

# ISO 15926 Tutorial



- *Background Problem and Business Case*
  - *The Datasheet Problem*
- Ontologies and semantic technologies
  - Solutions to the Datasheet Problem
- The Industry Standard ISO 15926
  - What It Is
  - How To Use It



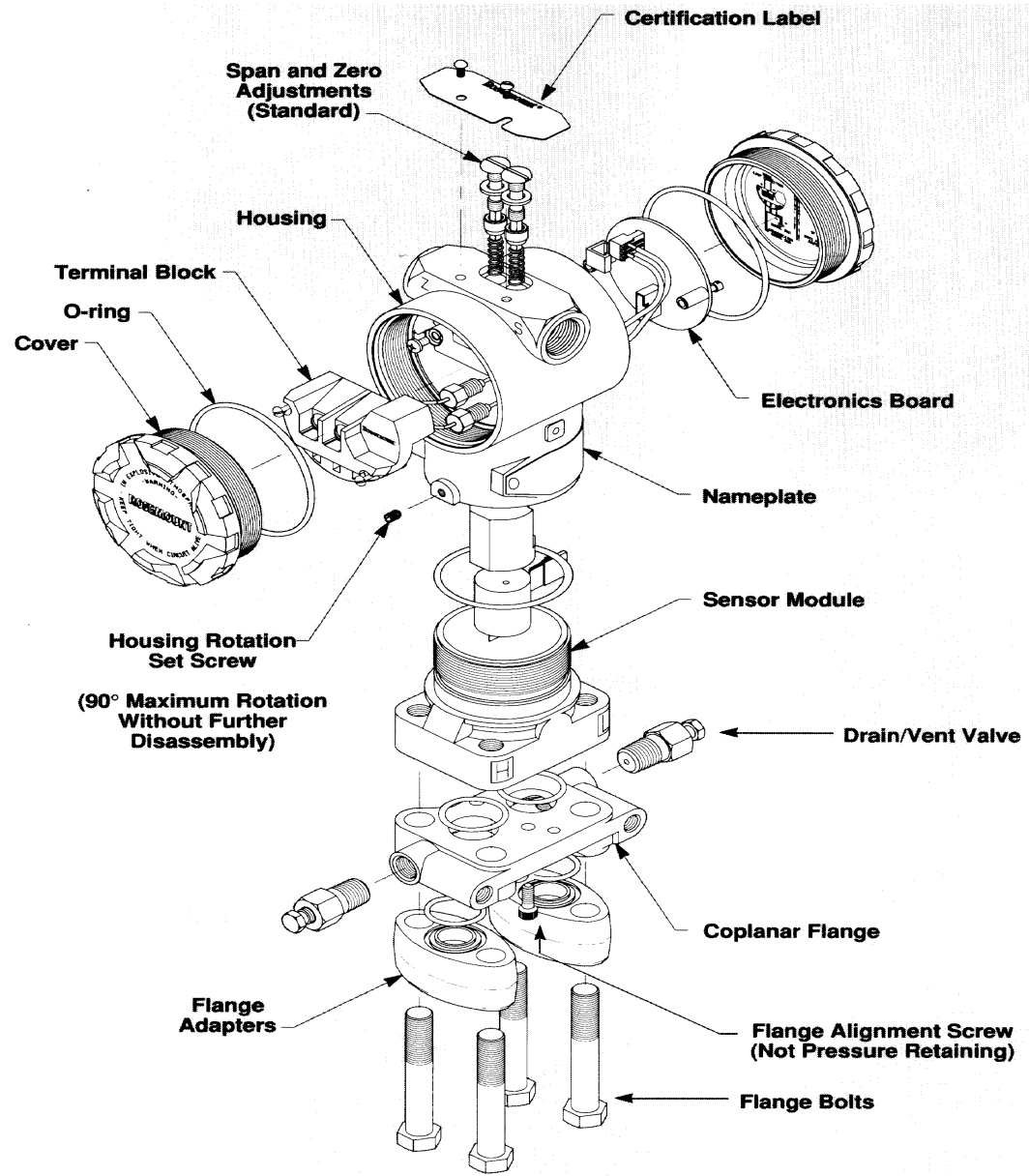
# Background Problem and Business Case



- The need for semantic technologies arises from lack of standardization of information representation.
- Information is represented in datasheets:
  - Describes an industry component, product or other artifact.
  - Different agents will use different datasheet formats to express the same information.
  - Often highly technical and/or domain specific → requires domain expertise to understand.
- The Datasheet Problem illustrates a general information representation problem

# Example: The Emerson Pressure Transmitter

MANAGING RISK



# Representations Of Product Data



NORSOK		INSTRUMENT DATASHEET P01			
		PRESSURE / DIFF. PRESSURE INSTRUMENT ELECTRIC			
Tag number	:	Scale Range	:		
Service description	:	Set/Alarm Point	:		
P&ID	:	Area	:		
Line/equipment no.	:	P. O. Number	:		
<b>1 GENERAL</b>			<b>5 TRANSMITTER</b>		
1.01 Type	:	5.01 Indicator	:		
1.02 Manufacturer	:	5.02 Output signal	:		
1.03 Manufacturer model no	:	5.03 Communication	:		
1.04 Operating Temp. Limits	:	5.04 Supply voltage	:		
1.05 Mounting	:	5.05 Consumption	:		
1.06 Weight	:	5.06 Load limitation	:		
1.07 Other	:	5.07 Other	:		
<b>2 INSTRUMENT CHARACTERISTICS</b>			<b>6 SWITCH</b>		
2.01 Calibrated input range	:	6.01 Reset; automatic or manual	:		
2.02 Characteristic	:	6.02 Deadband or differential	:		
2.03 Accuracy	:	6.03 Alarm at increase/decrease	:		
2.04 Repeatability	:	6.04 Contact configuration	:		
2.05 Lower / upper range limits	:	6.05 Contact material	:		
2.06 Min / max span	:	6.06 Contact rating	:		
2.07 Zero adjustment	:	6.07 Contact action on alarm	:		
2.08 Overpressure protect. to	:	6.08 Other	:		
2.09 Max static pressure	:				
2.10 Other	:				
<b>3 ELEMENT / SENSOR</b>			<b>7 CHEMICAL SEAL</b>		
3.01 Type	:	7.01 Type	:		
3.02 Material, element (sensor)	:	7.02 Material, upper/lower part	:		
3.03 Material, socket (inlet port)	:	7.03 Material, bolts / nuts	:		
3.04 Material, sensor bolts/nuts	:	7.04 Material, diaphragm	:		
3.05 Process conn. size/type	:	7.05 Fill fluid	:		
3.06 Sour service spec.	:	7.06 Capillary length/diameter	:		
3.07 Other	:	7.07 Material, capillary/armour	:		
		7.08 Process conn. size/type	:		
		7.09 Other	:		
<b>4 HOUSING</b>			<b>8 ACCESSORIES</b>		
4.01 Dimension	:	8.01 Mounting bracket	:		
4.02 Material	:	8.02 Material, mounting bracket	:		
4.03 Cable connection	:	8.03 Overpr. protection valve	:		
4.04 Cable entry	:	8.04 Material, overpr. prot. valve	:		
4.05 Enclosure protection	:	8.05 Pulsation damper	:		
4.06 Ex. classification	:	8.06 Material, pulsation damper	:		
4.07 Protective coating	:	8.07 Other	:		
4.08 Other	:				
<b>9 NOTES</b>					

