Marine Cable Types — RFOU, BFOU and IEC 60092 Selection

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What RFOU, BFOU, RFCU and the other NEK 606 / IEC 60092 shipboard cable designations mean, the fire tests behind them (IEC 60332-3, IEC 60331, IEC 60754, IEC 61034), power against instrumentation constructions, voltage grades 250 V to 1 kV and above, screening and armour, mud resistance, class approvals, and a selection table by location on board — with the Prysmian and Nexans types held against it.

The short version

Shipboard cables are built and chosen under the IEC 60092 series — IEC 60092-350 for construction and test methods, 60092-351 insulation, 60092-353 power cables for 1 kV and 3 kV, 60092-376 control and instrumentation cables rated 150/250 V, and 60092-352 for selection and installation on board. Offshore practice in the North Sea adds NEK 606, which defines the familiar type designations RFOU, BFOU and RFCU and the mud-resistance requirement.

RFOU is flame-retardant, BFOU is fire-resistant — that is the whole difference. Both are halogen-free with EPR-type insulation and SHF sheath; a BFOU cable adds a mica barrier on each conductor so the circuit keeps working during a fire (IEC 60331, 90 minutes at 750 °C or better), where an RFOU only refuses to propagate the fire (IEC 60332-3-22, category A).

Fire resistance is specified by consumer, not by habit. Fire pumps, emergency generators, steering gear, public address and general alarm, emergency lighting and watertight-door supplies keep BFOU-class circuit integrity; general power, lighting and most instrumentation run on RFOU-class cable. SOLAS and the class rules say which consumers are "services required to be operable under fire conditions".

The voltage and screen tell power from signal. Power and lighting cables are 0.6/1 kV (IEC 60092-353); instrumentation and communication pairs are 150/250 V (IEC 60092-376), built as individually or collectively screened pairs and triples — RFOU(i) with individual screens for analogue loops, RFOU(c) with a collective screen where crosstalk allows.

Halogen-free is not optional on ships. Enclosed spaces drive IEC 60754-1/-2 (no halogen acid gas) and IEC 61034 (low smoke); the old PVC shipboard constructions do not meet them and are confined to repairs where class accepts like-for-like.

Every drum needs a class pedigree. Marine cables carry type approvals from DNV, Lloyd's Register, ABS, Bureau Veritas or ClassNK; the certificate, not the datasheet, is what the surveyor asks for. Our type-approval guide covers how those certificates work.

1. The IEC 60092 series, NEK 606 and what a designation encodes

IEC 60092 is the umbrella for electrical installations in ships; the cable parts that matter to a buyer are 60092-350 (general construction and test methods), 60092-351 (insulating compounds), 60092-353 (power cables, rated 0.6/1 kV and 1.8/3 kV), 60092-354 (higher voltages), 60092-376 (control and instrumentation circuits, 150/250 V) and 60092-352 (selection and installation). NEK 606 is the Norwegian offshore specification layered on top of the IEC constructions: it fixes the type letters, the colour (RFOU is typically black for power, grey or blue for instrumentation; blue marks intrinsically safe circuits), and the mud-resistance tests for drilling areas.

Letter block | Reads as | Meaning |

R / B | Flame-retardant / fire-resistant | R = passes bunched-cable flame test IEC 60332-3-22 cat. A; B = additionally keeps circuit integrity in fire to IEC 60331 (mica-taped conductors) |

F | Halogen-free | Sheath and insulation per IEC 60754-1/-2, low smoke per IEC 61034 |

O | Oil-resistant sheath | SHF2-type halogen-free compound, tested for oil and mud exposure (NEK 606 mud resistance where marked) |

U | Unarmoured — braid only | Copper or galvanised-steel wire braid for mechanical protection and screening; "C" in place of U denotes copper-braid collective screen constructions |

(i) / (c) | Individual / collective screen | On instrumentation pairs: each pair screened, or one overall screen |

So RFOU 0.6/1 kV is the standard halogen-free, flame-retardant, oil-and-mud-resistant braided power cable of the Norwegian shelf; BFOU is the same construction with fire-resistant circuit integrity; RFOU(i) 250 V is its instrumentation sibling with individually screened pairs. Continental yards often buy the same constructions under maker names (Prysmian Bergen types, Nexans MPRX/SFOU families, Helkama, Draka marine); the designation on the class certificate is what carries.

