AfterSales Diagnostic Sheet

MAS002814

FROM: Maserati TSO
TO: Maserati Network
5/26/2023

Air suspension system - Blown F41 fuse

Section: 06.24 - 2 AIR SUSPENSION SYSTEM

Models: M161(All MY)

Problem: Difficulties changing the vehicle ride height with message “CHECK THE AIR SUSPENSION SYSTEM” on the Instrument Panel Cluster. Vehicle may show height difference between front and rear (front suspensions lower than the rear suspensions) and/or air suspension compressor fuse (F41 in RDU, Rear Distribution Unit) blown.

Faults: possible DTCs stored in ASCM:
C15A1-00 (55A100) - Unable to Obtain Desired Ride Height
C15D9-00 (55D900) - Low Air Mass
C1562-98 - Ride Height Air Pump Control-Component or System Over Temperature
C2212-00 (621200) ECU - in plant mode

Inspection: Submit a BOL as “Support Request”, and attach all the requested information outlined below:

1. Fill out **Attachments A** and **C** based on the **Clean Point** section, the checklist may need to be partially or completely filled out.

2. Acquisitions recorded with PicoScope (both in psdata format and PDF format) of the currents absorbed by the compressor, reversing valves and valve block during the execution of the active diagnoses "Vehicle Articulation Routine" and "Actuator Test".

Clean Point: Improvements have been implemented to address the issue. Vehicles that have already been equipped with this OEM improvement are identified as **Post-Clean Point**, whereas vehicles that have not yet received this improvement are identified as **Pre-Clean Point**.

To distinguish between **Pre-Clean Point** and **Post Clean Point** Vehicles, please refer to the following information:

- Lower than: VIN349849 – Assembly Number 6077076 = **Pre-Clean Point**
- Higher than: VIN349849 – Assembly Number 6077076 = **Post-Clean Point**

For **Pre-Clean Point** vehicles, perform steps 1. thru 7. of **Attachment A**: checklist.

For **Post-Clean Point** vehicles, perform steps 1. thru 9. of **Attachment A**: checklist.

Labor Times:
- For step 4, please refer to 06.24.001 - AIR SUSPENSION SYSTEM COMPLETE COMPRESSOR ASSEMBLY - Air suspension system leakage test = 0.30 h.
- For step 5, if necessary, carry out the procedure CAR HEIGHT CALIBRATION - Recording and testing with diagnostic tester = 0.35 h.

Pre-Clean Point Vehicles:
- For the remaining steps, in BOL, 0,75 h of extra-time will be granted via specific code.

Post-Clean Point Vehicles:
- For the remaining steps, in BOL, 1,5 h of extra-time will be granted via specific code.

Attachment A: Checklist

Preliminary questions: in which conditions did the anomaly occur? In particular:

a. Load conditions: number of passengers and load in the luggage compartment.
Answer:

_____

b. Vehicle speed.
Answer:

_____

c. Possible additional relevant information concerning specific manoeuvres or conditions that triggered the issue (e.g. vehicle ride height change).
Answer:

_____

d. Was the suspension stiffness setting set to hard setting (hard) or soft setting (soft) on the switch on the Central Tunnel?

☐Soft ☐Hard

e. Was the Easy Entry/Exit functionality (Entry/Exit: easier passenger entry and exit mode) active?

☐YES ☐NO

Note: after the execution of the Active Diagnoses reported in the following, it is normal that the DTC C2212-00 (621200) - ECU In-Plant Mode is stored in the ASCM ECU. By means of the Diagnostic Tool, select the ASCM module and carry out the ASCM > Active Diagnosis > Exit Plant Mode.

1. Is the fuse F41 in RDU (Rear Distribution Unit) blown?

☐YES ☐NO

If the answer is YES, replace it and proceed with the following steps.
If the answer is NO, proceed with the following steps.

2. With running engine, manually level the Vehicle by means of the height selector in the central tunnel.

   If the Vehicle does not change its height even after the replacement of F41 fuse, verify if the DTC C2212-00 (621200) ECU In-Plant mode set in ASCM. If this DTC is set, enter the ASCM module with the diagnostic tool and carry out the ASCM > Active Diagnosis > Exit Plant Mode.

Was it possible to change the Vehicle Height?

☐YES ☐NO

Did the compressor emit excessive noise while being active?

☐YES ☐NO

3. With the Diagnostic Tool, via Active Diagnosis > Ride Height, Pressure and Air Mass measures of the ASCM module (see **Figure 1**), verify the Total System Air Mass and the system pressure (Air Tank (Reservoir) Pressure) (see **Figure 2**).

   The acceptable value of Air Tank (Reservoir) Pressure is within 5 bar and 12 bar. The acceptable value of the Total System Air Mass is within 109 bar·liter and 159 bar·liter. The nominal value is 129 bar liter.

