The Automation, Systems, and Instrumentation

DICTIONARY

4th EDITION

ISA

Setting the Standard for Automation™

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The Automation, Systems, and Instrumentation Dictionary

Fourth Edition

ISA–The Instrumentation, Systems, and Automation Society 

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Preface to the Fourth Edition

This edition of *The Automation, Systems, and Instrumentation Dictionary,* formerly entitled *Comprehensive Dictionary of Measurement and Control,* is intended as an essential reference tool for all instrumentation and control professionals. To this end, several features have been added.

Coverage of digital topics has been expanded significantly. Of the over 1000 new definitions that have been added, most are in the areas of software and digital communication. These fields make heavy use of acronyms and abbreviations, so many of these have also been added.

Almost 200 illustrations are included, all new to the dictionary. At the standard exchange rate (1 picture = 1000 words) this is a 40% increase in the information provided.

Some definitions have been classified to increase clarity. A particular term may have one meaning in the context of manufacturing, another in that of control, and yet another in that of computation. Where provided, a classification is shown in brackets (e.g., [Comp]) preceding definition(s). The following classifications are used:

[Comm] - Communications

[Comp] - Computers and Computation

[Cont] - Control

[Eng] - Engineering

[Meas] - Measurement

[Mfg] - Manufacturing

[Proc] - Process

[Safe] - Safety

[Sci] - Science and Mathematics

Each entry consists of the defined term in **boldface**, followed by the definition(s) in regular typeface. If a term has more than one definition, each definition is preceded by a number. Terms are listed in alphabetical sequence, on a letter-by-letter basis. Hyphens, commas, word spacing, etc., within a term are ignored in constructing the sequence. The first and last term on each page are shown in large type at the top of that page.

Definitions are limited to those used in the fields of measurement and control; everyday common usages are omitted. Thus, **worm** is defined as “A shaft having at least one complete spiral tooth…”, but not as a relatively small elongated soft-bodied animal.

All definitions from ISA Standards are included. Each definition from a standard is followed by the designation of that standard (e.g., [ISA-12.01.01-1999]) in brackets. A separate section contains a full numerical list of ISA Standards. ISA Standards definition may have been changed slightly for readability. Please reference the standard for full information.

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Paul G. Friedmann

Definitions

A

α
(alpha) Average percentage change in resistance per degree of pure metal resistance of device between 0°C and 100°C. Usually designated by the Greek letter alpha, with units of W/W/ °C.

aberration
Deviation from ideal behavior by a lens, optical system, or optical component. Aberration exists in all optical systems, and designers must make trade-offs among the different types depending on how much aberration they will tolerate.

ABI
Application Binary Interface; to run without porting.

abnormally distributed uncertainty
In the ISA recommended practice ISA-RP67.04.022000 this term denotes uncertainties that do not have a normal distribution.

abort
In data processing, to terminate a computer operation before its normal conclusion.

abrasion
1. The act of removing surface material from a substance through sliding or rolling contact with the hard particles made of the same or another substance. The particles themselves may be loose or part of another surface brought into contact with the first. 2. A surface blemish caused by roughening or scratching.

abrasive
1. Particulate matter, usually having sharp edges or points, that can be used to shape and finish workpieces

in grinding, honing, lapping, polishing, blasting, or tumbling processes. Depending on the process, abrasives may be loose, formed into solid shapes, glued to paper or cloth, or suspended in a paste, slurry, or air stream. 2. Any substance capable of removing material from a surface through the act of abrasion. 3. A material formed into a solid mass, usually fired or sintered, and used to grind or polish workpieces; common forms are grinding wheels, abrasive disks, honing sticks, cones, and burrs.

ABS

Acrylonitrile butadiene styrene; frequently used for enclosures; good high-temperature resistance with high impact strength and cold-temperature impact, good overall chemical resistance; can be adversely affected by ultraviolet.

absolute accuracy error

The deviation of the analog value at any code from its theoretical value after the full-scale range has been calibrated. Expressed in percent, ppm, or fractions of 1 LSB.

absolute address

An address that indicates the exact storage location at which the referenced operand is to be found or stored in the actual machine code address numbering system. It is synonymous with *specific address* and *actual address* and related to *absolute code*.

absolute alarm

An alarm caused when a system has detected a variable that has exceeded a set of prescribed high- or low-limit conditions.

absolute altimeter

See *terrain clearance indicator*.

absolute altitude

Distance between an aircraft or spacecraft and the actual surface of a planet or natural satellite.

