

AfterSales Diagnostic Sheet

MAS002758
(BOL 21-23)



From: AfterSales – TSO
To: Maserati Network
Auburn Hills, MI
September 20, 2021

Air suspension system - Blown F41 fuse

NOTE: The below in depth diagnostic procedures are to be used along with the procedures listed in the Workshop Manuals if a more comprehensive diagnosis is required.

Section: 06.24 - 2 AIR SUSPENSION SYSTEM

Models: M161

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

Errors in ECUs: 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

Checks: If the Customer complained about this type of anomaly, it is necessary to submit a BOL report for a Support Request, attaching all the information requested in the following.

It is necessary to fill in the attachments: Attachment A: Checklist and Attachment C: Summary Table of the Vehicle Height of each corner of the vehicle, and attach them to the BOL.

Labor times (Referring to the Workshop Manual):

- For step 2, refer to section 09.13.005 - RH REAR WHEEL BAY FRONT GUARD - Removal/refitting or replacement = 0.2h;
- For step 6, refer to section 06.24.001 - AIR SUSPENSION SYSTEM COMPLETE COMPRESSOR ASSEMBLY - Air suspension system leakage test = 0.30 h.
- For step 7, it will be necessary to carry out the procedure CAR HEIGHT CALIBRATION - Recording and testing with the diagnostic tester = 0.35 h.
- For the remaining steps, in the BOL, 3 h of extra-time will be granted via specific Warranty codes.

Considerations:

Submit a BOL Support Request by attaching the filled-in Attachment A: Checklist, and the filled in tables of the vehicle height recorded at steps 6, 7, 8, 9 and 10.

1) Attach the completed Checklist. Attach the filled-in Vehicle Height Attachment C:Summary table of the Vehicle Height at each corner of the vehicle.

Acquisitions recorded with the PicoScope (both in psdata format and PDF format) of the current absorbed by the:

- Compressor,
- Reversing valves
- Valve block

All recorded during the execution of the activediagnosis "Vehicle Articulation Routine" and "Actuator Test".

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 maneuvers or conditions that triggered the issue (e.g. vehicle ride height change).

Answer:

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. Using the Diagnostic Tool, select the ASCM module and carry out the ASCM > Active Diagnosis > Exit Plant Mode.

Steps to be carried out:

1. Is 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 using of the height selector in the central console.

If the Vehicle does not change height even after the replacement of the F41 fuse, verify if 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 ☐

3. Measure the pressure in the air suspension tank:

3.1. Using an external pressure gauge, along with the dedicated adapter, at the external filling port (see Figure 1). The engine must be OFF.

3.2. Using the diagnostic tool, via the Active Diagnosis > Ride Height, Pressure and Air Mass measures of the ASCM module (see Figure 2).

Note: It is advisable to perform this Active Diagnosis with the engine running. It is normal that, as soon as this Active Diagnosis is launched, the message “Airmass Too Low” is shown. In this situation, it is advisable to keep the engine running for a few minutes, then click on the Update button. If the Active Diagnosis keeps returning the message “Airmass too Low”, with all parameters equal to zero (0), proceed with the following steps.



Figure 1: Measuring the pressure of the air suspension system using a pressure gauge.

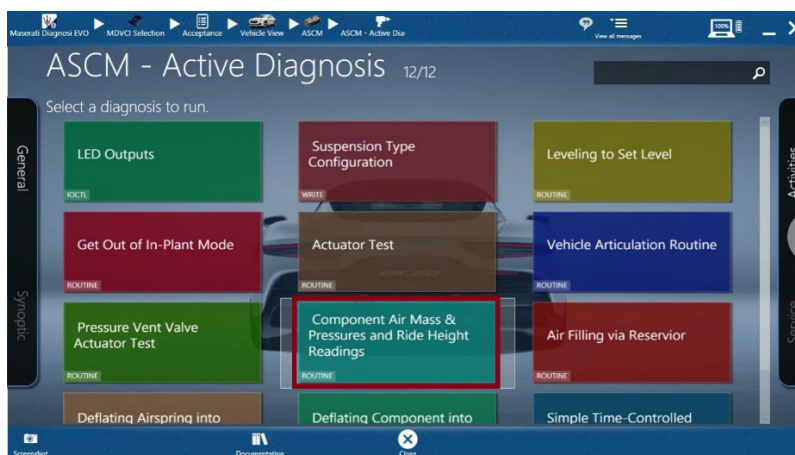


Figure 2: Air suspension system pressure reading with the Active Diagnosis of the ASCM ECU.

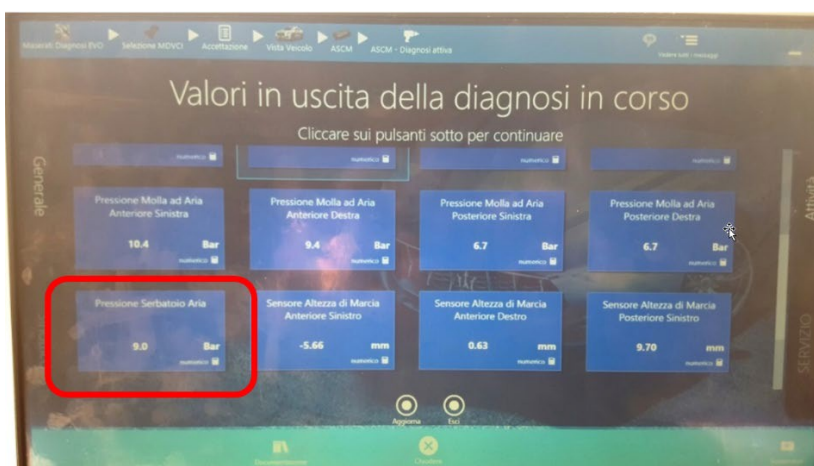


Figure 3: Results of the system pressure reading in Active Diagnosis.

