
**Information technology — Media
context and control —**

**Part 2:
Control information**

*Technologies de l'information — Contrôle et contexte de supports —
Partie 2: Informations de contrôle*



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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

This third edition cancels and replaces the second edition (ISO/IEC 23005-2:2013), which has been technically revised.

ISO/IEC 23005 consists of the following parts, under the general title *Information technology — Media context and control*:

- *Part 1: Architecture*
- *Part 2: Control information*
- *Part 3: Sensory information*
- *Part 4: Virtual world object characteristics*
- *Part 5: Data formats for interaction devices*
- *Part 6: Common types and tools*
- *Part 7: Conformance and reference software*

Introduction

This International Standard (MPEG-V) provides an architecture and specifies associated information representations to enable interoperability between virtual worlds, e.g. digital content provider of a virtual world, gaming (serious), simulation, DVD, and the real world, e.g. sensors, actuators, vision and rendering, robotics (e.g. for revalidation), (support for) independent living, social and welfare systems, banking, insurance, travel, real estate, rights management, and many others.

Virtual worlds (often referred to as 3D3C for 3D visualization and navigation and the 3Cs of Community, Creation and Commerce) integrate existing and emerging media technologies (e.g. instant messaging, video, 3D, VR, AI, chat, voice, etc.) that allow for the support of existing and the development of new kinds of social networks. The emergence of virtual worlds as platforms for social networking is recognized by businesses as an important issue for at least two reasons.

- 1) It offers the power to reshape the way companies interact with their environments (markets, customers, suppliers, creators, stakeholders, etc.) in a fashion comparable to the Internet.
- 2) It allows for the development of new (breakthrough) business models, services, applications and devices.

Each virtual world, however, has a different culture and audience making use of these specific worlds for a variety of reasons. These differences in existing metaverses permit users to have unique experiences. Resistance to real-world commercial encroachment still exists in many virtual worlds, where users primarily seek an escape from real life. Hence, marketers should get to know a virtual world beforehand and the rules that govern each individual universe.

Although realistic experiences have been achieved via devices such as 3D audio/visual devices, it is hard to realize sensory effects only with presentation of audiovisual contents. The addition of sensory effects leads to even more realistic experiences in the consumption of audiovisual contents. This will lead to the application of new media for enhanced experiences of users in a more realistic sense.

Such new media will benefit from the standardization of control and sensory information which consists of sensory effect metadata, sensory device capabilities/commands, user sensory preferences, and various delivery formats. The MPEG-V architecture can be applicable for various business models for which audiovisual contents can be associated with sensory effects that need to be rendered on appropriate sensory devices.

This part of ISO/IEC 23005 contains the tools of the control information for the media. It addresses the normative aspects of the control information including device capability description, user preference information, and also illustrates some non-normative examples.

The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) draw attention to the fact that it is claimed that compliance with this document may involve the use of patents.

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The holders of these patent rights have assured ISO and the IEC that they are willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statements of the holders of these patent rights are registered with ISO and the IEC. Information may be obtained from the companies listed in Annex B.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified in Annex B. ISO and the IEC shall not be held responsible for identifying any or all such patent rights.

Information technology — Media context and control —

Part 2:

Control information

1 Scope

This part of ISO/IEC 23005 specifies syntax and semantics of the tools required to provide interoperability in controlling devices in real as well as virtual worlds. In Figure 1, the scope of this part of ISO/IEC 23005 with tools defined in this part of ISO/IEC 23005 is shown. The adaptation engine (RV or VR engine), which is not within the scope of standardization, takes six inputs [sensory effects (SE), user's sensory effect preferences (USEP), sensory devices capabilities (SDC), sensor capability (SC), sensor adaptation preferences (SAP), and sensed information (SI)] and outputs sensory devices commands (SDCmd) and/or sensed information (SI) to control the devices in real world or virtual world objects. It is applicable to the interfaces between the adaptation engine and the capability descriptions of actuators/sensors in the real world, the user's sensory preference information, which characterize devices and users, and the sensor adaptation preferences information, which characterize sensors and users, so that appropriate information to control devices (actuators and sensors) can be generated. In other words, user's sensory preferences, sensory device capabilities, sensor adaptation preferences, and sensor capabilities are within the scope of this part of ISO/IEC 23005.

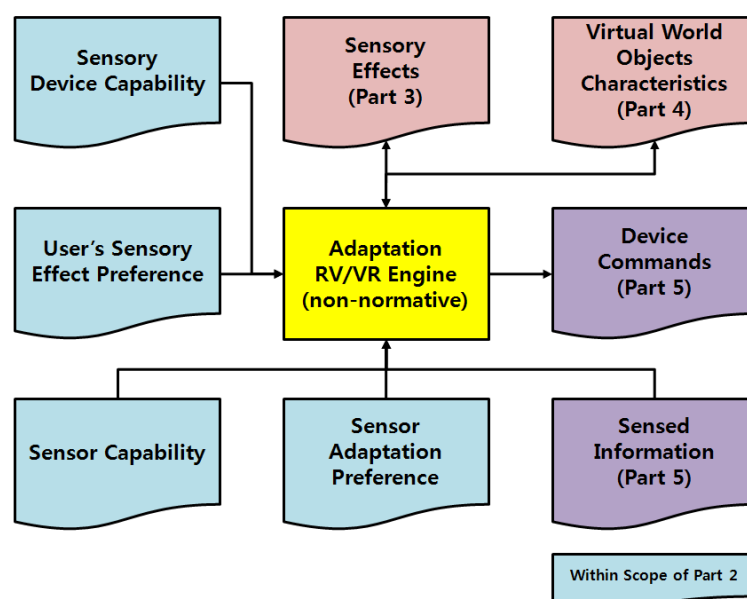


Figure 1 — Scope of the control information

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 15938-5:2003, *Information technology — Multimedia content description interface — Part 5: Multimedia description schemes*

ISO/IEC 21000-7, *Information technology — Multimedia framework (MPEG-21) — Part 7: Digital Item Adaptation*

ISO/IEC 23005-6:2016, *Information technology — Media context and control — Part 6: Common types and tools*

3 Terms, definitions, abbreviated terms and prefixes

For the purposes of this document, the terms and definitions given in ISO/IEC 23005-6 apply.

3.1 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

DIA	digital item adaptation (see ISO/IEC 21000-7)
MPEG-21	multimedia framework (ISO/IEC 21000-5)
CIDL	control information description language
DCDV	device capability description vocabulary
SCDV	sensor capability description vocabulary
SEPV	sensory effect preference vocabulary
SAPV	sensor adaptation preference vocabulary
XML	extensible mark-up language

3.2 Use of prefixes

For clarity, throughout this part of ISO/IEC 23005, consistent namespace prefixes are used.

“**xsi:**” prefix is not normative. It is a naming convention in this part of ISO/IEC 23005 to refer to an element of the <http://www.w3.org/2001/XMLSchema-instance> namespace.

“**xml:**” and “**xmlns:**” are normative prefixes defined in Reference [1]. The prefix “**xml:**” is by definition bound to “<http://www.w3.org/XML/1998/namespace>”. The prefix “**xmlns:**” is used only for namespace bindings and is not itself bound to any namespace name.

All other prefixes used in either the text or examples of this specification are not normative, e.g. “**sedl:**”, “**sev:**”, “**dia:**”, “**si:**”, “**mpeg7:**”.

In particular, most of the informative examples in this specification are provided as XML fragments without the normally required XML document declaration and, thus, miss a correct namespace binding context declaration. In these descriptions fragments, the different prefixes are bound to the namespaces as given in Table 1.

Table 1 — Mapping of prefixes to namespaces in examples and text

Prefix	Corresponding namespace
ct	urn:mpeg:mpeg-v:2016:01-CT-NS
sedl	urn:mpeg:mpeg-v:2016:01-SED-NS
sev	urn:mpeg:mpeg-v:2016:01-SEV-NS
dia	urn:mpeg:mpeg21:2003:01-DIA-NS
si	urn:mpeg:mpeg21:2003:01-DIA-XSI-NS
mpeg7	urn:mpeg:mpeg7:schema:2004
xsi	http://www.w3.org/2001/XMLSchema-instance
xsd	http://www.w3.org/2001/XMLSchema

4 Control information description language

4.1 General

This Clause describes basic structure of the tools in this part of ISO/IEC 23005 in the form of control information description language including the schema wrapper conventions, basic data types, root element, and top-level elements.

4.2 Schema wrapper conventions

The syntax defined in this part of ISO/IEC 23005 assumes the following schema wrapper to form a valid XML schema document.

