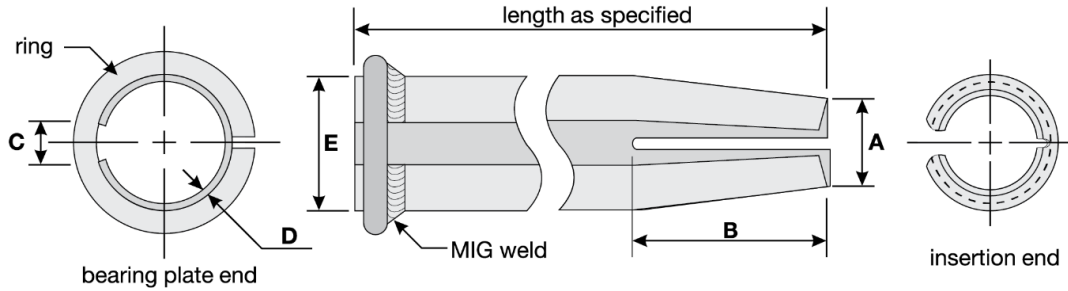


Friction stabilizers

Category: Split tube friction bolts

Overview

Nominal sizes 35mm, 39mm and 46mm



Technical specifications

Recommended nominal bit size	FS-35mm	FS-39mm	FS-46mm
Taper Diameter A	1-1/8" (28mm)	1-3/16" (30mm)	1-1/2" (38mm)
Taper Length B	2-3/8" (60mm)	2-1/2" (65mm)	2-1/2" (65mm)
Slot Width C	1/2" (13mm)	5/8" (16mm)	7/8" (22mm)
Steel Thickness D	3/32" (2.5mm)	3/32" (2.5mm)	1/8" (3mm)
Diameter E	1-3/8" (35mm)	1-1/2" (39mm)	1-13/16" (46mm)
Drill hole size	1-3/16" to 1-5/16" (31 to 33mm)	1-3/8" to 1-1/2" (35 to 38mm)	1 11/16" to 13/4" (43 to 45mm)
Available Tube Length	3' to 8' (0.9 to 2.4m)	3' to 10' (0.9 to 3.0m)	3' to 12' (0.9 to 3.7m)
Typical Breaking Capacity	24,000 lbs (107 kN)	28,000 lbs (124 kN)	40,000 lbs (178 kN)
Minimum Breaking Capacity	20,000 lbs (89 kN)	23,000 lbs (102 kN)	32,500 lbs (145 kN)
Capacity			
Ultimate Axial Strain	Typical 16%		

18" & 24" (0.46 m & 0.61 m) utility hangers also available - not intended for ground support also available hot dip galvanized to ASTM A123, CSA G164 specifications

Installation accessories

Standard driver tool - for stopers/jacklegs

- With 7/8" round x 4 1/4" long shanked end
- available in low profile design (9 1/4" long)
- L = FS-35: 13", 24", 36" and 42" overall
- FS-39: 13", 24", 36" and 48" overall
- FS-46: 13", 24" and 36" overall

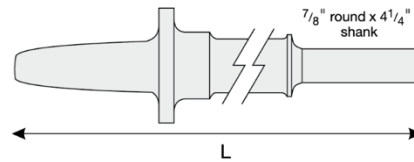
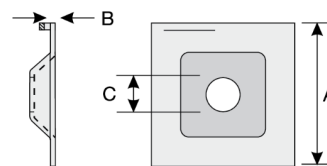


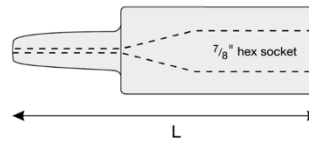
Plate washers

- Minimum A-36 material (36,000 psi yield)
- A = 6" square
- B = FS-35 & FS-39: 3/16" thick; FS-46: 1/4" thick
- C = FS-35: 36mm (1 7/16") diameter
- FS-39: 41mm (1 5/8") diameter
- FS-46: 48mm (1 7/8") diameter



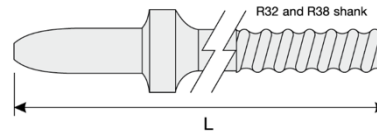
Female driver tool - for stopers/jacklegs

