CMS Industries

ALFA 4C: CMS machining centres to serve a ground-braking automotive project.

Alfa Romeo Case History →

Alfa Romeo 4C

A one-off design idea.

The Alfa Romeo 4C unites a double excellence: Alfa's design capability and Maserati's productive ability. The design has been asked to provide a mechanic that exalts the "sporty" character.

At the heart of the entire manufacturing process is the processing of materials: carbon fibre, aluminium and composite materials.

Alfa Romeo 4C comes to the fore as a wholly innovative car in terms of technology and design.

Alfa Romeo's "concept" is explicitly declared by the same carmaker of the Fiat Group: "we create functional beauty at the service of extreme mechanics". In order to achieve this objective, design and technology resolve to maintain a continuous, undissolvable and mutually supportive interaction. In particular the 4C sets some records in the employment of new materials, with the aim of reducing weight without jeopardizing the overall reliability of the car, while enhancing sporty performance and cutting down fuel consumption instead.

Especially interesting is the use of innovatory low-density and high-resistance composite materials, which made it possible to reduce weight by almost 20% compared to the traditional sheet steel. Furthermore, it is a stable material which, unlike other materials frequently used by the automotive industry, does not warp in the event of slight shocks, withstands chemical and weather agents sturdily and abates noise considerably, to the advantage of acoustic comfort.

The 4C proposal fits in the strategies of FIAT Group concerning the Alfa Romeo brand perfectly: the aim is relaunching the brand worldwide as a point of reference for sports cars with superlative technological features and a distinctive personality, where tradition and innovation are interwoven with the absolutely fascinating "Alfa" identity and the made-in-Italy values. 4C does not follow the beaten tracks, no matter how comfortable: it leads the way.

CMS' capabilities in the automotive industry meet ALFA ROMEO's high expectations

The use of ultra-light next-generation materials enables the 4C to weigh as little as 895 kg (overall dry weight) and to feature race car torsional rigidity at the same time, thanks to the optimization of the barycentre to the benefit of fast paced driveability along winding paths. With this approach in mind, the FIAT Group partner companies involved in the project were requested to provide a production response in line with the distinguishing traits of the car and an exceptional level of commitment in all respects. It should also be borne in mind that the 4C is a car "within a product range" and with production numbers well over a limited series.

That is why the main suppliers carefully considered new systems capable of meeting this real challenge: machines and machining centres able to guarantee the quality levels required by the project, but also to optimize the production rates, the individual production chains and related costs.

The invariable preference for CMS technologies speaks eloquently of the various and complex manufacturing aspects, as a striking confirmation of the level of specialization, versatility and reliability required by the manifold components and types of materials of the car.

CMS machining centres prove to be the technological solution of various problems inherent in the ALFA 4C manufacturing process.

Seat frame and padding
The seat frame is made of ultra-light carbon fibre; the race car design is enhanced by high-strength lightweight padding.

Aluminium engine crankcase and chassis
Technology at the service of performance. Aluminium permits a true paradox: strength and maximum lightness at the same time. That is why the engine crankcase, the front frame and the rear frame of the chassis are made of aluminium.

Carbon fibre body
This is a natural element and the most technical material used in the automotive industry at the same time. The chassis of the Alfa Romeo 4C is made up of a carbon fibre monobloc, a prerogative of supercars, which houses the driver's and passenger's seats for a comprehensive weight of a mere 65 Kg.

CMS
POSEIDON 38/50

CMS technologies used in the production of Alfa Romeo 4C

Poseidon is a 5-axis interpolated machining centre, designed for high speed machining of large-sized aluminium / light alloy / composite material / impregnated fibre workpieces. It is highly valued in the manufacturing of patterns and structures, finishing of components for the automotive, aerospace and marine industries, as well as machining of aluminium moulds for foundries. It is characterized by a stabilized steel frame, a movable dual-rack and a gantry-handled bridge. The mechanics are especially sturdy and accurate; it offers manifold customization options and a wide range of work tables.

