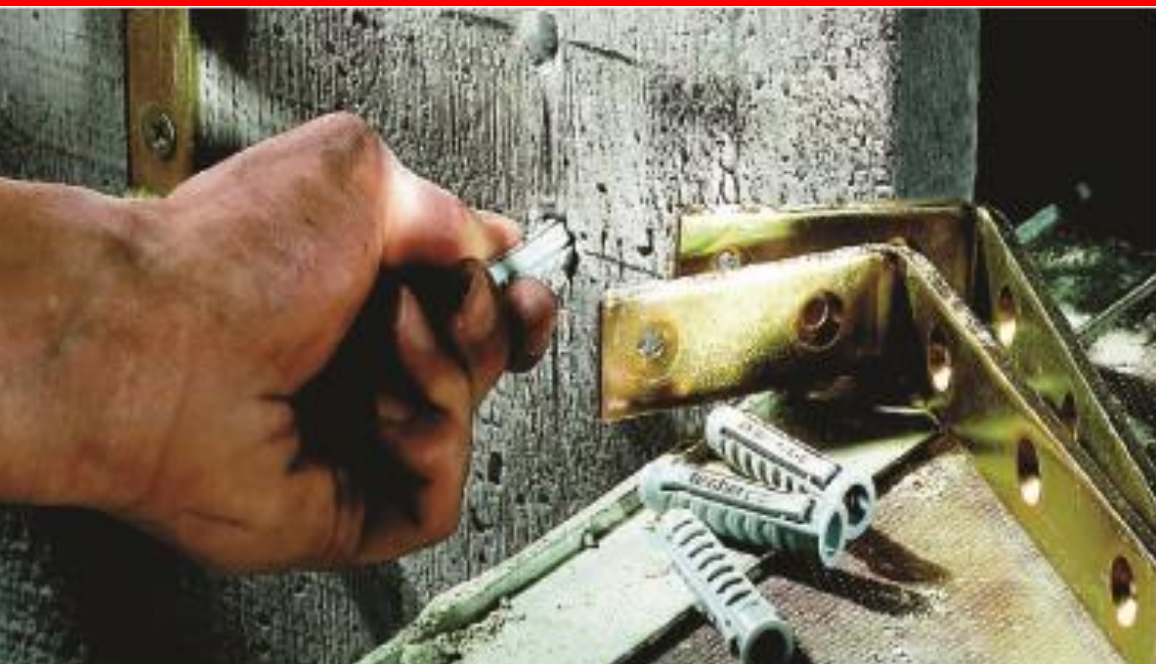


fischer Test Report



Fixing Tests for Bison Hollow Core Slabs



Testing on Bison Hollow Core Slabs

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6 January 2012

For the attention of Mirka Valovicova

Testing of Fischer Fixings in Bison Hollow Core Slabs

We confirm that the tests as detailed in your document title "Fixings Testing on Bison Hollow Core Slabs", were carried out in our laboratory. The tests were carried out on the soffit of a standard 150 mm deep slab, and the results are a true record of the tests. Therefore, we can recommend that the fixings described are suitable for use with hollow core slabs, up to the safe working loads stated.

Yours Faithfully

For Bison Manufacturing Ltd

Dr Kamel BENSALEM
Chief Structural Engineer

BISON MANUFACTURING LIMITED

Gresley Park, William Nadin Way, Swadlincote, Derbyshire, DE11 0BB
Facsimile: 01283 220563 Telephone: 01283 817500

Test Parameters

The fixings were tested into Tensland Section, a product of BISON Manufacturing Ltd. The Tensyland slab is a commonly used slab with in the industry and has with a wall thickness of 25mm and a minimum compressive strength of 55N/mm². These dimensions were in order to establish fixing products that would function with in these parameters.

The tests were carried out at:- BISON Manufacturing Ltd

Previously known as BISON Concrete Products Ltd and tested at the address below.

For current address please refer to the letter on the previous page.

Thorney Lane
Iver
Bucks
SL0 9HQ

All tests were carried out using a calibrated tensile tester. To conform to CFA (Construction Fixing Association) guidelines each type of fixing was tested six times.

