
Pac2 standard for micro-encapsulated adhesive threadlocker Dri-Loc®

Dimension and test specifications

Introduction

This standard conforms where applicable to DIN 267 part 27 and ISO 10964. Dimensions M4 and M7 have been added referring to DIN 267 part 27. Seated testing is based on 75% of proof load in 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 the dimension and testing of adhesive threadlocker Dri-Loc. Special performance or alternative dimension requirements should be agreed with customer in separate documentation. Specifications apply to not surface treated ISO 898, ISO 3506 and free cutting steel, brass, aluminium and titanium parts. They apply to parts and all surface treatments, e.g. ISO 2081, phosphate, Dacromet, Delta Tone and Delta Seal treated parts. Application of sealer or lubricant shall, if nothing else is specified, take place after application of threadlocker. Sealer or lubricant such as Gleitmo, Finigard or Enseal applied before application of threadlocker may result in loss of locking and sealing properties.

Dri-Loc is a chemical product and does not allow adjusting after curing. Disassembled part must be replaced by a new pre-applied part or refitted with anaerobic locking fluid so as not to lose it's locking properties.

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_{ba}	breakaway torque
M_{pr}	prevail torque
M_{in}	installation torque
M_{cu}	curing torque
M_{cl}	clamping torque
s	thickness ISO 4759
Ra	surface roughness

3 Requirements

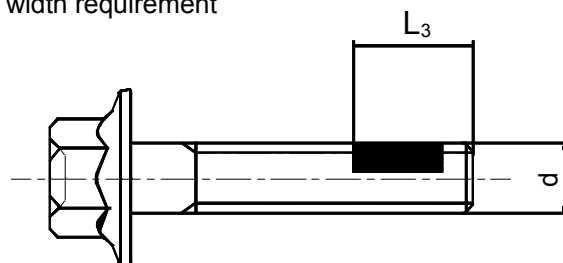
3.1 General requirements

Dri-Loc should meet all requirements on drawing or in standard.

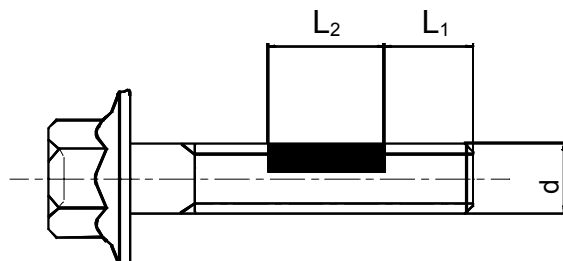
3.2 Dimension and test requirements

On screws Dri-Loc 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 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 $1.5xd$ Dri-Loc should cover thread length leaving one to three free lead threads in each end. In nuts the full thread length, allowing zero to one free lead thread in each end, should be covered with Dri-Loc. On drawing tolerances are best described in mm taking in consideration that resolution is one full pitch.

Alternative 1 : Standard width requirement



Alternative 2 : Special width requirement



Diameter of thread and Dri-Loc must not exceed clearance hole diameter grade fine according to ISO 273 displayed in table 3.2.a. Locking shall be tested according to this standard and correspond to requirements in table 3.2.a.

Table 3.2.a : Diameter and test requirements

Thread size d	Installation torque (max) M _{in}	Curing torque M _{cu}	Clamping M _{cl} Nm		Diameter mm max.
			5.6 5.8	8.8 10.9 12.9	
M4 ¹⁾	0.9	1	1,3	2,8	4.3
M5	1	2	2,6	5,5	5.3
M6	1.5	3.5	4,5	9,5	6.4
M7 ¹⁾	2.5	6	8.4 ³⁾	20	7.4
M8	3.0	8	11	23	8.4
M10	5.5	16	22	46	10.5
M12	7.5	28	38	79	13
M14	11	45	60	125	15
M16	14	68	90	195	17
M18	19	95	128	280	19
M20	22	134	176	390	21
M22	30	177	240	530	23
M24	36	233	310	670	25
M27	42	334	460	1000	28
M30	49	459	620	1350	31
M33	55	616	825	1850	34
M36	60	797	1100	2350	37
M39	70	1030	1400	3000	40

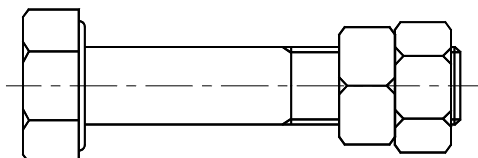
1) Not specified in DIN 267 part 27.

