Brazing recommendation Wieland K65

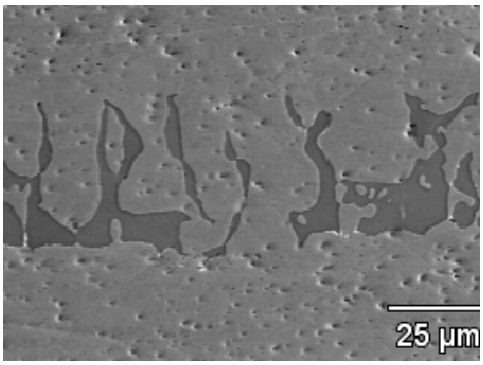
In the refrigeration industry, copper materials are brazed with copper-phosphor alloys (CuP), silver-copper-phosphor alloys (AgCuP) or cadmium-free silver brazing alloys. The new copper material K65 was developed for applications with high-pressure refrigerants (R410A, CO_2.) as opposed to the conventional pure copper Cu-DHP (99.9% Cu), this material is a CuFe2P alloy.

The alloy composition of K65 may be used for brazing with silver brazing alloys without any restrictions.

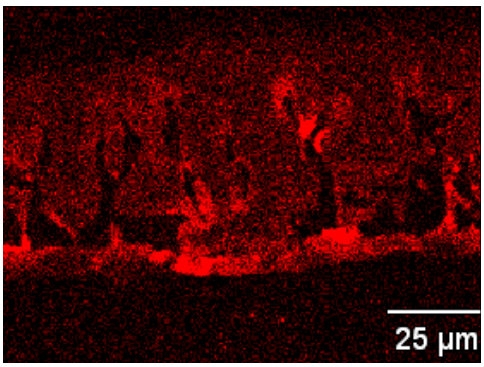
During brazing of steels and nickel based alloys with AgCuP and CuP-brazing filler metals brittle iron-phosphor- or nickel-phosphor phases. Due to the fact that the copper material K 65 contains iron (2%), a laboratory test was made to determine if brazing of K65 with AgCuP or CuP brazing alloys causes formation of brittle iron-phosphoric phases.

Laboratory test

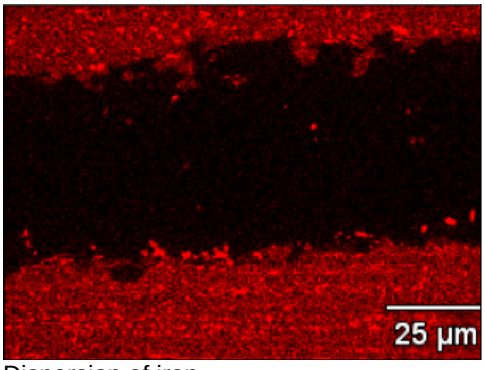
The material K65 was brazed with the brazing alloy BrazeTec S 2 (AgCuP) and the brazing specimen was then examined under an X-ray spectrograph (WDX). The dispersion of the elements (silver, copper, iron phosphor) in the joint are shown in the pictues below. No iron-phosphor phases were found.



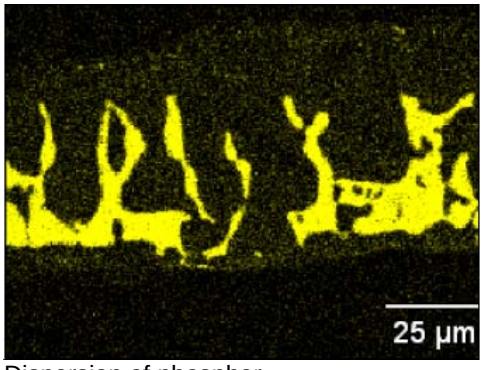
Examined cut



Dispersion of silver



Dispersion of iron



Dispersion of phosphor

Recommendation

The examination showed that the composition of the K65 material is not subject to any restrictions as concerns the selection of brazing alloy. The base material's wettability is comparable to that of Cu-DHP. In the presence of significant overlapping lengths, it might be advisable to use the flux paste BrazeTec h for better gap filling.

The recommended brazing alloys are listed in chart 1. In addition to the brazing alloys admissible under DVGW worksheet GW 2 for gas and domestic water installations, the list also encompasses BrazeTec S 5 and BrazeTec S 15, which may also be used in the refrigeration industry. The listed silver brazing alloys BrazeTec 4576, BrazeTec 3476 and BrazeTec 4404 must always be processed with the flux paste BrazeTec h.

For hard to reach brazing joints, such as can occur in complex parts or installations, the use of silver brazing alloys, like BrazeTec 3476 or BrazeTec 4576, is recommended instead of copper-phosphorous alloys. These silver brazing alloys ensure higher degree of gap filling and formation of better fillets.

The selection of brazing alloy depends also on other factors (vibration, operating temperatures) and must be clarified with the brazing alloy supplier for each specific application.

Chart 1: Recommended brazing alloys.

Brazing alloy	DIN EN ISO 17672	DVGW-Number	Working temperature [°C]	Composition [% by weight]				
				Ag	Cu	Zn	Sn	P
BrazeTec 4576	Ag 145	DV-0105CM0043	670	45	27	25,5	2,5	-
BrazeTec 3476	Ag 134	DV-0105CM0045	710	34	36	27,5	2,5	-
BrazeTec 4404	Ag 244	DV-0105CM0044	730	44	30	26	-	-
BrazeTec S 15	CuP 284	-	700	15	80	-	-	5.0
BrazeTec S 5	CuP 281	-	710	5	89			6.0
BrazeTec S 2	CuP 279	DV-0105CL0475	740	2	91,7	-	-	6.3

Chart 2: Recommended flux.

Flux	DIN EN 1045	DVGW-Number	Active temperature [°C]	Annotations
BrazeTec h	FH 10	DV-0101AU2227	550 -970	Flux residues are corrosive and must be removed.

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