

Inserts and connections in precast concrete

R SYSTEM®, **KAPTOR®**, **KONNEKTOR®**, **FISIS®**,
RUREFAST®, **GIRELLA®** E **TIRELLA®**, **BOCCOLA RUR®**





CONNECTIONS FOR PRECAST CONCRETE

- All inserts and connections presented in this document are produced and distributed by RUREDIL. More information and technical data on www.ruredil.com

- Metallic connections combine the advantages of precast concrete with precision and tolerances of steel

- R System: lifting system

- Kaptor: rebar coupler

- Konnektor: structural connection system for thermal break sandwich panels

- Fisis: sliding cladding panel-to-structure connection

- Rurefast: fall prevention system

- Girella and Tirella: bracket systems for the support of panels

- RUR socket: mechanical socket for the connection of threaded bars

The consultant commitment towards the conception of equipping precast structures with metallic connections allowing dry assemblage and safe lifting and assemblage started in the mid-90s.

A series of products aimed at combining the well-known and tested concrete related technology with the advantage of metallic connections, extremely light, dry and precise, have been defined and engineered.

The main connection systems designed by DLC in collaboration with RUREDIL, which produces and commercialises them, are listed hereunder:

R system®

Quick-fit lifting system that solves the problem of handling of the precast elements

Kaptor®

Mechanical coupler for rebars conceived to create clamped joints

Konnektor®

Structural connection system between concrete layers conceived to support suspended concrete layers in thermal break sandwich panels

Fisis®

Sliding tie-back fastener connecting horizontal or vertical cladding panels to the structure also in seismic area

Rurefast®

Safety system supporting the operator during fall from above during the phase of assemblage of prefabricated structures

Girella® and Tirella®

Overturning or extractable bracket systems for the support of panels with small dimensions and large tolerances

RUR® socket

Self-sustaining threaded socket to be inserted in precast concrete elements for the connection with threaded bars



R SYSTEM®



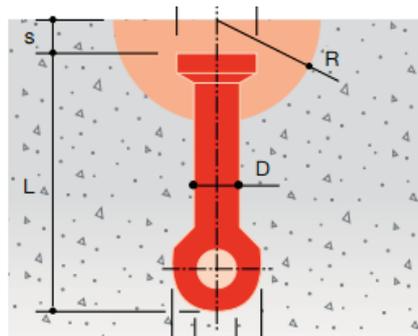
The lifting system R SYSTEM has been engineered over 50 years, and the product range has been extended to cover all the demands for handling of concrete elements of any size and weight. It is the most used lift device in Italy and it is also used abroad.

R SYSTEM is tested and certified, and guarantees at every stage, from design to assembly on site, maximum safety, speed, efficiency and functionality.



headed anchor

The various types of anchors are classified with a design strength to be compared with the weight to be lifted. The anchor is made with a special very high-strength steel with mechanical properties that are significantly enhanced with respect to the standard steel currently on the market.



anchor with hole

A special adaptable plastic sheath fixes the anchor in the cast and allows to cover and protect the enlarged head for hooking.

The types of anchorage are the following:

- Headed anchors
- Anchors with hole
- Anchors for side lift
- Anchors with plate



anchor for side lift

For headed studs a specific criterion for the calculation of the additional reinforcement required when the concrete cone is not complete has been studied.

The anchors with hole have been conceived with a rebar to be inserted in it acting in shear.



The anchor for side lift is conceived to avoid the contact between handle and concrete, since the latter would be brought to cracking.

The anchor plate can be used as an alternative to the headed stud. Its strength is enhanced by the reinforcement that is cast over the plate.



KAPTOR®

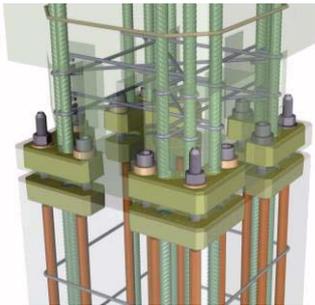
KAPTOR is a mechanical rebar coupling system for precast concrete which allows to create different clamped joints.

