Petrochemical Library Specification Form Design

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REVISION and APPROVALS				
Rev.	**Date**	**Description**	**By**	**Approved**

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1. OVERVIEW

The need for electronic specifications forms and work processes that reflect the instrumentation products that dominate the present market place are universally recognized as necessary. The desired content of such data files can vary expensively; dependant upon the life-cycle activities that the users choose to implement. Therefore; Intergraph has been providing expanded and new functionality for specification form utilization at some future time when external organizations build a demand for such functionality.

The ISA-20.00.03-2001 Specification Forms for Process Measurement and Control Instruments Part 3: Form Requirements and Development Guidelines Standard and its first 50 example forms (ISA-TR20.00.01-2001) provided a modern technical basis or the procurement portion of the specification life-cycle. Intergraph added many additional specification form tables and fields and two sample implementation form files, to support the development of that standard in SPI version 6.0. These changes proved to be insufficient to support the normalization of the ISA form's data, so hundreds more fields were added in the SPI2007 schema; which significantly facilitated the implementation of that model's schema as well as other data exchange life-cycle international standards that have initiated their own development.

The ISA style of specifications requires extensive data integration to be cost effective and only a few software developers attempted such integration; even on a very limited basis. The SPI application has extensive integration functionality, much of which is not used in its previous forms or third party forms that are sold for use with SPI. Therefore, the major objectives of the new Industrial Practice forms include:

- **A single document source** of extensive data integration with Index, Process Data, Calculation, Calibration, Document Binder modules and the Browser and Complex Analyzer functionality
- Highly data modeled procurement life-cycle specification forms; including smart/intelligent instrument functionality
- Consistent separation of process/device design parameters from device parameters
- Incorporate lessons learned from implementations and user feedback of the ISA style forms
- Provide for more rapid implementation, revision and additional of new forms without the extended approval cycle of forms tied to any standard organization
- Provide a highly normalized database schema that facilitates data import and export with external vendor applications

2. INTEGRATION WITH SPI DATABASE SCHEMA AND WORK PROCESSES

2.1 Process Data Module Integration

The Process data schema, and associated property accessibility criteria; originates in the Line Process Data interface and are extended in to the Process Data module. These shall be extended to the Specification module.

2.1.1 All Process Data operating variables (PROPERTIES) except for the Level process variables, are data values coincidental with the minimum, normal, or maximum flow conditions, even when the flow condition data is not displayed

on the form. This is necessary to support data to be copied or propagated between the Line Process data and the Instrument Process Data; while maintaining consistent definition of that data.

2.1.2 All Process Data design conditions (ADDITIONAL PROPERTIES) are absolute minimum or maximum values of any case or operating condition data.

2.1.3 Pressure and flow unit of measures must be explicitly clarified with their associated database style flag field, for all process data occurrences. This practice should be utilized for all other specification fields using these pressure and flow variables; where space is adequate to support such unambiguous identifications.

2.1.4 Support for multiple cases of data must exist for all specifications requiring process data.

2.1.5 Base Condition properties are required for process data flow variables to allow conversion between units of measure and their flow style clarifiers.

2.1.6 Design conditions for both minimum and maximum pressure and temperature are required fields for all devices connected to process lines or equipment.

2.1.7 Limits on pressure drop across flowmeter is integrated with Process Data design conditions.

2.1.8 Minimum and Maximum Design Ambient Temperature data is generally required to correlate to the design pressure and temperature definitions.

2.1.9 Allow either density or specific gravity to be entered for all Fluid States, with the limitation that Process Data module gas specific gravity is only available for the normal flow condition. Provide unambiguous separate fields for liquid properties from Gas/Vapor properties; on the specification forms.

2.1.10 The Fluid State data logically disables data entry for inappropriate values into the following properties

- Viscosity
- Compressibility
- Specific heat ratio
- Vapor pressure
- Critical pressure
- Molecular mass

2.1.11 The flow units of measure style clarifier data logically disables data entry for inappropriate values into the following properties

- Base condition pressure
- Base condition temperature
- Base condition density and specific gravity
- Base condition compressibility

2.1.12 The state of several relative properties are identified where appropriate, including:

- Corrosive
- Erosive
- Toxic
- Build-up tendency
- Transparent
- Colored

2.1.13 Use validated dropdown list for all process unit of measure symbols.

2.1.14 Templates can/should be used to identify default Fluid State and associated units of measure for all process variables. When the template data is initialized, its default units will overwrite the normal process data default units.

2.1.15 Ambient temperature units and Barometric pressure are read from the Units of Measure and Accuracy default value table.

2.1.16 Include Fluid phase for all forms that support two-phase process data.

2.1.17 Include Pressure type style flag so that it can be managed from the specification form.

2.1.18 Required measurement range data from the Process Data module shall be included with the PROCESS DESIGN CONDITIONS section.

2.1.19 Alarm and Trip setpoint data from the Process Data module should be integrated through copying functionality in the Calibration module; to document those requirements on the specification form's Calibration section.

2.1.20 Flow rate label is logically linked to the flow units of measure style flag to display either Mass flow or Volumetric flow.

