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REMINC / CONTI

REMFORM® II HS™ SCREWS

END-USER SPECIFICATIONS

PR-186
August 2024

Leaders in Lowering the Cost of Assembly

INTRODUCTION and SCOPE

This document provides end-users dimensions, recommended material and heat treatment along with test methods to confirm desired mechanical properties for standard for REMFORM® II HS™ screws. End-users may use this copyrighted material to create their own in-house REMFORM® II HS™ standards. This information is for use only with REMFORM® II HS™ products and requires prior notification to and permission from REMINC/CONTI before its inclusion into any company documents.

REMFORM® II HS™ screws - as covered in this document (PR-186) - are a variant of the primary REMFORM® II™ (PR-182) standard for REMINC/CONTI thread forming screws for plastics. Another variant REMFORM® II F™ is covered in its separate document (PR-187).

DESIGN

REMFORM® II HS™ fasteners were developed to combine the features of REMFORM® II™ and REMFORM® II F™ fasteners with an optimized gap between the threads (pitch) and core diameter.

The optimized pitch allows more threads to be in contact with the plastic material. The optimized pitch in combination with an optimized core diameter allows for improved mating plastic material flow downwards toward the load flank and will accept a higher amount of material between the flanks. This reduces the risk of overstressing and cracking of the plastic material particularly during the assembly process.

REMFORM® II HS™ fasteners employ a Unique Radius Flank™ asymmetrical thread form – Figure 1. The leading thread flank is most influential in forming the mating thread. The intercepting radius form on the lead flank (Long Concave Radial Flank – Figure 1) promotes efficient material displacement and material flow. The steep trailing, or pressure flank (Steep Convex Radial Flank – Figure 1) opposes the fastener head resists pull-out forces, whether applied by a tensile load (joint service loads) or induced by torque resulting in high strip torque. This unique thread and its narrow tip angle efficiently displace material and therefore require minimal energy to form an internal thread. This results in low drive torque. High strip torque and low drive torque provide a generous installation window for the assembly line, thus creating a more robust installation process.