SHARECART		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 High	:	71 barG	Range Unit	:	barG										
P & ID	:	28-1A-KOG-C78-00275-0002	Area	:	N/A										
Line/Equipment no.	:	XX-42-0002	PQ:	:	T12-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; revised and resubmit 4. Issued for information 5. Interface information as clouded is accepted and frozen Date: <table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> </table> Sign: <table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td> </tr> </table>		1	2	3	4	5					
1	2	3	4	5											
<b>Area</b>		<b>General</b>													
Explosion protection	:	EEx ia	Description	:	Gauge										
Gas-group	:	IIC	Description	:	Smart, hart protocol										
Temperature class	:	T5	Supply	:	10.5 - 55 V DC										
Approval authority	:	BASEEFA	Mounting	:	Coplanar flange bracket for pipe or panel										
Certificate	:	BAS 97ATEX1089X													
IP-Class	:	IP66													
ATEX group	:	II	<b>Material</b>												
ATEX category	:	1	Body material	:	Stainless steel										
ATEX explosive atmosphere	:	G	Filling fluid	:	Silicone oil										
Ambient temperature	:	-40 - 85 °C	Seal material	:	Glass filled TFE										
			Process connection material	:	Stainless steel										
<b>Dimensions and Weight</b>			Non process cover material	:	316										
Weight	:	4.7 kg	Flange bolt material	:	316 AUSTENITIC										
			Drain/vent material	:	Stainless steel										
<b>Function</b>			Diaphragm material low pressure	:	316L connection										
Range	:	0 - 13800 kPa	Diaphragm material high pressure	:	316L connection										
Span limit minimum, Pressure	:	138 kPa	Bracket material	:	Stainless steel										
Span limit maximum, Pressure	:	13800 kPa	Bracket bolt material	:	Stainless steel										
Alternative Range	:	0 - 138 bar	Adapter bolt material	:	316 AUSTENITIC										
Alternative span limit minimum, Pressure	:	1.38 bar													
Alternative span limit maximum, Pressure	:	138 bar	<b>Process Connection</b>												
Output signal	:	4 - 20 mA	Connection design	:	NPT										
Accuracy	:	+/- 0.075 %	Size	:	1/4"										
Display type	:	LCD	Thread pitch	:	18 thr/in										
Static working pressure	:	3626 psi													
			<b>Supply Connection</b>												
			Supply connection design	:	Metric threaded										
			Supply connection size	:	20 mm										
			Thread pitch supply	:	1.5 mm/thr										
<b>Comment</b>															
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)															
1	09.11.2006 14:44	Generated by SHARECART	P.M.												
Rev.	Date	Issue/description	Prepared	Checked	Disc. Appr.										
					Client. Appr.										
					Page 1 of 1										

# Examples Of Inconsistent Representations



MANAGING RISK

NORSOK		INSTRUMENT DATASHEET P01	
		PRESSURE / DIFF. PRESSURE INSTRUMENT ELECTRIC	
Tag number :	Scale Range :	Service description :	Set/Alarm Point :
P&ID :	Area :	Line/equipment no. :	P. O. Number :
<b>1 GENERAL</b>		<b>5 TRANSMITTER</b>	
1.01 Type :	5.01 Indicator :	1.02 Manufacturer :	5.02 Output signal :
1.03 Manufacturer model no. :	5.03 Communication :	1.04 Operating Temp. Limits :	5.04 Supply voltage :
1.05 Mounting :	5.05 Consumption :	1.06 Weight :	5.06 Load limitation :
1.07 Other :	5.07 Other :		
<b>2 INSTRUMENT CHARACTERISTICS</b>		<b>6 SWITCH</b>	
2.01 Calibrated input range :	6.01 Reset; automatic or manual :	2.02 Characteristic :	6.02 Deadband or differential :
2.03 Accuracy :	6.03 Alarm at increase/decrease :	2.04 Repeatability :	6.04 Contact configuration :
2.05 Lower / upper range limits :	6.05 Contact material :	2.06 Min / max span :	6.06 Contact rating :
2.07 Zero adjustment :	6.07 Contact action on alarm :	2.08 Overpressure protect. to :	6.08 Other :
2.09 Max static pressure :		2.10 Other :	
<b>3 ELEMENT / SENSOR</b>		<b>7 CHEMICAL SEAL</b>	
3.01 Type :	7.01 Type :	3.02 Material, element (sensor) :	7.02 Material, upper/lower part :
3.03 Material, socket (inlet port) :	7.03 Material, bolts / nuts :	3.04 Material, sensor bolts/nuts :	7.04 Material, diaphragm :
<b>3.05 Process conn. size/type :</b>	7.05 Fill fluid :	3.06 Sdr. service spec. :	7.06 Capillary length/diameter :
3.07 Other :	7.07 Material, capillary/armour :		7.08 Process conn. size/type :
	7.09 Other :		
<b>4 HOUSING</b>		<b>8 ACCESSORIES</b>	
4.01 Dimension :	8.01 Mounting bracket :	4.02 Material :	8.02 Material, mounting bracket :
4.03 Cable connection :	8.03 Overpr. protection valve :	4.04 Cable entry :	8.04 Material, overpr. prot. valve :
4.05 Enclosure protection :	8.05 Pulsation damper :	4.06 Ex. classification :	8.06 Material, pulsation damper :
4.07 Protective coating :	8.07 Other :	4.08 Other :	
		<b>9 NOTES</b>	

