Smart Instrumentation Data Integration 1.0

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Smart Instrumentation Data Integration 1.0

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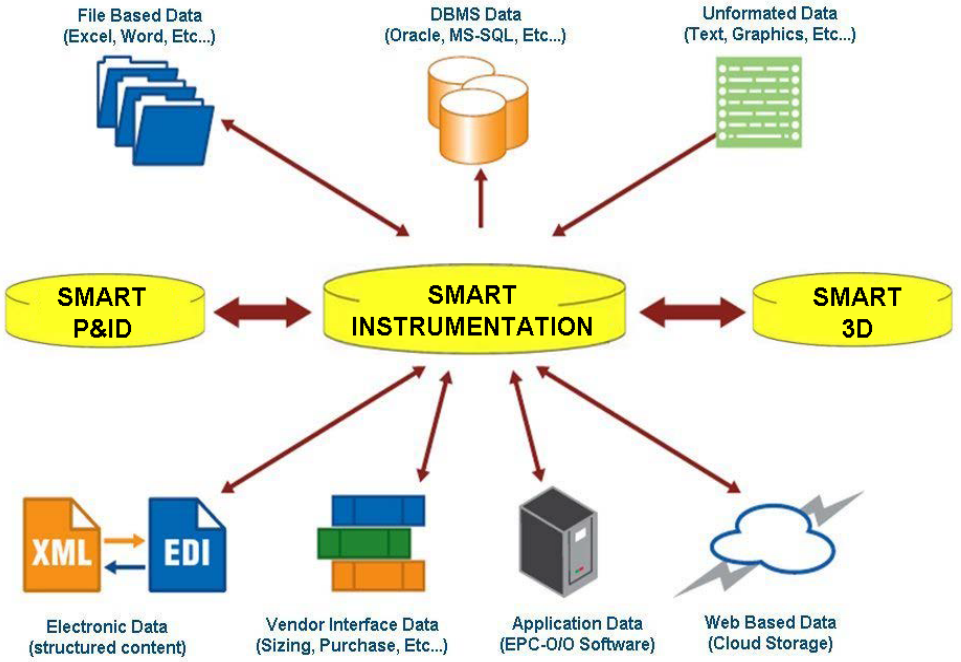


Smart Instrumentation Data Integration Methods

Effective Data Integration uses one or more of the following Integration Methods:

Method	Description	Smart Instrumentation Example
Manual data integration	Data export and Import using a common format	SI Integration by mapping one database to another
Data transformation	Converts data from one format to another.	SI Integration using Excel or CSV files
Data propagation	Copies data from one location to another.	SI Integration using warehousing or Data backup.
Data consolidation	Combine data from different sources into a single file	SI Integration with SmartPlant Foundation repository
Data federation	Allows users to access data from multiple sources	SI Integration with Intergraph Smart Reference Data
Middleware integration	Uses software solutions to integrate data (EAI, SaaS, APIs, etc.)	SI Integration with Enterprise Application Integration (EAI)

Smart Instrumentation Data Integration Standards

- ISO 15926 Industrial automation systems and integration - Integration of life-cycle data for process plants including oil and gas production facilities
  - Part 1 – Introduction, Purpose is to facilitate integration of data
  - Part 2 - Data Model, a generic model that can support all disciplines, supply chain company types and life cycle stages
  - Parts 3 – 6 - Reference Data, the terms used within facilities for the process industry.
  - Part 7 – 9 - Implementation, Methods for the integration of distributed systems, defining an implementation architecture based on the W3C Recommendations for the Semantic Web


INTERNATIONAL STANDARD

ISO 15926-1

First edition 2004-07-15

Industrial automation systems and integration — Integration of life-cycle data for process plants including oil and gas production facilities —

Part 1:
Overview and fundamental principles

Systèmes d'automatisation industrielle et intégration — Intégration de données de cycle de vie pour les industries de «process», y compris les usines de production de pétrole et de gaz —

