



(Sample picture not binding)

Horizontal axis balancing machine model ZB300/TC/GV

hard bearing technology, permanent calibration based on rotor dimensions, with belt drive system

(sample lay-out 39IO050813 - 39IO050814)

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1 Main machine specifications

The balancing machine we are proposing is 'hard bearing' type.

This feature allows to easily calibrate the machine and to obtain the best possible measuring accuracy.

Machine calibration is simply achieved by setting rotor geometrical dimensions.

This done, after one spin only and independently from the rotation speed, the machine automatically displays the value in grams and the angular position of unbalance for both planes.

At the end of the cycle, the balancing machine instrument keeps this data in the memory.

The measuring cycle is fully automatic; in fact, by pressing the start button, the machine accelerates the rotor progressively, completes the unbalance search cycle, stores the obtained data and decelerates the rotors till stop. Depending on rotor inertia, this operation is completed in a few seconds.

Many other special functions are also available on the instrument panel and this thanks to the experience we have accumulated in more than 30 years manufacture of hard bearing balancing machines.

Our machines make use of piezo-electric force transducers and this ensures remarkable advantages when compared to the 'semi-rigid' or 'dynamometric' system with electro-dynamic pick-ups as in use by other manufacturers.

In fact, thanks to the mechanical rigidity of these new type transducers, a wider range of application is ensured, since the measuring of the relative elasticity of the pedestals is not altered.

With the 'dynamometric' or 'semi-rigid' system it was in fact necessary to come to a compromise between the pedestals stiffness (necessary for maintaining the assembly rotor-pedestal far from the critical speed and thus allow the dimensional calibration) and the must to pick-up in any case a displacement of the pedestals by means of an electro-dynamic transducer.

By making use instead of the piezo-transducers, it is no more necessary to have any relatively elastic element. This implies that a large size balancing machine may also balance very light rotors with the same accuracy obtainable with a small size balancing machine and that wider application (stiffness) range may be obtained in comparison with semi-rigid balancing machines having same dimensions.

2 Technical specifications

Rotor characteristics			
Nominal weight capacity (see note n.1)	Min	3	kg
	Max	300	kg
Max occasional load per pedestal (see note n.2)		225	kg
Max rotor diameter over the bedplate		1.000	mm
Length of the bedplate (see note n.3)		1.800	mm
Distance between support bearing centreline	Min	185	mm
	Max	1.650	mm
Rotor journals diameter range (see note n.4)	Min	5	mm
	Max	70	mm
Belt drive system			
Motor power		2,20	kW
Max motor speed		3.700	rpm
Driving pulley diameter		50 / 75	mm
Max rotor driving diameter for the belt		300	mm
Machine performances			
Instrumental measuring speed capacity (see note n.5)		70 ÷ 200.000	rpm
Maximum sensitivity (see note n.6)		0,8	g.mm
WN ² max (see note n.7)		345 x 10 ⁶	WN ²
Unbalance measuring uncertainty (see note n.8)		2	g.mm
Minimum achievable residual nominal unbalance <i>e_{mar}</i> (see notes n.8 and 9)		0,3	g.mm/kg
Minimum achievable residual specific unbalance <i>e_{mar}</i> (see notes n.8 and 9)		0,1	g.mm/kg
Unbalance reduction ratio with one spin only		> 95	%
Power requirements		400V/3P/50Hz	
NOTES			
1) It has to be considered as the maximum mass for rotor with symmetrical distribution of the weight between the two pedestals.			
2) The occasional load per pedestals is only stated for the lowest balancing speed.			
3) It is intended to be the primary bedplate length plus, if included in the supply, the additional bedplate length and the distance between the two bedplates.			
4) Range is achieved with the roller carriages included in the supply.			
5) The balancing speed is defined by the ratio between the motor pulley and the driven diameter.			
6) The maximum sensitivity per plane is defined as the instrument's ability to read (according to DIN standard 1319).			
7) The value of WN ² defines, based on the rotor weight, the balancing speed which gives the unbalance reduction ratio (R _{ur} based on ISO directive ISO21940-21) of 90%. The dimensional calibration can be performed within 70% of the declared WN ² value and with the self-learning calibration function from 70% to 100%. The use of the machine in the declared WN ² value excludes any risk of structural damage. CEMB does not take any responsibility in case of use of the machine over the declared WN ² . This value largely depends on the machine fixing and foundations.			
8) The declared values are valid using proving rotors based on the ISO norm ISO21940-21.			
9) The minimum achievable residual unbalance on a rotor, depends in general from the conditions of the rotor journals, from the geometrical and elastic characteristics of the rotor, from the type and wearing conditions of the belt drive, from the rotor weight, from the balancing speed and signal filtering.			

