SAFETY IS POWER

HARDLOCK®

Register of International Marks

World's Strongest

Self-Locking Nut

- Mining
- Argiculture
- Railway
- Infrastructure
- And more...

HARDLOCK Industry Co., Ltd.

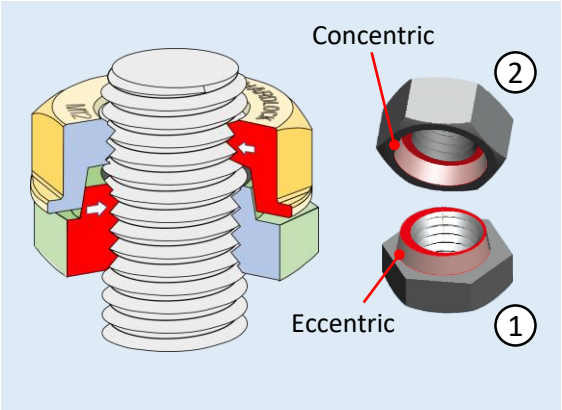
HARDLOCK NUT RIM & HARDLOCK NUT BASIC

FEATURES OF HARDLOCK NUT

- ◆ Reusable without reduction in performance ！
- ◆ Full torque management and completely fastened even with ZERO (0) clamp load ！
- ◆ Available in various materials and surface treatments tailored to the environment ！
- ◆ No special tools required for installation ！

LOCKING MECHANISM

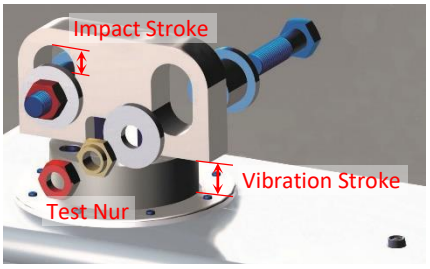
HARDLOCK NUT consists of two nuts, the first nut ① "Convex Nut" (clamping nut) has an eccentric protrusion on the upper surface. The second nut ②"Concave Nut"(locking nut) is designed with a concentric conical recess for locking the two nuts together.
By tightening the concave nut onto the convex nut, a strong perpendicular load will be applied to the bolt from both sides.



PROVED SUPERIOR IN A VARIETY OF LOOSENING TESTS

1) Accelerated vibration test conforming to NAS 3350/3354 (National Aerospace Standard)
To determine the capability of fasteners to withstand accelerated vibration condition.

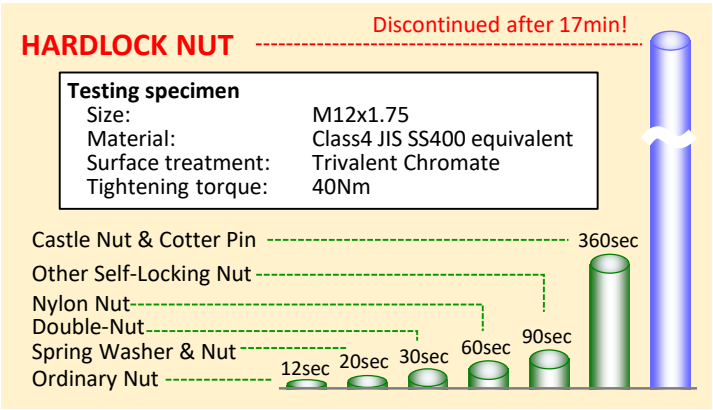
Assembly of NAS testing machine



Testing conditions

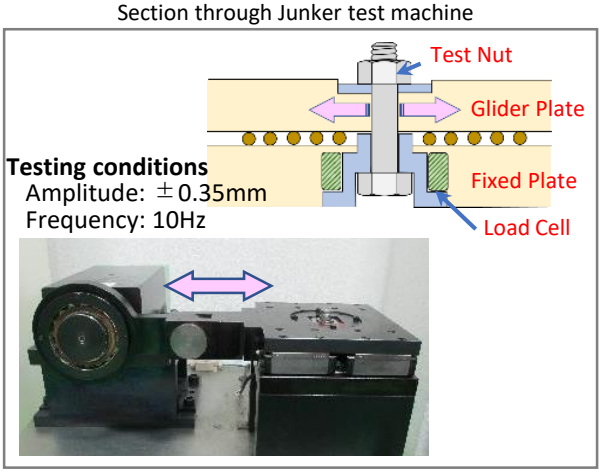
Testing frequency:	1,780c.p.m
Vibration stroke:	11mm
Impact stroke:	19mm

