



13-15 September / Eylül 2012, Tüyap, İstanbul

6th International Ankiros Foundry Congress
6. Uluslararası Ankiros Döküm Kongresi



**Bu bildiri 6. Uluslararası Ankiros Döküm
kongresinde sunulmuştur**

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Foundry Congress**

<http://kongre.tudoksad.org.tr/>

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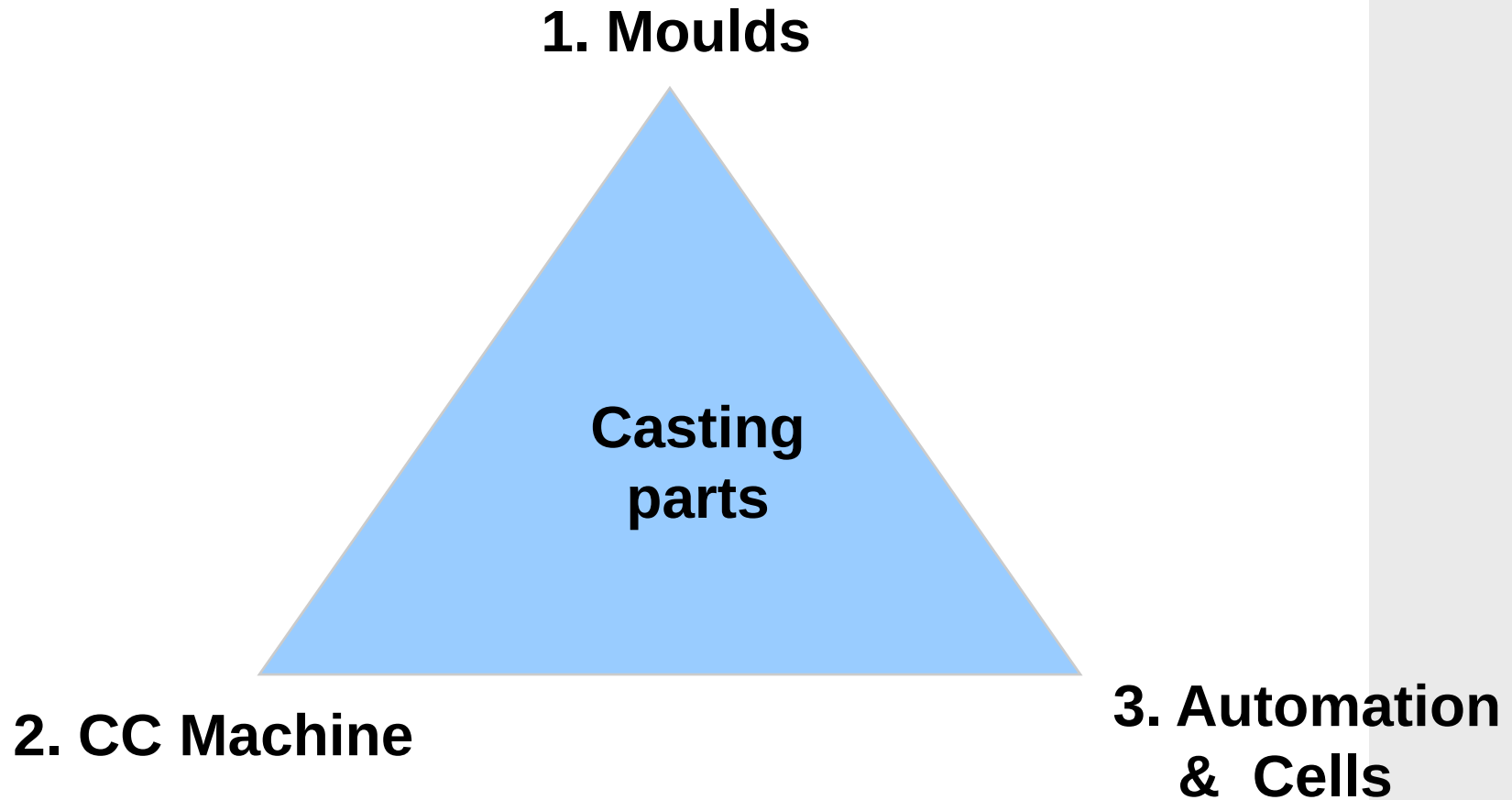
Practical experiences in production of high-quality Aluminium die castings

ANKIROS

Istanbul, Turkeye

September 13. – 16, 2012

Dipl.-Betriebswirt F. Kern



Frech Cold Chamber machine



However the application is,
a modern die casting machine has to offer:

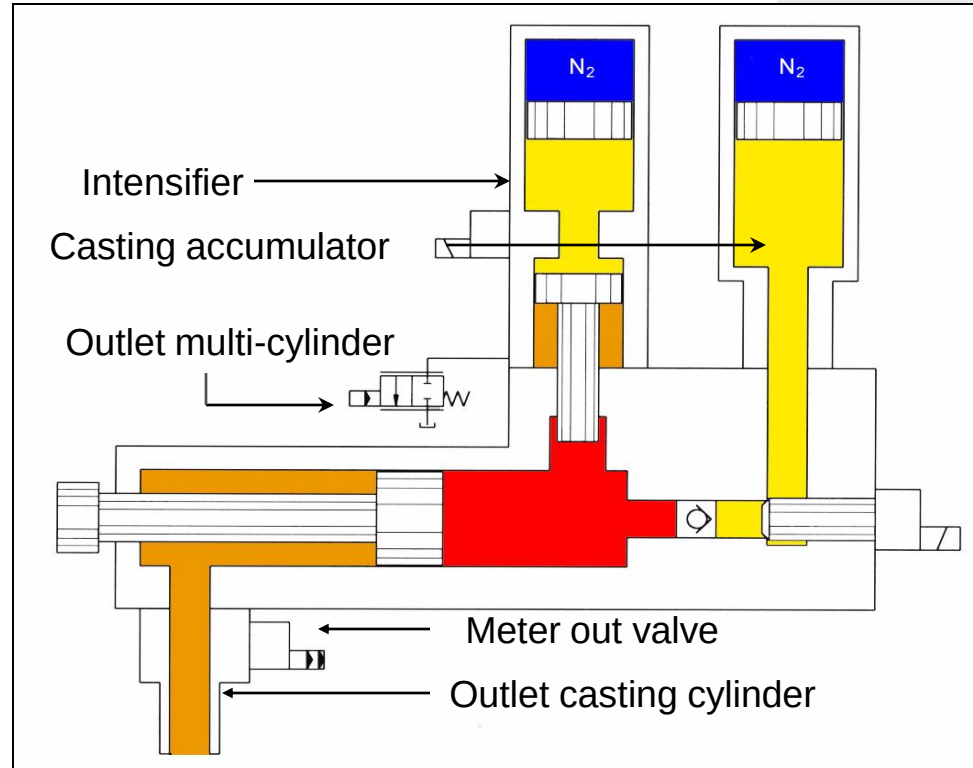
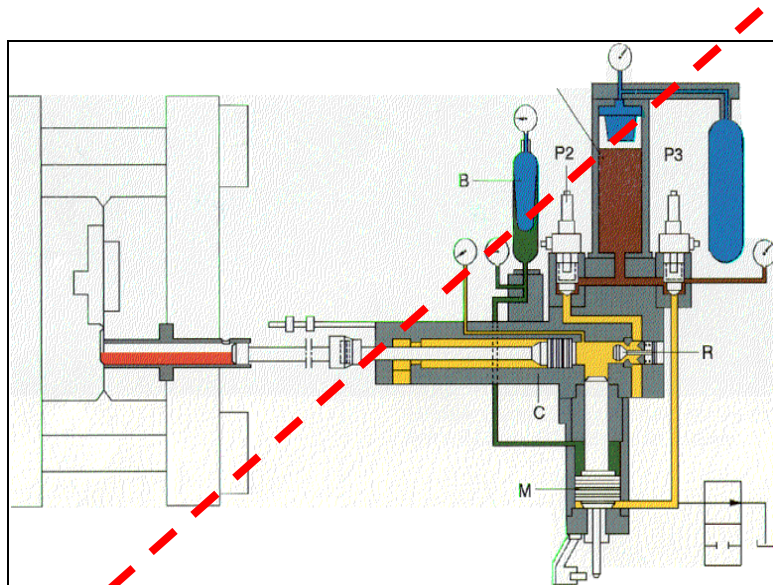
- Modular design
- Easy adaptation of parameters
- Quick cycle time
- Stable and safe production at high production rates
- Strong design concept

