“Short Market Overview Gigacasting and Giga Presses in the Automotive Industry”

Information compiled by anp management consulting GmbH, Essen, Germany

Essen, 2nd of November 2023

Experts in Market Intelligence & Benchmarking

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The global market for EV chassis integrated die-casting is projected to be worth $2.6 billion by 2030, from $751 million currently.

Source: Minsheng Securities

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The global aluminium die casting market was worth almost $73 billion last year and is projected to top $126 billion by 2032, according to an AlixPartners analysis based on Apollo Reports data.

Source: Apollo Reports

Latest News

2023

- LK Machinery has recently unveiled their massive 16,000-ton Giga Press
- Xiaomi has installed two 9,100 ton machines from Haitian to manufacture its upcoming EV.
- Subaru has announced interest in Gigacasting technology. Nothing confirmed though.
- The new Linamar facility in Welland, Ont., will be the first North American auto parts supplier-owned and operated gigacasting plant.
- A 6.100 t Gigapress with the Ford brand printed on it, had been assembled and was being tested in IDRA's plant in Travalgiato, Italy.

Giga Press Costs

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How much does a Giga Press cost in China?

- 6,000 ton ~ € 6,000,000 (DCC 6000 Impress Plus L.K.)
- 9,000 ton ~ €10,500,000 (estimation)
- 12,000 ton > €14,500,000
- 16,000 ton ~ € 20,000,000 (estimation)
- The die casting peripheral equipment costs are about € 8 mio.
- The logistic costs of a Giga Press from IDRA are approx. 10-15% of the value of the machine.
- The tooling costs are one of the largest contributors to the part price. Gigacastings rely on AlSi7CuMg for Tesla or AlSi7MnMg for OEMs like Volkswagen or Volvo.
- At the same time, the gross win rate of large die casting machines is 10-15 points higher than that of ordinary die casting machines, and the net win rate is between 15-20%.

Sources: 6,000 ton: LK Machinery, 12,000 ton: Horizon Insights

Giga Press Facts

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For OEM Giga Presses it can be generally estimated an annual production of about 120,000 parts for these components, depending on the plant sizes.

- This figure p.a. is variable:
  - The thickness of the components is crucial; thinner parts solidify faster than thicker ones.
  - The component's shape is also significant.
- Each part takes about two minutes to produce.
- Considering all the changeover times and full plant availability, this leads to the mentioned parts number.
- A vehicle manufacturer targting an annual production of 500,000 BEVs - with a part for the rear – would require four to five Giga Presses.
- If they also want parts for the car's front, they'd need to double number of machines.
- Each press can of course produce various components by switching the moulds.

Major Machinery Supplier

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Currently the market is dominated by Asian Supplies, considering that IDRA is owned by L.K. Holdings.

- Bühler, Switzerland (LINK)
- Guangdong Hongtu Technology (Holdings) Co. Ltd. (LINK)
- Ningbo Haitian Precision Machinery Co., Ltd., China (LINK)
- IDRA (owned by Chinese L. K. Technology Holdings Ltd.), Italy (LINK)

  IDRA has so far signed orders for 25 presses, 21 of which have already been produced and shipped, including to leading "Tier 1" parts makers.
- Shibaura Machine, Japan (LINK)
- Ube Machinery Corporation Ltd., Japan (LINK)
- Yizumi, China (LINK)

Japanese auto supplier Aisin said Sept. 2023 that it will start using "gigacasting to produce aluminum components for electric vehicles.

Press research

- AISIN to invest $3.4B over next three years in BEV and intelligence products; move to gigacasting.
- The supplier intends to revamp its product portfolio, and will establish BEV products, safe and comfortable entry, and braking systems as growth areas.

Additional Information:

- Aisin aims to achieve sales in the order of US$37.2-40.6 billion by 2030.
- Major initiatives in the BEV area will include: eAxles and braking sytems.
- AISIN has been planning and conceptualizing functionally integrated body components using “Gigacasting” to reduce the number of components.

Bühler announced the order of four Carat 610 extended megacasting solutions from one of the largest OEMs for their US operations.

