

AMERICAN NATIONAL STANDARD

ANSI/ISA-61241-1 (12.10.03)-2006 (R2015)

**Electrical Apparatus for Use in Zone 21 and
Zone 22 Hazardous (Classified) Locations –
Protection by Enclosures “tD”**

Approved 29 September 2015

ANSI/ISA-61241-1 (12.10.03)-2006 (R2015), Electrical Apparatus for Use in Zone 20, Zone 21 and Zone 22 Hazardous (Classified) Locations – Protection by Enclosures “tD”

ISBN: 978-1-941546-38-3

Copyright © 2015 by IEC and ISA. All rights reserved. Not for resale. Printed in the United States of America. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic mechanical, photocopying, recording, or otherwise), without the prior written permission of the Publisher.

ISA
67 Alexander Drive
P.O. Box 12277
Research Triangle Park, North Carolina 27709

Preface

This preface, as well as all footnotes and annexes, is included for information purposes and is not part of ANSI/ISA-61241-1 (12.10.03)-2006 (R2015).

This document has been prepared as part of the service of ISA toward a goal of uniformity in the field of instrumentation. To be of real value, this document should not be static but should be subject to periodic review. Toward this end, the Society welcomes all comments and criticisms and asks that they be addressed to the Secretary, Standards and Practices Board; ISA; 67 Alexander Drive; P. O. Box 12277; Research Triangle Park, NC 27709; Telephone (919) 549-8411; Fax (919) 549-8288; E-mail: standards@isa.org.

The ISA Standards and Practices Department is aware of the growing need for attention to the metric system of units in general, and the International System of Units (SI) in particular, in the preparation of instrumentation standards. The Department is further aware of the benefits to USA users of ISA standards of incorporating suitable references to the SI (and the metric system) in their business and professional dealings with other countries. Toward this end, this Department will endeavor to introduce SI-acceptable metric units in all new and revised standards, recommended practices, and technical reports to the greatest extent possible. *Standard for Use of the International System of Units (SI): The Modern Metric System*, published by the American Society for Testing & Materials as IEEE/ASTM SI 10-97, and future revisions, will be the reference guide for definitions, symbols, abbreviations, and conversion factors.

It is the policy of ISA to encourage and welcome the participation of all concerned individuals and interests in the development of ISA standards, recommended practices, and technical reports. Participation in the ISA standards-making process by an individual in no way constitutes endorsement by the employer of that individual, of ISA, or of any of the standards, recommended practices, and technical reports that ISA develops.

CAUTION — ISA DOES NOT TAKE ANY POSITION WITH RESPECT TO THE EXISTENCE OR VALIDITY OF ANY PATENT RIGHTS ASSERTED IN CONNECTION WITH THIS DOCUMENT, AND ISA DISCLAIMS LIABILITY FOR THE INFRINGEMENT OF ANY PATENT RESULTING FROM THE USE OF THIS DOCUMENT. USERS ARE ADVISED THAT DETERMINATION OF THE VALIDITY OF ANY PATENT RIGHTS, AND THE RISK OF INFRINGEMENT OF SUCH RIGHTS, IS ENTIRELY THEIR OWN RESPONSIBILITY.

PURSUANT TO ISA'S PATENT POLICY, ONE OR MORE PATENT HOLDERS OR PATENT APPLICANTS MAY HAVE DISCLOSED PATENTS THAT COULD BE INFRINGED BY USE OF THIS DOCUMENT AND EXECUTED A LETTER OF ASSURANCE COMMITTING TO THE GRANTING OF A LICENSE ON A WORLDWIDE, NON-DISCRIMINATORY BASIS, WITH A FAIR AND REASONABLE ROYALTY RATE AND FAIR AND REASONABLE TERMS AND CONDITIONS. FOR MORE INFORMATION ON SUCH DISCLOSURES AND LETTERS OF ASSURANCE, CONTACT ISA OR VISIT WWW.ISA.ORG/STANDARDSPATENTS.