Note: Perform the Active Diagnosis while the engine is running. It is normal for the message "Airmass Too Low" to appear as soon as the Active Diagnosis is initiated. In such cases, it is recommended to keep the engine running for a few minutes before clicking on the Update button. If the Active Diagnosis continues to display the "Airmass Too Low" message with all parameters equal to zero (0), follow the steps outlined below.

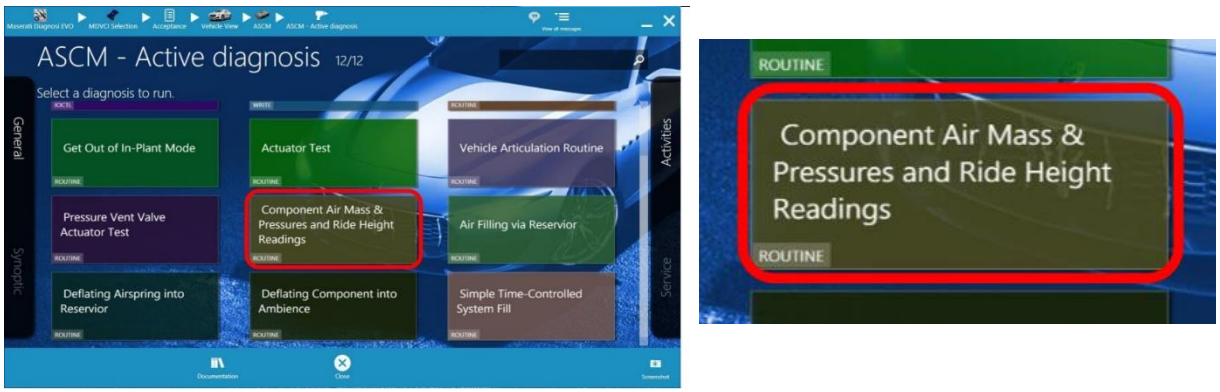

Figure 1: air suspension system pressure reading with the Active Diagnosis of the ASCM ECU.

Figure 2: results of the system pressure reading Active Diagnosis.

4. Perform 06.24.001 - AIR SUSPENSION SYSTEM COMPLETE COMPRESSOR ASSEMBLY - Air suspension system leakage test, to check if there is any leakage in the air suspension system: was there any leakage?

☐YES ☐NO

If the answer is YES, first solve this anomaly. If the answer is NO, proceed to the next step.

5. Measure the Vehicle Height at each corner. Perform the measure as shown in **Figure 3**, reporting the value in millimetres (mm) in Table 2 of **Attachment C**:summary table of the Vehicle Heights of each Vehicle corner.

Figure 3: measuring method of the Vehicle Height at each corner.

- Do the Vehicle Heights of the same axle show a difference greater than 5 mm (example: front left corner Vehicle height: 450 mm; front right corner Vehicle height: 460 mm)?

☐YES ☐NO

If YES, please proceed from step 5.1; conversely skip to step 6.

5.1. Carry out the procedure of the Workshop Manual 00.20.034 – 35 CAR HEIGHT CALIBRATION - Recording and testing with diagnostic tester.

5.2. Measure Vehicle height at each corner as shown in **Figure 3**.

Note: fill in the column of the Table 1 of **Attachment C:** summary table of the Vehicle Heights of each Vehicle corner

Operations to be carried out with MDEVO

In the following, the steps to be performed using the Diagnosis tool (MD EVO), as a continuation of the previous section, are listed.

6. Perform: Active Diagnosis > Pressure Vent Valve Actuator Test of the ASCM module = **3 times**, as shown in **Figure 4**. The purpose of this step is to evaluate the operation of the reversing valves (inside the compressor), the environment valve and the pressure sensor, which is located inside the valve block.

This diagnosis forces the air circuit to be emptied between the tank and the pressure sensor via the environment valve.
The expected result on a properly functioning car is that:
- A hiss/vent noise is heard.
- The height of the four corners of the vehicle should not be reduced (tolerance is 5 mm).
- The diagnosis ends correctly without errors.

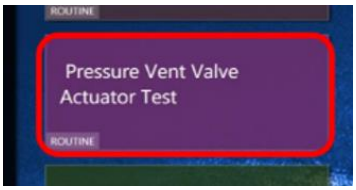

Figure 4: Active Diagnosis > Pressure Vent Valve Actuator Test.

6.1. Did the diagnosis complete correctly?

☐YES ☐NO

In case the active diagnosis does NOT end correctly, repeat it.
In any case, proceed from the step 6.2.

6.2. Did you hear a hiss/vent noise?

☐YES ☐NO

6.3. Measure the Vehicle heights at the four corners (as shown in **Figure 3**), reporting the readings in the Table 1of **Attachment C**:summary table of the Vehicle Heights of each Vehicle corner.

