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Subject 2250 (13, 83, and 1277)

1285 Walt Whitman Road
 Melville, NY 11747
 November 14, 1996

TO: Electrical Council of Underwriters Laboratories Inc.,
 Subscribers to UL's Listing Service for
 Power Limited Circuit Cable (QPTZ)
 Thermoplastic Insulated Wires (ZLGR)
 Power and Control Cable (QPOR)

SUBJECT: Announcement of New Category: Instrumentation Tray Cable

Underwriters Laboratories Inc. announces the creation of a new category Instrumentation Tray Cable for cables intended for use in industrial establishments in accordance with Article 727 and other applicable parts of the 1996 National Electrical Code. The requirements for these cables are in the new Standard for Instrumentation Tray Cable, UL 2250, which will have a publication date of December 20, 1996. Until the Standard is published, the requirements proposed in the Subject 2250 bulletin dated February 28, 1996 may be used as a guide.

Type ITC Instrumentation Tray Cables are rated 300 volts and are for use only in industrial establishments on circuits rated 150 volts or less and 5 amperes or less. The basic flame test requirement for these cables is a Cable Tray Flame Test.

Attached as Appendix A is the Listing information for the new category.

Attached as Appendix B is the Guide information for this category.

UNDERWRITERS LABORATORIES INC.

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2250BUL.D02;SLD;mc

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A P P E N D I X A
LISTING INFORMATION

LISTING MARK

UL is making Listing Marks available for Instrumentation Tray Cable. This product will be covered under the Type L Follow-Up Service Inspection Program, and the names of the Listees will appear under the new CCN "NYTT" in the Electrical Construction Materials Directory. The cable will be identified as a Listed product by the presence of an Underwriters Laboratories Inc. combination Listing Mark. The Listing Mark consists of the following declaration:

	UNDERWRITERS LABORATORIES INC.
LISTED	
INSTRUMENTATION TRAY CABLE	
TYPE ITC	
ISSUE NO. XXXX	
FOOTAGE	XYZ Co.

The company name, logo, trademark, or other identification that is acceptable to Underwriters Laboratories Inc. and relates to the identity of the Listed company must be included. All Listing Marks will include the control (issue) number assigned by UL which the Laboratories uses to maintain a record of the Subscriber to whom the labels are released, the date of the release, and the approximate date of use. The footage represented by the label shall be within ± 10 percent of the actual footage of cable on the reel. Manufacturers may not use the Listing Mark until UL has authorized its use.

SERVICE CHARGE

The Listing Marks will be released at the following rates:

Listing Mark Denomination	Price Per One Thousand Listing Marks
100 feet	\$ 29.16
200 feet	58.31
250 feet	72.89
500 feet	145.78
1,000 feet	291.55
5,000 feet	1457.75
10,000 feet	2915.50

The Service Charge for these Listing Marks does not include Follow-Up Test charges for Laboratory Tests. Consequently, Follow-Up Test costs will be charged directly to the manufacturer when this product is tested at UL.

ORDERING LISTING MARKS

All orders for combination Listing Marks may be placed with the Label Center at the UL office to which the manufacturer normally makes new-work submittals. When placing orders with the UL Label Center, please reference the new Listing category as:

Label Account 13, Classification 10

Nondenominational Listing Marks (labels without a footage imprint) and Computer-Generated Markings (labels printed by the manufacturer) are also available under this Listing Service. When Nondenominational and/or Computer-Generated labels are used by a Subscriber, UL service charges are recovered through the reporting of monthly production figures at the Subscriber's facility. *Please note that the use of Nondenominational and/or Computer-Generated labels requires Procedure authorization, which is obtained through a 2-part evaluation conducted by the Follow-Up Services Department.*

Anyone requesting further information regarding Listing Marks should contact Mr. William Kline of our Follow-Up Services Department, at UL's Melville Office (516) 271-6200, Extension 22544.

INSPECTION PROGRAM

The Type L Follow-Up Services Inspection Program for this cable includes periodic visits to the manufacturing location, where the UL Representative will witness the performance of Factory Follow-Up Testing and select samples for further testing at UL.

