Ryme worldwide

PCE

User manual
FRL/FRU/FRQ/FRM
Version 03
November
2020
ENGLISH

Técnicas Reunidas de Automoción, S.A.
C. Merindad de Cuesta Urría, 4
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www.ryme.es

CERTIFICADO DE CUMPLIMIENTO DE NORMA

Ryme

TECNICAS REUNIDAS DE AUTOMOCION, S.A.
Polígono Industrial de Villalonquéjar. C/ Merindad de Cuesta Urría, 4.
09001 BURGOS (ESPAÑA)

DECLARA QUE LA MÁQUINA:

Línea de inspección de vehículos ligeros/pesados

Marca: **Ryme**
Modelo: **FRL/FRU PCR**
Número de serie: **123456**

Compuesto por:

Alineador al paso modelo: **ALL/ALU**
Número de serie: **123456**
Banco de suspensión: **BSL/BSU**
Número de serie: **123456**
Frenómetro modelo: **FRL/FRU**
Número de serie: **123456**

ES CONFORME CON LA DIRECTIVA DEL CONSEJO 2006/42/CE

En su diseño se han contemplado las siguientes normas y directivas:

UNE-EN12100:2010
UNE-EN1037:1996 + A1:2008
UNE-EN 61000-4-3:2007
Directiva 2006/95/CE
Directiva2004/108/CE

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Contents

***Note**: Técnicas Reunidas de Automoción, S.A., is not responsible for the modifications and differences of the software shown in the manual due to modifications by regulations or clients. The software may be modified without prior notice due to constant innovation and development.*

1 Presentation

1.1 Object of the document

The purpose of this document is:

- To inform about the importance of applying safety precautions when using this equipment.
- To test all equipment features, plus all instructions displayed directly on the monitor screen as the tests are performed.

1.2 Reference documentation

Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery and amending Directive 95/16/EC (recast). Specifications for technical control in the countries of use.

1.3 General instructions

LEA ATENTAMENTE ANTES DE PONER EN MARCHA O UTILIZAR POR PRIMERA VEZ EL APARATO

Upon receiving the line, the user must fill out the equipment reception form, which certifies:

- The correct installation of the machine, the start and the reception of the proper training according to the documents provided by RYME and, in particular, these instructions.
- That the installers, designated by the purchaser of the equipment, accept sole responsibility for the use and maintenance of the equipment and for ensuring that the safety instructions indicated in this summary, as well as in the data sheets provided with the equipment, are strictly respected.

	**Lea atentamente y respete las instrucciones y advertencias contenidas en estas instrucciones.**

1.3.1 General safety instructions

The line is a machine in the sense of the Directive 2006/42/CE. This machine presents risks that can cause injuries or damage to health. These risks have been considered in the design of the machine, but some have not been completely addressed and give rise to the safety instructions below, which must be scrupulously observed.

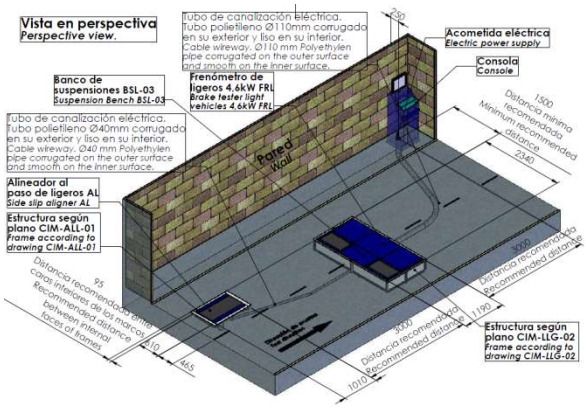
Do not use the line without having been trained by a person qualified by RYME in the characteristics of the material, the danger it represents and its use. Before starting to use it independently, make sure that you have fully understood the operation and that you comply with all the following instructions:

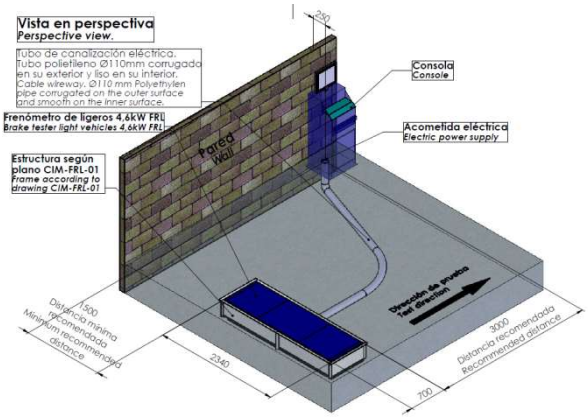
Note: *It is not essential to install the brake tester on an inspection pit.*

If the user wishes to install the brake tester over an inspection pit, he must take all necessary steps to protect people from accessing the bench through the pit.

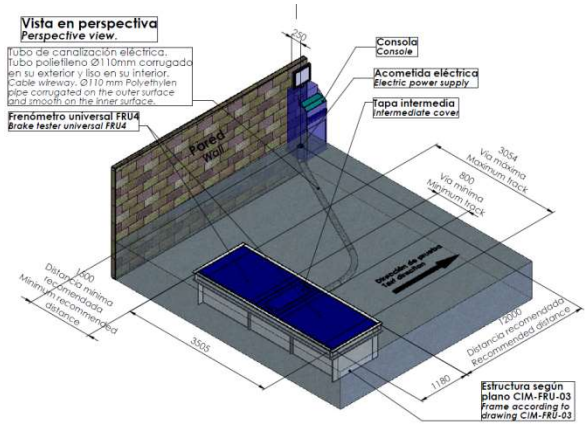
Before starting up the FRL/FRU it is essential:

- To understand the instructions of the machine and to know the capacities, characteristics, and dangers of the material.
- To ensure that all potential operators are perfectly trained and know how to use the material safely.
- To ensure that safety measures are strictly applied to prevent unauthorized persons from approaching the security zone.
- To ensure that the implementation has been carried out according to RYME's civil engineering plan, respecting all the rules and regulations in force. For the definition of civil engineering, safety zones and the implementation of safety accessories, please refer exclusively to the RYME implementation plans.





1 Ryme FRL Line Civil Engineering Plan



2 Ryme FRU Line Civil Engineering Plan

- To establish the security zone on the ground and at the bottom of the pit (marked with yellow/black bi-colour tape around the perimeter of the inset equipment).

3 Perimeter marked by bi-colour tape

- Depending on the location, to provide for installation:
  - Of lateral barriers that prevent access to the bench.
  - Of pit lanes.
  - Of pit supervision.
  - Of spherical surveillance mirrors from the control areas.
  - Of complementary systems that allow the protection of any person who may have access to the installation.
  - Of preventive systems for the extraction of exhaust gases to the outside.

4 Pit side barrier

5 Chain fence

6 Fume extraction system

- To se all necessary personal protective equipment, such as: safety glasses, safety gloves, etc.

7 Mandatory protective equipment

- Not to carry out any intervention on the equipment (maintenance, repair, verification, movement…), without first having removed the tension.

- To carry out a periodic maintenance as described in the Maintenance Manual.
- To install the lighting of the working area and also of the pit according to the lighting standards in force at the workstations.

- To place the cabinet in a position in which the operator has a good view of the control screen, regardless of outside lighting conditions.
- To check that, in the worst case, between the operator and the screen (depending on the type and length of the vehicle), the viewing of the screen is always sufficient. If this is not the case, install an active repeater screen in the right place to meet this requirement.

Keep this manual in an easily accessible place and do not forget to refer it periodically.

ATENCIÓN: cuando se coloca un eje de vehículo sobre el banco de frenado, los rodillos del banco pueden ponerse en marcha y se convierten en elementos peligrosos. Es pues imprescindible prever todas las precauciones necesarias para que ninguna persona se encuentre en la zona seguridad, y en particular en el foso de visita, cuando un vehículo está realizando la prueba.

Por otro lado durante la prueba de un vehículo, según el tipo de circuito de frenado y en función del tipo de prueba realizado, las ruedas del eje que se está probando pueden bloquearse. En algunos casos, esto puede implicar el retroceso intempestivo del vehículo. Es necesario, por tanto, comprobar permanentemente que no hay ninguna presencia en la zona de seguridad y en particular que nadie se encuentra detrás el vehículo.

La reglamentación aplicable en el lugar de instalación puede obligar a la instalación de un sistema de seguridad aprobado, que prohíba lo mejor posible el acceso a los rodillos y al foso. En caso contrario, pueden instalarse también a petición expresa del propietario.

El fabricante declina toda responsabilidad en caso de modificación realizada en un elemento del material susceptible de ser causa de daños o accidentes. En particular están prohibidas la degradación, puesta fuera de servicio o supresión de los dispositivos de seguridad o coberturas de protección.

Nuestra linea está diseñada exclusivamente para controlar vehículos de las dimensiones y pesos autorizados. Está prohibida cualquier utilización diferente de lo que se describe en las instrucciones de uso.

1.3.2 Instructions for handling and installation

Remember that during the operations of loading, unloading, maintenance, installation, assembly and disassembly of the equipment, operators must take all the necessary precautions imposed by the rules of prevention of accidents at work (helmet, gloves, safety shoes, etc.) in accordance with current regulations.

The handling of packed materials must be carried out with means adapted to the lifting and moving of pallets. Unpacked materials must be handled and installed only by technicians trained and qualified by RYME.

The consoles are delivered on pallets. The surface in contact with the floor of the pallet ensures the necessary stability during transport and handling operations. After installation, the consoles must be fixed to the floor.

The chassis incorporate lifting rings and are delivered on pallets. Their installation in the pit must be done by slinging with a four-legged sling hooked to the four lifting rings screwed to each chassis. Once installed in the pit, these are fully inset and immobilized.

The weights of the packages that require a handling device are indicated on the implementation documents sent to the customer with the commercial documents and are visibly marked on the packages.

1.3.3 Instructions for the electrical installation

Note: the electrical wiring diagrams required for the maintenance of the equipment are not supplied as the reparation and maintenance operations should only be performed by RYME qualified staff. Ryme technicians have all the necessary documentation.

General case: Electrical power 230/400 V 50 Hz:

For the connection of the console, install a single-phase electric line of 230 volts ±10% + Ground, 50Hz, 16A. With the connection of the electric motors, install a 400 volts electric line three-phases + Ground, 50Hz (63A for heavy vehicles and 25/32A for light vehicles), with protection according to current standards.

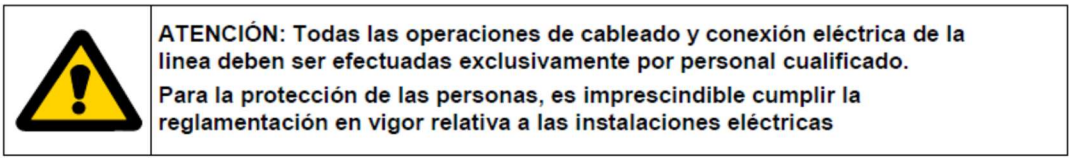
For any other supply voltage: the characteristics of the electrical lines and protections to be installed are defined in the installation plans. Any power supply other than those mentioned above must be specified when ordering the equipment.

Please, pay attention to the following instructions:

- Fix the console to the floor, taking into account where the electrical cables are located. A poorly fixed or unfixed console can cause damage to the electrical cables and pose a risk of electrocution.
- Power supply cables must pass through the subway sleeves indicated on the assembly drawings and be protected from any risk of damage (such as crushing, cutting, tearing,…).
- The inset electrical covers of the consoles must lead to embeddable electrical cabinets on which the console is placed, and no cables appear outside.
- The cables must be protected, and the pit must be cleaned in case any liquid (water, oil, gasoline, etc…) from a vehicle should spill and reach the cables.
- If a pit is placed without water evacuation (e.g. for fear of groundwater resurgence), take the necessary precautions to avoid any water run-off or snow blocks falling from the vehicles onto the equipment. In the event of heavy rains, avoid flooding the benches; do not allow the pit to fill up.

- You must know the particularities of the low voltage cables coming from the measurement circuits, printer or computer connections, etc.
    - These cables must be installed in cable networks separated from power cables.
    - The sleeves for the measurement cables must be separated by more than 0,5 m from the power cables of other machines that may be a source of disturbance: compressor, powerful motors, arc welding stations, etc.
    - Avoid having a magnetic field near the console and the magnetic readers (floppy disks, hard disks, etc.) that could damage the data of the software.
    - Similarly, a very high voltage power line less than 50m from the premises or a powerful radio transmitter could disturb the operation of the computer or measuring equipment.

It is forbidden to modify the passage of the cables without the authorisation of RYME or its representative.



1.3.4 Other precautions and instructions

Usage of the remote control

- To ensure the proper functioning of the remote control, it is necessary to avoid any infrared source that does not come from RYME devices (such as alarms, vehicle remote controls, etc.), and any neon lamp within 2.5 m of the infrared receivers.

TURN ON LEFT MOTOR

TURN ON RIGHT MOTOR

FLUCTUAT

LIGHT V.: SAVE FRONT AXLE BRAKE

HEAVY V.: SAFE SERVICE BRAKE, PRESS THIS BUTTON + AXLE NUMBER (1,2,3…)

LIGHT V.: SAVE REAR AXLE BRAKE

HEAVY V.: SAVE EMERGENCY BRAKE, PRESS THIS BUTTON + AXLE NUMBER (1,2,3…)

LIGHT V.: SAVE PARKING BRAKE

HEAVY V.: SAFE SERVICE BRAKE, PRESS THIS BUTTON + AXLE NUMBER (1,2,3…)

GO UP ↑

GO DOWN ↓

MAIN MENU: SELECT BRAKE TESTER, SUSPENSION, NEW TEST, SUMMARY, SAVE, REPORTS

HEAVY V.: SAVE AND SELECT THE AXLE NUMBER

REPEAT AXLE

EXIT

Prevention of computer risks, rules of caution and handling instructions

- The computer equipment supplied has been configured for professional use with its software.

It is forbidden

- To turn off the PC using the console's switch, as the PC must be turned off following the adequate procedure for closing the program.
- To modify the BIOS.
- To add components to the PC, such as RAM, boards, …
- To modify the Windows configuration parameters
- To install any software not related to the Technical Control
- To connect removable items, such as USB keys, not certified by RYME
- To attempt any modification without RYME's authorization

Console protection

- Protect the console from any contact with water, oil, or any liquid as well as from dust in the environment. If necessary, place a protective sleeve during periods of non-use.
- Protect the console and its components from heating due to direct radiation from heat sources (sun, radiant heating, etc…)

1.3.5 Priority stop devices

The line incorporates means that allow for a priority stop at any time:

- By pressing the 'Esc' key on the PC keyboard

1.3.6 Emergency stop devices

The line incorporates several means to force an emergency stop at any time:

- By pressing the main switch installed on one side of the console, the single and three phase electrical supplies in the machine will be cut off completely.
- By pressing the emergency stop button installed on the front door of the console, the single-phase electrical supplies will be cut off completely.

1.3.7 Precautions for vehicles checked on the brake tester

Caution: before testing a vehicle on the brake tester, it is mandatory:

- To check the cleanliness of the tyre treads, wash off any mud present that could disturb the quality of the measurements by reducing the grip, and remove all objects embedded in the treads that could damage the surface coating of the rollers.
- After cleaning, to look for signs of aggression or cuts in the tyre treads; the stresses transmitted by the rollers to the rubber during the test can aggravate existing injuries and tear pre-cut rubber chips.

Only vehicles whose axles have the weights and dimensions in accordance with the local Standard Code or with the maximum characteristics authorised for the type of brake tester installed may be used on the bench.

FRENÓMETRO LIGEROS: FRL

DATOS TÉCNICOS

Carga máxima por eje	4 Tn
Motores de accionamiento	**2 x 4,6 kW**
Velocidad de ensayo	6 km / h.
Ancho de vía máximo	**2.178 mm.**
Ancho de vía mínimo	876 mm.
Voltaje	**400 V. 50 Hz. Trifásico**
Fusible de protección	3 x 20 A
Protector térmico	**16 A**
Diámetro de los rodillos	208 mm.
Longitud de los rodillos	**674 mm.**
Longitud útil de los rodillos Soldadura / Corindón	624 / 660 mm.
Distancia entre centros	**400 mm.**
Coeficiente de adherencia	0,9 seco 0,7 mojado
Escala de medición	**0 - 6 kN**
Escalón de medida	10 N
Error indicación de medida	**1 %**

8 FRL line technical data

FRENÓMETRO SEMI : FRL 5.5

DATOS TÉCNICOS

Carga máxima por eje	8 Tn
Motores de accionamiento	**2 x 5,5 kW**
Velocidad de ensayo	4 km / h.
Ancho de vía máximo	**2.460 mm.**
Ancho de vía mínimo	872 mm.
Voltaje	**400 V. 50 Hz. Trifásico**
Fusible de protección	3 x 20 A
Protector térmico	**16 A**
Diámetro de los rodillos	208 mm.
Longitud de los rodillos	**821 mm.**
Longitud útil de los rodillos Soldadura / Corindón	770 / 805 mm.
Distancia entre centros	**400 mm.**
Coeficiente de adherencia	0,9 seco 0,7 mojado
Escala de medición	**0 - 12 kN**
Escalón de medida	10 N
Error indicación de medida	**1 %**

9 FRL 5.5 line technical data

FRENÓMETRO UNIVERSAL: FRU 4

DATOS TÉCNICOS

Carga máxima por eje	**20 Tn**
Motores de accionamiento	2 x 11 kW (S2)
Velocidad de ensayo	**2,6 km / h.**
Ancho de vía máx. / mín.	3.100 / 850 mm.
Voltaje	**400 V. 50 Hz. Trifásico**
Fusible de protección	3 x 50 A
Protector térmico	**2 x 25 A**
Diámetro de los rodillos	282 mm.
Longitud de los rodillos Soldadura / Corindón	**1.135 mm.**
Longitud útil de los rodillos Soldadura / Corindón	1.050 / 1.115 mm.
Distancia entre centros	**485 mm.**
Sobre elevación del rodillo trasero	50 mm.
Error indicación de medida	**1 %**
Coeficiente de adherencia (Rodillos de soldadura)	0,9 seco 0,7 mojado
Dos escalas de medida	**0-8 kN / 0-40 kN**
Escalón de medida	10 N

10 FRU 4 line technical data

In case that in the vehicle that is being tested is driven by an untrained person (the owner of the vehicle, for example), the operations must be carried out under the

control of a trained operator who must provide the driver with all the necessary information to avoid any risk of misuse.

The maximum speed of the vehicle during the test (time of entry and exit of the test) is limited to 10km/h.

1.3.8 Maintenance, checking or repair

	**ATENCIÓN: antes de cualquier intervención en el material, es imprescindible poner éste sin tensión.** **Cualquier intervención, que no sea el mantenimiento que se describe en estas instrucciones, sólo puede efectuarla personal cualificado por la Empresa RYME.** **Caso particular de comprobaciones metrológicas:** **Durante la intervención de comprobación, que requiere que el material permanezca bajo tensión, es imprescindible que ninguna otra persona aparte del técnico inspector tenga acceso a los mandos, y pueda intervenir sobre el banco.** **Durante una intervención en el material, el acceso a la zona de trabajo está prohibido a cualquier persona que no sea el técnico habilitado.** **ATENCIÓN: Después de cualquier mantenimiento o limpieza de los bancos, fijar de nuevo todas las chapas y equipamientos de protección que se hayan desmontado.** **Cualquier anomalía relativa a la utilización de nuestra linea debe indicarse al S.P.V. de RYME o de su representante.**

1.3.9 Recycling

In order to proceed with the dismantling of the machine, it is necessary to be careful and take into account that the materials coming from the dismantling of this equipment must be disposed of in accordance the regulations in force in the country

- Collect the oil and take it to a specialised centre.
- Dismantle any electrical or electronic parts.
- Dispose of the rest as iron and take it to special collection centres.

The attached symbol indicates that, in accordance with the Directive 2002/96/CE, electrical and electronic equipment cannot be disposed of with municipal waste but must be sent to a specialised centre for the separate collection and treatment of WEEE (Waste Electrical and Electronic Equipment).

The law punishes those who dump such waste into the environment: dumping it into the environment or using it in an inappropriate manner, WEEE waste can release substances that are dangerous to the environment and to people's health.

1.3.10 Fire protection

The equipment itself cannot, in the first place, be the cause of a fire.

However, the room must meet fire protection standards in accordance with the regulations in force at the place of installation of the equipment.

The vehicle being tested may be the cause of a fire (accidental leakage of petrol, petrol vapours, sparks or other causes). It is therefore recommended that a fire protection device (fire extinguisher) is always within reach (in the area reserved for the operator) in order to immediately eliminate any danger that may arise from such situations.

1.3.11 Warranty conditions

Any modification of the material or use other than that defined by the manufacturer and which does not obtain his agreement, any deterioration of the characteristics as a result of poor maintenance or lack of precaution, will result in the loss of the benefit of the guarantee.

The company RYME declines its responsibility if there are erroneous measures resulting from an operating method other than that indicated in the manual, and if the operating, maintenance and safety conditions are not met.

1.3.12 Environmental conditions of use

The environment of the materials must meet the following specifications:

- **RYME equipment must in adequate facilities.**

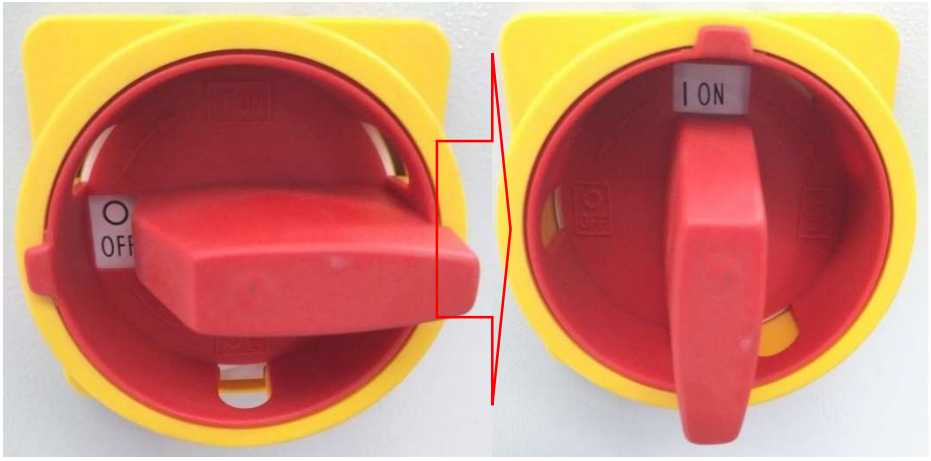
Temperatura: campo de referencia	*20 °C ±5.*
Temp. ambiente (intervalo máx.)	*Entre +0 y +40 °C ** *Ampliable a -15 - +40 °C con dispositivo climatizador en el panel de mando*
Condiciones climáticas	*Humedad relativa entre 5 y 85 % *.*
Presencia de agua	*Despreciable (sin caída vertical de gotas de agua). Sin rastros de humedad en las paredes del local y con buena ventilación.*
Polvo	*El polvo no debe influir sobre los equipos eléctricos.* *Presencia de cuerpos sólidos superiores a 2,5 mm.*
Presencia de sustancias corrosivas	*Presencia de posibles agentes corrosivos o contaminantes de origen atmosférico, pero sin contacto directo.*
Golpes	*Choques de energía inferiores a 2 julios.*
Vibraciones	*Habituales en medio industrial* *Frecuencia entre 10 y 50 Hz* *Amplitud inferior a 0,15 mm*
Influencias electromagnéticas, electrónicas o ionizantes	*No debe haber estaciones de potencia, emisores de corriente a alta frecuencia, aparatos con sustancias radioactivas, líneas de alta tensión ni líneas de tracción eléctrica en las proximidades.*
Radiación solar	*Debe ser despreciable*
Efectos sísmicos	*S < 30 gal (1 gal = 1 cm/s²)*
Rayo	*Nivel ceráunico: N < 25* *N = Número de días al año en que se oyen truenos.*
Movimiento del aire	*Velocidad inferior a 1 m/s*
Nivel de ruido	*< 70 dB*
Impresora	*Temperatura ambiente entre + 5°C y 40°C* *Humedad entre 20% y 80% (sin condensación).* *Sector 230 V ± 10% a 50 o 60 Hz con toma de tierra.*
Toma a tierra	*La toma a tierra debe realizarse en función del tipo de suelo del lugar y según la reglamentación vigente.* ** Salvo para aparato específico.* *ej.: impresora, lector de disquetes, etc.*

2 Introduction

The company Técnicas Reunidas de Automoción has developed a set of programs to control different machines aimed at guaranteeing the safety of vehicles, as well as care for the environment.

This document describes the use and operation of the PCE platform. This software serves as a link for the different equipment intended for testing light and heavy vehicles and motorbikes.

Start the line making sure that the main switch is turned to 'ON' position and that the emergency stop is deactivated:



11 Main switch

12 Emergency stop

Then, turn on the computer to be able to work with the line, first accessing the Windows menu, and then the programs.

Access the application management software provided with the purchase of a RYME product, which will install the two necessary applications, RYME_PCE and RYME_CalConf_PCE. First, you must configure the latter, for which you will have to consult the user manual of the RYME_CalConf_PCE application.

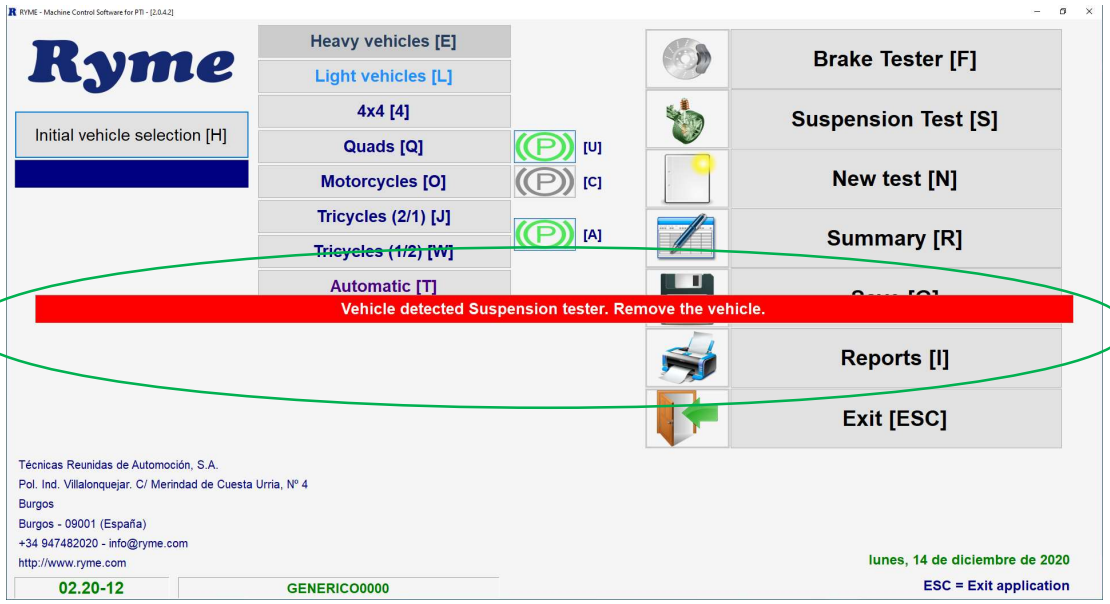
The RYME_PCE application allows to configure the applications that are launched through it.

To Access this platform, please double-click on the RYME_PCE.

13 RYME_PCE.exe and RYME_CalcConf_PCE.exe applications

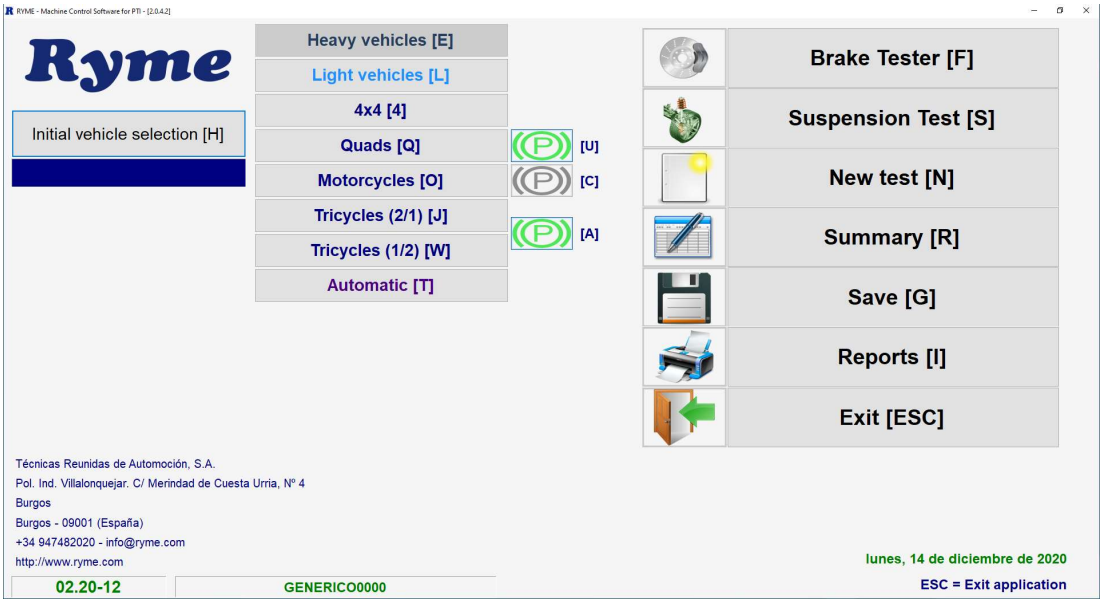
The main menu of RYME_PCE will appear. The first thing the program does is to check that there is no vehicle in any of the machines that conform the line. A message will appear in the program while performing this action. If there is no vehicle on any of the equipment connected to the program, the operation shall proceed.

If there is a vehicle on any equipment when the program is started, the software will automatically display a warning message



14 Main menu when a vehicle presence detected

Then, unlike the previous image, you can observe that there is no presence detected, for which you will be able to proceed with the test.

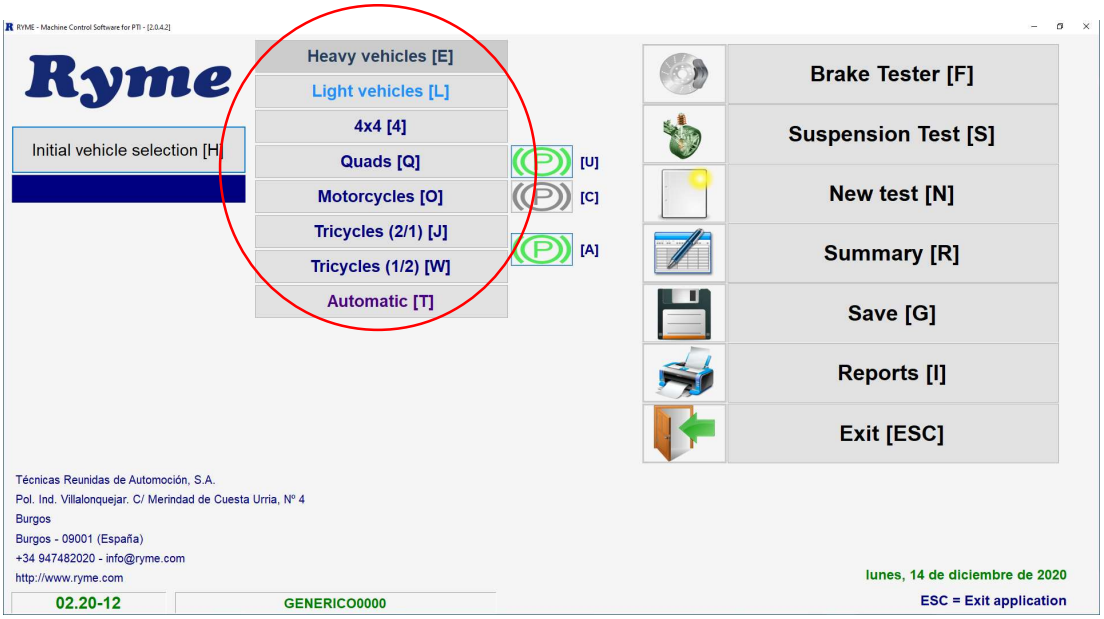


15 Main menu when a vehicle presence is not detected

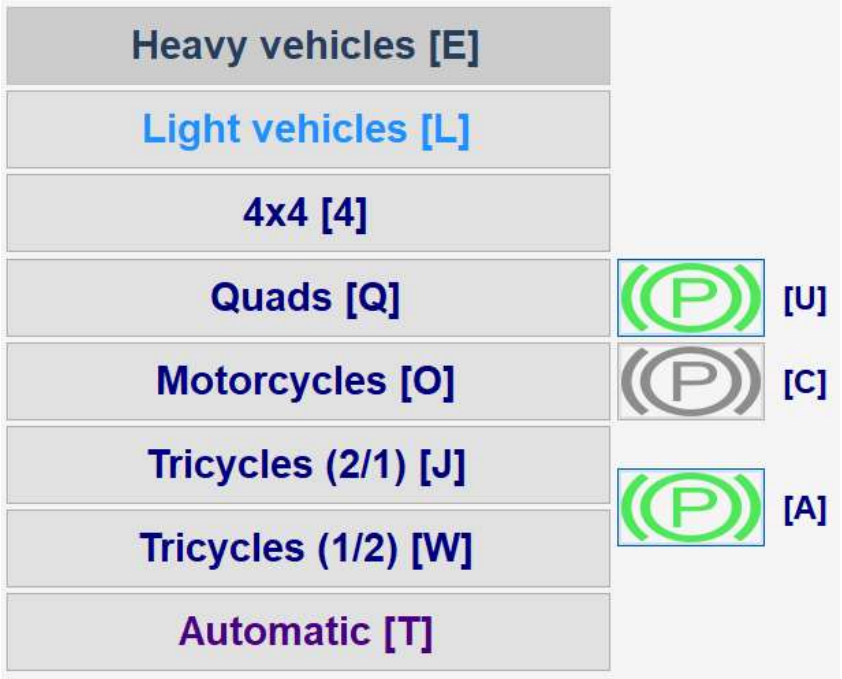
3 Configuration of the test

3.1 Selection of the type of vehicle

From the main menu of the program, you can configure the different machines installedhh and the type of vehicle to be tested:



16 Main menu



17 Vehicle selection menu

Here you must choose the type of vehicle to be tested by clicking on the corresponding icon with the mouse or by pressing the assigned key on the keyboard:

- **Heavy vehicles:** With this mode of operation, you can carry out the brake and alignment test on so-called heavy vehicles, manually or automatically.
- **Light vehicles:** With this mode of operation, you can carry out brake, suspension and alignment tests on light vehicles, either manually or automatically.
- **4WD vehicles:** With this mode of operation, you can test the brakes, suspension and alignment of four-wheel drive vehicles, manually or automatically.
- **Quads:** With this mode of operation, you can test the brakes of this type of vehicle, manually or automatically.

  If the quad to be tested includes a parking brake you will select the icon  , which will remain lighted in green. Otherwise you will leave the icon deactivated  , which will remain coloured in grey.
- **Motorbikes:** With this mode of operation, you can test the brakes of two wheeled vehicles, manually or automatically.

  If the motorbike to be tested includes a parking brake, you will select the icon  , which will remain lighted in green. Otherwise you will leave the icon deactivated  , which will remain coloured in grey.
- **Tricycles:**
  - Tricycles (2/1): With this mode of operation, you can test the brakes of this type of vehicles (front axle with 2 wheels and rear axle with 1 wheel), manually or automatically. If the tricycle to be tested includes a parking brake, you have to select the following icon  , which will remain lighted in green. Otherwise you will leave the icon deactivated  , will remain coloured in grey.
  - Tricycles (1/2): With this mode of operation, you can test the brakes on this type of vehicle (front axle with 1 wheel and rear axle with 2 wheels), manually or automatically. If the tricycle to be tested includes a

parking brake, you have to select the icon  , which will remain lighted in green. Otherwise you will leave the icon deactivated  , which will remain coloured in grey.

3.2 Selection of automatic/manual mode

There are two ways to perform the test, manually or automatically.

The manual mode is used when the technician wants to start a test with a certain device and save it manually.

- **Manually**, if we want to carry out a test and save it manually, or repeat one of the tests and save it manually, you must press the corresponding key or click with the mouse on the icon in order to select this mode.

It allows you to access the start screen for vehicle brake and suspension tests in a manual mode.

This mode of operation allows you to:

- Check the brakes of the vehicle independently.
- Check the suspension of the axles with independent graphs.
- In the two previous cases it does not influence whether the vehicle to be tested is a front or rear-wheel drive vehicle.
- Storing the results manually.

The automatic mode is used when the previously configured tests are to be carried out with the different machines, either independently or collectively.

- **Automatically**, by default, the automatic button is pre-selected as standard (when the application is opened or when a new test is selected). If the button is not activated in purple, press the 'T' key on the keyboard or click on the icon with the mouse.

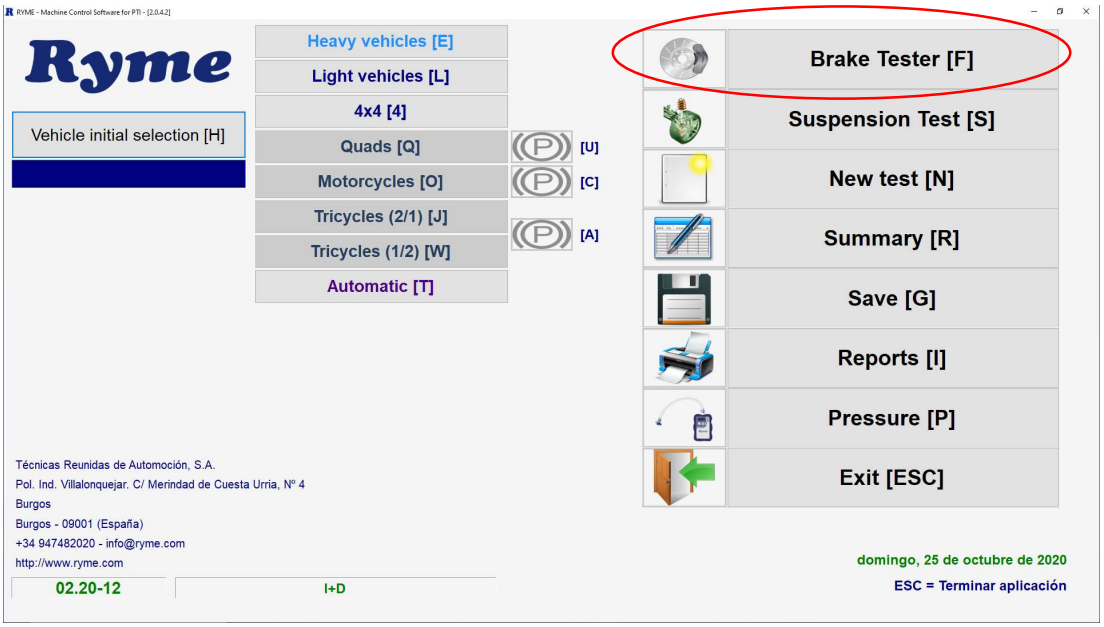
In this mode, you can automatically check the brakes and suspension of a front or rear-wheel drive vehicle.

4 Brake tester

4.1 Description of the heavy vehicles brake tester menu

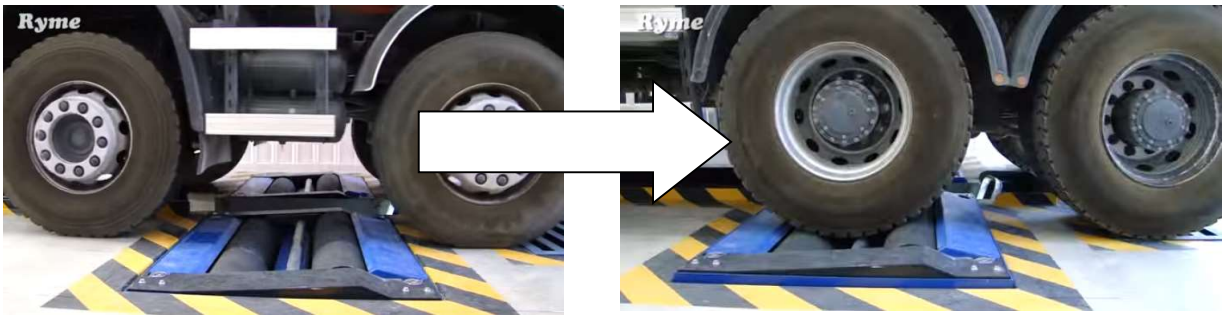
In the main menu of the program, you have the possibility to access the 'Brake Tester' application in different ways:

- By clicking on the icon 'Brake Tester'
- By pressing the key 'F' on the keyboard
- Using the remote control



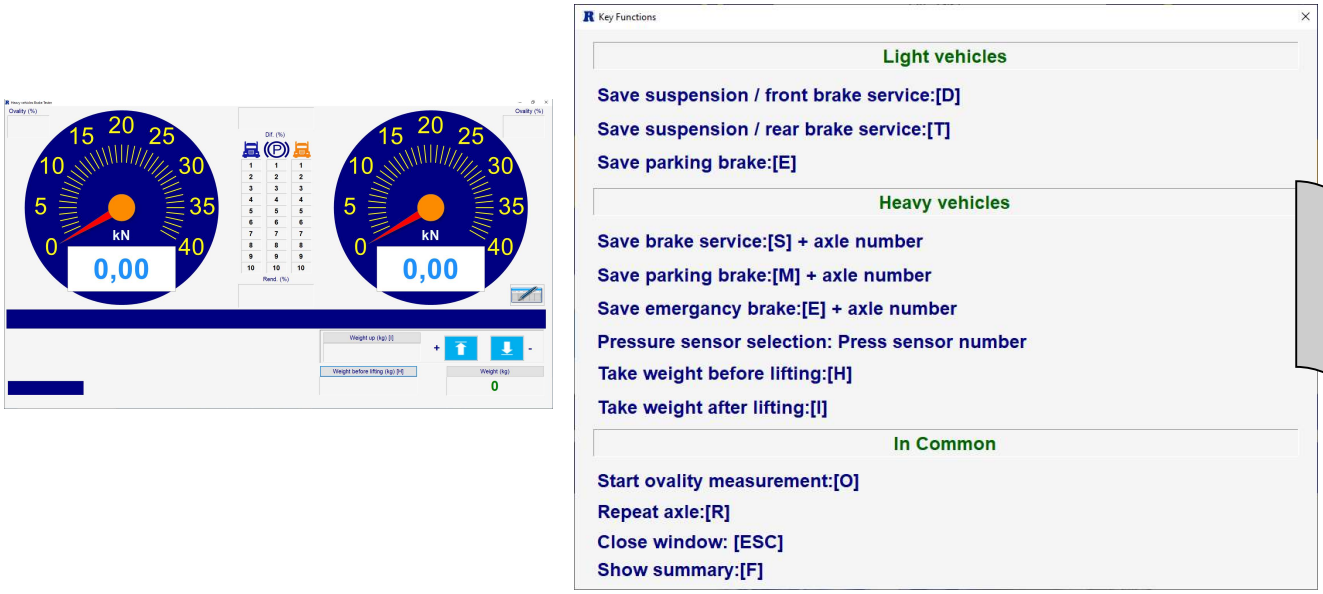
18 Main menu

Another way to access the brake tester will be directly by detecting the presence of a vehicle in the program. For this, no vehicle can be on the bench, as it must be entered afterwards so that the program automatically detects its presence.



19 Vehicle: Present/Not present

From the display of the brake tester, you can access to the help menu pressing the 'Ctrl' key on the keyboard.



20 Heavy vehicles brake tester display

- **Save service brake:** Once the axle test has been carried out, press the corresponding key on the 'S' keyboard (previously configured in the RYME_CalConf_PCE.exe application) or remote control and then press with the keyboard or remote control the number of the axle for which the test has been carried out to save it.

- **Save emergency brake:** Once the axle test has been carried out, press the corresponding key on the 'E' keyboard (previously configured in the RYME_CalConf_PCE.exe application) or remote control and then press with the keyboard or remote control the number of the axle for which the test has been carried out to save it.

- **Save parking brake:** Once the axle test has been carried out, press the corresponding key on the 'M' keyboard (previously configured in the RYME_CalConf_PCE.exe application) or remote control and then press with the keyboard or remote control the number of the axle for which the test has been carried out to save it.

- **Fluctuation:** In the middle of the braking test, by pressing the corresponding key on the 'O' keyboard (previously configured in the RYME_CalConf_PCE.exe application) or remote control, the program will measure the fluctuation of the different wheels of the selected axle, storing

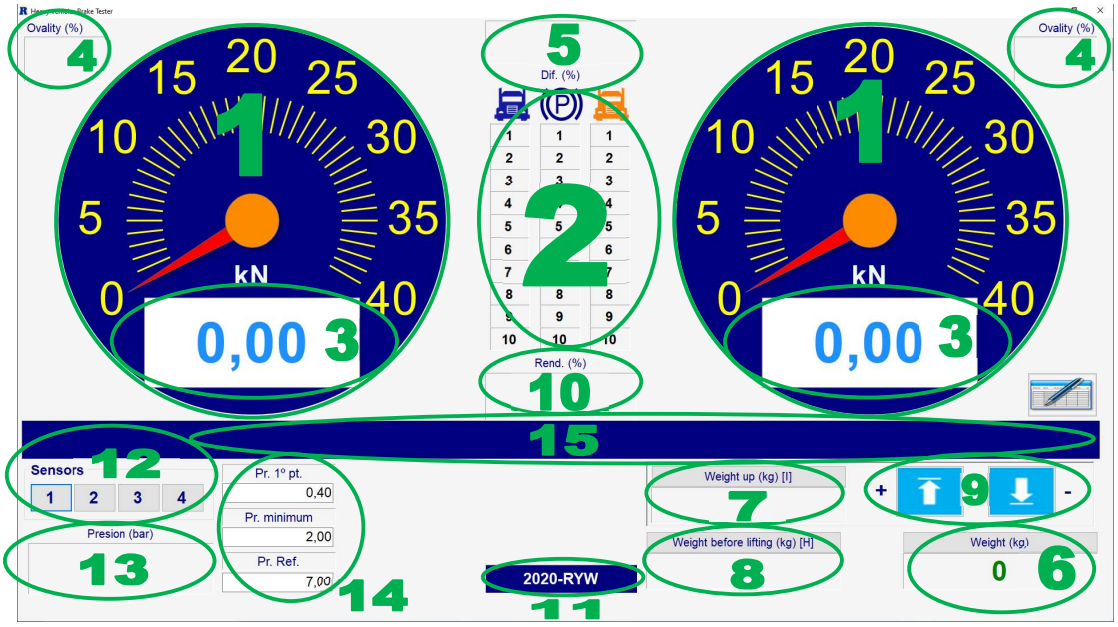
the data automatically when the corresponding axle is subsequently saved, so that these can be shown together in the report.

- **Repeat:** To repeat and save the test data of an axle, simply overwrite the data of the type of brake you have made on the corresponding axle.

Exit. This function allows you to exit the light/heavy vehicle brake tester display to the main menu. This function can be accessed by clicking on the close window icon with the mouse or by pressing the 'Esc' key on the keyboard or the 'KG' key on the remote control.

4.1.1 Description of the brake tester display

On the heavy vehicles brake tester display, you can find different sections displaying the information of the test, you can see them below:



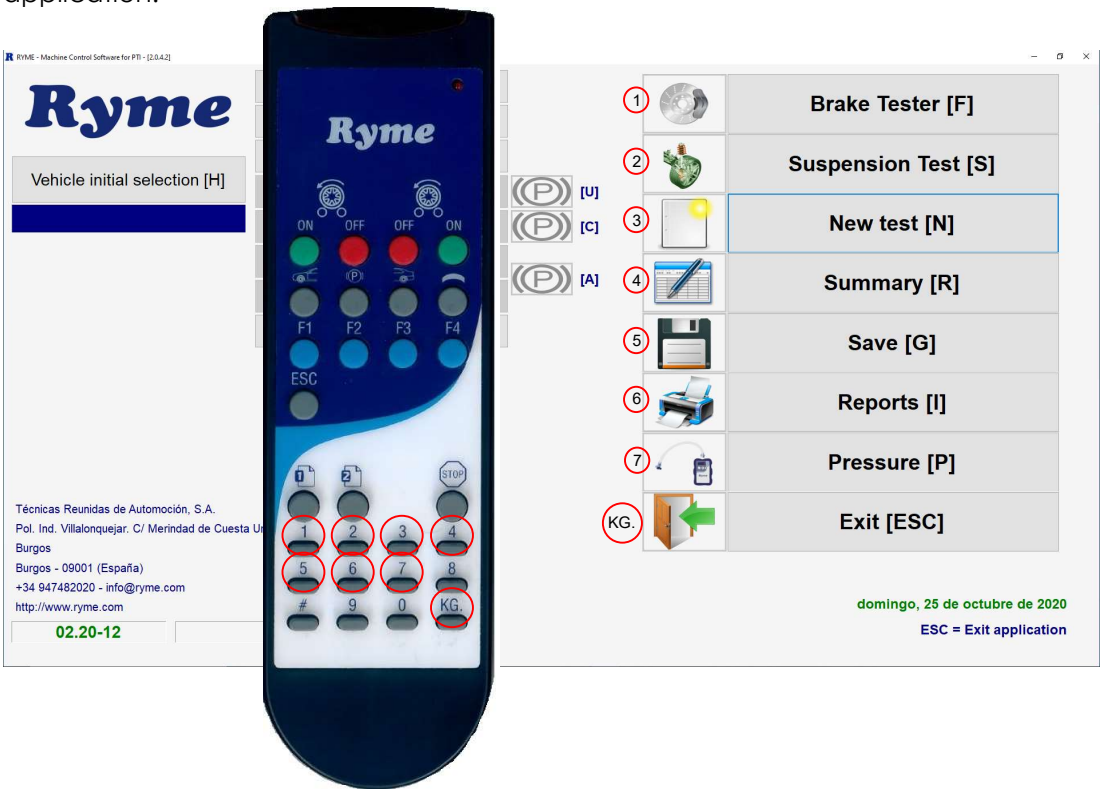
21 Heavy vehicles brake tester display

1) Braking indicator, numbered with the braking force values in kN, the value range is assigned at machine start-up by the user in the configuration, important to perform this operation before calibration.
2) Saved axle and brake information. In this table you can see when it changes to blue, the brake and the axle corresponding to the saved test. You have the possibility to save a total of 10 axles with their corresponding brakes: service, parking or emergency brake.
3) This table shows the value of the force, in kN. It displays the current braking of the vehicle.
4) This part shows the numerical value in percentage obtained from the fluctuation measurement of the wheel. This is the fluctuation of the disc on which the test has been carried out.
5) Percentage braking difference between the wheels of the same axle to be tested. This is the instantaneous difference between the different wheel forces.
6) Weight in kg of the axle to be tested (Optional on the machine), this box shows the current weight value.

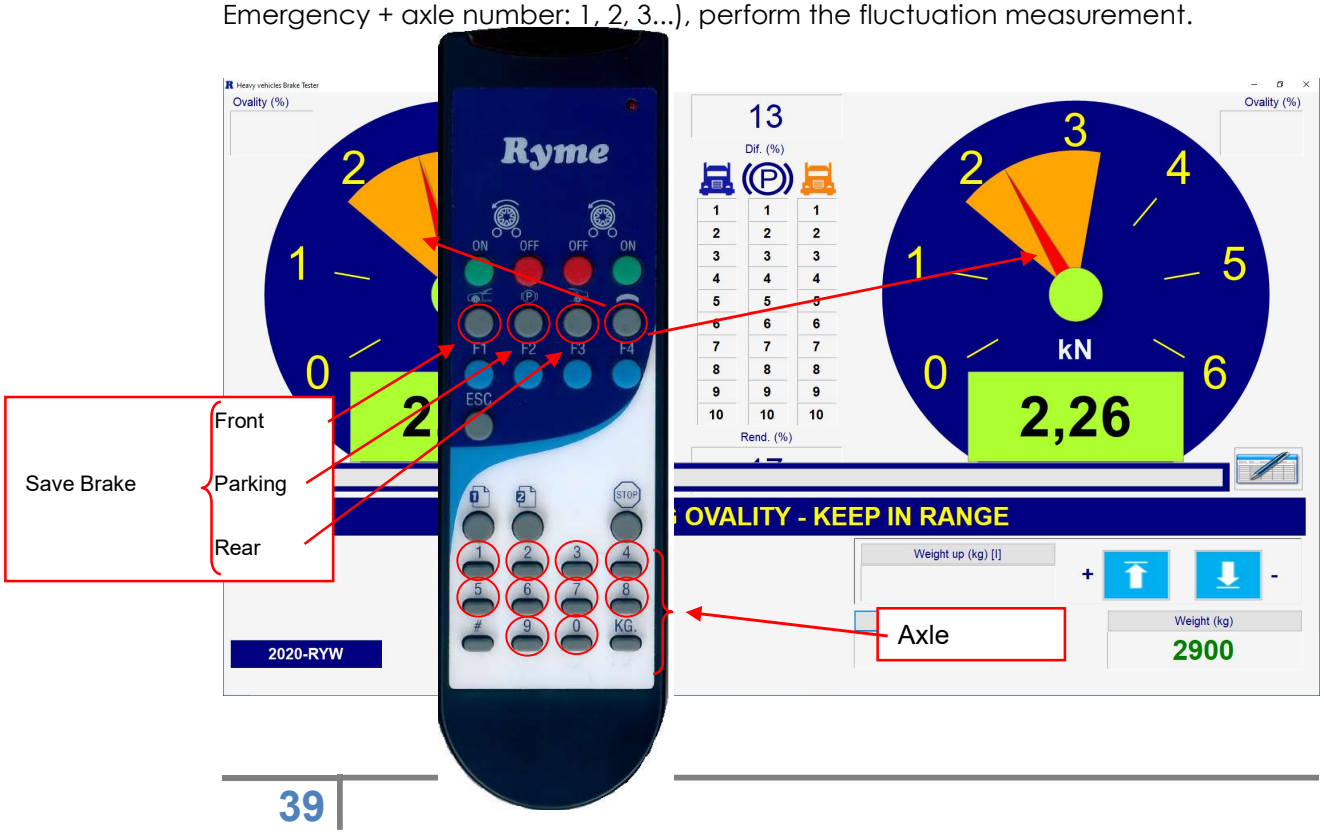
7) Weight when lifted (kg): By pressing the corresponding key or clicking on the icon with the mouse, you will take the weight value in kg, this value will be taken once the vehicle to be tested has been lifted.
8) Weight before lifting (kg): By pressing the corresponding key or clicking on the icon with the mouse, you will take the value of the weight in kg, this value will be taken just at the entrance of the vehicle in the brake tester, when the vehicle is at ground level.
9) Activate lifting: by clicking with the mouse on any of the two icons, lift or lower, the hydraulic group will start, followed by the second click of the mouse which will activate the function of lifting or lowering, depending on which icon you click. Note: the hydraulic group will stop automatically after a configured time.
10) Efficiency: effectiveness of the brakes expressed as a percentage, corresponding to the front or rear wheels. This value is related to the braking forces of the wheels and the weight supported by the corresponding axle.
11) Registration of the vehicle to be tested.
12) Sensor selection: by pressing the key on the keyboard corresponding to each sensor (1, 2, 3, 4) or by clicking with the mouse on the icon of the sensor you want to use for the test, the sensor will change from grey to green when activated.
13) Pressure (bar): in this window you can see the current pressure value of the selected sensor.
14) In these windows you will enter the values from the vehicle's data sheet, depending on each axle, for the calculation of the extrapolation data
15) Indicative screen for the use of the technician: by means of messages the technician will be informed of the stage of the test and the actions to be carried out in order to proceed with a correct test.

4.1.2 Remote control

From the main menu, you can choose which screen you want to enter with the remote control: Brake Tester, Suspension, Pressure, save the test, view reports, or exit the application.



When entering the menu of the brake tester in automatic mode, you can save the tests on the different axles and type of brake (type of brake: Service, Parking or Emergency + axle number: 1, 2, 3...), perform the fluctuation measurement.




Ryme
ON
OFF
OFF
ON
F1
F2
F3
F4
ESC
STOP
KG.
Ovality (%)
Dif. (%)
Rend. (%)
kN
0,00
Weight up (kg) [I]
Weight before lifting (kg) [H]
Lift
Lower
Lifting commands
2020-R


Ryme
Ovality (%)
kN
0,00
Start / Stop Motor
ON (F1)
ON (F2)
Weight (kg)
2880
2020-RYW

4.2 Heavy vehicles brake tester: Manual mode

In this mode, all the actions performed on the equipment are according to the commands given by the user step by step.

You can choose manual testing in two ways:

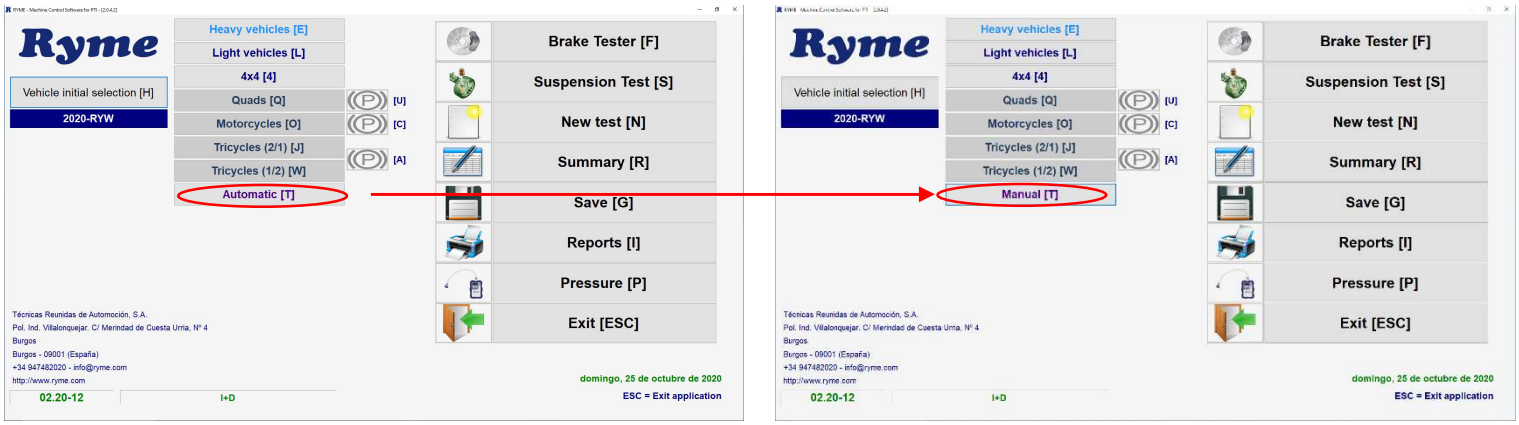
- At the beginning of the test
- At any time after performing the test in automatic mode.

