

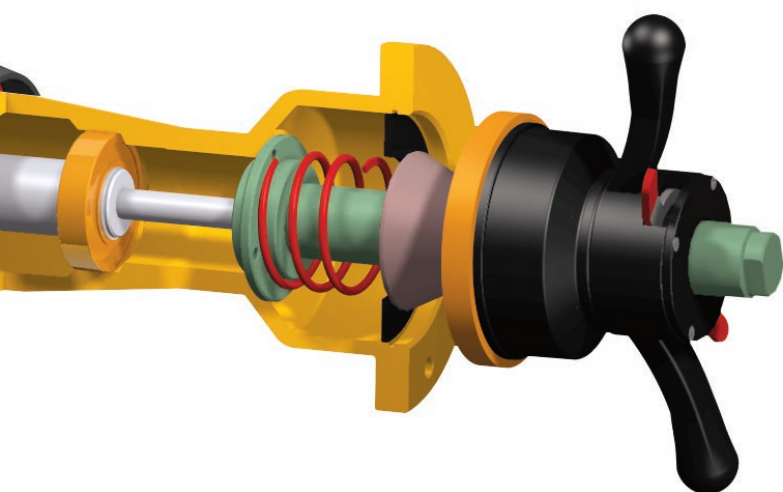
# Tech talks

FASEP GUIDES FOR EXPERTS

WHEEL BALANCING

## Theory and Practice of Wheel Balancing.

For true experts.



you ask, we answer

 ENGLISH EDITION 2014

**FASEP**   
MADE IN ITALY

**Qualcuno di cui ti puoi fidare.**  
SOMEONE YOU CAN TRUST.

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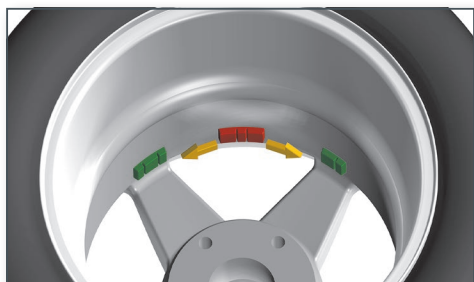
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SPLIT is a special program that allows the operator to **divide ("split") the balance weight and select the required position to place the two resulting weights.**

**SPLIT can be used to hide the weights behind the spokes of an ALU wheel.**

This is of particular advantage when handling all types of aluminum rims with spokes, for example the latest twin-spoke rims. SPLIT is also useful to avoid a valve, an uneven surface or when operator wishes to place the weights exactly at a required position: **once the new position are selected, the new unbalance is re-calculated automatically with no need of a new spin.**



Divide the (red) balancing weight into two separate weights (green) then place them hidden behind the spokes of a rim.

This function leaves nothing to be desired in user convenience and ease of operation.

SPLIT is of course for a general purpose, but it works great for adhesive weights on ALU wheels: when SPLIT is used in combination with ALU-S, the ALU-S device automatically recalculates all data in order to apply the stick-on adhesive weights at the required positions.

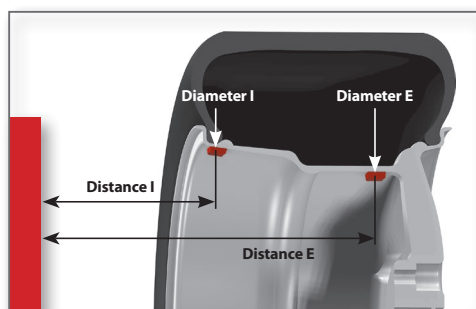
## SPLIT

Split weight function



ALU-SE is an innovative device designed to put an end to the guess-game when balancing with adhesive weights using standard ALU modes.

**The ALU-SE device allow you to set the exact measures of the two planes where balancing will be calculated, with a great precision as opposite to the approximation errors of traditional ALU functions.**



Once the balancing is calculated ALU-SE device will help the operator to position the adhesive weights exactly in the position where balancing was calculated. As a result ALU-SE makes it possible to balance ALU wheels at the first spin with no need of reposition or recalculate the weights required to balance.

## ALU-S ALU-SE

ALU Special functions.

**ALU-S:**  
manual data entry

**ALU-SE:**  
electronic data entry

For a quality wheel balancing, a perfect mechanical design is a must. FASEP wheel balancers are built around the VQI System. VQI ("Vincoli Quasi Ideali" = nearly ideal mechanical ties), is a unique 3-sensor system, a FASEP exclusive design.

Developed in collaboration with the University of Florence, VQI is a system for measuring vibrations designed so that mechanical ties do not influence the measuring system.

### What does it means?

As a result, plane separation is practically perfect and in/out influence (also know as "cross-talk" or "side-to-side influence") is practically null. VQI infact allows accuracy on any size (big diameter, big width) and drastically reduces "cross-talks" (side-to-side influence). The basic point of this unique design is that it is a 3-sensors system. By mean of the 3-sensors, the system is "intrinsically stable" and no strong mechanical ties are needed. To understand this fact, imagine a 3-legged table that stands while a 2 legged table falls: the 3-sensor system "stands" completely on the sensors and this is sufficient to make it stable.

