■ VibraSens ■

White Paper on: M12 connectors in Industrial Accelerometers

prepared by : Ange Brunner
September 2005

INTRODUCTION

For the last 40 years, most industrial accelerometers have been manufactured by American companies. The de facto connector used was therefore based on the American MIL-C-5015 norm which had been established back in the late 1950s.

Original Metallic Mil-C-5015 2-Pole

Nowadays this norm could not tackle industrial tasks.

VibraSens provides an innovative solution using the M12 (per IEC 60947-5-2) connector industry standard.

HISTORICAL ANALYSIS

Standard Mil-C-5015 cable assemblies were not able to provide IP67/IP68 protection which is nowadays a de facto for a sensor connection. Two American companies, Conxall and Method decided to solve this problem. They designed an all plastic MIL-C-5015 equivalent connector which could be overmolded with cable provided by customers. Most American accelerometer manufacturers have been buying their cable assemblies from these two companies for the last 15 years. Not one European company has come up with a similar solution and year after year European customers keep having to buy cable assemblies through American accelerometer manufacturers.

Overmolded Plastic Mil-C-5015 2-Pole

VIBRASENS AND THE M12 CONNECTOR

Vibrasens has decided to be the first major European industrial piezoelectric accelerometer manufacturer to include glass seal M12 connectors in its range of accelerometers. We expect other manufacturers to soon follow our lead.

Overmolded Plastic M12

Sensor with overmolded M12 harness

PRICING

In the last 5 years, the price of industrial piezoelectric accelerometers has dropped significantly and has become a viable option for many applications. The cable and the interconnection box now drive the cost of the vibration chain. A 30 meters standard polyurethane MIL-C-5015 overmolded cable could easily run twice the cost of the accelerometer itself. The price tag for 20 chains of 30 meters of cable could add up significantly. A European or Asian customer would then be charged the air freight from the U.S.A for 20 chains of *30 meters* at 20g/meter = 50 kg .

For those who have switched to M12 connectors, the cost is minimized :

- M12 cables are available directly from overmolding cable companies at a lower price than MIL-C-5015.
- Reduced shipping cost.
  American, Asian and European cus-

■

tomers have local manufacturers of M12 overmolded cable assemblies.

- Length saving due to low cost standard IP67 interconnection box.

M12 BENEFITS

M12 connectors offer incredible benefits :

- Off the shelves product with 24 hours shipping through local electronic distributor.
- M12 is a 4-pin connector. Only one cable assembly is used for all types of accelerometers :
  - Piezoelectric with various output : acceleration, acceleration with temperature, 4-20mA with raw acceleration, velocimeter, ..
  - Piezoelectric with 3 axis sensing
  - Piezoresistive
  - Capacitive
- large choice of overmolding cable assemblies : PUR, PVC, zero halogen, extra flexible cable, AISI316L nut, high temperature, ...

- Availability of IP67, IP68 and even IP69K overmolded cable assemblies
- Anti- vibration-locking nut
- lower price due to worldwide volume production.
- Hundreds of components are available : distribution boxes, adapter, IDC connectors, feedthrough, PCB connectors, ...
  The range is still growing everyday.
- Worlwide availability
- Compatible with hundreds of sensors in the automation industry: capacitive, photoelectric, proximity switch, LVDT, ultrasonic ....
- More than 15 manufacturing companies.
- M12 with D-coding is now a world-standard for all network connections : Field-bus, Profibus, AS-i, Device Net, Interbus, industrial Ethernet, ...

- M12 provides Low cost IP67/IP68 solution from sensor to control room using overmolded cables, potted and overmolded passive and active distribution boxes and overmolded M12 D-coding network cable.
- Direct installation without the need for a protective housing .

- M12 connectors are compatible with standard cable glands manufacturer. Accessories could be used for connecting hose, strain relief, conduit.
- No spare parts are needed. M12 connector and distribution boxes are usually already in use through the plant.
- Half the size of MIL-C-5015

M12 LIMITATIONS

M12 connectors are generally limited to 90°C. Few manufacturers go up to 110°C. For environment with temperature up to 150°C or even 260°C where IP67 is not required, Metallic MIL-C-5015 is the only choice. This is one reason that has pushed VibraSens to still propose Industrial accelerometer with glass seal MIL-C-5015 connector.

MIL-C-5015 LIMITATIONS

- Overmolded version only available through American accelerometer manufacturers.
- Overmolded MIL-C-5015 cable assemblies are only used by accelerometer manufacturers.
- Limited choice of overmolding cable assemblies.
- Not Vibration proof and tightening
- High price due to limited production.
- No accessories available : No distribution boxes, No IDC connectors, No feedthrough, No PCB connectors, ...
- No Worldwide availability.

- Not compatible with other sensors found in the automation industry.

- Only two Americans manufacturing companies. No Asian, or European companies.

- Not networkable

- Standard accessories from cable gland manufacturers could not be used.

- No anti- vibration-locking nut

M12 MANUFACTURERS

Below is a non exhaustive list of manufacturers that provide at least overmolded M12 cable assemblies.

http://www.weidmuller.com
http://www.phoenixcontact.com
http://www.lumberg.com
http://www.hirschmann.de
http://www.amphenol.com
http://www.woodhead.com
http://www.bradharrisonsales.com
http://www.binder-connector.de
http://www.turck.com
http://www.harting.com
http://www.escha.de
http://www.murrelektronik.com
http://www.jaegerconnecteurs.com
http://www.coninvers.com
http://www.shield.net
http://www.frai.de

SENSOR MANUFACTURERS WITH M12 CONNECTOR

All the leaders in their respective technology have already adopted the M12 connector. To name a few, we have Baumer electric, IFM, Balluf, Honeywell sensor, Schneider automation, Siemens automation, Heidenhain, Sick, Keyence, Omron, Pepperl-fuchs, Jumo,...

CONCLUSION

As a European piezoelectric vibration sensor leader, VibraSens is proud to be the first to offer the glass seal M12 connector to its range of industrial accelerometers. On top of above M12 advantages customers will also benefit from the distributed standardised installation technology.

- Using low cost passive distribution boxes installed directly on the machine floor (IP67), you will be able to collect cables from individual sensors and combine them into one, multi-conductor cable for routing over long distances to the central data collection point. This in turn reduces overall cable costs and provides a cleaner, neater single-cable run, rather than a bundle of individual cables.

- Networkability is only a plug and play operation using standard M12 active distribution boxes (IP67).

ABOUT THE AUTHOR.

Ange Brunner holds a master's degree in micromecanic and piezoelectric material science from the School of engineering in Besancon (France). He is the founder of VibraSens. Previously, he has been in charge of accelerometer and pressure piezoelectric sensor design for world class manufacturers. His main area of expertise is in high temperature (800 °C) sensor and industrial accelerometers.

E-mail : ange.brunner@vibrasens.com

ABOUT VIBRASENS

VibraSens production facility is based in Besancon, France.
VibraSens manufactures industrial piezoelectric accelerometer and associated cable assemblies. Our products are dedicated to vibration monitoring for the industrial market.

VibraSens
13 Impasse sur Roche
25660 Montfaucon
France
Ph:+33 3 81 83 31 45
Fax: +33 3 81 81 03 65
http://www.vibrasens.com