AACHENER VERFAHRENS-TECHNIK | RWTH AACHEN UNIVERSITY

DEXPI PID Instrumentation Model

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ISO 15926 – Instrumentation SIG

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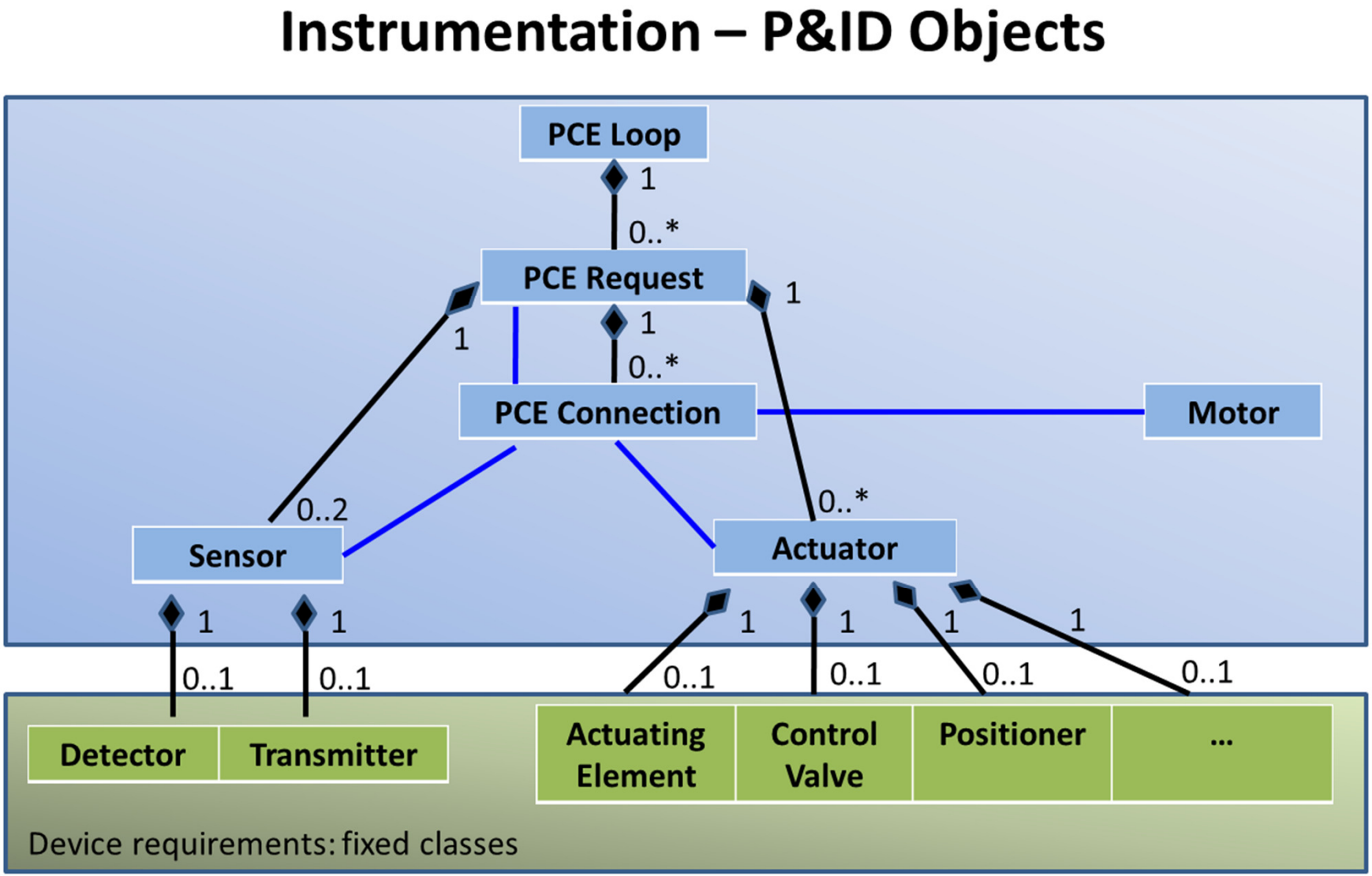
What do we need?



