System Development

Special Cable Systems for Vibration Monitoring

Vibration monitoring in "harsh" industrial environments poses a number of problems concerning the reliability of the monitoring equipment. Many of the problems associated with such systems are due to unreliable accelerometers, cables and their interconnection. To minimize such difficulties, B&K manufacture a range of robust Industrial Accelerometers, and to complement these a number of high quality, rugged, cable systems. These cables combine low-noise signal transmission with high mechanical strength and long-term survivability.

These cable systems can be split into two groups; Low-Noise Accelerometer Cables and Multipair Cables – they are generally used as shown in Fig. 1. Where the distance between accelerometer and Monitor is not great, Low-Noise Accelerometer Cables can be used throughout. However, where long lengths of cable are required or many channels are connected to the system – short lengths of this Accelerometer Cable are used between the accelerometer and a junction box. From there to the Monitors the signals are routed by one of the Multipair Cables, described overleaf.

To overcome noise problems, charge preamplifiers can also be incorporated into these junction boxes. It should be noted though, that these Multipair Cables are intended for voltage signal transmission. Should they be used for charge signal transmission, special precautions, such as routing the cable through conduiting, must be taken.

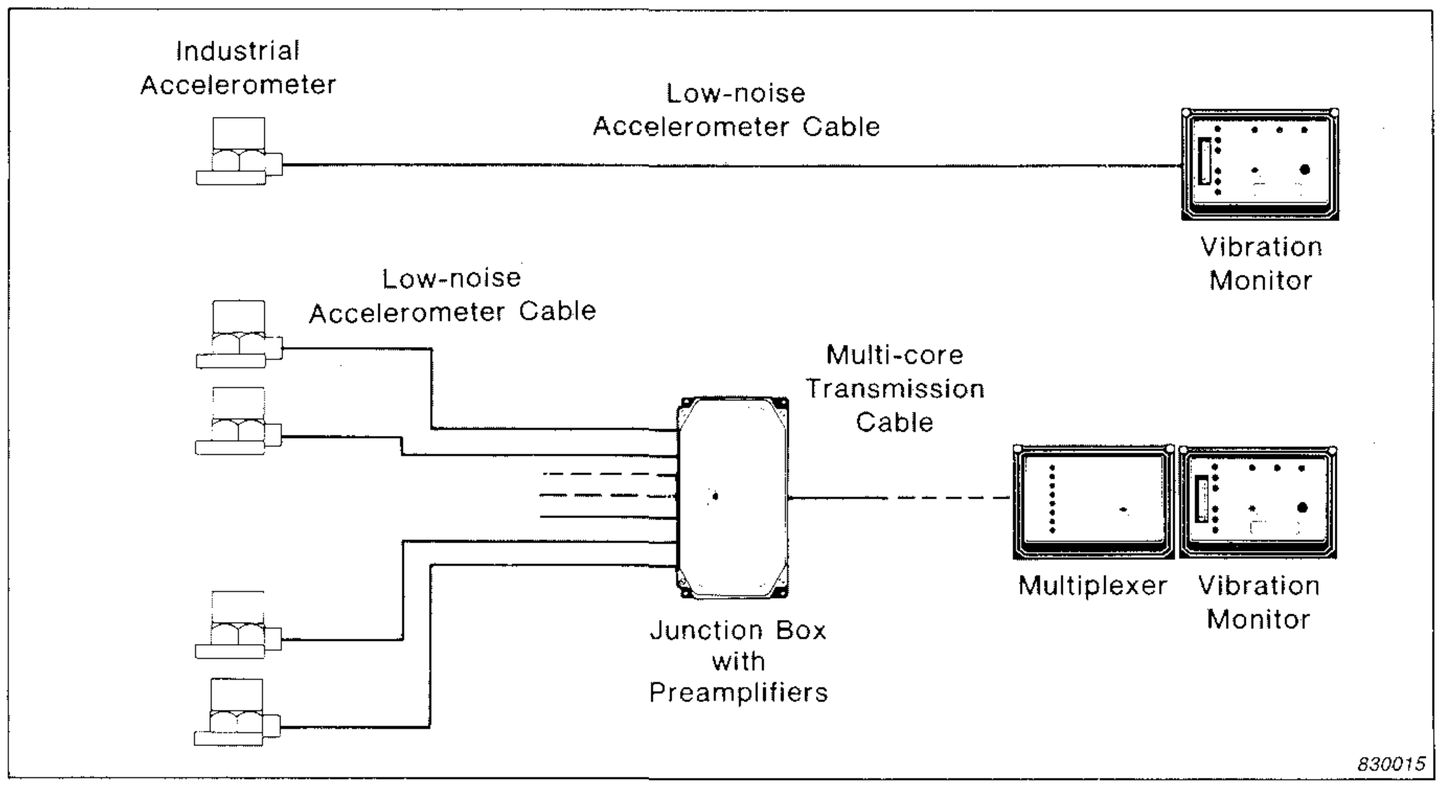

Fig. 1. Typical cable configurations

Low-Noise Accelerometer Cables

Designed for carrying charge signals direct from the accelerometer, these top quality cables are constructed to provide an extremely high standard of signal transmission. A special noise reduction treatment is used to virtually eliminate noise caused by effects such as the triboelectric effects*, and each length of cable is individually tested with regard to mechanical and electrical performance.

