

DEXPI PID Instrumentation Model

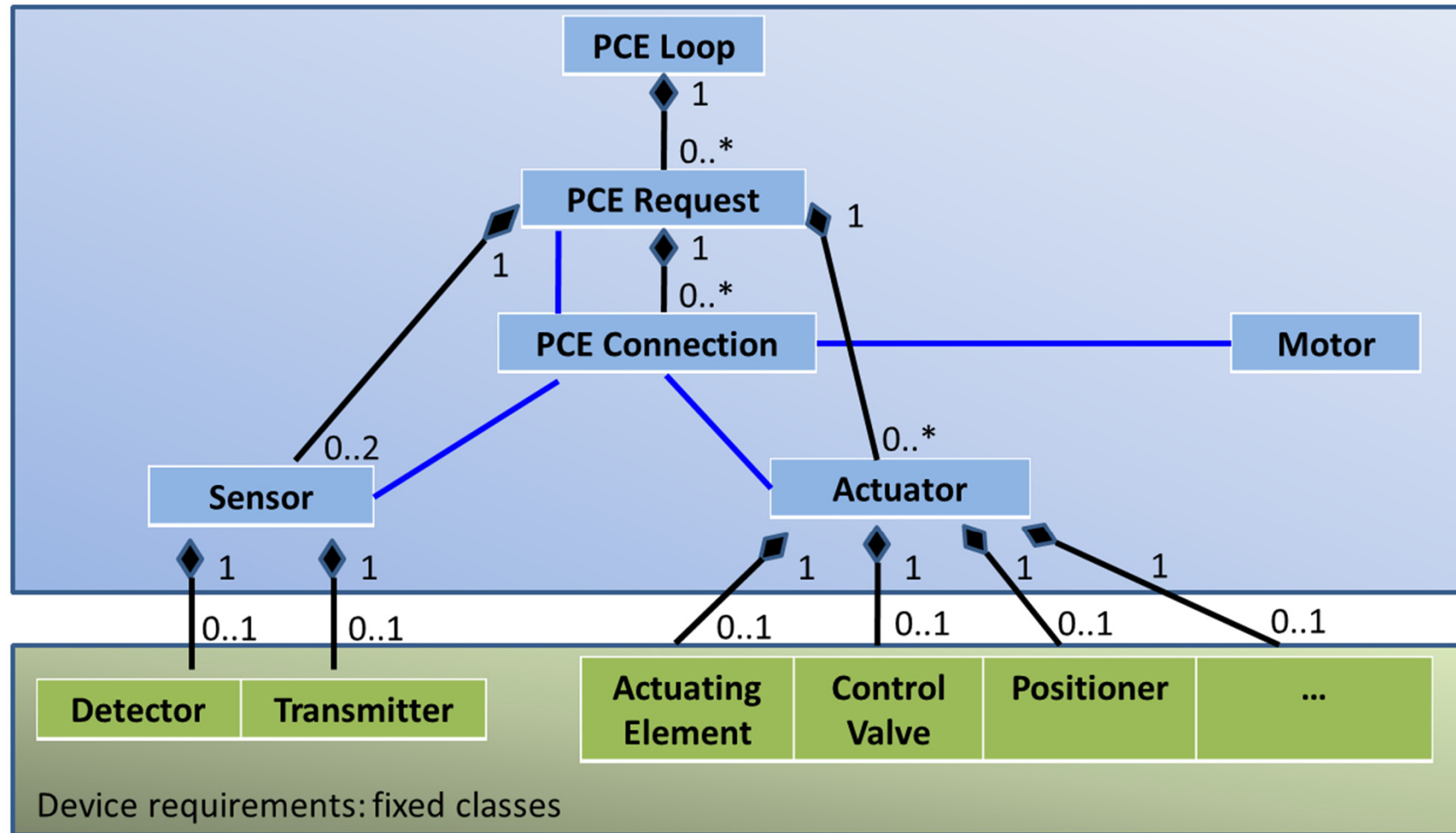
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ISO 15926 – Instrumentation SIG