The joints are classified as follows:

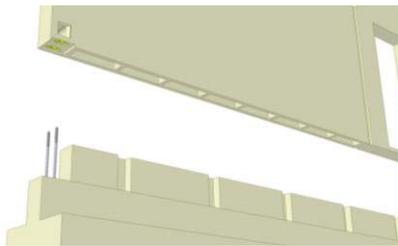
- Column-to-foundation
- Column-to-column
- Wall-to-foundation
- Wall-to-wall
- Beam-to-column



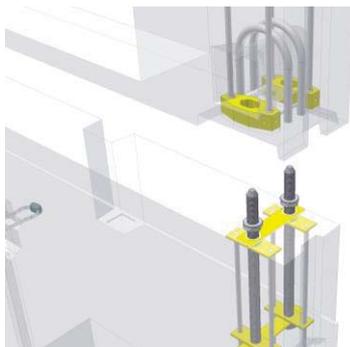
column-to-foundation joint



column-to-column joint



wall-to-foundation joint



wall-to-wall joint



beam-to-column joint

The connection is made by metallic pre-cast inserts to be connected through bolting. Depending on the use, two thick plate inserts can be cast into the elements and connected in situ with a high strength bolt or one thick plate and a threaded bar anchor can be cast into the elements, and directly connected in situ.

The use of the Kaptor system is simple and does not require calculations, since it is over-designed with respect to the reinforcement that it couples. The reinforcement can then be considered spliced.

The assemblage of plates and bars is fully mechanical, avoiding welding and allowing this connection to be used also for critical areas designated to seismic energy dissipation. The assemblage of plates and bars is manual and can be performed during caging in the mould.

In particular applications out of critical areas it is possible to directly weld the rebars to the plates.

All kaptor connections of vertical elements allow temporary bearing and stability due to the simple support of the element on top of the bolt nuts. Furthermore, the mechanical regulation of verticality is easily performed by acting on the bolt nuts with wrench.

The connections, once tightened, are then completed with a small completion pouring of a special high-strength thixotropic mortar.



KONNEKTOR®

Konnektor is a patented system consisting of bearing and tie-back mechanical devices connecting inner and outer concrete layers of thermal break sandwich panels. This connection system allows for vertical support and out-of-plane strength, while allowing for in-plane free thermal movements.

The connection devices can be arranged in panels with any size limit.

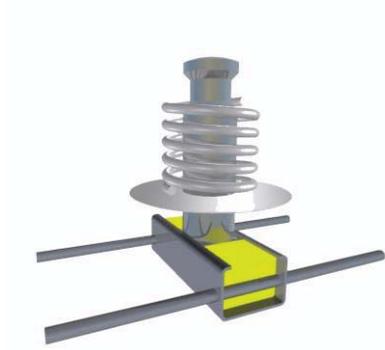
The Konnektor system is used for the production of sandwich panels with different technologies, including light-weighted, ventilated and aerated.

The bearing elements, fixed to the inner layer, support the weight of the outer layer with a statically determined scheme, allowing for thermal expansion and contraction of the outer exposed layer. These elements are made of a galvanised steel pin of diameter 40 mm.

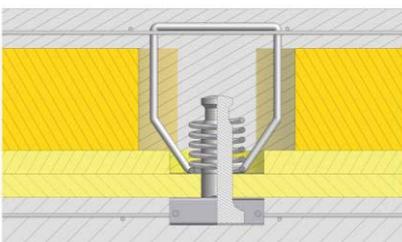
At the base of these elements a metallic profile having the function of distributing the load in the concrete is applied. It can be easily fixed to the reinforcing net of the hanging layer, keeping the support in the correct position during the casting phase.

When the guide is filled with concrete the connection acts as a shear key (fixed support); if the guide is equipped with appropriate sponge, the connection acts as an horizontal roller (sliding support).

The system is designed to allow for a maximum gap between the bearing layer and the suspended one of up to 12 mm.



