Schöck Isokorb®

Thermal bridging solutions.
Schöck Isokorb® specifiers handbook.

BBA BRITISH BOARD OF AGRÉMENT
CERTIFICATE No 05/4277

The purpose of this guide.
Innovative thinking in practice.

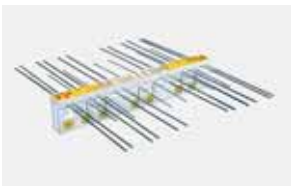
Over 10 million units of Schöck Isokorb® installed in Europe since its introduction more than 20 years ago.

Content

The purpose of this guide is to provide guidance for architects, structural engineers and other building professionals on the impact of thermal bridges due to cantilever building elements and how they can meet compliance with the far-reaching Part L of the Building Regulations, through the energy efficient design and construction of cantilevered balconies and other similar construction elements.

A leading European supplier

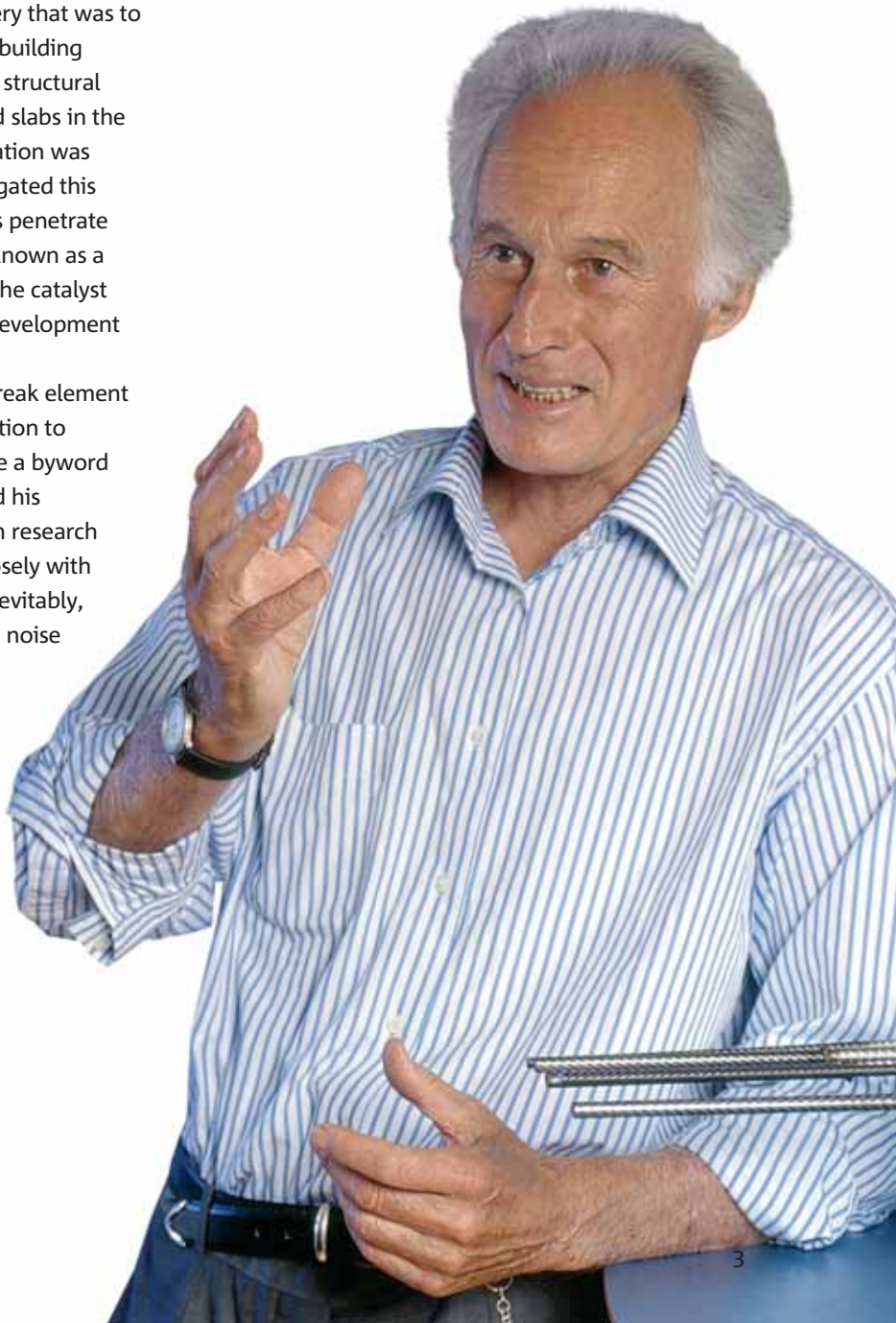
Today, still on the original site, we have grown to become one of Europe's leading suppliers of innovative thermal energy insulation, noise impact suppression and reinforcement technology solutions. In addition to our headquarters at Baden-Baden, we have a production plant in Halle/Saale and further subsidiaries have been established in Great Britain, Austria, Netherlands, Switzerland, Hungary, Poland and France. A network of highly qualified distributors provide expert sales and technical support in many countries including the Czech Republic, Belgium, Luxembourg and Ireland...