OTHER PATENTS OR PATENT CLAIMS MAY EXIST FOR WHICH A DISCLOSURE OR LETTER OF ASSURANCE HAS NOT BEEN RECEIVED. ISA IS NOT RESPONSIBLE FOR IDENTIFYING PATENTS OR PATENT APPLICATIONS FOR WHICH A LICENSE MAY BE REQUIRED, FOR CONDUCTING INQUIRIES INTO THE LEGAL VALIDITY OR SCOPE OF PATENTS, OR DETERMINING WHETHER ANY LICENSING TERMS OR CONDITIONS PROVIDED IN CONNECTION WITH SUBMISSION OF A LETTER OF ASSURANCE, IF ANY, OR IN ANY LICENSING AGREEMENTS ARE REASONABLE OR NON-DISCRIMINATORY.

ISA REQUESTS THAT ANYONE REVIEWING THIS DOCUMENT WHO IS AWARE OF ANY PATENTS THAT MAY IMPACT IMPLEMENTATION OF THE DOCUMENT NOTIFY THE ISA STANDARDS AND PRACTICES DEPARTMENT OF THE PATENT AND ITS OWNER.

ADDITIONALLY, THE USE OF THIS DOCUMENT MAY INVOLVE HAZARDOUS MATERIALS, OPERATIONS OR EQUIPMENT. THE DOCUMENT CANNOT ANTICIPATE ALL POSSIBLE APPLICATIONS OR ADDRESS ALL POSSIBLE SAFETY ISSUES ASSOCIATED WITH USE IN HAZARDOUS CONDITIONS. THE USER OF THIS DOCUMENT MUST EXERCISE SOUND PROFESSIONAL JUDGMENT CONCERNING ITS USE AND APPLICABILITY UNDER THE USER'S PARTICULAR CIRCUMSTANCES. THE USER MUST ALSO CONSIDER THE APPLICABILITY OF ANY GOVERNMENTAL REGULATORY LIMITATIONS AND ESTABLISHED SAFETY AND HEALTH PRACTICES BEFORE IMPLEMENTING THIS DOCUMENT.

THE USER OF THIS DOCUMENT SHOULD BE AWARE THAT THIS DOCUMENT MAY BE IMPACTED BY ELECTRONIC SECURITY ISSUES. THE COMMITTEE HAS NOT YET ADDRESSED THE POTENTIAL ISSUES IN THIS VERSION.

The following people served as members of ISA Subcommittee ISA12.10:

NAME	COMPANY
A. Engler, Chair	Det Norske Veritas DNV
M. Coppler,* Managing Director	Ametek Inc.
S. Arnold*	Ametek Drexelbrook
D. Bishop	David N Bishop Consultant
E. Briesch	Underwriters Laboratories Inc.
R. Buschart	Cable Tray Institute
R. Fontaine	FM Approvals
J. Kuczka	Killark
E. Massey	Rockwell Automation
A. Page	MSHA Approval & Certification Center
P. Schimmoeller	CSA International
T. Schnaare	Rosemount Inc.
D. Wechsler	Dow Chemical Company
R. Wigg	E-x Solutions International Pty. Ltd.

* One vote per company.

The following people served as members of ISA Committee ISA12:

NAME	COMPANY
T. Schnaare, Chair	Rosemount Inc.
W. Lawrence, Vice Chair	FM Approvals
M. Coppler, Managing Director	Ametek Inc.
N. Abbatiello	Optimization Technology
D. Ankele	Underwriters Laboratories Inc.
A. Ballard	Crouse Hinds Division of Cooper Industries
D. Bishop	David N Bishop Consultant
H. Bockle	R. Stahl Inc.
K. Boegli	Phoenix Contact Inc.
D. Burns	Shell Exploration & Production Company
R. Buschart	Cable Tray Institute
R. Cardinal	Bently Nevada LLC

C. Casso
J. Cospolich
S. Czaniecki
J. Dolphin
T. Dubaniewicz
U. Dugar
A. Engler
W. Fiske
G. Garcha
D. Hohenstein
D. Jagger
P. Jonscher
F. Kent
P. Kovscek
J. Kuczka
B. Larson
E. Massey
A. Mobley
S. Nguyen
A. Page
P. Schimmoeller
R. Seitz
D. Wechsler
R. Wigg