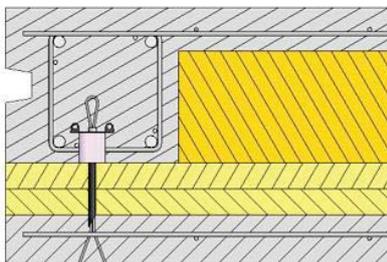
axonometric view of the bearing element



cross-section on the bearing element



positioning of the konnektor bearing member



tie-back device allowing for large relative movements between bearing and suspended layers



FISIS®

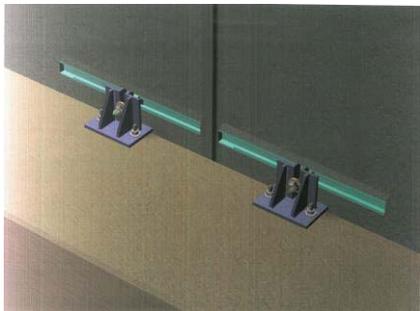
FISIS is a cladding-to-structure connection system conceived for use in seismic areas. It can be also used in non-seismic areas as a strong tie-back connection.

In case of earthquake the industrial and commercial precast frame structures are usually subjected to large displacements.

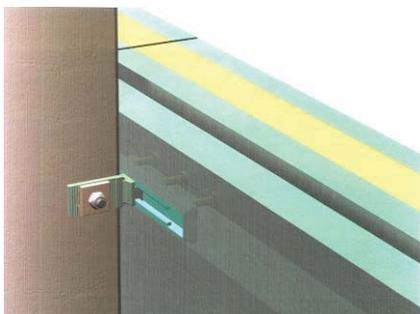
If the stiff peripheral panels are rigidly fixed to the structure, the seismic behaviour of the structure becomes highly altered, since the seismic forces tend to be driven to the panels placed parallel to the direction the earthquake, concentrating high forces in the panel connections.



FISIS panel-to-beam shear connection for vertical/horizontal panels



FISIS panel-to-beam axial connection for vertical panels



FISIS panel-to-column shear connection for horizontal panels

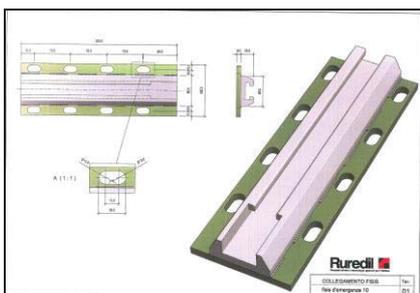
The FISIS system has been designed to allow the panels to not interact with the seismic behaviour of the frame, creating a roller connection between the panel and the structure; this constraint is realised with a horizontal sliding guide inserted in the panel or in the structure, according to the different version of the product. The sliding element has also been engineered in collaboration with Politecnico di Milano to be able to slide even if subjected to out-of-plane contemporary forces, through an experimental campaign.

The FISIS system decouples therefore the structure-panel in-plane deformation, while hanging the panels in their outer plane avoiding their collapse.

Three versions of the FISIS system have been engineered:

- panel-to-beam axial connection for vertical panels
- panel-to-beam shear connection for vertical/horizontal panels
- panel-to-column shear connection for horizontal panels

Emergency profiles to be connected with post-inserted fasteners for retrofit and strengthening purposes to existing structures are also available.



emergency profile for retrofit and strengthening of existing structures



RUREFAST 3®

Rurefast 3 is a safety line system designed and patented in accordance with UNI EN 795/02.

Rurefast consists of simple, effective and practical plastic inserts to be embedded in concrete which support the safety line, which can be easily and safely installed in phase of assemblage of the structure.

Rurefast, updated to the third release, is the most effective and diffused safety line system across Italy to prevent falls from above during the assemblage of precast structures.

Rurefast 3 is made by a sacrificial element to be embedded in concrete (socket 100) and by dismantlable items to be assembled in situ. The flexible horizontal safety line is activated by connecting the steel diagonal bracers to the struts and manually extending the special synthetic rope.

The system is designed to be used with maximum comfort; the safety line to which the operator can hang by means of a connector, a rod and the harness, stops the operator after falling at one metre from the ground, given a proper number of struts.

Rurefast 3 is coupled to a software that helps designing the correct configuration of the safety line depending on the height from the ground and on few other parameters.

All components of the system are studied to be easily adjustable, assembled and disassembled with simple manual operations.

