

**Operating manual
Line operation manual**

P.1932 SHB

Imprint

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Language

The original operating manual was produced in German. All translations are based on the language of the original operating manual.

Change

The contents of this operating manual are subject to change by Brückner without notice.

We reserve the right to make technical changes.

We welcome your suggestions concerning the improvement of our products and of this operating manual.

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1 About this operating manual

1.1 Importance of this operating manual

Information for operation	All specifications, measures and commands in this operating manual are only applicable for the machine and film production line supplied. Operation and any work on the machine or the film production line may only begin when the contents of the operating manual have been understood. <ul style="list-style-type: none">• Read this operating manual carefully before starting the work.• This operating manual, especially the safety instructions, must be followed by all persons who work on the machine or the film production line.• This operating manual contains information that facilitates the safe and correct operation of the machine or film production line.• In addition, the regulations and instructions for accident prevention that apply to the usage site must be followed.• Carry out work in the specified sequence.• The operating manual must be stored in a safe place and it is important to ensure that the operating manual is available to all persons working on the machine or the film production line.
Warranty	Damage that is covered by the guarantee must be reported to Brückner immediately, together with the order number. The warranty does not cover wearing parts.

Brückner shall not be liable for damage or malfunctions in the following situations:

- non-compliance with the operating manual
- incorrect operation of the machine or film production line
- incorrect and improper maintenance work

All guarantee claims are voided in the following cases:

- improper handling
- connection of defective or unsuitable devices that are not part of our scope of service and supply
- use of non-original spare parts and accessories
- modifications to the machine or film production line without prior written consent from Brückner

Target group

This operating manual is directed at the following target groups:

- operating company
- visitors
- operators
- control room personnel
- process engineers
- assembly personnel
- service and maintenance personnel

1.2 Safety information

Requirement for operation

Requirement for safe handling and trouble-free operation of this machine and film production line is knowledge of the basic safety instructions and the safety regulations.

Safety manual

In addition to the safety information in this operating manual, the separate "Safety Manual" operating manual must be read and understood before any work is carried out on the machine or film production line.

Qualification of the personnel

Before operation, observe the information on required qualifications for personnel in the "Safety manual" operating manual.

1.3 Display conventions

Orientation aids

Orientation aids help to find your way more quickly through the operating manual.

The following orientation aids are used in printed operating manuals:

- table of contents

At the beginning of the operating manual there is an overall list of contents which lists the individual chapters. Chapters are also specified in the header.

- marginals

Marginals (titles at the side) reflect the subject of the following chapter.

The following orientation aids are used in online operating manuals:

- side navigation

The side navigation is displayed at the edge and contains a tree structure for all pages and sub-pages of the operating manual.

- subheaders

Subheaders reflect the topic of a section within a page.

Illustrations

The figures in this operating manual show examples. The figures are not necessarily identical to your line.

Instruction

Instructions can be divided into a number of action steps and prompt the operator to carry out an activity. These instructions must be followed at all times.

The specified requirements must be fulfilled before beginning work.

	This arrow indicates an action step. Multiple arrows indicate a sequence of action steps.
	This symbol indicates a requirement that must be met to carry out an action step. Alternatively, requirements are also indicated by marginals or sub-headings.
	This arrow indicates the result of an action step or sequence of action steps.

Types of symbols

The following symbol types are differentiated:

- general symbols

Are only used in the operating manual.

- safety symbols

Are used in the operating manual and on the machine or film production line.

General symbols

Symbol	Designation	Description
	film path, material flow	Specifies the direction that the film runs.
	operating side, operator	Specifies the operating side. Specifies the position of the operator.
	drive side, motor	Specifies the drive side.

For information on other symbols, see "Symbols" operating manual.

Control knobs

Controls such as buttons and switches are indicated by square brackets and a different font: [Button 1].

Links

Links are identified by a blue font: [Display conventions \[▶ 14\]](#).

Info**INFO**

Identifies application tips and additional information.

1.3.1 Safety instructions

Introduction

Safety instructions are part of the passive warning measures. They help to protect persons, the machine or line, or the environment from damage. They draw attention to dangers and indicate measures for averting the danger.

Use

Safety instructions can be found in the relevant documentation and on the safety posters and/or safety signs directly on the machines.

Safety instructions are offset from the other text and are specially marked by corresponding pictograms and in the documentation.

1.3.1.1 Construction and structure

This chapter describes the structure of the safety instructions in more detail.

Example**⚠ DANGER****Type and source of danger.**

Result/consequence in case of non-compliance with the following measures.

- ✓ Condition for the following measures.
- ▶ Measure(s) for averting the danger and risk mitigation.

Information elements

The safety instructions in this documentation contain the following information elements:

- safety symbols

Safety symbols visualise the source and/or result of the danger.

The safety symbol does not, however, replace the warning text. The warning text must always be read in full.

- signal word with warning sign on a coloured background

The signal word classifies the danger as a function of its seriousness and probability of occurrence.

- source of the danger

Description of the source of danger.

- consequences of the danger

Result/consequence in case of non-compliance with the following measures.

- remedial measures

Measures and precautions that must be taken to avert the danger or mitigate the risk.

Danger to persons

Dangers to persons are classified by signal words based on the scope of the danger and the probability of occurrence.

Signal word	Meaning
⚠ DANGER	Warns of a hazardous situation that leads to severe injury or death if the specified measures are not taken.

Signal word	Meaning
 WARNING	Warns of a hazardous situation that can lead to serious injury if the specified measures are not taken.
 CAUTION	Warns of a hazardous situation that can lead to slight injury if the specified measures are not taken.

Property damage

Information on possible damage to the machine, line or environment, or on poor production results, is classified as follows.

Signal word	Meaning
ATTENTION	Warns of a situation that can lead to damage to the machine, line, or individual components or to production faults.

1.4 Further documents

Additional documents

In addition to the information in this operating manual, observe the following documents as appropriate:

- line operation manual
- line overview
- tightening torques for screws
- thermal insulation of piping
- electric documentation
- spare parts catalogue
- forms
- manufacturer list
- intervals
- units
- process manual
- lubricant table
- safety manual
- Software documentation
- symbols
- rolls and rollers
- heat exchanger
- tool list
- additional maintenance instructions

1.5 External documents

External equipment

Apart from the components manufactured in-house, the machine and film production line also contain externally sourced or already existing components, hereinafter referred to as external equipment.

External documents

This external equipment is supplied with instruction leaflets, manufacturer's information, operating, installation, adjustment and service instructions and/or other user information, hereinafter referred to as external documents.

Replacement, maintenance, operation

External documents must also be read and observed, particularly in case of replacement or maintenance.

When replacing external equipment, observe the enclosed instruction leaflets.

The operation of the external equipment is not described in this operating manual.
The respective external document is only referred to.

2 General safety

2.1 General safety regulations

About this chapter	This chapter provides:
	<ul style="list-style-type: none">• safety information that applies to the operation of the entire film production line, all the assemblies it contains and the product• safety information that additionally applies only to the operation of the respective assembly or product.
	The content in this section is supplemented by warnings concerning the operating instructions.
	In addition to the safety information in this documentation, the safety information in the operating manuals for the individual line components must be observed.
Safety manual	In addition to the safety information in this operating manual, the separate "Safety Manual" operating manual must be read and understood before any work is carried out on the machine or film production line.
Personal protective equipment	Always wear protective clothing and safety shoes when remaining at the line. Additional protective equipment is required for certain activities.
Safeguards	An overview of the safeguards can be found in the "Line overview" operating manual. Information on the safeguards can be found in the "Safety manual".
Safety symbols	An overview of the safety symbols can be found in the operating manual entitled "Safety manual".
Duties of the operating company and personnel	Information on the obligations of the operating company and the obligations of the personnel can be found in the separate operating manual entitled "Safety Manual" and in the section "Intended use".

2.2 Intended use

Intended use	The film production line is used for the manufacture of plastic film. Here, a cast film is manufactured first. This is stretched in the machine direction and then in the transverse direction. The plastic film is then wound up onto mill rolls. The machine is contractually specified by parameters and must only be operated within them.
Disclaimer	Any use that goes beyond the designated use is forbidden. Brückner accepts no liability for any consequential damage. Improper use can present danger to life and limb, the machine and connected equipment, and to the efficient operation of the machine.
Risk assessment and work instructions	The operating company has to carry out a risk assessment and create operating instructions for the handling of the machine. Inputs listed in this operating manual for personal protective equipment are based on the risk assessment taking into consideration the experience with film production and film stretching lines. The actually occurring hazards can deviate in individual cases. In this case, the measures of the hazard assessment of the operating company must be taken into consideration and applied.

2.3 Film production line

▲ DANGER

The presence of persons in the danger zone of the line can lead to life-threatening injury.

- ▶ No entry for unauthorised personnel.

▲ DANGER

Faulty or ineffective safeguards.

The protective function is lost.

Life-threatening situations or very serious injuries may occur.

- ▶ Put the safeguards back in place after the maintenance work is complete.
- ▶ Check that the safeguards are operating correctly and effectively.
- ▶ Do not bypass safeguards.
- ▶ Do not render safeguards ineffective.
- ▶ Do not change the arrangement of the safeguards.

▲ WARNING

Risk of injury due to vapours and gases that are harmful to health

Raw materials release vapours and gases that are harmful to health when heated and cause irritation of skin, eyes and airways.

- ▶ Only carry out this work if the area is well ventilated.
- ▶ Do not breathe in the gases.
- ▶ Avoid skin contact.
- ▶ Wear suitable protective clothing.
- ▶ Follow the safety data sheets of the raw material manufacturer.

▲ WARNING

Moving machine parts can crush, entangle, draw in and crash into body parts.

This can lead to serious injury.

- ▶ Before actuating the machine parts, ensure that no one is located in the danger zone.
- ▶ Wear personal protective equipment.
- ▶ Keep away from the area of movement.
- ▶ Do not reach into the vicinity of moving machine parts.
- ▶ Wait for the machine to come to a standstill.

▲ WARNING

Hot surfaces can cause serious burns.

- ▶ Do not touch hot surfaces.
- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing.

⚠ WARNING

Hot melt escaping under pressure causes serious burns.

- ▶ Do not reach into the outlet area.
- ▶ Wear heat-resistant protective gloves.
- ▶ Wear a hard hat with face protection.
- ▶ Wear protective clothing.

⚠ WARNING

Hearing damage due to noise > 85 dB(A)

Staying in areas with noise > 85 dB(A) leads to hearing damage. The danger also applies to short stays in areas with this noise emission.

- ▶ Wear ear protection.
- ▶ Comply with the safety symbols on the machine or film production line.
- ▶ Comply with the specifications on noise in the technical data of the machine or film production line.

2.4 Platform, ladders and pits

⚠ DANGER

There is a danger of falling when working on elevated parts of the line.

This can cause life-threatening injury.

- ▶ Wear a safety harness.
- ▶ Use suitable ascent supports.

⚠ WARNING

Ascents and descents present a danger of slipping and tripping.

This will lead to serious injury.

- ▶ Ascend and descend with care.
- ▶ Wear a hard hat.

⚠ CAUTION

Danger of slipping and danger of tripping due to material lying around.

This can lead to head injuries and serious bodily injury.

- ▶ Immediately remove material lying around (e.g. tools).

⚠ CAUTION

There is a danger of being pushed and of tripping when in the machine.

This can lead to head injuries.

- ▶ Wear a hard hat.
- ▶ Observe the markings.

2.5 Blades and sharp-edged objects

⚠ WARNING

The extremely sharp blade causes serious cutting injuries or cuts off body parts.

- ▶ Do not reach into the blade.
- ▶ Retract the blade after use.
- ▶ Wear cut-resistant protective gloves.

ATTENTION

Sharp-edged, hard objects or extremely sharp blades damage the roll surface.

- ▶ Do not touch the roll surface with sharp-edged or hard objects or blades.
- ▶ Do not place loads onto or step on the roll surface.

2.6 Film

⚠ DANGER

Danger of death due to electric shock

Electrostatic discharge due to charged film or rolls can cause life-threatening injuries from electric shock.

- ▶ Access is forbidden for people with a pacemaker or an implanted defibrillator.
- ▶ Before beginning work, discharge the film or the rolls with a discharging rod in accordance with the manufacturer documentation.

⚠ WARNING

People can be entangled and pulled along by the moving film web.

This will lead to serious injury.

- ▶ Keep your distance from the moving film web.
- ▶ Do not go through under a running film track.
- ▶ Wear close-fitting, protective clothing.

⚠ WARNING

Film on the ground can cause persons to slip, fall and be pulled along.

This will lead to serious injury.

- ▶ Do not step on the film.
- ▶ Keep your distance from the moving film.
- ▶ Keep the workplace and corridors clean.

⚠ WARNING

A fast running film edge can cause serious cutting injuries.

- ▶ Wear protective clothing.
- ▶ It is forbidden to remain in or at the film path.
- ▶ Keep your distance.

⚠ CAUTION

The sharp film edge can cause serious cutting injuries.

- ▶ Wear protective gloves.
- ▶ Wear protective clothing.

⚠ CAUTION

Hot film can cause burns.

- ▶ Wear protective gloves.
- ▶ Wear protective clothing.

ATTENTION

Film contamination damages the roll surface.

- ▶ Only thread clean film.

2.7 Floors

⚠ CAUTION

Danger of slipping and danger of tripping on soiled and uneven floors

Slipping and tripping on soiled and uneven floors can cause injury.

- ▶ Wear safety shoes.
- ▶ Do not enter the area.
- ▶ Close off access to the area.
- ▶ Remove soiling immediately.
- ▶ Remove any uneven areas and danger of tripping.
- ▶ Eliminate the cause if necessary.
- ▶ Keep the workplace and corridors clean.

⚠ CAUTION

Danger of slipping on wet floors.

Slipping on wet floors can lead to injuries.

- ▶ Do not enter the wet area.
- ▶ Close off access to the wet area.
- ▶ Eliminate the cause if necessary.
- ▶ Remove leaked fluid immediately.
- ▶ Keep the workplace and corridors clean.

2.8 Magnetic and electromagnetic assemblies

▲ DANGER

Even when the machine is switched off, strong magnetic fields of permanent magnets have a direct impact on people and can interfere with the operation of active medical accessories. The following people must maintain a safety distance of at least 0.8 m:

- ▶ People who have a heart pacemaker and/or metal implants.
- ▶ People who use insulin pumps and/or hearing aids.
- ▶ People who wear magnetic or electrically conductive objects.

▲ DANGER

Powerful magnetic and electromagnetic fields disrupt the functioning of active medical devices such as pacemakers, insulin pumps and hearing aids.

- ▶ Personnel with such active medical equipment must maintain a safe distance of at least 0.8 m at all times.

ATTENTION

Powerful magnetic and electromagnetic fields can damage electronic devices, measuring instruments, watches and data storage media.

This can cause irreparable damage.

Electronic devices and measuring instruments can change their calibration.

Data loss can occur on magnetic and electronic data storage media.

- ▶ Do not bring parts near the magnets.
- ▶ Maintain a safety distance of 0.8 m.

▲ WARNING

Powerful magnetic and electromagnetic fields exert extremely high powers of attraction on magnetisable (ferromagnetic) materials.

There is a danger of cuts and danger of crushing.

- ▶ Even if the machine is switched off, powerful magnetic fields from permanent magnets are present.
- ▶ Work in the vicinity of magnetic parts must be carried out by at least 2 persons.
- ▶ Wear protective gloves and other personal protective equipment if necessary.
- ▶ Keep magnetisable objects (e.g. watches, keys, fixing parts made of steel, steel or iron tools) and permanent magnets away from magnetic parts.
- ▶ Use suitable tools made of non magnetisable material.
- ▶ Use non magnetisable materials (e.g. a wooden bar) to free pinched body parts in case of an accident.

ATTENTION

Powerful magnetic and electromagnetic fields attract ferromagnetic parts such as tools or fixing parts made of steel.

- ▶ Do not bring ferromagnetic parts, i.e. magnetisable parts, near the magnets.

2.9 Flexible pipes and wires

⚠ CAUTION

Flexible pipes may whip about when lines are under pressure and can cause injury.

- ▶ Depressurise the system prior to service work.
- ▶ Only release the connections when depressurised.

2.10 Pneumatic system

⚠ DANGER

Pneumatic valves switched by a person can lead to uncontrolled movements.

Uncontrolled movements of pneumatically operated assemblies lead to death or serious injury.

- ▶ Only actuate pneumatic valves when no one is located in the danger zone.

⚠ WARNING

Unexpected movements caused by defects in the pneumatic system can cause serious injury.

- ▶ Do not remain in the swivelling range of the pneumatically moved component.
- ▶ Wait until the standstill position is reached.

⚠ WARNING

Moving machine parts can crush, entangle, draw in and crash into body parts.

This can lead to serious injury.

- ▶ Before actuating the machine parts, ensure that no one is located in the danger zone.
- ▶ Wear personal protective equipment.
- ▶ Keep away from the area of movement.
- ▶ Do not reach into the vicinity of moving machine parts.
- ▶ Wait for the machine to come to a standstill.

⚠ CAUTION

Flexible pipes may whip about when lines are under pressure and can cause injury.

- ▶ Depressurise the system prior to service work.
- ▶ Only release the connections when depressurised.

2.11 Hydraulic system

⚠ DANGER

Hydraulic valves switched by a person can lead to uncontrolled movements.

Uncontrolled movements of hydraulically operated assemblies lead to death or serious injury.

- ▶ Only actuate hydraulic valves when no one is located in the danger zone.

▲ WARNING

Hydraulic oils irritate the skin and cause toxic vapours.

Irritation of skin, eyes and airways.

Changes in mental state from solvent vapours.

- ▶ Only carry out this work if the area is well ventilated.
- ▶ Do not breathe in the vapours.
- ▶ Wear suitable protective clothing.
- ▶ Immediately change oil-contaminated clothing.
- ▶ Do not carry oil-contaminated cleaning cloths within your clothing.
- ▶ Avoid contact with skin and eyes.
- ▶ If hydraulic oil penetrates under the skin under high pressure immediately consult a doctor (danger of tissue damages).
- ▶ Keep away from food and beverages.
- ▶ Pay attention to the safety data sheets of the manufacturer.

▲ WARNING

Hydraulic oils are combustible.

Danger of fire!

- ▶ Regularly check the structural fire protection devices.
- ▶ Regularly check the hydraulic system for leaks.
- ▶ Immediately fix any leaks.
- ▶ Remove and properly dispose of leaked oils immediately. Use oil absorbent if necessary.
- ▶ Stow oil-contaminated cleaning cloths in non-combustible, closed containers.
- ▶ Keep hydraulic oil away from sources of ignition.
- ▶ Pay attention to the safety data sheets of the manufacturer.

▲ WARNING

Unexpected movements can be caused by faults or service work on the pneumatic system or hydraulic system.

This can lead to serious injury.

- ▶ Depressurise the pneumatic system prior to maintenance work.
- ▶ Switch off the hydraulic system prior to maintenance work.
- ▶ Wait for the machine to come to a standstill.
- ▶ Only switch the pneumatic valves manually when no one is located in the danger zone.

⚠ WARNING

Moving machine parts can crush, entangle, draw in and crash into body parts.
This can lead to serious injury.

- ▶ Before actuating the machine parts, ensure that no one is located in the danger zone.
- ▶ Wear personal protective equipment.
- ▶ Keep away from the area of movement.
- ▶ Do not reach into the vicinity of moving machine parts.
- ▶ Wait for the machine to come to a standstill.

⚠ CAUTION

Emerging hydraulic oils result in environmental hazards, if they contaminate the soil or the groundwater.

- ▶ Prior to usage always pay attention to the safety data sheets of the manufacturer.
- ▶ Use oils safely.
- ▶ Keep the working areas clean.
- ▶ Remove and properly dispose of leaked oils immediately. Use oil absorbent if necessary.
- ▶ For the collection, storage and transport of used hydraulic oil, use suitable containers.
- ▶ Properly dispose of empty containers with remains of oil and used hydraulic oil.
- ▶ Avoid oil from penetrating the soil, the canalisation or water bodies.
- ▶ In case of escape into the environment, inform the authority in charge.

3 Line overview

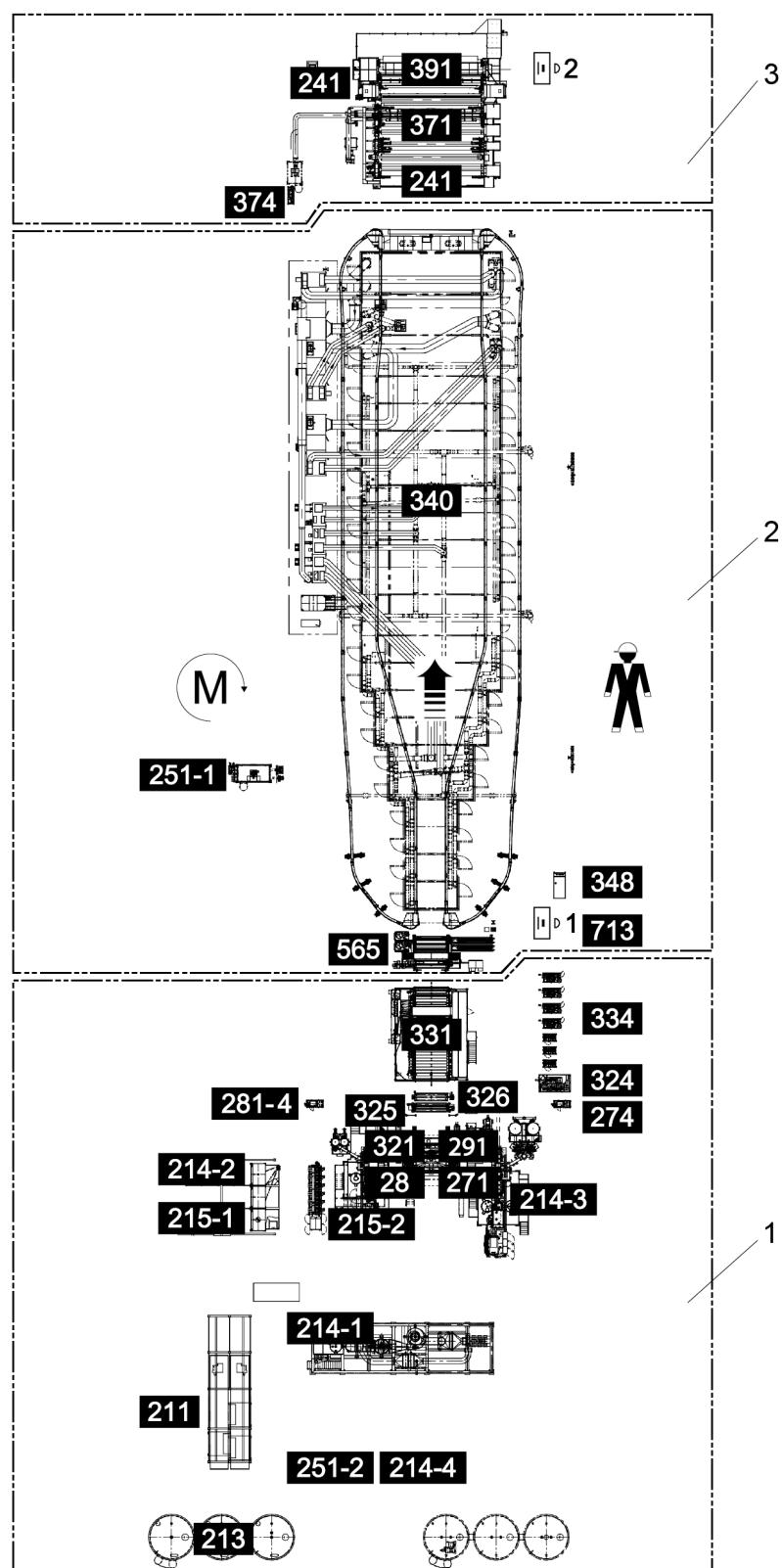
Line overview

For an overview of your line, see the separate "Line overview" operating manual.

INFO

The following figure shows a schematic diagram. The figure is not necessarily identical to your line.

Schematic diagram



- 1 From the raw material to the cast film
- 2 Stretching
- 3 Finishing and winding
- 1 Control room 1
- 2 Control room 2

General symbols	Symbol	Designation	Description
		film path, material flow	Specifies the direction that the film runs.
		operating side, operator	Specifies the operating side. Specifies the position of the operator.
		drive side, motor	Specifies the drive side.

Other manufacturers

INFO

Some components are provided by manufacturers other than Brückner.

Multi-digit structure numbers

For the unique identification of components of a line, multi-digit structure numbers are used.

Your line may contain more or less components than listed below.

- 211 Raw material reception and raw material storage
- 213 Raw material supply for main extruder
- 214 Main extruder feeding
 - 214-1 Feed for crystalliser
 - 214-2 Raw material reception for main extruder
 - 214-3 Feed for main extruder
 - 214-4 Exhaust air filter for dosing the main extrusion
- 215 Raw material supply and feeding for coextrusion
 - 215-1 Raw material supply for coextrusion
 - 215-2 Raw material feeding for coextrusion
- 241 Edge trim recycling
- 251 Film recycling
- 251-1 Fluff silo
- 251-2 Exhaust air filter for fluff silo
- 271 Main extrusion
- 274 Heating and/or cooling units for main extrusion
- 28 Coextrusion
- 281-4 Heating/cooling units for coextrusion
- 291 Melt die unit
- 321 Film casting unit
- 324 Heating and/or cooling units for film casting unit
- 325 Film casting stand
- 326 Auxiliary winder for film casting unit
- 331 Machine direction orienter
- 334 Heating and/or cooling units for MDO
- 340 Transverse direction orienter
- 348 Heating and/or cooling units for TDO

- 371 Pull roll unit
- 374 Heating and/or cooling units for pull roll unit
- 391 Winder unit
- 565 Inline coating device
- 713 Cooling unit for water supply

4 Operating concept

Operating concept	<p>The film production line consists of several line components. The line components are controlled by the process control system.</p> <p>The speeds of the line components are coupled to one another during start-up by means of the Process Control System. During shut-down, the couplings are released again by means of the Process Control System.</p>
WinCC OA	<p>WinCC OA is the visualisation of the process control system.</p> <p>It enables easy and user-friendly operation of the film production plant.</p> <p>WinCC OA offers the following functions:</p> <ul style="list-style-type: none">• Clearly arranged display of parameters and operational states on the film production line• User-friendly change of parameters and operational states on the film production line• Communication with the controller• Monitoring of the film production line• Recipe management• Product management• Thickness control with evolution strategy TCE
Control knobs	<p>Communication with the Process Control System is carried out via the computer in the control room, the operator panels and the control knobs on the line components.</p> <p>An overview of the control knobs can be found in the "Line overview" operating manual.</p>
Duties of the operating personnel	<ul style="list-style-type: none">• The operating personnel must be trained in the operation of the film production line and must have read and understood the operating manual.• The necessary safety instructions were executed.• Personal protective equipment was handed over and must be worn according to the activities to be carried out. The personal protective equipment used must be able to fulfil its function.• The operating personnel received the necessary tools and auxiliary materials. Only approved auxiliary materials must be used.• Do not bypass safeguards.• The control room and film production line must be manned by qualified operating personnel during operation. The assigned seats for operating the film production line are occupied.• Make sure that no persons are exposed to danger.• In the event of irregularities, the responsible person must be informed.• The film production plant must be clean.

5 Safety

Further information

Additional safety information can be found directly where the activities are described and in the safety manual.

Personal protective equipment

Always wear protective clothing and safety shoes when remaining at the line. Additional protective equipment is required for certain activities.

Handling the film

WARNING

Uncontrolled electrostatic discharge due to charged film or rolls.

This can lead to serious injury from electric shock.

- ▶ Persons with active medical accessories (e.g. pacemakers, insulin pumps, hearing aids) are forbidden from remaining at and dealing with film or rolls.
- ▶ Before working in the vicinity of electrostatically charged film or rolls, discharge these parts.

The film has sharp edges.

WARNING

The sharp film edge will cause serious cutting injuries.

- ▶ Wear protective gloves.

The film is pulled through the line.

WARNING

Fast running film edge causes cuts.

- ▶ It is forbidden to remain in or at the film path.
- ▶ Keep your distance.
- ▶ Wear close-fitting, protective clothing.

WARNING

People can be entangled and pulled along by the moving film web.

This will lead to serious injury.

- ▶ Keep your distance from the moving film web.
- ▶ Do not go through under a running film track.
- ▶ Wear close-fitting, protective clothing.

When threading the film into the line, film residues can accrue.

The film can sag down to the floor between 2 machines.

WARNING

Film on the ground can cause persons to slip, fall and be pulled along.

This will lead to serious injury.

- ▶ Do not step on the film.
- ▶ Keep your distance from the moving film.
- ▶ Keep the workplace and corridors clean.

ATTENTION

Film contamination damages the roll surface.

- ▶ Only thread clean film.

The film is cut with a safety knife or a film cutter.

▲ WARNING

The extremely sharp blade causes serious cutting injuries or cuts off body parts.

- ▶ Do not reach into the blade.
- ▶ Retract the blade after use.
- ▶ Wear cut-resistant protective gloves.

The film can be hot.

▲ CAUTION

Hot film can cause burns.

- ▶ Wear protective gloves.
- ▶ Wear protective clothing.

Machine parts can also become hot through contact with the hot film.

▲ CAUTION

Hot surfaces can cause burns.

- ▶ Do not touch surfaces.
- ▶ Wear protective gloves.
- ▶ Wear protective clothing.

Work on the rolls

Damage to the rolls can have a negative impact on film quality.

ATTENTION

Sharp-edged, hard objects or extremely sharp blades damage the roll surface.

- ▶ Do not touch the roll surface with sharp-edged or hard objects or blades.
- ▶ Do not place loads onto or step on the roll surface.

6 Starting up the film production line

6.1 Requirement

DANGER

Faulty or ineffective safeguards.

The protective function is lost.

Life-threatening situations or very serious injuries may occur.

- ▶ Put the safeguards back in place after the maintenance work is complete.
- ▶ Check that the safeguards are operating correctly and effectively.
- ▶ Do not bypass safeguards.
- ▶ Do not render safeguards ineffective.
- ▶ Do not change the arrangement of the safeguards.

The following film production line requirements must be met:

- Lubrication, inspection and repair on the line have been carried out.
- Problems and malfunctions on the film production line have been corrected.
Malfunctions on the film production line have been reset.
- The film production line has been cleaned.
- The film production line is ready for operation:
 - The main switches are switched on.
 - The control voltage or the uninterruptible power supply is switched on.
 - The control functions are switched on.
 - The cooling systems are switched on.
- All media are connected and fulfil the requirements:
The requirements of Brückner (e.g. "Requirements for Thermal Oil", "Requirements for Plant Water", "Requirements for Plant Air", "Requirements for Steam") and the requirements of the component manufacturers must be fulfilled.
The heat transfer media (e.g. oil, water, steam) are at operating temperature and ready for operation.
The compressed air is connected.
- The raw materials are ready.
The main components are in the outdoor silos, the containers for additives are ready and the suction hoses are connected.

6.2 Preparations

Description

Here is an overview of the activities required preceding the threading of the film into the line.

For further preparations and checks prior to and during start-up, see the operating manuals of the machines.

Prior to the other activities

Activity

- ▶ Inform all persons on the film production line that the line is being started up.
- ▶ Take measures to ensure the safety of the persons.

Activity
<p>► Check the safeguards.</p> <ul style="list-style-type: none"> • All safeguards are mounted and functioning.
<p>► Carry out a visual inspection of the film production line.</p> <ul style="list-style-type: none"> • The infrastructure is not damaged or faulty. • The transportation routes are level and not blocked. • The film production line is sufficiently illuminated. • The components are not damaged or faulty. • The conducting components have a functional earthing. • The covers are mounted and functioning. • The roll surfaces are flat. • All leaks are eliminated. • All contamination is eliminated.
<p>► Check operational readiness.</p> <ul style="list-style-type: none"> • All warning messages are reset. • The operating stations are ready for operation. • The visual signals to the line components are ready for operation. • The acoustic signals to the line components are ready for operation.

Resin supply

Activity	Cross reference to the instructions
<p>► If necessary, set the resin supply system.</p>	Setting the resin supply system [▶ 125]

Extrusion

Activity	Cross reference to the instructions
<p>► Switch on the exhaust system of the melt die unit and check that the exhaust system is functioning properly.</p>	The exhaust system is provided by the customer.
<p>► Heat the extrusion system.</p>	Chapter "Heating the extrusion system"

	Activity	Cross reference to the instructions
	<ul style="list-style-type: none"> ▶ Flush the extrusion system with melt. <p>The film is threaded into the film casting unit directly after the flushing of the extrusion system with melt. To do so, the extruder remains switched on after the flushing.</p>	Chapter "Flushing the extrusion system with melt"
Film casting unit	<ul style="list-style-type: none"> ▶ Set the operating temperature and switch on the film casting unit. 	Setting the temperature of the film casting unit [▶ 143] Switching on the film casting unit [▶ 143]
Auxiliary winder	<ul style="list-style-type: none"> ▶ Preparing the winding shaft of the auxiliary winder. ▶ Connect the auxiliary winder to the drive unit. 	Preparing the winding shaft of the auxiliary winder [▶ 147] Connecting the auxiliary winder to the drive unit [▶ 148]
Machine direction orienter	<ul style="list-style-type: none"> ▶ Adjust the stretching process. ▶ Set the operating temperature and switch on the machine direction orienter. ▶ Prepare the threading chain for threading the film. 	Adjusting the stretching process [▶ 158] Setting the temperature of the machine direction orienter [▶ 158] Switching on the machine direction orienter [▶ 157] Preparing the threading chain for threading the film [▶ 166]
Inline coating device	<ul style="list-style-type: none"> ▶ Preparing the threading chain. 	Preparing the threading chain for threading the film [▶ 172]

	Activity	Cross reference to the instructions
	▶ Set the coating area in the film so that no film-guiding parts are contaminated.	Manufacturer documentation
Transverse direction orenter	Activity	Cross reference to the instructions
	▶ Switch on the drives of the TDO.	Switching on the transverse direction orenter [▶ 182]
	▶ Set the temperature of the TDO.	Setting the temperature of the transverse direction orenter for the processing of PET [▶ 183]
Pull roll unit	Activity	Cross reference to the instructions
	▶ Set the operating temperature and switch on the pull roll unit.	Setting the temperature of the pull roll unit [▶ 197] Switching on the pull roll unit [▶ 196]
Winder unit	Activity	Cross reference to the instructions
	Empty winding cores must be located on both winding shafts of the two-station turret winder. ▶ If necessary, insert empty winding cores into the two-station turret winder.	Replacing the winding core on the two-station turret winder with a crane [▶ 214]
	▶ Switch on the winder unit.	Switching on the winder unit [▶ 207]
	▶ Prepare the winding core of the two-station turret winder.	Preparing the winding core in the two-station turret winder [▶ 216]
Directly prior to threading the film	Activity	Cross reference to the instructions
	▶ In WinCC OA, set the setpoints for threading the film into the line.	Online help
	▶ Enter the setpoints in the window of the line component for each line component.	
	▶ If required, set the line threading modes in the "Stretching: Line Speed: Threading" window.	Chapter "Operating the film production line"
	▶ If required, call up the required recipe in the recipe manager and transmit it.	Online help

Activity	Cross reference to the instructions
▶ Ensure that the line components are in "Production Mode".	Chapters "Operating the line component"
▶ Make sure that all manually adjustable components are adjusted correctly.	Operating manuals of the line components and the manufacturers.

6.3 Threading the Film into the Line

6.3.1 Threading the film into the film casting unit

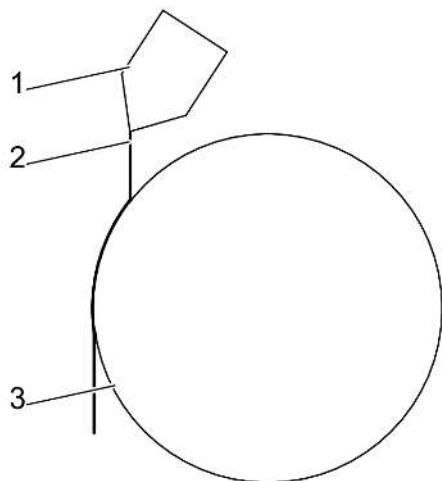
Procedure

First, components of the film casting unit are moved to the park position. Now the "Chill Roll Thread Mode" is started. Afterwards, the chill roll is moved to the working position while the extrusion system is running and the melt is placed on the chill roll. The melt cools down on the chill roll. This forms the film. The auxiliary winder is switched on. The film is threaded into the film casting stand. Then the film is wound up on the auxiliary winder. The components of the film casting unit are moved to the working position and switched on.

Requirement

- The drive of the chill roll is running. The chill roll turns.
- The line components up to and including the film casting unit are heated to operating temperature.
- The winding shaft of the auxiliary winder is prepared with adhesive tape.

The film is threaded into the film casting unit directly after the flushing of the extrusion system with melt. To do so, the drives of the extrusion system remains switched on after the flushing.



1	Melt die	2	Melt
3	Chill roll		

- The melt flows out of the melt die and runs off on the chill roll.
- The extrusion system is flushed with melt.
- The film pinning device is in the park position.

Required personnel

Four operators are required.

- 2 operator to operate the operating panel and ensure safety at the film casting unit.
- 1 operator upstream from the chill roll.
- 1 operator downstream from the chill roll.
- Heat-resistant protective gloves
- Heat resistant protective clothing
- Hard hat with face protection
- A bamboo spatula for severing the melt at the melt die.
- A magnetic pad approx. 0.7 m * 0.3 m in size for placing the melt on the chill roll.

Safety

The exhaust system of the melt die unit is not included in the scope of supply. The exhaust system must be switched on before the drives are switched on and it must be ensured that they are functioning properly.

► WARNING

Raw materials emit vapours and gases, which cause irritation of skin, eyes and airways.

- Ensure that the exhaust system is running effectively.
- Follow the safety data sheets of the raw material manufacturer.

The melt can spray profusely under the following conditions:

- The melt pipe is overheated.
- There is moisture in the melt or the lines.
- The melt contains air bubbles.

WARNING

Hot melt escaping under pressure causes serious burns.

- ▶ Wear heat-resistant protective gloves.
- ▶ Wear a hard hat with face protection.
- ▶ Wear protective clothing.

The extrusion system is very hot.

The covers at the melt die and the adapter block are for insulation purposes and do not serve as safeguards.

Other components of the melt die unit and the film casting unit can be hot.

WARNING

Hot surfaces can cause serious burns.

- ▶ Do not touch hot surfaces.
- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing.

During operation, following components of the extrusion system are loud:

- Optional: drive of the extruder
- Optional: drive of the melt pump
- Optional: vacuum system

WARNING

Constant noise > 85 dB causes permanent damage to the hearing.

- ▶ Wear ear protection.

The components are moved or swivelled into the working or park position.

WARNING

Moving machine parts can crush body parts.

This can lead to serious injury.

- ▶ Do not reach into the vicinity of moving machine parts.
- ▶ Wait for the machine to come to a standstill.
- ▶ Before actuating the machine parts, ensure that no one is located in the danger zone.

Moving components into the park position

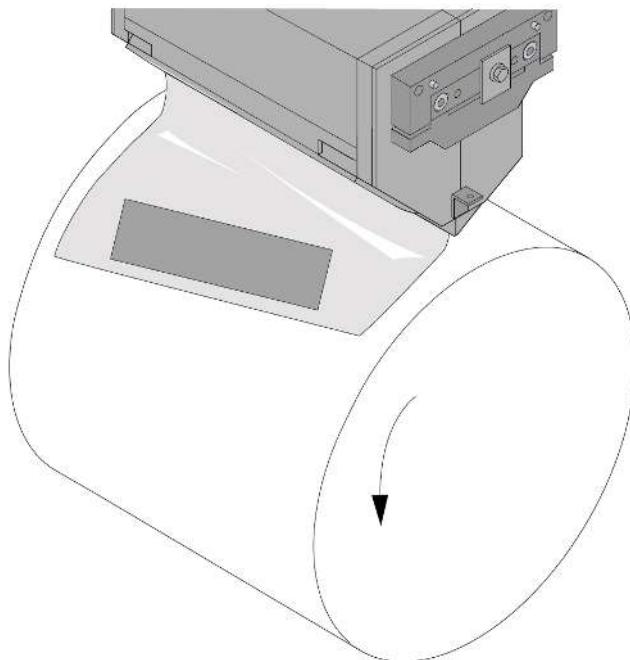
- ▶ Move the take-off roll on the film casting unit into the park position. On the film casing unit, press [take off roll park pos.].
- ▶ Move the nip roll on the film casting stand into the park position and switch off the drive for turning the rolls. On operator panel BM1, press [nip roll P.R. park pos.].

Starting the "Chill Roll Thread Mo de"

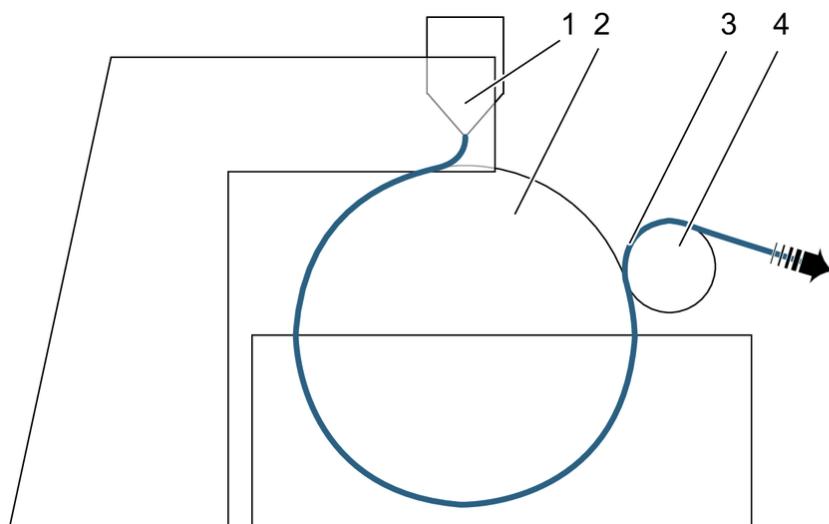
- ✓ The interlocks for the "Chill Roll Thread Mode" must be fulfilled.
- ▶ Start the "Chill Roll Thread Mode". On the operator panel BEC press [chill roll thread mode].

**Threading the film
into the film casting
unit**
ATTENTION**Danger of film break**

- ▶ The die lips must be clean and free of plastic remnants.
- ▶ Sever the melt below the die lips using a spatula.
- ▶ Remove the melt on the chill roll.
- ▶ Move the frame with chill roll into the horizontal working position. On operator panel BEC, press and hold [chill roll work pos.] until the frame is in the working position.
 - ⇒ During the movement, an acoustic warning signal sounds or the signal light flashes.
- simultaneously -

**ATTENTION****A contaminated magnetic pad scratches the chill roll surface.**

- ▶ Ensure that the magnetic pad is clean.
- ▶ Do not contact the chill roll with the magnetic pad. Only lay the magnetic pad on the melt web.
- ▶ While the movement is being moved, place the melt on the chill roll using the magnetic pad.



1	Melt die	2	Chill roll
3	Melt/Film	4	Take-off roll

- ▶ When the film is on the other side of the chill roll, pull out the magnetic plate and film. Set aside the magnetic pad.
- ▶ Guide the film over the take-off roll.

Switching on auxiliary winder downstream from the film casting unit

At the inlet of the machine direction orienter

- ▶ Ensure that no-one is located in the danger zone of the auxiliary winder.
- ▶ Switch on the auxiliary winder. On operator panel BM1, press [aux. winder 1 run].
 - ⇒ The auxiliary winder turns at the speed of the previous line component.
 - ⇒ The auxiliary winder turns at the torque set on the operator panel.
 - ⇒ At a speed above 15 m/min, the triggered safeguard causes an emergency stop of the auxiliary winder.

Briefly bridging the light barrier to the auxiliary winder after the film casting unit

At the auxiliary winder after the film casting unit

- ▶ Press the safety enabling button to the centre position and hold it there.
 - ⇒ At a speed of the auxiliary winder above 15 m/min, triggering the light barrier causes not an emergency stop of the auxiliary winder.
 - ⇒ The green signal light lights.

WARNING

Rotating parts on the auxiliary winder draw in clothing and body parts.

This can lead to injury.

- ▶ Maintain the distance to the auxiliary winder.
- ▶ Wear close-fitting clothing.

- ▶ Pass through the light barrier.
 - ⇒ The torque of the auxiliary winder is reduced and limited.
 - ⇒ The yellow signal light lights.
 - ⇒ With speeds of the auxiliary winder above 15 m/min: If the push button of the safety enabling button is released or if it is pressed down all the way to the stop, an emergency stop of the auxiliary winder is executed.
 - ⇒ With speeds of the auxiliary winder below 15 m/min: If the push button of the safety enabling button is released or if it is pressed down all the way to the stop, an emergency stop of the auxiliary winder is executed.

ATTENTION

Due to the security settings on the auxiliary winder, the film in front of the auxiliary winder can sag.

The film can be pulled into the machine in front of it.

The film cannot be properly pulled into the following machine.

- ▶ Keep the presence of persons in the danger zone of the auxiliary winder as short as possible.
- ▶ After leaving the danger zone, reset the security settings.
- ▶ Tension the sagging film.

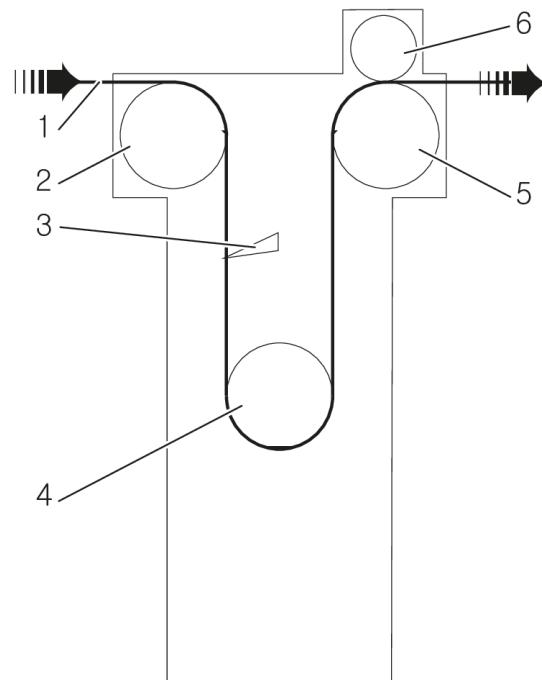
Threading the film into the film casting stand

▲ CAUTION

During the threading process, there is a draw-in hazard and danger of crushing between the film and the machine parts

This can lead to injury.

- ▶ Take care when working.



1	Film path	2	Guide roll
3	Cross cutting device	4	Guide roll
5	Guide roll	6	Driven nip roll

- ✓ The blade of the cross cutting device (3) must be in the park position.
- ✓ The driven nip roll (6) must be in the park position.

- ▶ Guide the film over the guide roll (2).
- ▶ At the cross cutting device (3), guide the film downwards.
- ▶ Guide the film below and around the guide roll (4).
- ▶ Guide the film between the guide roll (5) and the driven nip roll (6).

Placing the film on the auxiliary winder after the film casting unit

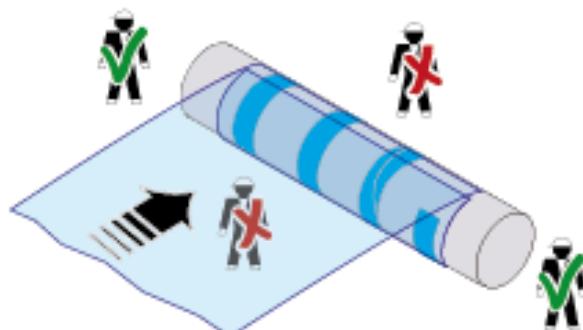
At the auxiliary winder after the film casting unit

WARNING

Rotating parts on the auxiliary winder draw in clothing and body parts.

This can lead to injury.

- ▶ Operating the auxiliary winder only from the side.
- ▶ Do not remain in front of or behind the auxiliary winder.
- ▶ Wear close-fitting clothing.



	Presence allowed		Presence forbidden
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- ▶ Place the film on the prepared winding shaft of the auxiliary winder.

Resetting the light barrier to the auxiliary winder after the film casting unit

At the auxiliary winder after the film casting unit

- ✓ No one is located in the danger zone of the auxiliary winder.
- ▶ Reset the light barrier protective function. Press [light barrierer reset] outside the danger zone of the auxiliary winder.
 - ⇒ The auxiliary winder turns with the set torque.
- ▶ Release the safety enabling button.
 - ⇒ At a speed of the auxiliary winder above 15 m/min, triggering the light barrier causes an emergency stop of the auxiliary winder.