Nabors Industries
Waldemar S Nelson & Company Inc.
Intrinsic Safety Concepts Inc.
PSC Solutions
NIOSH
Mobil Chemical Company
Det Norske Veritas DNV
Intertek Testing Services
GE Energy
Pepperl + Fuchs Inc.
Bifold-Fluid Power
Adalet PLM
Honeywell Inc.
Industrial Scientific Corporation
Killark
Turck Inc.
Rockwell Automation
3M Company
Siemens Milltronics Ltd.
MSHA Approval & Certification Center
CSA International
Artech Engineering
Dow Chemical Company
E-x Solutions International Pty. Ltd.

* One vote per company.

This standard was approved for publication by the ISA Standards and Practices Board on 24 July 2006.

NAME

COMPANY

I. Verhappen, Vice President
F. Amir
D. Bishop
M. Coppler
B. Dumortier
W. Holland
E. Icyan
A. Iverson
R. Jones
K. Lindner
V. Maggioli
T. McAviney
A. McCauley
G. McFarland
R. Reimer
N. Sands
H. Sasajima
T. Schnaare
J. Tatera
R. Webb
W. Weidman
J. Weiss
M. Widmeyer
M. Zielinski

MTL Instrument Group
E I Du Pont Company
David N Bishop Consultant
Ametek Inc.
Schneider Electric
Consultant
ACES Inc.
Ivy Optiks
Consultant
Endress + Hauser Process Solutions AG
Feltronics Corporation
Jacobs Engineering Group
Chagrin Valley Controls Inc.
Emerson Process Mgmt. Pwr & Water Solutions
Rockwell Automation
E I du Pont
Yamatake Corporation
Rosemount Inc.
Tatera & Associates Inc.
Robert C. Webb PE
Worley Parsons
KEMA Inc.
Stanford Linear Accelerator Center
Emerson Process Management

The following members of ISA12 reaffirmed this standard in 2015.

NAME	COMPANY
T. Schnaare, Chair	Rosemount Inc.
W. Lawrence, Vice Chair	FM Approvals LLC
M. Coppler, Managing Director	Det Norske Veritas Certification Inc.
R. Allen	Honeywell Inc.
D. Ankele	UL LLC
K. Boegli	Consultant
D. Burns	Shell P&T – Innovation / R&D
M. Dona	Santos Ltd.
T. Dubaniewicz	NIOSH
D. El Tawy	Solar Turbines Incorporated
W. Fiske	Intertek
G. Garcha	GE Water and Power
R. Holub	The DuPont Company Inc.
P. Kavscek	Industrial Scientific Corporation
E. Leubner	Eaton's Crouse-Hinds Business
N. Ludlam	FM Approvals Ltd.
E. Massey	Baldor Electric Company
J. Miller	Detector Electronics Corporation
A. Page	Consultant
R. Seitz	Artech Engineering
R. Sierra	USCG
M. Spencer	Columbia Gas Transmission
R. Wigg	E-x Solutions International Pty. Ltd.

This standard was reaffirmed by the Standards and Practices Board on 7 September 2015.

NAME	COMPANY
N. Sands, Vice President	DuPont
D. Bartusiak	ExxonMobil Research & Engineering
P. Brett	Honeywell Inc.
E. Cosman	OIT Concepts, LLC
D. Dunn	Phillips 66
J. Federlein	Federlein & Assoc. Inc.
B. Fitzpatrick	Wood Group Mustang
J. Gilsinn	Kenexis Consulting
J. Hauet	KB Intelligence
J. Jamison	Encana Corp.
K. P. Lindner	Endress + Hauser Process Solutions AG
V. Maggioli	Feltronics Corp.
T. McAviney	Instrumentation and Control Engineering, LLC
V. Mezzano	Fluor Corporation
C. Monchinski	Automated Control Concepts Inc.
H. Sasajima	Azbil Corp.
T. Schnaare	Rosemount Inc.
J. Tatera	Tatera & Associates Inc.
K. Unger	Stone Technologies Inc.
I. Verhappen	Orbis Engineering Field Services
W. Weidman	WCW Consulting
J. Weiss	Applied Control Solutions LLC
M. Wilkins	Yokogawa IA Global Marketing (USMK)
D. Zetterberg	Chevron Energy Technology Co.

