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Data and information contained in this publication may be outdated as a result of changes adopted by IVECO, at any time, for technical or commercial reasons or due to the need to adapt the vehicle to new legal requirements.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

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

Modifications or versions indicated in these Directives 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;
- 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 Directives.
I.4 AUTHORISATION REQUEST

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

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

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

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

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

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

The manufacturer of the vehicle is defined as first-stage manufacturer, while the bodybuilder is defined as Second-stage manufacturer or that of the next stage.
1. **IVECO**
2. Authorized workshop upon Dealer order
3. Bodybuilder
4. Customer

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

Consequently:

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

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

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

### 1.8 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 CHOICE OF MATERIALS TO USE: ECOLOGY - RECYCLING

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

To this regard, please note that:

- it is forbidden to use materials that are harmful to health, or at least which may pose a risk, such as those containing asbestos, lead, halogen additives, fluorocarbons, cadmium, mercury, hexavalent chromium, etc.;
- it is advisable to use materials whose processing produces limited waste quantities and allows easy recycling after first use;
- in synthetic materials of the composite type, it is advisable to use components that are compatible with each other, allowing use with the possible addition of other recovery components. Prepare the required markings in accordance with the regulations in force;
- the batteries contain substances that are very dangerous for the environment. To replace the batteries it is possible to go to the Service Network, equipped for disposal in accordance with the nature and the law.
To comply with Directive 2000/53 EC (ELVs), IVECO prohibits the in-vehicle installation of components that contain lead, mercury, cadmium and hexavalent chromium; exceptions are made in cases allowed by Annex II of the above Directive.

I.12 VEHICLE MANAGEMENT ON THE PART OF BODYBUILDER

Acceptance of chassis

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.

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.

Delivery of the vehicle to the final customer

Before delivering the vehicle, the Body builder 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 20-181 2 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 vehicles (T.B.D.) does not match type-approval, a complete example of which is provided below.

Type approval name

**DAILY 70C18HA8 CC W**

- **DAILY** – Vehicle name
- **70** – Gross mass - GWW (no/10 = weight in t)
  - 35
  - 5.5 t
  - 70
  - 7.0 t
- **C** – Rear wheels
  - S Single rear wheels
  - C Twin rear wheels
- **18** – Engine power (no. x 10 = power in HP)
  - 186
  - 146 HP
  - 188
  - 180 HP
- **H** – Engine type
  - H Euro VI Engine (combined with engine power code 18)
  - E3 Euro III Engine (combined with engine power code 15)
- **A8** – Type of transmission
  - – Manual gearbox
  - A8 Automatic gearbox
- **CC** – Version
  - – Chassis-cab version
  - D Dual cab (6+1)
  - V Van
  - SV Semi-windowed
  - CC Cowl
  - CCS Stripped chassis cowl
  - CA Cut Away
- **W** – 4x4
1.14 IDENTIFICATIONS

Logos, identification tradenames 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 tradenames 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.

![Diagram showing the positioning of the IVECO logo on the engine bonnet]

1. Front view
2. Side view

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

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

1.15 DIMENSIONS AND GROUND

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.

Weighing of the chassis

It should be noted that variations are possible on the masses of the order of 3%.

For this reason, before carrying out the fitting, it is a good idea to determine the mass of the chassis cab vehicle and its distribution on the axles.

Vehicle adaptability

The body length limits mainly depend on:

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

Rear-view 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. 8643, 8644, 76129).
**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.

\[
L_1 = \frac{W_1}{W} \quad W_1 = \text{Measurement of payload on rear axle}
\]

\[
L_1 = \frac{W_1}{W} \quad L = \text{Actual wheelbase}
\]

\[
W = \text{Payload plus superstructure}
\]

\[
W_2 = \text{Measurement of payload on front axle}
\]

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.
Even distribution of load

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

**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:

- fixed loads,
- mobile loads;
- loads that result in increased aerodynamic actions.

**a) Fixed loads**

![Diagram of fixed loads]

\[
\begin{align*}
H_t &= \frac{W_w \cdot H_w + W_s \cdot H_s}{W_c + W_s} \\
H_s &= \frac{(W_w + W_s) \cdot H_t - W_w \cdot H_w}{W_s}
\end{align*}
\]

**Control at full load**

- \(H_w\) = Vehicle centre of gravity height (loaded)
- \(H_s\) = Height of payload centre of gravity from the ground
- \(H_t\) = Complete full-load vehicle centre of gravity height
- \(W_w\) = Vehicle tare weight
- \(W_s\) = Payload
- \(W_t\) = Complete vehicle ground at full load
For any inspections with the vehicle set up without payload you can proceed similarly, assuming Ws is only the tare weight of the superstructure (considering for Hv a value appropriate for the load and between the no-load chassis cab version trim and the full-load trim).

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

### Table 1.1

<table>
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<th>Tyres</th>
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<th>265/70 R19.5 single wheel</th>
<th>255/100 R16</th>
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<tr>
<td>T.G.W. [kg]</td>
<td>7000</td>
<td>7000</td>
<td>5500</td>
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<td>Max. mass on front axle [kg]</td>
<td>2700</td>
<td>2700</td>
<td>2450</td>
</tr>
<tr>
<td>Max. mass on rear axle [kg]</td>
<td>5000</td>
<td>5000</td>
<td>3700</td>
</tr>
<tr>
<td>Height of centre of mass of outfitting [mm]</td>
<td>1620</td>
<td>1670</td>
<td>1710</td>
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<tr>
<td>Height of centre of mass of vehicle complete with load [mm]</td>
<td>1480</td>
<td>1510</td>
<td>1500</td>
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**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 ECE 111, special attention should therefore be paid:

- 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.
Adoption of stabilizer bars

The application of additional or reinforced stabilizer bars, where available, reinforcing the springs or rubber elastic parts (in accordance with the procedure outlined in Chapter 2.9 (⇒ Page 18)), may allow higher values of the centre of gravity of the payload, to be determined on a case by case basis. The operation must be carried out after careful evaluation of the outfitting characteristics, the wheelbase and the distribution of transverse forces on the suspension, and should generally concern both the front and the rear. However, it should be kept in mind that in many cases it is advisable to carry out the operation only on the rear axle; acting on the front axle would give the driver an incorrect sensation of greater stability, making it actually harder to perceive the safety limit. Interventions on the front axle may be performed in the presence of concentrated loads behind the cab (e.g. cranes) or of superstructures with high rigidity (e.g. vans).

Respect 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.

Variations on 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, filter, 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.

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

In these Guidelines the following conventions are adopted:

- **Wheelbase**: distance between the centre lines of the steering axle and the rear axle.
- **Rear overhang**: Distance between the centre line of the rear axle and the rear end of the chassis side members.
- **Dimensions A, B and t** of the chassis section: See Figure to the side.
SECTION 2

CHASSIS
INTERVENTIONS
## Contents

2.1 GENERAL CHASSIS MODIFICATION
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CHASSIS INTERVENTIONS

2.1 GENERAL CHASSIS MODIFICATION STANDARDS

Keep in mind that:

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

![Warning]

- **As regards remounting safety components, it is prohibited to re-use the same screws and tightening must be done at 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.

Preventive measures

![Warning]

- **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).**

![Figure 1]
Precautions for alternators and electric/electronic components

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

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

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

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

Earth connection

The original earth connections of the vehicle should never be altered; in cases where these connections must be moved or new connections 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 earth within 5 minutes after application of the paint.

For ground connections at the signal level (e.g. sensors or devices with low absorption), absolutely never use standardised IVECO M1 points (ground connection of the batteries), M2 or M8 (grounding the starter motor, depending on the position of the guide) and connect the signal cable ground on points separate from the power cables and wires that serve as radio frequency screens.

Avoid earth connections between devices in a concatenated fashion for electronic equipment; install individual earth connections of optimal length (favour the shortest routes).

Braking and electrical systems

For additional details on the braking and electrical systems see Chapters 2.15 (⇒ Page 28) and 5.4.

Characteristics of the material used in chassis modifications

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

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

**Table 2.1 - Material to be used in chassis modifications**

<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</td>
<td>Fe E420</td>
<td>530</td>
<td>420</td>
</tr>
<tr>
<td>Europe</td>
<td>S420MC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>Q5eE420TM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2.2 - Section dimension and chassis thickness

<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>35 - 55 - 70</td>
<td>truck</td>
<td>3080</td>
<td>935</td>
<td>144 x 69 x 5</td>
<td>184 x 69 x 5</td>
</tr>
<tr>
<td>35 - 55 - 70</td>
<td>truck</td>
<td>3480</td>
<td>940</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55 - 70</td>
<td>van</td>
<td>3780</td>
<td>1145</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55 - 70</td>
<td>van</td>
<td>4175</td>
<td>1715</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55 - 70</td>
<td>van</td>
<td>3595</td>
<td>855 / 1255</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55 - 70</td>
<td>van</td>
<td>4175</td>
<td>1840</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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: $\sigma_{\text{adm}} = 100 \text{ N/mm}^2$

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

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

2.2 DRILLS ON THE CHASSIS

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

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

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

Hole position and size

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.
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 (crossbars, shear resistant plates, brackets)</td>
<td>800</td>
<td>640</td>
</tr>
<tr>
<td>10.9</td>
<td>High resistance screws (springs supports, stabiliser 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.

Sealing 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.

**Original vehicle parts**

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 B2</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 radiator grille (class B) External cab ramps</td>
</tr>
<tr>
<td>B1</td>
<td>Only for rear axles and front axles</td>
<td>Engine and relative parts</td>
</tr>
<tr>
<td>C</td>
<td>Parts in direct contact with atmospheric agents, not in clear view</td>
<td>Pedals - Seat coverings - Fastening elements - etc., mounted inside the cab</td>
</tr>
<tr>
<td>D</td>
<td>Parts not in direct contact with atmospheric agents</td>
<td></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 (*)</td>
<td>18-0506</td>
<td>A</td>
</tr>
<tr>
<td>Geomet (‡)</td>
<td>18-1101</td>
<td>B B1 B2</td>
</tr>
<tr>
<td>Geomet (‡)</td>
<td>18-1101</td>
<td>C</td>
</tr>
<tr>
<td>Geomet (‡)</td>
<td>18-1101</td>
<td>D</td>
</tr>
<tr>
<td>Zinc coating (‡)</td>
<td>18-1102</td>
<td>A</td>
</tr>
<tr>
<td>Zinc coating (‡)</td>
<td>18-1102</td>
<td>B B1 B2</td>
</tr>
<tr>
<td>Zinc coating (‡)</td>
<td>18-1102</td>
<td>C</td>
</tr>
<tr>
<td>Zinc coating (‡)</td>
<td>18-1102</td>
<td>D</td>
</tr>
<tr>
<td>Alloy Zn-Ni</td>
<td>18 - 1103</td>
<td>A</td>
</tr>
<tr>
<td>Alloy Zn-Ni</td>
<td>18 - 1103</td>
<td>B B1 B2</td>
</tr>
<tr>
<td>Alloy Zn-Ni</td>
<td>18 - 1103</td>
<td>C</td>
</tr>
<tr>
<td>Alloy Zn-Ni</td>
<td>18 - 1103</td>
<td>D</td>
</tr>
<tr>
<td>Type of protection</td>
<td>IVECO standard</td>
<td>Classes</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Alloy Zn-Ni</td>
<td>Fe/Zn Ni 7 IV</td>
<td>18 - 1103</td>
</tr>
<tr>
<td>Aluminium</td>
<td>Anode oxidation</td>
<td>18-1148</td>
</tr>
<tr>
<td>Painting</td>
<td>See Table III</td>
<td>yes</td>
</tr>
</tbody>
</table>

