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Data and information contained in this publication may be outdated as a result of changes adopted by IVECO, at any time, for technical or commercial reasons or due to the need to adapt the vehicle to new legal requirements.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

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<tr>
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<td>Indicates correct behaviour in order that vehicle use is as environmentally friendly as possible.</td>
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GENERAL INFORMATION

1.1 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.

1.2 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.

1.3 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;
- applications of retarders;
- power take-off applications;
- tyre size variations;
- modifications to the coupling parts (hooks, articulations);
- any modification not included in these Guidelines.
1.4 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.

1.5 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.

1.6 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.

1.7 TYPE APPROVAL

With reference to Directive 2007/46/EU, the manufacturer of the vehicle is defined as the "1st stage Manufacturer" while the Bodybuilder is defined as the "2nd stage Manufacturer" or subsequent.

Technical Agreement

A contract of cooperation known as a "Technical Agreement" must be drawn up and signed between IVECO "1st stage Manufacturer" and a Bodybuilder who intends to carry out type approval. This Technical Agreement will establish in detail, the contents and obligations of both parties.

As a result of this contract:
• IVECO is responsible for providing, in the agreed form, the type approval documents (EC/ECE type approvals) and the technical information necessary for the proper implementation of the fitting and/or transformation (manuals, drawings, specifications);

• The Bodybuilder is responsible for:
  ■ the design and implementation of modifications to the basic vehicle received from IVECO
  ■ reattainment of type approvals of systems already type-approved in a previous stage if type approvals need to be updated due to changes made to the basic vehicle
  ■ 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 qualify the Bodybuilder, in order to verify suitability to achieve the potential fittings and/or transformations.

The contents of the "Technical Agreement" can be evaluated in detail upon request to the Manager for relations with Bodybuilders for the individual Market.

**Determination of the CO₂ emissions and fuel consumption of vehicles to be subjected to "individual" or "multi-stage" type approval**

Directive 510/2011/EU specifies that the "1st stage Manufacturer" is responsible for CO₂ emissions of vehicles manufactured in several stages:

• even after completion by the "2nd stage Manufacturer"
• Regardless of the type and scale of the interventions

Therefore, when the vehicle is "incomplete" or "complete" and is then subjected to a subsequent modification:

• the "1st stage Manufacturer" (for example, IVECO) must ensure the availability of a calculation instrument for the "2nd stage Manufacturer" (Bodybuilder) to determine the final values of the CO₂ emissions and fuel consumption of the completed vehicle (see annex XXI to Regulation 2017/1151/EU)
• the Bodybuilder must enter the information relating to the completed vehicle on a form (provided by IVECO) in addition to the information (already known) relating to the basic vehicle (see annex IX to Directive 2007/46/EU)


*a) Single Type Approval / Inspection (Single Type Approval)*

The Bodybuilder must enter the following into the calculation instrument:

• VIN code (*Vehicle Identification Number*, number of the vehicle chassis)
• MRO mass (*Mass Running Order*) of the completed vehicle in running order (sum of the mass of the incomplete vehicle and the basic outfitting, which must be between 2355 kg and 2815 kg for the vehicle to be included in the "Light Duty" category).

This data is used to produce a report (see Figure 1) which, together with the "1st stage Certificate of Conformity" (COC) serves to complete the documentation required for vehicle registration.

*b) 2nd stage or subsequent European Type Approval (Multi Stage Type Approval)*

The Bodybuilder must enter the following into the calculation instrument:

• VIN code (*Vehicle Identification Number*, number of the vehicle chassis)
• MRO mass (*Mass Running Order*) of the completed vehicle in running order (sum of the mass of the incomplete vehicle and the basic outfitting, which must be between 2355 kg and 2815 kg for the vehicle to be included in the "Light Duty" category).
• mass of the "2nd stage" optional devices added to the basic version
• the highest mass of the combination of optional devices which can be added to the standard equipment of the completed vehicle ("2nd stage")
• vehicle class of the completed vehicle (if they are replaced)
• front area of the completed vehicle (according to Standard ISO 612)
• axle ratio of the completed vehicle (if modified)
• outfitting code (derived from the official list of Directive 2007/46/EU)

This data is used to produce a report (see Figure 1) needed to complete some specific parts of the "2nd stage Certificate of Conformity" required for vehicle registration.

### FUEL CONSUMPTION AND CO2 EMISSIONS

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<td>Weighted, combined:</td>
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<tr>
<td>Weighted, combined:</td>
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</tr>
<tr>
<td>Test mass (kg):</td>
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<td>(1)</td>
<td>(2)</td>
</tr>
</tbody>
</table>

The CO2 emissions value is defined on the basis of official test according with the provisions of the EU Regulation in force at the time of type approval.
(1) in accordance with Annex XII, point 2 of the Commission Regulation (EU) No 2017/1153, the version in force.
(2) CO2 value determined on the basis of the measurement correlation method referring to the NEJDC cycle in accordance with Commission Regulation (EU) No 2017/1153, the version in force.
(3) CO2 value determined according to the new WLTP test procedure in accordance with Commission Regulation (EU) No 2017/1153, the version in force.
(4) Data compiled on the basis of the declared fuel.

---

**Figure 1**
1.8 Warranties

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.

1.9 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.

1.10 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.
1.11 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.

1.12 VEHICLE MANAGEMENT ON THE PART OF BODYBUILDER

1.12.1 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.

1.12.2 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.

1.12.3 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.

### 1.13 VEHICLE NAMES

The commercial name of IVECO vehicles (for example **DAILY 40-160**) does not correspond to the type approval name. A complete example is provided below.

**1.13.1 Type approval name**

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<thead>
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<th><strong>DAILY 40C16HA8 SV/P</strong></th>
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</tr>
<tr>
<td><strong>40</strong> – Gross mass - GVW (no/10 = weight in t)</td>
</tr>
<tr>
<td>33</td>
</tr>
<tr>
<td>35</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>45</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>65</td>
</tr>
<tr>
<td>70</td>
</tr>
<tr>
<td><strong>C</strong> – Rear wheels</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td><strong>16</strong> – Engine power (no. x 10 = power in HP)</td>
</tr>
<tr>
<td><strong>H</strong> – Engine type</td>
</tr>
<tr>
<td>–</td>
</tr>
<tr>
<td>H</td>
</tr>
<tr>
<td>G</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td><strong>A8</strong> – Type of transmission</td>
</tr>
<tr>
<td>–</td>
</tr>
<tr>
<td>A8</td>
</tr>
</tbody>
</table>
1.14 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.

For the actual measurements and for the realization of a possible template, please consult the design 5801 620982.

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

1.15 DIMENSIONS AND GROUND

1.15.1 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.
1.15.2 Vehicle adaptability

The body length limits depend on:

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

On DAILY MY2019, the measurements 2200 mm and 2350 mm (up to version 50C) and 2550 mm (starting with the version 60C) are type-approved.

1.15.3 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 arms of varying widths available in the catalogue (opt. 73022, 73024, 73025).

1.15.4 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.

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.

![Figure 4](image1.png)

Even distribution of load

Uneven distribution of load

![Figure 5](image2.png)

Even distribution of load

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

1.15.5 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

\[ H_t = \frac{W_v \cdot H_v + W_s \cdot H_s}{W_v + W_s} \]
\[ H_s = \frac{(W_v + W_s) \cdot H_t - W_v \cdot H_v}{W_s} \]

Control at full load

Hv = 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  
Wv = 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 (payload + dump body and/or equipment) with reference to the vehicle’s crossways stability.

**Table 1.1**

<table>
<thead>
<tr>
<th>Models</th>
<th>Height of centre of mass (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33S</td>
<td>1400</td>
</tr>
<tr>
<td>35S</td>
<td>1500</td>
</tr>
<tr>
<td>35C - 40C (Frontal transverse leaf)</td>
<td>1800</td>
</tr>
<tr>
<td>35C - 40C (Front longitudinal torsion bar)</td>
<td>1900</td>
</tr>
<tr>
<td>45C - 50C</td>
<td>1950</td>
</tr>
<tr>
<td>60C - 65C - 70C</td>
<td>2050</td>
</tr>
</tbody>
</table>

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.

1.15.6 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 (☞ Page 31)) 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).

1.15.7 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 ± 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.
1.15.8 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.

1.16 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.
1.17 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.

![Figure 7](image)

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.

1.18 CONVENTIONS

The following conventions are adopted in these Guidelines:

- **Wheelbase**: distance between the centre lines of the first steering axle and the first rear axle (engine or not).
- **Rear overhang**: distance between the centre line of the last axle and the rear extremity of the chassis side members.
- **Dimensions A, B and t** of the chassis section: see the picture on the side.

![Figure 8](image)
SECTION 2

CHASSIS

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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 9) and in Chapters 2.4 (⇒ Page 15), and 2.5 (⇒ Page 19));
- **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" (⇒ Page 11));
- 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).
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 48) 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>
<thead>
<tr>
<th>Table 2.1 - Material to be used in chassis modifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of steel</td>
</tr>
<tr>
<td>IVECO</td>
</tr>
<tr>
<td>Europe</td>
</tr>
<tr>
<td>Germany</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2.2 - Section dimension and chassis thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>33S-35S</td>
</tr>
<tr>
<td></td>
</tr>
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<td></td>
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<td></td>
</tr>
<tr>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>35C</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
### Table

<table>
<thead>
<tr>
<th>Class</th>
<th>Type</th>
<th>Wheelbase [mm]</th>
<th>Rear overhang chassis [mm]</th>
<th>A x B x t Side member section wheelbase area [mm]</th>
<th>A x B x t Side member section rear overhang area [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>3SC - 50C</td>
<td>truck</td>
<td>3000</td>
<td>1240</td>
<td>174 x 70 x 4</td>
<td>114 x 70 x 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3450</td>
<td>1355</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3750</td>
<td>1655</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4100</td>
<td>1715</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4350 (1)</td>
<td>1885</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4750 (2)</td>
<td>2350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3SC - 40C</td>
<td>van</td>
<td>3520</td>
<td>840</td>
<td>174 x 69 x 3</td>
<td>114 x 69 x 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3520 long overhang</td>
<td>1240</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4100</td>
<td>1825</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4SC - 50C</td>
<td>van</td>
<td>3520</td>
<td>840</td>
<td>174 x 70 x 4</td>
<td>114 x 70 x 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3520 long overhang</td>
<td>1240</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4100</td>
<td>1825</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60C - 70C</td>
<td>truck</td>
<td>3450</td>
<td>1355</td>
<td>174 x 69 x 5</td>
<td>174 x 69 x 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3750</td>
<td>1655</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4100</td>
<td>1715</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4350</td>
<td>1885</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4750</td>
<td>2350</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5100</td>
<td>2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>van</td>
<td>4100</td>
<td>1825</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4100 long overhang</td>
<td>2220</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) Only 3SC
(2) Only 4SC - 50C

### 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: $\sigma_{\text{min}} = 120 \text{ N/mm}^2$

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.

![Image of hole positioning](image_url)

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>
<thead>
<tr>
<th>Resistance class</th>
<th>Use</th>
<th>Breaking strength [N/mm²]</th>
<th>Yield stress [N/mm²]</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.8</td>
<td>Intermediate resistance screws (cross members, shear resistant plates, brackets)</td>
<td>800</td>
<td>640</td>
</tr>
<tr>
<td>10.9</td>
<td>High resistance screws (springs supports, stabilizer bars and shock absorbers)</td>
<td>1000</td>
<td>900</td>
</tr>
</tbody>
</table>

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).

![Figure 3](image)

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 leafs 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).

- 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).

- 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 of 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 13)).
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 18-1600 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 18 - 1600 (Prospectus I)**

<table>
<thead>
<tr>
<th>Class</th>
<th>Part requirements</th>
<th>Examples of parts involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Parts in direct contact with atmospheric agents</td>
<td>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.</td>
</tr>
<tr>
<td>B</td>
<td>Parts in direct contact with atmospheric agents that mainly have structural characteristics, in clear sight</td>
<td>Chassis and relative parts, including its fasteners Parts below the front grille (class B) External cab footboards</td>
</tr>
<tr>
<td></td>
<td>Only for rear axles and front axles</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Parts in direct contact with atmospheric agents, not in clear view</td>
<td>Engine and relative parts</td>
</tr>
<tr>
<td>D</td>
<td>Parts not in direct contact with atmospheric agents</td>
<td>Pedals - Seat covering - Fastening elements - etc., mounted inside the cab</td>
</tr>
</tbody>
</table>

**Table 2.5 - Unpainted aluminium parts - IVECO Standard 18 - 1600 (Table IV)**

<table>
<thead>
<tr>
<th>Type of protection</th>
<th>IVECO standard</th>
<th>Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel (1)</td>
<td>18-0506</td>
<td>A</td>
</tr>
<tr>
<td>Geomet (2)</td>
<td></td>
<td>yes</td>
</tr>
<tr>
<td>GEO 321-8</td>
<td>18-1101</td>
<td>yes</td>
</tr>
<tr>
<td>GEO 500-8</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>GEO 321-8 PM</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>GEO 321-8 PML</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>GEO 321-8 PL</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>GEO 500-8 PL</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>GEO 321-5</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>GEO 500-5</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>GEO 321-5 PM</td>
<td></td>
<td>–</td>
</tr>
</tbody>
</table>
## 2.3 RUST AND PAINT PROTECTION

<table>
<thead>
<tr>
<th>Type of protection</th>
<th>IVECO standard</th>
<th>Classes</th>
<th>A</th>
<th>B - B1 - B2</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geomet ‡</td>
<td>GEO 321-5 PML</td>
<td>18-1101</td>
<td>–</td>
<td>yes</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>GEO 321-5 PL</td>
<td></td>
<td></td>
<td>yes Class B1 wheel studs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GEO 500-5 PL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zinc coating ‡</td>
<td>Fe/Zn 12 II</td>
<td>18-1102</td>
<td>–</td>
<td>–</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>Fe/Zn 7 IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fe/Zn 12 IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fe/Zn 7 IV LUB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fe/Zn 7 IV S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fe/Zn 12 IV S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alloy Zn-Ni</td>
<td>Fe/Zn Ni 7 VI S</td>
<td></td>
<td>–</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>Fe/Zn Ni 7 IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminium</td>
<td>Anode oxidation</td>
<td>18-1148</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>Painting</td>
<td>See Table III</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

(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 18 - 1600 (Prospectus III)

<table>
<thead>
<tr>
<th>Cycle phase description</th>
<th>Classes</th>
<th>A</th>
<th>B ‡</th>
<th>B1 ‡</th>
<th>B2</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>MECHANICAL SURFACE CLEANING ‡</td>
<td>Sandshot blasting</td>
<td>–</td>
<td>yes ‡</td>
<td>–</td>
<td>yes ‡</td>
<td>yes ‡</td>
<td>yes ‡</td>
</tr>
<tr>
<td></td>
<td>Brushing</td>
<td></td>
<td>yes ‡</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sandpapering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRE-TREATMENT</td>
<td>Iron phosphating (only for non-precoated ferrous materials)</td>
<td>–</td>
<td>yes ‡</td>
<td>–</td>
<td>yes ‡</td>
<td>yes ‡</td>
<td>yes ‡</td>
</tr>
<tr>
<td></td>
<td>Zinc phosphating (‡)</td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CATAPHORETIC PAINTING</td>
<td>High thickness (30-40 μm)</td>
<td>yes ‡</td>
<td>yes ‡</td>
<td>–</td>
<td>yes ‡</td>
<td>yes ‡</td>
<td>yes ‡</td>
</tr>
<tr>
<td></td>
<td>Medium thickness (20-30 μm)</td>
<td>yes ‡</td>
<td>yes ‡</td>
<td></td>
<td>yes ‡</td>
<td>yes ‡</td>
<td>yes ‡</td>
</tr>
<tr>
<td></td>
<td>Acrylic finishing (&gt;35 μm)</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RUST PREVENTER</td>
<td>Bi-component (30-40 μm)</td>
<td>–</td>
<td>yes</td>
<td>–</td>
<td>yes ‡</td>
<td>yes ‡</td>
<td>yes ‡</td>
</tr>
<tr>
<td></td>
<td>Single-component (30-40 μm)</td>
<td>–</td>
<td>yes</td>
<td>–</td>
<td>yes</td>
<td>yes ‡</td>
<td>yes ‡</td>
</tr>
<tr>
<td>ANTIROCK PRIMER</td>
<td>Single (130 °C) or bicomponent (30-40 μm)</td>
<td>yes ‡</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>VARNISH</td>
<td>Single (130 °C) or bicomponent (30-40 μm)</td>
<td>yes ‡</td>
<td>–</td>
<td>–</td>
<td>yes ‡</td>
<td>yes ‡</td>
<td>yes ‡</td>
</tr>
<tr>
<td></td>
<td>Powders (40-110 μm)</td>
<td>yes ‡</td>
<td>–</td>
<td>–</td>
<td>yes ‡</td>
<td>yes ‡</td>
<td>yes ‡</td>
</tr>
<tr>
<td></td>
<td>Low temperature single-component (30-40 μm)</td>
<td>–</td>
<td>–</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(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.

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

(9**) 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

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

(1) Modifications on rear axles, from axles and engine (classes B1 and C) not allowed

(2) Preferably epoxy

(3) Preferably polyurethane

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

<table>
<thead>
<tr>
<th>Type of protection</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel</td>
<td>A - B (1)</td>
</tr>
<tr>
<td>Geomet</td>
<td>yes</td>
</tr>
<tr>
<td>Zinc coating (1)</td>
<td>–</td>
</tr>
</tbody>
</table>

(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**

<table>
<thead>
<tr>
<th>Model</th>
<th>Suspension front ()</th>
<th>Maximum load on front axle [kg]</th>
<th>Maximum load on rear axle [kg]</th>
<th>Maximum value of wheelbase [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>335</td>
<td>Quad-leaf</td>
<td>1800</td>
<td>2060</td>
<td>3450</td>
</tr>
</tbody>
</table>
### 2.4 Wheelbase Modification

<table>
<thead>
<tr>
<th>Model</th>
<th>Suspension front (*)</th>
<th>Maximum load on front axle [kg]</th>
<th>Maximum load on rear axle [kg]</th>
<th>Maximum value of wheelbase [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>3SS</td>
<td>Quad-Leaf</td>
<td>1900</td>
<td>2200</td>
<td>4100</td>
</tr>
<tr>
<td>3SC</td>
<td>Quad-Leaf</td>
<td>1900</td>
<td>2600</td>
<td>4100</td>
</tr>
<tr>
<td></td>
<td>Quad-Tor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50C</td>
<td>Quad-Tor</td>
<td>2100</td>
<td>3700</td>
<td>4750</td>
</tr>
<tr>
<td>60C</td>
<td>Quad-Tor</td>
<td>2300</td>
<td>4650</td>
<td>5100</td>
</tr>
<tr>
<td>65C</td>
<td>Quad-Tor</td>
<td>2500</td>
<td>5000</td>
<td>5100</td>
</tr>
<tr>
<td>70C</td>
<td>Quad-Tor</td>
<td>2500</td>
<td>5350</td>
<td>5100</td>
</tr>
</tbody>
</table>

(*) Quad-Leaf = cross leaf spring; 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

<table>
<thead>
<tr>
<th>Model</th>
<th>Suspension front (*)</th>
<th>Maximum load on front axle [kg]</th>
<th>Maximum load on rear axle [kg]</th>
<th>Minimum value of wheelbase [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>3SS</td>
<td>Quad-Leaf</td>
<td>1800</td>
<td>2060</td>
<td>3000</td>
</tr>
<tr>
<td>3SC</td>
<td>Quad-Leaf</td>
<td>1900</td>
<td>2200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quad-Tor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50C</td>
<td>Quad-Tor</td>
<td>2100</td>
<td>3700</td>
<td>3450</td>
</tr>
<tr>
<td>60C</td>
<td>Quad-Tor</td>
<td>2300</td>
<td>4650</td>
<td></td>
</tr>
<tr>
<td>65C</td>
<td>Quad-Tor</td>
<td>2500</td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td>70C</td>
<td>Quad-Tor</td>
<td>2500</td>
<td>5350</td>
<td></td>
</tr>
</tbody>
</table>

(*) Quad-Leaf = cross leaf spring; 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 9)) mark a second line of reference points so that the work area is set between the two lines (plan for a distance 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 9);
- 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 9).

Additional information

- Protect the surfaces against oxidation as in Paragraph "Added or modified parts" (⇒ Page 13).
- Restore the braking and electrical systems as according to Chapters 2.15 (⇒ Page 48) and 5.4 .
- Follow the instructions in Chapter 2.8 (⇒ Page 26) 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 or 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.).

Figure 6 shows an example.

In any case an additional crossbar must be installed for elongations exceeding 600 mm.

The distance between the two cross members must generally be within 1000–1200 mm.

The minimum distance between two cross members, especially for "heavy duty use" must not be less than 600 mm; this restriction excluded "lightweight" cross member supporting the transmission and shock absorbers.

2.4.8 Reinforcements on the chassis

Figure 7 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.
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 (Page 26) 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.

**Note** If you need to adjust the length of the electrical circuits, see Chapter 5, "Special instructions for 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 extension, are shown in Figures 8, 9 and 10.

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 8 and 9; 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 10.

![](image1.png)

*Figure 8*

![](image2.png)

*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 tow hook must be suitable for the permitted loads and must be of type approved by national legislation.

> 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 11).

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.

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 INSTALLING THE TOW HOOK

1. Free field for towing hooks

2. Free field for coupling hooks according to standard DIN 74058 ESC-152
2.6.3 Hook types

The following types of hook are available:

1. ball-joint
2. automatic

Hooks with pins can only be installed on the truck version and require the use of a suitable cross member.

Both types, if not supplied directly by IVECO, must be type-approved in accordance with current regulations.

Table 2.11 lists certain data for the tow couplings available from the production line.

<table>
<thead>
<tr>
<th>Type</th>
<th>Class</th>
<th>D [kN]</th>
<th>S [kN]</th>
<th>No. of ECE type approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSS00</td>
<td>5</td>
<td>23</td>
<td>2.8</td>
<td>E11 SSR-010533</td>
</tr>
<tr>
<td>GA381</td>
<td>5</td>
<td>30</td>
<td>3.5</td>
<td>E11 SSR-011613</td>
</tr>
</tbody>
</table>

2.6.4 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 central axle trailers therefore requires the use of suitable tow hooks and appropriate reinforcement to the tractor chassis (see Table 2.12).

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).

Towing hooks that bear special approvals and with values greater than those listed in the above standards may be used. However, these towing hooks may pose restrictions in relation to the type of trailer used (e.g. drawbar length); in addition, the drawbar may require reinforcement for the towing vehicle as well as larger counter chassis profile section.

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

\[ D_c = g \left( T \cdot C \right) / (T + C) \]
\[ V = a \cdot C \left( X^2 / L^2 \right) \]

- \( D_c \) = 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]
- \( S \) = static vertical load on the hook [kg], namely part of the mass of the trailer which, in static conditions, is transmitted to the coupling point on the vehicle. Since \( S \) must be at least equal to 4% of \( R \) (\( R = 3,500 \) kg max with inertia braking), the first equipment hook is type-approved for \( S = 150 \) kg. However, in the case of a centre axle trailer, where \( R = 750 \) kg (limit without braking), the value of \( S \) must be at least 25 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]

* Printed 692.69.008 – Ed. - Base 03/2020
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 12)

L = theoretical drawbar length, distance between the centre of the drawbar eye and the centre line of the trailer axles [m], (see Figure 12)

\[ \frac{X^2}{L^2} \geq 1 \] if the result is less than the unit, use the value 1

Table 2.12 shows data for the towing cross member in production for a central axle trailer.

<table>
<thead>
<tr>
<th>Type</th>
<th>Class</th>
<th>D [kN]</th>
<th>S [kN]</th>
<th>No. of ECE type approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>TI2018 - TH018</td>
<td>S</td>
<td>18</td>
<td>2.0</td>
<td>E11 S5-017533</td>
</tr>
<tr>
<td>TI2019 - TH019 - TH000</td>
<td>S</td>
<td>23</td>
<td>2.8</td>
<td>E11 S5-017534</td>
</tr>
</tbody>
</table>

2.6.5 Rear crossbar in lowered position

When the drawbar coupling must be lowered from its original position, IVECO may issue an authorisation to lower the original drawbar or install an additional drawbar, which is the same as the original, in a lowered positioned.

Figures 13 and 14 show the examples respectively.

Connection of the drawbar in its new position must be performed in the same way and using screws of the same type (diameter and resistance class) in relation to the original connection.

Anti-unscrewing systems must be used in the connections.
2.6 Installing the Tow Hook

1. Chassis side member
2. Bracket for lowered cross member

Figure 13

1. Chassis side member
2. Bracket for lowered cross member

Figure 14

2.6.6 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.

2.6.7 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.
2.6.8 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

The installation of extra axles on the vehicle is not envisaged.

2.8 MODIFICATIONS TO THE DRIVELINE

Following modification of the wheelbase, any modification to the driveline must be made according to the layout of the driveline of an equivalent standard production vehicle with a similar wheelbase.

The maximum tilt values of the standard propeller shafts must be respected, also in the event of interventions on the suspension and on the engine rear axle.

If any difficulties arise, contact the IVECO TECH PE T&H - BODY BUILDER SUPPORT and send them a diagram with the length and tilt of the new driveline for a constant-velocity check.

The technical specifications indicated in the manuals provided by the Manufacturers of the drivelines, must be used to ensure correct production and positioning of the sections.

\[
\beta_n = \sqrt{\pm \beta_1^2 \pm \beta_2^2 \pm \beta_3^2} \leq 3^\circ
\]

Maximum allowed angularity

\( n = \text{engine speed} \)

\( \beta_1 \cdot n < 20,000 \) for classes 2040-2045-2050

\( \beta_3 \cdot n < 25,000 \) for classes 2025-2030-2035

Values that must be valid both when the vehicle is empty (tare only) and when the vehicle has a static load considering the maximum allowed load on the rear axle.

The indications provided in this manual serve to safeguard the correct operation of the driveline, limit the sound level and avoid stress transmitted by the drive assembly. In no way does this relieve the Outfitter of any work related liabilities.
2.8.1 Permitted lengths

1. The maximum possible operating lengths, both for "LG" sliding sections as well as for "LZ" intermediate ones (see Figure 16), may be determined based on the outer diameter of the existing pipe of the vehicle and on the maximum number of operating revs. (see formula and Table 2.13).

If the shaft length calculated in this fashion is insufficient for the modification at hand, it is necessary to insert a new section with the same characteristics as those mounted.

2. In some cases, a propeller shaft with a larger diameter can be used and calculated (again, see Table 2.13) in relation to the length required and the maximum number of engine rpm.

![Figure 16](image)

<table>
<thead>
<tr>
<th>LG</th>
<th>Length of sliding sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>LZ</td>
<td>Length of intermediate sections</td>
</tr>
<tr>
<td>LT</td>
<td>Total length</td>
</tr>
</tbody>
</table>

For sliding shafts, the length LG must be evaluated between the universal joint centres and with the sliding stem in the intermediate position. Always check both stems LG and LZ.

The maximum number of engine rpm must be calculated with the following formula:

\[ n_{IG} = \frac{n_{max}}{i_G} \]

where:

- \( n_{IG} \) is the maximum engine speed [rpm]
- \( n_{max} \) is the engine speed [rpm] at maximum output power, see Table 2.11
- \( i_G \) is the gear ratio at highest speed, see Table 2.11

<table>
<thead>
<tr>
<th>Engine</th>
<th>Engine code</th>
<th>Power [kW] - [HP]</th>
<th>( n_{max} ) [rpm]</th>
<th>Gearbox</th>
<th>( i_G )</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIA Euro 6</td>
<td>F1AGL11X*E</td>
<td>85 - 116</td>
<td>3500</td>
<td>ZF 8HP 70L</td>
<td>0.701</td>
</tr>
<tr>
<td></td>
<td>F1AGL11Y*E</td>
<td>100 - 136</td>
<td></td>
<td></td>
<td>0.667</td>
</tr>
<tr>
<td></td>
<td>F1AGL115*E</td>
<td>115 - 156</td>
<td></td>
<td></td>
<td>0.701</td>
</tr>
<tr>
<td></td>
<td>F1AGL11U*E</td>
<td>115 - 156</td>
<td></td>
<td></td>
<td>0.667</td>
</tr>
<tr>
<td>FIA Euro VI</td>
<td>F1AGL1ID*F</td>
<td>100 - 136</td>
<td>3500</td>
<td>ZF 8HP 70L</td>
<td>0.701</td>
</tr>
<tr>
<td></td>
<td>F1AGL1IC*F</td>
<td>115 - 156</td>
<td></td>
<td></td>
<td>0.667</td>
</tr>
<tr>
<td></td>
<td>F1AGL1IB*F</td>
<td>115 - 156</td>
<td></td>
<td></td>
<td>0.701</td>
</tr>
<tr>
<td>FIC Euro VI</td>
<td>F1CFL116*M</td>
<td>118 - 160</td>
<td>3500</td>
<td>ZF 8HP 70L</td>
<td>0.791</td>
</tr>
<tr>
<td></td>
<td>F1CFL117*M</td>
<td>132 - 180</td>
<td></td>
<td></td>
<td>0.667</td>
</tr>
</tbody>
</table>
### Table 1

<table>
<thead>
<tr>
<th>Engine</th>
<th>Engine code (1)</th>
<th>Power [kW] - [HP]</th>
<th>n&lt;sub&gt;max&lt;/sub&gt; [rpm]</th>
<th>Gearbox</th>
<th>I&lt;sub&gt;g&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIC</td>
<td>F1CGL4115*M</td>
<td>155 - 210</td>
<td>3500</td>
<td>ZF 8HP 70L</td>
<td>0.667</td>
</tr>
<tr>
<td>Euro VI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIC</td>
<td>F1CFA401C*</td>
<td>100 - 136</td>
<td>3500</td>
<td>2840.6</td>
<td>0.791</td>
</tr>
<tr>
<td>Euro VI</td>
<td>FICL401C*K</td>
<td></td>
<td></td>
<td>ZF 8HP 70L</td>
<td>0.667</td>
</tr>
</tbody>
</table>

1. Check the engine code on the engine plate

### Note

Usually, the fork universal joints of the same shaft must not be rotated.

#### 2.8.2 Thickness of the pipe

The pipe thickness depends on the torque that the shaft must transmit, as well as on the construction setting of the driveline (torque, power train ratio, engine axle load).

If using a pipe with a greater diameter than the original pipe, then the thickness should in theory be reduced until the same torsional capacity is achieved; nevertheless, the dimensions of the fork male-end, need for adaptor rings, and the dimensions of pipes on the market must also be taken into account.

Hence, the pipe thickness must be established on a case to case basis in relation to the dimensions of the propeller shaft (e.g. cardan joint size), in concert with the propeller shaft Manufacturer authorised shops.

Minimum operating length (from flange to flange) must be at least 600 mm for sliding shafts and 300 mm for intermediate shafts.

---

1. Critical Speed Tube ø6.35 x 2.11 mm

2. Critical Speed Tube ø84 x 1.7 mm

3. Critical Speed Tube ø7.6 x 1.7 mm

---

**Figure 17**
2.8.3 Positioning of sections

On drivelines with several sections, each axle must be of approximately the same length. In general, between an intermediate shaft and sliding shaft (see Figure 18) the difference in length must not exceed 600 mm, while it must not exceed 400 mm between two intermediate shafts. As regards sliding shafts, there must be a minimum margin of 20 mm between minimum operating length and maximum sealing length.

In compliance with effective travel, position the static set-up as close as possible to the central zone.

1. Engine, clutch, gearbox line
2. Cardan shaft with sliding
3. Shaft support
4. Cardan shaft
5. Rear axle casing tilt (static load)
6. Rear axle casing tilt (max compression)
7. Rear axle casing tilt (no load on vehicle)
8. The cardan shaft (sliding) and rear axle casing axis must have the same angle x° compared to horizontal

The intermediate shaft and the axle casing axle must be aligned.