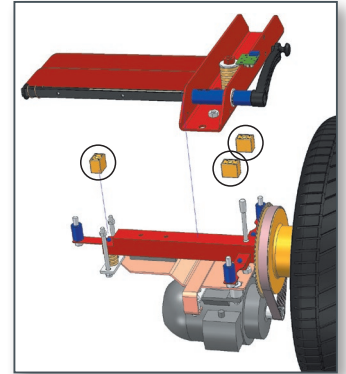
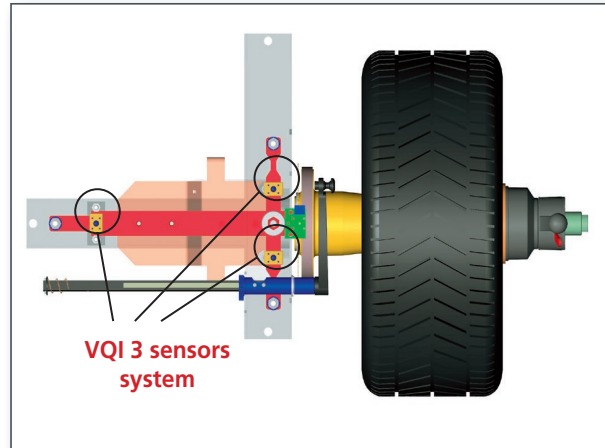
On the contrary, a 2-sensors systems, need at least one mechanical tie to be stabilized. In the 2-sensors systems, the presence of one or more mechanical ties alters the measurements of vibrations, as the vibrations may not completely go through the sensors but, at least partially, they go through the mechanical ties. When mechanical ties are present, a "parametric" modeling of the measuring system is necessary, as the system changes every time that the tie changes (i.e.: micro variations from one unit to another, variations of temperature, replacement of parts of the system). Therefore, a simple self-calibration may not be enough, but a "factory calibration" is needed, to compensate errors in measurements.

## VQI

3-Sensors  
nearly ideal  
mechanical ties

## WHEEL BALANCING

In 3-sensors VQI System, **the centrifugal force caused by the unbalance goes completely through the sensors as there is no other mechanical tie.** In such way, the vibration force is therefore completely known and measured. This makes sure that in every condition and with any type of wheel, wide small or, measurements will be always perfect.



exploded view with the 3 sensors (yellow) clearly visible

## LASER

### Laser System for application of adhesive weights



WATCH  
LASER  
IN ACTION

LASER system,  
for accurate application  
of adhesive weights  
inside the rim.

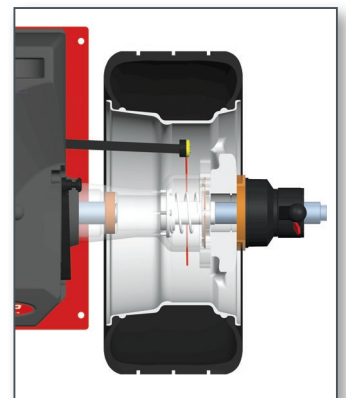
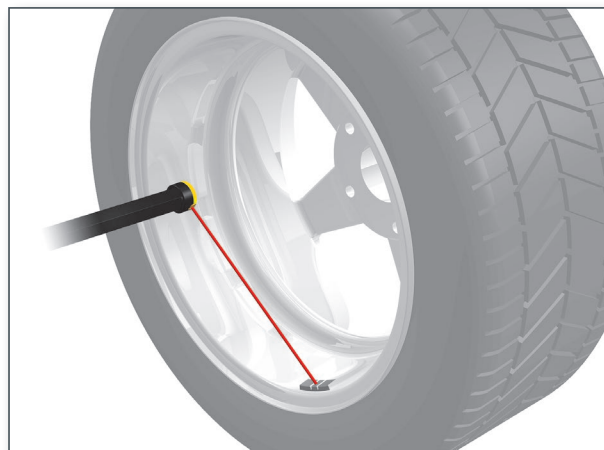


For a quality wheel balancing, accuracy in placing weights is a must.

FASEP video wheel balancers can be equipped with LASER system for accurate application of adhesive weights inside the rim.

With the LASER system, user get a lot of advantages:

- identify, from the start, that is during input of rim dimensions, the point of application of weights to avoid areas of the rim that are not flat.
- after measuring spin, find easily the point of application in a very visible zone in the lower part of the rim.
- clean point of application easily as you see very well the exact point the weight must be placed.
- apply the adhesive weight, very accurately, with no chance of mistake even by a few millimeters as the LASER is just a dot. Unlike traditional ALU-S system working at 12 o'clock in a place the user cannot see.



Laser view from top

FASEP introduces the brand new 16-bit technology on all its wheel balancers. This innovation is done to introduce more and more features and possibility in modern wheel balancers. And there is a number of brand-new features that makes wheel balancing easier and more accurate, as it has never been before.