Test results

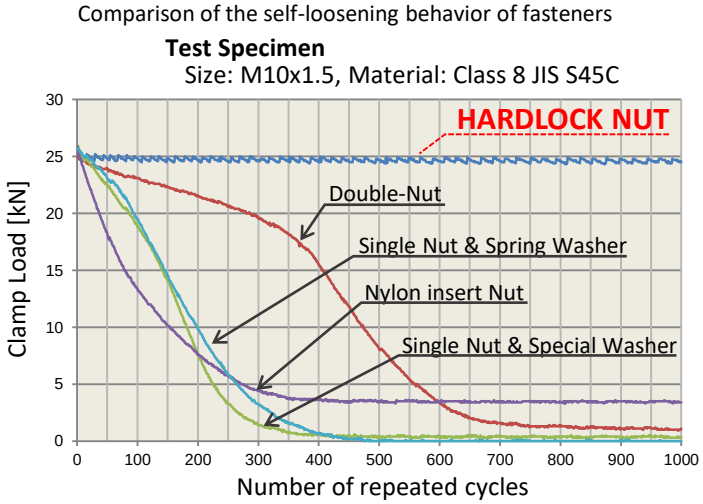


2) Junker Vibration Test
The test bench applies a transverse cyclic vibration to the glider plate, and the clamp load is measured in real time and plotted on a graph.

Section through Junker test machine



Comparison of the self-loosening behavior of fasteners

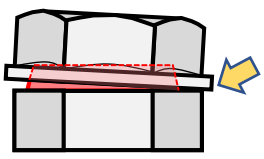


INSTALLATION

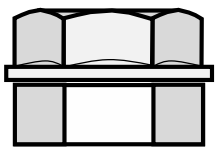
Use a tightening tool (spanner, torque wrench etc.) to tighten the Convex Nut to the appropriate torque for the application. The Convex Nut has the same Strength Class as a regular hexagon nut and can therefore be tightened to its maximum limit.

Install the Concave nut onto the Convex nut manually by hand until it no longer turns. Make sure that there is a gap of about 1 thread pitch between the nuts.
If the gap is less than 1 pitch, there may be a chance that sufficient locking effect will not be produced so please refrain from using HARDLOCK NUT with the bolt.
(The same conditions apply for reuse.)

Use a torque wrench to tighten the Concave nut with the **recommended torque set by HARDLOCK Industry Co., Ltd**.
＊Page 5-6



One-sided contact
* The inclination in the figure is exaggerated.



Full contact

If it is difficult to manage the tightening torque of the Concave nut, please use **"one-sided contact"** as a guide for ensuring locking power.
When tightening the Concave nut on to the Convex nut, one side of nuts will first come into contact, which gives an indication of sufficient locking effect (The Concave nut will slightly incline after the contact between the protrusion and the recess.)
By applying additional torque , the nuts will come into **full contact**. This state produces the ultimate locking effect of the HARDLOCK NUT.

It is recommended to stop tightening the concave nut when the nuts come into **full contact** even though the applying torque is less than the maximum of recommended tightening torque.

Gap

Even after correctly tightening the Concave nut with the torque within the range of recommended tightening torque, there may remain a gap between the nuts due to the tolerance of bolt diameter.
Even in this condition, sufficient locking effect is secured but the Concave nut can be further tightened to come into **one-sided contact or full contact** even with more torque than the recommended torque to better ensure locking effect.

