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TEST REPORT
EN 61386-23:2004
EN61386-23:2004+A11:2010
Conduit systems for cable management –
Part 23: Particular requirements- Flexible conduit systems

EN61386-1:2008
Conduit systems for cable management - Parts 1: General requirements

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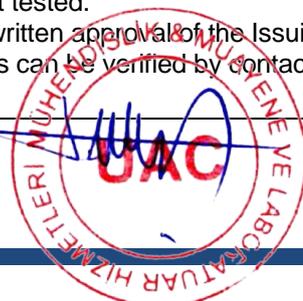
Applicant's name : **METAKSAN ELEKTRİK VE İNŞAAT MAL. SAN. TIC. LTD STİ**
Address : **Ortakoy Sanayi Sitesi İtler Bulvarı 16/1**
Selimpasa - İstanbul / TÜRKİYE

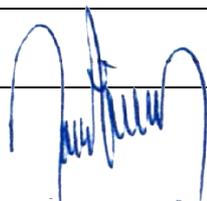
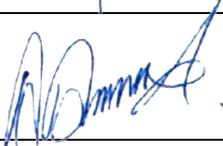
Test specification:
Standard : **EN 61386-1**
EN 61386-23
Test procedure..... : **CB Scheme (LVD Test Procedure)**
Non-standard test method..... : **N/A**

Test Report Form No...... : **EN 61386-1/EN 61386-23**
Test Report Form(s) Originator.... : **IEC**
Master TRF : **EN 61386-1/EN 61386-23**

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Test item description	STEEL FLEXIBLE CONDUIT	
Trade Mark	METAKSAN	
Manufacturer	METAKSAN ELEKTRİK VE İNŞAAT MAL. SAN. TIC. LTD STİ	
Model/Type reference.....	PVC Coated Steel Flexible Conduit, PVC Coated Steel Flexible Conduit Wired, PVC Coated Galvanized Steel Flexible Conduit, PVC Coated Galvanized Steel Flexible Conduit Wired, Liquid Tight Flexible Metal Conduit, Steel Flexible Conduit, Steel Flexible Conduit Wired, Galvanized Steel Flexible Conduit, Galvanized Steel Flexible Conduit Wired.	
Ratings.....	<p><u>PVC Coated Steel Flexible Conduit & Steel Flexible Conduit</u> Size: 9 mm, 11 mm, 14 mm, 16 mm, 18 mm, 21 mm, 26 mm, 29 mm, 32 mm, 35 mm, 37 mm, 40 mm, 42 mm, 45 mm, 50 mm</p> <p><u>PVC Coated Steel Flexible Conduit Wired & Steel Flexible Conduit Wired</u> Size: 11 mm, 14 mm, 16 mm, 18 mm, 21 mm, 26 mm, 29 mm, 32 mm, 35 mm, 37 mm, 40 mm, 42 mm, 45 mm, 50 mm</p> <p><u>PVC Coated Galvanized Steel Flexible Conduit & Galvanized Steel Flexible Conduit</u> Size: 7 mm, 9 mm, 11 mm, 14 mm, 16 mm, 18 mm, 21 mm, 26 mm, 29 mm, 32 mm, 35 mm, 37 mm, 40 mm, 42 mm, 45 mm, 50 mm</p> <p><u>PVC Coated Galvanized Steel Flexible Conduit Wired & Galvanized Steel Flexible Conduit Wired</u> Size: 11 mm, 14 mm, 16 mm, 18 mm, 21 mm, 26 mm, 29 mm, 32 mm, 35 mm, 37 mm, 40 mm, 42 mm, 45 mm, 50 mm</p> <p><u>Liquid Tight Flexible Metal Conduit</u> 1/4", 3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3", 4"</p>	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	UAC Engineering Consultancy & Training Auditing Inspection and Laboratory Services Co.
	Testing location/ address	Atalar Mah. Çanakkale Cad. No:69 Kat:4 D:5 Kartal/İstanbul / Türkiye
<input type="checkbox"/>	Associated CB Testing Laboratory:	--
	Testing location/ address	--
	Tested by (name, function, signature)	UĞUR ÇOBAN Test Personnel 
	Approved by (name, function, signature) ..	AYLİN DENLİK & MUAYENE VE LABORATUVAR HİZMETLERİ Laboratory Manager 



Summary of testing: EN 61328-1 Article 11**Tests performed (name of test and test clause):** STEEL FLEXIBLE CONDUIT**Testing location:** Atalar Mah. Çanakkale Cad. No:69 Kat:4 D:5 Kartal/İstanbul / Türkiye**General test conditions**

Conduit systems declaring electrical continuity characteristics shall be checked by the tests specified in Bonding Test immediately after the tests specified in Resistance against corrosion. Conduit systems, in some circumstances, may be used in total or in part as a protective conductor in an electrical installation. In that event, the system will be tested after final installation to confirm its suitability for that purpose, in accordance with the installation rules. Conduit systems of metal or composite materials shall be so constructed that accessible metal parts can be bonded to earth. Compliance is checked by the test in Bonding Test. Accessible conductive parts of the metal or composite conduit system, which may become live in the event of a fault, shall be effectively earthed. Compliance is checked by the test in Bonding Test. Conduit systems of non-metallic or composite materials, where declared, shall have an adequate electrical insulating strength and insulating resistance. Compliance is checked by the test in Electrical insulating strength and resistance.

