
Pac2 standard for prevailing torque threadlocker Dri-Loc® Plastic

Test, material and performance specifications

Introduction

This standard conforms where applicable to DIN 267 part 28, DIN 267 part 15 and ISO 2320. Dimensions M20 to M24 has been added referring to DIN 267 part 28. Dimensions M2, M2.5 and M7 are added. Seated testing is based on 75% of proof load and ISO 898-1. Torque is calculated according to DIN 946 and $\mu = 0.12$ on ISO 4014 screws. Test joint and procedures are modified from DIN and ISO. This standards original language is swedish and the swedish issue is valid compared to the english.

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1 Scope and field of application

These specifications are valid for storing, handling, applying and testing Dri-Loc Plastic. They apply to used materials and threadlocker pre-applied on all materials, surfaces and ISO metric screw threads from M2 to M24 according to ISO 261. Standard does not cover manufacturing of Dri-Loc Plastic materials. Dri-Loc Plastic is typically used on ISO 898 and free cutting steel parts. Dri-Loc Plastic is a mechanical product and allows adjusting after assembly. Not clamped Dri-Loc Plastic threads are possible to reuse up to five times.

2 Abbreviations and definitions

μ	friction coefficient DIN 946
d	diameter ISO 261
d_1	clearance hole ISO 273
d_2	outside diameter ISO 4759
dw	bearing area ISO 4759
M_{in}	installation torque
M_{re}	removal torque
s	thickness ISO 4759
Ra	surface roughness

3 Requirements

3.1 General requirements

Dri-Loc Plastic should meet all requirements in Loctite Technical Information Sheet, on drawing or in standard.

3.2 Supply condition Dri-Loc Plastic materials

Dri-Loc Plastic materials are delivered as plastic powder and fluent primer. Neither are sensitive to out- or indoor temperatures but should not be exposed to excessive humid conditions or big temperature changes.

3.3 Supply condition pre-applied Dri-Loc Plastic

Pre-applied Dri-Loc Plastic is delivered on threaded parts as a patch. It is normally red and covers threads at 90° to 180° of the circumference. Pre-applied Dri-Loc Plastic is not sensitive to normal out- or indoor temperatures, humidity or periods of exposure to UV-light.

3.4 Storage and shelf life requirements

Dri-Loc Plastic materials shall have shelf life of at least 5 years and pre-applied threadlocker at least 20 years from manufacturing date. To meet shelf life requirements Dri-Loc Plastic materials and pre-applied threadlocker should be stored indoors not exposed to excessive humidity or UV-light.

3.5 Corrosion resistance requirements

When manufacturing Dri-Loc Plastic, threads are heated above the plastic's melting temperature 185°C±1°C. Electroplated coatings of zinc are damaged causing lower corrosion resistance due to the heating. Corrosion inhibitors in cooling bath determine corrosion resistance. If nothing else is specified corrosion protectant according to Pac2 standard M-1020 should be used.

3.6 Dimension and performance requirements

Dri-Loc Plastic width L_3 should be $1.5d \pm 0.2d$ leaving two to three free lead threads according to alternative 1. Alternative 2 is used to specify special width L_2 or lead thread L_1 requirements. On set screws the Dri-Loc Plastic patch should cover the thread length leaving two to three free lead threads in each end except on short thread lengths. On thread lengths not exceeding $2xd$ for M2 and $1.5xd$ for M3 to M24 Dri-Loc Plastic patch should cover thread length leaving one to three free lead threads in each end. On drawing tolerances are best described in mm taking in consideration that resolution is one full pitch.

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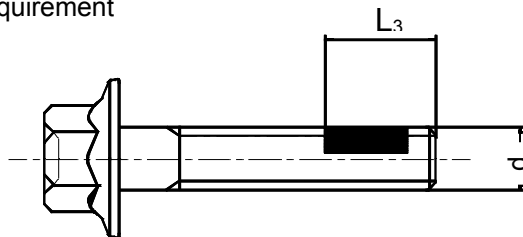
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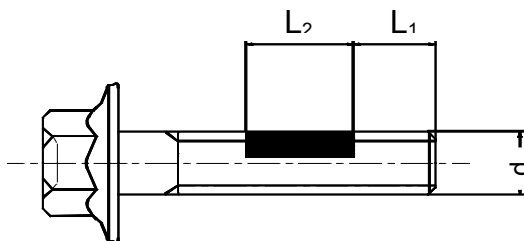
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alternative 1 : standard width requirement



alternative 2 : special width requirement



Diameter of thread and Dri-Loc Plastic patch must not exceed clearance hole diameter grade fine according to ISO 273 displayed in table 3.6.a. Locking performance tested according to this standard should correspond to torque in table 3.6.a.