Product Information

HLN-R (HARDLOCK Nut Standard Rim Type)

(1) Description
  1) The HLN-R is our standard product.
  2) The HLN-R has a rim on the bottom surface of the Concave Nut for increased workability.
(2) Thread Standard: Metric (Course) Thread Standard only
(3) Thread Tolerance Class: ISO 6H (6AX if over-tapped for Hot Dip Galvanizing)
(4) Size: M5 to M30
  HLN-R is not available in size M14 and M18
(5) Material:
  1) Class 4 / JIS SS400, Equivalent to ASTM-A563 - Grade A (Low Carbon Steel)
  2) Class 8 / JIS S45C, Equivalent to ASTM-A194 - Grade 2H (Medium Carbon Steel)
  3) Class 10 / JIS SCM435, Equivalent to ASTM A194 - Grade 7 (Chromium Molybdenum Steel)
  4) A2 / JIS SUS 304, Equivalent to ASTM A194 – Grade 8 (Stainless Steel)
  NOTE: HLN-R in A2 is only available up to M16
(6) Surface Treatment:
  1) Class 4 with Zinc Trivalent Chromate or Hot-dip Galvanizing (Zinc).
  2) Class 8 with Manganese Phosphate Coating or Trivalent Chromate.
  3) Class 10 with Manganese Phosphate Coating.
  4) A2 Unplated
  *Other Surface Treatments are available in Made-To-Order

HLN-B (HARDLOCK Nut Basic Normal Type)


～M30


M33～

(1) Description
  1) The HLN-B is our original product (first concept) with a “Basic” shape.
  2) The HLN-B is available in more sizes, pitches, materials and thread standard options.
  3) HLN-B Type is not available if HLN-R Type is available for the requested item
  NOTE* If HLN-R is not applicable for the application, please contact us.
(2) Thread Standards:
  Metric Thread Standard (Course/Fine)
  Unified Thread Standard (Course/Fine)
  British Whitworth Thread Standard (Course)
(3) Thread Tolerance Class:
  6H - Metric thread
  2B - Unified thread
  Normal Class (JIS B0206 Class3) – British Whitworth thread
(4) Size: M6 to M130
  1) The Concave Nut from M33 and above is Thin Type (lower height).
  2) Thin Type HLN-B (both Convex and Concave Nut) is available from M16
(5) Material:
  1) Class 4 / JIS SS400, Equivalent to ASTM-A563 - Grade A (Low Carbon Steel)
  2) Class 8 / JIS S45C, Equivalent to ASTM-A194 - Grade 2H (Medium Carbon Steel)
  3) Class 10 / JIS SCM435, Equivalent to ASTM A194 - Grade 7 (Chromium Molybdenum Steel)
  4) A2 / JIS SUS 304, Equivalent to ASTM A194 – Grade 8 (Stainless Steel)
  *Other materials are available in Made-To-Order
(6) Surface Treatment:
  1) Class 4 with Zinc Trivalent Chromate or Hot-dip Galvanizing (Zinc).
  2) Class 8 with Manganese Phosphate Coating or Zinc Trivalent Chromate.
  3) Class 10 with Manganese Phosphate Coating.
  4) A2 Unplated
  *Other Surface Treatments are available in Made-To-Order.

Tightening Torque

Tightening Torque Table for HARDLOCK Nut Standard Rim

Nominal diameter	Pitch	Reference tightening torque for the convex nut (same as general hex nut) *70% of the bolt yield point						Recommended tightening torque for the concave nut Common to all (Min – Max)
		Class4		Class8	Class10	A2		
		(SS400 or equivalent)		(S45C)	(SCM435)	(SUS304 or equivalent)		
		4.8(320N/mm²)		8.8(640N/mm²)	10.9(900N/mm²)	A2-50	A2-70	
		CR3	HDZ35	Manganese Phosphate		Unplated		
M5	0.8	2.5	–	–	–	1.6	3.4	2～3
M6	1.0	4.1	–	–	–	2.7	5.7	4～5
M8	1.25	9.8	23	19.7	27.7	6.5	14	9～20
M10	1.5	20	45	39	55	13	27	18～27
M12	1.75	34	79	68	96	22	48	27～50
M16	2.0	84	197	170	237	55	120	70～120
M20	2.5	165	384	330	463	–	–	120～200
M22	2.5	225	523	450	630	–	–	150～250
M24	3.0	285	664	570	801	–	–	160～300
M27	3.0	415	972	835	1,171	–	–	250～390
M30	3.5	565	1,319	1,130	1,590	–	–	270～440

Please stop tightening the Concave nut if there is full contact between the Convex nut and Concave nut before reaching the highest torque value in the Tightening Torque Table.