3 Machine composition

3.1 Steel Bedplate

Steel bedplate where pedestals and the relative roller carriages are lodged.

- Bedplate length 1800mm

3.2 Hard bearings pedestals

The hard bearings pedestals can accommodate all the carriages where the rotor to be balanced is placed. The piezo-electric force transducers are fitted inside the pedestals.

- N. 1 Z200/300 right base pedestal
- N. 1 Z200/300 left base pedestal

3.3 Roller carriages

The roller carriages are composed of a plate with a couple of rollers sized in thickness and diameter in order to process rotors within the entire machine range application. Rollers are crowned on the external diameter with the aim to maintain undamaged the surface of the rotor journals and to avoid the generation of axial thrust that can influence the unbalance reading.

There must be a +/- 5% variation in the ratio between the diameter of the rotor journals and the diameter of the rollers on the carriages (the ratio can't be equal, multiple or submultiple) in order to avoid instability of the readings especially at low unbalance values.

- N. 2 Roller carriage for journals Ø5-70mm / R.Ø80x11mm

3.4 Safety hold down

A vertically adjustable safety hold down is mounted at the top of the pedestal so as to limit and contain any eventual shake of the rotor in case of excessive high unbalance.

- N. 2 Standard safety brackets

3.5 Belt drive system

This comprises a motor with speed regulation by frequency converter, fitted on a slide adjustable along the bedplate and by an idle pulley system fitted on the same slide, so as to allow rotor driving by means of a flat belt. By choice we have two different type of belt driving:

- **TCN:** overslung type, the belt carrying arms allows to drive the rotor on a cylindrical zone with diameters from 30 to 300 mm. The support is built so that, in low position, the belt wraps the rotor about 180°; in open position the rotor is completely free to be removed from the machine pedestals
- **TCI:** underslung type, the flat belt must be placed around the rotor on a cylindrical zone and tightened by means the manual device. The central pulley can be displaced in order to cover a range of diameters from 50 to 540mm.

Different size belts are supplied in order to cover a range of diameters over which belt can drive.

It is also supplied a cross upright with the photocell (or no contact sensor if supplied) for the unbalance phase detection and proper synchronization and filtering of the signal.

The photocell can read a phase reference mark done on the rotor with a felt pen, reflective tape or either by chalk. A couple of axial stopper with bearing installed on each pedestal, secure the rotor from any axial displacement during the unbalance reading.

- Z200/300 Overslung belt-drive 2,2kW - belt tensioning by hand

3.6 Power and measuring cabinet

Containing the machine power portion, the drive for motor and the measuring unit.

The cabinet is connected to the mechanical unit by means of a reinforced flexible cable, thus making installation and displacement of the machine very easy and quick.

The power cabinet is made according to E.C. regulations.

- Rack control cabinet with dimensions 600x630x1800(h)mm

3.7 Measuring instrumentation

The measuring chain is entirely produced by CEMB with proprietary software and electronic PCBs designed and developed in house.

The CEMB industrial PC has the main following characteristics:

- Operating System: Windows 10 IOT Enterprise 64 bit LTSC.
- Touch-screen 15 inch, large luminosity and IP66 protection.
- Ethernet port + front USB port.
- 2 simultaneous measuring channels.

The main characteristics of the software are the following ones:

- 999 balancing programs memory with fast search database system and with possibility of direct backup on a USB key or remote.

