



The Brock Metal Company Ltd

Walsall Road, Norton Canes,
Cannock, Staffordshire. WS11 9NR
United Kingdom

Tel: +44 (0) 1543 276666
Fax: +44(0) 1543 246418
Email: brock@brock-metal.co.uk

www.brockmetal.com



The Brock Metal Company Limited

ZINC ALLOY SPECIFICATIONS FOR **DIECASTING**



BROCK



The Brock Metal
Company Limited

BROCK



As one of the leading suppliers of primary Zinc alloys throughout Europe, The Brock Metal Company Limited has an unrivalled reputation for metal quality, technical support and service.

We specialise in the supply of alloys to the diecasting and galvanising industries, producing over 25,000 tonnes of primary zinc alloys per annum and supplying 25 countries across Europe and the world.

To manufacture a consistent diecast component requires total confidence in the quality and consistency of the alloy used. The track record, systems and traceability at Brock Metal are second to none and ensure the highest level of confidence in our products at the design, specification and production stages.

All of our Zinc alloys conform to EN 1774 1998 and are manufactured from primary or virgin Zinc conforming to SHG (Super High Grade) or Zn1 grades which are 99.995% pure and themselves conform to international specifications such as EN1179. Our quality assurance systems are fully accredited to ISO 9001.



As well as the more generally available diecasting and foundry zinc alloys, Brock Metal also produces a number of specialist diecasting alloys. Brock Metal can also make alloys to special chemistries to meet specific customer requirements.

Unlike other metals, a number of generic terms for zinc alloys have developed which still leads to considerable confusion to product designers and specifiers, so we strongly encourage the identification of alloys through the relevant EN or International standard classifications listed in this booklet.



The Brock Metal Company Limited

BROCK INGOT & PACK SIZES

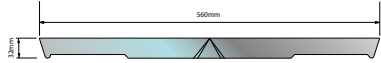


The Brock Metal Company Limited

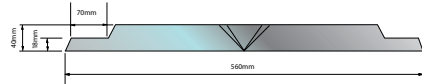
BROCK INGOT & PACK SIZES



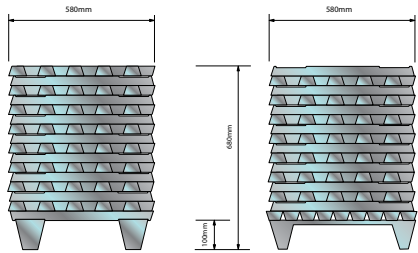
STANDARD INGOTS AND PACKS



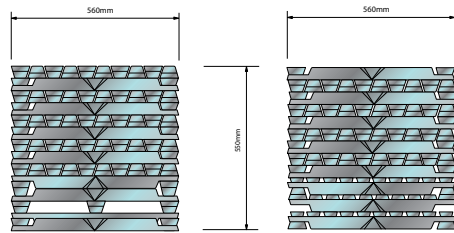
Standard Ingot - 7Kg nominal weight
Available in ZL3, ZL5, ZL7, ZL7+



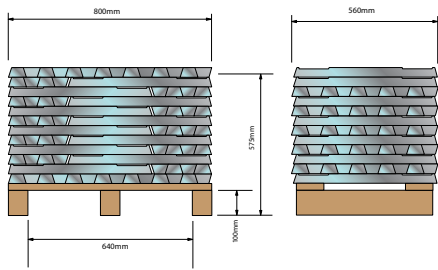
Standard Feeder bar or hooked ingot - 7Kg nominal weight



Standard pack on legs - As drawn 1000kg nominal or 530kg at 410mm high
Available for supply ZL3 and ZL5, supplied banded and plastic wrapped.

