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Practical use of ISO 15926

Session 5

Pressure Transmitter, Part 1 & 2

June 7, 2011

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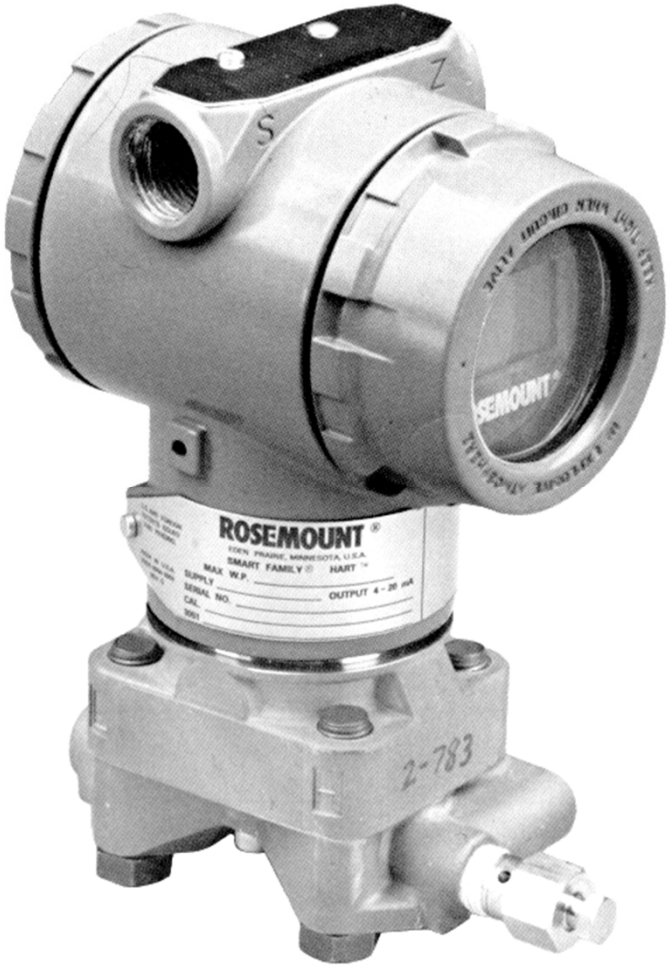
with

Johan W. Klüwer, DNV

In this session we will return to the Rosemount 3051 Gauge Pressure Transmitter



A range on the data sheet

SHARECAT
ANY PART. ANY PROJECT. ANYWHERE.

Datasheet
Transmitter, Pressure, Electric

Document Number	:	**28-1A-KOG-I54-27500-0012**	Revision	:	**1**
Plant/Platform	:	**Test Installation 2**	Process Datash. No.	:	**N/A**
Tag number	:	**PT -42-0304**	System	:	**N/A**
SerialNo	:	**N/A**	Range From	:	**0**
SetPoint Low	:	**10 barG**	Range To	:	**110**
SetPoint Hight	:	**71 barG**	Range Unit	:	**barG**
P & ID	:	**28-1A-KOG-C78-00275-0002**	Area	:	**N/A**
Line/Equipment no.	:	**XX-42-0002**	PO:	:	**TI2-M022-ME-01**
Service description	:	**SCALE INHIBITOR. PUMP OUTLET**			

Unique no.	**TEK-00018117**
Manufacturer	**EMERSON PROCESS MANAGEMENT**
Type	**3051CG**
Manuf. Partno.	**3051CG-5-A-2-2-A-1-K-B4-I1-**
Class	**Transmitter, Pressure, Electr**

1. Accepted
2. Accepted with comments incorporated
3. Not accepted, revise and resubmit
4. Issued for information
5. Interface information as clouded is accepted and frozen

Area

Explosion protection	:	**EEx ia**
Gas-group	:	**IIC**
Temperature class	:	**T5**
Approval authority	:	**BASEEFA**
Certificate	:	**BAS 97ATEX1089X**
IP-Class	:	**IP66**
ATEX group	:	**II**
ATEX category	:	**1**
ATEX explosive atmosphere	:	**G**
Ambient temperature	:	**-40 - 85 °C**

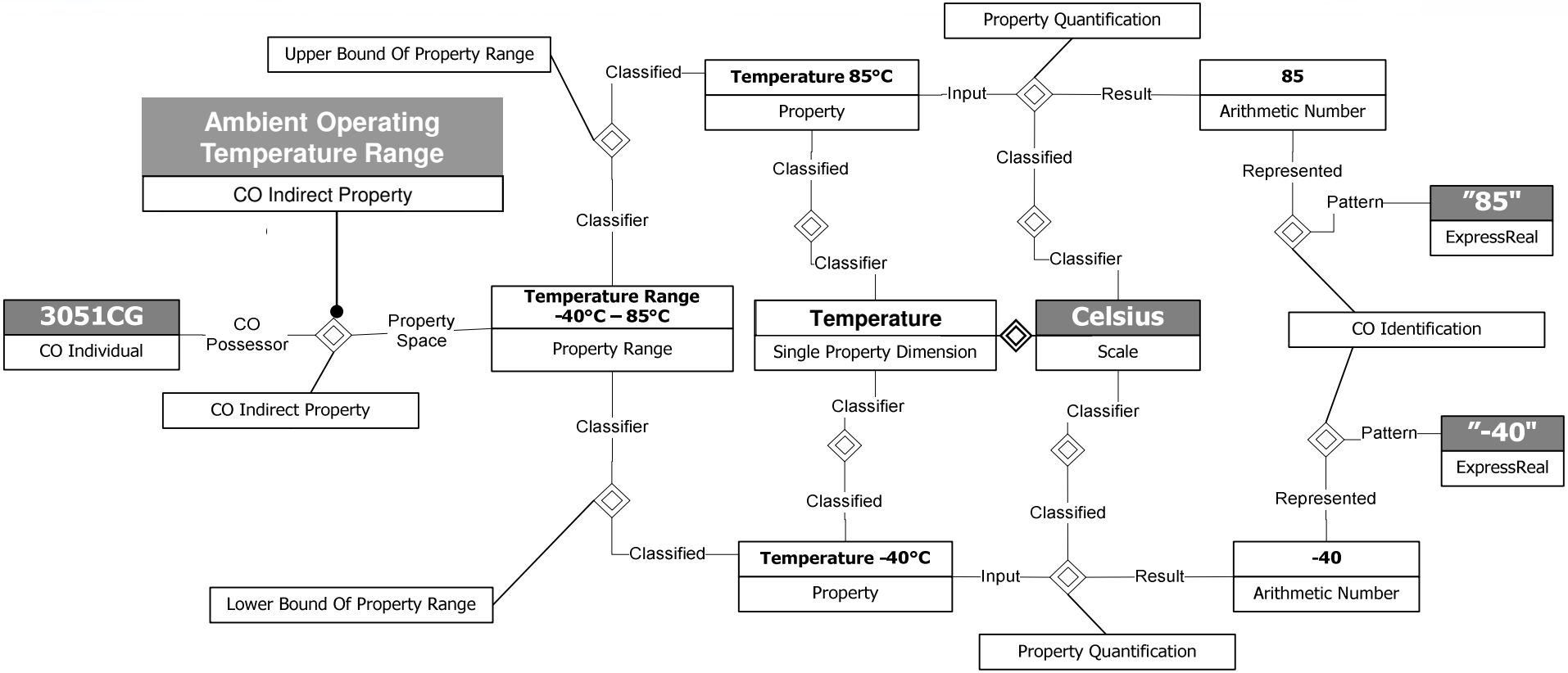
Dimensions and Weight

Weight	:	**4.7 kg**

Filling fluid	:	**Silicone oil**
Seal material	:	**Glass filled TFE**
Process connection material	:	**Stainless steel**
Non process cover material	:	**316**
Flange bolt material	:	**316 AUSTENITIC**
Drain/vent material	:	**Stainless steel**

ATEX group	:	**II**
ATEX category	:	**1**
ATEX explosive atmosphere	:	**G**
Ambient temperature	:	**-40 - 85 °C**

Representation of “attribute”: Ambient Temperature



3051CG has a ” ambient operating temperature”: -40 C – 85 C

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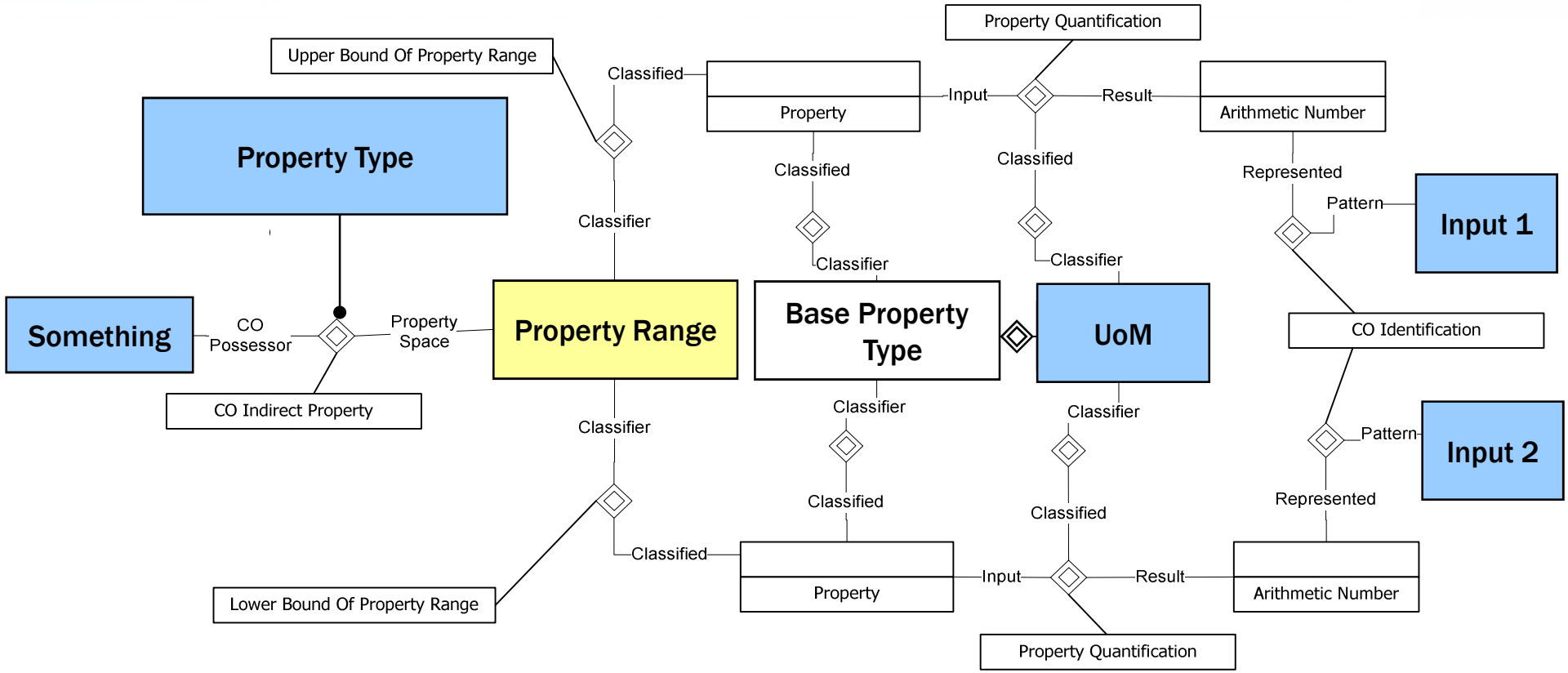
ISO 15926 Generic Property Range Template