SHARECRT		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 High :	71 barG	Range Unit :	barG
P & ID :	28-1A-KOG-C78-00275-0002	Area :	N/A
Line/Equipment no. :	XX-42-0002	PO :	T12-M022-ME-01
Service description :	SCALE INHIBITOR. PUMP OUTLET		
Unique no. :	TEK-00018117	<small>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</small>	
Manufacturer :	EMERSON PROCESS MANAGEMENT	Date:	1 2 3 4 5
Type :	3051CG	Sign:	
Manuf. Partno. :	3051CG-5-A-2-2-A-1-K-B4-I1-L4-M6-Q4		
Class :	Transmitter, Pressure, Electric		
<b>Area</b>		<b>General</b>	
Explosion protection :	EEx ia	Description :	Gauge
Gas-group :	IIC	Description :	Smart, hart protocol
Temperature class :	T5	Supply :	10.5 - 55 V DC
Approval authority :	BASEEFA	Mounting :	Coplanar flange bracket for pipe or panel
Certificate :	BAS 97ATEX1089X	<b>Material</b>	
IP-Class :	IP66	Body material :	Stainless steel
ATEX group :	II	Filling fluid :	Silicone oil
ATEX category :	1	Seal material :	Glass filled TFE
ATEX explosive atmosphere :	G	Process connection material :	Stainless steel
Ambient temperature :	-40 - 85 °C	Non process cover material :	316
<b>Dimensions and Weight</b>		Flange bolt material :	316 AUSTENITIC
Weight :	4.7 kg	Drain/vent material :	Stainless steel
<b>Function</b>		Diaphragm material low pressure connection :	316L
Range :	0 - 13800 kPa	Diaphragm material high pressure connection :	316L
Span limit minimum, Pressure :	138 kPa	Bracket material :	Stainless steel
Span limit maximum, Pressure :	13800 kPa	Bracket bolt material :	Stainless steel
Alternative Range :	0 - 138 bar	Adapter bolt material :	316 AUSTENITIC
Alternative span limit minimum, Pressure :	1.38 bar		
Alternative span limit maximum, Pressure :	138 bar	<b>Process Connection</b>	
Output signal :	4 - 20 mA	Connection design :	NPT
Accuracy :	±0.075 %	Size :	1/4"
Display type :	LCD	Thread pitch :	18 thr/in
Static working pressure :	3626 psi	<b>Supply Connection</b>	
		Supply connection design :	Metric threaded
		Supply connection size :	20 mm
		Thread pitch supply :	1.5 mm/thr
<b>Comment</b>	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)		
1	09.11.2006 14:44	Generated by SHARECRT	P.M.
Rev.	Date	Issue/description	Prepared
			Checked
			Disc. Appr.
			Client. Appr.
			Page 1 of 1

# Daily Challenges For Data Sheet Mapping

- Need to recognise which representation is used by which proprietary representation
- In order to resolve this, a neutral, system independent representation that can map to any proprietary representation is required.

NORSOK	B37	SHARECAT	M45, M46, M47
14 Conn. Size/Type Proc. : 1/4"-18 NPT (F)		Connection design.	: NPT
		Size	: 1/4"
		Thread pitch	: 18 thr/in

ANSI/ASME B1.20.1 1/4 - 18 NPT-F



# Context Of Codes I



NORSOK		INSTRUMENT DATASHEET P01	
		PRESSURE / DIFF. PRESSURE INSTRUMENT ELECTRIC	
Tag number :	Scale Range :	Service description :	Set/Alarm Point :
P&ID :	Area :	Line/equipment no. :	P. O. Number :
<b>1 GENERAL</b>	<b>5 TRANSMITTER</b>		
1.01 Type :	5.01 Indicator :		
1.02 Manufacturer :	5.02 Output signal :		
1.03 Manufacturer model no :	5.03 Communication :		
	5.04 Supply voltage :		
1.04 Operating Temp. Limits :	5.05 Consumption :		
1.05 Mounting :	5.06 Load limitation :		
1.06 Weight :	5.07 Other :		
1.07 Other :			
<b>2 INSTRUMENT CHARACTERISTICS</b>	<b>6 SWITCH</b>		
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2.05 Lower / upper range limits :	6.05 Contact material :		
2.06 Min / max span :	6.06 Contact rating :		
2.07 Zero adjustment :	6.07 Contact action on alarm :		
2.08 Overpressure protect. to :	6.08 Other :		
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<b>3 ELEMENT / SENSOR</b>	<b>7 CHEMICAL SEAL</b>		
3.01 Type :	7.01 Type :		
3.02 Material, element (sensor) :	7.02 Material, upper/lower part :		
3.03 Material, socket (inlet port) :	7.03 Material, bolts / nuts :		
3.04 Material, sensor bolts/nuts :	7.04 Material, diaphragm :		
3.05 Process conn. size/type :	7.05 Fill fluid :		
3.06 Sour service spec. :	7.06 Capillary length/diameter :		
3.07 Other :	7.07 Material, capillary/armour :		
	7.08 Process conn. size/type :		
	7.09 Other :		
<b>4 HOUSING</b>	<b>8 ACCESSORIES</b>		
4.01 Dimension :	8.01 Mounting bracket :		
4.02 Material :	8.02 Material, mounting bracket :		
4.03 Cable connection :	8.03 Overpr. protection valve :		
4.04 Cable entry :	8.04 Material, overpr. prot. valve :		
4.05 Enclosure protection :	8.05 Pulsation damper :		
4.06 Ex. classification :	8.06 Material, pulsation damper :		
4.07 Protective coating :	8.07 Other :		
4.08 Other :			
	<b>9 NOTES</b>		

SHARECRT		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
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P & ID :	28-1A-KOG-C78-00275-0002	Area :	N/A
Line/Equipment no. :	XX-42-0002	PO :	T12-M022-ME-01
Service description :	SCALE INHIBITOR. PUMP OUTLET		
Unique no. :	TEK-00018117	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	
Manufacturer :	EMERSON PROCESS MANAGEMENT	Date:	1 2 3 4 5
Type :	3051CG	Sign:	
Manuf. Partno. :	3051CG-5-A-2-2-A-1-K-B4-I1-L4-M6-Q4		
Class :	Transmitter, Pressure, Electric		
<b>Area</b>		<b>General</b>	
Explosion protection :	EEx ia	Description :	Gauge
Gas-group :	IIC	Description :	Smart, hart protocol
Temperature class :	T5	Supply :	10.5 - 55 V DC
Approval authority :	BASEEFA	Mounting :	Coplanar flange bracket for pipe or panel
Certificate :	BAS 97ATEX1089X	<b>Material</b>	
IP-Class :	IP66	Body material :	Stainless steel
ATEX group :	II	Filling fluid :	Silicone oil
ATEX category :	1	Seal material :	Glass filled TFE
ATEX explosive atmosphere :	G	Process connection material :	Stainless steel
Ambient temperature :	-40 - 85 °C	Non process cover material :	316
<b>Dimensions and Weight</b>		Flange bolt material :	316 AUSTENITIC
Weight :	4.7 kg	Drain/vent material :	Stainless steel
<b>Function</b>		Diaphragm material low pressure :	316L
Range :	0 - 13800 kPa	connection	
Span limit minimum, Pressure :	138 kPa	Diaphragm material high pressure :	316L
Span limit maximum, Pressure :	13800 kPa	connection	
Alternative Range :	0 - 138 bar	Bracket material :	Stainless steel
Alternative span limit minimum, Pressure :	1.38 bar	Bracket bolt material :	Stainless steel
Pressure		Adapter bolt material :	316 AUSTENITIC
Alternative span limit maximum, Pressure :	138 bar	<b>Process Connection</b>	
Pressure		Connection design :	NPT
Output signal :	4 - 20 mA	Size :	1/4"
Accuracy :	+/- 0.075 %	Thread pitch :	18 thr/in
Display type :	LCD	<b>Supply Connection</b>	
Static working pressure :	3626 psi	Supply connection design :	Metric threaded
		Supply connection size :	20 mm
		Thread pitch supply :	1.5 mm/thr
<b>Comment</b>			
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)			
1	09.11.2006 14:44	Generated by SHARECRT	P.M.
Rev.	Date	Issue/description	Prepared
Rev.	Date	Issue/description	Prepared
			Checked
			Disc. Appr.
			Client. Appr.
			Page 1 of 1