Bonding test: An arrangement of conduit and conduit fittings, consisting of 10 pieces of conduit, shall be coupled together, in accordance with the manufacturer's instructions and figure 3, by means of conduit fittings representing, in approximately equal numbers, each type of fitting in the batch. The fittings shall be spaced between 25 mm and 28 mm apart. A current of 25 A, having a frequency of 50 Hz to 60 Hz derived from an a.c. source having a no-load voltage not exceeding 12 V, is passed through the assembly for $1 \text{ min}^{+5}_0 \text{ s}$, after which the voltage drop is measured and the resistance calculated from the current and that voltage drop. The resistance shall not exceed 0,05 Ω .

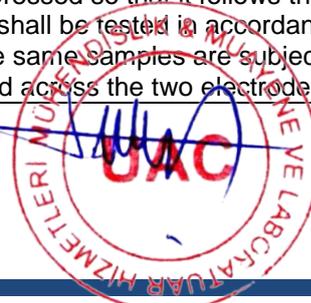
Electrical insulating strength and resistance: Conduits: Samples of conduit are immersed over a length of $1 \text{ m} \pm 10 \text{ mm}$ in accordance with EN 61386-1 standard of figure 4 or figure 5 in a salt water solution at $(23 \pm 2) ^\circ\text{C}$, with a length of 100 mm kept above the level of the solution. Rigid conduit samples are to be supplied by the manufacturer complete with one end sealed with an appropriate insulating material with high electrical insulation, for example silicon elastomer; see EN 61386-1 standard of figure 4.

Pliable and flexible conduit samples are bent into a "U" shape and then immersed; see EN 61386-1 standard of figure 5. The salt water solution is made by completely dissolving 1 g/l of sodium chloride.

The salt water solution is poured into the open end of the conduit to match the external level. An electrode is placed inside the conduit and another placed into the tank. After $24 \text{ h} \pm 15 \text{ min}$, a voltage is applied across the two electrodes, gradually being increased from 1000 V to 2000 V of substantially sine wave form and having a frequency of 50 Hz to 60 Hz. Having reached 2000 V, the voltage is maintained for a period of $15 \text{ min}^{0+5} \text{ s}$. The high-voltage transformer used for the test is so designed that, when the output terminals are short-circuited after the output voltage has been adjusted to the appropriate test voltage, the output current is of at least 200 mA. The overcurrent relay shall not trip when the output current is less than 100 mA. Care is taken that the r.m.s. value of the test voltage applied is measured within $\pm 3 \%$. The samples shall be considered to have adequate electrical insulating strength if a 100 mA trip device, incorporated into the circuit, does not trip during the 15 min test.

Immediately after the test in conduits test, the same samples shall be subjected to an electrical insulation resistance test. A direct voltage of 500 V shall be applied across the two electrodes. After $(60 \pm 2) \text{ s}$ from the application of the voltage, the insulation resistance between the electrodes shall be obtained. Conduits shall be considered to have adequate electrical insulation resistance if the measured resistance is greater than 100 M Ω .

Conduit fittings: Samples of conduit fittings shall be immersed for $24 \text{ h} \pm 15 \text{ min}$, in water at $(23 \pm 2) ^\circ\text{C}$, and then thoroughly dried at room temperature. Conduit fitting samples shall be assembled in accordance with the manufacturer's instructions with a short length of conduit. All other open ends are sealed with an appropriate insulating material. The inside of the fitting is filled with lead shot of a diameter between 0,5 mm and 1,0 mm, and an electrode is inserted into the lead shot via the conduit. An outer electrode of aluminium foil is wrapped around the outside of the fitting and compressed so that it follows the outer contour of the fitting as closely as possible. Conduit fitting samples shall be tested in accordance with 11.3.2.3 of removal from the water. Immediately after the test in 11.3.2.3, the same samples are subjected to an electrical insulation resistance test. A d.c. voltage of 500 V is applied across the two electrodes. After (60

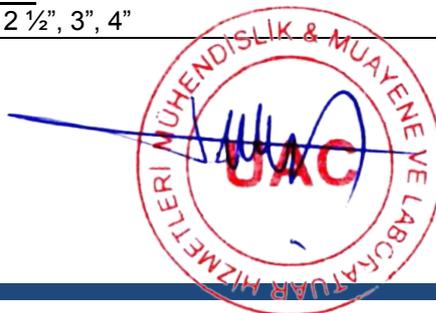


± 2) s from the application of the voltage, the insulation resistance between the electrodes is obtained. Fittings are considered to have adequate electrical insulation resistance if the resistance is greater than 5 MΩ.

The product fulfils the requirements of EN 61386-1 & EN 61386-23
Test Result: Pass.



Test item particulars: STEEL FLEXIBLE CONDUIT	
Classification of installation and use: N/A	
Supply Connection: N/A	
.....:	
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)	
Testing:	
Date of receipt of test item: 20 November 2014	
Date (s) of performance of tests: 09 December 2014	
General remarks:	
"(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.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60332-1:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies): N/A	
General product information:	
Product Name :	
<u>PVC Coated Steel Flexible Conduit & Steel Flexible Conduit</u>	
Size: 9 mm, 11 mm, 14 mm, 16 mm, 18 mm, 21 mm, 26 mm, 29 mm, 32 mm, 35 mm, 37 mm, 40 mm, 42 mm, 45 mm, 50 mm	
<u>PVC Coated Steel Flexible Conduit Wired & Steel Flexible Conduit Wired</u>	
Size: 11 mm, 14 mm, 16 mm, 18 mm, 21 mm, 26 mm, 29 mm, 32 mm, 35 mm, 37 mm, 40 mm, 42 mm, 45 mm, 50 mm	
<u>PVC Coated Galvanized Steel Flexible Conduit & Galvanized Steel Flexible Conduit</u>	
Size: 7 mm, 9 mm, 11 mm, 14 mm, 16 mm, 18 mm, 21 mm, 26 mm, 29 mm, 32 mm, 35 mm, 37 mm, 40 mm, 42 mm, 45 mm, 50 mm	
<u>PVC Coated Galvanized Steel Flexible Conduit Wired & Galvanized Steel Flexible Conduit Wired</u>	
Size: 11 mm, 14 mm, 16 mm, 18 mm, 21 mm, 26 mm, 29 mm, 32 mm, 35 mm, 37 mm, 40 mm, 42 mm, 45 mm, 50 mm	
<u>Liquid Tight Flexible Metal Conduit</u>	
1/4", 3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3", 4"	



