

LEONI *productreport*

Data cables for potentially explosive atmospheres 09/2018



Threat of explosion in the offshore sector

Typical areas at risk of explosion have existed for a long time on oil and gas production platforms as well as on ships that perform the first refining of the extracted raw materials.*

There are consequently strict technical specifications for installing cables in these areas. There is, furthermore, ever more often the need to fit high-quality data connections where zones that are potentially explosive cross over to zones that are not at threat.

The increasing use of LNG (Liquid Natural Gas) as a means of propelling ships, especially also cruise ships and ferries, means that the cases of application in the crossover areas described above are becoming ever more frequent.

LEONI has made it its mission to provide safe solutions for cables that serve data transmission for these crossover areas to all potential users.

* FPSO ships (Floating Production and Storage Offloading).

Marine

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Technical changes excepted.
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Technical requirements in the offshore sector

The cables used for data transmission in the crossover area between the zones exposed to risk of explosion and those that are not in the event of a threat (an explosion) must allow no more than a minimal amount of gas to flow from one zone into the other. This gas flow normally occurs across gas permeable cavities found longitudinally in cables. These might be gussets, but also gas permeable taping.

The gas flow is usually measured by means of a pressure vessel and timed recording of the pressure drop inside the vessel. The procedure is set out in Annex E of the IEC 60079-14:2013 standard and states as follows:

"A piece of cable with a length of 0.5 m should be type tested when installed into a sealed enclosure of 5 l (± 0.2 l), under constant temperature conditions. The cable is considered acceptable if the time interval required for an internal overpressure of at least 0.3 kPa (30 mm water gauge) to drop by 0.15 kPa (15 mm water gauge) is not less than 5 s.

The enclosure must be completely tight to avoid pressure loss through the enclosure gaps."



Fig. 1: LEONI testing device

Alongside the specific requirements concerning the cables' pressure response, the corresponding stipulations of the IEC 60092 Part 350 through Part 376 series of standards must also absolutely be observed for offshore use.

LEONI SeaLine® data cables for potentially explosive atmospheres

LEONI has developed a complete range of copper data cables for such atmospheres, which meet the requirements stipulated in the presented standards and can therefore be deployed in the offshore sector without restriction. The product portfolio comprises the following product groups, among others:

- Ethernet cables for transmission categories 5e, 6, 6A and 7
- PROFIBUS cables
- CAN-Bus cables
- CCTV camera cables
- Hybrid cables

Transmission category 7 Ethernet cable is depicted below as a design example.

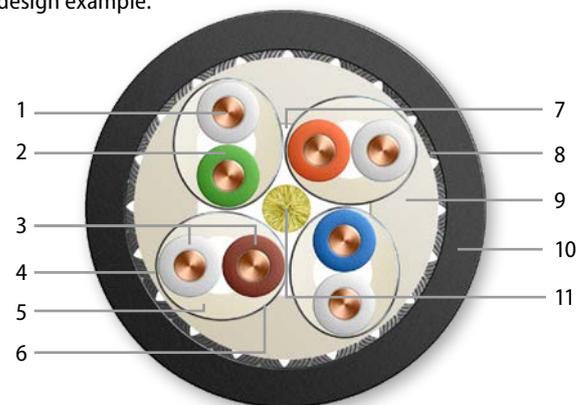


Fig. 2:
Cross-sectional view of the Cat. 7 data cable

Cable structure:

1. metallic conductor
2. dielectric
3. twisted data pair
4. electrical shield
5. filler compound in the twisted data pair
6. data pair element
7. "clearance", gusset
8. overall electric shield
9. filler compound inside the cable
10. cable jacket
11. central member

