Information on Contact Tips

The contact tip is an important – and even in many cases the decisive – factor to guarantee an optimal welding process.

Further conditions among others are:

- Choice of the suitable welding torch for the respective welding job
- Quality of the welding filler metal
- The shielding gas used (having a considerable influence on the temperature of the arc and therefore on the thermal load acting on the welding torch)
- A wire conduit in the cable assembly exactly tuned to the filler metal and its diameter
- The wire feeder

There are certainly more points to be mentioned here, but BINZEL considers the contact tip as the most important factor.

Unfortunately, less and less importance is attached to this component – especially in the field of manual welding – as a service life comparison of these components in the field of manual welding can only be carried out with the responsible cooperation of the welder. For the fully automatic welding process, however, the situation is completely different.

The contact tip materials preferably used by BINZEL are E-Cu = electrolytic copper and the harder and more heat-resistant variant of CuCrZr = copper-chrome-zirconium alloy.

In the following table you will find a list of data regarding the above mentioned types of contact tips as well as manufacturing tolerances for the respective bore diameter of the standard types with indent no. 140.xxxx.

	E-Cu *	CuCrZr* (wrought alloy)
Electric conductivity at 20° C in m / Ω x mm²	≥ 50	≥ 40
Thermal conductivity at 20° C in w / m x k	≥ 350	≥ 330
Vickers hardness	110 – 115	+15/-5
Distortion temperature **	ca. 260° C	ca. 500° C

- acc. to BINZEL standard

- Competition products with the same material description may achieve values different from those mentioned above.

** acc. to the indications of the raw material supplier

Indent no. 140.xxxx contact tip for wire diameter	Bore diameter E-Cu	Bore diameter CuCrZr
0,8	1,0 -0,1	0,93 +/- 0,03
1,0	1,2 -0,1	1,16 +/- 0,03
1,2	1,5 -0,1	1,39 +/- 0,03
1,6	1,9 -0,1	1,83 +/- 0,03

Contact tips for ductile wires (soft wires) with indent no. 141.xxxx have a 0,2 mm larger bore diameter than the respective E-Cu contact tip listed above.

The advantage of E-Cu – provided that its distortion temperature is not reached due to the welding parameters required – is its good electric conductivity, its higher thermal conductivity and its lower price when compared to CuCrZr.

This advantage, however, becomes less important with increasing arc power. Especially for pulsed arc, but also in the range of spray arc, thermal loads may act on the contact tip reaching or even exceeding the above mentioned values for E-Cu. A thermal overload results in a blue tarnish color of the copper material and can lead in extreme cases to a scaling of the surface. Wire-feeding problems and a sticking of the wire in the contact tip are then the inevitable consequences.

The narrow manufacturing tolerances prescribed by Binzel – especially regarding CuCrZr – are in general only observed by competition products when the contact tips are not produced out of bars (wrought copper alloy) but when their manufacture is based on powder-metallurgy, i.e. by pressing and sintering of powder material. But, the electric and thermal conductivity reached by this process is far below that of the CuCrZr mentioned above. An objective comparison shows that a higher wear on the contact tip, especially due to sticking wire in the contact tip, is the consequence.

Such signs of failure can often be found on cheap, conventional drilled contact tips. The drag lines created in the bore hole result in a poor current transfer to the filler metal (welding wire).

In addition to the contact tip types mentioned in the ordering documentation, further types of contact tips are available.

Indent no. 147.xxxx
This is a silver-coated CuCrZr contact tip having the same dimensions as the tips with indent no. 140.xxxx.

Special features:
Considerable reduction of the weld spatter adhesion
Improved current transfer and heat dissipation due to the silver-coating

Indent no. 143.xxxx
ABITIP contact tips based on the CuCrZr contact tips.
Compared to the standard contact tip with ident no. 140.xxxx, the bore diameter of these contact tips is 0,3 mm smaller and the manufacturing tolerance considerably limited to
- 0,02 mm (otherwise +/- 0,03). And these tolerances are achieved by a new, patented manufacturing process for contact tips.

In order to make full use of the advantages of this type of contact tips, the welding filler metal has to have special quality features too, i.e. among others

exact and uniform wire diameter
a perfect, uniform applied copper layer in case of copper-coated wires, which is not peeling-off during the wire feeding
clean wire surface free from remainders from the wire drawing process
no deformation of the wire by the wire feeding rolls

If these conditions are fulfilled, a 2 to 3 times longer service life of the contact tip can be achieved - especially in the field of automatic welding processes - when compared to standard CuCrZr contact tips.

Reputed manufacturers are offering wires of so-called “rob” quality complying with these requirements. But there are certainly manufacturers offering a standard quality also meeting the above requirements and thus helping to improve the service life of contact tips.

It is also true that a smaller bore has a much better contact transfer when using straight torch necks and this is also increasing the service life considerably.

Indent no. 144.xxxx
The ABITIP Plus variant is the silver-coated version of the ABITIP contact tip.

The additional advantages resulting from this have already been described for the contact tips with indent no. 147.xxxx.

We hope that this information will help to explain to our customers the importance of the contact tip for the welding process and that the purchase price should not be the only criteria for the selection of the contact tip type to be used