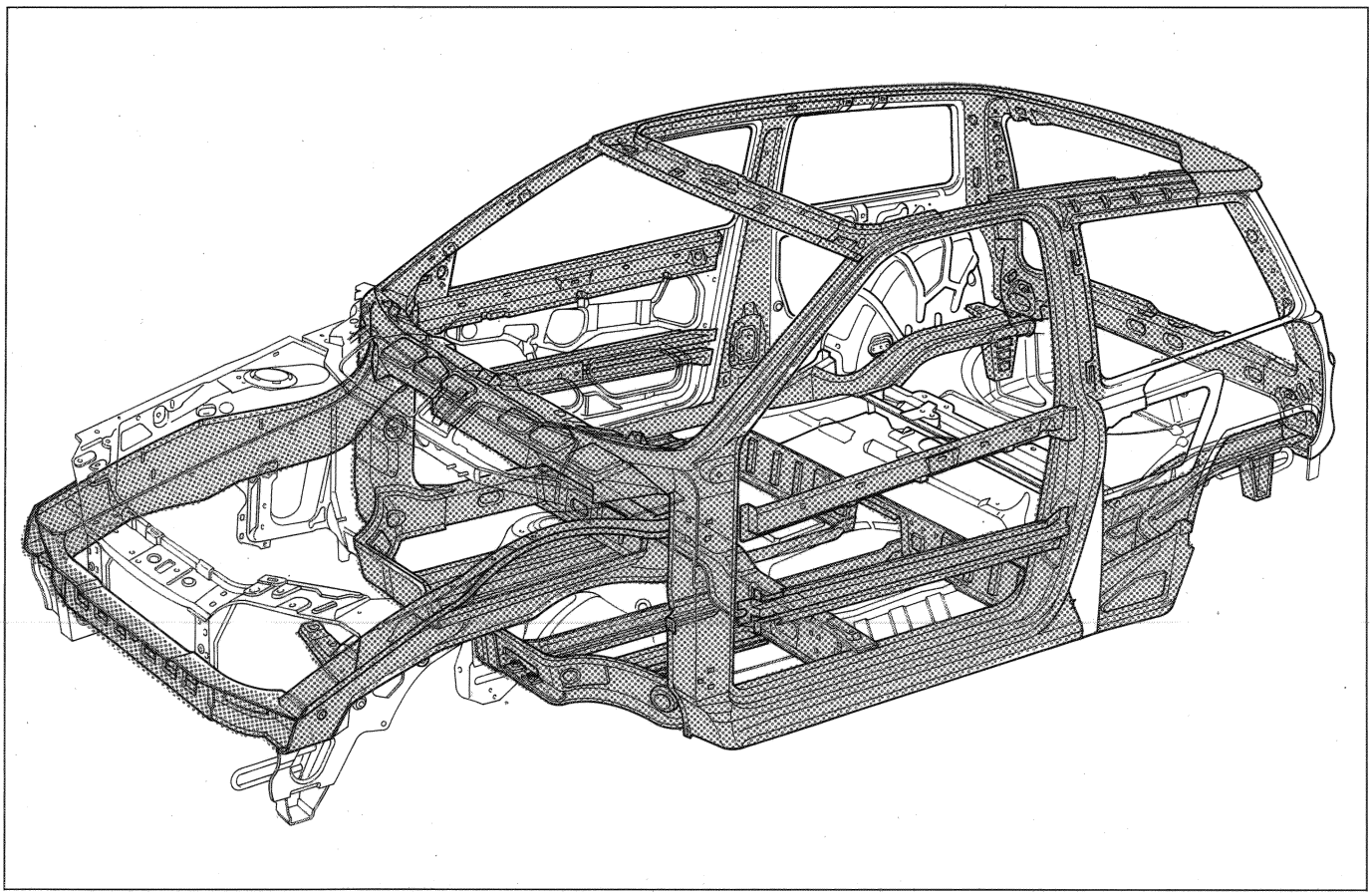
PASSIVE SAFETY

Safety in the case of impact

The bodyshell has been specially designed to deform in a controlled manner in the case of both frontal and side impacts, in order to absorb the energy developed by the impact, without, however, compromising the vital space of the passenger compartment which keeps the survival chamber in tact.
Consequently, for the protection of the passengers, there are reinforcements on the floor panel, the underdoor side member, at the joins between the shock absorber attachment and the side member, on the doors and on the door side pillar, which exceed the future safety regulations.
This model meets not only all the current EEC regulations in force, but also the most restrictive regulations already in force in the States and recently received in Italy but not yet approved.
For example, ECE regulation 12 in the case of an impact against a barrier at a speed of 48.3 km/h, states that the steering wheel should not move more than 12.7 cm back. The vehicle offers a superior performance to that required by the law, with the steering wheel moving less than 10 cm horizontally, vertically and sideways.



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Structural reinforcements (survival chamber)

During the head on impact test against a barrier inclined 15° at a speed of 55 kph, special mannequins (HIBRID II) which have a bio-mechanical faithful likeness to man were used, i.e. they are made in such a way that they are capable of detecting the stresses which human organs would be subjected to in the same impact conditions in order to faithfully monitor the consequences of the impact.

The tests carried out by FIAT on this model, havev made it possible to discover that in these impact conditions the survival of the driver and any passengers is guaranteed.
During the front and rear collision tests at a speed of 15 kph as laid down by German Insurers who use the results to establish insurance premiums, the vehicle has passed this test with very little damage, reduced structural distortion and still able to be driven.

This obviously involves advantages not only for German customers (lower insurance premiums) but also, in the case of a real accident, a reduction in the repair costs to all customers irrespectively.

The table below contains the torsional and bending rigidity values.

	Torsional rigidity (kgm/degree)	**Bending rigidity (kgm/mm)**
Version 3 door	1169	510
Version 5 door	1117	545

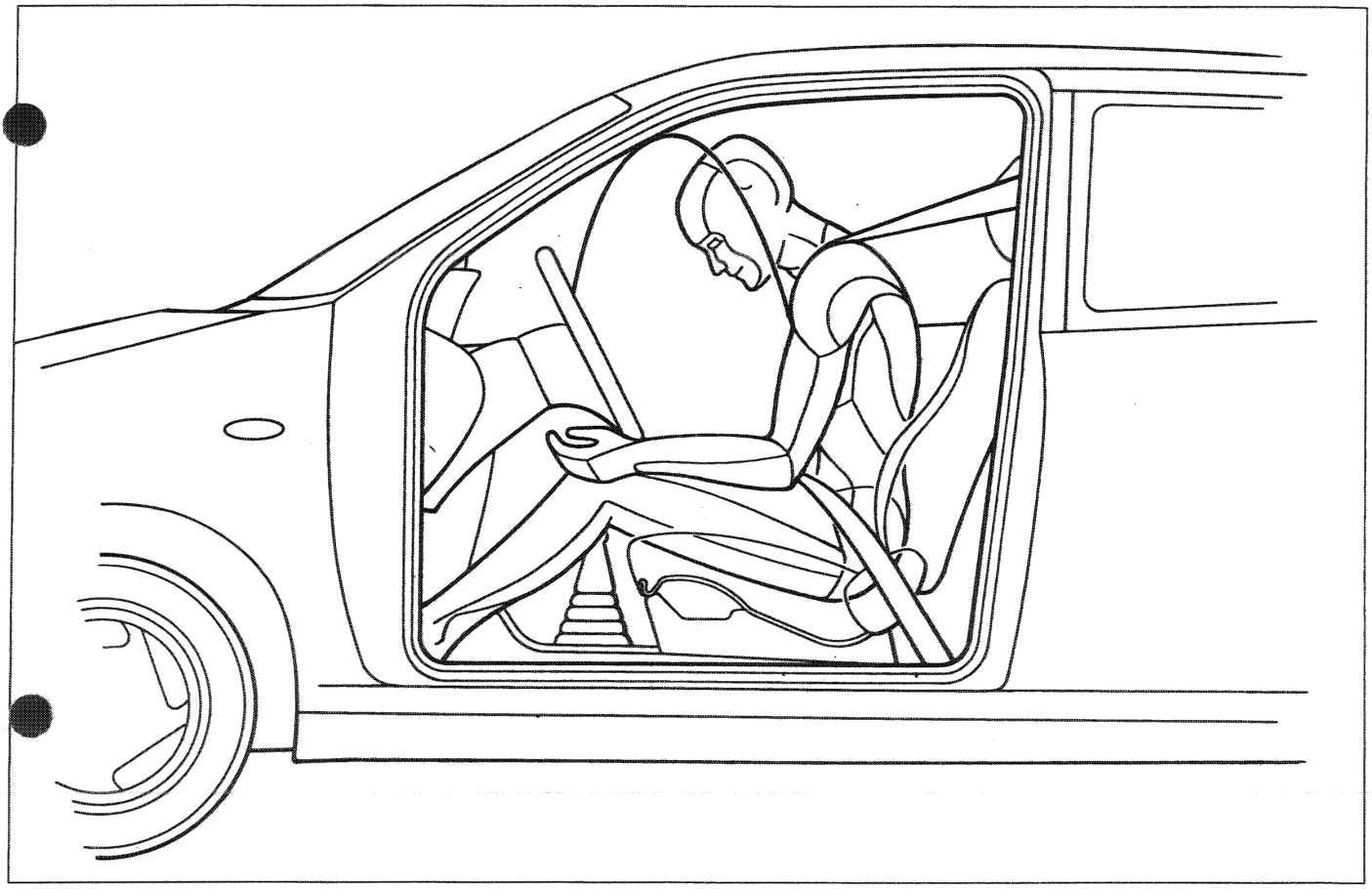
These high rigidity values translate into the following advantages:
- less vibration;
- less noise;
- improved driveability;
- greater resistance to breakages caused by the use of the vehicle on particularly uneven road surfaces;
- compact sensation of the vehicle;
- improved maintenance over a period of time of the overall qualities of the vehicle.