Some examples :

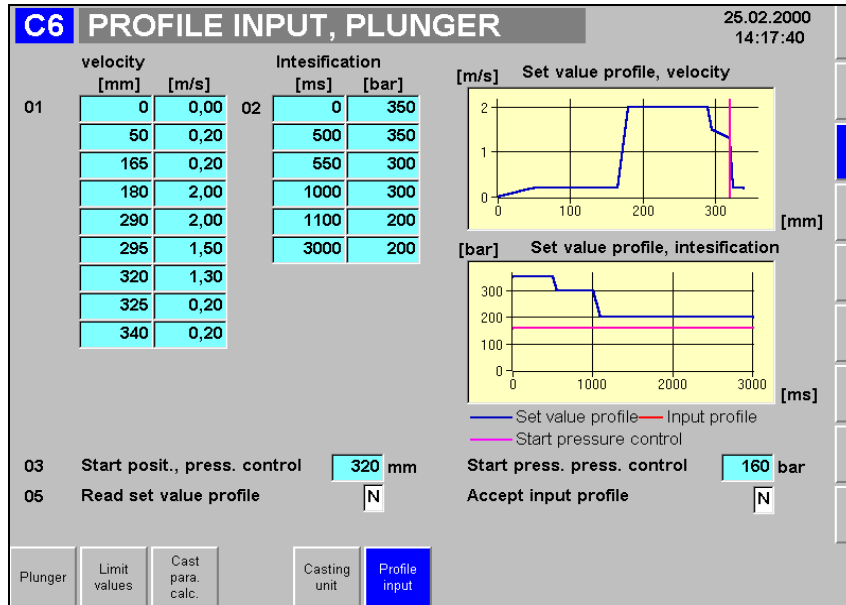
1. Powerful injection system
2. RC (real-controlled shot end)
3. Tie bar removal
4. Die temperature control
5. Interface to die heating-and cooling device
6. Tele-diagnosis via modem

1. Powerful Injection System

The FRECH Multipress shot end offers a meter out piston movement as standard equipment, which allows the programming of any three-phase- velocity profile. This also means, that a third velocity phase can be used to stop or to decelerate the casting piston. For many applications this is sufficient to avoid flashing.



2. Real time Datadialog - control



In the standard equipment

- 3 velocity values
 - 1 pressure value
- can be selected.

With the ***DATADIALOG - RC***

- 12 velocity values
 - 10 pressure value
- can be selected +

During the casting process the highly dynamic movements of the plunger and the casting pressure are monitored. Deviations to the programmed settings result in immediate correction of these values. This happens in **real-time** during the casting process. The advantages are:

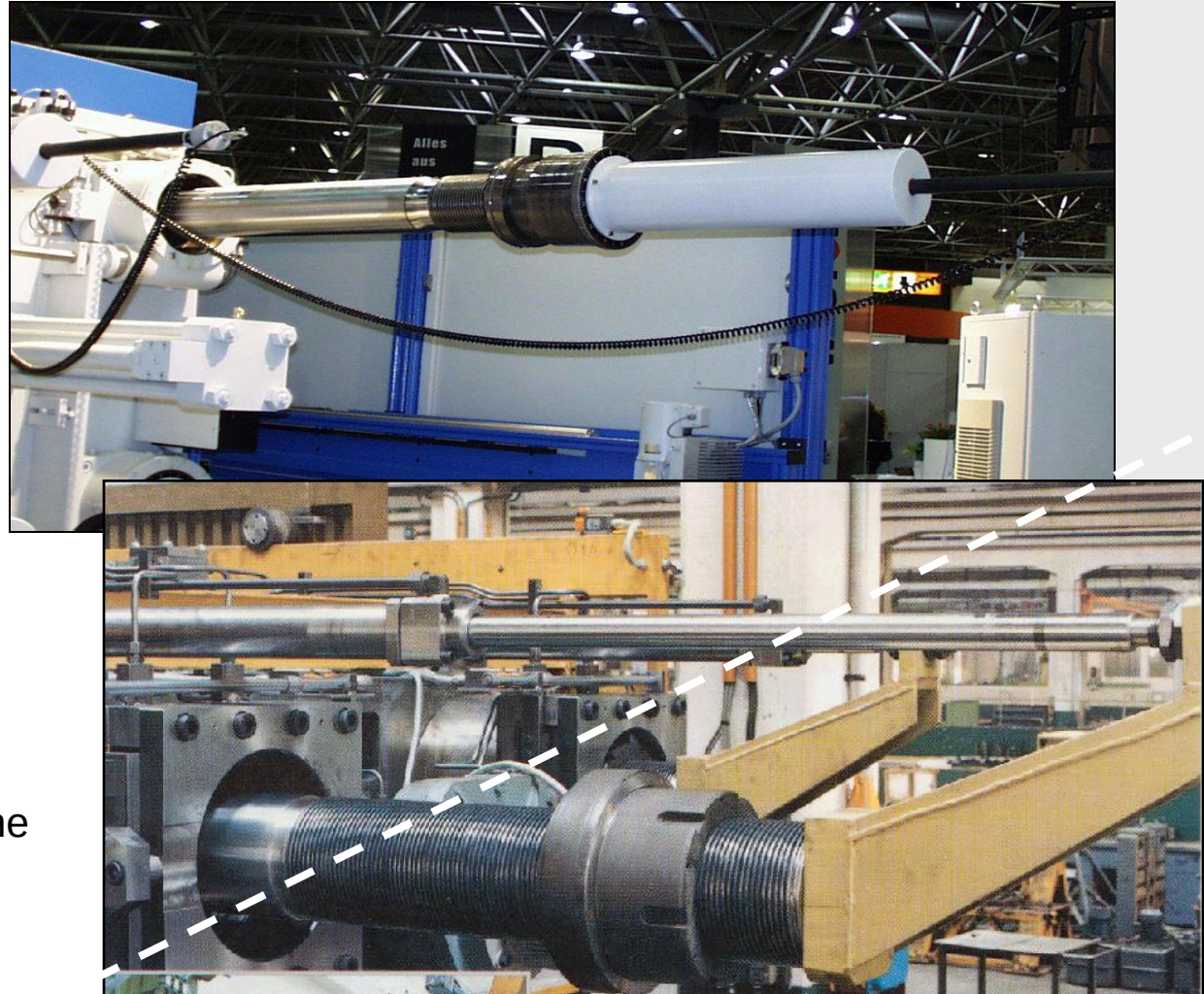
- Optimised casting quality and tolerances
- Avoidance of flash / reduction of pressure peaks in the casting system
- High reproducibility from shot to shot

3. Automatic tie-bar retraction

The front, rear or even both upper tie bars are retracted quickly according to the stored machine program by turning a switch.