Before we start …

- 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

About the standards

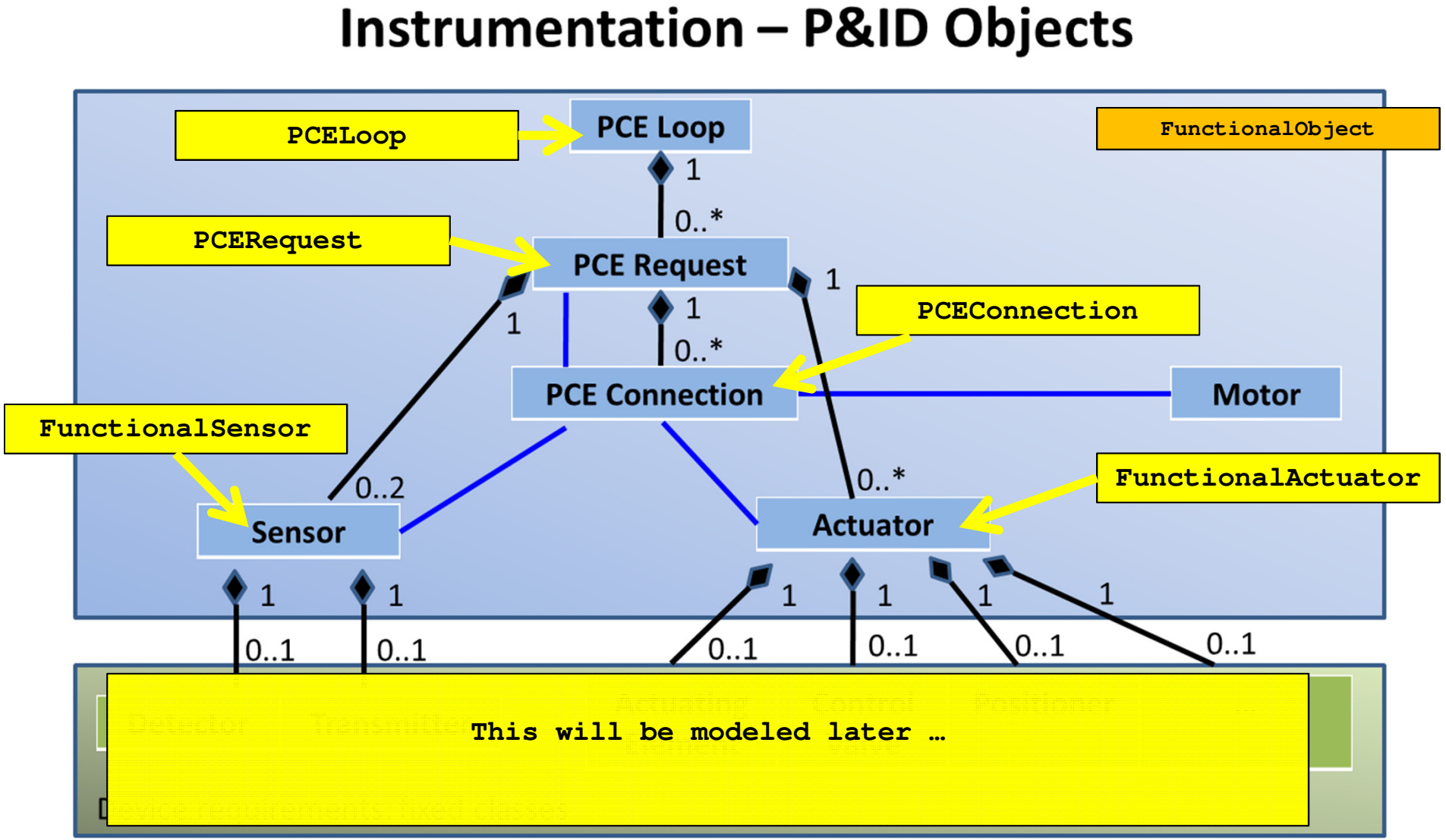
- ISO 15926
  - This is us! (?)