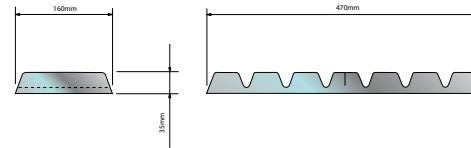


Standard slotted pack - 750kgs as drawn or 1000kgs at 700mm high
Available for ZL2, ZL3, ZL5 - hooked feeder bar ingots
Supplied banded and plastic wrapped

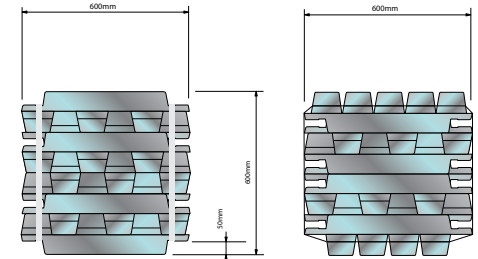


Standard pack on wooden pallet - 1000kg
Available for supply ZL2, ZL3, ZL5, Standard ingot and hooked or feeder bar ingot.

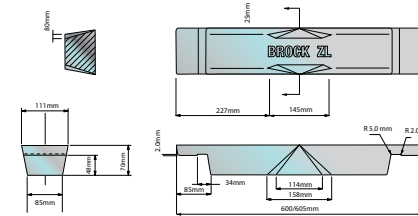
SPECIAL ALLOYS



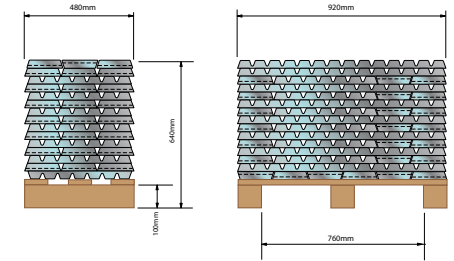
15kg Notched Ingot



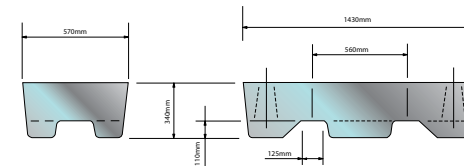
Standard Ingot Pack - 24Kg Ingot - 1000Kg



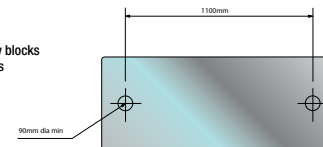
24kg Ingot



Side line ingot pack - available in G5 galvanizing alloys and other alloys on request.
Nominal pack weight - 1000Kgs. Supplied - Banded wrapped on wooden pallets.



Zn Al Galvanising alloy blocks - available chemistries





The Brock Metal Company Limited

BROCK ZL-2



The Brock Metal Company Limited

BROCK ZL-3



PRESSURE DIE CASTING AND TOOLING ALLOY

ZL2 is a Zinc based alloy which conforms to EN 1774 1997 Ingot Specification and which can be used for pressure die cast components or gravity cast specialised tooling. It is one of a family of versatile high grade zinc alloys manufactured by Brock Metal.

Application

Pressure Diecast

ZL2 is used selectively for small castings where improved as cast tensile strength or hardness are required. Its dimensional stability and retention of mechanical properties over a period of years or when subject to higher service temperatures are not as good as ZL3 or ZL5. It has excellent fluidity during casting

Gravity Cast.

ZL2 in the gravity cast condition, in sand or plaster moulds is ideal for use in such applications as press forming tools, rubber moulds, blow moulding tools and plastic injection moulding inserts because of its excellent mechanical and physical properties. Being easily castable with a constant solidification shrinkage, tools and moulds can be cast to close dimensional tolerances requiring only a minimum of machining.

ZL2 tooling can be produced easily and quickly and has a long operational life. Redundant tooling can be reclaimed providing there is no contamination. However, since the level of impurities allowed are very low, specialist knowledge is required. You are advised to contact Brock Metal who provide a reclaiming service.

When designing a stressed component using ZL2 further reference should be made to the alloys properties, at elevated temperatures, after natural or artificial ageing and the alloys creep properties.