Press research

- **Handtmann**, the largest family-run light metal foundry in Europe, is the first Tier 1 that has invested a mid-double-digit million amount in Megacasting.
- The investments include both an optimized infrastructure and the acquisition of a Bühler Carat 610 extended at the technology site in Biberach.

Additional Information:

- The acquisition of a Carat 610 extended with 61,000 kN clamping force and a shot weight of up to 128 kg of aluminium will enable the production of ever larger structural parts, such as large battery housings for EVs or megacastings, such as the complete rear or front underbody.

- The Carat 840 die-casting machines provide 8,400 tons locking force and are capable to inject over 200 kilograms of liquid aluminum into a mold, producing a new component for an automobile within less than two minutes. 120 trucks are necessary to transport the machine on the road to the client.

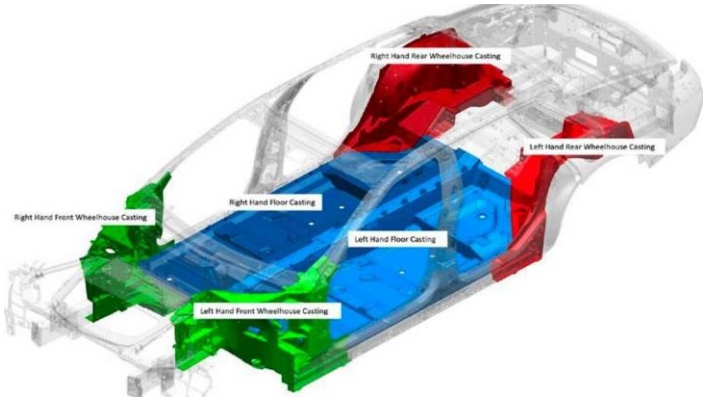
Cadillac takes a page from Tsla’s book, uses mega castings on Celestiq.

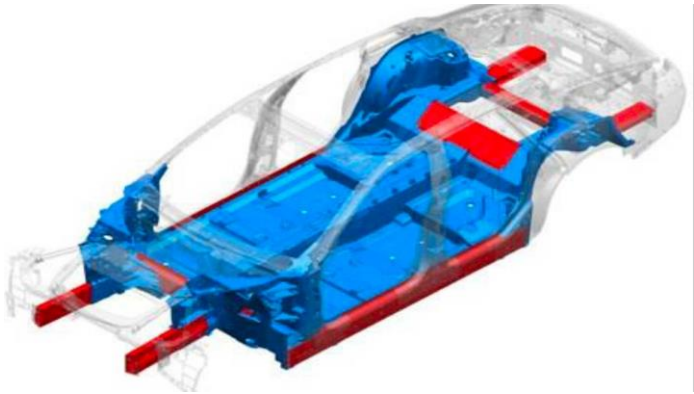
Press research

- The ultra-luxury flagship's production processes also include the 3D printing of 115 parts and a procedure called Flex Fabrication.

Additional Information:

- In designing the Cadillac Celestiq's underbody frame, GM is using what it describes as "mega precision sand casting" technology, which has cost and design flexibility advantages in low-volume applications, GM officials said.
- The GM car's entire lower structure combines six fairly large castings including front and rear structures connected to two 8 ft long (2.5 m) castings, which are adhesively bonded and spot-welded into a single floor pan.
- The CELESTIQ underbody includes six large precision sand-cast aluminum components.
- Each casting reduces part count by 30 to 40 components, compared to typical stamped construction.
- The benefits being more efficient use of space, simplicity and improved structural rigidity.
- The CELESTIQ precision sand-casted content and processes are ideal for low volume, handcrafted, bespoke vehicles.