Is the pressure within 5 and 12 bar?

☐ YES

NO ☐

Report the pressure value read by the pressure gauge in bar:

_____ bar

Report the pressure value in bar read from Active Diagnosis:

_____ bar

If the pressure is NOT within 5 bar and 12 bar:

- Adjust the pressure value following the Workshop Manual Procedure 6.24.000 - AIR SUSPENSION SYSTEM EMPTING/FILLING - System Emptying - Filling.
- Carry out the test 06.24.001 - AIR SUSPENSION SYSTEM COMPLETE COMPRESSOR ASSEMBLY - Air suspension system leakage test, in order to check for potential air leaks in the system.

Verify if the value read by the pressure gauge is close to the one read via Active Diagnosis > Ride Height and Pressure & Components Air Mass reading (see Figure 3).

It is possible that the values read by the diagnostic tool and the pressure gauge differ by about 1 bar. If the difference is greater than 1 bar and if the DTC C15D9-00 (55D900) is set in ASCM, proceed with the next steps of the checklist, paying particular attention to the Active Diagnosis at step 8.

4. Switch KIN to RUN (running engine, closed doors and tailgate closed):
 - 4.1. Starting from Normal position, set Aero1 mode and wait 30 seconds for the completion of levelling.
 - 4.2. Set the Easy Entry/Exit and wait 30 seconds for the completion of levelling.
 - 4.3. Set Normal position and wait 30 seconds for the completion of levelling.
 - 4.4. Set Off-Road1 position and wait 30 seconds for the completion of levelling.
 - 4.5. Set Off-Road2 position and wait 30 seconds for the completion of levelling.
 - 4.6. Please repeat the steps from 4.1 to 4.5 for a number of times, e.g. 5 times.
 - 4.7. Switch the engine off and switch KIN to OFF.

Answer the following questions:

- Did the Vehicle change height?

☐ YES

NO ☐

- Did the compressor emit excessive noise while being active?

☐ YES

NO ☐

- If initially blown, did the fuse F41 blow again?

☐ YES

NO ☐

- Was the DTC C15A1 (55A100) initially set in the ASCM module?

☐ YES

NO ☐

- If the answer to the above question was YES, did the DTC C15A1 (55A100) set again?

☐ YES

NO ☐

- If the Vehicle did NOT change height:
 - Check if the fuse F41 is blown again and/or the DTC C15A1 (55A100) in ASCM module.
 - Check if the DTC C2212-00 (621200) ECU - in plant mode set in the ASCM module: if this DTC is set, perform the Active Diagnosis > Exit Plant Mode, then repeat Step 4.

Even if the compressor emitted excessive noise during the levelling, proceed with the checklist and provide the results.

5. Carry out the test 06.24.001 - AIR SUSPENSION SYSTEM COMPLETE COMPRESSOR ASSEMBLY - Air suspension system leakage test to check if there is any leaks in the air suspension system: Were there any leaks detected in the air suspension?

☐ YES

NO ☐

If the above answer is YES, first solve this anomaly.

If the above answer is NO, proceed with the following step.

Measure the Vehicle Height at each corner. Perform the measurement as shown in Figure 4. Report the value in millimeters (mm) in Table 2 of Attachment C: Summary Table of the Vehicle Height at each corner.

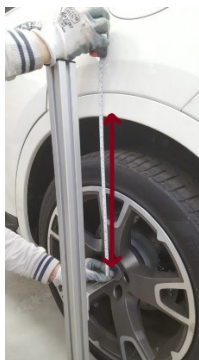


Figure 4: Measuring method of the Vehicle Height at each corner.

- 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 to step 5.1; If NO, skip to step 7.

- 5.1. Carry out the procedure in the Workshop Manual 00.20.034 – 35 CAR HEIGHT CALIBRATION - Recording and testing with the Diagnostic tester.
- 5.2. Measure the vehicle height at each corner as shown in Figure 4.

Note: Fill in the column in 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, three times, the Active Diagnosis > Pressure Vent Valve Actuator Test of the ASCM module, as shown in Figure 5.

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.