Bison Hollow Core Slab Information

Introduction to Bison:

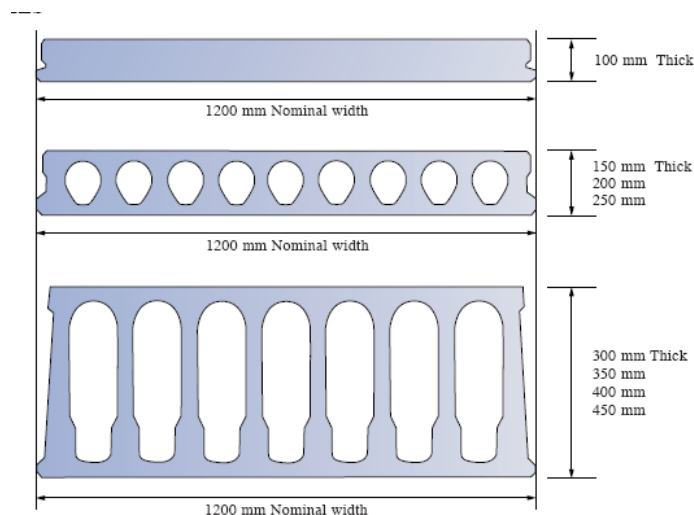
Bison is the largest producer of precast concrete floors in the United Kingdom. The company has been a leader in the design and manufacture of structural products since 1919. There are five Bison factories throughout the UK strategically situated to provide a comprehensive service to their customers.

Other products pioneered by Bison and for which they hold a market leading position include house floors for use both at ground floor and intermediate levels and precast prestressed staircases produced by a patented method which provides a product of excellent quality at moderate cost.



In the field of structures too, Bison and for which they hold a market leader producing precast concrete, steel and composite structures for use in retail, industrial, commercial building and car parks as well as in housing, educational and government projects.

Technical Information:



Bison Hollow Core Floors are manufactured using a long line casting technique with automatic casting equipment which places high strength, low water/cement ratio concrete under a high degree of vibration and compaction.

The section profile incorporates hollow cores to reduce self-weight without significant reduction in section stiffness. Reinforcement is by high tensile prestressing

strand or wire which has an ultimate strength of more than 3 times that of conventional high tensile reinforcement.

The structural performance resulting from the combination of those featured produces a slab which is highly efficient and economic for any load/span situation.

Advantages:

Speed of Erection – Time consuming activities such as propping, shuttering and concrete pouring are virtually eliminated.

Immediate Unpropped Working Platform – Propping is generally not required with hollow core floors. Once a precast floor is erected it is immediately available as a working platform. Steel deck systems, by comparison, can present problems in achieving level surfaces whilst concrete is poured and in providing access whilst in the propped condition.

Minimum Insitu Concrete – Using a precast floor, a large volume of work is carried out off site. This reduces what can be a complex and time consuming site operation that is subject to the vagaries of the climate.

Extra Long Spans – Factory made prestressed units offer the maximum design advantages of achieving long span units for given depths. This avoids the need for intermediate supports.

Diaphragm Action – Precast floor slabs are structurally grouted to provide a floor with full diaphragm action as required in most multi-storey frameworks.

Flexibility of Design Approach – Precast floors can provide the technical solution for the requirements of Part A of the Buildings Regulations 2004 for disproportionate Collapse.

Composite Steel Beam Design – Composite Steel Beam Design incorporating hollow core or solid slabs provides a structural and cost efficient solution for steel frames. It reduces total tonnage of steel beams up to 40% and also reduces the number of components to be erected.

Sound Requirements Building Regulations Part E – Bison Concrete Products have developed a series of solutions to cover the use of precast concrete units in association with masonry building and steel and concrete frames.

Preformed Site Services – Precast floors can be provided with factory formed service holes, thus avoiding laborious setting out the shuttering on site.

Structural Efficiency – A hollow core slab offers the ideal structural section by reducing the deadweight whilst providing the maximum structural efficiency with in the slab depth.

