

## Technical News Bulletin

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### Steel and Tungsten Carbide Shear Blade Overview



## 1 Introduction

Bucher Emhart Glass extended its highly regarded family of steel shear blades with the addition of Tungsten carbide blades. The outstanding hardness and toughness properties of this superior material offer the possibility of extremely long production runs without the interruption of changing blades and without suffering any degradation of the very clean cutting characteristics.

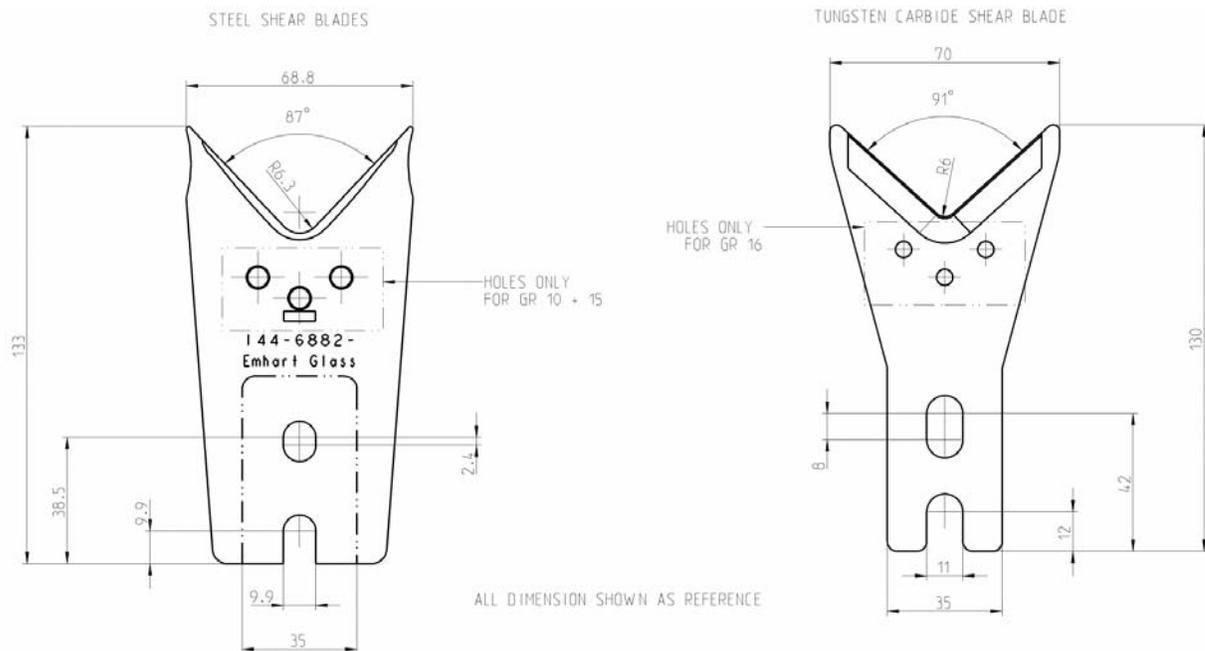
Since the first introduction the number of plants successfully using tungsten carbide blades has steadily increased, assisted by the introduction of special blade forms for improved shear spray application, and handling larger gobs.

The increasing demand for blades has permitted an optimisation of the very complex production process for tungsten carbide material. As a result, Bucher Emhart Glass was able to optimize the shear blade family by introducing redeveloped high class but affordable tungsten carbide blades. Optimized production methods lead to a significantly lower price and an improved technology at the same time. The dimensions and mechanical properties of the Tungsten blades are virtually identical to those of the existing steel blades.