# Context Of Codes II

## 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

**T5:** [www.informativos.telecinco.es](http://www.informativos.telecinco.es)  
**t5.no-thobben på nett**  
**Sony tilbakekaller Cyber-shot DSC-T5**  
**Volvo T5**

**T5 here:** T5 APPARATUS IEC 60079-0

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

**IIC here:** GROUP IIC APPARATUS IEC 60079-0

**IP66:** IP66 APPARATUS IEC 60529

**EEx ia:** EX IA APPARATUS IEC 60079-11

# 8 definitions of mean time between failure

## ■ MEAN TIME BETWEEN FAILURE (#RDS7925234)

A period of time which is the mean period of time interval between failures.

## ■ MEAN TIME BETWEEN FAILURE 1 A (#RDS14647190)

The time duration between two consecutive failures of a repaired item.

International Electrotechnical Vocabulary (IEV) online database

## ■ MEAN TIME BETWEEN FAILURE 1 B (#RDS14647235)

The expectation of the time between failures: Note. - In English, the use of the abbreviation MTBF in this sense is now deprecated.

International Electrotechnical Vocabulary (IEV) online database

## ■ MEAN TIME BETWEEN FAILURE 1 C (#RDS14647280)

The expectation of the operating time between failures.

International Electrotechnical Vocabulary (IEV) online database

## ■ MEAN TIME BETWEEN FAILURE 1 D (#RDS14647325)

Total time duration of operating time between two consecutive failures of a repaired item

International Electrotechnical Vocabulary (IEV) online database

## ■ MEAN TIME BETWEEN FAILURE 2 (#RDS14647415)

Predicts the average number of hours that an item, assembly, or piece part will operate before it fails.

Jones J. V. (1987), Integrated Logistics Support Handbook, McGraw Hill Inc., USA.

## ■ MEAN TIME BETWEEN FAILURE 3 (#RDS14647145)

For a particular interval, the total functional life of a population of an item divided by the total number of failures within the population during the measurement interval. The definition holds for time, rounds, miles, events, or other measure of life units.

MIL-PRF-49506 (1996), Performance Specification Logistics Management Information

## ■ MEAN TIME BETWEEN FAILURE 4 (#RDS14646965)

The average length of time a system or component works without failure.

# The Datasheet Problem

- Simple text searches will not work across datasheets.
- Information is likely to be context-dependent by for instance:
  - relying on implicit knowledge
  - refer to internal standards
- Domain experts often required to get correct interpretations of datasheets.

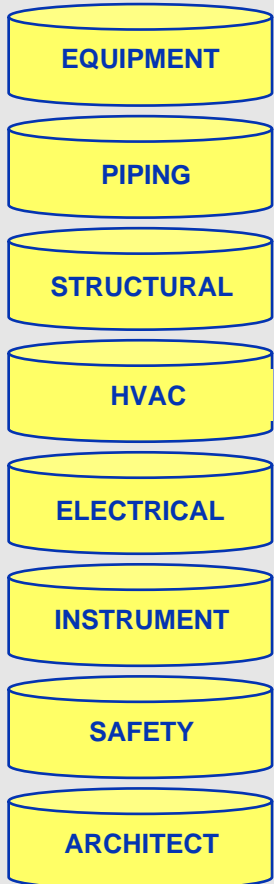
- The Datasheet Problem: Different formats for representing information makes translation and communication difficult
  
- The Datasheet Problem could also apply to internal processes:
  - Datasheets may change over time
  - Different departments may use different datasheets.
  
- Dangers related to the Datasheet Problem:
  - Data degradation.
  - Information exchange becomes costly and time-consuming.