70.

Seat belts with mechanically operated pyrotechnic pre-tensioners are fitted as standard.
These devices allow a faster and more effective response in the first moments following an impact.

Pre-tensioners have an operating range which ensure operation after a head on impact against a barrier at 0° at a speed equal to or more than 24 kph and do enter into operation at a speed equal to or less than 15 kph.
It is possible to have a drivers Air Bag (volume 45 litres) or a passenger Air Bag (positioned on the dash-board - volume 90 litres) fitted as optional extras, operated by a centralized electronic control unit with a single operating level.

Air Bags have an operating range whereby for a head on impact against a barrier at 0°, they enter into operation at a speed equal to or more than 28 kph and the device does not enter into operation at a speed of equal to or less than 20 kph.



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Protection against fires

The collection of measures to protect against the risk of the vehicle catching fire after an impact consist ofthe adoption of metal fuel pipes;
- the fitting of an anti-flow fuel inertia system, including an electric supply pump cut-off and a one-way valve on the relevant pipe;

THE BODYSHELL AND PROTECTIVE TREATMENTS

Protective treatments:

The choice of the materials making up the bodyshell is directed at achieving an excellent standard of quality in order to offer a quality product which is practical and long lasting.
45% of the weight of the bodyshell components is made from bi-galvanized metal, whilt another 15% in weight is made from mono-galvanized metal.
Galvanized panels make up 90% of the total value of the body panels.
The galvanizing takes place in accordance with different technological processes:

- deposition through a galvanizing process, the panel is immersed in or comes into contact with a salt bath, depending on whether bi-galvanizing or galvanizing is involved, which results in a high degree of surface finish;
- fire deposition; the melted zinc is deposited thermally on the panel. With this process, which is used mainly for structural elements of the bodyshell, thicknesses of up to 20 micron are achieved, compared with the 7 micron obtained from the galvanizing process.

The protection of all the box sections is achieved using galvanized body panels which, after painting, are sprayed on the inside with wax based oil to prevent the phenomenon of internal oxidation.

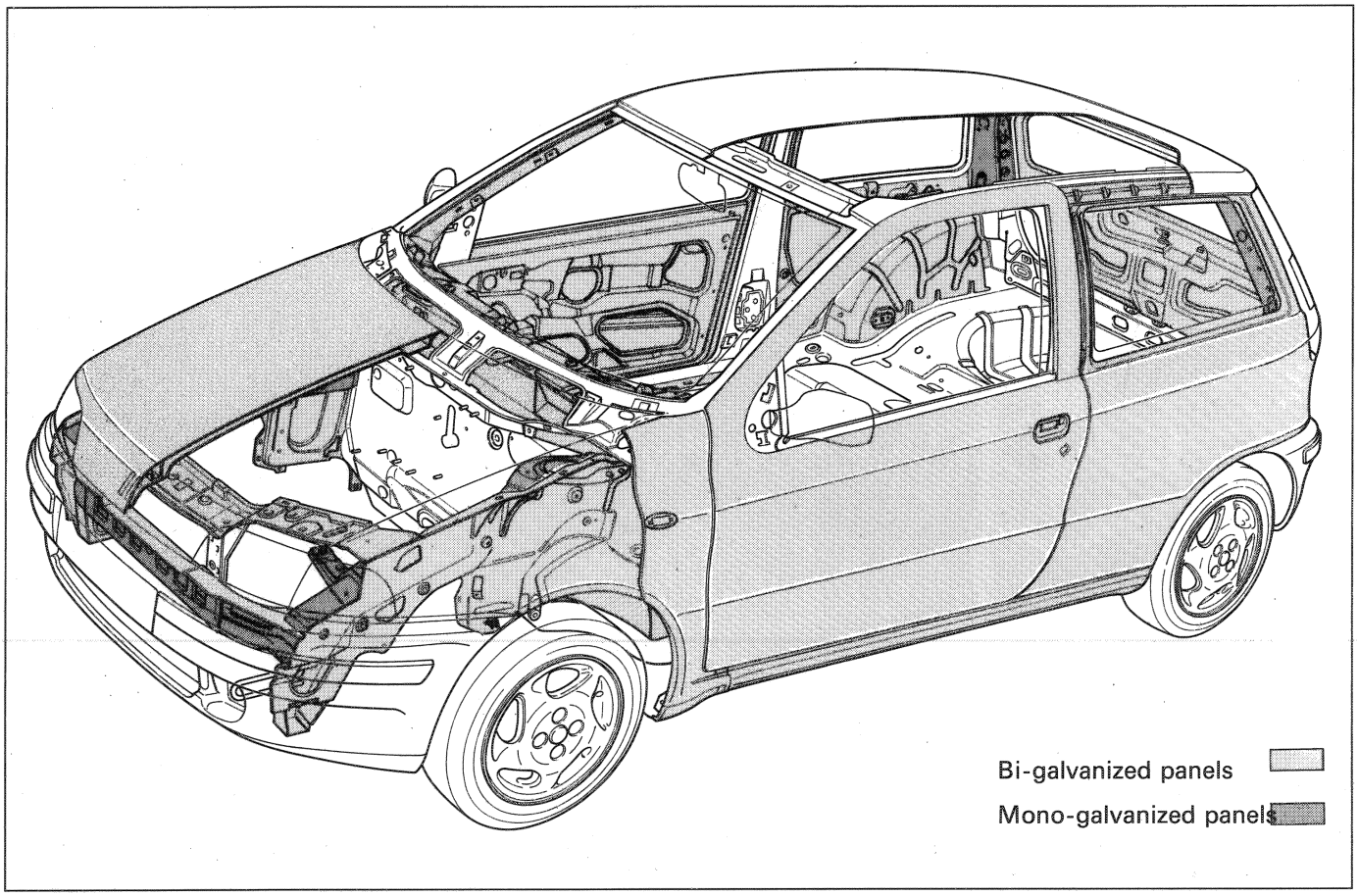

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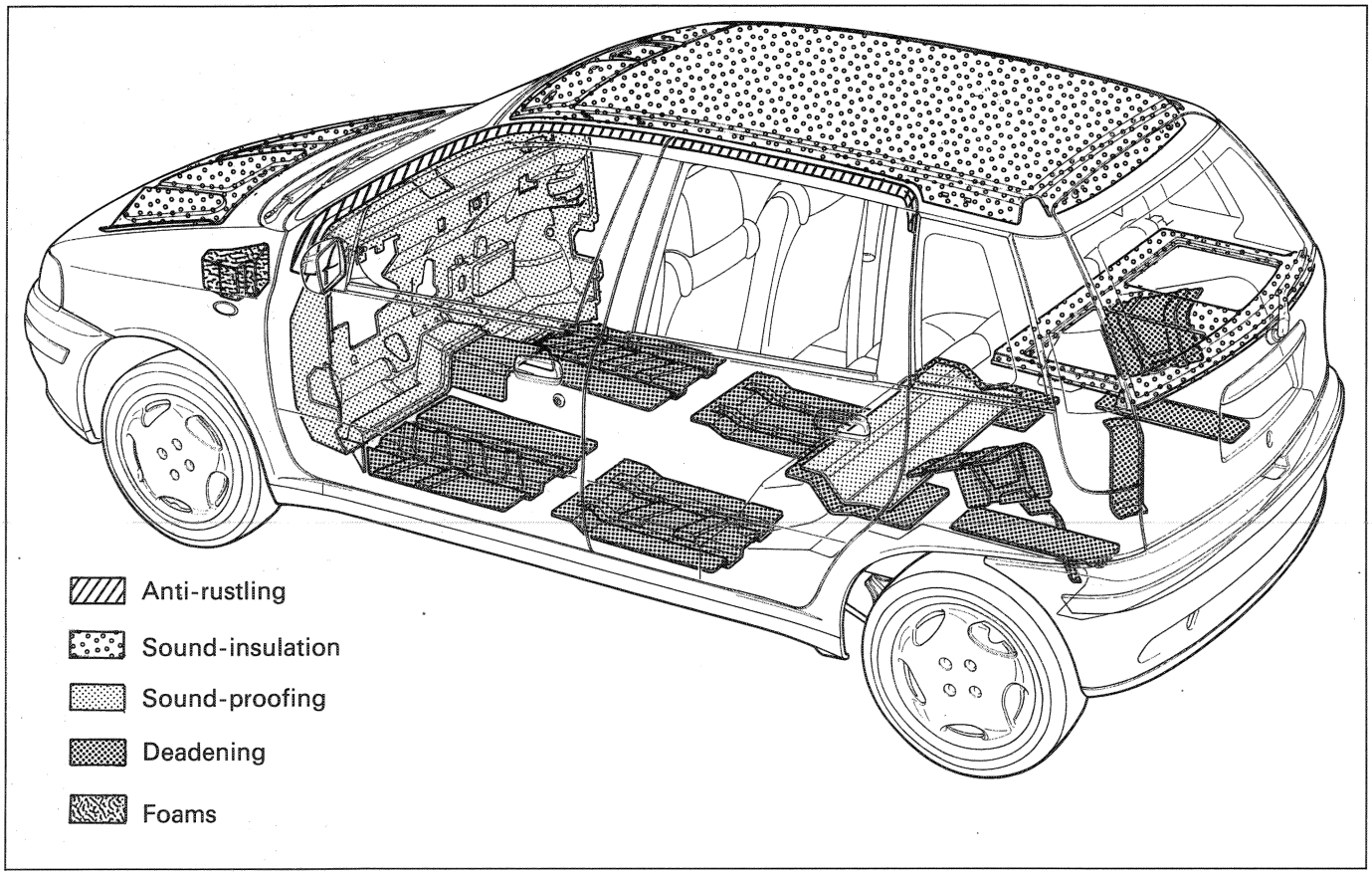
Diagram showing bodyshell with distinction between mono and bi-galvanized panels

70.