- 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

What do we need?



PCE Loop

- 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)

PCE Request

- 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*“)

PCE Request - Attributes

- 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

PCE Connection

- 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*“)

PCE Connection - Attributes

- 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

Sensor → Functional Sensor

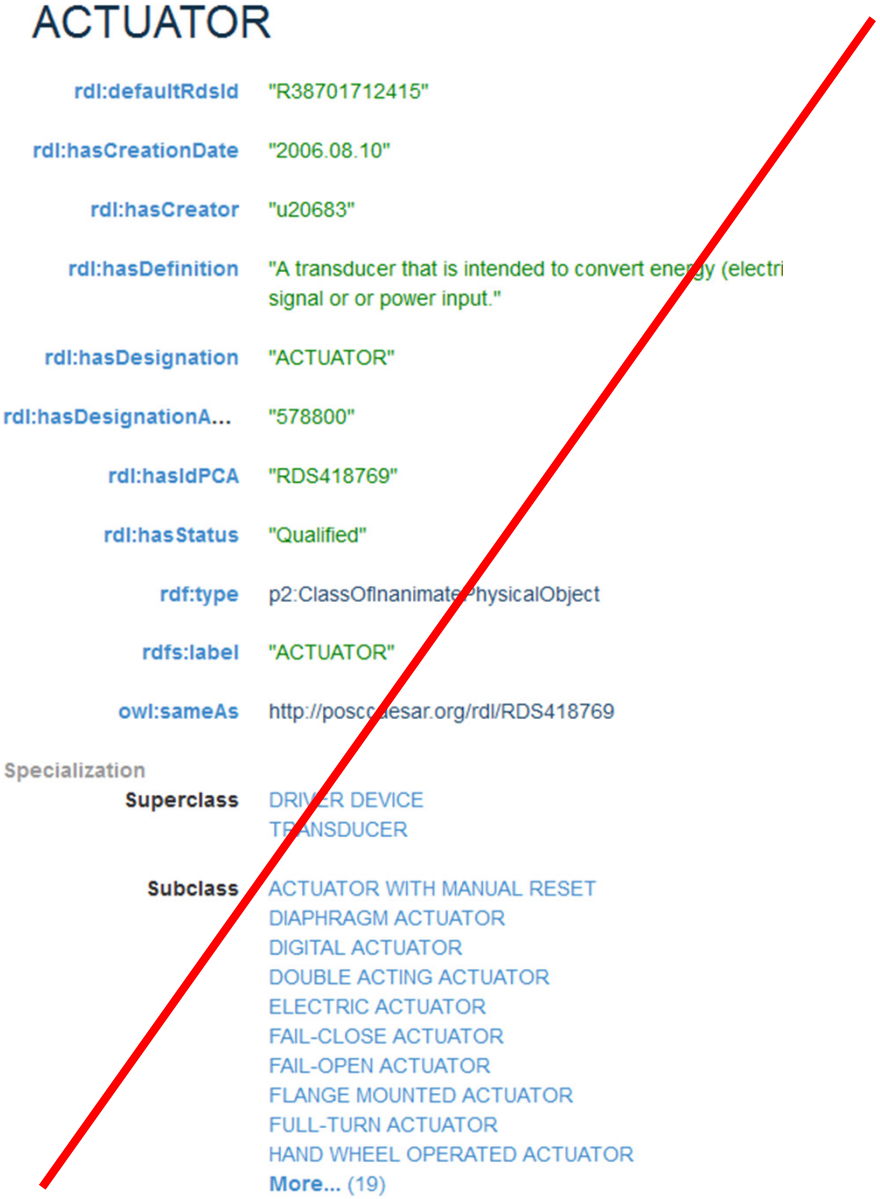
- http://data.posccaesar.org/rdl/RDS461879
- *“An artefact that converts the input variable into a signal suitable for measurement.”*
- **Not a functional object!**
- → new Element „FunctionalSensor“
- http://sandbox.dexpi.org/rdl/FunctionalSensor
- Description:
  „functional unit that senses the effect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