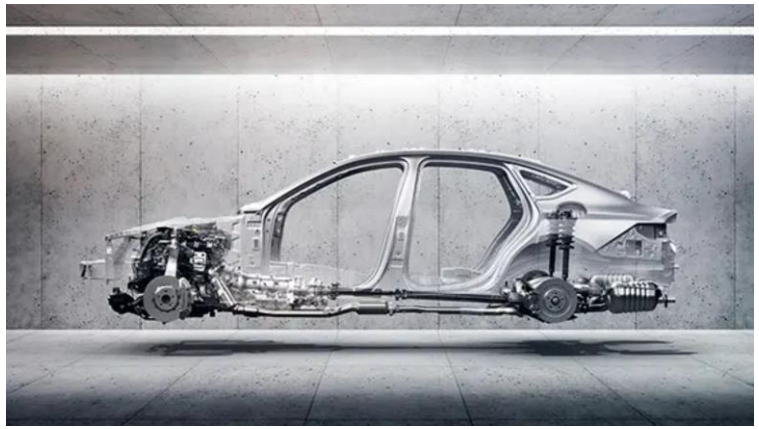




Hyundai to introduce Tesla-style ‘Hypercasting' in 2026.

Press research

- Hyundai Motor will begin mass-producing cars in 2026 using 'hypercasting', a process inspired by Tesla's car production method. The process involves injecting molten aluminum alloy into casting molds that harden into the vehicle’s frame.



Additional Information:

- Hyundai will build its own casting, machining and assembly production plant so that hypercasting can be applied to mass production. It plans to finalize a site this year and break ground 2024. Potential sites include an idle site in the existing powertrain division.

- The company already filed for the “hypercasting” trademark with the United States Patent and Trademark Office on August 21, 2023.

Lexus shows first ‘gigacast’ electric vehicles with new-generation battery tech.

Press research

- The electric Lexus LF-ZC and Lexus LF-ZL concepts have been revealed at the Japan Motor Show in Tokyo and will be the luxury brand’s first vehicles to use a Tesla-like ‘gigacasting’ production method on an autonomous assembly line.

Additional Information:

- That production method is now public with a pair of new generation EV vehicle concepts using a ‘gigacasting’ process for a new modular structure as part of that fundamental change.
- Lexus LF-ZC and LF-ZL will use gigacasting to create a new modular structure that is split into front, centre and rear sections. Lexus says gigacasting has enabled more flexibility in the component layout and therefore look of both concepts, which leads to better interior space – including a flat floor – and superior drivability. That includes a ‘prismatic’ battery pack that is positioned low and central in the vehicle.
- Toyota, parent company of Lexus, produced its first prototype gigacast vehicle earlier in 2023 at its Myochi, Japan plant after announcing in June 2023 that it would adopt the manufacturing technique.

Mercedes is planning to use mega-casting for its EQXX concept car.

Press research

- The EQXX was unveiled at the Consumer Electronics Show in January 2022 and is a technological showcase that aims to achieve a range of over 1,000 km on a single charge, using a battery pack of less than 100 kWh.
- Mercedes-Benz is reportedly working on megacastings for its EQS electric sedan, which will have a single-piece rear structure that weighs 50 kg and replaces 40 parts.

Additional Information:

- The body structure employs a megacasting in the rear that, unlike the one in the Tesla Model Y, features "bionic design."
- The team utilized ZBrush "digital sculpting" software to shape this megacasting, as well as the cast front shock towers, die-cast rear shoulder-belt anchors, and the 3-D-printed aluminum windshield wiper motor support.
- Mercedes-Benz is also working on a new project called Bionicast, which applies bionic engineering principles to optimize the design and material usage of mega-castings.
- The project aims to create parts that are lighter, stronger, and more efficient than conventional castings.