6.4. Did the heights, on the 4 corners, change, from step 6, by more than 5 mm?

☐YES ☐NO

7. Carry out the Active Diagnosis > Deflating Component into Ambience of the ASCM module, with the following settings:
- Deflating Mode: Fixed short time deflating mode, as illustrated in **Figure 5**.
- Deflating Component: one by one FL, FR, RL, RR, as illustrated in **Figure 5**.

The purpose of this step is to evaluate the operation of the environment valve and the valve of each air spring.
This diagnosis forces the emptying of the air circuit of the single air spring through the environment valve.
The expected result on a properly functioning car, is that:
- A hiss/vent noise is heard.
- The heights of the 4 corners of the vehicle must be reduced by a value greater than 5 mm.

By performing this Active Diagnosis individually for all four air springs, it is possible to assess their individual functionality.

Figure 5: Active Diagnosis > Deflating Component into Ambience of the ASCM module.

7.1. Was a hiss/vent noise heard?

☐YES ☐NO

7.2. Measure the Vehicle Height at each corner (as shown in **Figure 3)** reporting the values in the Table 1 of the **Attachment C**:summary table of the Vehicle Heights of each Vehicle corner.
Did the Vehicle heights for the four corners change by more than 5 mm, with respect to step 6?

☐YES ☐NO

Note: as indicated on the first page, proceed with the steps 8. And 9. For Post-Clean Point Vehicles only.

8. Carry out 10 levelling operations from Off Road 2 to Aero 2 to warm the Air Suspension System up.

- Level the Vehicle back to normal height level.
- Perform, twice, as better described below, the ASCM > Active Diagnosis > Vehicle Articulation Routine.

Between the first and the second execution of the Active Diagnosis, level the Vehicle back to normal height level. Before and after the first of the two required executions of the Active Diagnosis, it is necessary to register, in the Table 2 of the **Attachment C**:summary table of the Vehicle Heights of each Vehicle corner, the Vehicle Height of all the four corners.

To install the current clamps required for the current measurements described below, it is necessary to raise the vehicle on a hoist. Once the installation of the current clamps is complete and the vehicle is at ground level, the vehicle height must be recorded before beginning the Vehicle Articulation Routine.

This Active Diagnosis activates the individual single air springs by opening the single valves for a duration of 5 seconds, in the following order:
a. Front Left.
b. Front Right.
c. Rear Left.
d. Rear Right.

Simultaneously, to monitor the current absorbed by the compressor, valve block, and reversing valves during active diagnosis executions, it is necessary to measure the current absorbed by these system components. Please refer to **Attachment B**: current absorption of the compressor for detailed instructions. The purpose of this measurement is to evaluate the performance of the ASCM ECU. For this reason, this step 8 must be repeated twice.

First execution of the Active Diagnosis
a. Channel A: current absorbed by the compressor (B1: current absorbed by the compressor), and at the same time
b. Channel B: current absorbed by the valve block (B2: current absorbed by the valve block).

Second execution of the Active Diagnosis:
a. Channel A: current absorbed by the compressor (B1: current absorbed by the compressor), and at the same time
b. Channel B: current absorbed by the reversing valves inside the compressor (B3: current absorbed by the reversing valves).

Note: it is possible to save one psdata and one PDF file of the measures with PicoScope for each one of the two executions of the Active Diagnosis so that an overall four files are created for this step 8. If the F41 fuse blew during this test, replace it. **Did the F41 fuse blow?**

☐YES ☐NO

9. Level the Vehicle back to normal height level.

Perform, the ASCM > Active Diagnosis > Actuator Test, selecting (one-by-one) **2 times**:
- FL (Front Left).
- FR (Front Right).
- RL (Rear Left).
- RR (Rear Right).

After the first execution of the Active Diagnosis, reposition the vehicle to its normal height level before proceeding with the second execution.

Before and after the first of the two required executions of the Active Diagnosis, it is necessary to register, in the Table 2 of the **Attachment C**:summary table of the Vehicle Heights of each Vehicle corner, the Vehicle Height of all the four corners. The screenshot of the diagnostic tool is shown in **Figure 6**.

This diagnosis activates the reversing valves inside the compressor and the valve of each air spring, subsequently inflating each air spring one by one.

The expected result on a properly functioning vehicle, is that:

- All springs are inflated and deflated (reaching the same height).
- The springs are inflated and deflated one at a time: this means that no more than one at a time must be involved.

Simultaneously, for the purpose of evaluating the performance of the ASCM ECU, it is necessary to measure the current absorbed by the compressor, valve block, and reversing valves inside the compressor during active diagnosis executions.

Please refer to **Attachment B**: Current Absorption of the Compressor, Valve Blocks, and Compressor Reversing Valves Test for detailed instructions on how to measure the electrical current absorbed by these system components.

Due to this requirement, **Step 9** needs to be repeated twice. It is necessary to measure the current simultaneously by connecting to channel A and channel B of the PicoScope instrument, respectively.

