



# Vibration Sensors, Monitoring systems & Predictive maintenance for Rotating Machines

تجهیز انرژی باختر



Vibration equipment division

T A J H I Z E N E R G Y B A K H T A R

**CEMB**

# CEMB spa: a Product company with global Service

**Family Owned Company**

**Now thirsd generation of Buzzi family are running the business**

**Funded in:** 1946

**HQ & Manufacturing facilities:**

Mandello del Lario, Italy

**Other facilities & Commercial Offices:**

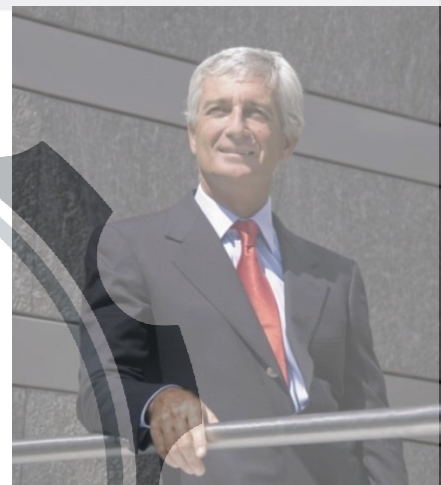
US, UK, DE

**Turnover:** 60 M/year

**Employees:** 270

**Surface:** Manufacturing: 15,000 sqm  
Offices & training: 14,000 sqm

**Certification:** ISO 9001:2015  
ATEX, IECEx, API, SIL  
(depending on products)



President: Ing. Carlo Buzzi



HQ & Manufacturing Facility1 , Mandello del Lario, Italy



Vibration equipment division

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## History:

In 1946 Luigi Buzzi designed the first balancing machine with a revolutionary solution, covered by patent. Production was started in 1952 with balancing machines for motor vehicles.

In 1960, he encouraged the constitution of an R&D department in the rapidly growing field of electronics: the immediate result was the application of new technologies to traditional systems as well as to monitoring and supervisory instrumentation for large scale power plants.

Carlo Buzzi is a graduate in engineering at Milan University who joined his father's company in 1977.

Carlo Buzzi gave a considerable boost to new designs based on the latest digital technologies. Microprocessor applications were conceived for automatic control of the balancing machines

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Garage



Industrial



Vibration

**Garage Equipment:** Tire  
Balancing machines for repair  
shops

**Balancing Machines:**  
Industrial & Automotive

**Vibration Monitoring:**  
Sensors, MMS & Portable  
Instruments for Energy, O&G,  
Chemical Water & Industrial

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The Industry Division of CEMB designs, manufactures and exports all over the world balancing machines, horizontal and vertical axis, suitable for any type of rotor, with manual or automatic correction of the unbalance; besides it produces fully automatic machines dedicated to the automotive industry and to be inserted directly into the production lines; in this last field Cemb works closely with the partner Company Hofmann Maschinen und Anlagenbau based in Germany.

## 1. Balancing machines with horizontal axis

Suitable for the balancing of rotors with a known axial length and with weight in the range 10 g up to 100.000 kg.



### ZBS/TO2

The balancing of rotors with weight up to 3 Kg.



### Z5-TC

The balancing of rotors with weight up to 10 Kg.



### Z4500-TC

The balancing of rotors with weight up to 6000 Kg.



### Z8000-G-TC

The balancing of rotors with weight up to 10000 Kg.

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## 2. Balancing machines with vertical axis

Suitable for balancing rotors having reduced axial length as regards the diameter, with or without its own shaft. The vertical axis balancing machines can be realized for the measurement and the correction of rotors on one plane only or on two planes and with a weight from few grams up to 3000 kg. When choosing a vertical balancing machine, special care should be taken with the device (an adaptor or a tool) used to fix the rotor to the machine: it must be practical and fast to use, but above all accurate.



**TB 7**  
Dynamic tool balancer



**V5-15-30**  
Balancing machine for small size rotors



**V50-100 UFA**  
Balancing machine with automatic drilling unit



**V500**  
Balancing machine for large size rotors

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## 3. Balancing machines for turbochargers

Suitable for the series balancing of Turbochargers and their components (Turbine Wheel Shaft and Compressor Wheel). High-performance and automatic machines with the possibility of manual or robot piece loading and unloading. They are made for measurement and correction on a single plane or on two planes, and are able to cover the entire range of pieces available on the market (weight, size and shape). Productivity up to 50 pieces/hour for high speed machines, and up to 120 pieces/hour for component machines.

## 4. Balancing machines for special purpose

For brake discs , brake drums, clutches, crankshafts, flywheels, Differential cases, fans, pulleys, pumps, rims, wheels, train – wheels and wheel assembly, aircraft industry and electric motors.



