Vibration equipment division

TDSP monitoring system

CEMB
BALANCING MACHINES

CEMB S.p.A. - Via Risorgimento, 9
23826 Mandello del Lario (LC) - Italy
www.cemb.com

Vibration analysis division:
Phone +39 0341 706111
e-mail: stm@cemb.com

TIRGAN
VIBRATION ANALYSIS & CONDITION MONITORING EQUIPMENT

Address: Unit 6, No. 52, Jouybar St.
Tehran - 1415795361, IRAN
Tel: +98-21-88996358-60 Fax: +98-21-88992367
www.cemb-iran.com
info@cemb-iran.com

CEMB/TDSP/VERSION 06 / 11-06-2018

TDSP SYSTEM

The instrumentation for monitoring vibrations and diagnostics of machinery using the TDSP system is based on CEMB's many years experience in the field of vibro-technics and the diagnosis of rotating machinery.

Thousands of CEMB systems have been installed to protect steam / gas / hydraulic turbines, pumps, compressors and fans.

In addition to all the principal functions required for monitoring, the TDSP system is designed with particular care to the operator interface, in order to simplify all the operations necessary for managing the equipment correctly.

The new TDSP system is designed using modern DSP based architecture to meet the demands for maximum flexibility and modularity, providing a high performance solution to a wide range of needs. The TDSP system can be used either for protecting a single machine that calls for just a few measuring points, monitoring, acquiring and storing typical data for intelligent supervision or as a sophisticated diagnostic system used for machinery in a complete plant.

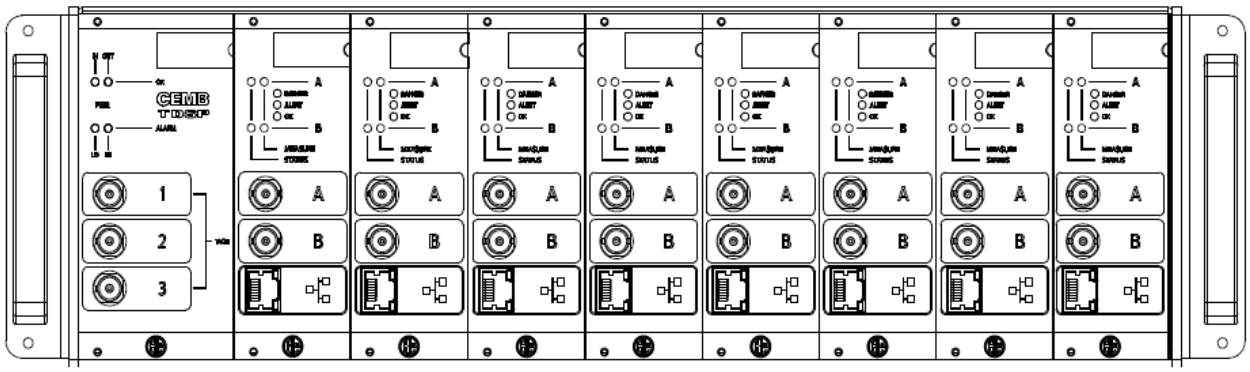
The system is based on the TDSP processing module, which is dual-channel and can operate on a stand-alone basis. Its terminal board makes it possible to connect to measuring transducers with analogue and digital inputs/outputs. The ethernet port on the front is used for configuring the board and makes it possible to connect to a dedicated PC that can be used for presenting data and for connecting to external diagnostic systems and/or DCS.

Basic structure of the TDSP system

The basic composition is the most simple in the system and is normally used for controlling a relatively low number (6-10) of measuring points spread over one or more machines.

This solution guarantees the basic protection functions:
- Acquisition of sensor signals (accelerometers, velocity sensors and proximity probes)
- Availability of an analogue signal (0–10 V or 4–20 mA) proportional to the magnitude measured
- Availability of alarm contacts when prepoints are exceeded

Depending on the number of channels, the instrumentation's structure comprises:
- A standard 19" rack
- Power supply (possibly redundant)
- Up to 8 TDSP modules



Software for setting all the operating parameters for the processing module simplifies this operation and makes it possible to save all the settings selected in a PC.

