

SERVICE STATION MANUAL

1Q000704



Vespa Elettrica



Vespa Elettrica

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Piaggio & C. S.p.A. Viale Rinaldo Piaggio, 25 - 56025 PONTEDERA (PI), Italy www.piaggio.com

SERVICE STATION MANUAL Vespa Elettrica

This service station manual has been drawn up by Piaggio & C. Spa to be used by the workshops of Piaggio dealers. It is assumed that the user of this manual for maintaining and repairing Piaggio vehicles has a basic knowledge of mechanical principles and vehicle repair technique procedures. Any significant changes to vehicle characteristics or to specific repair operations will be communicated by updates to this manual. Nevertheless, no mounting work can be satisfactory if the necessary equipment and tools are unavailable. It is therefore advisable to read the sections of this manual concerning special tools, along with the special tool catalogue.

N.B. Provides key information to make the procedure easier to understand and carry out.

CAUTION Refers to specific procedures to carry out for preventing damages to the vehicle.

WARNING Refers to specific procedures to carry out to prevent injuries to the repairer.



Personal safety Failure to completely observe these instructions will result in serious risk of personal injury.



Safeguarding the environment Sections marked with this symbol indicate the correct use of the vehicle to prevent damaging the environment.



Vehicle intactness The incomplete or non-observance of these regulations leads to the risk of serious damage to the vehicle and sometimes even the invalidity of the guarantee.



INDEX OF TOPICS

| PRE-DELIVERY | PRE DE |
|-------------------|----------|
| | |
| TECHNICAL DATA | DT |
| Tooling | TOOL |
| MAINTENANCE | MAIN |
| TROUBLESHOOTING | TROUBL |
| ELECTRICAL SYSTEM | ELE SYS |
| Engine | ENG |
| SUSPENSIONS | SUSP |
| BRAKING SYSTEM | BRAK SYS |
| Chassis | CHAS |

INDEX OF TOPICS

PRE-DELIVERY

PRE DE

Aesthetic inspection

Appearance check:

- Paintwork
- Fitting of plastics
- Scratches
- Dirt
- Check there are "warning" stickers

Tightening torques inspection

Lock check

Make sure that the marking is on the:

- Safety fasteners
- Fastening screws

Safety fasteners:

- Upper fastening of rear shock absorber
- Rear shock absorber lower fastener
- Front wheel axle nut
- Wheel hub nut
- Swingarm bolt Frame
- Handlebar lock-nut
- Lower steering ring nut
- Upper steering ring nut
- Fixing electric motor, swingarm and brake calliper wheel nuts

Locking tubes and cables:

- Brake cables and brake fluid tubes
- Accelerator cable

Electrical system

Electrical system:

- Diagnosis by tool:
 - checks last calibrations for all the systems
 - checks presence of any errors in memory and deletion.
- Traction battery, charge state.
- Charging plug
- VMS cooling solenoid valve functionality
- Services battery charge state level (at least 10 hours charge with controlled current)

- Condition of fuses
- Main switch
- Headlamps: high beam lights, low beam lights, tail lights, parking lights and their warning lights
- Headlight adjustment according to regulations in force
- Rear light, parking light, stop light
- Front and rear stop light switches
- Turn indicators and their warning lights
- Instrument panel lights
- Instrument panel: temperature indicator
- Instrument panel warning lights
- Horn
- Buzzer indicator light
- Perform the ancillary battery commissioning procedure

Transmissions:

- accelerator control / demand sensor play
- steering play
- brake lever play

Locks:

- Ignition key and block
- Steering lock
- Saddle closure
- Remote control operation bike finder

TO ENSURE MAXIMUM PERFORMANCE, THE BATTERY MUST BE CHARGED BEFORE USE. INADEQUATELY CHARGING THE BATTERY WITH A LOW ELECTROLYTE LEVEL BEFORE IT IS USED FOR THE FIRST TIME WITH SHORTEN THE LIFE OF THE BATTERY.

WARNING

KEEP THE BATTERY AWAY FROM NAKED FLAMES OR SPARKS WHILE IT IS CHARGED. REMOVE THE BATTERY FROM THE VEHICLE, DISCONNECTING THE NEGATIVE TERMINAL FIRST.

CAUTION

WHEN INSTALLING THE BATTERY, ATTACH THE POSITIVE LEAD FIRST AND THEN THE NEG-ATIVE ONE.

WARNING

BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SUL-PHURIC ACID. AVOID CONTACT WITH EYES, SKIN AND CLOTHING.

IF IT ACCIDENTALLY COMES INTO CONTACT WITH YOUR EYES OR SKIN, WASH WITH ABUN-DANT WATER FOR APPROX. 15 MIN. AND SEEK IMMEDIATE MEDICAL ATTENTION.

IF ACCIDENTALLY SWALLOWED, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.

BATTERIES PRODUCE EXPLOSIVE GAS; KEEP CLEAR OF NAKED FLAMES, SPARKS OR CIG-ARETTES. VENTILATE THE AREA WHEN RECHARGING INDOORS. ALWAYS WEAR EYE PRO-TECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES.

KEEP OUT OF THE REACH OF CHILDREN.

CAUTION

NEVER USE FUSES WITH A CAPACITY HIGHER THAN THAT RECOMMENDED. USING A FUSE OF UNSUITABLE RATING MAY SERIOUSLY DAMAGE THE VEHICLE OR EVEN CAUSE A FIRE.

- Charge the traction battery to 100% state of charge





CHARGE THE BATTERY IN A WELL VENTILATED PLACE AWAY FROM SOURCES OF HEAT, NAKED FLAME OR SPARKS.

IN THE EVENT OF PROLONGED PERIODS WITH THE VEHICLE NOT IN USE, CHARGE THE TRACTION BATTERY COMPLETELY AT LEAST ONCE EVERY THREE (3) MONTHS. TO CHARGE THE TRACTION BATTERY, USE A PUBLIC CHARGING STATION FOR ELECTRIC VEHICLES OR CONNECT THE VEHICLE TO A HOUSEHOLD MAINS POWER SOCKET COMPLI-ANT WITH APPLICABLE STANDARDS AND EQUIPPED WITH AN EARTH CONNECTION AND A DIFFERENTIAL CIRCUIT BREAKER.

N.B.

THE INTEGRATED CHARGE SYSTEM AUTOMATICALLY ENSURES THAT THE TRACTION BAT-TERY IS CHARGED COMPLETELY. HOWEVER, THE VALUES INDICATED FOR CERTAIN PA-RAMETERS MAY DEVIATE SLIGHTLY FROM NOMINAL VALUES DURING THE CHARGE-DISCHARGE CYCLES.

THE TRACTION BATTERY ALSO CHARGES THE ANCILLARY BATTERY WHEN CHARGING FROM MAINS POWER. HOWEVER, THE SYSTEM AUTOMATICALLY STOPS CHARGING ONCE THE TRACTION BATTERY REACHES 100% CHARGE. IN ORDER TO CHARGE THE TRACTION BATTERY AGAIN, THE PLUG MUST BE DISCONNECTED FROM THE MAINS SOCKET AND THEN RECONNECTED.

ONCE THE TRACTION BATTERY REACHES 100% CHARGE WHEN CHARGING FROM MAINS POWER, <u>THE ANCILLARY BATTERY MAY STILL NOT BE FULLY CHARGED</u>. THE ANCILLARY BATTERY IS, HOWEVER, ALWAYS CHARGED WHILE THE VEHICLE IS RUNNING. WARNING

◬

IF THE VEHICLE IS EXPOSED FOR A PROLONGED PERIOD OF TIME TO TEMPERATURES BE-TWEEN 0°C AND -10°C, THE ON-BOARD ELECTRONICS WILL ONLY PERMIT A SLOW, PARTIAL TRACTION BATTERY CHARGING CYCLE, LASTING INDICATIVELY 6 HOURS AND TO A BAT-TERY STATE OF CHARGE OF 60% ; THIS IS NECESSARY TO PROTECT THE BATTERY ITSELF AGAINST DAMAGE. WARNING

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PREFERABLY CHARGE THE TRACTION BATTERY AS SOON AS YOU HAVE FINISHED USING THE VEHICLE FOR THE DAY. AT BATTERY TEMPERATURES ABOVE 0°C, THE NORMAL CHARGE CYCLE TO 100% STATE OF CHARGE IS PERFORMED (NORMAL CHARGE), WHEREAS AT BATTERY TEMPERATURES BELOW 0°C, A SLOW, PARTIAL CHARGE CYCLE IS PER-FORMED (SLOW CHARGE).

WARNING



WHEN STOWING THE CHARGING CABLE IN ITS COMPARTMENT, MAKE SURE THAT THE CA-BLE WILL NOT KNOCK AGAINST THE VEHICLE OR RUB AGAINST PAINTWORK, CAUSING DAMAGE TO THE CABLE ITSELF AND/OR TO THE VEHICLE. CAUTION



THE VEHICLE CANNOT BE SWITCHED ON UNLESS THE CHARGING CABLE IS STOWED COR-RECTLY IN ITS COMPARTMENT AND THE RELATIVE COVER IS FITTED CORRECTLY, ACTI-VATING THE START ENABLE SWITCH SITUATED UNDER THE COVER ITSELF. N.B.

THE VEHICLE IS EQUIPPED WITH AN ELECTRIC COOLING FAN SITUATED UNDER THE FOOT-BOARD WHICH IS ACTIVATED WHEN THE VEHICLE IS CHARGED. IF THE VEHICLE IS PRO-TECTED WITH A VEHICLE COVER, KEEP THIS AREA UNCOVERED AND MAKE SURE THAT IT CAN RECEIVE AN ADEQUATE FLOW OF FRESH AIR.

Levels check

Level check:

- Hydraulic braking system fluid level.
- Rear hub oil level

Road test

Dynamic road test:

- Standard adjustment of the rear view mirrors
- Check digital display functions (eg.: lamps indicator lights, Km/h, odometer, adjustment keys, etc.)
- Stand switch operation test
- Performance control test (e.g.: engine output, frame and suspension, etc.)
- Braking system functionality
- Starting control
- Throttle control unit functionality (should be "free" along its entire travel)
- Stability on acceleration and braking
- Front and rear suspension efficiency
- No anomalies (noise and/or vibrations)

Static test

Static control after the test drive:

- No leaks (brake fluids, hub oil, etc.)
- Starting control
- No anomalous play (steering and wheels, luggage carrier)
- No loose components (e.g.: tail bag, luggage carrier, windshield, etc.)

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CAUTION
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CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE. CAUTION

NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES SINCE THE TYRES MAY BURST.

Functional inspection

Functional Checks:

- Braking system (hydraulic)
- Lever travel
- Braking system (mechanical)
- Lever travel

Engine

- Throttle travel check

Others

- Check documentation
- Check the chassis and engine numbers
- Tool kit
- License plate fitting
- Check locks
- Check tyre pressures
- Installation of mirrors and any accessories

Specific operations for the vehicle

Install the underbody caps as shown in the figure.



LICENCE PLATE HOLDER USA version: To fit the license plate holder, proceed as follows: -10 - Put the license plate holder. - Insert the fastening screws - Insert the flat washer, the washer and the nut on each screw. - Tighten the screws.

INDEX OF TOPICS

TECHNICAL DATA

SECTION CONTENTS

This section contains the following chapters:

- Rules/instructions
 - Safety rules
 - maintenance instructions
- Identifying the vehicle
- Vehicle data
- Engine specifications
- Capacities
- Unit of measurement conversion table
- Tightening torques

Rules

This section describes general safety rules for any maintenance operations performed on the vehicle.

Safety rules

SAFETY NOTICES

To avoid the risk of damage and injury, follow the instructions in the manual exactly as indicated and with due caution.

To avoid the risk of fire, never smoke or allow naked flame near the vehicle. Keep a fire extinguisher within reach at all times.

Specific PIAGGIO tools must be used for some of the procedures described in the manual to ensure the safety of the operator and that the work itself is carried out correctly.

Always comply with applicable safety legislation. To prevent the risk of danger, always observe the safety notices and warnings given in the manual.

When using chemical substances, observe the instructions given in the safety sheet provided with the product.

Only use fastener hardware components manufactured from the same material as the original components. Using fastener hardware in other materials may result in corrosion and/or may not retain the component fastened correctly.

Self-locking screws and nuts, and screws and nuts fitted with thread lock adhesive must always be replaced with new components of the same type after removal.

WARNINGS

To avoid the risk of damage and injury, follow the instructions in the manual exactly as indicated and with due caution.

To loosen stubbornly fastened components, tap gently:

- with an aluminium or lead hammer, in the case of components in ferrous materials, or;
- with a wooden or plastic mallet, in the case of alloy components.

When reassembling:

- always observe the tightening torques specified;
- always replace any seal rings, oil seals, spring washers, retainer washers, self-locking nuts and pre-coated screws, and any other fastener parts found to be damaged, with new components.

Before starting any work on the electrical system (on connectors, electrical components, wiring etc.), always turn the ignition switch to OFF and then disconnect the negative cable from the battery.

BRAKE PADS

- Clean the brake pads in a well-ventilated area, directing the jet of compressed air in such a way that you do not breathe in the dust produced by the wear of the friction material. Even though the latter contains no asbestos, inhaling dust is harmful.

ANCILLARY BATTERY

- The battery electrolyte contains sulphuric acid. Protect your eyes, clothes and skin. Sulphuric acid is highly corrosive; in the event of contact with your eyes or skin, rinse thoroughly with abundant water and seek immediate medical attention.

- The battery produces hydrogen, a gas that can be highly explosive. Do not smoke and avoid sparks or flames near the battery, especially when charging it.

TRACTION BATTERY

Before handling batteries, remove all metal jewellery such as rings, bracelets, necklaces etc., as these could accidentally come into contact with the battery terminals.

If the batteries are removed from their original container for inspection, handle with extreme caution to prevent the risk of short circuit. Never stack batteries on top of one another.

Check each battery for signs of mechanical damage due to accidental dropping. Check any battery with a bent/damaged casing for signs of electrolyte leakage. Do not install a battery with a bent/damaged casing in a vehicle. Handle with care and dispose of correctly.

In the event of contact with electrolyte spilt or expelled as a result of damage or a battery explosion, use the following first aid measures:

- in the event of contact with the eyes, rinse the eyes repeatedly with fresh water, keeping the eyelids of the victim open, for at least 15 minutes;
- in the event of skin contact, remove all contaminated clothing and wash and rinse the affected area with soap and plenty of water for at least 15 minutes. Do not apply petroleum jelly or other ointments;
- in the case of swallowing, have the victim drink plenty of water to dilute the acid and seek immediate medical help. Make sure that the victim does not choke on his/her own vomit and

that the airways are not obstructed by mucous. Never attempt to give an unconscious person anything by mouth;

in the event of inhalation, take the victim to a clean area ventilated adequately with fresh air.
Give the victim oxygen or administer CPR if necessary.

Never, for any reason whatsoever, attempt to modify or tamper with the batteries. Any modification or tampering may result in a severe accident occurring at any time during installation of the batteries or when the end user is using the vehicle.

Always use the following specific personal protective equipment for high voltage systems:

- Insulated gloves for electricians compliant with the standard EN 60903
- Protective visor compliant with the standard 61482-1
- Protective garments meeting at least class 1 protection requirements and compliant with the standard EN 61482-1-2
- Safety footwear compliant with the standard EN 345-1 S1



1. Insulated safety gloves

- tested for use with voltages up to 1000 V
- in natural latex
- compliant with EN 60903
- with class 1 protection against electric arc hazards, in compliance with the regulation EN 61482-1
- approximately 400 mm in length

do not use after the indicated expiry date

2. Protective visor

- complete protection of the entire face and ensuring an completely unobstructed field of view
- chip-resistant
- acid and alkali resistant
- with class 1 protection against electric arc hazards, in compliance with the regulation EN 61482-1

3. Protective garments (meeting at least class 1 protection requirements)

- complete adequate protection for working in safety against sparks, electric arcs and flame
- long-sleeved jacket or shirt in fire retardant fabric compliant with the standard EN 61482-1-2

4. Safety footwear

- with protective toe cap
- with anti-static insole and oil and hydrocarbon resistant outer sole with non-slip tread
- compliant with the standard EN 345-1 S1

CHARGING PLUGS



CHARGING PLUGS - VESPA ELETTRICA

| Country | Type of charging plug / adapter | Drawing / Code |
|---------|---|---|
| ITALY | Integrated Scame 3A plug + Schuko adapter | Code 1D001863 + electrical ADAPTER code 641893 for domestic |
| | | use only |
| EUROPE | Integrated Schuko plug with retaining ring | Code 1D002772 - Electrical adapter not provided |
| UK | Integrated BS1363/A plug with retaining ring | Code 1D002921 - Electrical adapter not provided |
| USA - | Integrated NEMA 5-15 plug with retaining ring | Code 1D002833 - Electrical adapter not provided |
| CAN | | |

EARTH CONTINUITY TEST - ITALY version - SCAME plug

the purpose of this test is to check the integrity of the connections in the vehicle earth system.

This test is required after every operation involving the electrical components that are part of the traction and/or vehicle control system (electric motor, swinging arm and earth cable, body, VMS, traction battery, charging cable, electrical system).

To perform the test, do the following:

- Disconnect the auxiliary battery.

CAUTION



ALWAYS DISCONNECT THE NEGATIVE POLE FIRST.

- Prepare the multimeter, select the resistance measurement.







- Locate the following points on the vehicle where the tester terminals must be connected:

- **1.** SCAME charging plug earth pole.
- 2. Electrical system terminal to negative terminal of auxiliary battery.
- 3. Rear brake lever.

- Two different measurements must be made for this test: the first between point **1** and point **2** and the second between point **1** and point **3**.

- Connect the terminals to take the first measurement.

- The terminal must be connected to the plug earth pin which is diagonally opposite the pilot pin and smaller than the others.



- Connect one of the tester terminals to the SCAME plug earth pole.



- Connect the other tester terminal to the negative electrical system terminal of the auxiliary battery (black).



- Check for continuity on the tester.

- The measured resistance value must be lower than the maximum permitted value.

Electric characteristic Maximum permitted resistance 0.5 Ω

- Connect the terminals to take the second measurement.

- Disconnect the tester terminal from the negative electrical system terminal of the auxiliary battery and connect it to the rear brake lever.



- Check for continuity on the tester.

- The measured resistance must be lower than the maximum permitted value.

Electric characteristic Maximum permitted resistance 0.5 Ω

- Connect the auxiliary battery.

CAUTION



ALWAYS CONNECT THE POSITIVE POLE FIRST.





ELECTRICAL INSULATION TEST - ITALY version - SCAME plug

The purpose of this test is to check the integrity of the insulation between the earth, phase and neutral.

This test is required after every operation involving the electrical components that are part of the traction and/or vehicle control system (electric motor, swinging arm and earth cable, body, VMS, traction battery, charging cable, electrical system). To perform the test, do the following:

- Disconnect the auxiliary battery.





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ALWAYS DISCONNECT THE NEGATIVE POLE FIRST.



- Prepare the insulation tester and select the $\ensuremath{^{"\!\!I\!N}}$

SULATION" function

Specific tooling

UT531 - UNI-T insulation tester UT531 - Insulation tester with minimum specifications: 500V; 40 M Ω .

- The SCAME charging plug has four pins:
- 1. Earth.
- 2. Phase.
- 3. Neutral.
- 4. Pilot.

- Two different measurements must be made for this test: the first between point **1** and point **2** and the second between point **1** and point **3**.

To take the first measurment, do the following:

- Connect one of the tester terminals to earth pole

"1" on the SCAME plug.

- Connect the other tester terminal to phase pole "2" on the SCAME plug.









- Select Range 500V, DO NOT TOUCH THE VE-

HICLE.

- Perform the insulation test by pressing the spe-

cial "TEST" button on the tester.

- The measured resistance must be higher than

the minimum permitted value.

CAUTION

WARNING



WHEN PERFORMING THE INSULATION TEST, SINCE THE TESTER SENDS A POTENTIAL DIFFERENCE OF APPROX-IMATELY 500 VOLT TO THE SYSTEM IN ORDER TO PER-FORM THE TEST, DO NOT TOUCH THE VEHICLE.

Electric characteristic

Minimum permitted resistance

 $10 \ \text{M}\Omega$

- To take the second measurment, do the follow-

ing:

- Leave the terminal connected to earth pole "1"

and move the other tester terminal by connecting

it to neutral pole "3" on the SCAME plug.

- With the tester already set to Range 500V, DO

NOT TOUCH THE VEHICLE.

- Perform the insulation test by pressing the

- "TEST" button on the tester.
- The measured resistance must be higher than

the minimum permitted value.

- Insulation test successfully completed.

CAUTION



WHEN PERFORMING THE INSULATION TEST, SINCE THE TESTER SENDS A POTENTIAL DIFFERENCE OF APPROX-IMATELY 500 VOLT TO THE SYSTEM IN ORDER TO PER-FORM THE TEST, DO NOT TOUCH THE VEHICLE.

Electric characteristic

Minimum permitted resistance







 $10 \ \text{M}\Omega$

- Connect the auxiliary battery.

CAUTION

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ALWAYS CONNECT THE POSITIVE POLE FIRST.



EARTH CONTINUITY TEST- Version EUROPE -SHUKO Plug

the purpose of this test is to check the condition of the connections that make up the vehicle's earthing system.

This test should have a successful outcome before the insulation test is carried out.

This test is necessary after every operation involving electric components that are part of the traction and/or vehicle management system (electric motor, oscillating arm and its relative ground cable, chassis, VMS, Traction battery, recharging cable, electrical system).

To carry out the procedure proceed as follows:

- Disconnect the services battery.

CAUTION



Δ

ALWAYS DISCONNECT THE NEGATIVE POLE FIRST.

- Prepare the multimeter, select the resistance measurement.







- Locate the following points on the vehicle where the tester terminals must be connected:

- **1.** Charging plug earth contact.
- 2. Electrical system terminal to negative terminal of auxiliary battery.
- 3. Rear brake lever.

- Two different measurements must be made for this test: the first between point **1** and point **2** and the second between point **1** and point **3**.

- Connect the terminals to take the first measurement.

- The terminal must be connected to the plug earth contact.



- Connect one of the tester terminals to the plug earth contact.





- Check for continuity on the tester.

- The measured resistance value must be lower than the maximum permitted value.

Electric characteristic Maximum permitted resistance 0.5 Ω

- Connect the terminals to take the second measurement.

- Disconnect the tester terminal from the negative electrical system terminal of the auxiliary battery and connect it to the rear brake lever.





- Check for continuity on the tester.

- The measured resistance must be lower than the maximum permitted value.

Electric characteristic Maximum permitted resistance 0.5 Ω

- Connect the auxiliary battery.

CAUTION



ALWAYS CONNECT THE POSITIVE POLE FIRST.





ELECTRICAL INSULATION TEST- VERSION EUROPE - SHUKO Plug

The purpose of this measurement is to check the condition of the insulation of the system between the ground, phase and neutral.

This test is necessary after every operation involving electric components that are part of the traction and/or vehicle management system (electric motor, oscillating arm and its relative ground cable, chassis, VMS, Traction battery, recharging cable, electrical system).

To carry out the procedure proceed as follows:

- Disconnect the services battery.

CAUTION



ALWAYS DISCONNECT THE NEGATIVE POLE FIRST.



- Prepare the insulation tester and select the $\ensuremath{^{\text{IN-}}}$

SULATION" function

Specific tooling

UT531 - UNI-T insulation tester UT531 - Insulation tester with minimum specifications: 500V; 40 M Ω .

- The SHUKO charging plug has two poles and a

ground contact:

- 1. Phase Pole.
- 2. Neutral Pole.
- 3. Ground contact.

- For this test two different measurements should be carried out:

To carry out the first measurement, proceed as follows:

- Connect a terminal of the tester to the negative electric system terminal of the services battery (Black).

- Connect the other tester terminal to phase pole "1" on the charging plug.









- Select Range 500V, DO NOT TOUCH THE VE-

HICLE.

- Perform the insulation test by pressing the spe-

cial "TEST" button on the tester.

- The measured resistance must be higher than

the minimum permitted value.

CAUTION

WARNING



WHEN PERFORMING THE INSULATION TEST, SINCE THE TESTER SENDS A POTENTIAL DIFFERENCE OF APPROX-IMATELY 500 VOLT TO THE SYSTEM IN ORDER TO PER-FORM THE TEST, DO NOT TOUCH THE VEHICLE.

Electric characteristic

Minimum permitted resistance

 $10 \ \text{M}\Omega$

To carry out the second measurement, proceed as follows:

- Leave the terminal of the tester connected to the electrical system negative of the services battery and move the other terminal connecting it to the neutral pole "2" of the charging plug.

- With the tester already set to Range 500V, $\ensuremath{\text{DO}}$

NOT TOUCH THE VEHICLE.

- Perform the insulation test by pressing the

- "TEST" button on the tester.
- The measured resistance must be higher than

the minimum permitted value.

- Insulation test successfully completed.

CAUTION



WHEN PERFORMING THE INSULATION TEST, SINCE THE TESTER SENDS A POTENTIAL DIFFERENCE OF APPROX-IMATELY 500 VOLT TO THE SYSTEM IN ORDER TO PER-FORM THE TEST, DO NOT TOUCH THE VEHICLE.

Electric characteristic

Minimum permitted resistance





10 MΩ

- Connect the auxiliary battery.

CAUTION

 Λ

ALWAYS CONNECT THE POSITIVE POLE FIRST.



EARTH CONTINUITY TEST - UK version - 1363A plug

the purpose of this test is to check the integrity of the connections in the vehicle earth system.

This test is required after every operation involving the electrical components that are part of the traction and/or vehicle control system (electric motor, swinging arm and earth cable, body, VMS, traction battery, charging cable, electrical system). To perform the test, do the following: - Disconnect the auxiliary battery.



CAUTION



Λ

ALWAYS DISCONNECT THE NEGATIVE POLE FIRST.

- Prepare the multimeter, select the resistance measurement.





- Locate the following points on the vehicle where the tester terminals must be connected:

- 1. Charging plug earth pole.
- 2. Electrical system terminal to negative terminal of auxiliary battery.
- 3. Rear brake lever.

- Two different measurements must be made for this test: the first between point **1** and point **2** and the second between point **1** and point **3**.

- Connect the terminals to take the first measurement.

- The terminal must be connected to the plug earth contact.



- Connect one of the tester terminals to the plug earth contact.



- Connect the other tester terminal to the negative electrical system terminal of the auxiliary battery (black).



- Check for continuity on the tester.

- The measured resistance value must be lower than the maximum permitted value.

Electric characteristic Maximum permitted resistance 0.5 Ω

- Connect the terminals to take the second measurement.

- Disconnect the tester terminal from the negative electrical system terminal of the auxiliary battery and connect it to the rear brake lever.



- Check for continuity on the tester.

- The measured resistance must be lower than the maximum permitted value.

Electric characteristic Maximum permitted resistance 0.5 Ω

- Connect the auxiliary battery.

CAUTION



ALWAYS CONNECT THE POSITIVE POLE FIRST.





ELECTRICAL INSULATION TEST - UK version - BS 1363A plug

The purpose of this test is to check the integrity of the insulation between the earth, phase and neutral.

This test is required after every operation involving the electrical components that are part of the traction and/or vehicle control system (electric motor, swinging arm and earth cable, body, VMS, traction battery, charging cable, electrical system). To perform the test, do the following:

- Disconnect the auxiliary battery.





$\overline{\mathbb{A}}$

ALWAYS DISCONNECT THE NEGATIVE POLE FIRST.



