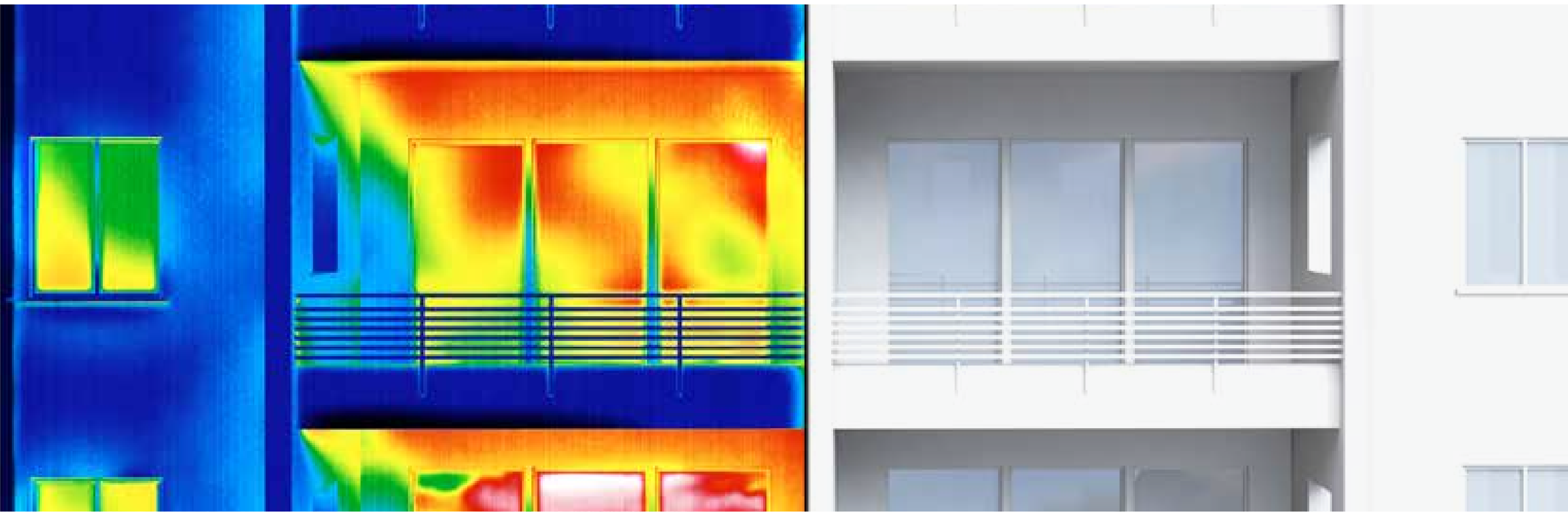
Schöck
Innovative Building Solutions



Thermal breaks.
Solutions with verifiable performance.

Schöck.
A world leader in its speciality.

In the UK specifically, Schöck Ltd is best known as market leader for its Isokorb range of products. These prevent thermal bridging and condensation at critical points where balconies and other cantilever constructions connect with the building.
It is the most comprehensive and effective range of products on the market – allowing connections to be made between concrete-to-concrete, concrete-to-steel and steel-to-steel. The many different unit types available, combined with their ability to enable the transmission of shear, bending moment, tension and compression forces, also means that the options available effectively run into thousands when the different combinations are taken into account.

Schöck is recognised internationally as one of the leading suppliers of innovative noise impact suppression, reinforcement technology and thermal insulation solutions.

Unrivalled technical performance

As a leading specialist in its field, Schöck demands extremely high product performance standards. The company always guarantees that all Isokorb units exceed the necessary building regulations – and that any performance claims are independently verified.

In summary, this means that unlike many of the other claimed thermal insulation solutions on the market, Schöck thermal break units provide comprehensive assurances by providing:

- BBA Certification
- LABC Registration
- Independent test performance results from the Oxford Institute for Sustainable Development (OISD), verifying the thermal performance.
- Excellent lambda values in compliance with the Government Standard Assessment Procedure, SAP 2009, concerning CO_2 emissions from buildings and respectively heat losses through non-repeating thermal bridges.

A crucial factor too is the temperature factor used to indicate condensation risk (f_{RSI}). This is a requirement described in BRE IP1/06 – a document cited in Building Regulations Approved Documents Part L1 and L2 and Section 6 in Scotland – where the f_{RSI} must be greater than, or equal to, 0.75 for residential buildings, and greater than, or equal to, 0.50 for commercial buildings. This factor is comfortably exceeded by incorporating the Schöck product into the design.

