



MECHATRONIK

Thickness Gauges



*Automatic Systems
for Extrusion-Dies*

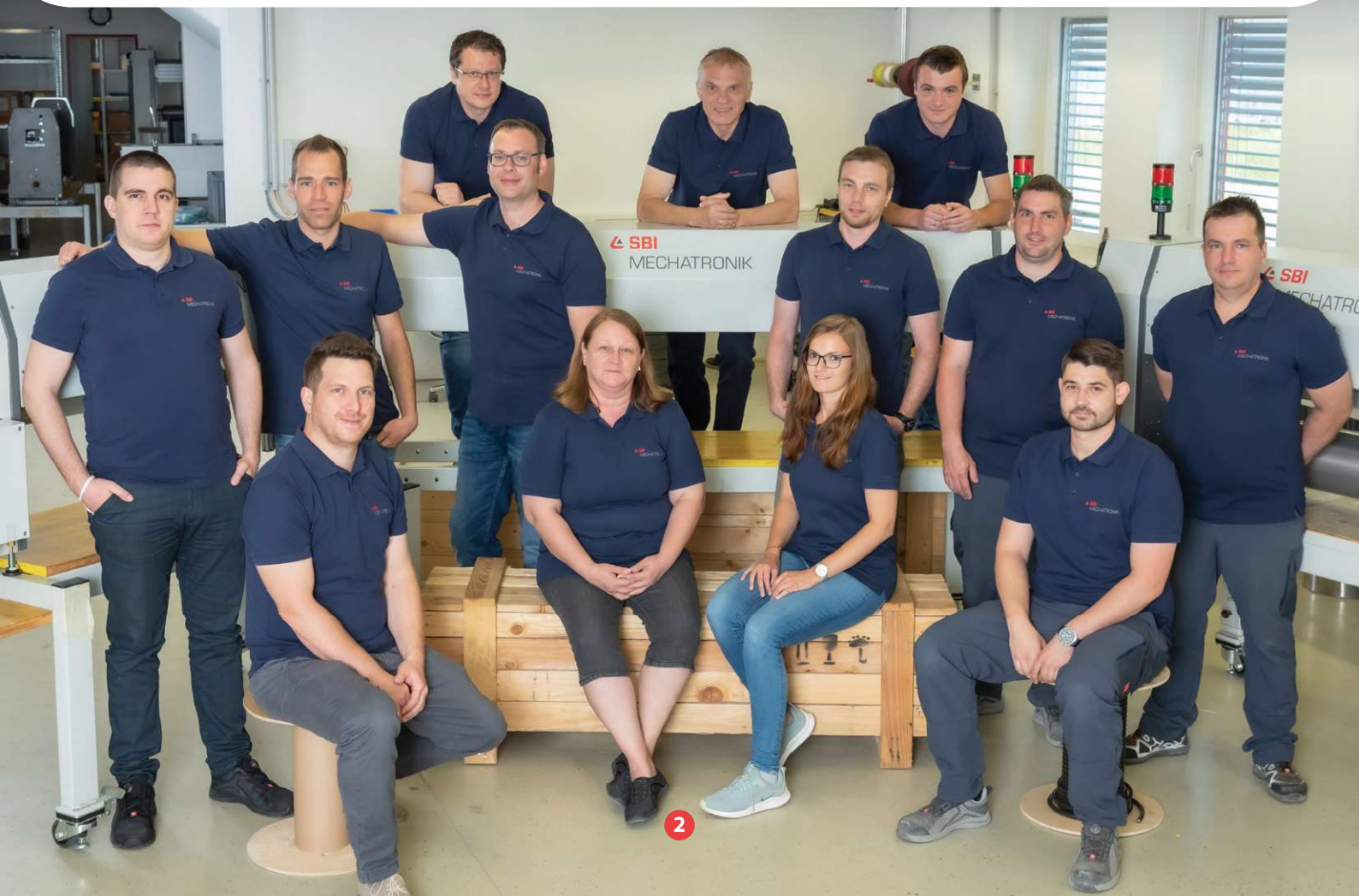


Our Vision :

To use as much plastic as necessary. Not a micron more, Not a micron less.

