EFAFLEX

Technical product description
High-speed spiral door for deep-freeze applications

EN

For internal use only

This technical product description applies to
the following door system types:
EFA-SST® TK-100

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Door system designation

Official designation of the door system	Spiral type	Designation in this product description
EFA-SST® TK-100	Round spiral	273

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1 Short description

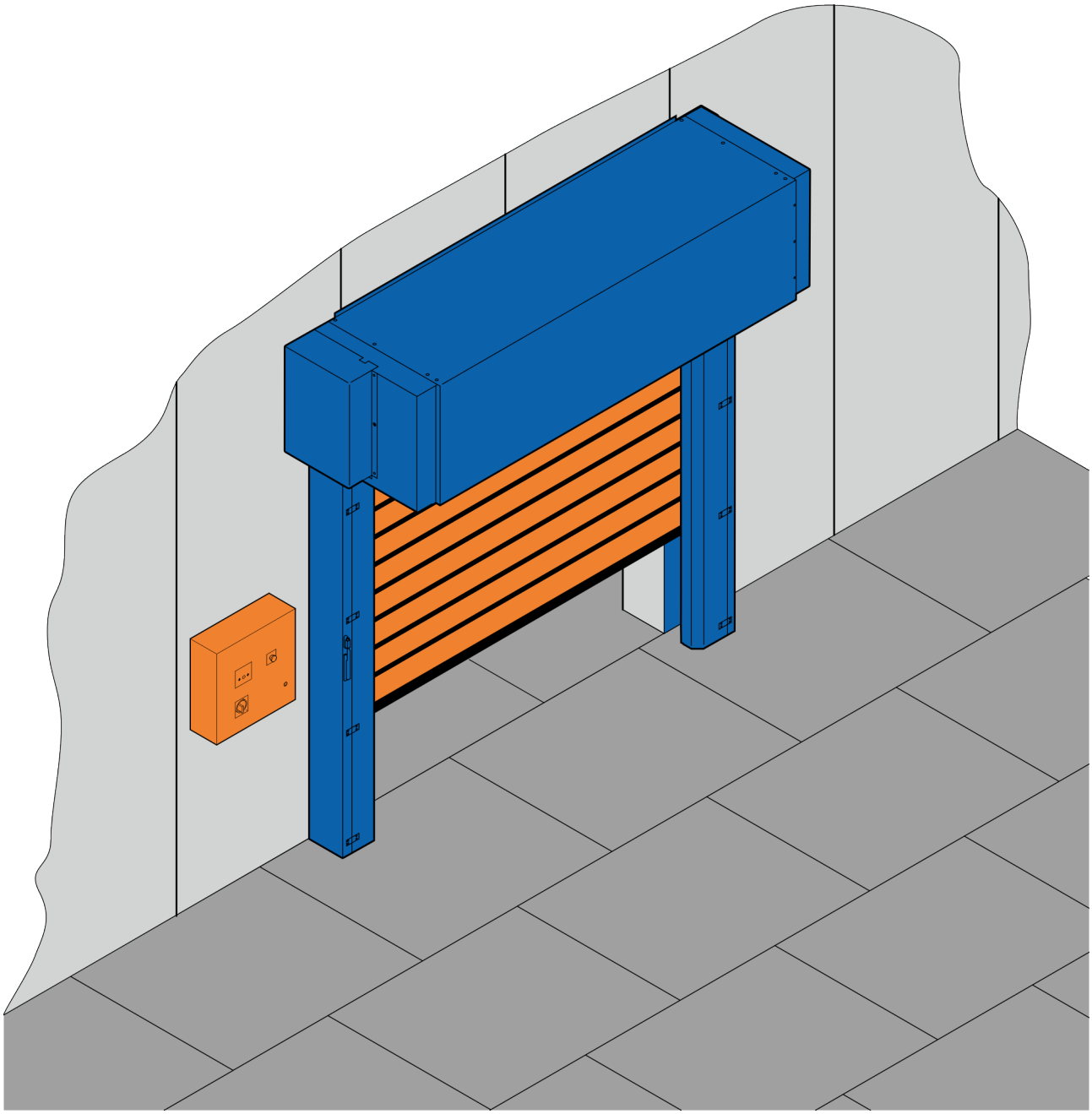


Fig. 1: High-speed spiral door for deep-freeze areas

Short description

The high-insulation and virtually hermetic high-speed spiral door EFA-SST® TK-100 is specifically designed for use in deep-freeze areas and for industrial and commercial purposes with high insulation and tightness demands. The basic construction is based on tried-and-tested spiral door technology. The door leaf is equipped with EFA-THERM® laths of a 100 mm thickness. The hermetic seal is achieved by means of a dynamic system comprising a moving door leaf guide and seals all around the circumference in which the heating lines are integrated in deep-freeze applications.

2 Technical properties

Use in the deep-freeze area:
door system on the warm side

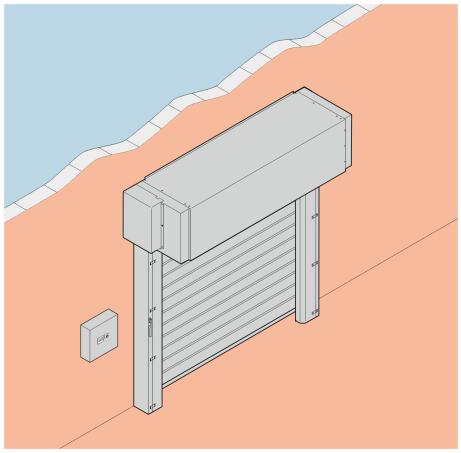


Fig. 2: Use on the warm side

Door system as a seal for deep-freeze areas.

	Deep-freeze area (-30 °C to 0 °C)
	Warm area (0 °C to 30 °C)

Door system width	Maximum temperature difference within this area
≤ 3000 mm	60 °C
> 3000 mm	40 °C

The door system and control cabinet are installed in the warm area.

Use in the deep-freeze area:
door system on the cold side

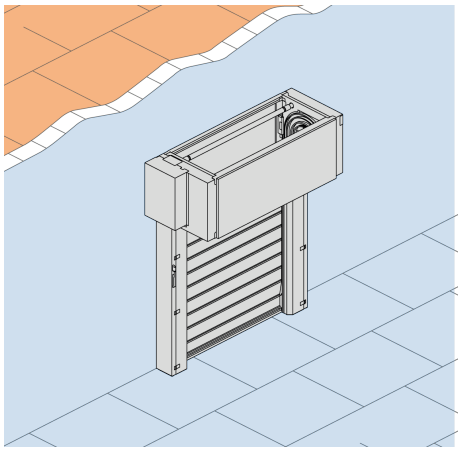


Fig. 3: Use on the cold side

Door system as a seal for deep-freeze areas.

	Deep-freeze area (-30 °C to 0 °C)
	Warm area (0 °C to 10 °C)

The door system is installed in the cold area, while the control cabinet is installed in the warm area.

When using the door system in the cold area, the air humidity must be below 60 % in the warm area.

Use of door system: hall closure

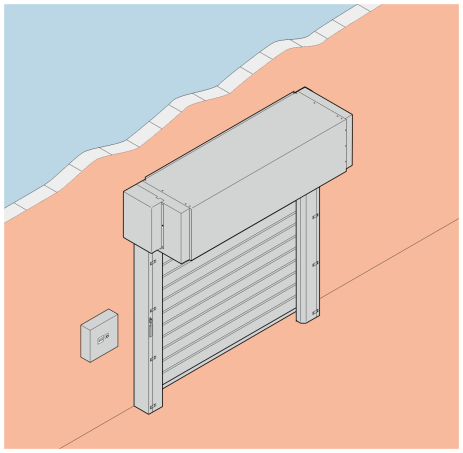


Fig. 4: Use as hall closure

Use

- Industrial door
- Hall door
- Outdoor installation under a canopy provided by the owner possible
- Sealing areas with a defined atmosphere (e.g. inertisation)

	Outdoor (-15 °C to +50 °C)
	Indoor (+5 °C to +50 °C)

The control cabinet must be installed in an ambient temperature of > +5 °C.