DIAGRAM SHOWING APPLICATION OF SOUND-DEADENING PRODUCTS

The maximum noise inside the vehicle at 120 km/h in fifht gear for all versions (excluding the 1372 turbo) is equal to 73 decibels.
This has been achievely by mainly concentration on the following three areas of noise generation: engine, rolling, aerodynamics.
The main operations have been as follows:

- Improving the bodyshell; carefully studying all the components and fixings which creak, such as for example the dashboard and the seats. The rigidity of these components has been increased and the anchorage points have been reinforced with extreme care being taken over the selection of contact materials.
- Inserting a foam which polymerizes in the engine compartment struts which creates a barrier inside the box sections preventing the noise from entering the passenger compartment.
- A sound-deadening cover for panels using thermofusible materials applied before painting.
- A sound-insulation cover for the front of the dashboard, front and rear footrests, with pre-formed composite panels.
- Sound-proofing; very thick roof lining stuck to confer improved sound-insulation.
- The use of openings for passing the cables between the engine compartment and the passenger compartment with seals both in the panel and the sound-deadening material to reduct the transmission of the noise from the engine compartment to the passenger compartment.



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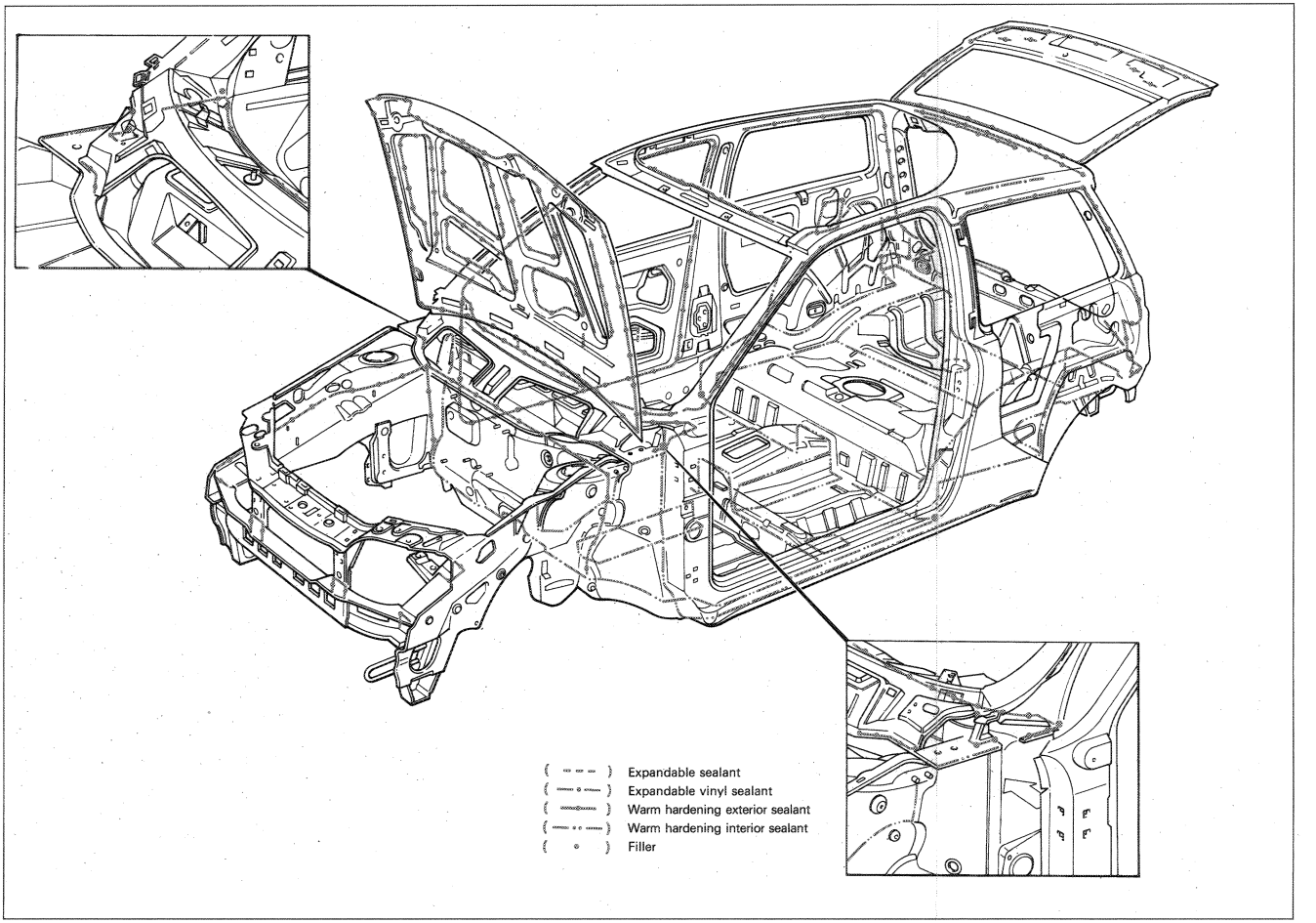
Taking into consideration the excellent level of acoustics achieved, in the case of repairs the solutions adopted during manufacture should be guaranteed to the same level.

SEALANTS

All the join lines (85 metres) are sealed to prevent the penetration of corrosive agents.
In Service conditions it is advisable to use polyurethane sealants (NI Epox 854210 or an equivalent product) to renew the sealant lines.
These products dry in depth even if applied very thickly and can be painted soon after (about 20 minutes later).
The diagram below shows all the sealant lines to facilitate the search for air, water or dust penetration.



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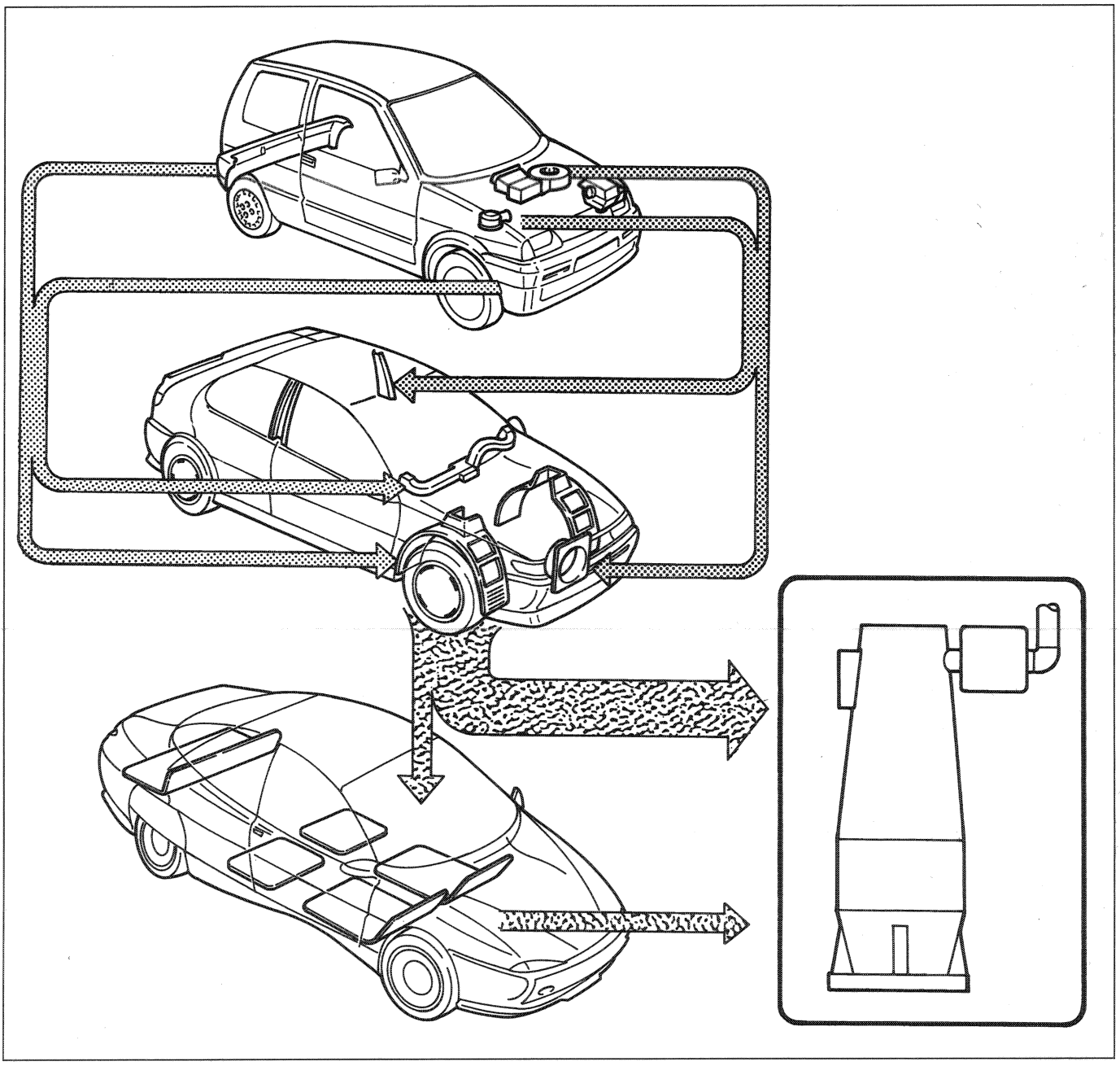
RECYCLING

Recyclability of materials

The solution to the problem of recycling plastic materials stems from the design stage. The possibility of reusing the material for future components should be evaluated at this stage.
Currently when the vehicle reaches the end of its life only the metal parts are recoverd and reused to produce new steel and new aluminium castings.
All the rest of the vehicle, corresponding to about 25% in weight, is abbandoned or dumped.
An enormous amount of materials and energy is therefore wasted in addition to contributing to the size of the problem of disposing of solid waste.