Alloy Composition

	Min	Max
Aluminium	3.8%	4.2%
Copper	2.7%	3.3%
Magnesium	0.035%	0.06%
Zinc	Remainder	

Impurities

Iron	-	0.020%
Lead	-	0.003%
Cadmium	-	0.003%
Tin	-	0.001%
Nickel	-	0.001%
Silicon	-	0.02%

Typical as cast physical and mechanical properties

		Pressure Die Cast	Gravity Cast
Casting Temperature	°C	425-435	400-440
Freezing Range	°C	378-390	
Specific Heat	J/gk	0.4187	
	-	(0.10)	
Solidification Shrinkage	Cm/m (in/ft)	1.08 (0.13)	
	Casting Shrinkage	Mm/mm (in/in)	0.006 (0.006)
Thermal Conductivity at 18°C		W/m°C (C.G.S)	105 (0.25)
Thermal Expansion Linear per °C	-	28x10 ⁶	

		Pressure Die Cast	Gravity Cast
Electrical Conductivity at 20°C	%age IACS	26	
Specific Gravity	-	6.8	
Density	Kg/m ³ (lb/in ³)	6,700 (0.24)	
	Tensile Strength at 20°C	N/mm ² (lb/in ²)	338 (49,000)
Elongation at 20°C		%in 2in	8
Impact strength at 20°C (unnotched samples)	J (ft.obf)	46.8 (34.5)	2.4 (1.80)
	Hardness	BHN	100
Compressive Strength	N/mm ² (lb/in ²)	641	773 (112,200)

Figures relate to material in casting form. Properties vary for different processes. Further data available in the technical resource area on brockmetal.com

PRESSURE DIE CASTING ALLOY

ZL3 is a hot chamber pressure die casting zinc base alloy which conforms to EN 1774 1997 Ingot Specification and is one of a family of versatile high grade zinc alloys manufactured by Brock Metal.

Application

ZL3 is a general-purpose alloy and is primarily used for producing castings for a variety of applications on a hot chamber pressure die casting machine. The alloy's mechanical and physical properties make it ideal for use in castings for the engineering and automotive industry, household equipment and utensils, office equipment, builders hardware, locks, toys, giftware etc. ZL3 is easily machined, buffed, polished, lacquered and electroplated for decorative or functional purposes.

National Specifications

The composition of ZL3 conforms to the current EN 1774 1997 Standard, which is now common to all EU countries.

When designing a stressed component using ZL3 further reference should be made to the alloys properties, at elevated temperatures, after natural or artificial ageing and the alloys creep properties.

Alloy Composition

	Min	Max
Aluminium	3.8%	4.2%
Magnesium	0.035%	0.06%
Zinc	Remainder	

Impurities

Iron	-	0.020%
Copper	-	0.03%
Lead	-	0.003%
Cadmium	-	0.003%
Tin	-	0.001%
Nickel	-	0.001%
Silicon	-	0.02%

Typical as cast physical and mechanical properties

		405-425
Casting Temperature	°C	405-425
Freezing Range	°C	382-387
Specific Heat	J/gk	0.4187
	-	(0.10)
Solidification Shrinkage	Cm/m (in/ft)	1.17 (0.14)
	Casting Shrinkage	Mm/mm (in/in)
Thermal Conductivity at 18°C		W/m°C (C.G.S)
Thermal Expansion Linear per °C	-	28x10 ⁶

		26
Electrical conductivity at 20°C	%age IACS	26
Specific Gravity	-	6.7
Density	Kg/m ³ (lb/in ³)	6,700 (0.24)
	Tensile Strength at 20°C	N/mm ² (lb/in ²)
Elongation at 20°C		%in 2in
Impact strength at 20°C (unnotched samples)	J (ft.obf)	56.9 (42)
	Hardness	BHN

Figures relate to material in casting form. Properties vary for different processes. Further data available in the technical resource area on brockmetal.com



The Brock Metal Company Limited

BROCK ZL-5



The Brock Metal Company Limited

BROCK ZL-7



PRESSURE DIE CASTING ALLOY

PRESSURE DIE CASTING ALLOY

ZL5 is a zinc base pressure die casting alloy which conforms to EN 1774 1997 Ingot Specification and is one of a family of versatile high grade zinc alloys manufactured by Brock Metal.