absolute code
Coding that uses machine instructions with absolute addresses. Synonymous with *specific code*.

absolute encoder
An electronic or electromechanical device that produces a unique digital output (in coded form) for each value of an analog or digital input. In an absolute rotary encoder, for instance, you can determine directly the position following any incremental movement, without having to refer to the starting position.

absolute feedback
In numerical control, the action of assigning a unique value to each possible position of a machine slide or actuating member.

absolute humidity
The weight of water vapor in a gas–water vapor mixture per unit volume of space occupied, as, for example, grains or pounds per cubic foot.

absolute instrument
An instrument that determines the value of a measured quantity in absolute units by making a simple physical measurement.

absolute measurement
A measured value that is expressed in terms of fundamental standards of distance, mass, and time.

absolute pressure
1. The pressure measured relative to zero pressure (vacuum). 2. The combined local pressure that is induced by some source and the atmospheric pressure at the location of the measurement. 3. Gauge pressure plus barometric pressure expressed in the same units of measurement.

absolute programming
In numerical control, the process of using a single point of reference to determine all positions and dimensions.

absolute stability
A linear system is absolutely stable if there exists a limiting value of the open-loop gain such that the system is stable for all lower values of that gain and unstable for all higher values.

absolute value error
The magnitude of the error disregarding the algebraic sign or, if a vectorial error, disregarding its direction.

absolute viscosity
A measure of the internal shear properties of fluids. It is expressed as the tangential force per unit area at either of two horizontal planes separated by one unit thickness of a given fluid, with one of the planes fixed and the other moving with unit velocity.

absorbance
An optical property expressed as log $(1/T)$, where T is the transmittance.

absorptance
The fraction of the incident light absorbed by something.

absorption
[Sci] 1. The reduction in intensity of a beam of electromagnetic or particulate radiation as it passes through matter. This reduction is chiefly due to interactions with atoms or electrons or with their electric and magnetic fields. [Comm] 2. In fiber-optic cable, the loss of power resulting from the conversion of optical energy into heat. This loss is usually caused by impurities such as transition metals and hydroxyl ions.

absorption band
A region of the electromagnetic spectrum in which a given substance exhibits a high absorption coefficient

compared to adjacent regions of the spectrum.

absorption coefficient
An inherent material property that is expressed as the fractional loss in radiation intensity per unit mass or per unit thickness. It is determined over an infinitesimal thickness of the given material at a fixed wavelength and bandwidth.

absorption curve
A graph showing the variation of transmitted radiation through a fixed sample while the wavelength material of a given thickness is changed at a uniform rate.

absorption dynamometer
A device for measuring mechanical force or power by converting the mechanical energy into heat in a friction mechanism or bank of electrical resistors.

absorption–emission pyrometer
An instrument for determining gas temperature by measuring the radiation emitted by a calibrated reference source both before and after the radiation passes through the gas, where it is partly absorbed.

absorption hygrometer
An instrument for determining the water vapor content of the atmosphere by measuring the amount of water absorbed by a hygroscopic chemical.

absorption meter
An instrument for measuring the quantity of light transmitted through a transparent medium by means of a photocell or other light-detecting device.

absorption spectroscopy
The study of the wavelengths of light that are absorbed by materials and the relative intensities at which different wavelengths are absorbed. This technique can be used to identify materials and measure their optical densities.

AC

Alternating current; electric current that reverses its direction at regularly recurring intervals, such as 60 times/second (60 Hz).

accelerated life test

A method for estimating the reliability or durability of a product by subjecting it to operating conditions above its maximum ratings.

accelerating agent

1. A substance that increases a chemical reaction rate.
2. A chemical that hastens the curing of rubber, plastic, cement or adhesives, and may also improve their properties. Also known as *accelerator*.

accelerating electrode

An auxiliary electrode in an electron tube that is maintained at an applied potential so as to accelerate electrons in a beam.

acceleration

The time rate of change of velocity; the second derivative of a distance function with respect to time.

acceleration error

The maximum difference, at any measured value within the specified range, between output readings taken with and without the application of specified constant acceleration along specified axes. Note: See *transverse sensitivity* when applied in the context of acceleration transducer.

