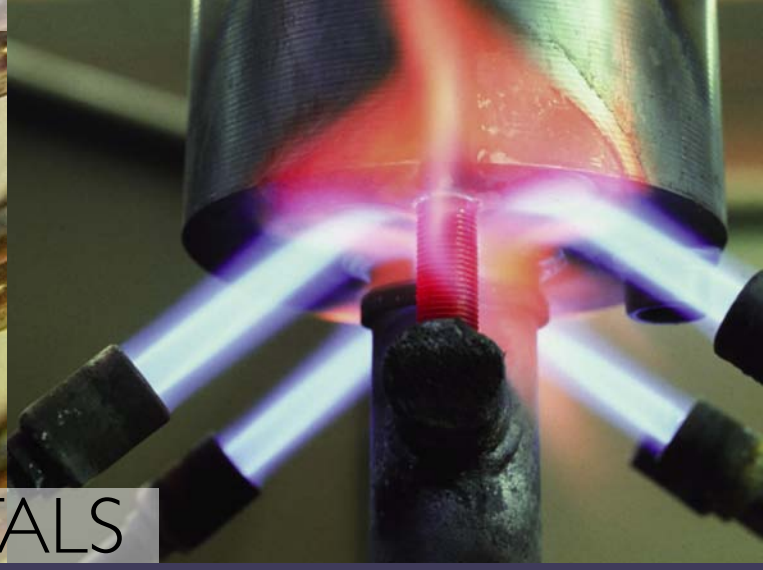
Brazing filler metals • Soft solder alloys
Copper filler metals



BRAZING FILLER METALS

UTP Filler metals for brazing and soldering

Brazing is a method to join 2 metals by means of another molten metal (brazing rod) under additional use of flux or shielding gas. The melting temperature of the brazing rod is below the one of the metals to join. These metals are brought to sweat without being molten. The brazing temperature is the same as the melting temperature of the brazing rod.

The working temperature is the lowest surface temperature at which the brazing rod can malt, flow and bind the base metal. To achieve this, the brazing rod does not always have to be completely molten. Very often the working temperature is between the solidus* and the Liquidus**, which is within the melting interval. The working temperature is, however, always higher than the solidus temperature of the brazing rod.

Depending the working temperature, the methods are called soldering with soft solder (below 450° C) and brazing with brazing filler metals (above 450° C). The term Brazing temperature is also used, meaning the actual temperature on the surface of the work piece at the moment of the actual brazing.
The brazing temperature has to be at the minimum as low as the working temperature and as a maximum at a hight which is not damaging the brazing rod, the base metal or the flux.

* Solidus temperature = border temperature, below is no molten metal

** Liquidus temperature = border temperature, above is only molten metal

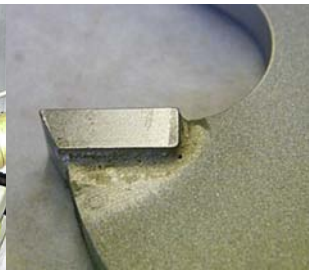
UTP The Function and Properties of Fluxes

The chief purpose of the flux is to dissolve the oxide layers formed continuously with the heating of the workpiece, and quite generally to shield the joint against all detrimental outside influences.

The composition of the flux must be matched to the type of parent metal. It should be liquid and capillary-active about 100° C below the working temperature of the solder, so that the joint to be soldered is thouroughly wetted and the surface tension of the solder is reduced.

Some UTP fluxes are available to the user both in powder and paste form (e. g. for silver brazing filler metal AGX powder of AGF paste). Paste fluxes are handier to use, because they adhere in any position and not just on horizontal surfaces. They can also be applied to the cold workpiece to protect the surface from oxidation during preheating, whereas powder would be blown away in part by the torch flame. Compared with pastes mixed by the user, pastes suplied ready for use by the maker possess superior homogeneity and higher efficiency.

The UTP material sheets indicate the particular fluxes which according to our experience have acquitted themselves best for all-round duty. For general soldering operations therefore, the flux types quoted on the material sheet for the solder are quite adequate. Often however problems arise in connection with awkward soldering positions, post-treatments, workpiece dimensions, special heating sources (e. g. high-frequency induction), batch production etc., calling for the use of special fluxes.
In such cases the UTP Advisory Service is available to our customers at all times.



