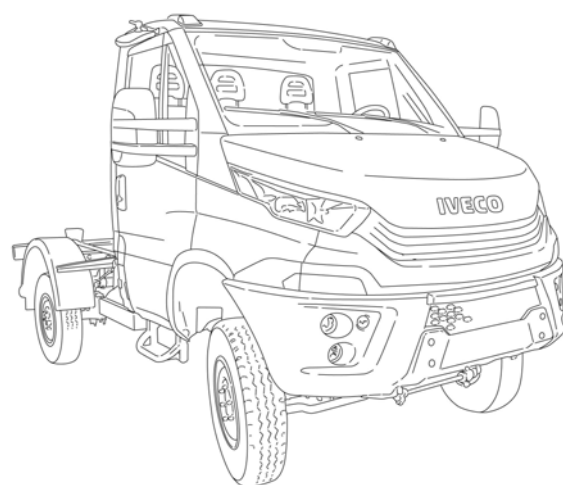


DAILY

4x4

BODYBUILDERS
INSTRUCTIONS



LIGHT RANGE

IVECO

ISSUE 08-2020

IVECO S.p.A
“TECH PE T&H - BODY BUILDER SUPPORT”
Lungo Stura Lazio, 49
10156 Torino (TO) - Italy

www.iveco.com

Printed **692.68.999** – 3rd Ed. 08/2020

Images and text: IVECO S.p.A. 2020
All rights reserved.



UPDATE DATA

Section	Chapter	Description	Revision date

INTRODUCTION

This publication provides information, features and instructions for transformation and fitting of the vehicle; considering the type of content, it is meant for qualities and specialised staff.

The Body builder is manager of the project and its execution, and must assure compliance with what is set forth in this publication and in the laws in forth.

Any modification, transformation or fitting not described in this manual and not expressly authorized will relieve IVECO of any liability and the warranty, if present, will immediately be null and void.

The same applies to individual assemblies and components; those described in this manual have been deliberated, approved and tested by IVECO and are part of normal production. The adoption of any type of unit that is not approved (e.g. PTO, tyres, horns, etc.) shall relieve IVECO of any responsibility.

IVECO is available to provide information on the implementation of the interventions and to provide instructions for any cases and situations not covered in this publication.

Before performing any operation, it is necessary to:

- verify that you have the manuals for the vehicle model on which you are about to work;
- ensure that all the safety devices (goggles, helmet, gloves, shoes, etc.), as well as the equipment used for work, lifting and transport, is available and working;
- ensure that the vehicle is placed in safe conditions.

At the end of the operation, the operational, efficiency and safety conditions set by IVECO must be restored. Contact the Service network for vehicle calibration if necessary.

Data and information contained in this publication may be outdated as a result of changes adopted by IVECO, at any time, for technical or commercial reasons or due to the need to adapt the vehicle to new legal requirements.

In the event of discordance between the information herein and the actual vehicle, please contact the Product Manager operating on the market before performing any interventions.

SYMBOLS - WARNINGS

	Danger for persons Failure to comply with these prescriptions can result in the risk of serious injury.
	Risk of serious damage to the vehicle Partial or complete non observance of these prescriptions can lead to serious damages to the vehicle and can sometimes result in the guarantee being voided.
	General danger Includes the dangers of both above described signals.
	Environmental protection Indicates correct behaviour in order that vehicle use is as environmentally friendly as possible.
NOTE	Indicates an additional explanation for a piece of information.

GENERAL INFORMATION	1
CHASSIS INTERVENTIONS	2
APPLICATIONS OF SUPERSTRUCTURES	3
POWER TAKE-OFFS	4
ELECTRONIC SUB-SYSTEMS	5
ADBLUE AND SCRT SYSTEM	6
EXPANSION MODULE	7
Hi-MATIC AUTOMATIC GEARBOX	C



SECTION 1

GENERAL INFORMATION

Contents

I.1 SCOPE OF THE GUIDELINES	5	I.16 INSTRUCTIONS FOR PROPER FUNCTIONING OF THE VEHICLE PARTS AND ACCESSIBILITY	16
I.2 TECHNICAL DOCUMENTATION AVAILABLE ELECTRONICALLY	5	I.17 GENERAL REGULATION FOR THE PREVENTION OF FIRE RISK	17
I.3 AUTHORISATION	5	I.18 CONVENTIONS	17
I.4 AUTHORISATION REQUEST	6		
I.5 RESPONSIBILITIES	6		
I.6 LEGISLATIVE REQUIREMENTS	6		
I.7 MULTI STAGE TYPE APPROVAL - COLLABORATION (only for vehicles registered in the EU, Switzerland and Turkey)	6		
I.8 GUARANTEES	7		
I.9 QUALITY SYSTEM MANAGEMENT	8		
I.10 ACCIDENT PREVENTION	8		
I.11 ENVIRONMENTAL ASPECTS	8		
I.12 VEHICLE MANAGEMENT ON THE PART OF BODYBUILDER	9		
I.12.1 Chassis acceptance	9		
I.12.2 Maintenance	9		
I.12.3 Delivery of the vehicle to the end customer	9		
I.13 VEHICLE NAMES	10		
Type approval name	10		
I.14 IDENTIFICATIONS	11		
I.15 DIMENSIONS AND GROUND	11		
I.15.1 General information	11		
I.15.2 Vehicle adaptability	11		
I.15.3 Rearview mirrors	12		
I.15.4 Determination of the centre of gravity of the superstructure and the payload	12		
I.15.5 Height of centre of gravity	13		
I.15.6 Adoption of stabilizer bars	15		
I.15.7 Observance of the permitted masses	15		
I.15.8 Variations on the permitted masses	16		

GENERAL INFORMATION

I.1 SCOPE OF THE GUIDELINES

The scope of this publication is to provide information, features and instructions for fitting and transformation of the original IVECO vehicle in order to ensure its functionality, safety and reliability.

These Guidelines also aim to indicate to bodybuilders:

- the quality level to be obtained;
- obligations regarding the safety of operations;
- obligations regarding the objective responsibility of the product.

It should be noted that the collaboration with IVECO is based on the assumption that the bodybuilder uses the maximum of their technical and organisational skills and that operations are technically and perfectly complete.

As outlined below, the topic is extensive and we can only provide the rules and minimum precautions that can allow development of the technical initiative.

Faults or defects caused by total or partial failure to comply with these Guidelines are not covered by the guarantee on the chassis or relative mechanical units.

I.2 TECHNICAL DOCUMENTATION AVAILABLE ELECTRONICALLY

The following technical documentation is available from <http://ibb.iveco.com/en/SitePages/Home.aspx>:

- Directives for transformation and fitting of vehicles;
- technical specifications;
- truck diagrams;
- tractor diagrams;
- chassis diagrams;
- other range-specific data.

I.3 AUTHORISATION

Modifications or versions indicated in these Guidelines and carried out in full compliance of the instructions provided, do not require any specific authorisation.

If this is not the case, IVECO authorisation is required to carry out:

- particular changes to the wheelbase;
- work on the braking system;
- Modifications to the steering system, as a mechanical element and as power steering (also electric);
- modifications to the stabilizer bars and suspensions;
- modifications to the cab, cab mounts, locking and tilting devices;
- replacing the engine or the "driveline" with electric motor or hybrid systems;
- modifications to intake, engine exhaust and SCR components;
- power take-off applications;
- tyre size variations;
- modifications to the coupling parts (hooks, articulations);
- any modification not included in these Guidelines.

I.4 AUTHORISATION REQUEST

Authorisation requests, when necessary, must be sent to the responsible IVECO Departments on the market.

The Bodybuilder must provide vehicle data (cab, wheelbase, overhang, chassis No.) and adequate documentation (drawings, calculations, technical report, etc.) showing the realisation, use and operating conditions of the vehicle. The drawings should evidence everything that differs from these instructions.

Upon completion of the interventions the bodybuilder shall be responsible for attainment of definitive approval from the competent authority.

I.5 RESPONSIBILITIES

The authorisations issued by IVECO are exclusively related to the technical/conceptual feasibility of the modification and/or fitting. The bodybuilder is therefore responsible for:

- the design;
- the choice of materials;
- the implementation;
- the compliance of the design and implementation of any specific indications provided by IVECO and the laws in force in the countries where the vehicle is destined;
- effects on functionality, safety, reliability and, in general, good behaviour of the vehicle;
- components that are installed and/or those already present on the vehicle if they are to be modified and / or replaced;
- supply of replacement parts for a period of at least 10 years from the last fitting of an order.

I.6 LEGISLATIVE REQUIREMENTS

The bodybuilder must verify that the final product is compliant, without exception, to all applicable legal requirements, on the municipal/autonomous/national level of each State in which it is registered and/or will circulate (Highway code, Official Regulations, etc.) and on the international level (European Union Directives, ONU/Geneva ECE Regulations, etc.). It is also necessary to comply with all requirements for accident prevention, instructions for assistance, the environment, etc.

The regulations on accident prevention or the legal indications cited in these Guidelines may be considered the most important, but are not meant in any way to replace or eliminate the obligation and responsibility of the bodybuilder to stay properly informed.

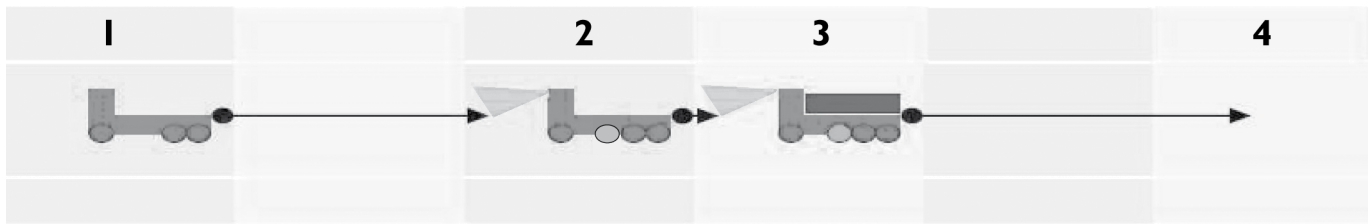
For this reason, IVECO shall not be held liable for any consequences due to errors caused by insufficient knowledge or incorrect interpretation of the legal provisions in force.

I.7 MULTI STAGE TYPE APPROVAL - COLLABORATION (only for vehicles registered in the EU, Switzerland and Turkey)

Annex XVII of Directive 2007/46/EC concerns *Multi-stage Type Approval*.

This procedure requires that each manufacturer is responsible for the approval and compliance of the production of systems, components and "separate technical units" produced by the same or applied to the vehicle.

The manufacturer of the vehicle is defined as *first-stage manufacturer*, while the bodybuilder is defined as *Second-stage manufacturer* or that of the next stage.



191319

Figure 1

- | | |
|--|----------------|
| 1. IVECO | 3. Bodybuilder |
| 2. Authorised workshop upon Dealer order | 4. Customer |

Based on this Directive, IVECO (main vehicle manufacturer) and a bodybuilder intending to launch the multi-stage approval process must sign a specific Collaboration Contract, called *Technical Agreement*, which sets out the content and reciprocal obligations in detail.

Consequently:

1. IVECO has the responsibility of providing, in the agreed form, the approval documents (EC/ECE approvals) and the technical information necessary for the proper implementation of the fitting and/or transformation (manuals, drawings, specifications);
2. the bodybuilder has the following responsibilities:
 - the design and implementation of modifications to the basic vehicle received from IVECO,
 - reattainment of approvals of systems already approved in a previous stage when, due to changes on the basic vehicle the approvals need to be updated,
 - compliance with national/international laws and in particular the laws of the destination country, for all changes made,
 - presentation of the changes made to a technical service, for evaluation,
 - appropriate documentation of the changes made, in order to give objective evidence of compliance to the aforementioned provisions of law (e.g. approval documents/test reports).

Before signing the *Technical Agreement* IVECO reserves the right to visit the bodybuilder, in order to verify qualifications to carry out the fittings and/or processing for which the above collaboration is requested.

The contents of the *Technical Agreement* can be evaluated in detail upon request to the Manager for relations with the bodybuilder for the single Market.

1.8 GUARANTEES

The guarantee that the work has been performed to standard must be given by the bodybuilder who made the superstructure or modifications to the chassis, in full compliance with the instructions in these Guidelines.

IVECO reserves the right to void the warranty on the vehicle, if:

- unauthorised fittings or transformations have been carried out;
- a chassis not suitable for the fitting or intended use has been used;
- the standards, specifications and instructions, provided by IVECO for proper execution of the work, have not been respected;
- original spare parts or equivalent, or components made available by IVECO for specific operations have not been used;
- safety regulations have not been respected;
- the vehicle is used for purposes other than those for which it was designed.

I.9 QUALITY SYSTEM MANAGEMENT

IVECO has always promoted the training and development of a Quality System for Bodybuilders.

This requirement is not only due to regulations on product liability, but also to the increasingly higher quality level demands, new organizational forms in various sectors and the search for more advanced levels of efficiency.

IVECO therefore considers it appropriate for Bodybuilders to be equipped with:

- organizational charts for roles and responsibilities;
- quality objectives and indicators;
- design technical documentation;
- process documentation, including controls;
- plan for product improvement, also obtained through corrective actions;
- post-sales assistance;
- training and qualification of staff.

The availability of ISO 9001 certification, even though not required, is considered very important by IVECO.

I.10 ACCIDENT PREVENTION

Do not allow unauthorised personnel to intervene or operate on the vehicle.



- ▶ **It is forbidden to use the vehicle with safety devices that have been tampered with or are damaged.**



- ▶ **Structures and devices installed on the vehicles must comply with the applicable regulations for accident prevention, and with safety regulations required in the individual countries where the vehicles are used.**

All precautions dictated by technical knowledge must be taken to avoid damage and functional defects.

Compliance with these requirements must be overseen by the manufacturer of the structures and devices.



- ▶ **Seats, coatings, gaskets, protective panels, etc., may pose a fire hazard when exposed to an intense heat source. Remove them before working with welding and with flames.**

I.11 ENVIRONMENTAL ASPECTS

In the study and design phase, the choice of materials to be used by be made carefully, even from the ecological and recycling point of view.

To this regard, please note that:

- it is forbidden to use materials that are harmful to health, or at least which may pose a risk, such as those containing asbestos, lead, halogen additives, fluorocarbons, cadmium, mercury, hexavalent chromium, etc.;
- it is advisable to use materials whose processing produces limited waste quantities and allows easy recycling after first use;
- in synthetic materials of the composite type, it is advisable to use components that are compatible with each other, allowing use with the possible addition of other recovery components. Prepare the required markings in accordance with the regulations in force;
- the batteries contain substances that are very dangerous for the environment. To replace the batteries it is possible to go to the Service Network, equipped for disposal in accordance with the nature and the law.



- **To comply with Directive 2000/53 EC (ELVs), IVECO prohibits the in-vehicle installation of components that contain lead, mercury, cadmium and hexavalent chromium; exceptions are made in cases allowed by Annex II of the above Directive.**

I.12 VEHICLE MANAGEMENT ON THE PART OF BODYBUILDER

I.12.1 Chassis acceptance

The bodybuilder receiving a chassis/vehicle from IVECO or from a Dealer must perform a preliminary check, notifying of any missing accessories or damage attributable to the transporter.

I.12.2 Maintenance

To preserve the chassis/vehicle in its full efficiency, even while parking in the warehouse, maintenance operations may be necessary within a predetermined time.

The expenses for carrying out these operations are borne by the owner of the vehicle in that moment (Bodybuilder, Dealer or Customer).



- **In case of long periods of vehicle inactivity, it is advisable to disconnect the negative pole of the battery to maintain optimal charging status.**

I.12.3 Delivery of the vehicle to the end customer

Before delivering the vehicle, the bodybuilder must:

- calibrate its production (vehicle and/or equipment) and verify functionality and safety;
- for items which will be subjected to the intervention, carry out the controls set out in the Pre Delivery Inspection (PDI) list, available in the IVECO network;
- measure battery voltage with a digital multimeter (2 digit decimal), keeping in mind that:
 1. optimal value is equal to 12.5 V,
 2. between 12.1 V and 12.49 V the battery should be put under a slow charge,
 3. with values less than 12.1 V the battery should be replaced.

Note *The batteries must be maintained at regular intervals (refer to IVECO Std 20-1812 and/or IVECO Std 20-1804) until delivery of the vehicle to the Customer/Dealer to avoid problems of insufficient charging, short circuit or corrosion. IVECO reserves the right to nullify the guarantee on the battery if the prescribed maintenance procedures are not respected.*

- carry out a functional road test (in case of vehicle transformation). Any defects or problems should be notified to the IVECO Assistance Service to verify conditions for inclusion in the PDI costs;
- prepare and deliver to the final Customer the necessary instructions for service and maintenance of the fitting and any added units;
- report new data on special labels;
- provide confirmation that the operations carried out comply with the indications of the vehicle Manufacturer and legal requirements;
- draw up a guarantee covering the changes made.

I.13 VEHICLE NAMES

The commercial name of vehicles (**DAILY 4x4**) does not match that of the type-approval, a complete example of which is provided below.

Type approval name

DAILY 70C18HA8 CC W

- **DAILY** – Vehicle name
- **70** – Gross mass - GVW (no/10 = weight in t)

35	3.5 t
55	5.5 t
70	7.0 t

- **C** – Rear wheels

S	Single rear wheels
C	Twin rear wheels

- **18** – Engine power (no. x 10 = power in HP)

15	146 HP
18	180 HP

- **H** – Engine type

H	Euro VI Engine (combined with engine power code 18)
E3	Euro III Engine (combined with engine power code 15)

- **A8** – Type of transmission

–	Manual gearbox
A8	Automatic gearbox

- **CC** – Version

–	Chassis-cab version
D	Dual cab (6+1)
V	Van
SV	Semi-windowed
CC	Cowl
CCS	Stripped chassis cowl
CA	Cut Away

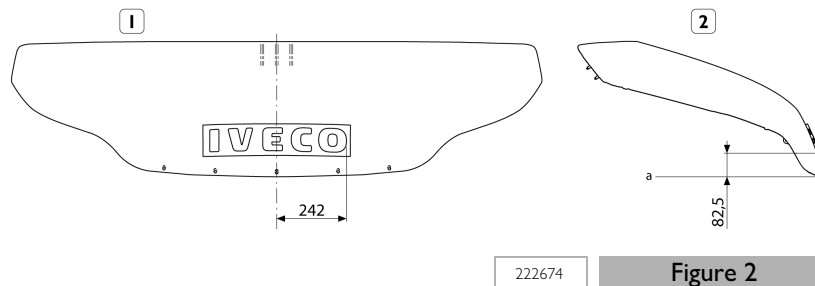
- **W** – 4x4

I.14 IDENTIFICATIONS

Logos, identification trade names and nameplates must not be modified, displaced or removed since the original design appearance of the vehicle must be safeguarded.

The application of trademarks relating to the transformation or outfitting must be authorised. They must not be applied near to the IVECO trade names or logos.

In the event of cowl vehicles, the positioning of the IVECO logo on the engine bonnet must be done only after final paint spraying and must respect the measurements indicated qualitatively in the following figure.



1. Front view
2. Side view

- a. Bonnet lower edge

For the actual measurements and for the realization of a possible template, please consult the design 5801620982.

IVECO reserves the right to withdraw its trade names and logos if the above requirements are not met.

I.15 DIMENSIONS AND GROUND

I.15.1 General information

The dimensions and masses of vehicles allowed on the axles are shown in the drawings, the technical descriptions and, more generally, on the documents on the official IVECO website. Defects refer to vehicles in their standard versions; the use of special equipment may lead to changes on the masses and their distribution on the axles.

I.15.2 Vehicle adaptability

The body length limits mainly depend on:

- wheelbase length
- distribution of mass on the axles
- maximum permitted width

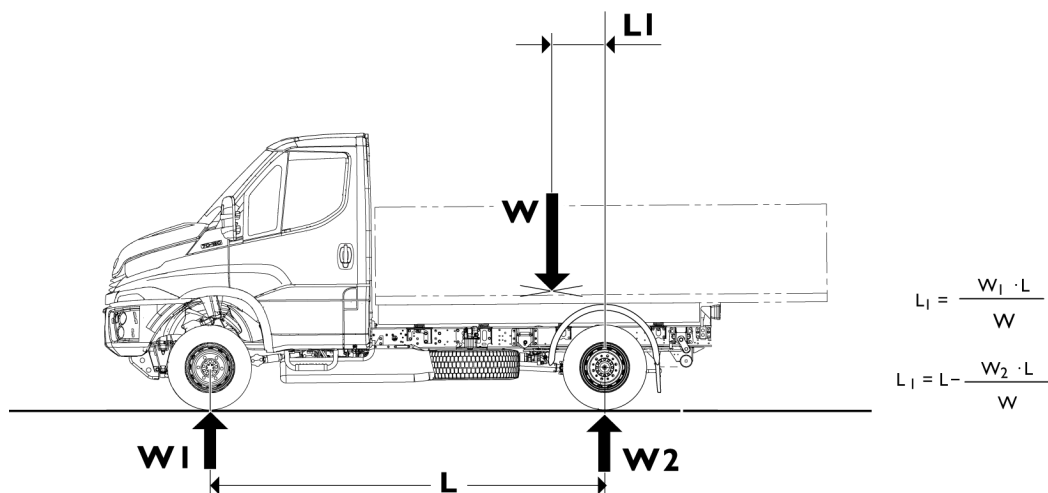
I.15.3 Rearview mirrors

Depending on the width of the version, the rear visibility angles imposed by the Regulations can be respected choosing the most appropriate of the three rear-view mirrors with two arms of varying widths available in the catalogue (opt. 8644, 78318).

I.15.4 Determination of the centre of gravity of the superstructure and the payload

To determine the position of the centre of gravity of the superstructure and of the payload, proceed according to the following examples.

The specific technical documentation for each model (chassis cab version diagram) illustrates the positions allowed with the standard version vehicle. The masses and the positioning of the individual components of the vehicle are shown on the chassis and weight allocation diagram.



261809

Figure 3

W = Payload plus superstructure

W_1 = Measurement of payload on front axle

W_2 = Measurement of payload on rear axle

L_1 = Distance of centre of gravity from centre line of rear axle

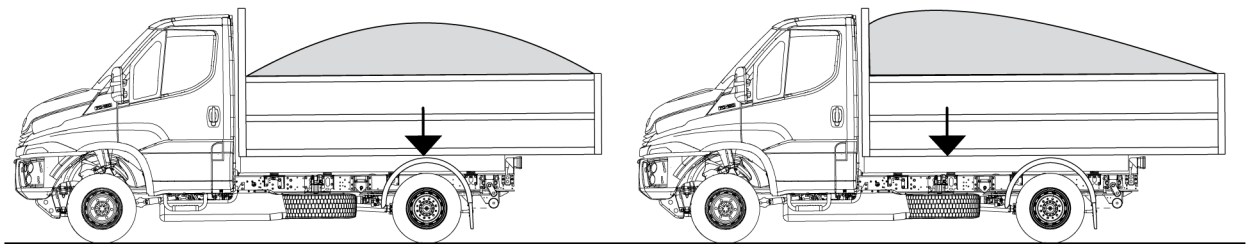
L = Actual wheelbase

For the purposes of payload distribution on the axles, it is assumed that this is evenly distributed, except in cases in which the shape of the load surface results in a different load distribution.

For equipment, the centre of gravity is obvious considered for its actual position.

In the realisation of the superstructure or containers, automatic loading and unloading of the goods transported must be provided to avoid excessive variations of the distribution and/or excessive loads on the axles, providing information for users if necessary.

The bodybuilder should also provide a suitable anchoring systems for the load on the superstructure, so that transport can occur in maximum security.

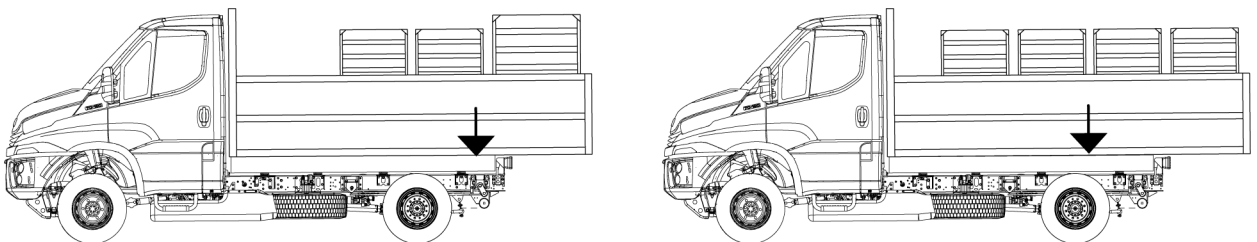


261810

Figure 4

Even distribution of load

Uneven distribution of load



261811

Figure 5

Even distribution of load

Uneven distribution of load (attention to loads on axles and minimum ratio)

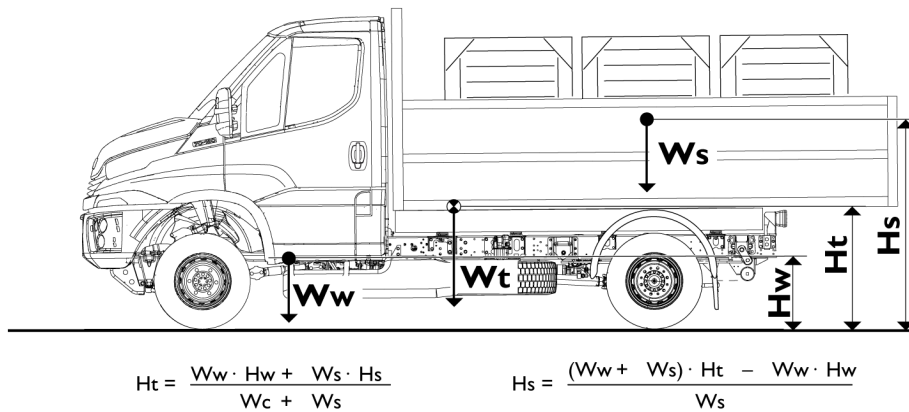
I.15.5 Height of centre of gravity

For the chassis cab version and no-load vehicle, the value of the height of the centre of gravity is shown on the specific technical documentation for each model (chassis cab version diagram).

For the vehicle complete with super structure and full load, this height must comply with the maximum values allowed by national or international standards, in particular, Directives ECE 13 on longitudinal stability and ECE 111 on lateral stability while driving.

The following cases should be distinguished:

- a) fixed loads,
- b) mobile loads,
- c) loads that result in increased aerodynamic actions.

a) Fixed loads

261812

Figure 6**Control at full load**

Hw = Vehicle centre of gravity height (loaded)

Hs = Height of payload centre of gravity from the ground

Ht = Complete full-load vehicle centre of gravity height

Ww = Vehicle tare weight

Ws = Payload

Wt = Complete vehicle ground at full load

For any inspections with the vehicle set up without payload you can proceed similarly, assuming Ws is only the tare weight of the superstructure (considering for Hv a value appropriate for the load and between the no-load chassis cab version trim and the full-load trim).

The following table lists the maximum indicative heights of the overall centre of mass of the outfitting (payload + dump body and/or equipment) with reference to the crossways stability of the vehicle.

Table I.1

Tyres	225/75 R16 twin wheels	265/70 R19.5 single wheel	255/100 R16
T.G.W. [kg]	7000	7000	5500
Max. mass on front axle [kg]	2700	2700	2450
Max. mass on rear axle [kg]	5000	5000	3700
Height of centre of mass of outfitting [mm]	1620	1670	1710
Height of centre of mass of vehicle complete with load [mm]	1480	1510	1500

b) Mobile loads

In the versions where the load can be moved laterally while cornering (e.g.: suspended loads, liquid transport, animal transport, etc..) high lateral dynamic forces may be generated which may jeopardise the stability of the vehicle.

With reference to the indications of the regulation ECE 111, special attention should therefore be paid to:

- in defining the height of the fitted vehicle's centre of gravity and at full load;
- in assessing the dynamic forces and the lateral displacement of the centre of gravity;
- in considering (for liquids) the density;
- in prescribing the adoption of adequate precautions for driving.

Any cases where evaluation is difficult should be submitted to IVECO for approval.

c) Loads that result in increased aerodynamic actions

In fittings characterised by high vertical and surface development (e.g.: advertising panelling), the height of the centre of thrust, determined in the case of cross-wind, must be evaluated very carefully.



- **Even with the low centre of gravity, a vehicle fitting that has a high surface area may not provide sufficient lateral stability and may be exposed to the danger of tilting.**

Special attention must therefore be paid:

- in defining the height of the fitted vehicle's centre of gravity and at full load,
- in assessing the aerodynamic forces,
- in prescribing the adoption of adequate precautions for driving.

Any cases where evaluation is difficult should be submitted to IVECO for approval.

I.15.6 Adoption of stabilizer bars

The application of additional or reinforced stabilizer bars, reinforcing the springs or flexible elements in rubber (in accordance with the indications provided in Chapter 2.9) helps to compensate for any high values of the centre of gravity of the payload. In this case, the operation must be carried out on the rear axle, since acting on the front may give rise to an incorrect sensation of higher vehicle stability and higher safety limits. Interventions on the front axle can be carried out in the presence of concentrated loads behind the cab (for example, cranes) or of superstructures with high rigidity (for example, vans).

I.15.7 Observance of the permitted masses

All the limits shown on IVECO documentation must be respected. It is particularly important to evaluate the maximum ground on the front axle in any load condition, in order to ensure the necessary steering features in all road surface conditions.

Special attention must therefore be paid to vehicles with concentrated load on the rear overhang (e.g.: cranes, tail lifts, trailers with centre axle) and short wheelbase vehicles and high centre of gravity.

Note *In the positioning of the auxiliary bodies and superstructure, a proper load distribution in the transverse direction must be ensured. A variation on the nominal load may be permitted for each wheel (50% load on the corresponding axle) of $\pm 4\%$ (e.g.: load allowed on the axle 3,000 kg; allowed for each wheel side from 1,440 to 1,560 kg) in compliance with what is permitted by the tyres, without affecting the braking and driving stability characteristics of the vehicle.*

Unless other specific dispositions are provided for individual vehicles, one must consider for the mass on the front axle a minimum value of 25% of the effective mass of the vehicle (with loads distributed uniformly as well as with loads on the rear overhang or associated with a trailer, if attached).

Note *The rear overhang of the superstructure must be implemented in full compliance with the permitted axle loads, the minimum load required on the front axle, length limits, the position of the tow hook and the under-run protection as envisaged by various standards and regulations.*

I.15.8 Variations on the permitted masses

Special exemptions from the maximum permissible masses may be granted for specific uses, for which, however, there are precise limits for use and reinforcements to be made to parts of the vehicle.

These exceptions, if they exceed the limits of the law, must be authorised by the Administrative Authority.

In the authorisation request, you must indicate:

- type of vehicle, wheelbase, chassis number, intended use;
- division of the tare weight on the axles (in fitted vehicles, e.g.: crane with flatbed), with the position of the payload centre of gravity;
- any proposals for strengthening the parts of the vehicle.

Reduction of the permitted mass on the vehicles (downgrading) can lead to interventions on the suspensions and brakes; in these cases the necessary indications may be provided.

I.16 INSTRUCTIONS FOR PROPER FUNCTIONING OF THE VEHICLE PARTS AND ACCESSIBILITY

In carrying out the transformations and applying any type of equipment, there should be no alteration to what enables the proper functioning of the vehicle units and parts under various working conditions.

For example:

- free access must be guaranteed to the places that need inspection, maintenance or periodic controls (e.g., battery replacement, access to the air suspension compressor) and, in the case of enclosed superstructures, special compartments and doors should be provided;
- the possibility of disassembling the various groups for assistance operations must be maintained;
- in the fitting that provides the tipping of the lateral tails, consider the size of the most protruding parts of the vehicle, in order to avoid limitations to tipping or damage to the parts.
- conditions should not be affected regarding cooling (radiator grille, radiator, air passages, cooling etc.), fuel supply (pump positioning, filters, pipe diameter, etc.) and engine air intake;
- the soundproofing panels must not be altered or moved so as not to affect the approved sound emission limits. If any openings need to be made (e.g. for the passage of pipes or added sections), they must be thoroughly closed, using fireproof and soundproofing materials equivalent to the original materials used;
- adequate ventilation must be maintained for the brakes and battery casing (particularly in the execution of truck bodies);
- in the placement of fenders and wheel arches, free shaking of the rear wheels must be guaranteed, even under the conditions of use with chains.
- adjustment of the vehicle's headlamps must be checked once construction is completed, to correct any changes in their structure; for adjustment, proceed according to the instructions given in the "Use and Maintenance Handbook";
- for any elements supplied loose (e.g. spare wheel, chocks), the Body builder must position and fasten them in an accessible and secure way, in compliance to any national regulations.

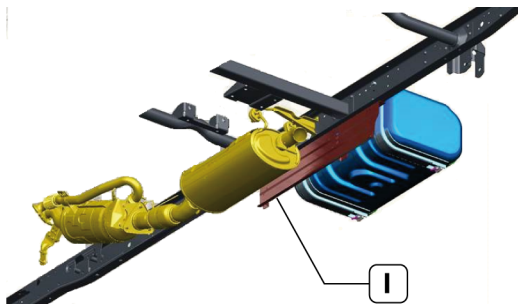
I.17 GENERAL REGULATION FOR THE PREVENTION OF FIRE RISK



- **Assemblies or parts made using flammable material must never be fitted near the vehicle's exhaust system.**

Synthetic materials must not be exposed to temperatures exceeding 70 °C; adequate protections must be implemented if higher temperatures are expected (isolating shielding).

The factory mounted fuel tank is made from materials belonging to this class and therefore pay careful attention if fitting in a position other than the original position.



257753

Figure 7

I Isolating shielding

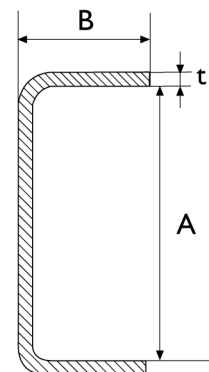
Particular attention must be paid to prevent the spillage of hydraulic fluids or inflammable liquids above components which may become hot or overheated.

Therefore, when pipes must be inevitably installed near the engine, exhaust system, catalytic converter or turbocharger, suitable insulating shields or protective plates must be provided.

I.18 CONVENTIONS

The following conventions are adopted in these Guidelines:

- **Wheelbase:** distance between the centre lines of the steering axle and the rear axle.
- **Rear overhang:** Distance between the centre line of the rear axle and the rear end of the chassis side members.
- **Dimensions A, B and t** of the chassis section: see the picture on the side.



91473

Figure 8

SECTION 2

CHASSIS INTERVENTIONS

Contents

2.1 CHASSIS MODIFICATION STANDARDS	5	2.6.4 Observations on payload	24
2.1.1 General precautions	5	2.6.5 Increase of towable weight	24
2.1.2 Special precautions	5	2.6.6 Nameplates	24
2.1.3 Characteristics of the material used in chassis modifications	6	2.7 ASSEMBLING AN ADDITIONAL AXLE	25
2.1.4 Stresses on the chassis	7	2.8 MODIFICATIONS TO THE DRIVELINE	25
2.2 DRILLS ON THE CHASSIS	7	2.9 WORK ON SUSPENSIONS	25
2.2.1 Positioning and dimensions of the holes	7	2.10 MODIFYING THE ENGINE AIR INTAKE AND EXHAUST SYSTEMS	26
2.2.2 Screws and nuts	8	2.10.1 Intake	26
2.2.3 Welding	8	2.10.2 Engine exhaust (only Euro III)	27
2.2.4 Closing holes by welding	10	2.11 MODIFYING THE ENGINE COOLING SYSTEM	27
2.3 RUST AND PAINT PROTECTION	10	2.12 MODIFICATIONS TO THE HEATING/CONDITIONING PLANT	28
2.3.1 Original vehicle components	10	2.12.1 Installing an additional heating system	28
2.3.2 Added or modified parts	12	2.12.2 Installing an air conditioning system	30
2.3.3 Precautions	13	2.13 BODYWORK INTERVENTIONS	31
2.4 WHEELBASE MODIFICATION	14	2.13.1 General information	31
2.4.1 General information	14	2.13.2 Interventions on chassis cab vehicles	32
2.4.2 Authorisation	14	2.13.3 Protection of the vehicle occupants	34
2.4.3 Impact on steering	14	2.13.4 Steering column adjustment	35
2.4.4 Impact on braking	15	2.14 CHANGING TYRE SIZE	35
2.4.5 Intervention procedure	15	2.14.1 Requirements	35
2.4.6 Verification of the chassis stresses	16	2.15 WORK ON THE BRAKING SYSTEM	36
2.4.7 Cross members	16	2.15.1 General information	36
2.4.8 Reinforcements on the chassis	16	2.15.2 Brake pipe	36
2.4.9 Modifications to the transmissions	17	2.16 ESP (ELECTRONIC STABILITY CONTROL)	38
2.5 REAR OVERHANG MODIFICATION	17	2.16.1 Derating of the ESP system	40
2.5.1 General information	17	2.16.2 Variation of GVW	40
2.5.2 Authorisation	18	2.16.3 Wheelbase variation	40
2.5.3 Shortening	18	2.16.4 Modification or replacement of suspensions	40
2.5.4 Lengthening	18	2.16.5 Modification or replacement of the stabilizer bars	41
2.6 INSTALLING THE TOW HOOK	19	2.16.6 Tyre changes	41
2.6.1 General information	19		
2.6.2 Precautions for installation	20		
2.6.3 Tow hook for trailers with central axle	22		

2.17	PART RELOCATION AND ANCHORAGE OF ADDITIONAL UNITS AND EQUIPMENT	41
2.17.1	Horn	41
2.17.2	Wheel mount	41
2.17.3	Fuel tank	41
2.18	TRANSPORT OF HAZARDOUS MATERIALS (ADR)	42
2.19	INSTALLING A RETARDER	42
2.20	REAR UNDER-RUN PROTECTION (RUP)	42
2.21	REAR MUD GUARDS AND WHEEL ARCHES	43
2.22	MUDFLAPS	43
2.23	SIDE PROTECTIONS	44
2.24	REARVIEW MIRRORS	44

CHASSIS INTERVENTIONS

2.1 CHASSIS MODIFICATION STANDARDS

2.1.1 General precautions

Keep in mind that:

- **weldings on the supporting structures of the chassis are absolutely forbidden** (except as prescribed in Paragraph "Weldings" (➡ Page 8) and in Chapters 2.4 (➡ Page 14), and 2.5 (➡ Page 17));
- **no holes may be drilled on the wings of the side members** (except for that stated in Chapter 3.3 - Paragraph "Choosing the type of connection");
- for cases where modifications to nailed unions are allowed, the nails may be replaced with flanged head screws or with hex head screws classed 8.8 with the next higher class diameter and nuts fitted with an anti-unscrewing system. Screws larger than M14 may not be used (maximum hole diameter of 15 mm), unless otherwise specified;
- for cases where unions that require screws are restored, the suitability of these screws must be checked before being re-used, and they must be tightened to the appropriate torque;



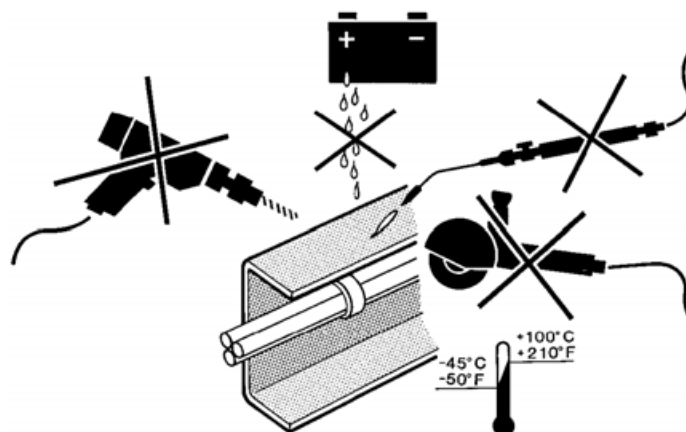
- ▶ **With regards to refitting safety components, it is prohibited to re-use the same screws they must be tightened to the specified torque (contact the Service Network for the value).**

- for cases involving remounting of safety components where nails are replaced by screws, the union must be checked again after about 500 - 1000 km of travel.

2.1.2 Special precautions



- ▶ **During operations involving welding, drilling, grinding or cutting carried out near the brake pipes or wiring, always disconnect the battery to prevent damage to the electronic control units. It is also necessary to adopt appropriate measures to protect these pipes and cables, even including removal if necessary (respect the indications provided in Chapters 2.15 and 5.4).**



91444

Figure 1

Precautions for alternators and electric/electronic components

In order to avoid damage to the rectifier diode, the battery must never be disconnected (or the isolator switch opened) while the engine is running.

In cases where the vehicle must be started by towing (strongly discouraged), make sure that the battery is charged and connected so as to ensure minimum supply voltage to the engine ECU.

Recharge the battery only after disconnecting it from the vehicle circuit. If the engine must be started-up with external charging equipment, be sure to avoid using the "Start" function (should these devices feature this function) in order to avoid peak currents that may damage electric and electronic components.

Start-up must be performed only via an external battery trolley, making sure that polarity is respected.

Earth connection

For further details on the connections to ground, see the Chapter 5.4 .

Braking and electrical systems

For additional details on the braking and electrical systems see Chapters 2.15 (➡ Page 36) and 5.4 .

2.1.3 Characteristics of the material used in chassis modifications

For modifications on the vehicle chassis (all models and wheelbases) and for applications of reinforcements on the side members, the material used must correspond to the original frame material in terms of quality and thickness (see Tables 2.1 and 2.2).

If it is not possible to procure materials of the thickness indicated, materials having immediately higher standard thickness may be employed.

Table 2.1 - Material to be used in chassis modifications

Name of steel		Breaking strength [N/mm ²]	Yield stress [N/mm ²]	Extending
IVECO	Fe E420	530	420	21%
Europe	S420MC			
Germany	QStE420TM			

Table 2.2 - Section dimension and chassis thickness

Class	Type	Wheelbase [mm]	Rear overhang chassis [mm]	A x B x t Side member section wheelbase area [mm]	A x B x t Side member section rear overhang area [mm]
55 - 70	truck	3080	935	144 x 69 x 5	184 x 69 x 5
		3480	940		
		3780	1145		
		4175	1715		
	van	3595	855 / 1255		
		4175	1840		

2.1.4 Stresses on the chassis

The following stress value in static conditions cannot be exceeded for any reason whatsoever:

Note Permitted static stress on the chassis: $\sigma_{adm} = 100 \text{ N/mm}^2$

In any case, respect any more restrictive limits placed by national standards.

Welding causes material property deterioration; therefore, when checking stresses in thermally altered zones, a resistance reduction of 15% must be accounted for.

2.2 DRILLS ON THE CHASSIS

Installation of auxiliary equipment onto the chassis must be done using the factory drilled holes whenever possible.



- **It is strictly forbidden to drill holes into the side member flaps, with exception to what is indicated in Chapter 3.3 - Paragraph "Choosing the type of connection".**

When new holes must be made for specific applications (installation of shelves, corner shelves, etc.), these must be drilled into the upright rib of the side member and must be thoroughly de-burred and bored.

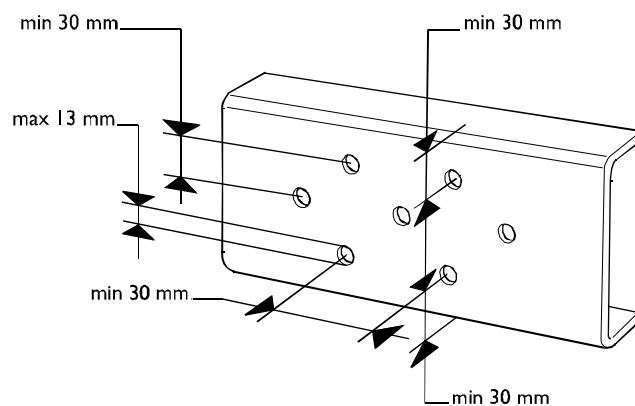
2.2.1 Positioning and dimensions of the holes

The new holes must not be drilled into the areas subjected to greater stresses (such as spring supports) or where the side member section varies.

Hole diameter must be suited to sheet metal thickness but cannot exceed 13 mm (unless otherwise stated). The distance of the axis of the holes from the edge of the side member must not be less than 30 mm; in the same way, the axes of holes must not be less than 30 mm from each other or from other existing holes.

The holes must be offset as in Figure 2.

The original hole layout must be maintained when moving spring supports or crossbars.



102420

Figure 2

2.2.2 Screws and nuts

We generally recommend the use of the same type and class of screws and nuts as those employed for similar anchorages on the original vehicle (see Table 2.3).

Table 2.3 - Screws resistance classes

Resistance class	Use	Breaking strength [N/mm ²]	Yield stress [N/mm ²]
8.8	Intermediate resistance screws (cross members, shear resistant plates, brackets)	800	640
10.9	High resistance screws (springs supports, stabilizer bars and shock absorbers)	1000	900

The screws belonging to classes 8.8 and 10.9 must be well cleaned and, for applications with diameter ≤ 6 mm, protection FeZnNi 7 IV S is recommended; for diameters > 6 mm, protection GEO-8 is recommended.

Screw treatment allowed is Geomet or zinc coating. Geomet treated screws are discouraged when using them in welding operations.

Use flange headed screws and nuts if there is sufficient space.

Use nuts with an anti-unscrewing system and keep in mind that the tightening torque must be applied to the nut.

