A-ISOPRO®

Thermal insulation units 80mm
EN 1992-1-1

Sealing ▪ Thermal insulation ▪ Formwork ▪ Sound insulation ▪ Reinforcement ▪ Connection ▪ Accessories

Forward constructing.

OUR MISSION:
FORWARD CONSTRUCTING.

It is our mission not only to provide the very latest building technology, but to also be one crucial step ahead of the game at all times. That is why we are constantly and ertaking pioneering work in all product areas. Our employees consistently put their extensive practical experience and creativity to use in the interests of our customers. In constant dialogue with our target groups on a partnership basis, we are already developing the products today that will be needed tomorrow. Our momentum continues to set new benchmarks in structural engineering – yesterday, today and tomorrow, too. This is what we mean by "forward constructing".

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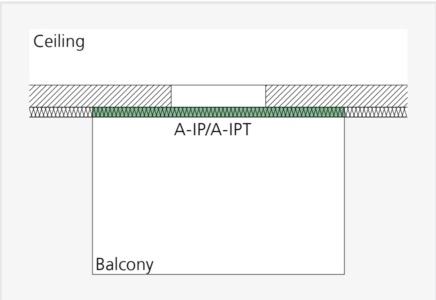
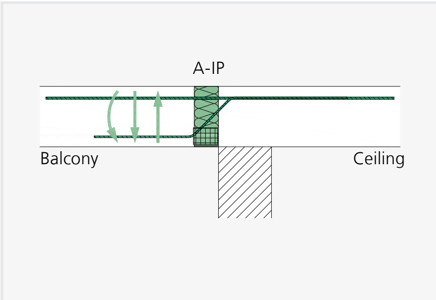
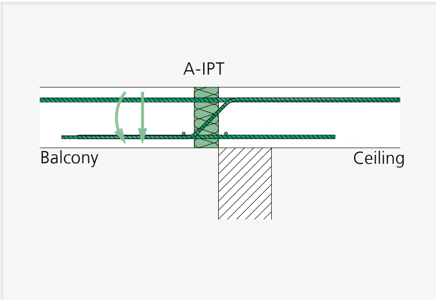
CANTILEVERED STRUCTURES





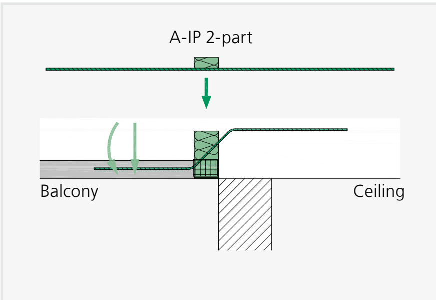
ISOPRO® A-IP

- Transfer of negative moments and positive shearing forces
- Transfer of negative shearing forces with version A-IP QX
- Version with concrete compression bearings
- P. 24



ISOPRO® A-IPT

- Transfer of negative moments and positive shearing forces
- Transfer of negative moments as well as positive and negative shearing forces with version A-IPT 120 Q12X
- Version with steel pressure rods
- P. 24

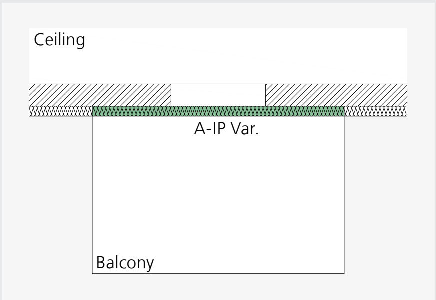


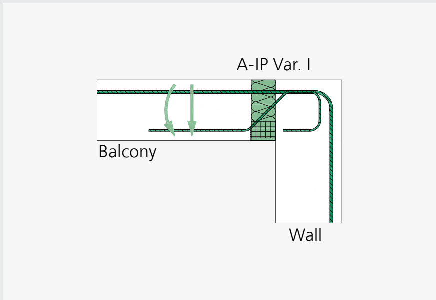
ISOPRO® A-IP 2-teilig

- Transfer of negative moments and positive shearing forces
- Version with concrete compression bearings
- Two-part version for prefab slabs
- P. 38

TYPE OVERVIEW

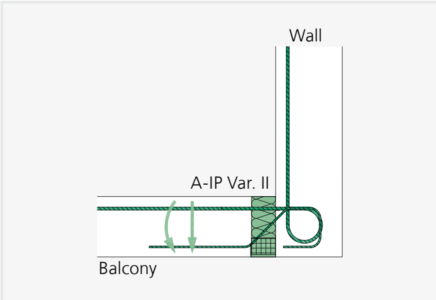
CANTILEVERED STRUCTURES AT WALL CONNECTIONS/VERTICALLY OFFSET CEILINGS





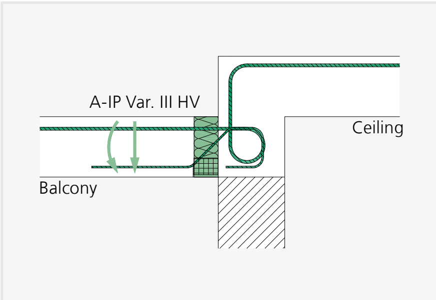
ISOPRO® A-IP VAR. I

- Transfer of negative moments and positive shearing forces
- Version with concrete compression bearings
- Connection to a wall leading downwards
- P. 42



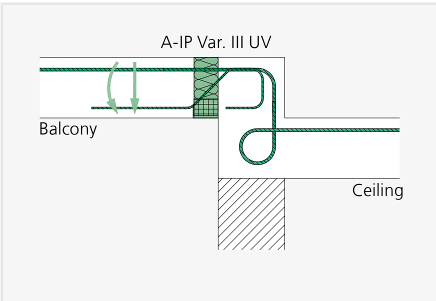
ISOPRO® A-IP VAR. II

- Transfer of negative moments and positive shearing forces
- Version with concrete compression bearings
- Connection to a wall leading upwards
- P. 42



ISOPRO® A-IP VAR. III HV

- Transfer of negative moments and positive shearing forces
- Version with concrete compression bearings
- Connection to a ceiling vertically offset downwards
- P. 42

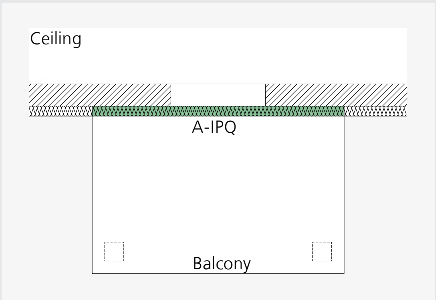


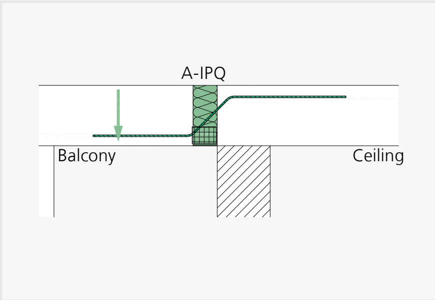
ISOPRO® A-IP VAR. III UV

- Transfer of negative moments and positive shearing forces
- Version with concrete compression bearings
- Connection to a ceiling vertically offset upwards
- P. 42

TYPE OVERVIEW

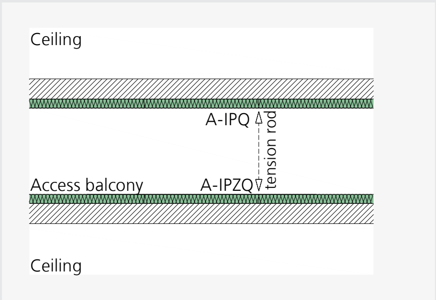
SUPPORTED STRUCTURES

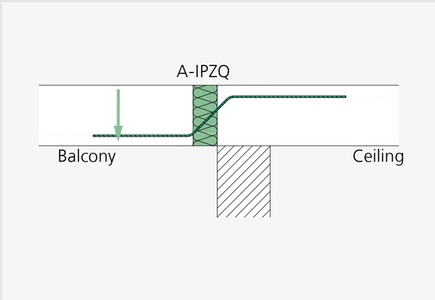




ISOPRO® A-IPQ

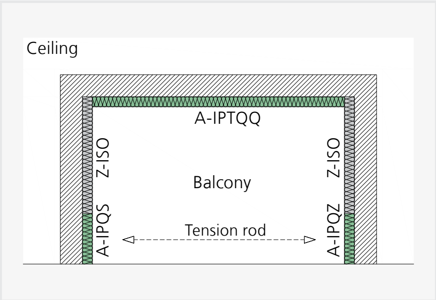
- Transfer of positive shearing forces
- Version with concrete compression bearings
- P. 50

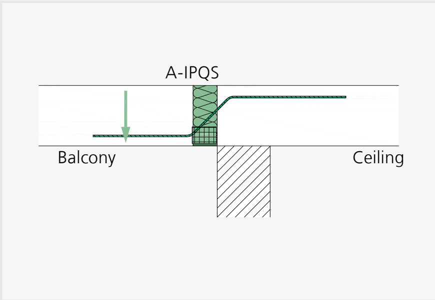




ISOPRO® A-IPZQ

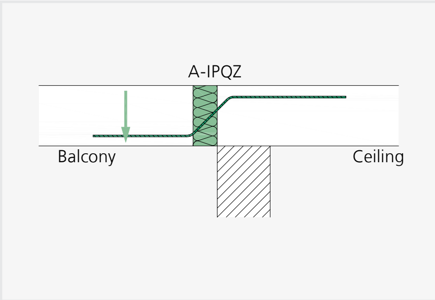
- Transfer of positive shearing forces
- Version without compression bearing for constraint-free connections
- P. 50





ISOPRO® A-IPQS

- Transfer of positive shearing forces
- Version with concrete compression bearings
- Short unit for bearing loads at specific points
- P. 50

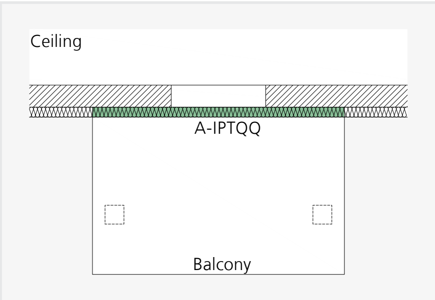


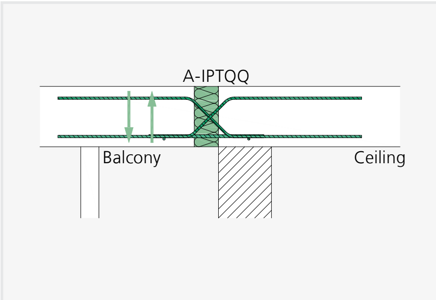
ISOPRO® A-IPQZ

- Transfer of positive shearing forces
- Version without compression bearing for constraint-free connections
- Short unit for bearing loads at specific points
- P. 50

TYPE OVERVIEW

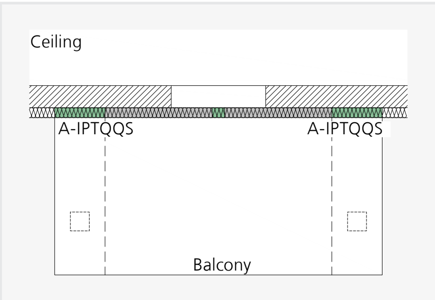
SUPPORTED STRUCTURES WITH LIFTING LOADS

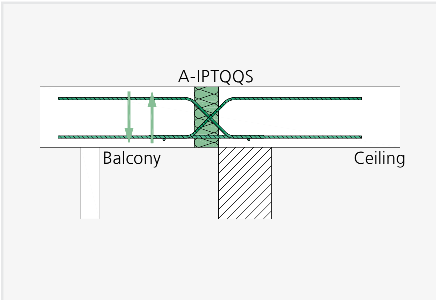




ISOPRO® A-IPTQQ

- Transfer of negative and positive shearing forces
- Version with steel pressure rods
- P. 58

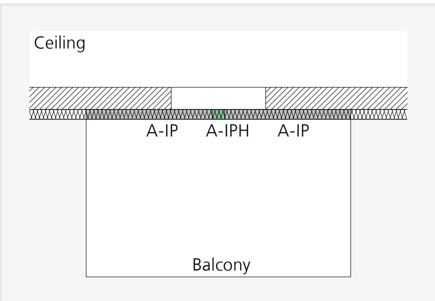


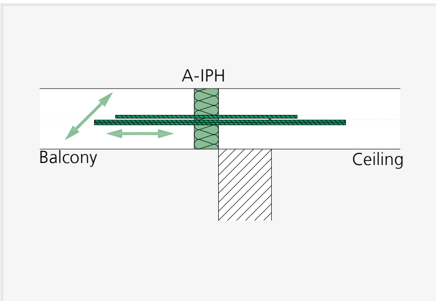


ISOPRO® A-IPTQQS

- Transfer of negative and positive shearing forces
- Version with steel pressure rods
- Short unit for bearing loads at specific points
- P. 58

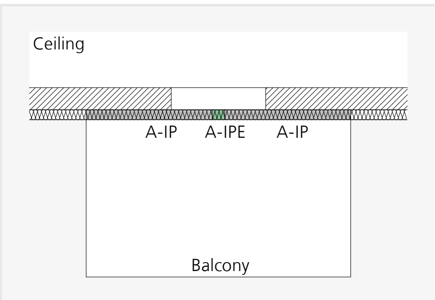
HORIZONTAL LOADS AND EARTHQUAKE LOADS

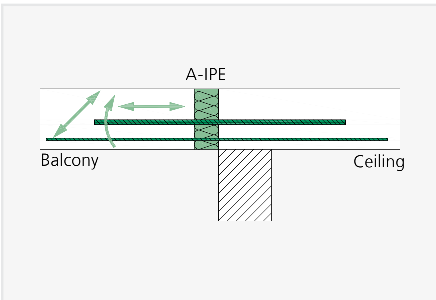




ISOPRO® A-IPH

- Transfer of horizontal loads parallel and/ or perpendicular to the insulation plane
- P. 70



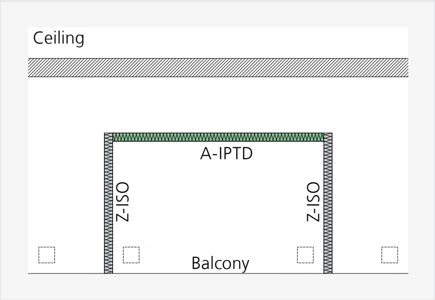


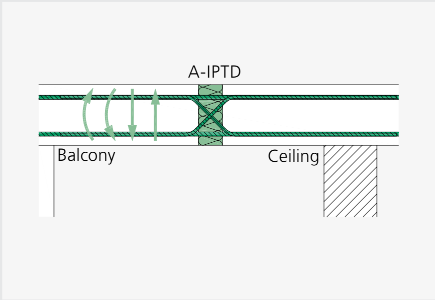
ISOPRO® A-IPE

- Transfer of horizontal loads parallel and perpendicular to the insulation plane
- In combination with the ISOPRO® units A-IP, A-IPT and A-IPTD: Transfer of positive moments
- Used for earthquake
- P. 74

TYPE OVERVIEW

CONTINUOUS SLABS

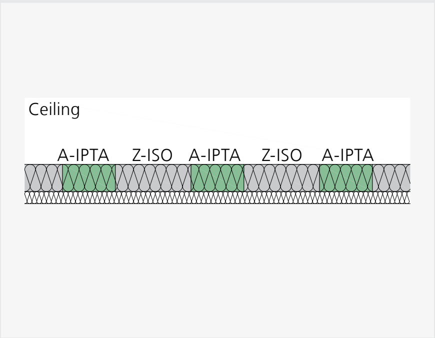


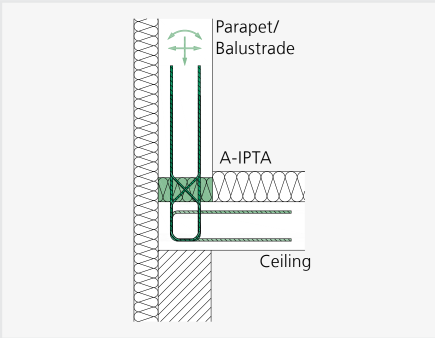


ISOPRO® A-IPTD

- Transfer of positive and negative moments and shearing forces
- Version with tension/pressure rods
- P. 64

PARAPETS AND BALUSTRADES CONNECTED TO THE HORIZONTAL FACE

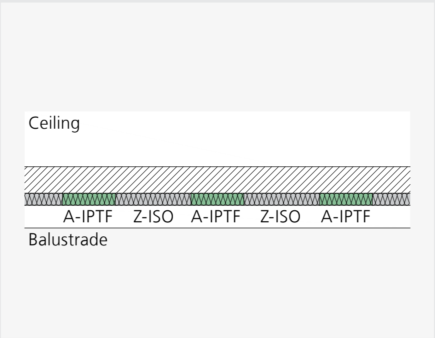


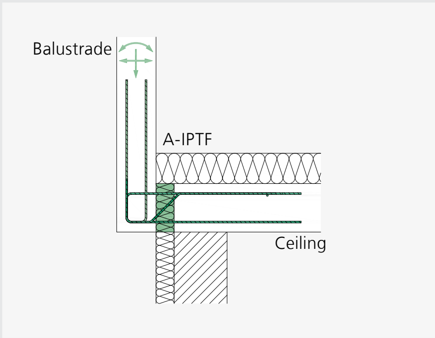


ISOPRO® A-IPTA

- Transfer of moments, normal forces and horizontal forces
- Used at specific points
- P. 78

BALUSTRADE CONNECTED TO THE VERTICAL FACE

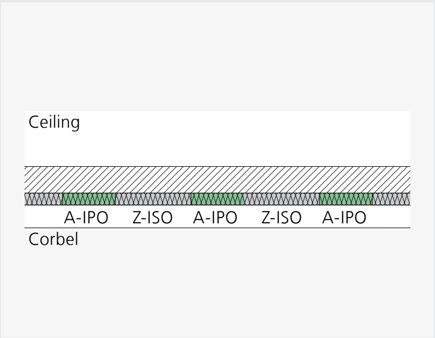


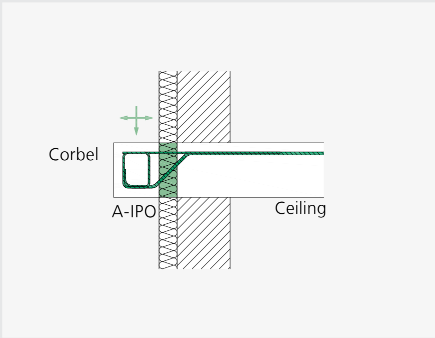


ISOPRO® A-IPTF

- Transfer of moments, shearing forces and horizontal forces
- Used at specific points
- P. 82

CORBEL





ISOPRO® A-IPO

- Transfer of shearing forces and horizontal forces
- Used at specific points
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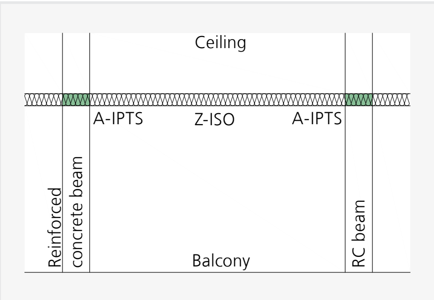
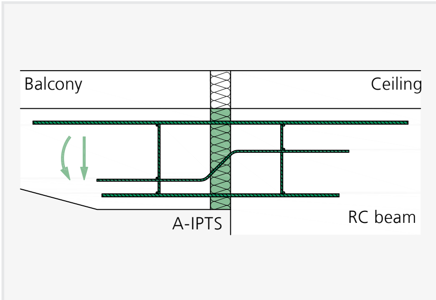
TYPE OVERVIEW

BEAMS

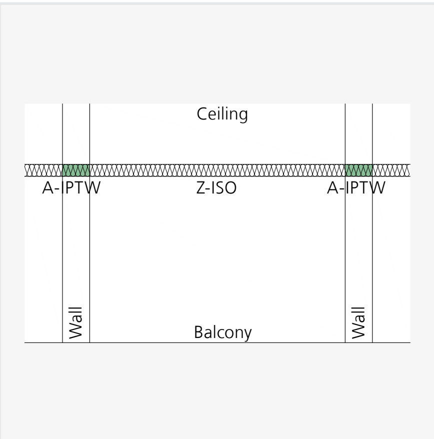


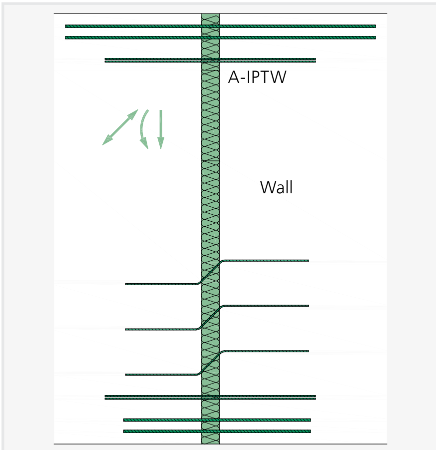


ISOPRO® A-IPTS

- Transfer of negative moments and positive shearing forces
- Version with pressure rods
- P. 90

WALLS

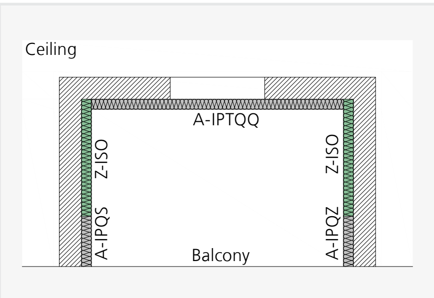


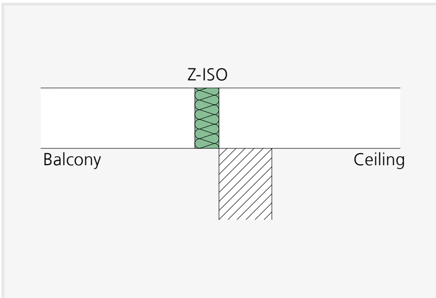


ISOPRO® A-IPTW

- Transfer of negative moments, positive shearing forces and horizontal forces
- Version with pressure rods
- P. 94

INTERMEDIATE INSULATION





ISOPRO® Z-ISO

- No structural function
- Intermediate insulation for support at specific points
- P. 100

PRODUCT INFORMATION

FUNCTION OF THE ISOPRO® UNIT

As a load-bearing thermal insulation unit, ISOPRO® undertakes the following functions:
- Thermal separation of reinforced concrete components to resolve structural problems at the transition between internal and external components
- Frictional connection of the reinforced concrete components across the insulating joint.

The load transfer across the joint is carried out by means of tension and shear rods as well as a pressure component. Depending on the ISOPRO® type, the pressure component is designed as a pressure unit made of special concrete (A-IP unit) or as a steel pressure rod (A-IPT unit). For corrosion-protection reasons, and to reduce heat transition through the structural components, stainless steel reinforcement units are implemented in the area of the insulating body. The transition from stainless steel to carbon steel is carried out using a special welding method. In the area of the insulating body the tension rods of standard units are made of stainless steel and have a reduced diameter compared to the adjoining carbon steel rods.
The ISOPRO® unit is available in different load-bearing capacities. With regard to the load-bearing capacities, the units vary in terms of the number of tension and shear rods, as well as the number of pressure components. In principle, the units are available in heights from 160 mm. However, depending on the diameter of the shear rod used, there may be restrictions in terms of the minimum height.
During installation it is crucial to note the direction of installation indicated on the label. The direction of installation is marked clearly on each unit by the indication of the top and an arrow to the balcony side (of the cold area).

MATERIALS OF THE ISOPRO® UNIT

Tension, shear, pressure rod:	Reinforcing steel B500B Stainless steel rebar according to general technical approval Material no. 1.4571, 1.4362 or 1.4482
Compression bearing:	High-performance special concrete
Insulating body:	NEOPOR®* Rigid polystyrene foam, λ = 0.031 W/mK
Fireproof panels:	Fibre-cement panels of building material class A1 Intumescent coating

TECHNICAL APPROVAL

ISOPRO®:	Usage principles according OIB "Thermal insulation units with continuous reinforcement" OIB-095.4-038/99-011 Certificate of compliance of Upper Austria Nr. Z-2.1.8-10-3634, certification authority of construction products, quality management systems and individuals in Leonding

MATERIALS OF THE ADJOINING PARTS

Concrete:	Standard concrete acc. EN 1992-1-1 with a raw density of 2000 to 2600 kg/m³
Concrete strength classes:	External components ≥ C25/30 Internal components ≥ C20/25
Reinforcing steel:	B500B, B550B, B450C

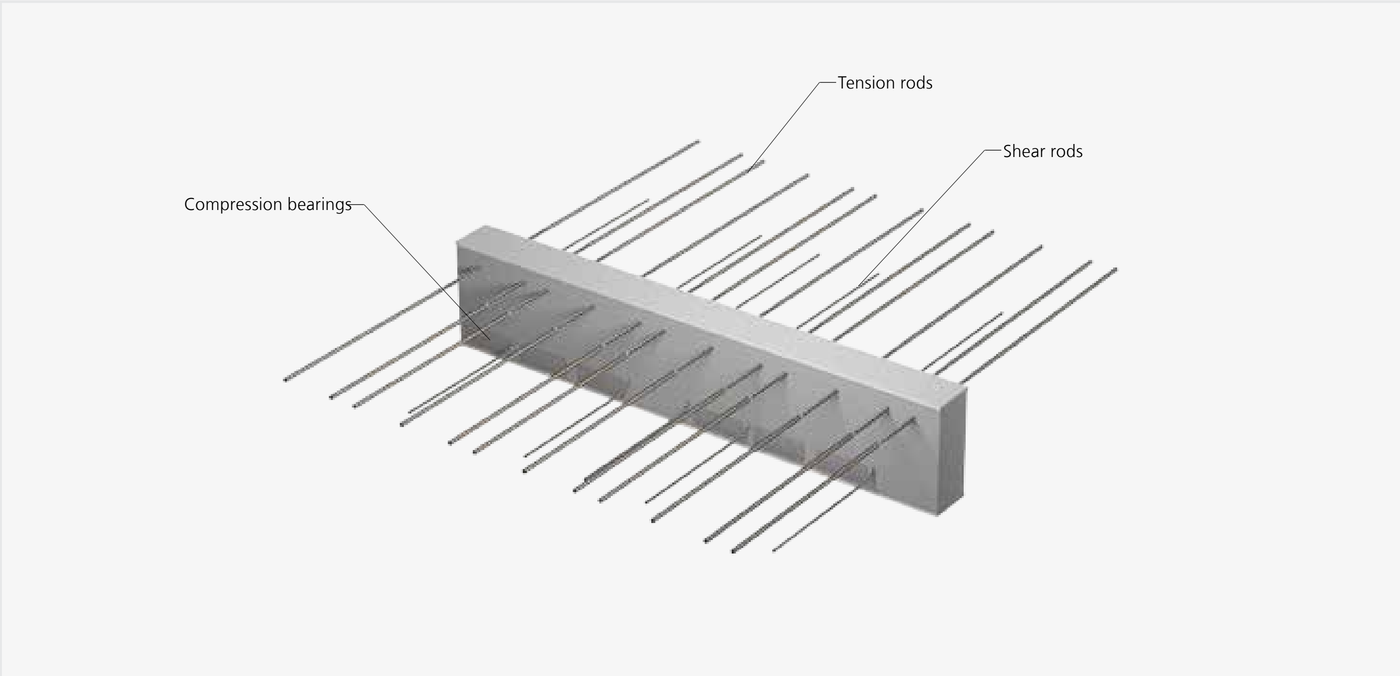
SUPPLEMENTARY REINFORCEMENT

The components adjoining the ISOPRO® units are reinforced in accordance with the structural engineer´s design based on the structurally required reinforcement. Any supplementary reinforcement mentioned in this brochure has to be added to the reinforcement specified by the designer.

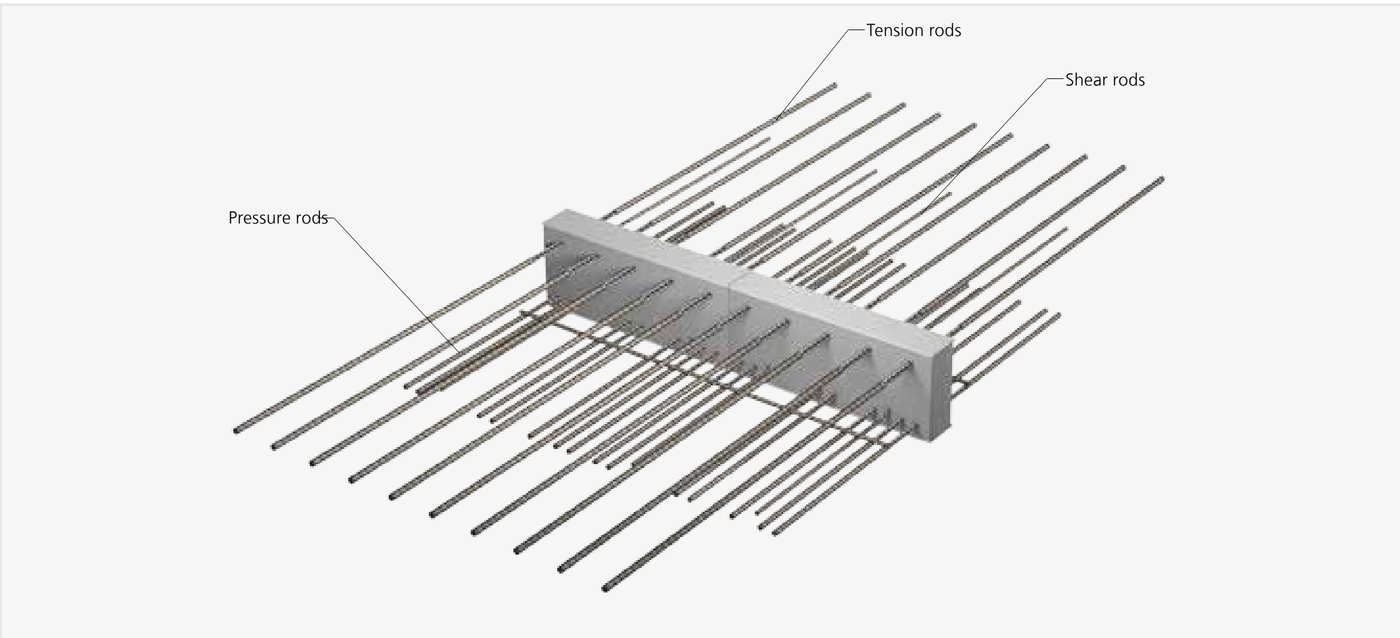
*Neopor® is a registered trademark of BASF, Ludwigshafen

PRODUCT COMPONENTS

ISOPRO® A-IP



ISOPRO® A-IPT



CONCRETE COVERING

EXPOSURE CLASS AND CONCRETE COVERING

The minimum concrete strength for the components adjoining the ISOPRO® units as well as the required concrete covering cv for the ISOPRO® units are calculated according to the exposure class and the approval. The higher minimum concrete strength class is definitive in each case.

Reinforcement corrosion		Minimum concrete strength class			Concrete covering [mm]	
EN 1992-1-1		EN 1992-1-1/NA	Approval for internal components	Approval for external components	Components c_{nom}	ISOPRO® cv
XC3	Moderate humidity, external components, wet areas	C20/25	C20/25	C25/30	35	30
XC4	Alternately wet and dry, external components directly exposed to rain	C25/30			40	35
XD1	Moderate humidity, spray zone from road surfaces	C30/37			55	50
XS1	Salty air, external components near coast	C30/37			55	50
XD1	Moderate humidity, spray zone from road surfaces	C30/37			55	50
XS1	Salty air, external components near coast	C30/37			55	50

ISOPRO® CONCRETE COVERING

- In accordance with EN 1992-1-1/NA, the cv dimension of the ISOPRO® units may be reduced by Δc_{dev} = 5 mm using suitable quality measures during production.
- For ISOPRO® types A-IP/A-IPT/two-part/A-IP Var., cv35 or cv50 can be selected for the tension rod concrete covering.
- For the shear units, the concrete covering at the top is cv35 to cv115, depending on the height.
- The concrete covering for pressure rods and shear rods at the bottom is generally cv30 (usually lower exposure compared to the top side of the balcony).
- ISOPRO® A-IPTD units have a bottom concrete covering of cv30 for the selected top concrete covering of cv35, and a bottom concrete covering of cv50 for the selected top concrete covering of cv50.

DESIGN AND INSTALLATION

NOTES ON DESIGN

- The design for the reinforced concrete components adjoining the ISOPRO® units is provided by the structural engineer.
- When there are different concrete qualities in the adjoining components (e.g. balcony C25/30; ceiling C20/25), the lower concrete quality is definitive for design the ISOPRO® units.
- The specified table values for supplementary reinforcement apply to full utilisation of the ISOPRO® units. A reduction by m_{Ed}/m_{Rd} or v_{Ed}/v_{Rd} is permissible.
- The specified minimum heights depending on the shearing force load-bearing capacity apply to concrete cover cv35. The minimum heights must be increased by 20 mm accordingly for cv50.
- To bear planned horizontal loads, the ISOPRO® A-IP and A-IPT units must be combined with ISOPRO® A-IPH and A-IPE short units.
- ISOPRO® units for cantilevered constructions without live load, but with an ordinary moment from a load not increasing the shear forces, must be proven separately by our application technology
- For reinforcement, please note ability for concrete pouring. This applies in particular to ISOPRO® units with a high number of rods.

SPECIAL UNITS

- Beyond the standard units listed in this documentation, we also offer special structures tailored to the construction project, resultant forces and component geometry. Planning, design and production of special structures is carried out in compliance with the requirements of the approvals and according to EN 1992-1-1 and EN 1992-1-1/NA.

HANDLING AND INSTALLATION ON-SITE

- When using ISOPRO® units with concrete compression bearings, please ensure that the frictional connection between the compression bearing and the concrete of the component is guaranteed. When using prefab slabs, an in-situ concrete or grouting strip at least 100 mm wide must be taken into account.
- For simultaneous use of ISOPRO® units with steel pressure rods and prefab slabs, it must be ensured that the width of the in-situ concrete strip is matched to the length of the pressure rods.
- When using ISOPRO® units with fire protection version R90/REI120, please ensure that the fireproof panels are not damaged.
- Please note that subsequent bending of the reinforcement rods on the construction site will render the approval and warranty by H-BAU Technik GmbH void.
- On-site partition of ISOPRO® metre units is possible – reduced load-bearing capacity and minimal edge distance of the ISOPRO® components must be taken into consideration.
- In highly reinforced structures (e.g. joists) it should be considered to install the ISOPRO® unit before the supplementary reinforcement.

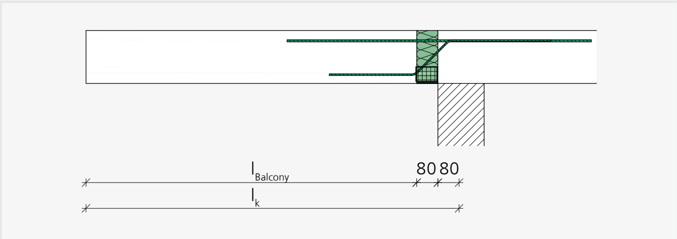
Our Applications Technology department would be pleased to assist in finding further solutions.
Phone: +49 (0) 7742 9215-300
Fax: +49 (0) 7742 9215-319
E-mail: technik@h-bau.de

DESIGN

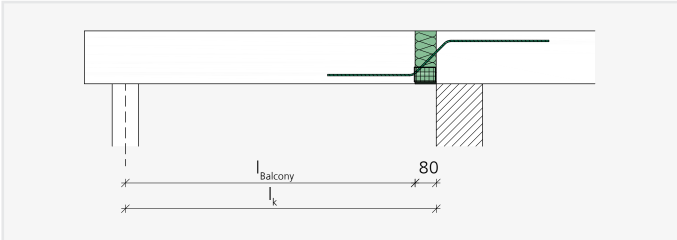
DESIGN OF ISOPRO® UNITS – FEM CALCULATION/MANUAL CALCULATION

SYSTEM CALCULATION

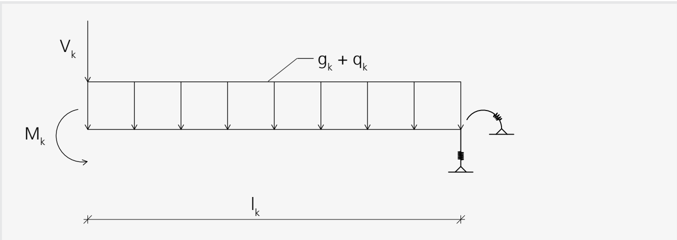
Cantilevered balcony

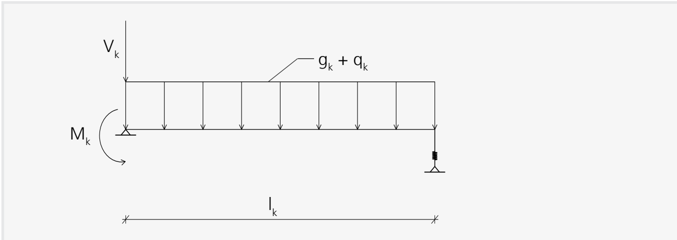


Supported balcony



Model





System

SUPPORT CONDITIONS

	Cantilevered balcony		Supported balcony
Manual calculation:	Clamped		Hinged
FEM calculation:			
Torsion spring:	10,000 kNm/rad/m	Torsion spring:	–
Vertical spring:	250,000 kN/m/m	Vertical spring:	250,000 kN/m/m

LOAD ASSUMPTIONS

g_k: Permanent loads (dead load + superimposed load)
q_k: Live load
V_k: Edge load (railings, balustrade, plinth, etc.)
M_k: Edge moment (due to horizontal load on railings, balustrade, etc.)

