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Document Title: **Instrumentation - General**

Document No: **U211-IC-SP-0003**

Revision: **02**

Issue Date: **06-Sep-2024**

WBD Contract No: **U211**

RPC – Revised as per comments	02	06-Sep-2024	NR	GŠ	GŠ
RPC – Revised as per comments	01	12-Jul-2024	NR	GŠ	GŠ
IFI - Issued for Information	00	20-Jun-2024	NR	GŠ	GŠ
Revision Descriptions	**Rev**	**Date**	**Originator**	**Checker**	**Approver**

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1.0 INTRODUCTION

This specification gives directives for the basic design criteria for instrumentation in general. Specific design requirements for each type of instrument or instrument system are covered by the individual specification as per section 2.0 “References”.

2.0 REFERENCES

This document shall be read in conjunction with the following documents:

- U211-IC-SP-0002 Instrumentation - Requirements
- U211-IC-SP-0004 Instrumentation - Design

3.0 AREA CLASSIFICATION

The unit shall be installed within the hazardous area due to explosive gas atmosphere.

Hazardous area classification: Zone 2 IIA T3

4.0 CODES AND STANDARDS

The instrumentation shall be designed, constructed and tested in accordance with the requirements of this specifications and the edition of the applicable National and/or International Codes and Standards.

Where a conflict between the codes, etc., might exist, the most stringent requirements shall govern.

API Std 520	Size, Selection and Installation of Pressure-relieving Devices in Refineries
API Std 521	Pressure-relieving and Depressuring Systems
API Std 526	Flanged Steel Pressure-relief Valves
API Std 527	Seat Tightness of Pressure Relief Valves
API 556	Instrumentation, Control, and Protective Systems for Gas Fired Heaters
API Std 560	Fired Heaters for General Refinery Service
API 2000	Venting Atmospheric and Low-pressure Storage Tanks
API Std 607	Fire Test for Quarter-turn Valves and Valves Equipped with Nonmetallic Seats
API Std 670	Machinery Protection Systems
API Spec 6FA	Fire Test for Valves
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.10	Face to Face and End-to-End Dimensions of Valves
ASME B16.34	Valves – Flanged, Threaded and Welding End
ASME B16.47	Large Diameter Steel Flanges: NPS26 Through NPS60 Metric/Inch Standard
ASME B31.3	Process Piping
ASME B46.1	Surface Texture (Surface Roughness, Waviness and Lay)
ASME B1.20.1	Pipe Threads, General Purpose (Inch)
ASME PTC 19.3 TW-2010	Thermowells

ASME Boiler & Pressure Vessel Code – Section I	Rules of Construction of Power Boilers
ASME Boiler & Pressure Vessel Code – Section VIII	Rules of Construction of Pressure Vessels
EN 10204	Metallic Products - Types of Inspection Documents
EN 62337	Commissioning of Electrical, Instrumentation and Control Systems in the Process Industry – Specific Phases and Milestones
EN 62381	Automation Systems in the Process Industry – Factory Acceptance Test (FAT), Site Acceptance Test (SAT) and Site Integration Test (SIT)
EN 62382	Control Systems in the Process Industry – Electrical and Instrumentation Loop Check
EN 746-2	Industrial Thermoprocessing Equipment – Part 2: Safety Requirements for Combustion and Fuel Handling Systems
DIN EN 161	Automatic Shut-Off Valves for Gas Burners and Gas Appliances
DIN EN 12266-1	Industrial Valves – Testing of Valves – Part 1: Pressure Tests, Test Procedures and Acceptance Criteria – Mandatory Requirements
DIN EN 12266-2	Industrial Valves – Testing of Valves – Part 2: Tests, Test Procedures and Acceptance Criteria – Supplementary Requirements
DIN EN 13190	Dial Thermometers
DIN EN 50446:2007-04	Straight Thermocouple Assembly with Metal or Ceramic Protection Tube and Accessories
DIN EN ISO 15848	Industrial Valves – Measurement, Test and Qualification Procedures for Fugitive Emissions
IEC 60079	Electrical Apparatus for Explosive Gas Atmospheres
IEC 60085	Electrical Insulation – Thermal Evaluation and Designation
IEC 60331	Tests for Electric Cables under Fire Conditions – Circuit Integrity
IEC 60332	Tests on Electric and Optical Fibre Cables under Fire Conditions
IEC 60423	Conduits for Electrical Purposes - Outside Diameters of Conduits for Electrical Installations and Threads for Conduits and Fittings
IEC 60529	Degrees of Protection Provided by Enclosures (IP Code)
IEC 60534	Industrial – Process Control Valves
IEC 60571	Industrial Platinum Resistance Thermometers and Platinum Temperature Sensors
IEC 60584	Thermocouples
IEC 60654	Operating Conditions for Industrial-process Measurement and Control Equipment
IEC 61000	Electromagnetic Compatibility for Industrial Process Measurement and Control
IEC 61131-3	Programmable Controllers – Part 3: Programming Languages