Factory-Produced to Rigorous Quality Standards – Because precast floors are factory-produced, they are manufactured in an environment with is more controlled than a building site. Quality control systems are properly implemented and are independently examined on a regular basis, under the British Standards Institution Quality Management Scheme defined in BS EN ISO 9001:2000.

2. Fixing Products Tested

FISV 360S & FIS H18x85 N with M10 Threaded Rod

Material:- Resin: Vinyl ester Hybrid Resin
 Rod: Zinc Plated grade 5.8 & Stainless Steel A4
 Net: Plastic frame with flexible yellow net

Range:- FISH 16 for M8 Threaded Studs
 FISH 18 for M10 Threaded Studs
 FISH 20 for M12 Threaded Studs



The outstanding features of the fischer injection anchoring is its adaptability to varying installation parameters, such as the varying web thickness of the hollow core slabs and resulting damage caused when hammer drilling through to the hollow of slabs.

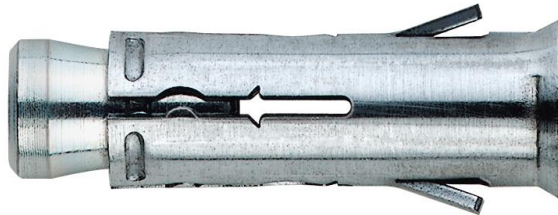
The FISV 360 S Vinyl ester resin contains a high-strength, rapid setting, two component hybrid resin. This combination of net with composite resin allows a type of form locking inside the hollow section to provide a stress free fixing solution.



FHY Expansion Anchor

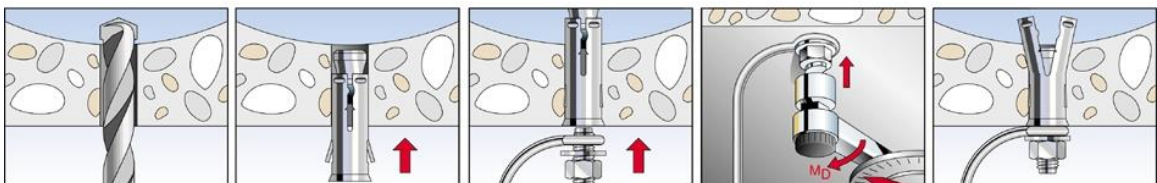
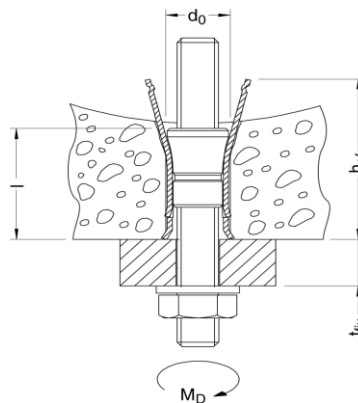
Material:- Metal, Bright Zinc Plated or Stainless Steel

Range:- M6-M10



The FHY expansion anchor is a sleeve anchor with an internal thread specially for anchoring in prestressed concrete hollow ceilings. When the bolt, or stud and nut is tightened, the cone is pulled into the solid material against the drill hole wall. Use the A4 Stainless Steel version for outdoor use or in damp conditions.

Suitable for cavities and solid zones of prestressed concrete hollow ceiling and can take either screws or studs with metric threads. The anchor can also be installed outside the cavity axis up to 5cm from the tensioning wire.



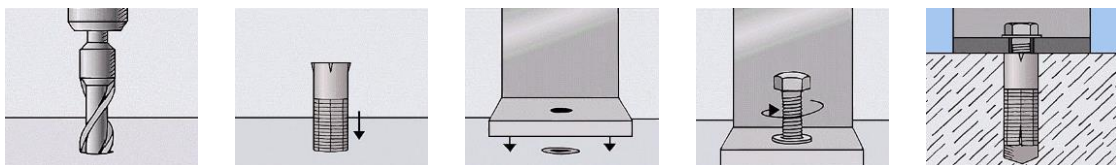
Nylon M Unit M10

Material:- Glass Reinforced Nylon (Polyamide 6) with Brass Cone

Range:- M5-M16



The M Unit is a glass reinforced nylon expansion anchor with an integral internally threaded brass cone. The M Unit expands like a conventional 'Wall Bolt', but due to the walls of the M Unit being glass reinforced nylon the expansion forces are less aggressive preventing the hollow core concrete from crushing. The glass reinforced nylon also reduces noise caused by vibration of pipes, for Mechanical & Electrical applications.