- Prepare the insulation tester and select the $\ensuremath{^{\text{-}}\text{IN-}}$

SULATION" function

Specific tooling

UT531 - UNI-T insulation tester UT531 - Insulation tester with minimum specifications: 500V; 40 M Ω .

- The BS 1363A charging plug has two poles and
- an earth contact:
- 1. Neutral pole.
- 2. Phase pole.
- 3. Earth contact.
- Two different measurements must be made for this test.

To take the first measurment, do the following:

- Connect one of the tester terminals to earth pole "3" on the plug.

- Connect the other tester terminal to phase pole "2" on the plug.





- Select Range 500V, DO NOT TOUCH THE VE-

HICLE.

- Perform the insulation test by pressing the spe-

cial "TEST" button on the tester.

- The measured resistance must be higher than

the minimum permitted value.

CAUTION

WARNING



WHEN PERFORMING THE INSULATION TEST, SINCE THE TESTER SENDS A POTENTIAL DIFFERENCE OF APPROX-IMATELY 500 VOLT TO THE SYSTEM IN ORDER TO PER-FORM THE TEST, DO NOT TOUCH THE VEHICLE.

Electric characteristic

Minimum permitted resistance

 $10 \ \text{M}\Omega$

- To take the second measurment, do the follow-

ing:

- Leave the terminal connected to earth pole "3"

and move the other tester terminal by connecting

it to neutral pole "1" on the plug.



- With the tester already set to Range 500V, DO

NOT TOUCH THE VEHICLE.

- Perform the insulation test by pressing the

"TEST" button on the tester.

- The measured resistance must be higher than

the minimum permitted value.

- Insulation test successfully completed.

CAUTION WARNING



WHEN PERFORMING THE INSULATION TEST, SINCE THE TESTER SENDS A POTENTIAL DIFFERENCE OF APPROX-IMATELY 500 VOLT TO THE SYSTEM IN ORDER TO PER-FORM THE TEST, DO NOT TOUCH THE VEHICLE.

Electric characteristic

Minimum permitted resistance





10 MΩ

- Connect the auxiliary battery.

CAUTION

 Λ

ALWAYS CONNECT THE POSITIVE POLE FIRST.



EARTH CONTINUITY TEST - USA version - NEMA plug

the purpose of this test is to check the integrity of the connections in the vehicle earth system.

This test must be passed before performing the insulation test.

This test is required after every operation involving the electrical components that are part of the traction and/or vehicle control system (electric motor, swinging arm and earth cable, body, VMS, traction battery, charging cable, electrical system).

To perform the test, do the following:

- Disconnect the auxiliary battery.

CAUTION



 \wedge

ALWAYS DISCONNECT THE NEGATIVE POLE FIRST.

- Prepare the multimeter, select the resistance measurement.






- Locate the following points on the vehicle where the tester terminals must be connected:

- **1.** Charging plug earth contact.
- 2. Electrical system terminal to negative terminal of auxiliary battery.
- 3. Rear brake lever.

- Two different measurements must be made for this test: the first between point **1** and point **2** and the second between point **1** and point **3**.

- Connect the terminals to take the first measurement.

- The terminal must be connected to the plug earth contact.



- Connect one of the tester terminals to the plug earth contact.



- Connect the other tester terminal to the negative electrical system terminal of the auxiliary battery (black).



- Check for continuity on the tester.

- The measured resistance value must be lower than the maximum permitted value.

Electric characteristic Maximum permitted resistance 0.5 Ω

- Connect the terminals to take the second measurement.

- Disconnect the tester terminal from the negative electrical system terminal of the auxiliary battery and connect it to the rear brake lever.





- Check for continuity on the tester.

- The measured resistance must be lower than the maximum permitted value.

Electric characteristic Maximum permitted resistance 0.5 Ω

- Connect the auxiliary battery.

CAUTION



ALWAYS CONNECT THE POSITIVE POLE FIRST.





ELECTRICAL INSULATION TEST - USA version - NEMA 5-15 plug

The purpose of this test is to check the integrity of the insulation between the earth, phase and neutral.

This test is required after every operation involving the electrical components that are part of the traction and/or vehicle control system (electric motor, swinging arm and earth cable, body, VMS, traction battery, charging cable, electrical system). To perform the test, do the following:

- Disconnect the auxiliary battery.





$\overline{\Lambda}$

ALWAYS DISCONNECT THE NEGATIVE POLE FIRST.



- Prepare the insulation tester and select the $\ensuremath{^{\text{IN-}}}$

SULATION" function

Specific tooling

UT531 - UNI-T insulation tester UT531 - Insulation tester with minimum specifications: 500V; 40 M Ω .

- The NEMA 5-15 charging plug has two poles and

- an earth contact:
- 1. Phase pole.
- 2. Neutral pole.
- 3. Earth contact.
- Two different measurements must be made for this test.

To take the first measurment, do the following:

- Connect one of the tester terminals to earth pole
- "3" on the NEMA plug.

- Connect the other tester terminal to phase pole

"1" on the charging plug.





- Select Range 500V, DO NOT TOUCH THE VE-

HICLE.

- Perform the insulation test by pressing the spe-

cial "TEST" button on the tester.

- The measured resistance must be higher than

the minimum permitted value.

CAUTION

WARNING



WHEN PERFORMING THE INSULATION TEST, SINCE THE TESTER SENDS A POTENTIAL DIFFERENCE OF APPROX-IMATELY 500 VOLT TO THE SYSTEM IN ORDER TO PER-FORM THE TEST, DO NOT TOUCH THE VEHICLE.

Electric characteristic

Minimum permitted resistance

 $10 \ \text{M}\Omega$

- To take the second measurment, do the follow-

ing:

- Leave the terminal connected to earth pole "1"

and move the other tester terminal by connecting

it to neutral pole "2" on the plug.



- With the tester already set to Range 500V, $\ensuremath{\text{DO}}$

NOT TOUCH THE VEHICLE.

- Perform the insulation test by pressing the

- "TEST" button on the tester.
- The measured resistance must be higher than

the minimum permitted value.

- Insulation test successfully completed.

CAUTION WARNING



WHEN PERFORMING THE INSULATION TEST, SINCE THE TESTER SENDS A POTENTIAL DIFFERENCE OF APPROX-IMATELY 500 VOLT TO THE SYSTEM IN ORDER TO PER-FORM THE TEST, DO NOT TOUCH THE VEHICLE.

Electric characteristic

Minimum permitted resistance





 $10 \ \text{M}\Omega$

- Connect the auxiliary battery.

CAUTION

ALWAYS CONNECT THE POSITIVE POLE FIRST.



Maintenance rules

- Use original PIAGGIO spare parts and lubricants recommended by the Manufacturer. Non-original or non-conforming spare parts may damage the vehicle.

- Use only the appropriate tools designed for this vehicle.

- Always use new gaskets, seal rings and cotter pins when reassembling.

- After removal, clean the components using non-flammable or low flash-point solvents. Lubricate all the work surfaces, except tapered couplings, before refitting these parts.

- After refitting, make sure that all the components have been installed correctly and work properly.

- Use only equipment with metric sizes for removal, service and reassembly operations. Metric bolts, nuts and screws are not interchangeable with coupling members using English measurements. Using unsuitable coupling members and tools may damage the vehicle.

- When carrying out maintenance operations on the vehicle that involve the electrical system, make sure the electrical connections have been made properly, particularly the ground and battery connections.

Vehicle identification

Identification registration numbers are made up of a prefix and a number, stamped on the frame and on the engine. The serial number must always be indicated when ordering spare parts. We recommend checking that the frame registration number stamped on the vehicle corresponds with that on the vehicle documentation.

CAUTION



PLEASE REMIND THAT ALTERING IDENTIFICATION REGISTRATION NUMBERS CAN LEAD TO SERIOUS PENAL SANCTIONS (IMPOUNDING OF THE VEHICLE, ETC.).

Frame number

- To locate and read the frame number:
- lift the saddle;
- lift the helmet compartment by removing it.



The frame number **A** is stamped on the right hand side of the frame.



Engine number

The engine number **«B**» is stamped near the rear left shock absorber lower support.



Vehicle data

EUROPE VERSION



VEHICLE DATA

| Specification | Desc./Quantity |
|---|---|
| Frame | Stamped plate body with welded structural reinforcements. |
| Front suspension | Single arm with helical spring and single double-acting hy- |
| | draulic shock absorber. |
| Rear suspension | Double-acting shock absorber, adjustable to four positions at |
| | pre-loading. |
| Front brake | Ø 200 mm hydraulically operated disc brake controlled from RH |
| | handlebar lever. |
| Rear brake | Ø 140-mm drum brake with mechanical control controlled from |
| | LH handlebar lever. |
| Wheel rims type | Light alloy. |
| Front rim | 12"x 3.00" |
| Rear rim | 11" x 2.75" |
| Front tire | 110/70 - 12" M/C 47P |
| Rear tire | 120/70 - 11" M/C 56L |
| Front tire pressure (with passenger) | 2.1 bar (2.1 bar) |
| Rear tire pressure (with passenger) | 2.3 bar (2.3 bar) |
| Kerb mass | 105 Kg (excluding the 25 Kg battery) |
| Maximum technically permissible weight at full load | 305 kg |
| Battery | 12 V / 4 Ah |
| | |

FOR MOTORCYCLE VERSION

VEHICLE DATA

| Specification | Desc./Quantity |
|------------------|---|
| Frame | Stamped plate body with welded structural reinforcements. |
| Front suspension | Single arm with helical spring and single double-acting hy- |
| | draulic shock absorber. |
| Rear suspension | Double-acting shock absorber, adjustable to four positions at |
| | pre-loading. |
| Front brake | Ø 200 disc brake with hydraulic command operated with the |
| | RH lever from the handlebar, or with the LH lever via the CBS |
| | system combined action. |

| Specification | Desc./Quantity |
|---|---|
| Rear brake | Ø 140-mm drum brake with mechanical control controlled from |
| | LH handlebar lever. |
| Wheel rims type | Light alloy. |
| Front rim | 12"x 3.00" |
| Rear rim | 11" x 2.75" |
| Front tire | 110/70 - 12" M/C 47P |
| Rear tire | 120/70 - 11" M/C 56L |
| Front tire pressure (with passenger) | 2.1 bar (2.1 bar) |
| Rear tire pressure (with passenger) | 2.3 bar (2.3 bar) |
| Kerb mass | 105 Kg (excluding the 25 Kg battery) |
| Maximum technically permissible weight at full load | 305 kg |
| Battery | 12 V / 4 Ah |

For motorcycle version 70 Km/h

VEHICLE DATA Specification **Desc./Quantity** Stamped plate body with welded structural reinforcements. Frame Front suspension Single arm with helical spring and single double-acting hydraulic shock absorber. Rear suspension Double-acting shock absorber, adjustable to four positions at pre-loading. Front brake Ø 200 disc brake with hydraulic command operated with the RH lever from the handlebar, or with the LH lever via the CBS system combined action. Rear brake Ø 140-mm drum brake with mechanical control controlled from LH handlebar lever. Wheel rims type Light alloy. Front rim 12"x 3.00' 11" x 2.75" Rear rim 110/70 - 12" M/C 47P Front tire 120/70 - 11" M/C 56L Rear tire Front tire pressure (with passenger) 2.1 bar (2.1 bar) Rear tire pressure (with passenger) 2.3 bar (2.3 bar) 105 Kg (excluding the 25 Kg battery) Kerb mass Maximum technically permissible weight at full load 305 kg Battery 12 V / 6 Ah

FOR USA-LATAM VERSION



VEHICLE DATA

| Specification | Desc./Quantity |
|---|--|
| Frame | Stamped plate body with welded structural reinforcements. |
| Front suspension | Single arm with helical spring and single double-acting hy- |
| · | draulic shock absorber. |
| Rear suspension | Double-acting shock absorber, adjustable to four positions at |
| | pre-loading. |
| Front brake | Ø 7.9 in (Ø 200 mm) hydraulically operated disc brake control- |
| | led from RH handlebar lever. |
| Rear brake | Ø 5.51 in (140 mm) mechanically operated drum brake con- |
| | trolled from LH handlebar lever. |
| Wheel rims type | Light alloy. |
| Front rim | 12"x 3.00" |
| Rear rim | 11" x 2.75" |
| Front tire | 110/70 - 12" M/C 47P |
| Rear tire | 120/70 - 11" M/C 56L |
| Front tire pressure | 26.1 psi (1.8 bar) |
| Rear tire pressure (with passenger) | 29 psi (2 bar) (36.2 psi (2.5 bar)) |
| Kerb mass | 231 lb, excluding the 55 lb battery (105 Kg, excluding the 25 kg |
| | battery) |
| Maximum technically permissible weight at full load | 748 lb (340 Kg) |
| Battery | 12 V / 4 Ah |
| | |

Engine Data

ENGINE DATA - 45 Km/H VERSION

| Specification | Desc./Quantity |
|----------------|--|
| Electric Motor | Continuous motor power 3.5 kW (4 kW peak) |
| Riding modes | Power, Eco, Reverse |
| Maximum speed | 45 Km/h (30 Km/h in "Eco" mode) |
| Range (*) | Up to 100 Km in "Eco" mode / Up to 80 Km in "Power" mode |

| Specification | Desc./Quantity |
|--|--|
| Maximum gradient (**) | Up to 30% (with rider only, weighing 75 Kg) Up to 20% (rider |
| | and passenger, weighing 75 Kg each). |
| Traction battery | 4.2 kWh lithium ion battery; voltage 48.1 V; 86.4 Ah. |
| | With integrated B.M.S (Battery Management System). |
| Battery charging | Up to 1.5 kW, with charging system integrated in vehicle with |
| | charge cable for connecting to public charging station or house- |
| | hold mains power socket. |
| Complete charge time | 4 hours in "normal charge" state (complete charge at temper- |
| | atures between 0°C and 45°C) and up to 6 hours in "slow |
| | charge" state (partial charge at temperatures between 0°C and |
| | -10°C). |
| Permitted temperature range for charging | from -10°C to 40°C |
| Energy recovery | K.E.R.S - Kinetic Energy recovery system - active during brak- |
| | ing and deceleration. |
| Maximum power | 3.5 kW at 5500 rpm |

(*): the value may vary depending on the type of route and load. (**): value may vary in relation to load.

ENGINE DATA - 25 Km/H VERSION

| Specification | Desc./Quantity |
|--|--|
| Electric Motor | Continuous motor power 3.5 kW (4 kW peak) |
| Riding modes | Power, Eco, Reverse |
| Maximum speed | 25 km / h (in both "Power" and "Eco" modes) |
| Range (*) | Up to 105 km / h (in both "Power" and "Eco" modes) |
| Maximum gradient (**) | Up to 30% (with rider only, weighing 75 Kg) Up to 20% (rider |
| | and passenger, weighing 75 Kg each). |
| Traction battery | 4.2 kWh lithium ion battery; voltage 48.1 V; 86.4 Ah. |
| | With integrated B.M.S (Battery Management System). |
| Battery charging | Up to 1.5 kW, with charging system integrated in vehicle with |
| | charge cable for connecting to public charging station or house- |
| | hold mains power socket. |
| Complete charge time | 4 hours in "normal charge" state (complete charge at temper- |
| | atures between 0°C and 45°C) and up to 6 hours in "slow |
| | charge" state (partial charge at temperatures between 0°C and |
| | -10°C). |
| Permitted temperature range for charging | from -10°C to 40°C |
| Energy recovery | K.E.R.S - Kinetic Energy recovery system - active during brak- |
| | ing and deceleration. |
| Maximum power | 3.3 kW at 3,500 rpm |

(*): the value may vary depending on the type of route and load. (**): value may vary in relation to load.

FOR MOTORCYCLE VERSION

ENGINE SPECIFICATIONS

| Specification | Desc./Quantity |
|--|--|
| Electric Motor | Continuous motor power 3.5 kW (4 kW peak) |
| Riding modes | Power, Eco, Reverse |
| Maximum speed | 52 km/h (30 km/h in "Eco" mode) |
| Range (*) | Up to 100 km in "Eco" mode / Up to 70 km in "Power" mode |
| Maximum gradient (**) | Up to 30% (with rider only, weighing 75 Kg) Up to 20% (rider |
| | and passenger, weighing 75 Kg each). |
| Traction battery | 4.2 kWh lithium ion battery; voltage 48.1 V; 86.4 Ah. |
| | With integrated B.M.S (Battery Management System). |
| Battery charging | Up to 1.5 kW, with charging system integrated in vehicle with |
| | charge cable for connecting to public charging station or house- |
| | hold mains power socket. |
| Complete charge time | 4 hours in "normal charge" state (complete charge at temper- |
| | atures between 0°C and 45°C) and up to 6 hours in "slow |
| | charge" state (partial charge at temperatures between 0°C and |
| | -10°C). |
| Permitted temperature range for charging | from -10°C to 40°C |
| Energy recovery | K.E.R.S - Kinetic Energy recovery system - active during brak- |
| | ing and deceleration. |
| Maximum power | 3.5 kW at 5500 rpm |
| | |

(*): the value may vary depending on the type of route and load. (**): value may vary in relation to load.

For motorcycle version 70 Km/h

ENGINE SPECIFICATIONS

| Specification | Desc./Quantity |
|--|---|
| Electric Motor | Continuous motor power 3.5 kW (4 kW peak) |
| Riding modes | Power, Eco, Reverse |
| Maximum speed | 67 km/h (40 km/h in "Eco" mode) |
| Range (*) | Up to 100 km in "Eco" mode / Up to 70 km in "Power" mode |
| Maximum gradient (**) | Up to 30% (with rider only, weighing 75 Kg) Up to 20% (rider and passenger, weighing 75 Kg each). |
| Traction battery | 4.2 kWh lithium ion battery; voltage 48.1 V; 86.4 Ah. With integrated B.M.S (Battery Management System). |
| Battery charging | Up to 1.5 kW, with charging system integrated in vehicle with charge cable for connecting to public charging station or house- hold mains power socket. |
| Complete charge time | 4 hours in "normal charge" state (complete charge at temper- atures between 0°C and 45°C) and up to 6 hours in "slow charge" state (partial charge at temperatures between 0°C and -10°C). |
| Permitted temperature range for charging | from -10°C to 40°C |
| Energy recovery | K.E.R.S - Kinetic Energy recovery system - active during brak- ing and deceleration. |
| Maximum power | 3.6 kW at 5,450 rpm |

(*): the value may vary depending on the type of route and load. (**): value may vary in relation to load.

RANGE

* In case of high temperatures of the traction battery caused by high ambient temperatures or immediately after battery recharge, or due to prolonged driving conditions uphill or at full power, the maximum speed may be reduced compared to the nominal speed.

** In both riding modes (POWER and ECO), when the traction battery charge state reaches 10%, the system gradually reduces the maximum speed from 67 km/h (or from 40 km/h in ECO mode) to 30 km/h, until the charge state reaches 7%.

| RIDING MODE | CHARGE STATE | MAXIMUM SPEED Km/h (mph) | REMAINING LIFE km (miles) |
|-------------|------------------|-------------------------------|------------------------------|
| POWER | from 100% to 12% | 67 (41.6) * | 70 (43.5) |
| POWER | from 12% to 7%** | from 67 (41.6) to 30 (18.6) * | 70 (43.5) |
| POWER | from 7% to 0% | 30 (18.6) | 70 (43.5) |
| ECO | 100% to 12% | 40 (24.8) | 100 (62) |
| ECO | 12% to 7%** | 40 (24.8) ÷ 30 (18.6) | 100 (62) |
| ECO | 7% to 0% | 30 (18.6) | 100 (62) |

FOR USA-LATAM VERSION

ENGINE SPECIFICATIONS

| Specification | Desc./Quantity |
|--|---|
| Electric Motor | Continuous motor power 3.5 kW (4 kW peak) |
| Riding modes | Power, Eco, Reverse |
| Maximum speed | 28 mph (45 km / h), 18.6 mph (30 km / h) in "Eco" mode |
| Range (*) | Up to 62 mi (100 km) in "Eco" mode / Up to 50 mi (80 km) in |
| | "Power" mode |
| Maximum gradient (**) | Up to 30% (with rider only, weighing 165 lb (75 Kg)); Up to 20% |
| | (with rider only, weighing 165 lb (75 Kg)). |
| Traction battery | 4.2 kWh lithium ion battery; voltage 48.1 V; 86.4 Ah. |
| | With integrated B.M.S (Battery Management System). |
| Battery charging | Up to 1.5 kW, with charging system integrated in vehicle with |
| | charge cable. |
| Complete charge time | 4 hours in case of "normal charge" (full charge between 32°F |
| | and 113°F (between 0°C e 45°C)) and up to 6 hours in case of |
| | "slow charge" (partial charge between 32°F and 14°F (between |
| | 0°C and -10°C)). |
| Permitted temperature range for charging | from 14°F to 104°F (from -10°C to 40°C) |

| Specification | Desc./Quantity |
|-----------------|--|
| Energy recovery | K.E.R.S - Kinetic Energy recovery system - active during brak- |
| | ing and deceleration. |
| Maximum power | 4.7 hp (3.5 KW) at 5500 rpm |

Maximum power

(*): the value may vary depending on the type of route and load. (**): value may vary in relation to load.

CHARGE TIMES IN RELATION TO AMBIENT AND VEHICLE TEMPERATURE CONDITIONS

IMMEDIATELY AFTER USING VEHICLE ON ROAD ("HOT" BATTERY)

T = Temperature

_

* = Slow charge to only partial capacity

| Ambient temperature range | T < -10°C | -10°C < T < 0°C | 0°C < T < 30°C | 30°C < T < 40°C | T > 40°C |
|---------------------------|---------------|-----------------|----------------|-----------------|---------------|
| Estimated charge time | Charging does | 5 hours * | 4 hours | 8 hours | Charging does |
| | not start | | | | not start |

For motorcycle version 70 Km/h

IMMEDIATELY AFTER USING VEHICLE ON ROAD ("HOT" BATTERY)

T = Temperature

* = Slow charge to only partial capacity

| Ambient temperature range | T < -10°C | -10°C < T < 0°C | 0°C < T < 30°C | 30°C < T < 40°C | T > 40°C |
|---------------------------|----------------------------|-----------------|----------------|-----------------|----------------------------|
| Estimated charge time | Charging does not start | 5 hours * | 6 hours | 8 hours | Charging does not start |

VEHICLE PARKED FOR A FEW HOURS/DAYS SINCE LAST USE ("COLD" BATTERY)

T = Temperature

* = Slow charge to only partial capacity

| Ambient temperature range | T < -10°C | -10°C < T < 0°C | 0°C < T < 30°C | 30°C < T < 40°C | T > 40°C |
|---------------------------|---------------|-----------------|----------------|-----------------|---------------|
| Estimated charge time | Charging does | 6 hours * | 4 hours | 5 hours | Charging does |
| | not start | | | | not start |

For version 45 mph - 70 Km/h (USA)

ENGINE SPECIFICATIONS

| Specification | Desc./Quantity |
|--|---|
| Electric Motor | Continuous motor power 3.5 kW (4 kW peak) |
| Riding modes | Power, Eco, Reverse |
| Maximum speed | 41.6 mph (67 km/h), 24.8 mph (40 km/h) in "Eco" mode |
| Range (*) | Up to 62 mi (100 km) in "Eco" mode / Up to 43.5 mi (70 km) in |
| | "Power" mode |
| Maximum gradient (**) | Up to 30% (with rider only, weighing 165 lb (75 Kg)); Up to 20% |
| | (with rider only, weighing 165 lb (75 Kg)). |
| Traction battery | 4.2 kWh lithium ion battery; voltage 48.1 V; 86.4 Ah. |
| | With integrated B.M.S (Battery Management System). |
| Battery charging | Up to 1.5 kW, with charging system integrated in vehicle with |
| | charge cable. |
| Complete charge time | 4 hours in case of "normal charge" (full charge between 32°F |
| | and 113°F (between 0°C e 45°C)) and up to 6 hours in case of |
| | "slow charge" (partial charge between 32°F and 14°F (between |
| | 0°C and -10°C)). |
| Permitted temperature range for charging | from 14°F to 104°F (from -10°C to 40°C) |
| Energy recovery | K.E.R.S - Kinetic Energy recovery system - active during brak- |
| | ing and deceleration. |
| Maximum power | 4.8 hp (3.6 KW) at 5450 rpm |
| | |

(*): the value may vary depending on the type of route and load.

(**): value may vary in relation to load.

RANGE

* In case of high temperatures of the traction battery caused by high ambient temperatures or immediately after battery recharge, or due to prolonged driving conditions uphill or at full power, the maximum speed may be reduced compared to the nominal speed.