EN 61386-1 & EN61386-23			
Clause	Requirement + Test	Result - Remark	Verdict
1.	SCOPE		P
	Scope	APPROPRIATE STANDARD	P
2.	NORMATIVE REFERENCES		P
	Normative reference	APPROPRIATE STANDARD	P
3.	DEFINITIONS		P
	Definitions	APPROPRIATE STANDARD	P
4.	General requirements		P
	General requirements	APPROPRIATE STANDARD	P
	Conduit and conduit fittings within the scope of this standard shall be so designed and constructed that in normal use their performance is reliable and without danger to the user or surroundings. When assembled in accordance with manufacturer's instructions as part of a conduit system, conduits and conduit fittings shall provide mechanical and, where required, electrical protection of the insulated conductors and cables contained herein.		P
	The protective properties of the joint between the conduit and conduit fitting shall not be less than that declared for the conduit system.		P
	Conduit and conduit fittings shall withstand the stresses likely to occur during transport, storage, recommended installation practice and application.		P
	In general, compliance is checked by carrying out all the tests specified.		P
5.	General conditions for tests		P
	Type tests		N/A
	Unless otherwise specified, the tests shall be carried out at an ambient temperature of $(23 \pm 2)^\circ\text{C}$.	22,4 °C	P
	Unless otherwise specified, each test shall be made on three new samples.		P
	Samples of non-metallic and composite conduits and conduit fittings shall be conditioned for at least 240 h, at a temperature of $(23 \pm 2)^\circ\text{C}$ and a relative humidity between 40 % and 60 %. All tests shall be carried out immediately after general conditioning.		P
	Unless otherwise specified, the samples for each test shall be in a clean and new condition, with all parts in place and mounted as in normal use. After checking dimensions in accordance with clause 8, and unless otherwise specified in the relevant test, the conduit fittings shall be assembled with adequate lengths of conduit of the type for which they are intended. Due regard shall be taken of the manufacturer's instructions, especially where force is required in the assembly of the joint. NOTE – Where similarities are claimed, the selection of representative fittings for test purposes can be agreed between the manufacturer, or responsible		P



EN 61386-1 & EN61386-23			
Clause	Requirement + Test	Result - Remark	Verdict
	vendor, and the testing station.		
	Where the conduit entries are part of the detachable or loose type conduit fitting, the detachable conduit fitting shall be capable of being assembled again, after the test, according to the manufacturer's instructions without loss of the declared properties according to clause 6.		P
	Unless otherwise specified, three samples are submitted to the tests, and the requirements are satisfied if the tests are met. If only one of the samples does not satisfy a test, due to an assembly or a manufacturing defect, that test and any preceding one which may have influenced the result of the test shall be repeated, and also the tests which follow shall be made in the required sequence on another full set of samples, all of which shall comply with the requirements.		P
	When toxic or hazardous processes are used, due regard shall be taken of the safety of the persons within the test area.		P
	Conduit systems which are used as an integral part of other equipment shall also be tested in accordance with the relevant standard for that equipment.		P
6	Classification	APPROPRIATE STANDARD	P
6.1	According to mechanical properties		--
6.2	After the temperatures.		N/A
6.3	The electrical properties.		N/A
6.4	After the resistance to external influences.		--
6.5	After the resistance to flame propagation		--
7	Marking and documentation		P
7.1	The conduit shall be marked on the product with a trade mark or a name identifying the manufacturer or responsible vendor.		P
	The conduit shall in addition be marked in such a way that it can be identified in the manufacturer's, or responsible vendor's, literature.		P
7.1.1	The conduit may also be marked with the classification code, which shall be in accordance with annex A, and which shall include at least the first four digits.		P
7.1.2	The manufacturer shall be responsible for indicating the compatibility of parts within a conduit system.		P
7.1.101	The conduit shall be marked in accordance with 7.1 along its entire length at regular intervals of preferably 1m but not longer than 3m. Where this is technically impractical, the mark shall be on a label attached to the product at each end, or on the packaging.		
7.1.102	The manufacturer shall document or add to the packaging for the system the minimum inside diameter, the minimum bend radius and the classification in		