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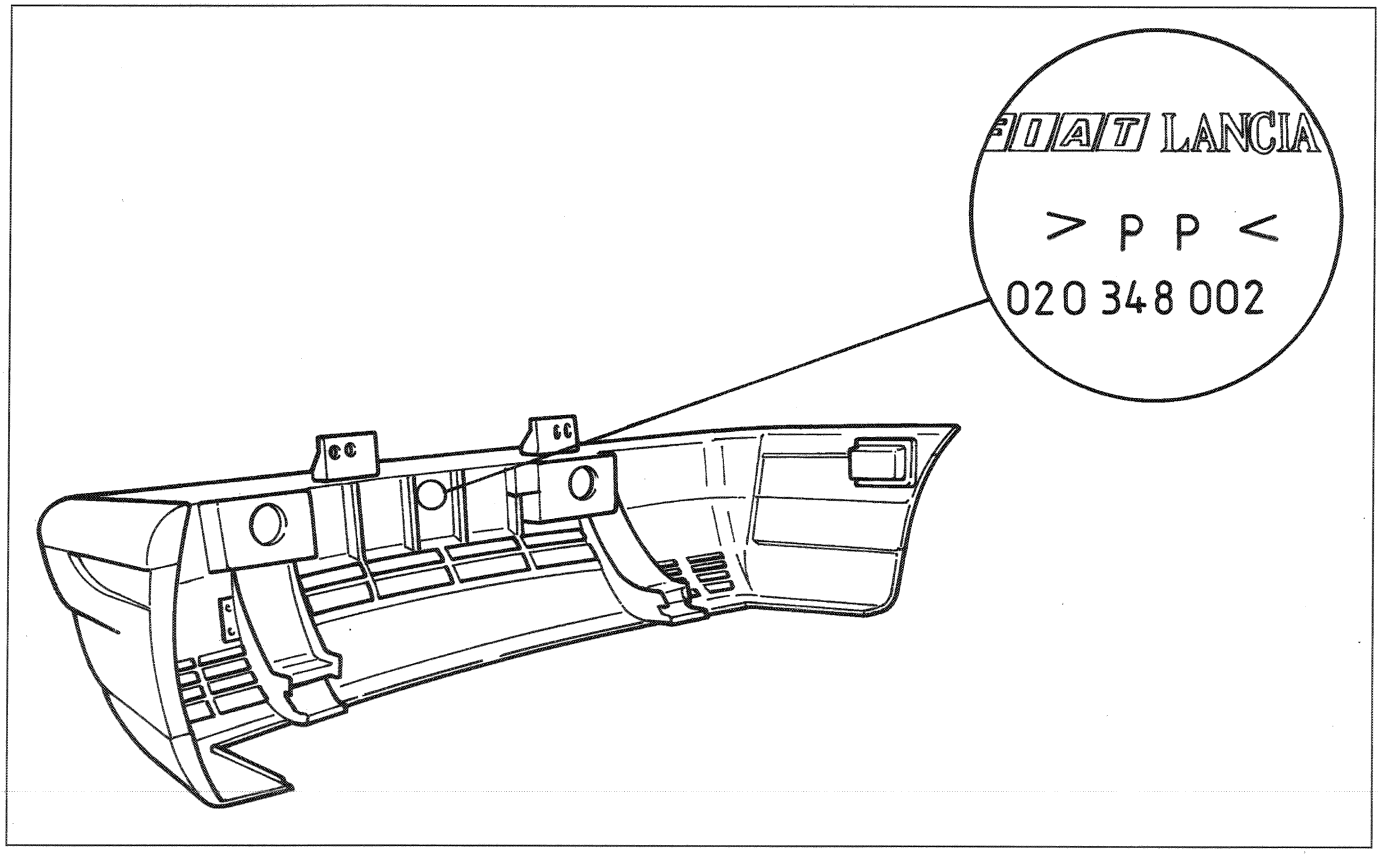
Recycling does not allow obtaining a component equal to the starting product because the material may not guarantee the necessary characteristics of reliability or may not be convenient.
From the plastics which make up the seat upholstery insulating materials are obtained for building.
For other plastic materials recycling is carried out in the following way: for example from the plastics for the bumpers the material is obtained for the wheel arch liners which later become elements for sound-insulation covers and finally end up as fuel for ovens.

Recycling thereby involves three successive generations of vehicles, making a contribution to saving raw materials.

This model has been designed so that all the plastic and rubber materials more than 50 grams in weight have been marked with coded symbols to allow the recognition of the material during recycling and so that all components can be recycled.



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Plastic materials

A basic requirement for achieving the objective of recycling plastic materials is their immediate recognition. Different families of plastic materials are in fact (with rare exceptions) incompatible with one another at a pressing level.
Fiat Auto has introduced marking on the entire range for recycling all plastic components.
This procedure means that when the vehicle is being scrapped (at the end of its life) the exact composition of each component can be ascertained from the special ISO 1043 codes (International Standard Organization) and therefore the appropriate method of recycling can be adopted for each of them.
All the polypropelene bumpers, the wheel arches and certain types of bands and spoilers are recovered to be reused. The material undergoes washing and "flotation" treatments (to separate pollutant elements such as metals, stones or other types of plastics). After this preparatory treatment the material is then ground and extruded into granules which can be used for pressing new components.

Thermoplastic and thermosetting materials

	ISO SYMBOL	FAMILY NAME	
THERMOPLASTICS	ABS	ACRYLONITRILE-BUTADIENE-STYRENE	
	CA	CELLULOSES	
	PA 6	POLYAMMIDES WITH:	6 C atoms in a manometric structure
	PA 66		two manometric structures each with 6 C atoms
	PA 11		11 C atoms in a manometric structure
	PA 12		12 C atoms in a manometric structure
	POTP	POLYESTERS	polybutylene
	PETP		polybutylene
	PC	POLYCARBONATES	
	PC + ABS	POLYCARBONATE ALLOYS/ABS	
	PE	POLYETHYLENES	
	PMMA	METACRYLICS	
	POM	ACETALS	
	PP	POLYPROPYLENES	
	PPOX	POLYPHENOLS - MODIFIED OXIDES	
	PPOX + PA	THERMOPLASTIC ALLOYS (POLYPHENOL OXIDES/POLYAMMIDES)	
	PSE	POLYSTYRENES (EXPANDED)	
	PVC-P	FLEXIBLE VINYLS	
	PVC	RIGID VINYLS	
	SAN	STYRENES	Polymer styrene - acrylonitrile
	SMA		Polymer styrene - maleic anhydride
THERMOSETTING MATERIALS	MF	MELAMINES	
	PF	PHENOLS	
	PUR	POLYURETHANES	
	UF	URICS	
	UP	POLYESTERS UNSATURATED	compression pressing (SMC)
		THERMOSETTING MATERIALS	injection pressing (BMC)

Loads and reinforcements

ISO SYMBOL	DESCRIPTION
GB	Glass balls
GF	Glass fibre
GH	Glass matting
M	Minerals
T	Talc
WD	Wood chippings (shavings)
SF	Textile fibres (synthetic or natural)

Elastomer materials

ISO SYMBOL	TYPE OF RUBBER
ACM	CHLORLY-VINYL-ETHER-ACRYLATE
AU	POLYURETHANE
CSH	POLYETHYLENE CHLOROSULPHONATE
CR	CHLOROPRENE
EPDM	ETHYLENE PROPYLENE DIENE MONOMER
ECO	EPICHLORIDRINE
FPM	FLUOROCARBON
MVQ	SILICON
NBR	ACRYLONITRILE-BUTADIENE
NR	NATURAL ISOPRENE
IR	SYNTHETIC ISOPRENE
SBR	STYRENE BUTADIENE
IIR	ISOBUTENE/ISOPRENE

Foams

The polyurethane foams, from which the seats are made, are compressed in special presses which reduce their volume by around ten times and make the product suitable for reuse. During the recycling stage the foams are firstly ground into fine pieces, then a resin which acts as a bonding material is added, then the material is transformed into a tape which is wound up. From these tapes, mattings of various thickness are obtained which can be used as carpet underlays.
This and other similar applications allows the material recovered to be put to a wide range of uses and gives considerable energy savings.