1. Coupling with other materials must not cause the "battery effect".
2. Coatings free from chromium salts.

**Table 2.6 - Painted parts - IVECO Standard 18 - 1600 (Prospectus III)**

<table>
<thead>
<tr>
<th>Cycle phase description</th>
<th>Classes</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B (1)</td>
<td>B1 (3)</td>
<td>B2</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>MECHANICAL SURFACE</td>
<td></td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
</tr>
<tr>
<td>CLEANING (1)</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>Brushing</td>
<td></td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
</tr>
<tr>
<td>Sandblasting</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>PRE-TREATMENT</td>
<td></td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
</tr>
<tr>
<td>Iron phosphating</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>(only for non-precoated</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>ferrous materials</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>Zinc phosphating (**)</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>CATAPHORETIC PAINTING</td>
<td></td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
</tr>
<tr>
<td>High thickness (30-40 µm)</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>Medium thickness (20-30 µm)</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>Acrylic finishing (&gt;35 µm)</td>
<td>–</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>RUST PREVENTER</td>
<td></td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>B-component (30-40 µm)</td>
<td>–</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>Single-component (30-40 µm)</td>
<td>–</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>ANTIROCK PRIMER</td>
<td></td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>Single (130 °C) or</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>bicomponent (30-40 µm)</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>VARNISH</td>
<td></td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>Single (130 °C) or</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>bicomponent (30-40 µm)</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>Powders (40-110 µm)</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>Low temperature</td>
<td>–</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</td>
</tr>
<tr>
<td>single-component (30-40 µm)</td>
<td>–</td>
<td>–</td>
<td>yes (1)</td>
<td>–</td>
<td>yes (1)</td>
<td>yes (1)</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 axes.
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.
10. Alternative products and cycles for the same phase under the condition of comparability with the part to treat.
11. Specific phosphates must be used for zinc coated or aluminium sheets.
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 used 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>Mechanical surface cleaning</td>
<td>Brushing/sandpapering/sand blasting</td>
</tr>
<tr>
<td>(including elimination of burrs/oxidation and cleaning of out 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></td>
<td>A-B</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>yes</td>
</tr>
<tr>
<td>Geomet</td>
<td>–</td>
</tr>
<tr>
<td>Zinc coating (5)</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>yes</td>
</tr>
</tbody>
</table>

(1) Free from hexavalent chromium

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

Variation of the wheelbase is only permitted upon specific approval of IVECO.

In any case, the following must always be taken into account:

- lengthening the wheelbase has a negative effect on the steering (turning circle, effort applied on the steering wheel and vehicle reaction times as contained in the ECE Regulation or EC Directive in force);
- shortening the wheelbase will have a negative effect on braking.

### 2.5 REAR OVERHANG MODIFICATION

Any rear chassis lengthening must be explicitly authorized by IVECO.
2.6 INSTALLING THE TOW HOOK

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.

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

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

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

- clearances required for the coupling of the brakes and electrical system;
- distance between the hook pin axis and the rear edge of the superstructure (see Figure 3).

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

2. **Free field for coupling hooks according to standard DIN 74058 ESC-152**

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.
Tow hooks for centre axle trailers

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

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

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

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

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

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

- \( D_c \) = 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]
- \( S \) = vertical static load on the hook [kg], namely the mass part which in static conditions, is transmitted to the coupling point on the vehicle. \( S \) must be \( \leq 0.1 \times R \) and, in any case, less than 1000 kg.
- \( C \) = sum of maximum axial loads of the centre axle trailer at full load. Equal to the maximum weight of the trailer minus the vertical static load (\( C = R - S \) [kg])
- \( V \) = value of the intensity of the theoretical dynamic vertical force between the vehicle and the trailer [kN]
- \( a \) = vertical acceleration in the area of the drawbar coupling/hook, in function of the rear tractor suspension, use the following values:
  - \( a = 1.8 \text{ m/s}^2 \) for air suspensions
  - \( a = 2.4 \text{ m/s}^2 \) for other types of suspensions
- \( X \) = length of the load bed [m], (see Figure 4)
- \( L \) = theoretical drawbar length, distance between the centre of the drawbar eye and the centre line of the trailer axles [m], (see Figure 4)
- \( \frac{X^2}{L^2} \geq 1 \) if the result is less than the unit, use the value 1
2.6 INSTALLING THE TOW HOOK

As original equipment, the DAILY 4x4 vehicles may be fitted with a "mixed" type tow hook, i.e. ball type with safety device. This tow hook may only be fitted on the rear closing cross member of the chassis.

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

**Table 2.9 - Type-approved hooks**

<table>
<thead>
<tr>
<th>EC certified</th>
<th>Type</th>
<th>Class</th>
<th>D [kN]</th>
<th>Dc [kN]</th>
<th>S [kN]</th>
<th>V [kN]</th>
</tr>
</thead>
<tbody>
<tr>
<td>E2 55R-01 122009</td>
<td>CR32C</td>
<td>S</td>
<td>31</td>
<td>31</td>
<td>340</td>
<td>–</td>
</tr>
<tr>
<td>E1 55R-01 2262</td>
<td>AC100</td>
<td>S</td>
<td>30</td>
<td>30</td>
<td>350</td>
<td>18</td>
</tr>
<tr>
<td>E3 55R-01 3040</td>
<td>BC40</td>
<td>AS0-X</td>
<td>23.41</td>
<td>250</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

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

- have characteristics that are wholly equivalent to those shown in Table 2.9;
- be approved in observance of the current national and international legislation (e.g. EC Directives);
- be fitted in accordance with the manufacturer’s instructions.
Note Any other solutions must be explicitly authorised by IVECO.

Observations of 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.

Increase of tow 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.

Plates
Some countries require a plate to be applied on the towing device, which must list maximum tow load and maximum vertical load allowed.
If not already mounted, the Bodybuilder shall see to its manufacture and installation.

2.7 ASSEMBLING AN ADDITIONAL AXLE
Application not provided.

2.8 TRANSMISSION MODIFICATION
Any modifications to the transmission must be authorised by IVECO.
The maximum inclination $X^\circ$ of the rear axle casing must be less than 5$^\circ$ in relation to the horizontal.

**Note**  *It is strictly forbidden to move the transfer box.*

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

The universal joints may not be modified.

For each modification of the transmission, or of any of its parts, careful dynamic balancing must be performed on each modified section.

> **Given that the transmission is an important part of the vehicle in terms on safety, we strongly recommend that all modifications made to it stand up to maximum safety standards. Therefore, all modifications should be made only by highly specialised Companies that are qualified by the transmission Manufacturer.**

### 2.9 WORK ON SUSPENSIONS

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

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

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

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

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

**Note**  *Adaptation of the suspension assumes a corresponding adaptation of the ESP system controlling stability (see Paragraph "Derating of the ESP system" (⇒ Page 32)).*
2.10 MODIFYING THE ENGINE AIR INTAKE AND EXHAUST SYSTEMS

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

### Table 2.10 - Maximum permitted exhaust back pressure and vacuum on intake under normal operating conditions and at full load

<table>
<thead>
<tr>
<th>Engine</th>
<th>Engine code</th>
<th>Exhaust back pressure [kPa]</th>
<th>Min - max vacuum on intake [kPa]</th>
</tr>
</thead>
<tbody>
<tr>
<td>.18H VGT Euro VI</td>
<td>F1CFL411W*E</td>
<td>40</td>
<td>1 - 9</td>
</tr>
<tr>
<td>.1SH WG Euro III</td>
<td>F1CED489R*L</td>
<td>13</td>
<td>1 - 5</td>
</tr>
</tbody>
</table>

**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 to support a steady temperature of 100 °C, with short durations of 120 °C, without undergoing visible deformations or deteriorations. The compartment must keep airflow sections efficient for the entire circuit.

The holes that must be made in the box part of the van must have an area of about twice that of the cross-section of the pipe upstream of the filter; these openings (e.g. grille holes) must have minimal dimensions to prevent possible clogging.

The following are not allowed:

- alterations or replacement of the original air filter with one of lower capacity;
- modifications to the silencer body;
- 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).

**Engine exhaust (only Euro III)**

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

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

Authorisation must always be obtained from IVECO.
2.11 MODIFYING THE ENGINE COOLING SYSTEM

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

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

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

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

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

2.12 MODIFICATIONS TO THE HEATING/CONDITIONING PLANT

Installing an additional heating system

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

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

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

In addition, be sure to:

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

The system must allow easy access and prompt maintenance.
The Bodybuilder must provide all necessary maintenance instructions.

a) Water heaters

When the original vehicle heating and engine cooling circuits are involved (see Chapter 2.11 (⇒ Page 20)), 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

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

Figure 7 shows a layout for a supplementary 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.
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** From 1/1/2017:

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.
Second air conditioner compressor
Removal
Cut the elastic belt (4 - Fig. 8) as it cannot be reused.

Refitting
Apply 8) the specific chock 99360186 (2) to the pulley (1 - Fig. 8) with the elastic belt (4) placing the belt on the roller (3) and pulley (5) and ensuring that the ribs of the belt are placed in the corresponding grooves of the pulley (1, 5).

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

2.13 BODYWORK INTERVENTIONS

General information
All interventions on the steering cab 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 9)).

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 (L.S. 18-1317 class ZNT/F/10/2S or L.S. 18-1318 class ZNT/10/2S), both surfaces must undergo protective treatment.

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

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

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

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 9 ensuring that the minimum coupling radius as indicated is observed;
- eliminate the rear cross member structure at roof level;
- implement a structure capable of ensuring that uprights cannot be deformed in order to retain the efficiency of the upper couplings of the safety belts;
- this structure should have a compression strength of at least 800 daN;
- implement the connection with the new structure following the general indications provided above.
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 9
d) Creation of sleeper cabs
Not applicable

Protection of persons on-board the vehicle
The coupling points of the safety belts, the positioning of reels and pre-tensioners and the anchorage of seats are all elements subject to specific type-approval tests.
Any modification to these components may compromise the safety of persons on-board.

a) Anchoring of seat belts
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.

b) Seats
Moving or fitting additional seats is only permitted on vehicles originally fitted with supplementary anchoring points and already subject to alternative type approval.
Any other solution is implemented under to total responsibility of the bodybuilder as regards installation and final test procedures (destructive).

2.14 CHANGING TYRE SIZE

Note: Replacing the tyres with others of a different size or load bearing capacity compared to the specifications recorded during vehicle type approval requires IVECO certification and verification of whether the electronic management of the braking system requires reprogramming.

The vehicle must then be presented to the competent Body that will inspect the new tyres and the vehicle documents.
Mounting larger 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 consequential need to verify the spare wheel holder modification;
- 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 34));
- requires the need to check compliance of the limit transversal contour allowed in relation to the various standards.

Prescriptions

Note: Replacing tyres with others of different outer diameter and/or speed indices affects vehicle performance (e.g. speed, max. vehicle ramp slope, tow load, braking force, etc.), therefore the Body Computer (speedometer, tachograph and speed limiter) must be subject to recalibration at an authorised IVECO workshop.

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

The tyre load bearing capacity and the relative reference speed must be suitable to the vehicle's performance.
Mounting tyres with lower load bearing capacity or reference speed entails a reduction of allowed loads; on the other hand, mounting tyres with greater load bearing capacity does not automatically entail an increase of load allowed on the axles. The dimensions and load bearing capacity of the tyres are established by international and national standards (ETRTO, DIN, CUNA, etc.) and are listed in the manuals of their respective Manufacturers.

Particular performance values may be envisaged by national standards for special uses, fire prevention, winter services, airport tank trucks, buses, etc.

- 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. In addition, tighten the wheel studs at the tightening torque according to the IVECO standard (see the following Table).