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Anyone interested in having their cable Listed by UL under the new category should contact either Brett Milau at UL's Melville facility at (516) 271-6200, Extension 22592 or David Cassano at UL's Santa Clara facility at (408) 985-2400, Extension 32109.

A P P E N D I X BGUIDE INFORMATION FOR
INSTRUMENTATION TRAY CABLE (NYTT)

Type ITC instrumentation tray cable is intended for use only in industrial establishments in accordance with Article 727 of the National Electrical Code. The cable consists of two or more insulated copper or thermocouple-alloy conductors enclosed within a nonmetallic jacket. Cables may have a metal sheath or armor over the nonmetallic jacket. The cable may contain grounding conductors and/or optical-fiber members.

These cables are rated 300 volts and are intended for use on circuits rated 150 volts or less and 5 amperes or less. The cable is Listed in conductor size Nos. 22 - 12 AWG. Conductor sizes within a cable may be mixed.

Cable identification "TYPE ITC" and other markings are visible on the surface of the nonmetallic jacket.

Cables with thermocouple-alloy conductors are intended for thermocouple-extension use only and are so marked or have the marking "THCPL EXTN".

The temperature rating of the cable is 60°C unless otherwise marked on the cable.

Cables containing optical-fiber members are identified with the suffix "-OF".

Cables that have been evaluated in accordance with the Limited-Smoke Test requirements specified in the UL 1685 Standard Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables are marked with the suffix "-LS".

Cables investigated for direct burial in the earth are marked "DIRECT BURIAL" or "DIR BUR".

Regarding cable seals as outlined in Article 501 of the National Electrical Code, Type ITC cable has a sheath that is considered to be gas/vapor-tight but the cable has not been investigated for inability to transmit gases through its core.

The basic Standard used to investigate products in this category is UL 2250, "Instrumentation Tray Cable".

The Listing Mark of Underwriters Laboratories Inc. on the product is the only method provided by UL to identify products manufactured under its Listing and Follow-Up Service. The Listing Mark for these products includes the name and/or symbol of Underwriters Laboratories Inc. (as illustrated in the Introduction to this Directory) together with the word "LISTED"; a control number; and the product name "Instrumentation Tray Cable", Type ITC.

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Subjects 2250 (13, 1277)
 (In reply, refer to Subject 2250)

1285 Walt Whitman Road
 Melville, NY 11747
 February 28, 1996

TO: Electrical Council of Underwriters Laboratories Inc.,
 Subscribers to UL's Standards Services for
 Power-Limited Circuit Cables
 Electrical Power and Control Tray Cables With Optional Optical-Fiber Members

SUBJECT: Request for Comments on the Proposed First Edition of the Standard for Instrumentation
 Tray Cable, UL 2250; PROPOSED EFFECTIVE DATE

SUMMARY OF TOPICS

This bulletin proposes the first edition of the Standard for Instrumentation Tray Cable.

COMMENTS DUE: APRIL 10, 1996

Attached as Appendix A for your review and comment is the proposed First Edition of the Standard for Instrumentation Tray Cable, UL 2250. Questions regarding interpretation of requirements should be directed to the responsible UL Staff. Please see Appendix B of this bulletin regarding designated responsibility for the subject product category.

Please note that proposed requirements are of a tentative and early nature and are for review and comment only. Current requirements are to be used to judge a product until these requirements are published in final form.

PROPOSED EFFECTIVE DATE

These proposed requirements will not necessitate a review or additional testing of currently Listed products. Therefore, UL proposes that the new requirements become effective upon publication.

IMPACT

A new category will be created to List these cables.

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REQUEST FOR COMMENTS ON PROPOSALS

Please provide the following:

1. Your comments concerning the proposed requirements; and
2. Your comments concerning the proposed effective date, should the proposals be adopted.

Comments should be made in writing and may be sent by fax (516-271-6221) or by mail to the attention of Mr. Steven L. Dinowitz at UL's Melville office, 1285 Walt Whitman Road, Melville, NY 11747-3081. Please reference all correspondence to Subject 2250.

All comments should be sent by April 10, 1996.