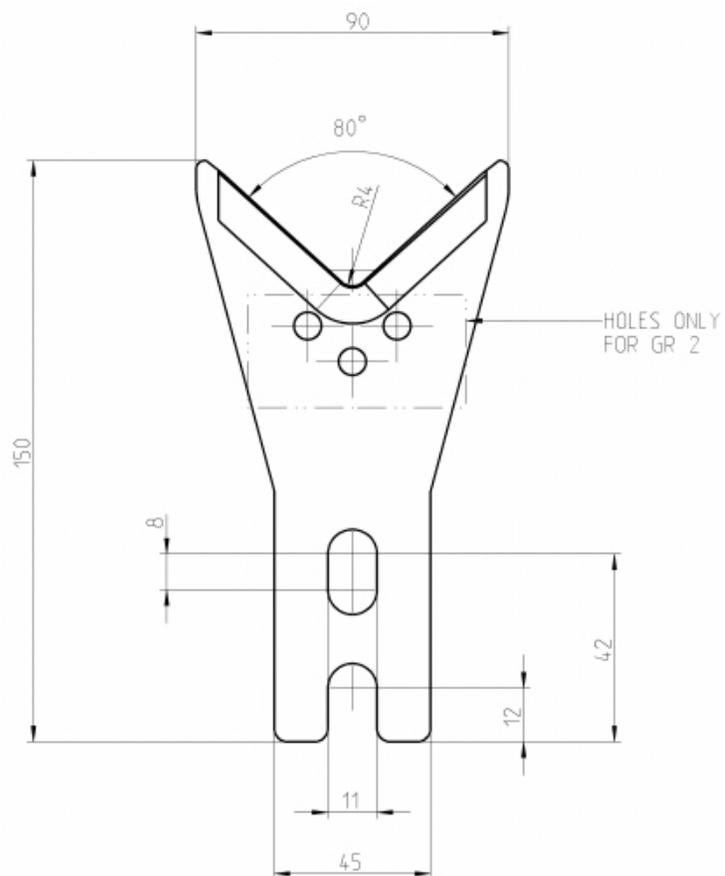
The Bucher Emhart Glass Shear Blade family consists of blades manufactured from two different materials, the long-established steel blades and the high quality and long life tungsten carbide blades. Blades in both types of material are available in different sizes, and can be supplied with or without drainage holes to facilitate the flow of shear spray liquid to both sides of the blade.

## 2 Shear Blades Overview

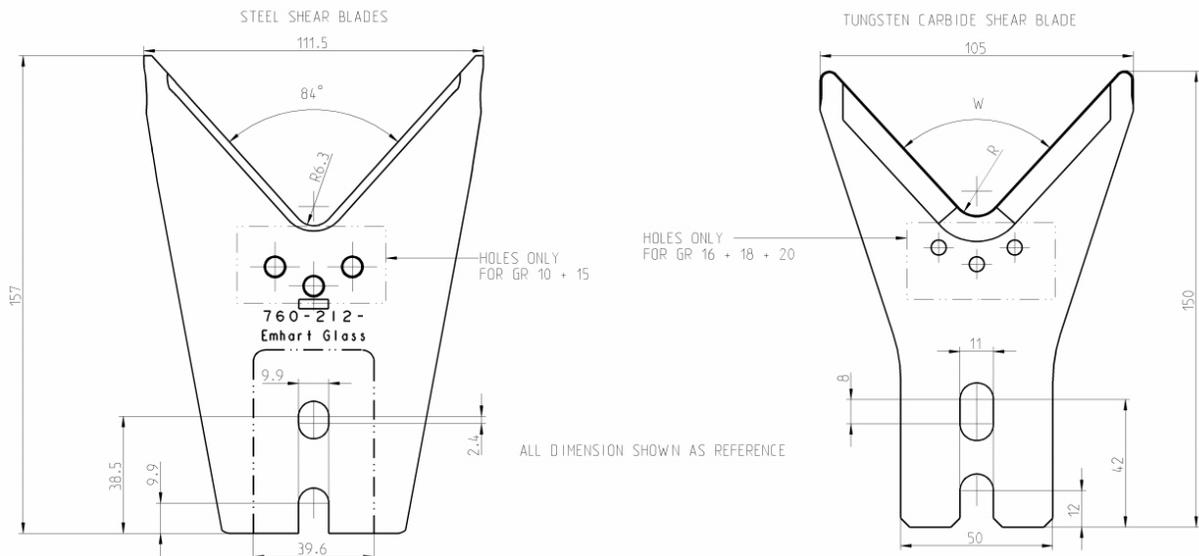
<b>Shear Blades Small Type</b>			
Item no.	Approx. cutting width	Type	Material
144-6882-1	55 mm	Standard grind	Black oxide
144-6882-2	55 mm	Standard grind	Nickel-Thallium-Boron
144-6882-3	55 mm	Special grind	Black oxide
144-6882-10	55 mm	Standard grind, with drainage holes	Black oxide
144-6882-15	55 mm	Special grind, with drainage holes	Black oxide
144-6882-16	55 mm	Standard grind, with drainage holes	Tungsten Carbide
144-6882-17	55 mm	Standard grind	Tungsten Carbide