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:mpeg7="urn:mpeg:mpeg7:schema:2004" xmlns:dia="urn:mpeg:mpeg21:2003:01-DIA-
NS" xmlns:mpegvct="urn:mpeg:mpeg-v:2016:01-CT-NS" xmlns:cidl="urn:mpeg:mpeg-
v:2016:01-CIDL-NS" xmlns:dcdv="urn:mpeg:mpeg-v:2016:01-DCDV-NS"
xmlns:scdv="urn:mpeg:mpeg-v:2016:01-SCDV-NS" xmlns:sepv="urn:mpeg:mpeg-v:2016:01-
SEPV-NS" xmlns:sapv="urn:mpeg:mpeg-v:2016:01-SAPV-NS"
targetNamespace="urn:mpeg:mpeg-v:2016:01-CIDL-NS" elementFormDefault="qualified"
attributeFormDefault="unqualified" version="ISO/IEC 23005-2" id="MPEG-V-
CIDL.xsd">
  <import namespace="urn:mpeg:mpeg7:schema:2004"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
7_schema_files/mpeg7-v2.xsd"/>
  <import namespace="urn:mpeg:mpeg21:2003:01-DIA-NS"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
21_schema_files/dia-2nd/UED-2nd.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2016:01-CT-NS"
schemalocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V_schema_files/MPEG-V-CT.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2016:01-DCDV-NS"
schemalocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V_schema_files/MPEG-V-DCDV.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2016:01-SCDV-NS"
schemalocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V_schema_files/MPEG-V-SCDV.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2016:01-SEPV-NS"
schemalocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V_schema_files/MPEG-V-SEPV.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2016:01-SAPV-NS"
schemalocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V_schema_files/MPEG-V-SAPV.xsd"/>
```

Additionally, the following line should be appended to the resulting schema document in order to obtain a well-formed XML document.

```
</schema>
```

4.3 Mnemonics for binary representations

The mnemonics are defined in ISO/IEC 23005-6:—, 4.3.

4.4 Common header for binary representations

The common header is defined in ISO/IEC 23005-6:—, 4.4.

4.5 Root element and top-level tools

4.5.1 General

This subclause specifies the root element and the top-level tools which can follow root element in control information. The root element is the only element which can appear as the topmost element when the control information specified in this part of ISO/IEC 23005 is instantiated. The top-level tools are defined as the elements which are allowed to appear as the topmost element within the root element.

4.5.2 XML representation syntax

```
<!-- ##### -->
<!-- Root Element -->
<!-- ##### -->
<element name="ControlInfo" type="cidl:ControlInfoType"/>

<complexType name="ControlInfoType">
  <sequence>
    <element name="SensoryDeviceCapabilityList"
      type="cidl:SensoryDeviceCapabilityListType" minOccurs="0"/>
    <element name="SensorDeviceCapabilityList"
      type="cidl:SensorDeviceCapabilityListType" minOccurs="0"/>
    <element name="UserSensoryPreferenceList"
      type="cidl:UserSensoryPreferenceListType" minOccurs="0"/>
    <element name="SensorAdaptationPreferenceList"
      type="cidl:SensorAdaptationPreferenceListType" minOccurs="0"/>
  </sequence>
</complexType>

<complexType name="SensoryDeviceCapabilityListType">
  <sequence>
    <element name="SensoryDeviceCapability"
      type="cidl:SensoryDeviceCapabilityBaseType" maxOccurs="unbounded"/>
  </sequence>
</complexType>

<complexType name="SensorDeviceCapabilityListType">
  <sequence>
    <element name="SensorDeviceCapability"
      type="cidl:SensorCapabilityBaseType" maxOccurs="unbounded"/>
  </sequence>
</complexType>

<complexType name="UserSensoryPreferenceListType">
  <sequence>
    <element name="USPreference" type="cidl:UserSensoryPreferenceBaseType"
      maxOccurs="unbounded"/>
  </sequence>
</complexType>