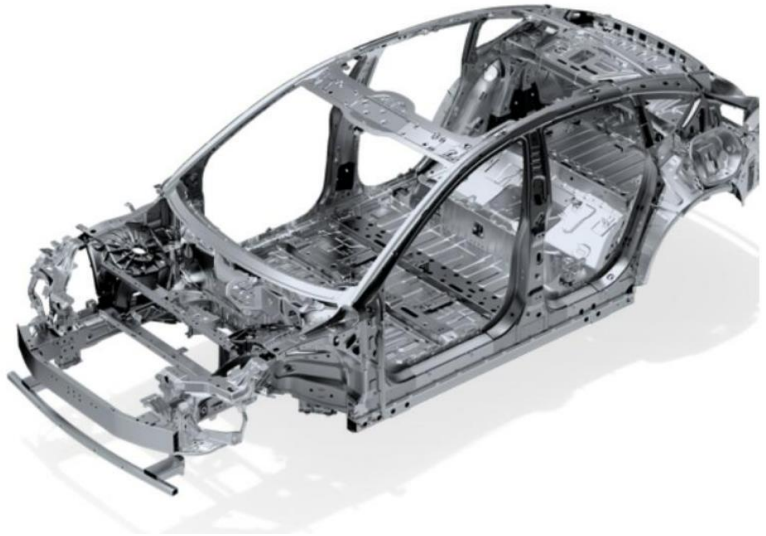
NIO has ordered injection molding machines capable of 12,000 tons of force from IDRA.

Insights of Giga Press

- Guangdong Hongtu Technology announced that it has signed an agreement with LK Technology, the parent company of Idra, to provide 6,800-ton die-casting machines to NIO.
- NIO aims to use mega-casting for the Nio ET5 rear sub-frame and possibly for the ET7 sedan

Additional Information:

- There is nothing official to outright prove that NIO may use the machines developed and produced by GHT and LK technology. However, GHT has made it clear that it is an official supplier, though it hasn't provided details about what it may be supplying this brand.
- NIO announced that it had successfully validated the development of a heat-treatment-free material that could be used to make large die castings.
- CnEVPost found, when checking the ET5's technical specifications, that the ET5's rear subframe uses a so-called integrated hollow cast aluminum process.
- The car does utilize an integrated hollow-cast aluminum rear sub-frame which reduces weight by 13 kilograms and permits 11 liters of storage in the trunk.



ET5's single-piece casting

Japan's auto parts maker Ryobi to 'gigacast' EV body components.

Press research

- Ryobi, a major Japanese supplier of aluminum auto parts, will produce large EV body parts using "gigacasting," in order to reduce the manufacturing cost of a car body by 20%.
- The UB6500iV2 Die Casting Machine is delivered by UBE Machinery Corporation, Ltd.

Additional Information:

- Ryobi will invest about 5 billion yen ($35.2 million) to construct a building on the premises of its Kikugawa plant in Shizuoka Prefecture and introduce a molding machine with a 6,000-tonne clamping force.

- It expects to receive orders for parts mainly from domestic automakers from March 2025 following a trial run. In the future, the company intends to be responsible for the installation, operation and maintenance of molding machines at automaker plants.

UBE Machinery Profile

Name	UBE Machinery Corporation, Ltd.
Location	1980, Okinoyama, Kogushi, Ube City, Yamaguchi Prefecture
Representative	Hironori Miyauchi, Representative Director & President
Business Description	Manufacture, sale, service, and maintenance of die casting machines, extrusion presses, injection molding machines, kilns, chemical equipment, crushers, vertical mills, bulk handling machines, water screening equipment, bridges, floodgates, steel structures and other industrial machinery
Capital	6,700 million yen
Founded	January 1914
Established	September 1999
Shareholder	UBE Corporation (100%)
Number of Employees	1,200 (As of September 1, 2023)

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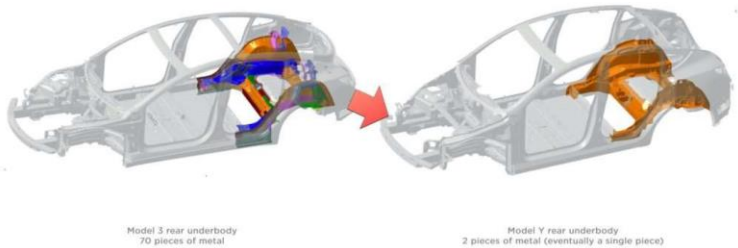
Tesla is working on 'gigacasting' tech to mould underbody in one piece.