# Example of O&G Engineering Applications

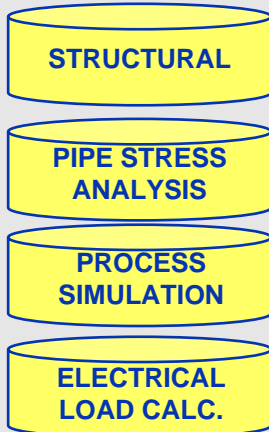
MANAGING RISK



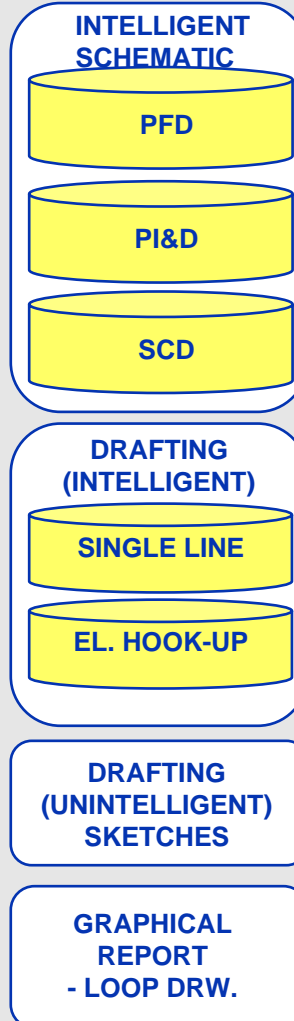
## 3D CAD



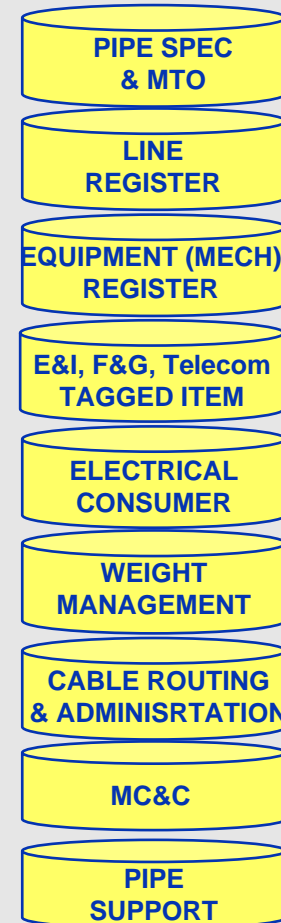
## ANALYSIS/ SIMULATION



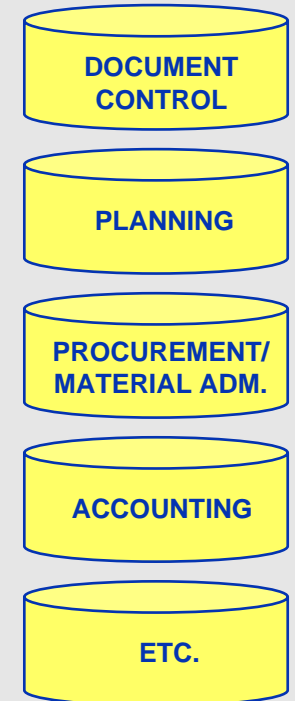
## 2D CAD



## ENGINEERING DB (TECHNICAL DB)

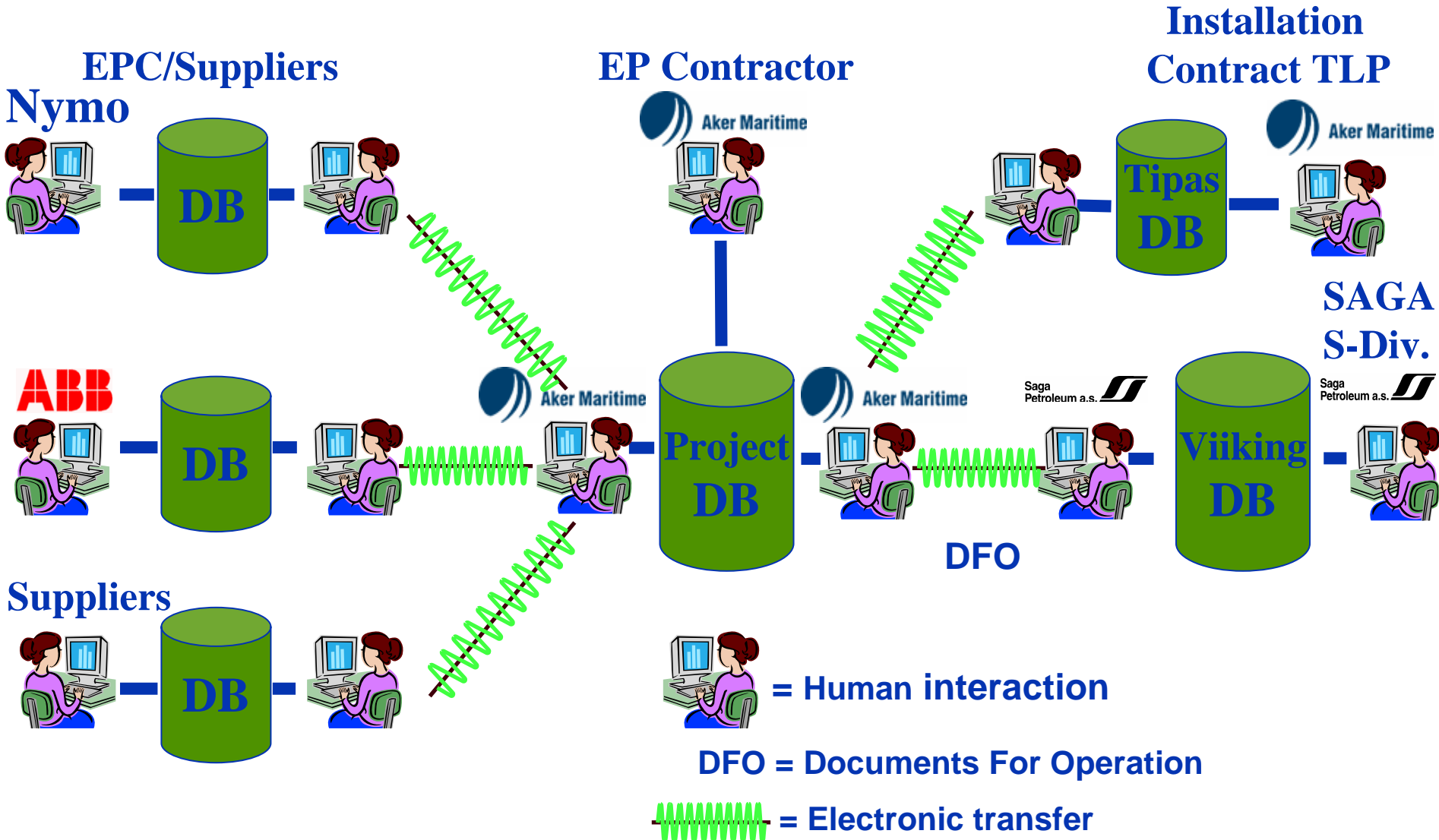


## ADMINISTRATIVE



+ 'MS OFFICE'

# Technical Information- Vigdis



# Example cases

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- To Be Done



- Questions?
- Comments?





# Ontologies



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## Solutions to the Datasheet Problem

