

Technical conditions and operating parameters for production using Erlenbach machines/systems



General information

Important information about machine/system safety

The operation of a machine/system first placed on the European market is accepted in EU member states only if compliance with the Machinery Directive 2006/42/EC is assured by the manufacturer – in the form of a Declaration of Conformity – and the machine/system is marked with the CE symbol.

If the machine/system is, in terms of its safety, not ready for use in the sense as defined by the Machinery Directive, we as the manufacturer will issue a Declaration of Incorporation. In this declaration, we confirm that we fulfil all of the requirements from the Machinery Directive 2006/42/EC with the exception of the interfaces that we have described in the operating instructions and in the enclosed technical file. In this case, the Declaration of Conformity must be prepared by the machine/system owner.

National safety regulations, e.g. as issued by professional associations, social funds, government agencies for occupational safety and others must also be observed by the machine/system owner.

Use of the machines/systems

The buyer must ensure fulfilment of all technical and operational requirements for operating machines/systems from Erlenbach GmbH. Erlenbach GmbH accepts no liability for errors, defective goods, or other loss or damage resulting from the buyer's failure to fulfil the technical requirements given in the operating or maintenance instructions, or the specifications for the raw material. Requirements other than these can be agreed only in writing and must be countersigned by both parties, otherwise the specifications apply as defined here.

The machines/systems are designed solely for foaming work using the kinds of particle foams widely available on the market. The safety instructions and details from raw material manufacturers must be observed by the machine/system owner, and compared with those from Erlenbach GmbH as necessary. Any other or variant use is considered to be a non-intended use. The machine/system owner – and not Erlenbach GmbH – is liable for any loss or damage resulting from such use.

Intended use of the machine/system also includes observing and complying with the inspection and maintenance conditions set out in the operating instructions. The machines/systems must be operated and maintained only by trained personnel.

In addition to the operating instructions, generally applicable statutory and other binding regulations about accident prevention and environmental protection must be observed and employees instructed in their application.

The machine/system owner must observe the intervals for recurring checks/inspections as prescribed or otherwise specified in the operating instructions. If the corresponding records are not documented and made available to Erlenbach GmbH, this will void the warranty offered by Erlenbach GmbH. The maintenance activities must be completed by using machine shop equipment appropriate for the work and performed solely by qualified personnel.

Individual parts and large assemblies being moved for replacement purposes should be carefully attached to lifting tackle and secured to avoid the risk of accidents. All lifting and load-handling gear used must be appropriate, with adequate load-bearing capacity and in perfect working order. Work must not be performed while under suspended loads. Spare parts must meet the technical requirements as specified by Erlenbach GmbH. This is assured only when using original spare parts from the machine/system manufacturer. Refrain from any working practice that is potentially unsafe. The machine/system owner is responsible for accidents or hazards that endanger other persons or their property.

The machine/system owner must not make any changes to the machines/systems that impair the safety of the machines/systems when operated. Erlenbach GmbH accepts no liability whatsoever for personal injury or damage to property that occurs as a result of a failure to use components approved by Erlenbach GmbH.

The system must be placed in a safe state before all repair, cleaning and maintenance work. Instructions for doing so can be found in the machine/system documentation from Erlenbach GmbH.

To operate the system, a constant air pressure of 6 to 8 bar is required at the machine. During machine/system installation, an adequately sized tank and corresponding cleaning system must be provided for. The required compressed air quality for machines/systems from Erlenbach GmbH is specified according to DIN ISO 8573-1 as follows:

- Oil class 5: max. 25 mg/m³ oil content
- Water class 4: max. dew point 3 °C
- Solid/dirt class 3: max. particle density of 5 mg/m³
max. particle size of 5 µm

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Machine/system corrosion

If not explicitly agreed otherwise, the water used in the application for cooling and steam generation must be treated and filtered to avoid corrosive damage to the machines/systems. The table below provides a summary of the necessary quality values, which must be checked at regular intervals and adjustments made to achieve these values as necessary.

