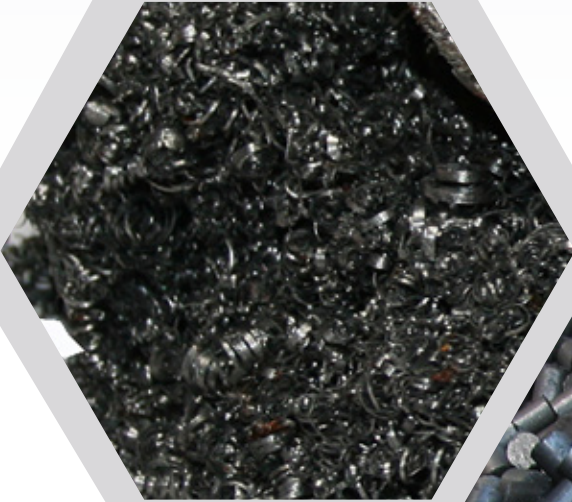




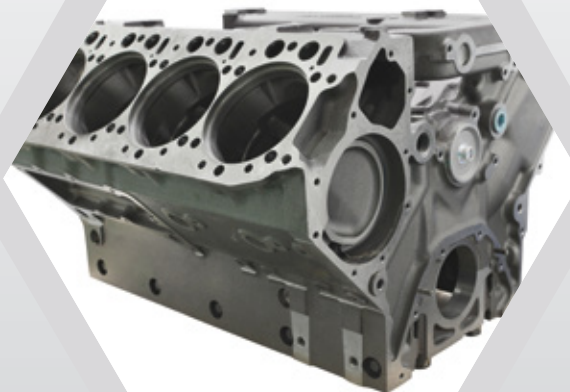
ADDING  
VALUE.

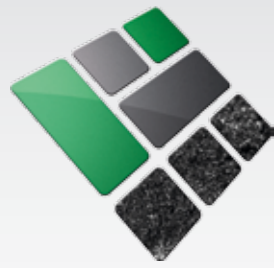
**RUF**  
BRIQUETTING SYSTEMS



# BRIQUETTING MELTING ADDING VALUE

Real life examples from foundries





## CAST IRON

### KEEP RESOURCES INHOUSE SECURING QUALITY REDUCING COSTS

Ruf Maschinenbau GmbH & Co. KG is a family run business, which made the decision over thirty years ago to focus on the development and production of briquetting systems.

Today there are more than 3,700 Ruf briquetting systems in operation, spread across more than 100 countries. They compress fine particle materials like chips, sludge and dust, which are the residuals of industrial processing. We produce briquetting systems with throughputs between 30 and 4,800 kg/hour for the briquetting of cast iron, steel, aluminium and copper.

Depending on the type of material, chip quality and briquette format, our hydraulic presses work with a specific pressure up to 5,000 kg/cm<sup>2</sup>. The results are solid briquettes, which in many cases enable an improved melting process when compared with loose chips.

The following sample references from real life foundries demonstrate the numerous benefits which our customers experience thanks to briquetting. We would be delighted to show you the benefits possible in your foundry.

#### Foundry specific benefits of a RUF briquetting system

- ◆ Reduction of volume and coolant drainage of the metal chips
- ◆ Storage and logistics are simplified
- ◆ Enables or resp. simplifies charging
- ◆ Re-melting of metallurgical-familiar materials is made possible
- ◆ More efficient melting process (power consumption, melting times, increased metal yield)
- ◆ Higher cost benefits: the loss in value inherent in the sale of loose chips is avoided
- ◆ When scrap is sold there is an increase in profit compared with the sale of loose chips
- ◆ Worldwide service



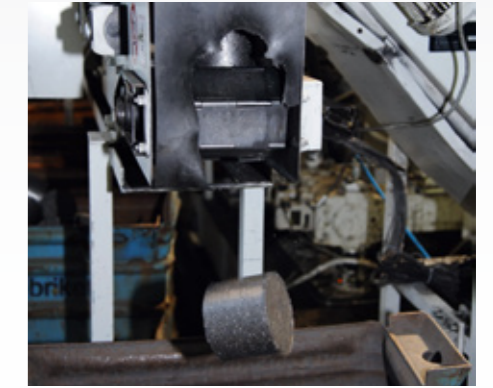
#### LEADING SUPPLIER TO THE AUTOMOTIVE INDUSTRY MELTS BRIQUETTES IN CUPOLA FURNACE

The company produces components from ductile graphite iron for cars and commercial vehicles and machines these components, mainly in-house. Emulsion coated chips were sold in the past at a low price to a scrap dealer. Attempts to melt the chips in loose form were abandoned. For this reason a briquetting system has been in operation since 2008. (Performance of 1.4 tons/hr.) It recognises the various types of chips, presses them separately into monomaterial briquettes and transports them finally into separate containers. Maximum value creation is thereby achieved.

