

FASLOC® X-TREME Resin Cartridges

Category: Resin capsules



Overview

FASLOC® X-TREME resin was developed to allow bolts, in a variety of lengths, to be grouted and anchored in one simple operation, without the need for injection equipment and process.

FASLOC® X-TREME resin complements products and provide an optimum system of bolt and resin.

FASLOC® X-TREME resin is produced by the most modern and technologically advanced equipment in the resin business, with the most accurate system for ratio control of the resin/limestone mixture ensuring that resin/catalyst proportions are consistent. The entire plant is interconnected to provide coordinated control of the entire process.

The two-compartment cartridge shown in illustration A above consists of a heat-sealed tube of polyester film clipped at both ends. One compartment contains a dark gray resin; the other, a light gray catalyst. A cross section of the cartridge is shown in illustration B.

Resin cartridge size

The diameter and length of the FASLOC® X-TREME cartridge depends on the dimensions of the specific bolt and borehole. The diameter and length of cartridges employed in USA coal mines are specified by ASTM F-432-10. The systems developed by FASLOC® X-TREME engineers following ASTM F-432-10 are summarized in the following table:

Technical Data - FASLOC® X-TREME Resin Cartridges

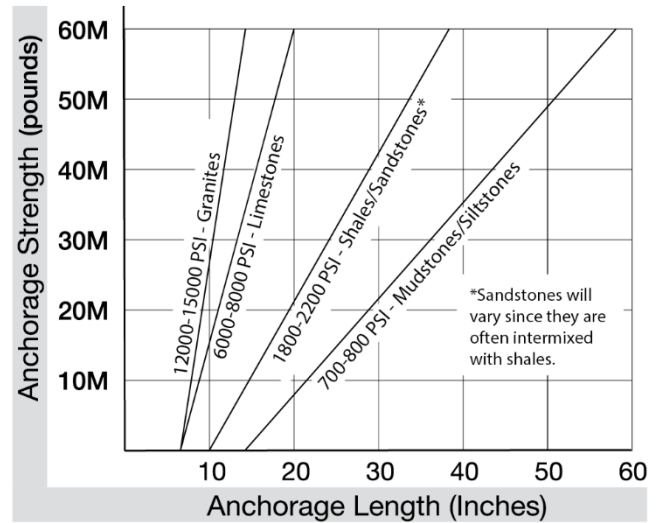
Cartridge diameter, in.(mm)	Hole diameter in.(mm)	Bolt type	Bolt diameter In.(mm)	FASLOC® X-TREME SYSTEM	Product use class	Strength index
0,9(23)	1(25)	#6 Rebar	3/4(19)	A	1,11,111	10
0,9(23)	1(25)	Point Anchor #6 Tension	3/4(19)	A-TA	1,11,111	10
0,9(23)	1(25)	#5 Rebar	5/8(16)	B	1,11,111	10
0,9(23)	1(25)	Cable	0.5,0.6,0.7(13,15,18)	CA,A,B	1,11,111	10
0,9(23)	1(25)	Instal Resin	5/8(16)	BI	1,11,111	10
1,25(32)	1-3/8(35)	#7 Rebar	7/8(22)	J,C,J,JI	1,11,111	10
1,25(32)	1-3/8(35)	Cable	0.5,0.6,0.7(13,15,18)	CJ	1,11,111	10
1,25(32)	1-3/8(35)	Instal Resin	3/4 - 7/8(19 - 22)	JI	1,11,111	10
1,25(32)	1-3/8(35)	Combination	7/8(22)	CB,J,J	1,11,111	10
0,9(23)	1(25)	#6 Rebar	3/4(19)	TA	1,11,111	10
0,9(23)	1(25)	#5 Rebar	5/8(16)	TB	1,11,111	10

Designated FASLOC® X-TREME Systems are shown for typical applications and can be used for other bolt types and sizes

General features

- A film barrier of heat-sealed polyester film prevents migration between the resin and the catalyst to provide optimum shelf life.
- The excellent chemical resistance of the film minimizes migration from the inside and the absorption of contaminants from the outside.
- The lightweight, dimensionally stable casing of film is strong enough to withstand rough handling, but shreds quickly and thoroughly during the installation procedure.
- FASLOC® is thixotropic and fast setting. This reduces viscosity during insertion of the bolt and permits relatively low installation force and torque.
- The results are fast installation, rapid achievement of full strength, and a minimum tendency for ungelled resin to drip from the holes during installation.
- The proprietary FASLOC® package has a distinct advantage over other resin systems due to:
 - High catalyst/resin ratio
 - Uniform installation time
 - Mixing efficiency
 - Cartridges are available in lengths from 12" to 60".
 - R25 1.65", 2"