acceleration limit

The maximum vibration and shock acceleration that the transducer can accept in either direction along its sensitive axis without permanent damage. This limit is usually stated as +_____g's. The acceleration limits are usually much wider than the acceleration range and

thereby represent a measure of the overload capability of the transducer. [ISA/RP-37.2 (R1995)]

acceleration range
The range of accelerations over which the transducer has the specified linearity. [ISA/RP-37.2 (R1995)]

acceleration time
[Comp] 1. The amount of time it takes a mechanical component of a computer to go from rest to running speed. [Sci] 2. The measurement of the time required for any object to reach a predetermined speed.

accelerators
A feature of some computer applications to create keyboard commands that provide alternatives to screen menus for selecting choices. The keystroke has special meaning within that particular application, which means more involved, but usually more “user- friendly,” procedures can be saved for making requests or entries.

accelerometer
1. An instrument for measuring acceleration or an accelerating force such as gravity. If the instrument includes provisions for making a recorded output, it is called an “accelerograph.” 2. A transducer used to measure linear or angular acceleration.

acceptance angle
In fiber-optic cable, the half angle of cone within which incident light is totally reflected internally by the fiber core.

acceptance test
A series of tests used to demonstrate the capabilities and workability of a new system and usually conducted by the manufacturer to show the customer that the system is in working order.

access

The state in which it is permissible to place information into, or retrieve information, from a storage device.

access, direct storage (DSA)
The procedure whereby data are transferred to or from storage that is essentially coincident with the normal operation of a computer, without disturbing the central processing unit registers. [ISA/RP-55.1-1975 (R1983)]

access, random
1. The process of obtaining data from, or placing data into, storage such that the time required for such access is independent of the location of the data most recently obtained or stored. 2. A type of storage device in which the access time is effectively independent of the location of the data. [ISA/RP-55.1-1975 (R1983)]

access, serial
The process of obtaining data from, or placing data into, storage when there is a sequential relation governing the time it takes to access successive storage locations. [ISA/RP-55.1-1975 (R1983)]

access code
A group of alphanumeric characters that identifies the user to the system so information can be placed or retrieved by other devices in the system.

access line
The portion of a leased communication line, such as in a telephone system, that permanently connects the user with the serving central office or wire center.

access method
Any of the data-management techniques available to the user for transferring data between main storage and an input/output device.

access privilege
The right or permission to access (read or write) a file that is granted by the processor after such permission

has been requested.

access procedures
The procedure by which the devices attached to the network gain access to the medium. The access procedure typically includes provisions for guaranteeing fairness in the sharing of the network bandwidth between attached devices. The most common access procedures for LANs are CSMA/CD, token bus, token ring, and slotted ring. See *MAC*.

access time
1. The interval between a request for stored information and the delivery of that information; often used to refer to the speed of memory. 2. The time interval that is characteristic of a storage unit. A measure of the time required to locate information in a storage position and make it available for processing or to return information from the processing unit to a storage location.

access unit interface
(AUI) The optional interface between a data station that uses an IEEE 802.3 LAN and a transceiver or modem. The AUI makes it possible to transparently connect a data station to either baseband or broadband media.

accessible
1. A system feature that is viewable by and interactive with the operator, and allows the operator to perform user-permitted control actions, for example, make set point changes and auto–manual transfers or perform on–off action. 2. The capacity to be touched with a standard test finger or test pin, when used as specified in Section 6.2 of ANSI/ISA-82.02.01-1999 (IEC 1010-1 Mod). [ANSI/ISA-82.02.01-1999 (IEC 1010-1 Mod)]

accessible area
An area that is routinely or periodically entered by plant personnel in their performance of routine functions

during normal plant operation and in accordance with applicable health physics procedures. [ISA-67.03-1982]

accessible isolation valve
The isolation valve that is nearest the measured process on an instrument-sensing line, which is available to personnel during normal plant operation. The root valve may or may not perform the function of the accessible isolation valve, depending on where it is located. [ANSI/ISA-67.02.01-1999]

accessible part
A part that can be touched during normal use or operator servicing. [ANS/ISA-82.01.01-1999 (IEC 1010-1 Mod)

accessible surface
A surface to which a flammable or combustible mixture has access. [ANSI/ISA-12.01.01-1999]

accessible terminal
A node in an electronic network that is configured to allow it to be connected to an external circuit.

accessory
A peripheral device that supports a main system function, such as a floppy disk drive or printer.