You must select the mode in the main menu.

To carry out a test on a heavy vehicle, by default the box 'Heavy vehicles' is pre-selected, so it is important to make sure at the start of the test that the 'Manual mode' is selected.

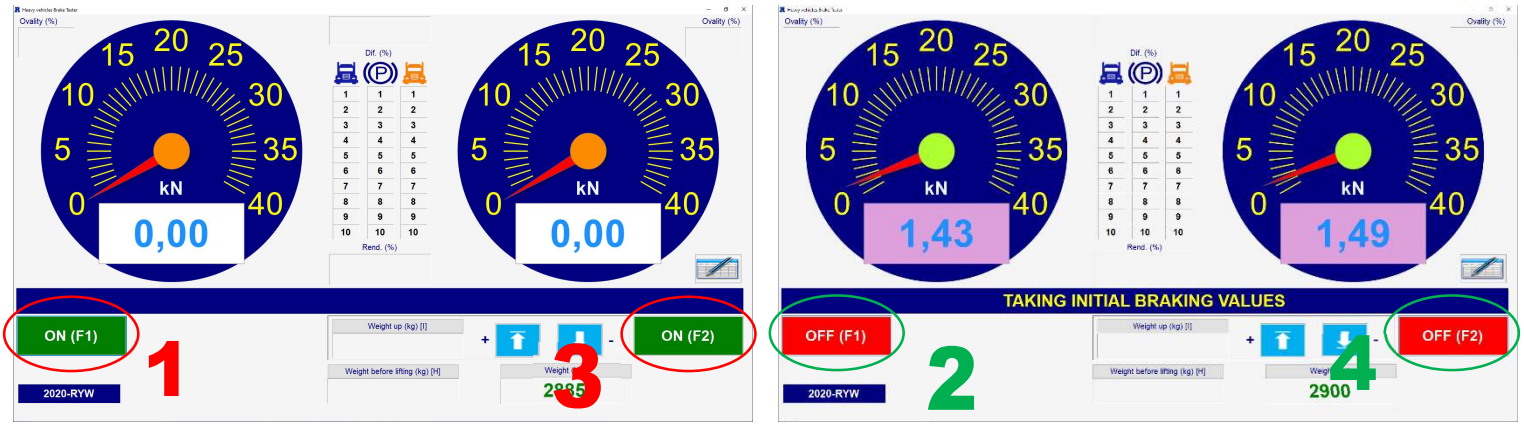
22 Main menu

To change the test mode, press the corresponding key on the keyboard ('T') or click with the mouse on the icon, changing it from Automatic to Manual mode.



23 Main menu

In the display of the brake tester you will find some icons from which you will be able to control the machine at all times:



24 Heavy vehicles brake tester: Manual mode

1. **Start left motor**: You can start the left motor in several ways:
   - Click on this icon
   - Press the corresponding key on the keyboard 'F1'.
   - Press the corresponding button on the remote control
2. **Stop the left motor:** To stop the left motor, you can:
   - Click on this icon
   - Press the corresponding key on the keyboard 'F1'.
   - Press the corresponding button on the remote control
3. **Start right motor:** You can start the right motor in several ways:
   - Click on this icon
   - Press the corresponding key on the keyboard 'F2'.
   - Press the corresponding button on the remote control
4. **Stop right motor:** To stop the right motor, you can:
   - Click on this icon
   - Press the corresponding key on the keyboard 'F2'.
   - Press the corresponding button on the remote control

4.2.1.1 Functioning

In manual mode, all operations must be guided by the technician.

1) Once in this display, introduce a vehicle on the brake bench, at which time the system will measure the weight of the axle introduced, waiting for a new instruction. (Important: for this step, the brake tester must have the scale option)

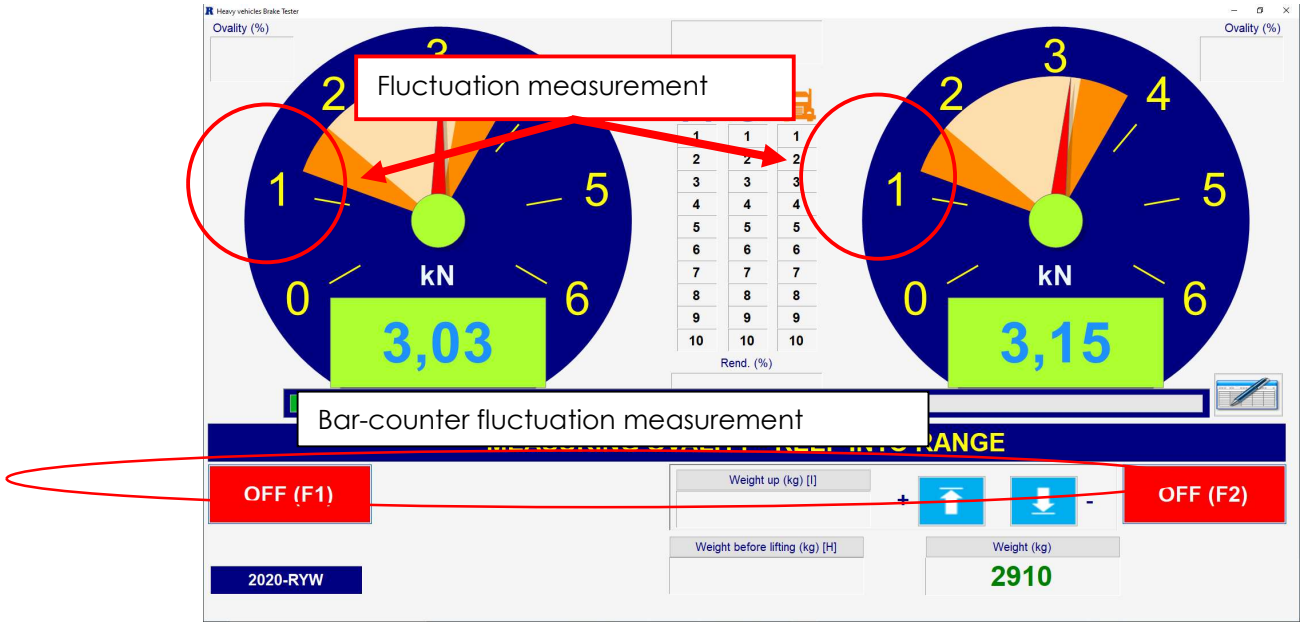
25 Heavy vehicles brake tester: Manual mode

In the case that the line does not have a weighing system, you will simply not obtain the weight measurement of the axle, being able to work normally with the rest of the installed machines.

2) When one of the motors is started, using the keyboard, press the 'F1' -left- or 'F2' -right- key or via the remote control, the system will start to measure the effort made by the corresponding wheel brake. This braking force must be saved once each axle measurement has been completed.

3) When the corresponding motor is in operation and the braking force begins to vary, the deceleration will start slowly and progressively until it reaches a force equal to the average braking force.
4) With that pressure on the brake pedal, which will be kept constant, the fluctuation of the brake will be measured. To do this:

1. Press the 'O' key on the keyboard, clicking on the icon with the mouse or using the remote control (if the fluctuation is configured in automatic mode, this step is not necessary).
2. A shaded orange area will appear on the braking measurement clock, in which you must maintain the needle indicating the braking value in order to correctly measure the fluctuation.
3. A green timing bar will appear at the bottom of the display while braking in the orange area.
4. When the green timing bar at the bottom disappears, the program will have finished measuring the fluctuation and will display it in the corresponding window.



26 Heavy vehicles brake tester: Manual mode - Fluctuation measurement

5. After the wheel fluctuation measurement has been completed, the brake pedal should be released slowly and progressively until the corresponding motor stops.

The motor can stop in three different ways:

- Manually, by pressing the 'F1' or 'F2' key on the keyboard, clicking on the icon or pressing the key on the remote control, when observing that the braking force is high and the wheel starts to slip.
- Automatically, when the slippage that occurs exceeds that set in the configuration.

- Automatically when the braking force drops, if the motors do not lock due to slippage, when the brake pedal is released the system will detect it and store the results (the highest braking).

The difference between the braking forces of the left and right wheel will only be evaluated if the measurement is made simultaneously on both wheels or if one of the wheels on the same axle has already been measured.

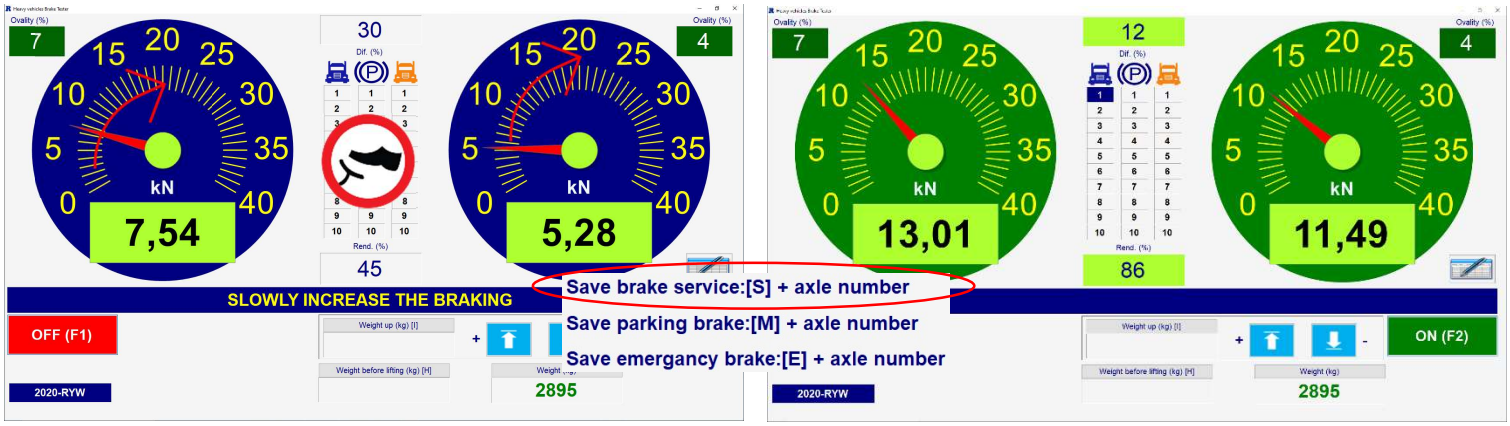
The efficiencies are calculated in real time and refer to the efficiency of each wheel (to be able to see this value on the screen, you will need to have obtained the weight of the axle).

4.2.2 Saving the test manually

Once the desired measurement has been made (independent wheel or complete axle), the different brakes of the vehicle will be saved - SERVICE BRAKE, HAND BRAKE or EMERGENCY BRAKE. After choosing the type of brake, you must press on the keyboard the number of the axle on which you are doing the test (1, 2, 3, 4.... 0).

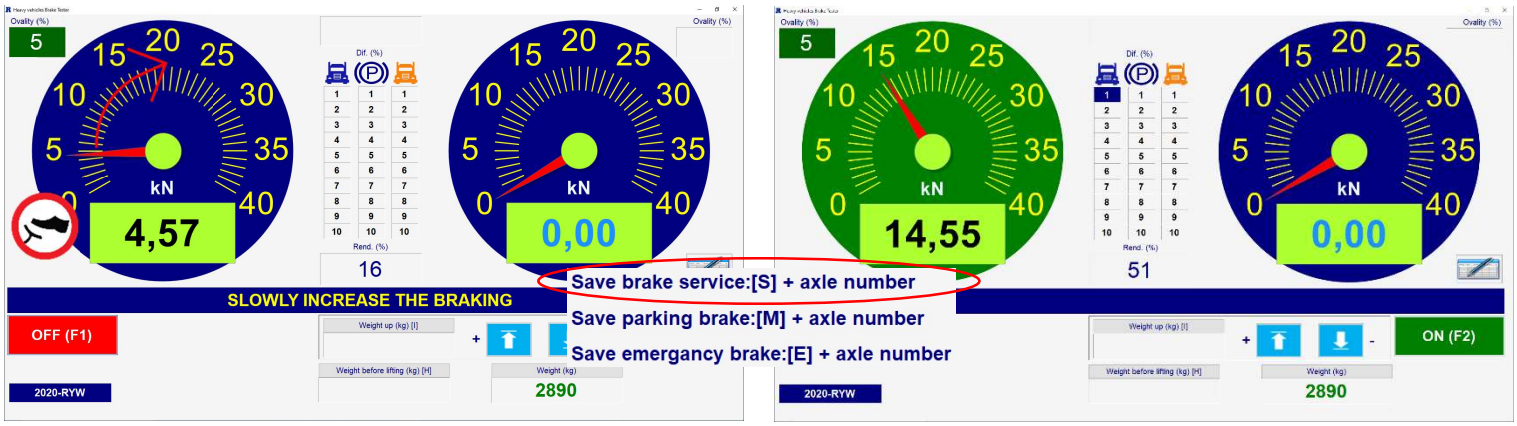
This operation will be carried out either by pressing the corresponding key (Example service brake axle 1: key: 'S'+'1') on the keyboard or by pressing the corresponding button on the remote control. After the measurement of each axle, it will be necessary to save its results in order to ensure that the saving of the test results is carried out correctly.

- Case1: two-wheel start, saving front axle results:



27 Heavy vehicles brake tester: Manual mode- saving axle 1

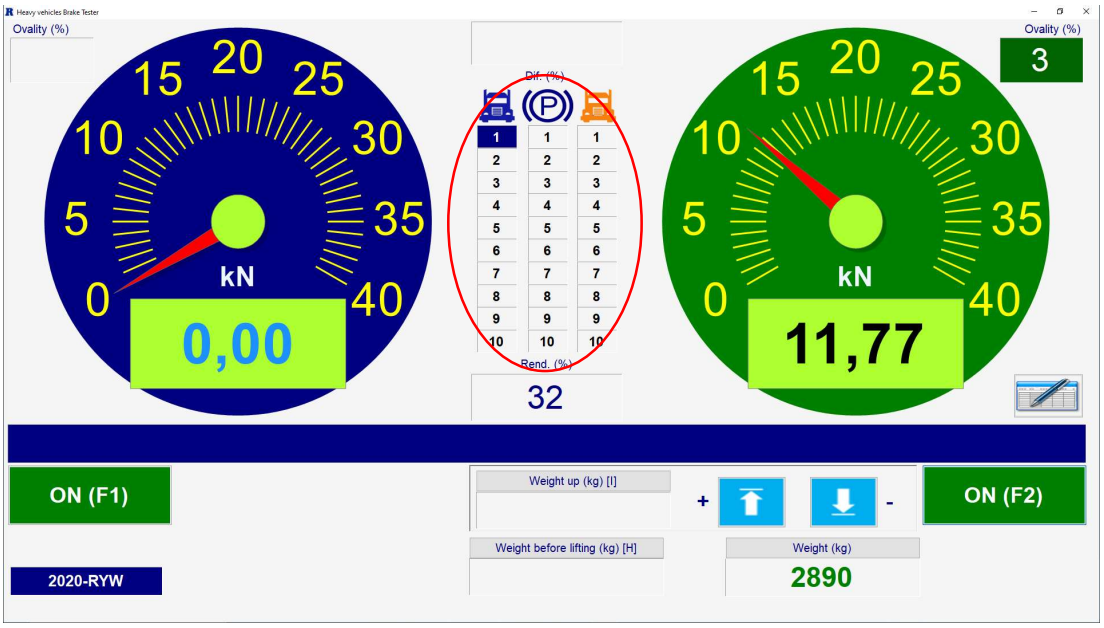
- Case 2: individual left wheel start, saving of service brake axle 1 (the application will store the data individually when pressing 'Save', in case of a single wheel):



28 Heavy vehicles brake tester: Manual mode - saving axle 1 / left.

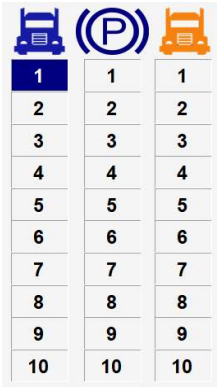
4.2.3 Example

- Measurement of the right wheel: carry out the brake test on axle 1, press save service brake (S), it will appear in green when pressing.



29 Heavy vehicles brake tester: Manual mode - saving axle 1 / right

This way you will be able to see the axles on which you have made the different braking measurements and the type of brake.



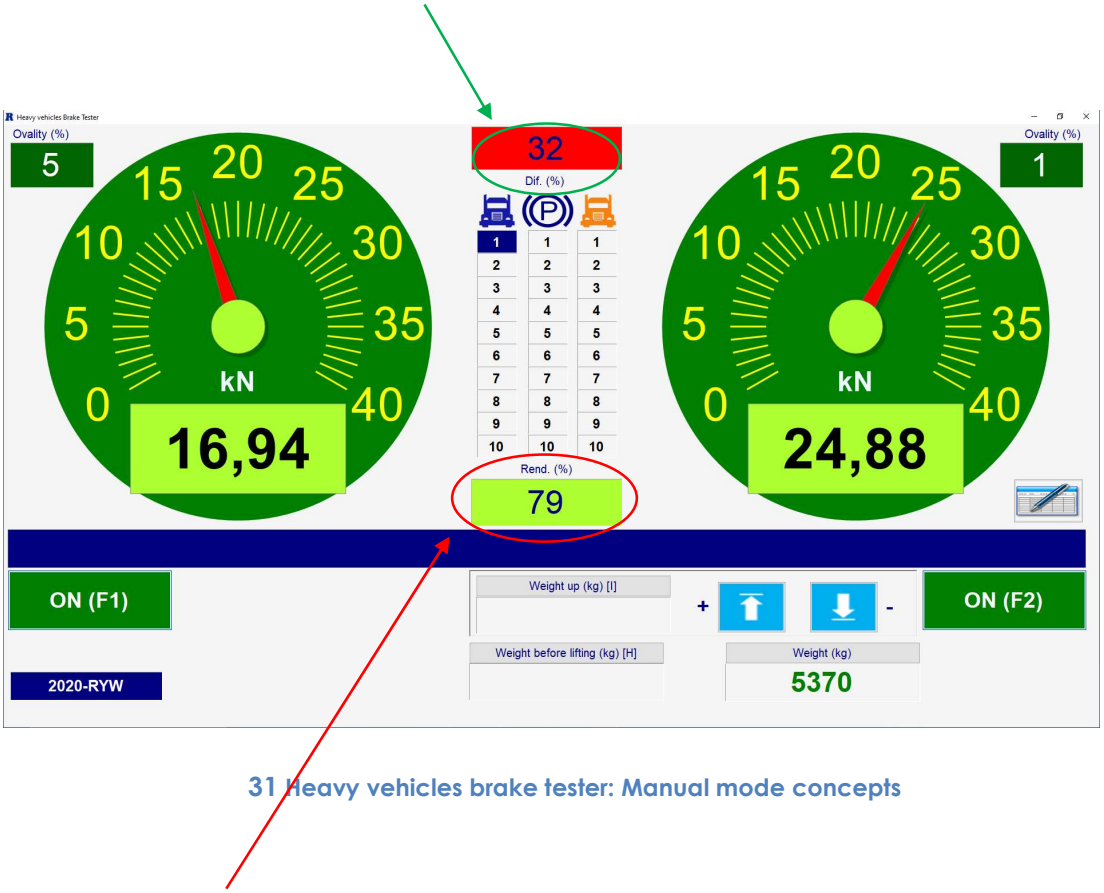
30 Axle-Brake Type Information Box

Note: If this operation is not performed, the measured values will not be shown in the 'Summary', nor in the 'Report' of the last vehicle tested. This operation does not automatically save the test in any database, for that there is a specific operation.

4.2.4 Possible test behaviours

In the performance of a test, you can observe different cases in which the configured values, which have you will have to introduce at the beginning, are not exceeded, as can be:

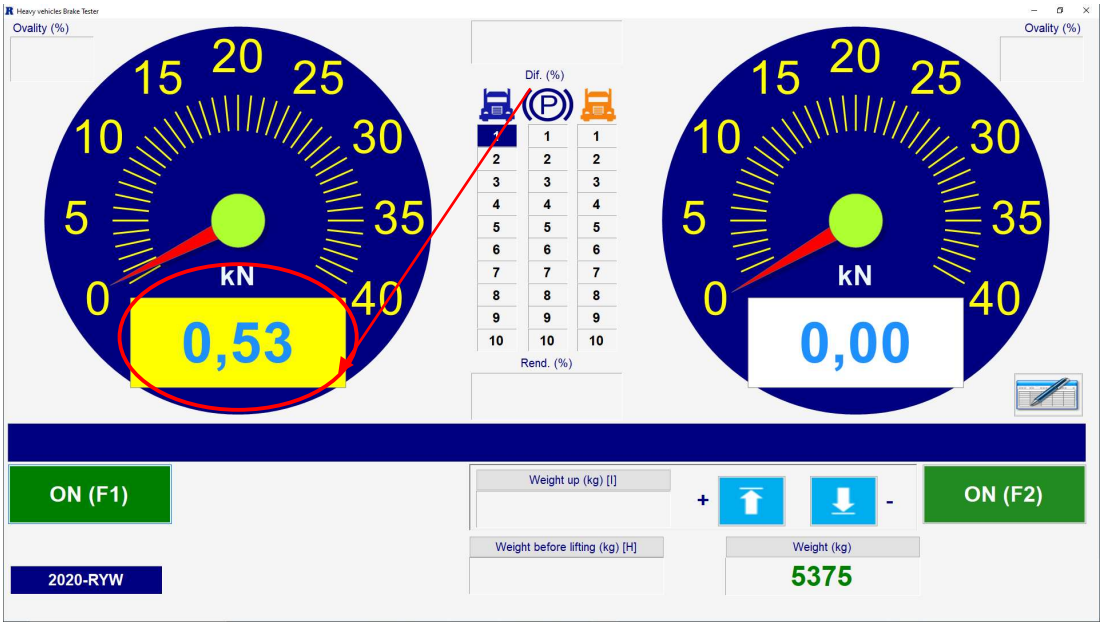
1) **High percentage difference:** This means that the difference between the left and right braking values is higher than the configured value and the 'Difference %' box will be marked in red because you have exceeded the parameters previously configured.



31 Heavy vehicles brake tester: Manual mode concepts

2) If the box 'Efficiency (%)' is in green, the value will be considered correct, as it is within the parameters.

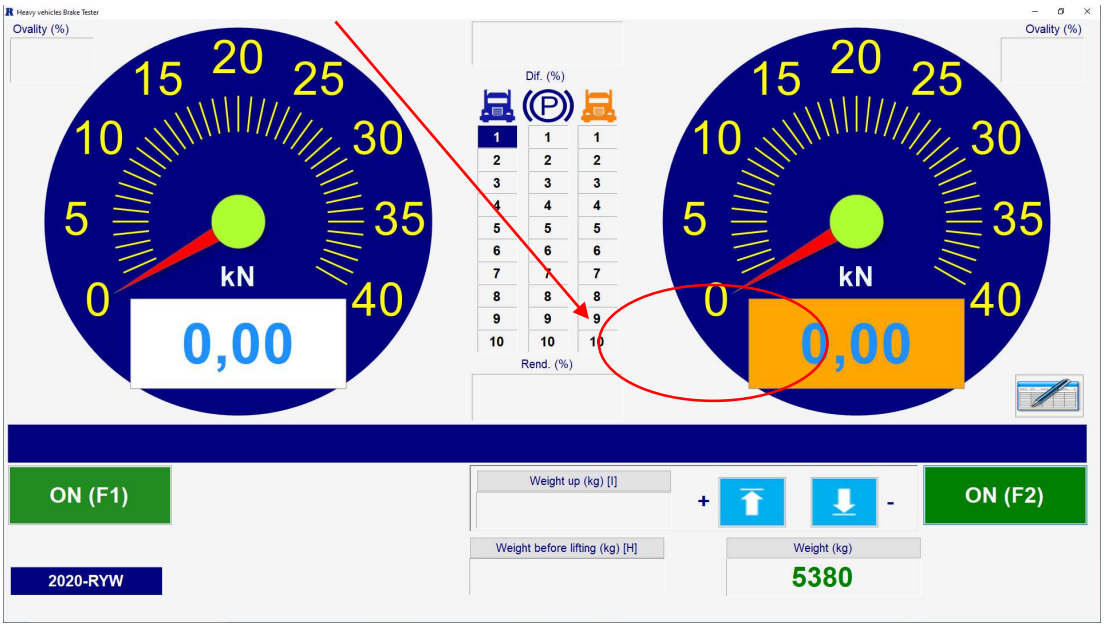
3) **Indicator of locking by slippage**, in case the left pilot appears (in practice it can be either side) of the measurement clock in yellow, it will mean that when trying to take the residual braking values, the slippage bar is practically blocked or its speed is lower than that of the motors (by a configured %), so the latter will try to start but will stop because the slippage bar does not roll, or rolls at a speed below the nominal one. Even if the braking force is not large, the motors will stop when the slippage is higher than the stablished in the setup.



32 Heavy vehicles brake tester: Manual mode - Slippage

4) **Braked or locked wheel indicator**. If the pilot on the right side of the measuring clock appears in orange (in practice it can be either side), it means that the machine has detected a force (kN) on one of the sides as soon as the motor is started, higher than the one configured.

Observe that the wheel of the highlighted side is blocked, and the system will automatically stop both motors for the security of the vehicle and of the people who could be in the area of the test.



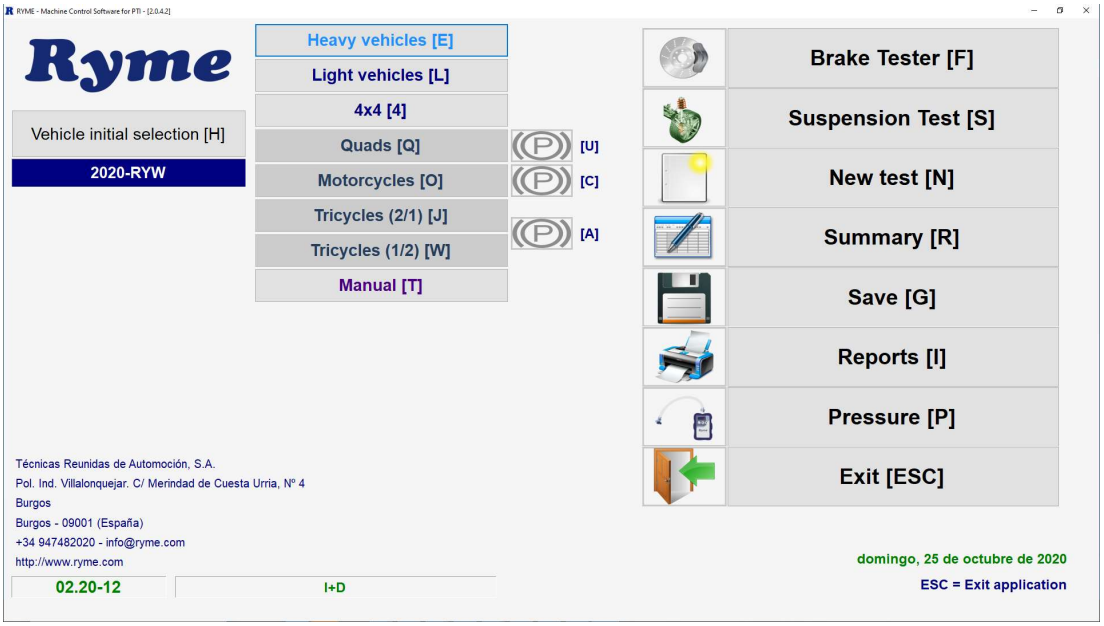
33 Heavy vehicles brake tester: Manual mode - Locking

4.2.5 Notes

- If a wheel is not able to reach the locking value, the braking value will be memorized indicating whether it is front, rear, or parking brake.
- The fluctuation will only be measured on that wheel that is in operation.
- If, when the motor is started, the wheel is locked due to an abnormal brake system situation, the roller set will start and stop immediately.
- In case that the vehicle to be tested has an electric parking brake, the test will not be considered completely correct due to the very abrupt way of braking of this braking system, which could lead to an erroneous measurement. So, the efficiency when braking immediately will be measured taking into account the regulations of each country.

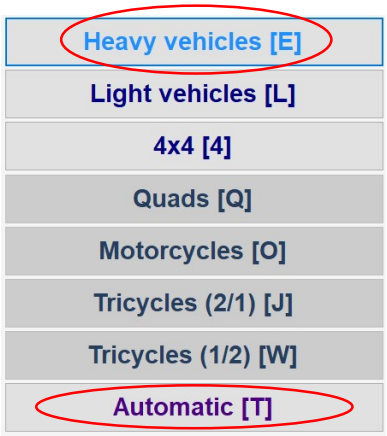
4.3 Heavy vehicles brake tester: Automatic mode

To perform a test of a heavy vehicle in automatic mode, open the application RYME_PCE.exe,



34 Main menu

Make sure that you have configured the automatic mode for heavy vehicles (by default this is always pre-selected). Check that the following boxes are selected:



35 Main menu

4.3.1.1 Functioning

In this mode, the system guides the technician during the execution of the test and manually saves the results. The most important difference with the manual mode will be the starting of the motors since these will start automatically with the detection of the vehicle.

36 Heavy vehicles brake tester: Automatic mode

1) When a vehicle is introduced into the brake tester, the system will start the rollers on both sides, with a configurable delay, carrying out the simultaneous measurement of the braking forces of both wheels.

IMPORTANT: DO NOT START BRAKING UNTIL A MESSAGE APPEARS ON THE SCREEN: 'INCREASE BRAKING SLOWLY', AS YOU MUST FIRST TAKE THE RESIDUAL BRAKING MEASURE.

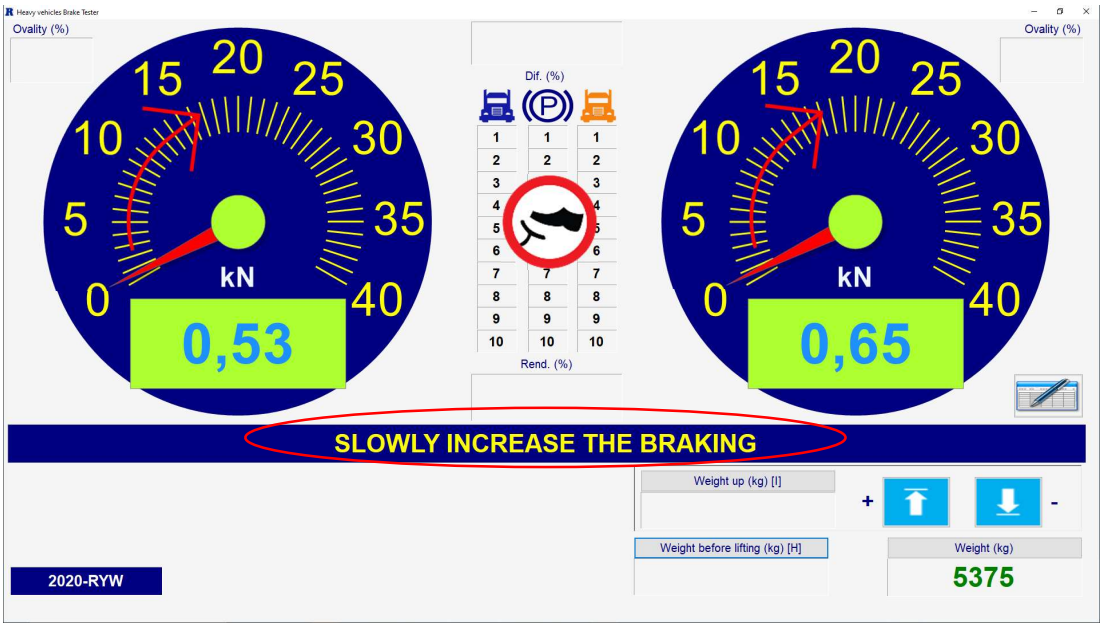
2) The first measurement will be the residual braking on the axle to be tested. In this step the measurement boxes located at the bottom of the clocks will change from white to light grey for a configurable time until the residual value is taken.

37 Heavy vehicles brake tester: Automatic mode – Start of measurement

3) This value will be stored and will be visible at the end of the test in the 'Summary' display.

Then, proceed as follows:

4) Once the motors are running, the residual measurement is taken and the braking forces start to vary, the boxes at the bottom of the clocks will change from light grey to green. Start braking (pressing the pedal of the vehicle's braking system) slowly and progressively until a force equal to the average maximum braking force is reached.

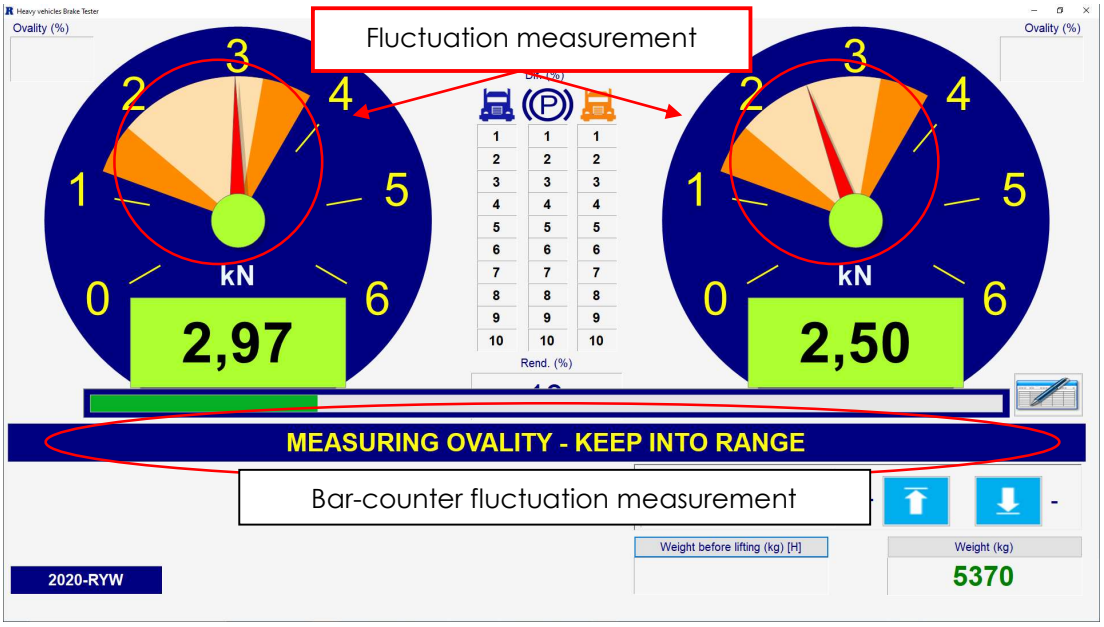


38 Heavy vehicles brake tester: Automatic mode – Start of measurement

5) Proceed to increase the pressure of the brake system pedal until you reach the point of measuring the fluctuation. At this point, try to keep the needle inside the gauge graph measuring fluctuation, keeping the braking constant within the measuring range of the needle.

Important: This measurement will be performed if the fluctuation measurement option is active in the configuration.

The fluctuation measurement will be done and stored automatically.



39 Heavy vehicles brake tester: Automatic mode – Fluctuation measurement

6) After taking the fluctuation measurement on both wheels, slow and progressive braking will continue until one of these cases occurs:

- The motors are stopped by slippage.
- Slightly pull the vehicle out of the brake tester and the sensors will not detect the vehicle's presence.
- The vehicle does not block the rollers, in which case you will have to release the brake pedal for the system to detect that you have tested the axle by braking decrease.

40 Heavy vehicles brake tester: Automatic mode – Taking the measurements

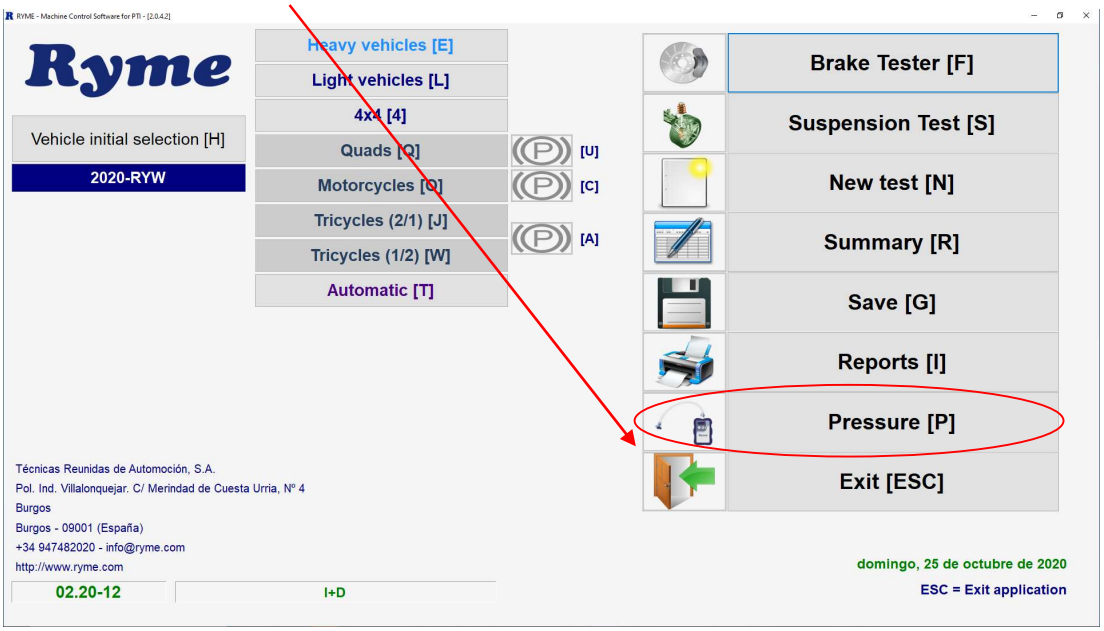
For this type of test, it is important to take into account certain details:

- The efficiencies and other values are calculated in real time and refer to the efficiency and results of each axle.
- Once the motors have stopped, the results are stored manually on the tested axle. This operation does not save the test in any database, there is a specific operation for this purpose.
- To facilitate the exit of the measured axle, configure the brake tester in such a way that it activates both rollers without taking any measurements, if the brake option is not available.
- In the case that the vehicle to be examined has the electric parking brake, the test will not be considered completely correct due to the very abrupt way of braking this electric system, which could lead to an erroneous measurement. The efficiency when braking immediately will be measured taking into account the regulations of each country.

4.3.2 Functioning with lifting and extrapolation:

4.3.2.1 Preparation of a test

Before performing the test, enter the data of the vehicle to be tested. For the preparation of a test on a heavy vehicle with the extrapolation method, once all the parameters are configured in RYME_CalConf.exe, open the application Ryme_PCE.exe and click with the mouse on the icon 'Pressures' or press the corresponding key on the keyboard or remote control:



41 Main menu: pressures

Then, a window will be opened where you must enter:

- Number of axles to be measured
- Maximum Authorized Mass (MAM) of the vehicle
- Minimum point calculation (%): minimum percentage value to be reached to perform extrapolation calculations.
- Maximum Authorized Mass (MAM) per axle
- Minimum pressure for the calculation of the extrapolation (bar)
- Minimum force for the calculation of the extrapolation (kN)
- Reference pressure per axle, for the calculation of the extrapolation (kN)
- Type of extrapolation:
  - At cut-off
  - Between two points
  - Without extrapolation
- Current pressure value of the selected sensor
- Sensor number selection. Also, by presenting either a green or red colour it will indicate if there is an established connection.

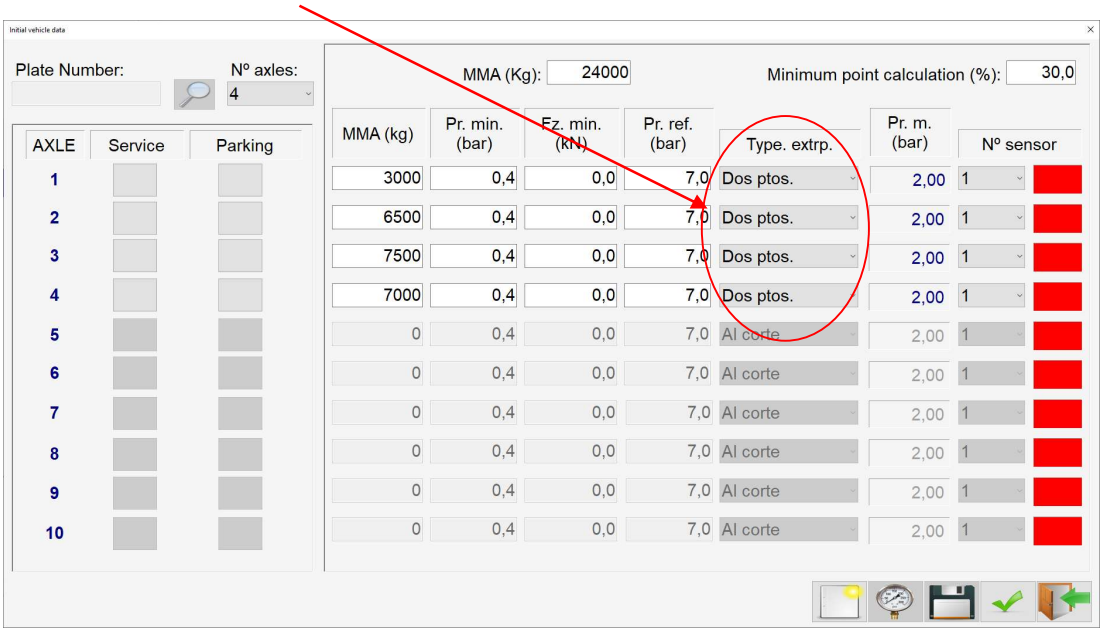
42 Initial vehicle data display: Pressures

You can perform the test with two different methods of extrapolation:

1) Method of extrapolation: Between two pressure points.

The system of this method consists of capturing the braking force at an initial pressure point for the calculation of extrapolation between 2 previously configured values (RYME_CalConf).

These pressure values can be modified before the test from the pressure screen.



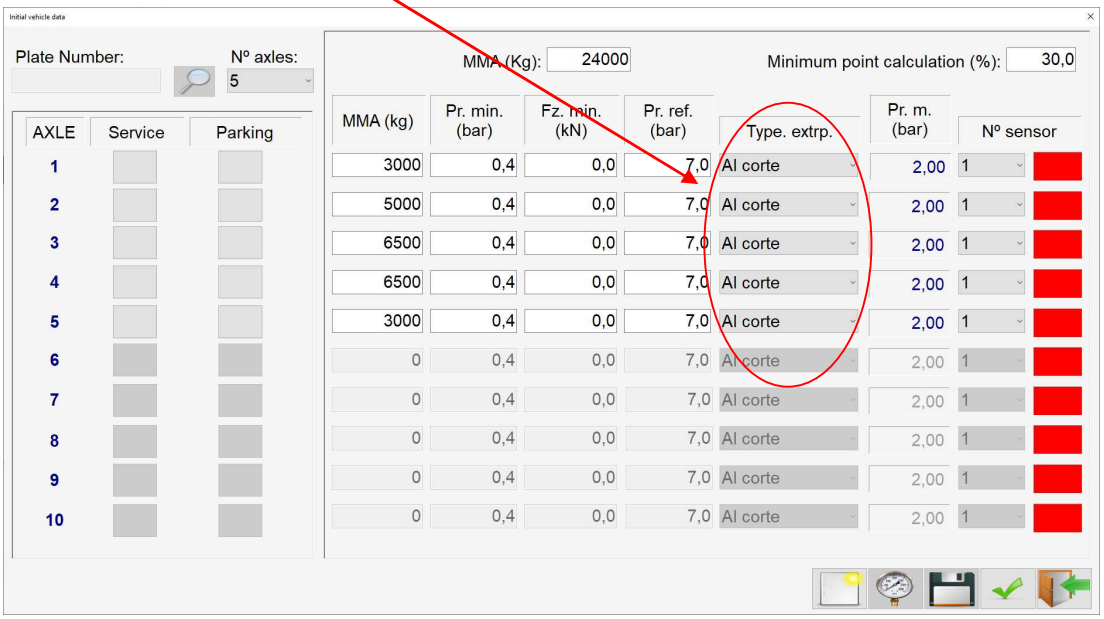
43 Initial vehicle data display: Extrapolation between two points

In this method you only must enter the weights. You can observe the selected sensors and the pressure if they are turned on.

2) Method of extrapolation: At cut-off

This method consists in obtaining the braking force from the calculation of a minimum pressure point. The percentage for the calculation of the minimum point of extrapolation must be entered before starting the test. If you want to set a default value, it must be configured from the RYME_CalConf.exe application.

The maximum value that appears as the minimum pressure (calculated with the percentage of the minimum extrapolation point) will be 2 bar, according to the master plan.

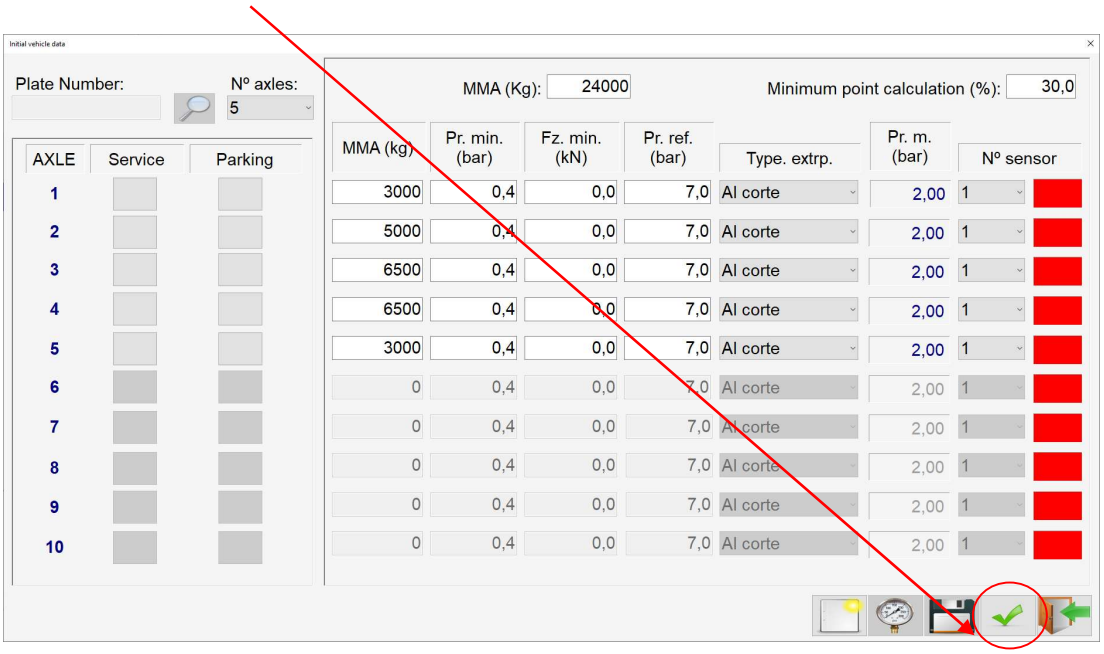


44 Initial vehicle data display: Extrapolation at cut-off

Note: The sum of the axles does not have to coincide with the total MAM.

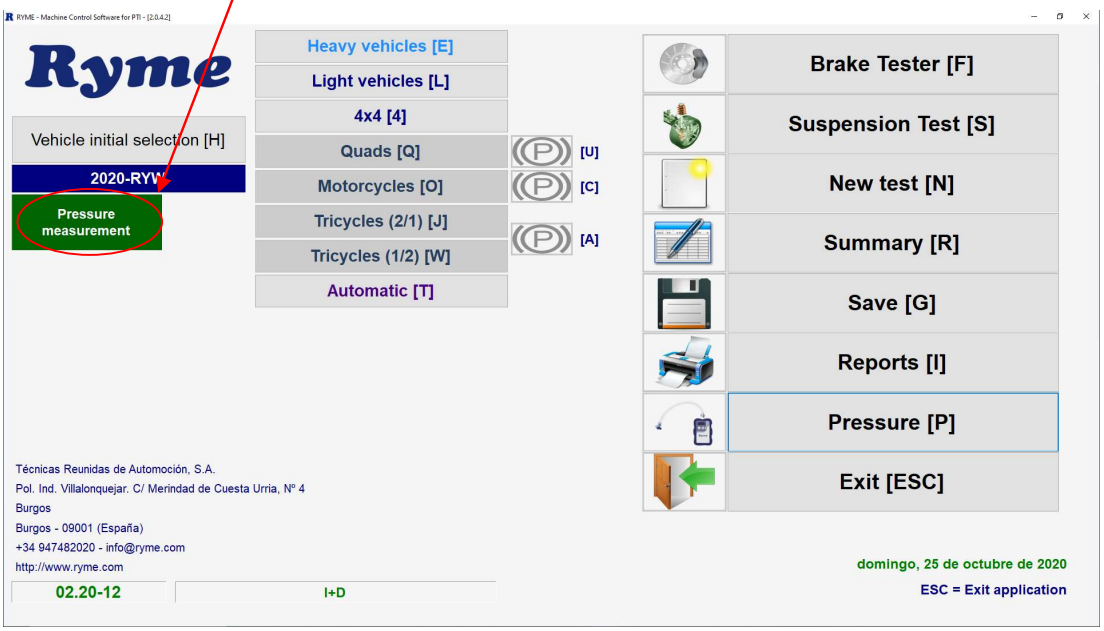
4.3.2.2 *Performance of a test*

Once all the boxes have been configured, click on the 'OK' icon.



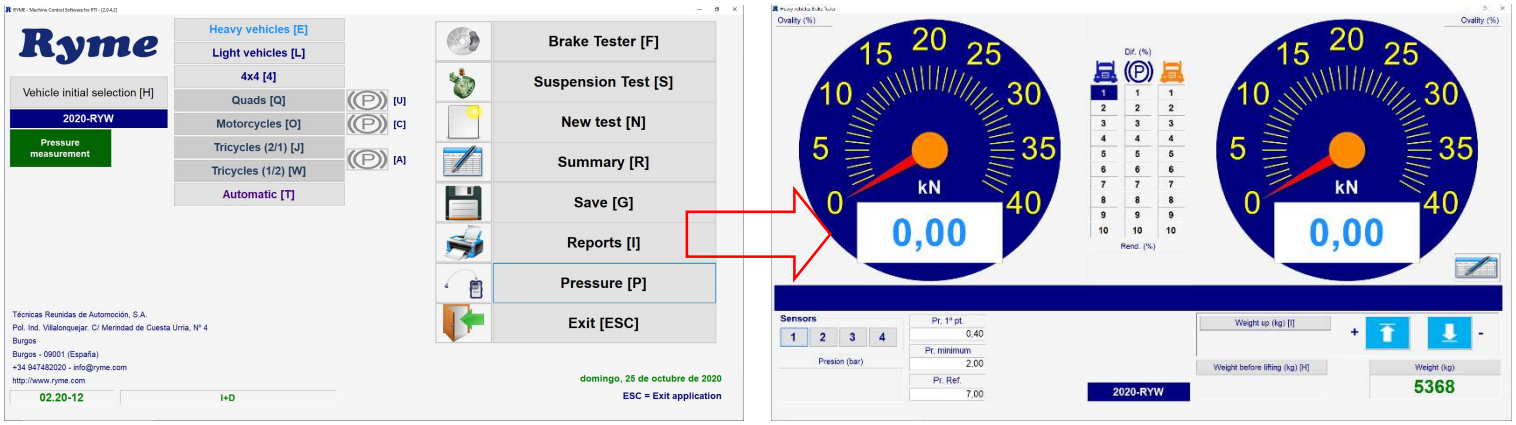
45 Initial vehicle data display: Performance of a test

A box with the text 'Measurement with pressures' will appear on the main screen, indicating that the test to be carried out will use pressure to calculate the braking force.



46 Initial vehicle data display: Pressure measurement

The test can be started in two different ways: either by entering the axle in the brake tester and automatically starting the motors, or manually by clicking the 'Brake Tester' icon with the mouse or pressing the corresponding key on the keyboard.

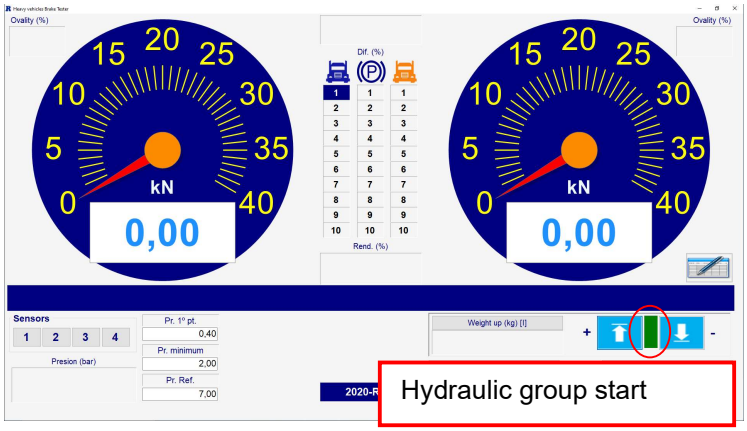


47 Heavy vehicles brake tester main menu

1) At this point, if you have selected the load lifting option in the RYME_CalConf application, you can lift or lower the vehicle until you get the necessary weight for the test according to the country's regulations.

By pressing the icon to lift, on the button to lower or by pressing the corresponding key on the keyboard or remote control.

- The first time either icon is pressed, the hydraulic unit will start. The activation of this will be shown by means of a green icon, being the latter activated in a configured time.

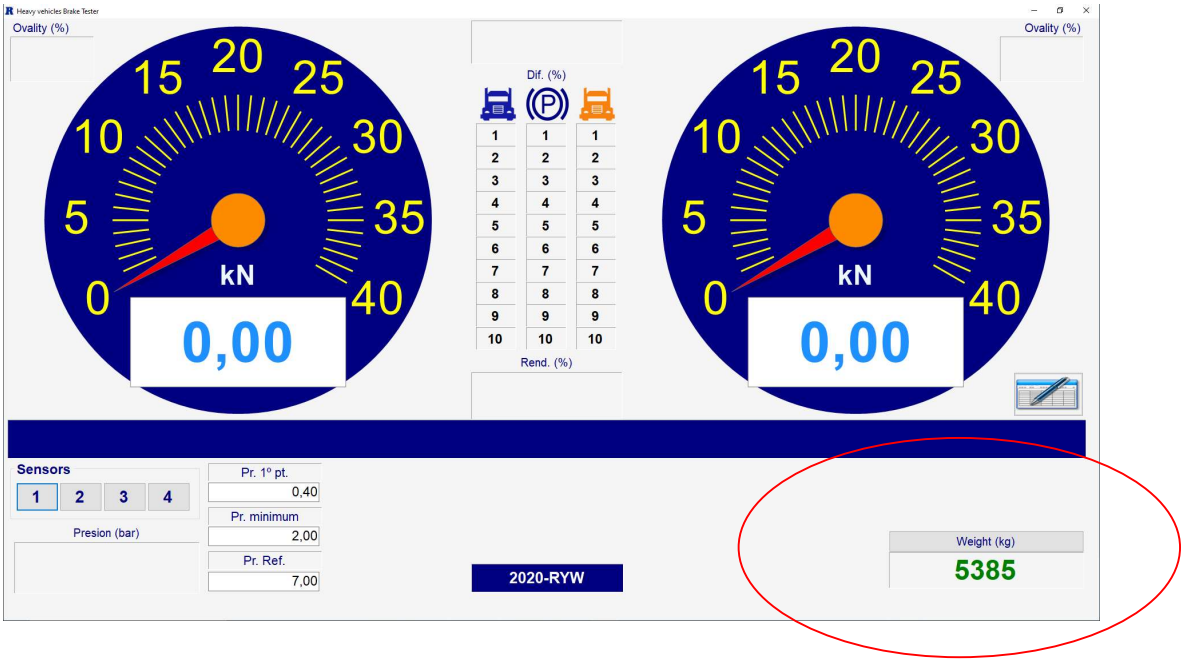


48 Heavy vehicles brake tester: Hydraulic group start

- The second time it is pressed, the brake tester will begin to rise or fall until you consider a weight suitable for the performance of the test. This will be reflected by the arrow as it changes to yellow.

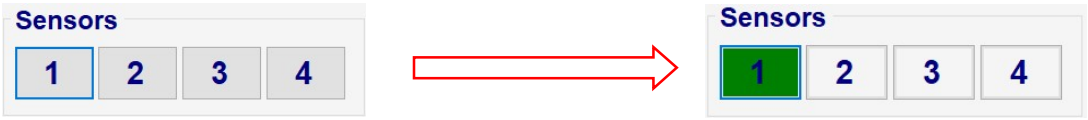
49 Heavy vehicles brake tester: Lift / Lower

In case you have not selected the option of lifting the load in the configuration, the icons mentioned above will not appear and the program will proceed directly to perform the test.



50 Heavy vehicles brake tester: No lifting

2) Next, in the sensor boxes (lower part), select the sensor number with which you want to perform the test by clicking with the mouse on the sensor number or by pressing the corresponding key on the numerical keyboard: 1, 2, 3, 4. (Important: check the connector socket of the vehicle before connecting the pressure sensors and starting the sampling, check that the pressure sensor is on).