UTP Brazing filler metals without Ag

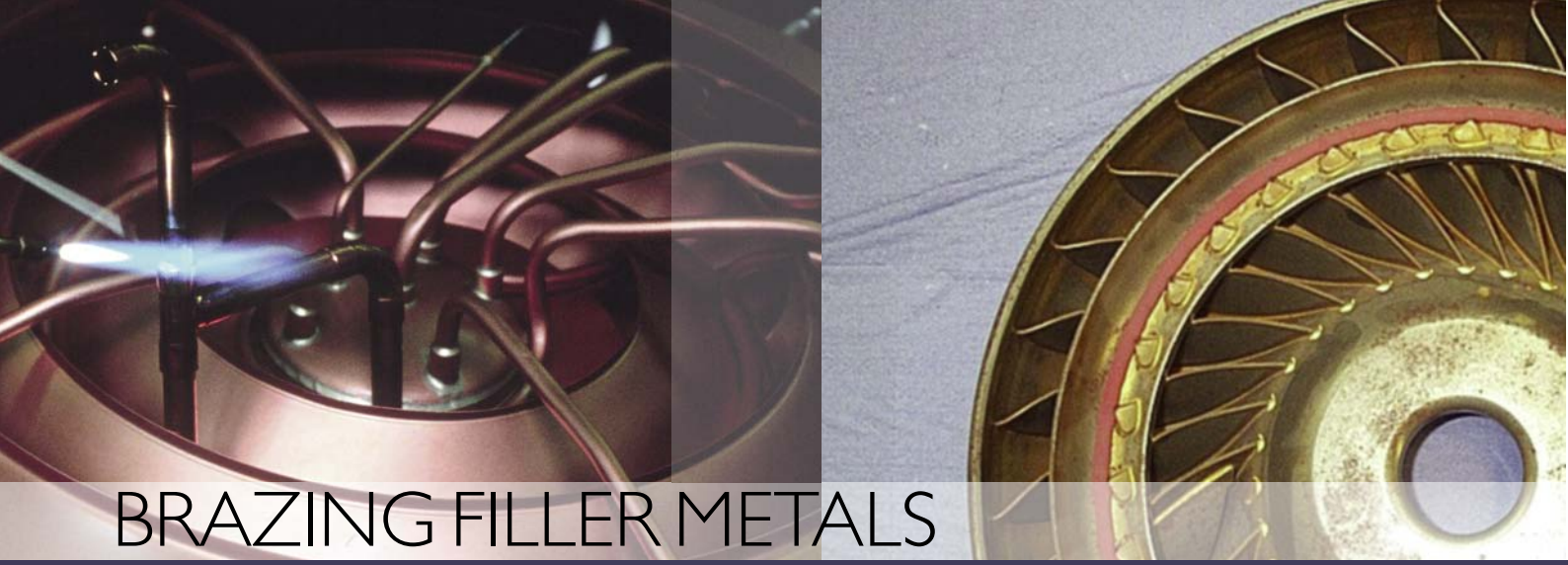
UTP Product	DIN EN 1044 DIN EN ISO 3677 (DIN 8513)	Tensile strength on S355 MPa	Working temp. ° C	Alloying ele-ments	Suitable UTP FX= Flux	Application field
1 **1 M** **1 MR**	CU 304 B-Cu60Zn(Sn)-870/900 (L-CuZn39Sn)	420	890	Cu, Zn, Sn	HLS-B	Brass type special ductile alloy for ferrous and cuprous metals. UTP 1 is particularly recommended for hot-galvanized tubes.
2 **2 M** **2 MR**	CU 305 B-Cu48ZnNi-890/920 (L-CuNi10Zn42)	690	910	Cu, Zn, Ni	HLS HLP	Ni containing brass brazing rod for building up on steel, grey cast iron and malleable cast iron against gliding wear. The deposit is also corrosion resistant.
6 **6 M** **6 MR**	--- --- ---	480	900	Cu, Zn, Ni, Ag	HLS HLP	High-strength nickel and silver containing special alloy for brazing of butt joints on heavily stressed components in the construction of vehicles and sleeveless pipe assembles.