METHOD FOR FEM CALCULATION

- Calculate the balcony slab as a separate system from the load-bearing structure of the building
- Define supports in the connecting area with the aforementioned rigidities
- Calculate resultant forces using linear-elastic approach
- Select ISOPRO® units
- Set the calculated resultant forces as the edge load for the load-bearing structure of the building

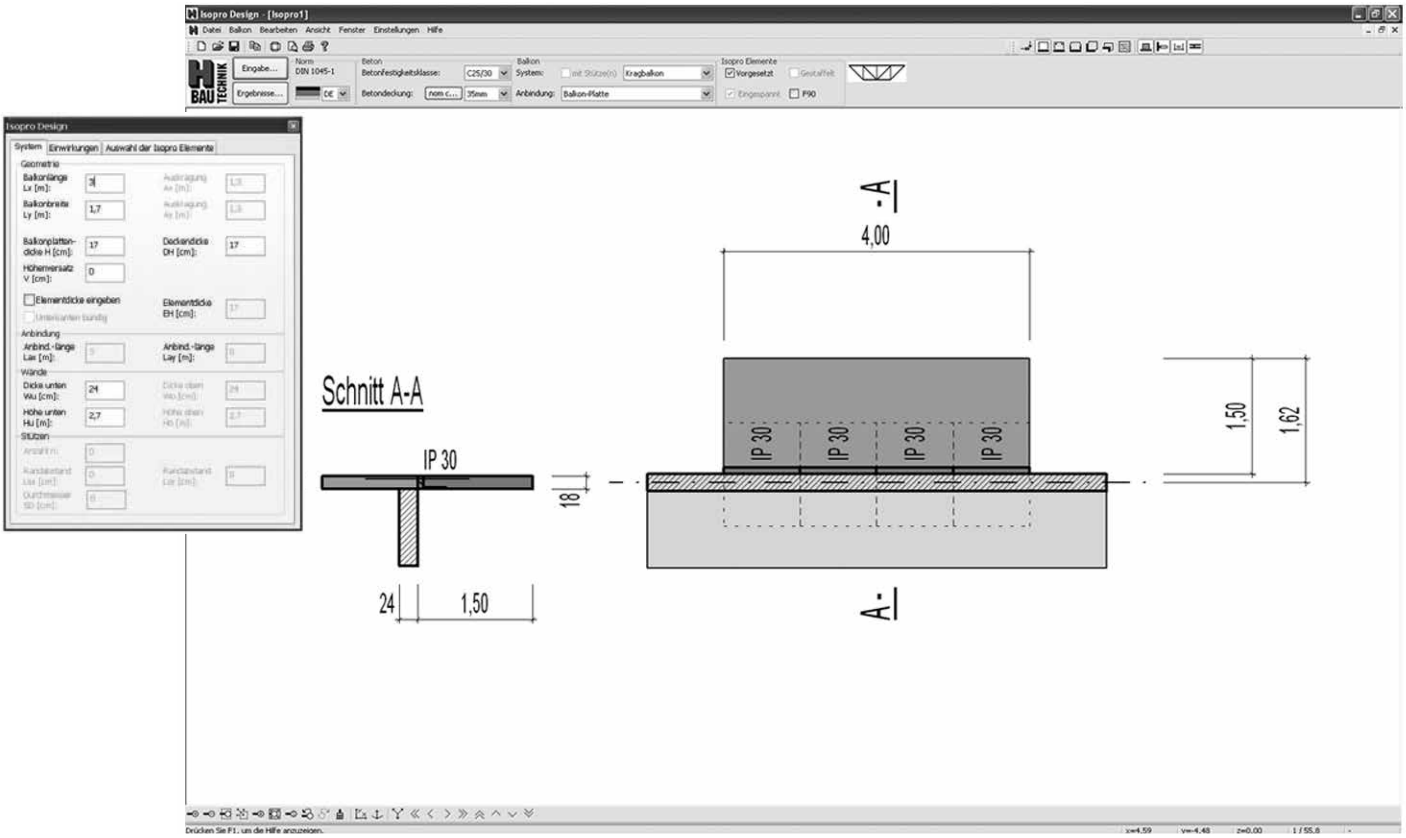
NOTE

If the rigidity ratios along the slab edge vary significantly (e.g. supports along the slab edge and no continuous wall), the balcony slab should not be calculated as a system separate from the building. In this case, a hinged line should be defined along the edge of the balcony slab, with the aforementioned rigidities. The ISOPRO® units can be determined based on the joint forces.

SOFTWARE

DESIGN OF THE ISOPRO® UNITS – SOFTWARE ISOPRO® DESIGN

The ISOPRO® DESIGN program allows us to pass on to you our many years of experience in designing our ISOPRO® thermal insulation units for the most common balcony systems.
You can choose between the balcony systems comprising a cantilevered balcony, balcony on supports, loggia, internal corner balcony and external corner balcony or you can work with the free input tool when design values are known. After entering the geometric data and the applied loads, you can select the corresponding ISOPRO® units.
The arrangement and geometric parameters of the ISOPRO® units can be checked for feasibility in the layout and cross-section and, if necessary, can be printed out as a formwork drawing or exported as a DXF file for further editing.



ADVANTAGES

- All common balcony systems can be selected
- Design with FEM-module
- Log output including proof
- CAD export

Our Applications Technology department would be pleased to assist in finding further solutions.
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E-mail: technik@h-bau.de

PROOF OF SERVICABILITY

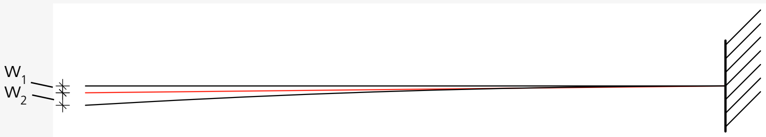
CAMBERS AND BENDING SLENDERNESS

DEFLECTION

A cantilevered slab deforms under load, with the maximum deflection occurring at the end of the cantilever arm. If a cantilevered slab is connected to an ISOPRO® unit, the share of deflection from the slab itself must be superimposed with that of the ISOPRO® unit in order to calculate the maximum deflection.
The ISOPRO® tension and pressure components behave in approximately the same way as a spring system that is stretched or compressed. The resulting angle of rotation α is used to calculate the maximum deflection by the ISOPRO® unit.
We recommend providing proof of the limit state of serviceability for the quasi-permanent load case combination. To calculate the required camber of the cantilevered slab, the deflection should be rounded up or down according to the direction of the planned drainage.

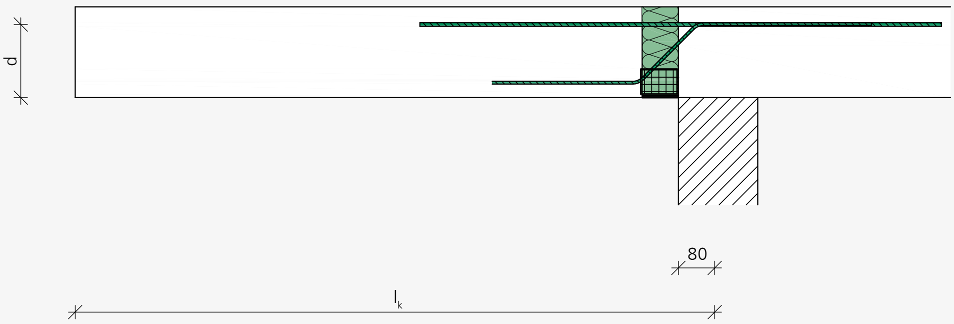
For the calculation of the deflection of the ISOPRO® units please refer to product chapters.

w_1 = deflection due to thermal insulation unit
w_2 = deflection due to slab



BENDING SLENDERNESS

The bending slenderness is defined as the ratio of the static height d of the balcony slab to the cantilever length l_k. The bending slenderness of a slab has an impact on its vibration characteristics. We therefore recommend limiting the bending slenderness. Limits for the bending slenderness are specified on page 31.

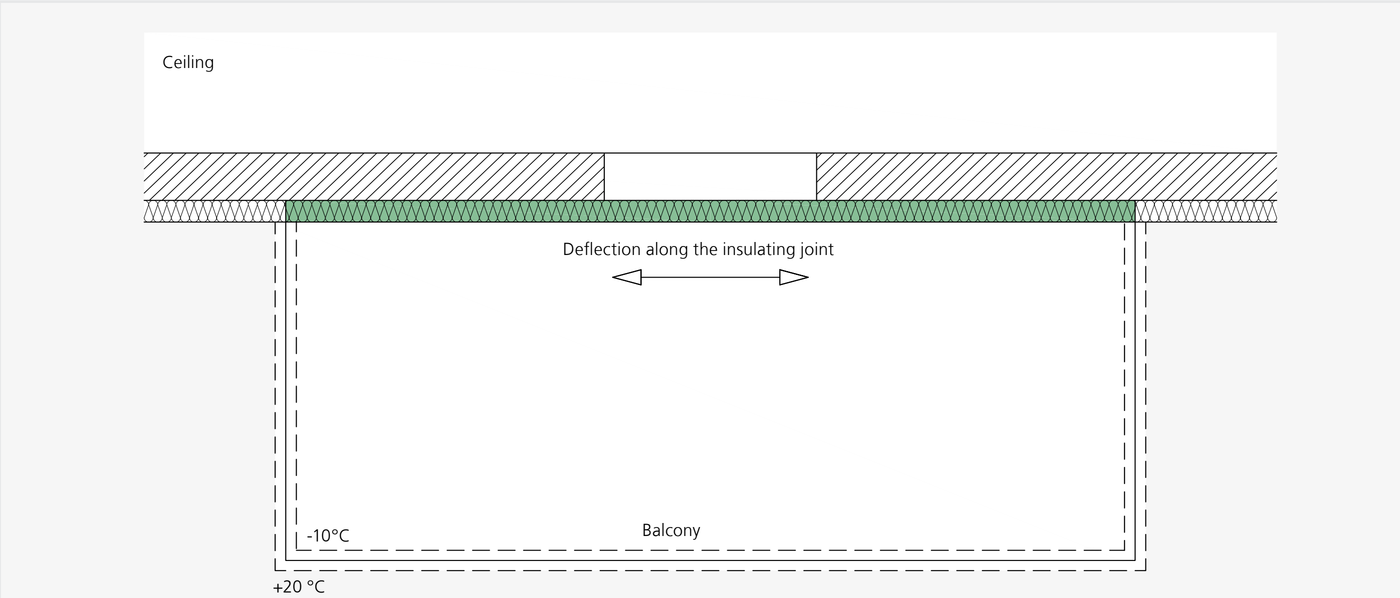


ISOPRO® A-IP – Static system

DISTANCE BETWEEN EXPANSION JOINTS

DISTANCE BETWEEN EXPANSION JOINTS

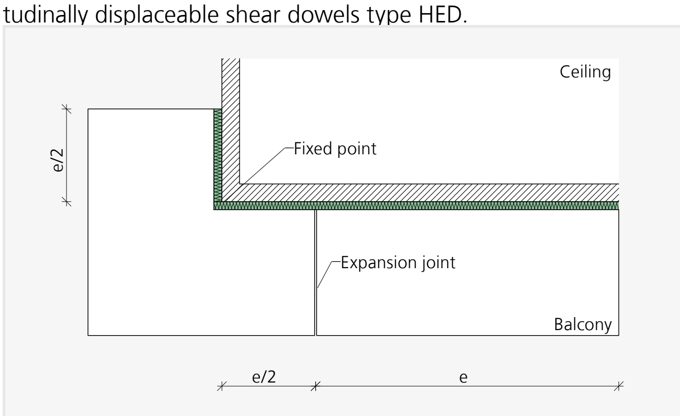
Due to the influence of temperature on external components such as balconies or canopies, deflection of reinforced concrete components can occur. These components expand when heated and contract when cooled. If the reinforced concrete components are thermally separated with ISOPRO® units, then deflection of the ISOPRO® components parallel to the insulating joint occurs due to the deflection of the reinforced concrete slab.

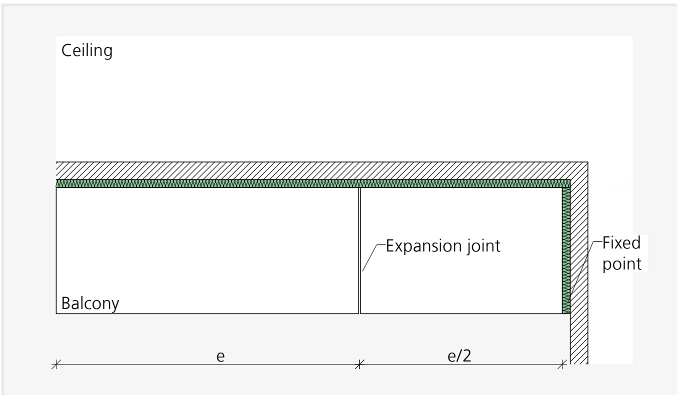


Balcony slab under influence of temperature

To limit the stress on ISOPRO® units as a result of the influence of temperature, very long reinforced concrete components must be separated using expansion joints. The maximum permissible distance between expansion joints e is regulated in the technical approval. The maximum permissible distance between expansion joints e is dependent on the rod diameter and therefore on the ISOPRO® types used. Details can be found in the respective product sections. The use of fixed points such as corner supports or the use of ISOPRO® A-IPH or A-IPE units results in increased constraints, which means the maximum permissible distance between expansion joints must be reduced to e/2.

To prevent uneven settlement of the structural components separated by expansion joints, we recommend connecting the slabs with longitudinally displaceable shear dowels type HED.





Expansion joint layout for different balcony systems

THERMAL INSULATION

THERMAL BRIDGES

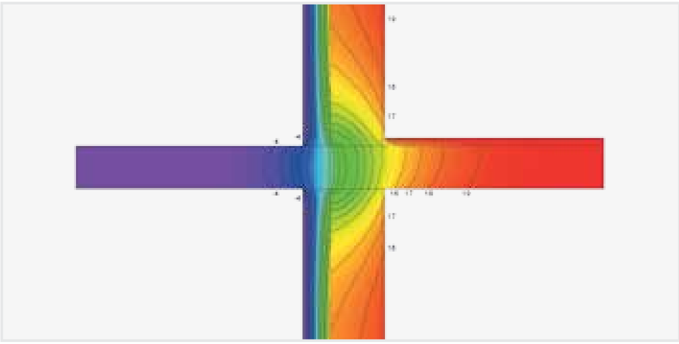
Thermal bridges are weak points in the heat-conducting building envelope, which result in a locally increased heat loss in comparison with standard components. We distinguish between thermal bridges caused by geometric factors, where there is a larger external surface opposite the thermal outflow of the internal surface, and thermal bridges caused by material factors, where an increased heat loss occurs due to local installation parts or material changeovers.

IMPACT OF THERMAL BRIDGES

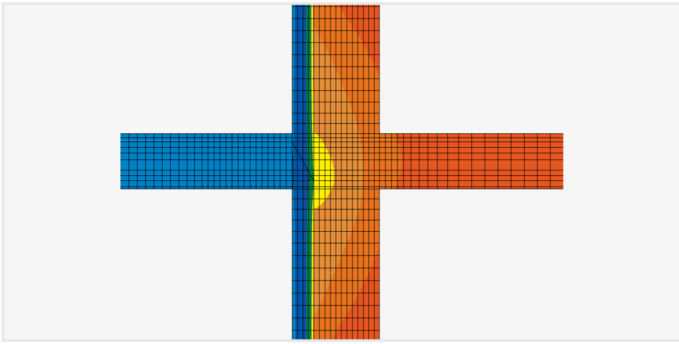
Thermal bridges have a significantly higher heat flow in comparison with the rest of the envelope surface. This increased heat flow causes the inside surface temperature to fall sharply in this area. The consequence is an increased heating energy requirement.
In particular when the outside temperature is low, the surface temperature can fall below what is referred to as the mould temperature. This leads to the formation of mould and the resulting health burdens.
If a further drop in the surface temperature causes the temperature to fall below the dew point temperature, the humidity in the room air condenses, which causes condensation to form on the cold surfaces concerned.

THE BALCONY THERMAL BRIDGE

A balcony designed as a projecting reinforced concrete slab is the classic example of a linear thermal bridge.
If a highly heat-conductive reinforced concrete slab penetrates the thermal insulation layer of the building, the effects of the thermal bridges – caused by geometric factors – are superimposed by the large external surface and the effects of the material-dependent thermal bridge. The results are a significant cooling of the ceiling in the rooms and, as a result, increased heating costs, condensation and mould formation.
If ISOPRO® thermal insulation units are used in the connecting area between the reinforced concrete slabs and the building, thermal bridges are minimised.



Temperature distribution in balcony with continuous reinforced concrete slab



Temperature distribution in balcony with thermally separated reinforced concrete slab

THERMAL INSULATION

DEW-POINT TEMPERATURE

The temperature at which the amount of water contained in the saturation of vapour of the air is sufficient (relative humidity 100%) is called the dew-point temperature. If the temperature is lowered further, the excess moisture is released as dew water from the air. The condensation then settles on colder surfaces.
The higher the temperature and the relative humidity of the room air is, the higher the dew-point temperature will be. This increases the occurence of condensation. Usually, the indoor air climate is 20° C and 50% relative humidity. In this case, the dew point temperature is 9.3° C.

MOULD TEMPERATURE

In addition to the damage to the construction due to moisture build-up in the component, mold fungus formation in these areas leads to health problems. Mold formation does not only occur in the case of condensation, but already at a relative humidity of 80%.
A relative humidity of 80% in the area of cold component surfaces is achieved at a room air temperature of 20° C and 50% relative humidity with a surface temperature of 12.6° C. If this surface temperature is not undershot at any point of the component, then there is no risk of mould formation.

CHARACTERISTIC VALUES FOR THERMAL INSULATION

TEMPERATURE FACTOR f_{RSi}

The temperature factor f_{RSi} is the difference between the temperature at the inner surface θ_{Si} of a structural component and the outside air temperature θ_e, relating to the difference between temperature of indoor air temperature θ_i and outside air temperature θ_e.

$$f_{Rsi} = \frac{\theta_{si} - \theta_e}{\theta_i - \theta_e}$$

with basic conditions
θ_{Si} – Surface temperature in the room
θ_i – Indoor air temperature, 20°C
θ_e – Outdoor air temperature, 5°C
relative humidity 50%

If the temperature factor $f_{RSi} \geq 0.71$ is maintained, this corresponds to a room-side surface temperature of $\theta_{Si} \geq 12.6°$ C. Thus, there is no risk of mould formation.

LINEAR COEFFICIENT OF HEAT TRANSMISSION ψ [W/MK]

"Quotient of steady state heat flux and the product of length and temperature difference between the ambient temperatures on each side of the thermal bridge."
The length-related coefficient of heat transmission is the size that describes the influence of a linear thermal bridge on the total heat flow. This is needed, for example, for continuous thermal insulation units ISOPRO® A-IP, A-IPT and A-IPQ.

LOCAL COEFFICIENT OF HEAT TRANSMISSION χ [W/K]

"Quotient of steady state heat flux and the temperature difference between the ambient temperatures on each side of the thermal bridge."
The local coefficient of heat transmission is the size that describes the influence of a local (one point only) thermal bridge on the total heat flow. This is needed, for example, for thermal insulation units used at specific points, e.g. ISOPRO® A-IPQS, A-IPTQQS, A-IPO and A-IPTA.

NOTES

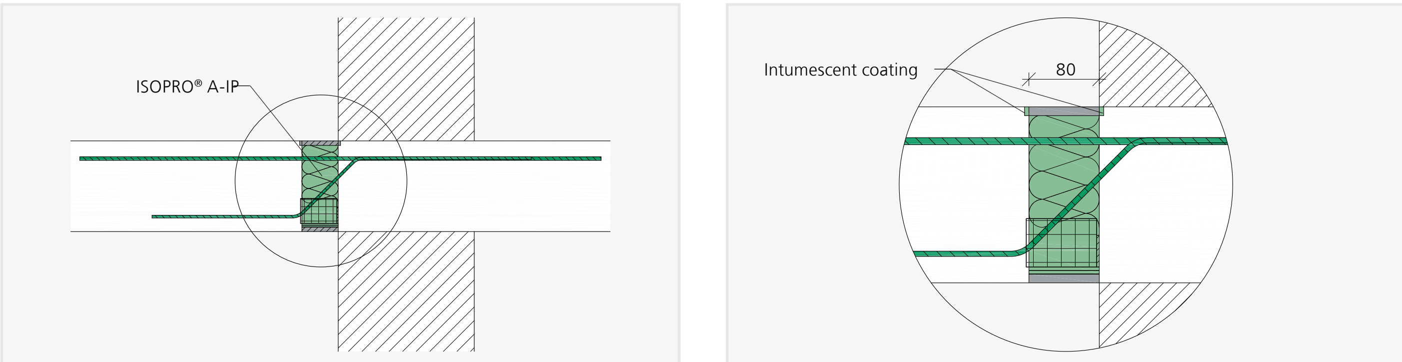
- The exact definition of thermal bridges requires a considerable computational effort, since all thermal bridges with their heat loss coefficients are to be taken into account and calculated.
- All material thicknesses and material properties of the components adjacent to the ISOPRO® units influence the heat loss coefficients.
- Object-related calculation of ψ-values upon request.

FIRE PROTECTION

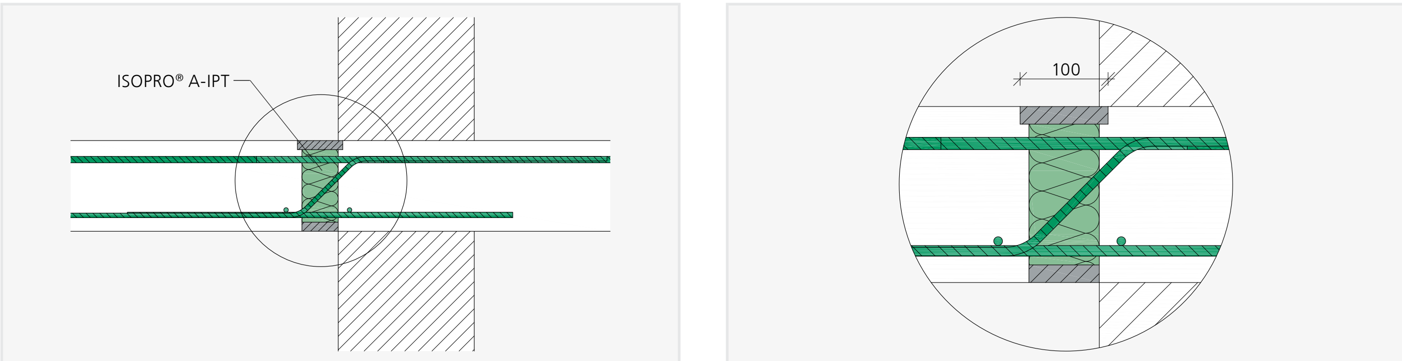
FIRE RESISTANCE CLASSES R90/REI120

Where there are fire protection requirements regarding the fire resistance class of components, all ISOPRO® units with concrete compression bearings are available in fire resistance class REI120 and all ISOPRO® units with a steel pressure plane are available in fire resistance class R90.

To this end, the ISOPRO® units are fitted with fireproof panels on the top and bottom ex works. The prerequisite for classification into R90/REI120 is that the adjoining components meet the requirements of the respective fire resistance class. If a physical barrier (E) and heat shielding (I) are also required in the event of fire, then it must be ensured that ISOPRO® Z-ISO FP1 in EI120 is used as the intermediate insulation where ISOPRO® units are used at specific points.



ISOPRO® unit with concrete compression bearings in REI120 version with fireproof panels at the top and bottom, intumescent coating at the side



ISOPRO® unit with steel pressure rods in R90 version with fireproof panels overhanging at the top and flush at the bottom

FIRE RESISTANCE CLASSES OF ISOPRO® UNITS

ISOPRO® units achieve the following fire resistance classes:

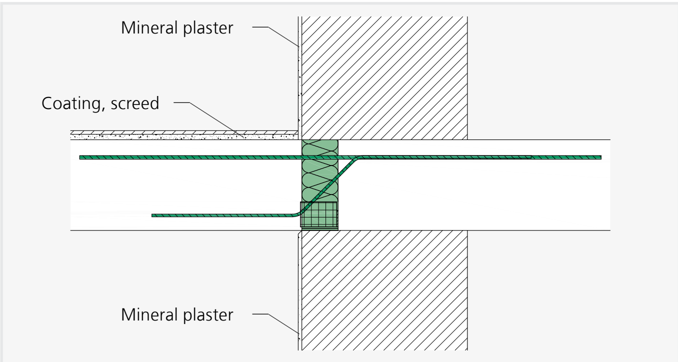
ISOPRO®	A-IP, A-IP two-part, A-IP Var., A-IPQ, A-IPZQ, A-IPQS, A-IPQZ, A-IPH, A-IPE, A-IPO	A-IPT, A-IPTQQ, A-IPTQQS, A-IPTD, A-IPTA, A-IPTF, A-IPTS, A-IPTW	IP Z-ISO FP1
Fire resistance class	REI120	R90	EI120

FIRE PROTECTION

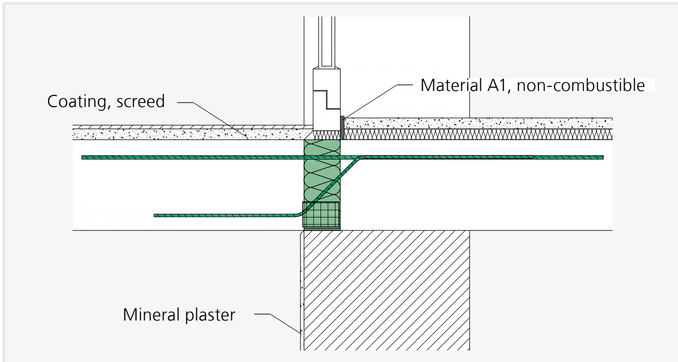
FIRE RESISTANCE CLASS REI30

All ISOPRO® standard units can be classified in fire resistance class REI30 if the following requirements for the overall structure are met:

- The components adjoining the ISOPRO® unit are clad with mineral protective layers on the surface or
- The components adjoining the ISOPRO® unit are clad with protective layers made of non-combustible materials on the surface and
- The ISOPRO® unit is embedded in the overall structure with protection against exposure to direct flames from above and below.

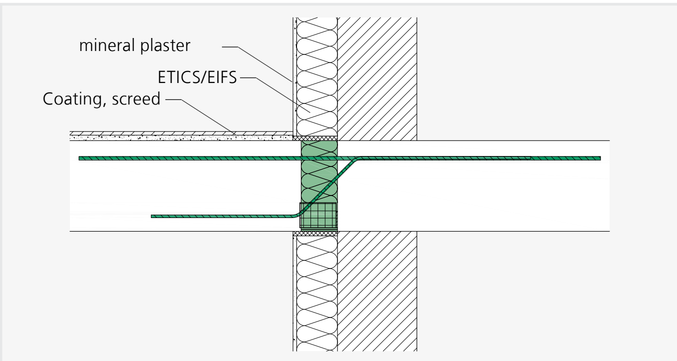


REI30 formation in wall area

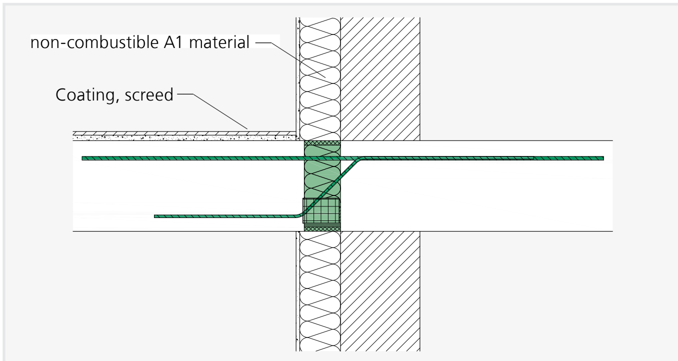


REI30 formation in door area

FIRE RESISTANCE CLASS REI120



REI120 embedment of ISOPRO® unit im thermal insulation composite system

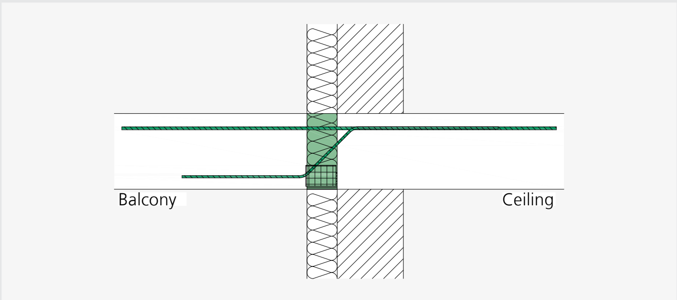


REI120 embedment of ISOPRO® unit in non-combustible insulation

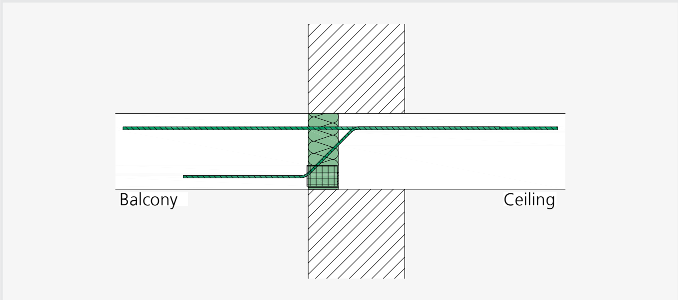
INSTALLATION INSTRUCTIONS

POSITION IN COMPONENT

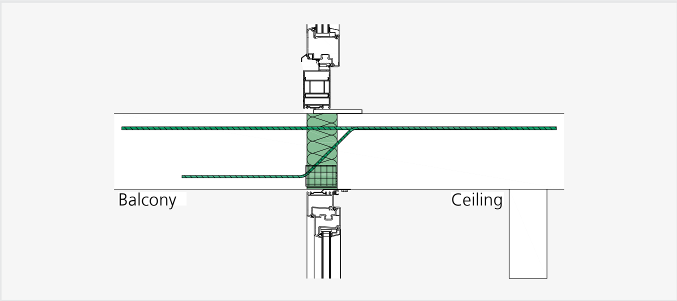
To reliably prevent thermal bridges, the ISOPRO® units are installed in the insulation plane.



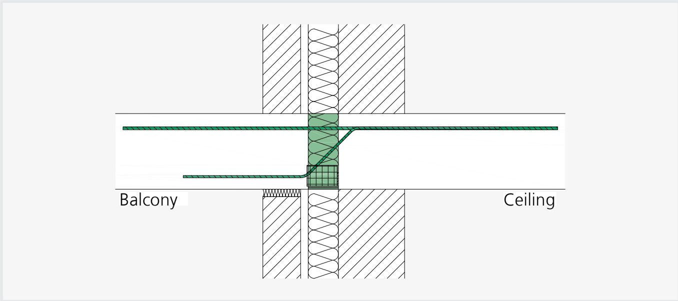
ISOPRO® IP – Installation cross-section for external thermal insulation composite system



ISOPRO® IP – Installation cross-section for single-leaf masonry



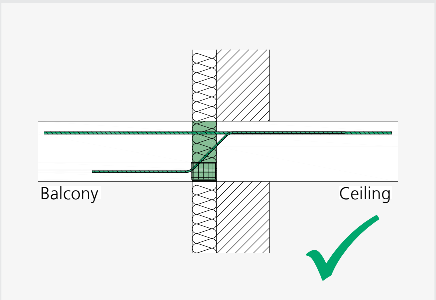
ISOPRO® IP – Installation cross-section for glass façade



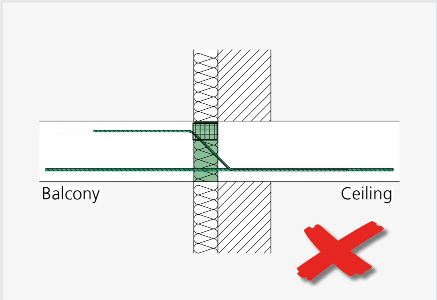
ISOPRO® IP – Installation cross-section for double leaf masonry

DIRECTION OF INSTALLATION

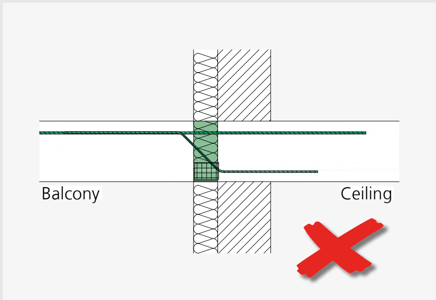
During installation, note the correct direction of installation on the balcony/ceiling as well as at the top/bottom. Ensure that the tension rods are at the top and the compression bearings/pressure rods are at the bottom. Starting at the bottom, the shear rod runs diagonally through the ISOPRO® unit on the balcony and ends at the top of the ceiling.



ISOPRO® IP – Correct installation



ISOPRO® IP – Incorrect installation, tension rod must be at the top



ISOPRO® IP – Incorrect installation, shear rod must be on the bottom side of the balcony

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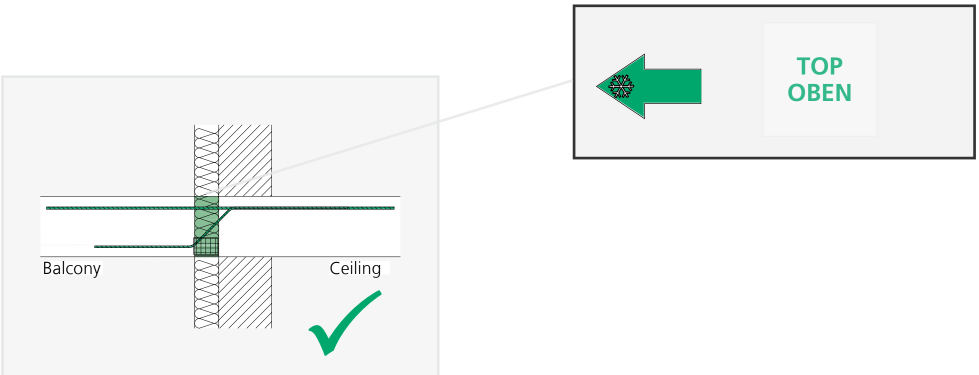
INSTALLATION - PRESSURE JOINT

DIRECTION OF INSTALLATION

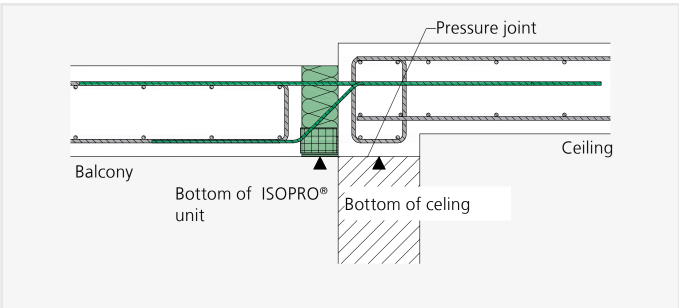
During installation it is crucial to note the direction of installation indicated on the label. The direction of installation is marked clearly on each unit by the indication of the top and an arrow to the balcony side (of the cold area).



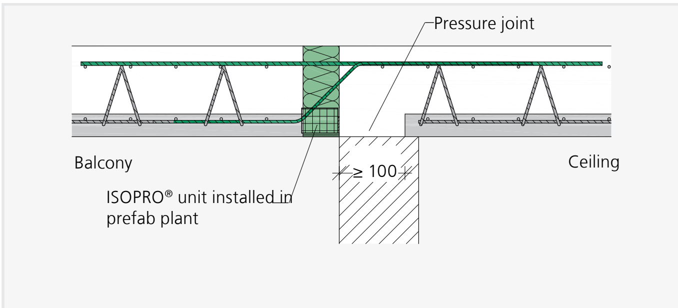
ISOPRO® IP – correct installation

PRESSURE JOINT

Both when using prefabricated components and semi-finished components, i.e. also when installing ISOPRO® units in an in-situ concrete structure, ensure that a form-fitting connection is produced between the compression bearing and the fresh concrete. A pressure joint of ≥ 100mm must be provided for this purpose.



ISOPRO® A-IP – Pressure joint for in-situ concrete construction and vertically offset slabs



ISOPRO® A-IP – Pressure joint for prefab slabs on the ceiling

ISOPRO®
A-IP and A-IPT

UNITS FOR CANTILEVERED BALCONIES

ISOPRO® A-IP

- For transferring negative moments and positive and ,depending on version (QX), negative shearing forces
- Pressure plane with concrete compression bearings
- Load bearing capacities A-IP 10 to A-IP 100
- Shearing force load-bearing capacities standard, Q8, Q10, Q12, Q8X, Q10X and Q12X
- Concrete covering of tension rods cv30, cv35 or cv50
- Unit heights depending on the shearing force load-bearing capacity starting from h_{min} = 160 mm
- Fire resistance classes see page 20

ISOPRO® A-IPT

- Pressure plane with steel pressure rods
- Load-bearing capacities A-IPT 120 to A-IPT 160
- Shearing force load-bearing capacities Q10, Q12, Q14 and Q12X
- Concrete covering cv30, cv35 or cv50
- Unit heights depending on the shearing force load-bearing capacity starting from h_{min} = 160 mm
- Fire resistance classes see page 20

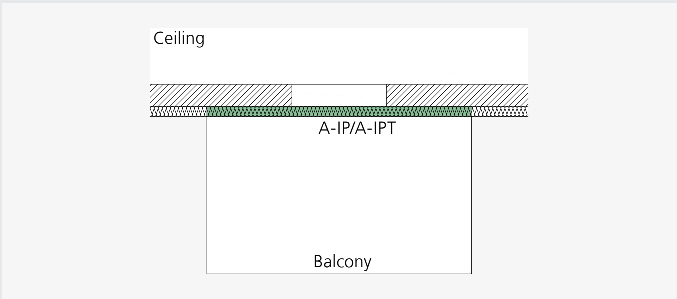
TYPE DESIGNATION

A-IP 60 Q8 cv35 h200 REI120

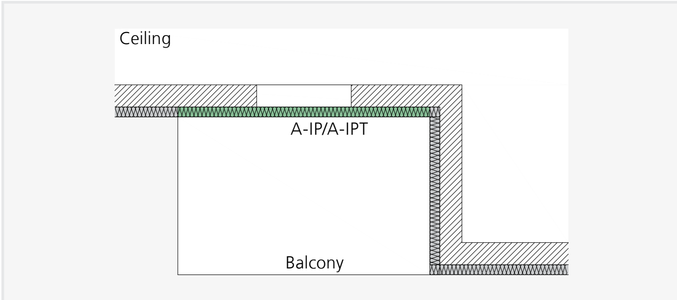
- REI120 — Fire protection version
- h200 — Unit height
- cv35 — Concrete covering
- Q8 — Shearing force load-bearing capacity
- A-IP 60 — Type and load-bearing capacity

APPLICATION – UNIT ARRANGEMENT

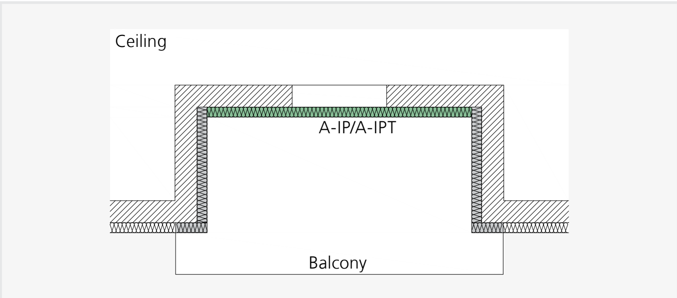
This chapter provides planning aids and specific information about this product. In addition, the general information on materials, design, building physics, installation on site, etc. on pages 10 - 23 has also to be considered.