E.M.A.R.C

Under the Alfa Romeo 4C project, the EMARC company attended to manufacture of aluminium parts, namely the engine crankcase and the front and rear chassis frame. At the engineering department of Vinvo and the production site of Chivasso, both in the province of Torino, EMARC actively contributed to the realization of the 4C concept as regards one of the strategic factors of the project: the combination of sturdiness and lightness by means of aluminium. In view of this specific activity EMARC utilized a CMS Poseidon 38/50 machining centre (featuring X5000 - Y3800 - Z1300 strokes and a 15 kW spindle). The Poseidon machining centre has provided optimal performance in the finishing and machining of aluminium parts, in particular by meeting the exacting demands of the FIAT Group engineers as regards accuracy and tolerance values (within 0,05 mm). Much appreciated also is the width of the worktable (up to 11 metres) and the speed in workpiece machining.

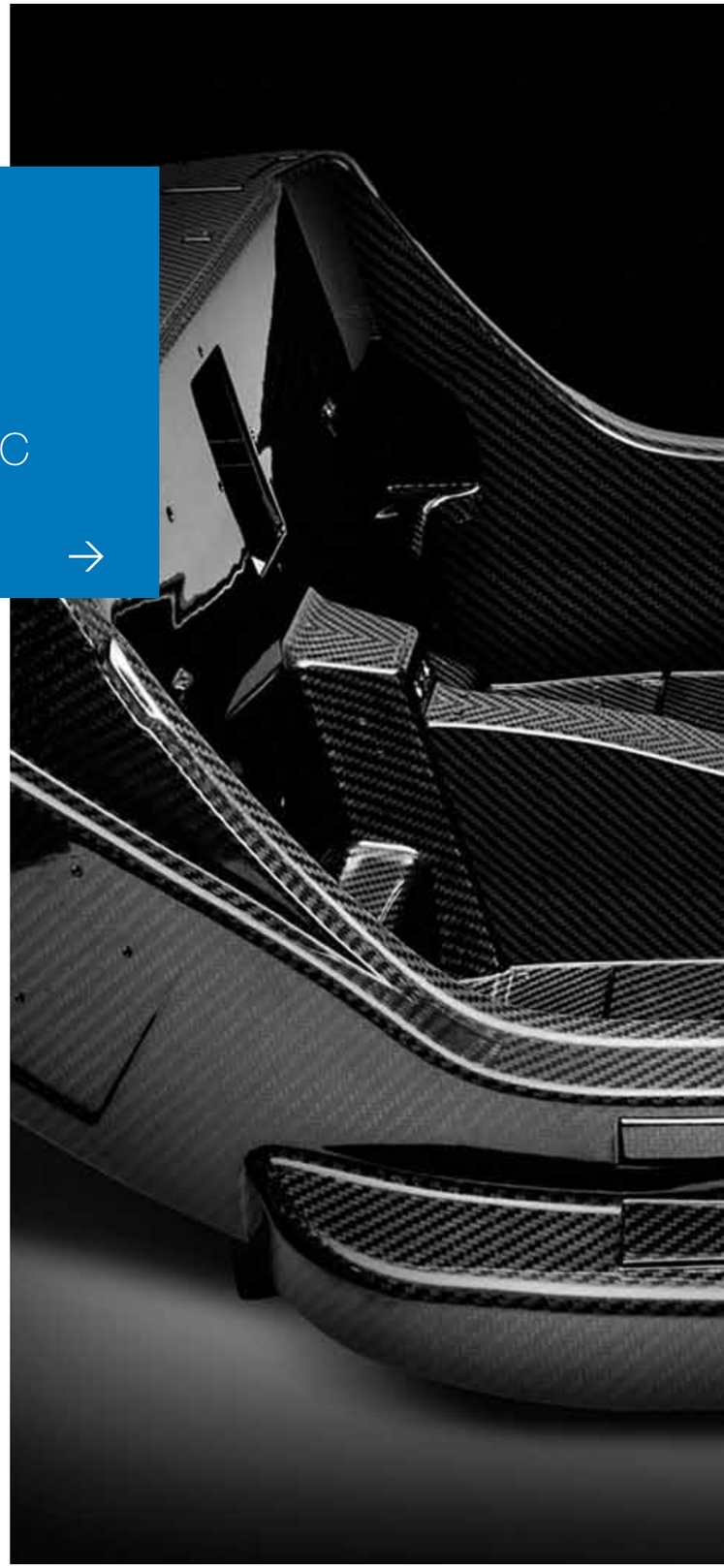
CMS
ARES LINE

A complete range of 5-axis interpolated machining centres, capable of ensuring high performance and extreme versatility in the machining of various materials and workpiece types. They are especially appreciated in the high-speed machining of small/medium-sized, light alloy / composite material / plastic material / impregnated fibre workpieces. They ensure an excellent investment-work capacity ratio. Frame, mechanical components and control systems afford high precision with the most demanding jobs too. The range also includes a model equipped with linear motors.