Angle may vary by a maximum of 1° compared to the engine-clutch-gearbox axis and this may be achieved by inserting a wedge between the rear axle casing and the spring.

The maximum angle of the rear axle casing must in any case be between 4° and 6° (5° nominal) compared to horizontal.

Note For vehicles equipped with the "antibooming" solution (with a flexible coupling on gearbox output), the following geometric restriction must be considered: the relative angle between the gearbox axis and the section of shaft on gearbox output must not exceed 1°. If it is between 1° and 1°30′ it must be authorised by IVECO. If it is more than 1°30′ it should be assumed as not authorised.

When wheelbase lengthening is substantial, it may be necessary to mount an additional intermediate section, as indicated in Figure 19. In this case, make sure that the engine-gearbox axle, the second intermediate shaft and the axle casing axis when in static load are all aligned with the same tilt.
The application of flexible supports must be done using support plates with a thickness of at least 5 mm (see Figure 20), connected to cross members with characteristics similar to those specified by IVECO.

In modifying the wheelbase, it is best to plan for disassembly of intermediate shafts when shaft length is less than approximately 600 mm.

The considerations made up to this point are valid for vehicles with separate gearboxes.

Furthermore, the wheelbase on these vehicles may not be reduced beyond the shortest value for the series (e.g. tipper truck).

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/mm² (42 kg/mm²) 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 setups 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.

**Note** It is strongly recommended that leaf spring suspensions are not used in the following cases:
- drawing 5801523776 OPT 06104 (H2500) for versions with a barycentre exceeding 950 mm (Box/Refrigerated version)
- drawing 5801642218 OPT 08623 (H2500) with reduced flexibility for versions with empty load on rear axle <900 kg
- drawing 5802536207 OPT 06064 (H2500) with parabolic two-leaf suspension for versions with empty load on rear axle <1200 kg

2.9.1 Modification or replacement of the stabilizer bars

Any modification or replacement of the stabilising bars must ensure the operating characteristics remain unchanged compared to the original assemblies and in any case must be authorized by IVECO.

2.9.2 Conversion of the suspension from mechanical to air

This type of conversion is extremely critical since it involves vital groups and components for the active safety of the vehicle; so, technical approval is required from IVECO. Moreover, this conversion requires the exclusive use of solutions (layout, assemblies groups and finalisation) used for normal production.

2.9.3 Camper 35C, wheelbase 3750 mm or 3950 mm, lightened chassis

Following approval by IVECO, adaptations are allowed of the original mechanical suspension by adding air-operated bellows of appropriate dimensions. The maximum inflation pressures envisaged by the manufacturer must be strictly observed in order to avoid excessive vehicle stiffness and consequent reduction of comfort and driving performance.

**Note** Adaptation of the suspension assumes a corresponding adaptation of the ESP system controlling stability (see Paragraph "Derating of the ESP system").
2.9.4 Modifications to the air suspension (shop van version)

After approval by IVECO, modifications of the original air suspension are allowed.

2.9.5 Protecting the air springs

The bodywork must have a partition protecting the air springs separating them from the wheels and preventing damage caused by sand, mud or stones.

The partition must leave a free space of 350 mm around the spring and must not obstruct access for inspections and maintenance of the other suspension components.

2.10 MODIFYING THE ENGINE AIR INTAKE AND EXHAUST SYSTEMS

Table 2.14 - Back pressure at nominal speed and full load

<table>
<thead>
<tr>
<th>Engine</th>
<th>Engine code (1)</th>
<th>Exhaust back pressure [kPa]</th>
<th>Min - max vacuum on intake [kPa]</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIA Euro 6</td>
<td>FIAGL411X*E</td>
<td>23</td>
<td>1 - 9</td>
</tr>
<tr>
<td></td>
<td>FIAGL411Y*E</td>
<td>25</td>
<td>1 - 9</td>
</tr>
<tr>
<td></td>
<td>FIAGL411W*E</td>
<td>30</td>
<td>1 - 9</td>
</tr>
<tr>
<td></td>
<td>FIAGL411U*E</td>
<td>30</td>
<td>1 - 9</td>
</tr>
<tr>
<td>FIA Euro VI</td>
<td>FIAGL411D*F</td>
<td>25</td>
<td>1 - 9</td>
</tr>
<tr>
<td></td>
<td>FIAGL411C*F</td>
<td>30</td>
<td>1 - 9</td>
</tr>
<tr>
<td></td>
<td>FIAGL411B*F</td>
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<td>1 - 9</td>
</tr>
<tr>
<td>FIC Euro VI</td>
<td>FICFL4116*M</td>
<td>35</td>
<td>1 - 9</td>
</tr>
<tr>
<td></td>
<td>FICFL4117*M</td>
<td>40</td>
<td>1 - 9</td>
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<td></td>
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<td>27</td>
</tr>
<tr>
<td></td>
<td>FICFL401C*K</td>
<td>NP</td>
<td>27</td>
</tr>
</tbody>
</table>

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 de-formations 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 up-stream 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

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 be 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;
• to draw off the fuel, connect the fuel supply system to an auxiliary tank. Direct connection to the vehicle tank is allowed under the condition that it occurs independently from the engine fuel supply, and the new circuit must be perfectly airtight;
• 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 33)), 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 18-0400;
• 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

On vehicles with diesel fuel and with direct cab installation, pay special attention to the exhausts (to ensure that combustion gasses are not trapped in the vehicle) and the correct distribution of hot air (in order to avoid direct flows).

Note In the case of vehicles with natural gas (CNG), specific connections to the engine fuel system are required and therefore authorisation from IVECO is required and the vehicle must once again be type-approved.

Figure 21 shows a layout (quality) for an additional heating system with an additional heater.
1. Main heater
2. Optional additional heater
3. Solenoid valve
4. Additional heater installed by body builder

**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 1, 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.

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DAILY – GUIDELINES FOR BODYBUILDERS
CHASSIS INTERVENTIONS
2.12 MODIFICATIONS TO THE HEATING/CONDITIONING PLANT
2.12.3 Second air conditioner compressor

**Removal**
Cut elastic belt (4), as it cannot be reused.

**Refitting**
On the pulley (1) apply the specific chock 99360186 (2) with the elastic belt (4), placing the latter 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).

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 11)).

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/10/25 or I.S. 18-1318 class ZNT/10/25), 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 23, making sure to comply with the minimum coupling radii indicated;
- 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 kg;
- implement the connection with the new structure following the general indications provided above.
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

Figure 23
d) Creation of sleeper cabs

In the realization of sleeper cabs (e.g. 8+1), for special vehicles, municipal applications, fire brigade etc., the suspension must be adapted to the increased weight and to any extra places that are realized.

To perform work of this kind, confirmation must be obtained from IVECO of the suitability of the original suspension devices. In outline, it may be possible to adopt solutions that are equivalent to those envisaged in routine production for similar versions.

Defining a suitable suspension system must:

- respect the cab structure provided in the standard vehicle;
- avoid that added weight causes serious damage to the original parts of the cab and relative suspension;
- ensure the normal oscillations along the vertical, longitudinal and transverse plane.

To help maintain the integrity of the cab, it is recommended to keep the rear structure as much as possible unchanged. The cut must be made laterally without damaging the door ring.

The bodybuilder must make the necessary connections to the load-bearing structure, comprising the longitudinal profiles and the uprights, connecting the new floor to them; inspection panels must also be provided, if necessary.

It is advisable to pay special attention to the surface preparation of parts to be welded (using a zinc primer) and to adopt the necessary precautions to ensure good preparation of the base for subsequent painting (see Chapter 2.3 (Page 11)).

When modifying the cab, components such as the air intake and the filter may be involved. The use of original elements already provided for similar fittings, can be a good solution and allow the compliance with legislative regulations.

⚠️ A deep cab may affect the handling and safety of the vehicle (suspension, commands). Inasmuch, it must be carried out with the utmost care and all necessary precautions.

**Note** For work on the bodywork of vehicles equipped with front suspension with torsion bar, it is vital to ensure access to the trim adjustment system.
2.13.3 Interventions on van vehicles

a) Baggage compartment installation

The installation must be carried out using the fixing devices specifically envisaged on the roof (low roof and medium roof versions), bearing in mind the following indications:

- the fixing element must include the baggage rack anchoring device and ensure the necessary resistance to longitudinal and crossways forces.
- to avoid altering the vehicle’s cornering stability, the load must not exceed a total of 150 kg;
- the mass allowed on each fixing element must not exceed 25 kg.

Table 2.15

<table>
<thead>
<tr>
<th>Wheelbase [mm] / Roof</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>3000 / H1</td>
<td>1721.5 m</td>
<td>935</td>
<td>790</td>
<td>1548</td>
<td>1548</td>
<td>1548</td>
</tr>
<tr>
<td>3520 SC / H1</td>
<td>2280 m</td>
<td>754</td>
<td>932</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3520 SC / H2</td>
<td>2154 m</td>
<td></td>
<td></td>
<td>1229</td>
<td>1229</td>
<td>1229</td>
</tr>
<tr>
<td>3520 SL / H2</td>
<td>2549 m</td>
<td></td>
<td>1082</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4100 / H2</td>
<td>3713 m</td>
<td></td>
<td>935</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4100 SL / H2</td>
<td></td>
<td></td>
<td></td>
<td>1229</td>
<td>1229</td>
<td>1229</td>
</tr>
</tbody>
</table>

Figure 25

0 Reference at the front wheel axle
b) Fitting a transparent roof

At the time of publication of these Directives, it is still not possible to collect information and components for this kind of conversion.

c) Fitting a hatch

It is possible to fit an hatch on the roof provided that this task does not affect the ribbing and that the seal and strength of the modified parts are not affected.

Figure 26 shows an installation example.

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![Diagram of a transparent roof and hatch installation](image)

1. Cutting area
2. Anchorage profile
3. Sealant

---

d) Modifying the height of the roof

Three roof versions are available in production having respective inside heights of:

- low roof = 1595 mm
- medium roof = 1900 mm
- high roof = 2100 mm

Modifying the height of the roof is a very demanding and difficult task; this task should therefore only be performed on medium and high roofs, since they have the same roof structure.

Figure 27 shows the cross-section of the two versions, highlighting that the roof is a standardised structure.

To allow correct connection with the original roof, the bodybuilder must envisage appropriate intervention on the side ribbing.
e) **Opening side windows**

Opening side windows in van vehicles requires the specific precautions and expedients indicated below.

- Cut the sheet metal, taking care to maintain a profile with a minimum width of:
  - 15 mm (for fixed window with gasket seal);
  - 20–25 mm (for a bonded window).
- Create an internal supporting structure (see Figure 28) to ensure the necessary resistance and make the connection as indicated in the Figure.
- Remove the upright in the area affected by the new window and implement appropriate reinforcement at the base point.
f) Internal shelving

Installing inside shelves must be carried out with great care to ensure suitable stiffness and self-support. The lower support must involve the floor support structure (cross members and longitudinal profiles) and must be implemented in a manner that ensures uniform load distribution.

Anchoring of the side structure must avoid creating pre-load effects and may involve:

• the box uprights, where holes are already present;
• the upper connecting small beams.

g) Box section and flooring sections

Over and above the indications and precautions already mentioned, also bear in mind that:

• when drilling holes in the box sections, avoid areas where stresses are more concentrated (especially uprights A and B);
• The holes used for anchorage to the floor must be protected and sealed against infiltration of water, dust and exhaust gas;
2.13.4 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-P” 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. N1) 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).
2.13.5  **Steering column adjustment**

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

![Steering column adjustment](image)

*Figure 29*

- 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 (ERTRO, 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 56));

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 2.16 - Wheel tightening torque according to IVECO STD 17-9219

<table>
<thead>
<tr>
<th>N.</th>
<th>CONNECTING ELEMENTS</th>
<th>Thread</th>
<th>CLASS</th>
<th>Torque [Nm]</th>
<th>FEATURES &quot;S&quot; (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>1</td>
<td>Front and rear wheel mounting (33S-35S)</td>
<td>Stud bolt M14</td>
<td>II</td>
<td>144</td>
<td>176</td>
</tr>
<tr>
<td>2</td>
<td>OPT Alloy wheels (33S-35S)</td>
<td>Stud bolt M14</td>
<td>II</td>
<td>200</td>
<td>245</td>
</tr>
<tr>
<td>3</td>
<td>Front and rear wheel mounting (35C-50C)</td>
<td>Nut M18x1.5</td>
<td>II</td>
<td>290</td>
<td>350</td>
</tr>
<tr>
<td>4</td>
<td>Front and rear wheel mounting (60C-65C-70C)</td>
<td>Nut M18x1.5</td>
<td>II</td>
<td>290</td>
<td>350</td>
</tr>
</tbody>
</table>

(*) 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.

2.14.2 TPMS (Tire Pressure Monitoring System)

The operating principle and the data detected are described in the Use and Maintenance Manual.

For correct operation of the device, the addition of large metal parts below the lower edge of the vehicle chassis along the route between the rear wheels and the control unit must be avoided.

After having installed the system, carry out a first functional check (position and detection of the sensors):

- drive the vehicle for at least 10 minutes at a speed exceeding 30 km/h
- change the air pressure in each wheel
- check the correct behaviour

In the case of special equipment, please contact IVECO for further information.

The optional TPMS can be removed but configuration modification must be carried out also using IVECO service equipment in order to disable the display menu.

In this case, the control unit connector must be disconnected and protected from water/dust etc.

The control unit can also be removed and the sensors can be replaced with standard valves.
2.15 \hspace{1em} \textbf{WORK ON THE BRAKING SYSTEM}

2.15.1 \hspace{1em} \textbf{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 \hspace{1em} \textbf{Brake pipe}

- It is absolutely forbidden to weld the pipes.

\textbf{Note} \hspace{1em} In the case of changes to the wheelbase or moving the units, the brake lines involved should preferably be replaced with new ones 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.

\textbf{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

\textbf{Plastic pipes}

Used on vehicles with air suspension to connect air springs to the built-in control unit and to operate the braking corrector.

When making a replacement, bear in mind that plastic materials are not permitted:

- in areas were the temperature may exceed 80 °C, (e.g. within 100 mm of the engine exhaust system);
- between the chassis and moving parts, where special flexible pipes (hoses) should be used.

Operations must provide:

- materials and dimensions: Standards DIN 73378 and 74324 (Maximum operating pressure 11 bar)
- radii of curvature (referring to the centre line of the pipe): min 6 mm- outer $\varnothing$
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 the Figure below) 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.

![Diagram of pipe preparation and assembly]

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 2.17**

<table>
<thead>
<tr>
<th>Thread</th>
<th>Tightening torque [Nm ± 10%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 8 x 1 mm</td>
<td>20</td>
</tr>
<tr>
<td>M 12 x 1.5 mm</td>
<td>24</td>
</tr>
<tr>
<td>M 14 x 1.5 mm</td>
<td>28</td>
</tr>
</tbody>
</table>

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.
The figure below shows two examples of brackets complete with retaining collars used to secure brake lines along the chassis.

1. Three seats for pipes Ø 4–6
2. Seat for pipe Ø 4.8
3. Seat for pipe Ø 7.5–8

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.

In passing the pipes through the chassis (side members or crossbars), take precautions to avoid damage. One solution would be to use a pass-through connector for straight or angle passes, or a rubber protective eyelet, as shown in the Figure below.

1. Pipe
2. Through-coupling
3. Chassis
4. Rubber protection

After each intervention, thoroughly bleed the air, using only the specific equipment used 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 that contributed to the active safety of the vehicle and inasmuch is compulsory under European Regulations.

This function ensures control of crossways dynamics and stability by means of the components indicated in Figure 33. In particular, in the event of potential vehicle instability and through the electrohydraulic modulator, the control unit activates modulated braking of one or more wheels simultaneously.

1. Electrohydraulic modulator
2. Braking system control unit
3. Yaw and acceleration sensor
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. Derating of the ESP system involves the complete **deactivation** of the stability checks, emergency braking (AEBS) and driving assistance (ADAS).

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
- ASR (Anti Slip Regulator) to reduce drive wheel slipping on breakaway
- 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 breakaway from a standstill in ascent

### 2.16.2 Variation of GVW

Variations of vehicle GVW must be authorised since it involves the verification of the availability of an appropriate ESP system management software; degrading is only possible in the cases indicated in Attachment XI of Directive 2007/46/EC.

### 2.16.3 Wheelbase variation

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 which does not correspond to any of those in production for the specific vehicle model, the availability of a suitable system management software must be verified; degrading is only possible in the cases 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;
- air-operated suspensions may be replaced by mechanical suspensions and vice versa provided that already type-approved groups are used 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 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 18)).

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 chassis cabs not supplied with a spare wheel holder, or in cases where it is necessary to move the spare wheel, a special support must be made that allows rapid extraction and meets a minimum entry angle of 7°.

Figures 34 and 35 show two possible solutions.

To secure the spare wheel to the side of the vehicle with a support applied to the rib of the side member, we recommend the application of a local reinforcement plate arranged inside or outside the side member itself and sized depending on both the mass of the wheel and the presence or absence of other reinforcements on the side member.

![Figure 34](image-url)
To minimise torsional stress on the chassis of the vehicle it is advisable to perform the installation in correspondence with a cross-bar, especially in the case of high mass units.

Similarly, it must act for the installation of tanks, compressors, etc.; the distribution of weight must also be taken into account for their positioning (see Chapter 1.15). In all these applications, one should always provide a sufficient margin in their height from the ground in relation to the use of the vehicle.

The holes to be drilled for the new arrangements should be made on the rib of the side member, according to the regulations given in Chapter 2.2 ( رغم Page 8) and taking care to use the existing holes as much as possible.

2.17.3 Fuel tank

When range needs to be increased in relation to the original configuration, the tank can be replaced with another chosen from standard models.

Alternatively, it is possible to adopt different tanks provided that are produced by specialised qualified companies.

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).

**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.

- DAILY CNG vehicles cannot be outfitted for the transport of hazardous goods of category EXII and EXIII because they do not comply in terms of the cylinders and engine fuel supply system.

2.19 INSTALLING A RETARDER

- The installation of a retarder brake is complex and requires perfect integration with electrical and electronic vehicle systems through the use of suitable "datasets": therefore approval by IVECO is always necessary.

The suitability of the vehicle for retarder installation (only of the electro-magnetic type with electronic management) must be checked on the basis of:

- the product grid (for example, models 33S and 35S are excluded)
- contents of the original wiring (data exchange between the retarder and the vehicle must be possible via CAN)
- the steps and versions to be created

With this in mind:

**Note** On vehicles 60C-70C, wheelbase 3450, the retarder can only be fitted if, with the complete version, the following minimum load is guaranteed on the rear axle:

- 2500 kg, with semi-elliptical leaf springs
- 3000 kg, with leaf spring + beam

During the various stages, installation requires significant interventions to be carried out on the propeller shaft (safety component) and must therefore be carried out by a workshop authorised by the brake Manufacturer, who is responsible for these operations.
Following the intervention, certain control units must be reprogrammed (Body Computer, instrument panel) at an IVECO Service Centre.

The retarder selection must be carried out according to the formula:

\[
\frac{i_p \cdot C_f}{R' \cdot PPT} \approx 1
\]

1. \(i_p\) = rear axle ratio
2. \(C_f\) = Maximum braking torque [Nm]
3. \(R'\) = radius under load of the used tyre [m]
4. \(G\) = Gross Vehicle Weight [kN]

### 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 MUDGUARDAS AND WHEEL ARCHES

#### 2.21.1 Chassis cab vehicles

The cab vehicles are provided without rear mudguards.

To implement them, it should also be noted that:

- the supporting structure must be robust and also able to limit vibrations;
- the supporting structure may be secured to the rib of the side members of the vehicle (only using the existing holes) or directly to the applied superstructure (see Figure 37).
• the width of the mudguard must be greater than the maximum dimensions occupied by the tyres, within the limits set by the regulations;
• the upward oscillations of the wheels must not be limited, above all if using snow chains (see Figure 38 and Table 2.18):

A

B

A. 33S - 35S
B. 35C - 70C

a. Maximum possible lowering
2.21.2 Vans

To realise the rear wheel arch compartments of the van, it should be noted that:

- the width of the wheel arch compartment must be greater than the maximum dimensions occupied by the tyres, within the limits set by the regulations;
- lowering in relation to the standard compartment must also take into account upward oscillations of the wheels and the simultaneous presence of snow chains.

Figure 39 shows the cases which may occur while Table 2.18 indicates the maximum oscillations of the wheels.

A. 33S - 35S  
B. 35C - 50C  
C. 60C - 70C  

1. Standard wheel arch profile, van version  
2. Maximum possible lowering

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Tyres</th>
<th>Trucks(*)</th>
<th>Vans(**)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33S</td>
<td>215 / 65 R16</td>
<td>230</td>
<td>195</td>
</tr>
<tr>
<td>35S</td>
<td>225 / 65 R16</td>
<td>230</td>
<td>195</td>
</tr>
<tr>
<td>35S</td>
<td>235 / 65 R16</td>
<td>245</td>
<td>210</td>
</tr>
<tr>
<td>35C - 50C</td>
<td>195 / 75 R16</td>
<td>200</td>
<td>165</td>
</tr>
<tr>
<td>60C - 65C-70C</td>
<td>225 / 75 R16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(*) measured from the top edge of the chassis side member  
(**) measured from the top edge of the flat body
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 8).

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 2.19 shows the interventions required for each type of rear-view mirrors installed.

Table 2.19 - Rearview mirrors and interventions on the vehicle

<table>
<thead>
<tr>
<th>Models</th>
<th>Maximum width workable body [mm]</th>
<th>IVECO type-approved rearview mirrors</th>
<th>Type of intervention on the vehicle rear which is the responsibility of the Bodybuilder</th>
<th>Type of intervention on the vehicle front which is the responsibility of the Bodybuilder</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>2200</td>
<td>short arm (see Figure 40 A)</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>35</td>
<td></td>
<td>long arm (see Figure 40 B)</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td>extra-long arm (see Figure 40 C)</td>
<td>1) moving rear lights less than 400 mm from the external profile of the body shape</td>
<td>1) installation of side marker lights on version as indicated in Regulation 48 2) darkening/elimination of side marker light above cab roof</td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>2200</td>
<td>short arm (see Figure 40 A)</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>65</td>
<td></td>
<td>long arm (see Figure 40 B)</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>70</td>
<td></td>
<td>extra-long arm (see Figure 40 C)</td>
<td>1) installation of side marker lights on version as indicated in Regulation 48</td>
<td></td>
</tr>
</tbody>
</table>

⚠️ It is advisable to always use type-approved components.

Note In versions 60, 65, 70 the vehicle ordered with the extra long rearview mirrors is supplied originally without marker lights on the roof.
The distances differ between the left and right rearview mirror.
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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 (1) 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>
<thead>
<tr>
<th>Name of steel</th>
<th>Breaking strength [N/mm²]</th>
<th>Yield stress [N/mm²]</th>
<th>Elongation</th>
</tr>
</thead>
<tbody>
<tr>
<td>IVECO Fe 360D</td>
<td>360 (1)</td>
<td>235 (1)</td>
<td>25% (1)</td>
</tr>
<tr>
<td>EUROPE S2352G3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GERMANY ST37-3N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.K. 40D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IVECO Fe E420</td>
<td>530</td>
<td>420</td>
<td>21%</td>
</tr>
<tr>
<td>EUROPE S420MC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GERMANY Q5E420TM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.K. 50F4S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IVECO Fe S10D</td>
<td>520</td>
<td>360</td>
<td>22%</td>
</tr>
<tr>
<td>EUROPE S3552G3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GERMANY ST52-3N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.K. 50D</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.1.2 Dimension of sections

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

The indicated value Wc, 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 Wc and inertia time Jc, of the new C section are not of a lower value.

<table>
<thead>
<tr>
<th>Section modulus Wc [cm³]</th>
<th>Recommended C profile [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 ≤ W ≤ 19</td>
<td>80 × 50 × 4</td>
</tr>
<tr>
<td>20 ≤ W ≤ 23</td>
<td>80 × 60 × 4</td>
</tr>
<tr>
<td>24 ≤ W ≤ 26</td>
<td>80 × 60 × 5</td>
</tr>
<tr>
<td>27 ≤ W ≤ 30</td>
<td>80 × 60 × 6</td>
</tr>
<tr>
<td></td>
<td>80 × 60 × 7</td>
</tr>
<tr>
<td></td>
<td>100 × 50 × 5</td>
</tr>
</tbody>
</table>
### Section modulus $W_s$ [cm$^3$]

<table>
<thead>
<tr>
<th>Section Modulus $W_s$ [cm$^3$]</th>
<th>Recommended C Profile [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>$31 \leq W_s \leq 33$</td>
<td>$80 \times 60 \times 8$</td>
</tr>
<tr>
<td>$34 \leq W_s \leq 36$</td>
<td>$100 \times 60 \times 6$</td>
</tr>
<tr>
<td>$37 \leq W_s \leq 41$</td>
<td>$100 \times 60 \times 7$</td>
</tr>
<tr>
<td>$42 \leq W_s \leq 45$</td>
<td>$80 \times 80 \times 8$</td>
</tr>
<tr>
<td>$46 \leq W_s \leq 52$</td>
<td>$120 \times 60 \times 6$</td>
</tr>
<tr>
<td>$53 \leq W_s \leq 58$</td>
<td>$120 \times 60 \times 8$</td>
</tr>
<tr>
<td>$59 \leq W_s \leq 65$</td>
<td>$140 \times 60 \times 7$</td>
</tr>
<tr>
<td>$66 \leq W_s \leq 72$</td>
<td>$140 \times 60 \times 8$</td>
</tr>
<tr>
<td>$73 \leq W_s \leq 79$</td>
<td>$160 \times 60 \times 7$</td>
</tr>
<tr>
<td>$80 \leq W_s \leq 88$</td>
<td>$180 \times 60 \times 8$</td>
</tr>
<tr>
<td>$89 \leq W_s \leq 93$</td>
<td>$160 \times 70 \times 7$</td>
</tr>
<tr>
<td>$94 \leq W_s \leq 104$</td>
<td>$180 \times 60 \times 8$</td>
</tr>
<tr>
<td>$105 \leq W_s \leq 122$</td>
<td>$200 \times 80 \times 6$</td>
</tr>
<tr>
<td>$123 \leq W_s \leq 126$</td>
<td>$220 \times 60 \times 7$</td>
</tr>
<tr>
<td>$127 \leq W_s \leq 141$</td>
<td>$220 \times 60 \times 8$</td>
</tr>
<tr>
<td>$142 \leq W_s \leq 160$</td>
<td>$200 \times 80 \times 8$</td>
</tr>
<tr>
<td>$161 \leq W_s \leq 178$</td>
<td>$220 \times 80 \times 8$</td>
</tr>
<tr>
<td>$179 \leq W_s \leq 201$</td>
<td>$250 \times 80 \times 8$</td>
</tr>
<tr>
<td>$202 \leq W_s \leq 220$</td>
<td>$250 \times 80 \times 8$</td>
</tr>
<tr>
<td>$221 \leq W_s \leq 224$</td>
<td>$220 \times 80 \times 8$</td>
</tr>
<tr>
<td>$225 \leq W_s \leq 245$</td>
<td>$250 \times 100 \times 8$</td>
</tr>
<tr>
<td>$246 \leq W_s \leq 286$</td>
<td>$280 \times 100 \times 8$</td>
</tr>
<tr>
<td>$290 \leq W_s \leq 316$</td>
<td>$300 \times 80 \times 8$</td>
</tr>
<tr>
<td>$316 \leq W_s \leq 380$</td>
<td>$340 \times 100 \times 8$</td>
</tr>
<tr>
<td>$440$</td>
<td>$380 \times 100 \times 8$</td>
</tr>
<tr>
<td>$480$</td>
<td>$400 \times 100 \times 8$</td>
</tr>
</tbody>
</table>

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 Subframe dimension

In case of elastic connection between chassis and subframe the bending moment $M_i$ must be subdivided proportionately between chassis and subframe at the moments of inertia of the sections:
### 3.1 CONSTRUCTION OF THE SUBFRAME

\[ M_t = M_c + M_f \]
\[ \frac{M_c}{M_t} = \frac{I_c}{I_t} \]
\[ \frac{M_c}{M_t} = M_f \cdot \frac{I_c}{I_t + I_c} \]
\[ \sigma_c = \frac{M_c}{W_c} \leq \sigma_{amn} \]
\[ \sigma_t = \frac{M_t}{W_t} \leq \sigma_{amn} \]

- **\( M_t \)** = static bending moment generated by the superstructure [Nmm]
- **\( M_c \)** = proportional share of the static bending moment \( M_t \) applied to the subframe [Nmm]
- **\( M_f \)** = proportional share of the static bending moment \( M_t \) applied to the chassis [Nmm]
- **\( I_c \)** = moment of inertia of the section of the subframe [mm\(^4\)]
- **\( I_t \)** = moment of inertia of the section of the chassis [mm\(^4\)]
- **\( \sigma_c \)** = maximum static stress applied to the subframe [N/mm\(^2\)]
- **\( \sigma_t \)** = maximum static stress applied to the chassis [N/mm\(^2\)]
- **\( W_c \)** = section modulus of the section of the subframe [mm\(^3\)]
- **\( W_t \)** = section modulus of the section of the chassis [mm\(^3\)]
- **\( \sigma_{amn} \)** = maximum static stress allowed on chassis [N/mm\(^2\)] see chapter 2.1, Paragraph “Stresses on the chassis” (⇒ Page 7)

#### 3.1.4 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/mm\(^2\) compared to 21,000 kg/mm\(^2\)).

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.

![Figure 2](image-url)

In cases in which the plugs for the cab rear suspension (e.g. deep cabs) do not allow the passage of the profile in the entire section, this can be realised as in Figure 3. This may require verification of the minimum section of resistance in the presence of high front bending moments (e.g. with a crane behind the cab when operating towards the front of the vehicle) and requires fixing if possible at no more than 250 mm from the front end of the subframe.

![Figure 3](image-url)

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 elastically to the vehicle chassis and boxed sections when you require greater stiffness of the assembly.

Care should be taken to achieve a gradual transition from the boxed section to the open section, as in the examples in Figure 4.
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 introducing strips of sheet metal or light alloy.

If a rubber undercraw element is to be introduced (figure 4, ref. 3), it is recommended that the characteristics and thicknesses are 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 from 3.4 to 3.11). 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.

![Figure 5](image)

### 3.2.3 Stiffening of the subframe

For some superstructures (e.g. tipping bodies, concrete mixers, cranes on rear overhang, superstructures with high centre of gravity), the subframe should be stiff in the back.

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

- boxing the longitudinal sections in the rear area;
- adopting closed section crossbars (see Figure 6);
- applying cross diagonals (see Figure 7);

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

![Figure 6](image)
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 configuration.

3.3 CONNECTION BETWEEN CHASSIS AND SUBFRAME

3.3.1 Choosing the type of connection

The choice of the type of connection to be used, if not provided by IVECO originally, is very important for the purposes of contribution of the subframe in terms of strength and stiffness.

It can be elastic (brackets or clamps) or rigid, resistant to shear stress (plates sealed longitudinally and transversally); the choice must be made according to the type of superstructure to be applied (see Chapters 3.4 to 3.14), by evaluating the stresses that the added equipment transmits to the chassis, both in static and dynamic conditions. Number, size and construction of the anchors, reasonably allocated in the length of the subframe, must be such as to ensure a good connection between the chassis and the subframe.

The screws and the clamps must have material strength class of not less than 8.8, and the nuts must be fitted with systems that prevent unscrewing. The first anchor should be positioned, if possible, at a distance of about 250–350 mm from the front end of the subframe.

The elements for the original connection already existing on the vehicle chassis must be preferred.