Intermediate structure

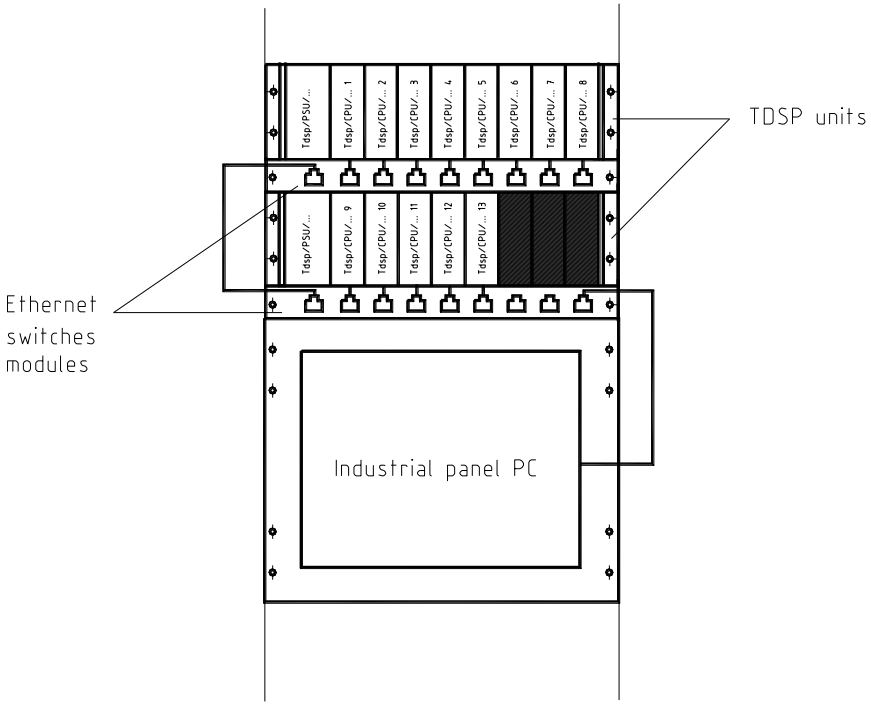
This solution extends the basic composition by using the ethernet link to interface all the TDSP modules with an industrial PC for acquiring, displaying and saving data.

The composition for the basic structure has the following devices added:
- 1 switch for the ethernet connection of the various modules to the PC
- 1 industrial PC with suitable characteristics

This configuration is combined with a specific software package for managing and presenting data in online mode and can display:
- ⇒ The values for the various magnitudes
- ⇒ The measurement trend
- ⇒ The status of the various measurements
- ⇒ Alarm indication

Measurement information is made available in real-time for third party applications as well, using an OPC Server/Client type interface.

Where required, a further software package can be supplied for saving data (in a database or for subsequent analysis).



