

1.0 Introduction

1.1 Scope. This standard covers requirements for metric high performance thread rolling screws suitable for use in engineering applications. High performance thread rolling screws have performance capabilities beyond those normally expected of other standard types of tapping screws.

It is the intent that all types of high performance thread rolling screws shall meet the mechanical and performance requirements specified in this standard with the only difference between types being in their dimensional characteristics.

NOTE: The performance requirements covered in this standard apply only to the combination of laboratory conditions described in the testing procedures. If other conditions are met in an actual service application (such as different materials, thicknesses, hole sizes, etc.) drive torque and proof torque values may require adjustment.

1.2 Designation. There are several types of high performance thread rolling screws. The dimensions and illustrations for some of these are contained in Table 1.

2.0 Requirements. This standard provides for three grades of high performance thread rolling screws, Type 2, Type 9, and Type 10. The grades differ in materials and/or processing requirements.

2.1 Material and Process Requirements: Type 2

2.1.1 Material and Chemistry. The materials shall conform to the requirements of IFI-140. Selection of a given grade of material shall be based on conformance with the following chemical composition limits:

Type 2

Analysis ¹	Composition Limits (% by weight)			
	Carbon		Manganese	
	Min	Max	Min	Max
Ladle	0.15	0.25	0.70	1.65
Check	0.13	0.27	0.64	1.71

NOTE 1: Ladle analyses are shown for informational purposes. Check analyses are mandatory and refer to individual determinations of uncarburized or core portions of the body.

2.1.2 Heat Treatment. Type 2 screws shall be heat treated in a carbonitriding or gas carburizing system.

2.1.3 Quenching Media. Screws shall be quenched in a proper medium to obtain a 90 percent minimum martensitic microstructure.

2.1.4 Tempering Temperature. Minimum tempering temperature shall be 340°C.

2.2 Material and Process Requirements: Types 9 and 10.

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2.2.1 Applications. Types 9 and 10 high performance thread rolling screws are designed to be able to carry a tensile load in an application as do through hardened bolts. The screw design incorporates a through hardened threaded shank and a selectively hardened area from the extreme end of the screw not to go beyond the third full thread. The selectively hardened area of the point must extend beyond the load carrying portion of the internal thread to perform correctly. In a through-hole application, the selectively hardened point must extend completely beyond the internally threaded assembly component. In a blind-hole application, a length of full-formed threads equal to at least one nominal screw diameter must be engaged in the hole in addition to the first three threads of the screw's point to assure correct performance.

2.2.2 Material and Chemistry. The materials shall conform to the requirements of IFI-140. Selection of a given alloy from IFI-140 shall be based on conformance with these chemical composition limits:

Type 9 and Type 10

Constituent	Cast or Heat Analysis % by Mass	Product Analysis % by Mass
Carbon	0.35 – 0.40	0.33 – 0.42
Manganese	0.70 – 0.90	0.67 – 0.93
Silicon	0.15 – 0.30	0.13 – 0.32
Molybdenum	0.20 – 0.30	0.18 – 0.32

2.2.3 Heat Treatment. Screws of Type 9 and 10 shall be heat treated in a continuous noncarburizing furnace using fine grain practice.

2.2.4 Quench Tempering Temperatures

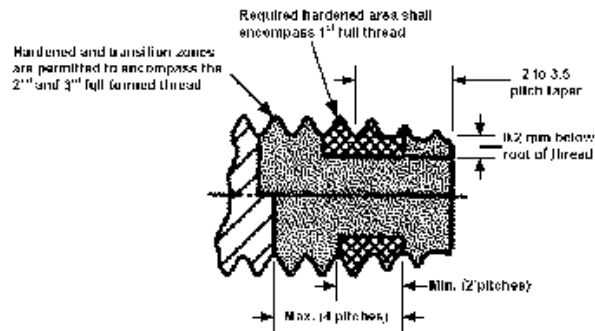
2.2.4.1 Type 9 shall be oil quenched and tempered at a minimum tempering temperature of 460°C.

2.2.4.2 Type 10 shall be oil quenched and tempered at a minimum tempering temperature of 425°C.

2.2.4.3 Lead threads of Type 9 and Type 10 shall be induction hardened to a minimum hardness equivalent of Rockwell C45 for at least the first full formed thread and not to extend beyond the third full formed thread from the screw point.

2.3 Finish. Screws may be furnished plain or with a protective coating (electrodeposited or mechanical plating or chemical conversion coating) as specified by the user. At the option of the manufacturer screws may be provided with an additional supplementary lubricant as necessary to meet the performance requirements.

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Electroplated screws shall be baked for a minimum of one hour within the temperature range 190°-230°C as soon as practicable after plating to avoid hydrogen embrittlement. Alternately, ASTM F1940 may be used for process control to prevent hydrogen embrittlement.

When screws are plated or coated following delivery to the purchaser (or where plating or coating of screws is otherwise under the control of the purchaser) the screw producer shall not be responsible for failure of the screws to meet mechanical or performance requirements due to plating or coating. In such cases, additional screws from the same lot shall be stripped of plating or coating, baked, lubricated with machine oil and retested in the natural finish.

2.4 Dimensional Requirements

2.4.1 Head Dimensions. Head dimensions shall conform to those specified in ASME B18.6.5M or comparable ISO standard.

2.4.2 Thread and Point Dimensions. Thread and point dimensions shall conform to those given in Table 1. Threads shall have a basic 60 degree thread form.

2.4.3 Thread Length. Screws with nominal lengths equal to or shorter than those shown in column A in the table below shall have full form threads extending within two thread pitches of the underside of the head. Unless otherwise specified by the purchaser, screws with nominal lengths longer than those given in column A shall have the minimum length of thread equal to the lengths shown in column B.

Nominal Screw	Nominal Lengths	
	A	B
M2	16	12
M2.5	20	15
M3	25	18
M3.5	30	21
M4	35	24
M5	40	30
M6	45	38
M8	45	38
M10	45	38
M12	50	38

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