



TEST REPORT IEC 60800:2021 Heating cables with a rated voltage up to and including 300/500 V for comfort heating and prevention of ice formation		
Report Number..... :	ACTE202303302	
Date of issue	16/07/2023	
Total number of pages.....	37	
Applicant's name	Milano Tiling	
Address	3/103 Gasson Street, Sydenham, Christchurch 8011, New Zealand	
Purchase Oder / Reference	QU-1073	
Testing laboratory..... :	ACT NZ Limited trading as Auckland Lab	
Testing location	1066E Great South Road, Mount Wellington, Auckland 1060, New Zealand	
Test specification:		
Standard	IEC 60800:2021	
Test procedure..... :	Full Test	
Test Report Form No. :	ACT-TRF-60800	
Revision..... :	1.0	
Test item description..... :	Electric Heating Cable	
Trademark	Milano Tiling	
Manufacturer	ANHUI HUANRUI Heating Manufacturing Co., Ltd	
Model/Type reference	Model S-CABLE15-300	
Ratings	Refer to Marking Plate Section	
Summary of testing	The received sample of Electric Heating Cable Model S-CABLE15-300 <u>fulfils</u> the requirements of the Standard IEC 60800:2021.	
	Tested by (name + signature):	Yuran Zhou
	Yuran Zhou	
	Approved by (name + signature):	John Liu
	John Liu	

Copy of marking plate The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBS that own these marks.



HUANRUI

ANHUI HUANRUI HEATING MANUFACTURING CO., LTD

Underfloor Heating Cable

Code : S-CABLE15-300

Rated Voltage : 230VAC

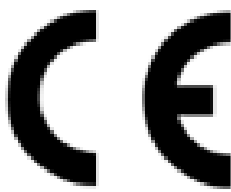
power:15W/M

Length : 20M

Total power: 300W

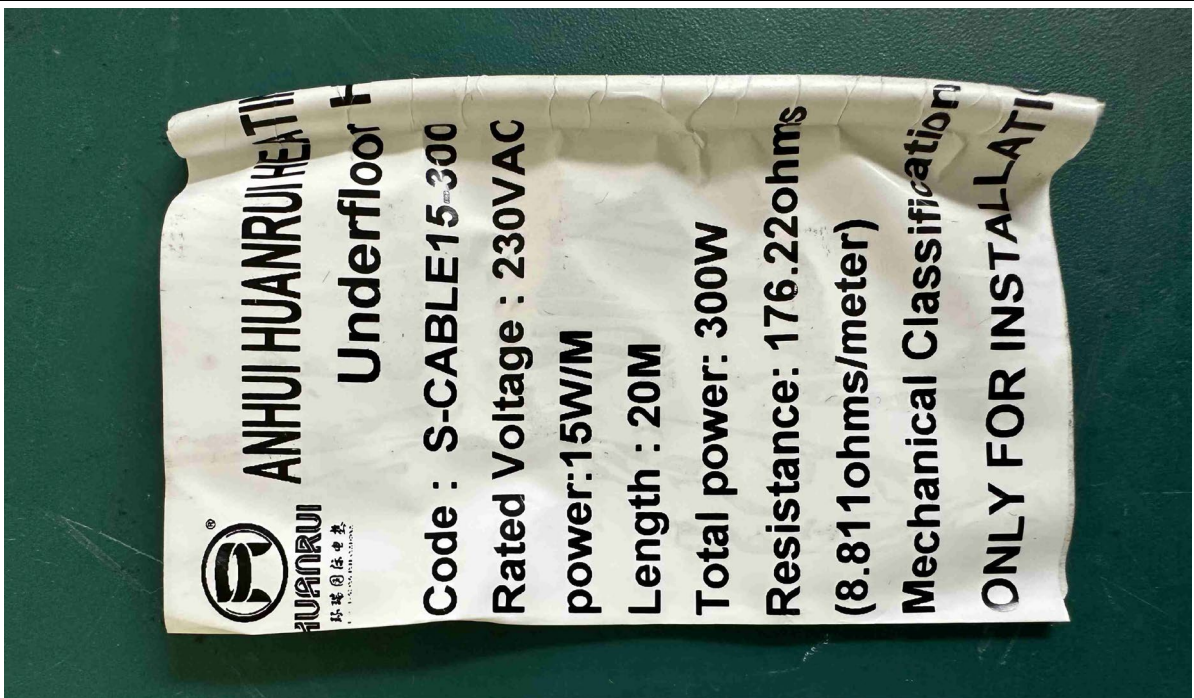
Resistance: 176.22ohms
(8.811ohms/meter)

Mechanical Classification : M1



ONLY FOR INSTALLATION IN CONCRETE!

Marking Label (Electronic Copy)



Marking Label Front Side



Marking Label Back Side

Test item particulars	Electric Heating cable
Possible test case verdicts:	
- test case does not apply to the test object...:	N/A
- test object does meet the requirement	P (Pass)
- test object does not meet the requirement...:	F (Fail)
- object for information or notification only....:	Noted
Testing.....:	
Date of receipt of test item	01/04/2023
Date (s) of performance of tests	07/04/2023 - 30/06/2023
General remarks:	
<p>The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. "(see Enclosure #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report. Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator. All our IECEE testing equipment met the accuracy requirements in accordance with IECEE OD-5014:2019. If required, it is available in the ACT NZ LTD Testing laboratory at applicant's request. Determination of the test results from IEC standards in CB scheme includes consideration of measurement uncertainty from the accuracy of these test equipment. For these testing standards which are outside the scope of IEC CB Scheme, the decision rule regarding measurement uncertainty is not taken into account when making compliance decisions.</p>	

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Clause	Requirement - Test	Result - Remark	Verdict
4	Mechanical classification		P
	The cables in this standard have been divided into two classes which indicate their ability to withstand mechanical forces during and after installation. These classes are as follows:		P
	– mechanical class M1: for cables intended for installation with low risk of mechanical damage.	<i>Mechanical class M1 claimed by manufacturer.</i>	P
	– mechanical class M2: for cables intended for installation with higher risk of mechanical damage.	<i>Not mechanical class M2.</i>	N/A
	The class of any heating cable is determined by its performance as measured against the requirements in 8.2.7 and 8.2.14.	<i>Refer to clauses 8.2.7 and 8.2.14.</i>	P
5	Requirement for marking		P
	The product shall be marked by printing, embossing or indenting on the sheath or on a label attached to the product or on a component inside the cable.	<i>Cable marked by a label attached.</i>	P
	Embossing shall not be used on the insulation.	<i>No embossing.</i>	P
	A label shall be attached to the product in a permanent way and be clearly detectable to the electrical installer.	<i>Label detectable.</i>	P
	The label shall be attached to the part of the product which is clearly visible when unpacking the product ready for installation.		P
	The marking shall at least contain:		P
	– identification of the manufacturer by name and or a symbol;	<i>Manufacturer name marked. Refer to marking label.</i>	P
	– the type reference;	<i>Type reference marked. Refer to marking label.</i>	P
	– resistance per metre of cable at 20 °C in Ohms per metre if single or twin conductor series resistive cables, or for a parallel cable, power output in Watts per metre at a reference temperature. For series resistive cables with more than two conductors the resistance of each conductor shall be clearly marked;	<i>Series single conductor cable marked with resistance per metre. Refer to marking label.</i>	P