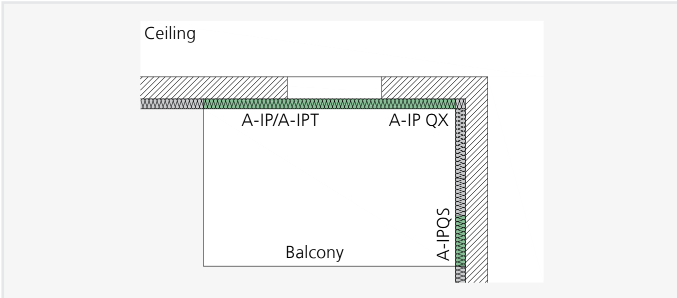
ISOPRO® A-IP/A-IPT – Cantilevered balconies



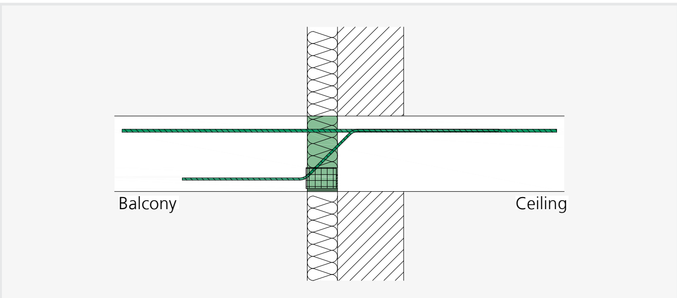
ISOPRO® A-IP/A-IPT – Cantilevered balconies in façade extensions



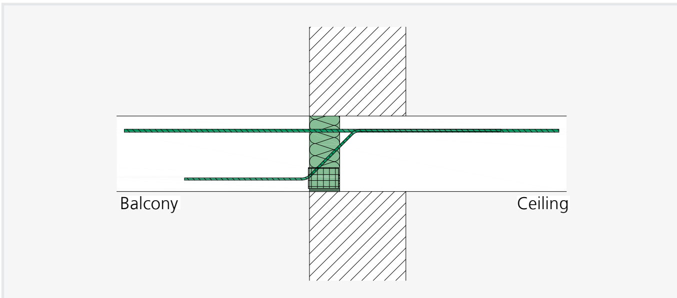
ISOPRO® A-IP/A-IPT – Cantilevered balconies in façade recesses



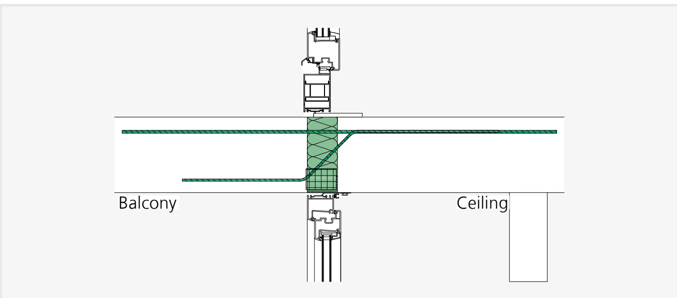
ISOPRO® A-IP/A-IPT in combination with A-IP QX and A-IPQS for internal corner balconies



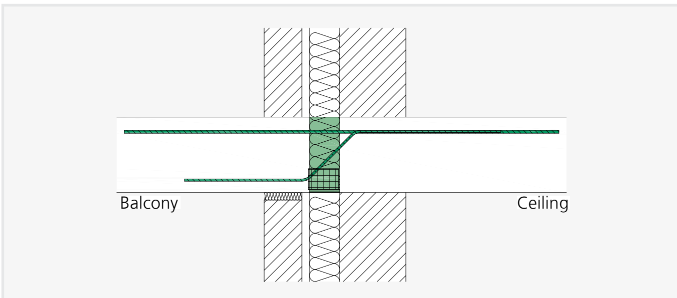
ISOPRO® A-IP – Installation cross-section for external thermal insulation composite system



ISOPRO® A-IP – Installation cross-section for single-leaf masonry



ISOPRO® A-IP – Installation cross-section for glass façades



ISOPRO® A-IP – Installation cross-section for double leaf masonry

DESIGN TABLE FOR CONCRETE ≥ C25/30

DESIGN VALUES OF ALLOWABLE MOMENTS m_{Rd} [kNm/m]

Unit height [mm] depending on cv [mm]			ISOPRO®						
30	35	50	A-IP 10	A-IP 15	A-IP 20	A-IP 30	A-IP 40	A-IP 50	A-IP 60
–	160	–	8,1	12,2	16,3	20,3	24,4	28,5	31,4
160	–	180	8,6	12,9	17,1	21,4	25,7	30,0	33,1
–	170	–	9,0	13,5	18,0	22,5	27,0	31,5	34,8
170	–	190	9,4	14,2	18,9	23,6	28,3	33,0	36,5
–	180	–	9,9	14,8	19,8	24,7	29,6	34,6	38,2
180	–	200	10,3	15,5	20,6	25,8	30,9	36,1	40,0
–	190	–	10,8	16,1	21,5	26,9	32,3	37,6	41,7
190	–	210	11,2	16,8	22,4	28,0	33,6	39,2	43,4
–	200	–	11,6	17,4	23,3	29,1	34,9	40,7	45,1
200	–	220	12,1	18,1	24,1	30,2	36,2	42,2	46,8
–	210	–	12,5	18,8	25,0	31,3	37,5	43,8	48,5
210	–	230	12,9	19,4	25,9	32,3	38,8	45,3	50,2
–	220	–	13,4	20,1	26,7	33,4	40,1	46,8	51,9
220	–	240	13,8	20,7	27,6	34,5	41,4	48,3	53,6
–	230	–	14,2	21,4	28,5	35,6	42,7	49,9	55,3
230	–	250	14,7	22,0	29,4	36,7	44,1	51,4	57,0
–	240	–	15,1	22,7	30,2	37,8	45,4	52,9	58,7
240	–	260	15,6	23,3	31,1	38,9	46,7	54,5	60,4
–	250	–	16,0	24,0	32,0	40,0	48,0	56,0	62,1
250	–	270	16,4	24,7	32,9	41,1	49,3	57,5	63,9
–	260	–	16,9	25,3	33,7	42,2	50,6	59,1	65,6
260	–	280	17,3	26,0	34,6	43,3	51,9	60,6	67,3
–	270	–	17,7	26,6	35,5	44,4	53,2	62,1	69,0
270	–	–	18,2	27,3	36,4	45,5	54,5	63,6	70,7
–	280	–	18,6	27,9	37,2	46,6	55,9	65,2	72,4
280	–	–	19,1	28,6	38,1	47,6	57,2	66,7	74,1

DESIGN VALUES OF ALLOWABLE SHEARING FORCES v_{Rd} [kN/m]

Capacity	h_{min} [mm]	A-IP 10	A-IP 15	A-IP 20	A-IP 30	A-IP 40	A-IP 50	A-IP 60
Standard	160				61,8			
Q8	160				92,7			
Q10	170				144,9			
Q12	180				208,6			
Q8X	160				+61,8/-46,4			
Q10X	170				+96,6/-72,5			
Q12X	180				+139,1/-104,3			

DESIGN TABLE FOR CONCRETE ≥ C25/30

DESIGN VALUES OF ALLOWABLE MOMENTS m_{Rd} [kNm/m]

Unit height [mm] depending on cv [mm]			ISOPRO®					
30	35	50	A-IP 70	A-IP 75	A-IP 80	A-IP 85	A-IP 90	A-IP 100
–	160	–	34,6	37,7	44,0	44,7	53,7	57,5
160	–	180	36,4	39,7	46,4	47,2	56,6	60,7
–	170	–	38,3	41,8	48,8	49,7	59,6	63,8
170	–	190	40,2	43,8	51,2	52,1	62,5	67,0
–	180	–	42,1	45,9	53,5	54,6	65,5	70,2
180	–	200	43,9	47,9	55,9	57,0	68,4	73,3
–	190	–	45,8	50,0	58,3	59,5	71,4	76,5
190	–	210	47,7	52,0	60,7	62,0	74,3	79,6
–	200	–	49,6	54,1	63,1	64,4	77,3	82,8
200	–	220	51,5	56,1	65,5	66,9	80,2	86,0
–	210	–	53,3	58,2	67,9	69,3	83,2	89,1
210	–	230	55,2	60,2	70,3	71,8	86,2	92,3
–	220	–	57,1	62,3	72,7	74,3	89,1	95,4
220	–	240	59,0	64,3	75,1	76,7	92,1	98,6
–	230	–	60,9	66,4	77,4	79,2	95,0	101,8
230	–	250	62,7	68,4	79,8	81,6	98,0	104,9
–	240	–	64,6	70,5	82,2	84,1	100,9	108,1
240	–	260	66,5	72,5	84,6	86,5	103,9	111,2
–	250	–	68,4	74,6	87,0	89,0	106,8	114,4
250	–	270	70,2	76,6	89,4	91,5	109,8	117,6
–	260	–	72,1	78,7	91,8	93,9	112,7	120,7
260	–	280	74,0	80,7	94,2	96,4	115,7	123,9
–	270	–	75,9	82,8	96,6	98,8	118,6	127,0
270	–	–	77,8	84,8	99,0	101,3	121,6	130,2
–	280	–	79,6	86,9	101,4	103,8	124,5	133,4
280	–	–	81,5	88,9	103,7	106,2	127,5	136,5

DESIGN VALUES OF ALLOWABLE SHEARING FORCES v_{Rd} [kN/m]

Capacity	h_{min} [mm]		A-IP 70	A-IP 75	A-IP 80	A-IP 85	A-IP 90	A-IP 100
Standard	160			61,8			61,8	
Q8	160			92,7			92,7	
Q10	170			144,9			144,9	
Q12	180			208,6			208,6	
Q8X	160	170		+61,8/-46,4			+61,8/-46,4	
Q10X	170	180		+96,6/72,5			96,6/-69,6	
Q12X	180			+139,1/-104,3			139,1/-69,6	

DESIGN TABLE FOR CONCRETE ≥ C25/30

DESIGN VALUES OF ALLOWABLE MOMENTS m_{Rd} [kNm/m]

Unit height [mm] depending on cv [mm]			ISOPRO®		
30	35	50	A-IPT 120	A-IPT 150	A-IPT 160
–	180	–	79,3	89,2	–
180	–	200	83,2	93,6	–
–	190	–	87,1	98,0	114,4
190	–	210	91,0	102,4	116,6
–	200	–	94,9	106,7	124,8
200	–	220	98,8	111,1	130,0
–	210	–	102,6	115,5	135,4
210	–	230	106,5	119,8	140,6
–	220	–	110,4	124,2	145,8
220	–	240	114,3	128,6	151,0
–	230	–	118,2	133,0	156,4
230	–	250	122,1	137,3	161,6
–	240	–	126,0	141,7	166,8
240	–	260	129,9	146,1	172,0
–	250	–	133,7	150,5	177,2
250	–	270	137,6	154,8	182,6
–	260	–	141,5	159,2	187,8
260	–	280	145,4	163,6	193,0
–	270	–	149,3	168,0	198,2
270	–	–	153,2	172,3	203,6
–	280	–	157,1	176,7	208,8
280	–	–	161,0	181,1	214,0

DESIGN VALUES OF ALLOWABLE SHEARING FORCES v_{Rd} [kN/m]

Capacity	hmin [mm]	A-IPT 120	A-IPT 150	A-IPT 160
Q10	180	96,6	96,6	96,6
Q12	180	139,1	139,1	208,6
Q14	190	189,3	189,3	284,0
Q12X	190	+139,1/-94,6	–	–

DIMENSIONS AND ASSIGNMENT

ISOPRO® A-IP 10 TO A-IP 50

ISOPRO®	A-IP 10	A-IP 15	A-IP 20	A-IP 30	A-IP 40	A-IP 50
Unit length [mm]	1.000					
Tension rods	4 Ø 8	6 Ø 8	8 Ø 8	10 Ø 8	12 Ø 8	14 Ø 8
Compression bearings	4 DL					
Shear rods standard	4 Ø 8					
Shear rods Q8	6 Ø 8					
Shear rods Q10	6 Ø 10					
Shear rods Q12	6 Ø 12					
Shear rods Q8X	4 Ø 8/3 Ø 8					
Shear rods Q10X	4 Ø 10/3 Ø 10					
Shear rods Q12X	4 Ø 12/3 Ø 12					

ISOPRO® A-IP 60 TO A-IP 100

ISOPRO®	A-IP 60	A-IP 70	A-IP 75	A-IP 80	A-IP 85	A-IP 90	A-IP 100
Unit length [mm]	1.000			1.000	500+500		
Tension rods	10 Ø 10	11 Ø 10	12 Ø 10	14 Ø 10	10 Ø 12	12 Ø 12	14 Ø 12
Compression bearings	6 DL			8 DL	8 DL		
Shear rods standard	4 Ø 8			4 Ø 8	4 Ø 8		
Shear rods Q8	6 Ø 8			6 Ø 8	6 Ø 8		
Shear rods Q10	6 Ø 10			6 Ø 10	6 Ø 10		
Shear rods Q12	6 Ø 12			6 Ø 12	6 Ø 12		
Shear rods Q8X	4 Ø 8/ 3 Ø 8			4 Ø 8/ 3 Ø 8	4 Ø 8/ 2 Ø 10		
Shear rods Q10X	4 Ø 10/ 3 Ø 10			4 Ø 10/ 3 Ø 10	4 Ø 10/ 2 Ø 12		
Shear rods Q12X	4 Ø 12/ 3 Ø 12			4 Ø 12/ 3 Ø 12	4 Ø 12/ 2 Ø 12		

ISOPRO® A-IPT 120 TO A-IPT 160

ISOPRO®	A-IPT 120	A-IPT 150	A-IPT 160
Unit length [mm]	500+500	500+500	500+500
Tension rods	12 Ø 14	14 Ø 14	12 Ø 16
Compression bearings	16 Ø 12	18 Ø 12	14 Ø 16
Shear rods Q10	4 Ø 10	4 Ø 10	4 Ø 10
Shear rods Q12	4 Ø 12	4 Ø 12	6 Ø 12
Shear rods Q14	4 Ø 14	4 Ø 14	6 Ø 14
Shear rods Q12X	4 Ø 12/ 2 Ø 14	–	–

DEFLECTION AND CAMBER

DEFLECTION

During their construction, cantilevered reinforced concrete structures are elevated to take into account the anticipated deflection. If these structures are thermally separated with ISOPRO® units, when calculating the pre-set, the deflection due to the ISOPRO® unit itself is superimposed with the deflection due to flexion of the slab in accordance with EN 1992-1-1/NA. It must be ensured that the required pre-set is rounded up or down, according to the planned drainage direction. If a drainage system is installed at the building façade, the value must be rounded up, but for drainage at the end of the cantilever arm, it must be rounded down. We recommend providing proof of suitability for use in the serviceability limit state for the quasi-continuous load combination ($\gamma_G = 1{,}0$, $\gamma_Q = 1{,}0$, $\psi_2 = 0{,}3$). The tables below show the deflection factors tan α for calculating the deflection due to ISOPRO®.

DEFLECTION DUE TO THE ISOPRO® CANTILEVER SLAB CONNECTION

$$w = \tan\alpha \cdot (m_{Ed}/m_{Rd}) \cdot l_k \cdot 10$$

With
w = Deflection at the end of the cantilever arm [mm]
tan α = Deflection factor, see product sections
m_{Ed} = Bending moment for determining the camber as a result of the ISOPRO® unit. The definitive load combination for the servicability limit state is determined by the structural engineer
m_{Rd} = Resistance moment of the ISOPRO® unit, see product section
l_k = System length [m]

DEFLECTION FACTOR TAN α FOR CONCRETE C 20/25

ISOPRO®	Concrete covering cv [mm]	Unit height h [mm]												
		160	170	180	190	200	210	220	230	240	250	260	270	280
A-IP 10 to A-IP 50	30	0,85	0,77	0,70	0,65	0,60	0,56	0,53	0,50	0,47	0,44	0,42	0,40	0,38
	35	0,89	0,81	0,74	0,68	0,63	0,58	0,54	0,51	0,48	0,45	0,43	0,41	0,39
	50	–	–	0,85	0,77	0,70	0,65	0,60	0,56	0,53	0,50	0,47	0,44	0,42
A-IP 60 to A-IP 80	30	1,01	0,92	0,84	0,77	0,72	0,67	0,63	0,59	0,56	0,53	0,50	0,48	0,45
	35	1,07	0,96	0,88	0,81	0,75	0,69	0,65	0,61	0,57	0,54	0,51	0,49	0,46
	50	–	–	1,01	0,92	0,84	0,77	0,72	0,67	0,63	0,59	0,56	0,53	0,50
A-IP 85 to A-IP 100	30	1,05	0,95	0,87	0,80	0,74	0,69	0,64	0,60	0,57	0,54	0,51	0,49	0,46
	35	1,10	0,99	0,90	0,83	0,77	0,71	0,66	0,62	0,59	0,55	0,53	0,50	0,48
	50	–	–	1,05	0,95	0,87	0,80	0,74	0,69	0,64	0,60	0,57	0,54	0,51
A-IPT 120 and A-IPT 150	30	–	–	1,62	1,48	1,36	1,26	1,18	1,10	1,03	0,98	0,92	0,88	0,84
	35	–	–	1,70	1,55	1,42	1,31	1,22	1,14	1,07	1,00	0,95	0,90	0,86
	50	–	–	–	–	1,62	1,48	1,36	1,26	1,18	1,10	1,03	0,98	0,92
A-IPT 160	30	–	–	–	1,66	1,53	1,42	1,32	1,23	1,16	1,09	1,03	0,98	0,93
	35	–	–	–	1,74	1,59	1,47	1,37	1,27	1,19	1,12	1,06	1,00	0,95
	50	–	–	–	–	–	1,66	1,53	1,42	132	1,23	1,16	1,09	1,03

BENDING SLENDERNESS – DISTANCE BETWEEN EXPANSION JOINTS

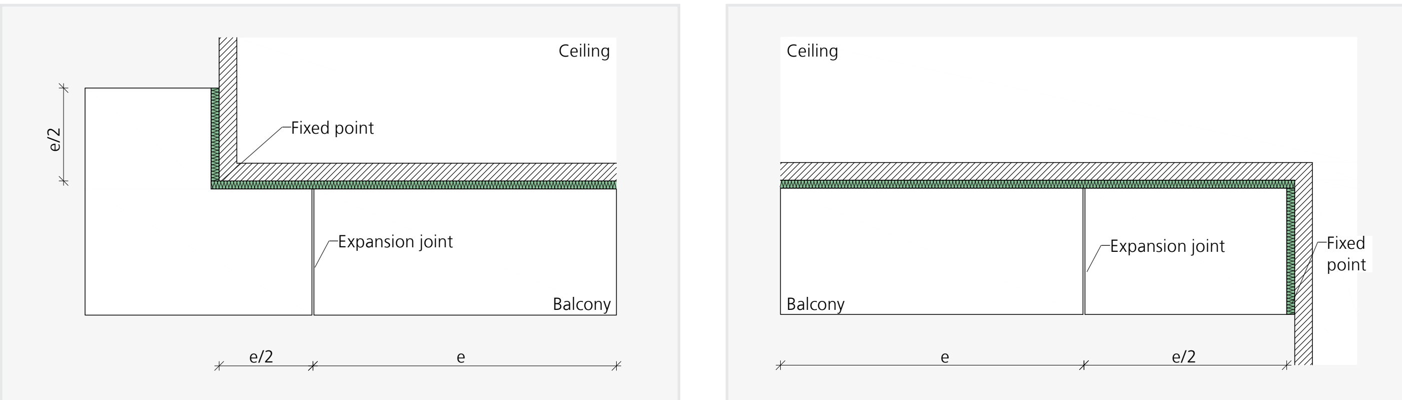
BENDING SLENDERNESS

The bending slenderness is defined as the ratio of the static height d of the balcony slab to the cantilever length l_k. The bending slenderness of a slab has an impact on its vibration characteristics. We therefore recommend limiting the bending slenderness for cantilevered reinforced concrete structures in accordance with EN 1992-1-1 to a maximum value of $l_k/d = 14$. This results in the following maximum recommended cantilever lengths l_k:

Concrete covering cv [mm]	Max. l_k [m] depending on unit height h [mm]												
	160	170	180	190	200	210	220	230	240	250	260	270	280
30	1,75	1,89	2,03	2,17	2,31	2,45	2,59	2,73	2,87	3,01	3,15	3,29	3,43
35	1,68	1,82	1,96	2,10	2,24	2,38	2,52	2,66	2,80	2,94	3,08	3,22	3,36
50	1,47	1,61	1,75	1,89	2,03	2,17	2,31	2,45	2,59	2,73	2,87	3,01	3,15

DISTANCE BETWEEN EXPANSION JOINTS

If the component dimensions exceed the maximum permissible distance between expansion joints, expansion joints must be arranged perpendicular to the insulation plane. The maximum permissible distance between expansion joints e is dependent on the maximum rod diameter guided across the expansion joint and is thus type-dependent.
The use of fixed points such as corner supports or the use of ISOPRO® A-IPH or A-IPE units results in increased constraints, which means the maximum permissible distance between expansion joints must be reduced to e/2. Half of the maximum distance between expansion joints is always measured from the fixed point.



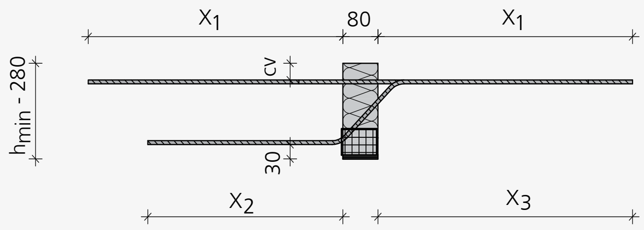
Expansion joint layout for different balcony systems

MAXIMUM PERMISSIBLE DISTANCE BETWEEN EXPANSION JOINTS

ISOPRO®	A-IP 10 to A-IP 80		A-IP 85 to A-IP 100	A-IPT 120, A-IPT 150	A-IPT 160
Shear force capacity	Standard to Q10, Q8X, Q10X	Q12	Standard to Q12 Q8X, Q10X	Q10 to Q14, Q12X	Q10 to Q14
Distance btw. joints e [m]	13,0	11,3	11,3	10,1	9,2

UNIT STRUCTURE

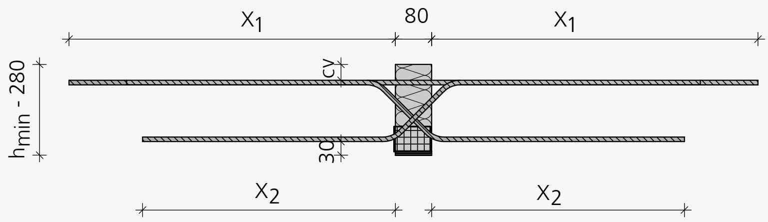
ISOPRO® A-IP 10 TO A-IP 100 - POSITIVE SHEARING FORCES



Length tension rod [mm]	A-IP10 - A-IP50	A-IP60 - A-IP80	A-IP85- A-IP100
X_1	580	720	840

Length Shear rod [mm]	Shearing force load-bearing capacity			
	Standard	Q8	Q10	Q12
X_2	450	450	560	670
X_3	≤ 560	≤ 560	≤ 670	≤ 775
h_{min}	160	160	170	180

ISOPRO® A-IP 10 TO A-IP 100 - POSITIVE AND NEGATIVE SHEARING FORCES

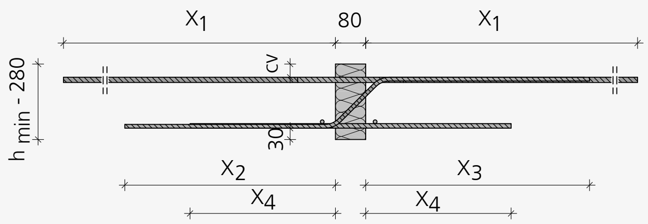


Length tension rod [mm]	A-IP10 - A-IP50	A-IP60- A-IP80	A-IP85- A-IP100
X_1	580	720	840

Length Shear rod [mm]	Shearing force load-bearing capacity		
	Q8X	Q10X	Q12X
X_2	≤ 560	≤ 670	≤ 670
h_{min}	160	170	180

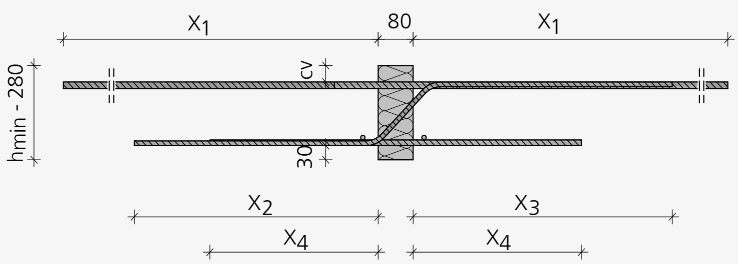
UNIT STRUCTURE

ISOPRO® A-IPT 120



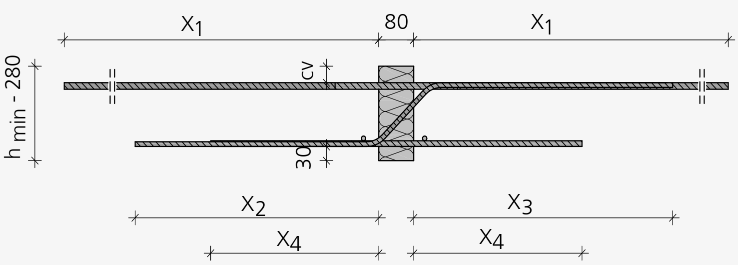
Length tension and pressure rod [mm]	A-IPT 120			
Tension rod X_1	980			
Pressure rod X_4	385			
Length shear rod [mm]	Shearing force load-bearing capacity			
	Q10	Q12	Q14	Q12X
X_2	560	670	780	780
X_3	≤ 670	≤ 775	≤ 890	≤ 890
h_{min}	170	180	190	190

ISOPRO® A-IPT 150



Length tension and pressure rod [mm]	A-IPT 150		
tension rod X_1	980		
pressure rod X_4	385		
Length shear rod [mm]	Shearing force load-bearing capacity		
	Q10	Q12	Q14
X_2	560	670	780
X_3	≤ 670	≤ 775	≤ 890
h_{min}	170	180	190

ISOPRO® A-IPT 160

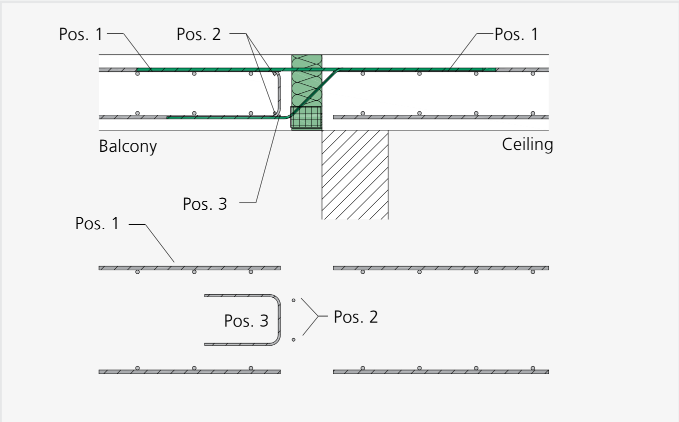


Length tension and pressure rod [mm]	A-IPT 160		
Tension rod X_1	950		
Pressure rod X_4	630		
Length Shear rod [mm]	Shearing force load-bearing capacity		
	Q10	Q12	Q14
X_2	560	670	780
X_3	≤ 670	≤ 775	≤ 890
h_{min}	170	180	190

SUPPLEMENTARY REINFORCEMENT

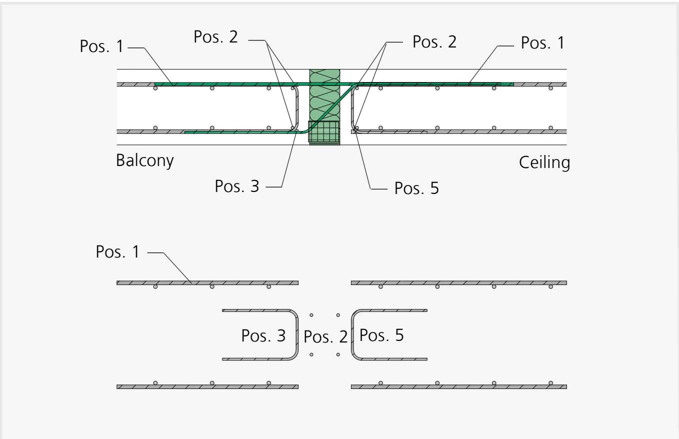
ISOPRO® A-IP 10 TO A-IP 100

DIRECT SUPPORT



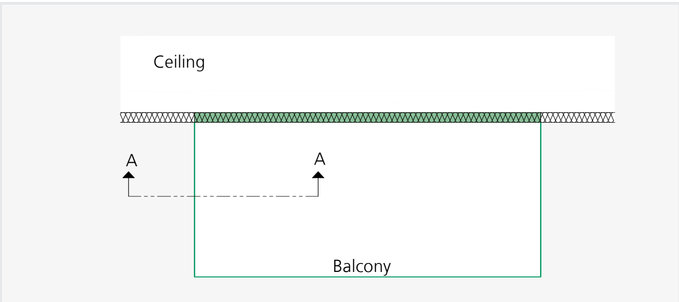
- Pos. 1 connection reinforcement for the ISOPRO® unit – p. 36
- Pos. 2 spacing bar 2 Ø 8 balcony side
- Pos. 3 structural edging parallel to the ISOPRO® A-IP unit in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)

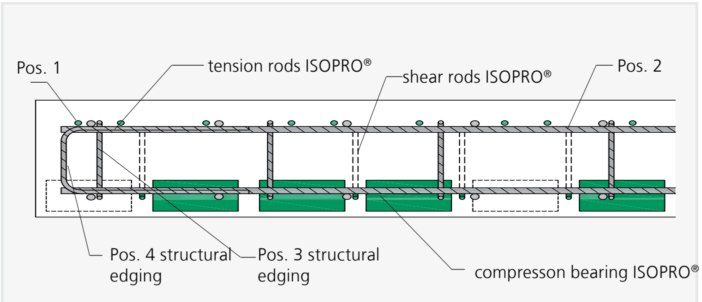
INDIRECT SUPPORT



- Pos. 1 connection reinforcement for the ISOPRO® unit – p. 36
- Pos. 2 spacing bar 2 x 2 Ø 8 balcony and ceiling side
- Pos. 3 structural edging parallel to the ISOPRO® A-IP unit in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)
- Pos. 5 Edging or supplementary stirrup - p. 36

EDGING STIRRUP AT THE FREE BALCONY EDGE



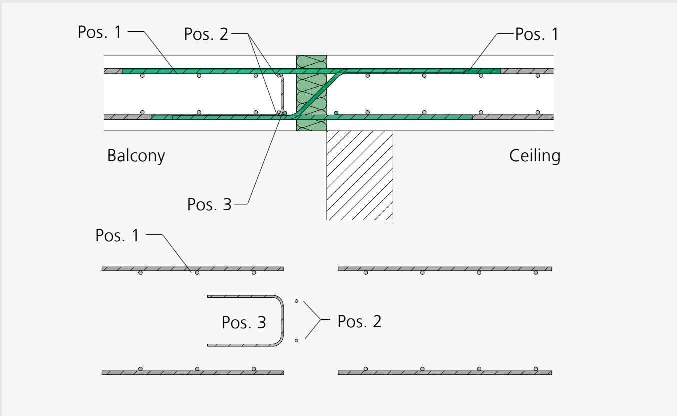


ISOPRO® A-IP – section A-A

SUPPLEMENTARY REINFORCEMENT

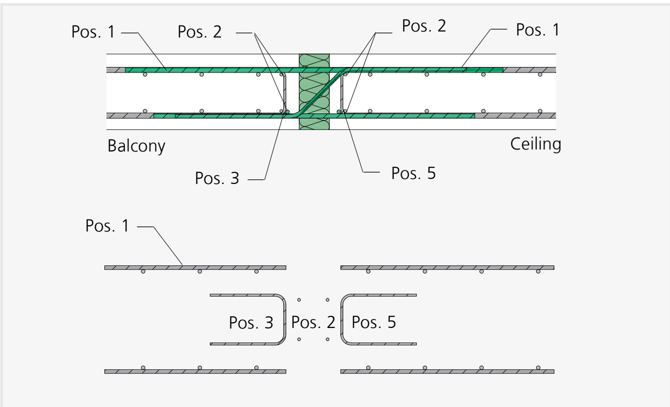
ISOPRO® A-IPT 120 TO A-IPT 160

DIRECT SUPPORT



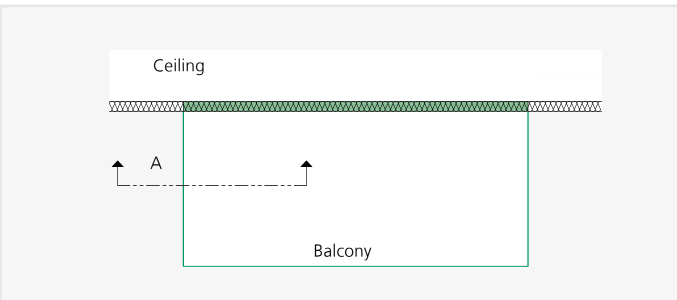
- Pos. 1 connection reinforcement for the ISOPRO® unit – p. 36
- Pos. 2 spacing bar 2 Ø 8 balcony side
- Pos. 3 structural edging parallel to the ISOPRO® A-IP unit in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)

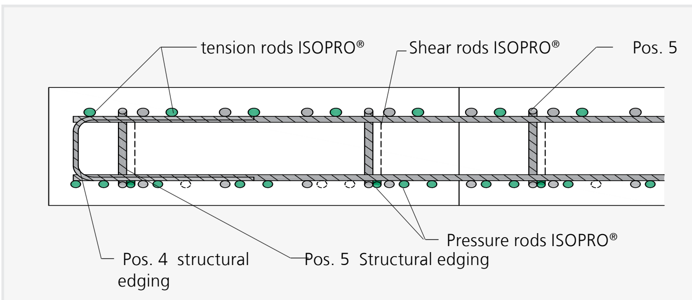
INDIRECT SUPPORT



- Pos. 1 connection reinforcement for the ISOPRO® unit – p. 36
- Pos. 2 spacing bar 2 x 2 Ø 8 balcony and ceiling side
- Pos. 3 structural edging parallel to the ISOPRO® A-IP unit in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)
- Pos. 5 Edging or supplementary stirrup - S. 36

EDGING STIRRUP AT THE FREE BALCONY EDGE





ISOPRO® A-IPT – section A-A

SUPPLEMENTARY REINFORCEMENT

CONNECTION REINFORCEMENT POS. 1 FOR B500B*

ISOPRO® A-IP 10 TO A-IP 100 AND A-IPT 120 TO A-IPT 160

ISOPRO®	$a_{s,erf}$ [cm²/m]	Suggestion B500B [pc./m]
A-IP 10	2,01	4 Ø 8
A-IP 15	3,02	6 Ø 8
A-IP 20	4,02	8 Ø 8
A-IP 30	5,03	10 Ø 8
A-IP 40	6,04	12 Ø 8
A-IP 50	7,05	14 Ø 8
A-IP 60	7,85	10 Ø 10
A-IP 70	8,66	11 Ø 10
A-IP 75	9,41	12 Ø 10
A-IP 80	10,27	14 Ø 10
A-IP 85	11,30	10 Ø 12
A-IP 90	13,58	12 Ø 12
A-IP 100	14,52	13 Ø 12
A-IPT 120	16,27	11 Ø 14
A-IPT 150	18,30	12 Ø 14
A-IPT 160	22,02	12 Ø 16

* For connection reinforcement B550B the reinforcement quantity can be reduced by factor 0,91.
For connection reinforcement B450C the reinforcement quantity has to be increased by 1,12.

EDGE/SUPPLEMENTARY STIRRUPS FOR INDIRECT SUPPORT POS. 5

ISOPRO® A-IP 10 TO A-IP 100 AND A-IPT 120 TO A-IPT 160

Shearing force load-bearing capacity	ISOPRO®			
	A-IP 10 to A-IP 100	A-IPT 120	A-IPT 150	A-IPT 160
	$a_{s,erf}$ [cm²/m]	$a_{s,erf}$ [cm²/m]	$a_{s,erf}$ [cm²/m]	$a_{s,erf}$ [cm²/m]
Standard	1,42	-	-	-
Q8	2,13	-	-	-
Q10	3,33	2,22	2,22	2,22
Q12	4,79	3,19	3,19	4,79
Q14	-	4,79	4,35	6,53
Q8X	1,42	-	-	-
Q10X	2,22	-	-	-
Q12X	3,19	3,19	-	-

DESIGN EXAMPLE

System:

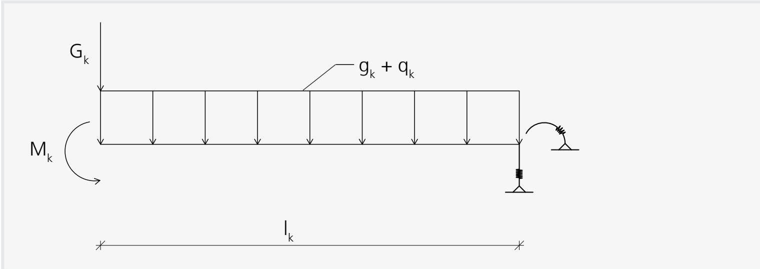
Cantilever arm

Length of cantilever l_k = 2,0 m

Slab thickness balcony = 180 mm

Concrete cover cv35

Concrete class C25/30 balcony and ceiling



Load assumptions:

Dead load g_k = 4,50 kN/m²

Superimposed load g_k = 1,50 kN/m²

Live load q_k = 4,00 kN/m²

Edge load/railing G_k = 1,50 kN/m

Edge moment M_k = 0,00 kNm/m

Resultant forces:

$m_{Ed} = (g_k \cdot 1{,}35 + q_k \cdot 1{,}5) \cdot l_k^2 /2 + (G_k \cdot 1{,}35) \cdot l_K$

$v_{Ed} = (g_k \cdot 1{,}35 + q_k \cdot 1{,}5) \cdot l_k + (G_k \cdot 1{,}35)$

$m_{Ed} = (6{,}00 \cdot 1{,}35 + 4{,}00 \cdot 1{,}5) \cdot 2{,}00^2 /2 + (1{,}5 \cdot 1{,}35) \cdot 2{,}00 = \underline{32{,}25 \text{ kNm/m}}$

$v_{Ed} = (6{,}00 \cdot 1{,}35 + 4{,}00 \cdot 1{,}5) \cdot 2{,}00 + (1{,}5 \cdot 1{,}35) = \underline{30{,}23 \text{ kN/m}}$

Design:

Chosen: A-IP 50, cv30, h = 180 mm $m_{Rd} = 36{,}10$ kNm/m ≥ 32,25 kNm/m (see page 26)

$v_{Rd} = 61{,}80$ kN/m ≥ 30,23 kN/m

Deflection due to thermal insulation unit:

Quasi-permanent load-combination $\Psi_2 = 0{,}30$, $\gamma_G = 1{,}00$, $\gamma_Q = 1{,}00$

$m_{Ed,perm} = m_{gk} + m_{qk} \cdot \Psi_2$

$m_{Ed,perm} = (g_k + q_k \cdot \Psi_2) \cdot l_k^2 /2 + G_k \cdot l_K$

$m_{Ed,perm} = (6{,}00 + 4{,}00 \cdot 0{,}3) \cdot 2{,}00^2 /2 + 1{,}50 \cdot 2{,}00 = \underline{17{,}40 \text{ kNm/m}}$

$w_1 = \tan \alpha \cdot (m_{Ed,perm}/m_{Rd}) \cdot l_k \cdot 10$

$\tan \alpha = 0{,}7$ (s. Seite 30)

$w_1 = 0{,}7 \cdot (17{,}40 / 36{,}80) \cdot 2{,}00 \cdot 10 = \underline{6{,}47 \text{ mm } (\sim 7{,}00 \text{ mm})}$*

*) w_1 = deflection due to thermal insulation unit. Factor w_2 due to slab deflection has to be added to w_1 by the structural designer. w_2 is in general much smaller than the deflection from the thermal insulation units.