In 1962, as a young structural engineer, Eberhard Schöck founded a specialist construction company at Baden-Baden, in southern Germany. His vision was to develop innovative construction solutions that would allow more effective and efficient processes on the building site. He dedicated his working time to considering every aspect of building physics and technologies, constantly looking for ways to improve construction techniques.

About Schöck

Ironically, it was while on a skiing holiday in 1979 that Eberhard Schöck made the dramatic discovery that was to have so much impact on thermally efficient building design. He noticed that where conventional structural connections were used to join balconies and slabs in the buildings in which he was staying, condensation was forming in the walls and ceilings. He investigated this further and discovered that where balconies penetrate the building insulation envelope, an effect known as a "thermal bridge" is created. This was to be the catalyst for him to spend four years of his life on a development programme which resulted, in 1983, in the groundbreaking Schöck Isokorb® thermal break element being launched onto the market. His dedication to technical research and development became a byword and from that point on Eberhard Schöck and his company have continued to invest heavily in research and development programmes, working closely with many universities and research institutes. Inevitably, other innovations followed, most notably in noise suppression and reinforcement technology. The Schöck Tronsole®, an impact noise suppressor for stairways, helping to create a quieter living environment and the Schöck Bole® punching-shear reinforcement system, which set a benchmark in reinforcement technology.



The balcony – spacious, but demanding.
Environment – sustainability – freedom of design.

Part L paragraph 1.30 reads:
"The building fabric should be constructed so that there are no significant thermal bridges or gaps in the insulation layer(s) within the various elements of the fabric..."

A balcony is an important part of a modern building. It offers a feeling of freedom and spaciousness and has so many different uses – an outside meal, sunbathing, drying clothes, talking to the neighbours – not significant events, but important in terms of lifestyle and relaxation. Unfortunately, incorporating a balcony may not be so relaxing for the architect or structural engineer. Cantilever balcony connections and other similar construction elements which project through the building envelope, breaking the insulation layer in the process, are well known for creating thermal bridges, resulting in significant heat and energy loss. Moreover, if there is sustained exposure to condensation, plaster and paintwork will be subject to serious deterioration and mould growth.

Combat climate change

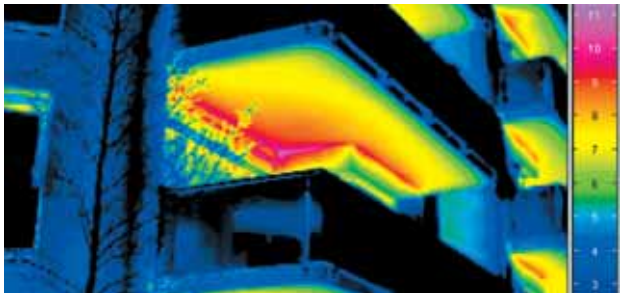
In the UK, Building Regulation Approved Document Part L1 (ADL1) and Part 2 (ADL) cites BRE IP1/06 for guidance, for requirements in terms of thermal bridges

- Relating to minimum surface temperature
- In terms of thermal losses

which originally came into force in April 2002. It places an obligation on everyone, particularly architects, designers, contractors and subcontractors, to contribute to the control and reduction of energy consumption by encouraging the industrywide adoption of energy efficient practices, in both building design and construction and help fulfil the UK's commitments to the Kyoto Protocol and the reduction of greenhouse gas emissions.

The future of building is more than ever linked to environmental considerations, placing greater pressure on the industry to provide thermally efficient, energy saving construction technologies to satisfy the demand for sustainable buildings. Schöck is a specialist dedicated to meeting the expectations of the professionals involved in delivering such technologies.

The structural thermal bridge.
Where thermal bridging occurs.



The effects of the thermal bridge

- Energy consumption can increase by up to one third.
- If there is sustained exposure to condensation, plaster and paintwork will be subject to serious deterioration.
- Mould growth is not only an aesthetic disaster, it is hazardous to health and well known for being a major source of respiratory conditions, such as asthma.

Minimum surface temperature requirements

Requirements relating to minimum surface temperature are stated in the Building Regulation Approved Document Part L1 (ADL1) and Part L2 (ADL2). The critical temperature factor (f_{CRsi}) is introduced as a means of avoiding mould growth on absorbent surfaces and limiting the risk of surface condensation.

