



This technical product description
applies to the following door system types:

EFA-STR@-L

EFA-STR@-S

EFA-STR@-L Low lintel

EFA-STR@-S Low lintel

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Translation of the original

Version 00-EN

08.04.2020

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Door system designations

Official designation of the door system	Spiral type	Designation of the door system in this product description
EFA-STR®-L	Round spiral	249 R
	Low lintel	277 N
EFA-STR®-S	Round spiral	251 R
	Low lintel	256 N

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1 Short description

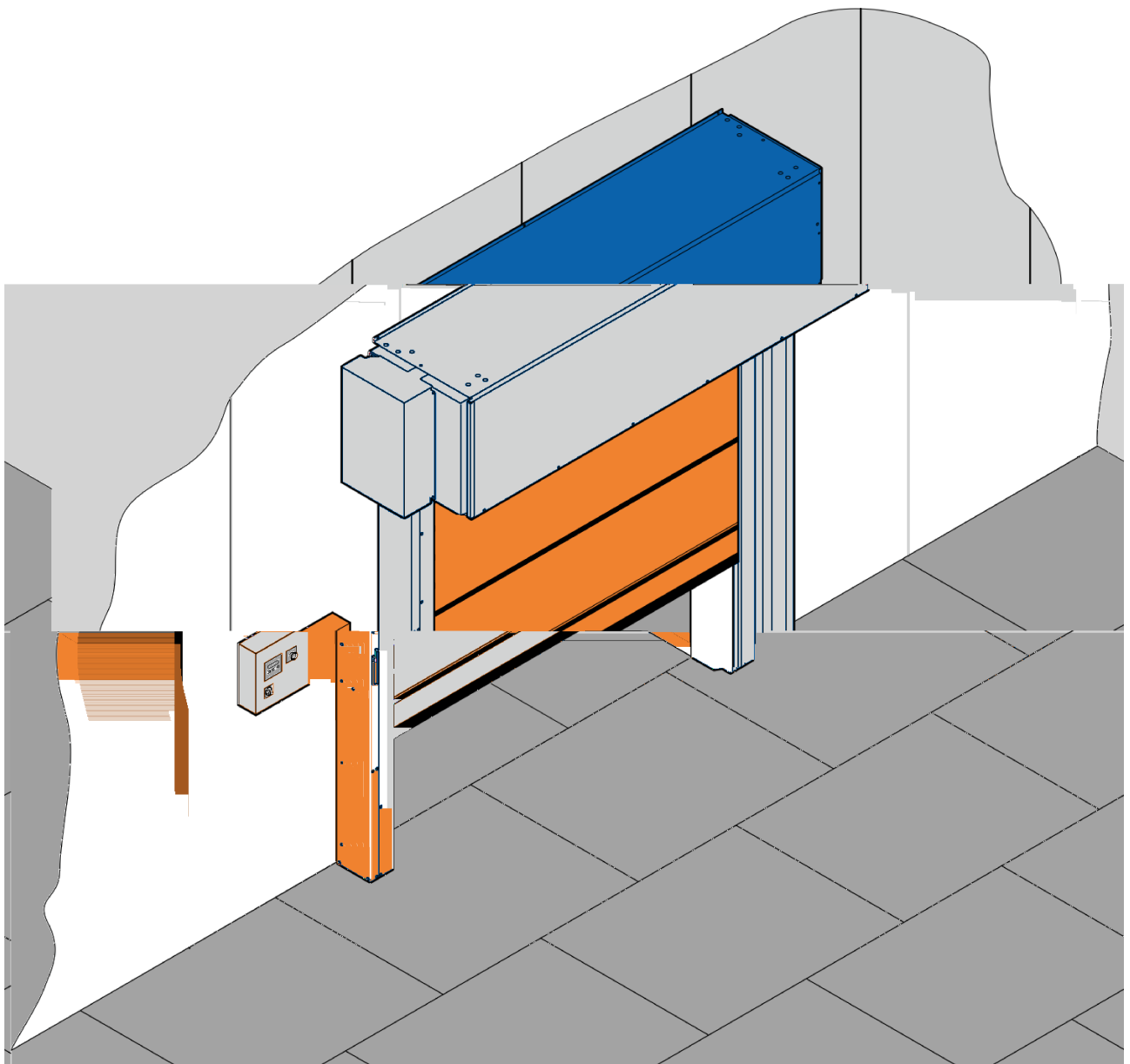


Fig. 1: High-speed turbo roll-up door

High-speed turbo roll-up doors of the S series are door systems designed for industrial and commercial purposes. The basic construction is based on tried and tested spiral door technology.

Through the use of a non-insulated door leaf, an extremely low door leaf weight can be achieved, which nevertheless ensures a high resistance to wind load as well as high opening and closing speeds.

The door leaf for the EFA-STR® is equipped with 40 or 60 mm thick, extruded aluminium profiles and a polyester fabric filling, which is secured tightly with keder profiles. The extruded profiles have a spacing of 225 mm.

2 Technical properties

Use

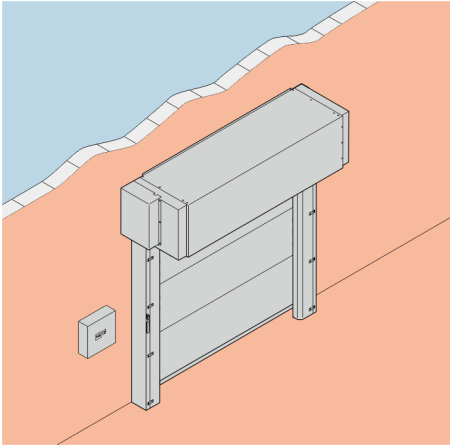


Fig. 2: Use

Use

- Industrial door
- Hall door
- Outdoor installation under a canopy provided by the owner possible
- Interior door

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

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

Dimensions 249 R

Door height in cm

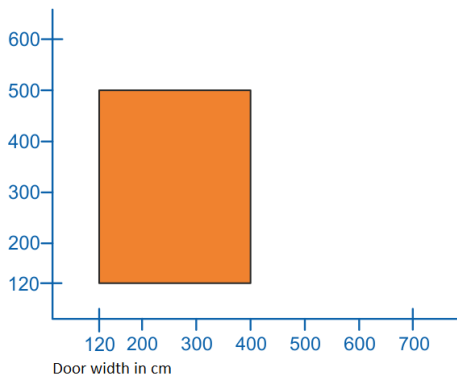


Fig. 3: Diagram of possible door system heights and door system widths

i It is not possible to use a door light grid if the height of the door system is less than 1850 mm.