Table 2.11 - Wheel tightening torques according to IVECO STD 17-9219

<table>
<thead>
<tr>
<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>Front and rear wheel mounting</td>
<td>Stud M18x1.5</td>
<td>II</td>
<td>335</td>
<td>410</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.

2.15 WORK ON THE BRAKING SYSTEM

General information

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

- Any modification to the braking system requires authorisation from IVECO, it being understood that no changes may be made to the following parts: brake cylinders and callipers, adjustment units and valves, parking brake, brake control and auxiliary systems.

If the national standards provide it, the vehicle must be presented to the competent authority for inspection.

Brake pipes

- It is absolutely forbidden to weld the pipes.

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

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

For procurement please contact IVECO Assistance Service, whereas for assembly the directions in IVECO STD 17-2403 must be complied with.
The total or partial painting of the brake pipes must be absolutely avoided and, for this purpose, appropriate masking of the pipes must be provided.

Metal pipes

Additions and replacements must envisage:

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

Preparation and assembly (IVECO STD 17-2403)

Cut the pipe at right angles (15° maximum error), using a special tool in order to avoid imperfections that affect the sealing. Permanently mark the section of pipe (dimension L in Figure 9) 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](image)

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 2.12 |
|-------------|---------------|
| **Thread**  | **Tightening torque [Nm \( \pm 10\% \)]** |
| M 8 x 1 mm  | 20            |
### Thread |
<table>
<thead>
<tr>
<th>M 12 x 1.5 mm</th>
<th>M 14 x 1.5 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</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.

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

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

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

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

### Bleed air using "E.A.S.Y." on vehicles with ABS/ESP system

The conventional manual bleed operation may not be sufficient on vehicles equipped with the ABS/ESP system.

Therefore the operation must be carried out which will be guided by "E.A.S.Y." This makes it possible to perform a full bleed (primary circuit and secondary circuit of the modulator).

Follow the instructions as they are displayed, making sure not to exceed the pump and solenoid activation time to avoid superheating the components.

If this happens, the system switches off and you must wait for the preset time before resuming the operation.

> **When replacing the modulator (supplied by IVECO Parts already filled with brake fluid in every part), it is enough to use the manual bleed procedure, taking care however not to empty it and not to cycle the pump and solenoid before filling is completed.**

The ABS/ESP modulator devices are situated on the chassis in the engine compartment and must not be moved.

> **Perform the necessary checks and controls after every such task at an Authorised Workshop having specific equipment.**
ESP (Electronic Stability Program)

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

By continuously analysing acceleration signals, yaw, steering angle and wheel revolutions (see Figure 11), the control unit is able to compare the set trajectory with the actual vehicle trajectory.

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

1. Electrohydraulic braking 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.

Derating of the ESP system

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

If derating is implemented, functions nonetheless remain active:

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

Variation of GVW

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

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

Wheelbase variation

As stated in Chapter 2.4 (⇒ Page 12), the variation of the wheelbase is only permitted upon specific approval of IVECO. In the event of approval the following alternatives may be verified:

a) To values included in the product grid

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

a) To values not included in the product grid

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

If an ESP system is present:

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

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

Modification or replacement of stabilising bars

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

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

Changing tyres

See Chapter 2.14

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

2.16 ELECTRICAL SYSTEM: CURRENT INTERVENTIONS AND DRAWS

For information on work on the electrical system, refer to what is described in Section 5 - Chapter 5.4.

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.

Horn

The displacement of the horn obligates the body builder 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.

Wheel holder

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

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

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

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

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

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

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

### 2.18 TRANSPORT OF HAZARDOUS MATERIALS (ADR)

Each vehicle complies fully with the technical specifications of Regulation 105 - Series 06 - attachment "B" of the Agreement ADR 2017 - Part 9 (Requirements relating to the construction and approval of vehicles) with regards to the paragraphs:

At the time of publication of this draft (6/2018), the list is still in the defining stage.

It is understood that compliance with these requirements by the additional structures and their connections to "incomplete" vehicles, is the full responsibility of the Bodybuilder.

### 2.19 INSTALLING A RETARDER

Application not provided

### 2.20 REAR UNDER-RUN PROTECTION (RUP)

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

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

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

The compliance of the modified device with standards in force must be demonstrated to the competent authorities by appropriate documentation or test certificates.
2.21 REAR MUD GUARDS AND WHEEL ARCHES

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

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

- the free shaking of the wheels must be ensured even in the conditions of use with chains; any indications on limit values can be requested via the Support Service;
- the width of the mudguard must be greater than the maximum dimensions occupied by the tyres, within the limits set by the regulations;
- the support structure of the mudguard must have adequate strength and be able to limit the vibrations;
- the connection may be made on the vertical rib of the side members of the vehicle (only using the existing holes) or directly under the applied superstructure (see Figure 11).

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

2.22 RAIN FLAP

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 EC) require the application of side protections. Compliance with the required characteristics should be assured by the Bodybuilder who handles completion of the vehicle, if it was not already equipped as such originally (optional setting).

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

In implementing the outer protection, as required by the regulations (e.g. 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.
SECTION 3

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SUPERSTRUCTURES
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APPLICATIONS OF SUPERSTRUCTURES

Note  The following specific instructions complement the regulations contained in Section 1 "GENERAL INFORMATION".

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.

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 3.1 - Material to be used for the construction of superstructures Std IVECO 15-2110 and 15-2812

<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</td>
<td>Fe 360D</td>
<td>360 (1)</td>
<td></td>
</tr>
<tr>
<td>EUROPE</td>
<td>S235J2G3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GERMANY</td>
<td>ST37-3N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.K.</td>
<td>40D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IVECO</td>
<td>Fe E420</td>
<td>530</td>
<td></td>
</tr>
<tr>
<td>EUROPE</td>
<td>S420MC</td>
<td>420</td>
<td>21%</td>
</tr>
<tr>
<td>GERMANY</td>
<td>QS1E420TM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.K.</td>
<td>50F45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IVECO</td>
<td>Fe S10D</td>
<td>520</td>
<td></td>
</tr>
<tr>
<td>EUROPE</td>
<td>S355J2G3</td>
<td>360</td>
<td>22%</td>
</tr>
<tr>
<td>GERMANY</td>
<td>ST52-3N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.K.</td>
<td>50D</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sizing of profiles

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

The indicated value Ws 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 Ws and inertia time J, of the new C section are not of a lesser value.
### Table 3.2 - Profile dimensions

<table>
<thead>
<tr>
<th>Section modulus $W_s$ [cm$^3$]</th>
<th>Recommended C profile [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 ≤ $W_s$ ≤ 19</td>
<td>80 × 50 × 4</td>
</tr>
<tr>
<td>20 ≤ $W_s$ ≤ 23</td>
<td></td>
</tr>
<tr>
<td>24 ≤ $W_s$ ≤ 26</td>
<td></td>
</tr>
<tr>
<td>27 ≤ $W_s$ ≤ 30</td>
<td></td>
</tr>
<tr>
<td>31 ≤ $W_s$ ≤ 33</td>
<td></td>
</tr>
<tr>
<td>34 ≤ $W_s$ ≤ 36</td>
<td></td>
</tr>
<tr>
<td>37 ≤ $W_s$ ≤ 41</td>
<td></td>
</tr>
<tr>
<td>42 ≤ $W_s$ ≤ 45</td>
<td>80 × 80 × 8</td>
</tr>
<tr>
<td>46 ≤ $W_s$ ≤ 52</td>
<td>120 × 60 × 6</td>
</tr>
<tr>
<td>53 ≤ $W_s$ ≤ 58</td>
<td></td>
</tr>
<tr>
<td>59 ≤ $W_s$ ≤ 65</td>
<td></td>
</tr>
<tr>
<td>66 ≤ $W_s$ ≤ 72</td>
<td></td>
</tr>
<tr>
<td>73 ≤ $W_s$ ≤ 79</td>
<td></td>
</tr>
<tr>
<td>80 ≤ $W_s$ ≤ 88</td>
<td></td>
</tr>
<tr>
<td>89 ≤ $W_s$ ≤ 93</td>
<td>160 × 70 × 7</td>
</tr>
<tr>
<td>94 ≤ $W_s$ ≤ 104</td>
<td></td>
</tr>
<tr>
<td>105 ≤ $W_s$ ≤ 122</td>
<td>200 × 80 × 6</td>
</tr>
<tr>
<td>123 ≤ $W_s$ ≤ 126</td>
<td></td>
</tr>
<tr>
<td>127 ≤ $W_s$ ≤ 141</td>
<td></td>
</tr>
<tr>
<td>142 ≤ $W_s$ ≤ 160</td>
<td>200 × 80 × 8</td>
</tr>
<tr>
<td>161 ≤ $W_s$ ≤ 178</td>
<td>220 × 80 × 8</td>
</tr>
<tr>
<td>179 ≤ $W_s$ ≤ 201</td>
<td>250 × 80 × 7</td>
</tr>
<tr>
<td>202 ≤ $W_s$ ≤ 220</td>
<td>250 × 80 × 8</td>
</tr>
<tr>
<td>221 ≤ $W_s$ ≤ 224</td>
<td>220 × 80 × 8</td>
</tr>
<tr>
<td>225 ≤ $W_s$ ≤ 245</td>
<td>250 × 100 × 8</td>
</tr>
<tr>
<td>246 ≤ $W_s$ ≤ 286</td>
<td>280 × 100 × 8</td>
</tr>
<tr>
<td>290 ≤ $W_s$ ≤ 316</td>
<td>300 × 80 × 8</td>
</tr>
<tr>
<td>316 ≤ $W_s$ ≤ 380</td>
<td>340 × 100 × 8</td>
</tr>
<tr>
<td>440</td>
<td>380 × 100 × 8</td>
</tr>
<tr>
<td>480</td>
<td>400 × 100 × 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.
Subframe dimension

In case of elastic connection between chassis and subframe the bending moment $M_f$ must be subdivided proportionately between chassis and subframe at the moments of inertia of the sections:

\[ M_f = M_c + M_t \]

\[ M_c = \frac{I_c}{I} \]

\[ M_t = \frac{I_t}{I} \]

\[ M_c = M_f \cdot \frac{I_c}{I + I_c} \]

\[ M_t = M_f \cdot \frac{I_t}{I + I_t} \]

\[ \sigma_c = \frac{M_c}{W_c} \leq \sigma_{amm} \]

\[ \sigma_t = \frac{M_t}{W_t} \leq \sigma_{amm} \]

$M_f =$ static bending moment generated by the superstructure [Nmm]

$M_c =$ proportional share of the static bending moment $M_f$ applied to the subframe [Nmm]

$M_t =$ proportional share of the static bending moment $M_f$ 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$^3$]

$\sigma_{amm} =$ maximum static stress allowed on chassis [N/mm$^2$] see chapter 2.1, Paragraph "Stresses on the chassis" (➡️ Page 7)

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 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

Longitudinal profiles

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.

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

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 means of interposition of strips of sheet metal or light alloy.

