

**MACHINERY APPLICATION NOTE**  
With Bill of Materials (BOM)

**Motor Pump Application**

Vibration Monitoring for horizontal Motor Driven Pumps

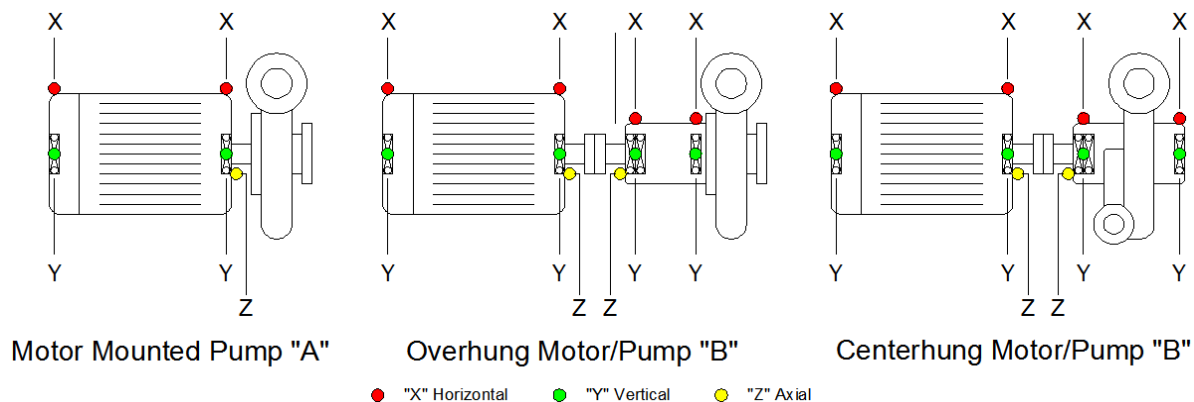


**Machinery Applications**

Horizontal Pumps with Rolling Element Bearings, API Pumps, ANSI Pumps, Centrifugal Pumps, Booster Pumps, Multistage Pumps, Axial Flow Pumps, Fire Pumps, Industrial Pumps, Overhung Pumps, End Suction Pump, Slurry Pump, Pump Condition Monitoring, Pump Vibration Monitoring, Pump Protection System, Pump VMS.

**General**

Simple constant speed (synchronous) Motor Driven Pumps of both the Overhung and Centerhung Type using Rolling Element Bearings (REB) should be monitored with Industrial Accelerometers mounted at each Radial Bearing. Only "X" or Horizontal Accelerometers marked in Red are recommended for Full Time Vibration Monitoring (Protection) System. Walk Around Data Collector or PdM Programs usually require "X" Horizontal (Red), "Y" Vertical and "Z" Axial (Green) Sensors for analysis. When economic decisions must be made to reduce sensor count due to the size or criticality of the Motor Driven Pump, "X" or horizontal sensors should be installed first as they are closer to the load zone of the bearing and in the direction of freedom of movement.



Permanently mounted Accelerometers are recommended for walk-around Data Collector Programs where the number of sensors or vibration measurement points are based on the current established collection and analysis techniques. Together with a local BNC Switch Box, they provide more reliable and repeatable readings; faster, safer, and more convenient.

STI Products work with all manufacturer's data collectors and analyzers.

## **Machinery Example**

A slurry pump is designed to pump liquid containing solid particles. Slurry pumps changes in design and construction to adjust to multiple type of slurry which varies in concentration of solids, size of solid particles, shape of solid particles, and composition of solution.

Slurry pumps are affected by impeller wear and cavitation regardless on the pump design. Abrasive solids, corrosives and voids in the liquid can cause excessive impeller wear and severe damage. One must note the impact that impeller wear has on the performance and reliability of other mechanical components.

Damage to the impeller also effects the bearings. As the impeller wears, it creates an imbalance, causing excessive vibrations and eventually, shaft deflections. These vibrations and shaft deflections increase the loads on the bearings and seals. Unpredictable flow behavior and elevated temperatures can further stress the system, causing the seal to leak and the bearings to fail.

A Machine Monitoring System will help to increase the machine's reliability by detection of bearing-related effects from cavitation, impeller wear, unpredictable flow behavior (and elevated temperatures).

The STI solution for slurry pumps includes vibration sensors mounted on the bearing housing in horizontal direction. Each sensor is connected to one of the three Machinery Monitoring Systems. The Temperature measurements are optional. When the system detects excessive vibrations, which can be caused by either an impeller imbalance or a clogged/closed inlet, the Machine Monitoring System or the Control System can provide the means to alert the operator.



## CMCP-HR4VT High Read Vibration System

### Monitoring System using existing Control Systems (Plant PLC or DCS)

Provides a simple low-cost approach to Vibration Monitoring in standalone or by making use of the plants PLC/DCS or Historian for alarming and trending of values. Loop-powered Sensors provide the 4-20 mA signal for connection to local Field IO (Input/Output). Up to four 4-20 mA Output Sensors are mounted onto the machine, providing Signal Integration (g's to Velocity), and the Vibration System or the Control System can deliver the Constant Current Sensor Power. Select the High Read position on the CMCP-HR4 to monitor and display the highest Vibration reading with the CMCP7300D Display and Relay model.