Reference values for boiler feed water (DIN EN 12953-10)						
Boiler type		Fire/smoke tube boiler				High-speed steam generator
Boiler water chemistry		saline/low-salt		salt-free	salt-free	salt-free
Operational positive pressure	bar	≤ 20	> 20-40	≤ 20	> 20-40	all pressure stages
General requirements		colourless, clear, no undissolved substances				
pH at 25 °C ⁵⁾		> 9,2	> 9,2	> 9,2	> 9,2	> 9,2
K _{S,9,2} (p-value) ⁴⁾	mmol/l	≤ 0,7	≤ 0,5	≤ 0,7	≤ 0,5	≤ 0,7
Alkaline earth metals	mmol/l	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01
Total hardness	°d	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05
Oxygen (O ₂)	mg/l	< 0,05	< 0,02	< 0,05	< 0,02	< 0,05
Oxygen binder ST-DOS		see technical fact sheets				
Conductivity at 25 °C	μS/cm	for saline, limit values apply to boiler water only, for salt-free 0.2-50		≤ 30	≤ 30	> 500
Iron, total (Fe)	mg/l	< 0,03	< 0,1	< 0,3	< 0,1	< 0,3
Copper, total (Cu)	mg/l	< 0,05	< 0,03	< 0,05	< 0,03	< 0,05
Oils, greases	mg/l	< 1	< 1	< 1	< 1	< 1
KMnO ₄ - consumption	mg/l	< 10	< 10	< 10	< 10	< 10
Silicon dioxide (SiO ₂)	mg/l	limit value applies to boiler water only				

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Reference values for boiler water (DIN EN 12953-10)				
Boiler type	Fire/smoke tube boiler			
Boiler water chemistry		saline ³⁾		Low-salt ⁴⁾
Operational positive pressure	bar	≤ 20	> 20-40	< 0,5
General requirements		colourless, clear, no undissolved substances		
pH at 25 °C		10,5 - 12	10,5 - 11,8	10 - 11
K _{S,8,2} (p-value)		1 - 12	1 - 8	0,1 - 1,0
Alkaline earth metals	mmol/l	< 0,01	< 0,01	< 0,01
Total hardness	°d	< 0,05	< 0,05	< 0,05
Oxygen binder ST-DOS	see technical fact sheets			
Sodium sulphite (Na ₂ SO ₃)	mg/l	10 - 30	10 - 20	10 - 20
Conductivity at 25 °C	µS/cm	< 6.000	< 3.000	< 1.500
Phosphate (PO ₄) ²⁾	mg/l	10 - 30	10 - 30	6 - 15
Phosphate-free boiler scale agent	mg/l	phosphate-free alkaline earth binding agents can be used		
Silicon dioxide (SiO ₂)	mg/l	< 130 bei K _{S,8,2} = 10 mmol/l	< 40 bei K _{S,8,2} = 5 mmol/l	< 30 bei K _{S,8,2} = 0,5 mmol/l
Important!	The reference values from the boiler manufacturer must also be observed.			

Reference values for the condition of the circulating water in cooling systems (VDI 3803, VDI 6022, VDMA 24649)					
Condition			Material in contact with water		
			Carbon steel and non-ferrous metals	Carbon steel and other metals, fully coated	Plastics Cr-Ni-Mo steel
Appearance		-	Ideally colourless, clear and without sediment		
pH		-	7.5 to 9.0		
Electrical conductivity at reference temperature of 20 °C		mS/m	< 220	< 250	< 300
Calcium	Ca	g/m³	> 20		
Total hardness	TH	°d	< 60		
Carbonate hardness	KH	°d	< 4		
Carbonate hardness with hardness stabilising	KH	°d	< 20		
Sulphate	SO4	g/m³	< 325	< 400	< 600
Colony count	CFU	1/ml	< 10,000 / < 1,000*		
Legionella	CFU	1/100 ml	< 1,000		
* If, contrary to specifications, cooling tower vapours condense in offices and other working areas or are present near ventilation/air-con system intakes (site-based evaluation)					

The use of additives containing chlorine, e.g. to combat bacteria, must always be avoided in all media supplied to our machines (including the raw material to be processed), as these can attack metals, including stainless steels.

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To obtain the required air quality of the control air for machines/systems – and especially for pneumatic drive systems, control valves, linear units, injectors, etc. – the air must be filtered and treated according to DIN ISO 8573-1. Instructions for doing so can be found in the machine/system documentation supplied by the manufacturer and as provided for the individual machine/system types.

In addition, the basic safety and operator instructions for the technical machines-/system documentation from the various machine-/system -and tool manufacturers must also be considered.