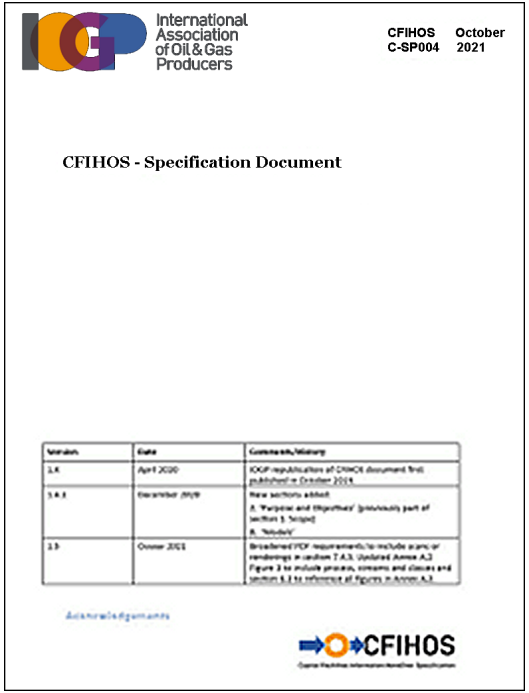
Partie 1: Vue d'ensemble et principes fondamentaux

Smart Instrumentation Data Integration Standards

ISO 15926 Industrial automation systems and integration Standard		
Standard Parts	**Description**	**Data Examples**
ISO 15926-1	Introduction	Purpose is to facilitate integration of data defined in the Specification
ISO 15926-2-3	General Concepts .	Domain, Hierarchy, Plant, Entity, Process Function (Flow, Pressure, etc...).
ISO 15926-4-6	Industry Standards	Pump, Tank, Equipment, Instruments, Standards (ASME, API, DIN, etc...)
ISO 15926-7-8	Reference Data.	Specific Data Templates, Reference Data Libraries, etc...
ISO 15926-9	Facade	Data Presentation, HMI, Display, Representation, etc...
ISO 15926-10	CFIHOS Migration	Capital Facilities Information Handover Specification using Web APIs

Smart Instrumentation Data Integration Standards

- **Capital Facilities Information Handover Specification (CFIHOS)** is an industry standard developed to improve how information is exchanged between the companies who own, operate, and construct equipment for the process and energy sectors.
  - **Technical specification** - Requirements, rules and principles for information handover.
  - **Data model** - For structuring data and documents about assets.
  - **Implementation advice and guidance** - Outlining implementation steps (and do's and don'ts).
  - **Dictionary (Reference Data Library)** - Consistent naming of equipment, properties and documents.
  - **Implementation software requirements** - Outlining functional system requirements for handover.

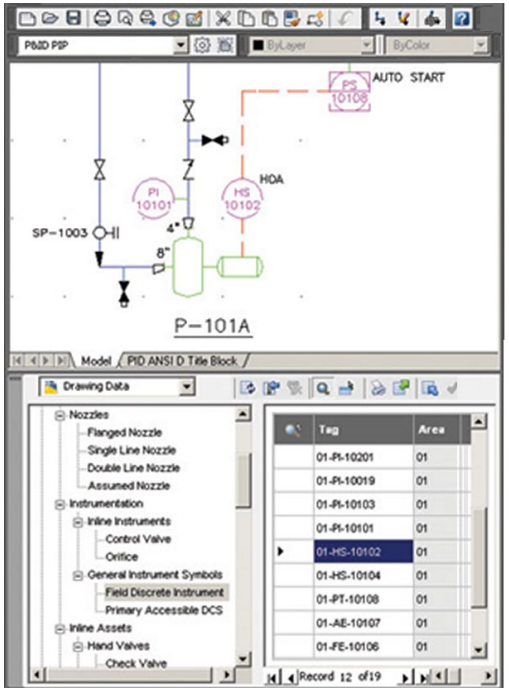


Smart Instrumentation Data Integration Standards

CFIHOS - Capital Facilities Information Handover Specification		
Standard Steps	**Description**	**Data Examples**
Specify	Technical specification	Purpose is to facilitate integration of data defined in the Specification
Define	Data Model	Domain, Hierarchy, Plant, Entity, Process Function (Flow, Pressure, etc...).
Manage	Implementation advice	Pump, Tank, Equipment, Instruments, Standards (ASME, API, DIN, etc...)
Set up	Reference Data Library	Specific Data Templates, Reference Data Libraries, etc...
Software	API Implementation	Handover Data using Enterprise Application Integration API Software