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Clause	Requirement - Test	Result - Remark	Verdict
	– mechanical classification;	<i>Classification M1 marked.</i>	P
	– the rated voltage for parallel heating cables or maximum operating voltage for series heating cables;	<i>Rated voltage marked.</i>	P
	– if applicable, the indication “not flame-retardant”.		N/A
	The distance between the end of one complete set of marks and the beginning of the next shall not exceed:	<i>No marking on cable.</i>	N/A
	– 550 mm, if the marking is on the sheath;		N/A
	– 275 mm, if the marking is on a component inside the cable.		N/A
	If the units are factory assembled, the following additional information shall be provided:		N/A
	For series resistive units:		P
	– nominal voltage;	<i>230Vac marked.</i>	P
	– total wattage;	<i>300W marked</i>	P
	– total resistance.	<i>176.22 ohms marked.</i>	P
	For parallel resistive units:	<i>Not such type.</i>	N/A
	– nominal voltage;		N/A
	– power output in watts per metre at a reference temperature or total wattage.		N/A
	Printed marking shall be durable. Compliance with this requirement shall be checked by the test given in 8.2.21.	<i>Laminated marking declared by manufacturer.</i>	P
	The above are the minimum requirements and suppliers are free to add any additional information which may be useful.	<i>Additional info added.</i>	P
6	Requirements for installation instructions		P
	The manufacturer shall provide product specific installation instructions for heating cables, heating cable sets and components. The instructions shall be clearly identified as to the products and locations that apply, and shall include the following information:		P
	a) the intended use(s), either by general application type or by specific listed application;	<i>Installation location specified.</i>	P

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Clause	Requirement - Test	Result - Remark	Verdict
	b) a means of isolating all line conductors from the supply;	<i>Isolation specified.</i>	P
	c) over-current protection provided;	<i>Protection device mentioned.</i>	P
	d) the statement "Residual current device (RCD) having a residual current not exceeding 30 mA is required";	<i>Statement included.</i>	P
	e) for mechanical classification M1 heating cables, intended for reduced levels of mechanical forces, the statement "Caution: Do not use in areas subject to high mechanical loads or impact";	<i>Warning included.</i>	P
	f) an applicable statement to indicate that any metal sheath, braid, screen or equivalent electrically conductive covering of the heating cable shall be connected to an earth terminal;	<i>Similar warning included.</i>	P
	g) if unscreened heating cables are installed, the indication that they shall be covered by an electrically earthed mesh or equivalent and protected by a 30 mA RCD according to the installation standard. See also IEC 60364-7-701 and IEC 60364-7-753;	<i>Not such type.</i>	N/A
	h) minimum installation temperature;	<i>Min. temperature specified.</i>	P
	i) minimum bending radius;	<i>Bending radius specified.</i>	P
	j) maximum sheath temperature, if applicable.	<i>Sheath temperature declared.</i>	P
	k) the statement: "The presence of the heating cable shall be made evident by the posting of caution signs or markings, such as in the fuse box, at appropriate locations, such as at the power connection fittings and/or at frequent intervals along the circuit and be part of any electrical documentation following the installation";	<i>Statement included.</i>	P
	l) if applicable, the statement "The heating cable shall only be installed in concrete".	<i>Statement included.</i>	P
	m) for series resistive heating cables with more than two conductors, the indication that the resistance of each conductor shall be given.	<i>Not such type.</i>	N/A

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Clause	Requirement - Test	Result - Remark	Verdict
	The above are the minimum requirements and suppliers are free to add any additional information which may be useful.		P
7	General requirements for construction of cables		P
7.1	General		P
	The heating cables shall be designed and constructed so as to give electrical, thermal and mechanical durability, and so that, in normal use, their performance is without danger to the user or surroundings.		P
	Tapes, fillers, filler strings, etc. may be used in the heating cable.	<i>No such parts.</i>	N/A
	All integral components shall comply with this standard. All others shall comply with relevant product standards.		P
	Compliance is checked by all the requirements and tests specified in this standard.		P
	It is presupposed that all exposed parts of a heating cable and heating cable set intended for use in contact with tap water are constructed of materials that meet relevant national or local requirements.		Noted
7.2	Conductors		P
	Conductors shall consist of one or more wires of pure or alloyed metal, or other suitable material.	<i>Alloyed conductor used.</i>	P
	The resistance of the conductors at 20 °C ± 1 °C shall be in accordance with the values given by the manufacturer with a maximum tolerance of +10 -5 %.	<i>Resistance of the heating wires within the range of the tolerance.</i>	P
	The heating conductor material used shall not have a negative temperature coefficient of resistance. Compliance shall be checked according to the test in 8.2.1.	<i>Not negative temperature coefficient conductors. Refer to clause 8.2.1.</i>	N/A
7.3	Insulation		P
	The insulating materials used in heating cables shall be suitable for the intended use. This shall be verified by meeting the tests and the requirements given in this standard.		P

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Clause	Requirement - Test	Result - Remark	Verdict
	The minimum average value of the insulation thickness shall be stated by the manufacturer, and measured according to IEC 60811-201, and meet the minimum requirement specified in 8.3.4.	<i>Minimum thickness of 0.3mm declared by manufacturer. (See appended table)</i>	P
7.4	Electrically conducting screen		P
	When applicable and required, heating cables shall be provided with an evenly distributed electrically conductive metallic screen, or electrically conductive metallic sheath, tape or laminate or other suitable electrically conductive material. The metallic screen or electrically conductive material shall enable protection device(s) to operate as intended.	<i>Metallic screen provided in the heating cable.</i>	P
	The resistance of the conductive sheath or screen, inclusive of a separate earthing conductor which shall be in contact with the sheath or screen, shall be not higher than the resistance of each conductor in the cable or higher than the resistance of a plain copper conductor having 0,5 mm ² cross-sectional area as given for a class 1 conductor according to IEC 60228, whichever is the lesser. The combined resistance of any earthing conductor included with this screen or sheath shall not be greater than that of a 0,5 mm ² copper conductor. A number of copper wires may be included in order to comply with the requirements.	<i>Table1 of the IEC 60228 for class 1 plain copper conductor was referenced. (See appended table)</i>	P
	Compliance shall be checked as described in 8.2.1.	<i>Refer to clause 8.2.1.</i>	P
	If conductive sheath or screen alone is used as the earthing conductor, the resistance measured shall be the total resistance including the earthing connections delivered with the cable.	<i>Measured in combination of two.</i>	P
	Electrically conductive screens shall be so constructed as to prevent the penetration of foreign substances greater than 1 mm in diameter into the insulation without touching the screen. Compliance shall be checked by the test specified in 8.2.5.	<i>Refer to clause 8.2.5.</i>	P
7.5	Armouring	<i>No armouring.</i>	N/A

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Clause	Requirement - Test	Result - Remark	Verdict
	Separate armouring, if any, may consist of metallic or non-metallic wires, sheath, tape or laminate. Electrically conductive armouring shall be so constructed as to prevent the penetration of foreign substances greater than 1 mm in diameter into the insulation without touching the armouring. Compliance shall be checked by the test specified in 8.2.5.		N/A
7.6	Sheath		P
	The sheathing materials used in heating cables shall be suitable for the intended use. This shall be verified by meeting the tests and the requirements given in this standard. A non-metallic outer sheath shall give mechanical and/or corrosion protection dependent on the type of cable.		P
	The minimum average value of the sheath thickness shall be stated by the manufacturer and measured according to IEC 60811-202, and meet the minimum requirement specified in 8.3.5.	<i>Minimum thickness of 0.5mm declared by manufacturer. (See appended table)</i>	P
7.7	Moisture resistance		P
	Heating cables shall comply with the requirements as stated in 8.2.2.	<i>Refer to clause 8.2.2.</i>	P
8	Testing		P
8.1	Type tests – General requirements		P
	All described routine and sample tests shall be included in the type test, except for the spark test specified in 8.3.1.		
	For heating cables intended to be supplied in bulk, a 5 m sample of the heating cable shall be used for testing, if not otherwise specified.		P
	For heating cable sets which are factory assembled, including cold lead, splice and end seal, the complete heating cable set shall be used for testing. Alternatively a 5 m sample of cable may be tested. The various parts such as cold lead, connection splice and end termination may be assembled on a dummy length of cable and tested separately.	<i>A complete heating cable set was supplied and tested.</i>	P

