipment delivered by ANDRITZ, including Windows PCs and servers, is IEC62443 compliant helping organizations understand and mitigate system risks.
3. Comprehensive complaint reports are provided for all Windows PCs and servers, keeping you informed about your system's security state.

OPTIONAL FEATURES

1. **Updating the equipment with new patches:** Regular updates are crucial for maintaining the security and functionality of your equipment. They help to fix vulnerabilities, improve performance, and add new features.
2. **Implementing additional hardening, per spOT's security overview and compliance reports:** Hardening your systems can significantly enhance your security posture. It helps to reduce system vulnerabilities and protect against potential threats.

ADDITIONAL OPTION - OTORIO RAM²

Otorio RAM² is a distinct, advanced OT cybersecurity platform for organizations looking to further invest in their cybersecurity governance. It integrates seamlessly with existing systems, serving as an overlay or standalone solution for industrial control systems (ICS) and cyber-physical systems (CPS). Please note that the platform would be a separate acquisition on the part of the customer.

FEATURES

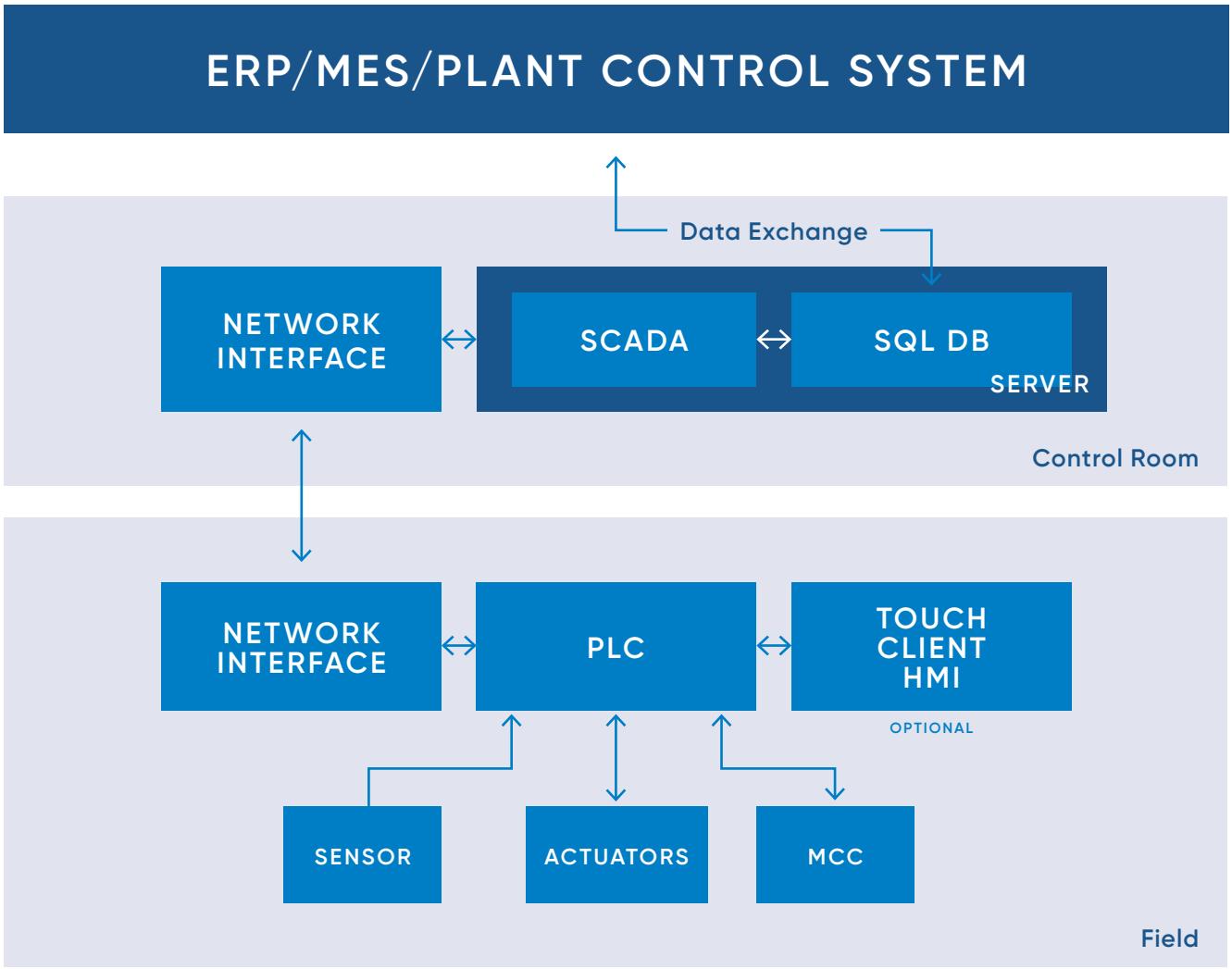
1. **Unparalleled Visibility:** RAM² orchestrates data from cross-domain sources, providing a consolidated view of your entire operational network. This feature makes monitoring and risk management more efficient and proactive.
2. **Correlated Insights:** RAM² correlates data from various sources, reducing noise and providing actionable "insights". This enhances focus and effectiveness in threat response.
3. **Non-intrusive Attack Simulations:** With the help of cyber digital twin technology, RAM² forms a virtual duplicate of your OT network. This allows security teams to simulate potential breaches and attacks, helping to foresee and prepare for possible threat paths.
3. **Integrated Overlay:** RAM² can be used as an overlay or a standalone OT security solution, maximizing ROI from your existing operational security stack. This feature prevents downtime and financial losses.
5. **Powerful Noise Reduction:** RAM² reduces unimportant and irrelevant alerts by up to 80%, eliminating alert fatigue and making sure that genuine threats are not obscured.