**Customer:** Foundry active in the automotive casting sector, Germany  
**Production:** Automotive, various parts

**Material:** Ductile cast iron GJS 400 - 700, emulsion coated  
**Furnace:** Cupola furnace.

**Briquetting system:**  
RUF 30/3700/100 (adapted model)



#### BRIQUETTING HIGH VALUE CASTING CHIPS PAYS OFF, EVEN WITH ONLY 10 TONS OF CHIPS PER MONTH

The customer casts parts with a unit weight up to 2 tons. The components are partly mechanically machined in dry processing. Particular attention is paid to the re-use of these metallurgical-familiar recyclable materials. This has been enabled by a RUF briquetting system since 2005, which made a return on the investment after only 2.5 years despite the low quantities. Special feature: in advance of the briquetting, the chips are slightly oiled (a few tenths of a per cent based on weight).

**Customer:** Frischhut, a company in the Talis Group, Germany  
**Production:** Mountings and fittings for gas & water installations

**Material:** Ductile cast iron of varying NGC types, dry, 120 tons/year  
**Furnace:** 5-ton Induction furnace medium frequency, Otto Junker

**Briquetting system:**  
RB 4/2800/60S



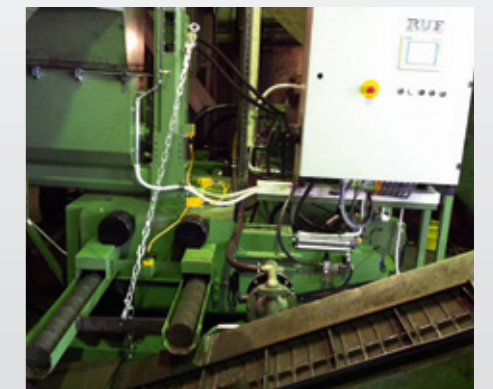
#### SUPPLIER TO THE AUTOMOTIVE INDUSTRY BRIQUETTES GJMB CAST IRON CHIPS (MALLEABLE CAST IRON)

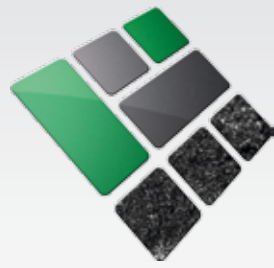
The manufacture of components needs partly internal machining and produces dry and also wet chips. This supplier to the automotive industry has relied on systems from RUF since 2004 and has been running several briquetting systems parallel for several years now (total system capacity 10,000 tons/year). The chip briquettes can be placed in the cupola furnace without problems; the proportion of the charge make-up is 12%. The amortisation for the briquetting system was less than two years.

**Customer:** ES Automobilguss, Deutschland  
**Production:** Differential housing for cars (7.5 Million units per year)

**Material:** Malleable cast iron GJMB  
**Furnace:** 2 lining less continuous cupola furnaces from Küttner Melting capacity 10 tons/h

**Briquetting systems:**  
2x RUF 30/3700/100,  
1x RB 30/3000/100





## CAST IRON



### THE WORLD'S LARGEST PRODUCER OF CRANKCASES USES RUF BRIQUETTING SYSTEMS

The components are manufactured in a highly automated production process. The chips created, which are coated in emulsions, are briquetted and these briquettes are melted in the cupola furnace with a proportion of the charge make-up of up to 20%. The briquetting capacity in the main plant is 20,000 tons/year, and at the branch plant it is 18,000. All of the purchased systems are running successfully and have amortised themselves within a short period of time.