UTP Cu-P-(Ag) brazing filler metals

UTP Product	DIN EN 1044 DIN EN ISO 3677 (DIN 8513)	Tensile strength on Cu MPa	Working temp. ° C	Alloying ele-ments	Suitable UTP FX= Flux	Application field
3706	CP 203 B-Cu94P-710/890 (L-CuP6)	250	710	Cu, P	AGX* 3 W	Brazing alloy with wide melting interval and enhanced tenacity. Recommended for hot and cold water installations.
3707	CP 202 B-Cu93P-710/820 (L-CuP7)	250	730	Cu, P	F300 (powder) F300PH (paste)	Capillary brazing of copper, brass, bronze and red brass. For tank construction and apparatus engineering.
35	CP 104 B-Cu89PAg-645/815 (L-Ag5P)	250	710	Cu, Ag, P	AGX*	For equipment engineering and shipbuilding, for electrical engineering and refrigeration techniques; - 40 °C.
36	CP 105 B-Cu92PAg-645/825 (L-Ag2P)	250	710	Cu, Ag, P	AGX*	Very fluid brazing alloy for electrical industry, sanitary installations heating and refrigeration techniques; - 20 °C.
37	CP 201 B-Cu92P-710/770 (L-CuP8)	250	710	Cu, P	AGX* 3 W	Very fluid brazing filler metal for electrical industry, sanitary installations, heating and refrigeration engineering.
3515	CP 102 B-Cu80AgP645/800 (L-Ag15P)	250	710	Cu, Ag, P	AGX*	Particularly suited on copper, if brazing is done without flux. For electrical engineering, refrigeration techniques, equipment engineering and shipbuilding; - 70 °C
3518	CP 101 B-Cu75AgP-645 ---	250	650	Cu, Ag, P	AGX* 3 W	Capillary brazing on copper, brass, bronze and red-bronze. Operating temperatures up to +150° C and down to -70° C.
A 39	CU 104 B-Cu100-1085 (L-SF Cu)	340 (on S 235)	1085	Cu	HF	Brazing of unalloyed steels. High-temperature brazing of alloyed and unalloyed steels

by adding "M" = flux coated rod
"MR" = rod with a minimum amout of flux

* no flux required for joints of copper,
* not to be used for steel and nickel base metals



BRAZING FILLER METALS

The information below should help to provide a general overview of the UTP fluxes:

Application

After cleaning the brazing zone down to the bright metal and degreasing with tri- or tetra-chloroethylene for difficult joints, the correct amount of flux is applied. Too much flux or too little will result in difficulty when removing the residues. In addition insufficient flux means inadequate oxidation protection during soldering, moreover the oxides will not be dissolved completely.

Removing flux residues

Flux type	mechanically	chemically
for silver brazing filler metals	brushing, grinding or sandblasting, hammering, knokking	A, B, C, E
for aluminium solders		A, D, E
for brazing filler metals based on copper, brass, German silver and bronze		A, B, C, E
for soft solders	—	A

A	hot H2O	(water)
B	10 °/a H2SO4	(sulphuric acid)
C	10 % HCl	(hydrochloric acid)
D	10 % NaOH	(caustic soda)
E	up to 40 % HNO3	(nitric acid)

Gap width

This must be chosen so that sufficient flux can get into the soldering gap to dissolve the oxides formed there. Experience indicates an optimal gap width of about 0,05 - 0,1 mm for silver solders. For brazing metals it is about 0,2 mm, for aluminium up to 0,5 mm, for soft solders about 0,1 mm.

Diluting the fluxes

The brazing and silver soldering fluxes may generally be mixed to a paste with distilled water, or if necessary diluted. The best wetting ability is obtained by mixing or diluting with HERKUL.

The choice of acid or lye concentration depends an the parent metal employed. As corrosion-proof materials, stainless steels for instance are pickled with highly concentrated nitric acid (E).
The soldering and pickling agents must be removed afterwards by rinsing with water, which may be neutralized, in particular with sodium bicarbonate solution (NaHCO3) for aluminium.