** In both riding modes (POWER and ECO), when the traction battery charge state reaches 10%, the system gradually reduces the maximum speed from 41.6 mph (67 km/h) (or from 24.8 mph (40 km/h) in ECO mode) to 18.6 mph (30 km/h), until the charge state reaches 7%.

| RIDING MODE | CHARGE STATE | MAXIMUM SPEED Km/h (mph) | REMAINING LIFE km |
|-------------|------------------|-------------------------------|-------------------|
| | | | (miles) |
| POWER | from 100% to 12% | 67 (41.6) * | 70 (43.5) |
| POWER | from 12% to 7%** | from 67 (41.6) to 30 (18.6) * | 70 (43.5) |
| POWER | from 7% to 0% | 30 (18.6) | 70 (43.5) |
| ECO | 100% to 12% | 40 (24.8) | 100 (62) |
| ECO | 12% to 7%** | 40 (24.8) ÷ 30 (18.6) | 100 (62) |
| ECO | 7% to 0% | 30 (18.6) | 100 (62) |
| 200 | 1 /0 10 0 /0 | 00 (10:0) | 100 (02) |

Capacities

EUROPE VERSION

CAPACITY

Specification

Hub oil

FOR USA-LATAM VERSION

CAPACITY

Specification Hub oil

Desc./Quantity 15.3 in³ (250 cm³)

Desc./Quantity 250 cm³

MEASUREMENT UNITS CONVERSION - FROM THE ANGLO-SAXON SYSTEM TO THE INTERNATION-AL SYSTEM (I.S.).

| Specification | Desc./Quantity |
|---------------------------------|---|
| 1 Inch (in) | 25.4 Millimetres (mm) |
| 1 Foot (ft) | 0.305 Metres (m) |
| 1 Mile (mi) | 1.609 Kilometres (km) |
| 1 US gallon (gal US) | 3.785 Litres (I) |
| 1 Pound (lb) | 0.454 Kilograms (Kg) |
| 1 Cubic inch (in ³) | 16.4 Cubic centimetres (cm ³) |
| 1 Pound per foot (lb ft) | 1.356 Newton metres (N m) |
| 1 Mile per hour (mi/h) | 1.602 Kilometres per hour (km/h) |
| 1 Pound per square foot (PSI) | 0.069 (bar) |
| 1 Fahrenheit (°F) | 32+(9/5) Celsius (°C) |

Tightening Torques

Centre stand



WARNING

(*) GREASE THE ENDS OF THE SPRING AND THE RELATIVE MOUNTING POINTS WITH THE PRODUCT INDICATED IN THE TABLE (**) GREASE THE HOLE FOR THE BOLT WITH THE PRODUCT INDICATED IN THE TABLE

Recommended products

Calcium based grease Calcium grease

Smooth-textured appearance; Ivory coloured Specification TL 9150 066, symbol NATO G 460

| | Centre stand | | | | | |
|------|--------------|------|----------------------|------------|--|--|
| Ref. | Fastener | Q.ty | Description | Value (Nm) | | |
| 1 | Bolt | 1 | Centre stand - Frame | 42.5± 2.5 | | |

guard





GUARD

| Ref. | Fastener | Q.ty | Description | Value (Nm) |
|------|----------|------|--|------------|
| 1 | Joint | 1 | Front brake pipe - Front brake master cylinder | 22.5 ± 2.5 |
| 2 | Nut | 1 | Rear-view mirror | 30 ± 1.0 |
| 3 | Screw | 2 | Front brake master cylinder - Handlebar | 8.5 ± 1.5 |
| 4 | Screw | 1 | Rear brake lever - Handlebar | 11 ± 1.0 |
| 5 | Bolt | 1 | Handlebars - Steering tube | 52.5 ± 2.5 |

Electric motor



ELECTRIC MOTOR

| Ref. | Fastener | Q.ty | Description | Value (Nm) |
|------|----------|------|---|------------|
| 1 | Screw | 4 | Electric motor cover - Electric motor casing | 12 ± 1.0 |
| 2 | Nut | 1 | Rotor - Electric motor shaft | 43.5 ± 1.5 |
| 3 | Screw | 1 | Rear brake control rod - Reduction gear cover | 12 ± 1.0 |

| Ref. | Fastener | Q.ty | Description | Value (Nm) |
|------|----------|------|---------------------------|------------|
| 4 | Screw | 6 | Hub cover - Motor housing | 25.5 ± 1.5 |
| 5 | Screw | 1 | Hub oil drain screw | 16 ± 1.0 |

Front suspension



FRONT SUSPENSION

| Ref. | Fastener | Q.ty | Description | Value (Nm) |
|------|----------|------|--|------------|
| 1 | Screw | 1 | Speed sensor cover - Front wheel hub | 9 ± 1.0 |
| 2 | Screw | 2 | Front brake calliper - Shock absorber-brake calliper mount | 22 ± 2.0 |
| 3 | Bolt | 2 | Front shock absorber - Shock absorber-brake calliper mount | 23.5 ± 2.5 |
| 4 | Screw | 2 | Front shock absorber bracket - Steering tube | 22 ± 2.0 |
| 5 | Nut | 1 | Front shock absorber - Steering tube | 26.5 ± 2.5 |
| 6 | Screw | 1 | Front brake pipe fastener bracket - Front shock absorber | 9 ± 1.0 |
| 7 | Joint | 1 | Front brake pipe - Front brake calliper | 22.5 ± 2.5 |
| 8 | Nut | 1 | Front wheel hub - Front wheel axle | 85 ± 8.0 |
| 9 | Screw | 5 | Front wheel - Front wheel hub | 20 ± 2.0 |
| - | Ring nut | 1 | Lower steering tube fastener ring nut | 9 ± 1.0 |
| - | Ring nut | 1 | Upper steering tube fastener ring nut | 37.5 ± 2.5 |

Rear suspension





REAR SUSPENSION

| Ref. | Fastener | Q.ty | Description | Value (Nm) |
|------|----------|------|--|------------|
| 1 | Bolt | 1 | Swingarm - Frame | 79.5 ± 3.5 |
| 2 | Screw | 2 | Traction battery mounting frame bracket - Frame | 71 ± 3.0 |
| 3 | Bolt | 1 | Bracket - Traction battery mounting frame | 79.5 ± 3.5 |
| 4 | Bolt | 2 | Electric motor mounting bracket - Swingarm | 51.5 ± 2.5 |
| 5 | Bolt | 2 | Electric motor mounting bracket - Electric motor | 51.5 ± 2.5 |
| 6 | Screw | 1 | Electric motor mounting bracket - Electric motor | - |
| 7 | Bolt | 2 | Rear shock absorber mounting bracket - Electric motor | 22.5 ± 2.5 |
| 8 | Bolt | 1 | Rear shock absorber - Mounting bracket | 42.5 ± 2.5 |
| 9 | Nut | 1 | Rear shock absorber - Chassis | 22.5 ± 2.5 |
| 10 | Screw | 2 | Traction battery mounting frame - Frame | 71 ± 3.0 |
| 11 | Nut | 2 | Tie-rod - Traction battery retainer bracket | 12.5 ± 2.5 |
| 12 | Screw | 2 | Rear brake control Bowden cable - Swingarm | 10 ± 1.0 |
| 13 | Screw | 1 | Rear brake control Bowden cable bracket - Electric motor | 10 ± 1.0 |
| - | Nut | 1 | Rear wheel - Wheel axle | 115 ± 11 |

INDEX OF TOPICS

TOOLING

TOOL

| | SPECIFIC TOOLS | |
|-------------|---|--|
| Stores code | Description | |
| 001330Y | Tool for fitting steering seats | 000000000 |
| 001467Y | Extractor for bearings for holes | Contraction of the second seco |
| 001467Y009 | Bell for OD 42-mm bearings | |
| 001467Y013 | Calliper to extract ø 15-mm bearings | Contraction of the second seco |
| 001467Y017 | Bell Ø 35 | |
| 006029Y | Punch for fitting steering bearing on the steering tube | |
| 020004Y | Punch for removing steering bearings from headstock | |

| Stores code | Description | |
|-------------|-----------------------------------|---|
| 020037Y | Punch | |
| 020038Y | Punch | |
| 020055Y | Wrench for steering tube ring nut | |
| 020151Y | Air heater | |
| 020329Y | Mity-Vac vacuum pump | A |

| Stores code | Description | |
|-------------|----------------------------------|---------|
| 020335Y | Magnetic mounting for dial gauge | |
| 020357Y | 32 x 35-mm Adaptor | |
| | | |
| 020359S | 42 x 47 mm Adaptor | |
| | | 9120350 |
| 020360S | 52 x 55 mm adaptor | |
| | | |
| 020363Y | 20-mm guide | |
| | | |

| Stores code | Description | |
|-------------|--------------------|--|
| 020364Y | 25-mm guide | |
| 020365Y | 22 mm guide | |
| 020376Y | Adaptor handle | |
| 020412Y | 15-mm guide | |
| 020439Y | 17-mm guide | |
| 020441Y | 26 x 28 mm adaptor | |

| Stores code | Description | |
|---------------------------------|--|--|
| 020456Y | Ø 24 mm adaptor | |
| 020459Y | Punch for fitting the bearing on the steer- ing tube | |
| 020922Y | Diagnosis Tool | |
| 020931Y | Diagnostic cable | |
| UT531 - UNI-T insulation tester | UT531 - Insulation tester with minimum specifications: 500V; 40 MΩ. | |

INDEX OF TOPICS

MAINTENANCE

MAIN

SECTION CONTENTS

This section contains the following chapters:

- SERVICE icon behaviour
- Resetting the SERVICE icon
- Maintenance schedule
- Recommended products
- Hub oil
 - Check
 - Replacement
- Braking system
 - Check level
 - Top-up
- Headlight adjustment

LIST OF TIGHTENING TORQUES

| | Fastener | Q.ty | Description | Value (Nm) |
|--------------------------------------|----------|------|---------------------|------------|
| Screw 1 Hub oil drain screw 16 ± 1.0 | Screw | 1 | Hub oil drain screw | 16 ± 1.0 |

SERVICE ICON BEHAVIOUR

When the ignition switch is turned to **ON**, immediately after the initial check cycle, the SERVICE icon flashes for 10 seconds and then extinguishes if less than 300 km (187.5 mi) remain until the next scheduled service.

Once the service interval mileage is reached, the SERVICE icon lights steadily when the ignition switch is turned to **ON** and will remains lit until it is reset.

SERVICE ICON RESET

Reset the SERVICE icon as follows:

- turn the ignition switch to ON and then pushing

the MODE selector briefly and repeatedly to the

RIGHT to scroll through the functions available

and select CONS mode.

CAUTION

"PRESS BRIEFLY AND RELEASE": PRESS THE BUTTON AND RELEASE WITHIN 0.5 SECONDS; "PRESS AND HOLD": PRESS THE BUTTON AND HOLD FOR AT LEAST 2 SECONDS.







Press and hold the MODE button for at least 10 seconds but not more than 15 seconds. The SERVICE icon extinguishes when the button is released. If the MODE button is released without waiting 10 seconds, the SERVICE icon will not extinguish and the service interval counter will not be reset.

N.B.

THE PROCEDURE TO RESET THE SERVICE ICON MAY ONLY BE PERFORMED WHEN THE VEHICLE IS STATION-ARY (SPEED = 0 Km/h).

Maintenance chart



.

SCHEDULED MAINTENANCE TABLE

I: CHECK AND CLEAN, ADJUST, LUBRICATE OR REPLACE IF NECESSARY. C: CLEAN, R:REPLACE, A: ADJUST, L:LUBRICATE (1) Diagnosis and system update: VMS (Vehicle Management System); Instrument panel; VMP (Vespa Multimedia Platform).

| km x 1.000 (mi x 1,000) | 1 (0.6) | 5 (3.1) | 10 (6.2) | 15 (9.3) | 20 (12.4) | 25 (15.5) | 30 (18.6) | EVERY 12 MONTH S | EVERY 24 MONTH S |
|--|------------|------------|-------------|-------------|--------------|--------------|--------------|---------------------------|---------------------------|
| Safety fasteners | I | | I | | I | | I | | |
| Centre stand | | L | L | L | L | L | L | L | L |
| Accelerator control | I | | | | I | | I | | |
| Traction battery diagnosis / update | I | I | I | | I | I | I | I | |
| Diagnosis / update with tool (1) | I | I | | I | I | 1 | I | I | I |
| Electrical system and ancillary battery | I | I | I | | I | I | I | | |
| Braking system | I | I | I | Ι | I | I | I | I | I |
| Braking system - Adjusting the rear drum brake | Α | A | А | Α | Α | А | Α | А | А |
| Brake fluid | I | I | | I | I | | I | I | R |
| Hub oil | R | | I | | I | | I | I | I |
| Headlight direction adjustment | | | I | | I | | I | | |
| Brake pads | I | I | I | Ι | I | I | I | I | I |
| Tyre pressure and wear | I | I | I | I | I | I | I | I | I |
| Vehicle road test | I | I | I | I | I | I | I | I | I |
| Suspensions | | | I | | I | | I | I | I |
| Steering | A | | I | | I | | I | | |
| Transmission | | | L | | L | | L | | |
| Labour time (minutes) | 70 | 50 | 60 | 50 | 60 | 50 | 60 | 50 | 50 |
| N.B. | | | | | | | | | |

AT EACH SCHEDULED MAINTENANCE MUST BE VERIFIED WITH THE DIAGNOSTIC TOOL IF THERE ARE ERRORS AND THE IF THE PARAMETERS ARE CORRECT. ENSURE THAT THE VEHICLE CALIBRATION IS UP TO DATE AFTER UPDATING THE DIAGNOS-TIC TOOL.

CAUTION

AFTER THE PROVIDED MAINTENANCE PROGRAM IS INDICATED TO PROCEED WITH THE MAINTENANCE OF THE VEHICLE STARTING FROM THE SERVICE OF 5,000 Km (3,106 mi) OR 5 MONTHS.

Recommended products

Piaggio Group recommends the use of prod-

ucts from its Castrol official partner for the

scheduled maintenance of its vehicles.

Only use lubricants and fluids which meet or ex-

ceed the performance characteristics specified.

This also applies when topping up only.



TABLE OF RECOMMENDED PRODUCTS

| Product | Description | Specifications |
|------------------------------|--|--|
| Transmission oil 80W-90 | Lubricant for gearboxes and transmis- | SAE 80W-90; API GL-4 |
| | sions. | |
| DOT 4 brake fluid | Synthetic brake fluid. | SAE J 1703; FMVSS 116; ISO 4925; CU- |
| | | NA NC 956 DOT4 |
| Lithium-based grease | Lithium-based grease, suitable for vari- | Yellow grease ISO L-X-BCHA 3 - DIN 51 |
| | ous uses. | 825 K3K -20 |
| Water repellent spray grease | Water repellent pouring calcium spray | R.I.D./A.D.R. 2 10°b) 2 R.I.Na. 2.42 - |
| | grease. | I.A.T.A. 2 - I.M.D.G. class 2 UN 1950 Pag. |
| | | 9022 EM 25-89 |

Hub oil

Check

- Check the hub oil level with the following procedure:

- park the vehicle on level ground and place it on its stand;
- unscrew and remove the oil dipstick, wipe it with a clean cloth and then fit it back into place, tightening fully;



- Unscrew and remove the dipstick and check that

the oil level reaches the 1st notch on the dipstick

from the bottom end;

- refit the dipstick in its seat and tighten fully.

WARNING



THE FUNCTION OF THE HUB WITH INSUFFICIENT HUB LUBRICATION OR WITH CONTAMINATED OR IMPROPER LUBRICANTS ACCELERATES THE WEAR AND TEAR OF THE MOVING PARTS AND CAN CAUSE SERIOUS DAM-AGE.

N.B.

THE OTHER NOTCHES ON THE HUB OIL DIPSTICK ARE APPLICABLE FOR OTHER MODELS AND HAVE NO FUNC-TION ON THIS VEHICLE.

Replacement



USED OIL CONTAINS SUBSTANCES WHICH CAN BE HARMFUL TO THE ENVIRONMENT. TAKE USED OILS TO AN AUTHORISED SERVICE CENTRE, WHICH IS PROPERLY EQUIPPED TO DIS-POSE OF USED OIL WITHOUT DAMAGING THE ENVIRONMENT AND IN COMPLIANCE WITH APPLICABLE LEGISLATION.

- Unscrew and remove the hub oil dipstick.

- Remove the rear wheel.



- Place a suitable container underneath to collect the hub oil.

- Undo the drain plug and wait for all the hub oil to drain into the container.

- Once the system has been drained, refit the drain plug and tighten to the specified torque.

- Refit the rear wheel.





- Fill the system via the filler hole at the top of the wheel hub.

- Check that the oil level is correct with the dipstick.

Braking system

LEVEL CHECK

- Rest the vehicle on its centre stand with the handlebars perfectly horizontal;

- Check the level of liquid with the related warning light **«A**».

A certain lowering of the level is caused by wear on the brake pads.

TOP-UP

- Disconnect the negative terminal clamp of the ancillary battery.

- Remove the following components:

- Rear view mirrors
- Headlamp bezel
- Upper handlebar cover

- Remove the reservoir cap by loosening the two screws, remove the gasket and top-up using only the fluid specified without exceeding the maximum level.

CAUTION ONLY USE DOT 4-CLASSIFIED BRAKE FLUID. CAUTION



AVOID CONTACT OF BRAKE FLUID WITH EYES, SKIN, AND CLOTHING. IN CASE OF ACCIDENTAL CONTACT, RINSE WITH WATER. CAUTION

BRAKE CIRCUIT FLUID IS HIGHLY CORROSIVE: DO NOT LET IT COME INTO CONTACT WITH PAINTED PARTS. CAUTION





BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR. IF THE CON-TENT OF MOISTURE IN THE BRAKE FLUID EXCEEDS A CERTAIN VALUE, BRAKING WILL BE INEFFICIENT. NEVER USE BRAKE LIQUID FROM OPEN OR PARTIALLY USED CONTAINERS.

UNDER NORMAL CLIMATIC CONDITIONS, REPLACE FLU-ID AS INDICATED IN THE SCHEDULED MAINTENANCE TABLE.

N.B.

SEE THE BRAKING SYSTEM CHAPTER WITH REGARD TO THE CHANGING OF BRAKE FLUID AND THE BLEEDING OF AIR FROM THE CIRCUITS.

Headlight adjustment

Proceed as follows:

1. Position the vehicle in running order and with

the tyres inflated to the prescribed pressure, onto

a flat surface 10 m away from a half-lit white

screen; ensure that the longitudinal axis of the vehicle is perpendicular to the screen;

2. Turn on the headlight and check that the boundary of the light beam projected onto the screen is not higher than 9/10 or lower than 7/10 of the distance between the centre of the headlight and the ground;

3. Otherwise, adjust the right headlight with screw **«A»**.

N.B.

THE PROCEDURE DESCRIBED IS THAT ESTABLISHED BY EUROPEAN STANDARDS FOR THE MAXIMUM AND MINIMUM HEIGHT OF THE LIGHT BEAM. REFER TO THE STATUTORY REGULATIONS IN FORCE IN EVERY COUN-TRY WHERE THE VEHICLE IS USED.





INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

Transmission and brakes

Insufficient braking

INEFFICIENT OR NOISY BRAKING

| Possible Cause | Operation |
|---|--|
| Worn brake pads or shoes | Replace the brake pads or shoes and check for brake disk or |
| | drum wear conditions. |
| Front brake disk loose or deformed | Check the brake disc screws are locked; use a dial gauge and |
| | a wheel mounted on the vehicle to measure the axial shift of |
| | the disc. |
| Air bubbles inside the hydraulic braking system | Carefully bleed the hydraulic braking system, (there must be |
| | no flexible movement of the brake lever). |
| Fluid leakage in hydraulic braking system | Failing elastic fittings, plunger or brake pump seals, replace |
| Excessive clearance in the rear brake control cable | Adjust the clearance with the appropriate adjuster located on |
| | the back part of the crankcase. |
| | |

Brakes overheating

BRAKES OVERHEATING

| Possible Cause | Operation |
|---|---|
| Rubber gaskets swollen or stuck. | Replace gaskets. |
| Compensation holes on the pump clogged. | Clean carefully and blast with compressed air. |
| Brake disc slack or distorted | Check the brake disc screws are locked; use a dial gauge and a wheel mounted on the vehicle to measure the axial shift of the disc. |
| Defective piston sliding. | Check calliper and replace any damaged part. |

Electrical system

Battery

BATTERY

| Possible Cause | Operation |
|----------------|--|
| Battery | The battery is the electrical device in the system that requires the most frequent inspections and thorough maintenance. If the vehicle is not used for some time (1 month or more) the battery needs to be recharged periodically. The battery runs down completely in the course of 5 - 6 months. If the battery is fitted on a motorcycle, be careful not to invert the connections, keep- ing in mind that the black ground wire is connected to the negative terminal while the red wire is connected to the terminal marked+. Follow the instructions in the ELECTRICAL SYSTEM chapter for the recharging of the batteries. |
| | |

Steering and suspensions
Heavy steering

STEERING HARDENING

Possible Cause Steering hardening Operation

Check the tightening of the top and bottom ring nuts. If irregularities continue in turning the steering even after making the above adjustments, check the seats in which the ball bearings rotate: replace them if they are recessed or if the balls are flattened.

Excessive steering play

EXCESSIVE STEERING CLEARANCE

 Possible Cause
 Operation

 Excessive steering clearance
 Check the tightening of the top ring nut. If irregularities continue in turning the steering even after making the above adjustments, check the seats in which the ball bearings rotate: replace if they are recessed.

Noisy suspension

NOISY SUSPENSION

Possible Cause Noisy suspension

Operation If the front suspension is noisy, check: that the front shock absorber works properly and the ball bearings are good condition. Finally, check the locking torque of the wheel axle nut, the brake calliper and the disc. Check that the swinging arm connecting the engine to the frame and the rear shock absorber work properly.

Suspension oil leakage

OIL LEAKAGE FROM SUSPENSION

| Possible Cause | Operation | |
|------------------------|--|--|
| Faulty or broken seals | Replace the shock absorber. Check the condition of wear of | |
| | the steering covers and the adjustments. | |
| | | |

INDEX OF TOPICS

ELECTRICAL SYSTEM

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SECTION CONTENTS

This section contains the following chapters:

- Layout of components
- Instrument cluster
- Throttle control sensor
- Switches-Selectors-Buttons
 - Lateral switchgear sets
- Front lights
 - Front light unit
 - Front turn indicator/running light
 - Front daylight running lights
 - Front running light bulb
 - Front turn indicator bulb
- Tail light unit
 - Tail light
 - Brake light bulb
 - License plate light
 - Rear turn indicator
 - Rear turn indicator bulb
- Ground points
- Electric traction system
 - Traction battery
 - Inverter
 - Electric inverter cooling fan
 - Charging cable
- Electrical system installation
 - Main wiring harness
 - VMS (Vehicle Management System) ground cable
 - Frame-bodyshell ground cable
 - Electric traction motor wiring harness
- Checks and inspections
 - Immobilizer
 - Lighting system
 - Fuses
 - Sealed battery
 - Battery installation
- Connectors

- Opening saddle with remote control

Programming

LIST OF TIGHTENING TORQUES

| Fastener | Q.ty | Description | Value (Nm) |
|----------|------|---|------------|
| Screw | 2 | Traction battery mounting frame bracket - Frame | 71 ± 3.0 |
| Nut | 2 | Tie-rod - Traction battery retainer bracket | 12.5 ± 2.5 |
| Screw | 2 | Traction battery mounting frame - Frame | 71 ± 3.0 |

Components arrangement

LIST OF COMPONENTS

| Component | See figure No. |
|--|----------------|
| Immobilizer antenna | 3 |
| Saddle opening actuator | 4 |
| B.M.S. (Battery Management System) | 5 |
| Ancillary battery | 4 |
| Bike-Finder | 2 |
| Blinker | 2 |
| Secondary fuse holder unit | 3 |
| Horn | 2 |
| Ignition switch | 3 |
| Electric cooling fan connector | 5 |
| Charge socket connector, V.M.S. side . (Vehicle Management | 5 |
| System) | |
| Motor phase sensor connector | 5 |
| Engine temperature sensor connector | 5 |
| RH switchgear set | 1 |
| LH switchgear set | 1 |
| Tracking device (where applicable) | 4, 5 |
| Tail light (brake light) | 6 |
| Tail light (license plate light) | 6 |
| Main fuses | 4 |
| Main wiring harness/handlebar wiring harness junction con- | 1 |
| nector | |
| Instrument cluster | 1 |
| Rear right turn indicator | 6 |
| Rear left turn indicator | 6 |
| RH front turn indicator/running light | 2 |
| LH front turn indicator/running light | 2 |
| Right hand brake lever switch | 1 |
| Left hand brake lever switch | 1 |
| Licence plate light | 6 |
| Ground on bodyshell | 5 |
| Frame ground | 4, 5 |
| VMS ground (Vehicle Management System) | 5 |
| Provision for side stand | 4 |
| Diagnostic port | 6 |
| Charge plug | 6 |
| USB port | 3 |
| Headlight | 1 |
| Emergency power on button (if available) | 6 |
| Saddle release switch | 3 |
| Charge plug stowed position button | 6 |
| Throttle grip position sensor | 2 |
| Buzzer | 3 |
| V.M.P. (Vespa Multimedia Platform) | 4 |
| V.M.S. (Vehicle Management System) | 5 |



- 1. Right hand brake lever switch
- 2. RH switchgear set
- 3. Instrument cluster
- 4. Headlight
- 5. LH switchgear set
- 6. Right hand brake lever switch
- 7. Main wiring harness/handlebar wiring harness junction connector



- 1. RH front turn indicator/running light
- 2. Throttle grip position sensor
- 3. Bike-Finder
- 4. air temperature sensor
- 5. Blinker
- 6. LH front turn indicator/running light
- 7. Horn





- 1. USB port
- 2. Saddle release switch
- 3. Ignition switch
- 4. Immobilizer antenna
- 5. Buzzer
- 6. Secondary fuse holder unit



- 1. Saddle lock release actuator
- 2. V.M.P. (Vespa Multimedia Platform)
- 3. Provision for side stand
- 4. Main fuses
- 5. Tracking device (where applicable) (also see View 5)
- 6. Centre ground point on frame (also see View 5)
- 7. Ancillary battery
- 8. Front ground point on bodyshell



- 1. Centre ground point on frame (also see View 4)
- 2. Tracking device (where applicable) (also see View 4)
- 3. Rear ground point on frame
- 4. Rear ground point on bodyshell
- 5. B.M.S. (Battery Management System)
- 6. VMS ground (Vehicle Management System)
- 7. Charge socket connector, V.M.S. side (Vehicle Management System)
- 8. Electric cooling fan connector
- 9. Engine temperature sensor connector
- 10. Motor phase sensor connector
- 11. V.M.S. (Vehicle Management System)
- 12. Electric traction motor



- 1. Diagnostic port
- 2. Rear right turn indicator
- 3. Licence plate light
- 4. Tail light (rear running light)
- 5. Tail light (brake light)
- 6. Rear left turn indicator
- 7. Charge plug stowed position button
- 8. Emergency power on button (if available)
- 9. Charge plug

Instrument panel

INSTRUMENT PANEL



Indicator and warning lamps:

- A = Turn signal on;
- **B** = High beam on;
- **C** = Low traction battery charge warning;
- **D** = Immobilizer LED;
- **E** = Digital display light sensor;
- **F** = READY lamp selected riding mode confirmed;
- **G** = General fault warning;
- **H** = Motor stop warning;
- I = Electric motor fault warning;
- L = Digital display.

General fault warning lamp (G)

This indicator light switches on if an anomaly is encountered at the V.M.S. Vehicle Management System at the Immobilizer system.





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Key:

- A = Service icon
- **B** = Charge plug not stowed correctly warning icon

Q

- C = Riding style indicator
- $\mathbf{D} = Clock$
- E = Riding mode icon
- F = Ice hazard icon
- **G** = Ambient temperature
- \mathbf{H} = Traction battery power output
- I = Remaining range in Km / miles
- L = Recovered energy

- $\mathbf{M} = Audible$ warning signal on indicator
- N = Multifunctional panel
- **O** = Speedometer
- **P** = Battery state of charge
- **Q** = VMP (Vespa Multimedia Platform) icon cluster
- **R** = Side stand icon (provision).

The digital display displays the message **"Welcome**" when the ignition switch is turned to **ON**, and displays the message **"Goodbye"** when the ignition switch is turned to **OFF**.

Service icon (A)

The icon illuminates to notify the user of scheduled maintenance service intervals.

This icon has 3 possible states:

- 1. Off.
- Flashing: the icon flashes for 5 seconds each time the ignition switch is turned to ON if less than 300 Km remain until the next service.
- Steady: the icon is displayed steadily when the mileage for the service interval is reached.

CHARGE PLUG NOT STOWED CORRECTLY WARNING ICON (B)

The icon illuminates when the protective cover of the charge plug, situated under the saddle, is removed.





RIDING STYLE INDICATOR (C)

This indicator provides the rider with energy consumption information relative to the riding mode selected in the form of a bar gauge. The gauge consists of 10 blocks which illuminate in different colours.



DIGITAL CLOCK (D)

To access the clock settings, push the MODE selector to the right to scroll through the modes available until SETTINGS is shown on the display; press and hold the MODE button to access the menu.

- Clock (set time, 12h, 24h)
- Unit of measurement
- Pairing configuration
- Exit

Press the MODE button to select the "Clock (Set time, 12h, 24h)" function and press the centre button of the MODE selector to confirm. Now select the required parameter:

- Set time (hours, minutes, exit)
- 12h
- 24h
- Exit

RIDING MODE ICON (E)

To enable starting, after turning the ignition switch to ON, one of the following riding modes must be selected by pressing the MAP button on the right hand switchgear set:

- POWER: The electric engine delivers full power and maximum performance reaching a maximum speed of 45 km/ h, 52 km/h for the Motorcycle version, 67 km/h for the Motorcycle version 70 km/h or 25 km/h for the version with reduced speed;
- ECO: an energy saving mode for increased range. In this configuration, the maximum speed drops to 30 km/h, 40 km/h for the Motorcycle version 70 km/h or 25 km/h for the version with reduced speed;





 REVERSE: a riding mode providing assistance for manoeuvres; only crawling speeding is permitted in this mode.

ICE HAZARD ICON (F)

At ambient temperatures below 3°C, the ice hazard icon is shown on the digital display to warn the rider of the possibility of ice on the road. In such conditions, it is recommended to drive carefully.