Dimensions for use in the deep-freeze area

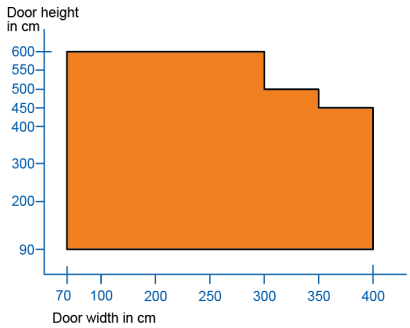


Fig. 5: Diagram of possible door system heights and widths

Door system heights and widths (inner clear height)

Door system type	Widths	Heights
273	700 – 3000 mm	900 – 6000 mm
	3001 – 3500 mm	900 – 5000 mm
	3501 – 4000 mm	900 – 4500 mm

Dimensions for use as hall closure

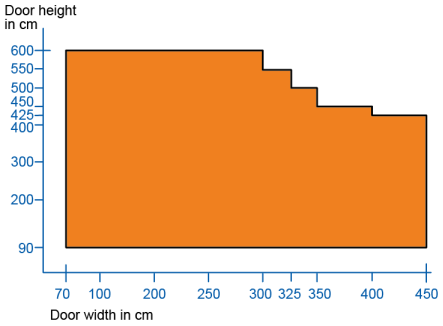


Fig. 6: Diagram of possible door system heights and widths

Door system heights and widths (inner clear height)

Door system type	Widths	Heights
273	700 – 3000 mm	900 – 6000 mm
	3001 – 3250 mm	900 – 5500 mm
	3251 – 3500 mm	900 – 5000 mm
	3501 – 4000 mm	900 – 4500 mm
	4001 – 4500 mm	900 – 4250 mm

Speeds

Door system type	Average speed (max. speed)		
	Opening speed	Closing speed with door light grid	Closing speed with safety edge and light barrier
273	1.5 m/s (2.0 m/s)	0.5 m/s	0.5 m/s

Speed dependent on the height of the door system

Performance features in accordance with DIN EN 13241

Door system type	Specification	Value
273	Resistance to wind load in compliance with DIN EN 12424	Class 3
	Resistance to water ingress in compliance with DIN EN 12425	npd
	Air permeability in compliance with DIN EN 12426	Class 5
	Airborne sound insulation in compliance with DIN EN ISO 717-1	Rw = 26 dB
	Thermal insulation in accordance with DIN EN 12428 (with 4,000 x 4,500 door system)	U = 0.62 W/m²K

npd = no performance determined

Fire performance in compliance with DIN 4102

Specification	Value
Material class	B2 flammable

Technical properties

Applicable regulations, safety standards and directives

The following regulations, standards and directives were taken into account in planning, engineering and production:

Regulations

EUV 305/2011	REGULATION (EU) NO. 305/2011 OF THE EUROPEAN PARLIAMENT AND THE COUNCIL OF 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

Directives

2006/42/EC	DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL of 17 May 2006 on machinery, and amending Directive 95/16/EC
2014/30/EU	DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND COUNCIL of 26 February 2014 on harmonisation of the laws of the member states relating to electromagnetic compatibility
2014/53/EU	DIRECTIVE 2014/53/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC

Standards

DIN EN 13241	Doors – Product standard, performance characteristics
DIN EN ISO 13849-1	Safety of machinery – Safety-related parts of control systems – Part 1 General principles for design
DIN EN ISO 13849-2	Safety of machinery – Safety-related parts of control systems – Part 2 Validation
DIN EN ISO 12100	Safety of machinery – General principles for design – Risk assessment and risk reduction

Performance

Door system type	Load cycles per year	Life cycle
273	200,000	10 years

3 Construction of the high-speed spiral door

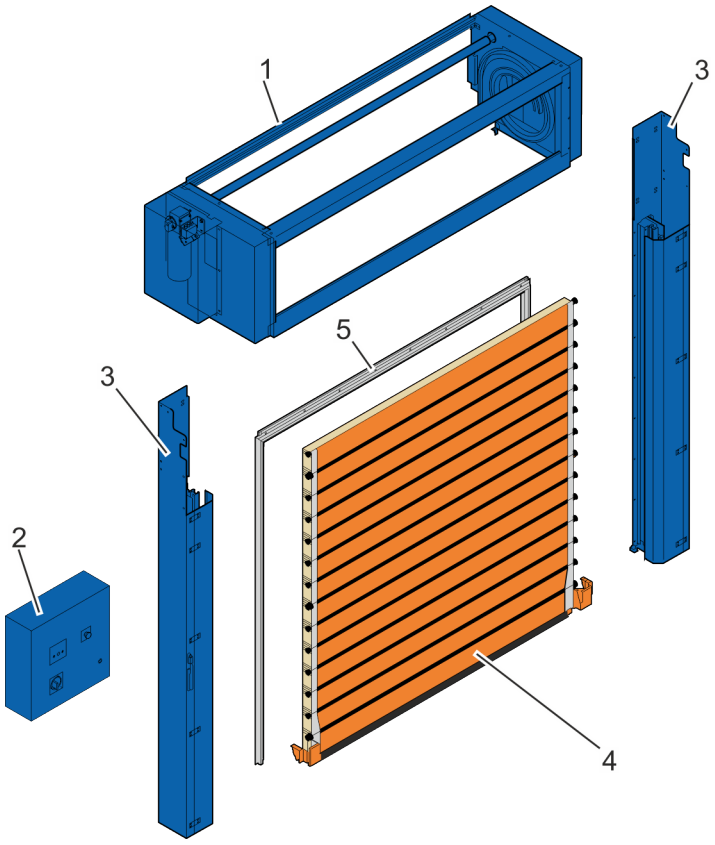


Fig. 7: Assemblies

1	Spiral case with main support, spiral guide, motor, drive shaft, bearings, reinforcement profiles, cover (optional; for door system on the cold side at the bottom and front as standard)	*‘Overview of drives’ on page 24* *“Spiral case versions” starting on page 12*
2	Control unit	*“Overview of control units”, on page 24*
3	Side frames with vertical door leaf guide, supporting components, weight counterbalance and door light grid	*‘Side frame with active guide rail mechanism (EFA-AFM)’ on page 18* *‘Transmission of force’ on page 14* *‘Weight counterbalance’ on page 15* *“Safety edge and door light grid” starting on page 28*
4	Door leaf	*“Door leaf” starting on page 19*
	Laths	*“EFA-THERM® lath” on page 20*

	Safety edge	*“Safety edge and light barrier” starting on page 28*
5	Circumferential profile seal	*‘Seal’ on page 22* *‘Heating only for deep-freeze applications’ on page 23*

Spiral case versions

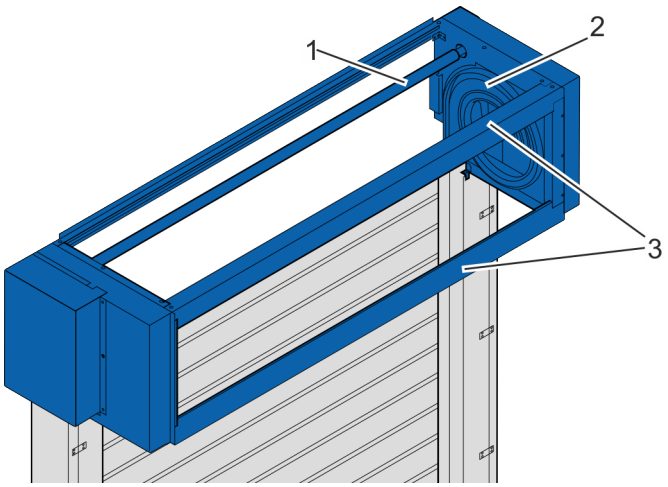


Fig. 8: Spiral case

The spiral case comprises:

