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X3P:
Open Source Implementation of an ISO5436-2 based XML Data Format

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Motivation

- Need for a standardized file format to exchange
  - measurement data sets
  - software gauges

- ISO 5436-2 defines a set of necessary records

- File format defined in ISO 5436-2 is not state of the art
  - mixed ASCII-binary
  - no compression
  - redundant information
  - not extensible

Advantages of X3P

- Using XML-format to store all records
  - Clear definition of data types and contents in XSD
  - Automatic testing of validity and integrity
  - Human readable for debugging purposes
  - Transparently extensible without loosing compatibility
- Storage in compressed ZIP-Container
- Transparent storage of binary encoded mass data for improved performance

Advantages of X3P

- Platform independent
  - Lead development on Windows
  - Unix/Mac following
- Extensible
  - Excellent base for vendor specific data formats
  - Readable by all other systems
  - Protecting your secrets

Application of X3P

▸ Universally applicable

▸ Line **and** area data

▸ View oriented data from camera based 3D-scanners can be stored in topologic order!

▸ Unsorted point clouds from (CMMs, etc.)

▸ Multi-layer Systems

Easy use of X3P

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- ▶ Open source implementation freely available soon at: www.opengps.eu

- ▶ DLL-Version with ANSI-C interface (high binary compatibility)

- ▶ Link-Library (easy in your project)

- ▶ Transparent and easy access to 3d-coordinates independent from the internal representation of coordinates

- ▶ Full access to XML-document structure for extended control

X3P Container

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ZIP Container (.x3p)