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

The dimensions specified for the side members of the various types of superstructures are the recommended minimum values and, as a rule, are valid for vehicles with standard wheelbases and rear overhangs (see Tables 3.3 to 3.5). In all cases similar profiles can be used, but with moments of inertia and resistance which are the same or higher. These values can be obtained from the technical documentation of the profile manufacturers.
Cross members

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](image1)

Stiffening of the subframe

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

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

- boxing the longitudinal sections in the rear area (ref. A in Figure 6);
- adopting closed section cross members (ref. B in 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](image2)
Self-supporting superstructures with subframe functions

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

3.3 CONNECTION BETWEEN CHASSIS AND SUBFRAME

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

This solution (see Figure 8) allows limited movement between the two structures and makes it possible for respective resistant sections to be considered "cooperating", as each takes on a share of the bending moment proportional to its moment of inertia. For the correct realization of the connection, the fastenings must:

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

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

In creating the connection, welding must not be performed on the side members of the chassis and holes must not be drilled into the wings.
Connection with brackets

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

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

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

Connections with greater elasticity

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.
1. Rubber block
2. Belleville washers
3. Coil spring

Bear closely in mind that:

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

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

### 3.4 CONTAINER APPLICATION

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

<table>
<thead>
<tr>
<th>Models</th>
<th>Minimum reinforcing profile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wheelbase [mm]</td>
</tr>
<tr>
<td>All</td>
<td>3080, 3480, 3780, 4175</td>
</tr>
</tbody>
</table>

Note  For the dimensions of the profiles see Table 3.2.

Fastening is achieved through specific pre-installed brackets (3) along the vertical rib of the side members (1) (see Figure 10) and, if these connections have not already been specified by IVECO, they must be made according to the indications provided in Chapter 3.3 - Paragraph "Connection with brackets".

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

![Figure 10](image)

1. Chassis
2. Subframe
3. Brackets
4. Cross members

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

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

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

Figure 11 shows an example installation where, in order to limit the height of the superstructure, the longitudinal profiles are integrated with cross members and brackets over the entire length.

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

![Figure 11](image)

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

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

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

Vans integrated with the cab

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

For couplings and fitting reinforcements, bear in mind that:

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

The use of rear or three-way tipping bodies generally subjects the chassis to considerable mechanical stress. Therefore, the following indications must be observed.

1. The use of a stabiliser bar on all IVECO models for which it is an optional, is recommended.
2. The subframe must be:
   - suitable for the type of vehicle and conditions of use,
   - with appropriately sized cross members and side members,
   - with the rear end stiffened with box sections and cross braces (see Figure 6 and Figure 7). The connections to the chassis must be flexible (brackets) at the front end, while the rear section requires stiff connections (plates) to allow the added structure to contribute more to the stiffness of the assembly. Omega brackets can be used on vehicles where these are originally fitted.
3. The rear tipping hinge must be fitted to the subframe; its position must be as close as possible to the rear support of the rear suspension. So as not to compromise vehicle stability during tipping operations and avoid excessive mechanical stress on the chassis, the distance must comply with the specifications given in Figure 12. If this is not possible, the subframe profiles must be larger than normal and additional reinforcement must be applied to the rear.
4. Particular attention must be paid to the positioning of the lifting device both in terms of providing supports with adequate strength and in order to correctly position the connections. In any case, in order to reduce the extent of the localised load, it is recommended that the lifting device is placed forwards of the centre of gravity of the payload-body assembly.
5. For rear tipping operations, it is recommended that a stabilizer is fitted to guide the body, particularly when the lifting cylinder is located behind the cab.
6. The lifting device hinge must be mounted on the additional subframe. The useful volume of the body must be in accordance with the density of the material to be transported (a density of approximately 1 600 kg/m³ is to be used for excavated material) in observance of the maximum permitted load on the axles. In the case of low density freight, the useful volume may be increased within the limits established for the maximum height of the centre of gravity of the payload (plus equipment).
7. The bodybuilder must ensure the good operation and safety of all parts of the vehicle (e.g. the positioning of lights, tow hook etc.) and ensure that, following the addition of the structure, vehicle stability is guaranteed during tipping operations.

![Figure 12](image-url)
**Table 3.4**

<table>
<thead>
<tr>
<th>Models</th>
<th>Minimum reinforcing profile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Section modulus $W_x$ [cm²]</td>
</tr>
<tr>
<td>All</td>
<td>36</td>
</tr>
</tbody>
</table>

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

### 3.5 TRACTOR FOR SEMI-TRAILER

Not provided.

### 3.6 TRANSPORT OF INSEPARABLE MATERIALS (TRAILER TRUCKS)

Not provided.

### 3.7 INSTALLATION OF TANKS AND LOOSE MATERIAL CONTAINERS

#### a) Installation with a subframe

The installation of tanks and containers is carried out, as a rule, using a suitable subframe. The approximate dimensions of the profile to be used for the subframe are shown in Table 3.5.

**Table 3.5**

<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 $W_x$ [cm²]</td>
</tr>
<tr>
<td>All</td>
<td>3080, 3480, 3780, 4175</td>
<td>21</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 13) in the front section while rigid supports resistant to the longitudinal and transverse forces are recommended at the rear.
As previously mentioned, the stiff connections positioned in correspondence with the rear suspension mounts are more suitable for transmitting forces directly to the suspension elements; elastic connections are to be arranged near the front suspension rear mount.

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

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

b) 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 13) to contain the longitudinal and transverse thrusts;
- the anchoring points must be of a sufficient length (approx. 400 mm – see Figure 14) 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 axe weight limits. In the case of tanks and single containers made with separate compartments, the minimum ratio between front axe 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

At the time of publication of these Directives (05/2019), the subject is still in the defining stage.

3.9 INSTALLATION OF TAIL LIFTS

At the time of publication of these Directives (05/2019), the subject is still in the defining stage.

3.10 TILT BEDS (BREAKDOWN RECOVERY)

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

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

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

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

The rear tipping hinge must be fitted to the subframe and its longitudinal position must be as close as possible to the rear support of the suspension. So as not to compromise vehicle stability during tipping operations and avoid excessive mechanical stress on the chassis, the distance between the tipping hinge and the rear support of the suspensions must comply with the specifications given in Figure 12. If this is not possible, larger than normal subframe profiles must be used together with additional stiffening at the rear.

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

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

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

3.11 VEHICLES FOR COUNCIL, FIRE PREVENTION AND SPECIAL USES

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

- the realization of a particularly robust subframe towards the rear and elastic type connections to the chassis towards the front of the vehicle;
- shortening of the rear overhang of the chassis.

When very short overhangs are necessary, the chassis may be shortened immediately downstream of the rear spring support (or after the bar coupling in the case of air suspension), thus keeping intact the connection to the chassis of the crossbar applied therein;

- the adoption of rear suspensions with greater rigidity (see Chapter 2.11);
- a new arrangement of the rear lights.

⚠️ Do not use the reversing light switch, mounted on the gearbox, to activate functions that require increased reliability and safety levels, (e.g. engine stop during reverse, on vehicles for urban waste collection from the personnel present on the rear footboards).
3.12 FRONT INSTALLATION OF SNOW PLOUGH ATTACHMENTS

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

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

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

In the event of winches:

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

3.14 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.
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.

Motor home
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.

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

All plans must be evaluated individually and must be specifically authorised by IVECO.

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

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

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

- assess the maximum static moment and the intended location of the superstructure;
- avoid abrupt sections changes;
- create a fastening solution such as the one in Figure 3.

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

The following must therefore be ensured:

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

**Note** Verification of the dynamic behaviour of the vehicle complete with the superstructure is the full responsibility of the bodybuilder.
SECTION 4

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TAKE-OFFS
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  PTO transmission ................................. 6

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POWER TAKE-OFFS

4.1 GENERAL INFORMATION

For motion take-off necessary for actuation of the auxiliary units, a power take-off (PTO) can be fitted on the transfer box. For the definition of 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 transmission phase (5 to 10% for the mechanical transmissions, belts and gears, and greater values for the hydraulic controls).

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

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

\[
P \text{ [HP]} = M \cdot n \cdot i / 7023 \\
P \text{ [kW]} = M \cdot n \cdot i / 9550
\]

\[P = \text{Available power}
\]

\[M = \text{Torque permitted for the power take-off}
\]

\[n = \text{Engine revolutions per minute}
\]

\[i = \text{Transmission ratio} = \text{PT output rpm} / \text{engine rpm}
\]

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.
PTO transmission

In full compliance of the Manufacturer’s transmission specifications, the kinematic forces from the power take-off to 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 transmission line with spatial inclinations according to angle $\phi$ (as shown in Figure 2), it is important to remember that the kinetic forces of the assembly can only be ensured if the intermediate section has forks offset by the same angle $\phi$ and if equal conditions are respected between the angles at the extremities $X_1$ and $X_2$.

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

![Figure 1](image1.png)

**Solution Z**

![Figure 2](image2.png)

**Solution W**
4.2  POWER TAKE-OFF ON THE GEARBOX
Not applicable on Daily 4x4 MY2016.

4.3  POWER TAKE-OFF FROM TRANSFER BOX
For the installation of a PTO on the transfer box, IVECO provides for the adoption of optional specific flanges.

Figure 3 shows some dimensions of the types envisaged.
4.4 POWER TAKE-OFF FROM DRIVE LINE

Not available on Daily 4x4.

4.5 POWER TAKE-OFF FROM ENGINE

Not available on Daily 4x4.

4.6 PTO MANAGEMENT

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

1. The PTO is engaged and disengaged by means of a solenoid valve which is activated by a button on the dashboard and manages a pneumumatic control. These operations are only possible with the vehicle stationary and the clutch pedal pressed (with the vehicle stationary and selector set to N in the case of automatic gearbox).

2. With the PTO engaged, the transfer box rpm must be between 1200 and 2500 rpm as this is the maximum value permitted regardless of the conditions of use (NB: the user is responsible for carrying out this check). Subsequently, use of 6th gear is not possible (7th and 8th in the case of automatic gearboxes) due to the high multiplication effect on the engine speed.

3. With the PTO engaged, the automatic gearbox must be operated in manual mode.

4. Torque delivery from the PTO is inversely proportional to the engine speed and the maximum value is 800 Nm.

5. The PTO can be used with a maximum angle of 30° (longitudinal) and 20° (transversal).

---

Caution!
The PTO must be disengaged:

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

---

Adjust the engine speed for motion take-off

The engine management control unit provides a function which enables simultaneous adjustment of the engine revs and the power take-off by operating the Cruise Control lever (see Figure 4)
The control unit is also able to perform the control of the set revolutions and maintain or restore balance depending on the applied load.

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

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

a) with steps of 50 rpm if the lever is operated for between 0.5 and 2 seconds;

b) with a ramp of 400 rpm for each second of continuous activation of the lever, beyond 2 seconds.

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

With Cruise Control activated, it is possible to return to the minimum engine speed condition (setting cancelled) by placing the selector shown in Figure 10 on OFF, or by pressing the brake pedal or clutch pedal.

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

**Multiple State Switch**

It is an alternative way of controlling the number of engine revs. with the power take-off engaged, and is available through the 32-way connector 72105A.

To obtain this function, it is necessary to create the circuit outlined in Section 5, Chapter "Bodybuilders connectors (_page 6)."  
**Note**  

After-sales PTO installation

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

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

**Note**  The after-sales installation of a PTO means, once installation is complete, referring to IVECO Assistance Service to update the ECU software through the teleservice.
SECTION 5

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ELECTRONIC SUB-SYSTEMS

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.