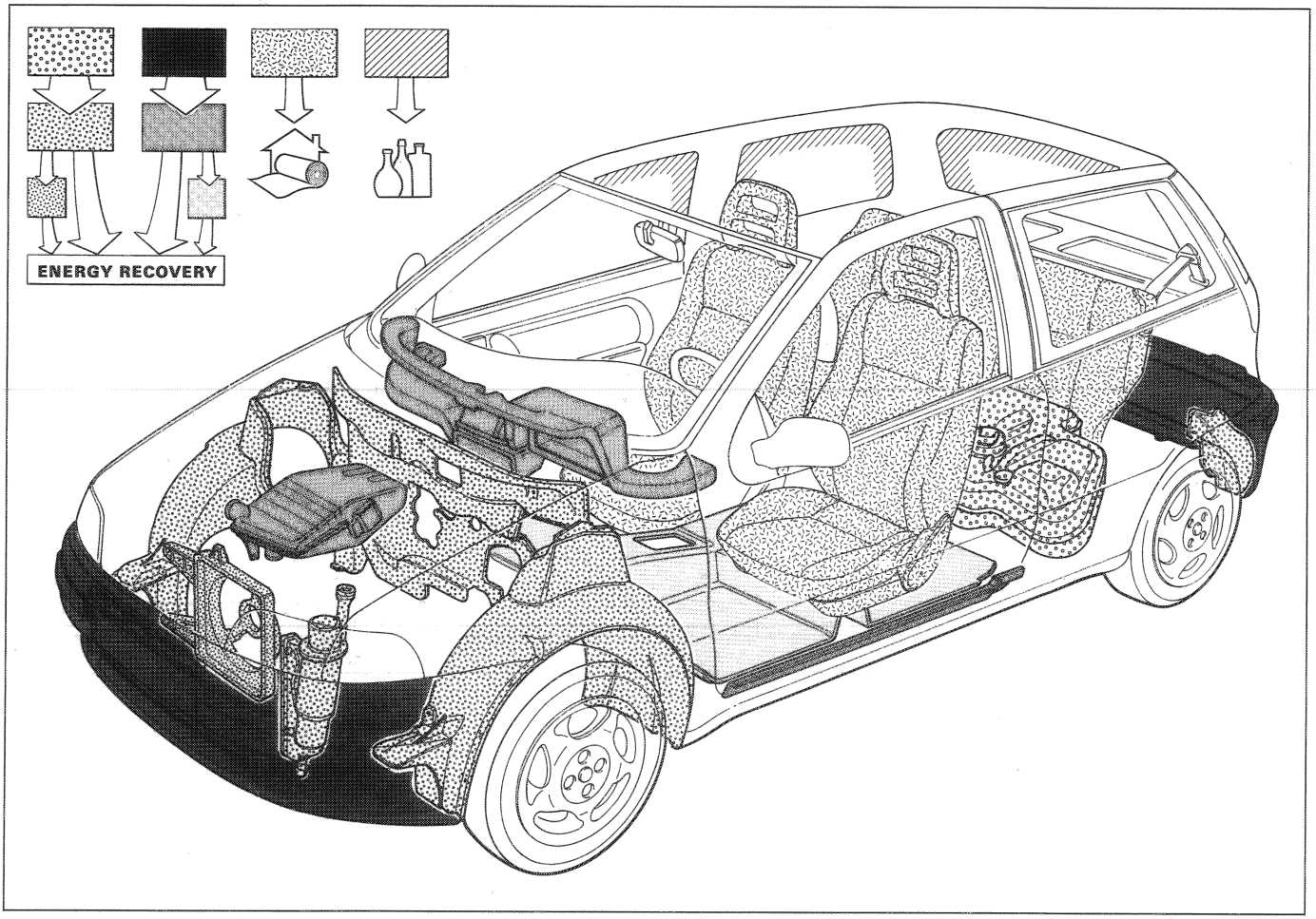
Glass

The glass (including the windscreen) is collected in special containers, which are periodically collected by an organization specialized in recycling; the glass is separated from the sheets of plastic material contained in the windscreen and then finely ground with the granuals being reused later.
The material prepared in this way is sent to the glass industry where it is transformed into bottles and various containers.

Bodyshells

The bodyshells stripped on the elements which can be recycled are sent to the steel works crushing department. The remaining organic material (Fluff) which stays on the bodyshell has a high calorific power, similar to that of conventional fuels. The energy which the fluff produces by combustion is used to heat the scrap metal for the electric ovens, reaching temperatures in excess of 400 °C.
The overall energy consumption is therefore considerably lower than compared with conventional technology.
This last action means that the aim of 100% recycling of motor vehicles at the end of their life, in terms of raw materials and energy, is achieved.

Bodyshell with recyclable materials



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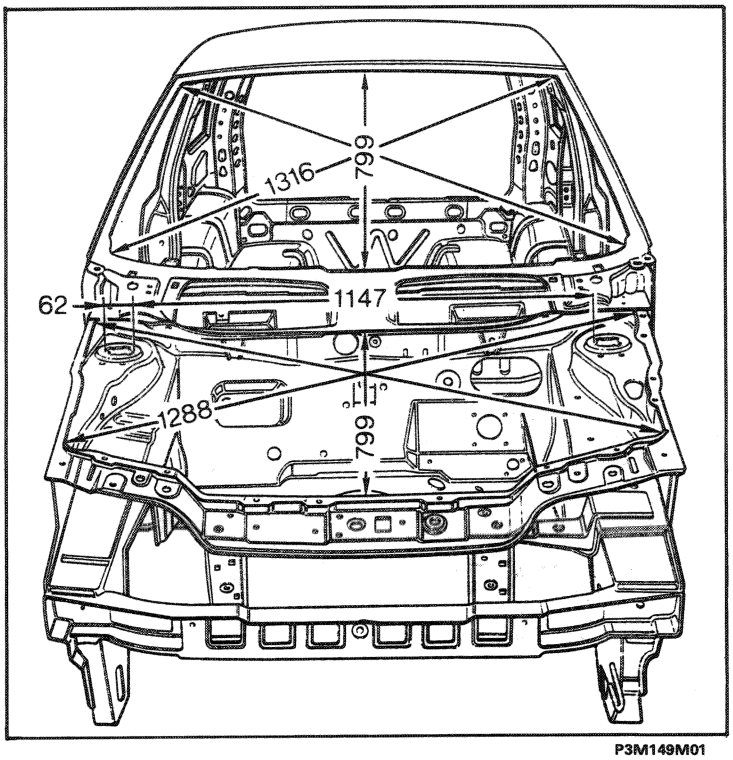
TYPICAL MEASUREMENTS

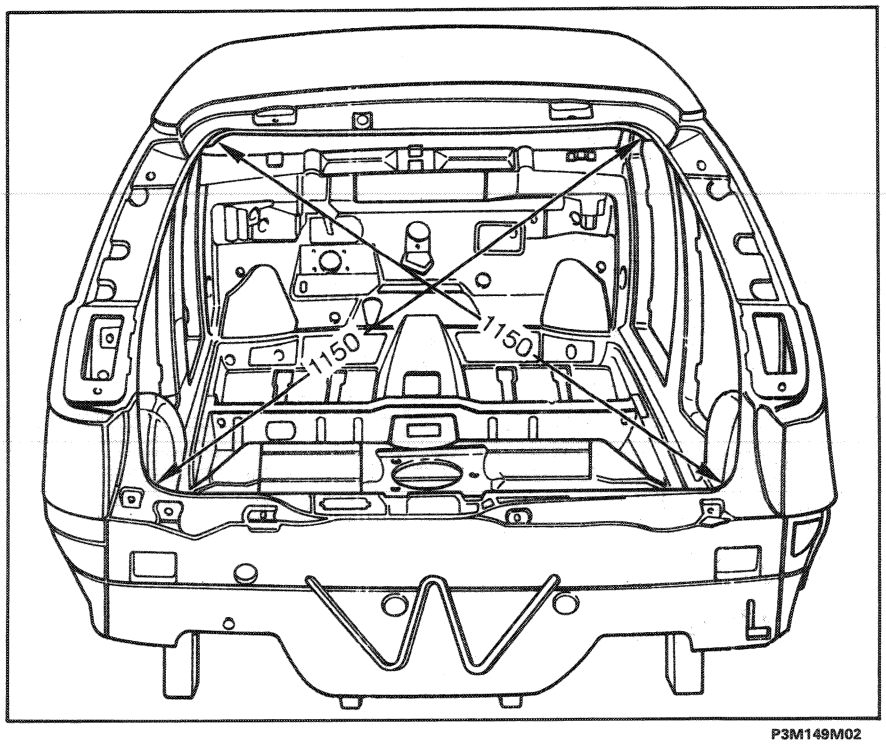
Measuring windscreen housing and engine compartment dimensions

The measurements for the housings given below are dealt with in the technical designs and are therefore subject to a tolerance of about ± 2 mm.



