



## ITT – Goulds Model 3196 *i-FRAME*



# 725.1A150

March 30, 2008

(New)

## Product Definition and Scope:

The primary objective of this product upgrade is to maintain our competitive advantage in the marketplace by adding new features to the line of X-Series power ends used on ANSI products – Models 3196, 3198, 3796, LF 3196, CV 3196 and HT 3196.

A product with increased reliability and onboard condition monitoring intelligence hits at the heart of the most important customer requirement – reduced life cycle cost achieved through increased Mean time between failure (MTBF). The exciting new features include:

### 1. Patented Onboard Condition Monitor (CM)

- a. Constantly measures vibration and temperature at the thrust bearing
- b. If pre-set limits are exceeded, the CM alerts the customer via blinking red lights (LED s)
- c. Lights can be seen by anyone walking by the pump, not just an operator on his daily, weekly or monthly inspection.
- d. Provides early warning of improper operation so that changes can be made to the process of the machine before catastrophic failure occurs



Figure 1

### How it works:

To properly activate the CM, the pump should already be running and have reached a steady flow and pressure, which usually only takes a few minutes. Once there, the unit is activated by simply touching a small magnet to the CM over the ITT logo. The unit will display a series of flashing red lights. Immediately after the red lights stop blinking and before the green light flashes, the CM will collect eight samples spaced approximately one second apart and average these eight readings to establish the baseline vibration level. This takes approximately twelve seconds from the activation of the CM to the first flash of the green light.

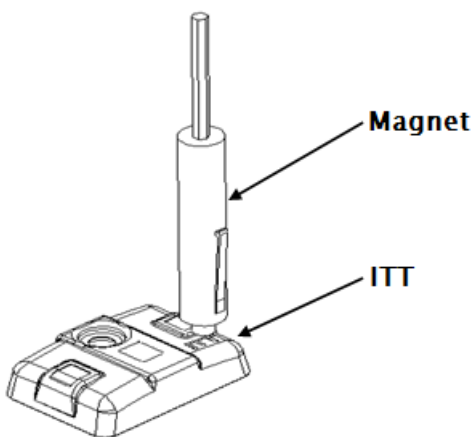


Figure 2

From that point on, the CM will measure vibration and temperature every five minutes. If pre-set levels of either vibration or temperature are exceeded over a period of 10 minutes (2 consecutive readings), the CM will annunciate improper operation with two blinking red lights (double flashes in two second intervals).

Temperature and Vibration Limits Alarm Levels:

- a. Vibration: 100% increase over the baseline level
- b. Temperature: 195°F (91°C)

Instead of applying the 100% increase in vibration to cause an alarm to all operation points, we did program some minimum and maximum levels to prevent the following:

- a. Nuisance alarms on very low vibrating pumps. Even if the vibration doubles on a pump running at 0.05 inches/sec, we don't need to alarm if the vibration increases to 0.10 inches/sec.
- b. Lack of alarm if a pump is vibrating above 0.50 inches/sec.

The chart in Figure 3 below shows the relative alarm levels vs. baseline measurements. The minimum alarm level is set to 0.125 inch/sec, while the maximum level is set at 0.50 in/sec. Basically any baseline level below 0.0625 inch/sec won't alarm until the unit reaches 0.125 inch/sec. Any baseline reading above 0.25 in/sec will automatically alarm when the unit reaches 0.50 in/sec. These levels are based on Hydraulic Institute Standards as well as our own internal testing and field experience.