main.xml

```
<p:ISO5436_2 xmlns:p="http://www.opengps.eu/2008/ISO5436_2"
             xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
             xsi:schemaLocation="http://www.opengps.eu/2008/ISO5436_2 I
  <Record1>
    <Revision>ISO5436 - 2000</Revision>
    <!-- "SUR" for surface or "PRO" for profile -->
    <FeatureType>SUR</FeatureType>
    <!-- Axis description-->
    <Axes>
      <CX>
        <!-- "I" for Incremental, "A" for Absolute -->
        <AxisType>I</AxisType>
        <!-- Datatype: "I" for int16, "L" for int32, "F" for float32
        <DataType>D</DataType>
        <!-- Increment is the length of one increment in Meter -->
        <Increment>1.60160000000000E-0002</Increment>
        <!-- The offset of the incremental axis -->
        <Offset>0.00000000000000E+0000</Offset>
      </CX>
```
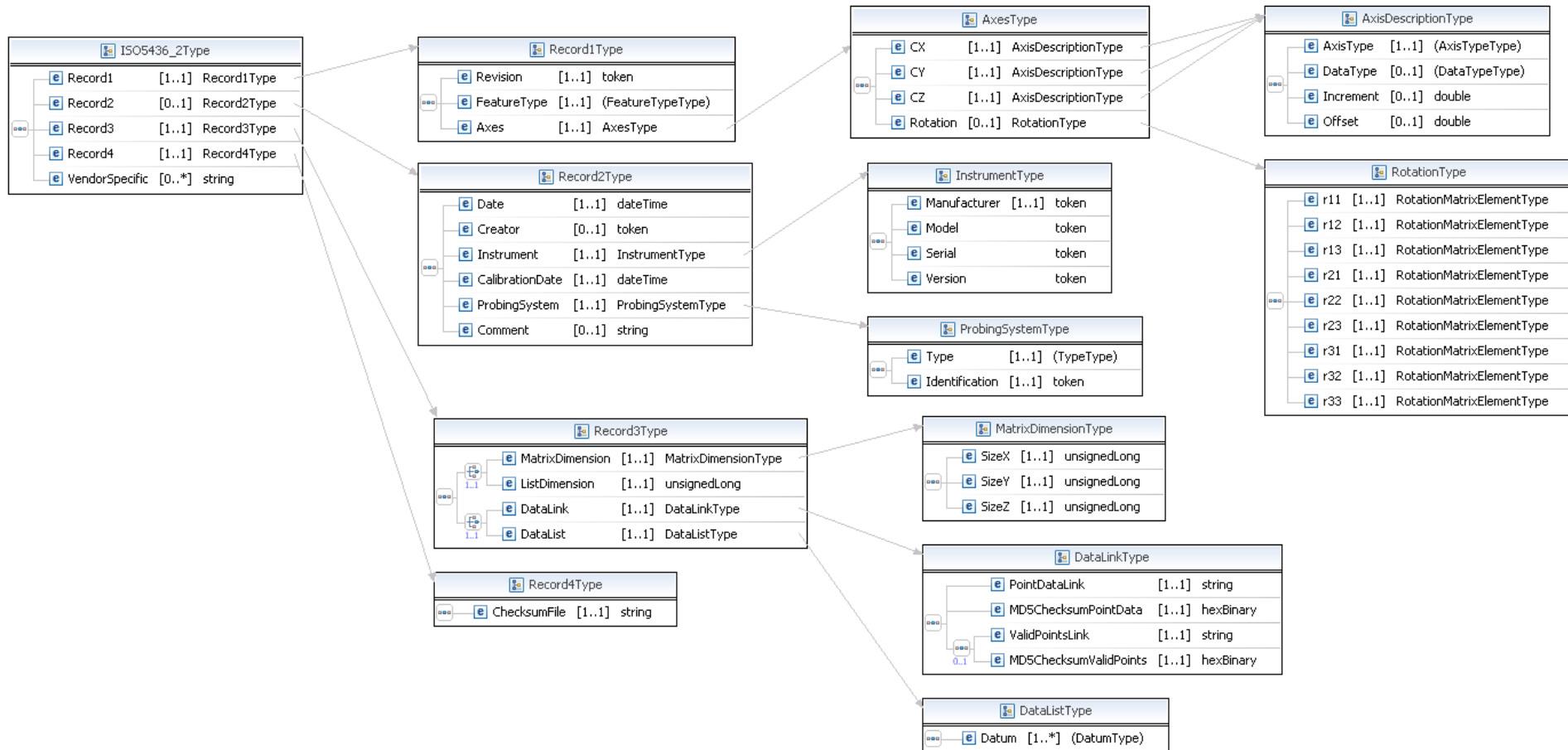
md5checksum.hex