Accredited Standard Committee
A standard committee accredited to ANSI.

accumulator
1. The register and associated equipment in the arithmetic unit of the computer in which arithmetical and logical operations are performed. 2. A unit in the digital computer where numbers are totaled, that is, accumulated. Often the accumulator stores one operand and when it receives any second operand it performs the indicated operations on them and then forms and stores the result. It is related to an *adder*. [Proc] 3. A pressure vessel containing water and steam that is used to store

the heat of the steam for use at a later time and at some lower pressure. 4. A relatively large-volume chamber or other hydraulic device that receives fluid under low hydraulic power, stores it, and then discharges it at high hydraulic power, after which it is ready to repeat the cycle. 5. A chamber or vessel for storing low-side liquid refrigerant in a refrigeration system. 6. An accumulator is also referred to as a *receiver*, a “reflux receiver”, or a “reflux drum.”

accuracy

1. The ratio of the error to the fullscale output or the ratio of the error to the output, as specified, expressed as a percentage. Note 1: Accuracy may be expressed in terms of units of measurand or as being within ± [number] percent of full-scale output. Note 2: The term *accuracy* should be used only for generalized descriptions of characteristics. It should not be used in specifications. The term *error* is preferred in specifications and other specific descriptions of transducer performance. [ISA-37.1-1975 (R1982)] 2. In process instrumentation, the degree of conformity of an indicated value to a recognized, accepted standard value or ideal value. [ANSI/ISA-51.1-1979 (R1983); ANSI/ISA-75.05.01-2000] 3. The degree to which an indicated value matches the actual value of a measured variable. 4. Quantitatively, the difference between the measured value and the most probable value for the same quantity, when the latter is determined from all available data and critically adjusted for sources of error. 5. The deviation or error by which an actual output varies from an expected ideal or absolute output. Each element in a measurement system contributes to errors, which should be separately specified if they contribute significantly to the degradation of total system accuracy. 6. In an analog-to-digital converter, accuracy is tied to

resolution. A 13-bit A/D, as used in the controller, for example, can resolve to one part in 2^{13} or 8,192, so the best accuracy as a percentage of full-scale range is theoretically 1/8192, or about 0.0125 percent.

accuracy (data processing)
The degree of freedom from error, that is, the degree of conformity to truth or to a rule. Accuracy is contrasted with precision. For example, four-place numerals are less precise than six-place numerals; nevertheless, a properly computed four-place numeral might be more accurate than an improperly computed six-place numeral. [ANSI/ISA-51.1-1979 (R1993)]

accuracy, mean (data processing)
Mean accuracy is precisely defined as (100 *E*) % F.R., where the mean error *E* is expressed as a percentage of full range (F.R.). It is common practice, however, to equate mean accuracy with the value of the mean error. That is, mean accuracy is commonly stated as 0.1% F.R. whereas a more precise and acceptable statement is that mean accuracy is 99.9% F.R. [ANSI/ISA-51.1-1979 (R1993)]

accuracy, measured
The maximum positive and negative deviation observed when testing a device under specified conditions and by a specified procedure. Note 1: Measured accuracy is usually measured as an inaccuracy and expressed as accuracy. Note 2: Measured accuracy is typically expressed in terms of the measured variable, percentage of span, percentage of upper-range value, percentage of scale length, or percentage of actual output reading. [ANSI/ISA-51.1-1979 (R1993)]

accuracy, reference
See *accuracy, rating*.

accuracy, total (data processing)

Total accuracy is precisely defined as (100 *E*max) % F.S. where the maximum error *E*max is expressed as a percentage of full-scale value. Total accuracy is a measurement of the worst-case effect of all the errors present in the analog subsystem. [ISA/RP-55.1-1975 (R1983)]

accuracy measured test

The procedure for this test is described in ISA Standard ANSI/ ISA-51.1-1979 (R1993).

accuracy rating

In process instrumentation, a number or quantity that defines a limit that errors will not exceed when a device is used under specified operating conditions. Note 1: When operating conditions are not specified, reference operating conditions shall be assumed. Note 2: As a performance specification, accuracy (or reference accuracy) shall be assumed to mean the accuracy rating of the device when used at reference operating conditions. Note 3: Accuracy rating includes the combined effects of conformity, hysteresis, dead band, and repeatability errors. The units being used should be stated explicitly. It is preferable to use a + sign before the number or quantity. Accuracy rating can be expressed in a number of forms. The following five examples are typical: (a) Accuracy rating can be expressed in terms of the measured variable. Typical expression: The accuracy rating is + 1°C, or + 2°F. (b) Accuracy rating can be expressed in percentage of span. Typical expression: The accuracy rating is + 0.5% of span. (This percentage is calculated using scale units such as degrees F, psig, etc.). (c) Accuracy rating can be expressed in percentage of the upper-range value. Typical expression: The accuracy rating is + 0.5% of upper-range value. (This percentage is calculated using scale units such as kPa, degrees F, etc.). (d) Accuracy

rating is expressed in percentage of scale length. Typical expression: The accuracy rating is + 0.5% of scale length. (e) Accuracy rating is expressed in percentage of actual output reading. Typical expression: The accuracy rating is + 1% of actual output reading. [ANSI/ISA-51.1-1979 (R1993)]