CMS technologies used in the production of Alfa Romeo 4C

ADLER GROUP

Adler is an industrial group of international standing based at Ottaviano (Naples), specialized in component parts made of innovative materials and dedicated to the transport sector (cars, trains and ships). It encompasses over 60 factories and 7 research centres all over the world. It is among the leading producers of parts designed to ensure the comfort and safety of cars, carrying out machining of various types on plastic, composite and carbon fibre materials. It operates in partnership with the most important car manufacturers in the world. Under the Alfa Romeo 4C project, Adler Group attends to the manufacture of the carbon fibre chassis, a single-block part that requires complex machining and finishing operations. To meet such needs, Adler opted for CMS Ares machining centres, mainly assigned to milling, drilling and marking operations. Each machining operation imposes the respect of extremely strict specifications, both relating to part design and tolerance limits.



CMS technologies used in the production of Alfa Romeo 4C

CMS ATHENA 30/15

5-axis machining centre issued from an in-depth research in the development stage: it offers high performance and optimization of the production chain with a moderate investment. The sturdy and compact structure reduces both installation and re-starting times. The worktable enables operating on medium- and large-sized parts, without any need to modify the machining centre configuration. The high-performance electrospindle guarantees excellent finishing and machining speed on all types of materials.

novation

The company is based at Montebelluna (Treviso) and is among the best known and appreciated players in the machining of innovative materials, such as injection plastics, special alloys and composite materials for the automotive and the sports equipment sectors. In the specific case of the Alfa Romeo 4C project, it dealt with some fundamental parts of the interior, among which is the seat structure (seat base and backrest), made of ultra-light high-resistance carbon fibre. Still dealing with the 4C interior, Novation Tech has the task of furnishing details and fittings, also made of carbon fibre, which complete the outfit and complement the padding assembly. As regards the finishing and machining of the seats and the above-mentioned parts, Novation Tech opted for the employment of a CMS Athena 30/15 machining centre (with X3050 - Y1500 - Z1200 stroke specifications and a 7.5 kW spindle) that reconfirmed even in the foreseen obligations of the destined supply chain for the 4C the ability to unite, more than the speed of the execution of the work, great versatility and a reduced restarting time.

CMS technologies used in the production of Alfa Romeo 4C

High-speed 5-axis machining centre, especially designed for the high speed machining of aluminium, light alloys and composite materials. It is provided with linear double-drive axes and rotary direct-drive axes. It ensures top-ranking speed and accelerations, along with high-level accuracy and repeatability. Especially appreciated in the automotive industry, also owing to the superior rigidity and extensive machinable volume.

Toscana Gomma SpA

Established provider of the FIAT Group as regards polyurethane foam dedicated to car seat padding, it belongs to OLMO industrial Group and is active in the development of innovative projects thanks to its expert know-how. As to the Alfa Romeo 4C car, it attended to the prototyping of padding based on the ergonomic design and synergy with the carbon fibre structure. For the realization of the moulds intended to yield the expanded polyurethane, Toscana Gomme exploited a CMS Cronus K 26/15 with X1500 - Y2600 - Z1200 stroke specifications and a 28 kW spindle). Also in this case, the machining centre has reconfirmed its characteristic combination of high-speed and accelerations with absolute accuracy and repeatability.