- Synchronous shaft with bearing (Fig. 8/1)
- bevelled, main supports with spiral guide (Fig. 8/2) on both sides
- Sheet metal reinforcement profiles (Fig. 8/3)

Spiral case cover (optional)

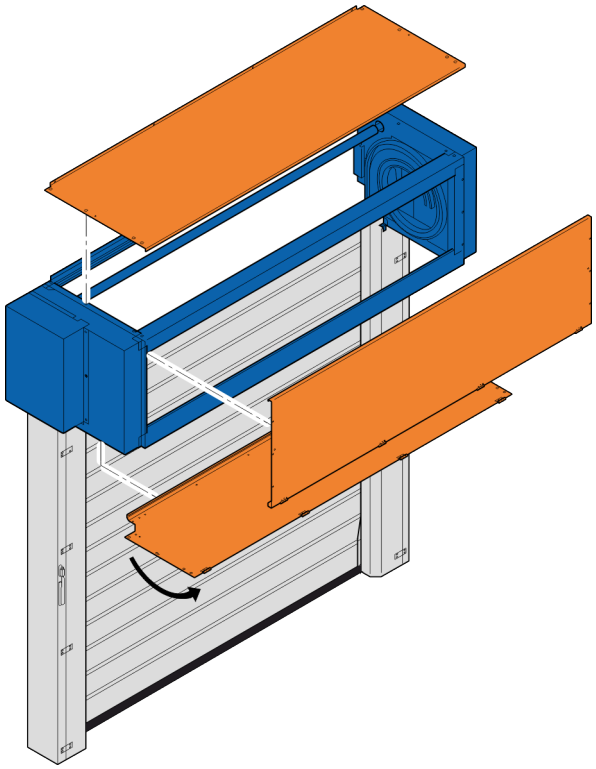


Fig. 9: Spiral case covers

In door systems on the warm side and when used as hall closure, the spiral case (Fig. 9) can optionally be covered in sheet metal profiles at the bottom, front and top. In door systems on the cold side, the cover at the bottom and front is standard; the cover at the top is optional.

Covers on the front and bottom are only possible in combination. The bottom cover is fastened to the front cover by hinges and can be opened downwards for maintenance purposes. The top cover is only possible if the front and bottom are also covered.

The cover on the spiral case for finger protection is mandatory for door systems with a height of less than 2500 mm.

Construction of the high-speed spiral door

Installation side	Sheet metal profile			Hinged side frame cover
	Bottom + front	Top	Clear height restriction	
Use of the door system on the warm side	○	○	None	○
Use of the door system on the cold side	●	-	None	○
Use of the door system as hall closure	○	○	None	○

● Standard

○ Optional

- Not possible

Transmission of force

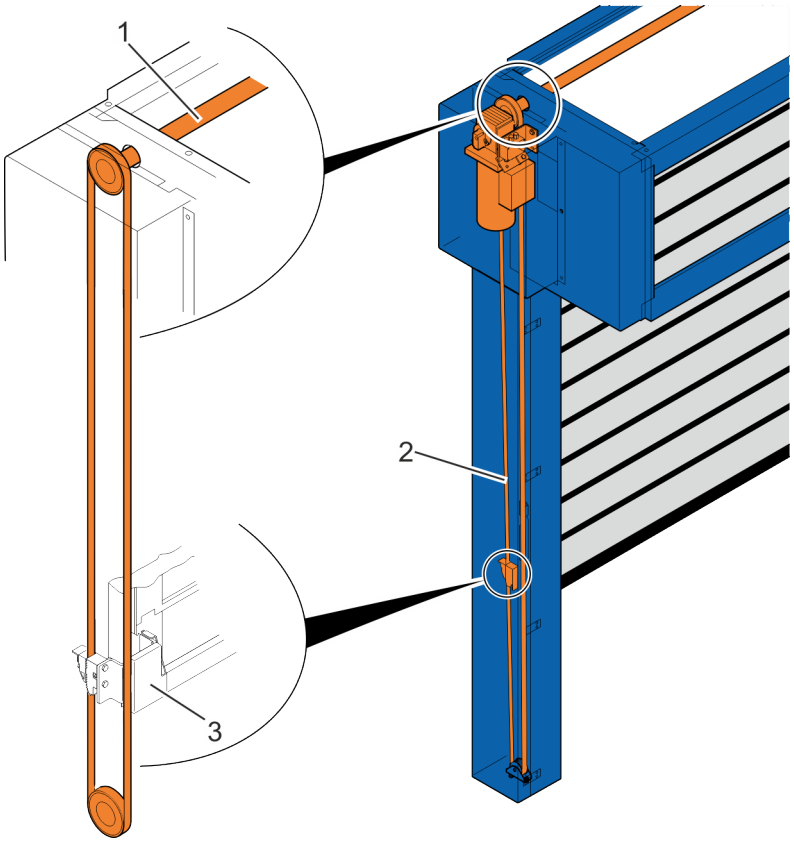


Fig. 10: Transmission of force

The transmission of force from the drive to the door leaf is established by the synchronous shaft (Fig. 10/1), the circumferential toothed belt (for door systems on the warm side and as hall closure) / the circumferential chain (for door systems on the cold side) (Fig. 10/2) and the door leaf mounts (Fig. 10/3).

The door leaf mounts are situated on the right and left-hand sides of the door leaf and are screwed to the hinge chains and the lowest lath of the door leaf (bottom lath). The hinge chains on both sides of the door system connect the bottom lath to the other laths. When the door system moves, the force is only applied to the bottom lath. All the other laths are fastened to the hinge chain and are moved at the same time without the effect of force.

Weight counterbalance

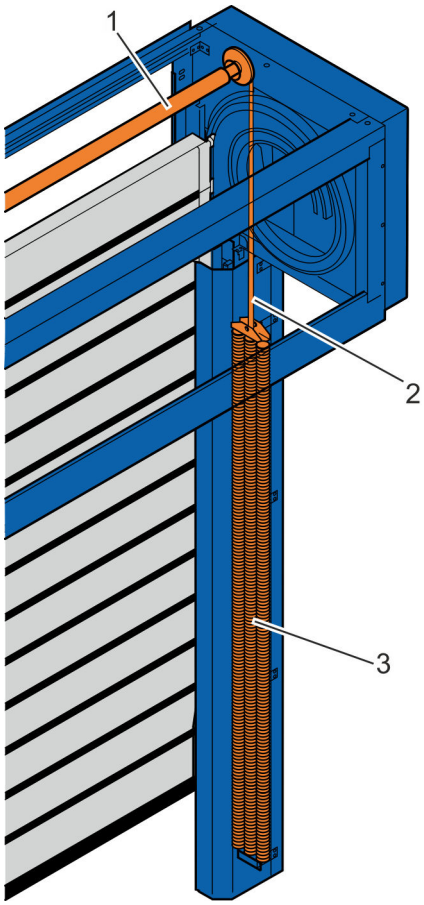


Fig. 11: Weight counterbalance

The door leaf weight counterbalance is a back pull mechanism: Tension springs (Fig. 11/3) are installed in the side frames. The tension springs are connected to the synchronous shaft (Fig. 11/1) by heavy-duty belts (Fig. 11/2). The tension springs are tensioned when the door system is closed and relaxed when the door system is open.

