



K-ALLOY™

The corrosion resistant structural
aluminum alloy for electrification

K-ALLOY™/ A304

Why Use K- A l l o y ™ ?

Aluminum alloy that provides unexpected levels of corrosion resistance when compared to traditional aluminum alloys.

- Eliminates water intrusion due to corrosion.
- Enables components to be placed lower in the vehicle.
- Protects costly electronic components.
- Reduces the mass over steel housings.
- Ductile metal as-cast, and heat treatable.
- Eliminates coating.
- Longer die life.



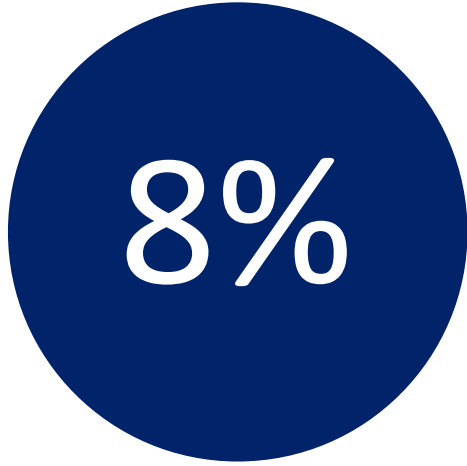
K-ALLOY™/ A304

Material Properties

PROPERTY	K-ALLOY AS CAST	K-ALLOY HEAT TREATED	AURAL-2 SILAFONT 36	A360	A380 ADC12	A413
Tensile Strength PSI (MPa)	43,000 (296)	42,000 (289)	41,000 (283)	46,000 (317)	47,000 (324)	42,000 (290)
Yield Strength PSI (MPa)	25,000 (172)	23,000 (159)	21,000 (145)	25,000 (172)	23,000 (159)	19,000 (131)
Elongation	5.0%	8-14%	4.5 –6.5% as cast 8-11% HT	3.5% as cast	3.5% as cast	3.5%
Thermal Conductivity (W/m.k. @77 °F)	120	120	120	113	96	121
Electrical Conductivity (% of AICS)	32	-	-	27	25	31
Density (gms cm-3)	2.63	2.63	2.64	2.63	2.71	2.66
Corrosion Resistance (1=worst, 10=best)	10	10	10	6	3	6
Die Life % of A380	100%	100%	40%	100%	100%	100%
Castability (1=worst, 10=best)	10	10	6	6	10	5

K-ALLOY™/ A304

Benefits



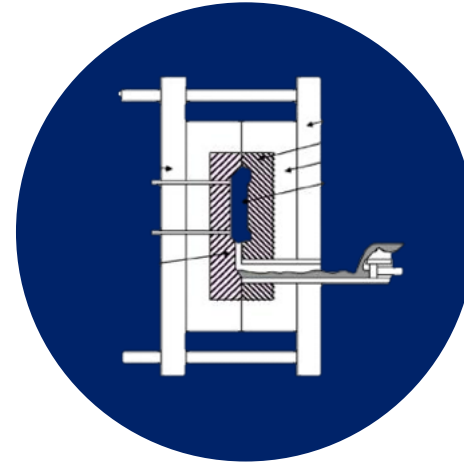
HIGH ELONGATION

5% as cast
8%-14% heat treated



CORROSION RESISTANT

Offers unique engineering solutions, no paint or coatings required.