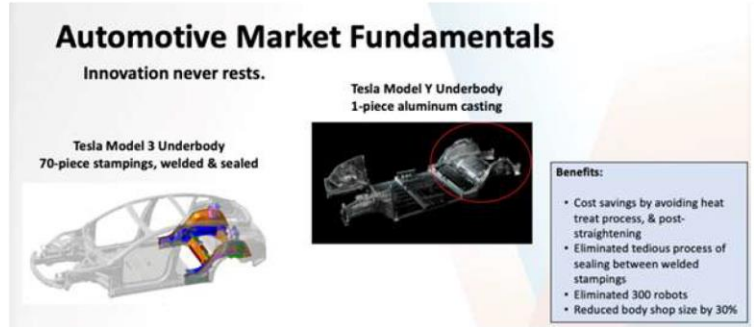
Press research

- Tesla is working on an upgrade of its "gigacasting" technology to die cast almost all vehicle underbody parts in one piece, the Shanghai Securities News reported on Wednesday citing unnamed sources close to the automaker.
- The state-owned Chinese newspaper, which based its report after a recent visit to Tesla's Shanghai factory, did not say when and where the upgrade will happen.



Additional Information:

- Tesla has pioneered the use of presses with 6,000 to 9,000 tons of clamping pressure to mould the front and rear structures of Model Y in its “Gigacasting" process.
- For Tesla, the use of a single component in the rear of the Model Y allowed it to cut related costs by 40%. In the Model 3, by using a single piece from the front and rear of the vehicle, Tesla was able to remove 600 robots from assembly.
- IDRA has already shipped 14 presses to Tesla, including two 9,000 ones for Tesla's large cybertruck production at its Austin plant, Texas, according to sources and posts by Tesla on social media.



Tesla Special

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Get your copy of the Gigapress Tesla PDF document here (Press on LINK) containing more in-depth information about IDRA and L. K. Technology Holdings Ltd..

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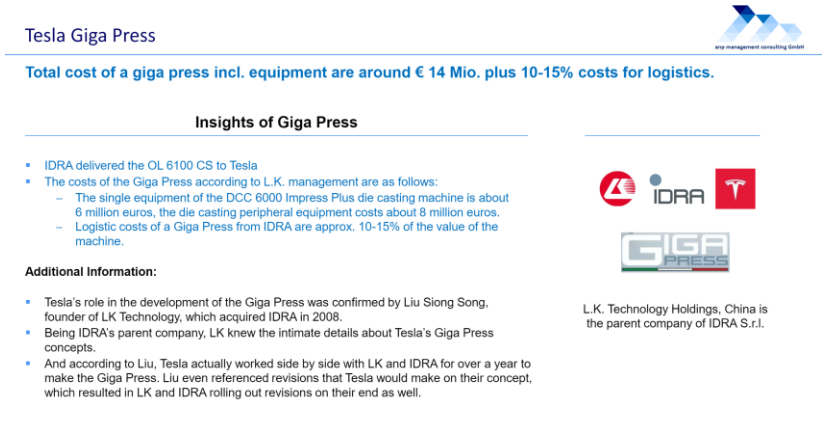


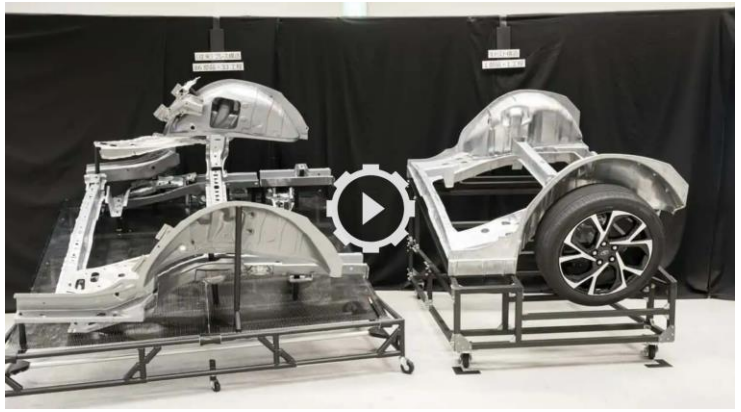
Toyota plans to adopt the megacasting technology in electric vehicles (EVs) to be sold in 2026.