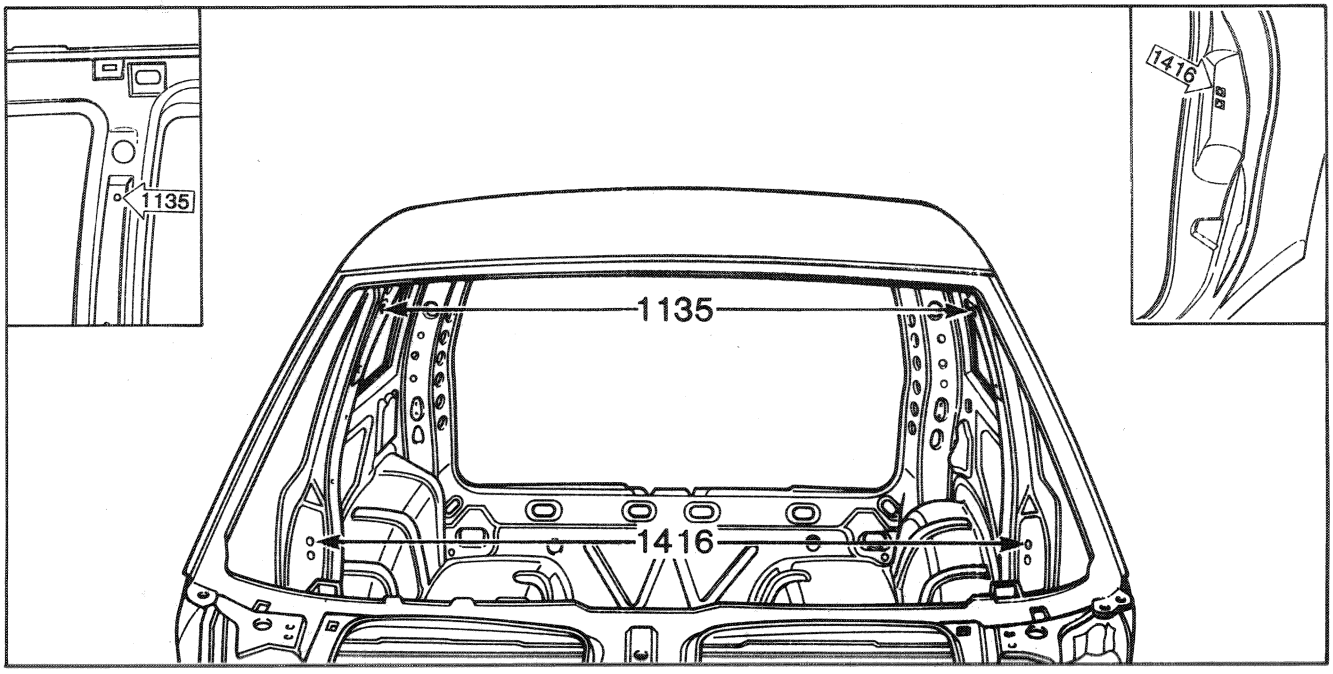
P3M149M01

Measuring rear door housing dimensions (3 and 5 door)



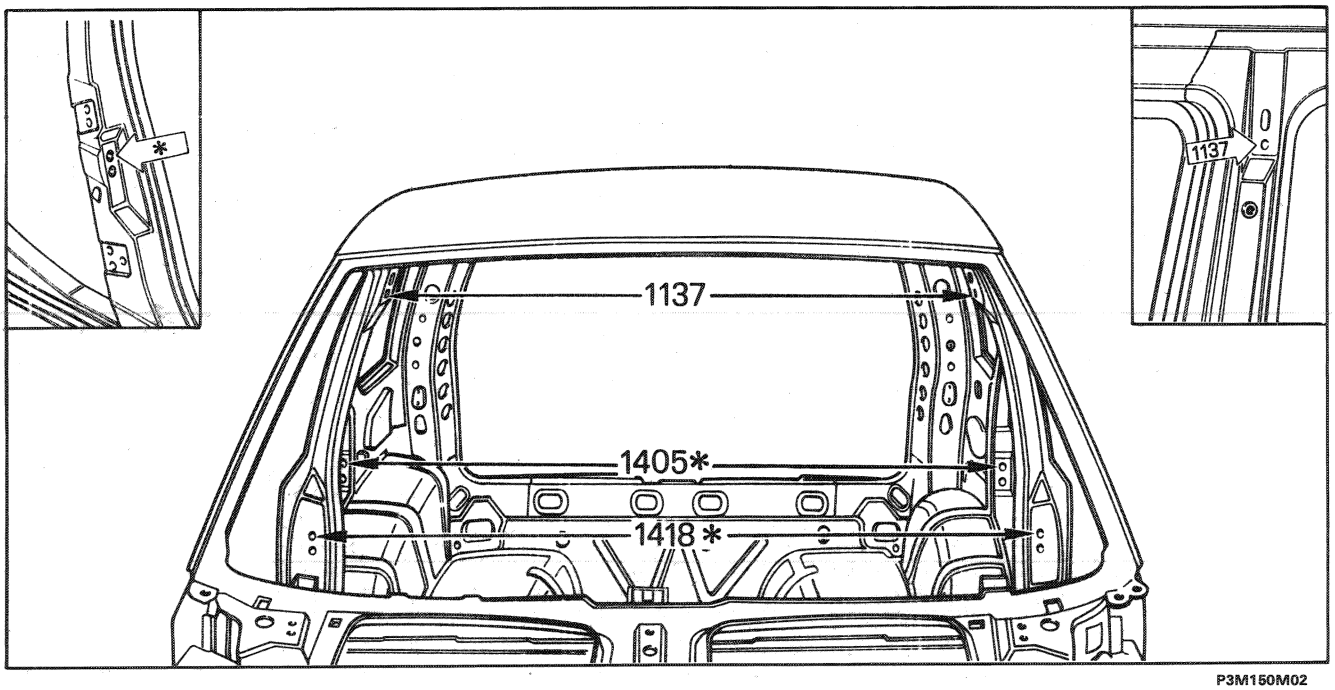
P3M149M02

Measuring dimensions of centre pillar housing (3 door version)



Measurements for checking distance between centre door pillars measured by the seat belt attachment nuts and between the lock strikers (3 door version).

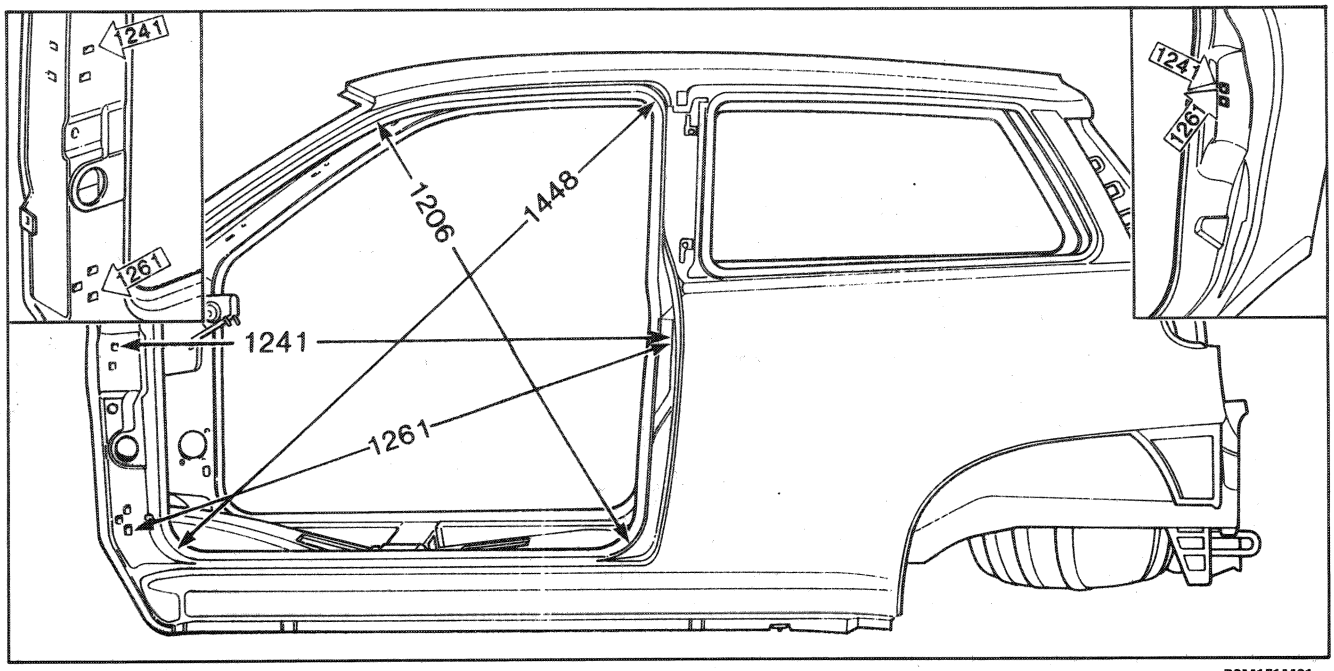
Measuring dimensions of centre and rear pillar housing (5 door version)