IEC 61518	Mating Dimensions between Differential Pressure (Type) Measuring Instruments and Flanged-On Shut-Off Devices Up to 413 bar (41.3 MPa)
IEC 62443	Industrial Automation and Control System Security
ISA 18.1	Annunciator Sequences & Specifications
ISA S5.1	Instrumentation Symbols and Identification
ISA S5.2	Binary Logic Diagrams for Process Operations
ISA S5.3	Graphic Symbols for Distributed/Shared Display Instrumentation, Logic and Computer Systems
ISA S5.5	Graphic Symbols for Process Displays
ISA S51.1	Process Instrumentation Terminology
2004/108/EC	Electromagnetic Compatibility
ISO 5167	Measurement of Fluid Flow by Means of Pressure Differential Devices Inserted in Circular Cross-Section Conduits Running Full
ISO TR 15377	Measurement of Fluid Flow by Means of Pressure Differential Devices. Guidelines for Specification of Orifice Plates, Nozzles and Venturi Tubes Beyond the Scope of ISO 5167
NACE MR 0103	Standard Material Requirements – Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments
NACE MR 0175-2002 edition	Standard Material Requirements – Materials for Sulfide Stress Cracking and Stress Corrosion Cracking resistance in Sour Oilfield Environments
Directive 94/9/EC	Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres (ATEX) – applicable to 19-Apr-2016
Directive 2014/34/EU	Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres (ATEX) – mandatory from 20-Apr-2016
Directive 97/23/EC	Pressure Equipment Directive
Directive 2006/95/EC	Low Voltage Electrical Equipment Directive
Directive 2006/42/EC	Machinery Directive
EN 13463-1	Non-Electrical Equipment for Use in Potentially Explosive Atmospheres - Part 1: Basic Method and Requirements
EN 1127-1	Explosive Atmospheres – Explosion Prevention and Protection - Part 1: Basic Concepts and Methodology
IEC 60947-5-6	Low Voltage Switchgear and Controlgear – Control Circuit Devices and Switching Elements, DC Interface for Proximity Sensors and Switching Amplifiers (NAMUR)
TA Luft	Technical Instructions on Air Quality Control

4.1 CE MARKING

Where applicable, all equipment, materials and components shall be CE certified, shall bear CE marking and shall be compliant to applicable EC directives.

4.2 SERBIAN AUTHORITY REQUIREMENTS

All equipment shall be in compliance with Serbian legislation and law requirements. Equipment vendors shall deliver all documentation requested by Serbian law (e.g. Serbian Ex Certificate) to be able to put equipment in operation in Serbia.

5.0 UNITS OF MEASUREMENT

The instrumentation, its system and associated functions where applicable, shall in principle follow and be executed adhering to the units adopted for the complete project. Unless otherwise indicated these will be based upon the internationally accepted SI units.

The following practical units of measurement should be applied:

Flow	Liquid	(by weight)	kg/h, t/h
		(by volume)	m^3/h
	Steam		kg/h, t/h
	Gas / Vapor	(by weight)	kg/h, t/h
		(by volume)	Nm^3/h
Level	Absolute		m, mm
	Relative		%
Pressure	Gauge		barg, mbarg
	Absolute		bara
Temperature			°C
Analysis			% or PPM
Viscosity			cP
Conductivity			µS/m
Density			kg/m^3
Velocity			m/s
Axial displacement			mm
Speed			rpm
Vibration (absolute)			mm/s (RMS)
Vibration (relative)			µm

6.0 BASIC CRITERIA

6.1 MEASUREMENT AND CONTROL

Instruments and control systems shall be provided for safe and efficient operation of the plant.

Instruments for measurement and control may either be mounted in the field or be based in the control building.

Smart transmitters with HART functionality shall be used where applicable preferably in Ex i execution according to IEC 60079.

Switch function should be snap acting, Single-pole Double Throw (SPDT), hermetically sealed and potential-free contacts.