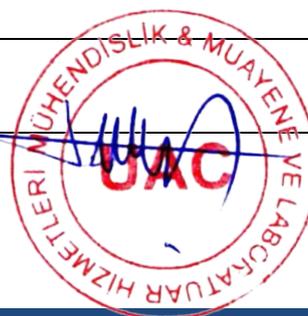


EN 61386-1 & EN61386-23

Clause	Requirement + Test	Result - Remark	Verdict
	accordance with clause 6.		
7.2	The conduit fitting shall be marked in accordance with 7.1, on the product wherever possible, but where this is impractical, then the mark may be on a label attached to the product, or on the box or carton containing the fittings.		N/A
7.3	Flame propagating material shall be orange in colour. It shall not be colored orange by painting or other superficial means.		N/A
	Non-flame propagating material may be of any colour except yellow, orange or red, unless clearly marked on the product to be of non-flame propagating material.	BLACK	P
7.4	Earthing facilities shall be indicated by the symbol for protective earth in accordance with IEC417, symbol 417-IEC-5019-a. This marking shall not be placed on easily removable parts, for example screws.		N/A
7.5	Compliance with 7.1 to 7.4 is checked by inspection		P
7.6.	The marking shall be durable and clearly legible		P
	Compliance is checked by inspection and by rubbing the marking by hand for 15s with a piece of cloth soaked with water, and again for 15s with a piece of cloth soaked with petroleum spirit.		P
	After the test, the marking shall be legible		P
8	Dimensions		P
8.1	Threads shall comply with IEC 60423.		P
8.2	The minimum inside diameter of the conduit system shall be as declared by the manufacturer.		P
9	Construction		P
9.1	Within the conduit system, there shall be no sharp edges, burrs or surface projections which are likely to damage insulated conductors or cables, or inflict injury on the installer or user.		P
	The manufacturer shall be responsible for providing guidelines to assist the safe installation of the conduit system.		P
9.2	Screws, if any, used for attaching components or covers to conduit fittings, or in joints to conduits, shall not cause damage to cable insulation when correctly inserted. They shall have ISO metric threads. Thread-cutting screws shall not be used.		N/A
	Fixing screws and small clips for use with non-metallic or composite conduit fittings need not be of non-metallic material if they are isolated from insulated conductors or cables.		N/A
	Screw fixing means shall be so designed to withstand the mechanical stresses occurring during installation and normal use.		N/A
9.3	Screws used with preformed threads shall be tightened and loosened 10 times for screws in		N/A



EN 61386-1 & EN61386-23			
Clause	Requirement + Test	Result - Remark	Verdict
	engagement with a thread of non-metallic material and for screws of non-metallic material, and five times in all other cases.		
	The test shall be made by using a suitable screwdriver or spanner applying the relevant torque given in table 3. the screws shall not be tightened by sudden or jerky motions.		N/A
	After the test, there shall be no damage sustained by screw or nut, such as breakage of the screw or damage to the head or thread, that will impair the further use of the screw or nut.		N/A
9.4	Thread-forming screws are tightened and loosened 10 times for screws in engagement with a thread of insulating material, and five times in all other cases. Screws in engagement with a thread of insulating material shall be completely removed each time.		N/A
	The text is made by using a suitable screwdriver or spanner applying the relevant torque given in table 3. the screws shall not be tightened by sudden or jerky motions.		N/A
	After the test, there shall be no damage, such as breakage of the screw or damage to the head or thread, that will impair the further use of the screw or nut.		N/A
9.5	Any material, for example rubber, fibre etc., within the joint, which may be exposed to external influences when assembled according to the manufacturer's instructions, shall have at least the same level of resistance to the external influence as either the conduit or the conduit fitting.		N/A
9.6	For conduit systems that are assembled by means other than threads, the manufacturer shall indicate whether the system can be disassembled and if so, how this can be achieved.		N/A
10	Mechanical properties		P
10.1	Mechanical strength		P
10.1.1	Conduit systems shall have adequate mechanical strength.		P
10.1.2	Conduits, according to their classification, when bent or compressed, or exposed to impact or extreme temperature of a specified value in accordance with impact and temperature classification declared for the product, either during, or after, installation according to the manufacturer's instructions, shall not crack and shall not be deformed to such an extent that introduction of the insulated conductors or cables becomes difficult, or that the installed insulated conductors or cables are likely to be damaged while being drawn in.		P
10.1.3.	Conduit systems intended as a mounting for other equipment shall have adequate mechanical strength to support such equipment and to withstand the force		P



EN 61386-1 & EN61386-23

Clause	Requirement + Test	Result - Remark	Verdict
	required to operate the equipment, both during and after installation.		
10.1.4.	Compliance of 10.1.1 to 10.1.3 is checked by the tests specified in 10.2 to 10.8.		P
10.2.	Compression test		P
10.2.1.	Samples of conduit, each (200±5)mm long, shall be subjected to a compression test at (23±2)°C, using the apparatus shown in figure 1.		P
10.2.2.	Before the test, the outside diameters of the samples shall be measured.		P
10.2.3.	The samples shall be positioned on a flat steel support, and a steel intermediate piece, as shown in figure 1, shall be placed in the middle of the sample.		P
10.2.4.	A uniformly increasing compression force, reaching the values shown in table 4 within (30±3)s, shall be applied to the intermediate piece.		P
10.2.5.	After the force given in table 4 has been applied for (60 ±2)s, the outside diameter of the sample shall be measured where flattening has taken place, without removing the force.		P
10.2.6.	The difference between the initial outside diameter and the diameter of the flattened sample shall not exceed 25% of the initial outside diameter measured before the test.		P
10.2.7.	The force and the intermediate piece are then removed and (60±2)s after removal, the outside diameter of the samples, where they have flattened, shall be measured again. The difference between the initial diameter and the diameter of the flattened samples shall not exceed 10% of the outside diameter, measured before the test.		P
10.2.8.	After the test, the samples shall show no cracks visible to normal or corrected vision without additional magnification.		P
10.3.	Impact test		P
10.3.1.	Twelve samples of conduit, each (200±5)mm in length, or twelve conduit fittings are subjected to an impact test by means of the apparatus shown in figure 2. Before the test, the samples are assembled with all the components as for normal use, including conduits required for conducting of the test. Parts, which are not accessible when mounted in normal use, and small conduit fittings whose maximum dimension is less than 20mm, are not subjected to this test.		P
10.3.2.	The test apparatus shall be placed on a pad of closed cell expanded sponge(40±1)mm thick when uncompressed, and having a density of (538±22) kg/m ³ . The test apparatus, together with the samples, shall be placed in a refrigerator, the temperature within which shall be maintained at the declared temperature as given in table 1 with a tolerance of ±2°C. When the samples have attained the temperature specified, or		P