This way the door system can also be opened by hand (without electrical power) in case of emergencies. In normal mode the engine is assisted by the force of the tension springs.

The spring tension is calculated for each individual door.

Fig. 12: Manual release lever on the side frame (left) and on a separate console (right)

The manual release lever is situated on the side frame or optionally on a separate console. When the lever is pulled, the drive brake is enabled and the door system is partially opened automatically by the tension springs of the weight counterbalance system. The door can be opened completely by pushing the door leaf upwards manually.

The manual release lever is also available in a lockable design (optional).

Door leaf guide, side frame and optional pivoting side frame cover

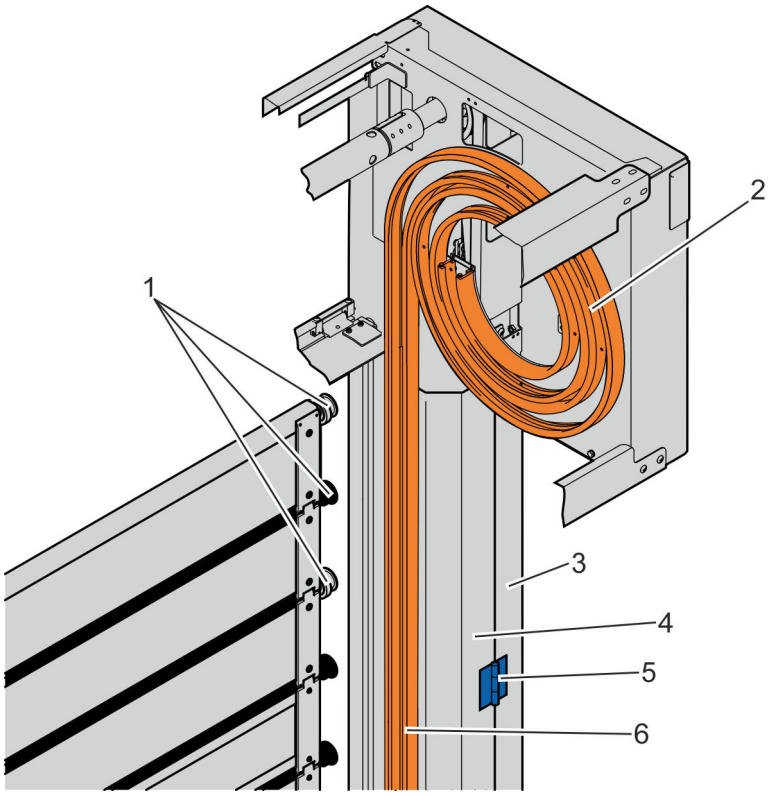


Fig. 13: Door leaf guide

The door leaf comprises laths which are connected by a hinge chain. Rollers (Fig. 13/1) are attached to the hinge chain. When the door system is opened and closed, the rollers are directed through the vertical (Fig. 13/6) and spiral-shaped (Fig. 13/2) door leaf guide. Very little noise is generated by the rolling of the rollers in the door leaf guide. The roller friction also ensures minimum wear on the rollers as no soiling is generated from abrasion. There is no wear on the door leaf itself. This gives the door system a long service life.

The vertical door leaf guides (Fig. 13/6) are made of sheet metal and aluminium profiles and are situated within the side frames (Fig. 13/3). Each side frame is made up of one main bevelled sheet metal profile and one bevelled sheet metal cover profile (Fig. 13/4). The sheet metal cover profiles are fastened with screws and can also be supplied in a pivoting design with hinges (Fig. 13/5).

For more information about this door-specific design option, see *‘Spiral case cover (optional)’ on page 13*.

Side frame with active guide rail mechanism (EFA-AFM)