Quick die changes,
increased availability
of machine/equipment

A hydraulic clamping system, integrated in the machine platens, avoids the installation of an external bulky cylinder.

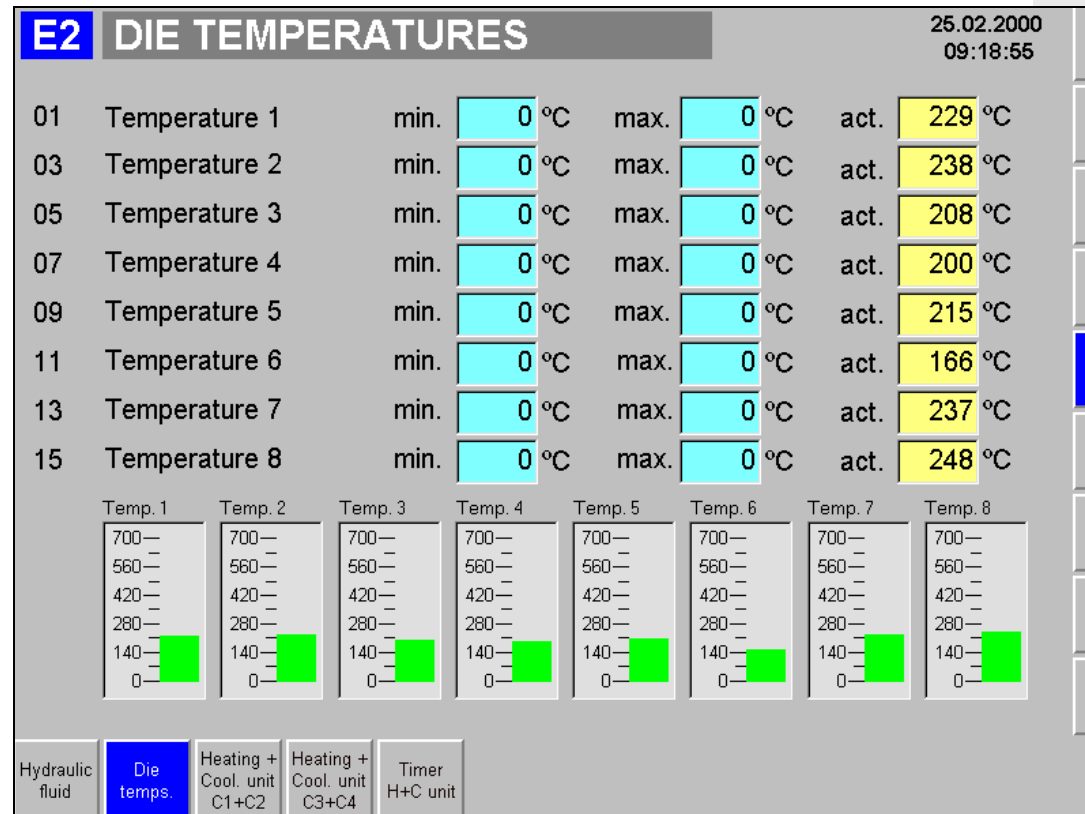


4. Die temperature control

To control max. 8 different die temperatures. Suitable sensors have to be provided in the die :

- NiCrNi
- FeCuNi
- PT 100

Stable temperatures,
Constant conditions,



5. Interface for heating-and cooling unit Thermocast

E3 HEATING + COOL. UNIT C1+C2 25.02.2000 09:19:41

01	Circuit1	Pres. die temperature	N	Die	0 °C
		Actual temperature Die in	0 °C	Die out	0 °C
02		Set temperature	Start	240 °C	Production
04		Limit value	Min.	200 °C	Max.
				250 °C	
06	Circuit 2:	Pres. die temperature	N	Die	0 °C
		Actual temperature Die in	0 °C	Die out	0 °C
07		Set temperature	Start	240 °C	Production
09		Limit value	Min.	200 °C	Max.
				250 °C	
11	Preselection, heat. + cool. unit interface Y				
12	Automatic switch, Start/Production		10	Time	15 Min

Hydraulic fluid Die temps. Heating + Cool. unit C1+C2 Heating + Cool. unit C3+C4 Timer H+C unit

E4 HEATING + COOL. UNIT C3+C4 25.02.2000 09:20:37

01	Circuit 3:	Pres. die temperature	N	Die	0 °C
		Actual temperature Die in	0 °C	Die out	0 °C
02		Set temperature	Start	240 °C	Production
04		Limit value	Min.	200 °C	Max.
				250 °C	
06	Circuit 4:	Pres. die temperature	N	Die	0 °C
		Actual temperature Die in	0 °C	Die out	0 °C
07		Set temperature	Start	240 °C	Production
09		Limit value	Min.	200 °C	Max.
				250 °C	

E5 TII

01	Active	
02	Monday	05:30
04	Tuesday	00:00
06	Wednesday	00:00
08	Thursday	00:00
10	Friday	00:00
12	Saturday	00:00
14	Sunday	00:00

Heating + cooling unit active

Hydraulic fluid Die temps. Heating + Cool. unit C1+C2 Heating + Cool. unit C3+C4 Timer H+C unit

This interface controls up to 4+ circuits of the heating and cooling unit directly from the machine control. Week-day time switch and temperature parameters are monitored on the display.



6. Modem for Diagnosis and Service support



Communication line

VPN- or
Telephone-
Router



Advantages :

- Fault diagnosis by VPN or Tel.
- Program changes for machine updates or special options
- Casting process support / optimizing of quality

Customer plant



Applications & examples

Classification of the main casting families :

- a. Thin walled parts**
- b. Pressure tight parts**
- c. Surface decorative parts**