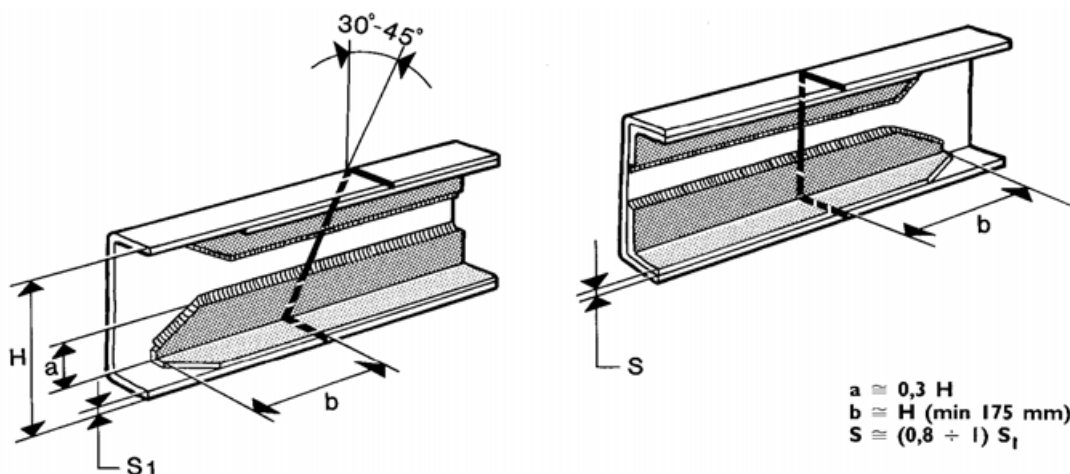
2.2.3 Welding



- **When welding, drilling, milling and cutting near brake hoses and electrical wires, be sure to adopt appropriate precautions for their protection; disconnect these parts if necessary (observe the specifications indicated in Chapters 2.15 and 5.4).**

Welds are allowed:

- in side member unions for elongations or trimming;
- in the application of corner reinforcements in the area regarding side member modification, as hereafter specified (see Figure 3).



91448

Figure 3

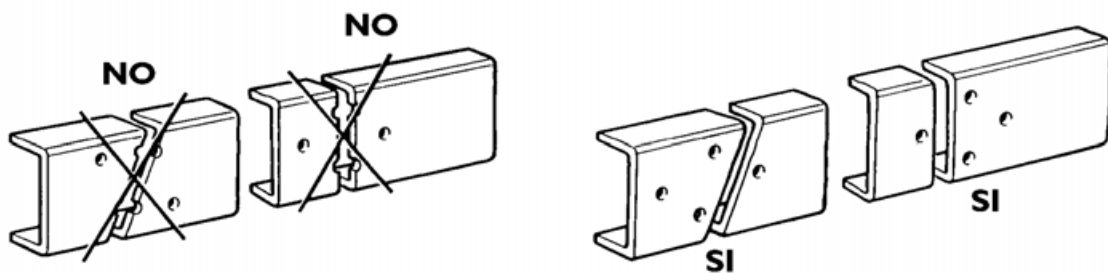
The following instructions must be respected when performing electric arc welding and in order to protect electrical components and ECUs:

- before disconnecting the power cables ensure there are no active electric users;

- if an electric circuit breaker (main switch) is present, wait for it to complete the cycle;
- disconnect the negative pole from the battery;
- disconnect the positive pole of the battery without connecting it to ground; do NOT short-circuit the negative pole;
- disconnect all ECU connectors, proceed with caution and do not touch the ECU connector pins;
- disconnect the ECU from the vehicle for welds close to the ECU;
- connect the welder ground directly to the weld piece;
- protect the plastic pipes from heat and disconnect them if necessary;
- protect the surfaces of the leaf and air springs against any weld splashes when welds are performed nearby;
- avoid touching the spring leaves with the electrodes or pliers.

Weld operations

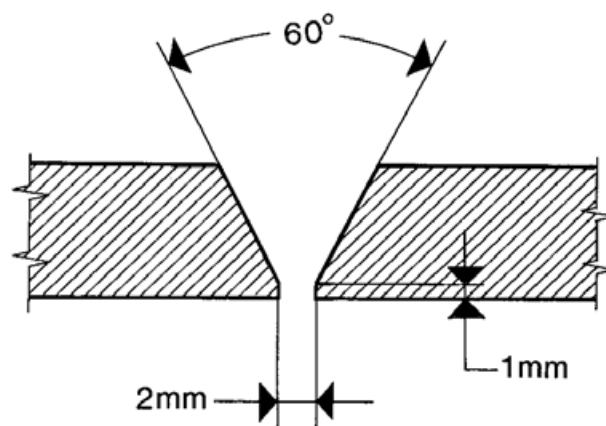
- Cut the side members with a skewed or vertical cut. Cuts are not permitted in areas where there are a high concentration of stresses (e.g. spring brackets). The cutting line must not go through the holes on the side member (see Figure 4).



91446

Figure 4

- Make a 60 degree bevel cut on the internal part of the side member of the parts to be joined, along the entire length of the weld area (see Figure 5).



91447

Figure 5

- Arc weld the area with multiple steps and use base electrodes that are thoroughly dried. Avoid power overloads; the welds must be free of marginal incisions and slag.
- Let the side members cool slowly and in a uniform fashion. No cooling with air jets, water or other means is allowed.
- Grind off the excess material.
- Mount steel corner reinforcements that have the same characteristics as the chassis; the minimum indicative sizes are shown in Figure 3.

Reinforcement anchorage must regard only the vertical rib of the side member and can be realised with a weld bead, staples, bolts or nails (even Huck nails).

Area and length of the weld bead, number and distribution of staples, number of nails or bolts must be adequate to transmit the bending and shearing moments.

- Once work is complete, use anti-rust protection (see Paragraph "Added or Modified Parts" (➡ Page 12)).

2.2.4 Closing holes by welding

If new holes are located near old holes, (see Figure 2), these last can be welded shut.

Good results are obtained by:

- chamfering the outer edge of the hole;
- applying a copper plate on the inner edge of the side member to hold the welding material;
- welding the side member on both sides with elimination of all residual material.

Holes of 20 mm diameter can be sealed off by using chamfered washers welded on both sides.

2.3 RUST AND PAINT PROTECTION

Note All components mounted on the chassis must be painted in compliance with IVECO Standard I8-I600 Colour IC444 RAL 7021 - 70/80 gloss.

2.3.1 Original vehicle components

The following tables show, respectively, the classes of coating and protection required for the original vehicle components, the protections required for the parts not painted or in aluminium and treatments required for the painted parts.

Table 2.4 - Class of protection - IVECO Standard I8 - I600 (Prospectus I)

Class	Part requirements	Examples of parts involved
A	Parts in direct contact with atmospheric agents	Bodywork - Rear-view mirrors - Windscreen wipers - Metallic structured sun visors - Metallic bumpers - Cab hook lock - Door stop device - Bodywork fastening elements (screws, bolts, nuts, washers), etc.
B B2	Parts in direct contact with atmospheric agents that mainly have structural characteristics, in clear sight	Chassis and relative parts, including its fasteners Parts below the front grille (class B) External cab footboards
B1		Only for rear axles and front axles
C	Parts in direct contact with atmospheric agents, not in clear view	Engine and relative parts
D	Parts not in direct contact with atmospheric agents	Pedals - Seat coverings - Fastening elements - etc., mounted inside the cab

Table 2.5 - Unpainted aluminium parts - IVECO Standard I8 - I600 (Table IV)

Type of protection		IVECO standard	Classes			
			A	B - B1 - B2	C	D
Stainless steel ⁽¹⁾		I8-0506	–	–	–	–
Geomet ⁽²⁾	GEO 321-8	I8-1101	yes	–	–	–
	GEO 500-8					
	GEO 321-8 PM					

Type of protection		IVECO standard	Classes			
			A	B - B1 - B2	C	D
Geomet ⁽²⁾	GEO 321-8 PML	18-1101	yes	–	–	–
	GEO 321-8 PL					
	GEO 500-8 PL					
	GEO 321-5		yes			
	GEO 500-5					
	GEO 321-5 PM					
	GEO 321-5 PML					
	GEO 321-5 PL		yes Class B1 wheel studs			
	GEO 500-5 PL					
Zinc coating ⁽³⁾	Fe/Zn 12 II	18-1102	–	–	yes	yes
	Fe/Zn 7 IV		–	–	yes	yes
	Fe/Zn 12 IV					
	Fe/Zn 7 IV LUB		–	yes	yes	yes
	Fe/Zn 7 IV S					
	Fe/Zn 12 IV S					
Alloy Zn-Ni	Fe/Zn Ni 7 VII S	18 - 1103	–	yes	yes	yes
	Fe/Zn Ni 7 IV					
Aluminium	Anode oxidation	18-1148	yes	yes	yes	yes
	Painting	See Table III	yes			

⁽¹⁾ Coupling with other materials must not cause the "battery effect".

⁽²⁾ Coatings free from chromium salts.

⁽³⁾ Coatings free of hexavalent chromium.

Table 2.6 - Painted parts - IVECO Standard I8 - I600 (Prospectus III)

Cycle phase description		Classes					
		A	B ⁽⁸⁾	BI ⁽⁵⁾	B2	C	D
MECHANICAL SURFACE CLEANING ⁽¹⁾	Sand/shot blasting	–	yes ^(*)	–	yes ^(*)	yes ^(*)	yes ^(*)
	Brushing	yes ^(*)					
	Sandpapering						
PRE-TREATMENT	Iron phosphating (only for non-precoated ferrous materials)	–	yes ^(*)	–	yes ^(*)	yes ^(*)	yes ^(*)
	Zinc phosphating ^(**)	yes					
CATAPHORETIC PAINTING	High thickness (30-40 µm)	yes ⁽²⁾	yes ^(*) ⁽⁶⁾	–	yes ^(*) ⁽⁶⁾	yes ^(*) ^{(6) (9)}	yes ^(*) ⁽⁶⁾
	Medium thickness (20-30 µm)	yes ⁽³⁾			–		
	Acrylic finishing (>35 µm)	–					
RUST PREVENTER	Bi-component (30-40 µm)	–	yes	–	yes	yes ^(*) ⁽⁹⁾	yes ^(*)
	Single-component (30-40 µm)		–	yes	–		
ANTIROCK PRIMER	Single (130 °C) or bicomponent (30-40 µm)	yes ⁽³⁾	–	–	–	–	–
VARNISH	Single (130 °C) or bicomponent (30-40 µm)	yes	yes ^(*)	–	–	yes ^(*)	yes ^(*) ⁽⁷⁾
	Powders (40-110 µm)	yes ⁽⁴⁾					
	Low temperature single-component (30-40 µm)	–					

⁽¹⁾ This operation must be performed when dealing with cutting burr, oxidation, weld slag, or laser-cut surfaces.

⁽²⁾ Two-layer bodywork cycle.

⁽³⁾ Three-layer bodywork cycle.

⁽⁴⁾ In alternative to single and bi-component paint only for particular bodywork (windscreen wipers, rear-view mirrors, etc.).

⁽⁵⁾ Only rear/front axles.

⁽⁶⁾ Excluding parts that cannot be immersed in pre-treatment baths or undergo painting because of compromised functionality (e.g.: mechanical parts).

⁽⁷⁾ Only if the colour is defined in a drawing according to I.C.

⁽⁸⁾ For fuel tanks in ferrous or pre-coated sheets.

⁽⁹⁾ Only parts to mount on the engine.

^(*) Alternative products and cycles for the same phase under the condition of comparability with the part to treat.

^(**) Specific phosphates must be used for zinc coated or aluminium sheets.

2.3.2 Added or modified parts

All vehicle parts (body, chassis, equipment, etc.) that are add-ons or subjected to modifications must be protected against oxidation and corrosion.

Areas free of protection on ferrous materials are not accepted.

Tables 2.7 and 2.8 indicate the minimal treatment that modified or added components must receive when it is not possible to have protection that is similar to that of original components. Different treatment is allowed if it ensures similar oxidation and corrosion protection.

Do not use powder varnish directly after degreasing has been performed.

Lightweight alloy, copper and brass parts must be protected.

Table 2.7 - Painted modified parts or add-ons

Cycle phase description	Class
	A - B - D ⁽¹⁾
Mechanical surface cleaning (including elimination of burrs/oxidation and cleaning of cut parts)	Brushing/sandpapering/sand blasting
Pre-treatment	Degreasing
Rust preventer	Bi-component (30-40 µm) ⁽²⁾
Varnish	Bi-component (30-40 µm) ⁽³⁾

⁽¹⁾ Modifications on rear axles, from axles and engine (classes B I and C) not allowed

⁽²⁾ Preferably epoxy

⁽³⁾ Preferably polyurethane

Table 2.8 - Unpainted or aluminium modified parts or add-ons

Type of protection	Class	
	A - B ⁽¹⁾	D
Stainless steel	yes	–
Geomet		–
Zinc coating ⁽¹⁾	–	yes

⁽¹⁾ Free from hexavalent chromium

2.3.3 Precautions

a) On the vehicle

Appropriate precautions must be taken to protect parts on which paint could be harmful to the conservation and operation thereof:

- hoses for pneumatic and hydraulic systems in rubber or plastic, **with particular reference to the braking system**;
- gaskets, rubber or plastic parts;
- propeller shaft and PTO flanges;
- radiators;
- suspension, hydraulic/pneumatic cylinder stems;
- air vent valve (mechanical assembly, air tank, thermostarter preheat tanks, etc.)
- sediment bowl and fuel filter assembly;
- plates, codes.

If painting is required after wheels are removed, it is necessary to:

- Protect the wheel rim mounting surfaces on the hubs and the contact areas of the locking lugs/wheel studs;
- ensure adequate protection of brake discs.

The electronic components and modules must be removed.

b) On engines and their electric and electronic components

Appropriate precautions must be taken to protect:

- engine wiring and ground contacts;
- the sensor/actuator side connectors and wiring side;
- the sensors/actuators on the flywheel and on the flywheel rpm sensor mounting bracket;
- pipes (plastic and metal) of the fuel circuit;
- complete basic diesel filter;
- the ECU and its base;
- the entire internal part of the sound-proof cover (injectors, rails, pipes);
- the common rail pump and its control valve;
- the vehicle electric pump;
- tank containers;
- the front V-belts and relative pulleys;
- the power steering pump and relative pipes.

Note *When the painting operation has been completed, and prior to oven drying (max. temperature 80 °C), all parts which may be damaged by exposure to heat, must be removed or protected.*

2.4 WHEELBASE MODIFICATION

2.4.1 General information

Note Any wheelbase modifications that regard the electric circuits and/or relocation of the electric/electronic components requires IVECO approval and must be carried out in compliance with chapter 5.7 instructions.

Usually, wheelbase modification must be performed on the standard wheelbase that is closest to the target value.

If the dimensions of the superstructure are suitable, it is best to use wheelbases in standard production; because this allows the use of original propeller shafts and pre-defined crossbar positions and existing "datasets" for EVSC and AEBS (see Section 5 - Chapter 5.8 - Paragraph "Safety electronic devices").

Nevertheless, IVECO must issue its authorisation for wheelbases below the minimum or maximum approved standard sizes on the market.

2.4.2 Authorisation

Wheelbase modification is allowed without IVECO authorisation only when:

- a) for extending
 - another length included in production for the vehicle model is to be made;
 - the thickness of the side member to be lengthened does not differ from a standard side member taken as reference, or it differs (is lower) by just one "step" of the value (see Table 2.2);
 - number, type and position of the cross members, the existing circuits and systems on the standard chassis are replicated taken as reference.
- b) for shortening
 - another length included in production for the vehicle model is to be made;
 - number, type and position of the cross members, the existing circuits and systems on the standard chassis are replicated taken as reference.

The workshop that performs the transformation must provide sufficient guarantees in terms of technology and inspections (qualified personnel, appropriate operational processes, etc.).

Note The operations must be performed in compliance with these directives, taking into account the suitable adjustments and adaptations, as well as all required precautions (e.g.: check whether the ECUs must be reparameterized, exhaust pipe adjusted, observance of minimum tare weight on the rear axle, etc.) provided for on the corresponding original wheelbases.

2.4.3 Impact on steering

Table 2.9 lists the maximum values of the wheelbase approved by IVECO.



► **Extending the wheelbase will have a negative effect on steering.**

Table 2.9 - Maximum wheelbase

Model	Suspension front (*)	Maximum load on front axle [kg]	Maximum load on rear axle [kg]	Maximum value of wheelbase [mm]
55C	Quad-Tor	2450	3700	4175

Model	Suspension front (*)	Maximum load on front axle [kg]	Maximum load on rear axle [kg]	Maximum value of wheelbase [mm]
70C	Quad-Tor	2700	5000	4175

(*) Quad-Tor = torsion bar



- ▶ **If the wheelbase is to be lengthened beyond the maximum value approved, these steering solutions must be authorised by IVECO. Any type approval tests are charged fully to the Bodybuilder.**

2.4.4 Impact on braking

Generally speaking, shortening the wheelbase will have a negative effect on braking.



- ▶ **Modifications to the wheelbase on vehicles equipped with electronic control systems for braking, grip and stability, require as mandatory the updating of the setting parameters (datasets) of the relevant control units via IVECO teleservices.**



- ▶ **Wheelbases which can be technically realised depend on the vehicle type (model/version). For wheelbases which are longer or shorter than the standard wheelbases, availability of the ESP system setting parameters must be verified.**

Table 2.10 lists the minimum values of the wheelbase approved by IVECO.

Table 2.10 - Minimum wheelbase

Model	Suspension front (*)	Maximum load on front axle [kg]	Maximum load on rear axle [kg]	Minimum value of wheelbase [mm]
55C	Quad-Tor	2450	3700	3080
70C	Quad-Tor	2700	5000	3080

(*) Quad-Tor = torsion bar

2.4.5 Intervention procedure

Proceed as follows to obtain good results:

- position the vehicle so that the chassis is perfectly horizontal, use appropriate trestles;
- detach the propeller shafts, braking system hoses, cables and all other equipment that may interfere with proper work execution;
- identify the reference points on the frame (e.g. guide holes, suspension supports);
- mark the reference points with a slight punch mark on the top flaps on both side members, after having verified that the conjunction line is at a perfect right angle with the longitudinal axle of the vehicle;
- if moving the suspension supports, identify the new position using the previously determined references;
- make sure that the new measurements are identical on both the right and left sides; the diagonal check, for lengths of at least 1500 mm must not yield deviations of over 2 mm;
- make the new holes using as jig - if any other tools are unavailable - the supports and gusset plates of the crossbars;
- secure the supports and crossbars using nails or screws; if using screws, bore the holes and use calibrated screws class 10.9 with anti-unscrewing nuts; if size allows, flanged head screws may be employed;
- if cutting the frame (to be carried out according to indications of the second item in "Welding Operations" - Paragraph "Welding" (➡ Page 8)) mark a second line of reference points so that the work area is set between the two lines (plan for a dis-

tance of at least 1500 mm upon work completed). Carry over the points relative to the cutting area between the two lines; proceed as instructed in Paragraph "Welding" (➡ Page 8);

- before welding, check that the side members and any added parts are perfectly aligned and perform the check measurements on both sides and along the diagonal line, as previously indicated. Apply the reinforcements as in Paragraph "Welding" (➡ Page 8).

Additional information

- Protect the surfaces against oxidation as in Paragraph "Added or modified parts" (➡ Page 12).
- Restore the braking and electrical systems as according to Chapters 2.15 (➡ Page 36) and 5.4 .
- Follow the instructions in Chapter 2.8 for interventions on the driveline.

2.4.6 Verification of the chassis stresses

With regard to wheelbase elongation, aside from local reinforcement in the joint area of the side members, the Bodybuilder must also account for reinforcements - along the entire contour of the wheelbase - until achieving area strength modulus equal to IVECO values for the same wheelbase or for the next admissible greater length. In alternative, for cases allowed by local standards, larger subframe profiles can be adopted.

The Bodybuilder must make sure that the stress limits prescribed by national standards are respected. These stresses must not be greater than those of the original wheelbase frame, assuming an evenly distributed load and considering the frame as a beam positioned in place of the suspension supports.

When an elongation is performed starting from the longest original wheelbase, the reinforcements adopted must account for wheelbase elongation, type of chassis produced and vehicle use.

2.4.7 Cross members

The need to apply one or more cross members is subordinate:

- to the entity of lengthening;
- to the position of the transmission support;
- to the welding area;
- to the points where forces caused by superstructures are exerted;
- to the vehicle's conditions of use.

Any additional cross members must have the same characteristics of those already mounted on the frame (bending and torsion strength, material quality, connection to side members, etc.).

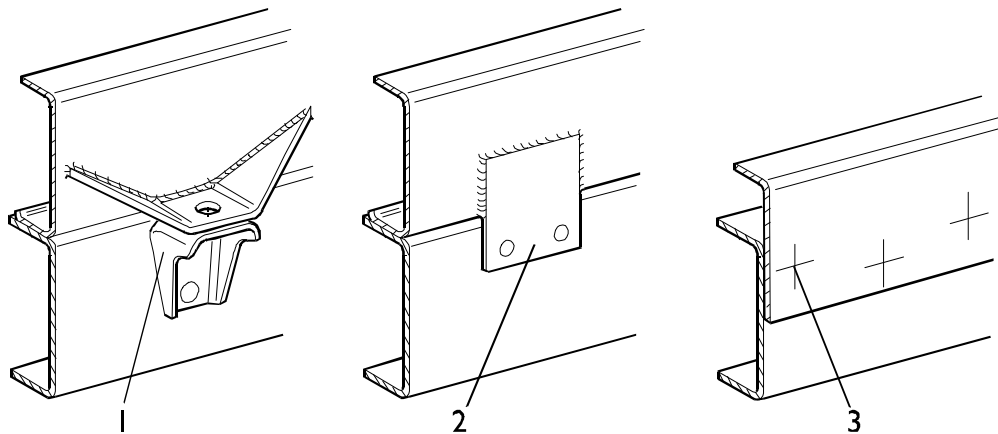
2.4.8 Reinforcements on the chassis

Figure 6 shows some examples of possible solutions.

The reinforcements must be continuous and extend over the entire length of the vehicle's chassis, up to the cab. To connect them to the side member, in the case of an angle profile, rivets or screws of resistance class 8.8 must be used; diameter and distribution must ensure that the profile provides the expected reinforcement resistance.

We recommend creating a cut-resistant joint in the area of the rear overhang and for about half of the wheelbase length (and always for lengths of at least 2 m from the front axle).

On the chassis converted in this way, bending stresses must be envisaged that do not exceed those of the chassis of the original vehicle in the corresponding sections.



102422

Figure 6

1. Bracket
2. Plate

3. Screws or rivets

To avoid affecting the resistance of the original sections, reinforcement plates may not be mounted directly onto the side member wings via holes filled with welding material.

Only when there is a proven necessity associated with subsequent superstructure installation stages may IVECO issue an exceptional authorisation.

In these cases, because of the deterioration caused by welding, a reduction of the characteristics of the material of about 15% should be borne in mind.

When calculating the dimensions of the reinforcements, use the material suggested in Table 2.1 and do not exceed the static stress values on the chassis given in the Paragraph "Stresses on the chassis (► Page 7)".

In any case, any more restrictive limits imposed by national standards will be valid.

2.4.9 Modifications to the transmissions

See Chapter 2.8 for checks of modifications allowed.

2.5 REAR OVERHANG MODIFICATION

2.5.1 General information

When modifying the rear overhang it is necessary to note the variations that this modification shall inflict on the payload distribution on the axles, in compliance with the loads established by IVECO (see Chapter 1.15). Limits set by national law must also be respected, as well as maximum distances from the rear structural edge and distance from ground, defined for towing hook and under-run protection. The distance from the tip of the frame to the rear edge of the superstructure must, as a rule, not exceed 350–400 mm.

Also observe the indications relating to vehicle mass (see Chapter 1.15 - Paragraph "Observance of the permitted masses")

If it is necessary to move the rear crossbar fixed using screws, it is necessary to maintain the same type of union as in the series (number of screws, dimensions, strength class).

If a drawbar shall be attached, it is necessary to leave sufficient space (approx. 350 mm) between the rear crossbar and that nearest, for any drawbar assembly/disassembly operations.

If all works are performed in a professional manner and according to the instructions contained herein, the original towing capacity may remain the same.

In all cases, the parties performing the work shall be liable thereof.

2.5.2 Authorisation

Rear frame elongation as well as shortening to the smallest value for each model of the series do not require authorisation if performed in compliance with the instructions provided herein.

The standard overhang values in relation to the wheelbases are shown in Table 2.11.

Table 2.11 - Standard overhang and wheelbases

Wheelbase [mm]	Overhang minimum - maximum [mm]
3080	879 - 1794
3480	899 - 2049
3780	963 - 2088
4175	1646 - 2436

Note If the length of the electrical circuits needs to be adjusted, please refer to Section 5, "Electronic subsystems".

2.5.3 Shortening

The last crossbar must be moved forward when shortening the rear overhang of the frame.

When the rear crossbar is too close to another crossbar, the latter can be eliminated if it plays no role in suspension support.

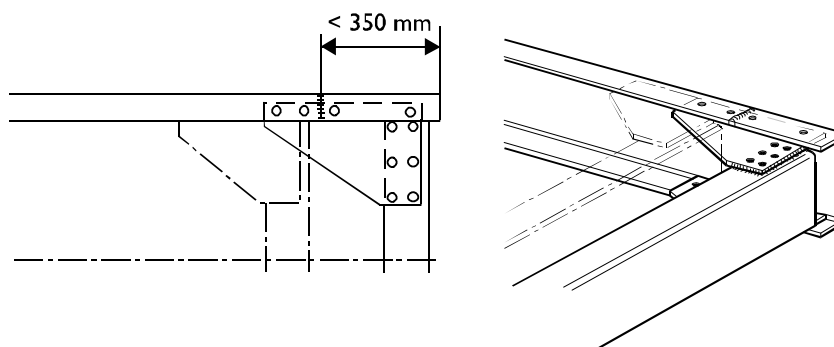
2.5.4 Lengthening

Possible solutions, in relation to the length of the elongation, are shown in Figures 7, 8, and 9.

Cuts can be of straight type. The minimum dimensions of the reinforcements to apply in the area of modification are shown in Figure 3.

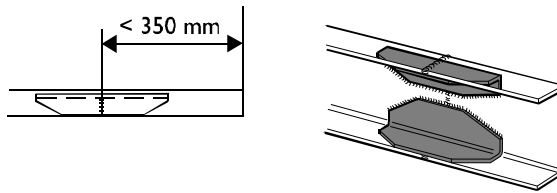
The solution for elongations no greater than 300–350 mm is shown in Figures 7 and 8; in this case, the corner reinforcements, which also serve as junction between cross member and frame, must have the same width and thickness of the original gusset plate. The union between the cross member and plate, originally performed using nails, can be done with screws class 8.8 having the next largest scale diameter and anti-unscrewing nuts.

The solution for elongations greater than 350 mm is shown in Figure 9.



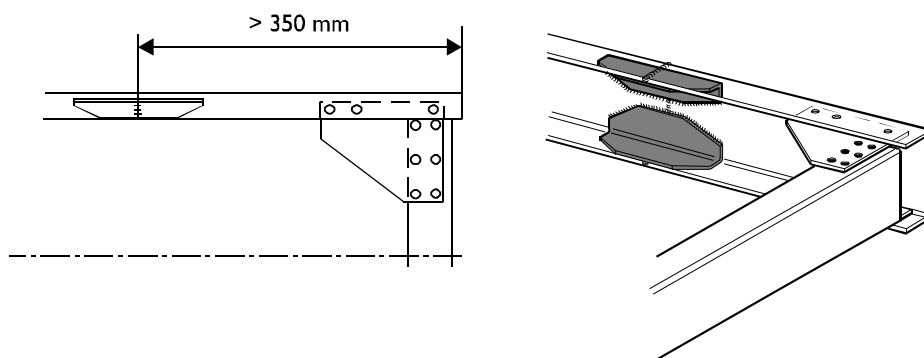
208211

Figure 7



208212

Figure 8



208213

Figure 9

When the elongation is rather large, the need of an additional crossbar must be evaluated on a case to case basis in order to ensure proper torsional strength of the frame. The insertion of an extra crossbar having characteristics similar to the series is necessary, however, when two cross members are spaced more than 1200 mm apart.

2.6 INSTALLING THE TOW HOOK

2.6.1 General information

Conversion from non-trailer version to type approved trailer version is allowed without requiring specific authorisation from IVECO.

Note A vehicle not originally intended for towing may be adapted to this purpose by adding the specific "trailer section", i.e. inserting the set of components listed in the type-approval documentation for the trailer version (chassis cross member, electrical coupling union, tow coupling, chronotachograph, etc...).

However, bear in mind that fitting the chronotachograph, when necessary in relation to current legislation, must be only carried out by the IVECO Service Network.

2.6.2 Precautions for installation

The towing hook must be suited for the loads allowed and must be of a type approved by national standards.

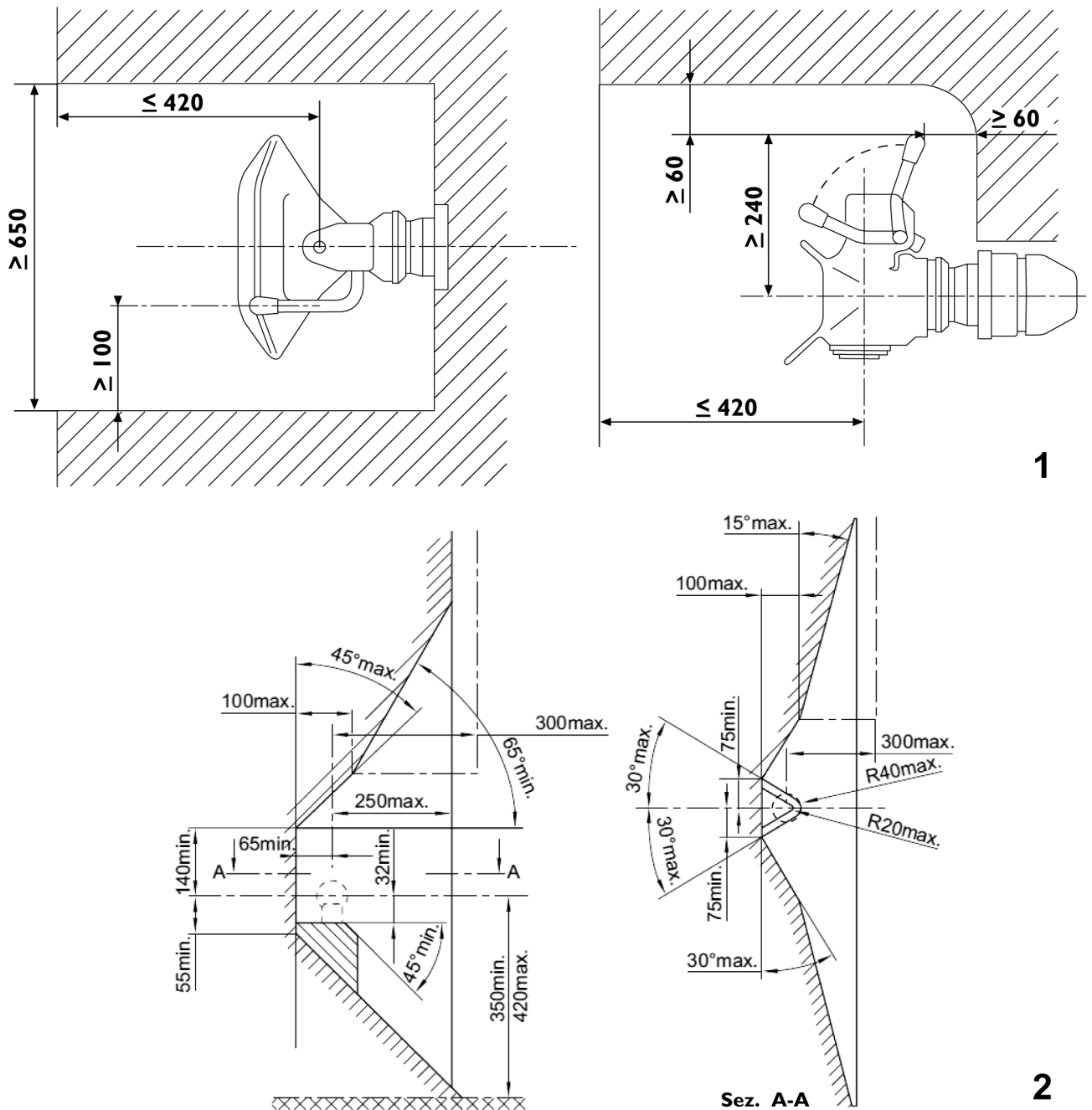


- **Given their importance related to safety, the drawbar couplings must not undergo modifications.**

In addition to the requirements of the hook manufacturer, it is necessary to respect the limitations imposed by the Regulations on:

- clearances required for the coupling of the brakes and electrical system;
- distance between the hook pin axis and the rear edge of the superstructure (see Figure 10).

In the European Community (UN-ECE Regulation No. 55), this will normally be about 420 mm, but values are allowed up to 550 mm if an appropriate mechanism is adopted for safe operation of the hand lever. For even higher values it is advisable to consult the aforementioned Regulation.



1

2

196787

Figure I0

1. Free field for towing hooks

2. Free field for coupling hooks according to standard DIN 74058 ESC-I 52

In cases where the connection flange of the drawbar coupling does not have holes suitable to those on the existing rear crossbar of the vehicle, the latter may be authorised for modification upon application of adequate reinforcements.

The Body builder has the duty of realising and installing the superstructure so as to allow coupling connection and checks without impairment or hazard of sort.

The trailer drawbar must be guaranteed freedom of movement.

2.6.3 Tow hook for trailers with central axle

Centre axle trailers are defined as those that have the drawbar rigidly connected to the frame and the axle (or more close axles) placed at half the length of the same chassis.

Compared to the articulated drawbars, the rigid drawbar acts on the tow hook with the increase of the static vertical loads and, in the braking phase or in the oscillations caused by the road surface, the increase of the dynamic vertical loads. By means of the hook, these loads lead to increases in the torsion of the rear crossbar of the vehicle, as well as push-ups on the overhang.

The use of centre axle trailers therefore requires the use of suitable tow hooks.

The values of the towed weights and vertical loads allowed are listed on the technical documents of the tow hook manufacturer and on the part manufacture plate (see DIN 74051 and 74052).

For mechanical coupling devices for trailers with a central axle, refer to the following formulas:

$$D_c = g (T \cdot C) / (T + C)$$

$$V = a \cdot C (X^2 / L^2)$$

D_c = representative value of tow hook class [kN]. This is defined as the determination of the theoretical reference value for horizontal load between tractor and trailer

g = acceleration of gravity [m/s²]

T = maximum weight of the towing vehicle [kg]

R = maximum weight of trailer at full load [kg]

S = vertical static load on the hook [kg], namely the mass part which in static conditions, is transmitted to the coupling point on the vehicle. S must be ≤ 0.1 × R and, in any case, less than 1000 kg.

C = sum of maximum axial loads of the centre axle trailer at full load. Equal to the maximum weight of the trailer minus the vertical static load (C = R - S) [kg]

V = value of the intensity of the theoretical dynamic vertical force between the vehicle and the trailer [kN]

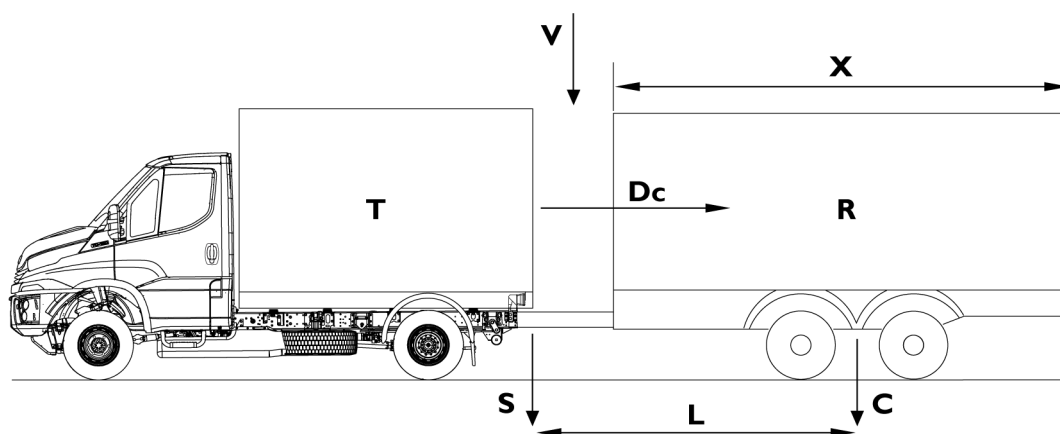
a = vertical acceleration in the area of the drawbar coupling/hook. in function of the rear tractor suspension, use the following values:

- **a** = 1.8 m/s² of air suspensions
- **a** = 2.4 m/s² for other types of suspensions

X = length of the load bed [m], (see Figure 11)

L = theoretical drawbar length, distance between the centre of the drawbar eye and the centre line of the trailer axles [m], (see Figure 11)

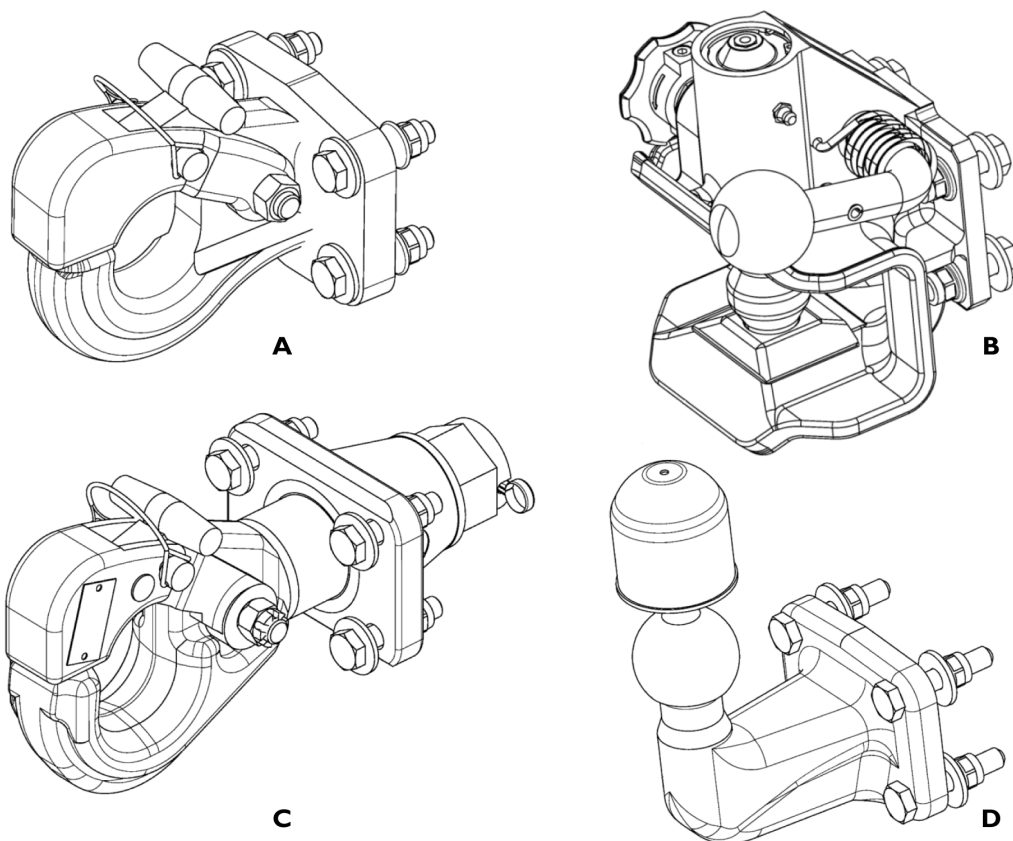
X² / L² ≥ 1 if the result is less than the unit, use the value 1



279565

Figure 11

As original equipment, the DAILY 4x4 vehicles may be equipped ball, hook or mixed type tow hook, i.e. ball type with safety device. These hooks may only be installed on the rear closing cross member of the chassis.



279566

Figure 12

A. Hook, type CR32C
B. Hook, type 2020

C. Hook, type HRC10
D. Hook, type BC40

The following chart contains the data of tow hook versions which are available in production.

Table 2.12 - Type-approved hooks

EC certified	Type	Class	D [kN]	Dc [kN]	S [kN]	V [kN]
E2 55R-01 12209	CR32C	S	31	31	340	–
E1 55R-01 2262	2020	S	30	30	350	18
E3 55R-01 3020	HRC10	K3	30	24.5	400	16
E3 55R-01 3040	BC40	A50-X	23.41		250	–

If it is not directly supplied by IVECO, then the tow hook must in any case:

- have characteristics that are wholly equivalent to those shown in Table 2.12;
- be approved in observance of the current national and international legislation (e.g. EU Directives);
- be fitted in accordance with the manufacturer's instructions.

Note Any other solutions must be explicitly authorised by IVECO.

2.6.4 Observations on payload

The static load on the tow hook must not exceed the load allowed on the rear axle of the vehicle. Furthermore, the minimum weight on the front axle must be respected as indicated in Chapter 1.15.

2.6.5 Increase of towable weight

As regards tow vehicles, IVECO may evaluate - in certain cases and for particular applications - the possibility to authorise greater tow weights than those normally allowed.

These authorisations include the towing conditions and, when necessary, provide the instructions relevant to any vehicle modifications or work required: standard crossbar reinforcements, or installation of a reinforced crossbar when available, or adjustments to the braking system.

The tow hook must be suited for the new use, and its connection flange must coincide with that of the crossbar.

Fix the crossbar to the chassis by using flanged head screws and nuts or hex head screws of 8.8 min. class.

Use anti-unscrewing systems.

2.6.6 Nameplates

Some countries require a plate to be applied on the towing device, which must list maximum tow load and maximum vertical load allowed.

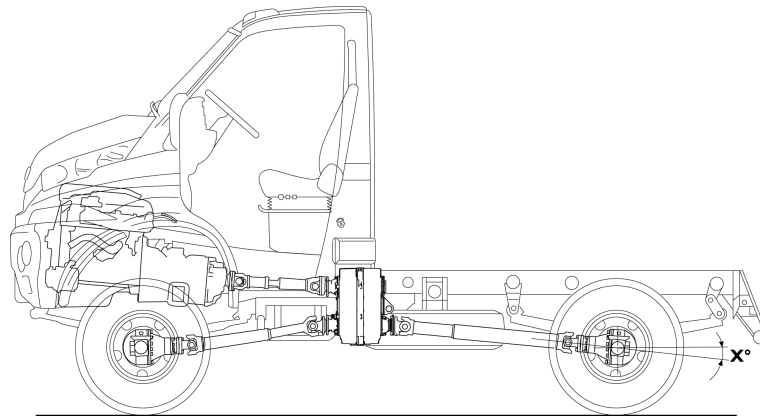
If not already mounted, the Bodybuilder shall see to its manufacture and installation.

2.7 ASSEMBLING AN ADDITIONAL AXLE

Application not provided.

2.8 MODIFICATIONS TO THE DRIVELINE

Any modifications to the driveline must be authorised by IVECO.



227321

Figure I3

The maximum inclination X° of the rear axle casing must be less than 5° in relation to the horizontal.

Note It is strictly forbidden to move the transfer box.

We recommend using original IVECO drivelines; if this is not possible, the use of raw steel pipes with a yield load of at least 420 N/mm^2 (42 kg/mm^2) may be used.

The universal joints may not be modified.

Any transformation of the driveline or of any of its parts requires thorough dynamic balancing to be carried out on each modified section.



- ▶ **Given that the driveline is an important part of the vehicle in terms of safety, any modifications made must meet the requirements of the maximum safety standards. Therefore, modifications should only be carried out by highly specialised companies, qualified by the Manufacturer of the driveline.**

2.9 WORK ON SUSPENSIONS



- ▶ **Modifications to the suspensions and springs (e.g. addition of leafs, variations in camber, etc...) affect the driving safety of the vehicle and therefore may only be implemented after obtaining approval from IVECO.**



- ▶ **In the case of interventions that have an impact on the suspension and / or the vehicle alignment, the original conditions must be restored at an IVECO Service Centre.**

In general, work on parabolic suspensions is not allowed. On vehicles with this type of suspension spring, exception is made for set-ups or special uses for which, in order to increase suspension rigidity, the application of rubber elastic elements may be authorised.

In exceptional cases and for specific uses, the possibility may be evaluated of allowing the addition of extra leaf springs on the parabolic springs; this must be carried out by a specialised spring manufacturer after approval by IVECO.

It is not allowed to use a parabolic spring on one end of the axle and a semi-elliptic string on the other end.



- **On vehicles equipped with an ESP system, modifications of the suspensions are not permitted. See Chapter 2.15 - Paragraph "Derating of the ESP System".**

Note Adaptation of the suspension assumes a corresponding adaptation of the ESP system controlling stability (see Paragraph "Derating of the ESP system" (► Page 40)).

2.10 MODIFYING THE ENGINE AIR INTAKE AND EXHAUST SYSTEMS

Table 2.13 - Back pressure at nominal speed and full load

Engine	Engine code	Exhaust back pressure [kPa]	Min - max vacuum on intake [kPa]
.18H VGT Euro VI	FICFL411W*E	40	1 - 9
.15H WG Euro III	FICE0489R*L	13	1 - 5

Note Any interventions, if authorised by IVECO, must not vary the original intake vacuum and exhaust back pressure values.

2.10.1 Intake

The air intake must be mounted as to avoid intake of hot air from the engine compartment, or dust and water.

The intake compartment must be sealed airtight and fitted with rubber gaskets that prevent hot air recirculation. The gaskets must be of high quality as to support a steady temperature of 100 °C, with short durations of 120 °C, without undergoing visible deformations or deteriorations. The compartment must keep airflow sections efficient for the entire circuit.

Any openings made in the box part of the van must have an area of approximately twice that of the cross-section of the pipe upstream of the filter. The protective grids must have a mesh with holes of maximum size 6 mm (to prevent the entry of foreign bodies or cigarette butts) and a minimum size that does not allow blockages.

The following are not allowed:

- alterations or replacement of the original air filter with one of lower capacity;
- intervene on equipment (injection pump, regulator, injectors, etc.) that may compromise good engine performance and affect exhaust gas emissions.
- change the Humidity sensor → Blow-by sequence in the segment between the air filter and turbine.

Lastly, it is necessary to check if new system approval is required in relation to specific national standards (sound level, smokiness).