First execution of the Active Diagnosis

a. Channel A: current absorbed by the compressor (Note: Before initiating the current measurement with current clamps, it is necessary to reset the current measure and ensure that the current reading on the PicoScope is zero in the absence of any current. To reset the current clamp, use the knob located on the clamp itself.
b. B1: and at the same time
c. Channel B: current absorbed by the valve block (B2: current absorbed by the valve block).

Second execution of the Active Diagnosis:

a. Channel A: current absorbed by the compressor (Note: Before initiating the current measurement with current clamps, it is necessary to reset the current measure and ensure that the current reading on the PicoScope is zero in the absence of any current. To reset the current clamp, use the knob located on the clamp itself.
b. B1: and at the same time
c. Channel B: current absorbed by the reversing valves inside the compressor (B3: current absorbed by the reversing valves).

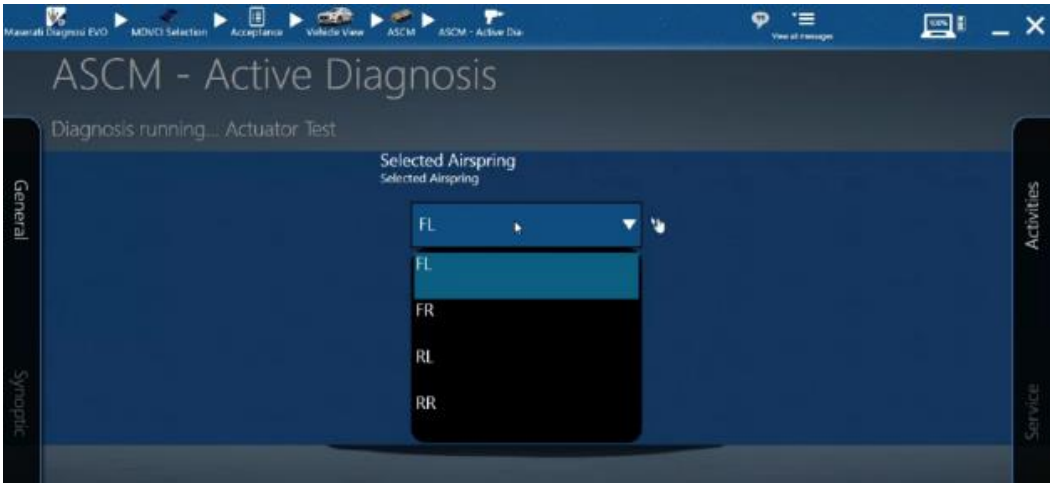

Figure 6: Active Diagnosis > Actuator Test.

Note: it is possible to save one psdata and one PDF file of the measures with PicoScope for each one of the two executions of the Active Diagnosis so that an overall four files are created for this step 9. If the F41 fuse blew during this test, replace it.

Did the F41 fuse blow?

☐YES ☐NO

Attachment B: Electrical current absorption of the compressor, valve blocks and compressor reversing valves test

Note: Before initiating the current measurement with current clamps, it is necessary to reset the current measure and ensure that the current reading on the PicoScope is zero in the absence of any current. To reset the current clamp, use the knob located on the clamp itself.

B1: Electrical current absorbed by the compressor.

The measurement of the current absorbed by the air compressor can be easily done by accessing the red wiring at the X090 connector, which is located near the rear differential. The position of the X090 connector, in the vehicle, is shown in **Figure 7**. To access it, it is recommended to release the blue lever shown.

Figure 7: position of the X090 connector for the current measurement absorbed by the compressor during the actuations. And secondary lock (blue, indicated by the arrow) of the X090 connector

The air suspension system compressor power wiring is the red one shown in **Figure 8.**

Figure 8: power supply wiring to the air suspension compressor.

Figure 9: current clamps to be used for the measurement of current absorbed by the compressor.

To perform the current measures, one should follow the following steps:

1. The current clamp TA167 (with a capacity of 2000 A to be set in configuration 200 A, by selector on the clamp itself) or the TA019 clamp (with a capacity of 600 A) can be used.
2. Connect the current clamp to connector A of the PicoScope tool.
3. Choose the correct clamp on PicoScope software. Click on Channel A and choose:

   a. Clamp with 2000 A capacity in 200A configuration if the TA167 current clamp is used, or
   b. Clamp with 600 A if the TA019 is used.

   The settings are shown in **Figure 10**.