Smart Instrumentation Integration to Smart P&ID

- **Smart P&ID is the source for all Smart Instrumentation Tags, but Data Integration is complicated by several issues:**
- Smart P&IDs graphic shortcuts result in loss of data:
  - Implied Tags are not represented in the P&ID database
  - Tabular referenced tags create no records in the P&ID database
- Outdated standards for P&IDs symbology and legends do not address data integration or latest instrument technology:
  - PIP and ANSI/ISA-5.1 standards are for Instrument P&ID Symbols but do not address data requirements
- P&ID workflows are focused only on the graphics part of the diagrams but need to address data integration



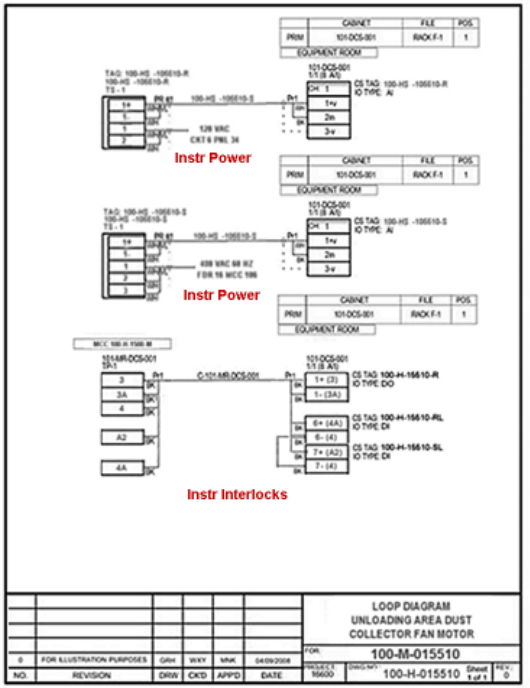
Smart Instrumentation Integration to Smart P&ID

Smart Instrumentation / P&ID Integration issues and Solutions		
Issue	**Description**	**Solution**
Out of Date Standards	Missing Technology Symbols	Use latest ANSI/ISA 5.1 Standards
Implied Tags	No P&ID Database Records	Show all signals on P&ID
Tabular Data	No P&ID Database Records	Show all signals on P&ID
Typical Abbreviated Symbols	No P&ID Database Records	Show all signals on P&ID
Complex Tag Numbering	Tag Mismatch between SI and P&ID	Use simple ISA Naming Convention
P&ID Graphic Wokflow	No Control Systems Data input	Use Smart P&ID Engineering Mode

Smart Instrumentation Integration to Smart Electrical

- **Smart Instrumentation Data integrated to Smart Electrical:**
  - Instrument Power Requirements
  - Instrument Interlock Signal Tags
  - Instrument Interlock Terminal Numbers
  - Instrument Panel Power Requirements
  - Cross reference Loop Diagram Numbers

- **Smart Electrical Data integrated to Smart Instrumentation:**
  - Instrument Power Circuit Numbers
  - MCC Interlock Signals Terminal Numbers
  - Instrument Panel Power Circuit Numbers
  - Cross reference Schematic Numbers



Smart Instrumentation Integration to Smart Electrical

Smart Instrumentation and Smart Electrical Data Correlation		
Element	**Smart Instrumentation**	**Smart Electrical**
Tag Number	Instrument Tag Number	I/O Signal Tag Number
Panel Number	Electrical Panel Number	Instrument Panel Number
Instrument Power Req'd	Instrument Tag Number	Electrical Circuit Number
Diagram Number	Loop Diagram Number	Electrical Schemtic Number
Terminal Numbers	I/O Terminal Numbers	MCC Terminal Numbers
Power Requirement	Load, Voltage, Supply	Load, Voltage, Supply