Position of electronic control units

A. Instrument panel
B. Steering wheel column and ignition switch
C. BDV control unit
D. CBA1 control unit on battery
E. Body Computer
F. CBA2 control unit in the engine compartment
G. Control unit for glow plug pre-heating
H. Engine Management control unit
I. ABS/ESP control unit
L. Green filter
M. Interconnection control unit (engine) SCM
N. Expansion Module
O. DTCO tachograph
5.2 BODYBUILDER CONNECTORS

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

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

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

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

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

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

The description of the function of these connectors is contained in the specific manual EM 603.95.826.
1. Connector ST13

Connector 72105A, black, 32-pin

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 &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>from 5 to 18</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 mm³ cable</td>
<td></td>
</tr>
<tr>
<td>5802291206 EZ</td>
<td>Male contact for 0.35 mm³ cable</td>
<td>from 19 to 30</td>
</tr>
<tr>
<td>5802290575 EZ</td>
<td>Male contact for cable from 0.50 to 0.75 mm³</td>
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<td>5802290577 EZ</td>
<td>Male contact for 1.5 mm³ cable</td>
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<tr>
<td>41118765 EZ</td>
<td>Male contact for 0.35 to 0.5 mm³ cable</td>
<td>31-32</td>
</tr>
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<td>41118766 EZ</td>
<td>Male contact for 0.75 to 1.00 mm³ cable</td>
<td></td>
</tr>
<tr>
<td>41118767 EZ</td>
<td>Male contact for cable from 1.50-2.00-2.50 mm³</td>
<td></td>
</tr>
<tr>
<td>41118768 EZ</td>
<td>Male contact for 4.00 mm³ cable</td>
<td></td>
</tr>
<tr>
<td>5802293738 EZ</td>
<td>Male contact for cable &gt;4.00-6.00 mm³</td>
<td></td>
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</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>Signal</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Engine start up</td>
<td>8888</td>
<td>Input max 15 A</td>
<td>75011 A/19</td>
<td>The engine starts only when the key is turned in the ignition block (K15 ON) (1) Protect with the appropriate fuse +12 V = engine start-up request Open wire = no action</td>
</tr>
<tr>
<td>2</td>
<td>Mechanical gearbox BHP D</td>
<td>6140</td>
<td>Input Max 200 mA</td>
<td>ZF8HP70/8</td>
<td>RPO bridge use</td>
</tr>
<tr>
<td>3</td>
<td>Mechanical gearbox BHP P</td>
<td>6141</td>
<td>Input Max 200 mA</td>
<td>ZF8HP70/10</td>
<td>RPO bridge use</td>
</tr>
<tr>
<td>4</td>
<td>N.D.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Mechanical parking brake</td>
<td>6662</td>
<td>Output Max 500 mA (with decoupling diode)</td>
<td>BCM F/44</td>
<td>Ground = parking brake engaged (2)</td>
</tr>
<tr>
<td>6</td>
<td>Clutch actuation</td>
<td>9273</td>
<td>Output Max 500 mA (with decoupling diode)</td>
<td>EDC K/34</td>
<td>+12 V = clutch pedal pressed</td>
</tr>
<tr>
<td>7</td>
<td>Side lights</td>
<td>3220</td>
<td>Output Max 500 mA</td>
<td>Relay managed by BCM</td>
<td>+12 V = side lights on (3)</td>
</tr>
<tr>
<td>8</td>
<td>Alternator status</td>
<td>7778</td>
<td>Output Max 500 mA</td>
<td>EDC K/22</td>
<td>Ground = engine off +12 V = engine speed &gt; 500 rpm</td>
</tr>
<tr>
<td>9</td>
<td>N.D.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Engaging reverse</td>
<td>2268</td>
<td>Output Max 100 mA (use a decoupling diode)</td>
<td>BCM C/17</td>
<td>+12 V = reverse gear engaged (4)</td>
</tr>
<tr>
<td>11</td>
<td>Positive with key</td>
<td>8879</td>
<td>Output Max 200 mA</td>
<td>BCM G/12</td>
<td>Positive with key protected by fuse on Body Computer - F49</td>
</tr>
<tr>
<td>12</td>
<td>Cruise Control</td>
<td>8156</td>
<td>Input</td>
<td>BCM H/56</td>
<td>Cruise Control interface (5)</td>
</tr>
<tr>
<td>13</td>
<td>Reference ground for Cruise Control transfer box</td>
<td>0000</td>
<td>Input</td>
<td>BCM H/45</td>
<td>Ground for Cruise Control interface</td>
</tr>
<tr>
<td>14</td>
<td>2nd speed limiter</td>
<td>0000</td>
<td>Output Max 200 mA</td>
<td>BCM H/41</td>
<td>Activation of 2nd speed limiter (30 km/h by default) (6) Minimum value 1.0 km/h, which may be set by the Assistance Service Ground = 2nd speed limiter activated</td>
</tr>
<tr>
<td>15</td>
<td>Programmable speed limiter;</td>
<td>9968</td>
<td>Input Max 200 mA</td>
<td>EDC K/68</td>
<td>Ground = programmable speed limiter activated</td>
</tr>
<tr>
<td>16</td>
<td>Speed signal (B7)</td>
<td>5517</td>
<td></td>
<td>BCM D/56</td>
<td>Mandatory to introduce 5 kΩ pull-up (7)</td>
</tr>
<tr>
<td>17</td>
<td>Battery disconnecting switch OFF</td>
<td>0000</td>
<td>Input / output Max 200 mA</td>
<td>BCM E/20</td>
<td>+12 V = TGC opening</td>
</tr>
<tr>
<td>18</td>
<td>Horn</td>
<td>116</td>
<td>Input / output Max 200 mA</td>
<td>BCM H/19</td>
<td>Remote activation of horn Ground = horn active</td>
</tr>
<tr>
<td>19</td>
<td>Engine speed (rpm)</td>
<td>5587</td>
<td>Output</td>
<td>EDC K/73</td>
<td>Engine speed signal (9) 4 pulses/rev</td>
</tr>
<tr>
<td>20</td>
<td>Radio MUTE control</td>
<td>1632</td>
<td>Input Max 10 mA</td>
<td>68000 C/9</td>
<td>ground = MUTE function request</td>
</tr>
<tr>
<td>21</td>
<td>N.D.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Multiple State Switch</td>
<td>0000</td>
<td>Input</td>
<td>BCM H/38</td>
<td>ISC input (Idle Speed Control) mode 1/2/3 (9) the ISC mode must be reactivated after every engine start-up.</td>
</tr>
</tbody>
</table>

---

<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>
</table>
| 23  | Ground for Multiple State Switch   | 0000       | Output max 15 A      | BCM H/36     | ISC input (Idle Speed Control) mode 1/2/3  
 ISC mode must be reactivated after every engine start-up. |
| 24  | Ground                             | 0000       | Output max 15 A      |              | Ground connection                                                      |
| 25  | K15 Remote                         | 8879       | Input Max 200 mA     | SCM B/67     | By providing a positive, the first turn of the key is simulated (key set to ON). Only the main loads are powered but it is not possible to start the vehicle from outside since the vehicle key recognition is missing.  
 +12 V = activation of K15 Remote |
| 26  | Engine shut down                   | 9903       | Input Max 10 mA      | BCM F/22     | The engine only switches off with vehicle speed < 4 km / h  
 + 12 V = engine stop  
 The command must be active until the engine is off |
| 27  | Service braking                     | 1176       | Output Max 500 mA    | BCM D/57     | +12 V = brake pedal pressed                                            |
| 28  | Stationary vehicle                 | 0000       | Output Max 200 mA (use a decoupling diode) | BCM H/32     | Ground = vehicle stopped                                               |
| 29  | Battery disconnecting switch ON    | 0000       | Input / output Max 200 mA |              | +12 V = TGC closing                                                   |
| 30  | Battery positive                   | 7772       | max 15 A             | BCM E/19     | Direct positive from the battery and protected by fuse on Body Computer - F33 |
| 31  |                                    |            |                      |              | N.D.                                                                    |
| 32  |                                    |            |                      |              | N.D.                                                                    |

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

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

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

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

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

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

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

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

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

(4) For vehicles in the Hi-MATIC version, refer to the indications provided in Annex C ( Page 9)

(5) Only supported with Cruise Control option.

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

- R = 2490 Ohm: CC ON. CC stays active, just like the PTO modes (important for vehicles without Cruise Control)
- R = 649 Ohm: SET+: the speed increases by +50 revs/min pulse (only when the vehicle is stationary) or adjustment of the CC speed (only at V > 30 km/h)
- R = 261 Ohm: SET-: the speed decreases by -50 revs/min pulse (only when the vehicle is stationary) or adjustment of the CC speed (only at V > 30 km/h)
- R = 133 Ohm: RES: activation of ISC MEMO speed or resuming the stored CC speed
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 2</td>
</tr>
<tr>
<td>CC ON</td>
<td>Pin 2</td>
</tr>
</tbody>
</table>

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

- The accuracy of the speed limiter is reduced at low vehicle speeds.
- The accuracy of the speed limiter is reduced at low engine speeds: interference with the engine idle speed regulator is possible, particularly below 1000 rpm.
- The speed limiter must only be used in 1st gear or in reverse gear.
- The speed limiter may be adjusted in steps of 1 km/h by the IVECO Assistance Service.
- The bodybuilder must check the functionality of the speed limiter for each application and is also responsible for preparing the relative specific instructions.
Mandatory insertion of a 5 kΩ pull-up resistor in addition to a diode as outlined in Figure 8.
The pull-up resistor and the diode must be fitted by the bodybuilder.
The resistor must be inserted between 72105A / Pin 16 and 72105A / Pin 11.
Without the pull-up resistor no B7 signal is available.

1. Outfitting
2. Connector 72105A

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

**Table 5.4 - Tachimetric signal characteristics**

<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 $U_{\text{in}}$</td>
<td>1.5</td>
<td>V</td>
<td>$I = 1 \text{ mA}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Voltage $U_{\text{ip}}$</td>
<td>5.5</td>
<td>V</td>
<td>$I = 1 \text{ mA}$</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>4 ms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Speed signal (terminal B.3) of the movement sensor fitted on the reduction unit

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

**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 revs/min);
- 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_JO</td>
<td></td>
<td>3.76</td>
<td>6.14</td>
<td>nF</td>
</tr>
<tr>
<td>I_Out</td>
<td></td>
<td>2.2</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>I_Out_SC</td>
<td></td>
<td>4</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>I_Leak_Off</td>
<td></td>
<td>20</td>
<td></td>
<td>μA</td>
</tr>
<tr>
<td>I_Out_Diag</td>
<td></td>
<td>980</td>
<td></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>800</td>
<td></td>
<td>mΩ</td>
</tr>
<tr>
<td>E_Clamp</td>
<td></td>
<td>4</td>
<td></td>
<td>mJ</td>
</tr>
<tr>
<td>V_Out_Clamp</td>
<td></td>
<td>60</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>R_Load_Diag</td>
<td></td>
<td>4.69</td>
<td></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_Dia: 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-Dia: 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_OC voltage.

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

(*) The signals to the Multiple State Switch may also be simultaneous to requests coming from the Expansion Module through CAN open (object 0x2001, sub 0xOC) 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>270</td>
<td>510</td>
<td>2000</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>

WARNING:

If the K15 Remote control was activated and the operator removed the ignition key with the engine running, the engine would not stop and it would be possible to move the vehicle with the steering locked. Therefore:
• **The K1S 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 K1S 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).

### 5.3 ELECTRONIC CONTROL UNITS

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

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

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

**Note**  For any exception to mounting instructions, IVECO’s written authorisation is necessary. Lack of observance of above described prescriptions involves guarantee lapse.
Disconnecting electronic control units

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

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

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

Repositioning 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

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.
5.4 ELECTRICAL SYSTEM

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

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

Precautions for work on the system

Interventions on the electrical system (e.g. removal of cables, addition of circuits, replacement of equipment or fuses etc.) carried out in a manner which is not compliant with IVECO’s instructions or carried out by non qualified personnel, can cause severe damage to on-board systems (control units, wiring, sensors etc.), affect driving safety and good operation of the vehicle and cause serious damage to the vehicle (e.g. short circuits with the possibility of fire risk or destruction) which is not covered by warranty.

Before removing any electrical/electronic equipment, disconnect the ground cable from the battery negative pole and then the positive cable.

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 fuses with the prescribed capacity for the specific function, and do not under any circumstances use higher capacity fuses.