13th of May 2014



Instrumentation – P&ID Objects



- Naming: PCE = *Process Control Engineering*
according to IEC 62424:2008
- 2 different ways of modeling:
 1. device oriented modeling
 2. function oriented modeling ← We will use this for P&ID scope!
- function oriented modeling does not model the device itself but the **requirement** for a device

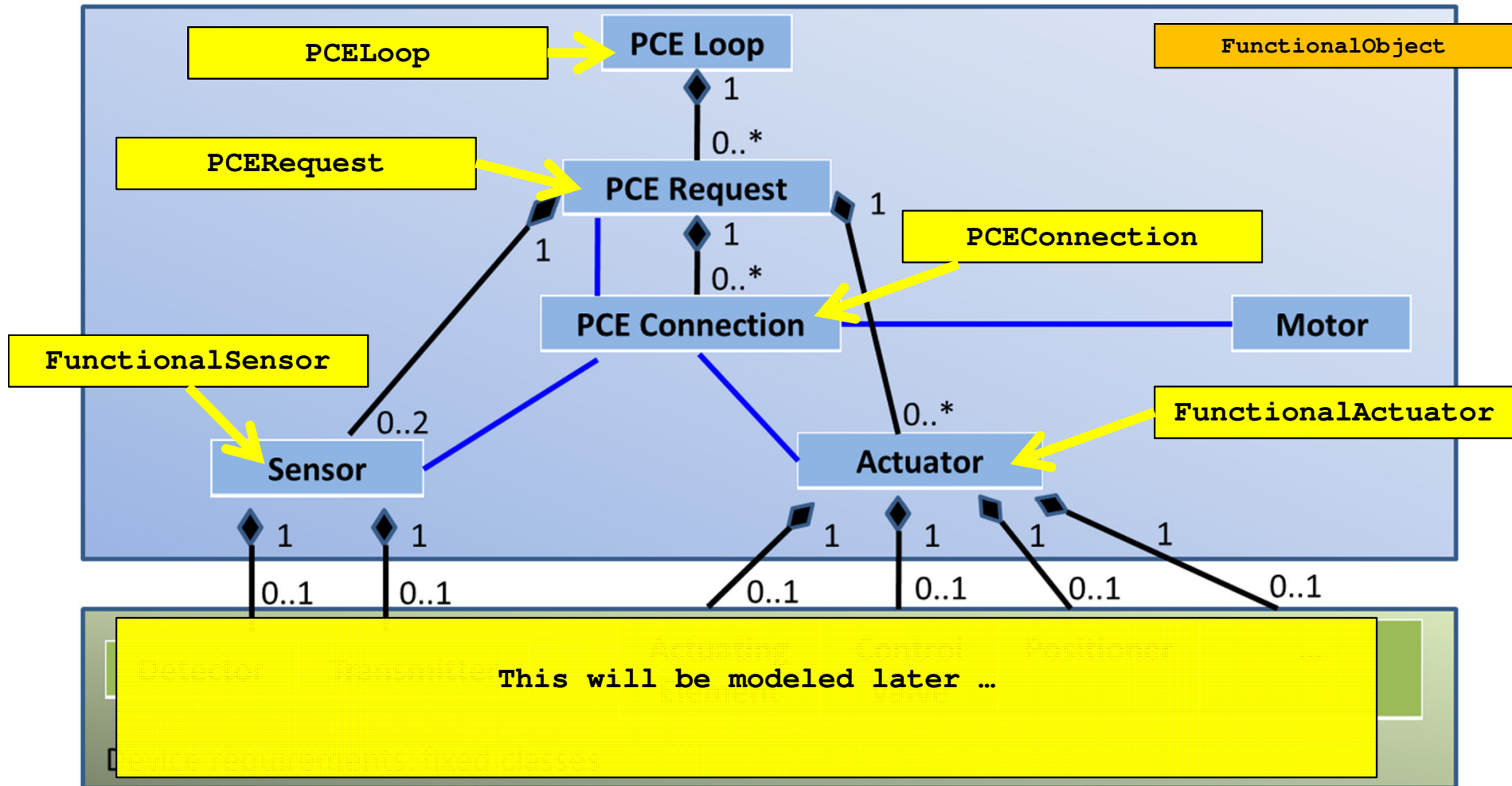
- ISO 15926
 - This is us! (?)