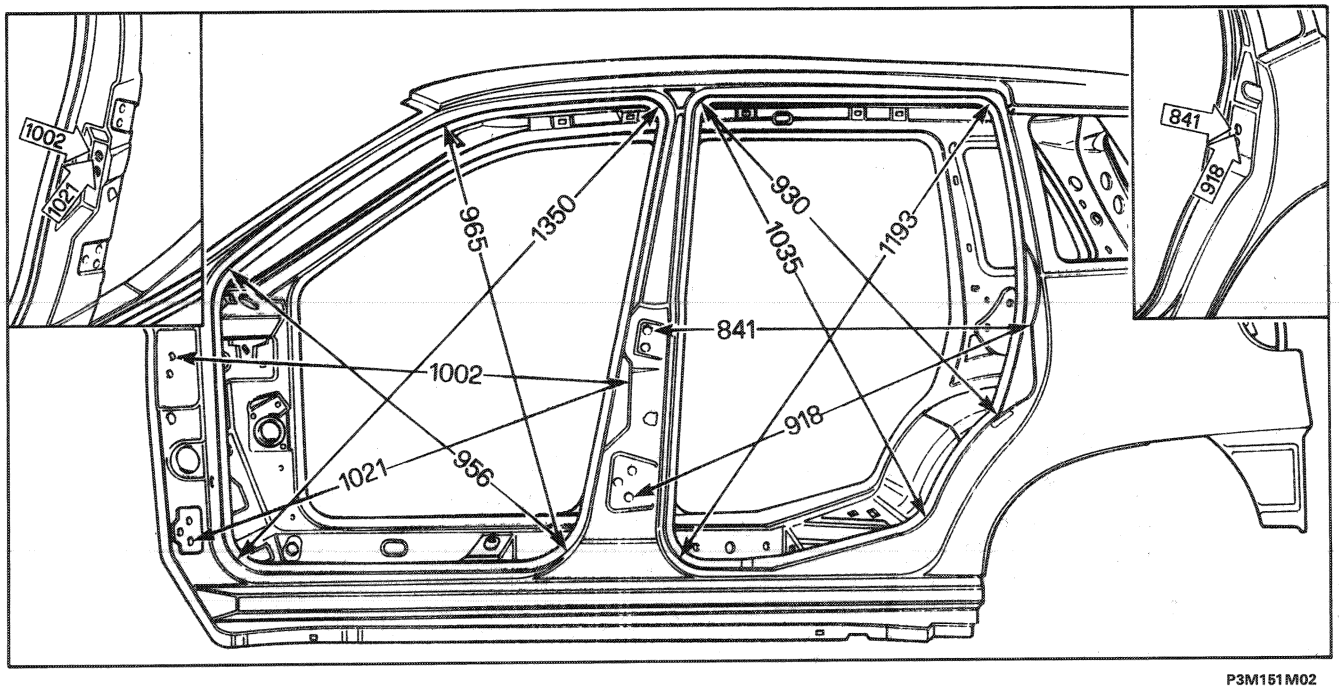
* 1418: Centre pillar
* 1405: Rear pillar

Measurements for checking the distance between the centre door pillars measured by the seat belt attachment nuts and between the lock strikers (5 door version).

Measuring door housing dimensions



3 door version

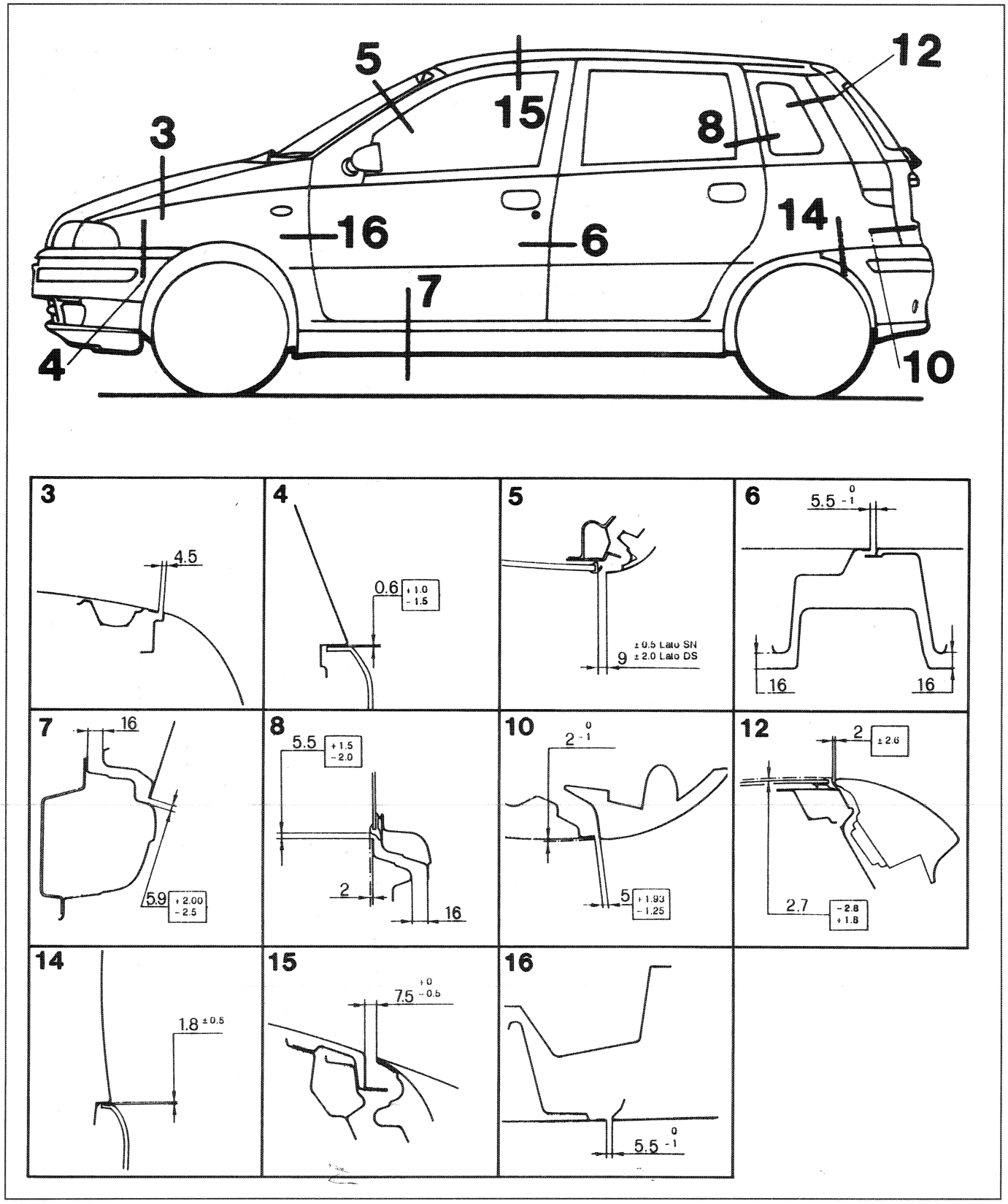


5 door version

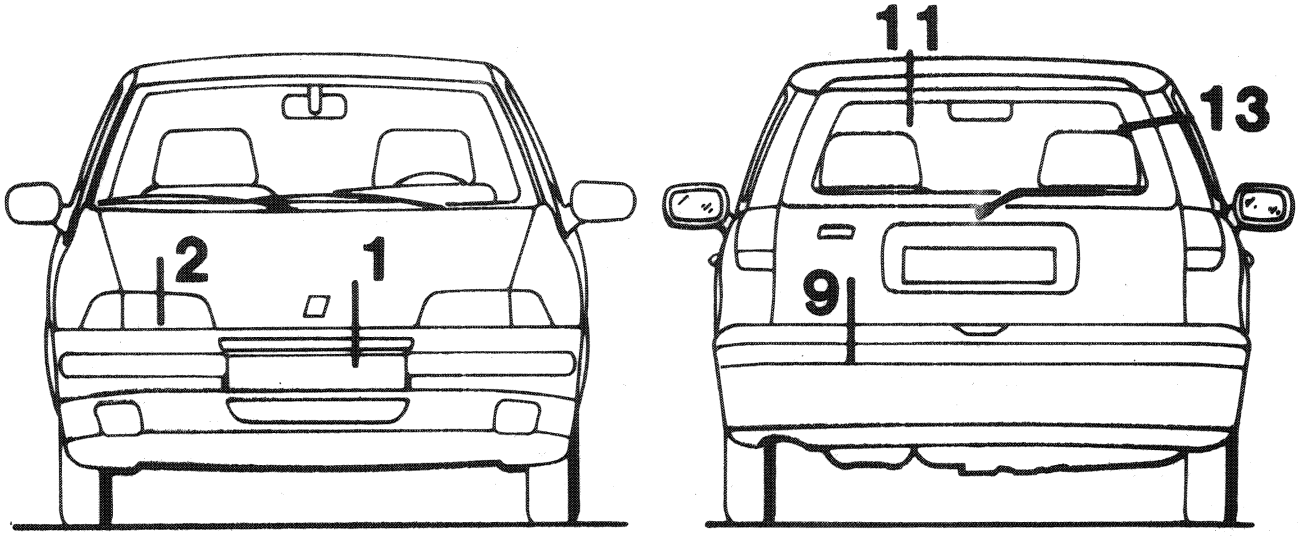
70.

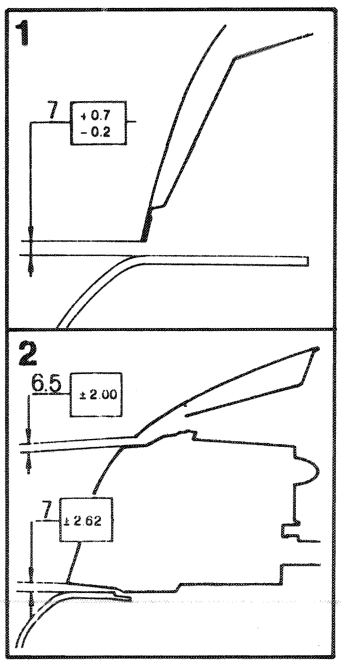
Measurements for adjusting moving components

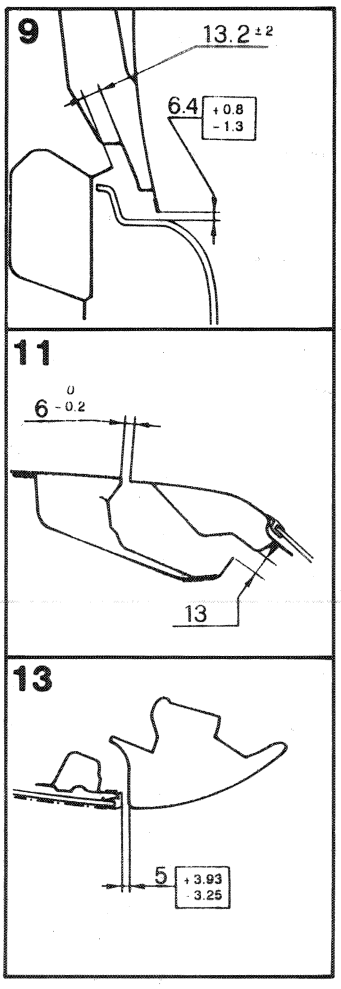
In order to facilitate and check the operations of dismantling the moving components, we give the value of the openings (the measurements are expressed in millimetres).