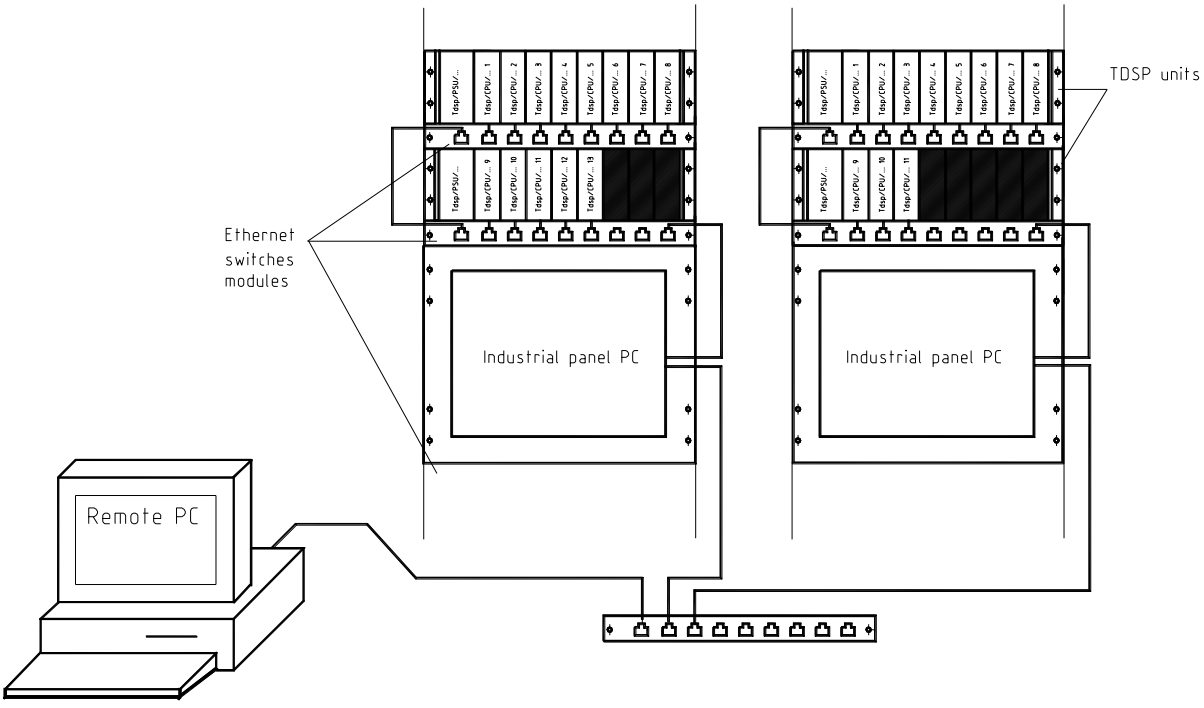
Struttura completa

Complete structure

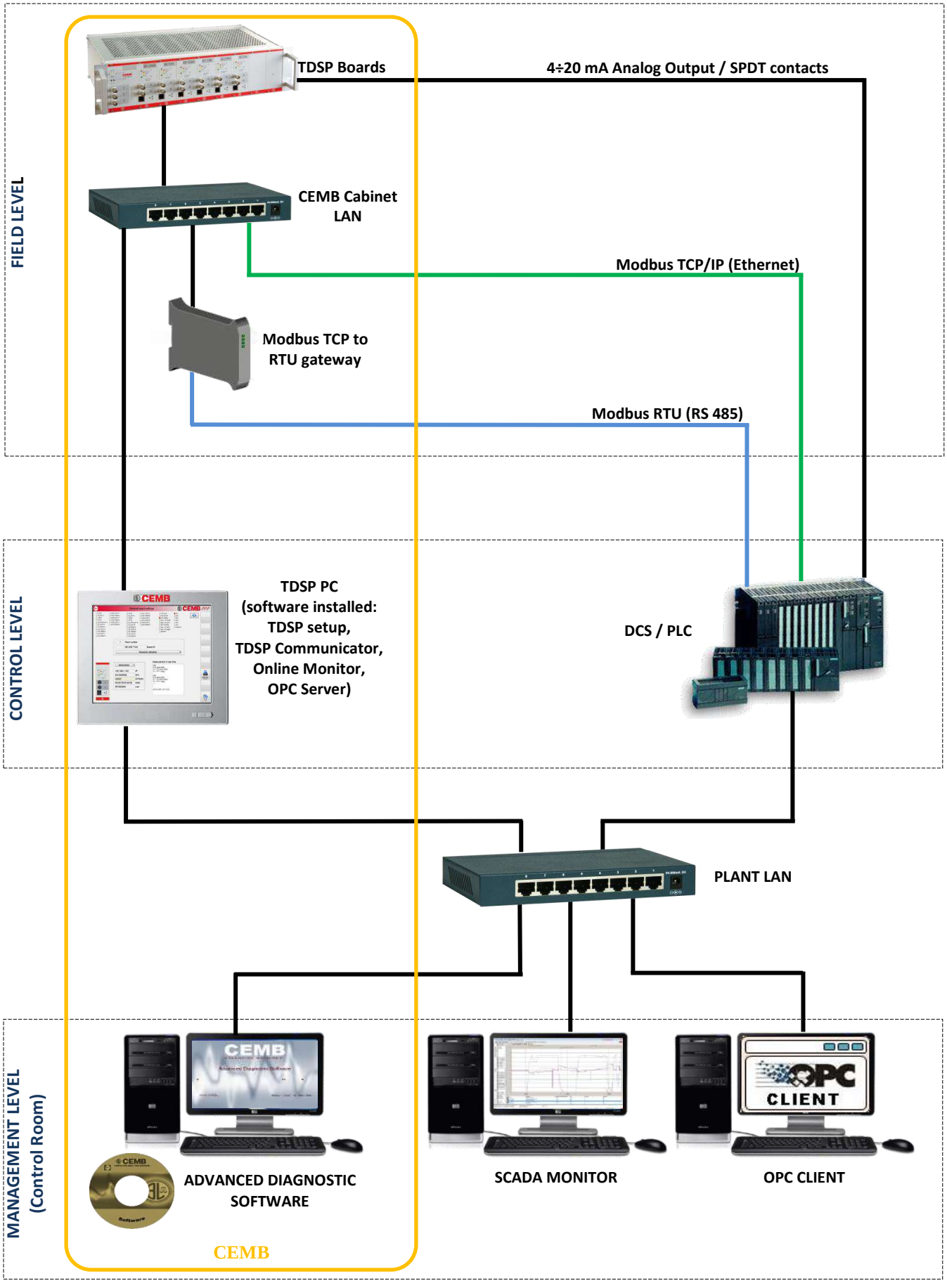
The industrial PC for the intermediate configuration can be inserted in the end user area network (LAN).