Type of building	f_{CRsi}
Dwellings, residential buildings, public buildings	0.75

Energy losses due to thermal bridging

ADL1 (Dwellings) uses the Government Standard Assessment Procedure SAP 2005 to determine overall carbon dioxide emissions from the building. Heat losses through non-repeating thermal bridges (H_{TB}) is calculated using different methods.
To describe the energy performance of the thermal bridge the values ψ and χ are used. If those specific values are not known, a default value has to be applied. This correction leads to a loss of approx. 40 % of the calculated energy performance of the building. Using Accredited Construction Details the calculated energy loss is reduced from 40 % to 20 %.
If numerical modeling with ψ and χ values is applied the calculated energy loss is only 5 %, eight times less than the calculation with not known specific values.

Schöck Isokorb® provides assured numerical modeling values. Maximum benefit is therefore gained.

Conventional balcony connections are a breeding ground for the conditions which create geometrical thermal bridges (the "Cooling fin" effect) and tangible thermal bridges (reinforced concrete slabs with a high thermal conductivity factor), thus causing a dramatic thermal outflow. Energy costs soar, as more and more warmth is lost and a drastic drop in surface temperature in these "cold spots" leads to various types of damage to the building.

Better insulated houses cut carbon dioxide emission and heating costs

Architects and specifiers must reduce carbon dioxide and greenhouse gas emissions by building more energy efficient buildings. It is well documented that better thermal insulation is a good means of tackling the issue of global warming, and the Schöck thermal break system helps compliance with both the regulations and public expectation.

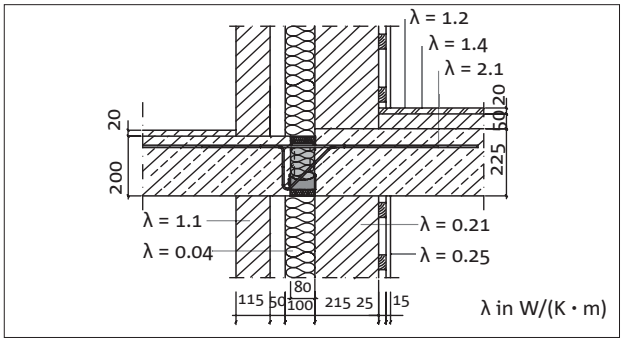
Characteristics values for balcony connections using the Schöck Isokorb®

The ψ and χ values depend on the type of construction used for the thermal bridge. To calculate them the thermal performance of the materials used and the equivalent thermal insulation value λ_{eq} of the thermal break are required.

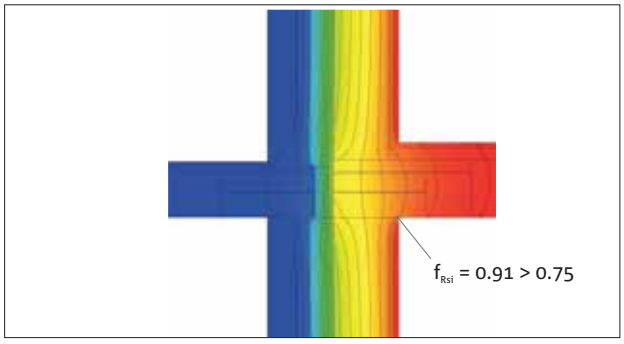
Characteristic thermal bridge values resulting from typical construction types, along with different Schöck Isokorb® types are shown in the table below. The underlying construction types and the isothermals are shown on page 8. Other thermal bridge construction types which do not match the ones shown here will have different values.

Schöck Isokorb® Type	K50	KS14	KST16
Equivalent thermal conductivity (3-dim.) W/(m · K)	λ_{eq} = 0.19	λ_{eq} = 0.31	λ_{eq} = 0.70
Thermal transmission coefficient ψ in W/(m · K) (in relation to external dimensions) or χ in W/K	ψ = 0.21	χ = 0.097	χ = 0.26
Temperature factor f_{Rsi}	f_{Rsi} = 0.91	f_{Rsi} = 0.93	f_{Rsi} = 0.82

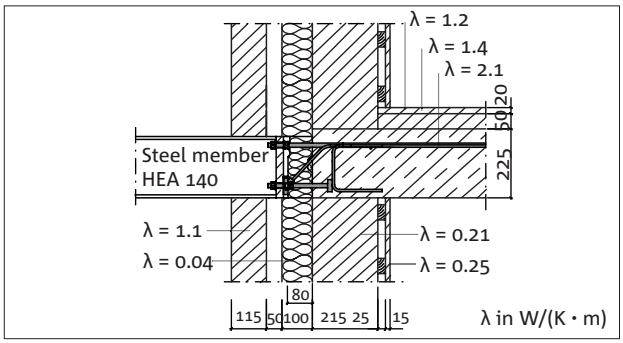
Note the effectiveness.
Schöck has a unique solution.