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Clause	Requirement - Test	Result - Remark	Verdict
	For heating cables intended to be field assembled, the connections and end terminations to be used and specified by the manufacturer shall be assembled, according to the manufacturer's instructions, with the heating cable to form a heating cable set. The complete heating cable set shall be tested. Alternatively a 5 m sample of cable may be tested. The various parts such as cold lead, connection splice and end termination may be assembled on a 5 m dummy length of cable and tested separately, if not otherwise specified.	<i>Not such type.</i>	N/A
	All sample components used shall be typical examples from what is supplied to the market or intended to be supplied to the market.		P
	Tests shall be conducted at a room temperature between 20 °C and 25 °C, unless otherwise specified.	<i>Tested as specified.</i>	P
	Unless otherwise specified, the test voltage shall be a.c. at a frequency between 49 Hz and 61 Hz of approximately sinusoidal waveform.	<i>50Hz applied.</i>	P
	For a parallel resistive cable, the power output in Watts per metre shall be checked according to the test in 8.2.3.	<i>Refer to clause 8.2.3.</i>	P
	For a parallel resistive cable, the start-up current shall be checked according to the test in 8.2.4.	<i>Refer to clause 8.2.4.</i>	P
	Separate samples may be used for each test unless otherwise specified. These shall be prepared in accordance with the manufacturer's recommendations.	<i>Refer to clause</i>	Noted
8.2	Type tests – Detailed test requirements		P
8.2.1	Electrical resistance of heating conductors and screen		P
	The resistance of the conductor(s) and screen, if any, shall be measured by any suitable means on samples at least 1 m long. Two measurements shall be taken for the individual conductors, the first at ambient temperature and the second at a temperature of 100 °C. The measurement at ambient temperature, corrected to 20 °C ± 1 °C, shall determine whether or not the resistance value specified by the manufacturer has been achieved, both for the conductors and the screen.	<i>Tested under both ambient and 100 °C.</i>	P

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Clause	Requirement - Test	Result - Remark	Verdict
	The measurement at the higher temperature shall be compared with that at ambient temperature to confirm that the individual conductor(s) does not have a negative temperature coefficient of resistance.	<i>Positive coefficient resistance.</i>	P
8.2.2	Water immersion and temperature cycling test		P
8.2.2.1	General remark		P
	A 5 m sample shall be subjected to two ageing cycles and shall be immersed for a total of 56 h in potable water at a temperature of 20 °C ± 5 °C for 8 h, 80 °C ± 5 °C for 16 h, 20 °C ± 5 °C for 8 h, 80 °C ± 5 °C for 16 h and 20 °C ± 5 °C for 8 h, i.e. 8 h + 16 h + 8 h + 16 h + 8 h.	<i>Tested as specified.</i>	P
	The sample shall be transferred to preheated water containers between each sub-cycle. The temperature in the water containers must be controlled, for example by placing them in preheated cabinets according to IEC 60811-401.	<i>Tested as specified.</i>	P
	Heating cable sets, including factory assembled cold lead, splice and end seal shall be subjected to this test after being assembled to a suitable heating cable.	<i>Complete heating cable used.</i>	P
	Splices and end seals intended for heating cables for field assembly shall be subjected to this test after being assembled to a suitable heating cable and with cold leads.	<i>Assembled in factory.</i>	N/A
	All heating cable types and heating cable sets must be tested, except if they are clearly identified as not to be used in wet or humid conditions.		N/A
	The sample may be transferred from the ageing water immersion unit to another water immersion unit for the dielectric testing described in 8.2.2.2 and the electrical insulation resistance test described in 8.2.2.3. The water temperature of both shall be 20 °C ± 5 °C.	<i>Tested as specified. Refer to clause 8.2.2.2 and 8.2.2.3.</i>	P
	After the cycle ageing the heating cable sheath shall be subjected to a mechanical test in accordance with IEC 60811-501.	<i>Tested as specified.</i>	P

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Clause	Requirement - Test	Result - Remark	Verdict
	There shall be no variation greater than $\pm 25\%$ from the original, unaged value for the tensile strength and no variation greater than $\pm 25\%$ from the original, unaged value for the elongation at break.	<i>(See appended table)</i>	P
8.2.2.2	Dielectric test		P
	A 5 m sample shall be submerged in potable water with uncovered ends of the sample protruding sufficiently to avoid flashover at the prescribed voltage. The metallic or other equivalent electrically conductive sheath shall be removed from the ends of the sample in order to prevent breakdown at these points.	<i>End of cable clear from water.</i>	P
	Cables which have not been factory assembled and which are supplied with special connections shall be tested with these connections submerged in water.	<i>No such connections.</i>	N/A
	For a twin- and multi-conductor series resistive cable where the conductors are electrically insulated from each other, the voltage shall be applied between the conductors and between the conductors connected together and the metallic or equivalent conducting material, sheath, armour or screen and water if no armour or screen is part of the cable construction.	<i>Not such type.</i>	N/A
	For single conductor series heating cables with a metallic, or equivalent conducting material, sheath, armour or screen the voltage shall be applied between the conductor and the sheath, armour or screen.	<i>Applied between conductor and screen.</i>	P
	For single conductor series heating cables without a metallic, or equivalent conducting material, sheath, armour or screen the cable shall be submerged in water with the ends protruding from the water to avoid flashover at the ends. The voltage shall be applied between the conductor and the water,	<i>Not such type.</i>	N/A
	For parallel resistive cables the voltage shall be applied between the conductors connected together and the metallic sheath, braid, screen or equivalent electrically conductive covering.	<i>Not such type.</i>	N/A

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Clause	Requirement - Test	Result - Remark	Verdict
	Dielectric strength for insulated heating wires shall be tested by placing the insulated wire in potable water. The voltage shall be applied between the conductor and the water.		P
	An a.c. test voltage of 2 000 V shall be applied for 5 min. The test voltage shall be increased gradually and the prescribed value reached in a time of 2 s to 10 s.	<i>Tested as specified.</i>	P
	No breakdown shall occur.	<i>No breakdown.</i>	P
8.2.2.3	Electrical insulation resistance test		P
	The electrical insulation resistance shall be measured on the test sample(s) prepared in accordance with 8.2.2.1, after the dielectric test in 8.2.2.2 has been carried out.		P
	Non-screened cables shall be tested, submerged in water, with any layer(s) outside the insulation removed.	<i>Not such type.</i>	N/A
	For single conductor, series resistive cables, the resistance of the electrical insulation shall be measured between the conductor and the metallic or equivalent conducting material, sheath or armour or conductive screen.	<i>Measured as specified.</i>	P
	For a multi-conductor series resistive cable, where the conductors are electrically insulated from each other, the resistance of the insulation shall be measured between the conductors connected together and the metallic, or equivalent conducting material, sheath or armour or conductive screen, and also between each conductor in turn with the remaining conductor(s) connected together.	<i>Not such type.</i>	N/A
	For parallel cables the resistance shall be measured between the conductors connected together and the metallic sheath, braid, screen or equivalent electrically conductive covering.	<i>Not such type.</i>	N/A
	The insulation resistance shall be measured by means of a d.c. voltage of 1 000 V, 1 min after application of the voltage, with the positive pole to the water. The measured value shall be not less than 50 MΩ.	<i>Tested as specified. (See appended table)</i>	P
8.2.3	Verification of rated output for parallel heating cables		N/A