Minimum contact rating for disconnecting inductive loads should preferably be:

- 1.0A for 24-48 V DC;
- 0.4A for 110-125 V DC;
- 5.0A for 60-260 V AC.

Transmitters instead of switches shall be in general utilized for trip functions.

Instrument ranges for trip functions and control functions in the same service shall be equal.

Where practicable, ranges used for measurement and control instrumentation shall overlap alarm and trip settings by minimum 5% of the span.

Receiver gauge scales shall be in the relevant engineering units.

Transmitters shall be provided with output indicators when required by application.

Asbestos and asbestos compounds are not allowed.

All field instruments, junction boxes, cabinets, panels etc. shall be provided with nameplates, indicating the instrument tag number or the tag number and the service.

6.2 SIGNAL TYPES

6.2.1 PNEUMATIC SIGNALS

Pneumatic signals may be applied for specific auxiliary local measurement and local control loops.

Pneumatic signal pressure range shall be in accordance with IEC 60654.

The standard pneumatic signals shall be 0.2 to 1.0 bar.

6.2.2 ELECTRIC SIGNALS

Electric signal transmission shall be applied in conjunction with electronic/digital control systems. In general the loop power will be supplied by the systems.

Analog Signals with standard 4 – 20 mA HART DC signals (24 V DC, two-wire system) shall be applied as measuring inputs and controller outputs.
Proximity sensors shall be in accordance with EN 60947 (NAMUR).
Digital signals may be applied either as potential-free inputs or as DC powered outputs.
In reasonable cases the use of serial communication shall be utilized (Profibus, Modbus RTU etc.)
The use of Remote I/O's is preferred for DCS indication purposes.

6.2.3 FIBER OPTIC LIGHT SIGNALS

When selected, the fiber optic system shall be in accordance with the recommendations of the manufacturer of the associated equipment.

6.2.4 HYDRAULIC SIGNALS

Hydraulic signals may be applied for special applications where found necessary.

6.2.5 OTHER SIGNALS

Other signals and/or the application of deviating standard signals like vibration monitoring, pulsed flow or speed signals, tank gauging, etc. may be required and shall be defined case by case.

Signals from thermocouples, resistance temperature detectors (RTD) should be converted to 4 – 20 mA in field in order to standardize control system hardware.

6.3 FIELD INSTRUMENTATION

Any instrumentation and ancillary connected directly to the process stream shall be subject to the requirements of the relevant process conditions.

6.3.1 IN-LINE INSTRUMENTATION

"In-line" instrumentation refers to process connected instrumentation which can't be isolated from the process by means of an isolating valve, e.g. flowmeters, control valves, thermowells, safety relief valves, etc.

In-line instruments shall fully conform to or exceed the Project piping specification of the relevant line and be compatible with the physical properties of the process medium.

The applicable pressure/temperature rating shall equal or exceed the rating of the associated process system.

In principle in-line instruments shall be flanged, in accordance with the relevant piping specifications and preferable be flanged 150 lbs. ASME as minimum. Exceptions for these rating requirements are:

- Safety/relief valves with inlet 300 lbs. ASME and outlet 150 lbs. ASME as a minimum.
- Orifice flanges with 300 lbs. ASME as a minimum.
- Control and on/off valves 300 lbs. ASME as minimum for valve sizes bellow and including 4".

6.3.2 OFF-LINE INSTRUMENTATION

"Off-line" instrumentation refers to process connected instrumentation, which can be isolated from the process by means of an isolating valve size 2" or smaller, e.g. pressure/pressure differential transmitters, pressure gauges, level transmitters, level gauges, etc.

Material for wetted parts shall be as per piping specification as a minimum.

6.3.3 INSTRUMENT / PROCESS CONNECTIONS

The table below lists the preferred sizes and types for basic "Instrument Connections" and "Instrument Process Connections" unless otherwise required by special application.

"Instrument Process Connection" is the connection at the piping interface.

"Instrument Connection" is the process connection at the instrument.

Note: For diaphragm seal, the seal is the instrument connection.

The connection size and type shall be in accordance with the Instrument/ Piping Interface.