WHAT IS THE RIGHT CHOICE FOR YOU?

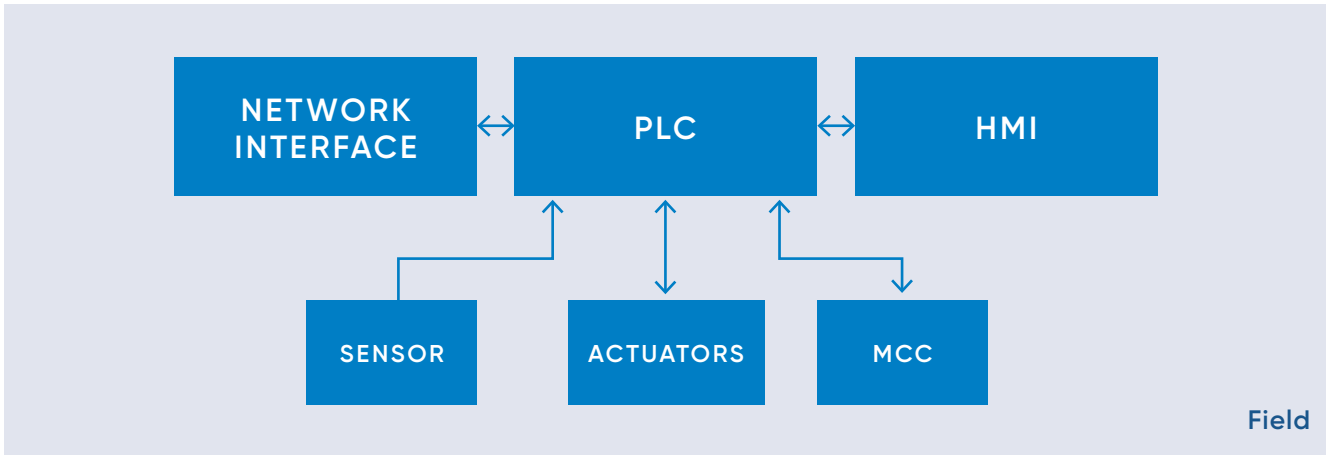
1. Otorio spOT: for a strong security foundation in your operation. Otorio spOT ensures essential protection, provides on-demand reports, and is a cost-effective solution. Additional, bonus features can be acquired if you wish to further strengthen your operation's security.
2. Otorio RAM²: if you wish to invest in enterprise-wide security strategy, have preexisting cybersecurity options that can be integrated, and desire total and comprehensive control and monitoring of your cybersecurity, Otorio RAM² is the ideal acquisition. It integrates with existing systems, maximizing return on investment.

Remember, the right choice is the one that best fits your specific needs and objectives, and we're here to help you make that choice.