Door system heights and widths (inner clear height)

Door system type	Widths	Heights
249 R	1200 – 4000 mm	1200 – 5000 mm

Dimensions 251 R

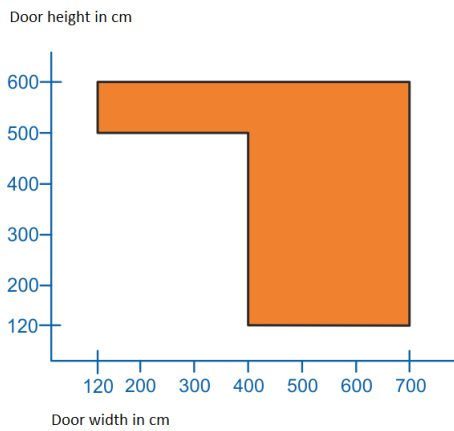


Fig. 4: Diagram of possible door system heights and door system widths



It is not possible to use a door light grid if the height of the door system is less than 1850 mm.

Door system heights and widths (inner clear height)

Door system type	Widths	Heights
251 R	1200 – 4000 mm	5000 – 6000 mm
	4001 – 7000 mm	1200 – 6000 mm

Dimensions 277 N

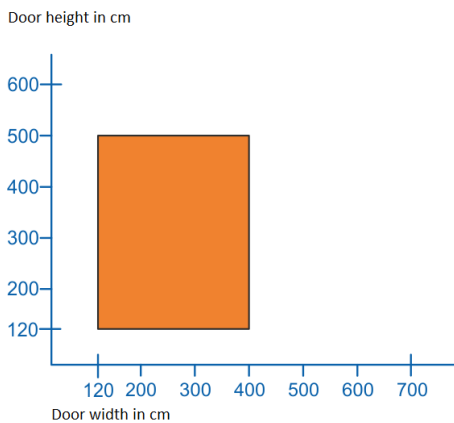


Fig. 5: Diagram of possible door system heights and door system widths



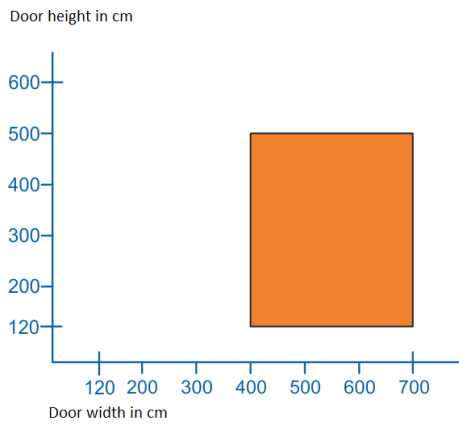
It is not possible to use a door light grid if the height of the door system is less than 1890 mm.

Door system heights and widths (inner clear height)

Door system type	Widths	Heights
277 N	1200 – 4000 mm	1200 – 5000 mm

Technical properties

Dimensions 256 N



It is not possible to use a door light grid if the height of the door system is less than 1890 mm.

Door system heights and widths (inner clear height)

Door system type	Widths	Heights
256 N	4000 – 7000 mm	1200 – 5000 mm

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

Speeds

Door system type	Average speed (max. speed)		
	Opening speed	Closing speed with door light grid	Closing speed with safety edge and safety light barrier
249 R	1.6 m/s (2.0 m/s)	1.0 m/s	0.75 m/s
	3.6 m/s (4.0 m/s)	1.0 m/s	0.75 m/s
251 R (B ≤ 5000 mm)	2.8 m/s (3.2 m/s)	1.0 m/s	0.75 m/s
251 R (5000 mm > B ≤ 6000 mm)	2.2 m/s (2.5 m/s)	1.0 m/s	0.75 m/s
251 R (B > 6000 mm)	1.6 m/s (2.0 m/s)	1.0 m/s	0.75 m/s
277 N	1.6 m/s (2.0 m/s)	1.0 m/s	0.75 m/s
	2.8 m/s (3.2 m/s)	1.0 m/s	0.75 m/s
256 N (B ≤ 5000 mm)	2.8 m/s (3.2 m/s)	1.0 m/s	0.75 m/s
256 N (5000 mm > B ≤ 6000 mm)	2.2 m/s (2.5 m/s)	1.0 m/s	0.75 m/s
256 N (B > 6000 mm)	1.6 m/s (2.0 m/s)	1.0 m/s	0.75 m/s

Speeds depend on the height of the door system

Performance properties in accordance with DIN EN 13241

Door system type	Specification	Door system width/size, other specifications	Value
249 R	Resistance to wind load in compliance with DIN EN 12424	$1200 \text{ mm} \leq B \leq 3500 \text{ mm}$	Class 3
		$3500 \text{ mm} < W \leq 4000 \text{ mm}$	Class 2
	Resistance to water penetration in compliance with DIN EN 12425	-	Class 0
	Air permeability in compliance with DIN EN 12426	-	Class 1
	Airborne sound insulation in compliance with DIN EN ISO 717-1	for standard door leaf	Rw = 12 dB
	Thermal insulation in compliance with DIN EN 12428	for standard door leaf for $4000 \times 5000 \text{ mm}$	U = 6.1 W/m ² K

Door system type	Specification	Door system width/size, other specifications	Value
251 R	Resistance to wind load in compliance with DIN EN 12424	$1200 \text{ mm} \leq W \leq 5000 \text{ mm}$	Class 3
		$5000 \text{ mm} < W \leq 7000 \text{ mm}$	Class 2
	Resistance to water penetration in compliance with DIN EN 12425	-	Class 0
	Air permeability in compliance with DIN EN 12426	-	Class 1
	Airborne sound insulation in compliance with DIN EN ISO 717-1	for standard door leaf	Rw = 12 dB
	Thermal insulation in compliance with DIN EN 12428	for standard door leaf for $7000 \times 6000 \text{ mm}$	U = 5.95 W/m ² K

Door system type	Specification	Door system width/size, other specifications	Value
277 N	Resistance to wind load in compliance with DIN EN 12424	1200 mm ≤ B ≤ 3500 mm	Class 3
		3500 mm < W ≤ 4000 mm	Class 2
	Resistance to water penetration in compliance with DIN EN 12425	-	npd
	Air permeability in compliance with DIN EN 12426	-	npd
	Airborne sound insulation in compliance with DIN EN ISO 717-1	for standard door leaf	Rw = 12 dB
Thermal insulation in compliance with DIN EN 12428	for standard door leaf for 4000 × 5000 mm	U = 6.1 W/m²K	

npd = no performance determined

Door system type	Specification	Door system width/size, other specifications	Value
256 N	Resistance to wind load in compliance with DIN EN 12424	4000 mm ≤ W ≤ 5000 mm	Class 3
		5000 mm < W ≤ 7000 mm	Class 2
	Resistance to water penetration in compliance with DIN EN 12425	-	npd
	Air permeability in compliance with DIN EN 12426	-	npd
	Airborne sound insulation in compliance with DIN EN ISO 717-1	for standard door leaf	Rw = 12 dB
Thermal insulation in compliance with DIN EN 12428	for standard door leaf for 7000 × 5000 mm	U = 6.00 W/m²K	