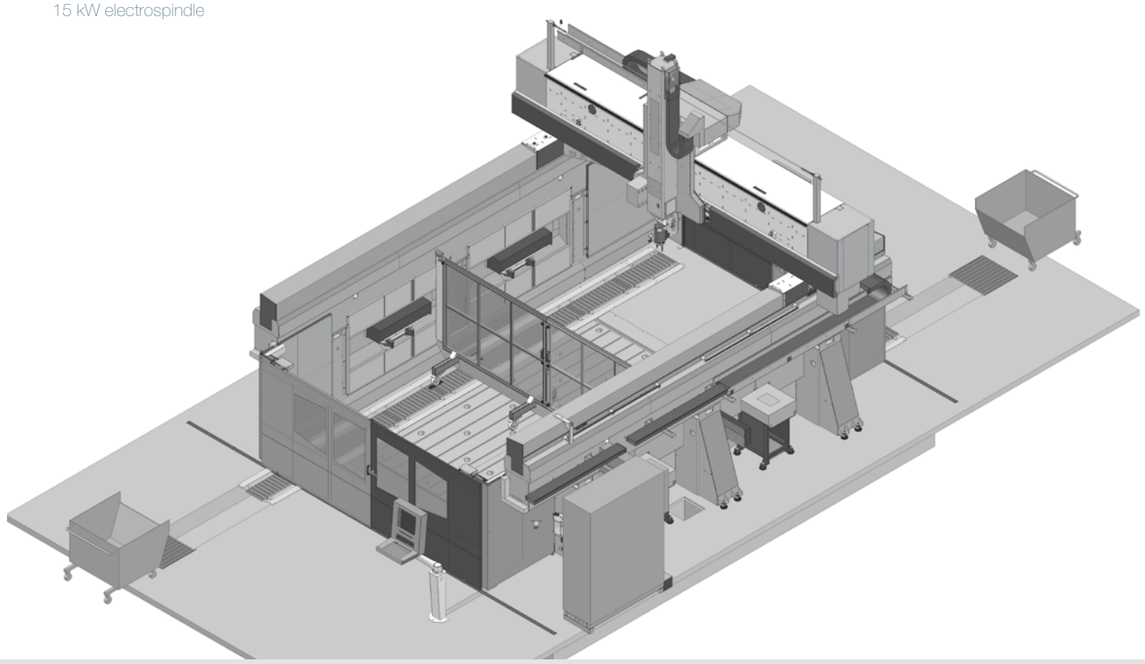
→ CMS CRONUS K 26/15

Technical data

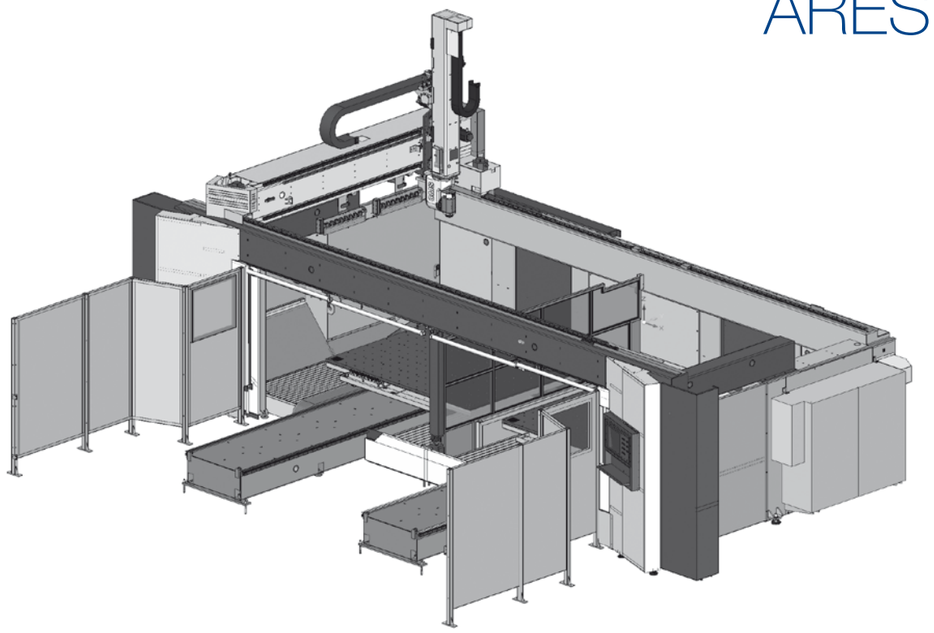
POSEIDON

POSEIDON									
MODEL	AXES STROKES					RAPID			
	(mm)			(°)		(m/min)		(°/min)	
	X	Y	Z	B	C	X/Y	Z	B	C
38/50	5000	3800	1300	±120	±270	85	45	9000	