2.10.2 Engine exhaust (only Euro III)

If it is necessary to change the pipe layout despite the availability of various optional solutions in the catalogue, it is advisable to envisage:

- the simplest possible route (curvatures with radii of no less than 2.5 times the outer diameter, passage sections no smaller than those of the original solution, absence of throttling);
- suitable distances (min. 150 mm) from electrical systems and plastic pipes (shorter distances progressively require plate guards, thermal insulators or the replacement of plastic pipes with steel ones).

Authorisation must always be obtained from IVECO.

Furthermore, modifications to the silencer body are not permitted.

2.11 MODIFYING THE ENGINE COOLING SYSTEM

The good operating conditions of the original system must not be altered, especially for what concerns the radiator, free surface of the radiator and pipes (dimension and layout).

In any case, if modifications are required (e.g. cab modifications) that entail interventions on the engine cooling system, keep in mind that:

- The air passageway area for radiator cooling must not be less than that on vehicles with series standard cabs;
- maximum air expulsion from the engine compartment must be guaranteed, making sure that there are no hot air pockets of recirculation by adopting guards or deflectors;
- fan performance must not be modified;
- any modifications of the water piping must not compromise complete filling of the circuit (done with a steady flow and without any backflow from the intake until the circuit is filled) and regular water flow; in addition, these modifications must not alter maximum water stabilisation temperature, even in the most demanding conditions of use;
- pipe layout must be done so as to avoid the formation of air pockets (e.g. eliminating siphoning bends or installing required vents) that may make water circulation difficult;
- check that water pump activation at engine start-up and successive operation during idling is immediate (accelerate a few times), even when circuit is not pressurised. During checks make sure that the water pump supply pressure, with engine at top speed and no load, is less than 1 bar.

To check the operation of the cooling circuit we must account for the water supply, bleed and circulation proceeding as follows:

- fill the circuit while the engine is off with a flow rate of 8 - 10 l/min, until water seeps from the overflow vent;
- start the engine and run idle for 5 minutes, successively check to see that the water level in the supply tank has not dropped below minimum level;
- gradually rev the engine, checking that average pressure in the water pump outlet pipes steadily increases without and discontinuities;
- keep accelerating the engine until the thermostat opens, causing air bubbles to pass through transparent pipes installed between:
 - engine output and radiator;
 - water supply tank and water pump;
 - engine bleed and water supply tank;
- check, after the thermostat has been open for 15 minutes, that there are no more bubbles in the circuit;
- check that, with thermostat open and engine running idle, that average pressure in the water pump inlet pipe is greater than 500 mm water column (0.05 bar).

2.12 MODIFICATIONS TO THE HEATING/CONDITIONING PLANT

2.12.1 Installing an additional heating system

We recommend using IVECO type heating systems whenever it is necessary to install an additional heating system.

On vehicles where IVECO does not employ these heaters, installation must be done in compliance with the instructions issued by the equipment Manufacturer (installation of heaters, pipes, electric system, etc.) and in relation to the following indications.

The additional heating system must respect all national standards on the subject (e.g. tests, specific installations for the transport of hazardous materials, etc.). It must avoid the use of vehicle equipment that requires certified approval whenever such equipment may cause a negative impact on performance.

In addition, be sure to:

- care for the proper operation of all other vehicle systems (e.g.: engine cooling system);
- check that the battery capacity and alternator power are sufficient for increased current draw (see Chapter 5.4) and install a protection fuse on the new circuit;
- connect the heater supply system to the dedicated fuel tank or directly to the designated pre-installation (optional) on the main tank of the vehicle;
- route piping and wiring layout (and installation of brackets and flexible fittings) in relation to the spaces available and the influence of heat on the chassis parts. Avoid any exposed parts that may be dangerous, and adopt suitable guards when necessary.

The system must allow easy access and prompt maintenance.

The Bodybuilder must provide all necessary maintenance instructions.

a) Water heaters

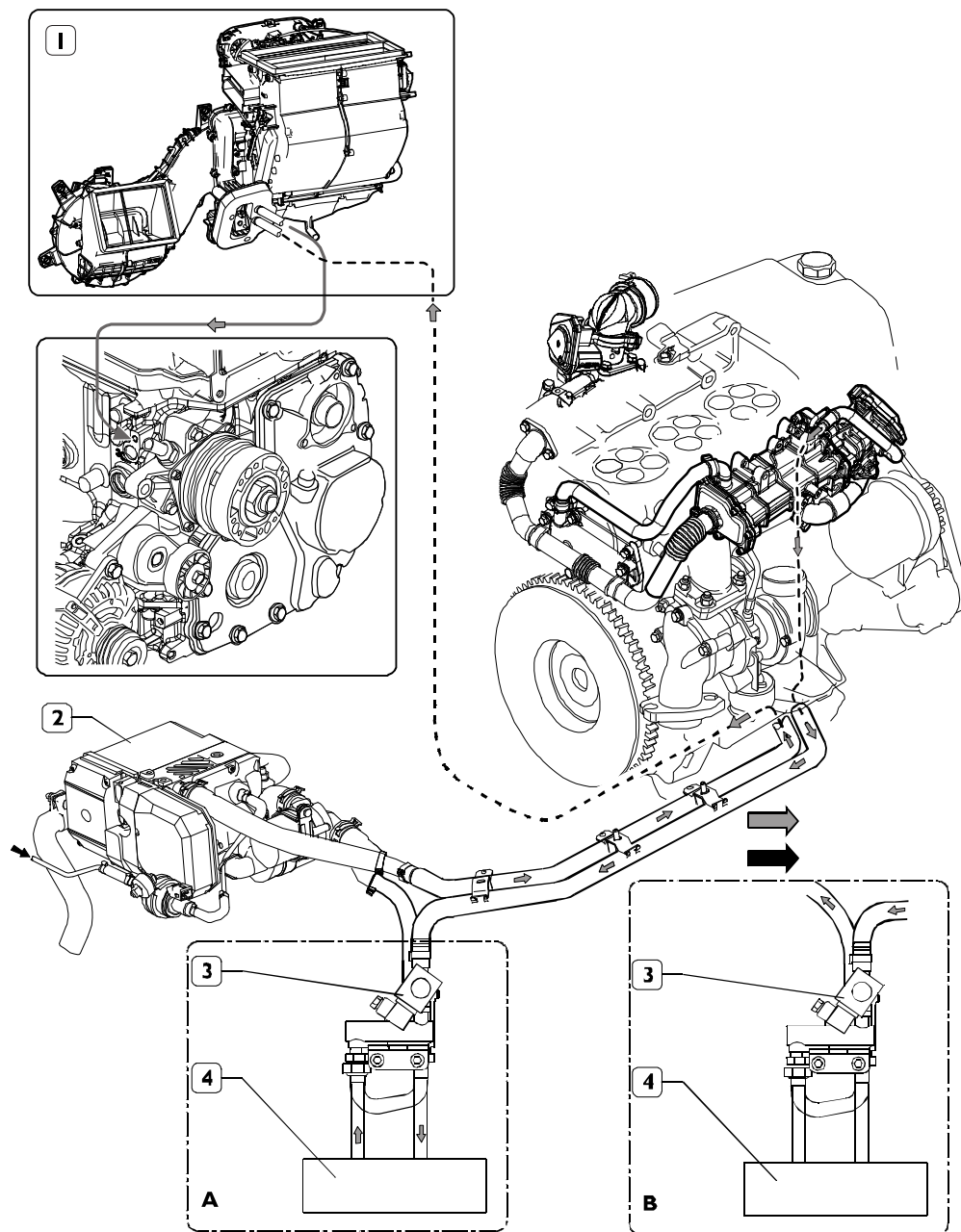
When the original vehicle heating and engine cooling circuits are involved (see Chapter 2.11 (➡ Page 27)), the following must be done to ensure good system operation and safety of the original system:

- carefully define the connection points between the additional and original systems, in agreement with IVECO, if necessary. The added pipes must be made of brass or other alloy resistant to the corrosive action of coolant, the coupling sleeves must respect the requirements put forth by the standard IVECO I8-0400;
- plan for a rational layout of pipes, avoiding bottlenecks and siphoning bends;
- install venting valves (bleed points) to allow proper system filling;
- allow complete circuit discharge, also by installing any additional plugs;
- adopt, when necessary, suitable protections to limit heat loss.

b) Air heaters

As regards these heaters and for direct cab installation, be particularly cautious with the exhausts (to avoid combustion gasses from being trapped in the vehicle) and correct distribution of hot air (in order to avoid direct flow).

Figure I4 shows a layout for a supplementary heating system with an additional heater.



204649

Figure I 4

- 1. Main heater
- 2. Optional additional heater
- 3. Solenoid valve
- 4. Additional heater installed by body builder

- A. Solenoid valve (3) open
- B. Solenoid valve (3) closed

N.B. Heaters (2) and (4) may even be present on their own.

2.12.2 Installing an air conditioning system

We recommend using original IVECO units for the installation of an air conditioning system.

When this is not possible, aside from complying with the specific requirements provided by the manufacturer of the equipment, it is necessary to:

- maintain good performance of the vehicle parts that may be involved in the intervention;
- check that the battery capacity and alternator power are sufficient for increased current draw (see Chapter 5.4 - Paragraph "Additional equipment") and install a protection fuse on the new circuit;
- plan the compressor installation modes with IVECO, if installed on the engine;
- route piping and wiring layout (and installation of brackets and flexible fittings) in relation to the spaces available and the influence of heat on the chassis parts;
- avoid layouts and installations where exposure may be dangerous when the vehicle is moving; fit suitable guards when necessary;
- the system must allow easy access and ensure prompt maintenance.

The Bodybuilder must provide all necessary maintenance instructions upon vehicle delivery.

In addition, in function of the type of system:

a) cab installed system:

- condenser installation must not cause negative effects on the engine cooling characteristics (reduction of exposed radiator-engine area);
- the condenser must not be installed together with the engine radiator but in a specific and suitably ventilated bay, unless a condenser is used that is equivalent (in shape and performance) to the standard model envisaged by IVECO;
- installation of the evaporator unit and of the bellow inside the cab (in cases where not provided directly from IVECO) must be planned as not to negatively impact control functions and access to equipment;

b) cab roof-installed systems:

- it is necessary to verify that the mass of the equipment does not exceed the weight allowed by the cab; in addition, the Bodybuilder must define the structural reinforcements to apply to the cab roof in relation to the unit's weight and type of intervention performed;
- contact IVECO or specific applications that involve an unoriginal compressor (e.g. fridge).



- **Note that for vehicles of category M1 and N1 class I, in accordance with Directive 2006/40/EC on the emissions of air conditioning systems for motor vehicles, the use of fluorinated GHG with overall heating potential exceeding 150 in relation to CO₂ is prohibited.**

Note a) If an additional climate control system is to be connected to the original system of the vehicle, the new total quantity of fluorinated greenhouse gases contained in the system (expressed in weight and in CO₂ equivalent) must be indicated by a data plate which replaces the original data plate.

b) if an additional independent system is to be added, the specific data plate indicating the fluorinated greenhouse gases must be positioned in line with the access points for the recharging operations.

In both cases, the data plate must be made according to the indications provided in Regulations 517/2014 (EU) and 2015/2068 (EU) in force in the European Union.

2.12.3 Second air conditioner compressor

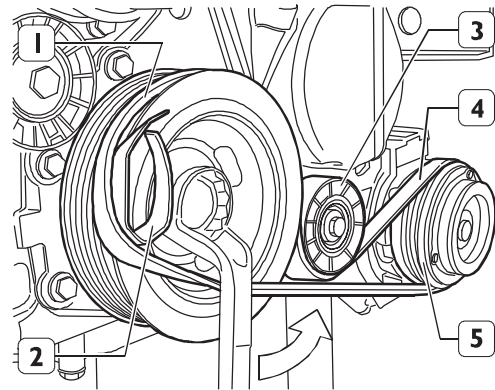
Removal

Cut the elastic belt (4 - Fig. 15) as it cannot be reused.

Refitting

On the pulley (1 - Fig. 15) apply the specific chock 99360186 (2) with the spring belt (4), placing the belt on the roller (3) and pulley (5) paying attention to place the ribs of the belt in the corresponding pulley grooves (1, 5).

Rotate the crankshaft in an anti-clockwise direction (→) until the belt (4) fits correctly on the pulley (1).



102201

Figure 15

2.13 BODYWORK INTERVENTIONS

2.13.1 General information

Note All interventions on the driver's cab or on the roof must be authorised by IVECO in advance.

The modifications must not hinder operation of the control devices located in the area of the modification (e.g. pedals, switches, pipes, etc.) nor alter the strength of load-bearing elements (frames, reinforcement profiles, etc.). Care must be taken when dealing with operations that regard the engine cooling and air intake pipelines.

In relation to variation of cab weight, it is necessary to consider the position of the payload in order to respect the division of the permitted axle loads (see Chapter 1.15).

As regards operations that entail the removal of internal sound barriers or protective panels (panelling, cladding) be sure to remove only the minimum amount possible; restore the protections as intended in the original design along with their original functionality.

Cab installation of controls and equipment (PTO engage switch, external operator cylinder control, etc.) is allowed as long as:

- installation is rational, performed in good detail and easy to access by the driver;
- the proper safety, control and signalling devices called for by national law are installed.

Make sure that the pipes and cables are installed correctly; adopt the necessary retainers and be sure to plan for appropriate distances from the engine, heat sources and moving parts.

Each structural modification must bear protection against corrosion (see Chapter 2.3 (► Page 10)).

The use of zinc coated sheet metal is recommended on both ends of newly inserted sheet metal on cut bodywork in order to avoid ferrous corrosion of the welds (I.S. 18-1317 class ZNT/F/10/2S or I.S. 18-1318 class ZNT/10/2S), both surfaces must undergo protective treatment.

Install gaskets with care and apply sealant to areas in need of protection.

Make sure that the seals are water, dust and smoke tight.

The bodybuilder must check that the chassis, after its structural modifications, complies with the standards in force for what concerns both internal and external structure.

2.13.2 Interventions on chassis cab vehicles

a) Cab

Any cab modifications performed to create specific configurations must be done with care in order to protect the resistance and maintain cab functionality and protections intact.

In the installation of units on the roof (e.g. air-conditioning systems), make sure that the weight of the equipment does not exceed that permitted by the cab. The applicable limits can be provided on request, depending on the version.

If an opening has to be made, the following is required:

- envisage coupling radii of no less than 50 mm;
- do not modify any ribbing that may be present;
- do not modify the curvature of the roof.

b) Installation of spoiler or box on the roof

On request, versions are available developed for IVECO on the basis of its design and verifications.

If "kits" of other origins are fitted, follow the specific indications supplied by the manufacturer.

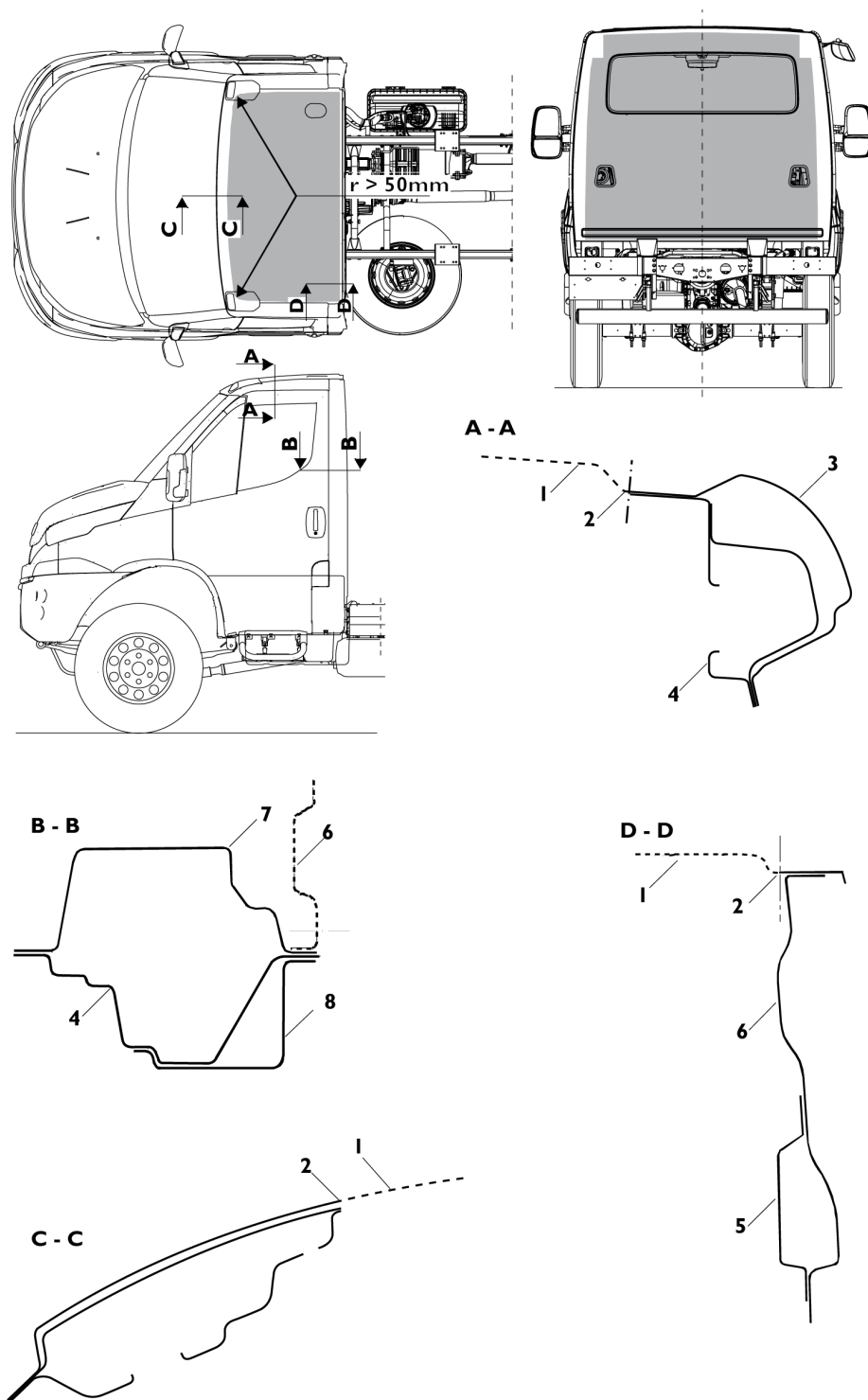
In any case, please note that the possible lack of contact between the superstructure and roof may trigger air turbulence resulting in fastidious vibrations or resonances; therefore the application of gaskets or sealing systems that protect the aerodynamics is strongly recommended.

If the national standards require it, these installations must be controlled by relevant type-approval authorities.

c) Roof and cab rear wall

If the rear wall and part of the roof have to be removed (e.g. auto-caravan set-ups), bear in mind the following indications:

- make the cut as shown in Figure 16 ensuring that the minimum coupling radius as indicated is observed;
- eliminate the rear cross member structure at roof level;
- implement a structure capable of ensuring that uprights cannot be deformed in order to retain the efficiency of the upper couplings of the safety belts;
- this structure should have a compression strength of at least 800 daN;
- implement the connection with the new structure following the general indications provided above.



228310

Figure 16

1. Roof panel
2. Cutting limit area
3. Side finishing of roof
4. Door support ring

5. Internal rear cross member
6. Rear wall
7. Door area rear finishing
8. Side finishing

d) Creation of sleeper cabs

Not applicable

2.13.3 Protection of the vehicle occupants

Airbags, safety belt fittings, the positioning of reels and pre-tension devices and anchorage of seats are all an integral part of passive safety.



- **Any modification of these components may compromise the protection of persons on-board and compliance with legal requirements.**

a) Airbag/Window bag

Work or component installations must not be carried out in areas that may inhibit the correct operation of the airbags.

Consequently, the following must be avoided:

- modifications to the front structure of the vehicle, floor, firewall, sides and dashboard fixture points;
- alterations in the airbag control unit installation area (located under the floor between the front seats) and points involved in the system of sensors and related wiring harness;
- installation of components near the dashboard aperture;
- modifications to the steering column;
- replacements or installations of seats a different "H" point compared to the original versions.

Note *Since the configuration of the electronic safety devices of the vehicles must not be modified, the Airbag system cannot be installed as "retrofit" and vice versa, must not be eliminated.*



- **The additional circuits must be separated from the main circuit of the vehicle and protected by means of a specific fuse.**

b) Seat belt anchoring

Work in the body areas where there are seat belt fittings may affect the function/operation of these devices.

It is therefore the responsibility of the bodybuilder to comply with regulations concerning:

- mounting and tightening torques
- choice of seat belts other than original versions;
- uniform operation between original seat belts and seats that may have a different configuration to the originals.

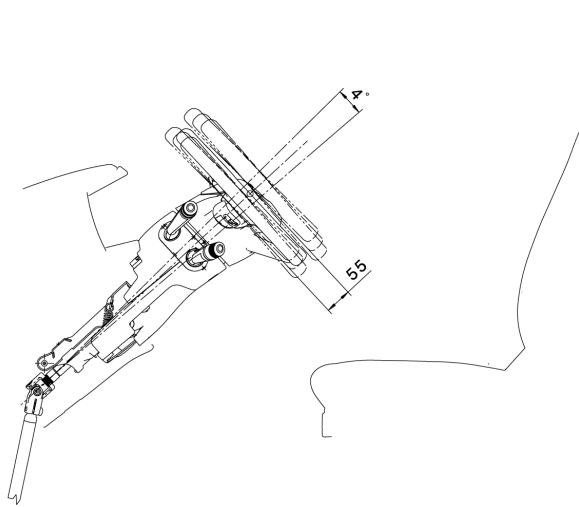
c) Seats

Moving the seats or fitting additional seats (for example, in a van of Cat. NI) is not permitted on vehicles already equipped with additional coupling points and which are the subject of alternative type-approval.

Any other solution is implemented under to total responsibility of the bodybuilder as regards installation and final test procedures (destructive).

2.13.4 Steering column adjustment

The possibility of carrying out the adjustments indicate in the following figure must be strictly stored.



263688

Figure 17



- **Is not permitted to make any modifications to the original assembly position of the steering column on the vehicle.**

Any other solution is implemented under the full responsibility of the Bodybuilder with regards to installation and final test procedures (destructive).

2.14 CHANGING TYRE SIZE

The dimensions and load bearing capacity of the tyres are established by international Regulations (ETRTO, ISO) however, on a national level, other different values for specific uses (fire-protection, winter, airports, etc.) are permitted.

The load capacity and the relative reference speed must be suitable for the maximum performance levels of the vehicle.

Subsequently, if tyres with a lower index than the type-approved ones are used, the loads permitted on the axles must be reduced; however, the use of tyres with a greater capacity does not automatically imply the increase of these loads.

2.14.1 Requirements



- **Replacing the tyres with others of a different size or load bearing capacity compared to the specifications recorded during vehicle type approval requires IVECO authorisation as well as verification of whether the electronic management of the speedometer, tachograph and speed limiter and traction and braking system requires reprogramming. This operation must be carried out by the IVECO Service Centre.**

In particular, mounting tyres with a larger diameter than the original tyres:

- always requires a size check in relation to mechanical components, wheel arches, etc., in the various dynamic, steering and vehicle shaking conditions;
- may entail rim replacement with the subsequent need to adjust the spare tyre holder;

- may affect distance from ground of the rear under-run protection device and, in this case, a check on standard compliance is required; if necessary the support brackets must be replaced with appropriate and approved counterparts (see chapter 2.20 (► Page 42));
- requires compliance of the transversal limit edge to be checked.



- **Tyres of different size and type of structure cannot be mounted on the same axle.**

The vehicle must then be presented to the competent Body that will inspect the new tyres and the vehicle documents.



- **If vehicle configuration requires the wheels to be removed, make sure that the contact surfaces between rim and connection flange are clean and free of corrosion when remounting the wheels. Furthermore, tightening of the wheel studs to torque must be ensured in compliance with IVECO Standard 17-9219.**

Table 2.14 - Wheel tightening torque according to IVECO STD 17-9219

CONNECTING ELEMENTS		TIGHTENING			
Name	Thread	CLASS	Torque [Nm]		FEATURES "S" (*)
			Min	Max	
Front and rear wheel mounting	Stud M18x1.5	II	335	410	"S"

(*) Characteristic "S": safety tightening (see IVECO std. 19-0405).



- **If using brackets to mount aesthetic studs positioned between the rim / lug or stud, or if using rims thicker than the original, geometric mounting functionality must be ensured through appropriate lengths of stud threading in the locking hole.**

2.15 WORK ON THE BRAKING SYSTEM

2.15.1 General information

The braking system, together with its components, is of fundamental importance in terms of safety.



- **No modifications to the adjustment unit, control valve, brake cylinders, valves, pedalbox, components of the AEBS, brake callipers, discs and pads (with the exception of normal replacement with spare parts), since they are safety components.**

If required by national regulations, the vehicle must be presented to the competent authority for testing.

2.15.2 Brake pipe



- **It is absolutely forbidden to weld the pipes.**

Note *In the case of changes to the cantilever, the brake lines involved should preferably be replaced with new pipes and in one piece. If it is not possible to use one-piece pipes, the couplings to be used must be of the same type as the original ones in the rest of the system.*

In the event of replacements the minimum internal dimensions, material and curvature radii of the pre-existing pipes must be respected.

For procurement please contact IVECO Assistance Service, whereas for assembly the directions in IVECO STD 17-2403 must be complied with.



- **The total or partial painting of the brake pipes must be absolutely avoided and, for this purpose, appropriate masking of the pipes must be provided.**

Metal pipes

Additions and replacements must envisage:

- for materials, dimensions, couplings: Standard ISO 4038
- radii of curvature (referring to the centre line of the pipe $\varnothing = 4.76$ mm): min 25 mm
- tightening torque:
 - stiff pipes, couplings M10x1 and M12x1: 14–18 Nm
 - hoses, male couplings M10x1: 17–20 Nm

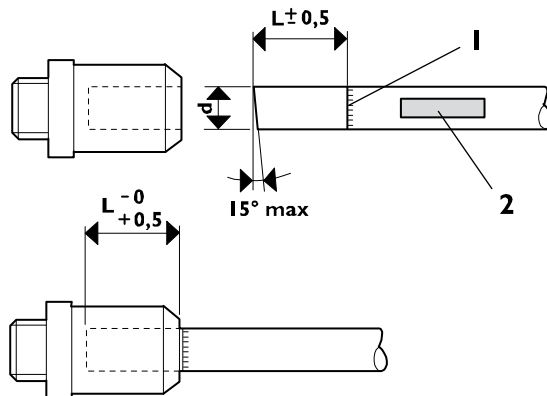
Preparation and assembly (IVECO STD 17-2403)

Cut the pipe at right angles (15° maximum error), using a special tool in order to avoid imperfections that affect the sealing.

Permanently mark the section of pipe (dimension L in Figure I 8) to be inserted into the coupling to ensure secure sealing.

Mark the pipe to avoid assembly errors in case of subsequent repair operations.

As much as possible, use the same couplings as the original ones, or otherwise belonging to the normal production of specialised manufacturers in the sector.



d (mm)	L (mm)
4	19,5
6	19,5
8	20,5

208209

Figure I 8

1. Identification of pipe limit

2. Marking

As much as possible, use quick-fit couplings.



- **For each intervention on the piping, verify whether there is the need, depending on the supplier, to use always new couplings or if it is possible to reuse those originally present through the use of appropriate tools (pliers).**

When the space conditions require it (e.g. in proximity of curves), couplings with metal inserts can be used.

Before inserting the pipe into the coupling, screw the coupling into the threaded insert of the same component (e.g. pneumatic valve), using the following values for tightening:

Table 2.15

Thread	Tightening torque [Nm ± 10%]
M 8 x 1 mm	20
M 12 x 1.5 mm	24
M 14 x 1.5 mm	28

Insert the pipe into the coupling for the previously marked stretch of length L, using a force of between 30 and 120 N, depending on the size of the tube.

The replacement of components (valves, etc.) is made possible because the engagement and coupling allow an internal rotation during the operation of unscrewing and screwing.

Vehicle pipe installation

Before use, the new pipes must be thoroughly cleaned inside, for example by blowing air with a compressor.

The pipes must be fixed to the frame with elements which envelop the pipe completely and which may be metal with rubber/plastic protection or be made of plastic material.

Provide appropriate distances between one fastening element and the other: generally, max. 500 mm for plastic pipes and max. 600 mm for metal pipes can be considered.

In order to avoid deformations and tensions at the time of closure of the couplings for the plastic pipes, it is necessary to take care of the line and the accommodation of the fastening elements, rubbing should be avoided with the fixed parts of the vehicle and meet the necessary safety distances from moving parts and heat sources.



- **After each intervention, both on the system and on the equipment, it is necessary to perform a precise air bleed operation (on vehicles with the ABS/ESP system only using special apparatus present in the IVECO Authorized Workshops).**

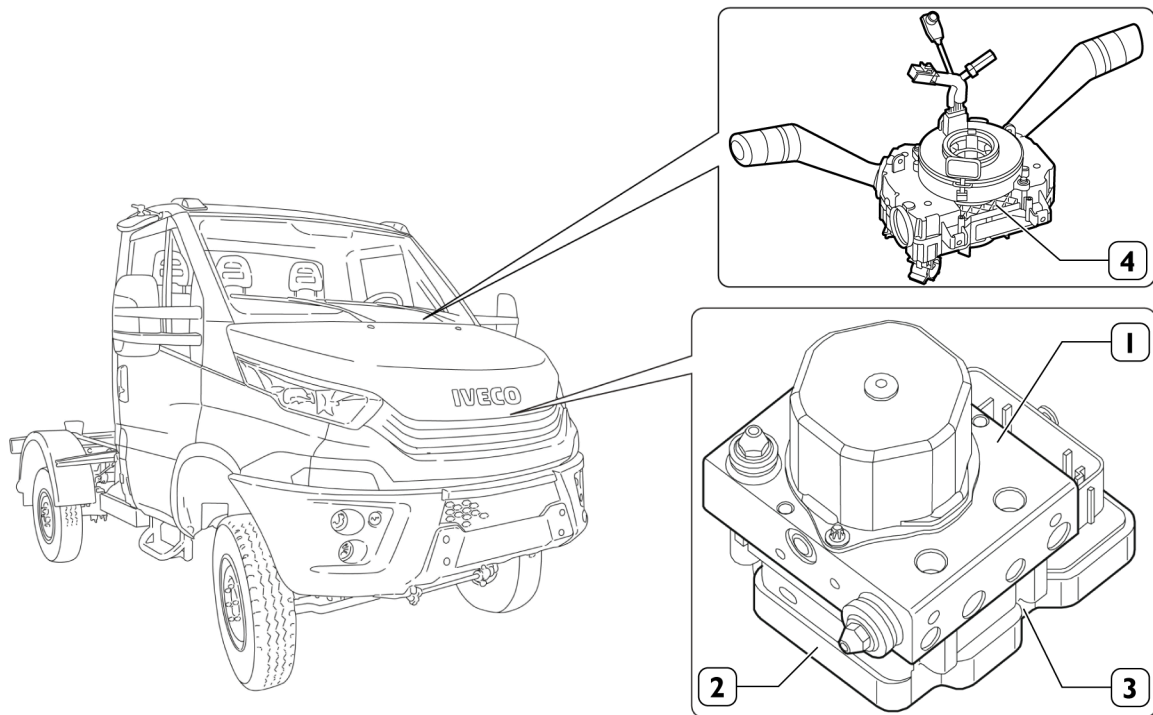
Note *The fluid discharged from the hydraulic circuit must not be used again. Top up using only new fluid of the prescribed type, contained in original, sealed containers that should only be opened when using the fluid.*

2.16 ESP (ELECTRONIC STABILITY CONTROL)

ESP is an electronic function which contributes to the vehicle's active security and therefore the European Legislation, relating to vehicles approved also for off-road use, provides that it is obligatory up to GVW of 3.5 t.

By continuously analysing acceleration signals, yaw, steering angle and wheel revolutions (see Figure 19), the control unit is able to compare the set trajectory with the actual vehicle trajectory.

if there is the danger of instability, the system activates the modulated braking of one or more wheels and intervenes in engine management by reducing its speed.



279567

Figure 19

- | | |
|---------------------------------------|--------------------------------|
| 1. Electrohydraulic braking modulator | 3. Yaw and acceleration sensor |
| 2. Braking system control unit | 4. Steering angle sensor |

To ensure correct programming of the ESP control unit (or Body Computer), the following parameters are important:

- vehicle configuration (van, truck, camper,...);
- wheelbase;
- GVW;
- type of suspension;
- type of gearbox/transmission
- wheel circumference;
- retarder (if equipped).



► **Every variation of one or more of these parameters requires re-programming of the ESP control unit (or Body Computer) or the functional degrading of the system.**

Note Reprogramming the control unit or derating of the ESP system must exclusively be performed by the IVECO Assistance Service.

2.16.1 Derating of the ESP system

- **The derating of the ESP system is only possible for certain vehicle categories: for their identification and relative dispositions, refer to Attachment XI of Directive 2007/46/EC - latest version amended. The derating of the ESP system involves the complete deactivation of vehicle stability control.**

If derating is implemented, functions nonetheless remain active:

- ABS (*Antilock Braking System*) to avoid wheel locking
- EBD (*Electronic Brake Force Distribution*) to distribute the braking force between front and rear axles
- MSR (*Motor Schleppmomenten Regelung*) to control the braking effect of the engine when released
- LAC (*Load Adaptive Control*) to adapt the extent of braking to the distribution of the load on the vehicle
- HHC (*Hill Holder Control*) to facilitate pick-up from a standstill in ascent

2.16.2 Variation of GVW

Variations of vehicle GVW must be authorised by IVECO and only in certain special cases is this compatible with the presence of the ESP system.

In the event of compatibility, system management software must be reprogrammed; in all other cases, Derating is compulsory, except as indicated in Attachment XI of Directive 2007/46/EC.

2.16.3 Wheelbase variation

As stated in Chapter 2.4, the variation of the wheelbase is only permitted upon specific approval of IVECO. In the event of approval the following alternatives may be verified:

a) To values included in the product grid

If the conversion involves a wheelbase value among those in production for the specific vehicle model, ESP system software has to be reprogrammed.

a) To values not included in the product grid

If the conversion involves a wheelbase value NOT corresponding to any of those in production for the specific vehicle model, derating of the ESP system is compulsory, except as indicated in Attachment XI of Directive 2007/46/EC.

2.16.4 Modification or replacement of suspensions

If an ESP system is present:

- modifications are not allowed of any suspension element;
- total replacement of the suspension is permitted with another suspension already type approved for the specific vehicle model;

Such intervention may only be performed after obtain authorisation from IVECO and require the reprogramming of ESP system software.

2.16.5 Modification or replacement of the stabilizer bars

The modification or replacement of stabilising bars must be authorised by IVECO and is not compatible with the presence of the ESP system.

Inasmuch, if authorisation is granted, Derating of this system is compulsory, except as indicated in Attachment XI of Directive 2007/46/EC.

2.16.6 Tyre changes

See Chapter 2.14 .



► **It is forbidden to modify the characteristics of the tyres outside the range type-approved by IVECO.**

2.17 PART RELOCATION AND ANCHORAGE OF ADDITIONAL UNITS AND EQUIPMENT

The movement of units (various components, fuel and urea tanks, batteries, spare wheel, etc.) for the installation of equipment is allowed on the condition that:

- the functionality of the unit is not compromised;
- the original type of connection is restored;
- the new placement and distribution of mass is compatible with that originally established.
- protection from high heat sources is provided by designated shielding (also see Chapter 1.17 (► Page 17)).

2.17.1 Horn

The displacement of the horn obligates the bodybuilder for a new approval. Also in the new position, the device must ensure the acoustic performance set by the regulations and must be adequately protected from exposure of weathering and/or soiling. IVECO reserves the right to void the warranty on the moved component.

2.17.2 Wheel mount

For the fastening of the wheel holder bracket and of the relative lifting device, the adoption of a stiffening plate inside or outside the side member is recommended and, where possible, its proximity to a chassis cross member.

The holes to be drilled for the new arrangements should be made on the rib of the side member, according to the regulations contained in Chapter 2.2 (► Page 7) and taking care to use the existing holes as much as possible.

2.17.3 Fuel tank

To obtain indications relating to fuel consumption and tank range, the signals relating to fuel level must be associated with the tank emptying law. This is provided by the Body Computer (see Chapter 5.1).

This is not possible when, wishing to increase the vehicle's fuel tank range, a tank of different form is adopted or when another tank is added.

In this case it is the Bodybuilder's responsibility to obtain specific type approval from the designated Authorities (see Chapter 1.5 (► Page 6)) and realize a suitable signal processing method.

Note *In the event of tank replacement the processing logic of the Body Computer must be adjusted.*

The adjustment must be carried out by the IVECO Assistance Service.

2.18 TRANSPORT OF HAZARDOUS MATERIALS (ADR)

Each vehicle complies fully with the technical specifications of **Regulation 105 - Series 06/01 - attachment "B"** of the Agreement **ADR 2019 - Part 9 (Requirements relating to the construction and approval of vehicles)** with regards to the paragraphs:

- 9.2.2.2 (Pipes)
- 9.2.2.3 (Fuses and circuit breakers)
- 9.2.2.5 (Lighting)
- 9.2.2.6 (Electrical connections between vehicles and trailers)
- 9.2.2.7 (Voltage)
- 9.2.2.8.1 (Battery cut-off)
- 9.2.2.8.4 (Battery cut-off)
- 9.2.2.8.5 (Battery cut-off)
- 9.2.2.9 (Permanently powered circuits)
- 9.2.4.3 (Fuel tanks)
- 9.2.4.4 (Engine without CNG - EXII and EXIII)
- 9.2.4.5 (Exhaust gas device)
- 9.2.6 (Coupling device for vehicles with engine and trailer)

Note *Compliance with these requirements by the additional structures and their connections to "incomplete" vehicles, is the full responsibility of the bodybuilder.*

2.19 INSTALLING A RETARDER

Application not provided

2.20 REAR UNDER-RUN PROTECTION (RUP)

The maximum distance between the rear under-run protection device (RUP = Rear Under-run Protection) and the rear-most point of the superstructure is 400 mm, less the deformation observed in the approval phase (on average 10 mm).

If the changes on the chassis require the adaptation of the rear overhang, the under-run protection must be placed by performing the same connection to the chassis as provided in the original version.

In the transformation of the vehicle or in the application of special equipment (e.g. rear tail lifts), it may be necessary to modify the structure of the under-run. The intervention must not change the resistance characteristics and the original rigidity.

The compliance of the modified device with standards in force must be demonstrated to the competent authorities by appropriate documentation or test certificates.

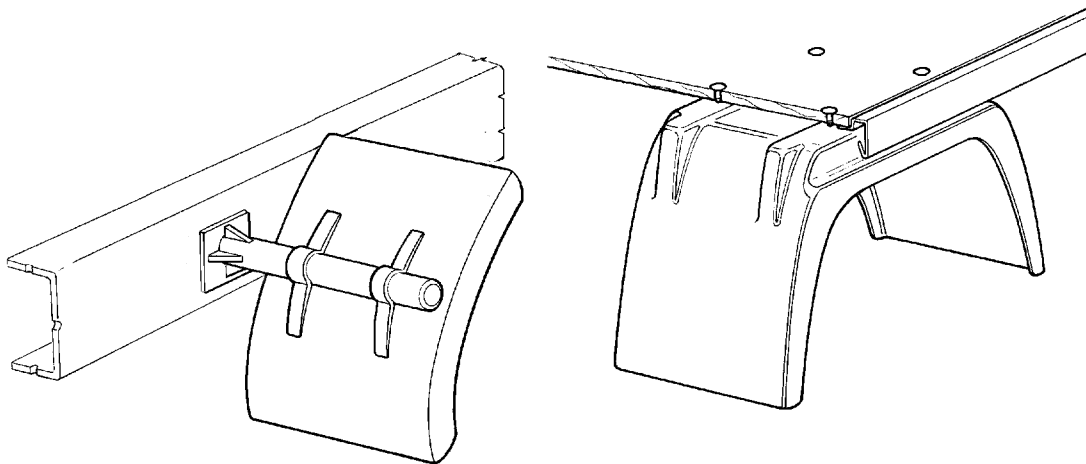
2.21 REAR MUD GUARDS AND WHEEL ARCHES

On chassis cab version vehicles without rear mudguards, the bodybuilder must implement solutions equal to those provided by IVECO.

For the realisation of the fenders, the wheel arch boxes and the shaping of the superstructure, keep in mind that:

- the free shaking of the wheels must be ensured even in the conditions of use with chains; any indications on limit values can be requested via the Support Service;
- the width of the mudguard must be greater than the maximum dimensions occupied by the tyres, within the limits set by the regulations;
- the support structure of the mudguard must have adequate strength and be able to limit the vibrations;
- the connection may be made on the vertical rib of the side members of the vehicle (only using the existing holes) or directly under the applied superstructure (see Figure 20).

The first and the second point are also to be considered in the implementation of wheel arches.



261813

Figure 20

2.22 MUDFLAPS

Once outfitting is complete, the mudflaps must be included in the vehicle equipment if and as indicated by the regulations in force.

2.23 SIDE PROTECTIONS

In some countries, regulations (national or UNECE) require the application of side protections. Compliance with the required characteristics should be assured by the bodybuilder who handles completion of the vehicle, if it was not already equipped as such originally (optional setting).

In permanently applied superstructures (e.g. fixed bodies, vans) side protection can be applied on the basis of their structure (e.g. frame of the floor beams), while for mobile superstructures (e.g. tippers) the connection can be made by means of suitable supports on the subframe or directly on the frame. In the latter case, use the existing holes on the vertical rib of the side member as much as possible, in compliance with Chapter 2.2 (► Page 7).

In the construction of the external protective element, in accordance with Regulatory specifications (for example, EC Directive), it is permitted to use either a single section with a surface extending in the vertical longitudinal sections, with pre-set dimensions and distances between them.

The protection must be connected to the support structures in order to be quickly removed or reversed in case of maintenance or repair of the units behind them

2.24 REARVIEW MIRRORS

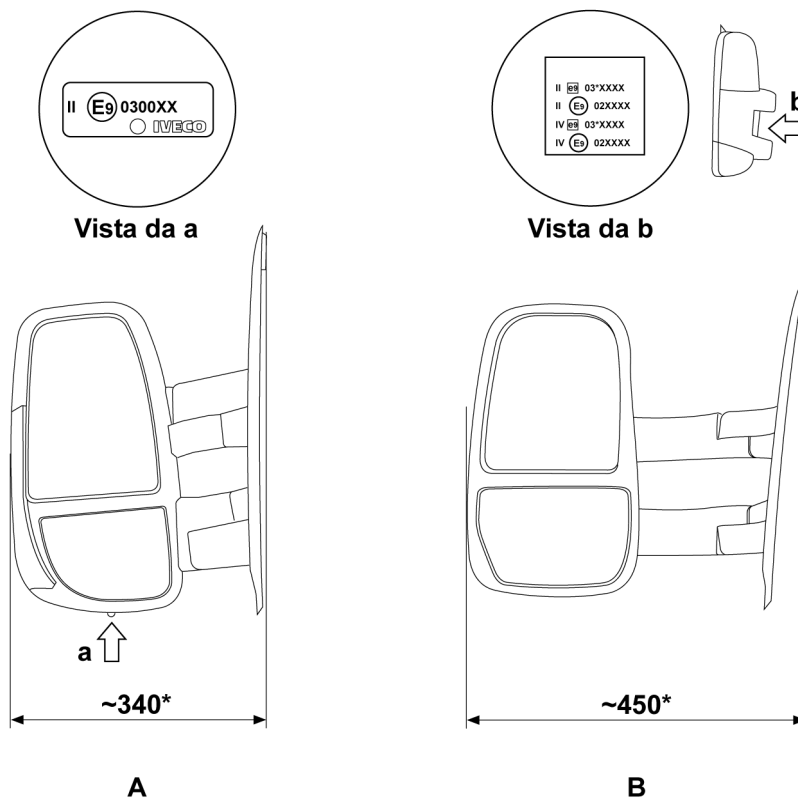
Depending on the width of the vehicle outfitting, it may be necessary to use rearview mirrors with an extended arm.

Table 2.16 - IVECO type- approved rearview mirrors

Models	Maximum body width [mm]	IVECO type- approved rearview mirrors
55	2200	short arm (see Figure 40 A)
70	2350	long arm (see Figure 40 B)



► **It is advisable to always use type-approved components.**



279568 **Figure 21**

* The distances differ between the left and right rearview mirror

SECTION 3

**APPLICATIONS OF
SUPERSTRUCTURES**

Contents

3.1 CONSTRUCTION OF THE SUBFRAME	5	3.12 FRONT INSTALLATION OF SNOW PLOUGH ATTACHMENTS	25
3.1.1 Material	5	3.13 APPLICATION OF A WINCH	26
3.1.2 Dimension of sections	5	3.14 BULL BAR APPLICATION	26
3.1.3 Aluminium subframe	6	3.15 SPECIAL OUTFITS	27
3.2 ELEMENTS MAKING UP THE SUBFRAME	7	3.15.1 Cowl chassis versions	27
3.2.1 Longitudinal sections	7	3.15.2 Motor homes	27
3.2.2 Cross member	9	3.15.3 Aerial work platforms	27
3.2.3 Stiffening of the subframe	9		
3.2.4 Self-supporting superstructures with subframe functions	11		
3.3 CONNECTION BETWEEN CHASSIS AND SUBFRAME	11		
3.3.1 Connection with brackets	11		
3.3.2 Connections with greater flexibility	12		
3.4 CONTAINER APPLICATION	13		
3.4.1 Dimensions and centres of gravity	13		
3.4.2 Fixed bodies	13		
3.4.3 Creation of van versions	14		
3.4.4 Tipping bodies	15		
3.5 TRACTOR FOR SEMI-TRAILER	16		
3.6 TRANSPORT OF INSEPARABLE MATERIALS (TRAILER TRUCKS)	16		
3.7 INSTALLATION OF TANKS AND LOOSE MATERIAL CONTAINERS	17		
3.7.1 Installation with a subframe	17		
3.7.2 Installation without a subframe	18		
3.8 INSTALLING A CRANE	19		
3.8.1 Crane behind the cab	20		
3.8.2 Crane on the rear overhang	21		
3.8.3 Removable cranes	22		
3.9 INSTALLATION OF TAIL LIFTS	22		
3.10 TIPPER BODIES (BREAKDOWN RECOVERY)	25		
3.11 VEHICLES FOR COUNCIL, FIRE PREVENTION AND SPECIAL USES	25		

APPLICATIONS OF SUPERSTRUCTURES

3.1 CONSTRUCTION OF THE SUBFRAME

The purpose of the subframe is to ensure a uniform load distribution on the vehicle chassis and the necessary cooperation with it to the effects of resistance and stiffness, depending on the vehicle's specific use.