<complexType name="SensorAdaptationPreferenceListType">
  <sequence>
    <element name="SAPreference"
      type="cidl:SensorAdaptationPreferenceBaseType" maxOccurs="unbounded"/>
  </sequence>
</complexType>
```

4.5.3 Binary representation syntax

ControllInfoType{	Number of bits	Mnemonic
SensoryDeviceCapabilityListFlag	1	bslbf
SensorDeviceCapabilityListFlag	1	bslbf
UserSensoryPreferenceListFlag	1	bslbf
SensorAdaptationPreferenceListFlag	1	bslbf
if (SensoryDeviceCapabilityListFlag) {		
SensoryDeviceCapabilityList		SensoryDeviceCapabilityListType
}		
if (SensorDeviceCapabilityListFlag) {		
SensorDeviceCapabilityList		SensorDeviceCapabilityListType
}		
if (UserSensoryPreferenceListFlag) {		
UserSensoryPreferenceList		UserSensoryPreferenceListType
}		
if (SensorAdaptationPreferenceListFlag) {		
SensorAdaptationPreferenceList		SensorAdaptationPreferenceListType
}		
}		
SensoryDeviceCapabilityListType {		
NumOfSensoryDevCap	32	uimsbf
for(i=1;i<NumOfSensoryDevCap;i++){		
IndividualSensoryDevCapType	8	bslbf
SensoryDeviceCapability		SensoryDeviceCapabilityType specified by IndividualSensoryDevCapType
}		
}		
SensorDeviceCapabilityListType {		

ControlInfoType{	Number of bits	Mnemonic
NumOfSensorCap	32	uimsbf
for(i=1;i<NumOfSensorCap;i++){		
IndividualSensorCapType	8	bslbf
SensorCapability		SensorCapabilityType specified by IndividualSensorCapType
}		
}		
UserSensoryPreferenceListType {		
NumOfUserSensoryPref	32	uimsbf
for(i=1;i<NumOfUserSensoryPref;i++){		
IndividualUserSensoryPrefType	8	bslbf
USPreference		USPreferenceType specified by IndividualUserSensoryPrefType
}		
}		
SensorAdaptationPreferenceListType {		
NumOfSensorAdaptationPref	32	uimsbf
for(i=1;i< NumOfSensorAdaptationPref;i++){		
IndividualSensorAdaptationPrefType	8	bslbf
SAPreference		SAPreferenceType specified by IndividualSensorAdaptationPrefType
}		
}		

4.5.4 Semantics

Semantics of the `ControlInfo` type:

<i>Name</i>	<i>Definition</i>
<code>ControlInfo</code>	The root element that serves as the topmost element in the control information description.
<code>SensoryDeviceCapabilityListFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>SensorDeviceCapabilityListFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>UserSensoryPreferenceListFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>SensorAdaptationPreferenceListFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>ControlInfoType</code>	The root type provides basic structure that the control information description should follow through the root element. This field, which is present in the binary representation, indicates the type of the <code>ControlInfo</code> element. There should be used at least one element among <code>ControlInfoType</code>.
<code>SensoryDeviceCapabilityList</code>	Optional wrapper element that serves as the placeholder for the list of sensory device capability descriptions.
<code>SensorDeviceCapabilityList</code>	Optional wrapper element that serves as the placeholder for the list of sensor device capability descriptions.
<code>UserSensoryPreferenceList</code>	Optional wrapper element that serves as the placeholder for the list of device user preference descriptions.
<code>SensorAdaptationPreferenceList</code>	Optional wrapper element that serves as the placeholder for the list of sensor device adaptation preference descriptions.
<code>SensoryDeviceCapabilityListType</code>	Wrapper element type which allows multiple occurrences of sensory device capability descriptions.
<code>NumOfSensoryDevCap</code>	This field, which is only present in the binary representation, specifies the number of <code>SensoryDeviceCapability</code> instances accommodated in the <code>SensoryDeviceCapabilityList</code> .
<code>IndividualSensoryDevCapType</code>	This field, which is only present in the binary representation, describes which <code>SensoryDeviceCapability</code> type shall be used. In the binary description, the following mapping table is used.

Name	Definition																																		
	<table> <tr> <th>Terms of device</th><th>Binary representation for device type (8 bits)</th></tr> <tr><td>Light device</td><td>00000000</td></tr> <tr><td>Flash device</td><td>00000001</td></tr> <tr><td>Heating device</td><td>00000010</td></tr> <tr><td>Cooling device</td><td>00000011</td></tr> <tr><td>Wind device</td><td>00000100</td></tr> <tr><td>Vibration device</td><td>00000101</td></tr> <tr><td>Sprayer device</td><td>00000110</td></tr> <tr><td>Scent device</td><td>00000111</td></tr> <tr><td>Fog device</td><td>00001000</td></tr> <tr><td>Color correction device</td><td>00001001</td></tr> <tr><td>Rigid body motion device</td><td>00001010</td></tr> <tr><td>Tactile device</td><td>00001011</td></tr> <tr><td>Kinesthetic device</td><td>00001100</td></tr> <tr><td>Mobile device position</td><td>00001101</td></tr> <tr><td>Bubble device</td><td>00001110</td></tr> <tr><td>Reserved</td><td>00001111-11111111</td></tr> </table>	Terms of device	Binary representation for device type (8 bits)	Light device	00000000	Flash device	00000001	Heating device	00000010	Cooling device	00000011	Wind device	00000100	Vibration device	00000101	Sprayer device	00000110	Scent device	00000111	Fog device	00001000	Color correction device	00001001	Rigid body motion device	00001010	Tactile device	00001011	Kinesthetic device	00001100	Mobile device position	00001101	Bubble device	00001110	Reserved	00001111-11111111
Terms of device	Binary representation for device type (8 bits)																																		
Light device	00000000																																		
Flash device	00000001																																		
Heating device	00000010																																		
Cooling device	00000011																																		
Wind device	00000100																																		
Vibration device	00000101																																		
Sprayer device	00000110																																		
Scent device	00000111																																		
Fog device	00001000																																		
Color correction device	00001001																																		
Rigid body motion device	00001010																																		
Tactile device	00001011																																		
Kinesthetic device	00001100																																		
Mobile device position	00001101																																		
Bubble device	00001110																																		
Reserved	00001111-11111111																																		

SensoryDeviceCapability Specifies single description of sensory device capability description. The list of single device capabilities is as follows.

Terms of device	Device capability type
Light device	LightCapabilityType
Flash device	FlashCapabilityType
Heating device	HeatingCapabilityType
Cooling device	CoolingCapabilityType
Wind device	WindCapabilityType
Vibration device	VibrationCapabilityType
Sprayer device	SprayerCapabilityType
Scent device	ScentCapabilityType

Name	Definition														
	<table> <tr> <td>Fog device</td><td>FogCapabilityType</td></tr> <tr> <td>Color correction device</td><td>ColorCorrectionCapabilityType</td></tr> <tr> <td>Rigid body motion device</td><td>RigidBodyMotionCapabilityType</td></tr> <tr> <td>Tactile device</td><td>TactileCapabilityType</td></tr> <tr> <td>Kinesthetic device</td><td>KinestheticCapabilityType</td></tr> <tr> <td>Mobile device position</td><td>MobileDevicePositionCapabilityType</td></tr> <tr> <td>Bubble device</td><td>BubbleCapabilityType</td></tr> </table>	Fog device	FogCapabilityType	Color correction device	ColorCorrectionCapabilityType	Rigid body motion device	RigidBodyMotionCapabilityType	Tactile device	TactileCapabilityType	Kinesthetic device	KinestheticCapabilityType	Mobile device position	MobileDevicePositionCapabilityType	Bubble device	BubbleCapabilityType
Fog device	FogCapabilityType														
Color correction device	ColorCorrectionCapabilityType														
Rigid body motion device	RigidBodyMotionCapabilityType														
Tactile device	TactileCapabilityType														
Kinesthetic device	KinestheticCapabilityType														
Mobile device position	MobileDevicePositionCapabilityType														
Bubble device	BubbleCapabilityType														
SensoryDeviceCapabilityBaseType	SensoryDeviceCapabilityBaseType shall extend dia:TeminalCapabilityBaseType as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensory device capability metadata types.														
SensorDeviceCapabilityListType	Wrapper element type which allows multiple occurrences of sensor device capability descriptions.														
NumOfSensorCap	This field, which is only present in the binary representation, specifies the number of SensorCapability instances accommodated in the SensorCapabilityList.														
IndividualSensorCapType	This field, which is only present in the binary representation, describes which SensorCapability type shall be used.														

In the binary description, the following mapping table is used.

Term of sensor capability	Binary representation for sensor type (8 bits)
Light sensor capability	00000000
Ambient noise sensor capability	00000001
Temperature sensor capability	00000010
Humidity sensor capability	00000011
Distance sensor capability	00000100
Atmospheric pressure Sensor capability	00000101
Position sensor capability	00000110
Velocity sensor capability	00000111
Acceleration sensor capability	00001000

Name	Definition
	Orientation sensor capability 00001001
	Angular velocity sensor capability 00001010
	Angular acceleration sensor capability 00001011
	Force sensor capability 00001100
	Torque sensor capability 00001101
	Pressure sensor capability 00001110
	Motion sensor capability 00001111
	Intelligent camera sensor capability 00010000
	Bend sensor capability 00010001
	Gas sensor capability 00010010
	Dust sensor capability 00010011
	Multi interaction point sensor capability 00010100
	Gaze tracking sensor capability 00010101
	Global position sensor capability 00010110
	Altitude sensor capability 00010111
	Weather sensor capability 00011000
	Camera sensor capability 00011001
	Proximity sensor capability 00011010
	Body weight sensor capability 00011011
	Engine oil temperature sensor capability 00011100
	Intake air temperature sensor capability 00011101
	Tire pressure monitor system sensor capability 00011110
	Distance traveled sensor capability 00011111
	Speed sensor capability 00100000

Name	Definition
	Vehicle speed sensor capability
	Mass air flow sensor capability
	Fuel level sensor capability
	Manifold absolute pressure sensor capability
	EngineRPM sensor capability
	Reserved

SensorDeviceCapability

Specifies single description of sensor device capability description. The list of single sensor capabilities is as follows.

Term of sensor	Sensor capability type
Light sensor	LightSensorCapabilityType
Ambient noise sensor	AmbientNoiseSensorCapabilityType
Temperature sensor	TemperatureSensorCapabilityType
Humidity sensor	HumiditySensorCapabilityType
Distance sensor	DistanceSensorCapabilityType
Atmospheric pressure Sensor	AtmosphericPressureSensorCapabilityType
Position sensor	PositionSensorCapabilityType
Velocity sensor	VelocitySensorCapabilityType
Acceleration sensor	AccelerationSensorCapabilityType
Orientation sensor	OrientationSensorCapabilityType
Angular velocity sensor	AngularVelocitySensorCapabilityType
Angular acceleration sensor	AngularAccelerationSensorCapabilityType

Name	Definition
Force sensor	ForceSensorCapabilityType
Torque sensor	TorqueSensorCapabilityType
Pressure sensor	PressureSensorCapabilityType
Motion sensor	MotionSensorCapabilityType
Intelligent camera sensor	IntelligentCameraCapabilityType
Bend sensor	BendSensorCapabilityType
Gas sensor	GasSensorCapabilityType
Dust sensor	DustSensorCapabilityType
Multi interaction point sensor	MultiInteractionPointSensorCapabilityType
Gaze tracking sensor	GazeTrackingSensorCapabilityType
Global position sensor	GlobalPositionSensorCapabilityType
Altitude sensor	AltitudeSensorCapabilityType
Weather sensor	WeatherSensorCapabilityType
Camera sensor	CameraSensorCapabilityType
Proximity sensor	ProximitySensorCapabilityType
Body weight sensor	BodyWeightSensorCapabilityType
Engine oil temperature sensor	EngineOilTemperatureSensorCapabilityType
Intake air temperature sensor	IntakeAirTemperatureSensorCapabilityType
Tire pressure monitor system sensor	TirePressureMonitorSystemSensorCapabilityType

Name	Definition														
	<table> <tr> <td>Distance traveled sensor</td><td>DistanceTraveledSensorCapabilityType</td></tr> <tr> <td>Speed sensor</td><td>SpeedSensorCapabilityType</td></tr> <tr> <td>Vehicle speed sensor</td><td>VehicleSpeedSensorCapabilityType</td></tr> <tr> <td>Mass air flow sensor</td><td>MassAirFlowSensorCapabilityType</td></tr> <tr> <td>Fuel level sensor</td><td>FuelLevelSensorCapabilityType</td></tr> <tr> <td>Manifold absolute pressure sensor</td><td>ManifoldAbsolutePressureSensorCapabilityType</td></tr> <tr> <td>EngineRPM sensor</td><td>EngineRPMSensorCapabilityType</td></tr> </table>	Distance traveled sensor	DistanceTraveledSensorCapabilityType	Speed sensor	SpeedSensorCapabilityType	Vehicle speed sensor	VehicleSpeedSensorCapabilityType	Mass air flow sensor	MassAirFlowSensorCapabilityType	Fuel level sensor	FuelLevelSensorCapabilityType	Manifold absolute pressure sensor	ManifoldAbsolutePressureSensorCapabilityType	EngineRPM sensor	EngineRPMSensorCapabilityType
Distance traveled sensor	DistanceTraveledSensorCapabilityType														
Speed sensor	SpeedSensorCapabilityType														
Vehicle speed sensor	VehicleSpeedSensorCapabilityType														
Mass air flow sensor	MassAirFlowSensorCapabilityType														
Fuel level sensor	FuelLevelSensorCapabilityType														
Manifold absolute pressure sensor	ManifoldAbsolutePressureSensorCapabilityType														
EngineRPM sensor	EngineRPMSensorCapabilityType														
SensorCapabilityBaseType	SensorCapabilityBaseType shall extend dia:TeminalCapabilityBaseType as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensor device capability metadata types.														
UserSensoryPreferenceListType	Wrapper element type which allows multiple occurrences of user preference descriptions on sensory effects.														
NumOfUserSensoryPref	This field, which is only present in the binary representation, specifies the number of USPreference instances accommodated in the UserSensoryPreferenceList.														
IndividualUserSensoryPrefType	This field, which is only present in the binary representation, describes which USPreference type shall be used.														

In the binary description, the following mapping table is used.

Terms of effect	Binary representation for effect type (8 bits)
Light effect	00000000
Flash effect	00000001
Heating effect	00000010
Cooling effect	00000011
Wind effect	00000100
Vibration effect	00000101
Sprayer effect	00000110

Name	Definition																
	<table> <tr> <td>Scent effect</td><td>00000111</td></tr> <tr> <td>Fog effect</td><td>00001000</td></tr> <tr> <td>Color correction effect</td><td>00001001</td></tr> <tr> <td>Rigid body motion effect</td><td>00001010</td></tr> <tr> <td>Tactile effect</td><td>00001011</td></tr> <tr> <td>Kinesthetic effect</td><td>00001100</td></tr> <tr> <td>Bubble effect</td><td>00001101</td></tr> <tr> <td>Reserved</td><td>00001110-11111111</td></tr> </table>	Scent effect	00000111	Fog effect	00001000	Color correction effect	00001001	Rigid body motion effect	00001010	Tactile effect	00001011	Kinesthetic effect	00001100	Bubble effect	00001101	Reserved	00001110-11111111
Scent effect	00000111																
Fog effect	00001000																
Color correction effect	00001001																
Rigid body motion effect	00001010																
Tactile effect	00001011																
Kinesthetic effect	00001100																
Bubble effect	00001101																
Reserved	00001110-11111111																

USPreference Specifies single description of user preference description on sensory effect. The list of single user preferences is as follows.

Terms of effect	Terms of user preference
Light effect	LightPrefType
Flash effect	FlashPrefType
Heating effect	HeatingPrefType
Cooling effect	CoolingPrefType
Wind effect	WindPrefType
Vibration effect	VibrationPrefType
Scent effect	ScentPrefType
Fog effect	FogPrefType
Spraying effect	SprayingPrefType
Color correction effect	ColorCorrectionPrefType
Rigid body motion effect	RigidBodyMotionPrefType
Tactile effect	TactilePrefType
Kinesthetic effect	KinestheticPrefType
Bubble effect	BubblePrefType

UserSensoryPreferenceBaseType UserSensoryPreferenceBaseType shall extend dia:UserCharacteristicBaseType as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensory device capability metadata

Name	Definition
	types.
SensorAdaptationPreferenceList Type	Wrapper element type which allows multiple occurrences of user preference descriptions on sensor adaptation.
NumOfSensorAdaptationPref	This field, which is only present in the binary representation, specifies the number of SAPreference instances accommodated in the SensorAdaptationPreferenceList.
IndividualSensorAdaptationPref Type	This field, which is only present in the binary representation, describes which SAPreference type shall be used.

In the binary description, the following mapping table is used.

Term of sensor adaptation preference	Binary representation for sensor type (8 bits)
Light sensor adaptation preference	00000000
Ambient noise sensor adaptation preference	00000001
Temperature sensor adaptation preference	00000010
Humidity sensor adaptation preference	00000011
Distance sensor adaptation preference	00000100
Atmospheric pressure sensor adaptation preference	00000101
Position sensor adaptation preference	00000110
Velocity sensor adaptation preference	00000111
Acceleration sensor adaptation preference	00001000
Orientation sensor adaptation preference	00001001
Angular velocity sensor adaptation preference	00001010
Angular acceleration sensor adaptation preference	00001011
Force sensor adaptation preference	00001100

Name	Definition										
	<table> <tr> <td>Torque sensor adaptation preference</td><td>00001101</td></tr> <tr> <td>Pressure sensor adaptation preference</td><td>00001110</td></tr> <tr> <td>Motion sensor adaptation preference</td><td>00001111</td></tr> <tr> <td>Intelligent camera sensor adaptation preference</td><td>00010000</td></tr> <tr> <td>Reserved</td><td>00010001-11111111</td></tr> </table>	Torque sensor adaptation preference	00001101	Pressure sensor adaptation preference	00001110	Motion sensor adaptation preference	00001111	Intelligent camera sensor adaptation preference	00010000	Reserved	00010001-11111111
Torque sensor adaptation preference	00001101										
Pressure sensor adaptation preference	00001110										
Motion sensor adaptation preference	00001111										
Intelligent camera sensor adaptation preference	00010000										
Reserved	00010001-11111111										

SAPreference Specifies single description of user preference description on sensor adaptation. The list of single sensor adaptation preferences is as follows.

Term of sensor	Sensor adaptation preference type
Light sensor	LightAdaptationPrefType
Ambient noise sensor	AmbientNoiseAdaptationPrefType
Temperature sensor	TemperatureAdaptationPrefType
Humidity sensor	HumidityAdaptationPrefType
Distance sensor	DistanceAdaptationPrefType
Atmospheric pressure Sensor	AtmosphericPressureAdaptationPrefType
Position sensor	PositionAdaptationPrefType
Velocity sensor	VelocityAdaptationPrefType
Acceleration sensor	AccelerationAdaptationPrefType
Orientation sensor	OrientationAdaptationPrefType
Angular velocity sensor	AngularVelocityAdaptationPrefType
Angular acceleration sensor	AngularAccelerationAdaptationPrefType
Force sensor	ForceAdaptationPrefType
Torque sensor	TorqueAdaptationPrefType
Pressure sensor	PressureAdaptationPrefType

Name	Definition	
	Motion sensor	MotionAdaptationPrefType
	Intelligent camera sensor	IntelligentCameraAdaptationPrefType
SensorAdaptationPreferenceBase Type	SensorAdaptationPreferenceBaseType shall extend dia:UserCharacteristicBaseType as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensory device capability metadata types.	

4.5.5 Examples

The followings are some examples of the ControlInfo type.

The following example shows an instantiation of SensoryDeviceCapabilityList. The SensoryDeviceCapabilityList allows multiple occurrences of SensoryDeviceCapability elements. For the details of SensoryDeviceCapability elements, see the examples of individual sensory device capability types.