All the historical data acquired can be accessed using specific software for the purposes of advanced analysis and diagnosis of the machinery.
This dedicated software is able to display:

- ⇒ Vibration spectrum
- ⇒ Wave form
- ⇒ Orbit
- ⇒ Spectral bands
- ⇒ Start-up and coast down spectra

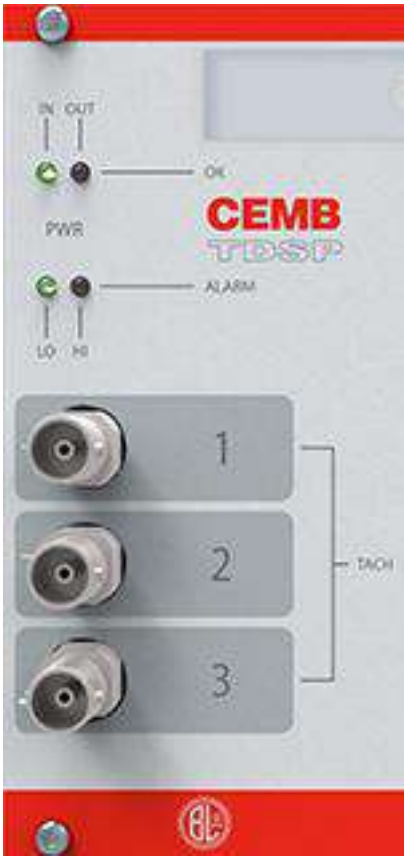


TDSP system communication architecture



Vibration equipment division

TDSP power supply module PSU



CEMB
BALANCING MACHINES

Via Risorgimento, 9 – Casella Postale 220 – 23826 Mandello del Lario (LC) - Italy
Tel. +39 0341 706111 - Telefax +39 0341 706299
www.cemb.com e-mail: stm@cemb.com

PSU TDSP power supply module

Description

The PSU TDSP power supply module is able to provide power to all modules fitted on a TDSP rack in order to guarantee correct operations safely and reliably.
In addition to converting the DC or AC voltage into the DC, stabilised voltage required for correct functioning of the various TDSP modules, the power supply module is fitted with 3 independent phase reference detection channels.

Characteristics / applications

The PSU TDSP power supply module is designed to be fitted on a standard 19" rack and is set up to allow for multiple use for applications that call for redundancy to guarantee more reliable working of the protection system. The correctness of the incoming and outgoing supplies is indicated by 4 LEDs on the panel and 2 relays.

Specifications

Electrical

- Inputs : 90 ÷ 264 VAC 50/60 HZ
  : 19 ÷ 32 VDC
  : 85 ÷ 140 VDC
  : 120 ÷ 370 VDC
- Power 100 W
- Output 24 VDC, 4A
- N° 3 phase reference channels
- N° 3 phase signal BNCs
- The entire TDSP unit conforms to the (EN 61010-1) electrical safety and (EN 61326-1) EMC standards

Ambient conditions

- Temperature range 0 °C to + 70 °C
- Humidity 95% non condensing

Mechanical conditions

- Dimensions as per DIN 41494 (12TE, 3HE, P220)
- Weight 400 g

Order information

PSU TDSP/ **A** / **B** / **C**

A Power supply

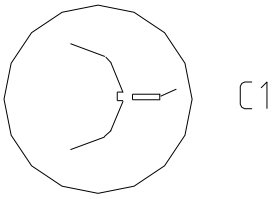
- A1 90 ÷ 264 VAC 50/60 HZ
- A2 19 ÷ 32 VDC
- A3 85 ÷ 140 VDC
- A4 120 ÷ 370 VDC