(Rough rule of thumb: $w_2 \sim 0{,}25 \cdot w_1$)

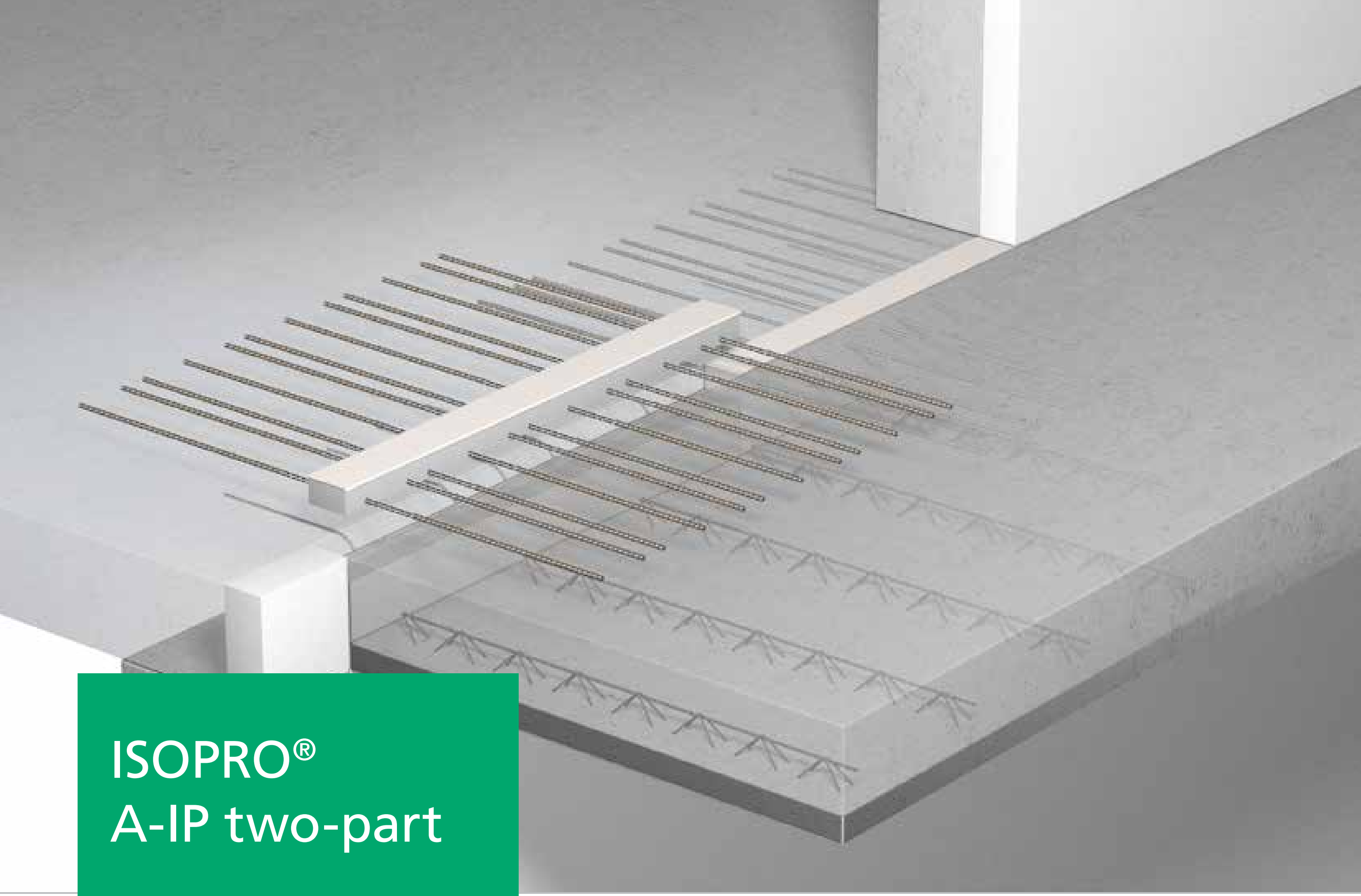
Camber:

Case 1) Dewatering towards end of cantilever

chosen: camber 7,00 mm **(rounded off)**

Case 2) Dewatering toward building **(rounded up)**

chosen: camber 10,00 mm



ISOPRO®
A-IP two-part

UNITS FOR CANTILEVERED BALCONIES WITH PREFAB SLABS

ISOPRO® A-IP TWO-PART

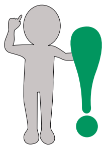
- Two-part units for installing the bottom section in element slabs in the prefabricated parts factory and fitting the upper section on the construction site
- For transferring negative moments and positive shearing forces
- Pressure plane with concrete compression bearings
- Load-bearing capacities A-IP 10 two-part to A-IP 100 two-part
- Shearing force load-bearing capacities standard, Q8, Q10, Q12, Q8X, Q10X, Q12X
- Concrete covering of tension rods cv30, cv35 or cv50
- Unit heights depending on shear force load-bearing capacity starting from h_{min} = 160 mm
- Fire resistance classes see p. 20

TYPE DESIGNATION

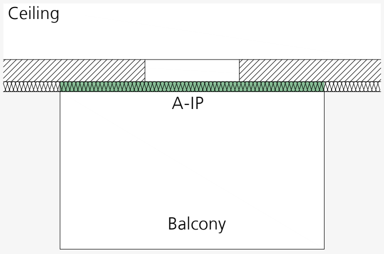
A-IP 60 Q8 cv35 h200 REI120 two-part

- two-part design
- fire protection version
- Unit height
- Concrete covering
- Shearing force load-bearing capacity
- Type and load-bearing capacity

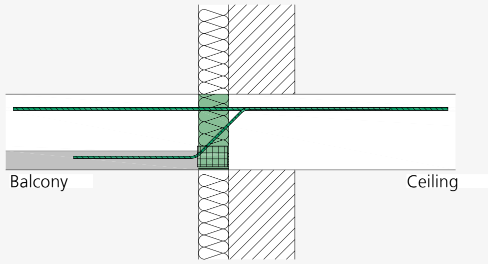
APPLICATION – UNIT STRUCTURE



This chapter provides planning aids and specific information about this product. In addition, the general information on materials, design, building physics, installation on site, etc. on pages 10 - 23 has also to be considered.

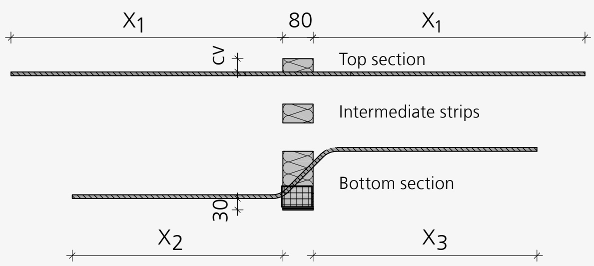


ISOPRO® A-IP two-part – Cantilevered balcony



ISOPRO® A-IP two-part – Installation cross-section thermal insulation composite system

UNIT STRUCTURE ISOPRO® A-IP 10 TWO-PART TO A-IP 100 TWO-PART



Length tension rod [mm]	A-IP10 - A-IP50	A-IP60- A-IP80	A-IP85- A-IP100
X_1	580	720	840

Length Shear rod [mm]	Shear force load-bearing capacity			
	Standard	Q8	Q10	Q12
X_2	330	450	560	670
X_3	≤ 475	≤ 530	≤ 640	≤ 745
h_{min}	160	160	170	180

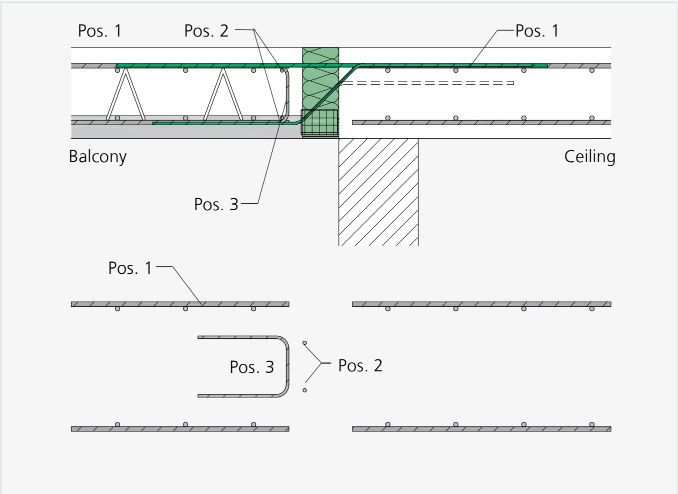
DESIGN AND UNIT STRUCTURE OF THE TWO-PART UNITS

- Design, unit structure and assignment of the units is identical to the corresponding one-part units – p. 26 to 28
- Design of the insulating body comprising a bottom section and a top section.
- Prefabricated parts factories have the option of ordering units in most current heights and doubling them as needed to create additional heights by adding intermediate strips. The shear rod is designed for the basic height and is not raised into the tension plane of the unit.
- Camber, bending slenderness and maximum permissible distance between expansion joints – p. 30 to 31.

SUPPLEMENTARY REINFORCEMENT

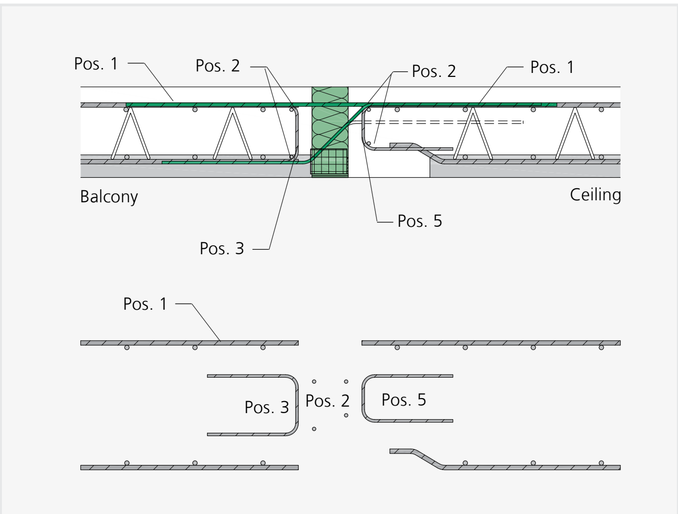
ISOPRO® A-IP 10 TWO-PART TO A-IP 100 TWO-PART

DIRECT SUPPORT



- Pos. 1 connection reinforcement for the ISOPRO® unit – p. 36
- Pos. 2 spacing bar 2 Ø 8 balcony side
- Pos. 3 structural edging parallel to the ISOPRO® A-IP unit in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)

INDIRECT SUPPORT



- Pos. 1 connection reinforcement for the ISOPRO® unit – p. 36
- Pos. 2 spacing bar 2 x 2 Ø 8 balcony side
- Pos. 3 structural edging parallel to the ISOPRO® A-IP unit in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)
- Pos. 5 Edging or supplementary stirrup - S. 36

SUPPLEMENTARY REINFORCEMENT

ISOPRO® A-IP 10 TWO-PART TO A-IP 100 2-PART

CONNECTION REINFORCEMENT POS. 1

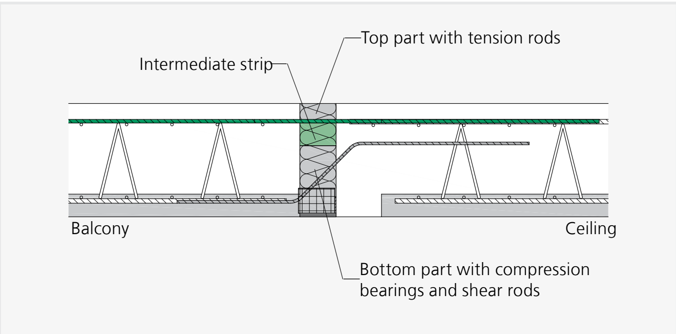
ISOPRO®	$a_{s,erf}$ [cm²/m]	Suggestion B500B [pc./m]
A-IP 10	2,01	4 Ø 8
A-IP 15	3,02	6 Ø 8
A-IP 20	4,02	8 Ø 8
A-IP 30	5,03	10 Ø 8
A-IP 40	6,04	12 Ø 8
A-IP 50	7,05	14 Ø 8
A-IP 60	7,85	10 Ø 10
A-IP 70	8,66	11 Ø 10
A-IP 75	9,41	12 Ø 10
A-IP 80	10,27	14 Ø 10
A-IP 85	11,30	10 Ø 12
A-IP 90	13,58	12 Ø 12
A-IP 100	14,52	13 Ø 12

EDGE / SUPPLEMENTARY REINFORCEMENT POS. 5 FOR B500B*

Shear force load-bearing capacity	ISOPRO®	
	A-IP 10 to A-IP 100	
	$a_{s,erf}$ [cm²/m]	Suggestion
Standard	1,42	4 Ø 8
Q8	2,13	6 Ø 8
Q10	3,33	6 Ø 10
Q12	4,78	6 Ø 10
Q8X	1,42	4 Ø 8
Q10X	2,22	6 Ø 8
Q12X	3,19	6 Ø 10

* For connection reinforcement B550B the reinforcement quantity can be reduced by factor 0,91.
For connection reinforcement B450C the reinforcement quantity has to be increased by 1,12.

INSTALLATION OF TOP SECTION



- The two-part ISOPRO® unit consists of a top section and a bottom section. The bottom section is concreted into the element slab in the prefabricated parts factory.
- The top section is installed on the construction site.
- The top section and bottom section are labelled so that they can be combined correctly. Please make sure you use the right combination on the construction site.
- When fitting the top section, ensure the correct direction of installation is observed.
- Without the top section, the load-bearing capacity of the connection is not guaranteed.

ISOPRO®
A-IP Variants

UNITS FOR CANTILEVERED BALCONIES

ISOPRO® A-IP VAR.

- For transferring negative moments and positive shearing forces
- Pressure plane with concrete compression bearings
- Load-bearing capacities A-IP 15 to A-IP 85, shear force load-bearing capacities standard and Q8
- Concrete covering of tension rods cv30, cv35 or cv50
- Unit heights depending on shear force load-bearing capacity starting from h_{min} = 160 mm
- Fire resistance classes see page 20

CONNECTION GEOMETRY

- Var. I – Connection to a wall, downwards
- Var. II – Connection to a wall, upwards
- Var. III HV – Connection to a ceiling vertically offset upwards
- Var. III UV – Connection to a ceiling vertically offset downwards

TYPE DESIGNATION

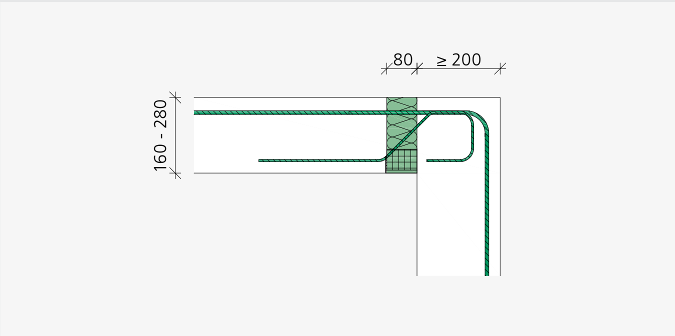
A-IP 60 Q8 cv35 h200 Var. I REI120

- REI120 – Fire protection version
- Var. I – Variant version
- h200 – Unit height
- cv35 – Concrete covering
- Q8 – Shearing force load-bearing capacity
- A-IP 60 – Type and load-bearing capacity

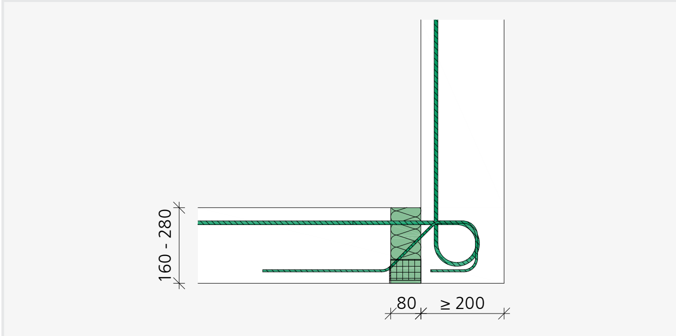
APPLICATION

CONNECTION TO A WALL

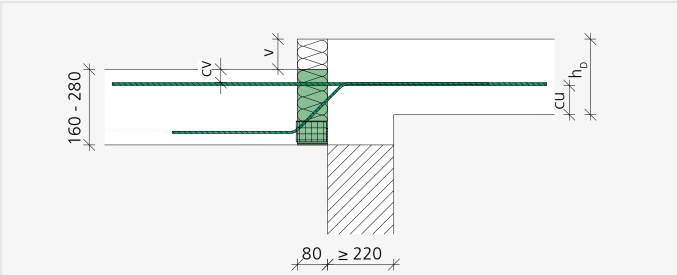
WALL CONNECTION DOWNWARDS – A-IP VAR. I



WALL CONNECTION UPWARDS – A-IP VAR. II



CONNECTION TO A SLIGHTLY VERTICALLY OFFSET CEILING WITH A STANDARD A-IP UNIT



$v \leq h_D - cv - d_s - cu$

with

v – Height offset

h_D – Ceiling thickness

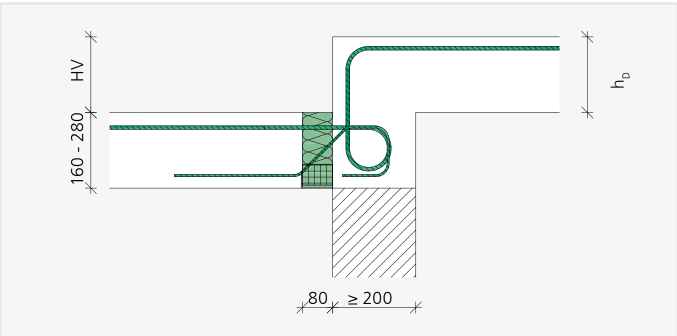
cv – Concrete covering of tension rods of the ISOPRO® unit

d_s – Diameter of the tension rods of the ISOPRO® unit

cu – oncrete covering of the tension rods of the ISOPRO® unit at the bottom edge of ceiling

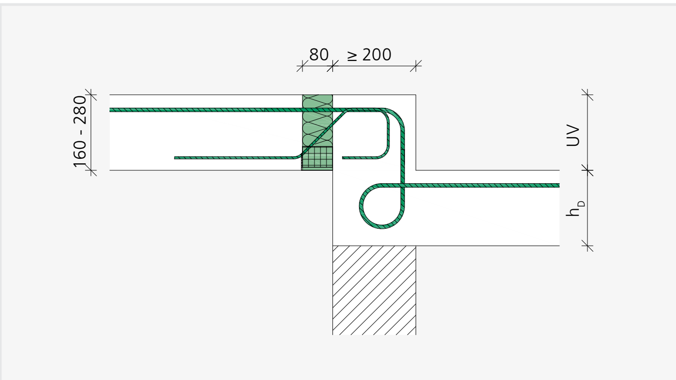
CONNECTION TO CEILINGS WITH AN OFFSET OF 90 TO 240 MM

HIGHER CEILINGS – A-IP VAR. III HV



Var. III HV	Height offset [mm]
HV 100	90 - 149
HV 150	150 - 199
HV 200	200 - 240

LOWER CEILINGS – A-IP VAR. III UV



Var. III UV	Height offset [mm]	Var. III UV	Height offset [mm]
UV 80	≤ 80	UV 150	141 to ≤ 150
UV 90	81 to ≤ 90	UV 160	151 to ≤ 160
UV 100	91 to ≤ 100	UV 170	161 to ≤ 170
UV 110	101 to ≤ 110	UV 180	171 to ≤ 180
UV 120	111 to ≤ 120	UV 190	181 to ≤ 190
UV 130	121 to ≤ 130	UV 200	191 to ≤ 200
UV 140	131 to ≤ 140		

DESIGN TABLE FOR CONCRETE ≥ C25/30

DESIGN VALUES OF ALLOWABLE MOMENTS m_{Rd} [kNm/m]

Unit height [mm] depending on cv [mm]			ISOPRO®					
30	35	50	A-IP 15 Var.	A-IP 20 Var.	A-IP 30 Var.	A-IP 40 Var.	A-IP 50 Var.	A-IP 55 Var.
–	160	–	12,6	15,7	18,8	22,0	25,1	28,3
160	–	180	13,2	16,6	19,9	23,2	26,5	29,8
–	170	–	13,9	17,4	20,9	24,4	27,9	31,3
170	–	190	14,6	18,3	21,9	25,6	29,2	32,9
–	180	–	15,3	19,1	22,9	26,8	30,6	34,4
180	–	200	16,0	20,0	24,0	28,0	32,0	36,0
–	190	–	16,7	20,8	25,0	29,2	33,3	37,5
190	–	210	17,3	21,7	26,0	30,4	34,7	39,0
–	200	–	18,0	22,5	27,0	31,6	36,1	40,6
200	–	220	18,7	23,4	28,1	32,7	37,4	42,1
–	210	–	19,4	24,2	29,1	33,9	38,8	43,6
210	–	230	20,1	25,1	30,1	35,1	40,2	45,2
–	220	–	20,8	26,0	31,1	36,3	41,5	46,7
220	–	240	21,4	26,8	32,2	37,5	42,9	48,3
–	230	–	22,1	27,7	33,2	38,7	44,3	49,8
230	–	250	22,8	28,5	34,2	39,9	45,6	51,3
–	240	–	23,5	29,4	35,2	41,1	47,0	52,9
240	–	260	24,2	30,2	36,3	42,3	48,4	54,4
–	250	–	24,9	31,1	37,3	43,5	49,7	55,9
250	–	270	25,5	31,9	38,3	44,7	51,1	57,5
–	260	–	26,2	32,8	39,3	45,9	52,5	59,0
260	–	280	26,9	33,6	40,4	47,1	53,8	60,5
–	270	–	27,6	34,5	41,4	48,3	55,2	62,1
270	–	–	28,3	35,3	42,4	49,5	56,5	63,6
–	280	–	29,0	36,2	43,4	50,7	57,9	65,2
280	–	–	29,6	37,1	44,5	51,9	59,3	66,7

DESIGN VALUES OF ALLOWABLE SHEARING FORCES v_{Rd} [kN/m]

Shear force	h_{min} [mm]	A-IP 15 Var.	A-IP 20 Var.	A-IP 30 Var.	A-IP 40 Var.	A-IP 50 Var.	A-IP 55 Var.
Standard	160	43,5	43,5	43,5	43,5	43,5	43,5
Q8	160	89,6	89,6	89,6	89,6	89,6	89,6

DIMENSIONS AND ASSIGNMENT

ISOPRO®	A-IP 15 Var.	A-IP 20 Var.	A-IP 30 Var.	A-IP 40 Var.	A-IP 50 Var.	A-IP 55 Var.
Unit length [mm]	1,000					
Tension rods	4 Ø 10	5 Ø 10	6 Ø 10	7 Ø 10	8 Ø 10	9 Ø 10
Compression bearings	4	4	4	4	4	6
Shear rods standard	5 Ø 6	5 Ø 6	5 Ø 6	5 Ø 6	5 Ø 6	5 Ø 6
Shear rods Q8	6 Ø 8	6 Ø 8	6 Ø 8	6 Ø 8	6 Ø 8	6 Ø 8

DESIGN TABLE FOR CONCRETE ≥ C25/30

DESIGN VALUES OF ALLOWABLE MOMENTS m_{Rd} [kNm/m]

Unit height [mm] depending on cv [mm]			ISOPRO®				
30	35	50	A-IP 60 Var.	A-IP 70 Var.	A-IP 75 Var.	A-IP 80 Var.	A-IP 85 Var.
–	160	–	31,4	34,6	37,7	40,8	44,0
160	–	180	33,1	36,4	39,7	43,1	46,4
–	170	–	34,8	38,3	41,8	45,3	48,8
170	–	190	36,5	40,2	43,8	47,5	51,2
–	180	–	38,2	42,1	45,9	49,7	53,5
180	–	200	40,0	43,9	47,9	51,9	55,9
–	190	–	41,7	45,8	50,0	54,2	58,3
190	–	210	43,4	47,7	52,0	56,4	60,7
–	200	–	45,1	49,6	54,1	58,6	63,1
200	–	220	46,8	51,5	56,1	60,8	65,5
–	210	–	48,5	53,3	58,2	63,0	67,9
210	–	230	50,2	55,2	60,2	65,3	70,3
–	220	–	51,9	57,1	62,3	67,5	72,7
220	–	240	53,6	59,0	64,3	69,7	75,1
–	230	–	55,3	60,9	66,4	71,9	77,4
230	–	250	57,0	62,7	68,4	74,1	79,8
–	240	–	58,7	64,6	70,5	76,4	82,2
240	–	260	60,4	66,5	72,5	78,6	84,6
–	250	–	62,1	68,4	74,6	80,8	87,0
250	–	270	63,9	70,2	76,6	83,0	89,4
–	260	–	65,6	72,1	78,7	85,2	91,8
260	–	280	67,3	74,0	80,7	87,5	94,2
–	270	–	69,0	75,9	82,8	89,7	96,6
270	–	–	70,7	77,8	84,8	91,9	99,0
–	280	–	72,4	79,6	86,9	94,1	101,4
280	–	–	74,1	81,5	88,9	96,3	103,7

DESIGN VALUES OF ALLOWABLE SHEARING FORCES v_{Rd} [kN/m]

Shear force	h_{min} [mm]	A-IP 60 Var.	A-IP 70 Var.	A-IP 75 Var.	A-IP 80 Var.	A-IP 85 Var.
Standard	160	52,2	52,2	52,2	52,2	52,2
Q8	160	89,6	89,6	89,6	89,6	89,6

DIMENSIONS AND ASSIGNMENT

ISOPRO®	A-IP 60 Var.	A-IP 70 Var.	A-IP 75 Var.	A-IP 80 Var.	A-IP 85 Var.
Unit length [mm]	1,000				
Tension rods	10 Ø 10	11 Ø 10	12 Ø 10	13 Ø 10	14 Ø 10
Compression bearings	6	6	6	8	8
Shear rods standard	6 Ø 6	6 Ø 6	6 Ø 6	6 Ø 6	6 Ø 6
Shear rods Q8	6 Ø 8	6 Ø 8	6 Ø 8	6 Ø 8	6 Ø 8

DEFLECTION AND CAMBER

DEFLECTION

During their construction, cantilevered reinforced concrete structures are elevated to take into account the anticipated deflection. If these structures are thermally separated with ISOPRO® units, when calculating the camber, the deflection due to the ISOPRO® unit itself is superimposed with the deflection due to flexion of the slab in accordance with EN 1992-1-1/NA. It must be ensured that the required camber is rounded up or down, according to the planned drainage direction. If a drainage system is installed at the building façade, the value must be rounded up, but for drainage at the end of the cantilever arm, it must be rounded down. We recommend providing proof of suitability for use in the serviceability limit state for the quasi-continuous load combination ($\gamma_G = 1{,}0$, $\gamma_Q = 1{,}0$, $\psi_2 = 0{,}3$). The tables below show the deflection factors tan α for calculating the deflection due to ISOPRO®.

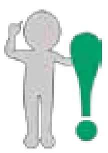
DEFLECTION DUE TO THE ISOPRO® CANTILEVER SLAB CONNECTION

$$w = \tan\alpha \cdot (m_{Ed}/m_{Rd}) \cdot l_k \cdot 10$$

With
w = Deflection at the end of the cantilever arm [mm]
tan α = Deflection factor, see below
m_{Ed} = Bending moment for determining the camber as a result of the ISOPRO® unit. The definitive load combination for the servicability limit state is determined by the structural engineer
m_{Rd} = Resistance moment of the ISOPRO® unit, see product section
l_k = System length [m]

DEFLECTION FACTOR TAN α FOR CONCRETE C 25/30

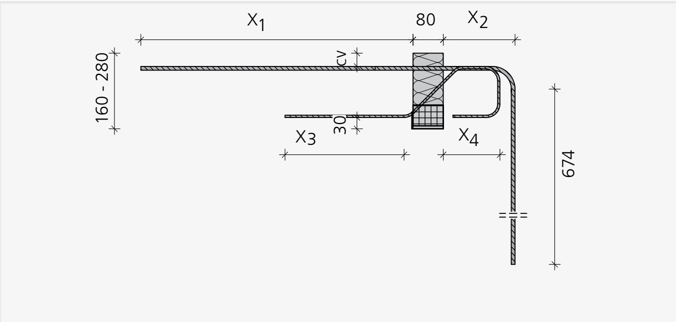
ISOPRO®	Concrete covering cv [mm]	Unit height h [mm]												
		160	170	180	190	200	210	220	230	240	250	260	270	280
A-IP 15 Var. to A-IP 85 Var.	30	0,66	0,60	0,55	0,50	0,47	0,44	0,41	0,38	0,36	0,34	0,33	0,31	0,30
	35	0,70	0,63	0,57	0,53	0,49	0,45	0,42	0,40	0,37	0,35	0,33	0,32	0,31
	50	–	–	0,66	0,60	0,55	0,50	0,47	0,44	0,41	0,38	0,36	0,34	0,33



This chapter provides planning aids and specific information about this product. In addition, the general information on materials, design, building physics, installation on site, etc. on pages 10 - 23 has also to be considered.

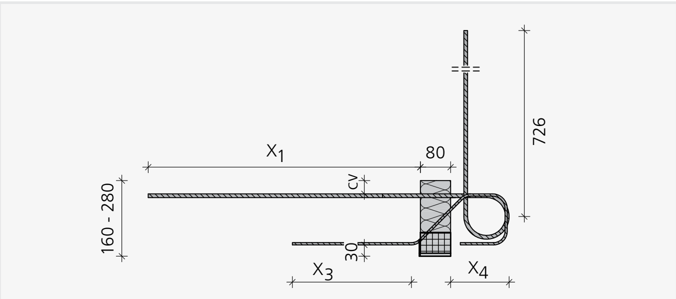
UNIT STRUCTURE

A-IP VAR. I



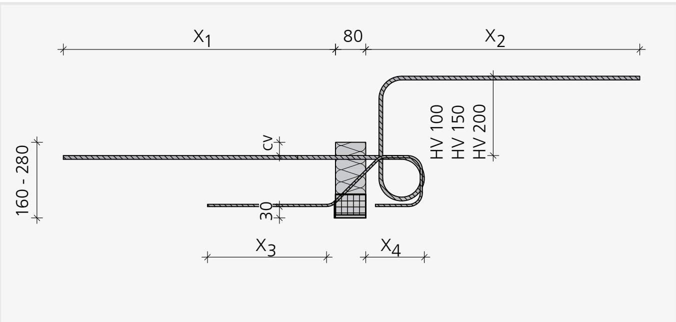
Tension rod [mm]	A-IP15 - A-IP85 Var.I	
X_1	760	
X_2	170	
Length shear rod [mm]	Shear force load-bearing capacity	
	Standard	Q8
X_3	340	450
X_4	150	≤ 170

A-IP VAR. II



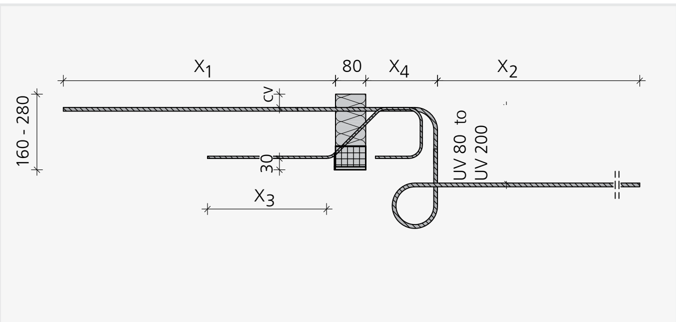
Tension rod [mm]	A-IP15 - A-IP85 Var.II	
X_1	760	
Length shear rod [mm]	Shear force load-bearing capacity	
	Standard	Q8
X_3	340	450
X_4	150	≤ 170

A-IP VAR. III HV



Tension rod [mm]	A-IP15 - A-IP85 Var.III HV	
X_1	760	
X_2	710	
Length shear rod [mm]	Shear force load-bearing capacity	
	Standard	Q8
X_3	340	450
X_4	150	≤ 170

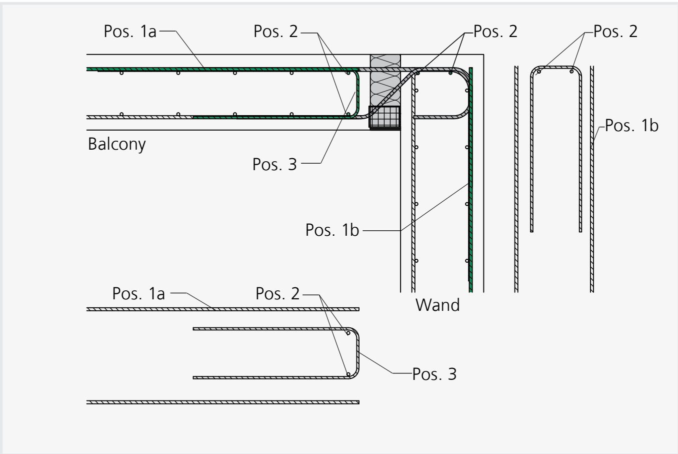
A-IP VAR. III UV



Tension rod [mm]	A-IP15 - A-IP85 Var.III UV	
X_1	760	
X_2	580	
Length shear rod [mm]	Shear force load-bearing capacity	
	Standard	Q8
X_3	340	450
X_4	150	≤ 170

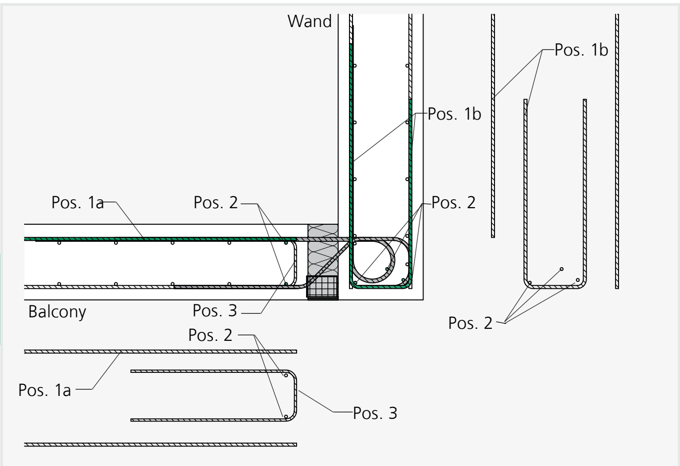
SUPPLEMENTARY REINFORCEMENT

CONNECTION TO A WALL, DOWNWARDS – A-IP VAR. I



- Pos. 1a connection reinforcement on the balcony for the ISOPRO® unit – see table
- Pos. 1b connection reinforcement for the ISOPRO® unit to bear the connection moment in the wall in accordance with the structural engineer's specifications
- Pos. 2 spacing bar 2 Ø 8 on the balcony, 2 Ø 8 in the wall
- Pos. 3 structural edging parallel to the ISOPRO® unit in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 4 (not shown here) slab and wall reinforcement in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- The ISOPRO® unit ideally is installed before the wall reinforcement is fitted.

CONNECTION TO A WALL, UPWARDS – A-IP VAR. II



- Pos. 1a connection reinforcement on the balcony for the ISOPRO® unit – see table
- Pos. 1b connection reinforcement for the ISOPRO® unit to bear connection moment and shear force in the wall in accordance with the structural engineer's specifications
- Pos. 2 spacing bar 2 Ø 8 on the balcony, 3 Ø 8 in the wall
- Pos. 3 structural edging parallel to the ISOPRO® unit in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 4 (not shown here) slab and wall reinforcement in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- The ISOPRO® unit ideally is installed before the wall reinforcement is fitted.

CONNECTION REINFORCEMENT (POS. 1A AND 1B) FOR B500B*

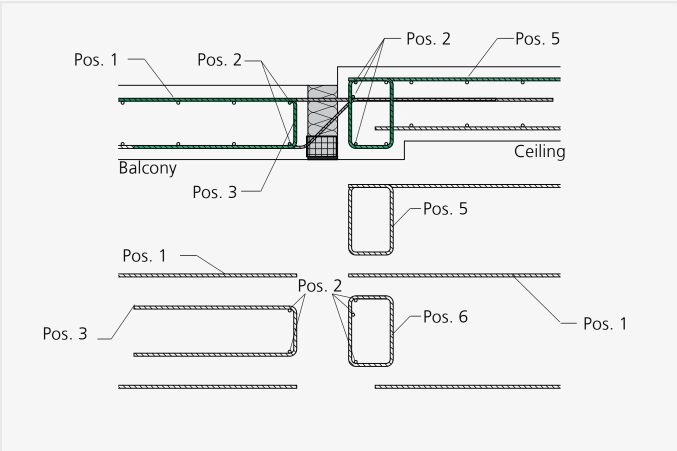
ISOPRO®	A-IP 15 Var.	A-IP 20 Var.	A-IP 30 Var.	A-IP 40 Var.	A-IP 50 Var.	A-IP 55 Var.
$a_{s,erf}$ [cm²/m]	3,14	3,93	4,71	5,50	6,28	7,07
Suggestion	4 Ø 10	5 Ø 10	6 Ø 10	7 Ø 10	8 Ø 10	9 Ø 10

ISOPRO®	A-IP 60 Var.	A-IP 70 Var.	A-IP 75 Var.	A-IP 80 Var.	A-IP 85 Var.
$a_{s,erf}$ [cm²/m]	7,85	8,64	9,42	10,21	11,00
Suggestion	10 Ø 10	11 Ø 10	12 Ø 10	13 Ø 10	14 Ø 10

* For connection reinforcement B550B the reinforcement quantity can be reduced by factor 0,91.
For connection reinforcement B450C the reinforcement quantity has to be increased by 1,12.

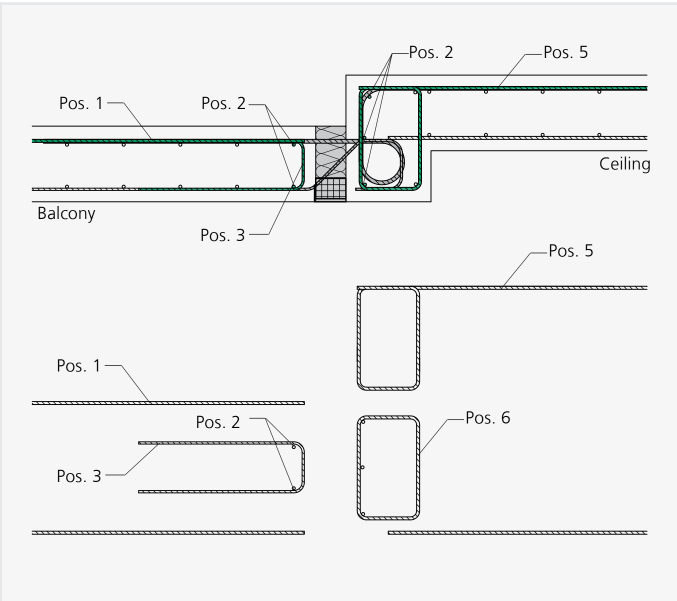
SUPPLEMENTARY REINFORCEMENT

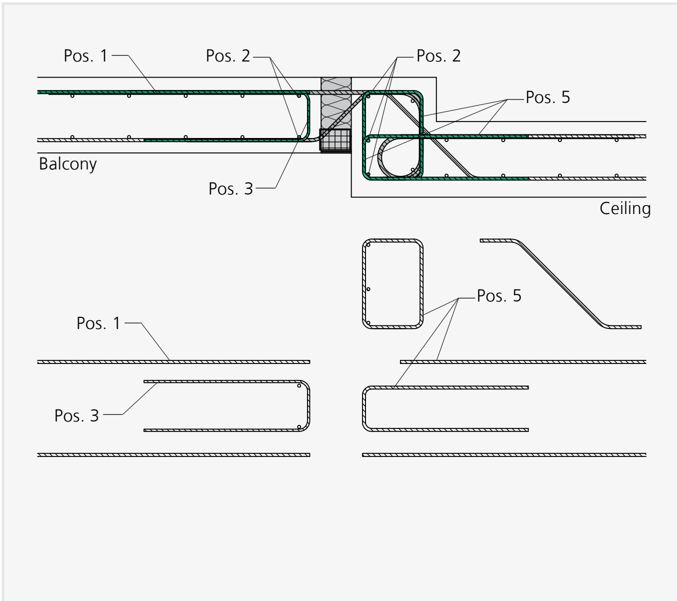
CONNECTION TO A SLIGHTLY VERTICALLY OFFSET CEILING WITH A STANDARD ISOPRO®



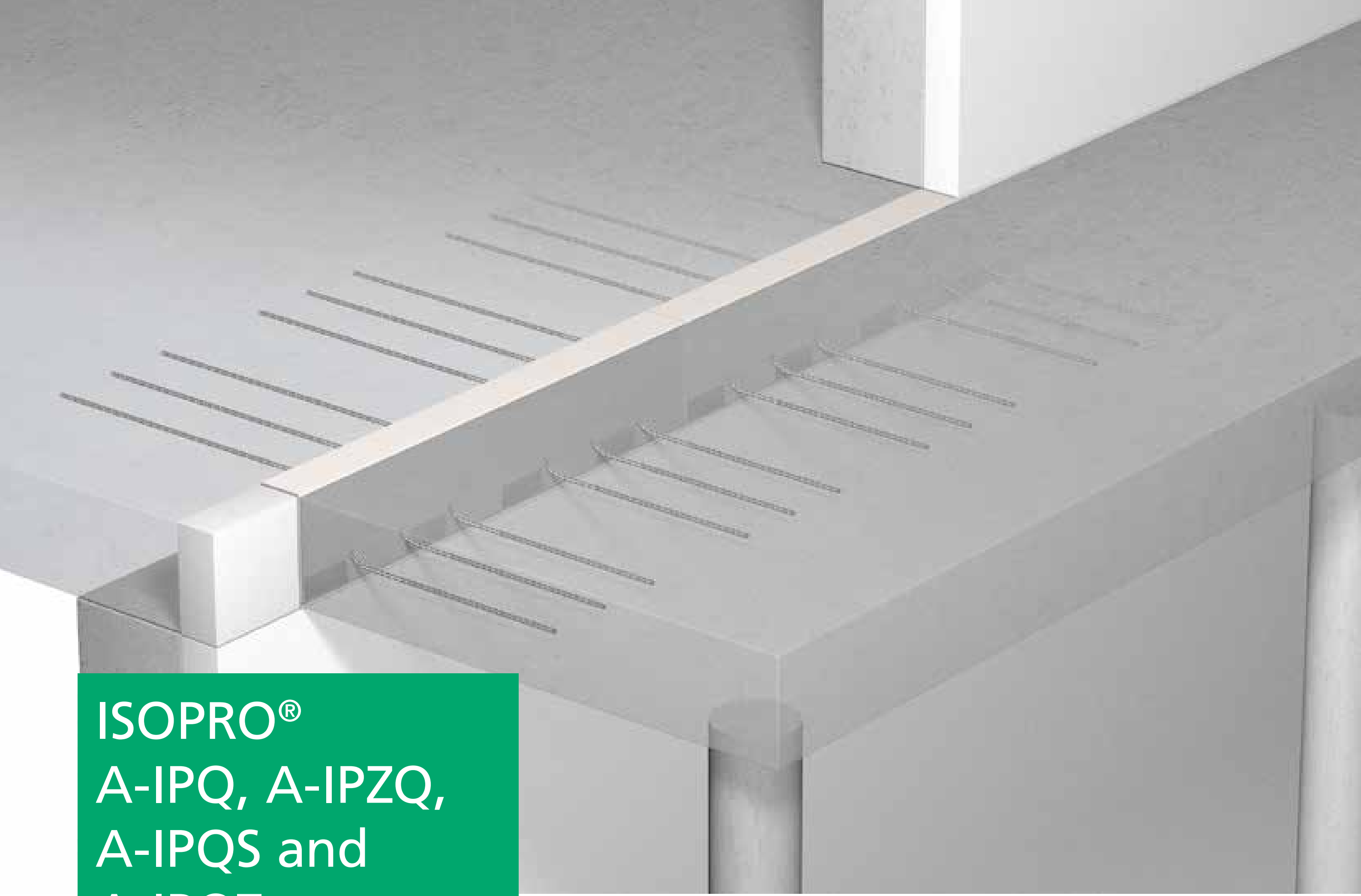
- Pos. 1 connection reinforcement for the ISOPRO® unit - p. 48
- Pos. 2 spacing bar 2 Ø 8 on the balcony, 3 Ø 8 on the ceiling
- Pos. 3 structural edging parallel to the ISOPRO® unit in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)
- Pos. 5 stirrup for deflecting the tensile force in the joist to the upper tensile reinforcement in accordance with the structural engineer's specifications. The overlap length with the tensile reinforcement must be guaranteed.
- Pos. 6 Shear reinforcement of the joist in accordance with the structural engineer's specifications.
- The ISOPRO® unit must be installed before the joist reinforcement is fitted.