Winding up the sagging film with the auxiliary winder after the film casting unit

At the inlet of the machine direction orienter

- ✓ The film wound up on the auxiliary winder is not tensioned.
- ▶ To wind up the sagging film, increase the rpm for the auxiliary winder. On the operator panel BM1, set the rotary switch [aux. winder torque].
- ▶ Move the nip roll on the film casting stand into the working position and start the drive for turning the rolls. On operator panel BM1, press [nip roll P.R. work pos.].

During operation, there are dangers on the electrostatic film pinning device.

▲ DANGER

High voltage at the film pinning device causes life-threatening injuries from electric shock.

- ▶ Do not touch parts.
- ▶ Keep your distance.
- ▶ Access is forbidden for people with a heart pacemaker.

▲ CAUTION

If the wire or the band of the film pinning device tears, parts can fly around.

This can lead to injury.

- ▶ Wear heat-resistant protective gloves.
- ▶ Wear a hard hat with face protection.
- ▶ Wear protective clothing.
- ▶ Move the electrostatic film pinning device in the direction of the working position. On operator panel BEC, BC2 or BC3 (option), press and hold [pinning work pos.] until the film pinning device has reached the horizontal safety position and stops automatically. Release the push button.
- ▶ Close the safety grid of the film pinning device.
- ▶ Move the electrostatic film pinning device to the working position and start. On operator panel BEC, BC2 or BC3 (option), press [pinning work pos.].
 - ⇒ The high voltage is released by the software immediately before the electrostatic film pinning device reaches the working position.
 - ⇒ The electrostatic film pinning device stops in the working position. As long as the electrostatic film pinning device is in the working position, the working position is adjusted in accordance with the settings in the "Stretching: Line Speed: Threading" WinCC OA window when changing the line threading mode.
 - ⇒ The electrostatic film pinning device lays the melt onto the chill roll.
- ▶ If necessary, adjust the position, current and voltage on the operator panels or directly on the generator so that the film runs free of bubbles on the rolls.
- ▶ Move the take-off roll to the working position. On the film casting unit, press and hold [take off roll work pos.] until the take-off roll is in working position. If the push button is released before the take-off roll is in the working position, it will automatically move back into the park position.

6.3.2 Threading the film into the machine direction orienter, the inline coating device and the transverse direction orienter

Procedure

First, the line threading mode MDO Thread Mode is activated. A film strip is threaded through the machine direction orienter with the help of the threading chain. The film strip is threaded through the inline coating device using the threading chain. Once this is done, the line threading mode TDO Thread Mode is activated. The film strip is then threaded into the transverse direction orienter. Now, the film (entire film width) is threaded into the machine direction orienter, the line coating device, and the transverse direction orienter. Finally, the line threading mode TDO Speed Up Mode is started.

These instructions describe the threading of the film beginning on the right-hand side of the line components.

Requirement

- The nip roll of the film casting unit must be in the working position.
- The film is threaded into the film casting unit and is wound on the auxiliary winder after the film casting unit.
- The drives of the machine direction orienter are running.
- The machine direction orienter is heated to operating temperature.
- The threading chain on the machine direction orienter is prepared with a rope for threading in the film.
- The stretching process for the machine direction orienter has been set. The following settings have been made depending on the stretching process:
 - number of stretching gaps
 - stretching ratios
 - Selection of the nip rolls that are moved into the working position.
 - Selection of the infrared radiators that are moved into the working position.

Inline coating device

- The inline coating device is in "Production Mode". The start enable is issued.
- The drives of the inline coating device are switched off.
- The spreading rollers are in the park position.
- The kiss-coat rolls are in the park position.
- The corona electrodes are in the park position.
- The threading chain is prepared.

Transverse direction orienter

- The transverse direction orienter is in "Production Mode". The start enable is issued.
- The drives of the transverse direction orienter are running.
- The transverse direction orienter is heated to operating temperature.

Required personnel

4 operators are required.

- 2 operators at the inlet who thread the film.
- Two operators at the outlet who take up the film.
- 1 high-strength rope with a length of 1.6 m
- Tool for severing the film

Auxiliary materials

Safety**Danger due to magnetic fields**

Powerful magnetic and electromagnetic fields occur at the following points:

- Optional: Linear motor of the edge control device (LIWEB) of the track system.

Powerful magnetic fields occur at the following points:

- Optional: Magnetic clip closers at the inlet of the track system.
- Optional: Magnetic clip openers at the outlet of the track system.
- Optional: Magnetic counterpiece on the clip opener or clip closer of the track system.
- Optional: In the stretching section, in track systems with magnetic relief.

▲ DANGER

Powerful magnetic and electromagnetic fields disrupt the functioning of active medical devices such as pacemakers, insulin pumps and hearing aids.

- ▶ Personnel with such active medical equipment must maintain a safe distance of at least 0.8 m at all times.

▲ DANGER

Even when the machine is switched off, strong magnetic fields of permanent magnets have a direct impact on people and can interfere with the operation of active medical accessories. The following people must maintain a safety distance of at least 0.8 m:

- ▶ People who have a heart pacemaker and/or metal implants.
- ▶ People who use insulin pumps and/or hearing aids.
- ▶ People who wear magnetic or electrically conductive objects.

▲ WARNING

Powerful magnetic and electromagnetic fields exert extremely high powers of attraction on magnetisable (ferromagnetic) materials.

There is a danger of cuts and danger of crushing.

- ▶ Even if the machine is switched off, powerful magnetic fields from permanent magnets are present.
- ▶ Work in the vicinity of magnetic parts must be carried out by at least 2 persons.
- ▶ Wear protective gloves and other personal protective equipment if necessary.
- ▶ Keep magnetisable objects (e.g. watches, keys, fixing parts made of steel, steel or iron tools) and permanent magnets away from magnetic parts.
- ▶ Use suitable tools made of non magnetisable material.
- ▶ Use non magnetisable materials (e.g. a wooden bar) to free pinched body parts in case of an accident.

ATTENTION

Powerful magnetic and electromagnetic fields can damage electronic devices, measuring instruments, watches and data storage media.

This can cause irreparable damage.

Electronic devices and measuring instruments can change their calibration.

Data loss can occur on magnetic and electronic data storage media.

- ▶ Do not bring parts near the magnets.
- ▶ Maintain a safety distance of 0.8 m.

ATTENTION

Powerful magnetic and electromagnetic fields attract ferromagnetic parts such as tools or fixing parts made of steel.

- ▶ Do not bring ferromagnetic parts, i.e. magnetisable parts, near the magnets.

Danger from heat

The surfaces inside and outside the transverse direction orienter are hot.

⚠ CAUTION

Hot surfaces can cause burns.

- ▶ Do not touch surfaces.
- ▶ Wear protective gloves.
- ▶ Wear protective clothing.

Hazard from noise

During operation, it is loud at the inlet and outlet of the transverse direction orienter.

⚠ WARNING

Constant noise > 85 dB causes permanent damage to the hearing.

- ▶ Wear ear protection.

Dangers at the shutters

When changing the line threading mode, the shutters in the oven can move.

Danger of crushing when opening and closing the shutters.

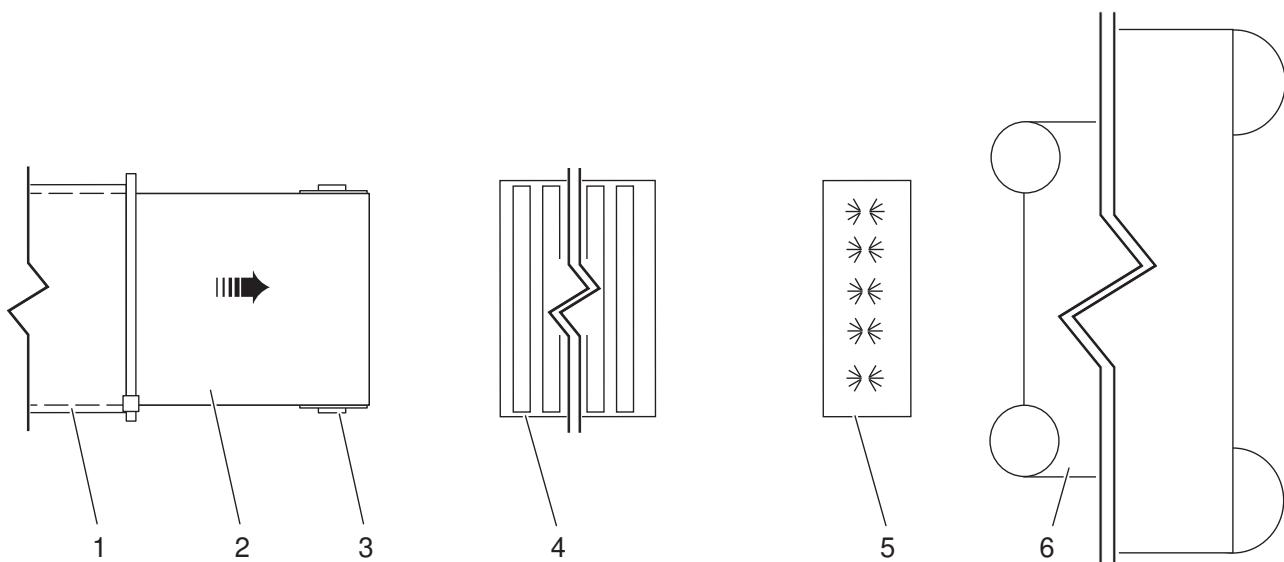
⚠ CAUTION

Moving machine parts can crush body parts.

This can lead to injury.

- ▶ Do not reach into the vicinity of moving machine parts.

Overview



1	Film casting unit	2	Film
3	Auxiliary winder	4	Machine direction orienter
5	Inline coating device	6	Transverse direction orienter

**Starting the
"MDO Thread Mode"**
**At the outlet of the film casting unit and at the inlet of the machine direction
orienter**

When starting "MDO Thread Mode", among other things, the nip roll at the outlet of the film casting unit is moved into the working position.

When the nip roll moves into the working position, there is a danger of crushing and being pushed.

Due to the rotating nip roll, body parts can be caught and drawn in.

⚠ WARNING

Moving machine parts can crush, entangle, draw in and crash into body parts.

This can lead to serious injury.

- ▶ Work with caution on moving parts.
- ▶ Wear close-fitting clothing.

- ✓ The interlocks for "MDO Thread Mode" must be fulfilled.

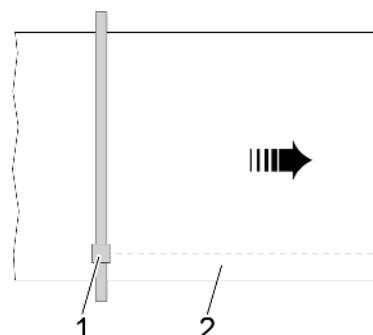
- ▶ Starting the "MDO thread mode". On operator panel BM1, press [MDO thread mode].

The line threading mode triggers the following actions:

- The "Automatic Chill Roll -> MDO" linking is active.
- The values in the "Stretching: Line Speed: Threading" window are transmitted to the film production line.
- All nip rolls of the machine direction orienter move into the park position.

If there is a driven nip roll at the machine director orienter outlet and if there is film at the machine direction orienter outlet when changing to the MDO Thread Mode line threading mode, the driven nip roll is not moved into park position.

- All infrared radiators of the machine direction orienter move into the park position.
- The conveying fan and the drive of the edge trim grinder are switched off.
- On the film casting unit, the driven nip roll swivels into working position.

**Cutting film strips
with the cross cutting
device of the film
casting unit**
Inlet of the machine direction orienter


1	Cutter head of the cross cutting device	2	Film strip
---	---	---	------------

WARNING

Moving cutting knives cause serious cutting injuries or cut off body parts.

- ▶ It is prohibited to be within the area of movement of the cutting knives.
- ▶ Keep your distance.

CAUTION

Moving machine parts can crush body parts.

This can lead to injury.

- ▶ Do not reach into the vicinity of moving machine parts.
- ▶ Wait for the machine to come to a standstill.
- ▶ Position the cutter head of the cross cutting device approx. 15 cm away from the film border.
 - For movement to the right, press and hold [cross cutter -->] on operator panel BM1 until the cutter head is in position.
 - For movement to the left, press and hold [cross cutter <--] on operator panel BM1 until the cutter head is in position.
- ▶ Pierce the film with the blade of the cutter head. On operator panel BM1, press [knife in film].
 - ⇒ The film is cut into 2 film strips.

Briefly bridging the light barrier to the auxiliary winder after the film casting unit

At the auxiliary winder after the film casting unit

- ▶ Press the safety enabling button to the centre position and hold it there.
 - ⇒ At a speed of the auxiliary winder above 15 m/min, triggering the light barrier causes not an emergency stop of the auxiliary winder.
 - ⇒ The green signal light lights.

WARNING

Rotating parts on the auxiliary winder draw in clothing and body parts.

This can lead to injury.

- ▶ Maintain the distance to the auxiliary winder.
- ▶ Wear close-fitting clothing.
- ▶ Pass through the light barrier.
 - ⇒ The torque of the auxiliary winder is reduced and limited.
 - ⇒ The yellow signal light lights.
 - ⇒ With speeds of the auxiliary winder above 15 m/min: If the push button of the safety enabling button is released or if it is pressed down all the way to the stop, an emergency stop of the auxiliary winder is executed.
 - ⇒ With speeds of the auxiliary winder below 15 m/min: If the push button of the safety enabling button is released or if it is pressed down all the way to the stop, an emergency stop of the auxiliary winder is executed.

ATTENTION

Due to the security settings on the auxiliary winder, the film in front of the auxiliary winder can sag.

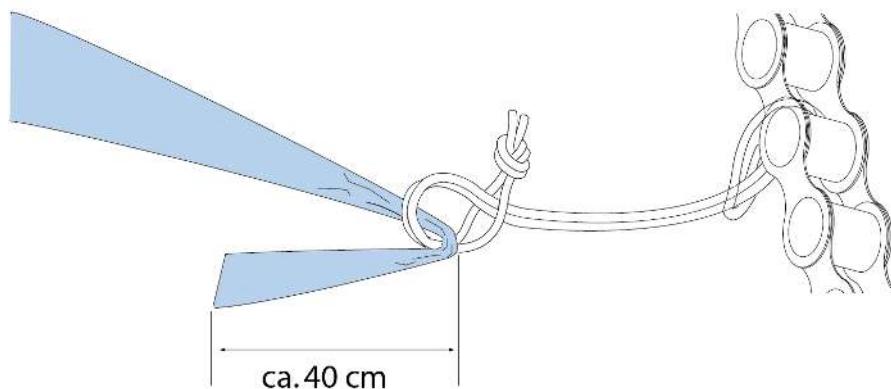
The film can be pulled into the machine in front of it.

The film cannot be properly pulled into the following machine.

- ▶ Keep the presence of persons in the danger zone of the auxiliary winder as short as possible.
- ▶ After leaving the danger zone, reset the security settings.
- ▶ Tension the sagging film.

Severing the narrow film strips after the film casting unit
At the outlet of the film casting unit

- ▶ Sever the narrow film strip with a suitable cutting tool transverse to the film direction.

Preparing the film for threading
Inlet of the machine direction orienter


- ▶ Fold the narrow film strip after approx. 40 cm.
⇒ A hook forms at the film end.
- ▶ Pull the hook of the film strip through the noose and tighten the noose.

Threading the film strip into the machine direction orienter
At the inlet of the machine direction orienter
▲ CAUTION

When the threading chain is running, there is a draw-in hazard between the threading chain and the guide.

- ▶ Keep your distance when the threading chain is running.
- ▶ Take care when working.

The requirements for switching on the threading chain must be fulfilled:

- ✓ The drives of the machine direction orienter are running.
- ✓ The maximum threading speed on the machine direction orienter has not been exceeded.
- ✓ The maximum threading/stretch ratio on the machine direction orienter has not been exceeded.
- ✓ "MDO Thread Mode" line threading mode is active.
- ✓ All nip rolls are in the park position.
- ✓ All infrared radiators are in the park position
- ▶ Switch on the threading chain. On operator panel BM1, press [threading chain run].
⇒ The threading chain pulls the film strip into the machine direction orienter.
- ▶ During the threading, pull the film strip to the middle of the roll so that the film strip does not slip off the roll.
⇒ The threading chain pulls the film to the outlet of the machine direction orienter.

Resetting the light barrier to the auxiliary winder after the film casting unit

At the auxiliary winder after the film casting unit

- ✓ No one is located in the danger zone of the auxiliary winder.
- ▶ Reset the light barrier protective function. Press [light barrierer reset] outside the danger zone of the auxiliary winder.
⇒ The auxiliary winder turns with the set torque.
- ▶ Release the safety enabling button.
⇒ At a speed of the auxiliary winder above 15 m/min, triggering the light barrier causes an emergency stop of the auxiliary winder.

Tensioning the film strip before the machine direction orienter

At the inlet of the machine direction orienter

- ✓ The film strip that is drawn into the machine direction orienter is not tensioned.
- ▶ When the film has reached the 4th preheating roll, tension the film between the machine direction orienter and the preceding line component. On operator panel BM1, press and hold [MDO overspeed].
⇒ For as long as the push button is pressed, the rolls turn at higher speed. This tensions the film.
- ▶ Just before the film is tensioned, release [MDO overspeed].

Winding up the sagging film with the auxiliary winder after the film casting unit

At the inlet of the machine direction orienter

- ✓ The film wound up on the auxiliary winder is not tensioned.
- ▶ To wind up the sagging film, increase the rpm for the auxiliary winder. On the operator panel BM1, set the rotary switch [aux. winder torque].

Taking up the film strip from the machine direction orienter

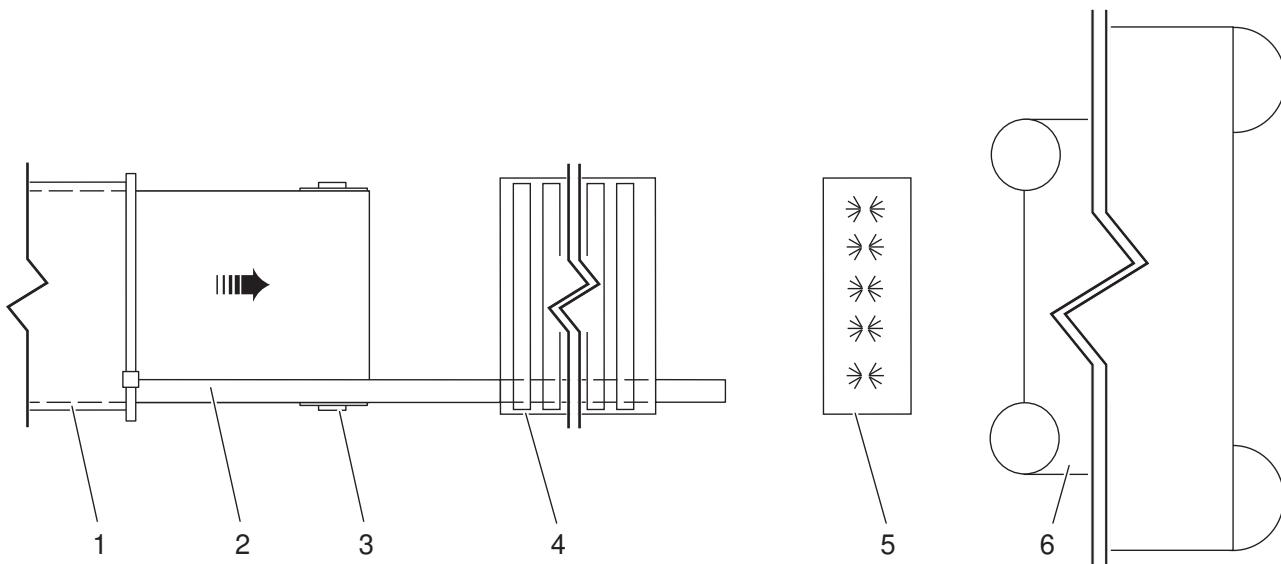
At the outlet of the machine direction orienter

2 operators must be positioned at the outlet to take up the film strip.

- ▶ When the film strip is at the outlet, switch off the threading chain. On operator panel BM3 or on the drive side (optional), press [threading chain stop].
- ▶ Release the rope from the chain and take up the film strip wearing protective gloves.

- ▶ Sever the kinked film end.

Overview



1	Film casting unit	2	Film strip
3	Auxiliary winder	4	Machine direction orienter
5	Inline coating device	6	Transverse direction orienter

Threading the Film Strip into the Inline Coating Unit

On the inline coating device

- ▶ Switch on all rolls of the inline coating device, except for the gravure roll. See chapter "Switching on the inline coating device".

⚠ CAUTION

When the threading chain is running, there is a draw-in hazard between the threading chain and the guide.

- ▶ Keep your distance when the threading chain is running.
- ▶ Take care when working.

The film strip is threaded into the inline coating device using the film threading system.

- ▶ Attach the film strip to the threading chain.
- ▶ Switch on the drive of the threading chain. On operator panel BK1, press [threading chain run].
⇒ The threading chain pulls the film strip through the inline coating device.
- ▶ If the film strip has been threaded into the inline coating device, switch off the drive of the threading chain. To do this, on operator panel BK1, press [threading chain stop] and release the film strip from the threading chain.

Starting the "TDO Thread Mode"

At the inlet of the transverse direction orienter

- ✓ The interlocks for "TDO Thread Mode" must be fulfilled.
- ▶ Start "TDO Thread Mode". On operator panel BT1, press [TDO thread mode].

The "TDO Thread Mode" is used for threading the film into the transverse direction orienter.

The line threading mode triggers the following actions:

- The "Automatic Chill Roll -> Winder" linking is active.
- The values in the "Stretching: Line Speed: Threading" window are transmitted to the film production line".¹⁾
- The settings in the window "Threading Mode Selection" for "TDO Thread Mode" are active.¹⁾
- If there is a nip roll in the film casting unit, move it into park position.
- The shutters in the transversal direction orienter will be opened.
- The conveying fan and the drive of the edge trim grinder are started.
- If there is an inline-operated waste film grinder, the conveying fan and the drive are started.

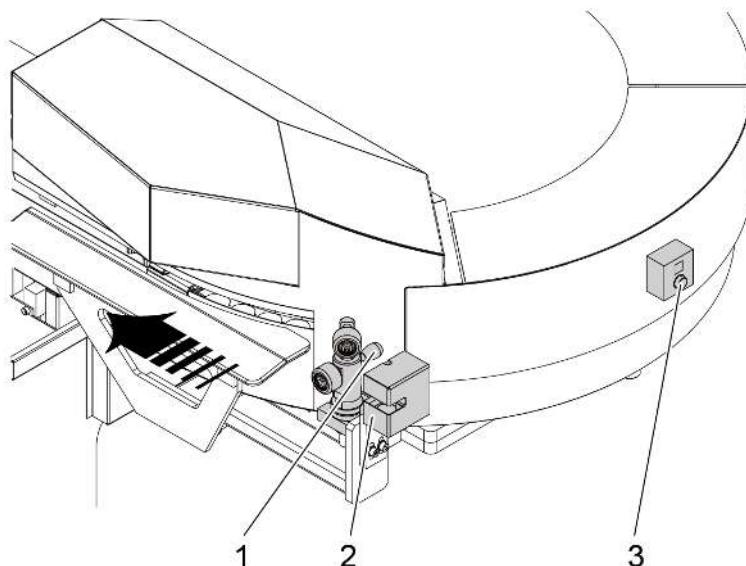
¹⁾ In the machine direction orienter, the setting for the stretching process becomes active with the MDO sequence.

The MDO sequence triggers the following action:

- If film is detected at the machine direction orienter outlet of the film break sensor, the selected nip rolls are moved into working position with a delay. The locked nip rolls are not moved.
- Depending on the number of stretching gaps, the selected infrared radiators are moved horizontally upwards and the selected infrared radiator are moved vertically upwards into the working position and started. The locked infrared radiators are not moved.
- The stretch ratios are activated with a time delay.

Preparing the transverse direction orienter

At the inlet of the transverse direction orienter

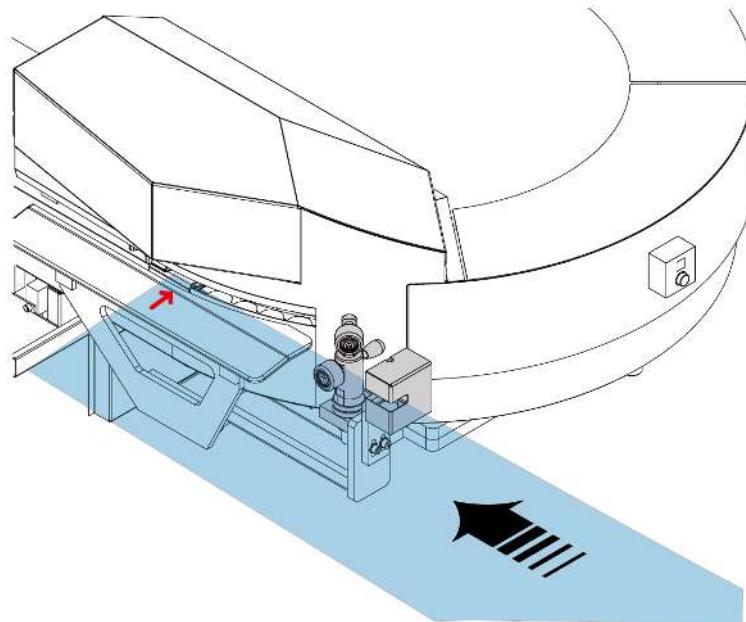


1	Lever for opening the spreading rollers	2	Edge control device
3	Push button of the edge control device		

- ▶ Activate "Manual Mode" on both sides of the edge control devices. Press the push button of the edge control device once on both inlet turn arounds.
 - ⇒ The edge control devices switch to "Manual Mode".
 - ⇒ The push buttons of the edge control devices flash.
- ▶ Open the spreading rollers on both inlet turn arounds with the lever.

Threading the film strip into the transverse direction orienter

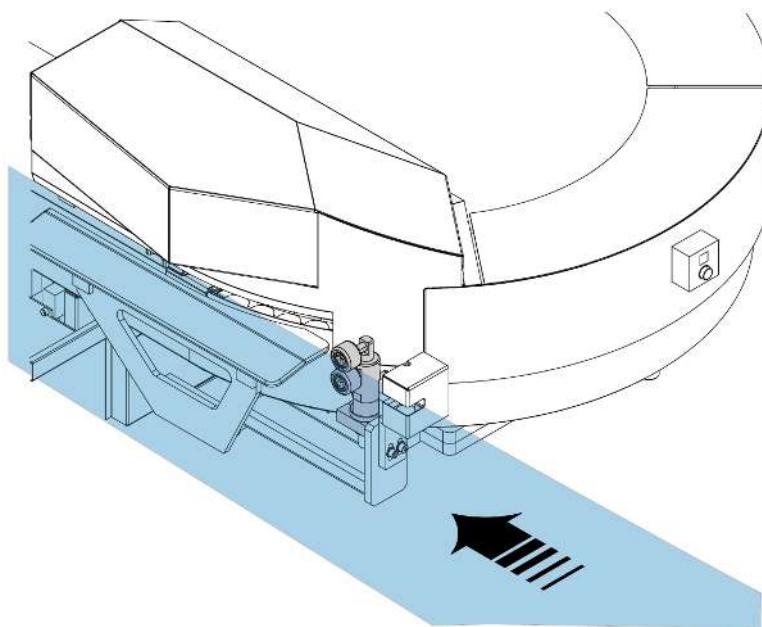
At the inlet of the transverse direction orienter



⚠ WARNING

Hot, moving clips and the moving film edge can result in serious injury by causing burns, cuts, or pulling in body parts.

- ▶ Wear close-fitting, heat resistant, protective clothing.
- ▶ Despite the increased draw-in hazard when wearing protective gloves, heat-resistant and cut-resistant protective gloves should nevertheless be worn.
- ▶ Take care when working.
- ▶ Guide the film strip through the sensor of the edge control device.
- ▶ Guide the film strip over the lower spreading roller.
- ▶ Thread the film strip into the clips so that the film strip is properly gripped by the clips.
 - ⇒ The film strip is threaded into the transverse direction orienter.
- ▶ If the film strip sags greatly, briefly press [TDO overspeed] several times on operator panel BT1 until the film strip is tight.

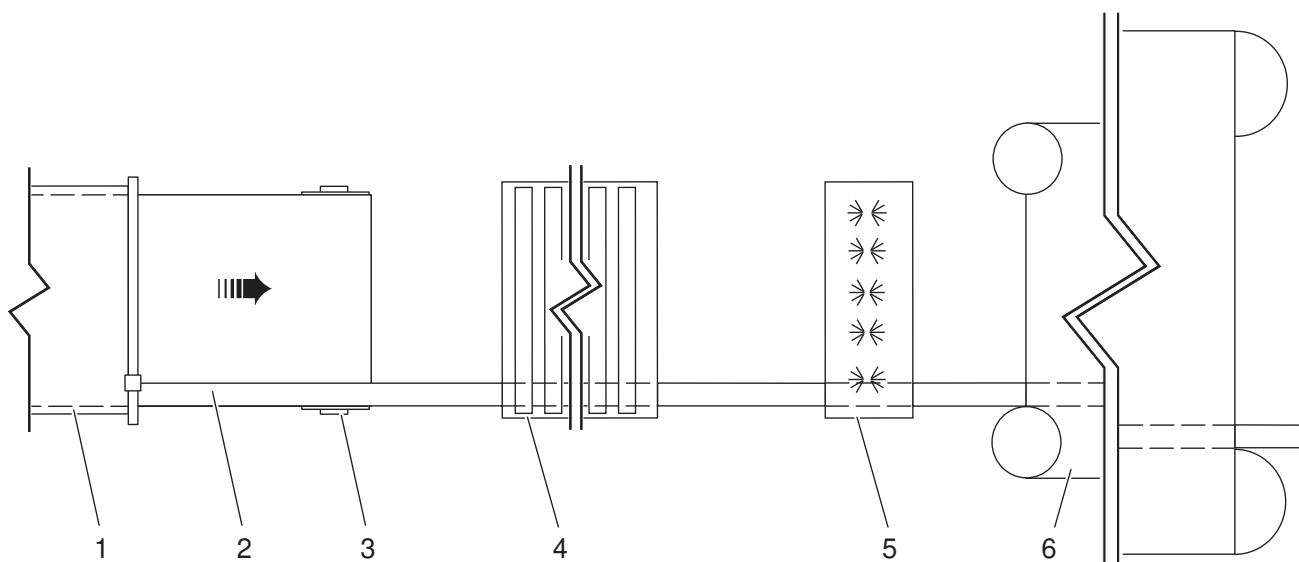


- ▶ On the side with the threaded film strip, close the spreading rollers with the lever.
- ▶ On the side with the threaded film strip, activate "Automatic Mode" on the edge control device. Press the push button once on the inlet turn around.
 - ⇒ The edge control device of the selected side changes to "Automatic Mode". The position of the film border is detected and when the position varies the inlet chain track is tracked accordingly.
 - ⇒ The push button of the edge control device lights up.

At the outlet of the transverse direction orienter

- ▶ Position a sufficient number of operators at the outlet of the transverse direction orienter to take up the film.

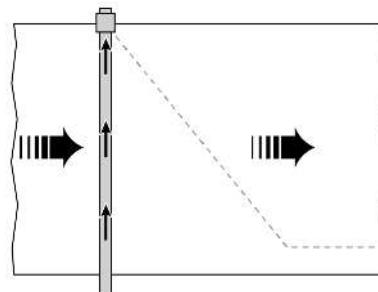
Overview



1	Film casting unit	2	Film strip
3	Auxiliary winder	4	Machine direction orienter
5	Inline coating device	6	Transverse direction orienter

Cutting off the film with the cross cutting device of the film casting unit

Inlet of the machine direction orienter



⚠ WARNING

Moving cutting knives cause serious cutting injuries or cut off body parts.

- ▶ It is prohibited to be within the area of movement of the cutting knives.
- ▶ Keep your distance.

⚠ CAUTION

Moving machine parts can crush body parts.

This can lead to injury.

- ▶ Do not reach into the vicinity of moving machine parts.
- ▶ Wait for the machine to come to a standstill.
- ▶ Cut off the film with the blade of the cross cutting device. To do so, move the cutter head with extended blade on the other film side.
 - For movement to the right, press and hold [cross cutter -->] on operator panel BM1 until the cutter head is in end position.
 - For movement to the left, press and hold [cross cutter <--] on operator panel BM1 until the cutter head is in end position.

When the cutter head stops in the end position, the blade is automatically retracted.

Inlet of the machine direction orienter

- ▶ Switch off the auxiliary winder. On the operator panel BM1, press [[aux. winder 1 stop]].
- ⇒ The drive is stopped.
- ⇒ The signal light goes out.

Threading the entire film into the machine direction orienter

On the machine direction orienter

- ✓ The film with the entire width is pulled into the machine direction orienter.
- ▶ Take up the film downstream from the machine direction orienter.

Threading the entire film into the inline coating device

On the inline coating device

⚠ WARNING

Moving machine parts can crush, entangle, draw in and crash into body parts.

This can lead to serious injury.

- ▶ Work with caution on moving parts.
- ▶ Wear close-fitting clothing.

When the coating chamber is in park position you can cut yourself at the scraper.

WARNING

Stationary knives cause serious cutting injuries or cut off body parts.

- ▶ Do not touch the knives.
- ▶ Wear cut-resistant protective gloves.
- ▶ Wear protective clothing.

CAUTION

Emission tips of the discharging bars can cause stabbing injuries and cutting injuries.

- ▶ Wear cut-resistant protective gloves.
- ▶ Thread the film with the entire film width into the inline coating device.
- ▶ Swivel the spreading rollers into the working position. On operator panel BK1, press [spreader roll work pos.].
 - ⇒ The spreading rollers selected in the "Threading, Mode Selection" view in WinCC OA are swivelled into the working position.

Threading the entire film into the transverse direction orienter

At the inlet of the transverse direction orienter

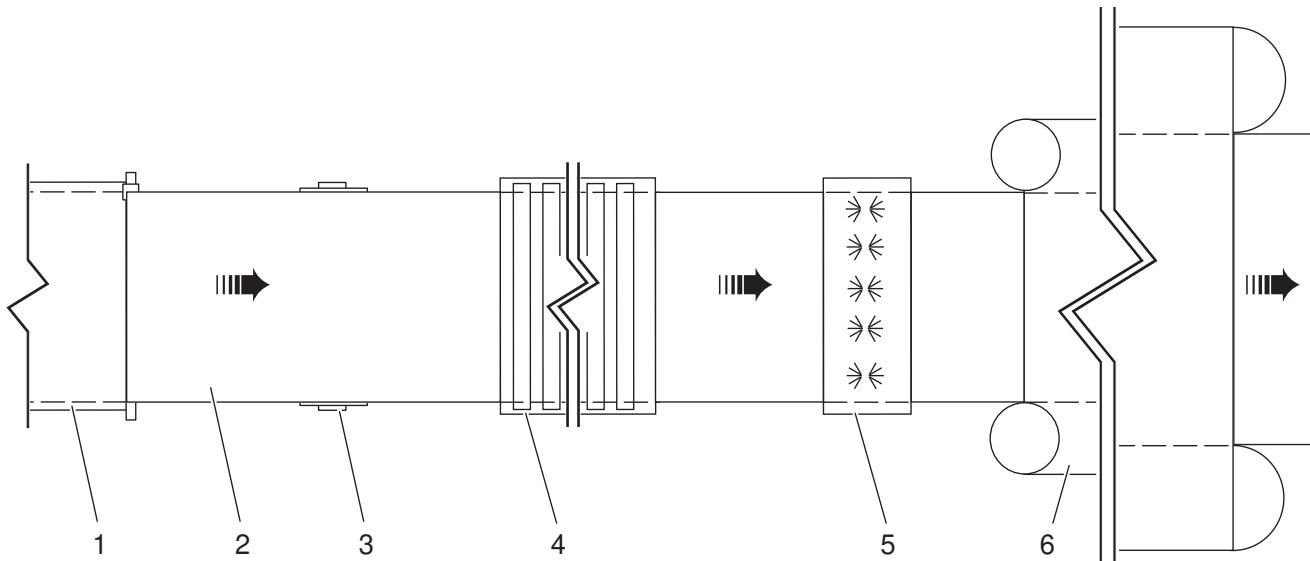
The film is now threaded into the inlet turn around into which no film is yet threaded.

WARNING

Hot, moving clips and the moving film edge can result in serious injury by causing burns, cuts, or pulling in body parts.

- ▶ Wear close-fitting, heat resistant, protective clothing.
- ▶ Despite the increased draw-in hazard when wearing protective gloves, heat-resistant and cut-resistant protective gloves should nevertheless be worn.
- ▶ Take care when working.
- ▶ Guide the free film border through the sensor of the edge control device and the spreading rollers.
- ▶ Thread the free film border into the clips until they properly grip the film.
 - ⇒ The film is threaded into the transverse direction orienter.
- ▶ Close the spreading rollers at the inlet with the lever.
- ▶ Activate "Automatic Mode" on the edge control device. Press the push button of the edge control device once on the inlet turn around.
 - ⇒ The edge control device of the selected side changes to "Automatic Mode".
The position of the film border is detected and, when the position varies, the inlet chain track is tracked accordingly.
 - ⇒ The push button of the edge control device lights up.
 - ⇒ The film strip is stretched in width in the transverse direction orienter.

Overview



1	Film casting unit	2	Film
3	Auxiliary winder	4	Machine direction orienter
5	Inline coating device	6	Transverse direction orienter

Starting "TDO Speed Up Mode" "

At the inlet of the transverse direction orienter

When activating "TDO Speed Up Mode", the blow-off nozzles at the outlet are activated. The blowing off of the film residues from the clips is loud.

⚠ CAUTION

Constant noise > 85 dB causes permanent damage to the hearing.

- ▶ Wear ear protection.

The blow-off nozzles blow the film residues off the clips.

⚠ CAUTION

The air flow can cause dust and film residues to fly around.

This can cause injury to the eyes.

- ▶ Wear eye protection.

✓ The interlocks for "TDO Speed Up Mode" must be fulfilled.

- ▶ Start "TDO Speed Up Mode". On operator panel BT1, press [TDO speed up mode].

"TDO Speed Up Mode" is used to increase the line speed.

The line threading mode triggers the following actions:

- The "Automatic Chill Roll -> Winder" linking is active.
- The values in the "Stretching: Line Speed: Threading" window are transmitted to the film production line.
- The blow-off nozzles of the transverse direction orienter are activated in order to blow film residues off the clips.

When film exits from the outlet across the entire working width, the blow-off nozzles stop automatically.

- or -

If not all film residues are removed from the clips, the transverse direction orienter is stopped. This prevents film residues from getting into the return track.

Further actions take place. For further information, see chapter "Film break in the transverse direction orienter".

- If there are settings for "TDO Speed Up Mode" in the "Threading Mode Selection" window, they become active.
- If there is a driven nip roll at the outlet of the machine direction orienter, it moves into park position. On reaching park position, the drive for turning the rolls stops.

6.3.3 Threading the film into the pull roll unit and winder unit

Procedure	The film is threaded into the pull roll unit and the winder unit at low speed using the threading slot.
Requirement	<ul style="list-style-type: none"> • The pull roll unit must be free of film residues. • The thickness gauge must be moved into the park position. • The drives of the pull roll unit and winder unit are running. • The pull roll unit is heated to the operating temperature. • There is a winding core that is prepared with adhesive tape in the rear winding shaft of the two-station turret winder. The other winding shaft contains an empty winding core. • The line must be in "TDO Speed Up Mode" at least.
Required personnel	<p>3 operators are required.</p> <ul style="list-style-type: none"> • 2 operators at the operating and drive sides who take up the film from the previous machine. • One operator who threads the film.
Auxiliary materials	<ul style="list-style-type: none"> • Tool for severing the film

Preparing the pull roll unit and winder unit

- ▶ Start "Open to Thread". On operator panel BW1, press [open to thread].
 ⇒ The contact roll is moved into the park position.
 - ⇒ If the rear winding shaft is in the loading/unloading position, it turns into the scrap winding position. Because of the turning process, the drives of the winder unit are started.
 - ⇒ The setpoints for oscillation and for the working width are started up. (option)
 - ⇒ The spreading rollers are moved into the park position.
 - ⇒ The part nip rollers in the edge area are swivelled into the park position.
 - ⇒ The nip rolls are moved into the park position.
 - ⇒ The blades of the edge trim device are moved into the park position.
 - ⇒ The cutting dust exhaust (option) of the edge trim device is started.
 - ⇒ In the corona treatment station (option), the electrodes are moved into the park position and the shutting flaps are opened.
 - ⇒ The web cleaning device (option) is moved into the park position.
 - ⇒ The edge charge device is swivelled into the park position.
 - ⇒ If all requirements for "Ready to Thread" are fulfilled, the signal lamp on the pull roll unit lights green.
- ▶ Move the threading aid to the working position. On operator panel BP1, press and hold [thread. aid work pos.] until the threading aid is in the working position. Release the push button.

Starting the "Pull Roll Thread Mode" **At the inlet of the pull roll unit**

- ✓ The interlocks for "Pull Roll Thread Mode" must be fulfilled.
- ▶ Start the "Pull Roll Thread Mode". On operator panel BP1, press [pull roll thread mode].

- or -

If the film is threaded into the pull roll unit directly after the film production (e.g. in the event of a film break in the transverse direction orienter), the "Pull Roll Thread Mode" can already be active.

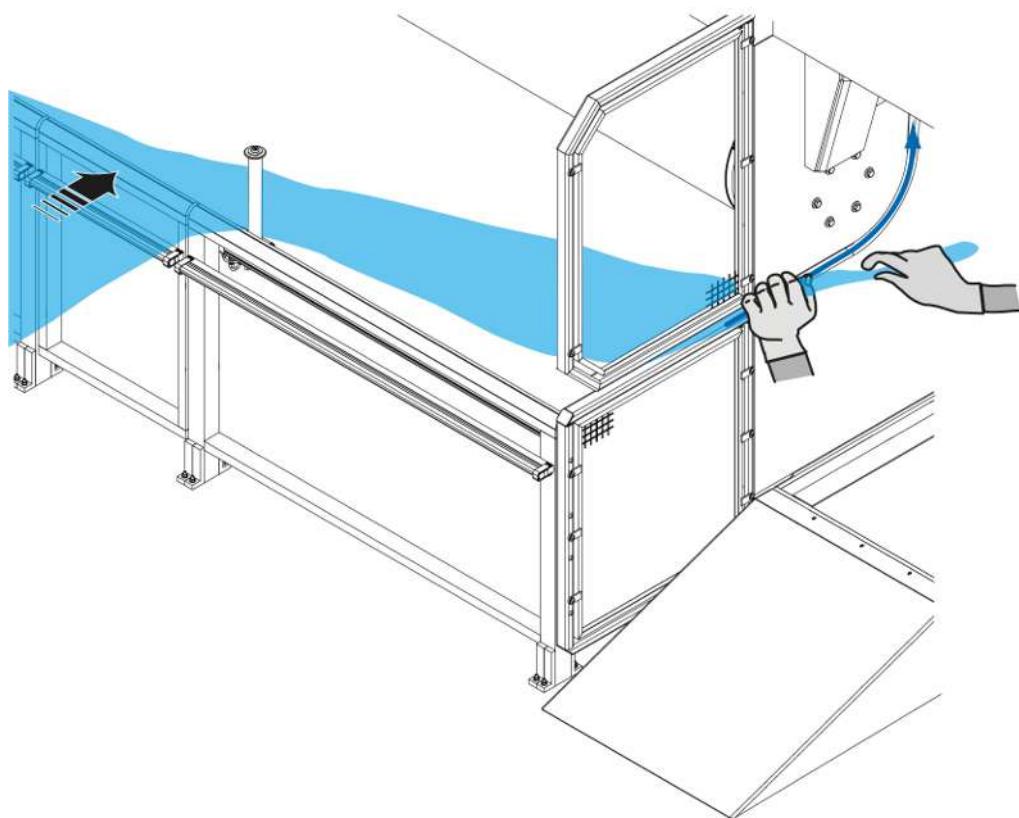
Preparing the film

- ▶ Sever the film upstream of the pull roll unit.

The film from the previous machine is used for threading.

Threading the film into the pull roll unit and winder unit

On the pull roll unit and on the winder unit



- ▶ Guide the film around the film threading aid.

⚠ WARNING

Moving machine parts can crush, entangle, draw in and crash into body parts.

This can lead to serious injury.

- ▶ Do not reach through the threading slot.
- ▶ Guide the film along the threading slot.
- ▶ Downstream from the winder unit from outside the safety fence, place the film on the prepared rotating winding core.
 - ⇒ The film is wound up on the winding core.
 - ⇒ The film spreads across the working width in the pull roll unit and the winder unit.
- ▶ Move the threading aid into the park position. On operator panel BP1, press and hold [thread. aid park pos.] until the threading aid is in the park position. Release the push button.
- ▶ Tension the film between the pull roll unit and the preceding line component. On the operator panel BP1, press and hold [pull roll overspeed].
 - ⇒ The rolls of the pull roll unit and the winder unit turn with greater speed as long as the push button is pressed. This tensions the film.
- ▶ Shortly before the film is tensioned, release [pull roll overspeed].

6.4 Going into Production

Procedure	Activity	Cross reference to the instructions
	▶ Start the Pull Roll Speed Up line threading mode.	Start the "Pull Roll Speed Up" line threading mode [▶ 64]
	▶ Sever the film edge trims.	Severing the film edge trim [▶ 65]
	▶ Start Production Mode line threading mode.	Starting "Production Mode" line threading mode [▶ 65]
	▶ Start the thickness profile control.	Starting the thickness profile control [▶ 66]
	▶ If the film is to be coated, start the film coating process on the line coating device.	Starting the coating of the film in the inline coating device [▶ 67]
	When the film quality is good, the change can be made from the scrap mill roll to an empty winding core. ▶ Turn the two-station turret winder semi-automatically.	Turning the two-station turret winder semi-automatically [▶ 211]

6.4.1 Start the "Pull Roll Speed Up" line threading mode

Safety

▲ DANGER

Ozone emission at the corona treatment station causes extreme irritation of the eyes and airways.

- ▶ Check that the exhaust system is functioning properly before starting production.
- ▶ Ensure a permanent ozone exhaust system when the corona treatment station is in operation.
- ▶ If there is a smell of ozone in the hall, check the ozone exhaust system for leaks.

When changing the line threading mode, the shutters in the oven can move.

Danger of crushing when opening and closing the shutters.

▲ CAUTION

Moving machine parts can crush body parts.

This can lead to injury.

- ▶ Do not reach into the vicinity of moving machine parts.

Start the "Pull Roll Speed Up" line threading mode

- ✓ The interlocks for the line threading mode Pull Roll Speed Up Mode must be fulfilled.
- ▶ Ensure that the film is threaded correctly into the film production line.
- ▶ Ensure that in the pull roll unit, the ozone exhaust system of the corona treatment station is running and that all shutting flaps are open.
- ▶ Start the Pull Roll Speed Up Mode line threading mode. On the operator panel BP1, press [pull roll speed up mode].

6.4.2 Severing the film edge trim

Safety

The cut-off knives of the edge trim chopping device can be moved by means of push buttons.

WARNING

Moving cutting knives cause serious cutting injuries or cut off body parts.

- ▶ It is prohibited to be within the area of movement of the cutting knives.
- ▶ Keep your distance.

Severing the film edge trim

- ▶ Pierce the film with the blades of the edge trim device on the operating and drive sides. On operator panel BP1, press [edge knives in film].
- ▶ When the slit film reaches the scrap mill roll, sever the film edge trim. On the operating side of the edge trim chopping device, press and hold the [edge trim chop] and [edge trim chop 2] push buttons with both hands until the cutting process is finished.
⇒ The film edge trims are severed and discharged via the suction funnels.

6.4.3 Starting "Production Mode" line threading mode

Safety

DANGER

Ozone emission at the corona treatment station causes extreme irritation of the eyes and airways.

- ▶ Check that the exhaust system is functioning properly before starting production.
- ▶ Ensure a permanent ozone exhaust system when the corona treatment station is in operation.
- ▶ If there is a smell of ozone in the hall, check the ozone exhaust system for leaks.

When changing the line threading mode, the shutters in the oven can move.

Danger of crushing when opening and closing the shutters.

CAUTION

Moving machine parts can crush body parts.

This can lead to injury.

- ▶ Do not reach into the vicinity of moving machine parts.

Starting "Production Mode" line threading mode

- ✓ The interlocks for the line threading mode Production Mode must be fulfilled.
- ▶ Ensure that the film is threaded correctly into the film production line.
- ▶ Ensure that in the pull roll unit, the ozone exhaust system of the corona treatment station is running and that all shutting flaps are open.
- ▶ Start the Production Mode line threading mode. On the operator panel BP1, press [production mode].