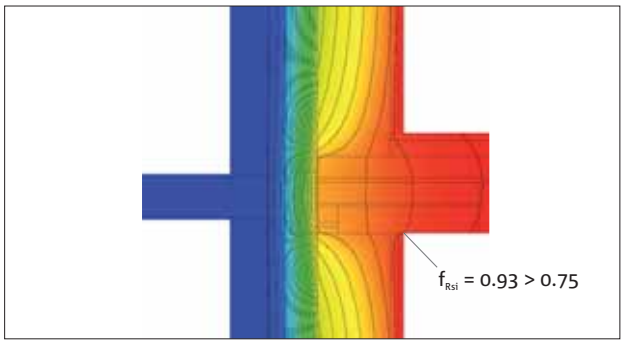
Balcony slab connection with Schöck Isokorb® type K50-CV30 and a composite thermal insulation system



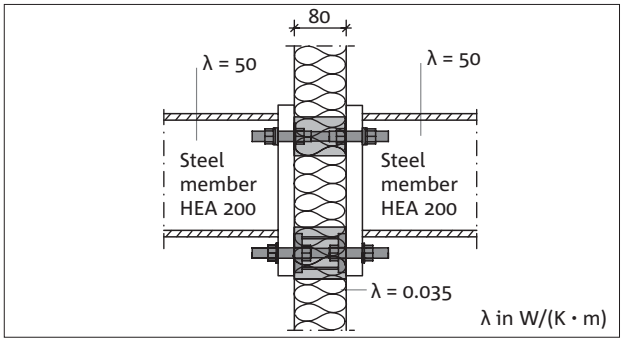
Isothermals for connection on the left side



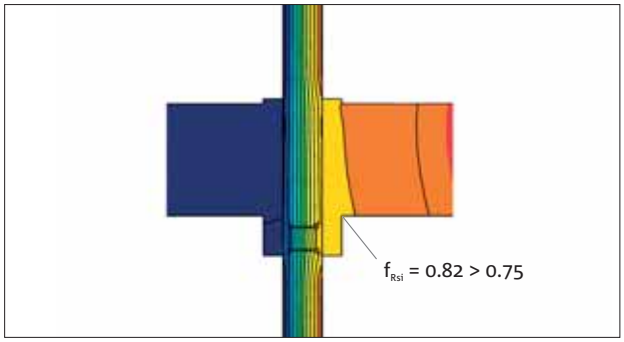
Connection of steel member HEA 140 with Schöck Isokorb® type KS14 and a composite thermal insulation system



Isothermals for connection on the left side

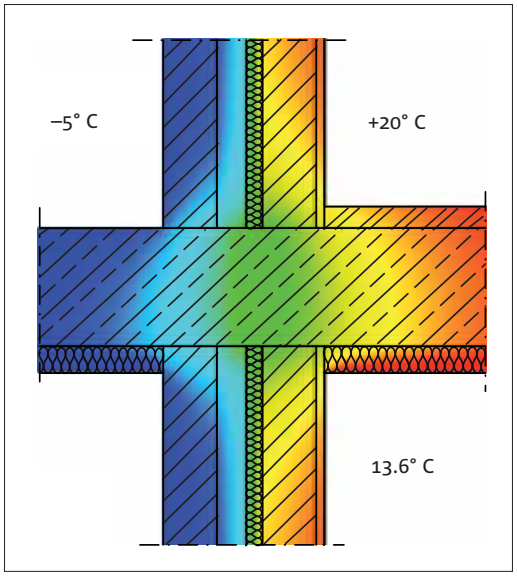


Connection of steel member HEA 200 with Schöck Isokorb® type KST16

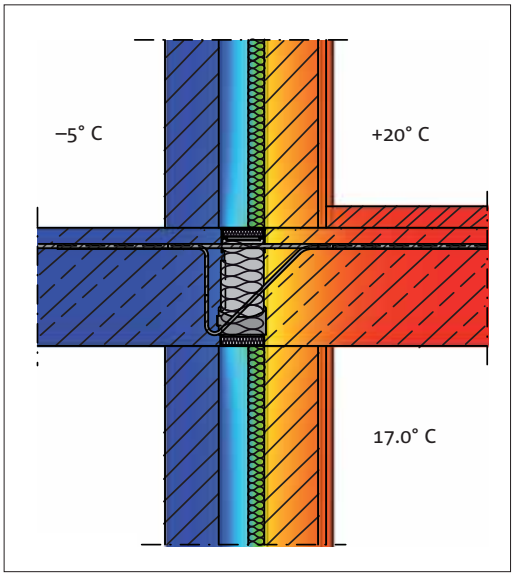


Isothermals for connection on the left side

The Schöck thermal elements are for use in concrete-to-concrete, concrete-to-steel and steel-to-steel construction and form a thermal break, whilst transferring load and maintaining full structural integrity. Known throughout Europe as the Schöck Isokorb® it has remained the most advanced, high performance thermal break element with over 10 million units installed since its introduction more than twenty years ago.