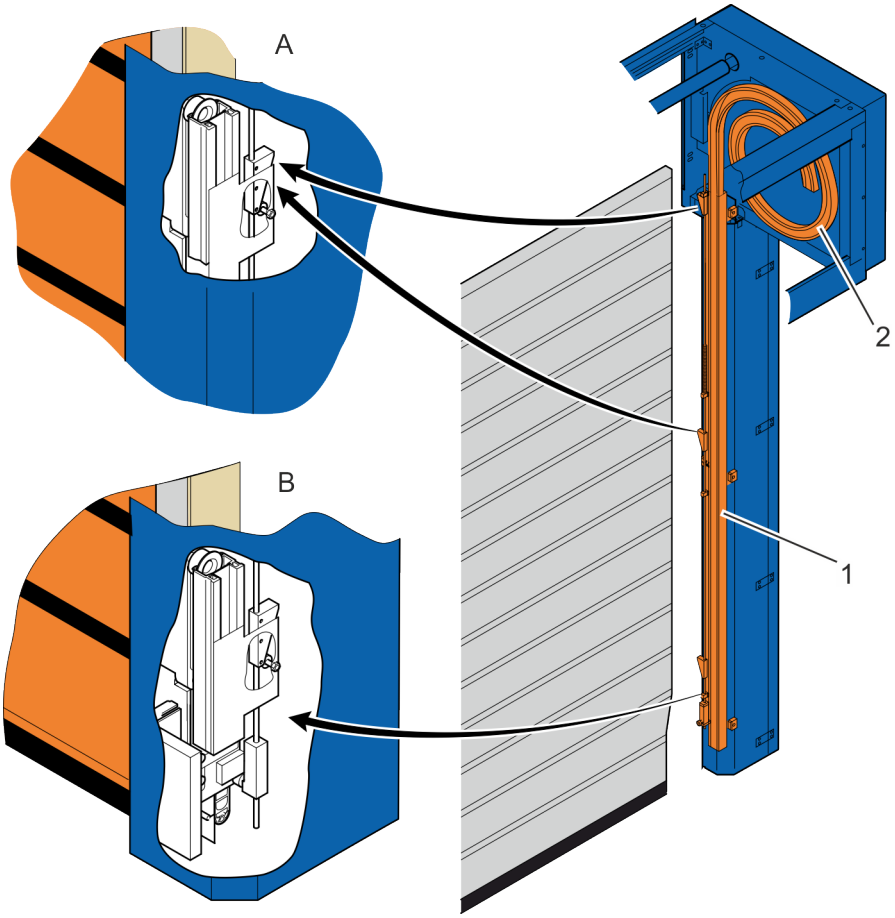


Fig. 14: Door leaf guides

A, B: rotated by 90°

Door leaf

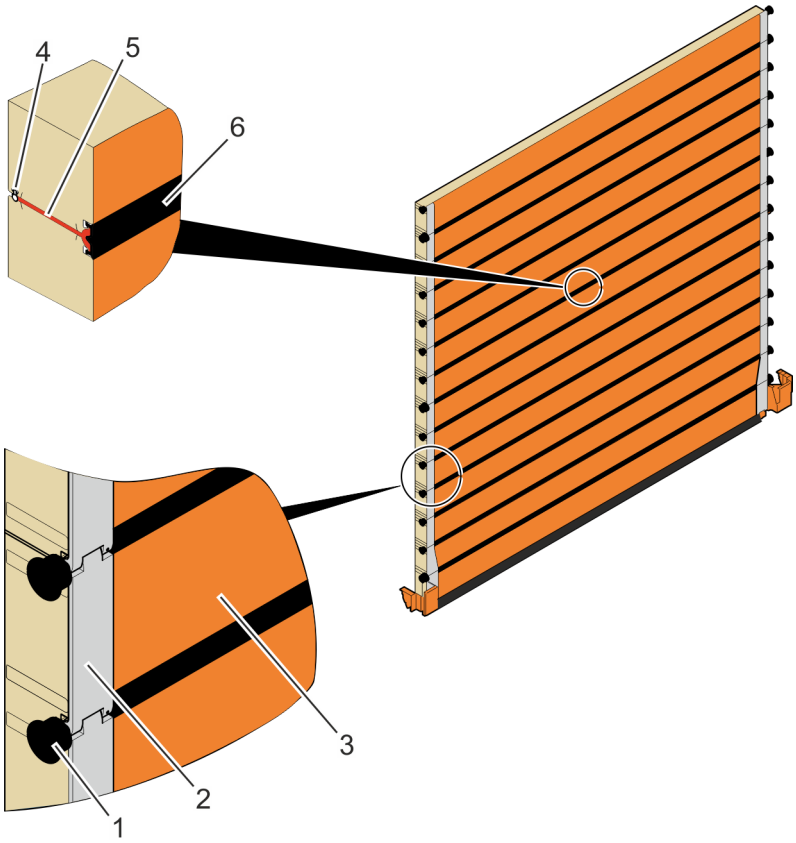


Fig. 15: Door leaf

The door leaf is assembled from laths (Fig. 15/3) which are kept at the correct spacing by hinge chains (Fig. 15/2) attached at the sides. This spacing prevents contact between the laths. They are thus free from wear. The forces for opening and closing the door system are transmitted via hinges.

Ball-bearing mounted rollers (Fig. 15/1) keep the door leaf firmly in the guides in the horizontal direction. The laths are connected to each other by rubber hinges (Fig. 15/6) and O-profile seals (Fig. 15/4). An air cushion (Fig. 15/5) is created inbetween. It provides insulation of similar effectiveness to that of the laths.

This homogeneous door leaf construction ensures the very good running performance, the high running speed and the excellent U-value.

Door system type	Thickness of the door leaf
273	100 mm

Construction of the high-speed spiral door

EFA-THERM® lath

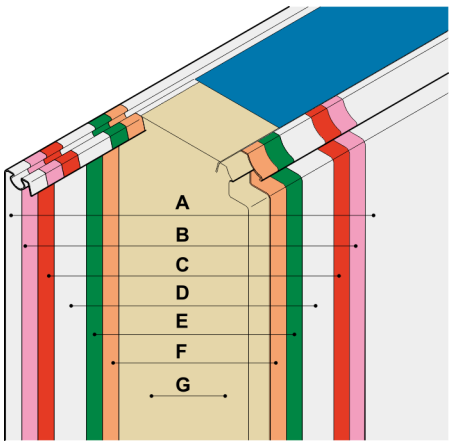


Fig. 16: Structure of the EFA-THERM® lath

The EFA-THERM® laths are structured with the following layers:

A Top coat
B Primer
C Zinc layer 150 g/m²
D Sheet (made of steel or aluminium coil)
E Zinc layer 150 g/m²
F Adhesive
G PU hard foam, 42 kg/m³, CFC and HCFC free

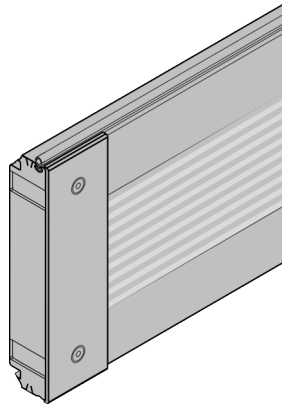


Fig. 17: EFA-THERM® lath

Dimensions	100 × 222 mm
Material	Sheet steel 0.4 mm
Finish	2 coats of paint
Colour	White aluminium, similar to RAL 9006 or RAL 9007
Optional	Wet lath coating Colours in compliance with SAP

Designs of the EFA-THERM® lath

		Door system type		**273**
		Side frame dimensions in mm		355 × 320
		Surface/colour		
Sheet thickness	Material	Coil colour	RAL paint	
0.4 mm	Steel	9006	as per SAP	available
0.4 mm	Steel	9007	not available	available

EFA-CLEAR® lath for door system used as hall closure

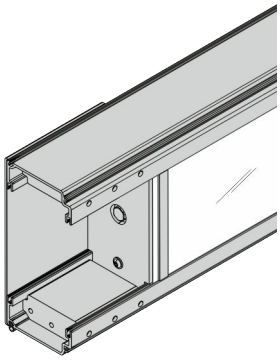


Fig. 18: EFA-CLEAR® lath (double-walled)

The EFA-CLEAR® double-walled, thermally insulated transparent laths are each comprised of two plastic panes which are pressed at intervals into glass fibre-reinforced plastic (GRP) profiles between the panes.

Dimensions	100 × 222 mm Viewing area height: approx. 143 mm
Finish	1 coats of paint (GRP profiles including lath protective sheets and screws)
Colour	White aluminium, similar to RAL 9006
Glazing	PMMA
Optional	GRP profile coating Colours in compliance with SAP

The number of transparent laths is limited.

Spare parts kit

Fig. 19: Spare parts kit

An optional spare parts kit can be selected to increase the availability of the EFA-SST® TK-100.

The spare parts kit contains:

- One bottom lath incl. safety edge(s)
- 3 door leaf laths incl. heating cables
- Hinges
- Rubber hinges
- Rollers

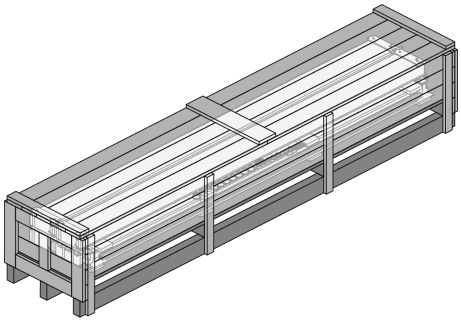


Fig. 20: Spare parts kit packaging unit

The spare parts kit is supplied in a separate packaging unit.