2.1.21 Pressure label is logically linked to the pressure units of measure style flag to display either gage or absolute pressure.

2.2 Additional Process Data Properties

2.2.1 Consistently use the following Process Data custom fields:

- Downstream line number
- Critical temperature and its units
- Design ambient temp, min
- Design ambient temp, max
- NFPA health hazard
- NFPA flammability
- NFPA reactivity

Note that the NFPA (M325) standard values are commonly available on Material Safety Data Sheets (MSDS) that are required for all materials that are exposed to personnel.

See Appendix "B" for SPI configuration of the header labels for these variables.

2.2.2 Line Properties Data displays the following line properties on the instrument specification forms

- Pipe standard
- Pipe spec
- Line size
- Schedule or Nominal Pressure
- Wall thickness
- Line inside diameter
- Pipe material
- Insulation purpose

2.2.3 The downstream Line number can be entered from a dropdown list of lines; on the specification form. However, the downstream line properties will not display until the data is refreshed.

2.3 User Interface Similarity and Differences

The instrumentation specification form's user interface should duplicate all of the application functionality listed above, where appropriate for the specific instrument type, including:

- Direct data entry from the specification module interface
- Logic based disabling of inappropriate properties
- Consistent terminology and data relationships with all modules

The significant differences between entering Process Data in the specification module interface rather than the Process Data interface; will include:

- No automatic unit conversion
- No database fluid property lookup
- No Process Data report revision identifications
- Access rights to edit process data fields

For the majority of work processes, the above differences in functionality may not be required. Therefore; data entry from the specification form is a viable work process for those situations.

2.4 Index Supporting Tables

The following supporting tables are managed in the Instrument Index module and enforce consistency with the data values that are entered or displayed on the specification forms:

- Instrument Criticality
- Instrument Certification
- Instrument Manufacturers
- Instrument Models
- Signal Type
- Linearity Types
- Power Supply

See Appendixes for the listing of values that are coordinated with these specification forms.

3. ADDITIONAL SPECIFICATION GENERAL OR PROCESS CONDITIONS

3.1 Project and Physical location data

- Project number
- Project (name)
- Plant
- Area
- Unit name
- Unit number

3.2 Service Identification Section

3.2.1 Additional line properties are available; including:
- Upstream and Downstream Pipe Orientation
- Available upstream and downstream lengths

3.2.2 Special Process or equipment properties where appropriate; including:
- Fluid Service
- Environmental area
- Mass Fraction Vapor
- Critical Temperature
- Turbulence Intensity
- Connection orientation
- Connection projection from wall
- Minimum immersion length

3.2.3 Area Classification parameters

Support for both US and IEC standard's values. Both local and remote area classification data will be included wherever split architecture is likely to apply for the form's instrument type.

3.3 Component Design Criteria Section

3.3.1 Criticality and Instrument Certification organization is consistently applied with a dropdown list from the Index module's supporting table; for all instrument types.

See Appendix "C" for Certification and Criticality values that have been coordinated with the specification form's dropdown list.

3.3.2 Various calculation basis parameters are identified when applicable to the instrument type.

3.3.3 Standard for Calculation

3.3.4 Component Design Criteria suitable for external vendor/software to perform sizing calculations or instrument range selection; which comply with the project's requirements; including:
- Application type
- Standard for sizing calculation
- Discharge coefficient
- Minimum and maximum diameter ratio
- Required measurement compensation

- Minimum required accuracy
- Preferred characteristic curve
- Test requirements
- Maximum allowable SPL
- Supply pressure medium and design pressures
- Fire-fighting / Drainage factor
- Required seat leakage or tightness

3.3.5 Unambiguous documentation of failure mode or actions for all instrument with such properties; including:
- Supply loss failure mode
- Signal loss failure mode

3.4 Material Flow Condition Section

3.4.1 Both upper and lower fluid process data properties for level applications

3.4.2 Support for a set of flow condition properties for instrument types were vendor software applications have been identified capable of utilizing such data.
- Secondary phase flow conditions
- Secondary stream flow conditions
- Composition data for flow applications
- Stream flash data for control valves
- Relief valve two-phase flow parameters

3.4.3 Vessel Identification properties for level applications; suitable for calculating volume or zero elevation or suppression for head meters.

3.4.4 Reference leg fluid properties documentation suitable for calculating zero elevation and suppression.

3.4.5 Explicit identification of level Interface for liquid-to-liquid applications.

3.4.6 User definable flow condition names for the three available sets of data. This allows sets of data that may have been derived form different cases for any instrument type; without creating Hybrid forms.

3.4.7 Document calculation results and warnings where available. The calculated results can be identified as derived from internal SPI calculations or from an external calculation.

4. MINIMIZE THE NUMBER OF FORMS AND PAGE DESIGNS

4.1 Form Scope May Be Dependant on Usage

While many forms are applicable to a single instrument type, many others will need the flexibility to address several different instrument types. Many different philosophies are seen within different organizations, and redundant form coverage frequently exist when the developer needs to satisfy multiple clients.