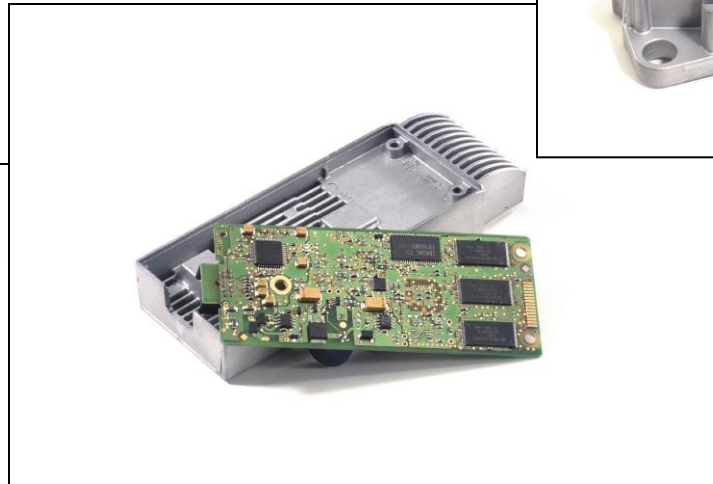
A. Thin walled Aluminium casting

In the past:	Smallest wall thicknesses of 2 mm
Today:	Wall thicknesses < 1 mm (local 0,7 mm) realised in serie
Application:	- Electronic housing for the automotive industry - Electronic control units for air condition - Control unit for airbags - Control unit for navigation service systems - Control unit for electronic brakes
Advantage:	- Optimal component protection - Optimal heat abstraction (transistors) - Electronic protection against disturbances caused by electro-magnetic smog (EMV) - Low part weight - Recycling 100 % is possible
Precondition:	- Real-time controlled cold chamber die casting machines - High-speed milled, coated tool - Tool simulation for filling / strength

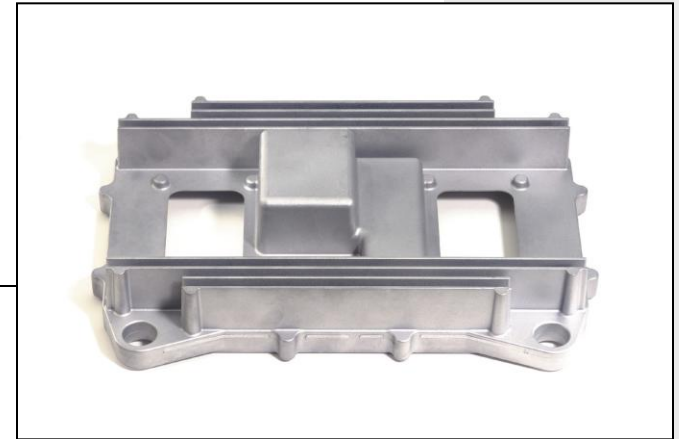
Examples of Thin walled parts



Electronic housing



Linguatronic box



Airbag housing

Examples of Thin walled parts



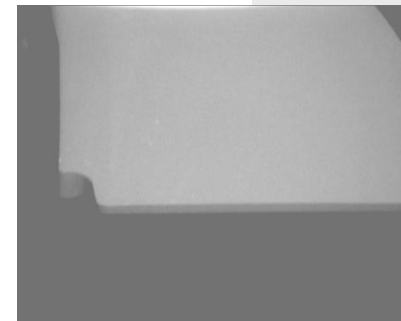
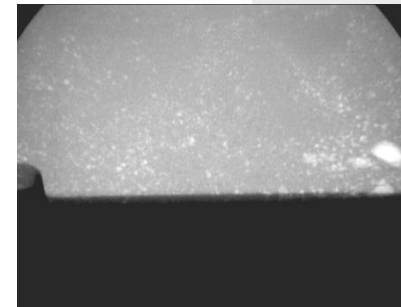
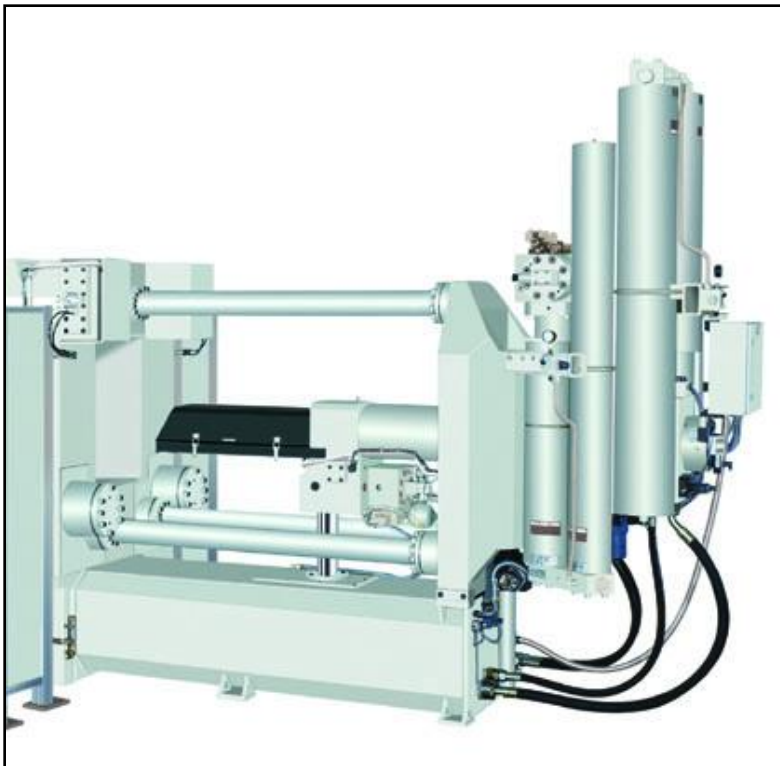
**Car break
component**

Machine preconditions concerning Thin walled parts casting

- Spraying program and tools
- Shot end $V1 = 0,1 \text{ m/s}$ with progressive ramp
- Shot end $V2 = 5 \text{ m/s}$
- Dynamic shot end (or short sleeve with spacer)
- Reserve of locking force

Shot end / Velocity

The shot end must be extremely dynamic and powerful. The new concept of our casting unit completely fulfils these conditions and allows dry shot piston velocities of approx. 10 m/s i.e. 6 to 8 m/s and more in casting operation. This characteristic is necessary to produce thin wall quality castings.



X - Ray

B. Pressure tight Aluminium castings

In the past:	Pressure tight parts had to be (impregnated) sealed, limited application spectrum
Today:	Production of complex, pressure tight Aluminium castings
Application:	- Filter cover parts for hydraulic drives - Gear box housing and utility vehicles - Components for vacuum pumps (servo brakes) - Oil pump housing
Advantage:	- Complex geometries, economically producible - Low part weights - Less mechanical processing is required
Precondition:	- Real-time controlled cold chamber die casting machines - Optimized tool design/layout