FHX' • 7P'

Applied ordinance, safety standards and directives

The following ordinance, standards and directives were applied for planning, engineering and production:

Ordinance

EUV 305/2011	Ordinance (EU) No. 305/2011 of the European Parliament and the Council of 9 March 2011 on the definition of harmonised conditions for the marketing of construction products and the withdrawal of Directive 89/106/EEC of the Council
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Directives

2006/42/EC	DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL from 17 May 2006 on machines and for amendment of Directive 95/16/EC (new release)
2014/30/EU	DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND COUNCIL from 26 February 2014 for harmonization of the laws of member states for electromagnetic compatibility (new release)
2014/53/EU	DIRECTIVE 2014/53/EU OF THE EUROPEAN PARLIAMENT AND COUNCIL from 16 April 2014 for harmonization of the laws of the member states for the provision of radio equipment on the market and withdrawal of Directive 1999/5/EC

Standards

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

Performance

Door system type	Load cycles per year	Life cycle
249 R 251 R	200000	10 years
Door system type	Load cycles per year	Life cycle
277 N 256 N	120000	10 years

3 Construction of the high-speed turbo roll-up door

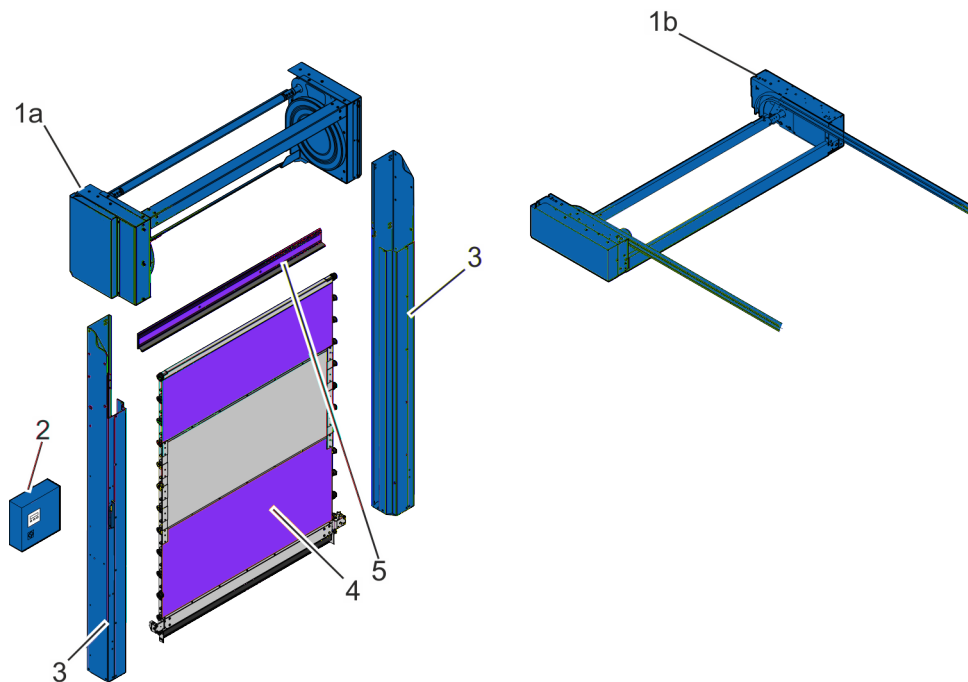


Fig. 7: Assemblies

1	Round spiral case (item 1a) or low spiral case (item 1b) with main support, spiral guide, motor, drive shaft, bearing, reinforcement profiles, cover (optional)	<ul style="list-style-type: none"> ↪ ‘Overview of the drives’ on page 24 ↪ ‘Spiral case versions’ starting on page 14
2	Control unit	↪ ‘Overview of the controls’, starting on page 24
3	Side frames with vertical door leaf guide, tooth belt for door leaf, weight counterbalance and door light grid	<ul style="list-style-type: none"> ↪ ‘Door leaf guide, side frame and optional pivoting side frame cover’ on page 18 ↪ ‘Transmission of force’ on page 15 ↪ ‘Weight counterbalance’ on page 16 ↪ ‘Door light grid’ starting on page 27
4	Door leaf	↪ ‘Door leaf’ on page 19
	Laths	↪ ‘Laths’ starting on page 20
	Safety edge	↪ ‘Safety edge and safety light barrier’ starting on page 27
5	Horizontal seal	↪ ‘Seal’ on page 23

Spiral case

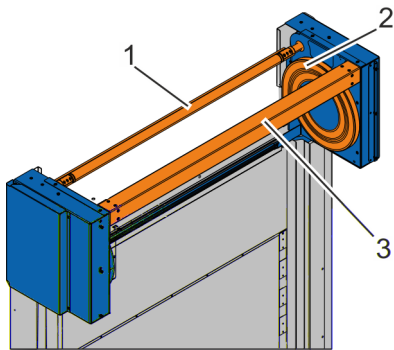


Fig. 8: Round spiral case

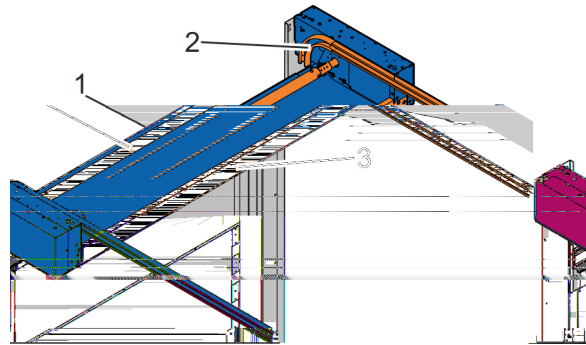


Fig. 9: Low spiral case

The spiral case is available in "round" and "low" versions.

The spiral case comprises:

- Synchronous shaft with bearing (item 1)
- Bevelled main supports with spiral guide on both sides (item 2)
- Sheet metal reinforcement profiles (item 3)

Construction of the high-speed turbo roll-up door

Spiral case cover (optional)

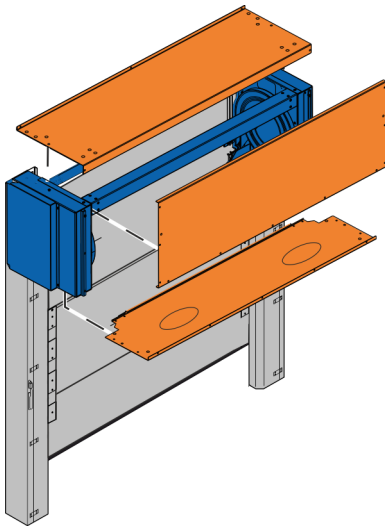


Fig. 10: Round spiral case cover

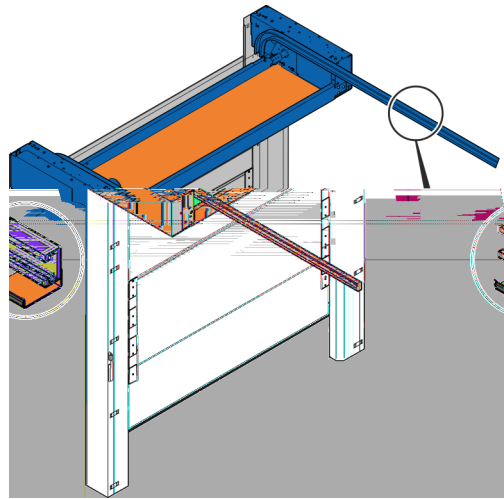


Fig. 11: Low lintel spiral case cover



The sheet metal profiles are equipped with inspection openings, which can be opened for maintenance purposes if necessary.