EN 61386-1 & EN61386-23

Clause	Requirement + Test	Result - Remark	Verdict
	after 2h, whichever is the longer period, each sample shall be placed in position on the steel base as shown in figure 2. The hammer shall be allowed to fall once on each sample. The mass of the hammer and the fall height shall be as given in table 5. The test shall be made on the weakest part of the conduit fitting, except that it shall not be applied to within 5 mm of any conduit entry. Samples of conduit are tested at the center of their length.		
10.3.3.	After the test, when samples have attained (20±5)°C, it shall be possible to pass the appropriate gauge specified in the relevant particular requirements (parts 21,22,23, etc.) through the conduit, under its own weight and without any initial speed, with the sample in the vertical position. There shall be no sign of disintegration nor shall there be any crack visible to normal or corrected vision without magnification. At least nine of the twelve samples shall pass the test.		P
10.4.	Bending test		N/A
	The test is specified in the relevant particular requirements (parts 21,22,23, etc) of this standard.		N/A
10.5	Flexing test		P
	The test is specified in the relevant particular requirements (parts 21,22,23, etc) of this standard.		P
10.5.101	An assembly consisting of a conduit with a terminating conduit fitting, assembled in accordance with the manufacturer's instructions, shall be subjected to a flexing test by means of the apparatus shown in figure 101.		P
10.5.102.	The test shall be made on six samples of conduit of an appropriate length. Three of the samples shall be tested at the minimum declared transport, application and installation temperature as given in table 1 with a tolerance of ±2°C. The other three samples shall be tested at the maximum declared application and installation temperature as given in table 2 with a tolerance of ±2°C.		P
	A manufacturer may declare that a flexible conduit is suitable for transport and installation according to table 1 but may only be suitable for flexing at ambient temperature as a minimum. In this case the test shall be carried out at (20± 2) °C and the 3rd digit of the classification code shall be X. the manufacturer shall clearly declare in his literature both the minimum transport and installation temperature in accordance with table 1, the minimum application temperature which is ambient and maximum installation and application temperature in accordance with table 2.		P
10.5.103.	The sample shall be fixed to the oscillating member by means of the terminating conduit fitting as shown in figure 101, so that when the conduit is at the middle of		P



EN 61386-1 & EN61386-23			
Clause	Requirement + Test	Result - Remark	Verdict
	its travel, the axis of the conduit is vertical and passes through the axis of the oscillation. The apparatus with the sample shall be conditioned for 2h or until the sample has attained the declared temperature, whichever period is the longer.		
10.5.104.	The oscillating member shall be moved backwards and forwards through a total angle of $(180\pm 5)^\circ$ divided equally about the vertical axis. The assembly shall be subjected to 5000 flexings at a rate of (40 ± 5) flexings per minute. A flexing constitutes, starting from the vertical position, one continuous cycle of movement of essentially sinusoidal forms.		P
	After the test the sample shall show no sign of disintegration, nor shall there be any cracks visible to normal or corrected vision without magnification.		P
10.5.105.	Collapse test		N/A
10.6.	The test is specified by the relevant particular requirements (parts 21,22,23, etc.) of this standard.		N/A
10.7	Tensile test		P
10.7.1	Conduit systems declaring tensile strength shall be tested as follows:		P
	A sample of conduit and two conduit fittings or terminating conduit fittings are assembled in accordance with the manufacturer's instructions so that the overall length is approximately 300mm. The assembly is subjected to a uniformly increasing tensile force reaching the value given in table 6, at $(23\pm 2)^\circ\text{C}$, in $(30\pm 3)\text{s}$. This tensile force is then applied for $2\text{min}\pm 10\text{s}$.		P
10.7.2.	Where elongation occurs, the manufacturer shall be responsible for providing guidelines to assist the safe installation of the conduit system.		P
10.7.3.	For conduit systems where tensile strength is not declared, the tensile strength of the joint shall comply with classification 1 in table 6.		P
10.7.4	After the test, the conduit fittings or terminating conduit fittings shall remain properly assembled to the conduit, and there shall be no damage visible to normal or corrected vision without magnification.		P
10.8	Suspended load test		P
	The conduit fitting, declared by the manufacturer to be suitable for suspended loads, is secured to a rigid structure using a method provided by the manufacturer, with the suspension means pointing downwards.		P
	A load, with a time duration in accordance with table 7, is suspended by the means provided, and installed in accordance with the manufacturer's instructions.		P
	The fitting shall be deemed to have passed if at the end of the test, there are no cracks visible to normal or corrected vision without magnification, and there is no No damage deformation of the conduit fitting impairing		P