Restore the original condition of the wiring (paths, protections, strips) making absolutely certain that the cable does not come into contact with any metal surfaces of the structure which could affect its integrity.

Precautions for work 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 11).

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

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

The cable bundles for low signal intensity electronic components must be arranged parallel to the metal plane of reference, that is adherent to the chassis/cab structure, in order to minimise parasitic capacities; space the path of the cable bundle added to the existing one as much as possible.
The added systems must be connected to the ground of the system with the utmost care (see Chapter 5.4 - Paragraph "Ground points"): the related wiring harnesses should not be coupled to the electronic circuits that already exist on the vehicle in order to avoid electromagnetic interference.

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

Carefully restore the original system after any operations.

Starting the engine

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

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

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

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. Battery compartment power ground
M2. Power ground on left side member
M3. Power ground on fire guard
MS3. Signal 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 right side panels
MS8. 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
M14. Power ground on side member
M1. Power ground in battery compartment

M2. Power ground on left side member
M3/MS3: Signal/power ground on fire guard

M9: Power ground on fire guard

M4: Power, engine compartment ground near front right headlight
M5. Power, engine compartment ground near front left headlight

M10. 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

MS8. Signal ground, in the cab, below the floor mat
M11. Power ground on side member

M12. Power ground on engine crankcase, left side
M13. Power ground, engine compartment, left side
M14. Power ground on side member

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

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

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

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

**Electromagnetic comparability**

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

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

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

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

**Note** Devices powered at 12 V be immune to interferences such as negative spikes of -300 V, positive spikes of +1 000 V, bursts of +/-1 50 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 dBuV/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>radiated</td>
<td>Aerial at a distance of 1 metre</td>
<td>Broad-band</td>
<td>almost peak</td>
<td>150-300 kHz</td>
</tr>
<tr>
<td>radiated</td>
<td></td>
<td>Broad-band</td>
<td>peak</td>
<td>63</td>
</tr>
<tr>
<td>radiated</td>
<td></td>
<td>Narrow band</td>
<td>peak</td>
<td>41</td>
</tr>
<tr>
<td>conduit</td>
<td>LISN 50 &amp; O 5 µH 0.11 µF</td>
<td>Broad-band</td>
<td>almost peak</td>
<td>80</td>
</tr>
<tr>
<td>conduit</td>
<td></td>
<td>Broad-band</td>
<td>peak</td>
<td>93</td>
</tr>
<tr>
<td>conduit</td>
<td></td>
<td>Narrow band</td>
<td>peak</td>
<td>70</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:

\[
\text{a} \geq 6 \text{ mm}
\]

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 SYSTEM

The most frequent applications include:

- Amateur receiver-transmitter units for CB (City Band) and 2 m bands;
- Bluetooth pre-installation for mobile phones
- GPS reception and satellite navigation equipment
- Toll collect equipment

General instructions

1. The equipment must be approved according to the law and be of a fixed nature (not 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:
   - use a low loss, top quality product with the same impedance as the transmitter and the antenna (see Figure 29);
   - in order to avoid interference and malfunctioning, create a path (the shortest possible) which maintains a suitable dis-
     tance (min. 50 mm) from pre-existing cabling or from other cables (radio, amplifiers and other electronic equipment),
     keeping the minimum distance from the metal structure of the cab and using existing holes in the sheet metal;
   - do not shorten or lengthen; avoid unnecessary tangles, tension, folds and crushing.
4. Outside the cab, the antenna must be installed on the vehicle on a metal base with a wide surface; it must also be fitted as ver-
   tically as possible with the connection cable pointing downwards and, in any case, following the manufacturer’s fitting instruc-
   tions and warnings (see Figure 28).
   Installation at the centre of the roof is to be considered the absolute best as the ground plane is proportional in all directions.
   Inside the cab, the receiver-transmitter equipment must be placed in the designated compartment provided on the dash-
   board, to the side of the gear shift lever.
5. The quality of the antenna, the mounting position and a perfect connection to the vehicle structure (ground) are factors of
   fundamental importance to guarantee the best performance of the transmitter equipment.

![Figure 28](image)

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. 50 - 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

Some specific instructions are given below for each type of equipment.

**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; if the transmission is impulsive it must be at a distance of least one metre 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 ANTENNA GAIN values must be as high as possible and guarantee a sufficient level of spatial uniformity, characterised by deviations in relation to the average value to the order of 1.5 dB in the 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:

1. if the ROS (Stationary Wave Ratio) is higher on the lower channels than on the higher ones, the antenna should be lengthened
2. 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.
Bluetooth setup

The Bluetooth setup consists of:

- specific control unit, positioned above the radio and hidden by a plastic cover,
- buttons on the steering wheel;
- ceiling fixture with microphone;
- USB socket;
- wiring.

For cowl version vehicles the ceiling fixture with microphone is provided in the box of accompanying material. If required by installation in the cab, the microphone can be removed and recovered (see Figure 31); its position, however, must be at a point as far away as possible from sources of noise and according to the reception area described in the (see Figure 32).
Table 5.8

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ground</td>
<td>White</td>
</tr>
<tr>
<td>2</td>
<td>Signal + Vcc</td>
<td>Shielded</td>
</tr>
</tbody>
</table>

The connector of the microphone connection, on the cab wiring side, is located in correspondence with the ceiling connectors.
GPS reception and satellite navigation equipment

Install the transmitting part in a flat, dry area, separate from the electronic components of the vehicle, away from humidity and vibrations. If the transmission is impulsive it must be at a distance of at least one meter away from other devices.

The GPS antenna must be installed so as to have the maximum visibility possible of the sky.

In fact, as the signals received from the satellite are at very low power (approximately 136 dBm), almost any obstacle can influence the quality and performance of the receiver.

The following should therefore be guaranteed:

- an absolute minimum angle of vision of the sky of 90°
- a distance no less than 30 cm from any other antenna
- a horizontal position and never underneath any metal which makes up part of the cab structure.

Moreover:

- the ROS value (Stationary Wave Ratio) must be as close as possible to the unit (the recommended value is 1.5), while the maximum must never be greater than 2 in the GPS frequency range (1575.42 ± 1.023 MHz).
- the ANTENNA GAIN values must be as high as possible and guarantee a sufficient level of spatial uniformity, characterised by deviations in relation to the average value to the order of 1.5 dB in the 1575.42 ± 1.023 MHz band.

Radio installation

Refer to the information contained in the Use and Maintenance Manual

Toll collect

Figure 33
This device consists of an aerial fitted onto the roof.
To install, carry out the following operations:

- drill a 20 mm hole on the roof in the position indicated in the figure;
- protect the hole with an anti-corrosion treatment;
- position the aerial (1) on the roof and secure it using the nut (2) supplied;
- tighten to a torque of 7 Nm;
- connect the two connectors (3) of the aerial with the connectors on the vehicle.

If devices are fitted which could interact with the electronic systems already present (retarders, additional heaters, power take-offs, air conditioners, automatic gearboxes, telematics and speed limiters) please contact IVECO in order to establish the compatibility checks.

Any damage caused by the use of non-certified transceivers or by the application of additional amplifiers is not covered by the warranty.

5.6 ADDITIONAL EQUIPMENT
Power for the equipment, when the voltage required is different to that for the system, must be obtained using a suitable DC/DC 12-24V converter if not already provided. The power cables must be as short as possible, avoiding any twists (coils) and maintaining the minimum distance from the reference plane.

Note If devices are fitted which could interact with the electronic systems already present (retarders, additional heaters, power take-offs, air conditioners, automatic gearboxes, telematics and speed limiters) please contact IVECO in order to establish the compatibility checks.

The use of non approved transmitters or supplementary amplifiers could seriously impede the correct functioning of the electrical/electronic devices normally supplied, with negative effects for the safety of the vehicle and/or the driver.

Any damage caused by the use of non-certified transceivers or by the application of additional amplifiers is not covered by the warranty.

The vehicle system is set up to supply the necessary power to the equipment provided, for each of which, as part of their function, the specific protection is assured as well as the correct sizing of cables.

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

The connection of the added users to ground must be made with an adequately sectioned cable, as short as possible and made to allow for any movements of the added equipment with respect to the chassis of the vehicle.

Having the need for higher capacity batteries, due to added loads, it is appropriate to request the optional with increased batteries and alternators.

In any case, when increasing battery capacity, it is advisable not to exceed 20-30% of the maximum values provided as optional by IVECO, so as not to damage some of the components (e.g. starter motor). When higher capacities are necessary, use additional batteries, making the necessary provisions for recharging as indicated below.
5.7 CURRENT DRAWS

In general it is advisable to:

- use suitable protection fuses in the vicinity near the current draw;
- protect cables inserted into designated sheathing or corrugated cables, installing according to the indications provided in Chapter 5.4 (⇒ Page 17) - Paragraph: "Precautions for interventions on the system".

![Diagram of vehicle with labels 1, 2, 3]

1. CBA2
2. Cable path between cab and engine compartment
3. Bodybuilders connector (inside cab)

⚠️ It is absolutely forbidden to draw current from unauthorised points. FIRE HAZARD.

Current draw from the CBA2 control unit in the engine compartment

Inside the CBA2 there are two fuses (FF and FG) reserved for the bodybuilders; terminals (HI and MI) downstream of these fuses are the only authorised points for current draw (see Figure 35) is requested.
Fuses FF and FG have a flow rate of 30 A each. If necessary, they can be replaced with ones of a higher capacity respecting the indication of a maximum total current draw (sum of the two fuses) equal to 130 A.

**Note** Each connection on the CBA2 must strictly maintain the integrity and correct positioning of the protective cover.

**Fuses**
- Fuses on the CBA1 control unit
Table 5.9 - 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>

- Fuses on the CBA2 control unit

Table 5.10 - 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>30</td>
<td>Body builders pre-installation</td>
</tr>
<tr>
<td>4</td>
<td>30</td>
<td>Body builders pre-installation</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>40</td>
<td>ABS BRAKE</td>
</tr>
</tbody>
</table>
Passage of cables from cab interior to cab exterior

In the engine compartment, close to the brake-servo, through the five premade 10 mm holes in the bulkhead, it is possible the to pass the electric cables from the cab to the engine compartment. Adequately seal the cable passage area to avoid passing fumes from the engine compartment to the cab.

![Figure 38]

- Any damage caused by failure to comply with procedure is not covered by warranty.

5.8 MISCELLANEOUS

a) Additional circuits

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

As already seen in Chapter 5.4 (⇒ Page 34) Paragraph "Precautions for work on the system", the cables used must be:

- of appropriate sizes and equipped with good original insulation;
- connected to the original system by means of tin joints equivalent to the original ones, protected with sheaths (not PVC) or intubated in polyamide conduits of type 6;
- installed protections from shock, heat, rubbing with other components (in particular with the sharp edges of the bodywork);
- secured separately with insulated cable clamps (e.g. nylon) and at suitable intervals (approx. 200 mm).

The passage through crossbars and/or sections must provide special cable raceways or protections; it is not possible to drill the chassis and/or the bodywork.

In case of external panels, use a specific sealant both on the cable and on the panel to prevent water, dust and fumes from infiltrating.

Where possible it shall also be provided a different cable path that transfers interference signals with high absorbed intensity (e.g. electric motor, solenoid valves) and low absorbed intensity susceptible signals (e.g. sensors); for both must be remained a positioning as close as possible to the metallic structure of the vehicle.

Plug and terminal connections must be protected, resistant to weathering, and executed using components of the same type as those utilised originally on the vehicle.