Control System Architecture



Management System Architecture



Panel System Architecture

Extrusion Control

SAFETY FEATURES

At ANDRITZ, we plan, engineer, and develop our products with a commitment to meeting the highest safety and environmental standards. Our control systems are designed with an extensive array of safety features, including comprehensive safety systems, absolute and limited interlocks, and operational monitoring. These ensure that every aspect of the operation runs smoothly and safely, protecting both people and processes.

GENERAL OVERVIEW

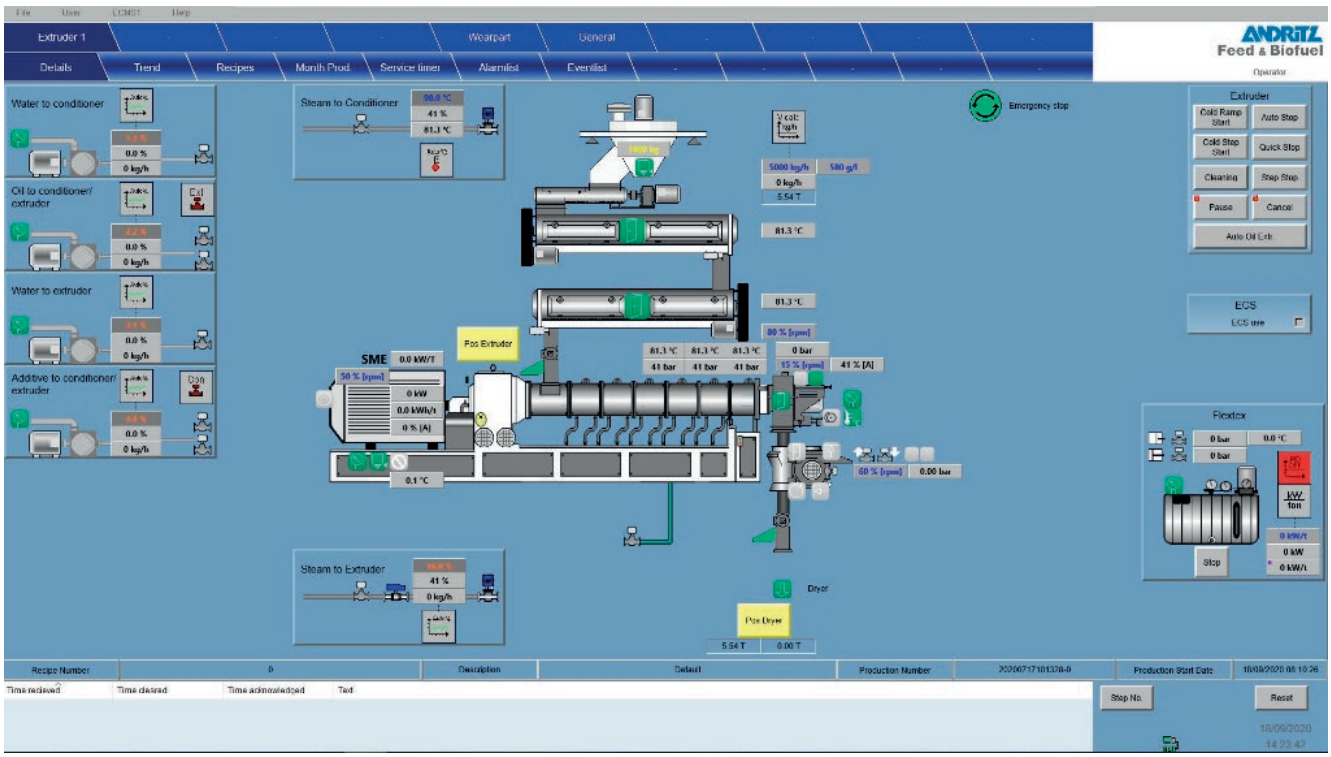
The extrusion control system is designed to efficiently manage and monitor every aspect of extrusion lines. Tailored specifically for feed production, it ensures the extruded product meets the highest standards of hygiene while achieving optimal appearance, quality, and consistency. Additionally, it maintains uniform quality, protects the equipment, and ensures safe operation throughout the process.