FFS Self Tapping Screw

Material:- Metal Zinc Plated and Passivated to 5 Microns

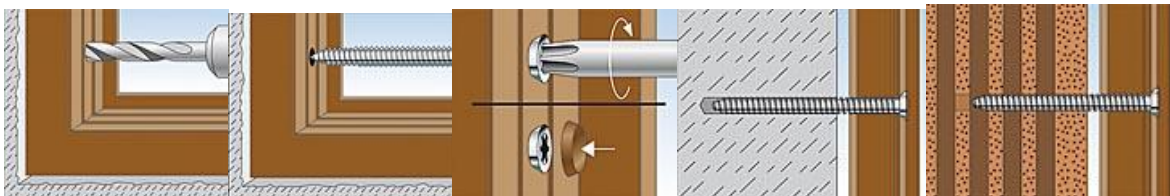
Range:- 7.5mm Diameter (various lengths)



The self tapping screw FFS allows a stress free 'through fixing' into the BISON hollow core slabs. A pre-drilled 6mm hole is required into the concrete. The FFS is then driven into the concrete. The minimum embedment into concrete is 20mm which is perfect when fixing into BISON slabs as the web thickness is 25mm before drilling and 20mm approx after hammer drilling.

The FFS has many advantages over other fixings:

- Drill hole diameter is only 6mm
- Installation using a machine with torx 30 bite is very quick
- Immediate loading
- Through fixings, easy for numerous fixing points i.e. battens or insulation
- Cover caps available for aesthetic finish



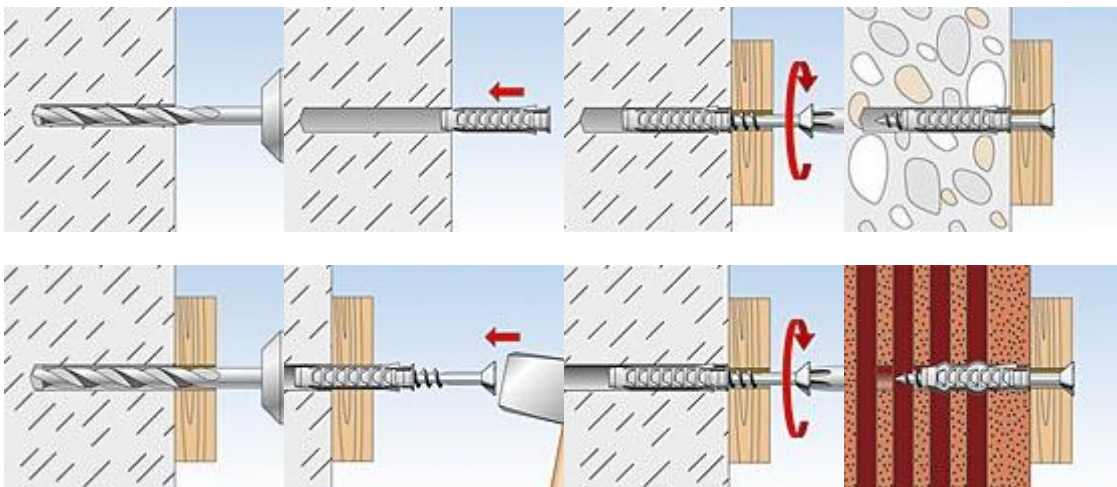
SX10 with 7mm Safety Screw

Material:-	Plug:	Nylon (Polyamide 6)
	Screw:	Metal Screw grade 5.8
Range:	SX 4-16	



The fischer SX plug has a four way expansion section compared to conventional two way expansion plugs. This unique four way expansion gives a greater load capacity as the surface area in contact with the concrete is much greater than with standard plugs. Therefore the SX is designed for both solid and hollow building materials.

Not only can the SX be installed as flush fixing but it can also be installed as through fixing due to its retaining collar and 'knock-in' lock effect just below the collar. This prevents the plug from expanding prematurely when the plug and screw are being hammered through the fixture towards the surface of the building material.