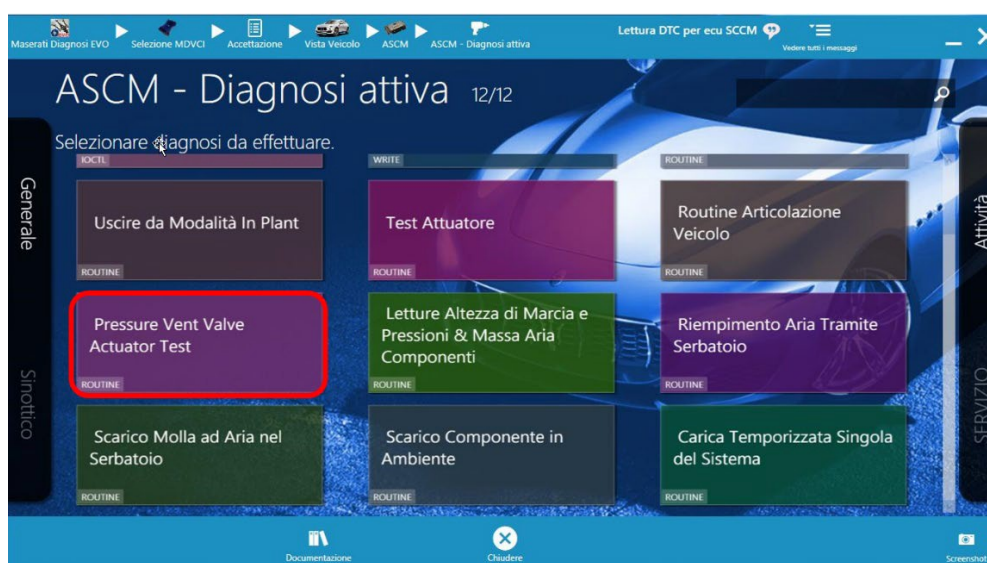


Figure 5: Active Diagnosis > Pressure Vent Valve Actuator Test.

- 6.1. Did the diagnosis complete correctly?

☐ YES

NO ☐

In the event the active diagnosis does NOT end correctly, repeat it.

6.2. Did you hear a hiss/vent noise?

☐ YES

NO ☐

6.3. Measure the vehicle height at the four corners (as shown in Figure 4), reporting the readings in the Table 1 of 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 ☐

If this Active Diagnosis fails to end correctly, together with a pressure difference of more than 1 bar, measured in step 3, may indicate a pressure sensor reading anomaly.

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 in Figure 6.
- Deflating Component: one by one FL, FR, RL, RR, as in Figure 6.

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 height 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 evaluate the correct functioning of each of them.

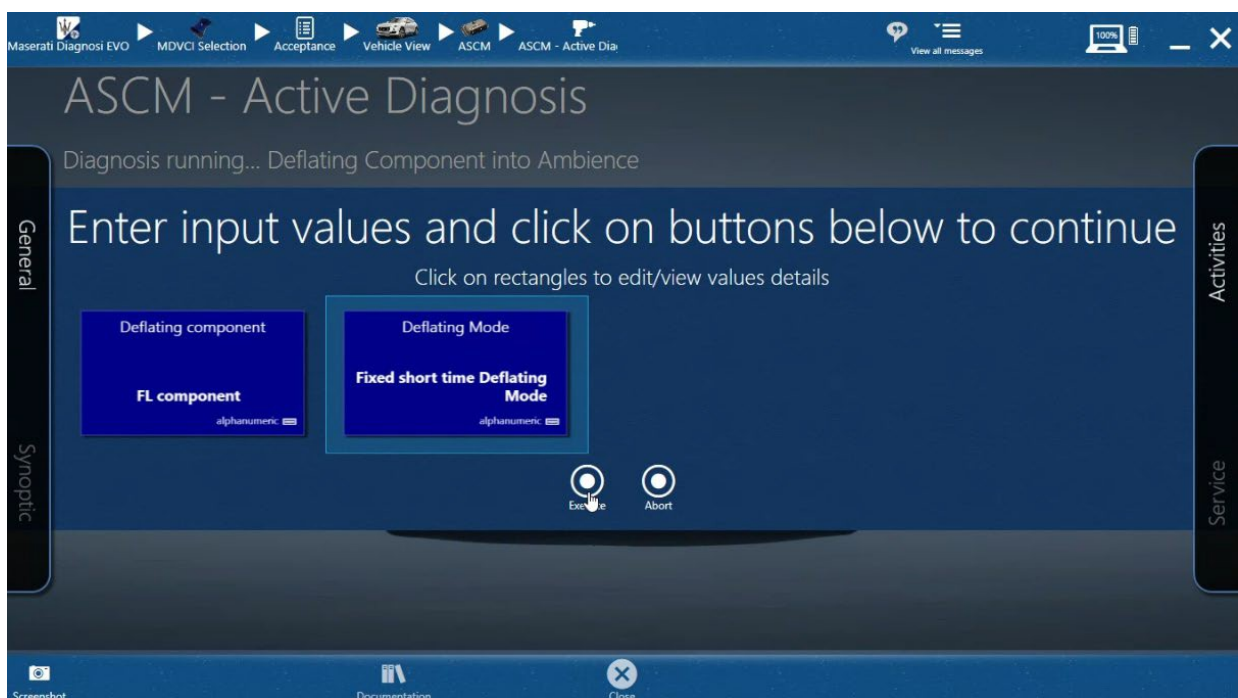


Figure 6: Active Diagnosis > Deflating Component into Ambience of the ASCM module.

7.1. Was a hiss/vent noise heard?

☐ YES

NO ☐

7.2. Measure the vehicle height at each corner (as shown in Figure 4) reporting the values in the Table 1 of the Attachment C: Summary Table of the vehicle heights of each vehicle corner.