### 16-BIT TECHNOLOGY ADVANTAGES

#### 1. 16-bit to enable accurate readings in LSB (low speed balancing)

**LSB** (low speed balancing): speed of revolution is below 100 rpm

**HSB** (high speed balancing): speed of revolution is above 100 rpm

At 100 rpm, or below, energy transmitted to sensors from the unbalance vibrations on the wheel is 4 times smaller then the energy transmitted by the same unbalance measured at 200 rpm, and 9 times smaller then unbalance measured at 300 rpm (high-speed wheel balancing = HSB).

Since the energy transmitted is much smaller, the measurement can be affected by electric noise.

To maintain a good accuracy in measurement, therefore it is very difficult and several compromises might become necessary.

With the introduction of 16-bit technology, FASEP has obtained that LSB is more accurate then previous HSB. Infact, 16-bit electronics, compared to previous 10-bit technology, allows an accuracy 64 times greater then before.

This means that, even if energy of unbalance is 4 times smaller, still 16-bit low speed balancing is 16 times more accurate then high speed balancing at 10-bit.

#### 2. LSB is a great advantage for safety and durability

LSB is, per-se, safer, thanks to reduced speed of revolving wheel. Also, LSB dramatically reduces all wears on electric power parts (relais, motor) and mechanical parts (motor bearings, belt, ball-bearings). All of this prolongs life of wheel balancer, as well as its accuracy over its life span.

#### 3. 16-bit : faster measurements

Being 16 times more accurate then HSB, 16-bit measurements allows to reduce the number of spins necessary to measure unbalance on the wheel accurately. A special function is available on 16-bit wheel balancer to operate in FAST MODE, reducing the number of spins by 50% and still maintaining a very good accuracy (only a 5% reduction of accuracy has been measured). The FAST-MODE is specially good for peak-periods with intense work-schedule.

#### 4. 16-bit: a number of new functions to make wheel balancing easier and more accurate

The introduction of powerful 16-bit microprocessor comes along with the possibility of introducing new functions and features that makes wheel balancing easier and accurate as it has never be.

- AFC** Automatic Flange Calibration: allows to use even non-balanced flanges (dirty, worn, etc.)
- MARS** Automatic Minimization of Residual Static Unbalance: allows automatically to reduce the static unbalance when using weights multiple of 5 grams.
- DUAL-OP** Double Operator (LEVEL 2): 2 users can share the unit at the same time independently.
- STATS** Statistics: shows the total number of spins, the % of success, the % for each diameter.
- FCC** Fast Calibration Check: the calibration of the unit can be proved easily in few seconds.
- ALU-6h** (LEVEL 3): Allows to place adhesive weights at 6 o'clock.
- APS** Automatic Positioning System (LEVEL 3): Allows to rotate wheel automatically to inside/outside position for application of the balancing weight.
- FAST** Fast balancing mode (LEVEL 3): Allows to measure wheel unbalance in half time (for when you have peak-hours time/periods).

Functions listed above might not be available on all models or might be optional on some model or some configurations.

#### 5. 16-bit electronics with FLASH technology: be ready for the future !

All 16-bit wheel balancers are controlled by an ultra-modern 16-bit microprocessor with incorporated flash memory.

Flash memory holds the wheel balancer's software and it can be upgraded in few seconds, just connecting the balancer to a PC.

You can always download the latest program and flash it to the balancer memory. In a snap you have it upgraded with the latest program version and latest features and technical developments.

## 16 bit

Why 16-bit technology  
(and low speed)  
is the best choice for  
your wheel balancer?



IFS

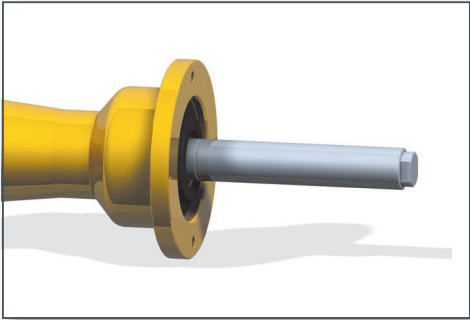
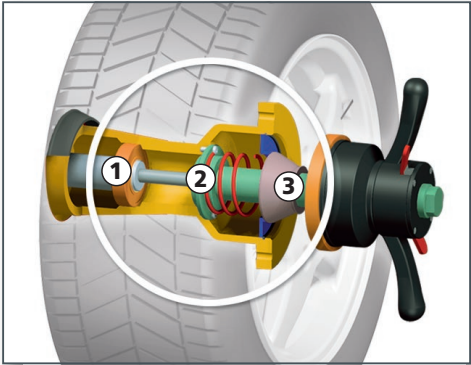
(Integrated-flange Shaft)

Flange is integrated on the shaft

Integrated Flange Shaft means no coupling.  
This is the only system which allows to eliminate tolerances of coupling improving dramatically the centering accuracy!

