Description

F Series is a range of structural bearings for locating structures. They are designed to react only horizontal loads. Fixed and guided bearings are available as standards for loads up to 2352 kN. The bearings fully meet the requirements of BS 5400 Section 9. They are manufactured to meet quality standards applicable throughout the world.

Bearing types

F series bearings are available in three forms -

- **10F** Fixed
- **11G & 21F** Free to move in one horizontal direction

In addition all bearings can accept compressive movements of up to 3mm which facilitates their use with bearings (such as elastomeric types) which deflect noticeably under load.

Typical 21F details

![Diagram of 21F bearing](image)

The sections through the top plate and base plate are staggered.

Attachment

All three types, 10F, 11F and 21F, have the facility for bolted attachment of the base to sockets, or an independent attachment plate. 10F and 21F top plates can also be fixed by way of bolts to sockets or an independent attachment plate.

The 11F bearing has been designed such that the top plate takes the form of a tang permanently embedded in infill concrete between adjacent precast elements.

Support and Installation

Important - See pages 21 - 23 for Installation and Maintenance.

The bearings are fitted with transport brackets which maintain a clearance for vertical movement. These must be removed after installation.
Concrete stress
Where suitable reinforcement has been provided the allowable concrete stress is dependent on the relative dimensions of the bearing/structure interface, the total support area, and the characteristic strength of the concrete. The stress on the structure should therefore be checked to ensure that it is acceptable.

With these bearings it is important to ensure that the sockets are embedded in structural concrete not less than the depth indicated on page 6 and in the case of 11F types that the tang is embedded to dimension H on page 5.
A material of adequate strength must be used in conjunction with suitable reinforcement to resist bursting and tensile forces.

Design loads
The designation of loading varies from country to country. These bearings are designed to BS5400 limit state loads. It may be assumed that the Serviceability Limit State load may be substituted for the maximum load in a working stress design.

Rotation
All the bearings can rotate at least 0.01 radians about the transverse horizontal axis. The 10F can rotate at least 0.01 radians about all other axes.

Movement
The dimensions for the 11F & 21F bearings allow for a longitudinal movement of ±50mm. Additional movements in increments of 50mm total can be supplied. We will be pleased to advise but this will change the top plate dimensions.

NB 11F & 21F bearings should not be used where movement at right angles to the guided direction is required.

Designation of part no.
The part number of a bearing is simply built up as below –

<table>
<thead>
<tr>
<th>Type</th>
<th>Maximum Working Load (kN)</th>
<th>Movement Longitudinal (mm)</th>
<th>Fixings Top</th>
<th>Fixings Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>10F</td>
<td>250</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>b</td>
<td>11F</td>
<td>250</td>
<td>100</td>
<td>N</td>
</tr>
<tr>
<td>c</td>
<td>21F</td>
<td>250</td>
<td>100</td>
<td>B</td>
</tr>
</tbody>
</table>

The basic part number is shown in the tables on pages 4 and 5. Select the type of attachment required and the smallest bearing in that range which can accommodate the specified operating conditions.

e.g. For a above the full part number would be 10F25/SS
    b above the full part number would be 11F25/100/NS
    c above the full part number would be 21F25/100/BS

'c' above denotes a guide bearing with bolted attachment to the top plate and bolts and sockets to the base plate. Maximum load capacity is 254kN SLS/420kN ULS and total movement capacity is 100mm.
<table>
<thead>
<tr>
<th>Bearing Part no</th>
<th>SLS Load (kN)</th>
<th>ULS Load (kN)</th>
<th>Installation dimensions (mm)</th>
<th>Approx Weight *(Kg)</th>
</tr>
</thead>
</table>

* Excluding fixings
### Standard F Series Bearings

**Guided 11F/21F**

#### Bearing SLS ULS Installation dimensions (mm) Approx Weight

<table>
<thead>
<tr>
<th>Bearing Part no</th>
<th>SLS Load (kN)</th>
<th>ULS Load (kN)</th>
<th>Installation dimensions (mm)</th>
<th>Approx Weight <em>(Kg)</em></th>
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<td>229</td>
<td>210 210 22 350 160 80 25 126 188 52 18 4 19</td>
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<tr>
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<tr>
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<tr>
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<td>1720</td>
<td>580 430 52 720 320 230 60 310 435 115 38 6 235</td>
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<tr>
<td>11F170</td>
<td>1742</td>
<td>2352</td>
<td>660 490 57 800 360 280 70 366 511 135 44 6 347</td>
<td>347</td>
</tr>
</tbody>
</table>

* Excluding fixings

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### Diagrams

**Type 11F**

- L holes in base K diameter

**Type 21F**

- L holes in base K diameter
- N holes in top M diameter*

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* Increase to suit additional movement. See page 3

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* Excluding fixings
The fixings described below are designed to suit the requirements of F Series bearings.