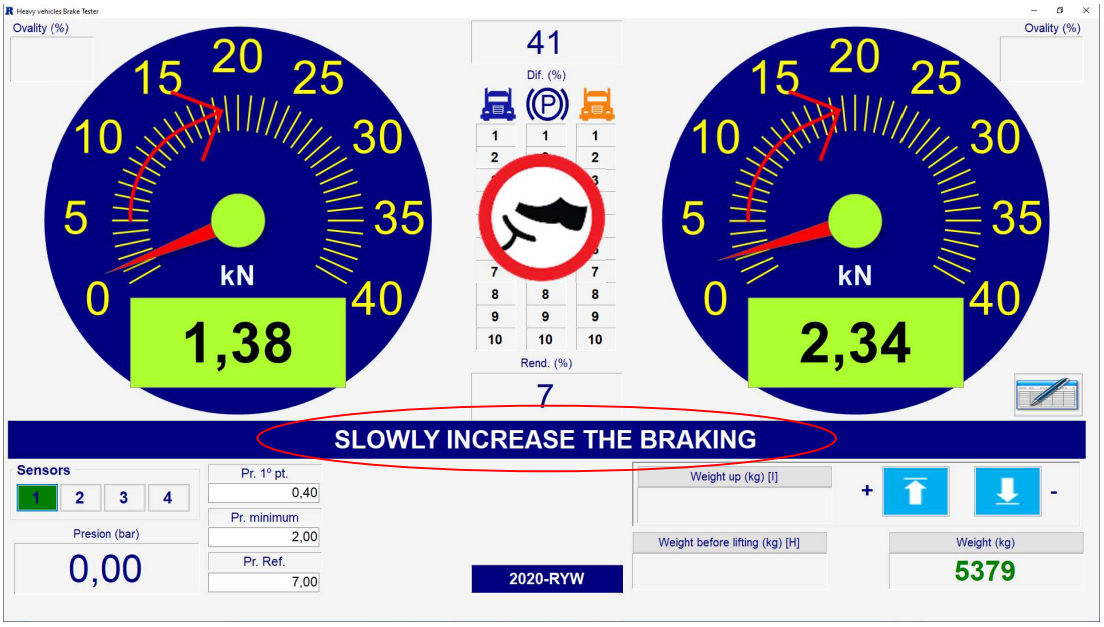


51 Heavy vehicles brake tester: Pressure sensor selection

3) Once you see the data acquisition display, wait for the motors to start.
At that time, the first measurement will be the residual braking on the axle to be tested, in this step the measurement boxes located at the bottom of the clocks will change from white to light grey for a configurable time to take the residual value,

52 Heavy vehicles brake tester: Residual braking

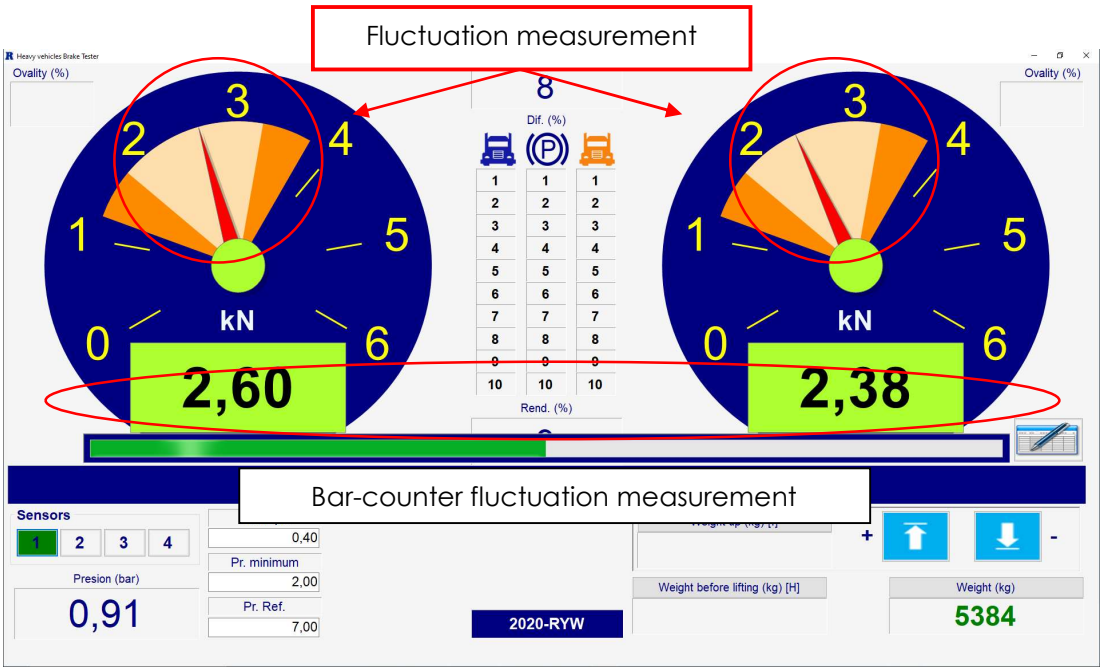
4) Once the motors are running, the residual measurement is taken and the braking forces start to vary, the boxes at the bottom of the clocks will change from light grey to green. Start to brake (pressing the pedal of the vehicle's braking system) slowly and progressively until a force equal to the average maximum braking is reached (parallel to this, the braking force of the axle and the pressure, measured in bars, acting on the brake of the axle to be measured will be measured).



53 Heavy vehicles brake tester: Start of measurement

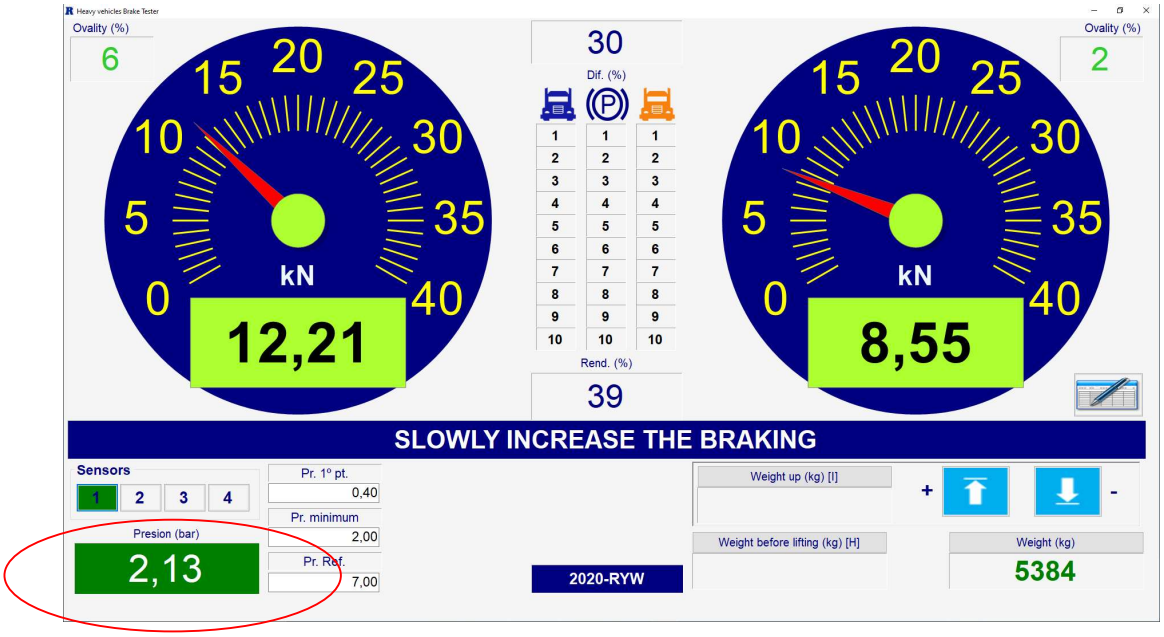
5) Proceed to increase the pressure of the braking system pedal until reaching the fluctuation measurement point. At this point, try to keep the needle inside the gauge graph measuring fluctuation, keeping the braking constant within the measuring range of the needle.

Important: This measurement will be performed if the fluctuation measurement option is active in the configuration. The fluctuation will be measured and stored automatically.



54 Heavy vehicles brake tester: Fluctuation measurement

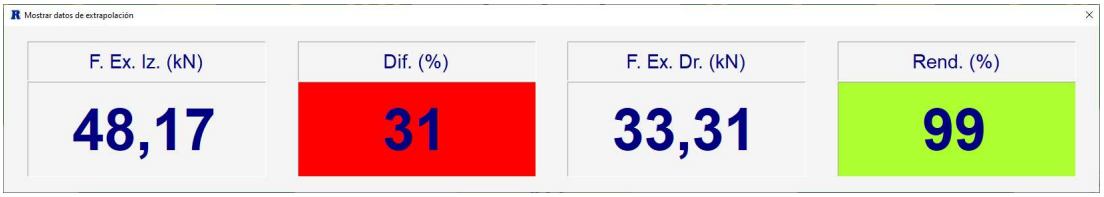
6) The pressure box will change colour from grey to green when it reaches the minimum pressure set (either at cut-off or between two pressure points): You will then be able to save the test in different ways. One method is to reach the saved value of pressure or exceed it slightly, immediately the rollers will stop, and you will be able to save the test as mentioned above, in this case by pressing service brake and the axle 1.



55 Heavy vehicles brake tester: Minimum pressure

You can also finish the test at any time you consider appropriate, keeping the values anyway.

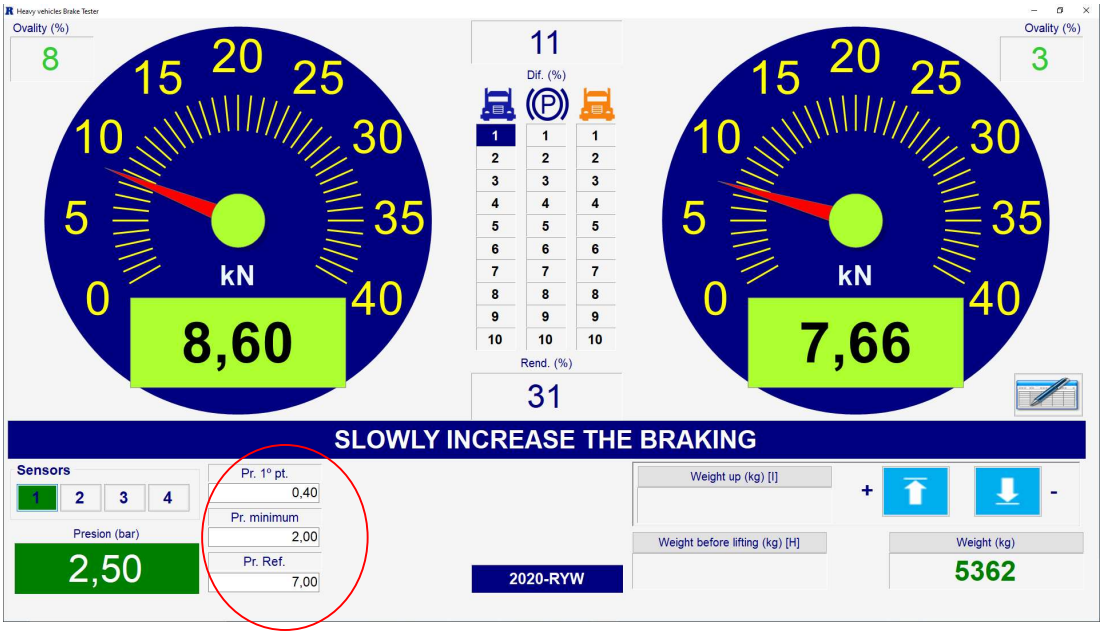
Upon saving the test, the application will indicate the extrapolation value that will be saved in the summary.



Note: The extrapolation method is only valid for the service brake.

7) To measure the rest of the axles, proceed in the same way as for the axle shown here.

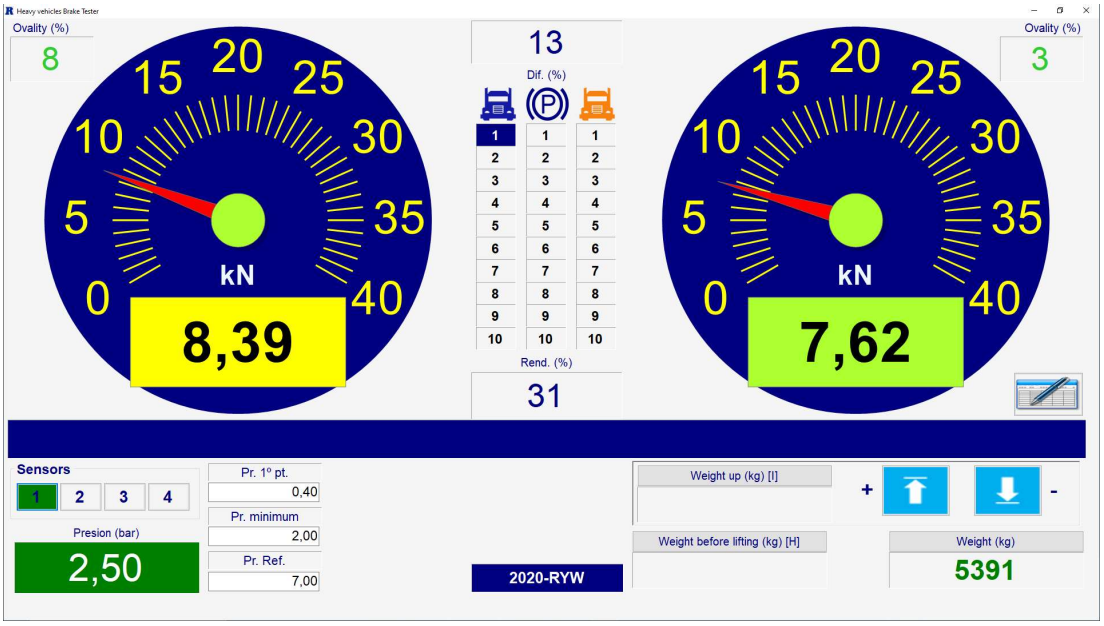
For this method there is also the possibility that different axles of the same vehicle have different reference pressures. Before performing the test, the reference pressure has already been selected, but it can be modified during the test in the lower Pressure window. Once the test starts for the axle to be modified, the reference pressure value can be modified so that the extrapolation is calculated with this last value.



56 Heavy vehicles brake tester: Data sheet - pressure per axle

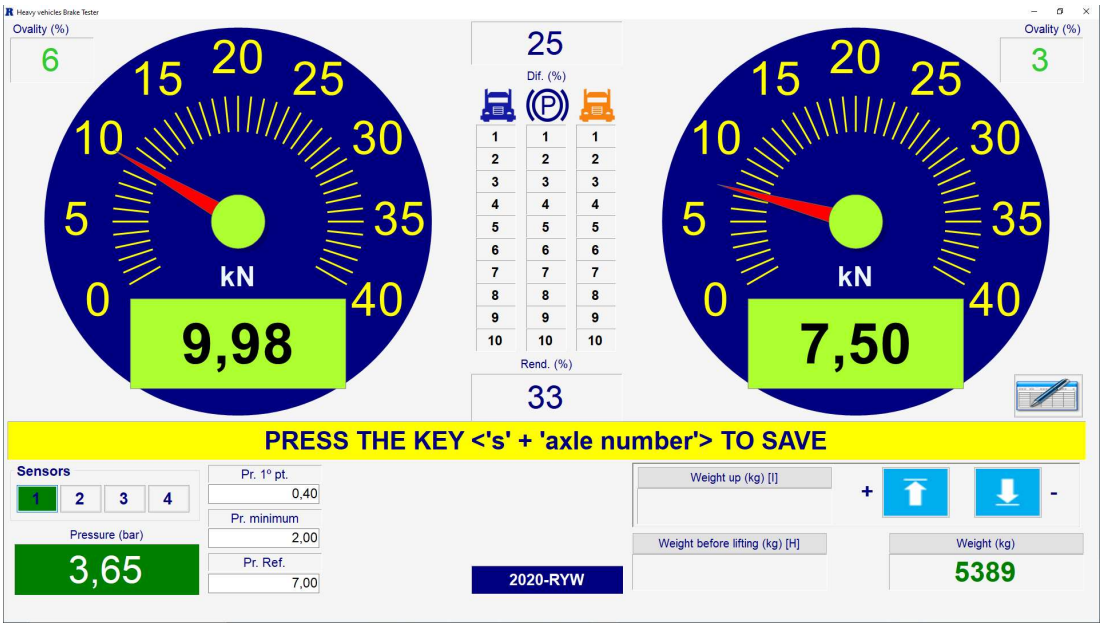
8) Continue braking slowly and progressively until one of these cases occurs:

- **The motors are stopped by slippage**: indicating in which wheel this has occurred by means of the yellow colour in the box on the corresponding side, being able to save the test as mentioned before, in this case pressing service brake and axle 1.



57 Heavy vehicles brake tester: Stop by slippage

- **By reaching maximum pressure**: being able to configure the maximum pressure at which you want the braking in the test to stop. This option is highly recommended because, in certain brands of vehicles, when reaching the maximum axle pressure, it falls sharply to a value of zero bars, giving you wrong information in the calculation of the extrapolation. This pressure is configurable in the RYME_CalConf.exe application.

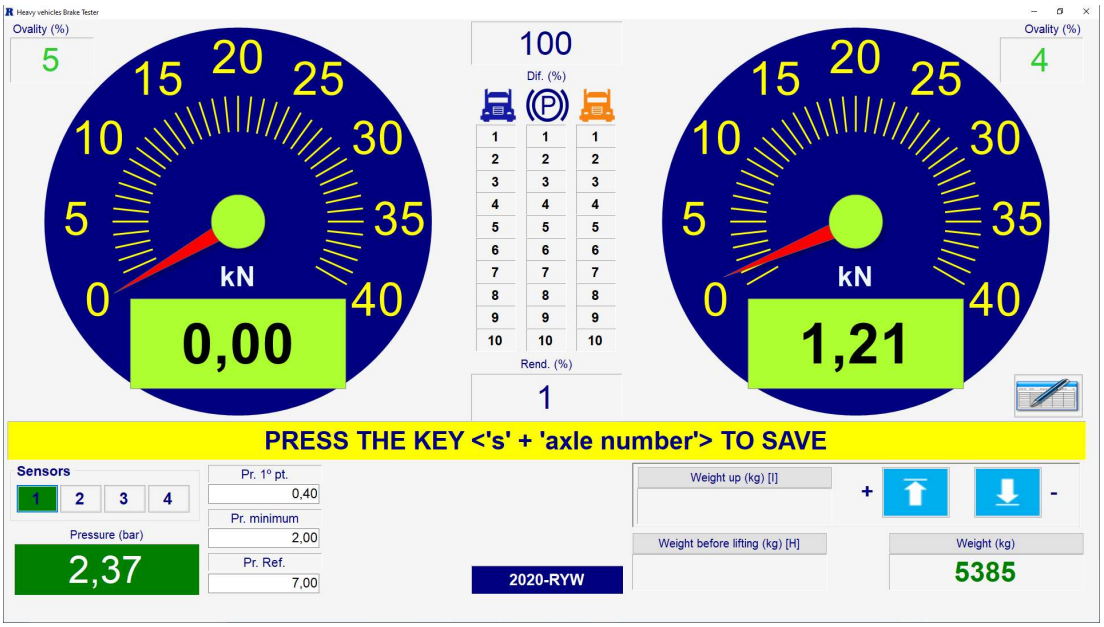


58 Heavy vehicles brake tester: Stop by reachimg maximun pressure.

- The vehicle slightly protrudes out of the brake tester and the sensors do not detect its presence.

59 Heavy vehicles brake tester: Stop by vehicle exit (sensors stop detecting its presence)

- The vehicle does not block the rollers, in which case you will have to release the brake pedal for the system to detect that you have tested the axle by braking decrease.



60 Heavy vehicles brake tester: Stop by force drop detection.

9) Given one of the previously mentioned cases, proceed to save the data of the axle, in this case, it will be service axle number 1 (press 'S' key and then number '1'):

61 Heavy vehicles brake tester: Saving the data

10) To lower the vehicle and continue measuring the other axles, click with the mouse on the icon or press the '-' key on the keyboard, so that the platform will begin to lower to floor level:

62 Heavy-duty brake tester display: Lowering axle

11) Once you have reached this point, introduce the next axle to continue with the test, being the procedure identical to the previous one, taking into account the possibility of changing the type of brake: Service, Parking or Emergency. If the type of brake to be carried out is not a service brake, no extrapolation calculations will be made.

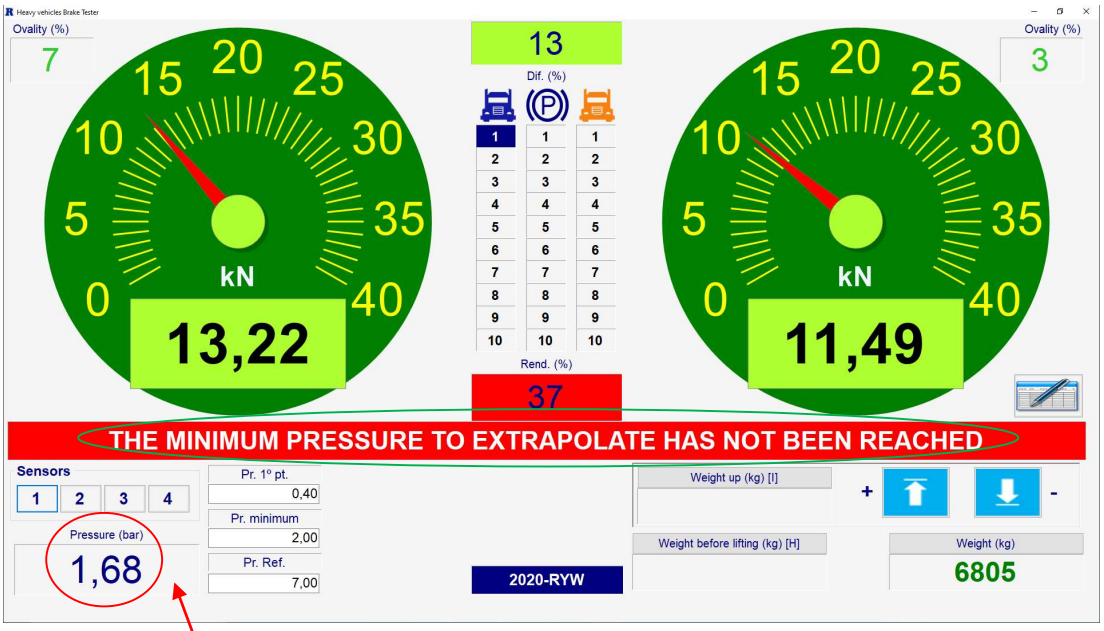
4.3.2.1 Possible behaviours of the test

4.3.2.1.1 Carrying out the test without reaching the minimum pressure

If the minimum pressure is not reached, at the end of the test on an axle the program will display a window indicating this by means of a message.

THE MINIMUM PRESSURE TO EXTRAPOLATE HAS NOT BEEN REACHED

If you continue, the actual braking values will be taken and no extrapolation will be calculated.



63 Heavy vehicles brake tester: Low pressure

Observe that the pressure box will not have changed colour from grey to green, since you have not reached the minimum pressure set to be valid the test with the selected pressure sensor.

The values displayed here will be the real time values taken in the test and not the extrapolated ones, since the minimum configured pressure has not been reached.

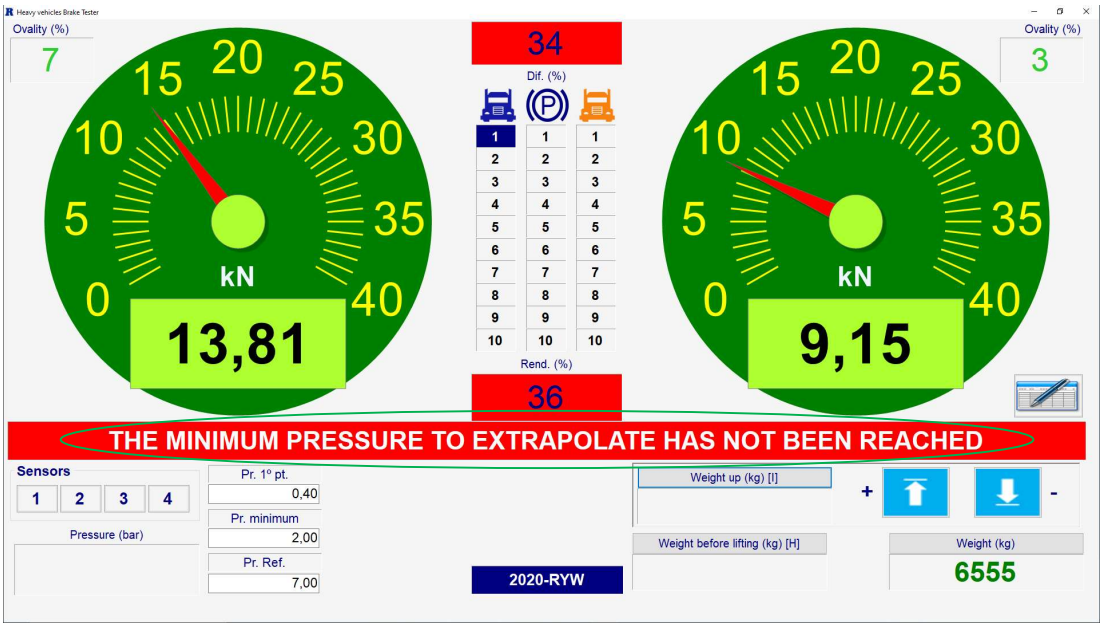
If data are stored in the corresponding axle, they will be saved as: service, parking or emergency; corresponding to the axle selected at the time of saving, but it will not be stored in pressures since the minimum pressure has not been reached.

4.3.2.1.2 Carrying out the test without selecting a pressure sensor

If no pressure sensor is selected, at the end of the test on an axle the program will display a window indicating this by means of a message.

THE MINIMUM PRESSURE TO EXTRAPOLATE HAS NOT BEEN REACHED

If you continue, the actual braking values will be taken and no extrapolation will be calculated.



64 Heavy vehicles brake tester: No pressure sensor

The values displayed will be the real time values taken in the test and not the extrapolated ones, since no pressure sensor has been selected.

If data are stored in the corresponding axle, they will be saved as: service, hand or emergency; corresponding to the axle selected at the time of saving, but it will not be stored in pressures since the minimum pressure has not been reached.

ANNEX 1

FORMULA FOR THE CALCULATION OF EXTRAPOLATED FORCES

$$Fe = F2 + \left(\frac{(F2 - F1)}{(P2 - P1)} \right) * (Pr - P2)$$

Where:

Fe → Resulting extrapolated force

Pr → Reference or design pressure (always 8, configurable)

ONE POINT METHOD	2 POINTS METHOD
F1 → Always 0	F1 → Force taken between 2 & 2,2 bars
F2 → Force taken between 2 & 2,2 bars	F2 → Force taken at cut-off
P1 → Always 0,4 (Configurable)	P1 → Force taken between 2 & 2,2 bars
P2 → Force taken between 2 & 2,2 bars	P2 → Force taken at cut-off

4.3.3 Saving the test manually

Refer to 4.2.2. *Saving the test manually*

4.3.4 Example

Refer to 4.2.3. Example.

4.3.5 Possible behaviours in a test

Refer to 4.2.4. Possible behaviours in a test

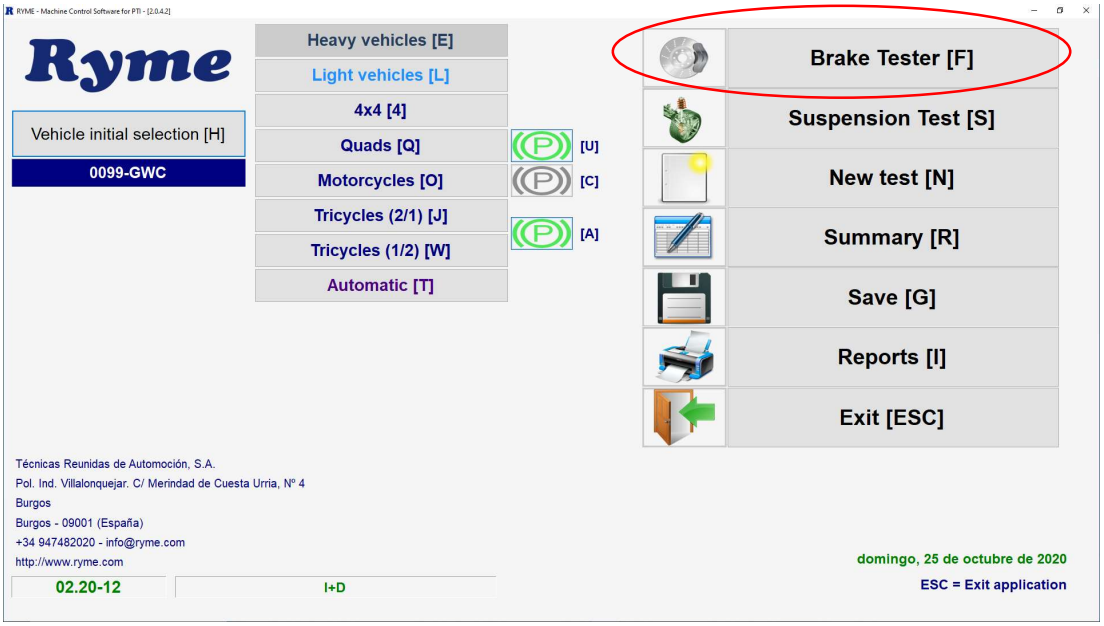
4.3.6 Notes

Refer to 4.2.5. Notes.

4.4 Main menu description for the light vehicles brake tester

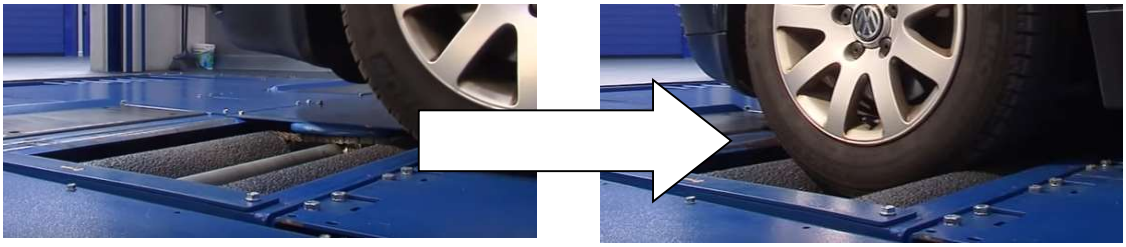
From the main menu of the program, you have the possibility to access the 'Brake Tester' application in different ways:

- By clicking with the mouse on the icon with the legend 'Brake Tester'.
- By pressing the corresponding key 'F' on the keyboard.
- Using the remote control, by pressing the corresponding button.



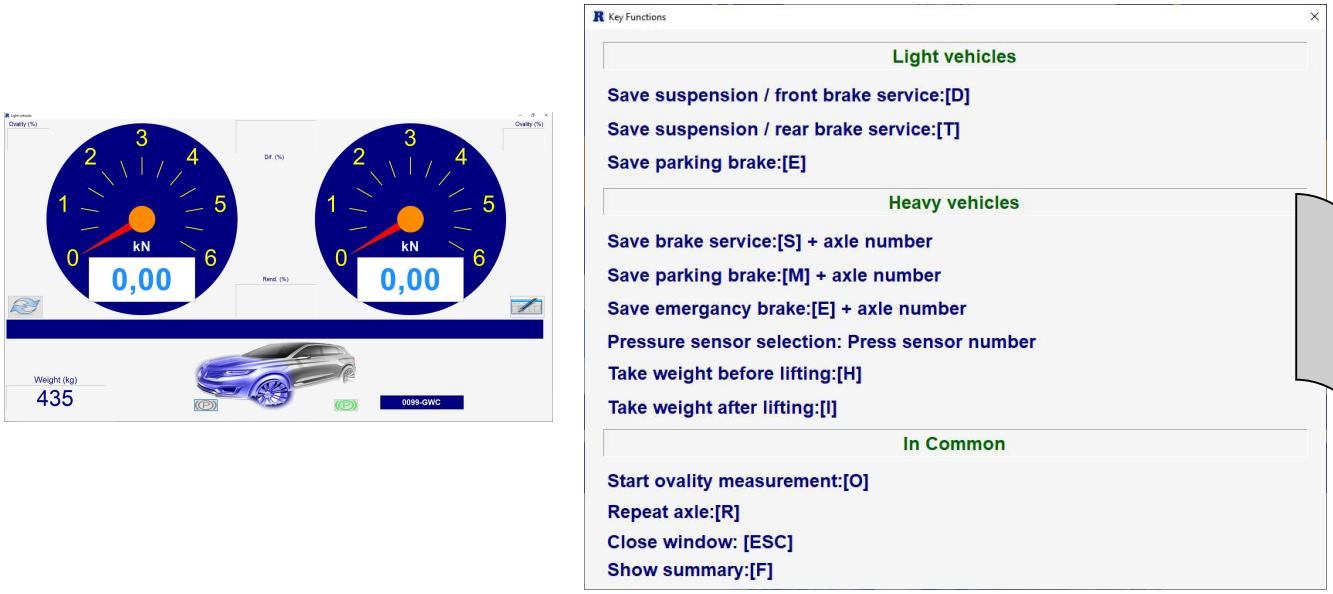
65 Main menu

Another way to access the brake tester program is to introduce the vehicle on the bench, when the sensors detect this in the correct position, the program will show the test display. For this, there should not be any vehicle on the bench as it will have to be introduced afterwards so that the program automatically detects the presence.



66 Vehicle: Not present / Present

From the display of the brake tester, the help menu can be accessed by pressing the 'Ctrl' key on the keyboard.



67 Light vehicles brake tester display

- **Save front service brake**: Once the front axle test has been performed (in manual mode), the corresponding key is pressed on the keyboard or on the remote control to save it (This key is configured in the application RYME_CalConf_PCE.exe).
- **Save rear service Brake**: Once the rear axle test has been performed (in manual mode), the corresponding key is pressed on the keyboard or on the remote control to save it (This key is configured in the application RYME_CalConf_PCE.exe).
- **Save parking brake**: Perform the test, whether you have the braking system to be measured in the front or rear, and once finished, press the corresponding key on the keyboard or remote control (previously configured in the application RYME_CalConf_PCE.exe) to save it.
- **Starting fluctuation measurement**: Once the braking test has been carried out (in manual mode), the corresponding key on the keyboard or on the remote control will be pressed. This way the software will measure the fluctuation of the different wheels on the selected axle. This data can be viewed on the summary screen.
- **Repeat axle test**: During the automatic test, you can find factors that can result in obtaining a wrong measurement. By pressing the 'R' key on the keyboard or the  icon on the screen, you can repeat again the measurement of the desired the axle as many times as necessary. Make sure that you have selected the axle to repeat in the image of the vehicle.

- **Show summary**: At any time during the test, the data obtained can be displayed by pressing the 'F' key or by clicking on the  icon.

- **Exit**. This function allows you to return from the light/heavy brake tester display to the main menu. To perform this action, click on the 'X' in the upper right-hand corner of the display with the mouse, press the 'KG' button on the remote control or the 'Esc' key on the keyboard.

4.4.1 Description of the light vehicles display

On the display of the light vehicles brake tester you can find different boxes showing the test information:

1) Braking indicator, numbered with the braking force values in kN, the range of values is assigned at machine start up by the user in the configuration, it is important to carry out this operation before proceeding with calibration.
2) Saved axle and brake information. In this chart you will be able to see when changing from blue to green colour, the brake and axle corresponding to the saved test. You have the possibility to save the front axle service brake, rear axle service brake and parking brake. Note that the parking brake can be found in the front or rear of the vehicle, so you will have to select this before the test, by clicking with the mouse on the corresponding axle (by default will come in the rear). The sequence of these colours will be: Grey (standby mode) - blue (next axle to be made) - green (axle made).

3) This table shows the value of the force, in kN, you visualize the instantaneous braking of the vehicle.
4) This box shows the numerical value in percentage obtained from the fluctuation measurement of the wheel. This is the fluctuation of the disk on which the test has been performed.
5) Percentage difference in braking between the wheels of the same axle when testing. This is the instantaneous difference between the different wheel forces.
6) Weight in kg of the axle to be tested (Optional on the machine)
7) Efficiency, brake effectiveness expressed as a percentage, corresponding to the front or rear wheels. This value is related to the braking forces of the wheels and the weight supported by the corresponding axle.
8) Registration of the vehicle on which the test is performed.
9) Indicative display for the technician's use: messages will inform the technician of the level of progress of the test and the actions to be performed to proceed with a correct test.

4.5 Light vehicles brake tester: Manual mode

In this mode all the actions of the machine conform to the commands that are given manually by the user.

You can proceed to perform the test manually in two ways:

- Either from the start of the test or,
- At any time after performing the test in automatic mode.

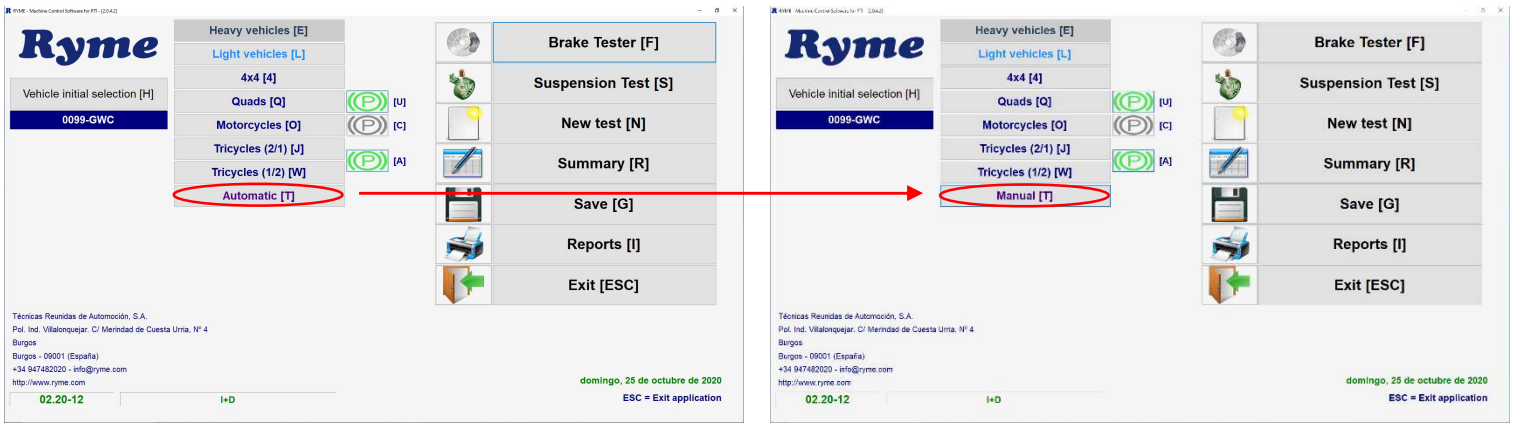
In any case not before selecting this mode in the main menu:

4.5.1 Light vehicles manual mode

To perform a test of a light vehicle, by default you will find the box 'Light vehicles' pre-selected, but you must make sure at the beginning of the test that it is selected.

68 Main menu

To change the test mode, press the corresponding key on the keyboard ('T') or click with the mouse on the icon, changing it from Automatic to Manual mode.



69 Main menu

Once you enter in the display of the brake tester you will find some icons from which you will control the machine at all times:

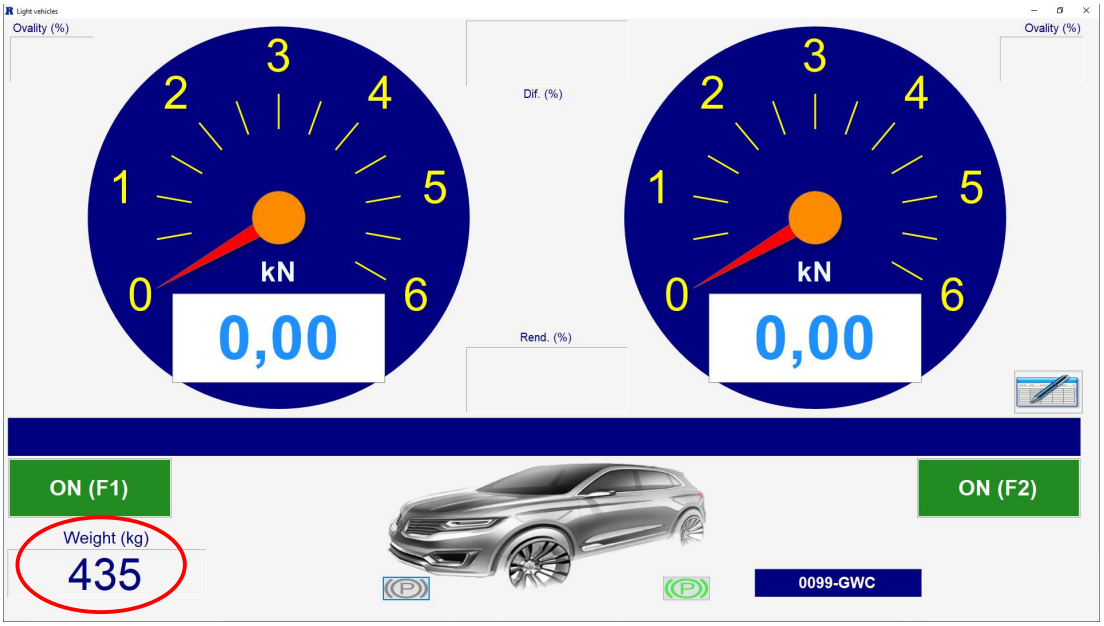
70 Light vehicles brake tester: Manual mode

1. **Start left motor:** You can start the left motor in several ways:
   - By clicking with the mouse on this icon.
   - By pressing the corresponding key 'F1' on the keyboard.
   - By pressing the button on the remote control.
2. **Stop left motor:** You can stop the left motor in several ways:
   - By clicking with the mouse on this icon.
   - By pressing the corresponding key 'F1' on the keyboard.
   - By pressing the button on the remote control.
3. **Start right:** You can start the right motor in several ways:
   - By clicking with the mouse on this icon.
   - By pressing the corresponding key 'F2' on the keyboard.
   - By pressing the button on the remote control.
4. **Stop right motor:** You can stop the right motor in several ways:
   - By clicking with the mouse on this icon.
   - By pressing the corresponding key 'F2' on the keyboard.
   - By pressing the button on the remote control.

4.5.1.1 Functioning

In manual mode all operations must be guided by the technician.

1) Once in this display, introduce a vehicle in the brake tester, moment at which the system will measure the weight of the introduced axle, waiting for a new instruction. (Important: the brake tester must have the scale option)



71 Light vehicles brake tester: Manual mode

In case the line does not have a weighing system, you simply will not obtain the weight measurement of the axle, being able to work normally with the rest of the installed machines.

2) When one of the motors is started, through the keyboard 'F1' – left – or 'F2' – right – or through the remote control, the system will start measuring the effort made by the corresponding wheel brake. This braking force must be saved once each axle is finished.

71 Light vehicles brake tester: Measuring residual braking values

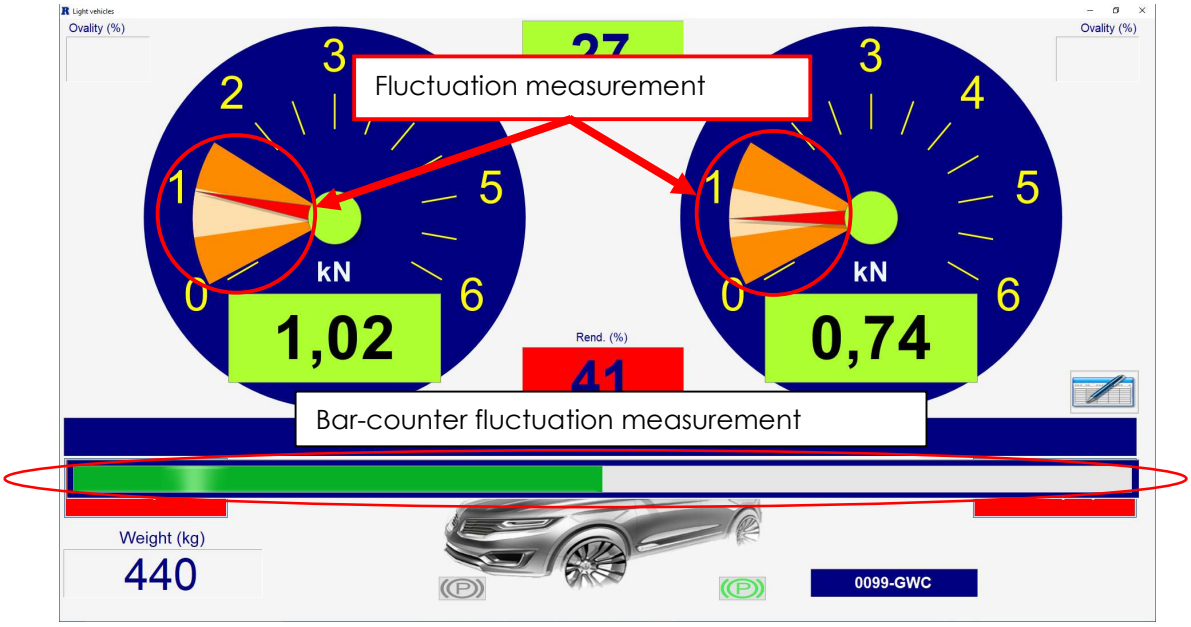
3) When the corresponding motor is running and the braking force starts to vary, the braking will start slowly and progressively to a force equal to the average braking.

72 Light vehicles brake tester: Start of measurement

4) With that pressure on the brake pedal, which will be kept constant, the fluctuation of the brake will be measured. To do this.

   1. Press the 'O' key on the keyboard, clicking on the icon with the mouse or using the remote control (if the fluctuation is set to automatic mode, this step is not necessary).

2. In the braking measurement clock, you will see a shaded orange area in which you must maintain the needle indicating the braking value to correctly measure the fluctuation.
3. A green timing bar will appear at the bottom while you keep the braking in the orange shaded area.
4. Once the green timing bar at the bottom disappears, the program will have finished measuring the fluctuation and will display it in the corresponding window.



73 Light vehicles brake tester: Manual mode - Fluctuation measurement

5. After the wheel fluctuation measurement has been completed, the brake pedal should be pressed slowly and progressively until the corresponding motor stops.

The motor can be stopped in three ways:

- Manually, by pressing keys (F1) or (F2) on the keyboard, clicking on the icon or pressing the key on the remote control, when the braking force is high and the wheel starts to slide.
- Automatically, when the slippage that occurs exceeds that set in the configuration.
- Automatically by decrease of the braking force, if the motors do not come to lock by slippage, when releasing the brake pedal the system will detect it and store the results (the highest braking).

The difference between the braking forces of the left and right wheel will only be evaluated if the measurement is made simultaneously on both wheels or if one of the wheels on the same axle has already been measured.

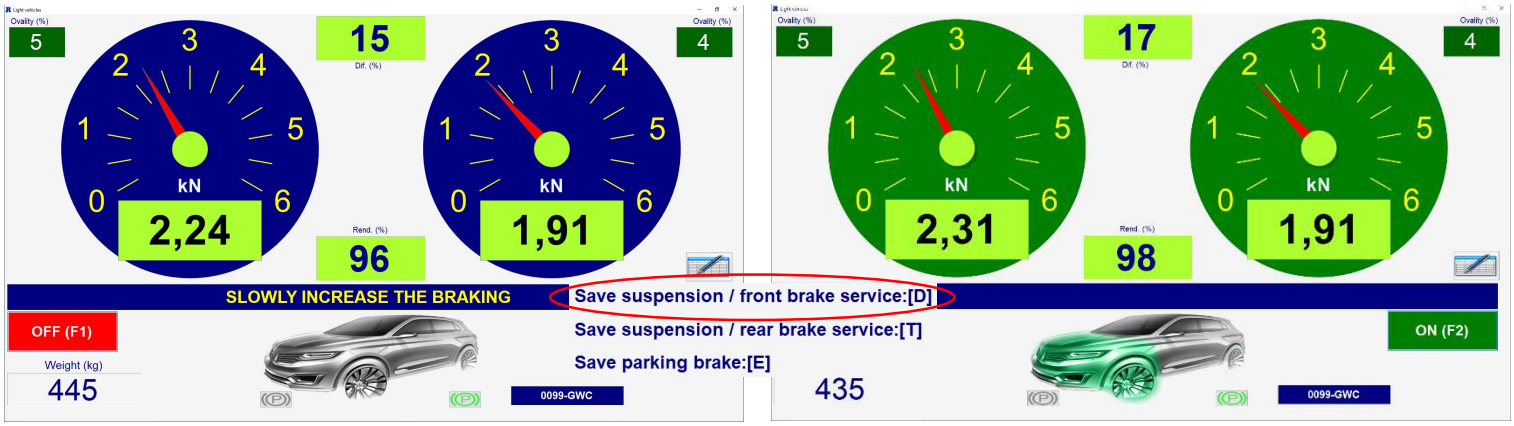
The efficiencies are calculated in real time and refer to the efficiency of each wheel (to be able to see this value on the display, you will need to have obtained the weight of the axle).

4.5.2 Saving the test manually

Once the desired measurement has been made (independent wheel or complete axle), the different brakes of the vehicle will be saved - FRONT AXLE SERVICE BRAKE, REAR AXLE SERVICE BRAKE or PARKING BRAKE.

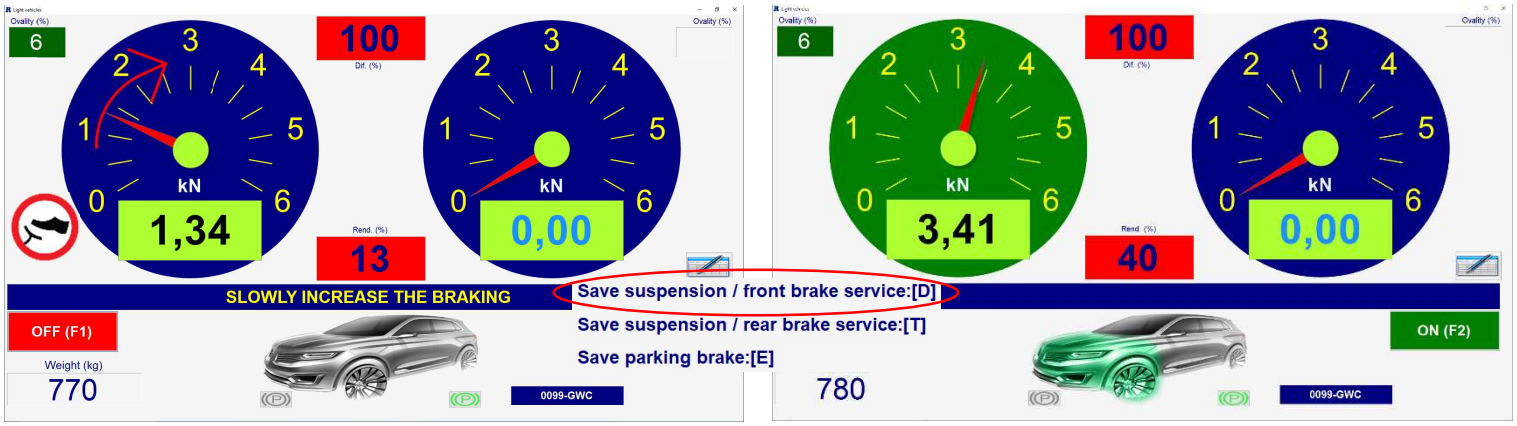
This operation will be performed either by pressing the corresponding key (Example front axle key: 'D') on the keyboard or by pressing the corresponding button on the remote control. After the measurement of each axle, it will be necessary to save its results in order to ensure that the saving of the test is carried out correctly.

- Case 1: two-wheel start, saving front axle results



74 Light vehicles brake tester: Manual mode – Saving the data

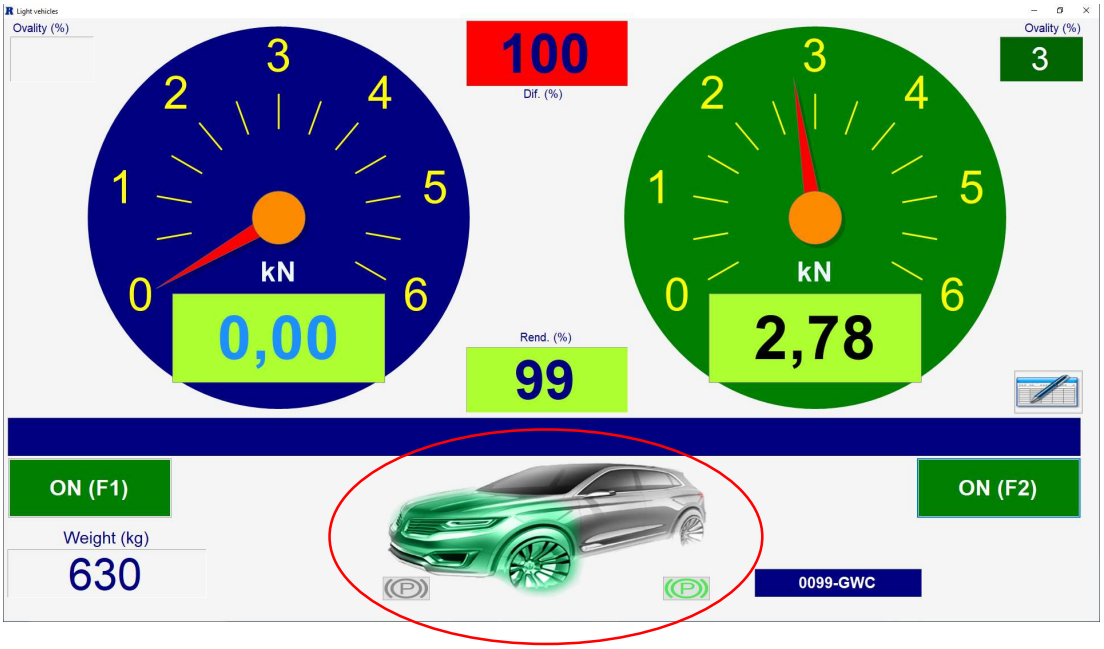
- Case 2: individual left wheel start, saving front axle results (the application will store the data individually when pressing 'Save', in case of a single wheel):



75 Light vehicles brake tester: Manual mode – Saving the data

4.5.3 Example

Measurement of the right wheel: carry out the brake test on the front axle and press Save service brake (D), which will be displayed in green when pressed.



76 Light vehicles brake tester: Manual mode - Manual saving

This way you will be able to visualize the axles on which you have made the different braking measurements and the type of brake.

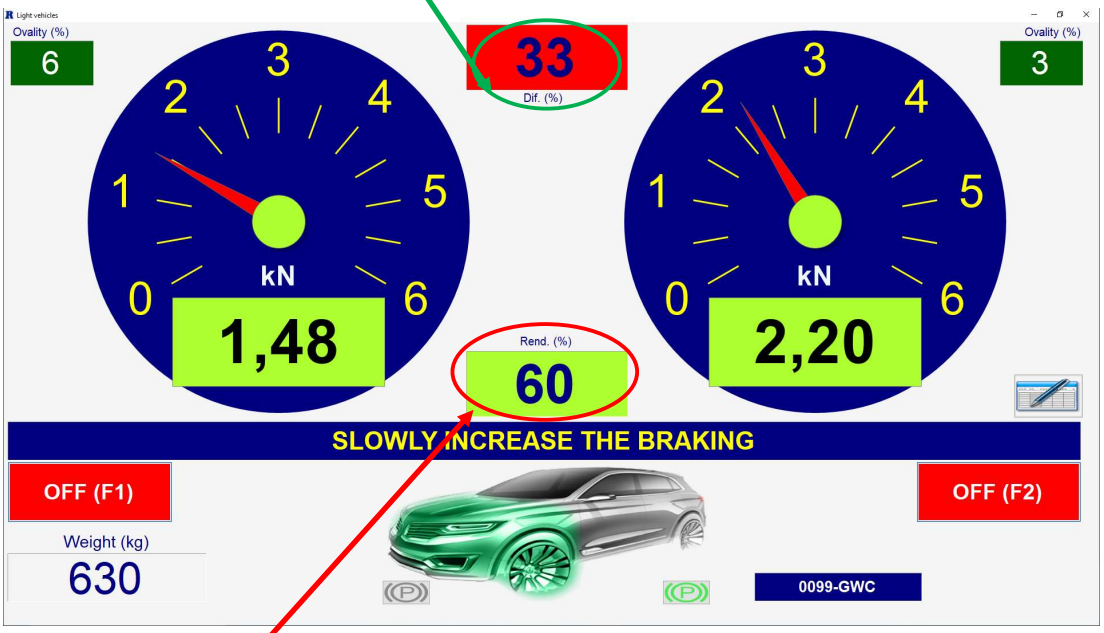
77 Axle / Brake Type Information Box

Note: If this operation is not performed, the measured values will not be shown in the 'Summary', nor in the 'Report' of the last vehicle tested. This operation does not automatically save the test in any database, for this there is a specific operation.

4.5.4 Possible test behaviours

In the performance of a test, you can observe different cases in which the configured values, which have you will have to introduce at the beginning, are not exceeded, as can be:

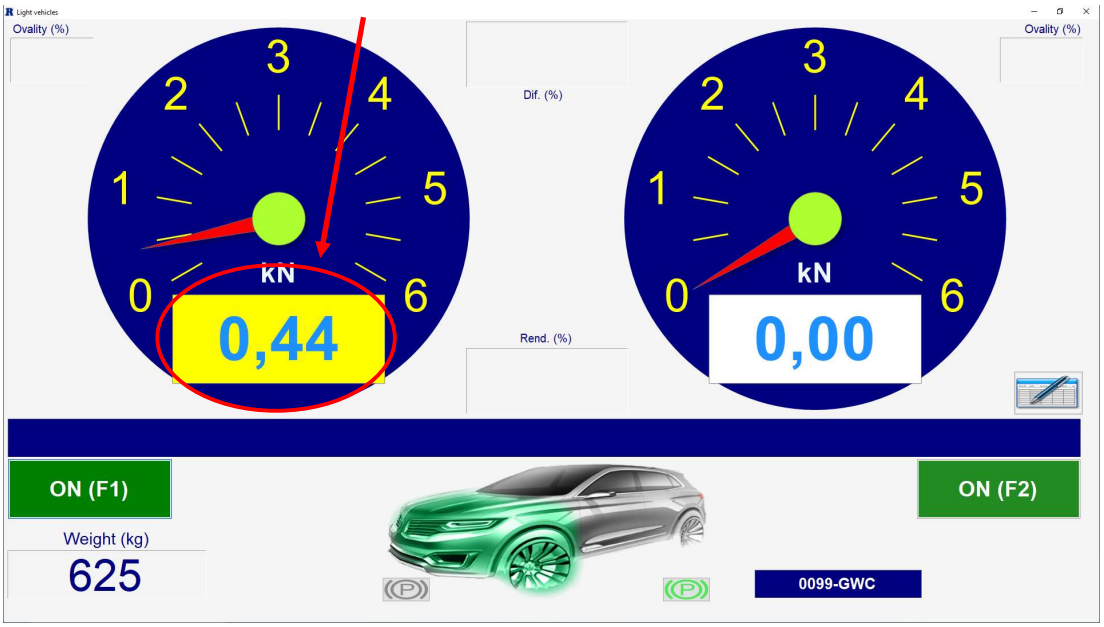
1) **High percentage difference**: The difference between the left and right braking values is higher than the configured value and the 'Difference %' box will be marked in red because you have exceeded the parameters previously configured.



78 Light vehicles brake tester: Manual mode concepts

2) If the box 'Efficiency (%)' is in green, the value will be considered correct, as it is within the parameters.