The respect of the distance indicated above for the first anchoring must be ensured especially in the presence of superstructures with concentrated loads behind the cab (e.g., crane, front body tilting cylinder, etc.), in order to improve the magnitude of the chassis stresses and contribute more to the stability. Provide additional connections if necessary.

If you have to install a superstructure with features different from those for which the chassis was designed (e.g., a tipping body on a chassis built for a fixed body) suitable connections must be provided (e.g., replacement of brackets with shear resistant plates in the rear area of the chassis).

> 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.
Note  In order to improve the longitudinal and transverse containment of the connection, holes are permitted on the wings of the side members only in the rear end and provided the anchoring of any cross members is not weakened (see Figure 12).

Evaluate the possible use of a solution as shown in Figure 11.

3.3.2 Characteristics of the connection

Elastic connections (see Figures 8, 9 and 10) allow limited movement between the chassis and the subframe; These connections make it possible to consider parallel cooperation of the two resistant sections, where each assumes a share of the bending moment proportional to its moment of inertia.

In the rigid connections (see Figure 11), a single resistant section can be considered for the two profiles, on the condition that the number and distribution of the connections are such as to withstand the consequent cutting forces.

The possibility of establishing a single resistant section between the chassis and the subframe allows you to achieve greater resistant capacity compared to the connections with brackets or clamps, obtaining the following benefits:

- lower height of the subframe profile to equal bending moment acting on the section;
- greater bending moment allowed, equal to the dimensions of the subframe profile,
- further increase in the resistance capacity if materials with high mechanical properties are adopted for the subframe.

3.3.3 Connection with brackets

Some examples of this type of connection are shown in Figures 8 and 9.

For the elasticity of the connection it is necessary that before closing the tightening screws, the distance between the brackets of the chassis and the subframe is 1–2 mm; greater distances should be reduced by means of suitable spacers. At the closure of the screws, brackets must be brought into contact.

The adoption of screws of a suitable length promotes the elasticity of the connection.

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 instead the brackets must be applied exactly to the wire, the side guide for the superstructure must be assured with other devices (e.g. using guide plates connected only to the subframe, or only to the vehicle chassis, see Fig-
ure 11). When the front connection is elastic (see Figure 9), the lateral containment must be assured even in conditions of maximum torsion of the chassis (e.g. off-road applications).

In the event in which the vehicle chassis is already equipped with brackets for the attachment 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).

3.3.4 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 9 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.

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 one of the solutions shown in Figure 9; especially when the vehicle has a long wheelbase, this solution must also be replicated for the next fixing, modifying only the stiffness.

For example, in the case of brackets with rubber pads, elements must be used having the same hardness (sh = 83), assembled in dual pairs for the first bracket and single pairs for the next bracket, with M10 screws and tightening torques of 15-18 Nm.
Also bear in mind that:

- for rubber plugs, use materials that ensure good elasticity over time.
- every solution requires the preparation of appropriate instructions for interval controls and possible resetting of the tightening torques of parts.
- In versions where the vehicle is lifted by hydraulic stabilizers (e.g. cranes, aerial work platforms), limit the collapse of the elastic element to ensure sufficient cooperation of the subframe and avoid excessive bending moments on the original chassis.

Also bear in mind that:

1. In the case of superstructures which generate high bending and twisting moments (e.g. a crane behind the cab), the subframe must be properly sized to support them;
2. In versions where the vehicle is lifted by hydraulic stabilizers (e.g. cranes, overhead work platforms), limit the collapse of the elastic element to ensure sufficient cooperation of the subframe and avoid excessive bending moments on the original chassis.

### 3.3.5 Connections with clevis fasteners or clamps

Figure 10 shows the main constructions of this type.

In this case the bodybuilder must interpose a spacer (preferably metal) between the wings of the two side members and in correspondence to the clevis fasteners, in order to avoid the bending of the wings under the pull of the clevis fasteners.

In order to drive and better contain the transverse direction of the structure added to the chassis, this type of fixing can be completed with the addition of plates welded to the subframe as shown in Figure 11.

The characteristics of this connection advise against a general integral use on the vehicle; in any case, to give the added structure the suitable containment in the longitudinal direction as well as adequate stiffness, it is necessary to integrate the fastening to the rear part with longitudinal and transverse sealing plates.

For this purpose, it is also possible to use connections by means of screws at the rear end of the chassis as shown in Figure 12.
3.3.6 Connection with longitudinal and transverse sealing plates (rigid connection)

The type of mounting shown in Figure 11, made with plates that are welded or bolted to the subframe and fixed with nails or screws to the vehicle chassis, ensures a good capacity for reacting to longitudinal and transverse thrusts and the greatest contribution to the stiffness of the assembly.

For the correct use of these plates, please keep in mind that:
3.3 CONNECTION BETWEEN CHASSIS AND SUBFRAME

- the vertical rib of the chassis should be fastened only after making sure that the subframe is snug against the chassis itself;
- the distribution must be limited to the central and rear area of the chassis;
- the number and the thickness of the plates and the number of fixing screws must be adequate to withstand the bending moments and cutting of the section.

In cases where the superstructure generates high bending and twisting moments on the chassis and its resistant capacity should be increased by adopting a cut-resistant connection between the chassis and the subframe, or if you want to contain the height of the subframe as much as possible (e.g. centre axle trailers, crane on rear overhang, tail lifts, etc.), use the information supplied in the table below (valid for all models):

<table>
<thead>
<tr>
<th>Chassis and counter chassis height/section ratio</th>
<th>Max. distance between the centre lines of the cut-resistant plates [mm]</th>
<th>Models (1)</th>
<th>Minimum characteristics of the plates</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 1.0</td>
<td>700</td>
<td>35C, 40C</td>
<td>Thickness [mm]</td>
</tr>
<tr>
<td>≤ 1.0</td>
<td>500</td>
<td>45C, 50C</td>
<td>4</td>
</tr>
<tr>
<td>≤ 1.0</td>
<td>500</td>
<td>60C, 65C, 70C</td>
<td>5</td>
</tr>
</tbody>
</table>

(1) The increase in the number of screws for each plate makes it possible to proportionally increase the distance between the plates (a double number of screws may allow a greater distance between the plates). In high stress areas (for example, supports of the rear spring or the rear air springs), the distance between the plates, must be reduced as much as possible.

(2) In the presence of contained thicknesses of the plates of the chassis and the subframe, it is advisable to connect by adopting spacer bushes, in order to use longer screws.

(3) For models 33S and 35S, the application of shear-resistant plates must be evaluated on a case by case basis.

3.3.7 Mixed connection

Based on the indications in Chapter 3.1 (Page 5) for realisation of the counter chassis and the considerations of Chapter 3.3 (Page 11), the connection between the vehicle chassis and the reinforcing counter chassis may be of mixed type, i.e. obtained by rationally using the elastic connections (brackets, clevis fasteners) and rigid connections (longitudinal and transverse sealing plates).

Note: It is preferable to have flexible connections in the front part of the subframe (one or two per side), while connections are recommended with plates toward the rear of the vehicle when the added structure is required to provide a greater contribution to the overall stiffness (e.g. tippers, cranes on rear overhang, etc.).

For this purpose, it is also possible to use connections by means of screws at the rear end of the chassis as shown in Figure 12.
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 normal chassis cab vehicles, valid only for road services, is normally made through a support structure consisting of longitudinal and transverse profiles. The minimum Approximate sizes of the longitudinal sections are shown in Table 3.4.

Table 3.4

<table>
<thead>
<tr>
<th>Models</th>
<th>Minimum reinforcing profile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wheelbase [mm]</td>
</tr>
<tr>
<td>33S, 35S</td>
<td>up to 3750</td>
</tr>
<tr>
<td>4100</td>
<td>16</td>
</tr>
<tr>
<td>35C, 40C, 45C, 50C</td>
<td>All</td>
</tr>
<tr>
<td>60C, 65C, 70C</td>
<td>Up to 3750</td>
</tr>
<tr>
<td></td>
<td>and 3750</td>
</tr>
</tbody>
</table>

Note For the dimensions of the profiles see Table 3.2.

Fastening is achieved through specially crafted brackets along the vertical rib of the side members; if such connections have not already been specified by IVECO, they must be made according to the instructions in Chapter 3.3 - Paragraph "Connection with brackets" (⇒ Page 12). To achieve adequate longitudinal containment, in the case of connections with brackets or clamps, it is good practice to provide a rigid connection on the end of the rear overhang (one per side), obtained with screws or plates on the upper wing of the side member (see Figures 11 and 12).

In no other case should new holes be made on the wings of the main side members.

In cases in which the body uses elevated supports above the subframe (e.g. crossbars), it is necessary to suitably stiffen such supports, to contain the longitudinal thrusts, as shown in Figure 13.

The front wall of the bodywork must have the necessary strength and toughness to support the forces generated by the transported load, in the case of sudden and high accelerations.
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 3.4.

Figure 14 shows an example installation where, in order to contain 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.

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 (see Figure 15).

To ensure the stability required for the cross members and avoid stiffening the front part of the vehicle chassis excessively, consider the indications given in the previous paragraph "Fixed bodies".
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.

**Front wall**

It must have the necessary strength and toughness to withstand the forces generated by the transported load, in the case of sudden and high decelerations.

**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 8)).

### 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 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 6 and Figure 7). The connections to the chassis must be elastic (brackets or supports) at the front end, whereas the rear section requires stiff connections (cleat plates) (see Figure 11) to allow the additional structure to contribute more effectively towards the rigidity of the assembly. Omega brackets can be used on vehicles where these are originally fitted.

2. 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. In order not to affect the stability of the vehicle during tipping and to not excessively increase the stress on the chassis, it must be respected the distances indicated in Figure 16. If for technical reasons this cannot be achieved, small increases may be permitted provided a higher strength subframe is used, in order to increase the rigidity of the rear end. Where long bodies are needed to transport large volumes, it is advisable to increase the wheelbase of the vehicle rather than create long overhangs.
3. 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.

4. 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.

5. 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/m$^3$ 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).

6. 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.

\[ \text{Figure 16} \]

1. Subframe
2. Brackets
3. Plates
4. Retainer with hinge

### Table 3.5

<table>
<thead>
<tr>
<th>Models</th>
<th>Minimum reinforcing profile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Section modulus $W_x$ [cm$^2$]</td>
</tr>
<tr>
<td>35C, 40C</td>
<td>19</td>
</tr>
<tr>
<td>45C, 50C, 60C, 65C, 70C</td>
<td>36</td>
</tr>
</tbody>
</table>

**Note** For the dimensions of the profiles see Table 3.2.
3.5 TRACTOR FOR SEMI-TRAILER

**Note** The range does not include vehicles designed to tow semi-trailers. To carry out conversion of a cab vehicle (category N2 only), specific authorisation from IVECO is required.

This authorisation provides the indications that the bodybuilder must observe, the masses allowed and provisions on use. Below are some general indications.

The limitation to category N2 implies that the ESP function is not available. This function is mandatory for category N1 vehicles and is not compatible with the tractor conversion.

### 3.5.1 Fifth wheel supporting structure

The application of a suitable subframe structure (see Figure 17) has the task of distributing the load on the articulation and ensuring the vehicle has a suitable torsional and bending contribution. The minimum sizes of the longitudinal sections are shown in Table 3.6.

To implement this, it should also be noted that:

- the structure must be suitably dimensioned for vertical and horizontal loads which the fifth wheel transfers;
- the material characteristics of the structure must refer to what is set out in Chapter 3.1 (Page 5);
- the upper and lower surfaces of the structure must be level so as to ensure a good contact on the chassis;
- the structure components, when this is formed by several elements, must be welded and/or nailed to form a single assembly;
- the structure should be fastened to the tractor by means of cleat plates in the middle and back of the chassis and brackets in the front. For fastening, use screws of a minimum class of 8.8 (number and diameter so as to achieve a tightening resistant to longitudinal and transversal forces) and use systems that prevent unscrewing.

<table>
<thead>
<tr>
<th>Models</th>
<th>Wheelbase [mm]</th>
<th>Minimum reinforcing profile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Section modulus $W_x$ [cm$^3$]</td>
</tr>
<tr>
<td>50C</td>
<td>3450</td>
<td>24</td>
</tr>
</tbody>
</table>

**Note** For the dimensions of the profiles see Table 3.2.
1. Longitudinal and cross members  
2. Fifth wheel support plate or crankcase  
3. Rear cab structure, electric and brake joints support, can also be used to support spare wheels  
4. Tapered rear  
5. Mudflap support  
6. Connections to chassis

### 3.5.2 Fifth wheel

All fifth wheels can be used on IVECO vehicles if their load capacity, size and performance are declared suitable by the manufacturer depending on their specific use.

Fifth wheel couplings must meet national and/or international legal requirements and be of an approved type. For mounting on the support structure and the number of screws, as well as the size and placement of the longitudinal and transversal stops, it is advisable to follow the manufacturer’s instructions.

⚠️ The fifth wheel must not be modified in any way since it is of particular importance for vehicle safety.

### 3.5.3 Braking system

The bodybuilder has to provide the fulfilment of the specific system for semi-trailer braking.

⚠️ Considering the importance of its effects on the active safety of the vehicle, extreme care must be given to the braking system in both design and implementation. Components, pipes and fittings of the same type as those used on the original vehicles must be used.

Depending on the total masses realised, the performance of the braking system (service, emergency and parking brake) must comply with national regulations or EC Directives in terms of deceleration, heat behaviour, response times, etc.

Documentation on the grip and compatibility curves should also be available (if not otherwise stated).

On request, IVECO can provide the technical documentation containing the system features and the braking capacity of the original vehicle.
3.5.4 Coupling between tractor and semi-trailer

The semi-trailer must not have construction features (i.e.: excessive chassis flexibility, inadequate braking capacity, etc.) that would have adverse effects on the driving behaviour of the articulated vehicle. All movements must be verified in the tractor and semi-trailer combination in various conditions of use; the necessary safety margins obviously must be ensured in compliance with any legislative or regulatory requirements.

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 section to be used for the counter chassis are shown in Table 3.7.

<table>
<thead>
<tr>
<th>Models</th>
<th>Wheelbase [mm]</th>
<th>Minimum value of the modulus of resistance of the counter chassis section ( W_c ) [cm(^2)] (^{(1)}) with ultimate tensile strength of the material equal to 360 N/mm(^2)</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35C, 40C, 45C, 50C</td>
<td>All</td>
<td>16</td>
<td>80x50x4</td>
</tr>
<tr>
<td>60C, 65C, 70C</td>
<td>up to 3750 and 3750</td>
<td>21</td>
<td>80x60x5, 100x50x5</td>
</tr>
</tbody>
</table>

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 18) in the front part and rigid supports resistant to the longitudinal and transverse forces towards the rear part.
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 with respect to those shown in Table 3.7. 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 m);
- the rests must be such that the load is evenly distributed over a suitably wide surface area and with appropriate bracings (see Figure 18) to contain the longitudinal and transverse thrusts;
- the anchoring points must be of a sufficient length (approx. 400 mm – see Figure 19) 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.

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 stabilisers (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 counter chassis, the construction of which must take into account all general specifications (see Chapter 3.1 (Page 5)), and with the dimensions of the sections given in Tables 3.8, 3.9 and 3.10.

The dimensions of the counter chassis resistance modulus refer to the maximum total static moment of the crane ($M_0$), deduced from the formula shown in Figure 20.

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

Special cases, whose $M_0$ value falls within the areas designated by letter “E” in the mentioned Table (or for higher values) must be checked individually each time and must receive specific authorisation from IVECO.

![Diagram of crane installation](image)

$$M_G [kNm] = \frac{g (W_L \times L + W_C \times l)}{1000}$$

- $g = \text{acceleration of gravity equals } 9.81 \text{ m/s}^2$
- $W_C = \text{mass applied to crane extremity [kg]}$
- $L = \text{horizontal distance between the payload application point } W_L \text{ and vehicle centre line [m]}$
- $W_C = \text{mass of the crane at its centre of gravity [kg]}$
- $l = \text{horizontal distance between centre of gravity of crane and vehicle centre line [m]}$

⚠️ 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 21), 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 3.8.

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 3.9.

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

The section of the crane counter chassis (Figure 21) can be integrated towards the rear end with that envisaged for another possible superstructure; the length "Lv" must in no case be less than 35% of the wheelbase if the superstructure section diameter is smaller.

![Figure 21](image)

1. Reinforcing profile
2. Brackets
3. Crane connections
4. Stabilizers

In installations of cranes on vehicles with deep cab (e.g. 6 + 1), the subframe must continue to underneath the cab (see Figure 2), 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 3.8 - Crane behind driver’s cab (counter chassis secured with shelves or flanges)

<table>
<thead>
<tr>
<th>Model</th>
<th>Frame section [mm]</th>
<th>Total torque $M_c$ max [kNm]</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>35C, 40C</td>
<td>174x70x4</td>
<td></td>
<td>21</td>
<td>36</td>
<td>57</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45C, 50C</td>
<td>174x70x4</td>
<td></td>
<td>21</td>
<td>36</td>
<td>57</td>
<td>89</td>
<td>105</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60C, 65C, 70C</td>
<td>174x69x5</td>
<td></td>
<td>19</td>
<td>21</td>
<td>46</td>
<td>57</td>
<td>89</td>
<td></td>
<td>105</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minimum value of the modulus of resistance of the counter chassis section $W_c$ [cm$^3$] (1) with yield point of the material equal to 360 N/mm$^2$.

Table 3.9 - Cranes mounted behind driver’s cab (counter chassis secured with shear resistant plates)

<table>
<thead>
<tr>
<th>Model</th>
<th>Frame section [mm]</th>
<th>Total torque $M_c$ max [kNm]</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>35C, 40C</td>
<td>174x70x4</td>
<td></td>
<td>19</td>
<td>21</td>
<td>31</td>
<td>57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45C, 50C</td>
<td>174x70x4</td>
<td></td>
<td>19</td>
<td>21</td>
<td>31</td>
<td>27</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60C, 65C, 70C</td>
<td>174x69x5</td>
<td></td>
<td>19</td>
<td>19</td>
<td>21</td>
<td>46</td>
<td>57</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minimum value of the modulus of resistance of the counter chassis section $W_c$ [cm$^3$] (1) with yield point of the material equal to 360 N/mm$^2$.

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 3.10.

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 (Page 8)) box sections and cross bracings in line with the rear suspension and along the entire length $L_v$ (see Figure 22) is requested.

The passage between box section s and open sections must be well fitted as shown in Figure 3.

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 $L_v$ see Figure 22) 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 3.10 - Crane at rear overhang (counter chassis secured with shear resistant plates)

<table>
<thead>
<tr>
<th>Model</th>
<th>Frame section [mm]</th>
<th>Total torque $M_a$ max [kNm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>35C, 40C</td>
<td>114x70x4</td>
<td>32</td>
</tr>
<tr>
<td>45C, 50C</td>
<td>114x70x4</td>
<td>32</td>
</tr>
<tr>
<td>60C, 65C, 70C</td>
<td>174x69x5</td>
<td>23</td>
</tr>
</tbody>
</table>

Minimum value of the modulus of resistance of the counter chassis section $W_x$ [cm$^3$] (1) with yield point of the material equal to 360 N/mm$^2$

$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.

---

1. Subframe on the entire body length
2. Plates
3. Brackets
4. Crane connections
5. Stabilizers
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 48)). 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 3.11, in the presence of trucks with rear overhangs as standard;
2. using the indications provided in Figure 23, with trucks with overhangs not as standard or specific tail lifts (for example, in aluminium).

Case I.

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

Table 3.11 - Installation of tail lifts (see Figure 23)

<table>
<thead>
<tr>
<th>Models</th>
<th>Wheelbase [mm]</th>
<th>Overhang [mm]</th>
<th>3 (300)</th>
<th>5 (500)</th>
<th>7.5 (750)</th>
<th>10 (1000)</th>
<th>12.5 (1250)</th>
<th>15 (1500)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35S, 35S</td>
<td>3450 3750 4100</td>
<td>1355 1655 1305</td>
<td>16</td>
<td>16</td>
<td>31</td>
<td>16</td>
<td>49</td>
<td>31</td>
</tr>
<tr>
<td>35C, 40C, 45C, 50C</td>
<td>3000 3450 4100</td>
<td>1240 1355</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>21</td>
<td>16</td>
<td>36</td>
</tr>
<tr>
<td>35C, 40C, 45C, 50C</td>
<td>3750 4100</td>
<td>1655 1715</td>
<td>16</td>
<td>16</td>
<td>21</td>
<td>16</td>
<td>36</td>
<td>21</td>
</tr>
<tr>
<td>45C, 50C</td>
<td>4350 4750</td>
<td>1885 2350</td>
<td>16</td>
<td>16</td>
<td>26</td>
<td>43</td>
<td>31</td>
<td>63</td>
</tr>
<tr>
<td>60C, 65C, 70C</td>
<td>3450 3750 4100</td>
<td>1355 1655 1715</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
</tbody>
</table>
3.9 INSTALLATION OF TAIL LIFTS

<table>
<thead>
<tr>
<th>Models</th>
<th>Wheelbase [mm]</th>
<th>Overhang [mm]</th>
<th>Tail lift capacity in kN (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60C, 65C, 70C</td>
<td>4350 4750 5100</td>
<td>1885 2350 2000</td>
<td>Minimum value of the section modulus of the subframe section Wc [cm³] (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Minimum value of the section modulus of the subframe section Wc [cm³] (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 (300) 5 (500) 7.5 (750) 10 (1000) 12.5 (1250) 15 (1500)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16 16 16 16 16 31 21 56 31 70 56</td>
</tr>
</tbody>
</table>

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.

\[ L_0 = \text{Rear overhang} \]
\[ W_T = \text{Weight of tail lift} \]
\[ W_L = \text{Tail lift capacity} \]
\[ S_c = \text{Distance of the tail lift from the rear axle} \]

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

\[ M \ [Nm] = W_L \cdot A + W_T \cdot B \] for tail lifts without stabilizers

\[ M \ [Nm] = W_L \cdot C + W_T \cdot D \] 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 23).

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 3.11.

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 56));
- 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 TILT BEDS (BREAKDOWN RECOVERY)

Using a tilt bed typically subjects the chassis to considerable stress. The vehicle used should therefore specifically indicated for this application. These vehicles are listed in Table 3.5 together with the indicative characteristics for the counter chassis necessary.

Where a very long bed is necessary, it is preferable to use a vehicle that already has a sufficiently long wheelbase rather than create a long overhang.

The counter chassis must be suitably sized and stiffened at the rear with boxing and diagonal crossbraces (see Figures 6 and 7).

Connections to the chassis must be elastic (brackets or supports) at the front end and stiff at the rear end (cleat plates, see Figure 11) to allow the additional structure to contribute more effectively towards the rigidity of the assembly.

The rear tilt pivot must be installed on the counter chassis, and must be situated longitudinally as close as possible to the rear suspension mount. To prevent the risk of the tilt bed compromising vehicle stability when operating and to avoid excessively increasing the stress sustained by the chassis, the distance between the tilt pivot and the rear suspension mount must comply with the specifications given in Figure 16. Should this not be possible, the counter chassis profiles must be larger than normal and additional stiffening must be applied to the rear.

The position of the lift system must be defined with particular attention to protect the structural integrity of the rams and permit a precise and practically location for the mountings. The ram should preferably be situated in the most practical position available ahead of the centre of gravity of the combined body and payload in order to reduce localised load.
The body builder must equip the vehicle appropriately to ensure stability during bed tilting manoeuvres. 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 (⇒ Page 34));
- 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 (⇒ Page 8).

> **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 (Page 5) and 2.2 (Page 8), 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 (Page 5) and 4.2 (Page 7);
- 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 SPECIAL OUTFITS

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

3.14.1 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.

3.14.2 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 19).
3.14.3 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 (Page 11) 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 24, in which the first fastening of the counter chassis is highlighted.

![Figure 24](image)

⚠️ **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.
Aerial platforms on 33S-35S vehicles

The installation of this version on 33S-35S vehicles (single wheels) is possible after having adopted specific stiffening straps on the chassis. These can be ordered with the specific opt. 78726 (dwg. 504267870 LH and 504267871 RH).

View from below

1. Reinforcement flap
2. First subframe fastening
3. Cab block
4. Detail of the cross section of the chassis

The straps must have a minimum thickness of 4 mm and be long enough (at least 1050 mm) to cover the side members of the chassis in front of the cab block area and behind the first fastening point of the subframe (see Figure 25).

The additional flaps must be fastened to the wing of the chassis by means of rivets with a maximum spacing of 110 mm and must be made of high-strength steel.

Note On vehicles with a shaped fuel tank of 70 or 100 litres (see Chapter 2.17 (☞ Page 53) - figure 36), installation of the reinforcement straps is not possible due to the interference this would cause between the nail heads and the top wall of the tank.
SECTION 4

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POWER TAKE-OFFS

4.1 GENERAL INFORMATION

Different types of power take-offs (PTO, Power Take Off) for motion pick-up can be mounted for operating auxiliary units. Depending on the type of use and performance required, the application can be fitted to:

- on the gearbox (if manual);
- the transmission;
- on the front of the engine.

The characteristics and performances are given in the paragraphs which follow and in the relevant documentation which will be supplied upon request.

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 transmission ratio for the power take-off should be made so that the absorption of power 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, expressed in [kgm] or [Nm]

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 X₁ and X₂.

For drivelines consisting of several sections, please refer to the indications provided in Chapter 2.8 (⇒ Page 26).
4.2 POWER TAKE-OFF ON THE GEARBOX

Drive may be taken from the gearbox layshaft via flanges or fittings located to the rear side or lower part of the casing. Table 4.1 shows available torque levels and the ratios between output rpm and engine rpm for the different types of IVECO optional gearbox/PTO combinations.

IVECO must authorize high torque take-offs for sporadic use, according to the type of use.

The PTO must normally be used with the vehicle at a standstill and must be engaged and released with the clutch disengaged so as to avoid excessive stress on synchronisers. When the PTO is used with the vehicle in motion, no gearshift must be carried out.

**Note** On vehicles equipped with automatic gearbox, installation of a PTO on the gearbox is not permitted. For further indications, refer to Appendix C.

---

1. Cover for power take-off pre-installation

---

Figure 3
4.2.1 Power take-off data from gearbox

The installation of a P.T.O. post vehicle production requires the reprogramming of gearbox electronic control (if automated), as well as interventions on the wiring system. Therefore, before proceeding, please carefully read Chapter 4.6.

Re-programming of the control unit must be carried out in accordance with the instructions in the IVECO technical manual using exclusively the diagnostic instrument (available from IVECO dealers and authorised IVECO service centres), providing the information regarding the specific PTO requirements.

**Table 4.1 - Transmission PTO data**

<table>
<thead>
<tr>
<th>Gearbox</th>
<th>Position (1)</th>
<th>Output (1)</th>
<th>Direction of rotation (2)</th>
<th>Maximum torque $C_{\text{max}}$ [Nm] (3)</th>
<th>PTO ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2835.6</td>
<td>Left side</td>
<td>Rear</td>
<td>Clockwise</td>
<td>180</td>
<td>0.943</td>
</tr>
<tr>
<td>2840.6</td>
<td>Left side</td>
<td>Rear</td>
<td>Clockwise</td>
<td>180</td>
<td>1.04</td>
</tr>
</tbody>
</table>

(1) With respect to the direction of travel

(2) Frontal view of the PTO output

(3) The maximum available torque refers to a speed of 1,500 rpm in output from the PTO. For higher speeds, proportionally reduce the available torque value

**WARNING**

IVECO reserves the right to void the guarantee on the gearbox if malfunctions are due to the PTO and, in that case, if the PTO installed by the body builder has performance other than those indicated in Table 4.1.

4.2.2 Direct installation of a user (pumps, compressors, etc.) on the PTO

In the case of pumps or other equipment applied directly on the power take-off without intermediate shafts, after ensuring that the dimensions of the pump or accessory leave an adequate safety margin with the chassis and powertrain unit, it is also necessary to verify that the static and dynamic torques exerted by the mass of the pump and by the PTO are compatible with the structural characteristics of the walls of the gearbox.

Furthermore, the value of the additional masses must be verified with regard to the inertial effects in order to avoid the induction of resonance conditions in the engine unit within the field of operational engine.

The power take-offs provided by IVECO include a flange for direct mounting of pumps with UNI 4 connection, the outlet consists of a grooved shaft 21 ISO 14.

**WARNING**

In the event of prolonged use, the gearbox oil temperature must not exceed 110 °C and the water temperature must not exceed 100 °C. Since not all power take-offs available on the market are suitable for continuous use, the specific requirements associated their use (work period, pauses, etc.) must be strictly adhered to.
4.3  POWER TAKE-OFF FROM TRANSFER BOX

Not available on Daily 4x2.

4.4  POWER TAKE-OFF FROM DRIVELINE

Authorisation for the application of a power take-off on the driveline downstream of the gearbox is issued by IVECO after examination of the documentation presented as required.

**Note**  On vehicles equipped with automatic gearbox, installation of a PTO on the transmission downstream of the gearbox is not permitted.

In general, the following should be noted:

- The power take-off may be operated only when the vehicle is stationary. The PTO engagement/disengagement shall be performed in gearbox Neutral. During engagement and disengagement power absorption form BodyBuilder must be reduced to 0 Nm;
- the power take-off rpm is dependent on the gear selected;
- the power take-off must be located immediately downstream of the gearbox; for vehicles with the driveline in two or more sections, the power take-off may also be fitted at the flexible support between the first and second sections (respect the indications given in Chapter 2.8 (Page 26));
- the angles of the driveline on the horizontal plane and vertical plane must be kept as close as possible to the original values;
- masses and rigidity added to the driveline must not provoke a loss of balance or abnormal vibrations or damage the transmission drive line (from engine to axle) either during vehicle movement or during operation with the power take-off;
- the power take-off must be fixed to the chassis with its own suspension.

⚠️ The transmission is an important part for the safety of the vehicle, and as such any intervention on the transmission must only be carried out by specialist companies approved by the manufacturer.

**Note**  Any intervention on the propeller shaft carried out without prior authorisation from IVECO will immediately invalidate the warranty.

4.5  POWER TAKE-OFF ON THE ENGINE

The use of these PTOs is intended for equipment requiring continuous power and with low torque values (e.g. driving AC systems).

Drive may be taken from the front of the engine by means of the belt transmission system. This belt must engage on a specific pulley, added externally to the one already present on the crankshaft. For definition of this belt, the essential data indicated in Table 4.2 may be useful.
Table 4.2 - PTO from the front engine

<table>
<thead>
<tr>
<th>Engine</th>
<th>( n_{\text{max}} ) [rpm] (1)</th>
<th>Maximum speed with no load [rpm]</th>
<th>Max. torque available [Nm]</th>
<th>Maximum moment of inertia [kgm²]</th>
<th>Maximum flexural moment [Nm] (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>3500</td>
<td>4200</td>
<td>35</td>
<td>0.005</td>
<td>42</td>
</tr>
</tbody>
</table>

(1) Max. number of rpm corresponding to maximum power
(2) Flush with crankcase front

4.6 SETTINGS

4.6.1 "First equipment" PTO

Vehicles can be fitted with up to two power take-offs and one of these (PTO1) must be installed on the gearbox.

For first equipment the vehicle can be alternatively equipped with:

A) PTO pre-installation (opt. 77910 on gearbox 2840.6 and 2850.6; opt. 75977 on gearbox 2835.6)

PTO pre-installation consists of:

- cover on gearbox (see Figure 3);
- bonnet cable.

b) PTO pre-installation (opt. 77910 on gearbox 2840.6 and 2850.6; opt. 75977 on gearbox 2835.6) and Expansion Module (opt. 8657)

The Expansion Module (EM) is an electronic interface designed for the management of the different types of configurations (additional lights, alarms, after-sales PTO, etc.).

c) PTO1 (opt. 75076/75077/75078) and Expansion Module (opt. 8657)

In this case the switch for PTO actuation is fitted on the dashboard (see Figure 4).