- With 7/8" hex socket
- Available in 12° and 11° tapers
- L = FS-35: 9 1/4" overall
- FS-39: 9 1/4" overall
- FS-46: 9 1/4" overall



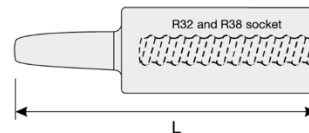
Threaded driver tool - for mechanized bolters

- With R32 and R38 rope thread
- Available in low profile design (9 1/4" long)
- L = FS-35: 18", 24" and 32" overall
- FS-39: 18", 24" and 32" overall
- FS-46: 18", 24" and 32" overall



Female threaded driver tool - for mechanized bolters

- With R32 and R38 rope thread socket
- L = FS-35: 7 1/2", 9 1/4" and 14" overall
- FS-39: 7 1/2", 9 1/4" and 14" overall
- FS-46: 7 1/2", 9 1/4" and 14" overall



Plates meet or exceed ASTM F432 specifications for deflection, available galvanized. Custom sizes and/or thread types available upon request.

Installation quality guidelines

The following are items to be aware of when using/installing friction stabilizers:

Type of Ground - The nature of the ground must be evaluated. Soft strata requires a longer anchorage length to be effective. Soft ground results in larger hole sizes for a given bit size (due to bit rattling and reaming).

Scaling - The ground should be thoroughly scaled (i.e. barred down) before drilling and bolting. Periodic re-scaling may be required while drilling.

Strength and Yield Capacity of Bolt - The mechanical properties of the bolt should be appropriate for the ground conditions, bolt length and bolting pattern. Pull tests should be performed to determine initial anchorage of the friction bolts.

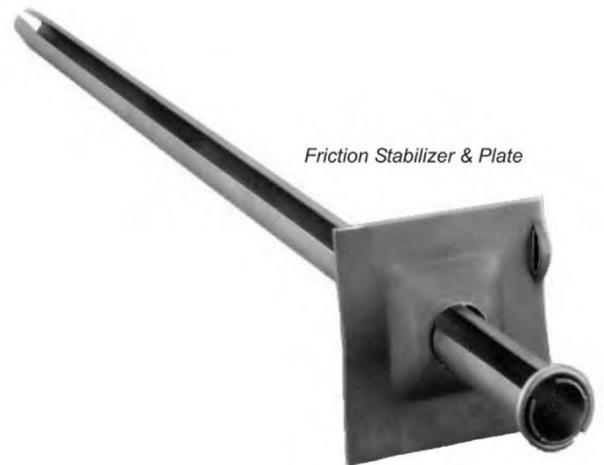
Proper Grade Plates - Thin or weak plates will deform at low bolt tension. The bolt could also rip through the plate during installation or by bolt loading. Plates should meet ASTM F432 specs.

Hole Condition - The hole should be cleaned and examined to ensure the friction bolt will insert smoothly. Variation in hole diameters (due to differing strengths of rock strata or excessively fragmented ground) can yield variations in anchorage capacities at various elevations.

Hole Length - If holes are drilled too short then the bolt will stick out of the hole and the plate will not make contact with the rock surface. Damage to the bolt will result if an attempt is made to drive the bolt further than the hole length will permit. The hole should thus be a few inches deeper than the bolt length being used.

Oversize Holes - The hole size required for the friction stabilizer is the most crucial aspect of the installation. The holding power of the bolt relies on the fact that the hole is smaller than the diameter of the bolt. The larger the hole relative to the bolt diameter, the less the holding force (at least initially). Oversized holes can be caused by using the wrong bit size, leaving the drill running while flushing the hole, soft ground (faults, gouge, etc.) and bent steel.

Undersize Holes - If the hole size is too small relative to the friction size then it becomes extremely difficult to install the bolt. The bolt can be damaged i.e. kinked or bent when installed. Undersized holes are usually caused by worn bits and/or wrong bit sizes being used. If integral steel is used with a stoper or jackleg, the hole diameter decreases with each change of steel (normal practice requires smaller bits be used as one drills deeper into the hole). With each reduction in hole diameter the anchorage capacity increases. Integral steel often results in crooked holes and should be avoided whenever possible.