AMBIENT TEMPERATURE (G)

To access the temperature display settings, push the MODE selector to the right to scroll through the modes available until SETTINGS is shown on the display; press and hold the MODE button to access the menu.

- Clock (set time, 12h, 24h)
- Unit of measurement
- Pairing configuration
- Exit

Press the MODE button to select the option "Units of measurement" and press the centre button of the MODE selector to confirm.

Now select the required parameter:

- Speed
- Temperature
- Exit

Press the MODE button to select the option "Temperature" and press the centre button of the MODE selector to confirm.

Now select the required parameter:

- ON or OFF
- °C or °F

Traction battery power output indicator (H-L)



The vehicle is equipped with a braking energy recovery system - K.E.R.S. Kinetic Energy Recovery

System.

This system recovers energy when braking or decelerating and uses it to charge the traction battery.

The user may set two different levels of brake recovery (Brake 1 and Brake 2) with the SETTING

function for the system:

- Brake 1: low brake energy recover;
- Brake 2: high brake energy recovery.

N.B.

BRAKE 1 PRODUCES A GENTLER BRAKING EFFECT WHEN DECELERATING WHILE BRAKE 2 PRODUCES A MORE DECISIVE BRAKING ACTION.

Depending on the selected settings, this indicator

in the digital display shows the following information:

- traction battery power output;

- power recovered by traction battery when decelerating.

This indicator consists of a bar gauge with 12 bars; bars from 5 to 12 represent power delivered by the traction battery, while bars from 4 to 1 represent power recovered by the traction battery.

REMAINING RANGE (I)

When the ignition switch is turned to ON, the remaining range calculated for the current mode is displayed in kilometres.

WARNING

RANGE VARIES DEPENDING ON THE RIDING STYLE OF THE USER.

BUZZER ENABLED ICON (M)

This icon illuminates when the function is enabled from the relative submenu of SETTINGS mode. This function lets the user:

- enable/disable automatic speed-dependent activation of the warning buzzer;
- set automatic activation speed.

The buzzer sounds when reverse mode is selected Once enabled in the settings, the warning buz-







zer may be switched on and off directly by briefly pressing the centre button of the MODE selector twice in succession.

MULTIFUNCTIONAL PANEL (N)

Press the MODE selector on the handlebar briefly to the right repeatedly to cycle through the following modes of the panel:

- ODO (total odometer);
- TRIP (trip odometer);
- TRIP TIME (total time since last trip odometer reset - trip time is only counted at vehicle speeds above 5 Km/h);
- MAX SPEED (maximum speed attained since last reset);
- AVG SPEED (average speed calculated since last reset);
- CONS (energy consumption meter with value refreshed every 5 seconds);
- BRAKE (brake energy recovery level);
- SETTINGS (settings).

WARNING

SEE THE USE AND MAINTENANCE MANUAL FOR DE-TAILS OF THE INDIVIDUAL FUNCTIONS

SPEEDOMETER (O)

Digital speedometer indicating vehicle speed. The unit of measurement used is selectable from the multifunctional panel.





TRACTION BATTERY STATE OF CHARGE (P)

The traction battery state of charge indicator also appears on the digital display when the ignition switch is turned to ON and remains visible while the vehicle is in use.



For motorcycle version 70 Km/h

RANGE

* In case of high temperatures of the traction battery caused by high ambient temperatures or immediately after battery recharge, or due to prolonged driving conditions uphill or at full power, the maximum speed may be reduced compared to the nominal speed.

** In both riding modes (**POWER** and **ECO**), when the traction battery charge state reaches 10%, the system gradually reduces the maximum speed from 67 km/h (or from 40 km/h in **ECO** mode) to 30 km/h, until the charge state reaches 7%.

| RIDING MODE | CHARGE STATE | MAXIMUM SPEED Km/h (mph) | REMAINING LIFE km (miles) |
|-------------|------------------|-------------------------------|------------------------------|
| POWER | from 100% to 12% | 67 (41.6) * | 70 (43.5) |
| POWER | from 12% to 7%** | from 67 (41.6) to 30 (18.6) * | 70 (43.5) |
| POWER | from 7% to 0% | 30 (18.6) | 70 (43.5) |
| ECO | 100% to 12% | 40 (24.8) | 100 (62) |
| ECO | 12% to 7%** | 40 (24.8) ÷ 30 (18.6) | 100 (62) |
| ECO | 7% to 0% | 30 (18.6) | 100 (62) |

Below 10% of traction battery charge state, the battery icon start flashing indicating the limitation of the current speed.



V.M.P. ICONS PANEL (VESPA MULTIMEDIA PLATFORM) (Q)

The vehicle is equipped with a VMP (Vespa Multimedia Platform) unit which communicates via Bluetooth with the user's smartphone to allow infotainment functions and to permit data transfer with the vehicle via a specific app installed on the smartphone itself.

Once a connection is established correctly between the VMP unit and the smartphone, the following functions are accessible and controllable directly from the digital display of the vehicle:

manage phone calls



- manage audio playback
- manage message notifications

WARNING

SEE THE USE AND MAINTENANCE MANUAL FOR DE-TAILS OF THE INDIVIDUAL FUNCTIONS

Demand Sensor

REMOVAL

- Disconnect the negative terminal clamp of the

ancillary battery.

- Remove the following components:
 - Leg shield back plate
- Disconnect the electrical connectors of the throt-

tle control sensor.

- Cut the cable tie fastening the immobilizer an-

tenna cable.

WARNING MOVE THE IMMOBILIZER ANTENNA CABLE OUT OF THE WAY





- Undo the screws fastening the throttle control sensor to the mounting bracket.



Electrical system

- Remove the throttle control sensor partially from its seat to be able to remove the cable access cover.

- Undo the fastener screw of the throttle control sensor cable fastener bracket.

- Undo the remaining fastener screws of the throttle control cable fastener bracket.

- Detach the ferrules of both throttle control sensor actuator cables from the relative seats.







- Remove the throttle control sensor from its seat.



REFITTING

- Fit the ferrules of both throttle control sensor actuator cables in the relative seats.

- Tighten the fastener screws of the throttle control sensor cable fastener bracket.



- Tighten the remaining fastener screws of the throttle control sensor cable fastener bracket.



- Fit the throttle cable access cover and refit the throttle control sensor in the relative seat.

- Tighten the screws fastening the throttle control sensor to the mounting bracket.





- Refit the cable of the immobilizer antenna and secure with a new cable tie.
- Fit the following components:
 - Leg shield back plate
- Connect the negative terminal clamp of the ancillary battery.

- Carry out the throttle grip zero position reset procedure.

Switches-Selectors-Buttons

The following components are described in this chapter:

• Lateral switchgear sets



LATERAL SWITCHGEAR SETS

Removal

- Disconnect the negative terminal clamp of the ancillary battery.

- Remove the following components:
 - Rear-view mirror
 - Headlamp bezel
 - Upper handlebar cover
 - Leg shield back plate

- Undo the lower fastener screw of the lateral elec-

tric switchgear set.

- Remove the front protective cover of the switchgear set, disengaging the relative retainer lugs from the seat.





- Undo the upper fastener screw of the lateral electric switchgear set.



- Undo the rear fastener screw of the lateral electric switchgear set.



- Disconnect the electrical connector of the lateral switchgear set.

- Release the electrical connector (1) from the mounting bracket and free the relative section of wiring harness from the retainer clips.

- Remove the lateral switchgear set from its seat.





Refitting

- Fit the lateral switchgear set in its seat.

- Lay out the relative section of wiring harness correctly.

- Fasten the electrical connector (1) to the mounting bracket and secure the relative section of wiring harness with the retainer clips.

- Connect the electrical connector of the lateral switchgear set.



- Tighten the rear fastener screw of the lateral electric switchgear set.



- Tighten the upper fastener screw of the lateral electric switchgear set.



- Fit the front protective cover of the switchgear set, engaging the relative retainer lugs in the seat.



- Tighten the lower fastener screw of the lateral electric switchgear set.

- Fit the following components:
 - Leg shield back plate
 - Upper handlebar cover
 - Headlamp bezel
 - Rear-view mirror

- Connect the negative terminal clamp of the ancillary battery.

Headlight unit

The following components are described in this chapter:



- Front light unit
- Front turn indicator/running light

FRONT LIGHT ASSEMBLY

Removal

- Disconnect the negative terminal clamp of the ancillary battery.

- Remove the following components:

- Rear view mirrors
- Headlamp bezel
- Upper handlebar cover



- Disconnect the electrical connector of the headlamp unit.

Unscrew the screws fastening the headlight from the handlebar support brackets. Remove the headlight.



Refitting

Tighten the screws fastening the headlight to the handlebar support brackets.



- Connect the electrical connector of the headlamp unit.

- Refit the following components:
 - Upper handlebar cover
 - Headlamp bezel
 - Rear view mirrors

- Connect the negative terminal clamp of the ancillary battery.



FRONT TURN INDICATOR/RUNNING LIGHT Removal

- Disconnect the negative terminal clamp of the ancillary battery.

- Remove the following components:
 - Leg shield back plate

- Detach the electrical connector of the front turn indicator/running light from the relative mounting bracket.

- Disconnect the electrical connector of the front turn indicator/running light.



- Remove the front turn indicator/running light from its seat.









Refitting

- Fit the front turn indicator/running light in its seat.



- Tighten the upper fastener screw of the of the front turn indicator/running light.



- Connect the electrical connector of the front turn indicator/running light.



- Fit the electrical connector of the front turn indicator/running light onto the relative mounting bracket.

- Fit the following components:
 - Leg shield back plate

- Connect the negative terminal clamp of the ancillary battery.



FRONT TURN INDICATOR BULB

Removal

- Disconnect the negative terminal clamp of the

ancillary battery.

- Open the front glove compartment.
- Remove the turn indicator bulb access cover.

N.B.

WHEN WORKING ON THE LEFT HAND SIDE OF THE VE-HICLE, UNDO THE UPPER FASTENER SCREW FIRST AND THEN REMOVE THE ACCESS COVER.





- Twist the bulb holder complete with front turn indicator and remove it from its seat.



- Remove the front turn indicator bulb from the bulb holder.



Refitting

Check that the front turn indicator bulb is in working order and replace with a new bulb if necessary.Fit the front turn indicator bulb into the bulb holder.

- Fit the bulb holder complete with front turn indicator bulb in the relative seat.



- Fit the turn indicator bulb access cover.
- Close the front glove compartment.
- Connect the negative terminal clamp of the an-

cillary battery.

N.B.

WHEN WORKING ON THE RIGHT HAND SIDE OF THE VE-HICLE, FIRST FIT THE ACCESS COVER AND THEN TIGHT-EN THE UPPER FASTENER SCREW



FRONT DAYTIME RUNNING LIGHT

Removal

- Disconnect the negative terminal clamp of the ancillary battery.

Remove the following components:

- Leg shield back plate
- Front turn indicator/running light

- Undo the fastener screws and remove the front

daytime running light.

WARNING

THE FRONT DAYTIME RUNNING LIGHT IS A LED UNIT AND CANNOT BE SEPARATED FROM THE TURN INDICA-TOR BULB HOLDER

Refitting

- Fit the front daytime running light in its seat and

tighten the fastener screws.

- Fit the following components:
 - Front turn indicator/running light
 - Leg shield back plate

- Connect the negative terminal clamp of the ancillary battery.

TURN INDICATORS FOR USA-LATAM VERSION

The front turn indicators **«A**» are under the handlebar.







To replace the bulb, proceed as follows:

- undo the transparent glass fixing screw.



- Remove the transparent glass.



In order to remove the bulb, press it slightly and turn anticlockwise.



Tail light unit

The following components are described in this chapter:

- Tail light
- STOP light bulb
- License plate light
- Rear turn indicator
- Rear turn indicator bulb

TAILLIGHT

Removal

- Disconnect the negative terminal clamp of the ancillary battery.

- Working from the rear wheel bay, undo the hand screw (1).



- Detach the tail light unit from its seat without re-

moving it.

N.B.

DISCONNECT THE TWO ELECTRICAL CONNECTORS AT THE BACK OF THE TAIL LIGHT UNIT BEFORE REMOVING THE TAIL LIGHT UNIT ITSELF.





- Disconnect the electrical connector of the brake light.

- Disconnect the electrical connector of the running light/license plate light.



Refitting

- Connect the electrical connectors of the brake light (1) and of the running/license plate light (2).



- Fit the tail light unit in its seat.



- Working from the rear wheel bay, tighten the hand screw (1).

- Connect the negative terminal clamp of the ancillary battery.

PARKING LIGHT BULB

Removal

- Disconnect the negative terminal clamp of the ancillary battery.

- Working from the rear wheel bay, undo the hand screw (1).

- Detach the tail light unit from its seat without removing it.





- Twist the bulb holder (1) and remove it from its seat.
- Remove the position light bulb (2).



Refitting

- Fit the bulb in the bulb holder.
- Fit the complete bulb holder in its seat in the tail light unit.
- Fit the tail light unit in its seat.

- Working from the rear wheel bay, tighten the hand screw (1)

- Connect the negative terminal clamp of the ancillary battery.





LICENSE PLATE LIGHT

Removal

- Disconnect the negative terminal clamp of the ancillary battery.

- Undo the fastener screws of the licence plate light.



- Separate the bulb holder from the licence plate light.



- Remove the licence plate light bulb from the bulb holder.



Refitting

Check that the licence plate light bulb is in working order and replace with a new bulb if necessary.Fit the licence plate light bulb in the bulb holder.

- Fit the complete bulb holder in its seat in the licence plate light.

- Refit the license plate light in its seat and tighten the fastener screws.

- Connect the negative terminal clamp of the ancillary battery.




REAR DIRECTION INDICATORS

Removal

- Undo the fastener screw and remove the rear turn indicator from its seat.

- Separate the bulb holder from the rear turn indicator.



Refitting

- Fit the complete bulb holder in the relative seat in the rear turn indicator.

- Fit the rear turn indicator in its seat and tighten the fastener screw.



REAR TURN INDICATOR BULB

Removal

- Disconnect the negative terminal clamp of the ancillary battery.

- Remove the following components:
 - Rear turn indicator

- Remove the rear turn indicator bulb from the bulb holder.

Refitting

- Check that the rear turn indicator bulb is in working order and replace with a new bulb if necessary.
- Fit the rear turn indicator bulb into the bulb holder.
- Fit the following components:



• Rear turn indicator

- Connect the negative terminal clamp of the ancillary battery.

TURN INDICATORS FOR USA-LATAM VERSION

- To replace the bulb, proceed as follows:
- undo the transparent glass fixing screw.





Ground points

GENERAL OVERVIEW OF VEHICLE



Key

- 1. Front ground point on frame
- 2. Centre ground point on frame
- 3. VMS ground
- 4. Rear ground point on swingarm
- 5. Rear ground point on frame
- 6. Electric motor-swingarm ground

DETAILS OF GROUND POINT LOCATIONS

- 1. Front ground point on frame
- 2. Centre ground point on frame





3. VMS ground



- 4. Rear ground point on swingarm
- 5. Rear ground point on frame



6. Electric motor-swingarm ground



Electric traction system

The following components are described in this chapter:

- Traction battery
- Inverter
- Electric inverter cooling fan
- Charging cable

Traction battery

REMOVAL

- Remove the following components:
 - Ancillary battery
 - VMS cooling fan
 - Rear wheel
 - Leg shield back plate
 - Footrest
 - Electric motor
 - Swingarm

- Lift the saddle and remove the helmet compart-

ment.

- Carry out the following in the compartment under the saddle:

- Disconnect the electrical connector of the diagnostic port (1)
- Cut the cable tie (2) of the diagnostic port wiring harness
- Undo the fastener screw (3) of the right hand electric motor guard



- Undo the fastener screw of the right hand electric motor guard.



- Undo the upper fastener screws of the centre electric motor guard.



- Undo the fastener screws of the right hand electric motor guard.



- Remove the right hand electric motor guard from its seat.



- Undo the fastener screws of the left hand electric motor guard.



- Remove the left hand electric motor guard from its seat.



- Undo the lower fastener screws of the centre electric motor guard.



- Remove the centre electric motor guard.





- Place a lift under the VMS to support the weight of and facilitate removal of the component.

- Working from the compartment under the saddle, undo the upper bolts fastening the traction battery mounting frame.

- Undo the screw fastening the ground cable to the bodyshell.

- With the help of another worker, undo the nut of the bolt fastening the traction battery mounting frame to the vehicle frame.







- Remove the bolt fastening the traction battery mounting frame to the vehicle frame.



2

- Disconnect the electrical connector of the charging plug cable to the V.M.S. (1).

- Detach the connector of the electric motor (3) from the relative fastener bracket.

- Lower the lift further to be able to disconnect the electrical connector of the traction battery control unit.

- Lower the lift to separate the traction battery mounting frame, complete with VMS unit, from the relative seat.





DISASSEMBLY ON WORK BENCH

- Disconnect the negative and positive contacts of the traction battery from the VMS.



- Undo the fastener screw and disconnect the negative cable of the traction battery.







- Undo the fastener nuts of the traction battery retainer bracket.



- Remove the traction battery retainer bracket.



- Remove the traction battery.



- Undo the front fastener screw of the traction battery mounting frame.



- Undo the rear fastener screws of the traction battery mounting frame.



- Separate the traction battery mounting frame from the VMS unit.



REASSEMBLY ON WORK BENCH

- Fit the traction battery mounting frame on the VMS unit.





- Undo the front screw fastening the traction battery mounting frame to the VMS unit.



- Fit the traction battery on the mounting frame.



- Fit the traction battery retainer bracket.



- Tighten the fastener nuts of the traction battery retainer bracket to the specified torque.



- Connect the positive cable of the traction battery and tighten the fastener screw



- Connect the negative cable of the traction battery and tighten the fastener screw.



- Connect the negative and positive contacts of the traction battery to the VMS.

REFITTING

- With the help of another worker, place the traction battery mounting frame, complete with VMS, on the lift.

- Raise the lift to fit the traction battery mounting frame, complete with VMS, in its seat.

- Raise the lift further to be able to connect the electrical connector of the traction battery control unit.





Vespa Elettrica

- Connect the charging plug cable connector to the

V.M.S. (1)

- Secure the connector of the electric motor (3) to the relative fastener bracket.

- Fit the bolt fastening the traction battery mounting frame to the vehicle frame.

- With the help of another worker, tighten the nut of the bolt fastening the traction battery mounting frame to the vehicle frame to the specified torque.

- Lay out the ground cable correctly and tighten the screw fastening the cable to the bodyshell.









- Working from the compartment under the saddle, tighten the upper bolts fastening the traction battery mounting frame to the vehicle frame to the specified torque.

- Remove the lift from under the VMS.





- Fit the centre electric motor guard.



- Tighten the lower fastener screws of the centre electric motor guard.



- Fit the left hand electric motor guard in its seat.



- Tighten the fastener screws of the left hand electric motor guard.



- Fit the right hand electric motor guard in its seat.



- Tighten the fastener screws of the right hand electric motor guard.



- Tighten the upper fastener screws of the centre electric motor guard.



- Tighten the fastener screw of the right hand electric motor guard.



- Carry out the following in the compartment under the saddle:

- Connect the electrical connector of the diagnostic port (1)
- Fit a new cable tie (2) to secure the diagnostic port wiring harness
- Tighten the fastener screw (3) of the right hand electric motor guard
- Fit the helmet compartment and close the saddle.
- Fit the following components:
 - Swingarm
 - Electric motor
 - Footrest
 - Leg shield back plate
 - Rear wheel
 - VMS cooling fan.
 - Ancillary battery



Inverter

V.M.S. (VEHICLES MANAGEMENT SYSTEM)

REMOVAL

- Remove the following components:

- Ancillary battery
- VMS cooling fan.
- Rear wheel
- Leg shield back plate
- Footrest
- Electric motor
- Swingarm

- Lift the saddle and remove the helmet compart-

ment.

- Carry out the following in the compartment under the saddle:

- Disconnect the electrical connector of the diagnostic port (1)
- Cut the cable tie (2) of the diagnostic port wiring harness
- Undo the fastener screw (3) of the right hand electric motor guard

- Undo the fastener screw of the right hand electric motor guard.





- Undo the upper fastener screws of the centre electric motor guard.



- Undo the fastener screws of the right hand electric motor guard.



- Remove the right hand electric motor guard from its seat.



- Undo the fastener screws of the left hand electric motor guard.



- Remove the left hand electric motor guard from its seat.



- Undo the lower fastener screws of the centre electric motor guard.



- Remove the centre electric motor guard.



- Place a lift under the VMS to support the weight of and facilitate removal of the component.



- Working from the compartment under the saddle, undo the upper bolts fastening the traction battery mounting frame.







- With the help of another worker, undo the nut of the bolt fastening the traction battery mounting frame to the vehicle frame.



- Remove the bolt fastening the traction battery mounting frame to the vehicle frame.



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- Disconnect the electrical connector of the charging plug cable to the V.M.S. (1).

- Detach the connector of the electric motor (3) from the relative fastener bracket.

Move back the V.M.S.-traction battery assembly just enough to access the sear of the Main connector of the vehicle wiring harness at the VMS.
Release the sear and disconnect the connector.





CAUTION

N.B.



PAY PARTICULAR ATTENTION WHEN RELEASING THE CONNECTOR, USING A FLAT SCREWDRIVER OF ADE-QUATE SIZE. IT IS NECESSARY TO PULL GENTLY DOWN-WARDS UNTIL HEARING THE SEAR RELEASE SOUND.

- Lower the lift further to be able to disconnect the electrical connector of the traction battery control unit.





- Lower the lift to separate the traction battery mounting frame, complete with VMS unit, from the relative seat.



DISASSEMBLY ON WORK BENCH

- Disconnect the negative and positive contacts of the traction battery from the VMS.



- Undo the fastener screw and disconnect the negative cable of the traction battery.



- Undo the fastener screw and disconnect the positive cable of the traction battery.



- Undo the fastener nuts of the traction battery retainer bracket.



- Remove the traction battery retainer bracket.



- Remove the traction battery.



- Undo the front fastener screw of the traction battery mounting frame.



- Undo the rear fastener screws of the traction battery mounting frame.



- Separate the traction battery mounting frame from the VMS unit.



REASSEMBLY ON WORK BENCH

- Fit the traction battery mounting frame on the VMS unit.



- Undo the rear screws fastening the traction battery mounting frame to the VMS unit.



- Undo the front screw fastening the traction battery mounting frame to the VMS unit.



- Fit the traction battery on the mounting frame.



- Fit the traction battery retainer bracket.



- Tighten the fastener nuts of the traction battery retainer bracket to the specified torque.



- Connect the positive cable of the traction battery and tighten the fastener screw



- Connect the negative cable of the traction battery and tighten the fastener screw.





REFITTING

- With the help of another worker, place the traction battery mounting frame, complete with VMS, on the lift.

- Raise the lift to fit the traction battery mounting frame, complete with VMS, in its seat.



- Raise the lift further to be able to connect the electrical connector of the traction battery control unit.

- Fit the bolt fastening the traction battery mounting frame to the vehicle frame.

- With the help of another worker, tighten the nut of the bolt fastening the traction battery mounting frame to the vehicle frame to the specified torque.

- Lay out the ground cable correctly and tighten the screw fastening the cable to the bodyshell.







- Working from the compartment under the saddle, tighten the upper bolts fastening the traction battery mounting frame to the vehicle frame to the specified torque.

- Remove the lift from under the VMS.





- Fit the centre electric motor guard.



- Tighten the lower fastener screws of the centre electric motor guard.



- Fit the left hand electric motor guard in its seat.



- Tighten the fastener screws of the left hand electric motor guard.



- Bring the V.M.S.-traction battery assembly into

place and connect the main connector of the ve-

hicle's wiring harness to the VMS.

WARNING

N.B.

WHEN CONNECTING THE CONNECTOR PUSH UNTIL THE END UNTIL THE SEAR LOCKING SOUND IS HEARD. FAIL-URE TO OBSERVE THIS REQUIREMENT COULD LEAD TO MALFUNCTION AND / OR THE UNEXPECTED STOP OF THE VEHICLE WHILE DRIVING.

- Connect the charging plug cable connector to the

V.M.S. (1)

- Secure the connector of the electric motor (3) to

the relative fastener bracket.





- Fit the right hand electric motor guard in its seat.



- Tighten the fastener screws of the right hand electric motor guard.



- Tighten the upper fastener screws of the centre electric motor guard.



- Tighten the fastener screw of the right hand electric motor guard.



- Carry out the following in the compartment under the saddle:

- Connect the electrical connector of the diagnostic port (1)
- Fit a new cable tie (2) to secure the diagnostic port wiring harness
- Tighten the fastener screw (3) of the right hand electric motor guard
- Fit the helmet compartment and close the saddle.
- Fit the following components:
 - Swingarm
 - Electric motor
 - Footrest
 - Leg shield back plate
 - Rear wheel
 - VMS cooling fan.
 - Ancillary battery

Inverter cooling fan

REMOVAL

- Undo the fastener screw of the VMS access cov-

er



- Remove the VMS access cover





- Disconnect the electrical connector of the cooling fan.



- Undo the fastener screws of the cooling fan.



- Push the cable of the cooling fan along the left hand side of the swingarm in the direction indicated by the arrow.



- Remove the connector of the cooling fan cable.



REFITTING

- Push the connector of the cooling fan into the space between the swingarm and the VMS.

- Push the connector of the cooling fan cable along in the direction indicated by the arrow and fit it in the correct seat.





- Tighten the fastener screws of the cooling fan.



- Connect the electrical connector of the cooling fan.



- Fit the VMS access cover



- Tighten the fastener screw of the VMS access cover



Charging cable

REMOVAL

- Remove the following components:
 - Ancillary battery
 - Leg shield back plate
 - Footrest
 - Taillight
 - Rear wheel
- Lift the saddle and remove the protective cover of the charging plug.

- Undo the fastener screws of the rear undersaddle compartment cover.




- Remove the rear undersaddle compartment cov-

er.

WARNING

THERE ARE ELECTRICAL CONNECTORS UNDER THE COVER.



- Disconnect the electrical connector of the emer-

gency power on switch.



- Disconnect the electrical connector of the mains charge plug stowed position switch.



- Undo the fastener screw of the charging plug cable holder, situated in the tail light recess.



- Undo the upper fastener screw of the charging plug cable holder.



- Undo the fastener screw of the charging plug cable holder, situated in the compartment under the saddle.





- Free the wiring harness of the charging plug cable from the retainer clips.
- Remove the holder complete with charging plug cable via the rear wheel bay.



REFITTING

- Fit the charging plug cable holder in its seat from the right hand side of the rear wheel bay.

- Lay out the wiring harness of the charging plug cable correctly, securing it to the relative retainer clips.

- Connect the electrical connector of the charging plug cable on the VMS side.

- Tighten the fastener screw of the charging plug cable holder, situated in the compartment under the saddle.

- Tighten the upper fastener screw of the charging plug cable holder.









- Tighten the fastener screw of the charging plug 11 cable holder, situated in the tail light recess. - Connect the electrical connector of the mains charge plug stowed position switch. - Connect the electrical connector of the emergency power on switch. - Carefully refit the rear undersaddle compartment cover in its seat.

- Tighten the fastener screws of the rear undersaddle compartment cover.



- Fit the protective cover of the charging plug and close the saddle.