6.4.4 Starting the thickness profile control

Description

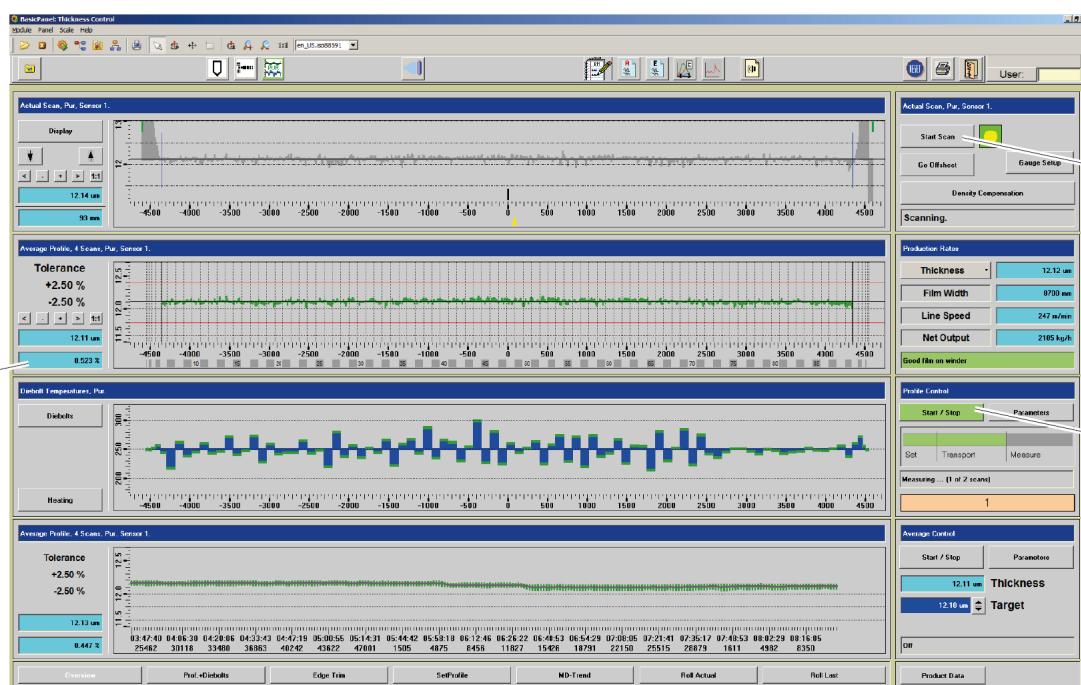
The thickness profile control measures the film thickness in the pull roll unit, uses the data to estimate the required changes in the lip gap at the melt die, and controls the lip adjustment.

Requirement

- The melt die and the lip adjustment must be at operating temperature.
- All extruders must be started and the melt must flow out of the melt die.
- The conditions for "Good Film on Winder" must be fulfilled.

Opening the TCE software

- Open the TCE for the end film.
 ⇒ The "Basic Panel: Thickness Control" window opens.



1	2-Sigma value	2	[Start scan] button for starting the thickness gauge
3	[Start/Stop] button for starting and stopping the thickness profile control		

Starting the thickness gauge

The thickness gauge starts automatically when the "Good Film on Winder" condition is fulfilled.

- If the thickness gauge is not running, click on [Start scan] (2) in the "Thickness Gauge" area on the "Basic Panel Thickness Control" window.
 ⇒ The thickness gauge starts.
- or -
- Start the thickness gauge on the operator panel of the thickness gauge.

Checking the thickness profile

- ▶ In the "Basic Panel Thickness Control" window, check the thickness profile across the entire film width.
- If the 2-Sigma value (1) is greater than 4%, the lip gap of the melt die should be manually adjusted.
Check the thickness profile again.
- If the 2-Sigma value (1) is less than 4%, the automatic thickness profile control can be started.
- ▶ In the "Profile Control" overview, click on [Start/Stop] (3).
⇒ The automatic thickness profile control starts.

Starting the thickness profile control

6.4.5 Starting the coating of the film in the inline coating device

First, the corona treatment is started on the inline coating device. Then, the coating of the film is started.

Requirement

- The conditions for Good Film on Winder must be met.
- The 2-Sigma value for the thickness profile across the film width should be less than 5%.

6.4.5.1 Starting corona treatment

Description

Every corona treatment station is started separately. To do this, the corona electrode is moved to in working position. If certain requirements are met, the corona treatment starts automatically.

Required personnel

This activity may only be performed by specialists and operating personnel.

Safety

⚠ DANGER

Ozone emission at the corona treatment station causes extreme irritation of the eyes and airways.

- ▶ Check that the exhaust system is functioning properly before starting production.
- ▶ Ensure a permanent ozone exhaust system when the corona treatment station is in operation.
- ▶ If there is a smell of ozone in the hall, check the ozone exhaust system for leaks.

⚠ DANGER

High voltage in the electrodes area in operating state.

Touch of high voltage may lead to death and long term damages to the health.

- ▶ Do not touch the electrode area.
- ▶ Do not remain in the vicinity of the electrode area. This can result in spark discharges.

⚠ CAUTION

During the corona treatment, ultraviolet radiation is generated.

Ultraviolet radiation can damage the eyes.

- ▶ Wear safety goggles.

Starting corona treatment

- ▶ Move the corona electrode to working position and start the ozone exhaust system.
- For the treatment of the film underside, press [corona bottom work pos.] on the BK1 operator panels.
- For the treatment of the film top side, press [corona top work pos.] on the BK1 operator panel.
- ▶ Ensure that the ozone exhaust system in the corona treatment station is running and all shutting flaps are open.

The corresponding corona generator starts automatically and the film is treated, if the following requirements are met:

- The corona generator is enabled.
- The roll speed is greater or equal to the minimum speed. The minimum speed can be set on operator panel BK 1.

6.4.5.2 Starting coating

Description

Each coating machine is started separately.

- If the film is to be coated on both sides, start the coating in coating machine 1 and coating machine 2.
- If the film top side is to be coated, start the coating in coating machine 1.
- If the film underside is to be coated, start the coating process on coating machine 2.
- If the film is not to be coated, no coating needs to be started.

Required personnel

This activity may only be performed by specialists and operating personnel.

Requirement

- The corona electrode is in working position and the corona treatment station is in operation.
- The drives, pumps and control systems of the inline coating device are enabled.
- The coating chamber must be in working position.
- In the container of the coating material supply, there is sufficient coating medium.
- If a coating agent is used with toxic solvent vapours, an exhaust system must be present. The exhaust system must be switched on.

Safety

Depending on the coating agent used, dangerous solvent vapours can occur.

⚠ WARNING

Solvents cause noxious vapours.

These can lead to irritation of the skin, eyes and airways as well as to changes in mental status from solvent vapours.

- ▶ Only carry out this work if the area is well ventilated.
- ▶ Do not breathe in the vapours.
- ▶ Avoid contact with the skin.
- ▶ Wear suitable protective clothing (breathing mask, safety goggles, protective gloves).
- ▶ Pay attention to the safety data sheets of the manufacturer.

When the drive is running, rolls turn.

⚠ WARNING

Rotating machine parts can draw in clothing and body parts.

This can lead to serious head and body injuries.

- ▶ Wear close-fitting clothing.
- ▶ Wear a hairnet if necessary.
- ▶ Do not reach into the vicinity of rotating machine parts.
- ▶ Do not go through under a running film track.
- ▶ Wait for the machine to come to a standstill.
- ▶ Before starting, ensure that no one is located in the danger zone.

The coating agent can contaminate workplaces and corridors.

⚠ WARNING

Danger of slipping on wet floors.

This will lead to serious head and body injuries.

- ▶ Do not step on soiled areas.
- ▶ Close off access to soiled areas.
- ▶ Remove leaked fluid immediately.
- ▶ Keep the workplace and corridors clean.

Selecting the coating machine

Starting the coating of the film

- ▶ Selecting the desired coating machine: On operator panel BK1, select [coater 1 select] or [coater 2 select].
- ▶ Switch on the pump of the coating material supply. On operator panel BK1, press [pump run].
 - ✓ The coating chamber must be filled with the coating medium.
 - ▶ Check the coating chamber is leak-tight.
- ▶ Switch on the drive of the gravure roll. On operator panel BK1, press [gravure roll run].
 - ▶ Check that the gravure roll is completely coated with coating medium.
 - ▶ Move the kiss-coat roll into the working position. On operator panel BK1, select [kiss coat roll work pos.].
 - ⇒ The flashing light flashes for at least 3 seconds before and during the movement.
 - ⇒ The kiss-coat roll moves to working position. This presses the film onto the gravure roll. The film is coated.

7 Production faults

7.1 Types of film break

Film break in the pull roll unit or the winder unit

- A film break in the pull roll unit or the winder unit triggers the following actions:
- The "Film Break" acoustic alarm sounds.
 - The drives of the pull roll unit and winder unit are stopped. If the film production line is in "Pull Roll Speed Up Mode" or "Production Mode", it switches to "Pull Roll Thread Mode". The speed is adjusted. Further actions on the film production line can be triggered by changing the line threading mode.
 - If there is an edge trim device, the blades or the circular knife are moved into the park position.
 - The spreading roller of the pull roll unit and the winder unit are swivelled into the park position.
 - If there are part nip rollers in the pull roll unit, they are moved into the parking position.
 - The nip rolls of the pull roll unit are swivelled into the park position.
 - If there is a corona treatment station in the pull roll unit, the electrodes are moved into the park position. This switches off the corona treatment, the generator and the ozone exhaust system.
 - The thickness gauge of the pull roll unit remains in its present position.
 - If there is a web cleaning device in the pull roll unit, it is stopped and moved into the park position.
 - If there is a corona treatment station in the inline coating device, the electrode is moved into the park position. This switches off the corona treatment, the generator and the ozone exhaust system.
 - In the inline coating device, the kiss-coat roll is moved into the park position. The flashing light flashes for at least 3 seconds before and during the movement. The coating of the film stops.
 - If there is an integrated grinder, the grinder and the feeding roll drives can start.

Film break in the transverse direction orienter

A film break in the transverse direction orienter triggers the following actions:

- The "Film Break" acoustic alarm sounds.
- The transverse direction orienter continues to run in order to transport film residues out of the transverse direction orienter.
- Optional: The pre-opener bar at the outlet turn around of the transverse direction orienter moves out in order to open the clips sooner.
- The blow-off nozzles of the transverse direction orienter are activated in order to blow film residues off the clips.

When film exits from the outlet across the entire working width, the blow-off nozzles stop automatically.

- or -

If not all film residues are removed from the clips, the transverse direction orienter is stopped. This prevents film residues from getting into the return track.

- If the drives of the transverse direction orienter stop, the film tension in the direction of the machine direction orienter is missing. This stops the drives of the machine direction orienter.

The line goes into "MDO Thread Mode" line threading mode. Further actions on the film production line can be triggered by changing the line threading mode.

If there is an integrated grinder, the grinder and the feeding roll drives can start.

- If the drives of the transverse direction orienter stop and the speed is coupled with the pull roll unit, the drives of the pull roll unit and the winder unit are stopped. Further actions take place.
- If there is a corona treatment station in the inline coating device, the electrode is moved into the park position. This switches off the corona treatment, the generator and the ozone exhaust system.
- In the inline coating device, the kiss-coat roll is moved into the park position. The flashing light flashes for at least 3 seconds before and during the movement. The coating of the film stops.

Film break in the inline coating device

There is no film break sensor in the inline coating unit.

- Film break in the machine direction orienter**
- A film break in the machine direction orienter triggers the following actions:
 - The "Film Break" acoustic alarm sounds.
 - The film production line goes into the "MDO Thread Mode" line threading mode.
 - The drives of the machine direction orienter are stopped.
 - If the speed of the machine direction orienter is coupled with the transverse direction orienter and there is film at the outlet of the machine direction orienter, the drives of the transverse direction orienter are stopped. The actions take place during a stop of the drives.
 - If there is a corona treatment station in the inline coating device, the electrode is moved into the park position. This switches off the corona treatment, the generator and the ozone exhaust system.
 - In the inline coating device, the kiss-coat roll is moved into the park position. The flashing light flashes for at least 3 seconds before and during the movement. The coating of the film stops.
 - If the drives of the transverse direction orienter are stopped, the drives of the following coupled line components also stop. The actions take place during a stop of the drives.
 - On the film casting unit, a safety action is implemented. For more information, see "Safety action on the film casting unit in the event of a malfunction".

- Film break in the film casting unit** There is no film break sensor in the film casting unit.

7.2 Eliminating a film break

- Safety** If there is a film break in the transverse direction orienter, the blow-off nozzles at the outlet are activated. The blowing off of the film residues from the clips is loud.

⚠ CAUTION

Constant noise > 85 dB causes permanent damage to the hearing.

- Wear ear protection.

The blow-off nozzles blow the film residues off the clips.

⚠ CAUTION

The air flow can cause dust and film residues to fly around.

This can cause injury to the eyes.

- Wear eye protection.

When changing the line threading mode, the shutters in the oven can move.

Danger of crushing when opening and closing the shutters.

⚠ CAUTION

Moving machine parts can crush body parts.

This can lead to injury.

- Do not reach into the vicinity of moving machine parts.

In the event of a film break in the film production line, the transverse direction orienter can stop.

ATTENTION

The chain remains in the hot transversal direction orienter for several hours ($\geq 100^{\circ}\text{C}$).

The chain lubricant may decompose.

- ▶ As long as the transverse direction orienter is hot, let the drives of the track system run.
 - ⇒ The clips move through the transverse direction orienter.

Eliminating a film break

The activities are described in the chapters of the line operation manual.

Stationary machines	Eliminating a film break
Pull roll unit, winder unit	<ul style="list-style-type: none"> ▶ Sever the film upstream of the pull roll unit. ▶ Remove produced film out of the rearmost running machine. ▶ Clean the stationary machines. ▶ Start up the stationary machines again.
There are also machines upstream of the pull roll unit.	<ul style="list-style-type: none"> ▶ The running machines shut down. ▶ Clean the machines. ▶ Start up the line. - or - ▶ Operate the machine in standby. - or - ▶ Switch off the machine.

Accumulation of film breaks

If multiple film breaks take place in a short period of time, check and adjust the raw material quality and line settings.

7.3 Fault types

Fault types

Type of fault	How can the fault be detected?
Poor film quality	<ul style="list-style-type: none"> • Appearance of the film • Quality of the film properties
Fault on the line	<ul style="list-style-type: none"> • Message in WinCC OA • Message on the line • Mechanical fault on the line (e.g. roll stationary)

7.4 Eliminating a fault

Safety

In the event of a fault in the line, the transverse direction orienter can stop.

ATTENTION

The chain remains in the hot transversal direction orienter for several hours ($\geq 100^{\circ}\text{C}$).

The chain lubricant may decompose.

- ▶ As long as the transverse direction orienter is hot, let the drives of the track system run.
 - ⇒ The clips move through the transverse direction orienter.

Eliminating a fault

The activities are described in the chapters of the line operation manual.

Type of fault	Eliminating a fault
Poor film quality	<ul style="list-style-type: none"> ▶ Localise the malfunction. <p>Eliminating the malfunction during production:</p> <ul style="list-style-type: none"> ▶ Eliminate the fault. <p>Shut down the line and eliminate the malfunction:</p> <ul style="list-style-type: none"> ▶ Shutting down the line. ▶ Eliminate the fault. ▶ If necessary, reset the fault. ▶ Clean the line. ▶ Start up the line. <p>- or -</p> <ul style="list-style-type: none"> ▶ Operate the line in standby. <p>- or -</p> <ul style="list-style-type: none"> ▶ Switch off the line.

Type of fault	Eliminating a fault
Fault on the line	<p>Eliminating the malfunction during production:</p> <ul style="list-style-type: none"> ▶ Eliminate the fault. <p>Partially shut down the line and eliminate the malfunction:</p> <ul style="list-style-type: none"> ▶ Carry out a cut back. ▶ Eliminate the fault. ▶ If necessary, reset the fault. ▶ Clean the stationary machines. ▶ Start up the stationary machines again. <p>Shut down the line and eliminate the malfunction:</p> <ul style="list-style-type: none"> ▶ Shutting down the line. ▶ Eliminate the fault. ▶ If necessary, reset the fault. ▶ Clean the line. ▶ Start up the line. <p>- or -</p> <ul style="list-style-type: none"> ▶ Operate the line in standby. <p>- or -</p> <ul style="list-style-type: none"> ▶ Switch off the line. <p>Eliminate a malfunction on the stationary line:</p> <ul style="list-style-type: none"> ▶ Eliminate the fault. ▶ Reset the fault. ▶ Clean the line. ▶ Start up the line. <p>- or -</p> <ul style="list-style-type: none"> ▶ Operate the line in standby. <p>- or -</p> <ul style="list-style-type: none"> ▶ Switch off the line.

Resetting the fault

Faults output by the process control system must be reset after the fault is eliminated.

- ✓ The fault is remedied.
- ▶ Reset the fault. On the operator panel, press [fault reset].
 - ⇒ All remedied faults on the line are reset.
 - ⇒ Triggered safeguards visible on the operator panel are reset. This does not apply on the operator panel in the control room.

After all faults and triggered safeguards have been reset, the line components can be started again.

7.5 Safety action on the film casting unit in the event of a malfunction

Safety action on the film casting unit

In case of a film break in the machine direction orienter or a crack of the wire or the strip in the film pinning device the frame with chill roll is moved in direction of the park position. The maximum movement distance is 100 mm. It is specified by the safety engineer and must not be changed.

8 Shutting down the film production line

Description

After the film production, the line is moved into a production-free operational state. The shutdown of the line is then described.

After the shutdown of the line, the machine must be cleaned. Additional information as regards cleaning can be found in the chapters of the line components or in the manuals of the line components.

The line components are then operated in standby or switched off. This information can be found in the chapters of the line components.

8.1 Carrying out a Cut Back

Procedure

In "Cut Back Mode", the line speed is reduced, the treatment is stopped in the inline coating device and the settings are adapted. Afterwards, the drives of the pull roll unit and the winder unit are stopped. The film is severed downstream of the transverse direction orienter and the incoming film is disposed of. On the machine direction orienter, the stretching ratio is reduced and the components are moved into the park position. The film is then cut off downstream from the film casting unit and wound onto the auxiliary winder. The machine direction orienter, the inline coating device and the transverse direction orienter are run until they are free of film.

Requirement

- The film production line is at least in "TDO Thread Mode".
- The winding shaft of the auxiliary winder is prepared with adhesive tape.

Personal protective equipment

- Cut-resistant and heat resistant protective gloves
- Protective clothing

Auxiliary materials

- Tool for severing the film

Safety

Danger due to magnetic fields

Powerful magnetic and electromagnetic fields occur at the following points:

- Optional: Linear motor of the edge control device (LIWEB) of the track system.

Powerful magnetic fields occur at the following points:

- Optional: Magnetic clip closers at the inlet of the track system.
- Optional: Magnetic clip openers at the outlet of the track system.
- Optional: Magnetic counterpiece on the clip opener or clip closer of the track system.
- Optional: In the stretching section, in track systems with magnetic relief.

DANGER

Powerful magnetic and electromagnetic fields disrupt the functioning of active medical devices such as pacemakers, insulin pumps and hearing aids.

- ▶ Personnel with such active medical equipment must maintain a safe distance of at least 0.8 m at all times.

▲ DANGER

Even when the machine is switched off, strong magnetic fields of permanent magnets have a direct impact on people and can interfere with the operation of active medical accessories. The following people must maintain a safety distance of at least 0.8 m:

- ▶ People who have a heart pacemaker and/or metal implants.
- ▶ People who use insulin pumps and/or hearing aids.
- ▶ People who wear magnetic or electrically conductive objects.

▲ WARNING

Powerful magnetic and electromagnetic fields exert extremely high powers of attraction on magnetisable (ferromagnetic) materials.

There is a danger of cuts and danger of crushing.

- ▶ Even if the machine is switched off, powerful magnetic fields from permanent magnets are present.
- ▶ Work in the vicinity of magnetic parts must be carried out by at least 2 persons.
- ▶ Wear protective gloves and other personal protective equipment if necessary.
- ▶ Keep magnetisable objects (e.g. watches, keys, fixing parts made of steel, steel or iron tools) and permanent magnets away from magnetic parts.
- ▶ Use suitable tools made of non magnetisable material.
- ▶ Use non magnetisable materials (e.g. a wooden bar) to free pinched body parts in case of an accident.

ATTENTION

Powerful magnetic and electromagnetic fields can damage electronic devices, measuring instruments, watches and data storage media.

This can cause irreparable damage.

Electronic devices and measuring instruments can change their calibration.

Data loss can occur on magnetic and electronic data storage media.

- ▶ Do not bring parts near the magnets.
- ▶ Maintain a safety distance of 0.8 m.

ATTENTION

Powerful magnetic and electromagnetic fields attract ferromagnetic parts such as tools or fixing parts made of steel.

- ▶ Do not bring ferromagnetic parts, i.e. magnetisable parts, near the magnets.

Danger from heat

The surfaces inside and outside the transverse direction orienter are hot.

▲ CAUTION

Hot surfaces can cause burns.

- ▶ Do not touch surfaces.
- ▶ Wear protective gloves.
- ▶ Wear protective clothing.

Hazard from noise

During operation, it is loud at the inlet and outlet of the transverse direction orienter.

WARNING

Constant noise > 85 dB causes permanent damage to the hearing.

- ▶ Wear ear protection.

Dangers at the shutters

When changing the line threading mode, the shutters in the oven can move.

Danger of crushing when opening and closing the shutters.

CAUTION

Moving machine parts can crush body parts.

This can lead to injury.

- ▶ Do not reach into the vicinity of moving machine parts.

Cut Back Mode

When starting Cut Back Mode, among other things, the nip rolls at the outlet of the film casting unit and at the outlet of the machine direction orienter is swivelled into working position.

When the nip roll moves into the working position, there is a danger of crushing and being pushed.

Due to the rotating nip roll, body parts can be caught and drawn in.

WARNING

Moving machine parts can crush, entangle, draw in and crash into body parts.

This can lead to serious injury.

- ▶ Work with caution on moving parts.
- ▶ Wear close-fitting clothing.

✓ The interlocks for Cut Back Mode must be fulfilled.

▶ Start Cut Back Mode. On the operator panel BM3, press [cutback mode].

▶ Wait until the line has finished reducing its speed.

▶ Switch off the pull roll unit. On operator panel, press [pull roll stop].

⇒ The drives of the pull roll unit are stopped.

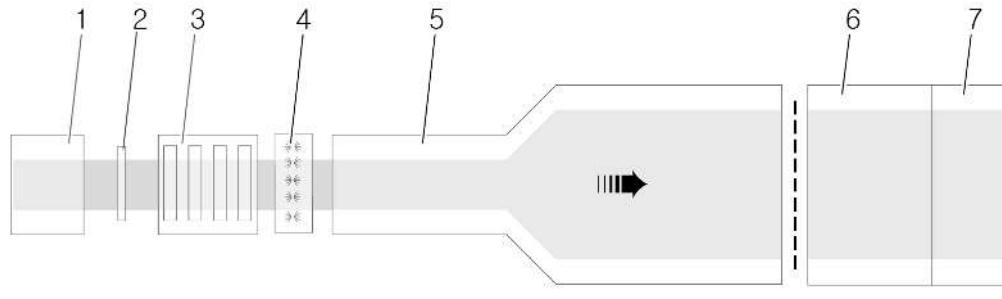
⇒ The drives of the coupled winder unit are stopped.

Switching off the pull roll unit

Severing the film downstream from the transverse direction orienter

Outlet of the transverse direction orienter

- ▶ Sever the film downstream from the transverse direction orienter.
- ▶ At the outlet of the transverse direction orienter, dispose of arriving film.

Overview

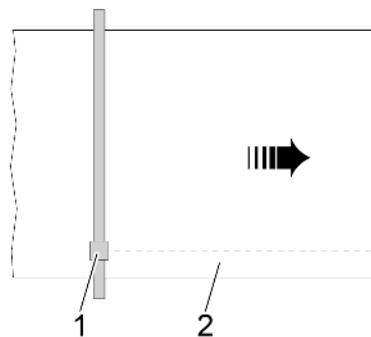
1	Film casting unit	2	Auxiliary winder
3	Machine direction orienter	4	Inline coating device
5	Transverse direction orienter	6	Pull roll unit
7	Winder unit		

Reducing the stretching ratio MD

- ▶ Reduce the stretching ratio MD in the visualisation WinCC OA.

Moving the components of the machine direction orienter into the park position

- ▶ Swivel the infrared radiators into the park position. On operator panel BM3, press [IR - heater park pos.].
⇒ The infrared radiators selected in the "Threading Mode Selection" window in the WinCC OA are moved into the park position.
- ▶ Swivel the nip rolls into the park position. On operator panel BM3, press [nip rolls park pos.].
⇒ The nip rolls selected in the "Threading Mode Selection" window in the WinCC OA are swivelled into the park position.

Cutting film strips with the cross cutting device of the film casting unit**Inlet of the machine direction orienter**

1	Cutter head of the cross cutting device	2	Film strip
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⚠ WARNING

Moving cutting knives cause serious cutting injuries or cut off body parts.

- ▶ It is prohibited to be within the area of movement of the cutting knives.
- ▶ Keep your distance.

⚠ CAUTION

Moving machine parts can crush body parts.

This can lead to injury.

- ▶ Do not reach into the vicinity of moving machine parts.
- ▶ Wait for the machine to come to a standstill.

- ▶ Position the cutter head of the cross cutting device approx. 15 cm away from the film border.
- For movement to the right, press and hold [cross cutter -->] on operator panel BM1 until the cutter head is in position.
- For movement to the left, press and hold [cross cutter <--] on operator panel BM1 until the cutter head is in position.
- ▶ Pierce the film with the blade of the cutter head. On operator panel BM1, press [knife in film].
- ⇒ The film is cut into 2 film strips.

Switching on auxiliary winder downstream from the film casting unit

At the inlet of the machine direction orienter

- ▶ Ensure that no-one is located in the danger zone of the auxiliary winder.
- ▶ Switch on the auxiliary winder. On operator panel BM1, press [aux. winder 1 run].
- ⇒ The auxiliary winder turns at the speed of the previous line component.
- ⇒ The auxiliary winder turns at the torque set on the operator panel.
- ⇒ At a speed above 15 m/min, the triggered safeguard causes an emergency stop of the auxiliary winder.

Briefly bridging the light barrier to the auxiliary winder after the film casting unit

At the auxiliary winder after the film casting unit

- ▶ Press the safety enabling button to the centre position and hold it there.
- ⇒ At a speed of the auxiliary winder above 15 m/min, triggering the light barrier causes not an emergency stop of the auxiliary winder.
- ⇒ The green signal light lights.

WARNING

Rotating parts on the auxiliary winder draw in clothing and body parts.

This can lead to injury.

- ▶ Maintain the distance to the auxiliary winder.
- ▶ Wear close-fitting clothing.
- ▶ Pass through the light barrier.
 - ⇒ The torque of the auxiliary winder is reduced and limited.
 - ⇒ The yellow signal light lights.
 - ⇒ With speeds of the auxiliary winder above 15 m/min: If the push button of the safety enabling button is released or if it is pressed down all the way to the stop, an emergency stop of the auxiliary winder is executed.
 - ⇒ With speeds of the auxiliary winder below 15 m/min: If the push button of the safety enabling button is released or if it is pressed down all the way to the stop, an emergency stop of the auxiliary winder is executed.

ATTENTION

Due to the security settings on the auxiliary winder, the film in front of the auxiliary winder can sag.

The film can be pulled into the machine in front of it.

The film cannot be properly pulled into the following machine.

- ▶ Keep the presence of persons in the danger zone of the auxiliary winder as short as possible.
- ▶ After leaving the danger zone, reset the security settings.
- ▶ Tension the sagging film.

Severing the narrow film strips after the film casting unit
At the outlet of the film casting unit

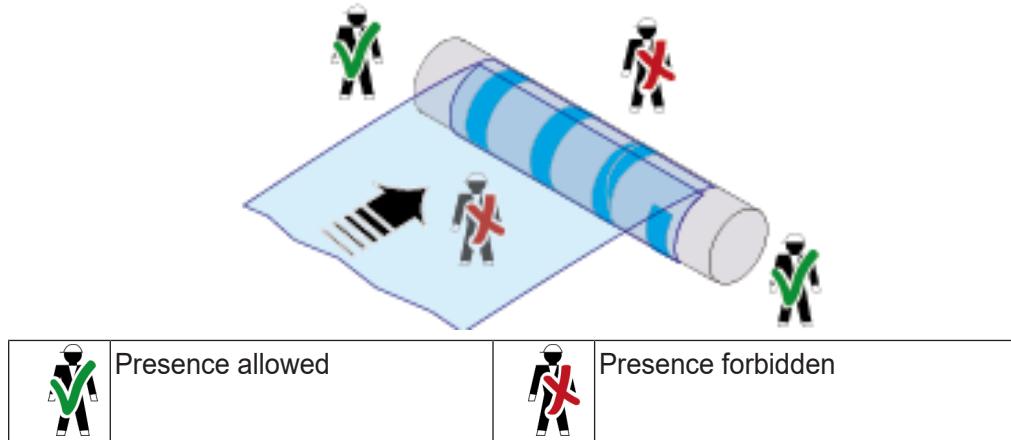
- ▶ Sever the narrow film strip with a suitable cutting tool transverse to the film direction.

Laying the film strip on the auxiliary winder
⚠ WARNING

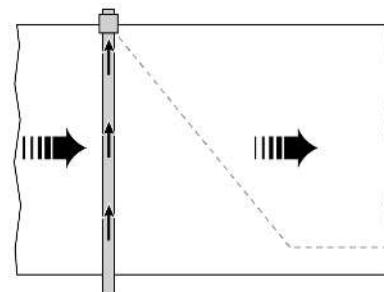
Rotating parts on the auxiliary winder draw in clothing and body parts.

This can lead to injury.

- ▶ Operating the auxiliary winder only from the side.
- ▶ Do not remain in front of or behind the auxiliary winder.
- ▶ Wear close-fitting clothing.



- ▶ Lay the film strips on the prepared winding shaft of the auxiliary winder.

Cutting off the film with the cross cutting device of the film casting unit
At the inlet of the machine direction orienter
**⚠ WARNING**

Moving cutting knives cause serious cutting injuries or cut off body parts.

- ▶ It is prohibited to be within the area of movement of the cutting knives.
- ▶ Keep your distance.

CAUTION

Moving machine parts can crush body parts.

This can lead to injury.

- ▶ Do not reach into the vicinity of moving machine parts.
- ▶ Wait for the machine to come to a standstill.
- ▶ Cut off the film with the blade of the cross cutting device. To do so, move the cutter head with extended blade on the other film side.
- For movement to the right, press and hold [cross cutter -->] on operator panel BM1 until the cutter head is in the end position.
- For movement to the left, press and hold [cross cutter <--] on operator panel BM1 until the cutter head is in the end position.

When the cutter head stops in the end position, the blade is automatically retracted.

The film from the film casting unit is wound up onto the auxiliary winder.

Guiding the severed film into the machine direction orienter

At the inlet of the machine direction orienter

- ▶ Make sure that the severed film is correctly drawn into the machine direction orienter.

Resetting the light barrier to the auxiliary winder after the film casting unit

At the auxiliary winder after the film casting unit

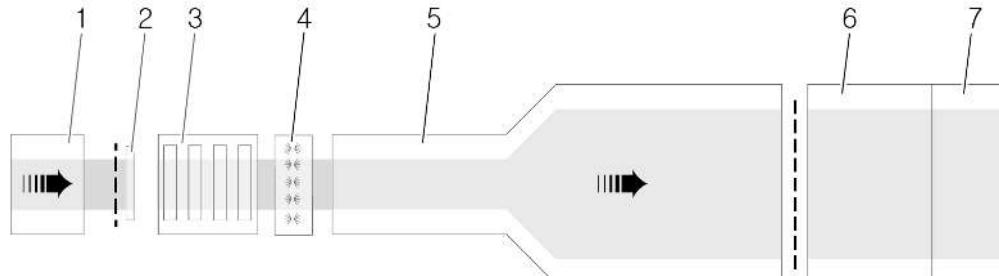
- ✓ No one is located in the danger zone of the auxiliary winder.
- ▶ Reset the light barrier protective function. Press [light barrierer reset] outside the danger zone of the auxiliary winder.
 - ⇒ The auxiliary winder turns with the set torque.
- ▶ Release the safety enabling button.
 - ⇒ At a speed of the auxiliary winder above 15 m/min, triggering the light barrier causes an emergency stop of the auxiliary winder.

Winding up the sagging film with the auxiliary winder after the film casting unit

At the inlet of the machine direction orienter

- ✓ The film wound up on the auxiliary winder is not tensioned.
- ▶ To wind up the sagging film, increase the rpm for the auxiliary winder. On the operator panel BM1, set the rotary switch [aux. winder torque].

Overview



1	Film casting unit	2	Auxiliary winder
3	Machine direction orienter	4	Inline coating device
5	Transverse direction orienter	6	Pull roll unit
7	Winder unit		

Moving the film out of the machine direction orienter

At the outlet of the machine direction orienter

- ▶ Make sure that the film has left the machine direction orienter completely.

Moving the film out of the inline coating device
▲ WARNING

Moving machine parts can crush, entangle, draw in and crash into body parts.

This can lead to serious injury.

- ▶ Work with caution on moving parts.
- ▶ Wear close-fitting clothing.

When the coating chamber is in park position you can cut yourself at the scraper.

▲ WARNING

Stationary knives cause serious cutting injuries or cut off body parts.

- ▶ Do not touch the knives.
- ▶ Wear cut-resistant protective gloves.
- ▶ Wear protective clothing.

▲ CAUTION

Emission tips of the discharging bars can cause stabbing injuries and cutting injuries.

- ▶ Wear cut-resistant protective gloves.
- ▶ Make sure that the severed film is pulled correctly through the inline coating device.
- ▶ When the film has left the inline coating device, switch off the drives of all rolls, except for the drives of the gravure rolls. On operator panel BK1, press [coater stop].

Moving the film out of the transverse direction orienter

- ▶ Make sure that the severed film is correctly drawn into the transverse direction orienter.

Do not switch off the drives of the transverse direction orienter before the transverse direction orienter has cooled down.

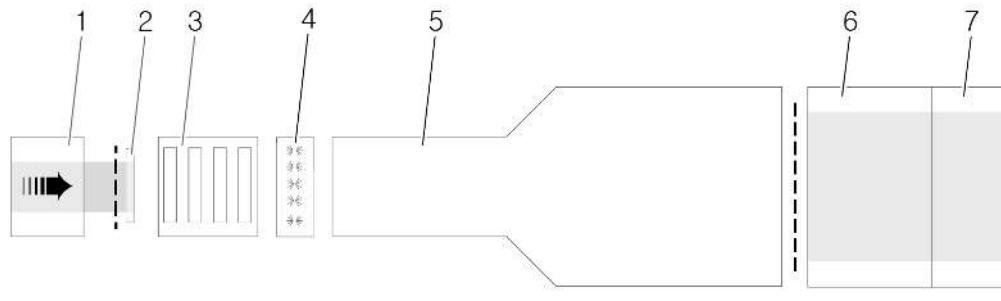
ATTENTION

The chain remains in the hot transversal direction orienter for several hours ($\geq 100^{\circ}\text{C}$).

The chain lubricant may decompose.

- ▶ As long as the transverse direction orienter is hot, let the drives of the track system run.
 - ⇒ The clips move through the transverse direction orienter.

Overview



1	Film casting unit	2	Auxiliary winder
3	Machine direction orienter	4	Inline coating device
5	Transverse direction orienter	6	Pull roll unit
7	Winder unit		

Flushing the coating machine and coating medium supply

If the coating medium dries on the gravure roll, it can only be removed with difficulty. Therefore, Brückner recommends flushing the coating machine, especially the gravure roll, with water directly while shutting down the inline coating device. For further information on cleaning, see chapter "Flushing the coating machine and coating medium supply" and manufacturer documentation.

After the flushing, the drive of the gravure roll is switched off with the pump of the coating medium supply running. The pump is switched off only when the gravure roll has come to a standstill.

8.2 Shutting down the film casting unit and extrusion systems

Description

The drives of all extrusion systems are switched off. Now the components of the film casting unit are moved into the park position. Let the film casting unit run until it is free of film. Finally the drive of the auxiliary winder is switched off.

Requirement

- The film from the film casting unit is wound up onto the auxiliary winder.

Required personnel

Three operators are required.

- One operator at operating panel
- 1 operator upstream of the film casting unit
- 1 operator downstream from the film casting unit
- Heat-resistant protective gloves
- Heat resistant protective clothing
- Hard hat with face protection
- A bamboo spatula for severing the melt at the die.

Personal protective equipment

Auxiliary materials

During operation, there are dangers on the electrostatic film pinning device.

DANGER

High voltage at the film pinning device causes life-threatening injuries from electric shock.

- Do not touch parts.
- Keep your distance.
- Access is forbidden for people with a heart pacemaker.

▲ CAUTION

If the wire or the band of the film pinning device tears, parts can fly around.

This can lead to injury.

- ▶ Wear heat-resistant protective gloves.
- ▶ Wear a hard hat with face protection.
- ▶ Wear protective clothing.

The melt can spray profusely under the following conditions:

- The melt pipe is overheated.
- There is moisture in the melt or the lines.
- The melt contains air bubbles.

▲ WARNING

Hot melt escaping under pressure causes serious burns.

- ▶ Wear heat-resistant protective gloves.
- ▶ Wear a hard hat with face protection.
- ▶ Wear protective clothing.

The extrusion system is very hot.

The covers at the melt die and the adapter block are for insulation purposes and do not serve as safeguards.

Other components of the melt die unit and the film casting unit can be hot.

▲ WARNING

Hot surfaces can cause serious burns.

- ▶ Do not touch hot surfaces.
- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing.

The components are moved or swivelled into the working or park position.

▲ WARNING

Moving machine parts can crush body parts.

This can lead to serious injury.

- ▶ Do not reach into the vicinity of moving machine parts.
- ▶ Wait for the machine to come to a standstill.
- ▶ Before actuating the machine parts, ensure that no one is located in the danger zone.

- ▶ Switch off the drives of all extrusion systems. See separate chapter.

Switching off the drives of all extrusion systems

Moving components into the park position and switching them off

- ▶ Move the electrostatic film pinning device in the direction of the park position. On operator panel BEC, BC2 or BC3 (option), press and hold [pinning park pos.] until the film pinning device stops automatically. Release the push button.
 - ⇒ When the working position is left, the high voltage of the electrostatic film pinning device is switched off.
- ▶ Open the safety grid of the film pinning device.

- ▶ Move the electrostatic film pinning device into the park position. On operator panel BEC, BC2 or BC3 (option), press and hold [pinning park pos.] until the film pinning device stops automatically. Release the push button.
 - ▶ Move the take-off roll into the park position. On the film casing unit, press [take off roll park pos.].
 - ▶ Move the nip roll into the park position. On operator panel BM1, press [nip roll P. R. park pos.].
 - ▶ Move the frame with chill roll into the park position. On operator panel BEC, press and hold [chill roll park pos.] until the chill roll is in park position. Release the push button.
 - ⇒ During the movement, an acoustic warning signal sounds or the signal light flashes.
- simultaneously -



- ▶ Before the chill roll has left the area beneath the melt die, sever the melt with a spatula.
 - ⇒ The film remaining on the chill roll is drawn through the film casting unit.
- ▶ Switch off the auxiliary winder. On the operator panel, press [aux. winder x stop].
 - ⇒ The drive is stopped.
 - ⇒ The signal light goes out.

Switching Off the Auxiliary Winder

Shutting down the film production line

Shutting down the film casting unit and extrusion systems

9 Operating the line

Master of the extrusion system

- In an extrusion system with extruder and melt pump, the melt pump is the master for the melt output of the extrusion system. If the rpm on the drive of the melt pump is changed, the rpm on the extruder and the throughput of the dosing unit change proportionally.
- In an extrusion system with extruder and without melt pump, the extruder is the master for the melt output of the extrusion system. If the rpm on the drive of the extruder is changed, the throughput of the dosing unit changes proportionally.

Setpoints

Setpoints are the settable values used to operate the line, e.g. temperatures, fan speeds, drive speeds.

The setpoints can be set and transmitted to the line in WinCC OA. These settings are described in the following sections.

9.1 Operating the drives

Contents

This chapter contains information which applies for all machines.

The switching on and off of the drives differs between individual machines. This information can be found in the chapters of the machines.

9.1.1 Setting the drive speed or rpm

Description

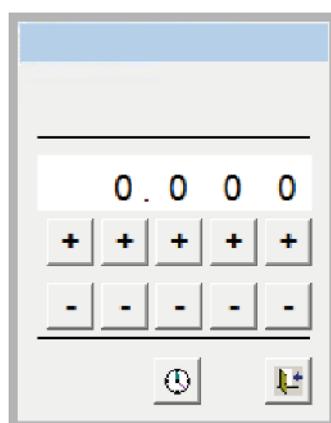
The drive speed or rpm of a drive is set in the component window in WinCC OA.

Requirement

- The speed linking for the line components being set must be switched off.

Setting the speed or rpm

- In the drive display, click on the speed or rpm with the dark blue background.
⇒ The input window opens.



Variant: Enter the setpoint and transmit it to the line.

- Enter the setpoint using [+] and [-].
⇒ The setpoint is transmitted to the line.

- or -

Variant: Enter the setpoint and transmit it with ramping to the line. For information, see online help.

- Close the input window. To do so, click on "Door".
⇒ The input window closes.

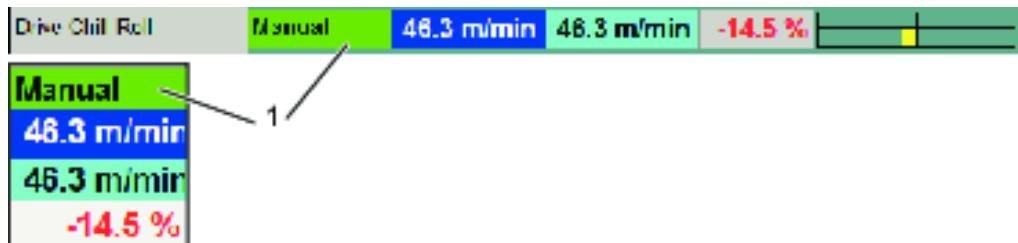
9.1.2 Displaying the locks of the drives

Description A machine can only be started and operated when none of its drives is interlocked. If an interlock occurs in operation, the machine stops.

Line component status The status of the line component is visible on the operator panels. The lighting of the push button which switches on the drives of the line component indicates the status and indicates the interlocks of the drives.

Operator panel	Line component status	Interlock of the drives
The push button does not light up.	The drives of the line component cannot be started.	One or more interlocks active.
The push button flashes.	The drives of the line component can be started.	No interlock is active.
The push button flashes rapidly.	The drives of the line component are started. The start sequence runs.	
The push button lights.	The line component is operating.	

Drive status The status of the drive is displayed in WinCC OA in the window of the line overview or in the windows of the machines.



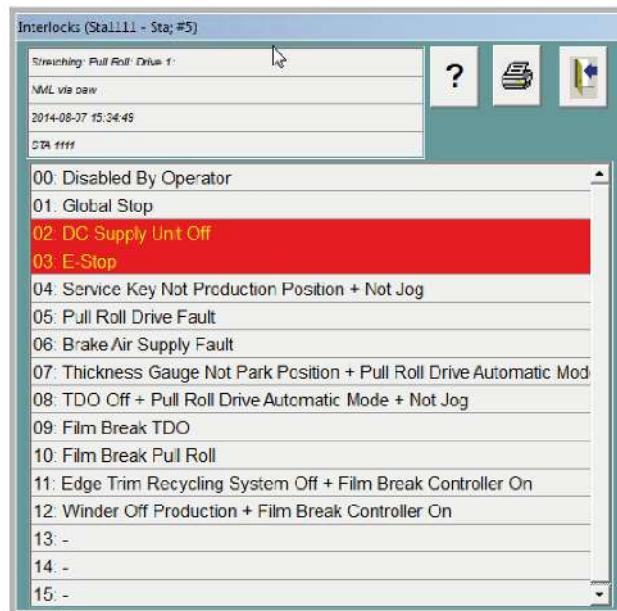
1 "Drive status" button

"Drive status" button	Drive status	Locking devices of the drive
Disabled	The drive cannot be started.	One or more locking devices is/are active.
Ready	The drive can be started.	No locking devices are active.
Automatic	The drive is running. The machine speed is linked.	
Manual	The drive is running. The machine speed is not linked.	
Jog	The drive runs in fast "Jogging Mode".	
Cleaning	The drive runs slow in "Jogging Mode".	
Not Ready	The drive is stopped. The drive is in the shutdown sequence.	-
Deselected	The drive is deselected.	-
Alert	There is an alarm for the drive.	One or more locking devices is/are active.

Calling up the interlocks of the drives

The interlocks of the drives can be displayed in WinCC OA.

- ▶ Click on the "Drive Status" button with the right mouse button and select [Interlocks..].
- ⇒ The window with the interlocks is displayed.
- ⇒ Active interlocks are highlighted in red.
- ⇒ Non active interlocks are highlighted in grey.



Example: Window interlocks of drive 1 of the pull roll unit

9.2 Setting the temperature of a component with a heating and cooling unit

9.2.1 Setting the temperature zones of the heating and cooling unit

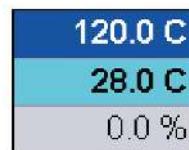
Description

The temperature zones of the heating/cooling unit are set in the component window in WinCC OA.

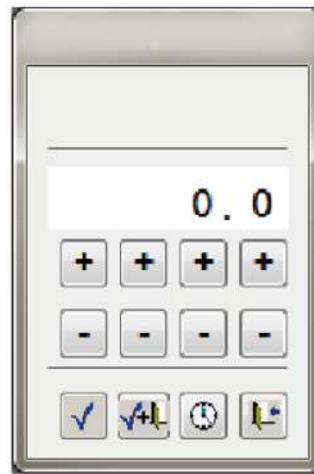
There are 2 possible ways of setting the temperature zones:

- Setting one temperature zone.
- Setting all temperature zones in the window.

Changing a temperature zone



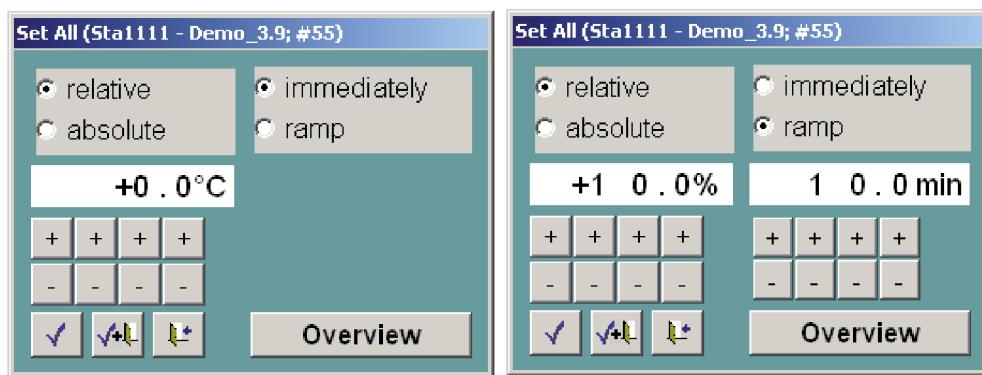
- ▶ In the temperature display, click on the temperature with the blue background.
- ⇒ The input window opens.



- ▶ Enter the temperature using [+] and [-].
- ▶ Transmit the temperature to the film production line and close the input window.
 - Tick: The temperature is transmitted to the film production line.
 - Tick + door: The temperature is transmitted to the film production line and the input window is closed.
 - Clock: The window for carrying out the ramping is opened. Here the temperature can be transmitted to the film production line in several steps during the time interval still to be entered. For further information, see online help.
 - Door: The input window closes. The temperature is not transferred to the line.
- ▶ Click on [All Zones].
 ⇒ The "All Zones" menu is displayed.



- ▶ Click on [Setpoint].
 ⇒ The input field opens.



- ▶ Select [absolute] or [relative].
 - absolute: The entered value equals the temperature.
 - relative: The temperature is increased or decreased by the entered value.
- ▶ Enter the temperature or temperature difference using [+] and [−].
- ▶ Select [immediately] or [ramp].
 - immediately: All temperatures are changed in one step.
 - ramp: All temperatures are changed in several steps during the specified time interval.
- ▶ If the [ramp] function was selected, enter the time interval for the change.
- ▶ Transmit the setpoint to the film production line and close the input window.
 - Tick: The setpoint is transmitted to the line.
 - Tick + door: The setpoint is transmitted to the line and the input window is closed.
 - Door: The input window closes. The setpoint is not transmitted to the film production line.

9.2.2 Adjusting the fan speed

Description

The fans are displayed and set in the component window in WinCC OA.

There are 2 possible ways of setting the fan speed:

- Setting the fan speed of one fan.
- Setting the fan speeds of all the fans in the window.

Fan display

The background color of the fan symbol indicates the fan status.



Background color of the fan symbol	Fan status
grey	The fan is switched off.
Green	The fan is running.