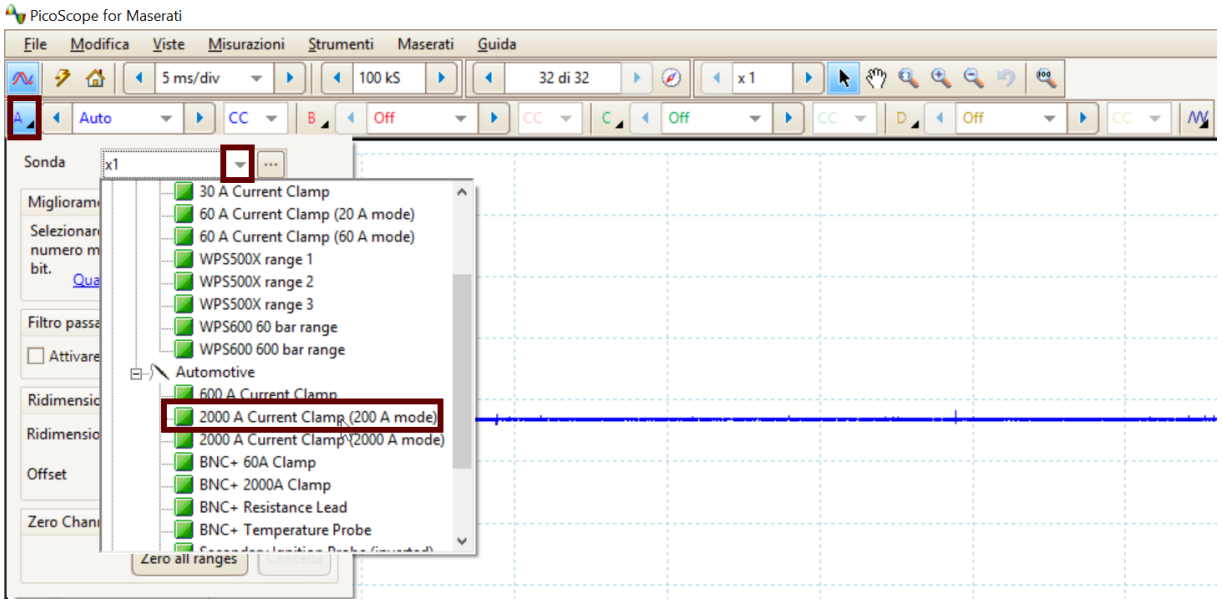

Figure 10: settings of PicoScope for the choice of the current clamp.

4. Set the correct range from the "scale setting" drop-down menu next to channel A : -100A/200A.
5. Set 2 s/div and sampling frequency to 100 kS. In this way it is possible to have a sampling frequency of 5 kHz: sampling refers to the number of samples stored in the total window of 10 divisions that is displayed on screen: with 2 s/div, as there 10 divisions and then on screen a measure of 20 s will be shown. In this way, therefore, the frequency will be equal to

$$f = \frac{\text{Samples}}{\text{Sampling time}} = \frac{100\ kS}{20\ s} = \frac{100000}{20\ s} = 5000\ \text{Hz}$$

PicoScope connections and settings	
Channel A scope	Current clamp TA019 (capacity 600 A) or current clamp TA167 set to 200 A
Channel A scale setting	-100 A/200 A DC
Time scale settings	2 s/div
Sampling	100 kS (100.000 samples)

6. Save the measures in psdata and PDF formats.

In **Figure 11** a typical current absorption profile by the compressor during a levelling is shown.