<b>Shear Blades Middle Type (only TC)</b>			
<b>Item no.</b>	<b>Approx. cutting width</b>	<b>Type</b>	<b>Material</b>
144-16095-1	70 mm	Standard grind	Tungsten Carbide
144-16095-2	70 mm	Standard grind, with drainage holes	Tungsten Carbide



<b>Shear Blades Large Type</b>					
Item no.	Approx. cutting width	Type	Material	Radius R	Angle W
760-212-1	90 mm	Standard grind	Black oxide	6.3 mm	84°
760-212-2	90 mm	Standard grind	Nickel-Thallium-Boron	6.3 mm	84°
760-212-3	90 mm	Special grind	Black oxide	6.3 mm	84°
760-212-10	90 mm	Standard grind, with drainage holes	Black oxide	6.3 mm	84°
760-212-15	90 mm	Special grind, with drainage holes	Black oxide	6.3 mm	84°
760-212-16	90 mm	Standard grind, with drainage holes	Tungsten Carbide	8 mm	85°
760-212-17	90 mm	Standard grind	Tungsten Carbide	8 mm	85°
760-212-18	90 mm	Standard grind, with drainage holes	Tungsten Carbide	20 mm	76°
760-212-19	90 mm	Standard grind	Tungsten Carbide	20 mm	76°
760-212-20	90 mm	Standard grind, with drainage holes	Tungsten Carbide	18 mm	78°
760-212-21	90 mm	Standard grind	Tungsten Carbide	18 mm	78°



All tungsten carbide shear blades are available only as pairs and include one spacer in the package. 1 Box = 2 TC blades + 1 spacer!

For the set-up of tungsten carbide shear blades a longer screw and a washer are necessary.

Bucher Emhart Glass recommends for a pair:

1pc of 2660-430 Screw  
1pc of 3360-1202 Washer

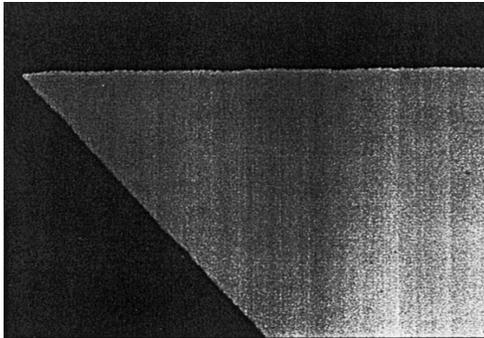
## Properties Of Tungsten Carbide

Tungsten carbide products are characterised by:

- *High wear resistance*
- *Fracture toughness*
- *High temperature resistance*
- *Good thermal conductivity*
- *Cutting accuracy*
- *Reduced downtime*
- *Shear spray minimisation*
- *Consistent cut quality*
- *Increased lifetime*
- *Sustainable cost reduction*

Specific Properties of Tungsten carbide shear blades are:

Grade	F14T
Hardness	HRA 88.0
Density	14.50 g/cm <sup>3</sup>
Thermal conductivity	90 W/mK
Transverse rupture strength	2'500 N/mm <sup>2</sup>
Elasticity module	630 kN/mm <sup>2</sup>

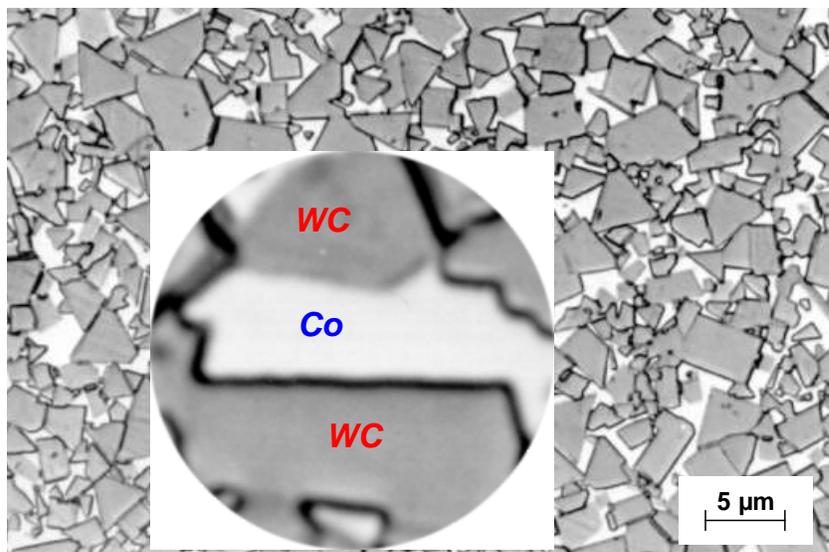


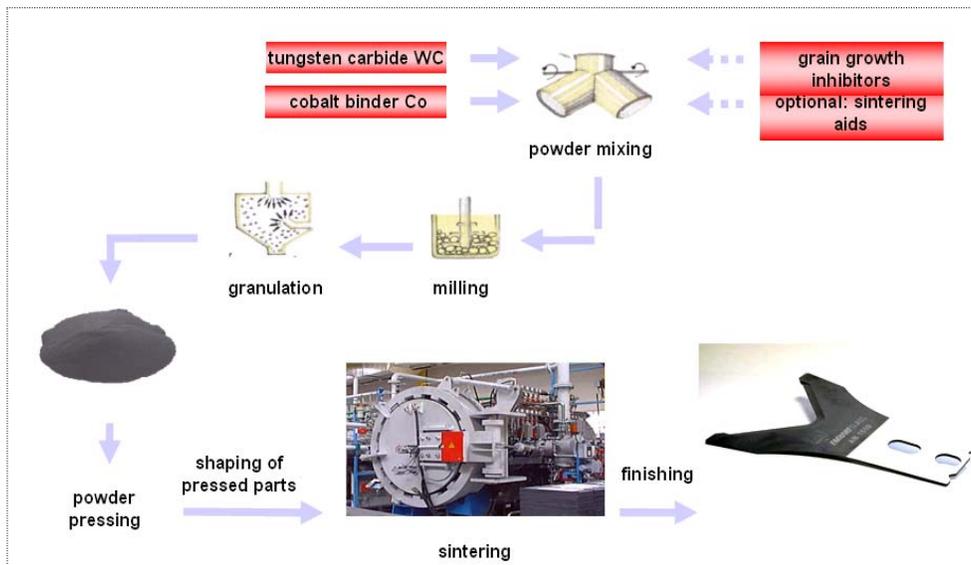
Tungsten carbide blade cutting edge (x100)



Steel blade cutting edge (x100)

Industrial tungsten carbide is a metal-matrix composite, consisting of a matrix of binder metal, cobalt (Co), in which are embedded particles of tungsten carbide (WC). The tungsten carbide particles give the composite the exceptional hardness for which it is noted, whilst the cobalt or nickel matrix ensures a higher degree of toughness. The manufacture of tungsten carbide products is a lengthy and complex process involving several distinct steps and specialised equipment.





### 3 Installation / Setting up

Proper setup is critical to successful operation of tungsten carbide blades, but this differs in some respects from setup of steel blades.

1. Use only blade holders in a new condition, without wear or corrosion, to ensure that the blades run truly parallel in all directions.
2. Do not strike the blades with a metal hammer or any other hard object. Although very tough, the blades are inflexible, and thus liable to be damaged by a blow, or by being dropped.
3. Always use the blade aligning fixture for setting up the blades in the blade holders. For Bucher Emhart Glass shear mechanisms this is 565-35-\*
4. Protect the cutting edge with tape to prevent damage from excessive contact with the dowel pin
5. Use spacers and hardened washers. The washers should be as large as possible.
6. **Use a feeler gauge to set up blades with a tight gap of 0.025mm (0.001 inch)**
7. **After mounting in the shear mechanism, re-check and adjust the gap, if possible.**
8. **Apply the absolute minimum tension between the blades, to avoid damage due to their inflexible nature. Tension should not exceed 2-3 turns, and should be applied only during installation until a good cut is obtained. Thereafter tension should not be increased.**

## 4 Areas of operation

Tungsten carbide shear blades have been used successfully in:

- mechanical and servo shear mechanisms
- accurate and parallel movement
- Single- Double- and Triple Gob configurations. There is no known reason to suppose that Quad-Gob would pose any special problems
- many glass colours and compositions

For special applications, we are prepared to consider the development of new or modified blade materials and shapes if required. Please contact your local sales representative for any inquiry.

## 5 Caution

- The use of tungsten carbide blades is not recommended where the glass contains a high number of stones, as these can damage the cutting edge.
- Tungsten carbide blades should not be allowed to remain in contact with molten glass as this would cause a deterioration of the blade surface

## 6 Trouble-shooting

Problem	Cause	Solution
<b>Cutting edge damaged in alignment fixture</b>	<i>Striking with hammer Forceful contact with dowel pin</i>	<i>Use non-metal hammer Wrap dowel pin in adhesive tape</i>
<b>Shear blade breaks in operation.</b>	<i>Excess tension between blades</i>	<i>Reduce blade tension</i>
<b>Wear marks on the cutting edge</b>	<i>Blades not running parallel</i>	<i>Check the setup to ensure truly parallel motion.</i>
<b>Poor quality cut</b>	<i>Blades worn or damaged Blades not parallel</i>	<i>Check blades for wear Check blade holders are clean and undamaged. Ensure setup is correct.</i>
<b>Deteriorating cutting quality, together with signs of blade corrosion</b>	<i>Electrical currents are damaging blade</i>	<i>Check that blade insulation is intact Connect to earth</i>

## **7 Operational comparison between Tungsten Carbide and steel shear blades**

- Tungsten carbide blades can be expected to achieve a much longer operating life than steel blades under the same conditions. As with traditional blades, the actual life depends on many factors, including glass composition and presence of stones, cutting rate and accuracy of setup. Provided they are properly set up and operated, most tungsten carbide blades can be expected to last at least 3 months, although cases have been documented of blades in continuous operation for longer periods.
- Long blade life means fewer stops to change blades. This reduced machine downtime is particularly important to machines dedicated to long-term jobs.
- Lower incidence of shear marks. Users of tungsten carbide blades report an improved quality of cut. This is particularly appreciated by producers of high-quality ware such as cosmetics and pharmaceuticals.
- More consistent cutting quality. Because blade tension is not varied, the initial setup is maintained throughout the job.
- Shear spray is required, but reportedly at lower rates than with steel blades.