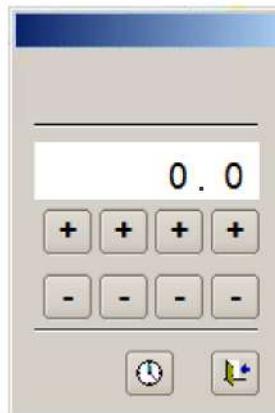
Background color of the fan symbol	Fan status
Yellow	The target speed of the fan is not identical to the actual fan speed. This occurs for example when switching on the fan, as long as the rpm of the fan is not yet reached.
red	There is a malfunction at the fan.

If there is a grid shown on the fan display, the fan is locked.

Changing a single fan speed



- ▶ In the fan display, click on the fan speed with the blue background.
 ⇒ The input window opens.



Transmitting the fan speed without ramping to the line

- ▶ Enter the fan speed using [+] and [-].
 ⇒ The fan speed is transmitted to the film production line.
- ▶ Close the input window. Click on "Door".

Transmitting the fan speed with ramping to the line

- ▶ Define the ramp. Click on "Clock".
 ⇒ The window for carrying out the ramping is opened. Here, the fan speed can be transmitted to the film production line in several steps during the time interval still to be entered. For further information, see online help.

- ▶ Enter the fan speed using [+] and [-].
 ⇒ The fan speed is transmitted to the film production line with ramping.

- ▶ Close the input window. Click on "Door".

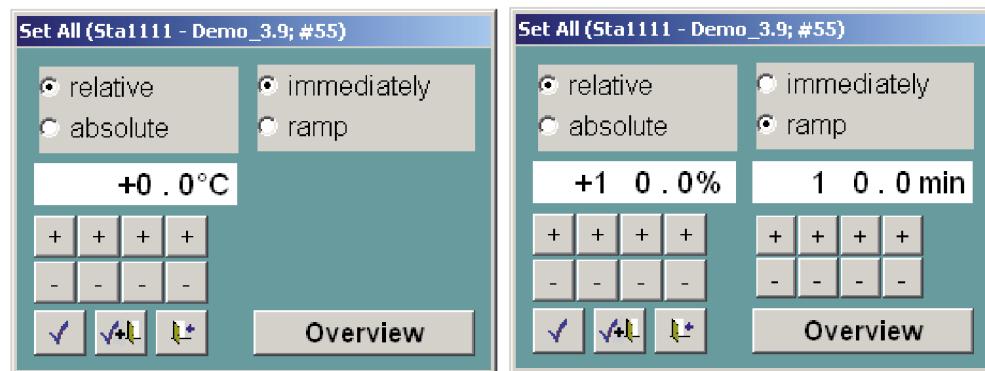
- ▶ Click on [All Fans].
 ⇒ The All Fans menu is displayed.

Changing all fan speeds globally



► Click on [Setpoint].

⇒ The input field opens.



► Select [absolute] or [relative].

- absolute: The entered value corresponds to the new fan speeds.
 - relative: All fan speeds are increased or decreased by the entered value.
- Enter the fan speed or the fan speed difference using [+] and [-].
- Select [immediately] or [ramp].
- immediately: All fan speeds are changed in one step.
 - ramp: All fan speeds are changed in several steps during the specified time interval.
- If the [ramp] function was selected, enter the time interval for the change.
- Transmit the setpoint to the film production line and close the input window.
- Tick: The setpoint is transmitted to the line.
 - Tick + door: The setpoint is transmitted to the line and the input window is closed.
 - Door: The input window closes. The setpoint is not transmitted to the film production line.

9.2.3 Adjusting the mass flow

Description

The mass flow is set in the component window in WinCC OA.

Adjusting a mass flow

► Click on the blue coloured mass flow in the display for the mass flow.



⇒ The input window opens.



- ▶ Enter the mass flow using [+] and [-].
- ▶ Transmit the mass flow to the film production line and close the input window.
- Tick: The mass flow is transmitted to the line.
- Tick + door: The mass flow is transmitted to the line and the input window is closed.
- Clock: The window for carrying out the ramping is opened. Here the mass flow can be transmitted to the film production line in several steps during the time interval still to be entered. For further information, see online help.
- Door: The input window closes. The mass flow is not transmitted to the film production line.

9.2.4 Switching on the heating and cooling units

Description

The heating and cooling units of a component are switched on in the component window in WinCC OA.

Safety

WARNING

Hot surfaces can cause serious burns.

- ▶ Do not touch hot surfaces.
- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing.

ATTENTION

The chain remains in the hot transversal direction orienter for several hours ($\geq 100^{\circ}\text{C}$).

The chain lubricant may decompose.

- ▶ As long as the transverse direction orienter is hot, let the drives of the track system run.
 - ⇒ The clips move through the transverse direction orienter.
- ▶ Click on [All Zones].
 - ⇒ The All Zones menu is displayed.

Switching on the heating and cooling units



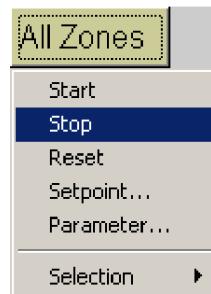
- ▶ In the "All Zones" menu, click on the [Start] list item.
 - ⇒ The heating and/or cooling units of the area shown in the window are started.
 - ⇒ In the transverse direction orienter, the heating and cooling units and the fans of the area shown in the window are started. If there is a clip cooling, this is started.
 - ⇒ The All Zones menu is closed.

9.2.5 Switching off the heating and cooling units

The heating and cooling units are switched off in the component windows in WinCC OA.

Switching off the heating and cooling units

- ▶ Click on the All Zones button.
 - ⇒ The All Zones menu is displayed.



- ▶ In the "All Zones" menu, click on the [stop] list item.
 - ⇒ The heating and/or cooling units of the area shown in the window are switched off.
 - ⇒ In the transverse direction orienter, the heating and cooling units and the fans of the area shown in the window are switched off. If there is a clip cooling, this is switched off.
 - ⇒ The All Zones menu is closed.

9.3 Recipe manager

In WinCC OA, the setpoints of the film production line for a product can be managed in the recipe manager.

The recipe manager is a product data memory that is used to save the setpoints as recipes. A formulation also includes the line threading modes. If the same product is produced again later, the saved setpoints can be loaded and transferred to the film production line.

Each recipe is loaded and transmitted separately.

9.4 Line threading modes

Description

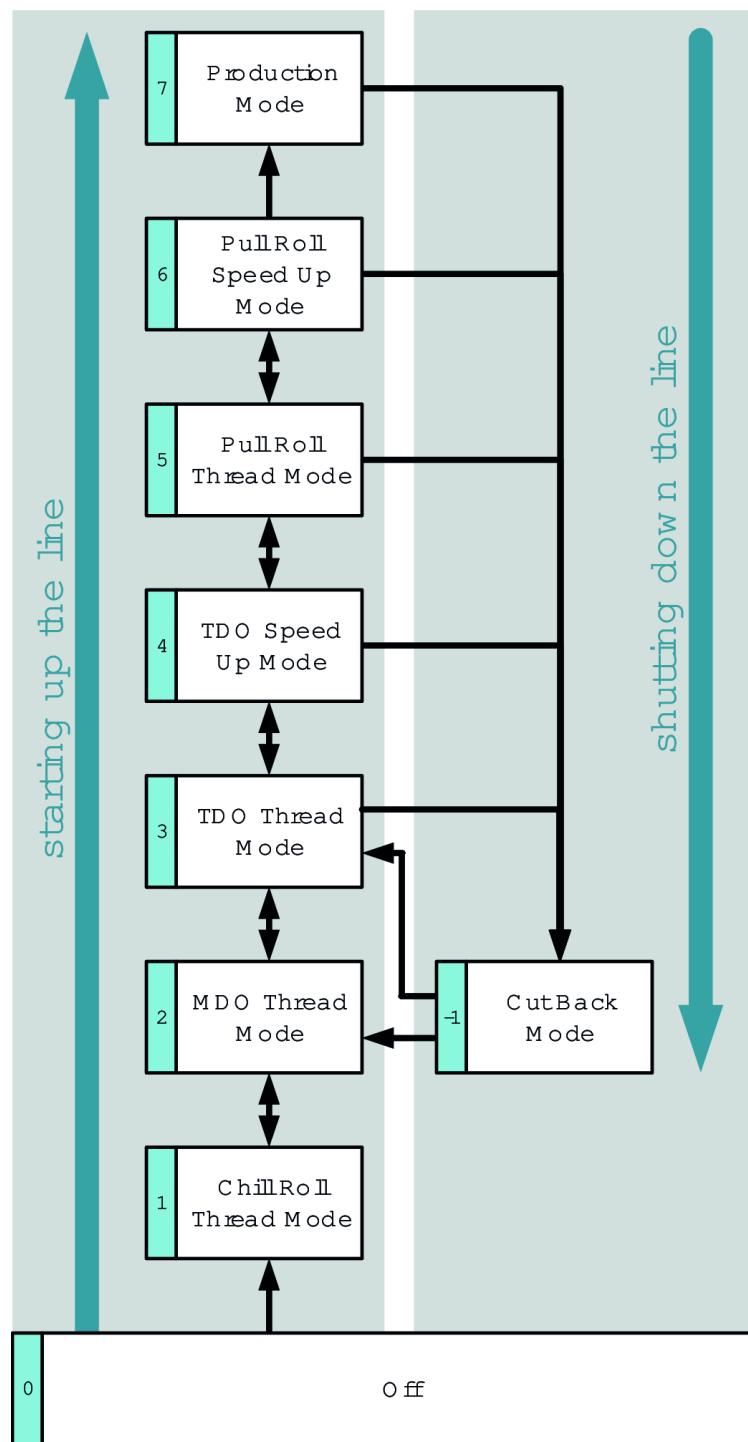
The line threading modes can be used to operate the film production line quickly and in a user-friendly and reproducible manner.

A line threading mode is a collection of setpoints and settings. In WinCC OA, many of these setpoints and settings can be changed.

Each line threading mode is activated on the operator panel with the push button of the line threading mode. Moreover, other actions can lead to process-related change of the line threading modes.

Overview of the line threading modes

The line threading modes are shown in the following graphic.



The line threading modes are activated according to the black arrows.

The line threading modes from "Off" to "Production Mode" are used when **starting up** the film production line.

"Cut Back Mode" is used for **shutting down** the film production line.

The **sequencing** of the line threading modes is marked with numerals on the graphic. A higher line threading mode is referred to if it is activated later when the film production line is started up. "Cut Back Mode" is not included. Example: "Pull Roll Thread Mode" means "Pull Roll Thread Mode", "Pull Roll Speed Up Mode" and "Production Mode" at least.

9.4.1 Line threading mode off

OFF

If the film production line is in no other line threading mode, it is in the Off line threading mode.

9.4.2 Chill Roll Thread Mode line threading mode

Chill Roll Thread Mode	The Chill Roll Thread Mode is used to thread the film into the film casting unit. The line threading mode triggers the following actions:
-------------------------------	--

- The values in the Stretching: Line Speed: Threading window are transmitter to the line.

9.4.3 MDO Thread Mode line threading mode

MDO thread mode	"MDO Thread Mode" is used to thread the film into the machine direction orienter.
------------------------	---

The line threading mode triggers the following actions:

- The "Automatic Chill Roll -> MDO" linking is active.
- The values in the "Stretching: Line Speed: Threading" window are transmitted to the film production line.
- All nip rolls of the machine direction orienter move into the park position.
If there is a driven nip roll at the machine director orienter outlet and if there is film at the machine direction orienter outlet when changing to the MDO Thread Mode line threading mode, the driven nip roll is not moved into park position.
- All infrared radiators of the machine direction orienter move into the park position.
- The conveying fan and the drive of the edge trim grinder are switched off.
- On the film casting unit, the driven nip roll swivels into working position.

9.4.4 TDO Thread Mode line threading mode

TDO Thread Mode	The "TDO Thread Mode" is used for threading the film into the transverse direction orienter.
------------------------	--

The line threading mode triggers the following actions:

- The "Automatic Chill Roll -> Winder" linking is active.
- The values in the "Stretching: Line Speed: Threading" window are transmitted to the film production line".¹⁾
- The settings in the window "Threading Mode Selection" for "TDO Thread Mode" are active.¹⁾
- If there is a nip roll in the film casting unit, move it into park position.
- The shutters in the transversal direction orienter will be opened.
- The conveying fan and the drive of the edge trim grinder are started.
- If there is an inline-operated waste film grinder, the conveying fan and the drive are started.

¹⁾ In the machine direction orienter, the setting for the stretching process becomes active with the MDO sequence.

MDO sequence

The MDO sequence triggers the following action:

- If film is detected at the machine direction orienter outlet of the film break sensor, the selected nip rolls are moved into working position with a delay. The locked nip rolls are not moved.
- Depending on the number of stretching gaps, the selected infrared radiators are moved horizontally upwards and the selected infrared radiator are moved vertically upwards into the working position and started. The locked infrared radiators are not moved.
- The stretch ratios are activated with a time delay.

9.4.5 TDO Speed Up Mode line threading mode

TDO Speed Up Mode "TDO Speed Up Mode" is used to increase the line speed.

The line threading mode triggers the following actions:

- The "Automatic Chill Roll -> Winder" linking is active.
- The values in the "Stretching: Line Speed: Threading" window are transmitted to the film production line.
- The blow-off nozzles of the transverse direction orienter are activated in order to blow film residues off the clips.

When film exits from the outlet across the entire working width, the blow-off nozzles stop automatically.

- or -

If not all film residues are removed from the clips, the transverse direction orienter is stopped. This prevents film residues from getting into the return track.

Further actions take place. For further information, see chapter "Film break in the transverse direction orienter".

- If there are settings for "TDO Speed Up Mode" in the "Threading Mode Selection" window, they become active.
- If there is a driven nip roll at the outlet of the machine direction orienter, it moves into park position. On reaching park position, the drive for turning the rolls stops.

9.4.6 Pull Roll Thread Mode line threading mode

Pull Roll Thread Mode

The Pull Roll Thread Mode is used to thread the film into the pull roll unit and the winder unit.

The line threading mode triggers the following actions:

- The values in the Stretching: Line Speed: Threading window are transmitter to the line.
- The settings in the Threading Mode Selection window for Pull Roll Thread Mode become active.

9.4.7 Pull Roll Speed Up Mode line threading mode

Pull Roll Speed Up Mode

The Pull Roll Speed Up Mode is used for increasing the line speed.

The line threading mode triggers the following actions:

- The values in the Stretching: Line Speed: Threading window are transmitted to the film production line.
- The settings in the Threading Mode Selection window for Pull Roll Speed Up are active.

9.4.8 Production Mode line threading mode

**Production Mode
(line threading mode)** The Production Mode line threading mode is used for the film production.

The line threading mode triggers the following actions:

- The values in the Stretching: Line Speed: Threading window are transmitted to the film production line.
- The settings in the Threading Mode Selection window for Production Mode are active.

9.4.9 Cut Back Mode line threading mode

Cut Back Mode The "Cut Back Mode" is used for shutting down the film production line up to a collection point for film (e.g. auxiliary winder).

The Line Threading Mode triggers the following actions:

- The values in the "Stretching: Line Speed: Threading" window are transmitted to the film production line.
- If there is an machine direction orienter, the film break detection in the machine direction orienter is switched off.
- If there is a treatment device, this is switched off.
- The components are moved into position.

9.4.10 Managing line threading modes

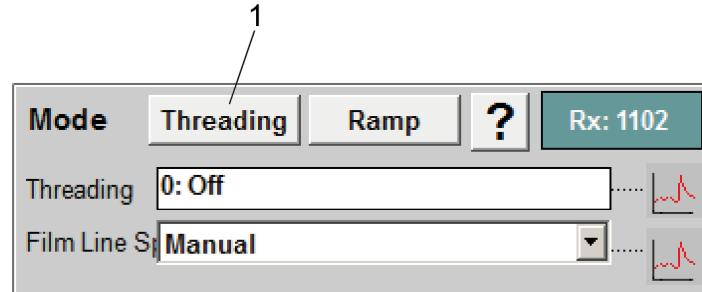
Managing line threading modes The system threading modes are managed in the WinCC OA in the Stretching: Line Speed: Threading window. The following activities, among others, can be performed:

- displaying and changing setpoints
- displaying the change
- displaying start conditions
see chapter "Activating the Line Threading Mode/Displaying the interlocks"

In the WinCC OA, there is also the Threading Mode Selection, view where settings for the line threading modes are made.

The windows and the views are described in brief below. A comprehensive description of the windows can be found in the online help.

Opening the "Stretching: Line Speed: Threading" window: Line Speed: Threading



- ▶ In the line overview, click on Threading in the Mode area.
- ⇒ The Stretching: Line Speed: Threading window is opened.

Changing the setpoints in the "Stretching: Line Speed: Threading" window

Changing the setpoints in the "Stretching: Line Speed: Threading" window

The following screenshot shows the Stretching: Line Speed: Threading window on the Threading Mode Setpoint tab for standard film production lines.

Stretching: Line Speed: Threading (Standard - Standard; 0.1)											
Threading Mode Setpoint		Production Mode Setpoint		Threading Mode Selection							
Film Line Threading Mode		Change Event		Threading Ready						Speed Limit	
1: Chill Roll Threading	2: MDO Threading	3: TDO Threading	4: TDO Speed Up	5: Pull Roll Threading	6: Pull Roll Speed Up	7: Production	-1: Cut Back	Target Setpoint	Actual Setpoint	Actual Value Speed	0: Off
0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0.0 rpm	0.0 rpm	0.0 rpm	0: Off
Extrusion Factor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0 rpm	0.0 rpm	0.0 rpm	0: Off
Coextrusion 1	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0.0 rpm	0.0 rpm	0.0 rpm	0: Off
Coextrusion 2	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0.0 rpm	0.0 rpm	0.0 rpm	0: Off
Coextrusion 3	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0.0 rpm	0.0 rpm	0.0 rpm	0: Off
Coextrusion 4	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	0.0 rpm	0.0 rpm	0.0 rpm	0: Off
Dmc: Chill Roll	0.0 m/min	0.0 m/min	0.0 m/min	0.0 m/min	0.0 m/min	0.0 m/min	0.0 m/min	0.0 m/min	0.0 m/min	0.0 m/min	0: Off
Pulling Voltage	0.00 kV	0.00 kV	0.00 kV	0.00 kV	0.00 kV	0.00 kV	0.00 kV	0.00 kV	0.00 kV	0.00 kV	0: Off
Pressure Air Valve	0 mbar	0 mbar	0 mbar	0 mbar	0 mbar	0 mbar	0 mbar	0 mbar	0 mbar	0 mbar	0: Off
MDO Ratio 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	1.000	1.000	0: Off
MDO Ratio 2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	1.000	1.000	0: Off
MDO Ratio 3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	1.000	1.000	0: Off
MDO Ratio 4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	1.000	1.000	0: Off
MDO Ratio 5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	1.000	1.000	0: Off
TDO Speed Automatic	-100.000 %	-100.000 %	-100.000 %	-100.000 %	-100.000 %	-100.000 %	-100.000 %	0.000 %	0.000 %	0.000 %	0: Off
Offset	Offset	Offset	Offset	Offset	Offset	Offset	Offset	Offset	Offset	Offset	Offset
Cooling Unit Temperature Offset	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C
Pulling Drive Horizontal Position	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm
Pulling Drive Vertical Position	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm
MDO Preheating Temperature Offset	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C
MDO Drawing Temperature Offset	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C
MDO Imprin. Heater Offset	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDO Preheating Temperature Offset	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C
MDO Threading Fan Offset	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
TDO Threading Temperature Offset	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C
TDO Arming Fan Offset	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
TIX Preheating Station Position	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm

- ▶ In the Stretching: Line Speed: Threading window, click on the desired dark blue highlighted value field on the Threading Mode Setpoint and Production Mode Setpoint tabs and enter the setpoint.
- All setpoints must be sensibly preallocated. Otherwise, when the line threading modes are transmitted to the film production line, a film break may occur or the film production line may be shut down.

Opening "Threading Mode Selection" view

Opening "Threading Mode Selection" view

The Threading Mode Selection view can be opened in multiple ways.

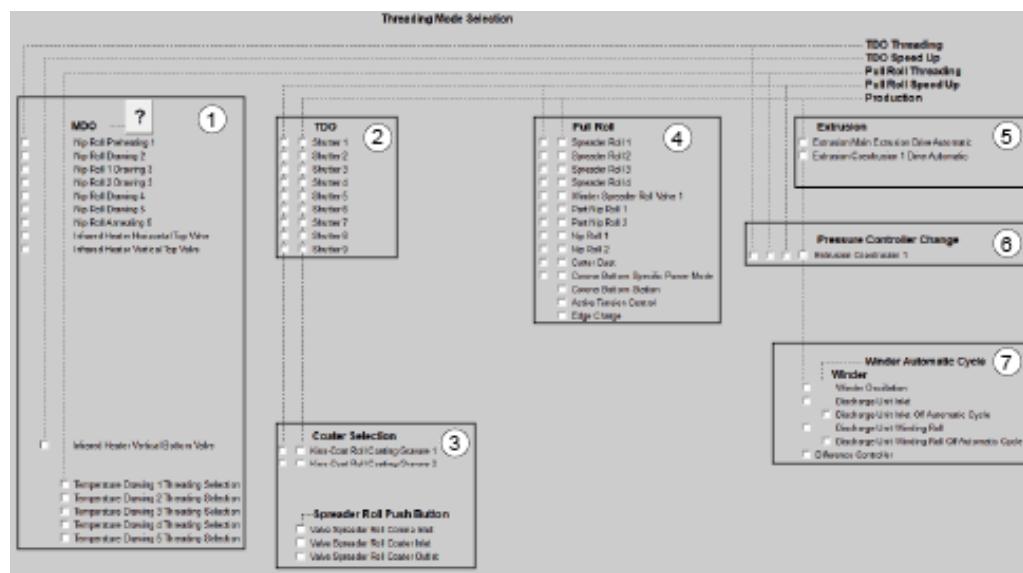
- In the WinCC OA in the Stretching: Line Speed: Threading window, click on the Threading Mode Selection tab.
 ⇒ The Threading Mode Selection tab is displayed.

- or -

- In the WinCC OA in the overview of a line component, click on Selection.
 ⇒ The Threading Mode Selection window is displayed.

"Threading Mode Selection" view

The following screenshot shows the "Threading Mode Selection" view on a PET film production line.



1	Machine direction orienter	2	Transverse direction orienter
3	Inline coating device	4	Pull roll unit
5	Extrusion system	6	Changeover of the pressure control on the melt pump
7	Winder unit		

Machine direction orienter

Designation	Action	Trigger
Nip Roll Preheating 1	The nip roll at preheating roll 1 is moved into the working position.	Movement into the working position <ul style="list-style-type: none"> When activating line threading mode TDO Thread Mode, film is detected on the machine direction orienter outlet.
	The nip roll on preheating roll 1 is moved into the park position.	
Nip Roll x Drawing y	Nip roll x on stretching roll y is moved into the working position.	<ul style="list-style-type: none"> On the operator panel, press the [nip rolls work pos.] push button.
	Nip roll x on stretching roll y is moved into the park position.	
Nip Roll Annealing 5	The nip roll on cooling roll 5 is moved into the working position.	Movement into the park position <ul style="list-style-type: none"> On the operator panel, press the [nip rolls park pos.] push button.
	The nip roll on cooling roll 5 is moved into the park position.	
Infrared Heater Horizontal Top Valve	The infrared radiator, top, horizontal is moved into the working position and started.	<ul style="list-style-type: none"> Line threading mode TDO Thread Mode On the operator panel, press the [IR-heater work pos.] push button.
	The infrared radiator, top, horizontal is switched off and moved into the park position.	
Infrared Heater Vertical Top Valve	The infrared radiator, top vertical is moved into the working position and started.	<ul style="list-style-type: none"> Line threading mode TDO Thread Mode On the operator panel, press the [IR-heater work pos.] push button.
	The infrared radiator, top, vertical is switched off and moved into the park position.	

Designation	Action	Trigger
Infrared Heater Vertical Bottom Valve	The infrared radiator, bottom, vertical is moved into the working position and started.	<ul style="list-style-type: none"> • Line threading mode TDO Speed Up Mode • On the operator panel, press the [IR-heater work pos.] push button.
	The infrared radiator, bottom, vertical is switched off and moved into the park position.	<ul style="list-style-type: none"> • On the operator panel, press the [IR-heater park pos.] push button.
Temperature Drawing x Threading Selection	The temperature controller of stretching roll x changes to the Low-Load setting.	<ul style="list-style-type: none"> • Line threading mode Pull Roll Thread Mode

Transverse direction orienter

Designation	Action	Trigger
Shutter x	Shutter x is closed.	<ul style="list-style-type: none"> • Line threading mode Pull Roll Speed Up Mode • Line threading mode Production Mode

Inline coating device

Designation	Action	Trigger
Valve Spreader Roll x	Spreading roller x is moved into working position.	<ul style="list-style-type: none"> • On the operator panel, press the [spreader roll work pos.] push button.
	Spreading roller x is moved to park position.	<ul style="list-style-type: none"> • On the operator panel, press the [spreader roll park pos.] push button.

If there are other options boxes for the inline coating device, no actions are triggered on this device.

Pull roll unit

Designation	Action	Trigger
Spreader Roll x	On the pull roll unit, spreading rollers x on the operating side and on the drive side are moved into the working position.	<ul style="list-style-type: none"> • line threading mode Pull Roll Speed Up Mode • line threading mode Production Mode

Designation	Action	Trigger
Winder Spreader Roll Valve 1	On the winder unit, spreading rollers 1 on the operating side and on the drive side are moved into the working position.	<ul style="list-style-type: none"> • line threading mode Pull Roll Speed Up Mode • line threading mode Production Mode
Part Nip Roll x	On the pull roll unit, part nip rollers x on the operating side and on the drive side are moved into the working position.	<ul style="list-style-type: none"> • line threading mode Pull Roll Speed Up Mode • line threading mode Production Mode
Nip Roll x	Nip roll x is moved into the working position.	<ul style="list-style-type: none"> • line threading mode Pull Roll Speed Up Mode • line threading mode Production Mode
Cutter Dust	The cutting dust exhaust is switched on.	<ul style="list-style-type: none"> • line threading mode Pull Roll Speed Up Mode • line threading mode Production Mode
Corona Bottom Specific Power Mode	On the corona treatment station, bottom, the control of the specific output is started.	<ul style="list-style-type: none"> • line threading mode Pull Roll Speed Up Mode • line threading mode Production Mode
Corona Bottom Station	The electrodes of the corona treatment station, bottom, are moved into working position.	<ul style="list-style-type: none"> • line threading mode Production Mode
Activ Tension Control	The active tension control is started.	<ul style="list-style-type: none"> • line threading mode Production Mode
Edge Charge	The edge charge device is started.	<ul style="list-style-type: none"> • line threading mode Production Mode

Extrusion

Designation	Action	Trigger
Extrusion x Drive Automatic	The pressure regulator is started on extrusion system x. The extrusion system x is in automatic mode.	<ul style="list-style-type: none"> • Line threading mode Production Mode

Changeover of the pressure control on the melt pump

Designation	Action	Trigger
Extrusion x	On extrusion x, the pressure control is changed over to the melt pump.	<ul style="list-style-type: none"> • Line threading mode TDO Thread Mode • Line threading mode Pull Roll Thread Mode • Line threading mode Pull Roll Speed Up Mode • Line threading mode Production Mode

Winder unit

Designation	Action	Trigger
Winder Oscilation	The oscillation at the winder unit is started.	<ul style="list-style-type: none"> • Line threading mode Production Mode • The winding core chucks of the rear winding shaft have been closed. <p>In addition, the line threading mode Production Mode is active.</p>
Discharge Unit Inlet	The discharge device on the winder unit inlet is started.	<ul style="list-style-type: none"> • Line threading mode Production Mode • The two-station turret winder has been turned automatically or semi-automatically. <p>In addition, the line threading mode Production Mode is active.</p>
Discharge Unit Inlet Off Automatic Cycle	Before the automatic or semi-automatic turning of the winding shafts, the discharge device on the winder unit inlet is switched off.	<ul style="list-style-type: none"> • Start of the automatic or semi-automatic turning of the winding shafts.
Discharge Unit Winding Roll	The discharge device on the winding shaft is started.	<ul style="list-style-type: none"> • Line threading mode Production Mode • The two-station turret winder has been turned automatically or semi-automatically. <p>In addition, the line threading mode Production Mode is active.</p>

Designation	Action	Trigger
Discharge Unit Winding Roll Automatic Cycle	Before the automatic or semi-automatic turning of the winding shafts, the discharge device on the front active winding shaft is switched off.	• Start of the automatic or semi-automatic turning of the winding shafts.
Difference Controller	If the contact winding more is set, the pressure regulator is started.	• Line threading mode Production Mode

Selecting settings in the "Threading Mode Selection" view

Selecting settings

- ▶ In the Threading Mode Selection view, select the desired settings. Locked settings are also displayed and can be selected. These settings cannot be activated due to their interlock.

Displaying the change in the "Stretching: Line Speed: Threading" window

Displaying the change in the "Stretching: Line Speed: Threading" window

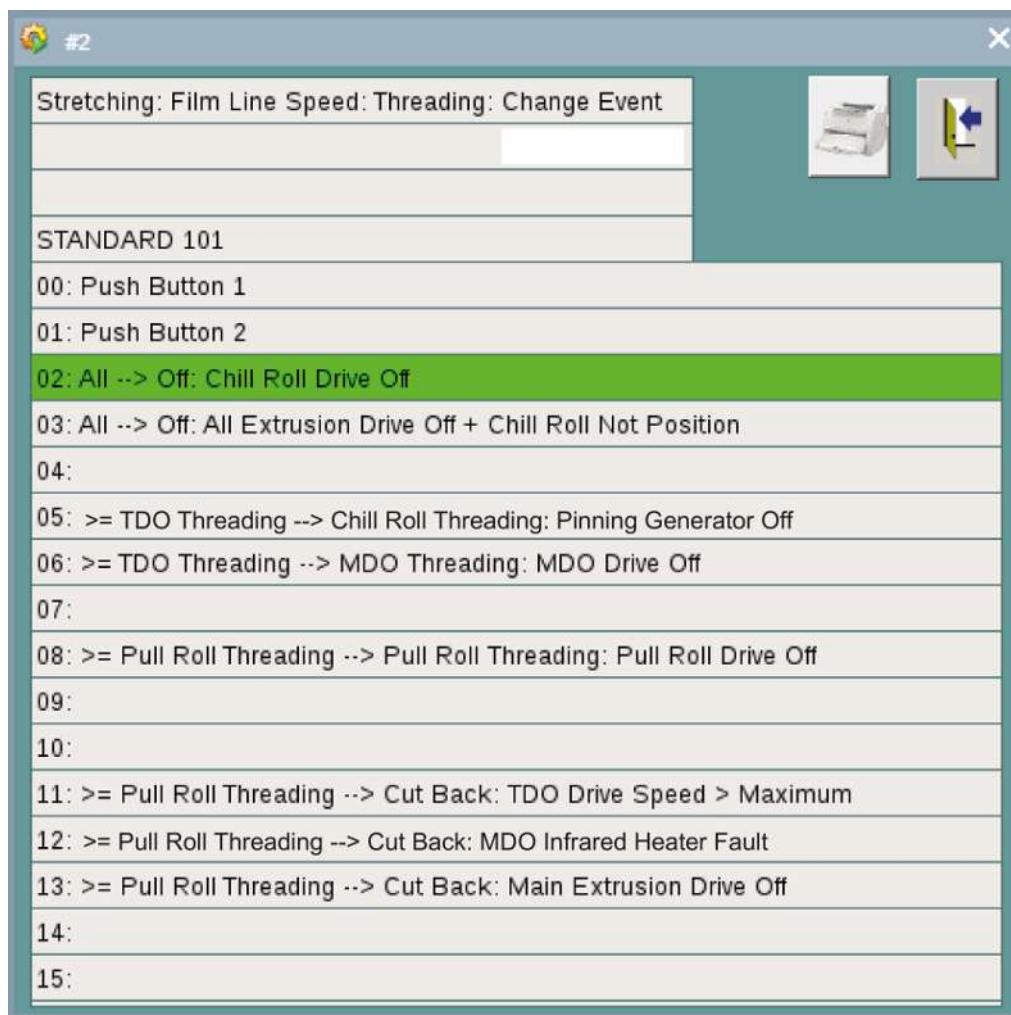
- ▶ In the Stretching: Line Speed: Threading window, click on the Threading Mode Setpoint tab on Change Event with the left mouse button.

⇒ The changes of the line threading modes are displayed.

A number is assigned to each change.

The last change is highlighted in green.

The following screenshot and the subsequent table show the change for standard film production lines.



No.	Meaning
00	The push button for activating the line threading mode on the operator panel was pressed.
01	The second push button for activating the line threading mode on the operator panel was pressed. (variant-dependent)
02	If the drive of the chill roll stops, the mode changes to the "Off" line threading mode.
03	If all drives of the extrusion system stop while the movement of the film casting unit is not in the working or park position, there is a change to the Off line threading mode.
04	-
05	If the generator of the electrostatic film pinning device stops and the line threading mode is at least MDO Thread Mode, the mode changes to Chill Roll Thread Mode.
06	If the drives of the machine direction orienter stop and the line threading mode is at least TDO Thread Mode, the mode changes to MDO Thread Mode.
07	-
08	If the drives of the pull roll unit stop and the line threading mode is at least Pull Roll Thread Mode, the mode changes to Pull Roll Thread Mode.
09	-
10	-

No.	Meaning
11	This change only takes place in transverse direction orienters with sliding chains. If the speed of the drives of the transverse direction orienter is above the maximum speed and the line threading mode is at least Pull Roll Thread Mode, the mode changes to Cut Back Mode.
12	If there is a fault on the infrared radiator of the machine direction orienter and the line threading mode is at least Pull Roll Thread Mode, the mode changes to Cut Back Mode.
13	If the drives of the main extrusion stop and the line threading mode is at least Pull Roll Thread Mode, the mode changes to Cut Back Mode.
14	-
15	-

9.4.11 Activating the "Line Threading Mode"

Displaying the status of the "Line Threading Mode"

The status of the line threading mode is displayed on the operator panel and in the "Stretching: Line Speed: Threading" window in WinCC OA.

Status	Operator panel	WinCC OA: "Stretching: Line Speed: Threading" window
All interlocks are fulfilled. The "Line Threading Mode" can be transmitted to the film production line.	The push button for starting the "Line Threading Mode" flashes.	The mode is highlighted in light green.
The "Line Threading Mode" is active on the film production line.	The push button for starting the "Line Threading Mode" lights (continuous light).	The mode is highlighted in dark green.
The interlocks are not fulfilled.	The push button for starting the "Line Threading Mode" does not light.	The mode is highlighted in grey.

Displaying the interlocks

The interlocks can be displayed with screen on the operator panels and in the Stretching: Line Speed: Threading window in WinCC OA.

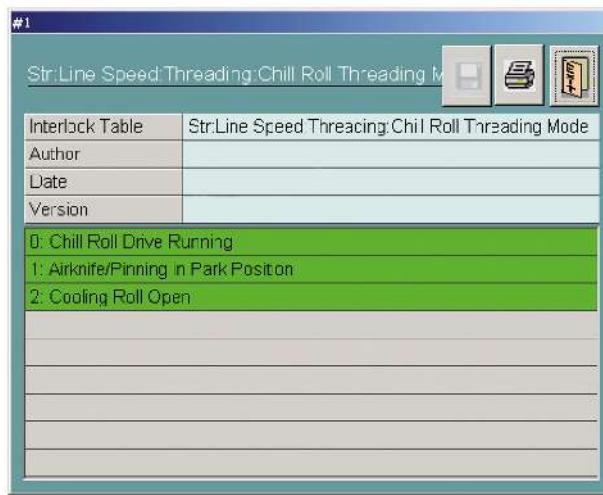
Operator panel

- ▶ On the operator panels with screen, click on [Thread Interlocks].
- ▶ Click the line threading mode in the Thread Interlocks menu.

- or -

WinCC OA

- ▶ Click the line threading mode in the Stretching: Line Speed: Threading window.
- ⇒ The interlocks are displayed.



Example: Interlocks Chill Roll Threading Mode window

- Fulfilled interlocks are highlighted in green.
- Interlocks that have not been fulfilled are highlighted in grey.

If all interlocks have been fulfilled, the line threading mode can be transmitted to the film production line.

Transmitting the "Line Threading Mode"

A "Line Threading Mode" is transmitted by pressing the push button on the operator panel at the line. The push button has the same name as the line threading mode (e.g. "Pull Roll Thread Mode") and is situated on the operator panel at the machine (e.g. BP1).

If the film production line is in the particular "Line Threading Mode" and the set-points have been changed in the "Stretching: Line Speed: Threading" window, the changes can be transmitted to the film production line by pressing the push button again.

9.5 Linking the machine speeds

Linking types

The speeds of the individual machines of a line can be linked.

There are two types of links:

- Linking beginning at the chill roll ("Auto Mode" or "Tandem Mode")
- Linking of the extrusion system and chill roll ("Extruder Automatic Mode" or "Extruder Slave Mode")

Master of the line speed

For the line speed, the chill roll is the master. If the speed of the chill roll is changed, the speeds of the linked machines change proportionally.

9.5.1 Linking beginning at the chill roll

The speed of the chill roll of the film casting unit can be linked to the speeds of the downstream line components.

Generally, the speed is linked during the start-up of the film production line, beginning at the chill roll when activating the line threading modes. To do so, the machines are linked with the speed of the chill roll one after the other.

The linkings beginning at the chill roll can also be activated manually. This is sensible for maintenance in certain cases.

The active linking influences the speed settings and the switching off of the drives.

Linking beginning at the chill roll

The following links are available:

- [manual]

The line component speeds are not linked. The speed of a line component is independent of the speeds of other machines. Starting or stopping a line component does not influence the other machines.

- [Automatic Chill Roll -> MDO]

The speed of the chill roll in the film casting unit determines the speed of the machine direction orienter.

This linking becomes active when activating the line threading mode MDO Thread Mode.

- [Automatic Chill Roll -> TDO]

The speed of the chill roll in the film casting unit determines the speed of the machines up to and including the transverse direction orienter.

- [Automatic Chill Roll -> Pull Roll]

The speed of the chill roll in the film casting unit determines the speed of the machines up to and including the pull roll unit.

- [Automatic Chill Roll -> Winder]

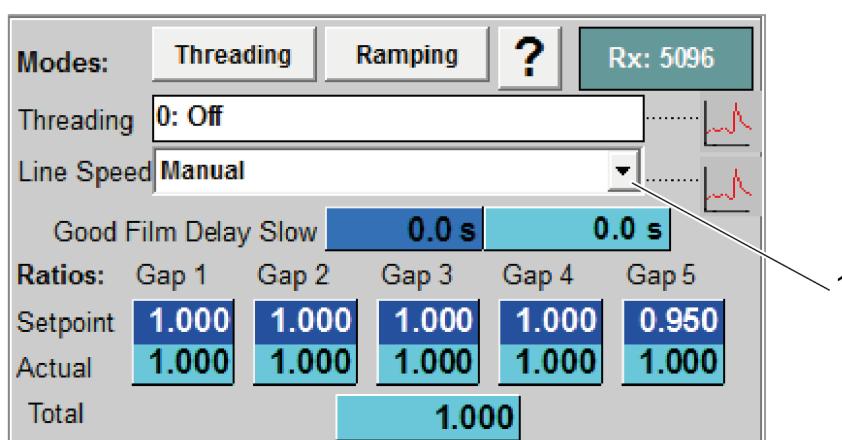
The speed of the chill roll in the film casting unit determines the speed of the machines up to and including the winder unit.

This linking becomes active when activating the line threading modes TDO Thread Mode or TDO Speed Up Mode.

Setting the linking manually

The linking can be viewed and set in the line overview in WinCC OA.

The following screenshot shows the menu "Modes" for standard film production lines in the line overview.



- ✓ This setting is only possible when the "Pull Roll Good Film" condition is not fulfilled. No film may be present in the pull roll unit.
- ✓ No film is processed in the respective machines.
- In the line overview, select the desired linking in the "Line_Speed" (1) drop-down list of the "Modes" menu.
 - ⇒ The linking is transmitted to the line.

Setting the drive speeds of a line component

When the linking is switched on, the speeds of the drives of the line component cannot be set directly via the drive displays. Speed differences between the drives are created based on speed ratios (e.g. 1.2 times the speed of the previous drive) or percentage values (e.g. 3.4 % higher than the speed of the previous drive).

Switching off the drive(s) of a line component

- If the drive(s) of a line component are switched off, the drives of all linked downstream line components also stop.

Example: If the drives of the pull roll unit are switched off when linking [Automatic Chill Roll -> Winder] is active, the drives of the winder unit also stop.

Exception: If there is no film in the transverse direction orienter, the coupled drives of the transverse direction orienter are not switched off by switching off the drives of the upstream line component.

- If the drives of the machine direction orienter are switched off, the linking [Automatic Chill Roll -> MDO] becomes active.
- If the drive of the chill roll in the film casting unit is switched off, the linking [manual] becomes active.

9.5.2 Linking of the extrusion system and chill roll

Linking of the extrusion system and chill roll

The output of the extrusion system can be linked with the speed of the chill roll in the film casting unit.

There are two states:

- The chill roll and extrusion system are not linked.

The output of the extrusion system can be set via the drive status in the line overview window or in the machine windows.

- The chill roll and extrusion system are linked.

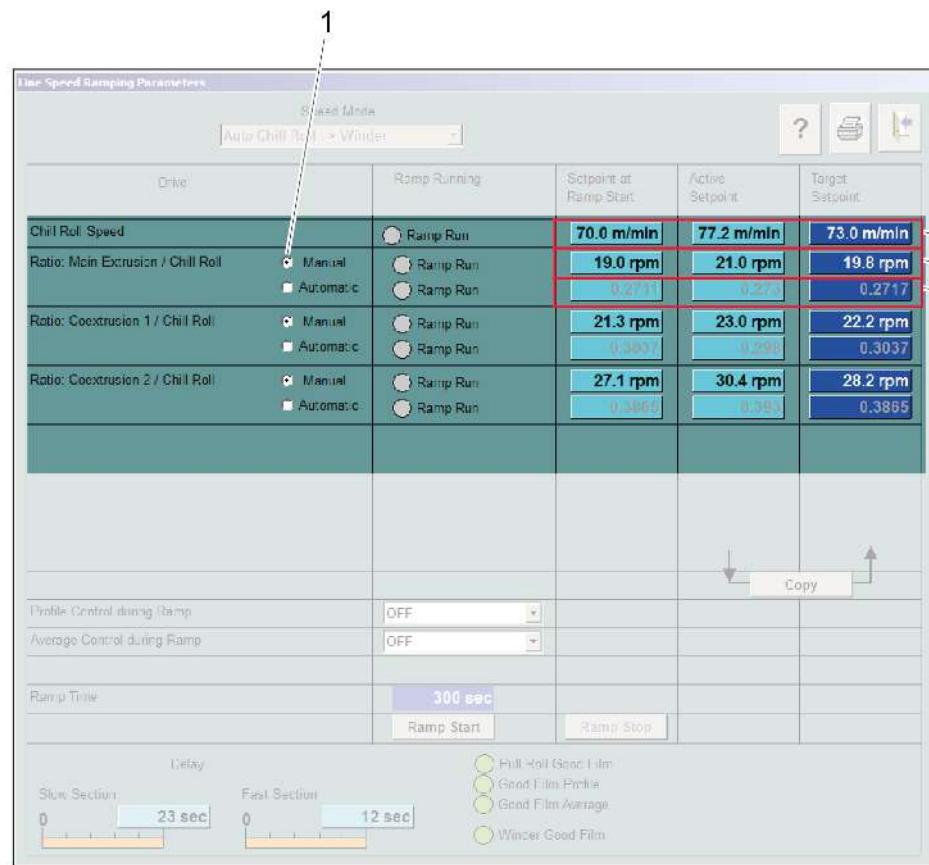
If the speed of the chill roll is changed, the output of the extrusion system adjusts its speed.

The linking is generally only switched on for ramping.

Setting the linking

The linking is set in the Line Speed Ramping Parameter window in WinCC OA.

The following screenshot shows the Line Speed Ramping Parameter window for standard film production lines.



1	Linking of the extrusion system and chill roll
2	Speed of the chill roll drive
3	Drive rpm
4	Speed ratio between the extrusion system and chill roll

The values refer to the master of the extrusion system.

- ▶ To switch off the coupling, click on [Manual].
 ⇒ If the linking of the extrusion system and chill roll is set to [Manual], the rpms of the drive in the extrusion system are active.
- or -
- ▶ To switch on the coupling, click on [Automatic].
 ⇒ If the linking of the extrusion system and chill roll is set to [Automatic], the speed ratios between the extrusion system and chill roll are active.

9.6 Ramping the line speed and film thickness

Explanation

To set the line speed and/or the film thickness, the chill roll speed or the melt output can be changed if the linking is set correctly. This process is referred to as "ramping".

Ramping is carried out during film production.

9.6.1 Changing the line speed while the film thickness remains constant

Procedure

To change the line speed, the speed of the chill roll is changed while the linking of the extrusion system and chill roll is active.

Activity	Cross reference to the instructions
▶ Carry out the ramping with linking of the extrusion system and chill roll switched on.	Carrying out ramping [▶ 121]
▶ Check and set the film production line.	Checking and setting the line [▶ 122]

9.6.2 Changing the film thickness while the melt output remains constant

Procedure

To change the film thickness while the melt output remains constant, adjust the target film thickness first. Then the chill roll speed is changed while the linking of the extrusion system and chill roll is inactive.

Activity	Cross reference to the instructions
▶ Calculate the speed of the chill roll.	Calculation, see below.
▶ Set the film thickness.	Setting the film thickness [▶ 119]
▶ Carry out the ramping with linking of the extrusion system and chill roll switched off.	Carrying out ramping [▶ 121]
▶ Check and set the film production line.	Checking and setting the line [▶ 122]

Calculating the chill roll speed

Calculating the target speed of the chill roll with constant layer thickness distribution of the film layers:

$$V_{CRtarget} = V_{CRactual} \cdot \frac{d_{actual}}{d_{target}}$$

Short form	Designation	Example
$V_{CRtarget}$	= target speed of the chill roll	= Value to be calculated
$V_{CRactual}$	= actual speed of the chill roll	= 76 m/min
d_{actual}	= actual thickness of the film	= 26.8 µm
d_{target}	= target thickness of the film	= 35.8 µm

Example:

$$V_{CRtarget} = 76 \frac{\text{m}}{\text{min}} \cdot \frac{26.8 \mu\text{m}}{35.8 \mu\text{m}}$$

$$V_{CRtarget} = 56.89 \frac{\text{m}}{\text{min}}$$

9.6.3 Changing the film thickness while the line speed remains constant

Procedure

To change the film thickness, adjust the target film thickness first. Then the output of the extrusion system is changed while the linking of the extrusion system and chill roll is inactive. The output is changed by changing the rpm of the master of the extrusion system.

Activity	Cross reference to the instructions
▶ Calculate the target RPM.	Calculation, see below.
▶ Set the film thickness.	Setting the film thickness [▶ 119]
▶ Carry out the ramping with linking of the extrusion system and chill roll switched off.	Carrying out ramping [▶ 121]
▶ Check and set the film production line.	Checking and setting the line [▶ 122]

Calculating the target RPM

Calculating the target rpm of the master of the extrusion system with constant layer thickness distribution of the film layers:

The target rpm must be determined for each extrusion system.

$$n_{EXtarget} = n_{EXactual} \cdot \frac{d_{target}}{d_{actual}}$$

Short form	Designation	Example
$n_{EXtarget}$	= target rpm of the master of the extrusion system	= Value to be calculated
$n_{EXactual}$	= actual rpm of the master of the extrusion system	= 41 rpm
d_{actual}	= actual thickness of the film	= 26.8 µm
d_{target}	= target thickness of the film	= 35.8 µm

Example:

$$n_{EXtarget} = 41 \text{ rpm} \cdot \frac{35.8 \mu\text{m}}{26.8 \mu\text{m}}$$

$$n_{EXtarget} = 54.77 \text{ rpm}$$

9.6.4 Setting the film thickness

Description

If the film thickness is to be changed, the average value control must be switched off and the target film thickness must be adjusted before ramping.

