

ENGLISH EDITION

FIAT CINQUECENTO





1. FERRARI TESTAROSSA
2. VOLVO 850 GLT
3. FERRARI F40
4. LAMBORGHINI DIABLO
5. OPEL ASTRA
6. BMW 850i
7. FIAT CINQUECENTO
8. BUGATTI EB 110
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AUTOMOBILIA



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Technical consultant:
Walter Beltrami
Editors:
Ippolito Alfieri, Silvia Giacobone
Photos:
Roberto Carrer, Gabriela Noris, Guy Mangiamele
Graphic design:
Giordano Barazzetti
Production:
Massimo Fabbri, Attilio Chiozza
Translation:
Jane Glover

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FIAT CINQUECENTO

Enrico Benzing

AUTOMOBILIA

THE ANCESTORS



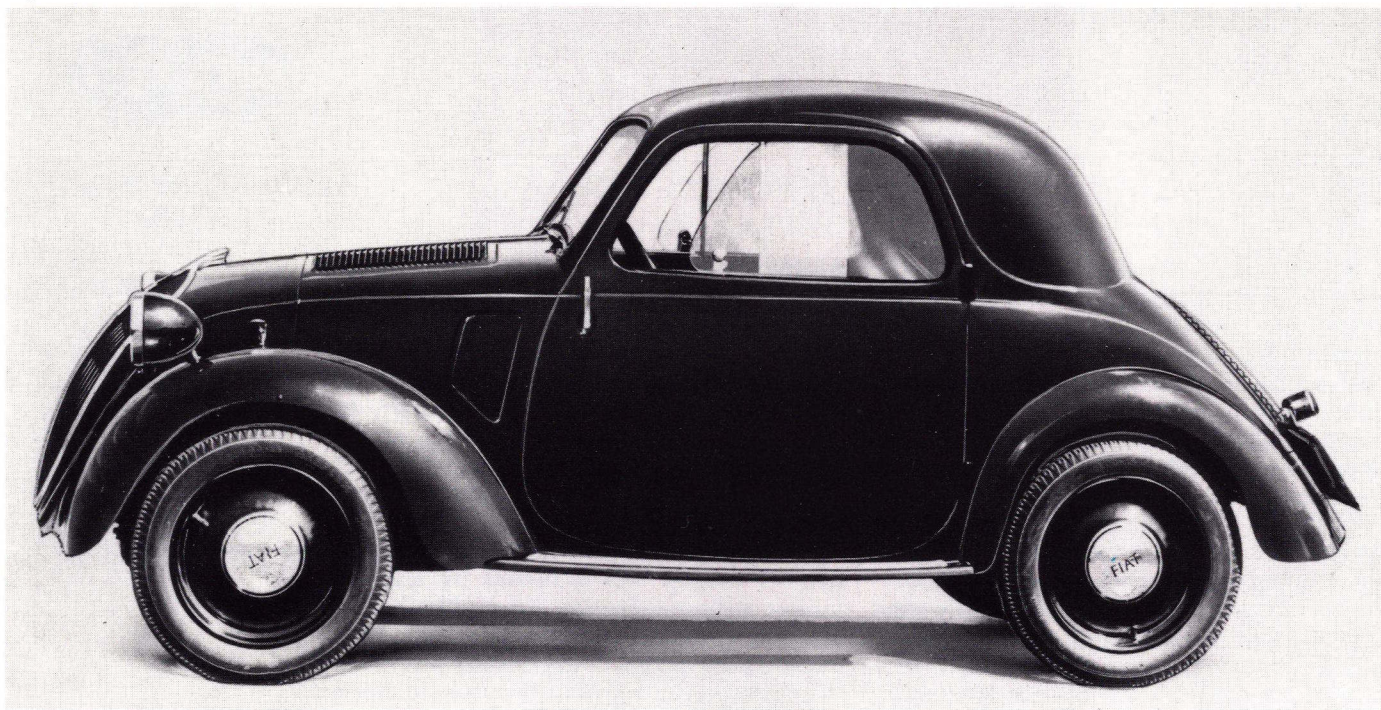
Fiat's tradition in the field of small cars is unique: at the beginning of the 1930s, the revolution brought about by mass-production techniques had already begun, and automotive engineering had started to come to grips with the small car. But the combined result of economies of scale and of operation which was to produce a modern popular car, was not yet in place. Then in 1933, Fiat's Senator Agnelli pronounced the formula for a car he wanted to build: small, very economical, priced Lit. 5,000.

For the times it was a technically ambitious plan. The industrial capacity was in place, concentrated in the Turinese factory of Lingotto, but not the conditions for designing a small car which would not be undermined by the insistence on keeping costs down. It needed a great designer, one already versed in what was to become the technology of the future: and Fiat found the right man in Dante Giacosa, a twenty-eight year old designer of special vehicles and aero engines. The operation got off to a flying start and by 7th October 1934 the

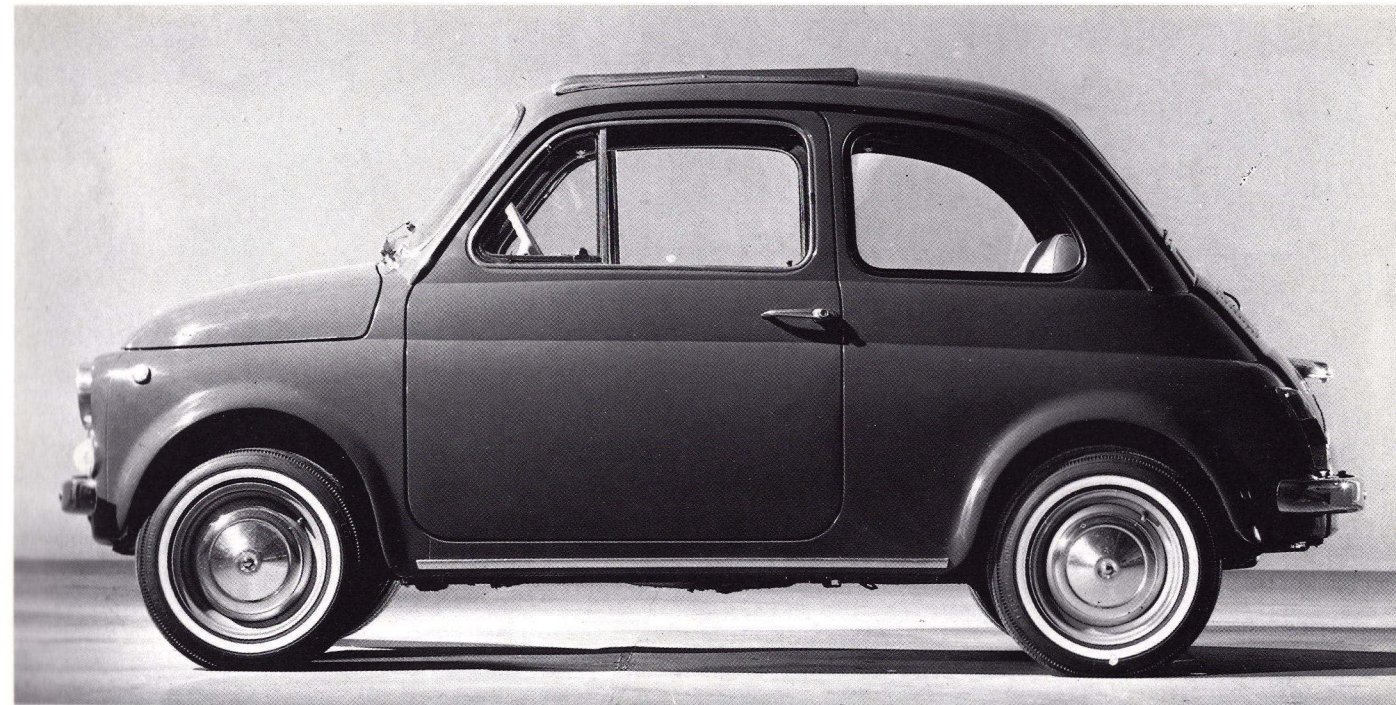
prototype of the world's first mass-produced minicar had already been built and undergone road-tests. It was actually during a motorway test that the top speed of 82 kph was produced, to everyone's great satisfaction. The project was known as "Zero A", as if to remind people of the successful Fiat Zero. The additional "A" stood for the Aero section where Dante Giacosa worked.

However, the rapid passage through the project stages was followed by slightly longer industrialisation times. Nevertheless the grand launch on 15th June 1936 caused a sensation. The little car was lovely to look at, its final list price was no more than Lit 8,900 and its technical content was observed to be excellent. It had a small 4-cylinder 569 cc engine with an output of 13 HP, was able to deliver a top speed of 85 kph with average consumption figures of 6 litres/100 km, and could carry two adults and a load of over 50 kg of luggage. This little Fiat was called simply the "500" and it still is today. The tradition continues right

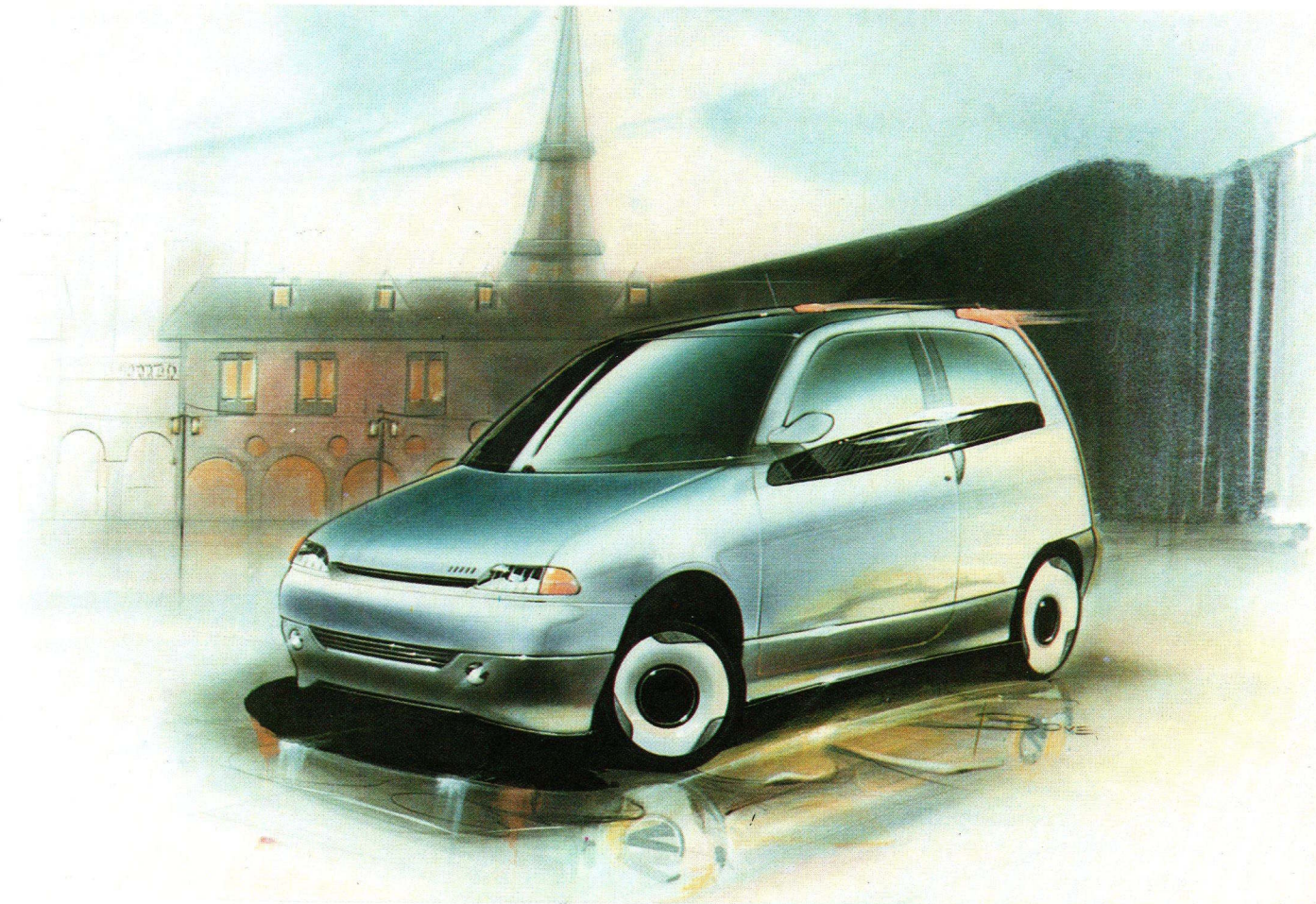
The Fiat Cincquecento (in the foreground), photographed together with its two illustrious ancestors, the 1957 Nuova 500, and the 1936 500 A ("Topolino").



The 500 A was launched in Italy on 15th June 1936. It immediately earned the nickname "Topolino" (Mickey Mouse), by which it has since been known.



The Sport version of the 1958 Nuova 500, with a sunshine roof.