Smart Instrumentation Integration with Vendors

- **Smart Instrumentation Vendor Data Integration categories:**
  - Identification Data
  - Instrument Sizing Data
  - Instrument Selection Data
  - Instrument Dimensional Data
  - Instrument Purchasing Data
  - Instrument DCS connection Data
- **Smart Instrumentation Vendor Integration Data sources:**
  - Smart Instrumentation Index Data
  - Smart Instrumentation Spec Data
  - Smart Instrumentation Process Data
  - Smart Instrumentation I/O wiring requirements
  - Smart Instrumentation Dimensional requirements

Smart Instrumentation Integration with Vendors

Smart Instrumentation Vendor integration with Index data		
Index Elements	**Smart Instrumentation Data Type**	**Vendor Provided Data**
Tagging and Identification	Tag, Spec, Loop Numbers.	Data Record Identifiers
Instrument Type	Process and Instrument Function	Process Requirements
Procurement Packaging	Construction, PO and Turn Over	Delivery schedule
Material Management Data	Engineered Items and Bulks	Shipping and Storage
Vendor Focused Data	Model and Catalog Numbers.	Model, Pricing and Catalog No.
Testing Requirements	Testing and Certification Requirements	FAT and Testing results
Dimensional Data	Dimensional Data for Piping (DDP)	Instrument Dimensional Data

Smart Instrumentation Integration with Vendors

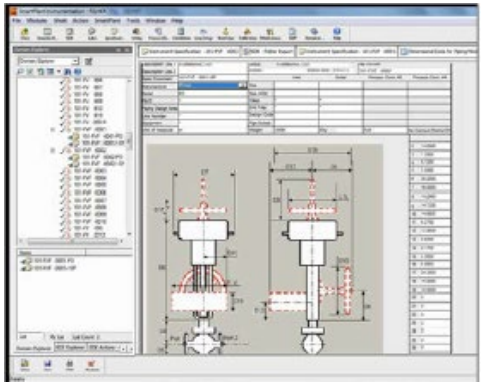
Smart Instrumentation Vendor integration with Spec Sheets		
Specification Elements	**Smart Instrumentation Data Type**	**Vendor Provided Data**
I.D. Numbers	Tag, Spec, P.O.	Data Record Identifiers
Process Conditions	Process Data	Process Requirements
Sizing Requirements	Size and Design Process Data	Sizing Calculations
Selection Data	Materials and Notes	Basis of Selection Criteria
Accessories	Positioners, Switches, Solenoids, etc.	Provided Accessories
Procurement Data	Manufacture, RFQ & PO Numbers	Model, Pricing and Catalog No.

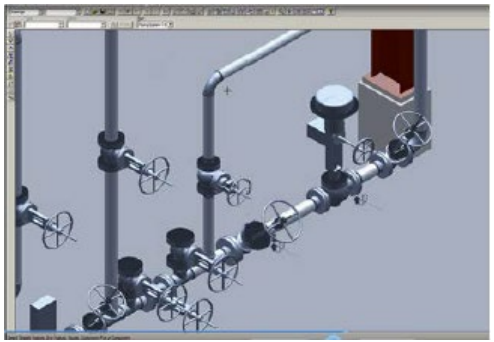
Smart Instrumentation Integration with Vendors

Smart Instrumentation Vendor integration with DCS & PLC Vendors		
DCS & PLC Elements	**Smart Instrumentation Functions**	**Vendor Provided Data**
I/O Wiring Hierarchy	Download I/O Card Library	Vendor Provide I/O Card Library
Field Wiring Matrix	Wiring and I/O Loading Data	Correlate I/O Addressing
DCS & PLC Configuration	Publish Loop and P&ID numbers	Program the Configuration
Process Narrative	Ranges and Set Points	DCS & PLC Calibration
Testing Requirements	I/O wiring verification	Factory Acceptance Test
Maintenance Requirements	Calibration and Loop Maintenance	Perform O/O Functions.