CONNECTION TO VERTICALLY OFFSET CEILINGS – ISOPRO® IP VAR. III





- Pos. 1 connection reinforcement for the ISOPRO® unit - see table
- Pos. 2 spacing bar 2 Ø 8 on the balcony, 3 Ø 8 on the ceiling
- Pos. 3 structural edging parallel to the ISOPRO® unit in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)
- Pos. 5 stirrup for deflecting the tensile force in the joist to the upper tensile reinforcement in accordance with the structural engineer's specifications. The overlap length with the tensile reinforcement must be guaranteed.
- Pos. 6 Shear reinforcement of the joist in accordance with the structural engineer´s specifications.
- The ISOPRO® unit must be installed before the joist reinforcement is fitted.



ISOPRO® A-IPQ, A-IPZQ, A-IPQS and A-IPQZ

UNITS FOR SUPPORTED BALCONIES

ISOPRO® A-IPQ, A-IPZQ

- For transferring positive shearing forces
- Unit length 1.0 m
- ISOPRO® A-IPQ pressure plane with concrete compression bearings
- ISOPRO® A-IPZQ for constraint-free support without pressure components
- Unit heights depending on the load-bearing capacity starting from h_{min} = 160 mm
- Fire resistance classes see page 20

ISOPRO® A-IPQS, A-IPQZ

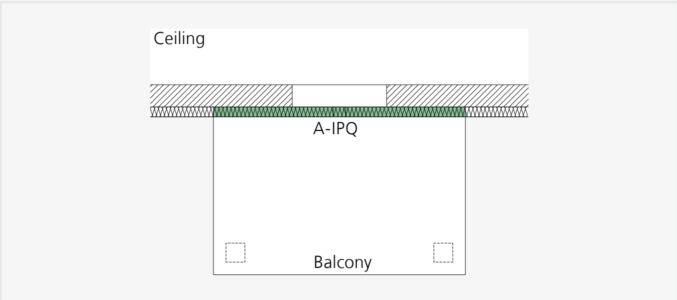
- Short units for load peaks at specific points
- Unit length depending on the load-bearing capacity 0.3 m, 0.4 m or 0.5 m
- ISOPRO® A-IPQS pressure plane with concrete compression bearings
- ISOPRO® A-IPQZ for constraint-free support without pressure components
- Unit heights depending on the load-bearing capacity starting from h_{min} = 160 mm
- Fire resistance classes see page 20

TYPE DESIGNATION

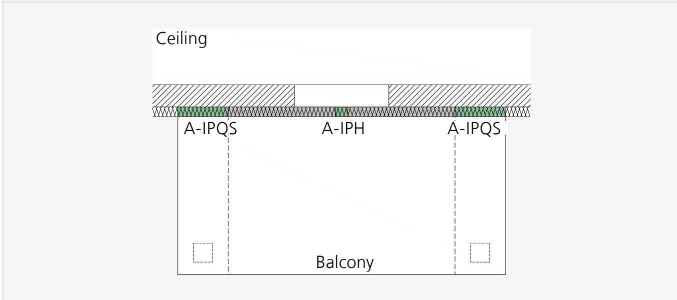
A-IPQ 20 h200 REI120

- REI120: Fire protection version
- h200: Unit height
- A-IPQ 20: Type and load-bearing capacity

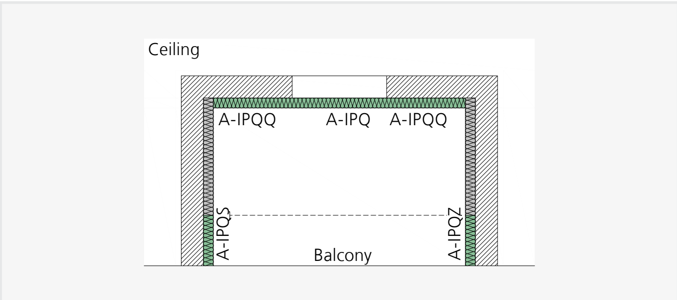
APPLICATION – UNIT ARRANGEMENT



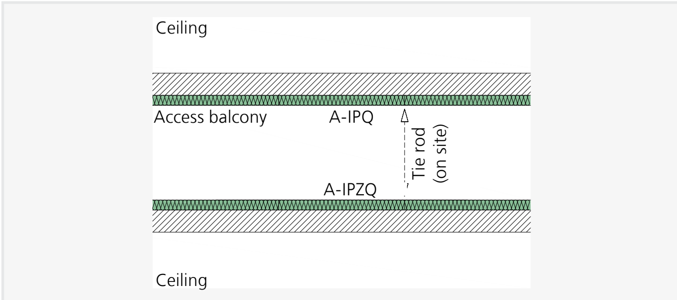
ISOPRO® A-IPQ – Supported balcony



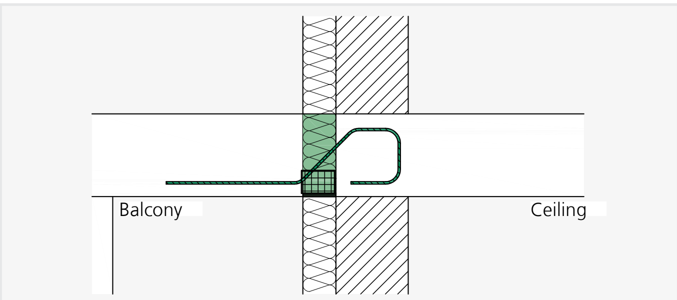
ISOPRO® A-IPQS – Supported balcony with beams and support at specific points with ISOPRO® A-IPQS units



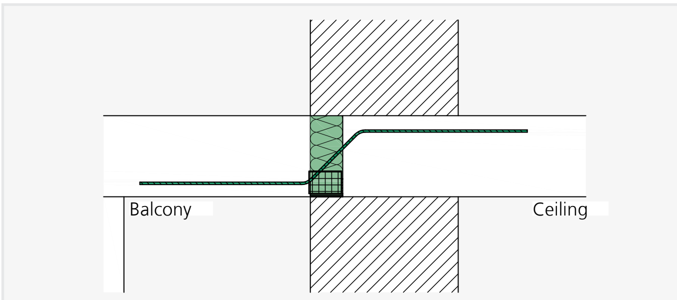
ISOPRO® A-IPQ, A-IPQQ, A-IPQS, A-IPQZ – Loggia balcony with load peaks at specific points and constraint-free support at the front



ISOPRO® A-IPQ, A-IPZQ – Access balcony with constraint-free support

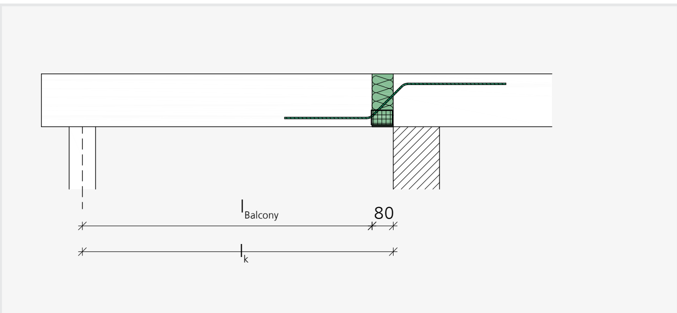


ISOPRO® A-IPQ, A-IPQS – Installation cross-section of thermal insulation composite system

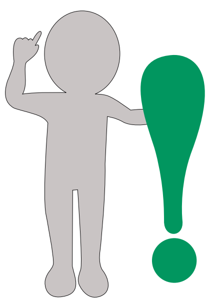


ISOPRO® A-IPQ, A-IPQS – Installation cross-section of single-leaf masonry

STATIC SYSTEM



ISOPRO® A-IPQ – Static system



For balconies connected with shear units, appropriate support must be provided in all construction conditions. Temporary supports may only be removed if the permanent supports, which may have been installed at a later date, are sufficiently strong and frictionally connected to the balcony.

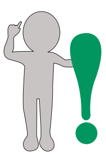
DESIGN TABLES

ISOPRO® A-IPQ – DESIGN VALUES OF ALLOWABLE SHEARING FORCE v_{RD} [kN/m]

ISOPRO®	Shear force v_{Rd} [kN/m]	Unit height [mm]	Unit length [mm]	Looped shear rod at ceiling	Shear rods	Compression bearings
A-IPQ 5	34,8	≥ 160	1000	x	4 Ø 6	4
A-IPQ 10	52,2	≥ 160	1000	x	6 Ø 6	4
A-IPQ 15	69,5	≥ 160	1000	x	8 Ø 6	4
A-IPQ 20	86,9	≥ 160	1000	x	10 Ø 6	4
A-IPQ 25	108,2	≥ 160	1000	–	7 Ø 8	4
A-IPQ 30	104,5	≥ 160	1000	x	7 Ø 8	4
A-IPQ 40	123,2	≥ 200	1000	x	4 Ø 12	4
A-IPQ 45	154,5	≥ 160	1000	–	10 Ø 8	4
A-IPQ 50	184,8	≥ 200	1000	x	6 Ø 12	4
A-IPQ 55	193,2	≥ 170	1000	–	8 Ø 10	4
A-IPQ 60	246,4	≥ 200	1000	x	8 Ø 12	4
A-IPQ 65	243,5	≥ 180	1000	–	7 Ø 12	5
A-IPQ 70	331,6	≥ 190	1000	–	7 Ø 14	6

ISOPRO® A-IPZQ – DESIGN VALUES OF ALLOWABLE SHEARING FORCE v_{RD} [kN/m]

ISOPRO®	Shear force v_{Rd} [kN/m]	Unit height [mm]	Unit length [mm]	Looped shear rod at ceiling	Shear rods	Compression bearings
A-IPZQ 5	34,8	≥ 160	1000	x	4 Ø 6	–
A-IPZQ 10	52,2	≥ 160	1000	x	6 Ø 6	–
A-IPZQ 15	69,5	≥ 160	1000	x	8 Ø 6	–
A-IPZQ 20	86,9	≥ 160	1000	x	10 Ø 6	–
A-IPZQ 25	108,2	≥ 160	1000	–	7 Ø 8	–
A-IPZQ 30	104,5	≥ 160	1000	x	7 Ø 8	–
A-IPZQ 40	123,2	≥ 200	1000	x	4 Ø 12	–
A-IPZQ 45	154,5	≥ 160	1000	–	10 Ø 8	–
A-IPZQ 50	184,8	≥ 200	1000	x	6 Ø 12	–
A-IPZQ 55	193,2	≥ 170	1000	–	8 Ø 10	–
A-IPZQ 60	246,4	≥ 200	1000	x	8 Ø 12	–
A-IPZQ 65	243,5	≥ 180	1000	–	7 Ø 12	–
A-IPZQ 70	331,6	≥ 190	1000	–	7 Ø 14	–



This chapter provides planning aids and specific information about this product. In addition, the general information on materials, design, building physics, installation on site, etc. on pages 10 - 23 has also to be considered.

DESIGN TABLES

ISOPRO® A-IPQS – DESIGN VALUES OF ALLOWABLE SHEARING FORCE V_{RD} [kN]

ISOPRO®	Shear force V_{Rd} [kN]	Unit height [mm]	Unit length [mm]	Looped shear rod at ceiling	Shear rods	Compression bearings
A-IPQS 5	17,4	≥ 160	300	x	2 Ø 6	1
A-IPQS 10	29,9	≥ 160	300	x	2 Ø 8	1
A-IPQS 15	30,9	≥ 160	300	–	2 Ø 8	1
A-IPQS 20	44,9	≥ 160	400	x	3 Ø 8	2
A-IPQS 25	46,4	≥ 160	400	–	3 Ø 8	2
A-IPQS 30	58,4	≥ 160	500	x	4 Ø 8	2
A-IPQS 35	61,8	≥ 160	500	–	4 Ø 8	2
A-IPQS 40	61,6	≥ 200	300	x	2 Ø 12	1
A-IPQS 45	69,6	≥ 180	300	–	2 Ø 12	1
A-IPQS 50	92,4	≥ 200	400	x	3 Ø 12	2
A-IPQS 55	104,3	≥ 180	400	–	3 Ø 12	2
A-IPQS 60	123,2	≥ 200	500	x	4 Ø 12	2
A-IPQS 65	139,1	≥ 180	500	–	4 Ø 12	3
A-IPQS 80	142,0	≥ 190	400	–	3 Ø 14	2
A-IPQS 90	189,4	≥ 190	500	–	4 Ø 14	3

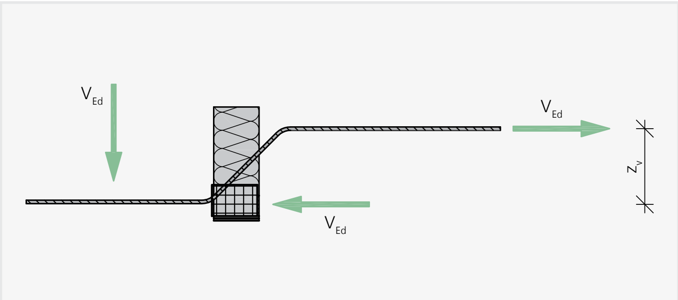
ISOPRO® A-IPQZ – DESIGN VALUES OF ALLOWABLE SHEARING FORCE V_{RD} [kN]

ISOPRO®	Shear force V_{Rd} [kN]	Unit height [mm]	Unit length [mm]	Looped shear rod at ceiling	Shear rods	Compression bearings
A-IPQZ 5	17,4	≥ 160	300	x	2 Ø 6	–
A-IPQZ 10	29,9	≥ 160	300	x	2 Ø 8	–
A-IPQZ 15	30,9	≥ 160	300	–	2 Ø 8	–
A-IPQZ 20	44,9	≥ 160	400	x	3 Ø 8	–
A-IPQZ 25	46,4	≥ 160	400	–	3 Ø 8	–
A-IPQZ 30	58,4	≥ 160	500	x	4 Ø 8	–
A-IPQZ 35	61,8	≥ 160	500	–	4 Ø 8	–
A-IPQZ 40	61,6	≥ 200	300	x	2 Ø 12	–
A-IPQZ 45	69,6	≥ 180	300	–	2 Ø 12	–
A-IPQZ 50	92,4	≥ 200	400	x	3 Ø 12	–
A-IPQZ 55	104,3	≥ 180	400	–	3 Ø 12	–
A-IPQZ 60	123,2	≥ 200	500	x	4 Ø 12	–
A-IPQZ 65	139,1	≥ 180	500	–	4 Ø 12	–
A-IPQZ 80	142,0	≥ 190	400	–	3 Ø 14	–
A-IPQZ 90	189,4	≥ 190	500	–	4 Ø 14	–

DESIGN

MOMENTS RESULTING FROM ECCENTRIC CONNECTIONS

When designing the connection reinforcement on the ceiling for shear units, a moment resulting from eccentric connections must also be considered. This moment is to be superimposed on the moments resulting from the planned loads if the moments are both positive or both negative. The moment is calculated Δ M_{Ed} on the basis of the assumption that the units are fully utilised.



ISOPRO® A-IPQ, A-IPQS – Units with concrete compression bearings
z_v – Lever arm for determining the offset moment

$$\Delta M_{Ed} = V_{Ed} \cdot z_v$$

OFFSET MOMENTS A-IPQ, A-IPZQ

ISOPRO®	Δm_{Ed} [kNm/m]	
	h < 200 mm	h ≥ 200 mm
A-IPQ/A-IPZQ 5	3,3	4,7
A-IPQ/A-IPZQ 10	4,9	7,0
A-IPQ/A-IPZQ 15	6,5	9,3
A-IPQ/A-IPZQ 20	8,2	11,6
A-IPQ/A-IPZQ 25	10,1	14,4
A-IPQ/A-IPZQ 30	9,7	13,9
A-IPQ/A-IPZQ 40	–	16,1
A-IPQ/A-IPZQ 45	14,4	20,5
A-IPQ/A-IPZQ 50	–	24,2
A-IPQ/A-IPZQ 55	17,8	25,5
A-IPQ/A-IPZQ 60	–	32,3
A-IPQ/A-IPZQ 65	21,9	31,9
A-IPQ/A-IPZQ 70	29,8	43,1

OFFSET MOMENTS A-IPQS, A-IPQZ

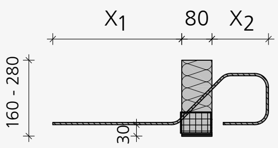
ISOPRO®	ΔM_{Ed} [kNm]	
	h < 200 mm	h ≥ 200 mm
A-IPQS/A-IPQZ 5	1,7	2,4
A-IPQS/A-IPQZ 10	2,8	4,0
A-IPQS/A-IPQZ 15	2,9	4,1
A-IPQS/A-IPQZ 20	4,2	6,0
A-IPQS/A-IPQZ 25	4,3	6,1
A-IPQS/A-IPQZ 30	5,5	7,9
A-IPQS/A-IPQZ 35	5,6	8,0
A-IPQS/A-IPQZ 40	–	8,1
A-IPQS/A-IPQZ 45	6,6	9,4
A-IPQS/A-IPQZ 50	–	12,1
A-IPQS/A-IPQZ 55	9,5	13,7
A-IPQS/A-IPQZ 60	–	16,1
A-IPQS/A-IPQZ 65	12,6	18,2
A-IPQS/A-IPQZ 80	12,8	18,5
A-IPQS/A-IPQZ 90	17,0	24,6

MAXIMUM PERMISSIBLE DISTANCE BETWEEN EXPANSION JOINTS

ISOPRO®	A-IPQ/A-IPZQ 5 to 30, 45,55 A-IPQS/A-IPQZ 5 to 30	A-IPQ/A-IPZQ 40, 50, 60, 65 A-IPQS/A-IPQZ 40 to 60	A-IPQ/A-IPZQ 70 A-IPQS/A-IPQZ 80 to 90
Distance btw. joints e [m]	13,0	11,3	10,1

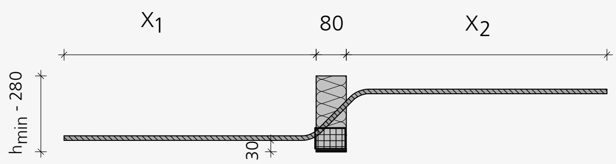
UNIT STRUCTURE

ISOPRO® A-IPQ, A-IPQS, A-IPZQ*, A-IPQZ*, LOOPED SHEAR ROD



Length shear rod [mm]	A-IPQ 5, 10, 15, 20 A-IPZQ 5, 10, 15, 20 A-IPQS 5 A-IPQZ 5	A-IPQ 30 A-IPZQ 30 A-IPQS 20, 30 A-IPQZ 10, 20, 30	A-IPQ 40, 50, 60 A-IPZQ 40, 50, 60 A-IPQS 40, 50 ,60 A-IPQZ 40, 50, 60
	Ø 6	Ø 8	Ø 12
X_1	340	450	670
X_2	150	170	220
h_{min}	160	160	200

ISOPRO® A-IPQ, A-IPQS, A-IPZQ*, A-IPQZ*, STRAIGHT SHEAR ROD



Length shear rod [mm]	A-IPQ 25, 45 A-IPZQ 25, 45 A-IPQS 15, 25, 35 A-IPQZ 15, 25, 35	A-IPQ 55 A-IPZQ 55	A-IPQ 65 A-IPQS 45, 55, 65 A-IPQZ 45, 55, 65	A-IPQ 70 A-IPZQ 70 A-IPQS 80, 90 A-IPQZ 80, 90
	Ø 8	Ø 10	Ø 12	Ø 14
X_1	450	560	670	780
X_2	≤ 560	≤ 670	≤ 775	≤ 890
h_{min}	160	170	180	190

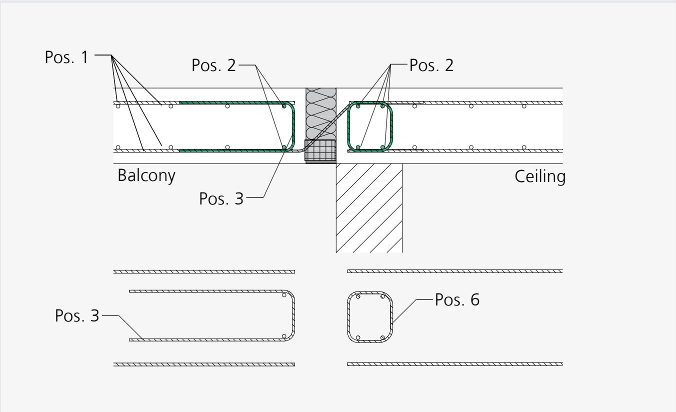
* A-IPZQ and A-IPQZ units do not have a pressure plane

NOTES

- The concrete covering of the shear rods at the bottom is generally 30 mm.
- The concrete covering of the shear rods at the top is cv35 to cv115 depending on the height and the rod diameter.

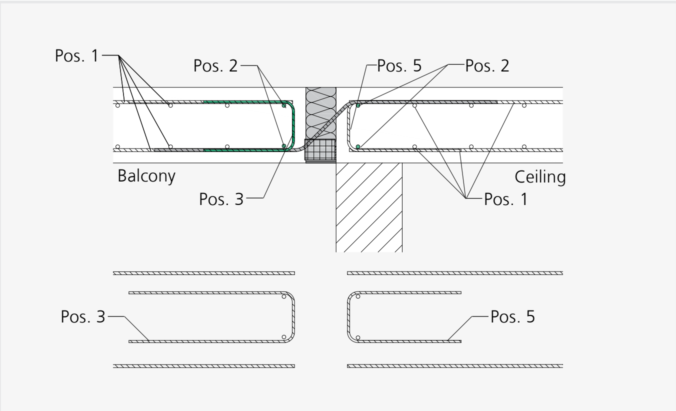
SUPPLEMENTARY REINFORCEMENT

ISOPRO® A-IPQ, A-IPZQ, A-IPQS, A-IPQZ WITH SHEAR ROD Ø 6 – LOOPED ON THE CEILING SIDE



- Pos. 1 slab reinforcement in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 2 spacing bar 2 Ø 8 on the balcony, 4 Ø 8 on the ceiling
- Pos. 3 structural edging parallel to the ISOPRO® unit in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)
- Pos. 6 stirrup (edge beam) Ø 6/200. For indirect support, a supplementary reinforcement must be arranged on the ceiling side (see table, Pos. 5).

ISOPRO® A-IPQ, A-IPZQ, A-IPQS, A-IPQZ – STRAIGHT ON THE CEILING SIDE



- Pos. 1 slab reinforcement in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 2 spacing bar 2 x 2 Ø 8 on the balcony and ceiling
- Pos. 3 structural edging parallel to the ISOPRO® unit in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)
- Pos. 5 Supplementary reinforcement with indirect support on the ceiling side (see table)

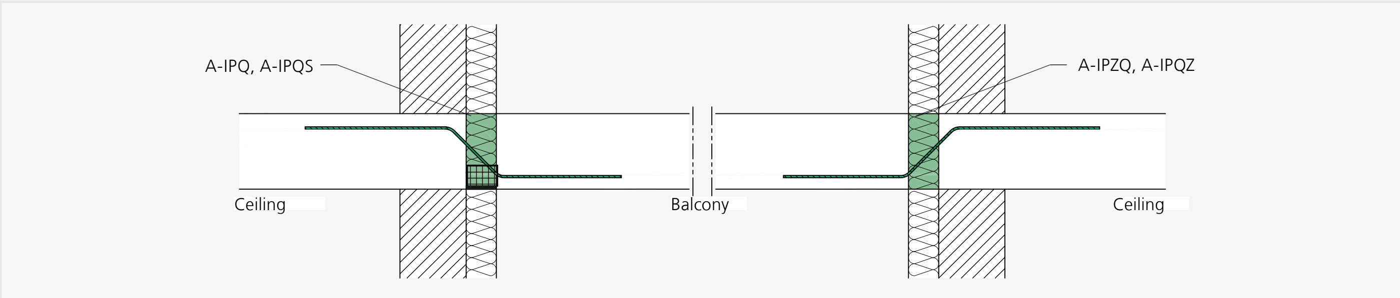
SUPPLEMENTARY REINFORCEMENT

ISOPRO®	Suppl. reinforcement Pos. 5 $A_{s,erf}$ [cm²]
A-IPQ/A-IPZQ 5	0,80
A-IPQ/A-IPZQ 10	1,20
A-IPQ/A-IPZQ 15	1,60
A-IPQ/A-IPZQ 20	2,00
A-IPQ/A-IPZQ 25	2,49
A-IPQ/A-IPZQ 30	2,40
A-IPQ/A-IPZQ 40	2,83
A-IPQ/A-IPZQ 45	3,55
A-IPQ/A-IPZQ 50	4,25
A-IPQ/A-IPZQ 55	4,44
A-IPQ/A-IPZQ 60	5,66
A-IPQ/A-IPZQ 65	5,60
A-IPQ/A-IPZQ 70	7,62

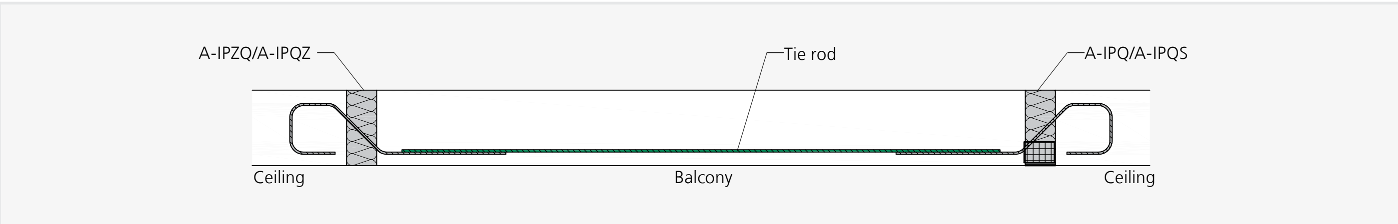
ISOPRO®	Suppl. reinforcement Pos. 5 $A_{s,erf}$ [cm²]
A-IPQS/A-IPQZ 5	0,40
A-IPQS/A-IPQZ 10	0,69
A-IPQS/A-IPQZ 15	0,71
A-IPQS/A-IPQZ 20	1,03
A-IPQS/A-IPQZ 25	1,07
A-IPQS/A-IPQZ 30	1,34
A-IPQS/A-IPQZ 35	1,42
A-IPQS/A-IPQZ 40	1,42
A-IPQS/A-IPQZ 45	1,60
A-IPQS/A-IPQZ 50	2,12
A-IPQS/A-IPQZ 55	2,40
A-IPQS/A-IPQZ 60	2,83
A-IPQS/A-IPQZ 65	3,20
A-IPQS/A-IPQZ 80	3,26
A-IPQS/A-IPQZ 90	4,35

SUPPLEMENTARY REINFORCEMENT

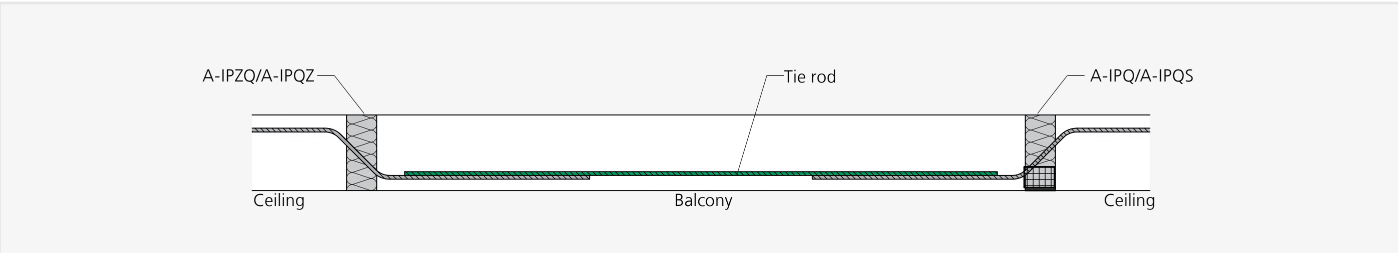
SUPPLEMENTARY REINFORCEMENT WITH CONSTRAINT-FREE SUPPORT



ISOPRO® A-IPQ/A-IPZQ , A-IPQS/A-IPQZ – Installation cross-section with opposite types of same load bearing capacity



ISOPRO® A-IPZQ/A-IPQ, A-IPQZ/A-IPQS – On-site tie rod in the bottom layer of reinforcement – Shear rod Ø 6 on the ceiling, looped



ISOPRO® A-IPZQ/A-IPQ, A-IPQZ/A-IPQS – On-site tie rod in the bottom layer of reinforcement – Shear rod on the ceiling, straight

For constraint-free support with an ISOPRO® A-IPZQ or A-IPQZ unit, a corresponding A-IPQ or A-IPQS unit must be used opposite. A tie rod must be installed between the two units in accordance with the shear reinforcement of the ISOPRO® units. .

TIE ROD ISOPRO® A-IPZQ

ISOPRO®	A-IPZQ 5	A-IPZQ 10	A-IPZQ 15	A-IPZQ 20	A-IPZQ 30	A-IPZQ 40
Tie rod	4 Ø 8	6 Ø 8	8 Ø 8	10 Ø 8	7 Ø 8	4 Ø 12

ISOPRO®	A-IPZQ 45	A-IPZQ 50	A-IPZQ 55	A-IPZQ 60	A-IPZQ 65	A-IPZQ 70
Tie rod	10 Ø 8	6 Ø 12	8 Ø 10	8 Ø 12	7 Ø 12	7 Ø 14

TIE ROD ISOPRO® A-IPQZ

ISOPRO®	A-IPQZ 5	A-IPQZ 10	A-IPQZ 15	A-IPQZ 20/25	A-IPQZ 30/35
Tie rod	2 Ø 8	2 Ø 8	2 Ø 8	3 Ø 8	4 Ø 8

ISOPRO®	A-IPQZ 40/45	A-IPQZ 50/55	A-IPQZ 60/65	A-IPQZ 80	A-IPQZ 90
Tie rod	2 Ø 12	3 Ø 12	4 Ø 12	3 Ø 14	4 Ø 14

ISOPRO® A-IPTQQ and A-IPTQQS

UNITS FOR SUPPORTED BALCONIES WITH LIFTING LOADS

ISOPRO® A-IPTQQ

- Unit length 1.0 m
- Pressure plane with steel pressure rods
- Load-bearing capacities A-IPTQQ 10 to A-IPTQQ 60
- For constraint-free support there are also A-IPZQQ units without steel pressure rods available
- Unit heights depending on diameter of shear rod starting from h_{min} = 160 mm
- Fire resistance classes see page 20

ISOPRO® A-IPTQQS

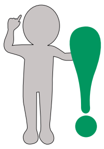
- Unit length depending on the load-bearing capacity 0.3 m, 0.4 m or 0.5 m
- Pressure plane with steel pressure rods
- Load-bearing capacities A-IPTQQS 10 to A-IPTQQS 90
- For constraint-free support there are also A-IPZQQS units without steel pressure rods available
- Unit heights depending on diameter of shear rod starting from h_{min} = 160 mm
- Fire resistance classes see page 20

TYPE DESIGNATION

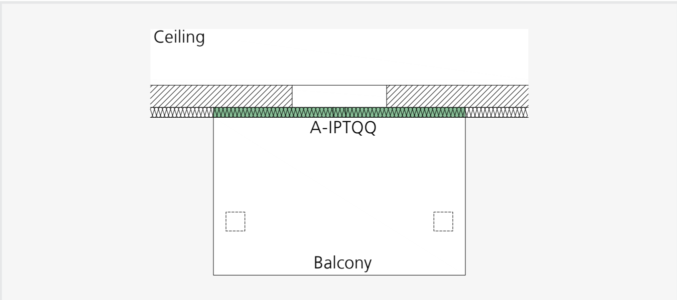
A-IPTQQ 20 h200 R90

- R90: Fire protection version
- h200: Unit height
- A-IPTQQ 20: Type and load-bearing capacity

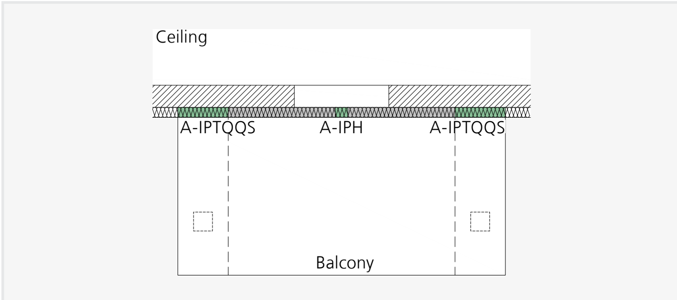
APPLICATION – UNIT ARRANGEMENT



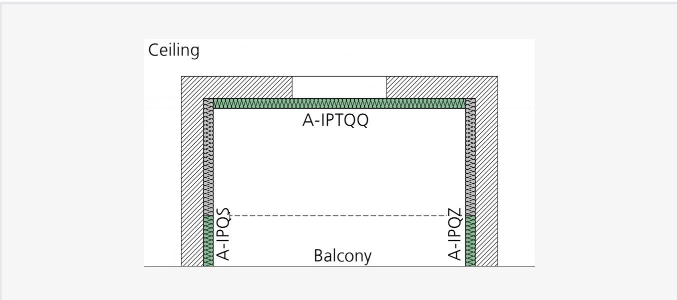
This chapter provides planning aids and specific information about this product. In addition, the general information on materials, design, building physics, installation on site, etc. on pages 10 - 23 has also to be considered.



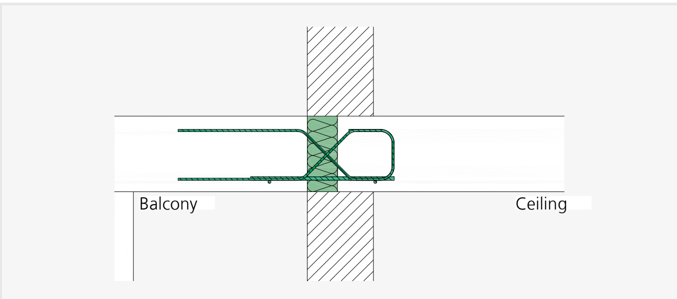
ISOPRO® A-IPTQQ – Supported balcony with recessed support position



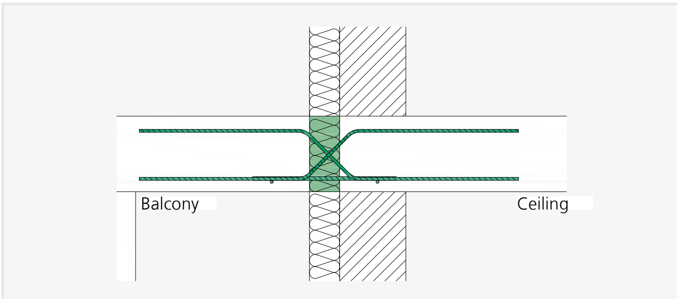
ISOPRO® A-IPTQQS – Supported balcony with joists and support at specific points with ISOPRO® A-IPTQQS units



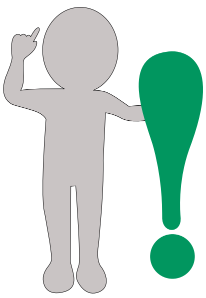
ISOPRO® A-IPTQQ, A-IPQS, A-IPQZ – Loggia balcony with load peaks at specific points at the front and lifting loads in the rear corner area



ISOPRO® A-IPTQQ –Installation cross-section of single-leaf masonry – shear rod on the ceiling, looped



ISOPRO® A-IPTQQ, A-IPTQQS – Installation cross-section of thermal insulation composite system – shear rod on the ceiling, straight



For balconies connected with shear units, appropriate support must be provided in all construction conditions. Temporary supports may only be removed if the permanent supports, which may have been installed at a later date, are sufficiently strong and frictionally connected to the balcony.