THE PROJECT

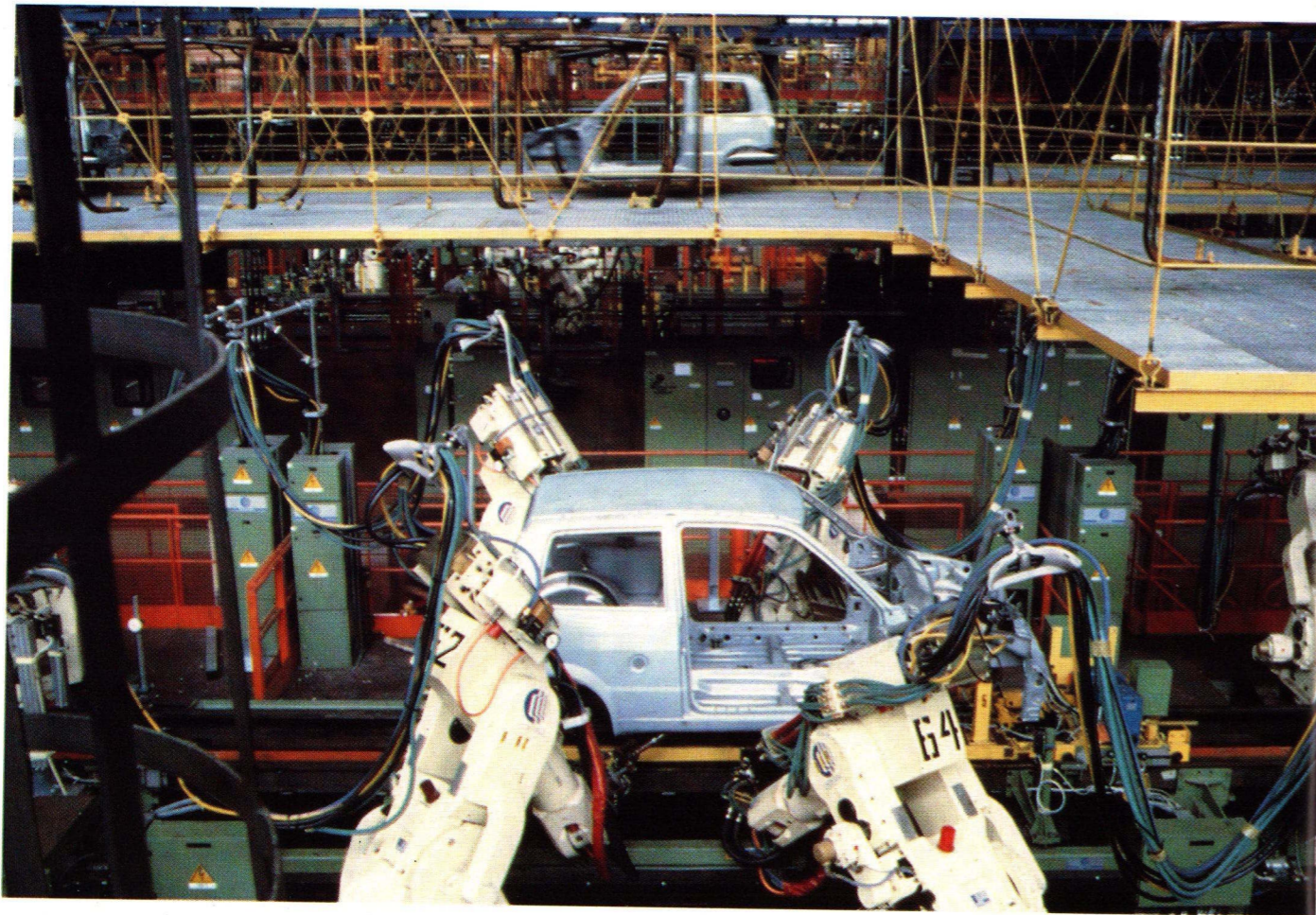
The first, spontaneous observation to be made about the Cinquecento project regards development times: after remembering that the legendary Topolino took shape in less than a year and its industrialisation required a couple of years, it may seem strange that in our day and age the same technical processes needed four years. In fact we know that the idea of a third-generation minicar goes back to the period of renewal at Fiat, at the end of the 1970s, when talk was of Tipo 1 (later simply the Uno), and Tipo 2 (just Tipo in the end), etc. The first of these two cars had just been launched when the opportunely camouflaged prototype of the car which was to become today's Cinquecento, was seen in testing. When the car was presented in Rome in December 1991, Fiat Auto's managing director Paolo Cantarella had this to say about the new car: the contract to build it at the new FSM facility in Poland was signed at the end of 1987. The Turin firm have made investments totalling more than \$ 800 millions to turn it into a high-tech

production plant like Mirafiori or Cassino; 750 prototypes have been tested over 8 million kilometres; training production lines have been set up at Turin as well as at Tychy in Poland, with line operatives, chargehands and testers.

This gives some idea of the extent of the project and helps to clear up the initial observation about development times. "Before the computer", pointed out Dante Giacosa himself, in his book *Progetti alla Fiat*, people designed in function of simpler production methodologies. At today's levels, when so much progress has been made, we can accept slightly longer development times in exchange for amazing acceleration in production automation and qualitative standards devised to satisfy the demands of the year 2000. But this is not all, in the interests of precision there are other considerations to be made.

The first of these is that the current Cinquecento was not planned as a Topolino or as a Nuova 500 – no more than runabouts. This concept had already been signific-

Development rendering for the Fiat Cinquecento.



antly developed with the 126 and the Panda.

Today's wide-ranging market has evolved and grown wealthier, and will no longer accept the previous limitations, even in the case of a bottom-range car.

Today's minicar must have three doors, and depending on its final market, must either be a complete family car or an authentic city car, small and suited to travel in large conurbations. It has to be a second or even a third car with dimensions suited to town traffic and easy parking, and with technical specifications which match the new criteria of environmental friendliness, energy saving and recycling, and absolute reliability.

It is in the light of these factors that a correct evaluation can be made of the project's rationale and the market objectives it was designed to attain. In Italy, in fact, small runabouts are classified in the first market sector, known as Segment A. The same classification is found in the other principal European countries but under a different name.

Adopting, for reasons of convenience, the Italian definition, it was observed that in the main European markets the demand for Segment A runabouts was gradually running out (in favour of the next group, Segment B compacts), and in Italy the fall was so drastic that Fiat stopped producing them. The transformation from a runabout

to a city car presupposes a particular customer maturity and can occur only after several important changes.

Furthermore, in view of the multifunctionality demanded of it and of economic resources in general, the city car itself has to be conceived to fulfil a wider role. While intended for town use, it has to be as comfortable as cars of a higher category and it has to be suited to heavier use, for short out-of-town trips, including motorway use. This is especially so since urbanisation is now so extensive and increasingly characterised by stretches of urban motorway and clearways, and in view of longer commuting distances.

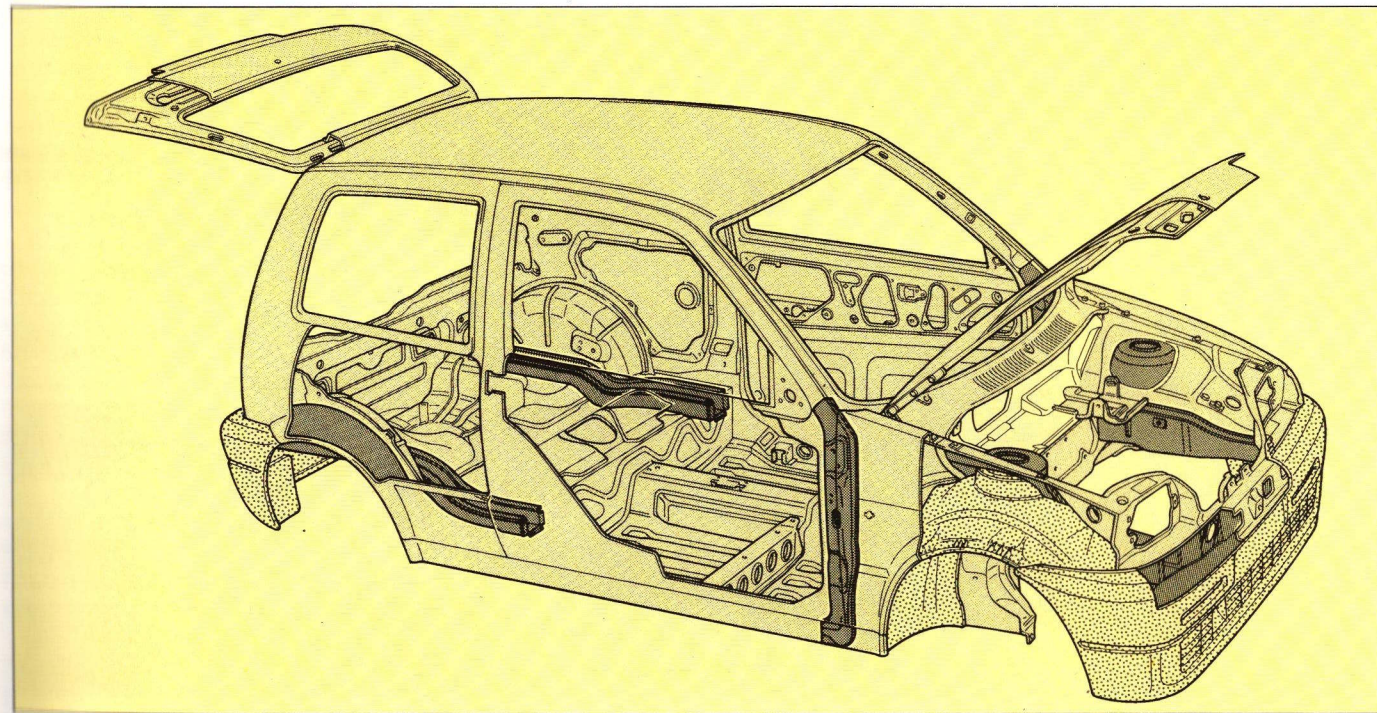
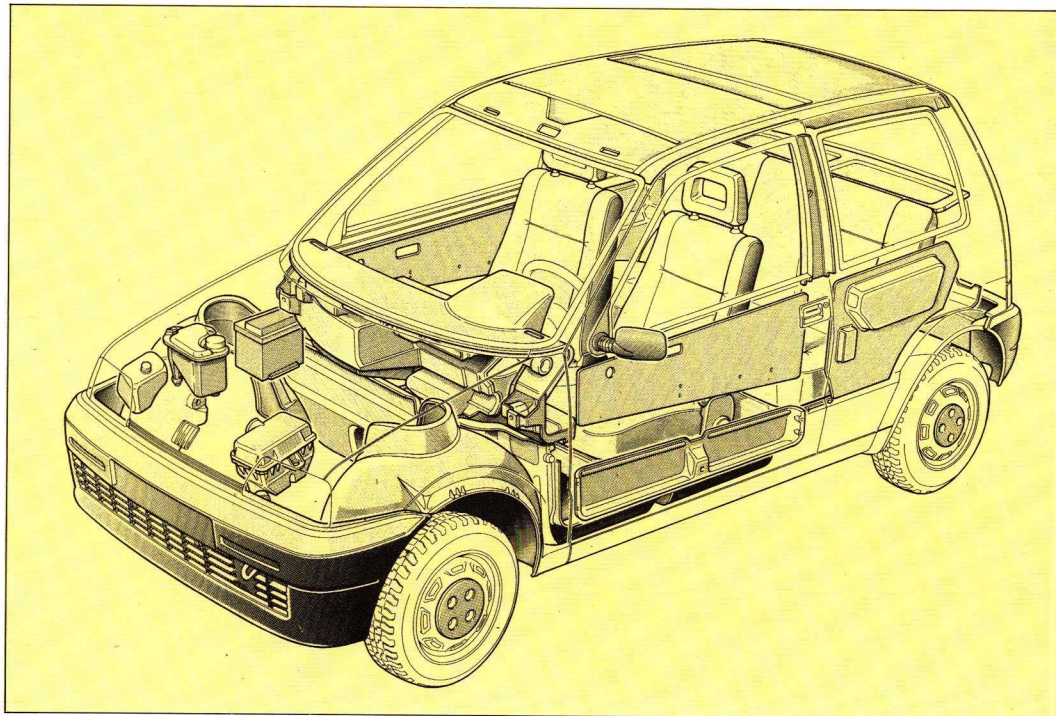
It must be recognised that when the Cinquecento project first took shape, the market opportunity was lacking in Italy as in the rest of western Europe.

The conspicuous investment required could not be justified on a number of counts, from feasible production numbers to the price the customer was prepared to pay. This explains the delay, or the long gestation, of a baby car which was ahead of its time.




Suddenly, however, these market possibilities opened up, through the social and economic changes in eastern Europe. Fiat, with plans already in the desk drawer, could immediately start work on the rebirth of its little car, continuing a unique tradition which had made it the pillar of the

The Cinquecento's assembly line in the town of Tychy, seventy kilometres away from Krakow, in Poland. The cars are seen here during the stage in which they are assembled by robots. Fiat has made investments of \$700 million.

This picture highlights the parts in recyclable plastic. The total weight of these components is limited to 60 kg, i.e. less than 10% of the car's overall weight.



The Cinquecento body shell is made from material which has undergone anti-corrosion treatment.

-  Galvanised steel.
-  Steel galvanised on one side.
-  Synthetic materials.

The entrance to the FSM (Fabrika Samochodov Mabolytrazowych) factory in Poland. Some parts of the Cinquecento are also manufactured in the subsidiary plants of Bielsko Biala, Czechowice, Sosnowiec and Ustron-Skoczow.



firm's production for so many years. In Poland today, a Cinquecento designed according to modern concepts is a much more evolved bottom-range car than the one we had in the 1950s. For Italy, or for western Europe, it is a valid step towards the city cars which will be needed in the twenty-first century.

We have now reached the heart of the project. It consists of a very advanced chassis design (in addition to the attractive bodywork) and rather less innovative mechanicals, for the two petrol versions: the 2-cylinder ED 704 (ED stands for Economy Drive) and the 4-cylinder 903. Nevertheless, these are engines which have been developed almost beyond belief to provide the same functionality, energy saving or low emissions which would figure in the brief for a new project. However, the enormous industrialisation effort called for in the modernisation of the Tychy factory was mainly directed at the production of the monocoque: automatic production lines, mechanised and automated panel pressing, 70 glazing robots, self-propelled component trolleys, automated stores, state-of-the art paint shops and brand new machines for checking dimensions and for quality control.