THE EXTRUSION CONTROL SYSTEM CONSISTS OF THE FOLLOWING PROCESS UNITS:

a. Prebin & dosing
b. Conditioning
c. Steam addition to conditioner and extruder
d. Liquid addition
e. Extrusion
Optional: ECS & FLEXTEX

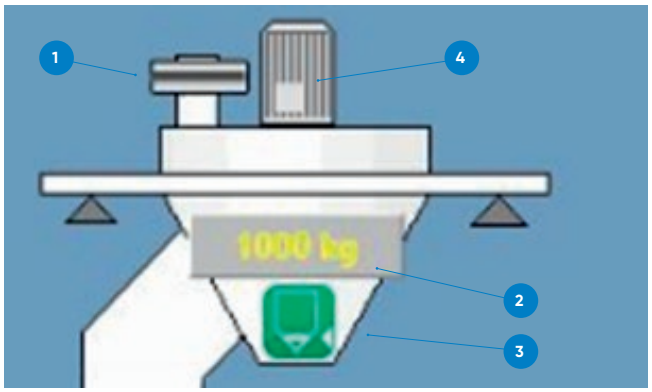
PROCESS DESCRIPTION

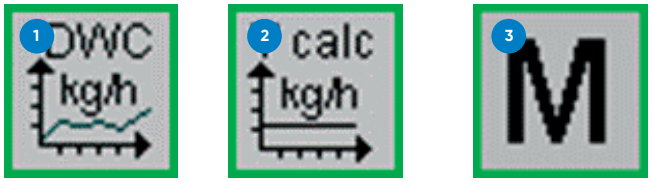
The speed-controlled screw feeder feeds material into the first conditioner, where it is mixed and supplied with steam, water, and other necessary liquids. The material then moves to a second conditioner, serving as a retention area, before being directed to a two-way distributor that guides it into the extrusion screw.
Finally, the material is pushed through the die ring and cut into pellets in the knife housing. ECS and Flextex are optional accessories for the extruder.



DOSING

The dosing unit is designed to ensure an even flow of product into the conditioner, control the feed rate to prevent overfilling or blockages, and track the amount of material into the production line.

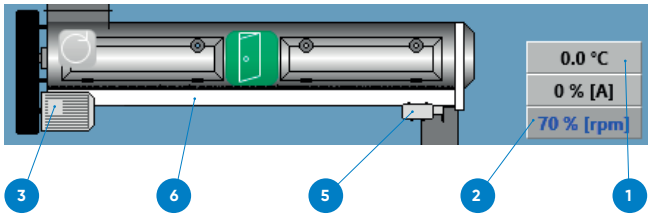




The feed screw capacity calculation mode can be changed by pressing the respective button in the interface.

CONDITIONING

Conditioning the raw material before extrusion is crucial for ensuring optimal texture, quality, and consistency. It enhances product uniformity and operational efficiency. The control system gives you precise control over conditioning parameters like speed and temperature, while also offering essential safety features to ensure reliable and consistent production.



DOSING CONTROL OPTIONAL COMPONENTS:

1. **Inlet slide gate:** Ensures complete order separation and prevents leakage.
2. **Load cells:** Accurately weights the amount of material in the prebin. The weight is displayed on the interface.
3. **Low-level indicator:** Alternative option for signaling pre-bin refill if a loss-in-weight system is not installed.
4. **Vertical bin mixer:** Ensures the material inside the prebin doesn't build up and get stuck.
5. **Feed screw:** Feeds the material from the pre-bin into the conditioner.
6. **Overflow switch:** Sits in the feedscrew outlet. If activated, stops the motor to protect screw flights.

FEEDSCREW CAPACITY CALCULATION

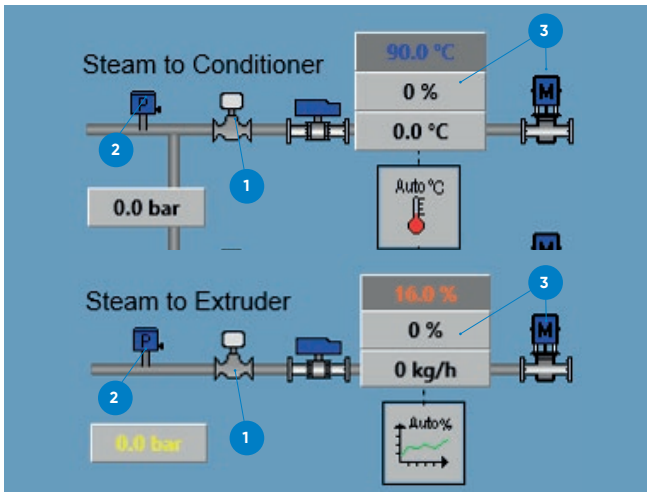
1. **Dynamic Weighting Control mode:** Only applicable if the prebin has loadcells. Uses the loss-in-weight to calculate the capacity of the feedscrew. This mode is the most accurate.
2. **Volumetric mode:** Uses the material density for accurate feedscrew capacity calculation.
3. **Manual mode:** The manual mode uses the manual setpoint for feed screw speed.