'Something' has 'Property Type' with 'Property Range' of 'Base Property Type' defined by 'Input 1' and 'Input 2' with 'UoM'

"Semantic" Mapping User Interface

Select RDL Class or Project Data

Select from standard/ customised list of RDL Instance

Select from standard/ customised list of RDL Instance

Temp. Inst. #	Something	Property Type	UoM	Input 1	Input 2
#nnn	3051CG	Ambient Operating Temperature Range	C	-40	85

Property Range

Base Property Type

Do not need to appear in user interface

This approach is based on using the generic "ISO 15926-7 PROPERTY RANGE RESTRICTION OF CLASS " template.

Specialised "Semantic" Mapping User Interface

Select RDL Class or Project Data

Select from standard/ customised list of RDL Instance

Temp. Inst. #	Something	UoM	Input 1	Input 2
#nnn	3051CG	C	-40	85

```
%
% axiom: ratpl:RatedAmbientOperatingTemperature
%
% RDL:RDS201644 is ARTEFACT CLASS
% RDL:RDS1054571911 is TEMPERATURE SCALE CLASS
% RDL:RDS1411476491 is AMBIENT OPERATING TEMPERATURE RANGE
%
ratpl:RatedAmbientOperatingTemperature( x1, x2, x3, x4 ) <->
  p7tpl:ClassificationOfClass( x1, RDL:RDS201644 ) &
  p7tpl:ClassificationOfClass( x2, RDL:RDS1054571911 ) &
  dm:ExpressReal( x3 ) &
  dm:ExpressReal( x4 ) &
  p7tpl:PropertyRangeMagnitudeRestrictionOfClass( x1, RDL:RDS1411476491, x2, x3, x4 ) .
```

This approach is based on using the specialised “Ambient Operating Temperature Range ” template.

One pr. attribute! Lower the mapping threshold! Well defined!

Pressure Transmitter Continued

(Extended with typical examples from other product types)

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Area in focus for this tutorial

NORSOK — INSTRUMENT DATASHEET P01

PRESSURE / DIFF. PRESSURE INSTRUMENT ELECTRIC

Tag number :
Service description :
Scale Range :
Set/Alarm Point :
P&ID :
Line/equipment no. :
Area :
P. O. Number :

1 GENERAL
1.01 Type :
1.02 Manufacturer :
1.03 Manufacturer model no :
1.04 Operating Temp. Limits :
1.05 Mounting :
1.06 Weight :
1.07 Other :

2 INSTRUMENT CHARACTERISTICS
2.01 Calibrated input range :
2.02 Characteristic :
2.03 Accuracy :
2.04 Repeatability :
2.05 Lower / upper range limits :
2.06 Min / max span :
2.07 Zero adjustment :
2.08 Overpressure protect. to :
2.09 Max static pressure :
2.10 Other :

3 ELEMENT / SENSOR
3.01 Type :
3.02 Material, element (sensor) :
3.03 Material, socket (inlet port) :
3.04 Material, sensor bolts/nuts :
3.05 Process conn. size/type :
3.06 Sour service spec. :
3.07 Other :

4 HOUSING
4.01 Dimension :
4.02 Material :
4.03 Cable connection :
4.04 Cable entry :
4.05 Enclosure protection :
4.06 Ex. classification :
4.07 Protective coating :
4.08 Other :

5 TRANSMITTER
5.01 Indicator :
5.02 Output signal :
5.03 Communication :
5.04 Supply voltage :
5.05 Consumption :
5.06 Load limitation :
5.07 Other :

6 SWITCH
6.01 Reset; automatic or manual :
6.02 Deadband or differential :
6.03 Alarm at increase/decrease :
6.04 Contact configuration :
6.05 Contact material :
6.06 Contact rating :
6.07 Contact action on alarm :
6.08 Other :

7 CHEMICAL SEAL
7.01 Type :
7.02 Material, upper/lower part :
7.03 Material, bolts / nuts :
7.04 Material, diaphragm :
7.05 Fill fluid :
7.06 Capillary length/diameter :
7.07 Material, capillary/armour :
7.08 Process conn. size/type :
7.09 Other :

8 ACCESSORIES
8.01 Mounting bracket :
8.02 Material, mounting bracket :
8.03 Overpr. protection valve :
8.04 Material, overpr. prot. valve :
8.05 Pulsation damper :
8.06 Material, pulsation damper :
8.07 Other :

9 NOTES

Rev	Date	Issue/description	Prepared	Checked	Approved	Datasheet no.	Page

SHARECAT

Datasheet
Transmitter, Pressure, Electric

Document Number	28-1A-KOG-I54-27500-0012	Revision	1
Plant/Platform	Test Installation 2	Process Datash. No.	N/A
Tag number	PT -42-0304	System	N/A
SerialNo	N/A	Range From	0
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P & ID	28-1A-KOG-C78-00275-0002	Area	N/A
Line/Equipment no.	XX-42-0002	PO:	TI2-M022-ME-01
Service description	SCALE INHIBITOR. PUMP OUTLET		

Unique no.	TEK-00018117
Manufacturer	EMERSON PROCESS MANAGEMENT
Type	3051CG
Manuf. Partno.	3051CG-5-A-2-2-A-1-K-B4-I1-L4-M6-Q4
Class	Transmitter, Pressure, Electric

1. Accepted
2. Accepted with comments incorporated
3. Not accepted, revise and resubmit
4. Issued for information
5. Interface information as clouded is accepted and frozen

Date:	1	2	3	4	5
Sign:					

Area

Explosion protection	EEx ia
Gas group	IIC
Temperature class	T5
Approval authority	BASEEFA
Certificate	BAS 97ATEX1089X
IP-Class	IP66
ATEX group	II
ATEX category	1
ATEX explosive atmosphere	G
Ambient temperature	-40 - 85 °C

Dimensions and Weight

Weight	4.7 kg

General

Description	Gauge
Description	Smart, hart protocol
Supply	10.5 - 55 V DC
Mounting	Coplanar flange bracket for pipe or panel

Material

Body material	Stainless steel
Filling fluid	Silicone oil
Seal material	Glass filled TFE
Process connection material	Stainless steel
Non process cover material	316
Flange bolt material	316 AUSTENITIC
Diaphragm material low pressure connection	316L
Diaphragm material high pressure connection	316L
Bracket material	Stainless steel
Bracket bolt material	Stainless steel
Adapter bolt material	316 AUSTENITIC

Function

Range	0 - 13800 kPa
Span limit minimum, Pressure	138 kPa
Span limit maximum, Pressure	13800 kPa
Alternative Range	0 - 138 bar
Alternative span limit minimum, Pressure	1.38 bar
Alternative span limit maximum, Pressure	138 bar
Output signal	4 - 20 mA
Accuracy	+/- 0.075 %
Display type	LCD
Static working pressure	3626 psi

Process Connection

Connection design	NPT
Size	1/4"
Thread pitch	18 thr/in

Supply Connection

Supply connection design	Metric threaded
Supply connection size	20 mm
Thread pitch supply	1.5 mm/thr

Comment

Accuracy for span greater than 10:1 of URL. Power consumption 18-36 mW. Load limitation: 587 Ohm. Static pressure value valid within transmitter temperature spec. Output: Digital signal based on hart protocol. Coplanar flange Intrinsic Safety and Dust approval. Calibration data sheet (5 points calibration at 0%, 25%, 50%, 75%, and 100% of range)

Rev	Date	Issue/description	Prepared	Cheked	Disc. Appr.	Client. Appr.	Page 1 of 1
1	09.11.2006 14:44	Generated by SHARECAT	P.M.				

Uniqueness of Alphanumeric "Attributes"

Area	
Explosion protection	: EEx ia
Gas-group	: IIC
Temperature class	: T5
Approval authority	: BASEEFA
Certificate	: BAS 97ATEX1089X
IP-Class	: IP66
ATEX group	: II
ATEX category	: 1
ATEX explosive atmosphere	: G
Ambient temperature	: -40 - 85 ℃

Remember: Codes and names are only unique within a defined context.

T5: **Telecinco,**
London Heathrow Terminal 5
Volvo T5 (car or engine?)

T5 here: **T5 APPARATUS IEC 60079-0 (Class of products) (not mentioned by Wikipedia)**

IIC: **International Institute for Conservation of Historic and Artistic Works**

IIC here: **GROUP IIC APPARATUS IEC 60079-0 (Class of products)**

IP66: **IP66 APPARATUS IEC 60529 (Class of products)**

EEx ia: **EX IA APPARATUS IEC 60079-11 (Class of products)**

Mapping is a multi-stage process

- **What is to be represented**
  - Format
  - Content
- **How to represent/implement**
  1. Everything beyond Part 7 is out of scope for this presentation

What is to be represented

- **Format**
  1. From a particular format determine which template signatures and classes to use to represent the types of statements represented by each label
     - This involves amongst other inspecting the source to identify the “implicit” object types
     - Identify shortcuts one might want to use to avoid representation “overkill”
  2. For potential new template signatures, define its corresponding expansion to full Part 2/3/4 representation.
  3. Which options are involved for types of objects represented using the format?