Smart Instrumentation Integration with Smart 3D

- Smart Instrumentation to Smart 3D uses Smartplant Foundation (SPF) for Integration
- Smart Instrumentation data published to SPF for retrieval into the Smart 3D model include:
  - In-line Valves and Flowmeters from DDP
  - On-line and Off-line instruments from Index
  - Instrument Mounting and Connection Details
  - Instrument Cable and Routing in raceways
  - Hook-up Details and Material Requirements for Construction Work Packages
- Location of Instruments, Junction Boxes and I/O Connection Points are created in Smart 3D





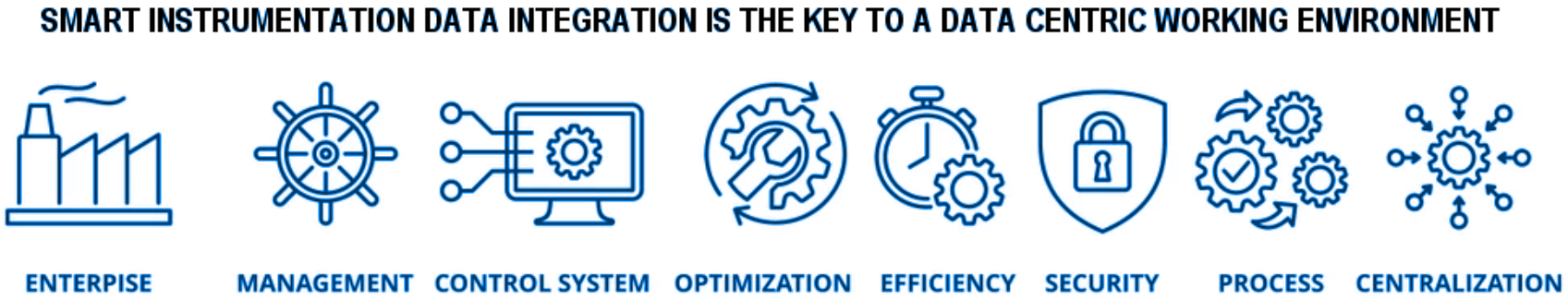
Smart Instrumentation Integration with Smart 3D

Smart Instrumentation Vendor integration with Smart 3D		
Smart 3D Data Sets	**Smart Instrumentation Functions**	**Smart 3D Activities**
Plant Hierarchy and CWAs	Match Plant Hierarchy to S3D	Define Construction Work Areas
Piping Inline Instrumentation	Define DDP data for S3D in-lines	Import DDP data from SI
Offline Instrumentation	Define Offline Instruments	Model Offline Instruments
Instrument Equipment	Define Instrument Junction Boxes	Model Instrument Junction Boxes
Instrument Cable Tray System	Pass Required tray to Electrical	Electrical Models trays in S3D
Instrument Cables in S3D	Publish Instrument Cable Schedule	Route Cables in S3D.

Smart Instrumentation Next Generation Integration

- The future of Smart Instrumentation data integration is not about transferring data from point A to point B. It's about enabling users to fully harness their data's potential with scalable, adaptable solutions built to handle the complexities of today's digital landscape
- The Next Generation of Data Integration should include the following functions:
  - **Data Activation:** The focus is on making data readily available for analysis
  - **Actionable Insights**: Minimizing the time from data collection to decision-making
  - **Real-time Data Movement:** Rapid integration for making timely strategic decisions
  - **Cost Savings:** Effective data integration adds value by avoiding data-related errors
  - **Adapting to Change:** Integration adapts to changing data sources and technologies
  - **Cloud-based integration:** Advantages include scalability, flexibility, and cost savings
  - **Data security:** Integration solutions that protect data from unauthorized access
  - **Artificial intelligence:** Automates data integration tasks and improve data quality
- **SDx opens the door to the future of Smart Instrumentation data Integration**

Smart Instrumentation Data Integration 1.0



“Data really powers everything that we do.”

~ Jeff Weiner

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