Independent tests prove ‘common solutions’ are inferior to the Isokorb KS14.

Recently there have been misconceptions that certain ‘common solutions’ for concrete-to-steel connections perform just as well as the Schöck Isokorb type KS14 thermal break. This is often not the case. Specifiers, contractors, developers and those in procurement need to be wary and question product performance claims involving bespoke solutions. Often they will be found wanting and the lack of transparency in determining true performance values may well mean a product being installed that is simply not fit for purpose. Due to building site ‘tolerances’ it is vital that thermal product solutions should, at the very least, exceed minimum standards and in many cases even that may not be good enough.

As for cost implications, the Isokorb product is ready for installation – there are no ‘add ons’. However, there are possible hidden costs with bespoke versions as it is likely that various bolts, brackets and thermal pads will need to be sourced before installation can be completed. This is complicated further by the possibility that a number of sub-contractors might need to be involved. Just one is required with the KS14.

As evidence of this, an independent investigation into the performance criteria concerning the effectiveness of steel balcony connections to concrete slabs, was carried out by the Oxford Institute for Sustainable Development, at Oxford Brookes University. The ‘common solutions’ in question being the direct connection of balcony support brackets to a concrete floor slab using no form of thermal break; a solution using brackets in conjunction with a 10mm ‘thermal pad’; and a further connection solution using a thicker 20mm ‘thermal pad’.

The first step in the independent investigation determined the heat loss, minimum surface temperature – and consequently the temperature factor (f_{RSi}) – resulting from the use of Schöck Isokorb type KS14 connecting a steel balcony to a concrete floor slab. The temperature factor (f_{RSi}) is used in the UK to indicate condensation risk as described in BRE IP1/06, a document cited in Building Regulations Approved Documents Part L1 and L2.

Once established, this calculated performance (1) was then compared with that of the three structurally equivalent ‘common solutions’. The table on the facing page presents the minimum surface temperatures and temperature factor (2) for the cases modelled, where the temperature factor used to indicate condensation risk (fRSi) must be greater than or equal to 0.75 for residential buildings.

The Isokorb KS14 unit, with f_{RSi} = 0.904, exceeds these values by some margin and therefore meets the requirements of Building Regulations Approved Documents L1 and L2. Further, the results demonstrate that where no unit is used (f_{RSi} = 0.681) and also with the 10mm and 20mm pad connections (f_{RSi} = 0.713 and 0.706 respectively) – all three would fail against the criteria required for residential buildings.

The OISD found the Isokorb type KS14 to be a superior thermal insulating element for connecting cantilevered steel components to reinforced concrete; while other comparable solutions failed to obtain the minimum amount of performance required by Part L of the building regulations.

The temperature results concluded:

Description	Min. surface temp °C	Temperature factor f_{RSi}
No balcony connection		0.949
Model 1 - Direct connection	13.62	0.681
Model 2 - Pad connection 10mm	14.26	0.713
Model 3 - Pad connection 20mm	14.11	0.706
Model 4 - KS14 H200	18.07	0.904

A free copy of the report (Reference: 120927SCH – 27/09/12) is available on request. See back page for contact details.

All calculation was by means of three-dimensional finite difference analysis using SOLIDO software from Physibel.

Temperature factor

$f_{RSi} = (t_{smin} - t_{ao})/(t_{ai} - t_{ao})$

Where: t_{ai} = inside air temperature
t_{ao} = outside air temperature
t_{smin} = minimum internal surface temperature

World’s largest passivhaus scheme trusts Schöck performance.

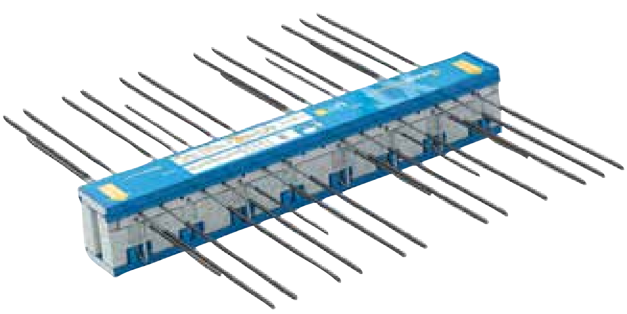
Many cities throughout the world are looking for ways in which to cope with population growth, whilst curbing energy consumption and environmental impact. And the unlikely focus of international interest currently is the historic city of Heidelberg, in south-west Germany. Residentially it is very popular and commercially it is very successful, but Heidelberg has an expansion problem. There is barely any property to be had in the city’s picturesque old town.