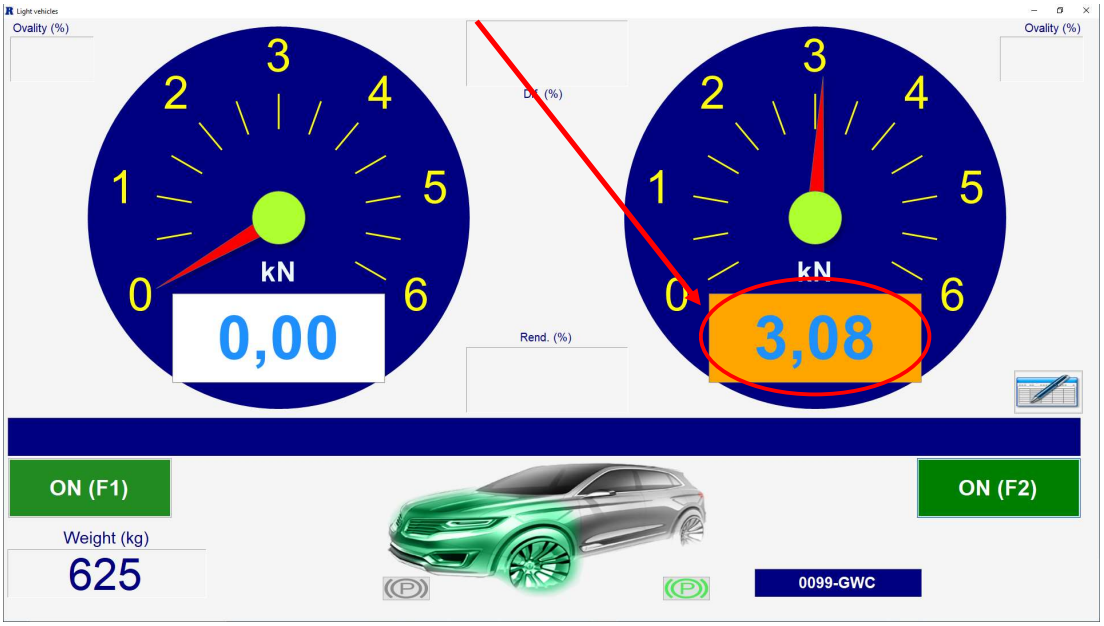
3) Indicator of locking by slippage. In case the left pilot (in practice it can be either side) of the measurement clock is shown in yellow, it will mean that when trying to take the residual braking values, the slippage bar is practically blocked or its speed is lower than the motor speed (by a configured %), so the motor will try to start but will stop because the slippage bar does not roll, or rolls at a speed below the nominal one. Even if the braking force is not large, the motors will stop when the slippage is greater than the set %.



79 Light vehicles brake tester: Manual mode - Slippage

4) Braked or locked wheel indicator. In case the pilot light on the right side of the orange measurement clock appears (in practice it can be either side), it means that the machine has detected a force (kN) on one of the sides as soon as the motor is started, higher than the one set.

Observe that the wheel of the highlighted side is blocked, and the system will automatically stop both motors for the security of the vehicle and of the people who could be in the area of the test.



80 Light vehicles brake tester: Manual mode - Locking

4.5.5 Notes

- If a wheel is not able to reach the locking value, the braking value will be memorized indicating whether it is front, rear or parking brake.

- The fluctuation will only be measured on that wheel that is in operation.

- If, when the motor is started, the wheel is locked due to an abnormal brake system situation, the roller set will start and stop immediately.

- It is important to select which axle is located in the parking brake of the vehicle. Click on the corresponding icon, changing colour from grey to green the axle where it is located. By default it will be located on the rear axle.

81 Parking brake rear axle / Parking brake front axle

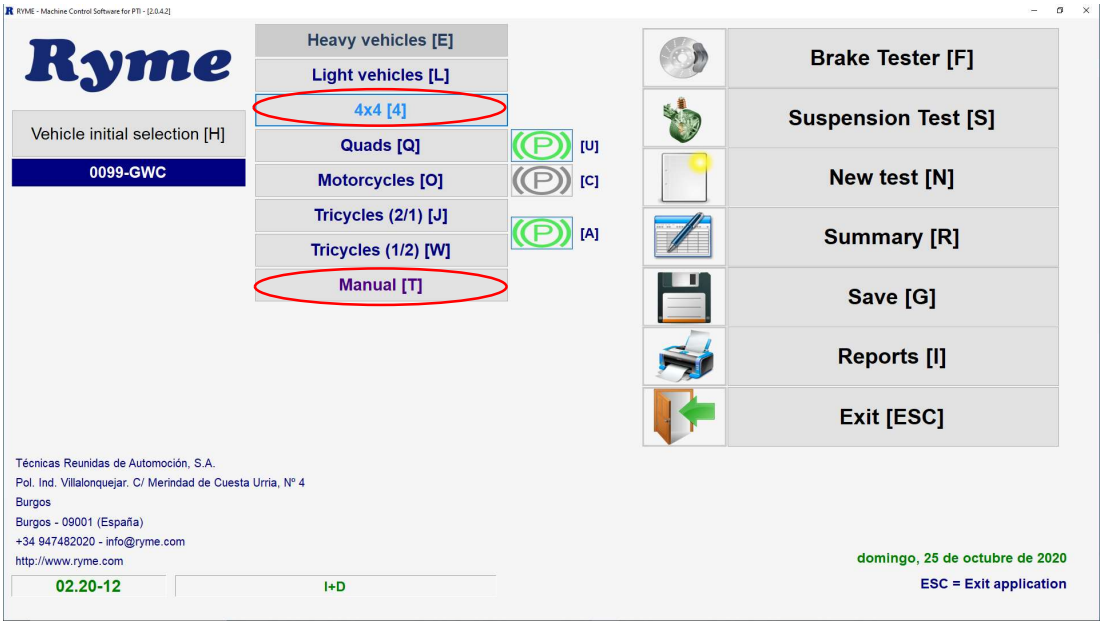
- In the case that the vehicle to be tested has an electric parking brake, the test will not be considered completely correct due to the very abrupt way of braking this braking system, which could lead to an erroneous measurement. For which the efficiency of immediate braking will be measured taking into consideration the regulations of each country.

4.5.6 4x4 light vehicles manual mode

Before initiating the test, you must:

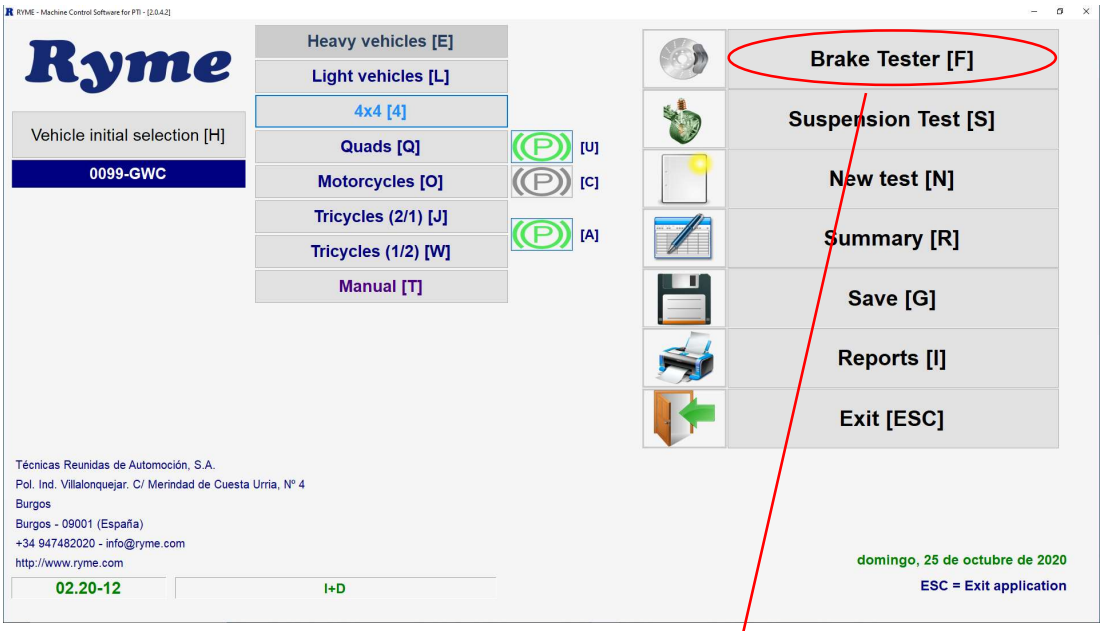
- Know that this test mode is only suitable for vehicles in which the measurement of the different parameters will be carried out wheel by wheel; due to the differential axle that this type of vehicle has as an outstanding characteristic.
- Make sure that the technician has reviewed the vehicle's technical data sheet to verify that the vehicle to be tested meets the necessary requirements.
- Keep in mind that the company Ryme is not responsible for improper use of the equipment.

Next, open the application RYME_PCE.exe and ensure that you have configured 4x4 mode and selected the Manual mode.

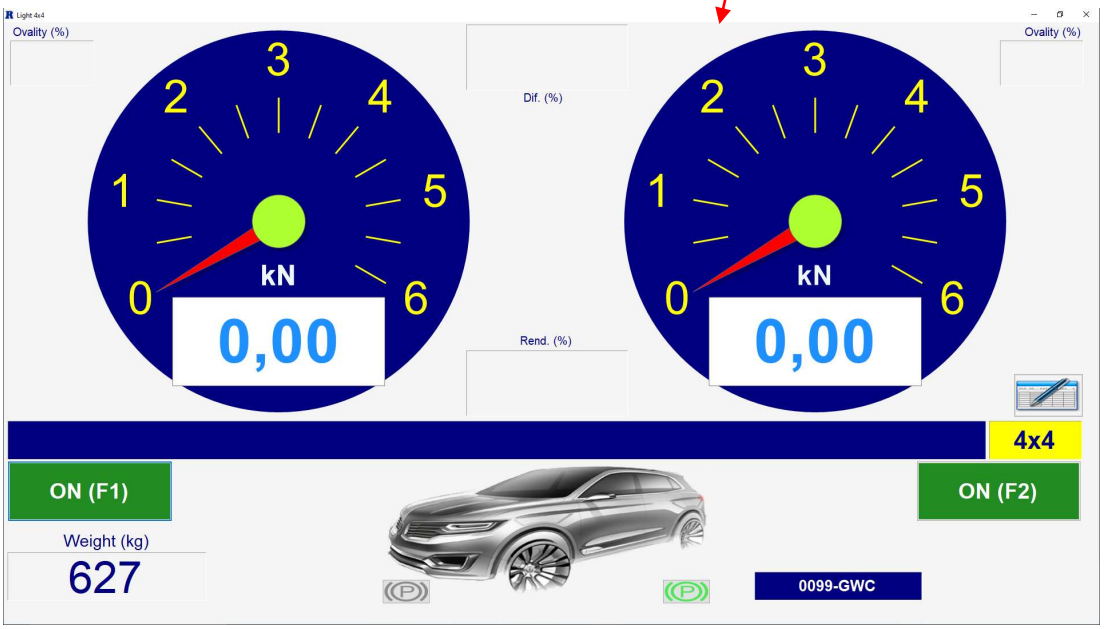


82 Main menu

From the main menu of the program, having configured the manual mode, access this mode by clicking with the mouse on the icon or by pressing the corresponding key on the keyboard or remote control, on the legend 'Brake Tester', located on the upper right side of the display.



83 Main menu



84 4x4 light vehicles brake tester: Manual mode

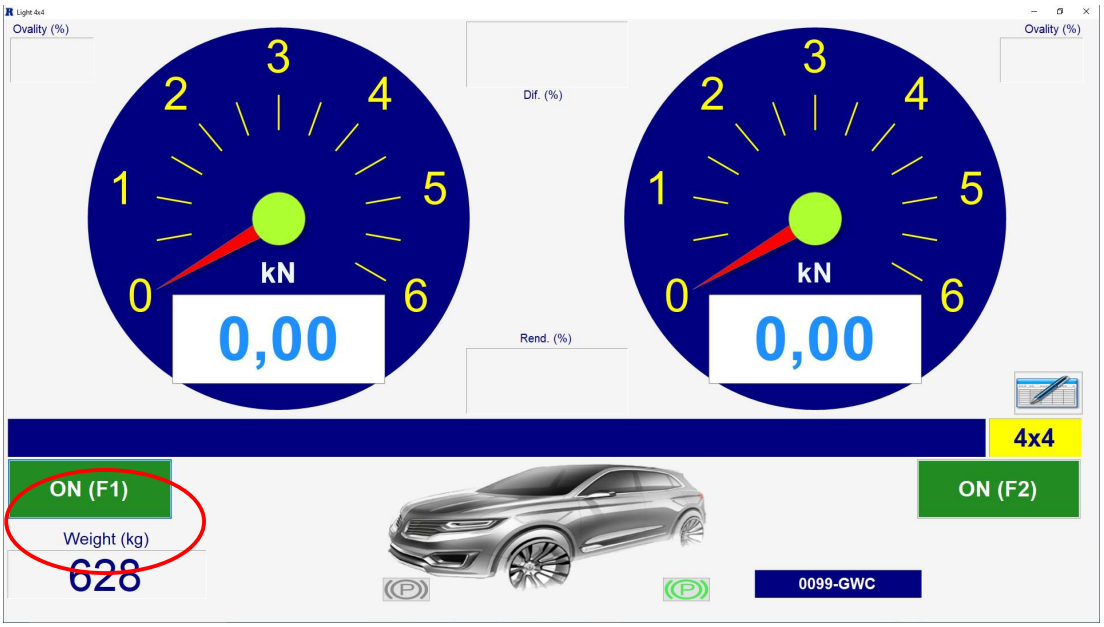
When you enter the display of the brake tester you will find some icons from which you will control the machine at all times:

85 4x4 light vehicles brake tester: Manual mode

1. **Start left motor normal / right motor reverse**: Click with the mouse on this icon or press the 'F1' key on the keyboard or the button on the remote control, to start the right motor in the opposite direction to the test one and the left motor in the normal running direction.
2. **Stop left motor reverse/ right motor normal**: Click on this icon with the mouse or press the 'F1' key on the keyboard or the button on the remote control, to stop the motors.
3. **Start right motor normal / left motor reverse**: Click with the mouse on this icon or press the 'F2' key on the keyboard or the button on the remote control, to start the left motor in the opposite direction to the test and the right motor in the normal direction of spinning (in forward direction).
4. **Stop right motor reverse/ left motor normal**: Click with the mouse on this icon or press the 'F2' key on the keyboard or remote control, to stop the motors

4.5.6.1 Functioning

In the manual 4x4 mode all operations must be guided by the technician. Once on this display, a vehicle must be introduced to the brake bench, at which time the system will measure the weight of the axle introduced (if the brake tester has the scale option), waiting for a new instruction.



86 4x4 light vehicles brake tester: Manual mode - Functioning

In case the line does not have a weighing system, you simply will not obtain the weight measurement of the axle, being able to work normally with the rest of the installed machines.

The operation is totally analogous to the one seen before in the manual mode of light (see point 4.4.2 Operation:), with the following exceptions:

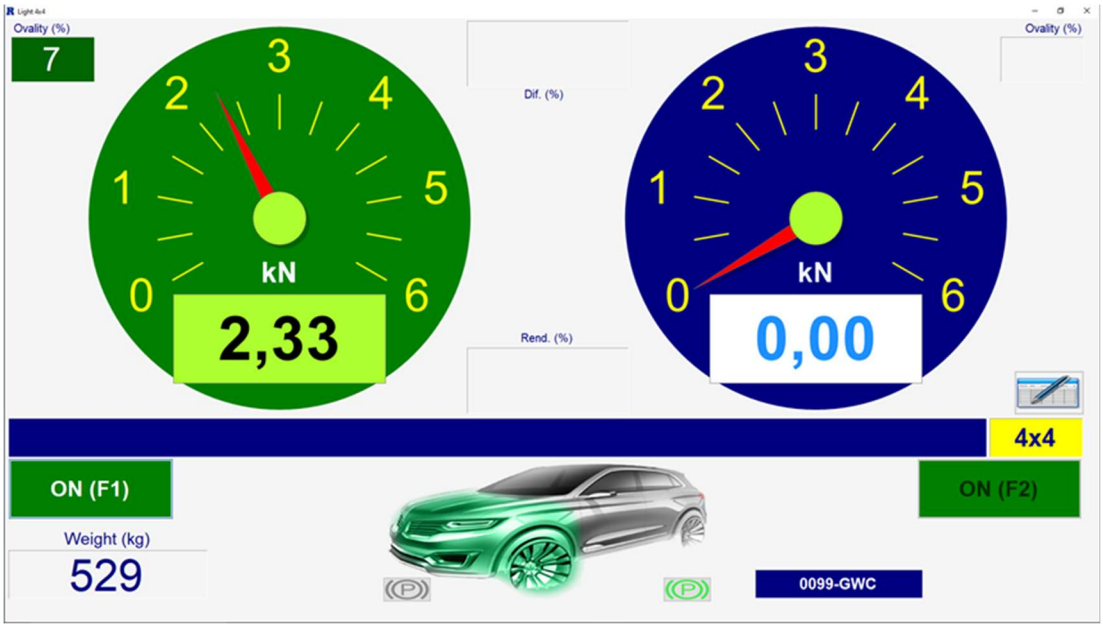
1. When starting the rollers on one side, the rollers on the opposite side will be started simultaneously, turning in the opposite direction. Braking force measurement is carried out on the side that is rotating in the direction of the vehicle.

87 4x4 light vehicles brake tester: Manual mode – Residual braking measurement

2. The measurement will be made first on one wheel and then the measurement on the opposite wheel of the considered axle. A simultaneous measurement cannot be made on both wheels of the same axle.

88 4x4 light vehicles brake tester: Manual mode – Start of measurement

3. When the test has been carried out on the braking system of one wheel, by measuring the opposite wheel, the results of the first one are not eliminated from the display, so that the comparison can be made.



4. Once the test has been carried out on both wheels, the data obtained can be stored, saving them on the corresponding axle. To do this, press the corresponding key on the keyboard or remote control.
5. The motors will stop automatically if:
   - The force of the braking system of the wheels of the vehicle axle, at the moment of starting, is higher than the configuration.
   - If the slippage is greater than the configuration
   - If the differential slippage is greater than the configurated slippage.
   - If you do not block the rollers for any of the above reasons, you must release the brake pedal of the vehicle for the motors to stop.
6. The display of the brake tester in 4x4 is almost identical to the normal mode, it differs from it in that the 4x4 display has a window with the legend '4x4' in yellow.

4.5.7 Saving the test manually

Refer to 4.4.3. Saving the test manually

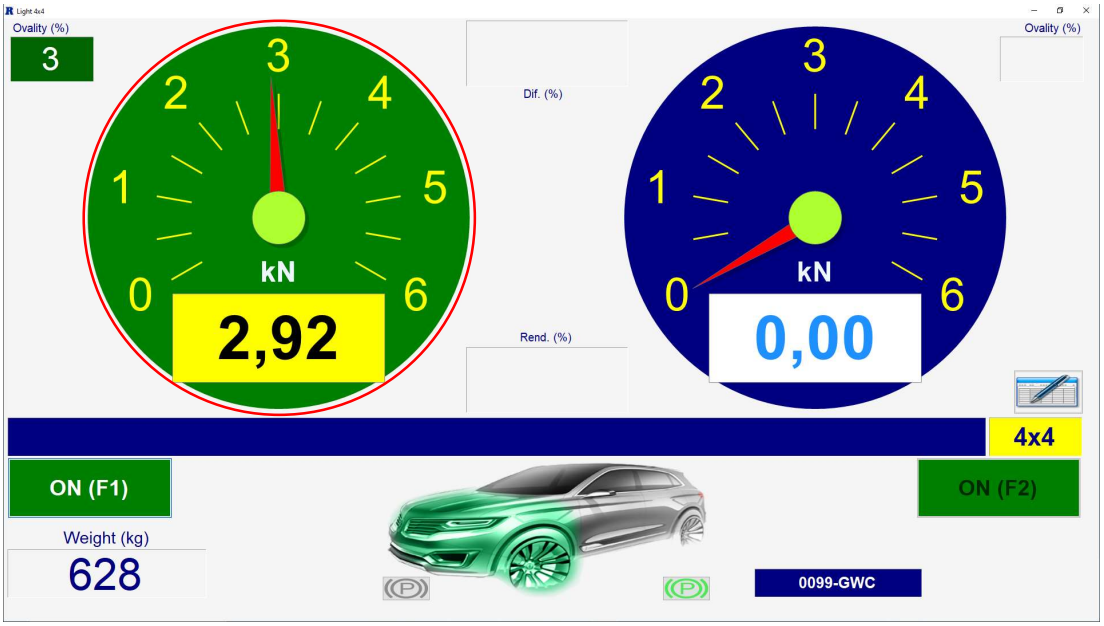
4.5.8 Possible behaviours of the test

Refer to 4.4.4. Possible behaviours of the test

4.5.9 Example

Measurement of the left front wheel / right front reverse: perform the brake test on the front axle having started the motors, press Save service brake (D), and you will see

the corresponding clock change to green as you save, storing the data of the wheel measured.



89 4x4 light vehicles brake tester: Manual mode - Test example

This way you can visualize the axles on which you have made the different braking measurements and the type of brake.

72 Axle / Brake Type Information Box

If this operation is not performed, the measured values will not be shown in the 'Summary' of the last vehicle, nor in the 'Report' of the last vehicle tested. This operation does not automatically save the test in any database, for that there is a specific operation.

4.5.10 Notes

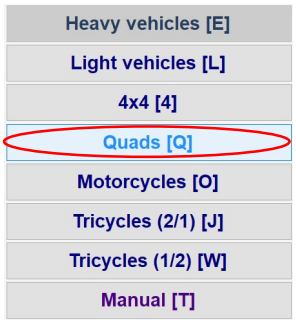
- The fluctuation will only be measured on that wheel that is in operation.
- If, when the motor is started, the wheel is locked due to an abnormal brake system situation, the roller set will start and stop immediately.
- It is important to select which axle is located in the parking brake of the vehicle, for this, click on the corresponding icon, changing colour from grey to green the axle where it is located. By default it will be located on the rear axle.

91 Parking brake rear axle / Parking brake front axle

- The motors can be stopped automatically when the slippage exceeds the one set in the configuration.
- The difference between the braking forces of the left and right wheel will only be measured and displayed in the 'Summary'.
- The efficiencies are not calculated in real time, to be able to see these you must open the 'Summary' display.

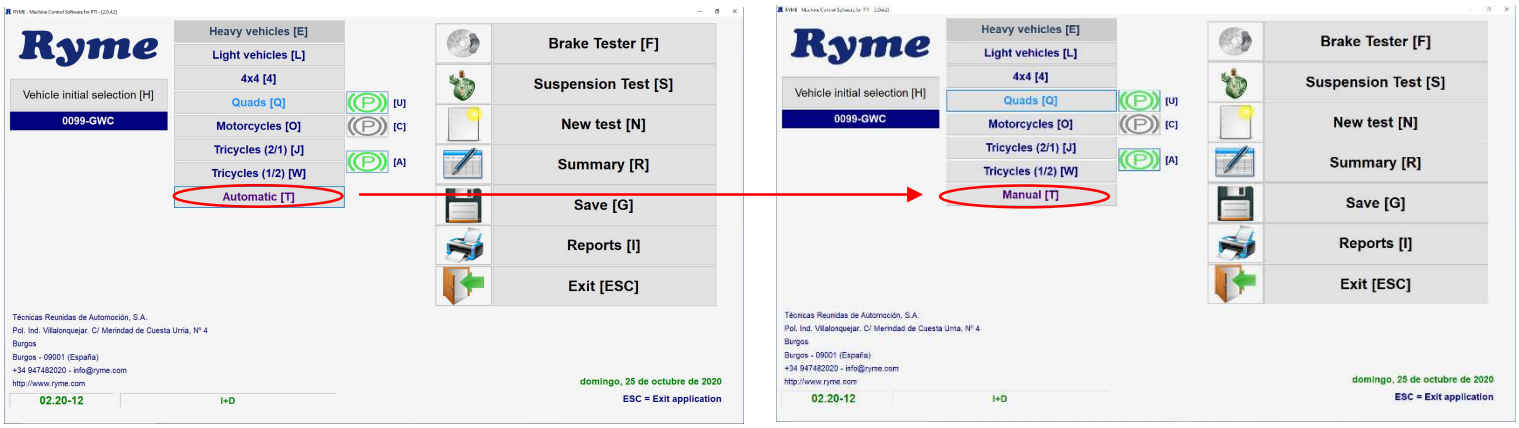
4.5.11 Quad manual mode

.To perform a test of a quad vehicle, select the corresponding box on the menu.



92 Main menu

To change the test mode, press the corresponding key on the keyboard or click with the mouse on the icon, changing it from Automatic to Manual mode.



93 Main menu

When you enter the display of the brake tester you will find some icons from which you will control the machine at all times:

94 Quads brake tester: Manual mode

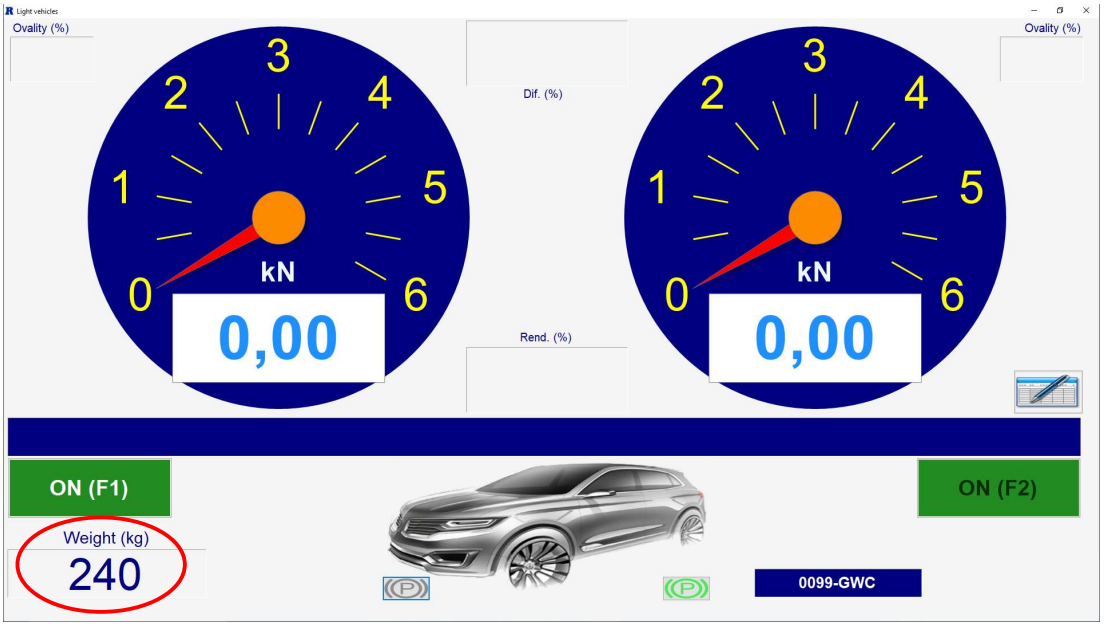
1. **Start left + right motor**: By clicking with the mouse on this icon or pressing the corresponding key on the keyboard or remote control (previously configured in the application RYME_CalConf_PCE.exe), you will start the left motor and the right motor simultaneously in order to avoid any damage to the vehicle.
2. **Stop left + right motor**: By clicking on this icon with the mouse or by pressing the corresponding key on the keyboard or remote control (previously configured in the RYME_CalConf_PCE.exe application), the left motor and the right motor will stop simultaneously.

Note: the icon for starting the motors on the right side will be disabled as it is not necessary.

4.5.11.1 Functioning

In manual mode all operations must be guided by the technician.

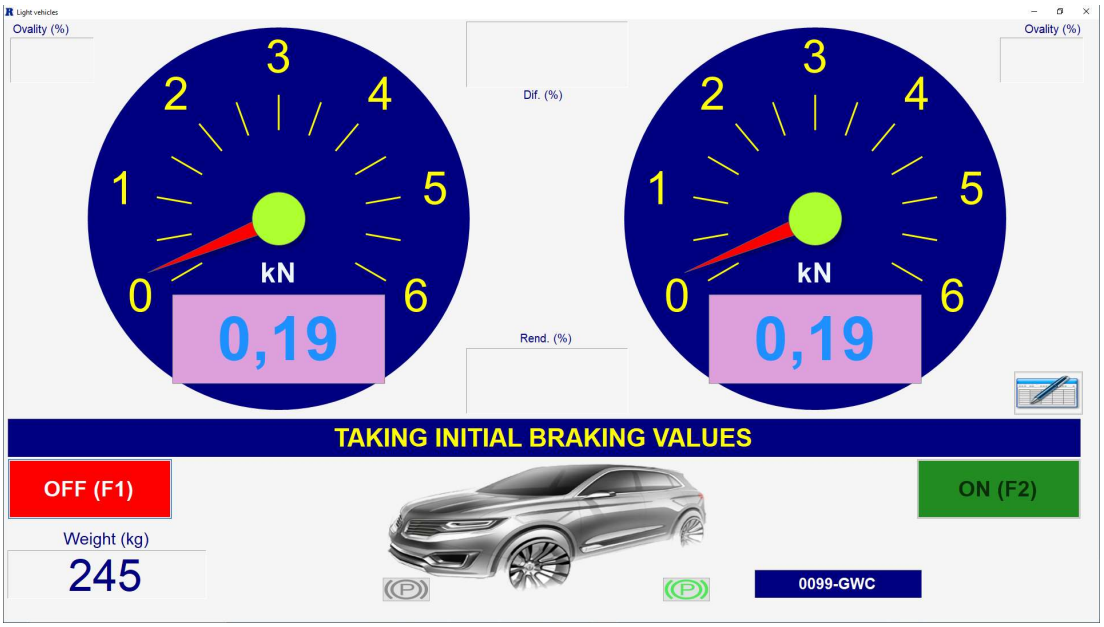
1) Once in this display, introduce a vehicle in the brake tester, moment in which the system will carry out the measurement of the weight of the introduced axle, (if the brake tester has the scale option) waiting for a new instruction.



95 Quads brake tester: manual mode

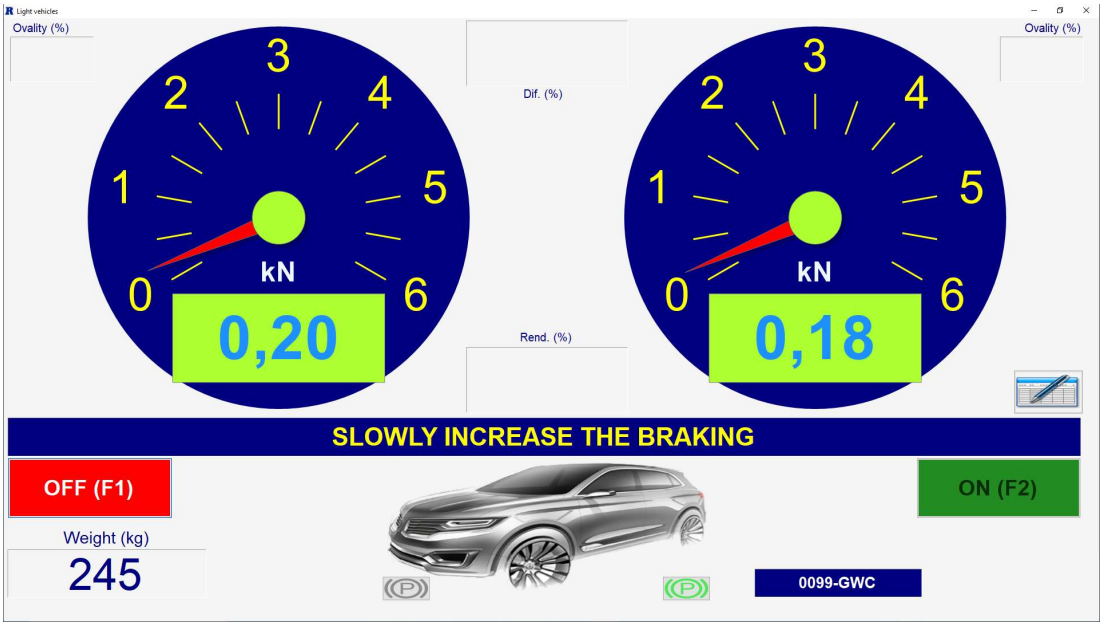
In the case that the line does not have a weighing system, you simply will not obtain the weight measurement of the axle, being able to work normally with the rest of the installed machines.

2) When the motors are started, via the keyboard 'F1' - 'Left Motor + Right Motor' or via the remote control, the system will start measuring the efforts made by the wheel brakes. These braking forces will have to be saved once each axle is finished.



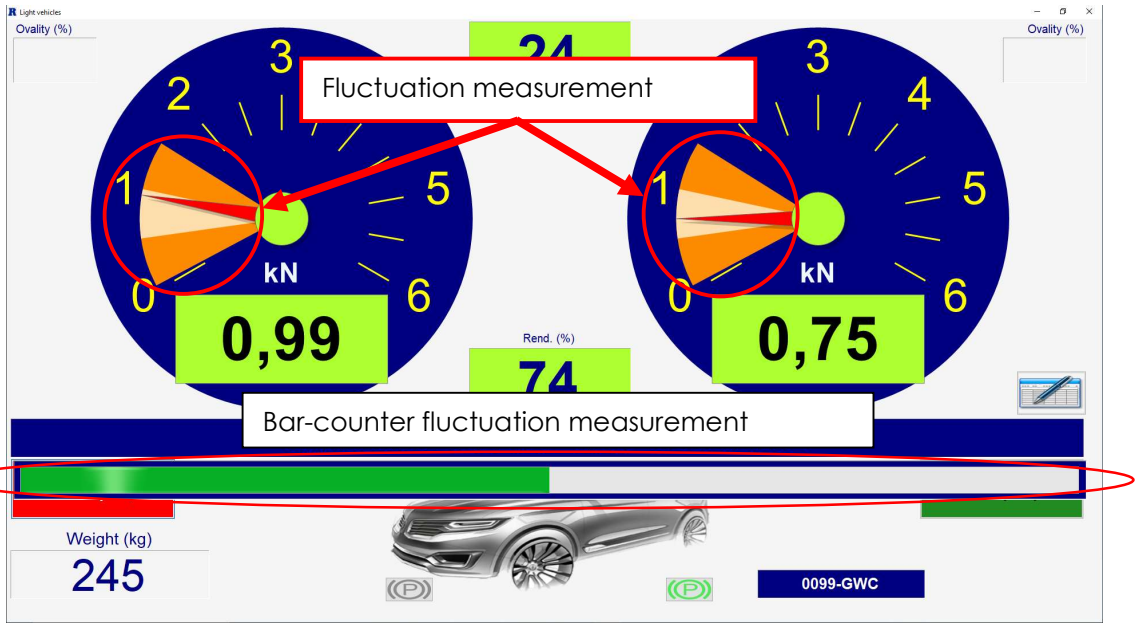
96 Quads brake tester: Manual mode - Initial braking values

3) When the motors are running and the braking forces start to vary, the braking will start slowly and progressively to descend to a force equal to the average braking.



97 Quads brake tester: Manual mode - Slowly increase the braking

4) With that pressure on the brake pedal, which will be kept constant, the brake fluctuation will be performed. To do this:
   1. Press the 'O' key on the keyboard, clicking on the icon with the mouse or using the remote control (if the fluctuation is set to automatic mode, this step is not necessary).
   2. In the braking measurement clock, you will see a shaded orange area in which you must maintain the needle indicating the braking value to correctly measure the fluctuation.
   3. A green timing bar will appear at the bottom while you keep the braking in the orange shaded area.
   4. Once the green timing bar at the bottom disappears, the program will have finished measuring the fluctuation and will display it in the corresponding window.



98 Quads brake tester: Manual mode - Fluctuation measurement

5. After the wheel fluctuation measurement has been completed, the brake pedal should be pressed slowly and progressively until the motors stop.

Motors can be stopped in three ways:

- Manually, by pressing the key (F1) on the keyboard, clicking on the icon or pressing the key on the remote control, when the braking force is high and the wheel starts to slide.

- Automatically, when the slippage that occurs exceeds that set in the configuration.
- Automatically by decrease of the braking force, if the motors do not come to lock by slippage, when releasing the brake pedal the system will detect it and store the results.

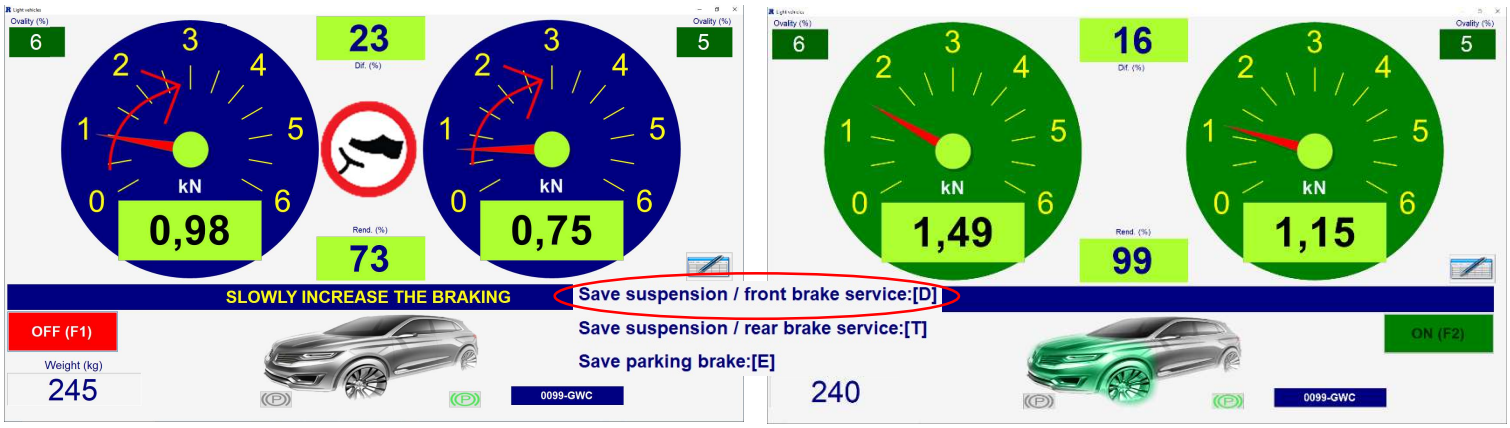
The efficiencies are calculated in real time and refer to the efficiency of each wheel (to be able to see this value on the display, you will need to have obtained the weight of the axle).

4.5.12 Saving the test manually

Once the desired measurement has been taken, the different brakes of the vehicle - FRONT AXLE SERVICE BRAKE, REAR AXLE SERVICE BRAKE or PARKING BRAKE - will be saved.

This operation will be performed either by pressing the corresponding key (Example front axle key: 'D') on the keyboard or by pressing the corresponding button on the remote control. After the measurement of each axle, it will be necessary to save its results in order to ensure that the saving of the test is carried out correctly.

- Example: saving front axle results:



99 Quads brake tester: Manual mode – Saving the data

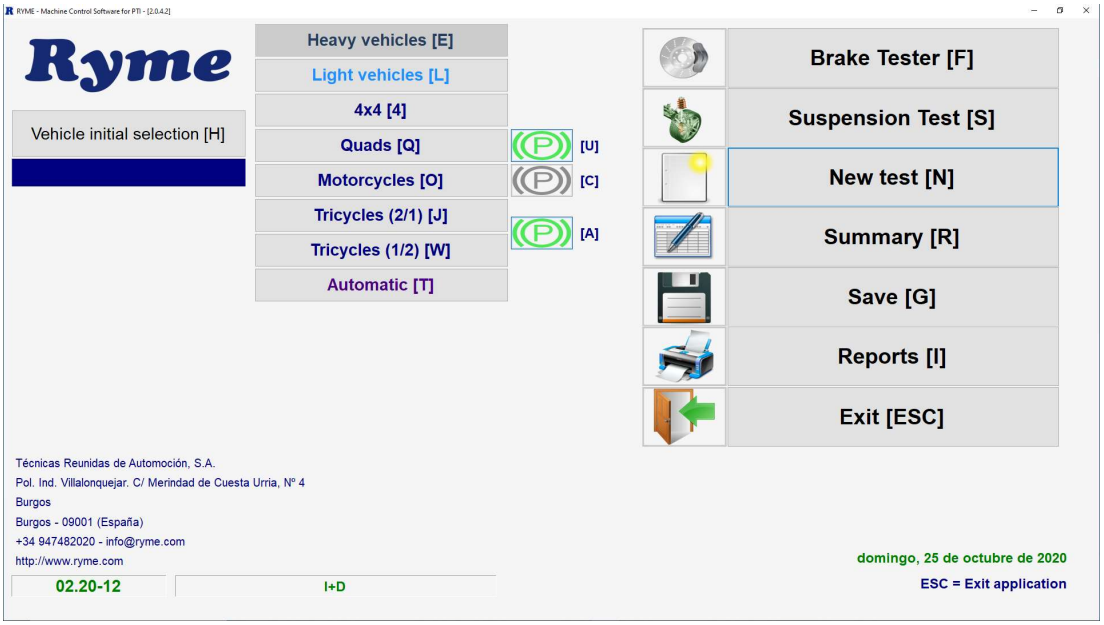
4.5.13 Possible behaviours of the test

Refer to 4.4.4. Possible behaviours of the test

4.6 Light vehicles brake tester: Automatic mode

4.6.1 Light vehicles automatic mode

To perform a test on a light vehicle in automatic mode, open the application RYME_PCE.exe,



100 Main menu

Once opened you must make sure that you have configured automatic mode for light vehicles (by default this is always pre-selected). Check that the corresponding boxes are selected:

101 Main menu

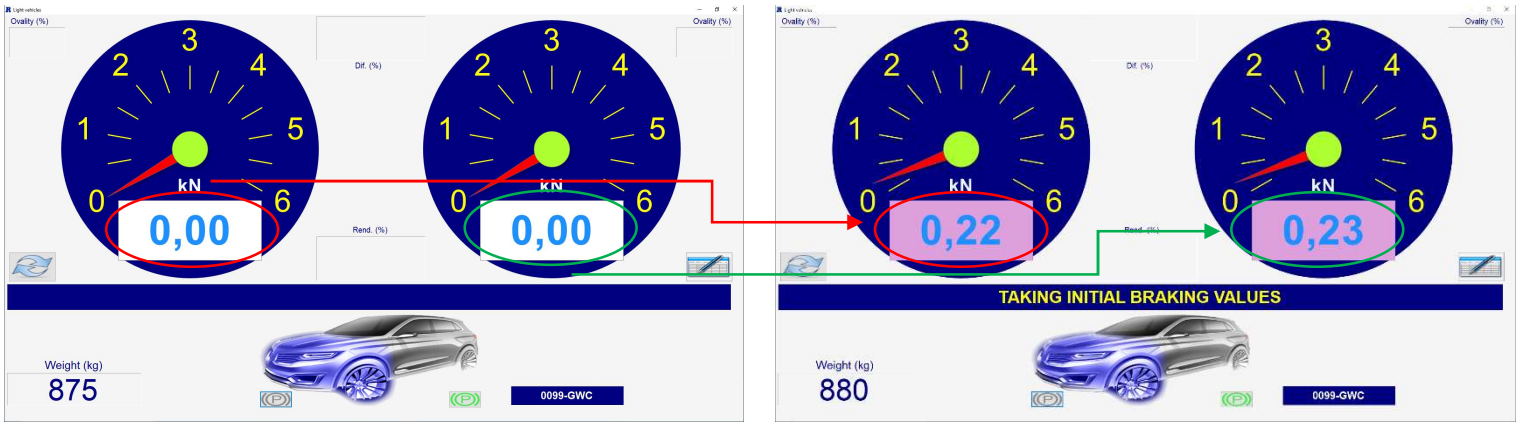
4.6.1.1 Functioning

In this mode it is the system that guides the technician during the execution of the test and automatically saves the results.

102 Light vehicles brake tester: Automatic mode

1) When a vehicle is introduced into the test bench, the system will start the rollers on both sides, with a configurable delay, carrying out the simultaneous measurement of the braking forces of both wheels.

2) The first measurement will be the residual braking on the axle to be tested, in this step the measurement boxes located at the bottom of the clocks will change from white to light grey for a configurable time until the residual value is taken.

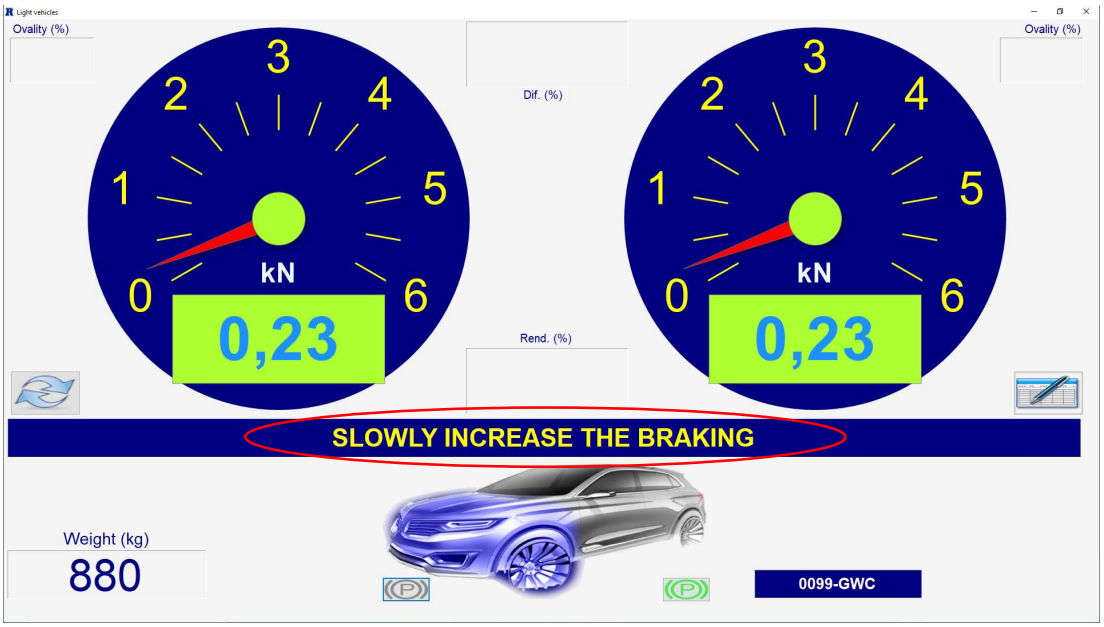


103 Light vehicles brake tester: Start of measurement

3) This value will be stored and will be visible at the end of the test in the 'Summary' screen.

Then, proceed as follows:

4) Once the motors are running, the residual measurement has been taken and the braking forces start to vary, the boxes at the bottom of the clocks will change from light grey to green.
Braking (pressing the pedal of the vehicle's braking system) will begin slowly and progressively until a force equal to the average maximum braking force is reached.



104 Light vehicles brake tester: Start of measurement

5) Increase the pressure of the brake system pedal until the fluctuation measurement point is reached.

At this point, try to keep the needle inside the gauge graph measuring fluctuation, keeping the braking constant within the measuring range of the needle.

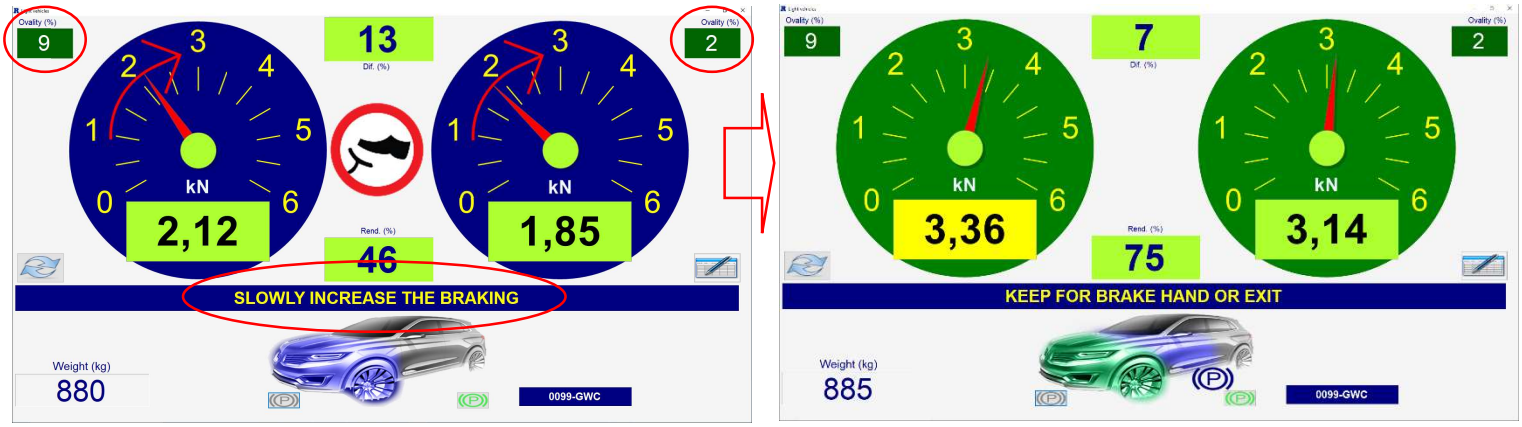
Important: This measurement will be performed as long as the fluctuation measurement option is active in the configuration.

The fluctuation measurement is done automatically and will be stored automatically.

105 Light vehicles brake test: Fluctuation measurement

6) After taking the fluctuation measurement on both wheels, the brakes will continue to be pressed slowly and progressively until one of these cases occurs:

- The motors are stopped by slippage.
- The vehicle slightly protrudes out of the brake tester and the sensors do not detect its presence
- The vehicle does not block the rollers, in which case you will have to release the brake pedal for the system to detect that you have tested the axle by braking decrease.



106 Light vehicles brake tester: Measurement

For this type of test it is important to take into account certain details:

- The efficiency and other values are calculated in real time and refer to the efficiency and results of each axle.
- Once the motors have stopped, the results are automatically stored on the tested axle. This operation does not save the test in any database, there is a specific operation for this purpose
- To facilitate the exit of the measured axle, configure the brake tester in such a way that it activates both rollers without taking any measurements, if the brake option is not available.
- It is important to select which axle is located in the parking brake of the vehicle, for this, click on the corresponding icon, changing colour from grey to green the axle where it is located. By default it will be located on the rear axle.

107 Parking brake rear axle / Parking brake front axle

- In case the vehicle to be tested has the electric parking brake, the test will not be considered completely correct due to the very abrupt way of braking this electric system, which could lead to an erroneous

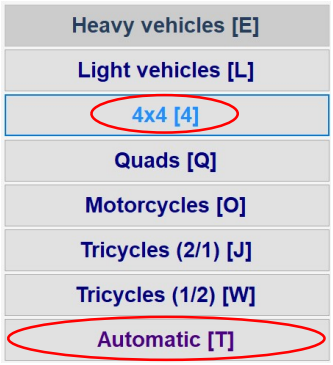
measurement. For which the efficiency of immediate braking will be measured taking into consideration the regulations of each country.

4.6.1.2 *Possible behaviour of the test*

Refer to 4.4.4. Possible behaviour of the test

4.6.2 4x4 automatic mode

To perform a test of a 4x4 vehicle in automatic mode, open the application RYME_PCE.exe. Once opened you must make sure that you have configured automatic mode for 4x4 vehicles, for this you must have selected the boxes:



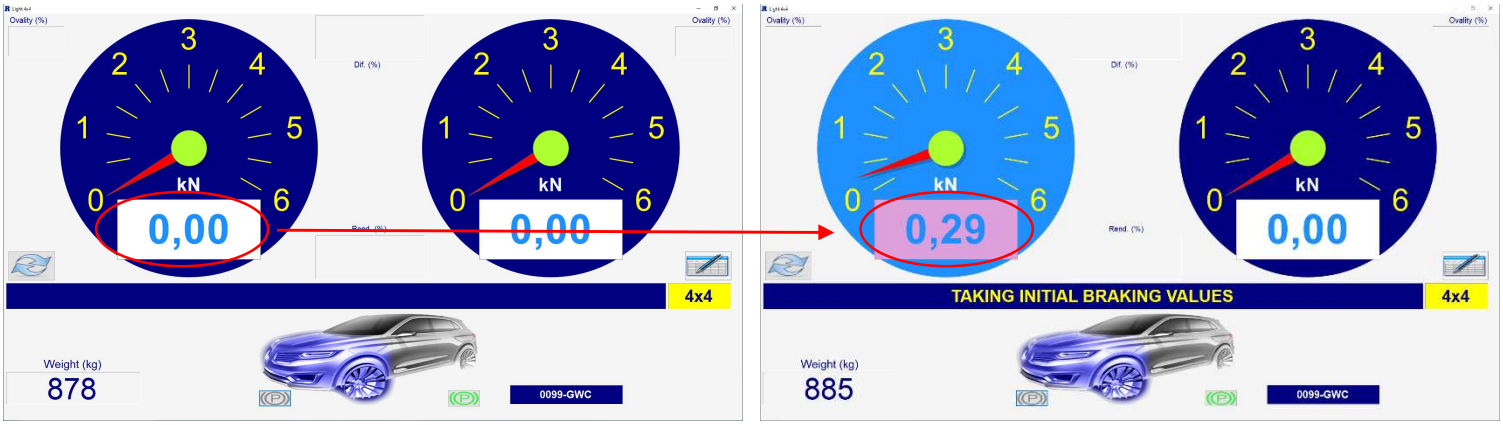
108 Main menu

4.6.2.1 *Functioning*

In this mode it is the system that guides the technician during the execution of the test and automatically saves the results.

109 4x4 light vehicles brake tester: Automatic mode

1) When the vehicle is placed on the test bench, the system will start the rollers on both sides in the opposite direction of each other, making the individual measurement of the braking forces of each wheel.
2) The first measurement performed by the application will be the residual braking on the wheel to be tested, in this step the measurement box at the bottom of the clock will change from white to light grey for a configurable time until the residual value is taken (this step will be repeated 2 times per axle, 1 time per wheel).

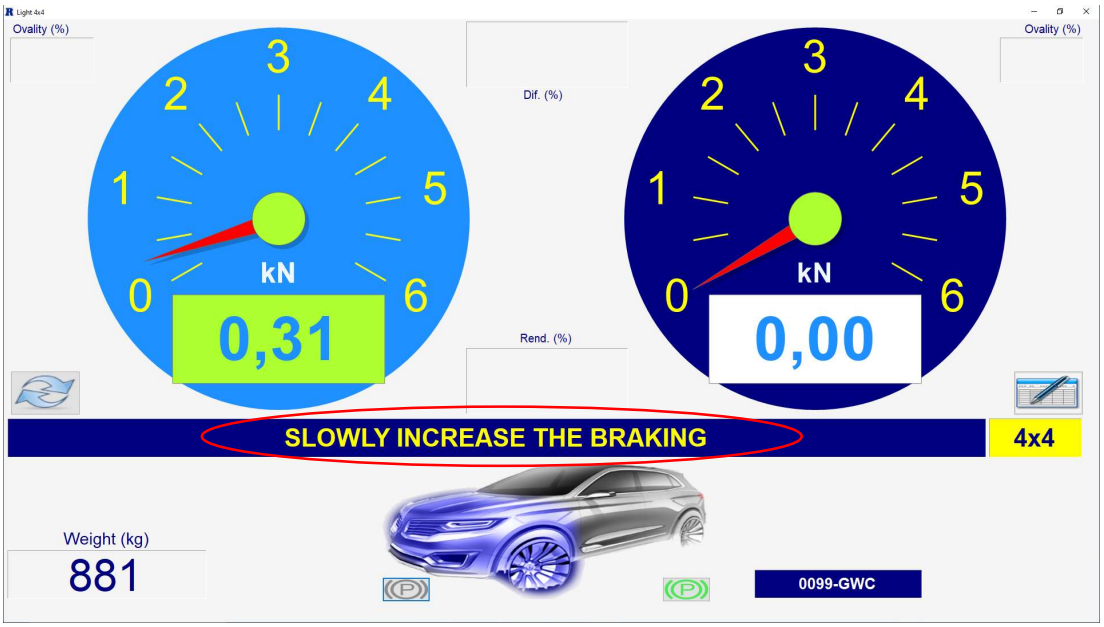


110 4x4 light vehicles brake tester: Start of measurement

3) This value will be stored and will be visible at the end of the test in the 'Summary' display.

Then, proceed as follows:

1) Once the motors are running, the residual measurement is taken and the braking force starts to vary, the box at the bottom of the clock corresponding to the wheel will change from light grey to green.
   At that time, through messages the application will indicate that you can start to brake slowly and progressively until a force equal to the maximum braking measure is reached.



111 4x4 light vehicles brake tester: Start of measurement

2) Increase the pressure of the brake system pedal until the fluctuation measurement point is reached.

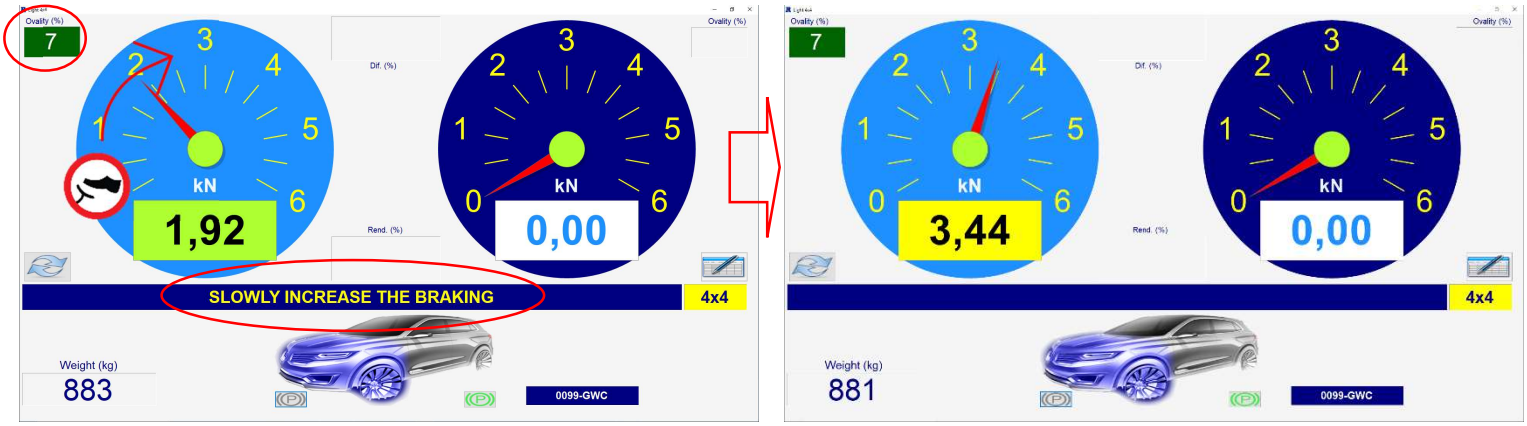
   At this point, try to keep the needle inside the gauge graph measuring fluctuation, keeping the braking constant within the measuring range of the needle.