Did the vehicle height for the four corners change by more than 5 mm, with respect to step 7?

☐ YES

NO ☐

8. Level the vehicle back to normal height level.

Perform, twice, as 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 Table 2 of the Attachment C: Summary Table of the vehicle height of each vehicle corner, the vehicle height of all four corners.

Due to the need of raising the vehicle on a hoist to install the current clamps for the current measurements described below, the vehicle height must be recorded once the setup of the current clamps is complete, and the vehicle is laying at ground level, just prior to starting 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.

At the same time, in order to monitor the current absorbed by the compressor, the valve block and reversing valves inside the compressor during the active diagnosis executions, it is necessary to measure the current absorbed by these two components of the system, following the instructions of Attachment B: Current Absorption of the Compressor. The purpose is to evaluate the performance of the ASCM ECU.

For this reason, step 9 must be repeated twice. It is necessary to measure, at the same time and by connecting respectively to channel A and channel B of the PicoScope instrument.

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 measurements with PicoScope for each one of the two executions of the Active Diagnosis so that four files are created for step 9.

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, twice, as described below, the ASCM > Active Diagnosis > Actuator Test, selecting (one-by-one):

- FL (Front Left).
- FR (Front Right).
- RL (Rear Left).
- RR (Rear Right).

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 Table 2 of Attachment C: Summary table of the vehicle height of each vehicle corner, the vehicle height of all the four corners.

The screenshot of the diagnostic tool is shown in Figure 7.

This diagnosis activates the reversing valves inside the compressor and the valve of each air spring.

This will inflate each air spring, one by one.

The expected result on a properly functioning car, 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.

At the same time, in order to monitor the current absorbed by the compressor, valve block and reversing valves inside the compressor during the active diagnosis executions, for the purpose of evaluating the performance of the ASCM ECU, it is necessary to measure the current absorbed by these two components of the system, following the instructions in Attachment B: Current Absorption of the compressor, valve blocks and compressor reversing valves test.

For this reason, step 10 must be repeated twice. It is necessary to measure, at the same time and by connecting respectively to channel A and channel B of the PicoScope instrument.

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 valveblock).

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).

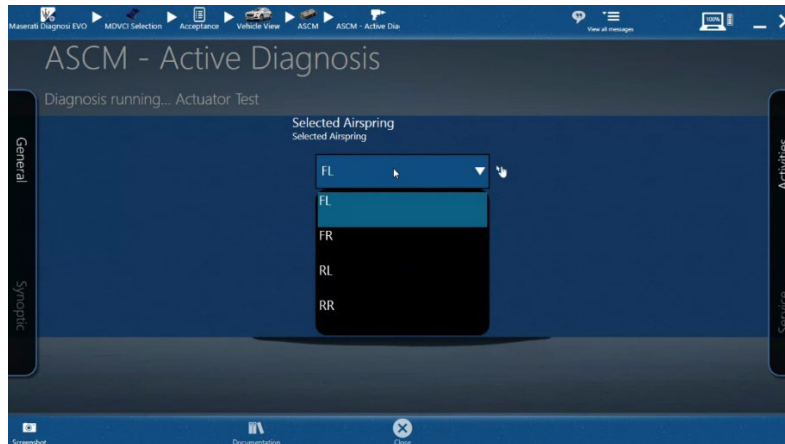


Figure 7: Active Diagnosis > Actuator Test.

Note: It is possible to save one psdata and one PDF file of the measurements with PicoScope for each one of the two executions of the Active Diagnosis so that four files are created for step 10.

If the F41 fuse blew during this test, replace it.

Did the F41 fuse blow?

☐ YES

NO ☐

Attachment B: Current Absorption of the compressor, valve blocks and compressor reversing valves test

Note: Before beginning the current measure with current clamps, reset the current measurement to zero. In other words, always make sure that, in the absence of current, the value read on PicoScope is zero. In order to reset the current clamp, use the knob on the clamp itself.

B1: Current Absorbed by the Compressor

The measure of the current absorbed by the air suspension system 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 below in Figure 8.



Figure 8: Position of the X090 connector for the current measurement absorbed by the compressor during the actuations.

In order to access it, release the blue connector shown below in Figure 9.

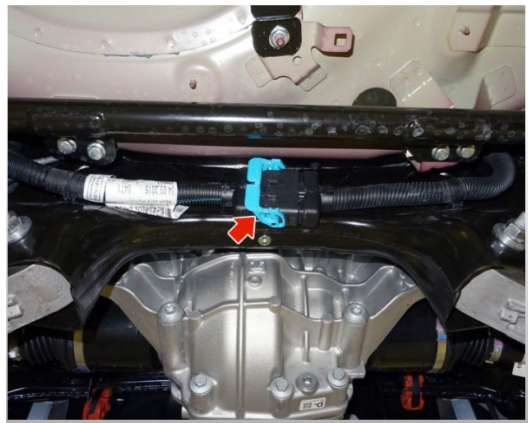


Figure 9: Secondary lock (blue, indicated by the arrow) of the X090 connector.

The air suspension system compressor power wiring is the red one shown below in Figure 10.



Figure 10: Power supply wiring to the air suspension compressor.



Figure 11: Current clamps to be used for the measurement of current absorbed by the compressor.