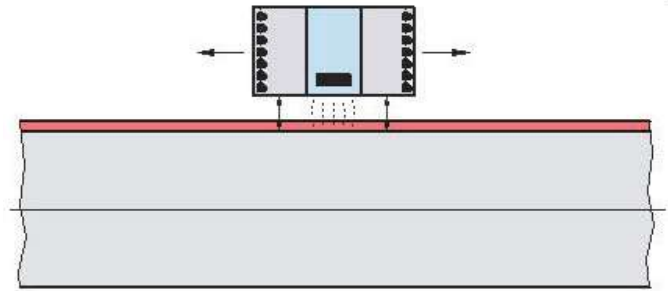
SBI was founded in 1999 in Hollabrunn, Austria with the objective to develop new methods for controlling thickness of extruded plastic film and sheet. In over 20 years SBI has successfully installed more than 800 systems in 52 countries.

Product portfolio of SBI include thickness measurement and control technologies for various plastic extrusion applications.



MEASURING WITH CAPACITIVE/EDDY CURRENT

Non-contact thickness measuring device for sheet/films up to 3 mm thickness (Kapa II for flexible plates up to 6 mm) and a maximum width of 8 m. It creates a thickness profile of the produced sheet/films with a repeatability of $\leq \pm 0,5 \mu\text{m}$ (Kapa II $\leq \pm 1 \mu\text{m}$).



MEASURING PRINCIPLE

The capacitance between the sensor and the roller is measured and the thickness is calculated (according to calibration). The capacitance depends also on the distance of the sensor to the roller, therefore this distance is measured constantly with an eddy current sensor (located together with the capacitive sensor in the same casing). According to the result of the eddy current measurement, the output is corrected.

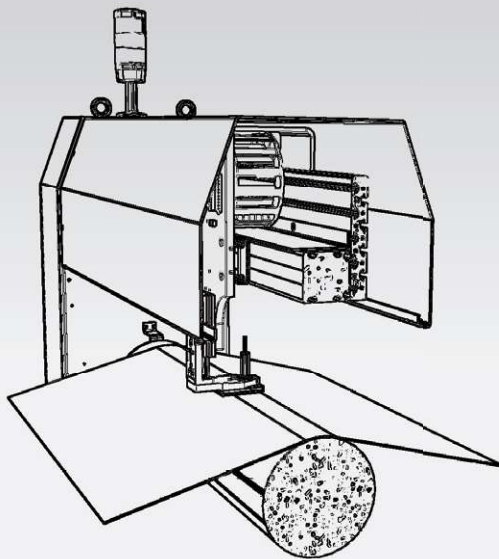
Technical Data	KAPA I	KAPA II
Measuring system	capacitive/eddy current	
Max. measuring thickness	3 mm	6 mm
Measuring gap	4,5 mm	9,5 mm
Diameter of the sensor	30 mm	45 mm
Measuring spot diameter	12 mm	12 mm
Sensor resolution	0,05 μm	0,5 μm
Repeatability	$\leq \pm 0,5 \mu\text{m}$	$\leq \pm 1 \mu\text{m}$
Measuring speed	10 – 300 mm/s adjustable	
Movement speed	10 – 500 mm/s adjustable	
Calibration	necessary for each material	
Diameter of the reference roller	200 mm	
Guiding roll (optional)	120 mm	
Dimension WxHxD	(Measuring width+633) x 720 x 400 mm	
Dimension Control cabinet WxHxD	600 x 1960 x 600 mm	
Colour	RAL 7035/7012	