To date, this set of forms have been developed without external pressures that require redundant forms. The criteria used to initiate consideration of an independent form; is the presence of 8 or more device properties that differ between the potential forms.

The following practices can facilitate a single form being used for multiple instrument types:

- Form sub-title which reflect different instrument types. This is being added to most newly developed forms.
- Develop form templates for the different instrument types
- Initialize different form templates associated with the instrument type profiles
- Provide dropdown list of properties that support the multiple instrument types+

4.2 Consistency between Forms should be optimized wherever possible

- Maximize use of common process data pages for forms of the same process function
- Use Multi-tag assembly style form for assembly of tagged instruments
- For single page forms, only include normal process operating conditions where minimum and maximum data is not required for selection or sizing
- Minimize device data not required to uniquely specify model and options
- Minimize performance characteristics that do not have established requirements; such as over-pressure or span limits
- Minimize special options that apply to all specifications in a purchase package by binding the specification with general notes
- Utilize user definable characteristic fields for infrequently specified properties
- Harmonize device properties with the latest published ISA specification forms which have had peer review and easy availability

5. USER FRIENDLY INTERFACE DESIGN

5.1 Consistency between forms and sections

5.1.1 Consistent terminology and mapping between all application modules and entities (Lines, Instruments, Calibration, and Calculation data)

5.1.2 Maximized consistent layout and data order between modules and forms, where practical

5.1.3 Basic two column approach places data immediately following its line number and label and minimizes the number of pages

5.1.4 Maximized terminology consistency for section names and characteristic names; across all specification forms

5.1.5 Dropdown list of typical values consistent with major manufacturer's offerings for all text fields, and some numeric fields

5.1.6 All dropdown list allow entry of data not in list; except for Process units of measure

5.1.7 Inclusion of Plant, Area, and Unit names for each specification document

5.1.8 Minimized overloaded data fields containing more than one characteristic, such as type, size, finish, rating being in a single field

5.1.9 Separated numeric data values from their unit of measure field. Locating units following their process data variables; complies with standards for units of measure and is consistent with device characteristic data presentation

5.1.10 Maximize consistency of order of properties within any section and across all forms

5.1.11 Properties provided for all data necessary to coordinate with the coded intelligent manufacturer's model numbers

5.1.12 Use of industry standard terminology and definitions

- Maximizing the harmonization with ISA specification form terminology
- Both NEC and IEC terminology for hazardous area, Type of protection and nominal size identifications

5.1.13 Provide a minimum of one user definable characteristic label and data value for each form section

5.1.14 Attempt to eliminate need for separate notes page containing unstructured and non-normalized data

5.1.15 rayed out appearance of all data that is read only

5.1.16 Maximize abbreviated labels such as "@ Minimum"; is important for process variables that do not display the flow data

5.1.17 Use of mint green background for section labels facilitates quick recognition of grouped properties and navigation

5.1.18 se of natural language form names and property labels

5.1.19 Material of construction properties grouped at end of each section; where required

5.1.20 Invalid process data resulting from a change of fluid state; is identified as RED color strikeout text and the field enabled to allow data deletion

5.1.21 Prevent text data type from being entered into fields requiring numeric data. Audible feedback is standard SPI functionality.

5.1.22 Identify when calculations have not yet been performed.

5.1.23 Calculated Noise SPL will display "NA (<50 dBa) consistent with the data displayed on the valve calculation report.

5.2 Usage of NA (Not applicable)

5.2.1 Display and print NA (not applicable) for process variables that are not appropriate for the entered Fluid State

5.2.2 Display and print NA (not applicable) for process variables that are not appropriate for single Fluid Phase; such as:

- Secondary phase state
- Mass fraction vapor
- Secondary mass flow
- Secondary phase density
- Secondary phase liquid SG

5.2.3 Display and print NA for all Calibration and Test fields that have NA entered in the Description field.

5.2.4 Inclusion of NA (not applicable) in all dropdown list; to consistently identify a characteristic that has been determined to not apply to the specific tag's device

5.3 Custom View Usage

A specification view named **v_projinfo** is required for use with these specification forms. This view has been made a Default view in SPI2009, however it will need to be manually loaded as a User-Defined view for SPI2007 applications.

This view retrieves the following type of data:

- Barometric pressure and units
- Line properties
- Downstream line properties
- PAU data
- Ambient temperature units

6 CONSISTENT APPLICATION OF SUPPORTING SECTIONS

6.1 PURCHASE Section

Properties are consistent across all forms.

6.2 CALIBRATION AND TEST Section

Groups the following properties data sets:

- Primary measurement or input signal integrated with the Calibration module and the Index fields
- Two or three secondary measurement signals which are only present on the form
- One or two display ranges that are integrated with the Calibration module
- Up to four alarm or trip setpoints that are integrated with the Calibration module
- Failure signal output data
- Valve leakage test that are integrated with the Calibration module

- Hydrostatic pressure test condition which is only present on the form
- User definable calibration or test which is only present on the form

6.3 ACCESSORIES Section

Includes major items that vendor provides with their own model number; which can be documented in the COMPONENT IDENTIFICATIONS section.