- Fit the following components:
 - Rear wheel
 - Taillight
 - Footrest
 - Leg shield back plate
 - Ancillary battery





CHARGING PLUGS - VESPA ELETTRICA

| Country | Type of charging plug / adapter | Drawing / Code |
|---------|--|---|
| ITALY | Integrated Scame 3A plug + Schuko adapter | Code 1D001863 + electrical ADAPTER code 641893 for domestic |
| | | use only |
| EUROPE | Integrated Schuko plug with retaining ring | Code 1D002772 - Electrical adapter not provided |
| UK | Integrated BS1363/A plug with retaining ring | Code 1D002921 - Electrical adapter not provided |
| | | |

| Country | Type of charging plug / adapter | Drawing / Code |
|------------------|---|---|
| USA - Int CAN | tegrated NEMA 5-15 plug with retaining ring | Code 1D002833 - Electrical adapter not provided |

Electrical system installation

The layouts of the following wiring harnesses/cables are illustrated in this chapter:

- Main wiring harness
- V.M.S. ground cable (Vehicle Management System)
- Frame-bodyshell ground cable
- Electric traction motor wiring harness

The locations of the relative fastener points on the bodyshell and/or frame (with cable ties and/or clips)

are also illustrated.

WARNING

FOR CLARITY, CERTAIN SYSTEM COMPONENTS AND/OR MECHANICAL/ELECTRICAL PARTS MAY NOT BE DEPICTED IN THE LAYOUTS.

MAIN WIRING HARNESS



- 1. Saddle release switch
- 2. Ignition switch
- 3. Junction with LH switchgear set
- 4. Headlight
- 5. Instrument cluster

6. Junction with RH switchgear set



- 1. LH front turn indicator/running light
- 2. Blinker
- 3. Horn



- 1. Secondary fuse holder unit
- 2. RH front turn indicator/running light
- 3. Immobilizer antenna
- 4. air temperature sensor
- 5. Bike Finder
- 6. Throttle grip position sensor
- 7. Buzzer



- 1. USB port
- 2. Front ground point on bodyshell
- 3. Ancillary battery negative terminal clamp
- 4. Ancillary battery positive terminal clamp
- 5. Main fuses
- 6. Provision for side stand
- 7. V.M.P. (Vespa Multimedia Platform)
- 8. Saddle opening actuator



- 1. Tracking device (if installed)
- 2. Motor phase sensor connector
- 3. V.M.S. (Vehicle Management System)
- 4. Electric cooling fan connector
- 5. Engine temperature sensor connector



- 1. B.M.S. (Battery Management System)
- 2. Diagnostic port



- **1.** Charge plug stowed position button
- **2.** Emergency power on button (if available)



Key

- 1. Licence plate light
- 2. Rear right turn indicator
- **3.** Tail light (rear running light)
- 4. Tail light (brake light)
- 5. Rear left turn indicator

V.M.S. GROUND CABLE (VEHICLE MANAGEMENT SYSTEM)



- 1. Ground cable fastening point on V.M.S. (Vehicle Management System)
- 2. Ground fastener point on bodyshell

FRAME-BODYSHELL GROUND CABLE



- 1. Ground fastener point on swingarm
- 2. Ground fastener point on bodyshell

ELECTRIC TRACTION MOTOR WIRING HARNESS



- 1. Electric traction motor
- 2. Motor phase sensor
- 3. Engine temperature sensor

Checks and inspections

The following components are described in this chapter:

- Immobilizer
- Lighting system
- Fuses
- Sealed battery
- Battery installation

Immobiliser

DESCRIPTION

The vehicle is equipped with the PIAGGIO IMMOBILIZER system, which is automatically armed, disabling the motor, each time the ignition key is removed from the switch.

When the user starts the vehicle, the PIAGGIO IMMOBILIZER system queries the key transponder only permits vehicle starting if the key is recognised correctly.

The entire system is managed by the instrument cluster, while the code is stored in the transponder integrated in the key fob. This allows the driver clear operation without having to do anything other than just turning the key.

The PIAGGIO IMMOBILIZER system consists of the following:

- Instrument cluster;
- Immobilizer antenna
- MASTER key and service key with integrated transponder;
- Diagnostic LED (on instrument cluster).

A specific indicator lamp flashes on the instrument panel to indicate that the PIAGGIO IMMOBILIZER system is armed.

So the battery does not run down, the signalling led turns off automatically when it has been working for forty-eight hours non-stop.

If there is a fault in the system, the indication led tells the Authorised Service Centre what the type of fault is through the type of flashing emitted.

IGNITION KEYS

Each vehicle comes with two keys:

- A MASTER key (brown fob): only one of these keys is provided to the user. This key is necessary for storing the codes of other keys in the system and to allow maintenance and repair work performed by a dealer.
- Service key (blue fob): only one of these keys is provided to the user. This is the key used normally to start the vehicle.

FUNCTIONS OF SYSTEM

Each time the ignition key is removed while in the "CLOSE" or "LOCK" position, the protection system engages the immobiliser.

Turning the key to "ON" disables the engine lock, provided that the protection system recognises the code transmitted by the key.

PROGRAMMING THE SYSTEM

- 1. From the "CLOSE" position, insert the "MASTER" key and turn it to the "ON" position. Leave the key in this position for 1 to 3 seconds, then turn it to the "CLOSE" position and remove it.
- 2. After having removed the "MASTER" key, insert the secondary key to be programmed within 10 seconds, and immediately turn it to the "ON" position. Leave the key in this position for 1 to 3 seconds, then turn it to the "CLOSE" position and remove it. Repeat this procedure as necessary, completing each step within the time limits indicated, to store up to 3 keys.
- 3. After removing the key to be stored in the system memory, insert the MASTER key in the ignition switch again and turn to ON with 10 seconds of removing the previous key. Leave the key in this position for 1 to 3 seconds, then turn it to the "CLOSE" position and remove it.

To check if the programming procedure has been completed successfully, insert the MASTER key with the transponder "C" deactivated (by turning the cover cap of the key by 90°), and turn the key to "ON".

Perform the engine starter operation. Ensure that the engine does not start. Insert a programmed key and repeat the start manoeuvre. Check that motor starts.

Lights list

BULBS

In this section are listed the bulb types for the vehicle fitting.



BULBS

| | Specification | Desc./Quantity |
|---|-----------------------------------|----------------------------------|
| 1 | High beam / low beam bulb | Type: LED |
| | | Quantity: 2 |
| 2 | Front daylight running light bulb | Type: LED |
| | | Quantity: 2 |
| 3 | Stop light bulb | Type: LED |
| | | Quantity: 1 |
| 4 | rear daylight running light bulb | Type: incandescent |
| | | Power: 12V - 10W |
| | | Quantity: 1 |
| 5 | Licence plate light bulb | Type: incandescent |
| | | Power: 12V - 5W |
| | | Quantity: 1 |
| 6 | Front indicator light bulb | Type: Halogen, BAZ9s base, amber |
| | | Power: 12V - 6W |
| | | Quantity: 1 RH + 1 LH |
| 7 | Rear indicator light bulb | Type: Halogen, BAZ9s base, amber |
| | | Power: 12V - 6W |
| | | Quantity: 1 RH + 1 LH |
| | | |

Fuses

MAIN FUSES

The electrical system has 2 main fuses "A", loca-

ted inside the battery compartment.

WARNING

BEFORE REPLACING THE FUSE IT IS NECESSARY TO FIND AND SOLVE THE FAILURE THAT CAUSED IT TO BLOW.

DO NOT REPLACE THE FUSE WITH ANY ALTERNATIVE FORM OF CONDUCTOR.

MODIFICATIONS OR REPAIRS TO THE ELECTRICAL SYS-TEM, PERFORMED INCORRECTLY OR WITHOUT STRICT ATTENTION TO THE TECHNICAL SPECIFICATIONS OF THE SYSTEM CAN CAUSE MALFUNCTIONING AND RISK OF FIRE.



The location and characteristics of the 2 main fuses installed on the vehicle are indicated in the table.



MAIN FUSES TABLE

| | Specification | Desc./Quantity |
|---|---------------|--|
| 1 | Fuse No. 1 | Capacity: 15A |
| | | Power feed: direct from battery. |
| | | Protected circuits: Key-on contact, bike finder, tracker |
| | | (if installed), instrument cluster, diagnostic port. |
| 2 | Fuse no. 2 | Capacity: 10A |
| | | Power feed: direct from battery. |
| | | Protected circuits: VMS - Vehicle Management Sys- |

SECONDARY FUSES

The electrical system is equipped with 4 secon-

dary fuses "B" located in the glove compartment.

WARNING

BEFORE REPLACING THE FUSE IT IS NECESSARY TO FIND AND SOLVE THE FAILURE THAT CAUSED IT TO BLOW.

DO NOT REPLACE THE FUSE WITH ANY ALTERNATIVE FORM OF CONDUCTOR.

MODIFICATIONS OR REPAIRS TO THE ELECTRICAL SYS-TEM, PERFORMED INCORRECTLY OR WITHOUT STRICT ATTENTION TO THE TECHNICAL SPECIFICATIONS OF THE SYSTEM CAN CAUSE MALFUNCTIONING AND RISK OF FIRE.

The location and characteristics of the 4 secon-

dary fuses installed on the vehicle are indicated in

the table.





SECONDARY FUSES TABLE

| | Specification | Desc./Quantity |
|---|---------------|--|
| 1 | Fuse no. 3 | Capacity: 7.5 A |
| | | Power feed: Key-on. |
| | | Protected circuits: Turn indicator flasher unit, VMP |
| | | (Vespa Multimedia Platform), bike finder, horn, USB |
| | | port, brake signal buttons, audible warning signal (buz- |
| | | zer), tracking device (if installed), diagnostic port. |
| 2 | Fuse 4 | Capacity: 4 A |
| | | |

| | Specification | Desc./Quantity |
|---|---------------|---|
| | | Power feed: Key-on. |
| | | Protected circuits: Headlight selector (low beam/high |
| | | beam function). |
| 3 | Fuse No. 5 | Capacity: 3 A |
| | | Power feed: Key-on. |
| | | Protected circuits: Right and left hand front daytime |
| | | running lights, tail light, licence plate light. |
| 4 | Fuse No. 6 | Capacity: 3 A |
| | | Power feed: Key-on. |
| | | Protected circuits: VMS - Vehicle Management Sys- |
| | | tem. |

Sealed battery

If the vehicle is provided with a sealed battery, the only maintenance required is the check of its charge and recharging, if necessary.

These operations should be carried out before delivering the vehicle, and on a six-month basis while the vehicle is stored in open circuit.

Besides upon pre-delivery it is therefore necessary to check the battery charge and recharge it, if required, before storing the vehicle and afterwards every six months.

INSTRUCTIONS FOR BATTERY REFRESH AFTER OPEN CIRCUIT STORAGE

1) Voltage check

Before installing the battery on the vehicle, check the open circuit voltage with a standard tester.

- If voltage exceeds 12.60 V, the battery can be installed without any renewal recharge.

- If voltage is below 12.60 V, a renewal recharge is required as explained in 2).

2) Constant voltage battery charge mode

- Constant voltage charge equal to 14.40 - 14.70V

- Initial charge voltage equal to 0.3 - 0.5 for Nominal capacity

- Charge time:

10 - 12 h recommended

Minimum 6 h

Maximum 24 h

3) Constant current battery charge mode

- Charge current equal to 1/10 of the battery rated capacity
- Charge time: Maximum 5 h

Battery installation

VRLA battery (valve-regulated lead-acid battery) Maintenance Free (MF)

WARNING

BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SUL-PHURIC ACID. AVOID CONTACT WITH EYES, SKIN AND CLOTHING. IF IT ACCIDENTALLY COMES INTO CONTACT WITH YOUR EYES OR SKIN, WASH WITH ABUNDANT WATER FOR APPROX. 15 MIN. AND SEEK IMMEDIATE MEDICAL ATTENTION. IN THE EVENT OF ACCIDENTAL INGESTION OF THE LIQUID, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR MILK. MAGNESIUM MILK, BATTERED EGG OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.

BATTERIES PRODUCE EXPLOSIVE GAS; KEEP CLEAR OF NAKED FLAMES, SPARKS OR CIG-ARETTES; VENTILATE THE AREA WHEN RECHARGING INDOORS.

ALWAYS WEAR EYE PROTECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES. KEEP OUT OF THE REACH OF CHILDREN.

1) Battery preparation

Position the battery on a flat surface. Remove the adhesive sheet closing cells and proceed as quickly as possible to run the subsequent activation phases.



2) Electrolyte preparation.

Remove the container of the electrolyte from the pack. Remove and preserve cover strips from the container, in fact, the strip will later be used as a closing cover.

Note: Do not pierce the sealing of the container or the container itself because inside there is sulphuric acid.

3) Procedure for filling the battery with acid.

Position the electrolyte container upside down with the six areas sealed in line with the six battery filler holes. Push the container down with enough force to break the seals. The electrolyte should start to flow inside the battery.

Note: Do not tilt the container to prevent the flow of electrolyte from pausing or stopping.

4) Control the flow of electrolyte

Make sure air bubbles are rising from all six filling holes. Leave the container in this position for 20 minutes or more.

Note: If there are no air bubbles coming out of the filling holes, lightly tap the bottom of the container two or three times. Do not remove the container from the battery.

5) Take out the container.

Make sure all the electrolyte in the battery is drained. Gently tap the bottom of the container if electrolyte remains in the container. Only once the container is completely empty, gently remove the container





itself from the battery. Leave the battery to rest, without sealing the six cells, for at least 1 hour before charging.

6) Recharging the new battery

With the above-mentioned procedure, the battery will have gained around 70% - 75% of its total electrical capacity. Before installing the battery on the vehicle, it must be fully charged and then must be recharged.

If the battery is to be installed on the vehicle prior to this pre-charged one, the battery will not be able to exceed 75% charge without jeopardising its useful life on vehicle.

The dry charge battery MF like the completely loaded YTX, must have a zero load voltage between 12.8 - 13.15 V Bring the battery to full charge, using the 020648Y battery charger:

a - select the type of battery with the red switch onthe left of the panel battery charger panelb - select NEW on the yellow timer

c - connect the clamps of the battery charger to the battery poles (black clamp to negative pole (-) and red clamp to positive pole (+)).

d - Press the red button, as shown in figure.





e - Press the "MF" black button to activate the battery recharge **Maintenance Free** as shown in figure.

f - Check the ignition of the green LED indicated with a red arrow in figure.

g - The activation cycle of the new battery lasts for30 minutes after the ignition of the recharge LEDhas taken place

h - Disconnect the clamps from the battery and check the voltage, if voltages are detected of less than 12.8 V, proceed with a new recharge of the battery starting from point c of the recharge procedure of **the new battery**, otherwise go to point i

i - The battery is now properly activated, disconnect the battery charger from the power supply and unplug the terminals from the battery.

7) Battery closing.

Insert the airtight cover strips into the filling holes.

Press horizontally with both hands and make sure that the strip is levelled with the top part of the battery.





Θ



BatteryMate 150

Note: To do this, do not use sharp objects that could damage the closing strip, use gloves to protect your hands and do not bring your face close to the battery.

The filling process is now complete.

Do not remove the strip of caps under any circumstances, do not add water or electrolyte.

Assembly procedure of the battery on the vehicle.

Connectors

The list, in alphabetical order, of the vehicle's electrical components is provided below:

- Immobilizer antenna
- Saddle opening actuator
- (Battery Management System)
- Bike Finder
- Blinker
- Secondary fuse holder unit
- Horn
- Ignition switch
- Diode
- RH switchgear set
- LH switchgear set
- Tracking device (if installed)
- Electric cooling fan
- Taillight
- Main fuses
- Instrument cluster
- RH front turn indicator and running light
- LH front turn indicator and running light
- Rear right turn indicator
- Rear left turn indicator
- Licence plate light
- Front ground point on bodyshell
- Electric motor
- Battery negative
- Battery positive
- Provision for side stand
- Diagnostic port
- Charge plug
- USB port

- Headlight
- Emergency power on button (where present)
- Saddle release switch
- Charge plug stowed position button
- Motor phase sensor
- Throttle grip position sensor
- air temperature sensor
- Engine temperature sensor
- Buzzer
- VMP (Vespa Multimedia Platform)
- VMS (Vehicle Management System);

Immobilizer antenna (valid until October 2019)

1. (Pink/Red) - Power feed input from instrument cluster

2. Not connected

3. (Pink/Black) - Reference ground from instru-

ment cluster

Immobilizer antenna (from October 2019)

1. (Pink/Red) - Power feed input from instrument cluster

2. (Pink/Black) - Reference ground from instrument cluster

Saddle opening actuator

- 1. (Black) Ground
- 2. (Blue/Black) (+) signal input from saddle re-

lease button







(Battery Management System)

- 1. (Yellow/White) Charge signal
- 2. (Yellow/Grey) (-) signal input from emergency

power on button (if present)

- 2. (Yellow/Grey) (-) signal output for VMS.
- 3. Not connected
- 4. Not connected
- 5. (Orange/Blue) Power ground
- 6. (Green/Grey) CAN L line
- 7. (Black) PN1_CFG signal
- 8. (Black) PN2_CFG signal
- 9. (Black) PN3_CFG signal
- 10. (Black) GND_BATT signal
- 11. Not connected
- 12. (Green/Blue) CAN H line

Bike Finder

1. (Orange/Blue) - Battery power input from fuse F01

- 2. (White) Key-on power input from fuse F03
- 3. (Black) Ground
- 4. (Pink) Saddle release command signal
- 5. (Blue/Black) Left hand turn indicator signal
- 6. (White/Blue) Right hand turn indicator signal

Blinker

- L. (Blue/Black) Signal output for left hand switchgear set (for turn indicators)
- **B.** (White/Green) Key-on power input from fuse F03



Secondary fuse holder unit

- 1. (Orange) Key-on power input for fuse F03
- 2. (Orange) Key-on power input for fuse F04
- 3. (Orange) Key-on power input for fuse F05
- 4. (Orange) Key-on power input for fuse F06
- 5. Not connected
- 6. Not connected







- 7. (White) Key-on power output from fuse F03
- 8. (Grey) Key-on power output from fuse F04

9. (Yellow/Black) - Key-on power output from fuse F05

10. (White/Red) - Key-on power output from fuse

F06

- 11. Not connected
- 12. Not connected

Horn

1. (Black) - Ground

| Horn |
|------|
|------|

1. (Grey/Black) - Horn command signal (+) input



1. (Orange/Blue) - Battery power input (from fuse F01)

2. Not connected

3. (White/Blue) - Key-on power feed output for

saddle release button

4. (Orange/Blue) - Battery power input (from fuse F01)

5. (Orange) - Key-on power feed output for fuse holder unit



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Diode

Anode (White) - Key-on power input (from fuse F03)



Cathode (White/Green) - Key-on power for flasher unit

RH switchgear set

- 1. (White) Key-on power feed input (brake light)
- **2.** (White/Black) Brake light command signal (+) output
- 3. (Orange/Blue) Ground (RUN/STOP function)
- **4.** (Orange) (-) signal output for VMS (RUN/STOP function)
- 5. Not connected
- **6.** (Light blue/Black) (-) signal output for instrument cluster from mode button
- 7. (Black) Ground
- **8.** (Green/Black) (-) signal output for instrument cluster from right select button
- 9. (Purple/Black) (-) signal output for instrument
- cluster from left select button
- **10.** (Brown/Black) (-) signal output for instrument cluster from confirm button

LH switchgear set

- 1. (Purple) High beam command signal (+) output
- 2. (Brown) Low beam command signal (+) output
- 3. (Grey/Black) Horn command signal (+) output
- **4.** (White) Key-on power feed input (horn and brake light)
- 5. (Grey) Key-on power feed input (low beam headlight)
- **6.** (Grey) Key-on power feed input (high beam headlight)
- **7.** (White/Blue) Right hand turn indicator command signal output





8. (Blue/Black) - Power feed input from flasher

(turn indicators)

9. (Pink) - LH side turn indicator command signal output

10. (White/Black) - Brake light command signal (+) output

Tracking device (if installed)

(Orange/Blue) - Battery power input from fuse
F01

- 2. (Black) Ground
- 3. (White) Key-on power input from fuse F03

Electric cooling fan

- 1. (Blue/Red) Power feed input from VMS.
- 2. (Blue/Black) Reference ground from VMS.





Tail light (brake light)

1. (Black) - Ground

2. (White/Black) - Brake light command signal (+) input

Tail light (rear running light)

1. (Yellow/Black) - Key-on power input from fuse F05

2. (Black) - Ground



13. Not connected

signal (+) input

selector button

VMS.

14. (Purple) - High beam indicator lamp command

15. (Light blue/Black) - (-) signal input from mode

16. (White/Red) - Key-on power feed input from

Main fuse 1. (Red) - Battery power input 2. (Orange/Blue) - Battery power output from fuse F01 2 1 Main fuse 1. (Red) - Battery power input 2. (Red/Black) - Battery power output from fuse F02 2 1 Instrument cluster 1. Not connected 2. (Pink/Red) - Immobilizer antenna power feed 103050709 0000000 3. (Pink/Black) - Reference ground for immobilizer ®000000 antenna 300000003 4. Not connected 5. (Yellow/Red) - Signal input from air temperature sensor 6. Not connected 7. Not connected 8. Not connected 9. (Orange/Blue) - Battery power input from fuse F01 10. Not connected 11. Not connected 12. (Green/Black) - (-) signal input from right select button (on right hand switchgear set)

17. Not connected

18. Not connected

19. (White/Blue) - Right hand turn signal indicator

lamp command signal input

20. (Pink) - Left hand turn signal indicator lamp

command signal input

21. Not connected

22. (Purple/Black) - (-) signal input from left select

button (on left hand switchgear set)

23. (Brown/Black) - (-) signal input from confirm button

- 24. (Black) Ground
- 25. Not connected
- 26. Not connected
- 27. Not connected
- 28. Not connected
- 29.Not connected
- 30. Not connected
- 31. Not connected
- 32. (Green/Grey) CAN L line
- 33. (Green/Blue) CAN H line
- 34. Not connected

LH front turn indicator and running light

1. (Yellow/Black) - Key-on power feed for running light command

- 2. (BLACK) Ground
- 3. (Pink) Turn indicator command signal input

RH front turn indicator and running light

1. (Yellow/Black) - Key-on power feed for running light command

2. (BLACK) - Ground

3. (White/Blue) - Turn indicator command signal input





Rear right turn indicator 1. (White/Blue) - Turn indicator command signal (+) input 2. (BLACK) - Ground Rear left turn indicator 1. (Pink) - Turn indicator command signal (+) input 2. (BLACK) - Ground Licence plate light 1. (Yellow/Black) - License plate light command signal (+) input 2. (Black) - Ground 2 Front ground point on bodyshell 1. (Black) - Front ground point on bodyshell **Electric motor** 1. (Red) - "U" phase 2. (Nero) - Star point 3. (Blue) - "V" phase

4. (Yellow) - "W" phase



Battery negative 1. (Black) - Ancillary battery negative terminal clamp **Battery positive** 1. (Red) - Ancillary battery positive terminal clamp Provision for side stand 1. (Orange/Blue) - Ground 2. (Brown) - (-) signal output for VMS. **Diagnostic port** 1. (Green/Blue) - CAN H line 2. (Green/Grey) - CAN L line 3. (White) - Key-on power feed input from fuse 2 5 4 3 F03</strong (WHITE) - Key-on power feed input

- from fuse F03
- 4. (Black) Ground
- **5.** (Orange/Blue) Battery power input from fuse F01

Diagnostic port (FOR EURO 5 VERSION)

- 1. (White) Key-on power input from fuse F03
- 2. (Green/Blue) CAN H line
- 3. (Black) Ground
- **4.** (Orange/Blue) Battery power input from fuse F01
- 5. (Green/Grey) CAN L line



Charge plug

L. (Brown/Blue - Brown, for Euro 5 version) -

Phase

N.(Light blue) - Neutral

E.(Yellow/Green) - Ground

P. (White/Black) - Pilot

USB port

1. (White) - Key-on power input from fuse F03

2. (Black) - Ground





2

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Headlight

1. (Brown) - Low beam command signal (+) input

2. (Purple) - High beam light command signal (+) input

3. (Black) - Ground

Emergency power on button (where present)

1. (Nero) - (-) signal input from 48V battery

2. (Yellow/Grey) - (-) signal output for VMS and48V battery



Saddle release switch

- 1. (White/Blue) Key-on power feed input
- 2. (Blue/Black) Saddle release signal (+) output



Charge plug stowed position button

1. (Light blue/Blue - Orange/Blue, for Euro 5 version) - Ground

2. (Grey) - (-) signal output for VMS.

Motor phase sensor

- 1. (Pink/Red) Power feed input from VMS.
- 2. (Pink/Black) Reference ground from VMS.
- 3. (Pink/Brown) Ground from VMS.
- 4. Not connected
- 5. (Pink/White) COS signal (-) output for VMS.
- 6. (Pink/Green) SIN signal (-) output for VMS.

Throttle grip position sensor

- A. (Brown/Red) Power feed input from VMS for
- SLAVE A potentiometer
- B. (Brown/Black) Reference ground from VMS
- for SLAVE A potentiometer
- C. (Brown/Yellow) Signal output for VMS from
- SLAVE A potentiometer
- D. (Brown/Red) Power feed input from VMS for
- SLAVE B potentiometer
- E. (Brown/Black) Reference ground from VMS for
- SLAVE B potentiometer
- F. (Brown/White) Signal output for VMS from
- SLAVE B potentiometer

Throttle grip position sensor

- A. (Light blue/Red) Power feed input from VMS
- for MASTER A potentiometer
- B. (Light blue/Black) Reference ground from
- VMS for MASTER A potentiometer
- C. (Light blue/Yellow) Signal output for VMS from
- MASTER A potentiometer
- D. (Light blue/Red) Power feed input from VMS
- for MASTER B potentiometer







E. (Light blue/Black) - Reference ground from

VMS for MASTER B potentiometer

F. (Light blue/White) - Signal output for VMS from

MASTER B potentiometer



VMP (Vespa Multimedia Platform)

- 1. (White) Key-on power input from fuse F03
- 2. (Black) Ground
- 3. (Green/Blue) CAN H line
- 4. (Green/Grey) CAN L line
- 5. Not connected
- 6. Not connected
- 7. (White/Blue) Right hand turn indicator signal
- 8. (Pink) Left turn indicator signal

VMS (Vehicle Management System);

- 1. (Black) Power ground
- 2. (White/Red) Key-on power input from fuse F06
- 3. (Light blue/Red) Power feed for MASTER
- throttle position sensors A-B
- 4. (Green/Blue) CAN H line
- 5. (Orange/Blue) Power ground
- 6. (Brown/Black) Reference ground for SLAVE
- throttle position sensors A-B

7. (Brown/Yellow) - Signal input from SLAVE throt-

tle position sensor A

8. (Brown/White) - Signal input from SLAVE throt-

tle position sensor B

9. (Orange) - (-) signal input from RUN/STOP button

10. (Grey) - (-) signal input from mains charging plug button

11. (Blue/Red) - Power feed for electric fan

- **12.** (Grey/White) Buzzer command signal (-) output
- 13. (Black) Power ground

14. (Brown/Red) - Power feed for SLAVE throttle position sensors A-B

15. (Green/Grey) - CAN L line

16. (Light blue/Black) - Reference ground for MAS-

TER throttle position sensors A-B

17. Not connected




18. (Pink/Red) - Power feed for motor phase sensor 19. (Pink/Black) - Reference ground for motor phase sensor 20. (White/Red) - Power feed for instrument cluster 21. (Pink/White) - COS signal input from motor phase sensor 22. (Pink/Green) - SIN signal input from motor phase sensor 23. (Yellow/Grey) - (-) signal input from emergency power on button (if present) 23. (Yellow/Grey) - Signal input from battery 48V 24. (Red/Black) - Ancillary battery charge power output 24. FOR EURO 5 VERSION (Red/Black) - Battery power supply input from fuse F02 25. (Red/Black) - Ancillary battery charge power output 25. FOR EURO 5 VERSION (Red/Black) - Battery power supply input from fuse F02 26. (Yellow/White) - Charge signal 27. (Light blue/Yellow) - Signal input from MAS-TER throttle position sensor A 28. (Light blue/White) - Signal input from MASTER throttle position sensor B 29. (Pink/Brown) - Ground for motor phase sensor 30. (Yellow/Red) - Power feed for motor temperature sensor 31. (Yellow/Black) - Reference ground for motor temperature sensor 32. (Green/Blue) - CAN L line 33. (Green/Grey) - CAN H line 34. (Brown) - (-) signal input from side stand connector (provision)

35. (Blue/Black) - Ground for electric fan

VMS (Vehicle Management System);

- 1. (Brown/Blue) Phase (L)
- 2. (Light blue) Neutral (N)
- 3. (Yellow/Green) Ground (E)
- 4. (White/Black) Pilot (P)

Remote seat opening

The vehicle is equipped with a remote control to open the saddle and for the recognition of the vehicle itself.