Note For the description of the features and ways of using the Expansion Module, refer to Section 7 and the specific IVECO manual no. 603.95.826.
4.6.2 "After-sales" PTO
If PTO is to be installed in after-sales, the following must be checked:

- 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, once installation is complete, IVECO Assistance Service has to be contacted for the engine control unit software to be updated through the teleservice.

4.6.3 PTO management on gearbox
Given the distinction between PTOs for manual or automated gearbox, up to two homogeneous PTOs can be installed on the vehicle. For instructions on how to insert and remove the PTO, refer to the Operator’s Manual.

The operation of the engine and transmission depend on their respective control units and, in the case of automated gearbox and activated PTO, operation of the Expansion Module can be communicated with the control units.

The behaviour of the gearbox can be affected therefore when the PTO is configured as "stationary" or "not stationary": in the first case the gearbox remains in neutral, in the second case it allows engagement of the first gear or the reverse gear.

- For safety reasons, when the non-stationary PTO is engaged, gear changes are not possible (involving the automatic switch-off) and the vehicle should not exceed a speed of 20 km/h.

- It is necessary to switch off the PTO when a torque withdrawal is not in progress.

- Before turning off the engine using the body builder connector, the PTO must be disengaged. In any case, the engine cannot be restarted from the connector while the PTO is still connected.

4.6.4 Adjust the engine speed for drive take-off
The ECM engine control electronic control unit (see Chapter 5.1 figure 1) is able to actuate:

- the simultaneous adjustment of engine speed and power take-off;
- the control of the set rpm, maintaining or re-establishing balance depending on the applied load.

The command is given using the buttons on the steering wheel (see Figure 5).
1. ACC/CC function CANC control
2. ACC/CC function SET+ control.
3. ACC/CC function RESUME control
4. ACC/CC function SET- control
5. Cruise Control ON/OFF
6. ACC function ON/OFF control
7. Control for setting distance between vehicles for ACC and QA
8. SL function ON/OFF control

⚠️ Engine speed adjustment must be performed with the vehicle stationary.

**procedure** (also see Use and Maintenance Manual)

After having turned the selector to the ON position, activate the lever towards "+" or "+" to increase or decrease the rpm.

This can take place:

- **a)** with steps of 50 rpm for each actuation lasting up to 2 seconds;
- **b)** with an increase of 400 rpm for each additional second.

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

Lastly, it is possible to restore the idle speed by setting the selector to OFF, or by pressing the brake pedal or the clutch (if present).

**Note**  To manage engine speed control, requested torque and other parameters programmable on the Expansion Module, consult the specific IVECO manual.

### 4.6.5 Multiple State Switch

To manage the engine speed with the power take-off engaged, the circuit in Figure 6 must be created requiring connection to pins 3 and 8 of the Bodybuilder connector 72075A (see Section 5, Chapter 5.2 “Bodybuilders connectors”).
Multiple State Switch (example)
A. 12-pin body builder connector
B. Responsibility of the body builder

1. Pull-up (in ECU)
2. Pull-down (only for EDC7CI)

<table>
<thead>
<tr>
<th>Table 4.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance Values [Ohm]</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>120</td>
</tr>
<tr>
<td>390</td>
</tr>
<tr>
<td>900</td>
</tr>
<tr>
<td>2900</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 4.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programmable speed [rpm] - basic settings</td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>CM</td>
</tr>
<tr>
<td>CA</td>
</tr>
</tbody>
</table>

Resistance $\%$ of $W$ and tolerance 1$\%$. 
operation

1. With the vehicle stopped and the switch on position 0:
   - Manual operation - press the RESUME button on the Cruise Control to increase the engine speed to the programmed speed.
   - Assisted operation mode - providing a positive to pin 15 of the 20-way bodybuilder connector, the engine speed is positioned to the set speed.

2. With the vehicle stopped and the switch on position 0:
   - without pressing the RESUME button, the engine speed stays in idle. When the switch position is changed, the number of engine revolutions will move to the programmed speed for each switch position.

By moving the Cruise Control switch to OFF, or by pressing the brake pedal or clutch pedal, the engine speed control function is switched off regardless of the switch position.
SECTION 5

ELECTRONIC
SUB-SYSTEMS
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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

![Diagram of control units]

A. Instrument panel  
B. Trailer control unit  
C. Steering wheel column and ignition switch  
D. Body Computer  
E. Oil control unit  
F. "ECM" engine control unit  
G. CBA1 control unit on battery  
H. CBA2 control unit in the engine compartment  
I. Automated gearbox control unit on the chassis  
L. SCM connection unit (engine)  
M. "EMI" Expansion Module  
N. Airbag ECU  
O. EVSC / ABS control unit  
P. ECAS Electronic Control Air Suspension  
Q. Control unit for glow plug pre-heating  
R. Automatic transmission control unit
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.

![Figure 2](image)

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

If the vehicle is pre-installed for the optional installation of the Expansion Module, the electrical system in the cab is also equipped with connectors 61071B, 72071, 72075B.

An additional connector ST13 is located inside the engine compartment (left side, see Figure 3) and is provided in the case of PTO use.

The description of the functions of these connectors can be found in the Chapter 7.3 (⇒ Page 11) of this manual.
1. Connector ST13

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

Table 5.1 - dwg. 5802291186 (Bodybuilders side)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>41200694 EZ</td>
<td>Male contact for 0.35 to 0.5 mm² cable</td>
<td>1-2-3-4</td>
</tr>
<tr>
<td>41200695 EZ</td>
<td>Male contact for 0.75 to 1.00 mm² cable</td>
<td></td>
</tr>
<tr>
<td>41200696 EZ</td>
<td>Male contact for cable from 1.50-2.00-2.50 mm²</td>
<td></td>
</tr>
<tr>
<td>41200697 EZ</td>
<td>Male contact for cable &gt;2.50-4.00 mm²</td>
<td></td>
</tr>
<tr>
<td>5802291206 EZ</td>
<td>Male contact for 0.35 mm² cable</td>
<td></td>
</tr>
<tr>
<td>5802290575 EZ</td>
<td>Male contact for 0.50 to 0.75 mm² cable</td>
<td></td>
</tr>
<tr>
<td>5802290577 EZ</td>
<td>Male contact for 1.0 mm² cable</td>
<td></td>
</tr>
<tr>
<td>5802290577 EZ</td>
<td>Male contact for 0.50 to 0.75 mm² cable</td>
<td></td>
</tr>
<tr>
<td>5802290577 EZ</td>
<td>Male contact for 1.5 mm² cable</td>
<td></td>
</tr>
<tr>
<td>41118765 EZ</td>
<td>Male contact for 0.35 to 0.5 mm² cable</td>
<td></td>
</tr>
<tr>
<td>41118766 EZ</td>
<td>Male contact for 0.75 to 1.00 mm² cable</td>
<td></td>
</tr>
<tr>
<td>41118767 EZ</td>
<td>Male contact for cable from 1.50-2.00-2.50 mm²</td>
<td></td>
</tr>
<tr>
<td>41118768 EZ</td>
<td>Male contact for 4.00 mm² cable</td>
<td>31-32</td>
</tr>
<tr>
<td>5802293758 EZ</td>
<td>Male contact for cable &gt;4.00-6.00 mm²</td>
<td></td>
</tr>
</tbody>
</table>
## Table 5.2 - Basic functions of the 32-pole connector 72105A

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Maximum load</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Remote engine start-up from Bodybuilder control</td>
<td>8888</td>
<td>15 A</td>
<td>BCM F/9 75016 A/R4-87 **</td>
<td>The engine only starts when the key is turned in the ignition lock(K15 ON) Protect with the appropriate fuse +12 V = engine start-up request</td>
</tr>
<tr>
<td>2</td>
<td>Automatic gearbox (&quot;P&quot; function)</td>
<td>6140</td>
<td>200 mA</td>
<td>8HP70/8</td>
<td>Ground = function &quot;P&quot; available</td>
</tr>
<tr>
<td>3</td>
<td>Automatic gearbox (&quot;D&quot; function)</td>
<td>6141</td>
<td>200 mA</td>
<td>8HP70/10</td>
<td>Ground = function &quot;D&quot; available</td>
</tr>
<tr>
<td>4</td>
<td>EPB engagement request (Electronic Parking Brake)</td>
<td></td>
<td></td>
<td>BCM H/16</td>
<td>R 600 Ohm = EPB (Electronic Parking Brake) active and dashboard button and IPC warning light activation Ground (CC) or open circuit = no visible effect, the dashboard button only works with no faults R 1600 Ohm or open circuit or 1000 Ohm = EPB does NOT change status (regardless of the start status)</td>
</tr>
<tr>
<td>5</td>
<td>Manual parking brake (with decoupling diode)</td>
<td>6662</td>
<td>200 mA</td>
<td>BCM F/44</td>
<td>Ground = parking brake engaged</td>
</tr>
<tr>
<td>6</td>
<td>Clutch actuation</td>
<td>9273</td>
<td>200 mA</td>
<td>BCM F/53</td>
<td>+12 V = clutch pedal released (clutch engaged) - Diesel engine Ground = clutch pedal released (clutch engaged - CNG engine) Open circuit = clutch pedal pressed (clutch disengaged)</td>
</tr>
<tr>
<td>7</td>
<td>Side lights</td>
<td>3320</td>
<td>200 mA</td>
<td>SCM 8/39 Relay T03</td>
<td>+12 V = side lights on</td>
</tr>
<tr>
<td>8</td>
<td>Alternator status</td>
<td>7778</td>
<td>200 mA</td>
<td>EDC K/69 (F/1) BCM D/45</td>
<td>Requires a specific circuit +12 V = engine speed &gt; 500 rpm</td>
</tr>
<tr>
<td>9</td>
<td>EPB status detection</td>
<td></td>
<td></td>
<td>ABS/34</td>
<td>Ground = EPB active Open circuit = EPB not active</td>
</tr>
<tr>
<td>10</td>
<td>Engaging reverse</td>
<td>2268</td>
<td>200 mA</td>
<td>BCM F/4</td>
<td>+12 V = reverse gear engaged</td>
</tr>
<tr>
<td>11</td>
<td>Positive with key K15</td>
<td>8879</td>
<td>5 A</td>
<td>BCM G/12</td>
<td>Positive protected by fuse F49 on Body Computer N.B. Check the electrical balance of the simultaneous loads if necessary (EM, climate control system, retarder, Tachograph, FMS, etc.)</td>
</tr>
<tr>
<td>12</td>
<td>Engine speed control</td>
<td>8156</td>
<td></td>
<td>BCM H/56</td>
<td>Only with opt. no. 2453: Cruise Control For safety reasons, this operation is only permitted allowed with the vehicle stationary</td>
</tr>
<tr>
<td>13</td>
<td>Reference ground for Engine speed check</td>
<td>0000</td>
<td></td>
<td>BCM H/45</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>2nd speed limiter</td>
<td>0000</td>
<td>200 mA</td>
<td>BCM H/41</td>
<td>Speed limitation to a pre-set value Default value = 30 km/h Ground = 2nd speed limiter activated</td>
</tr>
<tr>
<td>15</td>
<td>Reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Speed signal (B7)</td>
<td>5517</td>
<td></td>
<td>BCM D/56</td>
<td>Pulse Signal, see the description in Table 5.4</td>
</tr>
<tr>
<td>17</td>
<td>Central emergency control</td>
<td>0000</td>
<td>200 mA</td>
<td>BCM H/22</td>
<td>Ground = activation request</td>
</tr>
<tr>
<td>18</td>
<td>Horn</td>
<td>1116</td>
<td>200 mA</td>
<td>BCM H/31</td>
<td>Ground = horn active</td>
</tr>
<tr>
<td>19</td>
<td>Engine speed (rpm)</td>
<td>5587</td>
<td></td>
<td>EDC K/70</td>
<td>Engine speed signal</td>
</tr>
<tr>
<td>20</td>
<td>Radio-MUTE control</td>
<td>1632</td>
<td>10 mA</td>
<td>DAB C9</td>
<td>ground = MUTE function request</td>
</tr>
</tbody>
</table>
### Pin Description | Cable Code | Maximum Load | Connected to | Remarks |
|------------------|-----------|--------------|--------------|---------|
| 21 PTO1 signal in operation | 6993 | 200 mA | EM X3/08 | PTO feedback  
Ground = PTO1 engaged |
| 22 Multiple State Switch | 0000 | | BCM H/38 | ISC input (Idle Speed Control) mode 1/2/3  
The ISC mode must be reactivated after every engine start-up |
| 23 Ground for Multiple State Switch | 0000 | | BCM H/36 | | |
| 24 Ground | 0000 | 15 A | LM68 | Ground connection |
| 25 K15 Remote | 8879 | 200 mA | SCM B/68 | +12 V = activation of K15 Remote  
*Note* Due to the Immobilizer, the engine does not start unless the ignition key is inserted |
| 26 Engine shut down | 9903 | 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 | 500 mA | BCM D/57 | 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 |
| 28 Vehicle stationary signal | 0000 | 200 mA | BCM H/32 | The signal provides information on the "vehicle at standstill" condition  
Ground = vehicle stopped  
Vehicle speed can be other than zero, up to 4 km/h with signal active |
| 29 Hazard lights warning signal | 1114 | | BCM H/08  
53077/16 | +12 V (intermittent) = Hazard lights engaged |
| 30 Battery positive K30 | 7772 | 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 Parking brake fully engaged | | | EDC K/59 | Active with ground signal transmitted from Outfitting  
Ground = parking brake fully engaged |
| 32 Inhibition of S&G control | | | EDC K/44 | +12V = Active command |

(*) On vehicles without Stop&Start  
(**) On vehicles with Stop&Start

---

**For each of the 32 terminals of connector 72105 A, specific information is provided below.**

**Terminal 1**

The function is available on vehicles with EPB (Electronic Parking Brake) or Hi-Matic transmission, but not on vehicles with a manual gearbox and manual parking brake. The status of the EPB is detected automatically by the electronic system of the vehicle.

The conditions required for engine start-up are:

- parking brake fully engaged
- clutch pedal (for manual gearbox) or brake pedal (for automatic transmission) pressed or parking brake activated
- in the case of automatic transmission vehicles, the gearbox must not be in "Drive" or "Reverse"
To ensure safe operation with a manual parking brake, confirmation is required of the complete engagement of this brake using the function of terminal 31 and the dedicated switch on the brake lever.

The engine will only start with the ignition key inserted in the ignition lock (K15 ON). Activating the Remote signal K15 from pin 25 of connector 72105A and then inserting the key in the ignition lock (K15 ON) prevents engine start-up and an Immobilizer Error is signalled. In this case, before repeating start-up, both Remote signals K15 and K15 ON must be removed.

The starter motor is only activated when the engine is NOT running and must be active until the engine starts.

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.

When the command is sent, all unintentional movements or vibrations of the vehicle or unintentional activations of the Outfitting (for example, machinery or other movable parts activated by PTO engagement) must be avoided. The on-board control logic checks that the vehicle is prevented from any significant movement before allowing the engine to start.

It is the Bodybuilder’s responsibility to:

- ensure that the start-up request can be sent only with the Version in a safe condition,
- warn the end user to keep the gearbox in neutral,
- implement, if necessary, additional measures to ensure the safety of the vehicle and the safety of each operator, depending on the specific type and use of the outfitting to be installed.

Please note that even if the measures adopted on the vehicle limit the risk unintentional movements, there could still be a slight movement or a vibration of the vehicle in some conditions.

**Note** For correct management of the engine logic, if the remote engine start request occurs following a request for engine shutdown from pin 26 of connector 72105A, the bodybuilder is required to wait at least 6 seconds before requesting a subsequent start.

**Terminal 2 - Terminal 3**

The function is not supported in serial applications.

Two actions are required in order to enable the function:

- Hi-Matic gearbox specific programming (contact IVECO Service);
- addition of cables and resistors (wiring of both terminals 2 and 3 is mandatory).

---

1. **Connector 72105A**
2. **Outfitting**

---

**Figure 5**

1. 24
2. 3
3. 2

- 2.2 kΩ
- 1.08 kΩ

- 2.2 kΩ
- 1.08 kΩ
Terminal 4
This command allows the remote application of the EPB when required by Outfitting (for example, sliding doors, special functions, etc.) with the key set to ON. When the control of the version is set to ON, some of the EPB logics might not be active.

When the "engagement requested" signal is "active", the application request of the electronic parking brake EPB is sent.

The command is only activated when the vehicle is stationary. If the vehicle is moving and the command is present, it will be actuated when the vehicle returns to stationary conditions.

When the "engagement request" signal changes to "inactive", the engagement request is no longer sent. The command must be of the pulse type lasting 2 seconds and must be removed with the EPB engaged.

Release of the EPB is not permitted from the bodybuilder connector. To release the parking brake, remove the engagement request (engagement request = not active) and use the switch on the dashboard.

The current status of the electronic parking brake EPB can be detected by the signal of pin 9.

---

Terminal 5
When the "Parking brake engaged" signal indicates "Ground" this indicates that this brake has not been fully released and 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.

When using a High impedance ECU input to read this signal, insert a 10 kOhm pull-up resistor between 72105A / pin 11 (K15 signal) and 72105A / pin 05, as outlined in Figure 7.
1. **Outfitting**

2. **Connector 72105A**

**Terminal 6**
The signal is activated when the clutch is not fully disengaged.

**Terminal 7**
The output signal of the side marker lights may also be taken from the chassis connector ST38. If necessary, consult Chapter 5.4 – Paragraph "Arrangement of side lights (Side Marker Lamps)".

**Terminal 8**
To receive indications on the status of the alternator, the following circuit must be created.

**Terminal 9**
This output signal allows detection of the EPB status. It is important that the Bodybuilder continuously monitors the status of the EPB to verify that it has completed the engagement operation.

The feedback signal is valid only when no application request is sent on terminal 4 and when the key is set to ON.

It must be noted that:
The EPB Signal status can change depending on the status of the system (not only depending on the EPB command):
- the status of the signal may change, even if the status of the parking brake does not change, when the vehicle is switched off, depending on whether the system is activated or deactivated on the basis of the switch on the dashboard;
- a slight delay in changing the activation / deactivation request status is normal;
- the signal status does not supply diagnostic information, the indication of danger is only shown on the vehicle dashboard.

**Terminal 10**
For vehicles in the Hi-MATIC version, refer to Annex C.

**Terminal 11**
Refer to the "observations" in Table 5.2.

**Terminal 12 - Terminal 13**
Only with opt. No. 2463 Cruise Control.
To activate the function only with the vehicle stationary, the Bodybuilder must take the relevant measurements. An example is provided below.

![Diagram](https://example.com/diagram.png)

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. 32-way Bodybuilders connector Pin 11 (K15)

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
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

<table>
<thead>
<tr>
<th>Function</th>
<th>Short-cut necessary</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC Resume</td>
<td>Pin 2</td>
</tr>
<tr>
<td>CC Set-</td>
<td>Pin 2</td>
</tr>
<tr>
<td>CC Set+</td>
<td>Pin 5</td>
</tr>
<tr>
<td>CC ON</td>
<td>Pin 4</td>
</tr>
</tbody>
</table>

**Terminal 14**

The value of the "2nd Speed limiter" can be modified by the IVECO Assistance Service using the designated tool. It must be noted that:

- the quality and precision of the limitation is reduced at low speeds and at low engine rpm; interferences with the idle regulator are possible especially below 1000 rpm;
- The speed limiter can be adjusted in steps of 1 km/h (from a minimum of 10 km/h) and must only be used in 1st gear or in reverse gear
- The function must be verified for each application and the Bodybuilder is also responsible for preparing specific instructions.

**Terminal 15**

Reserved.

**Terminal 16**

Mandatory insertion of a 5 kΩ pull-up resistor in addition to a diode as outlined in Figure 11.

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.
1. Outfitting  

The B7 output supplies the signal relating to the speed according to [ISO16844-2].

**Table 5.4 - Tachimetric signal characteristics**

<table>
<thead>
<tr>
<th>Function</th>
<th>Parameter</th>
<th>min</th>
<th>max</th>
<th>Unit of measurement</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tachograph output B7</td>
<td>Voltage $U_{\text{low}}$</td>
<td>1.5</td>
<td>V</td>
<td>1 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Voltage $U_{\text{high}}$</td>
<td>5.5</td>
<td>V</td>
<td>1 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frequency ($1/T$)</td>
<td>1.6</td>
<td>kHz</td>
<td></td>
<td>Square wave</td>
</tr>
<tr>
<td></td>
<td>Pulse duration (t)</td>
<td>0.64</td>
<td>ms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

---

---
1. Speed signal (terminal B.3) of the movement sensor fitted on the gearbox

2. Temporal diagram and form of the pulse speed signal (terminal B.7) from tachograph
   a. Pulse delay: max 40 μs ± 10 μs jitter

![Figure 12](image)

**Terminal 17**

*Only to be used in an emergency. It is not a battery cut-off command.*

The switch must be activated only with the vehicle parked and the parking brake engaged.

Due to activation of this function, some electrical components and the engine are turned off (refer to the Operator’s Manual for details), while the hazard lights begin to flash.

Some electronic systems might not be able to store potential errors occurring during this K15 cycle.

**Note** The Bodybuilder is fully responsible for informing the operators on personal safety and IVECO declines all liability for any kind of damage.

If a battery disconnect function is required in stand-by conditions, the TBD option is available.

This terminal can also be used as a means of detecting activation of the emergency shutdown command on the dashboard, to enable the emergency strategies of the Bodybuilder equipment.

**Terminal 18**

The signal of terminal 18 can be used as the input for the remote actuation of the acoustic indicator.

**Terminal 19**

Engine 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 F1C Euro VI

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Condition</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Unit of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_EMI</td>
<td></td>
<td>3.76</td>
<td>5.64</td>
<td>nF</td>
</tr>
<tr>
<td>C_IO</td>
<td></td>
<td>3.76</td>
<td>6.14</td>
<td>nF</td>
</tr>
<tr>
<td>I_Out</td>
<td></td>
<td></td>
<td>2.2</td>
<td>A</td>
</tr>
<tr>
<td>I_Out_SC</td>
<td></td>
<td></td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>I_Leak_Off</td>
<td></td>
<td></td>
<td>20</td>
<td>µA</td>
</tr>
<tr>
<td>I_Out_Diag</td>
<td></td>
<td></td>
<td>980</td>
<td>µA</td>
</tr>
<tr>
<td>V_OC</td>
<td></td>
<td>3.23</td>
<td>3.77</td>
<td>V</td>
</tr>
<tr>
<td>V_THR</td>
<td></td>
<td>4.7</td>
<td>5.4</td>
<td>V</td>
</tr>
<tr>
<td>V_Out_Low</td>
<td></td>
<td></td>
<td>1.76</td>
<td>V</td>
</tr>
<tr>
<td>R_ON</td>
<td></td>
<td></td>
<td>800</td>
<td>mΩ</td>
</tr>
<tr>
<td>E_Clamp</td>
<td></td>
<td></td>
<td>4</td>
<td>mΩ</td>
</tr>
<tr>
<td>V_Out_Clamp</td>
<td></td>
<td></td>
<td>60</td>
<td>V</td>
</tr>
<tr>
<td>R_Load_Diag</td>
<td></td>
<td></td>
<td>4.69</td>
<td>kΩ</td>
</tr>
</tbody>
</table>

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%
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.

**Terminal 20**
Refer to the "observations" in Table 5.2.

**Terminal 21**
PTO 1 engaged

**Terminal 22 - Terminal 23**
The signals to the Multiple State Switch may also be simultaneous to requests coming from the Expansion Module via CANopen (object 0x2001, sub 0x0C) or through activation of "PTO1/PTO2/PTO3 Memo Speed". The highest value prevails in the event of contemporaneity.
Table 5.6

<table>
<thead>
<tr>
<th>Resistance Values [Ohm]</th>
<th>R0</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>120</td>
<td>390</td>
<td>900</td>
<td>2900</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Function</th>
<th>Short-cut necessary</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISC Mode 1</td>
<td>Pin 2</td>
</tr>
<tr>
<td>ISC Mode 2</td>
<td>Pin 5</td>
</tr>
<tr>
<td>ISC Mode 3</td>
<td>Pin 8</td>
</tr>
</tbody>
</table>

Terminal 24

Refer to the "observations" in Table 5.2.
Terminal 25
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.

ATTENTION:
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); please consult the specific manual EM 603.95.826 (currently being updated at the time of publication of the present document).

Terminal 26
Refer to the "observations" in Table 5.2.
For Hi-Matic gearboxes, also refer to Chapter C.5 - Paragraph C.5.2 (⇒ Page 10)

Note  If, following the engine shutdown request, the engine has to be restarted remotely via pin 1 of connector 72105A, the bodybuilder is required to read the indications provided in the paragraph relating to terminal 1.
Terminal 32
The command enables additional automatic control of the engine by the Outfitting (for example, refrigerators). The Outfitting can automatically send an engine stop inhibition request to the vehicle during a phase of high energy consumption in working conditions. 
The driver is not required to manually exclude the S&S device depending on the status of the Outfitting.
Functional notes:

- When the control is active, automatic switching off of the engine by S&S is inhibited.
- Only for vehicles equipped with an automatic gearbox: if the command is activated with the engine off by S&S, the engine is automatically restarted.
- Automatic engine start-up is activated only if the service brake is pressed and only if all the safety conditions which are normally activated with S&S are observed (doors closed,...).

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 CBA1 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 close 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. 

Lock of observance of above described prescriptions involves guarantee lapse.
5.3.2 Disconnecting the electronic control units

Follow the instructions below carefully 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);
- isolate the battery by disconnecting the battery cables: disconnect the negative terminal first followed by the positive terminal;
- 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 on the electrical system of the vehicle, please consult the NEW DAILY Service Manual, printout no. 603.95.723.

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 cables must have a suitable sectioning for the type of load and the position of the load in the vehicle.
- 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 (for hermetic 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 14)".

If required by the application of additional devices, diodes must be fitted to protect against any inductive current peaks.

The ground signal from the analogue sensors must only be wired 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 reference metal plane, namely 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 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, position, strips, cable shielding connection, etc.) comply with indications provided by IVECO.

⚠️ Carefully restore the original system after any operations.

5.4.4 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.
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

Position of ground points on vehicle

- **M1**: Power ground below cab access step
- **M2**: Power ground on side member
- **M3**: Power ground on fire guard
- **M4**: Power, engine compartment ground near front right headlight
- **M5**: Power, engine compartment ground near front left headlight
- **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
- **M8**: Power ground, in the cab on the side panels
- **M85**: Signal ground, in the cab, below the floor mat
- **M9**: Power ground on fire guard
- **M10**: Power, engine compartment ground near front left headlight
- **M11**: Power ground on side member
- **M12**: Power ground on engine crankcase, left side
- **M13**: Power ground, engine compartment, left side
M1. Power ground below cab access step

M2. Engine compartment ground on side member
M12. Power ground on engine crankcase

M13. Power ground, engine compartment, left side
M3/MS3 signal/power ground on fire guard

M9. Power ground on fire guard

M4. Power, engine compartment ground near front right headlight
5.4 ELECTRICAL SYSTEM

**Figure 22**

M5. Power, engine compartment ground near front left headlight

M10. Power, engine compartment ground near front left headlight

**Figure 23**

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

MS8. **Signal ground, in the cab, below the floor mat**
M11. Engine compartment 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
- With junction connectors (Figure 28) the unshielded sections "d" must be 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.
"STELLA" connections of various negatives with the system ground

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

5.4.5 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.L.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>
<thead>
<tr>
<th>Type of emission</th>
<th>Type of transducer</th>
<th>Type of disturbance</th>
<th>Type of detector</th>
<th>Frequency range and limits acceptable in dBμV/m</th>
<th>Unit of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiated</td>
<td>Aerial at a distance of 1 metre</td>
<td>Narrow band</td>
<td>almost peak</td>
<td>63 54 35 35 24 24 24 31 37</td>
<td>dBμV/m</td>
</tr>
<tr>
<td>Radiated</td>
<td>Aerial at a distance of 1 metre</td>
<td>Broad band</td>
<td>peak</td>
<td>76 67 48 48 37 37 37 44 50</td>
<td>dBμV/m</td>
</tr>
<tr>
<td>Radiated</td>
<td>Aerial at a distance of 1 metre</td>
<td>Broad band</td>
<td>peak</td>
<td>41 34 34 34 24 30 24 31 37</td>
<td>dBμV/m</td>
</tr>
<tr>
<td>Conduit</td>
<td>LSN 50 Ω 5 μH 0.11 μF</td>
<td>Broad band</td>
<td>almost peak</td>
<td>80 66 52 52 36 36</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Conduit</td>
<td>LSN 50 Ω 5 μH 0.11 μF</td>
<td>Broad band</td>
<td>peak</td>
<td>93 79 65 65 49 49</td>
<td>dBμV</td>
</tr>
<tr>
<td>Conduit</td>
<td>LSN 50 Ω 5 μH 0.11 μF</td>
<td>Narrow band</td>
<td>peak</td>
<td>70 50 45 40 30 36</td>
<td>dBμV</td>
</tr>
</tbody>
</table>

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:

![Figure 29](image)

10 R- 03 2439

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:

![Figure 29](image)

---

a ≥ 6 mm

The values in the table are only to be considered respected if the device comes form "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;
- receiver-transmitter units for cellular telephones and TETRA/TETRAPOL
- GPS navigation and reception equipment
- radio
- "Toll collect" equipment
- FMS (Fleet Management System)
- DSRC (Dedicated Short Range Communication)

5.5.1 General indications

1. The equipment must be approved according to the law and be of a fixed nature (not potable).
   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:
   - 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 passenger compartment of the vehicle the aerial must be installed on a metal base with a wide surface area and it must be fitted as vertically as possible with the connection cable pointing downwards.
   Installation on the centre of the roof is to be considered the best by far, as the grounding is proportional in all directions.

---

![Figure 30]

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
1. Antenna connector
2. Ground wire
3. Insulator
4. Signal wire
5. Condenser (100 pF)
6. Cable RG 58 (characteristic impedance = 50 Ω)
7. Clamp
8. Protection cap

9. Connector (N.C. SO - 239) transceiver side
10. Test executed sticker
11. The 100 pF condenser must be soldered on the lower pin and crimped to the ground braid
12. The lower pin must be soldered to the core conductor of the cable
13. Nut

In addition to indications provided in this Use and Maintenance Manual (Section: Controls and devices), below are some specific indications for each type of equipment.

5.5.2 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.
5.5.3 Equipment for GSM/PCS/UMTS mobile phones and TETRA/TETRAPOL

The indications in the previous paragraph apply with the exception of the AERIAL GAIN. The deviations of this from the mean value can be 1.5 dB in the 380-460 MHz and 870-960 MHz bands and 2 dB in the 1710-2000 MHz band. An optimum position for the antenna would be the front of the cab roof, at a distance of not less than 30 cm from other antennas.

5.5.4 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 recommended ROS value is 1.5 with max 2 in the frequency range 1575.42 ± 1.023 MHz.
- The AERIAL GAIN values may have deviations of 1.5 dB in relation to the average value in the 1575.42 ± 1.023 MHz band.

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.

5.5.5 Radio

In addition to the indications present in the Operator’s Manual, data and specifications relating to the radio appliance are provided below.

LIN communication details

The radio connector interface follows the DIN standards, while the signal of the controls on the steering wheel is based on LIN standards.

For radio appliances in after-market, the available controls are:

- Volume up/down/mute
- Scan up/down - Source
- Phone ON-OFF (communication mode)
- Voice command

The other commands cannot be used.


DAB / analog aerial connections

The vehicle is equipped with the DAB/Analog aerial active and two connectors are available in the DIN compartment.