   Important: This measurement will be performed as long as the fluctuation measurement option is active in the configuration.

   The fluctuation measurement will start automatically and will be stored in the same way.

112 4x4 light vehicles brake teste: Fluctuation measurement

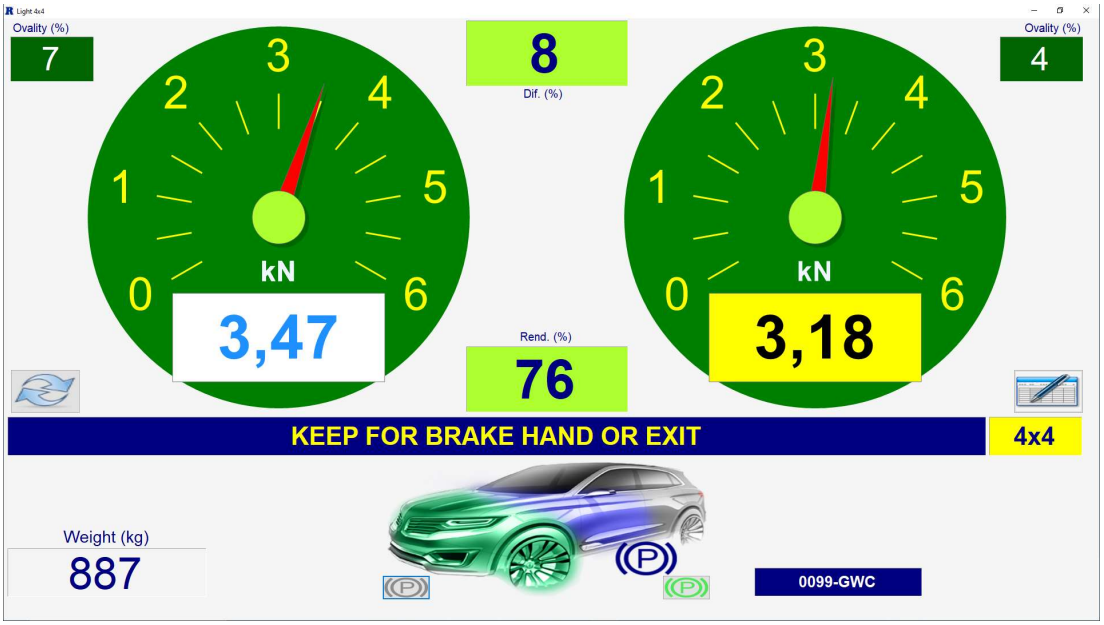
3) After taking the fluctuation measurement on the wheel, slow and progressive braking will continue until one of these cases occurs:
   - The motors are stopped by slipping.
   - The vehicle slightly protrudes out of the brake tester and the sensors do not detect its presence
   - The vehicle does not block the rollers, in which case you will have to release the brake pedal for the system to detect that you have tested the axle by braking decrease.



113 4x4 light vehicles brake teste: Measurement

For this type of test it is important to take into account certain details:

- The efficiencies and other values will be displayed after the measurement of the two wheels on each axle has been completed.



114 4x4 light vehicles brake tester: Information of the test

- Once the motors have stopped on the last test of each axle, the results are automatically stored on the corresponding axle tested. This operation does not save the test in any database, there is a specific operation for this purpose.
- To facilitate the exit of the measured axle, configure the brake tester in such a way that it activates both rollers without taking any measurements, if the brake option is not available.
- It is important to select which axle is located in the parking brake of the vehicle, for this, click on the corresponding icon, changing colour from grey to green the axle where it is located. By default it will be located on the rear axle.

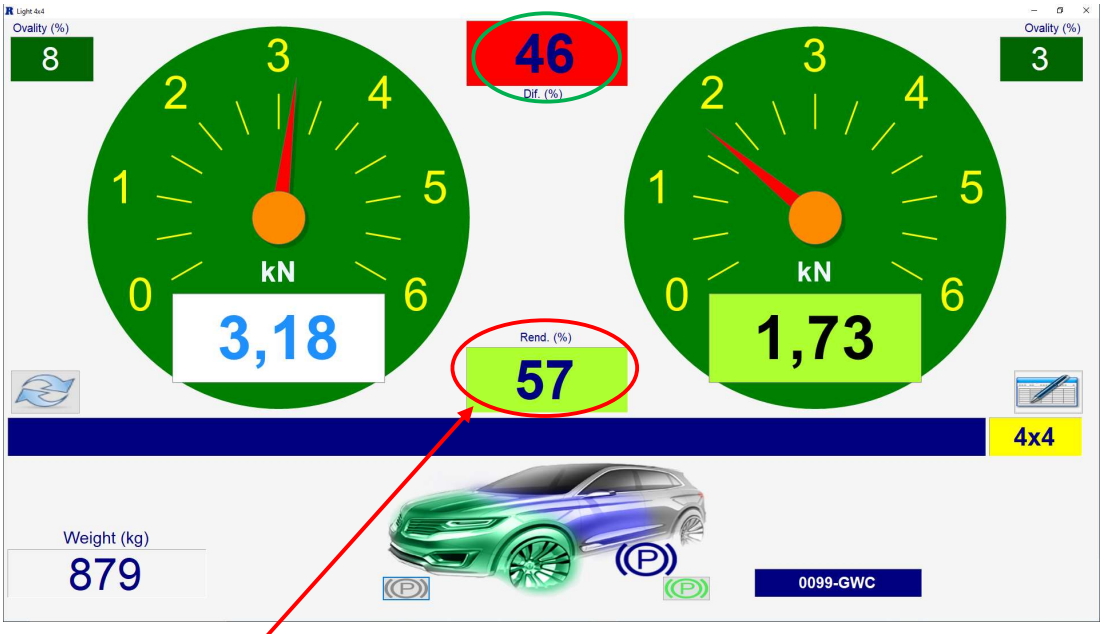
115 Parking brake rear axle / Parking brake front axle

In case the vehicle to be tested has an electric parking brake, the test will not be considered completely correct due to the very abrupt way of braking of this electric system, which could lead to an erroneous measurement. For which the efficiency of immediate braking will be measured taking into consideration the regulations of each country.

4.6.2.2 Possible behaviours of the test

In the performance of a test, you can observe different cases in which the configured values, which have you will have to introduce at the beginning, are not exceeded, as can be:

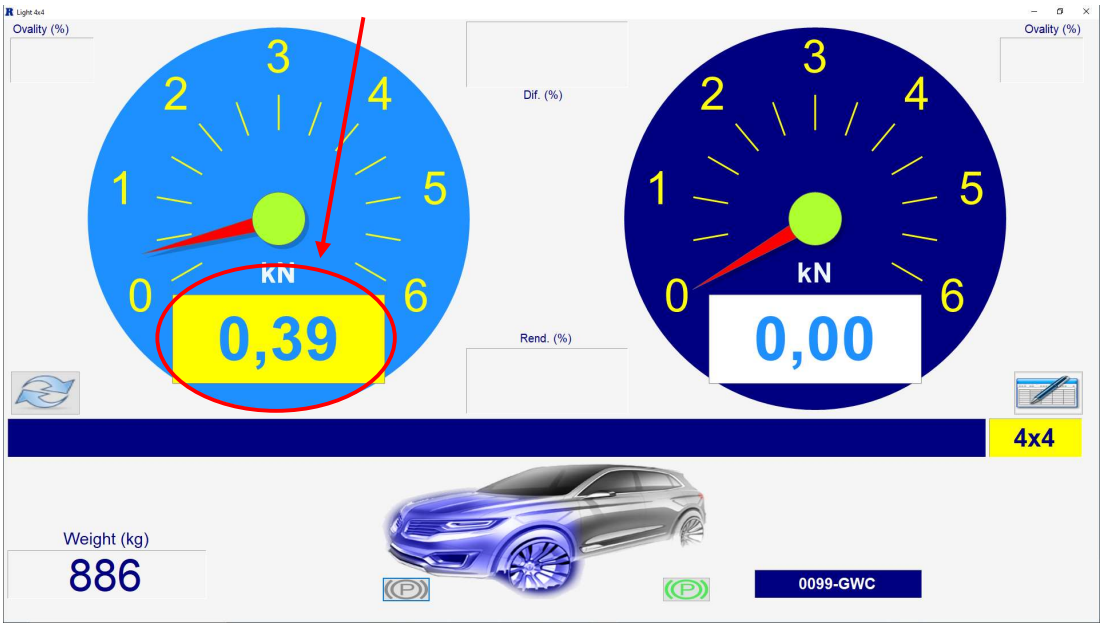
1) **High percentage difference**: The difference between the left and right braking values is higher than the configured value and the 'Difference %' box will be marked in red because you have exceeded the parameters previously configured.



116 4x4 light vehicles brake tester: Values displayed

2) If the box 'Efficiency (%)' is in green, the value will be considered correct, as it is within the parameters.

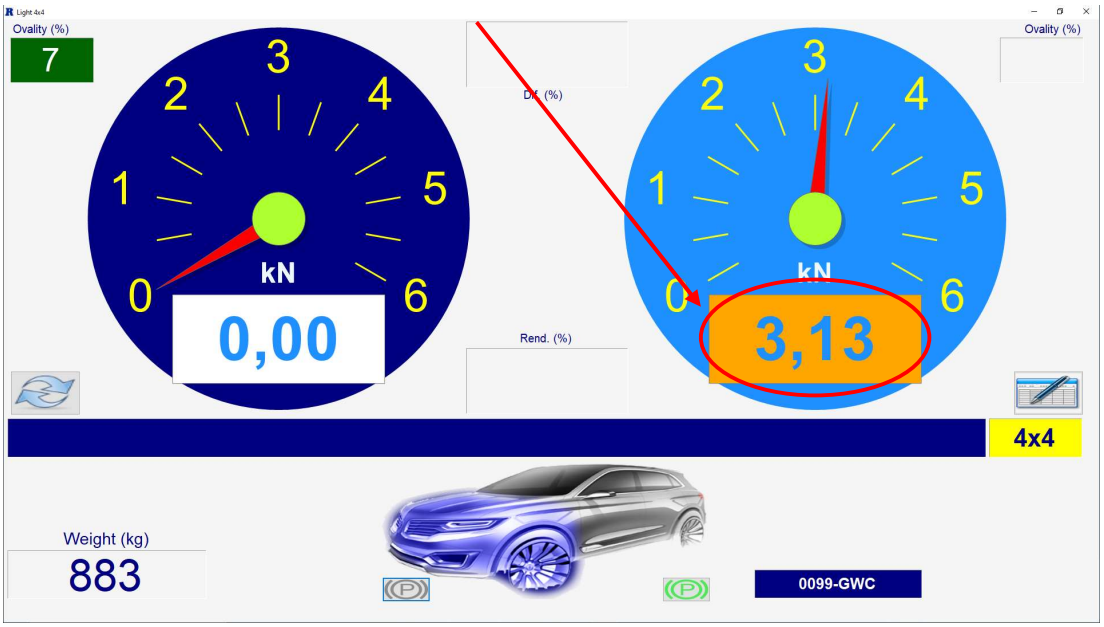
3) Indicator of locking by slippage. In case the left pilot (in practice it can be either side) of the measurement clock appears in yellow, it will mean that when trying to take the residual braking values, the slippage bar is blocked or its speed is lower than the motors' (in a configured %), so the motor will try to start but it will stop because the slippage bar does not roll, or it rolls at a speed below the nominal one. Even if the braking force is not large, the motors will stop when the slip is greater than the set configuration.



117 4x4 light vehicles brake tester: Slippage

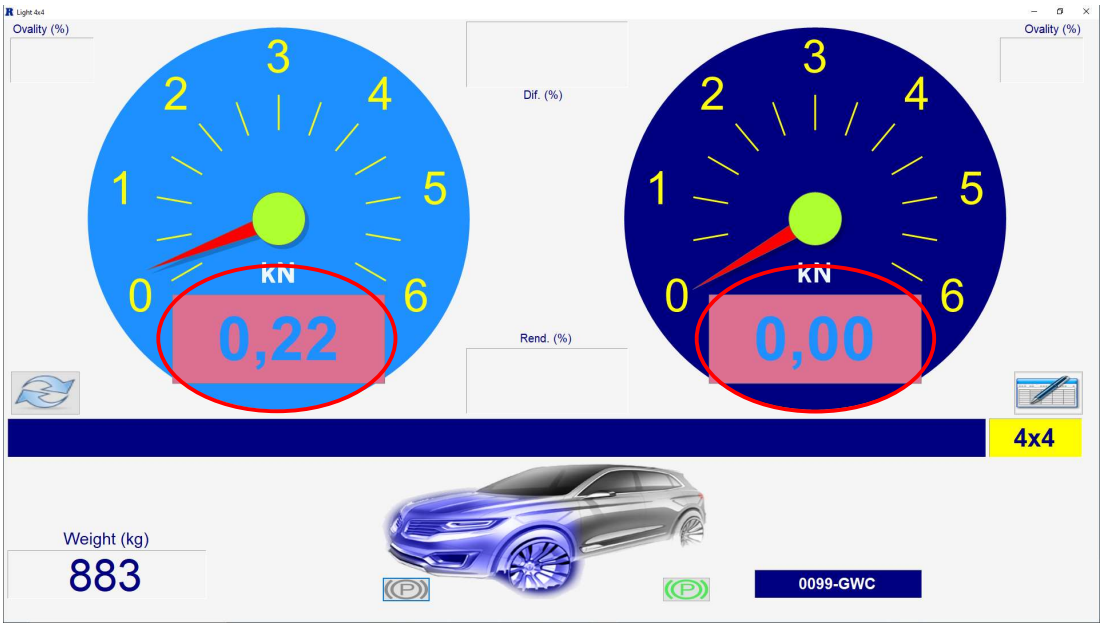
4) Braked or locked wheel indicator, in case the pilot light on the right side of the orange measurement clock appears (in practice it can be either side), it means that the machine has detected a force (kN) on one of the sides as soon as the motor is started, higher than the one set.

Observe that the wheel of the highlighted is blocked, and the system will automatically stop both motors for the security of the vehicle and of the people who could be in the area of the test.



118 4x4 light vehicles brake tester: Locking

5) Due to the sensitivity in certain 4x4 vehicles, the software controls at all times that there is no high differential slippage, this means that it checks at all times that the difference in speed in the rotation between the two wheels is not greater than that configured. If this effect occurs, it will be represented by painting the boxes located at the bottom of both clocks with a purple colour.



119 4x4 light vehicles brake tester: Differential slippage

4.6.3 Quads automatic mode

To perform a test of a Quad vehicle in automatic mode, open the application RYME_PCE.exe. Once opened, make sure that you have configured automatic mode for Quad vehicles, for this you must have selected the boxes:

120 Main menu

4.6.3.1 Functioning

This section will be practically identical to that of a test on a light vehicle, which you can see in section: 4.5.3.1 Functioning, with the only exception that in Quad mode both motors will start at the same time, without any delay to avoid possible breakdowns or damage to the vehicle.

4.6.3.2 Possible behaviours of the test

Refer to 4.4.4. Possible behaviours of the test

4.6.4 Notes

- If, when the motor is started, the wheel is locked due to an abnormal brake system situation, the roller set will start and stop immediately.
- It is important to select which axle is located in the parking brake of the vehicle, for this, click on the corresponding icon, changing colour from grey to green the axle where it is located. By default it will be located on the rear axle.

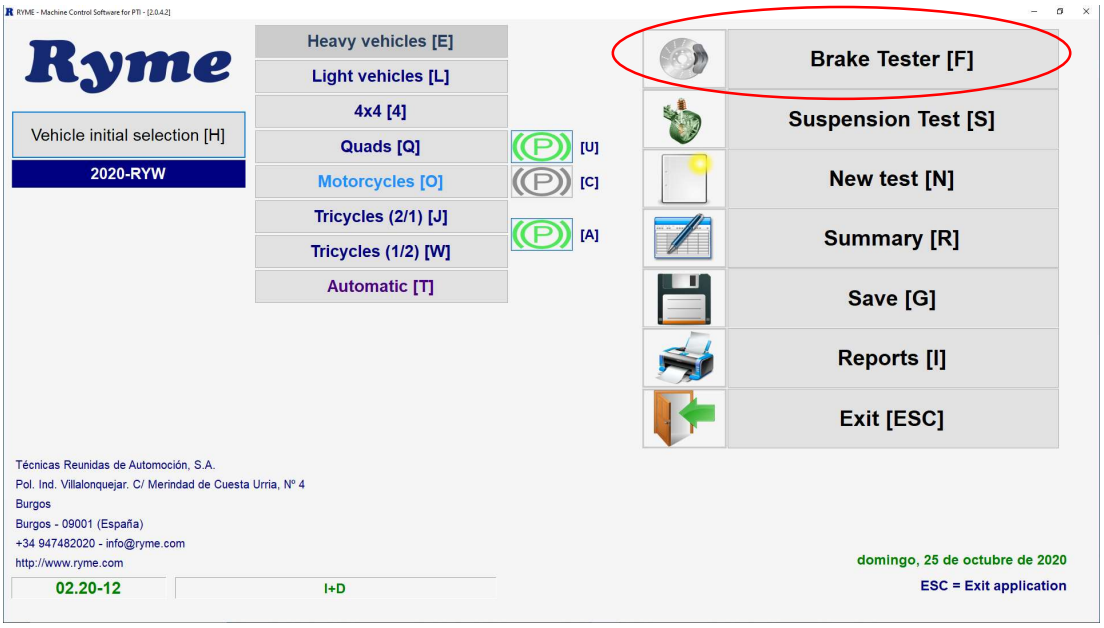
121 Parking brake rear axle / Parking brake front axle

- The motors can be stopped automatically when the slippage exceeds the setting.

4.7 Description of the motorcycles brake tester menu

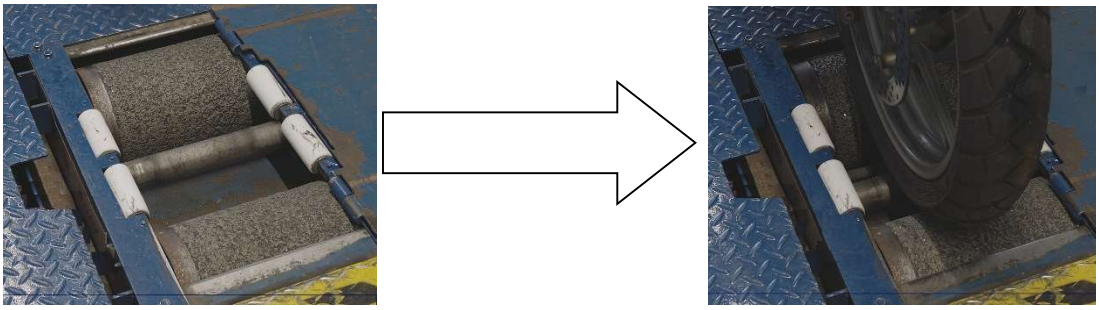
From the main menu of the program, you will be able to access the application 'Brake Tester' in different ways:

- By clicking with the mouse on the icon 'Brake Tester'.
- By pressing the corresponding key on the keyboard 'F'.
- Using the remote control by pressing the corresponding button.



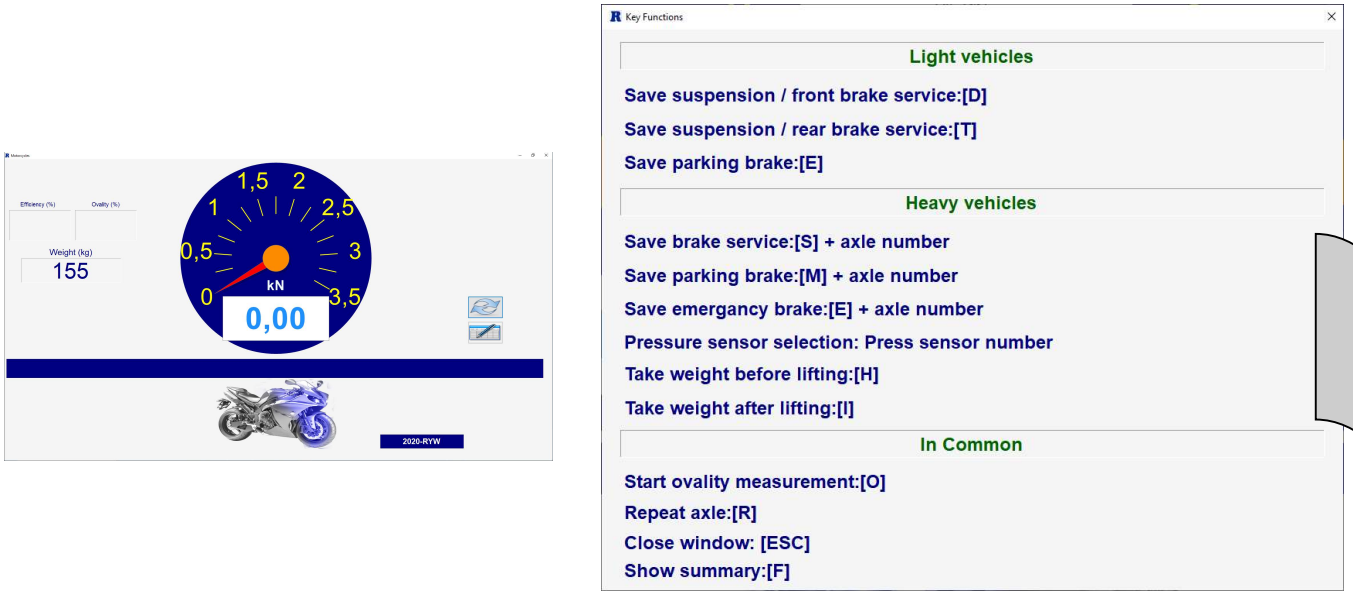
122 Main menu

Another way to access the brake tester will be directly by detecting the presence of a vehicle in the program. For this, no vehicle can be on the bench, as it must be entered afterwards so that the program automatically detects its presence.



123 Vehicle: Present / Not present

From the display of the brake tester, you can access the help menu by pressing the 'Ctrl' key on the keyboard.



124 Motorcycle brake tester display

- **Save front service brake**: Once the front axle test is done (in manual mode), press the corresponding key on the keyboard or remote control (previously configured in the application RYME_CalConf_PCE.exe) to save it.
- **Save rear service brake**: Once the rear axle test is done (in manual mode), press the corresponding key on the keyboard or remote control (previously configured in the application RYME_CalConf_PCE.exe) to save it.
- **Save parking brake**: Perform the test, whether you have the braking system to be measured in the front or rear, and once finished, press the corresponding key on the keyboard or remote control (previously configured in the application RYME_CalConf_PCE.exe) to save it.
- **Start fluctuation measurement**: While performing the brake test (in manual mode), press the corresponding key on the keyboard or remote control, so that the program will measure the fluctuation of the different wheels of the selected axle, storing the data automatically. It will be displayed in the summary.
- **Repeat axle test**: During the performance of an automatic test you can find factors that can result in obtaining a wrong measurement. By pressing the 'R' key or the  icon on the screen, you can repeat again the measurement

of the desired axle by pressing as many times as necessary. Make sure you have selected the axle to repeat in the image of the vehicle.

- **Show summary**: While performing the test, at any time you can see the test data by pressing the 'F' key or by clicking with the mouse on the  icon.
- **Exit**. This function allows you to exit the light/heavy brake tester to the main menu. This function can be accessed by clicking on the icon with the mouse or by pressing the **'Esc'** key on the keyboard or remote control.

4.7.1 Motorcycles brake tester display

In this display you can find different sections displaying the information of the test:

125 Motorcycles brake tester display

1) Brake Clock, numbered with the braking force values in kN, the range of values is you will have to assign previously in the configuration.

2) This table shows the value, in kN, of the instantaneous braking of the vehicle.

3) Saved axle and brake information. In this table you can see when changing to green, the brake and the axle corresponding to the saved test. You have the possibility to save the service brake of the front axle, service brake of the rear axle and parking brake. It should be noted that the parking brake can be found at the front or rear of the vehicle, so you will have to select it by clicking with the mouse on the corresponding axle (by default it will come in the rear). The sequence of these colours will be: Grey (standby mode) -blue (next axle to test) - green (axle tested).

4) Brake efficiency expressed in percentage corresponding to the front or rear wheel. This value is related to the braking force of the wheel and the weight supported by the corresponding axle.

5) It displays the value in percentage of the fluctuation measurement of the wheel.

6) Weight in kg of the wheel to be tested (Optional on the machine)

7) Registration of the vehicle which you are going to proceed to test.

8) Indicative display for the technician's use: messages will inform the technician of the level of progress of the test and the actions to be performed to proceed with a correct test.

4.8 Motorcycles brake tester: Manual mode

In this mode all actions of the machine will go according to the orders introduced manually.

A test can be performed manually in two ways:

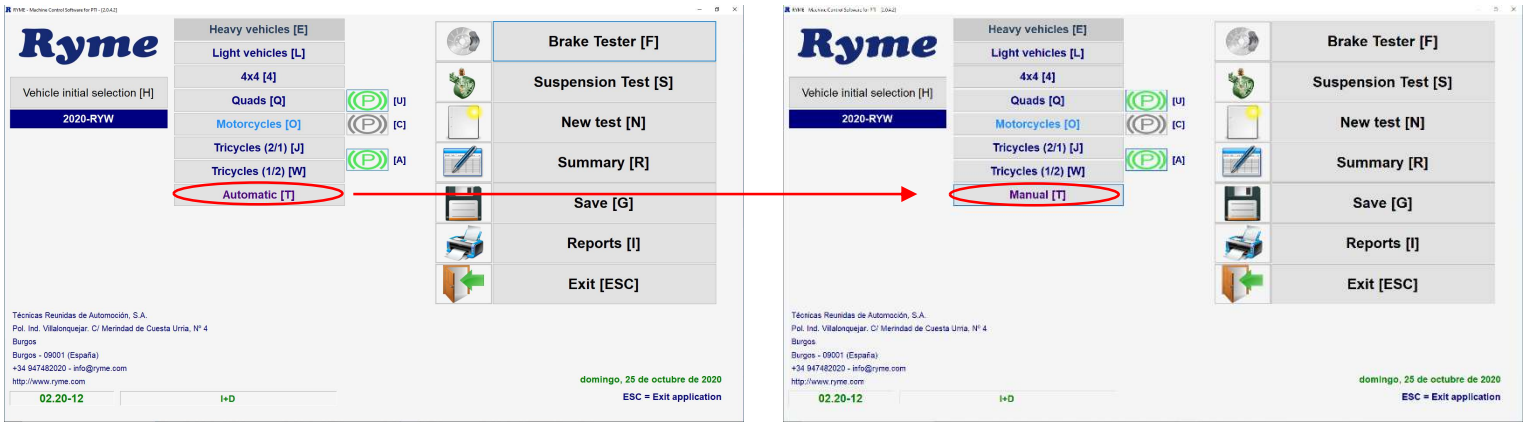
- From the start of the test.
- At any moment after having carried out the test in automatic mode

In any case not without first selecting this mode in the main menu.

For the test of a motorcycle, by default you will find the box 'Light vehicles' pre-selected, but it is important to make sure at the beginning of the test that it is selected.

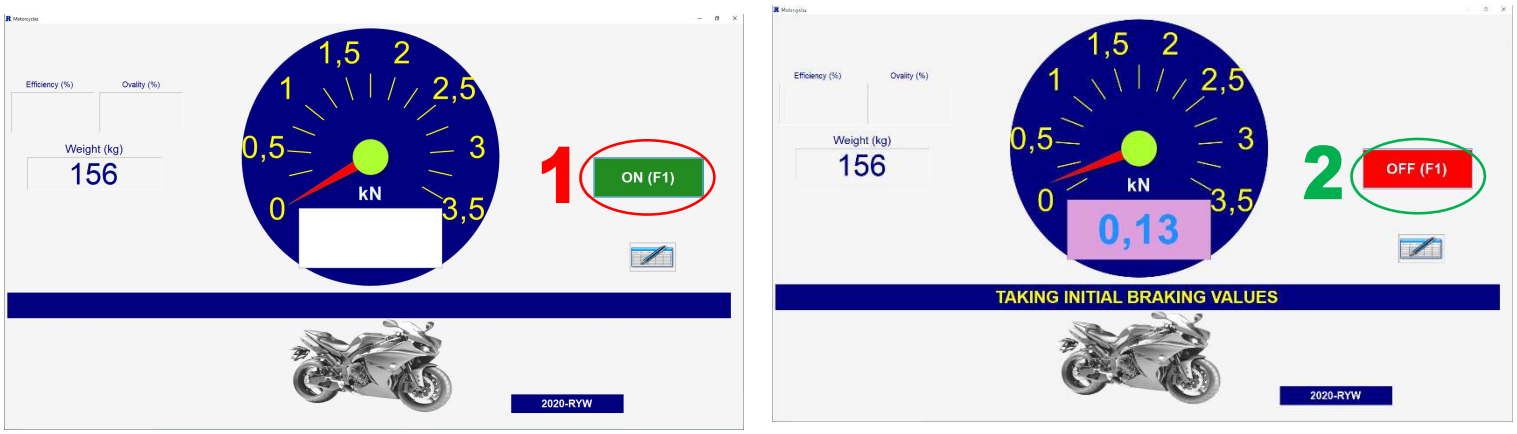
126 Main menu

To change the test mode, press the corresponding key on the keyboard or click with the mouse on the icon, changing it from Automatic to Manual mode.



127 Main menu

In the brake tester display you will find some icons from which you will control the machine at any moment:



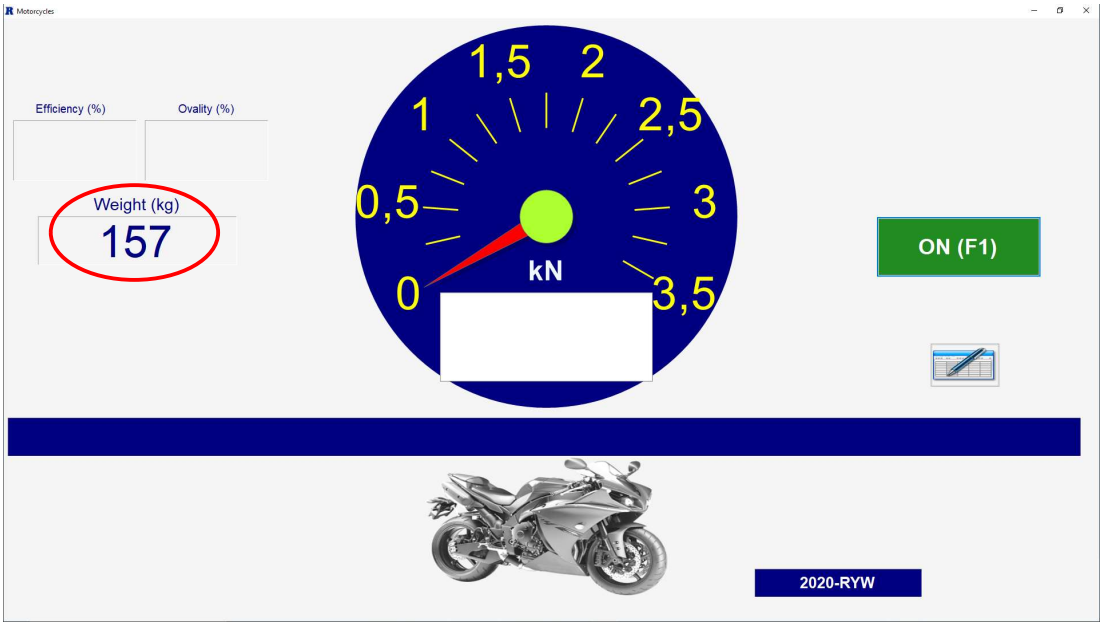
128 Light vehicles brake tester: Manual mode

1. **Start motor**: By clicking on this icon with the mouse or by pressing the corresponding key on the keyboard or remote control (previously configured in the application RYME_CalConf_PCE.exe), you will start the motor.
2. **Stop motor**: Clicking on this icon with the mouse or pressing the corresponding key on the keyboard or remote control (previously configured in the RYME_CalConf_PCE.exe application), you will stop the motor.

4.8.1.1 Functioning

In manual mode all operations must be guided by the technician.

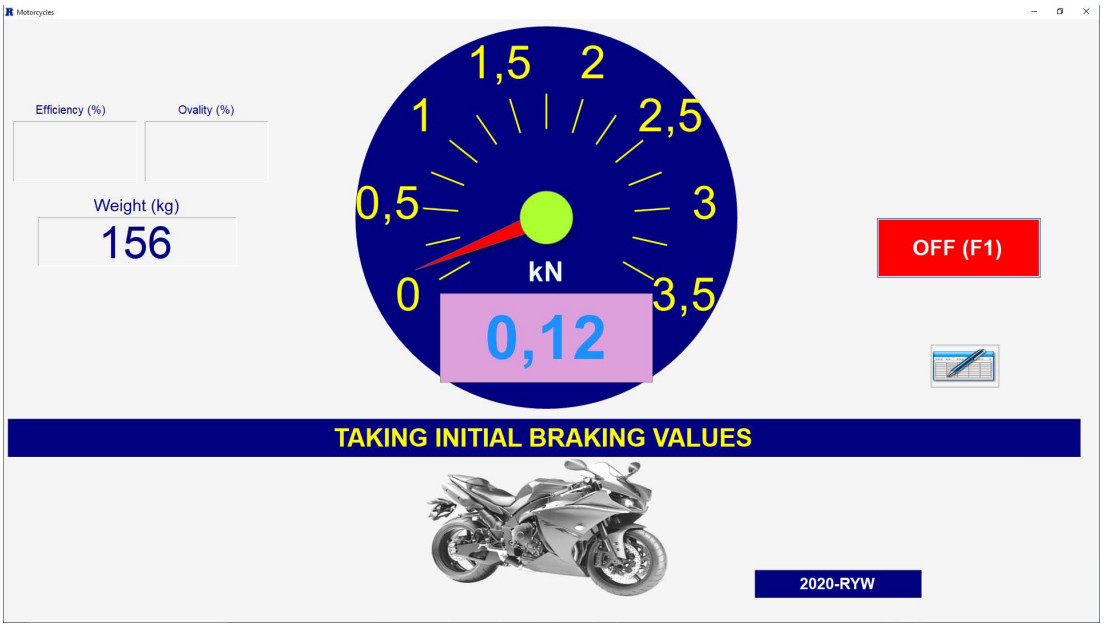
1) Once in this screen, introduce a vehicle in the brake bench, moment in which the system will carry out the measurement of the weight of the introduced axle, (if the brake tester has the scale option) waiting for a new instruction.



129 Motorcycles brake tester: Manual mode

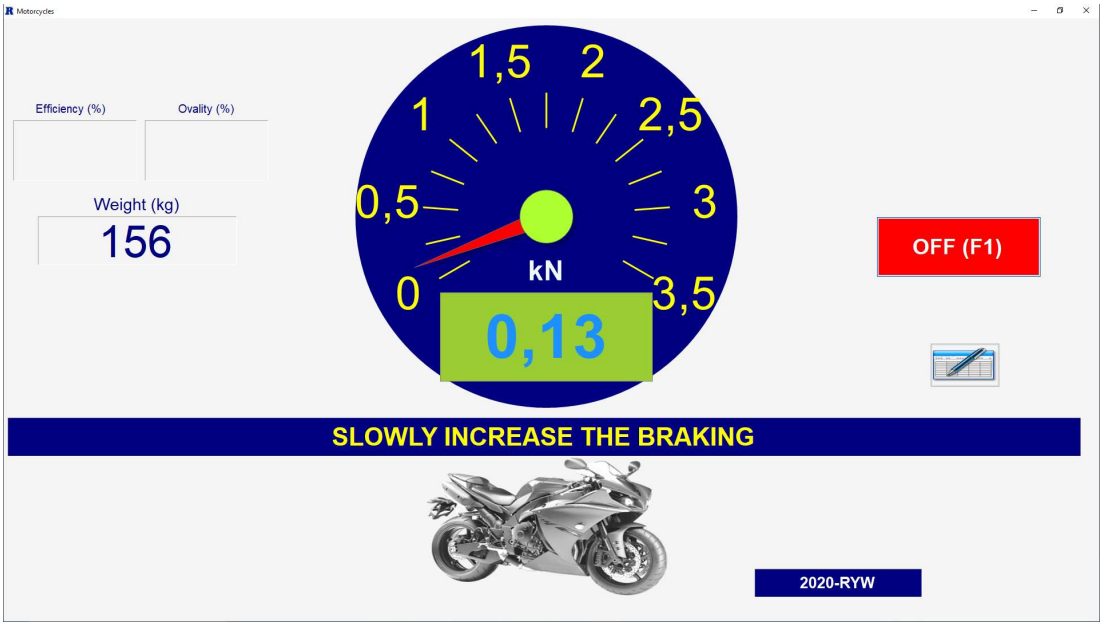
In case the line does not have a weighing system, you simply will not obtain the weight measurement of the axle, being able to work normally with the rest of the installed machines.

2) When the motor is started, through the keyboard (F1) or through the remote control, the system will start to measure the effort made by the corresponding wheel brake. This braking force must be saved once each axle is finished.



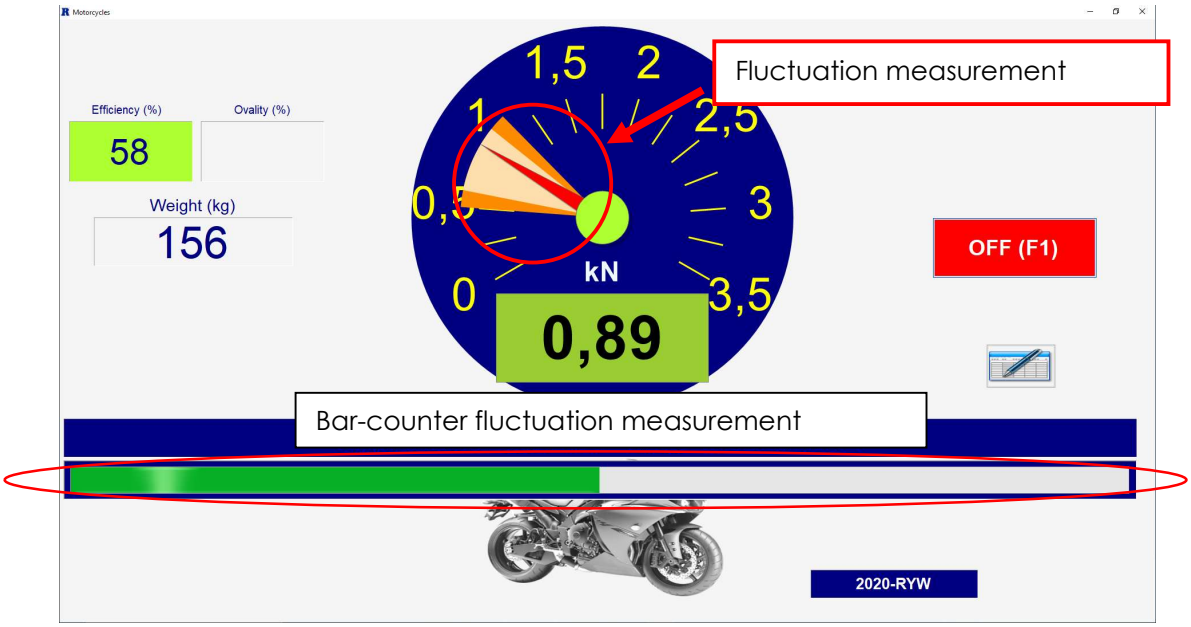
130 Motorcycles brake tester: Manual mode - Initial braking values

3) When the motor is running and the braking force starts to vary, the braking will start slowly and progressively to decrease to a force equal to the average braking.



131 Motorcycles brake tester: Manual mode - Increase the braking

4) With that pressure on the brake handle/pedal, which will be kept constant, the fluctuation of the brake will be measured. To do this:
   1. Press the 'O' key on the keyboard, clicking on the icon with the mouse or using the remote control (if the fluctuation is set to automatic mode, this step is not necessary).
   2. The braking measurement clock will show a shaded orange area where you must keep braking to measure the fluctuation correctly.
   3. A green timing bar will appear at the bottom while you keep braking in the orange shaded area.
   4. When the green timing bar disappears at the bottom, the program has finished measuring the fluctuation and will display it in the corresponding window.



132 Motorcycles brake tester: Manual mode - Fluctuation measurement

5. After the wheel fluctuation measurement has been completed, the brake handle/pedal should be pressed slowly and progressively until the motor stops.

The motor can be stopped in three ways:

- Manually, by pressing the key (F1) on the keyboard, clicking on the icon or pressing the key on the remote control, when the braking force is high and the wheel starts to slide.

- Automatically, when the slippage that occurs exceeds that set in the configuration.
- If the motors do not lock due to slippage, the system will automatically detect it and store the results when the brake handle/pedal is released.

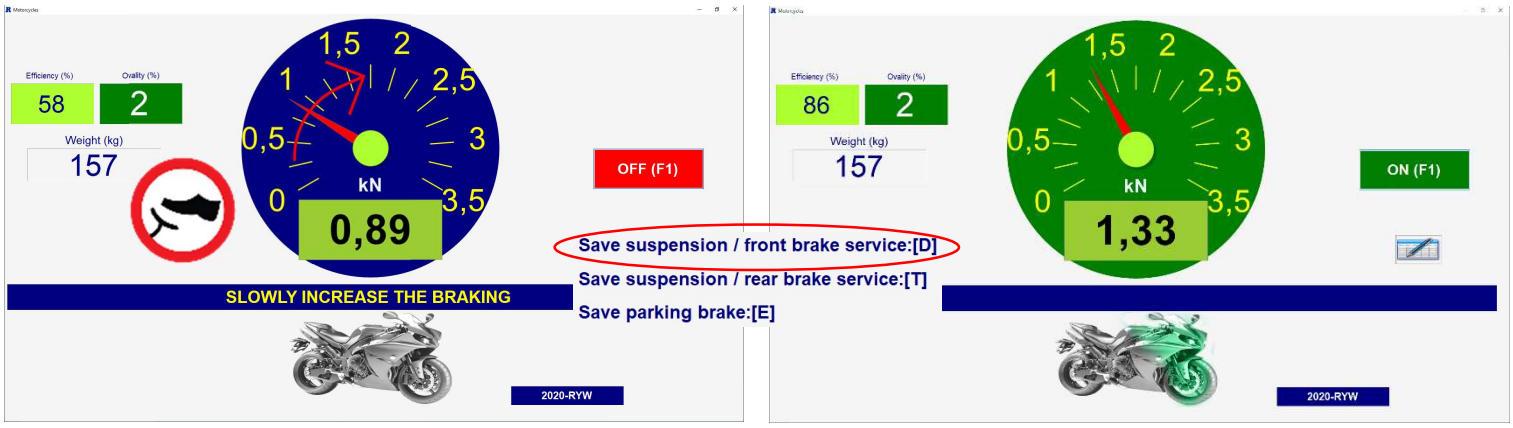
The efficiencies are calculated in real time and refer to the efficiency of each wheel (to be able to see this value on the screen, you will need to have obtained the weight of the axle).

4.8.2 Saving the test manually

Once the desired measurement has been taken, the different brakes of the vehicle - FRONT AXLE SERVICE BRAKE, REAR AXLE SERVICE BRAKE or PARKING BRAKE - will be saved.

This operation will be performed either by pressing the corresponding key (Example front axle key: 'D') on the keyboard or by pressing the corresponding button on the remote control. After the measurement of each wheel, it will be necessary to save its results in order to ensure that the saving of the test is carried out correctly.

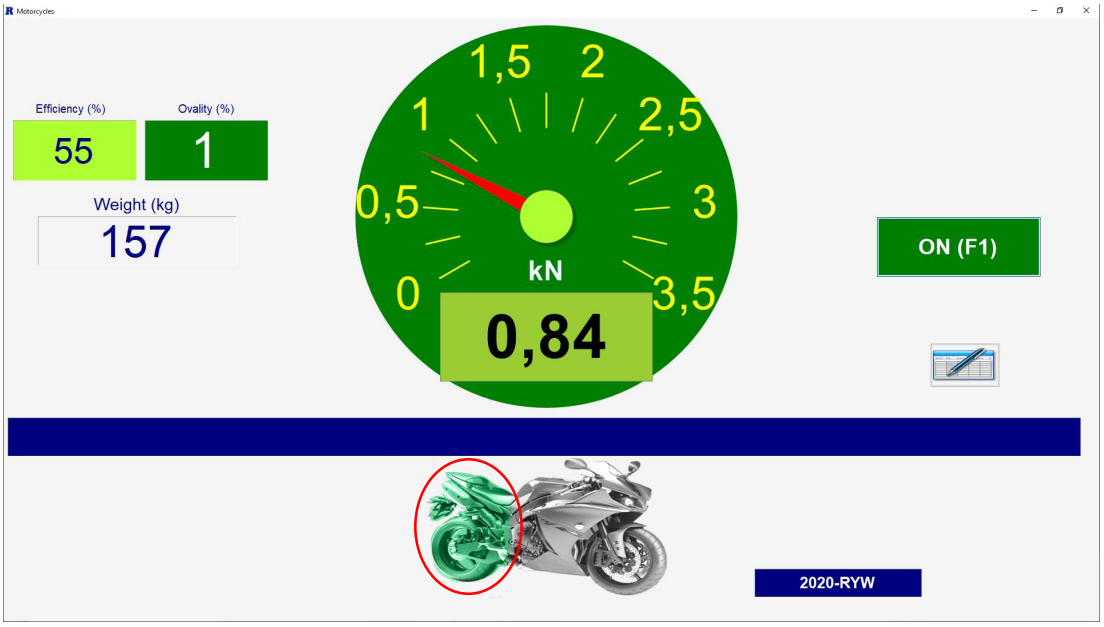
- Example: saving front axle results:



133 Motorcycles brake tester: Manual mode – Saving the data

4.8.3 Example

Rear wheel measurement: Carry out the brake test on the rear axle, and then press the corresponding key on the keyboard (T) or with the remote control to save the rear service brake: it will appear in green when pressed.



134 Motorcycles brake tester: Manual mode – Saving the data

This way you will be able to visualize the axles on which you have made the different braking measurements and the type of brake.

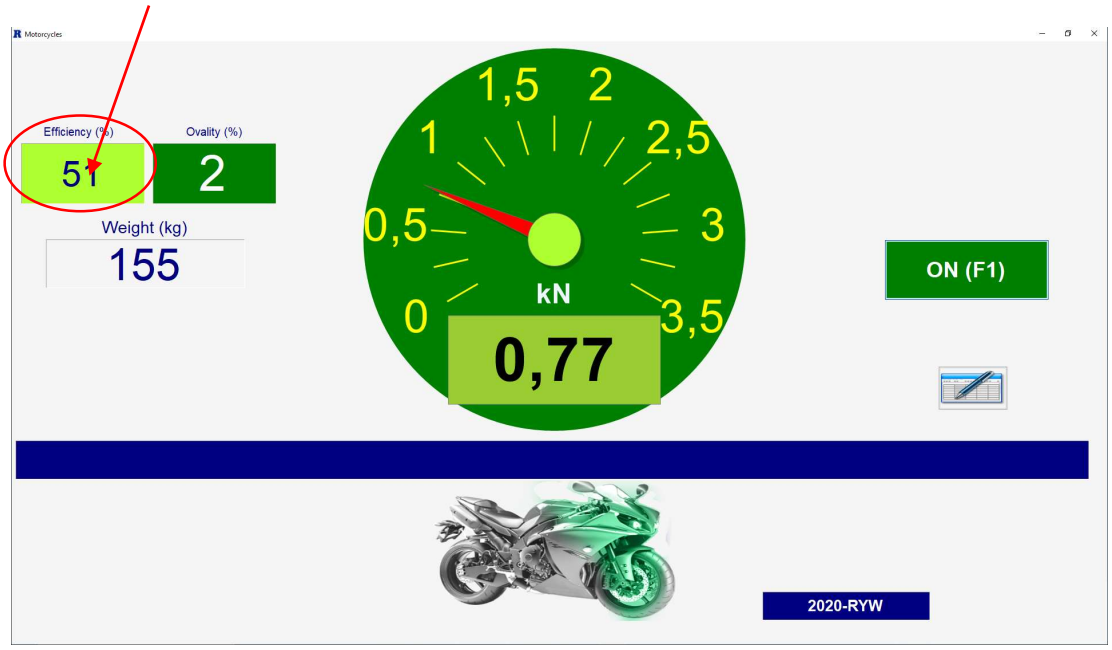
135 Brake / Axle Type Information Box

Note: If this operation is not performed, the measured values will not be shown in the 'Summary', nor in the 'Report' of the last vehicle tested. This operation does not automatically save the test in any database, for that there is a specific operation.

4.8.4 Possible behaviours of the test

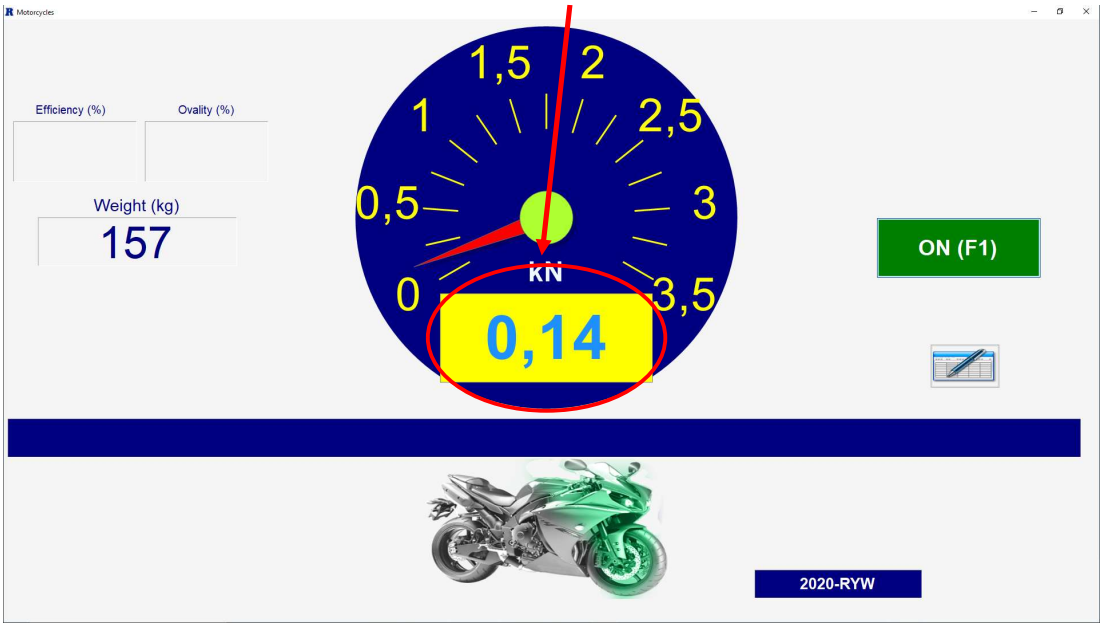
In the performance of a test, you can observe different cases in which the configured values, which have you will have to introduce at the beginning, are not exceeded, as can be:

1) If the box 'Efficiency (%)' is in green, the value will be considered correct, as it is within the parameters.



136 Motorcycles brake tester: Manual mode concepts

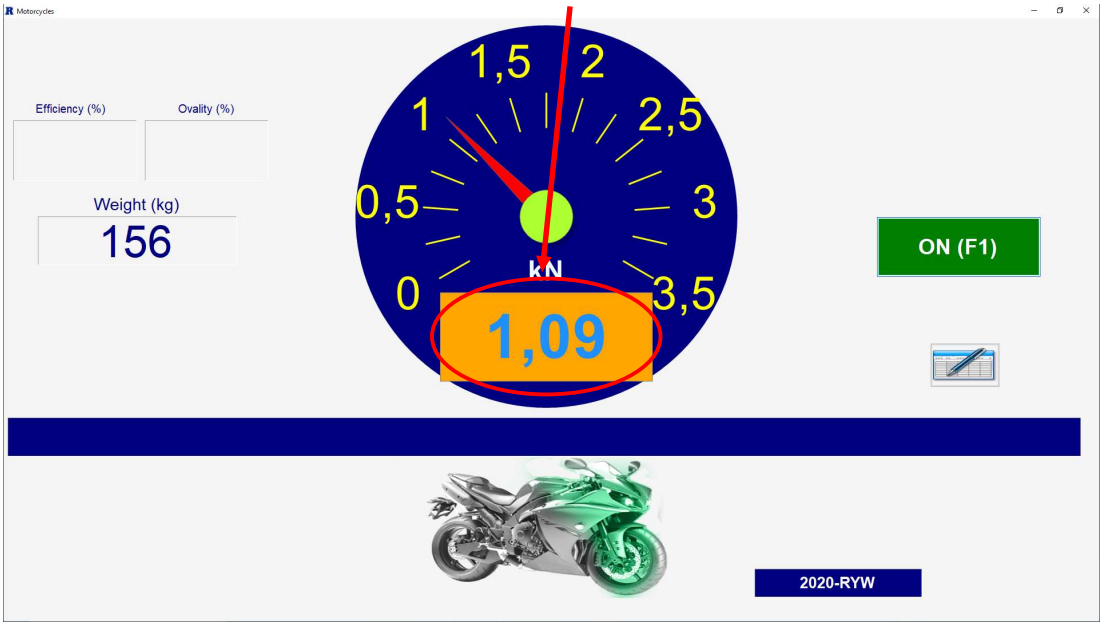
2) Indicator of locking by slippage, in case the light at the bottom of the measuring clock appears in yellow, it will mean that when trying to take the residual braking values, the slippage bar is practically blocked or its speed is lower than the motor speed (by a set %), so the motor will try to start but will stop because the slippage bar does not roll, or rolls at a speed below the nominal one. Even if the braking force is not large, the motor will stop when the slippage is greater than the set %.



137 Motorcycles brake tester: Manual mode - Slippage

3) Braked or locked wheel indicator. If the light at the bottom of the measuring clock appears in orange, it means that the machine has detected a force (kN), higher than the set one, as soon as the motor is started.

Observe that the wheel of the highlighted side is blocked, and the system will automatically stop both motors for the security of the vehicle and of the people who could be in the area of the test.



138 Motorcycles brake tester: Manual mode - Locking

4.8.5 Notes

- If a wheel cannot reach the locking value, the braking value will be memorized indicating whether it is front, rear or handbrake.

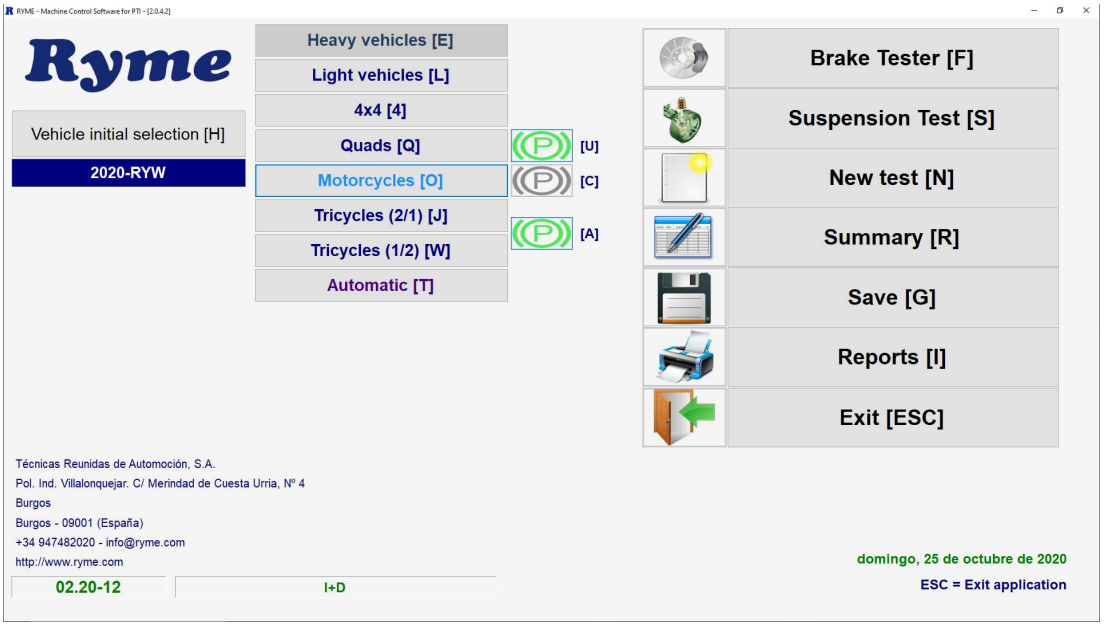
- If the wheel is blocked at the moment of starting the motor due to an abnormal situation of the braking system, the roller will start and stop immediately.

- It is important to select in which axle is located the parking brake of the vehicle, for this, click on the corresponding icon, changing the colour from grey to green the axle where it is located. By default it will not be located on any axle.

139 Parking brake rear axle / Parking brake front axle

4.9 Motorcycles brake tester: Automatic mode

To perform a test of a motorcycle type vehicle in automatic mode, open the application RYME_PCE.exe,



140 Main menu

Once opened you must make sure that you have configured the automatic mode for motorcycles (by default this is always pre-selected as a light vehicle), for this you must check that the corresponding boxes are selected:

141 Main menu

4.9.1.1 Functioning

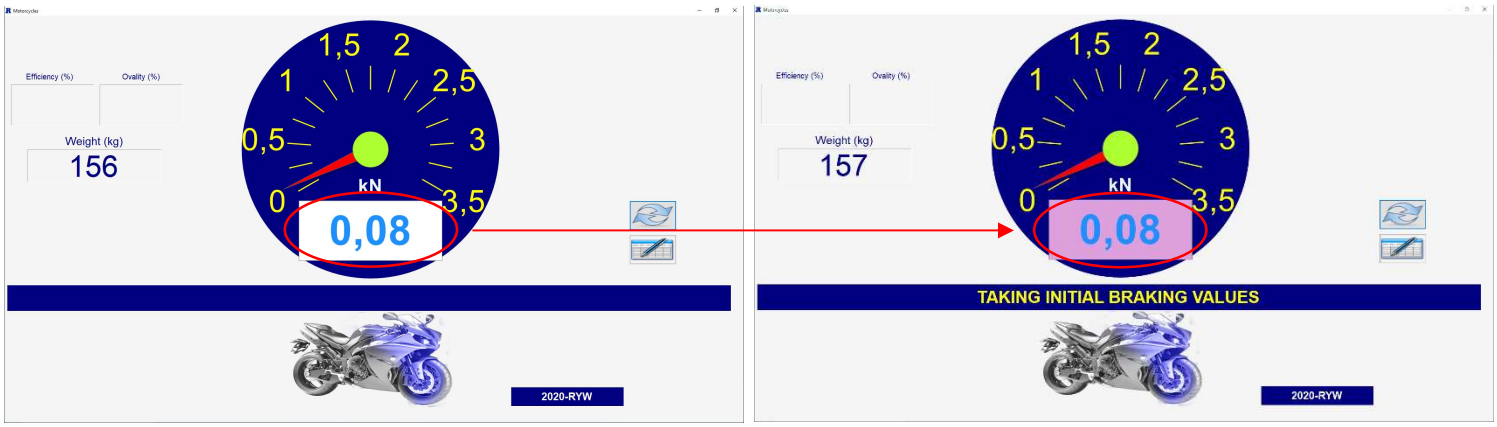
In this mode, it is the system that guides the technician during the execution of the test and automatically saves the results.