The spectacular solution is to build a completely new district – the Bahnstadt – on a 286 acre area that was once home to Heidelberg's now defunct rail freight and marshalling yards. The €2 billion initiative is claimed to be the largest single passivhaus development in the world; and when completed in 2022 it will provide living space for some 5000 residents. There will be a vibrant mixture of culture, education and employment, with around 7000 jobs created. All buildings, not just the 2500 residential properties, will meet advanced passivhaus standards, requiring only 10% of the energy of a conventional building. There are green roofs with only a small number of solar panels, large windows on south facing aspects and small windows to the north. To meet any additional heating needs a mainly wood chip district heating network with “mini-net” distribution will serve the entire district. The energy supply is 100% renewable and Bahnstadt will be the biggest single site in Europe in which the “smart meter” concept is applied throughout. In terms of energy efficiency, the new district by far exceeds national legal requirements as set out in the current Federal Energy Saving Ordinance, with consumption less than half that of traditionally constructed buildings.

Balcony connectivity used to be a problem with passivhaus construction

One of the key criteria for apartment living anywhere in the world these days, not least Bahnstadt, is the aesthetic and practical requirement for the inclusion of balconies. However, with the demands of high insulation levels and the prevention of thermal bridging being critical elements in passivhaus design, the incorporation of balconies has not necessarily been a popular choice with designers. However, the development of the Schöck Isokorb type XT structural thermal break unit has played a major role in resolving that particularly challenging connectivity issue.

This latest generation product for concrete-to-concrete applications offers such a high level of insulation that the Passivhaus Institute in Darmstadt has awarded the product with the "low thermal bridge construction" certificate and confirmed its suitability for passivhaus construction.



Thousands of type XT units are being incorporated into the Bahnstadt development and the major reason for its suitability is the thickness of the insulation body, which is increased from the standard 80mm to 120mm. As a result the unit not only improves thermal insulation performance by up to 30% in comparison to to the standard range, it also improves impact sound insulation by around 50% as well. A further reason for the superior performance of the type XT is the HTE module, a pressure bearing block made of steel fibre reinforced high-performance concrete with Kronolith, a titanium ore aggregate from Kronos Titan. The unit offers architects and engineers a variety of design options and there is even the capability to construct stepped height balconies, with increased fire protection also taken into account, as the HTE module offers fire-resistance class F 120. High quality stainless steel bars are also an integral part of the unit. Although there is a smaller rod diameter, the tensile strength is improved and the same load-bearing capacity is therefore maintained. This means a reduction in the thermally conducting cross-section, and an improvement in the heat insulation performance.

Before the Bahnstadt project, the Isokorb type XT had already seen considerable success in Germany, not least for its sound insulation characteristics, as there is now a stated minimum standard requirement for balconies. Previously this only applied to covered balconies, but the XT has the advantage that it conforms to the minimum requirements for impact sound protection – without any additional floating flooring on the balconies or covered balconies.

Surface temperature factor (f_{RSi}) is a critical calculation.

To identify areas where there is a risk of condensation and therefore mould growth in different design situations, a ‘surface temperature factor’ (f_{RSi}) can be used. It allows surveys under any thermal conditions and compares the temperature drop across the building fabric, with the total temperature drop between the inside and outside air. The ratio is described in BRE IP1/06; a document cited in Building Regulations Approved Documents Part L1 and L2 and Section 6 in Scotland.

It is a critical calculation, as the consequences of condensation and mould growth are likely to be more serious for building occupiers than any local heat loss. If low internal surface temperatures in the area of a thermal bridge are below the dew point of the air, condensation is almost certain to form. This in turn is likely to result in structural integrity problems with absorbent materials such as insulation products or plasterboard – and of even greater concern, the occurrence of mould growth. Practically every building contains mould spores within its fabric which are dormant and completely harmless. However, given the right conditions these spores will germinate and become a potential health risk to occupants in the form of asthma and allergies. Mould starts to form when the relative air humidity reaches 80%, and often before there is evidence of any condensation.

As the actual surface temperature will depend greatly on the temperatures both inside and out at the time of the survey, the surface temperature factor (f_{RSi}) has crucially been formulated to work independently of the absolute conditions.

The actual formula as it relates to internal surveys is that $f_{Rsi} = (T_{si} – T_e) / (T_i – T_e)$; where
T_{si} = the internal surface temperature;
T_i = the internal air temperature; and
T_e = the external air temperature.