Examples of Pressure tight castings



Gear housing



Oil pump cover



Oil pump housing

Examples of Pressure tight castings



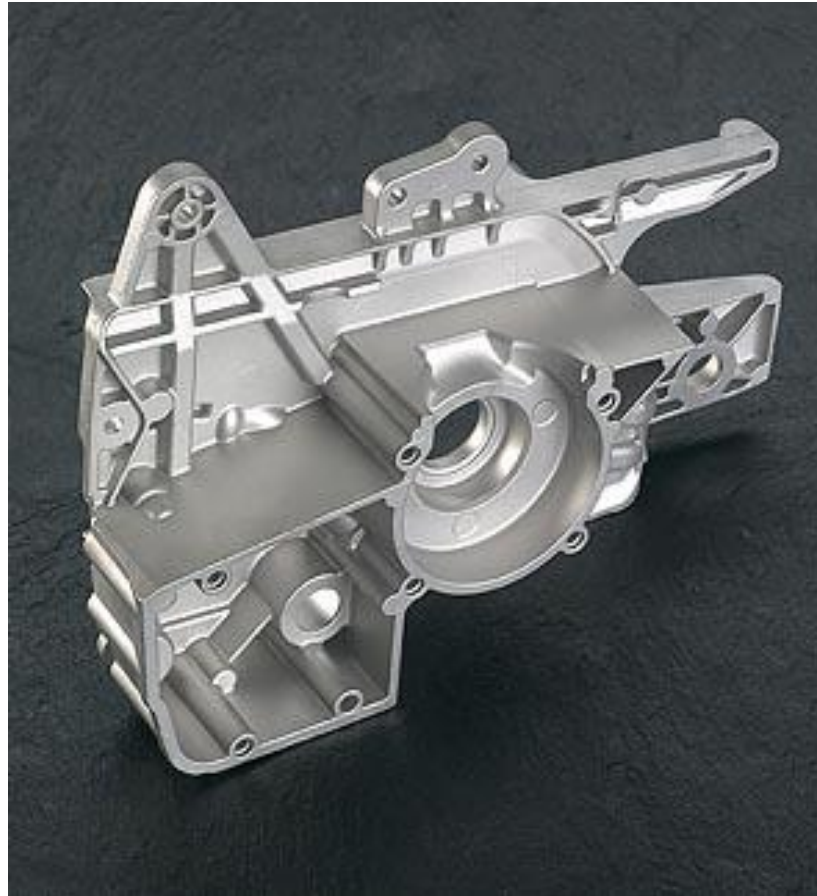
**Steering shaft
support**

Examples of Pressure tight castings



Transmission cover

Examples of Pressure tight castings



Housing

Machine preconditions concerning Pressure tight castings

- Squeezing program via core puller valves
- Spraying program and tools
- Intensifier profile adjustable
- Shot end $V_2 = 3 \text{ m/s}$
- Reserve in accumulator and in injection force

Squeeze Program

This software allows the drive of a squeeze cylinder.

What is a squeeze cylinder?

By moving a compression pin into the cavity, the metal is further compressed. Therefore porosity and air bubbles are squeezed together.

This option includes software and electric and hydraulic connections. The die must be prepared for the squeeze process.

A9 SQUEEZE CASTING		15.05.2000 15:26:05	
01	Preselection, squeeze cylinder 1		N
02	Start delay, squeeze cylinder 1	1,0	s
03	squeeze time	20,0	s
04	Lubrication time, squeeze cylinder 1	6,0	s
05	Preselection, squeeze cylinder 2		N
06	Start delay, squeeze cylinder 2	3,0	s
07	squeeze time	5,0	s
08	Lubrication time, squeeze cylinder 2	6,0	s

Locking unit	Ejector	Ejector graphic	Guards	Core pullers	Die height	Squeeze casting
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C. Surface Aluminium casting

In the past:	Aluminium castings only applicable for decorative parts on a very limited scale
Today:	Production of decorative parts for subsequent powder-coating or KTL-finishing
Application:	- Protective hoods for hand circular saws - Plug housings for electronic switch cabinets - Wiper fixings for cars - Motor housing for electric tools
Advantage:	- High component sturdiness - Corrosion resistant - Low part weight - 100 % recycling ability
Precondition:	- Process-safe production - High piston velocity > 5 m/s

Examples of Surface decorative casting



Motor housing



Protective hood



Fixing for wipers

Examples of Surface decorative casting

**Base cross
for office chair**



Examples of Surface decorative casting

**Base frame for
wood working
tool**



Machine preconditions concerning Surface decorative casting

- Spraying program and tools
- Shot end $V_2 = 5 \text{ m/s}$ (high constancy is required)
- Dynamic shot end (or short sleeve with spacer)

Statistic process control

G3 SPC CONFIGURATION 25.02.2000 10:23:30

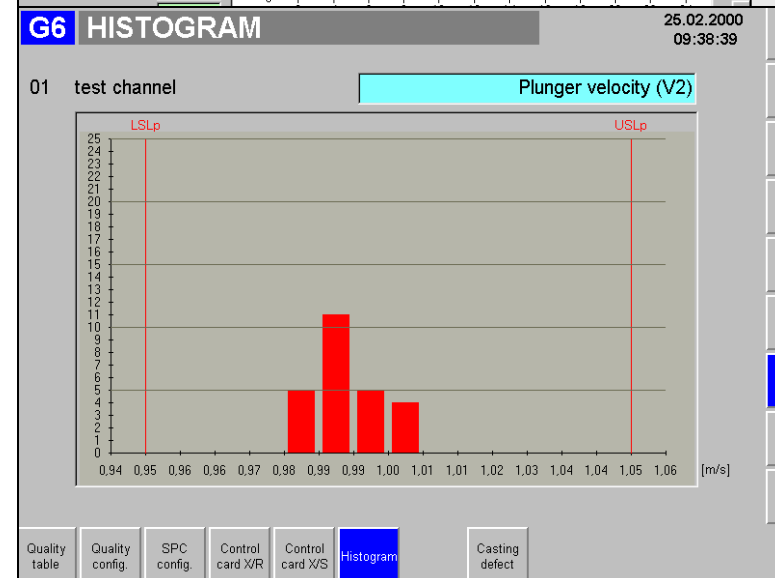
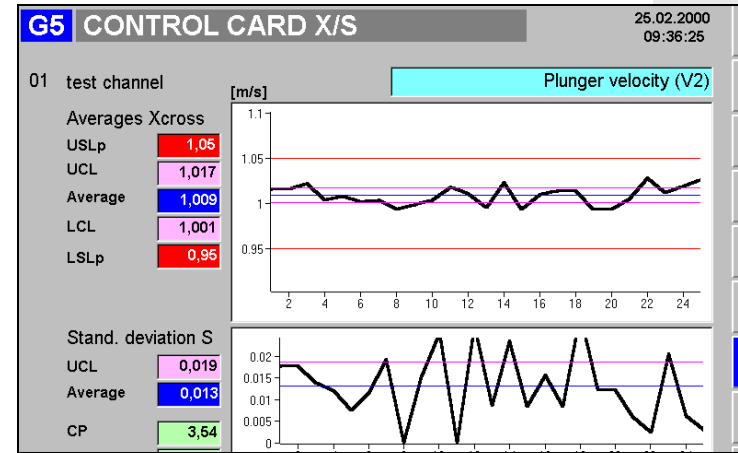
01	Casting pressure (P0)	N	Casting pressure (P3)	N
03	Pressure rise time (t3)	N	Plunger velocity (V1)	N
05	Plunger velocity (V2)	Y	Plunger stroke (s1)	N
07	Die temperature 1 (T01)	N	Die temperature 2 (T02)	N
09	Die temperature 3 (T03)	N	Die temperature 4 (T04)	N
11	Die temperature 5 (T05)	N	Die temperature 6 (T06)	N
13	Die temperature 7 (T07)	N	Die temperature 8 (T08)	N
15	test cycle	3	test quantity	2
17	test channel	Plunger velocity (V2)		
	min tolerance	2,90 m/s	max tolerance	3,50 m/s
18	LSLp	3,1 m/s	USLp	3,3 m/s
20	Tolerances to spec. limits	N	Spec. limit to tolerances	N

Quality table | Quality config. | **SPC config.** | Control card X/R | Control card X/S | Histogram | Casting defect

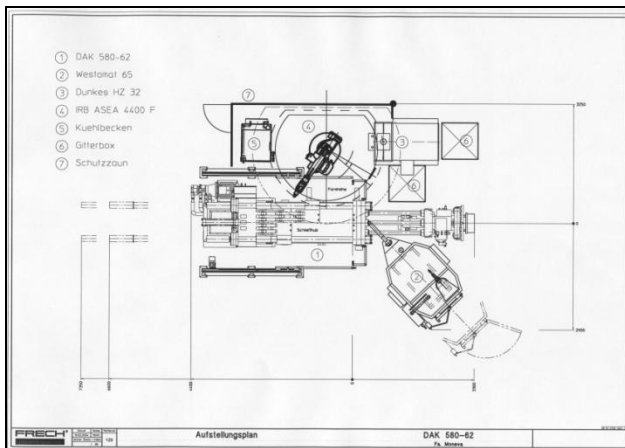
The SPC card proves and documents the capability of the casting process.