```
<cidl:ControlInfo xsi:schemaLocation="urn:mpeg:mpeg-v:2016:01-CIDL-NS CIDL.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:cidl="urn:mpeg:mpeg-
v:2016:01-CIDL-NS" xmlns:dcdv="urn:mpeg:mpeg-v:2016:01-DCDV-NS"
xmlns:sapv="urn:mpeg:mpeg-v:2016:01-SAPV-NS" xmlns:scdv="urn:mpeg:mpeg-v:2016:01-
SCDV-NS" xmlns:sepv="urn:mpeg:mpeg-v:2016:01-SEPV-NS"
xmlns:mpegvct="urn:mpeg:mpeg-v:2016:01-CT-NS">
  <cidl:SensoryDeviceCapabilityList>
    <cidl:SensoryDeviceCapability xsi:type="dcdv:LightCapabilityType">
      . . .
    </cidl:SensoryDeviceCapability>
    . . .
  </cidl:SensoryDeviceCapabilityList>
</cidl:ControlInfo>
```

The following example shows an instantiation of SensorDeviceCapabilityList. The SensorDeviceCapabilityList allows multiple occurrences of SensorDeviceCapability elements. For the details of SensorDeviceCapability elements, see the examples of individual sensor device capability types.

```
<cidl:ControlInfo xsi:schemaLocation="urn:mpeg:mpeg-v:2016:01-CIDL-NS CIDL.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:cidl="urn:mpeg:mpeg-
v:2016:01-CIDL-NS" xmlns:dcdv="urn:mpeg:mpeg-v:2016:01-DCDV-NS"
xmlns:sapv="urn:mpeg:mpeg-v:2016:01-SAPV-NS" xmlns:scdv="urn:mpeg:mpeg-v:2016:01-
SCDV-NS" xmlns:sepv="urn:mpeg:mpeg-v:2016:01-SEPV-NS"
xmlns:mpegvct="urn:mpeg:mpeg-v:2016:01-CT-NS">
  <cidl:SensorDeviceCapabilityList>
    <cidl:SensorDeviceCapability
      xsi:type="scdv:AmbientNoiseSensorCapabilityType">
      . . .
    </cidl:SensorDeviceCapability>
    . . .
  </cidl:SensorDeviceCapabilityList>
</cidl:ControlInfo>
```

The following example shows an instantiation of `UserSensoryPreferenceList`. The `UserSensoryPreferenceList` allows multiple occurrences of `USPreference` elements. For the details of `USPreference`, see the examples of user's sensory preference on individual sensory effects.