**Customer:** Supplier to the automotive industry, Latin America  
**Production:** Cylinder heads and crankcases (blocks and heads) total capacity 700,000 tons/year

**Material:** Mainly Compacted Graphite Iron CGI (vermicular graphite GJV)  
**Furnace:** Cupola furnace with melting capacity of 23 tons/h

**Briquetting systems:**  
 2xRUF 90/3900/120,  
 1xRUF 18,5/3700/100



### 5,000 TONS/YEAR OF CHIPS ARE TURNED TO PROFITABLE USE THROUGH BRIQUETTING

The benefits of the chip briquettes are: metallurgical-familiar material replaces scrap metal purchases, which would in addition lead to higher costs. Good storage possibilities and chargeability of the briquettes. Reduced power consumption, lower melting times and very low melt loss rates. The residual moisture rate of about 2% is not a critical factor. The system has already been in operation for 10 years. The costs for wear and tear have been calculated exactly. They are at 3.60€ per ton of briquettes (at a cost benefit of over 100€ per ton of briquettes).

**Customer:** Mahle Vöcklabruck GmbH, Österreich  
**Production:** Cylinder sleeves, piston ring inserts, anti-polishing-rings

**Material:** Cast iron with lamellar graphite GJL, specially adapted  
**Furnace:** 3 ton middle frequency furnace from ABB with 2000 kW and Inductotherm Duo Trak with 2500 kW

**Briquetting system:**  
 RB 30/3800/100



### BRIQUETTING OF VARIOUS CAST IRON TYPES LED TO HIGH SAVINGS

The foundry creates parts, which are machined to ready to install components in the in-house mechanical production, and some are put together as completed assemblies. The casting chips GJS, GJL und GJV are collected in a mixed form (separated collection is not possible) and pressed to briquettes. The briquettes get re-melted directly in the cupola furnace, which creates grey cast iron (up to 11% briquettes in the charge make-up). Since 2001 a yearly volume of 4,000 tons of chips have been recycled. The financial benefits lie at around 80€ per ton.

**Customer:** Supplier to the automotive industry, Germany  
**Production:** Automotive, various parts (e.g. drive trains as well as brake and axle parts). 30.000 tons/year good castings.

**Material:** Cast iron with lamellar graphite GJL, ductile cast iron GJS, compacted graphite iron GJV  
**Furnace:** Cupola furnace capacity 16 tons/h from the Kölsch and Fölzer plant

**Briquetting system:**  
 RB 22/3000/80

### CLOSED LOOP: CHIP BRIQUETTES ARE USED FOR NEW PRODUCTIONS OF CASTING PARTS IN AN EXTERNAL FOUNDRY

1,500 tons of emulsion-coated chips are produced yearly in the process of mechanical machining and these chips are strictly separated between GJL and GJS, collected and finally briquetted (90% GJS). The briquettes - now monomaterial separated - are sold to a foundry in the neighbourhood, which in turn uses the briquettes in the production of raw parts (up to 10% in the charge make-up). This means extra earnings for the customer from a long-term source and which made possible a return on investment on the briquetting system after only 18 months. The re-use of recovered emulsions adds to these earnings (after treatment through filtration). This also means a marked cost benefit for the foundry when compared with conventional scrap purchases.

**Customer:** NCB Lohmann GmbH, Deutschland  
**Production:** Drive system and components, focussing on rail traffic and wind power

**Material:** Cast iron with lamellar graphite GJL, ductile cast iron GJS  
**Furnace:** Cupola performance with a capacity of 7-10 tons/h (external)

**Briquetting systems:**  
 RUF 30/3700/100,  
 RUF 18,5/5000/80



### BRAKE DISC MANUFACTURER USES CHIP BRIQUETTES IN THEIR OWN FOUNDRY

During the production of brake discs, a huge quantity of both dry and emulsion coated chips are produced in the mechanical processing. These are compacted by a RUF system with a throughput of 2 tons per hour. The briquettes are melted in the middle frequency furnace in a mixture with other scrap. The wear and tear costs of the system have been calculated exactly since the commissioning in 2012. They are well under 2€ per ton of briquettes.