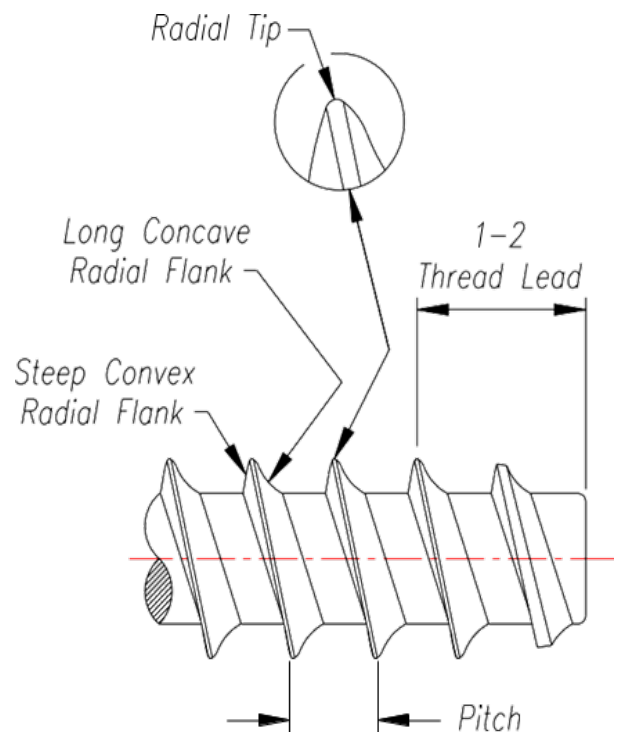


Figure 1: REMFORM® II HS™ thread profile

REMFORM® II HS™: END-USER SPECIFICATIONS

DIMENSIONS

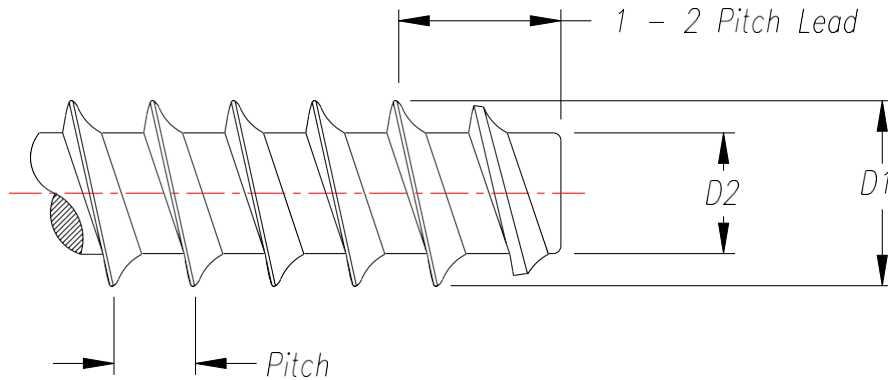


Figure 2: REMFORM® II HS™ Dimensions

METRIC SIZES ONLY		MAJOR DIA. - D1		MINOR DIA. - D2
SIZE	PITCH	Max.	Min.	Min.
2.0	0.78	2.08	2.00	1.28
2.2	0.85	2.28	2.20	1.43
2.5	0.95	2.60	2.50	1.64
3.0	1.12	3.10	3.00	2.01
3.5	1.29	3.60	3.50	2.37
4.0	1.46	4.10	4.00	2.73
4.5	1.63	4.60	4.50	3.09
5.0	1.80	5.15	5.00	3.43
6.0	2.14	6.15	6.00	4.16
7.0	2.48	7.18	7.00	4.86
8.0	2.82	8.18	8.00	5.58
9.0	3.16	9.25	9.00	6.28
10.0	3.50	10.25	10.00	7.00

Table 1: REMFORM® II HS™ Dimensions

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MATERIAL

Screws shall be manufactured from plain carbon aluminum-killed fine grain steel, for which the ladle analysis should fall within the following analysis:

Carbon 0.18 – 0.25%
Manganese 0.70 – 1.65%
Sulfur 0.045% Maximum
Phosphorous 0.035% Maximum
Silicon 0.10% Maximum
Boron 0.0005 – 0.002% (Optional)

Structural grades of alloy steel, stainless steels and non-ferrous metals are optional and not included herein.

HEAT TREATMENT

Standard REMFORM® II HS™ screws are neutral hardened.

Hardening and Quenching: Fasteners are heated above the steel transformation temperature and quenched directly from the furnace heat into water, oil, or a suitable synthetic with good agitation to achieve uniform quench hardness.

Tempering: Screws shall be tempered suitably to acquire physical and mechanical properties listed below.

PHYSICAL AND MECHANICAL PROPERTIES with TEST METHODS

Core Hardness: Rockwell “C” 33-39 (HV 327-382) when tested on the cross-sectional core of the shank a distance of one diameter from the point.

Core hardness shall be determined at the mid-radius of a transverse section through the screw taken at a distance sufficiently behind the point of the screw to be through the full minor diameter. The test shall comply with ISO 6507.

Surface Hardness: Carbon enrichment allowed; surface should not have any decarburization. Surface hardness shall not be more than 30 Vickers Points (HRC – 3 points) over core hardness reading.

Decarburization Control: When tested per ISO 898-1 Decarburization test, the surface shall not exhibit loss of carbon from the surface. Loss of carbon from the surface may result in softer spots on the fastener that can lower the fastener’s ability to thread form.

Ductility: Head of screw shall not separate from the shank after a deformation of 7 degrees (wedge block). For initial control purposes, a deformation of 10 degrees may be used.

Ductility Test: The sample screw shall be inserted into a hole in a hardened, 7° angle wedge block,

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having a hole size 0.5 to 1.0mm larger than the nominal screw size. An axial compressive load shall be applied against the top of the screw until the plane of the under head bearing surface is bent permanently to 7° with respect to a plane normal to the axis of the screw. It is acceptable to induce the 7° permanent deformation using a handheld hammer.

Minimum Torsional Strength: This is an important and realistic property attribute for inspection purposes, replacing tensile testing. See Table 2. Inch sizes - torsional strength in appendix.

Note that this torque is defined as FREE BREAKING TORQUE – FBT (no under head contact). Generally, these values are lower than failure torque (if achieved) during installation due to some torque being consumed to overcome friction.

Torsional Strength Test: The screw shall be clamped in place using a threaded or non-threaded clamping device (ex: tabletop vise clamp) so that a minimum of three threads are clamped without damage. Using a torque measuring device, torque shall be applied until the screw fractures. The torque required to cause fracture is the torsional strength. Fracture must occur in the exposed threads and not in the clamped portion.

SCREW SIZE		Minimum Torsional Strength (Nm)
Diameter mm	Pitch mm	
2.0	0.78	0.42
2.2	0.85	0.58
2.5	0.95	0.85
3.0	1.12	1.55
3.5	1.29	2.52
4.0	1.46	3.83
4.5	1.63	5.53
5.0	1.80	7.51
6.0	2.14	13.3
7.0	2.48	21.3
8.0	2.82	32.2
9.0	3.16	45.6
10.0	3.50	63.1

Table 2: Minimum Torsional Strength (Nm)

FASTENER FINISH / COATINGS

All REMFORM® II HS™ screws can accept standard coatings. Please note that some surface lubricants and sealers could have negative effects on polymers.

Hydrogen embrittlement risk mitigation through BAKING must be considered post-processing for electroplated fasteners and fasteners assembled with washers**. Washers** exhibit material conditions that when combined with environmental and loading factors can cause HE failures.

***ZINC plated, all shapes and designs of washers that are made of spring steel whether the washers are pre-heat-treated and assembled with unhardened screws or are heat treated and assembled with the screws).*