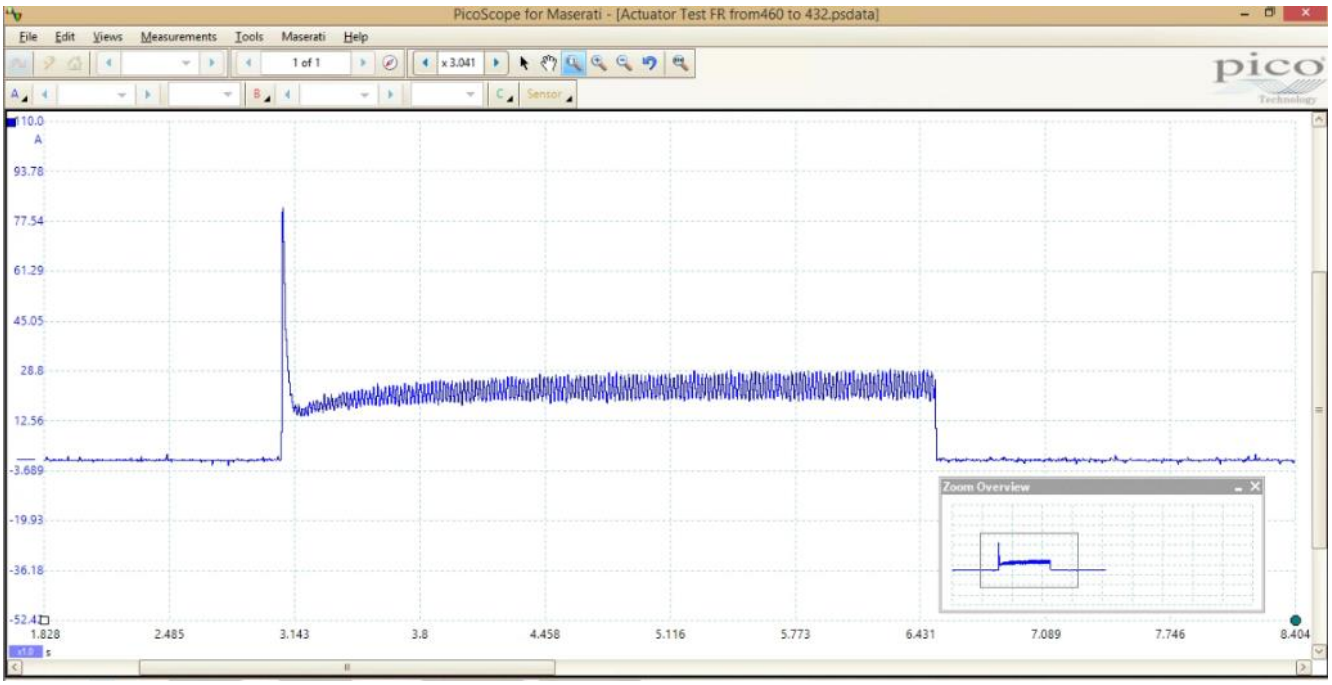

Figure 11: typical compressor current absorption profile during levelling.

B2: Electrical current absorbed by the valve block

The current measurement absorbed by the valve block of the air suspension system can be done from pin 23 of connector B of the ASCM module, as shown in **Figure 12**. Since, in this case, the current values are lower than those in the B1: current absorbed by the compressor, in addition to the fact that these measurements must be made at the same time as the current measurement absorbed by the compressor, it is required in this case to use the current clamp TA018, which has a capacity of 60 A. This clamp is shown in **Figure 13**.

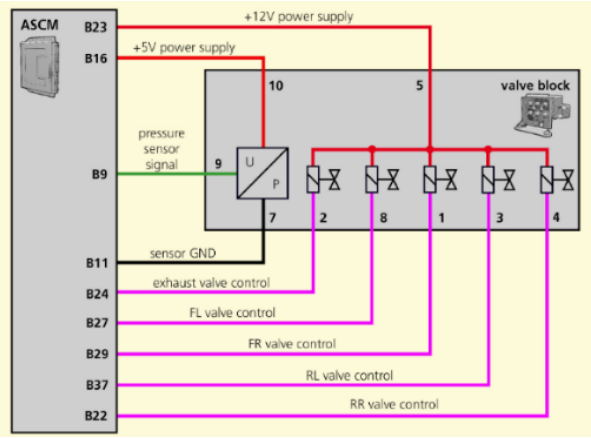

Figure 12: outline of the wiring diagram of the valve block.

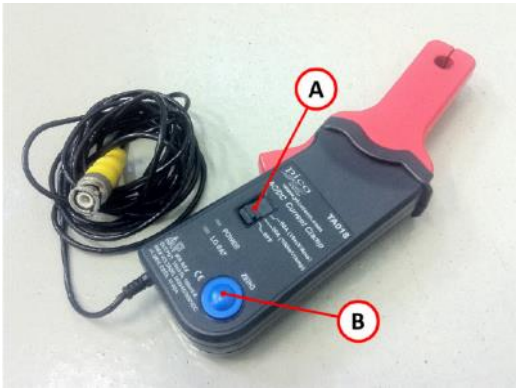

Figure 13: TA018 current clamp.

As the connector X090 shown in B1: Electrical current absorbed by the is more easily accessible than the connector B of the ASCM, please to measure the current by accessing the yellow-green wiring pin 16 of connector X090, as shown in **Figure 18**: pin 8 of connector X090 (grey-green wiring).

Figure 14: pin 16 of connector X090 (yellow-green wiring).

The TA018 current clamp can be located close to the TA0167 or TA019 current clamp, the latter being used to measure the current absorbed by the air suspension compressor.

In order to perform the measure of current absorbed by the valve block, one should follow the following steps:

1. Use the TA018 current clamp (with a capacity of 60 A to be set in configuration 20 A, by selector on the clamp itself).
2. Connect the current clamp to connector B of the PicoScope tool.
3. Choose correct claps on PicoScope software. Click on channel B and choose the clamp 60 A Current Clamp (20 A mode).The settings are shown in **Figure 15.**
4. Set the correct scale from the "scale setting" drop-down menu next to channel A : -/+5A.
5. Set 2 s/div and sampling frequency to 100 kS.
6. Save the measures in psdata and PDF formats.