B Type of tachometric sensor

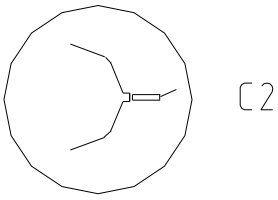
- B1 no-contact T-NC/API
- B2 no-contact T-NC/S
- B3 Hall effect T6-H
- B4 Electromagnetic T6-R

C Type of tachometric sensor mechanical reference

- C1 hollow



- C2 sensor



Order example

PSU TDSP/A3/B1/C1

Power supply with input voltage of 85÷140 VDC, T-NC8/API type tachometric sensor, hollow phase reference

Description of the external connections TDSP PSU

Rear terminal board

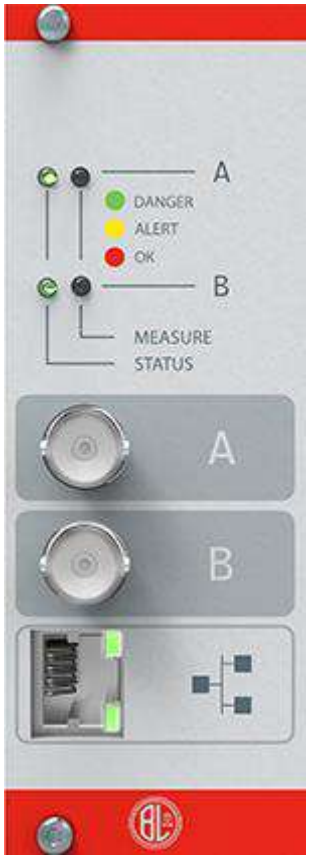
o o o o o o o o o o M2,5 holes for screens connection				
Output +24Vdc (to TDSP CPU)		D2	Z2	Output GND (to TDSP CPU)
Output +24Vdc (to TDSP CPU)		D4	Z4	Output GND (to TDSP CPU)
Output +24Vdc (to TDSP CPU)		D6	Z6	Output GND (to TDSP CPU)
Output +24Vdc (to TDSP CPU)		D8	Z8	Output GND (to TDSP CPU)
Output tach 1 (to TDSP CPU)		D10	Z10	Input sensor tach 1 SIG+
Output tach 2 (to TDSP CPU)		D12	Z12	Input sensor tach 1 SIG-
Output tach 3 (to TDSP CPU)		D14	Z14	Input sensor tach 1 Power supply
Relay V OUT N. Open		D16	Z16	Input sensor tach 2 SIG+
Relay V OUT N. Closed		D18	Z18	Input sensor tach 2 SIG-
Relay V OUT C. Common		D20	Z20	Input sensor tach 2 Power supply
Relay V IN N. Open		D22	Z22	Input sensor tach 3 SIG+
Relay V IN N. Closed		D24	Z24	Input sensor tach 3 SIG-
Relay V IN C. Common		D26	Z26	Input sensor tach 3 Power supply
Phase L (or Vdc+) Power supply		D28	Z28	Do not connect
Neutral N(or Vdc-)Power supply		D30	Z30	Do not connect
Ground Power supply		D32	Z32	Do not connect
o o o o o o o o o o M2,5 holes for screens connection				

On the rear terminal board are available:

- Power supply input
- Power supply output to TDSP CPU
- 3 tach sensor input with sensor power supply
- 3 tach output to TDSP CPU
- 2 self-diagnostic relays are available:
- Self-diagnostic relay V IN. The relay is activated when the input voltage is correct (normally energized operation). It is deactivated when the voltage is not within the parameters or in case of voltage failure
- Self-diagnostic relay V OUT. The relay is activated when the output voltage (+24Vdc) is correct (normally energized operation). It is deactivated when the voltage is not within the parameters or in case of voltage failure

Vibration equipment division

TDSP processing module CPU



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BALANCING MACHINES

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Tel. +39 0341 706111 - Telefax +39 0341 706299
www.cemb.com e-mail: stm@cemb.com

TDSP processing module

Description

The TDSP processing module is equipped with a modern, high-performance digital processor. This guarantees great reliability as it is able to operate fully autonomously, running a series of functions simultaneously.