Application

ZL5 is generally used for castings produced on a hot chamber pressure die casting machine where a slightly stronger and harder alloy than ZL3 is required and dimensional stability in the as cast condition is not such an important criterion. ZL5 has slightly better castability than ZL3 and therefore tends to be used for small intricate castings or when surface preparation of a ZL3 casting is difficult, prior to electroplating. Due to its higher Copper content the alloy is more expensive than ZL3 therefore it's application should be restricted to it's correct use.

ZL5 is easily machined, buffed, polished, lacquered and electroplated for decorative or functional purposes

National Specifications

The composition of ZL5 conforms to the current EN 1774 Standard, which is now common to all EU countries.

When designing a stressed component using ZL5 further reference should be made to the alloys properties, at elevated temperatures, after natural or artificial ageing and the alloys creep properties.

Alloy Composition

	Min	Max
Aluminium	3.8%	4.2%
Copper	0.7%	1.1%
Magnesium	0.035%	0.06%
Zinc	Remainder	

Impurities

Iron	-	0.020%
Lead	-	0.003%
Cadmium	-	0.003%
Tin	-	0.001%
Nickel	-	0.001%
Silicon	-	0.02%

Typical as cast physical and mechanical properties

Casting Temperature	°C	405-425
Freezing Range	°C	379-388
Specific Heat	J/gk	0.4187
	-	(0.10)
Solidification	Cm/m	1.17
Shrinkage	(in/ft)	(0.14)
Casting Shrinkage	Mm/mm	0.006
	(in/in)	(0.006)
Thermal Conductivity at 18°C	W/m°C	108.9
	(C.G.S)	(0.26)
Thermal Expansion Linear per °C	-	28x10 ⁶

Electrical conductivity at 20°C	%age IACS	26
Specific Gravity	-	6.7
Density	Kg/m ³	6,700
	(lb/in ³)	(0.24)
Tensile Strength at 20°C	N/mm ²	328-270
	(lbf/in ²)	(47,000)
Elongation at 20°C	%in 2in	7-13
Impact strength at 20°C (unnotched samples)	J	54-65
	(ft.obf)	(43)
Hardness	BHN	92-80

Figures relate to material in casting form. Properties vary for different processes. Further data available in the technical resource area on brockmetal.com

The ZL 7 is a derivative of the commonly used and very successful ZL 3 alloy. ZL 7 possesses similar properties to the number 3 alloy while minor changes to the chemistry of this material have enhanced its castability. The revisions have allowed castings section of 0.6-0.7 mm to be achieved using the hot chamber pressure die casting process. ZL 7 is not covered by the current EN 1774 or 12844 zinc alloy standards.

Application

This alloy should be selected for high volume casting applications where thin sections are required to reduce weight/create space, finish is important and the retention of torsional rigidity associated with metal structures and enclosures is imperative. Like all zinc alloys ZL 7 offers the added benefit of good EMI/RFI shielding properties and long term dimensional stability combined with net shape manufacturing.

Typical applications include electronics, computer hardware, telecommunication devices, automotive and builders' hardware etc.

Designers should be aware that the properties of this alloy change with age and reference should be made to the aged properties at the design stage.

Alloy Composition

	Min	Max
Aluminium	4.4%	4.6%
Magnesium	0.002%	0.006%
Zinc	Remainder	

Impurities

Copper	-	0.013%
Iron	-	0.005%
Lead	-	0.003%
Cadmium	-	0.002%
Tin	-	0.001%
Silicon	-	0.01%

Typical as cast physical and mechanical properties

Tensile Strength at 20°C	MPa	283
Elongation (51 mm)	-	10.0%
Compressive Yield strength 0.5%	MPa	418
Hardness	BHN	82
Poisons ratio		0.27
Impact Strength	Joules	58
Fatigue strength	MPa	47

Freezing range	°C	381-387
Density	grams/cm ³	6.6
Coefficient of thermal expansion	µ m/mK	27
Thermal conductivity	W/m/hr/m ² /°C @ 70-140°C	105
Electrical conductivity	%IACS	26.9
Electrical Resistivity (unnotched samples)	µm ohm cm @ 20°C	6.4