Opening the TCE software

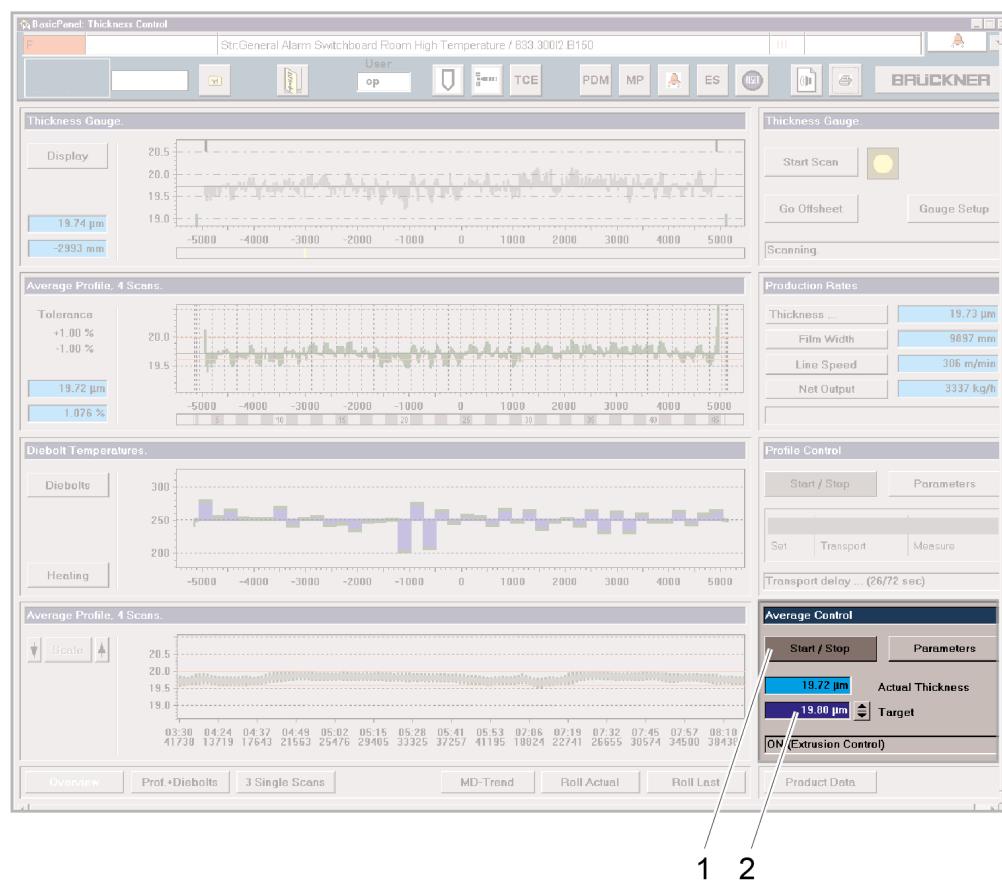
The film thickness is set in TCE.

- ▶ Open the TCE for the end film.

⇒ The "Basic Panel: Thickness Control" window opens.

Ramping the line speed and film thickness

Setting the film thickness



Basic Panel: Thickness Control window

- ▶ Switch off the average value control in the Average Control area with [start/stop] (1).
- ▶ Set the target film thickness (2) in the Average Control area.

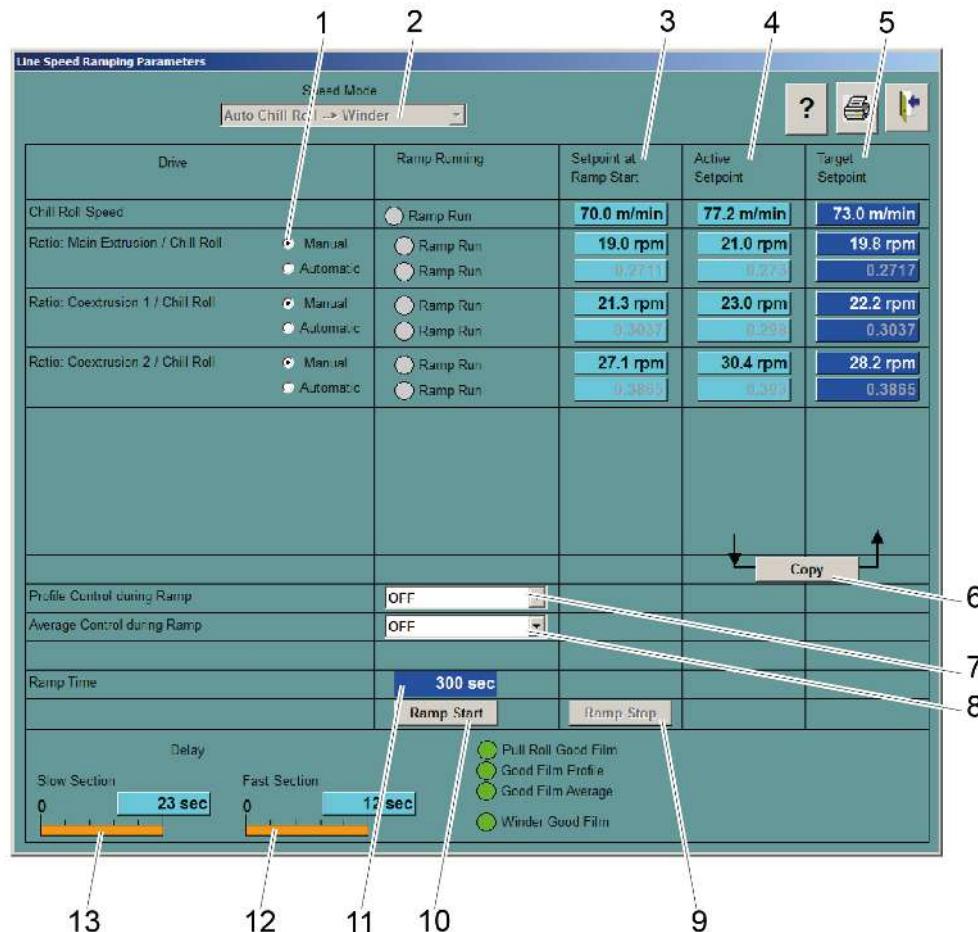
9.6.5 Carrying out ramping

Description

"Line Speed Ramping Parameter" window

The ramping is set in the "Line Speed Ramping Parameter" window in WinCC OA.

- ▶ In the "Mode" menu in the line overview, click on [Ramping].
- ⇒ The "Line Speed Ramping Parameter" window opens.



Example: "Line Speed Ramping Parameter" window

1	Manual Automatic	Linking of the extrusion system and chill roll
2	Auto Chill Roll -> Winder	Link of the chill roll with the downstream machines
3	Setpoint at Ramp Start	Actual values before the start of ramping
4	Active Setpoint	Current actual values of the line When ramping, the actual values of the line are displayed during ramping.
5	Target Setpoint	Setpoints that are to be set.
6	Copy	Copies the actual values (Active Setpoints) into the setpoints column (Target Setpoint).
7	Profile Control during Ramp	The thickness profile control can be switched on or off during ramping.
8	Average Control during Ramp	Average Control can be switched on or off during ramping. Average Control controls the average film thickness in relation to the target thickness.
9	Ramp Stop	Stops the ramping

10	Ramp start	Starts the ramping	
11	Ramp Time	Time span in which ramping takes place	
12	Fast Section	Bar showing progress beyond stretching unit of machine direction orienter	A film production line without machine direction orienter has only a progress bar.
13	Slow Section	Bar showing progress up to stretching unit of machine direction orienter	

Adjusting the linking of the extrusion system and chill roll

► Set the linking of the extrusion system and chill roll. Select the [Manual] or [Automatic] option button in the Line Speed Ramping Parameter window in the Ratio Main Extrusion / Chill Roll area.

- Manual: The linking of extrusion system and chill roll is switched off.
- Automatic: The linking of extrusion system and chill roll is switched on.

Carrying out ramping

Requirement: If the film thickness is changed, the set film thickness must be set in the TCE. [Setting the film thickness \[▶ 119\]](#)

All setpoints in the [Target Setpoint] column must be assigned to sensible values. Otherwise, during ramping a film break can occur or the line can be shut down. It is recommended to overwrite the setpoints first with the actual values.

- Click on [Copy] in the "Line Speed Ramping Parameter" window.
⇒ The setpoints are overwritten with the actual values.
- Enter the required rpm or speed of the chill roll in the blue display field of the [Target Setpoint] column.
- Set [Profile Control during Ramp] to [OFF].
- Set [Average Control during Ramp] to [OFF].
⇒ If "Profile Control during Ramp" and/or "Average Control during Ramp" are set to "off", only switch them off during the ramping.
⇒ If "Profile Control" and/or "Average Control" run before the ramping, they start again automatically after the ramping.
- Enter the time span for the ramping in [Ramp Time] in the blue display field. A time span between 120 - 400 seconds is recommended.
- Click on [Ramp start].
⇒ The film thickness or/and the line speed is/are changed.

Switching off the linking of the extrusion system and chill roll

- If the linking of the extrusion and chill roll is switched on, switch off the linking. Select the [Manual] option button in the Line Speed Ramping Parameter window in the Ratio Main Extrusion / Chill Roll area.

9.6.6 Checking and setting the line

Description

After the ramping, checks and any necessary adjustments must be made on the line.

Checking and setting the film casting unit

- Check that the film pinning device lays the film on the chill roll correctly. If necessary, adjust the film pinning device.

Checking and setting the line

- Check the correct film path throughout the entire line and adjust if necessary.

Checking and setting the TCE

- ▶ In the Basic Panel: Thickness Control window for thickness control evaluation, check the thickness profile across the entire film width. If the 2-Sigma value (1) is greater than 4%, the lip gap of the melt die should be manually adjusted.
- ▶ Check the alignment and adjust if necessary. For checking the alignment, see TCE operating manual. (Alignment = assignment of the lip adjustment bolts to the film.)
- ▶ If required, switch on the average value control. Switch on the average value control in the Average Control area in the Basic Panel: Thickness Control window with [start/stop].

10 Operating the resin supply

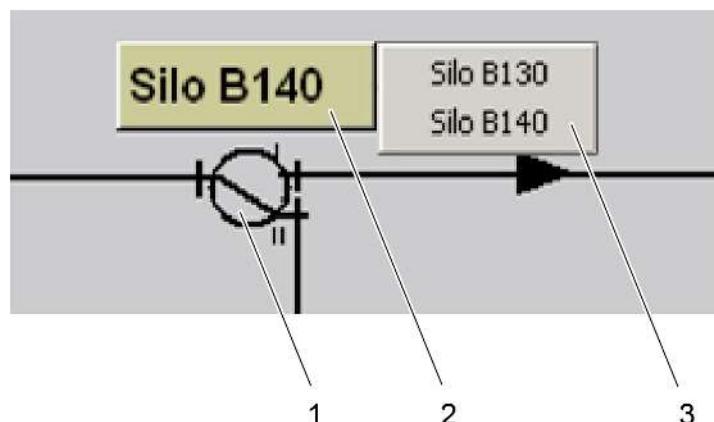
10.1 Setting the resin supply system

The resin supply system is set in WinCC OA.

Activities	Activity	Cross reference to the instructions
	When starting up the film production line without there having been a change in the resin, no settings are necessary.	
	Different raw materials are used by changing the silos. Procedure <ul style="list-style-type: none">▶ Change the conveying distance.▶ Select the "Main dosing" property for the desired silo.▶ Set the raw material amount for each silo.	Changing the conveying distance (default) [▶ 125] - or - Changing the conveying distance (option: several diverter valves) [▶ 126] Selecting the "Main dosing" property for a silo [▶ 127] Setting the raw material amount of a silo [▶ 127]
	The additive ratio is changed by changing the percentage raw material amount of the corresponding dosing units.	Setting the raw material amount of a dosing unit [▶ 129]
	Assign the "Main dosing" property to a different dosing unit. Procedure <ul style="list-style-type: none">▶ Select the "Main dosing" property for the desired dosing unit.▶ Set the raw material amount of the dosing unit.	Selecting the "Main dosing" property for a dosing unit [▶ 128] Setting the raw material amount of a dosing unit [▶ 129]

10.1.1 Changing the conveying distance (default)

Description	The conveying distance is changed by moving the diverter valve to another silo.
Requirement	<ul style="list-style-type: none"> • The filling of the silo via the adjustable conveying distances is stopped.
Changing the conveying distance	The conveying distance is changed in the "Resin Storage" window.



Example: Diverter valve in the "Resin Storage" window

- ▶ Click on the Silo (2) graphic button next to the diverter valve (1) to be changed.
 - ⇒ A menu (3) with the silo to be selected is displayed.
- ▶ Click on the desired silo.
 - ⇒ The diverter valve is adjusted.
 - ⇒ The selected silo is displayed.

Following activity

- The filling of the silo can be started.

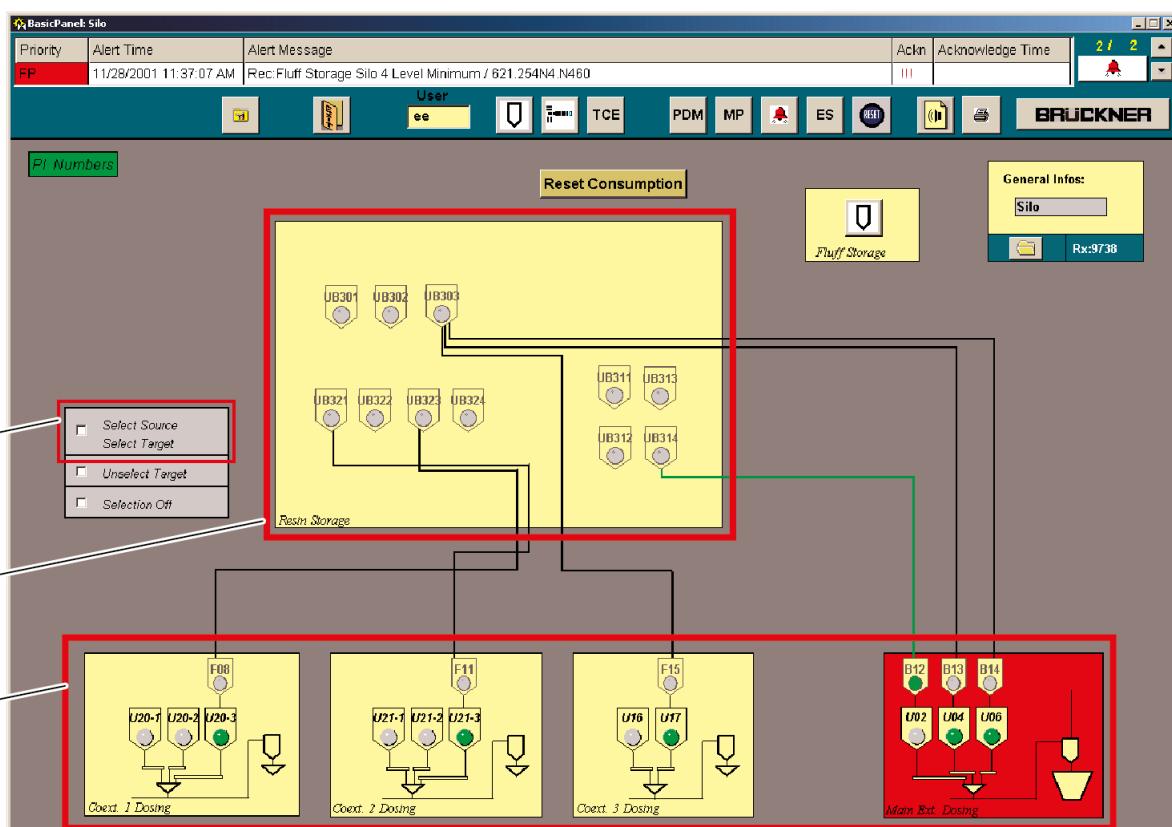
10.1.2 Changing the conveying distance (option: several diverter valves)

Requirement

- The filling of the silo via the adjustable conveying distances is stopped.

Changing the conveying distance

The conveying distance is changed in the "Silo" window.



Example of the "Silo" window

- ▶ Select the [Select Source] option button. (1)
 - ⇒ Selectable silos are shown in black in "Resin Storage".
- ▶ Click on the desired silo. (2)
 - ⇒ The "Select Target" option button is active. Selectable dosing units are shown in black, dosing units that are not available are shown in grey.

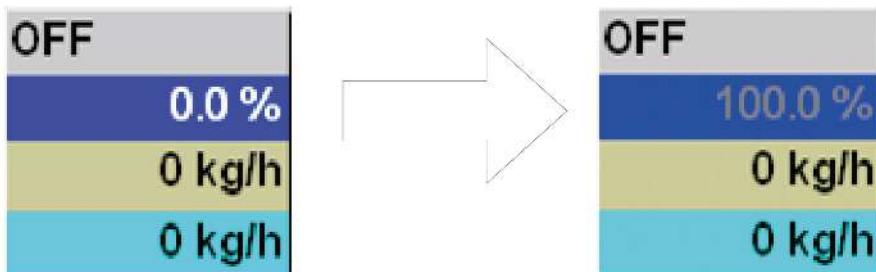
- ▶ Click on the desired dosing unit. (3)
 - ⇒ The selected connections are shown in black. The black connection line indicates readiness. As soon as material is being conveyed, the line turns green.

Following activity

- The filling of the silo can be started.

10.1.3 Selecting the "Main dosing" property for a silo

Description	Selecting the main dosing property sets the raw material amount of the silo to 100%.
Selecting the "Main dosing" property	The "Main dosing" property of a silo is selected in the "Resin Storage" window.

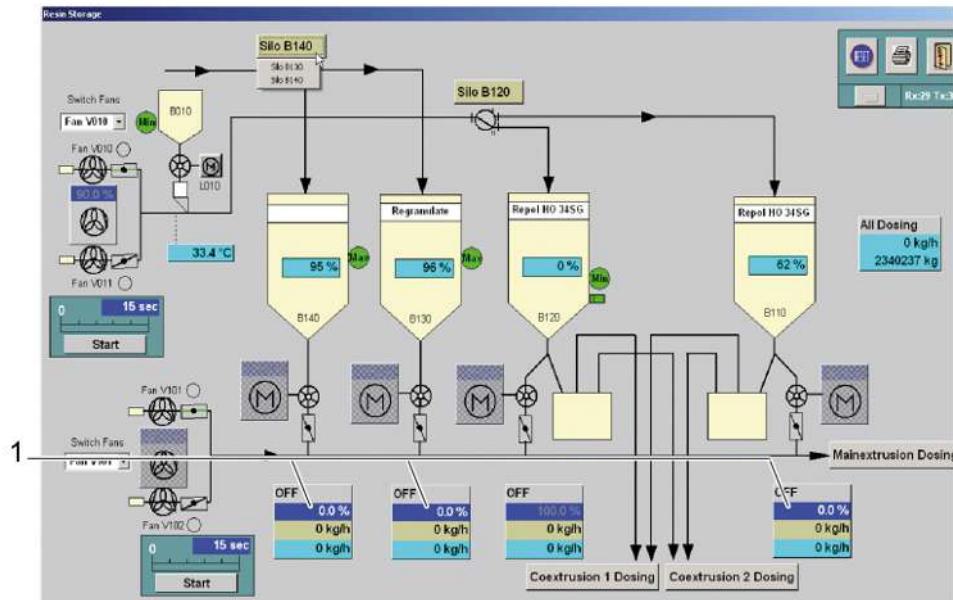


Example: Silo value field without and with the "Main dosing" property

- ▶ Click on the value field of the silo with the right mouse key.
 - ⇒ The menu opens.
- ▶ Click on [Select Maindosing] in the menu.
 - ⇒ The selected silo is set to the raw material amount 100%.

10.1.4 Setting the raw material amount of a silo

Description	In the basic setting the main dosing has a raw material amount of 100 % and the auxiliary dosings have a raw material amount of 0 %. The raw material amounts of the auxiliary dosings can be set. The raw material amount of the main dosing is reduced by the entered raw material amount of the auxiliary dosing. The raw material amount can also be changed during production.
Setting the raw material amount	The raw material amount of a silo is set in the "Resin Storage" window. The raw material amount must be set separately for each silo.



Example: "Resin Storage" window

- ▶ Click on the dark blue highlighted percentage (1) of the auxiliary dosing in the value field of the silo.
- ⇒ The input window opens.
- ▶ Enter the desired raw material amount and close the input window.
- ⇒ The raw material amounts of the entered auxiliary dosing and the main dosing are adjusted.

The dosing starts automatically together with the start of the relevant extrusion.

10.1.5 Selecting the "Main dosing" property for a dosing unit

Description

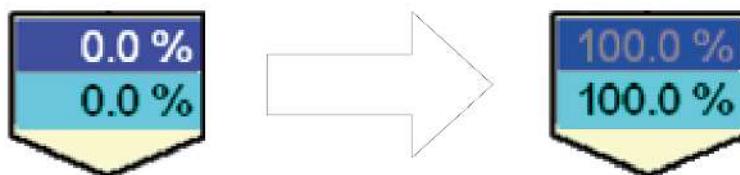
Selecting the "Main dosing" property sets the raw material amount of the dosing unit to 100%.

The "Main dosing" property may only be selected for dosing units with sufficient delivery volume.

Selecting the "Main dosing" property

The main dosing property for a dosing unit is selected in the "Extrusion X Dosing" window.

The main dosing property must be selected separately for each dosing unit.



- ▶ Click on the value field of the dosing unit with the right mouse key.
- ⇒ The menu opens.
- ▶ Click on [Select Maindosing] in the menu.
- ⇒ The selected dosing unit is set to the raw material amount 100%.

10.1.6 Setting the raw material amount of a dosing unit

Description

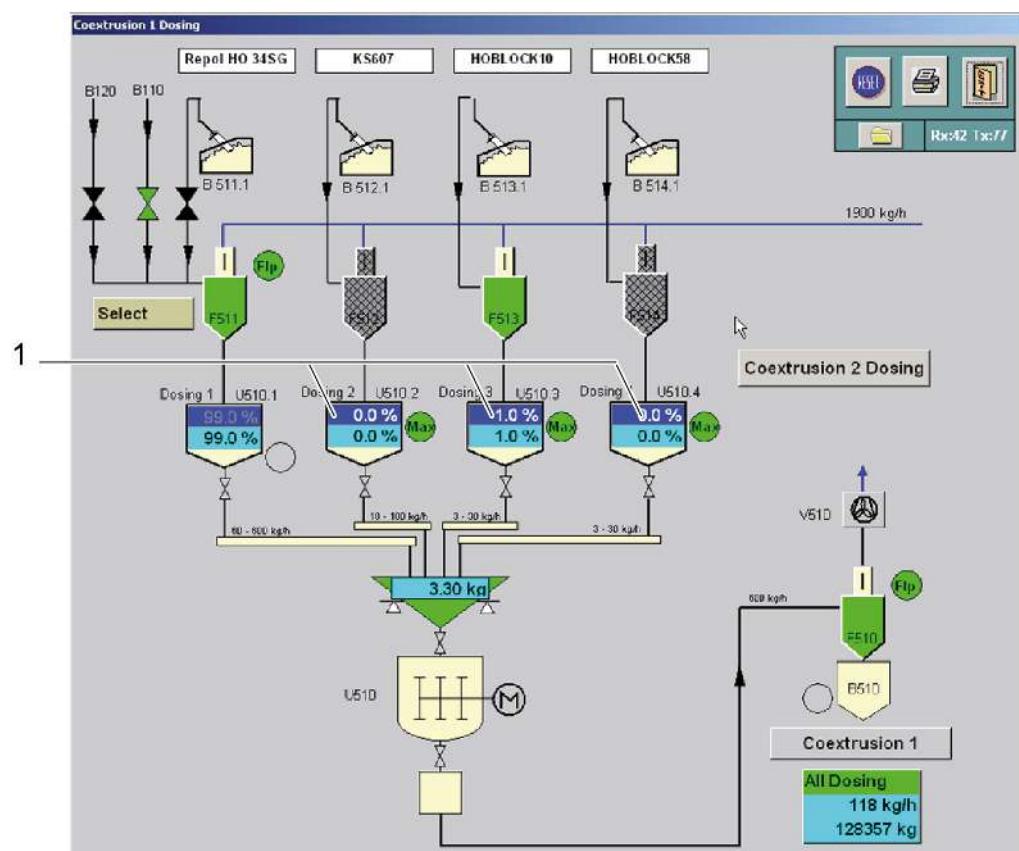
In the basic setting the main dosing has a raw material amount of 100 % and the auxiliary dosings have a raw material amount of 0 %. The raw material amounts of the auxiliary dosings can be set. The raw material amount of the main dosing is reduced by the entered raw material amount of the auxiliary dosing.

The raw material amount can also be changed during production.

Setting the raw material amount

The raw material amount of a dosing unit is set in the "Extrusion X Dosing" windows.

The raw material amount must be set separately for each dosing unit.



Example: "Coextrusion 1 Dosing" window

- ▶ Click on the dark blue highlighted percentage of the additive (1) in the value field of the dosing unit.
 ⇒ The input window opens.
- ▶ Enter the desired raw material amount and close the input window.
 ⇒ The raw material amounts of the entered auxiliary dosing and the main dosing are adjusted.

The dosing starts automatically together with the start of the relevant extrusion.

10.2 Cleaning the resin supply

Safety

WARNING

Polymer dust can ignite at sources of ignition.

This can lead to serious injury.

- ▶ Regularly check for polymer dust.
- ▶ Immediately remove polymer dust.
- ▶ Fire, naked flames and smoking are forbidden.

Cleaning the extrusion system

- ▶ Keep the resin supply clean. Remove granulate, polymer dust, film and flammable materials.
- ▶ For details of the cleaning of the components, see the operating manuals of the manufacturers.

11 Operating the extrusion system

Further information More information on operation can be found in the operating manual of the line assembly.

11.1 Switching the extrusion off and on

11.1.1 Switching on extruding process with twin screw extruder

Requirement

- The resin is ready for processing.
- *The resin supply system is correctly adjusted.
- If there is a slider for the resin supply system, this must be opened.
- The resin must be in the dosing scale upstream of the twin screw extruder. If there is no resin in the dosing scale, the drive of the twin screw extruder stops.
- The extrusion system is heated to operating temperature.
- The exhaust system of the melt die unit is switched on.
- The chill roll of the film casting unit is in the park position.

- or -

The drive of the chill roll has been switched on.

• No interlocks on the drives are active.

The push button on the operator panel for switching on the drives flashes.

Safety
The exhaust system of the melt die unit is not included in the scope of supply. The exhaust system must be switched on before the drives are switched on and it must be ensured that they are functioning properly.

WARNING

Raw materials emit vapours and gases, which cause irritation of skin, eyes and airways.

- ▶ Ensure that the exhaust system is running effectively.
- ▶ Follow the safety data sheets of the raw material manufacturer.

The melt can spray profusely under the following conditions:

- The melt pipe is overheated.
- There is moisture in the melt or the lines.
- The melt contains air bubbles.

WARNING

Hot melt escaping under pressure causes serious burns.

- ▶ Wear heat-resistant protective gloves.
- ▶ Wear a hard hat with face protection.
- ▶ Wear protective clothing.

The extrusion system is very hot.

The covers at the melt die and the adapter block are for insulation purposes and do not serve as safeguards.

⚠ WARNING

Hot surfaces can cause serious burns.

- ▶ Do not touch hot surfaces.
- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing.

During operation, following components of the extrusion system are loud:

- Optional: drive of the extruder
- Optional: drive of the melt pump
- Optional: vacuum system

⚠ WARNING

Constant noise > 85 dB causes permanent damage to the hearing.

- ▶ Wear ear protection.

Switching on the extrusion system

- ▶ Release the extrusion system. Press the push button on the operator panel for switching on the extrusion system.
 - ⇒ The continuous "start warning" acoustic signal sounds for 3 seconds.
 - ⇒ The alternating "start release" acoustic signal then sounds for 3 seconds.
The extrusion system can be switched on during this time.
- ▶ Switch on the extrusion system on the operator panel.
 - ⇒ During the start sequence, the push button flashes rapidly. Start the drives of the extrusion system. The melt begins to flow. When the pressure regulator switches on, the extrusion system is in automatic operation and the push button lights up continuously.

11.1.2 Switching off the extrusion system with twin screw extruder

Switching off the extrusion system

- ▶ Switch off the extrusion system on the operator panel.
 - ⇒ During the stop sequence, the push button flashes rapidly. The extruder is emptied. The drives of the extrusion system stop. The stop sequence takes approx. 90 seconds.
 - ⇒ Due to the pressure in the extrusion system, melt may continue to emerge from the extrusion system even after it has stopped.
 - ⇒ The vacuum system is ventilated.
 - ⇒ Further actions on the film production line can be triggered by stopping the drives.

11.2 Setting the temperature of a component with a heating/cooling unit

Further information

The setting, switching on and off of the heating and cooling units can be found in the chapter "Operating the line".

11.2.1 Setting the temperature of the extrusion

Safety

WARNING

Hot surfaces can cause serious burns.

- ▶ Do not touch hot surfaces.
- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing.

ATTENTION

Improper temperature setting of the extrusion system can cause machine damage.

If the extrusion system is not heated to the recommended temperatures according to the specified temperature setting steps, machine damage such as cylinder leaks on the extruder or damage to the filter cartridges can occur. Brückner accepts no responsibility for such machine damage and any further damage resulting from it, and the damage is not subject to the contractual warranty of Brückner.

- ▶ Observe the specified procedure for setting the temperature of the extrusion system.

Setting the temperature of the extrusion

The components of the extrusion must be heated in several temperature setting steps. The temperature setting steps with the recommended temperatures are given during the commissioning by Brückner.

- ▶ Set the temperatures for each temperature step in WinCC OA.
- ▶ During the first temperature step, switch on the heating and cooling units in WinCC OA.
- ✓ For melt filters with filter insert preheating
 - ▶ If the temperature in the melt filter is below the melt temperature heat up the clean filter insert in the filter insert preheating.
 - ▶ Install the preheated filter insert into the melt filter briefly before operation. For information about changing the filter insert, see the manufacturer documentation.

Setting the temperature of the filter insert of the melt filter

11.3 Rinsing the extrusion system with melt

Description	To remove thermally decomposed material from the extrusion system, the extrusion system must be flushed.
Requirement	<ul style="list-style-type: none"> • The resin is ready for the processing. • *The resin supply system is correctly adjusted. • If there is a slider for the resin supply system, this must be opened. • For extrusion with a twin screw extruder, resin must be in the dosing scale. If there is no resin in the dosing scale, the drive of the twin screw extruder stops. • When extruding with a single screw extruder, the resin must be in the feeding shaft; if there is no resin in the feeding compartment, the drive of the single screw extruder stops. • The extrusion system is heated to the operating temperature. • The drive of the chill roll is running. The chill roll turns. • The electrostatic film pinning device is in the park position.
Required personnel	Two operators are required. <ul style="list-style-type: none"> • 1 operator to operate the operating panel and ensure safety. • 1 operator who removes the melt.
Personal protective equipment	<ul style="list-style-type: none"> • Hard hat with face protection • Long protective gloves for working with the melt (heat resistant, solvent resistant) • Protective clothing
Safety	The exhaust system of the melt die unit is not included in the scope of supply. The exhaust system must be switched on before the drives are switched on and it must be ensured that they are functioning properly.

⚠ WARNING

Raw materials emit vapours and gases, which cause irritation of skin, eyes and airways.

- ▶ Ensure that the exhaust system is running effectively.
- ▶ Follow the safety data sheets of the raw material manufacturer.

The melt can spray profusely under the following conditions:

- The melt pipe is overheated.
- There is moisture in the melt or the lines.
- The melt contains air bubbles.

⚠ WARNING

Hot melt escaping under pressure causes serious burns.

- ▶ Wear heat-resistant protective gloves.
- ▶ Wear a hard hat with face protection.
- ▶ Wear protective clothing.

The extrusion system is very hot.

The covers at the melt die and the adapter block are for insulation purposes and do not serve as safeguards.

Other components of the melt die unit and the film casting unit can be hot.

⚠ WARNING

Hot surfaces can cause serious burns.

- ▶ Do not touch hot surfaces.
- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing.

During operation, following components of the extrusion system are loud:

- Optional: drive of the extruder
- Optional: drive of the melt pump
- Optional: vacuum system

⚠ WARNING

Constant noise > 85 dB causes permanent damage to the hearing.

- ▶ Wear ear protection.

The components are moved or swivelled into the working or park position.

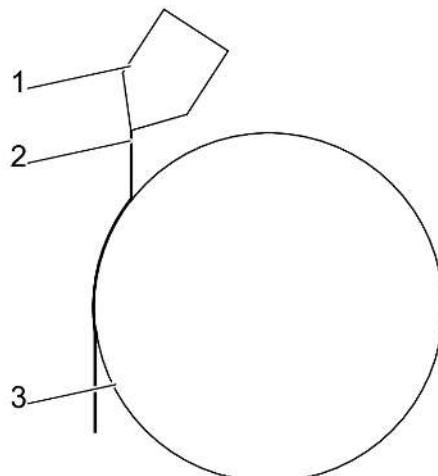
⚠ WARNING

Moving machine parts can crush body parts.

This can lead to serious injury.

- ▶ Do not reach into the vicinity of moving machine parts.
- ▶ Wait for the machine to come to a standstill.
- ▶ Before actuating the machine parts, ensure that no one is located in the danger zone.

Moving the chill roll with operating platform into position



1	Melt die	2	Melt
3	Chill roll		

Move the chill roll with operating platform into position so that the melt can drain when flushing the extrusion system on the chill roll. This means a gently flowing, stable melt curtain is achieved.

- ▶ For movement in the direction of the park position, press and hold [chill roll park pos.] on operator panel BEC until the frame is in position. Release the push button.
- ⇒ During the movement, an acoustic warning signal sounds or the signal light flashes.

- or -

Switching on all extrusion systems

Flushing the extrusion system to the drain valve

Rinsing the whole extrusion system

- ▶ For movement in the direction of the working position, press and hold [chill roll work pos.] on operator panel BEC until the frame is in position. Release the push button.

⇒ During the movement, an acoustic warning signal sounds or the signal light flashes.

- ▶ If present, open drain valves in all extrusion systems.
- ▶ Switch on all extrusion systems. See separate chapter.
⇒ The melt begins to flow.

The melt flows out of the drain valve or drain valves.

- ▶ Ensure that the following criteria are fulfilled:
 - The extrusion system was flushed for at least 10 minutes.
 - The melt runs clear or has a uniform colour.
 - The melt contains no contamination.
 - The melt contains no air bubbles.
- ▶ Close all drain valves.

Melt flows out of the melt die.

- ▶ Check on the non insulated components that the extrusion system is leaktight.
- ▶ Ensure that the following criteria are fulfilled:
 - The extrusion system was flushed for at least 30 minutes.
 - The melt runs clear or has a uniform colour.
 - The melt contains no contamination.
 - The melt contains no air bubbles.

11.4 Cleaning the die lip

Introduction

For a uniform melt flow, the die lip must be cleaned regularly.

Requirements

- The melt die is heated.
- A pan of sufficient size is under the melt die.
- The drives of the extrusion system are switched off.

Required personnel

This activity may only be performed by specialists and operating personnel.

Personal protective equipment

- Hard hat with face protection
- Heat resistant protective gloves with long sleeves
- Heat resistant protective clothing

Auxiliary materials

- Bamboo spatula and cloth
- Cleaning wax
- Pan for running out melt

Safety

WARNING

Raw materials emit vapours and gases, which cause irritation of skin, eyes and airways.

- ▶ Ensure that the exhaust system is running effectively.
- ▶ Follow the safety data sheets of the raw material manufacturer.

WARNING

Hot melt escaping under pressure causes serious burns.

- ▶ Wear heat-resistant protective gloves.
- ▶ Wear a hard hat with face protection.
- ▶ Wear protective clothing.

WARNING

Danger of slipping on wet floors.

This will lead to serious head and body injuries.

- ▶ Do not step on soiled areas.
- ▶ Close off access to soiled areas.
- ▶ Remove leaked fluid immediately.
- ▶ Keep the workplace and corridors clean.

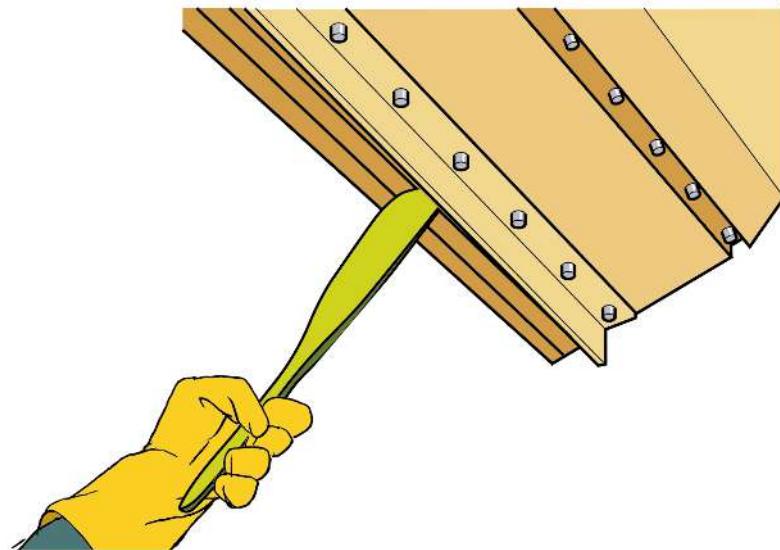
ATTENTION

Cleaning the die lip with unsuitable tools damages the melt die and the die lip surface.

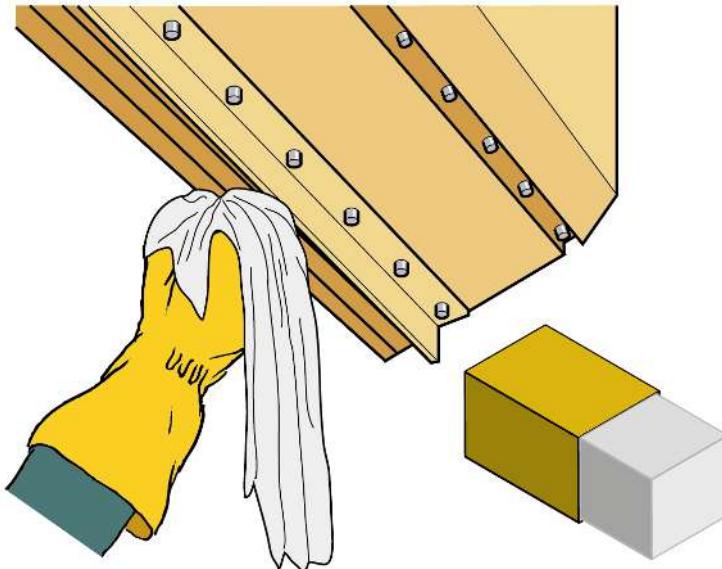
- ▶ Never insert tools in the die gap.
- ▶ Only use soft bamboo tools or a cloth to remove plastic remnants on the die lip.
Never use steel, brass or copper.



- ▶ Cut off the melt on the die lips using a bamboo spatula.



- ▶ Remove coarse melt residues using a bamboo spatula.



- ▶ Clean the die lips with cleaning wax and a cloth.
- ▶ Remove all residual wax with a clean cloth.

ATTENTION

Contaminated die lips

Danger of film break

- ▶ The die lips must be clean and free of contamination.
- ▶ Apply silicone oil spray to the die lip.
- ▶ Remove the pan with the melt.

11.5 Cleaning the extrusion system

Safety

WARNING

Polymer dust can ignite at sources of ignition.

This can lead to serious injury.

- ▶ Regularly check for polymer dust.
- ▶ Immediately remove polymer dust.
- ▶ Fire, naked flames and smoking are forbidden.

WARNING

Hot surfaces can cause serious burns.

- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing.

Cleaning the extrusion system

- ▶ Keep the extrusion section clean. Remove granulate, polymer dust, film and flammable materials.
- ▶ For details of the cleaning of the components, see the operating manuals of the manufacturers.

11.6 Operating or switching off the extrusion system in standby

Requirement

The line has been shut down and cleaned.

Short stop of the extrusion

- ▶ The heating and cooling units continue to run. Lower the temperature slightly as required.
- ▶ Flush the extrusion system regularly with melt. The purging time and the purging frequency depend on the resin.

Prolonged stop of the extrusion

- ▶ Switch off the heating and cooling units.
- ⇒ For melt filters with filter insert preheating: If the melt temperature in the melt filter is undercut, the filter insert must first be dismantled from the melt filter. The open melt pipes must be closed with compressed air by cooling down the melt. The closing of the melt pipes prevents oxidative degradation of the melt. The clean filter insert must be preheated in the filter preheating station the next time the extrusion system is heated.

12 Operating the film casting unit

Further information More information on operation can be found in the operating manual of the line assembly.

12.1 Operating modes of the film casting unit

Explanation There are 3 operating modes. They ensure that it is safe to work on the line component. Each operating mode makes different functions available.

- Production Mode

The line component can be put into operation in Production Mode.

- Service Mode

Service Mode is used for cleaning and inspection.

- Maintenance mode

Maintenance Mode is used for mechanical maintenance work. For all other maintenance work or modifications, further protective measures must be taken. Voltage may be present on the drives.

Operating modes of the film casting unit

Functions	Production Mode	Service Mode	Maintenance mode
The components can be moved.	Yes	No	No
Operation is possible.	Yes	Partial ¹⁾	No
Operation of the heating and cooling units is possible.	Yes	Yes	No
The pneumatic system is supplied with compressed air.	Yes	No	No

When the Production Mode is left, the following actions are triggered:

- The take-off roll is moved into the park position or remains stationary in the current position.
- If there is a cross cutting device, the blade is moved into the housing.
- If there is a thickness gauge with a radioactive source, the radioactive source is moved into the radiation protection housing.
- If there is a nip roll at the outlet of the film casting unit or at the film casting stand, this is swivelled into the park position.
- All other components remain in the current position.
- The pneumatic system is ventilated.
- The components are switched off.
- The components are locked.
- Further actions can be triggered on the film production line.

¹⁾ If the movement of the chill roll is in the park position in Service Mode, the main drive(s) of the film casting unit can be switched on with a limited speed. The further components of the film casting unit cannot be switched on.

When changing to Maintenance Mode, there is an emergency stop machine. The Process Control System triggers actions.

Safety**▲ WARNING**

The presence of persons in the danger zone of rotating and moving parts can lead to life-threatening situations or cause injury.

- ▶ The key for changing operating modes may only be used by trained technical personnel.
- ▶ The key must be kept in a place that is inaccessible to unauthorised persons.
- ▶ When entering the danger zone, the operator must take along the key.
- ▶ When changing the operating mode, ensure that no one is located in the danger zone.

Switching to "Service Mode" or "Maintenance Mode"

- ▶ Change the operating mode. Turn the key switch on the operator panel to the required operating mode.

Changing to "Production Mode"

- ▶ When entering the danger zone, take along the key.
- ▶ Ensure that no one is located in the danger zone.
- ▶ Change to Production Mode. On the operator panel, turn the key switch to [production].
- ⇒ The locking devices that became active by leaving Production Mode are eliminated.
- ✓ The [pneumatic reset] push button flashes on the operator panel.
- ▶ Reset the pneumatic system to the defined default status. Press [pneumatic reset] on the operator panel.

If emergency stop machine was triggered by the change of operating modes, proceed as follows:

- ✓ The [fault reset] push button flashes on the operator panel.
- ▶ Set the start release. On the operator panel, press [fault reset].

12.2 Operating the safety gate on the platform on the take-off roll

Description

The safety gate can be opened under certain conditions. Opening the safety gate blocks functions on the film casting unit.

Required personnel

This activity may only be performed by specialists and operating personnel.

Safety**▲ DANGER**

The presence of persons in the danger zone of the line can lead to life-threatening injury.

- ▶ No entry for unauthorised personnel.

Unlocking the safety gate

- ✓ The actual speed of the film casting unit is maximum 15 m/min.

- ✓ The chill roll with platform is in the park position.

- ✓ The take-off roll is in the park position.

- ▶ Unlock the safety gate. On the safety gate, turn the switch from [safety gate] to [release].

- ▶ Open the safety gate.

- ⇒ The speed of the film casting unit is limited to 15 m/min.

- ⇒ The chill roll with platform cannot be moved.

- ⇒ The take-off roll cannot be moved.

- Locking the safety gate**
- ▶ Ensure that no one is located in the danger zone.
 - ▶ Close the safety gate.
 - ▶ Lock the safety gate. On the safety gate, turn the switch [safety gate] to [lock].
 - ⇒ The disabled functions are enabled.

12.3 Switching the film casting unit off and on

12.3.1 Switching on the film casting unit

- Requirement**
- No interlocks are active on the drive.
 - or -
 - No interlocks on the drives are active.
 - The push button on the operator panel for switching on the film casting unit flashes.
- Switching on the film casting unit**
- ▶ Enable the film casting unit. Press the push button on the operator panel for switching on the film casting unit.
 - ⇒ The continuous "start warning" acoustic signal sounds for 3 seconds.
 - ⇒ The alternating "start release" acoustic signal then sounds for 3 seconds.
The film casting unit can be switched on during this time.
 - ▶ Switch on the film casting unit on the operator panel.
 - ⇒ All heating and cooling units that are present are started.
 - ⇒ The drive of the chill roll is switched on.
 - ⇒ If there is a driven cooling roll, it is switched on.

12.3.2 Switching off the film casting unit

- Switching off the film casting unit**
- ▶ Switch off the film casting unit on the operator panel.
 - ⇒ The drive of the chill roll is switched off.
 - ⇒ If there is a driven cooling roll, this is switched off.
 - ⇒ If the chill roll is not in the park position, the drives of the extrusion system are switched off.
 - ⇒ Further actions on the film production line can be triggered by stopping the drive(s).

12.4 Setting the temperature of components with a heating and cooling unit

- Further information**
- The setting, switching on and off of the heating and cooling units can be found in the chapter "Operating the line".

12.4.1 Setting the temperature of the film casting unit

- Setting the temperature of the film casting unit**
- Set the temperature of the film casting unit according to the following table:
- ▶ Set the temperature in WinCC OA.

- ▶ Switch on the film casting unit on the operator panel.

Heating programme of the film casting unit

INFO

The following settings are examples. They may possibly deviate slightly from the settings that you require for your process.

6 hours prior to start-up

Component	Operating temperature [°C]
Chill roll	20 - 35

12.5 Eliminating a failure of the pneumatic system

Failure of the pneumatic system

If the compressed air in the pneumatic system of a line component falls below the minimum value, the pressure valves in the control cabinet switch off. The components operated with compressed air remain in the current position. The nip rolls can move into the centre of gravity. The horn sounds and the error message is displayed on the visualisation. A failure of the pneumatic system usually leads to a malfunction of the film production line.

Requirement

- The line component is in "Production Mode".
- The [pneumatic reset] push button flashes on the operator panel.

Safety

⚠ WARNING

While resetting faults in the pneumatics supply, unexpected movements of individual components may occur.

This can cause life-threatening injury.

- ▶ Ensure that no one is located in the danger zone.
- ▶ Wait until the standstill position is reached.

Resetting the pneumatic system

- ▶ Ensure that no one is located in the danger zone.

- ▶ Reset the pneumatic supply to the defined initial state. Press [pneumatic reset] on the operator panel.

Resetting the fault

Faults output by the process control system must be reset after the fault is eliminated.

- ✓ The fault is remedied.
- ▶ Reset the fault. On the operator panel, press [fault reset].
 - ⇒ All remedied faults on the line are reset.
 - ⇒ Triggered safeguards visible on the operator panel are reset. This does not apply on the operator panel in the control room.

After all faults and triggered safeguards have been reset, the line components can be started again.

12.6 Operating the driven nip roll on the film casting stand

Function

If the film is not threaded into the following machine, the driven nip roll enables the transport of the film out of the film casting stand. To do so, the nip roll turns with line speed and is in working position.

The nip roll is not intended for use in "Production Mode".

When the nip roll moves into the working position, there is a danger of crushing and being pushed.

Due to the rotating nip roll, body parts can be caught and drawn in.

⚠ WARNING

Moving machine parts can crush, entangle, draw in and crash into body parts.

This can lead to serious injury.

- ▶ Work with caution on moving parts.
- ▶ Wear close-fitting clothing.

**Operating the driven
nip roll on the film
casting stand**

- In "Service Mode" and "Maintenance Mode", operation of the nip roll is not possible.
- In "Production Mode", operation of the nip roll is possible. The nip roll can turn and be pneumatically swivelled into the working and park position.

The nip roll swivels into the working position.

- During the following actions, the nip roll swivels into the working position and the drive for turning the rolls starts:
 - On the operator panel BM1, the push button [nip roll P.R. work pos.] is pressed.
 - The "MDO Thread Mode" line threading mode is started.
 - The "Cut Back Mode" line threading mode is started.

The nip roll swivels into the park position.

- During the following actions, the nip roll swivels into the park position:
 - On the operator panel BM1, the push button [nip roll P.R. park pos.] is pressed.
 - The "TDO Thread Mode" line threading mode is started.
 - At the nip roll, the drive for turning the rolls stops.
- As soon as the nip roll has left the working position, the drive for turning the rolls is switched off.

12.7 Cleaning the film casting unit

For the cleaning of the film casting unit, see the "Film casting unit" operating manual.

12.8 Operating the film casting unit in standby or switching it off

Requirement

The line has been shut down and cleaned.

Film casting unit

- ▶ Adjust the film casting unit according to the following table.