AC 0077

This high strength, low-noise cable, shown in Fig. 2, is ideal for accelerometers mounted in industrial environments. It has two cores with individually shielded and twisted copperweld conductors with a PTFE insulation. The cables inner jacket is made from PTFE with a further stainless steel armouring and an outer jacket of PFA.

The steel armouring ensures a strong and reliable cable connection at the accelerometer connector and the junction box entry, and provides excellent screening of the cable. The steel armour also allows the cable to be used as part of a double screened system. The cable can be used in the temperature range –70°C to 250°C. Minimum bending radius is 40 mm.

For use in explosive–risk environments, an intrinsically safe version of this cable, AC 0087, is also available. The cable is coloured blue, but identical in all other respects.

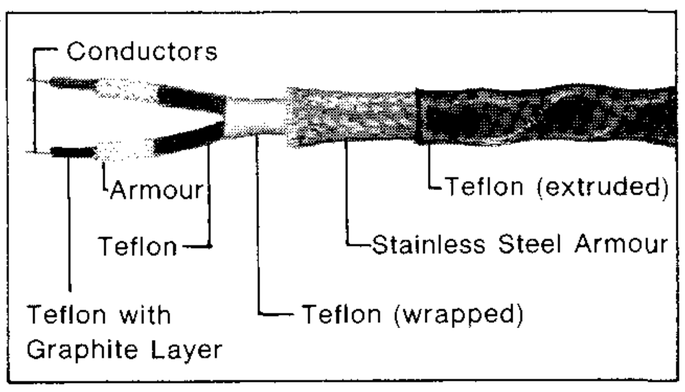

Fig. 2. AC 0077 Low-Noise Accelerometer Cable

WL 3003

This cable is intended for use in radioactive areas and can withstand approximately 10^7 Gy. It is a two core, individually shielded, twisted cable, with conductors made from copperweld, see Fig. 3. The insulation is polyimid (Capton) in a jacket of wrapped polyimid. The cable temperature range is –90°C to 200°C. Minimum bending radius is 30 mm.

* **Triboelectric Noise** can be generated in cables as they vibrate. It is due to local capacitive and charge changes between the conductor and the shield as the cable vibrates. The problem is avoided by using a proper internally graphited cable and fixing it to avoid cable movement as much as possible.