Figures relate to material in casting form. Properties vary for different processes. Further data available in the technical resource area on brockmetal.com



The Brock Metal Company Limited

BROCK ZL-8



The Brock Metal Company Limited

BROCK ZL-12



PRESSURE DIE CASTING ALLOY

ZL8 conforms to EN 1774 1997 Ingot Specification and is a hot chamber pressure die casting alloy which was developed to meet specific applications and is one of the family of versatile high grade alloys manufactured by Brock Metal. ZL8 is a direct replacement for ZA8 and can also be used to make sand and permanent mould castings.

Application

ZL8 is designed to extend the application range of Zinc alloy diecastings. In the past Zinc alloys were considered unsuitable for applications where moderate stress was anticipated at elevated temperatures. ZL8 offers the best creep resistance of all hot chamber diecasting alloys and it should be specified for structural or stressed applications for which other Zinc alloys would be unsuitable.

Although it is the strongest of the hot chamber alloys, it still possesses all of the properties associated with Zinc diecasting alloys. The combination of high strength, excellent dimensional stability, good surface finish and definition make it ideal for visible stressed parts which are subject to elevated temperature during service.

The increased levels of Aluminium have no significant effects on the finishing of castings made from this alloy. Finishes suitable for traditional Zinc pressure die casting alloys can be applied to

castings made from ZL8 alloys with excellent results.

Typical applications for this alloy are under bonnet automotive parts, stressed parts for hazardous or mining environments, stressed electrical or computer parts, micro wave guides etc.

This specification has been taken from EN 1774 – Zinc and Zinc Alloys – Alloys for Foundry Purposes – Ingot and Liquid.

The Noranda Research Centre, Quebec, Canada, developed the ZL8 alloy and carried out the detailed characterization of the material properties pertaining to this alloy.

Alloy Composition

	Min	Max
Aluminium	8.2%	8.8%
Copper	0.9%	1.3%
Magnesium	0.02%	0.03%
Zinc	Remainder	

Impurities

Iron	-	0.035%
Lead	-	0.005%
Cadmium	-	0.005%
Tin	-	0.002%
Nickel	-	0.001%
Silicon	-	0.035%

Typical as cast physical and mechanical properties

Casting Temperature	°C	415-435
Freezing Range	°C	375-404
Specific Heat	J/gk	0.4354
	-	(0.104)
Solidification	Cm/m	1.10
	(in/ft)	(0.132)
Shrinkage	mm/mm	0.007
	(in/in)	(0.007)
Thermal Conductivity at 18°C	W/m°C	114.7
	BTU/Ft/hr/Ft ² /F	66.3
Thermal Expansion Linear per °C	-	23.3x10 ⁶

Electrical conductivity at 20°C	%age IACS	27.7
Specific Gravity	-	6.3
	(lb/in ³)	(0.227)
Density	Kg/m ³	6,300
	N/mm ²	374
Tensile Strength at 20°C	(lbf/in ²)	(54,200)
Elongation at 20°C	%in 2in	6-10
Impact strength at 20°C (unnotched samples)	J (ft.obf)	42 (31)
Hardness	BHN	103

Figures relate to material in casting form. Properties vary for different processes. Further data available in the technical resource area on brockmetal.com

PRESSURE DIE CASTING FOUNDRY ALLOY

ZL12 is a 12% Aluminium – Zinc alloy which conforms to EN 1774 1997. It has been developed for use as a general-purpose foundry alloy. Its unique properties enable it to be cast using any of the conventional gravity casting processes. ZL12 is a strong, sound alloy capable of casting thin sections and intricate details. The economical ZL12 has low initial and conversions costs. It can be cold chamber pressure die cast using a similar process to that used for making Aluminium pressure castings.