Economic reasons are responsible (but only in this initial phase of the Cinquecento's production) for the deferred revolution in engine construction methods on a

par with that of the Fire. However, when all is said and done, what counts is the technical result: even without robots, Fiat have successfully produced two truly modern engines. After extensive development, the 2-cylinder and 4-cylinder, both well-tried and tested, have the same yield as the Fire. A mention here of two important features: mapped electronic ignition as in Formula 1 cars, and timing by hydraulic tappets (reduced engine noise and automatic valve play control). These innovations immediately indicate where these two engines stand on the scale of international technical values.

The commitment in time and investment to this project does not stop here: the Cinquecento has three engines, because the electric engine was planned right from the beginning of the project, producing the first car ever to be born with a conventional power unit and an electric engine, with zero pollution.

Although environmental protection is in general guaranteed by petrol engines with catalytic converters, as dictated by the most advanced current knowledge, the parallel proposal of electrical traction, available immediately, invests the Cinquecento project with the advanced specifications a 21st century city car must have. A car which until now had only been talked about by technical and scientific experts all over the world.



BODY DESIGN

Until recently it was held that the city car of the next century would have to be a rather outrageous shape, with the overall measurements and general compactness suited to urban use. The main point to be made is that the early designs went too far with their exaggerated glass areas and specially-curved windscreens, plumping for a very rounded rendition of the single-box type. In some cases there was also a tendency to limit height and width.

The Cinquecento has an innovative shape, but it is a derivation of a highly developed two-box scheme, providing almost single-box compactness, with an overall length of almost 3.3 metres – 3.227 m to be precise. Furthermore, the height and width place the car close to current Segment B models. The shape of the windscreen and the windows is simple, an assimilation of the most successful current designs.

It appears that designers and forecasters were mistaken in part: it looks now as if the new era town minicar will preserve all its links with the higher category

saloons, and will remain immune from stylistic excesses. Style innovations must be gradual and must gain the approval of the young. The end result must express practicality and rationality, in a framework of innovative technology and design. Small exterior measurements must be matched by plenty of room inside for passenger comfort and ease of load carrying, and there has to be excellent all-round vision in harmony with the limited areas available.

The considerable glass area provides an excellent view from inside the car, as well as plenty of light. Technically, in this size of car the position of the driver's seat is important. All-round vision is essential for comfortable and safe driving. It is equally important from the technical point of view that the glass areas be integrated with the shape of the body, which must be very aerodynamic. Here Fiat has obtained an adimensional Cd factor of 0.33, a very respectable achievement seeing that the principal laws of aerodynamics, as one might imagine, allow better penetration of

Side view of the Cinquecento. Fiat's new "baby" is destined to reconfirm the Turin firm's traditionally successful position in Segment A. In 1991 Fiat had a 66.7% share in Europe.



Three-quarter rear view. The Cinquecento's space economy benefits from its sawn-off rear, which is derived from the Uno.



Three-quarter front view. Its compactness is one of the Cinquecento's best features, both aesthetically and practically.

Rear view. The car's considerable width (1487 mm) sits well with its 1435 mm height. The strong horizontal design of the rear light clusters is one of its most attractive details.



Front view. The integral, hugely wrap-around, bumper was designed to absorb low-speed impacts, and is not so heavy as to disturb the Cinquecento's balanced line. The distinguishing Fiat five-bar logo has been given up-to-date styling.

Three-quarter rear view of the Elettra. From the outside it is recognisable by the attractive multi colour trim on the sides, as well as the name between the rear light clusters.



the air by long, tapering shapes. This makes it difficult to produce a shorter shape, with the same height and width, with a low drag factor. In other words, this particular low drag factor has been obtained without penalising space efficiency, and represents a notable technical achievement. It is the result of careful aerodynamics at both ends of the car as well as the fitting of the glass areas flush to the bodywork. It allows higher speeds without any increase in engine output, and lower fuel consumption figures without affecting other features. In addition to all this, the lower the Cd, the less wind noise there is. Aerodynamics ends up being important

for driving comfort too.

The Cinquecento's modern bodywork is instantly striking, the eye takes in the overall harmony and balanced volumes almost unconsciously. All this within the limits already established for a successful city car - nearly 3.3 metres long, 1.49 metres wide and 1.43 metres high. Were it not for the stylists' skill, the result would be a squat little object, accentuated by its sawn-off tail. But modern design can do miracles. The frontal especially has a marked personality, with a raked bonnet which sits well with the trapezoid lights and the restyled Fiat logo. Even shape of the bumper, especially designed to ab-



Three-quarter front view of the Cinquecento Elettra. For the first time in the history of the car, an electric version of an automotive model has been launched at the same time as the conventionally powered version.

sorb low-speed impacts, makes an incisive contribution to both aerodynamics and style. The short front overhang, coupled with the small bonnet and the raked windscreen in reinforced laminated glass, gives the car a very attractive nose.

From the side, the Cinquecento still looks slim, notwithstanding its compact dimensions. This is principally due to the inclined front upright and the angled cut of the rear. The doors are wraparound, completely covering the A-pillar, and have no external drip channel. The clean lines are accentuated by the recessed door handles, on big doors whose wide-opening-angles provide good access to

the rear seats. The flush to the body rear window (only for the 903 version) gives the car a modern look and aerodynamic efficiency. The 2.20 metres of the wheelbase and the tiny rear overhang are balanced by the size of the wheels: 13" rims but with low-profile 70-series tyres.

There is no doubt that it is the design of the slightly sloping rear which gives the shape its overall harmony. The wrap-around tailgate has gentle lines, perfectly in tune with the car body, housing a large rear window with wash and wipe. From the back the body still looks as light and the strong, horizontal cut of the light clusters dramatises the car's width.



CABIN STYLING

Inside, the trim is both attractive and practical, and the first evaluation to be made is that of space efficiency. It is simplest to describe this by giving the interior width at passenger elbow level: 1.243 metres on the front seats and 1.246 metres at the back. This is a record for the class, especially with these outside measurements. The car's dimensions provide room for five people, although most attention has been paid to the front seats, giving the driver the best position. The Fiat ergonomics specialists also took into account that each generation is growing taller, and this is a city car for the future and for the young. The boot is in line with what you would expect in this kind of car.

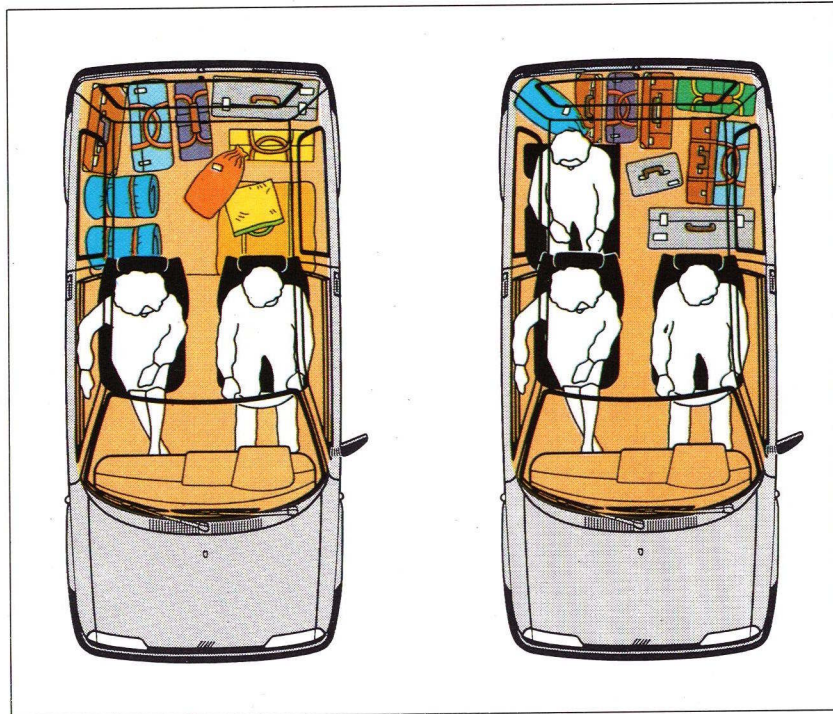
It takes 170 cu dm, rising to 810 cu dm when the rear seats are folded down. The whole of the load platform is available, as the spare wheel is stowed in a recess underneath. A 60/40 asymmetrically split back seat is available on request, increasing flexibility of use.

In a smaller car the dashboard plays a

more important role. The Cinquecento has been given a highly original, very curved fascia, to maximise space and give the front passengers room to move.

The shape and layout of the instruments is original too. They are well grouped: a series of warning lights sits on the left-hand side, the trip mileage counter and the coolant temperature gauge are inside the speedometer, and there is a big anti-glare lip to shade against reflections. The dashboard has a central console with switches for: rear foglights, heated rear windscreen and wash/wipe. Then come the heating and ventilation controls, the radio slot and ashtray with cigarette lighter. The digital clock at the top is an option on the ED 704. On the passenger's side there is a document compartment underneath the usual object tray. Other controls include those for the lights and the windscreen wipers behind the steering wheel and those for the electric windows on the steering column. On the 903 only there is a switch on the driver's side for opening the

The dashboard. The prevalently urban use for which the Cinquecento is intended did not justify fuller instrumentation. Most of the space available has been used for a large cubby. However, the instrument panel includes a well-endowed series of warning lights, to keep the car's mechanicals and principal functions under perfect control.



The Cinquecento is a versatile car, for transporting passengers and luggage. Its load-carrying capacity varies from 170 cu dm, to 810 cu dm with the back seats folded down.

tailgate from inside.

The inside door panels are trimmed in the same fabric as the seats. Light grey, enlivened by alternating red and blue stripes, this means that a single fabric design matches all body colours. There are eye-catching, long handles/arm-rests on the doors, and wide map pockets. The roof is lined with light coloured fabric and the whole of the floor and the hatrack with felt. The sunshades can be moved laterally.

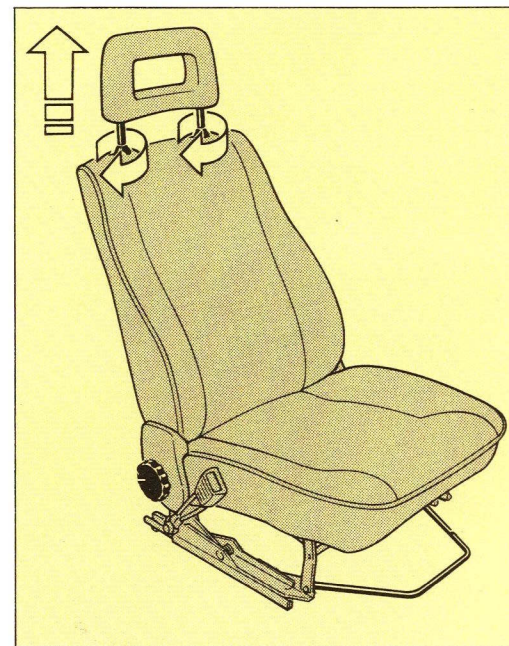
It is not just the colour and the elegance of the seats which is striking. Great care has been taken to make them comfortable, safe (front head supports) and ergonomically sound, especially the driver's seat. The front seats provide considerable lateral support. The foams used in moulding the squab are varied to provide differentiated pressure, with particular attention to low frequency vibrations. Evidence of the same care can be seen in the rear seats.

The structures of the front seats have been designed to create the maximum space for the rear passengers' feet. The runners for adjusting the front seats are in fact 210 mm long, and the seat backs have continued rake adjustment. A power assisted mechanism has been fitted to improve access to the rear seats, both for passengers and for fastening and unfastening child safety-seats: the normal lever for unlocking the front seatback moves the

seat forward at the same time.