6.4 SPECIAL REQUIREMENTS Section

containing additional requirements that are expected to effect the cost of the component, including

- Custom tag
- Reference specification
- Compliance standard
- Non-destructive Examination
- Construction code
- Calibration report
- Material certificate

6.5 CALIBRATION AND TEST Section

- Calibration settings integrated with Instrument Index and Calibration module
- Alarm setpoints integrated with the Calibration module

7 COMPLEX ANALYZER SCHEMA AND WORK PROCESSES

7.1 The complex analyzer work process

Fully integrated with specification forms that include all device properties; equivalent to all other specification form types.

7.2 The complex analyzer forms are multi-tag form designs.

8 MISCELLANEOUS DATA INTEGRATION

- Line power requirements are integrated with Instrument Index and Electrical Power Browsers and reports
- Mounting and Loop power range data are integrated with the instrument Index

- Full Scale Flow and associated pressure drop/loss data is integrated with calculation module table

9 DATABASE NORMALIZATION AND DATA TYPES

9.1 Process Data properties

All process data properties are normalized to unique fields. Most of these are numeric data type except for their associated units fields. Existing SPI mappings for process data tables are use wherever available.

9.2 Limitation of Available Fields

Although Intergraph has added extensive additional tables and fields for specification forms (ADD1 through ADD9), there still are insufficient quantity to fully normalize the specification forms.

Presently there are 1901 unique fields in use; which leaves only a handful of addition fields for future usage. Unless additional fields are made available, some of the existing fields will need to be used for multiple roles; on new forms.

9.3 Device Properties Normalized to Parameter ROLE

Over 90% of the device parameters are normalized to the ROLE played by that property. As an example; the field for a device's "pressure containing shell primary material of construction" is mapped to spec_udf_c1136; although the field labels are device specific; such as:

- Body / Housing material
- Body wetted material
- Body / Flange material
- Shell / cap material
- Body / Cage material
- Case material
- Etc

9.4 Usage of Proper Data Types

All properties, including device properties, that are defined as numeric data values have been mapped to numeric fields.

Presently there are 446 unique spec_udf_n??? fields in use.

10 DATA EXPORTS TO CONTROL VALVE VENDORS SOFTWARE

10.1 Process Data Fields

Pre-existing control valve form export fields are unchanged; therefore their custom vendor data export is not affected

10.2 Device Parameter Fields

Most by not all of the control valve device parameter field mappings; have been retained in the new control valve forms. Some fields need to be reassigned because of errors in the original mappings or ambiguous properties needing to be mapped to clearly defined properties.

11 FULLY POPULATED SPECIFICATION FORM DATA DICTIONARY

- User friendly Column Header names enable development of Specification Form Browser views for multiple tag review, editing, reports and data exports
- User friendly Column Header names enables meaningful Spec Binder change summary reports
- Restricting process data entry in specification form templates; harmonizes with the preferred work processes and prevents overwriting of such data when copying from templates
- Excluding columns that cause Browser views to fail, supports full use of the Browser module

- Testing of the generated Browser view SQL's; resolves problems that prevent the users form developing views

12 DATA DICTIONARY ENABLING EDITING PHILOSOPHY

The SPI Data Dictionary provides the functionality to manage the follow:

- Creating user friendly column header text for database columns
- Enabling columns to be editable and copied from a Template or Specification
- Enabling columns for Specification Browser views
- Enabling columns to be Editable in Intergraph External Editor

12.1 Browser Columns

Enable all columns except those which are non-editable, such as:

- Spec_note (too large)
- Columns from view_line
- Columns form custom views (v_projectinfo)
- Logo
- Plant, Area, Unit
- Compute columns

12.2 Template Columns

Disable the columns associated with the Process Data module to produce the equivalence of the access rights that would be in effect if the data was edited in the process data module or specification module with disables access to process data fields.

- pd_general table

Note that this philosophy will also effect copying from another specification and form importing data from an external source.

12.3 Editable in IEE Columns

Enable all columns except those which are non-editable, such as:

- Columns from view_line
- Columns form custom views (v_projectinfo)
- Logo
- Plant, Area, Unit
- Compute columns

Note that this will allow external parties (packaged equipment vendors) to enter process data, but the import copy is restricted by the Template disabling those fields. This will require a work-around activity when such data needs to be imported.

12.4 Column Header Naming

- Accept the form column label when it is unique
- Modify the form column label for uniqueness or clarity
  - Add "units" for the columns associated numeric columns
  - Add @ Min Flow, etc for Properties at Flow Conditions

  - Prefix the labels with section name if required for uniqueness
  - User the section name and “Label” or “Value” for user definable labels and their associated value columns
- Shorten column headers that are longer than 40 characters to prevent errors in saving data to Excel