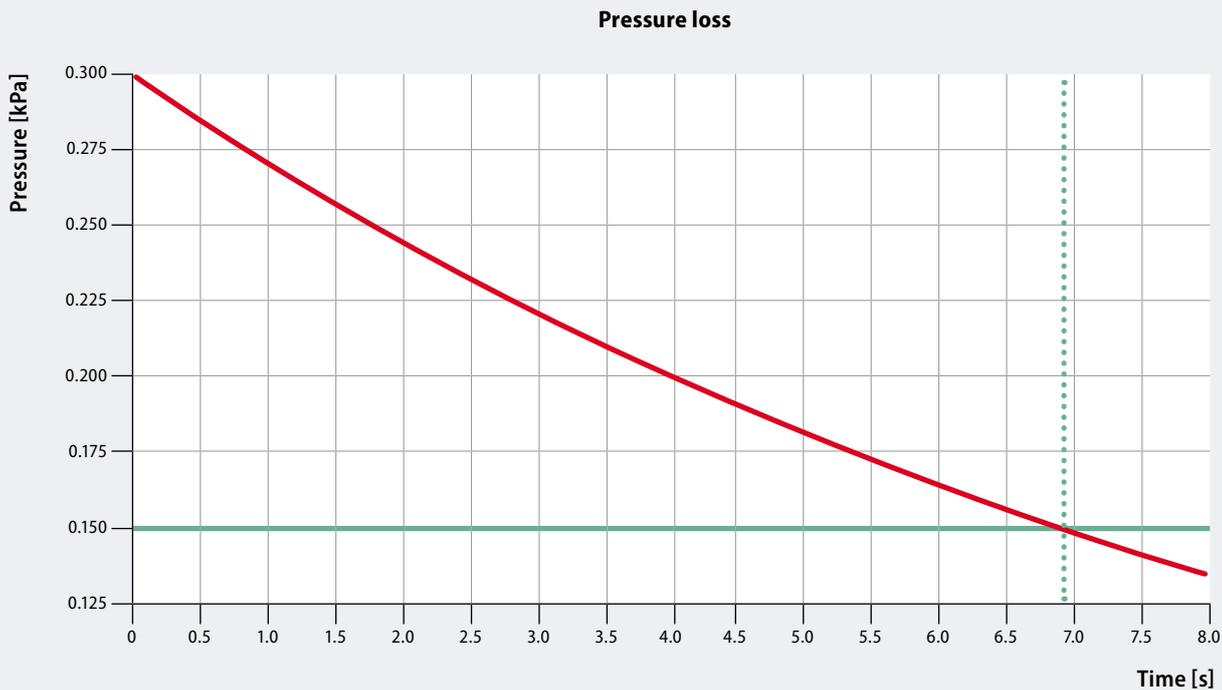


Fig. 3: Pressure drop diagram, measured on LEONI cable

The distinctive aspect when ensuring a reduction in gas flow through the cable is to minimise the volume of empty space. Meanwhile, it is important to make sure that such reduction of empty space does not come at the expense of the cable's transmission properties. For this reason, the cable's jacket is not extruded under high pressure because this would inevitably lead to deforming the data transmission pairs and thus to deterioration through to loss of data transmission properties. Cavities must therefore be filled in other ways. LEONI has developed a special process to do so, which

- almost entirely fills the cable's cavities, while this process can also – depending on the cable's construction – be applied multiple times
- only marginally affects the transmission properties
- only marginally changes the mechanical properties and cable dimensions (versus a comparable standard cable)
- can be easily removed during assembly of the cable
- does not stick to the core insulation

In addition to the various tests for cables in offshore applications pursuant to IEC 60092 Part 350, such as

- flame propagation on single cables (section 8.17.1)
- flame propagation on cable bundles (section 8.17.2)
- smoke density test (section 8.17.3)
- test of fume corrosiveness (section 8.17.4)
- test of the pH value and the conductivity of fumes dissolved in water (section 8.17.5)
- test of the fluoride content (section 8.17.6)

as well as the requirements under Part 360 for the individual materials used, the test described in standard IEC 60079-14 Annex E was also successfully passed.

The time of the pressure drop from 0.30 kPa to 0.15 kPa is thus 6.8 seconds and the cable meets the standard's requirements.