- **Content**
  - To establish the actual “relationships” that a particular “object” or “type of object” requires,
  - e.g. which particular relationships applies for “3051CG-5-A-2-2-A-1-K-I1-M6”

EPISTLE Principles - Attributes

- **Attributes should be defined as entities referred to by relationships**
  - The key question then is, what is the nature of the relationship?
- **Attributes cannot be referred to and are very inflexible to change**
  - attributes do not allow history
  - information about attributes cannot be held
    - e.g. Units of a number
    - e.g. language of a description
  - attributes do not allow different values
    - many descriptions
    - many names
    - changing values
  - attribution cannot be described
- **What is an entity in one model is an attribute in another models**
  - what is an entity and what is an attribute depend on your start point
  - does not support integration very well
  - remember that the title of ISO 15926 says "integration of life cycle data"

Main Categories of "Attributes"

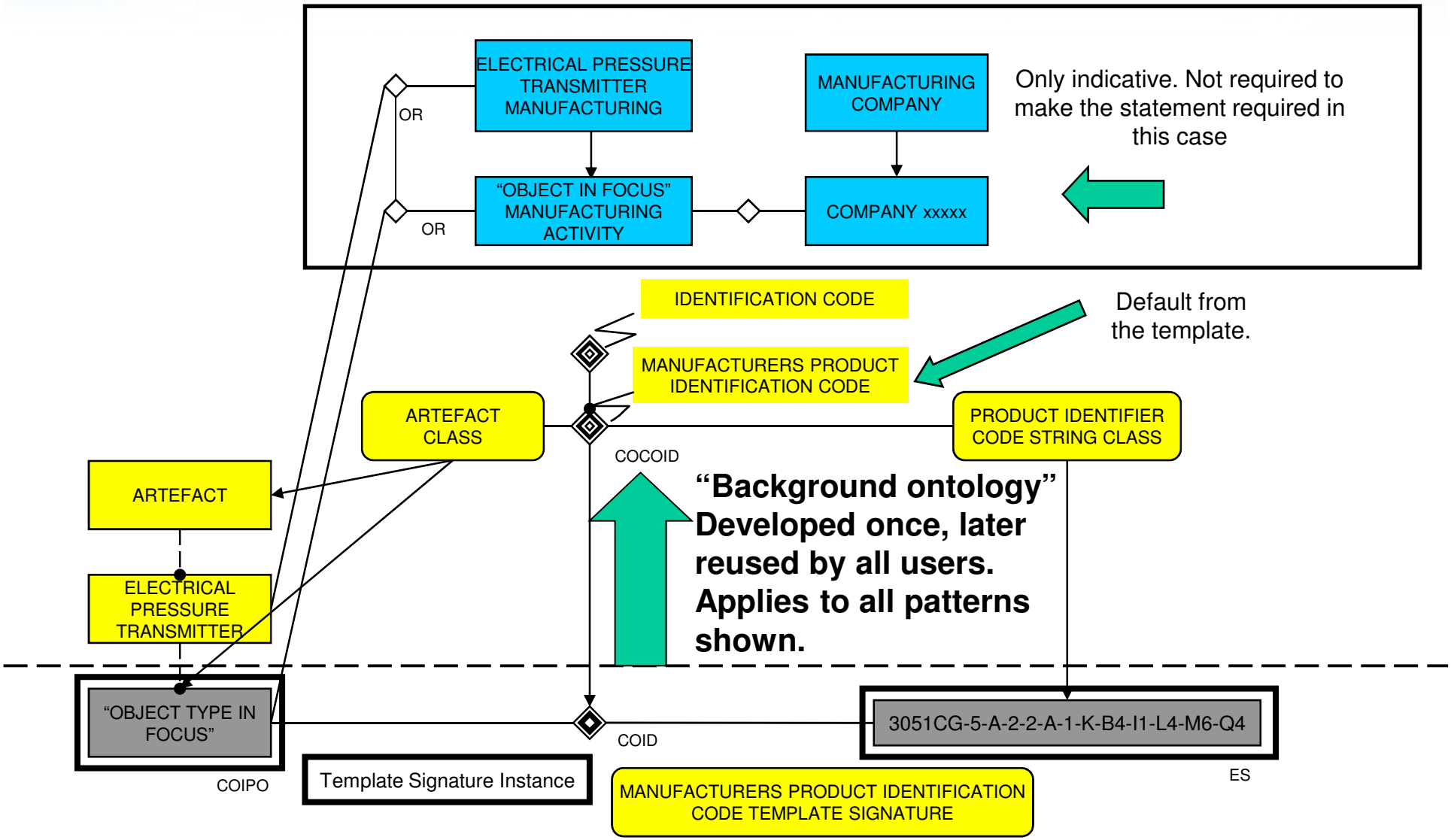
- **Numeric properties (Number + UoM)**
  - Warning! Look out for the "nominal sizes". These look like numeric properties but are not!
  - Are normally incorrectly dealt with in most existing applications

- **Alphanumeric "attributes"**
  - Identifiers
  - References
  - Descriptions
  - "Classifications"
  - "Material of construction"
  - Containment
  - Parts
  - "Features" (Typically relevant for threads and flanges)
  - Optional parts

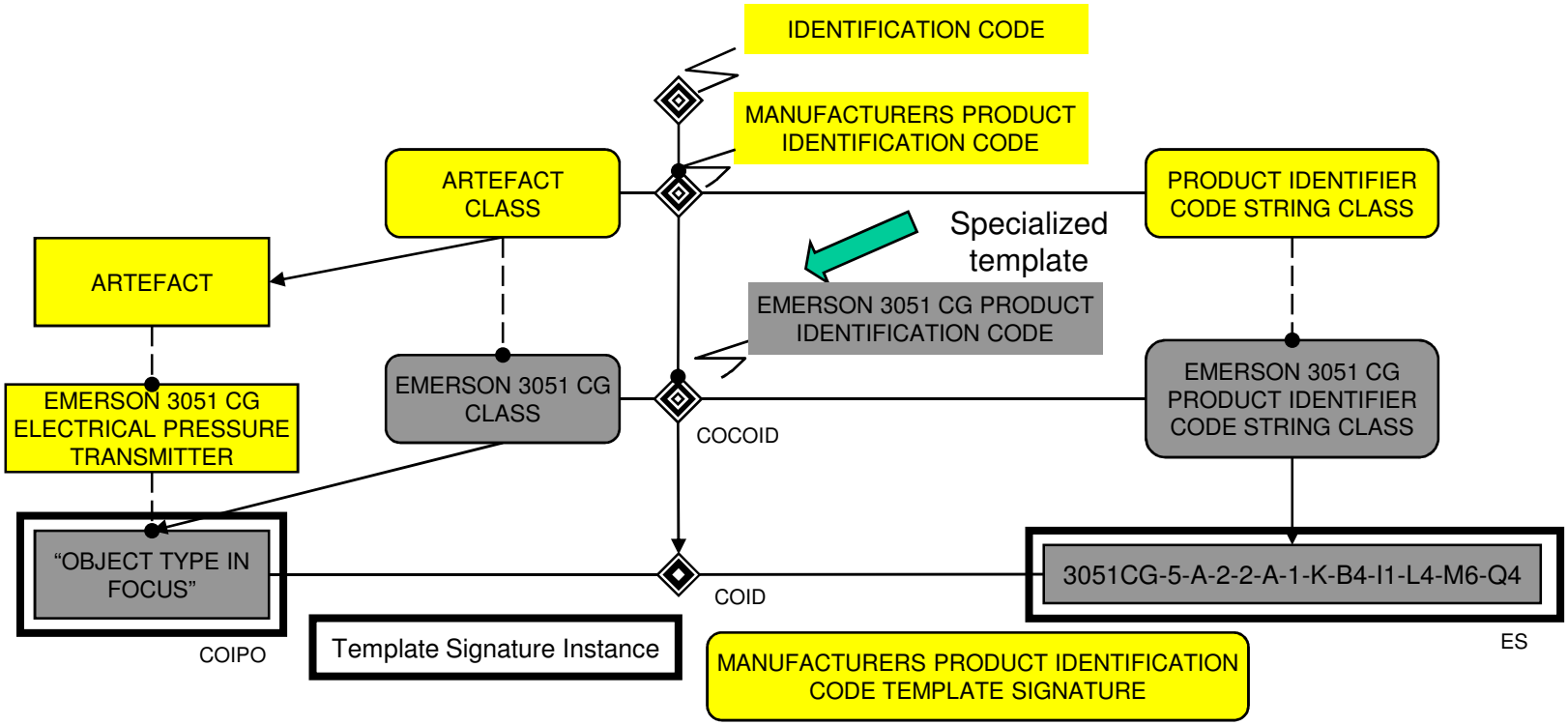
- **How to deal with these as there are no "attributes" in ISO 15926**
  - Remember, attributes are by definition represented as relationships
  - The question then becomes, what are the nature of these relationships
  - Are we describing an individual or a class (design)
  - **In this context we assume we are dealing with a class. Individuals normally only applies for an actual in a plant**

Identifiers

Label "Manufacturer's Partnumber"