Core assembly  
(HS) PC



Core assembly  
(HS) CV

# تجهیز انرژی باختر



# CEMB spa: a Product company with global Service

3 separate & autonomous divisions



**Garage Equipments:**  
Tyre Balancing machines  
for repair shops;

**Balancing Machines:**  
Industrial & Automotive;

**Vibration Monitoring:**  
Sensors, MMS & Portable  
Instruments for  
Energy, O&G, Chemical  
Water & Industrial

# تجهیز انرژی باختر



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> **CEMB spa:** a Product company with global Service

## Vibration Division

**Products:** Vibration sensors & transmitters,  
Accelerometers,  
Proximitors,  
Vibration Monitoring Systems

**In house :** Design & Manufacture  
(electric, mechanics, software)  
Testing & Quality  
Engineering Support  
Spare parts

**Competitors:** Bently Nevada, Vibrometer,  
Pruftechnik, Bruel & Kijer

**Customers...:** Isfahan Oil Refinery Co.,  
Hormozgan Steel co.,  
Bandar Abbas Oil Refinery Co.,  
Bushehr methanol Plant



Manufacturing Facility 2 , Mandello del Lario, Italy



Training Center, Mandello del Lario, Italy



Vibration equipment division

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# Our Products and Competences

- Vibration Sensors, Transmitters, Rotation speed



- Vibration Monitoring Systems & cabinets



- Portable Vibration Analyzers and Balancers



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**... CEMB: Solutions of any size  
for vibration monitoring &  
predictive maintenance**

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# CEMB: Small size machines and retrofit

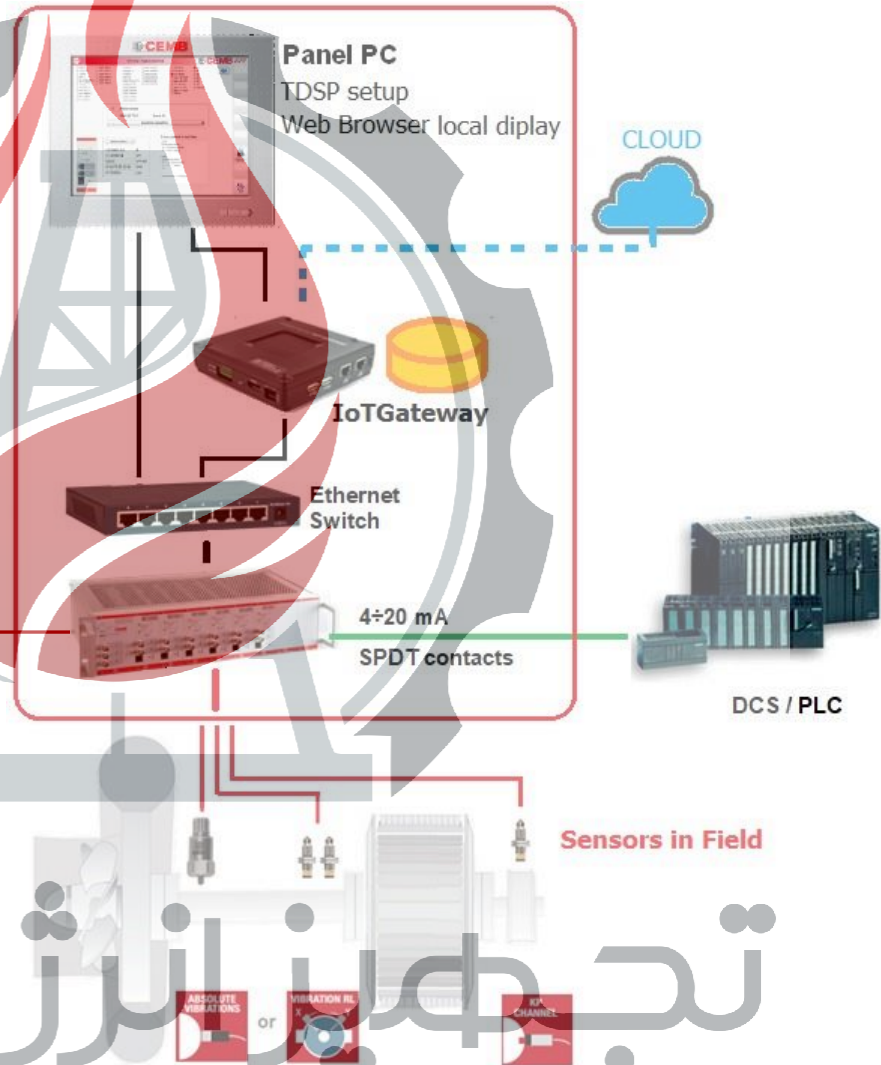


# CEMB: Medium size machines



- Fully modular solution: you pay what you use
- Advanced protection
- Real time acquisition & Monitoring
- Modbus communication to DCS
- Vibration analysis & predictive maintenance

