swibox
part of FARADEA

IOP-Enclosures

EN

Fire protection in tunnels

Safety and fire protection are top priorities in the planning and construction of tunnels. In the event of a fire, escape routes are long and must always be kept safe and smoke-free to protect life and limb. Particular attention is paid to the safety of electrical systems.

These are exposed to particular challenges in the harsh conditions underground.

These include high humidity and dust. But large alternating pressure effects, especially in railway tunnels, must also be taken into account.

The function of the electrical systems is the basis for the functioning of the tunnel operation - in normal cases but also in exceptional situations.

Gypsum in fire protection - the current situation

To this day, fire protection barriers for tunnelling are built using gypsum. For this purpose, fire protection barriers made of plasterboard are completely clad with stainless steel. This sandwich construction method makes it possible to fulfil the requirements for fire load insulation and functional integrity. This is because even if temperatures of up to 1,100 °C occur inside the enclosure during an electrical system fire, such an enclosure may only reach a temperature of 160 °C on the outside. And even in the reverse case of a fire on the outside of the enclosure, the air temperature inside should not exceed 100 °C.

Gypsum fibre fire protection board

- Non-combustible A1
- Easy to process
- Surface finishing with wood or plastic coatings
- Very suitable for drywall construction
- High proportion of crystalline bound water
- Hygroscopic (attracts water)
- Bulk density > 1500 kg/m³
- Heat resistant up to 650 °C
- High load-bearing capacity due to cellulose fibres
- Must be fully clad with stainless steel 1.4404 / 1.4571 when used in tunnels

Gypsum boards

Gypsum is a very soft material that is easy to work with. At the same time, this material contains a relatively high proportion of bound water of crystallisation. This is released as H_2O at temperatures above 163°C. The result is the slow dissolution of the already soft gypsum structure. Another aspect restricts the use of gypsum in tunnelling: Gypsum is hygroscopic. Water is therefore absorbed from the surrounding air. The consequence of this is the formation of mould.

Fire protection without gypsum - IOP-Enclosure

swibox has specialised in the design and construction of cabinets and enclosures for tunnel construction for many years.
In collaboration with the BFH (Bern University of Applied Sciences) and selected project partners, the Swiss company has looked for an alternative to the widespread use of gypsum and is now presenting a comprehensive range of innovative fire protection cabinets in the form of IOP cabinets. The IOP-Enclosures are based on cement-bonded fire protection boards that are also reinforced with glass fibre.

Just like gypsum board, these fulfil all fire protection requirements. However, they are much more stable and resistant to moisture and its consequences. These fibreboards are extremely stable, but also much more difficult to process. The challenge was therefore to optimise the processing of the material. The result is a product series within which customised, tailor-made sizes in different variations are possible.

Cement-bonded fire protection boards (Aestuver®)

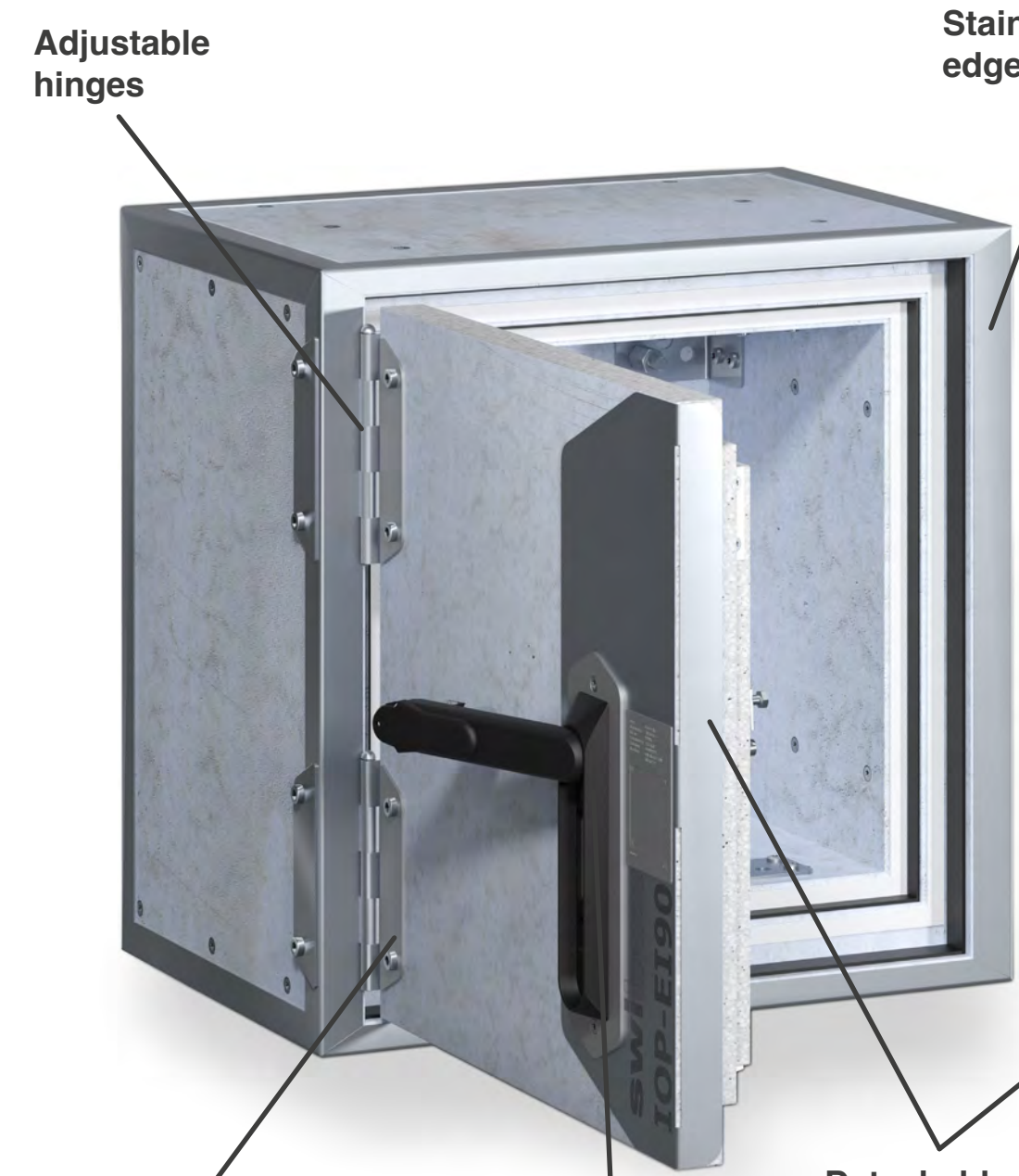
- Non-combustible A1
- Fire protection boards are frost, water and weather resistant
- Can be cleaned with a high-pressure cleaner
- High abrasion resistance
- Glass fibre reinforced lightweight concrete panels
- Bulk density > 965 kg/m³
- Good insulating properties thanks to integrated glass beads
- Easy to produce customised sizes
- Fulfils the requirements for tunnel construction