Press research

- The car body is divided into three parts, and each part is made of large aluminum Molded in one piece using a die-casting machine.

Additional Information:

- Toyota envisions its EV bodies consisting of three segments: front, middle, and rear.
- Gigacasts will be used for the front and rear sections.
- A prototype of the rear section combined 86 individual sheet metal parts that normally would be assembled across 33 steps into a single large structure, and the automaker expects to do the same for 91 components in the front end.
- Toyota envisions a new process with gigacasting, along with a self-propelled production line that does away with conveyor belts entirely.
- The chassis is assembled up to the point where the motor and battery can be installed, after which the partly finished car can drive itself through the rest of the production process. This technology is partly in place at Toyota's Motomachi plant in central Japan, where new EVs are moved autonomously from assembly to inspection.



Toyota's gigacast components

VW recently unveiled their first attempt at a megacast that will eventually underpin their Trinity electric vehicle.

Press research

- Trinity will be based on an updated version of its modular electric platform (MEB) and should be up and running in 2026, by using techniques such as large die casting and cutting the number of components in its cars by several hundred.
- The megacast replaces 30 individual parts and saves about 10kg (22lbs) in weight compared to their typical manufacturing techniques. VW's machine uses 4,400 tons of compressive force, and was able to complete the megacast in 2 minutes.

Additional Information:

- While VW can produce certain models such as the Tiguan or Polo in 18 and 14 hours in Germany and Spain respectively, its electric ID.3 - made in a factory juggling six models from three Volkswagen brands - still takes 30 hours to put together.

- At the Trinity plant, multiple work steps will be condensed into one through automation, shrinking the size of the body shop and reducing the number of jobs requiring uncomfortable physical labour.

VW will use the megacasting equipment at its factory in Kassel

Volvo Car Corp has invested € 855 mio. into its Torslanda plant for megacasting technologies.

Press research

- The company has chosen Swiss supplier Bühler to provide two die-casting cells for the plant, which will be used to produce the floor structure of its electric vehicles by 2025.
- These giant presses can apply 8400 tons of pressure to press car parts and will significantly contribute to Volvo's production capabilities. The parts for each press weighed 1,000 tons

Additional Information:

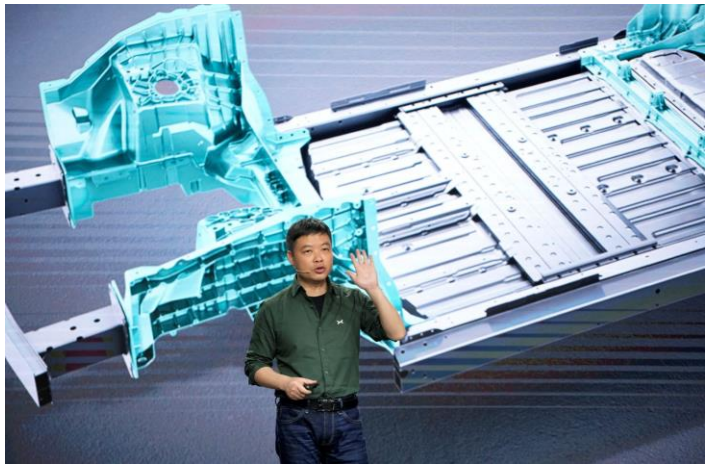
- Volvo is using megacastings for its XC90 electric SUV, which will have a single-piece front structure that weighs 45 kg and replaces 33 parts.
- Volvo expects to achieve a 15% weight reduction compared to steel solutions by using mega-casting.
- Volvo is also collaborating with Gestamp, a Spanish supplier of metal components, to develop new solutions for mega-casting. The partnership aims to create parts that are more sustainable, recyclable, and adaptable to different vehicle platforms.

Volvo’s Mega Casting process
for aluminum body parts

XPENG has ordered injection molding machines from IDRA.