Standard F Series fixings

By adding a two letter suffix to the bearing part number the type of fixing may be designated -

First letter - Top plate fixing
Second letter - Base plate fixing

N - No fixings
B - Bolts and washers only
S - Bolts, washers & sockets

e.g. /BS signifies -
B (top plate fixing) Bolts & washers
S (base plate fixing) Bolts, washers & sockets

N.B. If standard F series fixings are not used, care should be taken to ensure that bolts can be fitted without dismantling the bearing.

Bolts are Hexagon Head to BS 3692 grade 10.9
Sockets are steel to EN 10025 grade S275.

### Bolts and Sockets 10F

<table>
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<tr>
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<th>Socket B</th>
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<th>D</th>
<th>C</th>
<th>Socket B</th>
<th>A</th>
<th>D</th>
<th>E</th>
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### Bolts and Sockets 11F & 21F

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<th>D</th>
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<th>Socket B</th>
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CONSIDER THE EFFECTS IF BEARINGS ARE NOT CORRECTLY INSTALLED

Our structural bearings are manufactured to close tolerances by skilled technicians working in clean conditions. To obtain the requisite performance from bearings it is imperative that they are properly handled at the work site and installed with the same care as when they were assembled in the factory. The following notes will assist those responsible for specifying and supervising the installation of structural bearings.

Please note that Ekspan are able to provide installation, supervision or training of personnel. A test paper can also be supplied to verify the understanding of installers.

**Bearings must be installed with precision to meet the bridge and bearing design criteria.**

**Storage**

Our structural bearings are protected from contamination under normal working conditions by an efficient sealing system. Care should be taken in storage to prevent contamination and damage to the working surfaces.

**Handling**

Robust transportation devices are fitted to all bearings to ensure that the components are maintained in their correct relative positions before and during installation. The devices are normally finished in red paint. Unless special devices have been specified, they should not be used for slinging or suspending the bearings beneath beams.

Due to unpredictable conditions, which may occur during transportation or handling on site, the alignment and presetting (if applicable) of the assembled bearing should be checked against the drawing. Do not endeavour to rectify any discrepancies on site. The bearing should either be returned to Ekspan or, where practical, an Ekspan engineer should be called in to inspect and reassemble. Bearings too heavy to be lifted by hand should be properly slung using lifting equipment.

**Presetting**

If bearings are required to be preset eg where once only large movements may occur during stressing operations, this should be specified as a requirement and should only be carried out in our works prior to despatch. Do not attempt this operation on site.
Bedding

Bearing must be supported on a flat rigid bed. Steel spreader plates must be machined flat and smooth to mate exactly with the bearings’ upper and lower faces. Bearings may also be bedded on epoxy or cement mortar or by dry packing. Whichever system is preferred for the particular structure it is of extreme importance that the final bedding is free from high or hard spots, shrinkage, voids, etc.

Unless there is a specific design requirement, the planar surfaces must be installed in a horizontal plane. The correct installation of bearings is vital for the bearing performance. Costly repairs become necessary all too often due to inadequate specification or poor site supervision. The bearings should not be loaded until the bedding mortar has cured.

Cast-in-situ structures

Care must be taken to ensure that the bearings are not damaged by the formwork or contaminated by concrete seepage. The interface between the top plate and the formwork should be protected and sealed. Owing to the loading effects of a wet concrete mass, the top plates should be propped to prevent rotation and plate distortion. Bearing top plates of PTFE sliding bearings are especially vulnerable in this respect.

Bearing removability

Where possible, bearings should be fixed in such a manner as to facilitate removal. Our bearings have generally been designed with this in mind. However, when selecting the bearing type preferred, the removability feature should be highlighted in your enquiry.

Removal of transport brackets

These brackets, normally painted red should only be removed when the bearing is properly installed and ready for operation.

Check list for the installation of bearings

DO-

1. Handle carefully and where necessary with adequate craneage.
2. Store in a clean dry place.
3. Ensure that the bearings are installed in the correct location and orientation.
4. Ensure that the bearings are installed on a flat rigid bed before the design loads are applied.
5. Ensure that the fixings are uniformly tightened.
6. Complete any site coatings and make good paint damaged during handling and installation.
7. Protect working surfaces during the placing of in-situ concrete.
8. Keep the bearings and surrounding areas clean.
9. Remove any temporary transit clamps etc. before the bearings are required to operate.
10. Take special care to support top plates when casting in-situ concrete.