The cover for the low lintel design has no inspection openings.

Type 249 R and 251 R door systems have two inspection openings.

On doors with a round spiral, the spiral case can optionally be covered at the bottom, front and top. The covers may reduce the clear height.

Covers on the front and bottom are only possible in combination. The top cover is only possible if the front and bottom are also covered. On door systems with a low lintel design, the bottom cover also covers the front cover up to the maximum possible coverable area of the spiral case. A further cover is not possible on low lintel door systems.



The spiral case cover to prevent access is mandatory for door systems with a height of less than 2500 mm or 2300 mm with low lintel.

Door system type	Sheet metal profile			Hinged side frame cover
	bottom + front	top	Restriction of clear height	
249 R	available	available	35 mm	available
251 R	available	available	45 mm	available

Construction of the high-speed turbo roll-up door

Door system type	Sheet metal profile			Hinged side frame cover
	bottom + front	top	Restriction of clear height	
277 N	available	not available	none	available
256 N	available	not available	none	not available

Transmission of force

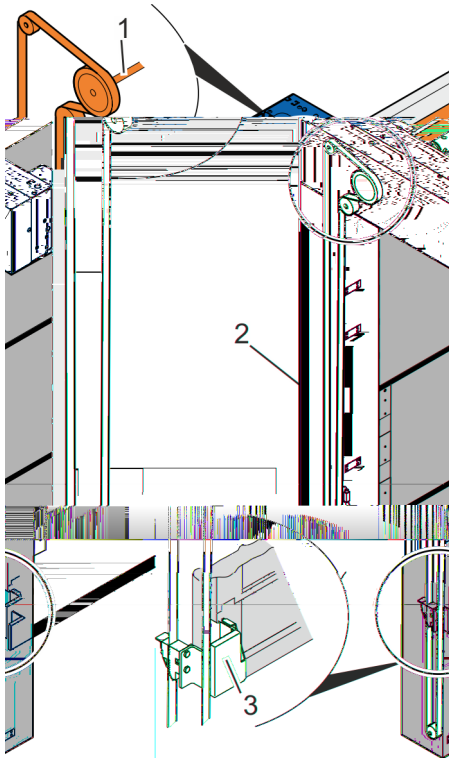


Fig. 12: Transmission of force, low lintel

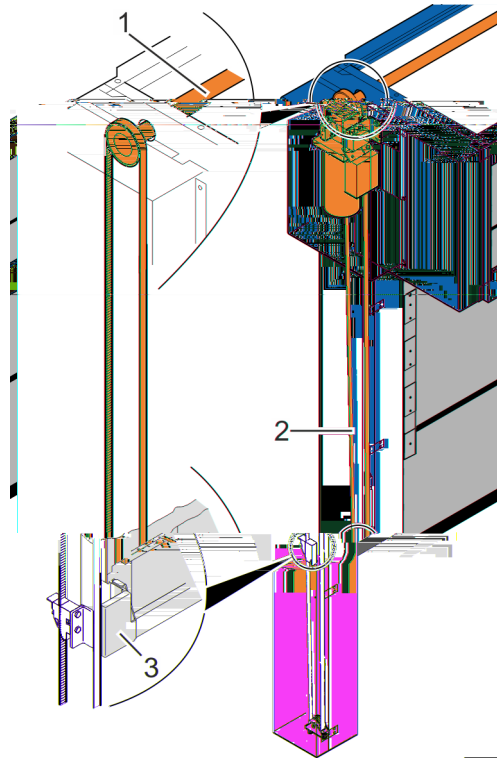


Fig. 13: Transmission of force, round spiral

The transmission of force from the drive to the door leaf is performed by the synchronous shaft (Fig. 13/1 and Fig. 12/1), the continuous toothed belt (Fig. 13/2 and Fig. 12/2) and the door leaf mounts (Fig. 13/3 and Fig. 12/3). Unlike a chain, the toothed belt runs very quietly.

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 leaf 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.

Construction of the high-speed turbo roll-up door

Weight counterbalance

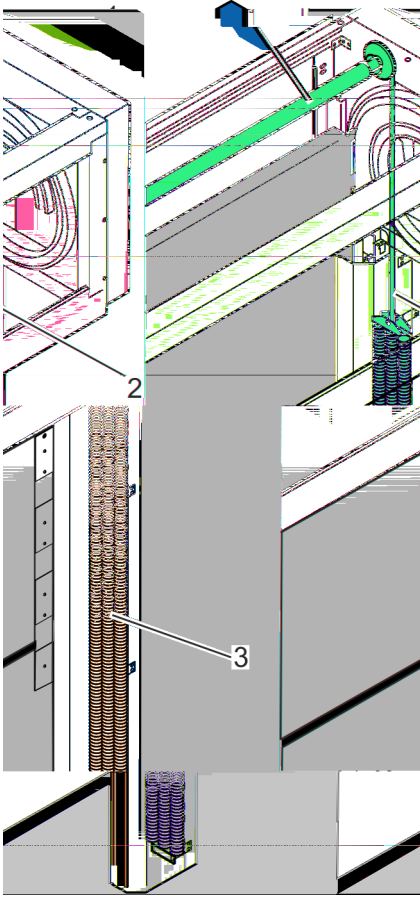


Fig. 14: Weight counterbalance

The door leaf is counterbalanced by a counter-pull mechanism: Tension springs (Fig. 14/3) are installed in the side frames (Fig. 14/2). The tension springs are connected to the synchronous shaft (Fig. 14/1) by heavy-duty belts. The tension springs are tensioned when the door system is closed and relaxed when the door system is open.

This means that the door system can also be opened manually (without electrical power) in case of emergencies. In normal mode the motor is assisted by the force of the tension springs.

The spring tension is calculated in accordance with the order.