APPENDIX A – TABLE OF SPECIFICATION PAGES AND FORMS

Process	Form No	Page	Form Name	Page Name
Analyzer	501	1	Analyzer Probe	Analyzer probe.psr
Analyzer	502	1	Analyzer Controller	Anaylzer controller.psr
Analyzer	510	1	Fixed Point Gas Monitor	Fixed point gas monitor1.psr
Analyzer	510	2	Fixed Point Gas Monitor	Fixed point gas monitor2.psr
Analyzer	518	1	Dissolved Oxygen Sensor	Analyzer device.psr
Analyzer	518	2	Dissolved Oxygen Sensor	Disolved oxygen sensor.psr
Analyzer	534	1	pH-ORP Sensor	Analyzer device.psr
Analyzer	534	2	pH-ORP Sensor	PH orp sensor.psr
Analyzer	537	1	Humidity-Dewpoint Xmtr	Analyzer device.psr
Analyzer	537	2	Humidity-Dewpoint Xmtr	Humidity dewpoint xmtr.psr
Analyzer	538	1	Conductivity Sensor	Analyzer device.psr
Analyzer	538	2	Conductivity Sensor	Conductivity sensor.psr
Analyzer	539	1	Entrained/Holdup Gas Sensor	Analyzer device.psr
Analyzer	539	2	Entrained/Holdup Gas Sensor	Entrained gas sensor.psr
Analyzer	540	1	Turbidity-Solids Sensor	Analyzer device.psr
Analyzer	540	2	Turbidity-Solids Sensor	Turbidity solids sensor.psr
Analyzer	560	1	Semi-continuous Analyzer	Complex analyzer device.psr
Analyzer	560	2	Semi-continuous Analyzer	Semi-continuous analyzer.psr
Analyzer	570	1	In-situ Gas Analyzer	Complex analyzer device.psr
Analyzer	570	2	In-situ Gas Analyzer	In-situ gas analyzer1.psr
Analyzer	580	1	Continuous Extractive Analyzer	Complex analyzer device.psr
Analyzer	580	2	Continuous Extractive Analyzer	Continuous extractive1.psr
Control Valve	600	1	Linear Motion Control Valve	Valve or regulator device.psr
Control Valve	600	2	Linear Motion Control Valve	Linear control valve.psr
Control Valve	601	1	Rotary Motion Control Valve	Valve or regulator device.psr
Control Valve	601	2	Rotary Motion Control Valve	Rotary control valve.psr
Control Valve	603	1	Severe Service Valve	Severe service vlv device.psr
Control Valve	603	2	Severe Service Valve	Severe service vlv device2.psr
Control Valve	603	3	Severe Service Valve	Linear control valve.psr
Control Valve	603	4	Severe Service Valve	Control valve aux 2.psr
Control Valve	604	1	Linear Motion MOV	Valve or regulator device.psr
Control Valve	604	2	Linear Motion MOV	Linear MOV.psr
Control Valve	604	3	Linear Motion MOV	Linear-rotary Mov pg2.psr
Control Valve	605	1	Rotary Motion MOV	Valve or regulator device.psr
Control Valve	605	2	Rotary Motion MOV	Rotary MOV.psr
Control Valve	605	3	Rotary Motion MOV	Linear-rotary Mov pg2.psr
Control Valve	607	1	Rotary Valve w/Auxilaries	Valve or regulator device.psr
Control Valve	607	2	Rotary Valve w/Auxilaries	Rotary control valve.psr
Control Valve	607	3	Rotary Valve w/Auxilaries	Control valve aux 2.psr

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Process	Form No	Page	Form Name	Page Name
Control Valve	608	1	On-Off Linear Valve	On-Off Valve Device.psr
Control Valve	608	2	On-Off Linear Valve	Linear on-off valve.psr
Control Valve	608	3	On-Off Linear Valve	On-off valve aux2.psr
Control Valve	609	1	On-Off Rotatry Valve	On-Off Valve Device.psr
Control Valve	609	2	On-Off Rotatry Valve	Rotary on_off Valve.psr
Control Valve	609	3	On-Off Rotatry Valve	On-off valve aux2.psr
Control Valve	611	1	Pressure Regulator	Valve or regulator device.psr
Control Valve	611	2	Pressure Regulator	Pressure regulator1.psr
Control Valve	614	1	Air-Release Air-Vacuum Valve	Air-release air vacuum.psr
Control Valve	615	1	Air Release Valve	Air-release valve.psr
Control Valve	616	1	Pilot Operated Regulator	Valve or regulator device.psr
Control Valve	616	2	Pilot Operated Regulator	Pilot pressure regulator.psr
Control Valve	617	1	Desuperheater	Desuperheater_device.psr
Control Valve	617	2	Desuperheater	Desuperheater.psr
Flow	101	1	Elbow Flowmeter	Flow device.psr
Flow	101	2	Elbow Flowmeter	Elbow flowmeter.psr
Flow	102	1	Flow Nozzle-Meter Tube	Flow device.psr
Flow	102	2	Flow Nozzle-Meter Tube	Flow nozzle meter tube.psr
Flow	103	1	Orifice Plate (Only)	Flow device.psr
Flow	103	2	Orifice Plate (Only)	Orifice plate1.psr
Flow	104	1	Orifice Meter Tube	Flow device.psr
Flow	104	2	Orifice Meter Tube	Orifice plate assembly.psr
Flow	105	1	Multivariable Flow Transmitter	Flow device.psr
Flow	105	2	Multivariable Flow Transmitter	Multivariable Flow Xmtr.psr
Flow	106	1	Paddle Flow Switch	Flow device.psr
Flow	106	2	Paddle Flow Switch	Paddle flow switch.psr
Flow	107	1	Pitot Tube	Flow device.psr
Flow	107	2	Pitot Tube	Pitot tube.psr
Flow	108	1	Segmental Wedge Flowmeter	Flow device.psr
Flow	108	2	Segmental Wedge Flowmeter	Segmental wedge flowmeter.psr
Flow	109	1	Paddle Flow Transmitter	Flow device.psr
Flow	109	2	Paddle Flow Transmitter	Paddle flow xmtr.psr
Flow	110	1	V-Cone Flow Element	Flow device.psr
Flow	110	2	V-Cone Flow Element	V-cone flow element.psr
Flow	111	1	Venturi-Flow Tube	Flow device.psr
Flow	111	2	Venturi-Flow Tube	Venturi or flow tube.psr
Flow	112	1	Local Reading Rotameter	Rotameter.psr
Flow	115	1	Flume Flowmeter	Flume flowmeter.psr
Flow	132	1	Magnetic Flowmeter Assembly	Flow device.psr
Flow	132	2	Magnetic Flowmeter Assembly	Magnetic flow assembly.psr
Flow	133	1	Magnetic Flowmeter Tube	Flow device.psr
Flow	133	2	Magnetic Flowmeter Tube	Magnetic flow tube.psr