**Customer:** Automotive, Turkey  
**Production:** Brake drums & Brake discs, 1.2 million units per year

**Material:** Ductile cast iron, cast iron with lamellar graphite 80,000 tons/year  
**Furnace:** 4 middle frequency furnaces with 8 tons capacity each from Inductotherm

**Briquetting system:**  
 RUF 55/3700/100





## COPPER CASTINGS



### ◆ COPPER FOUNDRY PROCESSES IMPURE SCRAP THROUGH BRIQUETTING

The customer produces copper cast alloys using various processes like horizontal continuous casting, sand casting and centrifugal casting. Chips produced from in-house mechanical processing as well as purchased chips (high percentage) have been briquetted since 2007. The starting point of 3-4% residual moisture is reduced to approx. 1% in this process. Briquettes make storage much simpler, enable problem-free charging and increase metal yield. An added advantage of the reduced residual moisture content is the avoidance of smoke generation. The briquetting system paid for itself within one year.

**Customer:** Sächsisches Metallwerk, Germany  
**Production:** NE Metal foundry, partly further processed to semi-finished products and finished products

**Material:** roughly 80 different copper cast alloys (gunmetal, various bronzes, special brass)  
**Furnace:** Gas heated crucible furnace and tandem induction furnace middle frequency 550 kg from ABP

**Briquetting system:**  
RUF 15/3700/100



### ◆ MANUFACTURER OF SEMI-FINISHED PRODUCTS GOES UP TO 70% BRIQUETTES IN THE CHARGE MAKE-UP

LCL has been placing its trust in 3 RUF systems since 2000. Purchased chips of various copper alloys are compacted to high tensile briquettes. This process also entails oil removal, and the batch-ability is achieved as well as an increase in yield level. Briquettes can make up 70% (!) of a charge, and that in counter flow so that the hot gases from the furnace completely dry out the briquettes as well as heating them up before they get to the metal bath of the furnace and are melted. In a continuous casting process various semi-finished products are manufactured of many varied alloys.

**Customer:** LCL Pty Ltd., Australia  
**Production:** Semi-finished products in continuous casting

**Material:** Various copper alloys: Brass, gunmetal, bronzes  
**Furnace:** 4 resistance heated crucible furnaces from Rautomead

**Briquetting systems:**  
2x RUF 30/4000/70,  
1x RUF 15/4000/70



### ◆ CHIP RECYCLING OPTIMISED THROUGH BRIQUETTING IN CHANNEL FURNACE

Several customers produce bars/bolts in their in-house foundries as well as carrying out the ensuing mechanical processing (dry processing). In the past the chips were melted in loose form in crucible furnaces. The induction channel furnace is markedly more economical from a power consumption point of view than a crucible furnace, however it cannot process fine particle material, so no loose chips. For this reason the chips are briquetted. The charge is then made up of briquettes together with gunmetal blocks and they are immersed in the liquid metal bath. Several customers have systems with diverse performance rates ranging between 0.5 and 2.5 tons per hour. The first unit went into operation in 2003. Thanks to the savings on power bills with the melting process in a channel furnace, the systems amortised within a few years.

**Customer:** Producer of installation technology, Germany and Europe  
**Production:** Fittings, mountings for plumbing systems and drainage systems

**Material:** Gunmetal various alloys  
**Furnace:** Channel furnace

**Briquetting systems:**  
1x RUF 55/3700/100  
and other systems

### ◆ COPPER CHIP BRIQUETTES REPLACE EXPENSIVE COPPER CATHODE SHEETS DURING FURNACE START UP PROCEDURE

Since 2008 the copper chips produced by the mechanical processing have been pressed in a RUF briquetting system, a total of 750 tons per year. Expensive copper cathode sheets which had been used to start up the furnaces have thus been replaced by these copper chip briquettes. This step has resulted in savings of roughly 500€ per ton as well as simplified charging processes.



**Customer:** Zollern Laucherthal, Germany  
**Production:** Cast and forged products for fittings, valves, plain bearings etc.

**Material:** Cu and CuCr, about 700 different alloys  
**Furnace:** INDUCTOTHERM Induction crucible furnace with 0.2-2 tons capacity

**Briquetting system:**  
RUF 15/4000/70

### ◆ BRIQUETTING SYSTEM FOR COPPER CHIPS AMORTISED IN LESS THAN ONE YEAR

When the large plates are sawed after the rolling process, copper chips are produced. In the past these were melted in a loose form and of course the melt loss was relatively high. Since 2014 however the customer has been operating a briquetting system and is pressing the chips before melting. The high levels of melt losses have been drastically reduced and in addition, emulsions from the chips are recovered and recycled. The press runs about 12 hours per day, seven days a week and has paid for itself in less than one year. The purchase of further briquetting systems is in the planning stage.