3) For class 5.8

4 Testing

Locking performance test is made seated with clamping torque or unseated with curing torque. 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 as well as assessing performance on a specific part or lot. When assessed, parts shall correspond to requirements referring to seated and unseated testing. Test should be performed at 23°C ± 5°C using test objects and devices that are at the same temperature. At the manufacturers recommendation clamping during curing shall be utilised by assembling a second clamping nut that is removed before the unseated test according to picture 4.a.

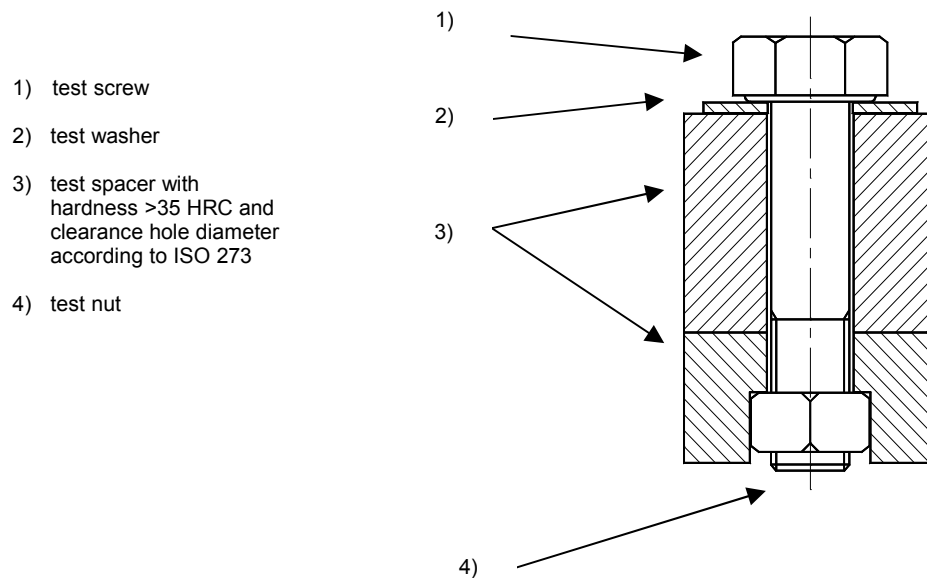
Picture 4.a: Test joint with clamping nut assembled during curing



T-26727**4.1 Test and measuring devices**

Torque transducer shall have bias less than $\pm 4\%$. Torque tool should be indicating type of at least class B, C or E according to ISO 6789. Test joint used to perform seated test shall be according to picture 4.1.a and used washers according to table 4.1.2.a. Picture displays test joint for pre-applied screw. To test pre-applied nuts the screw head shall be fixed.

Picture 4.1.a : Test joint set-up to test a pre-applied screw

**4.1.1 Test nut and screw for torque test**

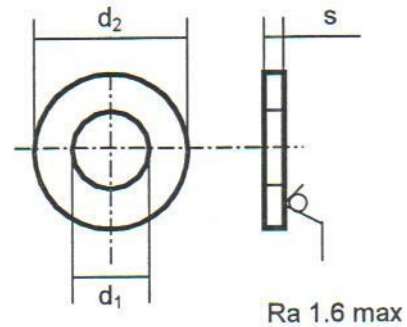
Nuts and screws used to test Dri-Loc shall be not surface treated or blackened and free from lubricants or oil. All threads shall be according to ISO 261. Test nut shall be according to ISO 4032, ISO 4161. DIN 934 shall be avoided. Test screw should be according to ISO 4014, ISO 4017, and ISO 4162 or equal. Used nut should be property class 8 and screw property class 8.8 according to ISO 898. For every test a new test nut or screw shall be used. Special nut steel threads may be used. The engagement length should be between 0.8 and 1.0 times the diameter. All nut threads must be recessed 120° and d_w 1.2 times the thread diameter according to ISO 4759. A thread gauge with tolerance 6H and 6g according to ISO 1502, stop and go, is used to approve test threads.