LONGER DIE LIFE

Equal to A380. Die life is 2-3x longer than alloys with low Fe



THERMAL CONDUCTIVITY

15% better than A380

K-ALLOY™/ A304

Typical Applications



Automotive



Marine



Lighting and Telecommunications



Construction / Agriculture



Furniture



Military

K-ALLOY™/ A304

Typical Automotive Applications



Electronics Housings



Structural Castings



LED Lighting Housings



e-Steering Gear Housings



Roof Rack & Exterior



Powertrain and E-Powertrain

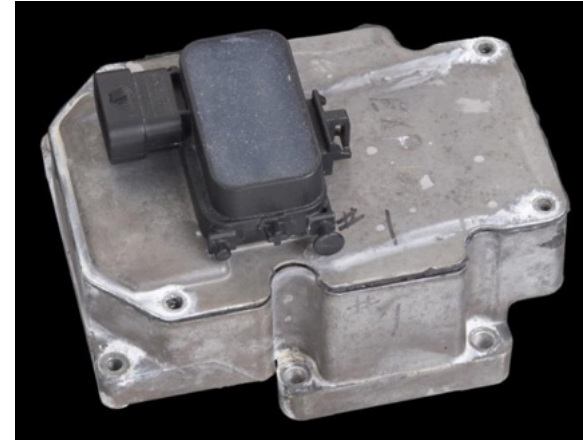
K-ALLOY™ / A304 FOR ELECTRONIC HOUSINGS

Corrosion Resistance (30 cycles of ASTM B117)



A360 Alloy

The housing shows signs of material loss, pitting, and raised perimeter completely missing.



K-Alloy / A304

The housing shows no visual corrosion, nor metal loss due to chemical reaction.



A360 Alloy

Housing shows signs of water intrusion. Corrosion to the edge of the housing is pronounced. Severe surface pitting is evident.



K-Alloy / A304

The same housing shows the top cover removed. The sealed surface remains intact and shows no signs of water intrusion nor surface corrosion.

K-ALLOY™/ COMPARED TO OTHER ALLOYS IN CORROSION TESTS

Superior Performance



A360 Alloy

The housing shows signs of material loss, and pitting. The raised perimeter is completely missing. Water intrusion will be the result.



A413 Alloy

The surface pitting from corrosion is extreme. The corrosion growth under the electrical connector pushes the seal open. Water intrusion will result.



A383 Alloy

The connectors are surrounded by severe crevice corrosion and the surface is heavily pitted from general corrosion. Parts fail leak testing.



K-ALLOY™ /

The same housing shows with the top cover removed. The seal surface remains intact and shows no signs of surface corrosion. The housing will be sealed.

30 Cycles

1 Cycle = 1 Day



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The housing is watertight, and corrosion is not evident under the connector.