## TDSP: Multi channel Machine Monitoring System

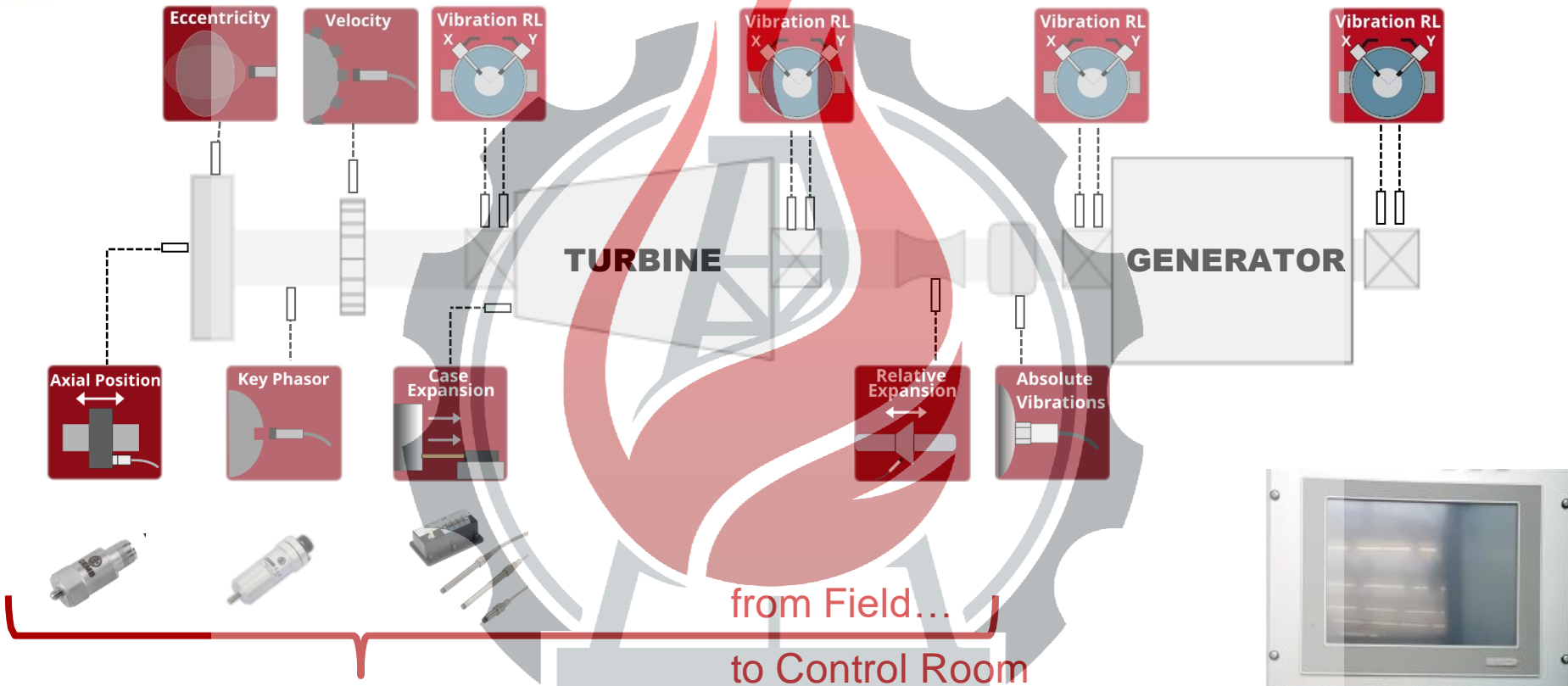


Up to 2 Racks, with the total n. of points:

- 24x vibration channel
- 24x Analog Input from 4-20mA
- 4x KP
- 60x SPDT relay output
- 40x 4-20mA Analog Output
- 8x Bis for trip multiply & bypass



# CEMB: big size machines



**TDSP: Multi channel Machine Monitoring System**



- Redundant power supply
- Advanced protection
- Real time acquisition, Monitoring & TCP-IP communication to DCS
- Vibration analysis & predictive maintenance



Portable Instruments

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# Portable Instruments for Field Balance & Analysis



## Intuitive, Accurate & Reliable

- Easy Balance procedures
- Measure vibration for periodic maintenance
- Install & Commissioning rotating machines
- Generate Balance & diagnostic certificates
- Standard & Color Graphic Display
- Battery operated