Instrument type	Instrument Process Connection	Instrument Connection
D/P Flow instruments	½" flanged, ½" O.D. tube flange adaptor 3)	½" NPTF
External Displacer/Float	2" flanged	2" flanged
Internal Displacer/Float	4" flanged	4" flanged
Top mounted Level instruments	4" or 6" flanged	4" or 6" flanged
Level gauges	1" flanged	1" flanged
D/P Level instruments	2" flanged, ½" O.D. tube flange adaptor 3)	½" NPTF
D/P Level instruments with diaphragm seal	2" or 3" flanged	2" or 3" flanged
Pressure transmitters	¾" flanged, ½" O.D. tube flange adaptor 2,3)	½" NPTF
Pressure gauges	¾" flanged with ½" NPTF thread 2)	½" NPTM
Pressure instruments with diaphragm seal	2" or 3" flanged	2" or 3" flanged
Thermowells 1)	1 ½" or 2" flanged 1)	1 ½" or 2" flanged

1) Thermowells in general 1 ½" flanged, except on vessels and special applications 2" flanged.
2) On static equipment 2" flanged
3) Double ferrule design flange adaptor (or lap joint connection) to ½" O.D. tube of required flange size by piping.

6.3.4 FURTHER REQUIREMENTS

Flanged instrument connections shall be in accordance with ASME B16.5.

Flange surface finish shall be as per relevant piping specification and in accordance with ASME B46.1.

Threaded connections shall be in accordance with ASME B1.20.1 (NPT)

Cable gland connections to be M20 x 1.5mm as a minimum in accordance with EN 60423.

Standard instrument connection shall be ½" NPT female, except pressure gauges and pressure switches shall have ½" NPT male connections.

For lined vessels and piping systems the connection size shall be increased as required to accommodate the inside diameter of the nozzle.

6.4 CONTROL BUILDING INSTRUMENTATION

All field-mounted instruments excluding local only loops shall have the ability to transmit a signal to a central location e.g. control building. Adequate transmission systems shall be used for that purpose.

Due to the various control and safeguarding implementation techniques being dependent on interfaces with existing systems, safety, operation requirement, etc., a project-specific approach should be defined. Starting point for further implementation should be the "Instrument System Block Diagram".

Note: For additional and/or specific requirements see section 2.0 “References”.

6.5 MATERIAL AND SUPPLY

As far as feasible, instruments, systems and installation materials shall be standardized in order to simplify spare parts requirements and maintenance.

6.6 SOURCE TRACKING/CERTIFICATION

To warrant good quality, it shall be ensured that source tracking of instruments and materials subject to creating potential hazards, is possible through internationally recognized authority certification. The requirements shall be as stated in the requisitions.

The following kind of reports/certificates should be considered where applicable:

- EC declaration of conformity
- ATEX declaration of conformity
- Manufacturer Calibration report
- Functional test report
- Welding procedure/report
- NDE report
- Material certificates
- Electrical certificates

6.7 INSTALLATION

All instrumentation work for given project shall be executed in adherence with:

- National and local codes for installation work
- Specifications and guidelines
- Internationally accepted standards of good workmanship
- The relevant installation contract including documents, procedures and/or instructions

6.8 DOCUMENTATION REQUIREMENTS

6.8.1 GENERAL

Seller shall provide all documents as specified on the Requirements For Documents form attached to the requisition, supplemented with following specific information as far as this is not already included.

6.8.2 EC DECLARATION OF CONFORMITY

The conformity of apparatus with the relevant EC directives shall be certified by an EC declaration of conformity issued by the manufacturer or his representative established within the European Community.

The EC declaration of conformity must contain the following:

- Description of the apparatus to which it refers
- Reference to the specification under which conformity is declared, and, where appropriate, to the national measures implemented to ensure the conformity of the apparatus with the provisions of the directive
- Identification of the signatory empowered to bind the manufacturer or his authorized representative

- Where appropriate, reference to the CE type examination certificate issued by a notified body

6.8.3 USER MANUAL

The user manual shall comprise all information as required by the relevant CE guidelines. The manual shall at least cover following topics:

Technical specification and other technical details
Safety aspects
Instructions for transport, installation, start-up and dismantling
Operating instructions
Maintenance and repair
Installation instructions
Disassembly and assembly instructions

7.0 PERFORMANCE

7.1 RELIABILITY

Reliability can be defined as the probability that a device will perform its objective adequately, for the period of time specified, under the operating conditions specified.

The principle to be applied is that continuous safe operation of the plant shall be maintained to maximum possible extent in case of failure of any component of an instrument or control system.

If vital components of systems cannot be expected to have acceptable availability, then reliability should be ensured through duplication or the application of redundancy techniques e.g. two out of three voting systems, etc.

7.2 AVAILABILITY

Availability can be defined as the percentage of time in which a system is able to fulfil its required task.