FunctionalSensor - Attributes

- 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)

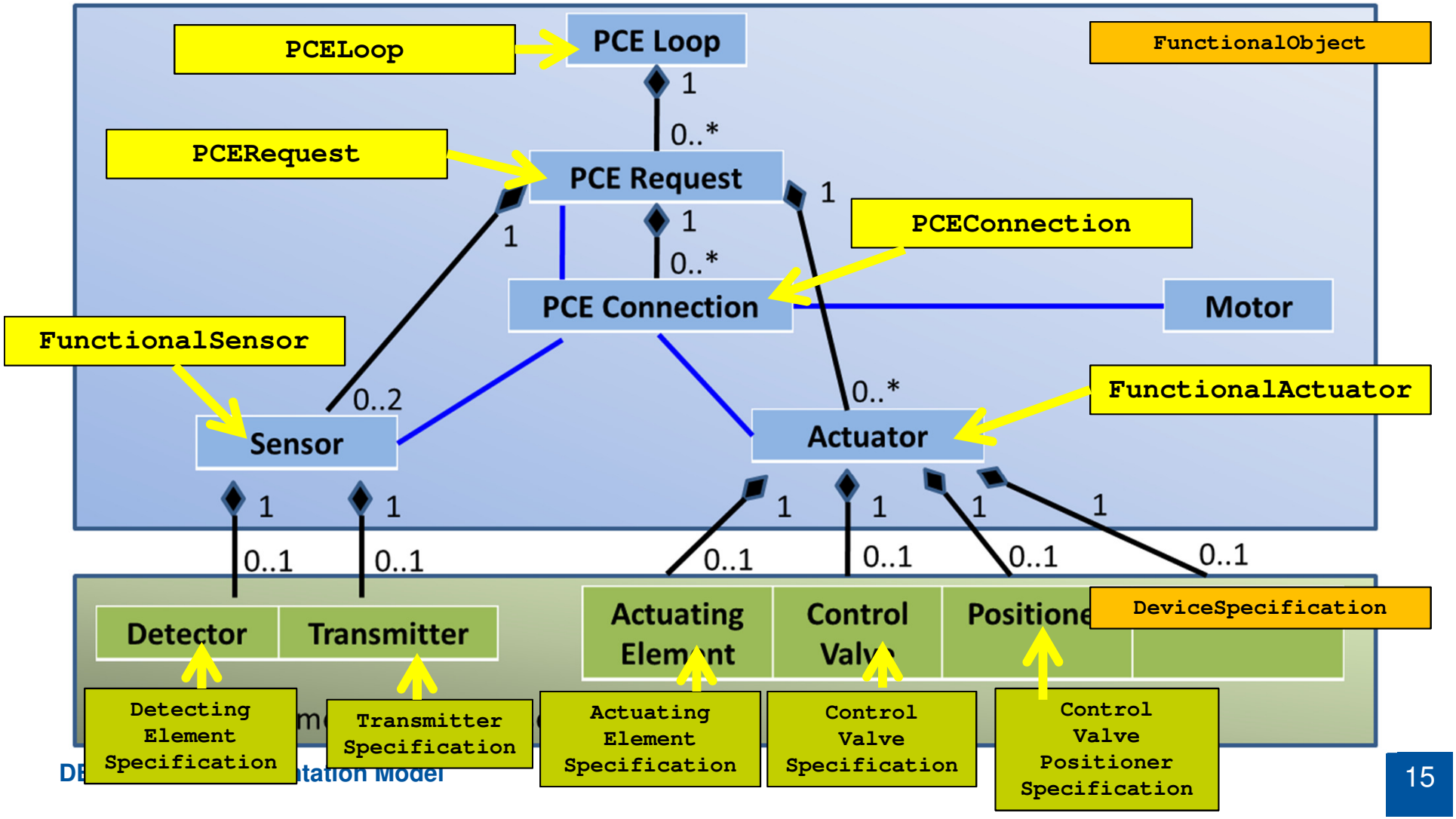


FunctionalActuator

- 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 Devices

Instrumentation – P&ID Objects



Vielen Dank für Ihre Aufmerksamkeit.

Thank you for your attention!

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process_control_equipment of OntoCAPE