Component	Next operation of the film production line	
	< 4 hours	> 4 hours
Heating and/or cooling units	Operating temperature	Switched off
Drives	Switched on	Switched off

13 Operating the auxiliary winder

Further information	More information on operation can be found in the operating manual of the line assembly.
----------------------------	--

13.1 Switching the auxiliary winder off and on

13.1.1 Switching on the auxiliary winder

Requirement	<ul style="list-style-type: none"> • The requirements are valid for the auxiliary winder, which shall be started: • No interlocks are active on the drive. <p>The push button on the operator panel for switching on the drive is flashing.</p>
Switching on the auxiliary winder	<p>► Ensure that no-one is located in the danger zone of the auxiliary winder.</p> <p>► Switch on the auxiliary winder. On the operator panel, press [aux. winder x run].</p> <p>⇒ The auxiliary winder turns with the speed of the previous line component.</p> <p>⇒ The auxiliary winder turns with the torque set on the operator panel.</p> <p>⇒ At a speed above 15 m/min, the triggered safeguard causes an emergency stop of the auxiliary winder.</p>

13.1.2 Switching Off the Auxiliary Winder

Switching Off the Auxiliary Winder	<p>► Switch off the auxiliary winder. On the operator panel, press [aux. winder x stop].</p> <p>⇒ The drive is stopped.</p> <p>⇒ The signal light goes out.</p>
---	---

13.2 Preparing the winding shaft of the auxiliary winder

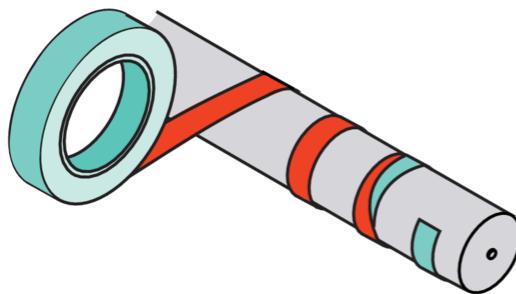
Description	The winding shaft of the auxiliary winder is manually prepared with adhesive tape. When winding the film onto the auxiliary winder, this makes the placing of the film easier.
Requirement	<ul style="list-style-type: none"> • The carriage of the auxiliary winder is outside the danger zone.
Required personnel	<ul style="list-style-type: none"> • One operator is required.
Personal protective equipment	<ul style="list-style-type: none"> • Cut-resistant protective gloves
Auxiliary materials	<ul style="list-style-type: none"> • Adhesive tape <p>To avoid contaminating the film with a different type of plastic, the adhesive tape should be made of the same plastic as the film being produced.</p>
Safety	<p>The adhesive tape can have sharp film edges.</p>

CAUTION

The sharp film edge can cause serious cutting injuries.

- Wear protective gloves.
- Wear protective clothing.

Preparing the winding shaft



- ▶ Stick the adhesive tape onto the winding shaft and turn the adhesive side outward.
- ▶ Wrap the adhesive tape onto the winding shaft in a spiral fashion. Turn the winding shaft manually.
- ▶ To complete the spiral, turn the adhesive tape again with the adhesive side to the winding shaft.
- ▶ Stick the adhesive tape onto the winding shaft and sever.

13.3 Connecting the auxiliary winder to the drive unit

Required personnel

- One operator is required.

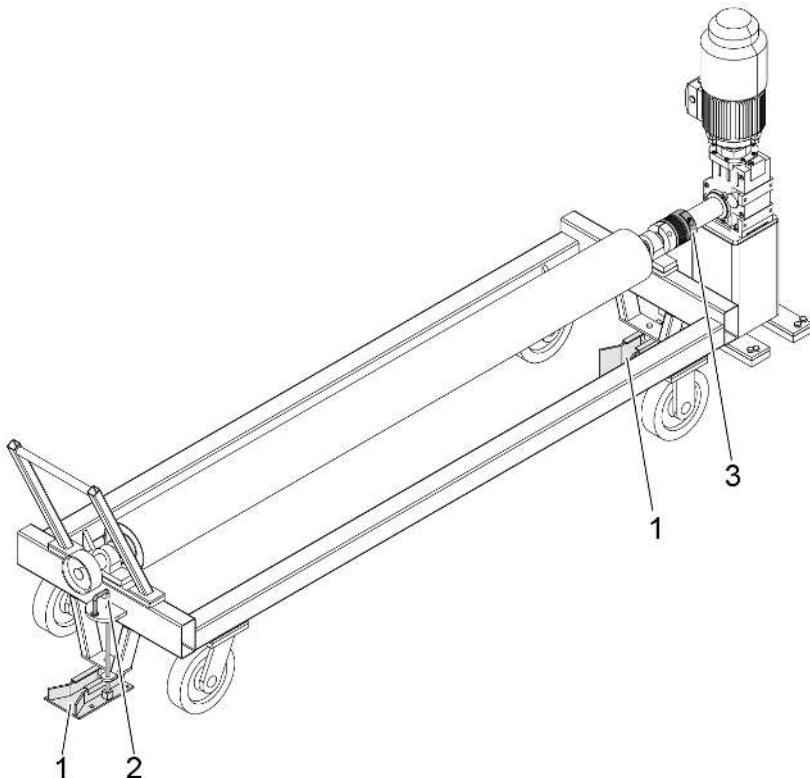
Personal protective equipment

- Safety shoes

Overview

INFO

The following figure shows an example. The figure is not necessarily identical to your line.



1	Threading aid	2	Locking unit
3	Coupling		

Connecting the auxiliary winder to the drive unit

- ▶ Move the auxiliary winder up to the stop in the threading aid.
- ▶ Connect the auxiliary winder with the coupling.
- ▶ Lock the locking unit.

The drive can only be started if the auxiliary winder is correctly connected to the coupling.

13.4 Releasing the auxiliary winder from the drive unit

Requirement

- The drive of the auxiliary winder is switched off.

Required personnel

- One operator is required.

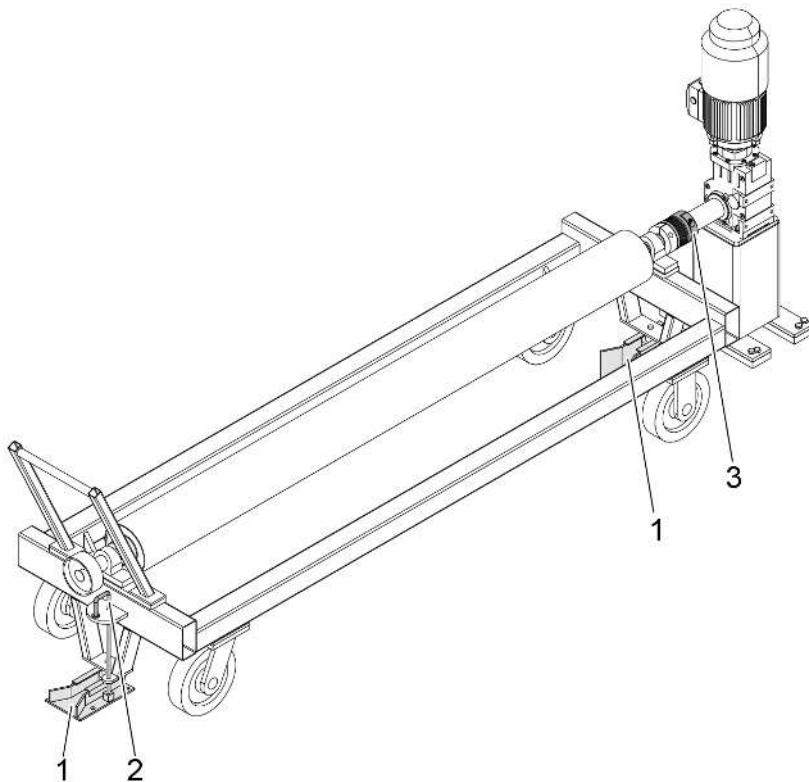
Personal protective equipment

- Safety shoes

Overview

INFO

The following figure shows an example. The figure is not necessarily identical to your line.



1	Threading aid	2	Locking unit
3	Coupling		

Releasing the auxiliary winder from the drive stands

- ▶ Unlock the locking unit.
- ▶ Release the auxiliary winder from the coupling.
- ▶ Move the auxiliary winder out of the threading aids.
- ▶ Move the auxiliary winder out of the danger zone.

13.5 Unwinding the film from the auxiliary winder

Requirement

- Film is wound up onto the winding shaft.
- The carriage is loosened from the drive unit.

Personal protective equipment

- Cut-resistant and heat-resistant protective gloves
- Protective clothing
- Safety shoes

Safety

▲ WARNING

Film on the floor presents a danger of sliding and tripping.

This will lead to serious head and body injuries.

- ▶ Do not step on film residues.
- ▶ Immediately remove film residues.
- ▶ Keep the workplace and corridors clean.

▲ WARNING

The sharp film edge will cause serious cutting injuries.

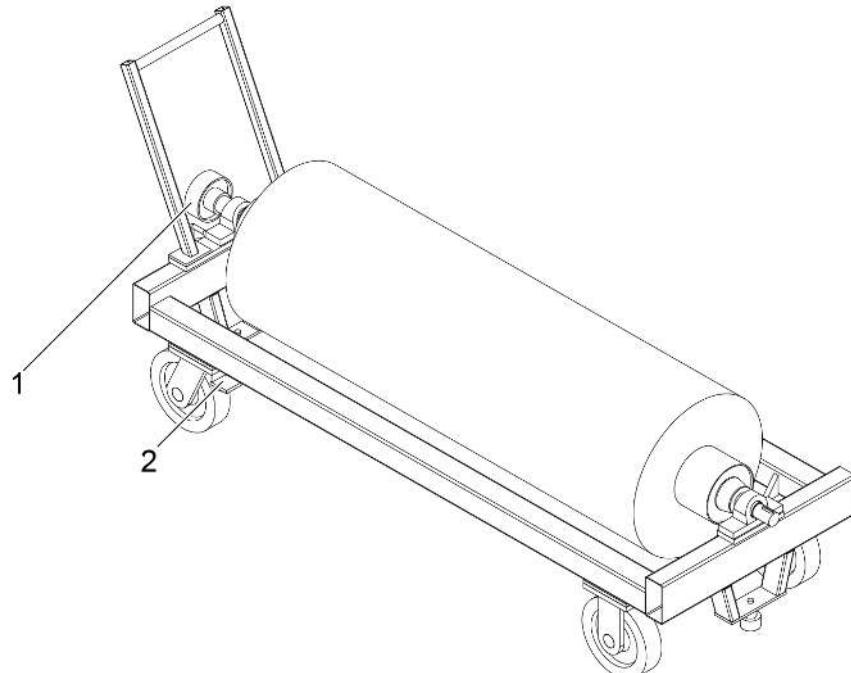
- ▶ Wear protective gloves.

▲ CAUTION

Hot film can cause burns.

- ▶ Wear protective gloves.
- ▶ Wear protective clothing.

Overview



1	Manual brake with handwheel
---	-----------------------------

2	Parking brake
---	---------------

Unwinding the film from the auxiliary winder

- ▶ Position the auxiliary winder.
- ▶ Secure the auxiliary winder against rolling away with the parking brake.
- ▶ Unwind the film. If necessary, the winding shaft can be braked with the handwheel.

13.6 Bridging the light barrier at the auxiliary winder briefly

The auxiliary winder is surrounded by light barriers. When switching on the drive on the auxiliary winder, the light barriers are activated. The light barriers are used to secure the danger zone on the auxiliary winder.

- At a maximum speed of 15 m/min, when triggering the light barrier, the torque of the drive is restricted.
- At a speed above 15 m/min, triggering the light barrier causes an emergency stop of the auxiliary winder. For works at the auxiliary winder the light barrier can be bridged briefly with the safety enabling button. For the access with the safety enabling button the torque of the drive is limited.

Signal light on the auxiliary winder

Signal light	Status of the auxiliary winder	Meaning
The green signal light lights.	<ul style="list-style-type: none"> • The speed of the auxiliary winder is maximum 15 m/min. • The speed of the auxiliary winder is higher than 15 m/min. • The safety enabling button is pressed down to the centre position. 	The light barrier can be cut without triggering an emergency stop of the auxiliary winder.
The yellow signal light lights.	<ul style="list-style-type: none"> • The speed of the auxiliary winder is maximum 15 m/min. • The light barrier was triggered. • The speed of the auxiliary winder is higher than 15 m/min. • The safety enabling button is pressed down to the centre position. • The light barrier was triggered. 	The torque at the auxiliary winder is reduced and limited.
The red signal light lights.	<ul style="list-style-type: none"> • The speed of the auxiliary winder is higher than 15 m/min. 	The crossing of the light barrier leads to an emergency stop of the auxiliary winder.

13.6.1 Bridging the light barrier with safety enabling button briefly

- | | |
|---|--|
| Requirement | <ul style="list-style-type: none"> • The drive of the auxiliary winder is switched on. |
| Required personnel | <p>2 operators are required.</p> <ul style="list-style-type: none"> • 1 operator ensures the safety in the danger zone at the operator panel and with the safety enabling button. • 1 operator, who wants to enter the danger zone. |
| Briefly bridging the light barrier | <p>► Press the safety enabling button to the centre position and hold it there.</p> <p>⇒ At a speed of the auxiliary winder above 15 m/min, triggering the light barrier causes not an emergency stop of the auxiliary winder.</p> <p>⇒ The green signal light lights.</p> |

⚠ WARNING**Rotating parts on the auxiliary winder draw in clothing and body parts.**

This can lead to injury.

- ▶ Maintain the distance to the auxiliary winder.
- ▶ Wear close-fitting clothing.
- ▶ Pass through the light barrier.
 - ⇒ The torque of the auxiliary winder is reduced and limited.
 - ⇒ The yellow signal light lights.
 - ⇒ With speeds of the auxiliary winder above 15 m/min: If the push button of the safety enabling button is released or if it is pressed down all the way to the stop, an emergency stop of the auxiliary winder is executed.
 - ⇒ With speeds of the auxiliary winder below 15 m/min: If the push button of the safety enabling button is released or if it is pressed down all the way to the stop, an emergency stop of the auxiliary winder is executed.

ATTENTION**Due to the security settings on the auxiliary winder, the film in front of the auxiliary winder can sag.**

The film can be pulled into the machine in front of it.

The film cannot be properly pulled into the following machine.

- ▶ Keep the presence of persons in the danger zone of the auxiliary winder as short as possible.
- ▶ After leaving the danger zone, reset the security settings.
- ▶ Tension the sagging film.

Resetting the light barrier

- ✓ No one is located in the danger zone of the auxiliary winder.
- ▶ Reset the light barrier protective function. Press [light barrierer reset] outside the danger zone of the auxiliary winder.
 - ⇒ The auxiliary winder turns with the set torque.
- ▶ Release the safety enabling button.
 - ⇒ At a speed of the auxiliary winder above 15 m/min, triggering the light barrier causes an emergency stop of the auxiliary winder.

14 Operating the machine direction orienter

Further information More information on operation can be found in the operating manual of the line assembly.

14.1 Operating modes of the machine direction orienter

Explanation There are 3 operating modes. They ensure that it is safe to work on the line component. Each operating mode makes different functions available.

- Production Mode

The line component can be put into operation in Production Mode.

- Service Mode

Service Mode is used for cleaning and inspection.

- Maintenance mode

Maintenance Mode is used for mechanical maintenance work. For all other maintenance work or modifications, further protective measures must be taken. Voltage may be present on the drives.

Operating modes of the machine direction orienter

Functions	Production Mode	Service Mode	Maintenance Mode
The components can be moved.	yes	no	no
Operation is possible.	yes	no	no
"Jogging Mode" is available.	yes	yes	no
Operation of the heating and cooling units is possible.	yes	yes ¹⁾	no
The safety gates and the service accesses can be opened.	no	yes	yes
The pneumatic system is supplied with compressed air.	yes	no	no

When Production Mode is left, the following actions are triggered:

- The blade of the cross cutting device is run into the housing.
- The pneumatically movable components are swivelled into the park position.
- The pneumatic system is ventilated.
- The roll drives are switched off. The rolls can still turn until they come to a standstill.
- All other components remain in the current position.
- The components are switched off.
- The components are locked.
- The safety gates and service accesses are unlocked.
- Further actions can be triggered on the film production line.

¹⁾ If the safety gate on the side of the machine direction orienter is opened to the pipework of the heat carrier in Service Mode, the pumps of the heating and/or cooling unit are switched off.

When changing to Maintenance Mode, there is an emergency stop machine. The Process Control System triggers actions.

When changing over to Production Mode, open safety gates or service accesses lead to emergency stop machine. The Process Control System triggers actions.

Safety

▲ DANGER

The presence of persons in the danger zone of the line can lead to life-threatening injury.

- ▶ No entry for unauthorised personnel.

▲ WARNING

The presence of persons in the danger zone of rotating and moving parts can lead to life-threatening situations or cause injury.

- ▶ The key for changing operating modes may only be used by trained technical personnel.
- ▶ The key must be kept in a place that is inaccessible to unauthorised persons.
- ▶ When entering the danger zone, the operator must take along the key.
- ▶ When changing the operating mode, ensure that no one is located in the danger zone.

Switching to "Service Mode" or "Maintenance Mode"

- ▶ Change the operating mode. Turn the key switch on the operator panel to the required operating mode.

Changing to "Production Mode"

- ▶ When entering the danger zone, take along the key.
- ▶ Ensure that no one is located in the danger zone.
- ▶ Close the safety gates and the service accesses.
- ▶ Change to Production Mode. On the operator panel, turn the key switch to [production].
- ✓ The [pneumatic reset] push button flashes on the operator panel.
- ▶ Reset the pneumatic system to the defined default status. Press [pneumatic reset] on the operator panel.

If emergency stop machine was triggered by the change of operating modes, proceed as follows:

- ✓ The [fault reset] push button flashes on the operator panel.
- ▶ Set the start release. On the operator panel, press [fault reset].
- ⇒ The locking devices that became active by leaving Production Mode are eliminated.

14.2 Carrying out "Jogging Mode" in the machine direction orienter

Description

In "Jogging Mode", the rolls can be moved slowly.

"Jogging Mode" is used for the following activities:

- Remove the film from the machine direction orienter.
- Clean the rolls.
- Lubricate the roll bearings.

Required personnel

This activity may only be performed by trained skilled persons.

Safety

⚠ DANGER

The presence of persons in the danger zone of the line can lead to life-threatening injury.

- ▶ No entry for unauthorised personnel.

⚠ WARNING

The presence of persons in the danger zone of rotating and moving parts can lead to life-threatening situations or cause injury.

- ▶ The key for changing operating modes may only be used by trained technical personnel.
- ▶ The key must be kept in a place that is inaccessible to unauthorised persons.
- ▶ When entering the danger zone, the operator must take along the key.
- ▶ When changing the operating mode, ensure that no one is located in the danger zone.

⚠ WARNING

Hot surfaces can cause serious burns.

- ▶ Do not touch hot surfaces.
- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing.
- ▶ Only perform service work on cool machine parts.
- ▶ Before starting, ensure that no one is located in the danger zone.

When the rolls turn, there is a draw-in hazard.

When working on the sides of the machine direction orienter, the drive strands are accessible. When the drive trains turn, there is a draw-in hazard.

⚠ WARNING

Machine parts rotating in "Jogging Mode" draw in clothing and body parts.

This can lead to injury.

- ▶ The foot switch must only be operated by instructed technical personnel.
- ▶ Connect the foot switch for "Jogging Mode" only and disconnect again afterwards.
- ▶ When actuating the foot switch, no 2nd person must be present in the danger zone.
- ▶ Exercise caution when working on rotating parts.
- ▶ Wear close-fitting clothing.

There is a danger of falling from the ladder.

⚠ WARNING

Ascents and descents present a danger of slipping and tripping.

This will lead to serious injury.

- ▶ Ascend and descend with care.
- ▶ Wear a hard hat.

There is a danger of being pushed in the passageway underneath the machine direction orienter.

If the passageway below the machine direction orienter is reached via a staircase, there is a danger of tripping.

▲ CAUTION

There is a danger of being pushed and of tripping when in the machine.

This can lead to head injuries.

- ▶ Wear a hard hat.
- ▶ Observe the markings.

"Jogging Mode": Removing the film from the machine direction orienter

Location	Requirement	Working method
outside of the safe-guard	<ul style="list-style-type: none"> • The machine direction orienter is in Production Mode or "Service Mode". • All safety gates and service accesses are closed. • The drives of the machine direction orienter are not locked. 	<ul style="list-style-type: none"> ▶ Plug in the foot switch below the machine direction orienter. ▶ Turn the rolls forward or backward with the foot switch. ⇒ The rolls turn continuously.

"Jogging Mode": Cleaning and inspecting the rolls

Location	Requirement	Working method
below the machine direction orienter	<ul style="list-style-type: none"> • The machine direction orienter is in Service Mode. • All lateral safety gates and service accesses of the machine direction orienter must be closed. • All safety gates above the machine direction orienter must be closed. • The drives of the machine direction orienter are not locked. 	<ul style="list-style-type: none"> ▶ At the inlet or outlet of the machine direction orienter, open the safety gate to access below the machine direction orienter. ▶ Plug in the foot switch below the machine direction orienter. ▶ Turn the rolls forwards or backwards with the foot switch. ⇒ The rolls with torque motors turn with 1/4 turns. ⇒ The rolls with softdrive motors turn continuously.
above the machine direction orienter	<ul style="list-style-type: none"> • The machine direction orienter is in Service Mode. • All lateral safety gates and service accesses of the machine direction orienter must be closed. • The safety gates at the inlet and at the outlet of the machine direction orienter must be closed. • The drives of the machine direction orienter are not locked. 	<ul style="list-style-type: none"> ▶ Open the safety gates above the machine direction orienter. ▶ Plug in the foot switch above the machine direction orienter. ▶ Turn the rolls with the foot switch. ⇒ The rolls with torque motors turn with 1/4 turns. ⇒ The rolls with softdrive motors turn continuously.

**"Jogging Mode":
Lubricating the roll
bearings**

Location	Requirement	Working method
on the side of the machine direction orienter	<ul style="list-style-type: none"> The machine direction orienter is in Service Mode. All safety gates and service accesses are closed. Only one safety gate on the side of the machine direction orienter may be opened. If the safety gate on the side of the machine direction orienter is opened to the pipework of the heat carrier in Service Mode, the pumps of the heating and/or cooling units are switched off. The drives of the machine direction orienter are not locked. 	<ul style="list-style-type: none"> ▶ Plug in the foot switch at the plug-in connector by the open safety gate. ▶ Turn the rolls forwards with the foot switch. ⇒ The rolls turn continuously.

14.3 Switching the machine direction orienter off and on

14.3.1 Switching on the machine direction orienter

- | | |
|--|---|
| Requirement | <ul style="list-style-type: none"> No interlocks on the drives are active.
The push button on the operator panel for switching on the drives flashes. |
| Switching on the machine direction orienter | <ul style="list-style-type: none"> ▶ Release the machine direction orienter. Press the push button on the operator panel for switching on the machine direction orienter. <ul style="list-style-type: none"> ⇒ The continuous "start warning" acoustic signal sounds for 3 seconds. ⇒ The alternating "start release" acoustic signal then sounds for 3 seconds.
The MDO can be switched on during this time. ▶ Switch on the machine direction orienter on the operator panel. <ul style="list-style-type: none"> ⇒ The heating and cooling units are started. ⇒ The drives are started. |

14.3.2 Switching off the machine direction orienter

- | | |
|---|--|
| Switching off the machine direction orienter | <ul style="list-style-type: none"> ▶ Switch off the machine direction orienter. On the operator panel, press [MDO stop]. <ul style="list-style-type: none"> ⇒ The drives of the rolls in the machine direction orienter are stopped. ⇒ The nip rolls move into the park position. ⇒ The infrared radiators move into the park position. ⇒ Further actions on the film production line can be triggered by stopping the drives. |
|---|--|

14.4 Setting the temperature of a component with a heating/cooling unit

Further information

The setting, switching on and off of the heating and cooling units can be found in the chapter "Operating the line".

14.4.1 Setting the temperature of the machine direction orienter

Safety

⚠ WARNING

Hot surfaces can cause serious burns.

- ▶ Do not touch hot surfaces.
- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing.

Setting the temperature of the machine direction orienter

Set the temperature of the machine direction orienter according to the following table:

- ▶ Set the temperature in WinCC OA.
- ▶ Switch on the machine direction orienter on the operator panel.

Heating programme of the machine direction orienter

INFO

The following settings are examples. They may possibly deviate slightly from the settings that you require for your process.

2 hours prior to start-up of the film production line		
Surface of the rolls	Operating temperature [°C]	Information
Preheating rolls		
Chrome	50 - 70	• The temperature progression is increasing. The temperature differences between 2 preheating rolls should not be greater than 10 °C.
Ceramic	75 - 100	
TFE-Lok®	75 - 120	
Stretching rolls		
TFE-Lok®	80 - 120	• The temperatures of the stretching rolls are the same or the temperature progression is slightly increasing.
Chrome	20 - 40	
Cooling rolls		
Chrome	20 - 30	• The temperatures of the chill rolls are the same or the temperature progression is slightly increasing.

14.5 Adjusting the stretching process

Description

Before threading the film into the MDO, the setting for the stretching process must be carried out.

The contract describes the following stretching processes:

- 1-gap stretching process
- 2-gap stretching process

The following settings must be made depending on the stretching process:

- Number of stretching gaps
- Stretching ratios
- Selection of the nip rolls that are moved into the working position.
- Selection of the infrared radiators that are moved into the working position.

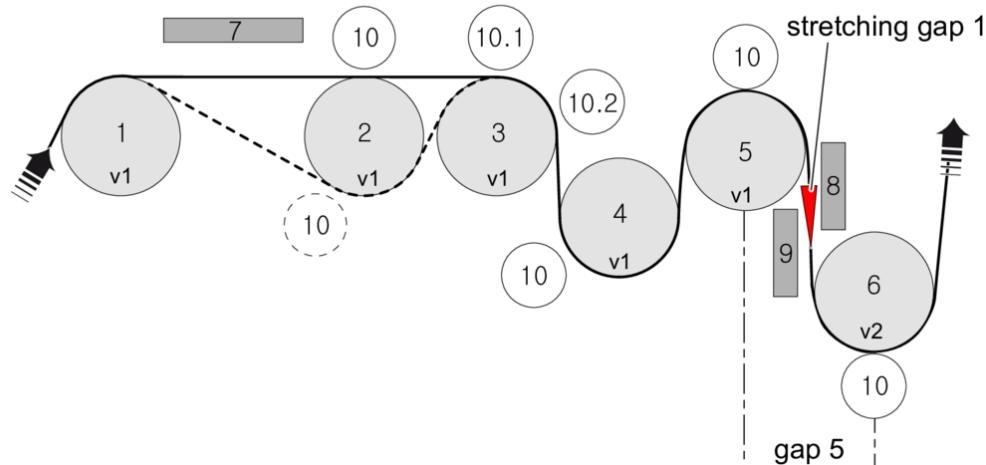
After threading the film into the MDO, settings on the stretching process are activated using the TDO Thread Mode and TDO Speed Up Mode threading modes.

14.5.1 Adjusting 1-gap stretching process

1-Gap Stretching Process

- The 1-gap stretching process is normally used for a final film thickness greater than or equal to 36 µm.
- Stretching gap:
The stretching process is carried out between stretching roll 5 and stretching roll 6.
- The stretching gap length can be adjusted using the moveable stretching roll 6.

Overview



1	Stretching roll 1	2	Stretching roll 2
3	Stretching roll 3	4	Moveable stretching roll 4
5	Stretching roll 5	6	Moveable stretching roll 6
7	Infrared radiator, horizontal	8	Infrared radiator, vertical, top
9	Infrared radiator, vertical, bottom	10	Nip roll
10.1	Nip roll 1 on stretching roll 3	10.2	Nip roll 2 on stretching roll 3
v1	Speed 1	v2	Speed 2

Requirement

- The drives of the MDO must be switched off. When switching off the drives in the MDO, the nip rolls and the infrared radiators move into park position.
- The infrared radiators are in the park position.
- The infrared radiators are in the park position.

Required personnel

This activity may only be performed by specialists and operating personnel.

Adjusting 1-gap stretching process

The following settings must be made:

- ▶ In WinCC OA in the line overview for the MDO, select the "1 Gap" stretching gap configuration. See [Setting the number of stretching gaps \[▶ 162\]](#).
- ▶ In WinCC OA, in the "Stretching: Line Speed: Threading" window, adjust the MDO stretch ratio. See [Managing line threading modes \[▶ 105\]](#).

MDO Ratio	Setting	Meaning
MDO Ratio 1	1,000	No stretching is carried out.
MDO Ratio 2	1,000	No stretching is carried out.
MDO Ratio 3	1,000	No stretching is carried out.
MDO Ratio 4	1,000	No stretching is carried out.
MDO Ratio 5	greater than 1,000	Stretching gap Stretching is carried out between stretching roll 5 and stretching roll 6.

- ▶ Select the components that are moved into working position after threading the film. To do this, select the following components in WinCC OA in the "Threading Mode Selection" view:

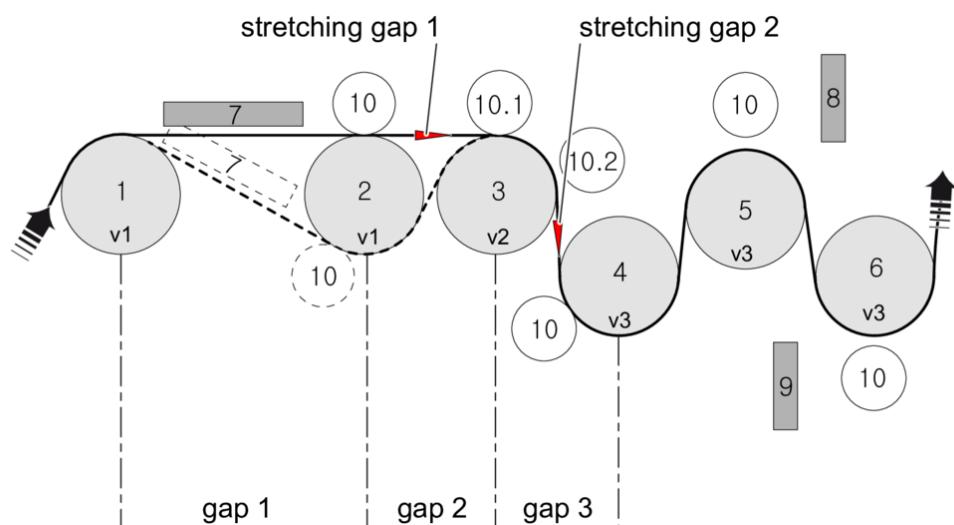
Component	Selection
Infrared radiator, vertical, top	Yes
Infrared radiator, vertical, bottom	Yes
Nip roll on stretching roll 2	Optional
Nip roll 1 on stretching roll 3	Optional
Nip roll on stretching roll 4	Optional
Nip roll on stretching roll 5	Yes
Nip roll on stretching roll 6	Yes

14.5.2 Adjusting 2-gap stretching process

2-Gap Stretching Process

- The 2-gap stretching process is normally used for a final film thickness less than 36 µm.
- Stretching gap 1:
Stretching is carried out between stretching roll 2 and stretching roll 3.
- Stretching gap 2:
Stretching is carried out between stretching roll 3 and stretching roll 4.
- The stretching gap length can be adjusted using the moveable stretching roll 4.

Overview



1	Stretching roll 1	2	Stretching roll 2
3	Stretching roll 3	4	Moveable stretching roll 4
5	Stretching roll 5	6	Moveable stretching roll 6
7	Infrared radiator, horizontal	8	Infrared radiator, vertical, top
9	Infrared radiator, vertical, bottom	10	Nip roll
10.1	Nip roll 1 on stretching roll 3	10.2	Nip roll 2 on stretching roll 3
v1	Speed 1	v2	Speed 2
v3	Speed 3		

Requirement

- The drives of the MDO must be switched off. When switching off the drives in the MDO, the nip rolls and the infrared radiators move into park position.
- The infrared radiators are in the park position.
- The infrared radiators are in the park position.

Required personnel

This activity may only be performed by specialists and operating personnel.

Adjusting 2-gap stretching process

The following settings must be made:

For the 2-gap stretching process, the 3 stretching gap configuration is selected in WinCC OA. The stretching in 2 stretching gaps is carried out via the MDO ratio setting.

- In WinCC OA in the "Line overview" for the MDO, select the "3 Gaps" stretching gap configuration. See [Setting the number of stretching gaps \[▶ 162\]](#).
- In WinCC OA, in the "Stretching: Line Speed: Threading" window, adjust the MDO stretch ratio. See [Managing line threading modes \[▶ 105\]](#).

MDO Ratio	Setting	Meaning
MDO Ratio 1	1,000	No stretching is carried out.

MDO Ratio	Setting	Meaning
MDO Ratio 2	greater than 1,000	Stretching gap 1 Stretching is carried out between stretching roll 2 and stretching roll 3.
MDO Ratio 3	greater than 1,000	Stretching gap 2 Stretching is carried out between stretching roll 3 and stretching roll 4.
MDO Ratio 4	1,000	No stretching is carried out.
MDO Ratio 5	1,000	No stretching is carried out.

- Select the components that are moved into working position after threading the film. To do this, select the following components in WinCC OA in the "Threading Mode Selection" view:

Component	Selection
Infrared radiator, horizontal	Yes
Nip roll on stretching roll 2	Yes
Nip roll 1 on stretching roll 3	Yes
Nip roll on stretching roll 4	Yes
Nip roll on stretching roll 5	Optional
Nip roll on stretching roll 6	Optional

14.5.3 Setting the number of stretching gaps

Description

The number of stretching gaps must be selected before starting the MDO.

In WinCC OA, the following stretching gaps can be set:

- 1 stretching gap
- 3 stretching gaps
- 5 stretching gaps

Selecting the stretching gaps, stretching gaps are unlocked automatically and partly moved into position or moved into position and locked. The nip rolls and infrared radiators are unlocked and locked automatically.

Requirement

- The drives of the MDO must be switched off. When switching off the drives in the MDO, the nip rolls and the infrared radiators move into park position.
- The infrared radiators are in the park position.
- The infrared radiators are in the park position.

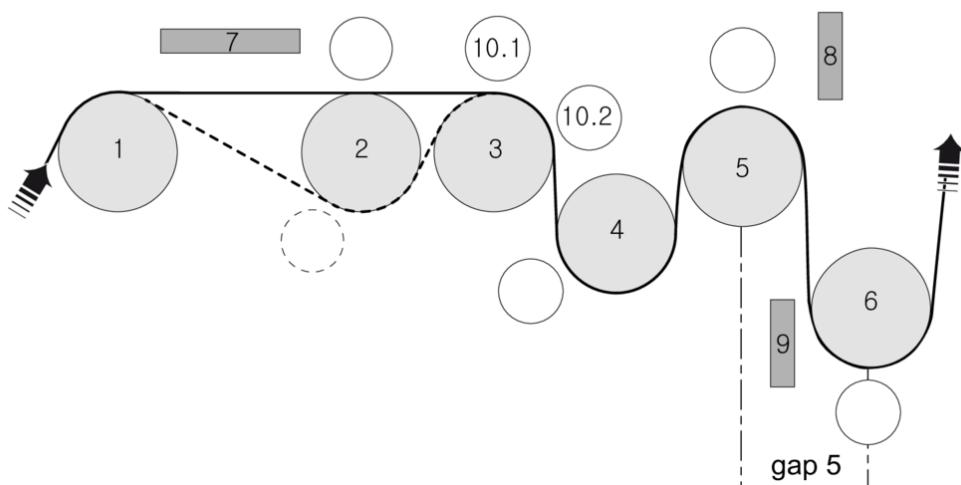
Required personnel

This activity may only be performed by specialists and operating personnel.

Setting 1 stretching gap

1 stretching gap

Stretching gap	The stretching gap is located between stretching roll 5 and stretching roll 6.
----------------	--

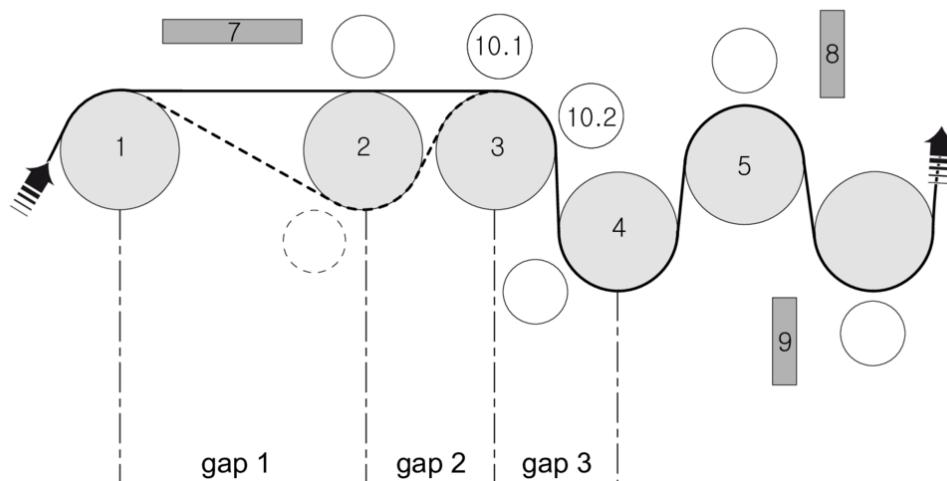


1	Stretching roll 1	2	Stretching roll 2
3	Stretching roll 3	4	Moveable stretching roll 4
5	Stretching roll 5	6	Moveable stretching roll 6
7	Infrared radiator, horizontal	8	Infrared radiator, vertical, top
9	Infrared radiator, vertical, bottom		
10.1	Nip roll 1 on stretching roll 3	10.2	Nip roll 2 on stretching roll 3

- In WinCC OA in the "Line overview" for the MDO, select the "1 Gap" stretching gap configuration.
 - ⇒ Moveable stretching roll 4 is moved automatically into the maximum working position and the movement is then locked.
 - ⇒ Moveable stretching roll 6 is moved automatically into the minimum working position and the movement is then locked.
 - ⇒ If moveable stretching roll 4 is at less than 225 mm, nip roll 2 on stretching roll 3 is locked automatically.
 - ⇒ The infrared radiator, horizontal, is locked automatically.
 - ⇒ If moveable stretching roll 6 is in the maximum working position, the infrared radiator, vertical, top, and the infrared radiator, vertical, bottom, are enabled automatically.

Setting the 3 stretching gaps 3 stretching gaps

Stretching gap 1	Stretching gap 1 is located between stretching roll 1 and stretching roll 2.
Stretching gap 2	Stretching gap 2 is located between stretching roll 2 and stretching roll 3.
Stretching gap 3	Stretching gap 3 is located between stretching roll 3 and stretching roll 4

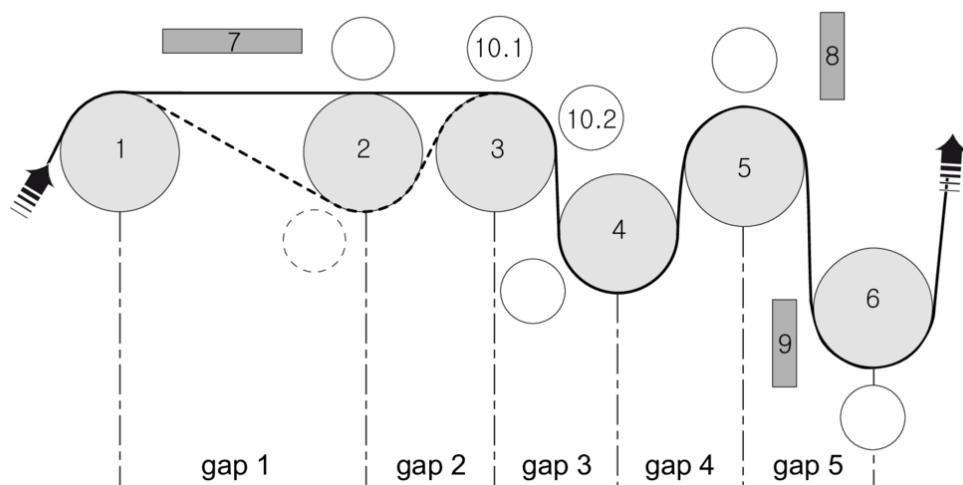


1	Stretching roll 1	2	Stretching roll 2
3	Stretching roll 3	4	Moveable stretching roll 4
5	Stretching roll 5	6	Moveable stretching roll 6
7	Infrared radiator, horizontal	8	Infrared radiator, vertical, top
9	Infrared radiator, vertical, bottom		
10.1	Nip roll 1 on stretching roll 3	10.2	Nip roll 2 on stretching roll 3

- ▶ Select the "3 Gaps" stretching gap configuration in WinCC OA in the "Line overview" for the MDO.
 - ⇒ Moveable stretching roll 4 automatically moves to the minimum working position and can be set as required between the minimum and maximum working position.
 - ⇒ Moveable stretching roll 6 is moved automatically into the minimum working position and the movement is then locked.
 - ⇒ If the moveable stretching roll 4 is at less than 225 mm, nip roll 2 on stretching roll 3 is locked automatically.
 - ⇒ If moveable stretching roll 4 is at greater than or equal to 225 mm, nip roll 2 on stretching roll 3 is released automatically.
 - ⇒ The infrared radiator, horizontal, is released automatically.
 - ⇒ If the moveable stretching roll 6 is in the minimum working position, the infrared radiator, vertical, top, and the infrared radiator, vertical, bottom, are locked automatically.

Setting the 5 stretching gaps

Stretching gap 1	Stretching gap 1 is located between stretching roll 1 and stretching roll 2
Stretching gap 2	Stretching gap 2 is located between stretching roll 2 and stretching roll 3.
Stretching gap 3	Stretching gap 3 is located between stretching roll 3 and stretching roll 4.
Stretching gap 4	Stretching gap 4 is located between stretching roll 4 and stretching roll 5.
Stretching gap 5	Stretching gap 5 is located between stretching roll 5 and stretching roll 6.



1	Stretching roll 1	2	Stretching roll 2
3	Stretching roll 3	4	Moveable stretching roll 4
5	Stretching roll 5	6	Moveable stretching roll 6
7	Infrared radiator, horizontal	8	Infrared radiator, vertical, top
9	Infrared radiator, vertical, bottom		
10.1	Nip roll 1 on stretching roll 3	10.2	Nip roll 2 on stretching roll 3

► Select the "5 Gaps" stretching gap configuration in WinCC OA in the "Line overview" for the MDO.

- ⇒ Moveable stretching roll 4 is released and can be set as required between the minimum and maximum working position.
- ⇒ Moveable stretching roll 6 is released and can be set as required between the minimum and maximum working position.
- ⇒ If the moveable stretching roll 4 is at less than 225 mm, nip roll 2 on stretching roll 3 is locked automatically.
- ⇒ If moveable stretching roll 4 is at greater than or equal to 225 mm, nip roll 2 on stretching roll 3 is released automatically.
- ⇒ The infrared radiator, horizontal, is released automatically.
- ⇒ If the moveable stretching roll 6 is in the minimum working position, the infrared radiator, vertical, top, and the infrared radiator, vertical, bottom, are locked automatically.
- ⇒ If the moveable stretching roll 6 is in the maximum working position, the infrared radiator, vertical, top, and the infrared radiator, vertical, bottom, are enabled automatically.

14.6 Preparing the threading chain for threading the film

Description At the inlet of the machine direction orienter, the threading chain is prepared for threading the film.

Requirement

- The drive of the threading chain is switched off.

Required personnel

- One operator is required.

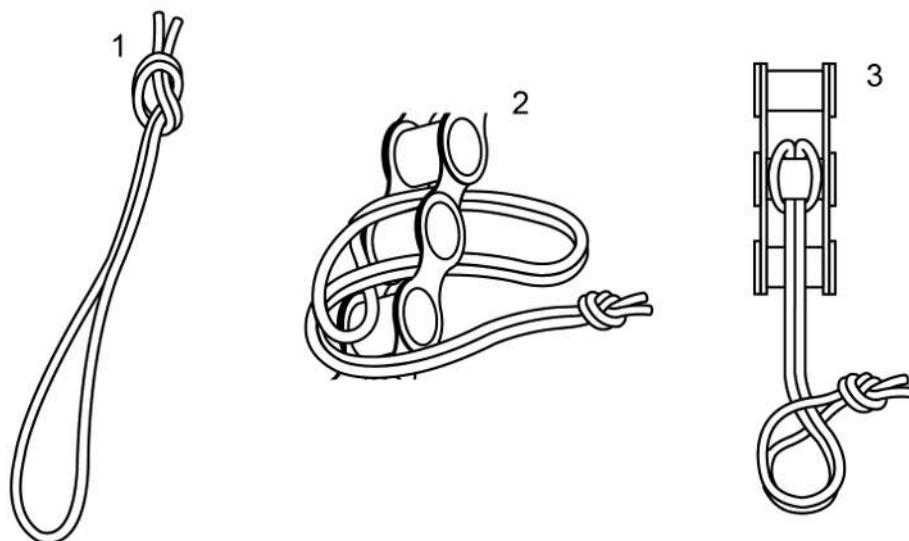
Auxiliary materials

- 1 high-strength rope with a length of 1.6 m

Preparing the thread-

ing chain of the ma-
chine direction ori-
enter

Inlet of the machine direction orienter



- ▶ Fold a rope in half and knot its ends together (1).
⇒ This results in a loop with a knot.
- ▶ Draw the loop approx. 10 cm through a chain link of the threading chain.
- ▶ Draw the knot through the threaded loop (2).
⇒ The rope is fixed to the threading chain.
- ▶ Create a noose (3).

14.7 Eliminating a failure of the pneumatic system

Failure of the pneu-
matic system

If the compressed air in the pneumatic system of a line component falls below the minimum value, the pressure valves in the control cabinet switch off. The components operated with compressed air remain in the current position. The nip rolls can move into the centre of gravity. The horn sounds and the error message is displayed on the visualisation. A failure of the pneumatic system usually leads to a malfunction of the film production line.

Requirement

- The line component is in "Production Mode".
- The key switch [maintenance air] on the pneumatic cabinet is set to [off].
- The [pneumatic reset] push button flashes on the operator panel.

Resetting the pneu-
matic system

- ▶ Reset the pneumatic supply to the defined initial state. Press [pneumatic reset] on the operator panel.

Resetting the fault	Faults output by the process control system must be reset after the fault is eliminated. <ul style="list-style-type: none">✓ The fault is remedied.▶ Reset the fault. On the operator panel, press [fault reset].<ul style="list-style-type: none">⇒ All remedied faults on the line are reset.⇒ Triggered safeguards visible on the operator panel are reset. This does not apply on the operator panel in the control room.
	After all faults and triggered safeguards have been reset, the line components can be started again.

14.8 Operating the nip roll at the outlet of the machine direction orienter

Function	If the film is not threaded into the following machine, the driven nip roll enables the transport of the film out of the machine direction orienter. To do so, the nip roll turns with line speed and is in working position. The maximum speed of the nip roll is smaller than the production speed of the film production line.
Safety	The nip roll is not intended for use in "Production Mode". When the nip roll is swivelled into working position, there is a danger of crushing.

▲ CAUTION

Moving machine parts can crush body parts.

This can lead to injury.

- Do not reach into the vicinity of moving machine parts.

Operating the nip roll at the outlet of the machine direction orienter

- In the Service and Maintenance operating modes, the operation of the nip roll is not possible.
- In Production operating mode, operation of the nip roll is possible. The nip roll can turn and be pneumatically swivelled into the working and park position.
- In "Jogging Mode", the nip roll does not turn.

The nip roll swivels into the working position.

- By pressing the push button on the operator panel, the drive for turning the rolls starts. As soon as the nip roll has reached the line speed, it swivels into the working position.
- When changing into the line threading mode Cut Back Mode, the drive of the nip roll starts. As soon as the nip roll has reached the line speed, it swivels into the working position.

The nip roll swivels into the park position.

- By pressing the push button on the operator panel, the nip roll can be swivelled into the park position.
- During the following actions, the nip roll swivels automatically into the park position:
 - When changing to the [MDO Thread Mode] line threading mode, there is no film at the outlet of the machine direction orienter.
 - The line threading mode TDO Speed Up Mode is started.
 - The line speed exceeds the maximum speed of the nip roll.
 - The drives of the machine direction orienter are switched off.
 - The machine direction orienter leaves the Production operating mode.
 - Emergency Stop machine direction orienter
- On reaching park position, the drive for turning the rolls stops.

14.9 Cleaning the machine direction orienter

For the cleaning of the machine direction orienter, see the "Machine direction orienter" operating manual.

14.10 Operating the machine direction orienter in standby or switching it off

Requirement The line has been shut down and cleaned.

Machine direction orienter ► Adjust the machine direction orienter according to the following table.

Component	Next operation of the film production line	
	< 4 hours	> 4 hours
Heating and cooling units	Operating temperature	Switched off
Drives	Switched on	Switched off

15 Operating the inline coating device

Further information More information on operation can be found in the operating manual of the line assembly.