AC/DC coupling

A selection on the front panel of some readout instruments. The ACcoupling position switches a capacitor into the input conductor. This is used for piezoelectric accelerometers to remove the power supply bias voltage. The DC-coupling position removes this capacitor from the input line. This is used for transducers that have an output at zero frequency (such as piezoresistive accelerometers and proximity probes), and it is desired to make measurements below 1 Hz.

ACE

Advanced Computing Environment initiative; alliance of more than twenty firms who support software standards for MIP architecture based on common ABI and API. Also known as asynchronous communications elements.

achromatic

Optical elements that are designed to refract light of different wavelengths at the same angle. Typically, achromatic lenses are made of two or more components of different refractive index and are designed to be uses at visible wavelengths only.

acid cleaning

The process of cleaning the interior surfaces of steam-generating units by using an inhibitor so as to prevent corrosion and then subsequently draining, washing, and neutralizing the acid with a further wash of alkaline water.

acid wash

A chemical solution that contains phosphoric acid, which is used to neutralize residues from alkaline cleaners and to simultaneously produce a phosphate coating that protects a surface of metal from rusting and prepares it for painting.

acidity

Represents the amount of free carbondioxide mineral acids and salts (especially sulphates of iron and aluminum) that hydrolize to yield hydrogen ions in water. Acidity is reported as milliequivalents per liter of acid, ppm acidity is reported as calcium carbonate, and pH is reported as the measure of hydrogen ion concentration.

acid-resistant

Able to withstand chemical attack by strongly acidic solutions.

AC input module

An I/O module that converts process-switched AC into logic levels for use in the PC.

ACK

A transmission control character that is transmitted by a receiving device as an affirmative response to a sending device. Also see *acknowledge*.

acknowledge

1. The sequence action that indicates that a new alarm has been recognized. [ANSI/ISA-18.1-1079 (R1992)] 2. A message sent between peer entities to indicate that data was properly received.

Acme screw thread

A type of power-transmission thread that is made in four series— 29° general purpose, 29° stub, 60° stub, and 10° modified square. The number of threads per inch is not standardized according to shank diameter.

acoustic

ANSI/ISA-75.22-1999 -- Face-to-Centerline Dimensions for Flanged Globe-Style Angle Control Valve Bodies (ANSI Classes 150, 300, and 600)

ISA-RP75.23-1995 -- Considerations for Evaluating Control Valve Cavitation

ANSI/ISA-75.25.01-2000 -- Test Procedure for Control Valve Response Measurement from Step Inputs

ANSI/ISA-TR75.25.02-2000 -- Control Valve Response Measurement from Step Inputs

ISA-RP76.0.01-1998 -- Analyzer System Inspection and Acceptance

ANSI/ISA-77.13.01-1999 -- Fossil Fuel Power Plant Steam Turbine Bypass System

ANSI/ISA-77.20-1993 -- Fossil Fuel Power Plant Simulators - Functional Requirements

ISA-77.41-1992 -- Fossil Fuel Power Plant Boiler Combustion Controls

ANSI/ISA-77.42.01-1999 -- Fossil Fuel Power Plant Feedwater Control System – Drum- Type

ANSI/ISA-77.43.01-1994 (R2002) -- Fossil Fuel Power Plant Unit/Plant Demand Development - Drum Type

ANSI/ISA-77.44.01-2000 -- Fossil Fuel Power Plant Steam Temperature Control System (Drum-Type)

ANSI/ISA-77.44.02-2001 -- Fossil Fuel Power Plant Steam Temperature Control System — Once-Through Type

ISA-RP77.60.02-2000 -- Fossil Fuel Power Plant Human-Machine Interface: Alarms

ISA-TR77.60.04-1996 -- Fossil Fuel Power Plant Human-Machine Interface-CRT Displays

ISA-RP77.60.05-2001 -- Fossil Fuel Power Plant Human-Machine Interface: Task Analysis