Press research

- Xpeng unveiled a new platform it developed in-house for making vehicles, which it said will reduce the development and manufacturing costs for its company's upcoming models.
- The architecture includes front and rear integrated aluminum die casting technologies and integrating battery packs into the car body, which will improve the manufacturing efficiency and reduce the weight of the vehicles, the company added.



Additional Information:

- Guangdong Hongtu Technology announced that it has signed an agreement with LK Technology, the parent company of Idra, to provide 6,800-ton die-casting machines to XPENG aiming to use mega-casting for the P7 wing edition.

- There is nothing official to outright prove that Xpeng may use the machines developed and produced by GHT and LK technology. However, GHT has made it clear that it is an official supplier, though it hasn't provided details about what it may be supplying this brand.

Geely's EV brand Zeekr jumps on the 'gigapress' bandwagon.

Press research

- Geely's EV brand Zeekr is the latest to join a growing list of automakers that have turned to the "gigapress" die casting technique.
- Zeekr's manufacturing technology chief Jiang Kehong confirmed that ZEEKR had started using massive aluminium die casts to make a large rear underbody section of its Zeekr 009 six-seat, multi-purpose van (MPV).

Additional Information:

- Zeekr's machines have a pressing power of 7,200 tons and they help pump out the 009's large underbody section, which is 1.4 m long and 1.6 m wide.
- The technique had helped Zeekr eliminate almost 800 welding points, cut defects, made the car lighter, and boosted its structural stiffness, in turn improving the ride of the MPV which went on sale in China this year.
- In the future, Zeekr will use giga-casting technology on more models.

Critical Voices

Gigacasting is viewed with mixed opinions. Below are some critical perspectives.

Press research

- **Magna** is skeptical about Tesla-driven move to megacasting. The supplier's new Europe boss, Uwe Geissinger, has concerns about the car-building technique pioneered by Tesla that Volvo, others also plan to adopt.
- Magna has been very cautious when it comes to moving into so-called megacasting, which combines multiple underbody parts in one.

Additional Information:

- **Professor Wolfram Volk** from the Technical University of Munich raises concerns about the complexity of aluminium die casting and its impact on scrap rates. He also notes that gigacasting is not necessarily a lightweight solution compared to cold-forming processes or sheet-metal shells.

- The **French Automobile Distribution Federation** (FEDA) recently issued an alert about the risks of giga press technology. As per the federation, the growing practice of using giga castings in the vehicle production process carries risks for the auto industry.

"Our customers are ripping these cars [made with megacastings] apart and really taking a look at them. Obviously, if the automakers want to go that way, we will look into it. But you have got to be careful," Magna Europe President Uwe Geissinger said.

Status Quo Market Overview Gigacasting

Sources [1/2]

- China's Xpeng aims to cut costs with new vehicle manufacturing platform (LINK)
- Get To Know Megacasting – Hype Or The Next Big Thing? (LINK)
- Geely's EV brand Zeekr jumps on the 'gigapress' bandwagon (LINK)
- Giga-casting : la FEDA lance l'alerte sur les risques pour l'environnement et le budget des ménages (LINK)
- Giga-casting and robots: How Volkswagen's Trinity aims to catch up with Tesla (LINK)
- Gigacasting: A Game-Changer for Automotive Manufacturing (LINK)
- Gigacasting's Impact on Automotive Manufacturing (LINK)
- Hyundai to introduce Tesla-style 'hypercasting' in 2026
- (LINK)
- Japan's auto parts maker Ryobi to 'gigacast' EV body components (LINK)
- Lexus shows first 'gigacast' electric vehicles with new-generation battery tech (LINK)
- NIO, Xpeng Supplier Planning Massive Giga Press W/ Tesla Supplier (LINK)
- Tesla's latest disruption in carmaking draws followers in Japan (LINK)
- Tesla's "toy car" technology is in the spotlight with Toyota following suit – Will it take root in Japan? (LINK)
- Toyota Revolutionizes Car Assembly with 'Gigacasting' in Shift Towards Electric Vehicles (LINK)
- Toyota gigacasting prototype cuts production from hours to minutes (LINK)
- Toyota Wants To Use Tesla's Giga Press Technology (LINK)

Sources [2/2]

- VW shows off first megacast that will underpin Trinity EV (LINK)
- Zeekr Is The Latest Carmaker Using ‘Gigapress’ Die-Casting To Slash Costs
- Magna skeptical about Tesla-driven move to megacasting (LINK)
- Megacasting: a chance to rethink body manufacturing (LINK)
- Linamar first Gigacasting plant in North America (LINK)
- anp management consulting: Tesla Gigapress Status 2022 (LINK)

L.K. Technology

LK Machinery 16,000 ton Giga Press unveiled!