Balcony connection without thermal break.
Insulation under balcony and ceiling.

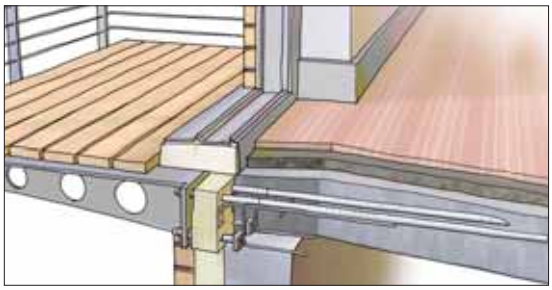


Balcony connection with Schöck Isokorb® K30.

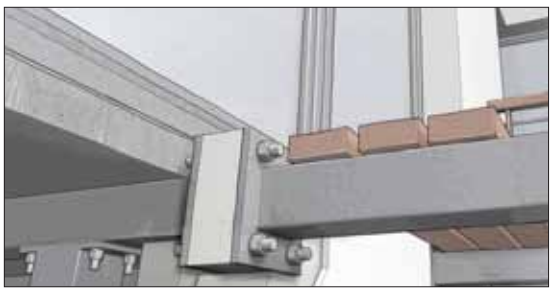
The Schöck Isokorb® thermal break element is the only product of its type that allows thermally efficient load bearing connections between

Concrete-to-concrete

Concrete-to-steel



Steel-to-steel



Schöck Isokorb® type K.
Concrete-to-concrete.

Setting a new benchmark
Using the latest generation of micro stainless steel fibre reinforced concrete pressure-bearing blocks, the Schöck Isokorb® range sets a new benchmark in thermal break technology. The Schöck Isokorb® type K with HTE-pressure-bearing module provides the best thermal performance achievable with thermal breaks today. At the same time this technique simplifies the installation on-site and thus reduces the installation time dramatically.

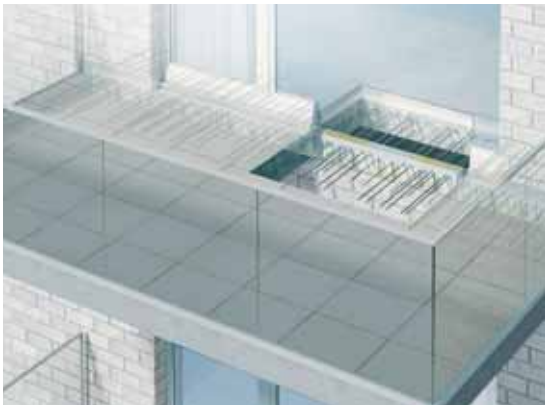
Schöck Isokorb® type	λ_{eq} = (W/m · K)
K10	0,081
K20/KF20	0,101
K30/KF30	0,131
K40	0,141
K50	0,164

Examples of the average thermal conductivity with a balcony slab thickness of 220 mm

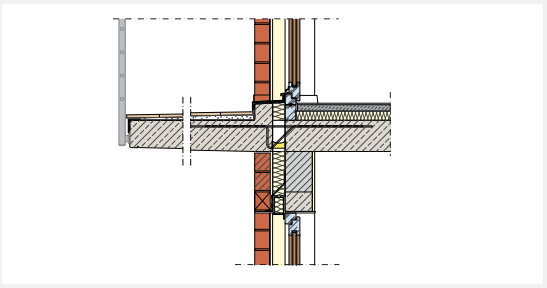
Other advantages in the construction process are:
- The units are light and easily handled by one man.
- Drop-in fast installation – averaging less than five minutes per unit.
- The product has a uniquely low thermal conductivity*.
- The first and therefore unique thermal break element with certification, No. 05/4277.

*One of the reasons why the Schöck Isokorb® was certified to be the best thermal break element by the ”Fraunhofer Institute for Building Physics”.

The Schöck thermal break element, the Isokorb®, with its simple "drop-in" installation, low thermal conductivity and integral load bearing capacity offers the ideal insulation solution to this problem. It is manufactured from state-of-the-art materials – stainless steel and high density microfibre reinforced concrete – which guarantee the highest quality thermal partitioning of balconies and floor slabs. The dramatically reduced thermal outflow means higher surface temperatures inside, eliminating the risk of extra condensation, damage and mould growth.