Unless specifically requested to do so, UL will not acknowledge comments indicating concurrence with these proposals.

UNDERWRITERS LABORATORIES INC.

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2250BUL.D01;SLD;cit

PROPOSED REQUIREMENTS ARE OF A TENTATIVE AND EARLY NATURE AND ARE FOR REVIEW AND COMMENT ONLY. CURRENT REQUIREMENTS ARE TO BE USED TO JUDGE A PRODUCT UNTIL THESE REQUIREMENTS ARE PUBLISHED IN FINAL FORM.

A P P E N D I X A

PROPOSED FIRST EDITION OF THE STANDARD FOR INSTRUMENTATION TRAY CABLE, UL 2250

(FEBRUARY 1996 - DRAFT)

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FOREWORD

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with the Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

INTRODUCTION

1 Scope

1.1 These requirements cover Type ITC instrumentation control cables consisting of two or more current-carrying copper or thermocouple alloy conductors with or without either or both (1) grounding conductor(s), and (2) one or more optical-fiber members, all under an overall jacket. These electrical and composite electrical/optical-fiber cables are intended for use (optical and electrical functions associated in the case of a hybrid cable) on circuits rated 150 V or less and 5 A or less in accordance with Article 727 and other applicable parts of the National Electrical Code (NEC).

1.2 These cables are rated 300 V and are so marked. Cables for direct-burial are so marked. Type ITC Cables comply with a 70,000 Btu/h (20.5 kW) vertical-tray flame test. At the cable manufacturer's option, the test is either of the following:

- a) The UL test described in 31.2.1 and 31.2.2 of these requirements. These paragraphs apply the test method of UL 1581 Section 1160.
- b) The FT4 test as described in 31.3.1 of these requirements. This paragraph applies the test method of UL 1581 Section 1164.
- c) The UL test described in 31.4.1 and 31.4.2 of these requirements. These paragraphs apply the test method of UL 1685.

1.3 A cable that contains one or more electromagnetic shields may be surface marked or have a marker tape to indicate that it is "shielded". A cable that contains one or more optical-fiber members has "-OF" supplementing the type letters and is limited (see 14.2) to carrying optical energy that has been ruled not hazardous to the human body. A cable may consist of or contain one or more coaxial members.

1.4 These cables may have a metal sheath or armor over the required non/metallic jacket

1.5 These requirements do not cover the optical or other performance of any optical-fiber member or group of such members.

1.6 The overall jacket on Type ITC cable is a "gas/vapor-tight continuous sheath" in the sense discussed in Sections 501-5(d) and 501-5(e) of the National Electrical Code, ANSI/NFPA 70-1996, (see the last sentence of 16.1.1).

1.7 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this Standard, and that involves a risk of fire, electric shock, or injury to persons shall be evaluated using the appropriate additional component and end-product requirements as determined necessary to maintain the acceptable level of safety as originally anticipated by the intent of this Standard. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this Standard cannot be judged to comply with this Standard. Where considered appropriate, revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this Standard.

2 Units of Measurement

2.1 In addition to being stated in the inch/pound units that are customary in the USA, each of the requirements in this Standard is also stated in units that make the requirement conveniently usable in countries employing the various metric systems (practical SI and customary). Equivalent – although not necessarily exactly identical – results are to be expected from applying a requirement in USA or metric terms. Equipment calibrated in metric units is to be used when a requirement is applied in metric terms.

3 References

3.1 Wherever the designation "UL 1581" is used in this standard, reference is to be made to the designated part(s) of the Reference Standard for Electrical Wires, Cables, and Flexible Cords (UL 1581).

3.2 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

CONSTRUCTION

4 Materials

4.1 Each material used in a cable shall be compatible with all of the other materials used in the cable.

4.2 Instrumentation tray cable shall comply in all respects with the applicable requirements for construction details, test performance, and markings.

5 Conductors

5.1 The conductors shall be of soft-annealed copper or thermocouple alloy. Soft-annealed copper shall comply with ASTM B 3 – 95. A metal coating that is provided on soft-annealed copper, in compliance with Section 8 shall be of tin complying with ASTM B 33 – 94, of a tin/lead alloy complying with ASTM B 189 – 95, of nickel complying with ASTM B 355 – 95, of silver complying with ASTM B 298–94 or of another metal or alloy (evaluation required). Thermocouple alloys are not specified.