15.1 Operating modes of the inline coating device

Explanation There are 3 operating modes. They ensure that it is safe to work on the line component. Each operating mode makes different functions available.

- Production Mode

The line component can be put into operation in Production Mode.

- Service Mode

Service Mode is used for cleaning and inspection.

- Maintenance mode

Maintenance Mode is used for mechanical maintenance work. For all other maintenance work or modifications, further protective measures must be taken. Voltage may be present on the drives.

Operating modes of the inline coating device

Functions	"Production Mode"	"Service Mode"	"Maintenance Mode"
Operation of the corona treatment station is possible.	yes	no	no
Operation of the corona treatment roll is possible.	yes	no	no
Operation of the electrodes of the discharge device is possible.	yes	no	no
Movement of the cartridge is possible.	yes	yes	yes
Operation of the gravure roll is possible, when the cartridge is in the working position.	yes	no	no
Operation of the kiss-coat roll is possible.	yes	no	no
Movement of the kiss-coat roll is possible.	yes	no	no
The motorised adjustment of the spreading rollers is possible.	yes	no	no
The pneumatic system is supplied with compressed air.	yes	no	no
The pneumatic movements of the following components are possible:			
• spreading rollers			
• corona treatment station			
The operation of the pumps for the coating material supply is possible.	yes	yes	no

When leaving Production operating mode, the following actions are triggered in the pneumatic system:

- The corona treatment station is moved into the park position or position of centre of gravity.
- The spreading rollers are moved into the park position.
- The cartridge remains in the current position.
- The movement of the kiss-coat roll stands still in the current position.
- The pneumatic system is ventilated.

When changing to Maintenance operating mode, there is an emergency stop machine. The Process Control System triggers actions

Safety

▲ DANGER

The presence of persons in the danger zone of the line can lead to life-threatening injury.

- ▶ No entry for unauthorised personnel.

▲ WARNING

The presence of persons in the danger zone of rotating and moving parts can lead to life-threatening situations or cause injury.

- ▶ The key for changing operating modes may only be used by trained technical personnel.
- ▶ The key must be kept in a place that is inaccessible to unauthorised persons.
- ▶ When entering the danger zone, the operator must take along the key.
- ▶ When changing the operating mode, ensure that no one is located in the danger zone.

Switching to "Service Mode" or "Maintenance Mode"

- ▶ Change the operating mode. Turn the key switch on the operator panel to the required operating mode.

Changing to "Production Mode"

- ▶ When entering the danger zone, take along the key.
- ▶ Ensure that no one is located in the danger zone.
- ▶ Change to Production Mode. On the operator panel, turn the key switch to [production].
 - ⇒ The locking devices that became active by leaving Production Mode are eliminated.
- ✓ The [pneumatic reset] push button flashes on the operator panel.
- ▶ Reset the pneumatic system to the defined default status. Press [pneumatic reset] on the operator panel.

If emergency stop machine was triggered by the change of operating modes, proceed as follows:

- ✓ The [fault reset] push button flashes on the operator panel.
- ▶ Set the start release. On the operator panel, press [fault reset].

15.2 Switching the inline coating device on and off

15.2.1 Switching on the inline coating device

Requirement

- No interlocks on the drives are active.

The push button flashes on the operating panel for switching on the inline coating device.

Safety

▲ WARNING

Rotating machine parts pull in clothing and body parts.

This can lead to injury.

- ▶ Exercise caution when working on rotating parts.
- ▶ Wear close-fitting clothing.

Switching on the inline coating device

- ▶ Enable the inline coating device. On operator panel BK1, press [coater run].
 - ⇒ The continuous "start warning" acoustic signal sounds for 3 seconds.
 - ⇒ The alternating "start release" acoustic signal then sounds for 3 seconds.
 The inline coating device can be switched on during this time.
- ▶ Switch on the inline coating device. On operator panel BK1, press [coater run].
 - ⇒ The drives of the rolls are started.
 Exception: The drives of the gravure rolls are not started.

15.2.2 Switching off the inline coating device

Switching off the inline coating device

- ▶ Switch off the inline coating device. On operator panel BK1, press [coater stop].
 - ⇒ The drives of the rolls in the inline coating device are stopped.
 Exception: The drives of the gravure rolls are not stopped.
 - ⇒ Further actions on the film production line can be triggered by stopping the drives.

15.3 Eliminating a failure of the pneumatic system

Failure of the pneumatic system

If the compressed air in the pneumatic system of a line component drops below the minimum value, the pressure valves in the switch cabinet switch off. The coating chamber and the spreading rollers of the spreading device remain stationary in the current position. If there is a corona treatment station, the electrodes remain in the current position or they are moved into the position of centre of gravity. The horn sounds and the error message is displayed in the visualisation. A failure of the pneumatic system usually leads to a malfunction of the film production line.

Requirement

- The line component is in "Production Mode".
- The key switch [maintenance air] on the pneumatic cabinet is set to [off].
- The [pneumatic reset] push button flashes on the operator panel.

Resetting the pneumatic system

- ▶ Reset the pneumatic supply to the defined initial state. Press [pneumatic reset] on the operator panel.

Resetting the fault

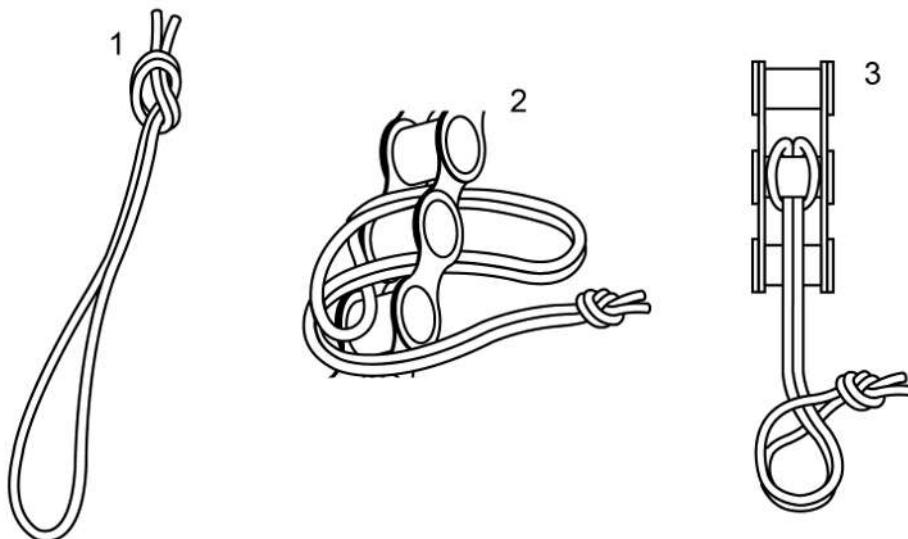
Faults output by the process control system must be reset after the fault is eliminated.

- ✓ The fault is remedied.
- ▶ Reset the fault. On the operator panel, press [fault reset].
 - ⇒ All remedied faults on the line are reset.
 - ⇒ Triggered safeguards visible on the operator panel are reset. This does not apply on the operator panel in the control room.

After all faults and triggered safeguards have been reset, the line components can be started again.

15.4 Preparing the threading chain for threading the film

Description	The threading chain is prepared for threading the film into the inline coating device.
Requirement	<ul style="list-style-type: none"> The film threading aid is switched off.
Required personnel	<ul style="list-style-type: none"> One operator is required.
Auxiliary materials	<ul style="list-style-type: none"> 1 high-strength rope with a length of 1.6 m



- ▶ Fold a rope in half and knot its ends together (1).
⇒ This results in a loop with a knot.
- ▶ Draw the loop approx. 10 cm through a chain link of the threading chain.
- ▶ Draw the knot through the threaded loop (2).
⇒ The rope is fixed to the threading chain.
- ▶ Create a noose (3).

15.5 Flushing and cleaning the inline coating device

Notes on cleaning

As long as there is pure coating medium in the coating chamber and on the gravure roll, the drive of the gravure roll must be switched on.

If the coating medium dries on the gravure roll, it can only be removed with difficulty.

Dried coating medium residues on the gravure roll can impair the coating quality.

Brückner recommends flushing the coating machine and the coating medium supply directly after stopping the coating.

Sequence of the cleaning

Sequence	Activity	Cross-reference
1	<ul style="list-style-type: none"> ▶ Flush the inline coating devices and the coating medium pipework. ▶ Switch off the drives of the gravure rolls. 	See Flushing the coating machine and coating medium supply [▶ 173].
2	<ul style="list-style-type: none"> ▶ Remove the doctor blade. 	See Cleaning the inline coating device [▶ 177] and the manufacturer operating manual.
3	<ul style="list-style-type: none"> ▶ Clean the inline coating device. 	Cleaning the inline coating device [▶ 175]

15.5.1 "Coater Manual Mode"

"Coater Manual Mode"

The Coater Manual Mode is enabled in the WINCC OA. The following conditions must be met to do this:

- The kiss-coat roll is in the park position.
- The roll drives are stopped.

The following interlocks are active in Coater Manual Mode:

- The gravure roll can turn with a maximum speed of 12 m/min.
- The pump of the coating material supply can only be operated with the minimum value.
- The drives of other rolls cannot be started.

15.5.2 Flushing the coating machine and coating medium supply

Description

First, the coating chamber is flushed with water. The coating machine, especially the gravure roll and the coating medium supply, are then flushed with water.

Requirement

- The kiss-coat roll(s) are in the park position.
- The Coater Manual Mode is activated.

Required personnel

This activity may only be performed by specialists.

Safety

When the coating chamber is in park position you can cut yourself at the scraper.

WARNING

Stationary knives cause serious cutting injuries or cut off body parts.

- ▶ Do not touch the knives.
- ▶ Wear cut-resistant protective gloves.
- ▶ Wear protective clothing.

Depending on the coating medium used, dangerous solvent vapours can occur.

WARNING

Solvents cause noxious vapours.

These can lead to irritation of the skin, eyes and airways as well as to changes in mental status from solvent vapours.

- ▶ Only carry out this work if the area is well ventilated.
- ▶ Do not breathe in the vapours.
- ▶ Avoid contact with the skin.
- ▶ Wear suitable protective clothing (breathing mask, safety goggles, protective gloves).
- ▶ Pay attention to the safety data sheets of the manufacturer.

▲ CAUTION

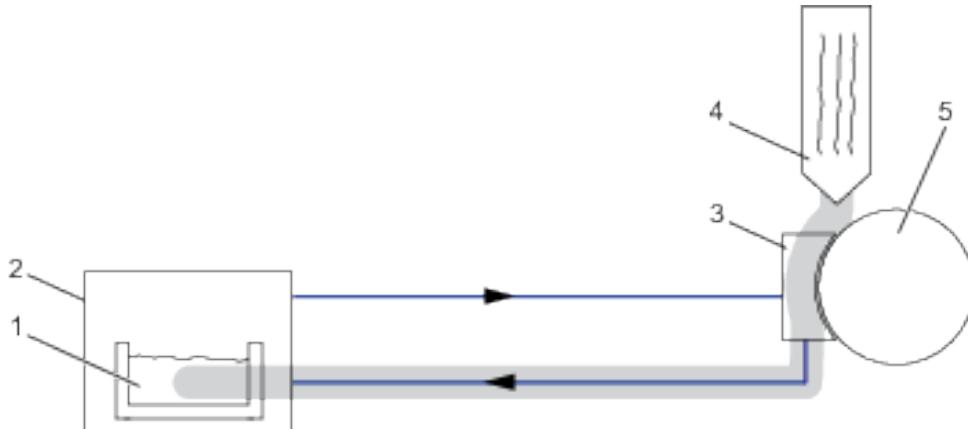
Danger of slipping on wet floors.

This can lead to head injuries and serious bodily injury.

- ▶ Wear non-slip shoes.
- ▶ Do not step on soiled areas.
- ▶ Close off access to soiled areas.
- ▶ Remove leaked fluid immediately.
- ▶ Keep the workplace and corridors clean.

Flushing the coating chamber

- ▶ Switch off the drive of the gravure roll.
- ✓ The pump may only be switched off when the gravure roll has come to a standstill.
- ▶ Switch off the pump of the coating material supply.
 - ⇒ The coating medium flows into the coating medium container.
- ▶ Remove the coating medium from the coating medium container.
- ▶ Move the coating chamber to the park position.



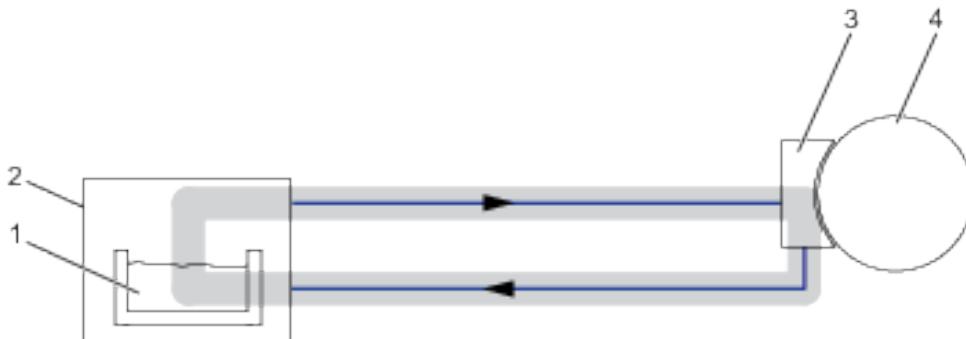
1	coating medium container	2	coating medium supply
3	coating chamber	4	water inlet
5	gravure roll		

- ▶ Flush the coating chamber with water.
 - ⇒ The water flows into the coating medium container.
- ▶ Move the coating chamber into the working position.
- ▶ Remove the water from the coating medium container.

Flushing the coating machine and coating medium supply

The coating machine and the coating medium supply must be flushed with fresh water at least twice.

- ▶ Fill fresh water into the coating medium container.



1	coating medium container	2	coating medium supply
3	coating chamber	4	gravure roll

- ✓ The coating chamber must be in the working position.
- ▶ Switch on the pump of the coating material supply.
⇒ The water flows from the coating medium container through the pipework into the coating medium chamber and back through the pipework to the the coating medium container.
- ▶ Switch on the drive of the gravure roll.
⇒ The gravure roll turns.
⇒ The engraving roll is flushed with water in the coating medium chamber.

Finishing the flushing procedure:

- ▶ Switch off the drive of the gravure roll.
- ✓ The pump may only be switched off when the gravure roll has come to a stand-still.
- ▶ Switch off the pump of the coating material supply.
- ▶ Remove the water from the coating medium container.

15.5.3 Cleaning the inline coating device

Description

The components of the inline coating device have been cleaned.

Safety

When the coating chamber is in park position you can cut yourself at the scraper.

WARNING

Stationary knives cause serious cutting injuries or cut off body parts.

- ▶ Do not touch the knives.
- ▶ Wear cut-resistant protective gloves.
- ▶ Wear protective clothing.

Depending on the coating medium used, dangerous solvent vapours can occur.

▲ WARNING

Solvents cause noxious vapours.

These can lead to irritation of the skin, eyes and airways as well as to changes in mental status from solvent vapours.

- ▶ Only carry out this work if the area is well ventilated.
- ▶ Do not breathe in the vapours.
- ▶ Avoid contact with the skin.
- ▶ Wear suitable protective clothing (breathing mask, safety goggles, protective gloves).
- ▶ Pay attention to the safety data sheets of the manufacturer.

▲ CAUTION

Danger of slipping on wet floors.

This can lead to head injuries and serious bodily injury.

- ▶ Wear non-slip shoes.
- ▶ Do not step on soiled areas.
- ▶ Close off access to soiled areas.
- ▶ Remove leaked fluid immediately.
- ▶ Keep the workplace and corridors clean.

▲ CAUTION

Emission tips of the discharging bars can cause stabbing injuries and cutting injuries.

- ▶ Wear cut-resistant protective gloves.

ATTENTION

Film residues or dirt can damage the treatment roll surface during treatment.

- ▶ Check and clean the treatment roll every time the machine stops.
 - The corona treatment station is cooled to the ambient temperature.
 - The cleaning is carried out in "Service Mode".
 - For details of the cleaning, see the operating manual of the manufacturer.

Cleaning the corona treatment station

Dried-on coating agent residues can damage the surface of the gravure roll and influence the coating result. Check the gravure roll each time it stops and clean if necessary.

- ✓ Cleaning is carried in the Service operating mode.
- ▶ Pull out the gravure roll with cartridge. For information, see "Inline coating device" operating manual.
- ▶ Open coating chamber. For information, see the manufacturer's operating manual.
- ▶ Depending on its surface, clean the gravure roll with a brush. Apply the cleaning agent to a brush and remove the dried-on coating agent residues. For cleaning, see the operating manual of the manufacturer.
- ▶ Close coating chamber. For information, see the manufacturer's operating manual.

Cleaning the gravure roll

- ▶ Push in the gravure roll with cartridge. For information, see "Inline coating device" operating manual.

Cleaning the coating chamber

- The doctor blade is removed.

Reason: when the coating chamber is in park position you can cut yourself at the scraper.

- The cleaning is carried out in "Service Mode".
- For details of the cleaning, see the operating manual of the manufacturer.

Cleaning the coating medium supply

The pipe connections must be disassembled and cleaned regularly to ensure their functioning:

- ✓ Cleaning is carried out in the Service operating mode.
- ▶ Disassemble the piping and mark the order of removal.
- ▶ Clean the pipe connections.
- ▶ Reassemble the pipe connections.

Cleaning the inline coating device

- The doctor blade is removed or the coating chamber is in the working or middle position.

Reason: when the coating chamber is in park position you can cut yourself at the scraper.

- The cleaning is carried out in "Service Mode".
- Film residues, coating medium and contamination are removed on and in the inline coating device.

Cleaning the doctor blade

The doctor blade is fixed in place by a pneumatic clamp. To remove the doctor blade, release the clamp with a compressed air hose.

For details of the cleaning, see the manufacturer operating manual.

15.6 Operating or switching off the inline coating device in standby

Requirement

The line has been shut down and cleaned.

Inline coating device

- ▶ Adjust the inline coating device according to the following table.

Component	Next operation of the film production line	
	< 4 hours	> 4 hours
Drives	Switched on	Switched off

16 Operating the transverse direction orienter

Further information More information on operation can be found in the operating manual of the line assembly.

16.1 Operating modes of the transverse direction orienter

Explanation There are 3 operating modes. They ensure that it is safe to work on the line component. Each operating mode makes different functions available.

- Production Mode

The line component can be put into operation in Production Mode.

- Service Mode

Service Mode is used for cleaning and inspection.

- Maintenance mode

Maintenance Mode is used for mechanical maintenance work. For all other maintenance work or modifications, further protective measures must be taken. Voltage may be present on the drives.

Operating modes of the transverse direction orienter

Functions	Production Mode	Service Mode	Maintenance Mode
track system			
Operation of the main drives of the track system is possible.	yes	no	no
"Jogging Mode" is available.	no	yes	no
The chains can be moved slowly with the main drives of the track system.			
Operation of the edge control device is possible.	yes	no	no
If there is a motorised width adjustment, operation is possible.	yes	no	no
Operation of the clip cleaning is possible.	yes	no	no
The main pneumatic system is supplied with compressed air.	yes	no	no
The pneumatic movement of the following components is possible:			
• shutters			
• if present, cover of the waste film shaft			
Operation of the sliding track lubrication is possible.	yes	yes	no
Operation of the sprocket tooth lubrication is possible.	yes	yes	no
Operation of the chain tensioning system is possible.	yes	yes	no ¹⁾
Operation of the water-cooled chain cooling is possible.	yes	yes	yes. ²⁾
Operation of the oil-cooled chain cooling is possible.	yes	yes	no
If there is oil extraction, the operation of the fans in the oil extraction is possible.	yes	no	no
oven			
If there is gas heating, operation is possible.	yes	yes	yes
If there is an oil, electric, steam or water heating, operation is possible.	yes	yes	yes. ²⁾

Functions	Production Mode	Service Mode	Maintenance Mode
Operation of the motors in the fans is possible.	yes	yes	yes
The gates at the oven can be opened.	yes	yes	yes

When leaving Production Mode, the following actions are triggered in the main pneumatic system:

- The pneumatically movable components are moved into the park position.
- The main pneumatic system is ventilated.

When changing to Maintenance Mode, there is an emergency stop machine. The Process Control System triggers actions.

²⁾ water-cooled chain cooling

- The water-cooled chain cooling continues in case of a sliding rail temperature of at least 80 °C during an emergency stop of the transverse direction orienter. This serves to prevent a pressure increase in the cooling circuit.
- The water-cooled chain cooling stops in case of a sliding rail temperature of less than 80 °C during an emergency stop of the transverse direction orienter.

¹⁾ When changing into Maintenance Mode, the hydraulic aggregate is switched off and locked. There may still be pressure in the hydraulic system.

Safety

▲ DANGER

The presence of persons in the danger zone of the line can lead to life-threatening injury.

- ▶ No entry for unauthorised personnel.

▲ WARNING

The presence of persons in the danger zone of rotating and moving parts can lead to life-threatening situations or cause injury.

- ▶ The key for changing operating modes may only be used by trained technical personnel.
- ▶ The key must be kept in a place that is inaccessible to unauthorised persons.
- ▶ When entering the danger zone, the operator must take along the key.
- ▶ When changing the operating mode, ensure that no one is located in the danger zone.

Switching to "Service Mode" or "Maintenance Mode"

- ▶ Change the operating mode. Turn the key switch on the operator panel to the required operating mode.

Changing to "Production Mode"

- ▶ When entering the danger zone, take along the key.
- ▶ Ensure that no one is located in the danger zone.

- ▶ Change to Production Mode. On the operator panel, turn the key switch to [production].

⇒ The locking devices that became active by leaving Production Mode are eliminated.

- ✓ The [pneumatic reset] push button flashes on the operator panel.

- ▶ Reset the pneumatic system to the defined default status. Press [pneumatic reset] on the operator panel.

If emergency stop machine was triggered by the change of operating modes, proceed as follows:

- ✓ The [fault reset] push button flashes on the operator panel.

- ▶ Set the start release. On the operator panel, press [fault reset].

16.2 Carrying out "Jogging Mode" on the transverse direction orienter

Description

In Service Mode, the chains of the transverse direction orienter can be moved forwards with low speed per foot switch. This is used for inspection of the chain and for positioning of the clips.

Required personnel

This activity may only be performed by trained skilled persons.

Safety

⚠ DANGER

The presence of persons in the danger zone of the line can lead to life-threatening injury.

- ▶ No entry for unauthorised personnel.

⚠ WARNING

The presence of persons in the danger zone of rotating and moving parts can lead to life-threatening situations or cause injury.

- ▶ The key for changing operating modes may only be used by trained technical personnel.
- ▶ The key must be kept in a place that is inaccessible to unauthorised persons.
- ▶ When entering the danger zone, the operator must take along the key.
- ▶ When changing the operating mode, ensure that no one is located in the danger zone.

⚠ WARNING

Machine parts moving in "Jogging Mode" can crush, entangle, draw in and crash into body parts.

This can lead to serious injury.

- ▶ The foot switch must only be operated by instructed technical personnel.
- ▶ Connect the foot switch for "Jogging Mode" only and disconnect again afterwards.
- ▶ Always supervise the connected foot switch.
- ▶ Do not reach into the vicinity of moving machine parts.
- ▶ Wear close-fitting clothing.

Carrying out "Jogging Mode" on the transverse direction orienter

- ✓ The transverse direction orienter is in Service Mode.
- ▶ Connect the foot switch on the transverse direction orienter.
- ▶ Actuate the foot switch.
 - ⇒ The horn sounds for approx. 5 seconds.
 - ⇒ Then the drives start and the chains are moved with low speed through the transverse direction orienter.
 - ⇒ During the entire "Jogging Mode", the signal lights on the transverse direction orienter flash.

16.3 Switching the transverse direction orienter off and on

16.3.1 Switching on the transverse direction orienter

Requirement

- No interlocks on the drives are active.

The push button on the operator panel for switching on the drives flashes.

Required personnel

2 operators are required.

- 1 operator at the operator panel that is located at the transverse direction orienter inlet.
- 1 operator at the operator panel that is located at the transverse direction orienter outlet.

Safety

WARNING

Moving machine parts can crush body parts.

This can lead to serious injury.

- ▶ Do not reach into the vicinity of moving machine parts.
- ▶ Wait for the machine to come to a standstill.
- ▶ Before actuating the machine parts, ensure that no one is located in the danger zone.

WARNING

During operation, small parts, dust or chips can fly out at the outlet of the transverse direction orienter.

This can cause injury to the eyes.

- ▶ Do not enter the area behind the outlet during production. After activities in the danger zone, leave it again immediately.
- ▶ Wear eye protection.

During operation, it is loud at the inlet and outlet of the transverse direction orienter.

WARNING

Constant noise > 85 dB causes permanent damage to the hearing.

- ▶ Wear ear protection.

Switching on the transverse direction orienter

- ▶ Release the transverse direction orienter. On operator panel BT2, press and hold [TDO run release].
 - ⇒ The continuous "start warning" acoustic signal sounds for 3 seconds.
 - ⇒ The alternating "start release" acoustic signal then sounds for 3 seconds.
The transverse direction orienter can be switched on during this time.
- ▶ Switch on the transverse direction orienter. On operator panel BT1, press [TDO run].
 - ⇒ The drives start with the preset speed.
 - ⇒ The clips are pulled through the transverse direction orienter.

16.3.2 Switching off the transverse direction orienter

Safety

ATTENTION

The chain remains in the hot transversal direction orienter for several hours ($\geq 100^{\circ}\text{C}$).

The chain lubricant may decompose.

- ▶ As long as the transverse direction orienter is hot, let the drives of the track system run.
 ⇒ The clips move through the transverse direction orienter.

ATTENTION

There is film in the hot, stationary line component.

The film sticks in the line component.

- ▶ Remove film residues rapidly and in a coordinated manner with several operators.

Letting the transverse direction orienter cool down

The hot transverse direction orienter must have cooled down before the drives can be switched off.

- ▶ Reduce the speed of the drives in WinCC OA.
- ▶ Switch off the heating and cooling units of the oven in WinCC OA.
- ▶ Leave the heating and cooling units of oven air system switched on.
- ▶ For cooling the transverse direction orienter set the air replacement of the oven air system in WinCC OA.
- ▶ When the transverse direction orienter has cooled, switch off the heating and cooling units of the oven air system in WinCC OA.
- ▶ Switch off the transverse direction orienter. On operator panel BT1 or BT2, press [TDO stop].
 ⇒ The drives of the transverse direction orienter are stopped.
 ⇒ Further actions on the film production line can be triggered by stopping the drives.

Switching off the transverse direction orienter

16.4 Setting the temperature of components with a heating and cooling unit

Further information

The setting, switching on and off of the heating and cooling units can be found in the chapter "Operating the line".

16.4.1 Setting the temperature of the transverse direction orienter for the processing of PET

Requirement

- The heat transfer oil of the central oil supply is heated to operating temperature.
- The drives of the transverse direction orienter are running.

Safety

The air in the oven is hot.

⚠ WARNING

Hot air in the oven causes serious burns.

- ▶ Do not enter the hot oven.
- ▶ Do not touch hot surfaces.

The surfaces inside and outside the transverse direction orienter are hot.

▲ CAUTION

Hot surfaces can cause burns.

- ▶ Do not touch surfaces.
- ▶ Wear protective gloves.
- ▶ Wear protective clothing.

Setting the temperature of the transverse direction orienter

Set the temperature of the transverse direction orienter according to the following table:

- ▶ Set the temperature and mass flow of the oven air system in WinCC OA.
- ▶ Switch on the heating and cooling units of the oven air system in WinCC OA.
- ▶ Set the temperature and fan speed of the oven in WinCC OA.
- ▶ Switch on the heating and cooling units of the oven in WinCC OA.

Heating programme of the external airing system
INFO

The following settings are examples. They may possibly deviate slightly from the settings that you require for your process.

2 hours prior to start-up of the film production line

Area	Operating temperature [°C]	Mass flow [kg/h]
Module - preheating section and stretching section		
fresh air	50 - 70	5000 - 7000
exhaust air	-	4500 - 6500
Module - annealing section		
fresh air	100 - 130	3500 - 5500
exhaust air	-	3500 - 5500
Module 1 - cooling section		
fresh air	85 - 110	2 x 10000 - 2 x 18000
exhaust air	-	2 x 10000 - 2 x 18000
Module 2 - cooling section		
fresh air	80 - 100	2 x 10000 - 2 x 18000
exhaust air	-	2 x 10000 - 2 x 18000
Module 3 - cooling section		
fresh air	25 - 40	2 x 12000 - 2 x 22000
exhaust air	-	30000 - 45000
Clip cooling		
fresh air	18 - 25	9000 - 12000

2 hours prior to start-up of the film production line		
Area	Operating temperature [°C]	Mass flow [kg/h]
exhaust air	-	9600 - 12500

Heating programme of the oven

INFO

The following settings are examples. They may possibly deviate slightly from the settings that you require for your process.

2 hours prior to start-up of the film production line			
Area	Operating tem- perature [°C]	Fan speed [%]	Information
preheating section	90 -105	60 - 90	<ul style="list-style-type: none"> The temperature and the fan speed depend on the output. The temperature progression is decreasing. The temperature changes should be approx. 1–2 °C.
stretching section	100 - 120	60 - 80	<ul style="list-style-type: none"> All temperatures are the same or the temperature progression is slightly increasing. The fan speed depends on the film thickness. Especially at film thicknesses < 20 µm, the fan speed is reduced.
annealing section	180 - 250	60- 90	<ul style="list-style-type: none"> Temperatures rise at the beginning, then level off and drop off at the end. The fan speed depends on the film thickness. Especially at film thicknesses < 20 µm, the fan speed is reduced.
cooling section	30 - 150	60 - 90	

16.5 Eliminating a failure of the pneumatic system

Failure of the pneumatic system

If the compressed air in the pneumatic system of a line component drops below the minimum value, the pressure valves in the switch cabinet switch off. All pneumatically operated components remain in the current position. The horn sounds and the error message is displayed in the visualisation. A failure of the pneumatic system usually leads to a malfunction of the film production line.

Requirement

- The line component is in "Production Mode".
- The [pneumatic reset] push button flashes on the operator panel.

Safety

WARNING

While resetting faults in the pneumatics supply, unexpected movements of individual components may occur.

This can cause life-threatening injury.

- ▶ Ensure that no one is located in the danger zone.
- ▶ Wait until the standstill position is reached.

Resetting the pneumatic system

- ▶ Ensure that no one is located in the danger zone.
- ▶ Reset the pneumatic supply to the defined initial state. Press [pneumatic reset] on the operator panel.

Resetting the fault Faults output by the process control system must be reset after the fault is eliminated.

- ✓ The fault is remedied.
- Reset the fault. On the operator panel, press [fault reset].
 - ⇒ All remedied faults on the line are reset.
 - ⇒ Triggered safeguards visible on the operator panel are reset. This does not apply on the operator panel in the control room.

After all faults and triggered safeguards have been reset, the line components can be started again.

16.6 Cleaning the transverse direction orienter

Description

The film residues in the transverse direction orienter have to be removed rapidly. Otherwise, the film residues could clog components.

Ensure, that in particular the following components remain clean:

- Nozzle boxes and shutters
 - For procedure, see [Removing film residues from the hot oven \[▶ 186\]](#).
- Clips and chains

The film residues in the clips and chains are removed at the outlet in Jogging Mode.

For procedure, see [Carrying out "Jogging Mode" on the transverse direction orienter \[▶ 181\]](#).

16.6.1 Removing film residues from the hot oven

Description

The film residues in the hot oven have to be removed rapidly. Otherwise, the film residues could clog components.

Ensure, that in particular the nozzle boxes and shutters remain clean.

Requirement

- The drives of the track system are running or switched off.
- The width adjustment is switched off and must not be operated during cleaning.

Safety

DANGER

The presence of persons in the danger zone of the line can lead to life-threatening injury.

- No entry for unauthorised personnel.

Danger due to magnetic fields

Powerful magnetic and electromagnetic fields occur at the following points:

- Optional: Linear motor of the edge control device (LIWEB) of the track system.

Powerful magnetic fields occur at the following points:

- Optional: Magnetic clip closers at the inlet of the track system.
- Optional: Magnetic clip openers at the outlet of the track system.
- Optional: Magnetic counterpiece on the clip opener or clip closer of the track system.
- Optional: In the stretching section, in track systems with magnetic relief.

DANGER

Powerful magnetic and electromagnetic fields disrupt the functioning of active medical devices such as pacemakers, insulin pumps and hearing aids.

- ▶ Personnel with such active medical equipment must maintain a safe distance of at least 0.8 m at all times.

DANGER

Even when the machine is switched off, strong magnetic fields of permanent magnets have a direct impact on people and can interfere with the operation of active medical accessories. The following people must maintain a safety distance of at least 0.8 m:

- ▶ People who have a heart pacemaker and/or metal implants.
- ▶ People who use insulin pumps and/or hearing aids.
- ▶ People who wear magnetic or electrically conductive objects.

WARNING

Powerful magnetic and electromagnetic fields exert extremely high powers of attraction on magnetisable (ferromagnetic) materials.

There is a danger of cuts and danger of crushing.

- ▶ Even if the machine is switched off, powerful magnetic fields from permanent magnets are present.
- ▶ Work in the vicinity of magnetic parts must be carried out by at least 2 persons.
- ▶ Wear protective gloves and other personal protective equipment if necessary.
- ▶ Keep magnetisable objects (e.g. watches, keys, fixing parts made of steel, steel or iron tools) and permanent magnets away from magnetic parts.
- ▶ Use suitable tools made of non magnetisable material.
- ▶ Use non magnetisable materials (e.g. a wooden bar) to free pinched body parts in case of an accident.

ATTENTION

Powerful magnetic and electromagnetic fields can damage electronic devices, measuring instruments, watches and data storage media.

This can cause irreparable damage.

Electronic devices and measuring instruments can change their calibration.

Data loss can occur on magnetic and electronic data storage media.

- ▶ Do not bring parts near the magnets.
- ▶ Maintain a safety distance of 0.8 m.

ATTENTION

Powerful magnetic and electromagnetic fields attract ferromagnetic parts such as tools or fixing parts made of steel.

- ▶ Do not bring ferromagnetic parts, i.e. magnetisable parts, near the magnets.

During operation, the following machine parts can be moved.

⚠ WARNING

Moving machine parts can crush body parts.

This can lead to serious injury.

- ▶ Do not reach into the vicinity of moving machine parts.
- ▶ Wait for the machine to come to a standstill.

The surfaces inside and outside the transverse direction orienter are hot.

⚠ CAUTION

Hot surfaces can cause burns.

- ▶ Do not touch surfaces.
- ▶ Wear protective gloves.
- ▶ Wear protective clothing.

The air in the oven is hot.

⚠ WARNING

Hot air in the oven causes serious burns.

- ▶ Do not touch hot surfaces.
- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing without synthetic fibre.
- ▶ Wear a hard hat with face protection.
- ▶ Wear protective footwear.

The edges in the oven are sharp.

⚠ CAUTION

Sharp edges inside the line can cause cutting injuries.

- ▶ Wear protective gloves.
- ▶ Wear long, close-fitting clothing.
- ▶ Wear a hard hat.

The fans in the oven are loud during operation.

⚠ CAUTION

Constant noise > 80 dB causes permanent damage to the hearing.

- ▶ Wear ear protection.

Required personnel

This activity has to be performed by 2 trained skilled persons.

Their physical aptitude must be ascertained.

Specialist 1 removes the film with the help of auxiliary materials.

Specialist 2 is responsible for the safety of specialist 1. If necessary, he must be able to save specialist 1 from the oven and provide First Aid.

Personal protective equipment

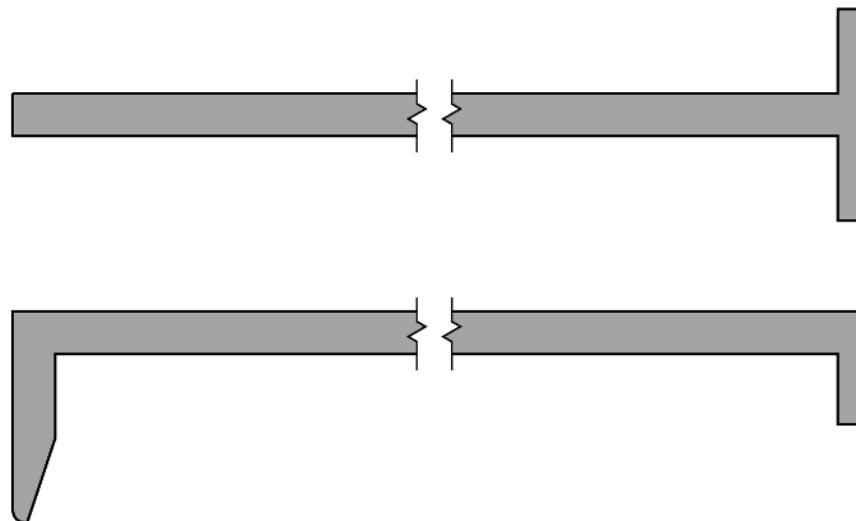
- Long, heat-resistant protective clothing without synthetic fibre
- Heat-resistant protective gloves
- Hard hat with face protection
- Ear protection
- Safety shoes

No metallic objects may be carried on the body.

Auxiliary materials

Long film bar with hook for removing the film (not included in the scope of supply)

The figure shows an example of a film bar.



Letting the oven cool down

- ▶ Open one or several oven doors and wait until the heat flood has escaped. Stand behind the oven door when opening for protection against the escaping heat.
- ▶ Let the oven briefly cool down.

Remaining outside the oven with oven door open

Remaining outside the oven with oven door open

- ▶ Remove the film residues in the oven with the auxiliary materials.

Remaining in the oven

Remaining in the oven

- ✓ The stay has to be as short as possible. The maximum period of time of remaining in the oven must not be longer than one minute.
- ✓ The oven may only be entered up to the first obstacle (e.g. nozzle boxes, track system, drives). It is forbidden to overcome obstacles. Supervision and rescue by specialist 2 have to be possible without any problem.
- ▶ Remove the film residues in the oven with the auxiliary materials.

After leaving the oven

The following points apply to all persons who have entered the oven:

- For the person concerned, plan sufficient time for cooling down.
- If required, provide the person concerned with sufficient liquid.
- Carry out repeated, brief successive entries of the oven, but not by the same person.

16.7 Operating the transverse direction orienter in standby or switching it off

Requirement

The line has been shut down and cleaned.

Transverse direction orienter

► Adjust the transverse direction orienter according to the following table.

Component	Next operation of the film production line	
	< 4 hours	> 4 hours
Heating and cooling units	Operating temperature	Switched off
Drives	Switched on	Switched off

17 Operating the pull roll unit

Further information More information on operation can be found in the operating manual of the line assembly.

17.1 Operating modes of the pull roll unit, the winder unit and the loading and unloading device

Common danger zone The following machines have a common danger zone with common operating modes:

- Pull roll unit
- Winder unit
- Loading and unloading device

Explanation There are 3 operating modes. The operating modes ensure that it is safe to work on the machines. The selected operating mode is enabled in all machines in the danger zone. Each operating mode makes different functions available.

- Production Mode

The line components can be put into operation in Production Mode.

- Service Mode

Service Mode is used for cleaning and inspection.

- Maintenance mode

Maintenance Mode is used for mechanical maintenance work. For all other maintenance work or modifications, further protective measures must be taken. Voltage may be present on the drives.

Operating modes

Functions	Production Mode	Service Mode	Maintenance Mode
The components can be moved.	Yes	no	no
Operation is possible.	Yes	no	no
In the pull roll unit "Jogging Mode" is available.	Yes	Yes	no
Operation of the heating and cooling units is possible.	Yes	Yes	no
The safety gates and the service hatches on the safety fence before the two-station turret winder can be opened.	no	Yes	Yes
The accesses in the safety fence behind the two-station turret winder have separate interlocks. They are independent of the operating modes of the line components.			
When entered, the pressure sensitive mat under the two-station turret winder triggers Emergency Stop Machine.	Yes	no	no
If there are mechanical brakes, their pneumatic system is supplied with compressed air.	Yes	Yes	no

Functions	Production Mode	Service Mode	Maintenance Mode
The pneumatic system of the other pneumatically operating components is supplied with compressed air.	Yes	no	no
When Production Mode is left, the following actions are triggered:			
<ul style="list-style-type: none"> • If there is an edge trim device, the blades or the circular knife are moved into the park position. • The pneumatically movable components are moved into the park position or position of centre of gravity (half open). • If there are mechanical brakes, their pneumatic system is not ventilated. • The pneumatic system of the other pneumatically operating components is ventilated. • The contact roll is moved into the park position. • If the thickness gauge has a radioactive source, this is moved into the radiation protection housing. • If there is a LINIP nip roll, the movement with the nip roll is moved into the park position. • All other components remain in the current position. • The components are switched off. • The drives of the rolls and rollers are switched off. The rolls and rollers can still turn until they come to a standstill. • The components are locked. • If there is a safety gate on the platform to the upper corona treatment roll, the safety gate can be opened. The safety gate to the platform is only unlocked by opening the safety gate. • All other safety gates and service hatches on the safety fence in front of the two-station turret winder are unlocked. • The pressure sensitive mat under the two-station turret winder is deactivated. • Further actions can be triggered on the film production line. 			
When changing to Maintenance Mode, there is an emergency stop machine. The Process Control System triggers actions.			
When switching to operating mode "Production Mode", the open safety gates lead to emergency stop machine. The Process Control System triggers actions.			
If there is a film inspection system, this is independent of the operating modes.			

Safety**▲ DANGER**

The presence of persons in the danger zone of the line can lead to life-threatening injury.

- ▶ No entry for unauthorised personnel.

WARNING

The presence of persons in the danger zone of rotating and moving parts can lead to life-threatening situations or cause injury.

- ▶ The key for changing operating modes may only be used by trained technical personnel.
- ▶ The key must be kept in a place that is inaccessible to unauthorised persons.
- ▶ When entering the danger zone, the operator must take along the key.
- ▶ When changing the operating mode, ensure that no one is located in the danger zone.

Switching to "Service Mode" or "Maintenance Mode"

- ▶ Change the operating mode. Turn the key switch on the operator panel to the required operating mode.

Changing to "Production Mode"

- ▶ Ensure that no one is located in the danger zone.
- ▶ The safety gates close.
- ▶ Change to Production Mode. On the operator panel, turn the key switch to [production].

- ✓ The [pneumatic reset] push button flashes on the operator panel.
- ▶ Reset the pneumatic system to the defined default status. Press [pneumatic reset] on the operator panel.

If emergency stop machine was triggered by the change of operating modes, proceed as follows:

- ✓ The [fault reset] push button flashes on the operator panel.
- ▶ Set the start release. On the operator panel, press [fault reset].
- ⇒ The locking devices that became active by leaving Production Mode are eliminated.

17.2 Carrying out "Jogging Mode" in the pull roll unit

17.2.1 "Jogging Mode" in "Production Mode"

Description

"Jogging Mode" is used in Production Mode for removing film in the pull roll unit. To do so, the driven rolls can be turned continuously forwards or backwards with the foot switch. If driven nip rolls are present, these are not turned.

Required personnel

This activity may only be performed by trained skilled persons.

Carrying out "Jogging Mode"

Location	Requirement	Working method
Outside the safeguards	<ul style="list-style-type: none"> • The foot switch is connected to a plug-in connector in the pull roll unit and is outside the safeguards. • Production Mode is active. • The drives of the rolls are switched off and not locked. 	<ul style="list-style-type: none"> ▶ Turn the rolls continuously forward or backward with the foot switch.

17.2.2 "Jogging Mode" in "Service Mode"

Description

"Jogging Mode" is used in Service Mode for the following activities in the pull roll unit:

- Removing wound-up film residues.
- Clean the rolls.
- Inspect the rolls.

To do so, the driven rolls can be turned continuously forwards or backwards with slow speed using the foot switch. If driven nip rolls or spreading rolls with drive belts are present, these are not turned.

Required personnel

This activity may only be performed by trained skilled persons.

Safety

▲ DANGER

The presence of persons in the danger zone of the line can lead to life-threatening injury.

- ▶ No entry for unauthorised personnel.

▲ WARNING

The presence of persons in the danger zone of rotating and moving parts can lead to life-threatening situations or cause injury.

- ▶ The key for changing operating modes may only be used by trained technical personnel.
- ▶ The key must be kept in a place that is inaccessible to unauthorised persons.
- ▶ When entering the danger zone, the operator must take along the key.
- ▶ When changing the operating mode, ensure that no one is located in the danger zone.

▲ WARNING

Machine parts rotating in "Jogging Mode" draw in clothing and body parts.

This can lead to injury.

- ▶ The foot switch must only be operated by instructed technical personnel.
- ▶ Connect the foot switch for "Jogging Mode" only and disconnect again afterwards.
- ▶ When actuating the foot switch, no 2nd person must be present in the danger zone.
- ▶ Exercise caution when working on rotating parts.
- ▶ Wear close-fitting clothing.

▲ WARNING

Uncontrolled electrostatic discharge due to charged film or rolls.

This can lead to serious injury from electric shock.

- ▶ Persons with active medical accessories (e.g. pacemakers, insulin pumps, hearing aids) are forbidden from remaining at and dealing with film or rolls.
- ▶ Before working in the vicinity of electrostatically charged film or rolls, discharge these parts.

⚠ WARNING

Hot surfaces can cause serious burns.

- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing.

⚠ CAUTION

There is a danger of being pushed and of tripping when in the machine.

This can lead to head injuries.

- ▶ Wear a hard hat.
- ▶ Observe the markings.

Danger due to magnetic fields

Powerful magnetic fields occur at the following points:

- Optional: Drive for the contact roll positioning system (LIWIND®) of the winder unit
- Optional: Linear motor of the nip roll (LINIP) in the pull roll unit

⚠ DANGER

Even when the machine is switched off, strong magnetic fields of permanent magnets have a direct impact on people and can interfere with the operation of active medical accessories. The following people must maintain a safety distance of at least 0.8 m:

- ▶ People who have a heart pacemaker and/or metal implants.
- ▶ People who use insulin pumps and/or hearing aids.
- ▶ People who wear magnetic or electrically conductive objects.

⚠ WARNING

Powerful magnetic fields exert extremely high powers of attraction on magnetisable (ferromagnetic) materials.

Even if the machine is switched off, powerful magnetic fields from permanent magnets are present.

There is a danger of cuts and danger of crushing.

- ▶ Work in the vicinity of magnetic parts must be carried out by at least 2 persons.
- ▶ Wear protective gloves and other personal protective equipment if necessary.
- ▶ Keep magnetisable objects (e.g. watches, keys, fixing parts made of steel, steel or iron tools) and permanent magnets away from magnetic parts.
- ▶ Use suitable tools made of non magnetisable material.
- ▶ Use non magnetisable materials (e.g. a wooden bar) to free pinched body parts in case of an accident.

ATTENTION

Powerful magnetic fields can damage electronic devices, measuring instruments, watches and data storage media. Even if the machine is switched off, powerful magnetic fields from permanent magnets are present.

This can cause irreparable damage.

Electronic devices and measuring instruments can change their calibration.

Data loss can occur on magnetic and electronic data storage media.

- ▶ Do not bring parts near the magnets.
- ▶ Maintain a safety distance of 0.8 m.

Carrying out "Jogging Mode"

Area and location	Requirement	Working method
in the pull roll unit	<ul style="list-style-type: none"> • Service Mode is active. • The drives of the rolls are not locked. • The safety gate on the pull roll unit is opened. 	<ul style="list-style-type: none"> ▶ Enter the area through the safety gate on the pull roll unit. ▶ Plug the foot switch into the plug-in connector. ▶ Turn the rolls with the foot switch.

17.3 Switching the pull roll unit system off and on

17.3.1 Switching on the pull roll unit

Requirement	<ul style="list-style-type: none"> • No interlocks on the drives are active. <p>The push button on the operator panel for switching on the pull roll unit flashes.</p>
Switching on the pull roll unit	<ul style="list-style-type: none"> ▶ Enable the pull roll unit. Press the push button on the operator panel for switching on the pull roll unit. <ul style="list-style-type: none"> ⇒ The continuous "start warning" acoustic signal sounds for 3 seconds. ⇒ The alternating "start release" acoustic signal then sounds for 3 seconds. The pull roll unit can be switched on during this time. ▶ Switch on the pull roll unit on the operator panel. <ul style="list-style-type: none"> ⇒ The heating and cooling units are started. ⇒ The drives of the driven rolls are started.