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## ■ The Datasheet Problem

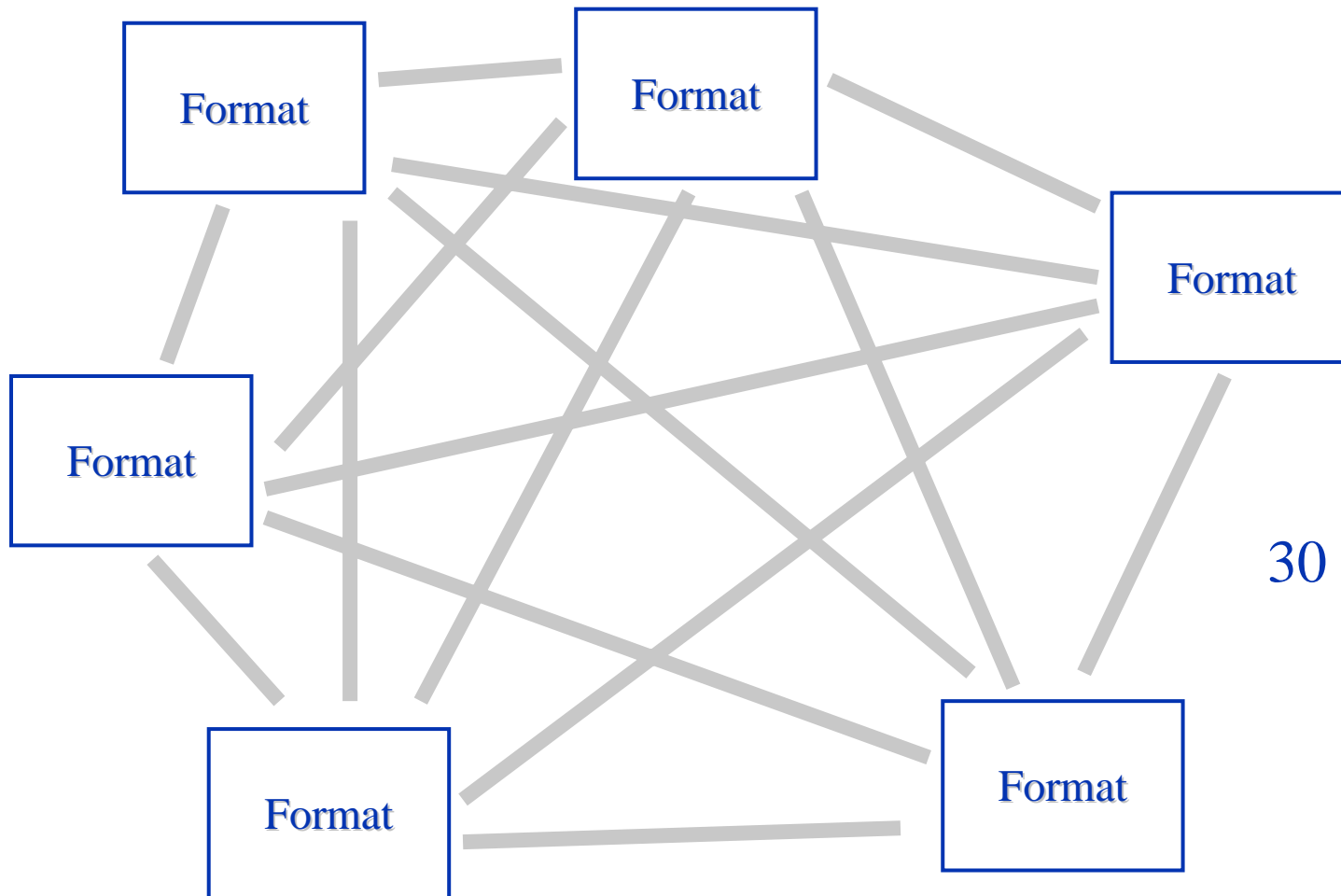
- Many different formats for information representation
- Data integration difficult, expensive and time consuming

## ■ Why don't all just use one common standard?

- Standards change, while assets may persist for many years
- Many actors in the industry, often with very different needs
- Fit for All → Preferred by None

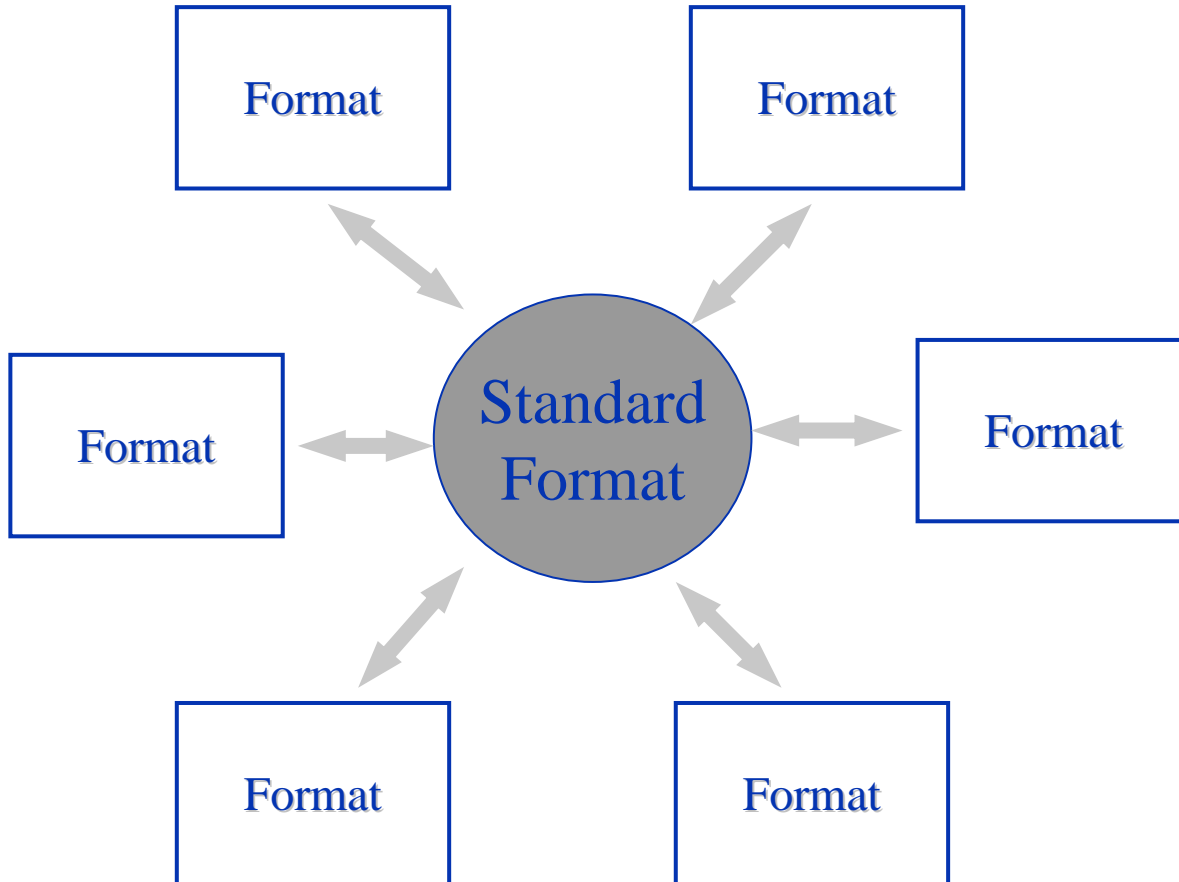
- One common format for data exchange
  - Allow different agents to employ their own internal formats
  - Independent standard
  - Greatly reduce the number of translations

# Direct translations: many mappings!



30 mappings

# Solution: Standardization



12 mappings

Max two translations

- An Independent Standard for Information Representation:
  - allow different agents to employ their own formats
  - greatly reduce the number of translations
  - reduce the risk of data degradation
  
- How to construct this standard? Ontologies provide an answer.

# Requirements For a Data Integration Standard

- Flexible
  - Allow many different types of information.
- Use-neutral
  - Particular pieces of data may be used in many different contexts
- High Quality
  - Precise definitions
  - Make implicit information explicit
- Support use of IT-tools.
  - Must be able to handle thousands of concepts and terms.