For a quality wheel balancing, mechanical concepts are fundamental. FASEP wheel balancers are built around the VQI System (a 3 sensor, quasi-ideal-constraints), a FASEP exclusive design, and with IFS system (integrated-flange-shaft) for maximum centering accuracy. The usual solutions of coupling shaft and flanges (conical, cylindrical, planar, rectified or not) do not eliminate the problem of the coupling tolerances, but simply they reduce it, leaving that wear and dirt increase such tolerance day by day.

With IFS system, where **the bell flange is integrated of the shaft (1)**, tolerances of coupling shaft and flange are simply radically eliminated, improving dramatically the centering accuracy and therefore the result of balancing process. **IFS system, moreover, allows the lodging of the spring (2) for centering with inner cone (3).** The spring always remains inside of the flange, does not have be found and mounted, but simply it is always to its place. Also, it is protected from the dirt, making easy the job of mounting any type of wheel.







Integrated flange shaft.

MARS

Minimization of Residual Static Unbalance

For a quality wheel balancing, tolerances and rounded measurements should be considered carefully! FASEP new 16-bit wheel balancers are programmed with an innovative software function that automatically **minimizes chances of come-backs due to vibrations caused by residual static unbalance**. On every wheel, chances of residual static unbalance (R.S.U.) are always there even after a correct wheel balancing has been performed. MARS program automatically minimizes residual static unbalance with no extra effort from the user!

		WITHOUT MARS		WITH MARS	
		Inside (grams)	Outside (grams)	Inside (grams)	Outside (grams)
 <div>unbalance measured by the wheel balancer (example)</div>		17	18	17	18
	unbalance rounded by the computer	15	20	15	20
				15	15
				20	15
 <div>residual unbalance due to rounded measures</div>		2	2	20	20
	+ accuracy of the balancer	3	3	MARS makes calculations and deliver the best choice	
	+ accuracy of the balancer				
	+ weight tolerance	4	4		
<div>.. but the balancer has a precision of +/- 1 gram. So, considering the worst case, the residual unbalance should be increased by 1 gr</div> <div>...the weight you put on the wheel might is built with 1 gram tolerance</div>					
	residual static unbalance	8 gr		minimized 0÷3 gr	
					

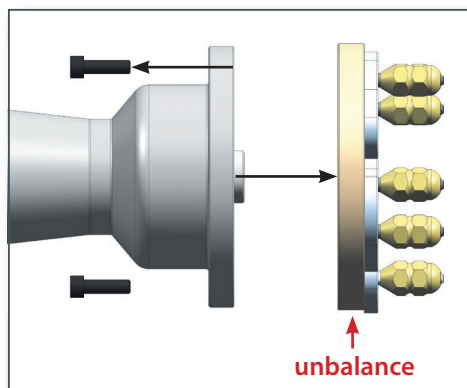
.. but the balancer has a precision of +/- 1 gram.  
So, considering the worst case, the residual unbalance should be increased by 1 gr

...the weight you put on the wheel might is built with 1 gram tolerance

..in the worst case, the two residual unbalance (inside and outside) might be in the same direction so, when you consider the static unbalance, they are to be added and you get a



For a quality wheel balancing, good software can help a lot. FASEP wheel balancers are equipped (optionally on some models) with AFC function, a FASEP exclusive design, for maximum accuracy of balancing also when using adapters. As everybody in the business knows, Self Calibration function is needed to compensate the unbalance of the wheel balancer's shaft, so that it does not affect the measurement of the unbalance of the wheel. However Self Calibration, of course, does not take into account the possibility of unbalance of the various adapters that can be used on a wheel balancer. Of course, adapters are balanced when they are new. But it is pretty common that after years of use, because of dirt and wear, the adapters become unbalanced, thus affecting the reading of the wheel balancer.



## AFC

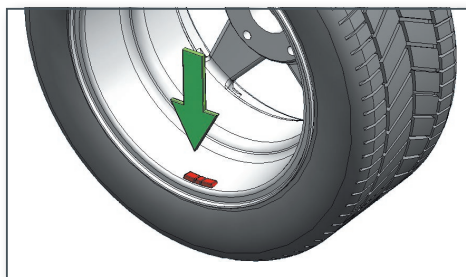
(Automatic Flange Calibration)  
for 16-bit  
wheel balancers.

*With AFC function, the user can easily measures and compensate the adapter unbalance in just one spin. When AFC is used, any unbalance of the adapter will not affect the reading of the unbalance of the wheel, thus allowing a perfect wheel balancing.*

Per una equilibratura di qualità un buon software può essere molto di aiuto. Le equilibratrici FASEP sono dotate (a richiesta su alcuni modelli) con funzioni speciali per la massima precisione di equilibratura. Queste funzioni sono un progetto esclusivo FASEP, pensate per migliorare la facilità di utilizzo e ottenere la massima precisione di equilibratura anche quando si usano pesi adesivi su cerchi in lega.