Instruments and control systems shall be designed to provide the maximum availability ratio compatible with process requirements.

7.3 ACCURACY AND REPEATABILITY

Consideration shall be given to the relevant function of the instrument and/or system, its required accuracy and repeatability, the maximum obtainable industrial accuracy and repeatability and its economics.

8.0 PROTECTION

8.1 CLIMATE

Instruments and systems shall be suitable to withstand or be protected against prevalent climatological conditions, as defined in the site and utility data sheet U211-PR-DS-0002.

Special attention shall be paid to:

Conditions such as sunshine, heavy rains/storms and moisture
Winter conditions such as freezing, ice formation/accretion and snow

8.2 ENVIRONMENT

The instruments to be designed to withstand negative environmental influences on the proper functioning of instruments and systems, which may be caused by contaminants (corrosive gasses and/or chemicals), dust, dirt, grease, electromagnetic interference, radio frequency interference and static electricity.

8.2.1 CONTAMINANTS (CORROSIVE GASSES AND/OR CHEMICALS)

Depending on the likelihood of occurrence of such contaminants, measures shall be taken to overcome the possible negative effects.

Special attention to be given to the protection of electrical contacts.

8.2.2 INGRESS PROTECTION AGAINST SOLIDS AND LIQUID

In order to cope with effects as aforementioned, field instrument and ancillary systems enclosures shall have a degree of protection in accordance with IEC 60529, protection code IP 65 as a minimum.

8.2.3 ELECTROMAGNETIC COMPATIBILITY (EMC)

The design of electronic instruments should be in compliance with the European Community (EC) harmonized codes and standards, which includes Radio Frequency Immunity (RFI).

8.3 ELECTRICAL SAFETY

All electric and electronic instrumentation and its ancillaries shall be executed for electrically safe operation in the area in which it operates. In general the instruments shall be of intrinsically safe execution where possible.

All electrical apparatus for use in hazardous areas shall be ATEX certified by a recognized authority and comply with CENELEC or equivalent international standard. All equipment must be re-certified by local authorities according to Serbian legislation.

The following types of protection should be used in accordance with IEC 60079:

IEC 60079-11	Intrinsic Safety “i” (ia for zone 2, 1 or 0 and ib for zone 2 or 1).
IEC 60079-1	Flameproof enclosures “d” (for zone 2 or 1).
IEC 60079-7	Increased Safety “e” (for terminal boxes only in zone 2 or 1).
IEC 60079-18	Encapsulation “m” (for zone 2 or 1).
IEC 60079-15	Type of protection “n” (non incentive for zone 2):
IEC 60079-2	Pressurized Enclosures “p” (for zone 2 or 1).

All electrical apparatus certified for use in the hazardous areas shall be marked accordingly.

9.0 SAFETY

Dedicated safety protection instrumentation shall be provided in order to warn and protect against unsafe situations of any kind during start-up, operation, shutdown and maintenance of plant.

The Emergency Shutdown System (ESD) shall be designed, manufactured, tested and commissioned to comply with the requirements of IEC 61508 and IEC 61511 following the appropriate Safety Integrity Level (SIL) assessment.

Instrumentation systems for safety (apart from safety valves and initiating devices, which will be mounted in the field) shall be based in the control building.

The safety protection instrumentation can be separated into the following categories:

- Regulatory control system (DCS) with pre-alarm for warning;
- Safeguarding system (ESD) consisting of initiating and activating elements working independently from the control system. The safeguarding system shall bring the relevant plant or part of plant automatically to a safe condition when an appropriate process variable reaches the limits of acceptable value.
- Safety relief devices for direct equipment protection. Relief systems shall be designed and installed adhering to the requirements/recommendations of the selected applicable codes and standards;
- Fire and gas detection equipment provided for property and personnel protection;
- Detection equipment should include items such as toxic gas, combustible gas, smoke and fire detection and alarming, etc.

Note: For additional and or specific requirements see section 2.0 “References”.

10.0 INSTRUMENT AIR SUPPLY

The quality of the instrument air and the air supply pressure range for transmission devices shall be in accordance with IEC 60654.

Instrument air shall be used for the pneumatic instrument and pneumatic operated instrumentation (e.g. control, on/off valves).

Instrument air may be used for purging purposes and for pressurizing of instrument enclosures.

The air supply conditions are as follows:

Minimum:	4 barg
Normal:	8 barg
Maximum:	10.5 barg

11.0 INSTRUMENT POWER SUPPLY

The instrument power supply systems shall be used for instrumentation purposes only.