In order to perform the current measurements, follow the below steps:

1. The current clamp TA167 (with a capacity of 2000 A is to be set at 200 A, by the selection 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 capacity if the TA019 is used.

NOTE: The settings are shown in Figure 12.

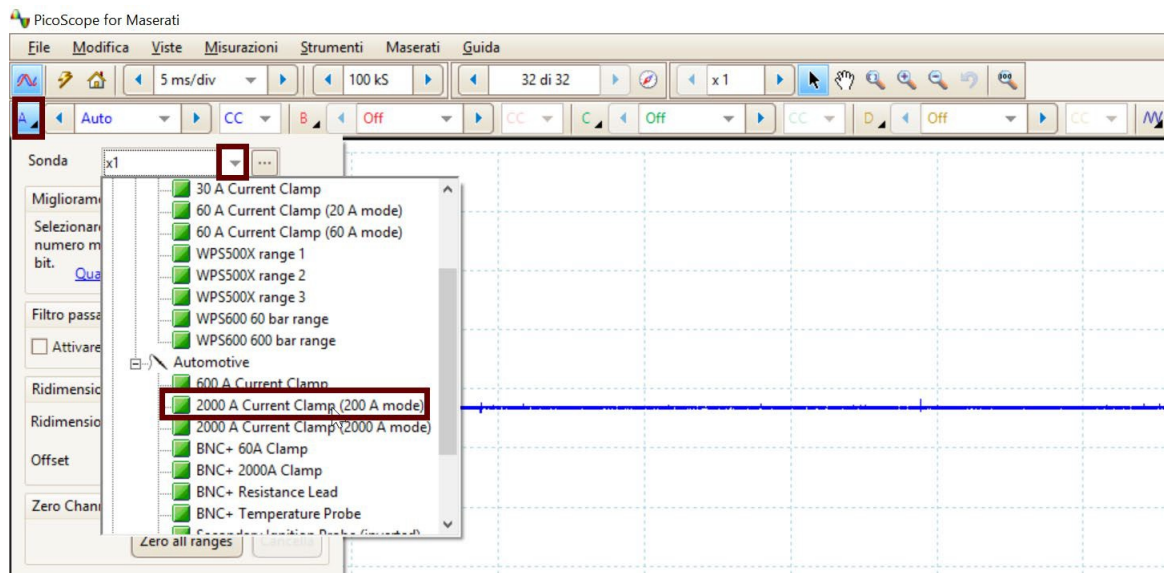


Figure 12: Settings of PicoScope for the choice of the current clamp.

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, the frequency will be equal to

$$ff = \frac{\text{Samples}}{\text{Sampling time}} = \frac{100 \text{ kkkk}}{20 \text{ ss}} = \frac{100000}{20 \text{ ss}} = 5000 \text{ Hz}$$

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 measurements in psdata and PDF formats.

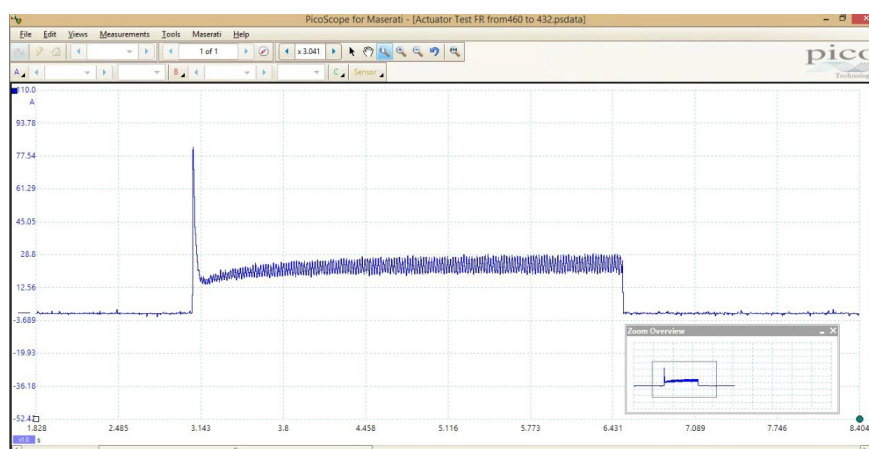


Figure 13: Typical compressor current absorption profile during levelling.

B2: 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 14. 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 15.