142 Motorcycles brake tester: Automatic mode

1) When a vehicle is put on the test bench, the system will start the rollers, making the measurement of the wheel braking forces.

143 Motorcycles brake tester with vehicle

2) The first measurement that the system will make will be the residual braking on the wheel to be tested, in this step the measurement boxes located at the bottom of the clocks will change from white to light grey for a configurable time until the residual value is taken.



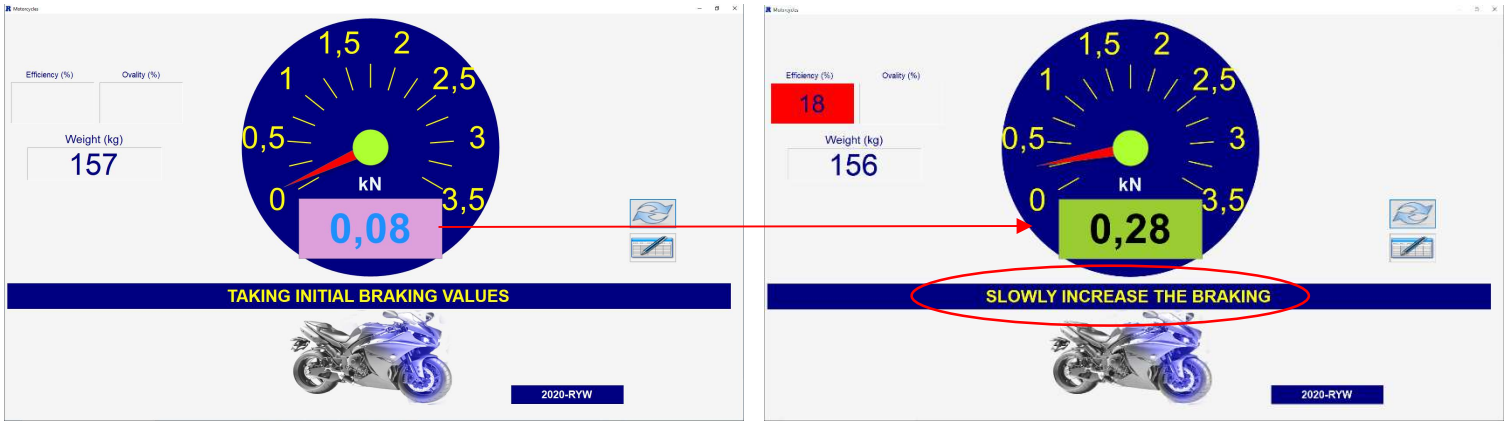
144 Motorcycle brake tester: Start of measurement

3) This value will be stored and will be visible at the end of the test in the 'Summary' screen.

Then, proceed as follows:

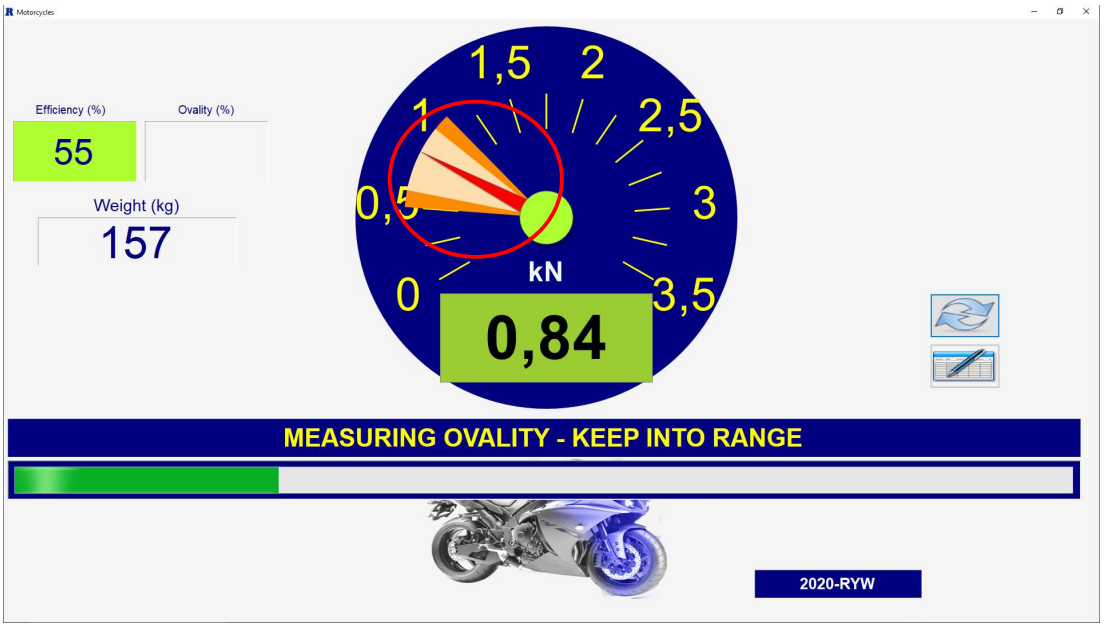
1) Once the motor is running, the residual measurement is taken and the braking force starts to vary, the box at the bottom of the clock will change from light grey to green.

   Braking (pressing the brake handle/pedal of the vehicle's braking system) will begin slowly and progressively until a force equal to the average maximum braking force is reached.

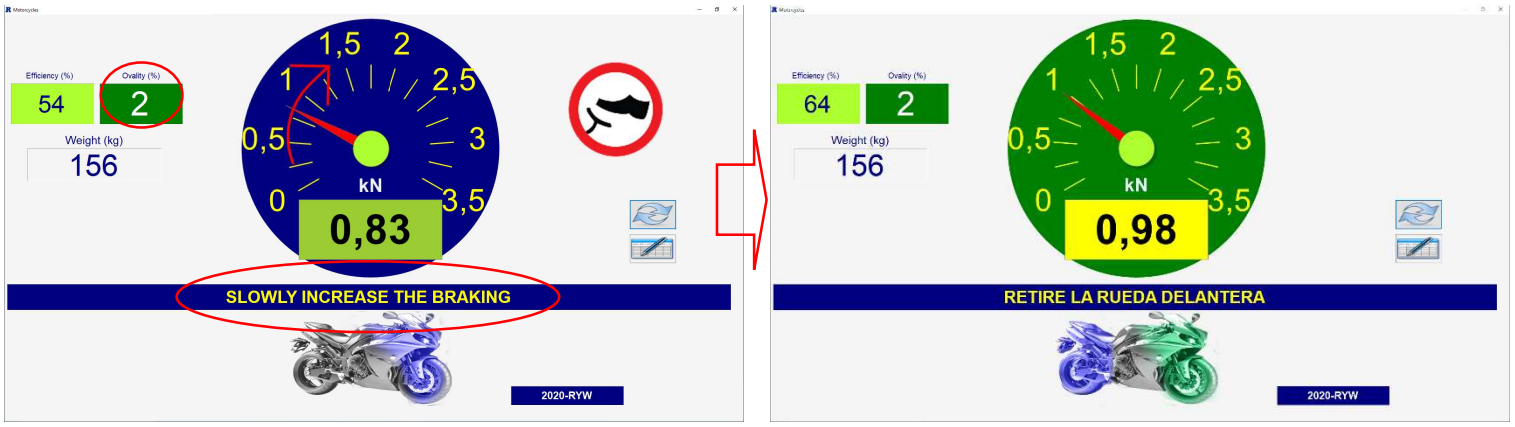


145 Motorcycle brake tester: Start of measurement

2) At this point, try to keep the needle inside the gauge graph measuring fluctuation, keeping the braking constant within the measuring range of the needle.
Important: This measurement will be performed as long as the fluctuation measurement option is active in the configuration.
The fluctuation measurement is done automatically and will be stored automatically.



3) After taking the fluctuation measurement, it will continue to slow down slowly and progressively until one of these cases occurs:
   - The motor stops due to slippage.
   - The vehicle slightly exits the brake tester and the sensor stops detecting it.
   - The vehicle does not block the roller, so you will have to release the brake handle/pedal, so that the system detects by braking decrease that you have made the axle test.



146 Motorcycle brake tester: Measurement

For this type of test it is important to take into account certain details:

- The efficiencies and other values are calculated in real time and refer to the efficiency and results of each wheel.
- Once the motor has stopped, the results are automatically stored on the tested axle. This operation does not save the test in any database, for this there is a specific operation.
- To facilitate the exit of the measured axle, configure the brake tester in such a way that it activates both rollers without taking any measurements, if the brake option is not available.
- It is important to select which axle is located the parking brake of the vehicle, for this, click on the corresponding icon, changing colour from grey to green the axle where it is located. By default it will be located on the rear axle.

147 Parking brake rear axle / Parking brake front axle

4.9.2 Possible behaviours of the test

Refer to 4.7.4. Possible behaviours of the test

4.10 Exit

To return to the main menu of the application once the test has been carried out:

- Click with the mouse on the 'X' icon located in the upper right corner.
- Press the 'Esc' key on the keyboard
- Press the button on the remote control, on the legend ‘KG’.

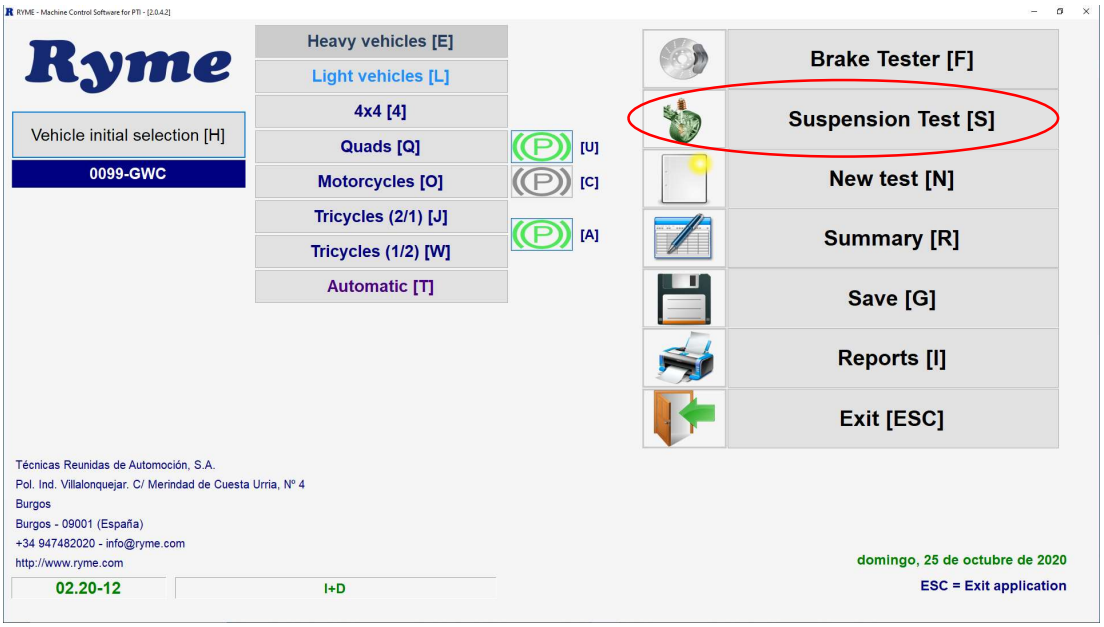
Any of these options will allow you to leave the application.

5 Suspension bench

5.1 Description of the suspension bench main menu

From the main menu of the program, you have the possibility to access the application 'Suspension' in different ways:

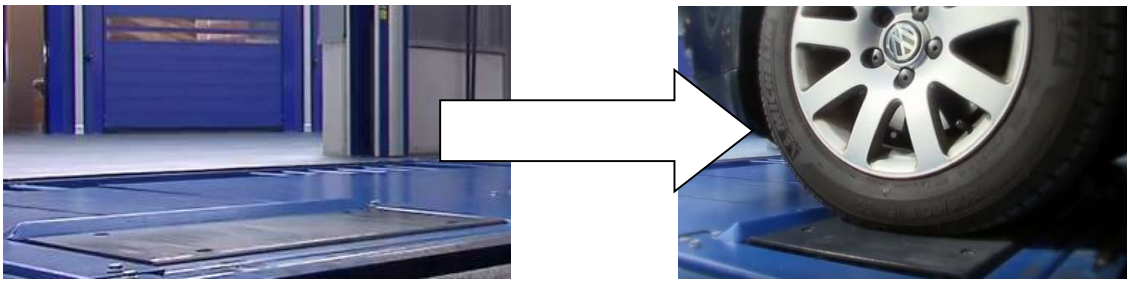
- By clicking on the icon with the legend 'Suspension' with the mouse.
- By pressing the corresponding key on the 'S' keyboard.
- Using the remote control by pressing the corresponding button.



148 Main menu

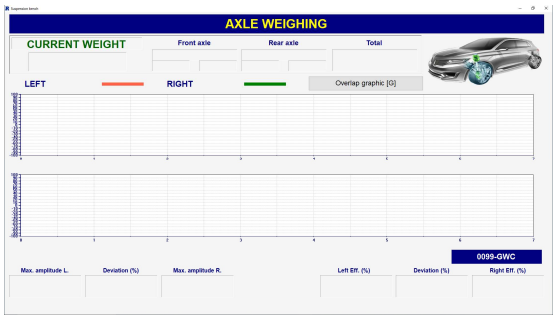
Another way to access the brake tester will be directly by detecting the presence of a vehicle in the program. For this, no vehicle can be on the bench, as it must be entered afterwards so that the program automatically detects its presence. Next, you will have to enter the vehicle so that the program automatically detects the weight of the axle and wheels individually (if the weight is lower than the one configured in the Ryme_CalConf application, then the program will not be executed for safety reasons).

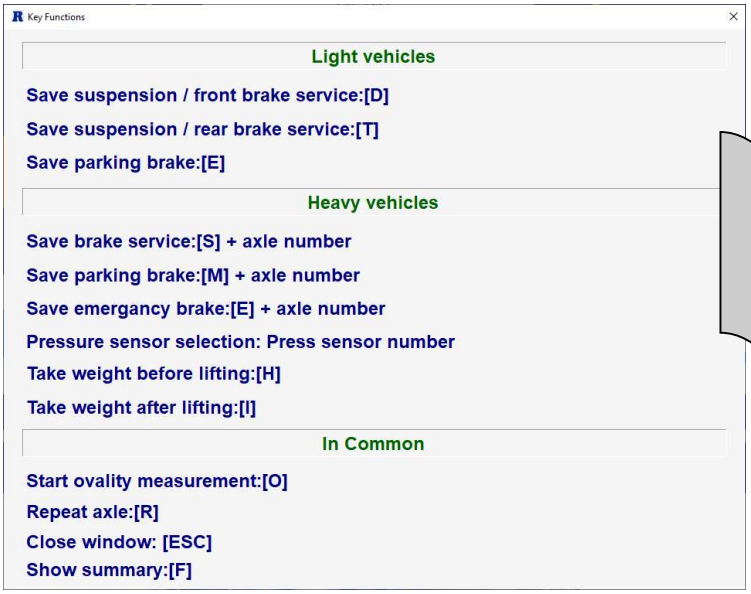
Important: This way of proceeding will only be possible if the 'Automatic' mode is selected.



149 Bench with weight / Bench with no weight

From the display of the suspension bench, the help menu can be accessed by pressing the 'Ctrl' key on the keyboard. This information will be useful on the different screens:



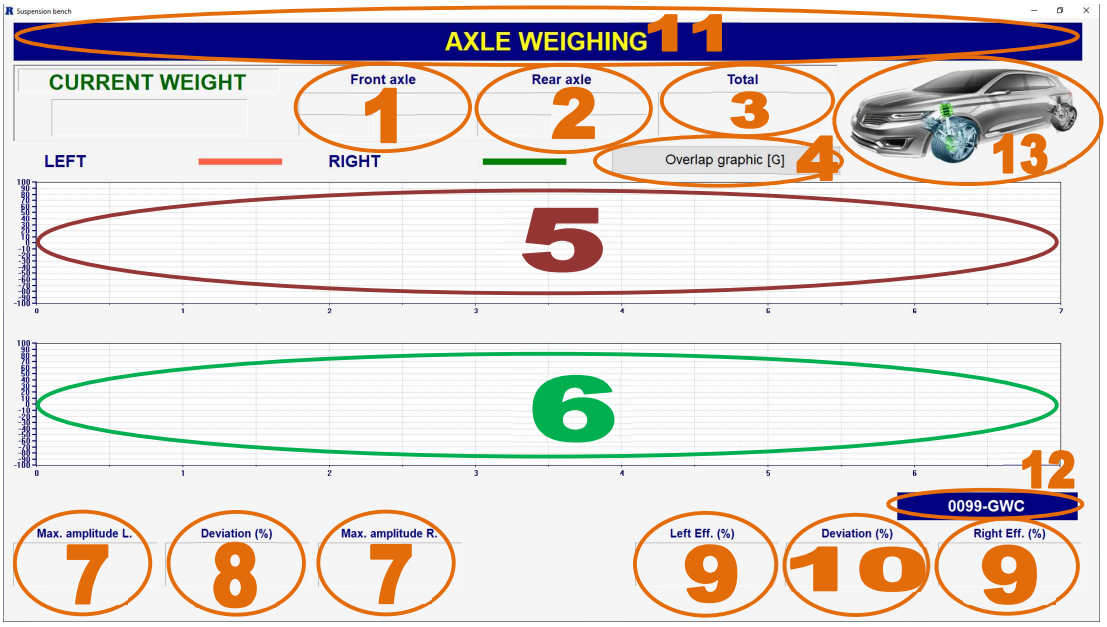


150 Suspension bench display

- **Save front axle suspension**: Once the front axle test is done, press the corresponding key on the keyboard ('D') to save it (previously configured in the application RYME_CalConf_PCE.exe).
- **Save the rear axle suspension**: Once the rear axle test has been performed, press the corresponding key on the keyboard ('T') to save it (previously configured in the application RYME_CalConf_PCE.exe).
- **Exit**. This function allows you to exit the suspension bench display to the main menu of the program. This function can be accessed by pressing the 'Esc' key on the keyboard or remote control.

5.1.1 Display description

In the screen of the suspension bench you can find different sections displaying the information of the test:



1) Total weight in kg of the front axle in the upper part of the box, and weight in kg of each wheel of the front axle in the lower part of the box.
2) Total weight in kg of the rear axle in the upper part of the box, and weight in kg of each wheel of the front axle in the lower part of the box.
3) Total vehicle weight in kg, sum of front axle plus rear axle.
4) By clicking with the mouse on this icon or by pressing the corresponding key on the keyboard, you can superimpose the graphs of the front and rear axle in order to make a comparison and a more exhaustive study of the suspension.
5) Left wheel graph, measuring its amplitude in a determined and configurable time.
6) Right wheel graph, measuring its amplitude in a determined and configurable time.
7) Maximum value of the amplitude that the suspension takes throughout the test on the different left and right wheels.
8) In this box you can see the difference (in percentage) between the maximum amplitudes of each wheel (right and left) on each axle.
9) Suspension efficiency (in percentage) on each left and right wheel.
10) In this box you can see the difference (in percentage) between the maximum amplitude of each wheel (left and right) on each axle.

11) Indicative screen for the use of the technician: by means of messages the technician will be informed of the stage of the test and the actions to be carried out in order to proceed with a correct test.
12) Registration number of the vehicle on which the test is to be carried out.
13) Image of the front and rear axle to inform about the axle to be tested, it will change from blue to green when the test is carried out.

5.2 Suspension bench: Manual mode

This mode is used to perform the necessary shakings to the axle suspension and manually save the data when considered a valid test.

You can proceed to perform the test manually in two ways:

- From the start of the test.
- At any time after the test has been performed in automatic mode.

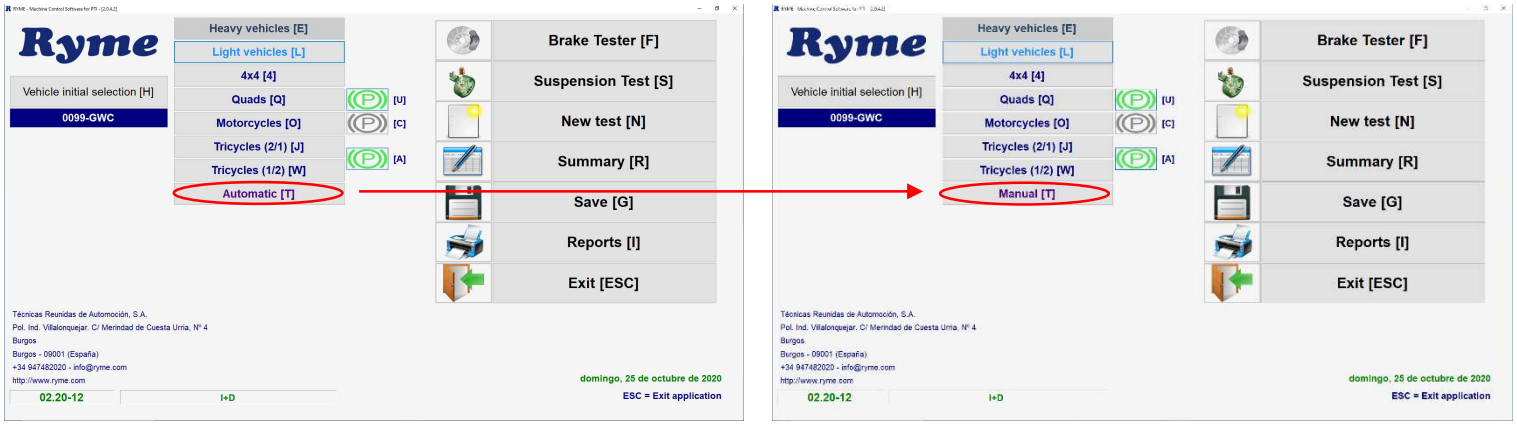
In either case, not without first selecting this mode in the menu on the main menu.

5.2.1 Light vehicles manual mode

To carry out a test on a light vehicle, by default you will find the box 'Light Vehicles' pre-selected, but make sure at the start of the test that it is selected.

151 Main menu

To change the test mode, press the corresponding key on the keyboard ('T') or click with the mouse on the icon, changing it from Automatic to Manual mode.

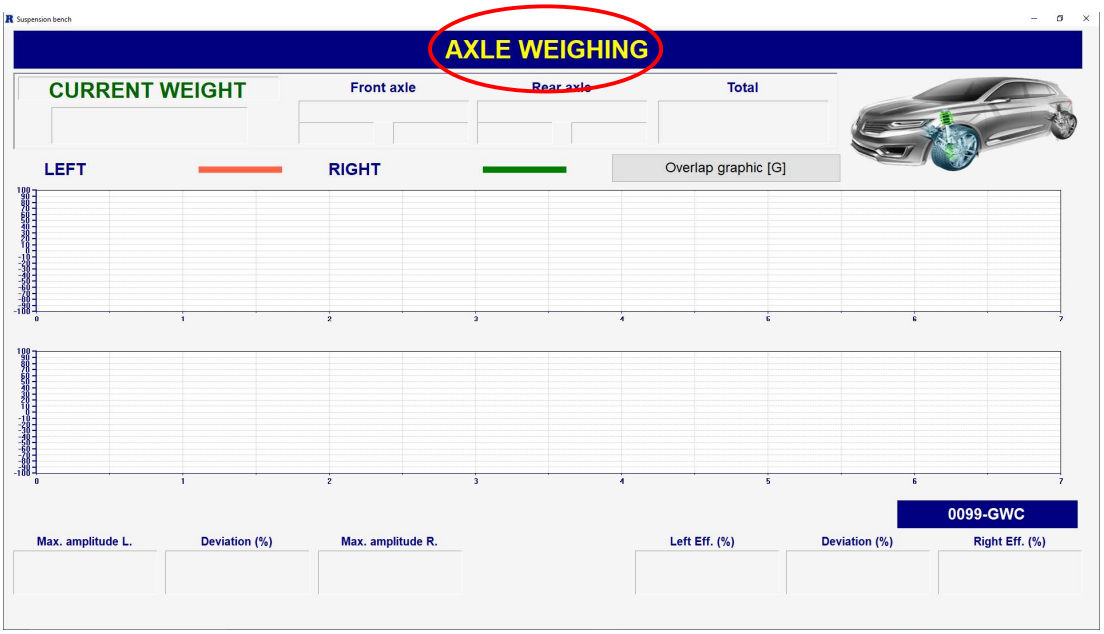


152 Main menu

5.2.1.1 Functioning

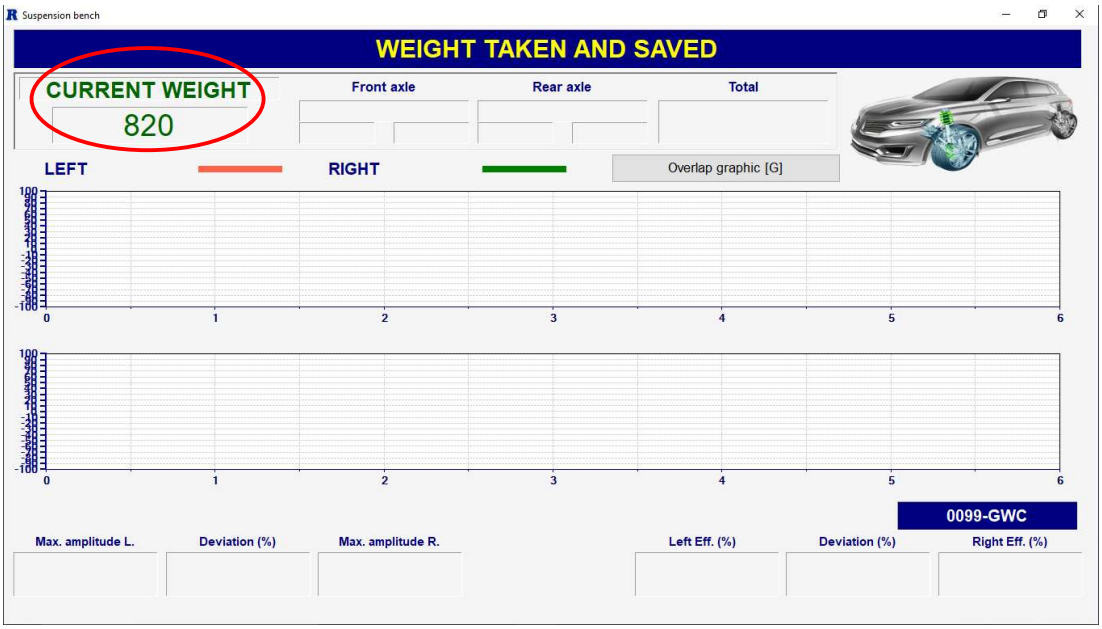
In manual mode the operations must be supervised by the technician as the motors will start automatically.

1) In order to carry out a suspension test in this mode of operation, it is absolutely necessary to insert a vehicle into the suspension bench.
2) Introduce first the front axle in the suspension bench.
3) Then a text message will appear at the top of the screen indicating that the weight is being taken - 'AXLE WEIGHING':



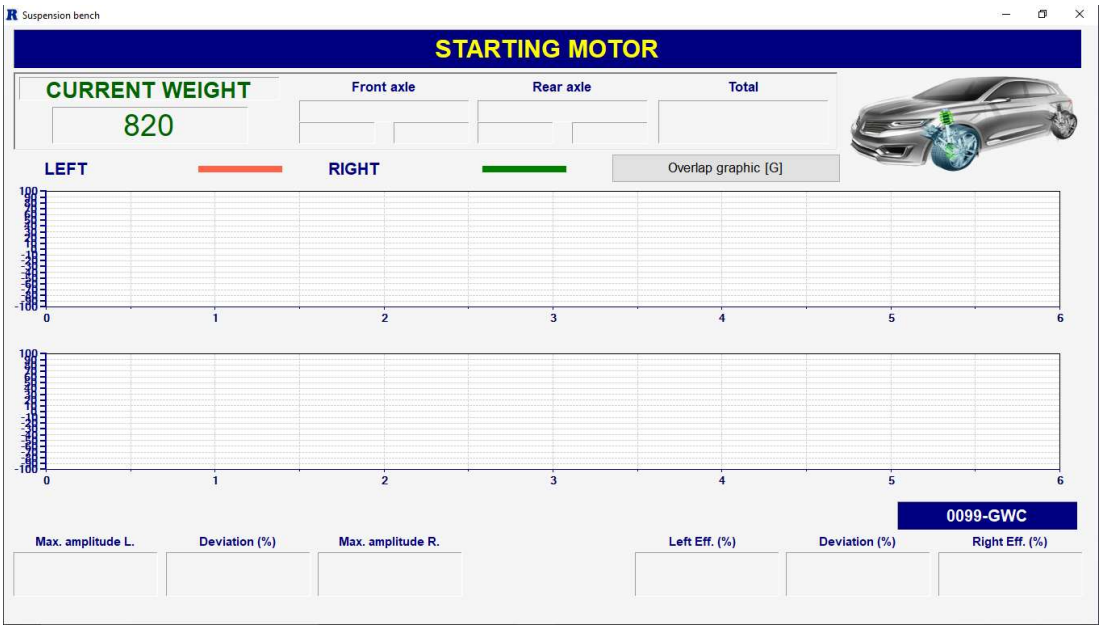
153 Suspension bench: Manual mode - Weighing axle

4) The current weight of the axle to be measured will be shown on the display. Once the weighing time has elapsed and the weight of the axle to be measured has been taken (configurable time), the measurement is carried out. Note: At this point, the weight is not yet allocated to the corresponding axle.

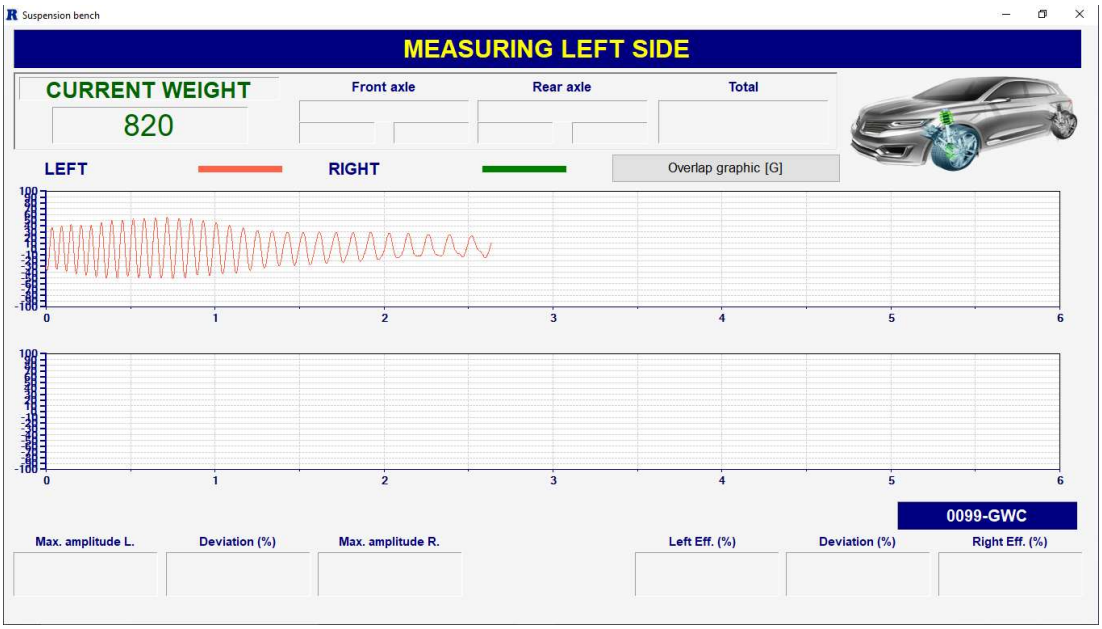


154 Suspension bench: Manual mode - Weight taken

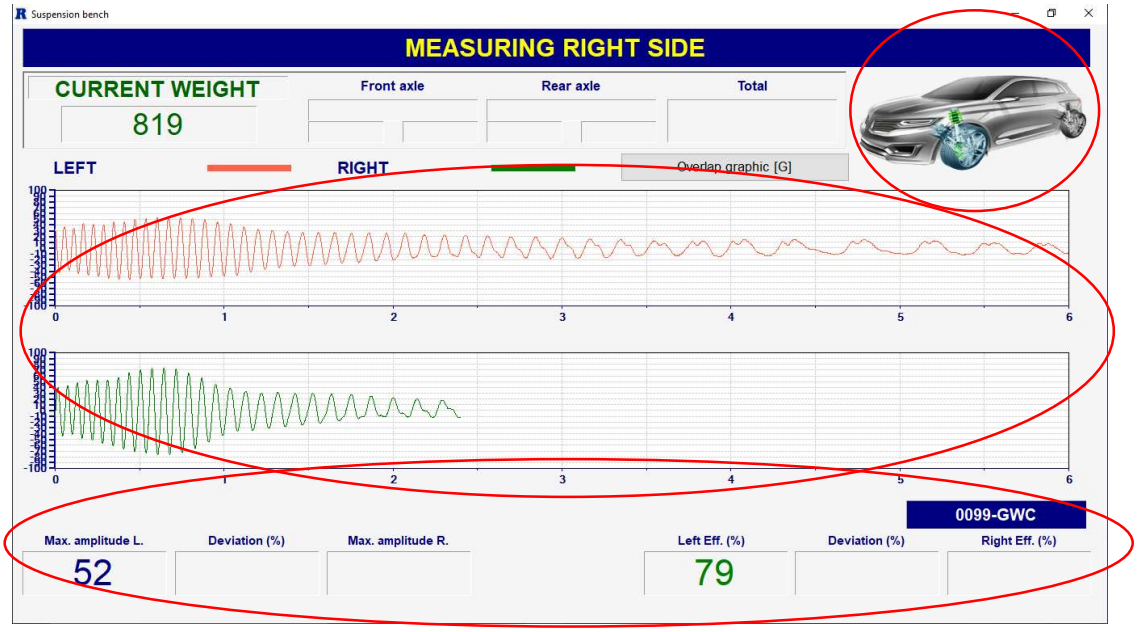
5) The motors will start automatically when the suspension bench detects weight (presence of the vehicle), so that the equipment will proceed with the measurement in a certain order, first the left wheel and then the right wheel.



155 Suspension bench: Manual mode - Left motor start

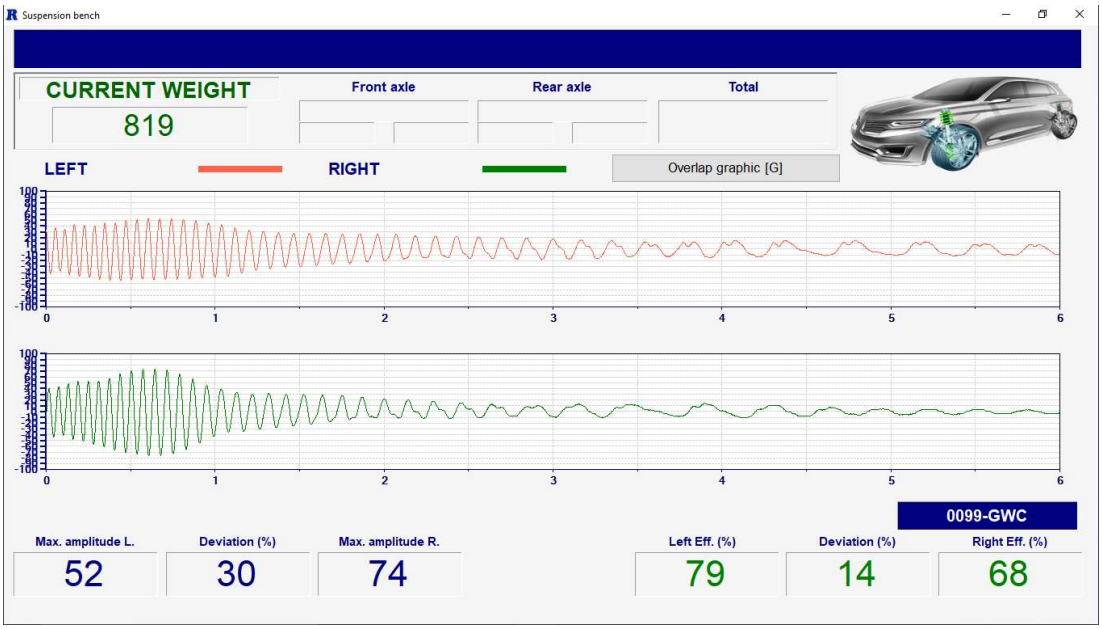


156 Suspension bench: Manual mode - Left wheel / front axle measurement



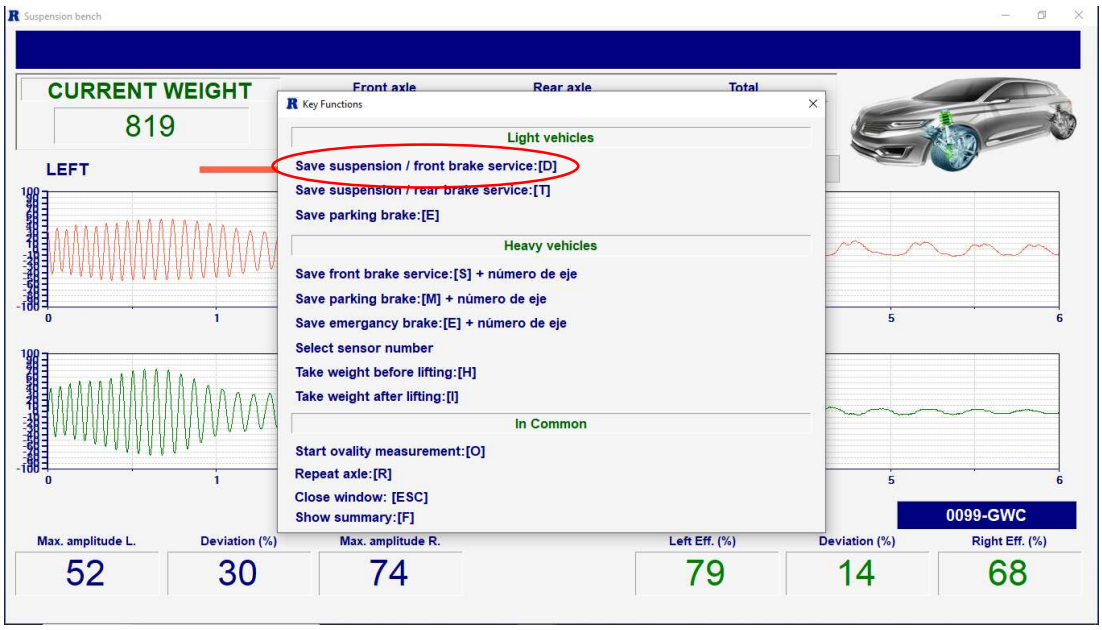
157 Suspension bench: Manual mode - Right wheel / front axle measurement

6) Once the motors stop and the application draws the graphs, the application will inform you with numerical data of the suspension status of the vehicle you have tested.

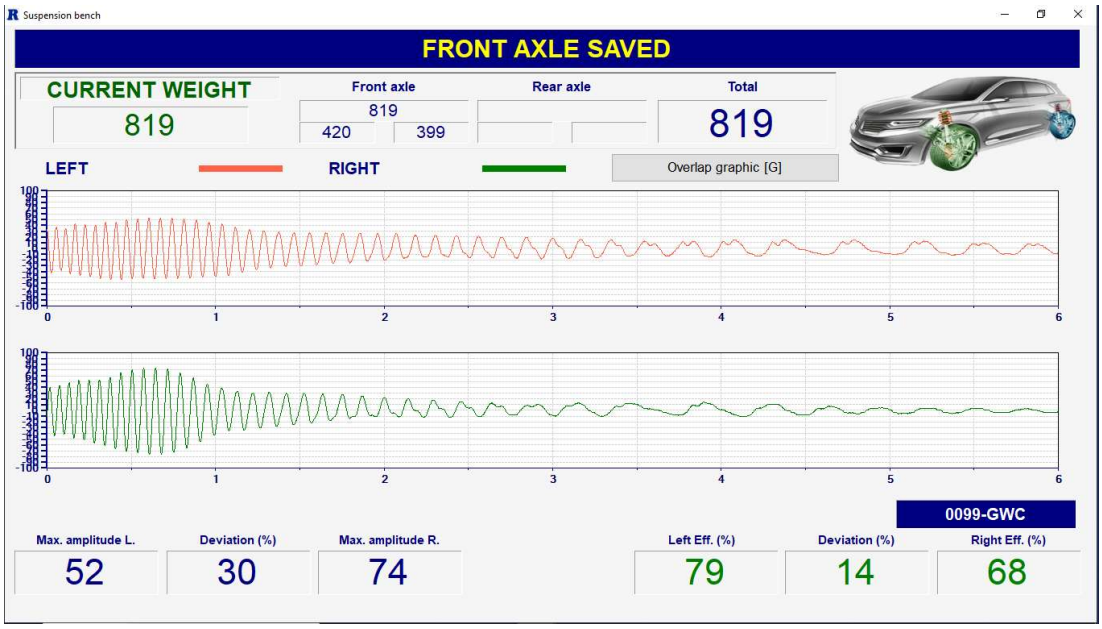


158 Suspension bench: Manual mode - Test results

7) Next, press the 'Ctrl' key, and the help menu will appear, where you can see the key corresponding to the axle to be saved. Press the 'Esc' key to return to the Suspension Bench screen. At this point the test will be saved by pressing the corresponding key, which you have just consulted, on the keyboard.

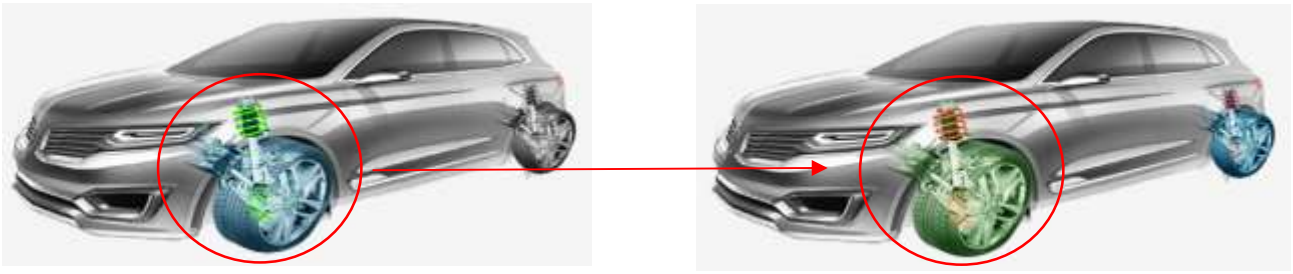


159 Suspension bench: Manual mode - Saving front axle



160 Suspension bench: Manual mode - Front axle saved

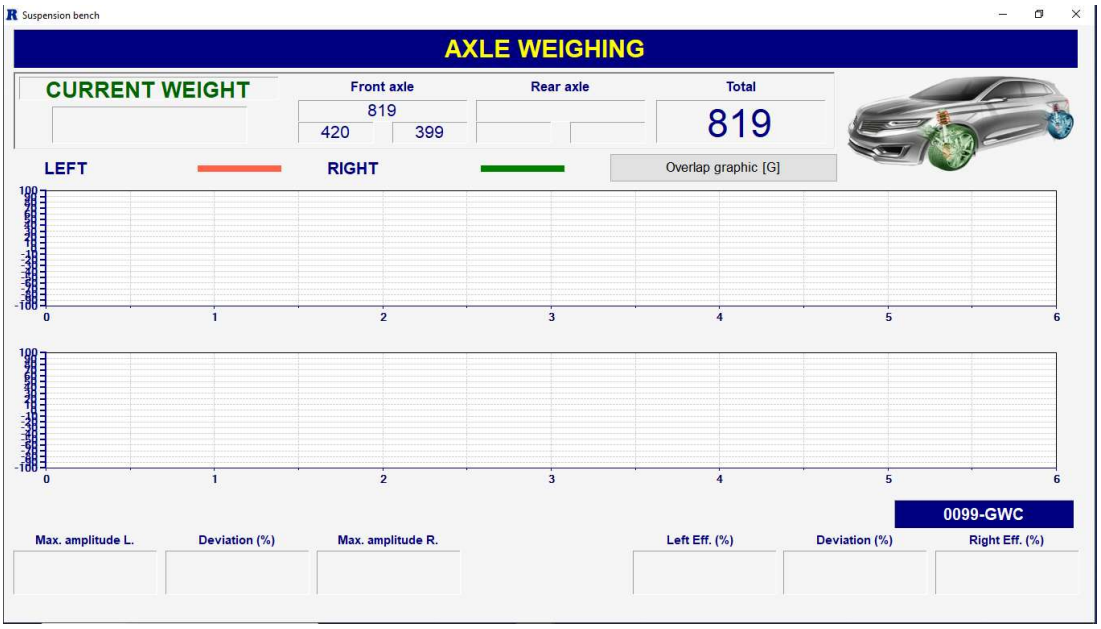
8) Once the front axle test has been saved, you will see the wheel in the image of the vehicle located on the upper right hand change from blue to green to visually inform us of its execution.



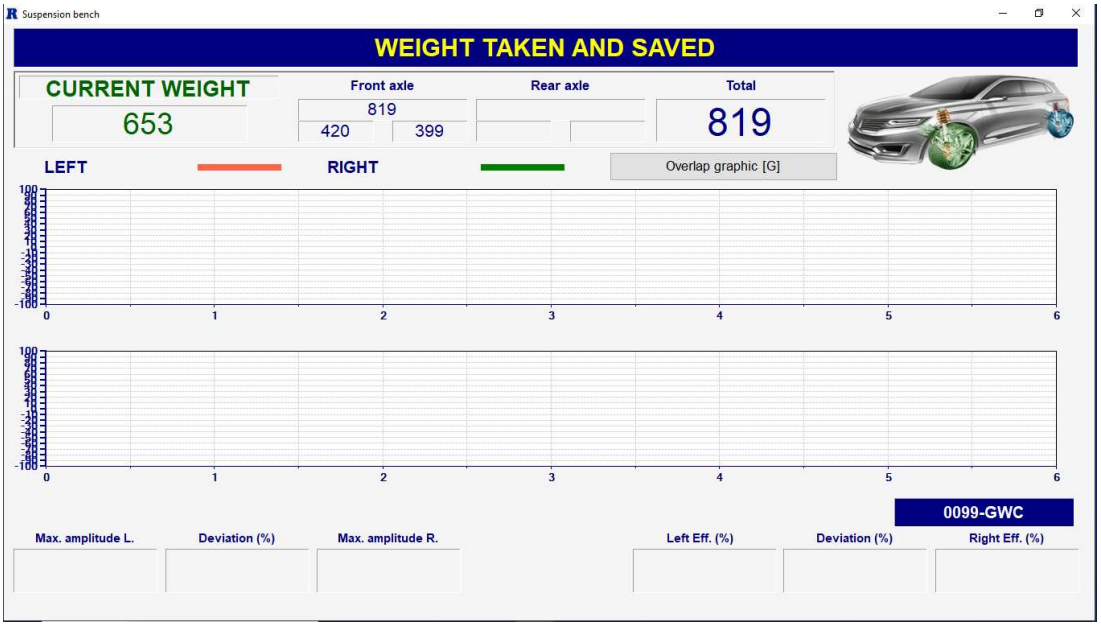
161 Suspension bench: Manual mode - Saved wheel

9) Proceed to remove the axle/vehicle from the bench, then close the screen of the Suspension Bench application and introduce the rear axle to take its measurement (At this point you can introduce again the front axle if it is necessary to repeat the measurement, returning to the starting point: 5.2.1.1 Functioning).

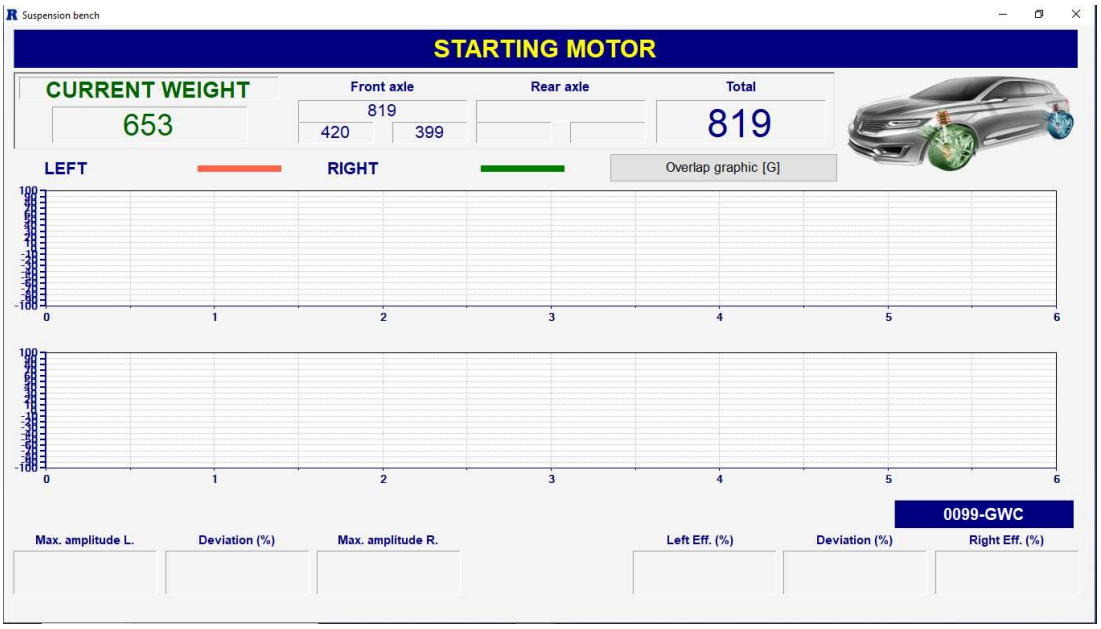
10) The process to follow for the measurement of the rear axle will be the same you have seen previously from point 3 to point 8 both inclusive, with the only exception that, when saving the axle test, you will have to select the rear axle instead of the front one. In the images below you can see this process:



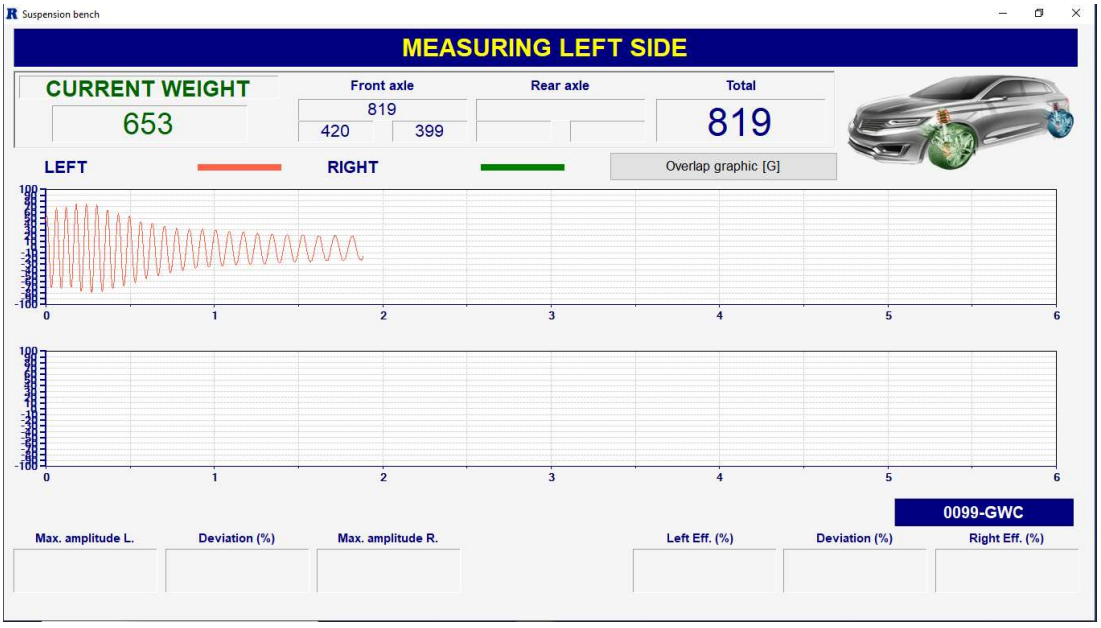
162 Suspension bench: Axle weighing



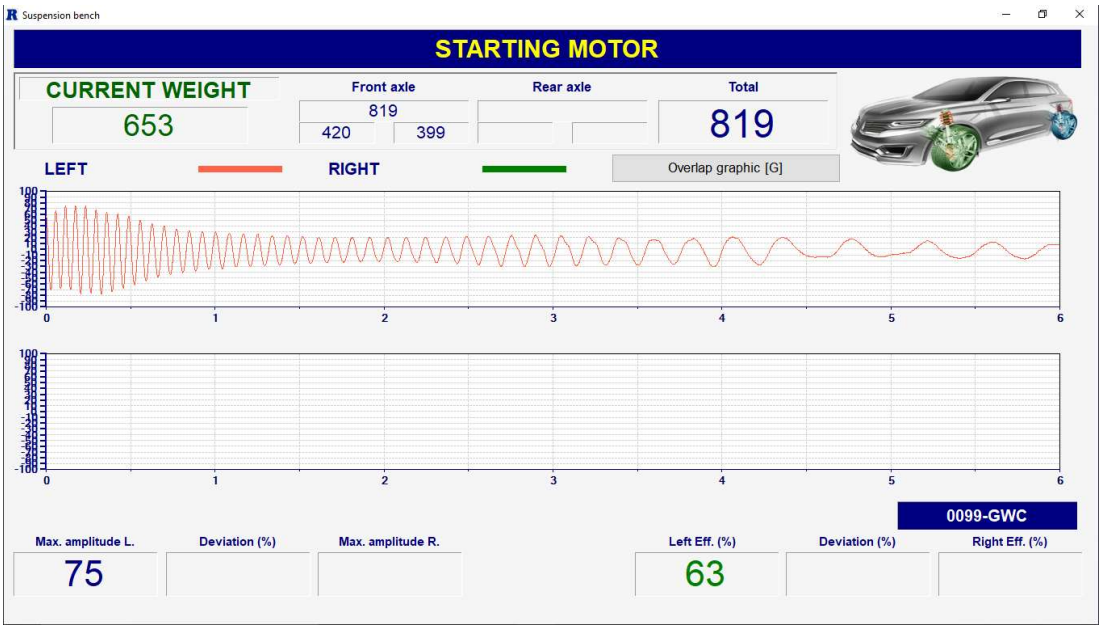
163 Suspension bench: Weight taken



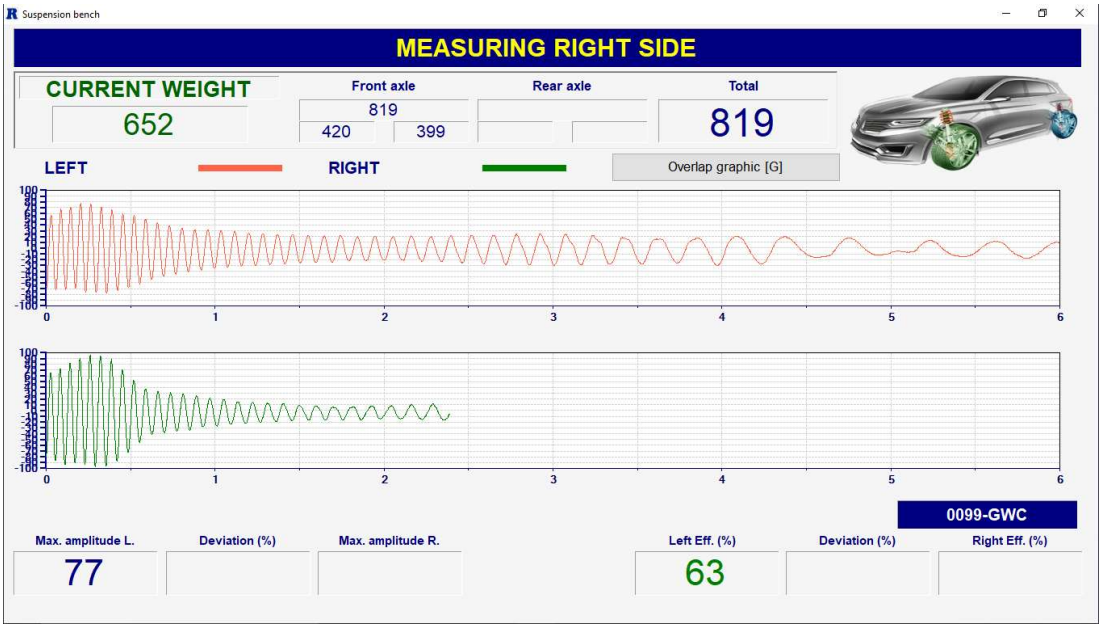
164 Suspension bench: Left wheel measurement



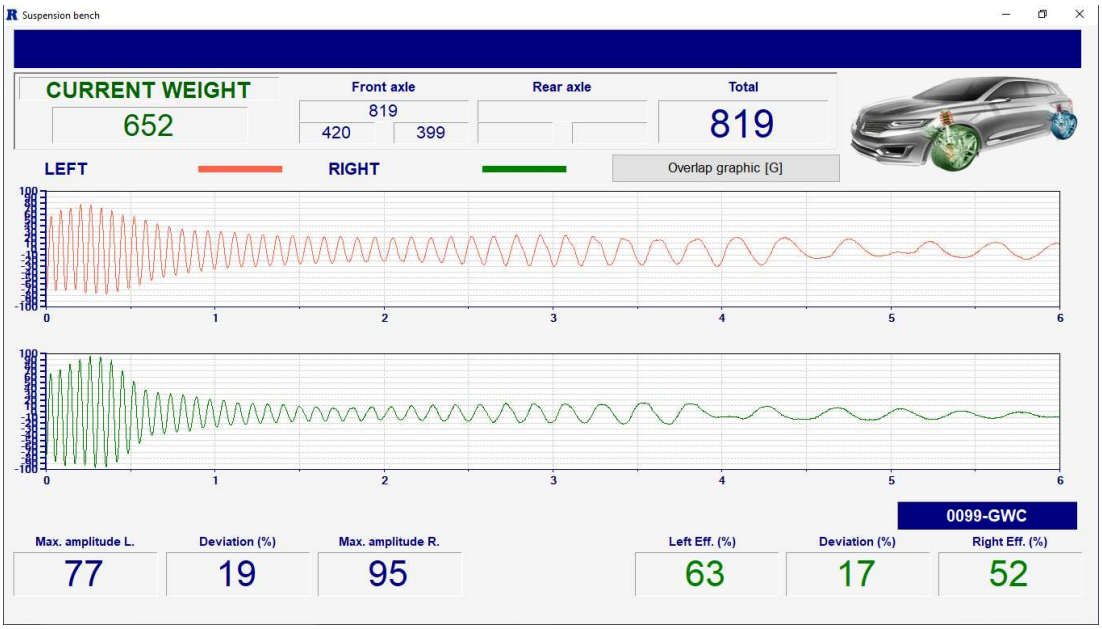
165 Suspension bench: Left wheel measurement