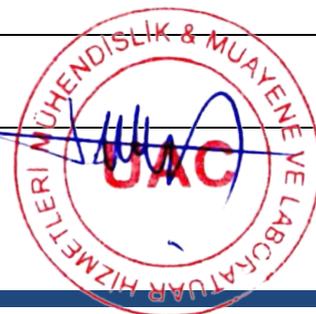


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Clause	Requirement + Test	Result - Remark	Verdict
	its normal use.		
	For non -metallic and composite conduit fittings, the test shall be carried out in a heating cabinet, the temperature within which is maintained at the declared maximum temperature given in table 2 with a tolerance of ± 2 °C.		
11	Electrical properties		P
11.1	Electrical requirements		P
11.1.1.	Conduit systems declaring electrical continuity characteristics shall be checked by the tests in 11.2 immediately after the tests in 14.2		P
11.1.2.	Conduit systems of metal or composite materials shall be so constructed that accessible metal parts can be bonded to earth.		P
11.1.3.	Accessible conductive parts of the metal or composite conduit system, which may become live in the event of a fault, shall be effectively earthed.		P
11.1.4.	Conduit systems of non-metallic or composite materials, where declared, shall have an adequate electrical insulating strength and insulating resistance.		P
11.2	A sample of conduit and terminating conduit fitting shall be assembled in accordance with the manufacturer's instructions and mounted as shown in figure 103. A current of 25A, not exceeding 12V, shall be passed through the assembly for (60+50)s. Then the voltage drop shall be measured between the points shown in figure 103 and the resistance calculated from the current and this voltage drop.		P
	The resistance shall not exceed 0.05Ω.		P
	Where special devices are required for the coupling of conduit fittings, they shall be sufficient to remove the protective coating from the conduit, or the protective finish shall be removed in accordance with the manufacturer's instructions.		P
11.3.	Electrical insulating strength and resistance		P
11.3.1.	Conduits		P
11.3.1.1.	Samples of conduit are immersed over a length of 1m±10mm in accordance with figure 4 or figure 5 in a salt water solution at (23±2)°C, with a length of 100mm kept above the level of the solution.		P
	Rigid conduit samples are to be supplied by the manufacturer complete with one end sealed with an appropriate insulating material with high electrical insulation, for example silicon elastomer.		P
	Pliable and flexible conduit samples are bent into a "U" shape and then immersed.		P
	The salt water solution is made by completely dissolving 1 g/l of sodium chloride.		P
	The salt water solution is poured into the open end of		P



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Clause	Requirement + Test	Result - Remark	Verdict
	the conduit to match the external level. An electrode is placed inside the conduit and another placed into the tank.		
11.3.1.2	After 24h ±15 min, a voltage is applied across the two electrodes, gradually being increased from 100V to 2000V of substantially sine wave form and having a frequency of 50 Hz to 60Hz. Having reached 2000V, the voltage is maintained for a period of 15min+50 s.		P
	The high-voltage transformer used for the test is so designed that, when the output terminals are short-circuited after the output current is of at least 200mA. The over current relay shall not trip when the output current is less than 100mA. Care is taken that the r.m.s. value of the test voltage applied is measured within ±3%.		P
	The samples shall be considered to have adequate electrical insulating strength if a 100mAtrip device, incorporated into the circuit, does not trip during the 15 min test.		P
11.3.1.3.	Immediately after the test in 11.3.1.2, the same samples shall be subjected to an electrical insulation resistance test. A direct voltage of 500 V shall be applied across the two electrodes.		P
11.3.1.4.	After (60±2)s from the application of the voltage, the insulation resistance between the electrodes shall be obtained. Conduits shall be considered to have adequate electrical insulation resistance if the measured resistance is greater than 100MΩ.	>100MΩ	P
11.3.2.	Conduit fittings		N/A
11.3.2.1.	Samples of conduit fittings shall be immersed for 24h± 15min, in water at (23±2)°C, and then thoroughly dried at room temperature.		N/A
11.3.2.2.	Conduit fitting samples shall be assembled in accordance with the manufacturer's instructions with a short length of conduit. All other open ends are sealed with an appropriate insulating material. The inside of the fitting is filled with lead spheres of a diameter between 1.0mm and 1.5mm, and an electrode is inserted into the lead shot via the conduit.		N/A
	An outer electrode of aluminium foil is wrapped around the outside of the fitting and compressed so that it follows the outer contour of the fitting as closely as possible.		N/A
11.3.2.3.	Conduit fitting samples shall be tested in accordance with 11.3.1.2 within 1 h of removal from the water.		N/A
11.3.2.4	.Immediately after the test in 11.3.2.3, the same samples are subjected to an electrical insulation resistance test. A d.c. voltage of 500 V is applied across the two electrodes.		N/A
11.3.2.5.	After (60±2)s from the application of the voltage, the insulation resistance between the electrodes is obtained. Fittings are considered to have adequate		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
	electrical insulation resistance if the resistance is greater than 5M Ω .		
12	Thermal properties		P
12.1	Non-metallic and composite conduits shall have adequate resistance to heat.		P
	Compliance is checked by the test in 12.2 and verified with 12.3.		P
	The load for the heating test shall be the same classification as the declared compression classification.		P
12.2	Samples of conduit, each (100 \pm 5)mm long, together with the test apparatus as shown in figure 8, shall be kept for 4h \pm 5 min in a heating cabinet at the declared temperature given in table 2, with a tolerance of \pm 2 $^{\circ}$ C.		P
	After this period, each sample is loaded for 24h \pm 15 min in and apparatus, as shown in figure 8, with an appropriate mass applied through a steel rod (6.0 \pm 0.1)mm in diameter, disposed at right angles to the axis of the conduit.		P
	The sample is subjected to a total mass, including the mass of the rod, as shown in table 9, placed in the middle of the sample.		P
	The sample, under load, shall then be allowed to cool to room temperature.		P
	The load is then removed and immediately after its removal it shall be possible to pass the appropriate gauge, in accordance with figure 102, through the conduit under its own weight and without any initial speed, with the sample in the vertical position.		P
12.3	The load is then removed, and immediately after its removal, it shall be possible to pass the appropriate gauge, specified in the relevant part 2, through the conduit, under its own weight and without any initial speed, with the sample in the vertical position.		P
13	Fire Hazard		P
13.1	Reaction to fire		P
13.1.1	Initiation of fire		N/A
	Not applicable.		N/A
13.1.2	Contribution of fire		N/A
	Under consideration.		N/A
13.1.3	Spread of fire		P
	Non-flame propagating conduit systems shall have adequate resistance to flame propagation.		P
13.1.3.1	Compliance of non-metallic and composite conduit fittings is checked by using the glow-wire test in IEC 60695-2-1/1:1994. component and tested accordingly.		P
	The glow wire shall be applied once to each sample in the most unfavourable position for its intended use (with the surface tested in a vertical position) at a		P