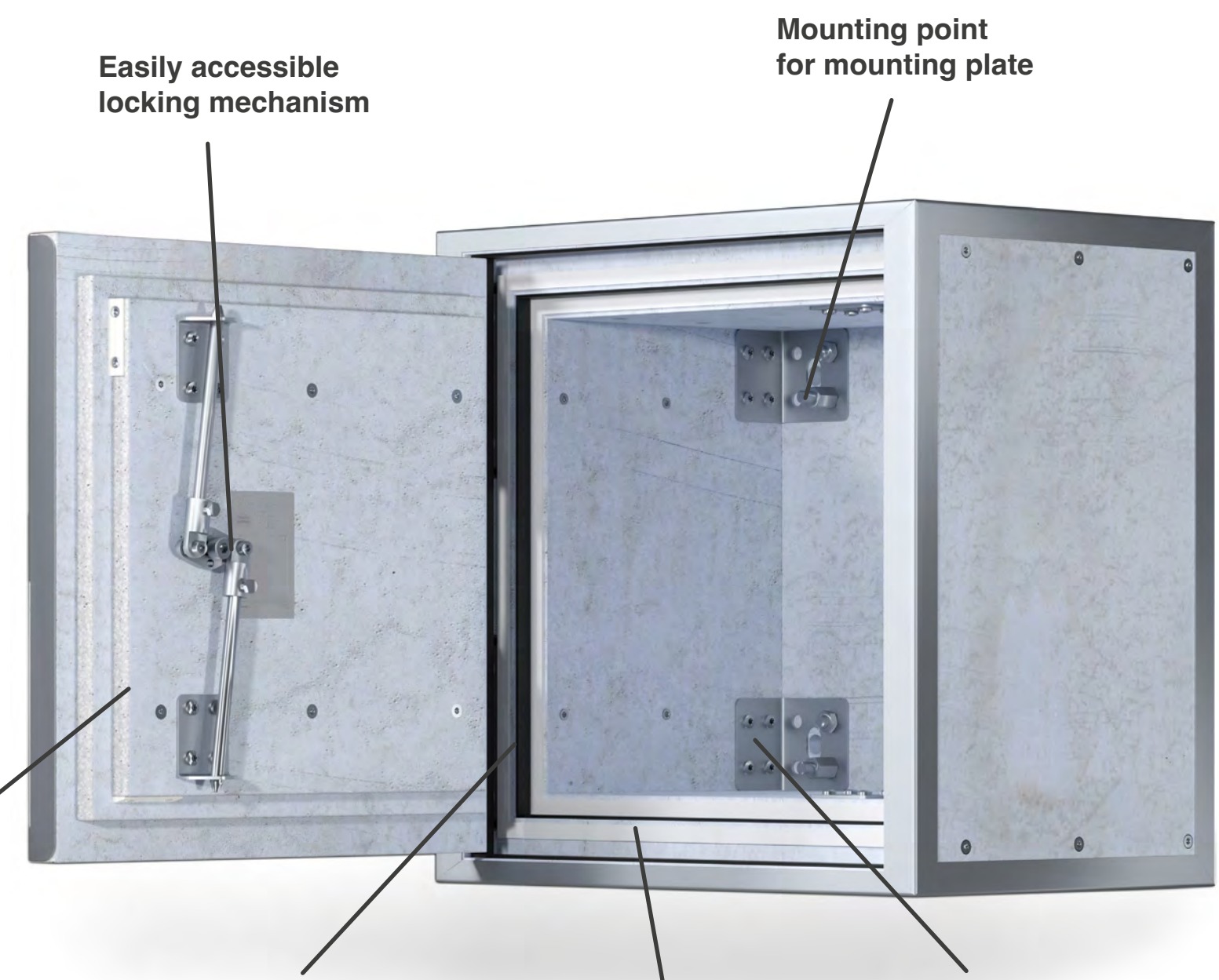
As the full stainless steel cladding is no longer required, IOP enclosures are considerably cheaper. This is a compelling argument, especially in times of ever-increasing cost pressure - even in tunnelling.