**N130:** 1Ch (10KHz) + Tacho

**N330:** 2Ch (10KHz) + Tacho

Vibrometer, Analyzer,  
Ball Bearing,  
Tachometer,  
Balancer,  
interface to PC



**N600:**

2Ch (10KHz) + Tacho Laser

7" Color Graphic Display  
Easy to use

vibrometer, FFT,  
analyzer, tachometer,  
balancer, data collector  
interface to PC

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# Portable Instruments for Shaft Alignment

## Intuitive, Accurate & Reliable

- Simplified Alignment procedures
- Generate report certificates
- Color Graphic Display
- Battery operated
- Easy to use
- Dual laser emitter

### AL30: Shaft Alignment

Dual Laser optics  
4" Colour TFT display  
Icon based graphics  
Real time values  
Wireless sensors  
interface to PC

### AL30: Pulley Alignment

Angular alignment  
Parallel alignment  
Dual Laser optics  
Easy to install  
AAA battery operated



The logo features a stylized red flame rising from a grey industrial structure, all enclosed within a grey gear-like border. A faint grey waveform is visible in the background on the left side.

## Monitoring Systems

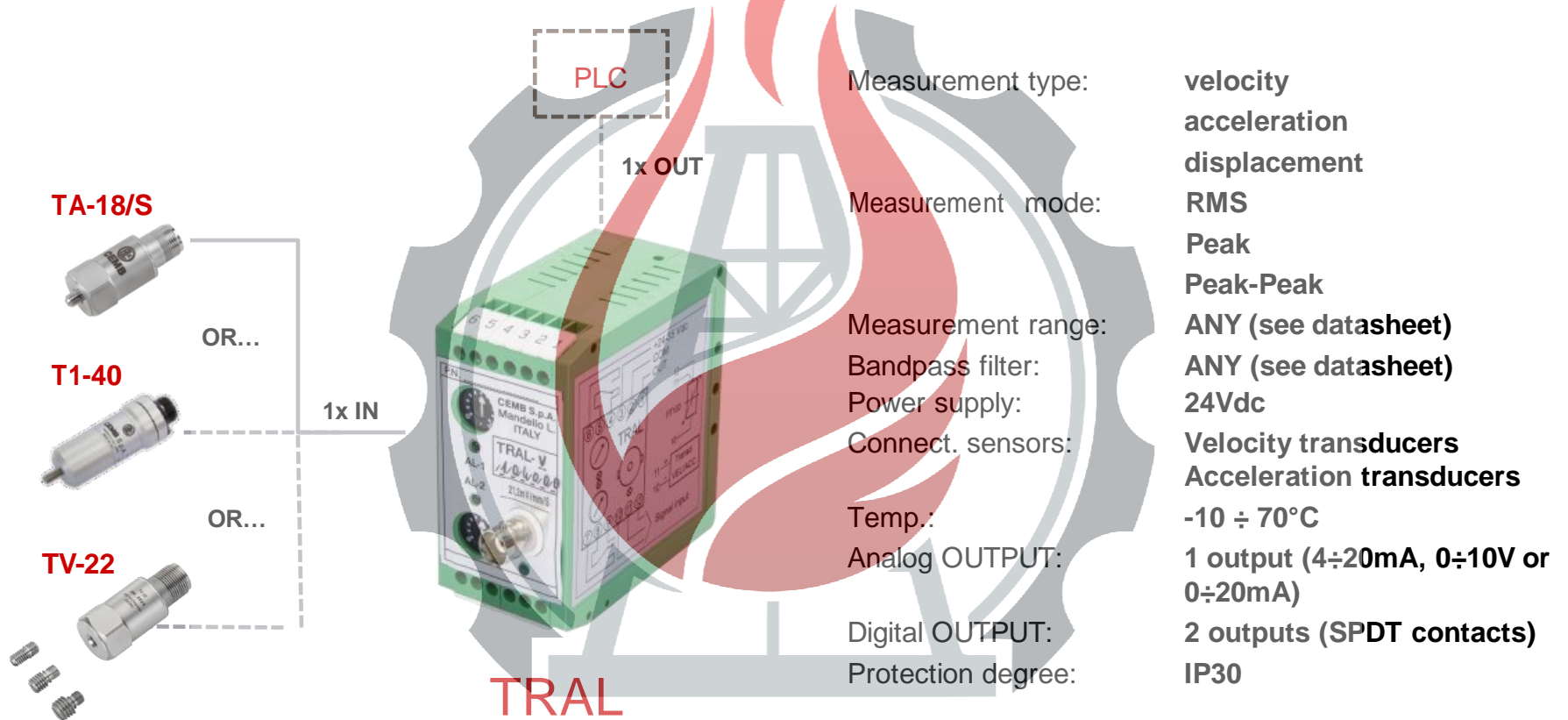
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# Rail-mount transmitters: TRAL - single channel



## Functions



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## Certifications:



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# Rail-mount equipment: TD2 – dual channel

TA-18/S



OR...