DESIGN TABLE

ISOPRO® A-IPTQQ – DESIGN VALUES OF ALLOWABLE SHEARING FORCE v_{RD} [kN/m]

ISOPRO®	Shear force v_{Rd} [kN/m]	Unit height [mm]	Unit length [mm]	Looped shear rod at ceiling	Shear rods	Pressure rods
A-IPTQQ 5	± 34,8	≥ 160	500 + 500	x	2 x 4 Ø 6	4 Ø 10
A-IPTQQ 10	± 52,2	≥ 160	500 + 500	x	2 x 6 Ø 6	4 Ø 10
A-IPTQQ 15	± 69,5	≥ 160	500 + 500	x	2 x 8 Ø 6	6 Ø 10
A-IPTQQ 20	± 86,9	≥ 160	500 + 500	x	2 x 10 Ø 6	6 Ø 10
A-IPTQQ 25	± 92,7	≥ 160	500 + 500	–	2 x 6 Ø 8	6 Ø 10
A-IPTQQ 30	± 119,4	≥ 160	500 + 500	x	2 x 8 Ø 8	6 Ø 10
A-IPTQQ 40	± 123,2	≥ 200	500 + 500	x	2 x 4 Ø 12	8 Ø 10
A-IPTQQ 45	± 144,9	≥ 170	500 + 500	–	2 x 6 Ø 10	8 Ø 10
A-IPTQQ 50	± 184,8	≥ 200	500 + 500	x	2 x 6 Ø 12	12 Ø 10
A-IPTQQ 55	± 208,6	≥ 180	500 + 500	–	2 x 6 Ø 12	12 Ø 10
A-IPTQQ 60	± 246,4	≥ 200	500 + 500	x	2 x 8 Ø 12	14 Ø 10

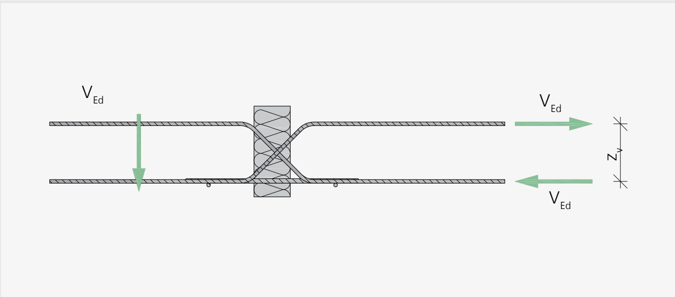
ISOPRO® A-IPTQQS – DESIGN VALUES OF ALLOWABLE SHEARING FORCE V_{RD} [kN]

ISOPRO®	Shear force V_{Rd} [kN]	Unit height [mm]	Unit length [mm]	Looped shear rod at ceiling	Shear rods	Pressure rods
A-IPTQQS 5	± 17,4	≥ 160	300	x	2 x 2 Ø 6	2 Ø 10
A-IPTQQS 10	± 29,9	≥ 160	300	x	2 x 2 Ø 8	2 Ø 10
A-IPTQQS 15	± 30,9	≥ 160	400	–	2 x 3 Ø 8	2 Ø 10
A-IPTQQS 20	± 44,9	≥ 160	400	x	2 x 3 Ø 8	3 Ø 10
A-IPTQQS 25	± 46,4	≥ 160	400	–	2 x 3 Ø 8	3 Ø 10
A-IPTQQS 30	± 58,4	≥ 160	500	x	2 x 4 Ø 8	4 Ø 10
A-IPTQQS 35	± 61,8	≥ 160	500	–	2 x 4 Ø 8	4 Ø 10
A-IPTQQS 40	± 61,6	≥ 200	300	x	2 x 2 Ø 12	4 Ø 10
A-IPTQQS 45	± 69,6	≥ 180	300	–	2 x 2 Ø 12	4 Ø 10
A-IPTQQS 50	± 92,4	≥ 200	400	x	2 x 3 Ø 12	6 Ø 10
A-IPTQQS 55	± 104,3	≥ 180	400	–	2 x 3 Ø 12	6 Ø 10
A-IPTQQS 60	± 123,2	≥ 200	500	x	2 x 4 Ø 12	7 Ø 10
A-IPTQQS 65	± 139,1	≥ 180	500	–	2 x 4 Ø 12	8 Ø 10
A-IPTQQS 70	± 94,7	≥ 190	300	–	2 x 2 Ø 14	3 Ø 12
A-IPTQQS 80	± 142,0	≥ 190	400	–	2 x 3 Ø 14	4 Ø 12
A-IPTQQS 90	± 189,3	≥ 190	500	–	2 x 4 Ø 14	6 Ø 12

MOMENTS RESULTING FROM ECCENTRIC CONNECTIONS

MOMENTS RESULTING FROM ECCENTRIC CONNECTIONS

When designing the connection reinforcement on the ceiling for the ISOPRO® IPTQQ and IPTQQS shear units, a moment resulting from eccentric connections must also be considered. This moment is to be superimposed on the moments resulting from the planned loads if the moments are both positive or both negative. The moment is calculated ΔM_{Ed} on the basis of the assumption that the units are fully utilised.



ISOPRO® A A-IPTQQ, A-IPTQQS – Units with steel pressure rods
z_v – Lever arm for determining the offset moment

$$\Delta M_{Ed} = V_{Ed} \times z_v$$

OFFSET MOMENTS A-IPTQQ

ISOPRO®	Δm_{Ed} [kNm/m]	
	h < 200 mm	h ≥ 200 mm
A-IPTQQ 5	3,3	4,7
A-IPTQQ 10	4,9	7,0
A-IPTQQ 15	6,5	9,3
A-IPTQQ 20	8,2	11,6
A-IPTQQ 25	10,1	14,4
A-IPTQQ 30	9,7	13,9
A-IPTQQ 40	–	16,1
A-IPTQQ 45	14,4	20,5
A-IPTQQ 50	–	24,2
A-IPTQQ 55	17,8	25,5
A-IPTQQ 60	–	32,3

OFFSET MOMENTS A-IPTQQS

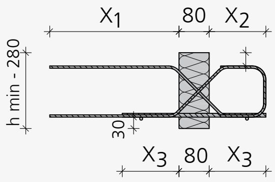
ISOPRO®	ΔM_{Ed} [kNm]	
	h < 200 mm	h ≥ 200 mm
A-IPTQQS 5	1,7	2,4
A-IPTQQS 10	2,8	4,0
A-IPTQQS 15	2,9	4,1
A-IPTQQS 20	4,2	6,0
A-IPTQQS 25	4,3	6,1
A-IPTQQS 30	5,5	7,9
A-IPTQQS 35	5,6	8,0
A-IPTQQS 40	–	8,1
A-IPTQQS 45	6,6	9,4
A-IPTQQS 50	–	14,1
A-IPTQQS 55	9,5	13,7
A-IPTQQS 60	–	16,1
A-IPTQQS 65	12,6	18,2
A-IPTQQS 70	8,5	12,3
A-IPTQQS 80	12,8	18,5
A-IPTQQS 90	17,0	24,6

MAXIMUM PERMISSIBLE DISTANCE BETWEEN EXPANSION JOINTS

ISOPRO®	A-IPTQQ 10 to 90 A-IPTQQS 10 to 50	A-IPTQQ 110 A-IPTQQS 60 to 70	A-IPTQQS 80 to 90
Distance btw. joints e [m]	13,0	11,3	10,1

UNIT STRUCTURE

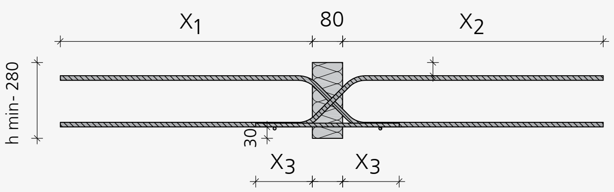
ISOPRO® A-IPTQQ - SHEAR ROD Ø 6



Length Shear rod [mm]	A-IPTQQ 5 to 20 A-IPTQQ 5	A-IPTQQ 30 A-IPTQQS 10, 20, 30	A-IPTQQ 40, 50, 60 A-IPTQQS 40, 50, 60
	Ø 6	Ø 8	Ø 12
X_1	340	450	670
X_2	150	170	220
h_{min}	160	160	200

Length pressure rod [mm]	A-IPTQQ 10 to A-IPTQQ 60 A-IPTQQS 5 to A-IPTQQS 60
	Pressure rod Ø 10
X_3	150

ISOPRO® A-IPTQQ, A-IPTQQS - SHEAR ROD ≥ Ø 8



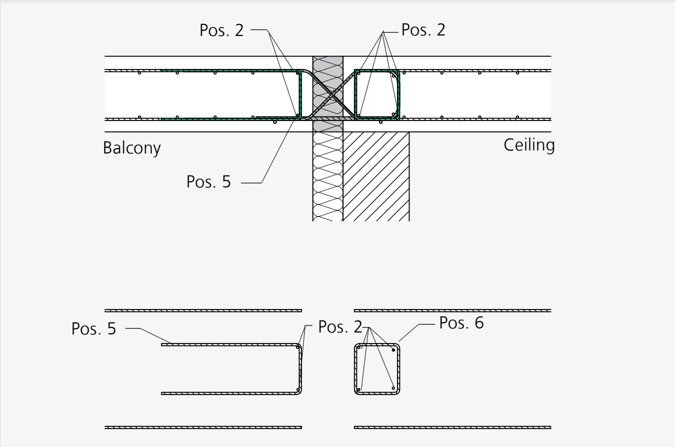
Length shear rod [mm]	A-IPTQQ 25 A-IPTQQS 15, 25, 35	A-IPTQQ 45	A-IPTQQ 55 A-IPTQQS 45, 55, 65	A-IPTQQS 70, 80, 90
	Ø 8	Ø 10	Ø 12	Ø 14
X_1	450	560	670	780
X_2	≤ 560	≤ 670	≤ 775	≤ 890
h_{min}	160	170	180	190

Length pressure rod [mm]	A-IPTQQ 25 to 55 A-IPTQQS 15 to 65	A-IPTQQS 70, 80, 90
	Ø 8 and Ø 10	Ø 12
X_3	150	385

- The concrete covering of the shear rods at the bottom is generally 30 mm.
- The concrete covering of the shear rods at the top is cv35 to cv115 depending on the height and the rod diameter.

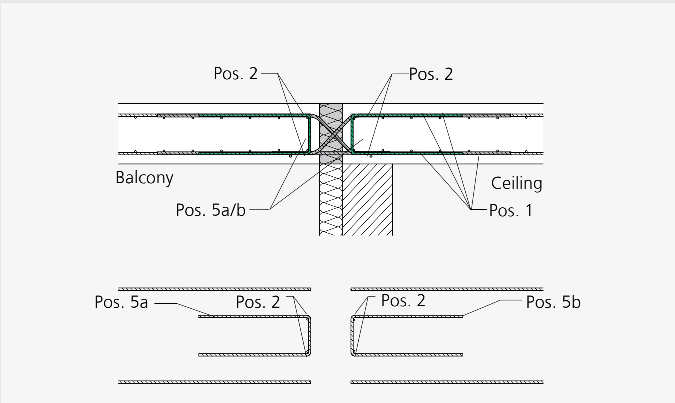
SUPPLEMENTARY REINFORCEMENT

ISOPRO® A-IPTQQ AND A-IPTQQS, SHEAR ROD LOOPED ON THE CEILING SIDE



- Pos. 1 slab reinforcement and edging in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 2 spacing bar 2 Ø 8 on the balcony, 4 Ø 8 on the ceiling
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)
- Pos. 5 supplementary reinforcement – see table below
- Pos. 6 stirrup (edge beam) Ø 6/200

ISOPRO® A-IPTQQ AND A-IPTQQS – SHEAR ROD STRAIGHT ON THE CEILING SIDE



- Pos. 1 slab reinforcement and edging in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 2 spacing bar 2 x 2 Ø 8 on the balcony and ceiling
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)
- Pos. 5a supplementary reinforcement balcony side – see table below
- Pos. 5b supplementary reinforcement with indirect support on the ceiling side (see table)

SUPPLEMENTARY REINFORCEMENT

ISOPRO® A-IPTQQ

ISOPRO®	Suppl. reinforcement $a_{s,erf}$ [cm²/m]
A-IPTQQ 5	0,80
A-IPTQQ 10	1,20
A-IPTQQ 15	1,60
A-IPTQQ 20	2,00
A-IPTQQ 25	2,13
A-IPTQQ 30	2,80
A-IPTQQ 40	2,83
A-IPTQQ 45	3,33
A-IPTQQ 50	4,24
A-IPTQQ 55	4,79
A-IPTQQ 60	5,66

ISOPRO® A-IPTQQS

ISOPRO®	Suppl. reinforcement $A_{s,erf}$ [cm²]
A-IPTQQS 5	0,40
A-IPTQQS 10	0,69
A-IPTQQS 15	0,71
A-IPTQQS 20	1,03
A-IPTQQS 25	1,07
A-IPTQQS 30	1,35
A-IPTQQS 35	1,42
A-IPTQQS 40	1,42
A-IPTQQS 45	1,60
A-IPTQQS 50	2,12
A-IPTQQS 55	2,40
A-IPTQQS 60	2,83
A-IPTQQS 65	3,20
A-IPTQQS 70	2,17
A-IPTQQS 80	3,26
A-IPTQQS 90	4,35

ISOPRO® A-IPTD

UNITS FOR CONTINUOUS SLABS

ISOPRO® A-IPTD

- For transferring positive and negative moments and positive and negative shearing forces
- Tension and pressure plane with steel tension/pressure rods
- Load-bearing capacities A-IPTD 10 to A-IPTD 60
- Shearing force load-bearing capacities standard, Q8, Q10
- Concrete covering of tension rods on top cv30, cv35 or cv50
- Concrete covering of the pressure rods at the bottom 30 mm for cv30/35 and 50 mm for cv50
- Unit heights depending on the shearing force load-bearing capacity starting from h_{min} = 160 mm
- Fire resistance classes see page 20

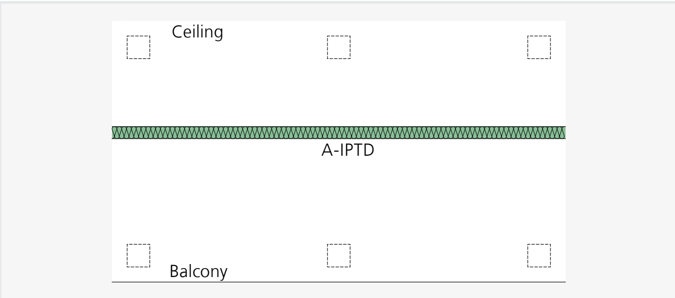
TYPE DESIGNATION

A-IPTD 50 Q8 cv35 h200 R90

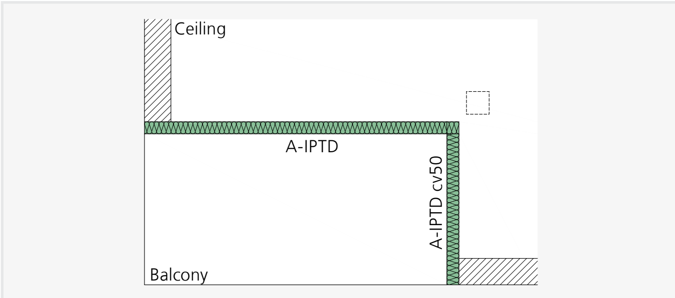
- R90 – Fire protection version
- h200 – Unit height
- cv35 – Concrete covering
- Q8 – Shearing force load-bearing capacity
- A-IPTD 50 – Type and load-bearing capacity

APPLICATION – UNIT ARRANGEMENT

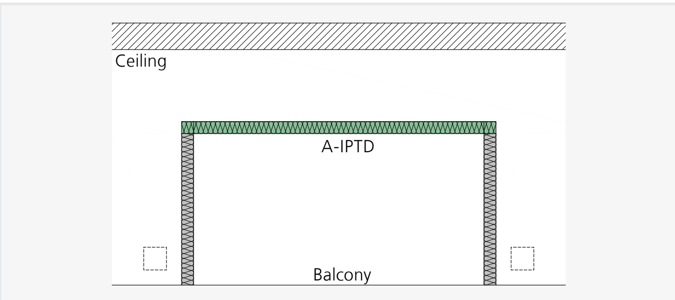
This chapter provides planning aids and specific information about this product. In addition, the general information on materials, design, building physics, installation on site, etc. on pages 10 - 23 has also to be considered.



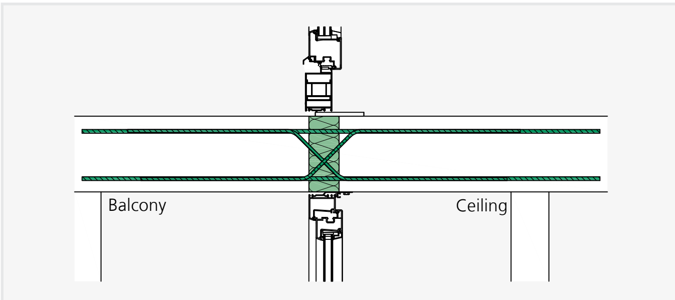
ISOPRO® A-IPTD – Continuous slab with a glass façade



ISOPRO® A-IPTD – Internal corner balcony with large dimensions and loads



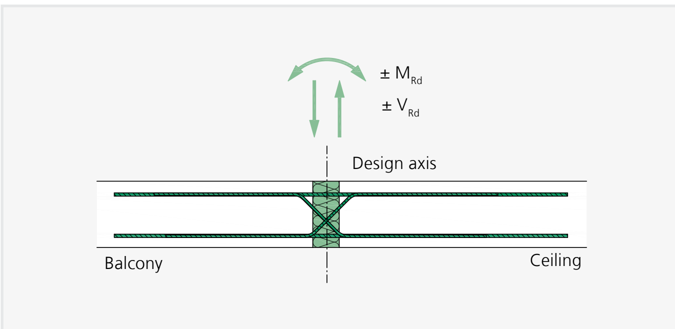
ISOPRO® A-IPTD –Inset balcony with glass façade, without direct support



ISOPRO® A-IPTD – Installation cross-section of glass façade

NOTE FOR DESIGN

- The gap between the balcony and the ceiling slab must be taken into account for the calculation in the FEM program
- With the ISOPRO® A-IPTD units only bending moments perpendicular to the insulation joint can be transferred
- When calculating the resultant forces, the spring stiffness of the ISOPRO® A-IPTD units must be iteratively included in the calculation. First, an assumption is made for the spring stiffness of the thermal insulation unit. A unit is then selected via the resulting static design values. In the next step, the definitive spring stiffness of the selected unit is included in the calculation. Possibly another iterative step is required to come to final solution.
- To transfer forces parallel and perpendicular to the joint, the A-IPTD units can be combined with ISOPRO® A-IPE units.



ISOPRO® A-IPTD – Static System

DESIGN TABLE FOR CONCRETE ≥ C25/30

DESIGN VALUES OF ALLOWABLE MOMENTS m_{Rd} [kNm/m]

Unit height [mm] depending on cv [mm]			ISOPRO®								
			A-IPTD 10			A-IPTD 20			A-IPTD 30		
30	35	50	Standard	Q8	Q10	Standard	Q8	Q10	Standard	Q8	Q10
–	160	–	± 14,6	± 13,0	-	± 22,0	± 20,4	-	± 30,1	± 28,5	-
160	–	200	± 15,5	± 13,7	-	± 23,3	± 21,6	-	± 31,9	± 30,2	-
–	170	–	± 16,3	± 14,5	± 12,5	± 24,7	± 22,8	± 20,8	± 33,7	± 31,9	± 29,9
170	–	210	± 17,2	± 15,3	± 13,1	± 26,0	± 24,1	± 22,0	± 35,5	± 33,6	± 31,5
–	180	–	± 18,1	± 16,0	± 13,8	± 27,3	± 25,3	± 23,1	± 37,3	± 35,3	± 33,1
180	–	220	± 18,9	± 16,8	± 14,4	± 28,6	± 26,5	± 24,2	± 39,1	± 37,0	± 34,7
–	190	–	± 19,8	± 17,5	± 15,1	± 30,0	± 27,8	± 25,3	± 40,9	± 38,7	± 36,3
190	–	230	± 20,7	± 18,3	± 15,7	± 31,3	± 29,0	± 26,4	± 42,8	± 40,5	± 37,9
–	200	–	± 21,5	± 19,1	± 16,4	± 32,6	± 30,2	± 27,6	± 44,6	± 42,2	± 39,5
200	–	240	± 22,4	± 19,8	± 17,0	± 33,9	± 31,4	± 28,7	± 46,4	± 43,9	± 41,1
–	210	–	± 23,2	± 20,6	± 17,7	± 35,3	± 32,7	± 29,8	± 48,2	± 45,6	± 42,7
210	–	250	± 24,1	± 21,4	± 18,4	± 36,6	± 33,9	± 30,9	± 50,0	± 47,3	± 44,3
–	220	–	± 25,0	± 22,1	± 19,0	± 37,9	± 35,1	± 32,0	± 51,8	± 49,0	± 45,9
220	–	260	± 25,8	± 22,9	± 19,7	± 39,2	± 36,3	± 33,2	± 53,6	± 50,7	± 47,6
–	230	–	± 26,7	± 23,7	± 20,3	± 40,6	± 37,6	± 34,3	± 55,4	± 52,4	± 49,2
230	–	270	± 27,5	± 24,4	± 21,0	± 41,9	± 38,8	± 35,4	± 57,2	± 54,2	± 50,8
–	240	–	± 28,4	± 25,2	± 21,6	± 43,2	± 40,0	± 36,5	± 59,1	± 55,9	± 52,4
240	–	280	± 29,3	± 25,9	± 22,3	± 44,5	± 41,3	± 37,6	± 60,9	± 57,6	± 54,0
–	250	–	± 30,1	± 26,7	± 22,9	± 45,9	± 42,5	± 38,8	± 62,7	± 59,3	± 55,6
250	–	–	± 31,0	± 27,5	± 23,6	± 47,2	± 43,7	± 39,9	± 64,5	± 61,0	± 57,2
–	260	–	± 31,8	± 28,2	± 24,3	± 48,5	± 44,9	± 41,0	± 66,3	± 62,7	± 58,8
260	–	–	± 32,7	± 29,0	± 24,9	± 49,8	± 46,2	± 42,1	± 68,1	± 64,4	± 60,4
–	270	–	± 33,6	± 29,8	± 25,6	± 51,2	± 47,4	± 43,3	± 69,9	± 66,2	± 62,0
270	–	–	± 34,4	± 30,5	± 26,2	± 52,5	± 48,6	± 44,4	± 71,7	± 67,9	± 63,6
–	280	–	± 35,3	± 31,3	± 26,9	± 53,8	± 49,9	± 45,5	± 73,5	± 69,6	± 65,2
280	–	–	± 36,1	± 32,0	± 27,5	± 55,1	± 51,1	± 46,6	± 75,4	± 71,3	± 66,8

DESIGN VALUES OF ALLOWABLE SHEARING FORCES v_{Rd} [kN/m]

ISOPRO®	A-IPTD 10			A-IPTD 20			A-IPTD 30		
	Standard	Q8	Q10	Standard	Q8	Q10	Standard	Q8	Q10
Shear force v_{Rd} [kN/m]	± 53,0	± 92,0	± 135,0	± 53,0	± 92,0	± 135,0	± 53,0	± 92,0	± 135,0

DIMENSIONS AND ASSIGNMENT

ISOPRO®	A-IPTD 10			A-IPTD 20			A-IPTD 30		
	Standard	Q8	Q10	Standard	Q8	Q10	Standard	Q8	Q10
Unit length [mm]	500 + 500								
Tension/Pressure rods	6 Ø 10			6 Ø 12			8 Ø 12		
Shear rods	2 x 4 Ø 8	2 x 6 Ø 8	2 x 6 Ø 10	2 x 4 Ø 8	2 x 6 Ø 8	2 x 6 Ø 10	2 x 4 Ø 8	2 x 6 Ø 8	2 x 6 Ø 10

DESIGN TABLE FOR CONCRETE ≥ C25/30

DESIGN VALUES OF ALLOWABLE MOMENTS m_{Rd} [kNm/m]

Unit height [mm] depending on cv [mm]			ISOPRO®								
			A-IPTD 40			A-IPTD 50			A-IPTD 60		
30	35	50	Standard	Q8	Q10	Standard	Q8	Q10	Standard	Q8	Q10
–	160	–	± 38,1	± 36,5	-	± 46,2	± 44,6	-	± 49,8	-	-
160	–	200	± 40,4	± 38,7	-	± 49,0	± 47,3	-	± 52,9	-	-
–	170	–	± 42,7	± 40,9	± 38,9	± 51,8	± 50,0	± 48,0	± 56,0	± 54,0	-
170	–	210	± 45,0	± 43,1	± 41,0	± 54,6	± 52,6	± 50,5	± 59,1	± 57,0	-
–	180	–	± 47,3	± 45,3	± 43,1	± 57,3	± 55,3	± 53,1	± 62,1	± 60,0	± 57,7
180	–	220	± 49,6	± 47,5	± 45,2	± 60,1	± 58,0	± 55,7	± 65,2	± 62,9	± 60,5
–	190	–	± 51,9	± 49,7	± 47,3	± 62,9	± 60,7	± 58,3	± 68,3	± 65,9	± 63,4
190	–	230	± 54,2	± 51,9	± 49,4	± 65,7	± 63,4	± 60,9	± 71,4	± 68,9	± 66,3
–	200	–	± 56,5	± 54,1	± 51,5	± 68,5	± 66,1	± 63,4	± 74,4	± 71,8	± 69,1
200	–	240	± 58,8	± 56,3	± 53,6	± 71,3	± 68,8	± 66,0	± 77,5	± 74,8	± 72,0
–	210	–	± 61,1	± 58,5	± 55,7	± 74,0	± 71,4	± 68,6	± 80,6	± 77,8	± 74,8
210	–	250	± 63,4	± 60,7	± 57,8	± 76,8	± 74,1	± 71,2	± 83,7	± 80,7	± 77,7
–	220	–	± 65,7	± 62,9	± 59,8	± 79,6	± 76,8	± 73,7	± 86,7	± 83,7	± 80,5
220	–	260	± 68,0	± 65,1	± 61,9	± 82,4	± 79,5	± 76,3	± 89,8	± 86,7	± 83,4
–	230	–	± 70,3	± 67,3	± 64,0	± 85,2	± 82,2	± 78,9	± 92,9	± 89,6	± 86,3
230	–	270	± 72,6	± 69,5	± 66,1	± 88,0	± 84,9	± 81,5	± 96,0	± 92,6	± 89,1
–	240	–	± 74,9	± 71,7	± 68,2	± 90,7	± 87,6	± 84,1	± 99,0	± 95,6	± 92,0
240	–	280	± 77,2	± 73,9	± 70,3	± 93,5	± 90,2	± 86,6	± 102,1	± 98,6	± 94,8
–	250	–	± 79,5	± 76,1	± 72,4	± 96,3	± 92,9	± 89,2	± 105,2	± 101,5	± 97,7
250	–	–	± 81,8	± 78,3	± 74,5	± 99,1	± 95,6	± 91,8	± 108,3	± 104,5	± 100,5
–	260	–	± 84,1	± 80,5	± 76,6	± 101,9	± 98,3	± 94,4	± 111,4	± 107,5	± 103,4
260	–	–	± 86,4	± 82,7	± 78,7	± 104,7	± 101,0	± 97,0	± 114,4	± 110,4	± 106,2
–	270	–	± 88,7	± 84,9	± 80,8	± 107,4	± 103,7	± 99,5	± 117,5	± 113,4	± 109,1
270	–	–	± 91,0	± 87,1	± 82,9	± 110,2	± 106,4	± 102,1	± 120,6	± 116,4	± 112,0
–	280	–	± 93,3	± 89,3	± 85,0	± 113,0	± 109,1	± 104,7	± 123,7	± 119,3	± 114,8
280	–	–	± 95,6	± 91,5	± 87,0	± 115,8	± 111,7	± 107,3	± 126,7	± 122,3	± 117,7

DESIGN VALUES OF ALLOWABLE SHEARING FORCES v_{Rd} [kN/m]

ISOPRO®	A-IPTD 40			A-IPTD 50			A-IPTD 60		
	Standard	Q8	Q10	Standard	Q8	Q10	Standard	Q8	Q10
Shear force v_{Rd} [kN/m]	± 53,0	± 92,0	± 135,0	± 53,0	± 92,0	± 135,0	± 92,0	± 135,0	± 180,0

DIMENSIONS AND ASSIGNMENT

ISOPRO®	A-IPTD 40			A-IPTD 50			A-IPTD 60		
	Standard	Q8	Q10	Standard	Q8	Q10	Standard	Q8	Q10
Unit length [mm]	500 + 500								
Tension/Pressure rods	10 Ø 12			12 Ø 12			12 Ø 14		
Shear rods	2 x 4 Ø 8	2 x 6 Ø 8	2 x 6 Ø 10	2 x 4 Ø 8	2 x 6 Ø 8	2 x 6 Ø 10	2 x 6 Ø 8	2 x 6 Ø 10	2 x 6 Ø 12

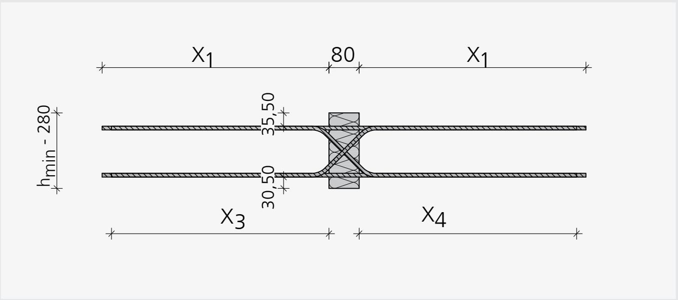
DESIGN - UNIT STRUCTURE

MAXIMUM PERMISSIBLE DISTANCE BETWEEN EXPANSION JOINTS

ISOPRO®	A-IPTD 20	A-IPTD 30 to A-IPTD 90	A-IPTD 100
Distance btw. joints e [m]	13,0	11,3	10,1

UNIT STRUCTURE

ISOPRO® A-IPTD

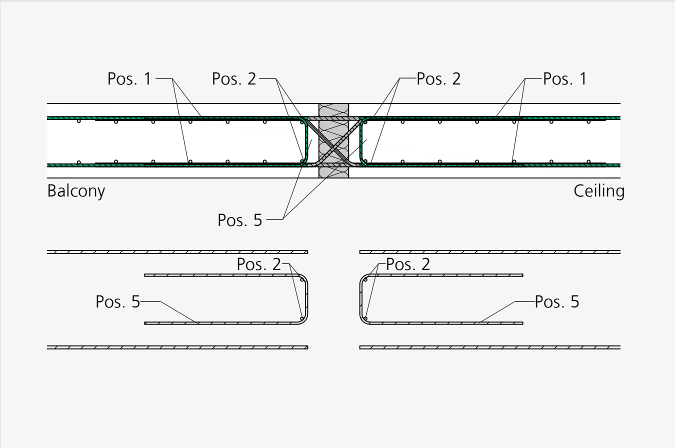


Length tension rods / Length pressure rods [mm]	A-IPTD 10	A-IPTD 20 to A-IPTD 50	A-IPTD 60
X_1	740	860	980

Length Shear rod [mm]	A-IPTD 10 to A-IPTD 50 Shear force load-bearing capacity			A-IPTD 60 Shear force load-bearing capacity		
	Standard	Q8	Q10	Standard	Q10	Q12
X_3	450	450	560	450	560	670
X_4	≤ 560	≤ 560	≤ 670	≤ 560	≤ 670	≤ 775
h_{min}	160	160	170	160	170	180

SUPPLEMENTARY REINFORCEMENT

ISOPRO® A-IPTD



- Pos. 1 connection reinforcement for the ISOPRO® unit – for negative moments at the top, for positive moments at the bottom – see table
- Pos. 2 spacing bar 2 x 2 Ø 8 on balcony and ceiling side
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)
- Pos. 5 supplementary reinforcement on balcony and ceiling side – see table below

CONNECTION REINFORCEMENT (POS. 1) FOR B500B*

ISOPRO®	A-IPTD 10	A-IPTD 20	A-IPTD 30	A-IPTD 40	A-IPTD 50	A-IPTD 60
$a_{s,erf}$ [cm²/m]	4,71	6,79	9,05	11,30	13,70	18,48
Suggestion	6 Ø 10	6 Ø 12	8 Ø 12	10 Ø 12	12 Ø 12	12 Ø 14

SUPPLEMENTARY REINFORCEMENT (POS. 5) FOR B500B*

ISOPRO®	A-IPTD 10 to A-IPTD 50			A-IPTD 60		
	Standard	Q8	Q10	Standard	Q8	Q10
$a_{s,erf}$ [cm²/m]	1,21	2,11	3,10	2,11	3,10	4,13
Suggestion	Ø 8/200	Ø 8/200	Ø 10/200	Ø 8/200	Ø 10/200	Ø 10/150

* For connection reinforcement B550B the reinforcement quantity can be reduced by factor 0,91.
For connection reinforcement B450C the reinforcement quantity has to be increased by 1,12.

ISOPRO®
A-IPH

UNITS FOR PLANNED HORIZONTAL LOADS

ISOPRO® A-IPH

- Load-bearing capacities A-IPH 1, A-IPH 2 and A-IPH 3
- ISOPRO® A-IPH 1 for transferring horizontal forces parallel to the insulating joint
- ISOPRO® A-IPH 2 for transferring horizontal forces perpendicular to the insulating joint
- ISOPRO® A-IPH 3 for transferring horizontal forces parallel and perpendicular to the insulating joint
- Clearly defined concrete covering, see product details
- Unit heights starting from h_{min} = 160 mm
- Fire resistance classes see page 20

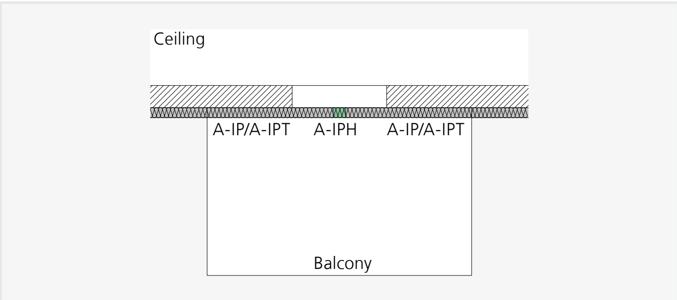
TYPE DESIGNATION

A-IPH 2 h200 REI120

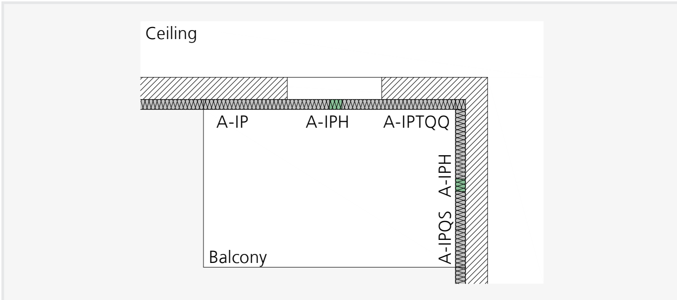
- REI120 – Fire protection version
- h200 – Unit height
- A-IPH 2 – Type and load-bearing capacity

APPLICATION – UNIT ARRANGEMENT

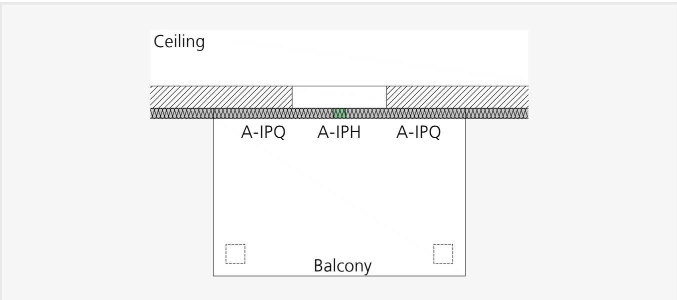
This chapter provides planning aids and specific information about this product. In addition, the general information on materials, design, building physics, installation on site, etc. on pages 10 - 23 has also to be considered.



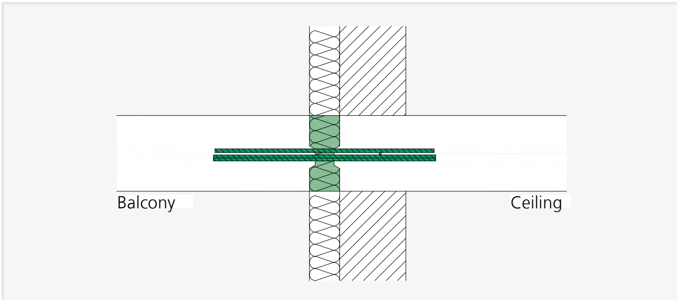
ISOPRO® A-IPH – Cantilevered balcony with planned horizontal loads



ISOPRO® A-IPH –Supported internal corner balcony with planned horizontal loads



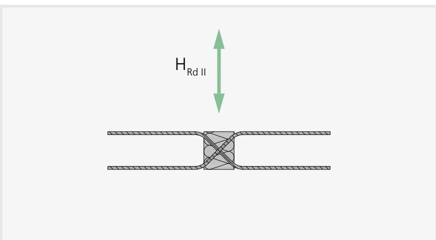
ISOPRO® A-IPH – Balcony on hinged supports with A-IPH structural units



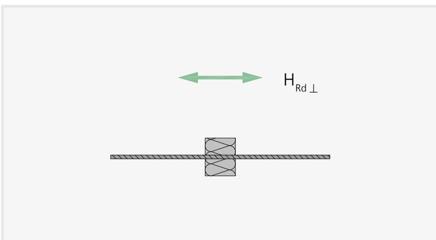
ISOPRO® A-IPH 3 – Installation cross-section of thermal insulation composite system

DESIGN VALUES OF ALLOWABLE HORIZONTAL LOADS H_{Rd} [kN] FOR CONCRETE ≥ C25/30

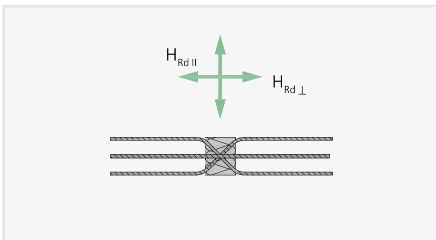
ISOPRO®	A-IPH 1	A-IPH 2	A-IPH 3
Horizontal force parallel $H_{Rd\parallel}$ [kN]	± 8,6	–	± 8,6
Horizontal force vertical $H_{Rd\perp}$ [kN]	–	± 20,9	± 20,9



A-IPH 1



A-IPH 2



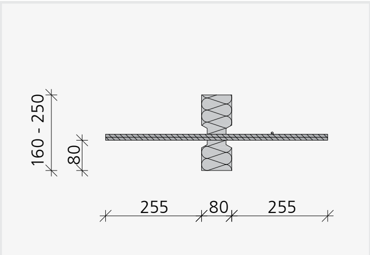
A-IPH 3

DESIGN - EXPANSION JOINTS

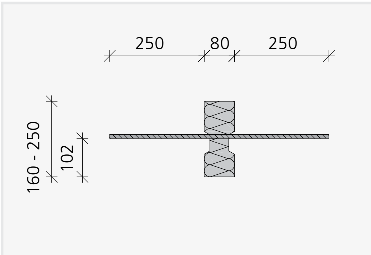
NOTES ON DESIGN

- The quantity and position of the ISOPRO® A-IPH units are in accordance with the structural engineer's specifications.
- When using ISOPRO® A-IPH units, it must be ensured that the length and therefore also the load-bearing capacity of the linear connection is reduced by the proportion of the A-IPH units used.
- The steel rods of the ISOPRO® A-IPH units are anchored on both sides of the insulaton joint. Therefore there is no connection reinforcement required.

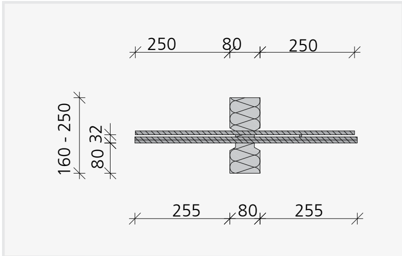
UNIT STRUCTURE ISOPRO® A-IPH



A-IPH 1



A-IPH 2



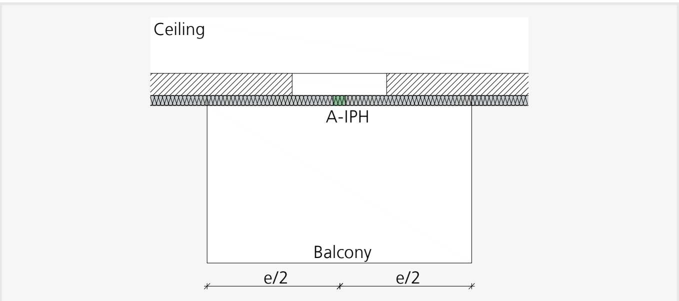
A-IPH 3

DIMENSIONS AND ASSIGNMENT

ISOPRO®	A-IPH 1	A-IPH 2	A-IPH 3
Unit length [mm]		100	
Shear rods	2 x 1 Ø 8	–	2 x 1 Ø 8
Tension/pressure rods	–	1 Ø 10	1 Ø 10

DISTANCE BETWEEN EXPANSION JOINTS

By using ISOPRO® A-IPH units, a fixed point is created, resulting in increased constraints. The maximum permissible distance between expansion joints is therefore reduced to e/2 when ISOPRO® A-IPH units are used. Half of the maximum distance between expansion joints is always measured from the fixed point.