5.2 Each conductor shall be continuous throughout the entire length of the finished cable - see test in 19.1 and 19.2.

6 Size, Temper, and Assembly

6.1 Conductors shall be solid or stranded 22 – 12 AWG copper or solid size 22 – 12 AWG thermocouple alloy. The sizes of thermocouple-extension wire are nominal and are intended only for use in the cable marking that is described in 38.1(h). The conductor in a thermocouple-extension wire is not required to comply with a diameter or resistance value.

7 Conductor Diameter and Cross-Sectional Area

7.1 The diameter of a solid conductor shall not be smaller than indicated in Table 20.1 of UL 1581 when determined as described in 200.1 and 200.2 of UL 1581. The cross-sectional area of a stranded conductor shall not be smaller than indicated in the 0.98X nominal column Table 20.1 of UL 1581 when determined as required in 7.2.

7.2 The cross-sectional area of a stranded conductor is to be determined either:

- a) As the sum of the areas of its component strands, or
- b) By the weight method outlined in 210.1 – 210.4 of UL 1581.

8 Metal Coating

8.1 If the insulation adjacent to a conductor is of a material that corrodes unprotected copper in the test in 500.1 of UL 1581, and if a protective separator is not provided, the solid conductor and each of the individual strands of a stranded conductor shall be separately covered with a metal or alloy coating complying with 5.1 as applicable to the finished wire type.

8.2 In the case of a stranded conductor on which a coating is not needed for corrosion protection but is solely to keep the insulation from adhering to copper, it is acceptable to coat only the wires of the outer layer.

8.3 The maximum temperature rating of the cable is not specified relative to the diameter of copper wires used in the serving, wrap, or braid shielding described in 15.5.2(b). Otherwise, copper strands and solid copper conductors shall not be used in a cable with a temperature rating higher than indicated in Table 8.1.

Table 8.1
Maximum temperature rating of cable relative to
diameter and coating of solid copper conductor or
of copper conductor strands

Metal coating of copper strands or of solid copper conductor	Diameter of each strand or of the solid conductor	
	Smaller than 0.015 inches or 0.38 mm	At least 0.015 inches or 0.38 mm
Uncoated or coated with tin or a tin/lead alloy	150°C (302°F)	200°C (392°F)
Coated with silver	200°C (392°F)	200°C (392°F)
Coated with nickel	Over 200°C (392°F)	200°C (392°F)

9 Separator

9.1 A separator is acceptable between the conductor and the insulation of a solid or stranded wire or cable, but is not required. A separator shall be insulating but shall not be considered to be part of the required insulation.

9.2 A separator used between a conductor and insulation shall be colored or shall be opaque to make the separator clearly distinguishable from the conductor once the insulation is removed. The color shall be other than green or green and yellow and may be solid, striped, or in some other pattern.

10 Joints

10.1 A joint in a solid conductor or in one of the individual wires of a stranded conductor shall be made in a workmanlike manner, shall be essentially smooth, and shall not have any sharp projections. A joint in a stranded conductor shall be made by separately joining each individual wire. A joint made before insulation is applied to a conductor shall not increase the diameter of the solid conductor or individual wire (strand). The insulation applied to joints made after insulating shall be equivalent to that removed and shall comply with the requirements in this standard.

11 Resistance

11.1 The direct-current resistance of any length of conductor shall not be higher than the maximum acceptable (nominal $\times 1.02$) indicated in the applicable one of the eleven Tables 30.1 – 30.5, 30.5A, and 30.6 – 30.10 of UL 1581 at 20°C (68°F) or at 25°C (77°F) or in Table 11.1 or 11.2 of this Standard when measured as described in 220.1 – 220.9 of UL 1581.