### ALU-6h (Stick-on at 6 o'clock)

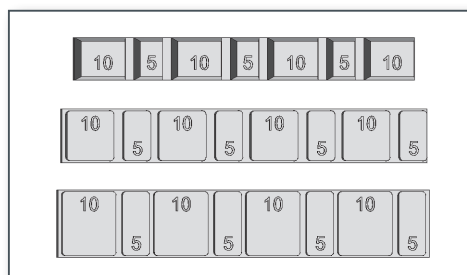
Application of stick-on weights on ALU rims can be difficult because of the position of the weight at top-dead-center (12 o'clock). With ALU-6h, the user can choose to place weights at 6 o'clock (bottom-dead-center) when needed. 6 o'clock is a convenient position for the user to apply the balancing weight as in that position it is easy to clean the rim and to place the weight in the exact position. Obviously, Laser is always the preferred choice to ease this job!



### ALU-6h

### ALU-DIM (Stick-on weights dimensions setup)

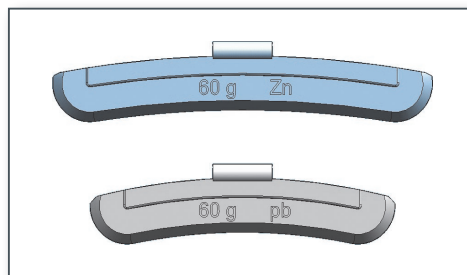
In case of stick-on weights for ALU rims, calculations of center of gravity are depending on weight width. A weight width that is different from the one written in the wheel balancer software may alter the weight position calculated by the computer and then result in measurements cross-talks from Inside to Outside and viceversa. Since different weights manufacturers use different standards, balancing a wheel with stick-on weights is always more difficult then balancing a wheel with clip weights. ALU-DIM let the user setup the wheel balancer for the specific width of adhesive weights used with the choice among 12, 15 and 19 mm width.



### ALU-Dim

### ALU-MAT (Balancing Materials)

With the new European regulations coming in place, the use of LEAD (Pb) on balancing weight has been banned. Consequently, balancing weights are being manufactured using new materials such as Zinc (Zn), Iron/Steel (Fe) and Tin (Sn). The density of the materials used instead of Lead (Pb) is quite different and this fact affects the dimensions of the weights. Weights in materials other than Lead are usually longer and larger. Using the new weight on old wheel balancer may introduce a relevant error in calculations "center-of-gravity" of the weight especially in case of clip-weights. With longer weights, the weight center-of-gravity position changes and consequently an error is introduced in the wheel balancer calculations. **ALU-MAT let the user setup the wheel balancer for the specific type of materials used, choosing among Zinc (Zn), Iron/Steel (Fe) and Tin (Sn).** In this way a more accurate balancing job is done with no extra spins or extra efforts!



### ALU-Mat



## TILT System

Perfect mount without efforts.



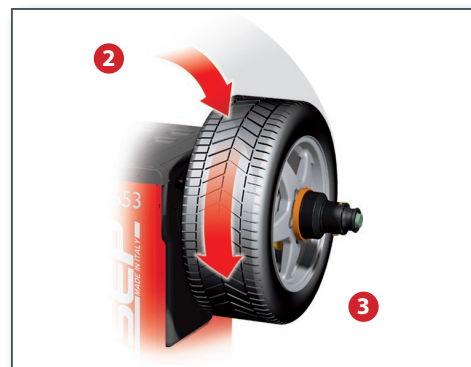
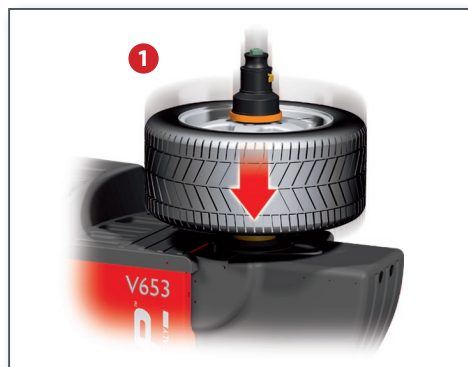
For a quality wheel balancing, good mechanics can do a lot. FASEP V653 and B441 wheel balancers are equipped with a TILT System for maximum accuracy when balancing any kind of wheels.

### A unique advantage: Tilt-system and horizontal mounting.

Centering the wheel perfectly and with no efforts becomes easy and minimizes come-backs! On any normal wheel balancer, mounting the wheel needs a lot of attention by the operator, as centering the wheel is a critical operation in the whole balancing process.

Proper centering is affected by the weight of the wheel and fatigue of the operator.

**The Tilt-system of this balancer allows a wheel to be mounted horizontally on the wheel balancer, so that centering is always perfect, regardless of operator training, skill and fatigue.**



### 1. HORIZONTAL MOUNTING

means perfect accuracy of centering, without efforts. Centering is not affected by the weight of the wheel.

### 2. TILTING

is automatic (V653) or manually operated (B441).

### 3. MEASURE and BALANCING

is done in vertical position for maximum user convenience to apply weights..