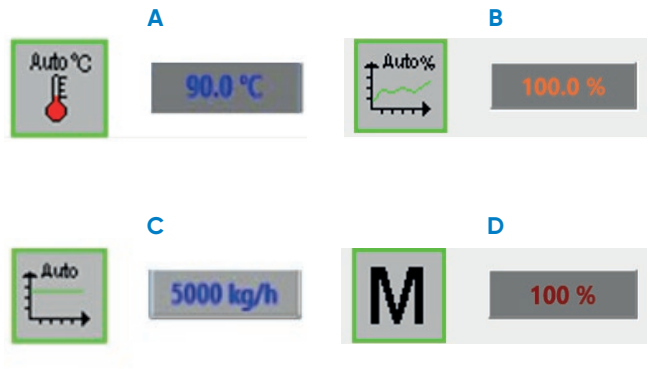
CONDITIONING CONTROL COMPONENTS:

1. **Controller:** Regulates steam application at the conditioning outlet based on the temperature setpoint.
2. **Variable Frequency Drive:** Conditioner speed can be adjusted with a VFD. Increasing speed enhances shear effect, reducing lump formation.
3. **Motor:** Minimum motor speed is set via the interface to prevent it from dropping too low, ensuring material keeps moving to avoid blockages.
4. **Motor Alarm:** If blockages occur, motor current exceeds the limit, triggering an alarm and stopping the motor to prevent damage.
5. **Temperature Sensor:** The cycle time for cleaning the outlet temperature probe is adjustable. A clean sensor ensures quick and accurate steam application.
6. **Door Safety Switch:** Prevents the door from opening during operation and blocks startup if the door is open.

STEAM ADDITION TO CONDITIONER & EXTRUDER

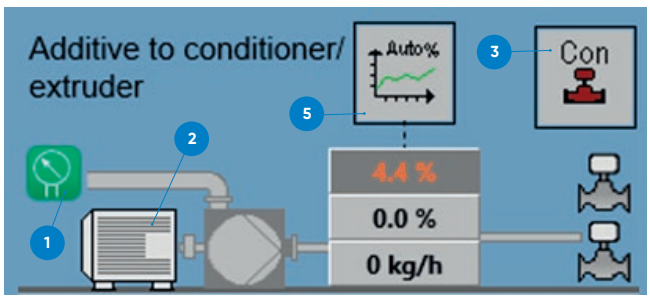
Temperature and humidity are key to achieving optimal gelatinization, ensuring the product has the desired appearance and consistency. These parameters are managed through steam addition, where injecting the right amount at the correct pressure is essential. The extrusion control system simplifies this process by efficiently monitoring and regulating steam addition.





LIQUID ADDITIVES TO CONDITIONER/EXTRUDER

The extrusion control system also manages the precise addition of additives. Introducing the right substances into the conditioner or extruder enhances the quality and structure of the final product. The system carefully monitors the liquid addition, ensuring the exact amount is used according to the recipe, leading to superior product quality while minimizing overdosing and reprocessing.



STEAM ADDITION COMPONENTS:

1. **ON/OFF valve:** Opens to allow steam to flow into the regulation valve.
2. **Pressure transmitter:** Steam pressure at the inlet is monitored and displayed for troubleshooting. Consistent steam pressure is key to stable operation.
3. **Regulation valve:** Controls the flow of steam into the conditioner. A controller regulates the position of the valve based on the steam injection mode.

ADDITIVE INJECTION MODES

Multiple additive injection control modes can be selected by pressing the respective button in the interface.