- CAEX / PAS 62424
 - 2 Parts: 1. Information-Model 2. Transport-Layer (CAEX)
 - We will take-over ideas from Part 1
 - Transport Layer will be in ISO 15926 (RDL, RDF, Sandboxes, etc.)

- OntoCAPE
 - Few elements for PCE, good meta-layer

- ANSI/ISA-S5.1-1984 (R 1992)
 - Describes symbols and abbreviations, those P&IDs should be transportable with our approach

Instrumentation – P&ID Objects



- PCA-RDL „Loop“ not usable.
- **Suggestion: Invent new „PCELoop“**
- <http://sandbox.dexpi.org/PCELoop/>
- Description:
„collection of PCE requests depicting their functional coherence“
- attributes
 - LoopNumber as unique identifier string
- has PCE Requests as parts (0..N)

LOOP

rdl:defaultRdsId	"R80475913938"
rdl:hasCreationDate	"2007.05.22"
rdl:hasCreator	"tchr"
rdl:hasDesignation	"LOOP"
rdl:hasIdPCA	"RDS47466172100"
rdl:hasStatus	"Qualified"
rdf:type	p2:ClassOfAbstractObject
rdfs:label	"LOOP"
owl:sameAs	http://posccaesar.org/rdl/RDS47466172100
Specialization	
Superclass	ARCWISE CONNECTED SPACE
Subclass	DIRECTED LOOP MANIFOLD LOOP
Classification	
Classifier	ISO TS 15926-3 (2007) REFERENCE DATA CLASS
ClassOfDescription	
Pattern	rdl:RDS4746616114 rdl:RDS4746616117
ClassOfDefinition	
Pattern	rdl:RDS4035582813

- Nothing similar found in PCA-RDL
- <http://sandbox.dexpi.org/rdl/PCERequest/>
- IEC 62424 says: *„requirement for process control equipment represented by a bubble [...]“*
- We say: *„process control engineering requirement for process control equipment which collects all information on the functional requirements and is represented by a bubble in the P&ID ”*
- Type: *ClassOfFunctionalObject*
- SuperClass: *„ISO 15926-4 Functional Object“* (PCA-RDL)
(request for renaming this to *„FunctionalObject“*)

- attributes
 - PCERequestNumber as unique identifier string
 - Category 1 or 2 letters
 - ProcessFunctions string
 - Location values: Central, Panel, Field
 - SymbolRegistrationNumber string
 - SafetyRelevanceClass
 - SymbolRegistrationNumber string
 - IsGMPRelevant
 - SymbolRegistrationNumber string
 - IsQualityRelevant
 - SymbolRegistrationNumber string
 - Vendor string
 - TypicalInformation string
 - DeviceInformation string
- can have PCE Connections as parts

- Nothing similar found in PCA-RDL
- <http://sandbox.dexpi.org/rdl/PCEConnection>
- Description: „ A 'connection point' where an instrument is connected to an object, excluding process connections.“
(similar to PCA:InstrumentConnection)
- Type: *ClassOfFunctionalObject*
- SuperClass: „*ISO 15926-4 Functional Object*“ (PCA-RDL)
(request for renaming this to „*FunctionalObject*“)

- Is part of a PCE Request and connects this PCE Request with a sensor (or an device of the sensor), an actuator (or an device of the actuator), another PCE request or a motor
- Attributes
 - SymbolRegistrationNumber string
 - Source (my PCE Request)
 - Sink
 - Type
 - TagNumber
 - and for signal lines:
 - SignalPointNumber as unique identifier number (1,2,3,4,5 or 6)
 - ReferencedLevel string, HHH, ... , LLL perhaps part 4 classes
 - Function(s) string
 - O.P.: how to identify? Perhaps the sink