### Install it in the right place

Mounting the wheel horizontally, instead of vertically by side, is a good choice also if you think that the **wheel to be balanced has usually just been fitted on a tyre changer**, where it also laid in horizontal position. A TILT balancer should be ideally located nearby the tyre changer or at the end of a tyre mounting line like those manufactured by Ahcon, for example.

### V653 Automatic Tilt sequence

1. Wheel is mounted in horizontal position
2. Pneumatic lock
3. Tilt the wheel to vertical position automatically
4. Cover closes automatically
5. Wheel is spun automatically
6. Cover opens automatically at the end of the spin

### B441 Tilt sequence

1. Wheel is mounted in horizontal position
2. Pneumatic lock optional
3. Tilt the wheel to vertical position with pneumatic switch
4. Cover closes manually
5. Wheel is spun automatically
6. Cover opens manually



WATCH  
TILT SYSTEM  
ON V653



WATCH  
TILT SYSTEM  
ON B441



For a quality wheel balancing, sometime good software can help to save money. FASEP Videotronic.CE wheel balancers are equipped with WOW System for maximum accuracy when balancing any kind of wheels.

WOW System represents an alternate approach to balancing a rim and tyre, totally changing the traditional corrective calculation on its head and saving the owner hundreths if not thousands of kilograms during the lifetime of the balancer.

Screenshot of Videotronic.CE with WOW Function



### What is WOW (WIZARD of WEIGHT) system?

WOW is a new function that is designed to reduce the cost of ownership of a balancer by limiting the quantity of wheel weight required to balance a wheel to within an acceptable and satisfactory tolerance. Traditionally when carrying out a 'dynamic' balance the machine examines the dynamic imbalance (i.e. side to side) by looking straight at the rim in 2 planes (i.e. inner/outer).

WOW firstly eliminates completely the static imbalance (the bit that the driver really feels) and at the same time, based on several key parameters, calculates the minimum amount of corrective weight needed to bring the dynamic residual imbalance within acceptable limits.

### Apart from saving money on weights, does WOW offer other benefits?

Unquestionably the other major benefit has to be aesthetics. With wheel weights now being of larger size than traditional lead weights in order to achieve the same weight, anything that reduces the amount of visible weight has to be good. This, in turn, makes carrying out a behind spoke balance a much easier, tidier and more cost effective process.

### But is WOW still accurate?

In all honesty that is a point for discussion. Some wheel balancer manufacturers who have similar weight saving programs will hail them as being 100% accurate, but it depends on how you view 'accuracy'. It is certainly not 'perfect', how can it be? But as already stated it does provide a balance within what we as a balancer manufacturer accepts as 'tolerable'. It is for this reason that economy programs are not, in our opinion, for every job. Particularly sensitive vehicles (or indeed customers!) may be best served using traditional, conventional balancing methods. But the beauty of WOW is that you have the flexibility to use it when you want: no need to turn the function on or off – just on-the-run you can decide to use WOW or not, while balancing a wheel.

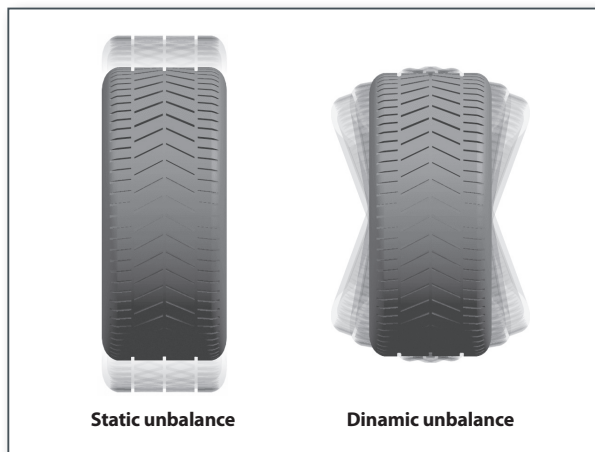


### So does WOW means you no longer need using a TILT balancer to improve mounting and therefore balancing accuracy?

Absolutely not. Anything that improves the accurate mounting of a wheel will have a huge, positive effect on the balancing results. So, in fact, if you intend to operate an economy balance then using proper flanges like Centering Bushings or Stud Plates will improve its accuracy.

### Static unbalance and dynamic unbalance

The WOW program permits a higher threshold, but remains under the 'maximum tolerance' point deemed acceptable by the machine (and ultimately by the operator, as threshold can be set by the user). And remember, **the static imbalance is still 100% eliminated, regardless of dynamic tolerance.**



# WOW

Wizard Of Weights.

Save Weights  
and Save money.