- **Temperature mode:** Used for temperature-based control of steam addition. **(A)**
- **Auto% mode:** Requires an available steam flow meter. Is used for remote control of flow setpoint. **(B)**
- **Auto mode:** Requires an available steam flow meter. Is used for fixed control of flow setpoint. **(C)**
- **Manual mode:** The manual mode is used for manual control of the regulation valve opening. **(D)**

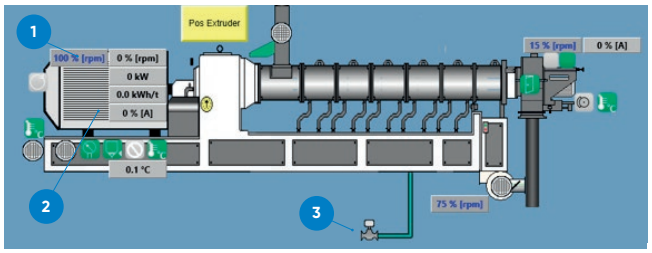
The steam addition to conditioner and extruder supports all 4 injection modes.

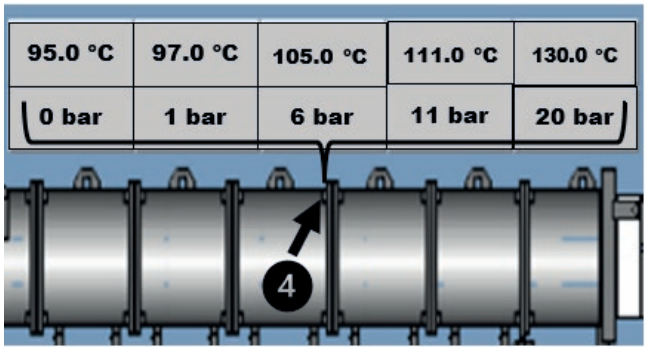
LIQUID ADDITION COMPONENTS:

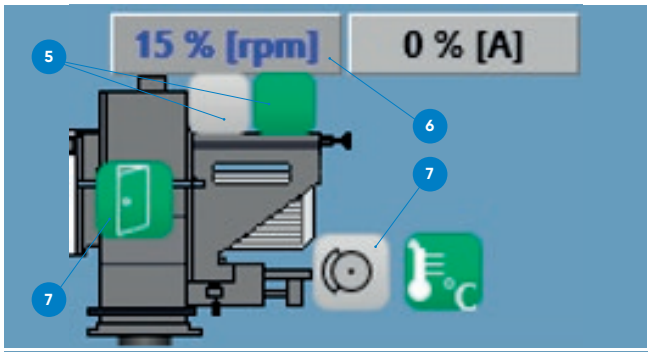
1. **Pressure transmitter:** Monitors and maintains pressure at the required level, preventing clogs caused by excessive pressure.
2. **Motor/Pump:** A controller adjusts the pump speed according to the setpoint and selected control mode, increasing flow rate in response to a higher meal flow rate.
3. **Injection path selection:** The injection path can be switched between the conditioner and the extruder by pressing the injection path selection button on the interface.
4. **No flow alarm:** Generates an alarm when the liquid flow rate falls below a certain limit.
5. **Liquid injection modes:** Supports Auto, Auto%, and Manual mode.

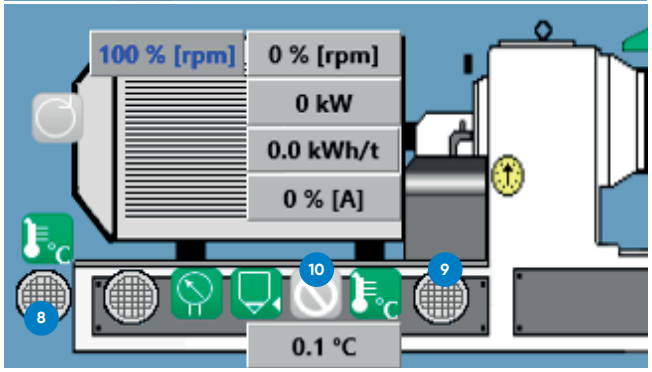
EXTRUSION

The extrusion group includes all equipment related to the process of extrusion, such as the extruder machine, barrel, knife, and transmission signals. The extrusion control system is designed to monitor and adjust these components, ensuring efficient and safe operation, boosting production, minimizing downtime, and extending the lifespan of the equipment.









EXTRUDER CONTROL COMPONENTS:

1. **Variable frequency drive:** Controls the speed of the extruder based on the setpoint. Enables screw speed control according to product quality.
2. **Power consumption values:** The extruder speed feedback, main motor power, SME, and main motor current are displayed on the control interface.
3. **Cooling water inlet valve:** When the cooling water enable button is pressed on the overview page, the valve opens. After the extruder stops, the valve automatically closes after a 10-minute delay.