4.1.2 Test washer for torque test

Test washer shall be according to ISO 273, ISO 4759 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.

Table 4.1.2.a : Test washer

d	d ₁ ISO 273 medium	d ₂ ISO 4759-3 >1,2 x d _w	s min
M3	3.4		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 Test procedure

On screw threads the test nut shall be assembled so that it covers the threadlocker the full nut thread length. When testing pre-applied nuts the nut shall be assembled on the test screw so that four to seven screw threads exit the nut thread. During assembly without achieving clamping force the highest torque is the installation torque (M_{in}). When performing unseated tests a clamping nut shall, if required be assembled in contact with the test nut to curing torque (M_{cu}). Seated test requires the pre-applied part to be tightened to clamping torque (M_{cl}). After assembly the joint shall be left at test temperature to cure specified time. In unseated joints that utilises curing torque, the clamping nut shall be removed prior to testing the locking performance. When the pre-applied part is disassembled the highest torque as the threadlocker breaks is the breakaway torque. Breakaway torque is normally achieved at 3° to 8° of turning. After breaking the highest torque during the next 360° is the prevail torque.

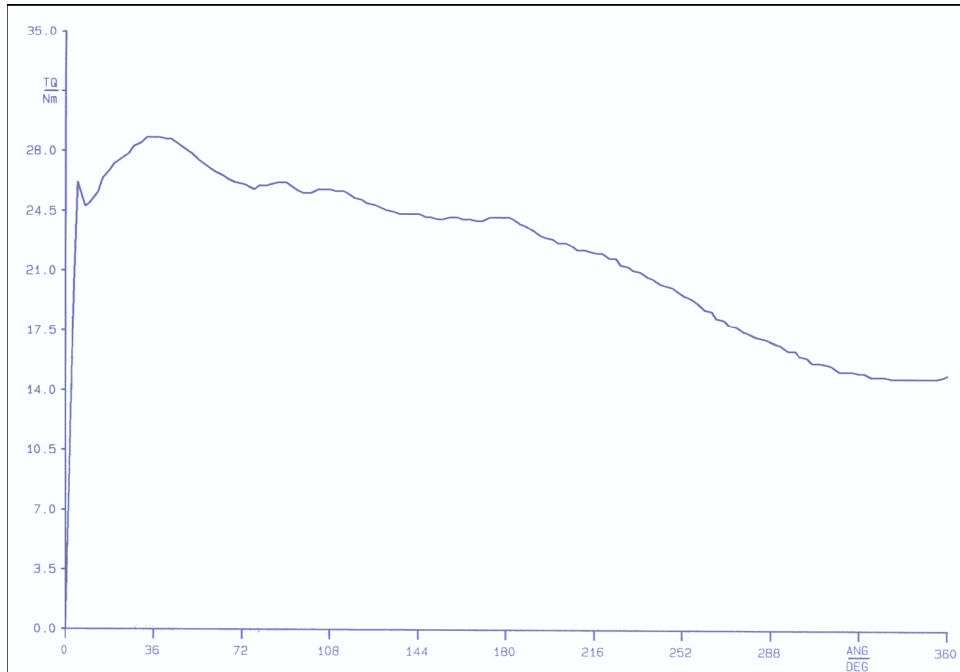
Test should be carried out at a speed of 5-rpm. When assessing product a motor capable of keeping a constant speed should be used. Manufacturing test may be carried out manually though it shall be known that it requires skill and experience to distinguish between breakaway and prevail torque.

5 References

DIN 267 part 27
DIN 934
DIN 946
ISO 10964
ISO 1502
ISO 2081
ISO 261
ISO 273
ISO 4014
ISO 4017
ISO 4032
ISO 4161
ISO 4162
ISO 4759
ISO 6789
ISO 7092
ISO 898

Appendix A

1 Breakaway torque with peak transition from rupture to prevail



2 Breakaway torque with smooth transition from rupture to prevail