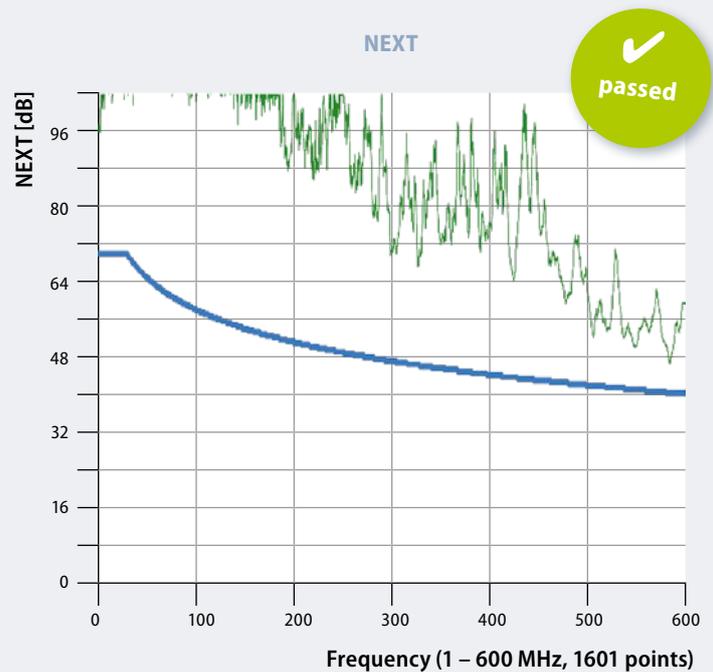
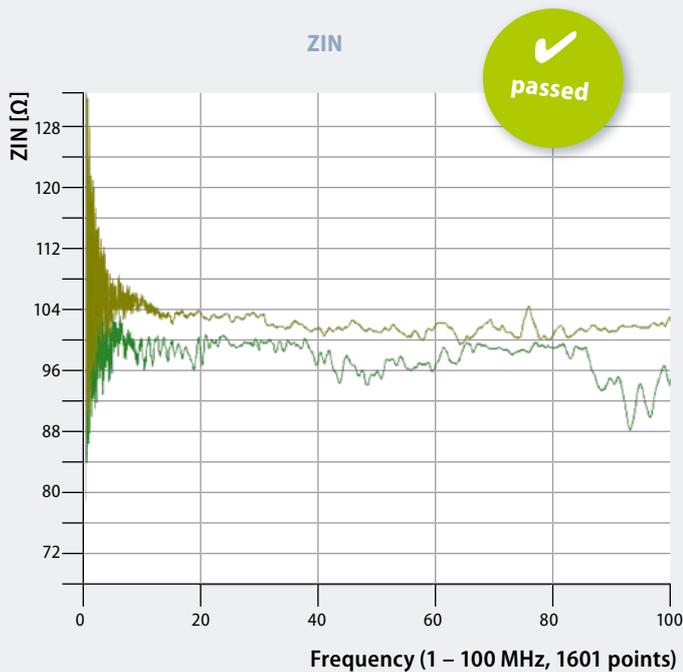
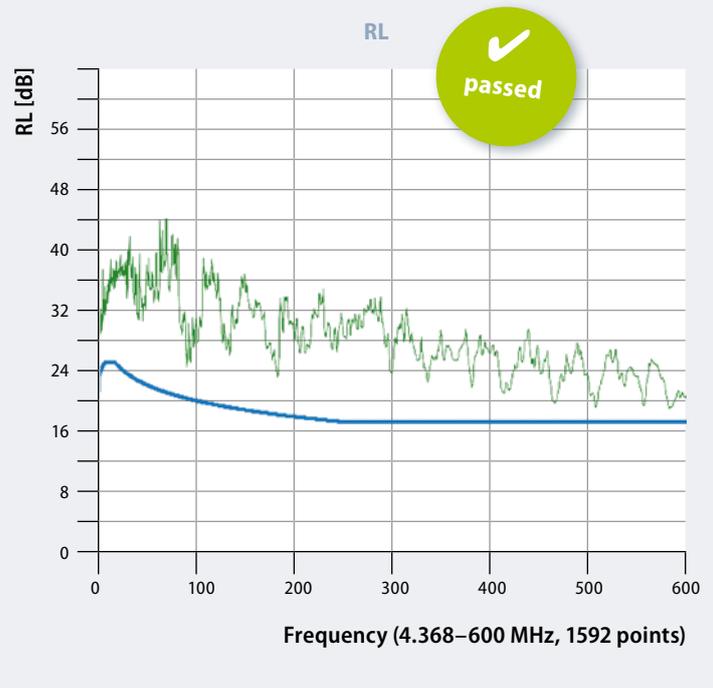


Fig. 4: HF test reports

Of course, the cables we developed fulfil all the stipulated requirements concerning the cables' transmission properties. As an example, Fig. 4 shows the test readings for the key transmission properties of

- impedance (ZIN)
 - near-end crosstalk (NEXT) and
 - return loss (RL)
- of a Cat. 7 Ethernet cable.

All LEONI Ethernet data cables made within this product group can easily be assembled with Type RJ45 as well as M12 standard connectors and sockets.



Summary

LEONI SeaLine® data cables, which were developed and are made for the crossover areas between potentially explosive atmospheres and those that are not, boast excellent data transmission properties during normal operation on board

ships and offshore platforms. Yet they also provide protection of persons and property in the event of danger by significantly reducing the gas that could flow through the cable.

LEONI thereby makes an important contribution to increasing safety on board ships and other offshore structures.