KAPA I & KAPA II

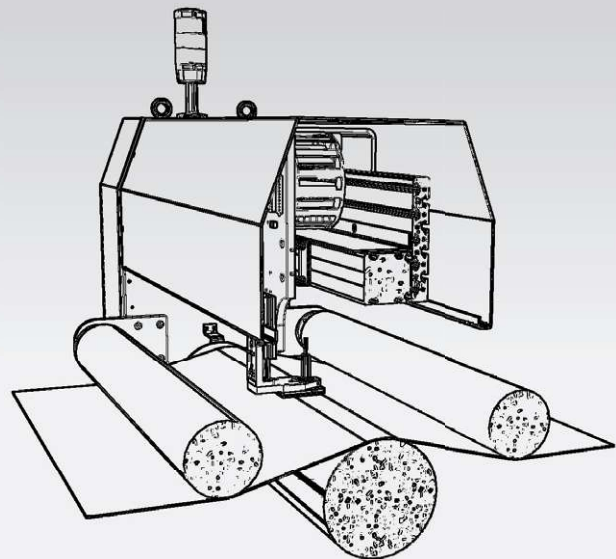


CALIBRATION

In the calibration mode, the sensor is placed in a fixed position (traversing stopped) during production. Measurement happens along a line of the sheet/films in the extrusion direction. A piece of sheet/films needs to be cut out along this line and measured manually. This manually measured value needs to be keyed in the software as a calibration value. Calibration is only required once per material or formulation and can be stored in the recipe.



Necessary sheet guiding

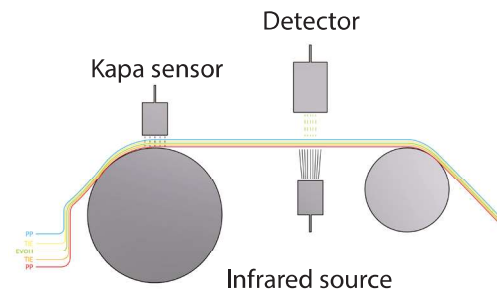


Optional with guiding roll

KAPA IR

NON-CONTACT THICKNESS MEASURING DEVICE FOR BARRIER SHEET/FILMS

This non-contact thickness measuring device is for sheet/films up to a total thickness of 3 mm and a maximum width of 8 m. It is equipped with 2 different sensor systems. A capacitive sensor (KAPA) measures the total thickness and an infrared sensor (IR) determines the EVOH layer thickness.



Technical Data	KAPA	IR
Measuring system	capacitive/eddy current	infrared
Thickness range	up to 3 mm	>10µm
Measuring gap	4,5 mm	35 mm
Sensor dimension	circularly Ø 30 mm	rectangular 50x60 mm
Measuring spot diameter	12 mm	10 mm
Sensor resolution	0,05 µm	1 µm
Repeatability	≤ 0,1 µm	≤ 5 µm
Measurement speed	10 – 300 mm/s adjustable	
Calibration	necessary for each material	

MEASURING PRINCIPLE AND CALIBRATION:

KAPA (for total thickness):

According to capacitive system as mentioned in page 2 and 3.

IR (for the EVOH layer):

It is based on a non-contact, transmission measurement principle. For the determination of the EVOH layer thickness, a wide infrared spectrum of the plastic is recorded and the resulting absorption of the EVOH polymer molecules is evaluated by using our modern analytic methods.

During calibration, the sensor is moved to a sample holder. In this holder, there must be a sample placed from the same material recipe which has to be measured with the EVOH gauging system. The EVOH layer thickness of this calibration sample needs to be previously determined by a microtome cut and to be keyed in the software as a calibration value. It is only necessary once per material and can be stored as a recipe.

XRS SOFT X-RAY

XRS is low energy x-ray gauging system (< 5kVA) that measures thickness and basis weight of thin films such as cast films, non-woven and other flexible packaging.

Due to low output voltage, XRS does not require licensing in most countries leading to easy installation.



MEASURING PRINCIPLE

XRS is a non-contact measurement system. The x-ray tube emits energy photons. Measurement is based on the absorption of x-ray particles from the source to determine the thickness and basis weight.

This results in greater control of the process whether it's film extrusion, sheet extrusion and extrusion coating.