Drive Times - For a typical 5 or 6 foot friction bolt, a stoper or jackleg will drive the bolt into the hole in 8 to 15 seconds. This drive time corresponds to proper initial anchorages of the stabilizer. Faster drive times should serve as a warning that the hole size is too large and thus the initial anchorage of the bolt will be too low. Longer drive times indicate smaller holes sizes probably caused by bit wear.

Bit Selection - Button bits are commonly up to 2.5mm larger than their slated size. A 37mm button bit may in reality be 39.5mm in diameter when new. This is too large for an SS- 39 friction.

Button bits do wear quickly however, increasing anchorage capacity and increasing drive times.

Cross or "X" bits, on the other hand, are sized true to stamped size usually within 0.03". They hold their gauge very well but tend to drill slower than button bits. They are preferable to button bits for friction installation where possible.

Perpendicular Installation - Bolts should be installed as near perpendicular to the rock surface as possible. This ensures the welded ring is in contact with the plate all round. Bolts not perpendicular to the plate and rock surface will result in the ring being loaded at a point which may cause early failure. Unlike other rock bolts, spherical seat washers are not available to correct for angularity with frictional stabilizers.

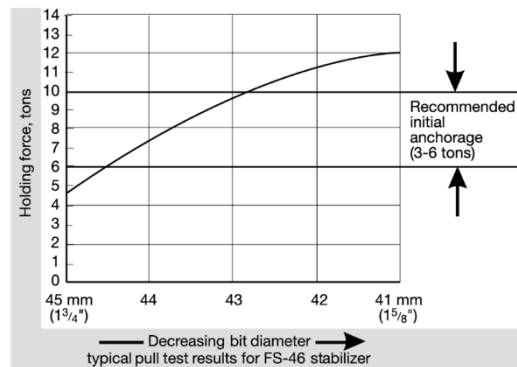
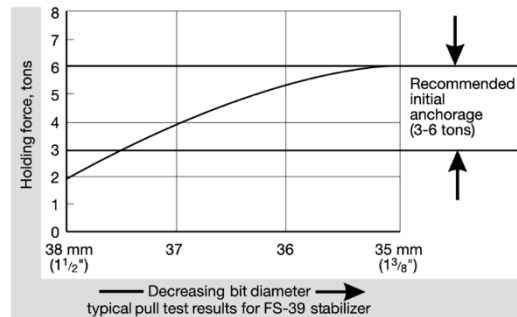
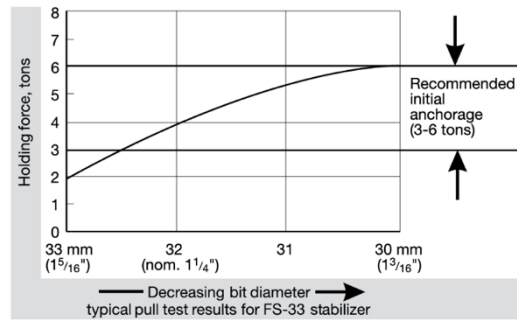
Installation Driver Tools - Driver tools must transfer percussive energy to the bolt during installing, not rotational energy. This is opposite to most other forms of ground support. The shank end of the driver must be the proper length to contact the drill piston in stopers and jacklegs (i.e. 4 1/4" long for 7/8" hex drill steel). The shank end on the drivers is round so as to not engage the rotation of the drill. The driver tools must have the proper end shape to fit into the friction without binding and causing damage to bolt during installation.

Education - Proper education of mining personnel and supervisors is mandatory. As manpower turnover is relatively frequent in bolting crews, education must be continuous. An informed workforce will save money in the long run.

Monitoring - Installation must be monitored to ensure proper procedures and quality are maintained. Pull-test measurements should be routinely conducted on friction stabilizers to check initial anchorage values.

Legal disclaimer

All dimensions, weights, quantities, and specifications are those applicable at the time of this publication and may be amended from time to time. Please contact your local representative for final confirmation of any key specifications.



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