3.1.1 Material

In general, if the stresses on the subframe are not high, the material for its realisation may have characteristics inferior to those of the chassis, notwithstanding the need to have good characteristics of weldability and limits that are not lower than the values **(I)** shown in Table 3.1.

In cases where the stress limits require it (e.g. for crane applications), or if you want to avoid high section height, materials with superior mechanical characteristics may be used. You should, however, keep in mind that the reduction of the time of inertia of the reinforcing section involves bending and higher stresses on the main chassis.

Following are the characteristics of certain materials which were taken into account in some of the applications stated below.

Table 3.1 - Material to be used for the construction of superstructures Std IVECO I5-2110 and I5-2812

Name of steel		Breaking strength [N/mm ²]	Yield stress [N/mm ²]	Elongation
IVECO	Fe 360D	360 (I)	235 (I)	25% (I)
EUROPE	S235J2G3			
GERMANY	ST37-3N			
U.K.	40D			
IVECO	Fe E420	530	420	21%
EUROPE	S420MC			
GERMANY	QStE420TM			
U.K.	50F45			
IVECO	Fe 510D	520	360	22%
EUROPE	S355J2G3			
GERMANY	ST52-3N			
U.K.	50D			

3.1.2 Dimension of sections

The following table shows the values of section modulus W_x for C section profiles recommended by IVECO.

The indicated value W_x refers to the actual section and takes into account the radii of curvature of the section (can be calculated with good approximation by multiplying the value obtained by 0.95 considering the section composed of simple rectangles). Profiles of different section may be used in lieu of those specified, provided that section modulus W_x and inertia time J_x of the new C section are not of a lesser value.

Table 3.2 - Profile dimensions

Section modulus W_x [cm ³]	Recommended C profile [mm]		
$16 \leq W \leq 19$	80 X 50 X 4	80 X 60 X 4	80 X 50 X 5
$20 \leq W \leq 23$		80 X 60 X 5	
$24 \leq W \leq 26$		80 X 60 X 6	
$27 \leq W \leq 30$		80 X 60 X 7	100 X 50 X 5

Section modulus W_x [cm ³]	Recommended C profile [mm]		
$31 \leq W \leq 33$		80 × 60 × 8	100 × 60 × 5
$34 \leq W \leq 36$		100 × 60 × 6	
$37 \leq W \leq 41$		100 × 60 × 7	
$42 \leq W \leq 45$	80 × 80 × 8	100 × 60 × 8	
$46 \leq W \leq 52$	120 × 60 × 6	120 × 60 × 7	
$53 \leq W \leq 58$		120 × 60 × 8	
$59 \leq W \leq 65$		140 × 60 × 7	120 × 70 × 7
$66 \leq W \leq 72$		140 × 60 × 8	120 × 80 × 8
$73 \leq W \leq 79$		160 × 60 × 7	
$80 \leq W \leq 88$		180 × 60 × 8	
$89 \leq W \leq 93$	160 × 70 × 7	180 × 60 × 7	140 × 80 × 8
$94 \leq W \leq 104$		180 × 60 × 8	
$105 \leq W \leq 122$	200 × 80 × 6	200 × 60 × 8	180 × 70 × 7
$123 \leq W \leq 126$		220 × 60 × 7	
$127 \leq W \leq 141$		220 × 60 × 8	
$142 \leq W \leq 160$	200 × 80 × 8	240 × 60 × 8	
$161 \leq W \leq 178$	220 × 80 × 8	240 × 70 × 8	
$179 \leq W \leq 201$	250 × 80 × 7	260 × 70 × 8	
$202 \leq W \leq 220$	250 × 80 × 8	260 × 80 × 8	
$221 \leq W \leq 224$	220 × 80 × 8	280 × 70 × 8	
$225 \leq W \leq 245$	250 × 100 × 8	280 × 80 × 8	
$246 \leq W \leq 286$	280 × 100 × 8		
$290 \leq W \leq 316$	300 × 80 × 8		
$316 \leq W \leq 380$	340 × 100 × 8		
440	380 × 100 × 8		
480	400 × 100 × 8		

While the section modulus represents a decisive value for the stress of the material, the moment of inertia is important mainly for the flexural hardness and for the quota of the bending moment to be taken, depending on the connection used.

3.1.3 Aluminium subframe

When using materials with different characteristics from those of steel, the size and structure of the subframe must be appropriately adjusted, ensuring at least the equivalent performance levels.

In particular, in the case of aluminium:

1. If the subframe serves to evenly distribute the load while the task of withstanding stress is left to the chassis, profiles with dimensions similar to those indicated for the steel can be used.
Typical examples of subframes for fixed bodies, vans and tankers, provided that the supports are continuous and close together or in the immediate vicinity of the suspension mounts.
2. If the subframe serves above all to assist in terms of robustness and rigidity (for example, superstructures with high concentrated loads, tipping bodies, cranes, centre axle trailers, etc.), make sure that it ensures bending and torsional resistance at least equal to that of a type-approved subframe in steel.
In defining the minimum dimensions of the profiles, in addition to the limit of the permitted stress, the different elastic modulus of aluminium in relation to steel must be taken into consideration (approx. 7,000 kg/mm² compared to 21,000 kg/mm²).

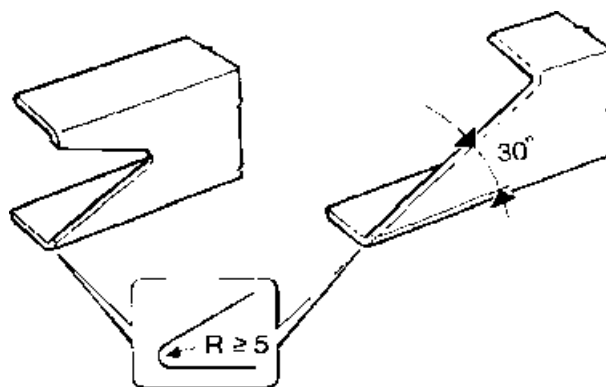
When the connection between the chassis and the subframe is such as to ensure the transmission of the shear stresses (connection with plates), in checking the stresses at the two ends of the individual section, the new neutral axis has to be defined on the basis of the different elastic modulus of the two materials.

3.2 ELEMENTS MAKING UP THE SUBFRAME

3.2.1 Longitudinal sections

The side members of the added structure must be continuous, extended as much as possible toward the front of the vehicle and towards the rear area of the front spring support; in addition, they must rest on the chassis and not on the brackets.

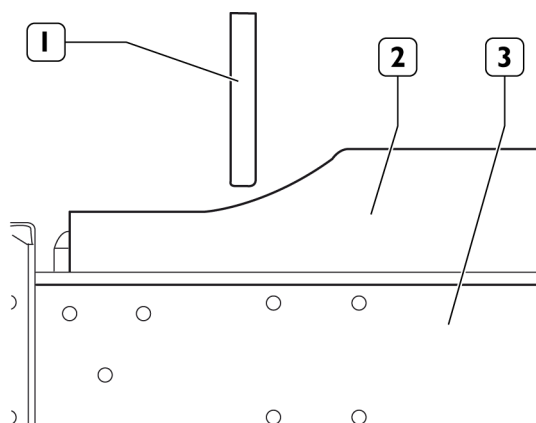
In order to achieve a gradual reduction of the resistant section, the front ends of the profile must be tapered in height with an angle not exceeding 30° , or another form of equivalent tapering (see Figure 2); the front end in contact with the chassis must be properly coupled, with min. radius of 5 mm.



91136

Figure 1

If the components (1) of the cab rear suspension do not allow the passage of the entire profile, this can be achieved as shown in Figure 3. This may require verification of the minimum resistant section when there are high front bending moments and may also require fixing to the chassis side member (3) at a distance of no more than 250 mm from the front end of the subframe (2).

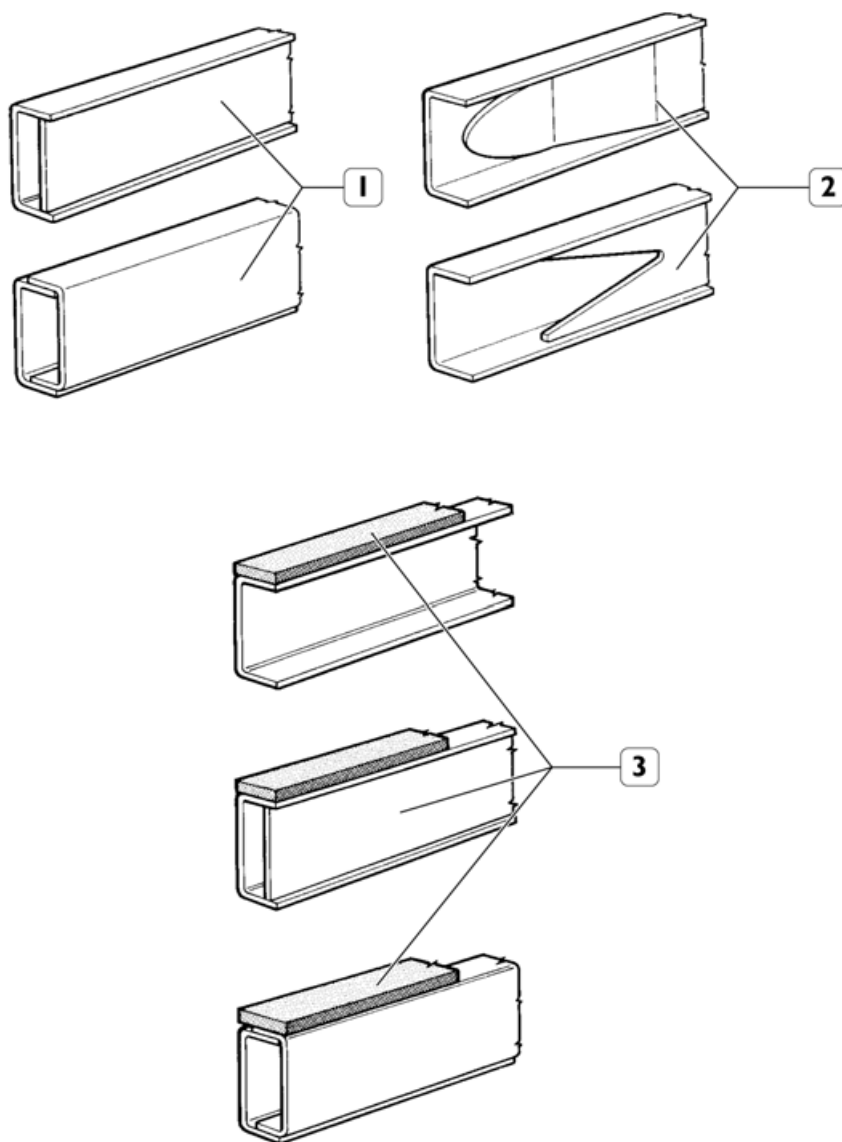


262152

Figure 2

The shape of the profile section is defined taking into account the function of the subframe and the type of overlying structure. Open C profiles are advisable when the subframe needs to adapt to the vehicle chassis and boxed sections when greater stiffness of the assembly is required.

Care should be taken to achieve a gradual transition from the boxed section to the open section, as in the examples in Figure 4.



193867

Figure 3

1. Normal boxed profiles

2. Gradual passage from the boxed section to the open section

3. 15 mm lintel (width of the wing of the profile)



- **It is necessary to create continuity of support between the profiles of the subframe and those of the chassis; if this is not obtained, the continuity can be restored by means of interposition of strips of sheet metal or light alloy.**

If there is to be a rubber undercrawl element we recommend characteristics and thicknesses similar to those used for normal production (hardness 80 Shore, max thickness 3 mm). Its use can prevent abrasive actions that can cause corrosion in the joining between materials of different composition (e.g. aluminium and steel).

The dimensions specified for the side members of the various types of superstructures are the recommended minimum values and, as a rule, are valid for vehicles with standard wheelbases and rear overhangs (see Tables 3.3 to 3.5). In all cases similar profiles

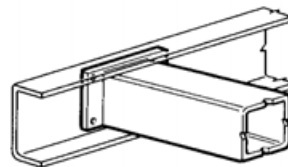
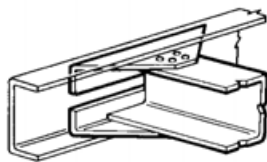
can be used, but with moments of inertia and resistance which are the same or higher. These values can be obtained from the technical documentation of the profile manufacturers.

3.2.2 Cross member

A sufficient number of crossbars, possibly to be placed in correspondence with the fastening clamps to the chassis, must brace the two sections of the subframe.

The crossbars may be open section (e.g. C), or closed section where you would want to impart greater stiffness.

In their connection, suitable gusset plates as in the figure must be used to give adequate resistance to the connection (see the following Figure on the left). When you want to achieve greater stiffness in the connection, it can be carried out according to the following Figure on the right.



193868

Figure 4

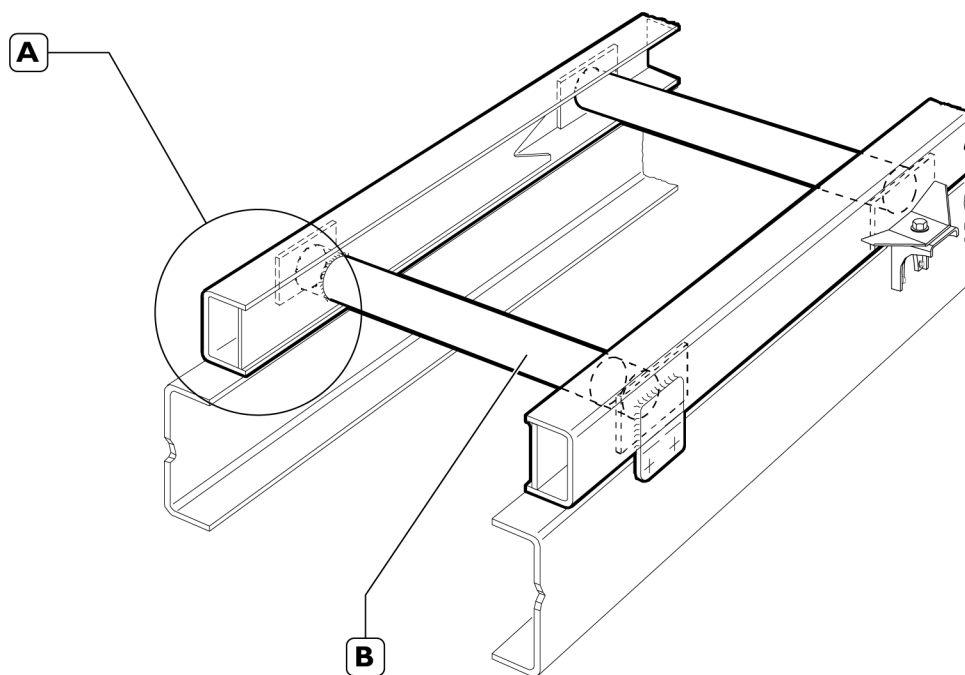
3.2.3 Stiffening of the subframe

For some superstructures (e.g. tipping bodies and cranes on rear overhang, superstructures with high centre of gravity), the subframe must be stiffened in the rear part.

This can be achieved by increasing the scope of stiffness to obtain:

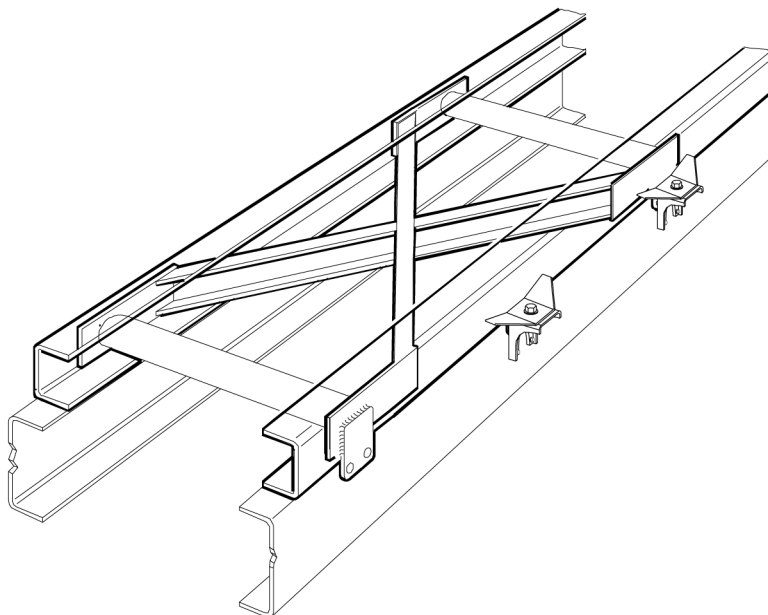
- boxing the longitudinal sections in the rear area (ref. A in Figure 5);
- adopting closed section cross members (ref. B in Figure 5);
- applying cross diagonals (see Figure 6);

In general the use of boxed longitudinal sections should be avoided in the front part of the subframe.



261817

Figure 5



261818

Figure 6

3.2.4 Self-supporting superstructures with subframe functions

The interposition of a subframe (longitudinal and transverse) can be omitted in the case of installation of self-supporting superstructures (e.g. vans, tanks), or when the underlying structure of the equipment to be installed already has the subframe conformation.

3.3 CONNECTION BETWEEN CHASSIS AND SUBFRAME

The connections between the chassis and the subframe must be flexible.

This solution (see Figure 7) allows limited movement between the two structures and makes it possible for respective resistant sections to be considered "cooperating", as each takes on a share of the bending moment proportional to its moment of inertia.

For the correct realization of the connection, the fastenings must:

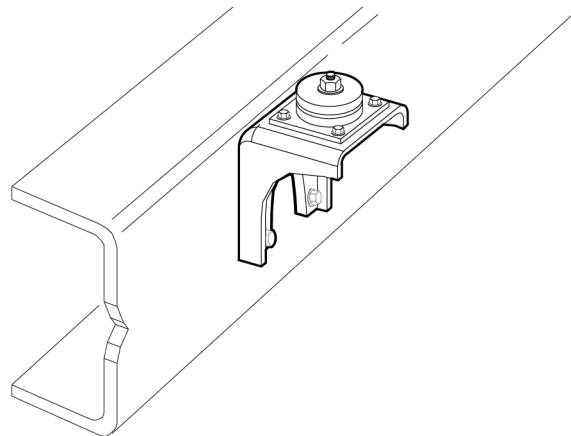
- be adequately distributed along the length of the subframe;
- use elements already pre-installed on the chassis;
- use screws with a resistance class of not less than 8.8 and anti-loosening nuts.

The first fixing point should be positioned approx 250–350 mm from the front end of the subframe, especially in the case of superstructures with concentrated loads behind the cab (e.g. crane, body tilting cylinder, etc.). This is to limit the magnitude of the stresses on the chassis and to provide greater stability. Provide additional connections if necessary.



► **In anchoring the structure to the chassis, welding must not be performed on the vehicle chassis, nor may holes be drilled into the wings of the side members.**

3.3.1 Connection with brackets



261820

Figure 7

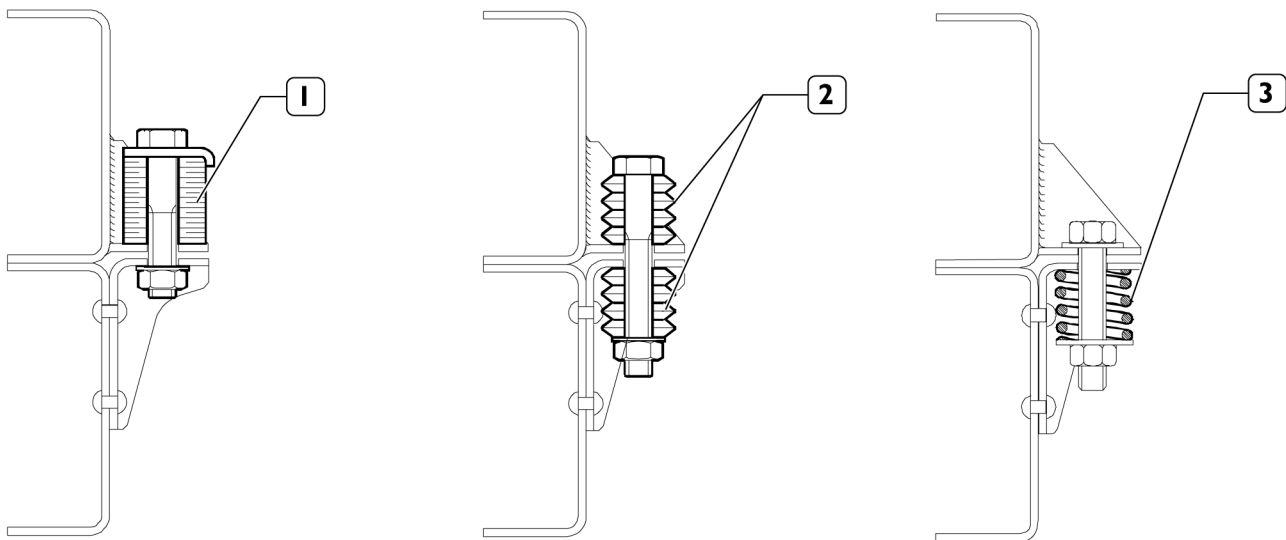
The brackets must be fixed to the rib of the side members of the vehicle by means of screws or nails.

In order to better contain the transverse loads, the brackets are normally applied so that there is a slight protrusion perpendicular to the upper edge of the chassis. If however the brackets have to be applied flush, the side guide for the superstructure must be secured with other devices (e.g. using guide plates connected only to the subframe, or only to the vehicle chassis).

If the vehicle chassis is already equipped with brackets for coupling of a body of a type established by IVECO, these brackets must be used for this purpose. For the brackets applied to the subframe or to the superstructure, resistance characteristics not less than those originally mounted on the vehicle should be provided (see Table 2.7 and Table 3.1).

3.3.2 Connections with greater flexibility

When the connection needs greater flexibility (e.g. vehicles with high stiffness of the superstructure such as vans, tanks, etc., used on winding roads or in poor conditions, vehicles for special use, etc.), hardware similar to the type indicated in Figure 8 should be adopted in the area behind the driver's cab. Brackets accompanied by rubber plugs (1) or Belleville washers (2) or helical springs (3) should be used.



256971

Figure 8

- 1. Rubber block
- 2. Belleville washers

- 3. Coil spring

Bear closely in mind that:

- the elastic element characteristics should be suited to the stiffness of the superstructure, the wheelbase and the type vehicle use (irregular road conditions);
- stiffness must progressively increase for fixing points closer to the rear part of the chassis;
- the overall connection capacity must also include fixing points resistant to shear stress to be positioned near the rear suspension.

Consequently, the first fixing behind the cab must be made using a flexible system and one which, especially when the vehicle has a long wheelbase, must also be replicated for the next fixing, modifying only the stiffness.

3.4 CONTAINER APPLICATION

3.4.1 Dimensions and centres of gravity

Check the correct load distribution and in particular, respect the indications regarding the height of the centre of gravity as provided in Section 1 using suitable construction precautions and ensure that the transported load has maximum stability while running.

3.4.2 Fixed bodies

The application on vehicles destined exclusively for road use can be achieved by means of a support structure consisting of longitudinal sections (2) and cross members (4). The minimum approximate dimensions of the longitudinal sections are shown in Table 3.3.

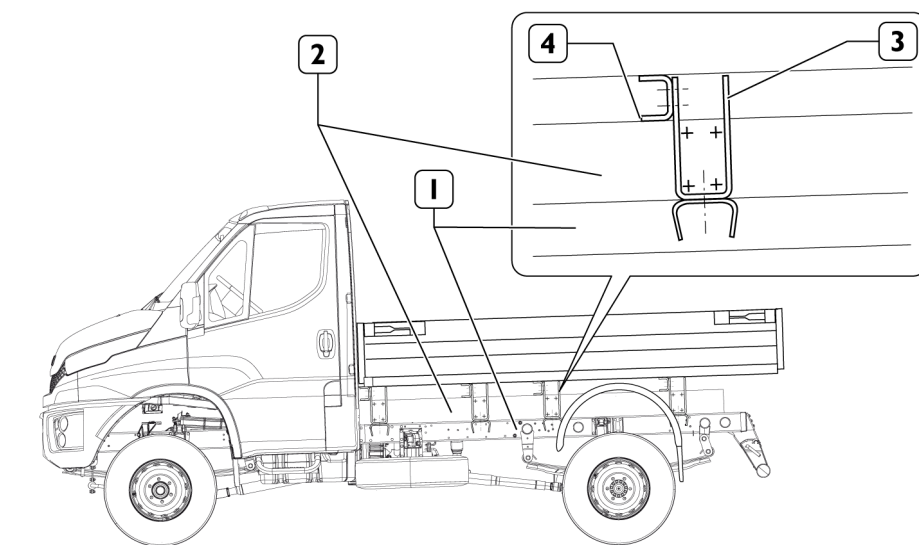
Table 3.3

Models	Minimum reinforcing profile	
	Wheelbase [mm]	Section modulus W_x [cm ³]
All	3080, 3480, 3780, 4175	21

Note For the dimensions of the profiles see Table 3.2.

Fastening is achieved through specific pre-installed brackets (3) along the vertical rib of the side members (1) (see Figure 9) and, if these connections have not already been specified by IVECO, they must be made according to the indications provided in Paragraph 3.3.2 "Connection with the brackets".

If brackets are used to obtain suitable longitudinal containment, then a rigid connection at the end of the rear overhang is recommended. This can be achieved by using plates.



271322

Figure 9

1. Chassis
2. Subframe

3. Brackets
4. Cross members

If the body needs to be kept separate from the chassis to avoid excessive overall torsional rigidity, connections are required which utilize box section structures secured to the rib of the side member.

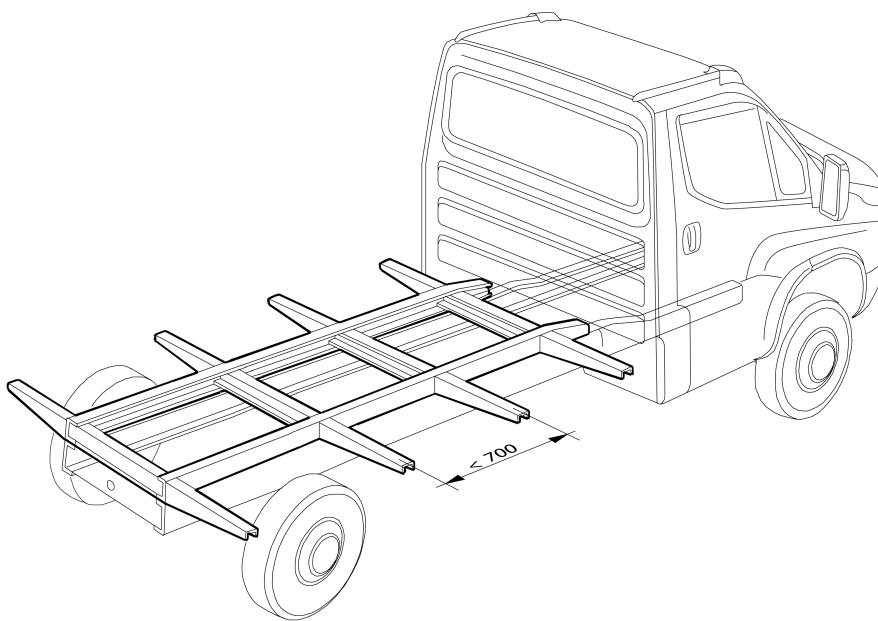
The front wall of the body must have the necessary strength and toughness to support the forces generated by the transported load, in the case of sudden and high decelerations.

3.4.3 Creation of van versions

A structure consisting of longitudinal profiles and cross members may be used for connection to the vehicle chassis. For the longitudinal profiles, refer to the indications in Table 3.3.

Figure 10 shows an example installation where, in order to limit the height of the superstructure, the longitudinal profiles are integrated with cross members and brackets over the entire length.

In this case, the rear wheel arches may be inserted into the base of the structure.



228302

Figure 10

When the floor makes use of cross beams which are no more than 700 mm apart and connected in such a way as to create a sufficiently rigid structure (self-supporting), it may not be necessary to use longitudinal profiles.

The front wall of the van box must have the necessary strength and toughness to withstand the forces generated by the transported load, in the event of sudden and high decelerations.

The mounting of dump bodies and structures having high torsional rigidity in general requires the use of flexible couplings towards the front part of the structure to avoid excessive reduction of the deformation characteristics of the main chassis.

Vans integrated with the cab

The coupling in these cases must be implemented so as to limit stress transmitted to the vehicle cab.

For couplings and fitting reinforcements, bear in mind that:

- no welding should be performed on the sheet metal of the cab and only mechanical fixture systems should be used;
- the self-supporting structure of the van must not require additional support provided by the cab;
- the parts of the cab affected by the conversion must be protected against oxidation and corrosion (see Chapter 2.2 (► Page 7)).

3.4.4 Tipping bodies

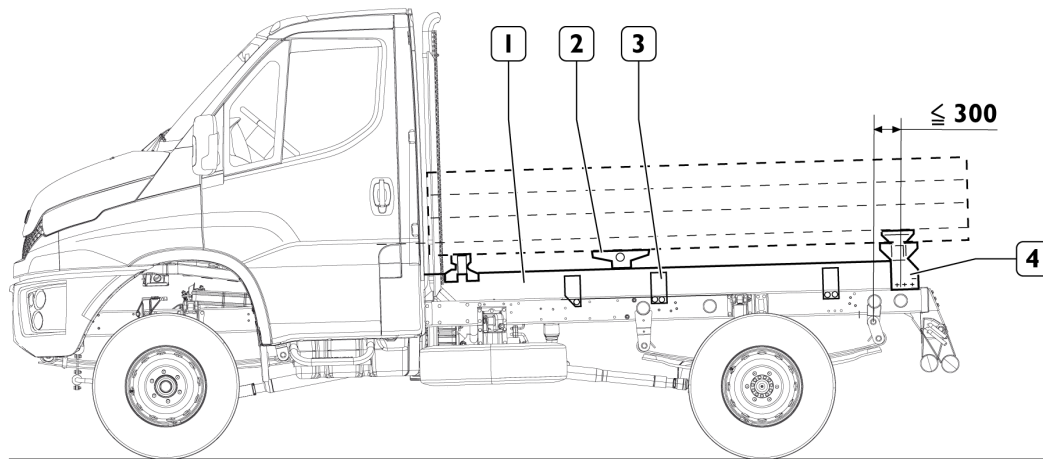
The use of rear or three-way tipping bodies generally subjects the chassis to considerable mechanical stress.

Therefore, the following indications must be observed.

1. The use of a stabiliser bar on all IVECO models for which it is an optional, is recommended.
2. The subframe must be:
 - suitable for the type of vehicle and conditions of use,
 - with appropriately sized cross members and side members,
 - with the rear end stiffened with box sections and cross braces (see Figure 5 and Figure 6). The connections to the chassis must be flexible (brackets) at the front end, while the rear section requires stiff connections (plates) to allow the added structure to contribute more to the stiffness of the assembly. Omega brackets can be used on vehicles where these are originally fitted.
3. The rear tipping hinge must be fitted to the subframe; its position must be as close as possible to the rear support of the rear suspension. So as not to compromise vehicle stability during tipping operations and avoid excessive mechanical stress on the chassis, the distance must comply with the specifications given in Figure 11. If this is not possible, the subframe profiles must be larger than normal and additional reinforcement must be applied to the rear.
4. Particular attention must be paid to the positioning of the lifting device both in terms of providing supports with adequate strength and in order to correctly position the connections. In any case, in order to reduce the extent of the localised load, it is recommended that the lifting device is placed forwards of the centre of gravity of the payload-body assembly.
5. For rear tipping operations, it is recommended that a stabilizer is fitted to guide the body, particularly when the lifting cylinder is located behind the cab.
6. The lifting device hinge must be mounted on the additional subframe. The useful volume in the body must conform with the maximum permissible load on the axles, to the density of the material to be transported (a density mass of approximately 1600 kg/m³ is to be used for excavated material). In the case of low density freight, the useful volume may be increased within the limits established for the maximum height of the centre of gravity of the payload (plus equipment).
7. The bodybuilder must ensure the good operation and safety of all parts of the vehicle (e.g. the positioning of lights, tow hook etc.) and ensure that, following the addition of the structure, vehicle stability is guaranteed during tipping operations.



- **The air springs must be completely discharged during unloading operations, to ensure stability of vehicles equipped with air suspensions. There must also be a nameplate highlighting this indication.**



228303

Figure 11

1. Subframe
2. Brackets

3. Plates
4. Retainer with hinge

Table 3.4

Models	Minimum reinforcing profile	
	Section modulus W_x [cm ³]	Dimensions [mm]
All	36	100x60x6

Note For the dimensions of the subframe sections see Table 3.2.

3.5 TRACTOR FOR SEMI-TRAILER

Not provided.

3.6 TRANSPORT OF INSEPARABLE MATERIALS (TRAILER TRUCKS)

Not provided.

3.7 INSTALLATION OF TANKS AND LOOSE MATERIAL CONTAINERS

3.7.1 Installation with a subframe

The installation of tanks and containers is carried out, as a rule, using a suitable subframe.

The approximate dimensions of the profile to be used for the subframe are shown in Table 3.5.

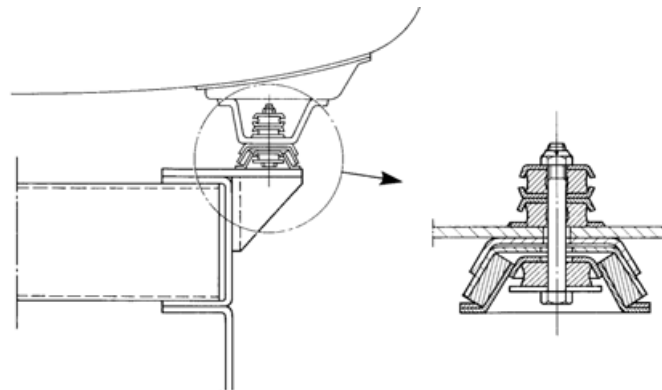
Table 3.5

Models	Wheelbase [mm]	Minimum reinforcing profile	
		Section modulus W_x [cm ³]	Dimensions [mm]
All	3080, 3480, 3780, 4175	21	80x60x5

Note For the dimensions of the profiles see Table 3.2.

The assembly of tanks, or stiff torsional structures in general, must ensure sufficient and gradual flexibility of the chassis, in order to avoid high stress areas.

The use of flexible parts is recommended for the connections between the cistern body and the subframe (see Figure 12) in the front section while rigid supports resistant to the longitudinal and transverse forces are recommended at the rear.



193895a

Figure 12

As previously mentioned, the stiff connections positioned in correspondence with the rear suspension mounts are more suitable for transmitting forces directly to the suspension elements; elastic connections are to be arranged near the front suspension rear mount.

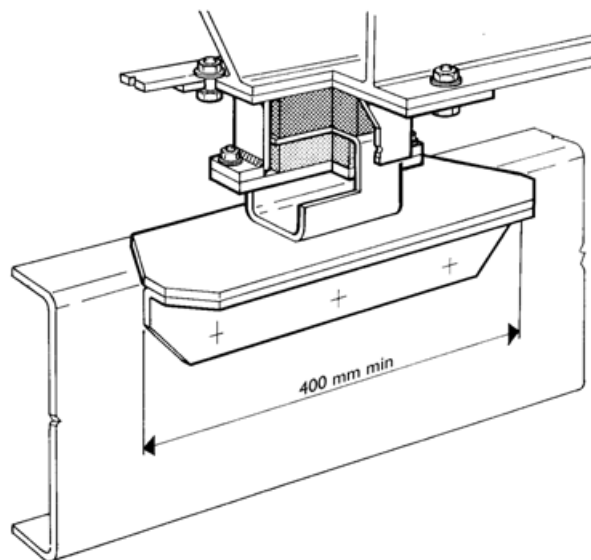
If this is not carried out, use suitably oversized longitudinal reinforcement sections compared to those shown in Table 3.5.

When defining elastic connections, consider the rigidity of the chassis in the area where the connections are to be applied and the type of functions for which the vehicle is intended.

3.7.2 Installation without a subframe

The application of tanks directly on the chassis is possible under the following conditions:

- the distance between the various rests must be established according to the load to be transmitted (approximately no more than 800 mm);
- the rests must be such that the load is evenly distributed over a suitably wide surface area and with appropriate bracings (see Figure 12) to contain the longitudinal and transverse thrusts;
- the anchoring points must be of a sufficient length (approx. 400 mm – see Figure 13) and be positioned in the immediate vicinity of the suspension connections.
Specifically, the front anchoring flexibility must be suited to contain the necessary torsional movements of the chassis;
- other anchoring solutions must be authorised by IVECO.



208921

Figure 13

The maximum volume, the degree of filling of the container and the volumetric mass of the transported goods must be defined in observance of the axle weight limits. In the case of tanks and single containers made with separate compartments, the minimum ratio between front axle weight and total fully loaded weight as well as the maximum loads on axles must be respected in all conditions of load (see Chapter 1.15).

In consideration of the type of outfit, the use of vehicles equipped with stabilizer bars is recommended and particular attention should be paid to limiting, as far as possible, the height of the overall centre of gravity (see Chapter 1.15); use of a vehicle with stabilizer bars is recommended.

In tanks and containers for liquids, transversal and longitudinal partitions are to be used in. In fact, if these are not completely full, the dynamic thrust which the liquid generates while the vehicle is in motion could negatively influence the vehicle's handling and resistance.

Follow the safety laws in force for containers intended to carry flammable liquids (see Chapter 2.18).

3.8 INSTALLING A CRANE

The selection of the crane must be made with due consideration to its characteristics and in relation to the performance of the vehicle.

The positioning of the crane and of the payload must be done within the load limits permitted for the vehicle. Installation of the crane must be carried out in compliance with statutory requirements, national standards (e.g. CUNA, DIN) and international standards (e.g. ISO, CEN) and verifying those required for the vehicle.

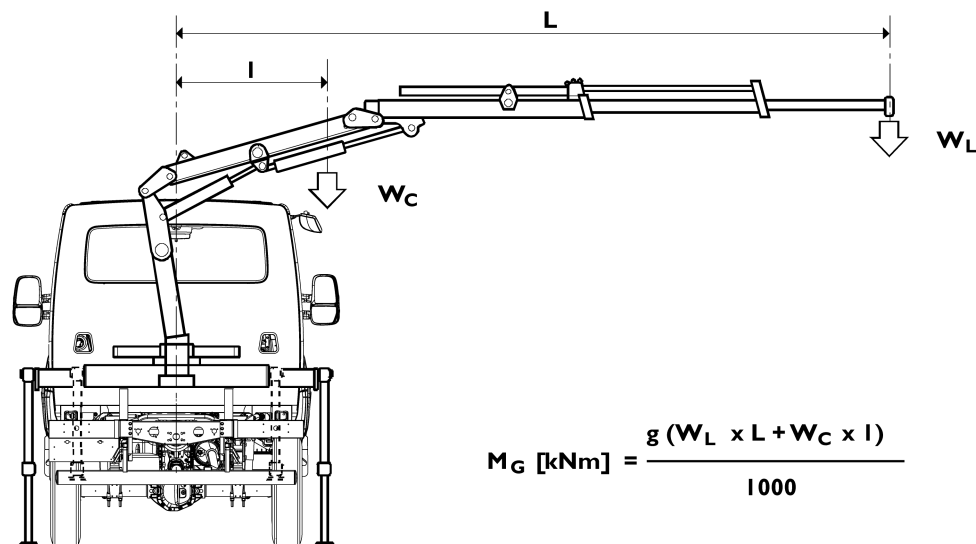
While the crane is operating, the stabilizers (hydraulic if possible) must be used and be in contact with the ground.

As a general rule, the installation of a crane requires the use of a suitable subframe, the construction of which must take into account the general specifications (see Chapter 3.1 (► Page 5)), and with the dimensions of the sections given in Tables 3.6, 3.7 and 3.8.

The dimensions of the subframe section modulus refer to the maximum total static moment of the crane (M_G), deduced from the formula shown in Figure 14.

If the vehicle outfitting requires the use of a section with section modulus greater than that required for the crane (e.g. tipper), this section may also be considered for the crane.

Special cases in which the moment M_G values correspond to the "E" value in the Table (or for higher values) must be checked individually each time and must receive specific authorisation from IVECO.



230046

Figure 14

g = acceleration of gravity equals 9.81 m/s^2

W_L = mass applied to crane extremity [kg]

L = horizontal distance between the payload application point W_L and vehicle centre line [m]

W_C = mass of the crane at its centre of gravity [kg]

l = horizontal distance between centre of gravity of crane and vehicle centre line [m]



- **The Bodybuilder must, case by case, check the vehicle stability and take all necessary precautions for its correct and safe use. The crane manufacturer and the Bodybuilder are responsible for defining the type and number of stabilisers as well as selecting the subframe on the basis of the maximum static moment and the position of the crane.**

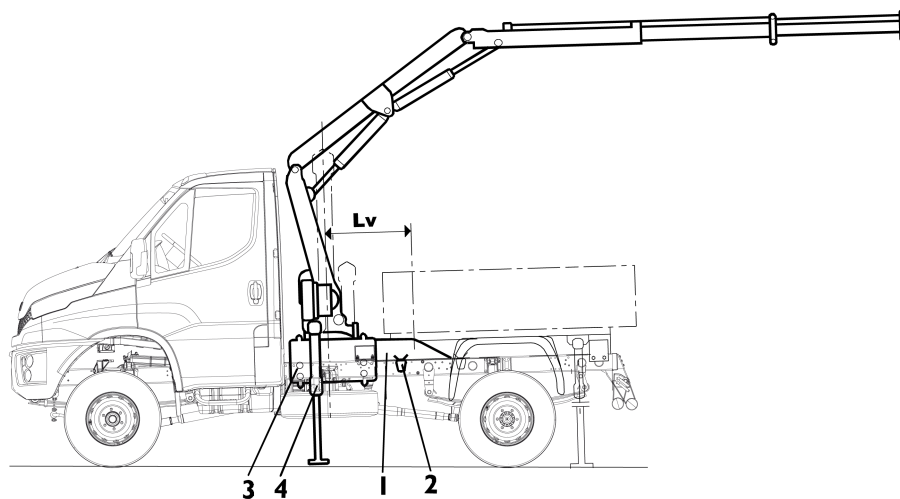
3.8.1 Crane behind the cab

The fastening of the reinforcement sections to the chassis must be carried out using the standard brackets (see Figure 15), supplementing them, if necessary, with other fasteners of elastic type (brackets or clamps) in order to keep the flexural and torsional characteristics of the chassis as unchanged as possible. The dimensions of the reinforcement sections to be used for this type of connection are shown in Table 3.6.

On vehicles for road use only, shearing resistant connections may be used for fastening the subframe to reduce the subframe section height. The minimum reinforcement section dimensions for all these applications are given in Table 3.7.

The implementation of constant diameter sections for the entire length of the vehicle is recommended.

The section of the crane subframe (Figure 15) can be integrated towards the rear end with that envisaged for another possible superstructure; the length " L_v " must in no case be less than 35% of the wheelbase if the superstructure section diameter is smaller.



228304

Figure 15

- | | |
|------------------------|----------------------|
| 1. Reinforcing profile | 3. Crane connections |
| 2. Brackets | 4. Stabilisers |

In installations of cranes on vehicles with deep cab (e.g. 6 + 1), the subframe must continue to underneath the cab (see Figure 3), otherwise, depending on the capacity of the crane, it will be necessary to limit the crane's range of rotation, so as not to exceed the permissible bending moment from the chassis.

The application of a crane on vehicles for on-off road use requires flexible connections to be made between the chassis and the subframe (see Figure 8) in the front and middle section so as not to excessively constrain the torsional movement of the chassis. The crane is practically connected to the subframe only, the dimensions of the longitudinal sections must therefore be suited to withstand the moment induced during use.

The container or equipment must normally be retracted to arrange the crane behind the cab. In the specific case of tipping equipment, particular attention must be paid to arranging the mounts of the lifting device and the tipper rear hinges which must be as retracted as possible.

Table 3.6 - Crane behind driver's cab (subframe secured with shelves or flanges)

Model	Frame section [mm]	Total torque M_G max [kNm]									
		20	20 30	30 40	40 50	50 60	60 70	70 80	80 90	90 100	
		Minimum value of the section modulus of the subframe section W_x [cm ³] ⁽¹⁾ with yield point of the material equal to 360 N/mm ²									
55C, 70C	174x69x5	19	21	46	57	89	105	E			

Table 3.7 - Cranes mounted behind driver's cab (subframe secured with shear resistant plates)

Model	Frame section [mm]	Total torque M_G max [kNm]								
		20	20 30	30 40	40 50	50 60	60 70	70 80	80 90	90 100
		Minimum value of the section modulus of the subframe section W_x [cm ³] ⁽¹⁾ with yield point of the material equal to 360 N/mm ²								
55C, 70C	174x69x5	19	19	21	46	57	89	E		

Close the reinforcement section in the crane assembly area.

E = To be checked case-by-case. Send IVECO technical documentation with verification of stress and stability.

⁽¹⁾ When a higher section modulus is required for the superstructure also use the latter for the crane.

Note For the dimensions of the profiles see Table 3.2.

3.8.2 Crane on the rear overhang

The subframe should extend for the entire length of the vehicle to the rear part of the cab; The dimensions of the longitudinal sections are shown in Table 3.8.