- Suitably conditioning and acquiring the signal from two measuring transducers for continuous monitoring of mechanical parameters
- Converting these signals into digital format and processing them adequately using a powerful DSP
- Measuring vibrations – differential and absolute expansion – axial displacement – eccentricity – rotor speed
- Checking exceeding of preset thresholds
- Suitably driving a series of relays in order to be able to protect rotating machines in the best manner
- Making available two analogic outputs proportional to the magnitudes measured
- Providing information on the status and level of measurement by means of multi-colour LEDs on the front panel

The dual channel TDSP module can transfer data to a dedicated PC via a 100 Mbps ethernet link that guarantees the proper transfer speed for the system's needs.
By means of the dedicated PC the data can be made available to an external DCS or used by adequate display, saving and post-analysis programs.

The TDSP processing module is specifically designed to form the basis of a modular system that is able to cover the most different needs:

- From just a few measuring points to an entire plant
- From a protection function to in-depth advanced diagnostic analysis of any rotating machine

The processing module's basic functions include:

- Protection against short-circuits on inputs and outputs
- Self-diagnosis function for anomalous conditions (board faults, sensor malfunctions, no phase reference)
- Conditioning and acquisition of a signal from two transducers (accelerometers, velocimeters and proximity sensors)
- Sampling and digital conversion of signals
- LED measurement status indication
- LED indication when preset thresholds are exceeded
- N° 2 analogic outputs 0÷10 V or 4÷20 mA opto-insulated
- N° 4 digital Bypass and Trip-Multiplier inputs
- N° 6 fully configurable relays with NO and NC contacts
- Replica of inputs on the front BNCs
- Possibility of hot insertion and extraction (hot-plug / hot-swap) without disconnecting the power supply to the box and without interfering with the other boards

Characteristics / applications

The main characteristics of the TDSP processing module are that it guarantees maximum flexibility, speed and calculating power, keeping up the high degree of reliability required by the protection function.

The processing module's structure makes it able to work autonomously as a stand alone board, without requiring any further external components. This characteristic, together with the whole range of functionality provided, means that it can be used for monitoring just one or two measuring points as well.

The TDSP processing module can be used for continuously monitoring vibrations on the widest range machines like fans, pumps, motors, compressors, steam / gas / hydraulic turbines.

Specifications

Electrical

- 2 sensor inputs (including power supply where applicable)
- 1 phase reference input
- 2 analogic outputs 0÷10 V or 4÷20 mA insulated
- 2 digital inputs per channel (bypass and trip multiplier)
- 6 relays with SPDT contacts
- 2 BNC connectors for analysis with external instruments
- 1 x 100 Mbps ethernet port
- 4 multi-colour LEDs
- Power supply 24 Vdc / 400 mA max
- The entire TDSP unit conforms to the (EN 61010-1) electrical safety and (EN 61326-1) EMC standards

Ambient conditions

- Temperature range 0 °C to + 70 °C
- Humidity 95% non condensing

Mechanical conditions

- Dimensions as per DIN 41494 (9TE, 3HE, P220)
- Weight 250 g

Order information

TDSP/ **A** / **B** / **C**

A Type of measurement

- A1 vibrations
- A2 differential expansion
  absolute expansion
  axial displacement
- A3 FTM class "F" – differential expansion fixed foot
- A4 eccentricity
- A5 velocity
  zero speed
  reverse rotation
  key phasor
- A6 valve position
- A9 dual-channels generic processing variable (pressure, temperature, etc..)

B Type of sensor

- B1 Electrodynamic velocimeter
- B2 IEPE (accelerometer / velocimeter) sensors
- B3 Proximity sensor (T-NC/API)
- B4 Electromagnetic sensor (T6-R)
- B5 Hall effect sensor (T6-H)
- B6 General 4÷20 mA
- B7 General 0÷10 V
- B8 Dynamic accelerometer 4÷20 mA (TA61)

C Type of output

- C1 4 – 20 mA
- C2 0 - 10 Vdc

Order example

TDSP/A1/B3/C1

Module for detecting vibration with a proximity sensor, 4÷20 mA output.