The casting properties of ZL12 enable it to compete favourably with other cast metals such as Iron, Brass, Bronze and Aluminium Alloys. ZL12 has excellent machining characteristics, good corrosion resistance and requires only the minimum of surface preparation for easy electroplating or painting. The original specification for this alloy was developed by the International Lead Zinc Research Organisation Inc. New York USA. ZL12 was known as Kayem 12 and ZA12 in the past. ZL12 is the EN 1774 equivalent of these alloys.

Mechanical

Mechanical		Sand Cast	Permanent Mould(Gravity Die)
Tensile	N/mm ²	276-310	345-380
	(lbf/in ² x10 ³)	(40-45)	(50-55)
Elongation	% in 2 in	3-4	4-7
Impact Strength (unnotched samples)	J	5.4-10.8	17.6
	(ft.lbf)	(4-8)	(13)
Hardness	BHN	105-125	

Physical

Density	g/cm ³	603	
	(lb/in ³)	(0.218)	
Pattern Makers Shrinkage	cm/m (in/ft)	1.30 (3/32)	1.04 (1/8)
	Electrical Conductivity	%age IACS 25	

Thermal

Melting Range	°C	380-430
Casting Temperature	°C	475-520
Thermal Conductivity at 24 °C	W/m°C	0.21-0.22

Comparison of Typical Properties

		ZL12	Brass BS 1400 SCB3	Aluminium Alloy LM6	Grey Cast Iron
Tensile Strength	N/mm ²	276-380	185-250	160-185	165-345
Elongation	%	3-7	15-30	5-7	<0.5
Hardness	BHN	105-125	45-65	55-60	200-250
Density	g/cm ³	6.03	8.5	2.65	7-7.5
Melting Range	°C	380-430	920-1000	580-640	1090-1260
Thermal Conductivity	W/m°C	0.21	0.26	0.34	0.1-0.12
Electrical Conductivity	%age IACS	25	25	37	-
Machinability Rating		Very Good	Very Good	Fair	Fair
Finishing Characteristics		Very Good	Very Good	Fair	Poor

Properties vary for different processes. Further data available in the technical resource area on brockmetal.com

Advantages

- Economical alloy cost with clean low-cost melting & low metal loss
- Insensitive to different cooling rates allowing it to be cast by all gravity casting processes
- Excellent castability giving pressure tightness, thin sections, intricate detail.
- Low shrinkage & gas porosity, high sand reclamation.
- Existing pattern equipment and gravity dies can be used
- Excellent machining properties
- Excellent buffing and polishing characteristics
- Easily electroplated, painted or lacquered.
- Good corrosion resistance
- Excellent tensile strength and hardness at ambient temperatures
- Non-sparking alloy suitable for hazardous environments
- Good bearing and wear properties for lightly loaded applications



The Brock Metal Company Limited

BROCK ZL-27



The Brock Metal Company Limited

BROCK ILZRO 16



FOUNDRY ALLOY

ZL27 is a 27% Aluminium – Zinc alloy which conforms to EN 1774 1997. It has been developed to address the need for an exceptionally high strength good bearing property Zinc base casting alloy. To improve the as cast ductility ZL27 can be given an inexpensive heat treatment. As with other Zinc Alloys, ZL27 is a sound alloy capable of casting thin sections & intricate detail. However, due to ZL27 casting characteristics large castings are best produced by sand moulding and thin-sectioned smaller castings can be produced either by permanent or shell moulding.

ZL27 can be pressure diecast on a cold chamber machine. ZL27 has excellent machining characteristics and good corrosion resistance. The economical cost of ZL27 together with low conversion costs and excellent properties enable it to compete favourably with other cast metals such as malleable and grey Iron, Manganese and Aluminium Bronzes and high strength Aluminium alloys.

The Noranda Research Centre, Quebec, Canada, developed the ZA 27 alloy and carried out the detailed characterization of the material properties pertaining to this alloy.