BARREL ZONES

4. **Barrel temperature and pressure control:** The barrel temperature, barrel pressure and position feedback of the heating/cooling regulation valve can be adjusted in the barrel configuration page in the interface.

KNIFE HOUSING:

5. **External start/stop push button:** Allows external control for aligning knife blades to the die.
6. **Variable frequency drive:** Controls the speed of the knife motor based on the setpoint.
7. **Door switch:** Knife door lock provides safety feedback via a safety relay.
8. **Knife motor electric brake:** The motor starts only after brake release; prevents dangerous after-run during shutdown.

GEARBOX:

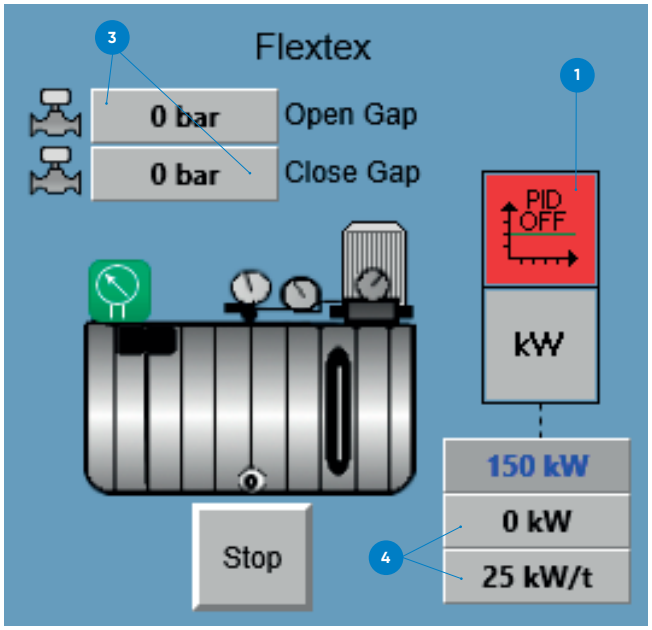
8. **Oil cooler:** Operates based on thermostat feedback to maintain correct oil temperature.
9. **Oil tank heater:** Activates based on thermostat feedback to assist with startup.
10. **Flow switch:** Provides feedback when oil flow to the gearbox is healthy during oil pump operation.

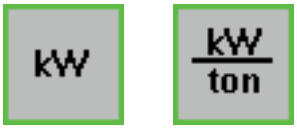
BYPASS EXTRUDER:

11. **Bypass control:** Depending on the model, bypass is available through a force feeder or two-way distributor; can be toggled on/off via the interface button.

OPTIONAL ADDITION - FLEXTEX

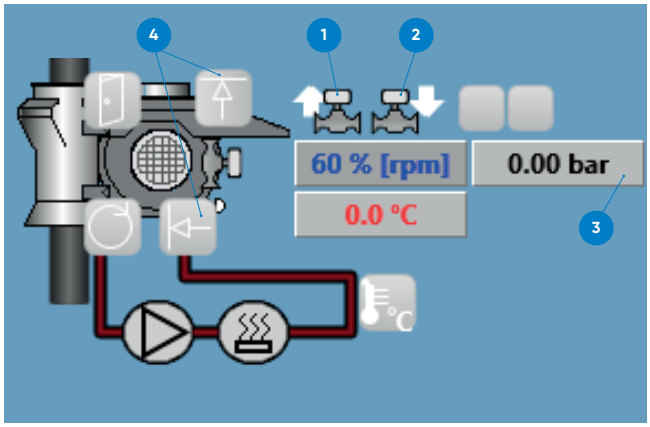
Flextex is a state-of-the-art system designed to optimize feed production by controlling the specific mechanical energy during the extrusion process. It ensures consistent product density, reduces operational downtime, and enhances the quality and efficiency of the feed production.





OPTIONAL ADDITION - ECS

The expansion control system is a reliable system for full, easy, automated control over the pellets density and expansion. The system is easy to set up, increases production capacity by 15-50% and lowers the costs of production by minimizing the need for liquid additives or higher quality raw material.