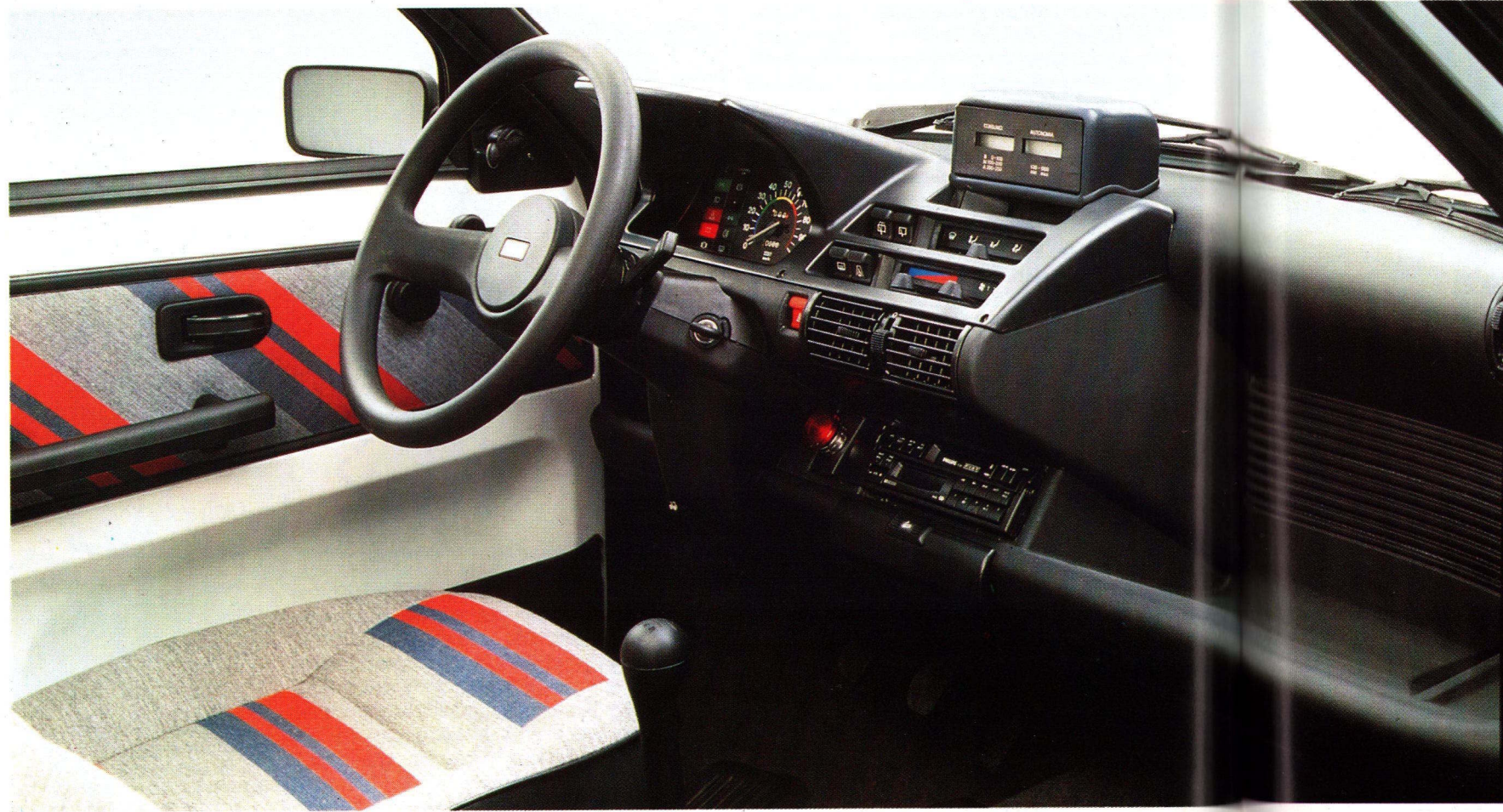
As already stated, a 60/40% back-seat split is available as an option, and the rich selection of standard equipment can be added to: radio with slide extractor and loud speakers, central locking, electric windows, additional side mirror, sunshine roof, headlight adjuster and metallic paint. Several of the items which are standard on the 903, such as tailgate release from the driving seat, swivel opening for the rear quarterlight windows, digital clock and larger tyres, are available for the ED 704 by request. There are six non-metallic body colours (racing red, white, black, green, Biarritz blue and turquoise) and four metallic ones (light grey, surf green, Storm blue and claret).

The high-quality interior trim is backed up by driving comfort. Wide use has been made of sound-proofing and sound-deadening materials. At 90 kph, for example, the noise level inside the Cinquecento 903 does not rise above 75 dB(A). Comfort is also increased by the excellent heating and ventilation system: rapid establishment and control of the air temperature, three airflow speeds and uniform direction and distribution, efficient change of air, with functioning only marginally affected by car speed, defrosting of side windows, etc. The positioning of the vents and the bi-directionality of four of them mean that all passengers, including those

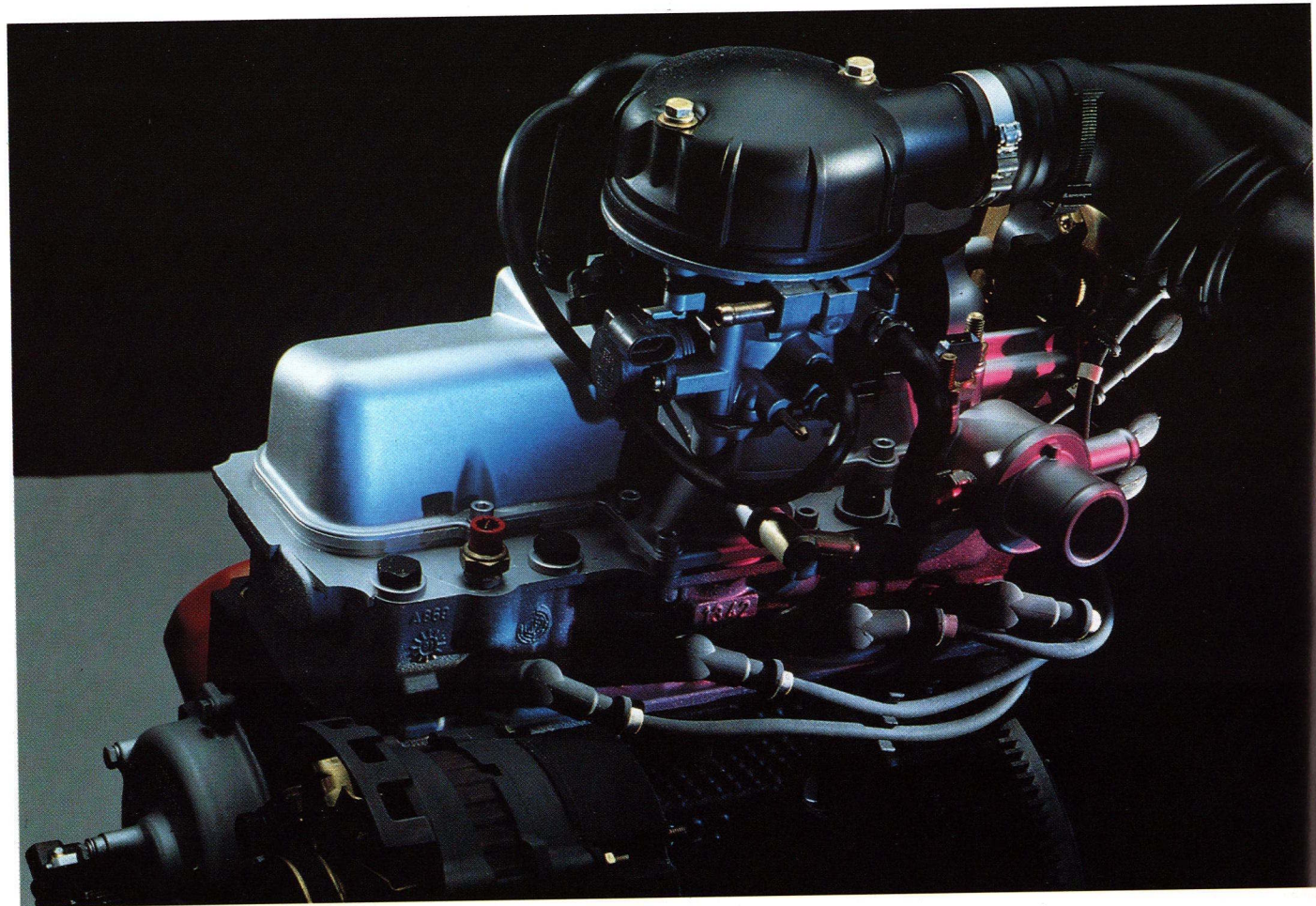


The front seats have been designed according to the most rigorous of modern ergonomic laws, as well as being environmentally friendly: the expanded polyurethane foam used to pad the seats is free from CFCs.

in the back, benefit from the airflows, which are on two levels: the warmer ones at floor level and the cooler ones higher up. Finally, the abolition of aromatic solvents (anti-corrosion protective coatings), formaldehyde (resins) and other chemical substances ensure that there can be no traces inside the car when the customer takes delivery – the air in the Cinquecento's cabin is really clean.



The tough, elegant grey fabric has bright red and blue stripes, which match all of the ten body colours available perfectly (see pages 70 and 71). Above, the Elettra's battery load indicator displays the electric engine's consumption figures and available mileage.



MECHANICALS: ENGINES, GEARBOXES, SUSPENSIONS, BRAKES

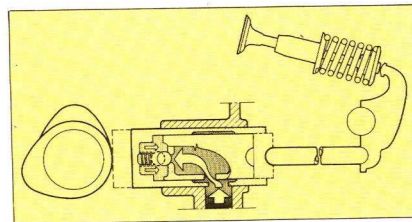
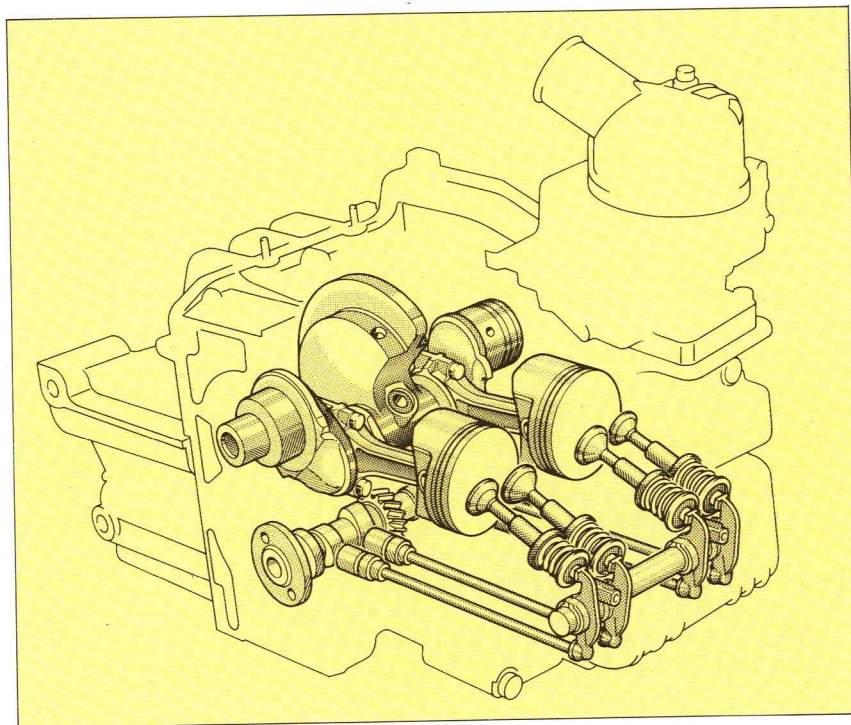
The Cinquecento's three engine versions, two petrol and one electric, spell out the car's intended use, from town to out-of-town to motorway, as well as illustrating a unique sequence of environmental respect, going from the conventional system through catalytic converters to zero pollution from the electric motor. All three of these engines are technically excellent. In the case of the Elettra and its power unit we are in the presence of one of the most advanced designs in this field, but to facilitate the description I shall take the traditional internal combustion engine first, followed by the electric version, opening up the wider perspectives of the city car of the near future.

As already stated, the two petrol engines are not radically new designs, but they have a past rich in evolution and experimentation, which constitutes a solid base for their reliability and further progress. In fact progress has to be mentioned immediately here, in consideration of the fact that both the 2-cylinder ED 704 and the

4-cylinder 903 have been developed in the direction of functionality (comparable to that of the Fire) and reduced noise levels. Both these engines have been given mapped electronic ignition and a timing system with hydraulic tappets. In the first case this is a really modern system, born for the Formula 1 engines, to give each cylinder a coil, eliminating the rotating parts of the distributor. In the second case, the notoriously noisy rod-and-rocker timing mechanism has been given hydraulic tappets, usually seen in higher level engine design, to reduce noise by an appreciable amount. This brings with it another important advantage: automatic valve play control, which facilitates engine maintenance, economically as well as technically.

The ED 704's two-stroke engine has distant origins, starting as it does right from the air-cooled model in the Nuova 500. But it has almost nothing in common with the original set-up any longer. The whole of the successive evolution, from the 126 to the Panda, took place through profound

The 903 cc 4-cylinder engine has an output of 41 HP at 5500 rpm. So far, 6 million of these engines, which also powered the 127, the A112 and the Panda, have been produced.



The adoption of hydraulic tappets is an important innovation. They are designed to reduce engine noise and have automatic valve take-up.

transformations which flattened it and raised both displacement and output. The smaller of the two Cinquecentos was reconditioned and is now water-cooled. Longitudinally located, at the front of the car, it has horizontally-opposed twin cylinders, bore 80 mm for a 70 mm stroke, giving a total displacement of 704 cc (hence the name of the model). Its manufacturing code is 170 A.000, and it features a light-alloy crankcase with press-fitted cast-iron liners, and light-alloy heads.

The driving shaft has two main bearings and cylinder centre distance is 102 mm. The in-line valves are operated by a chain-driven in-bloc camshaft. Timing is as follows (TDC, BDC – top and bottom dead centre of the pistons): inlet opens 15° before TDC, and closes 58° after BDC, exhaust opens 55° before BDC and closes 18° after TDC. Fuel intake is by a Weber double barrel carburettor, type 30 DGF 7, with manual cold-starting, a mechanical diaphragm pump and dry-type air filter, with paper cartridge and thermostatic regulation. The innovative mapped ignition has been named Nanoplex. Spark plug heat grading depends on the make: Marelli F7LRC, Champion RN9YC and Bosch WR7DC. The engine is water-cooled and the system includes a centrifugal pump, a thermostatically-controlled radiator with a small expansion tank and an electric fan, controlled by a ther-

mostatic switch on the radiator. Lubrication is forced by a geared pump, and recirculation of blow-by gases. There are two oil filters: a gauze strainer on the pump and a cartridge on the cylinder block.

With a compression ratio of 9 to 1 this engine delivers 31 HP or 23 kW at 5,000 rpm, with a torque peak of 52 Nm at 3,000 rpm. Its power curve is full at the bottom end, falling away slightly after the peak, and reaches 5,500 rpm. The torque curve is favourable too, and the area over 5 kgm can be exploited from around 2,200 to 4,500 rpm. The engine is designed to use "green" fuel, i.e. unleaded petrol, 95 RON. A successive, catalysed version will be possible, without changing the functional characteristics just described in any way. The engine is supplied with environmentally-friendly electronic carburettor control, governed by a Lambda probe, for direct air/fuel mixture dosage.