**Shown Right:** CMCP-HR4VT Four Channel Monitoring System with Relay and Display Module

### Bill of Material:

Type "A": Motor Mounted Pump  
 Type "B": Overhung or Centerhung Motor/Pump



QTY "A"	QTY "B"	Part ID	Description
2	4	CMCP420VT-01 or CMCP420VT-02	Loop Powered Vibration Transmitter, ATEX and IECEx Approved. -01 1 in/sec (25.4 mm/s) -02 2 in/sec (50.8 mm/s)
2	4	CMCP420EL and CMCP420WF	90 Degree 3/4" x 3/4" NPT Elbow & 3/4" NPT Weatherproof Cable Fitting
1	1	CMCP-HR4VT	4-Channel High Read Monitoring System Includes Power Supply, Display and Relay Module and High Read Module
<b>Alternate System</b>			
2	4	CMCP422VTS-I	Loop Powered Vibration Velocity Transmitter, Side Exit, 5 m Integral Braided Cable (IP65)
1	1	CMCP-HR4VT	4-Channel High Read Monitoring System Includes Power Supply, Display and Relay Module and High Read Module

## CMCP5300 Series of Monitoring System Stand Alone API Protection System

The CMCP5300 Series Monitoring Systems are one, two, four and six channel Vibration Monitors that have been designed for use on typical rotating machinery such as motors, pumps, fans, turbines, compressors, chillers, etc. The CMCP5300 Series accepts inputs from any industry standard 100 mV/g accelerometer, conditions the input signals to velocity and provides a digital display and alarm status indication. Analog outputs (4-20 mA) are provided for each channel for interface to a PLC or DCS for trending, alarm and operator interface. The alarm contacts for the OK circuit, and Alert and Danger may be interfaced to machine control and shutdown systems for a complete vibration protection solution. A BNC Buffered Output Connector is available on each monitor to provide a connection for further fault analysis with a vibration data collector. The system is a pre-wired turn-key package with power supply, and bright LED displays. The CMCP5300 Series Monitoring Systems come standard with STI's CMCP530A-100A-02R but are also available with any other CMCP500 Series Monitors. Enclosures are available in NEMA 4X Fiberglass, NEMA 4 Painted Steel and NEMA 4X Stainless Steel.

**Shown Right:** CMCP5304 Four Channel Monitoring and Protection System with individual displays



### Bill of Material:

Type "A": Motor Mounted Pump  
Type "B": Overhung or Centerhung Motor/Pump

QTY "A"	QTY "B"	Part ID	Description
2	4	CMCP786A or CMCP786A-I10	General Purpose, Top Entry, 2 Pin MS or -I 10m integral braid cable, 140°C Max 100 mV/g +/-10%, 1/4-28 UNF
2	4	CMCP602A-32-31-I	Armored Extension Cables for 2 Pin MS 5015 Sensors, 10-meter overall length
1	-	CMCP5302-E/M-FG-I	2-Channel Monitoring System, English or Metric, Fiberglass, includes Power Supply, 2x Displays and 2x Monitors
	1	CMCP5304-E/M-FG-I	4-Channel Monitoring System, English or Metric, Fiberglass, includes Power Supply, 4x Displays and 4x Monitors

## CMCP7504 Four Channel Machine Monitoring System with Display API Protection System with Modbus and DataView Signal Saver

The CMCP7504 Compact Machinery Protection System was designed to continuously monitor the Motor & Pump. The flexible design allows it to accept a combination of four vibration, position, temperature, speed, or analog inputs and can be used in conjunction with a Control System (PLC, DCS or SCADA) or in stand-alone. The system also allows for a single temperature and speed input for readout and visual alarming. Four dedicated BNC Buffered Outputs are located on the front cover and provide convenient access to the raw sensor signals for portable vibration analyzers. The local LCD display provides bar graphs, alarm indicators, and the overall vibration value directly on the front of the enclosure. The CMCP7504 is rated IP65 and protects against dust and water ingress. Enclosures are available for additional protection. An internal Micro SD-Card records a rolling buffer of the overall values which can be reviewed at a later time.



**Shown Left:** CMCP7504 Machine Monitoring and Protection System

### Bill of Material:

Type "A": Motor Mounted Pump  
Type "B": Overhung or Centerhung Motor/Pump

QTY "A"	QTY "B"	Part ID	Description
Complete System, Vibration and 1x Temperature			
1	3	CMCP785A-I10	Rugged Side-exit Accelerometer (100 mV/g) with 10 m over-braided integral cable.
1	1	CMCP785T-I10	Rugged Side-exit Accelerometer (100 mV/g) with Temperature with 10 m over-braided integral cable.
1	—	"A": CMCP7504-VA-VA	Machinery Protection System, 2 channel Velocity, plus 1 Temperature
—	1	"B": CMCP7504-VA-VA-VA-VA	Machinery Protection System, 4 channel Velocity, plus 1 Temperature

The CMCP7504 System is capable of monitoring two Motor Mounted Pumps (Type "A") or alternatively a second measurement type, like Enveloped Acceleration for early detection of bearing faults, can be added (CMCP7504-VA-EV-VA-EV).