```
<cidl:ControlInfo xsi:schemaLocation="urn:mpeg:mpeg-v:2016:01-CIDL-NS CIDL.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:cidl="urn:mpeg:mpeg-
v:2016:01-CIDL-NS" xmlns:dcdv="urn:mpeg:mpeg-v:2016:01-DCDV-NS"
xmlns:sapv="urn:mpeg:mpeg-v:2016:01-SAPV-NS" xmlns:scdv="urn:mpeg:mpeg-v:2016:01-
SCDV-NS" xmlns:sepv="urn:mpeg:mpeg-v:2016:01-SEPv-NS"
xmlns:mpegvct="urn:mpeg:mpeg-v:2016:01-CT-NS">
  <cidl:UserSensoryPreferenceList>
    <cidl:USPreference xsi:type="sepv:CoolingPrefType">
      . . .
    </cidl:USPreference>
    . . .
  </cidl:UserSensoryPreferenceList>
</cidl:ControlInfo>
```

The following example shows an instantiation of `SensorAdaptationPreferenceList`. The `SensorAdaptationPreferenceList` allows multiple occurrences of `SAPreference` elements. For the details of `SAPreference`, see the examples of user's preference on individual sensor adaptation.

```
<cidl:ControlInfo xsi:schemaLocation="urn:mpeg:mpeg-v:2016:01-CIDL-NS CIDL.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:cidl="urn:mpeg:mpeg-
v:2016:01-CIDL-NS" xmlns:dcdv="urn:mpeg:mpeg-v:2016:01-DCDV-NS"
xmlns:sapv="urn:mpeg:mpeg-v:2016:01-SAPV-NS" xmlns:scdv="urn:mpeg:mpeg-v:2016:01-
SCDV-NS" xmlns:sepv="urn:mpeg:mpeg-v:2016:01-SEPV-NS">
  <cidl:SensorAdaptationPreferenceList>
    <cidl:SAPreference xsi:type="sapv:IntelligentCameraAdaptationPrefType">
      .
      .
      .
    </cidl:SAPreference>
    .
    .
    .
  </cidl:SensorAdaptationPreferenceList>
</cidl:ControlInfo>
```

4.6 Sensory device capability description

4.6.1 General

This subclause specifies tools for describing device capabilities of sensory devices. The following subclause defines an abstract complex type of `SensoryDeviceCapabilityBaseType`, which the device capability description of individual sensory device should inherit.

4.6.2 Reference coordinate system

The origin of the reference coordinate for sensory devices is located at the position of the user. Each axis is defined as follows. X-axis is in the direction of the right hand side of the user facing the screen. Y-axis is in the reverse direction of gravity. Z-axis is in the direction of the user's facing the screen. The x-, y-, and z-axis are depicted in Figure 2.

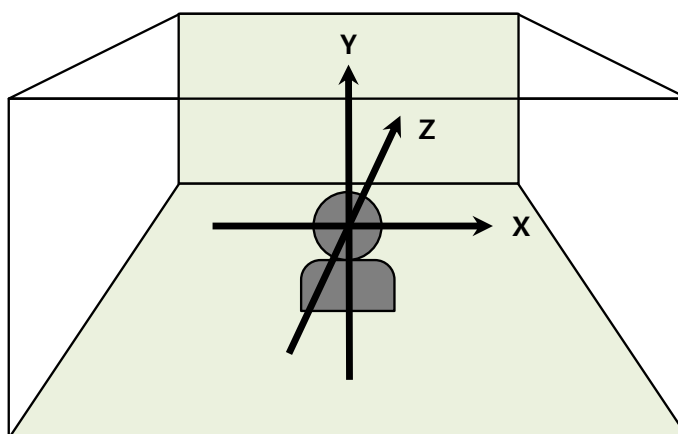


Figure 2 — Reference coordinate system for sensory devices

4.6.3 Sensory device capability base type

4.6.3.1 XML representation syntax

```
<complexType name="SensoryDeviceCapabilityBaseType" abstract="true">
  <complexContent>
    <extension base="dia:TerminalCapabilityBaseType">
      <attributeGroup ref="cidl:sensoryDeviceCapabilityAttributes"/>
    </extension>
  </complexContent>
</complexType>
```

4.6.3.2 Binary representation syntax

SensoryDeviceCapabilityBaseType{	Number of bits	Mnemonic
TerminalCapabilityBase		TerminalCapabilityBaseType
sensoryDeviceCapabilityAttributes		sensoryDeviceCapabilityAttributesType
}		

4.6.3.3 Semantics

Semantics of the `SensoryDeviceCapabilityBaseType` type:

Name	Definition
SensoryDeviceCapabilityBaseType	SensoryDeviceCapabilityBaseType shall extend <code>dia:TerminalCapabilityBaseType</code> as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensory device capability metadata types.
sensoryDeviceCapabilityAttributes	Describes a group of attributes for the device capabilities.

4.6.4 Sensory device capability base attributes

4.6.4.1 XML representation syntax

```
<attributeGroup name="sensoryDeviceCapabilityAttributes">
  <attribute name="zerothOrderDelayTime" type="nonNegativeInteger"
    use="optional"/>
  <attribute name="firstOrderDelayTime" type="nonNegativeInteger"
    use="optional"/>
  <attribute name="locator" type="mpeg7:termReferenceType" use="optional"/>
</attributeGroup>
```

4.6.4.2 Binary representation syntax

sensoryDeviceCapabilityAttributes {	Number of bits	Mnemonic
zerothOrderDelayTimeFlag	1	bslbf
firstOrderDelayTimeFlag	1	bslbf

locatorFlag	1	bslbf
if(zerothOrderDelayTimeFlag){		
zerothOrderDelayTime	16	uimsbf
}		
if(firstOrderDelayTimeFlag){		
firstOrderDelayTime	16	uimsbf
}		
if(locatorFlag){		
locator	7	bslbf
}		
}		

4.6.4.3 Semantics

Semantics of the `sensoryDeviceCapabilityAttributes` type:

Name	Definition
<code>sensoryDeviceCapabilityAttributes</code>	Describes a group of attributes for the sensory device capabilities.
<code>zerothOrderDelayTimeFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>firstOrderDelayTimeFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>locatorFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>zerothOrderDelayTime</code>	Describes required preparation time of a sensory device to be activated since it receives a command in the unit of millisecond (ms).
<code>firstOrderDelayTime</code>	Describes the delay time for a device to reach the target intensity since it receives a command and is activated in the unit of millisecond (ms).
<code>locator</code>	Describes the position of the device from the user's perspective according to the x-, y-, and z-axis as a reference to the <code>LocationCS</code> as defined in ISO/IEC 23005-6:—, A.2.3.

4.6.4.4 Examples

The following example shows a use of `sensoryDeviceCapabilityAttributes`, which describes that a sensory device, specified by the identifier value of `ldc1`, of “`specific_sensory_device_capability_type`” requires preparation time of 0 ms to start, and 1 ms to reach target intensity, and is located at the left side according to the position model defined in ISO/IEC 23005-6:—, A.2.3.

```
<cid1:SensoryDeviceCapability
xsi:type="dcdv:specific_sensory_device_capability_type"    firstOrderDelayTime="0"
zerothOrderDelayTime="1"    id="ldc1"    locator="urn:mpeg:mpeg-v:01-SI-LocationCS-
NS:left"/>
```

4.7 Sensor capability description

4.7.1 General

This subclause specifies tools for describing sensor capability of individual sensors. The following subclause defines the global coordinate for sensors which depends on the real world environment of user to determine the location of the sensors. An abstract complex type of `SensorCapabilityBaseType`, which the sensor capability description of individual device should inherit, is defined in the following subclause.

4.7.2 Global coordinate for sensors

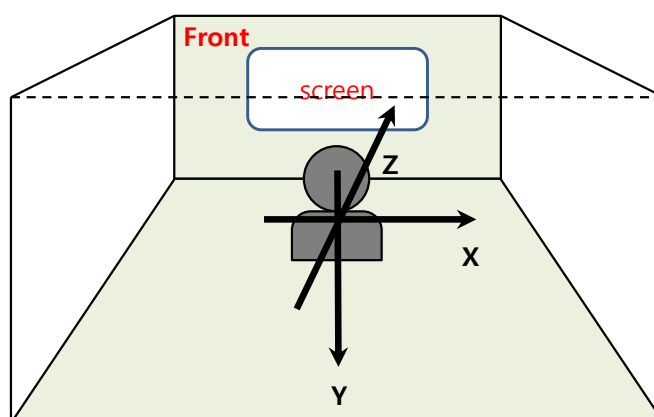


Figure 3 — Global coordinate for sensors

The origin of the global coordinate for sensors is located at the position of the user adapting the right handed coordinate system. Each axis is defined as follows. Y-axis is in the direction of gravity. X-axis is in the direction of the top right corner of the screen. Z-axis is in the opposite direction of the user's position. The x-, y-, and z-axis are depicted in Figure 3.

4.7.3 Sensor capability base type

4.7.3.1 XML representation syntax