Technical Data	XRS
Measuring system	X-Ray
Max. Thickness*	2000 micron
Resolution	0.1 µm
Measuring Rate	1000 samples/second
Movement Speed	230 mm/s (adjustable)

*max. thickness is depending on material

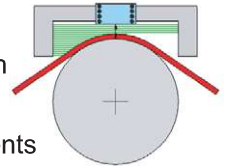
SHADOW

MEASURING WITH LASER SHADOWING

This non-contact thickness measuring device for sheet/films up to 3.5 mm thickness, maximum width of 8 m and offers a repeatability of $\leq \pm 1.5 \mu\text{m}$. It is equipped with a dual sensor system – a laser scanner and an eddy current sensor.

MEASURING PRINCIPLE

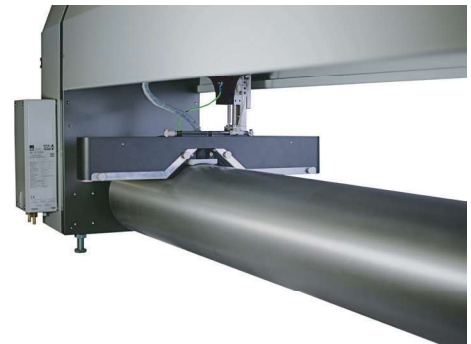
A laser light curtain is guided over the measurement roller and the sheet. The receiver (line scan camera) measure beams or shadows due to the thickness of the sheet. An eddy current sensor measures the distance between laser sensor and roller. With the result of both measurements (shadowing and eddy current) the thickness of the sheet is calculated.



CALIBRATION

No calibration with an external calibre is needed; the measurement is independent from other sheet properties!

Technical Data	SHADOW
Measuring system	Laser/eddy current
Max. measuring thickness	3,5 mm
Measuring gap	5,5 mm
Diameter of the sensor	30 mm
Measuring spot diameter	0,5 mm
Sensor resolution	0,5 μm
Repeatability	$\leq \pm 1,5 \mu\text{m}$
Measuring speed	10 – 300 mm/s adjustable
Movement speed	10 – 500 mm/s adjustable
Calibration	not essential
Diameter of the reference roller	200 mm







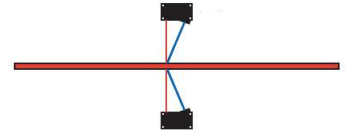
STG

MEASURING WITH LASER DISPLACEMENT

Equipped with a laser displacement sensor, the STG is designed for sheets up to 40 mm thickness, a maximum width of 3 m and with an accuracy of $\leq 20 \mu\text{m}$.

MEASURING PRINCIPLE

Non-contact indirect thickness measurement. On the top and bottom side of the extruded sheet, there are two laser displacement sensors scanning from a constant distance to the sheet. These laser-triangulation sensors (with high Resolution and excellent linearity), are designed for precise measurements in industrial applications.



The sensors are guided on two linear bearings across the sheet and are driven by stepper motor. Based on a calibration curve of the measuring frame (detected on a calibration scan without sheet), the measured values of the laser sensors determine the thickness profile and it is displayed on the screen.

Technical Data	STG
Measuring system	Laser triangulation/reflection
Max. measuring thickness	40 mm
Clear height	250 mm
Measuring spot diameter	0,2 mm
Sensor resolution	1 μm
Repeatability	$\leq 20 \mu\text{m}$
Measuring speed	10 – 100 mm/s adjustable
Movement speed	10 – 200 mm/s adjustable
Diameter roller	80 mm



General Data

COMPOSED OF

- Measuring frame with integrated control cabinet
- Traversing unit with electrical drive
- Measuring sensor mounted on a pneumatic lift-off-device on the traversing unit
- Control cabinet with industrial PC, 17" touch monitor, keyboard drawer with track ball
- Uninterrupted power supply (UPS)
- Connection cable PC-measuring frame, 10m length