Up to 14 parameters can be controlled and displayed in graphics :

- X/R
- X/S
- Histogram



3. Automation - Cells -

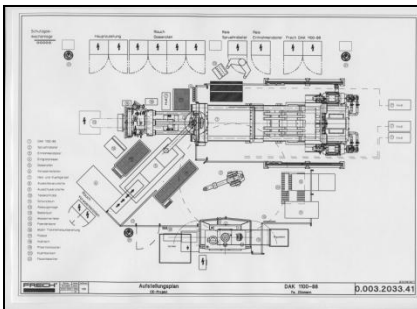


DAK 580 in Germany – Co. Moneva



DAK 1100 in Germany

ZITZMANN
DRUCKGUS



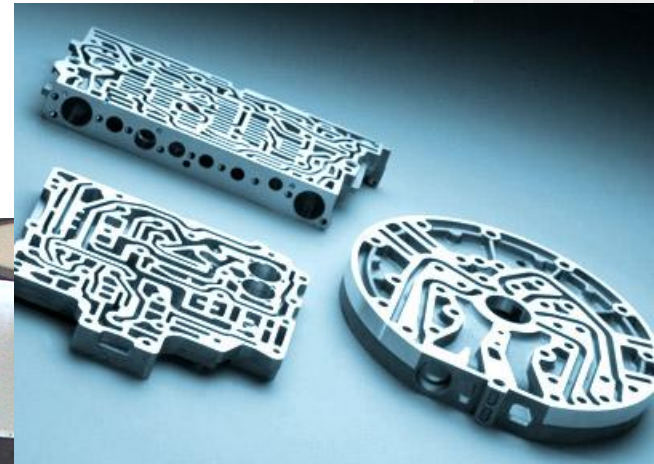
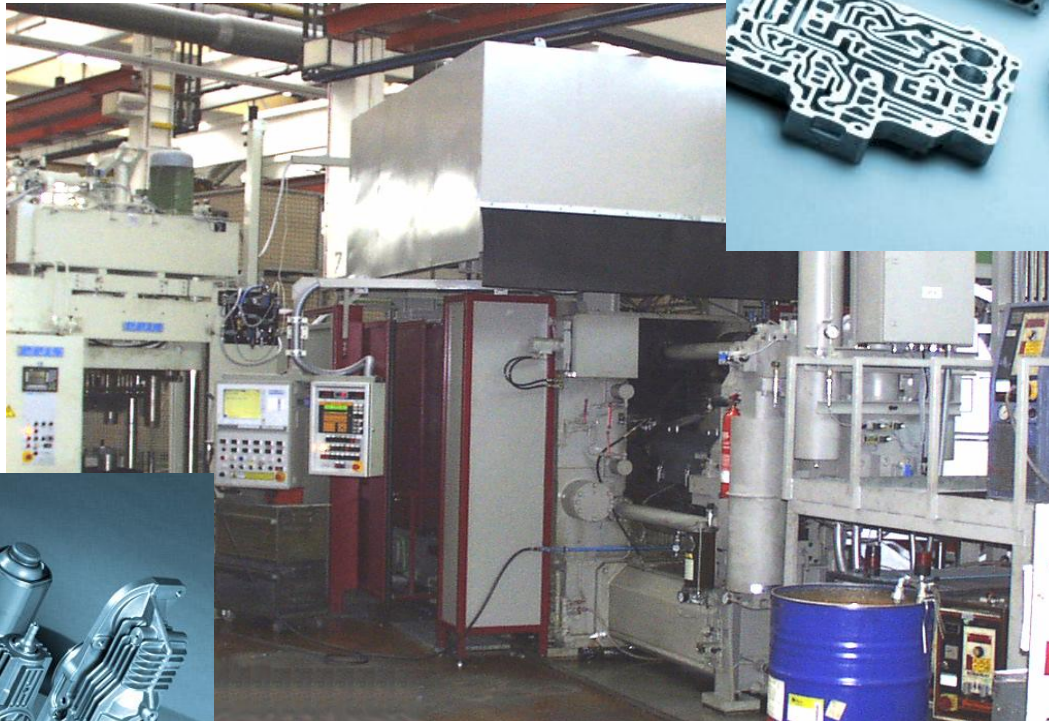