T1-40



OR...

Proximitor



OR...

Axial position



2x Input + PK

Measurement type: **absolute & relative vibration  
rotation speed  
axial displacement  
key phasor**

Bandpass filter: **1Hz to 5KHz**

Measurement mode: **Any**

ModBUS TCP/IP protocol



2x 4-20 mA output

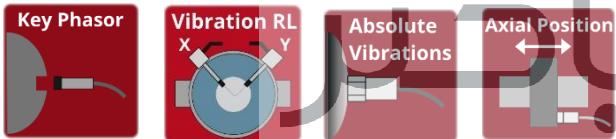


6x Configurable relays



2x Binary Input (Reset, Trip Multiply...)

## Functions



## Certifications:



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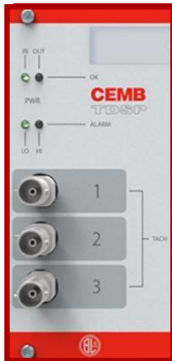
# Machine Monitoring System: TDSP: the hardware



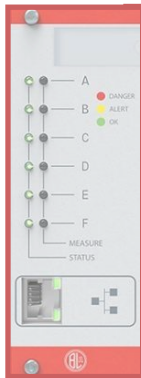
## TDSP Architecture - SIL2 certified -

- Standard 19" rack (height: 3 units)
- 1 power supply + 8 dual channel modules per rack
- Redundant power supply available
- MODBUS TCP-IP on each module to maximize comm. reliability

### PSU Module



### PRO Module



- 90:260Vac (50-60Hz) or 19-32Vdc or 85-370Vdc
- Up to 3 Key Phasors connectable to each power supply
- 2 Self diagnostic relays
- Up to 6 channels for process variable transmitters (Temp, Press,...)
- 3 Configurable relays with NO/NC + Self diagnostic
- 1 Bypass Digital Input + 6 Analog outputs (4-20mA or 0-10V)

### CPU Module



- 2 channels for....
- Absolute Vibration
- Relative Vibration
- Axial Displacement
- Case Expansion
- Differential Expansion
- Rotation Speed
- 6 Configurable relays with Self diagn.
- 2 Bypass digital inputs
- 2 Threshold multipliers
- 2 Analog outputs (4-20mA or 0-10V)
- 2 BNC to duplicate signals from field



# SIL3 Overspeed Protection

INPUTS	
Power supply	See Ordering code
Speed signal input types	See Ordering code
OUTPUTS	
CPU analog outputs	4 ÷ 20 mA each channel
CPU digital outputs	No.6 Single-pole, double-throw (SPDT) relays each channel Each relay is switch selectable for Normally De-energized or Normally Energized
Trip (PLC) digital outputs	No.3 (optionally 6) Single-pole, double-throw (SPDT) voting 2oo3 safety logic (2-out-of-3)
GENERIC'S	
Data interface	LAN port on each CPU ModBus TCP/IP communication
Response time to trip	40 ms
Accuracy	< 100 RPM ±0,1 RPM 100 ÷ 3000 RPM ±1 RPM > 3000 RPM ±0,1%
Protection grade	IP20
Back terminal boards	Screw terminal connectors, Phoenix Contact FRONT-SFL 2,5/F48
Environment condition	Operating temperature -20°C ÷ 70°C
Safety data	According to certificate
Weight	5 Kg approx
Dimensions (W x H x D)	482,5 x 305 x 132,5 mm (19" ; 3 units height)



## Overspeed SIL3/A/B

A

### Power Supply

- A1 90 ÷ 264 Vac (50/60 Hz)
- A2 19 ÷ 32 Vdc
- A3 85 ÷ 110 Vdc

B

### Type of RPM Sensors

- B3 eddy current T-NC/8-API
- B4 electromagnetic sensor T6-R
- B5 hall effect sensor T6-H

## Functions



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## Certifications:



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# Vibration Transmitters

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# Absolute Vibration (Seismic) Transmitters

TR-26/27 series



TR-26



TR-27



Measuring Range: ANY (see datasheet)  
Frequency: 1.5Hz – 2KHz (-3db)  
Temperature: -60 : 120°C  
Thread: ANY (see datasheet)  
Material: AISI316L  
On board connector: MIL-C or M12  
Output: Selectable g or mm/s

Measuring Range: ANY (see datasheet)  
Frequency: 1.5Hz – 2KHz (-3db)  
Temperature: -60 : 120°C  
Thread: ANY (see datasheet)  
Material: AISI316L  
Output: Selectable g or mm/s