External connections description TDSP CPU

CPU TDSP processor card terminal board

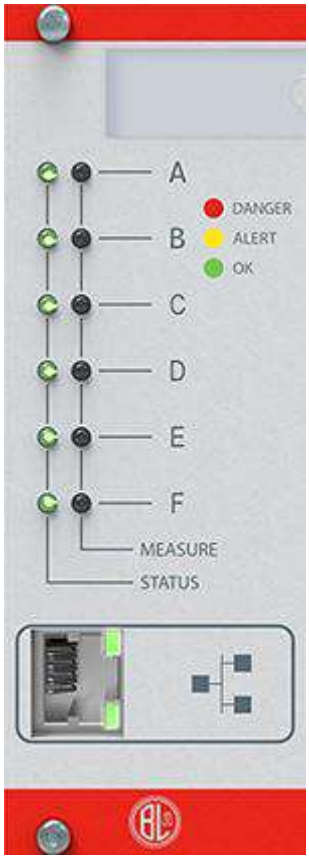
o o o o o o o o o					M2,5 holes for screens connection
D2	Relay 1 N. Open	B2	Relay 1 Common	Z2	Relay 1 N. Closed
D4	Relay 2 N. Open	B4	Relay 2 Common	Z4	Relay 2 N. Closed
D6	Relay 3 N. Open	B6	Relay 3 Common	Z6	Relay 3 N. Closed
D8	Relay 4 N. Open	B8	Relay 4 Common	Z8	Relay 4 N. Closed
D10	Relay 5 N. Open	B10	Relay 5 Common	Z10	Relay 5 N. Closed
D12	Relay 6 N. Open	B12	Relay 6 Common	Z12	Relay 6 N. Closed
D14	IN Channel A SIG +	B14	IN Channel A SIG -	Z14	IN Channel A Supply
D16	IN Channel B SIG +	B16	IN Channel B SIG -	Z16	IN Channel B Supply
D18	Do not connect	B18	Signal field A -	Z18	Signal field A +
D20	Do not connect	B20	Signal field B -	Z20	Signal field B +
D22	IN Tacho A (from PSU)	B22	Output 4-20mA A -	Z22	Output 4-20mA A +
D24	IN Tacho B (from PSU)	B24	Output 4-20mA B -	Z24	Output 4-20mA B +
D26	Activation TRM A	B26	Ground GND	Z26	Activation BYP A
D28	Activation TRM B	B28	Ground GND	Z28	Activation BYP B
D30	GND (from TDSP PSU)	B30	Ground GND	Z30	Do not connect
D32	+24Vdc (from TDSP PSU)	B32	Ground GND	Z32	Do not connect
o o o o o o o o o					M2,5 holes for screens connection

On the rear terminal board are available:

- 2 sensor input with sensor power supply
- 2 outputs for duplicating the pure signal of the "in field" sensor
- 2 analog outputs 4÷20mA (or 0÷10V)
- closure contacts to activate the BYPASS function (relays exclusion) and TRIM threshold multiplier function (insertion of a multiplier to the preset thresholds)
- 6 relays associable to different card operation criterias and to different levels of the acquired signals
- Input for TACHO signal
- Connection for power supply (From TDSP PSU)

Vibration equipment division

TDSP PRO (generic processing variable)



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TDSP-PRO processing module

Description

Equal to module TDSP CPU, the TDSP-PRO processing module is equipped with a modern, high-performance digital processor, which allows to perform simultaneously a series of functions.

- Suitably conditioning and acquiring the signal up to a maximum of 6 measuring transmitters for continuous monitoring of processing variables (temperature, pressure, current, flow, etc…)
- Converting these signals into digital format and processing them adequately using a powerful DSP
- Checking exceeding of preset thresholds
- Suitably driving a series of relays in order to be able to protect rotating machines in the best manner
- Making available up to 6 analogic outputs proportional to the magnitudes measured
- Providing information on the status and level of measurement by means of multi-colour LEDs on the front panel

The TDSP-PRO module can transfer data to a dedicated PC via a 100 Mbps ethernet link that guarantees the proper transfer speed for the system's needs.
By means of the dedicated PC the data can be made available to an external DCS or used by adequate display, saving and post-analysis programs.