KD 8 Gravity Toggle

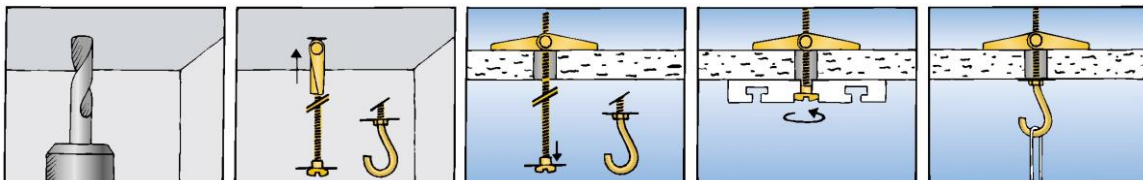
Material:- Metal, Zinc Plated, Yellow Passivated

Range:- 3-8mm Thread



The KD toggle is a heavy metal cavity toggle. The KD provides a completely stress free fixing, as well as a consistent and optimum pullout value. The KD toggle range beings with a 3mm thread up to 8mm therefore catering for many different types and sizes of applications.

As shown below in the installation instructions a larger drill hole than the thread is required to push the toggle section through into the cavity. Once the toggle is pushed into the cavity, gravity causes the toggle to open sit on the face of the concrete. It is this contact which retains the fixings inside the cavity and gives the ultimate fixings performance.



3.0 Test Results

3.1 FISV 360 S & FISH 18x85 N Anchor Sleeve

FISV 360 S

Test No:	Load Achieve	Remarks
1	20.0kN	Resin Failure
2	26.0kN	Resin Failure
3	29.0kN	Concrete Failure
4	28.0kN	Resin Failure
5	26.0kN	Resin Failure
6	26.0kN	Resin Failure

Average Ultimate Load is: = 25.8kN

Using a global safety factor of 4, safe working load is: = 6.45kN

For axial spacing see 'Conclusion' for details. As only one concrete failure occurred it is difficult to determine accurate axial spacing's. To be more detailed, further testing should be carried out.



Plate One



Plate Two

3.2 FHY Expansion Anchor M8 & M10

FHY M8

Test No:	Load Achieved	Remarks
1	9.9kN	1 st Tensile Slip
2	10.0kN	1 st Tensile Slip
3	10.1kN	1 st Tensile Slip
4	10.1kN	1 st Tensile Slip
5	10.1kN	1 st Tensile Slip
6	10.2kN	1 st Tensile Slip
7	10.0kN	1 st Tensile Slip
8	10.1kN	1 st Tensile Slip
9	10.1kN	1 st Tensile Slip
10	9.9kN	1 st Tensile Slip

Average Ultimate load is: = 10.05kN

Using a global safety factor of 4, safe working load is: = 2.51kN

FHY M10

Test No:	Load Achieved	Remarks
1	19kN	1 st Tensile Slip
2	16.5kN	1 st Tensile Slip
3	11.0kN	1 st Tensile Slip
4	19.0kN	1 st Tensile Slip
5	14.0kN	1 st Tensile Slip
6	17.0kN	1 st Tensile Slip

Average Ultimate load is: = 16.1kN

Using a global safety factor of 4, safe working load is: = 4.02kN

3.3 M Unit M10

M Unit M10

Test No:	Load Achieved	Remarks
1	11.5kN	1 st Tensile Slip
2	11.0kN	1 st Tensile Slip
3	11.0kN	1 st Tensile Slip
4	10.0kN	1 st Tensile Slip
5	10.0kN	1 st Tensile Slip
6	10.0kN	1 st Tensile Slip

Average ultimate load is: = 10.6kN

Using a global safety factor of 7, safe working load is: = 1.5kN

3.4 FFS – fischer Frame Screw

FFS frame screw

Test No:	Load Achieved	Remarks
1	10.5kN	Concrete Failure
2	12.0kN	Concrete Failure
3	10.0kN	Concrete Failure
4	8.25kN	Concrete Failure
5	9.0kN	Concrete Failure
6	10.0kN	Concrete Failure

Average ultimate load is: = 9.96kN

Using a global safety factor of 4, safe working load is: = 2.5kN

Concrete failure was consistently the failure with the FFS self tapping screw. The diameter of the concrete cone failure was 75mm. Therefore the characteristic axial spacing is 75mm.