Aestuver® panels are weather, frost and water resistant. They have been used for years in tunnelling and outdoor projects. These glass fibre-reinforced and cement-bonded lightweight concrete panels are ideal as fire protection panels, especially when climatic environmental conditions are challenging. Aestuver® fire protection boards are characterised above all by their stability. This is why **swibox** can dispense with cost-intensive stainless steel cladding for the IOP-Enclosures.

Aestuver® fire-protection board

IOP-Enclosures in detail





Technical data
IOP-Enclosure

IOP-EI90 wall housing

Maximum dimension

Inside	H 1200 x W 600 x D 400 mm
Outside	H 1310 x W 710 x D 470 mm

Minimum dimension

Inside	H 300 x W 300 x D 200 mm
Outside	H 410 x W 410 x D 270 mm

Housing

Protection type:	bis IP54
Protection class:	I
Impact resistance:	IK10
Ambient temperature:	-25 °C +40 °C
Colour code:	Concrete look
Housing:	Halogen-free Non-flammable A1

Edge protection: Optionally made of stainless steel (1.4404; 1.4301) or according to customer requirements
Connecting elements made of stainless steel
Fittings made of stainless steel 1.4404

Fastening

Pre-drilled fixing bracket Ø 13 mm
M8 threaded bolt to hold the mounting plate, concrete screws

Door

180° Opening angle Flush-fitting and fitted with all-round fire protection seal
Silicone seal prevents water and dust ingress
Hinges are adjustable

Locking

Two and three-point rod lock
Swivelling lever handle, profile half cylinder, Euro cylinder and other inserts as accessories

Approvals and tests

Fire protection panels ETA-11/0458
Tested in accordance with EN 62208
Empty housing standard Tested in accordance with EN 1363-1 Fire resistance up to EI90
Cleaning test with high-pressure cleaner
Arc testing in accordance with DIN VDE 030 Part 5

- Fire protection housing for fires from outside or inside
- Fire protection panels non-combustible A1
- Surface in concrete design
- Fire protection boards are frost, water and weather resistant
- Can be cleaned with a high-pressure cleaner
- High abrasion resistance
- Glass fibre reinforced lightweight concrete panels
- Bulk density > 965 kg/m³
- Customised sizes easy to produce
- Fulfils the requirements for tunnel construction
- Enclosure system very well suited for outdoor use

IOP-EI90 floor-standing enclosure

- Wall construction with cavity for air conditioning
- Interlocking with 2- and 3-point locking system
- Swivelling lever in plastic or stainless steel design
- Lockable through the use of 40 mm PHZ with 45° or 90° locking bar position (in accordance with DIN 18252)
- Locking system IP54
- All-round fire protection and silicone seal
- Halogen-free housing system
- Mounting bracket with mounting bolts for mounting plates

Maximum dimensions

Inside	H 2000 x W 600 x D 800 mm
Outside	H 2130 x W 730 x D 870 mm

Minimum dimension

Innen	H 1400 x W 250 x D 200 mm
Outside	H 1530 x W 380 x D 270 mm

Plinth

Height 100 mm, can be driven under

Housing

Protection type:	bis IP54
Protection class:	I
Impact resistance:	IK10
Ambient temperature:	-25 °C +40 °C
Colour code:	Concrete look
Housing:	Halogen-free Non-flammable A1

Edge protection: Optionally made of stainless steel (1.4404; 1.4301) or according to customer requirements
Connecting elements made of stainless steel
Adjustable plinth base

Fastening

Pre-drilled fixing bracket Ø 13 mm
M8 threaded bolt to hold the mounting plate, concrete screws

Door

180° Opening angle Flush-fitting and fitted with all-round fire protection seal
Silicone seal prevents water and dust ingress
Hinges are adjustable

Locking

Three-point rod lock
Swivelling lever handle, profile half cylinder, Euro cylinder and other inserts as accessories

Approvals and tests

Fire protection panels ETA-11/0458
Tested in accordance with EN 62208
Empty housing standard Tested in accordance with EN 1363-1 Fire resistance up to EI90
Cleaning test with high-pressure cleaner
Arc testing in accordance with DIN VDE 030 Part 5

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