Front-wheel drive is by a dry single-plate clutch (disc spring) and a 4-speed synchromesh gearbox unit with the following ratios: 3.250:1 in first gear, 2.050:1 in second, 1.312:1 for third and 0.872:1 for fourth (4.024:1 reverse). The differential is in the gearbox. It has 9/39 cylindrical and helical torque reduction, with a 4.333:1 ratio. The gearbox has twin control rods, one for selecting and engaging gear and the other a reaction rod connected to the engine.

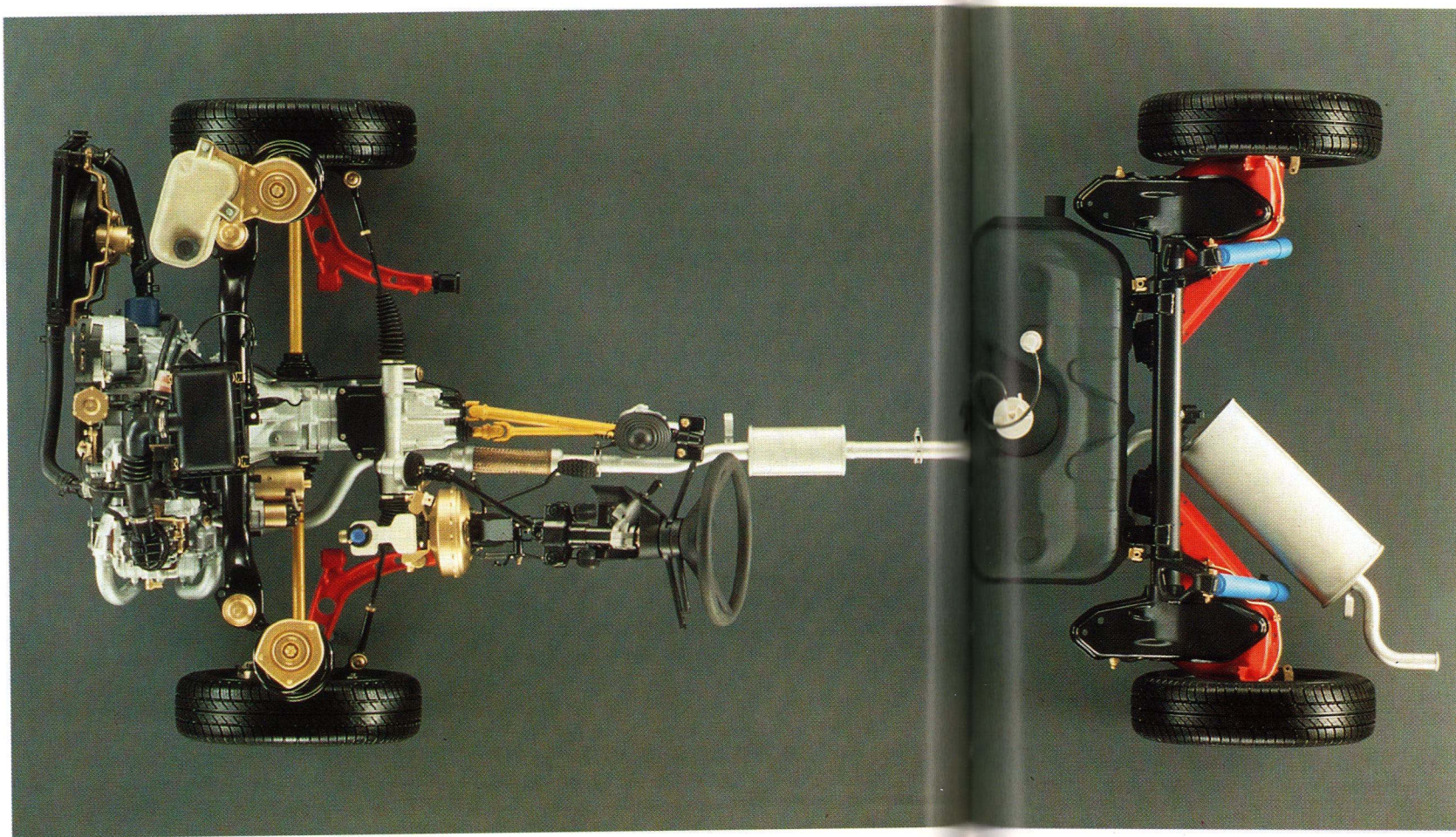
Six million units of the 903's engine have been built. It had its origins in the 127 and the A112. It is a traditional transverse front engine. A four in-line, bore and stroke are 65 mm x 68 mm, giving a total cylinder capacity of 903 cc. Its production code is 170 A1.046, and it has a cast-iron block and light-alloy cylinder heads. The driving shaft has three main bearings and the cylinder centre distance is 71-73-71 mm. The in-line valves are operated by rods and rockers (hydraulic tappets), with an in-bloc chain-driven camshaft. Timing: inlet opens 3° before TDC, and closes 34° after BDC; exhaust opens 34° before BDC and closes 3° after TDC.

The engine has Weber SPI single-point injection, selected with catalytic engines in mind, with a submerged electric pump. This means that the electronic control unit can also handle the information received from the Lambda probe in a platinum/rhodium three-way catalytic converter, and control the stoichiometric composition of the air/fuel mixture. Digiplex mapped electronic ignition is integrated with the electronic Marelli-Weber IAW fuel-feed system.

The engine is, as always, liquid-cooled, with a centrifugal pump and a radiator with a thermostatically-controlled electric fan.

Lubrication is by geared pump and blow-by gases are recirculated. The two oil filters are a gauze strainer on the pump

Diagram of the whole of the ED 704's engine/suspensions group. Note the interesting fuel tank location: inside the wheelbase, for reasons of safety.



and a cartridge on the cylinder block. The engine, with a compression ratio of 9:1, has an output of 41 HP or 30 kW at 5,500 rpm, with a torque peak of 65 Nm at 3,000 rpm. The power curve is distinguished by an initial steep rise, up to 3,000 rpm, which guarantees the high torque mentioned previously. At its peak there are still 500 rpm to be exploited after maximum yield, with hardly any loss in power. This power curve shows considerable torque concentration from 2,000-4,500 rpm, at values close to 6 kgm at these speeds, and constantly higher than the intermediate ones. This is with unleaded petrol at 95 RON.

The 903's (front wheel) transmission varies in some details but not in its technical substance. It has a dry plate clutch (disc spring) and the gearbox is a synchromesh 5-speed unit with the following ratios: 1st=3.909:1; 2nd=2.056:1; 3rd=1.344:1; 4th=0.978:1; 5th=0.837:1; reverse=3.727. The final drive ratio (cylindrical and helical torque reduction 14/57) is 4.071:1. This unit has a double Bowden control system, with two steel cables, one for selection and one for engagement. This appreciably reduces vibrations and noise levels, as well as repercussions on the gear lever when changing from acceleration to release and vice versa.

All the versions of the Cinquecento have the same chassis. The body shell, bonder-

ised by immersion and cataphoresis, was developed and built using the most advanced CAE and CAD design and calculation techniques. Simulation systems and detailed analyses optimised the car's safety, reliability, road holding, etc. Thanks to the structural analysis of the monocoque it was possible to check its total and partial rigidity, as well as testing its behaviour in the event of frontal impact. Analysis and checking of the suspensions allowed considerable improvements to be made in drivability. As far as the car's dimensions are concerned, the overhangs are interestingly small within an overall length of 3.227 metres: 570 mm at the front and 457 mm at the back, providing a wheelbase of 2.2 metres. The suspensions are similar to those designed for bigger cars, with four independent wheels. McPherson-type struts at the front with lower wishbones and telescopic arms with hydraulic double-acting dampers and offset coil springs. At the rear; swinging arms are anchored to an auxiliary cross member by compressible bushes, with separate coil springs and double-acting hydraulic dampers. Spring rate at the wheel (city streets are very uneven) is 0.62 and 0.63 mm/kg on the front and rear suspensions respectively, with wheel movements of 60-75 mm (upper and lower) and 80-90 mm. Steering is by rack and pinion, with a collapsible steering column; full-lock to full-lock is 3.9

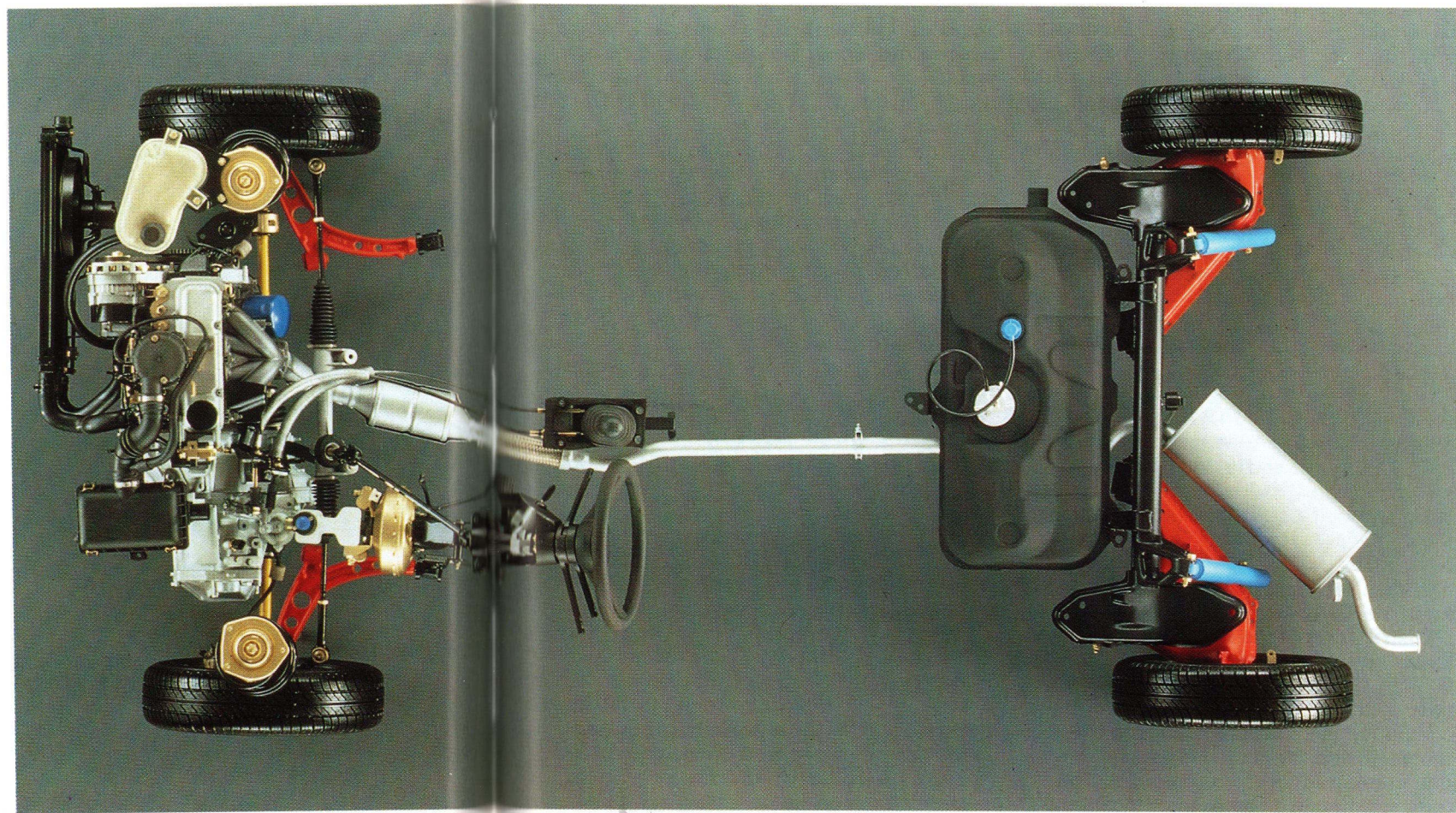


Diagram of the 903's engine/suspensions group. The overhangs have been greatly reduced thanks to the transverse engine.

turns, and the turning circle is 8.8 metres. The braking system is the usual mixture of front discs with sliding caliper at the front, and drums with self-centering shoes and automatic brake clearance adjustment at the rear.

The discs have 240 mm diameter and the drums 185 mm, with friction pad areas of 140 sq cm and 215 sq cm respectively. The cross-over, split, independent hydraulic circuits include a pedal-operated 7" vacuum servo brake. Stopping distances are: 14, 27 and 41 metres at 60, 80 and 100 kph respectively.

There are slight variations to the wheels and the electrics for the two engine sizes. The ED 704 version has 135/70 R 13S tyres and the 903 uses 145/70 R 13S with the same tyre seat (4"). The electrical system has a 55 A alternator, starter motors of 1 or 0.8 kW and 32 and 40 Ah batteries. Both cars have fuel tanks of 35 litres (800 km range between fuel stops at 90 kph), and once again it is the engines which cause the variation in unladen weight, from the 675 kg of the ED 704 to the 903's 710 kg.

Distribution of the mass is not much affected by this, changing from the 704's 60.6-39.4% to the 903's 62.5-37.5% front/rear split.