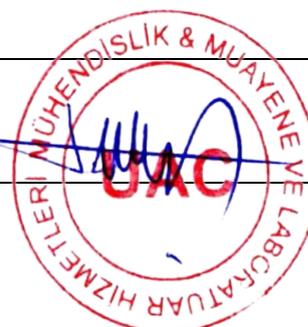


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Clause	Requirement + Test	Result - Remark	Verdict
	temperature of 750°C		
	The sample is deemed to have passed this test if there is no visible flame or sustained glowing, or if flames or glowing extinguish within 30s of the removal of the glow wire.		P
13.1.3.2	Compliance of non metallic and composite conduits is checked by applying a 1kW flame, as specified in IEC 60695		P
13.1.3.2.1	A sample of length (675±10)mm, is mounted vertically in a rectangular metal enclosure with one open face, as shown in figure 6, in an area substantially free of draughts.		P
	The general arrangement is shown in figure 7.		P
	Mounting is by means of two metal clamps approximately 25mm wide, spaced (550±10)mm apart and approximately equidistant from the ends of the sample.		P
	A steel rod of (2.0±0.1)mm for sizes up to 12mm, (6.0±0.1)mm for size 16mm to 25mm and (16.0±0.1)mm for conduits with diameters 30mm and above is passed through the sample. It is rigidly and independently mounted and clamped at the upper end to maintain the sample in a straight and vertical position. The means of mounting is such as not to obstruct drops from falling onto the tissue paper.		P
	A suitable piece of white pine wood board, approximately 10mm thick, covered with a single layer of white tissue paper, is positioned on the lower surface of the enclosure.		P
	The assembly of sample, rod and clamping apparatus is mounted vertically in the center of the enclosure, the upper extremity of the lower clamp being (500±10)mm above the internal lower surface of the enclosure.		P
13.1.3.2.2	The burner is supported so that its axis is at an angle of (45±2)° to the vertical.		P
	The flame is applied to the sample so that the distance from the top of the burner tube to the sample, measured along the axis of the flame, is (100±10)mm, and the axis of the flame intersects with the surface of the sample at a point (100±5)mm from the upper extremity of the lower clamp, and so that the axis of the flame intersects with the axis of the sample.		P
	The determination of material thickness of plain conduit, corrugated conduit and combined plain conduit and corrugated conduit is given in annex B. All three samples are measured and the mean material thickness is calculated for each sample. The highest mean value is used to determine the flame application time from table 11.		P
	After the conclusion of the test, and after any burning of the sample has ceased, the surface of the sample is		P



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Clause	Requirement + Test	Result - Remark	Verdict
	wiped clean by rubbing with a piece of cloth soaked with water.		
13.1.3.2.4	All three samples shall pass the test.		P
	The sample is deemed to have passed the test if it does not ignite.		P
	The sample is deemed to have passed the test if it does ignite but all of the following are met:		N/A
	- flaming or glowing of the sample is extinguished within 30s after removal of the test flame,		N/A
	- the tissue paper does not ignite,		N/A
	- after extinction of the flaming or glowing of the sample, there is no evidence of burning or charring within 50mm of the lower extremity of the upper clamp.		N/A
13.1.4	Additional reaction to fire characteristics		N/A
	Under consideration.		N/A
13.2	Resistance to fire		N/A
14	External influences		N/A
14.1	Degree of protection provided by enclosure		N/A
	Conduit systems, when assembled in accordance with the manufacturer's instructions, shall have adequate resistance to external influences according to the classification declared by the manufacturer, with a minimum requirement of IP 30.		N/A
14.1.1	Degree of protection Ingress of foreign solid objects		N/A
14.1.1.1	An assembly is made of a conduit fitting with a short length of conduit assembled in each entry. Where necessary, the open ends of the assembly are plugged, or are not part of the test.		N/A
14.1.1.2	The assembly shall be tested in accordance with the appropriate test of IEC 529. For numeral 5, category 2 applies		N/A
14.1.1.3	The assembly, tested for numeral 5 or 6, shall be deemed to have passed the test if there is no ingress of dust visible to normal or corrected vision without magnification.		N/A
14.1.2	Degree of protection Ingress of water		N/A
14.1.2.1	An assembly is made of a conduit fitting with a short length of conduit assembled in each conduit entry. Where necessary, the open end of the conduit is plugged, or is not part of the test.		N/A
14.1.2.2	The assembly shall be tested in accordance with the appropriate test of IEC 529.		N/A
	For numerals 3 and 4, the oscillating tube shall be used.		N/A
14.1.2.3	The assembly, tested for numeral 1 and above, shall be deemed to have passed the test if there is not sufficient ingress of water to form a drop visible to normal or corrected vision without magnification.		N/A