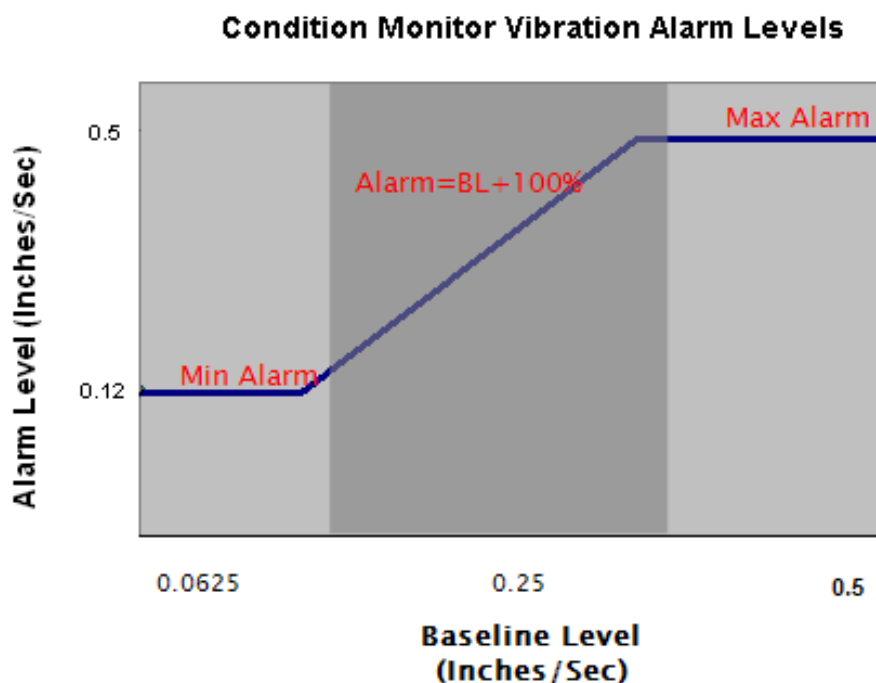


Figure 3

**What happens if the pump or process condition causing the alarm is corrected, do I need to re-set the unit?**

As mentioned above, the CM must see two consecutive readings of high-levels before it enters alarm mode. Once in alarm mode, the interval between measurements goes from five minutes down to every two minutes. If the process or pump condition causing the alarm is corrected, it only takes one single normal level measurement for the CM to go back to green mode.

**Why 100% increase in vibration? Doesn't that seem kind of high?**

It may seem high, but our data shows that even a perfectly sized pump can see increases of 40–60% in vibration between BEP (Best Efficiency Point) and low flows. That change can be even higher on higher Specific Speed pumps. Our experience tells us that a 100% increase in vibration is significant enough so that it doesn't pick up changes in vibration due to normal variations in flow on the pump curve – however low enough so that if detected, the user still has time to troubleshoot and correct the problem before failure occurs (i.e. it won't be too late – bearings already failed).

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## Fit for Industrial applications

- a. Small package: 2 inch X 1.5 inch X 0.5 inch (51mm X 38mm X 31mm)
- b. Durable 303 Grade Stainless Steel cover
- c. Temperature Range: -40°F to 212°F (-40°C to 100°C)
- d. Low voltage, non-replaceable 3 volt Lithium battery
- e. All electronics completely potted in epoxy
- f. Will have a label for CSA and ATEX as an intrinsically safe device
  - I. CSA qualification for USA and Canada (Complete)
    - i. Class I, Division 1 & 2, Group A, B, C, D
    - ii. Class II, Division 1 & 2, Group E, F, G
    - iii. Class III, Division 1 & 2
  - II. ATEX Certification Ex ia {Ex} II 1 G Ex ia IIC T4 (expected April '08)

## How long does the battery last?

Three to five years under normal operation, meaning the unit does not run in alarm mode for very long. If constantly running in alarm mode, the CM will last approximately one year .... because the pump certainly won't. No, the battery life is not covered under warranty.

## How do I know when the battery dies? Can I replace the battery? How do I dispose of the unit?

As part of the normal operation, a single green light flashes every five seconds, indicating normal levels of temperature, vibration, and battery power. Once the battery is exhausted, the green light will no longer flash. Since the internals are all potted in epoxy, the battery is not replaceable; the entire CM must be replaced. Since the CM contains no reactive or hazardous materials, it is safe to dispose of them through the user's normal municipal waste system.

## How accurate is it?

Across the entire temperature range, the CM is accurate to within  $\pm 15\%$ . That may sound high to some, but keep in mind that our alarm levels are based on percent change vs. the baseline level. So even though your pump is running at 0.20 in/sec and – worst case – the CM is reading 0.17 in/sec (15% less), the CM is looking for the 100% increase, or change over time. It's the change in vibration that indicates improper operation and/or damaged components. From that point on, the CM will measure vibration and temperature every five minutes. If pre-set levels of either vibration or temperature are exceeded over a period of 10 minutes (2 consecutive readings), the CM will announce improper operation with two blinking red lights (double flashes in two second intervals).