WATCH  
STATIC  
UNBALANCE  
IN ACTION



WATCH  
DYNAMIC  
UNBALANCE  
IN ACTION

## 3D.Scanner

### Sistema Scanner 3D automatico



WATCH IT  
IN ACTION

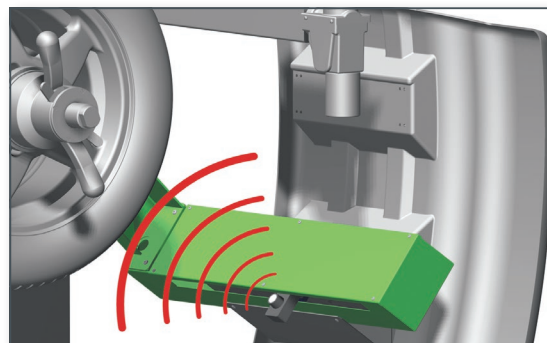
3D.SCANNER

The new automatic SCANNER system for Videotronic.CE machines is based on motorized SONAR sensor. The SCANNER control system **allows to measure the run-out of tire and rim with 1mm accuracy**, as well as **Side Slip of tire**.

It completely integrates with Videotronic.Ce software and it allows to visualize the following data:

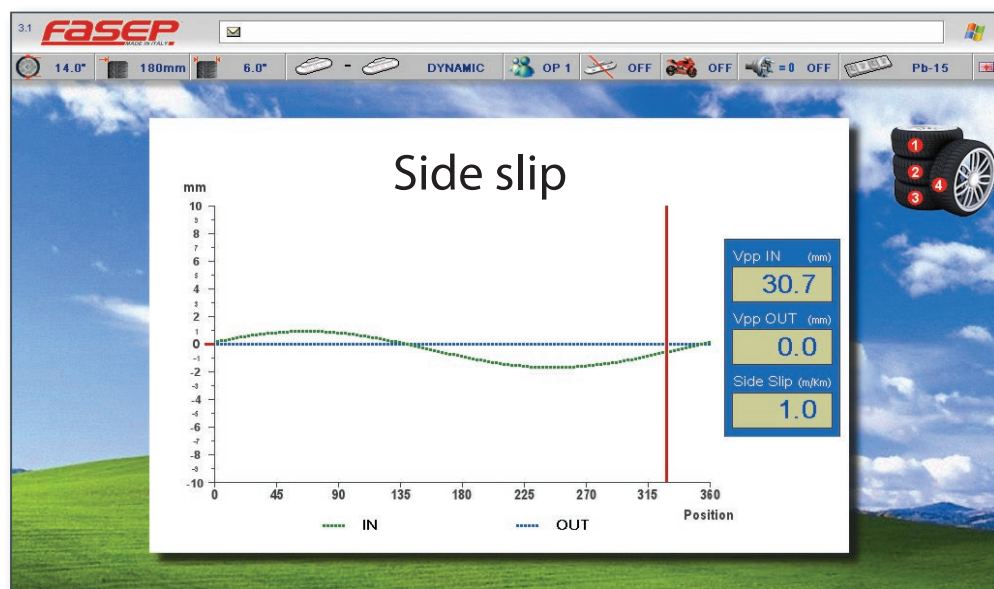
- Point-by-point measure
- Maximum deviation
- First harmonic
- Point of maximum deviation
- Side-slip for 4 wheels

With these data, it may be possible to match tire and rim geometrically, as well as match position of the wheel to compensate side slip tendency.



#### What is the side-slip?

- Vpp IN: peak-to-peak value of runout on the inner side ;
- Vpp OUT: peak-to-peak value of runout on the outer side ;
- Side Slip: The result is in km / m, and indicates how many meters wheel pull to the right (-) or left (+) after rolling 1 Km.



## Autoselect 2

### Automatic Balancing mode detection.

AUTOSELECT

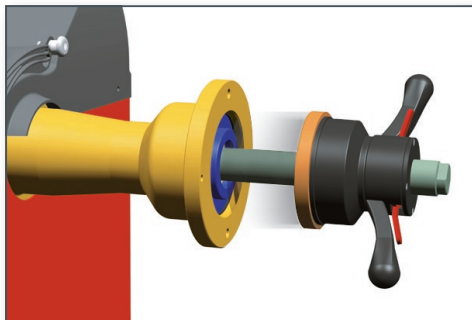
The AUTOSELECT function **allows automatic selection of Balancing mode (Dynamic, Alu-S1, Alu-S2) automatically when wheel is measured**. Shortly, according to how measures are taken, the AUTOSELECT function automatically select Dynamic mode (2 clip weights), Alu-S1 (1 clip weight + 1 stick on weight) or Alu-S2 (2 stick on weights).



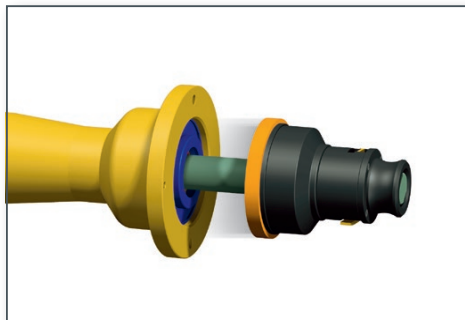
Screenshot of Videotronic.CE with Autoselect 2

For a quality wheel balancing, accuracy in clamping the wheel is a must. Most FASEP wheel balancers can be equipped with PNEULOCK system for accurate clamping of the wheel, with the following advantages:

- effortless accurate clamping of the wheel, without fatigue;
- safe operation;
- system operates even in the event of malfunction of pneumatic system or lack of compressed air.