VISUALISATION

- Heightened HMI panel for ease of visualisation and operations
- Cross profile diagram as bolt and line chart
- Trend and SPC analysis
- Roll protocol
- Recipe storage
- Alarm and history

Electrical Supply

Supply voltage	115/230 VAC ± 10 %
Supply frequency	50/60 Hz ± 1 %
Max. power consumption	700 W
Max. current consumption	5 A
Electrical equipment to EN 60204	

Ambience

Max. ambient temperature	40°C
Max. air humidity	95%, without condensation
Max. film temperature	90°C

General Data

Dimension of the control cabinet	600 x 600 x 1960 mm
Color	RAL 7035/7012
Documentation	EU Language
Operating pressure	6 bar



Software "SBI Gauge"

FUNCTIONS

- Production parameter (opening frame: production parameter)
- Calibration
- Analysis (opening frame: analysis)
- Alarms (displays alarm in readable text)
- Print
- Roll changing (reset parameters of frame production parameters, running meter e.g.)
- Roll protocol (report of every roll can be displayed, stored and printed)

PRODUCTION PARAMETER

Frame for setting production parameter

- Data of order: order no., customers name, article no.,
- Production parameter: thickness set value, +/- tolerances, resolution of displays, net width, etc.

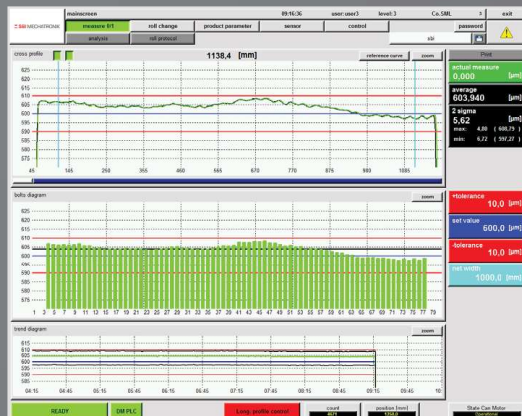
ANALYSIS

The display shows production data and trends

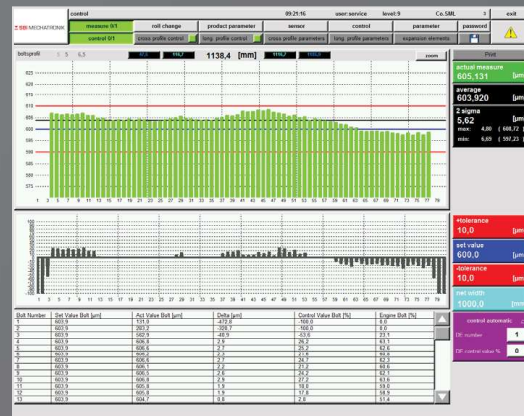
- Production data: time of start, time since start or roll changing, running meter since roll changing, speed, etc.
- Trend: Shows trend graphics of previous 24 hours, older trends are stored and can be loaded for viewing and printing. Trend graphics shows thickness average, set value and tolerances

THICKNESS CONTROL

Frames for thickness control (optional) with automatically adjustable extrusion dies.



Thickness/bolts/trend diagram



Control

Features

DESCRIPTION OF MOST IMPORTANT SCREEN SHOTS

LINE CHART/BOLT DIAGRAM

- Actual thickness profile displayed over measuring width
- Actual thickness via bolt number
- Average profile of last 3 scans
- Reference curve: freeze actual profile to compare with future profiles – reference curve can be stored
- Net width of film/sheet
- Zoom function (thickness profile and bolt diagram) for close inspection



Bolt diagram

TREND DIAGRAM

- The trend diagram shows the values of the film/sheet over the last 24 hours.
- The most important values like set value, actual/average thickness according to the cross profile
- Minimum, Maximum, 2 sigma and tolerances are displayed in a bar chart graphics

NUMERIC DISPLAYS

- Actual thickness (μm) according to the displayed sensor position
- Average thickness according to the cross profile, 2 Sigma value, min. and max. thickness
- Tolerance set values
- Thickness set value
- Net width set value