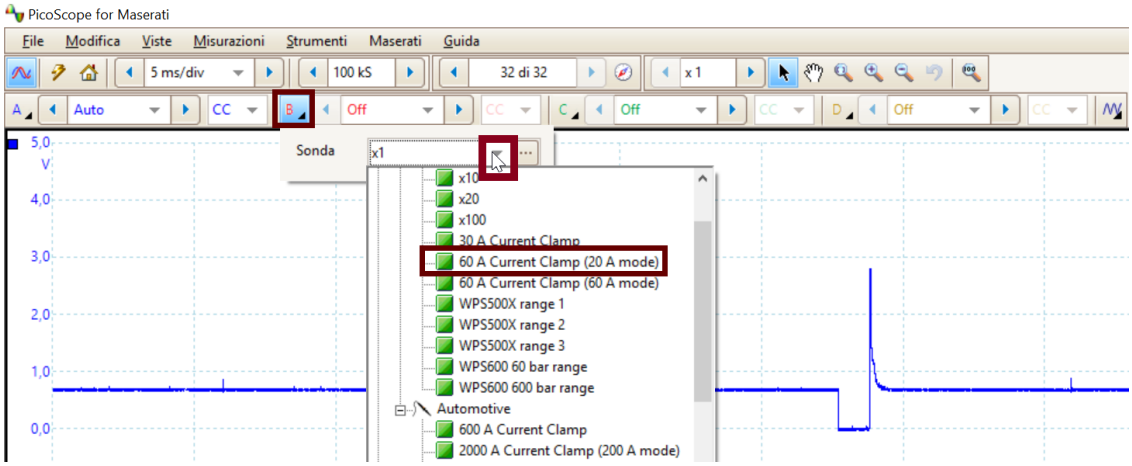

Figure 15: settings of the 60 A current clamp.

PicoScope connections and settings	
Channel B scope	TA018 Current Clamp (capacity 60 A) with selector on 20 A
Channel B scale setting	-5 A/5 A DC
Time scale settings	2 s/div
Sampling	100 kS (100.000 samples)

In **Figure 16** the typical current absorption profile by the valve block when performing an Actuator Test is shown.

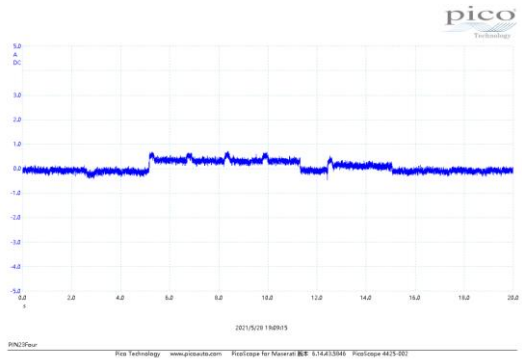

Figure 16: typical valve block current absorption profile during the execution of an Actuator Test.

B3: Electrical current absorbed by the reversing valves

The measurement of the current absorbed by the reversing valves of the air compressor can be conducted from pin 46 of connector B of the ASCM module, as depicted in **Figure 18**. Similar to the case of B2: current absorbed by the valve block, the current values for the reversing valves are lower compared to those measured in section B1: current absorbed by the compressor. Additionally, these measurements need to be performed simultaneously with the measurement of the current absorbed by the compressor. For this purpose, the current clamp TA018 with a capacity of 60 A is required. Refer to **Figure 14** for the depiction of this clamp.

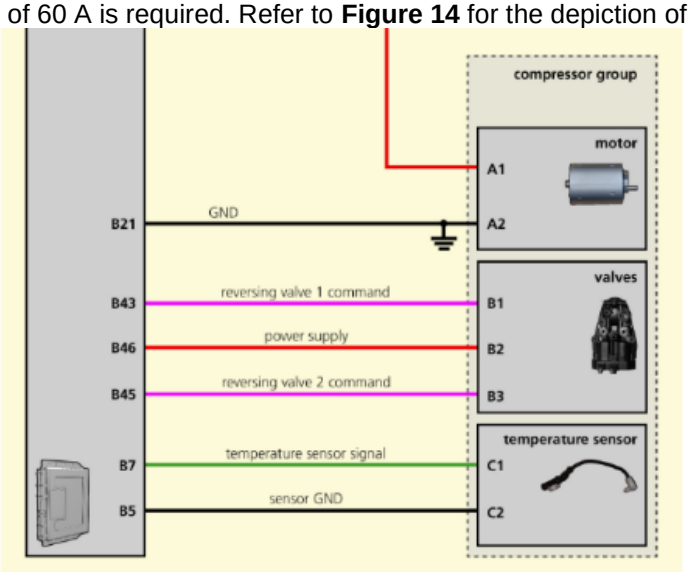

Figure 17: outline wiring diagram of the air suspension compressor.

Connector X090 shown in B1: Electrical current absorbed by the is more easily accessible than the connector B of the ASCM, please to measure the current by accessing the grey-green wiring pin 8 of connector X090, as shown in **Figure 18**.