30 Cycles



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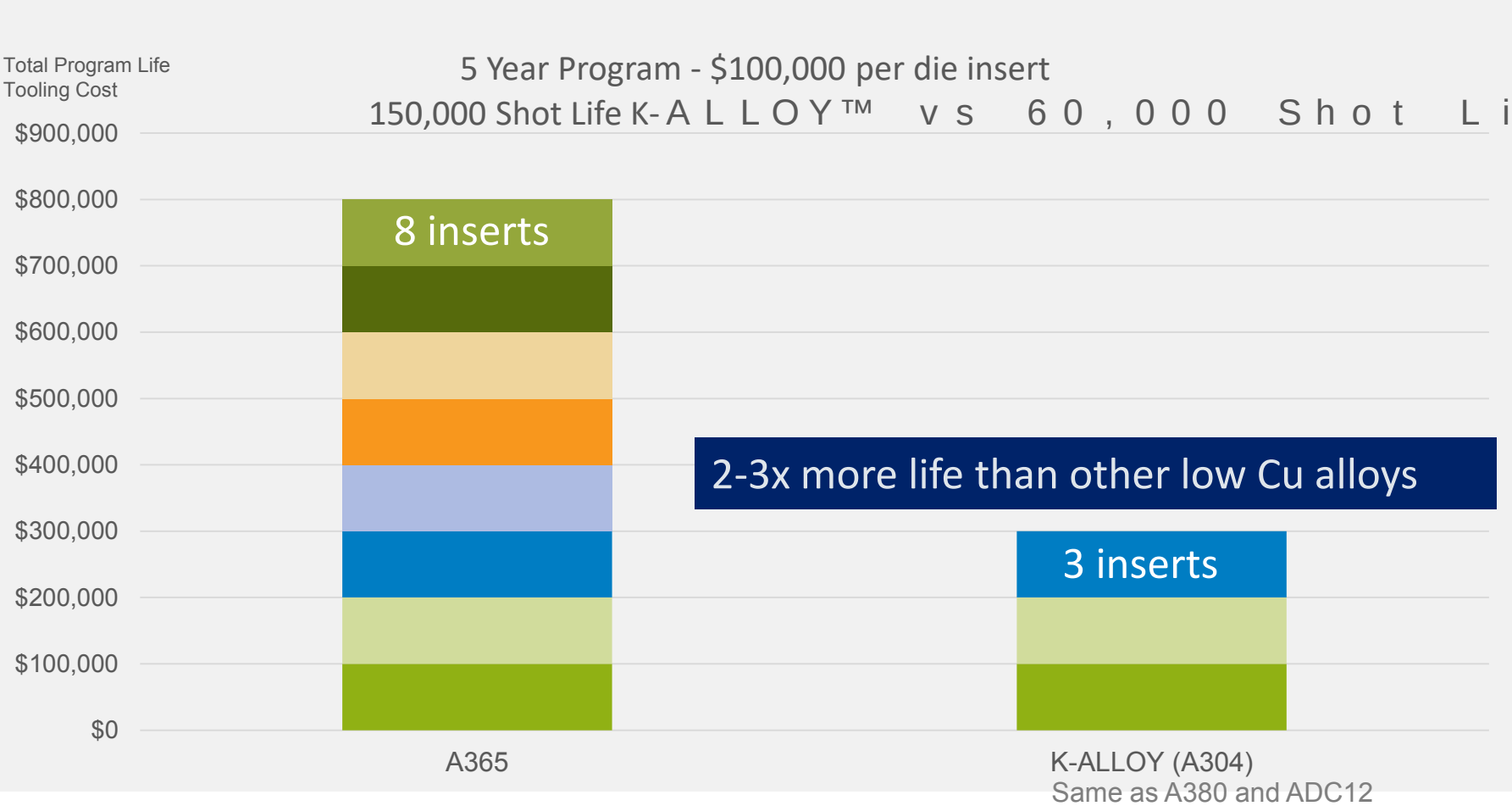
K-ALLOY™ / A304

The heatsink is clean and free from corrosion. The area around the connectors has some salt product (in white) but has no material loss or pitting. Parts pass leak testing.

40 Cycles

DIE LIFE SAVINGS

K-ALLOY™ A304 Die Life is 3x more than A365 or ADC12



MATERIAL SPECIFICATION

K-ALLOY™ is a registered alloy with The Aluminum Association, as A304.0 as from a die casting and A304.1, as from ingot

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The Aluminum Association



ALLOY REGISTRATION ACCEPTANCE FORM
(CASTINGS & INGOT)

DATE:

May 23, 2012

TO:

Technical Committee on Product Standards

FROM:

Parvaneh Shafiee 

ALLOY DESIGNATIONS:

304.0, 304.1

REGISTRANT:

Delphi Corporation

REGISTRATION DATE:

April 17, 2012

REGISTERED COMPOSITION LIMITS:

Alloy Desig.	Former Desig.	Product Form	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sn	Others ³¹		Aluminum
													Each	Total ³	
304.0	K-Alloy	Die Casting	9.0-11.5	0.8-1.2	0.05-0.08	0.30-0.50	0.30-0.50	0.05	0.03	0.20	0.03-0.18	0.03	0.03	0.15	Remainder
304.1 ³³	K-Alloy	Ingot	9.0-11.5	0.8-1.0	0.05-0.08	0.30-0.50	0.35-0.50	0.05	0.03	0.20	0.03-0.18	0.03	0.03	0.15	Remainder

Unless specified below for referenced footnotes refer to the pink sheets

cc:

SC on Alloy and Temper Registration Mailing List
Casting Standards Distribution List
Kurt O'Connor, Delphi Corporation
Michael Skillingberg
Revisions to the 2009 Edition of Pink Sheets
PN12-54 Project File
Project Completion File