THERMAL BOLTS

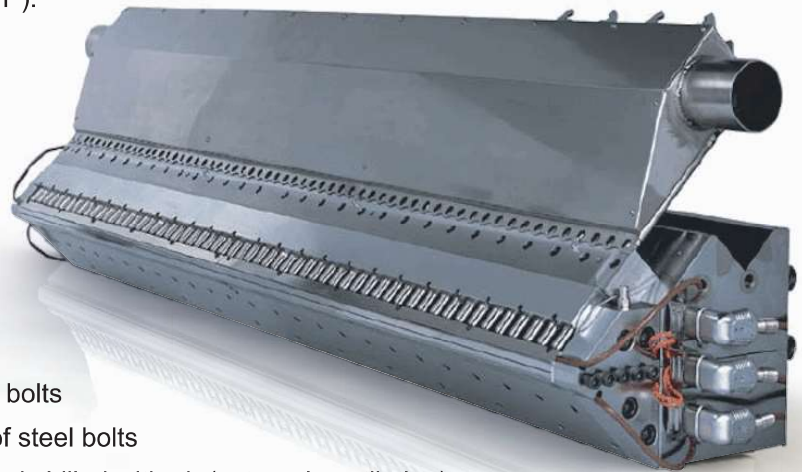
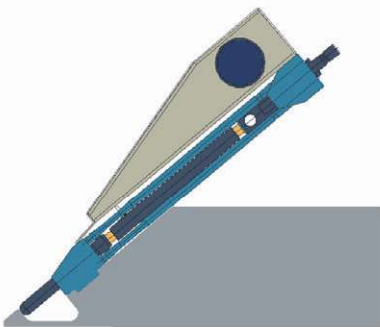
RETROFITABLE AUTOMATIC CONTROL SYSTEM FOR DIES

perfect system for automatic extrusion die adjustment in order to get an even thickness profile, controlled by state-of-the-art thickness gauges which are enabled to control automatic dies.

Operating range of bolts: 300 µm (± 150 µm).

Actuators are steel bolts with heating cartridges, operating range 300 µm + manual adjustment.

Partition of actuators: 30, 28 or 25,4 mm (1").



Automatic flat die adjustment with thermal bolts

Thermal bolts utilizes thermal expansion of steel bolts

Bolts are heated with heating cartridges and chilled with air (external ventilation)

Options include in:

Push only: Automatic die lip adjustment through push mechanism of thermal bolts. System of choice for film and sheet extrusion dies.

Push-Pull: Automatic die lip adjustment through push and pull mechanism of thermal bolts. Applications that demand faster response and even greater precision to die adjustments. e.g. Coating & Lamination extrusion dies.

COMPOSED OF

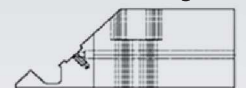
- Thermal bolts with heating cartridges
- Casing with connection for ventilation
- With and without blower (chilling with air or convection)



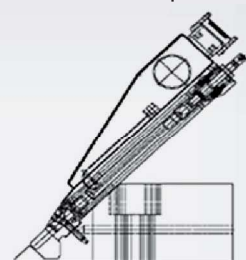
Upgrading Manual Dies to "Automatic Dies"



Original



Prepared



Thermal bolts system attached

Technical data	THERMAL BOLT
Operating range	300 µm
Partition	30mm, 28 or 25.4 mm (1")
Heating cartridges, rated power	80 W
Mechanical fine tuning with fine thread (0,5 mm/rev.)	
Thermal separation to extrusion die (thermal brakes)	

FRAD

(Full Range Automatic Die) operating range: 2 mm

FRAD is an automatic extrusion-die adjustment system in combination with a gap changing device.

Actuators are “thermal bolts” which are actuated all together by a sliding wedge.

The wedge is driven by an electronic motor and controlled by software of thickness gauge.



FRAD is a combination of two adjustment systems:

- Mechanical adjustment of all thermal bolts with a wedge system
- Thermal bolts utilizing thermal expansion of steel bolts

The bolts are heated with heating cartridges and chilled with air (external ventilation).