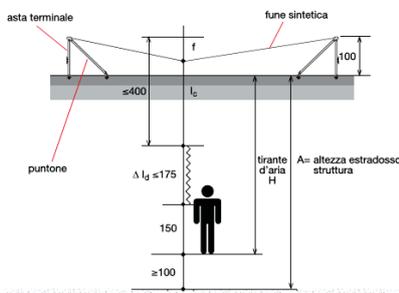
The safety line system Rurefast has already saved many lives.



bracer of the RUREFAST 3 system



operator protected by the RUREFAST 3 system



functioning scheme of RUREFAST 3



example of safety line with RUREFAST 3

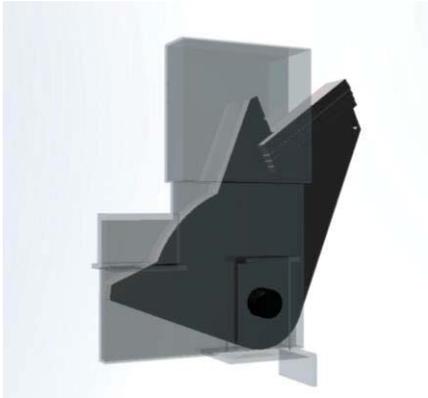




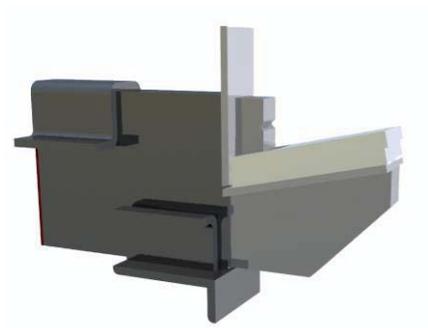
GIRELLA® AND TIRELLA®

GIRELLA and TIRELLA are bracket systems for the support of precast concrete cladding panels; the basic principles that have led to the development of the design of these elements are the following:

- reduction of incidence of manpower
- easy installation in the mould
- speed and convenience during assemblage
- versatility of use



Girella S bracket insert



Tirella S bracket insert

Two types of bracket have been engineered, both patented, having the same design criteria and the same large tolerances, while being physically different in order to better adapt to different scenarios.

The GIRELLA S connection is made with a column insert (the bracket) and a panel insert for shaping. The insert in the column consists of the bracket, which is placed at the level of the cast within a special box that is only opened after the phases of transportation and assemblage of the column.

During the assemblage of the panel, after removing the safety cover, the bracket is extracted by rotation and it is automatically positioned, providing a hidden support for the horizontal panel.

The TIRELLA S system has been designed to solve design and/or production problems by reducing the height of the box. The bracket is extracted by pulling.

The brackets can also be inserted in the thickness of the vertical panels to support the co-planar horizontal panels, as typically necessary for portals.

Also emergency corbels to be connected through post-inserted fasteners to existing structures are available.



overhanging bracket



positioning of the Girella bracket insert into a column in phase of arming



RUR® SOCKETS

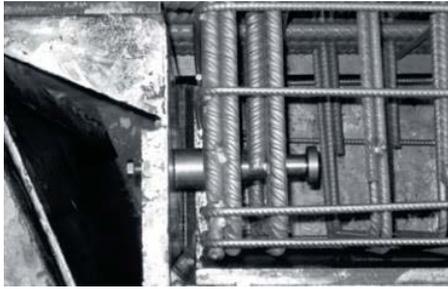
RUR classic or self-anchoring sockets allow the in situ fixing with bolts or threaded bars having several functions, including dowel.

The high strength of the sockets allows their application for earthquake-proof joints.

These inserts are placed in the concrete elements for the following uses:

- To quickly apply suspended loads for advs, MEP equipment, etc.
- To make the in-situ assemblage of precast concrete and metal structures (shelters, canopies, etc.)
- To screw mechanically assembled dowels avoiding drilling of the moulds
- To use them as lifting inserts

Typically for high actions, several sockets can be fixed on a metal plate functioning as a mounting template in order to keep the sockets in the exact position in the phase of insertion into the element and the in-situ bolting can be performed using the same template.



inserting a self-anchoring socket into the mould



self-anchoring socket with headed base



hook insert used for lifting with the RUR sockets