Construction of the high-speed turbo roll-up door

Manual release lever



Fig. 15: Manual release lever fitted on the side frame (left) and on a separate console (right)

The manual release lever is situated on the side frame. Pulling on the lever releases the motor brake, allowing the door to lift by means of the spring counterbalance. The door can be opened fully by pushing the door leaf upwards manually (with the lever still deployed). The control system will remain at EMERGENCY STOP status while the manual release lever remains deployed. Please note - a lockable manual release lever and console mounted release mechanism are available as factory fitted options.

Construction of the high-speed turbo roll-up door

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

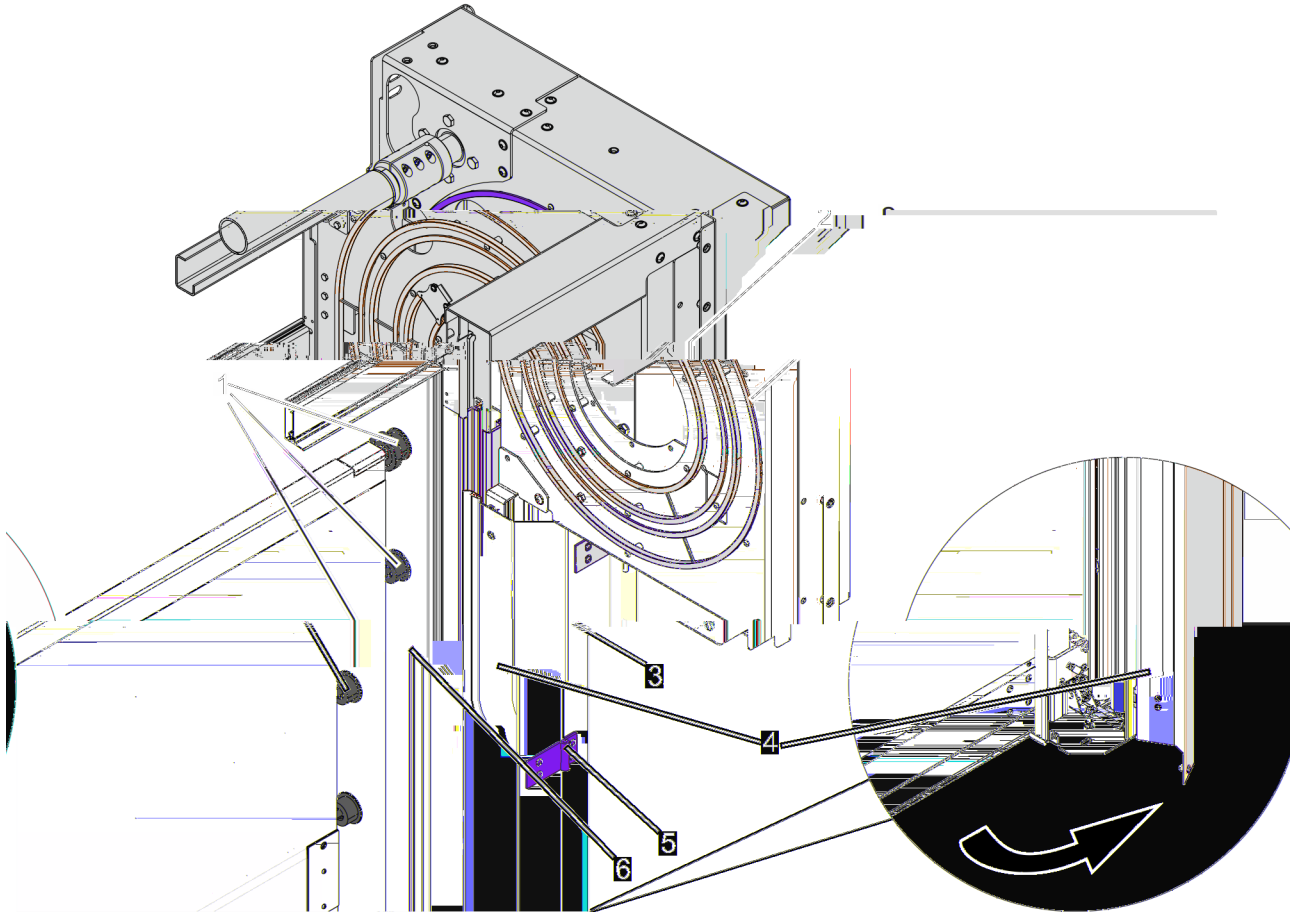


Fig. 16: Door leaf guide

The door leaf comprises laths which are connected by a hinge chain. Rollers (Fig. 16/1) are attached to the hinge chain. When the door system is opened and closed, the rollers are directed through the vertical (Fig. 16/6) and spiral-shaped (Fig. 16/2) 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. 16/6) are made of sheet metal and aluminium profiles and are situated within the side frames (Fig. 16/3). Each side frame is made up of one main bevelled sheet metal profile and one bevelled sheet metal cover profile (Fig. 16/4). The sheet metal cover profiles are fastened with screws and can also be supplied in a pivoting design with hinges (Fig. 16/5).

For more information about this door-specific design option, see [Table on page 14](#).

Door leaf

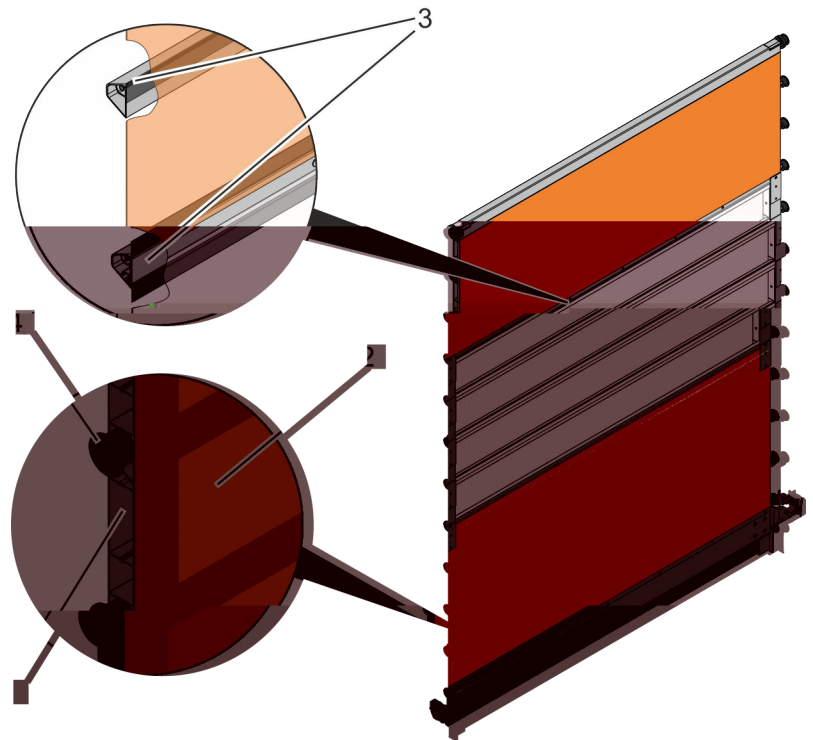


Fig. 17: Door leaf

The door leaf is assembled from extruded aluminium profiles (keder profiles), which are kept at the correct spacing by hinge chains (Fig. 17/1) attached at the sides.

