

TYPE APPROVAL CERTIFICATE

This is to certify:**That the High Voltage Cable**

with type designation(s)

RFOU P2/P9, RFOU P3/P10 & RFOU-VFD(EMC), RFOU P4/P11 & RFOU-VFD(EMC), RFOU P19/P21 & RFOU-VFD(EMC), RFOU P20/P22& RFOU-VFD(EMC)

Issued to

Controlcavi Industria S.r.l.
Ferentino FR, Italy

is found to comply with

Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det Norske Veritas' Offshore Standards**Application :****Power.****Flame retardant Cat. A. Halogen free. Low smoke.****Mud resistant. Ozone and UV resistant.****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.**

Type	Voltage (kV)	Temp. class (°C)
RFOU P2/P9	3,6/6	90
RFOU P3/P10 & RFOU-VFD(EMC)	6/10	90
RFOU P4/P11 & RFOU-VFD(EMC)	8,7/15	90
RFOU P19/P21 & RFOU-VFD(EMC)	12/20	90
RFOU P20/P22& RFOU-VFD(EMC)	18/30	90

This Certificate is valid until **2019-07-01**.Issued at **Høvik** on **2015-07-02**DNV GL local station: **Milan**Approval Engineer: **Ivar Bull**for **DNV GL**

Marit Laumann
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Job Id: **262.1-011080-2**
Certificate No: **TAE000003R**

Product description

Type: RFOU P2/P9 3,6/6 kV
RFOU P3/P10 & RFOU-VFD(EMC) 6/10 kV
RFOU P4/P11 & RFOU-VFD(EMC) 8,7/15 kV
RFOU P19/P21 & RFOU-VFD(EMC) 12/20 kV
RFOU P20/P22 18/30 kV RFOU-VFD(EMC) 18/30 kV

Construction:

Conductors:	Tinned copper flexible Class 2 IEC 60228
Conductor screen:	Extruded semiconducting layer
Core insulation:	HEPR
Insulation screen:	Extruded semiconducting layer
Screen:	Tinned copper wire braid
Earth conductors for RFOU-VFD(EMC)	Tinned copper HEPR insulated
Bedding:	SHF2
EMC (for RFOU-VFD)	Plain copper tape
Metal covering:	Tinned copper wire braid
Outer sheath:	SHF2 Mud

Type:	No of cores:	Cross sectional area [mm ²]
FOU P2/P9 3,6/6 kV	1	10 – 300
FOU P2/P9 3,6/6 kV	3	10 – 240
RFOU P3/P10 6/10 kV	1	16 – 300
RFOU P3/P10 6/10 kV	3	16 – 240
RFOU-(EMC) 6/10 kV	1	16 – 300
RFOU-VFD(EMC) 6/10 kV	3	3x25/3x6 – 3x185/3x50
RFOU P4/P11 8,7/15 kV	1	25 – 300
RFOU P4/P11 8,7/15 kV	3	25 – 240
RFOU-(EMC) 8,7/15 kV	1	25 – 300
RFOU-VFD(EMC) 8,7/15 kV	3	3x25/3x6 – 3x150/3x25
RFOU P19/P21 12/20 kV	1	35 – 240
RFOU P19/P21 12/20 kV	3	35/16 – 240/120
RFOU-VFD(EMC) 12/20 kV	1	35 – 240
RFOU-VFD(EMC) 12/20 kV	3	3x50/3x10 – 3x150/75
RFOU P20/P22 18/30 kV	1	50 – 500
RFOU P20/P22 18/30 kV	3	50/25 – 150/75
RFOU- EMC 18/30 kV	1	50 – 240
RFOU-VFD(EMC) 18/30 kV	3	3x50/3x10 – 3x150/75

Value after / indicates protective earth wire dimension

Application/Limitation

The requirements of SOLAS Amendments Chapter II-1, Part D, Reg. 45, 5.2 (provision to be taken to limit Fire Propagation along Bunches of Cables or Wires) are fulfilled without any additional measures.

Tests carried out

Standard	Issued	General description	Limitation
IEC 60092-350	2008-02	General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications	
IEC 60092-360	2014-04	Electrical installations in ships - Part 360: Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telecommunication cables.	
IEC 60092-354	2014-08	Electrical installations in ships - Part 354: Single- and three-core power cables with extruded solid insulation for rated voltages 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV)	
IEC 60332-3-22	2009-02	Tests on electric and optical fibre cables under fire conditions – Part 3-22: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category A	Bunch test Category A
IEC 60754-1	2011-11	Test on gases evolved during combustion of materials from cables - Part 1: Determination of the halogen acid gas content	Low Halogen: <0,5% Halogen
IEC 60754-2	2011-11	Test on gases evolved during combustion of materials from cables - Part 2: Determination of acidity (by pH measurement) and conductivity	Halogen free: pH > 4,3 Conductivity < 10µS/mm
IEC 61034-1/2	2013-07 2013-09	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke Light transmittance ≥60%
NEK 606 Ed. 4	2009-05	Cables for offshore installations. Halogen-free and/or mud resistant. Technical specification.	Mud resistance test: IRM903 100°C 7d. Ca Bromide 70°C 56d. <u>Oil based mud:</u> CarboSea 70°C 56d or EDC 95/11 70°C 56d
UL 1581	2008-07	Reference Standard for Electrical Wires, Cables, and Flexible Cords	Changes in tensile strength and elongation <15% after 300 h and <20% after 720 h.

Marking of product

CCI– RFOU P2/P9 3,6/6 kV or RFOU P3/P10 or RFOU-VFD(EMC) 6/10 kV or RFOU P4/P11 or RFOU-VFD(EMC) 8,7/15 kV or RFOU P19/P21 or RFOU-VFD(EMC) 12/20 kV or RFOU P20/P22 or RFOU-VFD(EMC) 18/30 kV – size – IEC 60332-3-22 - Year

Periodical assessment

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The scope of the Periodical assessment is to verify that the conditions stipulated for the Type approval is complied with and that no alterations are made to the product design or choice of materials.

The main elements of the Periodical assessment are:

- Inspection on factory samples, selected at random from the production line (where practicable)
- Results from Production Sample Tests (PST) and Routines (RT) checked (if not available tests according to PST and RT to be carried out)
- Review of type approval documentation
- Review of possible change in design, materials and performance
- Ensuring traceability between manufacturer's product type marking and Type Approval Certificate.

Periodical assessment to be performed at least every second year.

END OF CERTIFICATE