

OFFSHORE JACKETING MATERIALS

CHARACTERISTICS OF SHF-1,
SHF-2 & NEK 606 (MUD)

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Marine Shipboard and Offshore Cables are cables meant for use aboard a ship or a marine vessel. This can include ocean drilling rigs, submarines, cruise ships and naval vessels. The requirements of these cables are set in the standard IEC 60092-360 Edition 1.0 2014-04 (formerly IEC 60092-359), "ELECTRICAL INSTALLATIONS IN SHIPS - PART 360: INSULATING AND SHEATHING MATERIALS FOR SHIPBOARD AND OFFSHORE UNITS, POWER, CONTROL, INSTRUMENTATION AND TELECOMMUNICATION CABLES".

Cables designated SHF-1 and SHF-2 must be stronger than other cables due to the harsh environmental condition and mechanical demands that the cables must withstand.

Sheathing of offshore cables according to NEK 606 (MUD) (which is not a standard but a technical specification), can be either SHF-1 or SHF-2.

There are several differences in material characteristics between the two compounds. It depends on various situations, such as environmental aspects and application types, whether SHF-1 or SHF-2 will be a better choice. Table 1 below outlines some of the differences in characteristics between SHF-1 and SHF-2.

In both cases the materials and the properties of the materials employed in the insulation and the sheathing, are established in the above-mentioned IEC standard.

There can obviously be applications where the cable may have an application that needs to comply with both requirements. In that case, the type of cable should be OFFSHORE, since it has more stringent requirements.

Whatever the case, the cables must have formal approval by one or more of the following certifying organizations:

- ❖ Det Norske Veritas - Germanischer Lloyd (DNV-GL)
- ❖ American Bureau of Shipping (ABS)
- ❖ Lloyds Registry of Shipping (LR)
- ❖ Bureau Veritas
- ❖ Russian Maritime Registry of Shipping

TABLE I below shows some of the various characteristics and properties for the different classes.

It is important to mention that NEK 606 (MUD) is a technical specification. That is, it has specific requirements in addition to those established in IEC 60092-360.

Table I

Cable Type	SHF-1	SHF-2
Material type	Flame Retardant- Low Smoke-Zero Halogen Thermoplastic ^[1]	Flame Retardant-Low Smoke- Zero Halogen Thermosetting ^[1] or Elastomeric ^[2]
Hot set test for cross-linked materials 60811-508:2012 Electric and optical fiber cables - Test methods for non-metallic materials Part 507: Mechanical tests	Not applicable	❖ Maximum Elongation under a load of 20 N/mm ² at 200°C, 15 minutes (Required: <175%) ❖ Maximum permanent Elongation after cooling (Required: <25%)
Pressure at High Temperature 60811-508:2012 Electric and optical fiber cables - Test methods for non-metallic materials Part 508: Mechanical tests - Pressure test at high temperature for insulation and sheaths	80°C, 4 to 6 minutes under a load (load is a function of cable diameter) (Required Deformation < 50%)	Not required
Heat Shock Test IEC 60811-509:2012 Electric and optical fiber cables - Test methods for non-metallic materials Part 509: Mechanical tests - Test for resistance of insulations and sheaths to cracking	1 hour at 150°C	Not required
Ozone Resistant Test IEC 60811-403:2012 Electric and optical fiber cables - Test methods for non-metallic materials Part 403: Miscellaneous tests - Ozone resistance test on cross-linked compounds	Not required	24 hours at 25°C ± 2°C for Max 0,025 to 0,030 % ozone concentration (in volume)

^[1] Thermoplastic vs. thermosetting: The primary physical difference is that thermoplastics can be re-melted back, whereas thermoset plastics cannot.

^[2] Elastomeric: Any material, such as natural or synthetic rubber, that can resume its original shape when a deforming force is removed

Another key difference has to do with the chemical resistance requirements that the cables have to comply with:

In principle, whenever resistance to oils and fuels is required, the class should be SHF-2.

Currently the technical specification NEK 606 is established in NEK 606:2004. This specification requires specific chemical resistance tests in addition to those required in IEC 60092-360.

Until recently the distinction between the two sheathing materials were not very clear. In the latest version (edition 5) of NEK 606 (MUD) requirements for oil and MUD ("MUD" refers to a specific solution), for outer sheaths (SHF-2) have been updated by dividing it into a mandatory minimum level and two optional levels of higher performance. The levels are divided as follows:

- ❖ Minimum required oil resistance
- ❖ Enhanced oil resistance
- ❖ Mud resistance

Also, new requirements for hydraulic oil resistance have been added.

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