ISOPRO®
A-IPE

UNITS FOR EARTHQUAKE LOADS

ISOPRO® A-IPE

- For cantilevered, continuous or supported slabs as a supplement to the ISOPRO® units
- For transferring horizontal forces parallel and perpendicular to the insulating joint and lifting (positive) moments in connection with an ISOPRO® A-IP/A-IPT unit
- Load-bearing capacities A-IPE 1, A-IPE 2
- Clearly defined concrete covering, see design table
- Unit heights starting from h_{min} = 160 mm
- Fire resistance classes see page 20

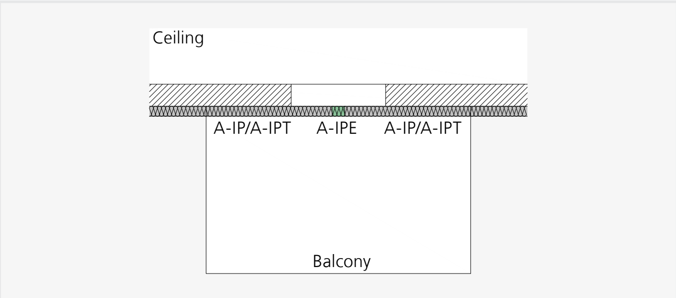
TYPE DESIGNATION

A-IPE 2 h200 REI120

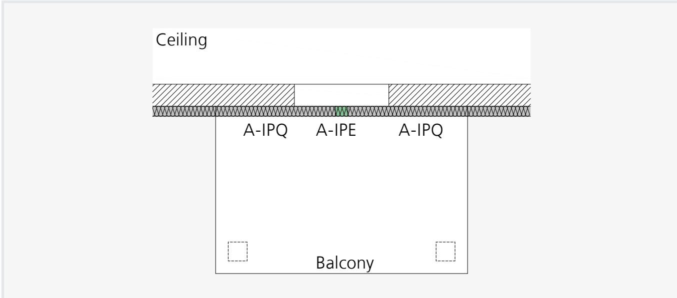
- REI120 – Fire protection version
- h200 – Unit height
- A-IPE 2 – Type and load-bearing capacity

APPLICATION – UNIT ARRANGEMENT

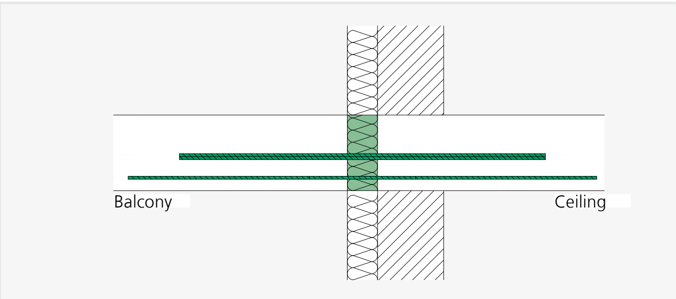
This chapter provides planning aids and specific information about this product. In addition, the general information on materials, design, building physics, installation on site, etc. on pages 10 - 23 has also to be considered.



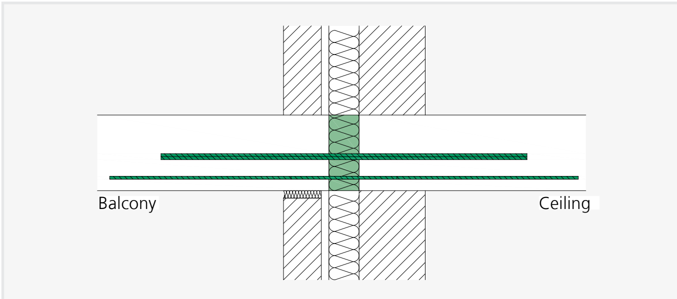
ISOPRO® A-IPE – Cantilevered balcony with lifting moments



ISOPRO® A-IPE – Supported balcony with high horizontal forces

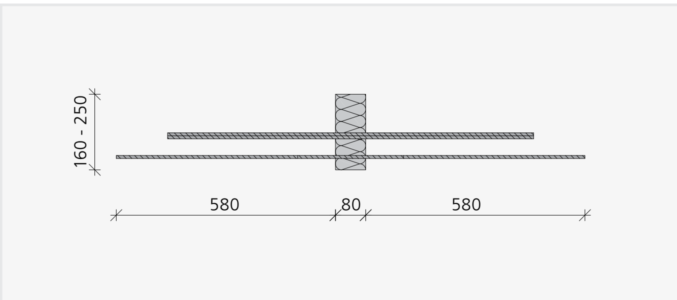


ISOPRO® A-IPE – Installation cross-section of thermal insulation composite system

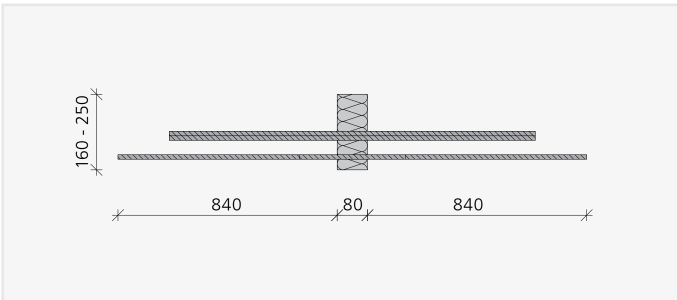


ISOPRO® A-IPE – Installation cross-section of two-leaf masonry

UNIT STRUCTURE



ISOPRO® A-IPE 1

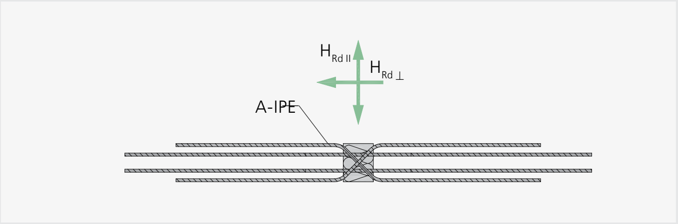


ISOPRO® A-IPE 2

DIMENSIONS AND ASSIGNMENT

ISOPRO®	A-IPE 1	A-IPE 2
Unit length [mm]	100	
Shear rods	2 x 1 Ø 8	2 x 1 Ø 12
Tension rods	2 Ø 8	2 Ø 12

DESIGN TABLE FOR CONCRETE ≥ C25/30



DESIGN VALUES OF ALLOWABLE HORIZONTAL FORCES H_{Rd} [kN]

ISOPRO®	A-IPE 1	A-IPE 2
Horizontal force parallel $H_{Rd\parallel}$ [kN]	± 15,4	± 34,7
Horizontal force vertical $H_{Rd\perp}$ [kN] for M_{Rd} = 0	± 40,6	± 97,2

DESIGN VALUES OF ALLOWABLE LIFTING MOMENTS m_{Rd} [kNm]

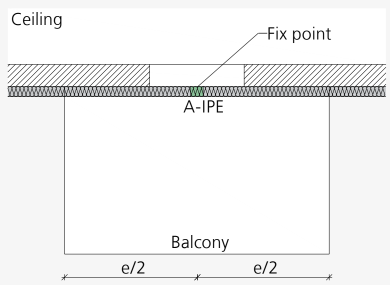
Unit height [mm] depending on cv [mm]			ISOPRO®	
30	35	50	A-IPE 1	A-IPE 2
–	160	–	3,7	8,2
160	–	180	3,9	8,7
–	170	–	4,1	9,1
170	–	190	4,4	9,6
–	180	–	4,6	10,1
180	–	200	4,8	10,6
–	190	–	5,0	11,1
190	–	210	5,2	11,6
–	200	–	5,5	12,1
200	–	220	5,7	12,6
–	210	–	5,9	13,1
210	–	230	6,1	13,6
–	220	–	6,3	14,1
220	–	240	6,5	14,6
–	230	–	6,8	15,0
230	–	250	7,0	15,5
–	240	–	7,2	16,0
240	–	260	7,4	16,5
–	250	–	7,6	17,0
250	–	270	7,8	17,5
–	260	–	8,1	18,0
260	–	280	8,3	18,5
–	270	–	8,5	19,0
270	–	–	8,7	19,5
–	280	–	8,9	20,0
280	–	–	9,2	20,5

DESIGN – EXPANSION JOINTS

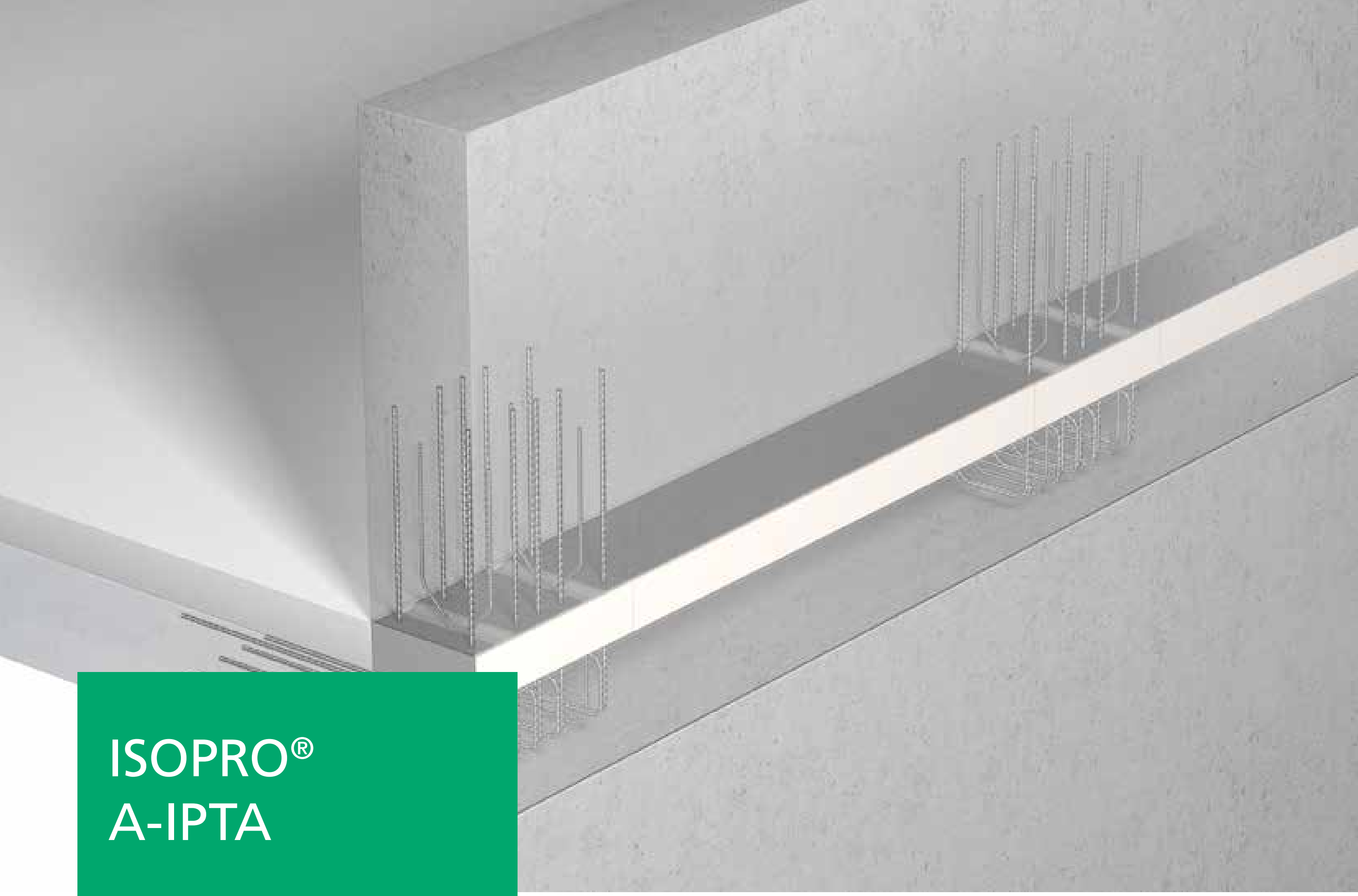
NOTES ON DESIGN

- Moments can only be transferred in connection with adjoining ISOPRO® A-IP or A-IPT units.
- To transfer the positive moments indicated in the table, the tension rods of the ISOPRO® A-IP or A-IPT units adjacent to the ISOPRO® unit A-IPE are activated as pressure rods. To ensure this, at least the following adjacent units are recommended:
  When using A-IPE 1 at least ISOPRO® A-IP 40, when using A-IPE 2 at least ISOPRO® A-IP 60.
- For the design, either $H_{Rd\perp}$ or M_{Rd} can be applied. This means that either a tensile force or a moment can be transferred with the unit; not both at the same time.
- The quantity and position of the ISOPRO® A-IPE units are in accordance with the structural engineer's specifications.
- When using ISOPRO® A-IPE units, ensure that the load-bearing capacity of the linear connection is reduced by the proportion of the length of the A-IPE units in relation to the total connection length.
- The tension rods at the bottom are to be overlapped with rods of the same diameter. The shear rods are anchored and require no further connection reinforcement.

DISTANCE BETWEEN EXPANSION JOINTS



If the component dimensions exceed the maximum permissible distance between expansion joints, expansion joints must be arranged perpendicular to the insulation plane. The maximum permissible distance between expansion joints e is dependent on the maximum rod diameter
across the expansion joint and is thus type-dependent. The maximum permissible distance between expansion joints for the ISOPRO® units is specified in the respective individual sections.
By using ISOPRO® A-IPE units, a fixed point is created, resulting in increased constraints. The maximum permissible distance between expansion joints is therefore reduced to e/2 when ISOPRO® A-IPE units are used. Half of the maximum distance between expansion joints is always measured from the fixed point.



ISOPRO®
A-IPTA

UNITS FOR PARAPETS AND BALUSTRADES

ISOPRO® A-IPTA

- For transferring normal forces, positive and negative moments and horizontal forces
- Unit length 350 mm
- Parapet/balustrade width 160 to 250 mm
- Concrete covering varies depending on parapet thickness – see unit structure
- Ceiling thickness ≥ 160 mm
- Insulation thickness 80 mm
- Fire resistance classes see page 20

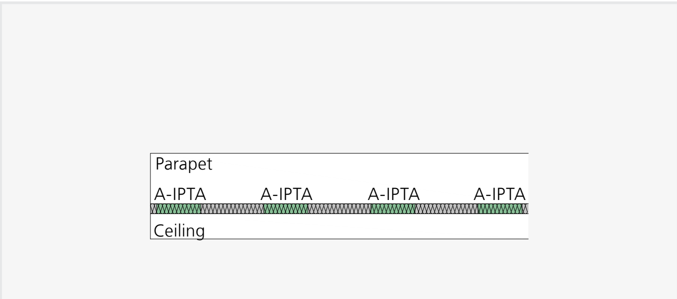
TYPE DESIGNATION

A-IPTA b200 R90

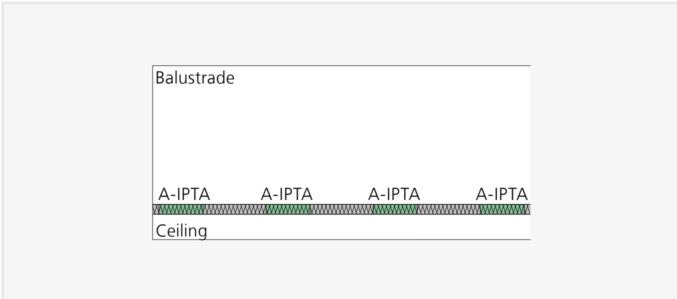
Fire protection version
Parapet/balustrade width
Type

APPLICATION – UNIT ARRANGEMENT

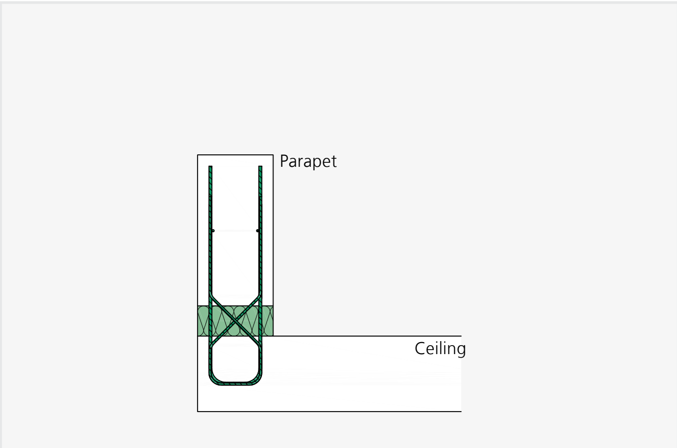
This chapter provides planning aids and specific information about this product. In addition, the general information on materials, design, building physics, installation on site, etc. on pages 10 - 23 has also to be considered.



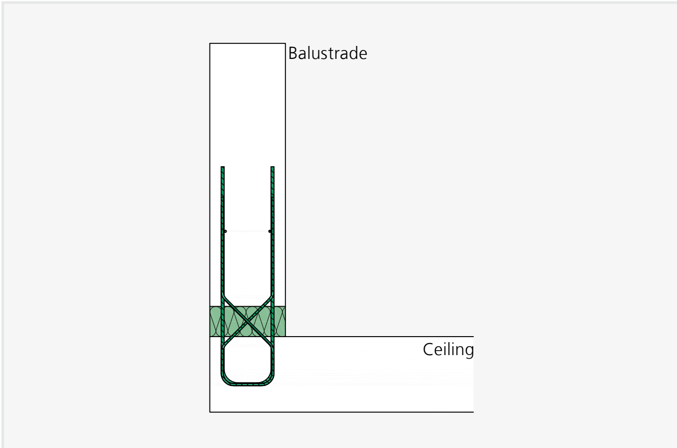
ISOPRO® A-IPTA – View of parapet connected to the horizontal face



ISOPRO® A-IPTA – View of balustrade connected to the horizontal face

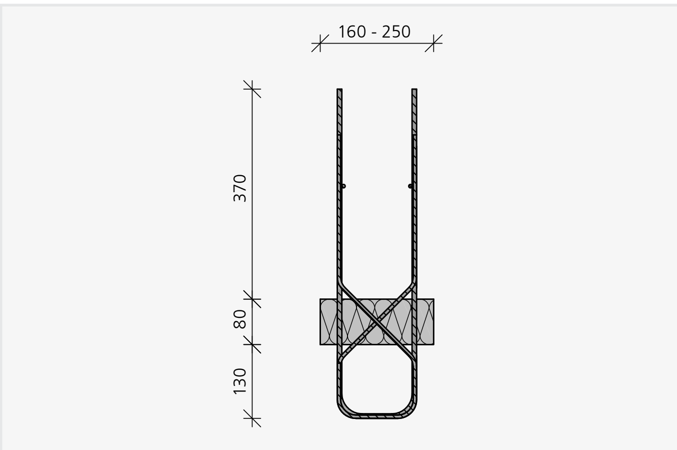


ISOPRO® A-IPTA – Installation cross-section of parapet

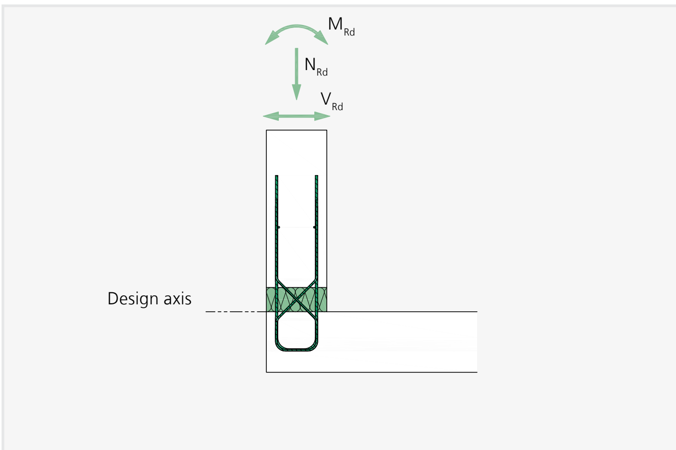


ISOPRO® A-IPTA – Installation cross-section of balustrade connected to the horizontal face

UNIT STRUCTURE



SIGN REGULATION/STATIC SYSTEM



DESIGN

DESIGN TABLE FOR CONCRETE ≥ C25/30

ISOPRO®	A-IPTA b < 200 mm	A-IPTA b ≥ 200 mm
Normal force* N_{Rd} [kN]	Moment M_{Rd} [kNm] depending on N_{Rd}	
0	± 4,4	± 6,4
5	± 4,2	± 6,0
10	± 4,0	± 5,7
15	± 3,8	± 5,4
20	± 3,5	± 5,1
25	± 3,3	± 4,7
30	± 3,1	± 4,4
35	± 2,8	± 4,1
40	± 2,3	± 3,7
Horizontal force V_{Rd} [kN]	± 12,0	± 12,0

- * As normal force only pressure can be transferred (no tensile force)

CONCRETE COVERING

Parapet/Balustrade width b [mm]	Concrete covering cv [mm]
150	25
160	30
170	35
180	40
190	45
200	30
210	35
220	40
230	45
240	50
250	55

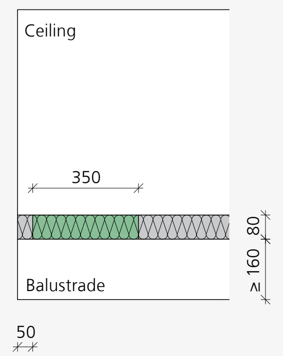
ASSIGNMENT AND DIMENSIONS

ISOPRO®	A-IPTA
Unit length [mm]	350
Parapet/Balustrade width b [mm]	150 - 250
Tension/Pressure rods	3 Ø 8
Horizontal force rods	2 x 2 Ø 6

MAX. PERMISSIBLE DISTANCE BETWEEN EXPANSION JOINTS

ISOPRO®	A-IPTA
Distance between joints e [m]	13,0

EDGE DISTANCE

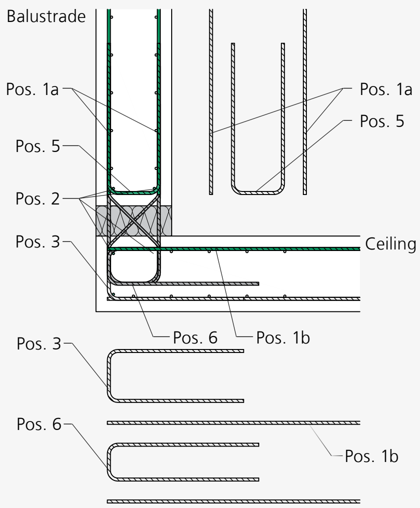


The following distances must be maintained around the edges of ceilings or balustrades and around expansion joints

- Distance from the edge is not required around balustrades.
- A 50 mm distance from the edge must be maintained around ceilings.

SUPPLEMENTARY REINFORCEMENT

ISOPRO® A-IPTA



- Pos. 1a connection reinforcement for the ISOPRO® unit in the balustrade – see table
- Pos. 1b connection reinforcement for the ISOPRO® unit in the ceiling – see table
- Pos. 2 spacing bar 2 x 2 Ø 8 on balustrade and ceiling side
- Pos. 3 structural edging in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications
- Pos. 4 structural edging at the free balcony edge in accordance with EN 1992-1-1 min. Ø 6/250 respectively in accordance with the structural engineer's specifications (not shown here)
- Pos. 5 supplementary reinforcement for the ISOPRO® unit in the balustrade – see table
- Pos. 6 connecting stirrup supplied ex works 3 Ø 8
- For ISOPRO® A-IPTA units with parapet/balustrade widths of 150, 160 and 200 mm, the supplementary reinforcement of the parapet/balustrade must be arranged within the unit reinforcement, as this has a concrete covering of cv < 35 mm

CONNECTION AND SUPPLEMENTARY REINFORCEMENT

	Suppl. reinforcement Pos. 5	Connecction reinforcement balustrade Pos. 1a	Connection reinforcement ceiling Pos. 1b
$A_{s,erf}$ [cm²]	0,30	2 x 1,51	1,51
Suggestion	Ø 6/250	2 x 3 Ø 8	3 Ø 8

Our Applications Technology department would be pleased to assist in finding further solutions.
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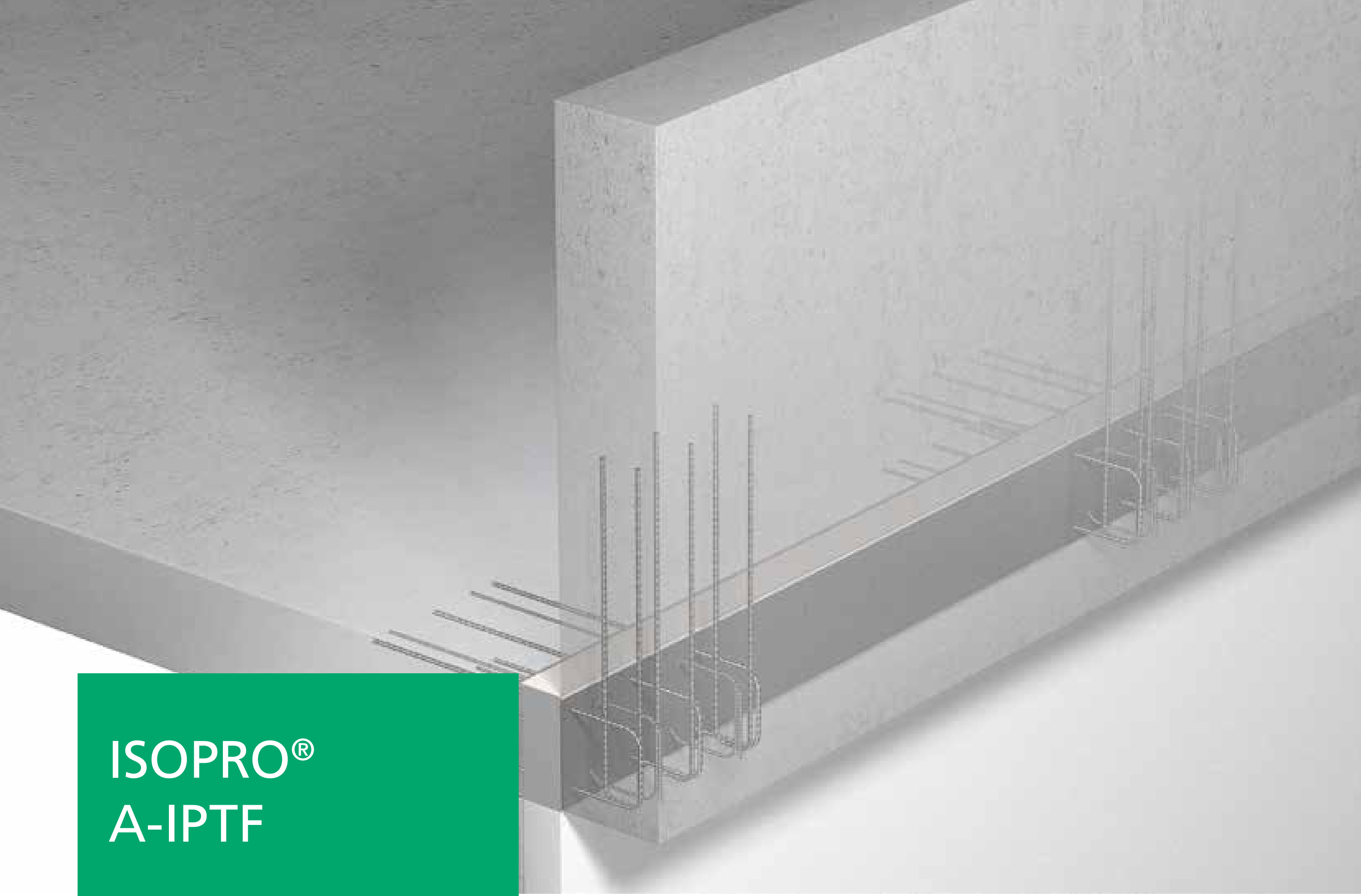


ISOPRO®
A-IPTF

UNITS FOR BALUSTRADES CONNECTED TO THE VERTICAL FACE

ISOPRO® A-IPTF

- For transferring positive shearing forces, positive and negative moments and horizontal forces
- Unit length 350 mm
- Unit heights 160 to 250 mm
- Concrete covering depending on the unit height – see unit structure
- Balustrade width ≥ 150 mm
- Insulation thickness 80 mm – 60 mm possible as an option
- Fire resistance classes see page 20

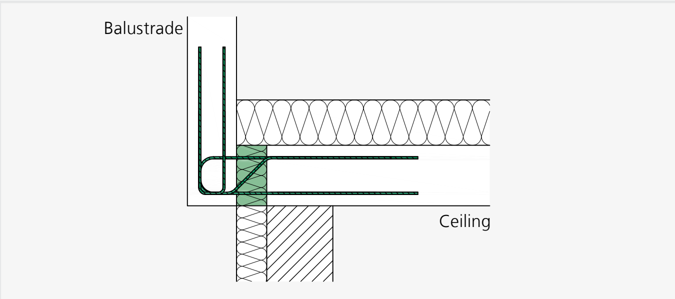
TYPE DESIGNATION

A-IPTF h200 R90

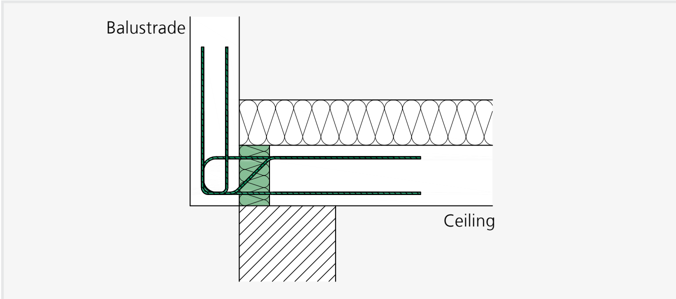
- R90 – Fire protection version
- h200 – Unit height
- A-IPTF – Type

APPLICATION – UNIT ARRANGEMENT

This chapter provides planning aids and specific information about this product. In addition, the general information on materials, design, building physics, installation on site, etc. on pages 10 - 23 has also to be considered.

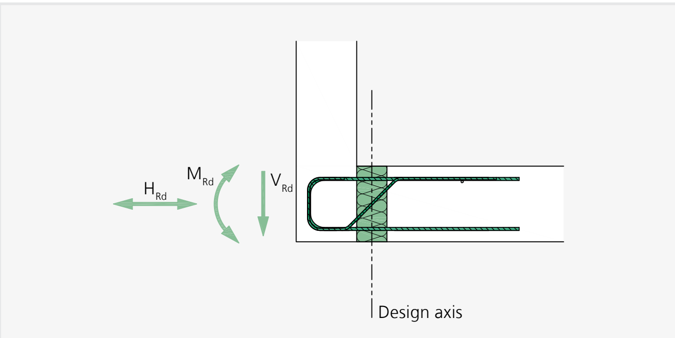


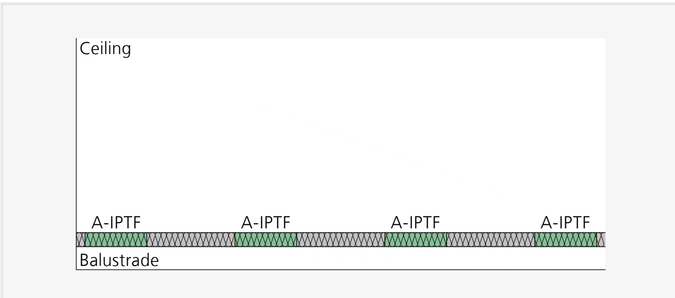
ISOPRO® A-IPTF – Installation cross-section of a balustrade connected to the vertical face with a thermal insulation composite system



ISOPRO® A-IPTF – Installation cross-section of a balustrade connected to the vertical face with thermally insulating masonry

SIGN REGULATION/STATIC SYSTEM





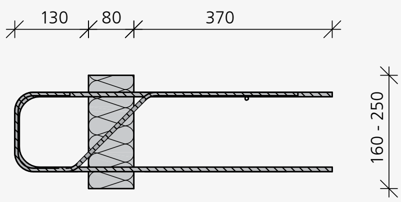
ISOPRO® A-IPTF – Plan view of balustrade connected to the vertical face

DESIGN TABLE FOR CONCRETE ≥ C25/30

ISOPRO®	A-IPTF h < 200 mm	A-IPTF h ≥ 200 mm
Horizontal force H_{Rd} [kN]	Moment M_{Rd} [kNm] depending on H_{Rd}	
0	± 4,4	± 6,4
5	± 4,2	± 6,0
10	± 4,0	± 5,7
15	± 3,8	± 5,4
20	± 3,5	± 5,1
25	± 3,3	± 4,7
30	± 3,1	± 4,4
35	± 2,8	± 4,1
40	± 2,3	± 3,7
Vertical force V_{Rd} [kN]	± 12,0	± 12,0

UNIT STRUCTURE - EXPANSION JOINTS

UNIT STRUCTURE ISOPRO® A-IPTF



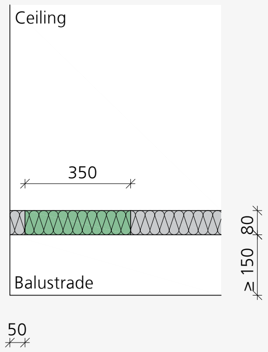
ASSIGNMENT AND DIMENSIONS

ISOPRO®	A-IPTF
Unit length [mm]	350
Unit height h [mm]	160 - 250
Tension/Pressure rods	3 Ø 8
Shear rods	2 Ø 6

MAX. PERMISSIBLE DISTANCE BETWEEN EXPANSION JOINTS

ISOPRO®	A-IPTF
Distance btw. joints e [m]	13,0

EDGE DISTANCE



CONCRETE COVERING

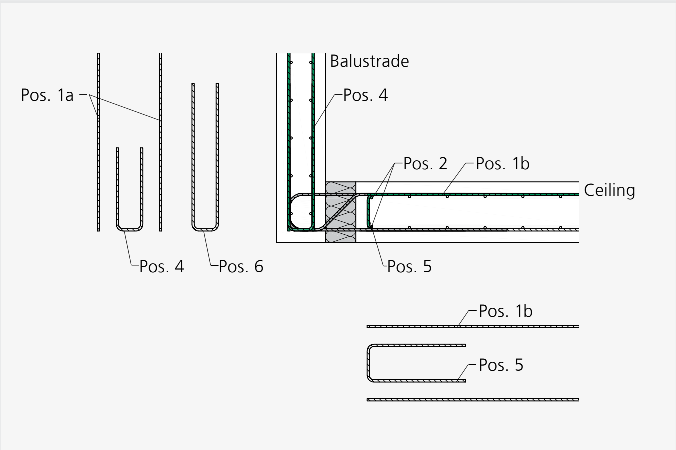
Unit height h [mm]	Concrete covering cv [mm]
160	30
170	35
180	40
190	45
200	30
210	35
220	40
230	45
240	50
250	55

The following distances must be maintained around the edges of ceilings or balustrades and around expansion joints

- Distance from the edge is not required around balustrades.
- A 50 mm distance from the edge must be maintained around ceilings.

SUPPLEMENTARY REINFORCEMENT

ISOPRO® A-IPTF



- Pos. 1a connection reinforcement for the ISOPRO® unit in the balustrade – see table
- Pos. 1b connection reinforcement for the ISOPRO® unit in the ceiling – see table
- Pos. 2 spacing bar 2 x 2 Ø 8 on balustrade and ceiling side
- Pos. 4 connecting bars for the ISOPRO® unit in the balustrade – see table
- Pos. 5 supplementary reinforcement for the ISOPRO® unit
- Pos. 6 connecting bars supplied ex works 3 Ø 8

CONNECTION AND SUPPLEMENTARY REINFORCEMENT

ISOPRO®	Supplementary reinforcement Pos. 5	Connection reinforcement stirrup Pos. 4	Connection reinforcement balustrade Pos. 1a	Connectrion reinforcement ceiling Pos. 1b
$a_{s,erf}$ [cm²/m]	1,13	1,51	2 x 1,51	1,51
Suggestion	Ø 6/250	3 Ø 8	2 x 3 Ø 8	3 Ø 8

NOTES

- For the reinforcement and selection of distances between the ISOPRO® A-IPTF units, note the ability for concreting.
- For ISOPRO® A-IPTF units with parapet/balustrade widths of 130 to 160 mm, pos. 4 can be omitted, as this is covered by pos. 6.

Our Applications Technology department would be pleased to assist in finding further solutions.

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ISOPRO®
A-IPO

UNITS FOR CORBELS

ISOPRO® A-IPO

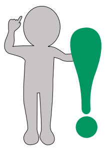
- For corbels that are used to support masonry or prefabricated units
- For transferring positive shearing forces, the resulting negative moments and horizontal forces
- Unit length 350 mm
- Unit heights 180 to 250 mm
- Concrete covering varies depending on the unit height – see unit structure
- Corbel width ≥ 160 mm
- Insulation thickness 80 mm – 60 mm possible as an option
- Fire resistance classes see page 20

TYPE DESIGNATION

A-IPO h200 REI120

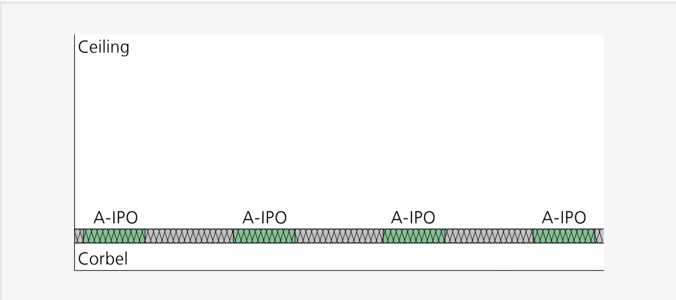
- REI120 – Fire protection version
- h200 – Unit height
- A-IPO – Type

APPLICATION – UNIT ARRANGEMENT

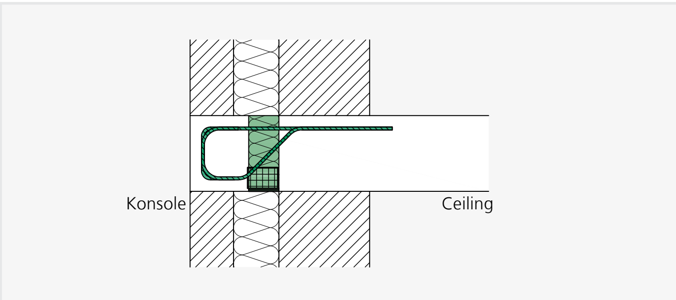


This chapter provides planning aids and specific information about this product. In addition, the general information on materials, design, building physics, installation on site, etc. on pages 10 - 23 has also to be considered.