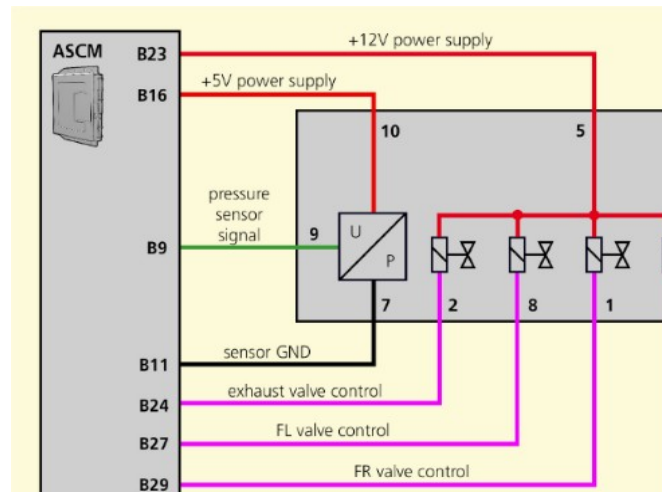


Figure 14: Outline of the wiring diagram of the valve block

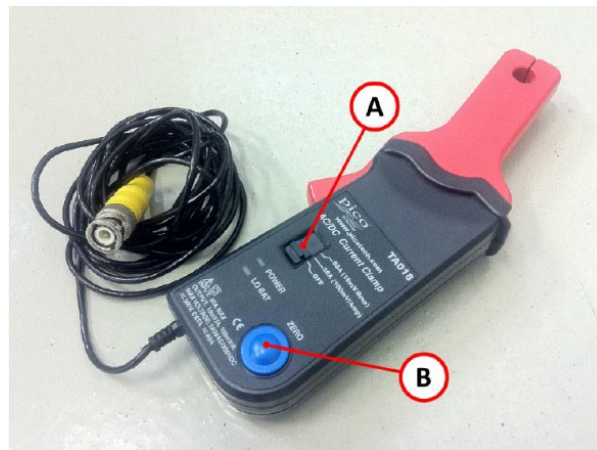
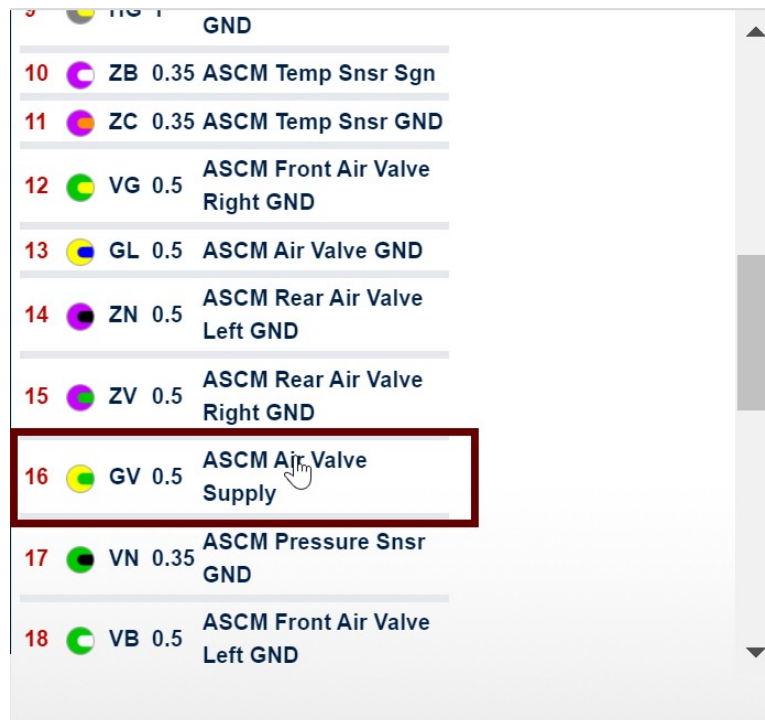


Figure 15: TA018 current clamp.

As the connector X090 shown in B1: current absorbed by the compressor is more easily accessible than the connector B of the ASCM. Measure the current by accessing the yellow-green wiring pin 16 of connector X090, as shown in Figure 20: pin 8 of connector X090 (grey-green wiring).



				GND
10		ZB	0.35	ASCM Temp Snsr Sgn
11		ZC	0.35	ASCM Temp Snsr GND
12		VG	0.5	ASCM Front Air Valve Right GND
13		GL	0.5	ASCM Air Valve GND
14		ZN	0.5	ASCM Rear Air Valve Left GND
15		ZV	0.5	ASCM Rear Air Valve Right GND
16		GV	0.5	ASCM Air Valve Supply
17		VN	0.35	ASCM Pressure Snsr GND
18		VB	0.5	ASCM Front Air Valve Left GND

Figure 16: 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 measurement of current absorbed by the valve block, follow the steps below:

1. Use the TA018 current clamp (with a capacity of 60 A to be set in configuration 20 A, with the selector on the clamp).
2. Connect the current clamp to connector B of the PicoScope tool.
3. Choose the correct clamps on PicoScope software. Click on channel B and choose the 60 A Current Clamp (20 A mode).

The settings are shown in Figure 17.