0.6 mm thick PVC-coated polyester fabric (PES fabric) (Fig. 17/2) is installed between the keder profiles as the filling.

Keder (Fig. 17/3) are welded to the PES fabric, thereby connecting the PES fabric and the keder profiles/laths.

These keder are mounted to fit snugly in the keder profiles and are therefore also taut and as wrinkle-free as possible.

This ensures the stability of the door leaf. The spacing created by the hinge chains prevents contact between the keder profiles/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. 17/4) keep the door leaf firmly in the guides in the horizontal direction.

This homogeneous door leaf construction ensures extremely good running performance, high running speed and good wind stability. The thickness of the door leaf varies according to the door system type.

Door leaf thicknesses

Door system type	Door leaf thickness
249 R	40 mm
277 N	40 mm

Construction of the high-speed turbo roll-up door

Door system type	Door leaf thickness
251 R	60 mm
256 N	60 mm

Door leaf versions

0.6 mm thick curtain made of PVC-coated polyester fabric (PES fabric), smooth on both sides

- blue, similar to RAL 5002
- red, similar to RAL 3002
- yellow, similar to RAL 1021
- light grey, similar to RAL 7035
- Soft PVC viewing area, transparent
 - min. 675 mm high
 - max. 1800 mm high

Overview of the laths

In this product description the term "lath" is used to refer to two keder profiles (single or double) which are screwed into the hinge chain and filled with PES fabric. This "lath" height is 225 mm, but it cannot be regarded as a single component.

The PES fabric with the welded-on keder in combination with the single or double keder profiles is called a segment. There are segment heights of 3 to 4 laths (675 mm or 900 mm) in the viewing area and 3 to 9 laths (675 mm to 2025 mm) in the PES fabric area. Segments with 225 mm or 450 mm are not provided. This means that the viewing area can only vary between 675 mm and 1800 mm with increments of 225 mm in each case.

Double keder profiles are used for the transition from one segment to the next.

Keder, which are inserted into the keder profiles, are welded to the PES fabric.

Construction of the high-speed turbo roll-up door

Closing strip, bottom

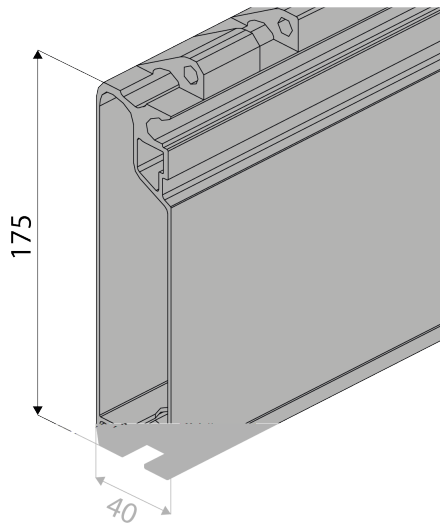


Fig. 18: Bottom closing strip (249 R; 277 N)

The bottom closing strip comprises a double-walled anodised aluminium profile.

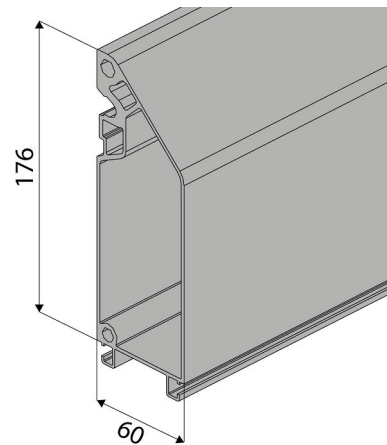


Fig. 19: Bottom closing strip (251 R; 256 N)