**PNEULOCK System in wheel balancers without TILT (automatic tilting system).**



**PNEULOCK System in wheel balancers with TILT (automatic tilting system).**

## Pneu-Lock

Accuracy in clamping.

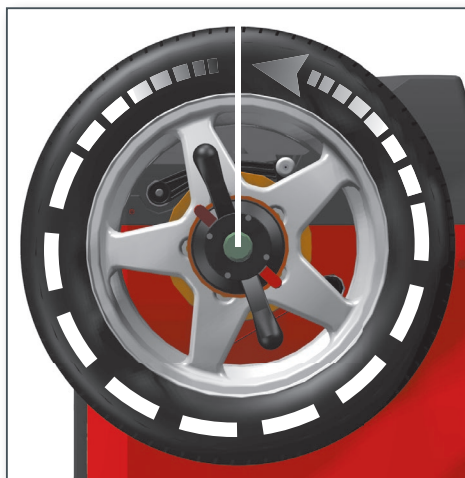


WATCH IT  
IN ACTION



The new technology G3.EXTREME introduces the following news:

- Electronic motor control (inverter)
- Use of quiet and powerful three-phase motors
- Very quick cycle time (start, braking and automatic wheel positioning in 5.5. sec)
- Automatic positioning system APS2 faster and more accurate, controlled by the keyboard or the brake pedal
- Electromagnetic brake included as standard (not for B2xx)
- 50-60Hz seamless operation (electronic motor control operates shaft always at same speed).



## G3.Extreme

Fluidity  
Silence  
Power

*Thanks to the electronic motor control by the inverter, the cycle of balancing is fluid (start and stop of wheel without oscillations or shots).*



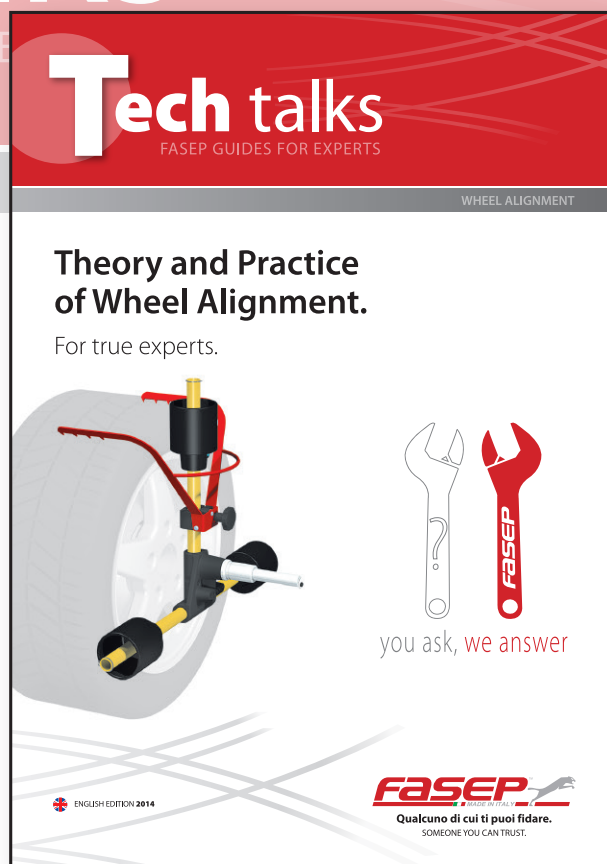
# Tech talks

FASEP GUIDES FOR EXPERTS

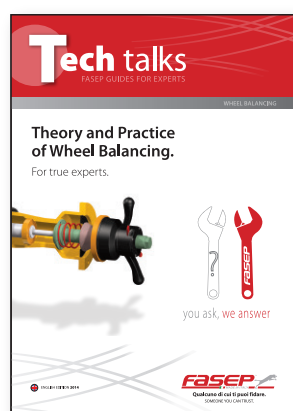
**See also  
the theoretical  
and practical guide  
about Wheel Alignment.**

For true experts.

All guides are available  
both in Italian and in English.

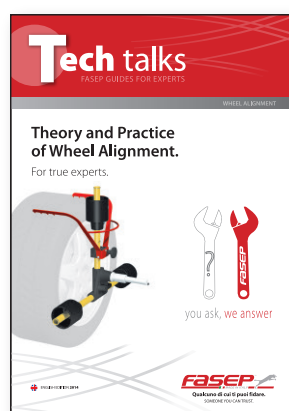


**Consult guides directly on the Tablet or Smartphone**



**Theory and Practice  
of Wheel Balancing.**

For true experts.



**Theory and Practice  
of Wheel Alignment.**

For true experts.



**Qualcuno di cui ti puoi fidare.**  
SOMEONE YOU CAN TRUST.

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