Considering the particular distribution of weights on the vehicle (load concentrated on overhang) and to ensure the necessary torsional stiffness for good performance on the road and during the working phase of the crane, the subframe must be suitably stiffened in relation to the crane capacity. Therefore, the use of (see Chapter 3.2) box sections and cross bracings in line with the rear suspension and along the entire length L_v (see Figure 16).

The passage between boxed sections and open sections must be well fitted as shown in Figure 4.

Shear resistant connections (a sufficient number of plates spaced at a maximum distance of 400 mm) must be used in the box section for fastening to the chassis, given that elastic fastenings are used on the front end. Check that the ratio between front axle and rear axle weight respects the limit defined for each vehicle under any load condition (see Chapter 1.15).

Considering that the necessary subframe rigidity depends on various factors (e.g. crane capacity, resting surface dimensioning, vehicle tare weight, chassis overhang), instructions valid for all situations cannot be given. For this reason bodybuilders shall, if necessary, proceed also by testing the vehicle's stability. If the test results show that rigidity is insufficient, the bodybuilder will adopt suitable precautions so as to obtain correct realisation.

The rear overhang of the crane (measurement L_U see Figure 16) must be as limited as possible (never exceeding 40% of the wheelbase) to maintain good vehicle drive characteristics and acceptable stress regimes for the chassis.

Table 3.8 - Crane at rear overhang (subframe secured with shear resistant plates)

Model	Frame section [mm]	Total torque M_G max [kNm]								
		20	20 30	30 40	40 50	50 60	60 70	70 80	80 90	90 100
		Minimum value of the section modulus of the subframe section W_x [cm ³] ⁽¹⁾ with yield point of the material equal to 360 N/mm ²								
55C, 70C	174x69x5	23	23	32	42	71	E			

E = To be checked case-by-case. Send IVECO technical documentation with verification of stress and stability.

⁽¹⁾ When a higher section modulus is required for the superstructure also use the latter for the crane.

Note For the dimensions of the profiles see Table 3.2.

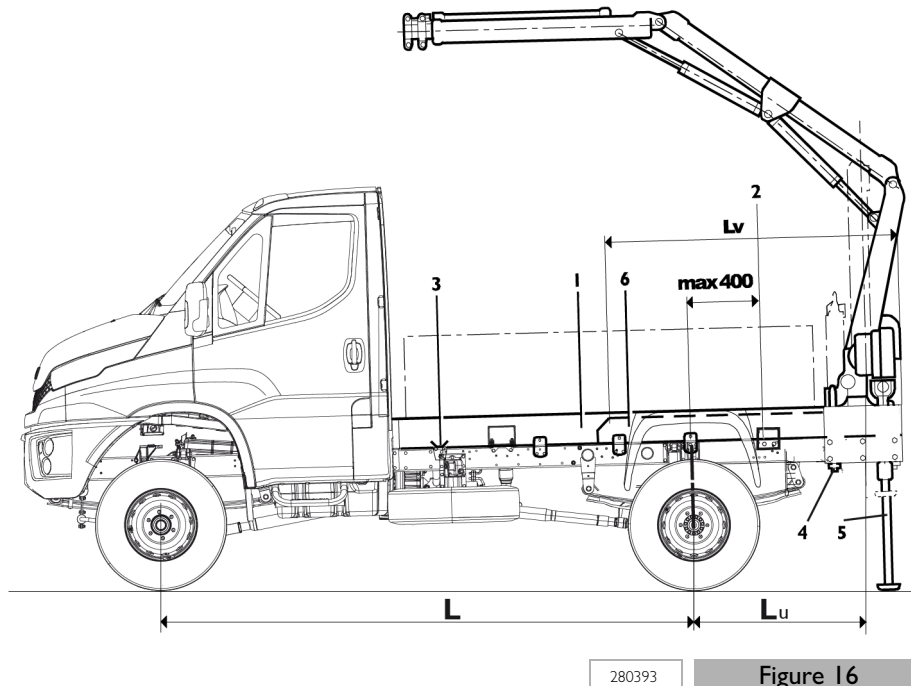


Figure 16

- | | |
|---------------------------------------|----------------------|
| 1. Subframe on the entire body length | 4. Crane connections |
| 2. Plates | 5. Stabilizers |
| 3. Brackets | 6. Connecting corner |

3.8.3 Removable cranes

The installation of removable cranes on the rear overhang may be carried out according to the specifications of the previous paragraph provided the type of fixing used between the crane and the subframe does not cause additional stress to the vehicle chassis. Since the vehicle may be used with or without the crane (where permitted), it is recommended that the position of the payload is marked on the superstructure.

If the vehicle retains its ability to tow a trailer, all regulations concerning the proper coupling of the vehicle must be observed.

3.9 INSTALLATION OF TAIL LIFTS

Note The installation of tail lifts must be carried out with due regard for the maximum permissible weights on the rear axles of the vehicle and of the minimum load established for the front axle (see Chapter 1.15 (► Page 36)). If this is not possible, the rear overhang will have to be reduced.

The tail lift must be fastened to a structure which enables the distribution of the forces, in particular, all configurations without a subframe.



- **Standard vans can only be fitted with tail lifts with capacities limited to 300 kg, and only provided that adequate reinforcements are provided on the chassis. For higher capacities, approval is required from IVECO on a case by case basis.**

The indications provided below refer to the possible installation on trucks.

The dimensions of the profiles of the structure to be created are defined as follows:

1. using Table 3.9, in the presence of trucks with rear overhangs as standard;
2. using the indications provided in Figure 17, with trucks with overhangs not as standard or specific tail lifts (for example, in aluminium).

Case 1.

The bending moments on the chassis, depending on the capacity of the tail lifts, have average values which are already defined.

Table 3.9 - Installation of tail lifts (see Figure 17)

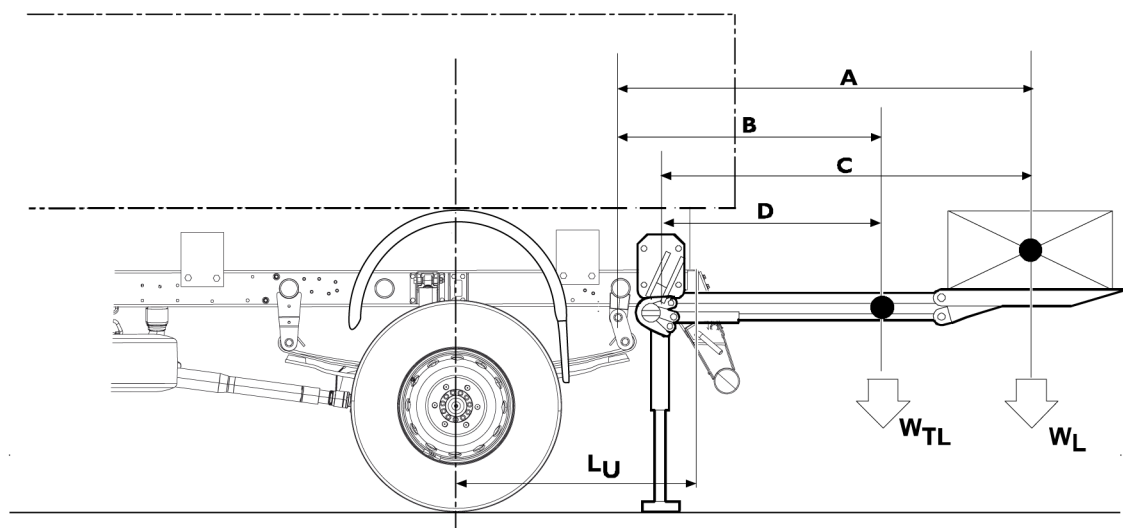
Wheelbase [mm]	Tail lift capacity in kN (kg)											
	3 (300)		5 (500)		7.5 (750)		10 (1000)		12.5 (1250)		15 (1500)	
	Minimum value of the section modulus of the subframe section W_x [cm ³] ⁽¹⁾ with yield point of the material equal to 360 N/mm ²											
	—	S	—	S	—	S	—	S	—	S	—	S
3080	16	16	16	16	16	16	21	16				
3480	16	16	16	16	21	16	26	21	36	26	50	38
3780	16	16	21	16	26	21	36	26	50	38	61	46
4175	16	16	21	16	36	26	50	38	61	46	71	56

Note S = presence of stabilizers.

For the dimensions of the profiles see Table 3.2.

Case 2.

The bending moments on the chassis based on the load capacity of the tail lifts must be calculated on a case by case basis.



230047

Figure 17

L_U = Rear overhang

W_{TL} = Weight of tail lift

W_L = Tail lift capacity

S_L = Distance of the tail lift from the rear axle

The bending moment on the chassis may be obtained using the following ratio:

$M [Nm] = W_L \cdot A + W_{TL} \cdot B$ for tail lifts without stabilizers

$M [Nm] = W_L \cdot C + W_{TL} \cdot D$ for tail lifts with stabilizers

The calculations must be carried out considering a platform with a standard length ($H = 1200$ mm). For longer platforms, the load on the tail lift must be reduced in proportion to the increase in the length of the platform.

The position of the stabilizers is established according to the values existing in the reference market ($S = 950$ mm from the rear axle). If the stabilizers are positioned further forward (< 950 mm), the load on the tail lift must be reduced in proportion to the reduction of this distance.

To ensure the necessary strength and rigidity, and especially in the case of overhangs exceeding 1200 mm, the connection between the chassis and the subframe must be made using shear-resistant plates (spaced no further than 400 mm from one another) in the area of the rear overhang, and must continue up to the front support of the rear suspension (see Figure 17).

To compensate for frame flexing, which is inevitable when the tail lift is in operation, the bodybuilder may use reinforcement structures with larger dimensions than those indicated in Table 3.9.

This consideration applies even more in the case of high and non-standard overhangs; in this case the necessity to adopt the stabilizers must also be verified.

The possibility of using materials with superior mechanical characteristics requires verification of the total moment of resistance of the chassis plus subframe.



- **The Bodybuilder must carefully assess any variations in the stability and alignment of the vehicle caused by suspension compression and the chassis during all stages in the operation of the tail lift. Always evaluate whether installing stabilisers is advisable even if their use is not rendered necessary by the stresses sustained by the chassis.**

The stabilizers must be attached to the support structure of the tail lift, and should be preferably hydraulically operated.

Note For the indications relating to the electrical parts, please refer to Section 5. 8.

The bodybuilder is also responsible for:

- type-approval of the application of the tail lift on the vehicle,
- any modifications to the under-run cross member or the arrangement of another new type (see Chapter 2.20 (► Page 42));
- the observance of the visibility of the rear lights,
- the observance of the overhang angles,
- the positioning of the tow hook,

based on the various national legislation.

3.10 TIPPER BODIES (BREAKDOWN RECOVERY)

The use of tipping bodies generally subjects the chassis to considerable mechanical stress. It is therefore necessary that the vehicle is included in those permitted for this application as listed in Table 3.4 together with the general features of the subframe profile required.

Where an extremely long flat body is necessary, it is preferable to use a vehicle that already has a sufficiently long wheelbase rather than create a long overhang.

The subframe must be suitably sized and stiffened at the rear with box sections and cross braces (see Figure 6 and Figure 7).

The connections to the chassis must be flexible (brackets) at the front end, while the rear section requires stiff connections (plates) to allow the added structure to contribute more to the stiffness of the assembly.

The rear tipping hinge must be fitted to the subframe and its longitudinal position must be as close as possible to the rear support of the suspension. So as not to compromise vehicle stability during tipping operations and avoid excessive mechanical stress on the chassis, the distance between the tipping hinge and the rear support of the suspensions must comply with the specifications given in Figure 11. If this is not possible, larger than normal subframe profiles must be used together with additional stiffening at the rear.

Particular attention must be paid to the positioning of the lifting device both in terms of protecting the strength of the supports and in order to correctly position the connections. It is therefore recommended that in order to reduce the extent of the localised load, the lifting device is placed forwards of the centre of gravity of the payload-body assembly.

The Bodybuilder must equip the vehicle appropriately to ensure stability during tipping operations.

All equipment and structures must comply with any applicable national legislation.

3.11 VEHICLES FOR COUNCIL, FIRE PREVENTION AND SPECIAL USES

The outfitting of vehicles for municipal use (compactor trucks, road rollers; road cleaning vehicles) in many cases require:

- the realization of a particularly robust subframe towards the rear and elastic type connections to the chassis towards the front of the vehicle;
- shortening of the rear overhang of the chassis.
When very short overhangs are necessary, the chassis may be shortened immediately downstream of the rear spring support (or after the bar coupling in the case of air suspension), thus keeping intact the connection to the chassis of the crossbar applied therein;
- the adoption of rear suspensions with greater rigidity (see Chapter 2.11);
- a new arrangement of the rear lights.



- ▶ **Do not use the reversing light switch, mounted on the gearbox, to activate functions that require increased reliability and safety levels, (e.g. engine stop during reverse, on vehicles for urban waste collection from the personnel present on the rear footboards).**

3.12 FRONT INSTALLATION OF SNOW PLOUGH ATTACHMENTS

The application of a snowplough attachment (blade or ploughshare) to the front part of the vehicle must be carried out using a suitable support structure, appropriately anchored to the core of the chassis side members and in observance of the prescriptions contained in Chapter 2.2.



- ▶ **Resistant structures which make use of struts or tie rods that act on the leaf spring and/or on relative supports are strictly prohibited.**

Since, when used to remove snow, the vehicle is weighted at the rear and the maximum speed is limited (e.g. 40 km/h), a small increase in maximum axle load may be allowed upon specific assessment and authorisation by IVECO.

It should be possible to use all the elements of the vehicle front panel (e.g. tow-bar, supports for windscreen cleaner); otherwise, equivalent systems must be provided in compliance with the safety requirements.

Observance of the required load must be documented and guaranteed by the company that carries out the installation.

3.13 APPLICATION OF A WINCH

The application of a winch on the vehicle can be carried out at the following points:

- on the front part of the chassis (frontal);
- on the chassis of the vehicle, behind the cab;
- between the side members of the vehicle, in a central or lateral position;
- on the rear part of the chassis.



- **The application of a winch on the front of the vehicle is incompatible with the airbag system. Therefore, after-sales installation of this device means that it must be deactivated.**

The installation must be carried out so as not to alter the correct functioning of the vehicle's assemblies and components, in observance of the maximum permitted axle limits and following the instructions of the winch manufacturer. Securing the assembly must be carried out in full compliance with Chapters 2.1 and 2.2, ensuring that the coupling area is reinforced on the basis of the rope (particularly of the transversal component when the traction is oblique).

The installation of a winch in the area behind the cab must allow for the insertion of an auxiliary frame, of suitable dimensions and structure (crossbars and diagonals for stiffening) for the winch capacity.

In the event of winches:

- hydraulically controlled: previously installed hydraulic pumps can be used for other services (tipping bodies, cranes, etc.);
- mechanical: for transmission of the control it is necessary to follow the indications contained in Chapter 4.1 and 4.2 ;
- with worm screw control: the dimensioning of the drive parts must take into account the low efficiency of controls of this type;
- electric: these are used for low power applications of brief duration, given the limited capacity of the vehicle battery and alternator.

3.14 BULL BAR APPLICATION



- **The application of a "Bull Bar" front protection system is not compatible with the airbag system. Therefore, after-sales installation of this device means that it must be deactivated.**

3.15 SPECIAL OUTFITS

The bodybuilder must ensure compliance of operations carried out with legal requirements, especially in the case of configurations for the transport of persons.

3.15.1 Cowl chassis versions

They are made specifically for the installation of special bodies or equipment (shop vans, motor homes, etc.).

The indications and precautions shown on the technical documentation (chassis diagram) provided by IVECO must be carefully respected.

3.15.2 Motor homes

Mass limits applicable to single axles must be strictly adhered to, as well as the total limit, keeping in mind a sufficient load margin in addition to the number of people expected:

- baggage, tents, sporting equipment;
- water tank, sanitary facilities;
- gas cylinders, etc.

It is necessary to ensure that the load to be transported can be placed in specific compartments, with appropriate safety margins and providing suitable directions.

Special attention must be given to the construction of compartments for gas cylinders, which must be built in compliance with specific regulations in force and adopting the necessary safety precautions.

For repair operations on the rear overhang, see the instructions in Chapter 2.5 (➡ Page 17).

3.15.3 Aerial work platforms

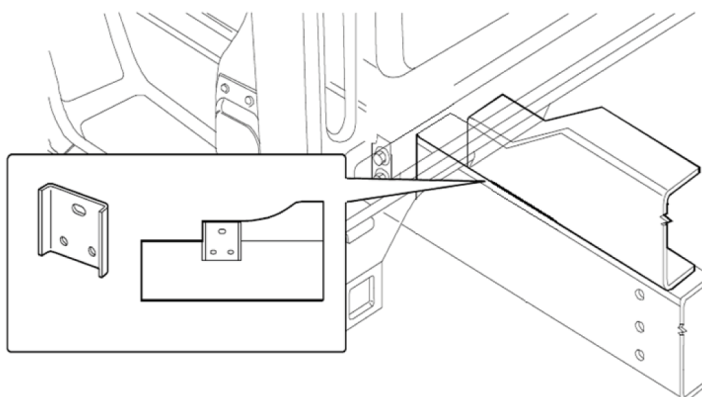
The application of a platform or aerial platform must comply with national standards (for example, CUNA, DIN) and international standards (e.g. ISO, CEN), as well as any specific requirements.

The choice of the type of platform must be made by checking compatibility with the features of the vehicle chassis, which is available.

Positioning on the vehicle must respect limits and distribution of permitted load.

The installation requires a suitable subframe, the creation of which requires observance of not only the general indications (see Chapter 3.3 and Table 3.2 and Table 3.3), but also:

- assess the maximum static moment and the intended location of the superstructure;
- avoid abrupt sections changes;
- create a fastening solution such as that in Figure 3 or, in cases of high stress, that in Figure 18, in which the first fastening of the subframe is highlighted.



277298

Figure 18



► **Adopt solutions which ensure the stability of the vehicle and its safety during the operation.**

The bodybuilder must therefore:

- Define the type and number of stabilizers;
- provide vehicle lifting/lowering speed control on the stabilizers through appropriate flow control valves in the hydraulic system;
- limit, as much as possible (3-5 cm), lifting of the front axle of the vehicle from the ground, compatible with the condition of keeping the horizontal alignment.

Note *Verification of the dynamic behaviour of the vehicle complete with the superstructure is the full responsibility of the bodybuilder.*

SECTION 4

POWER TAKE-OFFS

Contents

4.1	GENERAL INFORMATION	5
4.1.1	Type of use	5
4.1.2	PTO transmissions	6
4.2	POWER TAKE-OFF ON THE GEARBOX	7
4.3	POWER TAKE-OFF FROM TRANSFER BOX	7
4.4	POWER TAKE-OFF FROM DRIVE LINE	8
4.5	POWER TAKE-OFF FROM ENGINE	8
4.6	PTO MANAGEMENT	8
4.6.1	Adjust the engine speed for drive take-off	8
4.6.2	After-sales installation of PTO	9

POWER TAKE-OFFS

4.1 GENERAL INFORMATION

For drive take-off necessary for actuation of the auxiliary units, a power take-off (PTO) can be fitted on the transfer box (PTO *Power Take Off*).

When defining the power necessary for the apparatus to be controlled, particularly when the values requested are high, the absorbed power should also be considered during the drive phase (5 to 10% for mechanical transmissions, belts and gears, and higher values for the hydraulic controls).

The choice of the transmission ratio for the power take-off should be made so that the power absorption occurs in a flexible engine operating range; low speeds (around 1000 rpm) must be avoided to prevent irregular running.

The available power can be calculated in relation to the power take-off speed and the established torque.

$$P \text{ [HP]} = M \cdot n \cdot i / 7023$$

$$P \text{ [kW]} = M \cdot n \cdot i / 9550$$

P = Available power

M = Torque permitted for the power take-off

n = Engine revolutions per minute

i = Transmission ratio = PTO output rpm / engine rpm

4.1.1 Type of use

The maximum torque take-off values refer to continuous usage of up to 60 seconds.

Torque take-off values exceeding the maximum values indicated for occasional, limited usage (less than 30 s), must be approved on a case by case basis in relation to the type of application.

In the case of continuous usage exceeding 60 seconds, where the function is comparable to that of a stationary motor, the necessity of reducing torque take-off in relation to other, peripheral conditions (such as engine and transmission cooling necessities) must also be evaluated.

Note *Not all types of power take-offs are suitable for continuous use, therefore the following indications must be observed (working period, breaks etc.).*



- **During prolonged use, the gearbox oil temperature must not exceed 110 °C and the water temperature must not exceed 100 °C.**

In the case of prolonged usage which may lead to high oil temperatures, it is advisable to contact the PTO supplier to determine whether the installation of a dedicated "external oil circuit kit" is necessary.

The scheduled take-off values are also applicable for uses which do not involve large variations of torque either in frequency or magnitude.

In other cases, to avoid overload (e.g. hydraulic pumps, compressors) it may be necessary to include the application of devices such as clutches or safety valves.

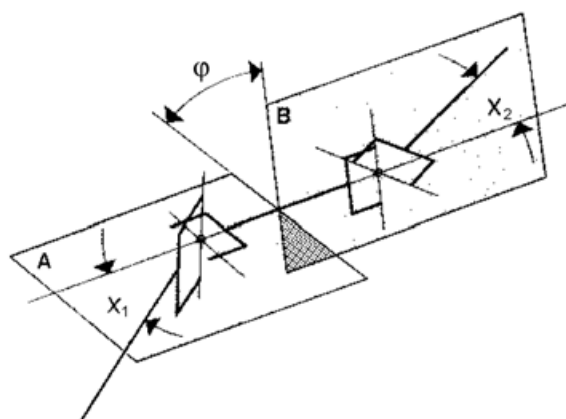
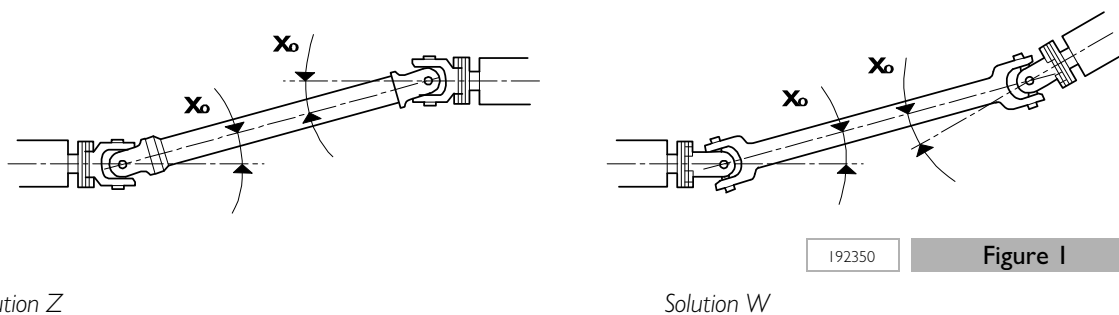
4.1.2 PTO transmissions

In full compliance with the specifications provided by the Manufacturer of the driveline, the constant-velocity forces from the power take-off at the relevant apparatus should be carefully considered (angles, rpm, moment) during the design phase as well as the dynamic behaviour in the installation phase.

This means that:

- the dimensions should take into consideration the forces which might occur under maximum power and torque conditions;
- to ensure effective kinetic forces, the shaft ends must be at the same angle (see Figure 1), and this angle must not exceed 7° ;
- solution Z is preferred to solution W due to the lower loads on the bearings of the power take-off and the equipment being driven. When it is necessary to obtain a different driveline with spatial inclinations according to angle ϕ (as shown in Figure 2), it is important to remember that the constant-velocity forces of the assembly can only be guaranteed if the intermediate section has forks offset by the same angle ϕ and if equal conditions are observed between the angles at the extremities X_1 and X_2 .

For transmissions employing multiple sections, please refer to the indications provided in Chapter 2.8 .



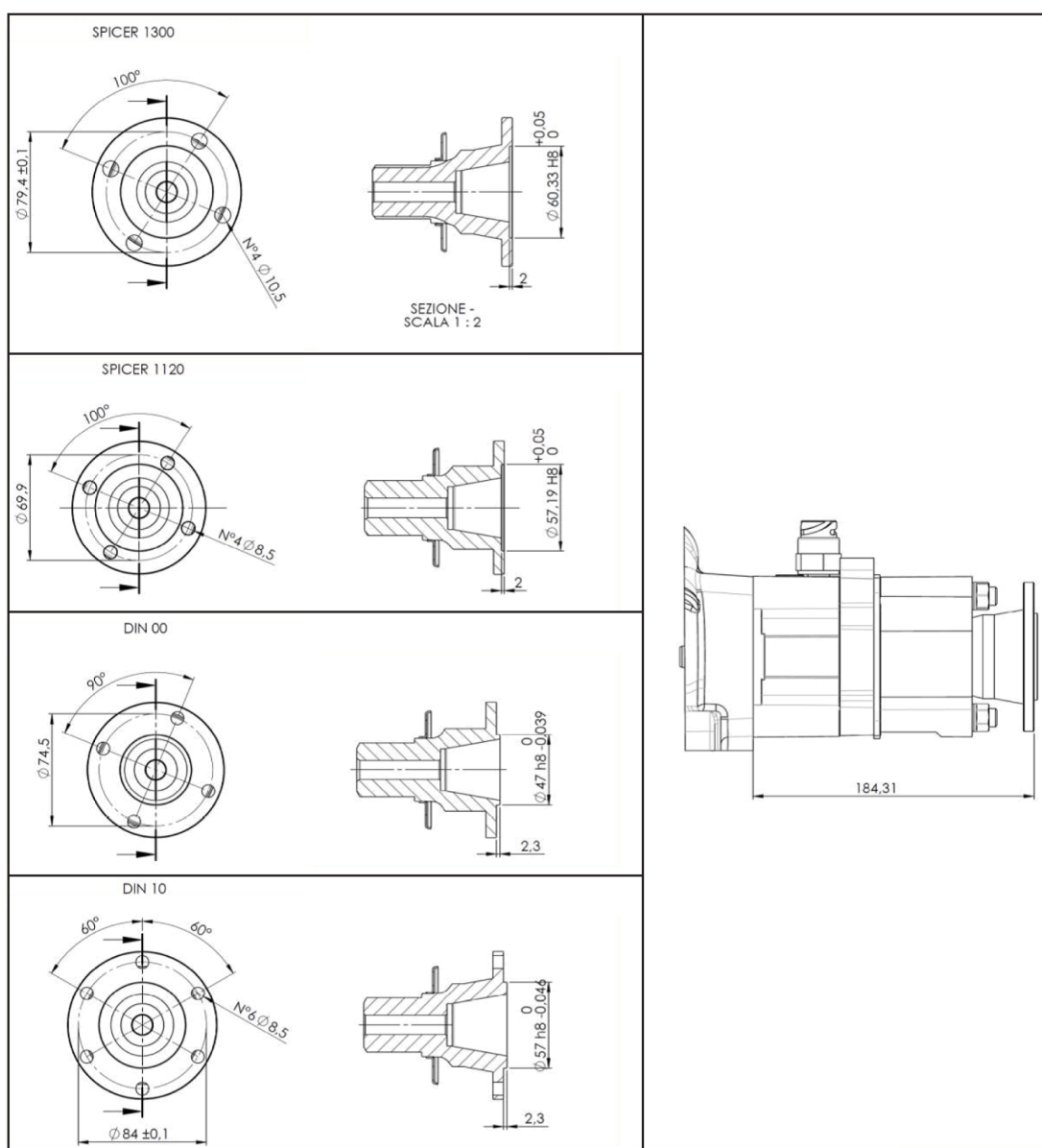
4.2 POWER TAKE-OFF ON THE GEARBOX

Not applicable on Daily 4x4.

4.3 POWER TAKE-OFF FROM TRANSFER BOX

For the installation of a PTO on the transfer box, IVECO provides for the adoption of optional specific flanges.

Figure 3 shows some dimensions of the types envisaged.



262158

Figure 3

4.4 POWER TAKE-OFF FROM DRIVE LINE

Not available on Daily 4x4.

4.5 POWER TAKE-OFF FROM ENGINE

Not available on Daily 4x4.

4.6 PTO MANAGEMENT

In addition to referring to the Use and Maintenance Handbook, it is recommended that the indications listed below are always observed.

1. The PTO is engaged and disengaged by means of a solenoid valve which is activated by a button on the dashboard and manages a pneumatic control.
These operations are only possible with the vehicle stationary and the clutch pedal pressed (with the vehicle stationary and selector set to N in the case of automatic gearbox).
2. With the PTO engaged, the transfer box rpm must be between 1200 and 2500 rpm as this is the maximum value permitted regardless of the conditions of use (NB: the user is responsible for carrying out this check).
Subsequently, use of 6th gear is not possible (7th and 8th in the case of automatic gearboxes) due to the high multiplication effect on the engine speed.
3. With the PTO engaged, the automatic gearbox must be operated in manual mode.
4. Torque delivery from the PTO is inversely proportional to the engine speed and the maximum value is 800 Nm.
5. The PTO can be used with a maximum angle of 30° (longitudinal) and 20° (transversal).



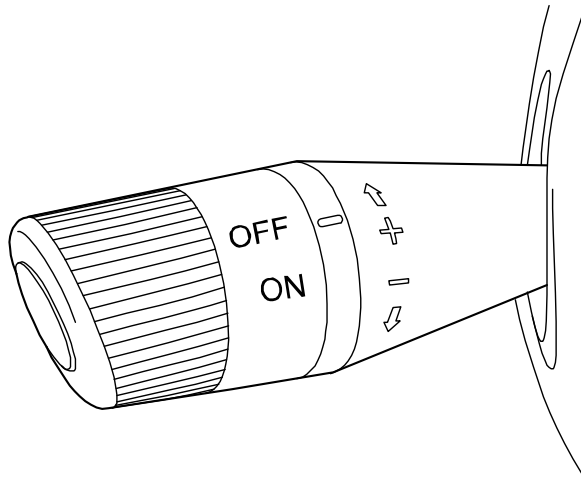
Caution!

The PTO must be disengaged :

- ▶ **a) before switching off the engine using the Bodybuilder connector; otherwise, it will not be possible to restart the engine using this connector.**
 - ▶ **b) when torque take-off is not in progress.**
 - ▶ **c) before moving the vehicle in reverse gear (limitations on the PTO cooling pump due to high engine speed).**
-

4.6.1 Adjust the engine speed for drive take-off

The engine management control unit provides a function which enables simultaneous adjustment of the engine revs and the power take-off by operating the Cruise Control lever (see Figure 4)



208927

Figure 4

The control unit is also able to perform the control of the set revolutions and maintain or restore balance depending on the applied load.

Note The adjustment of engine speed through Cruise Control (Working Engine Speed Demand) may only be performed with the vehicle stationary or when the vehicle speed is less than between 10 and 20 km/h, depending on the vehicle version.

After turning the selector of Figure 4 in the ON position, actuating in the direction + or - makes it possible to increase or decrease the number of revolutions in two ways:

- a) with steps of 50 rpm if the lever is operated for between 0.5 and 2 seconds;
- b) with a ramp of 400 rpm for each second of continuous activation of the lever, beyond 2 seconds.

It is possible to store a new speed (with PTO on) by pressing and holding the RESUME button for at least 5 seconds.

With Cruise Control activated, it is possible to return to the minimum engine speed condition (setting cancelled) by placing the selector shown in Figure 4 on OFF, or by pressing the brake pedal or clutch pedal.

4.6.2 After-sales installation of PTO

If PTO is to be installed in after-sales, then it is necessary to check the following:

- that the vehicle is equipped with the Cruise Control opt.;
- obtain approval for the intervention from IVECO and any specific instructions that may be required.

Note The after-sales installation of a PTO means that once installation is complete, IVECO Assistance Service must be contacted in order for the software of the engine control unit, the BDV control unit and, if present, the automatic transmission control unit to be updated via teleservices.

SECTION 5

**ELECTRONIC
SUB-SYSTEMS**

Contents

5.1 ELECTRONIC SYSTEM	5	5.8 MISCELLANEOUS	37
5.1.1 Location of control units	5	5.8.1 Additional circuits	37
5.2 BODYBUILDER CONNECTORS	6	5.8.2 Interventions for modifying wheelbase and overhang	39
5.2.1 Connector 72105A, black, 32-pin, dwg. 5802442666	7	5.8.3 Pre-installation for trailer	39
5.3 ELECTRONIC CONTROL UNITS	16	5.8.4 Installation of lateral side lights (Side Marker Lamps)	42
5.3.1 Precautions	16	5.8.5 Reverse gear signal	44
5.3.2 Disconnecting the electronic control units	17	5.8.6 Antitheft system	45
5.3.3 Repositioning the electronic control units	17		
5.4 ELECTRICAL SYSTEM	17		
5.4.1 General information	17		
5.4.2 Precautionary measures when working on the system	18		
5.4.3 Precautionary measures when working on the chassis	19		
5.4.4 Engine start-up	19		
5.4.5 Ground points	19		
5.4.6 Electromagnetic compatibility	26		
5.5 RECEIVER-TRANSMISSION SYSTEMS	28		
General instructions	28		
5.5.1 Amateur equipment for CB (27 MHz) and 2 m band (144 MHz)	29		
5.5.2 Bluetooth pre-installation	30		
5.5.3 GPS receiver and satellite navigation units	32		
5.5.4 Radio installation	32		
5.5.5 Toll collect	32		
5.6 ADDITIONAL EQUIPMENT	33		
5.7 CURRENT DRAWS	34		
5.7.1 Current draw from the CBA2 control unit in the engine compartment	34		
Fuses	35		
5.7.2 Passage of cables from cab interior to cab exterior	37		

ELECTRONIC SUB-SYSTEMS

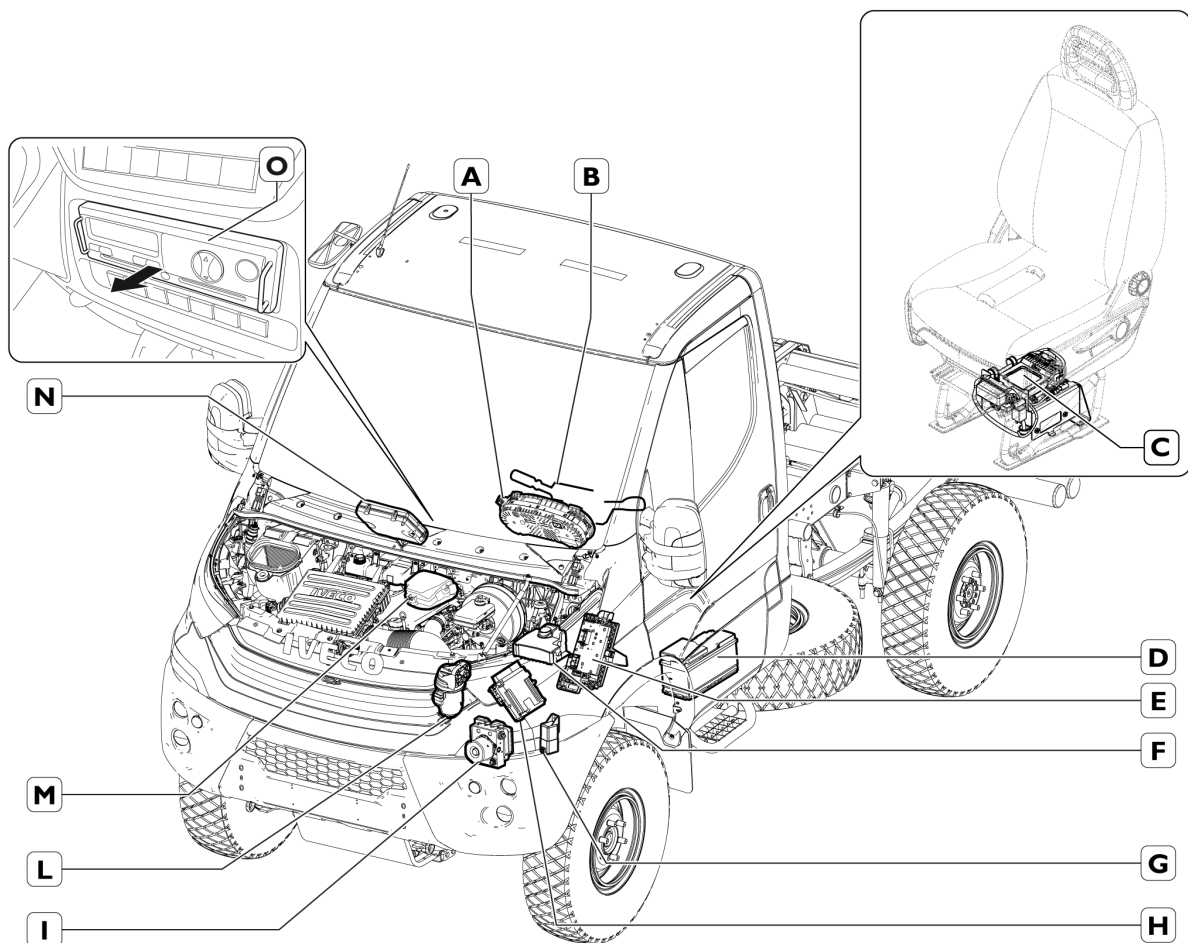
It is strictly **PROHIBITED** to carry out connections to connectors other than those intended by IVECO and to make any changes to the original electrical system.

5.1 ELECTRONIC SYSTEM



- It is not permitted to connect devices or electrical circuits directly to the control units. Only the connectors listed in Chapter 5.2 may be used.

5.1.1 Location of control units



262151

Figure I

- A. Instrument panel
- B. Steering wheel column and ignition switch
- C. BDV control unit
- D. CBA1 control unit on battery
- E. Body Computer
- F. CBA2 control unit in the engine compartment

- G. Control unit for glow plug pre-heating
- H. Engine Management control unit
- I. ABS/ESP control unit
- L. Green filter
- M. Interconnection control unit (engine) SCM
- N. Expansion Module
- O. DTCO tachograph

5.2 BODYBUILDER CONNECTORS

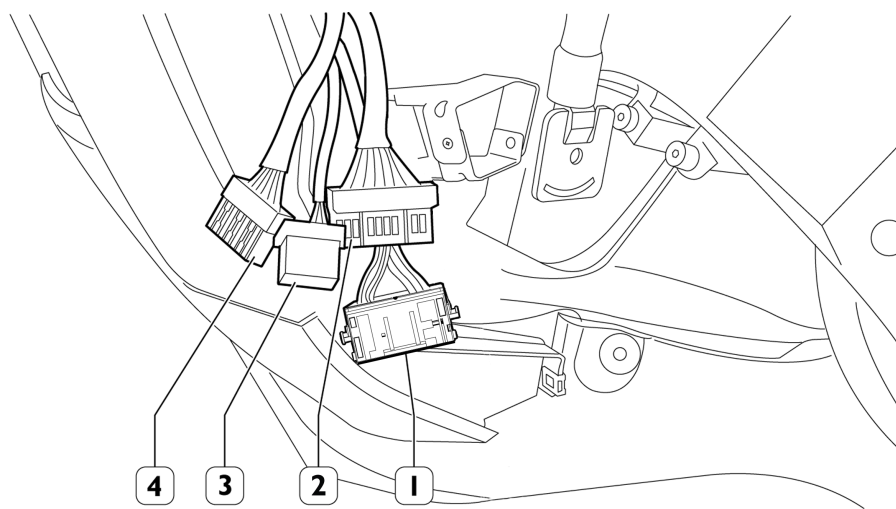
Note Given the multiplicity of vehicular variants and of associated wiring, the present chapter only provides information concerning the basic version of the electrical system; please contact the IVECO Assistance Service should you require more specific information.

The vehicle's electrical system contains specific connectors for connecting the bodybuilder installations; access to these allows the system's functional integrity and validity of the warranty to be preserved.

As standard there is a connector 72105A, interfaced with the dashboard cable of the cab and accessible after having removed the panel of the passenger side storage compartment (see Figure 2).



- **Any taking of signals from the vehicle to the outfitting must be performed using suitable diodes, relays and bridles. It is strictly prohibited to make a direct connection to connector 72105A, under penalty of immediate revocation of the warranty.**



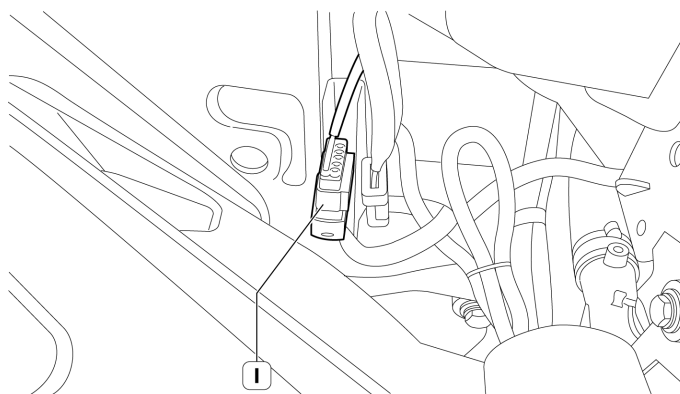
262153

Figure 2

- | | |
|---------------------------------|------------------------|
| 1. Bodybuilder connector 72105A | 3. Connector EM 72071 |
| 2. Connector EM 61071B | 4. Connector EM 72075B |

For the Expansion Module, the electrical system in the cab is also equipped with connectors 61071B, 72071, 72075B.

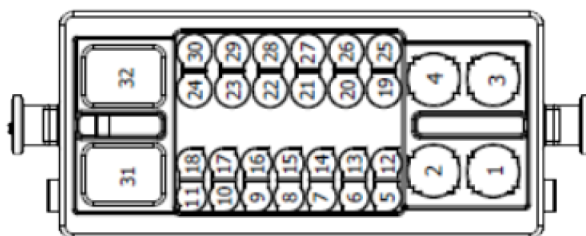
The description of the functions of these connectors can be found in Chapter 7.3 (➡ Page 5).



230828

Figure 3

I. Connector ST/3

5.2.1 Connector 72105A, black, 32-pin, dwg. 5802442666

262203

Figure 4

Table 5.1 - dwg. 5802291186 (Bodybuilders side)

Code	Description	terminal
41200694 EZ	Male contact for 0.35 to 0.5 mm ² cable	1-2-3-4
41200695 EZ	Male contact for 0.75 to 1.00 mm ² cable	
41200696 EZ	Male contact for cable from 1.50-2.00-2.50 mm ²	
41200697 EZ	Male contact for cable >2.50-4.00 mm ²	
5802291206 EZ	Male contact for 0.35 mm ² cable	from 5 to 18
5802290575 EZ	Male contact for 0.50 to 0.75 mm ² cable	
5802290577 EZ	Male contact for 1.0 mm ² cable	
5802291206 EZ	Male contact for 0.35 mm ² cable	from 19 to 30
5802290575 EZ	Male contact for cable from 0.50 to 0.75 mm ²	
5802290577 EZ	Male contact for 1.5 mm ² cable	
41118765 EZ	Male contact for 0.35 to 0.5 mm ² cable	31-32
41118766 EZ	Male contact for 0.75 to 1.00 mm ² cable	
41118767 EZ	Male contact for cable from 1.50-2.00-2.50 mm ²	
41118768 EZ	Male contact for 4.00 mm ² cable	
5802293758 EZ	Male contact for cable >4.00-6.00 mm ²	

Table 5.2 - Basic functions of the 32-pole connector 72105A

Pin	Description	Cable code	signal	Connected to	Remarks
1	Engine start up	8888	Input max 15 A	75011 A/19	The engine starts only when the key is turned in the ignition block (K15 ON) ⁽¹⁾ Protect with the appropriate fuse +12 V = engine start-up request Open wire = no action
2	Mechanical gearbox 8HP D	6140	Input Max 200 mA	ZF8HP70/8	FIPO bridle use
3	Mechanical gearbox 8HP P	6141	Input Max 200 mA	ZF8HP70/10	FIPO bridle use
4	N.D.				
5	Mechanical parking brake	6662	Output Max 500 mA (with decoupling diode)	BCM F/44	Ground = parking brake engaged ⁽²⁾
6	Clutch actuation	9273	Output Max 500 mA (with decoupling diode)	EDC K/34	+12 V = clutch pedal pressed
7	Side lights	3220	Output Max 500 mA	Relay managed by BCM	+12 V = side lights on ⁽³⁾
8	Alternator status	7778	Output Max 500 mA	EDC K/22	Ground = engine off +12 V = engine speed > 500 rpm
9	N.D.				
10	Engaging reverse	2268	Output Max 100 mA (use a decoupling diode)	BCM C/17	+12 V = reverse gear engaged ⁽⁴⁾
11	Positive with key	8879	Output Max 200 mA	BCM G/12	Positive with key protected by fuse on Body Computer - F49
12	Cruise Control	8156	Input	BCM H/56	Cruise Control interface ⁽⁵⁾
13	Reference ground for Cruise Control transfer box	0000	Input	BCM H/45	Ground for Cruise Control interface
14	2nd speed limiter	0000	Output Max 200 mA	BCM H/41	Activation of 2nd speed limiter (30 km/h by default) ⁽⁶⁾ Minimum value 10 km/h, which may be set by the Assistance Service Ground = 2nd speed limiter activated
15	Programmable speed limiter;	9968	Input Max 200 mA	EDC K/68	Ground = programmable speed limiter activated
16	Speed signal (B7)	5517		BCM D/56	Mandatory to introduce 5 k Ω pull-up ⁽⁷⁾
17	Battery disconnecting switch OFF	0000	Input / output Max 200 mA	BCM E/20	+12 V = TGC opening
18	Horn	116	Input / output Max 200 mA	BCM H/19	Remote activation of horn Ground = horn active
19	Engine speed (rpm)	5587	Output	EDC K/73	Engine speed signal ⁽⁸⁾ 4 pulses/rev
20	Radio MUTE control	1632	Input Max 10 mA	68000 C/9	ground = MUTE function request
21	N.D.				
22	Multiple State Switch	0000	Input	BCM H/38	ISC input (Idle Speed Control) mode 1/2/3 ⁽⁹⁾ the ISC mode must be reactivated after every engine start-up.