Fig. 1. Resin anchorage related to compressive strength of rock



Gel, spin and hold times

Gel time

Generally, the sum of the Spin Time and Hold Time is the Gel Time. The time from the start of mixing until the resin starts to harden is the Gel Time. Gel Time is influenced by temperature of resin, strata and bolt. Additionally, the amount of heat generated in mixing during the spin time also affects Gel Time. Field trials are recommended.

Spin time

Cartridge contents should be completely mixed to achieve maximum anchorage. The generally accepted mix standard is a minimum of 30 revolutions of the bolt. Spin Time is the time required, at typical bolter rotation of 400 - 600 rpm, to achieve the complete mix.

Hold time

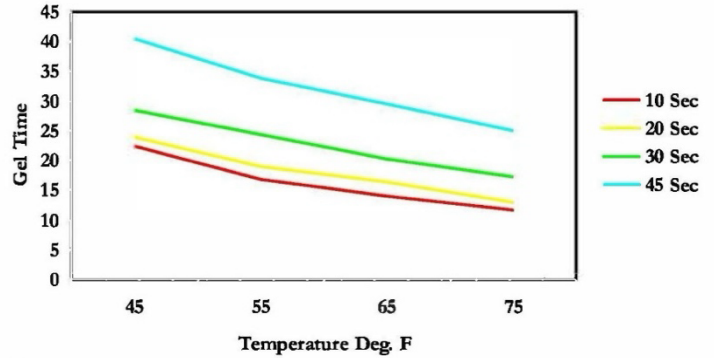
After the cartridge contents are mixed, the resin must harden to achieve strength. The time required after mixing is completed and the bolt has achieved a firm anchorage is referred to as Hold Time.

Gel, spin and hold times

Gel time seconds	Spin time Seconds	Hold time Seconds	Color Code	
10	3 to 5	3 to 8	Pink	
20	3 to 6	4 to 8	Orange	
30	3 to 7	8 to 15	Blue	
45	4 to 9	8 to 20	White	
60	5 to 10	18 to 28	Green	
75 & 90	5 to 10	20 to 40	Green/White	
120	5 to 10	25 to 75	Yellow	
120-240 & higher	5 to 15	45 to 240	Yellow/White	

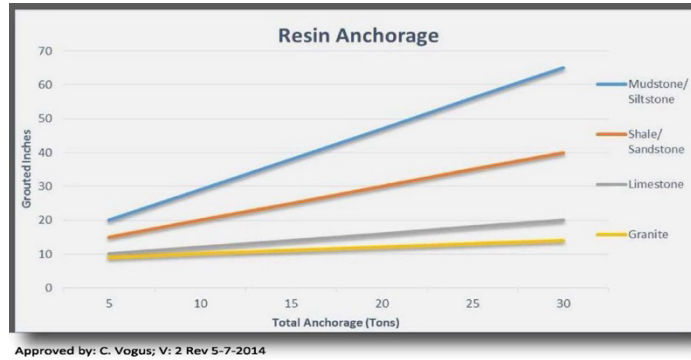
DSI FASLOC® X-TREME gel times at various temperatures

FASLOC® X-TREME resin is formulated to be used at 55-60° F (13-16° C). Expect a one-minute resin to gel in one minute at 55 F (13 C). Resin is temperature sensitive, so at lower temperatures, gel time will be slower than normal and at higher temperatures the gel time will be faster than normal. FASLOC® X-TREME resin cartridges should be stored away from direct sunlight in a dry, cool, well-ventilated area. Storage under adverse conditions will reduce shelf life. Product should not be subjected to temperatures above 90° F (32° C) for prolonged periods. For best results, pallets and cases of FASLOC® X-TREME.