081061bd38f95b58483588c33da09a65
*main.xml

./bindata/

data.bin

```
$ hexdump -C data.bin
00000000   da 03 f7 01 cc
00000010   2c 05 12 05 c7
00000020
```
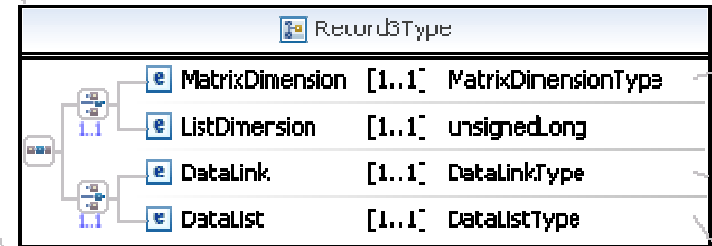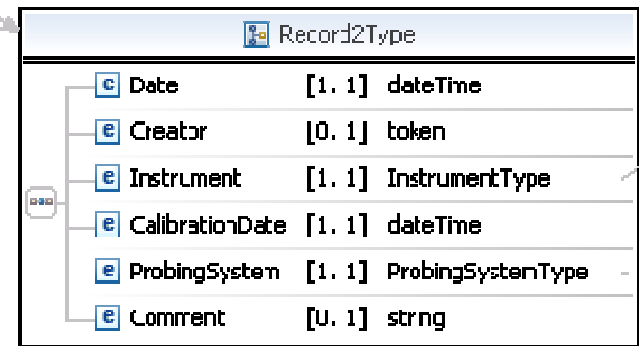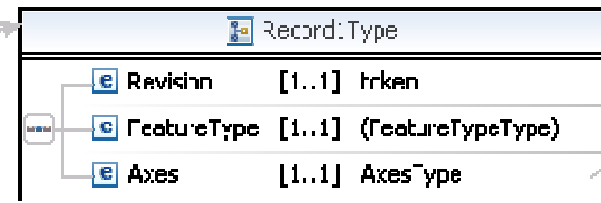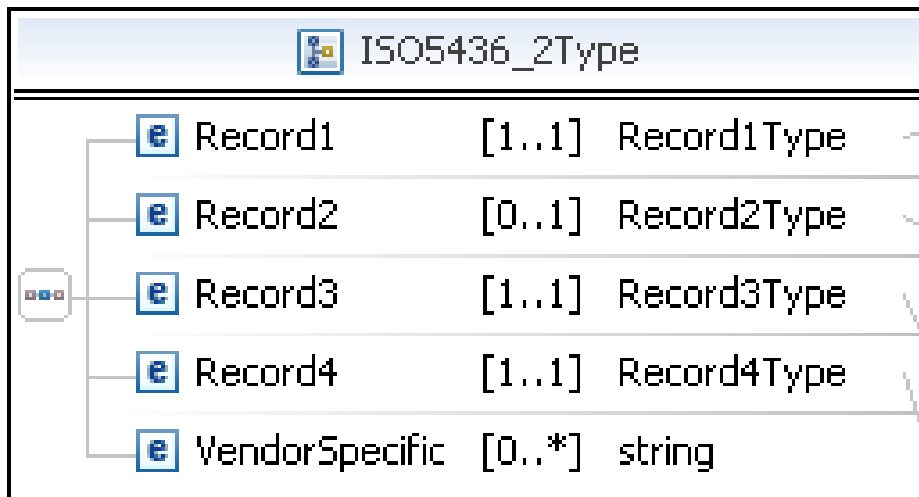
valid.bin

```
$ hexdump -C valid.bin
00000000   7f ff
```

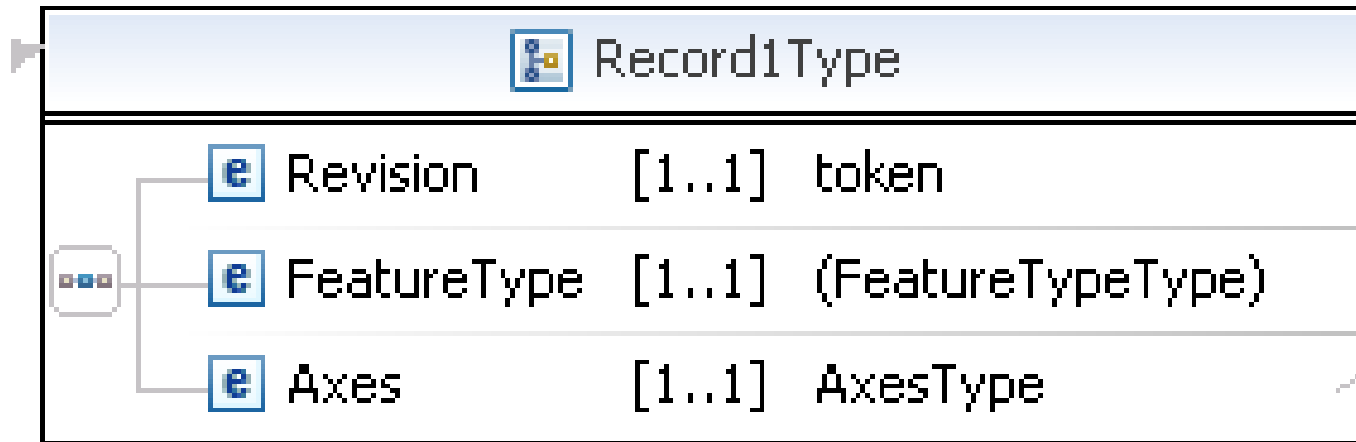# ISO 5436-2 XML Main Document: The big picture