OntoCAPE: process_control_system

- Actuator → ControllingInstruments

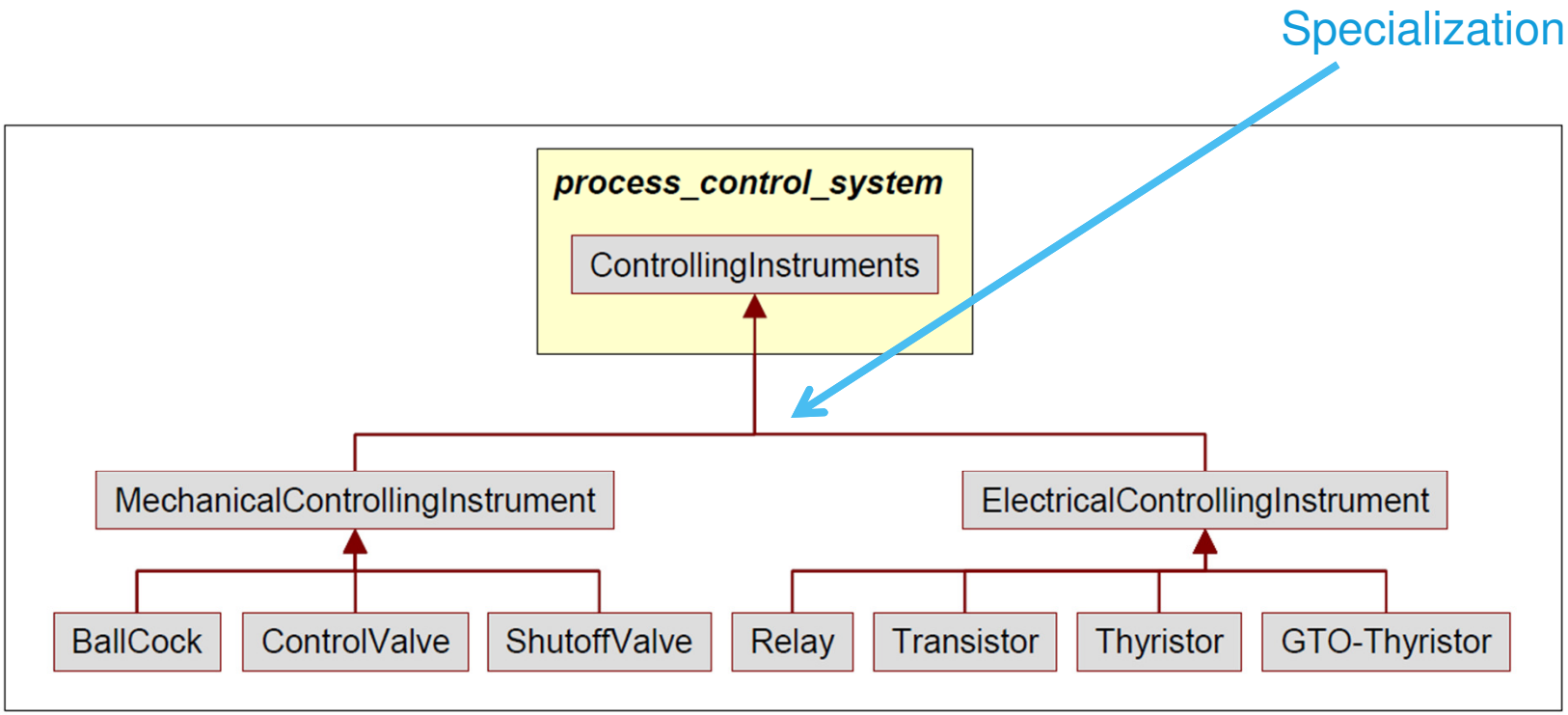

Fig. 8.35: Class diagram for some controlling instrument