Seal

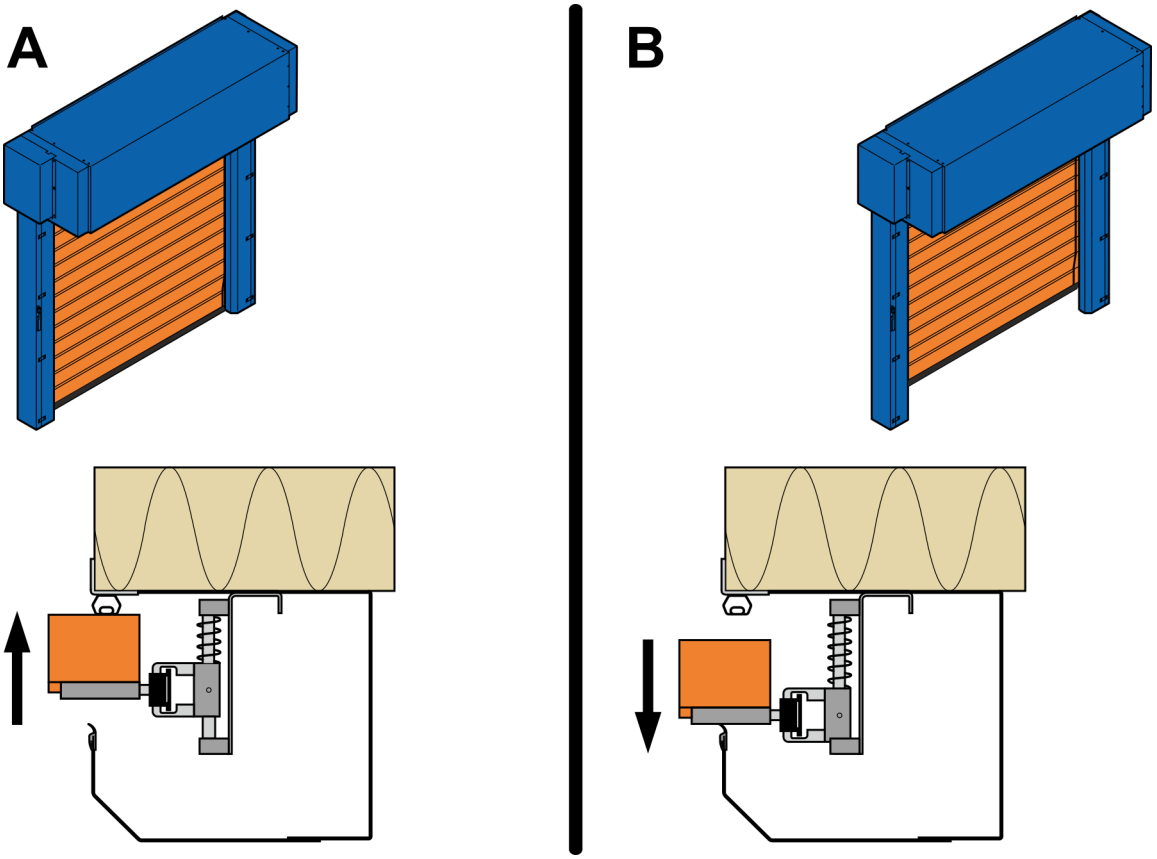


Fig. 21: Seal

The door leaf is pushed against the seal when the door system (Fig. 21/A) is closed and is thus almost hermetically sealed. When opening the door system (Fig. 21/B), the door leaf is lifted from the seal immediately. This prevents any permanent scraping of the seals on the door leaf.

Heating only for deep-freeze applications

The integrated heaters are necessary to prevent potential icing on the sealing surfaces (Fig. 22/A, B, C, D) of the door system. The heating lines which are integrated in the sealing profiles provide temperature control for the contact surfaces between the seal and door leaf, between the seal and the floor and between the seal and the laths.

Direct and local heating of the contact surfaces only requires a low level of heating power.

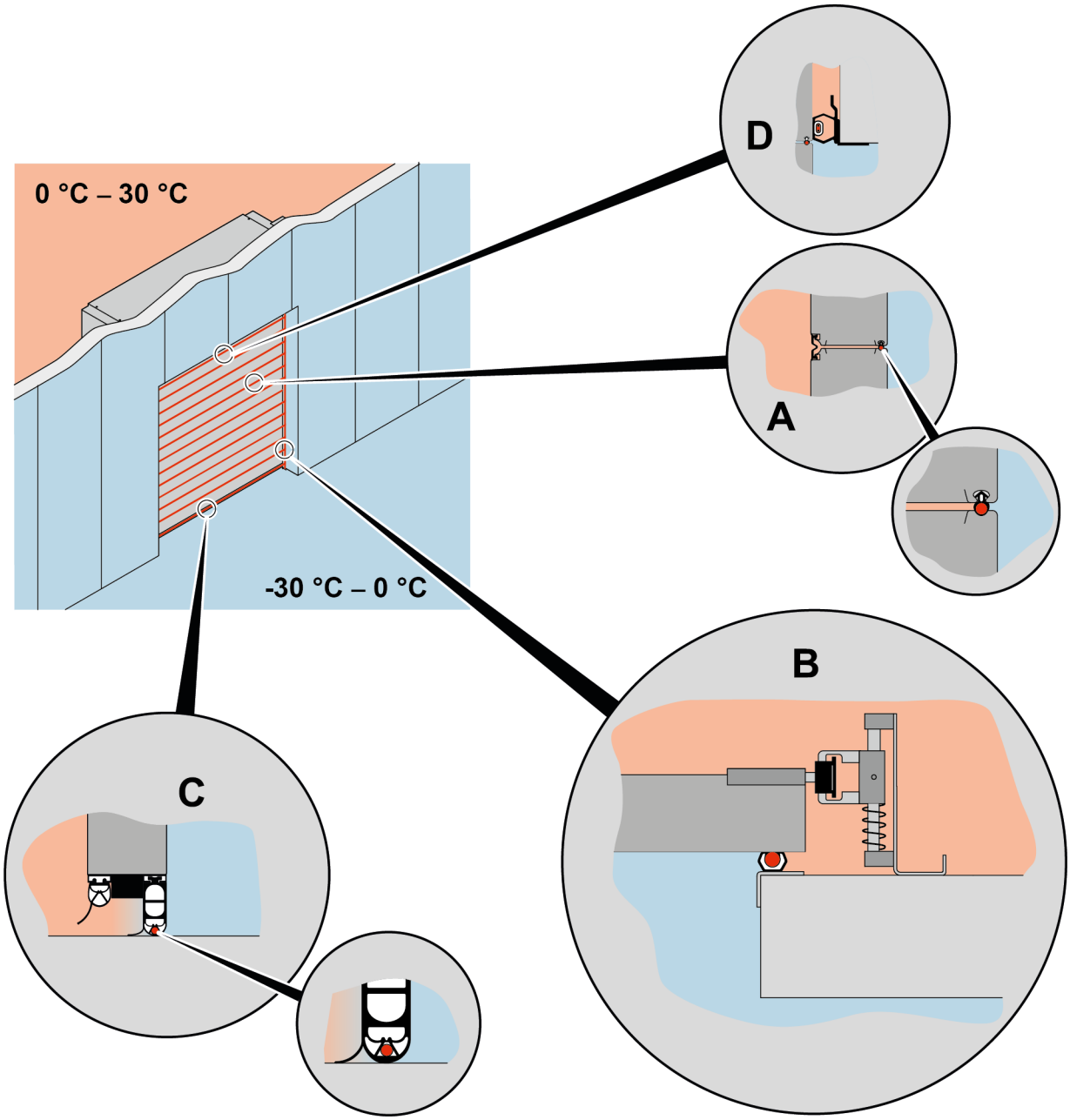
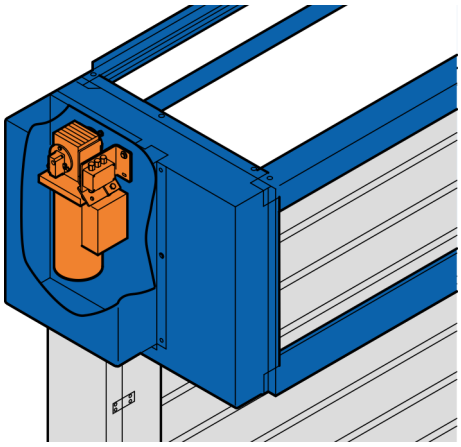


Fig. 22: Heater, shown in the example for door systems on the warm side. The temperature specifications are the opposite for door systems on the cold side

A	Door leaf / laths	Resistance heating line approx. 20 W/m, 48 V AC
B, D	All-round seal	Resistance heating line approx. 23 W/m, 230 V AC
C	Floor seals / safety edges	Resistance heating line approx. 25 W/m, 48 V AC

Overview of drives



Drive type	Direct mount drive (Spur gear asynchronous AC motor)
Power classes	2.2 kW
Protection type	IP54
Position detection	Absolute encoder. Thus no reference run is required.
Heating	Standard for deep freeze doors on the cold side

Fig. 23: Drive

Control units

Use of the door system	EFA-TRONIC®	EFA-TRONIC® Professional 380 x 380 x 210	EFA-TRONIC® Professional 600 x 600 x 210	Standard installation position
On the hot side	-	-	●	On the side, next to the side frame
On the cold side	-	-	●	
As hall closure	●	○	-	