Client: Guangdong Hongtu Technology (Holdings) Co. Ltd.

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Haitian Giga Press

Haitian 8,800 tons GIGA PRESS at Haitian Open Day

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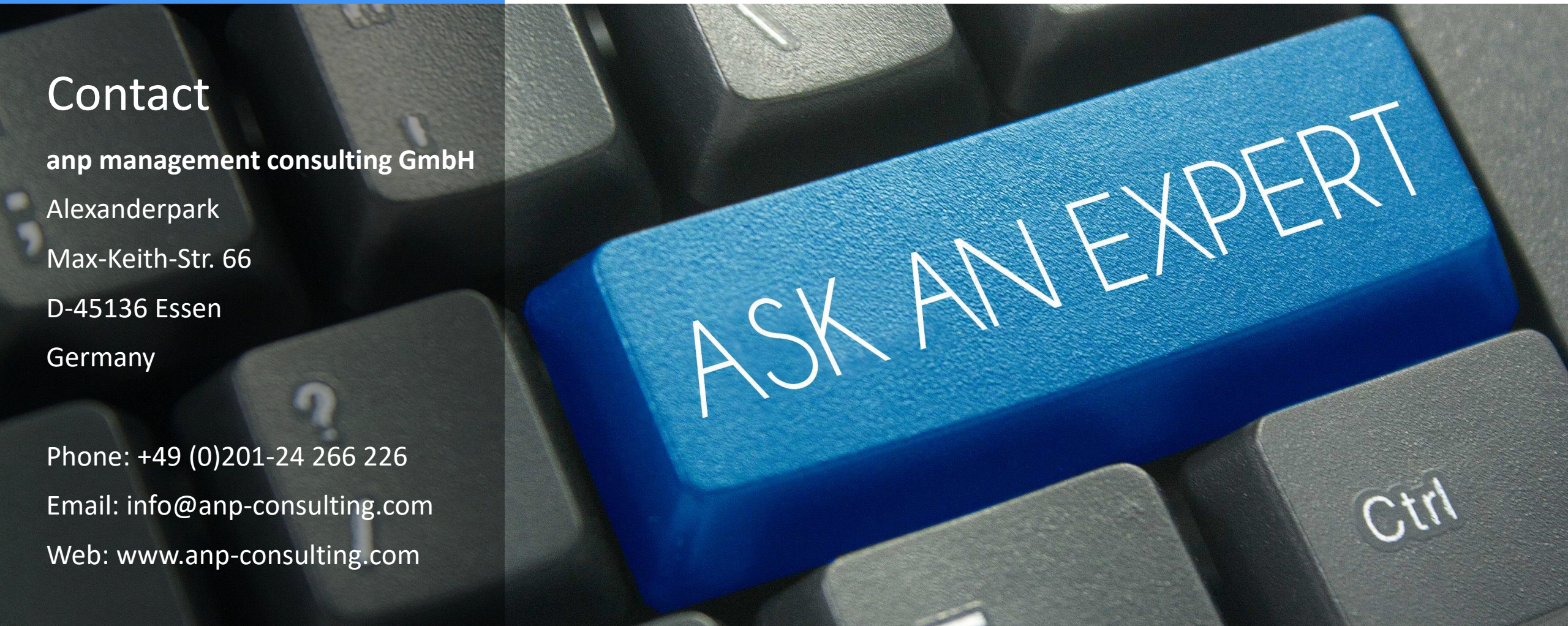

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