## What should I do when a pump is shut down and/or taken out of service?

If the pump is to be shut down for a period of time, we recommend you deactivate the CM to conserve battery life. The CM can be turned off by touching a small magnet on the CM over the ITT logo. Once this is done, the CM will display solid red lights for a few seconds indicating the unit is shutting down. When it comes time to reinstall that pump or power end, simply follow instructions above to reactivate the CM and establish a new baseline. Especially after a pump has been shut down for service on the power end (bearing replacement for example), it is recommended that a new baseline be established once the pump is up and running again. To do this, simply turn the CM off, then on again.

## 2. Premium Severe Duty Thrust Bearings

- a. Premium thrust bearing materials increase bearing fatigue life by 2–5 times that of standard bearing materials.
- b. 40° degree angular contact bearings offered as standard on MTi frame
  - a) Increases thrust carrying capabilities by 35%
  - b) Common issue taken from VoC interviews from customers who push the limit of the MTX power end, when they should be using an LTX
  - c) L10 bearing life is increased by roughly 2 times.

All bearing steels contain some level of non-metallic imperfections, or foreign particles known as *inclusions*. Some inclusions are harder than the steel, resulting in high stress concentrations where sub-surface cracks can begin in the loaded areas. These cracks can eventually reach the surface of the raceway causing flaking or broken pieces of steel this is known as *spalling*.

Because the *i-FRAME* thrust bearings have higher purity steels when compared to competitive offerings, the result is better wear resistance and longer fatigue life. Bearing components are then heat treated to increase material hardness. As a result, the steel has better wear resistance and longer life under adverse conditions.

Figure 4 below denotes actual product testing that shows the *i-FRAME* bearings having an increased fatigue life of two-to-five times that of conventional bearings.

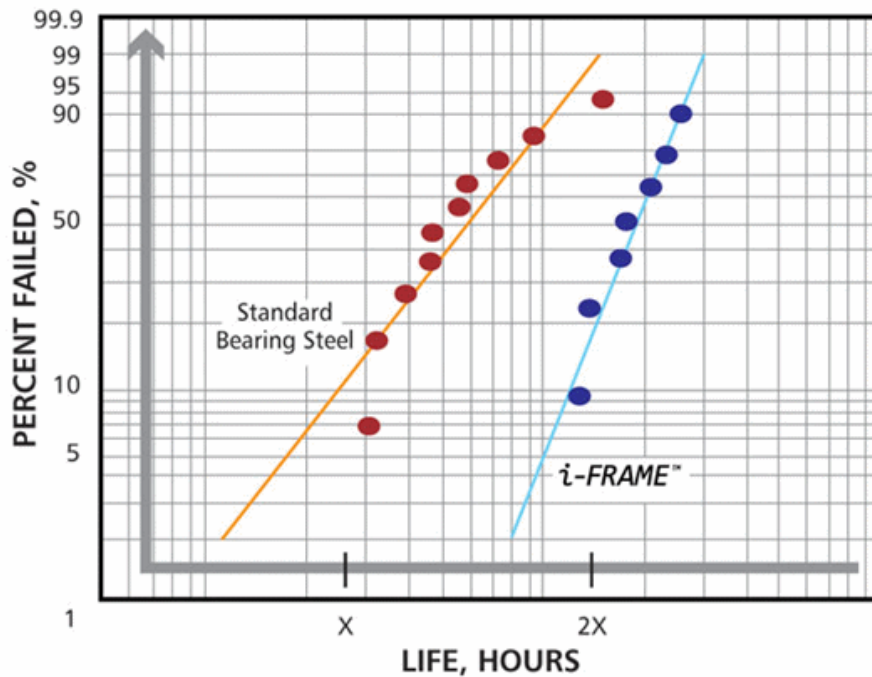


Figure 4

The 40° angular contact bearing on the *i-FRAME* increases the thrust load carrying capability by 35% over competitive ANSI pumps using a 30° contact angle. The result is roughly a two-times improvement in L10 bearing life as shown in Figure 5 below.

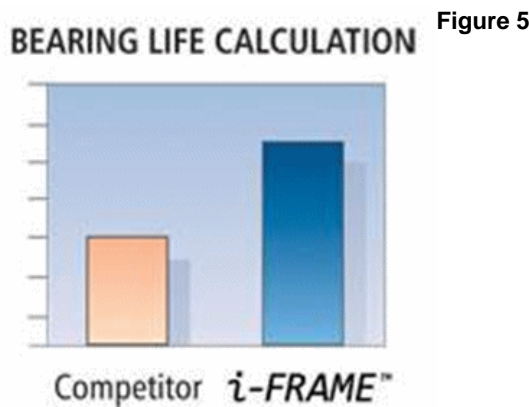


Figure 5

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## Are these completely interchangeable with existing X-Series pumps/bearings?