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Clause	Requirement - Test	Result - Remark	Verdict
	The rated output shall be verified by the method described in 5.2.10.3.2 of IEC 623951: 2013.		N/A
8.2.4	Verification of start-up current for parallel heating cables		N/A
	The start-up current of the heating cable shall be measured as described in IEC 62395-1:2013.		N/A
8.2.5	Penetration test for electrical conductive screen		P
	A steel test pin with a diameter of 1 mm shall be pushed through the conductive screen into the insulation when the cable is straight and also when it is wound onto a mandrel of diameter equal to five times the diameter, or the minor axis of the cable.	<i>Tested as specified.</i>	P
	One sample, at least 5 m in length, shall be tested at three places, at approximately the midpoint and at approximately 500 mm from each end. Before testing, 1 m of the sample, to include the mid-point of the sample, shall be bent on a mandrel to the minimum bend radius as given by the manufacturer and then straightened.	<i>Tested as specified.</i>	P
	It shall not be possible to push the test pin into the insulation, touching a live conductor, without touching the screen. This shall be verified by activating a residual current device (RCD) which operates at a maximum of 30 mA. The test shall be conducted at rated voltage, and with the test pin not connected to earth when the RCD is connected between the branch supply and the sample, and according to the RCD supplier's instruction.	<i>Not possible to touch the live conductor without firstly touching the screen.</i>	P
8.2.6	Flammability test		P
	Heating cables intended to be installed and embedded in concrete, mortar or other non-combustible materials shall be exempt from this test. This does not apply to cold leads in heating cables sets, i.e., cold leads shall be flame retardant.	<i>(See appended table)</i>	P

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Clause	Requirement - Test	Result - Remark	Verdict
	A flammability test shall be performed on heating cables and cold leads with the test apparatus described in IEC 60332-1-1 and the procedure and requirements described in IEC 60332-1-2. The requirement for charring extending downwards does not apply when the end seal forms the lower part of the sample.	<i>Tested as specified.</i>	P
	The test shall be performed on the heating cable and all integral components of a heating cable set.		P
	If a product constitutes splice and end seal components, samples shall be prepared so that each component and the cables are tested separately, and so that the middle part of the splice or end seal forms the part of the cable sample to which the test flame is applied, and the heating cable and/or the cold-lead forms the upper part of the sample (see Figures 1 and 2). When the end seal is tested the sample may be supported by a 0,5 mm to 1,0 mm diameter steel wire with a weight necessary to keep the sample in a stable position.	<i>Flame applied at heating cable.</i>	P
8.2.7	Deformation test for installation classification		P
8.2.7.1	General remark		P
	Heating cables shall be capable of withstanding the mechanical forces to which they will normally be subjected during installation and while in service. The cables are therefore grouped into two classes: mechanical class M1 with mechanical compression requirements as defined in 8.2.7.2, and mechanical class M2 as defined in 8.2.7.3.	<i>Heating cable classified as mechanical class M1. Refer to clause 8.2.7.2.</i>	P
	The test also applies to integral components such as connection splice, end seal and cold lead which are factory mounted or intended to be field assembled and with the accessories specified by the manufacturer.	<i>Applied to cold leads, end seals and heating cable.</i>	P
8.2.7.2	Class M1: cables intended for installation with low risk of mechanical damage		P
	Three samples of minimum 200 mm length of the completed cable shall be placed individually, at a temperature of 20 °C ± 5 °C, on top of, and at right angles to, a cylindrical steel rod 6 mm in diameter resting upon a flat steel support.		P

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Clause	Requirement - Test	Result - Remark	Verdict
	A force of 600 N shall be applied without shock at any point of intersection of the test piece and the steel rod by means of a rigid plate 100 mm by 100 mm. After the force has been applied for 30 s, the test piece still under load shall be capable of withstanding, without breakdown, a voltage of 1 500 V a.c. for 30 s. The voltage shall be applied between the conductor(s) and the metallic or other equivalent material, screen, braid or sheath. For cables without screen, the voltage shall be applied between the conductor(s) and the steel rod. If the cable has more than one conductor, the voltage test shall also be applied between the phase conductors.	<i>Tested as specified. (See appended table)</i>	P
	There shall be no cracks in the outer layer visible by visual inspection.	<i>No cracks.</i>	P
	None of the screen wires or conductors shall be broken as seen by visual inspection after cutting out the sheath and insulation.	<i>No internal breakdowns.</i>	P
	If one of the samples fails to meet the requirement, two new complete sets of samples (3 + 3) shall be tested. If both sets pass the test requirement, the heating cable shall be deemed to meet the test.		
8.2.7.3	Class M2: cables intended for installation with higher risk of mechanical damage	<i>Not class M2.</i>	N/A
	As for 8.2.7.2, but with a force of 1 500 N with a tolerance of $\pm 5\%$.		N/A
8.2.8	Cold impact test		P
	This test is to be carried out at $-5\text{ }^{\circ}\text{C}$, or the lowest installation temperature specified by the manufacturer, whichever is lower.	<i>$-5\text{ }^{\circ}\text{C}$ applied.</i>	P
	The test shall be carried out on three samples, of a minimum length of 0,5 m, using the impact test apparatus described in IEC 60811-1-4.		P
	A heating cable having a non-circular cross-section shall be so positioned that the impact is applied along the minor axis.	<i>Not such type.</i>	N/A
	Heating cables and heating cable sets according to class M1 shall be subjected to this test with impact energy of 2 Joules.	<i>2 joules applied on M1 cable.</i>	P

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Clause	Requirement - Test	Result - Remark	Verdict
	Heating cables and heating cable sets according to class M2 shall be subjected to this test with impact energy of 4 Joules.	<i>Not such type.</i>	N/A
	This test also applies to connection splice, end-termination and cold lead which are factory mounted or intended to be field assembled and accessories specified by the manufacturer.	<i>Applied on all parts.</i>	P
	After the impact test, the test piece shall be capable of withstanding, without breakdown, a voltage of 1 500 V a.c. for 30 s and according to the procedure in 8.2.2.2.	<i>(See appended table)</i>	P
	For cables with metallic or other equivalent material, screen, armour or sheath the voltage shall be applied between the conductor(s) and the screen, armour or sheath and the apparatus.	<i>Voltage applied between the conductor and screen.</i>	P
	In the case of unscreened cables, the test pieces shall be submerged in water for 5 min before the test voltage is applied, with the test piece still in water and with earth connected to the water.	<i>Not such type.</i>	N/A
	There shall be no cracks in the outer layer visible by visual inspection.	<i>No cracks.</i>	P
	All samples shall pass the test requirements.		P
	If one or more of the samples fails to meet the requirement, two new complete sets of samples (3 + 3) shall be tested. If both sets pass the test requirement, the cable shall be deemed to meet the test.		N/A
8.2.9	Cold bend test		P