This remote control is supplied together with the keys and it has been programmed to control the opening device control unit at the manufacturing stage. If the remote control is lost, a new one can be requested and programmed.

- By pressing the buttons «1» or «2» of the remote control for about 3 seconds, the «Bike Finder» device will allow the opening at a distance of the saddle and the recognition of the vehicle with an optical signal by flashing the turn indicator. While holding one of the two buttons, the system will continue to repeat the operation described above until the button is released.
- By instead pressing the buttons «3» or «4» of the remote control, the «Bike Finder» device will be only activated for the recognition of the vehicle by emitting quick optical signals through the turn indicator.

The remote control is powered by internal batteries that get discharged after extended used; If the LED turns on when the button is pressed, the remote control is working properly.



You may need to replace the batteries if the remote control fails or if its range of operation is reduced. To separate the two halves of the remote control, insert the blade of a plain slot screwdriver at one point on the edge and slide it all around. Once the remote control is open, remove the two batteries from the contact terminal. Install the two new **CR2016** batteries with the positive pole facing the contact terminal. Reassemble the remote control by pressing the two clip-on halves gently with your fingers.

Programming

To program the new radio commands, do the following:

- 1. disconnect the battery of the vehicle;
- 2. reconnect the battery of the vehicle;
- within 5 seconds of reconnecting the battery, simultaneously press buttons "1" and "3" on the remote control twice. the «Bike Finder» device will confirm the process with an optical signal by the quick flashing of the turn indicator;
- the programming of the new radio command generates the end of the procedure and the system is ready for use.

If it is necessary to erase a radio command from the memory of the device, it will be necessary to repeat the programming 4 times even with the same remote control, in order to recover the 4 provided memories.



TO STORE THE OTHER REMOTE CONTROLS TO MEMO-RY (4 MAXIMUM) YOU NEED TO REPEAT THE WHOLE PROCEDURE AGAIN. FAILURE TO CARRY OUT THESE OPERATIONS WITHIN THE INDICATED TIMES WILL RE-SULT IN THE REMOTE-CONTROL UNIT KEY PROGRAM-MING PROCEDURE BEING ABANDONED AUTOMATICAL-



LY. STORING A FIFTH REMOTE CONTROL MAY LEAD TO CANCELLATION OF THE FIRST ONE.



DO NOT KEEP THE REMOTE CONTROL IN PLACES WITH TEMPERATURES EXCEEDING 60° C: THE BATTERY WILL RUN DOWN TOO QUICKLY.

CAUTION



TO AVOID BATTERY DISCHARGE, THE SADDLE OPEN-ING REMOTE CONTROL RADIO RECEIVER DEACTIVATES 3 MINUTES AFTER THE LAST RECEIPT. TO RESTORE FUNCTIONS SIMPLY PRESS THE ACTIVATION BUTTON ON THE REMOTE CONTROL FOR ABOUT 3 SECONDS, AS DESCRIBED ABOVE.

Diagnostic instrument

ELECTRIC MACHINE TIMING

At the end of each operation performed on the electric machine it is necessary to perform the reset and new timing operation.

- Put the vehicle on the stand and make sure that the rear wheel can rotate freely.

- Lift the saddle and remove the helmet compartment.

- Remove the diagnostic socket from the housing.





- Make sure that the key is turned to "OFF".





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- Turn the panel off and on.



- On the indicator unit to the right of the digital display, the **ENGINE STOP** indicator starts to flash.



- Press and hold the "MAP" button.



- The rear wheel starts rotating, the vehicle performs the automatic timing procedure.

- Wait for the procedure to be completed.

- When the rear wheel stops and the engine stop indicator switches off, the procedure is completed.

DEMAND SENSOR END STOP RESET PROCE-DURE

At the end of each operation performed on the demand sensor it is necessary to perform the end stop reset operation.

- Put the vehicle on the stand.

- Lift the saddle and remove the helmet compartment.

- Remove the diagnostic socket from the housing.



READY











- Follow the instructions displayed on the screen.
 Turn the throttle hand grip to maximum.
 Then select: OK.
 Follow the instructions displayed on the screen.
- Turn the throttle hand grip to minimum.
- Then select:

OK.



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- Turn the panel off and on.

The demand sensor end stop reset procedure is completed.

| VESPA VESPA ELETTRU | Strokes demand regulation | iagnostic |
|---|---|-----------|
| Parameters Status Status Proceed Error codes Ele Activations Adjustments ECU data Report Technical apscrifications Ov Extinctions | Regulation carried out Turn off and on again the key | |
| Analysis chart | | |

Diagnostic trouble codes (DTC)

The following section will highlight the errors of each control unit with which Vespa Elettrica is equipped, more precisely:

BMS (Battery management system) control unit - Control unit within battery.

VMS (Vehicle management system) control unit - Main control unit.

EMD (Engine machine drive) control unit - Control unit within VMS.

DSB (Dashboard) control unit - Instrument panel.

BMS (Battery management system) control unit - Control unit within battery.

| Error Code | Description Description | |
|------------|--|-------------------------------------|
| P1B01 | Battery opening in scooter mode for temperature above maximum threshold | Over discharge temperature open |
| P1B02 | Battery opening in charging mode for temperature above maximum threshold | Over charge temperature open |
| P1B03 | Battery opening in scooter mode for current above maximum threshold | Over discharge current open |
| P1B04 | Battery opening in charging mode for current under maximum threshold | Over charge current open |
| P1B05 | Battery opening in scooter mode for temperature un- der maximum threshold | Under discharge temperature open |
| P1B06 | Battery opening in charging mode for temperature under maximum threshold | Under charge temperature open |
| P1B07 | Battery opening for voltage above maximum threshold | Over voltage battery open |
| P1B08 | Cell opening for voltage above maximum threshold | Over voltage cell open |
| P1B09 | Battery opening in scooter mode for voltage under maximum threshold | Under voltage scooter battery open |
| P1B0A | Cell opening in scooter mode for voltage under max- imum threshold | Under voltage scooter cell open |
| P1B0B | Battery opening in charging mode for voltage under maximum threshold | Under voltage recharge battery open |
| P1B0C | Cell opening in charging mode for voltage under maximum threshold | Under voltage recharge cell open |
| U0100 | Communication error with the electric traction mod- ule (EMD) on CAN | Diagnosis CAN EMD |
| U1001 | SLAVE1 communication error on CAN | Diagnosis CAN SLAVE1 |
| U1002 | SLAVE2 communication error on CAN | Diagnosis CAN SLAVE2 |
| U1003 | SLAVE3 communication error on CAN | Diagnosis CAN SLAVE3 |
| U1004 | SLAVE4 communication error on CAN | Diagnosis CAN SLAVE4 |
| U1005 | SLAVE5 communication error on CAN | Diagnosis CAN SLAVE5 |
| U1006 | SLAVE6 communication error on CAN | Diagnosis CAN SLAVE6 |
| U1007 | SLAVE7 communication error on CAN | Diagnosis CAN SLAVE7 |
| U0155 | MASTER communication error on CAN | Diagnosis CAN MASTER |

B.M.S. (BATTERY MANAGEMENT SYSTEM) ERROR TABLE

| Error Code | Description | Description |
|------------|--|---|
| U0001 | BusOff error | Diagnosis BusOff |
| U1008 | Unknown communication error with slaves | Diagnosis unknown slaves |
| P1B0D | Communication error with the BMS temperature | Diagnosis temperature sensors T1Aux |
| | sensor no. 1 | |
| P1B0E | Communication error with the BMS temperature | Diagnosis temperature sensors T2Aux |
| | sensor no. 2 | |
| P1B0F | Communication error with the BMS temperature | Diagnosis temperature sensors T3Aux |
| | sensor no. 3 | |
| P1B10 | Communication error with the BMS temperature | Diagnosis temperature sensors T1Sense |
| | sensor no. 1 AFE | |
| P1B11 | Communication error with the BMS temperature | Diagnosis temperature sensors T2Sense |
| | sensor no. 2 AFE | |
| P1B12 | Communication error with the BMS temperature | Diagnosis temperature sensors T3Sense |
| | sensor no. 3 AFE | |
| P1B13 | Fuse communication error | Diagnosis fuse |
| P1B14 | Communication error with 3V3_aux | Diagnosis 3V3_aux |
| P1B15 | ADC communication error | Diagnosis ADC |
| P1B16 | Communication error with the cell voltage sensor | Diagnosis cell voltage reading sensor |
| U029A | Front end communication error | Diagnosis front end communication |
| P1B17 | Switch Open communication error | Diagnosis Switch_Open |
| P1B18 | Switch Closed communication error | Diagnosis Switch_Closed |
| P0B13 | AFE current coherence failure error | Diagnosis coherence current AFE MCU |
| P1B19 | AFE T1 temperature coherence sensor failure error | Diagnosis coherence temperature T1_AFE_MCU |
| P1B1A | AFE T1 temperature coherence sensor failure error | Diagnosis coherence temperature T2_AFE_MCU |
| P1B1B | AFE T1 temperature coherence sensor failure error | Diagnosis coherence temperature T3_AFE_MCU |
| P1B1C | AFE open circuit shunt error | Diagnosis shunt OC AFE |
| P1B1D | AFE current sensor error - Reference voltage | Diagnosis reference voltage AFE sensor current |
| P1B1E | AFE voltage below maximum threshold error | Diagnosis UV AFE |
| P1B1F | AFE voltage above maximum threshold error | Diagnosis OV AFE |
| P1B20 | AFE open circuit error | Diagnosis CT_open AFE |
| P1B21 | Functional OV / UV AFE check circuit error | Diagnosis CTx OV/UV AFE functional verification |
| P1B22 | AFE temperature above maximum threshold error | Diagnosis OT AFE |
| P1B23 | AFE temperature below maximum threshold error | Diagnosis UT AFE |
| P1B24 | AFE VCOM voltage above maximum threshold error | Diagnosis VCOM_OV AFE |
| P1B25 | AFE VCOM voltage below maximum threshold error | Diagnosis VCOM_UV AFE |
| P1B26 | Pin error | Diagnosis Pin fault |
| P1B27 | Input voltage signal above maximum threshold error | Diagnosis Vpwr OV AFE |
| P1B28 | Input voltage signal below maximum threshold error | Diagnosis Vpwr UV AFE |
| P1B29 | Battery voltage coherence failure error | Diagnosis Vbattery coherence |
| P1B2A | ISO sensing voltage error | Diagnosis V_ISO sensing |
| P1B2B | Overflow counter error (coulomb) | Diagnosis coulomb counting AFE overflow |
| P0C78 | Error in preload mode - maximum time exceeded | Diagnosis precharge_MaxTime |
| P1C78 | Error in preload mode - maximum load exceeded | Diagnosis precharge_MaxEnergy |

VMS (Vehicle management system) control unit - Main control unit.

V.M.S. (VEHICLE MANAGEMENT SYSTEM) ERROR TABLE

| Error Code | Description | Description |
|------------|--|--------------------------------------|
| 7531 | Main battery voltage too high | Main battery voltage too high |
| 7532 | Main battery voltage too low | Main battery voltage too low |
| 7533 | Main battery current too high | Main battery current too high |
| 7535 | Dangerous battery pack status | Dangerous battery pack status |
| 7536 | Battery pack state of charge too low | Battery pack state of charge too low |
| 753B | Electric motor temperature too high | Electric motor temperature too high |
| 753C | Buzzer not working | Buzzer not working |
| 753D | Buzzer on permanently | Buzzer always on |
| 753E | BMS active fault | Actual BMS fault |
| 753F | Stored BMS fault | Stored BMS fault |
| 7540 | Bus condenser voltage too high | Bus condenser voltage too high |
| 7541 | SPI master-slave communication error | SPI communication master-slave wrong |
| 7542 | No communication with the instrument panel | Dashboard absent |
| 7543 | No communication with the BMS | BMS absent |
| 7544 | EMD hardware fault | EMD hardware fault |
| 7545 | Temperature sensor electric problem | Temperature sensor electric problem |
| 7547 | DC/DC control fault | DC/DC control fault |
| 7549 | Battery voltage too low | Battery voltage too low |

| Error Code | Description | Description | |
|------------|--|--|--|
| 754A | Battery current too high | Battery current too high | |
| 754B | Failure to turn on fan | Failure to turn on fan | |
| 754C | Failure to turn off fan | Failure to turn off fan | |
| 754E | Instrument panel supply too high | Instrument panel supply too high | |
| 754F | Instrument panel supply too low | Instrument panel supply too low | |
| 7550 | Bridge temperature too high | Bridge temperature too high | |
| 7551 | The calculated torque exceeds the maximum per- | The calculated torque exceeds the maximum admis- | |
| | missible value | sible value | |
| 7552 | The torque is less than the minimum admissible val- | The torque is less than the minimum admissible val- | |
| | ue | ue | |
| 7553 | The calculated torque is at least 1 Nm higher than | The calculated torque is at least 1 Nm higher than | |
| | the reference | the reference | |
| 7554 | The calculated torque (with limitation) is out of range | The calculated torque (with limitation) is out of range | |
| 7562 | Sensor A and C power supply absent | Sensor A and C power supply absent | |
| 7563 | Sensor B and D power supply absent | Sensor B and D power supply absent | |
| 7564 | Hand grip electrical fault | Hand grip electric fault | |
| 7565 | Potentiometer A output voltage too high | Potentiometer A output voltage too high | |
| 7566 | Potentiometer A output voltage too low | Potentiometer A output voltage too low | |
| 7567 | Potentiometer B output voltage too high | Potentiometer B output voltage too high | |
| 7568 | Potentiometer B output voltage too low | Potentiometer B output voltage too low | |
| 7569 | Potentiometer C output voltage too high | Potentiometer B output voltage too high | |
| 756A | Potentiometer C output voltage too low | Potentiometer C output voltage too high | |
| 756B | Potentiometer D output voltage too high | Potentiometer D output voltage too high | |
| 756C | Potentiometer D output voltage too low | Potentiometer D output voltage too low | |
| 756D | Variation of the congruence test voltage over the threshold | Full congruence test voltage variation over threshold | |
| 756E | Variation of the congruence test voltage under the threshold | Full congruence test voltage variation under the threshold | |
| 756F | Partial congruence test failed | Partial congruence test failed | |
| 7570 | Non-redundant master congruence test failed | Master not redundance congruence test failed | |
| 7571 | Redundance test on the main (Master) unit failed | Redundance test on the master unit failed | |
| 7572 | Redundance test on the secondary (slave) unit failed | Redundance test on the slave unit failed | |
| 7573 | Wrong SPI communication | Wrong SPI communication | |
| 7574 | ADC reference voltage out of range of admissibility | ADC reference voltage out of range of admissibility | |

EMD (Engine machine drive) control unit - Control unit within VMS.

E.M.D. (ELECTRIC MACHINE DRIVE) ERROR TABLE

| Error Code | Description Description | | |
|------------|---|---|--|
| 9C41 | Battery pack voltage too high | Battery pack voltage too high | |
| 9C42 | Battery pack discharge current too high | Battery pack discharge current too high | |
| 9C43 | Phase U current too high | U phase current too high | |
| 9C44 | Phase U current too low | U phase current too low | |
| 9C45 | Phase V current too high | V phase current too high | |
| 9C46 | Phase V current too low | V phase current too low | |
| 9C47 | U phase current too high (Hardware) | U phase current too high (Hardware) | |
| 9C48 | V phase current too high (Hardware) | V phase current too high (Hardware) | |
| 9C49 | Bus power feed sensor voltage too low | Bus voltage sensor power supply too low | |
| 9C4A | High voltage secondary coil voltage too high | High voltage secondary side current too high | |
| 9C4B | Electric motor temperature sensor - open circuit | Electric motor temperature sensor - open circuit | |
| 9C4C | Electric motor temperature sensor - short circuit | Electric motor temperature sensor - short circuit | |
| 9C4D | H-Bridge HV temperature sensor - open circuit | H-Bridge HV temperature sensor - open circuit | |
| 9C4E | H-Bridge HV temperature sensor - short circuit | H-Bridge HV temperature sensor - short circuit | |
| 9C4F | Bridge LV temperature sensor - open circuit | Bridge LV temperature sensor - open circuit | |
| 9C50 | Bridge LV temperature sensor - short circuit | Bridge LV temperature sensor - short circuit | |
| 9C51 | Ancillary voltage < 12V - Power feed fault | Auxiliary voltage < 12V - Fault supply | |
| 9C52 | Battery current sensor too high | Battery current sensor too high | |
| 9C53 | Battery current sensor too low | Battery current sensor too low | |
| 9C54 | Pre-charge current too low | Precharge current is too low | |
| 9C55 | Voltage across condenser terminals too high | Voltage across condenser terminals too high | |
| 9C56 | SPI master-slave communication error | SPI communication master-slave wrong | |
| 9C57 | Mains charging current too high | Recharge current from power grid is too high | |
| 9C58 | Line sensor current too high | Line current sensor too high | |
| 9C59 | Line sensor current too low | Line current sensor too low | |
| 9C5A | SEN sensor signal too high | SEN sensor signal too high | |
| 9C5B | SEN sensor signal too low | SEN sensor signal too low | |

| Error Code | Description Description | |
|------------|---|--|
| 9C5C | COS sensor signal too high | COS sensor signal too high |
| 9C5D | COS sensor signal too low COS sensor signal too low | |
| 9C5E | Line sensor voltage too high Line sensor voltage too high | |
| 9C5F | Line condenser current too high Line condenser current too high | |
| 9C60 | Line condenser voltage too high | Line condenser voltage too high |
| 9C61 | Serial communication error with programmable logic | Serial communication with programmable logic |
| | | wrong |
| 9C64 | Position sensor power supply - absent | Position sensor power supply - absent |

DSB (Dashboardcontrol unit) - instrument cluster

DSB - DASHBOARD ERROR TABLE

| Error Code | or Code Description Description | | |
|------------|--|---|--|
| B0003 | Immobilizer: Key code read but not recognised | Immobilizer - Key code read but not acknowledged | |
| B0004 | Immobilizer: Key code reading error | Immobilizer - Key code reading error | |
| B0005 | Immobilizer: antenna electrical fault (o.c. or s.c.) | Immobilizer - antenna electric fault (O.C. or S.C.) | |
| B0006 | Immobilizer: internal error | Immobilizer - internal error | |
| B0007 | Immobilizer: insufficient number of keys memorised | Immobilizer - insufficient number of stored keys | |
| B0008 | Can line reception error | CAN line reception error | |
| B0009 | Can line transmission error | CAN line transmission error | |
| B0011 | Central button error | Central button error | |
| B0012 | Right switch button error | Right button error | |
| B0013 | Left switch button error | Left button error | |
| B0014 | Map button error | Map button error | |
| B0023 | Immobilizer: Key code read but not recognised | Immobilizer - Key code read but not acknowledged | |
| B0024 | Immobilizer: Key code reading error | Immobilizer - Key code reading error | |
| B0025 | Immobilizer: internal error | Immobilizer - internal error | |
| B0026 | Immobilizer: insufficient number of keys memorised | Immobilizer - insufficient number of stored keys | |

INDEX OF TOPICS

Engine ENG

SECTION CONTENTS

This section contains the following chapters:

- Electric motor
- Final drive reduction gear

N.B.

THE UNITS OF MEASUREMENT CONTAINED IN THIS CHAPTER ARE EXPRESSED IN TERMS OF THE DECIMAL METRIC SYSTEM. TO CONVERT BETWEEN IMPERIAL/US UNITS OF MEAS-UREMENT AND METRIC UNITS, SEE THE CHAPTER "UNIT OF MEASUREMENT CONVERSION TABLE" IN THE SECTION "TECHNICAL DATA".

LIST OF TIGHTENING TORQUES

| Fastener | Q.ty | Description | Value (Nm) |
|----------|------|--|------------|
| Screw | 4 | Electric motor cover - Electric motor casing | 12 ± 1.0 |
| Nut | 1 | Rotor - Electric motor shaft | 43.5 ± 1.5 |
| Screw | 6 | Hub cover - Motor housing | 25.5 ± 1.5 |
| Bolt | 2 | Electric motor mounting bracket - Swingarm | 51.5 ± 2.5 |
| Bolt | 1 | Rear shock absorber - Mounting bracket | 42.5 ± 2.5 |
| Screw | 2 | Rear brake control Bowden cable - Swingarm | 10 ± 1.0 |
| Screw | 1 | Rear brake control Bowden cable bracket - Electric motor | 10 ± 1.0 |

Exploded view of electric motor



Key

- 1. Hub cover
- 2. Gasket
- 3. Rear wheel axle
- 4. Idler gear
- 5. Rotor shaft

- 6. Hub oil dipstick
- 7. Electric motor casing
- 8. Gasket
- 9. Rotor
- 10. Spring washer
- 11. Rotor fastener nut
- 12. Seal ring
- **13.** Electric motor casing cover

Electric motor

REMOVAL

- Remove the following components:
 - Ancillary battery
 - Electric motor cooling fan
 - Rear wheel
 - Leg shield back plate
 - Footrest

- Place a hydraulic lift under the scooter at the midpoint of the footboard.

- Undo and remove the rear brake control cable adjuster nut.





- Undo the screw and remove the rear fastener bracket of the rear brake control Bowden cable.



- Detach the cover on the swingarm guard.



- Undo the fastener screws of the swingarm guard.



- Remove the swingarm guard.



- Undo the fastener screw of the rear retainer clamp of the rear brake control Bowden cable.



Undo the fastener screw of the front retainer clamp of the rear brake control Bowden cable.Move the rear brake control Bowden cable out of the way.

Disconnect the electrical connectors (1), (2) and(3) of the electric motor wiring harness from the VMS.

- Free the electric motor wiring harness (1) from the retainer clip (2).



123

- Undo the fastener screws of the electric motor wiring harness fastener bracket.



- Undo and remove the bolt fastening the rear shock absorber to the mounting bracket on the electric motor.



Cerp

- With the help of another worker, undo and remove the lower bolt fastening the electric motor to the swingarm.

- With the help of another worker, undo and remove the upper bolt fastening the electric motor to the swingarm.



- Remove the electric motor from its seat.



- Set the electric motor down safely on the lift.



- Lift the scooter with the lift by just enough to make room in the area indicated (1) to pull the electric motor wiring harness out from its seat.

- Remove the retainer clip (2) of the electric motor wiring harness.

- Pull the electric motor wiring harness out from its seat.





- Remove the complete electric motor from its seat and set it down in a safe place.



DISASSEMBLY

- Drain the rear hub oil.



- Undo the fastener screws of the electric motor cover.



- Lift the electric motor cover and turn it over.



- Remove the split pin.



- Remove the speed sensor.



- Restrain the screw of the stator to prevent it from turning and undo the fastener nut of the rotor by turning **clockwise**.



- Remove the fastener nut of the rotor.



- Remove the cup spring washer.



- Remove the gasket.



- Fit two M4 screws in the threaded holes in the
- surface of the rotor.
- Remove the rotor.



STATOR REMOVAL

- Remove the rear reducer and the electric engine axle.



- Unscrew and remove the screws that fasten the cable lead-through cover.





- Remove the gasket from its housing.



- Using the specific tool, heat the stator housing body.

Specific tooling

020151Y Air heater



- grab the stator from inside and remove it from the aluminium body.



- Remove the bushing.



FITTING

- Insert the power supply and temperature sensor cables.

- Insert the bushing.



- Using the specific tool, heat the stator housing body.

Specific tooling

020151Y Air heater



- Bring the stator to its housing.



- Take care to match the notch on the outer surface of the stator with the bushing.



- Insert the stator.



- Put the gasket in its housing.



- Put the cable lead-through cover.



- Insert and tighten the screws that fasten the cable lead-through cover.



- Refit the electric engine axle and the rear reducer.

- Remove the power supply and temperature sensor cables.



REASSEMBLY

- Fit the rotor in its seat.

- Remove the two M4 screws fitted previously to extract the rotor from its seat.





- Fit the cup spring washer.



- Tighten the fastener nut of the rotor.



- Use a torque wrench with a reversible ratchet head to tighten the fastener nut of the rotor to the specified torque, **turning anticlockwise**.





- Fit a new split pin.

- Fit the speed sensor.

WARNING

USE A NEW SPLIT PIN EACH TIME THE MOTOR IS REAS-SEMBLED, BENDING THE ENDS OF THE PIN CAREFULLY AROUND THE SHAFT.

- Fit the electric motor cover.



- Fit the fastener screws of the electric motor cover and tighten to the specified torque.

- Refill the hub with oil to the correct level.



REFITTING

- Set the electric motor down on the lift.
- Lay out the electric motor wiring harness correctly.

- Fit the retainer clip (1) of the electric motor wiring harness.

- Lower the scooter with the lift.



With the help of another worker, align the electric motor correctly with the holes on the swingarm.Fit the lower and upper bolts and tighten the relative fastener nuts.







- Remove the lift from under the VMS.



- Tighten the fastener screws of the electric motor wiring harness fastener bracket.



- Connect the electrical connectors (1), (2) and (3) of the electric motor wiring harness to the VMS.



- Fasten the electric motor wiring harness (1) in the retainer clip (2).



- Tighten the fastener screw of the front retainer

clamp of the rear brake control Bowden cable to

the specified torque.

N.B.

FASTEN THE RETAINER CLAMP TOGETHER WITH THE RIGID RETAINER CLIP OF THE ELECTRIC MOTOR WIRING HARNESS

- Tighten the fastener screw of the rear retainer

clamp of the rear brake control Bowden cable to the specified torque.

- Fit the swingarm guard, ensuring that the ring (1) is installed correctly in its seat.



- Tighten the fastener screws of the swingarm guard.



- Fit the cover onto the swingarm guard, engaging the fastener pins in the relative seats.

Fit the ferrule of the rear brake control Bowden cable in the relative seat on the link lever.
Fit the rear fastener bracket of the rear brake control Bowden cable and tighten the fastener screw to the specified torque.

- Fit the adjuster nut of the rear brake control cable.
- Fit the following components:
 - Footrest
 - Leg shield back plate
 - Rear wheel
 - VMS electric cooling fan.
 - Ancillary battery
- Remove the lift.

- Adjust the rear brake cable with the procedure described as follows:

- While turning the rear wheel in the normal direction of rotation, tighten the adjuster nut (1) until the brake shoes start to drag against the drum;
- From this position, undo the adjuster nut (1) by 2 complete turns, and then tighten the check nut (2).

- Perform the insulation and ground continuity tests.







End gear

REMOVAL

- Remove the following components:

- Ancillary battery
- Electric inverter cooling fan
- Rear wheel
- Rear drum brake
- Leg shield back plate
- Footrest
- Electric motor
- Drain the rear hub oil.