11.1 POWER SUPPLY (PS)

Instruments which require a continuous supply, but can withstand a short interruption of the supply, i.e. time to change over automatically to another electric power supply source, shall be connected to a PS system.

The PS shall provide 230V AC, 50 Hz.

11.2 UNINTERRUPTABLE POWER SUPPLY (UPS)

Instruments, which require continuous power, supply and cannot accept a short interruption shall be connected to an UPS system.

The UPS shall provide 230 V AC, 50 Hz.

One power supply feeder shall be used to power each field instrument or auxiliary room based instrument.

Two power supply feeders shall be used to power each instrument control and safeguarding system cabinet.

The feeders shall be connected to the UPS distribution boards in such a way that at all times power will be available on at least one feeder.

The conversion to the required voltage level(s) shall be made in each system cabinet by means of redundant power supply system.

12.0 INSTRUMENTATION EARTHING

12.1 GENERAL

All equipment for electric transmission including the enclosures as well as the cable armouring, lead sheathing and screening of cables, shall be properly earthed for personnel safety reasons and to obtain the maximum possible rejection of interference.

All equipment in the control satellite building shall be connected either to the general plant earthing system or to the instrument earthing system.

Unintentional interconnections between the two systems are not allowed to occur.

All earth connections shall be protected against corrosion, which might adversely affect the earth resistance.

12.2 GENERAL EARTHING SYSTEM

All metal enclosures housing instrument and/or instrument systems and all armouring of field cables shall be connected to the general earthing system.

12.3 INSTRUMENT EARTHING SYSTEM

Instrument earthing system shall be designed in line with Control and Safeguarding system vendor requirements.

The instrument earthing shall terminate in a copper bus, mounted centrally to all instrument equipment, but electrically isolated from any other equipment or structure.

To avoid undesired ground loops due to differences in earth potential or influence of surface currents, the shield of signal wires shall be connected to the instrument earth system only at one side (in the control room/satellite building). The shielding shall be kept isolated from cable armouring and instrument enclosures.

13.0 CABLING

Cabling installation shall be provided to enable all signal and power supply distribution through-out the instrument systems and installations.

14.0 PACKAGE UNITS

14.1 GENERAL

A package unit (PU) is a prefabricated process or utility unit.

Package units shall form an integral part of the plant and are supplied as individual units ready for installation.

PU's may vary from simple pumps with ancillaries, to complete systems like compressor or turbine installations, chemical dosing units, additive injection units, metering skids, weigh bridges, heaters, flare systems, etc.

As far as practicable, PU's should be completely installed by the seller with all necessary instruments or instrument systems, requiring only the external connections or connections between individual PU modules to be executed by others.

14.2 PU CATEGORIES

The extent of the instrumentation requirements will differ from one PU to another. For this purpose, the PU's are classified into two following categories.

Irrespective of the selected PU category, special attention shall be paid to:

- Instrument installation,
- Integration into plant control and safeguarding system
- Interfaces with the rest of the plant
- Tag numbering
- Area classification
- Environmental conditions
- Certifications (electrical and material)
- Seller documentation
- Inspection and testing

14.2.1 CATEGORY I

This category consists of completely self-contained units with seller standard instrumentation, for which deviations are not recommended or feasible.

In this category, the complete functionality of the PU should normally be implemented locally (on the skid). The minimum requirements shall be stated in the PU requisition, with special attention to the interfaces with the plant instrumentation like DCS communication, alarms and safeguarding functions, type of electrical contacts, etc.

Examples of this category are:

- Chemical dosing units
- Pumps with special integrated instrumentation
- Pump seal systems
- Additive injection units
- Liquid filtering systems

14.2.2 CATEGORY II

This category consists of units with a reasonable amount of standard commercially available instrumentation which enables standardization with the rest of the plant to a certain degree.

Implementation of monitoring, control and safeguarding functions which require electronic components should in general be based locally under PU seller's responsibility. However, when the unit cannot be isolated for reasons of operation or maintenance without disturbing the main process or when safety is in question, the control and safeguarding functions may be considered to be implemented in the total plant systems.

The applicable specification for "Package Unit Instrumentation", which contains the minimum instrumentation requirements (summarized from the project engineering, design and installation specifications), is applicable in this case.

Examples of this category are:

- Compressor/Turbine installations
- Fired heaters
- Flare systems

The above examples of PU categories are given for guidance only. The exact definition should be incorporated in the PU requisitions.