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Clause	Requirement - Test	Result - Remark	Verdict
	The apparatus used for the cold bend test is shown in Figure 3, with the radius of the mandrel as shown, or with the radius equal to the manufacturer's stated minimum bend radius. A sample of heating cable shall be fixed in the apparatus as shown. The apparatus and sample shall be placed in a refrigerated compartment and maintained at $-10\text{ }^{\circ}\text{C}$, or at the manufacturer's minimum recommended installation temperature, whichever is lower for a period not less than 4 h. At the end of this period, the sample shall be bent through 90° around one of the mandrels, then bent through 180° in the opposite direction over the second mandrel and then straightened to its original position. All the bending operations shall be carried out in the same plane. This cycle of operation shall be performed three times and the rate of bend shall not be faster than 5 s per cycle.	<i>Tested to the minimum bend radius declared by manufacturer.</i> <i>Tested as specified.</i>	P
	This test only applies to the heating cable and the cold lead, if any.		P
	Conformity is verified by testing the electrical insulation in accordance with 8.2.2.2 without submersion in water for screened cables and with unscreened cables submersed in water for 5 min before the test voltage is applied, with the test piece still in water.	<i>(See appended table)</i>	P
	There shall be no cracks in the outer layer visible by visual inspection.	<i>No cracks.</i>	P
8.2.10	Ageing test for insulation		P
	The insulation shall be aged in a heating cabinet in accordance with IEC 60811-401. Unaged and aged samples shall be tested for tensile strength and elongation at break in accordance with IEC 60811-501.		P
	The ageing shall be performed for 14 days at $135\text{ }^{\circ}\text{C}$.	<i>Tested as specified.</i>	P
	There shall be no variation greater than $\pm 25\%$ from the unaged value for the tensile strength and no variation greater than $\pm 25\%$ from the unaged value for the elongation at break.	<i>(See appended table)</i>	P
	The unaged minimum value for the elongation at break shall be minimum 150 %.	<i>(See appended table)</i>	P

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Clause	Requirement - Test	Result - Remark	Verdict
8.2.11	Ageing test for non-metallic sheath		P
	If provided, the sheath shall be aged in a heating cabinet in accordance with IEC 60811-401. Unaged and aged samples shall be tested for tensile strength and elongation at break in accordance with IEC 60811-501. The material shall pass one of the following tests described in method A or method B.		P
	If the test specimen melts during test method A, then use method B.		P
	Method A: The ageing shall be performed for 14 days at $(135 \pm 2) ^\circ\text{C}$. The unaged value for the tensile strength shall be minimum 10 MPa. The unaged minimum value for the elongation at break shall be minimum 100 %. There shall be no variation greater than $\pm 25\%$ from the original, unaged value for the tensile strength and no variation bigger than $\pm 25\%$ from the original, unaged value for the elongation at break.	<i>Sheathing did not melt. Method A adopted. (See appended table)</i>	P
	Method B: The ageing shall be performed for 80 days at $(110 \pm 2) ^\circ\text{C}$. The unaged value for the tensile strength shall be minimum 10 MPa. The unaged minimum value for the elongation at break shall be minimum 100 %. There shall be no variation greater than $\pm 25\%$ from the original, unaged value for the tensile strength and no variation bigger than $\pm 25\%$ from the original, unaged value for the elongation at break.	<i>Method B not adopted.</i>	N/A
8.2.12	Compatibility test		P
	A complete heating cable sample shall be aged for 14 days at $(110 \pm 2) ^\circ\text{C}$ in a heating cabinet in accordance with IEC 60811-401.	<i>Tested as specified.</i>	P
	Three samples shall be tested from the insulation and sheath.		P
	There shall be no variation greater than $\pm 25\%$ from the original, unaged value for the tensile strength and no variation greater than $\pm 25\%$ from the original, unaged value for the elongation at break both for the insulation and the sheath measured in accordance with IEC 60811-501.	<i>(See appended table)</i>	P

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Clause	Requirement - Test	Result - Remark	Verdict
8.2.13	Weathering and UV resistance test	<i>Not for outdoor installation.</i>	N/A
	This test is to determine the UV stability of the outer non-metallic sheathing material of the heating cable in the condition as manufactured. This is done by means of measuring tensile strength and elongation at break in the condition as manufactured and after exposure to ultraviolet light and water.		N/A
	The test is limited to applications where heating cables are exposed to sunlight or to other sources of UV-radiation.		N/A
	Two test methods are described, one based on ISO 4892-3, given in 8.2.13 and a test method given in Annex A.		N/A
	The test used shall be agreed between the manufacturer and the customer and certifying agency as applicable.		N/A
	A sample of the finished heating cable shall be selected to prepare 10 test pieces in accordance with IEC 60811-501.		N/A
	Five dumb-bell samples of the outer non-metallic sheath of the heating cable or heating cable set shall be tested with the apparatus described in ISO 4892-3, using type 1A (UVA-340) fluorescent UV lamp.		N/A
	The samples shall be exposed to UV light for 8 h at $(60 \pm 2) ^\circ\text{C}$ followed by 4 h of condensation at $(50 \pm 2) ^\circ\text{C}$. This cycle shall be repeated continuously for a total of 2000 h.		N/A
	After the exposure, the test specimens shall be removed from the equipment and conditioned at ambient temperature for at least 16 h.		N/A
	The five exposed test pieces and the five not exposed test pieces shall be tested separately and in close succession for tensile strength and elongation at break. The respective median values shall be calculated from the five tensile-strength and elongation at break values obtained for the conditioned test pieces and shall be divided by the median values of the five tensilestrength and elongation at break values obtained for the unconditioned test pieces.		N/A

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Clause	Requirement - Test	Result - Remark	Verdict
	It is required that the tensile strength and elongation at break after treatment of exposure have a variation of maximum $\pm 30\%$ of the values measured on not exposed test pieces.		N/A
	A colour fading may appear after the test.		N/A
	Heating cables having a continuous metal sheath with no outer non-metallic sheath shall be exempted from this test.		N/A
8.2.14	Tensile test		P
	Samples of completed heating cables, including cold lead, and splice (factory made or field assembled supplied with the cable) where this is a part of the finished product, shall be tested on a tensile machine equipped with jaws of a similar design to Figure 4. The sample shall be arranged in the jaws as shown in Figure 4. The initial separation of the jaws shall be 150 mm. The jaw separation rate shall be 50 mm/min. The conductors shall be monitored for continuity and the samples shall be continuously examined for evidence of failure of any constituent part of the cable. The load at which such evidence is first detected shall be deemed to be the failure load.	<i>Tested as specified.</i>	P
	Three samples shall be tested and the minimum measured failure load quoted as the test result.		P
	All completed cables shall be subjected to a tensile test and shall withstand a minimum force of 120 N.	<i>(See appended table)</i>	P
	Furthermore, cables designated mechanical class M2 shall withstand a minimum tensile force of 300 N.	<i>Not mechanical class M2.</i>	N/A
	If one of the samples fails to meet the requirement, two new complete sets of samples (3 + 3) shall be tested. If both sets pass the test requirement, the heating cable shall be deemed to meet the test.		P
8.2.15	Reverse winding test		P