## Functions



## Accessories

Connectors: - Straight / 90°  
- Mil-C / Sealed

Cables: - 2x1 Shielded  
- Armoured  
- ETFE (extreme environment)

## Certifications



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# Absolute Vibration (Seismic) Transmitters

TR-I series (Explosion proof)



## TR-I

Measuring Range Velocity:

0÷10 mm/s RMS  
0÷20 mm/s RMS  
0÷50 mm/s RMS  
0÷100 mm/s RMS

Measuring Range Acceleration

0÷1 g RMS  
0÷5 g RMS  
0÷10 g RMS  
0÷100 mm/s RMS

Special measuring under request

Frequency:

1Hz – 2KHz

Temperature range:

-40 : 70°C (HT)

Body Thread:

M8x1.5 or ¼"-18NPT

Body Material:

AISI316L

Electrical connection:

¾" - NPT

Case Material :

Die-casted Aluminium

Ex\_d:

Explosion proof

## Functions



## Options

- Painted case for marine applications
- Electrical connection adapter ¾"-NPT to any Thread

## Certifications:



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# Absolute Vibration (Seismic) Transmitters

SPINTROL (dual-output transmitter)



## SPINTROL

Frequency range:

**Low frequency**

(Out1 2÷1000Hz; Out2 1÷5KHz)

**High frequency**

(Out1 10÷2000Hz; Out2 2÷5KHz)

Measuring Range Velocity (Out 1):

**0÷10 mm/s RMS**

**0÷20 mm/s RMS**

Measuring Range Acceleration (Out 2):

**0÷5 g RMS**

**0÷10 g RMS**

Integrated cable length:

**max 99 mt.**

Temperature range:

**-40 ÷ 150°C**

Body Material:

**Cast aluminum**



## Functions



- Armoured integrated cable

## Options

## Certifications:



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# Proximity Transmitters

TR-NC/8 series



## Probe



Mat: **Stainless steel**  
Temp.: **-35 : 175°C**  
Thread: **M10 or 3/8"**  
Body: **40mm : 170mm**  
Oil proof: **Yes**

## Integrated cable types



Length: **0.5mt : 12mt**  
Armour: **Optional**

## Extension Cable (optional)



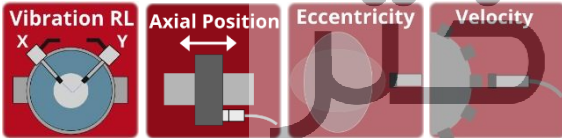
Mat.: **RG180 + golden contacts**  
Temp.: **-35 : 175°C**  
Cable: **3mt : 11mt**  
Armour: **Optional**

## Converter



Power supply: **18-32 Vdc**  
**current loop 4-20mA**  
Range: **2mm**  
Temp.: **-35 : 75°C**  
Frequency: **0Hz – 10KHz**  
Calibration: **up to 12mt**  
Target : **AISI 4140 (default)**  
**ANY Steel (optional)**  
Din Rail: **Yes**

## Functions



## Certifications:



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**INTEROPERABILITY of TDSP with  
Third parties MMS (BN, VM....)**

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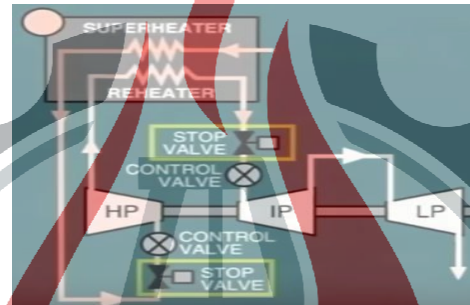


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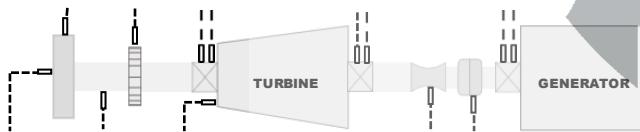
# Vibration Monitoring: System/Plant interoperability

100Mbit Ethernet communication bus supporting MODBUS protocol

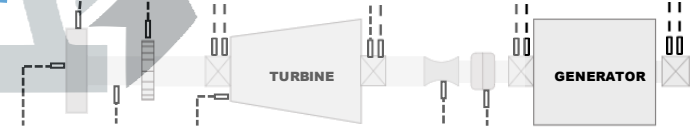


Machine Control & Governor

Allen Bradley,  
GE,  
ABB,  
....