15 kW electrospindle



ARES

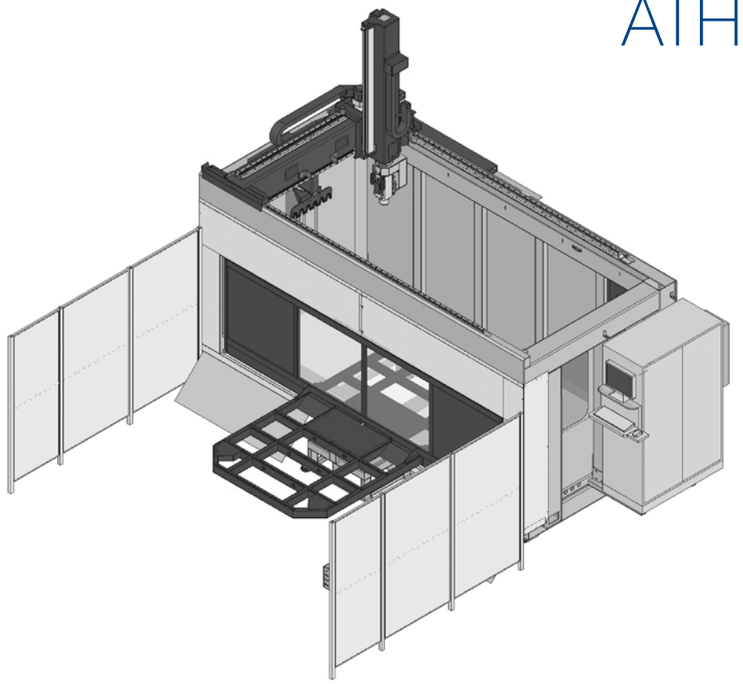


ARES									
MODEL	AXES STROKES					RAPID			
	(mm)			(°)		(m/min)		(°/min)	
	X	Y	Z	B	C	X/Y	Z	B	C
36/26	3600	2600	1200	±120	±270	80	70	9000	
48/26	4800	2600	1200	±120	±270	80	70	9000	
60/26	6000	2600	1200	±120	±270	80	70	9000	

15 kW electrospindle

Technical data

ATHENA



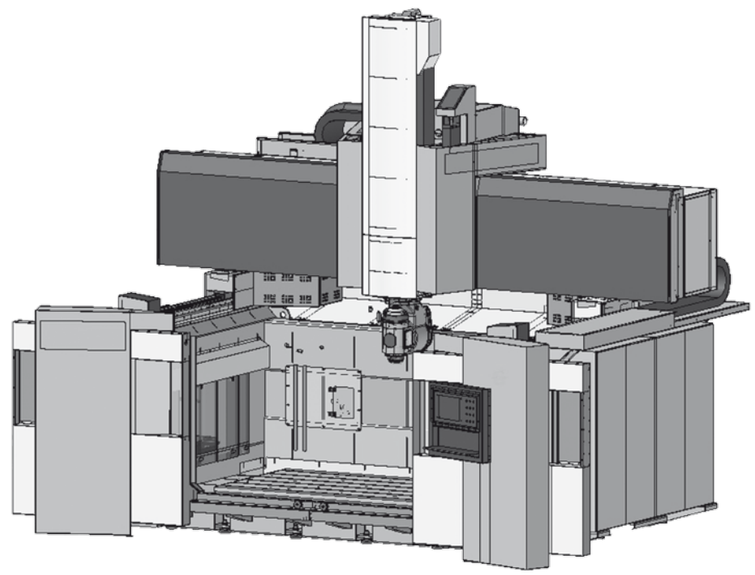
ATHENA									
MODEL	AXES STROKES					RAPID			
	(mm)			(°)		(m/min)		(°/min)	
	X	Y	Z	B	C	X/Y	Z	B	C
30/15	3050	1500	1200	±120	±270°	90	75	140 °/sec	

7,5 kW electrospindle

CRONUS K

CRONUS K									
MODEL	AXES STROKES					RAPID			
	(mm)			(°)		(m/min)		(°/min)	
	X	Y	Z	B	C	X/Y	Z	B	C
26/15	1500	2600	1200	±110	±300	85	45	36000	

28 kW electrospindle



CMS Industries

www.cmsindustries.it

CMS' experience with machining centres dedicated to the automotive industry expresses itself at the highest technological levels and continues to develop thanks to prestigious mature collaborations, established with many partners of the leading global carmakers. An extremely accurate selection of suppliers has been made by the most famous racing teams and the industrial groups which are building on innovative materials, in particular aluminium and composites, constraining manufacturers to equip themselves with cutting-edge technological solutions for their machining centres and special-purpose machinery. It is also worth noting that CMS' know-how builds on the mutual exchange of experiences and increases in value and exclusiveness in the global markets, as it applies advanced solutions to mass-production technologies intended for the standard car market.

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