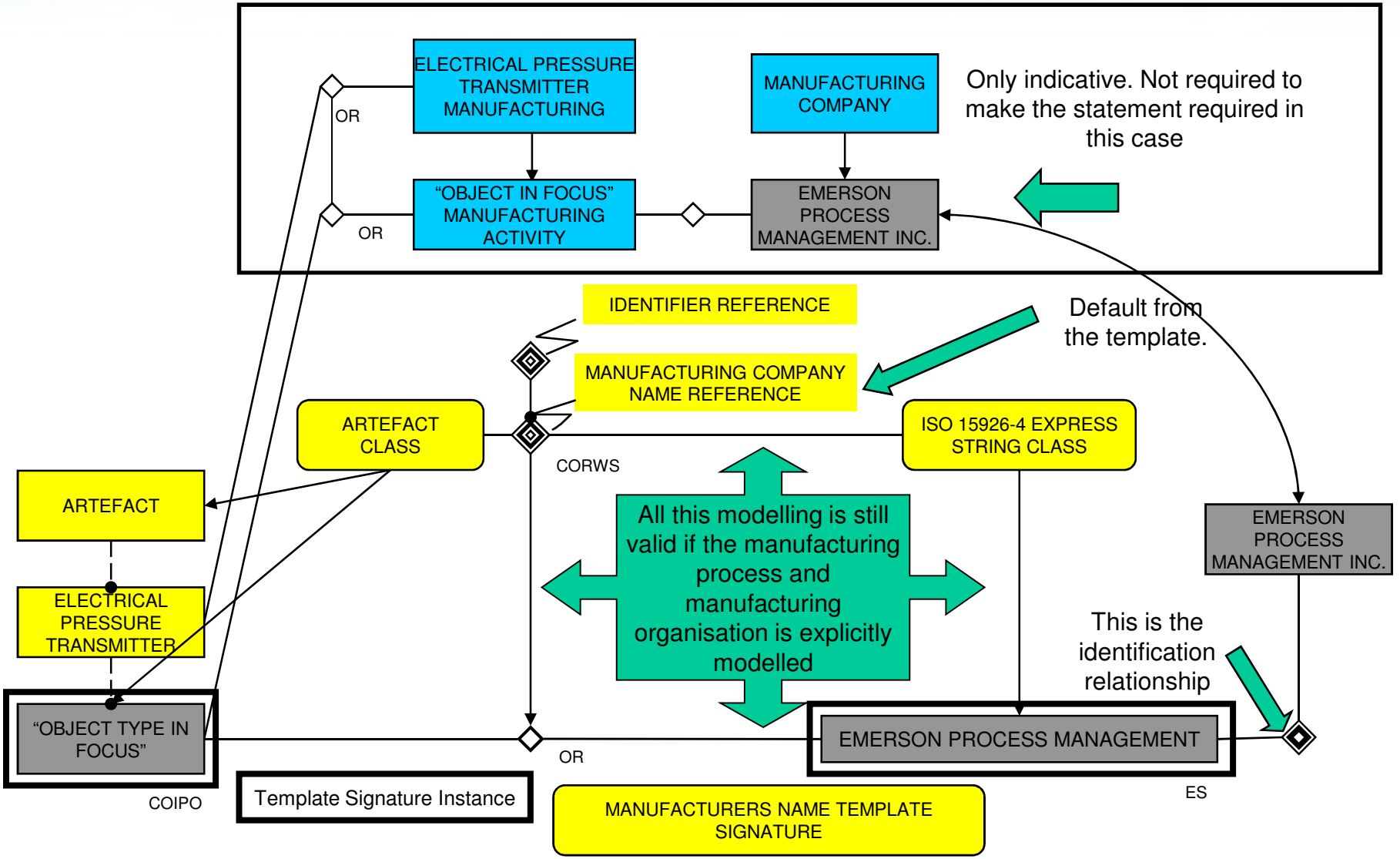


Label “Manufacturer’s Partnumber”

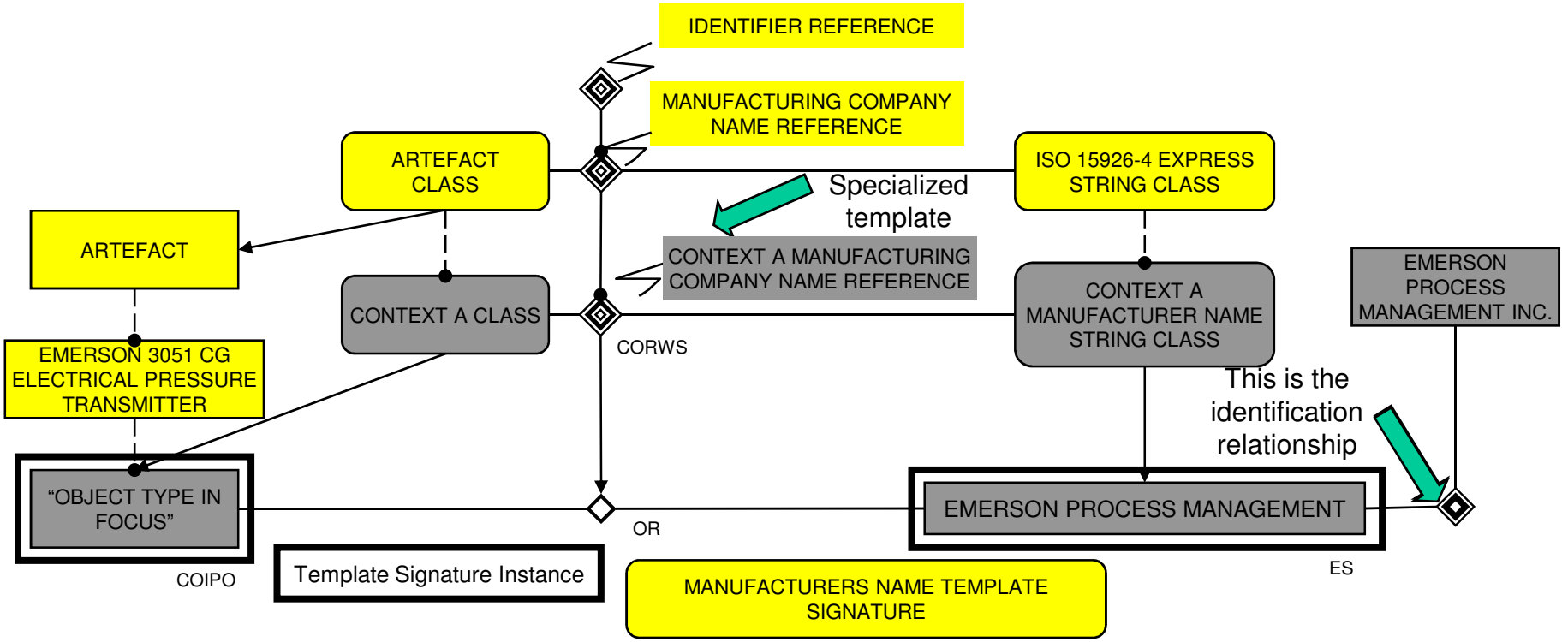


References

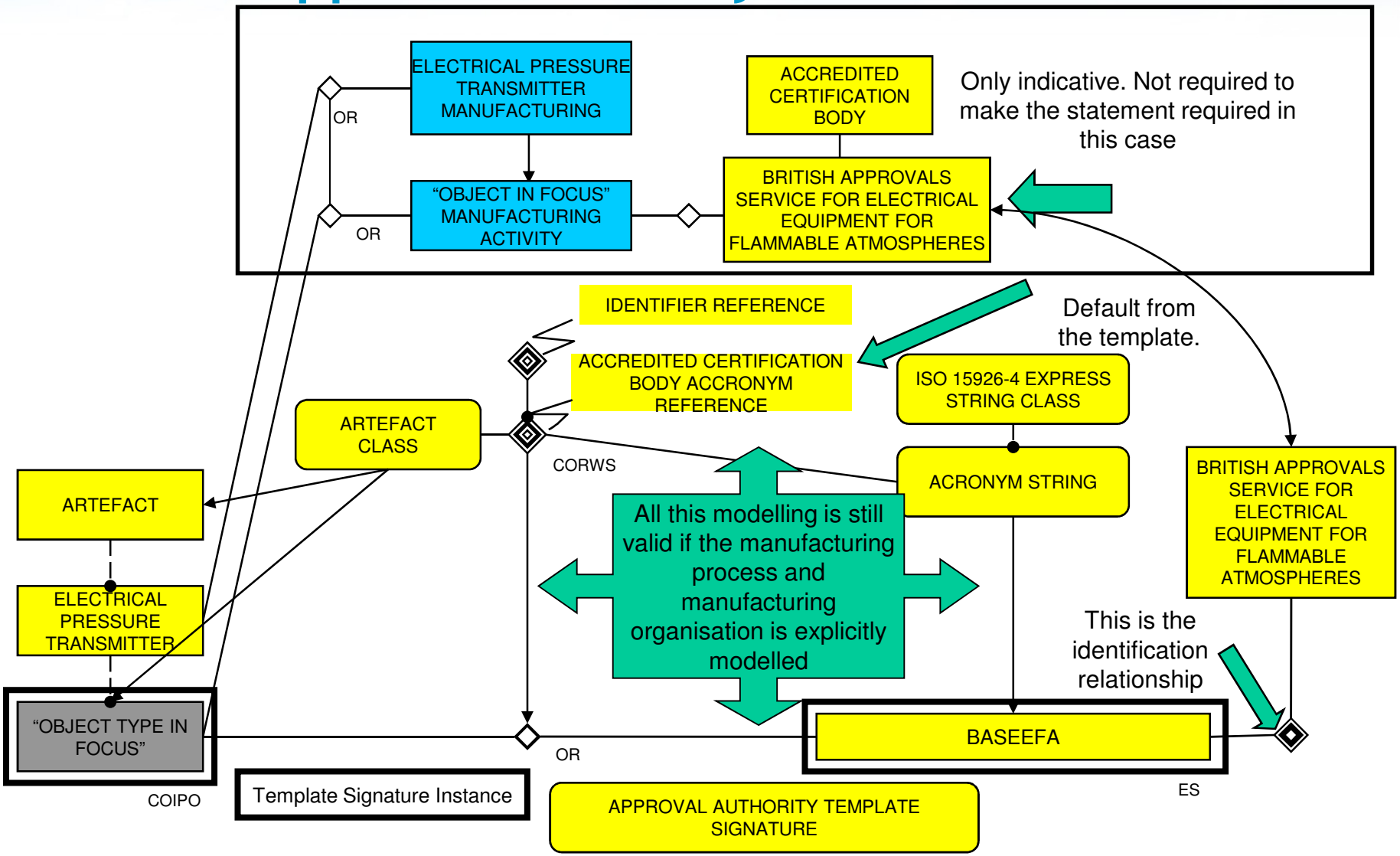
Label "Manufacturer"