**Customer:** Copper rolling mill, Russia  
**Production:** Strips and sheets (up to 80 mm)

**Material:** Copper and bronze in various purity classes  
**Furnace:** Induction furnace

**Briquetting system:**  
RUF 7,5/4000/70



## ALUMINIUM



### CHIPS FROM HIGH VALUE ALUMINIUM ALLOYS WITH TIN CONTENT ARE MELTED AS BRIQUETTES

Dry chips created during production have been compressed to briquettes since 2011 on a system providing a capacity of 55 kg/h. The briquettes have a density of 2 kg/l and can be recycled at a rate up to a maximum of 25% of a charge make-up. The charge is complemented with ingots in the empty furnace. Decisive for the profitability is the economic utilisation of the tin content in the alloy, which has led to amortisation in well under a year.

**Customer:** Automotive and mechanical engineering supplier, Middle East  
**Production:** Bearings

**Material:** SAE783 - Al 20%Sn 1% Cu and SAE788 - Al 12%Sn 2.5%Si 1%Cu  
**Furnace:** 200 kg middle frequency induction furnace

**Briquetting system:**  
RUF 4/1700/60x40



### SUPPLIER TO THE AUTOMOTIVE INDUSTRY SELLS CHIP BRIQUETTES IN-HOUSE

Aluminium die-cast parts are mechanically processed and the chips produced are briquetted. These briquettes from a RUF press have a density of 2.2 kg/l and a residual moisture level of under 3%. They are directly melted in the plant in order to produce new die-cast parts. The chip briquettes make up a total of 5% of the complete scrap utilised, the yield goes up to 95%.

**Customer:** AISIN Kyushu, Japan  
**Production:** Automotive, among others drive trains, Engines

**Material:** A die-casting  
**Furnace:** 2 chamber furnace from Sanken

**Briquetting system:**  
RUF 4/3700/60x40



### HIGH DENSITY BRIQUETTES ARE MELTED IN THE SHAFT FURNACE OF A WHEEL MANUFACTURER

Japan's leading wheel manufacturer is briquetting daily 6 tons of aluminium chips to high density briquettes with a residual moisture level of under 3%, since 2007. The briquettes make up 20% of the charge, the rest is ingots, sprue and other solid scrap. They are melted together in the in-house shaft furnace. The melted metal is then directly reused in the wheel production.

**Customer:** Wheel manufacturer, Japan  
**Production:** Aluminium wheels

**Material:** Aluminium pressure die-cast  
**Furnace:** Shaft furnace, from Nikon Khonetsu with a capacity of 3 tons/h

**Briquetting system:**  
RB 30/3000/80

### MILLING CHIPS PRODUCED BY THE PROCESSING OF ROLLING INGOTS: UNMIXED PROCESSING ENSURES MAXIMUM VALUE CREATION.

During the processing of rolling ingots an immense amount of milling and sawing chips (scalping chips) are produced. The customer has been relying on RUF briquetting systems since 2002 with a total capacity today of 8 tons/hour. The systems are set up so defined, clean alloys can be briquetted and melted afterwards. This leads to a maximum increase of value. The foundry melts briquettes in the double chamber furnace as well as in the hearth furnace.



**Customer:** Leading refiner in Central Europe  
**Production:** Sheets, strips, rolling ingots.  
Total alloys 260,000 tons/year

**Material:** Al 1000 to 8000 Series: Wrought alloys, Casting alloys as well as Aerospace alloys  
**Furnace:** Double chamber furnace, hearth furnace

**Briquetting systems:**  
Diverse systems from RUF 11/1600/80 to RUF 90/2500/150

### REFINER ACHIEVES HIGHEST METAL YIELDS THANKS TO IMMEDIATE BRIQUETTING

The customer melts scrap, purchased as well as self-produced in their own foundry. 6,000 tons per year of this scrap is made up of Aluminium briquettes with a density of 2.3 kg/l. Of special note here is that, thanks to immediate briquetting directly where chips are produced, no further oxidation takes place because of the drastically reduced surface area. Therefore the metal loss is reduced (benefit of 2%). In the two chamber furnace the briquettes are charged on the furnace bridge in order to remove completely the remaining residual moisture which can then be mixed in the Aluminium bath and melted. The immediate briquetting of the chips ensures the optimum method of chip processing, both from a metallurgical as well as economical point of view: maximum achievable Aluminium yield at lowest possible processing costs.