Mechanical

		Sand Cast	Heat treated
Mechanical Tensile	N/mm ²	400-440	310-324
	(lbf/in ² x10 ³)	(58-64)	(45-47)
Elongation	% in 2 in	3-6	8-11
Impact Strength (unnotched samples)	J	14.9	25.7
	(ft.lbf)	(11)	(19)
Hardness	BHN	110-120	90-100

Physical

Density	g/cm ³	5.01
	(lb/in ³)	(.181)
Pattern Makers	cm/m	1.30
Shrinkage	(in/ft)	(⁵ / ₃₂)
Electrical Conductivity	%age IACS	28

Thermal

Melting Range	°C	380-490
Casting Temperature	°C	510-560

Comparison of Typical Properties

		ZL27	Brass BS 1400 SCB3	Aluminium Alloy LM6	Grey Cast Iron
Tensile Strength	N/mm ²	310-440	185-250	160-185	165-345
Elongation	%	3-11	15-30	5-7	<0.5
Hardness	BHN	90-120	45-65	55-60	200-250
Density	g/cm ³	5.01	8.5	2.65	7-7.5
Melting Range	°C	380-490	920-1000	580-640	1090-1260
Electrical Conductivity	%age IACS	28	25	37	-
Machinability Rating		Very Good	Very Good	Fair	Fair

Properties vary for different processes. Further data available in the technical resource area on brockmetal.com

Advantages

- Approximately 43% lighter than Bronze and 30% lighter than cast Iron
- Economical alloy cost with clean low-cost melting and low metal loss
- Easily cast by sand moulding, shell moulding, permanent moulding and cold chamber machine pressure die.
- Good castability giving pressure tightness, thin sections, and good as cast finish.
- Low shrinkage and gas porosity, high sand reclamation.
- Excellent machining properties
- Good corrosion resistance
- Excellent tensile strength and hardness at ambient temperatures
- Inexpensive heat treatment to improve ductility.
- Excellent bearing and wear
- Good creep properties

COLD CHAMBER PRESSURE DIE CASTING ALLOY

ILZRO 16 is a specialized zinc alloy which conforms to the EN 1774 1997 Ingot specification and is one of a family of high grade zinc alloys manufactured by the Brock Metal Company Limited. Castings made from this alloy should conform to EN 12844 Zinc alloy castings specifications.

Application

Ilzro 16 was developed to address a specific application range within the zinc alloy range. It has a very explicit design application envelope which other alloys within the range are unable to address. The chemistry of this alloy dictates the manufacturing methods that can be adopted and effectively rule out the use of the most efficient hot chamber pressure die-casting process.

These factors have limited the potential applications for this alloy and it's use in the market place has been limited. However, ZL16 does have exceptional creep properties for a zinc alloy and retains the design benefits and dimensional capabilities offered by the more traditional hot chamber alloys. Use of this alloy should be considered where moderate stress, at elevated temperatures are anticipated and particularly when this is combined with a need for high complexity and dimensional accuracy.

Detailed creep data and fracture toughness

figures are covered in the technical resource file on the Brock Metal web site. Brock would advise that the potential user of this alloy considers the design of the part in line with good design practice and the properties of this alloy. It would be advisable to consult with the die cast supplier to ensure that they are prepared to manufacture castings from this alloy prior to committing the final design solution. This consultation would also ensure that process capability and cost effective tool design is achieved.

Alloy Composition

	Min	Max
Aluminium	0.01%	0.04%
Copper	1.0%	1.5%
Chromium	0.1%	0.2%
Titanium	0.15%	0.25%
Zinc	Remainder	

Impurities

	Min	Max
Magnesium	-	0.02%
Lead	-	0.005%
Cadmium	-	0.004%
Tin	-	0.003%
Iron	-	0.04%
Silicon	-	0.04%

Typical as cast physical and mechanical properties

Tensile strength at 20°C	MPa	230
Proof Stress (0.2% offset)	MPa	142
Elongation (51 mm)		5.5%
Hardness 500 kg	BHN	76
Density	g/cm ³	7.1
Solidification range W/m/hr/m2/0C	°C	418-416

Thermal expansion @ 10 -100°C	mm/mm/°C	27
Specific heat capacity @ 20-100°C	J/kg/°C	402
Thermal conductivity @ 70-140°C	W/m/hr/m2/°C	109
Electrical resistivity @ 20°C	µohm-cm	8.4