This page intentionally left blank.

CONTENTS

Foreword.....	11
1 Scope	13
2 Normative references	13
3 Terms and definitions	14
4 Construction	14
5 Practice A and practice B	14
6 Supplementary Requirements for electrical apparatus protected by enclosures for practice A for use in zones 20 , 21 and 22	14
6.1 General.....	14
6.2 <u>Joints</u>	15
7 Supplementary Requirements for electrical apparatus protected by enclosures for practice B for use in zone 20 or 21 or <u>22</u>	16
7.1 <u>General</u>	16
7.2 Joints.....	16
7.3 Operating rods, spindles or shafts	18
7.4 Clearance of bolts	19
8 Verification and tests	20
8.1 General.....	20
8.2 Type tests	20
9 Marking.....	22
<u>Annex A U.S. major deviations</u>	23
Bibliography	25
Figure 1 – Plain joints.....	17
Figure 2 – Spigotted joints	17
Figure 3 – Gasketed joints	18
Figure 4 – Power shafts for speeds of 100r/min or more	19
Figure 5 – Clearance of bolts	20
Table 1 – Plain joints	17
Table 2 – Gasketed joints	18
Table 3 – Power shafts for speeds of 100 r/min or more	19
Table 4 – Power shafts for speeds of less than 100 r/min	19

This page intentionally left blank.

Foreword

All text of IEC 61241-1:2004 (1st edition) is included. U.S. National Deviations are shown by ~~strikeout~~ through text deleted and underline under text added. There is one annex in this standard. It is informative and is not considered part of this standard.

IEC 61241-1:2004 has been withdrawn and replaced by IEC 60079-31:2008, *Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"*. ANSI/ISA-61241-1 (12.10.03)-2006 (R2015) is being maintained for the 2017 publication of NFPA 70: *National Electrical Code*®, in which the ISA standard is referenced.

This page intentionally left blank.

1 Scope

This ~~part of IEC 61244 standard is~~ applicable to electrical apparatus protected by enclosures and surface temperature limitation for use in ~~areas where combustible dust may be present in quantities which could lead to a fire or explosion hazard~~ explosive dust atmospheres classified as zone 21 or zone 22 hazardous locations in accordance with Article 506 of the NEC®. It specifies requirements for design, construction and testing of electrical apparatus.

This standard supplements the general requirements in ~~IEC 61244-0~~ ANSI/ISA-61241-0.

~~NOTE IEC 61244-14 gives guidance on the selection and installation of the apparatus. Apparatus within the scope of this standard may also be subjected to additional requirements in other standards — for example, IEC 60079-0.~~

The ignition protection is based on the limitation of the maximum surface temperature of the enclosure and on other surfaces which could be in contact with dust and on the restriction of dust ingress into the enclosure ~~by the use of "dust-tight" or "dust-protected" enclosures~~.

The application of electrical apparatus in atmospheres which may contain explosive gas as well as combustible dust, whether simultaneously or separately, requires additional protective measures.

Where the apparatus has to meet other environmental conditions, for example, protection against ingress of water and resistance to corrosion, additional methods of protection may be necessary. The method used should not adversely affect the integrity of the enclosure.

This standard does not apply to dusts of explosives which do not require atmospheric oxygen for combustion, or to pyrophoric substances.

This standard is not applicable to electrical apparatus intended for use in underground parts of mines as well as those parts of surface installations of such mines endangered by firedamp and/or combustible dust.

This standard does not take account of any risk due to an emission of flammable or toxic gas from the dust.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60529:2001, *Degrees of protection provided by enclosures (IP Code)*

IEC 60034-5, *Rotating electrical machines – Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification*