

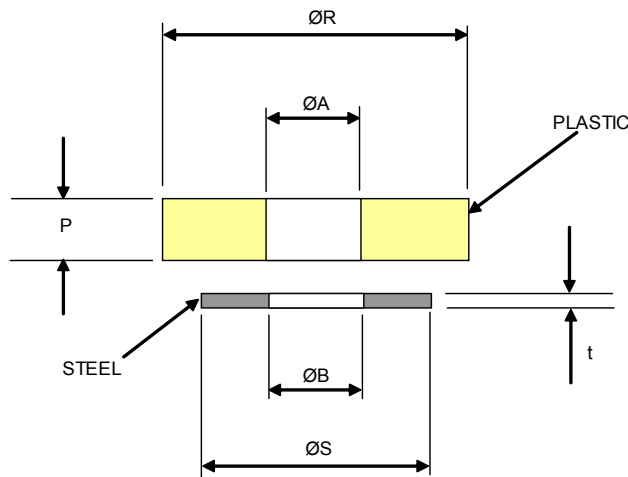
Avibulb® XT Steel Fastener 6.4 mm (1/4") Placed in soft materials

Joint Sample Ref.	t (mm)	P (mm)	Plastic Description (Colour)	Rivet Part No. 0BN01-	Photo	Comments on placed rivet blind side appearance	Rating ¹⁾
1	1.0	2.0	POLYETHYLENE (UNIDENTIFIED GRADE) – LOW STIFFNESS	00816		Large footprint sunk slightly into the plastic. Quite severe distortion of the plastic creates a concave surface. Secure but may not be aesthetically acceptable.	**
2	1.0	4.0		00820		Large footprint sunk slightly into the plastic. Quite severe distortion of the plastic creates a concave surface. Secure but may not be aesthetically acceptable.	**
3	1.0	2.0	PTFE (WHITE)	00816		Large footprint sitting on top of plastic. Slight distortion of the plastic creates a concave surface.	****
4	1.0	4.0		00820		Large footprint sitting on top of plastic. Plastic around the bulb is substantially flat.	*****
5	1.0	4.0	"MAKROLON" POLYCARBONATE SHEET (CLEAR)	00820		Large footprint sitting on top of plastic. No visible distortion of the plastic surfaces. Evidence of multiple tiny cracks on both faces of the plastic radiating outwards - see shadow in picture. These developed over several days after placing the rivet. Effect on strength of plastic due to cracks is unknown - further application development would be recommended.	*
6	1.0	4.0	30% GLASS FIBRE REINFORCED NYLON BAR FOR TURNING (BLACK)	00820		Large footprint sitting on top of plastic. Minimal distortion of the plastic close to the rivet bulb.	*****
7	1.0	2.0		00816		Large footprint sitting on top of plastic. No visible distortion of the plastic surfaces.	*****
8	1.0	6.0	"MAKROLON" POLYCARBONATE SHEET (CLEAR)	00820		Large footprint sitting on top of plastic. Evidence of multiple tiny cracks within the plastic on the blindside face only, radiating outwards. These developed over several days after placing the rivet. Effect on strength of plastic due to cracks is unknown - further application development would be recommended.	**
9	1.0	4.0	"ERTACETAL-C" ACETAL (BLACK)	00820		Large footprint sitting on top of plastic. No visible distortion of the plastic surfaces.	*****
10	1.0	2.0		00816		Large footprint sitting on top of plastic. Slight distortion of the plastic creates a concave surface.	****
11	1.0	4.0	NYLON 6.6 BAR (WHITE)	00820		Large footprint sitting on top of plastic. No visible distortion of the plastic surfaces.	*****
12	1.0	2.0		00816		Large footprint sitting on top of plastic. Minimal distortion of the plastic close to the rivet bulb.	*****

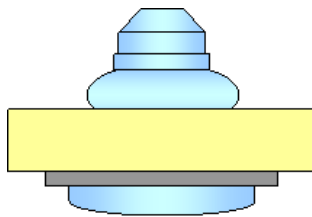
¹⁾ Star ratings out of 5:

Below 3 may be unsuitable to most customers, without application development and/or introduction of washers to spread clamp loads on the blindside.
Test configuration and summary see next page.

Test Configuration



- ØA = 6.8mm DRILLED
- ØB = 6.8mm PUNCHED
- ØR > 19mm
- ØS = 16mm



Summary

The conducted tests represent joints in which the softer material is positioned at the blind side. Normal engineering design practice however would be to arrange for the rivet head to bear on the softer material due to its larger bearing area. So these tests are relatively severe.

Nevertheless in most cases the tail formation created by Avibulb® XT fasteners offer a large footprint area with relatively minor or no visible distortion of the plastic beneath. This behaviour is beneficial for load bearing in-service or resisting destructive loads, and compares favourably with the formation of common "nail rivets" and other non-bulbing and hole-filling rivet designs which do not offer a large footprint. Observed in tests of other rivet designs, rivet expansion within the joint will dilate the hole in the plastic excessively, risking fracture, while offering a small effective footprint to resist tensile loads.

The above tests indicate that the Avibulb® XT fastener is suitable for applications where the blindside material is of an Engineering grade plastic such as nylon, acetal or a fibre-reinforced plastic composite. In all cases it would still be recommended that Avdel Application Engineering is engaged to review parameters such as hole size, material thickness and fastener length to optimise the joint design. For softer plastics like polypropylenes, polyethylene, polyurethanes and rubber, it is likely that the rivet head should bear on the softer material or the supplementary washers be employed where this is not possible.