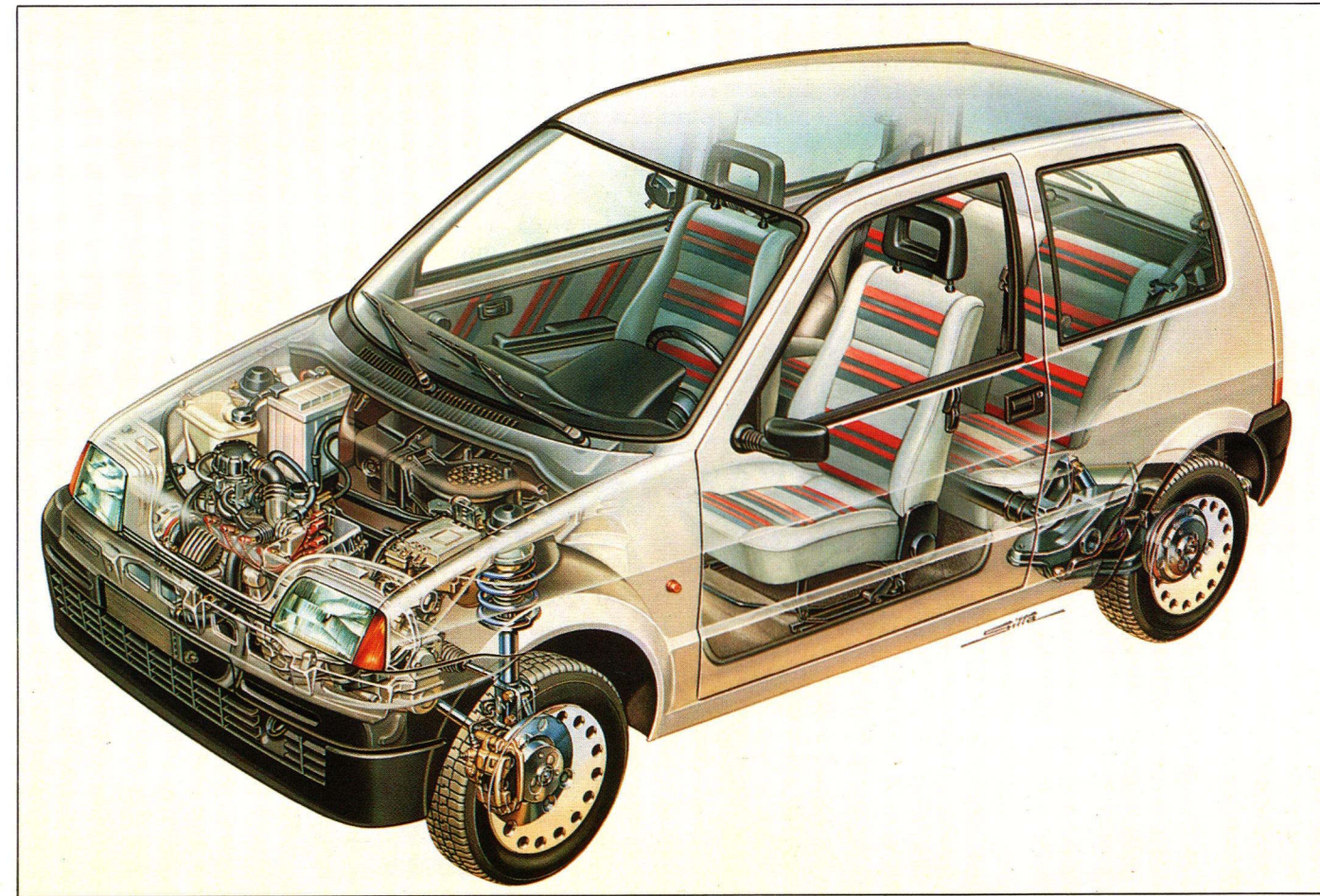
Finally, the Cinquecento Elettra. The technical and functional characteristics of this version are very interesting. The engine architecture comes from the 903, with

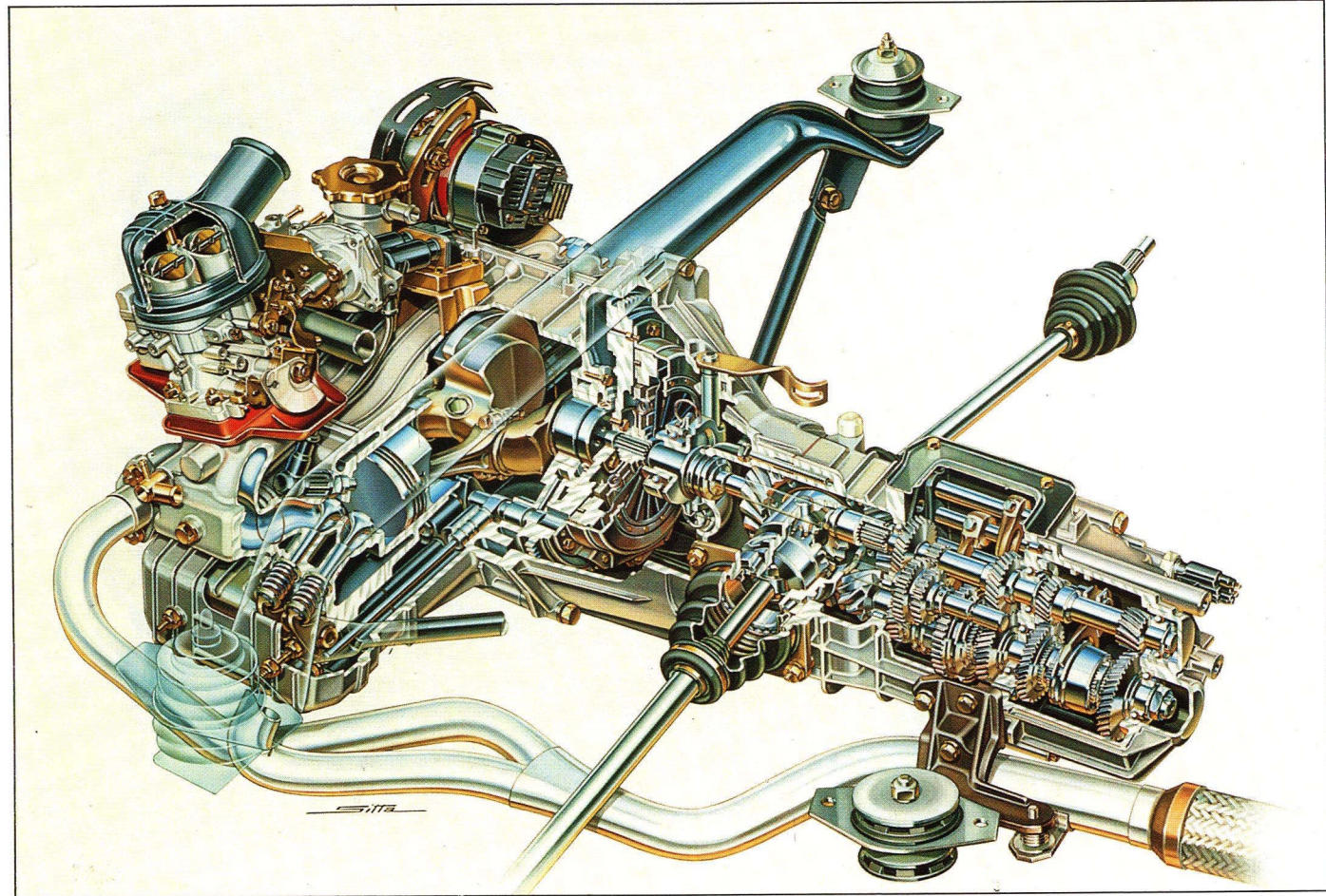
its transverse location, grouped with the same kind of 5-speed gearbox unit. A first impression would be that a fast gearbox would be superfluous with an electric motor – in this case 9.2 kW (12.5 HP) direct current with series excitation.

But the multi-speed gearbox unit was the highly original choice of the Fiat designers to optimise power utilisation. Output is controlled by a high-performance solid-state chopper (Mosfet) with a frequency of 18 kHz and maximum current of 330 A, functioning in such a way as to aid fuel economy. It also permits recovery of the car's kinetic energy in braking.

Designed principally for use in large towns, with zero emissions, the Cinquecento Elettra uses the most advanced electrical energy accumulation systems technology, reconciling the conflicting objectives of costs, performance, range between fuel-stops, weight and on-board space as far as possible. There are therefore two types of power supply, with differing costs: one system uses 12 6V lead/gel recombination batteries connected in series and weighing 360 kg overall. The other has a system of 12 6V nickel cadmium batteries, also connected in series, but with an overall weight reduced to 270 kg. In the first case these are almost conventional accumulators, and elimination of the electrolyte liquid (an added safety factor) removes the need for topping up at inter-

X-ray view of the Cinquecento. This picture illustrates how the compact mechanicals provided more room for the cabin.





vals and reduces gas emissions during recharging to very low levels. This means that this operation can be carried out in closed-in areas. These batteries should last for about 600 discharge/recharge cycles. The latter operation takes 8 hours using a battery recharger located in the engine bay and with normal 220 V alternating current (16 A power uptake). In the second case, although nickel-cadmium batteries are not yet produced on a fully industrial scale, they have greater specific energy, weigh about 25% less and permit up to about 2,000 discharge/recharge cycles. Given the equal volume, the batteries are housed at the rear in both cases (in a special container which is separated from the passenger compartment by a partition bulkhead), and the car will carry two adults and up to 150 kg of luggage.

The effect of the more advanced type of accumulators is mainly seen in the approximately 50% increase in the car's range. However, performance is also affected by overall weight which varies, depending on the battery configuration, from 1,110 to 1,020 kg.

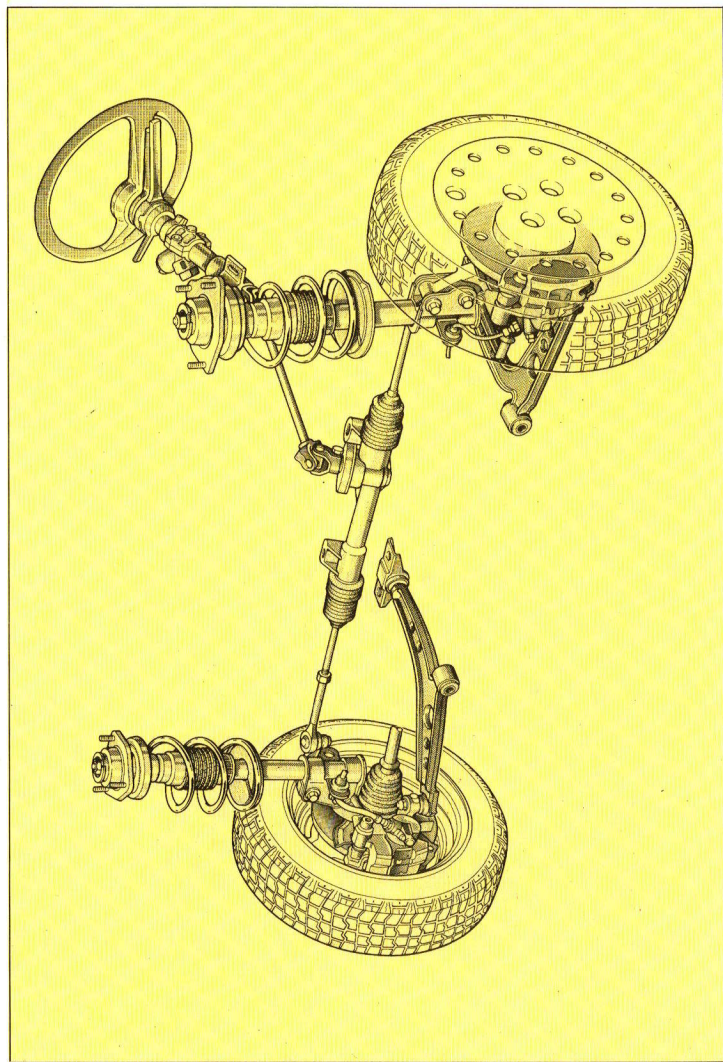
It is important to note that the car can cope with a maximum climbable gradient of 25% (found on many steep driveways and ramps). With the lighter overall weight, top speed rises from 80 to 85 kph, and acceleration from 0 to 40 kph is reduced from 12.5" to 9". As far as range is

concerned, with the conventional batteries the car is guaranteed to cover 100 km at a constant speed of 50 kph and 70 km in town. With the more advanced batteries the car will cover 150 km at 50 kph and 100 km in town. The Elettra also has special tyres which ensure low advancement resistance, a normal battery charged by the traction battery, a small petrol burner which supplies warm air to the heater and a micro-computer which continually monitors the car's functioning.

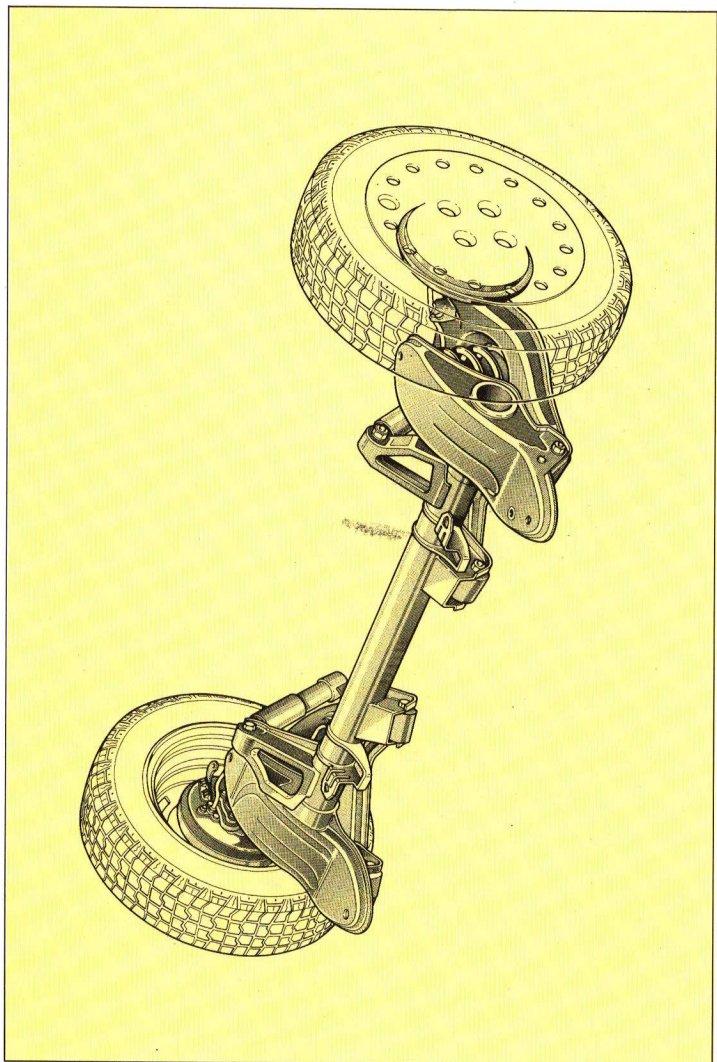
FIAT **Cinquecento**

Section plane of the flat twin-cylinder ED 704, and its gearbox unit. A version with carburetor feed-back control governed by Lambda-probe is planned for the end of 1992. ED stands for Economy Drive.