table 3.6.a : diameter and locking performance requirements

thread size d	first installation M_{in1} Nm max	first removal M_{re1} Nm min	fifth removal ²⁾ M_{re5} Nm min	clamping M_{cl} Nm				diameter mm max.
				5.6	5.8	8.8	10.9 12.9	
M2 ¹⁾	0,18	0,05	0,03	0,22 ³⁾		0,35		2,2
M2.5 ¹⁾	0,29	0,08	0,05	0,44 ³⁾		0,7		2,7
M3	0,43	0,12	0,08	0,6		1,2		3,2
M4	0,90	0,18	0,12	1,3		2,8		4,3
M5	1,6	0,29	0,20	2,6		5,5		5,3
M6	3,0	0,45	0,30	4,5		9,5		6,4
M7 ¹⁾	4,0	0,55	0,40	8,4 ³⁾		20		7,4
M8	6,0	0,85	0,60	11		23		8,4
M10	10,5	1,5	1,0	22		46		10,5
M12	15,5	2,3	1,6	38		79		13
M14	24	3,3	2,3	60		125		15
M16	32	4,5	3,0	90		195		17
M18 ¹⁾	42	6,0	4,2	128		280		19
M20 ¹⁾	54	7,5	5,3	176		390		21
M22 ¹⁾	68	9,5	6,5	240		530		23
M24 ¹⁾	80	11,5	8,0	310		670		25

¹⁾ Not specified in DIN 267 part 28.

²⁾ DIN 267 part 28 specifies third removal torque.

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³⁾ For class 5.8

3.6.1 Adhesion requirements

Dri-Loc Plastic shall adhere to the threads according to Pac2 standard T-267282. To aid adhesion patch primer may be used.

3.6.2 Resistance requirements

Pre-applied Dri-Loc Plastic assembled in a joint should be able to perform in the temperature range from -55 °C to 120°C. Dri-Loc Plastic consist of polyamide and is resistant to most organic and inorganic fluids and gases. Caution should be taken when used with phenols, inorganic acids and chlorinated hydrocarbons.

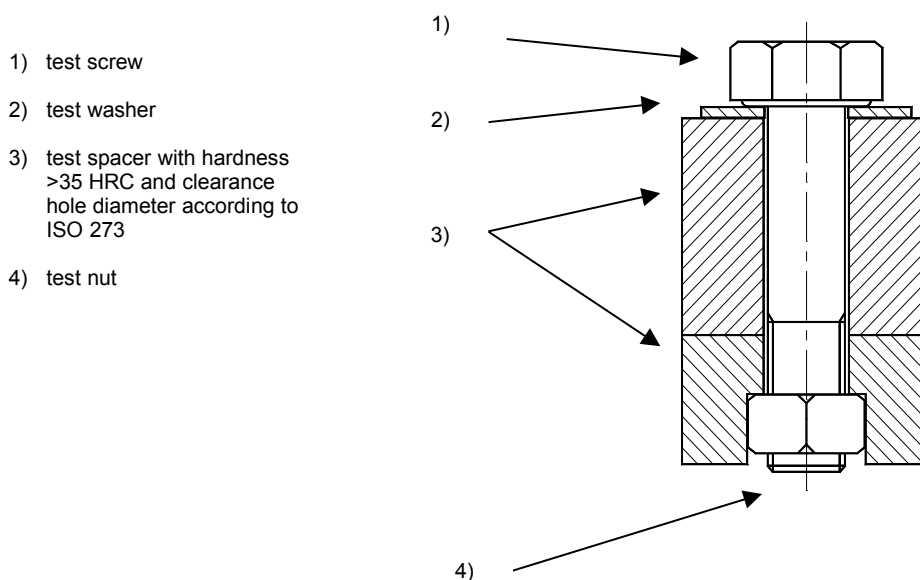
4 Testing

Dri-Loc Plastic is tested referring to locking performance, adhesion and dimensions. Locking performance test is made seated with clamping torque or unseated. Test procedure with seated joint is used to assess performance on a specific part or lot. Test procedure without seating is used to approve manufacturing. Performance established by assessment test procedure with seating should be valid when compared to performance established by manufacturing test procedure without seating. Test should be performed at 23°C ± 5°C using test objects and devices that are the same temperature.