DO NOT-

1. Dismantle the bearing on site.
2. Leave bearings uncovered.
3. Attempt to modify without our approval.
4. Install without qualified supervision.
Site Coating

Care should be taken to ensure that working surfaces are not damaged in any site coating operation. After installation damaged coatings must be repaired irrespective of any call for site coatings. Exposed fixing bolts should be protected after final tightening. Any tapped holes exposed after removal of transportation brackets etc. (coloured red) should be sealed with self-vulcanizing silicone sealant.

Routine maintenance of bearings

1. Immediately following installation bearings shall be inspected to ensure that all aspects of ‘Installation of bearings’ have been adhered to and bearings shall subsequently be re-inspected not less frequently than every two years after their installation.
2. Paint and /or other specified protective coatings must be maintained in good and efficient condition and free from scratches or chips. Any areas of the protective coating showing damage or distress must be rectified.
3. Areas surrounding the bearings must be kept clean and dry and free from the adverse effects of external influences such as airborne debris or water/salt (for example emanating from leaking joints).
4. The wearing surfaces of the bearing must be checked to ensure that they are continuing to operate efficiently.
5. Fixing bolts must be checked for tightness.
6. Any bedding material showing signs of distress or ineffectiveness must be replaced and the reason for its failure investigated and corrected.
7. Routine inspections shall include a check that translational and rotational capacities of the bearing have not been exceeded and show no sign of being likely to exceed the requirements specified at the design stage.

Sample Quality Bearing Specification Clauses - K Series Pot Bearings

1.01 The bearings should be designed in accordance with BS 5400 part 9 & EN1337 and be constructed from steel grade EN100025 S355 J2G3. (HIGH QUALITY STEEL GOOD LOADING CAPACITIES)

1.03 The sliding surface of the bearing must be fully welded to the top plate of the bearing. This prevents crevice corrosion de-lamination of the stainless steel ensuring bearing longevity. The stainless steel sliding surface should be mirror polished to a minimum of 8/1 P BS1449/ EN10088-2 or with a reflectivity of 46/55. Paint will be applied to overlap the welded area of the sliding surface so as to protect the area from the risk of corrosion. (REDUCES CORROSION IN UNLOADED AREAS WHICH IS THE CAUSE OF MOST BEARING FAILURES)

1.04 PTFE bearing surfaces shall be Virgin material with a dimpled surface and lubricated with silicon grease in accordance with EN1337-2. The PTFE shall be retained in the bearing by a machined recess. (FRICTION IS AT A MINIMUM, LIFE IS EXTENSIVE AND THE PTFE CANNOT “CREEP”)

1.05 Guide sliding surfaces should also be fully welded and mirror polished. The wear surface of the guide shall be a mechanically restrained high load resistant material DU(B) in accordance with EN1337-2. (THE LIFE OF BEARINGS IS EXTENDED WITH USE OF GOOD WEAR MATERIALS)

1.06 Pot bearing pistons are machined with a tightly controlled tolerance between the pot and the piston. (REDUCE EDGE PRESSURE EFFECTS ON RUBBER)

1.07 The rubber pad in a pot bearing is to have a minimum of 2 brass rings, which should be sized to meet and fit tight to the pot wall. EN1337-5. (THIS IS KEY TO ENSURE THAT THE RUBBER IS RETAINED IN THE POT - IF NOT THEN THE RUBBER MAY EXTRUDE UNDER LOAD)

1.08 The rubber pad shall meet BS5400 part 9, EN 1337 and be Natural rubber with a hardness of 55 to 65 IRHD. It will be preformed with a recess on the to surface which allows the retaining rings to finish flush with the rubber. (THIS MEANS THAT WHEN THE BEARING IS LOADED THERE ARE NO AIR GAPS TO CLOSE ENSURING THAT DATUMS ARE MAINTAINED)

1.09 The rubber pad shall fit in the pot without need for deflection. Corners should be moulded in such a way as to ensure that the pad fits to the machined pot base. (THIS ALSO REDUCES AIR ENTRAPMENT)

1.10 The outer surfaces of the bearing will be blasted to SA 3 and have the contract specified paint system applied.
BRIDGE & INDUSTRIAL BEARINGS

B Series  Sliding Bearings with elastomer base

D Series  Line Rocker Bearings

E Series  Anti-rotative Bearings

Elastomeric Bearings

G & GE Series  Spherical Bearings

K & KE Series  Pot Bearings

J Series  Roller Bearings

Link Bearings

EXPANSION & SEAL TYPE JOINTS

Multi Element Expansion Joints

TF Expansion Joints

Single Element Expansion Joints

Roller Shutter Expansion Joints

T-Mat Expansion Joints

EC Seal Expansion Joints

ES Seal Expansion Joints

TF B-75 and TF B-7 Expansion Joints

Finger Type Expansion Joints

EW Seal Expansion Joints

A world wide service offering effective solutions in:-

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Installation • Commissioning • Planned Maintenance

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