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Clause	Requirement - Test	Result - Remark	Verdict
	A piece of the completed cable shall be wound on to a mandrel, under a sufficient tensile load to form a close helix of at least three turns. The mandrel diameter shall be six times the overall diameter for unscreened and screened cables, and 15 times the overall diameter for armoured cables, or the minimum bending diameter specified by the manufacturer. For flat cables, the minor dimension of the cable shall be used in place of diameter.	<i>Mandrel of 18 mm in diameter used.</i> <i>Three turns applied.</i>	P
	The complete test shall comprise six test cycles, each cycle consisting of the winding of the cable onto the mandrel, unwinding and re-winding in the reverse direction so that the surface of the cable inside the helix during the first winding shall be on the outside surface of the helix upon re-winding. After visual inspection, there shall be no signs of damage on any part of the cable after this test. Slight puckering of the sheath shall not be considered as a failure.	<i>Winding and rewinding conducted.</i> <i>No signs of damage of the cable.</i>	N/A
	By visual inspection, there shall be no signs of damage on any part of the heating cable, such as cracks in the outer sheath, broken screen wires or conductors. Slight puckering of the sheath shall not be considered as a failure.	<i>No damage.</i>	P
	On completion of the reverse winding, the test piece shall be subjected to the dielectric test in 8.2.2.2, but with a water immersion period of 1 h prior to the voltage test.	<i>(See appended table)</i>	P
	The dielectric test shall be performed between conductors and between conductors and screen as applicable		P
8.2.16	Heat shock test		P
	IEC 60811-509 shall be used, with the following modifications.	<i>Tested as specified.</i>	P
	The heating part of a circular heating cable shall be wound onto a mandrel with six close turns, six times the sample outer diameter and placed in a heating cabinet at $(150 \pm 2) ^\circ\text{C}$ for 1 h. If the individual turns of the sample melt or stick together, the test shall be performed at $(110 \pm 2) ^\circ\text{C}$ for 8 h.		P

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Clause	Requirement - Test	Result - Remark	Verdict
	The heating part of a non-circular heating cable shall be so positioned that the widest surface is touching the mandrel. The mandrel shall have a diameter of 6 times the minor axis.	<i>Tested as specified.</i>	P
	One sample shall be tested.	<i>One sample tested.</i>	P
	There shall be no cracks in the outer layer visible by visual inspection, both from the outside and from the inside after removing the sheath. If the sample fails during the test, two new samples shall be tested and if both samples pass the test, the product shall be deemed to pass the test.	<i>No cracks in the outer layer.</i>	P
8.2.17	Shrinkage test for insulation and sheath		P
a)	Insulation		P
	Two samples, each 200 mm in length, shall be tested according to IEC 60811-1-3.	<i>Tested as specified.</i>	P
	The test shall be carried out at a temperature of 130 °C for 1 h.		P
	The average shrinkage of the two samples shall be less than 4 %.	<i>Less than 1 %.</i>	P
	If one of the samples fails to meet the requirement, two new complete sets of samples (2 + 2) shall be tested. If both sets pass the test requirement, the heating cable shall be deemed to meet the test.		P
b)	Sheath		P
	Two samples, each 300 mm in length, shall be tested in accordance with IEC 60811-503. The test is carried out at a temperature of (110 ± 2) °C for 1 h.	<i>Tested as specified.</i>	P
	The average shrinkage of the two samples shall be less than 4 %.	<i>Less than 1 %.</i>	P
	If one of the samples fails to meet the requirement, two new complete sets of samples (2 + 2) shall be tested. If both sets pass the test requirement, the heating cable shall be deemed to meet the test.		Noted
8.2.18	Hot set test		N/A

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Clause	Requirement - Test	Result - Remark	Verdict
	Cross-linked insulation and sheathing materials shall be checked for cross-linking degree by the hot set test method described in IEC 60811-507 at a temperature of $(200 \pm 3) ^\circ\text{C}$.	<i>Sheathing or insulating material not cross-linked.</i>	N/A
	The maximum allowable elongation under load shall be 175 % and maximum permanent elongation after cooling shall be 15 %.		N/A
8.2.19	Cyclic ageing test for the heating cable		P
	For heating cables intended to be installed in screeds or concrete, 5 samples of the nonmetallic outer layer of the cable, prepared according to IEC 60811-1-1, shall be subjected to a cyclic ageing test for 6 weeks at the following test conditions:	<i>Cable intended to be installed in concrete.</i>	P
	– one cycle = one week;		P
	– dry ageing: 120 h at $120 ^\circ\text{C}$ in air;		P
	– wet ageing in an alkaline water solution at $50 ^\circ\text{C}$ for 48 h.		P
	The water solution shall have a pH >12 and be made of potable water, CaCO_3 and $\text{Ca}(\text{OH})_2$, adjusting the pH with the $\text{Ca}(\text{OH})_2$. The samples shall be placed in a jar, filled with the water solution, in a heating cabinet according to IEC 60811-401.	<i>Tested as specified.</i>	P
	After six cycles the tensile strength and elongation at break shall be measured in accordance with IEC 60811-501.		P
	The variation from unaged samples shall be less than 25 % for the tensile strength and 25 % for the elongation at break.		P
8.2.20	Cyclic ageing test for splices and end seals		P
	Five dummy samples between 0,25 m and 0,5 m in length of heating cable sets intended to be installed in screeds or concrete, with incorporated end seals and/or splices shall be subjected to a cyclic ageing test for 6 weeks at the following test conditions:	<i>Intended to be installed in concrete.</i>	P
	– one cycle = one week in alkaline water solution.		P
	– dry ageing: 120 h at $(110 \pm 2) ^\circ\text{C}$ in air;		P

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Clause	Requirement - Test	Result - Remark	Verdict
	– wet ageing in an alkaline water solution at (50 ± 2) °C for 48 h.		P
	The water solution shall have a pH >12 and be made of potable water, CaCO ₃ and Ca(OH) ₂ , adjusting the pH with the Ca(OH) ₂ .		P
	The samples shall be placed in a jar at 50 °C for one week in a heating cabinet according to IEC 60811-1-2. Cover the jar with aluminium foil during the ageing period. After this time, the jar with the samples shall be naturally cooled to room temperature. The insulation resistance shall be measured between the conductor(s) and the screen, and between the conductor(s) and the water solution/earth.	<i>Tested as specified.</i>	P
	For wet ageing, the samples shall be placed in a jar at (50 ± 2) °C in a heating cabinet in accordance with IEC 60811-401. Cover the jar with aluminium foil during the ageing period. After this time, the jar with the samples shall be naturally cooled to room temperature. The insulation resistance shall be measured between the conductor(s) and the screen, and between the conductor(s) and the water solution.	<i>Tested as specified.</i>	P
	The insulation resistance shall be measured in accordance with 8.2.2.3.	<i>Tested as specified.</i>	P
	The measured value shall never be less than 50 MΩ.	<i>Greater than 5,000 MΩ.</i>	P
8.2.21	Checking of the durability of markings		P
	Compliance shall be checked by trying to remove the marking by rubbing lightly ten times with a piece of cotton wool or cloth soaked in water.		P
	The marking shall be legible with normal or corrected vision after the test has been performed.	<i>Laminated marking label to be used and declared by manufacturer.</i>	P
8.2.22	Pressure test at high temperature for insulation and sheath		P
	The tests shall be made in accordance with IEC 60811-508 and at a temperature of (90 ± 2) °C both for the insulation and sheath.	<i>Tested as specified.</i>	P
	The deformation shall not be more than 50 % of the initial thickness of the sample.	<i>Less than 50%. (See appended table)</i>	P