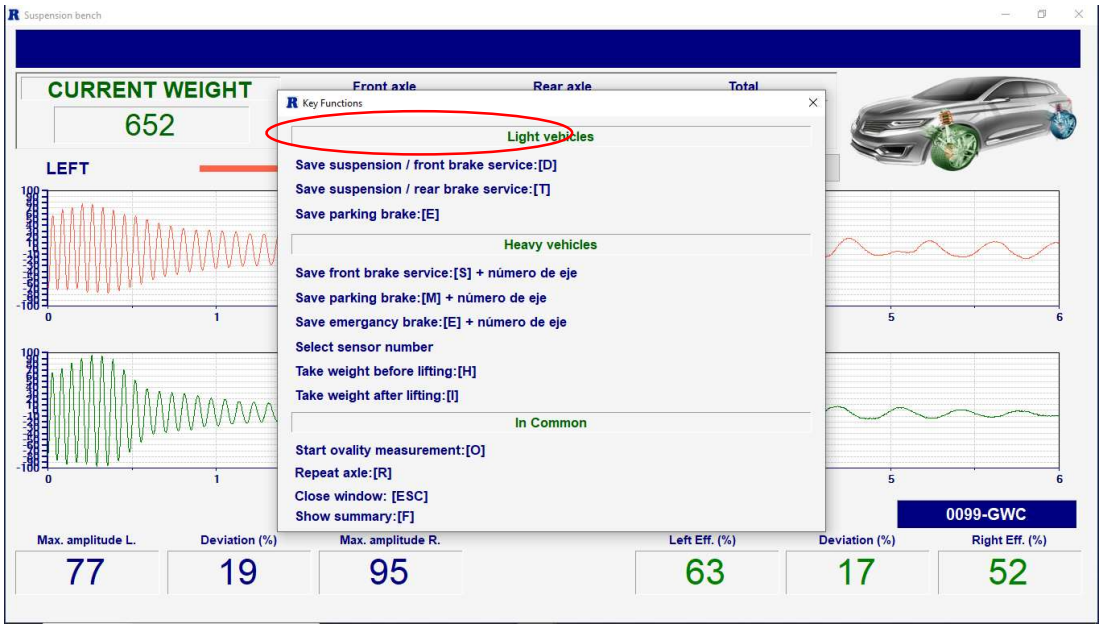
166 Suspension bench: Right motor start



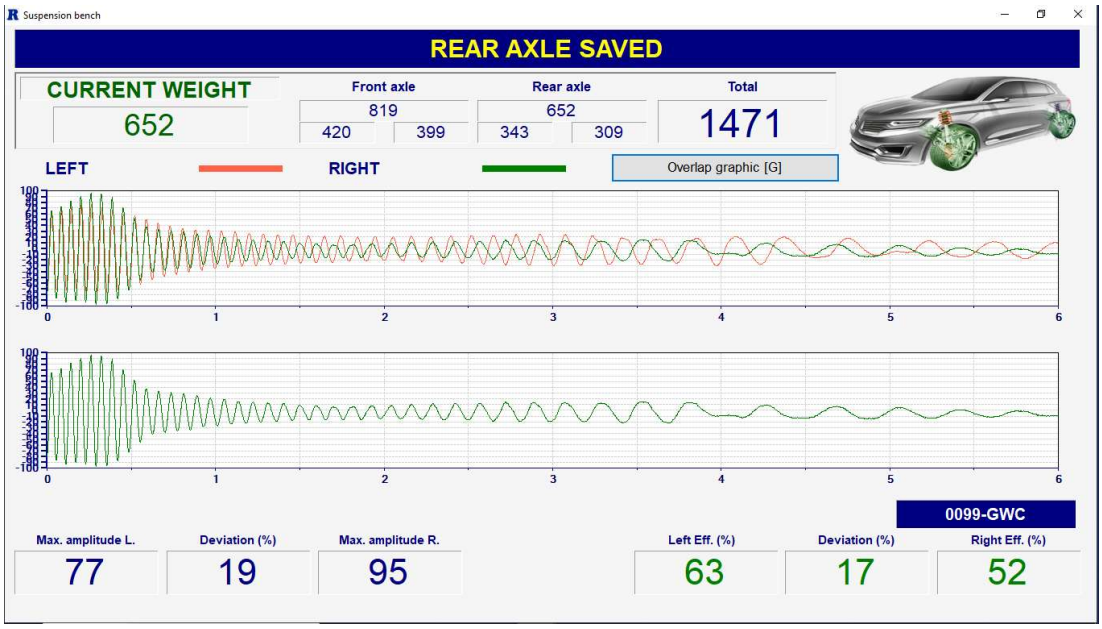
167 Suspension bench: Right wheel mesaurement



168 Suspension bench: Measurement finished



169 Suspension bench: Saving rear axle

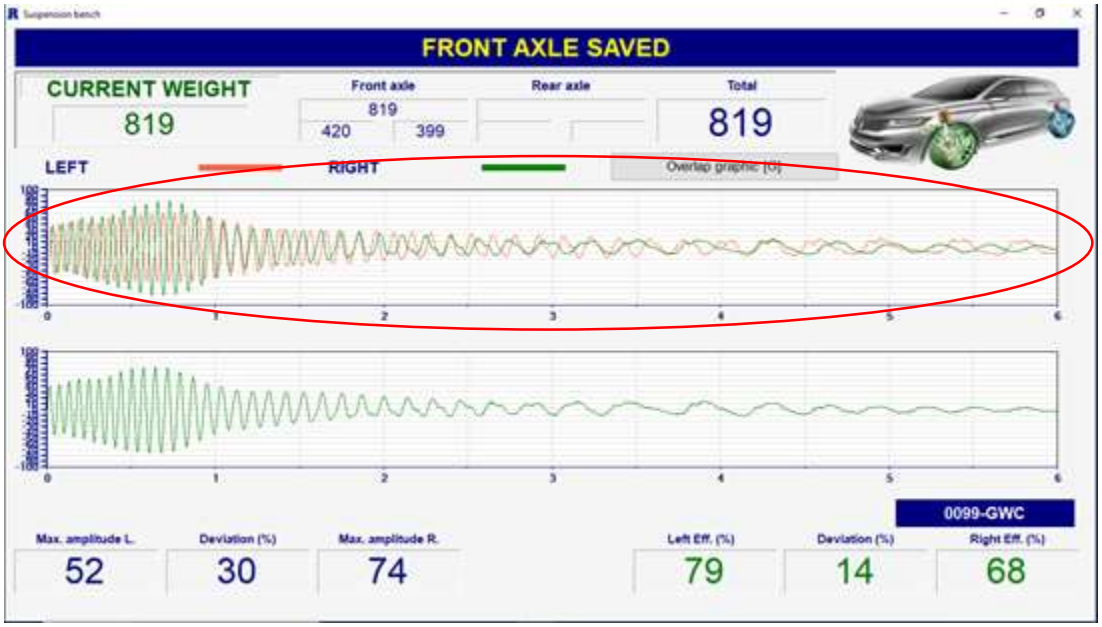


170 Suspension bench: Rear axle saved

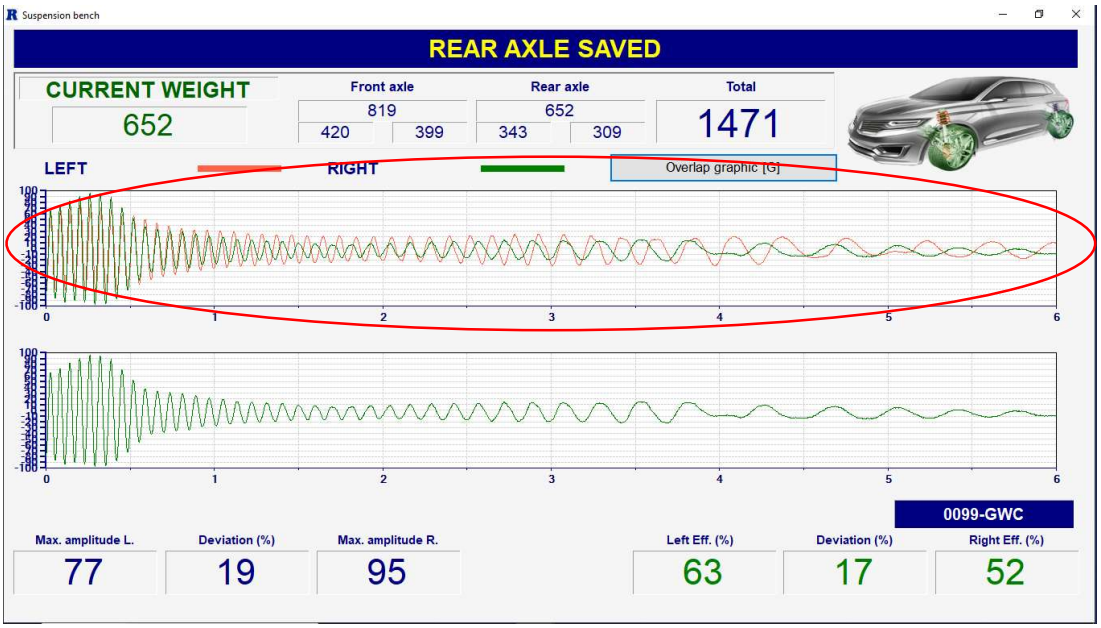
11) At this point you will have completed the test on the vehicle.

5.2.2 Superimpose graph

Once the two wheels have been measured, you can compare the measurement in a quick and very visual way. To do this, click on the Overlap graphic [G] icon with the mouse. This way you can observe possible defects, behaviour or other problems in the vehicle's suspension.



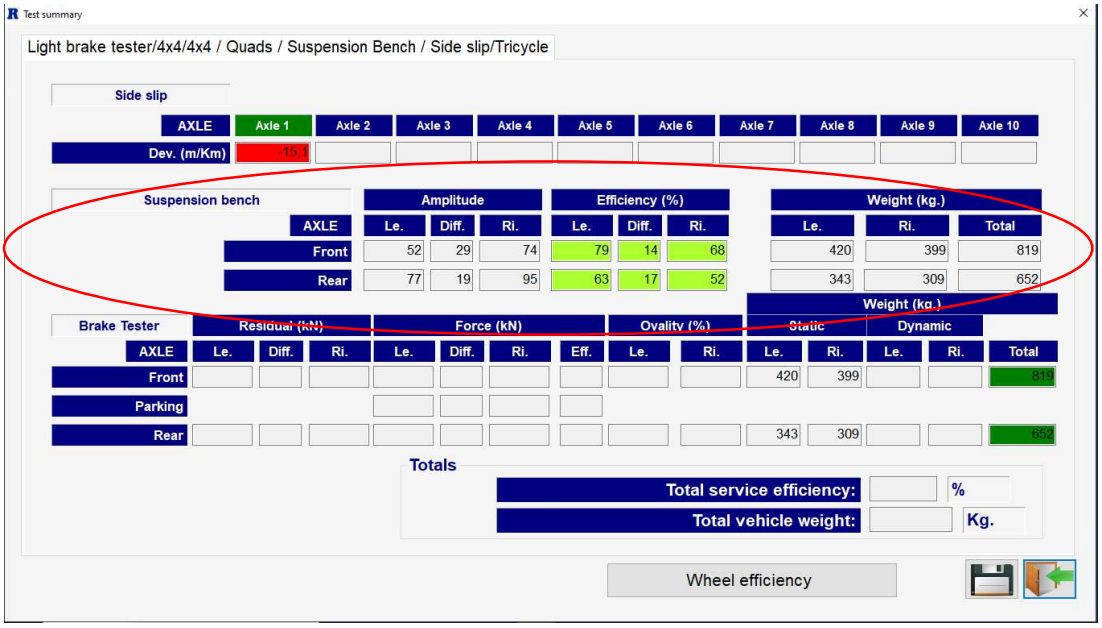
171 Suspension bench: Superimpose front axle



172 Suspension bench: Superimpose rear axle

5.2.3 Suspension summary

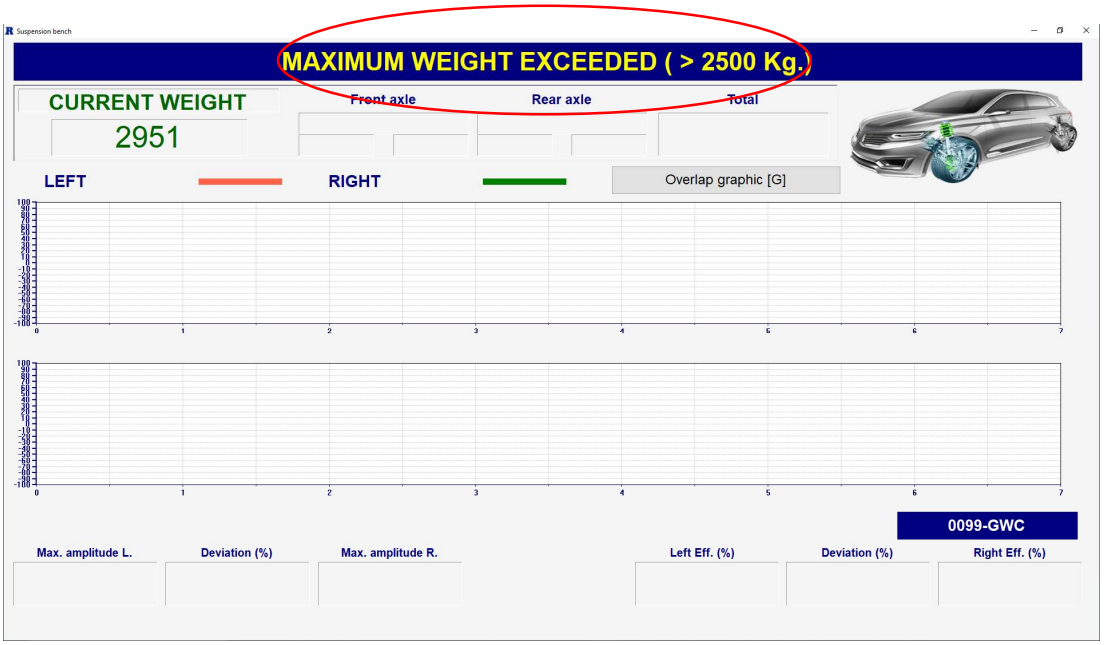
If the saving operation is not carried out, the measured values will not be shown on the 'Summary' of the last vehicle, nor on the 'Report' of the last vehicle tested. This operation does not automatically save the test in any database, there is a specific operation for this purpose.



173 Manual mode summary

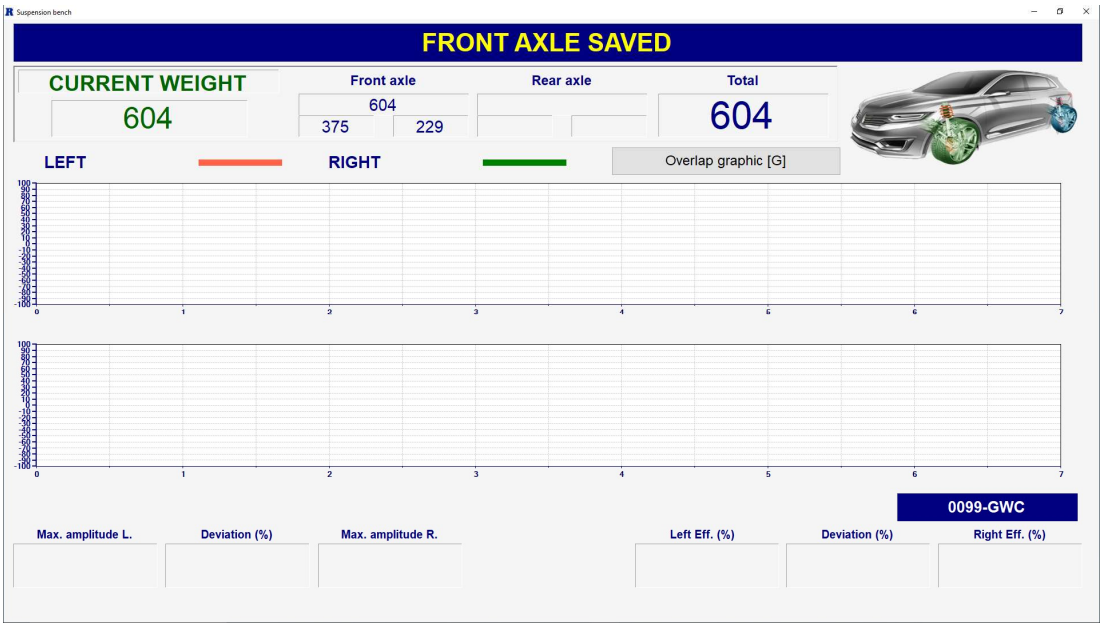
5.2.4 Possible test behaviours

1) If the weight of the axle of the vehicle to be tested exceeds the established limit, a message will appear informing you that you have exceeded the maximum weight, for which you will not be able to carry out the test unless you modify the configuration. (Important: The chassis data sheet includes a section with the maximum weight for carrying out the test).



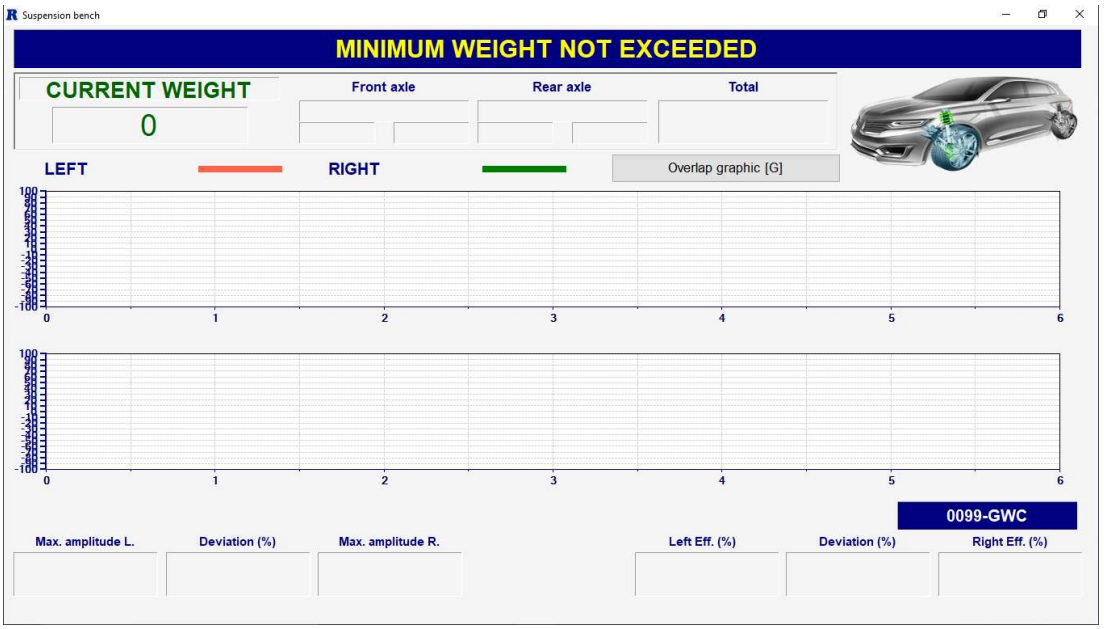
73 Suspension bench: Maximum weight exceeded

2) If 'Weight only' is selected in the configuration, when the vehicle is inserted in the suspension bench, it will take the weight without carrying out the test. Next, introduce the axle in the brake tester to perform the test, having stored the weight for the data calculation. Example: save front axle weight:



74 Suspension bench: Only front axle weighed

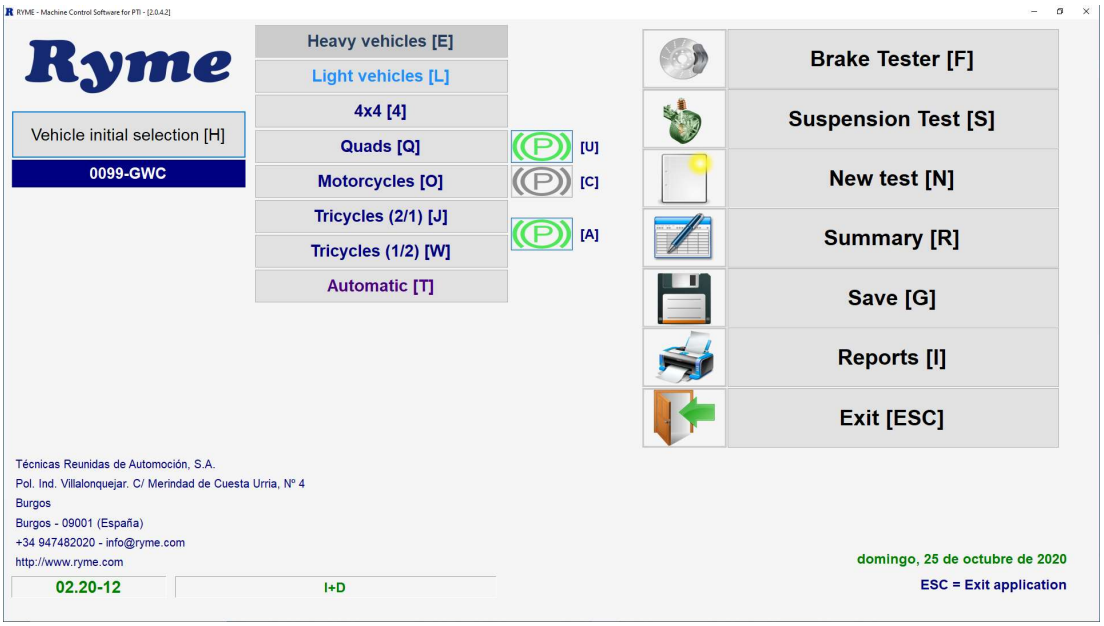
3) For security reasons, if the weight entered is less than that stipulated in the configuration, the display will indicate this with a message.



176 Suspension bench: Minimum weight not exceeded

5.3 Suspension bench: Automatic mode

To test a light vehicle in automatic mode, open the application RYME_PCE.exe,



75 Main menu

Once opened, you have to make sure that you have configured the automatic mode for light vehicles (by default this is always pre-selected):

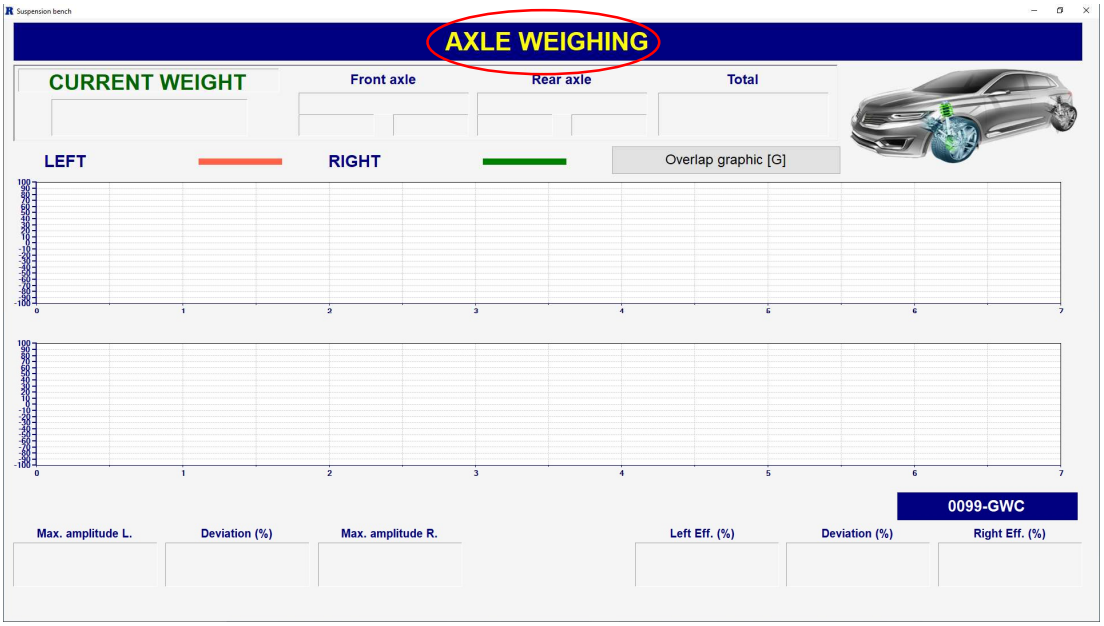
768 Main menu

5.3.1.1 Functioning

In this mode, the system guides the technician during the execution of the test and automatically saves the results, informing you at all times through messages of the actions taken.

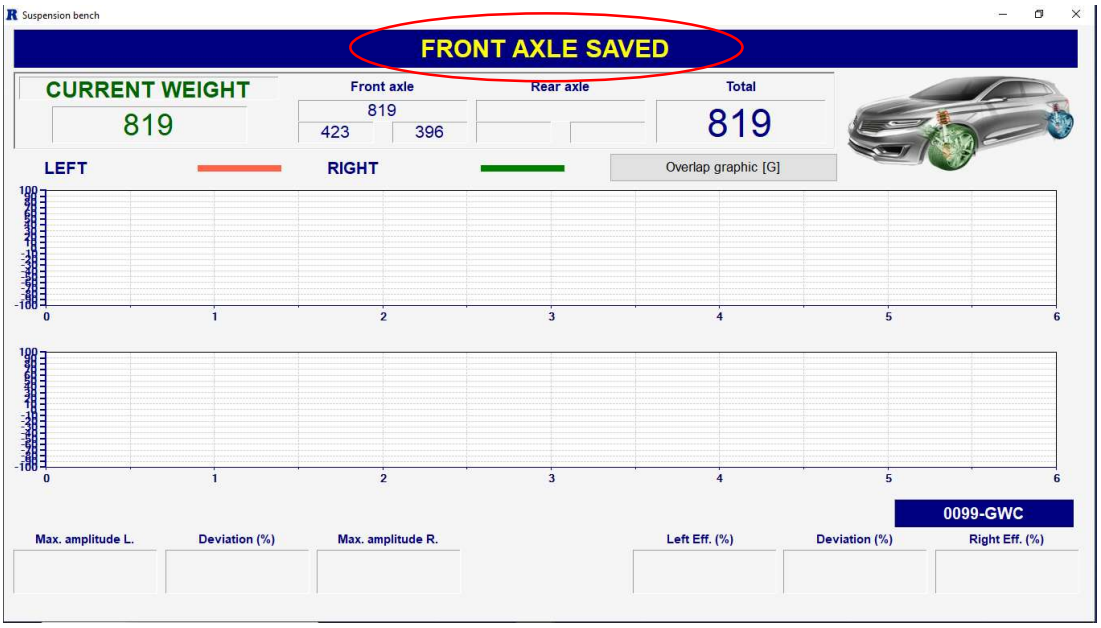
The procedure will be as follows:

1) Introduce the vehicle into the Suspension Bench (front axle first). The application will automatically, if you exceed the established minimum weight, start to run the Suspension Bench display and perform the test on the vehicle.
2) A message will then appear at the top of the screen indicating that the weight is being taken - 'AXLE WEIGHING':



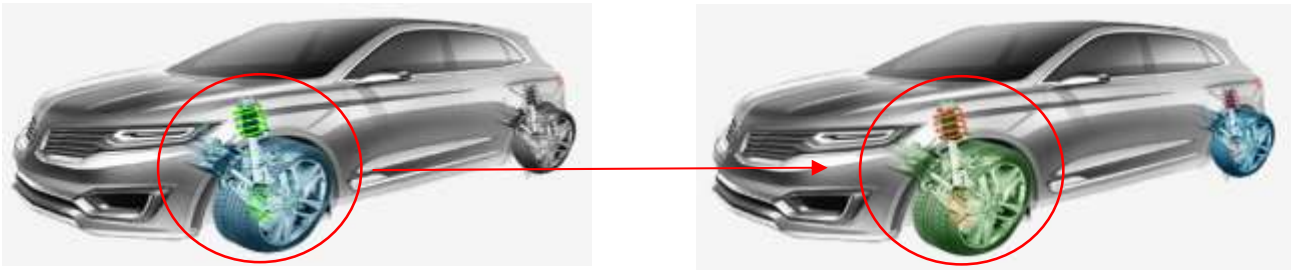
77 Suspension bench: Automatic mode - Weighing front axle

3) The display will show the current weight of the axle entered and the weight per wheel of the axle.



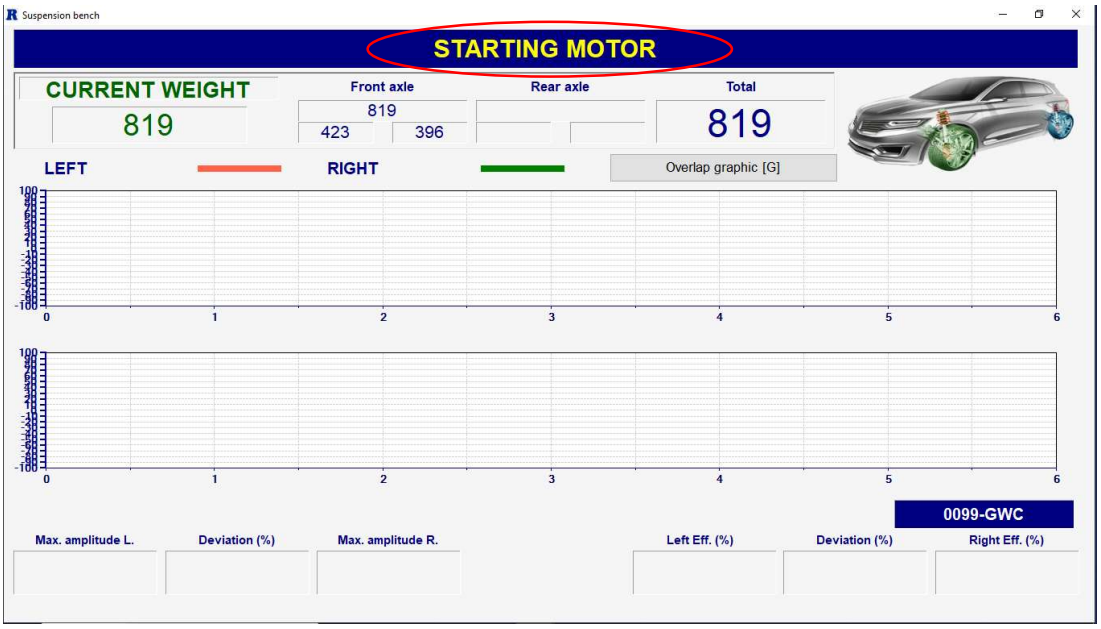
78 Suspension bench: Automatic mode - Front axle weight saved

4) Once the test of the front axle has been saved, you can observe in the wheel of the image of the vehicle located on the upper right side the change of colour from blue to green to visually inform you of its execution.



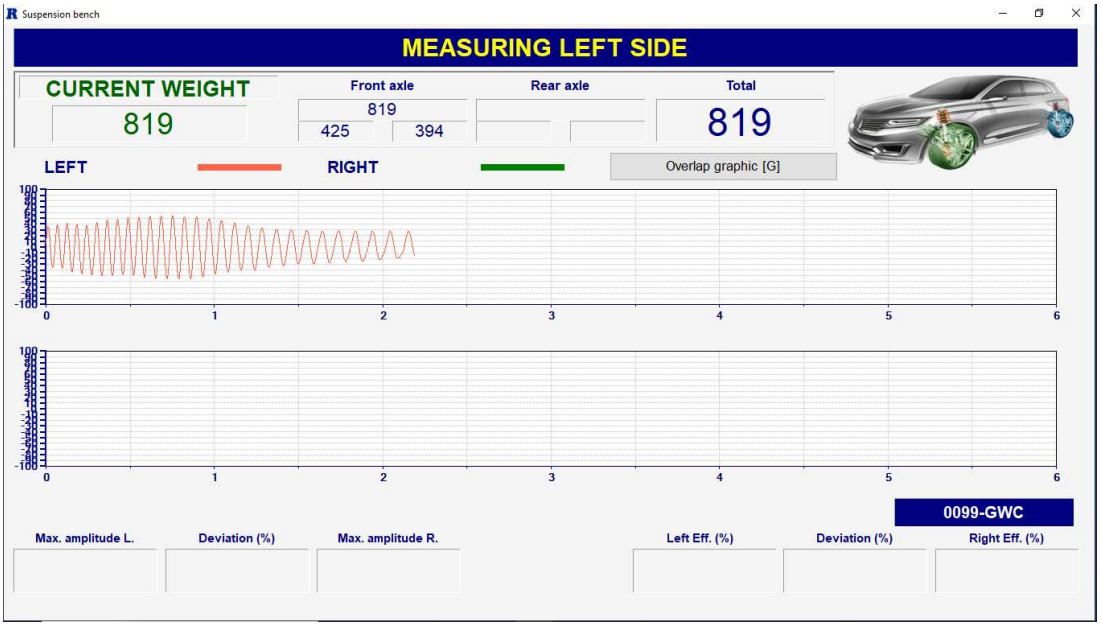
79 Suspension bench: Automatic mode - Saved wheel

5) Then, the left motor will be automatically activated after a few seconds, indicated by the message on the screen: 'Starting left motor'. This will shake for a set time, then turn off and the application will start the taking of measurements.



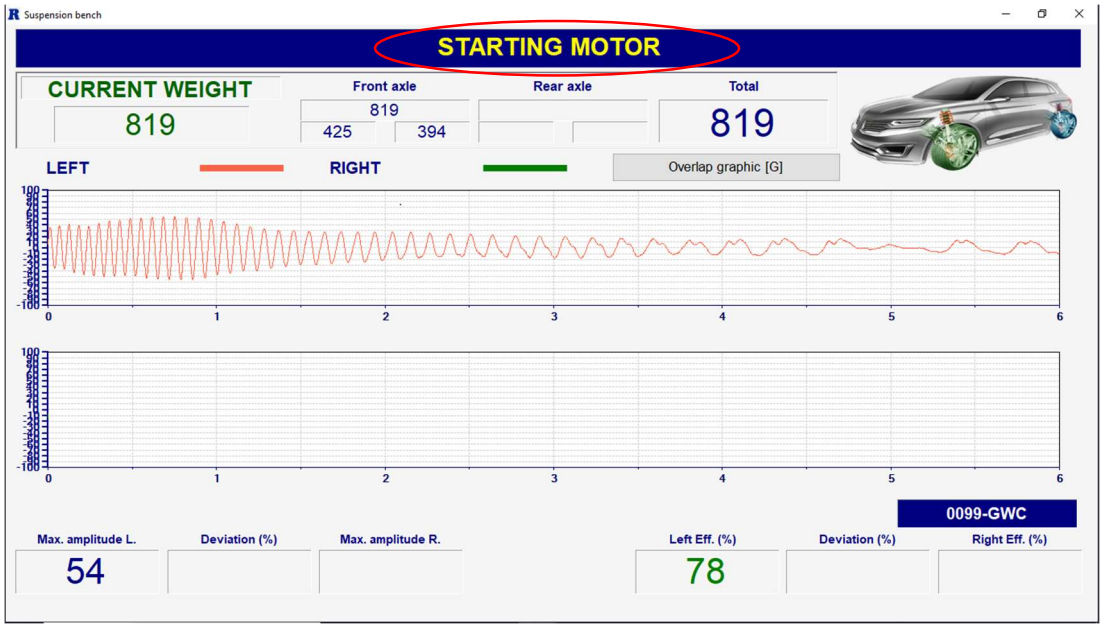
80 Suspension bench: Automatic mode - Starting left motor / front axle

6) When the motor is turned off, the application will start taking data for the creation of the graphs of the suspension test (left side). At the end of the test of each wheel, the program reflects on the screen: the complete graph, the maximum amplitude, and the efficiency, as a percentage.



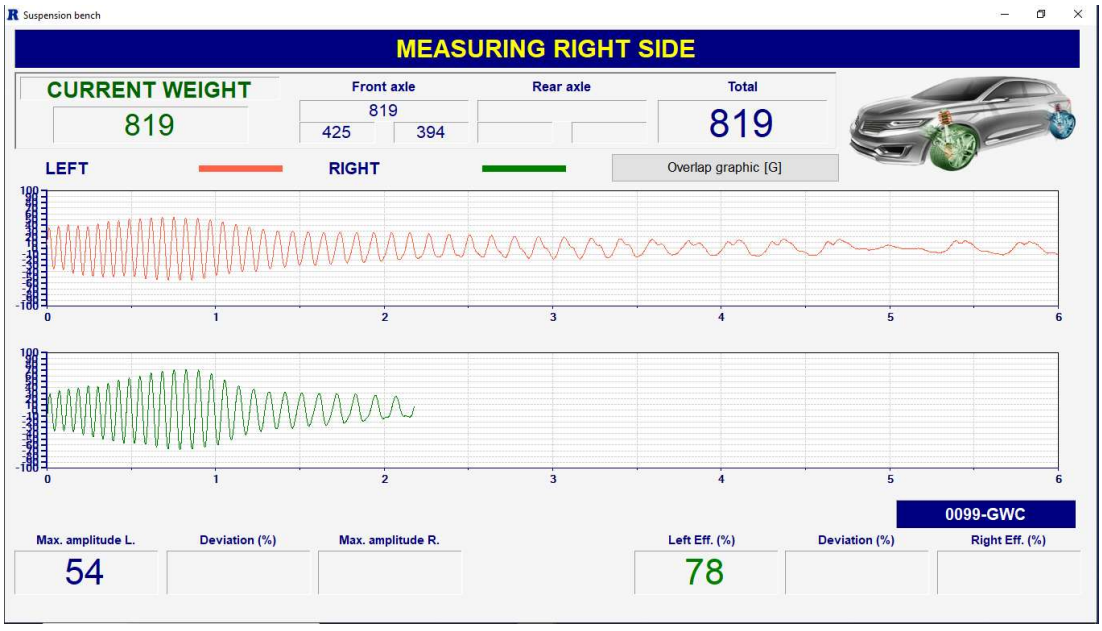
81 Suspension bench: Automatic mode - Left side / front axle measurement

7) Once the left wheel has been evaluated, the right motor will be automatically activated. The right motor will be stopped at a configurable time and then the data collection will start in order to draw the graph.



82 Suspension bench: Automatic mode - Right motor / front axle start

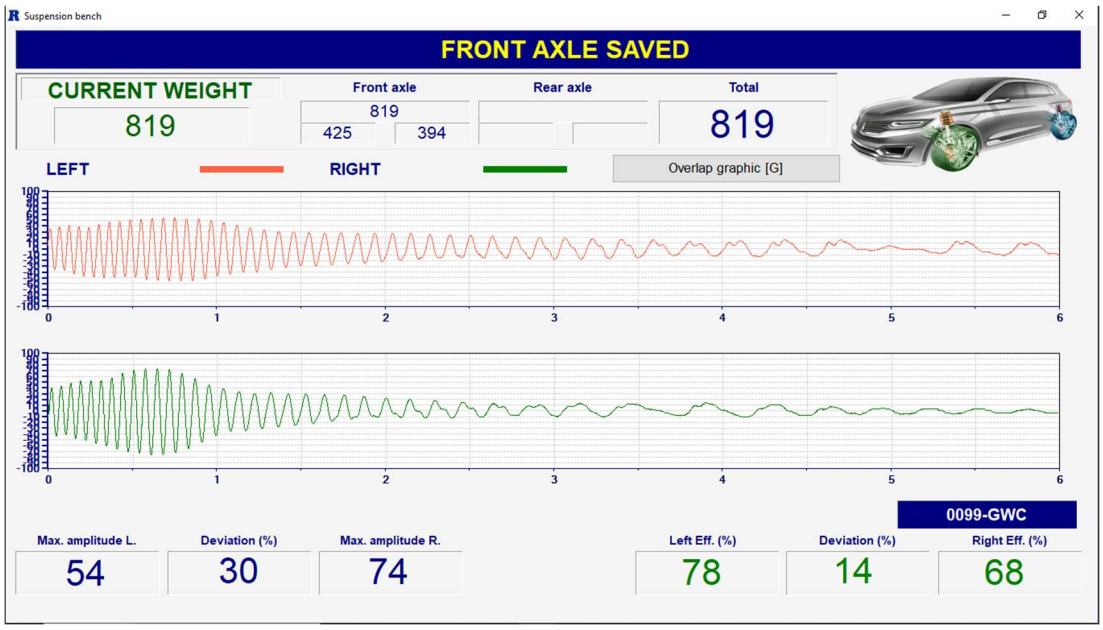
8) The Suspension Bench program then takes all the necessary data to perform the calculations (right side).



83 Suspension bench: Automatic mode - Measuring right side / front axle

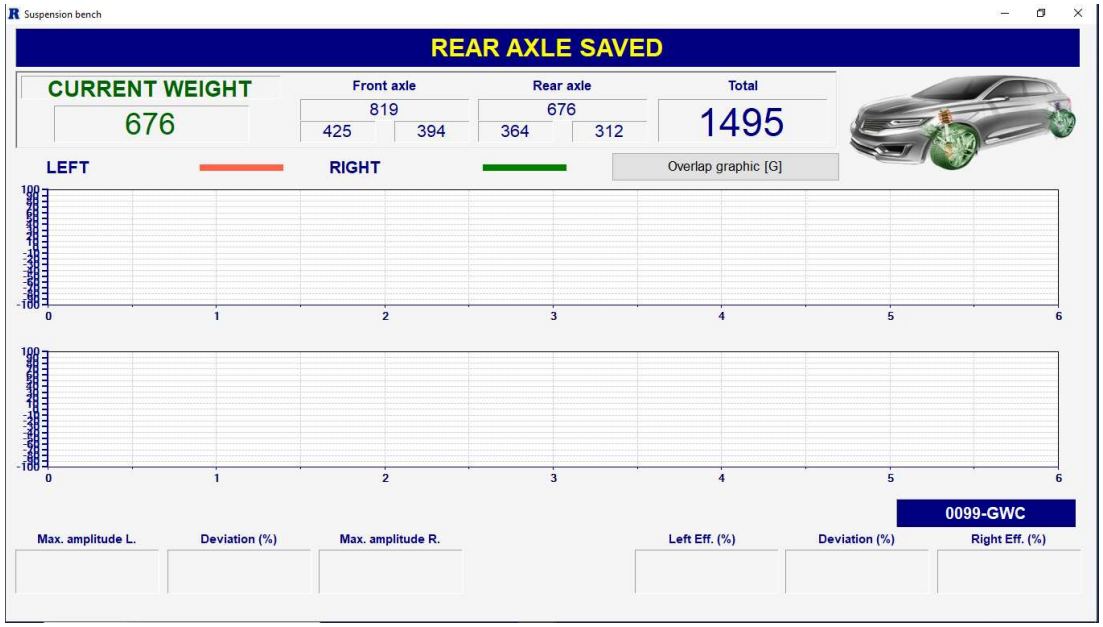
9) At the bottom of the screen you can see the different data calculated from the test, such as

- Maximum amplitude of each wheel
- Difference (%) between amplitudes and efficiencies
- Efficiency (%) of each wheel

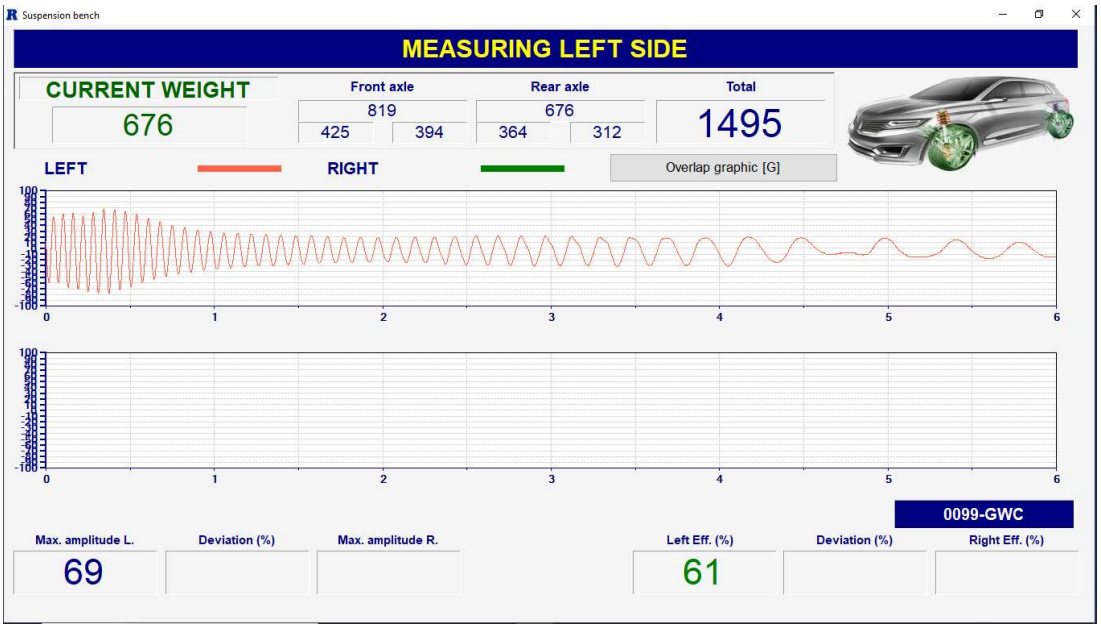


84 Suspension bench: Automatic mode - Front axle test finished

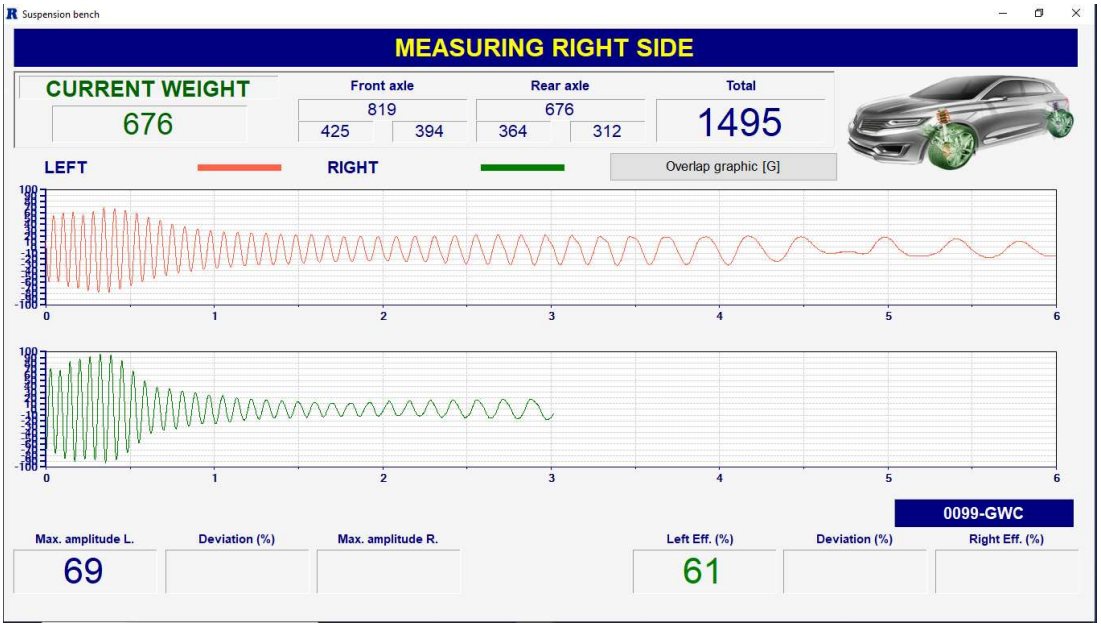
10) For the completion of the test, introduce the rear axle and follow the steps in the same way indicated above from point 1 to 9 inclusive.



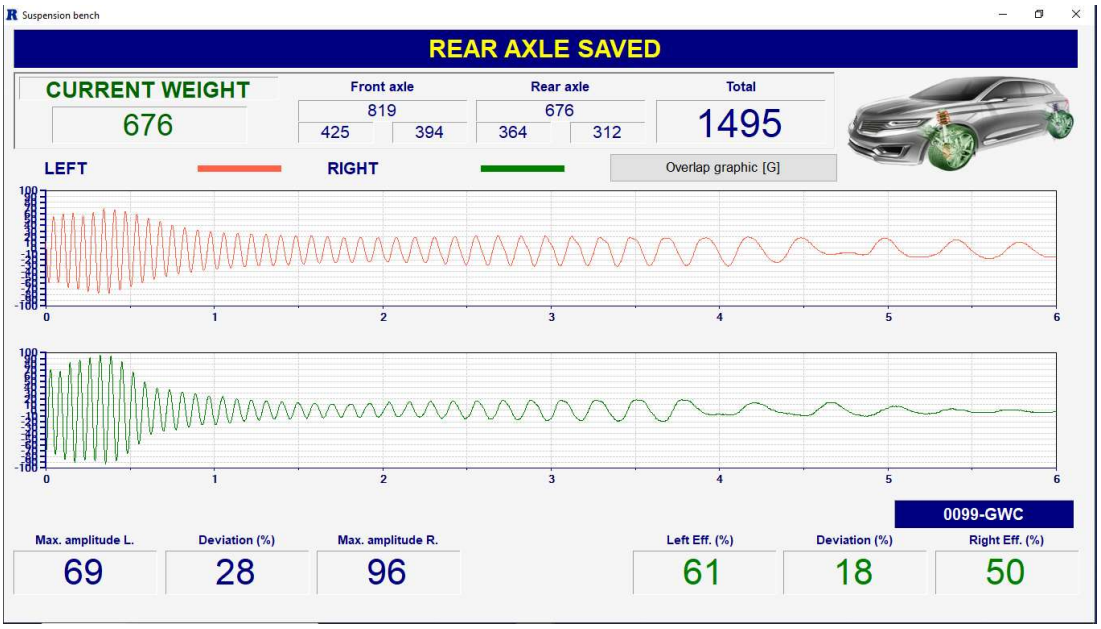
85 Suspension Bench: Automatic mode - Rear axle weight saved



86 Suspension bench: Automatic mode - Measuring left side / rear axle



87 Suspension bench: Automatic mode - Measuring right side / rear axle



88 Suspension bench: Automatic mode - Rear axle test finished

5.3.2 Superimpose graph

Refer to to **¡Error! No se encuentra el origen de la referencia.** Superimpose graph

5.3.3 Possible test behaviours

Refer to **¡Error! No se encuentra el origen de la referencia.** Possible test behaviours

5.3.4 Notes

- The program automatically saves the first axle entering the machine as the front axle and the second axle as the rear axle.
- After measuring one axle, exit the application by pressing 'Esc' or closing the window, and automatically when the next axle is detected, the application will start again to measure and save the other axle.
- For both modes of the suspension bench, automatic and manual, the motors will not start unless the two wheels of the same axle of the inspected vehicle are on the suspension bench.

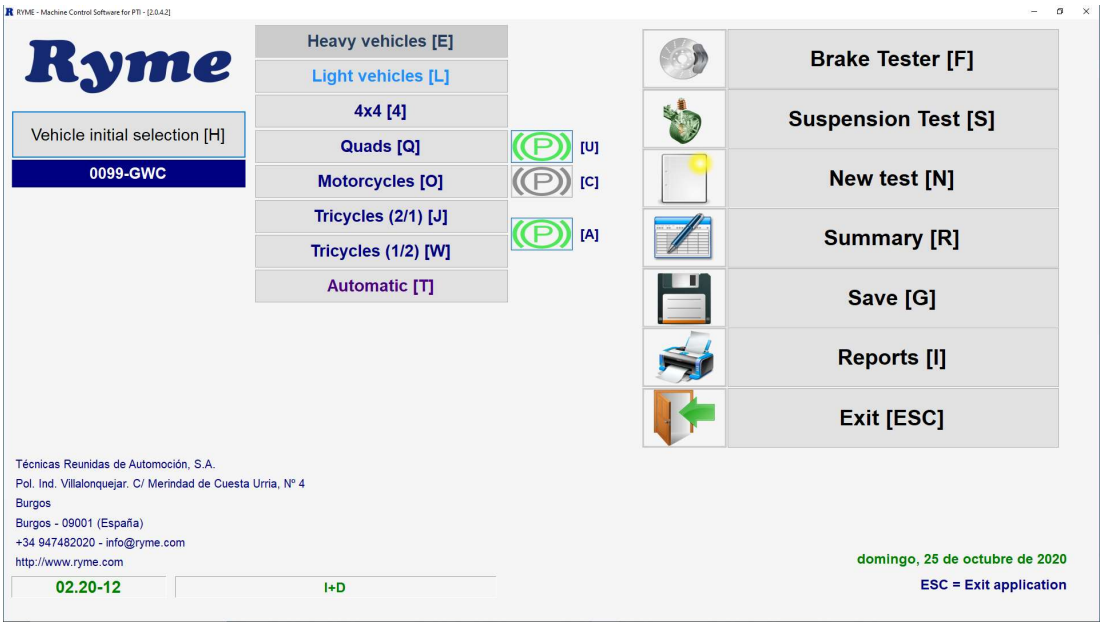
5.4 Exit

To return to the main menu of the application once the test has been carried out, press the 'Esc' key on the keyboard or the corresponding button on the remote control.

6 Side slip tester

6.1 Description of the side slip tester main menu

To perform a test, you must first access the main menu of the program:

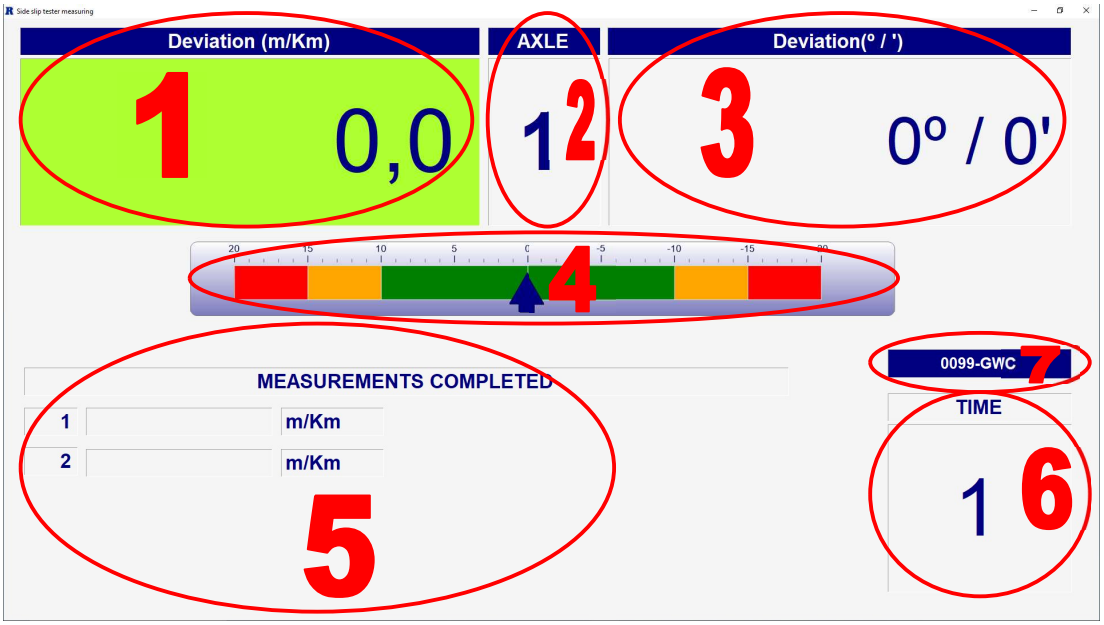


89 Main menu

From which, once a presence is noticed on the side slip tester, the screen corresponding to this equipment will automatically be displayed. The selection of Heavy, Light, 4x4, Quad mode will not affect the performance of the slip tester test.

6.1.1 Display description

On the screen of the side slip tester you can find different sections displaying the information of the test:

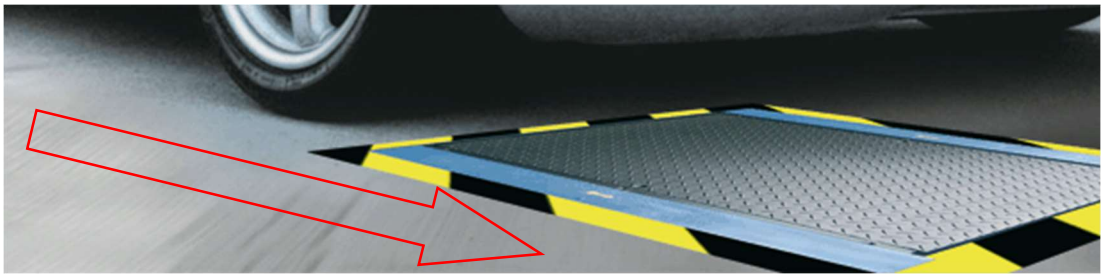


1) Value in m/Km of the deviation of the axle.
2) The number of the axle being tested. This will depend on the number of axles configured previously.
3) Value in degrees and minutes of the deviation.
4) Graphic scale in mm that will inform you of the convergence or divergence of the axle in real time.
5) Value in m/Km of the measurements made on the different axles of the vehicle, number of axles configured previously.
6) Time in seconds configured to take the value of the measurement made on each axle.
7) The tested vehicle's registration number, entered before the test is carried out.