ANSI/ISA-77.70-1994 -- Fossil Fuel Power Plant Instrument Piping Installation

ANSI/ISA-TR77.81.05-1995 -- Standard Software Interfaces for CEMS Relative Accuracy Test Audit Data

ANSI/ISA-82.02.01-1999 - (IEC 61010-1 Mod) -- Safety Standard for Electrical and Electronic Test, Measuring, Controlling, and Related Equipment - General Requirements

ANSI/ISA-82.02.02-1996 - (IEC 61010-2-031) -- Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use

ANSI/ISA-82.02.04-1996 - (IEC 61010-2-032) -- Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

ISA-82.03-1988 -- Safety Standard for Electrical and Electronic Test, Measuring, Controlling, and Related Equipment (Electrical and Electronic Process Measurement and Control Equipment)

ISA-TR84.00.02 -- Safety Instrumented Functions (SIF) - Safety Integrity Level (SIL) Evaluation Techniques Part 1: Introduction

ISA-TR84.00.02 -- Safety Instrumented Functions (SIF) - Safety Integrity Level (SIL) Evaluation Techniques Part 2: Determining the SIL of a SIF via Simplified Equations

ISA-TR84.00.02 -- Safety Instrumented Functions (SIF) - Safety Integrity Level (SIL) Evaluation Techniques Part 3: Determining the SIL of a SIF via Fault Tree Analysis

ISA-TR84.00.02 -- Safety Instrumented Functions (SIF) - Safety Integrity Level (SIL) Evaluation Techniques Part 4: Determining the SIL of a SIF via Markov Analysis

ISA-TR84.00.02 -- Safety Instrumented Functions (SIF) - Safety Integrity Level (SIL) Evaluation Techniques Part 5: Determining the PFD of SIS Logic Solvers via Markov Analysis

ISA-TR84.00.03 -- Guidance for Testing of Process Sector Safety Instrumented Functions (SIF) Implemented as or Within Safety Instrumented Systems (SIS)

ANSI/ISA-84.01-1996 -- Application of Safety Instrumented Systems for the Process Industries

ISA-TR88.0.03-1996 -- Possible Recipe Procedure Presentation Formats

ANSI/ISA-88.00.02-2001 -- Batch Control Part 2: Data Structures and Guidelines for Languages

ANSI/ISA-88.01-1995 -- Batch Control Part 1: Models and Terminology

ANSI/ISA-91.00.01-2001 -- Identification of Emergency Shutdown Systems and Controls that are Critical to Maintaining Safety in Process Industries

ISA-92.0.01, Part I-1998 -- Performance Requirements for Toxic Gas-Detection Instruments: Hydrogen Sulfide (Replaces ISAS12.15, Part I-1990)

ISA-RP92.0.02, Part II-1998 -- Installation, Operation, and Maintenance of Toxic Gas- Detection Instruments: Hydrogen Sulfide

ANSI/ISA-92.02.01, Part I-1998 -- Performance Requirements for Carbon Monoxide Detection

Instruments (50-1000 ppm Full Scale)

ISA-RP92.02.02, Part II-1998 -- Installation, Operation, and Maintenance of Carbon Monoxide Detection Instruments (50-1000 ppm Full Scale)

ISA-92.03.01-1998 -- Performance Requirements for Ammonia Detection Instruments (25-500 ppm)

ISA-RP92.03.02-1999 -- Installation, Operation, and Maintenance of Ammonia Detection Instruments (25-500 ppm - Full Scale)

ANSI/ISA-92.04.01, Part I-1996 -- Performance Requirements for Instruments Used to Detect Oxygen-Deficient/Oxygen-Enriched Atmospheres

ISA-RP92.04.02, Part II-1996 -- Installation, Operation, and Maintenance of Instruments Used to Detect Oxygen-Deficient/Oxygen- Enriched Atmospheres

ISA-92.06.01-1998 -- Performance Requirements for Chlorine Detection Instruments (0.5-30 ppm Full Scale)

ISA-RP92.06.02-1999 -- Installation, Operation, and Maintenance of Chlorine Detection Instruments (0.5-30 ppm - Full Scale)

ANSI/ISA-TR92.06.03-1999 -- Feasibility of Chlorine Detection Instrument Testing

ANSI/ISA-93.00.01-1999 -- Standard Method for the Evaluation of External Leakage of Manual and Automated On-Off Valves

ANSI/ISA-95.00.01-2000 -- Enterprise-Control System Integration - Part 1: Models and Terminology

ANSI/ISA-95.00.02-2001 -- Enterprise-Control System Integration Part 2: Object Model Attributes

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