ISO 5436-2 XML-Format Record Organisation

- **Record1: Coordinate System**

- **Record2: Meta information**

- **Record3: 3D-Data**

- **Record4: Checksum**
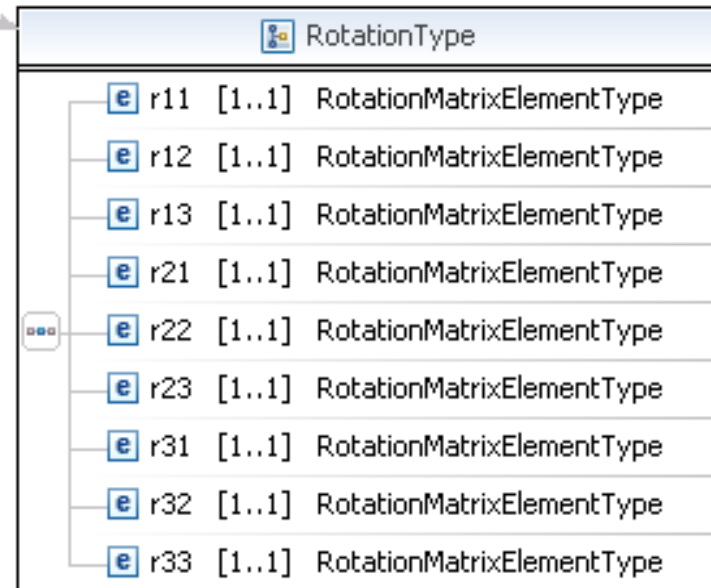
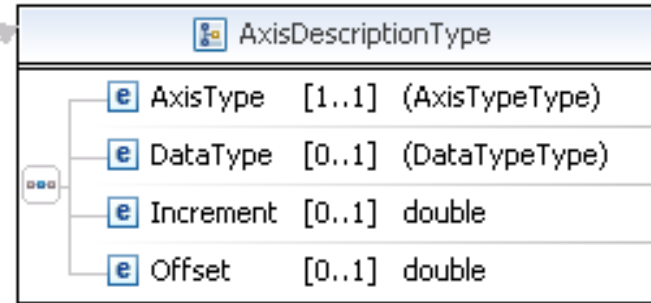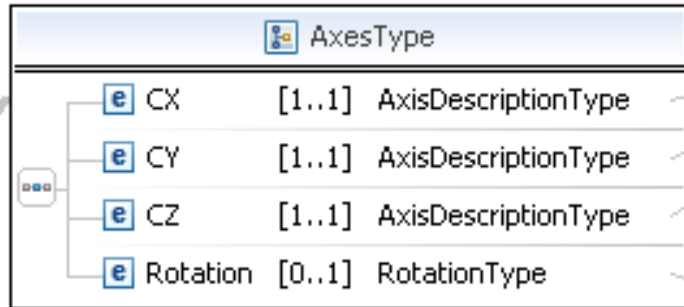- **VendorSpecific: Extension hook**

ISO 5436-2 XML-Format
Record 1: Coordinate System

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Record1Type		
e Revision	[1..1]	token
e FeatureType	[1..1]	(FeatureTypeType)
e Axes	[1..1]	AxesType

▸ File Format Revision

▸ Feature Type (3D-surface or 2D-profile)