	249 R; 277 N	251 R; 256 N
Dimensions of the lath	40 × 175 mm	60 × 176 mm
Finish	E6/EV1 (natural anodised)	

Single keder profile

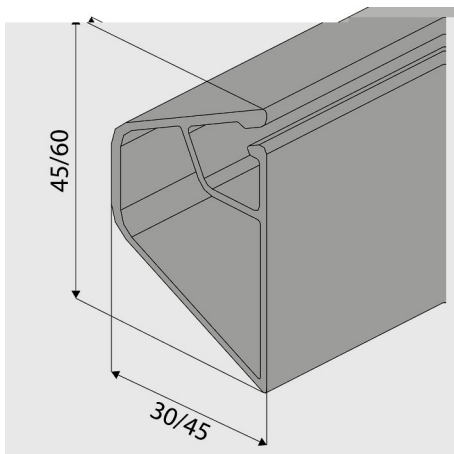


Fig. 20: Single keder profile

	249 R; 277 N	251 R; 256 N
Dimensions of the keder	30 × 45 mm	45 × 60 mm
Finish	E6/EV1 (natural anodised)	

Construction of the high-speed turbo roll-up door

Double keder profile

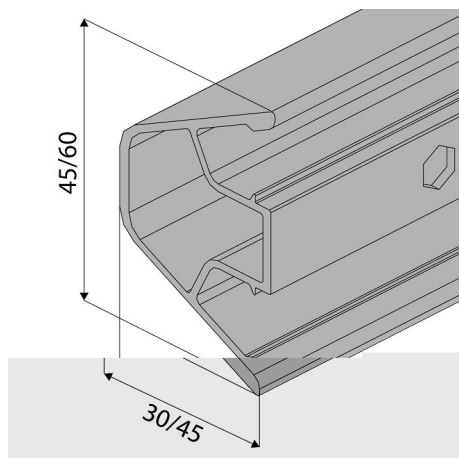


Fig. 21: Double keder profile

	249 R; 277 N	251 R; 256 N
Dimensions of the keder	30 × 45 mm	45 × 60 mm
Finish	E6/EV1 (natural anodised)	

Seal

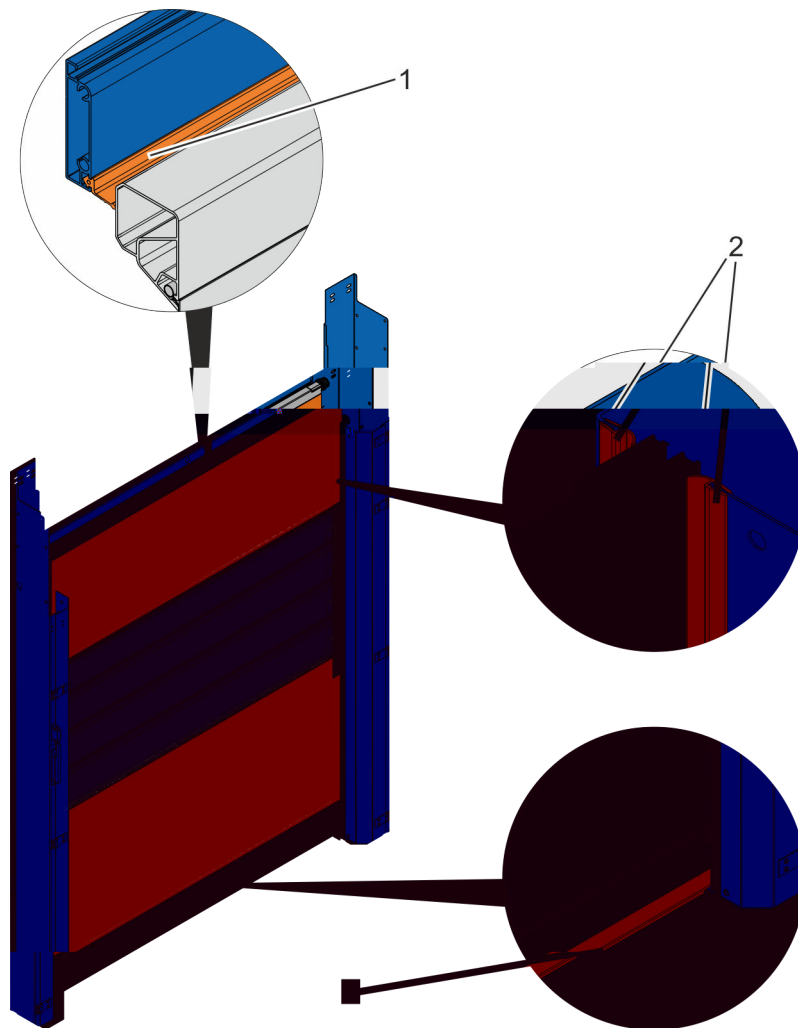


Fig. 22: Seal

A sealing profile, mounted on the lintel, seals off the top of the door system. If the door system is closed, the rubber lip seals against the laths (Fig. 22/1).

Low-wear plastic door leaf seals (Fig. 22/2) provide the vertical sealing effect. For door systems of the 277 N and 256 N types, the length of the horizontal rubber profile (Fig. 22/3) is $B - 15$ mm for structural reasons. For all other door system types of this product description, the rubber profile protrudes as far as the side frame on the left and on the right.

A rubber profile (Fig. 22/3) is used on the closing strip for horizontal sealing to the floor.

Construction of the high-speed turbo roll-up door

Overview of the drives

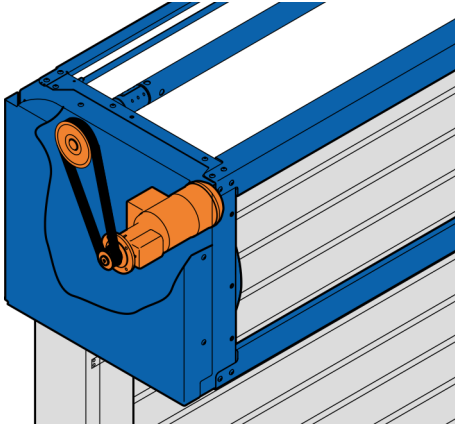


Fig. 23: Drive

249 R 251 R 277 N 256 N	
Drive type	Integrated into the spiral to save space; transmission of force via toothed belt (Spur gear, asynchronous AC motor)
Power classes	0.75 kW – 1.5 kW
Protection type	IP54
Position detection	Absolute encoder. Thus no reference run is required.
	Door system type 249 R; 251 R: Incremental encoder for an opening speed of 1.6 m/s

Controls

Door system type	EFA-TRONIC®	EFA-TRONIC® Professional	Standard installation position
249 R	●	○	On the side, next to the side frame
251 R	●	○	
277 N	●	○	
256 N	●	○	

● Standard

○ Optional

Construction of the high-speed turbo roll-up door

EFA-TRONIC® control

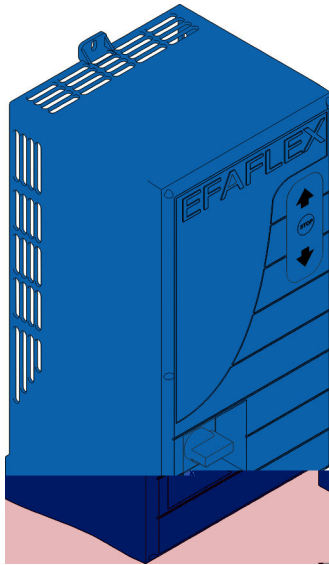


Fig. 24: EFA-TRONIC® control

Control	EFA-TRONIC® with frequency converter
Size (W × H × D)	210 × 400 (565)* × 200 mm (* incl. cable cover)
Housing	Polycarbonate housing
Protection type	IP65
Sight glass for display screen	Display of status messages and fault messages
Operating controls	Operating panel for operation and parametrisation 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 user (K characteristic)
With residual-current circuit breaker (RCCD) as necessary	300 mA as per DIN VDE 0100-530 (sensitive to universal current)

Construction of the high-speed turbo roll-up door

EFA-TRONIC® Professional

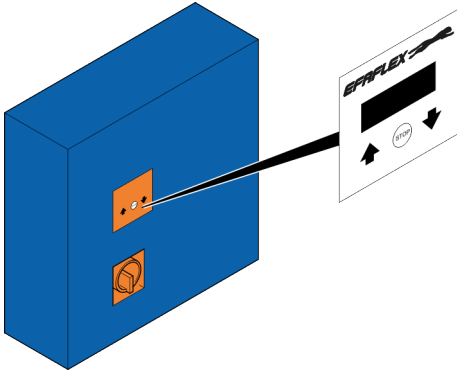


Fig. 25: EFA-TRONIC® Professional

Control unit	EFA-TRONIC® Professional with frequency converter
Size (W × H × D)	380 × 380 × 210 mm
Housing	Steel, V2A optional Colour: RAL 7035
Protection type	IP54
Viewing window for display screen	Display of status messages and fault messages
Operating controls	Operating panel for operation and parametrisation 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 on-site (K characteristic)
With residual current device (RCCD) as necessary	300 mA in accordance with DIN VDE 0100-530 (sensitive to universal current)

EFA-HDI operating unit

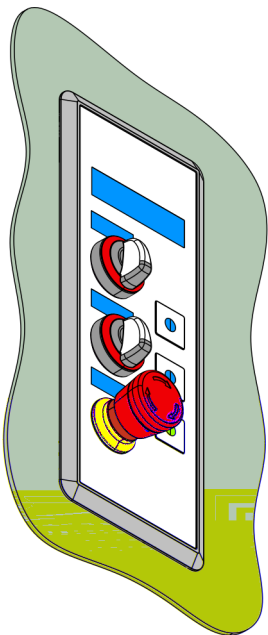


Fig. 26: EFA-HDI operating unit

As an enhancement of the EFA-TRONIC® Professional, an option to mount an additional operating unit on the wall is available. It is equipped with a display screen and offers full access to all parameters and all basic functions.