CONSISTING OF

- Mechanical adjustment with a driven wedge system, driven with electric motor
- Thermal bolts with heating cartridges
- Casing with connection for ventilation
- With and without blower (chilling with air or convection)

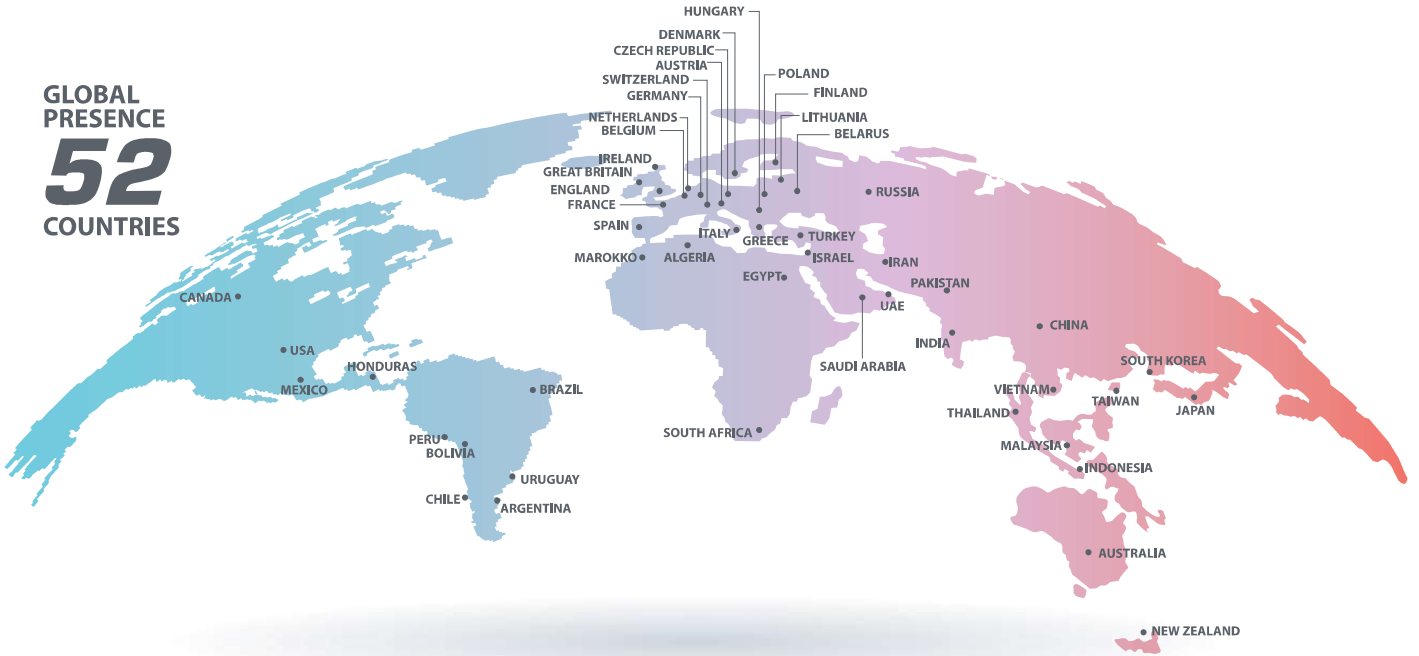


Technical data	WEDGE SYSTEM
Operating range	2 mm
Drive	asynchronous motor with gear-box and position measuring
Push only elements	

Many existing extrusion-dies are upgradeable.

Technical data	THERMAL BOLT
Operating range	300 µm
Partition	30 mm
Heating cartridges, rated power	80 W
Push only elements	
Mechanical fine tuning with fine thread (0,5 mm/rev.)	
Thermal separation to extrusion die (thermal brakes)	

GLOBAL
PRESENCE
52
COUNTRIES



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Subject to technical changes and mistakes!