- Setting of direct or automatically calculated balancing tolerances according to ISO or API standards, referred to correction plans or to the real ones for putting the rotor into service.
- Setting of different measuring units for unbalance, dimensions and tolerance.
- Indication of the unbalance angular position with an analogic display connected to the rotor position
- Displaying and storing of the values obtained in several measures so as to verify possible deformations or rotor variations when in rotation.
- Possibility to print balancing certificated in HTML format to be saved into a USB key and then to be printed.

3.7.1 Measuring instrumentation B11

For the B11 there are available a series of additional optional software that facilitate a lot the machine operator for both unbalance correction as well as the machine calibration check-up and certification.

3.7.2 (Optional) CSV saving program

After each measuring run or by pressing a dedicated video button, the measuring unit compresses in a string of data the unbalance values as well as the date and the hour of the current spin, adding the id read by the barcode reader o entered by the operator. The string is then queued to the previous measurements in a text file into a new directory on static memory.

The files saved can be imported inside a Microsoft Excel Program for statistical analysis.

3.8 (Optional) Ink jet printer

To print on A4 paper balancing certificates, results of readings of one or more measures, statistical dates etc. etc. It is placed on a support mounted in one side of the cabinet.

3.9 Electronic position repeater of unbalance angle

Composed of a position transducer e elaboration core (mounted in the measuring unit), has the function to show, with high precision, the position of the rotor when it is moved by hand.

That instrument enable to easily find the position to correct the imbalance also with the help of the video markers: when the rotor is almost in position, the pointer turns yellow and once the position is reached it turns red so showing the exact point where add or remove weight.

3.10 Micro safety switch (E.C. directives)

The machine is equipped with a micro-switch that allows guard opening only once the rotor is completely stopped. The same system doesn't allow the start if the guard is not properly closed.

- Single micro safety switch (floor sliding safety guard)

3.11 Tunnel guard sliding on floor-mounted rails

According to EU Directives and with special reference to what defined in the release currently in force of the "Machinery Directive 2006/42/CE", the machine cannot absolutely be operated without a suitable accident prevention safety guard.

The safety guard is "Tunnel" type, "C" class, sliding on floor-mounted rails allow the load and the unload of the rotors to be balanced: opening and closing is manually done by the machine operator.

We will send final lay-out for approval in phase of order.

- (Optional) Safety guard tunnel type, sliding on the floor, 2 sliding element/s, bedplate 1800mm, max rotor diameter 1000mm, safety class C300/180, opening left

3.12 Paint

- Machine and safety guards: Light Grey RAL 7035
- Electrical cabinet: Light Grey RAL 7035 with the upper side Graphite Grey RAL 7024 and lateral bands Red RAL 3020

3.13 Documentation

Will be supplied on electronic PDF format (USB drive).

- CE Conformity Declaration (in one of EC language) only for countries in the EU
- Introduction booklet (in one of EC language)
- Base Instruction manual (in one of EC language)
- Operator's manual (in one of EC language)
- Measuring manual (available languages: Italian, German, French, English, Russian, Spanish, Portuguese, Chinese, Swedish, Czech)
- Technical annexes just in Italian or English
- Wiring diagrams, EPLAN format (Italian or English)
- Mechanical assembly drawings, DXF format (Italian or English)

In case the machine has a PLC the list of it will be supplied in Italian (eventual translation shall be at extra price).

3.14 Machine accessories

Together with the machine we will supply the following accessories:

- Belt set to cover the operating range of machine
- Wrenches for fixing pedestal and carriages
- Plasticine for balancing test
- Elements for fixing the machine to the floor
- Detailed instruction manual

3.15 Packaging

The machine, properly protected with grease on exposed areas, will be fixed on a wooden base and enveloped with shrink-wrapped cellophane. Desiccants salts will be placed inside the pack to avoid any humidity formation. The base can be moved either by means of the forklift or overhead crane. Final weight and dimensions will be given once the machine is packed.

4 Exclusions

We intend excluded from the supply everything not clearly mentioned in particular the following:

- foundation and generic civil work
- fixage of the machine on the floor / foundation
- wirings and piping to the main sources
- machine unloading and displacement inside the factory