- The signal amplifiers are integrated in the body of the aerial and must be powered by the RF cable (phantom power supply)
- The requirements of the power stage are listed below
5.5 RECEIVER-TRANSMISSION SYSTEMS

Table 5.9 - AM/FM interface

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Minimum</th>
<th>Rated</th>
<th>Maximum</th>
<th>Unit of measurement</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of current DC</td>
<td>Not regulated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>8.5</td>
<td>13.5</td>
<td>16</td>
<td>Vdc</td>
<td>Circuit deactivation at V &gt; 16 V</td>
</tr>
<tr>
<td>Current absorption - Normal</td>
<td>20</td>
<td></td>
<td>90</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Inverse polarity</td>
<td>Requested</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charge-discharge</td>
<td>Requested</td>
<td></td>
<td></td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

Table 5.10 - DAB interface

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Minimum</th>
<th>Rated</th>
<th>Maximum</th>
<th>Unit of measurement</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of current DC</td>
<td>Not regulated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>8.5</td>
<td>13.5</td>
<td>16</td>
<td>Vdc</td>
<td></td>
</tr>
<tr>
<td>Current absorption - Normal</td>
<td>20</td>
<td></td>
<td>90</td>
<td>mA</td>
<td></td>
</tr>
</tbody>
</table>

Microphone active on the ceiling light fixture
The vehicle is equipped with an active microphone fitted on the ceiling light fixture.
The microphone connector is available in the DIN compartment.
The signal amplifier is integrated in the body of the microphone and must be powered by the signal cable (phantom power supply).

Table 5.11 - Electrical characteristics

<table>
<thead>
<tr>
<th>Characteristics of the aerial</th>
<th>Test conditions</th>
<th>Value minimum</th>
<th>Value Rated</th>
<th>Value maximum</th>
<th>Unit of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply voltage (V+)</td>
<td></td>
<td>+7.2</td>
<td>+8.0</td>
<td>+8.8</td>
<td>[Vdc]</td>
</tr>
<tr>
<td>supply current</td>
<td></td>
<td>–</td>
<td>7</td>
<td>15</td>
<td>[mA]</td>
</tr>
<tr>
<td>Signal decoupling</td>
<td>Coupling condenser CC</td>
<td></td>
<td></td>
<td></td>
<td>According to the application circuit</td>
</tr>
</tbody>
</table>

Figure 32

A. Microphone
B. Microphone control device
1. V+ power supply
2. Engine status output
3. Ground

---

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ELECTRONIC SUB-SYSTEMS

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- Printed 692,69.008 – 2 Ed. - Base 03/2020
### Table 5.12 - Acoustic characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Power supply voltage Power supply resistance</th>
<th>Microphone sensitivity [mV/Pa]</th>
<th>Directional SNR @ 1 kHz [dB]</th>
<th>SNR @ 1 kHz</th>
<th>THD @ 1 kHz, 94 dBSPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal value</td>
<td>8 V / 680 Ω</td>
<td>300 ± 3 dB</td>
<td>≥ 15</td>
<td>&gt; 60 dBA*</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

![Figure 33](image-url)

#### 5.5.6 "Toll collect" device

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.

5.5.7 FMS (Fleet Management System)

For the management of a fleet it is necessary that each vehicle provides a set of information on operation, the movements made and, if necessary, the driving style of the driver.

With the FMS function (opt. 14569) this information is made available (Remote Tachograph Download Data) on the standard of the same name, the specifications of which can be found at: www.fms-standard.com.

If the optional is present, the vehicle dashboard is fitted with a 12-way female connector (72070), dwg. 99478888 (1-967622-1 JPT), which interfaces with the male connector dwg. 41200682 (see Figure 35).
Connector 72070: positioning on the dashboard

### Table 5.13 - Connector 72070

<table>
<thead>
<tr>
<th>terminal</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Battery positive +30</td>
</tr>
<tr>
<td>4</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>L CAN line</td>
</tr>
<tr>
<td>9</td>
<td>H CAN line</td>
</tr>
<tr>
<td>10</td>
<td>Positive with key +15</td>
</tr>
</tbody>
</table>

The telematic device connected must be compatible with the FMS CAN termination.
The information that can be retrieved contains the message "FMS Standard Interface" and identifies the version that is supported. This message is not present if an interface that does not support this standard is installed.

In order to correctly acquire the CAN signal with the FMS data, an adequate termination resistor between pins 6 and 9 is required as well as programming of the SGW (Secure Gate Way). These operations must be performed by the IVECO Assistance Service.

### 5.5.8 DSRC (Dedicated Short Range Communication)

The DSRC aerial is necessary for tachograph operation.
IVECO provides an adhesive aerial (also on vans) that is still connected via a coaxial cable.
It is the Bodybuilder’s responsibility to install the aerial on the windscreen so as to meet the requirements of applicable legislation.

Compliance of the aerial with Regulations is tested and certified during the procedure for tachograph calibration on vehicle registration.
1. Windscreen
2. Road level
3. Aerial aim
4. maximum height 2 m - suggested < 1 m

Precautions for Installation

- The area of the windscreen where the DSRC adhesive aerial is to be affixed must be level and free of marks, incisions or coating.
- Dust, grease or other foreign matter must be removed by cleaning with a 50/50 mix of isopropyl alcohol and water (ensure sufficient ventilation).
- The windscreen and the aerial must both have a temperature of between + 15 °C and + 30 °C during installation.
- The aerial must be pressed on the windscreen with a force of 120 N for at least 10 seconds.

Additional information

It is possible to reduce the length of the cable by removing cable sections from 1.7 m or 2.5 m with Plug&Play connectors.
Connections exceeding 6 m from the tachograph to the aerial are not permitted.
The excess part of the cable must be routed in a safe area, preventing the "coil" effect.
The area must be placed in a position which is cleaned by the windscreen wipers and is free of any conductive material; if it is at the bottom of the windscreen, check the stop position of the windscreen wipers to prevent any interference.

> If the windscreen needs to be replaced (for example, if it breaks), the aerial will also need to be replaced, ensuring that it is placed in the same position as the previous one.
5.6 ADDITIONAL EQUIPMENT

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.

5.6.1 Additional batteries

The addition of a battery in the vehicle electrical system requires the provision of a circuit that, during start-up, makes it possible to section this battery with respect to the original. Given the new "smart" recharge strategies, the auxiliary battery must be equivalent to the originally installed battery and must have the same capacity (110 Ah).

In cases where it is necessary to use an additional battery in parallel with the series, we recommend the use of a larger alternator or the installation of an extra alternator.

The batteries can be traditional or "recombination" (AGM or gel).

Due to the normal chemical reaction that generates acid vapours during charging, installation must be performed in a way that ensures the safety of people and the protection of the vehicle.

Therefore, regardless of the type of battery, if you do not already have a segregated compartment, it is necessary to:

a) provide an airtight container corresponding to the passenger compartment, equipped with a system that vents vapours to the outside of the vehicle,

or

b) use a battery equipped with a lid with a vapour extraction system, anti-backfire (flame arrestor) system and a vent tube to the outside of the housing.

Also bear in mind that:

- vent systems should not cause depression inside the battery;
- the vapour release point must not be in areas where sparks can be triggered or near hear sources;
- the maximum allowable temperatures, for a short period of time, are 50 °C for conventional batteries and 40 °C for AGM or gel batteries.

➤ Ground connection of the additional battery must be made using a cable (the shortest possible) of adequate section.
5.6 ADDITIONAL EQUIPMENT

1. Standard battery
2. Additional batteries
3. Alternator with built-in regulator
4. Starter motor
5. Ignition key
6. Contactor switches
7. Body Computer
8. Engine Management control unit
9. Auxiliary load
10. Vehicle load
11. LIN bus

> All the lines downstream of all batteries are to be adequately protected, under any fault condition. Failure to ensure adequate protection may pose a fire hazard and a danger to persons.

5.6.2 Additional alternators

The diesel versions of the NEW DAILY are equipped with an advanced alternator ("smart") controlled by the engine management control unit.

This alternator is capable of delivering electrical current only when it is really necessary, and is able to always guarantee a correct state of battery charge through the sensor on the negative pole.

In cases where there are very onerous electrical loads a second alternator may be used, and it must be installed (with all the mechanical requirements necessary for compatibility with the vehicle and under the responsibility of the bodybuilder) according to the diagram in Figure 38.

The additional alternator must be of the traditional type, with pin L connected in order to ensure excitation with a current between 150 and 200 mA. The diagnostic light is optional, but a resistance is still necessary to ensure excitation.
Dual alternator operation requires that the additional traditional alternator is the one that delivers in any condition (as it is not controlled), while the original "smart" alternator intervenes when the electrical balance becomes negative (the battery charge status is monitored).

The diagnostic of the two alternators is ensured by:

- a battery indicator on the instrument panel, with regard to the first alternator
- an external diagnostic light (if installed) for the additional alternator

1. "Smart" first use alternator
2. Additional standard alternator
3. Battery
4. Electrical loads
5. Signal + I 5 from ignition switch
6. Body Computer
7. Instrument panel
8. Diagnostics Lamp or LED + Res. (current between 150 and 200 mA)
9. Engine Management control unit

**Note** The "smart" alternator is not provided on the CNG powered NEW DAILY. For the connection of an additional unit, refer to indications provided in Annex B.

The installation of additional equipment must include suitable protections and should not overload the vehicle system.

The additional alternators must be the type with Zener diode rectifiers to avoid damaging electric/electronic equipment due to accidental battery disengagement. Each alternator must also have a light or LED indicating low battery charge.

The additional alternator must have electrical features identical to those of the standard alternator and the cables must be correctly sized.

If you need to modify the system in a way other than described in this manual (for example, adding batteries in parallel), it is necessary to share the operation with IVECO.
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 22) - Paragraph: "Precautions for interventions on the system".

1. CBA2
2. Cable path between cab and engine compartment (see Figure 4.3)
3. Bodybuilder connectors (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 40).
H1. Current take off point protected by fuse FF

M1. 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 terminals) equal to 130 A.

▶ Only on vehicles without retardeer an additional point is represented by the terminal downstream of the fuse FN where a maximum current draw of 150 A is permitted.

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
Table 5.14 - List of fuses on CBA1

<table>
<thead>
<tr>
<th>Location</th>
<th>Amperage [A]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>150</td>
<td>Power supply CBA2</td>
</tr>
<tr>
<td>2</td>
<td>200</td>
<td>Power supply SCM and Body builders</td>
</tr>
<tr>
<td>3</td>
<td>500</td>
<td>Starter and Retarder</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>Body Computer power supply</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>TGC (opt)</td>
</tr>
</tbody>
</table>

b) Fuses on the CBA2 control unit
Table 5.15 - List of fuses on CBA2

<table>
<thead>
<tr>
<th>Location</th>
<th>Amperage [A]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>150</td>
<td>Retarder</td>
</tr>
<tr>
<td>2</td>
<td>150</td>
<td>SCM Power supply</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>Spare</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>EPS</td>
</tr>
<tr>
<td>5</td>
<td>60</td>
<td>Pre-/post-heating unit</td>
</tr>
<tr>
<td>6</td>
<td>30</td>
<td>Urea module</td>
</tr>
<tr>
<td>7</td>
<td>100</td>
<td>PTC power supply</td>
</tr>
<tr>
<td>8</td>
<td>30</td>
<td>Bodybuilders pre-installation</td>
</tr>
</tbody>
</table>

5.7.2 Cable path between cab and engine compartment

The passage of electrical cables between the inside of the cabin and the engine compartment is possible through the five holes of the bulkhead connector (Figure 43) located near the brake-servo (Figure 39).
To avoid infiltration of any fumes from the engine compartment to the cab, seal appropriately.

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 22) Paragraph "Precautions for work on the system", the used cables 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.

Note: The section of the cables must be suitably sized based on the current absorbed, the length of the cable, the voltage drop and the type of fuse used; intervention of the protection for overload or for short circuit must be guaranteed along the entire length of the protected line.

Use cables and fuses with the characteristics shown in the following table in accordance with the current draw:

<table>
<thead>
<tr>
<th>Max. continuous current (A)</th>
<th>Cable cross-section (mm²)</th>
<th>Fuse capacity (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 4</td>
<td>0.5</td>
<td>5</td>
</tr>
<tr>
<td>4 - 8</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>8 - 16</td>
<td>2.5</td>
<td>20</td>
</tr>
<tr>
<td>16 - 25</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>25 - 33</td>
<td>6</td>
<td>40</td>
</tr>
<tr>
<td>33 - 40</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>40 - 60</td>
<td>16</td>
<td>70</td>
</tr>
<tr>
<td>60 - 80</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>80 - 100</td>
<td>35</td>
<td>125</td>
</tr>
<tr>
<td>100 - 140</td>
<td>50</td>
<td>150</td>
</tr>
</tbody>
</table>

(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.
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 VEHH pre-installation for tail lifts

To ensure compliance with the VEHH standard (Association of European producers of tail lift manufacturers), optional 75182 is available, which makes it possible to install the tail lift without having to act on the electrical system of the vehicle.

1. Bridle in side member
2. Connector ST91
3. Lighting pre-installation (connector ST92)
4. VEHH tail lift bridle
5. Connector DIN 72585 (ST85) 7-pole
This pre-installation consists of:

- bridle with connector ST91 at the end of the rear overhang (Figure 47);
- bridle with 7-pin connector ST85, on the tail lift side (Figure 48);
- any wiring and connector ST92 (opt 75223) for the area lighting of the ramp (Figure 49);
- switches on the dashboard and warning lights (Figure 46) to activate and check the status of the tail lift.

![Diagram](image1)

1. Tail lift actuation switch
2. LED on switch
3. Tail lift indicator light

**Connector ST91**

![Diagram](image2)

**Table 5.17**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>U0931454 EZ</td>
<td>Male contact for 0.35 mm² cable</td>
</tr>
<tr>
<td>504079557 EZ</td>
<td>Male contact for 0.5 to 1.0 mm² cable</td>
</tr>
<tr>
<td>504079558 EZ</td>
<td>Male contact for 1.0 to 2.5 mm² cable</td>
</tr>
</tbody>
</table>
Table 5.18 - Connector ST91

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Signal</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power supply K30+</td>
<td>7772</td>
<td></td>
<td>75011/04</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Loading compartment lighting</td>
<td>4449</td>
<td></td>
<td>75011/23</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>H CAN line</td>
<td>2222</td>
<td></td>
<td>75011/20</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ground</td>
<td>0000</td>
<td></td>
<td>75011/17</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>L CAN line</td>
<td>9999</td>
<td></td>
<td>75011/16</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Power supply K30+</td>
<td>7772</td>
<td></td>
<td>75011/30</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Ground</td>
<td>0000</td>
<td></td>
<td>75011/25</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Hazard lights</td>
<td>1111</td>
<td></td>
<td>75011/18</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Switch for wheelchair ramp / Tail lift activation control</td>
<td>5500</td>
<td>Tail lift switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Connector ST85

Existing part on the vehicle (male), dwg. 41118387

Counterpart to be coupled (female), dwg. 504111928

Table 5.19

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/0931454 EZ</td>
<td>Male contact for 0.35 mm² cable</td>
</tr>
<tr>
<td>504079557 EZ</td>
<td>Male contact for cable 0.5 mm² - 1.0 mm²</td>
</tr>
<tr>
<td>504079558 EZ</td>
<td>Male contact for cable 1.0 mm² - 2.5 mm²</td>
</tr>
</tbody>
</table>

Table 5.20 - Connector ST85

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Signal</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tail lift activation control</td>
<td>5500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Signal from tail lift lamp relay</td>
<td>0258</td>
<td>max 5 A</td>
<td>75001 B/7514</td>
<td>Fuse FB7 - 5 A</td>
</tr>
</tbody>
</table>
### Table 5.21

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>98457375 EZ</td>
<td>Male contact for 0.35 to 0.5 mm² cable</td>
</tr>
<tr>
<td>98435370 EZ</td>
<td>Male contact for 0.75 to 1.5 mm² cable</td>
</tr>
</tbody>
</table>

### Table 5.22 - Connector ST92

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Signal</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ground</td>
<td>0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Lighting</td>
<td>4449</td>
<td></td>
<td>75001 B/23</td>
<td></td>
</tr>
</tbody>
</table>

- In order to operate the tail lift, the vehicle battery must be fully charged or an additional battery must be used.

**Note** For the operating mode and the precautions to be taken, refer to the Operator’s Manual.
5.8.4 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 and guard;
- chassis cable with trailer configuration;
- rear bridle for trailer socket.

For proper instillation it is necessary to:

- mount the electronic control unit onto the bracket; on the cab version also mount the guard;
- mount the entire bracket plus control unit onto the chassis as shown in Figure 51;
- replace the chassis cable with the new cable configured for the trailer socket (see Figure 52);
- fa connection bridle for the 13-pin socket compatible with the type of hook (high or low) (see Figure 53);
- Update the programming of the vehicle enabling the trailer control unit (contact the IVECO Service Network);
- Ensure that the seat securing the 13-pin socket complies with the distances indicated in Figure 50.

![Diagram](image_url)
A. Side view
B. Rear view

1. Trailer electronic control unit
2. Support bracket
3. Guard

1. Chassis cable
2. Connections with cab wiring
3. Trailer electronic control unit
4. Bridle with 13-pin socket
5. Tail lights
Note  The graphic is for illustration purposes only.

![Diagram of connector connections]

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 5.23 - 13-pin trailer socket

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rear left turn indicator</td>
<td>1120</td>
<td>1 21 W-12 V lamp</td>
</tr>
<tr>
<td>2</td>
<td>Rear fog lamp power supply</td>
<td>2283</td>
<td>2 21W-12V lamps</td>
</tr>
<tr>
<td>3</td>
<td>Ground</td>
<td>0000</td>
<td>–</td>
</tr>
<tr>
<td>4</td>
<td>Rear right turn indicator</td>
<td>1125</td>
<td>1 21 W-12 V lamp</td>
</tr>
<tr>
<td>5</td>
<td>Front left and rear right parking light Left license plate light and left side marker light</td>
<td>3335</td>
<td>3 5 W - 12V lamps</td>
</tr>
<tr>
<td>6</td>
<td>Stop signal lights power supply</td>
<td>1175</td>
<td>2 21W-12V lamps</td>
</tr>
<tr>
<td>7</td>
<td>Front right and rear left parking light. Right license plate light and right side marker light</td>
<td>3334</td>
<td>3 5 W - 12V lamps</td>
</tr>
<tr>
<td>8</td>
<td>Power supply for reverse light</td>
<td>2268</td>
<td>2 21W-12V lamps</td>
</tr>
<tr>
<td>9</td>
<td>After fuse F67 present on SCM1/B</td>
<td>7777</td>
<td>Battery positive</td>
</tr>
<tr>
<td>10</td>
<td>After fuse F49 present on Body Computer</td>
<td>8879</td>
<td>Positive with key</td>
</tr>
<tr>
<td>11</td>
<td>Ground</td>
<td>0000</td>
<td>–</td>
</tr>
</tbody>
</table>
| 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       | –       |
Note If using LED lights, diagnostics of an open circuit is ensured on pins 1 - > 8 if the absorbed current is ≥ 100 mA for each pin. To disable any diagnostic function, compatible with the legal restrictions, contact the IVECO Service Network.

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 the split the ground return using pins 3, 11 and 13.

5.8.5 Connector ST13 for PTO

Table 5.24

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/09314/54 EZ</td>
<td>Male contact for 0.35 mm² cable</td>
</tr>
<tr>
<td>504079557 EZ</td>
<td>Male contact for 0.5 to 1.0 mm² cable</td>
</tr>
<tr>
<td>504079558 EZ</td>
<td>Male contact for 1.0 to 2.5 mm² cable</td>
</tr>
</tbody>
</table>

Table 5.25 - Connector ST13

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Signal</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>PTO1 activation</td>
<td>9136</td>
<td>15 A</td>
<td>Fuse box and distributor Terminal 21</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PTO1 feedback switch</td>
<td>6993</td>
<td>10 mA</td>
<td>EM X3/8</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>PTO1+ activation</td>
<td>9135</td>
<td>15 A</td>
<td>Fuse box and distributor Terminal 22</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ground</td>
<td>0000</td>
<td>10 mA</td>
<td>Ground for PTO1 feedback switch</td>
<td>Ground for terminal 3</td>
</tr>
</tbody>
</table>
### 5.8.6 Reverse gear engagement signal

If on pin 10 of the connector 72105A (see Section 5. Table 5.2) the corresponding signal is not available when reverse gear is engaged, it is possible to proceed as follows:

- use the 2-way connector on the chassis near the right support bracket of the under-run bar;

**Table 5.26 - Reverse gear signal connector**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Signal</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reverse</td>
<td>2226</td>
<td>100 mA</td>
<td>BCM F01</td>
<td>Logic signal: (in parallel with the rear lamps +12 V = reverse gear engaged; no signal = reverse gear not engaged. Add a protection diode.</td>
</tr>
<tr>
<td>2</td>
<td>Ground</td>
<td>0000</td>
<td>100 mA</td>
<td></td>
<td>Ground signal for reverse gear</td>
</tr>
</tbody>
</table>

(*) if opt 7638 buzzer reverse gear is present, the maximum current is limited to 70 mA.

- Proceed as follows:
  - Use a protection diode, max current draw 100 mA
  - disconnect the 60-way connector from the Body Computer
  - remove approx. 100 mm of protection from the cables
  - connect a 0.75 mm² cable to the cable connected to pin LF04 (do not remove the pin from the connector) and insulate the connection properly (see Figure 55)
  - restore the cable protection
  - remove the terminal of the cable from slot 10 of the connector 72105A and protect it with insulating tape
  - put the 0.75 mm² cable into the available slot (use terminal no. 500314824) (see Figure 55)
  - protect the 0.75 mm² cable with 4.5 mm² of corrugated tubing and place it carefully in the dashboard going from the Body Computer to the Bodybuilder connector 72105A
  - reconnect the 60 ways connector to the Body Computer
5.8.7 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.), while the electric power supply must be obtained by the specific ST38 connector on the chassis (see Figure 56) is requested.

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.
Connector ST38

Existing part on the vehicle (male), dwg. 98435344

Counterpart to be coupled (female), dwg. 98435331

Table 5.27

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>98435331 EZ</td>
<td>3-way male connector</td>
</tr>
<tr>
<td>98457375 EZ</td>
<td>Male contact for 0.35 to 0.5 mm² cable</td>
</tr>
<tr>
<td>98455370 EZ</td>
<td>Male contact for 0.5 to 1.5 mm² cable</td>
</tr>
</tbody>
</table>
**Table 5.28 - Connector ST38 for Side Marker Lamps**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Max. current [A]</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ground</td>
<td>0000</td>
<td>2.5</td>
<td>ST43/1</td>
<td>Ground for left and right side markers</td>
</tr>
<tr>
<td>2</td>
<td>Vehicle left side clearance lights</td>
<td>3390</td>
<td>1.25</td>
<td>ST43/2</td>
<td>+12 V = vehicle left side markers on, no signal = vehicle left side markers off</td>
</tr>
<tr>
<td>3</td>
<td>Vehicle right side clearance lights</td>
<td>3390</td>
<td>1.25</td>
<td>ST43/2</td>
<td>+12 V = vehicle right side markers on, no signal = vehicle right side markers off</td>
</tr>
</tbody>
</table>

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.

### 5.8.8 Pre-installation for centralised door locking system

The following are present for "van" and "camper" versions:

- opt 5864 "Centralised door locking system + Pre-installation for an additional centralised door locking system", which provides an outlet on the central pillar. The bodybuilder can mount a remote controlled door on the body in combination with a centralised remove control central door locking system (lock/unlock).
- opt 5865 "Anti-theft system + Predisposition for an additional rear centralised door locking system", which offers the anti-theft system in combination with RCL (Remove Control Lock) + Predisposition for rear door.

These options offer the key with 3-button remote control (one button is dedicated to the rear door) to command the additional rear door, or with one button (lock/unlock for all the doors) on the dashboard.

The connector is located under the plastic coating at the base of the pillar (see Figure 58).

![Figure 58](ST62.png)

The following diagram (Figure 59) shows the connections between the rear door socket and the door lock switch/actuator.
A. Rear door socket
B. Body builder actuator
C. Body builder button switch

Closed circuit ➞ when the door is closed
Open circuit ➞ when the door is open

For the system to function properly it is essential to have a "closed door" signal (feedback of vehicle with closed door).

**Note**  
The vehicle is supplied with a connector for "closed door" simulation, inserted in the pre-installation connector ST62 (see Figure 60) is requested. Without this simulation the Body Computer would send an "open door" signal to the instrument panel and the central locking would not be activated.

In outfitting the vehicle it is therefore necessary to disconnect the counterpart provided for the simulation and connect the one for the outfit itself.

**Connector ST62**

The bodybuilder must also provide an identical connection for the driver and passenger doors for the side door sockets (Figure 61).
5.8.9 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 (in the central area of the flame guard);
- alarm siren (behind front bumper, right-hand side).

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.

Open circuit → when the door is closed
Closed circuit → when the door is open

For the operation mode refer to the Use and Maintenance Manual.
5.8.10 OBD socket

When creating a specific cab interior, for example Camper or Bus versions, the OBD socket (On Board Diagnosis, code 72069) must be kept in or close to the position established for trucks.

This position corresponds to the dashboard centre distance, below the air vent on the passenger side and behind trim panel. The need to ensure maximum accessibility and appropriate information in this regard must be highlighted.

5.9 SPECIFICATIONS FOR VERSIONS DERIVED FROM THE "COWL" VEHICLE

5.9.1 Electronic safety devices

Note It is recommended that the information in this chapter is integrated with information provided in the Operator’s Manual.

The ADAS system (Advanced Drive Assistance Systems) acquire measurement data from a radar installed at the centre of the front bumper and a camera installed on the inside of the windscreens.

By processing the data, the following functions are possible:

- AEBS + City Brake (opt. 72806)
- LKA (Lane Keeping Assist) (opt. 72805)
- ACC (Adaptive Cruise Control) (opt. 14522)
- ACC + Queue Assist (opt. 72803)

⚠️ As the radar and camera carry out processing operations which are essential for safety, installation and calibration procedures are required which can only be carried out by IVECO as part of the first equipment: After-sales installation is not permitted.

5.9.2 Radar

For compliance with the operating conditions specified in planning and design, the need to not modify the following must be highlighted:

- orientation of the radar;
- inclination of the radar equal to ± 0.5° on the horizontal reference plane with the vehicle outfitted;
- the area in front of the output cone of the radio waves, which must be free of any obstacles;
- the material, the shape and the dimensions of the protective cover, which must remain as originally provided on the cowl vehicle and on the stripped chassis cowl vehicle (see the diagrams in Figure 63);
- the integrity of the protection cover (no painting, tape, etc.).

With the outfitting completed according to IVECO procedure 5004357863, the protective cover must be in the following position in the bumpers:
The radar sensor together with the cover must observe the following positions:

### Table 5.29 - Installation dimensions

<table>
<thead>
<tr>
<th>Axles</th>
<th>Cowl vehicle</th>
<th>Stripped chassis cowl vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>min [mm]</td>
<td>max [mm]</td>
</tr>
<tr>
<td>Z (distance from the ground) (*)</td>
<td>+ 450</td>
<td>+ 690</td>
</tr>
<tr>
<td>X (distance from the calculated position)</td>
<td>- 10</td>
<td>+ 50</td>
</tr>
<tr>
<td>Y (distance from the calculated position)</td>
<td>- 10</td>
<td>+ 10</td>
</tr>
</tbody>
</table>

(*) Reference for radar sensor for distance Z

(1) TBC
Output cone of the radio waves

A. Top view  
B. Side view

Table 5.30 - Output cone of the radio waves

<table>
<thead>
<tr>
<th>Distance from the radar [mm]</th>
<th>Width [mm]</th>
<th>Height [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>75</td>
<td>50</td>
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<tr>
<td>30</td>
<td>120</td>
<td>63</td>
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<td>50</td>
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<td>100</td>
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<td>300</td>
<td>400</td>
<td>250</td>
</tr>
<tr>
<td>400</td>
<td>500</td>
<td>295</td>
</tr>
<tr>
<td>500</td>
<td>550</td>
<td>340</td>
</tr>
</tbody>
</table>

The output cone of the radio waves could be altered by:

- any obstacle on the bumpers in the area in front of the radar;
- damage to the bumpers for cowed vehicles, the radar fixing bracket or the tubular cross member at the back for stripped chassis cowl vehicles (for example, impact, collisions);
- poor refitting of the bumpers after they have been removed or replaced;
- excessive vibrations of the bumpers, if a bumper other than standard bumpers are used.
Since the vehicle fastening system (see fastening system in IVECO procedure 5004357863) significantly affects the vibrational behaviour of the radar sensor, it is mandatory that the following vibrational profile be observed along the axis X (the accelerometers must be positioned close to the fastening points of the radar sensor):

![Diagram](image)

A. Frequency
B. Movement along axis X (Peak - Peak)
C. Unmonitored zone
D. Maximum permitted movement

### Table 5.3.1

<table>
<thead>
<tr>
<th>Frequency [Hz]</th>
<th>Movement along axis X (Peak - Peak) [mm]</th>
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</thead>
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<tr>
<td>5</td>
<td>&lt;5</td>
</tr>
<tr>
<td>10</td>
<td>&lt;2</td>
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<tr>
<td>20</td>
<td>&lt;1.5</td>
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<tr>
<td>30</td>
<td>&lt;0.2</td>
</tr>
</tbody>
</table>

▶ At the end of any interventions involving the radar, the system must always be recalibrated at an IVECO Service Centre.
Table 5.32 - Radar control unit pinout

<table>
<thead>
<tr>
<th>PIN</th>
<th>FUNCTION</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CAN_H_ADAS (Fusion)</td>
<td>Not used if no camera is present</td>
</tr>
<tr>
<td>2</td>
<td>CAN_L_ADAS (Fusion)</td>
<td>Not used if no camera is present</td>
</tr>
<tr>
<td>3</td>
<td>Ground</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CAN_L_LAS (Vehicle)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CAN_H_LAS (Vehicle)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Power supply Ignition</td>
<td></td>
</tr>
</tbody>
</table>

5.9.3 Camera

IVECO includes a "database" of the installation position of the camera which allows maximum system performance.

- Contact IVECO to identify the best possible solution. Video camera contribution is only correct if it is installed in compliance with indications specified by IVECO.

Therefore, for vehicles based on cowl or stripped chassis cowl vehicles, the Bodybuilder must:

- obtain approval for the position of the device on the windscreen;
- request software modification;
- carry out the calibration of the entire system checked by the Service Network.

- The calibration must also be repeated when the windscreen is replaced.
Note  In the presence of the devices with the optional functions indicated at the beginning of Chapter 5.9, the following modifications are not permitted:
- increasing the GVW to beyond the limits set by IVECO;
- use of a wheelbase which is not included in the range;
- increasing the body width.

5.9.4 Rain sensor / light sensor

A dedicated sensor is required for automatic activation of the windscreen wiper and/or automatic activation of the lights. This sensor must be applied on the inside of the windscreen and must be positioned within the area cleaned by the windscreen wiper blades, according to the diagrams attached (see Figure 69) is requested.
A. Parallel windscreen wiper system
B. Opposing windscreen wiper system
C. Opposing windscreen wiper system

1. Position of rain sensor
2. Left-hand side
3. Right-hand side
4. Wiper zone

In order to meet the basic operating conditions on standard production vehicles, the sensor is installed on the basis of the following specifications:

**Table 5.33 - Installation specifications**

<table>
<thead>
<tr>
<th>Characteristics of the glass</th>
<th>Windscreen angle in relation to the vertical axis [°]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness external part [mm]</td>
<td>Thickness PVB [mm]</td>
</tr>
<tr>
<td>2.60</td>
<td>0.76</td>
</tr>
</tbody>
</table>
5.9.5 I/O Extender

The device consists of a relay combined with IVECO software which, starting from CAN signals provided by the vehicle, generates configurable signals for the Bodybuilder services.