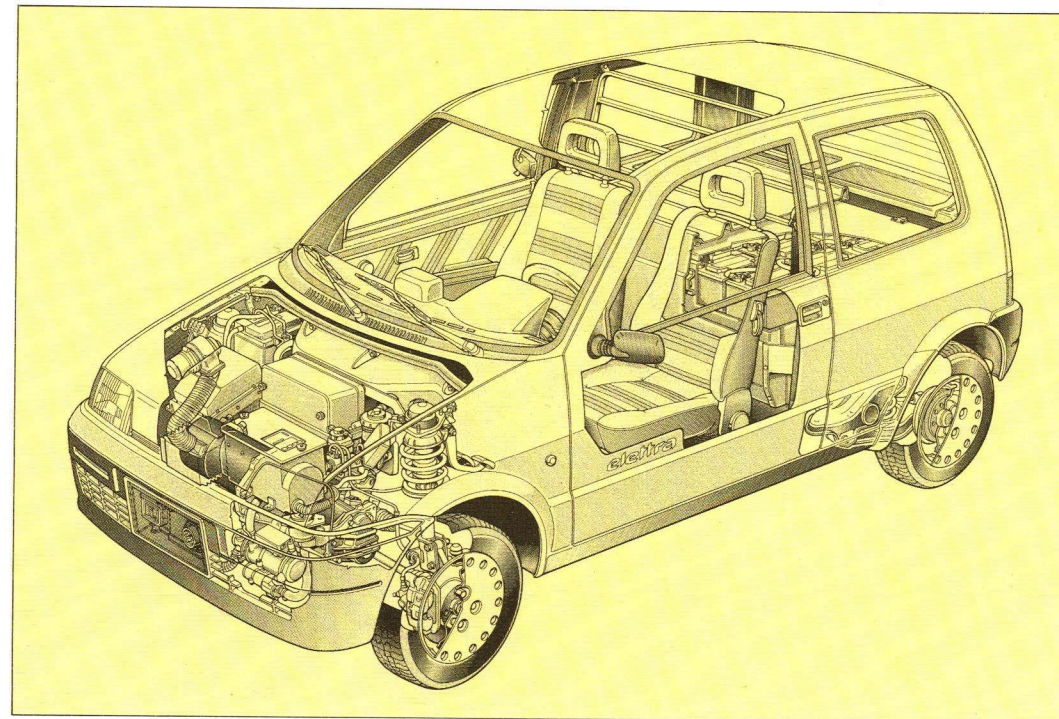
The front suspensions has MacPherson struts, with springs offset from the dampers. The brakes are disc, and steering is rack and pinion.



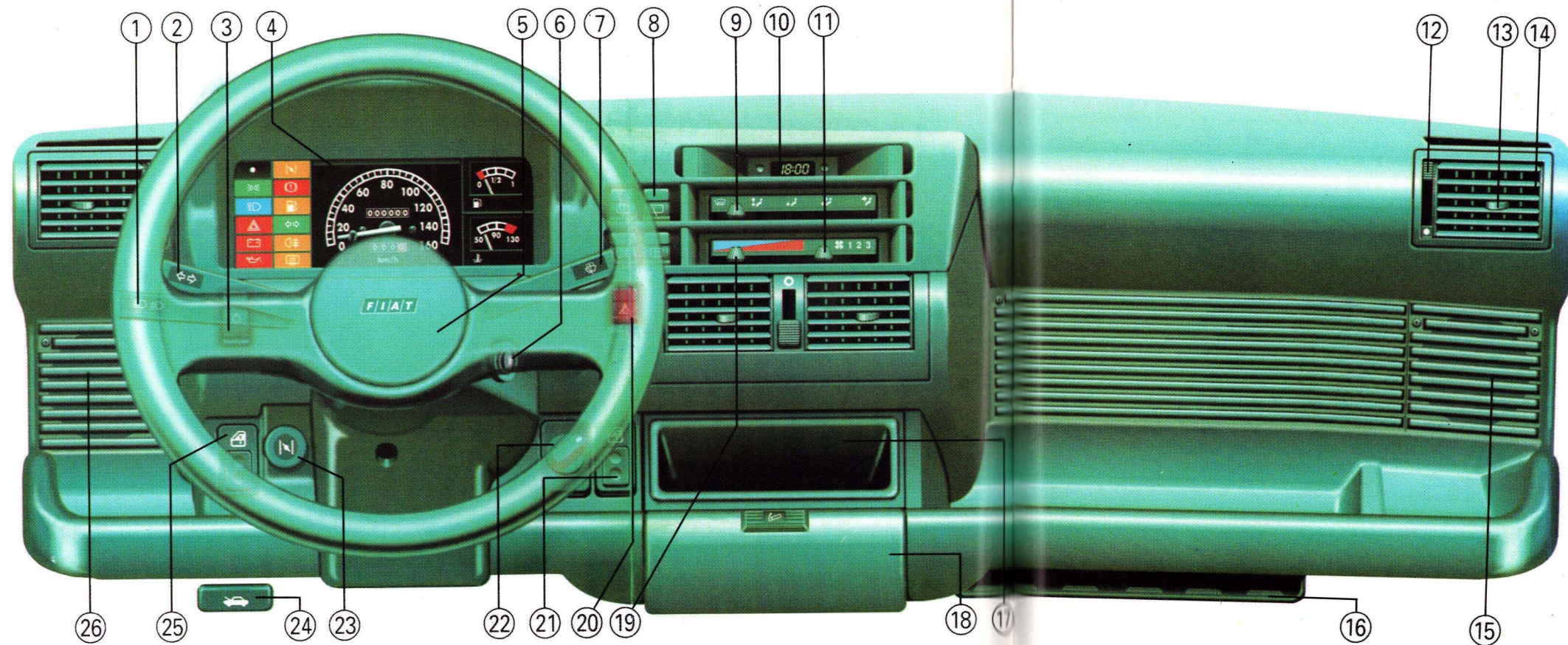
Rear suspension is by wishbones with an auxiliary cross member and compressible bushes; the coil springs are separate from the hydraulic dampers. Both versions have drum brakes.



The 12 batteries that power the Cinquecento Elettra are mounted in the rear.



Section plane of the Cinquecento Elettra. The 9.2 kW engine is located at the front. The rear-located batteries can be: 12 6V lead/gel batteries, for a total weight of 360 kg, or 12 6V nickel-cadmium batteries for a total weight of 270 kg.



Instruments and controls

- 1 - Exterior light indicator lever.
- 2 - Direction indicator lever.
- 3 - Light switch.
- 4 - Check panel.
- 5 - Horn button.
- 6 - Starting switch.
- 7 - Windscreen wiper indicator lever.
- 8 - Service switches.
- 9 - Air distribution indicator lever.
- 10 - Digital clock.
- 11 - Electric fan indicator lever.
- 12 - Air flow adjustment.
- 13 - Air flow orientation.
- 14 - Heating and ventilation air vents.
- 15 - Right loudspeaker seat.
- 16 - Pocket on the backrest rear side.
- 17 - Car radio seat.
- 18 - Ashtray/cigar lighter.
- 19 - Air temperature indicator lever.
- 20 - Hazard lights indicator lever.
- 21 - Right power window indicator lever.
- 22 - Headlight adjustment indicator lever.
- 23 - Starter.
- 24 - Bonnet opening lever.
- 25 - Left power window indicator lever.
- 26 - Left loudspeaker seat.

N.B. The positions of controls, instruments and indicators vary according to the model.

ENGINE	Cinquecento ED 704	Cinquecento 903 CAT
Disposition:	Front, lengthwise	Front, transverse
Materials:	Light alloy, with press-fitted cast iron liners	Light alloy
Cylinders:	2 in line	4 in line
Bore and stroke:	80 x 70 mm	65 x 68 mm
Piston displacement:	704	903
Compression ratio:	9 : 1	
Maximum power:	23 kW (31 HP) 5000 rpm	30 kW (41 HP) 5500 rpm
Maximum torque:	52 kW (5.3 kgm) 3000 rpm	65 Nm (6.7 kgm) 3000 rpm
Timing system:	single camshaft in the block with hydraulic tappets, 2 valves per cylinder	
Fuel feed and ignition:	Twin barrel; Nanoplex electronic	Weber electronic SPI; Digiplex electronic
Lubrication:	Forced-feed with recirculation of blow-by gases	
Cooling system:	Liquid-type, with centrifugal pump and supplementary expansion tank	
Anti-pollution system:	—	Trivalent catalytic converter with Lambda sensor
DRIVELINE		
Drive:	To front wheels	
Clutch:	Dry, single plate with plate engagement spring, mechanically operated	
Gearbox:	4-speed	5-speed
Final ratio:	Helical spur; 4.333 : 1	Helical spur; 4.071 : 1
Differential:	In the gearbox	

CAR BODY		
Type:	2-volume saloon, 3-door, 5-place	
Chassis:	Monocoque body	
Front suspension:	Independent McPherson-type, coil springs	
Rear suspension:	Independent, swinging arms, auxiliary cross member, coil springs	
Steering system:	Rack and pinion; turning circle 8.8 m	
Brakes:	Front discs (240 mm), rear drums (185 mm)	
Rims:	4.00 x 13" H, pressed steel	
Tyres:	135/70 R 13S	145/70 R 13S
Fuel tank:	35 liters	
DIMENSIONS AND WEIGHTS		
Length:	3227 mm	
Width:	1487 mm	
Height:	1435 mm	
Wheelbase:	2200 mm	
Front and rear tracks:	1264/1257 mm	
Kerb weight:	675 Kg	710 kg
Trunk capacity:	170 ÷ 810 dm ³	
PERFORMANCES		
Top speed:	127 km/h	~ 140 km/h (in 4 th)
Acceleration from 0 to 100 km/h:	28 sec	18 sec
1 Km from standing start:	43 sec	38.5 sec
Consumption 90/120/Urban C. (l/100 km):	4.3/-/6.1	4.8/6.3/6.7
Specific power (HP/l):	44.0	45.4
Weight to power ratio (kg/HP):	21.8	17.3



DRIVING IMPRESSIONS

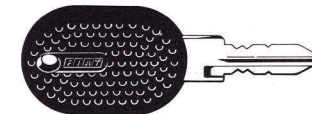
The functional characteristics of the Fiat Cinquecento's chassis can be judged independently from the engine. A short road-test is more than enough to appreciate the advanced level of design and its high rate of overall efficiency.

Attention goes first to the front axle, as front-wheel drive is always a technically complex subject, even when installed power is not high. It is immediately obvious that this car drives with extreme precision, and that it delivers a positive response in all conditions. What strikes one above all is the admirable lack of inertia, a feature which makes driving slick and very easy. Furthermore, it generates great confidence in the car, tempting one to try out its handling and stability immediately.

At first, in view of the almost four complete turns of the steering wheel (3.9 to be exact) between full locks, it may appear that the gearing-up is excessive for a runabout of these dimensions and with this level of drivability. But the quality of the

rack and pinion steering and the excellent geometry of the whole of the front end reveal that this is, without any doubt, the best compromise, providing light steering when parking and perfect control on all types of bend. In addition to the finesse provided by the rack and pinion steering, it is also gradual: smaller angles seem to need fewer turns, but sensitivity is unchanged by speed.

Next come the suspensions: the front McPherson struts provide silent functioning for the flexible springing. The rear suspension, with lower swinging arms anchored to an auxiliary subframe, is identical to the Tipo's, and is perfectly suited to front-wheel drive. The suspensions provide excellent comfort on the vertical axis, and on the longitudinal and transverse axes they ensure correctly controlled roll and dive, without recourse to anti-roll bars. In fact, the roll stability is greater than anything one might be led to expect, with an almost sporty note. Even driven to the limit on bends, manoeuvrability is still



The Cinquecento is a car which matches the changed traffic conditions of the Nineties. The increasing number of cars on the road creates traffic and pollution problems, to which the Cinquecento provides a valid answer.

Its city-car dimensions permit fast, practical transfers from A to B, at the same time as an excellent load-carrying capacity, thanks to the asymmetrical rear-seat split.



The car's turning circle of 8.8 metres, together with its size, make for easy getaways in any kind of traffic.



The two versions of the Cinquecento, 704 cc and 903 cc, have respective top speeds of 127 kph and 140 kph.

The Cinquecento carries five adults comfortably.



total, although the car does appear to be on tramlines. Obviously this degree of road-holding, together with such neutral and reassuring behaviour (the slightest hint of understeer) on entering and during bends, is largely due to the suspensions. Even at excessive limits there is still plenty of room for correction.

When the lock is changed repeatedly and in rapid succession, the car shows excellent directional stability and is swift, without hesitation, to respond. Self-alignment improves as increasing force is applied to the wheels.

There are, as we have seen, two different gear engagement systems for the ED 704 and the 903 double rod control system and double Bowden control system respectively. The first of these engages more precisely, because it allows the driver more sensitivity. It also gives the impression of making the gears slot in faster. However, the second of the two systems is definitely ahead in terms of comfort.