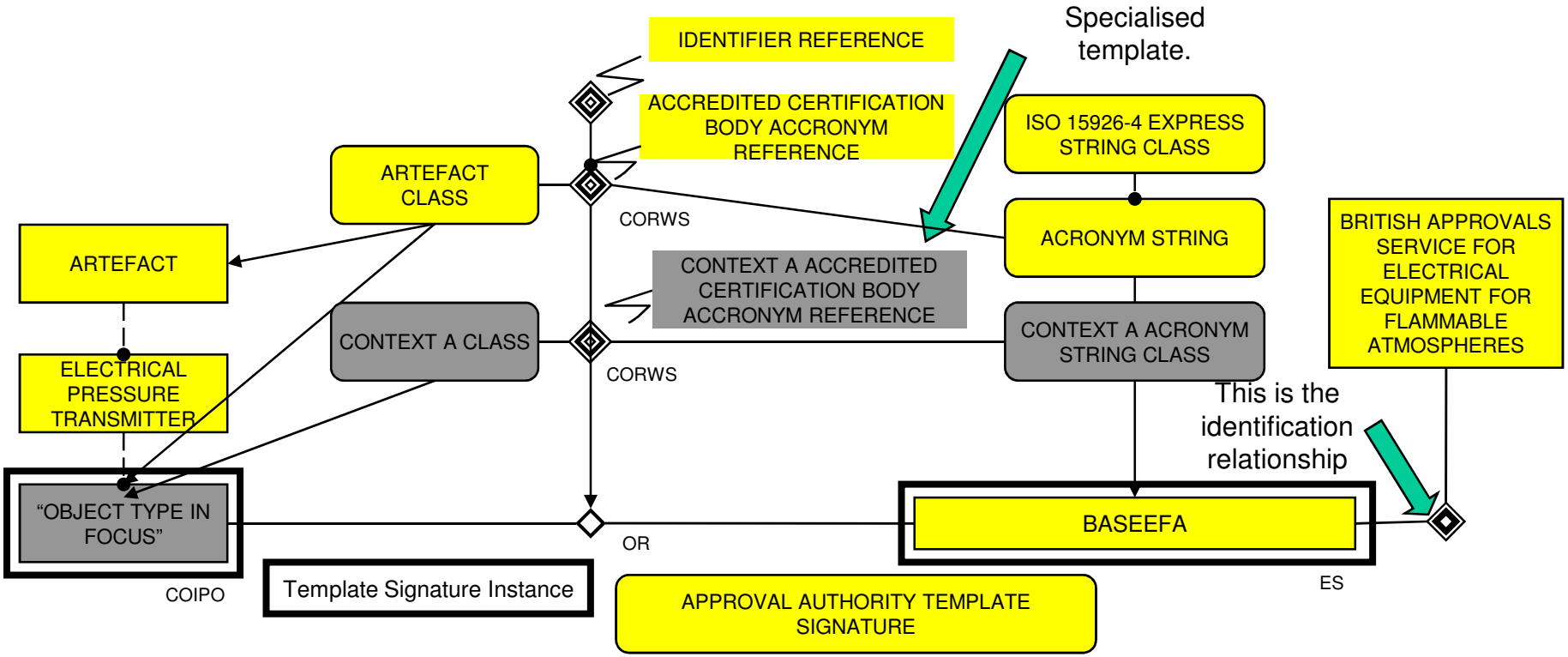
Label “Manufacturer” in a context



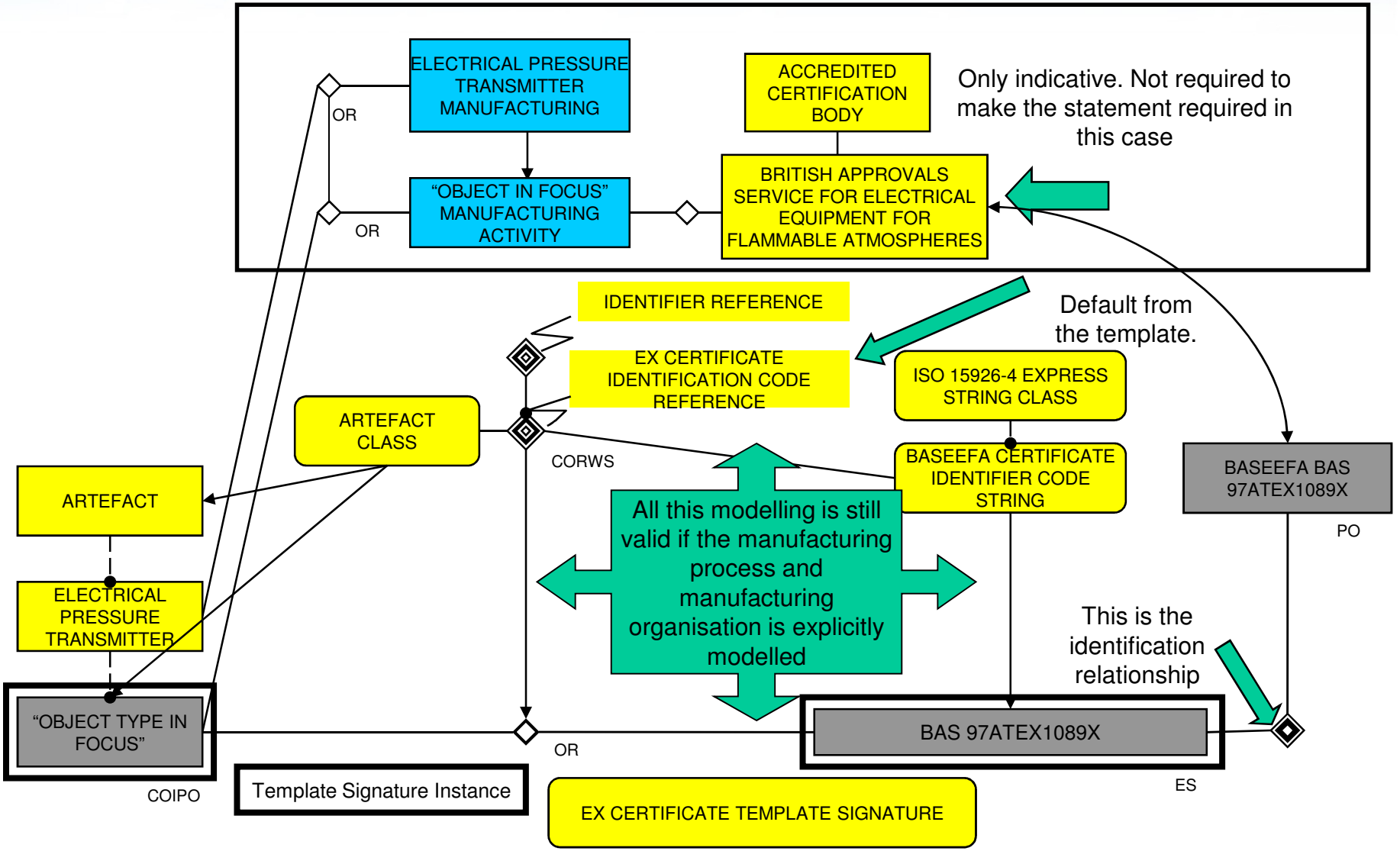
Label "Approval authority"



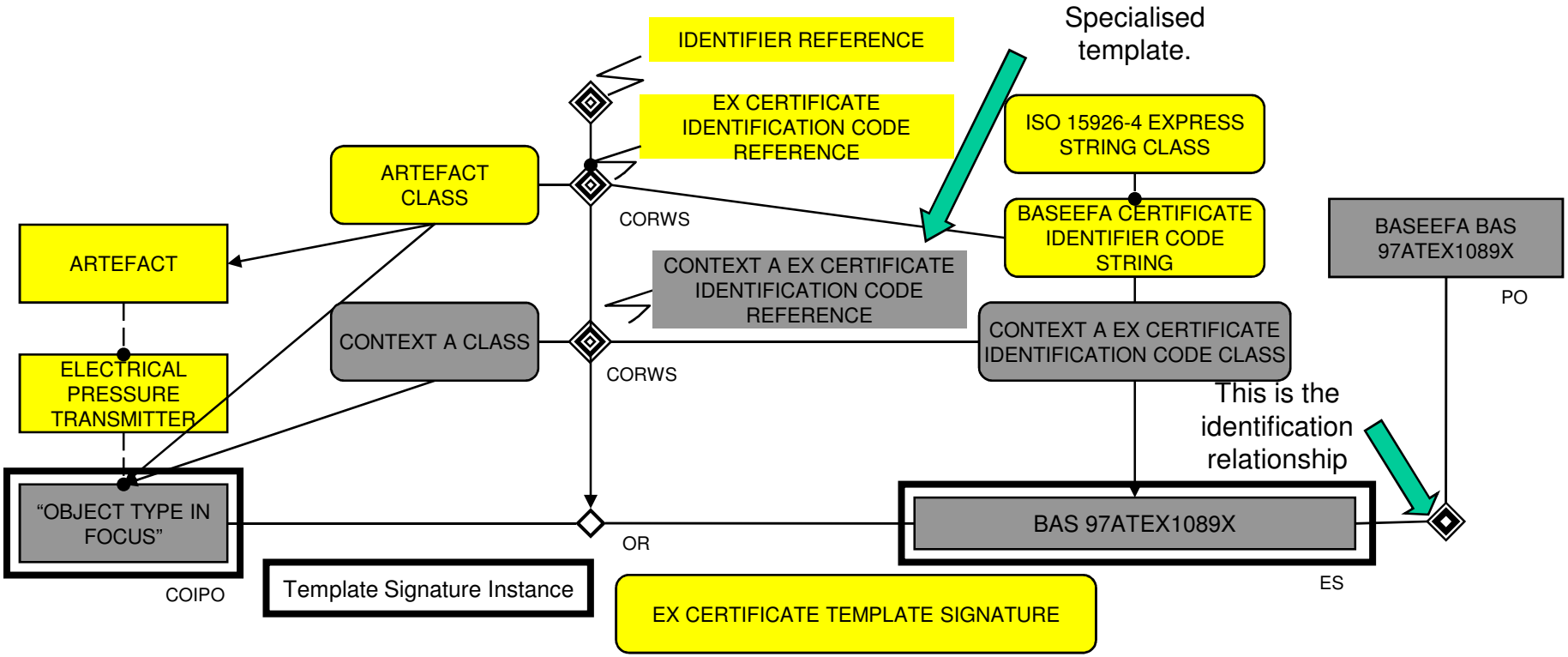
Label “Approval authority” in a context



Label "EX certificate number"