Process	Form No	Page	Form Name	Page Name
Flow	134	1	Ultrasonic Flowmeter Tube	Flow device.psr
Flow	134	2	Ultrasonic Flowmeter Tube	Ultrasonic flow tube.psr
Flow	135	1	Thermal Mass Flowmeter	Flow device.psr
Flow	135	2	Thermal Mass Flowmeter	Thermal mass flowmeter.psr
Flow	136	1	Thermal Mass Flow Switch	Flow device.psr
Flow	136	2	Thermal Mass Flow Switch	Thermal mass flow switch.psr
Flow	138	1	Vortex-Swirl Flowmeter	Flow device.psr
Flow	138	2	Vortex-Swirl Flowmeter	Vortex swirl flowmeter.psr
Flow	139	1	Sonar Flowmeter Sensor	Flow device.psr
Flow	139	2	Sonar Flowmeter Sensor	Sonar flow sensor.psr
Flow	141	1	Positive Displacement Ind	Positive displacement .psr
Flow	142	1	Positive Displacement Xmtr	Flow device.psr
Flow	142	2	Positive Displacement Xmtr	Positive displacement xmtr.psr
Flow	144	1	Ultrasonic Flare Flowmeter	Flow device w_Composition.psr
Flow	144	2	Ultrasonic Flare Flowmeter	Ultrasonic flare flowmeter.psr
Flow	152	1	Coriolis Flowmeter Assembly	Flow device.psr
Flow	152	2	Coriolis Flowmeter Assembly	Coriolis flowmeter assy.psr
Flow	153	1	Coriolis Flowmeter Tube	Flow Device non-head.psr
Flow	153	2	Coriolis Flowmeter Tube	Coriolis flow tube.psr
Flow	161	1	Sight Flow Indicator	Sight flow indicator.psr
General	114	1	Visual Signal Light	Visual signal light.psr
General	119	1	Audible Signal Device	Audible Signal Device.psr
General	137	1	Magnetic Flowmeter Transmitter	Magnetic flow xmtr.psr
General	143	1	Sonar Flowmeter Transmitter	Sonar flow Xmtr.psr
General	154	1	Coriolis Flow Transmitter	Coriolis flow xmtr.psr
General	155	1	Ultrasonic Flowmeter Xmtr	Ultrasonic flow xmtr.psr
General	422	1	RTD / TC temperature Xmtr	RTD tc temperature xmtr.psr
General	519	1	Electro-chemical Analyzer Xmtr	Disolved oxygen ozone.psr
General	535	1	pH-ORP Transmitter	PH-orp xmtr.psr
General	541	1	Turbidity / Solids Transmitter	Turbidity solids xmtr.psr
General	542	1	Entrained/Holdup Gas Xmtr	Entrained gas xmtr.psr
General	550	1	Conductivity-Resistivity Xmtr	Conductivity-resist xmtr.psr
General	606	1	Electric Actuator	Electric actuator.psr
General	606	2	Electric Actuator	Electric actuator pg2.psr
General	802	1	Receiver Gauge	Receiver gauge.psr
General	821	1	Load Cell Transducer	Weight Device.psr
General	821	2	Load Cell Transducer	Load cell transducer.psr
General	822	1	Electronic Weight Transmitter	Electronic weight xmtr.psr
General	851	1	Fieldbus Junction Box	Fieldbus junction.psr
General	861	1	Electromechanical Limit Sw	Electromechanical limit Sw.psr
General	862	1	Proximity Sensor	Proximity sensor.psr
Level	210	1	Capacitance-RF Admit Xmtr	Level device.psr