# Complexity vs. Computability

- High expressivity and high volume
  - Databases can handle large quantities of data, but are not flexible
  - Natural language dictionaries are flexible, but unmanageable for computers

- Ontologies
  - Accurate dictionaries
  - Machine processable
  
- Principal components
  - Classes
  - Subsumption hierarchy
  - Relations
  - Constraints
  - Language

- The subject area.
- A collection of objects that constitutes an ontology.

- Collections of things
- Classify objects in the domain
- Examples:
  - red object
  - car
  - veichle
- Example statement:
  - TEK-00018117 is an Emerson pressure transmitter
  - Emerson is a Company

- Classes are organized in a hierarchy
- Denoted by the subsumption relation  $\subseteq$
- Easily handled by computers
- `car`  $\subseteq$  `vehicle`
  - States that every instance of `car` is an instance of `vehicle`
  
- Example statement:
  - `TEK-00018117` is an `Emerson pressure transmitter`
  - `Emerson pressure transmitter`  $\subseteq$  `Electric pressure transmitter`
  - Derive: `TEK-00018117` is an `Electric pressure transmitter`

- Relations between things
- Examples:
  - is owned by
  - is part of
  - weighs more than
  
- Example statement:
  - TEK-00018117 is an Emerson pressure transmitter
  - Emerson is a Company
  - TEK-00018117 is manufactured by Emerson

- Constraints are useful to disallow certain constellations of classes and relations
  - Cars don't own Wheels
  - Pressure transmitters don't manufacture companies
- Concrete domains
  - Ex: numbers, strings.
  - Having a concrete domain enable objects to have concrete properties
- Example statements:
  - TEK-00018117 is an `Emerson pressure transmitter`
  - TEK-00018117 weighs `4.7 kg`

- Enable formation of new concepts and relations from atomic ones

- Typical language components:

- OR
- AND
- NOT

- Example:

- man **OR** woman [Definition of person]
- (man **OR** woman) **AND** (**NOT** child) [Definition of adult]
- adult **AND** (*has* **SOME** child) [Definition of parent]

- Example statements:

- TEK-00018117 is an  
(Emerson pressure transmitter **AND**(**NOT** Company))



- Operators behave according to explicit rules:
  - Classified by (child **AND** man) → Classified by *both* child and man
  - Classified by man → Classified by (man **OR** woman)
  - Classified by (child **AND** adult) → Unclassifiable
  
- Explicit rules makes the ontology machine readable.
  
- The type and number of **operators** (still) govern expressivity and computability.
  
- What needs computing?
  - Answer Queries (easy)
  - Check Consistency (hard, but important)

# An Ontology is ...

- A formal / machine processable language
- Built from a set of concepts and relations with unambiguous definitions.
- Hierarchy of classes, a *taxonomy*
- Mimics how we usually thinks of objects: Classifying objects and relating them to other objects.
  - "Planes are noisy"
  - "Girls just want to have fun"
  - "King Harald is the king of Norway"

# What does ontologies provide?

- As a form of formal languages, ontologies provide a **flexible and expressive** way to represent information.
- To the extent that ontologies manage to describe things as they are, they are **use-neutral**.
- To the extent that ontologies provide good definitions and a rich structure of classes and relations, they are suitable for recording detailed and **explicit information and data of high quality**
- Because ontologies are machine processable formal languages, they enable **computer support**

- Questions?
- Comments?





# ISO 15926



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What it is, and how to use it

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# What ISO 15926 is

- ISO 15926 needs to cope with multiple types of information
  - Product data and specification
  - Meta-data
  - Complex classes
  - In addition, the life-cycle of both product- and meta-data must be handled in a consistent manner.
- Too expressive for ontologies
  - Many ontology languages (such as OWL DL) does not support meta-classes.
  - Meta-data is generally outside the scope of ontologies.

# What ISO 15926 is, cont

- ISO 15926 is *not* an ontology
- It is an interconnected system of ontologies, spanning several domains and class-hierarchies.
- Allows uparaelled flexibility and expressivity
- ... but hampers IT-support.
- IT-support available for extracts of the model.

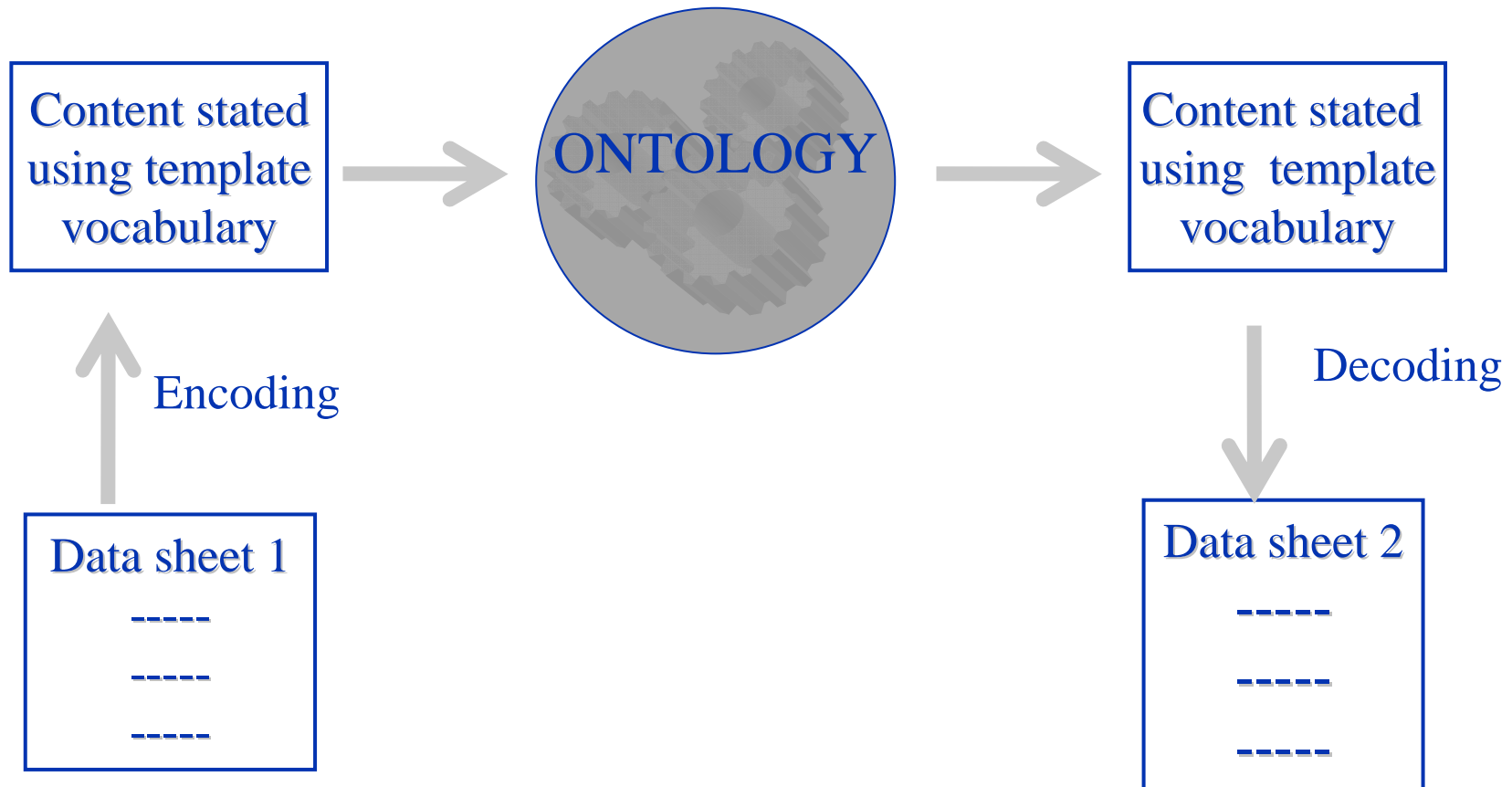
- The core part, (part 2)
  - The base *data model*
  - Specifies the structure of classes and relationships
  - Ex: `relationship`, `connection_of_individual`, `event`, `thing`
- Geometrical and topological data (part 3)
- The Reference Data Library, RDL (part 4)
  - Contains domain specific classes and relations
  - Adheres to the classes and relations in part 2
  - Ex: `Pump`, `Well head`
- Implementation methods, (part 7)
  - Templates, facilitating data entry and retrieval to/from 15926