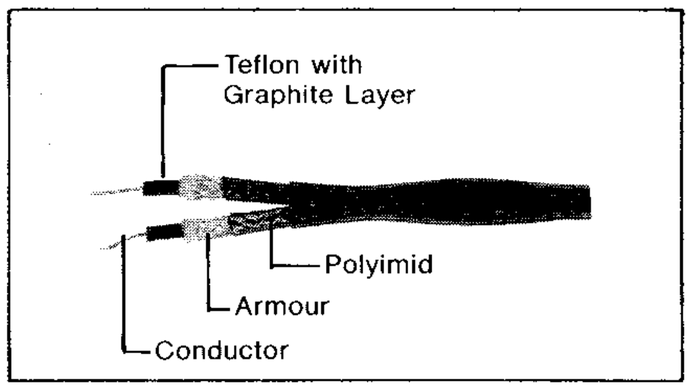

Fig. 3. WL 3003 Low-Noise Accelerometer Cable

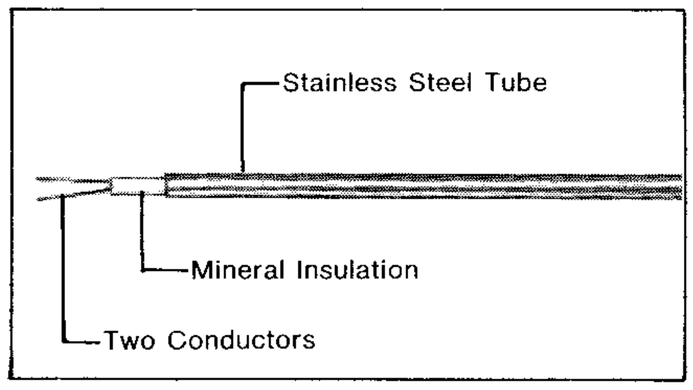

Fig. 4. AC 0202 Low-Noise Accelerometer Cable

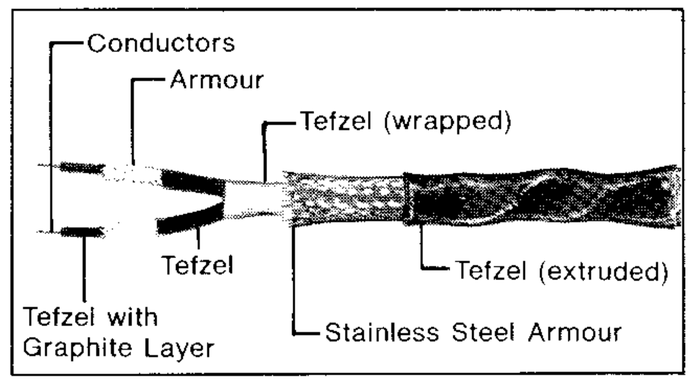

Fig. 5. WL 3146 Low-Noise Accelerometer Cable

AC 0202
This is two conductor minerally insulated high temperature cable, called the "Hard Line" cable, see Fig. 4. The conductors are of stainless steel with an insulation of AL_2O_3 and an outer jacket of stainless steel. The cable can withstand a radiation dose of at least 10^7 Gy and it can be used over the temperature range of –200°C to 800°C. The cable minimum bending radius is 30 mm and it will be brazed on to the accelerometer.

When this "Hard Line" cable is used with the Type 8324/8310 Industrial Accelerometer it can be put to "special" uses; namely measurements in underwater applications, high pressure enclosures and radioactive areas.

WL 3146
This high–strength, low–noise cable is intended for use with industrial accelerometers mounted in radioactive areas. It has two cores with individually shielded and twisted copperweld conductors in a Tefzel insulation, see Fig. 5. The cable meets the requirements of IEEE standard 383–1974 for cables to be used in nuclear power plants and is capable of withstanding approximately 10^7 Gy. The cable may be used at temperatures ranging from –200°C to 150°C. Minimum bending radius is 40 mm.

Multipair Cables

These high quality, screened, multipair cables fall into two categories: Signal Transmission Cables for routing multichannel signals from Junction Boxes, Preamplifier Boxes etc. to monitoring blocks; Interconnection Cables for interconnecting the Monitors, Multiplexers and Transceivers etc. in the monitoring blocks. If charge amplifiers are incorporated in the junction boxes, power for the amplifiers will also be routed along these cables.