Construction details Schöck Isokorb® type K

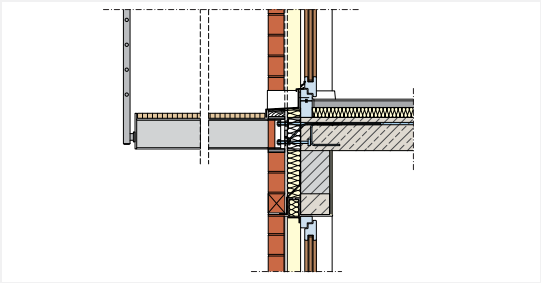


Construction materials Schöck Isokorb® type K

On-site concrete	Minimum density class C25 (at component junctions)
Pressure bearing pad	PE-HD synthetic cloaking
Reinforcement steel	Bst 500S and Bst 500 M
Steel construction	S235 JRG1
Stainless steel	Construction material nr. 1.4571 hardening level S460
	Reinforcement ribs Bst 500 NR
Fire protection plates	Lightweight building boards, materials class A1, cement-bound fire safety boards, mineral wool: ρ ≥ 150 kg/m³
	Melting point T ≥ 1000 °C with integrated fire protection strips
Insulation Material	Polystyrene hard foam

Schöck Isokorb® type KS and KST.
Concrete-to-steel & steel-to-steel.

Construction details Schöck Isokorb® type KS



Construction materials Schöck Isokorb® type KS

Reinforcing steel	B 500 B acc. to BS 4449, and BSt 500 NR
Pressure bearing	S 355 JO
Nonrusting steel	Material no.: 1.4401, 1.4404 and 1. 4571
Pressure plate	Grade A4-70 to BS EN
Spacer shims	ISO 3506
Threaded fasteners	
Insulation material	Polystyrene hard foam

On-site:

- Cuts down on operation time.
- Ensures corrosion protection with its stainless steel finish.
- Different types ensure the transmission of shear, bending moment and tension, as well as compression.

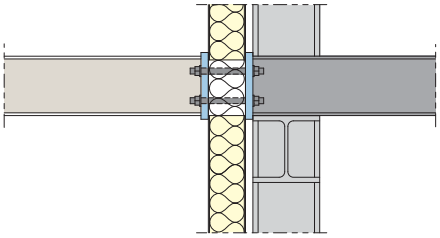
The Schöck Isokorb® type KS enables a thermally insulated, loadbearing connection to be made between reinforced concrete and steel construction components. Fine tuning and adjustment to optimize fitting tolerance is possible.

Free cantilever or canopies, balconies or walkways, the Schöck Isokorb® type KST offers complete freedom of design when it comes to steel construction. The unit is able to withstand extremely demanding loads and is effective against bending moment and shear force. Its stainless steel components mean that the unit is completely protected from corrosion.

On-site:

- It is easy to fit with regular end plate connections.
- All available steel profiles can be bolted on.
- Specific load situations controlled by modular use of components.
- Designed to suit loading conditions in residential and commercial buildings.

Construction details Schöck Isokorb® type KST

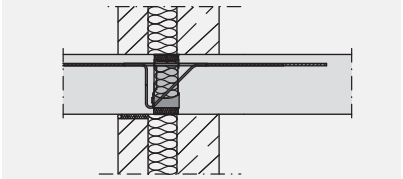


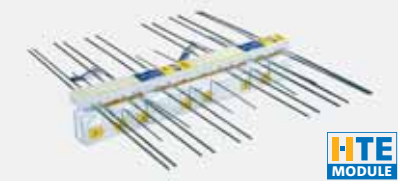
Construction materials Schöck Isokorb® type KST

Nonrusting steel	Material no.: 1.4401, 1.4404 and 1. 4571
Pressure plate Rectangular hollow section Threaded fasteners	Grade A4-70 to BS EN ISO 3506
Insulation material	Polystyrene hard foam

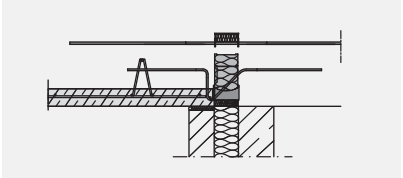
A comprehensive range for every application

Schöck Isokorb® type K
Load bearing element for cantilever balconies. Transfers shear force and bending moment stress. With integrated hanging and edge reinforcement fitted as standard, makes the (normally required) on-site adding of extra stirrups and reinforcement redundant.

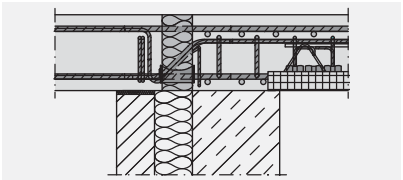




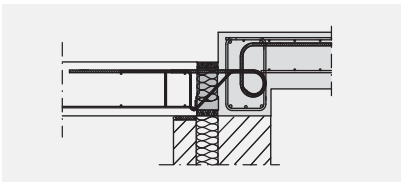
Schöck Isokorb® type KF
For cantilever hanging slabs as precast elements. Partitioned model specially for the requirements of prefabricating plants. The on-site hanging reinforcement is integrated as standard.