Pin	Description	Cable code	signal	Connected to	Remarks
23	Ground for Multiple State Switch	0000	Output max 15 A	BCM H/36	ISC input (Idle Speed Control) mode 1/2/3 ⁽⁹⁾ the ISC mode must be reactivated after every engine start-up.
24	Ground	0000	Output max 15 A		Ground connection
25	K15 Remote	8879	Input Max 200 mA	SCM B/67	By providing a positive, the first turn of the key is simulated (key set to ON). Only the main loads are powered but it is not possible to start the vehicle from outside since the vehicle key recognition is missing. ⁽¹⁰⁾ +12 V = activation of K15 Remote
26	Engine shut down	9903	Input Max 10 mA	BCM F/22	The engine only switches off with vehicle speed < 4 km / h + 12 V = engine stop The command must be active until the engine is off
27	Service braking	1176	Output Max 500 mA	BCM D/57	+12 V = brake pedal pressed
28	Stationary vehicle	0000	Output Max 200 mA (use a decoupling diode)	BCM H/32	Ground = vehicle stopped
29	Battery disconnecting switch ON	0000	Input / output Max 200 mA		+12 V = TGC closing
30	Battery positive K30	7772	max 15 A	BCM E/19	Direct positive from the battery and protected by fuse on Body Computer - F33 1) Vehicle equipped with Hi-Matic gearbox with trailer: no current draw is possible 2) Vehicle equipped with Hi-Matic gearbox without trailer: maximum current draw 7.5 A 3) Vehicle equipped with manual gearbox with trailer: maximum current draw 7.5 A 4) Vehicle equipped with manual gearbox without trailer: maximum current draw 15 A
31					N.D.
32					N.D.

⁽¹⁾ The vehicle does not supply any safety check. The vehicle does not prevent engine start-up with gear engaged, nor monitors the release of the clutch pedal. The bodybuilder must adopt preventative measures to avoid any unintentional movements of the vehicle.

The engine start-up control must be permanently active until the engine starts running.

The engine only functions with the key turned in the ignition block (K15 ON).

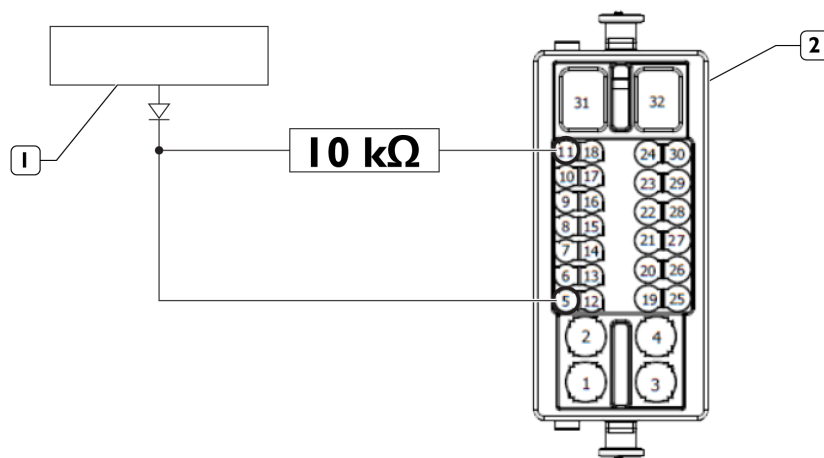
Activating the remote signal K15 from pin 25 of connector 72105A and then inserting the key in the ignition block (K15 ON) prevents engine start-up and an Immobilizer Error is signalled. In this case it is necessary to remove both the remote signals K15 and K15 ON.

When the procedure has been performed successfully it remains valid for the entire K15 ON cycle and this allows the bodybuilder to repeatedly stop and restart the engine until K15 stays active.

The starter motor is only activated when the engine is NOT running.

⁽²⁾ If the "parking brake engaged" signal indicates "ground", it means the parking brake has not been fully released. Therefore a residual braking torque on the rear axle cannot be excluded. IVECO does not recommend use of the signal as an indication of a stationary vehicle.

Obligatory insertion of a 10 kOhm pull-up resistor between 72105A / pin 11 (signal K15) and 72105A / pin 05 as outlined in Figure 5.



262160

Figure 5

1. Outfitting

2. Connector 72105A

(3) The output signal of the side markers may also be extracted from the chassis connector ST38. If necessary, consult Chapter 5.4 – Paragraph "Arrangement of side lights (Side Marker Lamps)".

(4) For vehicles in the Hi-MATIC version, refer to the indications provided in Annex C (➡ Page 8)

(5) Only supported with Cruise Control option.

The resistors must be connected between pin 12 and pin 13. Different functions may be activated depending on the resistor value:

R = 2490 Ohm	CC ON: CC stays active, just like the PTO modes (important for vehicles without Cruise Control)
R = 649 Ohm	SET+: the speed increases by +50 revs/min pulse (only when the vehicle is stationary) or adjustment of the CC speed (only at V > 30 km/h)
R = 261 Ohm	SET-: the speed decreases by -50 revs/min pulse (only when the vehicle is stationary) or adjustment of the CC speed (only at V > 30 km/h)
R = 133 Ohm	RES: activation of ISC MEMO speed or resuming the stored CC speed

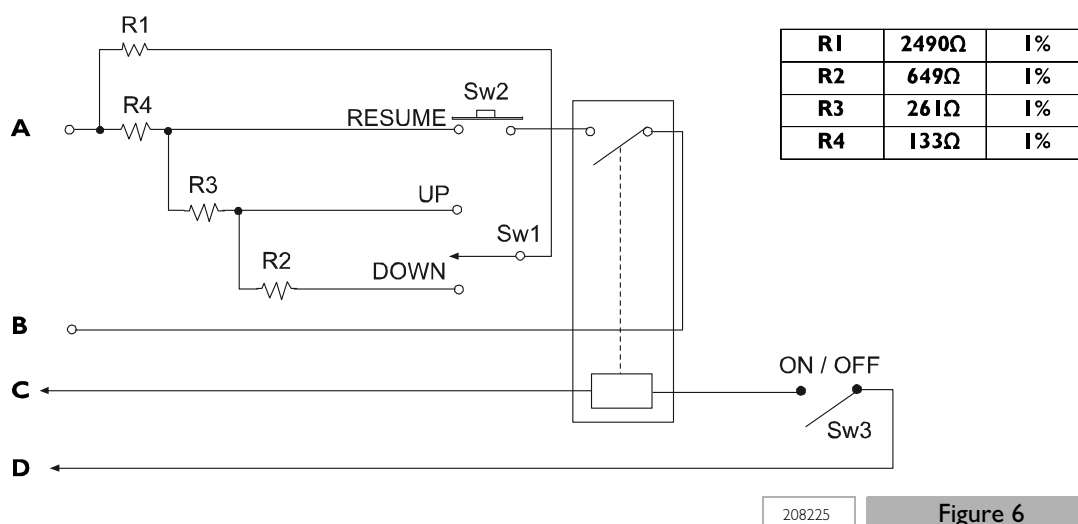


Figure 6

- A. 12-pin bodybuilders connector 32-way
 B. 13-pin bodybuilders connector 32-way (ground)

- C. 28-pin bodybuilders connector 32-way (ground if V=0)
 D. 11-pin bodybuilders connector 32-way (+15)

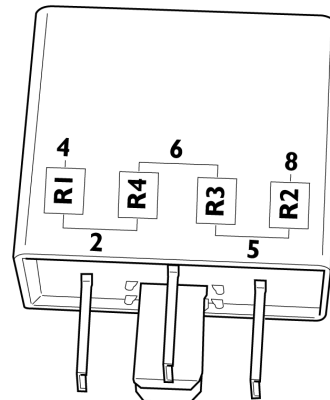
For this purpose IVECO recommends use of a relay which enables utilization of the same functions available on the steering wheel lever.

The Cruise Control option must be configured on both the ECM and BCM systems.

Please note that the driver must position the Cruise Control switch on the steering wheel lever to OFF, otherwise the external controls will be ignored.

Table 5.3

Function	Short-cut necessary	
CC Resume	Pin 2	Pin 6
CC Set-	Pin 2	Pin 8
CC Set+	Pin 2	Pin 5
CC ON	Pin 2	Pin 4



230050

Figure 7

(6) Should you wish to change the value of the 2nd speed limiter, using the tool available at the IVECO Assistance Service, please note that:

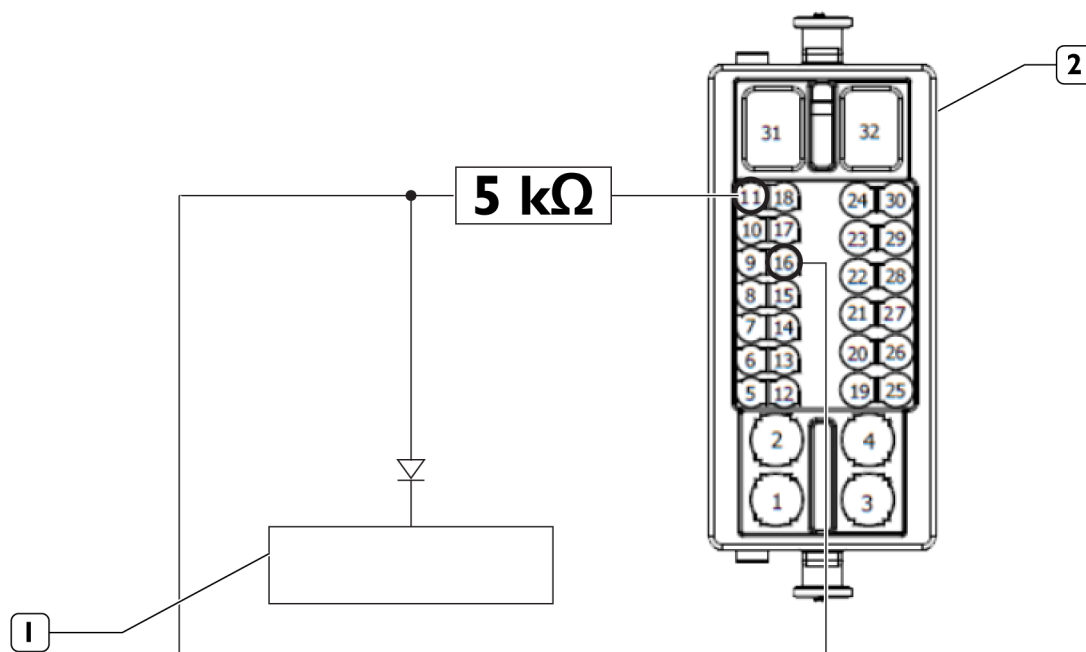
- The accuracy of the speed limiter is reduced at low vehicle speeds.
- The accuracy of the speed limiter is reduced at low engine speeds: interference with the engine idle speed regulator is possible, particularly below 1000 rpm.
- The speed limiter must only be used in 1st gear or in reverse gear.
- The speed limiter may be adjusted in steps of 1 km/h by the IVECO Assistance Service.
- The bodybuilder must check the functionality of the speed limiter for each application and is also responsible for preparing the relative specific instructions.

(7) Mandatory insertion of a 5 k Ω pull-up resistor in addition to a diode as outlined in Figure 8.

The pull-up resistor and the diode must be fitted by the bodybuilder.

The resistor must be inserted between 72105A / Pin 16 and 72105A / Pin 11.

Without the pull-up resistor no B7 signal is available.



262159

Figure 8

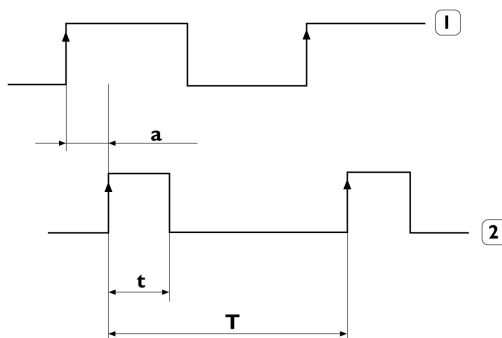
1. Outfitting

2. Connector 72105A

The B7 output supplies the signal relating to the speed according to [ISO 16844-2].

Table 5.4 - Tachimetric signal characteristics

Function	Parameter	min	max	Unit of measurement	Remarks
Tachograph output B7	Voltage U_{low}		1.5	V	I = 1 mA
	Voltage U_{high}	5.5		V	I = 1 mA
	Frequency (1/T)		1.6	kHz	Square wave
	Pulse duration (t)	0.64	4	ms	



230830

Figure 9

1. Speed signal (terminal B3) of the movement sensor fitted on the reduction unit

2. Temporal diagram and form of the pulse speed signal (terminal B7) from tachograph

a. Pulse delay: max $40 \mu\text{s} \pm 10 \mu\text{s}$ jitter

⁽⁸⁾ Rpm signal

The rpm signal is a square wave.

The characteristics of the rpm signal are:

- 4 pulses for each revolution of the crankshaft;
- frequency field 0–400 Hz (corresponding to 0–6000 rpm);
- duty-cycle fixed at 50%.

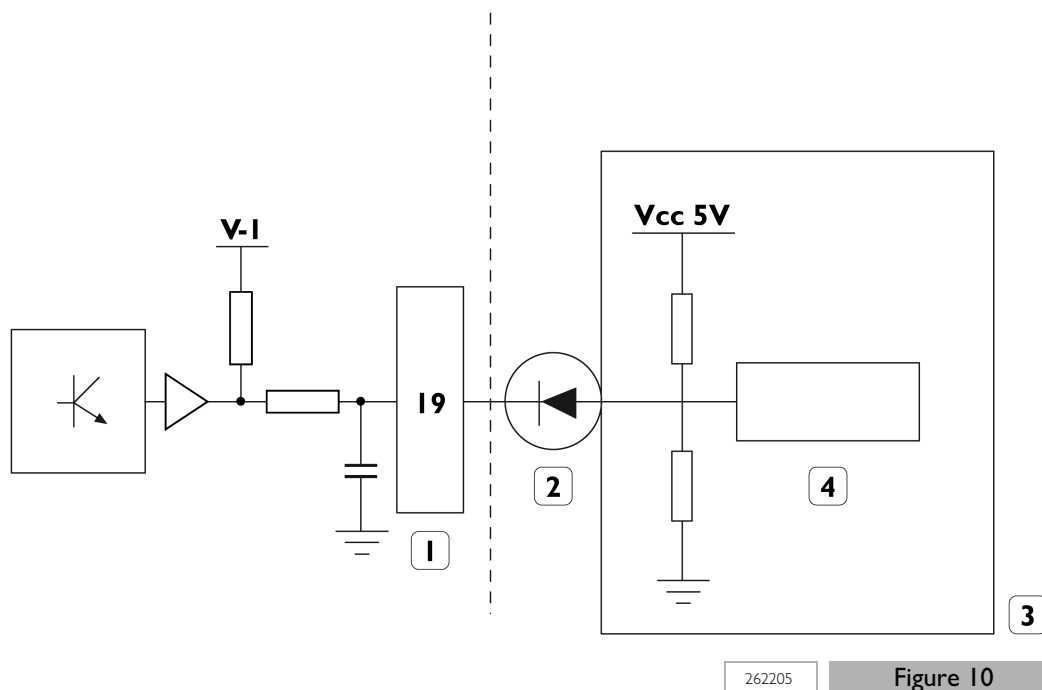
Table 5.5- Characteristics of engine speed signal FIC Euro VI

Characteristics	Condition	Minimum	Maximum	Unit of measurement
C_EMI		3.76	5.64	nF
C_IO		3.76	6.14	nF
I_Out			2.2	A
I_Out_SC			4	A
I_Leak_Off			20	μA
I_Out_Diag			980	μA
V_OC		3.23	3.77	V
V_THR		4.7	5.4	V
V_Out_Low			1.76	V
R_ON			800	m Ω
E_Clamp			4	mJ
V_Out_Clamp			60	V
R_Load_Diag			4.69	k Ω

Legend:

- C_EMI: EMI capacity at the connector terminals

- C_IO: capacity between input and output (in the event of output stage: C_IO is valid if the output stage is turned off)
- I_Out: output current
- I_Out_SC: output current
- I_Leak_Off: loss of current if the ECU is no longer powered
- I_Out_Diag: loss of current with ECU powered, but PS no longer powered. This parameter defines the ability of the hardware to provide a diagnostic current. The actual existence of the diagnostic current depends on the software configuration
- V_OC: voltage between CON_PIN and ground with open circuit
- V_THR: open load threshold voltage
- V_Out: output voltage
- V_Out_High: output voltage, HIGH level
- V_Out_Low: output voltage, LOW level
- R_ON: output resistor ON
- E_Clamp: energy at the output terminals
- V_Out_Clamp: voltage at the output terminals
- R_Load-Diag: Maximum diagnosable load resistance
- t_Fall: signal fall time from 90% to 10%



262205

Figure 10

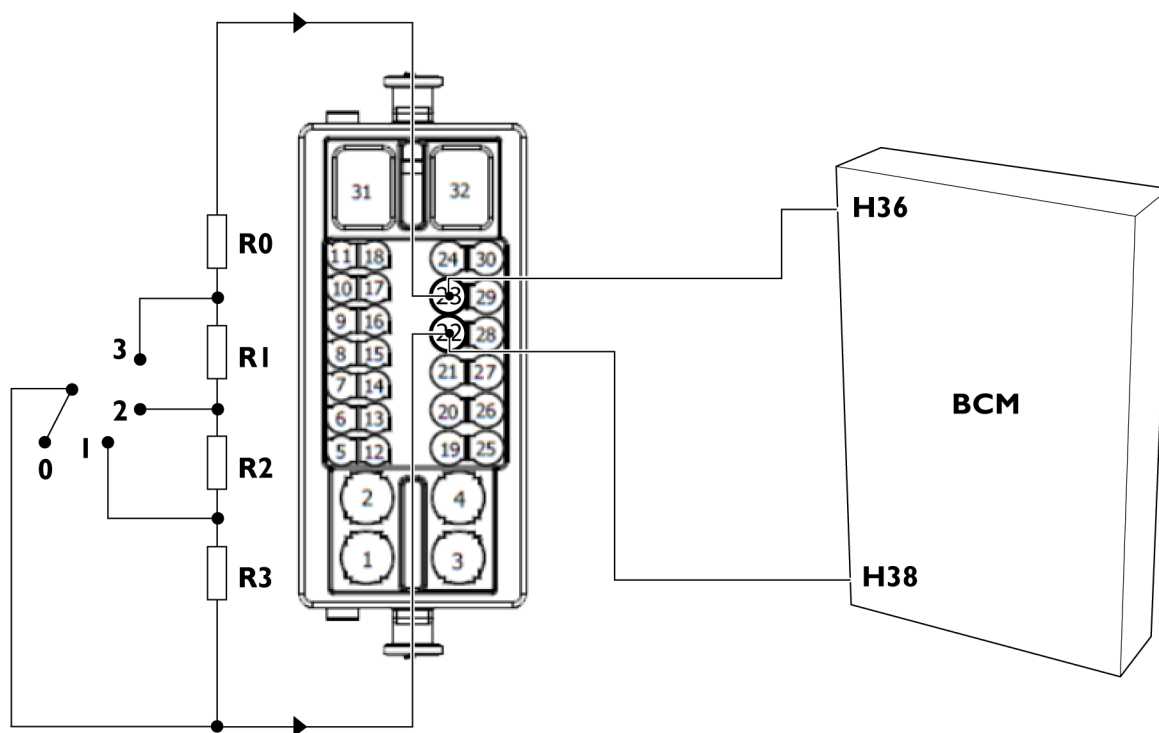
1. Bodybuilder connector 72105A
2. Separation diode REQUIRED

3. Interface responsibility of the designer of the processor
4. Signal processor

The bodybuilder must install a special separation diode so as not to lower the V_{ON} voltage.

The designer of the signal processor must ensure an input interface equal to that represented with a max. voltage V_{DC} of 5 V and "pull-up / pull-down" so as not to lower the voltage V_{ON} and to raise the response time set by the vehicle interface.

(9) The signals to the Multiple State Switch may also be simultaneous to requests coming from the Expansion Module through CAN open (object 0x2001, sub 0x0C) or through activation of "PTO1/PTO2/PTO3 Memo Speed". The highest value prevails in the event of contemporaneity.



262204

Figure 11

Table 5.6

Resistance Values [Ohm]	R0	R1	R2	R3
	120	270	510	2000

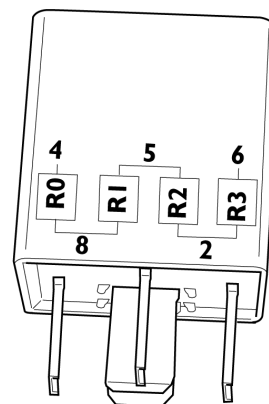
For this purpose IVECO recommends use of a relay (not identical to that for the Cruise Control interface) which enables utilization of the same functions available on the steering wheel lever.

The Cruise Control option must be configured on both the ECM and BCM systems.

Please note that the driver must position the Cruise Control switch on the steering wheel lever to OFF, otherwise the external controls will be ignored.

Table 5.7

Function	Short-cut necessary	
ISC Mode 1	Pin 2	Pin 6
ISC Mode 2	Pin 5	Pin 6
ISC Mode 3	Pin 8	Pin 6



230826

Figure 12

(10) WARNING:

If the K15 Remote control was activated and the operator removed the ignition key with the engine running, the engine would not stop and it would be possible to move the vehicle with the steering locked. Therefore:

- **The K15 Remote control must not be activated with the engine running.**
- **Similarly, to avoid unexpected movements of the vehicle with gear engaged, the engine must not be running when the K15 Remote control is activated.**

If, in spite of such requirements, engine operation must still be possible, IVECO recommends using the RunLock function offered by the Expansion Module (if present): refer to Chapter 7.3 (➡ Page 5).

5.3 ELECTRONIC CONTROL UNITS

5.3.1 Precautions

In order to avoid operations that could permanently damage or degrade the functioning of the vehicle ECUs, it is advisable to:

- remember that connection and disconnection from battery terminals may generate voltages that adversely affect vehicle electronic systems and control units;
- do not disconnect and/or connect connectors from/to the control units with engine running or control units powered;
- detach the electronic control units where particular processing operations involve temperatures above 80 °C;
- absolutely never employ a rapid battery charger for emergency start-up because it could damage the electronic systems, particularly the control units that manage the ignition and power supply functions;
- do not supply current to components served by electronic modules with jumper cables
- connect the control units equipped with metal casing to the ground of the system using a screw or bolt unless otherwise specified.

In case of any work on the chassis requiring arc welding:

- disconnect CBA I from the battery positive terminal and do not connect it to the chassis ground;
- disconnect the control unit connector;
- disconnect the control unit from the chassis (in case of welding near the control unit itself);
- perform welding with continuous current;
- ground the welding machine as close as possible to the welding point;
- do not place the battery cables parallel to the vehicle's electric cables.



- ▶ **When the operations have been completed, restore the original conditions of the wiring (paths, protections, strips), making sure that the cables are not in contact with metallic surfaces which could affect their integrity.**



- ▶ **It is prohibited to make any changes or connections to the CAN lines where any change is strictly prohibited. Diagnostic and maintenance operations can only be carried out by authorised personnel with IVECO approved equipment.**

Note For any exception to mounting instructions, IVECO's written authorisation is necessary.

Lack of observance of above described prescriptions involves guarantee lapse.

5.3.2 Disconnecting the electronic control units



- **Interventions which do not comply with the instructions specified by IVECO or which are performed by unqualified personnel may cause severe damage to on-board systems, affect driving safety, reliability and vehicle functioning and cause considerable damage which is not covered by the warranty.**

The following instructions must be strictly observed before disconnecting an electronic control unit:

- turn the ignition key to OFF and remove it;
- switch off the additional heaters and wait for the end of the cooling down cycle (the warning light of the corresponding key will go out);
- switch on the reading spotlights centrally positioned on the cross member;
- isolate the battery by disconnecting the power cables: first the negative pole followed by the positive pole; the aforesaid spotlights are now off;
- disconnect the control unit.

5.3.3 Repositioning the electronic control units

IVECO recommends avoiding modifications which entail the repositioning of the electronic control units. However, if repositioning is unavoidable, please follow the instructions below:

- the electronic control units must be positioned on the chassis or in the cab and secured with a fastening similar to the original one (i.e. suitable bracket);. The device must not be rotated in relation to the chassis so as to avoid potential malfunctions (e.g. infiltration of water). Therefore the original positioning must also be maintained;
- the electronic control units must not be fitted on the subframe;
- the covering must always be reinstalled;
- the control units must not be subjected to impact from road debris or stones coming from the vehicle's wheels when the vehicle is moving.

5.4 ELECTRICAL SYSTEM

5.4.1 General information

Vehicles are set to function normally with a 12 V electrical system.

The chassis represents the grounding (it acts as a current return conductor between the components located on it and the battery power source/alternator) and it is connected to the negative pole of the battery and components, if an isolated return is not provided for this.

When installing additional equipment or additional circuits, the following indications must be taken into account and, depending on the complexity of the operation, there must be proper documentation (e.g. wiring diagram) to match that of the vehicle.

The use of cables and connections with colours/codes identical to those used on the original vehicle makes installation correct and facilitates any repair work.

For effective and proper use of the electrical system, specific connection points for additional equipment have been prepared. This was necessary to exclude any type of alteration of the basic design, so as to ensure its functional integrity and therefore maintain the vehicle guarantee.

Note For more detailed information regarding the electrical system of the vehicle, refer to the Repair Manuals of DAILY 4x4 MY 2018, print 692.68.970 (Euro VI) and print 692.68.980 (Euro III).

This manual is available at the Service Network and can also be obtained from Sales Agencies.

5.4.2 Precautionary measures when working on the system



- ▶ **Electrical work (e.g. removing cables, adding circuits, replacing equipment or fuses, etc.), performed in a manner inconsistent with the IVECO instructions or by unqualified personnel, can cause serious damage to electronic control units and compromise driving safety.**



- ▶ **Any electrical work which does not comply with regulations may cause significant damage (e.g. short circuits with the possibility of fire and destruction of the vehicle) and authorises IVECO to annul the warranty.**

Before removing any electrical/electronic equipment, disconnect the ground cable from the battery negative terminal.

Note Whenever an electrical connection is opened, the two counterparts must be protected (for example, with sticky paper) to avoid infiltration of water or dirt.

To prevent damage to the vehicle's electrical system, follow the instructions of the cable manufacturer.

- The cables must have suitable sectioning for the type of load and the position of the load in the vehicle.
- The power cables (+ direct) must be:
 - individually intubated in conduits (of suitable diameter) and not together with other different cables for signal and negative;
 - placed at least 100 mm (reference value = 150 mm) from high heat sources (turbine, engine, exhaust manifold, etc.);
 - placed at least 50 mm from containers of chemical agents (batteries, etc.);
 - placed at least 50 mm from moving parts.
- The path of the cables must be defined with brackets and clamps dedicated and reconciled, to avoid hanging parts and to be able to restore the same installation after repairs or interventions.
- The passage of cables through holes and on the edges of metal sheets must be protected by cable gaskets in addition to the corrugated tube.
It is not possible to specially drill the chassis to allow the cables path.
- The corrugated tubing must completely protect the entire cable and be connected (with heat shrinking or taping) to the rubber caps on the terminals.
- All the positive terminals and cable terminals must be protected by rubber caps (air-tight in areas exposed to weathering or with possible stagnation of water).



- ▶ **Use only fuses with the features prescribed for the specific function. NEVER USE FUSES WITH A CAPACITY HIGHER THAN THE PRESCRIBED. Replace using only keys and disconnected users.**



- ▶ **When the operations have been completed, restore the original conditions of the wiring (paths, protections, strips), making sure that the cables are not in contact with metallic surfaces which could affect their integrity.**

5.4.3 Precautionary measures when working on the chassis

For work on the chassis, to protect the electrical system, its equipment and ground connections, respect the precautions shown in Chapter 2.1 - Paragraph "Special precautions (►► Page 5)" and Chapter 2.3 - Paragraph "precautions (►► Page 13)".

In cases where the application of additional devices requires it, the installation of protective diodes for inductive current spikes must be provided for.

The ground signal from the analogue sensors must be wired exclusively on the specific receiver; additional ground connections may distort the output signal from this sensor.

The cable bundles for low signal intensity electronic components must be arranged parallel to the metal plane of reference, that is adherent to the chassis/cab structure, in order to minimise parasitic capacities; space the path of the cable bundle added to the existing one as much as possible.

The added systems must be connected to the ground of the system with the utmost care (see Chapter 5.4 - Paragraph "Ground points"); the related wiring harnesses should not be coupled to the electronic circuits that already exist on the vehicle in order to avoid electromagnetic interference.

Ensure that the wiring of the electronic devices (length, type of conductor, dislocation, strips, cable shielding connection, etc.) comply with the original IVECO provision.



► **Carefully restore the original system after any operations.**

5.4.4 Engine start-up

- If the engine fails to start because of the battery and not because of problems with the electrical system, do not try to start the engine by towing.
- The battery must be disconnected from the vehicle's electrical system before recharging it.
- Starting the engine with auxiliary methods must only be carried out using an external battery trolley.



► **It is strictly FORBIDDEN to use a quick battery charger for emergency start-up: due to the high voltages applied, the electronic systems and the control units could be seriously damaged. Any damage to the electronic control units is not covered by the warranty.**

- The tanks must contain sufficient fuel during the engine start-up phase, in order to avoid serious damage to the injection system.

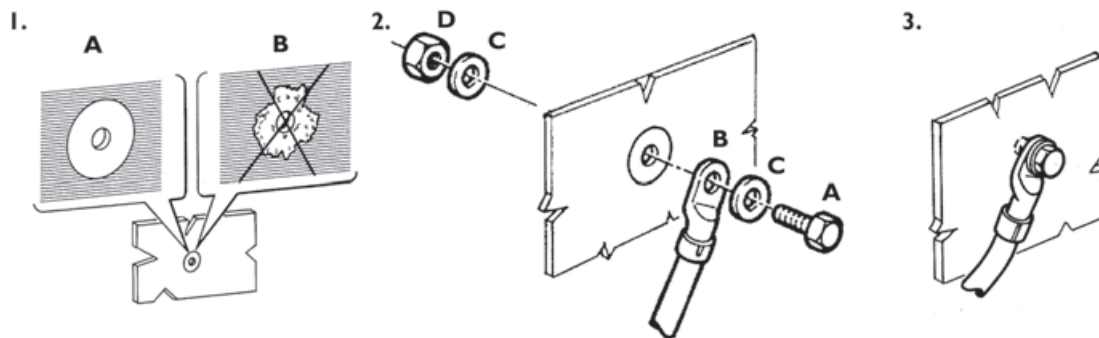
5.4.5 Ground points

The original ground connections of the vehicle should never be altered; in cases where these connections must be moved or new ground points added, use the holes present on the chassis to the extent possible, taking care to:

- mechanically remove - either by filing and/or with a suitable chemical based solution - the paint on both the chassis and terminal side, thus creating a contact surface free of indentations and edges;
- paint the area between the terminal and metal surface with a suitable high conductivity paint
- connect to ground within 5 minutes after application of the paint.

As regards the signal related ground connections (e.g. sensors or low-absorption devices), do not use the standardized points. Under no circumstances use standardized points for engine ground connection and chassis ground connection.

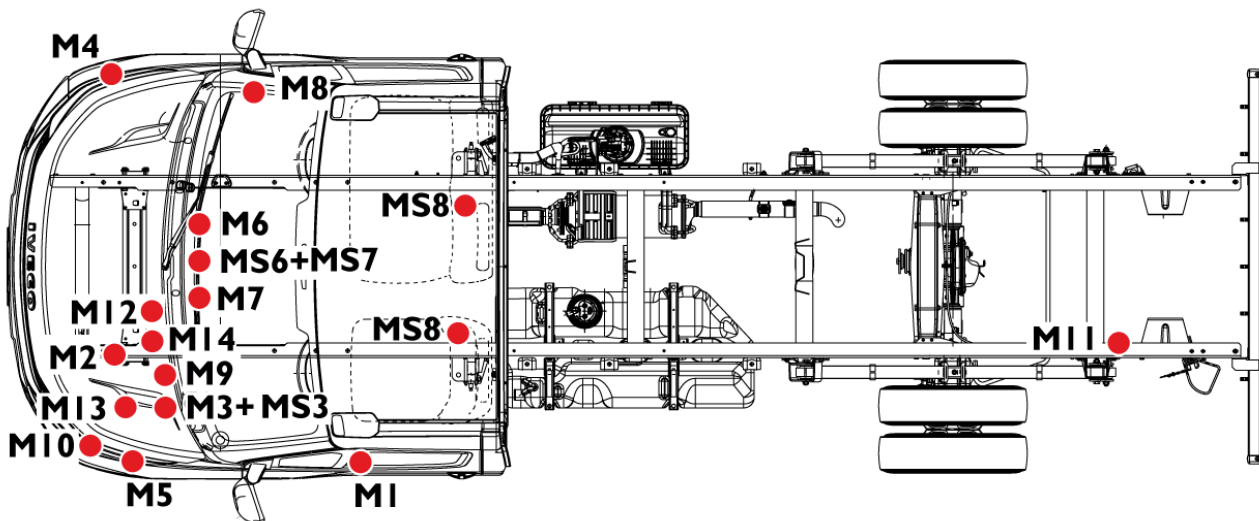
Additional signal grounds must be positioned at different points from the power ground.



191316

Figure 13

1. Ground connections: (A) connection is correct; (B) connection is incorrect
2. Correct cable fastening to the ground point using: (A) screw, (B) cable terminal, (C) washer, (D) nut
3. Cable connected to ground

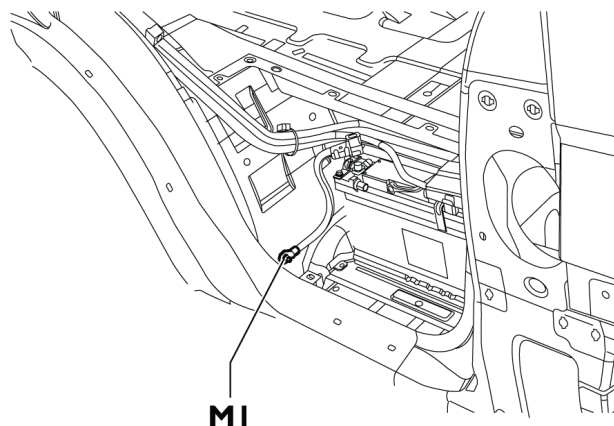


262154

Figure 14

Position of ground points on vehicle

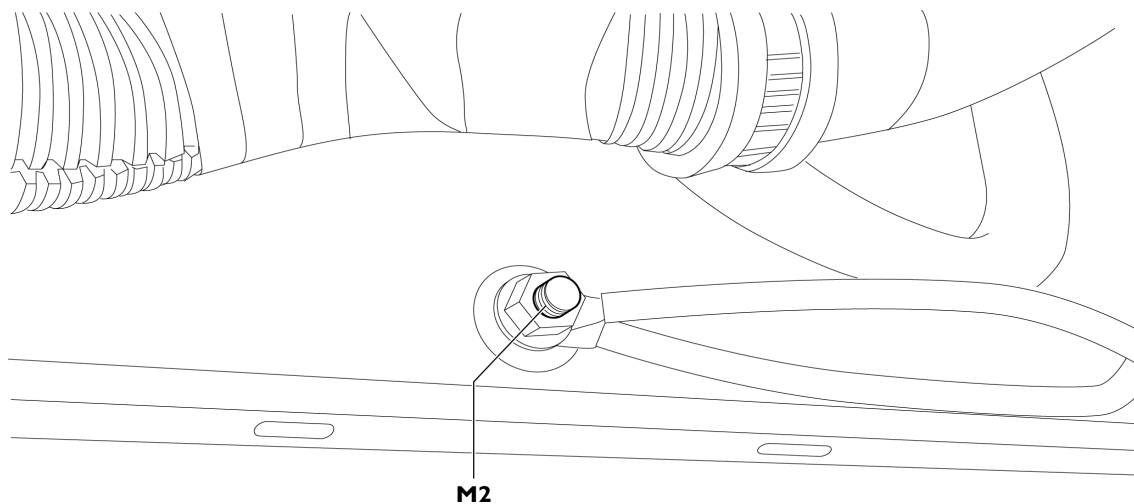
- | | | | |
|------|--|------|---|
| M1. | Battery compartment power ground | MS7. | Signal ground, in the cab, wall below dashboard |
| M2. | Power ground on left side member | M8. | Power ground, in the cab on the right side panels |
| M3. | Power ground on fire guard | M8S. | Signal ground, in the cab, below the floor mat |
| MS3. | Signal ground on fire guard | M9. | Power ground on fire guard |
| M4. | Power, engine compartment ground near front right head-light | M10. | Power, engine compartment ground near front left head-light |
| M5. | Power, engine compartment ground near front left head-light | M11. | Power ground on side member |
| M6. | Power ground, in the cab, wall below dashboard | M12. | Power ground on engine crankcase, left side |
| MS6. | Signal ground, in the cab, wall below dashboard | M13. | Power ground, engine compartment, left side |
| M7. | Power ground, in the cab, wall below dashboard | M14. | Power ground on side member |



243714

Figure 15

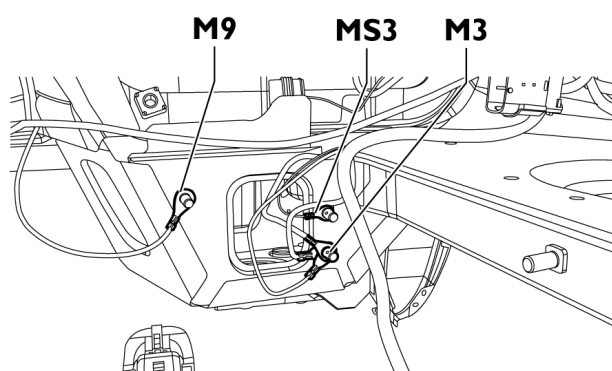
M1. Power ground in battery compartment



262235

Figure 16

M2. Power ground on left side member

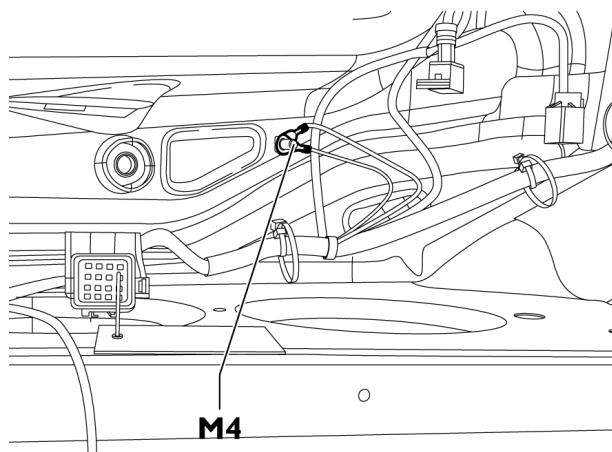


243716

Figure I7

M3/MS3 signal/power ground on fire guard

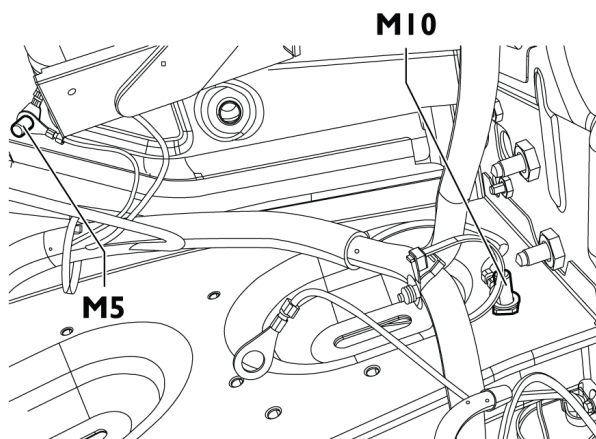
M9. Power ground on fire guard



243717

Figure I8

M4. Power, engine compartment ground near front right headlight

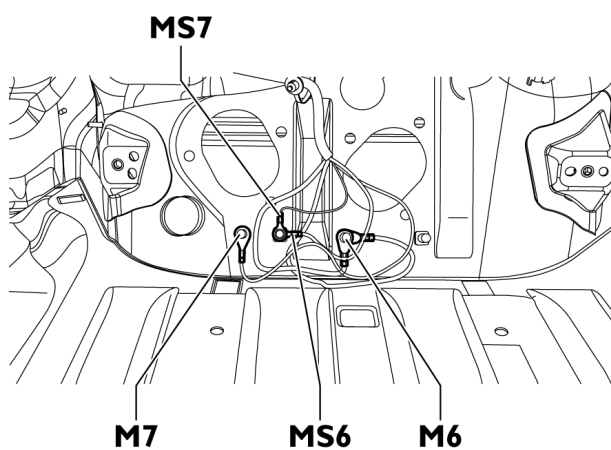


243718

Figure 19

M5. Power, engine compartment ground near front left head-light

M10. Power, engine compartment ground near front left head-light



243719

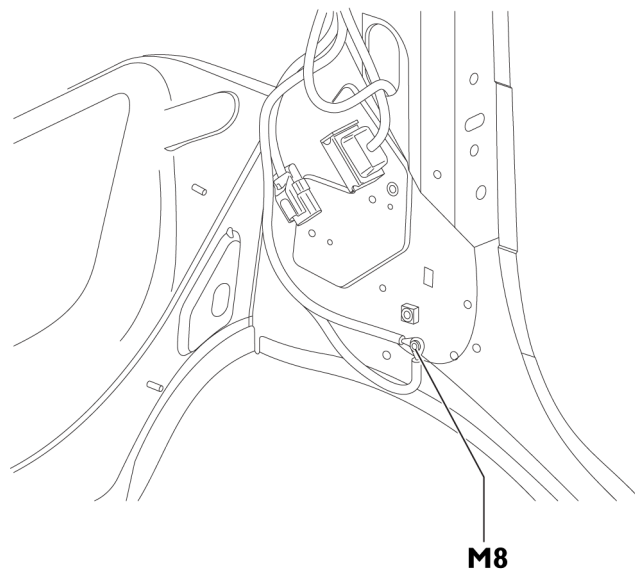
Figure 20

M6. Power ground, in the cab, wall below dashboard

MS6. Signal ground, in the cab, wall below dashboard

M7. Power ground, in the cab, wall below dashboard

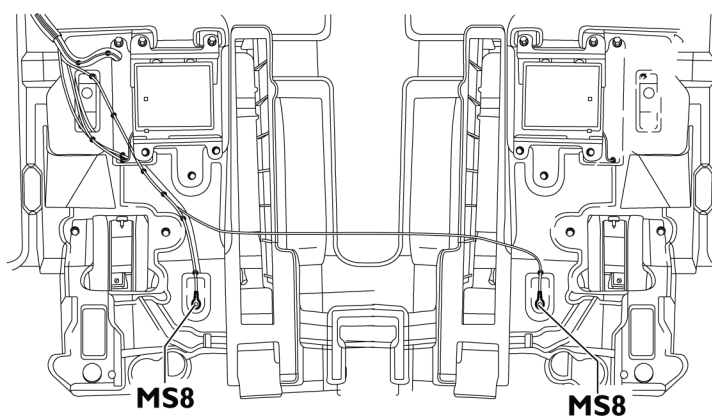
MS7. Signal ground, in the cab, wall below dashboard



208945

Figure 21

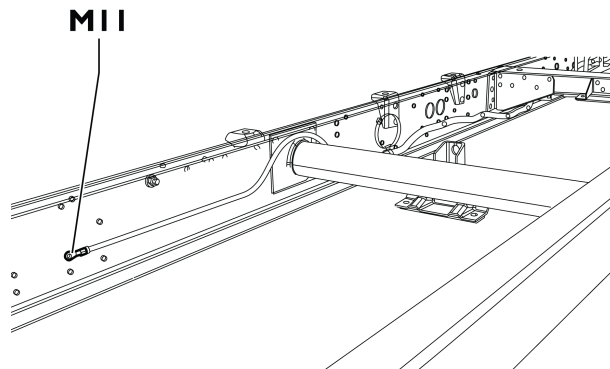
M8. Power ground, in the cab on the side panels



262232

Figure 22

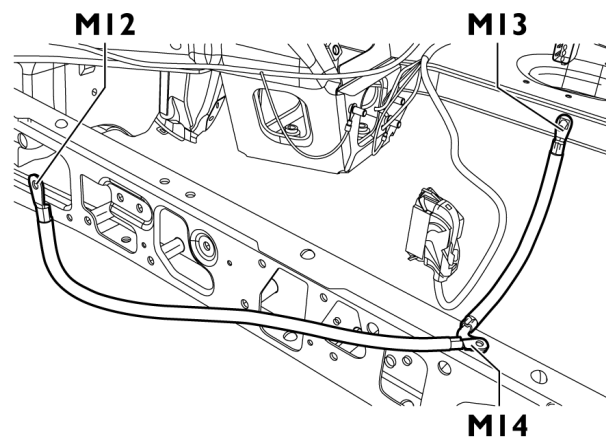
MS8. Signal ground, in the cab, below the floor mat



262233

Figure 23

M11. Power ground on side member



262234

Figure 24

M12. Power ground on engine crankcase, left side

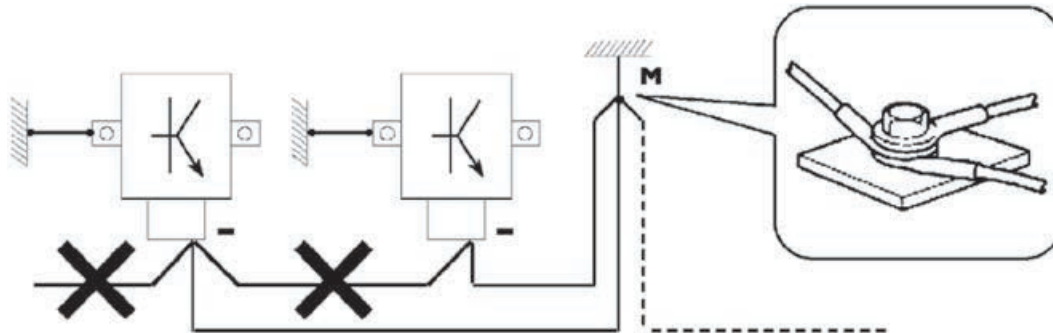
M13. Power ground, engine compartment, left side

M14. Power ground on side member

The negative leads connected to a ground point in the system must be as short as possible and must be connected to each other in a "star" formation, while tightening must be done in an orderly and adequate manner.