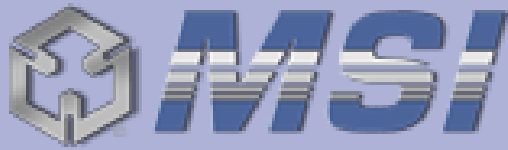
Kompetenz in Blech und Guss

FRECH®

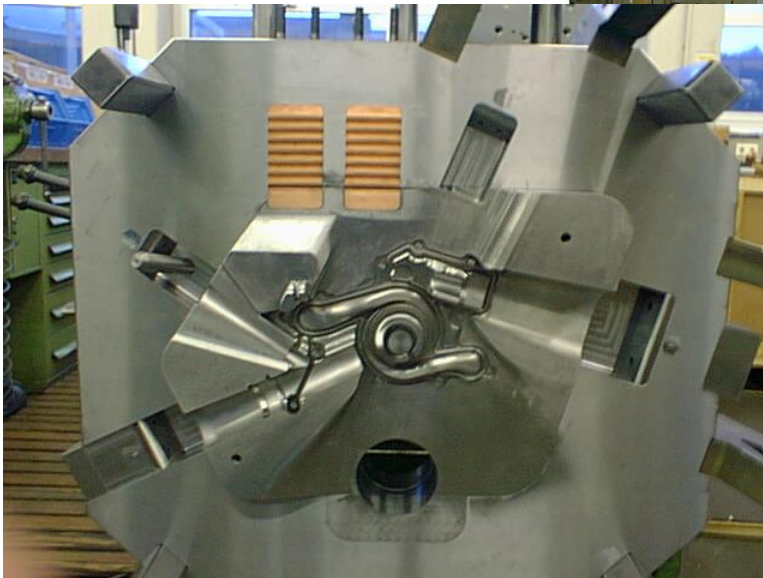
Ahead in Diecasting Technology

DAK 720 in Germany





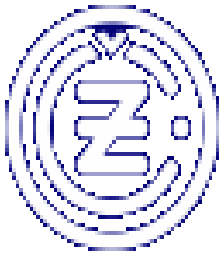
Water pump



DAK 720 in U.S.A

DAK 1600 in Spain





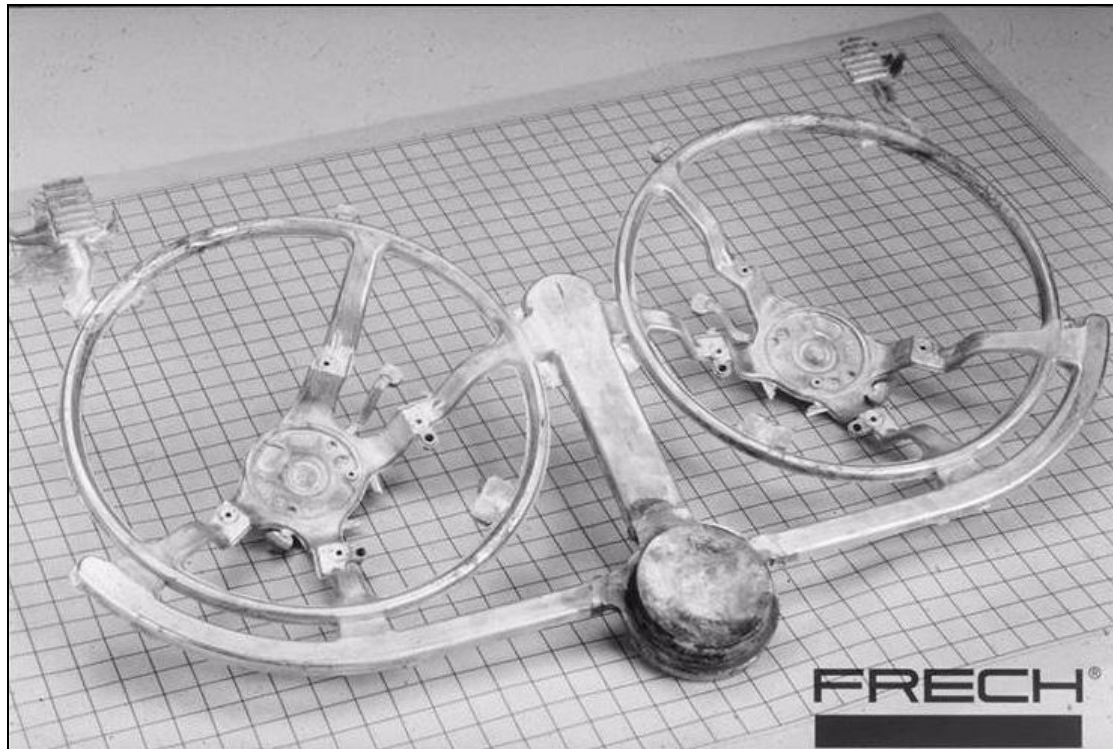
ÖZ a.s.