The processing module TDSP-PRO, eventually also coupled with the TDSP CPU module, is specially designed to form the basis of a modular system that is able to cover the most different needs:

The processing module's basic functions include:

- Protection against short-circuits on inputs and outputs
- Self-diagnosis function for anomalous conditions (board faults, sensor malfunctions, no phase reference)
- Conditioning and acquisition of signals in current (4÷20 mA) or voltage (0÷5V or 0÷10V) of six transmitters to measure process variables such as temperature, pressure, current, flow, etc...
- Sampling and digital conversion of signals
- LED measurement status indication
- LED indication when preset thresholds are exceeded
- No. 6 analogic outputs 4÷20 mA or 0÷10 V opto-insulated
- No. 1 digital Bypass input
- No. 3 fully configurable relays with NO and NC contacts
- Possibility of hot insertion and extraction (hot-plug / hot-swap) without disconnecting the power supply to the box and without interfering with the other boards

Characteristics / applications

The main characteristics of the TDSP-PRO processing module are that it guarantees maximum flexibility, speed and calculating power, keeping up the high degree of reliability required by the protection function.

The processing module's structure makes it able to work autonomously as a stand alone board, without requiring any further external components. This characteristic, together with the whole range of functionality provided, means that it can be used for monitoring just one or two measuring points as well.

The TDSP-PRO processing module can be used for continuously monitoring of process variables measured on the industrial machines.

Specifications

Electrical

- 6 transmitters inputs (including power supply where applicable)
- 6 analogic outputs 4÷20 mA or 0÷10 V insulated
- 1 digital input (bypass)
- 3 relays with SPDT contacts
- 1 x 100 Mbps ethernet port
- 12 multi-colour LEDs
- Power supply 24 Vdc / 400 mA max
- The entire TDSP unit conforms to the (EN 61010-1) electrical safety and (EN 61326-1) EMC standards

Ambient conditions

- Temperature range 0 °C to + 70 °C
- Humidity 95% non condensing

Mechanical conditions

- Dimensions as per DIN 41494 (9TE, 3HE, P220)
- Weight 250 g

Order information

TDSP-PRO/ **A** / **B**

A ***Type of sensor***
- A1 generic 4 ÷ 20 mA
- A2 generic 0 ÷ 10 V
- A3 generic 0 ÷ 5 V

B ***Type of output***
- B1 4 ÷ 20 mA
- B2 0 ÷ 10 Vdc

Order example

TDSP-PRO/A2/B1

Module for detecting of process variables with 6 voltage inputs, 4÷20 mA current outputs.

External connections description TDSP-PRO

TDSP-PRO processor module terminal board

o o o o o o o o o	M2,5 holes for screens connection				
D2	Relay 1 N. Open	B2	Relay 1 Common	Z2	Relay 1 N. Closed
D4	Relay 2 N. Open	B4	Relay 2 Common	Z4	Relay 2 N. Closed
D6	Relay 3 N. Open	B6	Relay 3 Common	Z6	Relay 3 N. Closed
D8	IN Channel A SIG +	B8	IN Channel A SIG -	Z8	IN Channel A Supply
D10	IN Channel B SIG +	B10	IN Channel B SIG -	Z10	IN Channel B Supply
D12	IN Channel C SIG +	B12	IN Channel C SIG -	Z12	IN Channel C Supply
D14	IN Channel D SIG +	B14	IN Channel D SIG -	Z14	IN Channel D Supply
D16	IN Channel E SIG +	B16	IN Channel E SIG -	Z16	IN Channel E Supply
D18	IN Channel F SIG +	B18	IN Channel F SIG -	Z18	IN Channel F Supply
D20	Output no.3 +	B20	Output no.2 +	Z20	Output no.1 +
D22	Output no.3 -	B22	Output no.2 -	Z22	Output no.1 -
D24	Output no.6 +	B24	Output no.5 +	Z24	Output no.4 +
D26	Output no.6 -	B26	Output no.5 -	Z26	Output no.4 -
D28	Do not connect	B28	Do not connect	Z28	Activation BYP IN
D30	GND (from TDSP PSU)	B30	Ground GND	Z30	Do not connect
D32	+24Vdc (from TDSP PSU)	B32	Ground GND	Z32	Do not connect
o o o o o o o o o	M2,5 holes for screens connection				

On the rear terminal board are available:

- 6 input with transmitter power supply
- 6 analog outputs (4÷20mA or 0÷10V)
- 1 closure contact to activate the BYPASS function (relays exclusion)
- 3 relays associable to different card operation criterias and to different levels of the acquired signals
- Connection for power supply (From TDSP PSU)

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Address: Unit 6, No. 52, Jouybar St.
Tehran - 1415795361, IRAN
Tel: +98-21-88996358-60 Fax: +98-21-88992367
www.cemb-iran.com
info@cemb-iran.com