As far as electronic components are concerned, the following instructions should be followed:

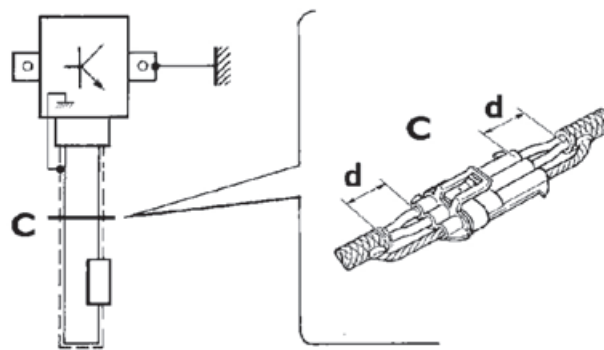
- electronic control units must be connected to the system ground when equipped with metal housings
- the negative cables of the electronic control units are to be connected to a system ground point, connected to the negative terminal of the battery;
- the analogue grounds (sensors), while not being connected to the system ground/negative terminal of the battery, are to have good conductivity. Consequently, particular care should be given to terminal parasitic resistances: oxidation, scratches, etc.;
- the metal braid of the shielded circuits must be in electrical contact only at the control unit side to which the signal is to be sent
- In the presence of junction connectors the unshielded section d, near them, should be as short as possible;
- The cables must be routed in such a way as to be parallel to the reference plane, as close as possible to the chassis/body.



191317

Figure 25

"STELLA" connections of various negatives with the system ground



191318

Figure 26

Shielding by means of a metal braid of a cable leading to an electronic component

5.4.6 Electromagnetic compatibility

It is recommended that electrical, electro-mechanical and electronic devices which comply with the following immunity requirements for electromagnetic emissions, both irradiated and conducted, are used, as shown below.

The level of electromagnetic immunity of the electronic devices equipping the vehicle at a distance of one metre from the transmitting aerial must be:

- 50 V/m immunity for devices performing secondary functions (not impacting on direct vehicle control), for frequencies varying from 20 MHz to 2 GHz
- 100 V/m immunity for devices primary secondary functions (not impacting on direct vehicle control), for frequencies varying from 20 MHz to 2 GHz;

The maximum excursion allowed for transient voltage with appliances powered at 12 V is +60 V, measured at the terminals of the artificial network (L.I.S.N.) if tested at the bench; otherwise, if tested on the vehicle, the excursion must be recorded in the most accessible location close to the disruptive device.

Note Devices powered at 12 V be immune to interferences such as negative spikes of -300 V, positive spikes of +100 V, bursts of +/- 150 V.

They must operate correctly during the phase when voltage drops to 5 V for 40 ms and to 0 V for 2 ms.

They must also resist the load dump phenomena up to 40 V.

The maximum radiated emission levels measured at the bench and the levels of conducted emissions generated by devices and also by 12 V power supplies are given in the following table:

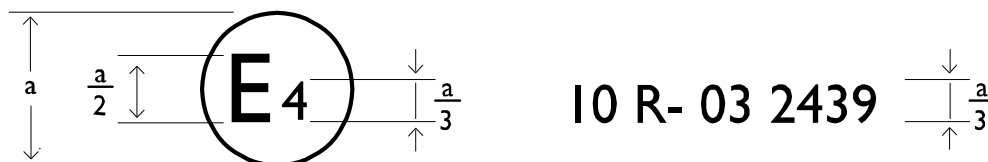
Table 5.8 - Electromagnetic emission levels

Type of emission	Type of transducer	Type of disturbance	Type of detector	Frequency range and limits acceptable in dB μ V/m									Unit of measurement
				150-300 kHz	0.53-2 MHz	5.9-6.2 MHz	30-54 MHz	68-87 MHz mobile services only	76-108 MHz broadcast only	142-175 MHz	380-512 MHz	820-960 MHz	
radiated	Aerial at a distance of 1 metre	Broad-band	almost peak	63	54	35	35	24	24	24	31	37	dB μ V/m
radiated		Broad-band	peak	76	67	48	48	37	37	37	44	50	
radiated		Narrow band	peak	41	34	34	34	24	30	24	31	37	
conduit	LISN 50 Ω 5 μ H 0.11 μ F	Broad-band	almost peak	80	66	52	52	36	36	Not applicable			dB μ V
conduit		Broad-band	peak	93	79	65	65	49	49				
conduit		Narrow band	peak	70	50	45	40	30	36				

Use electrical/electronic equipment in compliance with the UNECE directive on electromagnetic compatibility.

Only components with certified approval and with mark "e" are allowed: the "EC" marking is not sufficient.

By way of example, the mark prescribed by the current UNECE 10R3 on electromagnetic compatibility in the automotive field is shown below:



191312

Figure 27

$a \geq 6 \text{ mm}$

The values in the table are only to be considered respected if the device comes from "IVECO Spare Parts" or it has been certified as per the international standards ISO, CISPR, VDE etc.

Whenever equipment is used which runs on mains power (220 V AC) for its primary or secondary source of power, it must be checked to ensure that its characteristics are in line with IEC regulations.

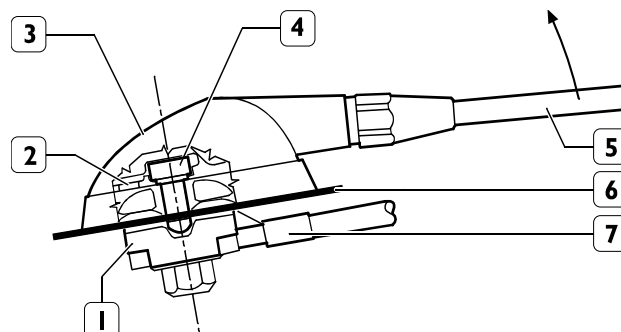
5.5 RECEIVER-TRANSMISSION SYSTEMS

The most frequent applications include:

- Amateur receiver-transmitter units for CB (City Band) and 2 m bands;
- Bluetooth pre-installation for mobile phones
- GPS reception and satellite navigation equipment
- Toll collect equipment

General instructions

1. The equipment must be approved according to the law and be of a fixed nature (not portable).
The use of non approved transmitters or supplementary amplifiers could seriously impede the correct functioning of the electrical/electronic devices normally supplied, with negative effects for the safety of the vehicle and/or the driver.
2. The system already provided on the vehicle must be used to power the transmitters and they must be connected to terminal K30 of the connector ST40 (and K15 where necessary) via a supplementary fuse.
Any additional power lines must be created respecting the correct sizing of cables and protection.
3. The coaxial antenna cable must be positioned taking care to:
 - use a low loss, top quality product with the same impedance as the transmitter and the antenna (see Figure 29);
 - in order to avoid interference and malfunctioning, create a path (the shortest possible) which maintains a suitable distance (min. 50 mm) from pre-existing cabling or from other cables (radio, amplifiers and other electronic equipment), keeping the minimum distance from the metal structure of the cab and using existing holes in the sheet metal;
 - do not shorten or lengthen; avoid unnecessary tangles, tension, folds and crushing.
4. Outside the cab, the antenna must be installed on the vehicle on a metal base with a wide surface; it must also be fitted as vertically as possible with the connection cable pointing downwards and, in any case, following the manufacturer's fitting instructions and warnings (see Figure 28).
Installation at the centre of the roof is to be considered the absolute best as the ground plane is proportional in all directions.
Inside the cab, the receiver-transmitter equipment must be placed in the designated compartment provided on the dashboard, to the side of the gear shift lever.
5. The quality of the antenna, the mounting position and a perfect connection to the vehicle structure (ground) are factors of fundamental importance to guarantee the best performance of the transmitter equipment.



98915

Figure 28

1. Antenna support
2. Gasket
3. Fixed joint cover

4. Fastening screw M6x8.5 (tighten to a tightening torque of 2 Nm)
5. Antenna
6. Roof panel
7. Antenna extension cable

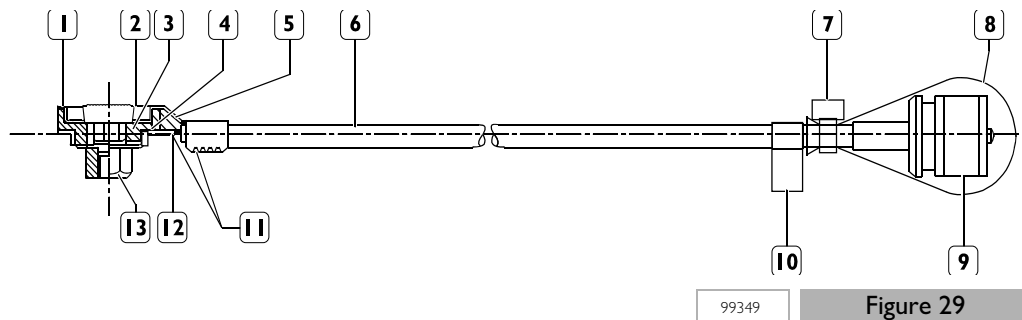


Figure 29

- | | |
|--|--|
| 1. Antenna connector | 9. Connector (N.C. SO - 239) transreceiver side |
| 2. Ground wire | 10. Test executed sticker |
| 3. Insulator | 11. The 100 pF condenser must be soldered on the lower pin and crimped to the ground braid |
| 4. Signal wire | 12. The lower pin must be soldered to the core conductor of the cable |
| 5. Condenser (100 pF) | 13. Nut |
| 6. Cable RG 58 (characteristic impedance = 50 Ω) | |
| 7. Clamp | |
| 8. Protection cap | |

Some specific instructions are given below for each type of equipment.

5.5.1 Amateur equipment for CB (27 MHz) and 2 m band (144 MHz)

The transmitter part must be installed in a separate area from the vehicle's electrical components; In the case of a pulse transmission system, it must be at a distance of at least 1 meter away from other devices.

- The ROS value (Stationary Wave Ratio) must be as close as possible to the unit (the recommended value is 1.5), while the maximum acceptable value must never be greater than 2.
 - The AERIAL GAIN values must be as high as possible and guarantee a sufficient level of spatial uniformity, characterised by deviations in relation to the average value of 1.5 dB in the typical CB band (26.965-27.405 MHz).
 - The IRRADIATED FIELD in cab value must be as low as possible, and however < 1V/m.
- In any case, limits set by the applicable European legislation must never be exceeded.

To determine whether the system is functioning well and to check that the antenna is calibrated, it is suggested that the following information is taken into account:

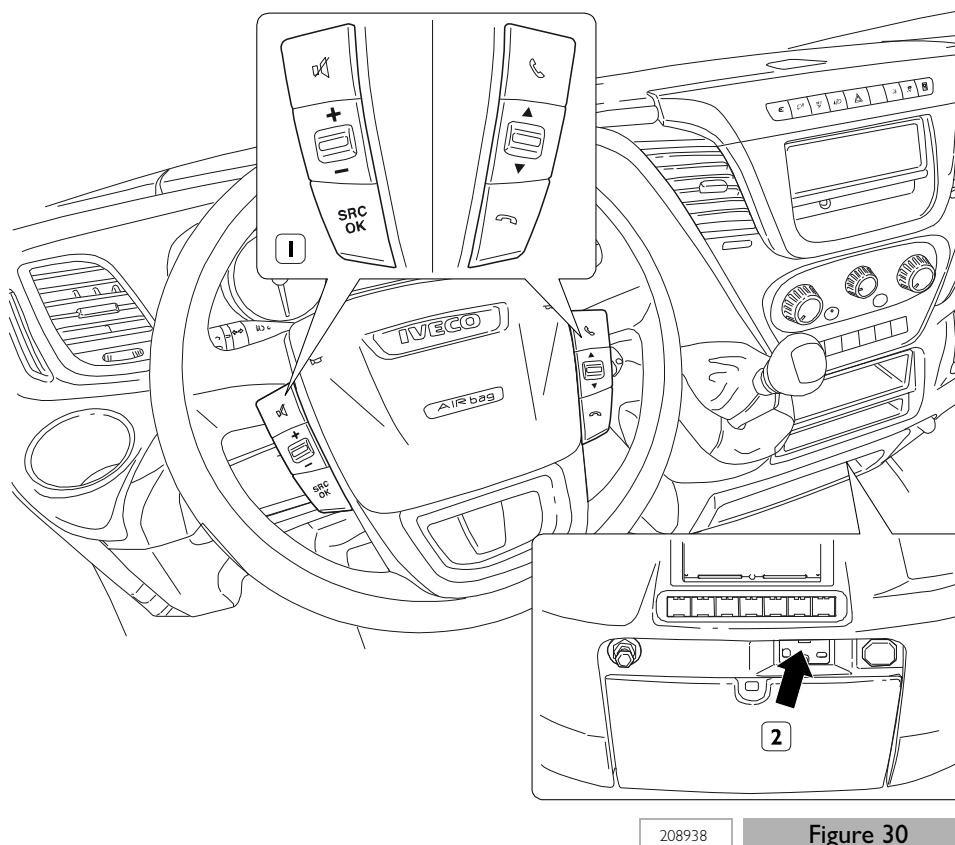
- if the ROS (Stationary Wave Ratio) is higher on the lower channels than on the higher ones, the antenna should be lengthened;
- if the ROS (Stationary Wave Ratio) is higher on the higher channels than on the lower ones, the antenna should be shortened.

After having calibrated the antenna, it is advisable to re-check the ROS (Stationary Wave Ratio) value on all the channels.

5.5.2 Bluetooth pre-installation

The Bluetooth setup consists of:

- specific control unit, positioned above the radio and hidden by a plastic cover;
- buttons on the steering wheel;
- ceiling fixture with microphone;
- USB socket;
- wiring.



208938

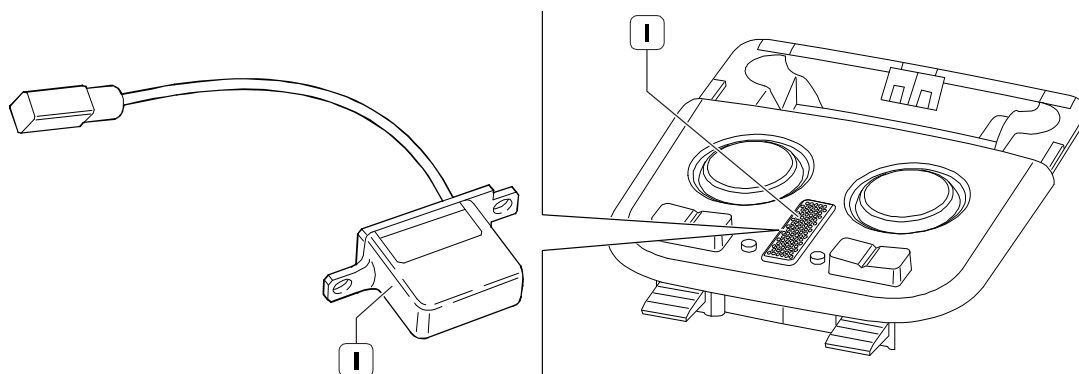
Figure 30

1. Buttons on the steering wheel

2. USB port

For cowl version vehicles the ceiling fixture with microphone is provided in the box of accompanying material.

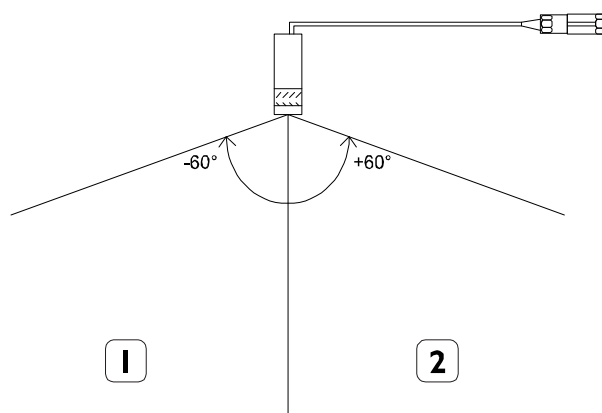
If required by installation in the cab, the microphone can be removed and recovered (see Figure 31); its position, however, must be at a point as far away as possible from sources of noise and according to the reception area described in the (see Figure 32).



208947

Figure 31

I. Bluetooth microphone



208949

Figure 32

I. Driver's side

2. Passenger side

Table 5.9

Pin	Description	Cable
1	Ground	White
2	Signal + Vcc	Shielded

The connector of the microphone connection, on the cab wiring side, is located in correspondence with the ceiling connectors.

5.5.3 GPS receiver and satellite navigation units

Install the transmitting part in a flat, dry area, separate from the electronic components of the vehicle, away from humidity and vibrations. In the case of a pulse transmission system, it must be at a distance of at least 1 meter away from other devices.

The GPS antenna must be installed so as to have the maximum visibility possible of the sky.

In fact, as the signals received from the satellite are at very low power (approximately 136 dBm), almost any obstacle can influence the quality and performance of the receiver.

The following should therefore be guaranteed:

- an absolute minimum angle of vision of the sky of 90°
- a distance no less than 30 cm from any other antenna
- a horizontal position and never underneath any metal which makes up part of the cab structure.

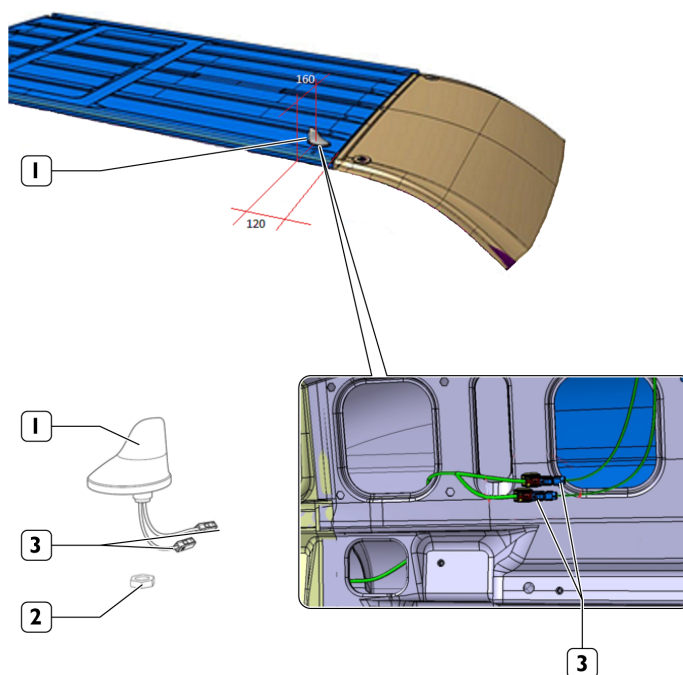
Moreover:

- the ROS value (Stationary Wave Ratio) must be as close as possible to the unit (the recommended value is 1.5), while the maximum must never be greater than 2 in the GPS frequency range (1575.42 ± 1.023 MHz).
- the ANTENNA GAIN values must be as high as possible and guarantee a sufficient level of spatial uniformity, characterised by deviations in relation to the average value to the order of 1.5 dB in the 1575.42 ± 1.023 MHz band.

5.5.4 Radio installation

Refer to the information contained in the Use and Maintenance Manual

5.5.5 Toll collect



256580

Figure 33

This device consists of an aerial fitted onto the roof.

To install, carry out the following operations:

- drill a 20 mm hole on the roof in the position indicated in the figure;
- protect the hole with an anti-corrosion treatment;
- position the aerial **(1)** on the roof and secure it using the nut **(2)** supplied;
- tighten to a torque of 7 Nm;
- connect the two connectors **(3)** of the aerial with the connectors on the vehicle.



- **If devices are fitted which could interact with the electronic systems already present (retarders, additional heaters, power take-offs, air conditioners, automatic gearboxes, telematics and speed limiters) please contact IVECO in order to establish the compatibility checks.**



- **Any damage caused by the use of non-certified transceivers or by the application of additional amplifiers is not covered by the warranty.**

5.6 ADDITIONAL EQUIPMENT

Power for the equipment, when the voltage required is different to that for the system, must be obtained using a suitable DC/DC 12-24V converter if not already provided. The power cables must be as short as possible, avoiding any twists (coils) and maintaining the minimum distance from the reference plane.

Note *If devices are fitted which could interact with the electronic systems already present (retarders, additional heaters, power take-offs, air conditioners, automatic gearboxes, telematics and speed limiters) please contact IVECO in order to establish the compatibility checks.*



- **The use of non approved transmitters or supplementary amplifiers could seriously impede the correct functioning of the electrical/electronic devices normally supplied, with negative effects for the safety of the vehicle and/or the driver.**



- **Any damage caused by the use of non-certified transceivers or by the application of additional amplifiers is not covered by the warranty.**

The vehicle system is set up to supply the necessary power to the equipment provided, for each of which, as part of their function, the specific protection is assured as well as the correct sizing of cables.

The installation of additional equipment must include suitable protections and should not overload the vehicle system.

The connection of the added users to ground must be made with an adequately sectioned cable, as short as possible and made to allow for any movements of the added equipment with respect to the chassis of the vehicle.

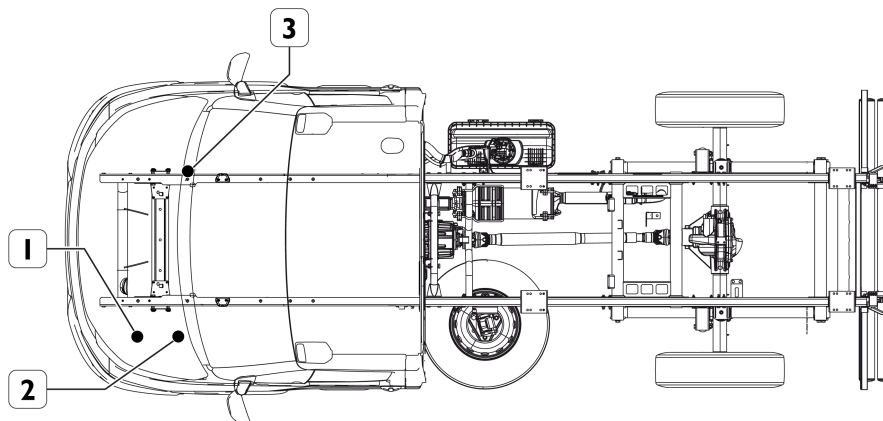
Having the need for higher capacity batteries, due to added loads, it is appropriate to request the optional with increased batteries and alternators.

In any case, when increasing battery capacity, it is advisable not to exceed 20-30% of the maximum values provided as optional by IVECO, so as not to damage some of the components (e.g. starter motor). When higher capacities are necessary, use additional batteries, making the necessary provisions for recharging as indicated below.

5.7 CURRENT DRAWS

In general it is advisable to:

- use suitable protection fuses in the vicinity near the current draw;
- protect cables inserted into designated sheathing or corrugated cables, installing according to the indications provided in Chapter 5.4 (➔ Page 17) - Paragraph: "Precautions for interventions on the system".



262157

Figure 34

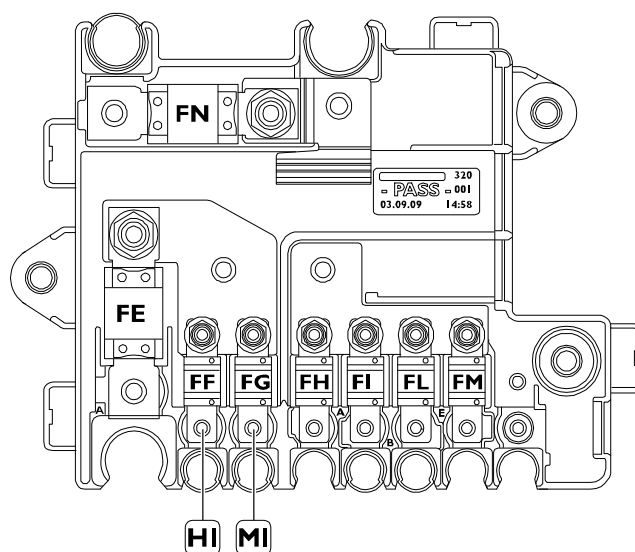
1. CBA2
2. Cable path between cab and engine compartment (see Figure 38)
3. Bodybuilders connector (inside cab)



► **It is absolutely forbidden to draw current from unauthorised points. FIRE HAZARD.**

5.7.1 Current draw from the CBA2 control unit in the engine compartment

Inside the CBA2 there are two fuses (FF and FG) reserved for the bodybuilders; terminals (HI and MI) downstream of these fuses are the only authorised points for current draw (see Figure 35) is requested.



209810

Figure 35

HI. Current take off point protected by fuse FF

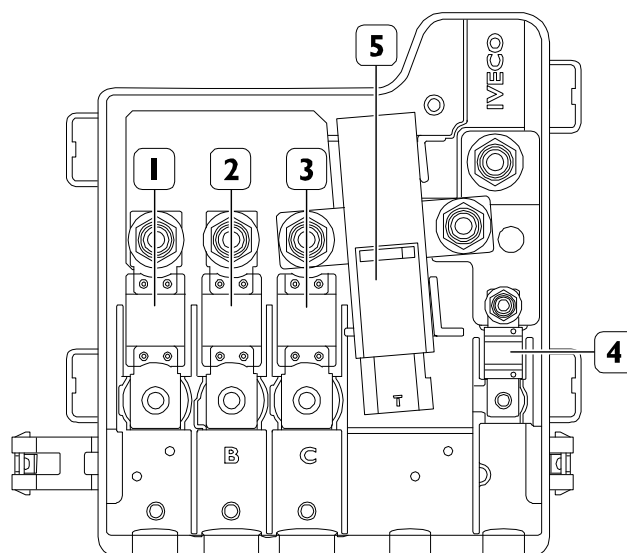
MI. Current take off point protected by fuse FG

Fuses FF and FG have a flow rate of 30 A each. If necessary, they can be replaced with ones of a higher capacity respecting the indication of a maximum total current draw (sum of the two fuses) equal to 130 A

Note Each connection on the CBA2 must strictly maintain the integrity and correct positioning of the protective cover.

Fuses

a) Fuses on the CBA1 control unit



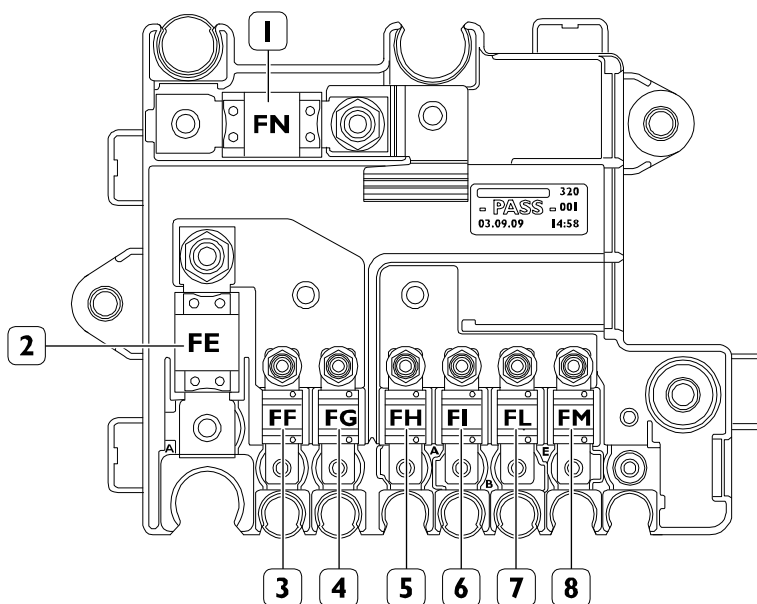
208221

Figure 36

Table 5.10 - List of fuses on CBA1

Location	Amperage [A]	Description
1	150	Power supply CBA2
2	200	Power supply SCM and bodybuilders
3	500	Starter and Retarder
4	80	Body Computer power supply
5		TGC (opt)

b) Fuses on the CBA2 control unit



209812

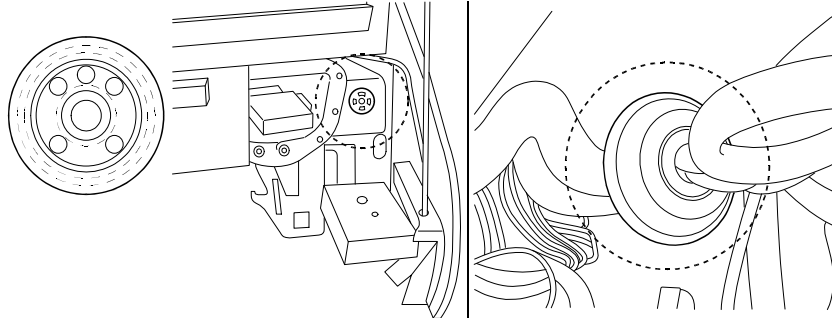
Figure 37

Table 5.11 - List of fuses on CBA2

Location	Amperage [A]	Description
1	150	Second battery (military vehicles)
2	150	SCM Power supply
3	30	Bodybuilders pre-installation
4	30	Bodybuilders pre-installation
5	60	Pre- / post- heating unit
6	90 - 30	Spare
7	100	PTC power supply
8	90 - 40	Spare

5.7.2 Passage of cables from cab interior to cab exterior

In the engine compartment, close to the brake-servo, through the five premade 10 mm holes in the bulkhead, it is possible to pass the electric cables from the cab to the engine compartment. Adequately seal the cable passage area to avoid passing fumes from the engine compartment to the cab.



119355

Figure 38



► **Any damage caused by failure to comply with procedure is not covered by warranty.**

5.8 MISCELLANEOUS

5.8.1 Additional circuits

The additional circuits must be separated from the vehicle and protected by means of a specific fuse

As already seen in Chapter 5.4 (➡ Page 34) Paragraph "Precautions for work on the system", the cables used must be:

- of appropriate sizes and equipped with good original insulation;
- connected to the original system by means of tin joints equivalent to the original ones, protected with sheaths (not PVC) or intubated in polyamide conduits of type 6;
- installed protections from shock, heat, rubbing with other components (in particular with the sharp edges of the bodywork);
- secured separately with insulated cable clamps (e.g. nylon) and at suitable intervals (approx. 200 mm).

The passage through crossbars and/or sections must provide special cable raceways or protections; it is not possible to drill the chassis and/or the bodywork.

In case of external panels, use a specific sealant both on the cable and on the panel to prevent water, dust and fumes from infiltrating.

Where possible it shall also be provided a different cable path that transfers interference signals with high absorbed intensity (e.g. electric motor, solenoid valves) and low absorbed intensity susceptible signals (e.g. sensors); for both must be remained a positioning as close as possible to the metallic structure of the vehicle.

Plug and terminal connections must be protected, resistant to weathering, and executed using components of the same type as those utilised originally on the vehicle.

Use cables and fuses with the characteristics shown in the following table in accordance with the current draw:

Table 5.12- Use of cables and fuses according to the current drawn

Max. continuous current ⁽¹⁾ [A]	Cable cross-section [mm ²]	Fuse capacity ⁽²⁾ [A]
0-4	0.5	5
4-8	1	10

Max. continuous current ⁽¹⁾ [A]	Cable cross-section [mm ²]	Fuse capacity ⁽²⁾ [A]
8–16	2.5	20
16–25	4	30
25–33	6	40
33–40	10	50
40–60	16	70
60–80	25	100
80–100	35	125
100–140	50	150

⁽¹⁾ For uses of more than 30 seconds.

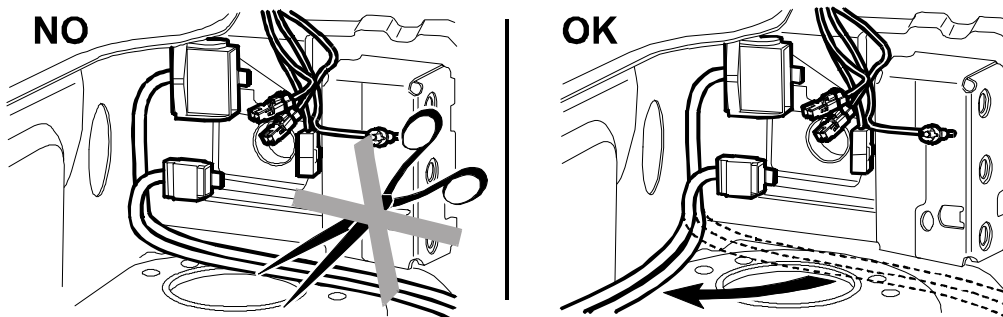
⁽²⁾ Depending on the position and therefore the temperature that may be reached in the housing, choose fuses that can be loaded to up to 70%- 80% of their maximum capacity.



► **The fuse must be connected as close as possible to the current take-off point.**

Precautions

- Incorrect installation of electrical accessories may affect occupant safety and cause severe damage to the vehicle. Contact IVECO if you have any questions.
- It is necessary to avoid coupling with the signal transmission cables (e.g. ABS), for which preferential routing has been provided in order to meet electromagnetic requirements (EMI).
It should be noted that when grouping several cables together, in order to compensate for lower heat dispersal capacity, the current intensity must be reduced with respect to the nominal value of a single cable.
- In vehicles with frequent engine start-ups, with limited current draw and engine rotations (e.g. vehicles with refrigeration chambers), provide for periodic battery charging to maintain efficiency.
- Plug and terminal connections must be protected, resistant to weathering, and executed using components of the same type as those utilised originally on the vehicle.
- In the event that a component has to be installed just next to the route of a cable belonging to the original system, make sure that its remains integral and avoid any cuts.



209813

Figure 39



► **Any damage caused by failure to comply with procedure is not covered by warranty.**

5.8.2 Interventions for modifying wheelbase and overhang

Should it be necessary to lengthen the wires on the chassis owing to the new dimensions of wheelbase and overhang, a watertight junction box must be used which has the same characteristics as those used on the standard vehicle. The electrical components used such as wires, connectors, terminal blocks, conduits etc. must be of the same type as those used originally and must be correctly fitted.

As for the functionality of the electronic control devices, junctions are not permitted: the cable must be replaced with a new one with similar characteristics to the one used on the vehicle and of adequate length.

5.8.3 Pre-installation for trailer

If the repetition of rear lights is necessary, the vehicle must be fitted with the 13-pin trailer socket.

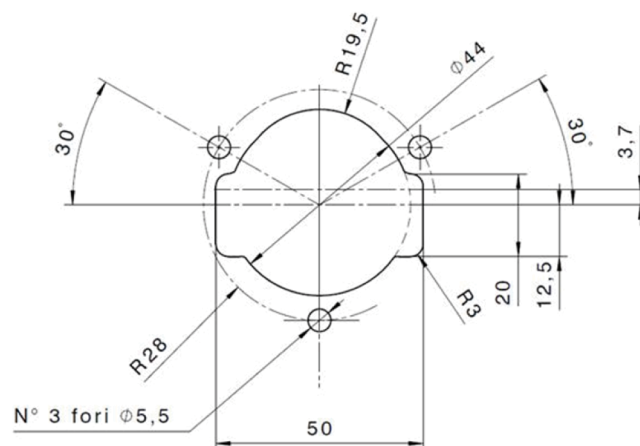
Do not hook up directly to the vehicle's light cables. This results in current overloads which are recognised as malfunctions by the on-board computer.

If the vehicle is not equipped with a trailer socket, it is possible to order a special kit comprising of:

- control unit with fastening bracket;
- chassis cable with trailer configuration;
- rear bridle for trailer socket.

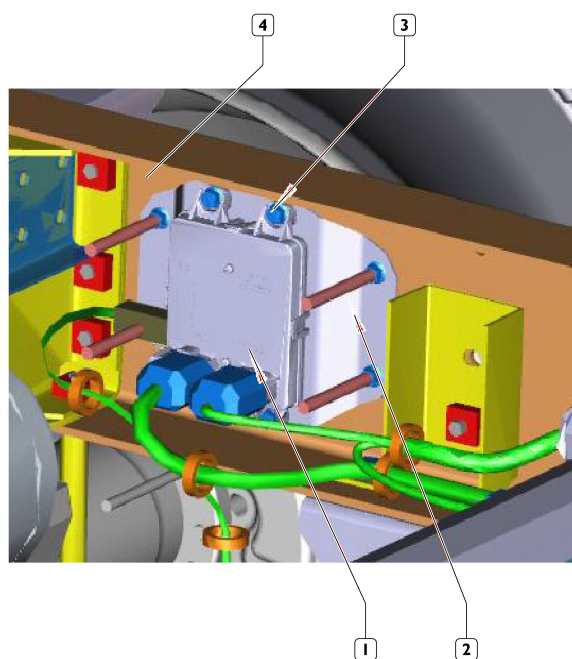
For proper installation it is necessary to:

- mount the electronic control unit onto the bracket;
- mount the entire bracket plus control unit onto the chassis as shown in Figure 41;
- replace the chassis cable with the new cable configured for the trailer socket (see Figure 42);
- fit a connection bridle for the 13-pin socket compatible with the type of hook (high or low) (see Figure 43);
- Ensure that the seat securing the 13-pin socket complies with the distances indicated in Figure 40.



277293

Figure 40

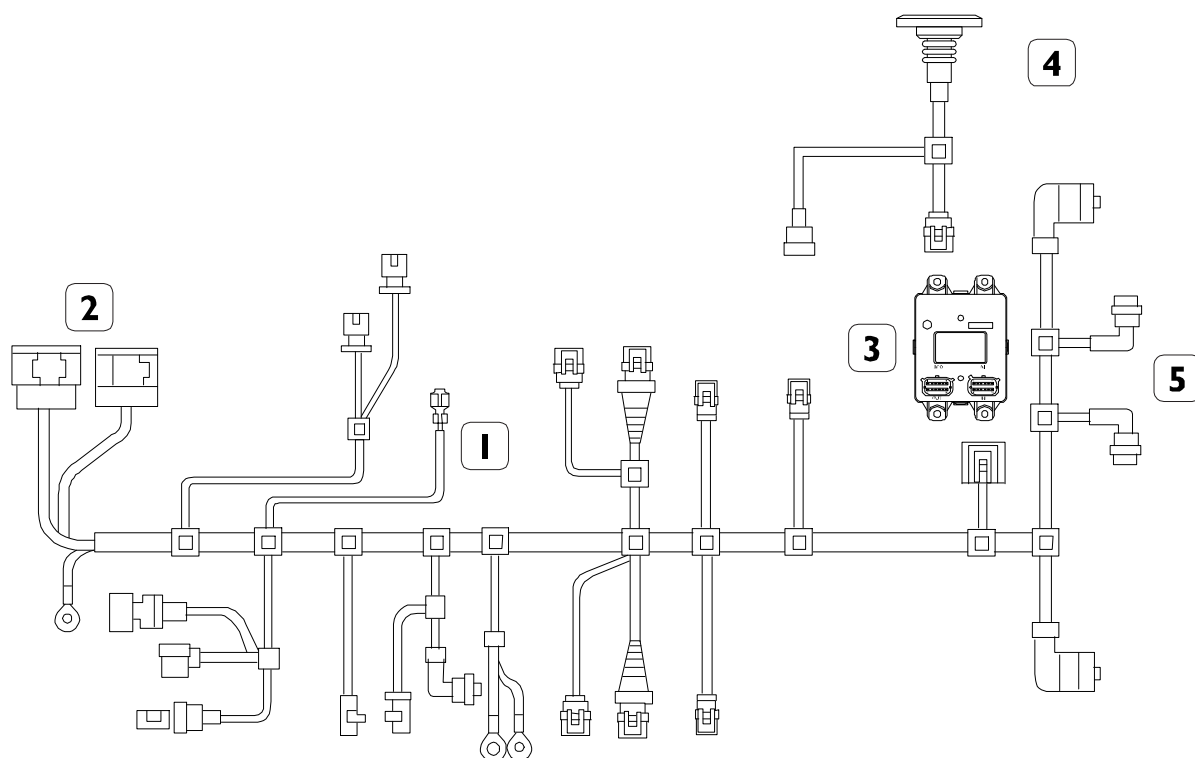


262155

Figure 41

- 1. Trailer electronic control unit
- 2. Support bracket

- 3. Guard
- 4. Chassis side member

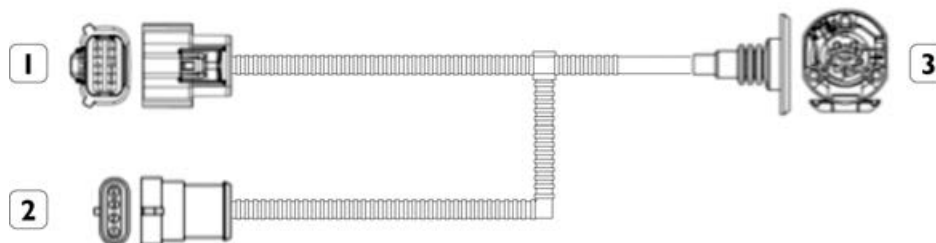


209816

Figure 42

- | | |
|------------------------------------|------------------------------|
| 1. Chassis cable | 4. Bridle with 13-pin socket |
| 2. Connections with cab wiring | 5. Tail lights |
| 3. Trailer electronic control unit | |

Note The graphic is for illustration purposes only.



209815

Figure 43

- | | |
|--|--|
| 1. Connector 86046_1 to connect to connector 1 (OUT) of trailer control unit | 2. Connector to connect to chassis cable |
| | 3. 13-pin trailer socket 72016 |

For further details on connections and installation, request wiring diagrams from IVECO.



► **Any damage to the light system caused by failure to comply with procedure indicated above is not covered by warranty.**

Table 5.13 - 13-pole trailer socket

Pin	Description	Cable code	Remarks
1	Rear left turn indicator	1120	1 21 W - 12 V lamp
2	Rear fog lamp power supply	2283	2 21W - 12V lamps
3	Ground	0000	–
4	Rear right turn indicator	1125	1 21 W - 12 V lamp
5	Front left and rear right parking light Left license plate light and left side marker light	3335	3 5 W - 12V lamps
6	Stop signal lights power supply	1175	2 21W - 12V lamps
7	Front right and rear left parking light. Right license plate light and right side marker light	3334	3 5 W - 12V lamps
8	Power supply for reverse light	2268	2 21W - 12V lamps
9	After fuse F67 present on SCM1/B	7777	Battery positive
10	After fuse F49 present on Body Computer	8879	Positive with key
11	Ground	0000	–
12	Trailer connection signal (Ground)	6676	1. Signal to be supplied through connection on the trailer, to permit trailer lights and parking sensor diagnostics (if present) 2. Pin 12 could be absent as it may have been replaced by a switch integrated in the socket; in this case it is not necessary to perform any connection on the trailer
13	Ground	0000	–



- **The electrical connection of a trailer entails a considerable increase in the length of the cables and results in a larger voltage drop on the line. Therefore the use of cables with the biggest possible cross-section is recommended, which are compatible with the system layout and with the 13-pin socket; on this it is then necessary to split the ground return using pins 3, 11 and 13.**

5.8.4 Installation of lateral side lights (Side Marker Lamps)

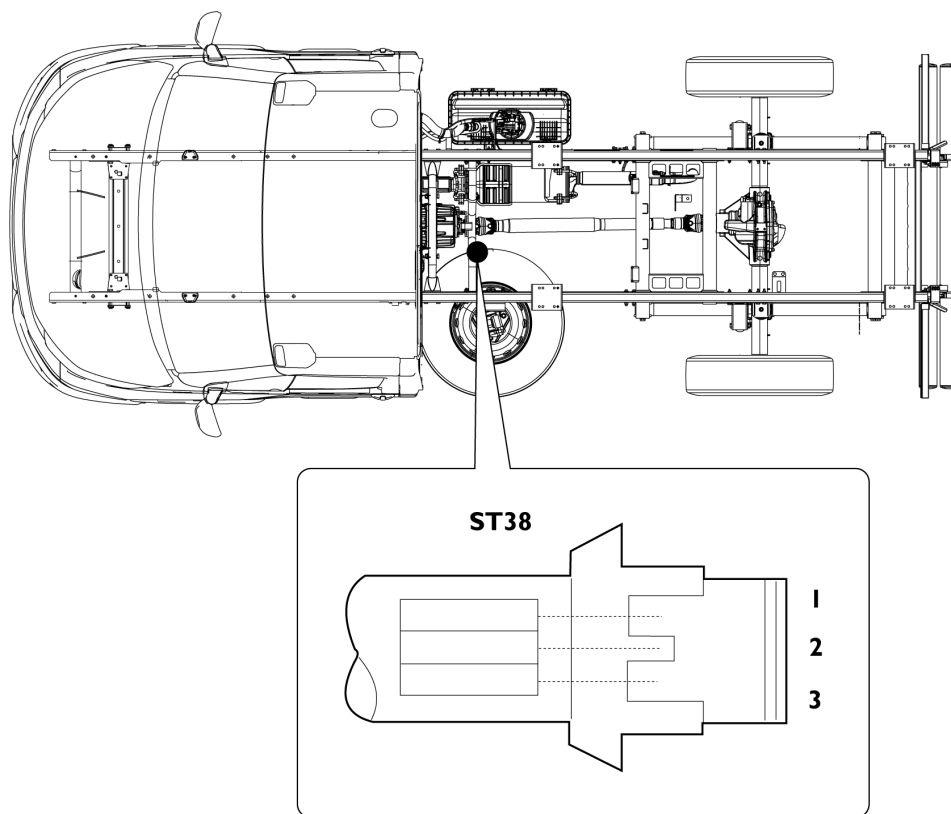
EC regulations require that vehicles are provided with side and clearance lights when the total length exceeds 6 m.

The installation of the lateral lights must be performed on the additional structures (containers, vans, etc.), when not required by regulations, while the electric power supply must be obtained by the specific ST38 connector on the chassis (see Figure 44).

In order to keep the electrical characteristics of the contacts of the female socket unchanged, the hood supplied by IVECO must be left attached.