Yes. Externally, they are dimensionally identical to the thrust bearings we've been supplying on ANSI pumps for decades. Fits on the shaft and in the bearing housing remain unchanged. For those customers that may not be ready to upgrade the entire power end, this is a great opportunity to upgrade their thrust bearings – and get them rolling with the best bearings on the market.

## Due to the higher contact angle, is *skidding* a concern on these bearings?

Rigorous testing done using several different loading conditions revealed no signs of skidding.

## You say the fatigue life on all sizes increases 2–5 times that of standard bearings, but the L10 life only increases on the MTi, why is this?

The standard AFBMA and ISO calculation for L10 bearing life does not take materials into account. It is strictly calculated based on contact angles and axial and radial loading figures. When you take special materials into account, it increases the life of the bearing considerably. To try and weigh material properties, dynamic loading, lubrication and temperature it becomes very difficult to reliably calculate estimated life. That's why we ran the test and got the data you see above in Figure 4. The advantages are dramatic!

### 3. Inpro VBXX–D Hybrid Bearing Isolators

Already known as the industry standard in lubricant protection, the i-FRAME improves upon that design by offering Stainless Steel rotors (external portion), for maximum protection against mechanical seal leakage and corrosive environments.

Figure 6

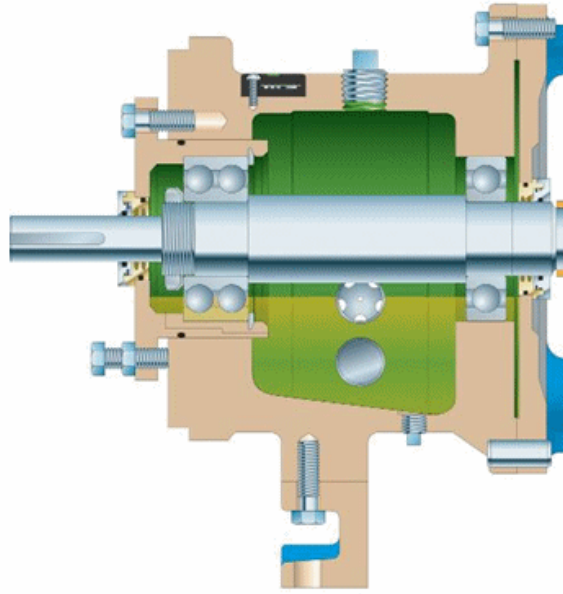


This came directly from Voice of the Customer interviews & they told us that sometimes they see bearing failures as a result of the mechanical seal failing – thus spraying the pumped fluid directly on the bronze seal. We've responded with a real problem–solver.

### 4. Optimized Oil Sump Design

Since bearings work most effectively with cool, clean lubricant, we've optimized our oil sump to maximize heat transfer for cooler running bearings and longer bearing life. Sump size and heat transfer surface area directly affect the amount of heat that can be removed from the bearings. For example, a 10% increase in sump size and 19% increase in surface area on the MTi frame translate into a 10°F drop in bearing temperature. The end result – longer bearing life.

Figure 7



The contoured sump directs any contaminants away from the bearings, to the magnetic drain plug for safe removal.

#### 5. Provisions for sight glass on either side of the frame

- a. Allows greater installation flexibility
- b. Better visualization and oil level control
- c. Saves customer from having to use a bottle oiler or greased bearings when pumps installed against a wall or in a densely populated area.

#### Does that mean that every frame will be supplied with two sight glasses?

No, we will continue to supply one sight glass. What's different is that there will now be an identical hole tapped and plugged on the other side of the frame, so the customer can move the sight glass if required.

#### 6. New look frame and adapter create a distinctive appearance, patented and exclusive to ITT Goulds

#### 7. New Frame-to-Adapter Gasket Material

- a. Eliminates nuisance oil leaks commonly seen in the field
- b. More tolerant of poor assembly procedures (less dependent on proper torque values)

#### 8. 5 Year Standard Warranty



A feature-rich product with tangible benefits over competitive designs will bring added value to the customer. But in addition to providing great value, buying the 3196 i-FRAME gives our customers peace of mind in knowing that they have an authentic GOULDS pump, designed and manufactured to our quality standards to minimize lifecycle costs and maximize uptime.