It is available from IVECO Parts with p/n 5802423286 and can only be installed if the vehicle has the Expansion Module optional and the relative supply cable.

This cable has a pre-installation connector (72106, see Figure 70), to which the Bodybuilder must connect the Extender using a specific bridle prepared by the Bodybuilder.


---

Table 5.34 - Connector 72106

<table>
<thead>
<tr>
<th>terminal</th>
<th>Description</th>
<th>Cable dimension [mm²]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>K15</td>
<td>0.5</td>
</tr>
<tr>
<td>2</td>
<td>C-CAN H</td>
<td>0.35</td>
</tr>
<tr>
<td>3</td>
<td>C-CAN H (*)</td>
<td>0.35</td>
</tr>
<tr>
<td>4</td>
<td>Spare</td>
<td>–</td>
</tr>
<tr>
<td>5</td>
<td>C-CAN L</td>
<td>0.35</td>
</tr>
<tr>
<td>6</td>
<td>C-CAN L (*)</td>
<td>0.35</td>
</tr>
</tbody>
</table>

(*) dedicated C-CAN with Expansion Module
SECTION 6

ADBLUE AND
SCRT SYSTEM
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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 NOx into nitrogen and water, which are harmless to the environment.

6.2.1 Main components of the SCRT system

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 NOx through the injection of AdBlue.

CUC: to eliminate the ammonia residues (NH₃).
6.3 INSTRUCTIONS

The following instructions are intended for the AdBlue injection system of the Bosch DeNOx 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; However, the tank can be replaced as long as it is replaced with the versions used for normal production (see Figure 5).

---

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 (1) 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, Type S-1/4 (dosing module interface) or SAE J2044, Type S-3/8 (plunger module interface).

At the end of any operations which involve the AdBlue tank, make sure that:

- the tank ventilation pipe is not closed or restricted;
- there is at least 6 litres of AdBlue present.

### 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

Note The parts in plastic must be at least 200 mm from any heat source (e.g. exhaust system); if heat-protecting panels are used this distance can be reduced to 80 mm.

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)

Note If it is necessary to change the position of one or more of the components of the AdBlue system for Outfitting requirements, this must be done ensuring that the new arrangement corresponds to one of the standard production layouts.

To this end, note that:

a) the original position of the dosing module DM on the exhaust pipe must never be modified;
b) if the AdBlue tank is moved, the installation heights must correspond to the SM module already approved;
c) any new heated pipe (by configuration or length) must only be selected from those used in production.

- All modifications must in any case be described and authorised by IVECO.
- After a component has been moved and/or the length of the AdBlue delivery pipe has been changed, the ECUSET engine control unit must be reprogrammed.
6.4.1 Representative vehicles

Table 6.1 lists 18 reference vehicles corresponding to the AdBlue system versions used for the production of the entire DAILY MY19 range.

The following tables show the application criteria of the main components of the systems on the aforementioned 18 vehicles. Users are reminded that, if outfitting of the vehicle requires modifications to the original layout of the AdBlue system, one of the fundamental 18 layouts must be replicated.

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle 1</td>
<td>Vehicles without outswinging door 355-50C</td>
</tr>
<tr>
<td>Vehicle 2</td>
<td>Vehicles without outswinging door 60C-70C</td>
</tr>
<tr>
<td>Vehicle 3</td>
<td>Vendor 355 - Wheelbase 3520 - Left-hand drive</td>
</tr>
<tr>
<td>Vehicle 4</td>
<td>Vendor 355 - Wheelbase 3520 - Right-hand drive</td>
</tr>
<tr>
<td>Vehicle 5</td>
<td>Vendor 35C-50C - Wheelbase 3520 - Left-hand drive</td>
</tr>
<tr>
<td>Vehicle 6</td>
<td>Vendor 35C-50C - Wheelbase 3520 - Right-hand drive</td>
</tr>
<tr>
<td>Vehicle 7</td>
<td>Vendor 355 - Wheelbase 4100</td>
</tr>
<tr>
<td>Vehicle 8</td>
<td>Vendor 35C-70C - Wheelbase 4100</td>
</tr>
<tr>
<td>Vehicle 9</td>
<td>Cab 355 - Wheelbase 3450-3750</td>
</tr>
<tr>
<td>Vehicle 10</td>
<td>Cab 35C-50C - Wheelbase 3450-4350</td>
</tr>
<tr>
<td>Vehicle 11</td>
<td>CAB 60C-70C - Wheelbase 3450-4100-4350-4750-5100</td>
</tr>
<tr>
<td>Vehicle 12</td>
<td>Cab 60C-70C - Wheelbase 3750</td>
</tr>
<tr>
<td>Vehicle 13</td>
<td>Cab 355 - Wheelbase 3000</td>
</tr>
<tr>
<td>Vehicle 14</td>
<td>Cab 35C-50C - Wheelbase 3000-4100-4750</td>
</tr>
<tr>
<td>Vehicle 15</td>
<td>Cab 355 - Wheelbase 4100 Cool box</td>
</tr>
<tr>
<td>Vehicle 16</td>
<td>Cab 35C-50C - Wheelbase 3750</td>
</tr>
<tr>
<td>Vehicle 17</td>
<td>Cab 355 air suspensions - Wheelbase 3000</td>
</tr>
<tr>
<td>Vehicle 18</td>
<td>Cab 355 - Wheelbase 4100</td>
</tr>
</tbody>
</table>

6.4.2 AdBlue pipe

![Image of AdBlue pipe]
### Table 6.2

<table>
<thead>
<tr>
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### 6.4.3 AdBlue tank

#### Figure 5

![AdBlue tank images](image_url)

### Table 6.3

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6.4.4 AdBlue tank brackets

![Images of AdBlue tank brackets A1, A2, B, C]

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6.4.5 AdBlue refuelling filler

![Images of AdBlue refuelling fillers A, B, C]

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Printed 692,69008 – 2 Ed. – Base 03/2020
6.4.6 Internal refuelling and breather pipes

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A. Angle of the filling pipe
   a. Minimum 10° angle of inclination

B. AdBlue refuelling inlet angle
   β. Angle of inclination - minimum 30° and maximum 90°
6.5 TYPE-APPROVED LAYOUTS

Vehicle 1 - Vehicle 2

Vehicle 3
Vehicle 4

Vehicle 5
Vehicle 6

Vehicle 7 - Vehicle 8
Vehicle 9

Vehicle 10
Vehicle 13

Vehicle 14
Vehicle 15

Vehicle 16
Vehicle 17

Vehicle 18
### 6.5.1 AdBlue tank position

**Position in Z**

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### 6.5 TYPE-APPROVED LAYOUTS

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**Position 4a**

**Position 4p**

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**Position in X – OPTION 1**

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**X1**

**X2**
Position in X – OPTION2

Vehicle 1 35C-50C - Vehicle 2

Position in X – OPTION3

Vehicle 3 - Vehicle 5 - Vehicle 7 - Vehicle 8

Position in X – OPTION4

Vehicle 4 - Vehicle 5
### Position in X – OPTION5

Vehicle 9 - Vehicle 13 - Vehicle 15 - Vehicle 17 - Vehicle 18

![Diagram of Position in X – OPTION5](image)

### Position in X – OPTION6

Vehicle 10 - Vehicle 11 - Vehicle 12 - Vehicle 14 - Vehicle 16

![Diagram of Position in X – OPTION6](image)

### Table 6.7

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SECTION 7

EXPANSION

MODULE
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EXPANSION MODULE

7.1 GENERAL INFORMATION

The Expansion Module (EM) shown in Figure 1, is an electronic interface designed to manage the different types of configurations.

This manual provides indications relating to:

- power take-off management (PTO)
- wiring diagram
- management of additional functions (additional lights, alarms, after-sales PTO, etc.)
7.2 PTO MANAGEMENT

The Expansion Module control unit, housed under the dashboard on the passenger side, is able to manage up to two power take-offs (PTO1, installed only on the gearbox, and PTO2).

To engage and disengage PTO1, there is a rocker button (1) (Figure 2) in the central part of the dashboard and a warning light indicating:

- if off: PTO1 disengaged (a).
- if steady on: PTO1 engaged (b).
- if flashing: transient stage from (a) → (b) or from (b) → (a) in which the EM searches, respectively, to engage or disengage PTO1.

![Figure 2](image)

To engage and disengage PTO2, a stable type switch is required, which is the responsibility of the Bodybuilder in the same way as the connections between the PTO2 and the available connector (see Chapter 7.2 - Paragraph "Electrical connections for PTO2 connection ".

7.2.1 Standard configuration of the PTO

IVECO may equip the vehicle with the EM control unit, PTO1 configured in standard mode and the activation button. This makes it possible to engage and disengage PTO1 according to the procedures indicated in the Operator’s Manual of the vehicle.

7.2.2 PTO customized configuration

To activate a specific power take-off operation, the Expansion Module must be programmed by IVECO Customer Service. By following the indications provided here, the Bodybuilder is able to organise system configuration in advance.

For each PTO, IVECO Customer Service can configure different parameters:

- engagement restrictions;
- disengagement conditions;
- engine checks (engine rpm request or maximum torque limit configuration or maximum rpm limit configuration).

**Note** The "control parameter on the engine" cannot be configured for a CNG engine.
a) **Engagement restrictions**

Engagement restrictions are used if the user wishes to impede engagement of the PTO to check (or not) the set conditions. The restriction conditions are considered as such only if they have a temporary duration of a few seconds or more. When this time has elapsed the EM control unit detects the presence of the restriction. A warning message will be displayed and engagement will not take place.

The following table contains the list of possible engagement restrictions; The user chooses which to enter for their own application from those indicated.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Possible Restriction 1</th>
<th>Possible Restriction 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brake</td>
<td>Depressed</td>
<td>Not depressed</td>
</tr>
<tr>
<td>Handbrake</td>
<td>Activated</td>
<td>Not activated</td>
</tr>
<tr>
<td>Clutch pedal (#)</td>
<td>Depressed</td>
<td>Not depressed</td>
</tr>
<tr>
<td>Coolant temperature</td>
<td>40 - 150 °C</td>
<td></td>
</tr>
<tr>
<td>Reverse</td>
<td>Engaged</td>
<td>Not engaged</td>
</tr>
<tr>
<td>Open circuit on the pressure switch if fitted on PTO2 ($)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short circuit to ground on the pressure switch if fitted on PTO2 ($)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low engine oil pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min rpm for engagement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max rpm for engagement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min vehicle speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max vehicle speed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(#) only for manual gearbox

($) for the electrical connection, see Chapter 7.2 "Wiring diagram" ( ⇒ Page 11)

**Note** These conditions can be modified only by IVECO Customer Service.

b) **Disengagement conditions**

The disengagement conditions are those in which the PTO switches itself off automatically. The disengagement conditions are considered as such only if they have a temporary duration of a few seconds or more. When this time has elapsed the EM control unit detects the presence of the disengagement condition. A warning message will be displayed on the instrument panel and the PTO will automatically disengage.

**Note** The automatic disengagement by the EM depends on the PTO load. In some situations, when the warning message is displayed in the instrument panel, the PTO is not switched off automatically. In this case it is necessary to:

- actuate the clutch (if the vehicle is stationary)
- engage neutral (if the vehicle is running)

The table below contains the list of possible disengagement conditions; The user chooses which to enter for their own application from those indicated.
### Table 7.2

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Possible condition disengagement 1</th>
<th>Possible condition disengagement 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brake</td>
<td>Depressed</td>
<td>Not depressed</td>
</tr>
<tr>
<td>Handbrake</td>
<td>Activated</td>
<td>Not activated</td>
</tr>
<tr>
<td>Clutch pedal (#)</td>
<td>Depressed</td>
<td>Not activated</td>
</tr>
<tr>
<td>Coolant temperature</td>
<td>40 - 150 °C</td>
<td></td>
</tr>
<tr>
<td>Reverse</td>
<td>Engaged</td>
<td>Not engaged</td>
</tr>
<tr>
<td>Open circuit on the pressure switch if fitted on PTO2 ($)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short circuit to ground on the pressure switch if fitted on PTO2 ($)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low engine oil pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min rpm for disengagement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max rpm for disengagement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min vehicle speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max vehicle speed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(#) only for manual gearbox

($) for the electrical connection, see Chapter 7.2 "Wiring diagram" (⇒ Page 11)

**Note** These conditions can be modified only by IVECO Customer Service.

### c) Engine checks

When the PTO is engaged the following checks on the engine are connected:

- RPM request (not available on CNG engines);
- configuration of maximum RPM limit (not available on CNG engines);
- configuration of maximum torque limit (a limit at lower torque values than necessary to support idling should not be set for CNG engines, otherwise the engine will cut out).

**Note** During the "rpm request" check the engine speed cannot be changed using the Cruise Control and/or the accelerator pedal.

Engine control ends when the PTO is released.

The parameter `PTO[x]_SwActCfg` (x = 1, 2 represents the PTO involved) defines whether to associate the control on the engine with the pressure of the button for PTO engagement:

### Table 7.3

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTO[x]_SwActCfg</td>
<td>No control requested</td>
</tr>
<tr>
<td></td>
<td>Engine control requested as soon as the PTO engagement button is pressed</td>
</tr>
</tbody>
</table>

> When the aforementioned parameter is set and when there are engagement restrictions, the engine control is applied for a certain period of time (a few seconds) until the EM control unit no longer detects the restriction.

**Note** These conditions can be modified only by IVECO Customer Service.
The parameter PTO[x].FbkActCfg (x = 1, 2 refers to the PTO involved) defines whether to associate the engine control to the successful engagement of the PTO, therefore only after the engine has sent a positive feedback to the EM.

**Table 7.4**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTO[x].FbkActCfg</td>
<td>No control requested</td>
</tr>
<tr>
<td></td>
<td>Engine control requested only after the PTO has been successfully engaged.</td>
</tr>
</tbody>
</table>

**Note** These conditions can be modified only by IVECO Customer Service.

### 7.2.3 Standard parameters for PTO1 supplied by IVECO

**Table 7.5**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
<th>Manual gearbox</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engagement restrictions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service brake pressed</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Service brake not pressed</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Handbrake activated</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Handbrake not activated</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Low engine oil pressure</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Clutch pedal pressed</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Clutch pedal not pressed</td>
<td></td>
<td>yes</td>
</tr>
<tr>
<td>Gear not in neutral</td>
<td></td>
<td>Not applicable</td>
</tr>
<tr>
<td>Reverse gear</td>
<td></td>
<td>Not applicable</td>
</tr>
<tr>
<td>Open circuit on the pressure switch if fitted on PTO2</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Open circuit on the pressure switch if fitted on PTO2</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Min rpm for engagement</td>
<td></td>
<td>700 rpm</td>
</tr>
<tr>
<td>Max rpm for engagement</td>
<td></td>
<td>1300 rpm</td>
</tr>
<tr>
<td>Min vehicle speed</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Max vehicle speed</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Lower gear engaged</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Higher gear engaged</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Maximum coolant temperature</td>
<td></td>
<td>110 °C</td>
</tr>
<tr>
<td><strong>Disengagement conditions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service brake pressed</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Service brake not pressed</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Handbrake activated</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Handbrake not activated</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Low engine oil pressure</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Clutch pedal pressed</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Clutch pedal not pressed</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Gear not in neutral</td>
<td></td>
<td>Not applicable</td>
</tr>
<tr>
<td>Reverse gear</td>
<td></td>
<td>Not applicable</td>
</tr>
<tr>
<td>Min rpm for disengagement</td>
<td></td>
<td>500 rpm</td>
</tr>
<tr>
<td>Open circuit on the pressure switch if fitted on PTO2</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Short circuit to ground on the pressure switch if fitted on PTO2</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Max rpm for disengagement</td>
<td></td>
<td>2000 rpm</td>
</tr>
</tbody>
</table>
### 7.2 PTO MANAGEMENT

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
<th>Manual gearbox</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disengagement conditions</td>
<td>Min vehicle speed</td>
<td>no</td>
</tr>
<tr>
<td></td>
<td>Max vehicle speed</td>
<td>no</td>
</tr>
<tr>
<td></td>
<td>Lower gear engaged</td>
<td>no</td>
</tr>
<tr>
<td></td>
<td>Higher gear engaged</td>
<td>no</td>
</tr>
<tr>
<td></td>
<td>Maximum coolant temperature</td>
<td>110 °C</td>
</tr>
<tr>
<td></td>
<td>Clutch slipping percentage</td>
<td>no</td>
</tr>
<tr>
<td>Engine management requested with PTO</td>
<td>No control requested</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>Engine control requested only after the PTO has been successfully engaged</td>
<td>no</td>
</tr>
<tr>
<td>Engine management requested on PTO engagement feedback</td>
<td>No control requested</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>Engine control requested only after the PTO has been successfully engaged</td>
<td>no</td>
</tr>
<tr>
<td>Type of engine management</td>
<td>No request/ Disabled</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>Rpm request</td>
<td>no</td>
</tr>
<tr>
<td></td>
<td>Torque request</td>
<td>no</td>
</tr>
<tr>
<td></td>
<td>Torque limit request/ rpm limit request</td>
<td>no</td>
</tr>
<tr>
<td>PTO[0]TSC.FIELD5</td>
<td>Control in rpm/ rpm limit request</td>
<td>no</td>
</tr>
<tr>
<td>PTO[0]TSC.FIELD6</td>
<td>Control in torque/Torque limit request</td>
<td>no</td>
</tr>
</tbody>
</table>

**Note** On CNG engines checks cannot be carried out on the engine (rpm request, configuration of the maximum rpm limit, configuration of the maximum torque limit).

**Note** During the "rpm request" check the engine speed cannot be changed using the Cruise Control and/or the accelerator pedal.

#### 7.2.4 Parameters that can only be set for PTO2

**a) Engagement Timeout**

If power take-off PTO2 requires a greater engagement time than two seconds, it is possible to act on the Engagement Timeout parameter PTO[x]_ERTimeout (x = 2, represents the PTO involved) that stabilises the time level outside of which an engagement restriction condition (if configured) is considered as such.

The EM control unit assesses the outcome of the PTO2 engagement and, if engagement has not been successful, displays any Engagement Timeout errors only once the "Engagement Timeout" time has elapsed.

**Note** The PTO[x]_ERTimeout parameter can be set by IVECO Customer Service.

**b) Disengagement Timeout**

If power take-off PTO2 requires a greater disengagement time than two seconds, it is possible to act on the Engagement Timeout parameter PTO[x]_SCTimeout (x = 2, represents the PTO involved) that stabilises the time level outside of which an engament restriction condition (if configured) is considered as such.

The EM control unit assesses the outcome of the PTO2 disengagement and, if disengagement has not been successful, displays any Disengagement Timeout errors only once the Disengagement Timeout.

Therefore, the EM control unit will detect the presence of the disengagement condition only once the Disengagement Timeout time has elapsed. Within 10 seconds a warning message will be displayed on the Instrument Panel and the PTO will automatically disengage.
Note The PTO[x]_SCTimeout parameter can be set by IVECO Customer Service.

7.3 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 61071 B and 72075 B (also see Section 5 - Figure 2).

The vehicle may be equipped with two other optional connectors: 72071 and ST13.

7.3.1 20-way EM connector, black (61071B)

Existing part on the vehicle (male), dwg. 500314809

Counterpart to be coupled (female), dwg. 500314816

<table>
<thead>
<tr>
<th>Table 7.6</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>500314820 EZ</td>
<td>Male contact for 0.35 to 0.5 mm² cable</td>
</tr>
<tr>
<td></td>
<td>500314821 EZ</td>
<td>Male contact for 0.75 to 1.5 mm² cable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 7.7 - Basic functions of connector 61071B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

- Printed 692.69.008 – 2 Ed. - Base 03/2020
### 7.3 Wiring Diagram

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Maximum load</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Reserved / CS: Additional light 1</td>
<td>9995</td>
<td>3 A</td>
<td>EM X1/7</td>
<td>(1) (2) 12 V = Light activated</td>
</tr>
<tr>
<td></td>
<td>CS: Blue light 1</td>
<td></td>
<td></td>
<td></td>
<td>0 V = Light deactivated</td>
</tr>
<tr>
<td>7</td>
<td>PTO 2 feedback</td>
<td>6132</td>
<td>5 mA</td>
<td>EM X3/9</td>
<td>Connection to ground to read PTO2 Feedback</td>
</tr>
<tr>
<td>8</td>
<td>Reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>PTO 2 pressure switch</td>
<td>0392</td>
<td>5 mA</td>
<td>EM X3/12</td>
<td>Connect to ground if active</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>It can be used to allow PTO engagement by the Bodybuilder</td>
</tr>
<tr>
<td>10</td>
<td>Reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Run-Lock switch</td>
<td>0132</td>
<td>5 mA</td>
<td>EM X3/6</td>
<td>(1) (4) Critical for Safety, see the Warning note</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground = RunLock activation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Open wire = no action</td>
</tr>
<tr>
<td>12</td>
<td>Scene light switch</td>
<td>0992</td>
<td>5 mA</td>
<td>EM X3/18</td>
<td>(1) (5) Ground = activation of Scene Lights</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 V = no action</td>
</tr>
<tr>
<td>13</td>
<td>Additional light switch 1</td>
<td>0993</td>
<td>5 mA</td>
<td>EM X3/19</td>
<td>(1) (5) Ground = activation of Additional Lights 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 V = no action</td>
</tr>
<tr>
<td>14</td>
<td>Additional light switch 2</td>
<td>0994</td>
<td>5 mA</td>
<td>EM X3/20</td>
<td>(1) (5) Ground = activation of Additional Lights 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 V = no action</td>
</tr>
<tr>
<td>15</td>
<td>EMCO bodybuilders (For future applications)</td>
<td>0995</td>
<td>5 mA</td>
<td>EM X3/21</td>
<td>Input for activation of the stop function of the CANOpen status, and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>only if pin 18 is enabled</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground = activation active</td>
</tr>
<tr>
<td>16</td>
<td>PTO 2 switch</td>
<td>0391</td>
<td>5 mA</td>
<td>EM X3/11</td>
<td>(1) PTO 2 mode (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Open circuit = not activated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground = activated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Without physical PTO, ISC Mode 2 activated</td>
</tr>
<tr>
<td>17</td>
<td>PTO 3 switch</td>
<td>0123</td>
<td>5 mA</td>
<td>EM X3/7</td>
<td>(1) PTO mode 3 (only for ISC) (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Open circuit = not activated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground = activated</td>
</tr>
<tr>
<td>18</td>
<td>Bodybuilder Enable</td>
<td>0991</td>
<td>5 mA</td>
<td>EM X3/17</td>
<td>(1) To be activated by Bodybuilder with Bodybuilder mission active</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground = activation active</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Open wire = no action</td>
</tr>
<tr>
<td>19</td>
<td>Spare</td>
<td>5983</td>
<td>5 mA</td>
<td>EM X4/29</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Run-Lock relay</td>
<td>6987</td>
<td>1 A</td>
<td>EM X4/1</td>
<td>Possible reconfiguration via Customer Service (CS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+12 V = RunLock activated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No signal = RunLock not activated</td>
</tr>
</tbody>
</table>

(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 16)). 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 the 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 16)).

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 16).

(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".

### 7.3.2 12-way EM connector, black (72075B)

![Connector Diagram]

 existing part on the vehicle (male), dwg. 500314807

 counterpart to be coupled (female), dwg. 500314814

**Table 7.8**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500314820 EZ</td>
<td>Male contact for 0.35 to 0.5 mm² cable</td>
</tr>
<tr>
<td>500314821 EZ</td>
<td>Male contact for 0.75 to 1.5 mm² cable</td>
</tr>
</tbody>
</table>

**Table 7.9 - Basic functions of connector 72075B**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Maximum load</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| 1   | Right low-beam light relay| 6988       | 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       | 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                  |            |              |              |                                                                         |
| 4   | Alarm command             | 5981       | 5 mA         | EM X4/14     | Possible reconfiguration via Customer Service (CS)  
+12 V = alarm function activation  
0 V = no action |
| 5   | Reserved                  |            |              |              |                                                                         |
| 6   | Reserved                  |            |              |              |                                                                         |
| 7   | Engine stop control       | 6990       | 1 A          | EM X4/21     | Output wired to 72105A / Pin 26  
+12 V = engine stop activation  
Open wire = no action |
| 8   | Side light 10W            | 6991       | 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 |
### 7.3 WIRING DIAGRAM

#### 7.3.3 9-way EM connector, yellow (72071)

**Figure 5**

Existing part on the vehicle (male), dwg. 504/63547

Counterpart to be coupled (female), dwg. 41200681

This connector is only present in the case of EM installation with CAN open (opt 75979).

**Table 7.10**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>41200694 EZ</td>
<td>Male contact for 0.2 to 0.5 mm² cable</td>
</tr>
<tr>
<td>5801867661 EZ</td>
<td>Male contact for 0.5 to 1.0 mm² cable</td>
</tr>
<tr>
<td>41200696 EZ</td>
<td>Male contact for 1.0 to 2.5 mm² cable</td>
</tr>
</tbody>
</table>

**Table 7.11 - Basic functions of connector 72071**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Maximum load</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>K30 +</td>
<td>7772</td>
<td>TBD</td>
<td>BCM G/10</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>K31</td>
<td>0000</td>
<td>Fuse holder and distributor case</td>
<td>Terminal 14/17</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>CO enabled CIA413</td>
<td>0975</td>
<td>0.5A</td>
<td>EM X4/28</td>
<td>LSO activated upon activation of the CO assembly (usually approx. 3 seconds after K15 engagement) contact IVECO Customer Service for adjustment Open circuit = CANopen not operational Ground = CANopen operative</td>
</tr>
<tr>
<td>4</td>
<td>Bodybuilders CAN H</td>
<td>6110</td>
<td>n.d.</td>
<td>EM X4/18</td>
<td>Gateway truck CAN Open, see CIA 413</td>
</tr>
<tr>
<td>5</td>
<td>Reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Bodybuilders CAN L</td>
<td>6111</td>
<td>n.d.</td>
<td>EM X4/20</td>
<td>Gateway truck CAN Open, see CIA 413</td>
</tr>
</tbody>
</table>
### 7.3.4 12-way EM connector, black (ST13)

![Figure 6](image1.png)

**Table 7.12**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I0931454 EZ</td>
<td>Male contact for 0.35 mm² cable</td>
</tr>
<tr>
<td>504079957 EZ</td>
<td>Male contact for 0.5 to 1.0 mm² cable</td>
</tr>
<tr>
<td>504079958 EZ</td>
<td>Male contact for 1.0 to 2.5 mm² cable</td>
</tr>
</tbody>
</table>

**Table 7.13 - Basic functions of connector ST13**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Maximum load</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reserved</td>
<td>9136</td>
<td>15 A</td>
<td>Terminal 21</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>PTO1 activation-</td>
<td>9136</td>
<td>15 A</td>
<td>Fuse holder and distributor case</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Terminal 21</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PTO1 feedback switch</td>
<td>6993</td>
<td>10 mA</td>
<td>EM X3/8</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>PTO1 + activation-</td>
<td>9135</td>
<td>15 A</td>
<td>Fuse holder and distributor case</td>
<td></td>
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<tr>
<td></td>
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<td>Terminal 22</td>
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<td>5</td>
<td>Ground</td>
<td>0000</td>
<td>10 mA</td>
<td>Ground for PTO1 feedback switch</td>
<td>Ground for terminal 3</td>
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<td>Reserved</td>
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</tbody>
</table>
7.3.5 Electrical connections for PTO2 connections

Figure 7 shows the connections to be made to install a PTO2. The Bodybuilder must see to:

- installation of the switch (which must be of the stable type);
- the wiring between the PTO and the 20-way EM connector, black (61071B).

For the ground connection, the following can be selected:

- use terminal 24 of the 32-way black bodybuilder connector (72105A);
- use the ground points available on the vehicle (see Chapter 5.4 - Paragraph "Ground points").

1. **EM 20-pin connector, black (61071B)**
2. **PTO 2 switch**
3. **Solenoid**
4. **Feedback**
5. **Pressure switch**

### 7.4 ADDITIONAL FUNCTIONS

The Expansion Module control unit makes available additional functions:

1. **Run-Lock**;
2. **Safety / Alarms**;
3. **Additional Lights 1 and Additional Lights 2**.

**Compatibility between PTO and additional functions**

It is not possible to use all functions of the Expansion Module (PTO and additional functions) simultaneously.

Each line of the following table indicates the maximum permitted configuration, bearing in mind that the sum of the electrical currents associated with the functions used should NOT exceed 10 A.

However note that the additional lights 1 are not compatible with the use of the signal "Vehicle with full CAN operation", while the additional lights 2 are not compatible with the use of PTO2.
Table 7.14

<table>
<thead>
<tr>
<th>N.</th>
<th>PTO1/ISC1</th>
<th>PTO2/ISC2</th>
<th>ISC3</th>
<th>Lights Rear</th>
<th>Lights Addition 1</th>
<th>Lights Addition 2</th>
<th>Scene Lights</th>
<th>Run-Lock</th>
<th>Flashing Low beam</th>
<th>Notes</th>
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</tr>
</tbody>
</table>

7.4.1 "Run-Lock"

The Expansion Module can control a by-pass relay of the ignition switch to allow the ignition key to be removed with the vehicle stationary without the engine stopping. This function is used on Police vehicles and Ambulances to power the multiple electrical devices and equipment.

Other possible applications are remote PTO operation from the vehicle, lifting the platforms, etc.

Connections

Figure 8 shows the connections to be made in order to use the Run-Lock function. Switch is low active.

The Bodybuilder must see to:

- the use of a switch
- the switch connection to terminal 11 of the 20-way EM connector, black (61071B)
- the connection between terminal 20 of this connector and terminal 25 of the black 32-way Bodybuilder connector (72105A)

For the ground connection, the following can be selected:

- use terminal 24 of the 32-way black bodybuilder connector (72105A)
- use the ground points available on the vehicle (see Chapter 5.4 - Paragraph "Ground points")
1. 20-way EM connector, black (610718)
2. Black 32-way Bodybuilder connector (72105A)

a) "Run-Lock" engage procedure

- engine running
- Stationary vehicle
- gearbox in neutral and clutch not pressed (with mechanical gearbox) or gearbox in neutral or in "P" (with automatic gearbox)
- parking brake engaged
- operate the Run-Lock switch
- remove the key

Note: During operation of Run-Lock mode, the engine will be shut down if one of the following conditions is detected:
- clutch depressed (mechanical gearbox) or gearbox not in neutral (automated gearbox)
- parking brake released
- vehicle speed > 0 km/h

b) "Run-Lock" disengage procedure

- insert the key and set it to position 2
- set the Run-Lock switch back to the OFF position

7.4.2 Safety/Alarm function

The Safety/Alarm function can be applied in all cases in which the vehicle is under attack. In this situation the engine is switched off or limited to a certain number of revs; the activation of the flashing low beam lights is possible.

Safety mode is turned on by operating the Alarm State switch.

The Expansion Module applies a different strategy according to whether the vehicle is parked or is moving. The details are as follows:

a) with vehicle at a standstill:
- the engine is turned off and immobilised and maybe started up only and exclusively if the alarm state switch is turned OFF
- both low beam lights will flash (a flashing period equal to 1 second is set by default);

b) with vehicle in motion:
• the speed is limited to 30 km/h;
• once the vehicle has stopped, stationary vehicle management begins to operate;
• both low beam lights will flash (a flashing period equal to 1 second is set by default).

**Connections**

Figure 9 shows the connections to be made in order to use the Alarm function. Switch is high active.

The Bodybuilder must see to:

• the use of a switch;
• connection of the switch to terminal 4 of the black 12-way EM connector (72075B) and to terminal 30 of the black 32-way Bodybuilder connector (72105A);
• the connection between terminal 7 of the black 12-way EM connector (72075B) and terminal 26 of the black 32-way Bodybuilder connector (72105A).