● Standard

○ Optional

- not available

EFA-TRONIC® Professional

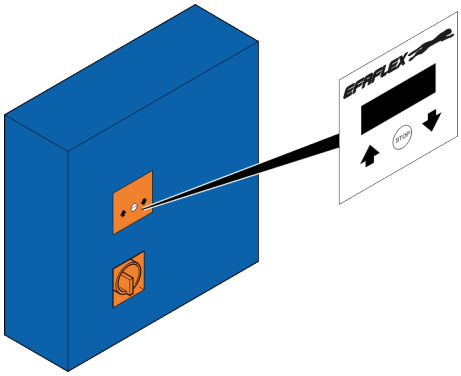


Fig. 24: EFA-TRONIC® Professional

Control unit	EFA-TRONIC® Professional with frequency converter
Size for deep-freeze application (W × H × D)	600 × 600 × 210 mm
Size for hall closure (W × H × D)	380 × 380 × 210 mm
Housing	Steel, colour RAL 7035 Optional: ■ Painted RAL colours in compliance with SAP ■ V2A
Protection type	IP65
Viewing window for display	Display of status messages and fault messages
Operating controls	Operating panel for operation and configuration of the door system Master switch
Supply voltage for deep-freeze application	3~L/N/PE 400 V ± 10 %
Supply voltage for hall closure	L/N/PE 230 V ± 10 % or 3~L/N/PE 400 V ± 10 %
Frequency	50 – 60 Hz
Supply line for deep-freeze application	Fuse protection of 25 A to be provided by the owner (K characteristic)
Supply line for hall closure	Fuse protection of 16 A to be provided by the owner (K characteristic)
With residual current device (RCD) as necessary	300 mA in compliance with DIN VDE 0100-530 (sensitive to universal current)

Construction of the high-speed spiral door

EFA-TRONIC® when used as: hall closure

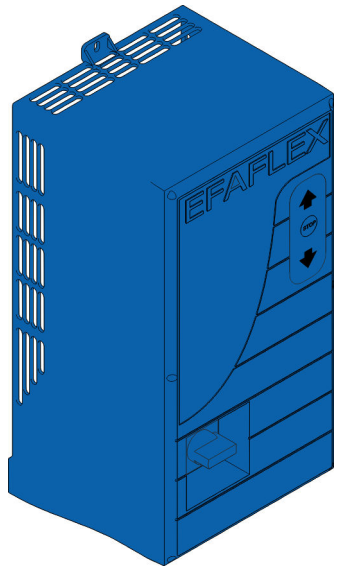


Fig. 25: EFA-TRONIC®

Control unit	EFA-TRONIC® with frequency converter
Size (W × H × D)	210 × 400 (565)* × 200 mm (* incl. cable cover)
Housing	Polycarbonate housing
Protection type	IP65
Viewing window for display	Display of status messages and fault messages
Operating controls	Operating panel for operation and configuration of the door system Master switch
Supply voltage	L/N/PE 230 V ± 10 % or 3~L/N/PE 400 V ± 10 %
Frequency	50 – 60 Hz
Supply cable	Fuse protection of 16 A to be provided by the owner (K characteristic)
With residual current device (RCD) as necessary	300 mA in compliance with DIN VDE 0100-530 (sensitive to universal current)

EFA-HDI® operating unit

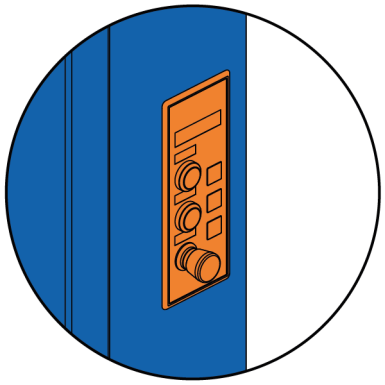


Fig. 26: EFA-HDI® operating unit

To supplement the EFA-TRONIC® Professional, it is possible to install an additional EFA-HDI® operating unit on the wall. It is equipped with a display screen and offers full access to all parameters and all basic functions.

Ammeter (optional)

The ammeters show the actual value of current consumption for the respective heater (48 V and 230 V). The set points are specified in the inspection book for the door system and on the adhesive labels on the respective ammeter.

4 Door safety

The main closing edge is secured by a combination of a safety edge and door light grid or safety edges and safety light barrier(s) (C device plus D device). This achieves the minimum protection level in line with DIN EN 12453.

In addition, the owner and the manufacturer have to consult with one another on providing protection for the approach area. This is based on the owner's risk assessment.

Installation side	Door light grid and safety edge	Light barrier(s) and safety edges
Use of the door system on the warm side	●	○
Use of the door system on the cold side	-	●
Use of the door system as hall closure	●	○

● Standard

○ Optional

- Not possible

Door light grid and safety edge

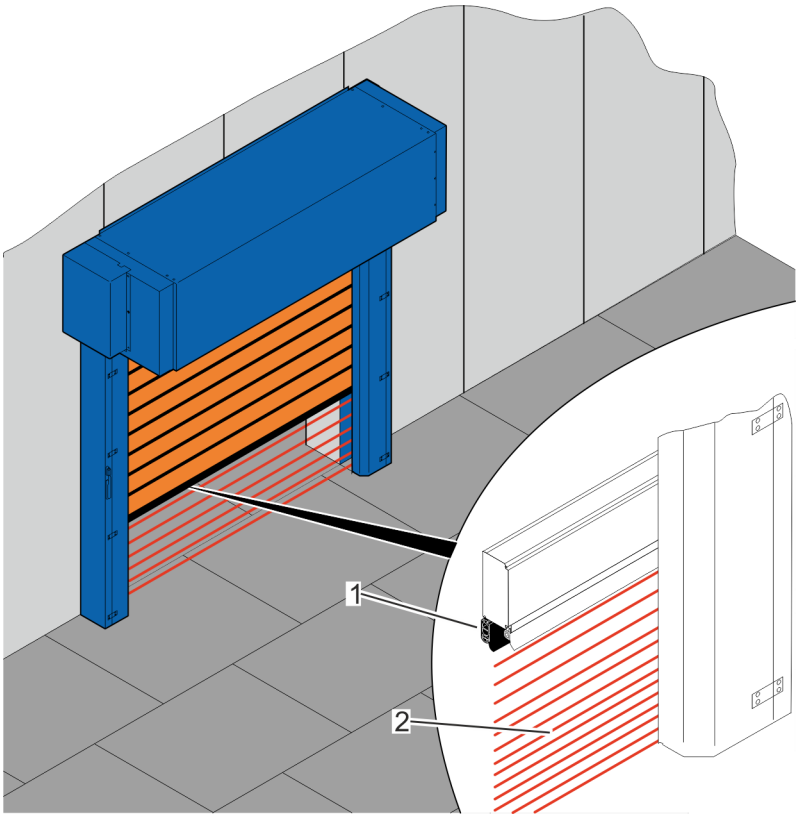


Fig. 27: Safety edge and door light grid

If the door system safety edge (Fig. 27/1) comes into contact with a person during closing, the door leaf stops, the door system opens completely and closes automatically again once the “keep-open” time has elapsed.

The door light grid (Fig. 27/2), which is installed in the side of the side frame, monitors the closing level up to a height of 2.5 metres. The door light grid prevents the door system from closing when a person is detected.