4.1 Test and measuring devices

Torque transducer shall have bias less than ±4%. Torque tool should be indicating type of at least class B, C or E according to ISO 6789. Test joint used to perform assessment test procedure shall be according to picture 4.1.a and used washers according to table 4.1.2.a.

picture 4.1.a : test joint



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4.1.1 Test nut for torque test

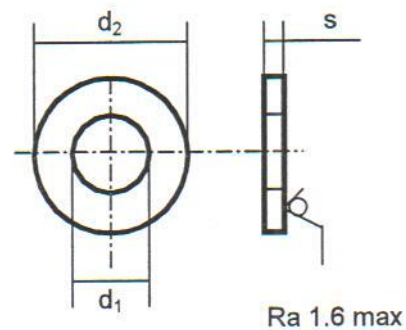
Nuts used to test Dri-Loc Plastic shall be not surface treated or blackened ISO 4032, ISO 4161 or DIN 934 nuts that are free from lubricants or oil. Used nuts should be property class 8 according to ISO 898-2. For every test screw a new nut shall be used. Special nut threads of steel hardened to 60 HRC min can be used that are reused many times. It is important that the engagement length is between 0.8 and 1.0 times the diameter with special width Dri-Loc Plastic and that it does not exceed 2.5 times the diameter with standard width. All nut threads must be recessed 120° and dw 1.2 times the thread diameter according to ISO 4759. Repeatedly used nut threads shall be thoroughly cleaned before every test screw. A thread gauge with tolerance 6H according to ISO 1502, stop and go, is used to approve test nut threads.

4.1.2 Test washer for torque test

Test washer shall be according to ISO 273, ISO 4759-3 and table 4.1.2.a. Washer hardness shall be >200 HV and for joints in property class 10.9 and 12.9 >300 HV. Washer shall be the same surface treatment as the screw or washers with electroplated zinc coating and white chromating according to ISO 2081 shall be used. ISO 7092 washers may be used.

tabell 4.1.2.a : test washer

d	d ₁ ISO 273 medium	d ₂ ISO 4759-3	s min
M3	3.4	>1,2 x d _w	0.5
M4	4.5		
M5	5.5		1
M6	6.6		1.6
M8	9.0		
M10	11.0		
M12	13.5		2
M14	15.5		2.5
M16	17.5		
M18	20.0		3
M20	22.0		
M22	24.0		
M24	26.0		4



4.2 Assessment and manufacturing test procedure

During testing requirements in table 3.6.a shall be maintained. Test screw threads should be assembled until the Dri-Loc Plastic is in contact with the countersunk chamfer in the test nut. First installation torque is the highest readout during the next five turnings or patch length L_2 . When performing assessment test the test joint is assembled to specified seating torque. Seated joint is held for 15 seconds before reversing the test screw 360°. During removal torque test the test screw is reversed five turnings or patch length L_2 and during the first two turnings or $L_2/2$ the removal torque is the highest readout. When performing not seated testing installation and removal is repeated five times. Installation torque must not exceed first installation torque requirement during any installation. Fifth removal torque is the highest readout during the two first turnings or $L_2/2$.

Test should be carried out at a speed of maximum 5-rpm. A motor capable of keeping a constant speed should be used for assessment test. Manufacturing test may be carried out by hand. Adhesion should be tested according to Pac2 standard T-267282..

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5 References

TIS Dri-Loc Plastic : May 1997
Pac2-S M-1020
Pac2-S T-267282
DIN 267 part 28
DIN 934
DIN 946
ISO 1502
ISO 2081
ISO 2320
ISO 273
ISO 4032
ISO 4161
ISO 4759
ISO 6789
ISO 7092
ISO 898

Appendix A

Colour codes for Dri-Loc Plastic. Standard colour red 7302 shall apply unless otherwise specified on drawing or in standard. Special colours require extensive cleaning of equipment why they normally should be avoided. Colour does not affect the locking properties of Dri-Loc Plastic.

designation	colour code	colour
Dri-Loc Plastic	7302	red
Dri-Loc Plastic 7174	7174	light blue
Dri-Loc Plastic 7411	7411	dark blue
Dri-Loc Plastic 7379	7379	yellow

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