3.5 SX10 Plug with safety screw

SX10

Test No:	Load Achieved	Remarks
1	7.5kN	1 st Tensile Slip
2	7.2kN	1 st Tensile Slip
3	7.0kN	1 st Tensile Slip
4	6.5kN	1 st Tensile Slip
5	6.0kN	1 st Tensile Slip
6	6.5kN	1 st Tensile Slip

Average ultimate load is: = 6.78kN

Using a global safety factor of 7, safe working load is: = 0.96kN

3.6 KD 8 Gravity Toggle

KD 8 Gravity Toggle

Test No:	Load Achieved	Remarks
1	12.0kN	Fixing Failure
2	12.5kN	Fixing Failure
3	12.2kN	Fixing Failure
4	12.5kN	Fixing Failure
5	10.5kN	Fixing Failure
6	12.5kN	Fixing Failure

Average ultimate load is: = 12.0kN

Using a global safety factor of 4, safe working load is: = 3.0kN

4. Results Summary

The table below shows the safe working loads of all the anchors tested in to the Tensland section product of BISON hollow core slabs.

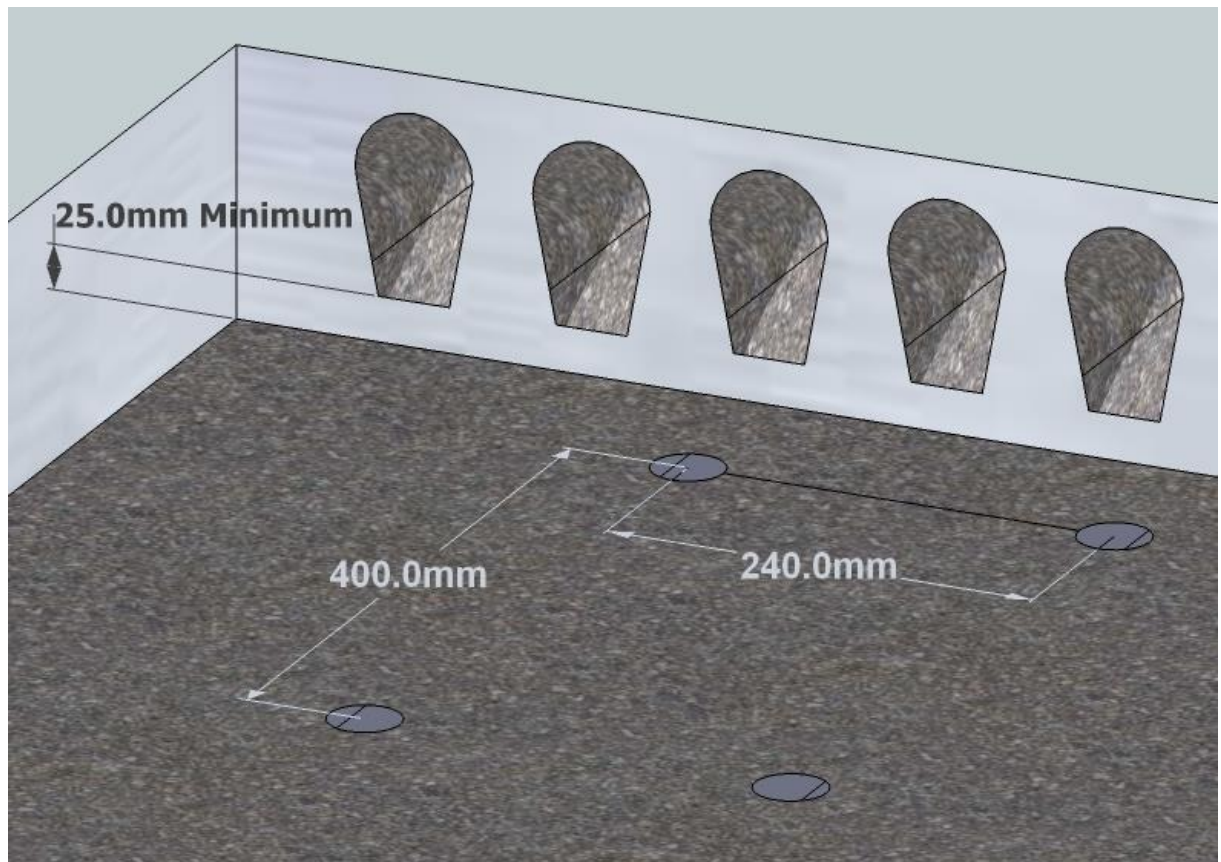
The Tensland slab has a concrete web thickness of 25mm and a minimum compressive strength of 55N/mm².