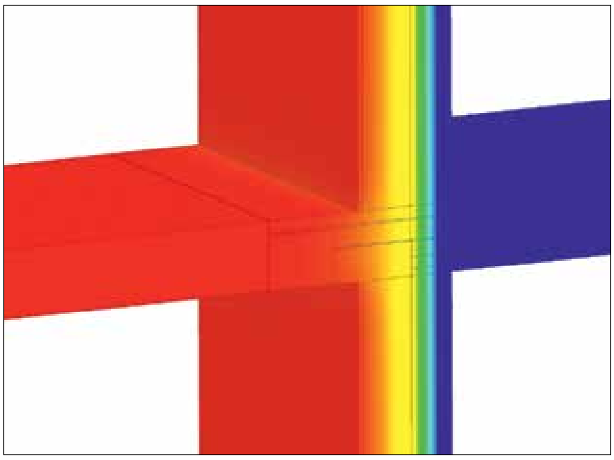
Mould is not a new phenomenon of course, but a combination of circumstances is elevating interest in the problem. Primarily these are better insulated and more airtight buildings, improved energy efficiency requirements and much greater environmental awareness.

Using the formula, the recommended (f_{RSi}) value for offices and retail premises is equal to or greater than 0.5; and to ensure higher standards of comfort for occupants in residential buildings, equal to or greater than 0.75. In more extreme conditions of high humidity, such as swimming pools or other wet areas, 0.9 would be anticipated. In summary, the surface temperature factor required will depend on the use of the building and the consequent internal relative humidity. To eliminate the possibility of condensation and any resultant mould growth, the higher the likely internal humidity, the greater the need for a higher surface temperature factor.

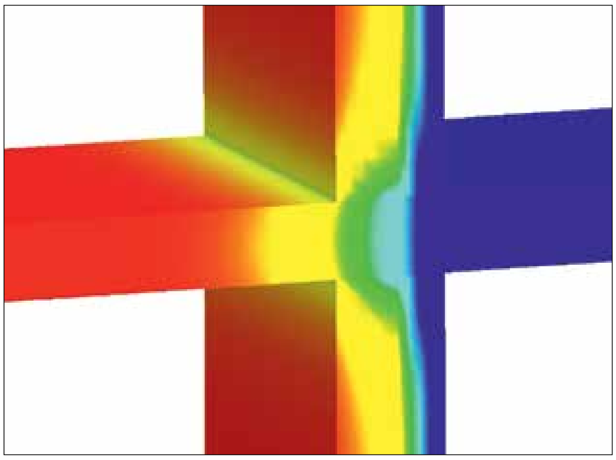
Maintaining leadership through innovative thinking.

From an initial idea, through production and right up to customer implementation, a fully structured concept and innovation management system ensures that all aspects of candidate development opportunities are fully explored. This is not always just an internal process either, as the company often works in close partnership with independent colleges and research institutes at both basic and applied research levels. Particularly relevant examples are the Oxford Institute for Sustainable Development (OISD); the Fraunhofer Institute for Building Physics in Stuttgart: and the Passive House Institute (PHI) in Darmstadt, which has played an especially crucial role in the development of the Passive House concept. It is this focus on values that facilitate such innovative, safe and sustainable technical performance levels that make Schöck the supplier of choice for so many of our partners.

Innovative thinking, continuous improvement and stringent quality control processes are pivotal principles in helping Schöck maintain its technological leadership.



With Isokorb



Without Isokorb

Unrivalled technical design and sales support.

The Schöck technical design team, along with the sales and administration functions for the UK, operate out of premises at Kidlington, just north of Oxford. These highly experienced teams are on hand to provide fully comprehensive design, technology and consultancy services, on all aspect of the company's products from project inception through to on-site construction.

All enquiries are allocated to key members of the various teams and every project rollout ensures that a tailored solution is provided, which includes full calculation presentation; relevant layout and / or location drawings; pictogram method statements and onsite guidance to assist in accurate positioning of the elements and the avoidance of any potential mismatch on site.

It is critical that the team has the fullest criteria available about any particular application, to ensure that the eventual design solution provides a totally cost-effective and optimal thermally efficient solution to meet the specific architectural requirements.

The design software used incorporates design reports and calculation sheets which are distributed to the structural engineers, specifiers, contractors and developers involved with the project, as required. The latest generation of Isokorb design software is in fact freely available to all professionals and calculates the present member forces for connections of widely differing balcony types.

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