# The parts ISO 15926, cont

## ■ Implementation methods, (part 7)

- Templates, facilitating data entry and retrieval to/from 15926



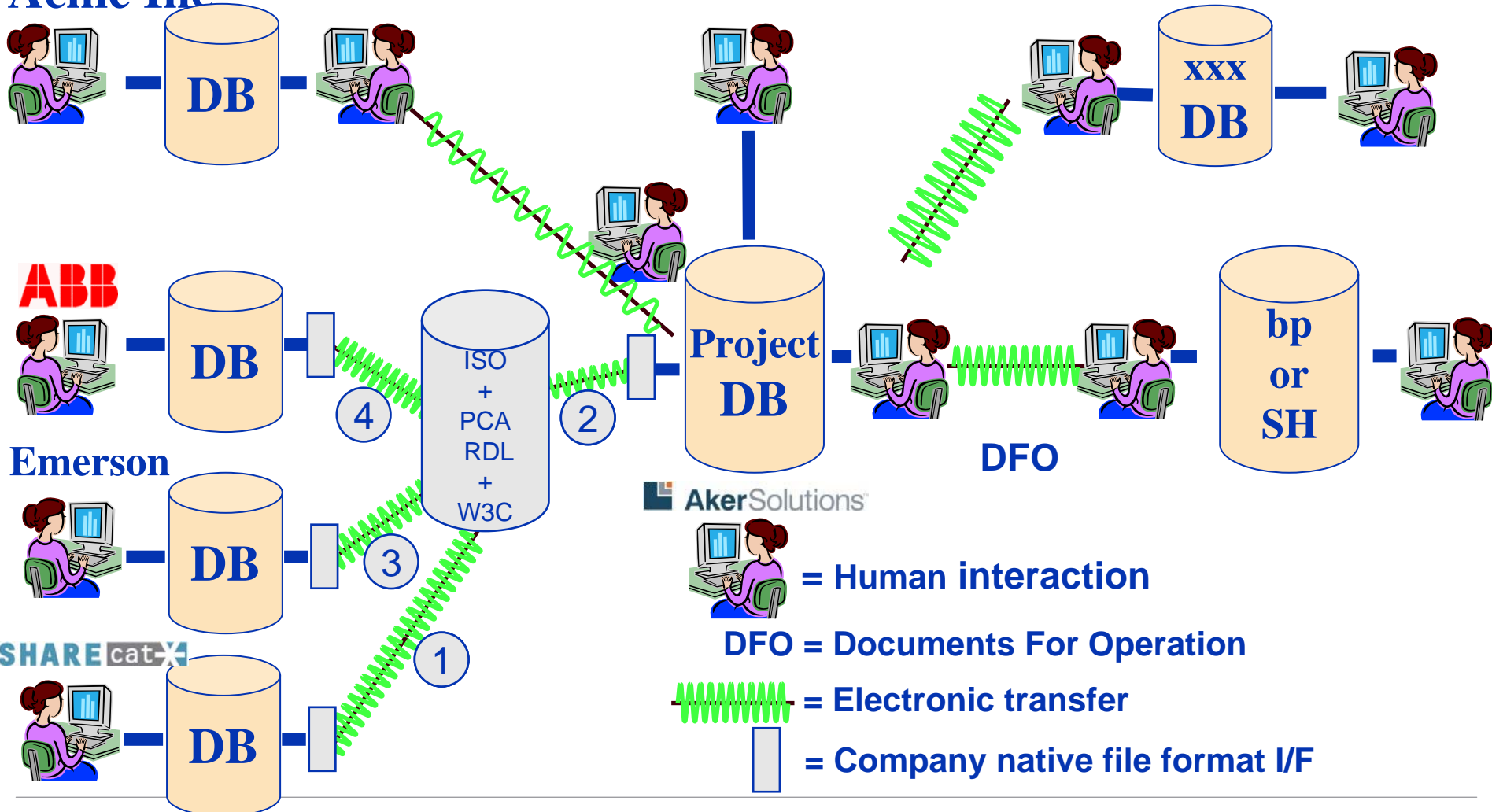
- **Nomenclature**
  - A number of nomenclatures are recorded in ISO 15926
- **Dictionary**
  - The ISO 15926 Reference Data Library (RDL) contains a large number of concepts and concept definitions.
- **Taxonomy**
  - The classes in the RDL are ordered in a subsumption hierarchy. This adds a structure to the data, which is accessible and useful for IT support.
- **Taxonomy with Relations**
  - Makes it possible to represent project data information concerning e.g. ownership and constituent parts, etc.
- **Complex Class and Relationship Structures**
  - Full use of the rich class and relationship structure of ISO 15926 makes it possible to represent complex information and meta-data.
- **Templates and project Data**
  - Enables users to make use of the ISO 15926 standard without having to learn or master the complex class and relationship structure.

# The IDS Test Case

## Installation Contractor

## EPC/Suppliers Acme Inc

## EP Contractor





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