Figures relate to material in casting form. Properties vary for different processes. Further data available in the technical resource area on brockmetal.com



The Brock Metal Company Limited

ACuZinc™ 5



The Brock Metal Company Limited

SPECIAL ALLOYS



PRESSURE DIE CASTING ALLOY

EXAMPLES OF WIDE RANGE SPECIALIST ALLOYS AVAILABLE

ACuZinc™ 5 is a special die-casting alloy, developed by General Motors to satisfy the demands of specific automotive applications. Subsequent tests demonstrated that this alloy had a much broader application range than originally anticipated and GM granted licences to selected Zinc alloy producers to allow them to manufacture this alloy.

The Brock Metal Company Limited is a licensed manufacturer of the ACuZinc alloy range. As such Brock are able to advise on the use of the alloy and its special properties. This alloy is not covered by the current EN specification but is covered by ASTM and other US standards.

Application

The ACuZinc™ 5 alloy was developed to extend the operating range of the traditional hot chamber Zinc die-casting alloys and to rival the performance of the cold chamber alloys while retaining the cost effective manufacturing benefits of the hot chamber die-casting process. A prime target for use of this alloy was the replacement of sintered metal parts on a performance basis with a more cost effective zinc alloy based solutions.

The high Copper content present in this alloy increases the general strength of the material, while improving both hardness and rigidity. This performance increase is apparent at higher operating/service temperatures and where increased wear and impingement resistance is a necessity. There is a marked cost penalty associated with the use of this alloy and therefore use of ACuZinc should be confined to applications where the increased properties are essential and can be justified on a commercial basis.

Alloy Composition

	Min	Max
Copper	5.0%	6.0%
Aluminium	2.8%	3.3%
Magnesium	0.025%	0.05%
Zinc	Balance	

Impurities

Iron	-	0.075%
Lead	-	0.005%
Cadmium	-	0.004%
Ti	-	0.003%

Typical as cast physical and mechanical properties

Tensile Strength at 20°C	MPa	407
Yield strength 0.2%	MPa	338
Elongation (51 mm)	-	6.0%
Young's Modulus	MPa	100x10 ³
Compressive Yield strength 0.5%	MPa	418
Hardness	BHN	105-125
Creep Rate 150°C	s ⁻¹ x10 ⁶ @3.7 ksi	0.5
Poisons ratio		0.29

Impact Strength	Joules	16
Fatigue strength	MPa	84
Hardness	BHN	105
Melting range	°C	460-480
Density	grams/cm ³	6.85
Coefficient of thermal expansion	µ m/mK	24.1
Thermal conductivity	j/s/cm/K	1.06
Electrical conductivity	%IACS	26.9
Electrical Resistivity	µm ohm cm	6.4

MILITARY - 18001

Military Sacrificial Anode Specification

Chemical Analysis:			
Alloying Additions		Impurities	
Al	0.10 - 0.50	Cu	0.005
Cd	0.025 - 0.07	Fe	0.005
		Pb	0.006
		Others	0.10

SPINCAST ALLOY 1

Chemical Analysis:			
Alloying Additions		Impurities	
Aluminium	3.5 - 3.7%	Iron	0.020% max
Copper	1.1 - 1.3%	Lead	0.003% max
Magnesium	0.4%	Cadmium	0.003% max
Zinc	Balance	Tin	0.001% max

SPINCAST ALLOY 2

Chemical Analysis:			
Alloying Additions		Impurities	
Aluminium	3.5 - 3.7%	Iron	0.020% max
Copper	2.5 - 3.5%	Lead	0.003% max
Magnesium	0.4%	Cadmium	0.003% max
Zinc	Balance	Tin	0.001% max

ZAMI ALLOY

Chemical Analysis:			
Alloying Additions		Impurities	
Aluminium	0.05 - 0.055%	Copper	0.010% max
Magnesium	0.4 - 0.45%	Iron	0.0010% max
Zinc	Balance	Lead	0.003% max
		Cadmium	0.0010%
		Tin	0.0010%