**Customer:** Hammerer Aluminium Industries GmbH, Austria  
**Production:** Bolts, extruded profiles for automotive and aerospace industry totalling 130,000 tons/year

**Material:** Wrought alloys, casting alloys as well as Aerospace alloys  
**Furnace:** 2 Chamber furnace, Hearth furnace

**Briquetting systems:**  
2x RUF 90/2500/150



### CHIP BRIQUETTES FROM DIE-CAST ALLOYS ARE USED IN THE PRODUCTION OF INGOTS

The customer produces ingots from secondary Aluminium. Chip briquettes make up 30% of the charge make-up, the rest is bolt material and scrap from extruded profiles. After pressing the briquettes have a residual moisture level of around 3%. The level is reduced even further to about 1% through drying (just by ambient air) before they are transported to the furnace. The customer is using a briquetting system with a capacity of 450 kg/h. The system was commissioned in 2002 and has been running to the customer's complete satisfaction ever since, a total of well over 25,000 operating hours.

**Customer:** Metlite, South Africa  
**Production:** Refiner

**Material:** Aluminium die-cast alloys  
**Furnace:** Hearth furnace, capacity 10 ton, oil fired

**Briquetting system:**  
RB 15/1700/150x60

### EXTRUSION PLANT MELTS BRIQUETTES IN IN-HOUSE FOUNDRY

The chips produced during the mechanical processing are compacted to briquettes with a pre-defined high density of 2.3kg/l. They are then placed in charges at a proportion of up to 5%, and melted in the foundry as part of the process of producing bolts. No metallurgic problems occur and the residual moisture level of under 3% also presents no problem. The commercial benefits are calculated at around 700€ per ton of chips → Sales revenue from chips external against purchasing costs of Aluminium ingots (melting costs already taken into account).

**Customer:** HMT Höfer Metall Technik GmbH & Co. KG, Germany  
**Production:** Extrusions

**Material:** Al EN AW 6060 (AlMgSi 0,5) and others  
**Furnace:** 12 ton gas fired hearth furnace

**Briquetting system:**  
RUF 4/3700/60x40



### MAXIMUM YIELD IN THE HEARTH FURNACE WITH BRIQUETTES OF VERY HIGH DENSITY

The Rolling & Extrusion division has an integrated cast house. There, two RUF briquetting presses are in operation, the first one since 1997. The machines mainly process edge strips of different sorts of Al-foils and also long sawing chips. The key is the briquette density. At least 2.3 kg/l ensures a high yield in the hearth furnace: briquettes nearly sink completely, so burn loss is negligible. In fact high quality briquetting is a precondition here for the reuse of the fine foil scrap in the hearth furnace.

**Customer:** Rolling mill, Latin America  
**Production:** Extruded and rolling mill products: profiles, sheets and foils in diverse qualities

**Material:** AA 1000, 2000, 3000, 5000 & 8000 series  
**Furnace:** Hearth furnace

**Briquetting Systems:**  
RB 30/1700/150x120,  
RB 15/1700/150x60

### ROLLING MILL USES BRIQUETTING TO ACHIEVE HIGHEST METAL YIELD

Assan is one of the leading aluminium rolling mills worldwide. When trimming strips and foils, huge amounts of aluminium chips are produced as well as trim strips. Since 2012 these have been pressed to briquettes with a density of 2.3 kg/l by several briquetting systems from RUF. Briquettes have several advantages to offer to the customer: Handling, Logistics and Charging are immensely simplified. Crucial for Assan was the possibility to re-melt briquettes of high density (2.3 kg/l) with lowest possible metal loss in the hearth furnace.

**Customer:** Assan Alüminyum San Ve Tic. A.S.; Turkey  
**Production:** Rolled products 250,000 tons/year

**Material:** Al EN AW 6060 (AlMgSi 0.5)  
**Furnace:** 12 ton gas heated hearth furnace

**Briquetting systems:**  
Various systems from RUF 4/2400/60x60 to RUF 15/1400/150x75





**RUF.**  
BRIQUETTING SYSTEMS

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