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Process	Form No	Page	Form Name	Page Name
Level	210	2	Capacitance-RF Admit Xmtr	Capacitance rf admit xmtr.psr
Level	211	1	Flange Mount DP Level Xmtr	Level device.psr
Level	211	2	Flange Mount DP Level Xmtr	Flanged dp level xmtr.psr
Level	212	1	Displacer Type Level Xmtr	Level device.psr
Level	212	2	Displacer Type Level Xmtr	Displacer type xmtr.psr
Level	213	1	Diff Pressure Level Xmtr	Level device.psr
Level	213	2	Diff Pressure Level Xmtr	Diff pressure level xmtr.psr
Level	214	1	Nuclear Level Transmitter	Level device.psr
Level	214	2	Nuclear Level Transmitter	Nuclear level xmtr.psr
Level	215	1	Resistance-Tape Level Xmtr	Level device.psr
Level	215	2	Resistance-Tape Level Xmtr	Resistance-tape level xtmr.psr
Level	217	1	Non-contact Ultrasonic Xmtr	Level device.psr
Level	217	2	Non-contact Ultrasonic Xmtr	Non-contact ultrasonic.psr
Level	218	1	Non-contact Radar Transmitter	Level device.psr
Level	218	2	Non-contact Radar Transmitter	Non-contact radar xmtr.psr
Level	219	1	Guided Wave Radar	Level device.psr
Level	219	2	Guided Wave Radar	Guided wave radar.psr
Level	230	1	Capacitance RF Admit Switch	Level device.psr
Level	230	2	Capacitance RF Admit Switch	Capacitance rf admit sw.psr
Level	231	1	Float or Displacer Level Sw	Level device.psr
Level	231	2	Float or Displacer Level Sw	Float-displacer level sw.psr
Level	232	1	Nuclear Radiation Level Sw	Level device.psr
Level	232	2	Nuclear Radiation Level Sw	Nuclear radiation level sw.psr
Level	235	1	Ultrasonic Contact Level Sw	Level device.psr
Level	235	2	Ultrasonic Contact Level Sw	Ultrasonic contact level.psr
Level	237	1	Rotary Level Switch	Level device.psr
Level	237	2	Rotary Level Switch	Rotary level switch.psr
Level	238	1	Tank Level Gauge or Ind	Level device.psr
Level	238	2	Tank Level Gauge or Ind	Tank level gauge or Ind.psr
Level	250	1	Liquid Level Gage Glass	Level device.psr
Level	250	2	Liquid Level Gage Glass	Liquid level gage glass.psr
Level	251	1	Magnetic Liquid Level Gage	Level device.psr
Level	251	2	Magnetic Liquid Level Gage	Magnetic liquid level gage.psr
Level	252	1	Magnetic Liquid Level Switch	Level device.psr
Level	252	2	Magnetic Liquid Level Switch	Magnetic liquid level sw.psr
Level	253	1	Diff Press Level Xmtr w/Seal	Level device.psr
Level	253	2	Diff Press Level Xmtr w/Seal	Diff press level xmtr-seal.psr
Level	299	1	Vibrating Element Switch	Level device.psr
Level	299	2	Vibrating Element Switch	Vibrating element level sw.psr
Pressure	300	1	Pressure Gauge	Pressure gauge1.psr
Pressure	301	1	Pressure Gauge w/Seal	Pressure gauge Seal.psr
Pressure	310	1	Diff Pressure Gauge	Diff pressure gauge.psr

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Process	Form No	Page	Form Name	Page Name
Pressure	320	1	Pressure Transmitter	Pressure device.psr
Pressure	320	2	Pressure Transmitter	Pressure xmtr.psr
Pressure	321	1	Pressure Transmitter w/Seal	Pressure device.psr
Pressure	321	2	Pressure Transmitter w/Seal	Pressure xmtr seal.psr
Pressure	330	1	Diff Pressure Transmitter	Diff pressure device.psr
Pressure	330	2	Diff Pressure Transmitter	Diff pressure xmtr.psr
Pressure	331	1	Diff Pressure Xmtr w/Seal	Diff pressure device.psr
Pressure	331	2	Diff Pressure Xmtr w/Seal	Diff pressure xmtr seal.psr
Pressure	340	1	Pressure Switch	Pressure device.psr
Pressure	340	2	Pressure Switch	Pressure switch1.psr
Pressure	350	1	Diff Pressure Switch	Diff pressure device.psr
Pressure	350	2	Diff Pressure Switch	Diff pressure switch.psr
Relief Valve	790	1	Rupture Disk Assembly	Relief device.psr
Relief Valve	790	2	Rupture Disk Assembly	Rupture disk assembly.psr
Relief Valve	791	1	Tank Vent	Vent device.psr
Relief Valve	791	2	Tank Vent	Tank vent.psr
Relief Valve	792	1	Pressure Relief Valve	Relief device.psr
Relief Valve	792	2	Pressure Relief Valve	Pressure relief Valve1.psr
Temperature	400	1	Bimetallic Thermometer	Bimetallic Thermometer.psr
Temperature	410	1	Filled-System Thermometer	Filled-system thermometer.psr
Temperature	411	1	Filled-System Temp Switch	Temperature device.psr
Temperature	411	2	Filled-System Temp Switch	Filled-system temp sw.psr
Temperature	412	1	Filled-System Temp Xmtr	Temperature device.psr
Temperature	412	2	Filled-System Temp Xmtr	Filled-system temp xmtr.psr
Temperature	420	1	RTD Assembly-Thermowell	Temperature device.psr
Temperature	420	2	RTD Assembly-Thermowell	RTD assembly thermowell.psr
Temperature	430	1	Thermocouple Assembly	Temperature device.psr
Temperature	430	2	Thermocouple Assembly	Thermocouple assembly.psr
Temperature	431	1	Multi-point Thermocouple	Temperature device.psr
Temperature	431	2	Multi-point Thermocouple	Thermocouple assembly.psr
Temperature	440	1	Thermal Radiation Transmitter	Temperature device.psr
Temperature	440	2	Thermal Radiation Transmitter	Thermal radiation temp.psr
Temperature	450	1	Thermowell / Protecting Tube	Thermowell protecting tube.psr