- <http://data.posccaesar.org/rdl/RDS461879>
- *“An artefact that converts the input variable into a signal suitable for measurement.”*
- **Not a functional object!**
- → new Element „FunctionalSensor“
- <http://sandbox.dexpi.org/rdl/FunctionalSensor>
- Description:
„functional unit that senses the effect of a measured variable at its input and places a corresponding measurement signal at its output” (IEC 62424)

DETECTING ELEMENT

<code>rdl:defaultRdsId</code>	"R88525339385"
<code>rdl:hasCreationDate</code>	"2006.06.07"
<code>rdl:hasCreator</code>	"u20683"
<code>rdl:hasDefinition</code>	"An artefact that converts the input variable into a signal suitable for measurement."
<code>rdl:hasDesignation</code>	"DETECTING ELEMENT"
<code>rdl:hasDesignationAl...</code>	"SENSING ELEMENT"
<code>rdl:hasIdPCA</code>	"RDS461879"
<code>rdl:hasNote</code>	"IEC 902 - 1987 A detecting element is the primary element of a measuring chain."
<code>rdl:hasStatus</code>	"Qualified"
<code>rdl:type</code>	p2:ClassOfInanimatePhysicalObject
<code>rdfs:label</code>	"DETECTING ELEMENT"
<code>owl:sameAs</code>	http://posccaesar.org/rdl/RDS461879
Specialization	
Superclass	ARTEFACT
Subclass	AXIAL DISPLACEMENT PROBE BAROMETRIC PRESSURE SENSOR CAPACITANCE PROBE CONDUCTIVITY CELL CORROSION PROBE DIFFERENTIAL FORCE SENSING ELEMENT DIFFERENTIAL PRESSURE CELL ELECTRONIC SENSOR EROSION PROBE FLOW SENSOR More... (22)

- Is connected to a PCE Request via Connect to Process Line and is part of this PCE Request
- Attributes
 - SensorNumber as unique identifier string
 - SensorType string
 - Sensor Device(s) like Detectors or Transmitter
 - DeviceType string
 - SymbolRegistrationNumber string
 - MediaCode string
 - PipingClass string
 - NominalDiameter
 - InsulationType string
 - InsulationThickness number with UOM length
 - HeatTracingType string
 - HeatTracingTemperature number with UOM temperature