DAK 880 in Czech Republic



DAK 880 in Germany



Steering wheels
in Mg

Casting cells in Germany



Co. Schefenacker DAK580



Co. Eisenmann DAK880

LAUKÖTTER GUSSTECHNIK

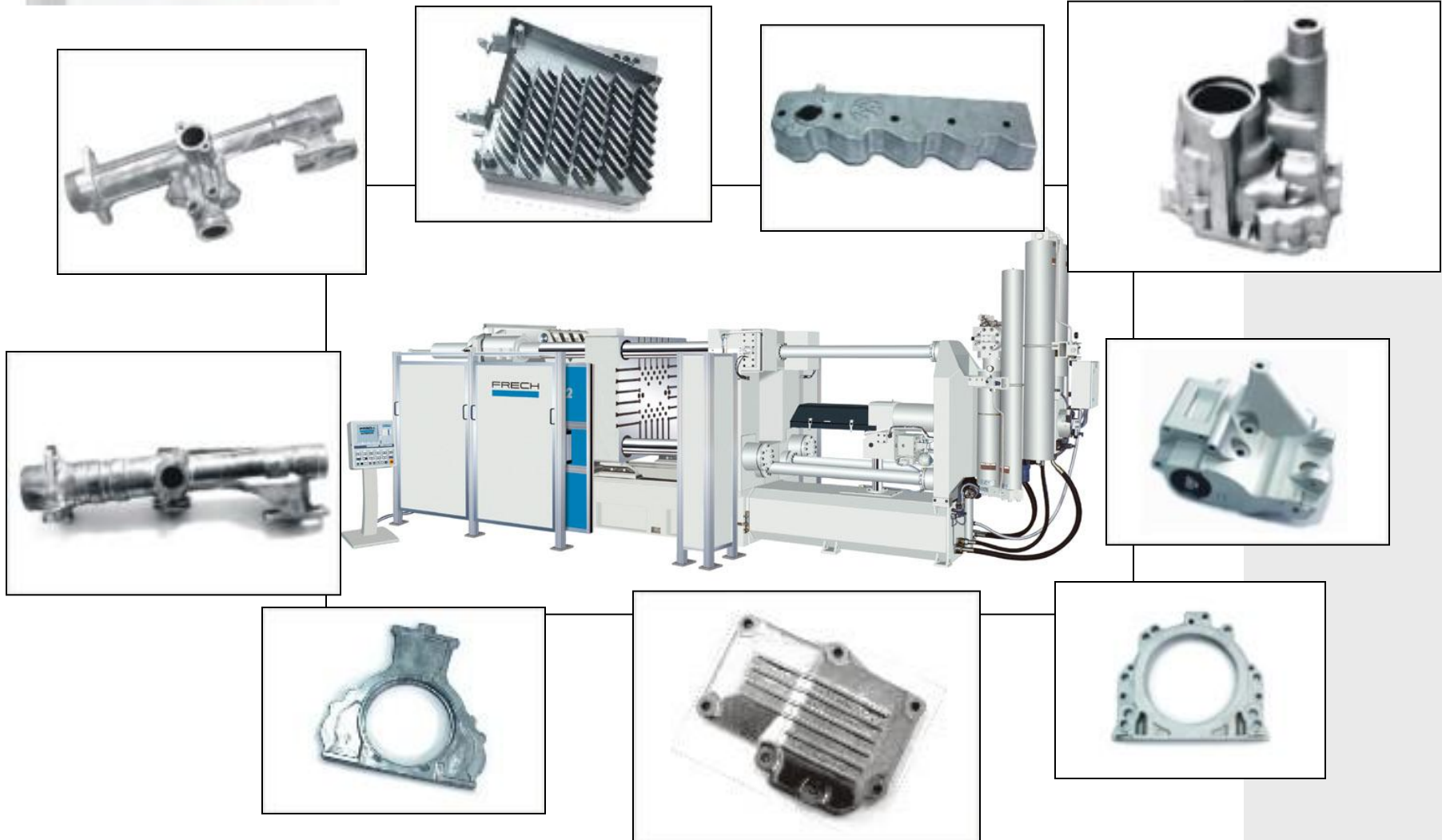
DAK 880 in
Germany



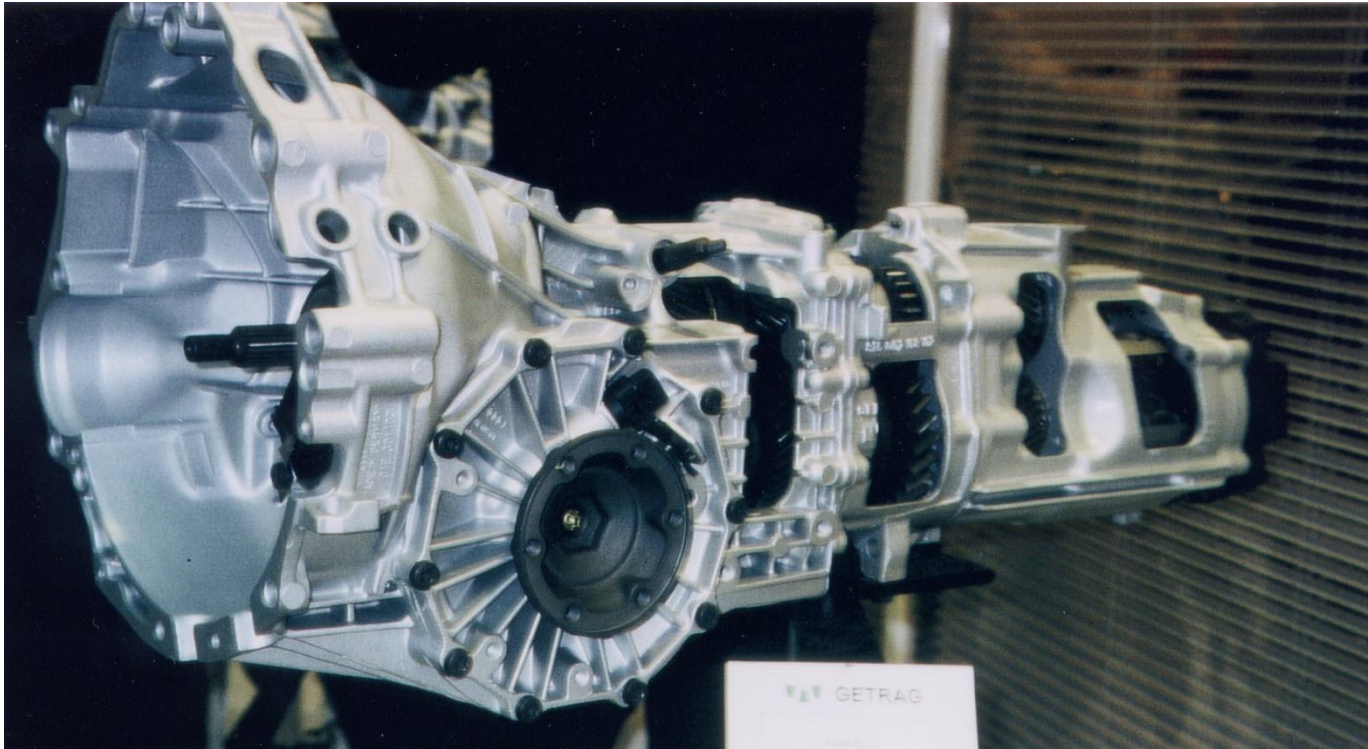


Automotive industry

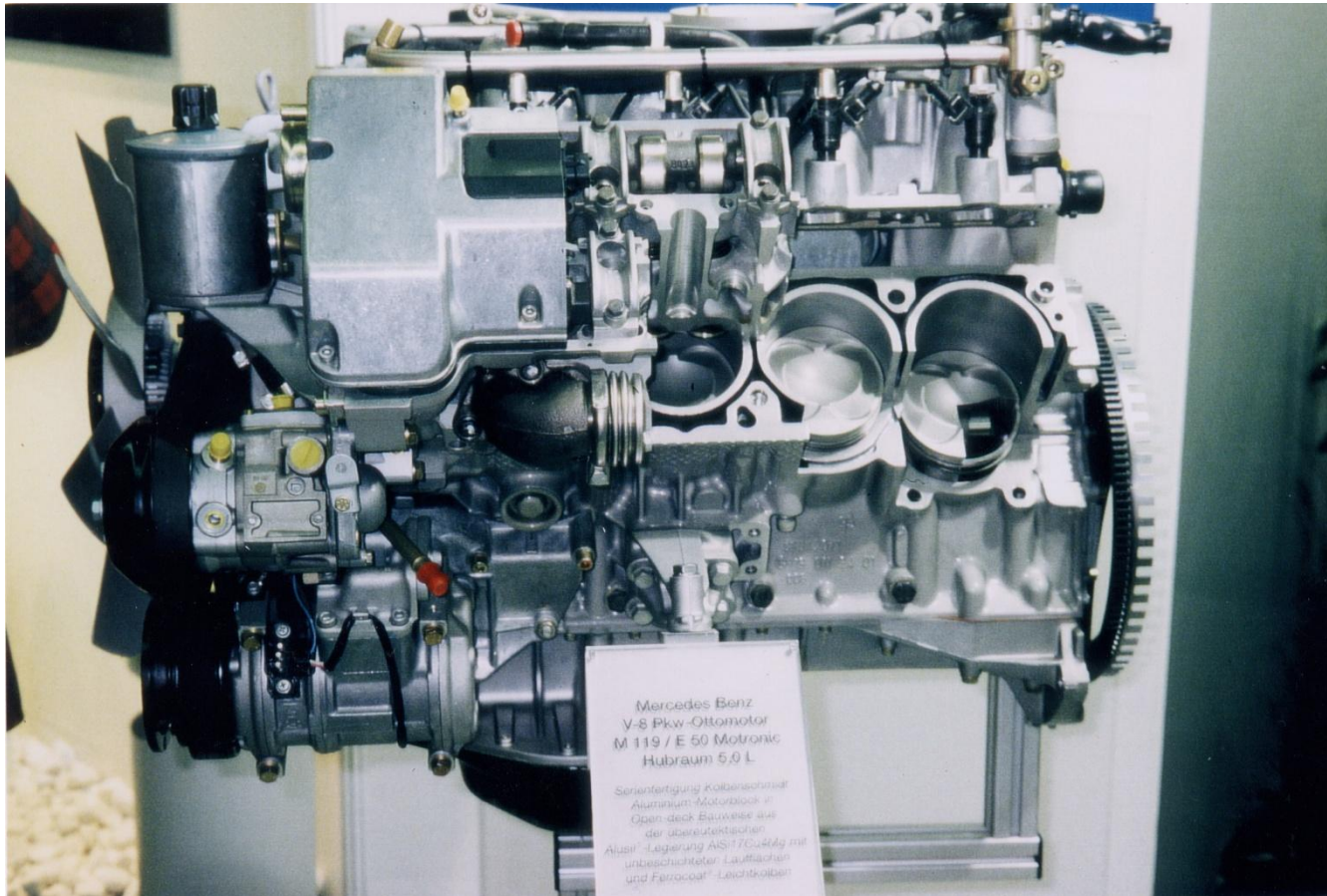
DAK 1250 in Brazil



Gear box housing



Engine block



4100 to in Germany





Metal Technologie



TAIME

ERALMETALL



trimet



ThyssenKrupp



End

For your kind attention many thanks

and all the best for a prosper and successfull
future in the challenging world of die casting