If low beam flashing is required, the following is the responsibility of the Bodybuilder:

• the two relays for the low beam lights;
• connecting the relays on the same line that runs from the low beam light relay on the normal production vehicle (relay T01 is present on the fuse box / under-dashboard relay) towards the headlights.

**Note**  IVECO Customer Service must disable the diagnosis of relay T01.

For the ground connection, the Bodybuilder can choose to use:

• use terminal 24 of the 32-way black bodybuilder connector (72105A);
• use the ground points available on the vehicle (see Chapter 5.4 - Paragraph "Ground points")

---

1. 12-way EM connector, black (72075B)
2. Black 32-way Bodybuilder connector (72105A)
Flashing of low beam lights/high beam headlights

When the Alarm function is activated, the low beam lights or the main beam headlights can also flash at the same time.

Bear in mind that, irrespective of the type of lights chosen, the flashing is interrupted if the low beam lights are activated via the steering column switch unit.

The flashing period can also be configured:

- the standard is 1 second;
- the minimum period which can be configured, usually corresponding to maximum frequency, is 0.5 seconds.

**Note** If the Additional Lights 1 and/or the Additional Lights 2 have been configured as present (see Paragraph "3. Additional Lights") and the Alarm function, and if for each of these functions there is a request for the low beam light flashing, the system takes the flashing time as the shortest period, namely the maximum frequency.

**Note** The flashing period may only be modified by IVECO Customer Service.

**Speed limit**

The speed limit for the Alarm function is set at 30 km/h as standard, but it can be changed. Bear in mind that the limit cannot be increased beyond the level set by the Speed Limiter.

**Note** If the Additional Lights 1 and/or the Additional Lights 2 have been configured as present (see Paragraph "3. Additional Lights ") and/or the Alarm function and/or the Scene lights, and if for each of these functions there has been a request for a speed limit, the system will always use the minimum limit as the limit.

**Note** The speed limit may only be modified by IVECO Customer Service.
7.4.3 Additional lights

The Additional Lights function offers the possibility of installing various additional lights managed directly by the Expansion Module control unit:

- Additional lights 1
- Additional lights 2
- Scene lights
- Rear lights

Connections

Figure 10 shows the connections to be made in order to use the Additional Lights function. All the switches are high active.

The Bodybuilder must see to:

- the use of switches;
- the use of the Scene Lights relay;
- connection of the switches to the terminals of the black 20-way EM connector (61071B);
- connection of the relay to the terminals of the black 12-way EM connector (72075B);
- installing the lights.

If low beam flashing is required, the Bodybuilder is responsible for:

- the two relays for the low beam lights;
- connecting the relays on the same line that runs from the low beam light relay on the normal production vehicle (relay T01 is present on the fuse box / under-dashboard relay) towards the headlights.

**Note** IVECO Customer Service must disable the diagnosis of relay T01.

For the ground connection, the Bodybuilder can choose to use:

- use terminal 24 of the 32-way black bodybuilder connector (72105A);
- use the ground points available on the vehicle (see Chapter 5.4 - Paragraph "Ground points").
1. 20-pin connector, black (61071B)
2. 12-pin connector, black (72075B)

a. Right brake light - 21 W
b. Right turn indicator - 21 W
c. Left brake light - 21 W
d. Left turn indicator - 21 W
e. Additional lights 2 - 21 W

f. Additional lights 1 - 21 W
g. Scene light switch
h. Additional light switch 1
i. Additional light switch 2
j. Right low beam relay
k. Left low beam relay
l. Side lights - 10 W
m. Scene lights relay
a) Additional Lights 1

For example, the additional lights 1 can be the blue ambulance and Police lights.
The maximum power consumption is 3A, while the maximum power is 36W.
These lights can be linked to different functions, all configurable upon Bodybuilder request:

- flashing of additional lights 1
- flashing of low beam lights
- speed limit when the Additional Lights 1 are ON
- speed limit when the Additional Lights 1 are OFF

**Flashing of additional lights 1**

It is possible to configure the flashing period, taking into account that:

- flashing is disabled by default;
- the minimum period which can be configured, usually corresponding to maximum frequency, is 0.5 seconds.

**Note** The flashing period may only be modified by IVECO Customer Service.

**Flashing of low beam lights/high beam headlights**

When the Additional Lights 1 are activated, the low beam lights or the main beam headlights may also flash at the same time.
Bear in mind that, irrespective of the type of lights chosen, the flashing is interrupted if the low beam lights are activated via the steering column switch unit.
It is also possible to configure the flashing period, taking into account that:

- flashing is disabled by default;
- the minimum period which can be configured, usually corresponding to maximum frequency, is 0.5 seconds.

**Note** If the Additional Lights 1 and the Additional Lights 2 and/or the Alarm function are configured and if for each of these functions there has been a request for the flashing of the low beam lights, the system takes the flashing time as the shortest period, namely the maximum frequency.

**Note** The flashing period may only be modified by IVECO Customer Service.

**Speed limit**

It is possible to configure a speed limit when the Additional Lights 1 are ON and/or when they are OFF.
This option is disabled by default.

**Note** If the Additional Lights 1 and/or Additional Lights 2 and/or the Alarm function and/or the Scene Lights are configured, and if for each of them there has been a request for a speed limit, the system will always use the minimum limit as the limit.

**Note** The speed limits may only be modified by IVECO Customer Service.
b) Additional Lights 2
For example, additional lights 2 may take the form of blue ambulance and Police lights.
The maximum power consumption is 1.5A, while the maximum power is 21W.
These lights can be linked to different functions, all configurable upon Bodybuilder request:

- Flashing of additional lights 2;
- flashing of low beam lights;
- speed limit when additional lights 2 are ON;
- speed limit when additional lights 2 are OFF.

**Note** Additional lights 2 are incompatible with the use of PTO2.

**Flashing of additional lights 2**
See the information provided for Additional Lights 1.

**Flashing of low beam lights/high beam headlights**
See the information provided for Additional Lights 1.

**Speed limit**
See the information provided for Additional Lights 1.

c) Scene Lights
The maximum power consumption is 1 A.

**Speed limit**
It is possible to configure a speed limit when the Scene Lights are ON and/or when they are OFF.
This option is disabled by default.

**Note** If the Additional Lights 1 and/or Additional Lights 2 and/or the Alarm function and/or the Scene Lights are configured, and if for each of them there has been a request for a speed limit, the system will always use the minimum limit as the limit.

**Note** The speed limit may only be modified by IVECO Customer Service.

d) Rear Lights
These consist of:

- right and left turn indicator lights;
- right and left stop lights;
- Side lights.

As shown in Figure 10 in the paragraph, it is possible to install rear lights provided that the maximum power of the individual light is equal to 21 W for the "turn indicator lights" and "stop lights" and 5 W for the "side lights".

The maximum power consumption is 7 A.
APPENDIX A

TRANSPORT

OF PEOPLE
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TRANSPORT OF PEOPLE

A.1 CHASSIS

A.1.1 Transport
The unfitted chassis is not roadworthy and must be transported on a car transporter.

A.1.2 Lifting for transport by ship, train, etc.
When the chassis is loaded onto ships, freight trains, etc. it must only be lifted by acting on the axles or wheels.

Note It is strictly prohibited to secure the crane cables to the cross or side members.

The chassis must only be secured to the vehicle during transport by hooking the axles and the weight must only be supported by the wheels.

A.1.3 Delivery
Before delivery, the chassis is to be subjected to strict quality controls.

On delivery the bodybuilder must carry out an inspection to detect missing materials or faults which could have occurred during transport.

IVECO does not accept claims after delivery or claims not recorded on the designated forms countersigned by the transporter.

For any claim, please provide the vehicle identification number; this number is on the core of the right chassis side member in the wheel arch near the suspension.

A.1.4 Storage
If the vehicle is to be unused for a long period of time, it must be suitably protected from the elements of the area where it is being kept.

The bodybuilder is responsible in particular for the protection of the dashboard, batteries, fuse boxes and relays, etc., the reliability and duration of which must not be compromised.

A.1.5 Weights and weighing
The design of the bodywork, the position of the seats and the loading compartment must be carried out without exceeding the total maximum permitted loads or the maximum permitted load on the individual axle.

In order to account for fabrication tolerances, the data relating to the weight of the models: 40C, 50C, 65C and 70C have a tolerance of ± 3%. For this reason, before carrying out the fitting, it is a good idea to determine the mass of the vehicle (chassis cab version, van or cowl) and its distribution on the axles.
A.2 GENERAL STANDARDS FOR SECURING THE BODY TO THE CHASSIS

Particular attention must be paid to the connection points of the chassis elements to the side of the bodywork: since these connection points must ensure a perfect transmission of stress.

At the same time, a localised application of stress determining high pressure on the connection points must be avoided.

The bodywork structure must be considered a load bearing unit together with the chassis: the bending, torsion and thrust stresses must be absorbed by the unit.

This layout is made necessary by the relative flexibility of the chassis. Please contact the IVECO Quality Department for any relevant queries.

The outfitting can be secured to the bodywork by means of welding or retainers to be screwed in and tightened.

Mixed type of connections are not recommended.

In any case, securing the bodywork elements must be carried out using intermediate plates.

A.3 BODYWORK CONSTRUCTION

This chapter provides instructions for the construction of the bodywork, with the most important technical and regulatory aspects. Defining the bodywork is left to the Body builder’s criterion depending on requirements.

A.3.1 Main dimensions

The entry and exit angles for all vehicles must be equal to or greater than 7°.

Bodywork construction must allow a steering radius as prescribed by Standard 107/ECE or by the equivalent Standard in force in the country where the registered vehicle will be used.

The vehicles must be equipped with mudflaps at the back of each wheel to a height of 75 mm from the ground.

The bodywork configuration must allow for inspection of the vehicle identification number.

A.3.2 Interior configuration and capacity of the vehicle

The surface area available for the number of seats for each class of vehicle must comply with prescriptions of Standard 107/ECE or the Standard for the country where the vehicle will be sold.

A.3.3 Driver’s seat specifications

a) Heating

There must be a sufficient number of hot air vents to demist the windscreen.

b) Sun visor

The driver must be able to make use of a sun visor, the height of which can be adjusted while driving and can be tilted.

A wind up sun blind or partially or totally coloured glass can also be fitted.

c) Driver’s seat (if different from the one provided)

It must be possible to adjust the height, incline and longitudinal distance from the steering wheel and each of these adjustments must be independent from the others.

d) Ergonomics of the driver’s seat

If the instrument assembly supplied with the vehicle is disassembled and reassembled in a customized dashboard, it is recommended that the position of the instruments and controls remains unchanged.

Furthermore, since the dashboard supplied complies with the Directive on "signalling, controls and luminous plates", after having made the modifications, the bodybuilder must verify this aspect and obtain new approval if necessary.
When fitting the trim around the driver's seat, the pedal stroke must not be limited.

**A.3.4 Requirements of materials relating to fire protection (R118.0X - compliant with current regulations)**

The materials of the trim used inside the engine compartment must be non-flammable and resistant to fuel or lubricant unless the material has been covered with a water-proof layer.

The rest of the bodywork materials must be "flame retarder" or self-extinguishing depending on the number of passengers the vehicle is permitted to transport and/or the Legislation in force in the country where the vehicle is to be used.

The polyamide conductors or the wiring braids which pass near any hot sections of the engine (manifold or exhaust pipes, turbocharger, etc.) must be protected by a metal shield in either aluminium or stainless steel, with a cladding of insulating material.

**A.3.5 Supporting structure of seats and fastening**

Anchoring the seats directly to the floor or the wheel arches is not permitted, therefore a designated structure must be provided (frame) to distribute the stress across the entire surface area of the floor.

**Note** The bodybuilder is entirely responsible for anchoring the seats to the frame as well as carrying out the inspection (destructive) and approval tests.

The figures below show some details of the structures and fastening procedures for the fixed seats and the seats on runners, taken from Dwg. IVECO 5801805133 and 5801752010.

Example: Installation diagram of fixed seats (see Dwg. 5801805133)
Example: Installation diagram of seats on runners (see Dwg. 5801752010)
A.3.6 Rear baggage compartment

The baggage compartment volume is dependent on the maximum permitted technical mass of the vehicle and its axles. Dimensioning and positioning must be validated by structural tests and calculations which are the responsibility of the bodybuilder.

A.3.7 Side access

Constructing a side access with a width exceeding the standard Minibus version must not alter the deformability of the panel structure of the area concerned.

---

**Note** Altering the height of the side door compartment is only permitted for interventions on the top or bottom section of the panel but never on both.

---

The dimensions of the compartment and the access steps must comply with Directive ECE107.

To prevent any interference with these elements, the AdBlue tank must be shifted slightly along the chassis side member. In this case, in order to use pipes which are longer but generally available from IVECO Parts, it is recommended that one of the positions provided for in the production of Daily Vendor and Minibus is replicated.

Please refer to Section 6 to view these positions and to obtain further information on the AdBlue pipes and system.

If the size of the shift does not allow for the indications provided above, the conversion must be authorized before work is carried out.

---

A.3.8 Applied structure and handhold fastenings

The handrails must be installed in such a way that passengers do not risk any injury, they must be in a contrasting colour and be non-slip. The construction of the handrails and their application on the vehicle must comply with the European Directive 2001/85/EC or ECE107.

The anchoring sections of the handrail onto the original structure of the vehicle must be suitably reinforced.
A.3.9  **Wheelchair lift for disabled passengers**

For this type of transport, the access door compartment must be equipped with a lift; furthermore, inside the vehicle there must be a reserved area with specific dimensions. In any case, this area must comply with the European Directive 2001/85/EC or ECE 107.

If the rear door is to be used for wheelchair access, please refer to the securing methods for the tail lift described in Chapter 3.9.

A.4  **SOUNDPROOFING**

The Body builder must make sure that the finished vehicle complies with all the indications relating to noise emissions, specific to each case and must also approve/reapprove the vehicle if necessary.

A.4.1  **External noise**

On the basis of the Directive 2007/34/EC, the noise emissions of the Daily "people Carrier" must not exceed 79 dB(A) as detected at the exhaust silencer.

A.4.2  **Internal noise**

Measurements must be taken in accordance with the provisions of Standard ISO 5128 and at a stable speed:

a) 60, 80 and 100 km/h in last but one gear
b) 80 and 100 km/h in last gear

With regard to the position of the phonometer, it is important to make a distinction between:

- the rear area: in the centre of the last but one row of seats, at the height of the passenger’s ears
- front area: at the height of the driver's ears.

In these conditions, the results must not exceed the following values:

<table>
<thead>
<tr>
<th>Table A.1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vehicle</strong></td>
</tr>
<tr>
<td>Inter-urban</td>
</tr>
<tr>
<td>Urban or suburban</td>
</tr>
</tbody>
</table>

It is however recommended that the required values are verified for the countries of homologation.

A.4.3  **Soundproofing insulation**

The installation of the sound-proof material must be as continuous as possible, without interruptions, in order to ensure good noise insulation; it is important that the hatches which connect the interior with the engine, gearbox and axle areas, etc. are as well sealed as possible.

For the floor trim in the passenger area, the door compartment and the steps, it is recommended that a wood panel is used with a minimum thickness of 15 mm and a layer of Septum.

The anchoring of the compartments for the steps must not show any signs of cracks or interruptions which would allow noise to enter inside the vehicle; this is also the case for the section below the doors.

Anchoring of the insulation and sound-proof materials must be strong and long lasting to prevent the material from becoming loose and prevent it from coming into contact with hot or moving parts. It is recommended that a good quality adhesive, metal clips or some other anchoring device is used.
A.5 HEATED INSULATION AND CLIMATE CONTROL

A.5.1 Insulation for cold climates

Vehicle insulation for cold climates must ensure that the engine coolant temperature does not fall below 80 °C with stable operation.

The thermostat inside the circuit ensures correct engine operation if the opening temperature is 68 ± 2 °C.

If despite the insulation, the engine operates at less than 80 °C and insufficient hot water reaches the heater, a preheater able to provide at least 25000 kcal/h is to be fitted.

The preheater is mandatory when the vehicle normally operates at temperatures below 0 °C.

Once engine insulation has been defined, it is necessary to measure its efficiency by testing the capacity of the cooling system and the heating system.

After the tests it may be necessary to carry out fine tuning consisting in:

- increasing the power or the insulation if the heating test temperatures are low;
- increasing the air passage and reducing the insulation if the temperatures obtained during the cooling test are too high.

IVECO is to be informed of the results and is to be consulted in relation to any modifications of the fine tuning.

A.5.2 High temperatures

As regards the thermal insulation, the most critical parts are the areas near the turbocharger, the manifold and exhaust pipes, the silencer and the electric retarder impellers.

When a non-metallic element of the bodywork is near a critical area it must be protected. This protection could consist of a layer of insulating felt covered with an aluminium sheet able to withstand a stable heat of 250 °C and with a maximum conductivity coefficient of 0.1 W/mK.

In any case, the minimum distance between a critical point and the insulation must not be less than 80 mm.

When the available space is reduced and above all in order to protect the polyamide pipes and wiring braids, it is recommended that a shield made of aluminium sheet with an insulating sandwich is used, with a conductivity coefficient equal to that of the felt; between the protected element and the shield there must be a minimum separation distance of 20 mm.

In order to maintain a comfortable temperature inside the vehicle, the insulation in the engine compartment/gearbox must have a minimum conductivity coefficient of 0.08 W/mK and a minimum temperature of 85 °C.

This noise-thermal insulation must cover the entire area separating the engine housing and the interior, including the steps, walls and other surfaces through which heat could penetrate.

In areas where noise insulation is not required, for example near the electric retarder, polyurethane foam can be used for thermal insulation as long as it has characteristics similar to those described.

Some points are not critical as regards heat transmission but they must however be considered for the insulation of bodywork elements or systems which may be damaged by excessive temperature.

A.5.3 Second air conditioner compressor

- If the intervention requires the removal of the engine drive belt organs (e.g.: installation of an additional compressor), the belt must be refit following the instructions in the Repair manual (version no. 603.95.723) shown in Fig. 5. This manual highlights the need to only use the specific tool 99360191 which can be obtained from IVECO Parts.
Removal
Cut elastic belt (4), as it cannot be reused.

Refitting
On the pulley (1) apply the specific chock 99360186 (2) with the elastic belt (4), placing the latter 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).

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.

A.6 CURRENT DRAWS

A.6.1 People carrier, CBA version

The distribution and protection control unit located on the battery has a circuit breaker to interrupt loads in the event of an emergency.

 Relay and fuse box on the battery (CBA I)
To restore the original vehicle conditions, restart the vehicle.

**A.7 BODYBUILDER CONNECTORS**

**A.7.1 Connector 72105A, black, 32-pin, dwg. 5802442666**

![Image of connector](image-url)

**Table A.3 - dwg. 5802291186 (Bodybuilders side)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>41200694 EZ</td>
<td>Male contact for 0.35 to 0.5 mm² cable</td>
<td>1-2-3-4</td>
</tr>
<tr>
<td>41200695 EZ</td>
<td>Male contact for 0.75 to 1.00 mm² cable</td>
<td></td>
</tr>
<tr>
<td>41200696 EZ</td>
<td>Male contact for cable from 1.50-2.00-2.50 mm²</td>
<td>from 5 to 18</td>
</tr>
<tr>
<td>41200697 EZ</td>
<td>Male contact for cable &gt;2.50-4.00 mm²</td>
<td></td>
</tr>
<tr>
<td>5802291206 EZ</td>
<td>Male contact for 0.35 mm² cable</td>
<td></td>
</tr>
<tr>
<td>5802290575 EZ</td>
<td>Male contact for 0.50 to 0.75 mm² cable</td>
<td></td>
</tr>
<tr>
<td>5802290577 EZ</td>
<td>Male contact for 1.0 mm² cable</td>
<td></td>
</tr>
<tr>
<td>5802291206 EZ</td>
<td>Male contact for 0.35 mm² cable</td>
<td></td>
</tr>
<tr>
<td>5802290575 EZ</td>
<td>Male contact for cable from 0.50 to 0.75 mm²</td>
<td>from 19 to 30</td>
</tr>
<tr>
<td>5802290577 EZ</td>
<td>Male contact for 1.5 mm² cable</td>
<td></td>
</tr>
<tr>
<td>41118765 EZ</td>
<td>Male contact for 0.35 to 0.5 mm² cable</td>
<td></td>
</tr>
<tr>
<td>41118766 EZ</td>
<td>Male contact for 0.75 to 1.00 mm² cable</td>
<td></td>
</tr>
<tr>
<td>41118767 EZ</td>
<td>Male contact for cable from 1.50-2.00-2.50 mm²</td>
<td>31-32</td>
</tr>
<tr>
<td>41118768 EZ</td>
<td>Male contact for 4.00 mm² cable</td>
<td></td>
</tr>
<tr>
<td>5802293758 EZ</td>
<td>Male contact for cable &gt;4.00-6.00 mm²</td>
<td></td>
</tr>
</tbody>
</table>
## Table A.4 - Basic functions of the 32-pole connector 72105A for Minibus with diesel fuel supply

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Maximum load</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| 1   | Remote engine start-up from Bodybuilder control      | 8888       | 15 A         | SCM B/73      | The engine only starts when the key is turned in the ignition lock (K15 ON)  
Protect with the appropriate fuse  
+12 V = engine start-up request |
| 2   | Automatic gearbox (function "P")                     | 6140       | 200 mA       | BHP70/8       | Ground = function "P" available                                       |
| 3   | Automatic gearbox (function "D")                     | 6141       | 200 mA       | BHP70/10      | Ground = function "D" available                                       |
| 4   | EPB engagement request                               |            |              |               | EPB (Electronic Parking Brake)                                         
Active when a resistance of 600 Ohm is applied  
Not active when a resistance of 1600 Ohm is applied  
Error status if a resistive value other than 600 or 1600 Ohm is applied |
| 5   | Manual parking brake                                 | 6662       | 200 mA (with decoupling diode) | BCM F/44     | Ground = parking brake engaged                                         |
| 6   | Clutch actuation                                     | 9273       | 200 mA       | EDC K/44      | +12 V = clutch pedal released (clutch engaged)                        |
| 7   | Side lights                                          | 3320       | 200 mA       | SCM B/39      | +12 V = side lights on                                                 |
| 8   | Alternator status                                    | 7778       | 200 mA       | ST05 - 13     | Requires a specific circuit                                            
+12 V = engine speed > 500 rpm                                      |
| 9   | Detection of EPB status (Electronic Parking Brake)   |            |              |               | Ground = EPB active                                                   
Open circuit = EPB not active                                        |
| 10  | Engaging reverse                                     | 2268       | 200 mA       | BCM C/17      | +12 V = reverse gear engaged                                          |
| 11  | Positive with key                                    | 8879       | 5 A          | BCM G/12      | Positive protected by fuse F49 on Body Computer                       |
|     |                                                       |            |              |               | N.B. Check the electrical balance of the simultaneous loads if necessary (EM, climate control system, outswinging door, retarder, tachograph, FMS, etc.) |
| 12  | Engine speed control                                 | 8156       |              | BCM H/56      | Only with opt. no. 2453: Cruise Control                               |
| 13  | Reference ground for Engine speed check              | 0000       |              | BCM H/45      | For safety reasons, this operation is only permitted allowed with the vehicle stationary |
| 14  | 2nd speed limiter                                    | 0000       | 200 mA       | BCM H/41      | Speed limitation to a pre-set value                                   
Ground = 2nd speed limiter activated                                  |
| 15  | Reserved                                              |            |              |               |                                                                        |
| 16  | Speed signal (B7)                                    | 5517       |              | BCM D/56      | Pulse Signal, see the description in Table 5.4                        |
| 17  | Central emergency control                            | 0000       | 200 mA (use a decoupling diode) | BCM E/20      | Ground = activation request                                           |
| 18  | Horn                                                  | 1116       | 200 mA (use a decoupling diode) | BCM H/19      | Ground = horn active                                                  |
| 19  | Engine speed (rpm)                                   | 5587       |              | EDC K/70      | Engine speed signal                                                   |
| 20  | Radio MUTE control                                   | 1632       | 10 mA        | DAB C/9       | ground = MUTE function request                                       |
| 21  | Reserved                                              |            |              |               |                                                                        |
| 22  | Reserved                                              |            |              |               |                                                                        |
| 23  | Reserved                                              |            |              |               |                                                                        |
| 24  | Ground                                                | 0000       | 15 A         | LM6B          | Ground connection                                                      |
### Table A.5 - Basic functions of the 32-pole connector 72105A for Minibus with CNG fuel supply

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Maximum load</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Remote engine start-up from Bodybuilder control</td>
<td>8888</td>
<td>15 A</td>
<td>SCM B/73</td>
<td>The engine only starts when the key is turned in the ignition lock (K15 ON)</td>
</tr>
<tr>
<td>2</td>
<td>Automatic gearbox (function “P”)</td>
<td>6140</td>
<td>200 mA</td>
<td>BHP70/8</td>
<td>Ground = function “P” available</td>
</tr>
<tr>
<td>3</td>
<td>Automatic gearbox (function “D”)</td>
<td>6141</td>
<td>200 mA</td>
<td>BHP70/10</td>
<td>Ground = function “D” available</td>
</tr>
<tr>
<td>4</td>
<td>EPB engagement request</td>
<td></td>
<td></td>
<td>BHP70/10</td>
<td>EPB (Electronic Parking Brake). Active when a resistance of 600 Ohm is applied.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not active when a resistance of 1600 Ohm is applied. Error status if a resistive value other than 600 or 1600 Ohm is applied.</td>
</tr>
<tr>
<td>5</td>
<td>Manual parking brake</td>
<td>6662</td>
<td>200 mA (with decoupling diode)</td>
<td>BCM F/44</td>
<td>Ground = parking brake engaged</td>
</tr>
<tr>
<td>6</td>
<td>Clutch actuation</td>
<td>9273</td>
<td>200 mA</td>
<td>B6112 V/50</td>
<td>Ground = clutch pedal released (clutch engaged)</td>
</tr>
<tr>
<td>7</td>
<td>Side lights</td>
<td>3320</td>
<td>200 mA</td>
<td>SCM B/39 Relay T03</td>
<td>+12 V = side lights on</td>
</tr>
<tr>
<td>8</td>
<td>Alternator status</td>
<td>7778</td>
<td>200 mA</td>
<td>BCM D/45 03000A</td>
<td>Requires a specific circuit. +12 V = engine speed &gt; 500 rpm</td>
</tr>
</tbody>
</table>

---

**Notes:**
- **Pin 25:** K15 Remote
- **Pin 26:** Engine shut down
- **Pin 27:** Service braking
- **Pin 28:** Vehicle stationary signal
- **Pin 29:** Hazard lights warning signal
- **Pin 30:** Battery positive K30
- **Pin 31:** Parking brake fully engaged
- **Pin 32:** Inhibition of S&S control

**Remarks:**
- **Pin 25:** For the Immobilizer, the engine does not start unless the ignition key is inserted.
- **Pin 26:** The command must be active until the engine is off.
- **Pin 27:** The command must be active until the engine is off. This signal does not provide any diagnostic information regarding the braking force.
- **Pin 28:** The signal provides information on the 'vehicle at standstill' condition.
- **Pin 29:** +12 V (intermittent) = Hazard lights engaged
- **Pin 30:** Direct positive from the battery and protected by fuse on Body Computer - F33
- **Pin 31:** Active with ground signal transmitted from Outfitting.
- **Pin 32:** +12V = Active command
<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Maximum load</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| 9   | Detection of EPB status (Electronic Parking Brake) |            |              |              | Ground = EPB active  
Open circuit = EPB not active                                                                 |
| 10  | Engaging reverse                                 | 2268       | 200 mA       | 86112 V/26   | +12 V = reverse gear engaged                                                                    |
| 11  | Positive with key                                | 8879       | 5 A          | BCM G/12     | Positive protected by fuse F49 on Body Computer  
N.B. Check the electrical balance of the simultaneous loads if necessary (EPM, climate control system, outswinging door, retarder, tachograph, PMS, etc.) |
| 12  | Engine speed control                             | 8156       |              | BCM H/56     | Only with opt. no. 2453, Cruise Control                                                          |
| 13  | Reference ground for Engine speed check          | 0000       |              | BCM H/45     | For safety reasons, this operation is only permitted allowed with the vehicle stationary        |
| 14  | 2nd speed limiter                                | 0000       | 200 mA       | BCM H/41     | Speed limitation to a pre-set value  
Ground = 2nd speed limiter activated                                                             |
| 15  |                                                  |            |              |              | Reserved                                                                                          |
| 16  | Speed signal (B7)                                | 5517       |              | BCM D/56     | Pulse Signal, see the description in Table S.4                                                  |
| 17  | Central emergency control                        | 0000       | 200 mA       | SCM B/68     | Ground = activation request                                                                      |
| 18  | Horn                                             | 1116       | 200 mA       | BCM H/19     | Ground = horn active                                                                               |
| 19  |                                                  |            |              |              | Reserved                                                                                          |
| 20  | Radio MUTE control                               | 1632       | 10 mA        | DAB C/9      | ground = MUTE function request                                                                  |
| 21  |                                                  |            |              |              | Reserved                                                                                          |
| 22  |                                                  |            |              |              | Reserved                                                                                          |
| 23  |                                                  |            |              |              | Reserved                                                                                          |
| 24  | Ground                                          | 0000       | 15 A         | LM68         | Ground connection                                                                                |
| 25  | K15 Remote                                       | 8879       | 200 mA       | SCM B/68     | +12 V = activation of K15 Remote  
Note Due to the Immobilizer, the engine does not start unless the ignition key is inserted       |
| 26  | Engine shut down                                 | 9903       | 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       | 500 mA       | BCM D/57     | The engine only switches off with vehicle speed < 4 km/h  
+12 V = brake pedal pressed  
The command must be active until the engine is off  
This signal does not provide any diagnostic information regarding the braking force               |
| 28  | Vehicle stationary signal                        | 0000       | 200 mA       | BCM H/32     | The signal provides information on the 'vehicle at standstill' condition  
Ground = vehicle stopped  
Vehicle speed can be other than zero, up to 4 km/h with signal active                             |
| 29  | Hazard lights warning signal                     | 1114       |              | BCM H/08 53077/16 | +12 V (intermittent) = Hazard lights engaged                                          |
| 30  | Battery positive K30                             | 7772       | 15 A         | BCM E/19     | Direct positive from the battery and protected by fuse on Body Computer - F33                  |
| 31  | Parking brake fully engaged                      | 5622       |              |              | Active with ground signal transmitted from Outfitting  
Ground = parking brake fully engaged                                                              |
| 32  |                                                  |            |              |              | Reserved                                                                                          |
For specific information regarding each terminal of connector 72105A, refer to the Paragraph ( ⇒ Page 7) in Section 5.

A.7.2 Connector 72075B, black, 12-pin
The indications provided below are valid for vehicles with diesel engines and for vehicles with CNG engines.