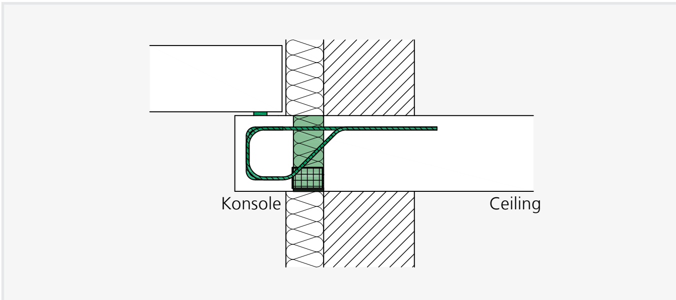
UNIT ARRANGEMENT



ISOPRO® A-IPO – Plan view of corbel

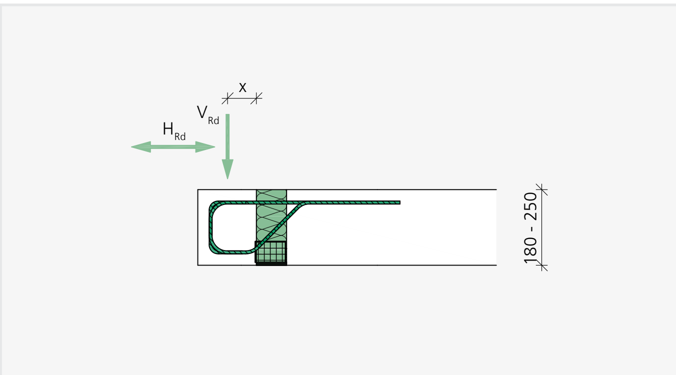


ISOPRO® A-IPO – Corbel with facing masonry



ISOPRO® A-IPO – Corbel as support for a prefabricated component, support with centring bearing

SIGN REGULATION/STATIC SYSTEM



DESIGN - UNIT STRUCTURE

DESIGN TABLE FOR CONCRETE ≥ C25/30

ISOPRO®		A-IPO		
Load transfer point x [mm]		60 - 90	100	110
Shear force V_{Rd} [kN] depending on unit height h [mm]	180	26,9	25,9	17,3
	200	26,9	26,9	20,3
	220	26,9	26,9	23,3
	240	26,9	26,9	23,1
	250	26,9	26,9	22,9
Horizontal force H_{Rd} [kN]		± 2,5		

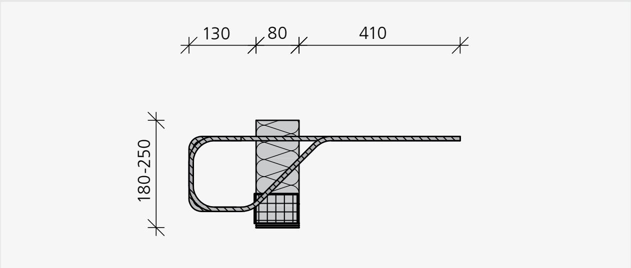
ASSIGNMENT AND DIMENSIONS

ISOPRO®	A-IPO
Unit length [mm]	350
Unit height h [mm]	180 - 250
Tension rods	2 Ø 8
Shear rods	3 Ø 8
Compression bearings	2

CONCRETE COVERING

Unit height h [mm]	Concrete covering at top cv [mm]	Concrete covering at bottom cv_u [mm]
180	30	30
190	40	30
200	30	30
210	40	30
220	30	30
230	40	30
240	40	40
250	50	40

UNIT STRUCTURE

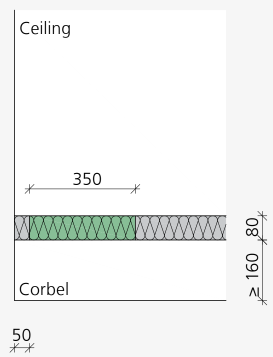


EXPANSION JOINTS - SUPPL. REINFORCEMENT

MAXIMUM PERMISSIBLE DISTANCE OF EXPANSION JOINTS

ISOPRO®	A-IPO
Distance btw. joints e [m]	13,0

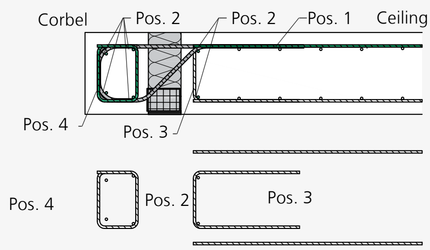
EDGE DISTANCE



The following distances must be maintained around the edges of ceilings or balustrades and around expansion joints:

- Distance from the edge is not required around balustrades.
- A 50 mm distance from the edge must be maintained around ceilings.

SUPPLEMENTARY REINFORCEMENT



- Pos. 1 connection reinforcement for the ISOPRO® unit 3 Ø 8
- Pos. 2 spacing bar 2 Ø 8 on the ceiling and at least 4 Ø 8 in the corbel
- Pos. 3 structural edging in accordance with EN 1992-1-1 min. Ø 6/250
- Pos. 4 closed bar in the corbel in accordance with the structural engineer's specifications

Our Applications Technology department would be pleased to assist in finding further solutions.
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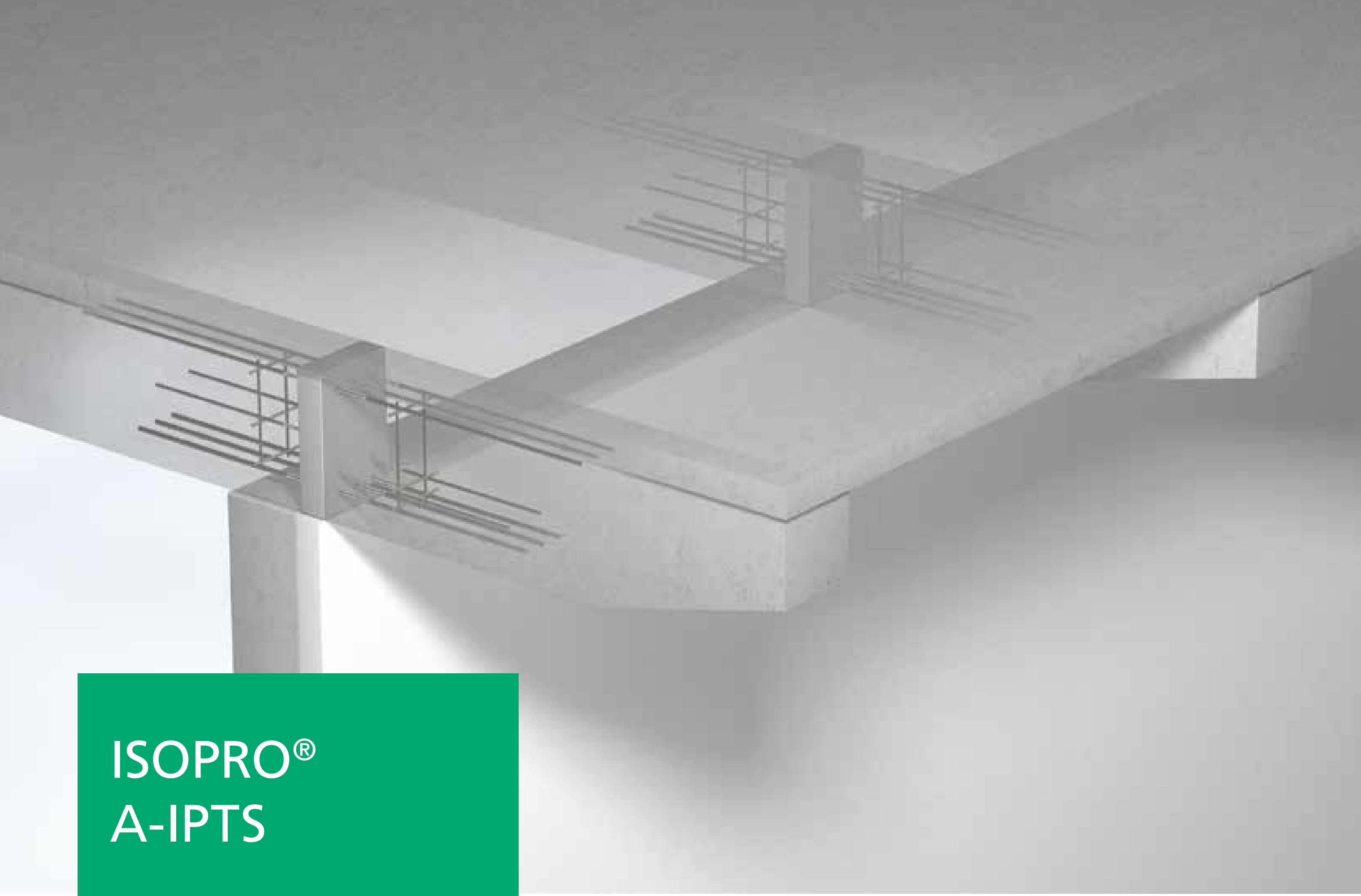


ISOPRO® A-IPTS

UNITS FOR CANTILEVERED JOISTS

ISOPRO® A-IPTS

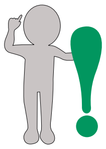
- For transferring negative moments and positive shearing forces
- Load-bearing capacities A-IPTS 1 to A-IPTS 4
- Unit widths 220 to 300 mm
- Unit heights 300 to 600 mm
- Concrete covering cv 50 mm at the top, bottom and side
- Anchoring length of tension rods designed for bonding area 1 – „good bonding conditions", bonding area 2 upon request
- Fire resistance classes see page 20

TYPE DESIGNATION

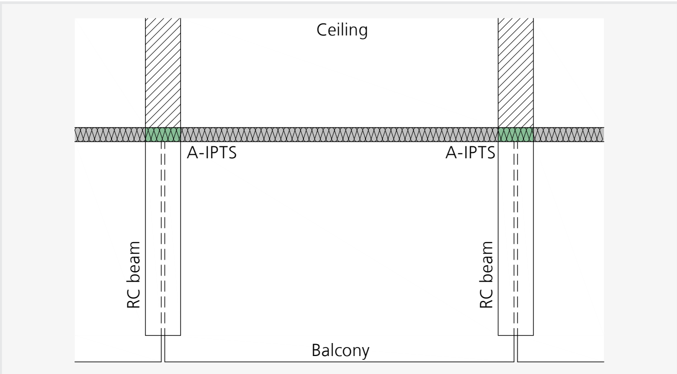
A-IPTS 2 b/h = 220/400 R90

- R90 — Fire protection version
- b/h = 220/400 — Unit dimensions
- A-IPTS 2 — Type and load-bearing capacity

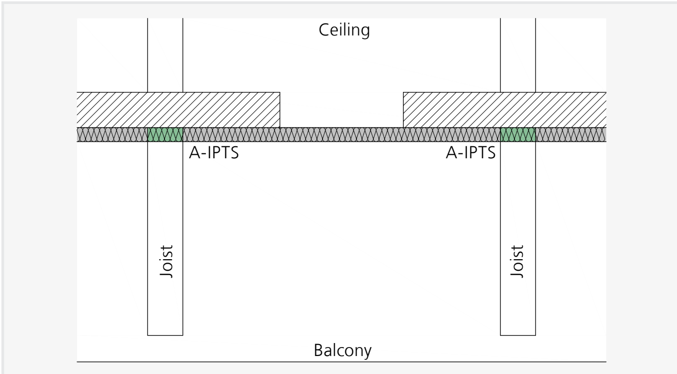
APPLICATION – UNIT ARRANGEMENT



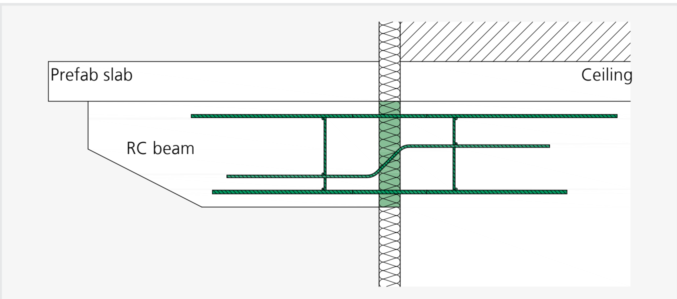
This chapter provides planning aids and specific information about this product. In addition, the general information on materials, design, building physics, installation on site, etc. on pages 10 - 23 has also to be considered.



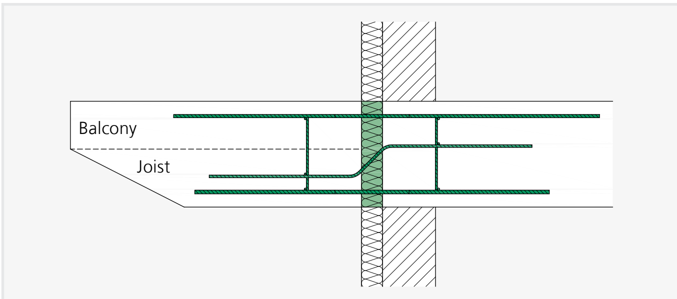
ISOPRO® A-IPTS – Balcony structure with prefabricated slabs joined by a non-static connection, and load-carrying joists



ISOPRO® A-IPTS – Balcony structure with joists connected to the balcony slab monolithically



ISOPRO® A-IPTS – Installation cross-section with prefabricated slabs



ISOPRO® A-IPTS – Installation cross-section with joists connected to the balcony slab monolithically

DESIGN TABLE FOR CONCRETE ≥ C25/30

DESIGN VALUES OF ALLOWABLE MOMENTS M_{Rd} [kNm]

Unit height [mm]	ISOPRO®			
	A-IPTS 1	A-IPTS 2	A-IPTS 3	A-IPTS 4
300	19,4	26,4	36,1	47,7
350	24,5	33,5	45,9	60,8
400	29,6	40,5	55,7	73,9
600	50,1	68,8	94,7	126,4

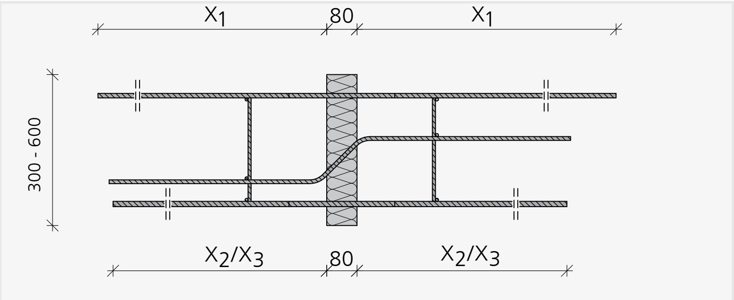
DESIGN VALUES OF ALLOWABLE SHEARING FORCES V_{Rd} [kN]

ISOPRO®	A-IPTS 1	A-IPTS 2	A-IPTS 3	A-IPTS 4
Shear force V_{Rd} [kN]	30,9	48,3	69,5	94,6

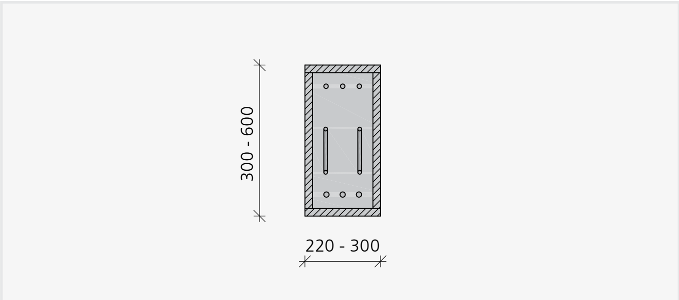
DIMENSIONS AND ASSIGNMENT

ISOPRO®	A-IPTS 1	A-IPTS 2	A-IPTS 3	A-IPTS 4
Unit width [mm]	220 - 300			
Unit height [mm]	300 - 600			
Tension rods	3 Ø 10	3 Ø 12	3 Ø 14	3 Ø 16
Shear rods	2 Ø 8	2 Ø 10	2 Ø 12	2 Ø 14
Pressure rods	3 Ø 12	3 Ø 14	3 Ø 16	3 Ø 20

UNIT STRUCTURE



ISOPRO® A-IPTS



ISOPRO® A-IPTS – Version with fireproof panels – R90

ISOPRO® Rod lengths [mm]	A-IPTS 1	A-IPTS 2	A-IPTS 3	A-IPTS 4
Tension rod* X_1	740	860	860	860
Shear rod X_2	420	530	630	740
Pressure rod X_3	580	650	785	955

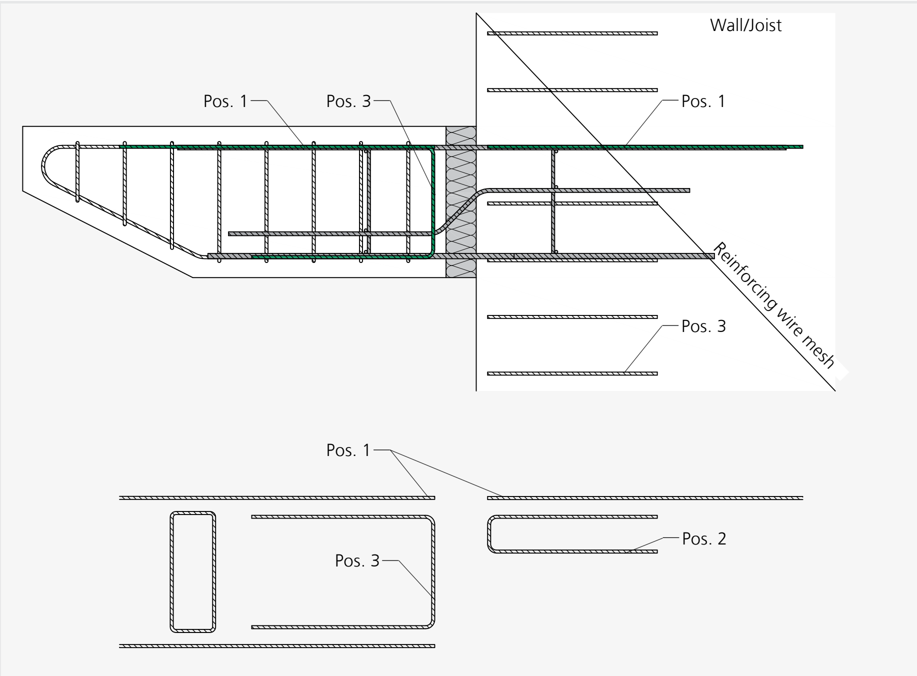
* The anchoring length of the tension rods is designed for bonding area 1, "good bonding conditions". On request, the anchoring length of the tension rods can also be designed for bonding area 2, "moderate bonding conditions".

EXPANSION JOINTS - SUPPL. REINFORCEMENT

MAXIMUM PERMISSIBLE DISTANCE BETWEEN EXPANSION JOINTS

ISOPRO®	A-IPTS 1	A-IPTS 2	A-IPTS 3	A-IPTS 4
Distance btw. joints e [m]	11,3	10,1	9,2	8,0

ISOPRO® A-IPTS SUPPLEMENTARY REINFORCEMENT



- Pos. 1 connection reinforcement for the ISOPRO® unit – see table
- Pos. 2 structural edging in accordance with EN 1992-1-1 min. Ø 6/250
- Pos. 3 supplementary reinforcement for the ISOPRO® unit – see table

CONNECTION REINFORCEMENT POS. 1 FOR B500B

ISOPRO®	A-IPTS 1	A-IPTS 2	A-IPTS 3	A-IPTS 4
$a_{s,erf}$ [cm²/m]	2,35	3,39	4,61	6,03
Suggestion	3 Ø 10	3 Ø 12	3 Ø 14	3 Ø 16

SUPPLEMENTARY REINFORCEMENT POS. 3 FOR B500B

ISOPRO®	A-IPTS 1	A-IPTS 2	A-IPTS 3	A-IPTS 4
$a_{s,erf}$ [cm²/m]	0,71	1,11	1,59	2,17
Suggestion	2 Ø 8	2 Ø 10	2 Ø 10	2 Ø 12

Our Applications Technology department would be pleased to assist in finding further solutions.
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ISOPRO®
A-IPTW

UNITS FOR CANTILEVERED RC WALLS

ISOPRO® A-IPTW

- For transferring negative moments, positive shearing forces and horizontal forces
- Load-bearing capacities A-IPTW 1 to A-IPTW 3
- Unit widths 150 to 250 mm
- Unit heights 1.500 to 3.500 mm
- Anchorage length of tension rods designed for bonding area 2 – "moderate bonding conditions"
- Concrete covering cv 50 mm at the top and bottom and cv 25 to cv 50 at the side, depending on the unit width
- Fire resistance classes see page 20
- Delivery of the units in at least three sub-units – bottom section with pressure and shear rods, intermediate section and top section with tension rods. For large unit heights, additional intermediate sections are added.

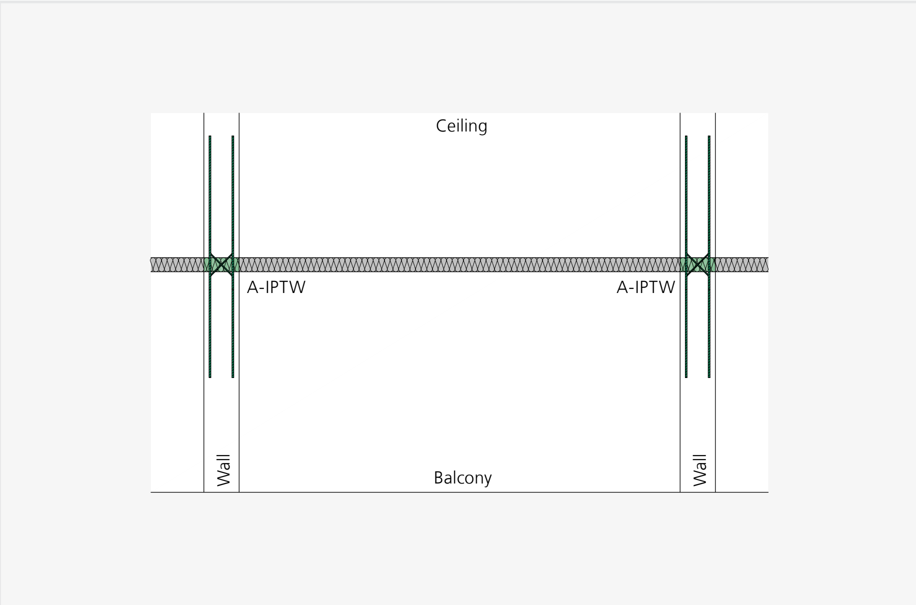
TYPE DESIGNATION

A-IPTW 2 b/h = 220/2.000 R90

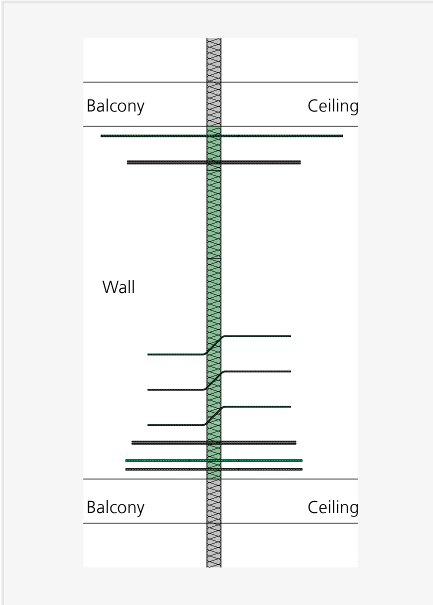
- R90: Fire protection version
- b/h = 220/2.000: Unit dimensions
- A-IPTW 2: Type and load-bearing capacities

APPLICATION – UNIT ARRANGEMENT

This chapter provides planning aids and specific information about this product. In addition, the general information on materials, design, building physics, installation on site, etc. on pages 10 - 23 has also to be considered.



ISOPRO® A-IPTW – Arrangement of units in the floor plan in combination with a balcony slab



ISOPRO® A-IPTW – Installation cross-section with wall slab connected to the balcony slab monolithically

DESIGN TABLE FOR CONCRETE ≥ C25/30

DESIGN VALUES OF ALLOWABLE MOMENTS M_{Rd} [kNm]

Unit height [mm]	ISOPRO®		
	A-IPTW 1	A-IPTW 2	A-IPTW 3
≥ 1.500	130,4	263,7	338,0
≥ 2.000	179,1	366,1	474,5
≥ 2.500	227,8	468,5	611,0
≥ 3.000	276,5	570,9	747,5
≥ 3.500	325,1	673,3	884,0

DESIGN VALUES OF ALLOWABLE SHEARING FORCES V_{Rd} [kN] AND HORIZONTAL FORCES H_{Rd} [kN]

ISOPRO®	A-IPTW 1	A-IPTW 2	A-IPTW 3
Shear force V_{Rd} [kN]	61,8	123,6	208,5
Horizontal force H_{Rd} [kN]	± 28,3	± 28,3	± 28,3

DIMENSIONS AND ASSIGNMENT

ISOPRO®	A-IPTW 1	A-IPTW 2	A-IPTW 3
Unit width [mm]		150 - 250	
Unit height [mm]		1.500 - 3.500	
Tension rods	4 Ø 10	6 Ø 12	8 Ø 12
Shear rods	4 Ø 8	8 Ø 8	6 Ø 12
Horizontal rods		2 x 2 Ø 8	
Pressure rods	4 Ø 10	6 Ø 12	8 Ø 12

NOTES ON DESIGN

- The anchoring length of the tension rods is designed for connection area 2, "moderate connection conditions".
- Moments from wind loads perpendicular to the wall slab cannot be borne by the ISOPRO® A-IPTW unit. These loads are transferred through the stiffening effect of the monolithically connected balcony slabs. If this is not possible, the ISOPRO® A-IPTW unit can be supplemented with an ISOPRO® A-IPTD unit. This then replaces the intermediate component.

Our Applications Technology department would be pleased to assist in finding further solutions.
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EXPANSION JOINTS - UNIT STRUCTURE

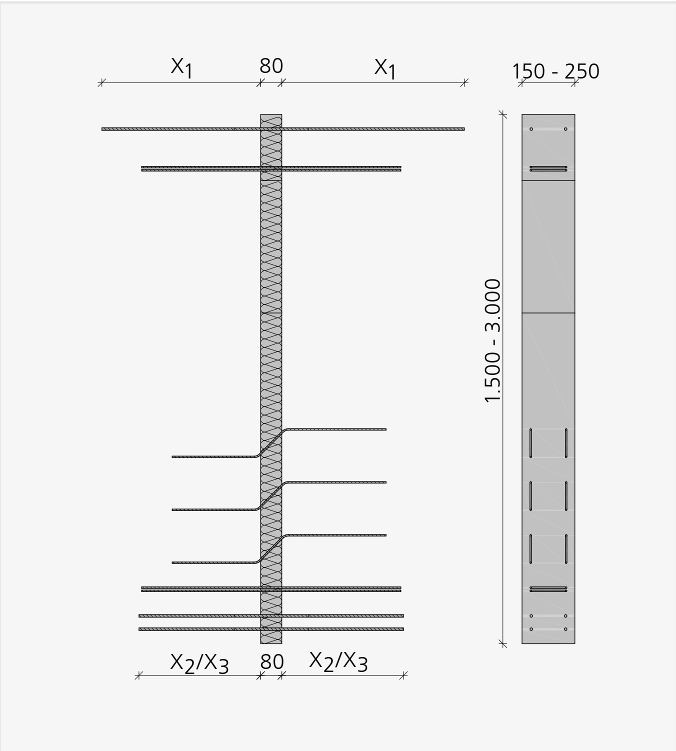
DISTANCE BETWEEN EXPANSION JOINTS

If the component dimensions exceed the maximum permissible distance between expansion joints, expansion joints must be arranged perpendicular to the insulation plane. The maximum permissible distance between expansion joints e is dependent on the maximum rod diameter guided across the expansion joint and is thus type-dependent.
Fixed points, such as support above a corner, result in increased constraints. As a result, the maximum permissible distance between expansion joints must be reduced to e/2. Half of the maximum distance between expansion joints is always measured from the fixed point.
If walls joined using ISOPRO® A-IPTW have a rigid connection with long balcony slabs, the maximum distances between expansion joints specified below shall apply.

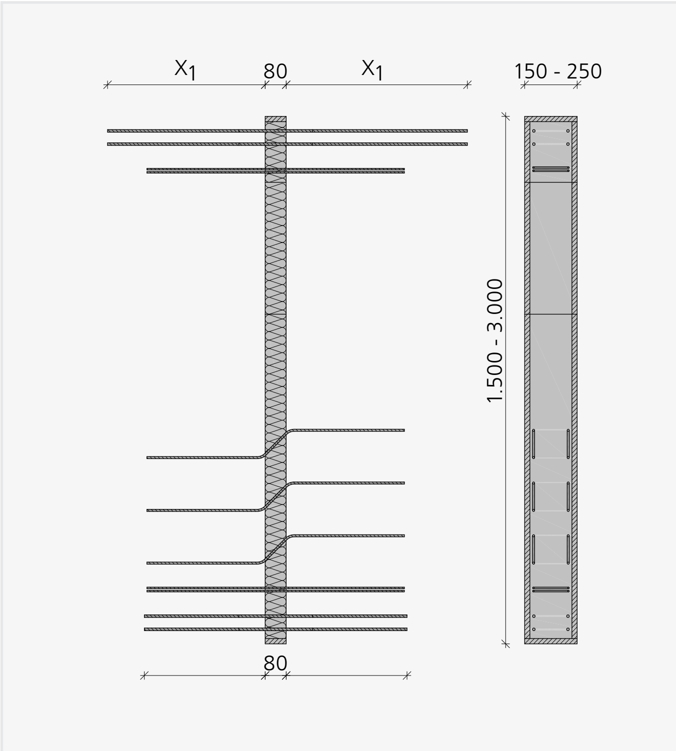
MAXIMUM PERMISSIBLE DISTANCE BETWEEN EXPANSION JOINTS

ISOPRO®	A-IPTW 1	A-IPTW 2	A-IPTW 3
Distance btw. joints e [m]	13,0	13,0	11,3

UNIT STRUCTURE ISOPRO® A-IPTW



ISOPRO® A-IPTW

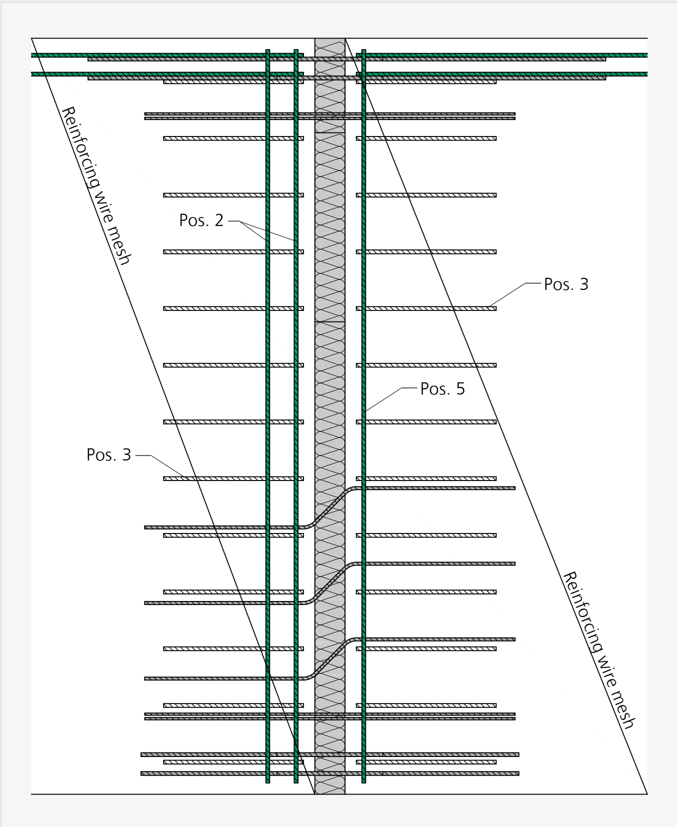


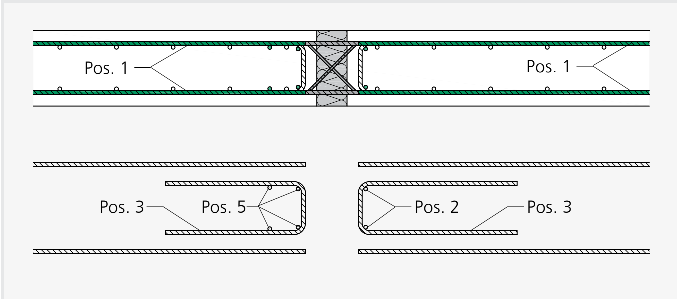
ISOPRO® A-IPTW – Version with fire proof panels – R90

ISOPRO® Rod lengths [mm]	A-IPTW 1	A-IPTW 2	A-IPTW 3
Tension rod X_1	740	740	860
Shear rod X_2	310/370	420	420
Horizontal shear rod	450	450	450
Pressure rod X_3	480	480	570

SUPPLEMENTARY REINFORCEMENT

ISOPRO® A-IPTW





- Pos. 1 connection reinforcement for the ISOPRO® unit – see table
- Pos. 2 spacing bar 2 Ø 8
- Pos. 3 structural edging in accordance with EN 1992-1-1 min. Ø 6/250
- Pos. 5 supplementary reinforcement for the ISOPRO® unit, anchored with stirrups – see table
- During concreting, even filling and compression on both sides must be ensured, as well as secure positioning.

CONNECTION REINFORCEMENT POS. 1 FOR B500B

ISOPRO®	A-IPTW 1	A-IPTW 2	A-IPTW 3
$a_{s,erf}$ [cm²/m]	3,14	6,79	9,05
Suggestion	4 Ø 10	6 Ø 12	8 Ø 12

SUPPLEMENTARY REINFORCEMENT POS. 5 FOR B500B

ISOPRO®	A-IPTW 1	A-IPTW 2	A-IPTW 3
$a_{s,erf}$ [cm²/m]	1,42	2,84	4,79
Suggestion	2 x 2 Ø 8	2 x 2 Ø 10	3 x 2 Ø 12

ISOPRO®
Z-ISO

UNITS AS INTERMEDIATE INSULATION

ISOPRO® Z-ISO

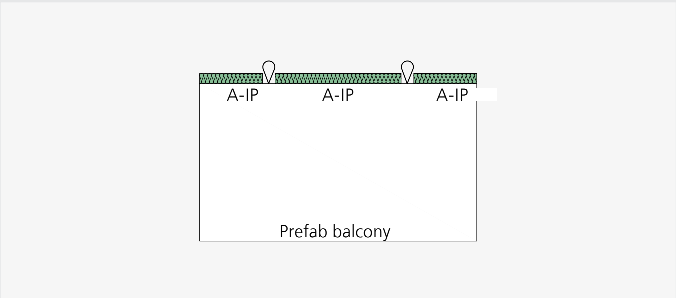
- No structural function
- Length 1000 mm
- Unit heights starting from 160 mm
- Short units and units up to a height of 280 mm available on request
- Fire resistance classes see page 20

TYPE DESIGNATION

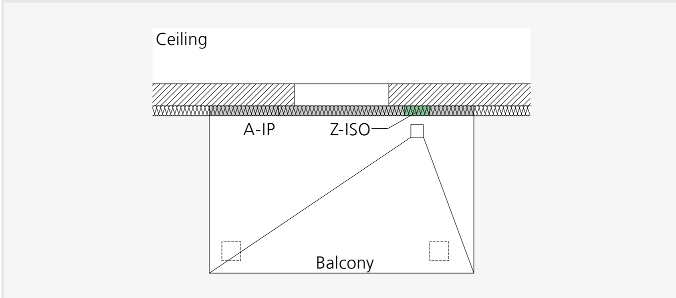
IP Z-ISO h200 FP1

- FP1 — Fire protection version
- h200 — Unit height
- IP Z-ISO — Type

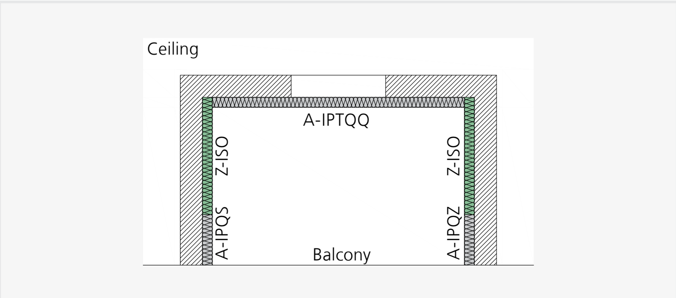
APPLICATION – UNIT ARRANGEMENT



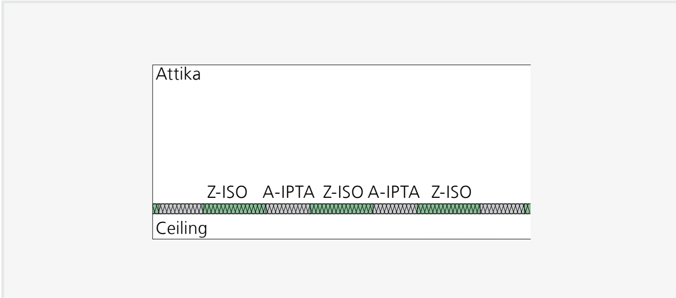
ISOPRO® Z-ISO – Balcony as prefabricated component with transport anchor – the Z-ISO units are added on site



ISOPRO® Z-ISO – Balcony on supports – Z-ISO units in the drainage recess area

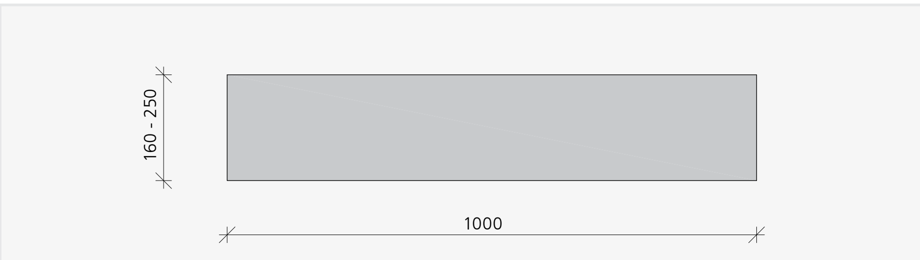


ISOPRO® Z-ISO – Loggia with support at specific points with A-IPQS/A-IPQZ

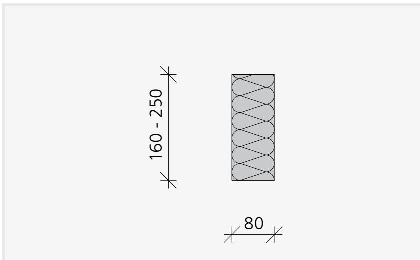


ISOPRO® Z-ISO – Use of parapet units at specific points ISOPRO® A-IPTA

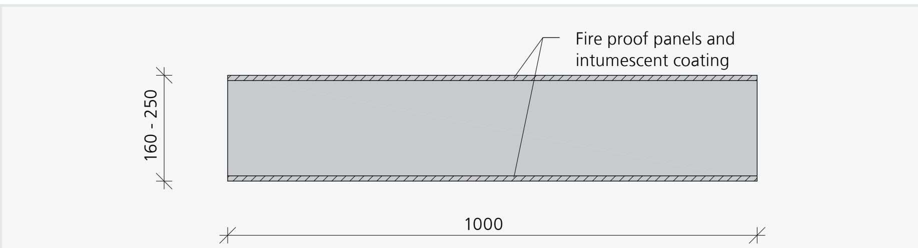
UNIT STRUCTURE



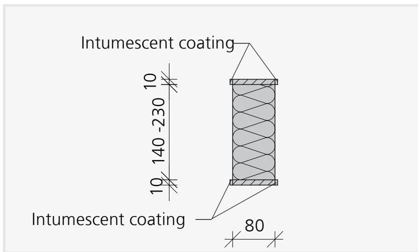
ISOPRO® Z-ISO – Product view



ISOPRO® Z-ISO – Product cross section



ISOPRO® Z-ISO FP1 – Product view with fireproof panels at the top and bottom



ISOPRO® Z-ISO FP1 – Product cross section

NOTES

- When using ISOPRO® Z-ISO units, it must be considered that the length and thus also the load-bearing capacity of the line connection is reduced by the length of the Z-ISO units relative to the total connection length
- The fire protection class of the Z-ISO FP1 unit corresponds to the maximum fire protection class of the statically supporting ISOPRO® units used in the line connection. E.g. Z-ISO in combination with ISOPRO® A-IP - REI120; Z-IS0 in combination with ISOPRO® A-IPT - R90

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