Label “EX certificate number” in a context

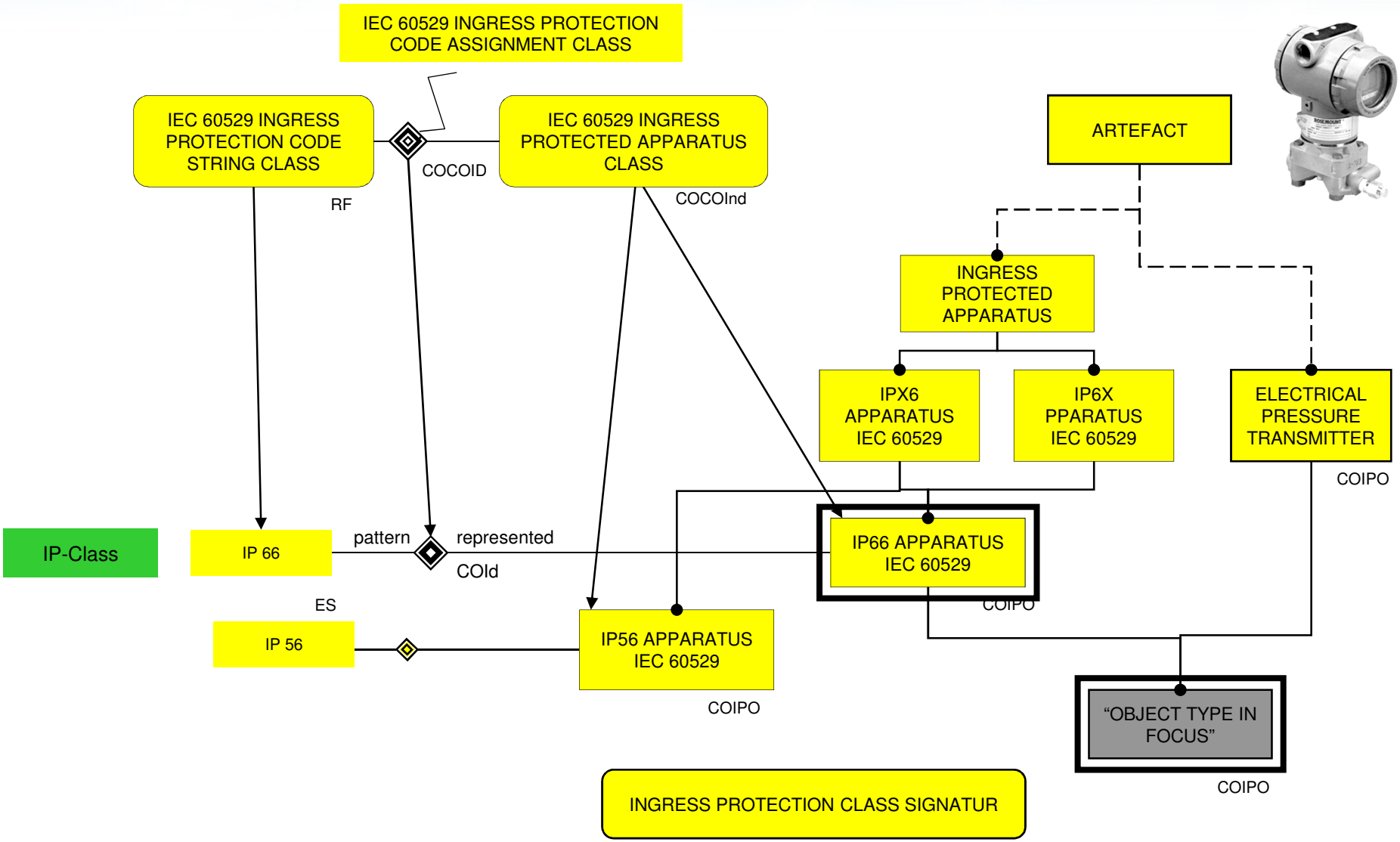


“Type attributes”

Attribute "Shut-off mechanism"

“Area Classification” Attributes

Label "IP-Class"



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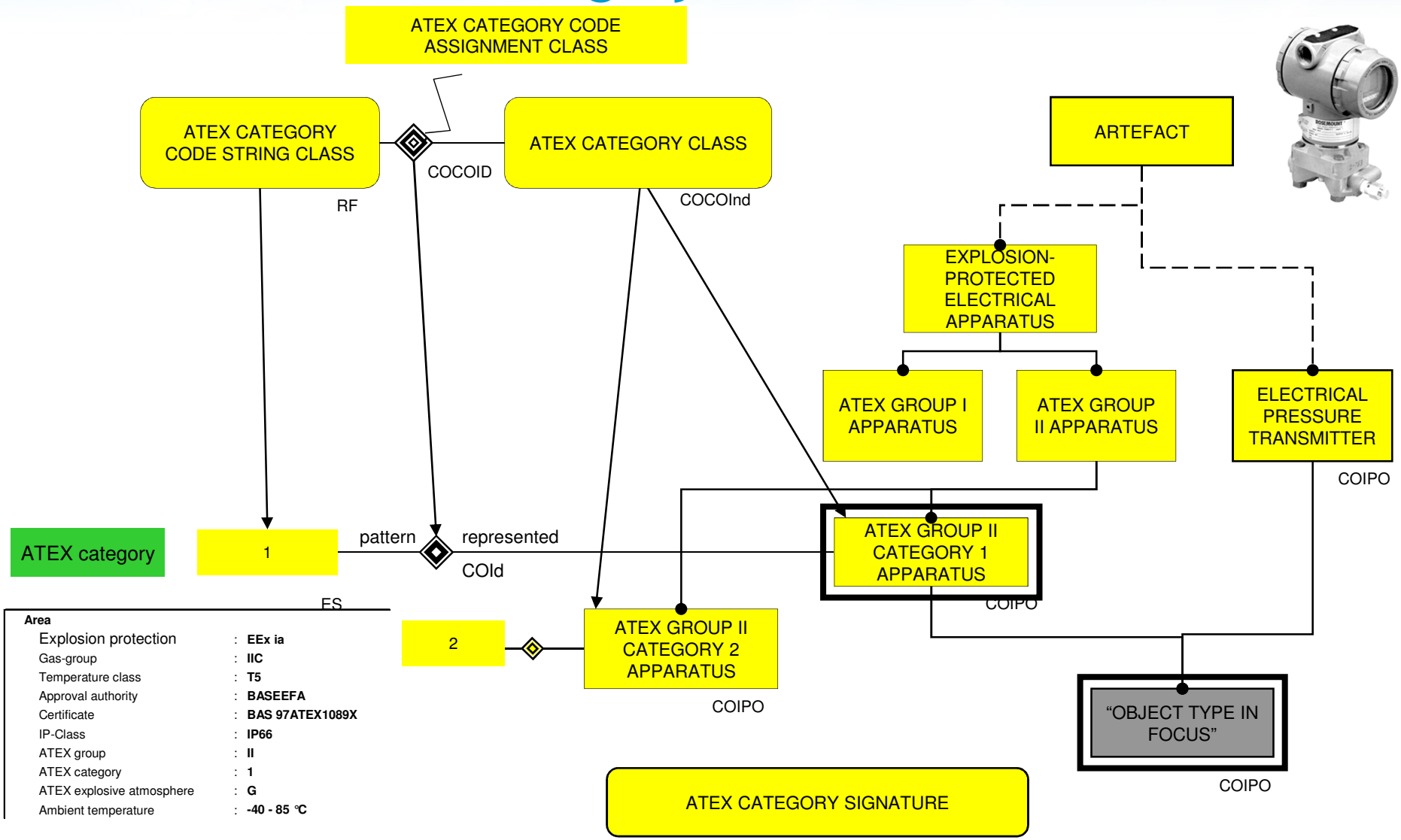
Report of IP Codes/classes from RDS to EqHub