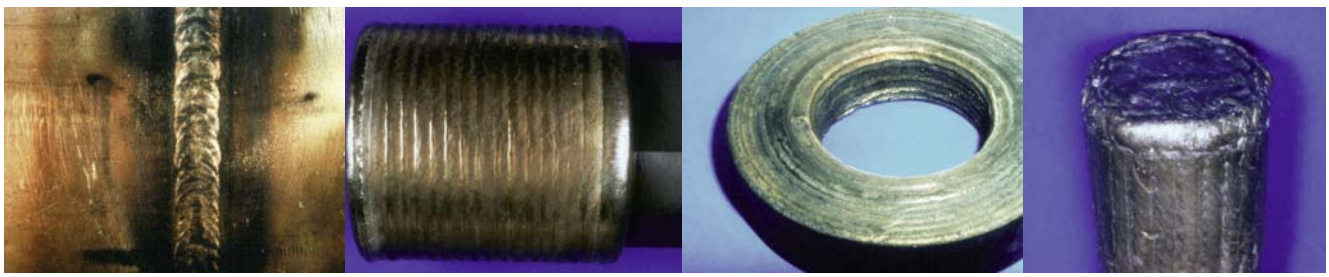
UTP Brazing filler metals, cadmium containing

UTP Product	DIN EN 1044 DIN EN ISO 3677 (DIN 8513)	Tensile strength on S 355 MPa	Working temp. ° C	Alloying elements	Suitable UTP FX= Flux	Application field
7 Cd 7 Cd M	AG 309 B-Cu40ZnAgCd-605-765 (Ag20Cd)	470	730	Ag, Zn Cu, Cd	AGF AGX	Highly fluid silver brazing alloy for iron, steel, nickel, stainless steel, alloyed steel, tool bits, copper, bronze and for colour-matching joints on brass.
31 N 31 NM	AG 306 B-Ag30CuCdZn-600/690 (L-Ag30Cd)	470	680	Ag, Zn Cu, Cd	AGF AGX	Universal brazing filler metal for series production of equipment, domestic appliances, shipbuildung and electrical engineering, sanitary installations etc.
3 3 M	AG 304 B-Ag40ZnCdCu-595/630 (L-Ag40Cd)	480	610	Ag, Zn Cu, Cd	AGF AGX	Universal, high-silver content brazing filler metal with a low working temperature for instruments, shipbuilding and electrical engineering, precision work and watchmaking.

by adding "M" = flux coated rod

UTP Brazing filler metals, cadmium-free

UTP Product	DIN EN 1044 DIN EN ISO 3677 (DIN 8513)	Tensile strength on S 355 MPa	Working temp. ° C	Alloying ele-ments	Suitable UTP FX= Flux	Application field
7 **7 M**	AG 206 B-Cu44ZnAg(Si)-690/810 (L-Ag20)	430	810	Ag, Cu Zn	AGF AGX 3 W	Silver containing brass coloured brazing filler metal with good capillary action for precision work, farbrica-tion of equipment, lighting fittings etc.
3034 **3034 M**	AG 106 B-Cu36AgZnSn-630/730 (L-Ag34Sn)	480	710	Ag, Cu Zn, Sn	AGF AGX 3 W	Silver brazing filler metal with good flowing properties for soldering joints on copper tubes for sanitary installations and on base materials of different nature, copper, brass, red brass, steel.
3040 **3040 M**	AG 105 B-Ag40CuZnSn-650/710 (L-Ag40Sn)	450	690	Ag, Zn Cu, Sn	AGF AGX 3 W	Silver brazing filler metal with very good flowing pro-perties, good corrosion resistance. For the food-stuffs industry, jewellery, distilling plants etc. Operating tem-perature up to 200° C.
3044 **3044 M**	AG 203 B-Ag44CuZn-675/735 (L-Ag44)	480	730	Ag, Zn Cu	AGF AGX 3 W	Recommended for brazing on steel, stainless steel, nickel and nickel alloys, copper and copper alloys. Particularly recommended for the foodstuffs industry, installation of copper tubes and precision works. For operating temperatures up to + 300° C and down to -200° C, colourmatching with brass.
306 **306 M**	AG 102 B-Ag56CuZnSn-620/655 (L-Ag55Sn)	430	650	Ag, Zn Cu, Sn	AGF AGX 3 W	High-silver content brazing filler metal with outstan-ding mechanical properties, for the foodstuffs industry and high vacuum technology. Seawater resistant.
3030 **3030 M**	AG 204 B-Cu38ZnAg-680/765 (L-Ag30)	430	750	Ag, Cu Zn	AGF AGX 3 W	For operating temperatures up to + 300° C and down to -200° C, colourmatching with brass.
3046 **3046 M**	AG 104 B-Ag45CuZnSn-640/680 (L-Ag45Sn)	430	670	Ag, Zn Cu, Sn	AGF AGX 3 W	High-silver containing brazing rod with good flowing properties and high mechanical values. For operating temperatures up to 200° C.
Trifolie	AG 502 B-Ag49ZnCuMnNi-680/705 (L-Ag49)	150 - 300 shear strength	690	Ag, Zn Cu, Mn Ni	AGF AGX 3 W	Laminated high silver containing brazing filler metal. Good wetting properties. Particularly suited for cut-ting tips, tools, flat brazing joints, particularly for joints susceptible to tension.