- Undo the screws fastening the hub cover to the electric motor casing.





- Remove the rubber plug.



- Undo the screw fastening the hub cover to the electric motor casing.



- Tap with a plastic or wooden mallet to separate the hub cover from the casing.



- Remove the hub cover.



- Remove the gasket.



- Remove the wheel axle.


Remove the idler gear.



- Check the state of the bearing (check for wear, free play and noise). If faults are detected, do the

following.

- Use the specific extractor tool to remove the 15 mm bearing.

Specific tooling

001467Y013 Calliper to extract ø 15-mm bearings

001467Y009 Bell for OD 42-mm bearings

- Support the hub cover properly to avoid damaging the sealing surface with the crankcase.

- Remove the Seeger ring from the outside.
- Operating on the inside, remove the oil seal.

- Remove the wheel axle bearing using the specific tool.

Specific tooling 020376Y Adaptor handle 020360S 52 x 55 mm adaptor 020364Y 25-mm guide







ENG - 218

- Support the weight of the casing adequately.

- Remove the retainer circlip.
- Remove the oil seal and the bearing with the specific tool.

Specific tooling 020363Y 20-mm guide 020376Y Adaptor handle 020359S 42 x 47 mm Adaptor

- Check the state of the bearing (check for wear, free play and noise). If faults are detected, do the following.

Use the specific extractor tool to remove the two17 mm bearings.

Specific tooling

001467Y009 Bell for OD 42-mm bearings

001467Y013 Calliper to extract ø 15-mm bearings













Hub shaft check

- Check that the teeth of the shaft gears and the idler gears, the bearing housings and the oil seals are not worn, damaged or distorted.

- In case of faults, replace the damaged parts.

Characteristic

Wheel axle

A: 15 mm -0 -0.020

B: 25 mm - 0.007 - 0.020

Idler shaft

C: 15 mm -0.01 -0.02

D: 15 mm - 0.01 - 0.02

Rotor shaft

E: 17 mm - 0.01 - 0.02







Checking hub cover

- Check that the fitting surface is not dented or distorted. - Check the bearing seats and the brake cam spindle seat. - Replace the hub cover if any damage is noted.

REFITTING

- Fit the oil seal.
- Heat the casing with a hot gun. Do not direct hot air onto the oil seal.

Specific tooling 020150Y Air heater mounting 020151Y Air heater

- Refit the driven pulley shaft bearing with the specific tools. Fit the bearing with the balls visible from the inner side of the hub.

Specific tooling 020376Y Adaptor handle 020363Y 20-mm guide 020359S 42 x 47 mm Adaptor



- Refit the circlip.



- Heat the components with a hot air gun

Specific tooling 020151Y Air heater

020150Y Air heater mounting



- The wheel axle bearing and the intermediate axle bearings MAY ONLY be fitted with the specific tools

Specific tooling

020376Y Adaptor handle 020439Y 17-mm guide

020359S 42 x 47 mm Adaptor





- Support the weight of the hub cover adequately.
- Heat the hub cover with a hot air gun.
- Drive the bearing into its seat with the specific tool.

Specific tooling 020150Y Air heater mounting 020151Y Air heater

020376Y Adaptor handle

020364Y 25-mm guide

020360S 52 x 54 mm adapter

- Insert the Seeger ring.

- Fit the oil seal.







- Install the intermediate gear bearing with the specific tool.

Specific tooling 020376Y Adaptor handle 020412Y 15-mm guide 020359S 42 x 47 mm Adaptor



- Fit the idler gear.



- Fit the wheel axle.



- Fit a new gasket.



- Fit the hub cover, ensuring that the breather pipe is in the correct position.



Tighten the screws fastening the hub cover to the casing to the specified torque.

- Refit the rubber plug.
- Fill the rear hub with oil.
- Fit the following components:
 - Electric motor
 - Footrest
 - Leg shield back plate
 - Rear drum brake
 - Rear wheel
 - Electric inverter cooling fan
 - Ancillary battery



INDEX OF TOPICS

SUSPENSIONS

SUSP

SECTION CONTENTS

This section contains the following chapters:

- Front

- front wheel removal
- Servicing the front wheel hub
- Assembling the front wheels
- guard
- Steering tube
- Front shock absorber
- shock absorber-brake calliper mount
- Steering bearings

- Rear

- Rear wheel removal
- Fitting the rear wheel
- Swingarm
- Shock absorber
- Centre stand

N.B.

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LIST OF TIGHTENING TORQUES

| Fastener | Q.ty | Description | Value (Nm) |
|----------|------|--|------------|
| Bolt | 1 | Centre stand - Frame | 42.5± 2.5 |
| Joint | 1 | Front brake pipe - Front brake master cylinder | 22.5 ± 2.5 |
| Screw | 1 | Rear brake lever - Handlebar | 11 ± 1.0 |
| Bolt | 1 | Handlebars - Steering tube | 52.5 ± 2.5 |
| Screw | 2 | Front brake calliper - Shock absorber-brake calliper mount | 22 ± 2.0 |
| Bolt | 2 | Front shock absorber - Shock absorber-brake calliper mount | 23.5 ± 2.5 |
| Screw | 2 | Front shock absorber bracket - Steering tube | 22 ± 2.0 |
| Screw | 1 | Front brake pipe fastener bracket - Front shock absorber | 9 ± 1.0 |
| Joint | 1 | Front brake pipe - Front brake calliper | 22.5 ± 2.5 |
| Nut | 1 | Front wheel hub - Front wheel axle | 85 ± 8.0 |
| Screw | 5 | Front wheel - Front wheel hub | 20 ± 2.0 |
| Ring nut | 1 | Lower steering tube fastener ring nut | 9 ± 1.0 |
| Ring nut | 1 | Upper steering tube fastener ring nut | 37.5 ± 2.5 |
| Nut | 1 | Rear wheel - Wheel axle | 115 ± 11 |
| Bolt | 1 | Swingarm - Frame | 79.5 ± 3.5 |
| Bolt | 1 | Rear shock absorber - Mounting bracket | 42.5 ± 2.5 |
| Nut | 1 | Rear shock absorber - Chassis | 22.5 ± 2.5 |

Front

Removing the front wheel

- Support the vehicle adequately.
- Lift the front wheel
- Loosen the screws fixing the wheel to the hub.

- Remove the front wheel pulling it to the right vehicle side.

- Remove the metal spacer between the wheel and the hub.



Front wheel hub overhaul

REMOVING THE FRONT WHEEL HUB

- Remove the following components:
 - Front wheel
- Undo the fastener screws and move the front

brake calliper out of the way.

WARNING DO NOT DISCONNECT THE BRAKE FLUID PIPE FROM THE CALLIPER





Remove the front wheel hub from its seat.



FRONT WHEEL HUB SERVICE

Remove the oil seal on the brake disc side using a flat-head screwdriver.



Turn the hub on the wheel side. Using the relative clamps, remove the Seeger ring.



Engage the specific tool on the inner ring of the bearing on the wheel side.

Specific tooling

001467Y Extractor for bearings for holes



Remove the bearing using the specific tool.

Specific tooling

001467Y Extractor for bearings for holes 001467Y017 Bell Ø 35



Remove the bearing and the specific tool.



Remove the roller bearing using the specific tool.

Specific tooling 020376Y Adaptor handle 020456Y Ø 24 mm adaptor 020363Y 20-mm guide

Check the seat of the bearing. Heat the bearing's seat on the hub using the specific tool.

Specific tooling 020151Y Air heater





Using the specific tool, place the new ball bearing in its seat with the shielding facing up.

Specific tooling 020376Y Adaptor handle 020357Y 32 x 35-mm Adaptor 020412Y 15-mm guide

Put the bearing all the way into its seat.





Put in the Seeger ring.



Turn the hub on the opposite side.

Using the specific tool, insert the roller bearing all the way in.

Apply the recommended product in the chamber

between the ball bearing and the roller bearing.

Specific tooling

020038Y Punch

Recommended products

Lubricant grease Lithium and medium fibre yellow brown coloured grease suitable for various uses.

ISO L-X-BCHA 3 - DIN 51 825 K3K -20



Using the specific tool, put a new oil seal in its seat.

Specific tooling

020376Y Adaptor handle 020357Y 32 x 35-mm Adaptor

020412Y 15-mm guide



Put the oil seal all the way into its seat.



FITTING THE FRONT WHEEL HUB

Place the wheel hub on the front wheel axle.



Screw on the fixing nut on the wheel axle.



- Tighten the fastener nut of the front wheel hub to the specified torque.



Put on the safety cap so that the hole for the cotter pin is visible.



Insert the safety cotter pin and fold the flaps outwards.

Refit the front brake calliper.

Fit the front wheel.



Refitting the front wheel

- Fit the metal spacer on the hub, aligning the screw holes.



- Fit the front wheel in its seat on the hub, aligning the relative holes.



- Tighten the screws fastening the front wheel to the hub to the specified torque.



Handlebar

REMOVAL

- Disconnect the negative terminal clamp of the ancillary battery.

- Remove the following components:

- Rear view mirrors
- Headlamp bezel
- Upper handlebar cover
- Leg shield back plate
- Lateral handlebar switchgear sets
 [both]
- Front light unit
- Front wheel

- Undo the fastener screws and remove the brake fluid reservoir lid.



- Place a suitable container underneath to collect the brake fluid.

- Undo the connector fastening the brake fluid pipe and wait for the fluid to drain into the container.

- Once the brake system has been drained, refit the brake fluid reservoir lid and tighten the fastener screws.

WARNING

RETRIEVE THE WASHERS FITTED ON THE CONNECTOR

- Undo and remove the rear brake control cable adjuster nut.





Undo the fastener bolt of the rear brake calliper.Remove the rear brake calliper from its seat and

disconnect the brake control Bowden cable.





- Disconnect the electrical connectors of the brake switches on the right and left hand sides of the handlebar.



- Undo the connector fastening the front brake pipe to the master cylinder.

WARNING

RETRIEVE THE WASHERS FITTED ON THE CONNECTOR



- On both sides, detach and remove the access covers for the handlebar fastener bolts.



- Undo the bolt fastening the handlebar to the

steering tube.

- Remove the handlebar from its seat.

WARNING

WHEN REMOVING THE HANDLEBAR, TAKE CARE NOT TO DAMAGE THE ELECTRICAL CABLES, PIPES AND ME-CHANICAL CABLES, WHICH MUST BE PULLED OUT OF THE HANDLEBAR ITSELF



REFITTING

- Fit the handlebar in its seat and tighten the fastener bolt to the specified torque.

- On both sides, fit the access covers for the handlebar fastener bolts.

der and tighten the connector, fitting the washers (1) and (2) correctly as shown in the figure.









- Connect the electrical connectors of the brake switches on the right and left hand sides of the handlebar.

- Connect the brake control Bowden cable to the rear brake calliper.

- Fit the rear brake calliper in its seat and tighten the fastener bolt.





- Tighten the adjuster nut of the rear brake control cable.



- Connect the brake fluid pipe to the calliper and tighten the connector to the specified torque, fitting the washers (1) and (2) correctly as shown in the figure.





- Undo the fastener screws and remove the brake fluid reservoir lid.

- Fill the brake system with fluid.
- Refit the brake fluid reservoir lid and tighten the

fastener screws.

- Bleed the brake system.
- Fit the following components:
 - Front wheel
 - Front light unit
 - Lateral handlebar switchgear sets
 [both]
 - Leg shield back plate
 - Upper handlebar cover
 - Headlamp bezel
 - Rear view mirrors

- Connect the negative terminal clamp of the ancillary battery.



- Adjust the rear brake cable with the procedure described as follows:

- While turning the rear wheel in the normal direction of rotation, tighten the adjuster nut (1) until the brake shoes start to drag against the drum.
- From this position, undo the adjuster nut (1) by 2 complete turns, and then tighten the check nut (2).



Steering column

Removal

- Disconnect the negative terminal clamp of the ancillary battery.

- Remove the following components:
 - Rear view mirrors
 - Headlamp bezel
 - Upper handlebar cover
 - Leg shield back plate
 - Lateral handlebar switchgear sets
 [both]
 - Front light unit
 - Front wheel
 - guard
 - Front brake calliper
 - Front wheel hub
 - Front shock absorber
 - shock absorber-brake calliper mount



- Tighten the screw fastening the front brake pipe retainer bracket to the shock absorber.



Specific tooling 020055Y Wrench for steering tube ring nut







- Undo the lower steering ring nut using the special tool.

Specific tooling

020055Y Wrench for steering tube ring nut



Remove the steering tube.



Overhaul

Servicing the front suspension-steering assembly, described below, deals mainly with replacing parts (pin- NADELLA roller bushings - sealing rings unit and dust gaiter) which connect the steering tube to the front wheel holder swinging hub.

N.B.

N.B.

BEFORE PROCEEDING WITH THE DESCRIBED SERVICE, CHECK THAT THE STEERING TUBE AND THE WHEEL HOLDER HUB ARE IN EXCELLENT CONDITIONS: ONLY THEN IS THE SERV-ICE JUSTIFIABLE.

MOREOVER, REMEMBER THE STEERING TUBE SHOULD BE REPLACED WITH A NEW ONE WHEN DEFORMED.

 $a = \emptyset$ 12 Punch

b = Sharp-edged end

Use a suitable punch with the dimensions indicated on the figure; hit with a mallet until the wedging washer is crushed and then extract it with the help of a pointed end.

Repeat the operation for the second washer using the punch on the side opposite to the one shown in the figure.

Use the tool fitted with part 1 as shown in the figure and move the tool hand-grip until the pin and the NADELLA are simultaneously ejected in the direction opposite the tool thrusting force.

After removing the pin and the first NADELLA, the swinging hub gets detached from the steering tube.

To remove the second NADELLA, use the tool fitted with part 2 instead of part 1, on the side opposite the one shown in the figure.

DURING THE REMOVAL OPERATIONS DESCRIBED ABOVE, THE ROLLER BUSHINGS ARE DESTROYED WHEN THE EXTRACTOR IS USED. UPON REFITTING, IT IS THEREFORE NECESSARY TO USE NEW BUSHINGS AS WELL AS A NEW PIN, NEW SEALING RINGS AND DUST GAITER.

Specific tooling

020021Y Front suspension service tool

Connect the swinging hub to the steering tube with the guiding pin.

- Use the tool fitted with part 3 on the stem and part

4.

Lubricate the pin with recommended grease and

insert it temporarily on the swinging hub, move the

tool hand-grip until part 3 is fully inserted on the

steering tube.

After fitting the pin, insert the two spacers, slightly

hitting them with the mallet.

N.B.

BEFORE PROCEEDING WITH THE DESCRIBED FITTING, PLACE THE TWO DUST GAITER RINGS ON THE SWING-ING HUB AS SHOWN IN THE FIGURE.

Specific tooling

020021Y Front suspension service tool

Recommended products

Molybdenum disulphide grease Lithium grease with molybdenum disulphide

Grey black grease.

Insert the sealing ring on the pin and the roller bushing with its wedging washer at the same time.

- Remove the tool and the part 5 (guide), which has been partially ejected during the previous pin fitting phase, and leave part 4 always fitted.

- Replace part 3 with part 16 (on the stem).

By moving the tool hand-grip, push the wedging washer - roller bushing - seal ring unit, placing part
16 until it stops on the swinging hub.

- Repeat the above operation using the tool with part 16 and part 22, instead of part 4, always fitted to the stem, on the side opposite that indicated in





the figure to fit the second wedging washer - roller

bushing - sealing ring unit.

WARNING

BEFORE PROCEEDING WITH THE DESCRIBED PRE-FIT-TING, DIP THE SEALING RINGS IN MINERAL OIL AND THE "NADELLA" ROLLER BUSHINGS (PREVIOUSLY WASHED IN PURE PETROL OR NEUTRAL PETROLEUM TO ELIMI-NATE THE ANTI-RUST PROTECTION), HALF-FILLED WITH GREASE.

Specific tooling

020021Y Front suspension service tool

Recommended products

Multi-purpose grease "Multi-purpose" lithium and medium fibre-based yellow brown grease suitable for various uses.

ISO L-X-BCHA 3 - DIN 51 825 K3K -20

- Use the tool fitted with part 20 on its stem and

part 21 on the tool base as shown in the figure.

- By moving the tool hand-grip, push the two NA-

DELLA bushings until their internal bottoms make contact with the pin end.

- Use the tool fitted with parts 3 and 4 to fit the pin, and press moving the tool hand-grip, until wedging the washers on the swinging hub.

- Now, remove the two spacers (parts 17 and 16) and, once the space between the NADELLAs -

steering tube and swinging hub - has been fully

filled with grease, move the dust gaiter rings until

they are placed in that space.

- By wedging the washers as described above, the front suspension unit refitting stage is finished.

Recommended products

Multi-purpose grease "Multi-purpose" lithium and medium fibre-based yellow brown grease suitable for various uses.

ISO L-X-BCHA 3 - DIN 51 825 K3K -20



Refitting

Insert the steering tube.



- Fit the lower fastener ring nut of the steering tube and tighten to the specified torque with the specific tool.

Specific tooling

020055Y Wrench for steering tube ring nut







- Fit the upper fastener ring nut of the steering tube and tighten to the specified torque with the specific tool.

Specific tooling 020055Y Wrench for steering tube ring nut



- Tighten the screw fastening the front brake pipe retainer bracket to the shock absorber to the specified torque.



- Fit the following components:

- shock absorber-brake calliper mount
- Front shock absorber
- Front wheel hub
- Front brake calliper
- guard
- Front wheel
- Lateral handlebar switchgear sets
 [both]
- Leg shield back plate
- Upper handlebar cover
- Headlamp bezel
- Rear view mirrors

- Connect the negative terminal clamp of the an-

cillary battery.

Front shock absorber

REMOVAL

- Remove the following components:

- Front wheel
- Front wheel hub

- Undo the fastener bolt of the shock absorber cover.





wards.



- Remove the front link arm cover.

er to the mount.

- Undo the upper screws fastening the shock absorber to the steering tube.



- Remove the front shock absorber from its seat.



FITTING

- Fit the front shock absorber in its seat.

- Tighten the upper screws fastening the shock absorber to the steering tube to the specified torque.





SUSP - 248

- Tighten the fastener bolt of the shock absorber cover.

- Fit the shock absorber cover, sliding up from the

- Tighten the lower bolts fastening the shock ab-

sorber to the mount to the specified torque.

- Fit the front link arm cover.

- Fit the following components:
 - Front wheel hub
 - Front wheel







bottom.



Shock-absorber - calliper bracket

REMOVAL

- Remove the following components:
 - Front wheel
 - Front wheel hub
 - Front shock absorber
- Undo the fastener screws and move the front

brake calliper out of the way.

WARNING DO NOT DISCONNECT THE BRAKE FLUID PIPE FROM THE CALLIPER

- Remove the circlip,









- Separate the shock absorber-brake calliper mount from the wheel axle.



- Remove the O-ring and the washer behind the O-ring from the wheel axle.



SERVICING

- Support the shock absorber-brake calliper mount securely.

- Remove the oil seal ring with a suitable tool.



- Remove the cartridge roller bearings with specific tools.

Specific tooling

020365Y 22 mm guide

020376Y Adaptor handle

020441Y 26 x 28 mm adaptor



- Turn the shock absorber-brake calliper mount over and remove the oil seal on the wheel hub side.

- Use the specific tool to install a **NEW** oil seal on the wheel hub side.

Specific tooling

020360S 52 x 54 mm adapter

020376Y Adaptor handle

- Use the specific tool to install the **NEW** cartridge roller bearings.

Specific tooling

020037Y Punch





. Turn the shock absorber-brake calliper mount around.

- Use the specific tool to install a **NEW** oil seal ring.



REFITTING

- Fit the washer and then the O-ring on the wheel axle.



- Fit the shock absorber-brake calliper mount onto the wheel axle.



- Insert the spacer.



- Insert the Seeger ring.

- Fit the front brake calliper and tighten the fastener

screws to the specified torque.

- Fit the following components:
 - Front shock absorber
 - Front wheel hub
 - Front wheel



Steering bearing

Removal

- Disconnect the negative terminal clamp of the ancillary battery.

- Remove the following components:
 - Rear view mirrors
 - Headlamp bezel
 - Upper handlebar cover
 - Leg shield back plate


- Lateral handlebar switchgear sets
 [both]
- Front light unit
- Front wheel
- guard
- Front brake calliper
- Front wheel hub
- Front shock absorber
- shock absorber-brake calliper mount
- Steering tube

Remove the lower ball cage from the steering tube.



Remove the lower plate of the steering bearing from the steering tube.



Using the specific tool, remove the track of the lower steering bearing on the steering headstock.

Specific tooling

020004Y Punch for removing steering bearings from headstock



Using the specific tool, remove the track of the upper steering bearing on the steering headstock.

Specific tooling

020004Y Punch for removing steering bearings from headstock

- Use the specific tool both to remove the lower seat of the upper bearing and to remove the upper seat

of the lower bearing fitted on the chassis.

N.B.

TO REMOVE THE LOWER SEAT OF THE LOWER STEERING BEARING JUST USE A SCREW-DRIVER AS A LEVER BETWEEN THE SEATING AND THE SLEEVE.

Specific tooling

020004Y Punch for removing steering bearings from headstock

- Remove the fifth wheel fitting and the dust gaiter

on the steering bearing as shown in figure, using

the specific tool. Proceed giving a few taps with the mallet.

Specific tooling

020004Y Punch for removing steering bearings from headstock

- Refit the fifth wheel fitting and the dust gaiter on

the steering bearing until they stop, using the specific tool.

Specific tooling

006029Y Punch for fitting steering bearing on the steering tube





Refitting

Insert the specific tool and the upper track of the lower steering bearing into the steering headstock.

Specific tooling

001330Y Tool for fitting steering seats

Insert the lower plate of the upper steering bearing into the specific tool and tighten the nut.



Make sure the tracks go all the way onto the steering headstock.



Using the specific tool, refit the lower plate of the steering tube bearing.

Specific tooling

020459Y Punch for fitting the bearing on the steering tube



Grease the track of the seat of the steering bearing with the recommended product.

Reposition the ball cage and refit the steering tube onto the headstock.

Recommended products Calcium based grease Calcium grease Smooth-textured appearance; Ivory coloured

Specification TL 9150 066, symbol NATO G 460



- Fit the fifth wheel fitting and the dust gaiter on the steering bearing until they stop, using the specific tool.

Specific tooling

006029Y Punch for fitting steering bearing on the steering tube

- Fit the following components:

- Steering tube
- shock absorber-brake calliper mount
- Front shock absorber
- Front wheel hub
- Front brake calliper
- guard
- Front wheel
- Lateral handlebar switchgear sets
 [both]
- Leg shield back plate
- Upper handlebar cover
- Headlamp bezel
- Rear view mirrors

- Connect the negative terminal clamp of the ancillary battery.

Rear

Removing the rear wheel

- Prise off and remove the cover.



- Straighten the ends of the split pin to permit removal.





- Remove the split pin. - Remove the cap. - Restrain the rear wheel to prevent it from turning and undo the fastener nut. - Remove the rear wheel.

- Retrieve the inner washer.



Refitting the rear wheel

- Fit the rear wheel, complete with inner washer, in its seat.



- Restrain the rear wheel to prevent it from turning and tighten the fastener nut.





- Fit the cap.

- Fit the split pin in its seat.



- Bend back the ends of the split pin to lock the assembly.

- Fit the cover.



Removal

- Remove the following components:
 - Ancillary battery
 - VMS electric cooling fan
 - Rear wheel
 - Leg shield back plate
 - Footrest
 - Electric motor
- Remove the cover (1) on both sides.

- Undo the bolt fastening the link arm to the frame and retrieve the nut with the relative washer





- Pull out and remove the pin fastening the link arm to the frame.



- Remove the rear frame link arm from its seat.
- If necessary, tap the swingarm with a rubber mal-
- let to facilitate removal.



Overhaul

- Check that the silent-blocks are in good conditions.
- Otherwise, replace the swinging arm.

Refitting

- Fit the swingarm in its seat.
- Fit the fastener of the rear frame link complete with washer.



- Fit the washer and then fit and tighten the fastener nut to the specified torque.



- Fit the cover (1) on both sides.
- Fit the following components:
 - Electric motor
 - Footrest
 - Leg shield back plate
 - Rear wheel
 - VMS electric cooling fan
 - Ancillary battery

Shock absorbers

REMOVAL

- Remove the following components:

- Helmet compartment
- Centre undersaddle compartment cover

- Place a lift under the vehicle at the mid-point of the footboard.

- Undo the bolt fastening the rear shock absorber to the mounting bracket on the electric motor.





- Remove the screw fastening the rear shock absorber to the mounting bracket on the electric motor.



- Support the weight of the shock absorber securely and undo the upper nut fastening the shock absorber to the frame.



- Remove the rear shock absorber from its seat.



REFITTING

- Fit the rear shock absorber in its seat.



Suspensions

- Support the weight of the shock absorber securely and tighten the upper nut fastening the shock absorber to the frame.

- Use suitable tools to lift the swingarm by just enough to be able to fit the screw fastening the rear shock absorber to the mounting bracket on the electric motor in its seat.

- Tighten the bolt fastening the rear shock absorber to the mounting bracket on the electric motor.

- Remove the lift from underneath the scooter.
- Fit the following components:
 - Centre undersaddle compartment cover
 - Helmet compartment







Centre-stand

REMOVAL

- Place a lift under the scooter at the mid-point of the footboard.

- Raise the scooter with the lift until the centre stand (extended) is off the ground.

- Use suitable tools to detach and remove the return springs.





- Undo the fastener nut of the centre stand.



- Remove the screw of the centre stand fastener bolt.
- Remove the centre stand.



FITTING

Grease the through hole for the centre stand fastener bolt with the product indicated in the table.Fit the centre stand and fit the fastener screw.

Recommended products Calcium based grease Calcium grease Smooth-textured appearance; Ivory coloured Specification TL 9150 066, symbol NATO G 460

- Tighten the fastener nut of the centre stand.





- Grease the ends of the centre stand return springs and the relative anchor pins with the product indicated in the table.

Recommended products Calcium based grease Calcium grease

Smooth-textured appearance; Ivory coloured Specification TL 9150 066, symbol NATO G 460

- Use suitable tools to fit the return springs, attaching the ends to the respective anchor points.

- Remove the lift from underneath the scooter.





INDEX OF TOPICS

BRAKING SYSTEM

BRAK SYS

SECTION CONTENTS

This section contains the following chapters:

- Front brake calliper
- Front brake disc
- Front brake pads
- Filling and bleeding the braking system

Front

- Checking brake fluid level
- Front brake master cylinder
- Rear drum brake

N.B.

THE UNITS OF MEASUREMENT CONTAINED IN THIS CHAPTER ARE EXPRESSED IN TERMS OF THE DECIMAL METRIC SYSTEM. TO CONVERT BETWEEN IMPERIAL/US UNITS OF MEAS-UREMENT AND METRIC UNITS, SEE THE CHAPTER "UNIT OF MEASUREMENT CONVERSION TABLE" IN THE SECTION "TECHNICAL DATA".

LIST OF TIGHTENING TORQUES

| Fastener | Q.ty | Description | Value (Nm) |
|----------|------|--|------------|
| Joint | 1 | Front brake pipe - Front brake master cylinder | 22.5 ± 2.5 |
| Screw | 2 | Front brake master cylinder - Handlebar | 8.5 ± 1.5 |
| Screw | 2 | Front brake calliper - Shock absorber-brake calliper mount | 22 ± 2.0 |
| Joint | 1 | Front brake pipe - Front brake calliper | 22.5 ± 2.5 |

Front brake calliper

REMOVAL

- Disconnect the negative terminal clamp of the

ancillary battery.