RDS identifier to be used for IP-codes

IEC 60529 Code	RDL Class	PCA class ID	Note(s) NB! Not definition
IP00	IP00 APPARATUS IEC 60529	RDS499189841	No protection against contact and ingress of objects and no protection against water ingress.|IEC 60529
IP10	IP10 APPARATUS IEC 60529	RDS5750818	Protected against solid foreign objects 50 mm and greater, but not protected against water ingress.|IEC 60529
IP11	IP11 APPARATUS IEC 60529	RDS5750863	Protected against solid foreign objects 50 mm and greater and against vertically falling water drops.|IEC 60529
IP12	IP12 APPARATUS IEC 60529	RDS5750908	Protected against solid foreign objects 50 mm and greater and against vertically falling water drops when enclo
IP20	IP20 APPARATUS IEC 60529	RDS4703990	Protected against solid foreign objects 12,5 mm and greater, but no protection against water ingress.|IEC 6052
IP21	IP21 APPARATUS IEC 60529	RDS4704035	Protected against solid foreign objects 12,5 mm and greater and against vertically falling water drops.|IEC 605
IP22	IP22 APPARATUS IEC 60529	RDS4704080	Protected against solid foreign objects 12,5 mm and greater and against vertically falling water drops when enc
IP23	IP23 APPARATUS IEC 60529	RDS1186469	Protected against solid foreign objects 12,5 mm and greater and against spraying water.|IEC 60529
IP24	IP24 APPARATUS IEC 60529	RDS499145520	Protected against solid foreign objects 12,5 mm and greater and against splashing water.|IEC 60529
IP30	IP30 APPARATUS IEC 60529	RDS5750953	Protected against solid foreign objects 2,5 mm and greater, but not protected against water.|IEC 60529
IP31	IP31 APPARATUS IEC 60529	RDS5750998	Protected against solid foreign objects 2,5 mm and greater and against vertically falling water drops.|IEC 6052
IP32	IP32 APPARATUS IEC 60529	RDS5751043	Protected against solid foreign objects 2,5 mm and greater and against vertically falling water drops when encl
IP33	IP33 APPARATUS IEC 60529	RDS5751135	Protected against solid foreign objects 2,5 mm and greater and against spraying water.|IEC 60529
IP34	IP34 APPARATUS IEC 60529	RDS5751180	Protected against solid foreign objects 2,5 mm and greater and against splashing water.|IEC 60529
IP40	IP40 APPARATUS IEC 60529	RDS5751225	Protected against solid foreign objects 1 mm and greater, but not protected against water ingress.|IEC 60529
IP41	IP41 APPARATUS IEC 60529	RDS5751270	Protected against solid foreign objects 1,0 mm and greater and against vertically falling water drops.|IEC 6052
IP42	IP42 APPARATUS IEC 60529	RDS5751315	Protected against solid foreign objects 1 mm and greater and against vertically falling water drops when enclos
IP43	IP43 APPARATUS IEC 60529	RDS1007594	Protected against solid foreign objects 1 mm and greater and against spraying water.|IEC 60529
IP44	IP44 APPARATUS IEC 60529	RDS5751360	Protected against solid foreign objects 1,0 mm and greater and against splashing water.|IEC 60529
IP45	IP45 APPARATUS IEC 60529	RDS5751405	Protected against solid foreign objects 1 mm and greater and against water jets.|IEC 60529
IP50	IP50 APPARATUS IEC 60529	RDS499153651	Dust-protected, but not protected against water ingress.|IEC 60529
IP51	IP51 APPARATUS IEC 60529	RDS499192951	Dust-protected and protected against dripping water.|IEC 60529
IP52	IP52 APPARATUS IEC 60529	RDS499212191	Dust-protected and protected against vertically falling water drops when enclosure is tilted up to 15 deg.|IEC 60
IP53	IP53 APPARATUS IEC 60529	RDS5751450	Dust-protected and protected against spraying water.|IEC 60529
IP54	IP54 APPARATUS IEC 60529	RDS5751495	Dust-protected and protected against splashing water.|IEC 60529
IP55	IP55 APPARATUS IEC 60529	RDS1006379	Dust-protected and protected against water jets.|IEC 60529
IP56	IP56 APPARATUS IEC 60529	RDS1007369	Dust-protected and protected against powerful water jets.|IEC 60529
IP57	IP57 APPARATUS IEC 60529	RDS499184471	Dust-protected and protected against immersion up to 1 m.|IEC 60529
IP58	IP58 APPARATUS IEC 60529	RDS11365160	Dust-protected and protected against water ingress caused by immersion beyond 1 m.|IEC 60529
IP63	IP63 APPARATUS IEC 60529	RDS499187651	Dust-tight and protected against spraying water.|IEC 60529
IP64	IP64 APPARATUS IEC 60529	RDS499186791	Dust-tight and protected against splashing water.|IEC 60529
IP65	IP65 APPARATUS IEC 60529	RDS1007414	Dust-tight and protected against water jets.|IEC 60529
IP66	IP66 APPARATUS IEC 60529	RDS1007459	Dust-tight and protected against powerful water jets.|IEC 60529
IP67	IP67 APPARATUS IEC 60529	RDS1007504	Dust-tight and protected against immersion up to 1 m.|IEC 60529
IP68	IP68 APPARATUS IEC 60529	RDS1007549	Dust-tight and protected against water ingress caused by immersion beyond 1 m.|IEC 60529

Label "ATEX category"



