HELUKABEL®

# »WHITE PAPER

## WHITE PAPER | INSTRUMENTATION CABLES FOR THE OIL AND GAS INDUSTRY

# » INSTRUMENTATION CABLES FOR THE OIL AND GAS INDUSTRY

Precise control, measurement and regulation technology is essential for trouble-free plant operation in the oil and gas industry. Reliable data transmission is a must, even under the most extreme mechanical and environmental conditions. This is made possible in part by instrumentation cables that are perfectly matched to the application, whether on ships and offshore platforms or in land-based refineries. In this white paper you will learn about the requirements and characteristics that these cables have to meet in practice.

## What are instrumentation cables used for in the oil and gas industry?

Instrumentation cables are multi-core cables, usually consisting of two, three or four conductors. They transmit low-voltage signals used to monitor or control electrical systems and processes, such as temperature, pressure or flow measurement. They can also be used to control valves, temperature controllers and indicator lights. In the oil and gas industry, they are an important part of many onshore and offshore applications.

## What is the difference between an instrument cable and a control cable?

Instrumentation cables are a kind of subset of control cables. They are mainly used as a test or control element - often over long distances - between sensors, probes or indicator lights in measurement and control applications. Control cables in general are designed for a wider range of applications.

## What insulation and jacket materials are used for instrumentation cables?

Different materials can be used for the core insulation and outer sheath of instrument cables. These include polyvinyl chloride (PVC), cross-linked polyethylene (XLPE) and halogen-free plastic or silicone blends. Depending on the blend, PVC is self-extinguishing, flame retardant, resistant to oil, moisture, abrasion and UV radiation. Compared to PVC, XLPE offers greater strength and durability, and is self-extinguishing. It is also halogen-free and produces very little smoke in the event of a fire. XLPE insulated cables also have low capacitance, which improves data transmission over long distances. This is particularly beneficial in the oil and gas industry, where distances between the control room and plant components can be very long.

For high temperature applications, glass fibre, Teflon, PFA or PTFE jackets are often used due to their excellent heat resistance. They are also flame retardant and can be used as a protective braid for silicone rubber insulated cables.


## Why are instrumentation cables screened?

During operation, electrical machines and motors generate electromagnetic interference, known as noise. This noise can distort the signals transmitted between devices, resulting in incorrect readings. Therefore, instrumentation cables are shielded with metal strips, foils or braids to prevent interfering signals and improve electromagnetic compatibility (EMC). Shielding can be applied in two ways: only to the entire cable, or to individual pairs, groups of three or four with additional shielding in the outer sheath.

## What approvals are required for instrumentation cables in the oil and gas industry?

Some of the approvals that govern the use of instrumentation cables in the oil and gas market include but are not limited to

- EN-50288-7 (Europa)
- PAS 5308 / BS5308 (Great Britain)
- UL 13 (USA)

For marine applications, additional approvals may be required depending on where the cable will be used on board a vessel. These include

- American Bureau of Shipping (ABS)
- Bureau Veritas (BV)
- Det Norske Veritas (DNV)
- Lloyd's Register (LR)
- Nippon Kaiji Kyokai (NK)
- Unites States Coast Guard (USCG)
- Transport Canada Maritime Safety (TC)

## Where are thermal or compensating cables and resistance temperature detectors (RTDs) used?

Thermowells and RTD (Resistance Temperature Detector) test leads are used in the transmission of temperature measurements as a connection between the thermocouple and the transducer. These are two or more wires with a positive and a negative conductor that transmit the temperature-dependent voltage of the thermocouple to the measuring device. The conductors of a thermocouple cable are made of the same material as the thermocouple, whereas compensating cables are made of different materials with the same thermoelectric properties. Depending on the application, there are different types designed for different temperature ranges.

An RTD (Resistance Temperature Detector) is a sensor whose resistance changes with temperature. RTDs are available with two, three or four wires, depending on the number of devices to be monitored. They are made of platinum, copper or nickel. These cables are used in industrial temperature

measurement applications and are preferred for their ease of use, electrical noise immunity and high sensitivity.

Thermal and compensating cables can carry temperatures up to 1,704°C (3,100°F). RTDs, on the other hand, have an operating temperature range of -200°C to +850°C (1,560°F), depending on the choice of conductor. In addition, thermal or compensating cables are available in versions with particularly high chemical or mechanical resistance.

## » Summary

Instrumentation cables provide reliable signal transmission in the oil and gas industry. They are used in temperature, pressure, flow and many other applications, often under high mechanical loads and extreme environmental conditions. Choosing the right insulation and sheathing materials for the job is essential for trouble-free, long-lasting cable performance. It is also important to ensure that the cables are properly screened and have all the necessary approvals. As an experienced partner of the oil and gas industry, HELUKABEL offers a comprehensive portfolio of electrical connection technology for this demanding industry and is happy to help you choose the ideal solution.

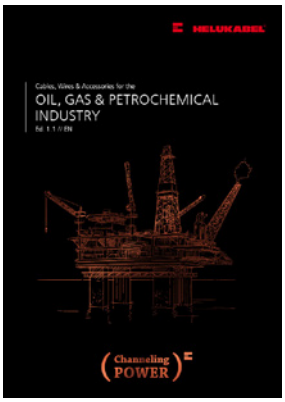
## » CONTACT

We look forward to your request and remain available for any further questions.

**Your contact person**

**Steffen Fuchs**
Global Segment Manager
Oil & Gas
Phone: +49 7150 9209 746
oilandgas@helukabel.de

**Volkan Alpaslan**
Sales Special Cables Oil & Gas
Phone: +49 7150 9209 333
oilandgas@helukabel.de




You can find an overview of our product portfolio in the catalogue Oil-, Gas- & Petrochemical industry