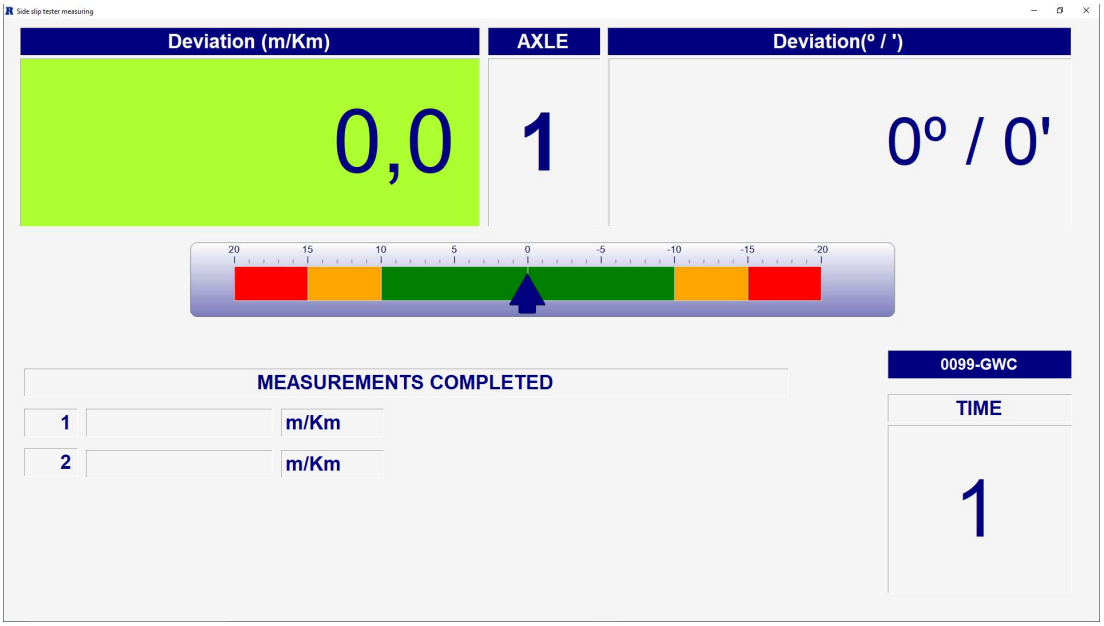
6.1.2 Functioning

The alignment test will be performed automatically when the presence sensors detect a vehicle.

1) The vehicle to be tested will pass over the 1m long slip tester platform, which will automatically detect presence when it is stepped on and take the measurement:

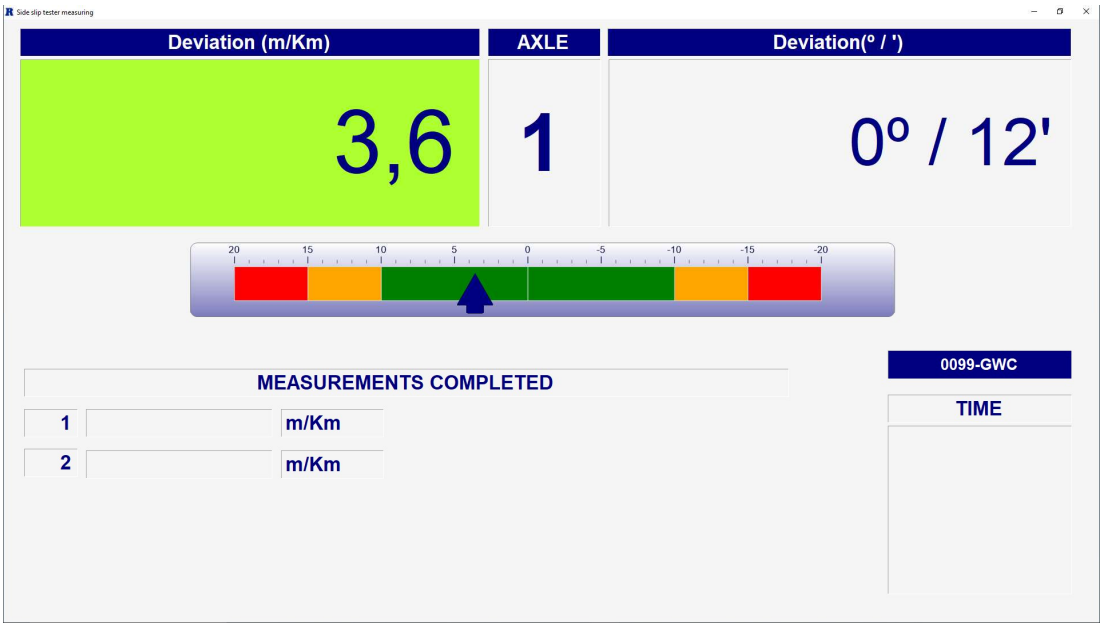


2) Next, the 'Side Slip Tester Measurement' window will appear, where you can see: in the upper part the deviation (in m/Km and °/'), the axle number, the measurements taken depending on the number of axles configured in the lower left part, and in the lower right part, the time configured for this test.



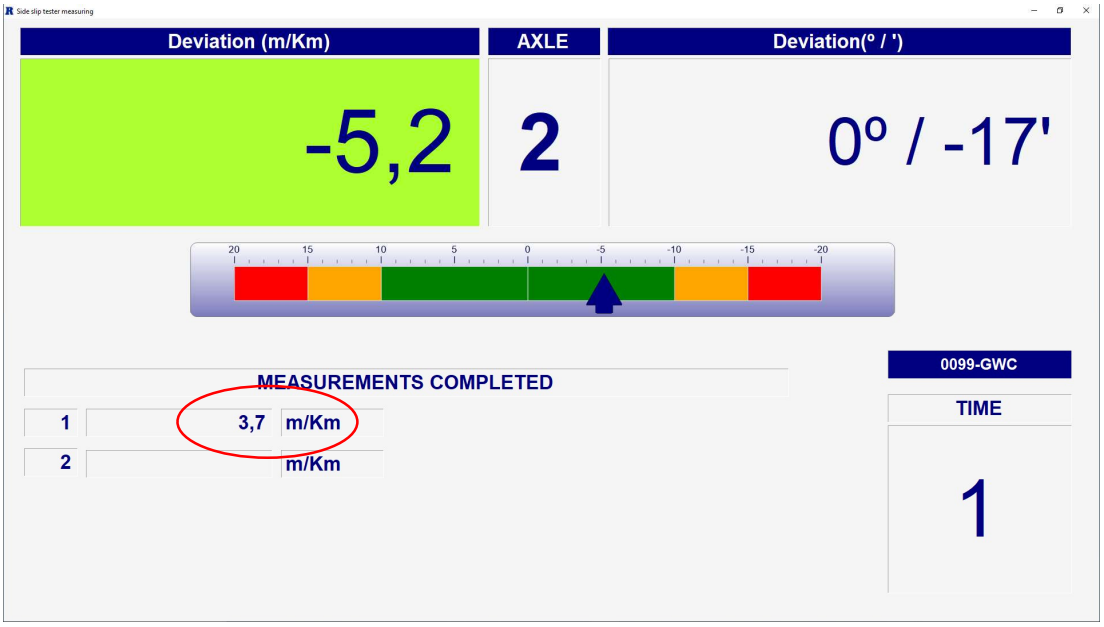
90 Side slip tester: Start of measurement

3) In the central scale, you can observe the instantaneous variation of the deviation in a visual and quick way; the arrow will be placed in the green zone if it is correct, orange will be considered as a slight defect and red if it is a serious defect (These valuations will be configured in the RYME_CalConf application).
4) Next, you can observe the measurement of the first axle:



91 Side slip tester: 'axle 1' measurement

5) Then the program will proceed to the measurement of the second axle, having visual access to the measurement of the previously made axle:



92 Side slip tester: 'axle 2' measurement

6) You will have as many windows and measurements as you have previously configured.

6.1.3 Saving the test

In the case of the side slip tester, the data of the vehicle will be automatically saved.

6.2 Exit

To return to the main menu of the application, you must wait for the configured time for it to close automatically.

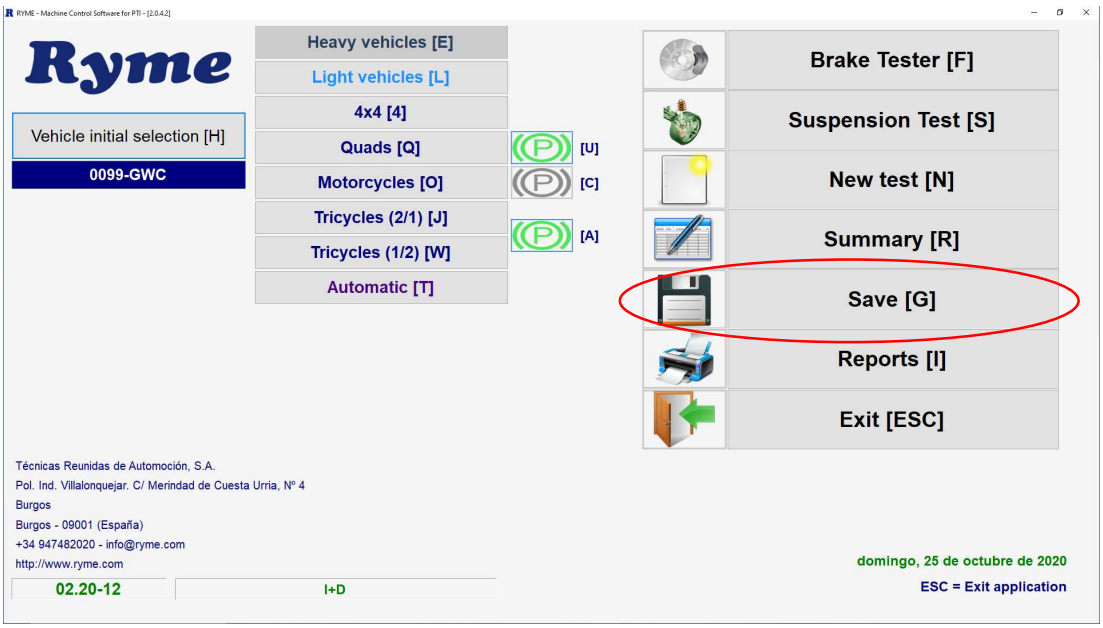
7 Saving the test

This option will allow you to save the test in the database, as long as you have a management system configured.

If the management system is not on the network, the test will be saved in the local database. On the other hand, if it is on a network, the test will be saved in a remote database, the office database.

To save a test in the database (local or remote), once the test has been performed, you can follow two different methods:

- From the main menu of the application
  - By pressing the 'G' key on the keyboard.
  - By clicking on the 'Save' icon with the mouse.
  - By pressing the corresponding key on the remote control.

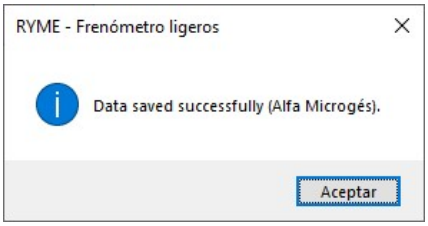


93 Main menu

- From the 'Summary' option:
  - By pressing the 'G' key on the keyboard.
  - By clicking on the 'Save' icon with the mouse.

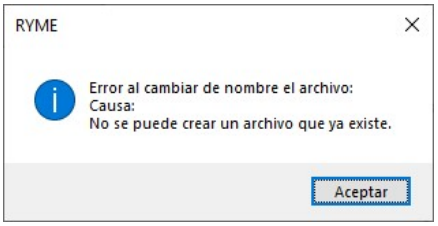
This will depend on the type of management system you have configured, as this will affect the screens that will appear.

In the most common management systems on the market, after saving and sending the data to the system, a window will appear informing you by means of a warning message, confirming that the data have been saved successfully.



94 Data saved correctly

If any problem is found during storage, you will be notified in the same way.



95 Data could not be saved

8 Database

The database is a Microsoft Access type database. This database will be in the own PC or in the office PC if the PCE application is on the network.

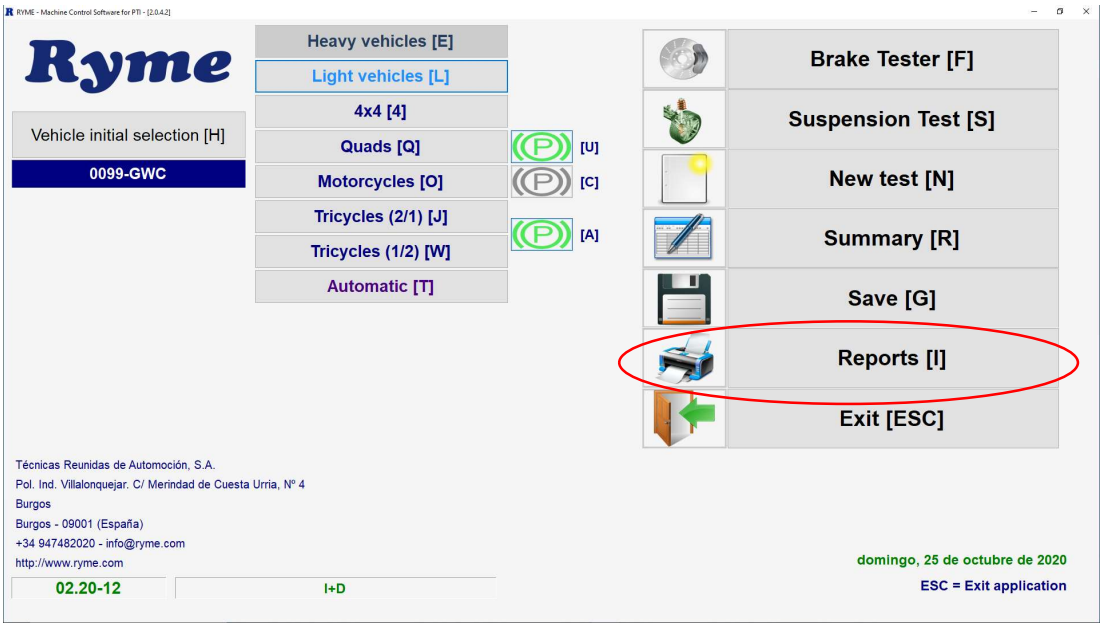
This database is common to all three machines: side slip tester, brake tester and suspension bench. The explanation of the database is given in the RYME_CalConf_PCE manual.

9 Report

You have the possibility of seeing and printing a complete report of the test. For this you must have carried out the test with a registration already saved or generated this at the end of the test.

Once these steps have been carried out, the window can be opened:

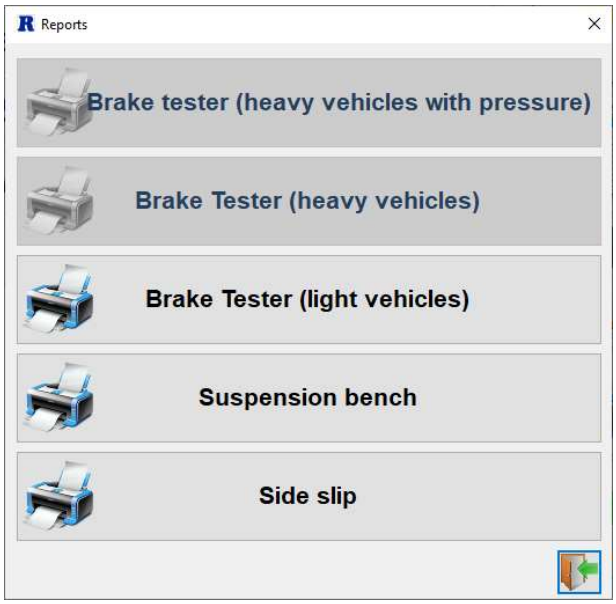
- By pressing the 'I' key on the keyboard.
- By clicking on the 'Save' icon with the mouse.
- By pressing the corresponding key on the remote control.



96 Main menu: Report

9.1 Light vehicles

Select the test that you want to see in the report in case you carry out the light vehicle test:



97 Report selection: Light vehicles

9.2 Light vehicles brake tester report

Técnicas Reunidas de Automoción, S.A.
Pol. Ind. Villalonquejar. C/ Merindad de Cuesta Urria, Nº 4
Burgos
Burgos - 09001
Phone: +34 947482020 Fax: +34 947482021

Lane number : 1 Serial number:

Plate Number: 0099-GWC **Inspector:**
Inspection Nº: 201810070 **Kilometers:**

BRAKE TESTER

Front axle

	Left	Deviation (%)	Right	
Axle weight (kg):	574		403	Total: 977
Ovality:	5		4	
Residual force:	0,10	0	0,10	
Braking force:	3,44	3	3,32	
Efficiency (%):	61		84	Axle: 71

Rear axle

	Left	Deviation (%)	Right	
Axle weight (kg):	357		274	Total: 631
Ovality:	7		4	
Residual force:	0,15	7	0,14	
Braking force:	2,44	27	1,77	
Efficiency (%):	70		66	Axle: 68

Parking

	Left	Deviation (%)	Right	Efficiency (%)
Braking force:	2,50	29	1,77	27

TOTAL	Service efficiency (%): 70 Parking efficiency (%): 27	Weight (kg): 1608

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9.3 Suspension bench report

Técnicas Reunidas de Automoción, S.A.
Pol. Ind. Villalonquejar. C/ Merindad de Cuesta Urria, Nº 4
Burgos
Burgos - 09001
Phone: +34 947482020 Fax: +34 947482021

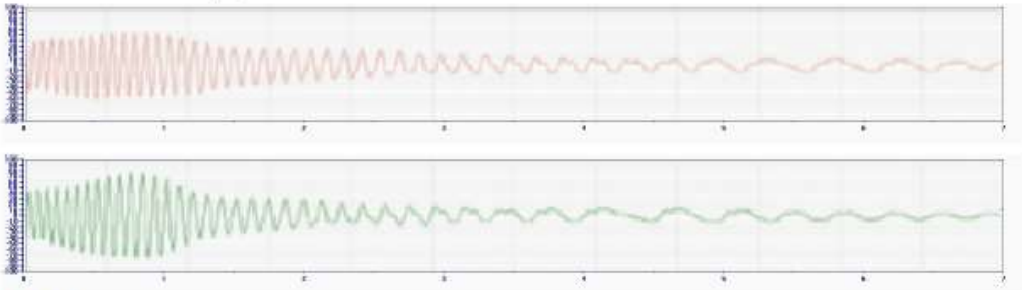
Lane number : 1 Serial number:

Plate Number: 0099-GWC **Inspector:**
Inspection Nº: 201810070 **Kilometers:**

SUSPENSION BENCH

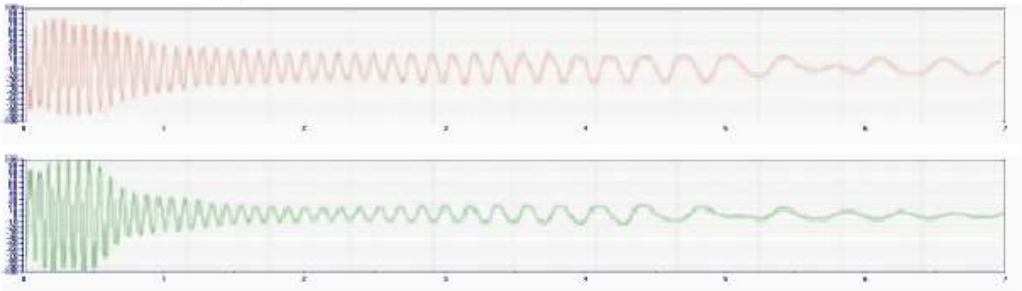
FRONT AXLE

	AXLE	LEFT WHEEL	RIGHT WHEEL
WEIGHT (Kg.)	977	574	403
	LEFT WHEEL	DEVIATION (%)	RIGHT WHEEL
AMPLITUDE	36	1	36
EFFICIENCY (%)	61	5	64



REAR AXLE

	AXLE	LEFT WHEEL	RIGHT WHEEL
WEIGHT (Kg.)	631	357	274
	LEFT WHEEL	DEVIATION (%)	RIGHT WHEEL
AMPLITUDE	42	3	43
EFFICIENCY (%)	59	3	57



TOTAL WEIGHT (Kg.): 1608

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9.4 Light vehicles side slip tester report

Técnicas Reunidas de Automoción, S.A.
Pol. Ind. Villalonquejar. C/ Merindad de Cuesta Urria, N° 4
Burgos
Burgos - 09001
Phone: +34 947482020 Fax: +34 947482021

Lane number : 1 Serial number:

Plate Number: 0099-GWC **Inspector:**
Inspection N°: 201810070 **Kilometers:**

SIDE SLIP TESTER

Axle numbe	Deviation (m/km)	Result	Axle numbe	Deviation (m/km)	Result
1	-0,9	Correcto	6		
2			7		
3			8		
4			9		
5			10		

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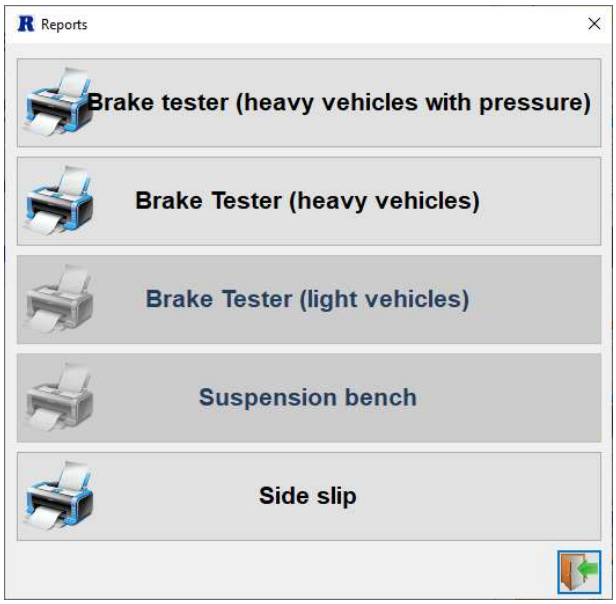
9.5 Heavy vehicles

Select the test that you want to see in the report in case you carry out the heavy vehicle test:



200 Report selection: Heavy vehicles

9.6 Heavy vehicles brake tester report

Técnicas Reunidas de Automoción, S.A.
Pol. Ind. Villalonquejar. C/ Merindad de Cuesta Urria, Nº 4
Burgos
Burgos - 09001
Phone: +34 947482020 Fax: +34 947482021

Lane number : 1 Serial number:

Plate Number: 2020-RYW **Inspector:**
Inspection Nº: 201810070 **Kilometers:**

BRAKE TESTER

Axle	1	2	3	4	5	6	7	8	9	10
Residual										
Left (kN):	0,96	1,75	1,06							
Right (kN):	0,73	2,10	1,49							
Deviation (%):	24	17	29							
Service:										
Left (kN):	11,26	7,54	11,15							
Right (kN):	9,07	6,29	9,72							
Deviation (%):	19	17	13							
Effi. (%):	34	19	41							
Rend. I/D (%):	31 40	18 22	36 48							
Weight Lf. (kg):	3755	4343	3169							
Weight Ri. (kg):	2334	2952	2061							
Oval. Lf. (%):	5	8	6							
Oval. Ri. (%):	2	4	4							
Parking										
Left (kN):	12,21	14,45								
Right (kN):	9,68	11,49								
Deviation (%):	21	20								
Effi. (%):	37	36								
Emergency										
Left (kN):		16,09								
Right (kN):		13,06								
Deviation (%):		19								
Effi. (%):		41								

TOTAL	Service efficiency (%): 30 Parking efficiency (%): 26 Emergency efficiency (%): 16	Weight (kg): 18614

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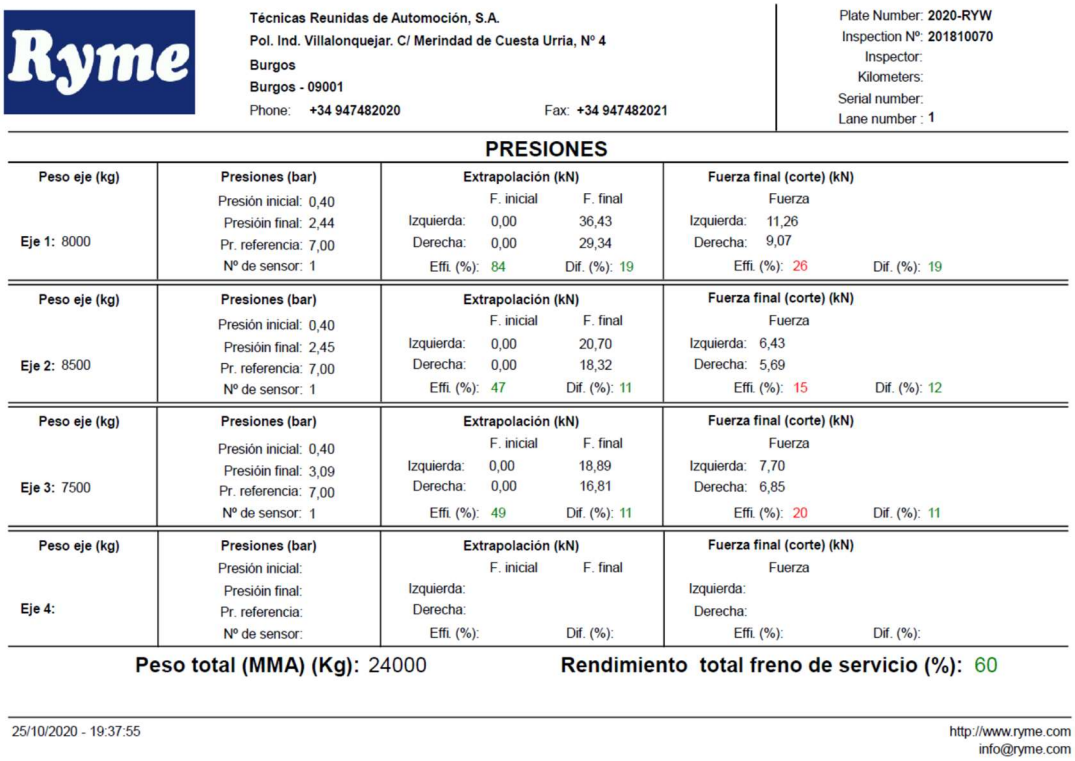
9.1 Heavy vehicles brake tester report with pressures



Técnicas Reunidas de Automoción, S.A.
Pol. Ind. Villalonquejar. C/ Merindad de Cuesta Urria, Nº 4
Burgos
Burgos - 09001
Phone: +34 947482020 Fax: +34 947482021

Plate Number: 2020-RYW
Inspection Nº: 201810070
Inspector:
Kilometers:
Serial number:
Lane number : 1

PRESIONES

Peso eje (kg)	Presiones (bar)	Extrapolación (kN)		Fuerza final (corte) (kN)	
		F. inicial	F. final	Fuerza	
	Presión inicial: 0,40				
	Presióin final: 2,44	Izquierda:	0,00	36,43	Izquierda: 11,26
Eje 1: 8000	Pr. referencia: 7,00	Derecha:	0,00	29,34	Derecha: 9,07
	Nº de sensor: 1	Effi. (%): 84		Dif. (%): 19	Effi. (%): 26 Dif. (%): 19

Peso eje (kg)	Presiones (bar)	Extrapolación (kN)		Fuerza final (corte) (kN)	
		F. inicial	F. final	Fuerza	
	Presión inicial: 0,40				
	Presióin final: 2,45	Izquierda:	0,00	20,70	Izquierda: 6,43
Eje 2: 8500	Pr. referencia: 7,00	Derecha:	0,00	18,32	Derecha: 5,69
	Nº de sensor: 1	Effi. (%): 47		Dif. (%): 11	Effi. (%): 15 Dif. (%): 12

Peso eje (kg)	Presiones (bar)	Extrapolación (kN)		Fuerza final (corte) (kN)	
		F. inicial	F. final	Fuerza	
	Presión inicial: 0,40				
	Presióin final: 3,09	Izquierda:	0,00	18,89	Izquierda: 7,70
Eje 3: 7500	Pr. referencia: 7,00	Derecha:	0,00	16,81	Derecha: 6,85
	Nº de sensor: 1	Effi. (%): 49		Dif. (%): 11	Effi. (%): 20 Dif. (%): 11

Peso eje (kg)	Presiones (bar)	Extrapolación (kN)		Fuerza final (corte) (kN)	
		F. inicial	F. final	Fuerza	
	Presión inicial:				
	Presióin final:	Izquierda:			Izquierda:
Eje 4:	Pr. referencia:	Derecha:			Derecha:
	Nº de sensor:	Effi. (%):		Dif. (%):	Effi. (%): Dif. (%):

Peso total (MMA) (Kg): 24000 **Rendimiento total freno de servicio (%):** 60

25/10/2020 - 19:37:55

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9.2 Heavy vehicles side slip tester report

Técnicas Reunidas de Automoción, S.A.
Pol. Ind. Villalonquejar. C/ Merindad de Cuesta Urria, Nº 4
Burgos
Burgos - 09001
Phone: +34 947482020 Fax: +34 947482021

Lane number : 1 Serial number:

Plate Number: 2020-RYW **Inspector:**
Inspection Nº: 201810070 **Kilometers:**

SIDE SLIP TESTER

Axle numbe	Deviation (m/km)	Result	Axle numbe	Deviation (m/km)	Result
1	7,56	Correcto	6		
2	4,90	Correcto	7		
3	-4,72	Correcto	8		
4	12,66	Correcto	9		
5	5,21	Correcto	10		

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By scrolling the vertical bar on the right, you will be able see the entire report. If you want to print it, click with the mouse on the printer icon in the upper left corner. To close this screen, click on the cross in the upper right-hand corner.

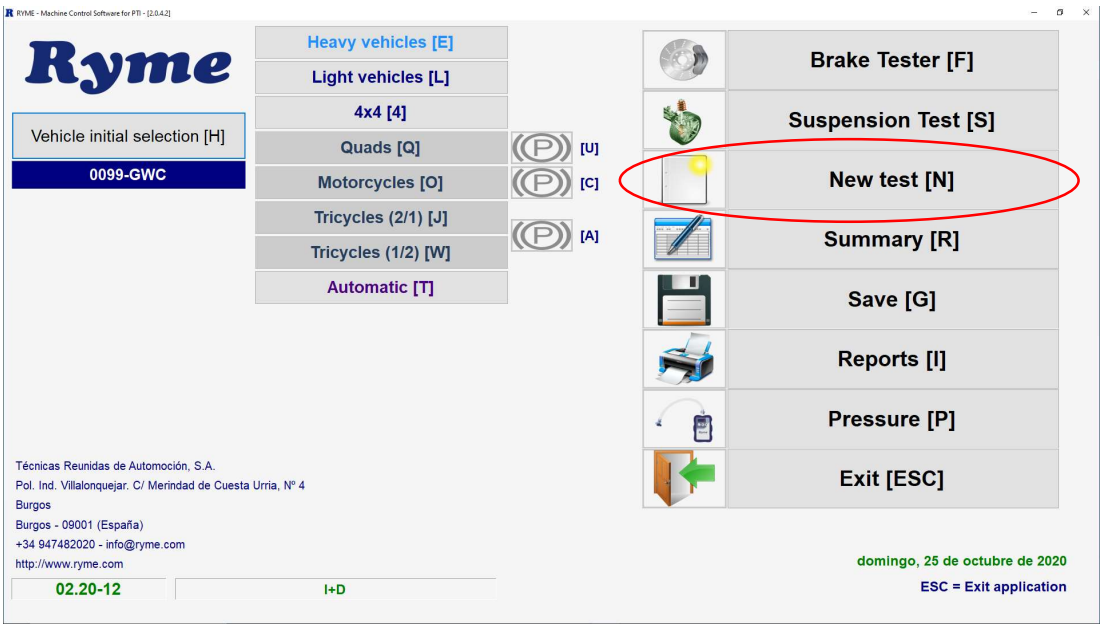
The report is evaluated according to the configuration values.

In this report, if no specific test has been performed, the data for that test will be blank.

10 New test

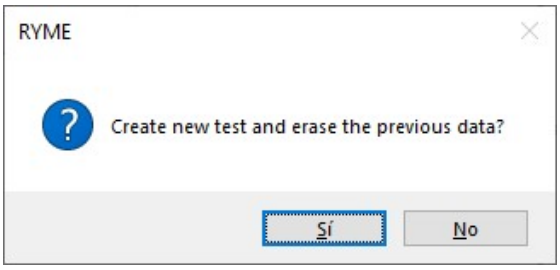
Once the test is fully or partially completed, a new test can be started in different ways:

- By pressing the 'N' key on the keyboard.
- By clicking on the 'New Test' icon with the mouse.
- By pressing the corresponding key on the remote control.



2098 Main menu: New test

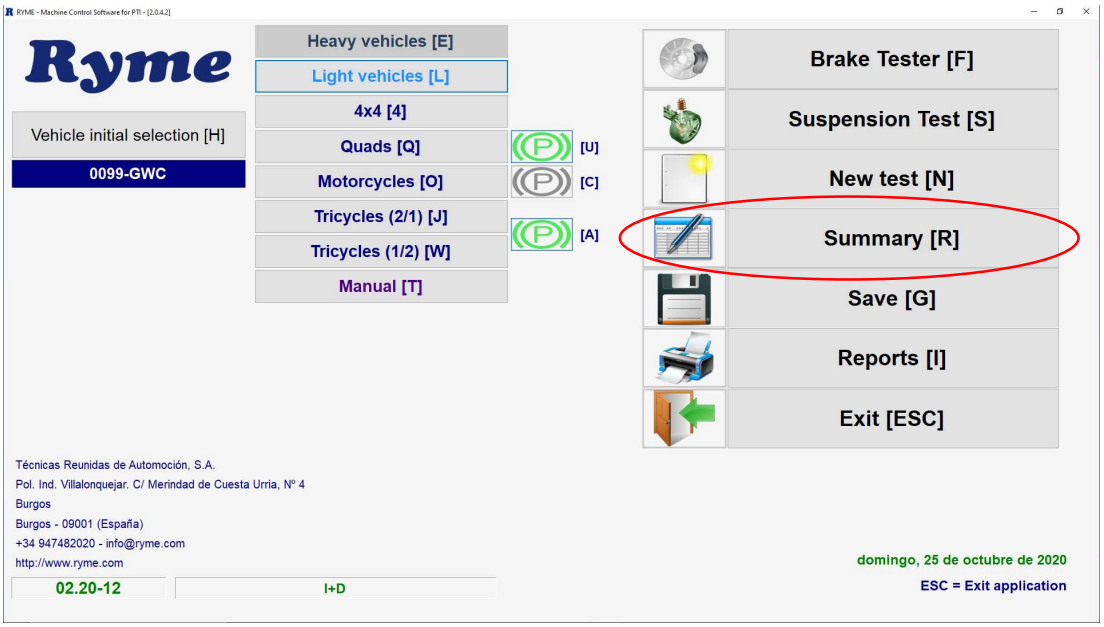
You will then be asked if you want to create a new test and erase the previous data.



Note: If a test has been started and you select this option, you will lose all data collected so far.

11 Summary

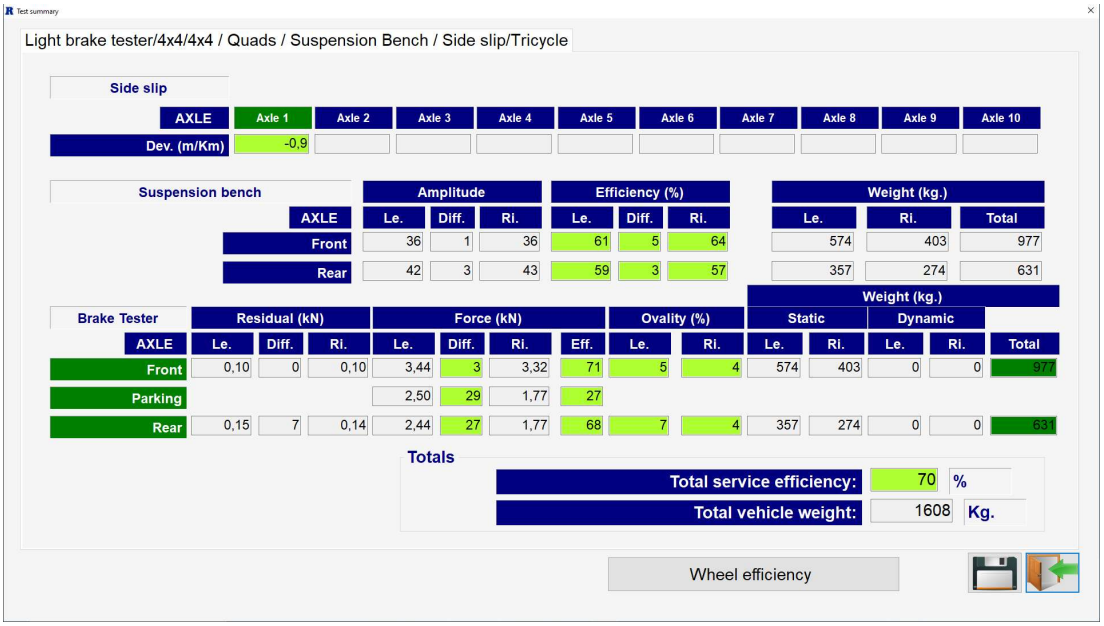
From the main menu of the application, you can access this test information by clicking on the icon with the mouse or by pressing the corresponding key on the keyboard or remote control, on the option 'Summary', located at the top right.



202 Main menu: Summary

11.1 Light vehicles summary

By entering the 'Summary' screen you will be able to observe and draw technical conclusions from the data shown on this screen. These results will be measurements taken or calculated during the test or at the end of the test:



203 Light Vehicles Summary

This screen will show the data obtained in the inspection of the last vehicle tested.

In order for the test results of the last vehicle to be shown, they have had to be saved earlier, during the test.

The information presented for each axle, on the display of the last inspected vehicle, is:

11.1.1 Light vehicles side slip tester

- Numerical representation of the axle deviation, convergent or divergent measure.

11.1.2 Light vehicles suspension bench

- Numerical representation of the resulting amplitude of the left wheel.

- Numerical representation of the percentage difference of the amplitudes between the wheels of each axle.
- Numerical representation of the resulting amplitude of the right wheel.
- Numerical representation of the efficiency percentage of the left wheel.
- Numerical representation of the difference in the efficiencies between the wheels of each axle.
- Numerical representation in efficiency percentage of the right wheel.
- Numerical representation in kg of the weight of each wheel on the left and right axle and the total.
- Summary of the total efficiency and weight of the vehicle.

Notes:

- To show the efficiency and weight of the axle, the suspension test must have been carried out immediately before. If this is not done, the efficiency and weight will not be displayed.

The percentage difference between the amplitudes is valued, if it is green it means that it is within the limits set in configuration. Red means the opposite.

11.1.3 Light vehicles brake tester

- Numerical representation in kN of the left residual braking force.
- Numerical representation of the percentage difference of the residual braking forces.
- Numerical representation in kN of the right residual braking force.
- Numerical representation of the left braking force in kN.
- Numerical representation of the percentage difference in the braking forces.
- Numerical representation of the right braking force in kN.
- Numerical representation in percentage of the left and right efficiency.
- Numerical representation in percentage of the left and right wheel fluctuation.

- Numerical representation in kg of the left and right axle weight and the total.
- Summary of the total efficiency and weight of the vehicle.

Notes:

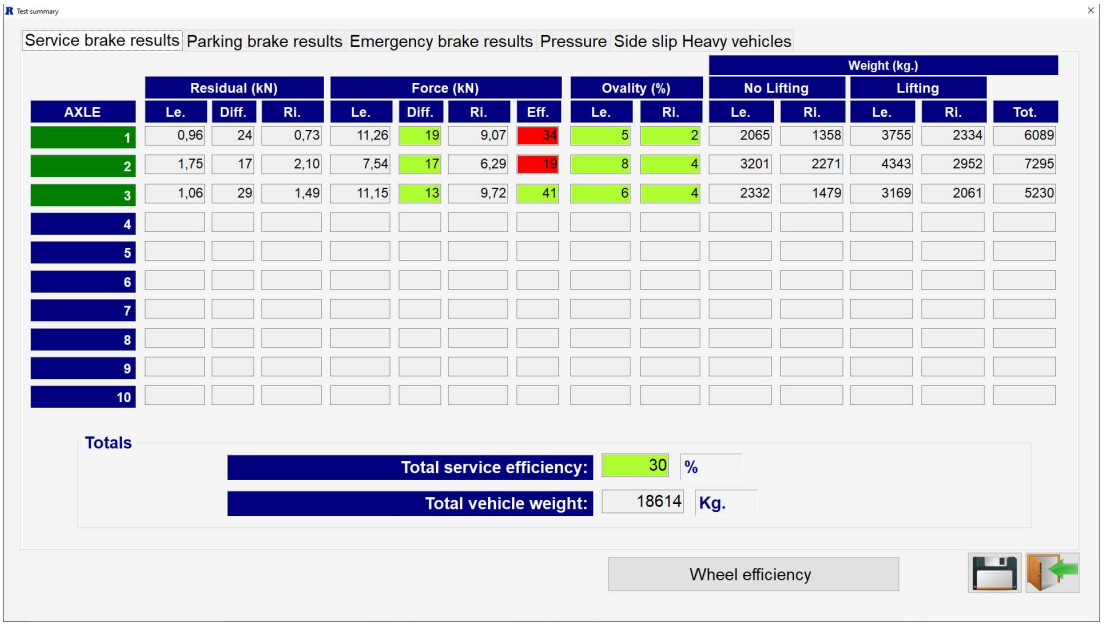
- To show the efficiency and weight of the axle, the suspension test must have been carried out immediately before. If this is not done, the efficiency and weight are not shown.
- For benches with a built-in scale the above note does not apply. (The scale on the light vehicle brake tester is optional)
- The percentage difference between the braking forces is measured, if it is green it means that it is within the limits set in configuration. Red means the opposite.

The fluctuation is another variable that is measured. If the fluctuation is within the limits set in the configuration, it is represented in green. Red means the opposite.

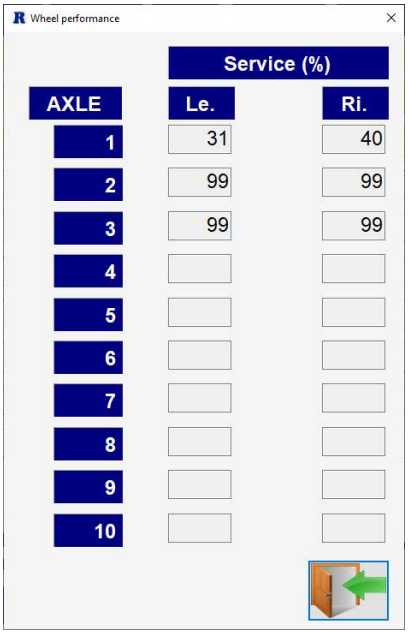
11.2 Heavy vehicles summary

The screen presented to you will be the one shown below, containing the summary of the test. By clicking on the tabs at the top of the screen, you can see the different results of the test: Heavy Vehicle Brake Tester (service), Heavy Vehicle Brake Tester (parking) and Heavy Vehicle Brake Tester (emergency).

11.2.1 Heavy vehicles brake tester summary (Service)



204 Heavy Vehicles Brake Tester Summary: Service brake



205 Heavy Vehicles Brake Tester Summary: Efficiency per wheel

Residual measurement (kN):

- Numerical representation in kN of the left residual braking force.
- Numerical representation of the percentage difference of the residual braking forces.
- Numerical representation in kN of the right residual braking force.

Force measurement (kN):

- Numerical representation in kN of the left braking force.
- Numerical representation of the percentage difference of the braking forces.
- Numerical representation of the right braking force in kN.
- Numerical representation in percentage of the left and right efficiency.

Fluctuation (percentage):

- Numerical representation in percentage of the fluctuation of the left and right wheel.

Weight (kg):

- Value in Kg of the weight of the axle to be tested 'Not Lifted', differentiating between left and right wheel.
- Value in Kg of the weight of the axle to be tested ' Lifted', differentiating between left and right wheel.
- Total weight in Kg, sum of the weights with the vehicle 'Lifted'.

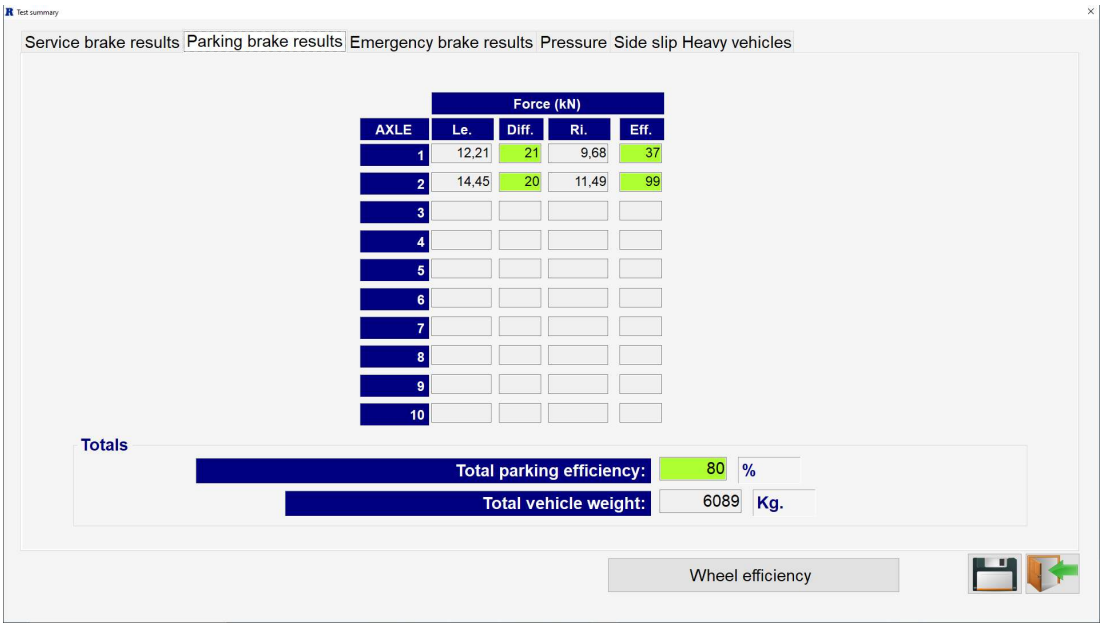
Total:

- Summary of the total efficiency calculated by adding the operating braking forces of the axles and the total weight of the vehicle.
- Total weight of the vehicle: sum of the total weights taken previously in the test (vehicle lifted).

Notes:

- The percentage difference and the efficiency between the braking forces is measured, if it is green it means that it is within the limits set in configuration. Red means the opposite.
- The fluctuation is another variable that is measured. If the fluctuation is between the limits set in the configuration, it is represented in green. Red means the opposite.
- This summary will show only the data of the axes previously configured in the application RYME_CalConf_PCE.

11.2.2 Heavy vehicles brake tester summary (Parking)



206 Heavy Vehicles Brake Tester: Parking Brake

Force (kN):

- Numerical representation in kN of the left braking force.
- Numerical representation of the percentage difference of the braking forces.
- Numerical representation of the right braking force in kN.
- Numerical representation in percentage of the left and right efficiency.

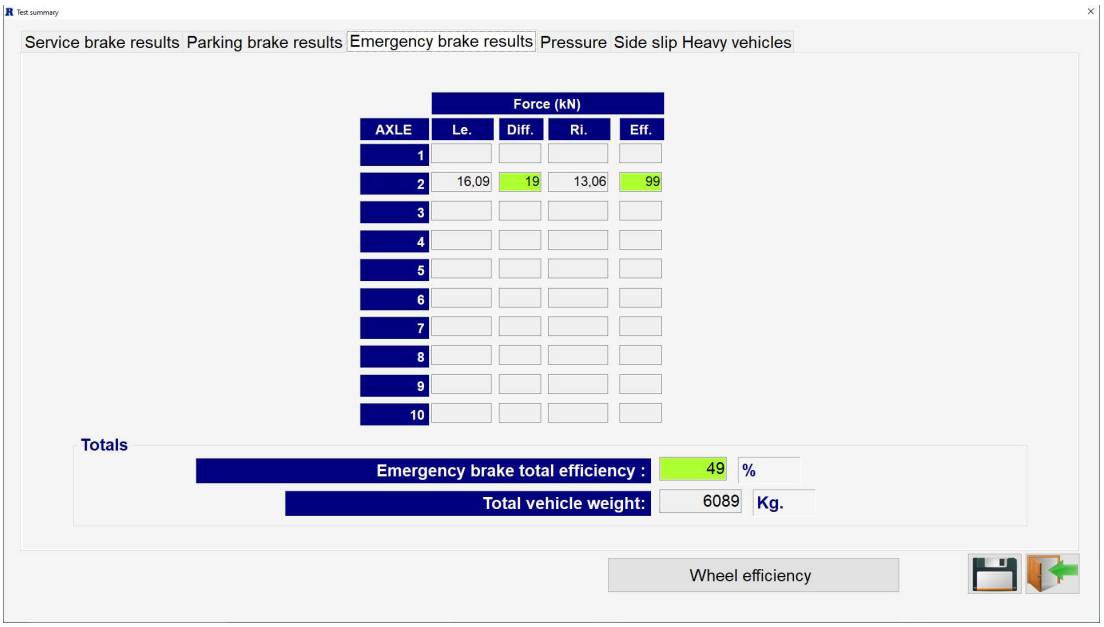
Total:

- Summary of total parking efficiency and total vehicle weight.

Notes:

- The percentage difference and the efficiency between the braking forces is measured, if it is green it means that it is within the limits set in configuration. Red means the opposite.
- This summary will show only the data of the axles previously configured in the RYME_CalConf_PCE application.

11.2.3 Heavy vehicles brake tester summary (Emergency)



207 Heavy Vehicles Brake Tester Summary: Emergency Brake

Force (kN):

- Numerical representation in kN of the left braking force.
- Numerical representation of the percentage difference of the braking forces.
- Numerical representation of the right braking force in kN.
- Numerical representation in percentage of the left and right efficiency.

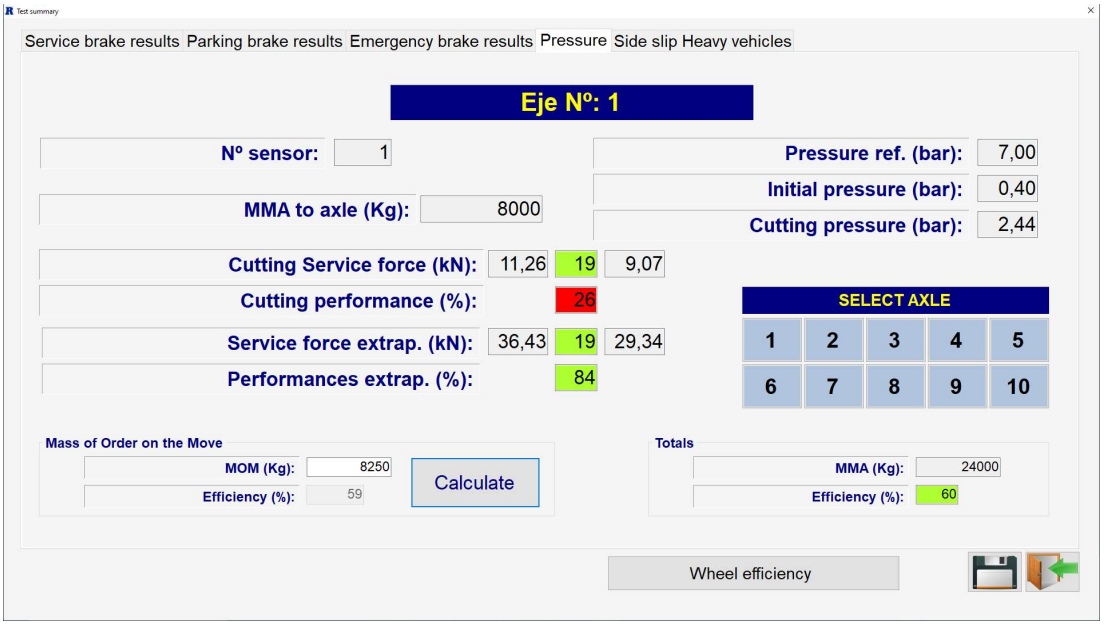
Total:

- Summary of total parking efficiency and total vehicle weight.

Notes:

- The percentage difference and the efficiency between the braking forces are measured, if they are green it means that they are within the limits set in configuration. Red means the opposite.
- This summary will show only the data of the axles previously configured in the RYME_CalConf_PCE application.

11.2.4 Heavy vehicles brake tester summary (Pressures)



208 Heavy Vehicles Brake Tester Summary: Pressures

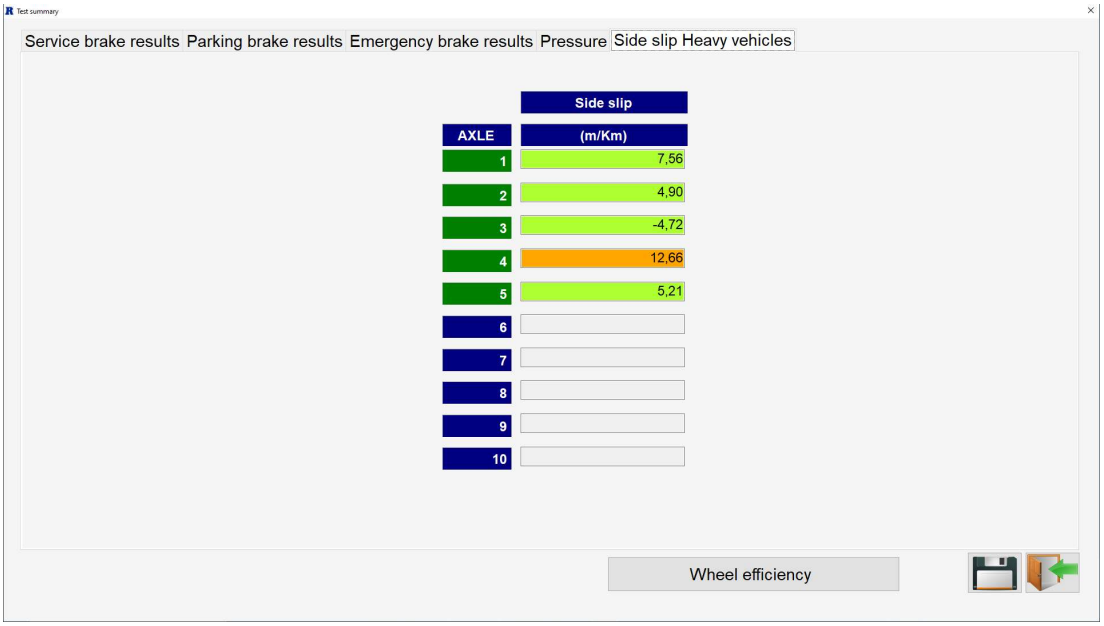
- **Sensor number**: sensor selected to perform the test on the corresponding axle.
- **MAM per axle (Kg)**: Maximum Authorised Mass entered at the beginning of the test for the performance of the test and calculations.
- **Service brake at cut-off (kN):**
  - Numerical representation in kN of the maximum left braking force.
  - Numerical representation of the percentage difference of the maximum braking forces.
  - Numerical representation in kN of the maximum right braking force.
- **Efficiency at cut-off(percentage):** Numerical representation in percentage of the efficiency calculated with the maximum braking forces of the axle and the mass of the axle.
- **Extrapolated value of the service brake (kN)**
  - Numerical representation in kN of the calculated extrapolated left braking force.
  - Numerical representation of the percentage difference of the extrapolated braking forces.

- Numerical representation in kN of the maximum calculated right braking force.

- **Extrapolated efficiency (percentage)**: Numerical representation in percentage of the efficiency calculated with the extrapolated braking forces of the axle and its mass.

- **Mass in order of motion:**
  - **MOM**: value saved in the technical sheet of the vehicle to be tested, this value is entered in kilograms for calculation purposes.
  - **Efficiency (percentage)**: Numerical representation in % of the efficiency calculated with the axle parking braking forces and the axle mass.
- **Referential pressure (bar)**: maximum individual pressure of each axle for the calculation of the extrapolated force.
- **Initial pressure (bar)**: Initial individual pressure of each axle for the calculation of the extrapolated force.
- **Pressure at cut-off (bar):** Pressure taken at the cut-off point. This pressure will be set for the calculation of the extrapolated braking data.
- **Select axle:** From these boxes you will be able to select the axle that you want to visualize, to observe the obtained and calculated data.
- **Total:**
  - **MAM (Kg):** Maximum Authorised Mass, value in kilograms of the value saved in the vehicle's technical data sheet.
  - **Efficiency (percentage):** Numerical representation in percentage of the efficiency calculated by adding the extrapolation braking forces of the axles and the MMA of the vehicle.

11.2.5 Heavy vehicles side slip tester

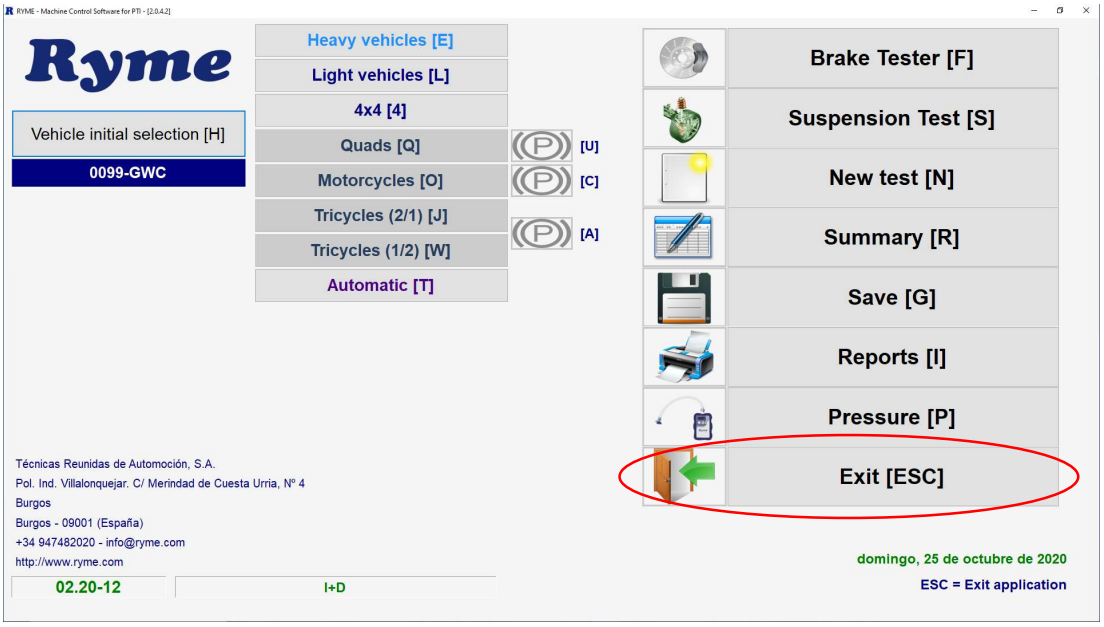


209 Heavy Vehicles Side Slip Tester Summary

- Numerical representation of the axle deviation, convergent or divergent measure.

12 Exit

To exit the PCE program, press the 'Esc' key on the keyboard or click with the mouse on the 'Exit' icon:



210 Main menu: Exit

Accept the warning message that appears on the screen.