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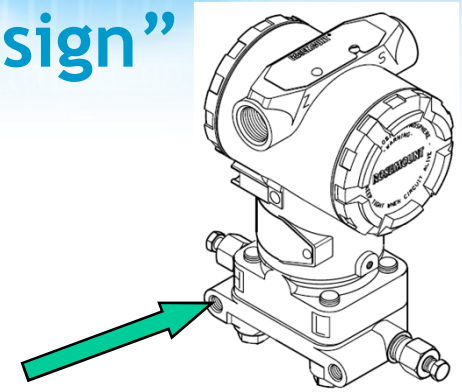
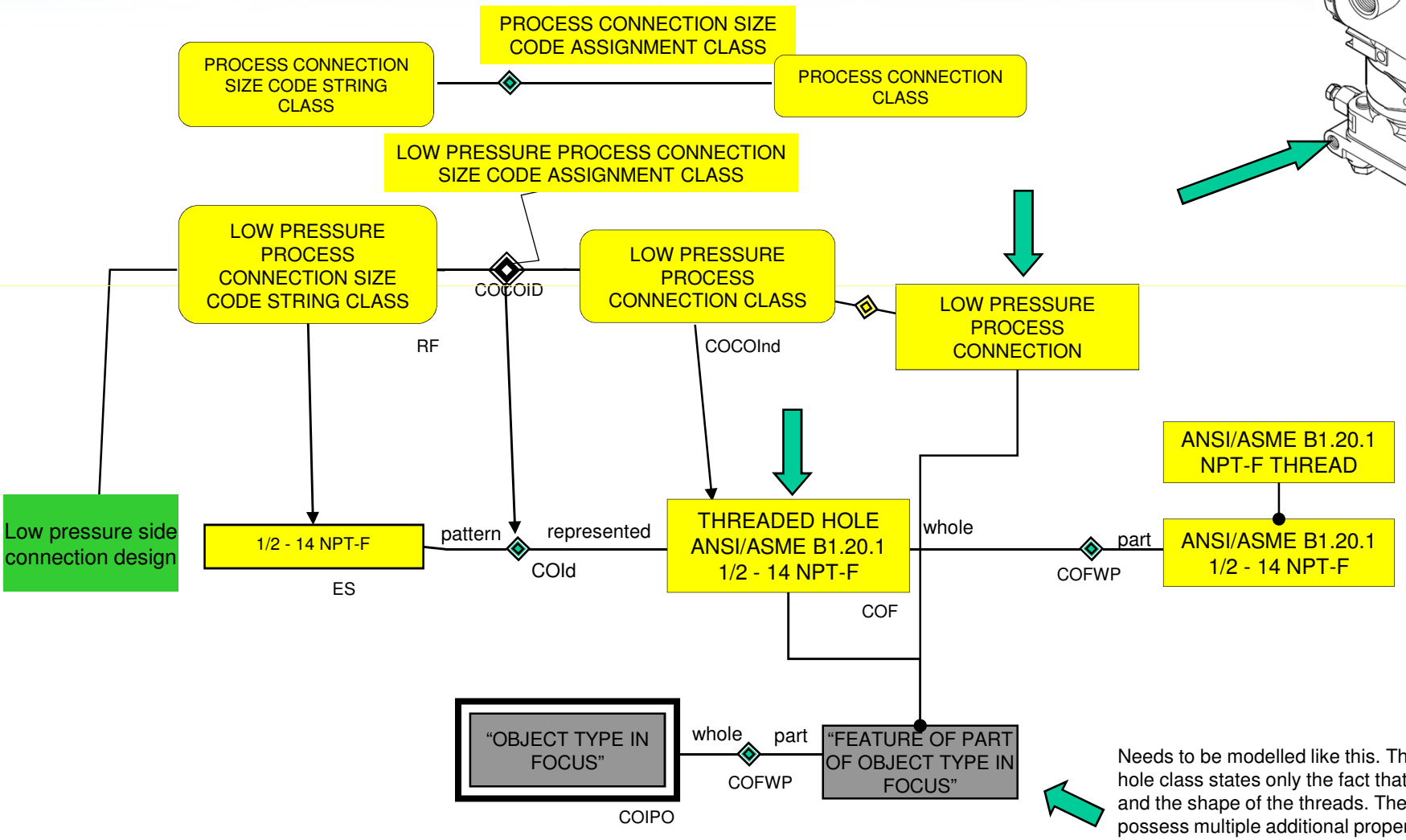
<?xml version="1.0" encoding="UTF-8" ?>
- <dataroot xmlns:od="urn:schemas-microsoft-com:officedata"
generated="2007-08-15T09:32:33">
-          <_TransmitterPressureElectric>
           <Id>1</Id>
            <A_AmbTempMin>-40</A_AmbTempMin>
            <A_AmbTempMax>85</A_AmbTempMax>
           <A_AmbTempUOM> C</A_AmbTempUOM>
           <A_AprAut>BASEEFA</A_AprAut>
           <A_AtexCat>1</A_AtexCat>
           <A_AtexExpAtm>G</A_AtexExpAtm>
           <A_AtexGroup>II</A_AtexGroup>
           <A_ExCert>BAS 97ATEX1089X</A_ExCert>
            <A_ExpProt>EEx ia</A_ExpProt>
           <A_GasGr>IIC</A_GasGr>
           <A_IpClass>IP66</A_IpClass>
           <A_TempCl>T5</A_TempCl>
           <DW_Weight>4,7</DW_Weight>
           <DW_WeightOUM>kg</DW_WeightOUM>
           <El_SuplVolt>10.5 - 55</El_SuplVolt>
           <El_SuplVoltUOM>V DC</El_SuplVoltUOM>
           <F_Acc>+/- 0.75 %</F_Acc>
           <F_DispTyp>LCD</F_DispTyp>
           <F_OutSig>4 - 20 mA</F_OutSig>
            <F_OutSigMin>1</F_OutSigMin>
```


3051CG-5-A-2-2-A-1-K-I1-M6

Multiple statements

Label "Low pressure side connection design"

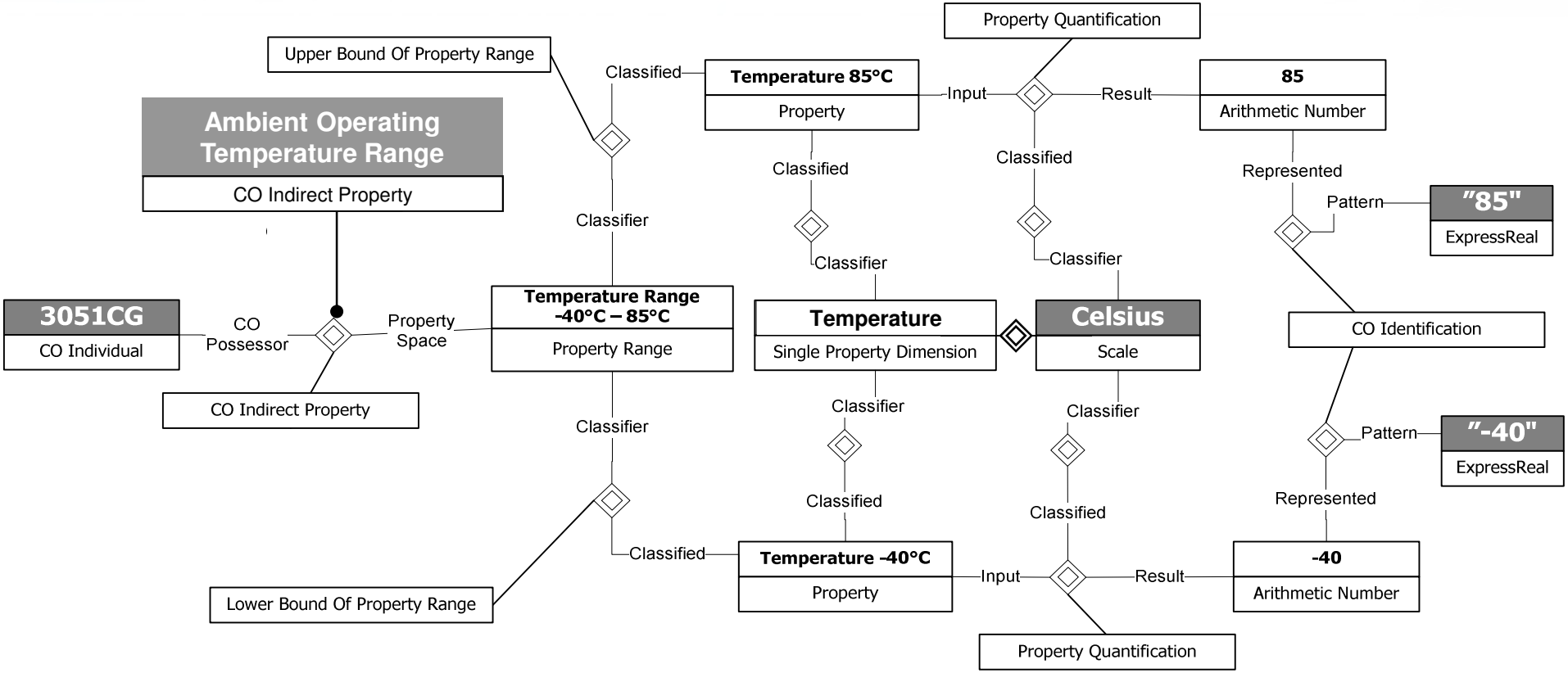




Needs to be modelled like this. The threaded hole class states only the fact that it is a hole and the shape of the threads. The feature possess multiple additional properties, e.g. thickness, orientation etc.

“Properties + UoM”

Representation of “attribute”: Ambient Temperature



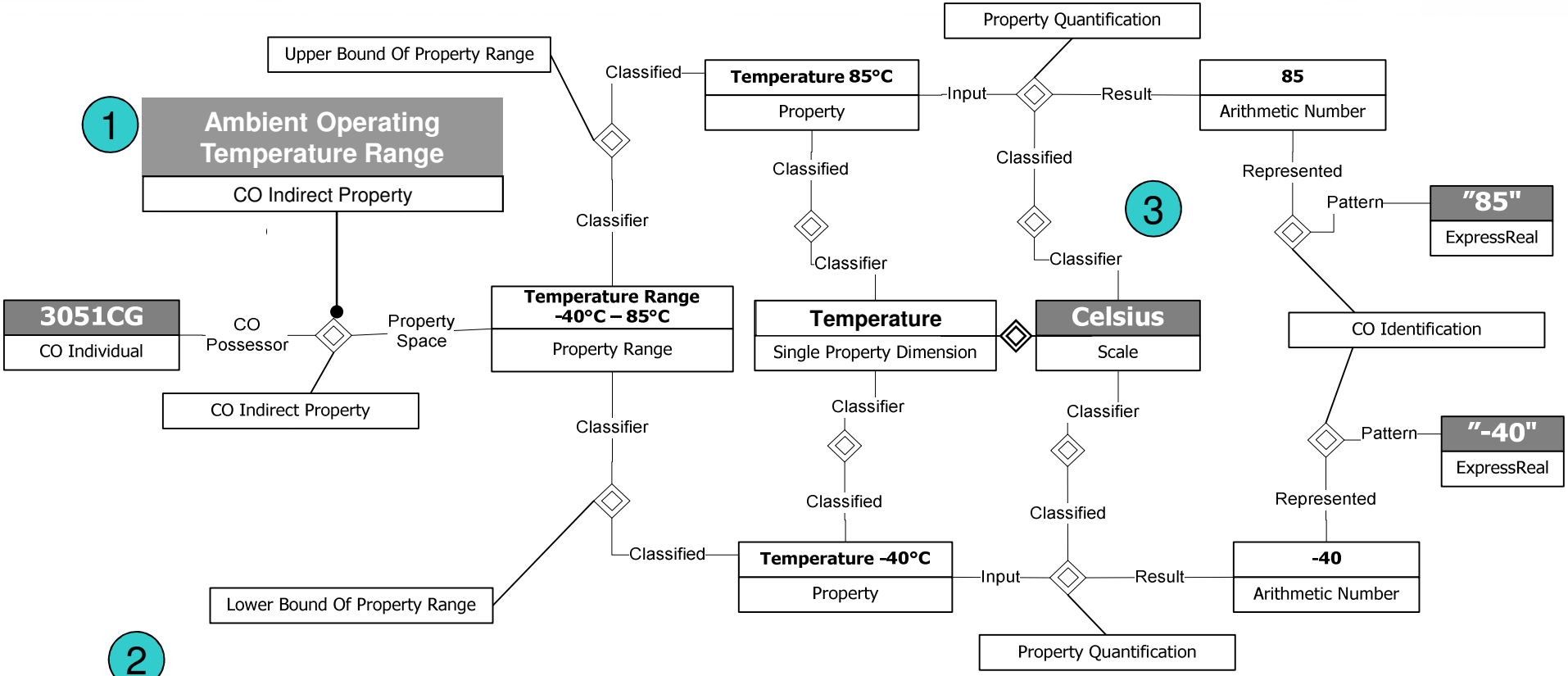
3051CG has a ” ambient operating temperature”: -40 C – 85 C

“Semantic” conformance

POSC Caesar Association

www.posccaesar.com

Ambient Temperature, Semantic level of compliance



2

Temp. Inst. #	Something	Property Type	UoM	Input 1	Input 2
#nnn	3051CG	Ambient Operating Temperature Range	C	-40	85

1 Dictionary/Part 4 compliant

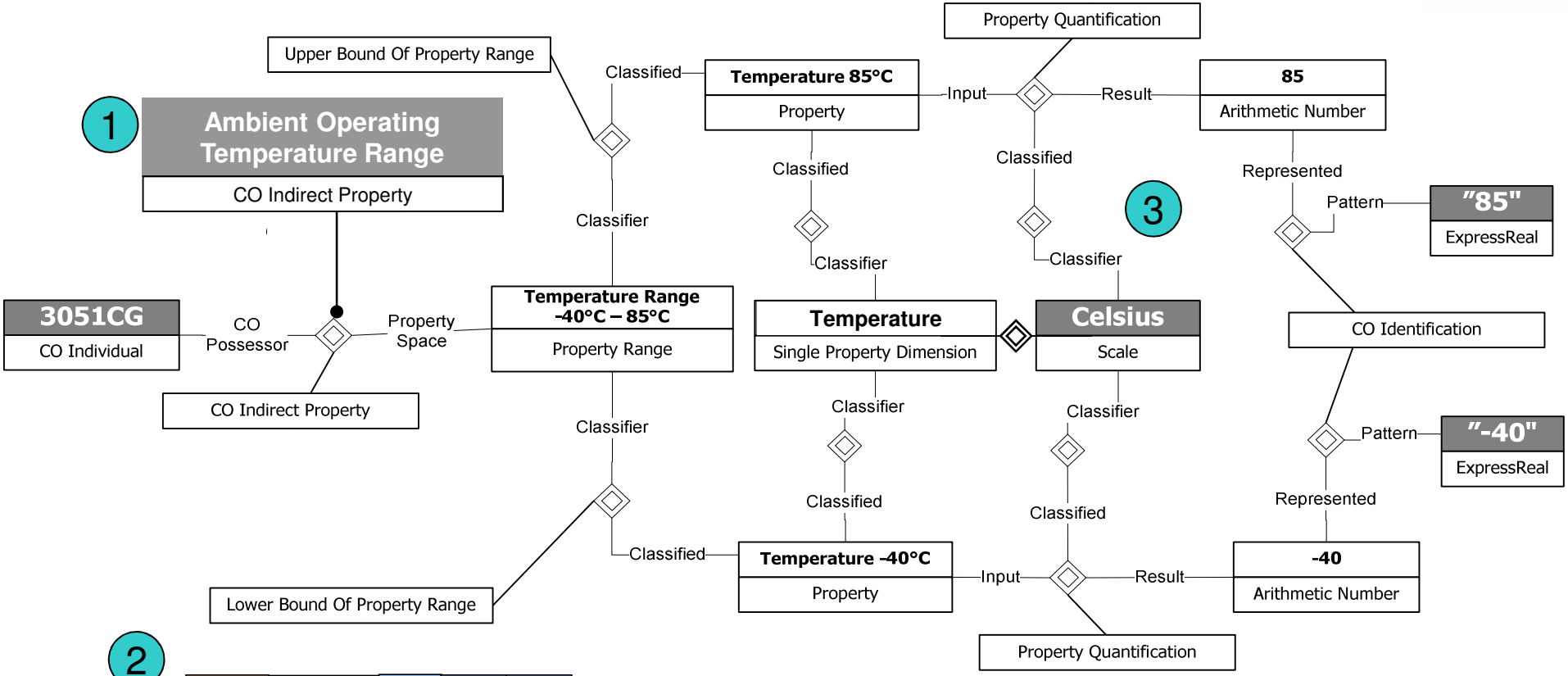
2 Part 7 signature compliant (Verification!)

3 Part 2 compliant

POSC Caesar Association

www.posccaesar.com

Ambient Temperature, Semantic level of compliance



2

Temp. Inst. #	Something	UoM	Input 1	Input 2
#nnn	3051CG	C	-40	85

1 Dictionary/Part 4 compliant

2 Part 7 signature compliant (Verification!)

3 Part 2 compliant

Compliance levels

- **Part 4 compliance (Dictionary level compliance)**
- **Part 7 compliance**
- **Part 2 compliance**
- **It is only Part 2 compliance that will provide the capability of fully implementation independent.**
- **It is only Part 7 compliance in combination with proper modelling that provides Part 2 compliance.**
  - Using Part 2 the object in focus has to be present in all statements
  - With Part 7 compliance each statement must be checked against modelling.
- **Part 8 compliance alone does not provide Part 4, 7 and 2 compliance.**