OntoCAPE: process_control_system

- Sensor → MeasuringInstruments

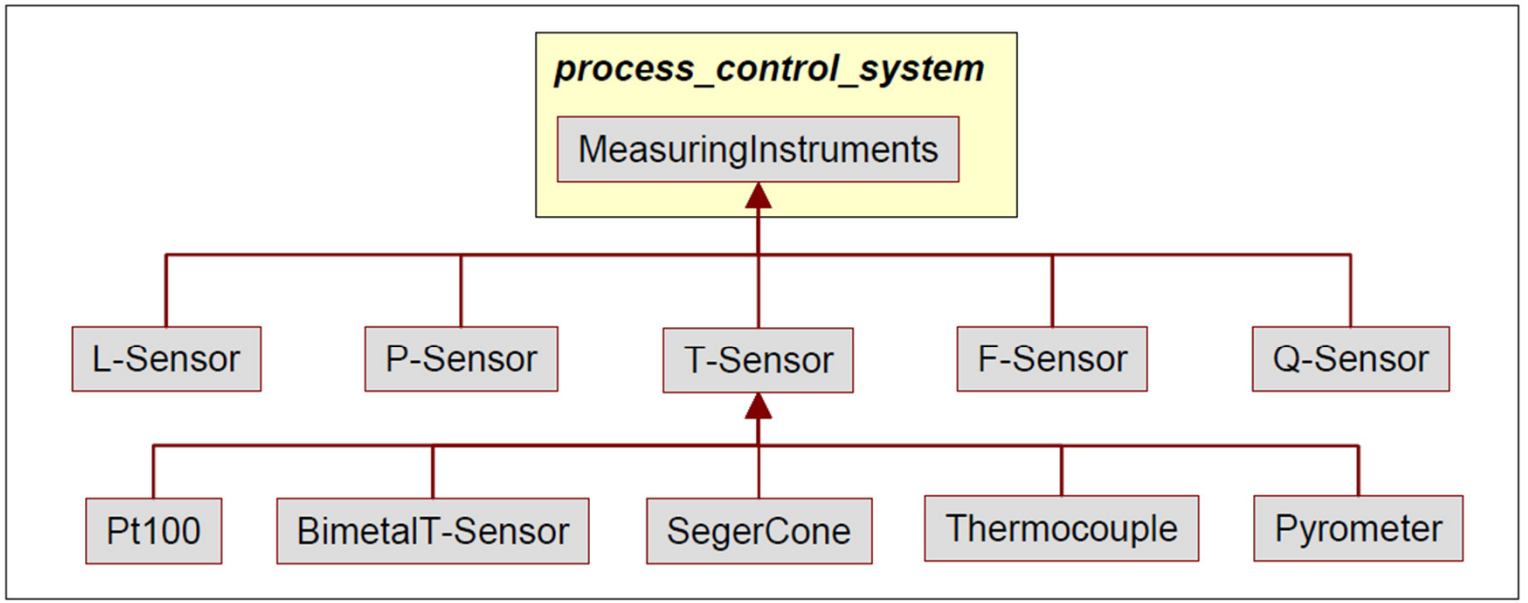

Fig. 8.34: Class diagram for some further specialization of T-Sensor