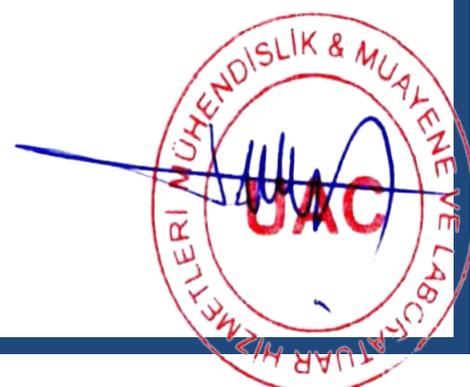
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Clause	Requirement + Test	Result - Remark	Verdict
14.2	Resistance against corrosion		N/A
14.2.1	Metallic and composite conduit systems, excluding screw threads, shall have adequate resistance against corrosion, both inside and outside, in accordance with the classification given in table 10.		N/A
	Compliance for painted and zinc coated steel and steel composite conduits and conduit fittings is checked by the tests in 14.2.2.		N/A
	For non-ferrous metallic and composite conduit systems, the manufacturer shall provide information about its protection against corrosion.		N/A
14.2.2	Tests for resistance to corrosion for painted and zinc coated steel and steel composite conduits systems		N/A
14.2.2.1	Low protection conduit and conduit fittings shall be inspected for completeness of covering by the protective coating, both inside and outside.		N/A
14.2.2.2	Medium protection conduit and conduit fittings shall be cleaned with a piece of wadding soaked in white spirit with a kauri-butanol value of 35+5.		N/A
	They shall then be totally immersed in a solution of 0.75% potassium ferricyanide $[K_3Fe(CN)_6]$ and 0.25% ammonium persulphate $[(NH_4)_2S_2O_8]$ in water and a quantity of about 0.1% of a suitable wetting agent, for instance a sodium salt of an alkylnaphthalene sulphonic acid, shall be added.		N/A
	The solution and the samples shall be maintained at a temperature of $(23\pm 2)^\circ C$		N/A
	Each sample shall be tested separately, a fresh solution being used each time.		N/A
	After immersion for 5min+50 s, the samples shall be removed from the solution and left to dry at ambient temperature in air. After completion of the test as described above, the samples shall show no more than two blue coloured spots on each square centimeter of the surface, and no blue spot shall have a demension larger than 1.5mm. Traces of rust on sharp edges, screw threads and machined surfaces, also any yellowish film removable by rubbing, shall be ignored.		N/A
14.2.2.3	High protection conduit and conduit fittings shall be degreased by immersion in white spirit with a kauri-butanol value of 35+5 for 10min+50 s and wiped dry with a piece of soft cloth. They shall then be immersed in a 2% solution of sulphuric acid in water for 15s, thoroughly cleaned in running water and again wiped dry with a piece of clean soft cloth. Each sample shall then be totally immersed in a solution of copper sulphate $(CuSO_4 \cdot 5H_2O)$ in distilled water, having a specific gravity of 1.186 kg/l at $(23\pm 2)^\circ C$.		N/A
	The solution and the samples shall be maintained at a temperature of $(23\pm 2)^\circ C$, without stirring.		N/A

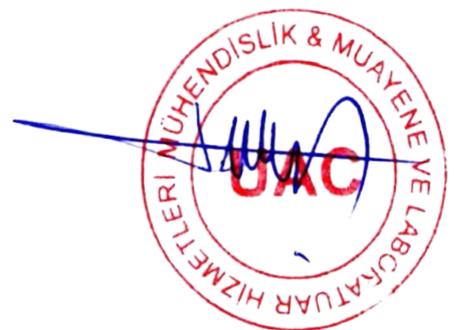


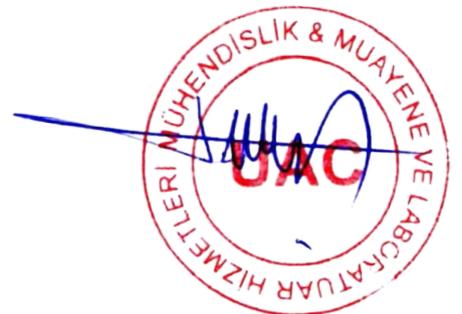
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Clause	Requirement + Test	Result - Remark	Verdict
	The container shall be such that it will not react with the solution and it shall be of such a size as to provide clearance of at least 25mm between the walls thereof and the sample.		N/A
	Each sample shall be immersed four times in succession in the same solution, each time for 1 min+50 s. A fresh solution shall be used for each sample. After each immersion, the sample shall immediately be cleaned in running water with a brush to remove any black deposit. The sample shall then be wiped dry with a piece of clean soft cloth, and. Except after the fourth immersion, returned to the solution. Case should be taken to clean out all holes and pockets.		N/A
	After the test, the sample shall show no precipitation of copper which cannot be scrubbed off in running water, if necessary after immersion for 15s in a 10% solution of hydrochloric acid in water.		N/A
	Trace of copper precipitation on screw threads, sharp edges and machined surfaces may be ignored		N/A
15	Electromagnetic compatibility		N/A
	Products covered by this standard are, in normal use, passive in respect of electromagnetic influences (emission and immunity)		N/A



Photos







***** End of Test Report *****

List of test equipment used:

TEST INSTRUMENT DATA

Test Gerilimi okuma Aralık (kV)	Çözünürlük (kV)	Doğruluk
0.100 ÷ 0.999	0.001	±(2 % + 5 dig.)
1.000 ÷ 0.001	5.000	±(3 % + 5 dig.)

Calibration Date : 07.06.2014



TRF No. EN 61386-1/EN 61386-23