FLEXTEX UNIT COMPONENTS:

1. **ON/OFF Button**: Used to enable/disable Flextex regulation in production.
2. **Hydraulic Unit Motor:** A hydraulic piston is used to control the outlet size, providing precise control over the pressure in the kneading zone and the specific mechanical energy provided.
3. **Open Gap & Close Gap:** The limits for close and open gap pressure can be set. If these pressures exceed the limits, the system detects the piston as fully engaged or retracted, triggering an alarm, and stopping the Flextex, as the piston should never be fully extended or retracted during production.
4. **Controller:** The Flextex can regulate either the extruder's main motor power (kW) or specific mechanical energy (kW/ton). The control mode can be changed via the button in the interface.

ECS UNIT COMPONENTS:

1. **Airflow Control Valve:** Used to control the airflow and thereby pressure in the ECS unit.
2. **Manual Pressure Relief Valve:** Used to manually release the pressure if necessary if too much flash-off steam is generated in the knife housing.
3. **Pressure Transmitter:** Measures and sends a read-out signal of what the specific pressure value is to a remote location.
4. **Position Feedback:** When the ECS is not needed, it can be released from lift and moved away, with the start and lift feedback turning off to prevent it from restarting during production.

EXTRUSION CONTROL

FUNCTIONAL SCOPE

Functional Unit	Unit Type	Functional description	Panel System	Management System
Dosing	Volumetric	• Variable speed of screw • Capacity calculated by the screws volume and speed	●	●
	Loss-In-Weight	• Variable speed of screw • Capacity calculated by loss-in-weight in the prebin • Weight indication in prebin	–	●
Conditioning 1	Meal conditio-ning (CM)a	• Temperature process value in the outlet • Temperature probe cleaner • Door safety circuit monitoring • Speed monitoring of shaft (V-belt protection)	●	●
Conditioning 2	Meal conditio-ning (CM)	• Variable speed of conditioner • Temperature process value in the outlet • Temperature probe cleaner • Door safety circuit monitoring • Speed monitoring of shaft (V-belt protection)	●	●
Extrusion	Extruder 618-1021	• Bypass of product to the extruder until set temperature by 2-way distributor. • Amperage measurement of extruder screw motor • Measurements of 3 temperatures in the barrel • Measurements of 3 pressures in the barrel • Variable speed of Knife motor • Amperage measurement of Knife motor	●	●
	Extruder 1250	• Variable speed of forced feeder and reversing • Bypass of product to the extruder until set temperature. • Control of bypass slide gate • Variable speed of extruder main motor • Amperage measurement of extruder screw motor • Measurements of 5 temperatures in the barrel • Measurements of 5 pressures in the barrel • Variable speed of knife motor • Amperage measurement of knife motor • Gear oil flow & temperature control • Cooling/heating control of 3 barrels	–	●
Die plate pressure regulation	FLEXTEX	• Control of hydraulic piston • Pressure measurement before die	★	●
Material density expansion	ECS	• Variable speed of airlock motor • Amperage measurement of airlock motor • Pressure control in knife house	★	●
Steam addition conditioner	Steam Train	• Addition by flow percentage relative to capacity of dosing screw • Addition by temperature according to temperature measured in conditioner outlet	●	●
Steam addition extruder barrel	Steam Train	• Addition by flow percentage relative to capacity of dosing screw	–	●
Liquid additive 1	Additive Unit for conditioner	• Addition by flow percentage relative to capacity of dosing screw	●	●
Liquid additive 2	Additive Unit for conditioner 1 or extruder barrel	• Addition by flow percentage relative to capacity of dosing screw	●	●
Liquid additive 3	Additive Unit for extruder barrel	• Addition by flow percentage relative to capacity of dosing screw	●	●
Liquid additive 4	Additive Unit for extruder barrel	• Addition by flow percentage relative to capacity of dosing screw	–	●

● included
– not included
★ optional addition

GLOBAL SUPPLIER – LOCAL PRESENCE

ANDRITZ Feed & Biofuel is truly a global organization – with local presence. We are represented all over the world. The global market is served from five main locations in Denmark, China, Netherlands, USA, and Slovakia.

In addition, ANDRITZ Feed & Biofuel operates from several strategic regional sales, engineering, and service locations in Australia, Bangladesh, Brazil, Canada, Chile, Dubai, France, Germany, India, Italy, Mexico, Poland, South Africa, Thailand, Turkey, the UK and Vietnam – and is also represented locally by agents and distributors in many other markets.

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