FASLOC® X-TREME polyester resin anchorage system

DSI Fasloc® X-TREME is a two-part polyester resin used to provide a mechanical link between a borehole's wall and the bolt's surface. The borehole should be rifled from drilling or mechanically scoured, for the cured composite system, to provide effective anchorage. The bolt should have ribs to promote anchorage. DSI Fasloc® X-TREME is resistant to mild alkalis and mild acids. DSI Fasloc® X-TREME is composed of 80% inert filler to reduce shrinkage. Resin alone would shrink and not provide effective anchorage. The composite has an unconfined compressive strength of 5,000 psi (ASTM O 790-02). The resin used to manufacture Fasloc® X-TREME has an unconfined compressive strength of 16,500 psi (ASTM O 790-02). Any anchorage system performance varies with the surrounding strata strength. DSI Fasloc® X-TREME provides approximately 1.25 to 2.0 tons per grouted inch pull-out resistance in hard rock, and 0.5 to 1.0 tons per grouted inch in soft rock. Estimated performance can be viewed in the graph.



FASLOC® X-TREME resin cartridge drill hole and fill charts

The required diameter and length of FASLOC™ X-TREME cartridges for civil and tunneling applications, not governed by ASTM F-432-10, is calculated by estimating the volume of the annulus between the bolt and the borehole. FASLOC™ X-TREME cartridges are manufactured in diameters of 23, 28, 32, 35, and 40 mm. Cartridges may be manufactured in lengths to suit specific bolt and borehole combinations. However, it is generally more efficient to employ multiple standard one foot (305 mm) long cartridges to anchor each bolt. The following English and metric tables, with 15% excess for borehole irregularities, assist in the selection and ordering FASLOC™ X-TREME cartridges. The English unit table estimates the inches grouted by a standard one-foot-long cartridge. The metric unit table estimates the millimetres grouted by a standard 305 mm long cartridge.

Metric Nominal rebar Diameter (mm)	Drill hole diameter (mm)					
	25	28	33	35	42	51
-	23	23	28	32	35	40
16	280					
18	466	305				
20	624	365	302			
22		468	344	367		
25			448	453		
28				616	332	
32					439	
35					603	308

English

		Drill hole diameter (in)						
Nominal rebar		1	1-1/4	1-3/8	1-1/2	1-3/4	2	2-1/4
		Resin cartridge diameter (in)						
Rebar	Diameter (in)	0.9	1-1/8	1-1/4	1-1/4	1-3/8	1-9/16	1-9/16
#6	3/4	19.6	12.7					
#7	7/8		15.9	14.7				
#8	1		22.5	18.6	13.2			
#9	1-1/8			26.5	16.8			
#10	1-1/4				24.1	13.2		
#11	1-3/8					16.9	12.3	
#12	1-1/2					24.4	14.8	9.2
#13	1-5/8						19	10.7
#14	1-3/4							12.9

For example: a project requires a 3 meter long 22 millimetre diameter rebar, anchored with a one meter long resin anchor. The metric table indicates that this rebar may be installed in a 28, 33, or 35 mm borehole. Assume available equipment is best suited to drill a 33 mm borehole. A 28 mm diameter cartridge is best suited for this rebar and borehole combination. A 305 mm long 28 mm cartridge grouts 344 mm. Therefore, three 305 mm cartridges would be required per bolt. Typically, a fast cartridge would be followed by two slow set cartridges, to provide for efficient.

The Resin Cartridge Drill Hole Fill Chart shows the length of drill hole that will be encapsulated by a 12 in. (305 mm) resin cartridge. This chart can be used as a guide for the most common combinations of hole, bolt, and resin diameters. Other combinations are possible as long as the annular space does not exceed 1/4 to 3/8 in. (6 to 10mm). Due to difficulty in overcoming drag of the bar through the resin cartridges during insertion, encapsulated resin drill holes are most practical with shorter anchorages. Insertion and rapid tensioning.