```
<complexType name="SensorCapabilityBaseType" abstract="true">
  <complexContent>
    <extension base="dia:TerminalCapabilityBaseType">
      <sequence>
        <element name="Accuracy" type="cid1:AccuracyType" minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

```

        </sequence>
        <attributeGroup ref="cidl:sensorCapabilityBaseAttributes"/>
    </extension>
</complexContent>
</complexType>

<complexType name="AccuracyType" abstract="true"/>

<complexType name="PercentAccuracy">
    <complexContent>
        <extension base="cidl:AccuracyType">
            <attribute name="value" type="mpeg7:zeroToOneType"/>
        </extension>
    </complexContent>
</complexType>

<complexType name="ValueAccuracy">
    <complexContent>
        <extension base="cidl:AccuracyType">
            <attribute name="value" type="float"/>
        </extension>
    </complexContent>
</complexType>

```

4.7.3.2 Binary representation syntax

SensorCapabilityBaseType {	Number of bits	Mnemonic
AccuracyFlag	1	bslbf
TerminalCapabilityBase		TerminalCapabilityBaseType
if(AccuracyFlag){		
Accuracy		AccuracyType
}		
SensorCapabilityBaseAttributes		SensorCapabilityBaseAttributesType
}		
AccuracyType {		
AccuracySelect	2	bslbf
if(AccuracySelect==00){		
PercentAccuracy	32	fsbf
} else if (AccuracySelect==01) {		
ValueAccuracy	32	fsbf
}		
}		

4.7.3.3 Semantics

Semantics of the `SensorCapabilityBaseType`:

Name	Definition
<code>SensorCapabilityBaseType</code>	<code>SensorCapabilityBaseType</code> shall extend <code>dia:TeminalCapabilityBaseType</code> as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensor device capability metadata types.
<code>AccuracyFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>Accuracy</code>	Describes the degree of closeness of a measured quantity to its actual value in <code>AccuracyType</code> .
<code>sensorCapabilityBaseAttributes</code>	Describes a group of attributes for the sensor capabilities.

Semantics of the `AccuracyType`:

Name	Definition
<code>AccuracyType</code>	Becomes a parent type providing a choice of describing the accuracy in either relative value or absolute value.
<code>AccuracySelect</code>	This field, which is only present in the binary representation, describes which accuracy scheme shall be used. “0” means that the <code>PercentAccuracy</code> type shall be used, and “1” means that the <code>ValueAccuracy</code> type shall be used.
<code>PercentAccuracy</code>	Describes the degree of closeness of a measured quantity to its actual value in a relative way using a value ranging from 0 to 1,0.
value	Provides an actual value in a relative way for accuracy where value 0 means 0 % accuracy and value 1,0 means 100 % accuracy. It shall be a <code>zeroToOneType</code> type as defined in ISO/IEC 15938-5.
<code>ValueAccuracy</code>	Describes the degree of closeness of a measured quantity to its actual value in an absolute value of given unit.
value	Provides an actual value in an absolute way, where the value means the possible range of error as (-value, +value) of given unit.

4.7.3.4 Examples

For examples of using `SensorCapabilityBaseType`, see the examples provided by the individual sensor device capability types.

4.7.4 Sensor capability base attributes

4.7.4.1 XML representation syntax

```
<attributeGroup name="sensorCapabilityBaseAttributes">
  <attribute name="unit" type="mpegvct:unitType" use="optional"/>
  <attribute name="maxValue" type="float" use="optional"/>
  <attribute name="minValue" type="float" use="optional"/>
  <attribute name="offset" type="float" use="optional"/>
  <attribute name="numOfLevels" type="nonNegativeInteger" use="optional"/>
  <attribute name="sensitivity" type="float" use="optional"/>
  <attribute name="SNR" type="float" use="optional"/>
</attributeGroup>
```

4.7.4.2 Binary representation syntax

SensorCapabilityBaseAttributesType {	Number of bits	Mnemonic
unitFlag	1	bslbf
maxValueFlag	1	bslbf
minValueFlag	1	bslbf
offsetFlag	1	bslbf
numOfLevelsFlag	1	bslbf
sensitivityFlag	1	bslbf
SNRFlag	1	bslbf
if(unitFlag){		
unit	8	bslbf
}		
if(maxValueFlag){		
maxValue	32	fsbf
}		
if(minValueFlag){		
minValue	32	fsbf
}		
if(offsetFlag){		
offset	32	fsbf
}		

SensorCapabilityBaseAttributesType {	Number of bits	Mnemonic
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
if(sensitivityFlag){		
sensitivity	32	fsbf
}		
if(SNRFlag){		
SNR	32	fsbf
}		
}		

4.7.4.3 Semantics

Semantics of the SensorCapabilityBaseAttributes:

Name	Definition
sensorCapabilityBaseAttributes	Describes a group of attributes for the sensor capabilities.
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
maxValueFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
minValueFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
offsetFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
numOfLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
sensitivityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
SNRFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall

Name	Definition
	be used and "0" means the attribute shall not be used.
unit	Describes the unit of the sensor's measuring value. Specifies the unit of the sensor's measuring value as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in ISO/IEC 23005-6:—, A.2.1, if a unit other than the default unit specified in the semantics of the <code>maxValue</code> and <code>minValue</code> is used for the values of <code>maxValue</code> and <code>minValue</code> are used.
maxValue	Describes the maximum value that the sensor can perceive. The terms will be different according to the individual sensor type.
minValue	Describes the minimum value that the sensor can perceive. The terms will be different according to the individual sensor type.
offset	Describes the number of value locations added to a base value in order to get to a specific absolute value.
numOfLevels	Describes the number of value levels that the sensor can perceive in between maximum and minimum value. EXAMPLE The value 5 means the sensor can perceive 5 steps from <code>minValue</code> to <code>maxValue</code> .
sensitivity	Describes the minimum magnitude of input signal required to produce a specified output signal in given unit.
SNR	Describes the ratio of a signal power to the noise power corrupting the signal.

4.7.4.4 Examples

The following example shows a use of `SensorCapabilityBaseAttributes`. It shows that an arbitrary sensor device of type `any_specific_sensor_device_capability_type` has an ID of "ans01" with `maxValue` of 100, `minValue` of 10, 20 levels, offset of -3, sensitivity of 0.8, and SNR of 99 dB. It also shows that the measuring unit of the specified sensor device is dB.

```
<cidl:SensorDeviceCapability
xsi:type="scdv:any_specific_sensor_device_capability_type" id="ans01"
maxValue="100" minValue="10" numOfLevels="20" offset="-3" sensitivity="0.8"
SNR="99" unit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:dB"/>
```

4.8 User's sensory preference description

4.8.1 General

This subclause specifies tools for describing preferences of individual users regarding the sensory experience. The following subclauses define an abstract complex type of `UserSensoryPreferenceBaseType`, which the user preferences on each individual type of sensory experience should inherit.

4.8.2 User sensory preference base type

4.8.2.1 XML representation syntax

```
<complexType name="UserSensoryPreferenceBaseType" abstract="true">
  <complexContent>
    <extension base="dia:UserCharacteristicBaseType">
      <attributeGroup ref="cidl:userSensoryPrefBaseAttributes"/>
    </extension>
  </complexContent>
</complexType>
```

4.8.2.2 Binary representation syntax

UserSensoryPreferenceBaseType {	Number of bits	Mnemonic
UserCharacteristicBase		UserCharacteristicBaseType
userSensoryPrefBaseAttributes		userSensoryPrefBaseAttributesType
}		

4.8.2.3 Semantics

Semantics of the UserSensoryPreferenceBaseType type:

Name	Definition
UserSensoryPreferenceBaseType	UserSensoryPreferenceBaseType shall extend dia:UserCharacteristicBaseType as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensory device capability metadata types.
userSensoryPrefBaseAttributes	Describes a group of common attributes for the describing user preferences on sensory experience.

4.8.2.4 Examples

For the examples of UserSensoryPreferenceBaseType, see the examples of preferences on individual sensory effect type.