P3M152M01


11
13
2
1
9


1
7
+0.7
-0.2
2
6.5
±2.00
7
±2.62


9
13.2±2
6.4
+0.8
-1.3
11
6
0
-0.2
13
13
5
+3.93
-3.25

P3M153M01

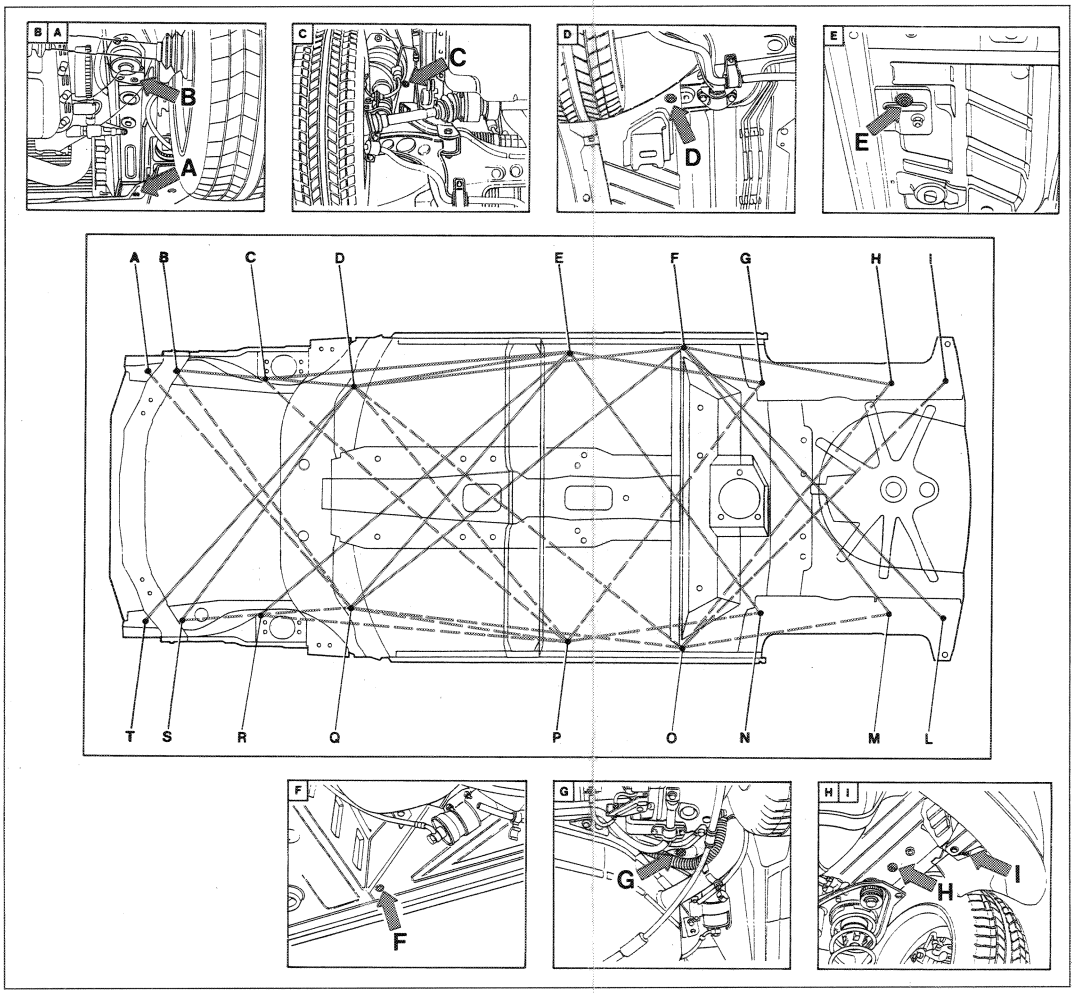
Check with graduated rod of main underbody reference points

NOTE *This chapter highlights the most sensible way of working in order to allow bodyshops to achieve the best results.*
Before starting to repair a vehicle, even if it is only slightly damaged, a series of checks must be carried out.

These checks make it possible to check, amongst other things, that the infrastructural elements are not distorted in relation to the original geometry, which would involve the detachment of the mechanical elements and the return of the vehicle to the repair bench.

The comparative distances may be subject to slight differences (about ± 3 mm) which the repairer will be able to recognize through experience and establish whether they are due to possible impact or manufacturing tolerances.

Do not neglect to check the mechanical elements which could also have been distorted.



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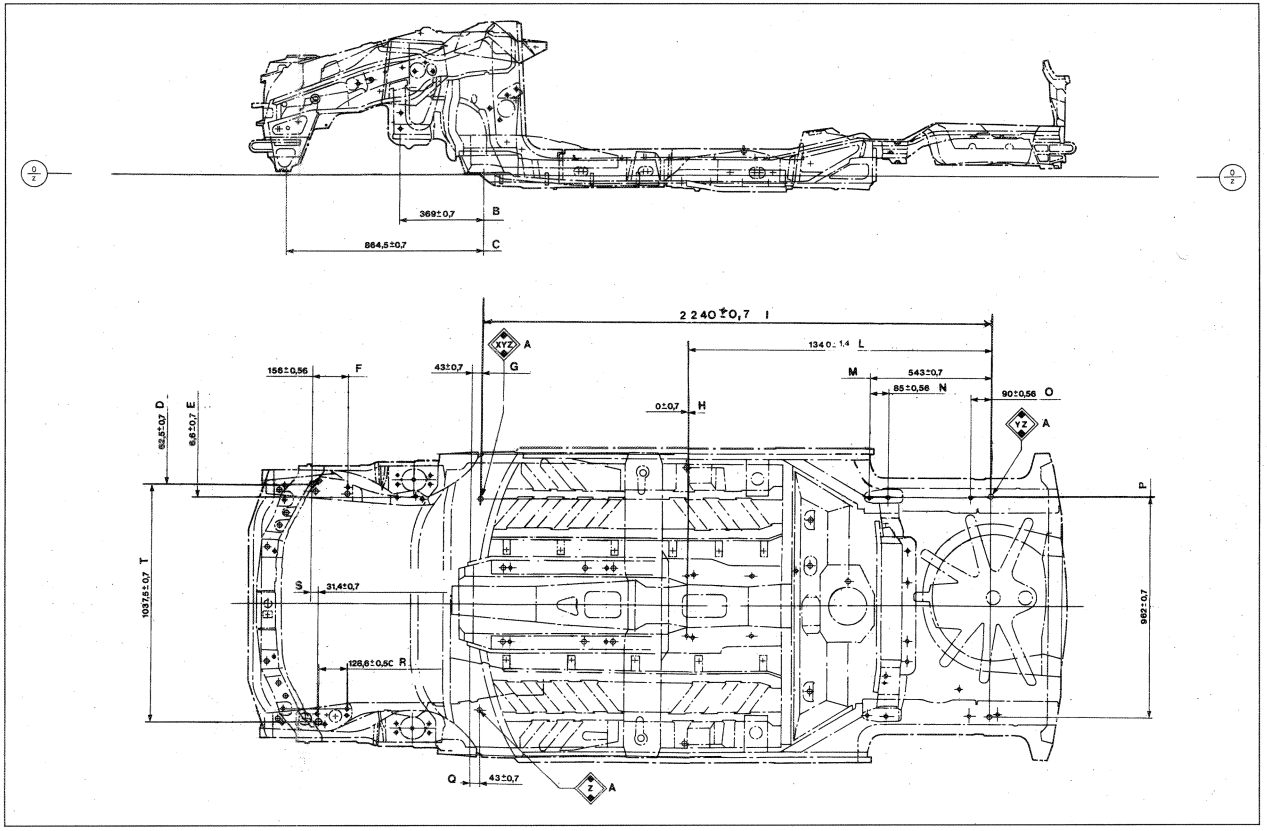
Check the following lengths:

ED=PQ	DO=QF
EQ=PD	DF=QO
ER=PC	EN=PG
EC=PR	EG=PN
DS=QB	FM=OH
DB=QS	FH=OM

Underbody checking points

A-T front cross member
B-S engine supports centering hole
C-R suspension front cross member centering hole
D-Q chassis/suspension front cross member centering hole
E-P chassis
F-O chassis
G-N rear suspension fixing centering
H-M chassis/rear side member
I-L rear cross member

Diagram for checking underbody



P3M327M01

A. Complete chassis
B. Suspension front cross member fixing
C. Centre for fixing rad. cross member
D. Centre for engine fixing
E. Suspension front cross member fixing
F. Engine fixing
G. Centre for cross member fixing
H. between centres for fixing right and left F.A.M. support
I. Chassis
L. Centre for fixing F.A.M. supports
M. Centre for fixing rear suspension
N. Rear suspension fixing
O. Rear suspension fixing
P. Centre for fixing rear suspension
Q. Centre for fixing suspension front cross member
R. Gearbox fixing
S. Between centres fixing right engine and left gearbox fixing centre
T. Engine/gearbox fixing centre