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

<table>
<thead>
<tr>
<th>Max. continuous current (1) [A]</th>
<th>Cable cross-section [mm²]</th>
<th>Fuse capacity (2) [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>
</tbody>
</table>

Table 5.11 - Use of cables and fuses according to the current drawn
Max. continuous current \(^{(1)}\) [A]  |  Cable cross-section [mm\(^2\)]  |  Fuse capacity \(^{(2)}\) [A]  
--- | --- | ---  
8 - 16  | 2.5  | 20  
16 - 25  | 4  | 30  
25 - 33  | 6  | 40  
33 - 40  | 10  | 50  
40 - 60  | 16  | 70  
60 - 80  | 25  | 100  
80 - 100  | 35  | 125  
100 - 140  | 50  | 150  

\(^{(1)}\) For uses of more than 30 seconds.

\(^{(2)}\) Depending on the position and therefore the temperature that may be reached in the housing, choose fuses that can be loaded to up to 70\%-80\% of their maximum capacity.

⚠️ The fuse must be connected as close as possible to the current take-off point.

### Precautions

- Incorrect installation of electrical accessories may affect occupant safety and cause severe damage to the vehicle. Contact IVECO if you have any questions.
- It is necessary to avoid coupling with the signal transmission cables (e.g. ABS), for which preferential routing has been provided in order to meet electromagnetic requirements (EMI).
  
  It should be noted that when grouping several cables together, in order to compensate for lower heat dispersal capacity, the current intensity must be reduced with respect to the nominal value of a single cable.
- In vehicles with frequent engine start-ups, with limited current draw and engine rotations (e.g. vehicles with refrigeration chambers), provide for periodic battery charging to maintain efficiency.
- Plug and terminal connections must be protected, resistant to weathering, and executed using components of the same type as those utilised originally on the vehicle.
- In the event that a component has to be installed just next to the route of a cable belonging to the original system, make sure that its remains integral and avoid any cuts.

⚠️ Any damage caused by failure to comply with procedure is not covered by warranty.
b) Interventions for modifying the 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.

c) Pre-installation for trailer

If the repetition of rear lights is necessary, the vehicle must be fitted with the 13-pin trailer socket.

Do not hook up directly to the vehicle’s light cables. This results in current overloads which are recognised as malfunctions by the on-board computer.

If the vehicle is not equipped with a trailer socket, it is possible to order a special kit comprising of:

- control unit with fastening bracket;
- chassis cable with trailer configuration;
- rear bridle for trailer socket.

For proper installation it is necessary to:

- mount the electronic control unit onto the bracket;
- mount the entire bracket plus control unit onto the chassis as shown in Figure 40;
- replace the chassis cable with the new cable configured for the trailer socket (see Figure 41);
- fit the connection bridle for the 13-pin socket compatible with the type of hook (high or low) (see Figure 42) is requested.
1. Trailer electronic control unit
2. Support bracket

3. Guard
4. Chassis side member

Figure 40
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.

1. Connector B6046_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 5.12 - 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</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</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       | –                                                                       |

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.

d) Positioning of side lights (Side Marker Lamps)

EC regulations require that vehicles are provided with side and clearance lights when the total length exceeds 6 m.

The installation of the lateral lights must be performed on the additional structures (containers, vans, etc.), when not required by regulations, while the electric power supply must be obtained by the specific ST3B connector on the chassis (see Figure 43) 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.
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.
e) Reverse gear signal

For safety reasons, certain vehicle versions must emit an external reversing warning sound which is activated when the vehicle is reversing.

This safety device may be originally requested as opt. 7638, regardless of the type of gearbox used. Application is recommended inside the rear cross member of the licence plate holder, as in Figure 44.

![Diagram of reverse gear signal]

1. Reverse buzzer
2. Reverse gear signal cable

This device is operated by a connector ST79 with three terminals with safety cap.
### Table 5.15 - Connector for reverse gear signal

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable code</th>
<th>Max. current [mA]</th>
<th>Connected to</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| 1   | Reverse     | 1614       | 500 - 1000       | BDV 1-G4     | The signal comes from the control unit in cab  
+ 12 V = reverse gear engaged  
no signal = reverse gear not engaged  
Add a protection diode |
| 2   |             |            |                  |              |         |
| 3   | Ground      | 0000       | 100              |              | Ground for reverse gear |

### f) Anti-theft system

In combination with the central locking, the vehicle can be equipped with an alarm system controlled by the Body Computer and a peripheral system.

This system consists of:

- a key with remote control, buttons for distance locking/unlocking;
- actuators for closing the cab doors and sliding side doors in the case of a van;
- open door sensors and engine bonnet opening perimeter sensor (Figure 45 left);
- alarm siren (12 V) (Figure 45 right).

The antitheft current absorption is 30-40 mA.

The bodybuilder must provide a "closed door" signal so that the antitheft system can also detect engine bonnet break-ins.

![Figure 45](image)

A. Engine bonnet socket  
B. Body builder button switch

1. Pin 1: door closed signal  
2. Pin 2: door closed signal

(2) Only for versions with stripped chassis cowl, cowl, stripped chassis cowl for camper with opt. 5865

- Open circuit → when the door is closed  
- Closed circuit → when the door is open
1. Bonnet open sensor
2. Engine bonnet socket
3. Alarm siren

For the operation mode refer to the Use and Maintenance Manual.
SECTION 6

ADBLUE AND
SCRT SYSTEM
Contents

6.1 GENERAL INFORMATION ...............  5

6.2 THE NITROGEN OXIDE CATALYTIC REDUCTION PRINCIPLE ...............  5

6.3 INSTRUCTIONS .......................  6
  AdBlue tank .........................  6

6.4 MOVING ADBLUE SYSTEM COMPONENTS .......................  7
ADBLUE AND SCRT SYSTEM

6.1 GENERAL INFORMATION

To comply with Euro VI Regulations on engine gas emissions, IVECO has developed the "SCRT" (Selective Catalytic Reduction Technology) system, consisting of the combined action of a diesel particulate filter (DPF) and post-treatment of exhaust gas (SCR). This post-treatment requires the use of an additive, commercially known as AdBlue (urea solution+water).

6.2 THE NITROGEN OXIDE CATALYTIC REDUCTION PRINCIPLE

The additive AdBlue, is sent from a dedicated tank by means of a SM (Supply Module) pumping module to a DM (Dosing Module) which injects AdBlue into the exhaust pipe. The mixture of exhaust gas and additive is then fed into the catalytic converter and chemically transforms NOx into nitrogen and water, which are harmless to the environment.

Main components of SCRT system

1. Diesel Oxidation Catalyst
2. Diesel Particulate Filter
3. Selective Catalytic Reduction
4. Clean Up Catalyst
5. Dosing Module
6. Temperature sensors
7. DPF Δp sensors
8. NOx sensors
9. NH₃ Sensor
10. Mixer
11. PM sensor

**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;
- 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).

AdBlue tank

- No modifications to the original tank are permitted.

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 Heating Pot unit (6) / Supply Module (4) / Tank (1) may only be disassembled by IVECO Authorised Workshops and must be repositioned according to the approved layout of normal production; any modifications must be authorised.
• The hydraulic connections must comply with Standard SAE_J2044 ¼.
• To ensure the seal of the SM pumping module on the tank, the ring nut tightening torque must be 85 Nm.

At the end of any operations which involve the AdBlue tank, make sure that:
• the tank ventilation pipe is not closed or restricted;
• the tank contains at least 5 litres of AdBlue to ensure the dosing module is cooled;
• the tank does not contain more than 85% of AdBlue (corresponding to the maximum reading of the level sensor) with respect to the tank total volume, so as to guarantee enough room for AdBlue to expand during freezing at temperatures below -11 °C.

AdBlue refuelling filler

The filler assembly consists of:
• a filler with a specific plug for AdBlue filler nozzles, a filter and a magnet for opening the nozzle valve;
• a pipe connecting the filler to the tank breather.

**Note** If the filler door on the bodywork is modified, the original accessibility to the underlying plug must be maintained.

The following points are **mandatory** since AdBlue crystallises at -11 °C:
• ensure the pipes are at an incline which prevents urea from accumulating (syphons) inside;
• respect the original incline of the filler in relation to the ground.

### 6.4 MOVING ADBLUE SYSTEM COMPONENTS

➤ **Modifications to the positions of the AdBlue system components are strongly discouraged and, in any case, must be specifically authorised by IVECO.**

Therefore please note that:
- a) the original position of the dosing module DM on the exhaust pipe must **never** be modified;
- b) any repositioning of the AdBlue tank must correspond to the installation heights of the already approved SM module;
- c) any new heated pipe (by configuration or length) must be chosen only from those adopted in production;
- d) plastic parts must be at least 200 mm from any heat source (eg. exhaust system); if heat-protecting panels are used this distance can be reduced to 80 mm.
Figure 3

1. SCR catalytic converter
2. Pumping module (SM)
3. AdBlue tank
4. AdBlue refuelling inlet
5. AdBlue delivery pipe
6. DPF Particulate filter
7. Dosing module (DM)
SECTION 7

EXPANSION MODULE
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EXPANSION MODULE

General information
The Expansion Module (EM) is an electronic interface designed to manage the different types of configurations. It is housed under the dashboard, on the passenger side.

7.1 PTO MANAGEMENT
The Expansion Module control unit, housed under the dashboard on the passenger side, manages the power take-off. There is a rocker button for engagement/disengagement (see Operator’s manual).

Customized PTO configuration
The vehicle can be supplied with the EM control unit, PTO configured in standard mode and the activation button.
To activate a specific power take-off operation, the Expansion Module must be programmed by IVECO Customer Service.
The following can be configured:

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

**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:

a) with a manual transmission
   - with the vehicle stationary, operate the clutch
   - with the vehicle moving, engage neutral

b) with an automated transmission
   - with the vehicle moving, engage neutral

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 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>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>

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;
- configuration of the maximum rpm limit;
- configuration of the maximum torque limit.

Standard parameters for PTO supplied by IVECO

Table 7.3

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
<th>Manual gearbox</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service brake pressed</td>
<td></td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td>Service brake not pressed</td>
<td></td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td>Handbrake activated</td>
<td></td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td>Handbrake not activated</td>
<td></td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td>Low engine oil pressure</td>
<td></td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td>Clutch pedal pressed</td>
<td></td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td>Clutch pedal not pressed</td>
<td></td>
<td>yes</td>
<td>–</td>
</tr>
<tr>
<td>Gear not in neutral</td>
<td></td>
<td>n.a.</td>
<td>–</td>
</tr>
<tr>
<td>Reverse</td>
<td></td>
<td>n.a.</td>
<td>–</td>
</tr>
<tr>
<td>Open circuit on the pressure switch if fitted on the PTO</td>
<td></td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td>Open circuit on the pressure switch if fitted on the PTO</td>
<td></td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td>Min rpm for engagement</td>
<td>700</td>
<td>rpm</td>
<td></td>
</tr>
<tr>
<td>Max rpm for engagement</td>
<td>1300</td>
<td>rpm</td>
<td></td>
</tr>
<tr>
<td>Min vehicle speed</td>
<td>no</td>
<td>km/h</td>
<td></td>
</tr>
<tr>
<td>Max vehicle speed</td>
<td>no</td>
<td>km/h</td>
<td></td>
</tr>
</tbody>
</table>
## 7.1 PTO Management