4.8.3 User sensory preference base attributes

4.8.3.1 XML representation syntax

```
<attributeGroup name="userSensoryPrefBaseAttributes">
  <attribute name="adaptationMode" type="cidl:adaptationModeType"
    use="optional"/>
  <attribute name="activate" type="boolean" use="optional"/>
</attributeGroup>

<simpleType name="adaptationModeType">
  <restriction base="string">
```

```

    <enumeration value="strict"/>
    <enumeration value="scalable"/>
  </restriction>
</simpleType>

```

4.8.3.2 Binary representation syntax

userSensoryPrefBaseAttributesType {	Number of bits	Mnemonic
adaptationModeFlag	1	bslbf
activateFlag	1	bslbf
if(adaptationModeFlag){		
adaptationMode		adaptationModeType
}		
if(activateFlag){		
activate	1	bslbf
}		
}		
adaptationModeType {		
adaptationMode	2	bslbf
}		

4.8.3.3 Semantics

Semantics of the userSensoryPrefBaseAttributes type:

Name	Definition
userSensoryPrefBaseAttributes	Describes a group of common attributes for the describing user preferences on sensory experience.
adaptationModeFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
activateFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
adaptationMode	Describes the user's preference on the adaptation method for the sensory effect. EXAMPLE The value "strict" means the user prefer to render sensory effect exactly as described. Otherwise, the value "scalable" means to render

Name	Definition								
	sensory effect with scaled intensity according to the device capacity.								
activate	Describes whether the effect shall be activated. A value of <code>true</code> means the effect shall be activated and <code>false</code> means the effect shall be deactivated.								
adaptationModeType	Tool for describing the adaptation mode with enumeration set. When its value is <code>strict</code>, it means that when the input value is out of range, the output should be equal to the maximum value that the device is able to operate. When its value is <code>scalable</code>, it means that the output shall be linearly scaled into the range that the device can operate. In the binary description, the following mapping table is used. <table> <tr> <th>adaptationModeType</th><th>adaptationMode</th></tr> <tr> <td>00</td><td>strict</td></tr> <tr> <td>01</td><td>scalable</td></tr> <tr> <td>10-11</td><td>Reserved</td></tr> </table>	adaptationModeType	adaptationMode	00	strict	01	scalable	10-11	Reserved
adaptationModeType	adaptationMode								
00	strict								
01	scalable								
10-11	Reserved								

4.8.3.4 Examples

For the examples of `userSensoryPrefBaseAttributes`, see the examples of preferences on individual sensory effect type.

4.9 Sensor adaptation preference description

4.9.1 General

This subclause specifies tools for describing preferences of individual users regarding the sensed information. The following subclauses define an abstract complex type of `SensorAdaptationPreferenceBaseType`, which the user preferences on each individual type of sensed information should inherit.

4.9.2 Sensor adaptation preference base type

4.9.2.1 XML representation syntax

```
<complexType name="SensorAdaptationPreferenceBaseType" abstract="true">
  <complexContent>
    <extension base="dia:UserCharacteristicBaseType">
      <attributeGroup ref="cidl:sensorAdaptationPrefBaseAttributes"/>
    </extension>
  </complexContent>
</complexType>
```

4.9.2.2 Binary representation syntax

SensorAdaptationPreferenceBaseType {	Number of bits	Mnemonic
UserCharacteristicBase		UserCharacteristicBaseType

sensorAdaptationPrefBaseAttributes		sensorAdaptationPrefBaseAttributesType
}		

4.9.2.3 Semantics

Semantics of the `SensorAdaptationPreferenceBaseType` type:

Name	Definition
<code>SensorAdaptationPreferenceBaseType</code>	<code>SensorAdaptationPreferenceBaseType</code> shall extend <code>dia:UserCharacteristicBaseType</code> as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensor capability metadata types.
<code>SensorAdaptationPrefBaseAttributes</code>	Describes a group of common attributes for describing the adaptation preferences on sensed information.

4.9.2.4 Examples

For the examples of `SensorAdaptationPreferenceBaseType`, see the examples of preferences on individual sensor adaptation preference type.

4.9.3 Sensor adaptation preference base attributes

4.9.3.1 XML representation syntax

```
<attributeGroup name="sensorAdaptationPrefBaseAttributes">
  <attribute name="sensorIdRef" type="anyURI" use="optional"/>
  <attribute name="sensorAdaptationMode" type="cidl:sensorAdaptationModeType"
use="optional"/>
  <attribute name="activate" type="boolean" use="optional"/>
  <attribute name="unit" type="mpegvct:unitType" use="optional"/>
  <attribute name="maxValue" type="float" use="optional"/>
  <attribute name="minValue" type="float" use="optional"/>
  <attribute name="numOfLevels" type="nonNegativeInteger" use="optional"/>
</attributeGroup>

<simpleType name="sensorAdaptationModeType">
  <restriction base="string">
    <enumeration value="strict"/>
    <enumeration value="scalable"/>
  </restriction>
</simpleType>
```

4.9.3.2 Binary representation syntax

sensorAdaptationPrefBaseAttributesType {	Number of bits	Mnemonic
sensorIdRefFlag	1	bslbf
sensorAdaptationModeFlag	1	bslbf

sensorAdaptationPrefBaseAttributesType {	Number of bits	Mnemonic
activateFlag	1	bslbf
unitFlag	1	bslbf
maxValueFlag	1	bslbf
minValueFlag	1	bslbf
numOfLevelsFlag	1	bslbf
if(sensorIdRefFlag) {		
sensorIdRef	See ISO 10646	UTF-8
}		
if(sensorAdaptationModeFlag) {		
sensorAdaptationMode		sensorAdaptationModeType
}		
if(activateFlag) {		
activate	1	bslbf
}		
if(unitFlag) {		
unit	8	bslbf
}		
if(maxValueFlag) {		
maxValue	32	fsbf
}		
if(minValueFlag) {		
minValue	32	fsbf
}		
if(numOfLevelsFlag) {		
numOfLevels		vluimsbf5
}		
}		
sensorAdaptationModeType {		
sensorAdaptationMode	2	bslbf

sensorAdaptationPrefBaseAttributesType {	Number of bits	Mnemonic
}		

4.9.3.3 Semantics

Semantics of the `SensorAdaptationPrefBaseAttributes` type:

Name	Definition
<code>SensorAdaptationPrefBaseAttributes</code>	Describes a group of common attributes for the describing adaptation preferences on sensed information.
<code>sensorIdRefFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>sensorAdaptationModeFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>activateFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>unitFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>maxValueFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>minValueFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>numOfLevelsFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>sensorIdRef</code>	Refers to the ID of an individual sensor that has generated the specific sensor adaptation preferences.
<code>sensorAdaptationMode</code>	Describes the user’s preference on the adaptation method for the sensed information. EXAMPLE The value “strict” means the user prefer to transmit sensed information to the virtual world exactly as described. Otherwise, the value “scalable” means to let the virtual world may adjust sensed information with scaled value according to user’s intention.
<code>activate</code>	Describes whether the user allows the sensed information to be used or not. A value of “true” means the sensed information is allowed to use and “false” means the sensed information is not allowed to use.
<code>unit</code>	Describes the unit of value which the user prefers to adapt.

Name	Definition
maxValue	Describes the maximum desirable value of the sensed information according to the maximum scale defined within the semantics definition of the individual sensor.
minValue	Describes the minimum desirable value of the sensed information according to the minimum scale defined within the semantics definition of the individual sensor.
numOfLevelsnumOfLevels	Describes the desirable number of value levels in between maximum and minimum value.
sensorAdaptationModeType	Tool for describing the adaptation mode with enumeration set. When its value is <i>strict</i> , it means that when the input value is out of range, the output should be equal to the maximum value that the device is able to operate. When its value is <i>scalable</i> , it means that the output shall be linearly scaled into the range that the device can operate.

4.9.3.4 Examples

For the examples of `sensorAdaptationPrefBaseAttributes`, see the examples of preferences on individual sensor adaptation preference type.

5 Device capability description vocabulary

5.1 General

This Clause describes syntax and semantics of the device capability description vocabulary, which comprises the following devices:

- light, colored light, flash light device;
- heating, cooling device;
- wind device;
- vibration device;
- scent device;
- fog device;
- sprayer device;
- color correction device;
- tactile device;
- kinesthetic device;
- rigid body motion device;
- mobile device position;
- bubble device.

NOTE DCDV has been designed in an extensible way and additional device capabilities can be added easily.

5.2 Schema wrapper conventions

The syntax defined in this Clause assumes the following schema wrapper to form a valid XML schema document.

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:mpeg7="urn:mpeg:mpeg7:schema:2004" xmlns:mpegvct="urn:mpeg:mpeg-v:2016:01-
  CT-NS" xmlns:cidl="urn:mpeg:mpeg-v:2016:01-CIDL-NS" xmlns:dcdv="urn:mpeg:mpeg-
  v:2016:01-DCDV-NS" targetNamespace="urn:mpeg:mpeg-v:2016:01-DCDV-NS"
  elementFormDefault="qualified" attributeFormDefault="unqualified"
  version="ISO/IEC 23005-2" id="MPEG-V-DCDV.xsd">
  <import namespace="urn:mpeg:mpeg7:schema:2004"
  schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
  7_schema_files/mpeg7-v2.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2016:01-CIDL-NS"
  schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
  V_schema_files/CIDL.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2016:01-CT-NS"
  schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
  V_schema_files/MPEG-V-CT.xsd"/>
```

Additionally, the following line should be appended to the resulting schema document in order to obtain a well-formed XML document.