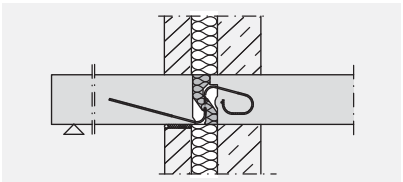
Schöck Isokorb® type K-corner
Produced as a supplement to types K and KF, Schöck Isokorb® type K-corner is used to form balconies with outside corners. The on-site hanging reinforcement is integrated as standard.



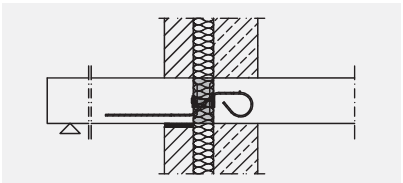
Schöck Isokorb® type K-HV, K-BH, K-WO, K-WU
For stepped cantilever balconies, i.e. where slabs and balconies have to be set at different heights. The on-site hanging reinforcement is integrated as standard.



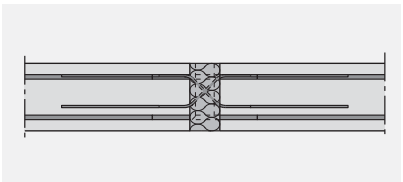
Schöck Isokorb® type V
For insulation of balcony slabs with flexible joints, podiums and column supported balconies. Ideal for shear force transfer.



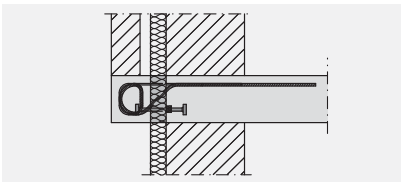
Schöck Isokorb® type Q
For shear and lateral force transfer, also where height and stress points are critical.



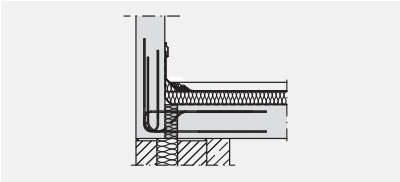
Schöck Isokorb® type D
For insulation of balcony slabs where they appear within the floor slab field. Carries not only positive and negative bending moment stress but also shear forces.



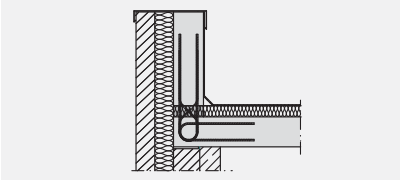
Schöck Isokorb® type O
For insulation of corbelled facing consoles. Point installation according to design requirement spacing.



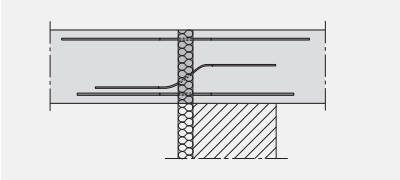
Schöck Isokorb® type F
For insulation between protruding balustrades. Point installation according to design requirements regarding spacing.



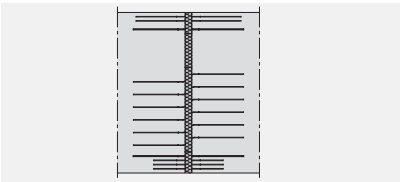
Schöck Isokorb® type A
For insulation between parapets and floor slabs. Point installation according to design requirements regarding spacing.



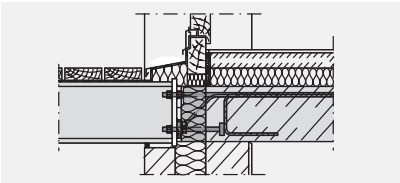
Schöck Isokorb® type S
For insulation at cantilever beams. Carries bending moment and shear force stress at exact point of origin. It is designed and manufactured according to the spacing requirements.



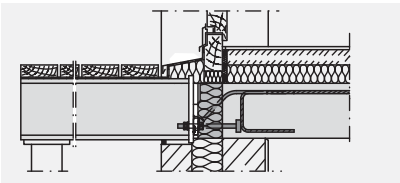
Schöck Isokorb® type W
moment and shear forces both vertically and horizontally. It is designed and manufactured according to the spacing requirements.



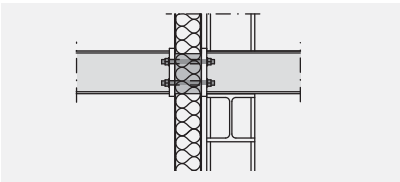
Schöck Isokorb® type KST
The thermal insulation connection element for cantilever steel construction connected to concrete slab.