4 Door safety

Available door safety

Door system type	Safety edge and safety light barrier(s)	Door light grid
249 R	•	○
277 N	•	○

Door system type	Door system width	Safety edge and safety light barrier(s)	Door light grid
251 R	≤ 5000 mm	•	○
256 N	≤ 5000 mm	•	○

Door system type	Door system width	Safety edge and safety light barrier(s)	Door light grid
251 R	> 5000 mm	○	•
256 N			

- Standard
- Optional

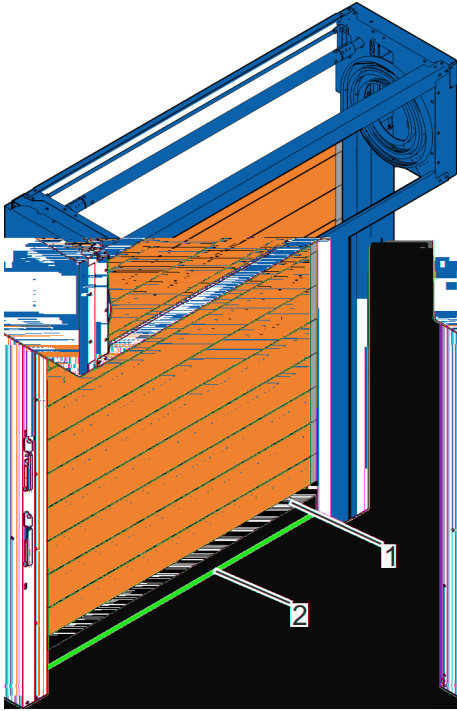


Simultaneous installation of a door light grid and safety light barrier(s) is not possible.

The main closing edge is secured by a combination of a safety edge and safety light barrier(s) (C device plus D device). This achieves the minimum protection level as per DIN EN 12453.

In addition, the owner and the manufacturer have to consult with each other in order to provide a safeguard for the approach area. This will be based on the owner's risk assessment.

Safety edge and safety light barrier



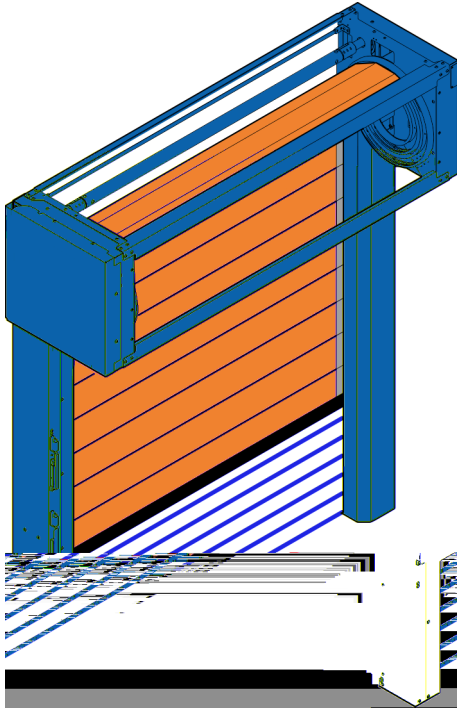
1	Safeguard for the closing edge	Safety edge
2	Safety light barrier (optional)	Unidirectional light barriers (IP67) max. 2

If the door system's safety edge comes into contact with an obstruction during the closing procedure, the door leaf stops, the door system opens completely and closes automatically again once the "keep-open" time has elapsed.

The safety light barriers, which are installed in the side frames at the sides, are positioned at the door closing level. The height of the safety light barriers is variable.

Fig. 27: Safety edge and safety light barrier

Door light grid



The door light grid, 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 in the danger area.

Fig. 28: Door light grid

5 Equipment

Possible equipment¹

- Galvanised basic door construction, 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 compliance 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
- EFA-TRONIC control®
- EFA-TRONIC® Professional control unit
- Emergency operation device on side frame, not lockable
- Door light grid
- Up to 2 safety light barriers
- Command devices : Push-buttons, pull switches, key switches etc.
- Command devices/safety: Radar detector, EFA-SCAN®, IR (infrared presence sensor)
- Spiral case covers
- Hinged side frame cover
- Frame extension on both sides

¹ depends on configuration

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

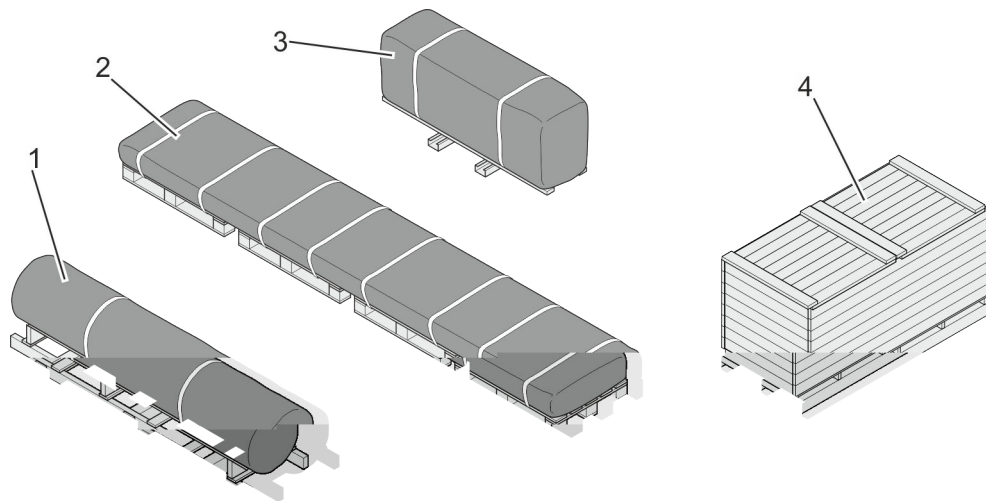


Fig. 29: Scope of delivery (left, standard transport unit), wooden crate (right, optionally for sea and fit-for-purpose* transport)



**Fit-for-purpose packaging is packaging which 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: Door leaf package ("low lintel" version only)

Transport unit 2: Side frame sections with covers, control, accessories

Transport unit 3: Spiral case with door leaf, drive

Transport unit 4: Wooden crate (optional)

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.

The wood for the wooden crates optionally complies with the IPPC standard. For sea freight, the wooden crates are lined with film to protect them from moisture.

Packaging units

Packages which are fastened to pallets can be transported by fork lift under the following conditions:

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

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