Actuator → FunctionalActuator

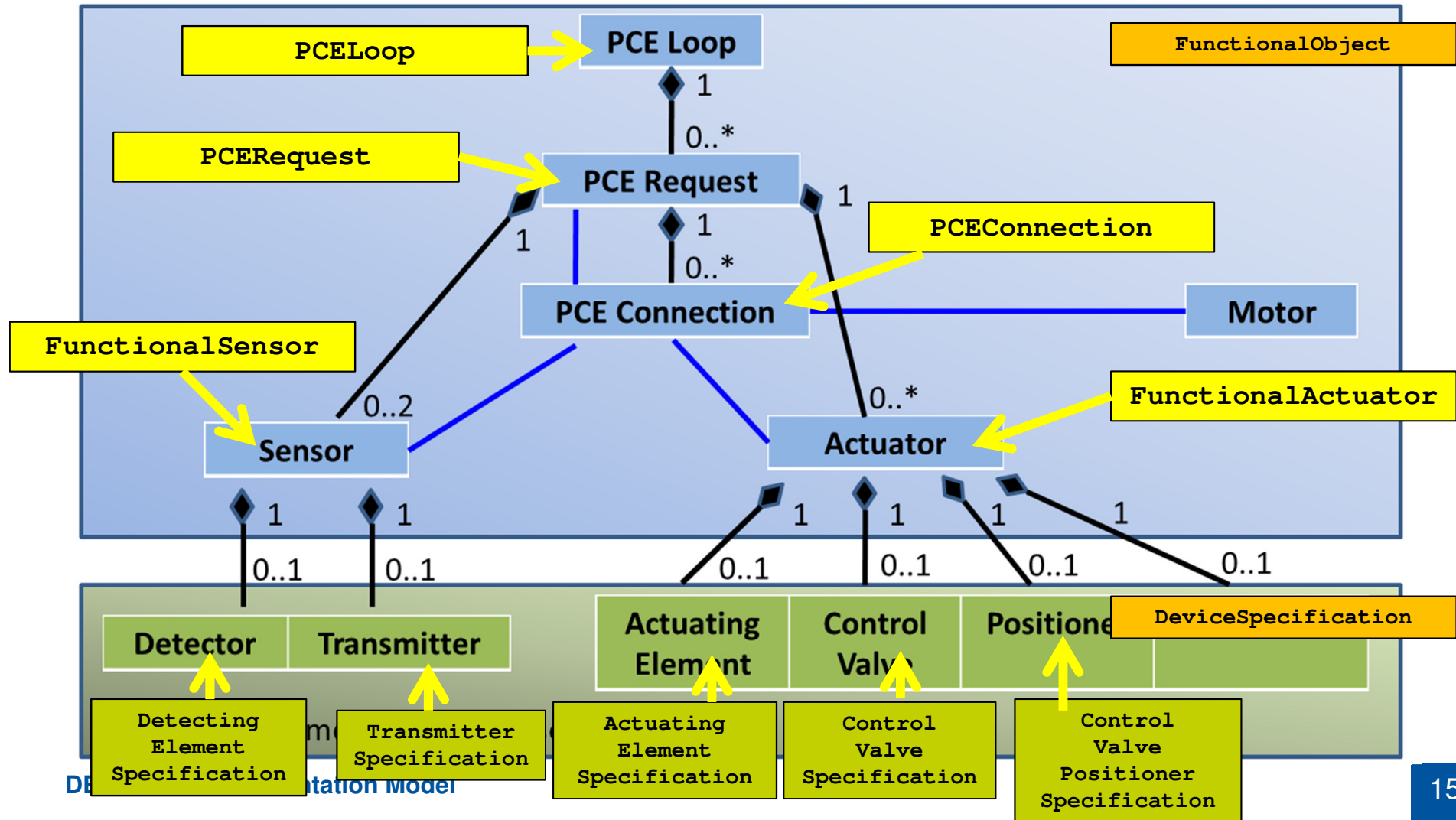
- <http://data.posccaesar.org/rdl/RDS418769>
- A transducer that is intended to convert energy (electric, mechanical, pneumatic or hydraulic) from an external source into kinetic energy (motion) in response to a signal or or power input.“
- **Not a functional object!**
- → new Element „FunctionalActuator“
- <http://sandbox.dexpi.org/rdl/FunctionalActuator>
- Description:
„functional unit that generates the manipulated variable from the controller output variable, required to drive the final controlling element“ (IEC 62424)

ACTUATOR

<code>rdl:defaultRdsId</code>	"R38701712415"
<code>rdl:hasCreationDate</code>	"2006.08.10"
<code>rdl:hasCreator</code>	"u20683"
<code>rdl:hasDefinition</code>	"A transducer that is intended to convert energy (electric signal or or power input."
<code>rdl:hasDesignation</code>	"ACTUATOR"
<code>rdl:hasDesignationA...</code>	"578800"
<code>rdl:hasIdPCA</code>	"RDS418769"
<code>rdl:hasStatus</code>	"Qualified"
<code>rdf:type</code>	p2:ClassOfInanimatePhysicalObject
<code>rdfs:label</code>	"ACTUATOR"
<code>owl:sameAs</code>	http://posccaesar.org/rdl/RDS418769
Specialization	
Superclass	DRIVER DEVICE TRANSDUCER
Subclass	ACTUATOR WITH MANUAL RESET DIAPHRAGM ACTUATOR DIGITAL ACTUATOR DOUBLE ACTING ACTUATOR ELECTRIC ACTUATOR FAIL-CLOSE ACTUATOR FAIL-OPEN ACTUATOR FLANGE MOUNTED ACTUATOR FULL-TURN ACTUATOR HAND WHEEL OPERATED ACTUATOR More... (19)