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
<th>Manual gearbox</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engagement restrictions</td>
<td>Lower gear engaged</td>
<td>no</td>
<td>gear</td>
</tr>
<tr>
<td></td>
<td>Higher gear engaged</td>
<td>no</td>
<td>gear</td>
</tr>
<tr>
<td></td>
<td>Maximum coolant temperature</td>
<td>110</td>
<td>°C</td>
</tr>
<tr>
<td>Disengagement conditions</td>
<td>Service brake pressed</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Service brake not pressed</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Handbrake activated</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Handbrake not activated</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Low engine oil pressure</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Clutch pedal pressed</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Clutch pedal not pressed</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Gear not in neutral</td>
<td>n.a.</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Reverse</td>
<td>n.a.</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Min rpm for disengagement</td>
<td>500</td>
<td>rpm</td>
</tr>
<tr>
<td></td>
<td>Open circuit on the pressure switch if fitted on the PTO</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Short circuit to ground on the pressure switch if fitted on the PTO</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Max rpm for disengagement</td>
<td>2000</td>
<td>rpm</td>
</tr>
<tr>
<td></td>
<td>Min vehicle speed</td>
<td>no</td>
<td>km/h</td>
</tr>
<tr>
<td></td>
<td>Max vehicle speed</td>
<td>no</td>
<td>km/h</td>
</tr>
<tr>
<td></td>
<td>Lower gear engaged</td>
<td>no</td>
<td>gear</td>
</tr>
<tr>
<td></td>
<td>Higher gear engaged</td>
<td>no</td>
<td>gear</td>
</tr>
<tr>
<td></td>
<td>Maximum coolant temperature</td>
<td>110</td>
<td>°C</td>
</tr>
<tr>
<td></td>
<td>Clutch slipping percentage</td>
<td>no</td>
<td>%</td>
</tr>
</tbody>
</table>

### Table 7.4

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
<th>Manual gearbox</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine management request with PTO engagement request</td>
<td>No control requested</td>
<td>yes</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Engine control requested only after the PTO has been successfully engaged</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td>Engine management request on PTO engagement feedback</td>
<td>No control requested</td>
<td>yes</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Engine control requested only after the PTO has been successfully engaged</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td>Type of engine management</td>
<td>No request/ Disabled</td>
<td>yes</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Rpm request</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Torque request</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Torque limit request/ rpm limit request</td>
<td>no</td>
<td>–</td>
</tr>
<tr>
<td>PTO[X]TSC[FIELD]</td>
<td>Control in rpm/ rpm limit request</td>
<td>no</td>
<td>rpm</td>
</tr>
<tr>
<td>PTO[X]TSC[FIELD]</td>
<td>Control in torque/Torque limit request</td>
<td>no</td>
<td>%</td>
</tr>
</tbody>
</table>

**Key:**
n.a. = not applicable

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

### 7.2 WIRING DIAGRAM

To ensure the functional integrity of the electrical system, IVECO has pre-installed specific connection points to be used for the added systems (see Chapter 5.4 - Paragraph "Current draws and fuses").

**Optional connectors for Expansion Module**

The Expansion Module control unit terminals are available through two connectors 61071B and 72075B (see also section 5 - Figure 2).

The vehicle may also have two other optional connectors: 72071 and ST13.

#### 20-pin black EM connector (61071B)

![Image of connector](image)

**Existing part on vehicle (male)**

**Counterpart to be coupled (female)**

#### Table 7.5

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Male contact for</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500314820 EZ</td>
<td>Male contact for 0.35 to 0.5 mm² cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500314824 EZ</td>
<td>Male contact for 0.75 to 1.5 mm² cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>504005092 EZ</td>
<td>Male contact for 2.5 mm² cable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Table 7.6 - Basic functions of connector 61071B

<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>Right stop light</td>
<td>9131</td>
<td>Output 1.5 A</td>
<td>EM X1/1</td>
<td>(†) +12 V = stop light activated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No signal = stop light not activated</td>
</tr>
<tr>
<td>2</td>
<td>Right turn indicator</td>
<td>6985</td>
<td>Output 1.5 A</td>
<td>EM X1/3</td>
<td>(†) +12 V = turn indicator activated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No signal = turn indicator not activated</td>
</tr>
<tr>
<td>Pin</td>
<td>Description</td>
<td>Cable code</td>
<td>Signal</td>
<td>Connected to</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------</td>
<td>------------</td>
<td>------------</td>
<td>--------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>3</td>
<td>Left stop light</td>
<td>9132</td>
<td>Output 1.5 A</td>
<td>EM X1/4</td>
<td>(1) +12 V = stop light activated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No signal = stop light not activated</td>
</tr>
<tr>
<td>4</td>
<td>Left turn indicator light</td>
<td>6986</td>
<td>Output 1.5 A</td>
<td>EM X1/8</td>
<td>(1) +12 V = turn indicator activated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No signal = turn indicator not activated</td>
</tr>
<tr>
<td>5</td>
<td>PTO 2 Solenoid / CS: Additional light 2 / CS: Blue light 2</td>
<td>9123</td>
<td>Output 1.5 A</td>
<td>EM X1/6</td>
<td>(1) (2) 12 V = PTO engaged activation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 V = PTO disengaged activation</td>
</tr>
<tr>
<td>6</td>
<td>Reserved / CS: Additional light 1 / CS: Blue light 1</td>
<td>9995</td>
<td>3 A</td>
<td>EM X1/7</td>
<td>(1) (2) (3) 12 V = Light activated</td>
</tr>
<tr>
<td></td>
<td></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>Input 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>Input 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>0393</td>
<td></td>
<td>EM X3/16</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Run-Lock switch</td>
<td>0132</td>
<td>Input 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 = Run-Lock 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>Input 5 mA</td>
<td>EM X3/18</td>
<td>(1) (5) +12 V = scene lights activation</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>Input 5 mA</td>
<td>EM X3/19</td>
<td>(1) (5) +12 V = additional lights 1 activation</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>Input 5 mA</td>
<td>EM X3/20</td>
<td>(1) (5) +12 V = additional lights 2 activation</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>EMCY bodybuilders (For future applications)</td>
<td>0995</td>
<td>Input 5 mA</td>
<td>EM X3/21</td>
<td>Input to activate the Vehicle Stopped Status, only if the Bodybuilder enable input is also activated (61071B / Pin 18)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground = activate low side switch</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Open wire = no action</td>
</tr>
<tr>
<td>16</td>
<td>PTO 2 switch</td>
<td>0391</td>
<td>Input 5 mA</td>
<td>EM X3/11</td>
<td>PTO 2 mode (6)</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>Input 5 mA</td>
<td>EM X3/7</td>
<td>PTO mode 3 (only for ISC) (7)</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>Input 5 mA</td>
<td>EM X3/17</td>
<td>To be activated by Bodybuilder with Bodybuilder mission active</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground = activate low side switch</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></td>
<td>EM X4/29</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Run-Lock relay</td>
<td>6987</td>
<td>Output 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 = Run-Lock activated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No signal = Run-Lock 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 14)). This also applies for activation of the PTO / ISC saved speeds for PTO Mode 1,2,3; these functions are also no longer available.

(3) If Additional Light 1 or Blue Light 1 are activated by Customer Service, then full vehicle CAN operation 72075B / 12 is no longer available (see Chapter 7.3 (⇒ Page 14)). 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 14).

(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".

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

![Diagram of 12-way EM connector](image)

**Table 7.7**

<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>500314824 EZ</td>
<td>Male contact for 0.75 to 1.5 mm² cable</td>
</tr>
<tr>
<td>504005092 EZ</td>
<td>Male contact for 2.5 mm² cable</td>
</tr>
</tbody>
</table>

**Table 7.8 - Basic functions of connector 72075B**

<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>
</table>
| 1   | Right low-beam light relay | 6988 | Output 1 A | EM X4/2 | To be enabled via TeleService  
If enabled the PTO / ISC stored speed is not available  
+12 V = low beams activated  
No signal = low beams not activated |
### 9-way EM connector, yellow (72071)

![Diagram showing a 9-way EM connector](image)

**Existing part on vehicle (male)**

**Counterpart to be coupled (female)**

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

### Table 7.9

<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>
</tbody>
</table>
### Table 7.10 - Basic functions of connector 72071

<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>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 box and distributor Terminal 14/17</td>
<td>Ground</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>CO enabled CIA413</td>
<td>0975</td>
<td>0.5 A</td>
<td>EM X4/28</td>
<td>LSO activated with CO unit activation (generally ~ 3sec after K15)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>contact IVECO Customer Service for the adjustment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Open circuit = CANopen not operational</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground = CANopen operational</td>
</tr>
<tr>
<td>4</td>
<td>Bodybuilders CAN H</td>
<td>6110</td>
<td>n.a.</td>
<td>EM X4/18</td>
<td>CAN Open truck gateway, see CIA 413</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Bodybuilders CAN L</td>
<td>6111</td>
<td>n.a.</td>
<td>EM X4/20</td>
<td>CAN Open truck gateway, see CIA 413</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td>Reserved</td>
<td></td>
</tr>
</tbody>
</table>

### 12-way EM connector, black (ST13)

![Diagram of 12-way EM connector](image)

*Existing part on vehicle (male)\*[Counterpart to be coupled (female)\]*

### Table 7.11

<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 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 7.12 - Basic functions of 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></td>
<td></td>
<td></td>
<td>Reserved</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>
</tbody>
</table>
### 7.3 ADDITIONAL FUNCTIONS

The Expansion Module can make additional functions available:

1. **"Run-Lock"** (ignition key removal, with the vehicle stationary, without the engine being stopped and electrical power supplies; remote PTO operation);
2. **Safety / Alarm** (engine switching off or reduction in engine speed and possible flashing of low beam / high beam lights);
3. **Additional Lights** (flashing on the roof, scene lights or rear lights).

For more in-depth information on configuration and use, please refer to IVECO Customer Service.

---

**Table:**

<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>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</td>
<td>Terminal 22</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>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td>Reserved</td>
<td></td>
</tr>
</tbody>
</table>
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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

Gearbox release lever

The lever can be positioned in a different location that its original mounting position, as long as:

- it compulsory remains inside the cab;
- is accessible from the drivers’ seat;
- does not entail great variation of the connected Bowden cable route.

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.
Propeller shaft

The automatic gearbox requires a specific propeller shaft for length and for the coupling joint (I). Any modifications which involve changes in one or more of these characteristics (e.g. wheelbase modification), are the full responsibility of the person who makes these modifications.

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.
Cooling

Given that the original positions of the cooling assemblies/parts yield the best operating performance and thus efficiency, changes are strictly forbidden and any variations not recommended.

a) Gearbox oil radiator and pipes

As the oil characteristics for automatic transmissions must carefully be kept intact, it is necessary to:

- maintain the oil level according to the requirements provided in the technical documents supplied with the vehicle;
- preserve the original connections of the pipes to the radiator and gearbox, in order to prevent extractions and possibility of oil pollution.

Slight displacements are allowed without any advance authorisation by IVECO only for needs of access during outfitting installation, making sure that no pipes are disconnected.

Note: Consistent displacements, definitive and/or with exceptional characteristics, must always be submitted to IVECO Engineering for approval, which will provide correct instructions for the new layout.

b) Fan

The fan intake air flow must not be altered or decreased in comparison to the original situation.

For the same reason, the position of the exchanger must remain unchanged in relation to the position of the conveyor and engine fan.

Additional devices

Note: On DAILY 4x4 with Hi-MATIC gearbox, no type of power take-off (PTO) or retarder can be fitted.
C.4 WARNING INDICATORS

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 $T \geq 120 \, ^\circ\mathrm{C}$ 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 $T \geq 125 \, ^\circ\mathrm{C}$ the automatic transmission ECU forces the engine EDC to reduce torque/power (derating). Furthermore, the function that controls derating "GET_$\_M\_$MOTMAX" forces vehicle operation only in 6th gear;
- if $T \geq 142 \, ^\circ\mathrm{C}$ and the vehicle is still in motion, the automatic transmission ECU "shuts down" the engine and, thus, stops the vehicle.