The test results below are tabulated starting with the highest performing anchor at the top.

Product Tested	Average Ultimate Load	Safe Working Load	Characteristic Axial Spacing
FISV 360 S Injection Resin with Anchor Sleeve	25.8kN	6.45kN	>240* >400*
FHY M8 Expansion Anchor	10.05kN	2.51kN	>200
FHY M10 Expansion Anchor	16.1kN	4.02kN	>200
KD 8 Gravity Toggle	12.0kN	3.0kN	>200
M Unit M10	10.6kN	1.51kN	>200
FFS Self Tapping Screw	9.96kN	2.5kN	>75
SX 10 Plug and fischer Safety Screw	6.78kN	0.96kN	>200

* See below for explanation

If a product has an ETA approval, ETA values take precedence and will be used in any structural design



Axial spacing explanation

5. Conclusion

It is in our opinion that the six fixing types tested in conjunction with BISON hollow core slabs are highly suitable for typical applications e.g. various M&E Services via hanging rods, timber battens, insulation, suspended ceilings etc.

As the tests were conducted into the most slender of the manufactured slabs (150mm overall depth), it is our opinion that the fixings would be suitable for all slab sections varying from 150-450mm deep with web thicknesses greater than 25mm.

The test results for all the fixings tested showed a good variation in ultimate loads. This allows the Engineer/Architect/End User to have a broad range of anchors to choose from depending on both function or load performance.

Axial spacing varies from anchor to anchor due to their expansion or form-locking characteristics. In our opinion it would be suitable to have axial spacing >200mm for all the anchors tested except the FISV 360 S and FFS Screw.

The axial spacing for the FISV 360 S as written above are conservative, for more detailed/comprehensive and possibly smaller spacing further testing should be carried out.

The FISV 360 S resin with net achieved a very large concrete cone failure in one of the tests. This cone is larger than the characteristic cone failure expected in standard reinforced concrete due to the compressive stress patterns that the prestressing induces.

As you can see from Plate 1 & 2 the concrete failure has a larger dimension parallel to the reinforcing strand than it does perpendicular to it. For this reason we recommend an axial spacing of ≥ 400 parallel to the reinforcing strands and ≥ 240 perpendicular to the reinforcing strands.

Technical disclaimer / Decisive factors

Due to the complexity of building materials, tools, fixing elements and installation techniques, a comprehensive recommendation depends on full and detailed understanding of specific site conditions.

This document is a factual record of results obtained under specific conditions and does not constitute an endorsement of the suitability of the product tested for any specific application. This responsibility remains with the customer.

The test results shall be used as a guide for assessment or anchor suitability. Even when our advice is given in good faith it cannot be binding for this reason and we cannot accept any liability for any anchor failure due to the wrong design, misuse or wrong installation.

If a product has an ETA approval, ETA values take precedence and will be used in any structural design.

For full Test Reports please contact the fischer technical Department:

Phone: 01491 827 920

E-mail: technical@fischer.co.uk

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The information in this catalogue is intended for general guidance only and is given without engagement. Additional information and advice on specific applications is available from our Technical Support Team. For this however, we require a precise description of your particular application.

All the data in this price list concerning work with our fixings must be adapted to suit local conditions and the type of materials in use.

If no detailed performance specifications are given for certain articles and types, please contact our Technical Service Department for advice.