The Aluminum Association keeps track of all of the available alloys and designations, globally. For high pressure casting standards, the alloys' standard compositions are found on the "Pink Sheets", which can be found at this link; <https://www.aluminum.org/pink-sheets>

K-ALLOY™ / A304

Material Properties

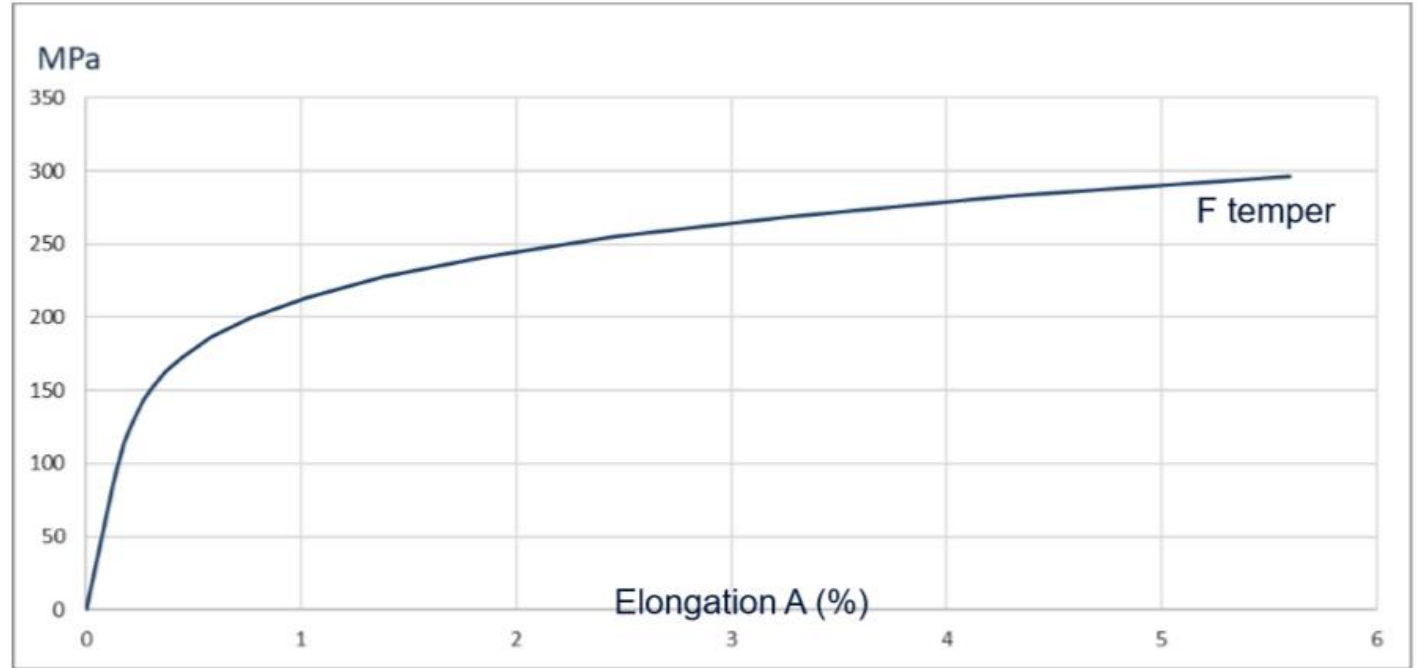
Pure Al, and Balanced Fe, for Higher %e

K-ALLOY™ parts have higher elongation and energy absorbing characteristics.

>5% elongation can be expected, which makes self threading fasteners, and the elimination of extra tapping operations, possible.

The combination of high elongation and high yield strength, makes K-ALLOY™ a suitable candidate for replacement of gravity cast A356-T6 castings.

The structural performance of a K-ALLOY™ part is suitable for replacement of any application using high pressure die cast A380, ADC12, or high pressure, vacuum die cast A365 alloy.