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Clause	Requirement - Test	Result - Remark	Verdict
8.3	Routine and sample tests		P
8.3.1	General remark		P
	The high voltage test and resistance test are routine tests while the other tests are sample tests.	<i>Routine tests applied to high voltage and resistance tests.</i>	P
	During the insulation and sheathing processes a spark test in accordance with IEC 62230 shall be performed according to the following voltage levels:		N/A
	Insulation: minimum 6 000 V.		N/A
	Sheath: minimum 3 000 V.		N/A
	Every heating cable set shall be tested for high voltage and unit resistance as routine tests.		N/A
8.3.2	Voltage test	<i>Routine test applied.</i>	N/A
	Each supplied length or item, whether in bulk or individually produced heating cable set, shall be subjected to a dielectric test		N/A
	The voltage test shall be performed between conductors and between conductors and screen, as applicable.		N/A
	For heating cable sets <300 m in length, the test shall be carried out at 2,5 kV a.c. for at least 5 s.		N/A
	For long bulk heating cables, the test shall be carried out at 2,5 kV a.c. for 1 min or at 3,5 kV d.c. for 1 min.		N/A
	No breakdown shall occur.		N/A
8.3.3	Heating cable resistance and output verification	<i>Routine test applied.</i>	N/A
	The output rating for each shipped length of electric heating cable shall be verified by measurement of the d.c. resistance or current at a given voltage and temperature.		N/A
	For d.c. resistance and conductance, the resistance of the heating element per metre of conductor length at 20 °C ± 1 °C shall be in accordance with the values given by the manufacturer with a maximum tolerance of %, unless otherwise specified. The value of current at a given voltage and temperature shall be within the manufacturer's tolerance.		N/A

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Clause	Requirement - Test	Result - Remark	Verdict
	For parallel resistive heating cables, the value of current at a given voltage and temperature shall be within the manufacturer's tolerance.		N/A
8.3.4	Insulation thickness	<i>Refer to clause 7.3.</i>	P
	The mean value of the insulation thickness shall be stated by the manufacturer.		P
	The measurement of mean and minimum insulation thickness shall be measured according to the method described in IEC 60811-201.		P
	The thickness at any place shall not be less than the minimum average value minus 15 %.	<i>(See appended table)</i>	P
8.3.5	Sheath thickness	<i>Refer to clause 7.6.</i>	P
	The minimum average value of the sheath thickness shall be stated by the manufacturer.		P
	The sheath thickness shall be measured according to the method described in IEC 60811-202.		P
	The thickness at any place shall not be less than the minimum average value minus 20 %.	<i>(See appended table)</i>	P
8.3.6	Hot set test		N/A
	Cross-linked insulation and sheathing materials shall be checked for cross-linking degree by the test method described in IEC 60811-2-1 at a temperature of 200 °C.	<i>Sheathing or insulating material not cross-linked type.</i>	N/A
	The maximum allowable elongation under load is 175 % and maximum permanent elongation after cooling is 15 %.		N/A

Table of Results:

7.2	TABLE: Conductor Resistance				P
Sample	Measured Resistance at 20 °C (Ω/m)	Declared Resistance at 20 °C (Ω/m)	Deviation	Tolerance	Remark
Earth (Cold lead) and Screen (Heating wire)	8.793	8.811	-0.2%	+10% -5%	P

Supplementary information: Declared resistance was calculated via formula provided by manufacturer in the declaration letter where resistance equals rated voltage squared divided by rated power.

7.3	TABLE: Insulation Thickness				P
Sample	Average Thickness (mm)	Declared Thickness t_i (mm)	Minimum Thickness (mm)	Required Minimum Thickness (mm)	Remark
Cold Lead – Brown Core	0.53	Not Specified	0.41	Not Specified	P
Cold Lead – Green Core	0.53	Not Specified	0.43	Not Specified	P
Heating Wire – Insulation	0.31	0.30	0.27	0.26	P

Supplementary information: Average thickness of insulation shall not less than nominal (declared) thickness and the minimum thickness shall not less than required minimum thickness. The onerous condition had been recorded.

7.4	TABLE: Earth and Screen Resistance			P
Sample	Measured Resistance at 20 °C (Ω/km)	Measured Conductor Resistance at 20 °C (Ω/km)	Maximum Resistance at 20 °C (Ω/km)	Remark
Earth (Cold lead) and Screen (Heating wire)	30.6	9694.2	36.0	P

Supplementary information: Resistance measured in combination of earth from cold lead and screens around the heating wires. Maximum resistance of a plain copper conductor having 0.5 mm² cross-sectional area as given for a class 1 conductor according to IEC 60228 was referenced based on clause 7.4.

7.6 TABLE: Sheath Thickness					P
Sample	Average Thickness (mm)	Declared Thickness t_s (mm)	Minimum Thickness (mm)	Required Minimum Thickness (mm)	Remark
Cold Lead – Outer Sheath	0.67	Not Specified	0.61	Not Specified	P
Heating Wire – Outer Sheath	0.59	0.50	0.46	0.40	P

Supplementary information: Average thickness of sheath shall not less than nominal (declared) thickness and the minimum thickness shall not less than required minimum thickness. The onerous condition had been recorded.

8.2.2.1 TABLE: Mechanical Tests After Water and Temp. Cycling					P
Sample	Variation of Tensile Strength (%)	Allowed Tensile Strength (%)	Variation of Elongation at Rupture (%)	Allowed Elongation at Rupture (%)	Remark
Sheath	-18	± 25	-15	± 25	P

Supplementary information: The median values of the results for tensile strength and elongation at break are recorded as the requirement of standard. Measured density > 0.925g/cm³ at 23°C, rate of separation 250 ± 5 mm/min. Test processed under 23 ± 2°C.

8.2.2.2 TABLE: High Voltage Test				P
Duration of voltage application			5 minutes	
Sample	Applied Voltage (kV)	Breakdown (Yes / No)	Remark	
Conductor and screen	2.0	No	P	

Supplementary information: The test voltage was increased gradually, and the prescribed value was reached in a time of 3 seconds from the application of the voltage.

8.2.2.3 TABLE: Electrical insulation resistance test				P
Applied Voltage			1000Vdc	
Sample	Insulation Resistance (MΩ)	Min. Insulation Resistance (MΩ)	Remark	
Heating Cable	36600	50	P	

Supplementary information: —

8.2.6 TABLE: Vertical Flame Propagation						P
Sample	Top support to the onset of charring (mm)	Allowed top support to the onset of charring (mm)	Top support to the bottom of charring (mm)	Allowed top support to the bottom of charring (mm)	Ignition of the filter paper (Yes / No)	Remark
Heating Cable	384	>50	485	≤540	No	P
Supplementary information: —						

8.2.8 TABLE: High Voltage Test after Cold Impact				P
Duration of voltage application		30 seconds		
Voltage applied between	Applied Voltage (kV)	Breakdown (Yes / No)	Remark	
Conductor and screen	1.5	No	P	
Supplementary information: The test voltage was increased gradually, and the prescribed value was reached in a time of 3 seconds from the application of the voltage.				

8.2.9 TABLE: High Voltage Test after Cold Bending				P
Duration of voltage application		5 minutes		
Voltage applied between	Applied Voltage (kV)	Breakdown (Yes / No)	Remark	
Conductor and screen	2.0	No	P	
Supplementary information: The test voltage was increased gradually, and the prescribed value was reached in a time of 3 seconds from the application of the voltage.				

8.2.10 TABLE: Ageing Test for Insulation							P
Sample	Elongation at rupture (%)	Min. Elongation at rupture (%)	Variation of Tensile Strength (%)	Allowed Tensile Strength (%)	Variation of Elongation at Rupture (%)	Allowed Elongation at Rupture (%)	Remark
Insulation	267	150	-15.7	± 25	-12.6	± 25	P
Supplementary information: The median values of the results for tensile strength and elongation at break are recorded as the requirement of standard. Measured density > 0.925g/cm ³ at 23°C, rate of separation 250 ±5 mm/min. Test processed under 23 ± 2°C.							