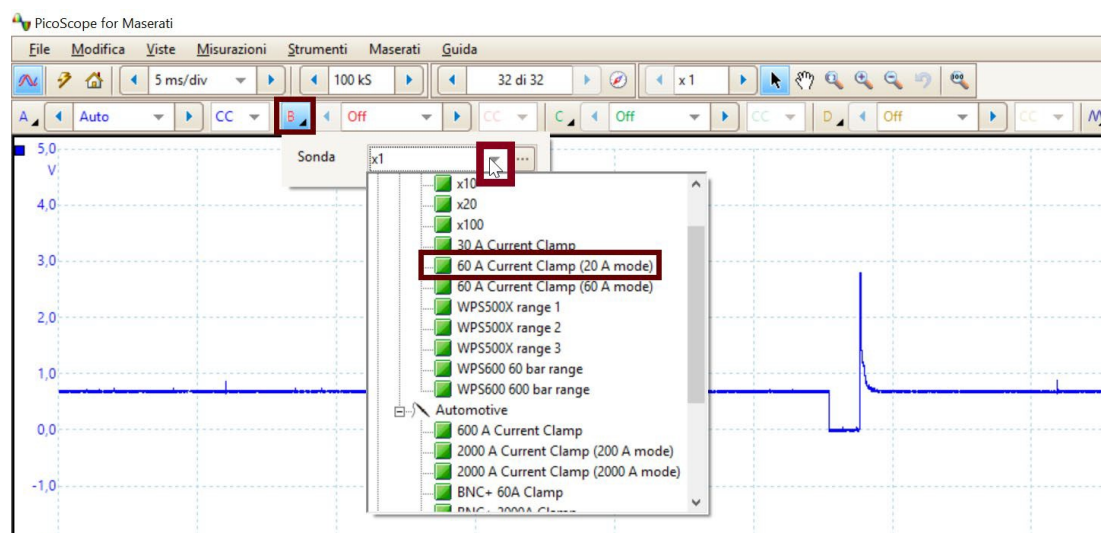


Figure 17: Settings of the 60 A current clamp.

4. Set the correct scale from the "scale setting" drop-down menu next to channel A : $\pm 5A$.
5. Set 2 s/div and sampling frequency to 100 kS.

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

6. Save the measurements in psdata and PDF formats.

In Figure 18 the typical current absorption profile by the valve block when performing an Actuator Test is shown.

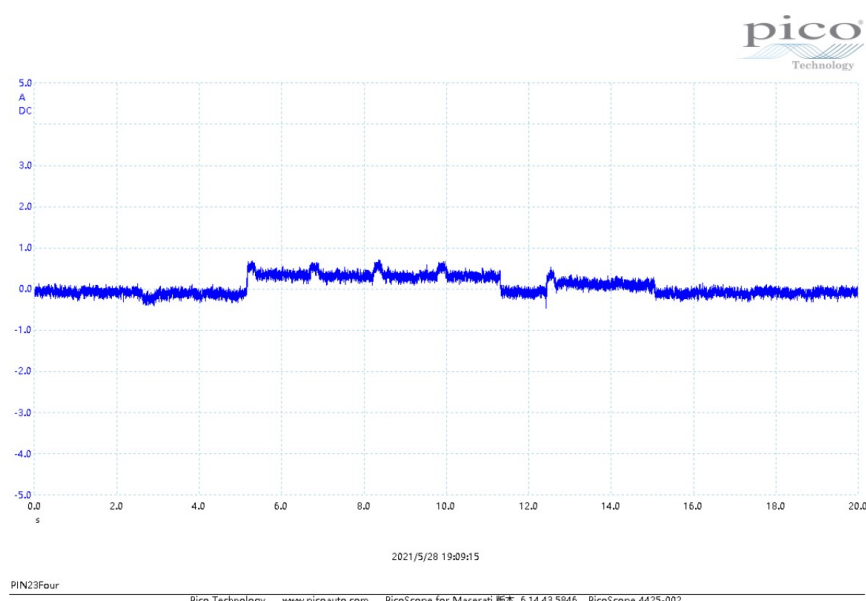


Figure 18: Typical valve block current absorption profile during the execution of an Actuator Test.

B3: Current Absorbed by the Reversing Valves

The measurement of the current absorbed by the reversing valves of the air suspension compressor can be done from pin 46 of connector B of the ASCM module, as shown below in Figure 19.

In this case as well, as in the case B2: current absorbed by the valve block, the values of current are lower than those measured in the section Note: before beginning the current measure with current clamps, one must reset the current measure to zero the current reading. In other words, always make sure that, in the absence of currents, the value read on PicoScope is zero. In order to reset the current clamp, use the knob on the clamp itself.

B1: Current absorbed by the compressor, in addition to the fact that these measurements must be made at the same time as the measurement of the current absorbed by the compressor, it is required to use the current clamp TA018, which has a capacity of 60 A. This clamp is shown in Figure 15.

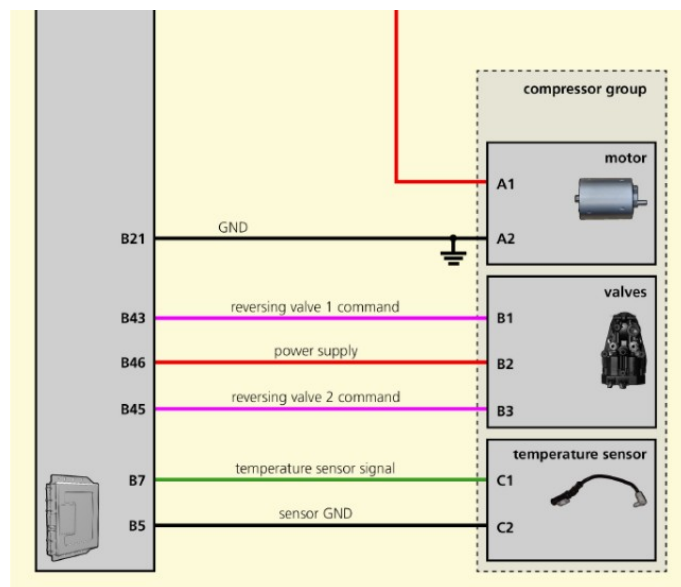


Figure 19: Outline wiring diagram of the air suspension compressor.