- Remove the following components:
 - Rear view mirrors
 - Headlamp bezel
 - Upper handlebar cover
 - Front wheel

- Undo the fastener screws and remove the brake

fluid reservoir lid.



- Place a suitable container underneath to collect the brake fluid.

- Undo the connector fastening the brake fluid pipe to the calliper and wait for the fluid to drain into the container.

WARNING

RETRIEVE THE WASHERS FITTED ON THE CONNECTOR

- Undo the fastener screws and remove the front brake calliper.





REFITTING

- Fit the front brake calliper in its seat and tighten the fastener screws to the specified torque.

Connect the brake fluid pipe to the calliper and tighten the connector, fitting the washers (1) and (2) correctly as shown in the figure.







- Tighten the connector fastening the brake fluid pipe to the calliper to the specified torque.



- Fill the brake system with fluid.

- Fit the brake fluid reservoir lid and tighten the fastener screws.

- Bleed the brake system.
- Fit the following components:
 - Front wheel
 - Upper handlebar cover
 - Headlamp bezel
 - Rear view mirrors

- Connect the negative terminal clamp of the an-

cillary battery.

Front brake disc



Removal

- Remove the following components:

- Front wheel
- Front wheel hub

- Place the wheel hub complete with brake disc on the work bench.

- Undo the screws fastening the brake disc to the wheel hub.

- Remove the front brake disc.





Refitting

Fit the brake disc in the correct position.

- Tighten the screws fastening the brake disc to the wheel hub. - Fit the following components:

- Front wheel
- Front wheel hub





Disc Inspection

Carefully clean the surface of the braking race and make sure there is no abnormal scoring.
Check the thickness of the disc in multiple areas and check that it lies within the permitted wear limits.

Characteristic New brake disc thickness

4.0 mm

Minimum permissible thickness of the brake disc

3.5 mm

- Use a suitable tool to check that the axial deviation lies within the permissible limits.

- Otherwise, replace the brake disc.

Characteristic Maximum axial deviation

0.1 mm

Front brake pads

Removal

Rest the vehicle on its centre stand.

Remove the plastic brake pads access cap.











0.5 mm



Refitting

Insert the pads in the brake calliper.



Insert the brake pads retaining spring.



Insert the brake pads retaining pin.



Insert the safety cotter pin on the brake pads pin.



Position the plastic brake calliper closing cap.



Fill

Front

- Remove the rubber cap from the bleed screw.
- Insert a rubber pipe in the bleed screw to permit the brake fluid to be recovered.
- With the right-hand brake lever, load the system and bring it up to the required pressure.
- Keeping the right-hand brake lever pulled, loosen the bleed screw to purge the air. Then tighten the bleed screw.



- Release the brake lever.
- Repeat the operation until only brake fluid comes out of the rubber pipe.
- Remove the fluid recovery pipe and refit the rubber cap over the bleed screw.
- Top up the brake fluid to the right level in the reservoir.

If necessary, bleeding can be done using a special vacuum pump

N.B.

DURING BLEEDING FREQUENTLY CHECK THE LEVEL TO PREVENT AIR GETTING INTO THE SYSTEM THROUGH THE PUMP.

N.B.

DURING THE BLEEDING OPERATIONS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE BODYWORK SO AS NOT TO DAMAGE IT. FURTHERMORE, DURING THE BLEEDING OPERATIONS REGARDING THE BRAKE CALLIPERS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE DISC BRAKES AND WITH THE BRAKE PADS. CONTACT WITH BRAKE FLUID WILL COMPROMISE THE PERFORMANCE AND EFFICA-CY OF THE BRAKING SYSTEM.

Specific tooling

020329Y Mity-Vac vacuum pump

Brake fluid level check

- Rest the vehicle on its centre stand on flat

ground.

- The brake fluid reservoir has a sight glass **«A»** made of transparent material; the quantity of liquid contained in the sight glass indicates the level of fluid in the reservoir.

- When the sight glass **«A**» is full, the level inside the reservoir is above the MIN level; when it is partially full, the level has dropped to the MIN level; when it is fully empty, the level of fluid in the res-

ervoir is below the MIN level.

N.B.

THE LEVEL TENDS TO DROP AS THE BRAKE PADS GET WORN, A MINIMUM LEVEL SHOULD NOT BE REACHED. IF THE LEVEL IS TOO LOW, CHECK AND FIX THE SYSTEM SEALS, IF REQUIRED. TOP UP THE PUMP RESERVOIR, IF REQUIRED, CONSIDERING THAT THE "MAX." LEVEL MUST ONLY BE OBTAINED WITH NEW PADS.



- Under standard climatic conditions, replace fluid as indicated in the scheduled maintenance table.

Front brake pump

REMOVAL

- Disconnect the negative terminal clamp of the ancillary battery.

- Remove the following components:
 - Rear view mirrors
 - Headlamp bezel
 - Upper handlebar cover
 - Front wheel

- Undo the lower fastener screw of the right hand side electric switchgear set.

- Remove the front protective cover of the switchgear set, disengaging the relative retainer lugs from the seat.





- Undo the upper fastener screw of the right hand side electric switchgear set.

- Move the right hand electrical switchgear set out of the way.



- Undo the fastener screws and remove the brake fluid reservoir lid.



- Place a suitable container underneath to collect the brake fluid.

- Undo the connector fastening the brake fluid pipe to the calliper and wait for the fluid to drain into the container.

WARNING

RETRIEVE THE WASHERS FITTED ON THE CONNECTOR

- Refit the brake fluid reservoir lid and tighten the fastener screws to prevent contamination of the brake circuit.

- Disconnect the electrical connectors of the right hand brake switch.

- Undo the connector fastening the brake fluid pipe.

- Undo the fastener screws and remove the front brake master cylinder mounting bracket.





- Loosen the fastener screws of the throttle grip.



- Slide the throttle grip away as far as necessary to permit removal of the front brake master cylinder from the relative seat.



- Undo the connector, retrieve the relative washers and disconnect the brake fluid pipe from the front brake master cylinder.



REFITTING

Connect the brake fluid pipe to the master cylinder and tighten the connector, fitting the washers(1) and (2) correctly as shown in the figure.





- Fit the front brake master cylinder in its seat.



- Refit the throttle grip in its seat and tighten the fastener screws.



- Fit the front brake master cylinder mounting bracket and tighten the fastener screws to the specified torque.



- Tighten the connector fastening the brake fluid pipe to the specified torque.



- Connect the electrical connectors of the right hand brake switch.



- Refit the lateral electric switchgear set in its seat and tighten the upper fastener screw.



- Fit the front protective cover of the switchgear set, engaging the relative retainer lugs in the seat.



- Tighten the lower fastener screw of the right hand side electric switchgear set.



Connect the brake fluid pipe to the calliper and tighten the connector, fitting the washers (1) and
(2) correctly as shown in the figure.





- Undo the fastener screws and remove the brake fluid reservoir lid.

- Fill the brake system with fluid.
- Refit the brake fluid reservoir lid and tighten the

fastener screws.

- Bleed the brake system.
- Fit the following components:
 - Front wheel
 - Upper handlebar cover
 - Headlamp bezel
 - Rear view mirrors

- Connect the negative terminal clamp of the ancillary battery.



Rear drum brake

REMOVAL

- Remove the following components:
 - Rear wheel

- Loosen the adjuster nut of the rear brake control cable.



- Fold the two drum brake shoes towards yourself to release the tension in the return springs, and remove them from the housing.



- On the work bench, separate the return springs from the shoes.



REFITTING

- Check the state of wear of the brake shoe linings.
- Replace the rear brake drums if required by the maintenance schedule.
- Fit the return springs on the shoes.



- Fit the lower brake shoe first against the pins (1) and (2).



- Lift the upper brake shoe over the pins so that it fits correctly in place in the housing.

- Fit the following components:
 - Rear wheel



- While turning the rear wheel in the normal direction of rotation, tighten the adjuster nut (1) until the brake shoes start to drag against the drum;
- From this position, undo the adjuster nut (1) by 2 complete turns, and then tighten the check nut (2).

CBS - Combined braking system

CBS COMBINED REAR BRAKING SYSTEM (IF APPLICABLE)





SYSTEM DIAGRAM

- A. Rear brake
- B. Rear brake mechanical transmission CBS
- C. Front brake master cylinder
- D. Front brake pump hydraulic pipe CBS
- E. CBS splitter
- F. CBS hydraulic pipe front brake calliper
- G. Front brake calliper
- H. Front brake disc
- I. CBS mechanical transmission rear brake drum
- L. Rear brake drum

REMOVAL

To remove the CBS valve, proceed as follows:

- Remove the upper handlebar cover.
- Remove the leg shield back plate.
- Remove the front brake calliper from the disc.
- Operate the front pump to bring the brake pads

into contact with each other.



- Unscrew the screws used to fasten the CBS valve to the bracket and remove them.



- Unscrew the screws coupling the brake pipes to the valve.



- Remove the screws and disconnect the brake pipe couplings paying particular attention to the copper washers.



- Turn the valve to the right.

- Using the specific key, remove the rear brake transmission adjustment device.



- Disconnect the rear brake control transmission cable.
- Remove the CBS valve.



FITTING

- Put the CBS valve.
- Insert the rear brake control transmission adjust-

ment device into its seat.







- Prepare the coupling screws of the brake pipes, using only new copper washers





- Adjust the transmission using the adjustment nut.



- Once the desired adjustment is achieved, tighten the lock nut.



- Put the CBS valve on its bracket.

- Insert and tighten the valve fixing screws, applying the recommended torque.

Locking torques (N*m) CBS valve - bracket 9.0 ± 1.0 Nm



- Use the specific tool to widen the brake pads.


- Fill the system and bleed it.



- Replace the upper handlebar cover.
- Refit the leg shield back plate.
- Adjust the rear drum brake.



INDEX OF TOPICS

CHASSIS

CHAS

SECTION CONTENTS

This section contains the following chapters:

- Saddle
- Rear view mirrors
- Instrument cluster
- Leg shield back plate
- Headlight bezel
- License plate light
- Footboard
- License plate mount
- Centre rear cover
- Front mudguard
- Handles and upper lateral flanks
 - Saddle handle
- Front centre cover
- Battery
- Upper handlebar cover
- Lower handlebar cover
- Throttle control cable
- Handgrip

N.B.

THE UNITS OF MEASUREMENT CONTAINED IN THIS CHAPTER ARE EXPRESSED IN TERMS OF THE DECIMAL METRIC SYSTEM. TO CONVERT BETWEEN IMPERIAL/US UNITS OF MEAS-UREMENT AND METRIC UNITS, SEE THE CHAPTER "UNIT OF MEASUREMENT CONVERSION TABLE" IN THE SECTION "TECHNICAL DATA".

| LIST OF TIGHTENING TORQUES | | | |
|----------------------------|------|------------------|------------|
| Fastener | Q.ty | Description | Value (Nm) |
| Nut | 1 | Rear-view mirror | 30 ± 1.0 |

Seat

REMOVAL

- Lift the saddle.
- Remove the helmet compartment.
- While supporting the saddle, undo and remove
- the fastener screws.



- Remove the saddle.



FITTING

- Fit the saddle in the relative seat.



- While supporting the saddle, fit and tighten the fastener screws.
- Refit the helmet compartment.



Driving mirrors

REMOVAL

- Detach the cover of the rear view mirror fastener.



- Undo the stem nut of the rear view mirror.



- Remove the rear view mirror, retrieving the washers.



REFITTING

- Fit the rear view mirror in its seat, complete with washers, and tighten the stem nut.



- Refit the cover of the rear view mirror fastener.



Instrument panel

REMOVAL

- Disconnect the negative terminal clamp of the

ancillary battery.

- Remove the following components:
 - Rear view mirrors
 - Headlamp bezel
- Undo the rear fastener screws.
- Undo the front fastener screws.





- Lift the upper handlebar cover slightly without re-

moving.

CAUTION

THE ELECTRICAL CONNECTOR OF THE INSTRUMENT CLUSTER, SITUATED UNDERNEATH THE COVER ITSELF, MUST BE DISCONNECTED BEFORE THE COVER CAN BE REMOVED.

- Disconnect the electrical connector of the instrument cluster.





- On the work bench, undo the fastener screws and separate the instrument cluster (1) from the upper handlebar bezel (2).



(1

REFITTING

- On the work bench, fit the instrument cluster (1) in the relative seat in the upper handlebar bezel (2) and tighten the fastener screws.

- Connect the electrical connector of the instrument cluster.



- Fit the upper handlebar bezel, ensuring that the relative fastener clips are engaged correctly in the relative seats.



- Tighten the front fastener screws.



- Tighten the rear fastener screws.

- Fit the following components:

- Headlamp bezel
- Rear view mirrors

- Connect the negative terminal clamp of the ancillary battery.



Knee-guard

REMOVAL

- Disconnect the negative terminal clamp of the ancillary battery.

- Open the glove compartment.

- Undo the lower right hand screw fastening the leg shield back plate to the frame.

- Undo the upper centre screw fastening the leg shield back plate to the frame.







- Undo the left hand lateral screw fastening the leg shield back plate to the frame.



- Undo the fastener screws and remove the right hand turn indicator access cover.



- Undo the right hand lateral screw fastening the leg shield back plate to the frame.



- Detach the leg shield back plate, disengaging the

relative fastener clips from the relative seats.

WARNING

DO NOT REMOVE THE LEG SHIELD BACK PLATE COM-PLETELY YET. THE FOLLOWING ADDITIONAL STEPS MUST BE PERFORMED ON THE INNER SIDE OF THE LEG SHIELD BACK PLATE BEFORE IT CAN BE REMOVED.



- Disconnect the electrical connector of the saddle release button.



- Disconnect the electrical connector of the USB port.



- Disconnect the ferrule of the saddle release cable from the release lever.



- Detach the fuse holder unit from the relative seat on the leg shield back plate.

- Remove the leg shield back plate.



CHAS - 300

REFITTING

- Pre-fit the leg shield back plate in place and fasten the fuse holder unit in its seat.

- Connect the ferrule of the saddle release cable to the release lever.

- Connect the electrical connector of the USB port.

- Connect the electrical connector of the saddle release button.







- Fit the leg shield back plate, engaging the relative fastener clips in the relative seats.



- Tighten the right hand lateral screw fastening the leg shield back plate to the frame.



- Fit the right hand turn indicator access cover and tighten the fastener screws.



- Tighten the left hand lateral screw fastening the leg shield back plate to the frame.





- Tighten the upper centre screw fastening the leg shield back plate to the frame.



- Tighten the lower right hand screw fastening the leg shield back plate to the frame.

- Close the glove compartment.
- Connect the negative terminal clamp of the ancillary battery.

Headlight bezel

REMOVAL

- Undo the fastener screw on both sides.



- Remove the headlamp bezel.



REFITTING

- Fit the headlamp bezel in its seat and tighten the fastener screw on both sides.



License plate light

REMOVAL

- Undo the fastener screws of the licence plate light.



- Separate the bulb holder from the licence plate light.



FITTING

- Fit the bulb holder in its seat in the licence plate light.



- Refit the license plate light in its seat and tighten

the fastener screws.



Footrest

REMOVAL

- Remove the following components:

- Ancillary battery
- Leg shield back plate

- Undo the fastener screw of the VMS access cov-

er

- Remove the VMS access cover





- Undo the front fastener screw of the footboard.

WARNING

REPEAT THIS STEP FOR THE SCREW ON THE OPPOSITE SIDE OF THE FOOTBOARD.



- Detach the outermost rubber anti-slip strip on the

footboard.

WARNING

REPEAT THIS STEP FOR THE ANTI-SLIP STRIP ON THE OPPOSITE SIDE OF THE FOOTBOARD.

- Undo the centre fastener screw of the footboard.

WARNING

REPEAT THIS STEP FOR THE SCREW ON THE OPPOSITE SIDE OF THE FOOTBOARD.





- Undo the fastener screws and remove the bead-

ing.

WARNING REPEAT FOR THE REMAINING BEADING.



- Undo the rear fastener screw of the footboard.

WARNING REPEAT THIS STEP FOR THE SCREW ON THE OPPOSITE SIDE OF THE FOOTBOARD.



- Detach and remove the rear footrest.

WARNING

REPEAT THIS STEP FOR THE FOOTREST ON THE OPPO-SITE SIDE.



- Undo the rear fastener screw of the footboard.

WARNING

REPEAT THIS STEP FOR THE SCREW ON THE OPPOSITE SIDE OF THE FOOTBOARD.



- Remove the footrest.



REFITTING

- Fit the footboard in its seat.



- Tighten the rear fastener screw of the footboard.

WARNING

REPEAT THIS STEP FOR THE SCREW ON THE OPPOSITE SIDE OF THE FOOTBOARD.



- Fit the rear footrest.

WARNING

REPEAT THIS STEP FOR THE FOOTREST ON THE OPPO-SITE SIDE.



- Tighten the rear fastener screw of the footboard.

WARNING

REPEAT THIS STEP FOR THE SCREW ON THE OPPOSITE SIDE OF THE FOOTBOARD.



- Fit the beading and tighten the fastener screws.

WARNING REPEAT FOR THE REMAINING BEADING.



- Tighten the centre fastener screw of the foot-

board.

WARNING

REPEAT THIS STEP FOR THE SCREW ON THE OPPOSITE SIDE OF THE FOOTBOARD.



- Fit the outermost rubber anti-slip strip on the foot-

board.

WARNING

REPEAT THIS STEP FOR THE ANTI-SLIP STRIP ON THE OPPOSITE SIDE OF THE FOOTBOARD.



- Tighten the front fastener screw of the footboard.

WARNING

REPEAT THIS STEP FOR THE SCREW ON THE OPPOSITE SIDE OF THE FOOTBOARD.



- Fit the VMS access cover



- Tighten the fastener screw of the VMS access cover
- Fit the following components:
 - Leg shield back plate
 - Ancillary battery



License plate holder

REMOVAL

- Remove the following components:
 - License plate light
- Undo the lateral fastener screws on both sides.



- Undo the centre fastener screws of the licence plate mount.



- Remove the license plate support.



REFITTING

- Fit the license plate mount in its seat.



- Fit and tighten the centre fastener screws.



- On both sides, tighten the lateral fastener screws on the license plate mount.

- Fit the following components:
 - License plate light



Rear central cover

REMOVAL

- Disconnect the negative terminal clamp of the ancillary battery.

- Lift the saddle and remove the helmet compartment.

- Remove the protective cover of the charging plug.



- Undo the fastener screws of the rear undersaddle compartment cover.



- Remove the rear undersaddle compartment cov-

er.

WARNING THERE ARE ELECTRICAL CONNECTORS UNDER THE COVER.

- Disconnect the electrical connector of the emergency power on switch.





- Disconnect the electrical connector of the mains charge plug stowed position switch.

- Remove the centre rear cover.



REFITTING

- Connect the electrical connector of the mains charge plug stowed position switch.

- Connect the electrical connector of the emergency power on switch.





- Carefully refit the rear undersaddle compartment cover in its seat.



- Tighten the fastener screws of the rear undersaddle compartment cover.



- Fit the protective cover of the charging plug.
- Fit the helmet compartment.
- Close the saddle.

- Connect the negative terminal clamp of the ancillary battery.



Front mudguard

- Disconnect the negative terminal clamp of the ancillary battery.
- Remove the following components:
 - Rear view mirrors
 - Headlamp bezel
 - Upper handlebar cover
 - Leg shield back plate
 - Lateral handlebar switchgear sets [both]
 - Front light unit
 - Front wheel
 - guard
 - Front brake calliper
 - Front wheel hub
 - Front shock absorber
 - shock absorber-brake calliper mount
 - Steering tube
- Undo the fastener nuts and remove the front

mudguard.

REFITTING

- Fit the front mudguard in its seat and tighten the fastener nuts.

- Fit the following components:
 - Steering tube
 - shock absorber-brake calliper mount
 - Front shock absorber





- Front wheel hub
- Front brake calliper
- guard
- Front wheel
- Lateral handlebar switchgear sets [both]
- Leg shield back plate
- Upper handlebar cover
- Headlamp bezel
- Rear view mirrors

- Connect the negative terminal clamp of the an-

cillary battery.

Handles and top side fairings

SADDLE HANDLE

Removal

- Raise the saddle.
- Remove the helmet compartment.
- Remove the protective cover of the charging

plug.

- Undo the fastener screws of the rear undersaddle compartment cover.





- Lift the rear undersaddle area cover and move it

aside. WARNING

THERE ARE ELECTRICAL CONNECTORS UNDER THE COVER.



- Undo the fastener screw of the access cover of

the rear fasteners of the saddle handle.



- Remove the access cover of the rear fasteners of the saddle handle.



- Undo the rear fastener screws of the saddle handle.



- Remove the saddle handle.



Refitting

- Fit the saddle handle in its seat and tighten the rear fastener screws.

- Fit the access cover of the rear fasteners of the saddle handle.



- Tighten the fastener screw of the access cover of the rear fasteners of the saddle handle.



- Carefully refit the rear undersaddle compartment cover in its seat.

- Tighten the fastener screws of the rear undersaddle compartment cover.
- Fit the protective cover of the charging plug.
- Fit the helmet compartment.
- Close the saddle.



Front central cover

REMOVAL

- Remove the "PIAGGIO" badge and undo the fas-
- tener screw under the badge.
- Remove the front centre cover.





REFITTING

- Fit the front centre cover and tighten the fastener screw.

- Fit the "PIAGGIO" badge.



Battery

REMOVAL

- Undo the fastener screws of the ancillary battery access cover.



- Remove the ancillary battery access cover.



- Undo the fastener screws and remove the retainer bracket of the ancillary battery.



- Undo the respective fastener screws and disconnect the negative and positive cables of the ancillary battery.



- Remove the ancillary battery from its seat.



REFITTING

- Fit the ancillary battery in its seat.



- Connect the negative and positive cables of the ancillary battery and tighten the relative fastener screws.



- Fit the retainer bracket of the ancillary battery and tighten the fastener screws.



- Fit the ancillary battery access cover.



- Tighten the fastener screws of the ancillary battery access cover.



Upper handlebar cover

REMOVAL

- Disconnect the negative terminal clamp of the

ancillary battery.

- Remove the following components:
 - Rear view mirrors
 - Headlamp bezel
- Undo the rear fastener screws.
- Undo the front fastener screws.





- Lift the upper handlebar cover slightly without re-

moving.

CAUTION

THE ELECTRICAL CONNECTOR OF THE INSTRUMENT CLUSTER, SITUATED UNDERNEATH THE COVER ITSELF, MUST BE DISCONNECTED BEFORE THE COVER CAN BE REMOVED.

- Disconnect the electrical connector of the instrument cluster.





- On the work bench, undo the fastener screws and separate the instrument cluster (1) from the upper handlebar bezel (2).



(1

REFITTING

- On the work bench, fit the instrument cluster (1) in the relative seat in the upper handlebar bezel (2) and tighten the fastener screws.

- Connect the electrical connector of the instrument cluster.



- Fit the upper handlebar bezel, ensuring that the relative fastener clips are engaged correctly in the relative seats.



- Tighten the front fastener screws.



- Tighten the rear fastener screws.

- Fit the following components:

- Headlamp bezel
- Rear view mirrors

- Connect the negative terminal clamp of the ancillary battery.



Lower handlebar cover

REMOVAL

- Disconnect the negative terminal clamp of the ancillary battery.

- Remove the following components:
 - Rear view mirrors
 - Headlamp bezel
 - Upper handlebar cover
 - Leg shield back plate
 - Lateral handlebar switchgear sets
 [both]
 - Front light unit
 - Front wheel
 - guard

- Undo the fastener screws of the handlebar cover on both sides.


- Remove the handlebar cover



REFITTING

- Fit the handlebar cover in its seat and tighten the

fastener screws on both sides.

- Fit the following components:
 - Handlebar
 - Front wheel
 - Front light unit
 - Lateral handlebar switchgear sets
 [both]
 - Leg shield back plate
 - Headlamp bezel
 - Upper handlebar cover
 - Rear view mirrors

- Connect the negative terminal clamp of the an-

cillary battery.

Throttle control cable

REMOVAL

- Disconnect the negative terminal clamp of the ancillary battery.

- Remove the following components:

- Rear view mirrors
- Headlight bezel
- Upper handlebar cover
- Leg shield back plate
- Throttle control sensor

- Undo the fastener screws of the throttle cable access cover.





- Remove the throttle cable access cover.

- Turn the throttle grip into the position necessary to allow removal of the ferrule on the end of the throttle cable from the relative seat.
- Repeat the procedure for the other throttle cable.
- Remove the throttle control cable from the seat.



REFITTING

- Check the throttle cable for damage and, if necessary, replace the entire assembly with a new assembly.

- Fit the throttle control cables in their seats, routing the Bowden cables correctly.





- Turn the throttle grip into the position necessary to allow fitment of the ferrule on the end of the throttle cable into the relative seat.

- Repeat the procedure for the other throttle cable.

- Fit the throttle cable access cover in the relative seat.





- Tighten the fastener screws of the throttle cable access cover.

- Fit the following components:

- Throttle control sensor
- Leg shield back plate
- Upper handlebar cover
- Headlight bezel
- Rear view mirrors

- Connect the negative terminal clamp of the ancillary battery.

Handlebar hand grip

REMOVAL

- Disconnect the negative terminal clamp of the ancillary battery.

- Remove the following components:

- Right rear-view mirror
- Headlight bezel
- Upper handlebar cover
- Leg shield back plate





- Undo the lower fastener screw of the right hand side electric switchgear set.

- Remove the front protective cover of the switchgear set, disengaging the relative retainer lugs from the seat.



- Undo the upper fastener screw of the right hand side electric switchgear set.



- Undo the rear fastener screw of the lateral electric switchgear set.

- Remove the right hand side switchgear set and move it out of the way.



- Undo the fastener screws of the throttle cable access cover.



- Remove the throttle cable access cover.



- Turn the throttle grip into the position necessary to allow removal of the ferrule on the end of the throttle cable from the relative seat.

- Repeat the procedure for the other throttle cable.

- Pull off and remove the throttle hand grip.



REFITTING

- Push the throttle hand grip into place.

- Turn the throttle grip into the position necessary to allow fitment of the ferrule on the end of the throttle cable into the relative seat.

- Repeat the procedure for the other throttle cable.



- Fit the throttle cable access cover in the relative seat.



- Tighten the fastener screws of the throttle cable access cover.



- Refit the right hand switchgear set in its seat and tighten the rear fastener screw.



- Tighten the rear fastener screw of the lateral electric switchgear set.



- Fit the front protective cover of the switchgear set, engaging the relative retainer lugs in the seat.



- Tighten the lower fastener screw of the lateral electric switchgear set.

- Fit the following components:

- Leg shield back plate
- Upper handlebar cover
- Headlight bezel
- Right rear-view mirror

- Connect the negative terminal clamp of the ancillary battery.



В

Battery: 72, 113, 163, 319 Brake: 267, 269, 271, 275, 276, 282 Brake fluid: 275 Bulbs:

С

Centre stand: Checks: 159

Ε

Electric: 113, 197

F

Fuses: 161

Η

Headlight: 70, 97, 303 Hub oil: 67

I

Identification: 42 Instrument panel: 82, 294

Μ

Maintenance: *4*2, *65*, *66* Mirrors: *29*2

R

Recommended products: 67

S

Shock absorbers: 261 Stand: Suspension: 73

Т

Technical Data: 14 Transmission: 72

V

Vehicle: 11, 42, 43