8.2.11	TABLE: Ageing Test for Sheath					P
Sample	Tensile strength at rupture (%)	Min. tensile strength at rupture (%)	Elongation at rupture (%)	Min. elongation at rupture (%)	Remark	
Sheath	14.7	10.0	289	100	P	
Sample	Variation of Tensile Strength (%)	Allowed Tensile Strength (%)	Variation of Elongation at Rupture (%)	Allowed elongation at Rupture (%)	Remark	
Sheath	-20.3	± 25	-12.1	± 25	P	

Supplementary information: The median values of the results for tensile strength and elongation at beak are recorded as the requirement of standard. Measured density > 0.925g/cm³ at 23°C, rate of separation 250 ±5 mm/min. Test processed under 23 ± 2°C.

8.2.12	TABLE: Compatibility Test					P
Sample	Variation of Tensile Strength (%)	Allowed Tensile Strength (%)	Variation of Elongation at Rupture (%)	Allowed Elongation at Rupture (%)	Remark	
Insulation	-9.5	± 25	-10.2	± 25	P	
Sheath	-16.1	± 25	-7.5	± 25	P	

Supplementary information: The median values of the results for tensile strength and elongation at beak are recorded as the requirement of standard. Measured density > 0.925g/cm³ at 23°C, rate of separation 250 ±5 mm/min. Test processed under 23 ± 2°C.

8.2.14	TABLE: Tensile Test on Completed Cable				P
Duration of voltage application			5 minutes		
Sample	Measured Tensile Load (N)	Min. Tensile Load (N)	Remark		
Complete Heating Cable	257	120	P		

Supplementary information: The median values of the results for tensile strength and elongation at beak are recorded as the requirement of standard. Measured density > 0.925g/cm³ at 23°C, rate of separation 50 ±5 mm/min. Test processed under 23 ± 2°C.

8.2.15	TABLE: High Voltage Test after Reverse Winding			P
Duration of voltage application		5 minutes		
Voltage applied between	Applied Voltage (kV)	Breakdown (Yes / No)	Remark	
Conductor and screen	2.0	No	P	
Supplementary information: The test voltage was increased gradually, and the prescribed value was reached in a time of 3 seconds from the application of the voltage.				

8.2.19	TABLE: Cyclic Ageing Test				P
Sample	Variation of Tensile Strength (%)	Allowed Tensile Strength (%)	Variation of Elongation at Rupture (%)	Allowed Elongation at Rupture (%)	Remark
Sheath	-13.1	± 25	-12.6	± 25	P
Supplementary information: The median values of the results for tensile strength and elongation at break are recorded as the requirement of standard. Measured density > 0.925g/cm ³ at 23°C, rate of separation 250 ±5 mm/min. Test processed under 23 ± 2°C.					

8.2.22	High Temperature Pressure Test (Sheath)			P
Sample	Median of Indentation (%)	Max. Indentation allowed (%)	Remark	
Sheath	30	50	P	
Insulation	15	50	P	
Supplementary information: The median values of the results are recorded as the requirement of standard. The most onerous results are presented.				

Photographs: Milano Tiling Underfloor Heating Cable



Overview



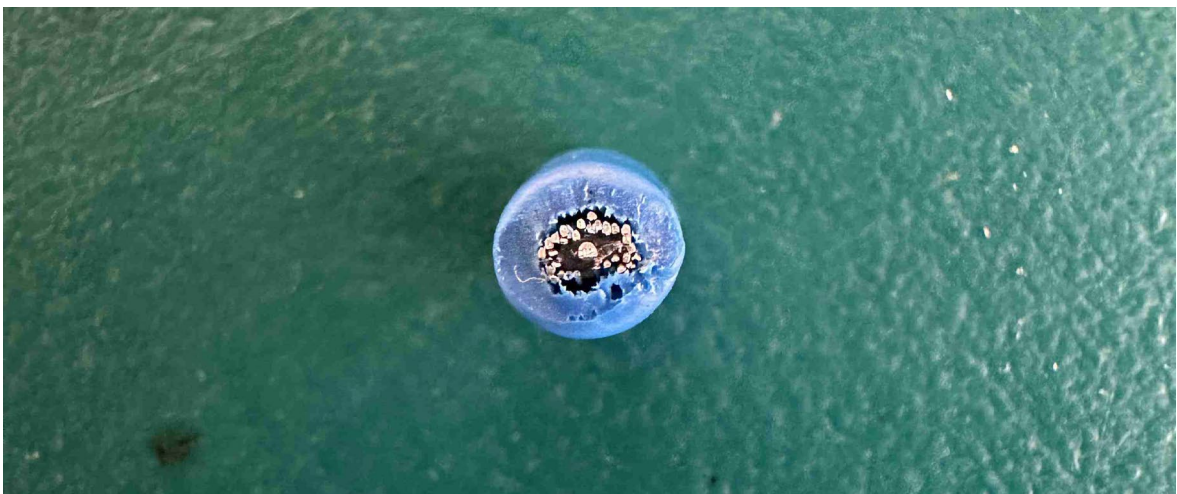
Cold Lead, Splice, and Heating Cable Assembly



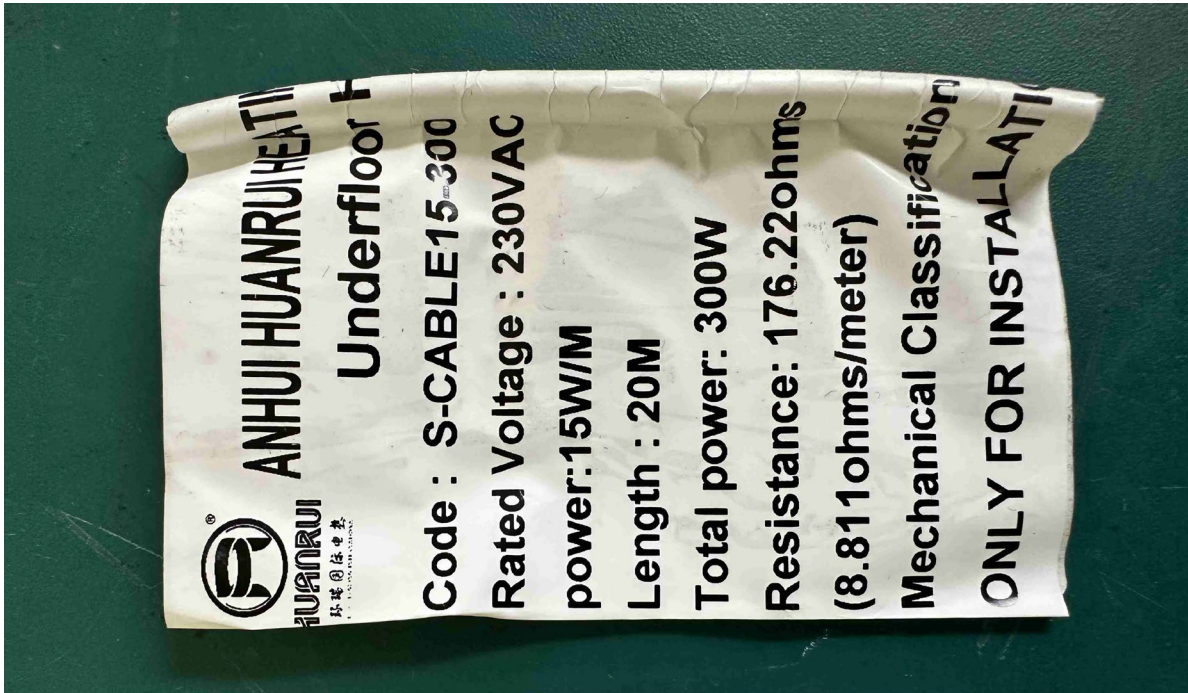
Cold Lead Cross Section



Splice Cross Section



Heating Cable Cross Section



Marking Label #1



Marking Label #2