```
</schema>
```

5.3 Light capability type

5.3.1 General

This subclause specifies syntax and semantics of lighting capabilities of lighting devices.

5.3.2 XML representation syntax

```
<complexType name="LightCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <sequence>
        <element name="Color" type="mpegvct:colorType" minOccurs="0"
          maxOccurs="unbounded"/>
      </sequence>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
      <attribute name="maxIntensity" type="nonNegativeInteger"
        use="optional"/>
      <attribute name="numOfLightLevels" type="nonNegativeInteger"
        use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

5.3.3 Binary representation syntax

LightCapabilityType {	Number of bits	Mnemonic
-----------------------	----------------	----------

ColorFlag	1	bslbf
unitFlag	1	bslbf
maxIntensityFlag	1	bslbf
numOfLightLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(ColorFlag){		
LoopColor		vluimsbf5
for(k=0;k<LoopColor;k++){		
Color[k]		ColorType
}		
}		
if(unitFlag){		
unit	8	bslbf
}		
if(maxIntensityFlag){		
maxIntensity	32	uimsbf
}		
if(numOfLightLevelsFlag){		
numOfLightLevels	16	uimsbf
}		
}		

5.3.4 Semantics

Semantics of the `LightCapabilityType` type:

Name	Definition
<code>LightCapabilityType</code>	Tool for describing a light capability.
<code>ColorFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
<code>unitFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.

Name	Definition
maxIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
numOfLightLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
unit	Specifies the unit of the maxIntensity, if a unit other than the default unit is used, as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1.
maxIntensity	Describes the maximum intensity that the lighting device can provide in terms of LUX.
numOfLightLevels	Describes the number of intensity levels that the device can provide in between maximum and minimum intensity of light.
LoopColor	This field, which is only present in the binary representation, specifies the number of color contained in the description.
Color	Describes the list of colors which the lighting device can provide as a reference to a classification scheme term or as RGB value. A CS that may be used for this purpose is the ColorCS defined in ISO/IEC 23005-6:—, A.2.2. EXAMPLE urn:mpeg:mpeg-v:01-SI-ColorCS-NS:alice_blue would describe the color Alice blue.

5.3.5 Examples

This example shows the description of a light capability with the following semantics. The light identifier is “light1”. The maximum intensity of the light is 300 lux. There are 10 light levels between maximum and minimum intensity. The location of the light is the right side according to the position model described in ISO/IEC 23005-3:—, Figure 3. The colors that can be displayed by the light are “white”, “red”, “blue”, and “green” from the classification scheme described in ISO/IEC 23005-6:—, A.2.2.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:LightCapabilityType"
id="light1" unit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:lux"
maxIntensity="300" numOfLightLevels="10" locator="urn:mpeg:mpeg-v:01-SI-
LocationCS-NS:right">
  <dcdv:Color>
    urn:mpeg:mpeg-v:01-SI-ColorCS-NS:white
  </dcdv:Color>
  <dcdv:Color>
    urn:mpeg:mpeg-v:01-SI-ColorCS-NS:red
  </dcdv:Color>
  <dcdv:Color>
    urn:mpeg:mpeg-v:01-SI-ColorCS-NS:blue
  </dcdv:Color>
  <dcdv:Color>
    urn:mpeg:mpeg-v:01-SI-ColorCS-NS:green_color_wheel_x11_green
  </dcdv:Color>
</cidl:SensoryDeviceCapability>
```

5.4 Flash capability type

5.4.1 General

This subclause specifies syntax and semantics of flash capabilities of lighting devices.

5.4.2 XML representation syntax

```
<complexType name="FlashCapabilityType">
  <complexContent>
    <extension base="dcdv:LightCapabilityType">
      <attribute name="maxFrequency" type="positiveInteger" use="optional"/>
      <attribute name="numOfFreqLevels" type="nonNegativeInteger"
        use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

5.4.3 Binary representation syntax

FlashCapabilityType {	Number of bits	Mnemonic
maxFrequencyFlag	1	bslbf
numOfFreqLevelsFlag	1	bslbf
LightCapability		LightCapabilityType
if(maxFrequencyFlag){		
maxFrequency	8	uimsbf
}		
if(numOfFreqLevelsFlag){		
numOfFreqLevels	8	uimsbf
}		
}		

5.4.4 Semantics

Semantics of the `FlashCapabilityType` type:

Name	Definition
<code>FlashCapabilityType</code>	Tool for describing a flash capability. It is extended from the light capability type.
<code>maxFrequencyFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition
numOfFreqLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
LightCapability	Describes a light capability.
maxFrequency	Describes the maximum number of flickering in times per second. EXAMPLE The value 10 means the device can flicker 10 times for each second.
maxIntensity	Describes the maximum intensity that the flash device can provide in terms of LUX.
unit	Specifies the unit of the maxIntensity, if a unit other than the default unit is used, as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1.
numOfFreqLevels	Describes the number of frequency levels that the device can provide in between maximum and minimum frequency.
numOfLightLevels	Describes the number of intensity levels that the device can provide in between maximum and minimum intensity of light.

5.4.5 Examples

This example shows the description of a flash light capability with the following semantics. The flash light identifier is "flash1". The maximum frequency of the flash light is 50 times per second. There are 10 levels between maximum and minimum frequency of the flash light. The location of the flash light is the left side according to the position model described in ISO/IEC 23005-3:—, Figure 3.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:FlashCapabilityType" id="flash1"
maxFrequency="50" numOfFreqLevels="10"
unit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:lux" maxIntensity="300"
numOfLightLevels="10" locator="urn:mpeg:mpeg-v:01-SI-LocationCS-NS:left"/>
```

5.5 Heating capability type

5.5.1 General

This subclause specifies syntax and semantics of capabilities of heating devices.

5.5.2 XML representation syntax

```
<complexType name="HeatingCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <attribute name="maxIntensity" type="nonNegativeInteger"
        use="optional"/>
      <attribute name="minIntensity" type="integer" use="optional"/>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
      <attribute name="numOfLevels" type="nonNegativeInteger"
        use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

```

    </extension>
  </complexContent>
</complexType>

```

5.5.3 Binary representation syntax

HeatingCapabilityType {	Number of bits	Mnemonic
maxIntensityFlag	1	bslbf
minIntensityFlag	1	bslbf
unitFlag	1	bslbf
numOfLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(maxIntensityFlag){		
maxIntensity	16	uimsbf
}		
if(minIntensityFlag){		
minIntensity	8	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.5.4 Semantics

Semantics of the HeatingCapabilityType type:

Name	Definition
HeatingCapabilityType	Tool for describing the capability of a device which can increase the room temperature.
maxIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be

Name	Definition
	used and “0” means the attribute shall not be used.
minIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
numOfLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
maxIntensity	Describes the highest temperature that the heating device can provide in terms of Celsius (or Fahrenheit).
minIntensity	Describes the lowest temperature that the heating device can provide in terms of Celsius (or Fahrenheit).
unit	Specifies the unit of the intensity, as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in ISO/IEC 23005-6:—, A.2.1 (it shall be a reference to either Celsius or Fahrenheit.) If the unit is not specified, the default unit is Celsius.
numOfLevels	Describes the number of temperature levels that the device can provide in between maximum and minimum temperature.

5.5.5 Examples

This example shows the description of a heating capability with the following semantics. The heating device identifier is “heater1”. The maximum intensity of the heating device is 40 °C, and the minimum intensity is 20 °C. This specified device can support 40 levels in controlling the intensity. This device takes 10 ms to start and 20 ms to reach the target intensity. The location of the heating device is the left side according to the position model described in ISO/IEC 23005-3:—, Figure 3.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:HeatingCapabilityType"
id="heater1" zerothOrderDelayTime="10" firstOrderDelayTime="20"
maxIntensity="40" minIntensity="20" numOfLevels="40"
locator="urn:mpeg:mpeg-v:01-SI-LocationCS-NS:left"/>
```

5.6 Cooling capability type

5.6.1 General

This subclause specifies syntax and semantics of capabilities of cooling devices.

5.6.2 XML representation syntax

```
<complexType name="CoolingCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <attribute name="maxIntensity" type="integer" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

```

    <attribute name="minIntensity" type="nonNegativeInteger"
        use="optional"/>
    <attribute name="unit" type="mpegvct:unitType" use="optional"/>
    <attribute name="numOfLevels" type="nonNegativeInteger"
        use="optional"/>
    </extension>
</complexContent>
</complexType>

```

5.6.3 Binary representation syntax

CoolingCapabilityType {	Number of bits	Mnemonic
maxIntensityFlag	1	bslbf
minIntensityFlag	1	bslbf
unitFlag	1	bslbf
numOfLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(minIntensityFlag){		
minIntensity	8	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.6.4 Semantics

Semantics of the CoolingCapabilityType type:

Name	Definition
CoolingCapabilityType	Tool for describing the capability of a device which can decrease the room temperature.
maxIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.