BRAZING FILLER METALS

UTP Soft solders and their pastes

UTP Product	DIN EN 29453 DIN EN ISO 3677 (DIN 1707 / 8513)	Shear strength MPa	Working temp. ° C	Alloying ele-ments	Suitable UTP FX= Flux	Application field
57 **57 Pa**	5 S-Pb60Sn40 B Pb 60 Sn 183-235 (L-PbSn 40 (Sb))		230	Pb, Sn Sb	570	Tin containing soft solder for continuous for electrical engineering, fabrication of equipment, mountings and fittings, for precision work, jewellery
570 **570 Pa**	29 S-Sn97Ag3 B Sn 96 Ag 221 (L-SnAg 5)		220	Sn, Ag	570 570 F 573	Silver containing lead, cadmium and zinc free tin solder for the foodstuffs industry, electrical engineering, vacuum technology and hot water installations. Heating systems operating up to 100° C.
573 **573 Pa**	24 S-Sn97Cu3 --- L-SnCu 3)		230 - 250	Sn, Cu	570 573	Special soft solder for copper tubes in drinking water installations. Recommended by the German plumbers union
576	25 S-Sn60Pb38Cu2 B Sn 60 Pb(Cu) 183-190 (L-Sn 60 Pb(Cu))	30 (on Cu) 50 (on S 355)	190	Sn, Pb Cu	570 570 F 573	Soft solder with low working temperature for precision soldering, galvanized fine steels. Electrical industry, electrotining.
560	--- B Sn 80 Zn 199-271 (L-SnZn 20)		270	Sn, Zn	570 570 F 573	Soft solder with a wide melt intervall for reparing mista-kes on hot galvanized parts

Pa = Soldering paste (solder with flux)

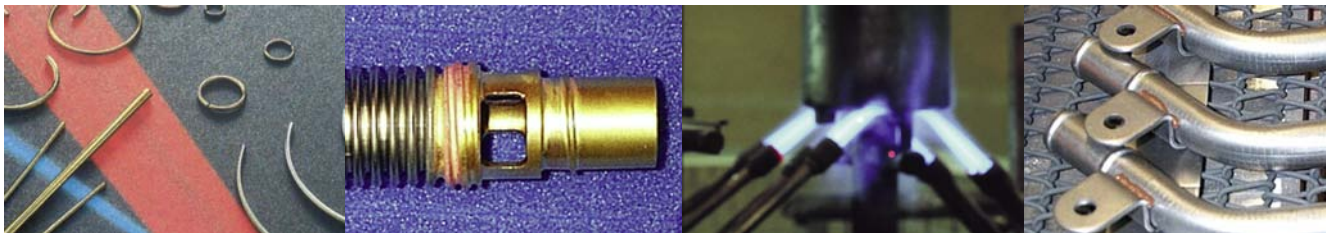
UTP Fluxes

UTP FX	Groups DIN 8511	Groups DIN EN1045 DIN EN 29 454*	Effective temperature range °C	Applications	Supply 1/2 and 1/1 boxes
AGF **AGX** **3 W**	F-SH 1 (silver solders)	FH 10	500 - 800	Universal silver solder flux Universal silver solder flux Universal silver solder flux	paste powder powder
HF	F-SH 2	FH 20	650 - 1000	Silver solder flux for high-frequency induction soldering	paste
HLP **HLS** **HLS-B**	F-SH 2 (brazing solders)	FH 21	700 - 950	Universal flux Universal flux Special flux for the UTP braze welding procedure for galvanized tubes	powder paste paste
4 Mg	F-LH 1 (aluminium)	FL 10	500 - 700	Special flux for Al-Mg-alloys	powder
5	Cast iron		800 - 1300	Special flux for cast welding rod 5	powder
570 **570 F**	F-SW 12 (soft solders)	3.1.1.A*	150 - 450	Universal soft solder flux on stainless steels Universal soft solder flux on stainless steels	liquid liquid
573	F-SW 21	3.1.1.C	150 - 450	Universal soft solder for non-ferrous material, e. g. Cu	paste