EMClassic / EMMotion moulding machine

EPS equipment:

To protect the system from damage, the following settings/parameters must be accounted for on the system:

- Steam pressure, fixed and movable end, maximum of 1.3 to 1.6 bar (different pressures are specified depending on the machine size in the machine/system documentation from Erlenbach GmbH)
- Constant steam inlet pressure during the entire machine cycle at the system of **3.5 to 4 bar**. The steam line must have a gradient of about 2% and be fitted with a condensate separator at the end
- Demoulding pressure, fixed and movable end, maximum of 1.5 bar (different pressures are specified in the machine/system documentation from Erlenbach GmbH). Filling pressure max. 2 bar

To ensure optimum product quality, the correct pre-expansion of the raw material used must be ensured on a discontinuous pre-expander for EPS based on a western European standard (raw material quality with 6–7% pentane content). The technical parameters of the various raw materials available on the market are definitive here. The moulding machines are also suitable for processing the low-pentane-materials. Performance specifications must always be agreed in advance in writing, and always reference the raw material utilised and the tool on which the components are produced.

EPP equipment

To protect the system from damage, always account for the following settings/parameters on the system:

- Steam pressure, fixed and movable end, maximum of 5 bar (different pressures are specified in the machine/system documentation from Erlenbach GmbH)
- Constant steam inlet pressure during the entire machine cycle at the system of **6 to 8 bar**. The steam line must have a gradient of about 2% and be fitted with a condensate separator at the end.
- Demoulding pressure, fixed and movable end, maximum of 5 bar (different pressures are specified in the machine/system documentation from Erlenbach GmbH)
- Filling pressure max. 5 bar.

General information for moulding machines

- Constant water inlet pressure during the entire machine cycle at the system of min. 4 bar. During machine/system installation, an adequately sized water tank and corresponding cleaning system must be provided for. Instructions for doing so can be found in the machine/system documentation from Erlenbach GmbH.
- The temperature of the water used for tool cooling must not exceed 50 °C.
- The water temperature for the vacuum pumps and the machine/system condenser should be between 20 °C and 25 °C.
- The design of the energy supplies for the machines/systems must meet the specifications from Erlenbach GmbH.
- A centralised vacuum unit or standalone vacuum unit with an additional tank must be appropriately designed to ensure adequate vacuum for the machines. The size or volume is roughly the double steam chamber volume of the machines/systems from Erlenbach GmbH that are to be connected. The vacuum system should generate a vacuum of at least –0.6 bar in order to ensure reliable production operations.
- To ensure reliable operation of the machines/systems, the machines must be correctly cabled and properly connected to the energy supply. Instructions for doing so can be found in the machine/system documentation from Erlenbach GmbH.
- The tools that will be used with the system from Erlenbach GmbH must meet the latest technical standards, and must be clean and free of all dirt, dust and paraffin in order to ensure optimum results from production. In terms of maintenance and cleaning for these tools, consult the information provided by the tool manufacturer.
- The machines/systems from Erlenbach GmbH must first be levelled and anchored in place after being moved to their place of use. Only then should the system be connected to the energy supply. Instructions for doing so can be found in the machine/system documentation from Erlenbach GmbH.
- The (machine/system owner) must ensure that all energy supply lines are equipped with lockable shut-off devices.
- The product quality of the components produced depends largely on the tools that are deployed. Specified quality and cycle times can only be given as binding values (by Erlenbach GmbH) if the tool has been supplied as well (by Erlenbach GmbH). In these cases, the system is considered to have been accepted if the component has been produced to the required specification in the factory (operated by Erlenbach GmbH). An acceptance record will be created for this purpose.

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EMBead pre-expanders

EPS equipment:

- During the entire machine cycle, constant steam inlet pressure is required at the machine/system. The steam line must be designed according to the schematic diagram included on the dimensional drawing for connections.
- Pre-expander machines/systems from Erlenbach GmbH are basically designed for raw materials commonly available on the market. Performance specifications for a discontinuous pre-expander for EPS are always based on the use of a western European standard (raw material quality with 6–7% pentane content). The technical parameters of the various raw materials available on the market are definitive here. The machines/systems (from Erlenbach GmbH) are also suitable for processing the low-pentane materials. Performance specifications must always be agreed in advance in writing, and always reference the raw material utilised. Any other agreements must be confirmed in writing by Erlenbach GmbH.