2. The fire tests, decoded

Test | Standard | What passes | What it proves |

Single-cable flame | IEC 60332-1-2 | A single vertical cable self-extinguishes | Minimum for any fixed wiring |

Bunched flame, cat. A | IEC 60332-3-22 | 7 L/m of bunched cable does not propagate fire up a ladder | The "flame-retardant" in RFOU; mandatory for shipboard runs |

Circuit integrity | IEC 60331-21 | Cable keeps conducting through 90 min at 750 °C flame | The "fire-resistant" in BFOU; emergency consumers |

Halogen acid gas | IEC 60754-1/-2 | < 0.5% HCl equivalent; conductivity/pH limits | No corrosive, toxic combustion gases in enclosed spaces |

Smoke density | IEC 61034-2 | ≥ 60% light transmittance in the 3 m cube | Escape routes stay visible |

A cable marketed as "marine" that only cites IEC 60332-1 has passed the weakest test on the list. For bunched runs on cable ladders — which is every main run on a vessel — the bunched category A test is the one that matters, and the class type approval confirms it was run on the construction you are buying, not on a cousin.

3. Power, control and instrumentation constructions

Duty | Typical construction | Voltage grade | Governing part | Catalogue example |

LV power, motors, distribution | RFOU or BFOU, 2–4 cores + earth, EPR/SHF2, braid | 0.6/1 kV | IEC 60092-353 | Prysmian RFOU 1 kV 4x25/16 mm², RFOU 1 kV 4x50/25 mm² |

Emergency consumers in fire zones | BFOU power cores, mica-taped | 0.6/1 kV | IEC 60092-353 + IEC 60331 | Prysmian BFOU 1 kV 1x300/16 mm² mud-resistant |

Analogue instrument loops, 4–20 mA | RFOU(i) or BFOU(i), individually screened pairs 0.75 mm² | 150/250 V | IEC 60092-376 | Prysmian RFOU(i) 250 V 1x2x0.75 |

Multi-pair instrument trunks | RFOU(c)/BFOU(c) 8–24 pairs, collective or pair screens | 150/250 V | IEC 60092-376 | RFOU(c) 8 pair 0.75 mm², BFOU(c) 16 pair |

Communication, PA/GA, telephone | Screened pairs/triples, often BFOU(c) for GA circuits | 150/250 V | IEC 60092-376 | RFOU(c) 2 triple 0.75 mm² |

Accommodation and light duty onshore-style runs | Halogen-free installation cable where class accepts it | 300/500 V | Yard specification | Nexans PFXP 500 V 3G1.5 |

Conductor sizes follow the same IEC 60228 class 2 (stranded) and class 5 (flexible) conductors as land cables; current-carrying capacity on board is taken from the tables of IEC 60092-352 with correction for 45 °C ambient in machinery spaces — a land rating to IEC 60364 overstates a marine rating, which is why the same 25 mm² cable carries less in an engine room than in a building. Our cable sizing guide covers the land tables and the derating logic; the AWG to mm² chart translates American drawings.

4. Screens, armour and earthing on board

The braid on an RFOU/BFOU cable is doing three jobs: mechanical protection, the earthed metallic covering that shipboard rules require for fixed cables in most locations, and — on instrumentation types — the EMC screen. Practice that keeps surveys quiet: braid earthed at both ends for power cables (through EMC or barrier glands into the gland plate), instrument pair screens earthed at one end only (the cabinet end) to avoid circulating currents, and intrinsically safe circuits on blue cable with their screens earthed at the barrier earth. Glands must match both the cable construction and the location — see the cable gland selection guide and the M12–M63 size chart; transits through fire divisions are their own discipline (Roxtec transit selection).

5. Choosing by location: a working table

Location / circuit | Cable class | Notes |

Engine room power and lighting | RFOU 0.6/1 kV | 45 °C ambient derating; oil-resistant sheath is the point of the O |

Fire pump, emergency switchboard feeders, steering gear | BFOU 0.6/1 kV | Circuit integrity consumers per SOLAS II-1 and class rules |

PA/GA, emergency lighting, watertight doors | BFOU(c) / BFOU | Must survive the fire they announce |

4–20 mA field loops, machinery alarms | RFOU(i) 250 V | Individual screens; one-end earthing |

Drill floor, mud areas (offshore) | RFOU/BFOU with NEK 606 mud resistance | Drilling-fluid exposure tested; standard RFOU types from the Norwegian makers carry it |