- Is connected to a PCE Request with a Connect to Process Line or a Signal Line and is part of this PCE Request
- Attributes
 - ActuatorNumber as unique identifier string
 - Device(s) (0..N) like Actuating Element, Control Valve, Positioner, ...
 - DeviceType string
 - SymbolRegistrationNumber string
 - FailAction string, perhaps part 4 classes
 - MediaCode string
 - PipingClass string
 - NominalDiameter
 - InsulationType string
 - InsulationThickness number with UOM length
 - HeatTracingType string
 - HeatTracingTemperature number with UOM temperature

Instrumentation – P&ID Objects



**Vielen Dank für Ihre
Aufmerksamkeit.**

Thank you for your attention!

process_control_equipment
of OntoCAPE



- Actuator → ControllingInstruments

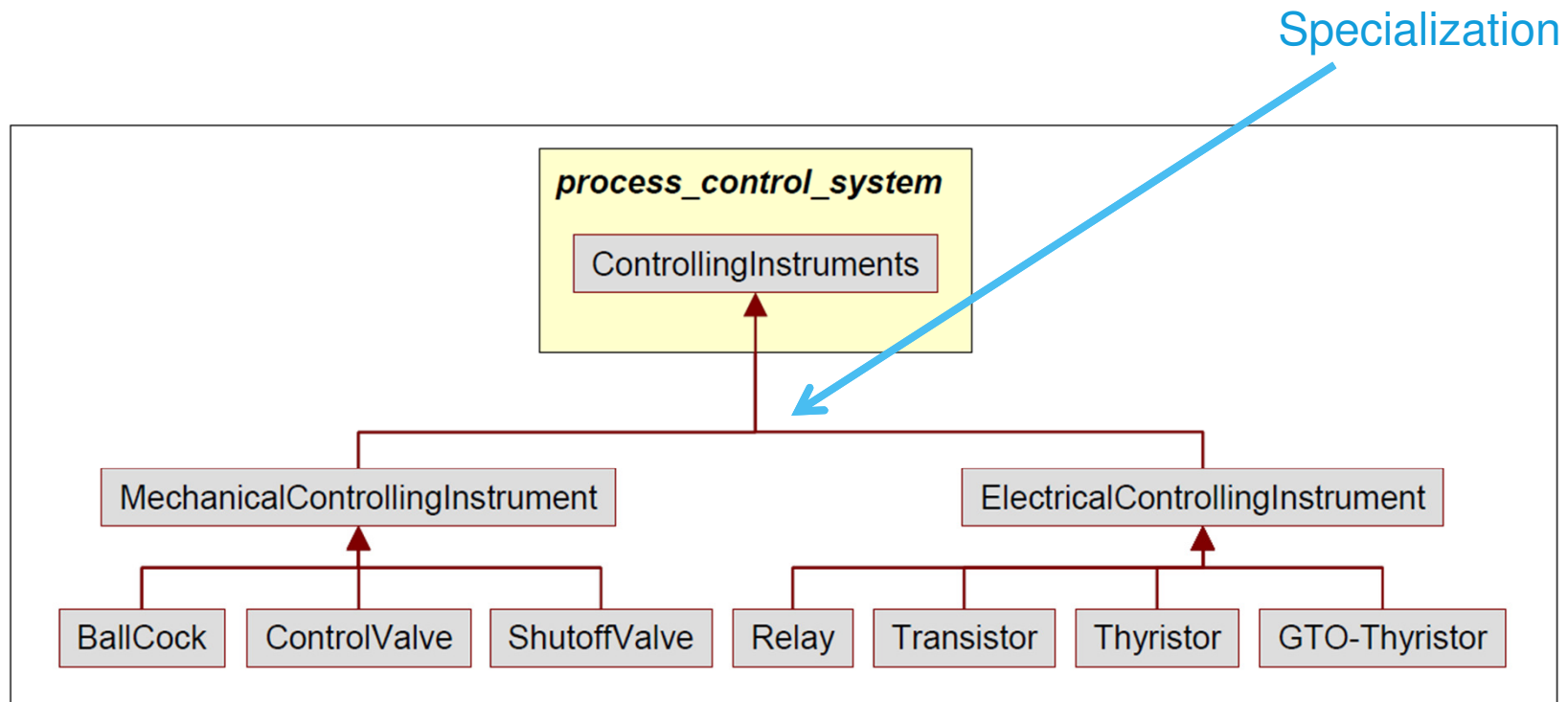


Fig. 8.35: Class diagram for some controlling instrument

- Sensor → MeasuringInstruments

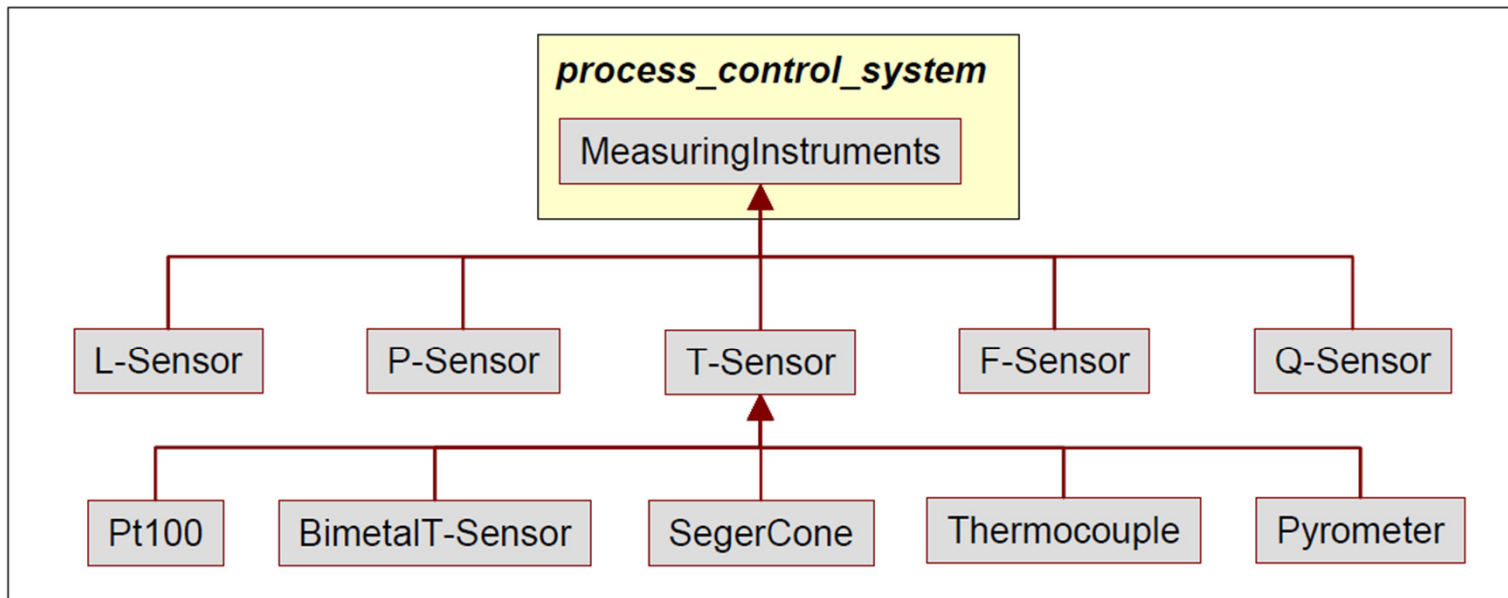


Fig. 8.34: Class diagram for some further specialization of T-Sensor