Group1 (e.g. by **CEMB**)



Group2 (e.g. by **BN**)

Inside each plant, **CEMB TDSP** and **BN 3500** or **VMS 600** offer equivalent capabilities and features and both of them can interface to the same machine governor system



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# Vibration Monitoring: Field sensor interoperability



3<sup>rd</sup> party vibration protection system or monitoring system



CEMB TDSP monitoring system



In-field sensors by CEMB



In-field sensors by 3<sup>rd</sup> party vibration sensors vendor

**CEMB VMS TDSP system** is able to read and capture signals from third party sensors (e.g. BN, Meggit, etc ...);

**CEMB sensors** (Accelerometers, Velocimeters, Proximity sensors) are fully compatible with third party VMS (e.g. BN35000, Vibrometer VM600, etc ...).





FIELD SENSORS

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# Sensors in field: Proximity, Displacement & KP

(T-NC/8-API SERIES)



## Probe



Mat: **Stainless steel**  
 Temp.: **-35 : 175°C**  
 Thread: **M10 or 3/8"**  
 Body: **40mm : 170mm**  
 Oil proof: **Yes**

### Integrated cable types



Length: **0.5mt : 12mt**  
 Armour: **Optional**

## Extension Cable (optional)



Mat.: **RG180 + golden contacts**  
 Temp.: **-35 : 175°C**  
 Cable: **3mt : 11mt**  
 Armour: **Optional**

## Converter



Sensitivity: **7.87 mV/μ (200mV/mil)**  
 Power supply: **-20 : -30 Vdc**  
 Range: **2mm**  
 Temp.: **-35 : 75°C**  
 Frequency: **0Hz – 10KHz**  
 Calibration: **up to 12mt**  
 Target : **AISI 4140 (default)**  
**ANY Steel (optional)**  
 Din Rail: **Yes (optional)**

## Functions



## Certifications:



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# Sensors in field: Proximity Probe Housing

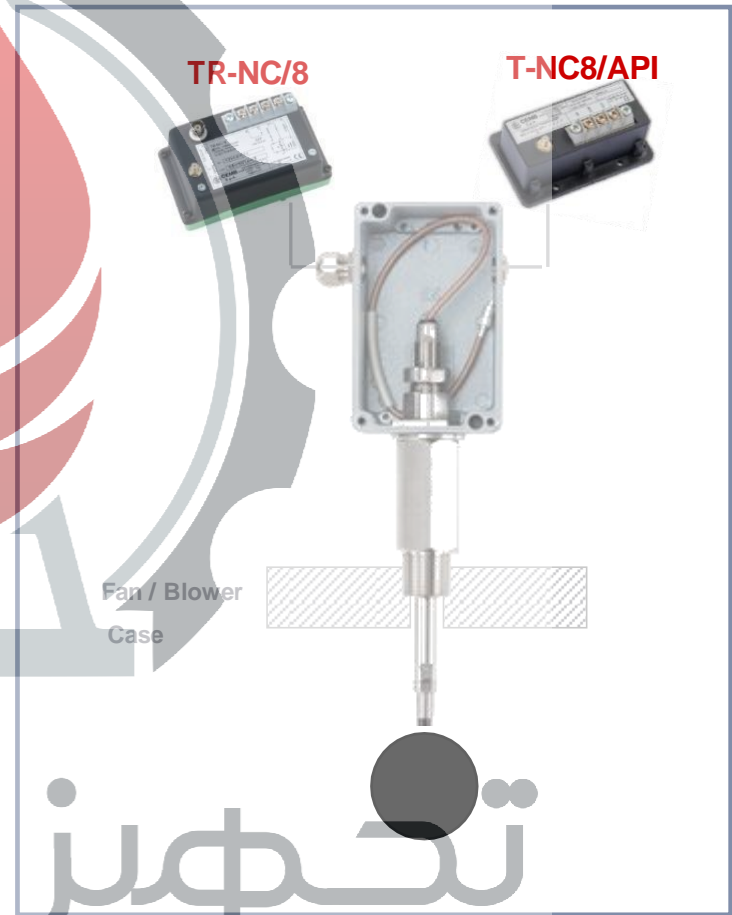


CEMB Probe Housing are recommended to mount proximity probes through the machine case. The probe housing simplifies the assembly and improves the regulation of the probe.

## SR7 Probe Housing



Adapter Material:	<b>Stainless steel AISI 304</b>
Enclosure Material:	<b>Cast aluminum</b>
GAP adjustment:	<b>±10mm</b>
Threads:	<b>-3/4" 14NPT    1/2" 14NPT</b> <b>1/2" GAS        M20 x 1,5</b>
Rod length:	<b>40mm ÷ 220 mm</b>
Temperature:	<b>-50 : 175°C</b>
Oil proof:	<b>Yes (Neoprene O-Ring is included)</b>



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# Sensors in field: Absolute Vibration