・The above reference tightening torque for the convex nut is calculated on the basis of the torque coefficient of 0.15.
・The above tightening torque for the Convex Nut with HDZ35 is calculated on the basis of a torque coefficient of 0.35.
・Regarding the tightening torque for the Convex Nut in A2, please check strength classification of the bolt used.
・The tensile strength of the Convex Nut is equal to an ordinary hexagon nut, therefore there is no unique torque value for the Convex Nut.
・The Concave Nut can be tightened until contact with the convex nut even if its tightening torque value exceeds our recommended maximum value because the torque coefficient will vary depending on the surface roughness and other factors.
・In the case of HDZ35, please tighten the Concave Nut 50% more than the above torque value due to the high torque coefficient.

Tightening Torque Table for HARDLOCK Nut Basic Normal

Nominal size	Pitch	Reference tightening torque for convex nut (same as general hex nut) *70% of the bolt yield point						Recommended tightening torque for the concave nut Common to all (Min - Max)
		Class4 (SS400 or equivalent)		Class8 (S45C)	Class10 (SCM435)	A2 (SUS304 or equivalent)		
		4.8 (320N/mm²)		8.8 (640N/mm²)	10.9 (900N/mm²)	A2-50	A2-70	
		CR3	HDZ35	Manganese Phosphate		Plain		
M8	1.25	–	–	–	–	–	–	9～13
M10	1.5	–	–	–	–	–	–	18～24
M12	1.75	–	–	–	–	–	–	27～39
M14	2.0	55	125	110	150	36	75	55～70
M16	2.0	–	–	–	–	–	–	70～100
M18	2.5	115	270	230	330	75	165	100～150
M20	2.5	–	–	–	–	110	230	120～240
M22	2.5	–	–	–	–	145	315	150～250
M24	3.0	–	–	–	–	185	400	160～380
M27	3.0	–	–	–	–	275	585	250～390
M30	3.5	–	–	–	–	370	790	270～440
M33	3.5	770	1,795	1,540	2,165	505	1,080	290～490
M36	4.0	990	2,305	1,975	2,780	650	1,390	340～590
M39	4.0	1,280	2,985	2,555	3,600	840	1,800	390～640
M42	4.5	1,580	3,690	3,160	4,445	1,035	2,225	440～690
M45	4.5	1,980	4,620	3,960	5,570	1,300	2,785	490～740
M48	5.0	2,370	5,530	4,740	6,670	1,555	3,335	540～780
M52	5.0	3,075	7,175	6,150	8,650	2,020	4,325	590～830
M56	5.5	3,820	8,915	7,640	10,745	2,505	5,370	640～880
M64	6.0	5,765	13,445	11,525	16,210	3,780	8,105	690～930
M68		6,980	16,287	13,960	19,630	4,581	9,816	Tighten the Concave Nut Between one-sided and full-contact
M72		8,370	19,531	16,741	23,540	5,493	11,771	
M76		9,931	23,172	19,862	27,930	6,517	13,965	
M80		11,677	27,246	23,353	32,840	7,663	16,420	
M85		14,131	32,973	28,263	39,745	9,274	19,872	
M90		16,907	39,450	33,814	47,550	11,095	23,776	
M95		20,023	46,721	40,047	56,315	13,140	28,158	
M100		23,503	54,841	47,006	66,100	15,424	33,051	
M105		27,363	63,847	54,726	76,960	17,957	38,479	
M110		31,623	73,787	63,246	88,940	20,753	44,470	
M115		36,302	84,705	72,605	102,100	23,823	51,050	
M120		41,425	96,658	82,850	116,505	27,185	57,254	
M125		47,006	109,682	94,013	132,205	30,848	66,103	
M130		53,067	123,823	106,134	149,250	34,825	74,625	