▸ Coordinate system and data type definitions

- **Definition of coordinate axes**

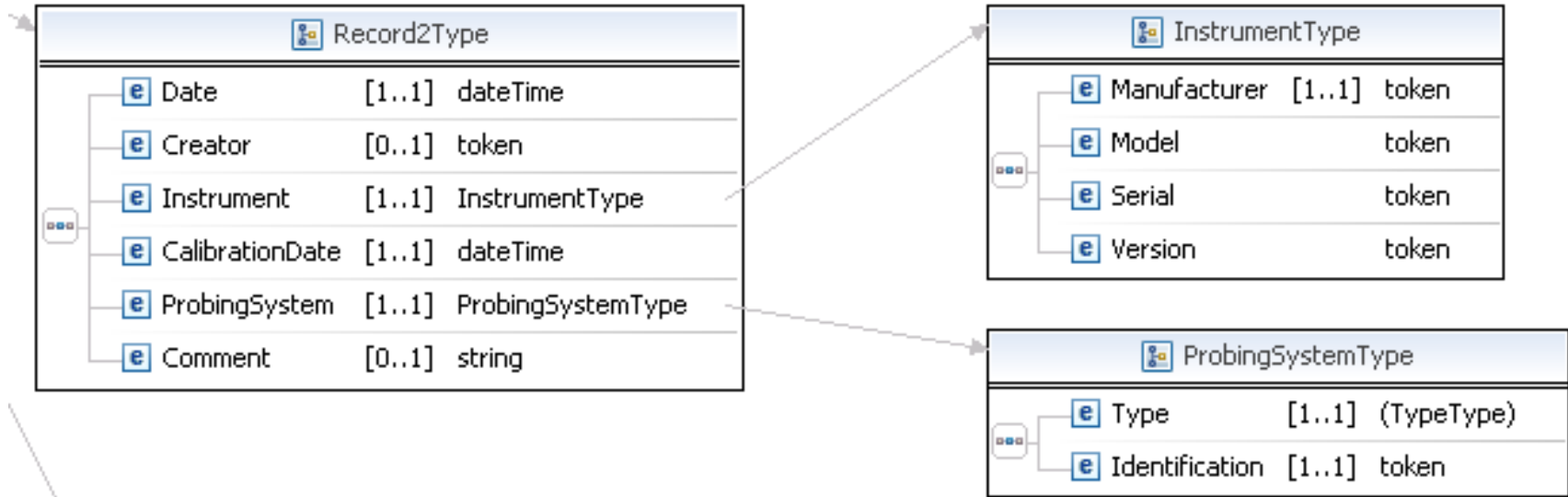 - **Type: incremental/absolute**

  - **Data type: Int/Float**

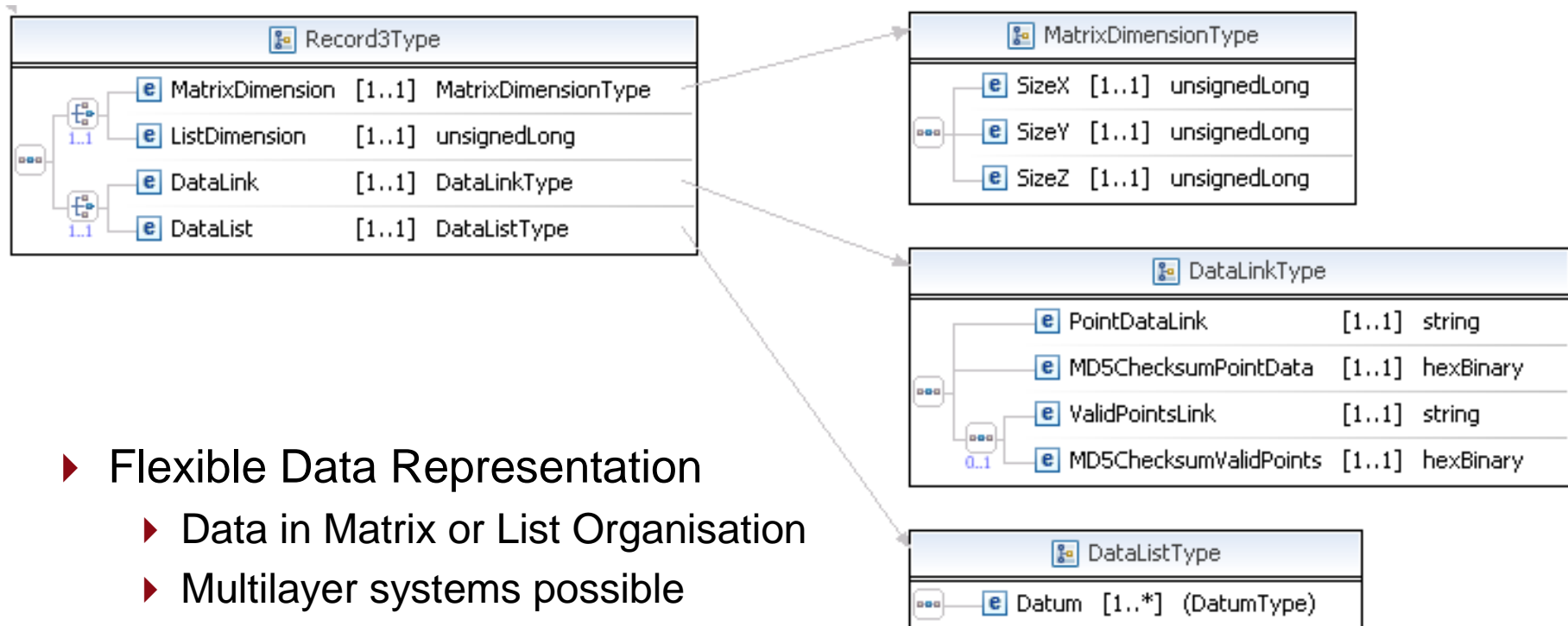 - **Increment**

  - **Offset**

- **Spatial rotation matrix**

ISO 5436-2 XML-Format: Record 2: Meta Information

- ▶ Date of Measurement or creation
- ▶ Creator
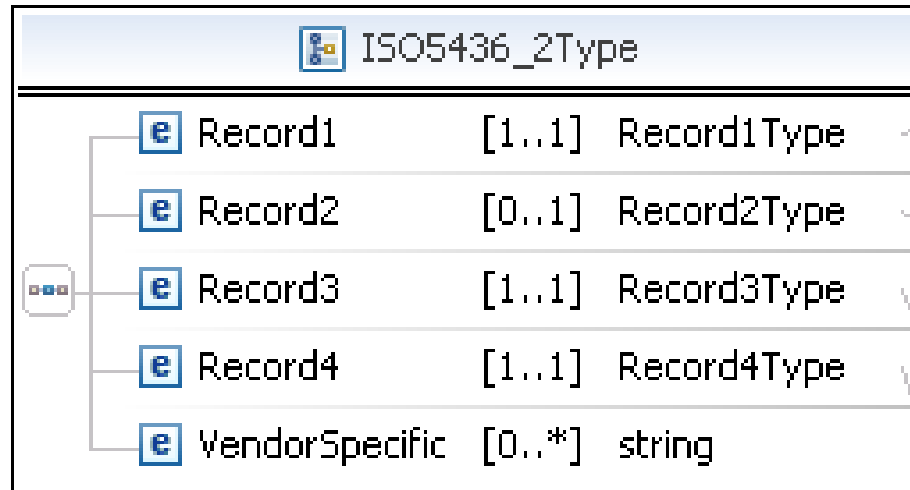- ▶ Instrument type and identificaiton
- ▶ Calibration information

- Flexible Data Representation
  - Data in Matrix or List Organisation
  - Multilayer systems possible
- Binary Storage of Mass Data
- MD5-Checksums
- Validity Information for each Point

ISO 5436-2 XML-Format Record4 / Extensions

▸ Record4: Checksum

▸ VendorSpecific: Extension hook for all vendor specific details

Outlook

▸ Implementation close to finish

▸ Alpha-testing in progress

▸ Beta-Release scheduled for March

▸ Test use planed by
NanoFocus and Alicona in May 2008