Table 11.1
Maximum acceptable direct-current resistance of solid copper conductors

AWG size of conductor	Uncoated				Coated			
	20°C		25°C		20°C		25°C	
	Ohms per 1000 Feet	Ohms per Kilo- meter	Ohms per 1000 Feet	Ohms per Kilo- meter	Ohms per 1000 Feet	Ohms per Kilo- meter	Ohms per 1000 Feet	Ohms per Kilo- meter
22	16.5	54.1	16.8	55.1	17.2	56.4	17.5	57.4
21	13.1	43.0	13.3	43.6	13.6	44.6	13.8	45.3
20	10.3	33.8	10.5	34.5	10.7	35.1	10.9	35.8
19	8.21	26.9	8.37	27.4	8.54	28.0	8.70	28.5
18	6.52	21.4	6.65	21.8	6.78	22.2	6.91	22.7
17	5.15	16.9	5.25	17.2	5.36	17.6	5.47	17.9
16	4.10	13.5	4.18	13.7	4.26	14.0	4.35	14.3
15	3.24	10.6	3.30	10.8	3.37	11.1	3.43	11.3

Table 11.2
Maximum acceptable direct-current resistance of stranded copper conductors

AWG size of conductors	Uncoated				Coated			
	20°C		25°C		20°C		25°C	
	Ohms per 1000 Feet	Ohms per Kilo- meter	Ohms per 1000 Feet	Ohms per Kilo- meter	Ohms per 1000 Feet	Ohms per Kilo- meter	Ohms per 1000 Feet	Ohms per Kilo- meter
22	16.9	55.4	17.2	56.4	17.5	57.4	17.9	58.7
21	13.3	43.6	13.6	44.6	13.9	45.6	14.1	46.3
20	10.5	34.4	10.7	33.1	10.9	35.8	11.1	36.4
19	8.39	27.5	8.66	28.4	8.71	28.6	8.87	29.1
18	6.66	21.9	6.79	22.3	6.92	22.7	7.04	23.1
17	5.29	17.4	5.40	17.7	5.47	17.9	5.59	18.3
16	4.19	13.7	4.27	14.0	4.35	14.3	4.44	14.6
15	3.30	10.8	3.37	11.1	3.44	11.3	3.50	11.5

12 Stranding

12.1 A stranded wire or cable shall have a minimum of seven strands. The length of lay of the strands shall be a maximum of 20 times the diameter of the conductor. The direction of the lay shall be left-hand.

12.2 The individual wires used in making up a stranded conductor are usually drawn to a specified mil diameter which may or may not be the diameter of any AWG or other standard gauge number. The individual wires of a concentric-lay-stranded conductor are not necessarily all of the same diameter.

13 Insulation

13.1 Material and application

13.1.1 Each conductor shall be insulated for its entire length with one or more of the insulation materials indicated in Table 13.1 or referenced in note ^a to Table 13.1. The insulation shall be solid. In any case, a solid dielectric skin (a thin, solid, extruded layer that may or may not be separable) of the same or other material from Table 13.1 may be applied over the solid insulation. The insulation shall be applied directly to the conductor, shall have a circular cross section, and shall fit tightly to the conductor but shall not adhere excessively. The insulation shall be uniform and shall not have any defects (bubbles, open spots, rips, tears, cuts, or foreign material) that are visible with normal or corrected vision without magnification.

Table 13.1
Index to insulations

Material(s) ^a	Insulation	Applicable table of physical properties in UL 1581 (see 13.2)
CP	90°C (194°F) solid	50.1
	75°C (167°F) solid	50.1
ECTFE and ETFE	150°C (302°F) solid	50.63 —
FEP	200°C (392°F) ^b solid	50.70 —
HDFRPE and LDFRPE	75°C (167°F) solid	50.133 —
HDPE	75°C (167°F) solid	50.136 —
LDPE	75°C (167°F) solid	50.136 —
PFA	200°C (392°F) ^b solid	50.137 —
PP (polypropylene)	75°C (167°F) solid	50.139 —
	60°C (140°F) solid	50.139 —
PTFE (TFE)	250°C (482°F) ^b solid	50.219 —
PVC	105°C (221°F) solid	50.182
	90°C (194°F) solid	50.182
	75°C (167°F) solid	50.182
	60°C (140°F) solid	50.182

(Continued)