APPENDIX B – PROCESS DATA CUSTOM FIELDS

- In the SPI Domain Administration, click the 

icon to open the Custom Fields window.
- Select the Process Data option from the Item type dropdown

- Provide the header labels in the Definition field of the custom table interface

Number	Visible	Definition
1	Check	Design ambient temp min
2	Check	Design ambient temp max
9	Check	Downstream line number
11	Check	Critical temperature
12	Check	Critical temperature Units
18	Check	NFPA health hazard
19	Check	NFPA flammability
20	Check	NFPA reactivity

APPENDIX C – INSTRUMENT CERTIFICATION AND CRITICALITY DATA

1. Instrument Certification values should be entered in the Index module's Tables menu option of Instrument Certification.

Instrument Certifications	
CMPNT_CERTIF_NAME	**CMPNT_CERTIF_DESC**
ASME NB	ASME National Board
ATEX	Explosive Atmospheres Directive
CCL	Communication Certification Laboratory
CE	CE Marking Directives
CSA	Canadian Standards Association
CSL	Curtis-Straus LLC
ERS	Electrical Reliability Services
FM	FM Approvals LLC
ITSNA	Intertek Testing Services NA
MET	MET Laboratories
NA	Not applicable
NFS	NSF International
NRTL	Nationally Recognized Testing Laboratory
NTS	National Technical Systems
SWRI	Southwest Research Institute
TUV	TUV Rheinland of North America
TUVAM	TUV America
UGSUS	SGS U.S. Testing Company
UL	Underwriters Laboratories
WL	Wyle Laboratories

2. Instrument Criticality values should be entered in the Index module's Tables menu option of Instrument Criticality.

Instrument Criticality	
CRITICALITY_NAME	**CRITICALITY_DESCRIPTION**
	None
NR	Not Required
SIL 1	SIL 1
SIL 2	SIL 2
SIL 3	SIL 3
SIL 4	SIL 4

APPENDIX D – SIGNAL TYPE

Signal type values should be entered in the Index module's Tables menu option of Signal type.

SIGNAL_TYPE_NAME
NA
NPN & PNP NO
NPN normally closed
NPN normally open
PNP normally closed
PNP normally open
PNP transistor
T1 mode, low speed
T2 mode, high speed
TTL compatible
analog current
analog current sink
analog current souce
analog fiber optic
analog pneumatic
analog resistance
analog voltage
binary pneumatic
current, TTL
current,digital
current,freq
current,freq,digital
current,freq,relay
current,freq/pulse
current,relay
current,voltage
digital
digital multi-var
digital,relays
discrete and analog
dry contact
dual analog current
fiber optics
frequency
frequency/pulse
low power
maintained contact
milivolt

SIGNAL_TYPE_NAME
multiplex
pulse
pulse,high rate
pulse,low rate
radio signal
relay
scalable pulse
smart multivariable
smart,single var
solid state relay
transistor sw NPN
transistor sw PNP
triac output
voltage
voltage,digital

APPENDIX D – LINEARITY TYPES

Linearity types values should be entered in the Index module's Tables menu option of Linearity types.

LINEAR_TYPE_NAME
NA
bilinear
characterized
configurable
equal percentage
fixed
high gain
linear
linear w/ave flow
linear w/composition
linear w/mass flow
linear w/measurement
linear w/resistance
linear w/temperature
linear w/volume
linear w/volume flow
linear w/weight

LINEAR_TYPE_NAME
logarithmic
non-linear
quasi-logarithmic
square root

APPENDIX E – SPECIFICATION FORM REVISIONS

These forms presently contain over 37,000 fields and associated headers and over 3500 unique dropdown list. Therefore; it can be expected that some errors will exist that did not get identified during the testing cycle. The forms were developed by reverse engineering vendor's catalogs for three to eight major vendors for each form, but there surely are other vendors whose options have yet to be identified. Therefore, if users will report any errors or suggest improvements with supporting vendor documentation, the forms will quickly be updated and revised files made available to those identifying such opportunities for improvement. Please send such issues to gbarta@comcast.com.