17.3.2 Switching off the pull roll unit

Switching off the pull roll unit	<ul style="list-style-type: none"> ▶ Switch off the pull roll unit. Press the push button on the operator panel for switching off the pull roll unit. <ul style="list-style-type: none"> ⇒ The drives of the rolls in the pull roll unit are stopped. ⇒ Further actions on the film production line can be triggered by stopping the drives.
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17.4 Setting the temperature of components with a heating and cooling unit

Further information	The setting, switching on and off of the heating and cooling units can be found in the chapter "Operating the line".
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17.4.1 Setting the temperature of the pull roll unit

Safety

ATTENTION

Condensation on the roll surface in combination with the resulting corona gas (e.g. ozone and gaseous nitrogen compounds) damage the roll surface due to corrosion.

- ▶ Set the temperature of the cooling water so that no condensation of water occurs outside or inside the roll.
- ▶ Comply with the quality requirements for the cooling water according to the specifications.

Setting the temperature of the pull roll unit

Set the temperature of the pull roll unit according to the following table:

- ▶ Set the temperature in WinCC OA.
- ▶ Switch on the pull roll unit on the operator panel.

Heating programme of the pull roll unit

INFO

The following settings are examples. They may possibly deviate slightly from the settings that you require for your process.

2 hours prior to start-up of the film production line	
Component	Operating temperature [°C]
cooling roll(s)	25 - 30 ¹⁾

¹⁾ To avoid corrosion damage on the heating and cooling roll, the temperature of flow medium of the cooling water must be set depending on the air temperature and humidity. The dew point table provides guidance on this.

Dew point table

Air temperature [°C]	Dew point temperatures (in °C) at a relative humidity of:										
	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
18	5.9	7.4	8.8	10.1	11.3	12.4	13.5	14.6	15.4	16.3	17.3
19	6.8	8.3	9.8	11.1	12.3	13.4	14.5	15.5	16.4	17.4	18.2
20	7.7	9.3	10.7	12.0	13.2	14.4	15.5	16.5	17.4	18.4	19.2
21	8.6	10.2	11.6	12.9	14.2	15.4	16.4	17.4	18.4	19.3	20.2
22	9.5	11.2	12.5	13.9	15.2	16.3	17.4	18.4	19.4	20.3	21.2
23	10.4	12.0	13.5	14.9	16.0	17.3	18.4	19.4	20.4	21.3	22.2
24	11.3	12.9	14.4	15.7	17.0	18.2	19.2	20.3	21.4	22.3	23.2
25	12.2	13.8	15.4	16.7	18.0	19.1	20.2	21.4	22.3	23.3	24.2
26	13.2	14.8	16.3	17.7	18.9	20.1	21.3	22.3	23.3	24.3	25.2
27	14.1	15.7	17.2	18.6	19.8	21.1	22.2	23.3	24.3	25.2	26.1
28	15.0	16.6	18.1	19.4	20.9	22.1	23.2	24.3	25.3	26.2	27.2
29	15.9	17.6	19.0	20.5	21.8	23.0	24.2	25.2	26.2	27.3	28.2
30	16.8	18.4	20.0	21.4	22.7	24.0	25.1	26.1	27.2	28.2	29.1
32	18.6	20.3	21.9	23.3	24.7	25.8	27.1	28.2	29.2	30.2	31.2
34	20.4	22.2	23.8	25.2	26.5	27.9	28.9	30.1	31.2	32.1	33.1
36	22.2	24.1	25.5	27.0	28.4	29.7	30.9	32.0	33.1	34.2	35.1
38	24.0	25.7	27.4	28.9	30.3	31.6	32.8	34.0	35.0	36.1	37.0
40	25.8	27.7	29.2	30.8	32.2	33.5	34.7	35.9	37.0	38.0	39.1

17.5 Eliminating a failure of the pneumatic system

Failure of the pneumatic system

If the compressed air in the pneumatic system of a line component falls below the minimum value, the pressure valves in the control cabinet switch off. The components operated with compressed air remain in the current position. The nip rolls can move into the centre of gravity. The horn sounds and the error message is displayed on the visualisation. A failure of the pneumatic system usually leads to a malfunction of the film production line.

Requirement

- The line component is in "Production Mode".
- The key switch [maintenance air] on the pneumatic cabinet is set to [off].
- The [pneumatic reset] push button flashes on the operator panel.

Resetting the pneumatic system

- Reset the pneumatic supply to the defined initial state. Press [pneumatic reset] on the operator panel.

Resetting the fault

Faults output by the process control system must be reset after the fault is eliminated.

- ✓ The fault is remedied.
- Reset the fault. On the operator panel, press [fault reset].
 - ⇒ All remedied faults on the line are reset.
 - ⇒ Triggered safeguards visible on the operator panel are reset. This does not apply on the operator panel in the control room.

After all faults and triggered safeguards have been reset, the line components can be started again.

17.6 Cleaning the pull roll unit

Requirement

- The line components in the danger zone are in "Service Mode".
- The drives of the machines in the danger zone are switched off.
- The thickness gauge is in the park position.

Safety

▲ DANGER

The presence of persons in the danger zone of the line can lead to life-threatening injury.

- No entry for unauthorised personnel.

▲ WARNING

The presence of persons in the danger zone of rotating and moving parts can lead to life-threatening situations or cause injury.

- The key for changing operating modes may only be used by trained technical personnel.
- The key must be kept in a place that is inaccessible to unauthorised persons.
- When entering the danger zone, the operator must take along the key.
- When changing the operating mode, ensure that no one is located in the danger zone.

The film and the rolls can be electrostatically charged.

⚠ WARNING

Uncontrolled electrostatic discharge due to charged film or rolls.

This can lead to serious injury from electric shock.

- ▶ Persons with active medical accessories (e.g. pacemakers, insulin pumps, hearing aids) are forbidden from remaining at and dealing with film or rolls.
- ▶ Before working in the vicinity of electrostatically charged film or rolls, discharge these parts.

For working above head height, use the provided or other ladders or working platforms. Do not climb onto machine parts. Always use appropriate safety equipment due to the danger of falling when working at great height. Keep handles, steps, railings, working platforms and ladders clean. The maximum load capacity must be heeded.

⚠ DANGER

There is a danger of falling when working on elevated parts of the line.

This can cause life-threatening injury.

- ▶ Wear a safety harness.
- ▶ Use suitable ascent supports.

The surfaces of the components can be hot.

The film border is hot.

If the film is more than 250 µm thick, it can still be hot.

⚠ WARNING

Hot surfaces can cause serious burns.

- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing.

The discharging bars have pointed emission tips.

⚠ CAUTION

Emission tips of the discharging bars can cause stabbing injuries and cutting injuries.

- ▶ Wear cut-resistant protective gloves.

Danger due to magnetic fields

Powerful magnetic fields occur at the following points:

- Optional: Drive for the contact roll positioning system (LIWIND®) of the winder unit
- Optional: Linear motor of the nip roll (LINIP) in the pull roll unit

⚠ DANGER

Even when the machine is switched off, strong magnetic fields of permanent magnets have a direct impact on people and can interfere with the operation of active medical accessories. The following people must maintain a safety distance of at least 0.8 m:

- ▶ People who have a heart pacemaker and/or metal implants.
- ▶ People who use insulin pumps and/or hearing aids.
- ▶ People who wear magnetic or electrically conductive objects.

⚠ WARNING

Powerful magnetic fields exert extremely high powers of attraction on magnetisable (ferromagnetic) materials.

Even if the machine is switched off, powerful magnetic fields from permanent magnets are present.

There is a danger of cuts and danger of crushing.

- ▶ Work in the vicinity of magnetic parts must be carried out by at least 2 persons.
- ▶ Wear protective gloves and other personal protective equipment if necessary.
- ▶ Keep magnetisable objects (e.g. watches, keys, fixing parts made of steel, steel or iron tools) and permanent magnets away from magnetic parts.
- ▶ Use suitable tools made of non magnetisable material.
- ▶ Use non magnetisable materials (e.g. a wooden bar) to free pinched body parts in case of an accident.

ATTENTION

Powerful magnetic fields can damage electronic devices, measuring instruments, watches and data storage media. Even if the machine is switched off, powerful magnetic fields from permanent magnets are present.

This can cause irreparable damage.

Electronic devices and measuring instruments can change their calibration.

Data loss can occur on magnetic and electronic data storage media.

- ▶ Do not bring parts near the magnets.
- ▶ Maintain a safety distance of 0.8 m.

Cleaning the pull roll unit

ATTENTION

Film that accumulates between the nip roll and the treatment roll damages the corona treatment station.

- ▶ Remove the film manually before starting the rolls.
- ▶ Remove large film residues with Jogging Mode.

ATTENTION

Film residues or dirt can damage the treatment roll surface during treatment.

- ▶ Check and clean the treatment roll every time the machine stops.
- ▶ Remove any remaining film residues.

Take special care to keep the following areas clean:

- surface treatment
 - thickness gauge
 - film break detection
 - film inspection system (option)
- ▶ Check the roll surface for deposits and damage.
- ▶ If necessary, clean the roll surfaces. For cleaning the roll surfaces, see the "Rolls and rollers" operating manual.
- ▶ If necessary, repair the damaged rolls. For the replacement of rolls, see chapter "Maintenance" in the "Pull roll unit" operating manual.

17.7 Operating the pull roll unit in standby or switching it off

Requirement

The line has been shut down and cleaned.

Pull roll unit

► Adjust the pull roll unit according to the following table.

Component	Next operation of the film production line	
	< 4 hours	> 4 hours
Heating and cooling units	Operating temperature	Switched off
Drives	Switched on	Switched off

Operating the pull roll unit

Operating the pull roll unit in standby or switching it off

18 Operating the winder unit

Further information	More information on operation can be found in the operating manual of the line assembly.
Front and rear winding shafts on the two-station turret winder	The position information of the winding shafts for the two-station turret winder are defined in the following texts: <ul style="list-style-type: none">• Front = Film inlet side• Back = Film outlet side

18.1 Operating modes of the pull roll unit and the winder unit

The operating modes of the pull roll unit and the winder unit can be found in the chapter "Operating the pull roll unit".

18.2 Unlocking and locking the safety gate behind the two-station turret winder

Safety gate safeguard	The safety gate (option: several safety gates) at the safety fence after the winder unit has an interlock with knob switch. The safety gate can be opened and closed under certain conditions.
Requirements	If the following requirements for opening the safety gate are fulfilled, the lamp at the safety gate lights: <ul style="list-style-type: none">• The cutting arm of the winder unit is in the park position.• The cross cutting device of the winder unit is in the park position.• The loading and unloading device is in the park position (optional).• If the front winding shaft is not in the winding position, the drives of the two winding shafts may turn at a maximum speed of 200 m/min.
Required personnel	This activity may only be performed by trained skilled persons.
Safety	DANGER The presence of persons in the danger zone of the line can lead to life-threatening injury. ► No entry for unauthorised personnel.

Unlocking the safety gate

- ▶ Unlock the safety gate behind the two-station turret winder. On the operator panel BW1, turn the switch [safety gate] to [release].
- ⇒ The two-station turret winder cannot be turned. If the maximum mill roll diameter is reached, the two-station turret winder stops.
- ⇒ The winding core chuck of the rear winding shaft of the two-station turret winder cannot be opened and closed.
- ⇒ The cutting arm of the winder unit is moved into park position. When the cutting arm is in the park position, it cannot be moved.
- ⇒ The cross cutting device of the winder unit cannot be moved.
- ⇒ The loading and unloading device and their components cannot be moved (optional).
- ⇒ The Safety Tension and Slow Speed settings are active. All winding cores that are not in the winding position can only turn with reduced torque and reduced speed.

If the function locks are active, the safety gate can be opened.

- ▶ Open the safety gate and leave it open.
- ▶ Ensure that no one is located in the danger zone behind the two-station turret winder.
- ▶ Close the safety gate.
- ▶ Lock the safety gate. On operator panel BW1, turn the switch [safety gate] to [lock].
- ⇒ The function locks of the safety gate are reset.

18.3 Pressure sensitive mat under the two-station turret winder

The pressure sensitive mat under the two-station turret winder is used to secure the hazardous points on the two-station turret winder.

Pressure sensitive mat under the two-station turret winder

The pressure sensitive mat is active in "Production Mode". The entry of the active pressure sensitive mat leads to an emergency stop of the line components in the danger zone. It is possible that the drives of the winding shaft and the reversing drive continue to turn for up to 20 seconds until they come to a stop.

18.4 Discharging the mill roll with a discharging rod

Description

The discharging rod is located in the tray at the safety gate behind the two-station turret winder. The long cable of the discharging rod is earthed.

Before presence in the vicinity of an electrically charged mill roll, the mill roll has to be fully discharged by means of a discharging rod.

The mill roll has to be fully discharged before any of these activities is carried out:

- If work is being carried out in the winder unit.
- Someone wants to enter the pull roll unit through the winder unit.
- The mill roll is to be lifted out of the two-station turret winder by a crane.
- The mill roll is to be lifted out of the loading and unloading device (optional) or the storage stand (optional) by a crane.
- If the mill roll in the two-station turret winder is to be discharged, the drive of this winding shaft has to be switched off. The winding shaft with the mill roll must not rotate.
- If the mill roll in the two-station turret winder is to be discharged and there is a second pressure sensitive mat (variant-dependent) downstream from the two-station turret winder, the requirements for entering the pressure sensitive mat have to be fulfilled.
- The safety gate downstream from the two-station turret winder is opened.

Requirement

Required personnel

Safety

This activity may only be performed by specialists and operating personnel.

WARNING

Uncontrolled electrostatic discharge due to charged mill roll.

This can lead to serious injury from electric shock.

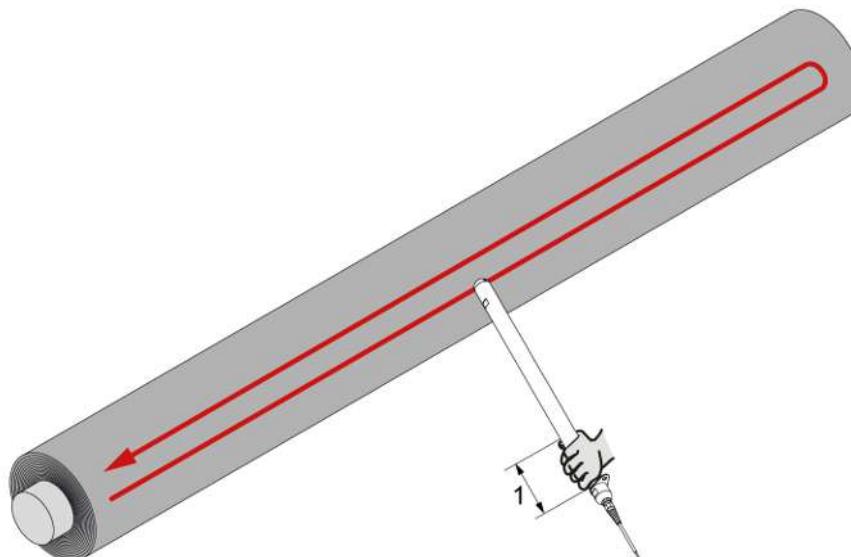
- ▶ Persons with active medical accessories (e.g. pacemakers, insulin pumps, hearing aids) are forbidden from remaining at and dealing with film or rolls.
- ▶ Discharge the mill roll in a controlled way before beginning work.

DANGER

The presence of persons in the danger zone of the line can lead to life-threatening injury.

- ▶ No entry for unauthorised personnel.

Discharging the mill roll with a discharging rod

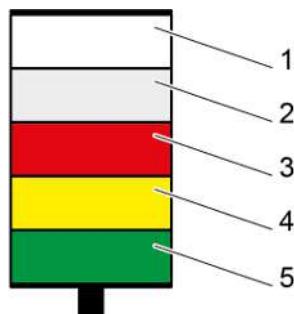


- ▶ Hold the discharging rod in the rear area (1).
- ▶ Put the discharging rod to the mill roll and pull along the mill roll.

18.5 Signal lights on the two-station turret winder

Signal lights on the two-station turret winder

The signal light is mounted on the frame of the two-station turret winder. It consists of several sections with lights in different colours. The lights light depending on the situation on the two-station turret winder.



Pos.	Colour	Meaning
1	white	The winding core on the rear winding shaft can be replaced. <ul style="list-style-type: none"> • The front winding shaft is in winding position. • The rear winding shaft is in the loading/unloading position. • The winding core chuck of the rear winding shaft is open.
2	-	The area has no function.
3	red	If there is a crane, it is not authorised to be in the danger zone of the winder unit. <ul style="list-style-type: none"> • The "Crane in Winder Area" alarm at the signal light sounds. • The two-station turret winder cannot be turned. If the maximum mill roll diameter is reached, the two-station turret winder stops. • The winding core chuck of the rear winding shaft of the two-station turret winder cannot be opened and closed. • The cutting arm of the winder unit cannot be moved. • The cross cutting device of the winder unit cannot be moved.
3	-	If there is no crane, the area has no function.
4	yellow	The two-station turret winder turns automatically or semi-automatically.
5	green	On the rear winding shaft, safe preparation of the winding core is possible. <ul style="list-style-type: none"> • The front winding shaft is in winding position. • The rear winding shaft is in the loading/unloading position. • The drive of the rear winding shaft turns at a maximum of 15 m/min. • The safety gate downstream from the two-station turret winder is open.

18.6 Switching the winder unit off and on

18.6.1 Switching on the winder unit

Requirement

- No interlocks on the drives are active.

Switching on the winder unit

- Switch on the winding shaft 1 and the contact roll stand. On operator panel BW1, press [winder[°]1°run].
- ⇒ The drive of the winding shaft 1 is started. The cone on the drive side turns.
 - ⇒ The drive of the contact roll is started.
 - ⇒ The drive of the contact roll adjustment unit is started.
 - ⇒ The drive of the tension measuring roll is started.

- or -

- Switch on the winding shaft 2 and the contact roll stand. On operator panel BW1, press [winder[°]2°run].
- ⇒ The drive of the winding shaft 2 is started. The cone on the drive side turns.
 - ⇒ The drive of the contact roll is started.
 - ⇒ The drive of the contact roll adjustment unit is started.
 - ⇒ The drive of the tension measuring roll is started.

18.6.2 Switching off the winder unit

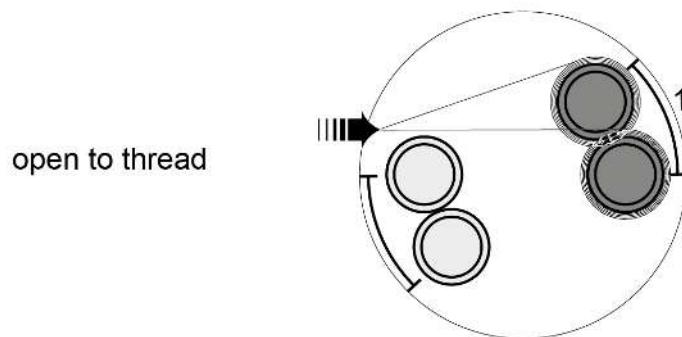
Switching off the winder unit

- Switch off winding shaft 1 and the contact roll stand. On operator panel BW1, press [winder 1 stop].
- ⇒ The drive of winding shaft 1 is stopped. The cone on the drive side stops.

- or -

- Switch off winding shaft 2 and the contact roll stand. On operator panel BW1, press [winder 2 stop].
- ⇒ The drive of winding shaft 2 is stopped. The cone on the drive side stops.
 - ⇒ If the drives at winding shaft 1 and winding shaft 2 are stopped, the drive of the contact roll is stopped.
 - ⇒ If the drives at winding shaft 1 and winding shaft 2 are stopped, the drive of the tension measuring roll is stopped.
 - ⇒ If the drives at winding shaft 1 and winding shaft 2 are stopped, further actions on the film production line can be triggered.
 - ⇒ The drive of the contact roll adjustment unit continues to run.

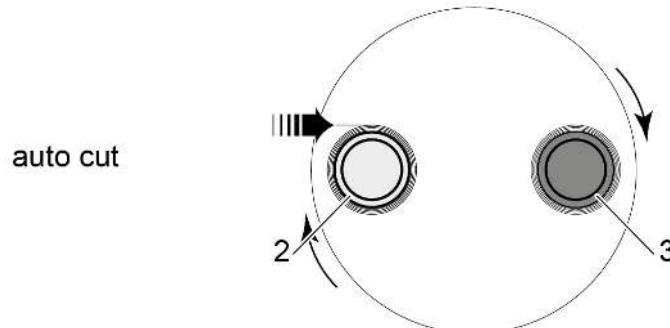
18.7 Positions of the winding shafts of the two-station turret winder



1	Scrap winding position		
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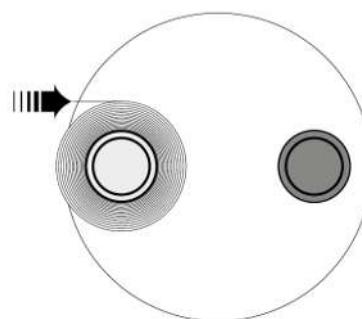
The scrap winding position is used for winding up the film on the rear winding shaft during the start-up of the line. The scrap winding position is dependent on the type of two-station turret winder.

The two-station turret winder turns into the scrap winding position if [open to thread] is pressed on operator panel BW1.

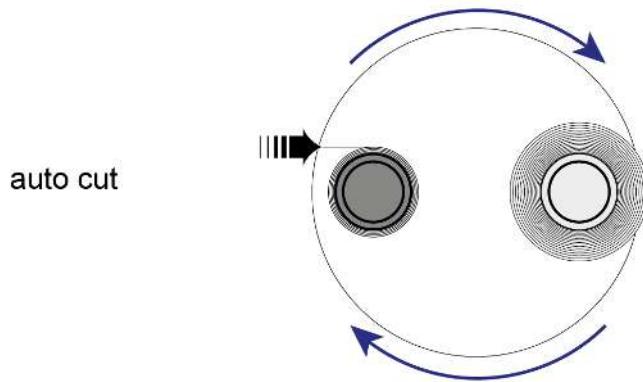


2	Winding position	3	Loading and unloading position
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During the first turning of the two-station turret winder with [auto cut] the two-station turret winder turns until the front winding shaft is in the winding position and the rear winding shaft is in the loading/unloading position. The film is cut off and wound onto the winding core in the front winding shaft.



During film production, the front winding shaft is in the winding position and the rear winding shaft is in the loading and unloading position. The film is wound up on the winding core on the front winding shaft.



When turning with [auto cut], the winding shafts exchange their positions. The film is cut off and wound onto the winding core in the front winding shaft.

18.8 Turning the two-station turret winder

18.8.1 Turning the two-station turret winder automatically

Description

During production, the two-station turret winder is automatically turned upon reaching the target film length or the maximum mill roll diameter. The mill roll and the empty winding core change positions and production continues without interruption on the empty winding core.

Requirement

- The winding core chucks of the rear winding shaft must be closed.
- The safety gate of the winder unit must be closed and locked.
- If there is a 2nd pressure sensitive mat behind the two-station turret winder, it must not be triggered.
- No interlocks are active on the components that are involved in the turning process.
- An empty winding core (on which no film is wound) must be on the rear winding shaft.

Turning the two-station turret winder automatically

1 minute before the target film length or the maximum mill roll diameter is reached, an acoustic signal sounds to indicate the two-station turret winder is going to turn.

Sequence of the turning process:

- The oscillating components move into the middle position and the oscillation stops.
 - If the switch-off of the discharge device when turning is selected in the "Threading Mode Selection" window in WinCC OA, the discharge device is switched off.
 - If there is an edge charge device, it is switched on.
 - The contact roll moves into the park position.
 - The two-station turret winder turns.
 - The cutting arm moves into the working position.
 - The contact roll moves into the working position. The contact roll touches the mill roll. "Contact Winding Mode" is active.
 - The cross cutting device moves into the working position and cuts off the film.
 - The film length counter is reset.
 - The calculation of the mill roll diameter is reset.
 - The film is wound onto the empty winding core.
 - The cut-off mill roll rotates with reduced speed and less torque. This prevents the film on the mill roll from unwinding.
 - The cutting arm moves into the park position.
 - The cross cutting device moves into the park position.
 - If the "Gap Winding Mode" is selected in the Winder window in WinCC OA and the minimum roll diameter is reached, the "Gap Winding Mode" becomes active.
 - If there is a discharge device and the discharge device is selected in the "Threading Mode Selection" window in WinCC OA, it is switched on.
 - If there is an edge charge device and it was switched off before the turning process, the edge charge device is now switched off again.
- Reset the signal. On operator panel BW1, press [reset horn].

Switching on the oscillation of the two-station turret winder

After closing the winding core chucks on the rear winding shaft, the oscillation of the two-station turret winder starts automatically if the following conditions are met.

- The oscillation is selected in the "Threading Mode Selection" window in WinCC OA.
- The line threading mode "Production Mode" is active.

- or -

The oscillation of the two-station turret winder can be switched on at the operating panel.

- Switch on the oscillation of the two-station turret winder. On operator panel BW1, press [oscillation run].

18.8.2 Turning the two-station turret winder semi-automatically

Description	If the two-station turret winder is to be turned before the target film length or the maximum mill roll diameter is reached, this must be initiated by operator intervention. The mill roll and the empty winding core change positions and production continues without interruption on the empty winding core.
Requirement	<ul style="list-style-type: none"> • The winding core chucks of the rear winding shaft must be closed. • The safety gate of the winder unit must be closed and locked. • If there is a 2nd pressure sensitive mat behind the two-station turret winder, it must not be triggered. • No interlocks are active on the components that are involved in the turning process. • An empty winding core (on which no film is wound) must be on the rear winding shaft. <p>► On operator panel BW1, press [auto cut]. ⇒ An acoustic signal is output to indicate that the mill roll is being turned.</p>
Turning the two-station turret winder semi-automatically	<p>Sequence of the turning process:</p> <ul style="list-style-type: none"> • The oscillating components move into the middle position and the oscillation stops. • If there is an edge charge device, it is switched on. • If the switch-off of the discharge device when turning is selected in the "Threading Mode Selection" window in WinCC OA, the discharge device is switched off. • The contact roll moves into the park position. • The two-station turret winder turns. • The cutting arm moves into the working position. • The contact roll moves into the working position. The contact roll touches the mill roll. "Contact Winding Mode" is active. • The cross cutting device moves into the working position and cuts off the film. • The film length counter is reset. • The calculation of the mill roll diameter is reset. • The film is wound onto the empty winding core. • The cut-off mill roll rotates with reduced speed and less torque. This prevents the film on the mill roll from unwinding. • The cutting arm moves into the park position. • The cross cutting device moves into the park position. • If the "Gap Winding Mode" is selected in the Winder window in WinCC OA and the minimum roll diameter is reached, the "Gap Winding Mode" becomes active. • If there is a discharge device and the discharge device is selected in the "Threading Mode Selection" window in WinCC OA, it is switched on. • If there is an edge charge device and it was switched off before the turning process, the edge charge device is now switched off again. <p>► Reset the signal. On operator panel BW1, press [reset horn].</p>

Switching on the oscillation of the two-station turret winder

After closing the winding core chucks on the rear winding shaft, the oscillation of the two-station turret winder starts automatically if the following conditions are met.

- The oscillation is selected in the "Threading Mode Selection" window in WinCC OA.
 - The line threading mode "Production Mode" is active.
- or -

The oscillation of the two-station turret winder can be switched on at the operating panel.

- ▶ Switch on the oscillation of the two-station turret winder. On operator panel BW1, press [oscillation run].

18.8.3 Manually turning the two-station turret winder

Description

If necessary, the two-station turret winder can be turned manually. The winding shaft can be in any position.

Required personnel

Manual turning requires a trained operator.

Requirement

- The winding core chucks of the rear winding shaft must be closed.
- The safety gate of the winder unit must be closed and locked.
- If there is a 2nd pressure sensitive mat behind the two-station turret winder, it must not be triggered.
- No interlocks are active on the components that are involved in the turning process.
- An empty winding core (on which no film is wound) must be on the rear winding shaft.

Moving the oscillation of the two-station turret winder into the centre and switching it off

- ✓ On the two-station turret winder, there is an oscillation.
- ▶ Switch off the oscillation. On operator panel BW1, press [oscillation stop].
- ▶ Move the oscillating components into the centre. On operator panel BW1, press [oscillation center].

Handling the operator panel

The following push buttons are on operator panel BW1:

- [contact roll]
- [turning]
- [cutting arm]
- [cross cutting]

Pressing one of these push buttons selects the appropriate function.

Then, the selected mode can be controlled with the following push buttons:

- [backward]
- [stop]
- [forward]

To move the cutting arm, the push buttons [forward] and [backward] must be pressed and held down.

To turn the two-station turret winder in the reverse direction, press and hold the [backward] push button.

Turning the two-station turret winder

- ▶ On operator panel BW1, press [turning].
⇒ The "Turning Mode" is activated.
- ▶ On operator panel BW1, press [forward].
⇒ The contact roll moves into the park position.
⇒ The two-station turret winder turns until the mill roll is in the correct position.
⇒ The contact roll moves into the working position. The contact roll touches the mill roll. "Contact Winding Mode" is active.

Moving the cutting arm to the working position

- ▶ On operator panel BW1, press [cutting arm].
⇒ "Cutting Arm Mode" is activated.
- ▶ On operator panel BW1 , press and hold [forward] until the cutting arm is in the working position.

Cutting off the film

- ▶ On operator panel BW1, press [cross cutting].
⇒ "Cross Cutting Mode" is activated.
- ▶ On operator panel BW1, press [forward].
⇒ The film is cut off and wound onto the other winding core.
⇒ The cross cutting device stops on the drive side.
⇒ The film length counter is reset.
⇒ The calculation of the mill roll diameter is reset.
⇒ The cut off mill roll rotates with reduced speed and less torque. This prevents the film on the mill roll from unwinding.

Moving the cutting arm to the park position

- ▶ On operator panel BW1, press [cutting arm].
⇒ "Cutting Arm Mode" is activated.
- ▶ On operator panel BW1 , press and hold [backward] until the cutting arm is in the park position.
⇒ The cutting arm moves into the park position.
⇒ When the cutting arm is in the park position, the cross cutting device automatically moves into the park position.
⇒ If the "Gap winding" winding mode is selected in theWinder window in WinCC OA and the minimum roll diameter is reached, the "Gap winding" winding mode becomes active.

Switching on the oscillation of the two-station turret winder

After closing the winding core chucks on the rear winding shaft, the oscillation of the two-station turret winder starts automatically if the following conditions are met.

- The oscillation is selected in the "Threading Mode Selection" window in WinCC OA.
- The line threading mode "Production Mode" is active.

- or -

The oscillation of the two-station turret winder can be switched on at the operating panel.

- ▶ Switch on the oscillation of the two-station turret winder. On operator panel BW1, press [oscillation run].

18.9 Replacing the winding core on the two-station turret winder with a crane

Description

With the help of a crane, the mill roll is removed from the rear winding shaft of the two-station turret winder. A winding core is then inserted.

Requirement

- There is a mill roll in the rear winding shaft.
- The rear winding shaft is in the loading/unloading position.
- The rear winding shaft is stopped.
- A winding core is ready for insertion in the two-station turret winder. The winding core is clean and smooth.

Required personnel

This activity may only be performed by trained skilled persons.

Personal protective equipment

- Hard hat
- Safety shoes

Auxiliary materials

These auxiliary materials are needed:

- Discharging rod
- Crane, cross beam and lifting gear
- or -
- Double crane and lifting gear

Safety

▲ DANGER

Falling or swinging loads can cause life-threatening injury.

- ▶ Wear protective footwear.
- ▶ Wear a hard hat.
- ▶ Only use approved and undamaged lifting accessories and lifting gear.
- ▶ Properly secure the load.
- ▶ Do not remain under swinging loads.
- ▶ Keep the transport area clear.

The film can be electrostatically charged. Only after the mill roll is fully discharged can work be carried out near the mill roll.

▲ WARNING

Uncontrolled electrostatic discharge due to charged mill roll.

This can lead to serious injury from electric shock.

- ▶ Persons with active medical accessories (e.g. pacemakers, insulin pumps, hearing aids) are forbidden from remaining at and dealing with film or rolls.
- ▶ Discharge the mill roll in a controlled way before beginning work.

Opening the winding core chuck of the rear winding shaft

- ▶ Open the winding core chuck of the rear winding shaft. On the operator panel BW1 or BU1 (optional), press [chuck open].
- ⇒ If the rear winding shaft is turning, the drive is switched off.
- ⇒ The drive of the rear winding shaft is locked. It cannot be switched on.
- ⇒ The two-station turret winder cannot be turned. When the maximum mill roll diameter is reached, the drives of the front winding shaft and the rubbed rollers in the contact roll stand stop. Further actions can be triggered on the film production line.
- ⇒ The winding core chuck of the rear winding shaft opens.
- ⇒ If the winding core chuck is open, the push button lights.

Preparing the crane

- ▶ Fix the lifting gear to the crane.
- ▶ Move the crane into the loading/unloading position.

Unlocking the safety gate

⚠ DANGER

The presence of persons in the danger zone of the line can lead to life-threatening injury.

- ▶ No entry for unauthorised personnel.
- ▶ Unlock the safety gate behind the two-station turret winder. On operator panel BW1, turn the switch [safety gate] to [release].
- ⇒ The function locks are activated.
- ▶ Open the safety gate and leave it open.
- ✓ If the white signal light on the two-station turret winder lights, the winding core or the mill roll can be replaced.
- ▶ Discharge the mill roll in the rear winding shaft with the discharging rod.
- ▶ Place the lifting gear around a winding core of the mill roll.
- ▶ Lift out the mill roll with a crane and put it down. When doing so, ensure that the mill roll is guided safely.
- ▶ Put down the mill roll safely and remove the lifting gear.

Removing the mill roll

- ▶ Place the lifting gear around a winding core to be inserted.
- ▶ Using a crane, place the winding core in the rear winding shaft on the two-station turret winder. Ensure that the winding core is moved safely.
- ▶ Remove the lifting gear from the winding core.
- ▶ Move the crane out of the danger zone of the winder unit.

Inserting the winding core

- ▶ Ensure that no one is located in the danger zone behind the two-station turret winder.
- ▶ Close the safety gate.
- ▶ Lock the safety gate. On operator panel BW1, turn the switch [safety gate] to [lock].
- ⇒ The function locks of the safety gate are reset.

Locking the safety gate

- ▶ Close the winding core chuck of the rear winding shaft. On operator panel BW1 or BU1 (optional), press [chuck close].
- ⇒ The winding core is clamped in place.

Closing the winding core chuck of the rear winding shaft

- ⇒ The function locks of the winding core chuck are reset.

Switching on the oscillation of the two-station turret winder

After closing the winding core chucks on the rear winding shaft, the oscillation of the two-station turret winder starts automatically if the following conditions are met.

- The oscillation is selected in the "Threading Mode Selection" window in WinCC OA.
- The line threading mode "Production Mode" is active.
- or -

The oscillation of the two-station turret winder can be switched on at the operating panel.

- ▶ Switch on the oscillation of the two-station turret winder. On operator panel BW1, press [oscillation run].

18.10 Preparing the winding core in the two-station turret winder

Requirement

- There is an empty winding core in the rear winding shaft.
- The winding core is easy to access.
- The rear winding shaft is turning.

Required personnel

This activity may only be performed by trained skilled persons.

- Adhesive tape
- Tool for severing the film
- Cut-resistant protective gloves

Personal protective equipment
Safety

The adhesive tape can have sharp film edges.

It is possible to be cut on knives and shears.

▲ CAUTION

Sharp film edges, knives or paper shears can cause cutting injuries.

- ▶ Wear cut-resistant protective gloves.

Unlocking the safety gate
▲ DANGER

The presence of persons in the danger zone of the line can lead to life-threatening injury.

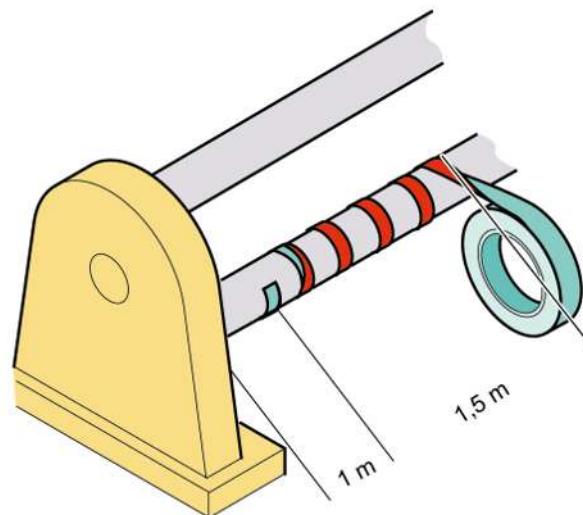
- ▶ No entry for unauthorised personnel.

- ▶ Unlock the safety gate behind the two-station turret winder. On operator panel BW1, turn the switch [safety gate] to [release].

⇒ The function locks are activated.

- ▶ Open the safety gate and leave it open.

Preparing the winding core



- ▶ Wrap the adhesive tape around the running winding core in a spiral fashion: On the operating side, stick the adhesive tape onto the winding core and turn the adhesive side outward. While the winder unit is turning, feed the adhesive tape toward the drive side. The adhesive tape is wound in a spiral fashion around the winding core. To complete the spiral, turn the adhesive tape again with the adhesive side to the winding core. Stick the adhesive tape onto the winding core and sever.

Locking the safety gate

- ▶ Ensure that no one is located in the danger zone behind the two-station turret winder.
- ▶ Close the safety gate.
- ▶ Lock the safety gate. On operator panel BW1, turn the switch [safety gate] to [lock].
⇒ The function locks of the safety gate are reset.

18.11 Winding modes

Winding modes

The two-station turret winder has the following winding modes:

- Contact winding
- Gap Winding Mode

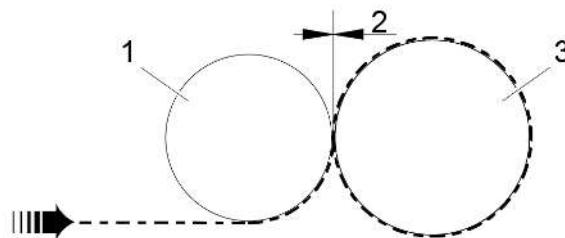
WinCC OA

The operation of the winding modes is carried out in WinCC OA.

- The winding mode can be selected.
- Settings for winding mode can be made.
- The winding density is calculated and displayed.

Contact winding

"Contact Winding Mode" is the standard winding mode.



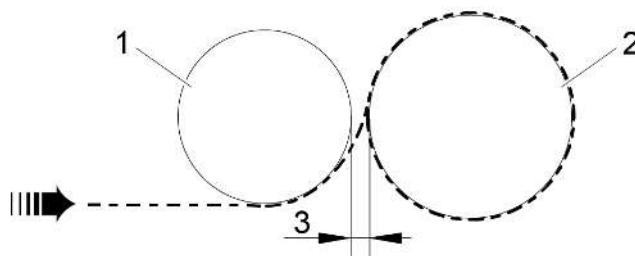
1	Contact roll	2	Gap ± 0
3	Mill roll		

During contact winding, the contact roll presses the film onto the mill roll. Thus, when winding up the film, the air inclusion between the film layers of the mill roll is reduced. The building up mill roll pushes the contact roll backward in its linear guidance. The contact pressure is continually controlled.

For contact winding, the following values can be set:

- Pressure of the contact roll on the mill roll depending on the mill roll diameter
- Tension of the mill roll depending on the mill roll diameter

Gap winding



1	Contact roll	2	Mill roll
3	Gap		

During gap winding, a constant gap is maintained between the contact roll and the mill roll. To achieve this, the contact roll moves back in the case of mill rolls increasing in size.

For gap winding, the following values can be set:

- Gap between the contact roll and mill roll
- Tension of the mill roll depending on the mill roll diameter

18.12 Eliminating a failure of the pneumatic system

Failure of the pneumatic system

If the compressed air in the pneumatic system of a line component falls below the minimum value, the pressure valves in the control cabinet switch off. The components operated with compressed air remain in the current position. The nip rolls can move into the centre of gravity. The horn sounds and the error message is displayed on the visualisation. A failure of the pneumatic system usually leads to a malfunction of the film production line.

Requirement

- The line component is in "Production Mode".
- The key switch [maintenance air] on the pneumatic cabinet is set to [off].
- The [pneumatic reset] push button flashes on the operator panel.

Resetting the pneumatic system

- ▶ Reset the pneumatic supply to the defined initial state. Press [pneumatic reset] on the operator panel.

Resetting the fault	Faults output by the process control system must be reset after the fault is eliminated.
	<ul style="list-style-type: none"> ✓ The fault is remedied. ► Reset the fault. On the operator panel, press [fault reset]. ⇒ All remedied faults on the line are reset. ⇒ Triggered safeguards visible on the operator panel are reset. This does not apply on the operator panel in the control room. <p>After all faults and triggered safeguards have been reset, the line components can be started again.</p>

18.13 Cleaning the winder unit

Requirement	<ul style="list-style-type: none"> • The line components in the danger zone are in "Service Mode". • All mill rolls in the danger zone are unloaded.
Required personnel	This activity may only be performed by trained skilled persons.
Personal protective equipment	<ul style="list-style-type: none"> • Heat-resistant protective gloves
Safety	<p>⚠ DANGER</p> <p>The presence of persons in the danger zone of the line can lead to life-threatening injury.</p> <ul style="list-style-type: none"> ► No entry for unauthorised personnel. <p>⚠ WARNING</p> <p>The presence of persons in the danger zone of rotating and moving parts can lead to life-threatening situations or cause injury.</p> <ul style="list-style-type: none"> ► The key for changing operating modes may only be used by trained technical personnel. ► The key must be kept in a place that is inaccessible to unauthorised persons. ► When entering the danger zone, the operator must take along the key. ► When changing the operating mode, ensure that no one is located in the danger zone. <p>The film and the rolls can be electrostatically charged.</p> <p>⚠ WARNING</p> <p>Uncontrolled electrostatic discharge due to charged film or rolls.</p> <p>This can lead to serious injury from electric shock.</p> <ul style="list-style-type: none"> ► Persons with active medical accessories (e.g. pacemakers, insulin pumps, hearing aids) are forbidden from remaining at and dealing with film or rolls. ► Before working in the vicinity of electrostatically charged film or rolls, discharge these parts. <p>For working above head height, use the provided or other ladders or working platforms. Do not climb onto machine parts. Always use appropriate safety equipment due to the danger of falling when working at great height. Keep handles, steps, railings, working platforms and ladders clean. The maximum load capacity must be heeded.</p>

▲ DANGER

There is a danger of falling when working on elevated parts of the line.

This can cause life-threatening injury.

- ▶ Wear a safety harness.
- ▶ Use suitable ascent supports.

The surfaces of the components can be hot.

The film border is hot.

If the film is more than 250 µm thick, it can still be hot.

▲ WARNING

Hot surfaces can cause serious burns.

- ▶ Wear heat-resistant protective gloves.
- ▶ Wear protective clothing.

Danger due to magnetic fields

Powerful magnetic fields occur at the following points:

- Optional: Drive for the contact roll positioning system (LIWIND®) of the winder unit
- Optional: Linear motor of the nip roll (LINIP) in the pull roll unit

▲ DANGER

Even when the machine is switched off, strong magnetic fields of permanent magnets have a direct impact on people and can interfere with the operation of active medical accessories. The following people must maintain a safety distance of at least 0.8 m:

- ▶ People who have a heart pacemaker and/or metal implants.
- ▶ People who use insulin pumps and/or hearing aids.
- ▶ People who wear magnetic or electrically conductive objects.

▲ WARNING

Powerful magnetic fields exert extremely high powers of attraction on magnetisable (ferromagnetic) materials.

Even if the machine is switched off, powerful magnetic fields from permanent magnets are present.

There is a danger of cuts and danger of crushing.

- ▶ Work in the vicinity of magnetic parts must be carried out by at least 2 persons.
- ▶ Wear protective gloves and other personal protective equipment if necessary.
- ▶ Keep magnetisable objects (e.g. watches, keys, fixing parts made of steel, steel or iron tools) and permanent magnets away from magnetic parts.
- ▶ Use suitable tools made of non magnetisable material.
- ▶ Use non magnetisable materials (e.g. a wooden bar) to free pinched body parts in case of an accident.

ATTENTION

Powerful magnetic fields can damage electronic devices, measuring instruments, watches and data storage media. Even if the machine is switched off, powerful magnetic fields from permanent magnets are present.

This can cause irreparable damage.

Electronic devices and measuring instruments can change their calibration.

Data loss can occur on magnetic and electronic data storage media.

- ▶ Do not bring parts near the magnets.
- ▶ Maintain a safety distance of 0.8 m.

Cleaning the winder unit

- ▶ Remove all film residues.
- ▶ Check the roll surface for deposits and damage.
- ▶ If necessary, clean the roll surfaces. For the cleaning of roll surfaces, see operating manual "Rolls and rollers".
- ▶ If necessary, repair the damaged rolls. For the replacement of rolls, see chapter "Maintenance" in the "Winder unit" operating manual.

18.14 Operating the winder unit in standby or switching it off

Requirement

The line has been shut down and cleaned.

Winder unit

- ▶ Adjust the winder unit according to the following table.

Component	Next operation of the film production line	
	< 4 hours	> 4 hours
Drives	Switched on	Switched off

Operating the winder unit

Operating the winder unit in standby or switching it off

19 Operating the edge trim recycling

19.1 Operating modes of the grinder

Common danger zone	The following machines have a common danger zone with common operating modes:																
	<ul style="list-style-type: none"> • grinder • conveying piping and conveying fan 																
Explanation	There are 3 operating modes. They ensure that it is safe to work on the line component. Each operating mode makes different functions available.																
	<ul style="list-style-type: none"> • Production Mode 																
	The line component can be put into operation in Production Mode.																
	<ul style="list-style-type: none"> • Service Mode 																
	Service Mode is used for opening and closing the service hatches.																
	<ul style="list-style-type: none"> • Maintenance Mode 																
	Maintenance Mode is used for mechanical maintenance work. For all other																
	maintenance work or modifications, further protective measures must be taken.																
	Voltage may be present on the drives.																
Operating modes of the grinder	<table border="1"> <thead> <tr> <th>Functions</th><th>Production Mode</th><th>Service Mode</th><th>Maintenance Mode</th></tr> </thead> <tbody> <tr> <td>Operation is possible.</td><td>Yes</td><td>No²⁾</td><td>No²⁾</td></tr> <tr> <td>If certain conditions ¹⁾ are fulfilled, the safety monitored service hatches can be operated.</td><td>No</td><td>Yes</td><td>No</td></tr> <tr> <td>The pneumatic system is supplied with compressed air.</td><td>Yes</td><td>Yes</td><td>Yes</td></tr> </tbody> </table>	Functions	Production Mode	Service Mode	Maintenance Mode	Operation is possible.	Yes	No ²⁾	No ²⁾	If certain conditions ¹⁾ are fulfilled, the safety monitored service hatches can be operated.	No	Yes	No	The pneumatic system is supplied with compressed air.	Yes	Yes	Yes
Functions	Production Mode	Service Mode	Maintenance Mode														
Operation is possible.	Yes	No ²⁾	No ²⁾														
If certain conditions ¹⁾ are fulfilled, the safety monitored service hatches can be operated.	No	Yes	No														
The pneumatic system is supplied with compressed air.	Yes	Yes	Yes														
	<p>¹⁾ If the following conditions are fulfilled, the safety monitored service hatches can be operated:</p> <ul style="list-style-type: none"> • Service Mode is active. • No emergency stop triggered by an emergency stop button is active. • The rotor of the grinder is not moving. After stopping the grinder, the rotor continues to turn for a certain period of time. 																
	<p>If there is a hydraulic pump and the conditions are not fulfilled any more, the hydraulic pump is switched off. The service hatch remains in the current position.</p>																
	<p>²⁾ When changing to Service Mode or Maintenance Mode, there is an emergency stop machine. The Process Control System triggers actions.</p>																
Safety	<p>DANGER</p> <p>The presence of persons in the danger zone of the line can lead to life-threatening injury.</p> <p>► No entry for unauthorised personnel.</p>																

⚠ WARNING

The presence of persons in the danger zone of rotating and moving parts can lead to life-threatening situations or cause injury.

- ▶ The key for changing operating modes may only be used by trained technical personnel.
- ▶ The key must be kept in a place that is inaccessible to unauthorised persons.
- ▶ When entering the danger zone, the operator must take along the key.
- ▶ When changing the operating mode, ensure that no one is located in the danger zone.

Changing to "Production Mode"

- ▶ Ensure that no one is located in the danger zone.
- ▶ Close the service hatches.
- ▶ Change to Production Mode. On the operator panel, turn the key switch to [production].

If emergency stop machine was triggered by the change of operating modes, proceed as follows:

- ✓ The [fault reset] push button in the control room flashes.
- ▶ Set the start release. Press [fault reset] in the control room.
- ⇒ The locking devices that became active by leaving Production Mode are eliminated.

Switching to "Service Mode" or "Maintenance Mode"

- ▶ Change the operating mode. Turn the key switch on the operator panel to the required operating mode.
- ▶ When entering the danger zone, take along the key.

20 Technical data

Product data

Raw material	PET
Product	Packaging film
Stretching	Biaxial, sequential