Herkul	UTP Herkul is a soldering aid. It is mixed with the powder fluxes instead of water, creating a low joints evenly when applied. It is not to be used with aluminium fluxes. Content: 950 ml

UTP Copper alloys esp. for brazing

UTP Product	AWS A 5.7 Material-No.	Tensile strength Rm MPa	Elongation A %	Hardness HB	Electrical conduc-tivity S · m mm≈	GMAW	GTAW	Application field
A 384	SG-CuSi 3 2.1461	350	40	80	3 - 4	•	•	Rods and wires for joining copper alloys according to DIN 17666, e. g. CuSi 2 Mn, CuSi 3 Mn, CuMn 2, CuMn 5, brass, galvanized steel.
A 34	SG-CuAl 8 2.0921	400	40	120	8	•	•	For joining and surfacing of aluminium bronzes, e. g. CuAl 5, CuAl 8. For surfacing of copper, brass, special brass (CuZn 20 Al), non-alloyed and lowalloyed steels.
A 3422	~ SG-CuAl 8 Ni 2 2.0922	650	25	160	5	•	•	For joining and surfacing of steel where high erosion and cavitation resistance is required as well as good corrosion resistance (e. g. against seawater).
A 3444	SG-CuAl 8 Ni 6 2.0923	700	15	200	4	•	•	Rods and wires for joining and surfacing of complex aluminium bronzes, e. g. CuAl 10 Ni, CuAl 10 Fe, CuAl 8 Fe and cast-alu-bronzes G-CuAl 10 Ni, G-CuAl 9 Ni, G-CuAl 10 Fe.
A 32	SG-CuSn 6 2.1022	300	20	80	7 - 9	•	•	Rods and wires for joining and surfacing tin bronzes, complex tin bron-zes, cast-tin bronzes, such as CuSn 2, CuSn 6, CuSn 8 and CuSn 6 Zn
A 320	SG-CuSn 12 2.1056	300	25	100	5 - 6	•	•	Rods and wires for joining and surfacing of seawater-resistant tin bron-zes and cast-tin bronzes with high Sn-content, brass, red brass. Chemical industry, pump impellers, bearing bushes.
A 381	SG-CuSn 2.1006	200	30	60	15 - 20	•	•	Rods and wires for joining and surfacing of copper grades according to DIN 1787 and DIN 17666. Equipment and pipe line construction



UTP Soft solders and brazing filler metals for aluminium

UTP Product	DIN EN 1044 DIN EN ISO 3677 (DIN 8513)	Tensile strength MPa	Workin g temp. ° C	Alloying ele-ments	Suitable UTP FX= Flux	Application field
4	AL 104 L-AlSi12 (B-Al88Si-575/585)	100	590	Al, Si	4 Mg	Universal aluminium brazing alloy with low melting point for the production of bicycles, for vessel fabrication and light metal furniture as well as lighting fittings.
548	- L-Zn97Al3-430/450	-	400-500	Al,Zn	570 Zn* 570 Al**	Soft solder for soldered joints on aluminium and aluminium alloys, also for joining Al to Cu.

* Flux 570 Zn (non-corrosive) for Al-alloys ** Flux 570 Al (corrosive) for AlMg-alloys only

Welding consumables:	Electrodes for welding nickel and nickel alloys Electrodes for hardfacing Special electrodes for welding different kind of stseels Electrodes for welding cast iron Electrodes for chamfering and cutting Electrodes for welding non-ferrous metals Electrodes for welding stainless, acid- and heat-resistant steels Silver solders, brazing alloys, soft solders Fluxes Electrodes for welding low- and medium-alloy steeels Wires and rods (MIG and TIG) Flux-cored wires Submerged arc welding wires and fluxes
Flame and Plasma Spray Powders:	Metal powders EXBOND powders UNIBOND powdersx HA-BOND powders METOXID powders PLASMA powders (PTA)

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