## Accelerometers (TA-18/S)



## Velomitors (TV-22 & 32)



## Velocimeters (T1-38 & 40)



Sensitivity: **100mV/g**  
Frequency: **0.5Hz – 15KHz**  
Temp.: **-50 : 120°C**  
Thread: **ANY** (see datasheet)  
Material: **AISI316 (SS)**  
Technology: **Piezo**

Sensitivity: **3.94 mV/mm/sec**  
Frequency: **1.5Hz – 12KHz**  
Temp.: **-50 : 120°C**  
Thread: **ANY** (see datasheet)  
Material: **AISI316 (SS)**  
Technology: **Piezo**

Sensitivity: **21.2 mV/mm/sec**  
Frequency: **3Hz – 2KHz**  
Temp.: **-40 : 175°C (HT)**  
Thread: **M8x1.5**  
Material: **Alu or AISI316 (SS)**  
Technology: **Electrodynamic**

## Functions



## Accessories

Connectors: - Straight / 90°  
- Mil-C / Sealed

Cables: - 2x1 Shielded  
- Armoured  
- ETFE (extreme environment)

## Certifications



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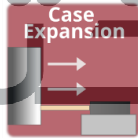
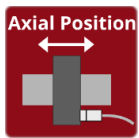
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# Sensors in field: Displacement Position (T-NC SERIES)



Probe			Converter	
Model:	16	20	30	
Range:	4mm	8mm	13mm	
Thread:	M20x1.5	M24x2	M36x3	
Temp.:	-50 : 175°C			
Body:	45mm : 105mm (Stainless Steel)			
Integrated cable types 				
Lenght:	1mt : 10mt			
Armour:	Optional			
Oil proof:	Yes			
			Output: 0-10V or 4-20mA Power supply: 20 – 30 Vdc Temp.: -20 : 70°C Calibration: up to 10mt Target : AISI 4140 (default) ANY Steel (optional)	

## Functions



## Certifications



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# Sensors in field: Rotation Speed Sensors

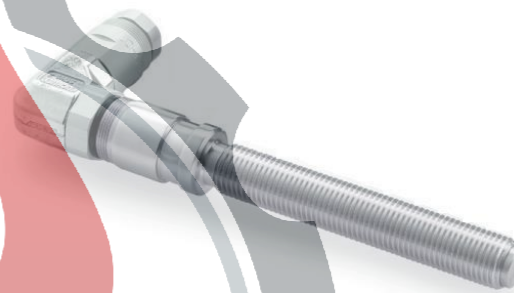


## T6-R



Material: **Brass**  
Technology: **Inductive**  
Power supply: **Not required**  
Range: **1 ÷ 30KHz**  
Thread: **M22 x 1**  
Thread size: **60mm**  
Temperature: **-35 ÷ 105°C**  
Oil proof: **Yes**

## T6-H



Material: **Stainless Steel**  
Technology: **Differential Hall Effect**  
Power supply: **5 ÷ 30 Vdc**  
Range: **0 ÷ 30KHz**  
Thread: **M14 x 1.5**  
Thread size: **90mm**  
Temperature: **-40 ÷ 120°C**  
Oil proof: **Yes**

Custom size available upon request

## Functions



## Certifications:



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T A J H I Z E N E R G Y B A K H T A R

# CEMB



References,  
Sales and Technical Team

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# They have already selected CEMB

**ABB**

**DRESSER-RAND**

**enel**

**FRANCO TOSI**  
MECCANICA

**FLOWERVE**

THE LINDE GROUP  
**Linde**

**Maire Tecnimont**

clean energy ahead  
**TURBODEN**  
A PRATT & WHITNEY POWER SYSTEMS COMPANY

**ANDRITZ**

**ENERPROJECT SA**  
ENERGY TECHNOLOGY

**EXERGY**

**GEA**

**HAFI**

**LUKOIL**  
OIL COMPANY

**SIEMENS**

**Turbomach**  
A Caterpillar Company

**ANSALDO**  
ENERGIA



**FINCANTIERI**



**KSB**

**MAPNA GROUP**

المؤسسة العامة لتحلية المياه المالحة  
Saline Water Conversion Corporation

## Some of CEMB recent installations:

- Aircooler (Algery)
- Al Gubrah (Oman)
- Al Jubail (Saudi Arabia)
- Aqaba power station (Jordan)
- Bandar Abbas (Iran)
- Bin Qasim power (Pakistan)
- Cantayus Colombia (Colombia)
- Cerro (Peru')
- Damanhour (Egypt)
- Deir Azzour (Syria)
- Daura (Iraq)
- Bushehr methanol Plant (Iran)
- Embalse (Argentina)
- Gebze ccpp kocaeli (Turkey)
- Hafi (Hungary)
- Khisvi (Greece)
- .....



Vibration equipment division

**TAJHIZ ENERGY BAKHTAR CEMB**