

QuickTip HF3000 Specifications

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Approved by: AO

Cutting and Wear have manufactured drilling tool components and consumables for the oil and gas exploration industry for over 50 years. C&W can apply both tungsten carbide and TSP (Thermally Stable Polycrystalline) diamond hardfacing on drilling tools based on the application. In both instances the insert is spot welded to the steel using C&W's QuickTip system with a defined gap between them, the gap is then filled with a nickel matrix powder using oxyacetylene method of thermal spraying. Tungsten carbide grit can be added to the matrix to improve the wear resistance of the nickel matrix.

The chart below lists the hardfacing classes that C&W can apply under QuickTip HF3000. The characteristics of each hardfacing class is proprietary information of C&W, which is gained through vast experience over the years of applying hardfacings. **QT1** is C&W's standard hardfacing class which has been applied to numerous tools without any surface defects.

	General Steels (AISI 4140, 4145, 4330, 4340) Martensitic Grade Stainless Steels (420 grade/17-4 PH SS)				Non Magnetic Austenitic Steels (Mn-Cr/Mn-Cr-Ni/Mn-Cr-Mo-Ni/Cr-Ni-N Steels)			
	<u>QT 1</u>	<u>QT 2</u>	<u>QT 3</u>	<u>QT 4</u>	<u>QT 5</u>	<u>QT 6</u>	<u>QT 7</u>	<u>QT 8</u>
Inserts*	CW40	CW40	TSP Xtreme	TSP Xtreme	CW60	CW60	TSP Xtreme	TSP Xtreme
Insert Spacing (mm)	2	3	2	3	2	3	2	3
Matrix Metal Spray	MSK30	MSK30	MSK30	MSK30	MSK20NM	MSK20NM	MSK20NM	MSK20NM
WC Grit Addition to	Nil	30	Nil	30	Nil	30	Nil	30
Surface Crack Probable	None	Low	Low	Low	Low	Low	Low	Low

* CW40 (13mm x 5mm x 3mm) , CW60 (13mm x 5mm x 3mm) and TSP Xtreme (13mm x 5mm x 4mm) are C&W grade designations for inserts.

** MSK30 (25-30 HRC) and MSK20NM (15-20 HRC) are C&W grade designations for Metal Spray Powder.

NDT Inspection Method

- An individual loss of backwall (i.e. cracks, lack of fusion, etc.) between the overlay and the parent metal, or between the overlay passes should be less than 0.30 in² in area and the minimum separation distance between the defects should be 0.748". (Certain critical areas such as leading edge of a stabilizer etc will have tighter restriction on loss of backwall).
- Hardfacing cracks are acceptable as per TH Hill DS-1 Spec Section 7.10.13.1. When hardfacing martensitic grade stainless steels, stress relief cracks in the surface of the hardfacing that exceed the requirements of DS-1 may occur due to the inherent thermal expansion and contraction property of the material.
- UT will be performed by trained personnel as per C&W Qualification Procedure.
- QT1, QT2, QT5 & QT6 hardfaced regions to be 100% ultrasonically inspected.
- QT3, QT4, QT7 & QT8 hardfaced regions, only the surrounding Ni-based matrix can be ultrasonically inspected.

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QuickTip HF3000 Hardfacing Selection Chart

The chart below explains the likeliness of hardfacing surface cracks occurring with relation to the matrix (Metal Spray Powder) hardness and incorporating tungsten carbide grit in to the matrix. The risk of cracks occurring will rise as the matrix hardness is increased and as a greater percentage of tungsten carbide grit is added to the matrix.

Insert Spacing	4mm	None	Low	Low	Low	Moderate
	3mm	None	Low	Low	Moderate	High
	2mm	None	Low	Moderate	High	High
		MSK30	MSK30/30	MSK40	MSK50	MSK50/30
Metal Spray Powder						

1. **MSK30** - Nickel based metal spray powder with a hardness of 25 - 30 HRC.
2. **MSK30/30** - Nickel based metal spray powder with a hardness of 25 - 30 HRC mixed with 30wt% of spherical tungsten carbide grit .
3. **MSK40** - Nickel based metal spray powder with a hardness of 35-40 HRC.
4. **MSK50** - Nickel based metal spray powder with a hardness of 51-54 HRC.
5. **MSK50/30** - Nickel based metal spray powder with a hardness of 51-54 HRC mixed with 30wt% of spherical tungsten carbide grit .