- **It is not possible to draw current from side marker lights.**



228308

Figure 44

Table 5.14

Code	Description
98435331 EZ	3-way male connector
98457375 EZ	Male contact for 0.35 to 0.5 mm ² cable
98455370 EZ	Male contact for cable with cross-section 0.5 to 1.5 mm ²

Table 5.15 - Connector ST38 for Side Marker Lamps

Pin	Description	Cable code	Max. current [A]	Connected to	Remarks
1	Ground	0000	2.5	ST43/1	Ground for left and right side clearance lights
2	Vehicle left side clearance lights	3390	1.25	ST43/2	+12 V = vehicle left side clearance lights on no signal = vehicle left side clearance lights off
3	Vehicle right side clearance lights	3390	1.25	ST43/2	+12 V = vehicle right side clearance lights on no signal = vehicle right side clearance lights off

The side markers are mandatory for vehicles with a total length exceeding 6 m.

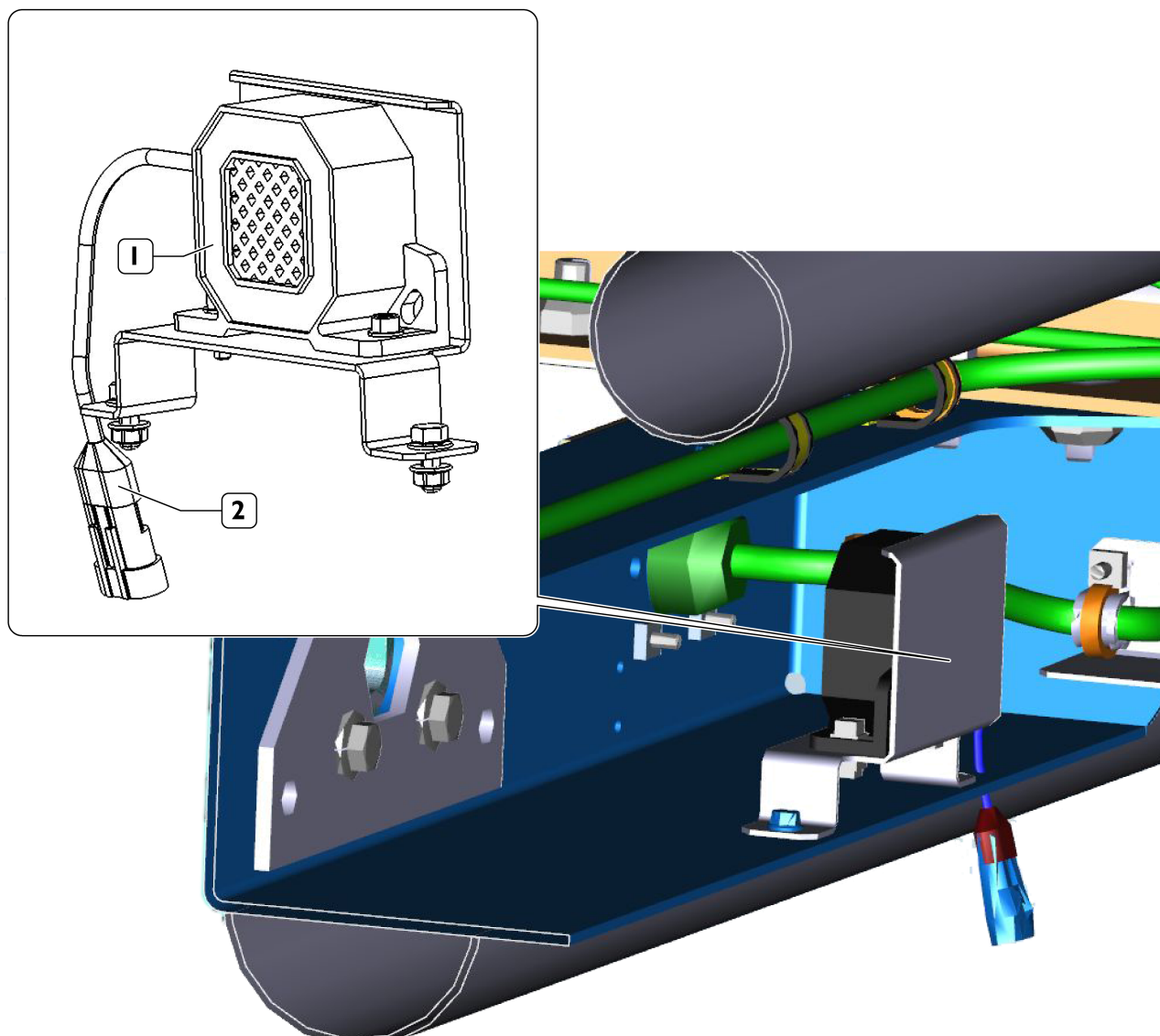
Installation of side markers requires the intervention of the IVECO Service Network in order to enable the Body Computer.

5.8.5 Reverse gear signal

For safety reasons, certain vehicle versions must emit an external reversing warning sound which is activated when the vehicle is reversing.

This safety device may be originally requested as opt. 7638, regardless of the type of gearbox used.

Application is recommended inside the rear cross member of the licence plate holder, as in Figure 45.



262156

Figure 45

1. Reverse buzzer

2. Reverse gear signal cable

This device is operated by a connector ST79 with three terminals with safety cap.

Table 5.16 - Connector for reverse gear signal

Pin	Description	Cable code	Max. current [mA]	Connected to	Remarks
1	Reverse	1614	500 - 1000 ⁽¹⁾	BDV 1-G4	The signal comes from the control unit in cab +12 V = reverse gear engaged no signal = reverse gear not engaged Add a protection diode
2					
3	Ground	0000	100		Ground for reverse gear

5.8.6 Antitheft system

In combination with the central locking, the vehicle can be equipped with an alarm system controlled by the Body Computer and a peripheral system.

This system consists of:

- a key with remote control, buttons for distance locking/unlocking;
- actuators for closing the cab doors and sliding side doors in the case of a van;
- open door sensors and engine bonnet opening perimeter sensor (Figure 47 left);
- alarm siren (12 V) (Figure 47 right).

The antitheft current absorption is 30-40 mA.

The bodybuilder must provide a "closed door" signal so that the antitheft system can also detect engine bonnet break-ins.



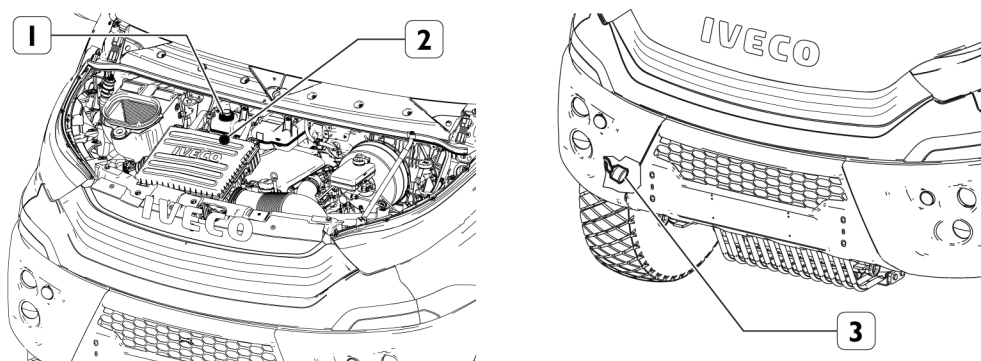
- A. Engine bonnet socket
B. Body builder button switch

1. Pin 1: door closed signal
2. Pin 2: door closed signal

⁽²⁾ Only for versions with stripped chassis cowl, cowl, stripped chassis cowl for camper with opt 5865

Open circuit → when the door is closed

Closed circuit → when the door is open



271321

Figure 47

- 1. *Bonnet open sensor*
- 2. *Engine bonnet socket*

- 3. *Alarm siren*

For the operation mode refer to the Use and Maintenance Manual.

SECTION 6

**ADBLUE AND
SCRT SYSTEM**

Contents

6.1	GENERAL INFORMATION	5
6.2	THE NITROGEN OXIDE CATALYTIC REDUCTION PRINCIPLE	5
6.2.1	Main components of the SCRT system	5
6.3	INSTRUCTIONS	6
6.3.1	AdBlue tank	6
6.3.2	AdBlue refuelling filler	7
6.4	MOVING ADBLUE SYSTEM COMPONENTS	7

ADBLUE AND SCRT SYSTEM

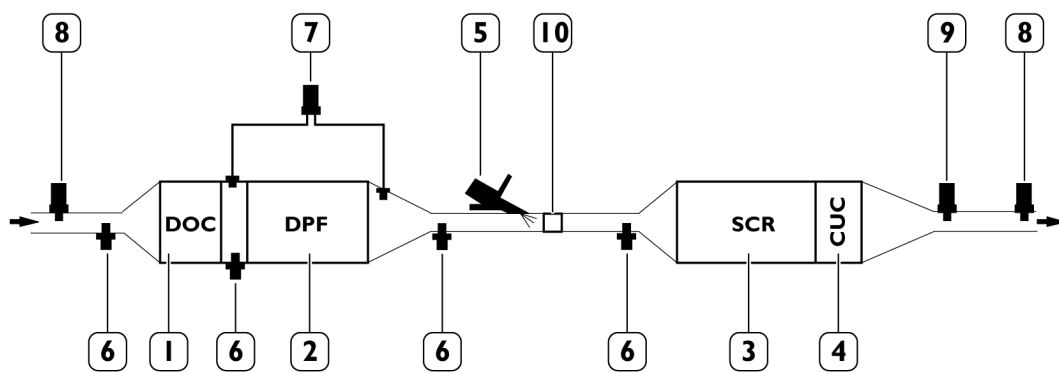
6.1 GENERAL INFORMATION

To comply with Euro VI Regulations on engine gas emissions, IVECO has developed the "SCRT" (Selective Catalytic Reduction Technology) system, consisting of the combined action of a diesel particulate filter (DPF) and post-treatment of exhaust gas (SCR). This post-treatment requires the use of an additive, commercially known as AdBlue (urea solution+water).

6.2 THE NITROGEN OXIDE CATALYTIC REDUCTION PRINCIPLE

The additive AdBlue, is sent from a dedicated tank by means of a SM (*Supply Module*) pumping module to a DM (*Dosing Module*) which injects AdBlue into the exhaust pipe. The mixture of exhaust gas and additive is then fed into the catalytic converter and chemically transforms NO_x into nitrogen and water, which are harmless to the environment.

6.2.1 Main components of the SCRT system



279569

Figure 1

1. Diesel Oxidation Catalyst
2. Diesel Particulate Filter
3. Selective Catalytic Reduction
4. Clean Up Catalyst
5. Dosing Module

6. Temperature sensors
7. DPF Δp sensors
8. NO_x sensors
9. PM sensor
10. Double mixer

DOC: to oxidise the exhaust gas components through the use of oxygen.

DPF: to eliminate the particulate before SCR through passive regeneration.

SCR: to reduce the NO_x through the injection of AdBlue.

CUC: to eliminate the ammonia residues (NH_3).

6.3 INSTRUCTIONS

The following instructions are intended for the AdBlue injection system of the Bosch DeNO_x 5.2Q type.

Note *The materials and layouts of normal IVECO production are specifically approved; all other circumstances of variation must be specifically authorized.*

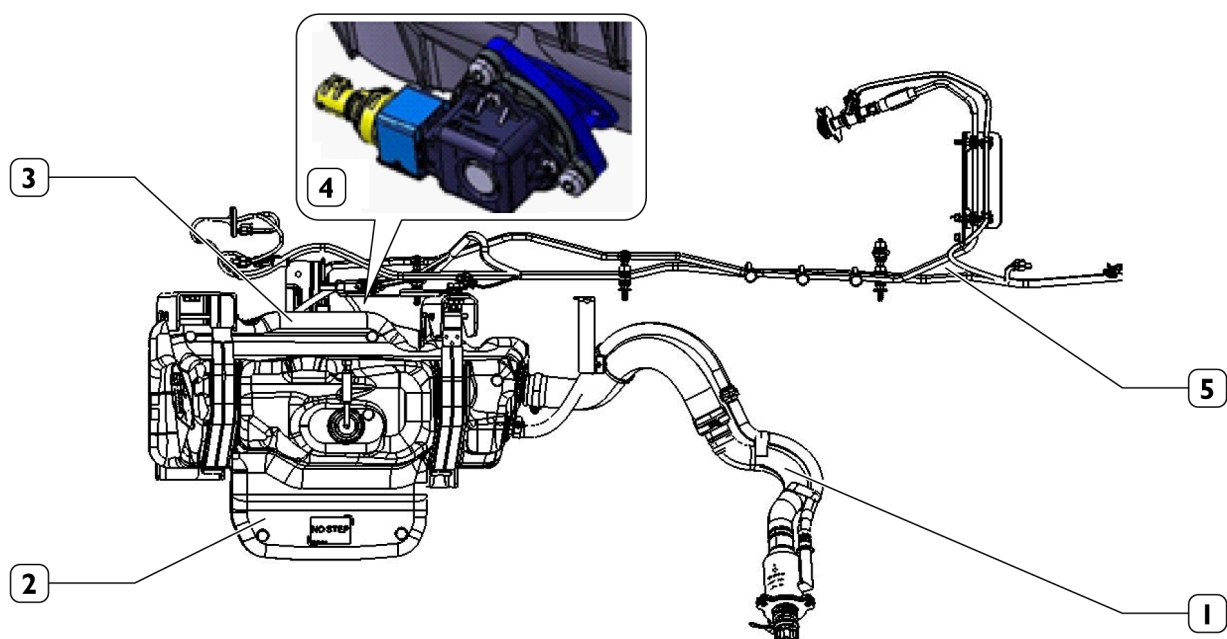
If changes are made to the chassis which involve this system, the following procedure must be followed under all circumstances:

- all post-treatment components must be installed under extremely clean conditions;
- the protection caps of the SM, DM and the AdBlue pipe bundle may only be removed just before assembly;
- the SM and DM fittings must be handled with care to ensure they are not broken during the operations;
- the screws securing the DM must be tightened to the torque specified in the assembly drawing;
- the seal of the DM flange on the ATS side must be replaced each time the DM is disassembled (the seal may only be used once);
- the "after-run" phase must not be interrupted using the battery manual switch or the ADR switch (the AdBlue pipes must always be emptied to prevent any crystallization or damage from freezing);

6.3.1 AdBlue tank



► **No modifications to the original tank are permitted.**



277297

Figure 2

1. AdBlue refuelling filler
2. AdBlue tank
3. SM Pumping module

4. Urea quality sensor (only for Euro VI engines)
5. Heated pipe for AdBlue delivery to dosing module DM

It should be noted that:

- The tanks must be equipped with fittings for bleeding and with a fitting for adding the AdBlue; the connections between the tank fittings and the inlet must be airtight.
- The tank must be positioned at a minimum height of 200 mm from the ground for an unloaded vehicle and in any case at a height equal to or greater than the lowest wire of the exhaust system.
- The tank is secured to the chassis with specific brackets; any modifications must be authorised by IVECO.
- The Pump / Tank (I) assembly can only be disassembled by IVECO Authorized Workshops and must be repositioned as per the type-approved layout and general production; any modifications must be authorised.
- The hydraulic connections must comply with Standard SAE_J2044 1/4.
- To ensure the seal of the SM pumping module on the tank, the ring nut tightening torque must be 85 Nm.

At the end of any operations which involve the AdBlue tank, make sure that:

- the tank ventilation pipe is not closed or restricted;
- the tank contains at least 5 litres of AdBlue to ensure the dosing module is cooled;
- the tank does not contain more than 85% of AdBlue (corresponding to the maximum reading of the level sensor) with respect to the tank total volume, so as to guarantee enough room for AdBlue to expand during freezing at temperatures below -11 °C.

6.3.2 AdBlue refuelling filler

The filler assembly consists of:

- a filler with a specific plug for AdBlue filler nozzles, a filter and a magnet for opening the nozzle valve;
- a pipe connecting the filler to the tank breather.

Note *If the filler door on the bodywork is modified, the original accessibility to the underlying plug must be maintained.*

The following points are mandatory since AdBlue crystallises at -11 °C:

- ensure the pipes are at an incline which prevents urea from accumulating (syphons) inside;
- respect the original incline of the filler in relation to the ground.

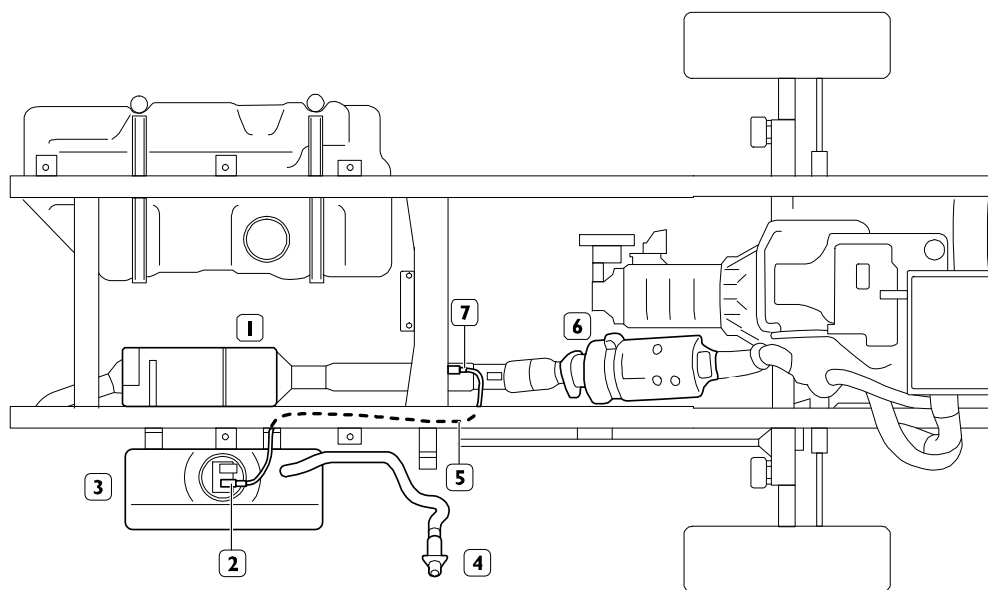
6.4 MOVING ADBLUE SYSTEM COMPONENTS



- ▶ **Modifications to the positions of the AdBlue system components are strongly discouraged and, in any case, must be specifically authorised by IVECO.**

Therefore please note that:

- a) the original position of the dosing module DM on the exhaust pipe must never be modified;
- b) any repositioning of the AdBlue tank must correspond to the installation heights of the already approved SM module;
- c) any new heated pipe (by configuration or length) must be chosen only from those adopted in production;
- d) plastic parts must be at least 200 mm from any heat source (eg. exhaust system); if heat-protecting panels are used this distance can be reduced to 80 mm.



208932

Figure 3

1. SCR catalytic converter
2. Pumping module (SM)
3. Adblue tank
4. Adblue refuelling inlet

5. Adblue delivery pipe
6. DPF Particulate filter
7. Dosing module (DM)

SECTION 7

EXPANSION

MODULE

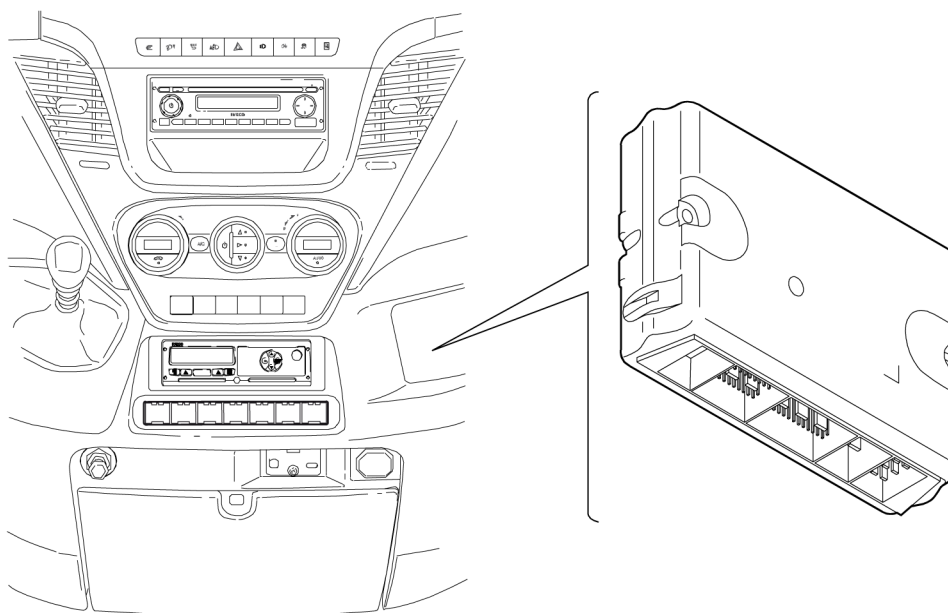
Contents

7.1	GENERAL INFORMATION	5
7.2	WIRING DIAGRAM	5
7.2.1	20-way EM connector, black (61071B)	6
7.2.2	12-way EM connector, black (72075B)	8
7.2.3	9-way EM connector, yellow (72071)	9
7.3	ADDITIONAL FUNCTIONS	10

EXPANSION MODULE

7.1 GENERAL INFORMATION

The Expansion Module (EM) is an electronic interface designed to manage the different types of configurations. It is housed under the dashboard, on the passenger side.



261815

Figure 1

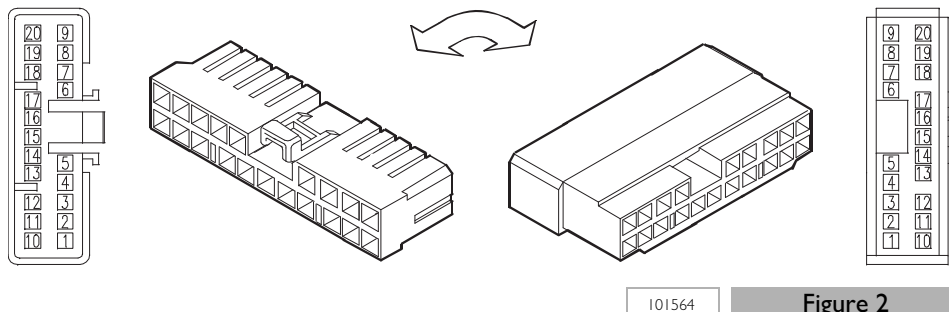
7.2 WIRING DIAGRAM

To ensure the functional integrity of the electrical system, IVECO has pre-installed specific connection points to be used for the added systems (see Chapter 5.4 - Paragraph "Current draws and fuses").

The Expansion Module control unit terminals are available via the two optional connectors 61071B and 72075B (also see Section 5 - Figure 2).

The vehicle may also be equipped with another optional connector: 72071.

7.2.1 20-way EM connector, black (61071B)



101564

Figure 2

Existing part on vehicle (male)

Counterpart to be coupled (female)

Table 7.5

Code	Description
500314820 EZ	Male contact for 0.35 to 0.5 mm ² cable
500314824 EZ	Male contact for 0.75 to 1.5 mm ² cable
504005092 EZ	Male contact for 2.5 mm ² cable

Table 7.6 - Basic functions of connector 61071B

Pin	Description	Cable code	Signal	Connected to	Remarks
1	Right stop light	9131	Output 1.5 A	EM X1/1	(1) +12 V = stop light activated No signal = stop light not activated
2	Right turn indicator	6985	Output 1.5 A	EM X1/3	(1) +12 V = turn indicator activated No signal = turn indicator not activated
3	Left stop light	9132	Output 1.5 A	EM X1/4	(1) +12 V = stop light activated No signal = stop light not activated
4	Left turn indicator light	6986	Output 1.5 A	EM X1/8	(1) +12 V = turn indicator activated No signal = turn indicator not activated
5	PTO 2 Solenoid / CS: Additional light 2 CS: Blue light 2	9123	Output 1.5 A	EM X1/6	(1) (2) 12 V = PTO engaged activation 0 V = PTO disengaged activation
6	Reserved / CS: Additional light 1 CS: Blue light 1	9995	3 A	EM X1/7	(1) (2) (3) 12 V = Light activated 0 V = Light deactivated
7	PTO 2 feedback	6132	Input 5 mA	EM X3/9	Connection to ground to read PTO2 Feedback
8	Reserved				
9	PTO 2 pressure switch	0392	Input 5 mA	EM X3/12	Connect to ground if active It can be used to allow PTO engagement by the Bodybuilder
10	Reserved	0393		EM X3/16	
11	Run-Lock switch	0132	Input 5 mA	EM X3/6	(1) (4) Critical for Safety, see the Warning note Ground = RunLock activation Open wire = no action

Pin	Description	Cable code	Signal	Connected to	Remarks
12	Scene light switch	0992	Input 5 mA	EM X3/18	(1) (5) +12 V = scene lights activation 0 V = no action
13	Additional light switch 1	0993	Input 5 mA	EM X3/19	(1) (5) +12 V = additional lights 1 activation 0 V = no action
14	Additional light switch 2	0994	Input 5 mA	EM X3/20	(1) (5) +12 V = additional lights 2 activation 0 V = no action
15	EMCY bodybuilders (For future applications)	0995	Input 5 mA	EM X3/21	Input to activate the Vehicle Stopped Status, only if the Bodybuilder enable input is also activated (61071B / Pin 18) Ground = activate low side switch Open wire = no action
16	PTO 2 switch	0391	Input 5 mA	EM X3/11	PTO 2 mode (5) Open circuit = not activated Ground = activated Without physical PTO, ISC Mode 2 activated
17	PTO 3 switch	0123	Input 5 mA	EM X3/7	PTO mode 3 (only for ISC) (5) Open circuit = not activated Ground = activated
18	Bodybuilder Enable	0991	Input 5 mA	EM X3/17	To be activated by Bodybuilder with Bodybuilder mission active Ground = activate low side switch Open wire = no action
19	Spare	5983		EM X4/29	
20	Run-Lock relay	6987	Output 1 A	EM X4/1	Possible reconfiguration via Customer Service (CS) +12 V = RunLock activated No signal = RunLock not activated

(1) Activation requires programming by Customer Service. Please contact IVECO After-Sales Service.

Output supported only during K15 ON. With K15 Off, the outputs are disabled.

(2) With the Additional Lights function enabled, the PTO functions are no longer available (see Chapter 7.3 (➡ Page 10)).

This also applies for activation of the PTO / ISC saved speeds for PTO Mode 1, 2, 3; these functions are also no longer available.

(3) If Additional Light 1 or Blue Light 1 are activated by Customer Service, then full vehicle CAN operation 72075B / 12 is no longer available (see Chapter 7.3 (➡ Page 10)).

In order to avoid any problems IVECO requests that the relay is disassembled for full vehicle CAN operation.

(4) The RunLock function is used for missions where the operator is not inside the cab.

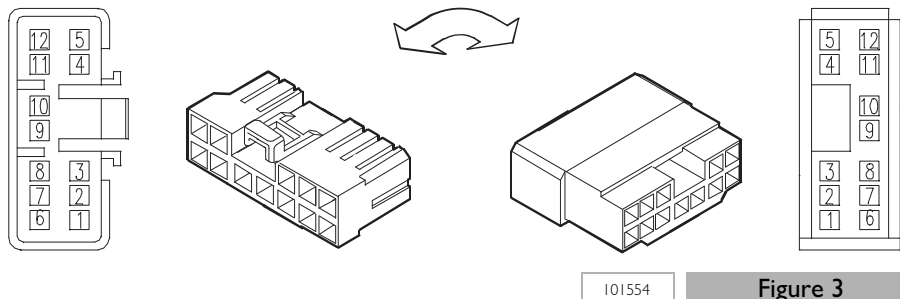
1. The RunLock Function must be enabled via TeleService.
2. The Bodybuilder must remove the Relay, if installed.
3. Also refer to Chapter 7.3 (➡ Page 10).

(5) The EM offers different configurations which can be selected upon specific request by the Customer. An overview of the available combinations is listed in Chapter 7.3 - Paragraph "Compatibility between PTO and additional functions".



► The functions related to the PTO are not available.

7.2.2 12-way EM connector, black (72075B)



Existing part on vehicle (male)

Counterpart to be coupled (female)

Table 7.7

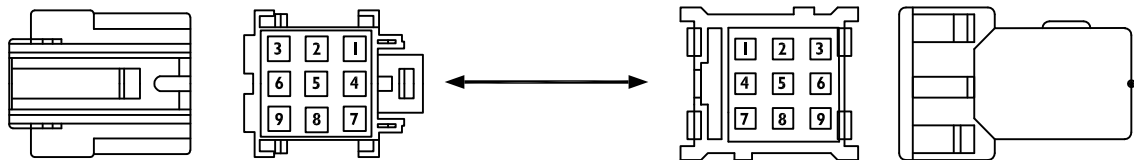
Code	Description
500314820 EZ	Male contact for 0.35 to 0.5 mm ² cable
500314824 EZ	Male contact for 0.75 to 1.5 mm ² cable
504005092 EZ	Male contact for 2.5 mm ² cable

Table 7.8 - Basic functions of connector 72075B

Pin	Description	Cable code	Signal	Connected to	Remarks
1	Right low-beam light relay	6988	Output 1 A	EM X4/2	To be enabled via TeleService If enabled the PTO / ISC stored speed is not available +12 V = low beams activated No signal = low beams not activated
2	Left low-beam light relay	6989	Output 1 A	EM X4/3	To be enabled via TeleService If enabled the PTO / ISC stored speed is not available +12 V = low beams activated No signal = low beams not activated
3	Reserved	0996		EM X4/6	
4	Alarm command	5981	Output 5 mA	EM X4/14	Possible reconfiguration via Customer Service (CS) +12 V = alarm function activation 0 V = no action
5	Reserved	5982		EM X4/15	
6	Reserved	5991		EM X4/16	
7	Engine stop control	6990	Output 1 A	EM X4/21	Output wired to ST 61071A / Pin 2 +12 V = engine stop activation Open wire = no action
8	Side light 10W	6991	Output 1 A	EM X4/22	Reconfiguration via CS possible If enabled ISC Memo / PTO stored speed is not available +12 V = side light activated No signal = side light not activated

Pin	Description	Cable code	Signal	Connected to	Remarks
9	Scene lights relay	6992	Output 1 A	EM X4/23	Reconfiguration via CS possible If enabled ISC Memo / PTO stored speed is not available +12 V = scene light activated No signal = scene light not activated
10	Reserved	5992		EM X4/38	
11	Ground	0000	5 A	Fuse box and distributor Terminal 14/17	
12	Vehicle with full CAN operation	0980	3 A		N.D. with Additional Light configuration via CS +12 V = Vehicle with full CAN operation Ground = Vehicle with full CAN operation

7.2.3 9-way EM connector, yellow (72071)



197421

Figure 4

Existing part on vehicle (male)

Counterpart to be coupled (female)

This connector is only present in the case of EM installation with CAN open (opt 75979).

Table 7.9

Code	Description
500314820 EZ	Male contact for 0.35 to 0.5 mm ² cable
500314824 EZ	Male contact for 0.75 to 1.5 mm ² cable
504005092 EZ	Male contact for 2.5 mm ² cable

Table 7.10 - Basic functions of connector 72071

Pin	Description	Cable code	Signal	Connected to	Remarks
1	K30 +	7772	TBD	BCM G/10	
2	K31	0000		Fuse box and distributor Terminal 14/17	Ground
3	CO enabled CIA413	0975	0.5A	EM X4/28	LSO activated with CO unit activation (generally ~ 3sec after K15) contact IVECO Customer Service for the adjustment Open circuit = CANopen not operational Ground = CANopen operational
4	Bodybuilders CAN H	6110	n.a.	EM X4/18	CAN Open truck gateway, see CIA 413
5	Reserved				

Pin	Description	Cable code	Signal	Connected to	Remarks
6	Bodybuilders CAN L	6111	n.a.	EM X4/20	CAN Open truck gateway, see CIA 413
7				Reserved	
8				Reserved	
9				Reserved	

7.3 ADDITIONAL FUNCTIONS

The Expansion Module can make additional functions available:

1. "Run-Lock" (ignition key removal, with the vehicle stationary, without the engine being stopped or electrical power supplies being interrupted).
2. Safety / Alarm (engine switching off or reduction in engine speed and possible flashing of low beam/high beam lights).
3. Additional Lights (flashing on the roof, scene lights or rear lights).

For more in-depth information on configuration and use, please refer to IVECO Customer Service.

APPENDIX C

Hi-MATIC

AUTOMATIC GEARBOX

Contents

C.1	GENERAL INFORMATION	5
C.2	LAYOUT	5
C.3	REQUIREMENTS	6
C.3.1	Gearbox release lever	6
C.3.2	Bowden cable	6
C.3.3	Propeller shaft	7
C.3.4	Rear cross member	7
C.3.5	Cooling	8
C.3.6	Additional devices	8
C.4	WARNING INDICATORS	8
C.4.1	Gearbox oil temperature	8

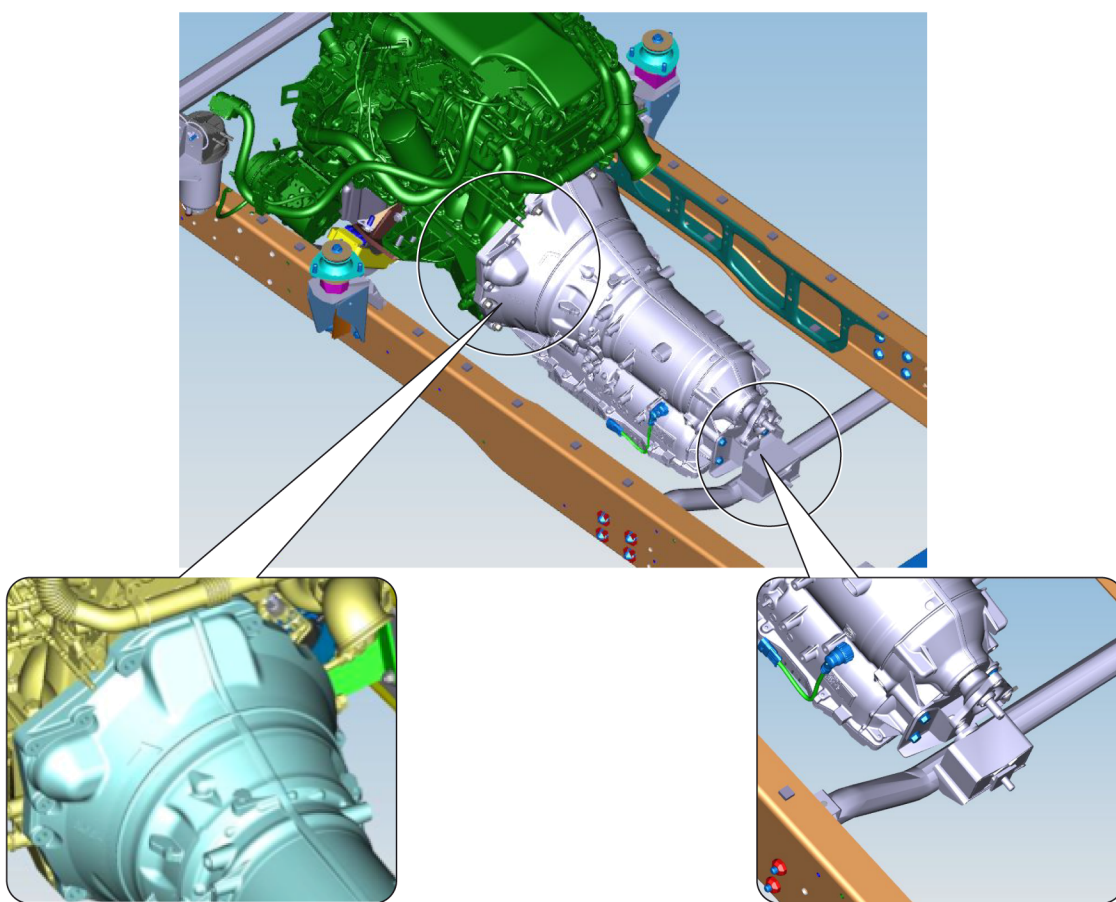
Hi-MATIC AUTOMATIC GEARBOX

C.I GENERAL INFORMATION

This document addresses the main specifications correlated with the presence of the Hi-MATIC automatic gearbox on the vehicle as well as the indications that must be followed before outfitting commences.

See the Bodybuilders' Manual on vehicles equipped with mechanical gearbox for other information.

C.2 LAYOUT



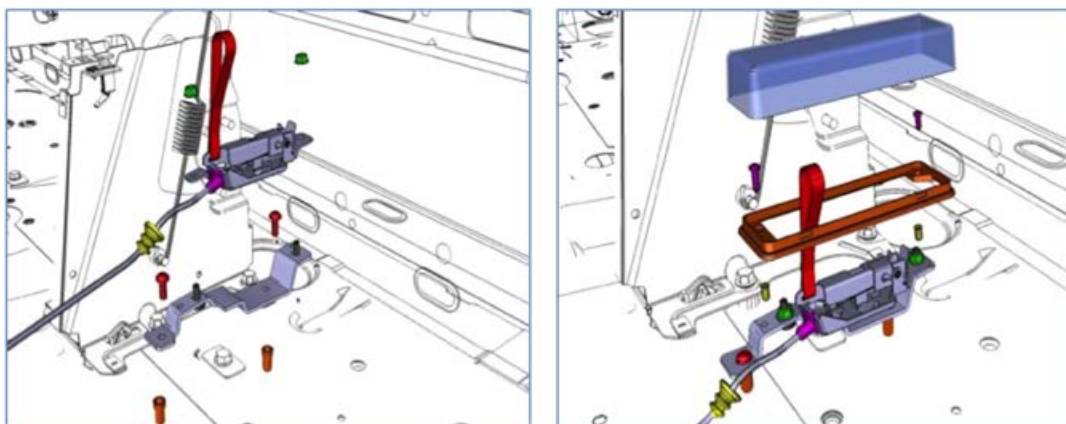
261977

Figure I

Some essential technical specifications (engine, propeller shaft, bonnet cable and dashboard cable, gearbox additional cooling system) and the need to subject the vehicle to new type-approval make it practically impossible to convert from a manual gearbox to an automatic gearbox, unless the "Power Pack" is replaced (engine/gearbox unit).

C.3 REQUIREMENTS

C.3.1 Gearbox release lever



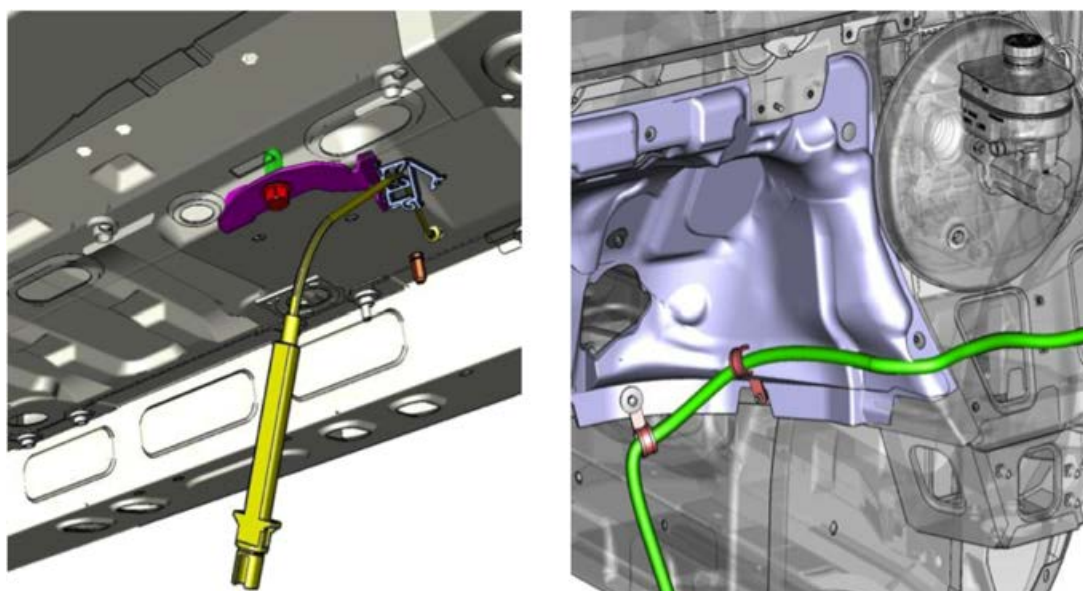
210249

Figure 2

The lever can be positioned in a different location than its original mounting position, as long as:

- it compulsorily remains inside the cab;
- is accessible from the drivers' seat;
- does not entail great variation of the connected Bowden cable route.

C.3.2 Bowden cable



210250

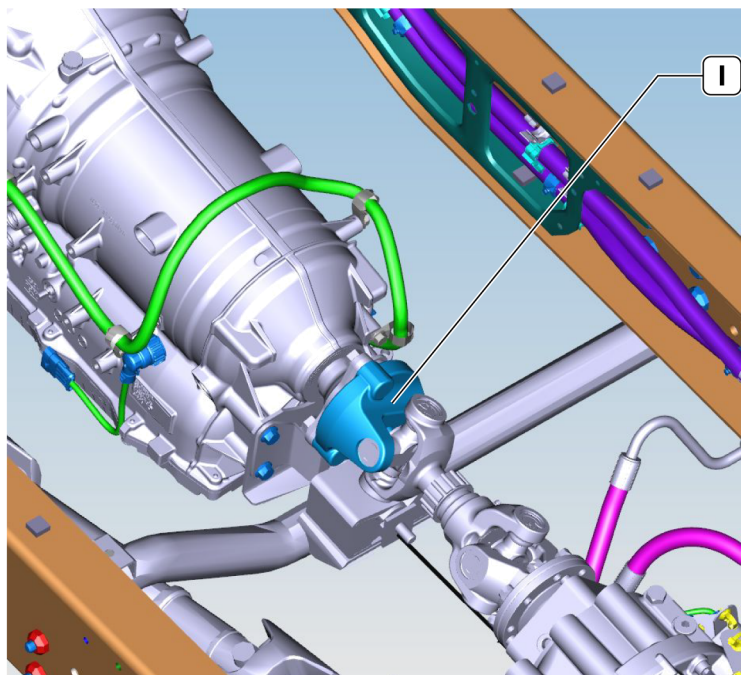
Figure 3

In order to maintain efficiency (performance) of the release system, the length of the Bowden cable must remain the same despite any new anchoring points and new layout.

Furthermore the Bowden cable must never be bent to an angle below 150°.

Note The warranty shall be voided if using different cable lengths or types.

C.3.3 Propeller shaft



261978

Figure 4

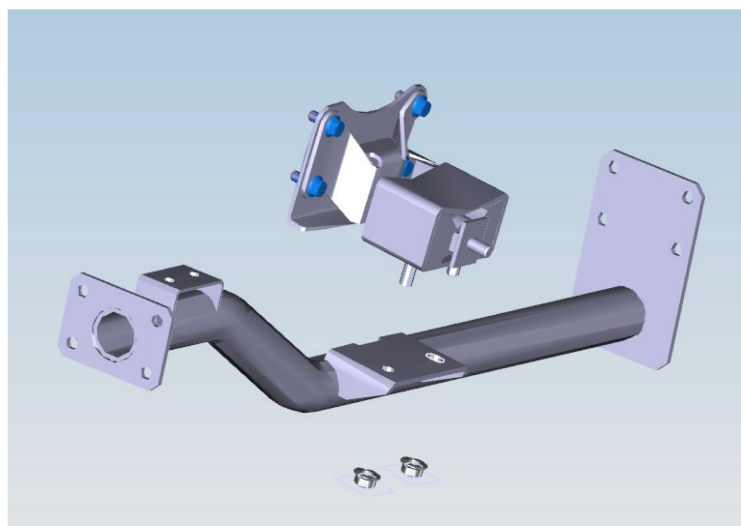
The automatic gearbox requires a specific propeller shaft for length and for the coupling joint (I).

Any modifications which involve changes in one or more of these characteristics (e.g. wheelbase modification), are the full responsibility of the person who makes these modifications.

C.3.4 Rear cross member

A specific crossbar is mounted to support the transmission from the rear (following Figure); despite this fact, in comparison to manual transmission vehicles, the comparability with structures installed behind the cab (e.g. crane) remains the same.

Careful verification is advised before proceeding.



261979

Figure 5

C.3.5 Cooling

- **Given that the original positions of the cooling assemblies/parts yield the best operating performance and thus efficiency, changes are strictly forbidden and any variations not recommended.**

a) Gearbox oil radiator and pipes

As the oil characteristics for automatic transmissions must carefully be kept intact, it is necessary to:

- maintain the oil level according to the requirements provided in the technical documents supplied with the vehicle;
- preserve the original connections of the pipes to the radiator and gearbox, in order to prevent extractions and possibility of oil pollution.

Slight displacements are allowed without any advance authorisation by IVECO only for needs of access during outfitting installation, making sure that no pipes are disconnected.

Note *Consistent displacements, definitive and/or with exceptional characteristics, must always be submitted to IVECO Engineering for approval, which will provide correct instructions for the new layout.*

b) Fan

The fan intake air flow must not be altered or decreased in comparison to the original situation.

For the same reason, the position of the exchanger must remain unchanged in relation to the position of the conveyor and engine fan.

C.3.6 Additional devices

Note *On DAILY 4x4 with Hi-MATIC gearbox, no type of power take-off (PTO) or retarder can be fitted.*

C.4 WARNING INDICATORS**C.4.1 Gearbox oil temperature**

The Hi-MATIC gearbox temperature is monitored by sensors on a mechatronics module.

The resulting signals are processed by the module in order to protect the transmission.

In detail:

- if $T \geq 120\text{ }^{\circ}\text{C}$ a warning indication is displayed on the dashboard in the cab in the form of a red indicator light that switches ON, making it necessary to stop the vehicle due to transmission oil overtemperature;
- if $T \geq 125\text{ }^{\circ}\text{C}$ the automatic transmission ECU forces the engine EDC to reduce torque/power (derating). Furthermore, the function that controls derating "GET_M_MOTMAX" forces vehicle operation only in 6th gear;
- if $T \geq 142\text{ }^{\circ}\text{C}$ and the vehicle is still in motion, the automatic transmission ECU "shuts down" the engine and, thus, stops the vehicle.