![Diagram of connector 72075B]

*Existing part on the vehicle (male), dwg. 500314807
Counterpart to be coupled (female), dwg. 500314814*

<table>
<thead>
<tr>
<th>Table A.9</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Code</strong></td>
</tr>
<tr>
<td>500314820EZ</td>
</tr>
<tr>
<td>500314821EZ</td>
</tr>
</tbody>
</table>

| Table 10 - Basic functions of the 12-pole connector 72075 |
|-----------------|------------------|-----------------|-----------------|------------------|
| Pin | Description | Cable code | Signal | Connected to | Remarks |
| 1 | Control status Outswinging door | 0003 | Output | 86014 - A/03 | Reserved |
| 2 | Outswinging door | | | | Only present with OPT outswinging door Ground = outswinging door open |
| 3 | Door control status | 6676 | Output | BCM H/23 53077 - 10 | + 12 V = doors closed |
| 4 | Emergency handle lock Outswinging door | 6606 | Output | BCM F/56 86014 - A/02 | Only present with OPT outswinging door Central locking extension to the emergency handle Ground = Outswinging door emergency handle jammed |
| 5 | Control malfunction Outswinging door | 6625 | Output | BCM F/42 86014 - A/07 | Only present with OPT outswinging door Ground = Door malfunction present |
| 6 | Reserved | | | | |
| 7 | Reserved | | | | |
| 8 | Reserved | | | | |
| 9 | Reserved | | | | |
### A.8 ROAD TESTS

**a)** The following checks must be performed prior to beginning functional testing:

- tyre pressure;
- brake oil, power steering oil, engine cooling water levels;
- efficiency of the parking brake;
- operation of the doors, emergency buttons, windscreen wipers, windscreen washers, horn, external lights, engine shutdown from the interior compartment;
- alignment of the body with respect to the frame, suspension heights, lack of interference with steering components;
- operation and visibility of the warning lights and buzzers.

**b)** The following must be checked during a 50 km drive over various roads (level ground, curves, uphill, downhill and uneven surface):

- the various chassis and body assemblies do not generate vibration or abnormal noise;
- no fault or hazard messages appear on the instrument panel;
- the response times of the retarder (if installed) are brief and the effect is always progressive;
- The speed limiter does not cause any jolting;
- actuating the "battery OFF" button stops the engine, activates the alarm and deactivates the battery;
- the heating and climate control unit work efficiently;
- the internal and external acoustic levels comply with standards;
- the dashboard and driver’s seat (if different than the original ones) do not limit the movements of the gearshift lever;
- position, longitudinal sliding and backrest adjustment of the driver’s seat are effective;
- the steering wheel (if different than the original type) does not obstruct the visibility of the instrument panel.

**c)** Proceed as follows when the road test is complete:

- make sure there are no infiltrations during and after being present below jets of pressurised water (rain test);
- identify any fluid leaks (water, oil, diesel oil, brake fluid, power steering fluid and clutch fluid);
- retighten the wheel nuts to 290 - 350 Nm.
A.9 UNDERBODY STIFFENER FOR DAILY MINIBUS

Vehicles destined for the transport of people must be able to pass the structural resistance test according to Regulation UN/ECE R66.02 as established for specific categories (M2, M3, more than 16 seats, etc.).

For this purpose, it is possible to increase the resistance of the basic vehicle underbody using a stiffening pack specifically prepared by IVECO and to be requested during the order process as optional no. 77416.

Made in high-strength steel, these stiffeners are specific for each wheelbase, passenger access door type and vehicle height and allow the Bodybuilder to reduce the number of elements to be installed in order to pass the test.

The technical documentation can be obtained from the IBB website (IVECO Body Builder).

> The mere presence of the stiffeners included in optional no. 77416 is no guarantee that the structural test will be passed.

The Bodybuilder must therefore:

- refer to the aforementioned Regulation and follow all the indications contained therein
- evaluate whether additional interventions are required in order to reach the levels of strength required
- prepare the all the documentation to be presented to the relevant Authority for type-approval

By way of example, attachment 1 indicates some of the "kits" included in terms of quality and the relevant installation on the vehicle.

A.9.1 Requirements

The stiffeners have been optimised taking into account:

- the total \( M_r \) of the outfitted vehicle in test conditions (see Table A.5)
- the barycentre \( G \) of the outfitted vehicle in test conditions (see Table A.6)

Table A.11 - Maximum Mass \( M_r \)

<table>
<thead>
<tr>
<th>Model</th>
<th>( M_r ) [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>50C</td>
<td>4.680</td>
</tr>
<tr>
<td>60C</td>
<td>5.180</td>
</tr>
<tr>
<td>65C</td>
<td>5.380</td>
</tr>
</tbody>
</table>
Table A.12 - Position of the barycentre G

<table>
<thead>
<tr>
<th>Model</th>
<th>$X_G$ [mm]</th>
<th>$Y_G$ [mm]</th>
<th>$Z_G$ [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>50C / 60C / 65C</td>
<td>$2,400 \leq X_G \leq 3,000$</td>
<td>$0 \pm 20$</td>
<td>$\leq 1,030$</td>
</tr>
</tbody>
</table>

A.9.2 Additional contributing factors

The adoption of passenger seats with lateral connection points on the side panel can contribute to increasing lateral structural resistance of the vehicle.

The best performance levels are obtained when the restraining point on axis "Z" is at a distance of:

$H \geq 315$ mm

in relation to the edge of the flooring (see following Figure)
Example of the positioning of the seat

Figure 10
ATTACHMENT 1 - Structure stiffening kit (opt. 77416)

Minibus wheelbase 3520L - sliding side door - roof H2

1. Cross member cannot be installed on vans without windows and with sliding side door
2. Non-structural elements provided on vans without windows and with sliding side door

Minibus wheelbase 4100 - forward outswinging door - roof H3
Minibus wheelbase 4100L - forward outswinging door - roof H3
APPENDIX B

CNG -
NATURAL POWER
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CNG - NATURAL POWER

B.1 GENERAL INFORMATION

Note The instructions of this Appendix do not exclude the need to also refer to those of the "Use and Maintenance handbook" and the "Services Manual".
Any additional information must be requested from the IVECO Service Assistance.

Natural gas is a mixture consisting mainly of methane (main component), ethane, propane, carbon dioxide and nitrogen. To be used as fuel for vehicles, this mix is compressed in designated cylinders, from which the name CNG (Compressed Natural Gas) comes.
CNG (or Natural Power) versions in the DAILY range are distinguished by the specifications of the engine and the electronic management, the presence of the gas cylinders and the relative pipes, as well as a petrol tank (optional) spare / emergency lights.
The increased level of technical complexity must therefore be taken into consideration when studying the conversion to be made to the vehicle and when implementing the relevant changes.

Note Interventions on the engine power supply system which:
- use components other than original parts (even if type-approved as Separate Technical Unit),
- modify the original architecture (movements or addition to cylinders, changes to the retainer types, etc.),
require prior approval from IVECO and require type approval of the vehicle to be repeated in compliance with Regulation ECE R110.
All the subsequent activities (planning, tests, documentation etc.) are charged fully to the Bodybuilder.

B.2 SAFETY REGULATIONS

▶ Please carefully read the same chapter in the Use and Maintenance Manual provided with the vehicle.

B.3 SPECIFICATIONS

B.3.1 General specifications

Note If extending or shortening the wheelbase length from a type-approved length to a type-approved length, authorisation from IVECO is not necessary if the gas system remains unchanged in terms of layout and position on the chassis.
If changing the configuration or layout, authorisation is required even if one of the possible type-approved alternatives is to be used.
The modifications must only be made by specialised personnel, working in authorised and certified workshops.

- Before any intervention, fully discharge the gas present in the pipes. This is possible by implementing the "Partial emptying" procedure (see Chapter A.5 ).
• Parts must be kept perfectly clean, and care must be taken to ensure that no sediment or foreign bodies can enter during handling operations.
• Pay particular attention to the direction of installation of all electrical connections.

**Note** All threaded connections must be tightened to the correct torque for special components for the first equipment: the values can be found in the Service Manual.

**Note** Washers, conical washers, self-locking nuts and gaskets are of the special type and contribute to the tightening efficiency via a deformation; therefore, before reassembly, these parts must be replaced.

▶ Regardless of the reason for the disassembly, the power fuel system components (in particular, the valves on the cylinders) must be replaced.

▶ After any intervention on the high pressure section of the CNG system, a TEST must be carried out to ensure there are no GAS LEAKS at 200 bar. The test can only be carried out at a Centre specifically enabled for this task. A Test Certificate is issued following a positive result.

▶ Check if local Regulations and the competent Authorities allow vehicles running on CNG to be parked in closed areas (for example, workshops) and that these areas are certified and authorised.

**B.3.2 Particular specifications**

a) Repainting the outfitted chassis

**Note** As well as the indications provided in Chapter 2.3 PROTECTION AGAINST RUST AND PAINTING (/Page 11) and especially page 13 of that Chapter, please note that it is also necessary to follow the indications provided by Regulation ECE R110 and any additional regulations of the individual country/market.

The following must be protected from paint:

• the stainless steel pipes of the gas supply system
• the pipe connection fittings
• the hose from the pressure reducer to the rail on the engine
• the solenoid valves and the relative coils on the gas cylinders
• the gas system pressure reducer
• the identification plates

**Note** The CNG tanks must be emptied; they must also be cleaned with nitrogen if the temperature in the painting booth exceeds 40 °C (maximum permitted temperature 60 °C).
b) Protection against high temperatures

- Use suitable heat guard screens if high temperatures are anticipated (> 70 °C) with the subsequent risk for pipes, electrical cables, synthetic materials, etc.

If the vehicle conversion vehicle requires the engine exhaust gas pipe to be positioned vertically behind the cab, consideration must be given to the fact that the temperatures of the gas may exceed 800 °C and therefore this pipe must be kept at a distance of at least 50 mm from the ECU control units.

c) Cylinders

Always keep a safe distance between the outfitting and the solenoid valves to allow the solenoid valves to open/close correctly and to allow for maintenance operations to be carried out: the minimum recommended distance is 200 mm.

- The gas tank must be at a minimum height of 200 mm from the ground to ensure compliance with Regulation ECE R110.

- Use suitable heat guard screens if high temperatures are anticipated (> 70 °C) with the subsequent risk for pipes, electrical cables, synthetic materials, etc.

- The breather valves are essential for the safe operation of the system and therefore must always be accessible. Please read the Use and Maintenance Manual carefully for all indications in this regard.

d) ATS system (After Treatment System)

The insulators and the heat shields must remain in their original position. Any modification must receive prior authorisation from IVECO.

e) Gas pipes

Any modification of the pipes must be compliant with Standard ECE R110 and all the components must be type-approved according to ECE R110.

Lengthening the pipes may have a negative impact on performance due to reduced injection pressure.

Do not reposition components of the gas system such as the regulator, sensor or filter without having received explicit authorisation and approval from IVECO.

- For reasons of safety, both when outfitting and during maintenance, it is strictly prohibited to use the gas pipes as a support for other pipes.
- In some situations of limited space, it is permitted to secure some electric cables (using collars) to the gas pipes, provided they serve only as a guide and not as a support.
- During these operations, pay careful attention to ensure that the pipes are not damaged in the process and remain free of any scratches, markings or deformation. Protect the pipes if necessary.
- When a gas pipe passes through the chassis side member, make sure that the rubber bulkhead connector is not dislodged in any way and is perfectly coaxial with the hole on the chassis.

- It is strictly prohibited to modify the diameter of the gas pipes.
B.3.3 Safety solenoid valve (CNG)

Each cylinder is fitted with a valve assembly consisting of the following devices:

- Manual closure for maintenance and shut-off;
- One-way solenoid valve served by the ignition key which interrupts the flow entering the cylinder; thus the cylinders must be charged when the solenoid valves are not powered;
- the flow relief valve intervenes in the event of a sudden change in pressure, significantly limiting the outward flow of gas from the cylinders (for example if a pipe breaks);
- the fusible plug (T-PRD) which in the event of a fire melts at 110 ± 10 °C and allows the gas to exit directly into the external environment, preventing the cylinder from exploding;
- the safety valve to control the pressure (P-PRD), with an opening threshold of 340 bar.

**Note**: Safety valves are not interchangeable and the respective orientation must not be modified.

B.4 EMPTYING THE CNG SYSTEM

**Note**: Contact the IVECO Service Network before carrying out any intervention.

- Before any welding operations on the vehicle or maintenance operations on the engine, the fuel system must be fully "ventilated", i.e., it must be emptied of gas.

It is usually sufficient to partially empty the circuit, namely, empty only the pipes; however, to operate in conditions of greater safety, it is recommended that the entire system is emptied, including the cylinders.

- The emptying operations must be carried out while the engine is OFF and in an environment with suitable air exchange (a forced air exchange is preferable).

- To limit the release of uncombusted gas as much as possible, keep the engine running until the pressure of the gas drops to the minimum value of 20 bar.

**Note**: Consumption of the gas at a residual pressure of 20 bar is a procedure which is less harmful to the environment than releasing the gas directly into the atmosphere.
B.4.1 Partial emptying

This operation only guarantees ventilation of the system downstream of the gas cylinders (see Figure 1).

- Prepare a rubber hose compatible with the gas and of a suitable diameter for coupling with the rigid pipe (2).
- Leave one end of the rubber hose at least 5 m from the cylinders and from any possible sources of flame. Position the other end close to the pressure reducer.
- Shut off power to the vehicle's electrical system at the master power switch (if present).
- Disconnect the battery cables and electrically ground the vehicle.
- Check that the cocks of the solenoid valves (4) on all the cylinders are closed.
- Loosen the fastening between the pipe (2) and the pressure reducer (1). Act slowly to prevent sudden decompression of gas and the effects correlated to it (freezing).
- Remove the pipe (2) and insert it quickly into the previously arranged rubber pipe.
- After a few minutes, check that the pressure in the system is null.
B.4.2 Emptying fully

After partially emptying the circuit, emptying fully involves ventilating the cylinders by extracting the mobile equipment of each shut-off valve as described below.

Before performing this operation:

- Perform the partial emptying operations described in the previous paragraph.
- Check that all the cocks of the solenoid valves (4, Figure 1) on the cylinders are closed.

- Disconnect the electrical connection from the coil.
- Unscrew the external nut of the coil (1) with the corresponding O-Ring (2).

- Using a screwdriver (1), immobilise the threaded pin (4). Using a wrench (2), remove the nut (3) to secure the coil (5).
- Remove the coil (5) from the shaft (6).
• Extract the spring washer.

⚠️ The valve contains a small amount of highly pressurised gas. To decrease this pressure, slowly unscrew the ring nut (2) of the coil sleeve (1).

• If there is no pressure, fully remove the coil shaft (1) with the corresponding O-Ring.

- Remove the piston (3) with the shutter (4) and the spring (2) from the coil shaft (1).
- Screw the empty coil shaft back in with its O-Ring and tighten the ring nut.
- Repeat the previous operations for all the shut-off valves of the cylinders.
- Partially open the cocks of the solenoid valves (4) on the cylinders (see Figure 1).

⚠️ This allows the pressurised gas to enter the previously emptied pipes from the cylinders: take maximum care.

After emptying, ensure that the engine cannot be started.
B.4.3  Restore the fittings after having disconnected / replaced a pipe

- Check intactness of unions and ferrules.
- Insert the end of the pipe into the union seat. To avoid pre-tensioning, always check the alignment of the end of the pipe with the union.
- Fit and manually screw in the nut of the union until the two sealing caps are packed. Mark the position of the nut with respect to the union body in this point.
- Tighten with the wrenches, turning the nut by half turn. This wedges the second ferrule under the first one, tensioning the sealing assembly.
- Fit the securing brackets, making sure not to stress the pipe.

⚠️ Before restoring system operation, the HYDRAULIC SEAL TEST must be carried out at a specialised Centre.

B.5  POWER TAKE-OFFS

The procedures for the engagement and disengagement of power take-offs are similar to those described in Section 4 for diesel engine vehicles, unless it is necessary (in the process of engaging) to increase the engine speed to 1200 rpm before operating the PTO switch as in Figure 4.4.

B.6  BODYBUILDER CONNECTORS

B.6.1  Connector 72105A, black, 32-pin, dwg. 5802442666

![Image of Connector 72105A](Figure 7)

Table B.1 - dwg. 5802291186 (Bodybuilders side)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>41200694 EZ</td>
<td>Male contact for 0.35 to 0.5 mm² cable</td>
<td>1-2-3-4</td>
</tr>
<tr>
<td>41200695 EZ</td>
<td>Male contact for 0.75 to 1.00 mm² cable</td>
<td></td>
</tr>
<tr>
<td>41200696 EZ</td>
<td>Male contact for cable from 1.50-2.00-2.50 mm²</td>
<td>from 5 to 18</td>
</tr>
<tr>
<td>41200697 EZ</td>
<td>Male contact for cable &gt;2.50-4.00 mm²</td>
<td></td>
</tr>
<tr>
<td>5802291206 EZ</td>
<td>Male contact for 0.35 mm² cable</td>
<td></td>
</tr>
<tr>
<td>5802290575 EZ</td>
<td>Male contact for 0.50 to 0.75 mm² cable</td>
<td></td>
</tr>
<tr>
<td>5802290577 EZ</td>
<td>Male contact for 1.0 mm² cable</td>
<td></td>
</tr>
<tr>
<td>5802291206 EZ</td>
<td>Male contact for 0.35 mm² cable</td>
<td>from 19 to 30</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>terminal</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>5802290575 EZ</td>
<td>Male contact for cable from 0.50 to 0.75 mm²</td>
<td>from 19 to 30</td>
</tr>
<tr>
<td>5802290577 EZ</td>
<td>Male contact for 1.5 mm² cable</td>
<td></td>
</tr>
<tr>
<td>41118765 EZ</td>
<td>Male contact for 0.35 to 0.5 mm² cable</td>
<td></td>
</tr>
<tr>
<td>41118766 EZ</td>
<td>Male contact for 0.75 to 1.00 mm² cable</td>
<td></td>
</tr>
<tr>
<td>41118767 EZ</td>
<td>Male contact for cable from 1.50-2.00-2.50 mm²</td>
<td>31-32</td>
</tr>
<tr>
<td>41118768 EZ</td>
<td>Male contact for 4.00 mm² cable</td>
<td></td>
</tr>
<tr>
<td>5802293758 EZ</td>
<td>Male contact for cable &gt;4.00-6.00 mm²</td>
<td></td>
</tr>
</tbody>
</table>

### Table B.2 - Basic functions of the 32-pole connector 72105A

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Maximum load</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Remote engine start-up from Bodybuilder control</td>
<td>8888</td>
<td>15 A</td>
<td>BCM F/9</td>
<td>The engine only starts when the key is turned in the ignition lock (K15 ON)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>75001 B/73</td>
<td>Protect with the appropriate fuse</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+12 V = engine start-up request</td>
</tr>
<tr>
<td>2</td>
<td>Automatic gearbox (function &quot;P&quot;)</td>
<td>6140</td>
<td>200 mA</td>
<td>BHP70/8</td>
<td>Ground = function &quot;P&quot; available</td>
</tr>
<tr>
<td>3</td>
<td>Automatic gearbox (function &quot;D&quot;)</td>
<td>6141</td>
<td>200 mA</td>
<td>BHP70/10</td>
<td>Ground = function &quot;D&quot; available</td>
</tr>
<tr>
<td>4</td>
<td>EPB engagement request</td>
<td></td>
<td></td>
<td></td>
<td>EPB (Electronic Parking Brake)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Active when a resistance of 600 Ohm is applied</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not active when a resistance of 1600 Ohm is applied</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Error status if a resistive value other than 600 or 1600 Ohm is applied</td>
</tr>
<tr>
<td>5</td>
<td>Manual parking brake</td>
<td>6662</td>
<td>200 mA</td>
<td>BCM F/44</td>
<td>Ground = parking brake engaged</td>
</tr>
<tr>
<td></td>
<td>(with decoupling diode)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Clutch actuation</td>
<td>9273</td>
<td>200 mA</td>
<td>86112 V/50</td>
<td>Ground = clutch pedal released (clutch engaged)</td>
</tr>
<tr>
<td>7</td>
<td>Side lights</td>
<td>3320</td>
<td>200 mA</td>
<td>SC M/B/39 Relay T03</td>
<td>+12 V = side lights on</td>
</tr>
<tr>
<td>8</td>
<td>Alternator status</td>
<td>7778</td>
<td>200 mA</td>
<td>BCM D/45</td>
<td>Requires a specific circuit</td>
</tr>
<tr>
<td></td>
<td>(Electronic Parking Brake)</td>
<td></td>
<td></td>
<td>03000A</td>
<td>+12 V = engine speed &gt; 500 rpm</td>
</tr>
<tr>
<td>9</td>
<td>Detection of EPB status (Electronic Parking Brake)</td>
<td></td>
<td></td>
<td></td>
<td>Ground = EPB active</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Open circuit = EPB not active</td>
</tr>
<tr>
<td>10</td>
<td>Engaging reverse</td>
<td>2268</td>
<td>200 mA</td>
<td>BCM C/17</td>
<td>+12 V = reverse gear engaged</td>
</tr>
<tr>
<td>11</td>
<td>Positive with key</td>
<td>8879</td>
<td>5 A</td>
<td>BCM G/12</td>
<td>Positive protected by fuse F49 on Body Computer</td>
</tr>
<tr>
<td>12</td>
<td>Engine speed control</td>
<td>8156</td>
<td></td>
<td>BCM H/56</td>
<td>Only with opt. no. 2453: Cruise Control</td>
</tr>
<tr>
<td>13</td>
<td>Reference ground for Engine speed check</td>
<td>0000</td>
<td></td>
<td>BCM H/45</td>
<td>For safety reasons, this operation is only permitted allowed with the vehicle stationary</td>
</tr>
<tr>
<td>14</td>
<td>2nd speed limiter</td>
<td>0000</td>
<td>200 mA</td>
<td>BCM H/41</td>
<td>Speed limitation to a pre-set value</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground = 2nd speed limiter activated</td>
</tr>
<tr>
<td>15</td>
<td>Reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Speed signal (B7)</td>
<td>5517</td>
<td></td>
<td>BCM D/56</td>
<td>Pulse Signal, see the description in Table S.4</td>
</tr>
</tbody>
</table>
# Daily – Guidelines for Bodybuilders
## CNG - Natural Power
### B.6 Bodybuilder Connectors

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Code</th>
<th>Maximum Load</th>
<th>Connected To</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Central emergency control</td>
<td>0000</td>
<td>200 mA (use a decoupling diode)</td>
<td>BCM E/20</td>
<td>Ground = activation request</td>
</tr>
<tr>
<td>18</td>
<td>Horn</td>
<td>1116</td>
<td>200 mA (use a decoupling diode)</td>
<td>BCM H/19</td>
<td>Ground = horn active</td>
</tr>
<tr>
<td>19</td>
<td>Reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Radio MUTE control</td>
<td>1632</td>
<td>10 mA</td>
<td>DAB C9</td>
<td>ground = MUTE function request</td>
</tr>
<tr>
<td>21</td>
<td>PTO1 signal in operation</td>
<td>693</td>
<td>200 mA (use a decoupling diode)</td>
<td>EM X3/08</td>
<td>PTO feedback</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground = PTO1 engaged</td>
</tr>
<tr>
<td>22</td>
<td>Multiple State Switch</td>
<td>0000</td>
<td></td>
<td>BCM H/38</td>
<td>ISc input (Idle Speed Control) mode 1/2/3</td>
</tr>
<tr>
<td>23</td>
<td>Ground for Multiple State Switch</td>
<td>0000</td>
<td></td>
<td>BCM H/36</td>
<td>The ISc mode must be reactivated after every engine start-up</td>
</tr>
<tr>
<td>24</td>
<td>Ground</td>
<td>0000</td>
<td>15 A</td>
<td>LM&amp;B</td>
<td>Ground connection</td>
</tr>
<tr>
<td>25</td>
<td>K15 Remote</td>
<td>8879</td>
<td>200 mA</td>
<td>SCM B/68</td>
<td>+12 V = activation of K15 Remote</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Note Due to the Immobilizer, the engine does not start unless the ignition key is inserted</td>
</tr>
<tr>
<td>26</td>
<td>Engine shut down</td>
<td>9903</td>
<td>10 mA</td>
<td>BCM F/22</td>
<td>The engine only switches off with vehicle speed &lt; 4 km / h</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+12 V = engine stop</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The command must be active until the engine is off</td>
</tr>
<tr>
<td>27</td>
<td>Service braking</td>
<td>1176</td>
<td>500 mA (use a decoupling diode)</td>
<td>BCM D/57</td>
<td>The engine only switches off with vehicle speed &lt; 4 km / h</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+12 V = brake pedal pressed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The command must be active until the engine is off</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>This signal does not provide any diagnostic information regarding the braking force</td>
</tr>
<tr>
<td>28</td>
<td>Vehicle stationary signal</td>
<td>0000</td>
<td>200 mA (use a decoupling diode)</td>
<td>BCM H/32</td>
<td>The signal provides information on the ‘vehicle at standstill’ condition</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground = vehicle stopped</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Vehicle speed can be other than zero, up to 4 km/h with signal active</td>
</tr>
<tr>
<td>29</td>
<td>Hazard lights warning signal</td>
<td>1114</td>
<td></td>
<td>BCM H08</td>
<td>+12 V (intermittent) = Hazard lights engaged</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>53077/16</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Battery positive K30</td>
<td>7772</td>
<td>15 A</td>
<td>BCM E/19</td>
<td>Direct positive from the battery and protected by fuse F33 on the Body Computer</td>
</tr>
<tr>
<td>31</td>
<td>Parking brake fully engaged</td>
<td>5622</td>
<td></td>
<td>BCM E/19</td>
<td>Active with ground signal transmitted from Outfitting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground = parking brake fully engaged</td>
</tr>
<tr>
<td>32</td>
<td>Reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For specific information regarding each terminal of connector 72105A, refer to the Paragraph (⇒ Page 7) in Section 5.
B.7 ADDITIONAL ALTERNATOR

The alternator fit as first equipment has the L line connected directly to the Body Computer, which performs the excitation and diagnostics functions.

The additional alternator must have the L pin connected in order to ensure excitation with a current between 150 and 200 mA, with the diagnostics warning light and external excitation.

1. Standard first use alternator
2. Additional standard alternator
3. Battery
4. Electrical loads
5. Signal +15 from ignition switch
6. Body Computer
7. Instrument panel
8. Diagnostics Lamp or LED + Res. (Current 150 - 200 mA)

The additional alternator must have all the mechanical requirements needed for compatibility with the vehicle. Installation is the full responsibility of the bodybuilder.
APPENDIX C

Hi-MATIC
AUTOMATIC GEARBOX
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Hi-Matic Automatic Gearbox

C.1 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

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

The lever can be positioned in a different location that 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

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

The automatic gearbox requires a specific propeller shaft for:

- length;
- gearbox connection flange (a);
- flexible coupling in rubber (b);
- centring element (c).

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.
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) Transmission 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.

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.

Likewise, also the position of the fan on the radiator must remain the same.

C.3.6 Retarder

On the Hi-MATIC automatic gearbox, it is not possible to fit any type of power take-off (PTO).

Vehicles with automatic gearbox and opt. “Electromagnetic retarder on transmission” have a specific gearbox, equipped with torsional vibration pendulum-type centrifugal damper (DAT).

The adoption of this type of retarder post-sales (only for version deliberated by IVECO), involves replacing the standard automatic gearbox with one equipped with DAT and the installation of the following parts in addition to the retarder and relative parts (not doing so will invalidate the warranty):

- Spacer ring between the engine and the gearbox
- Screws securing the gearbox to the engine and screws securing the specific starter motor gearbox with DAT
- Specific gearbox cross member for gearbox with DAT
- Specific gearbox bracket and suspension block for gearbox with DAT
Note  Once installation has been completed, installation of the retarder post-sales and the new automatic gearbox (with DAT) involves IVECO Customer Service being contacted to update the engine control unit software via teleservice.

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 \( T \geq 120 \, ^\circ\text{C} \) 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 \( T \geq 125 \, ^\circ\text{C} \) the automatic transmission ECU forces the engine EDC to reduce torque/power (derating). Furthermore, the function that controls derating \(^*\text{GET}_\text{M}_\text{MOTMAX}\) forces vehicle operation only in 6\(^{th}\) gear;
- if \( T \geq 142 \, ^\circ\text{C} \) and the vehicle is still in motion, the automatic transmission ECU *shuts down* the engine and, thus, stops the vehicle.

C.4.2 Reverse gear engagement signal

If on pin 10 of the connector 72105A (see Section 5, Table 5.2) the corresponding signal is not available when reverse gear is engaged, it is possible to proceed as follows:

- use the 2-way connector on the chassis near the right support bracket of the under-run bar;

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>signal</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reverse</td>
<td>2226</td>
<td>100 mA</td>
<td>BCM F01</td>
<td>Logic signal: (in parallel with the rear lamps +12 V = reverse gear engaged no signal = reverse gear not engaged Add a protection diode</td>
</tr>
<tr>
<td>2</td>
<td>Ground</td>
<td>0000</td>
<td>100 mA</td>
<td></td>
<td>Ground signal for reverse gear</td>
</tr>
</tbody>
</table>

(*) if opt 7638 buzzer reverse gear is present, the maximum current is limited to 70 mA.

- Proceed as follows:
  - Use a protection diode, max current draw 100 mA
  - disconnect the 60-way connector from the Body Computer
  - remove approx. 100 mm of protection from the cables
  - connect a 0.75 mm\(^2\) cable to the cable connected to pin LF04 (do not remove the pin from the connector) and insulate the connection properly (see Figure 7)
  - restore the cable protection
  - remove the terminal of the cable from slot 10 of the connector 72105A and protect it with insulating tape
  - put the 0.75 mm\(^2\) cable into the available slot (use terminal no. 500314824) (see Figure 7)
- protect the 0.75 mm² cable with 4.5 mm² of corrugated tubing and place it carefully in the dashboard going from the Body Computer to the Bodybuilder connector 72105A
- reconnect the 60 ways connector to the Body Computer

1. Body Computer - Connector F - Terminal LF04
2. 32-way Bodybuilder Connector - 72105A - Terminal 10

C.5 SAFETY

- The Bodybuilder must ensure compliance of the safety conditions required by Regulations associated with the function.

Note The automatic gearbox cannot be considered responsible for vehicle movement in the case of:
- an intentional movement of the selector to (D) or (R),
- an external request which compromises vehicle safety and integrity.

- The Parking function does not replace actuation of the parking brake.

Note For versions for the "Transport of people", please refer to Regulation ECE R107.

C.5.1 Safety function for vehicle parking

This function allows you to select the Parking (P) or Drive (D) on the automatic gearbox using a command outside of its control unit (see Section 5, Table 5.2, relating to terminals 2 and 3).

For (P), the engine must be switched off at the same time from the engine compartment.

For this purpose, it is mandatory to create the specific wiring in Figure 8 and then enable the function through IVECO Customer Service.
Following this intervention:

- If the vehicle has a speed of less than 0.5 km/h, the passage from (D) to (P) is determined by the lower switch (line 2) closing, while at higher speeds, the command is not accepted;
- the passage from (P) to (D) is determined by the top switch closing and simultaneous pressure on the brake pedal, otherwise the command is not accepted.

It is still possible to move to (D) by acting directly on the gearbox selector.

By way of example, the switches on Minibus vehicles correspond to the "outswinging door open/closed" contact.

**C.5.2 Engine shutdown from bodybuilder control**

This function allows the user to switch the engine off based on an external request.

To ensure correct behaviour of the vehicles equipped with Hi-Matic gearbox, dedicated programming is required. It is also necessary to implement a specific connection as shown in figure 9.

The command must be engaged in cascade to the one relating to the engagement of the Parking Lock (pin 2 of connector 72105, 32-pin, in order to correctly manage the INO of the Hi-Matic gearbox). Furthermore, pin 3 of the 32-pin connector must be connected correctly to prevent the circuit from remaining open.
1. Connector 72105A
2. Outfitting

Once the vehicle has been completely wired, in order to for the engine to be stopped via an external request, the list of checks indicated in Table C.2 must be carried out to verify correct implementation:

### Table C.2

<table>
<thead>
<tr>
<th>Test – With engine ON</th>
<th>Expected result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine ON and vehicle stationary (vehicle speed less than 0.5 km/h) Drive: engaged Engine shutdown request via external request</td>
<td>Parking brake engaged</td>
</tr>
<tr>
<td>Engine ON and vehicle stationary (vehicle speed greater than 0.5 km/h) Drive: engaged Engine shutdown request via external request</td>
<td>The gearbox remains in <em>Drive</em></td>
</tr>
</tbody>
</table>