EPP equipment

- During the entire machine cycle, constant steam inlet pressure is required at the machine/system. The steam line must be designed according to the schematic diagram included on the dimensional drawing for connections.
- Pre-expander machines/systems from Erlenbach GmbH are basically designed for raw materials commonly available on the market. Performance specifications for a discontinuous pre-expander for EPS are always based on the use of a western European standard in terms of raw material quality. Any other agreements must be confirmed in writing by Erlenbach GmbH.

General information for pre-expanders

- To ensure reliable operation of the machines/systems, the machines must be correctly cabled and properly connected to the energy supply. Instructions for doing so can be found in the machine/system documentation from Erlenbach GmbH.
- The machines/systems from Erlenbach GmbH must first be levelled and anchored in place after being moved to their place of use. Only then should the system be connected to the energy supply. Instructions for doing so can be found in the machine/system documentation from Erlenbach GmbH.
- The customer must ensure that all energy supply lines are equipped with lockable shut-off devices.

EMTower block machines/systems

General information for block machines/systems

During the entire machine cycle, constant steam inlet pressure of 1.8 to 2.4 bar is required at the machine/system. The steam line must have a gradient of about 2% and be fitted with a condensate separator at the end.

- If using a vacuum system with a dip condenser (not a dry vacuum): Constant water inlet pressure during the entire machine cycle at the system of min. 4 bar. During machine/system installation, an adequately sized water tank and corresponding cleaning system must be provided for. The water temperature should be between 20 °C and 25 °C. Further instructions can be found in the machine/system documentation from Erlenbach GmbH. The water pump for the feed line to the vacuum system requires a minimum volume of 80m³/h
- Cooling performance is reduced for dry vacuum systems at higher ambient temperatures. This has a negative effect on the level of throughput for the entire line. Throughput performance values offered can be guaranteed only at ambient temperatures of 20 °C.
- The machines/systems from Erlenbach GmbH must first be levelled and anchored in place after being moved to their place of use. Only then should the system be connected to the energy supply. Instructions for doing so can be found in the machine/system documentation from Erlenbach GmbH.
- The interim storage time for the pre-expanded raw material must be maintained in accordance with information from the material supplier and possibly following consultation with Erlenbach GmbH.
- The machines/systems from Erlenbach GmbH must first be levelled and anchored in place after being moved to their place of use. Only then should the system be connected to the energy supply. Instructions for doing so can be found in the machine/system documentation from Erlenbach GmbH.
- The customer must ensure that all energy supply lines are equipped with lockable shut-off devices.

To ensure optimum product quality, the correct pre-expansion of the raw material used must be ensured on a discontinuous pre-expander for EPS based on a western European standard (raw material quality with 6–7% pentane content). The technical parameters of the various raw materials available on the market are definitive here. The block machines/systems are also suitable for processing the low-pentane materials. Performance specifications must always be agreed in advance in writing, and always reference the raw material utilised.

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EMSilo silo units

While EPS is being stored and while processing EPS and the foamed materials manufactured from it, outgassing propellants (e.g. pentane) have the ability to create highly flammable propellant/air mixtures. The risk of these mixtures explosively igniting occurs with a concentration of propellant ranging from 1.3% and 7.8% by volume (lower/upper explosive limit) in the ambient air. This is equivalent to a concentration of 40 g to 260 g of propellant per m³ of air. To prevent the accumulation of flammable propellant/air mixtures, storage facilities and rooms in which EPS is stored or processed must be continuously ventilated to ensure that the concentration of pentane in the air is always kept at a safe distance from the lower explosive limit. When testing room air for propellant content, the sampling/measurement must be taken at the lowest point in the room. All components in the silo room must be earthed/connected as required by Erlenbach GmbH. The continuity of this entire system must be confirmed.

EMVacuum vacuum systems

- The water temperature for the vacuum pumps should be between 20 °C and 25 °C.
- The design of the energy supplies for the machines/systems must meet the specifications from Erlenbach GmbH.
- To ensure reliable operation of the machines/systems, the machines must be correctly cabled and properly connected to the energy supply. Instructions for doing so can be found in the machine/system documentation from Erlenbach GmbH.
- The machines/systems from Erlenbach GmbH must first be levelled and anchored in place after being moved to their place of use. Only then should the system be connected to the energy supply. Instructions for doing so can be found in the machine/system documentation from Erlenbach GmbH.
- The customer must ensure that all energy supply lines are equipped with lockable shut-off devices.

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