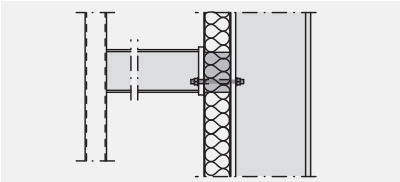
Schöck Isokorb® type QS
The thermal insulation element for steel construction connected to concrete slab, for shear forces only.



Schöck Isokorb® type KST
The thermal insulation element for use where a „steel on steel“ cantilever construction is planned.



Schöck Isokorb® type QST
The thermal insulation element for shear forces in „steel on steel“ construction.



Award winning Elektron goes for Schöck modules in a big way.

The spectacular new Elektron Building in Docklands features one of the largest scale uses in the UK to date of the revolutionary Schöck Isokorb® thermal break modules. It is a development that has won Barratt Homes the Innovation Award for Building Technology in the British Home Awards. This is presented for a development that demonstrates the adoption of new building technologies and the sustainable use of resources, with the Judges praising Elektron for the “good, modern, safe construction technology” being applied.

The Elektron Development site is situated on the north side of the River Thames directly opposite the Millennium Dome. The site enjoys panoramic views of Canary Wharf and the opportunity to exploit these views has generated a design of one 25 storey building and two 22 storey buildings, providing 437 apartments in all – and the Schöck Isokorb® units are installed throughout at the façade connectivity areas to prevent thermal bridging.

The particular Schöck Isokorb® unit used in the Elektron construction is the type KST, which is designed to provide effective thermal insulation and moment and shear force connections for steel-to-steel connections. It allows complete freedom of design and can be installed at balcony and cantilever canopy connections as well as fascia steelwork connections.

It is as a result of their exceptional thermal insulation properties that the Schöck KST Isokorb® modules dramatically reduce thermal energy loss in connective areas. This is by guaranteeing the homogeneity of the thermal envelope between cantilever structures and the internal floor, while also transferring load and maintaining full structural integrity. Inner surface area temperatures remain well in excess of those likely to cause condensation, which quickly leads to serious plaster and paintwork deterioration and extensive mould growth.

It is a highly successful solution, and quite apart from its performance ratings, the Schöck Isokorb® can claim two unique features. It is the only range to offer thermal break solutions for connections between concrete-to-concrete and concrete-to-steel, as well as steel-to-steel. Also, it is the only product of its type able to provide BBA Certification for its concrete-to-steel range.

The range is extensive too, with over 250 standard solutions enabling precise compliance with structural requirements, and providing complete freedom of design in the planning and construction phases of thermally efficient private or public sector buildings. If required, most Isokorb® modules can be tailored to suit a particular application.

Schöck thermal breaks show their all-round ability at new rotunda building.

A new landmark building is emerging in Thamesmead, with the construction of the nine-story rotunda building at Phoenix Point, Poplar Place. Designed by architects Stefan Zins for Gallions Housing Association, it provides a mix of 47 affordable three-bedroom homes, along with one and two-bedroom flats, for either rent or shared ownership.

The rotunda at Phoenix Point is being built on the site of the locally iconic old Boiler House, a discontinued community heating scheme demolished in 2007, which during its lifetime was the second largest community heating system in the UK. The fan assisted ducted warm air heating and hot water system used to be powered by six gas fired boilers, each larger than a double-decker bus and designed to push water around seventy-two miles of pipes.

However, like many housing developments at the time, homes were prone to suffer from poor thermal performance, often made worse by open balconies, and the resulting cold and damp conditions led to widespread condensation and mould related problems in the homes and considerable discomfort for residents.

It is perhaps a little ironic that today, the new Phoenix Point rotunda development, having risen from the footprint of the old Boiler House, incorporates the very best of today's technology for combating thermal bridging problems – the Isokorb® thermal break module from European market leaders Schöck.

It is the type K module, for concrete-to–concrete connections, that has been incorporated into the reinforced concrete frame rotunda building; and the internal and external balconies within the circular profile and central atrium have really allowed the Isokorb® to demonstrate its versatility here. A clever technique has been employed on site, whereby each module is divided into the appropriate length of section required and then effectively "pieced together" and dropped in to fit the required polygonal shape – the Isokorb® being extremely lightweight and easily handled by one man. Any open wedge-shaped areas are then filled with foam on site, or insulation is cut out and inserted.

A key element in the design of the type K Isokorb® is the HTE (high thermal efficiency) module. This is a pressure bearing pad made of high-density micro-fibre reinforced concrete, a highly effective HCFC-free Polystyrol hard foam insulation layer and stainless steel connectors – all of which result in the best thermal performance achievable.

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