Civil & tunneling applications

Metric & english

		Drill hole diameter in.(mm)										
Grade 75		1 (25)	1-1/4(32)	1-1/2 (38)	1-9/16(40)	1-1/2 (38)	1-9/16(40)	1-3/4(44)	1-7/8(48)	2(51)	2-1/4(57)	2-1/2(64)
		Resin cartridge diameter in.(mm)										
Grade 60 solid rebar		15/16(24)	1-1/8(29)	1-1/4(32)	1-1/4(32)	1-3/8(35)	1-3/8(35)	1-9/16(40)	1-9/16(40)	1-9/16(40)	1-3/4(44)	1-3/4(44)
-		20(508)	13(330)									
#6, 3/4 in.(19 mm)												
#7, 7/8 in.(22 mm)												
8, 1 in.(25 mm)			23(584)	13 (330)		16(406)	15(381)					
#9, 1-1/8 in.(29 mm)				16(406)	14(356)	20(508)	16(406)					
1-3/16 in.(30 mm)				19(483)	15(381)	23(584)	18(457)	15(381)				
#10, 1-1/4 in.(32 mm)					18(457)		22(559)	17(432)				
11, 1-3/8 in.(35 mm)								21 (533)	15(381)	12(305)		
#14, 1-3/4 in.(44 mm)											14(356)	
		150 ksi all-thread bar										
1 in.(25 mm)				15(381)	12(305)	18(457)	15(381)					
1-1/4 in.(32 mm)								23(584)	16(406)	12(305)		
1-3/8 in.(35 mm)									19(483)	14(356)		
1-3/4 in.(44 mm)											18(457)	12(305)

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General installation guidelines

The installation procedures should be followed carefully to ensure successful application of FASLOC® resin grouting.

- Various factors affect installation. These instructions are general guidelines. Mine tests must be conducted with bolts to determine actual “mix” and “hold” times.
- Bolts should be installed as soon as possible in newly exposed roof. Roof that has shifted or sagged offers least chance for successful support.
- Do not use ruptured or broken cartridges.
- Refer to M.S.D. sheets and Product Bulletin for additional technical and safety data.

Safe handling precautions

Caution: Do not open or puncture cartridge. Physical contact with liquid contained in cartridge may cause mild irritation. Safety glasses or eye shield should always be used when bolting is done. In case of eye contact, immediately flush with plenty of water for at least 15 minutes. Call a physician. In case of skin contact, flush skin with water. Prolonged contact with skin may cause mild irritation. Irritation should subside when material is removed.

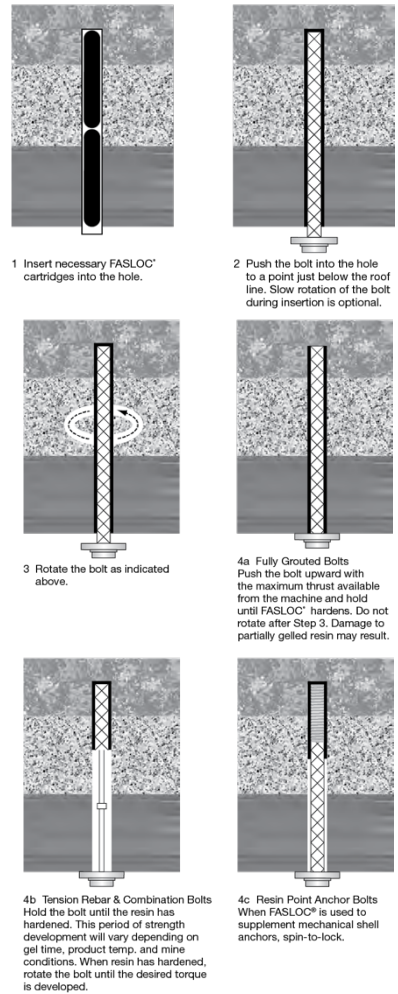
For complete safety information, refer to the Material Safety Data Sheets. Copies will be furnished upon request. Cartridges are filled with inert fillers, water, polyester resin and activator (active ingredients include low levels of styrene and modified benzoyl peroxide). FASLOC® cartridges are for industrial use only and are intended for use in conjunction with bolts. The relationship between hole dimensions, bolt size and the size and number of cartridges is critical to good performance. Your DSI representative will be glad to assist in determining the proper combinations for specific applications.

Storage recommendations

Storage life is up to 1 year when the resin cartridges are stored in a cool (less than 70°F), dry, ventilated area out of direct sunlight. Under adverse conditions the anticipated shelf-life is reduced. Note that DSI strongly recommends a vigorous stock rotation program, where resin is used on a first in, first out basis. While cold storage does not adversely affect the shelf-life of FASLOC®, it should be warmed to 50-60°F before use to bring gel times within the specified range. Use at temperatures below this range will result in slower gel times. The time required for cases of FASLOC® to warm or cool to ambient temperature is dependent on both the initial temperature and how the cases are stacked. Where the initial temperature is anywhere.

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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