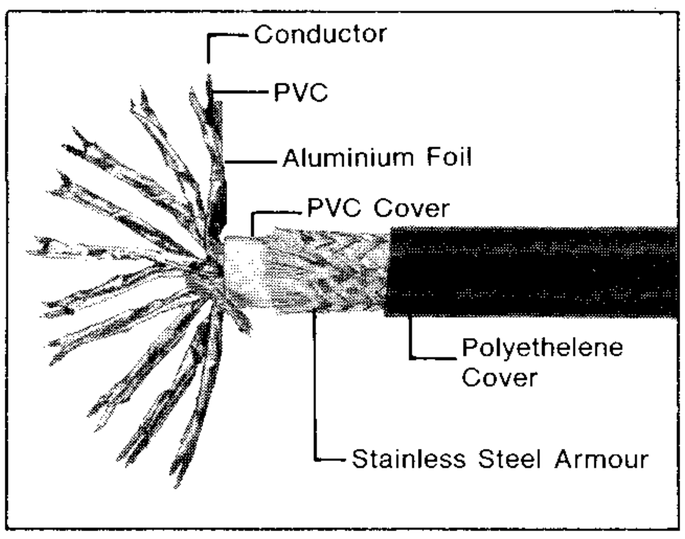

Fig. 6. WL 3128 Multipair Interconnection Cable

AC 0095 (WL 3148)†
This Signal Transmission Cable contains ten individually–screened, twisted pairs of conductors in an inner jacket of polyethylene. The inner jacket is armoured with a galvanized steel braid which in turn is covered by an outer jacket of black polyethylene. The cable has a minimum bending radius of 50 mm and may be used over temperatures ranging from –20°C to 85°C.

A special version of the cable is available for use in explosive–risk environments. This special cable, AC 0096 (WL 3150)†, is coloured blue but identical in all other respects.

WL 3128
This Interconnection Cable contains 10 twisted pairs of conductors in an inner jacket of PVC. The inner jacket is armoured with a galvanized steel braid which in turn is covered by an outer jacket of polyethylene, see Fig. 6. Only where the lack of space inhibits the use of this cable should AC 0075 (WL 3127)† be used.

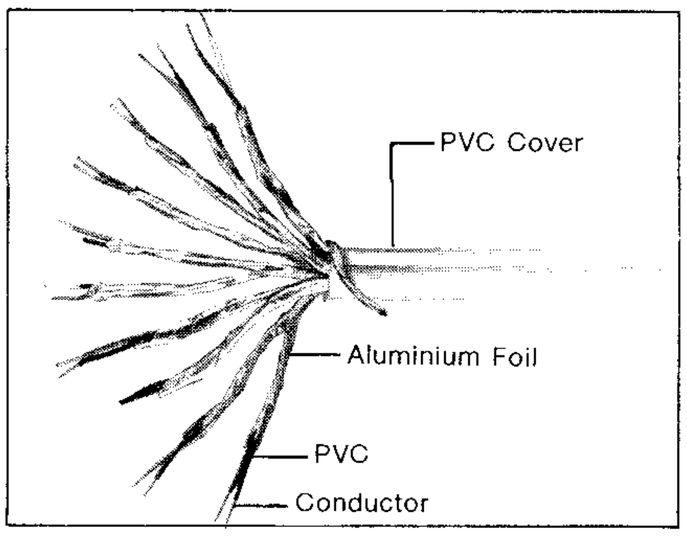

Fig. 7. AC 0075 Multipair Interconnection Cable

The armour is terminated in a waterproof (PG) gland in the junction box (or Monitor) resulting in an electrically double screened system. The cable temperature range is –20°C to 85°C. Minimum bending radius is 50 mm.

AC 0075 (WL 3127)†
This Interconnection Cable is identical in all respects to cable WL 3128, except that it is not armoured, see Fig. 7. The minimum bending radius is therefore reduced to 40 mm.

Specifying Cables

When enquiring about or ordering a monitor system, it is important to specify necessary cable lengths and cable environment in order to get the full benefit of our company's experience in tailoring such systems.

† The numbering system specifying certain cables has recently been updated. The specifiers in brackets are the old specifiers.

These accessories are a development of the Brüel & Kjær Systems Engineering Group and are not standard production items. Specifications can be modified, on a contract basis, to meet individual requirements. For prices and delivery time, please contact your local representative.

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