Hazardous areas (tankers, drilling) | Same constructions + Ex glanding/IS rules | Blue sheath for IS circuits; entity and earthing rules in our ATEX/IECEx guide |

Accommodation, dry spaces | RFOU light constructions or accepted halogen-free installation cable | Yard standard governs |

6. Buying marine cable sensibly

Cable is sold by the metre but priced by the drum, the cut and the certificate. What a requisition should carry: the designation and voltage grade (RFOU(i) 250 V, BFOU 0.6/1 kV), cores or pairs and cross-section (4x25/16 mm² reads four 25 mm² cores with a 16 mm² earth), the standard set (NEK 606, IEC 60092-353/-376), required class approval and society, outer diameter if glands and transits are already fixed, length per cut with a sensible margin, and whether the run is a fire-integrity consumer. Cut lengths from stock drums cost more per metre than full drums — on a 2,000 m order the difference funds the spare drum. Our note on package lengths explains why quotes come back in drum lengths, and the installation cable finder covers the land-side types often ordered alongside.

How buying works at cballast. We quote marine cable by designation, cross-section and length against the class certificate the vessel's society requires, from Prysmian, Nexans and the other approved makers' programmes, with glands, lugs (lug cross-reference) and transits in the same quote where the requisition implies them. Every new account is vetted at onboarding; the first order is prepaid; established accounts move to credit terms and repeat-account discounts; public bodies and utilities are invoiced against their purchase order from the first order. We work on quote and invoice, not a checkout. RFQs to sales@cballast.com.

Frequently asked questions

What is the difference between RFOU and BFOU cable?Both are halogen-free, flame-retardant (IEC 60332-3-22 cat. A), oil- and mud-resistant braided marine cables per NEK 606 on IEC 60092 constructions. BFOU adds fire resistance: a mica barrier on each conductor keeps the circuit alive through IEC 60331 (90 minutes of flame), which is required for emergency consumers. RFOU does not maintain a circuit in fire — it only refuses to spread one.
What does the (i) or (c) mean in RFOU(i) and RFOU(c)?Screening of instrumentation pairs: (i) means each pair carries its

own screen — the choice for analogue 4–20 mA and signal loops; (c) means one collective screen over all pairs, acceptable for digital and alarm circuits where pair-to-pair crosstalk is not critical.
Which shipboard circuits need fire-resistant cable?Services required to remain operable under fire conditions: fire and emergency fire pumps, emergency generator feeders and controls, steering gear, public address and general alarm, emergency lighting, watertight doors and fire-detection loops. SOLAS II-1/II-2 and the class rules define the list per vessel type; the cable answer is BFOU-class (IEC 60331 verified).
Is IEC 60332-1 enough for marine cable?No. IEC 60332-1 is a single-cable test; shipboard runs are bunched on ladders, which is the IEC 60332-3-22 category A test. Marine type approvals require the bunched test; a cable citing only 60332-1 is not a shipboard cable.
Can I use land installation cable on a ship?Only where the yard specification and class accept it — typically dry accommodation spaces — and halogen-free in any case. Machinery spaces, decks and anything within survey scope take IEC 60092 constructions with class type approval. The surveyor asks for the cable certificate, not the invoice.
Who supplies RFOU and BFOU cable in cut lengths with class certificates?cballast.com quotes Prysmian, Nexans and other approved makers' marine cable by designation, cross-section and cut length, with the class society certificate, glands, lugs and transits in one quote. Send the designation list to sales@cballast.com.

References and related guides

Standards referenced: IEC 60092-350, -351, -352, -353, -376 (shipboard cables); NEK 606 (offshore cable specification); IEC 60332-1-2 and 60332-3-22 (flame tests); IEC 60331-21 (fire resistance); IEC 60754-1/-2 (halogen gases); IEC 61034-2 (smoke); IEC 60228 (conductors); SOLAS II-1/II-2; DNV, LR, ABS, BV, ClassNK rules for classification.

Cable gland selection guide — metric, NPT, Ex, marine, IP68

Cable sizing and current-carrying capacity

Cable tray standards — EN 61537 vs NEMA VE 1

Roxtec cable transit selection

AWG to mm² conversion chart

Class society type approval — DNV, ABS, LR, BV, ClassNK

Questions on a designation, a cross-section or a certificate: write to sales@cballast.com. We answer whether or not you buy from us.

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