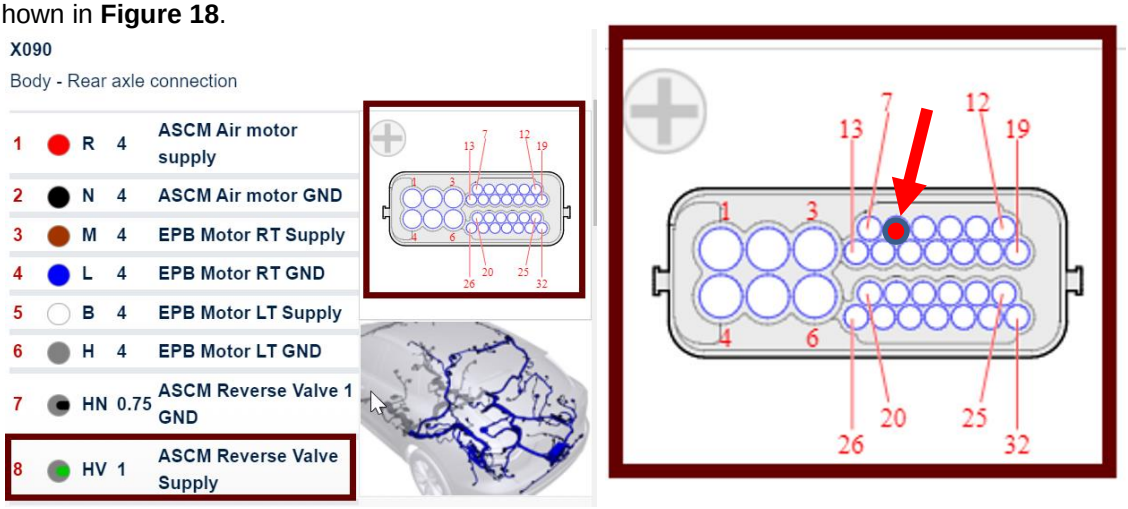

Figure 18: pin 8 of connector X090 (grey-green wiring).

The TA018 current clamp can be positioned near the TA0167 or TA019 current clamp, with the latter being utilized to measure the electrical current absorbed by the air suspension compressor.

To perform the measure of current absorbed by the valve block, one should follow the following steps:

1. Use the TA018 current clamp (with a capacity of 60 A to be set in configuration 20 A, by selector on the clamp itself).
2. Connect the current clamp to connector B of the PicoScope tool.
3. Choose correct claps on PicoScope software. Click on channel B and choose the clamp 60 A Current Clamp (20 A mode). **The settings are shown in Figure 15.**
4. Set the correct scale from the "scale setting" drop-down menu next to channel A : -/+5A.
5. Set 2 s/div and sampling frequency to 100 kS.
6. Save the measures in psdata and PDF formats.

PicoScope connections and settings	
Channel B scope	TA018 Current Clamp (capacity 60 A) with selector on 20 A
Channel B scale setting	-5 A/5 A DC
Time scale settings	2 s/div
Sampling	100 kS (100.000 samples)

In **Figure 19** a typical profile of the current absorption by the reversing valves group when performing an Actuator Test is shown.

The expected values (normal values) are summarized below for compressor, valve block and reversing valves are summarized below:

a. Compressor:
Average maximum current ≤ 36 A
Initial peak current ≤ 120 A during a time interval ≤ 200 ms.
b. Valve block power supply:
Maximum peak current ≤ 0,75 A
Maximum constant current ≤ 0,5 A
c. Reversing valves inside the compressor:
Maximum peak current ≤ 2 A
Maximum constant current ≤ 1,2 A

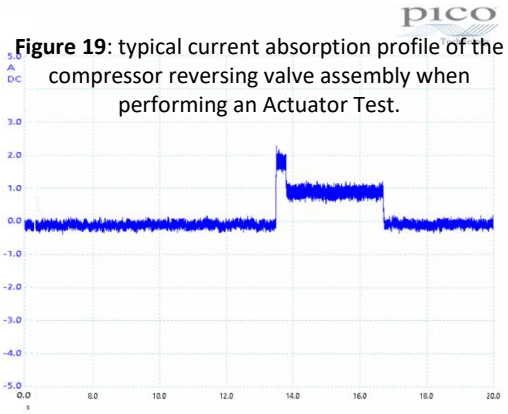

Figure 19: typical current absorption profile of the compressor reversing valve assembly when performing an Actuator Test.

Attachment C: summary table of the Vehicle Heights of each Vehicle corner

Table 1: table to register the Vehicle Heights for steps 5, 5, and 6.

	Step 5 (mm)	After Step 5.2* (mm)	After Step 5* (mm)	After Step 6 (mm)	After Step 7 (mm)
Front Left					
Front Right					
Rear Left					
Rear Right					

* if needed.

Table 2: table to register the Vehicle Heights at steps 8 and 9.

	Before Vehicle Articulation Routine (mm)	After Vehicle Articulation Routine (mm)	Before Actuator Test (mm)	After Actuator Test (mm)
Front Left				
Front Right				
Rear Left				
Rear Right				