Light barrier and safety edge

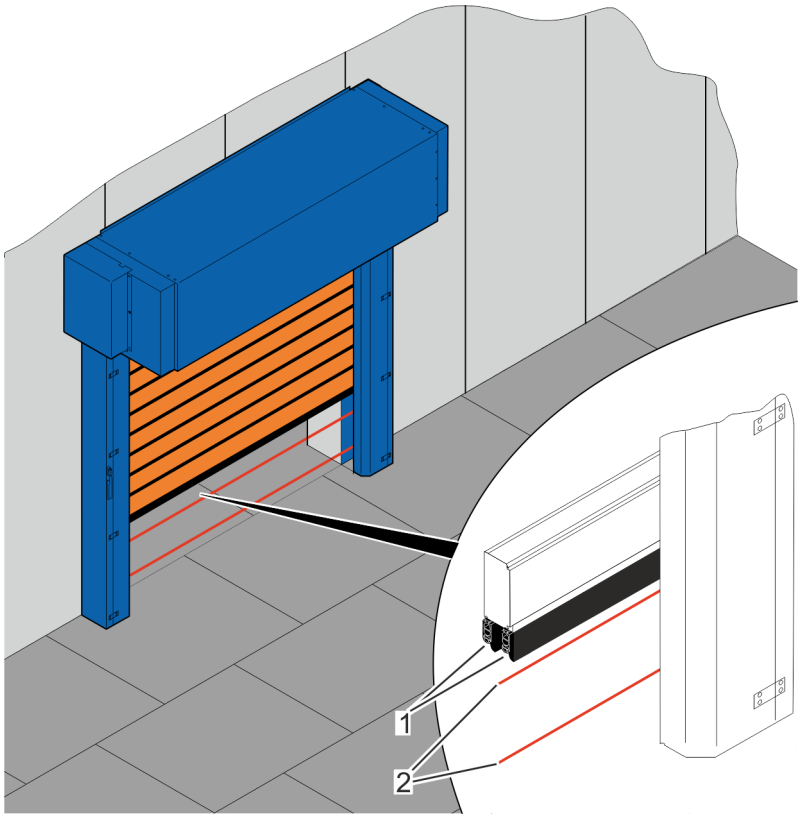


Fig. 28: Light barrier and safety edge

If the door system safety edge (Fig. 28/1) comes into contact with a person during closing, the door leaf stops, the door system opens completely and closes automatically again once the “keep-open” time has elapsed.

If one of the light barriers (Fig. 28/2) is broken during the closing operation, all movements stop, the door system opens completely and closes automatically again once the keep-open time has elapsed.

5 Equipment

Possible equipment[1]

- Basic door construction, galvanised, 275 g/m²
- Basic door construction galvanised (275 g/m²) with powder-coated surface of externally visible areas in colours in compliance with SAP
  - Polyester-based decorative powder coating
  - Coat thickness approx. 50 µm +/- 10 µm
  - Sheen level in accordance with DIN EN ISO 2813 (incidence angle 60°)
    75 % ± 10 %
  - Smooth surface (no structure)
- Basic door construction stainless steel V2A 1.4301, corrosion resistant, polished grain 220
- Laths
  - Polyurethane-based decorative coating
  - Coat thickness approx. 50 µm +/- 10 µm
  - Sheen level in accordance with DIN EN ISO 2813 (incidence angle 60°)
    30 % ± 10 %
  - Smooth surface (no structure)
- Round spiral door leaf guide
- Lath, 100 mm EFA-THERM®
- When used as hall closure: EFA-CLEAR® lath, 100 mm double-walled
- Deep-freeze application heating package
- When used as hall closure: EFA-TRONIC® control unit
- Direct mount drive
- Emergency operation device on side frame, not lockable
- When using the door system on the cold side: Motor heating
- When using the door system on the cold side: 2 safety edges and up to 2 light barriers
- When using the door system on the warm side / as hall closure: 1 safety edge and 1 door light grid
- When using the door system on the warm side / as hall closure: 2 safety edges and up to 2 light barriers
- Command devices: push-buttons, pull switches, key switches, etc.
- Control devices/safety: radar detector, IR (infrared presence sensor)
- When using the door system on the warm side / as hall closure: Spiral casing covers (bottom, front and top)
- When using the door system on the cold side: Spiral casing covers (bottom and front)
- Hinged side frame cover
- Floor plate stainless steel V2A
- “Door closed” limit switch, type Euchner CES safety limit switch, Pepperl and Fuchs NJ 15
- “Door open” limit switch, type Pepperl and Fuchs NJ 15
- EFA-HDI operating unit

[1] Depending on configuration

Equipment

Special constructions

Special constructions/special orders are design types which are not covered, either mechanically or electrically, by standard versions in the sales price lists or by a design from the technology variants table. They have to be requested specifically. Surcharges and extended delivery times are calculated for special designs in accordance with the actual expenditure.

6 Packaging units

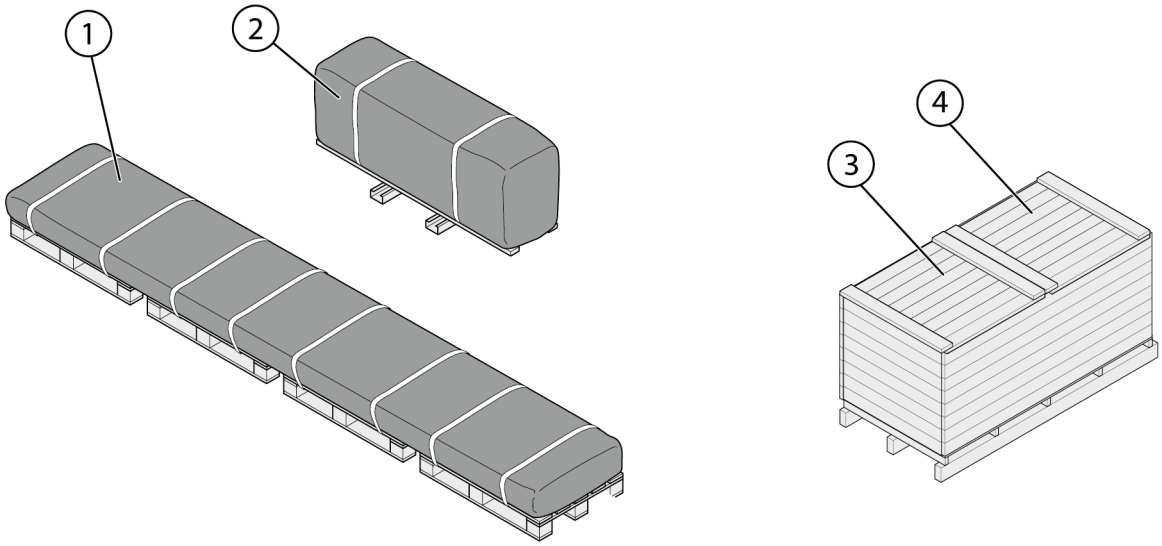


Fig. 29: Scope of delivery 273 (left, standard transport unit), wooden crate (right, optionally for sea and fit-for-purpose transport)*

**Fit-for-purpose packaging is packaging that ensures that the packaged goods reach the recipient without damage, taking into account the shipping loads, shipping route, shipping duration and transportation load profile.*

Transport unit (example)

Transport unit 1: Side frame sections with covers, control unit, accessories

Transport unit 2: Spiral case with door leaf, drive

Transport unit 3: Wooden crate (optional)

Transport unit 4: Spare parts kit

Number of transport units

The number of standard transport units depends on the selected number of door systems.

The door systems can also be delivered in a wooden crate. The number of wooden crates depends on the configuration of the door system types and the number of door systems.

Wood that complies with the IPPC standard is optionally available. For sea freight, the wooden crates are lined with film as protection against moisture.

Packaging units

Packages attached to pallets can be transported by forklift under the following conditions:

- The forklift must have the appropriate capacity for the weight of the packages.
- The package must be securely fastened to the pallet.
- The forklift driver must be authorised to drive industrial trucks with a driver’s seat or driver’s station in accordance with the local regulations.

EFAFLEX

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