As the connector X090 shown in B1: current absorbed by the compressor is more easily accessible than the connector B of the ASCM, measure the current by accessing the grey-green wiring pin 8 of connector X090, as shown in Figure 20.

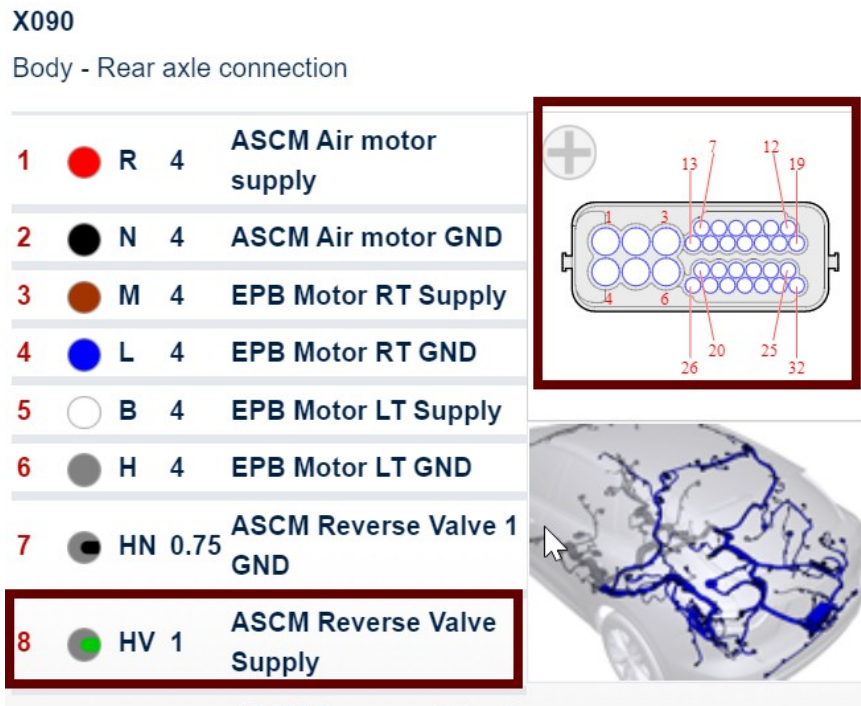


Figure 20: Pin 8 of connector X090 (grey-green wiring).

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 measurement of the current absorbed by the valve block, follow the below steps:

1. Use the TA018 current clamp (with a capacity of 60 A to be set in configuration 20 A, by the selector on the clamp).
2. Connect the current clamp to connector B of the PicoScope tool.
3. Choose the correct clamps on the PicoScope software. Click on channel B and choose the 60 A Current Clamp (20 A mode).

NOTE: The settings are shown in Figure 17.

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.

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)

6. Save the measurements in psdata and PDF formats.

In Figure 21, 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 the compressor, valve block and reversing valves.

- 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 $\leq 0,75$ A
 - Maximum constant current $\leq 0,5$ A
- c. Reversing valves inside the compressor:
 - Maximum peak current ≤ 2 A
 - Maximum constant current $\leq 1,2$ A

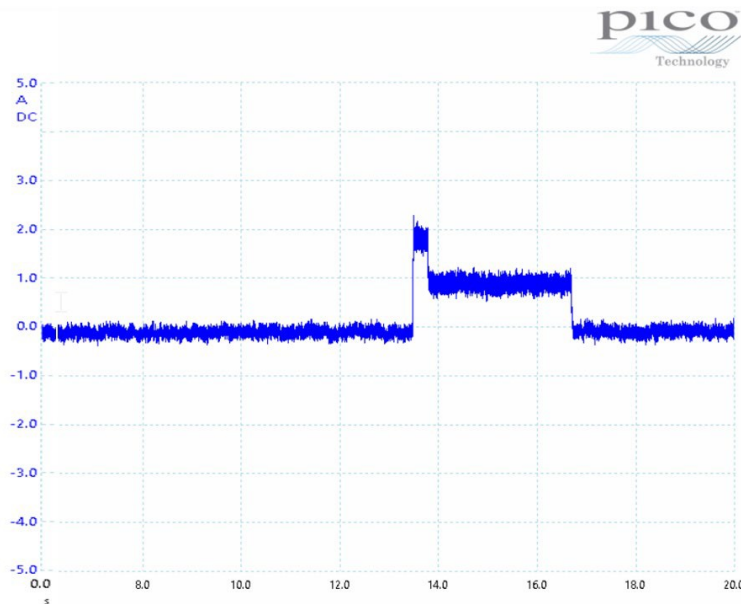


Figure 21: Typical current absorption profile of the compressor reversing valve assembly when performing an Actuator Test.

Attachment C: Summary Table of the Vehicle Height at each corner of the vehicle

Table 1: table to register the Vehicle Heights for steps 6, 7 and 8.

	Step 6 (mm)	After Step 6.2* (mm)	After Step 6 (mm)	After Step 7 (mm)	After Step 8 (mm)
Front Left					
Front Right					
Rear Left					
Rear Right					

* If needed.

Table 2: Table to register the Vehicle Heights at steps 9 and 10.

	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				