It is totally free from vibrations and noise. It is not as direct, but its precision cannot be criticised. In both cases the total synchromesh and silence are the hallmarks of a high-quality gearbox.

The ED 704 makes good use of the available power, especially at low revs. The limiter cuts in at 5,500 rpm, very discreetly, and there is no reaction to the



One of the Cinquecento's brightest colour combinations is this youthful Racing red.



interrupted ignition. The noisiness of the 2-stroke engine's previous evolution is reduced by hydraulic timing and sound insulation: it is only at top revs that a certain noisy tendency persists.

The gear ratio split starts from a necessarily short first and is well graduated, bearing in mind that fourth was intended to be long. Taking top gear as 100, the other ratios are 26.8% for first, then 42.5% and 66.5% for second and third. This means that at 5,500 rpm the respective speeds are 37.2, 59 and 92.1 kph, which is somewhat in contrast to the abundantly calibrated speedo. The firm declare a top speed of 127 kph in fourth at 5,040 rpm, with a final ratio of 25.2 kph per 1,000 rpm. Pick-up is good, even when carrying a full load. With two people up, the kilometre takes 45" from 40 kph in fourth. Under the same conditions, acceleration from 0 to 100 kph is 28", with 43" for the standing kilometre. Fuel consumption figures are 4.3 litres/100 km, or 23.2 km/litre at a constant speed of 90 kph, while the urban cycle figure is 6.1 litre/100 km.

The 903's engine has a reserve of 500 rpm over the point of maximum output, at 5,500 rpm, and the rev limiter functions in exactly the same way as the 704.

There is a fair division of ratios - 21.4%, 40.7% and 62.3% in the three first gears compared to fifth - producing speeds of 36.9, 70.1 and 107.2 kph at 6,000 rpm in the





first three gears, with excessive speedo calibrations here too. The declared top speed of 140 kph can be reached in fourth, at 5,690 rpm, while fifth is a so-called cruise gear – the 16.8% overdrive ratio drops the revs to 4,880, increasing fuel economy and reducing noise. The cruising speed of 120 kph is reached in fifth at 4,180 rpm. A comparison with larger-engined cars, using the standard parameter of the 130 kph motorway speed limit, has the Cinquecento 903 at 4,530 rpm in top gear, on a basis of 28.7 kph per 1,000 rpm. This final transmission ratio optimises fuel consumption, providing an EEC average of 5.9 litre. This is calculated on results of 4.8, 6.3 and 6.7 litres/100 kph, at constant speeds of 90 and 120 kph and on the urban cycle, respectively. These translate into figures of 20.8, 15.9 and 14.9 km/litre. The car's acceleration figures illustrate its brilliance, taking into consideration its 41 HP for an unladen weight of 710 kg: 18" from 0 to 100 kph and 38.5" over 1,000 metres, with 40.5" over the kilometre from 40 kph in fourth.

Lastly, the Cinquecento Elettra. A rapid trial is enough to show clearly that an electric motor twinned with a five-speed gearbox, with the same transmission ratios as the 903, is very profitable – both as regards drivability and reduced energy consumption.

Theoretically, in a minicar like this, with



The Elettra version has an urban range of between 70 and 100 km, depending on the type of power supply. At a constant speed of 50 kph, this range rises to around 150 km.



the electric motor's huge torque values, a single-speed or at the most a two-speed unit could be used with set top speeds. There are those who have pronounced a five-speed gearbox to be superfluous. In practice, the high number of gears allows a more rational utilisation of the output available at different engine speeds, almost on a par with the internal combustion engine. In normal town traffic the car can be driven in single-gear mode: third looks like the ideal choice for moving off well and adequate acceleration and pick-up. Out and about or on fast city roads the higher gears are useful: the instruments indicate how best to exploit the speeds available in each gear, to limit energy consumption.

Acceleration is completely satisfactory, but attention must be paid to the absence of engine braking in deceleration. Keep an eye on the microcomputer which shows a continual readout of instantaneous current uptake and allows the driver to establish the most economical gear for each cruising speed, along with the AR used up since the last charge, and thus the range available.

From the viewpoint of quality and reliability, the Cinquecento is a product that fully meets the most stringent requirements in observance of the principle of full customer satisfaction. Fiat has based its manufacturing philosophy on this prin-

ciple for some time now. Any major car manufacturer that wishes to be successful in this intensely competitive market is bound to make customer satisfaction one of the fundamental factors in determining its manufacturing philosophy.

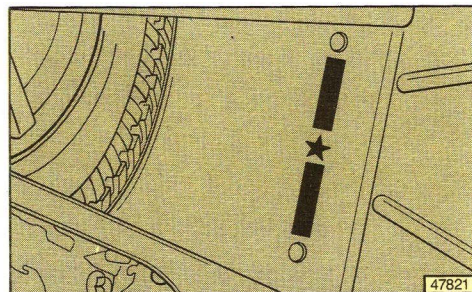
For the Cinquecento, as for any Fiat of the Nineties, overall quality is the result of a long process marked along the way by thorough assessment and merciless testing throughout the car's development.

FIAT **Cinquecento**

The Elettra is a valid answer to the problems of atmospheric pollution, as well as that of noise pollution in towns.

DATI PER L' IDENTIFICAZIONE

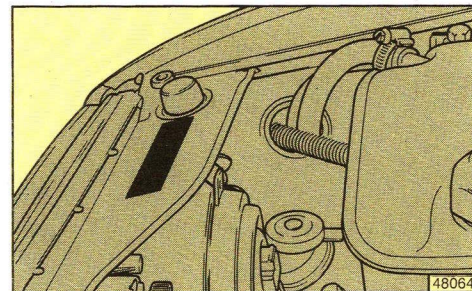
Marchatura autotelaio



È composta da due gruppi di sigle punzonate sul pianale del vano bagagli a fianco della sede per ruota di scorta ed è composta dal:

- codice del tipo di veicolo, riferimento C sulla targhetta riassuntiva: ZFA 170 000
- numero progressivo di fabbricazione dell'autotelaio.

Targhetta riassuntiva dei dati d'identificazione



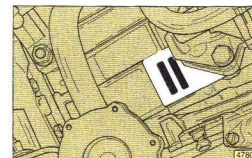
È applicata sul fondello sede proiettore destro e riporta i dati di identificazione di seguito elencati:

FIAT	A	
	B	
	C	D
	E	Kg
	F	Kg
1-	G	Kg
	H	Kg
MOTORE - ENGINE	I	
	L	
	M	

- A. Nome del costruttore
- B. Numero d'omologazione
- C. Codice d'identificazione del tipo di veicolo
- D. Numero progressivo di fabbricazione dell'autotelaio
- E. Peso massimo autorizzato del veicolo a pieno carico
- F. Peso massimo autorizzato a pieno carico del veicolo più rimorchio
- G. Peso massimo autorizzato sul primo asse (anteriore)
- H. Peso massimo autorizzato sul secondo asse (posteriore)
- I. Tipo motore
- L. Codice versione carrozzeria
- M. Numero per ricambi

DATI PER L' IDENTIFICAZIONE

Tipo del motore



È stampigliato sul blocco cilindri, in posizione diversa a seconda delle motorizzazioni; comprende il tipo ed il numero di fabbricazione.

Cinquecento - 704 c.c. 170 A.000
 Cinquecento - 903 c.c. 170 A1.000
 Cinquecento - 903 c.c. cat. 170 A1.046

Codice versione carrozzeria

(riportato solo sulla targhetta riassuntiva, riferimento L)

Versione con cambio 4 marce
 Cinquecento - 704 c.c. 170 AA 43A
 Versione con cambio 5 marce
 Cinquecento - 903 c.c. 170 AB 53A
 Cinquecento - 903 c.c. cat. 170 AC 53A

Targhetta d'identificazione della vernice della carrozzeria

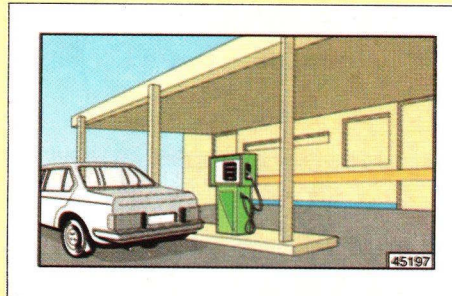
(applicata internamente al portellone posteriore)

- A. Fabbricante della vernice
- B. Denominazione del colore
- C. Codice del colore
- D. Codice del colore per ritocchi o riverniciatura

A	
B	
C	
D	

Combustibile da utilizzare per vetture catalizzate

I dispositivi antinquinamento che equipaggiano il sistema di scarico del motore impongono tassativamente l'impiego di benzina senza piombo conforme alla norma DIN 51607.



Il numero d'ottano (R.O.N.) deve essere come minimo 95.

Il diametro interno del bocchettone del serbatoio garantisce da accidentali rifornimenti erronei presso colonnine eroganti benzina con piombo; non tentare il rifornimento con questo tipo di benzina impiegando mezzi di fortuna.



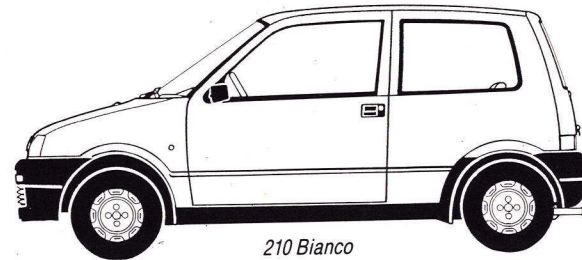
Attenzione
La benzina con piombo danneggia irrimediabilmente il convertitore catalitico.

Two pages from the Fiat Cinquecento owner's manual, containing data on identification and on what fuels to use in cars with catalytic converters.

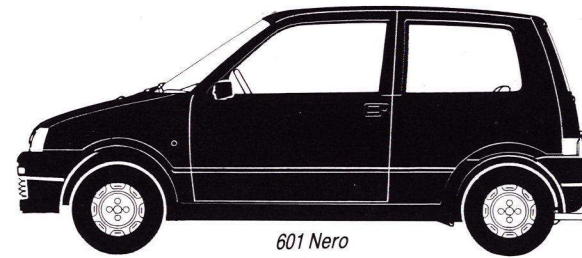
The Fiat Cinquecento is available in the following colours.



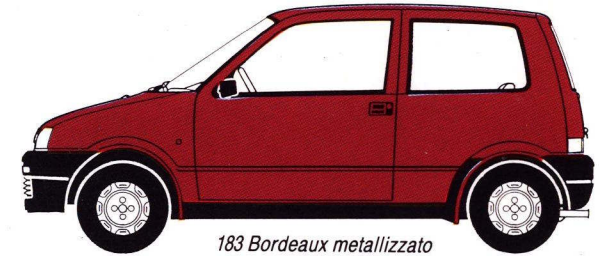
113 Rosso racing



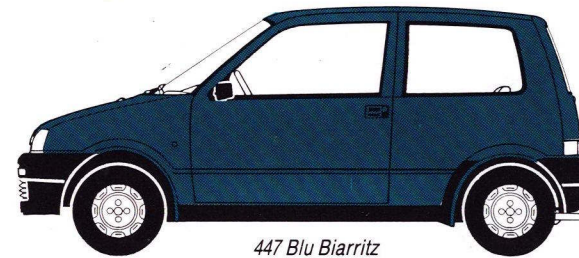
210 Bianco



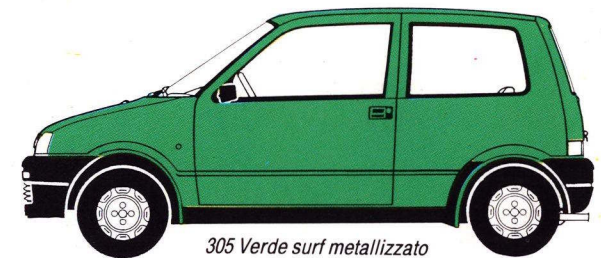
601 Nero



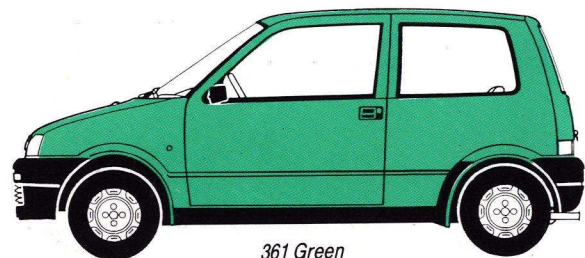
183 Bordeaux metallizzato



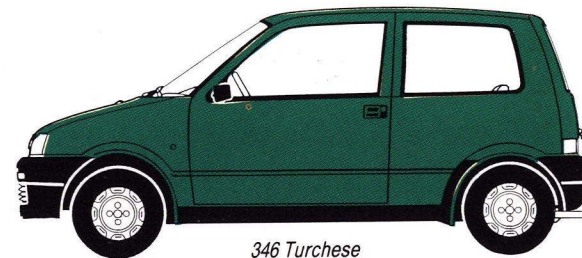
447 Blu Biarritz



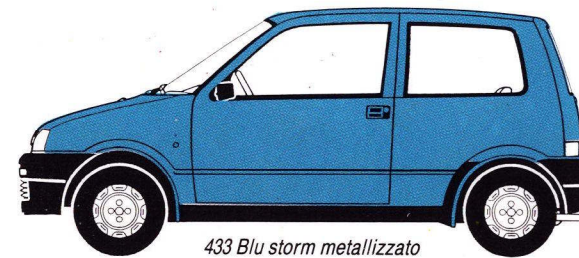
305 Verde surf metallizzato



361 Green



346 Turchese



433 Blu storm metallizzato



620 Grigio metallizzato



Automobilia wishes to thank Fiat Auto Spa for kindly providing the range of cars for testing, and for permitting the publication of technical and documentary material.

FIAT

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