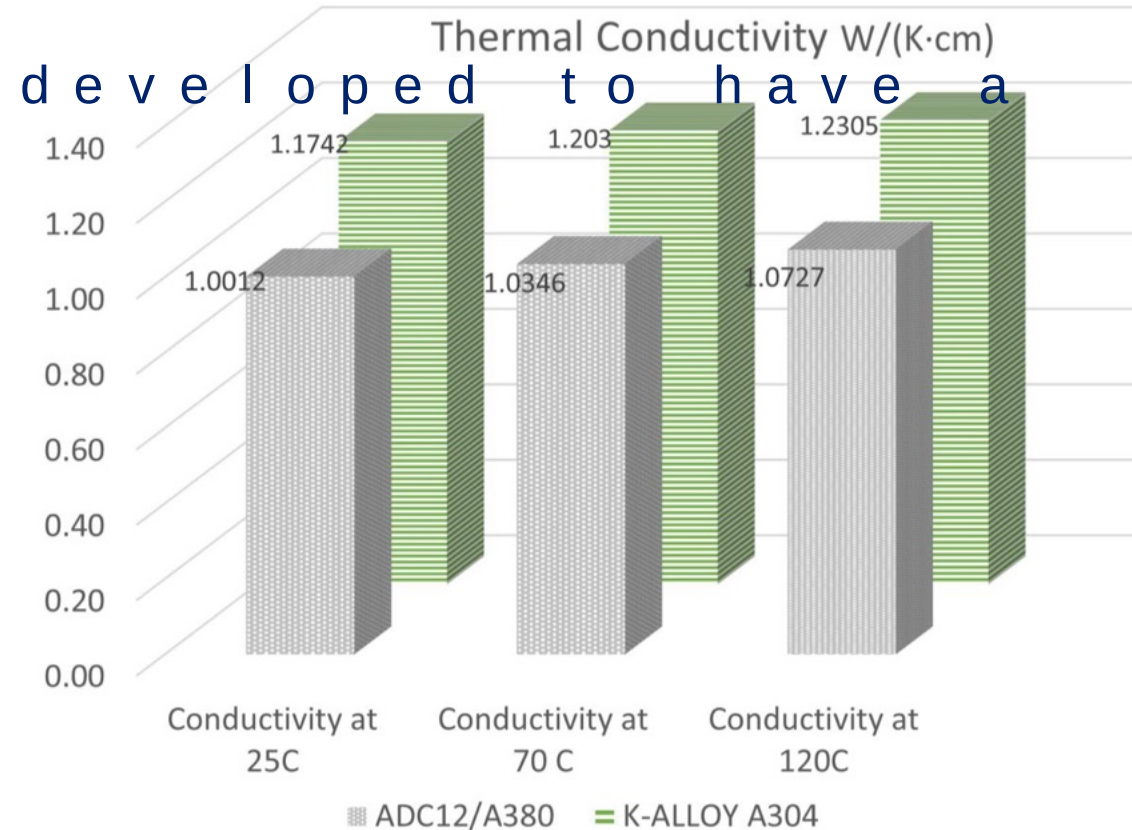


K-ALLOY™/ A304

Thermal Conductivity

Curated specifically as an electronics housing alloy, K-ALLOY™ (A304) was 15% better thermal conductivity than A380 die casting alloy.

In the eV market, this benefit is key to the designers that need to dissipate heat from electronic components.



Where to buy K-ALLOY™

> NORTH AMERICA

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Robert Khami - CEO
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(248) 231-6737

Rio Tinto –Global Sales
200 E Randolph St. Ste 7100
Chicago, IL 60601
PH: 847-915-1674
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> ASIA

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Fax: +86-573-8468-1818

> OTHER INFORMATION

- Borg Warner certifies its licensees for capability in manufacturing
- License holders have many locations globally
- Contact Eric Gottschling at egottschling@borgwarner.com
- For technical support contact Kurt O'Connor at k.oconnor@sbcglobal.net

Thank you!



Combustion



Hybrid



Electric