INTERNATIONAL STANDARD

ISO/IEC 23005-2

Third edition
2016-03-15

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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Reference number
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Foreword

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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*

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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.

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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.

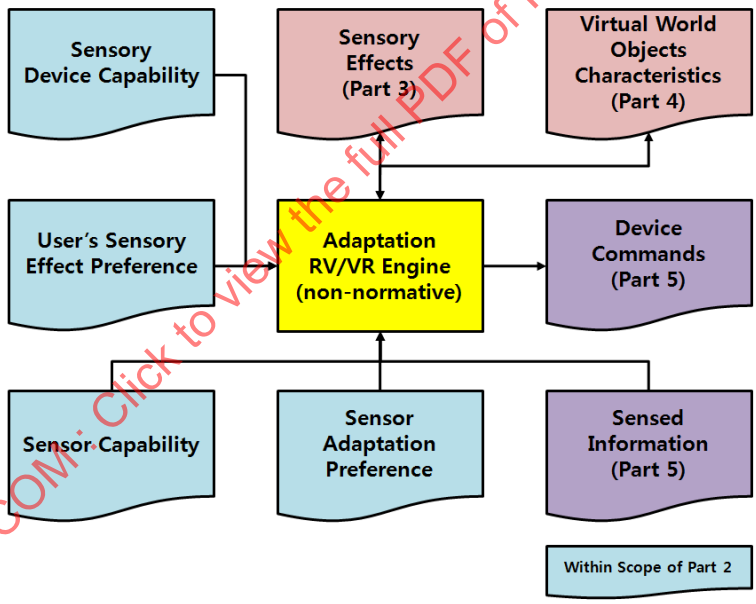

Figure 1 — Scope of the control information

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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*

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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-SEDL-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

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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"/>
```

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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.

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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>
```

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4.5.3 Binary representation syntax

ControlInfoType{	**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 {		

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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
}		
}		

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4.5.4 Semantics

Semantics of the `ControlInfo` type:

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Name	*Definition*
`ControlInfo`	The root element that serves as the topmost element in the control information description.
`SensoryDeviceCapabilityListFlag`	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.
`SensorDeviceCapabilityListFlag`	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.
`UserSensoryPreferenceListFlag`	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.
`SensorAdaptationPreferenceListFlag`	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.
`ControlInfoType`	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 `ControlInfo` element. There should be used at least one element among `ControlInfoType`.
`SensoryDeviceCapabilityList`	Optional wrapper element that serves as the placeholder for the list of sensory device capability descriptions.
`SensorDeviceCapabilityList`	Optional wrapper element that serves as the placeholder for the list of sensor device capability descriptions.
`UserSensoryPreferenceList`	Optional wrapper element that serves as the placeholder for the list of device user preference descriptions.
`SensorAdaptationPreferenceList`	Optional wrapper element that serves as the placeholder for the list of sensor device adaptation preference descriptions.
`SensoryDeviceCapabilityListType`	Wrapper element type which allows multiple occurrences of sensory device capability descriptions.
`NumOfSensoryDevCap`	This field, which is only present in the binary representation, specifies the number of `SensoryDeviceCapability` instances accommodated in the `SensoryDeviceCapabilityList`.
`IndividualSensoryDevCapType`	This field, which is only present in the binary representation, describes which `SensoryDeviceCapability` type shall be used. In the binary description, the following mapping table is used.

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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>
`SensoryDeviceCapability`	Specifies single description of sensory device capability description. The list of single device capabilities is as follows. <table><tr><th>Terms of device</th><th>Device capability type</th></tr><tr><td>Light device</td><td>`LightCapabilityType`</td></tr><tr><td>Flash device</td><td>`FlashCapabilityType`</td></tr><tr><td>Heating device</td><td>`HeatingCapabilityType`</td></tr><tr><td>Cooling device</td><td>`CoolingCapabilityType`</td></tr><tr><td>Wind device</td><td>`WindCapabilityType`</td></tr><tr><td>Vibration device</td><td>`VibrationCapabilityType`</td></tr><tr><td>Sprayer device</td><td>`SprayerCapabilityType`</td></tr><tr><td>Scent device</td><td>`ScentCapabilityType`</td></tr></table>

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Name	*Definition*
	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. 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

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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

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<table>
<tr><th>Name</th><th>Definition</th></tr>
<tr><td></td><td>
<table>
<tr><td>Vehicle speed sensor capability</td><td>00100001</td></tr>
<tr><td>Mass air flow sensor capability</td><td>00100010</td></tr>
<tr><td>Fuel level sensor capability</td><td>00100011</td></tr>
<tr><td>Manifold absolute pressure sensor capability</td><td>00100100</td></tr>
<tr><td>EngineRPM sensor capability</td><td>00100101</td></tr>
<tr><td>Reserved</td><td>0010011011111111</td></tr>
</table>
</td></tr>
<tr><td>SensorDeviceCapability</td><td>Specifies single description of sensor device capability description. The list of single sensor capabilities is as follows.
<table>
<tr><td>Term of sensor</td><td>Sensor capability type</td></tr>
<tr><td>Light sensor</td><td>LightSensorCapabilityType</td></tr>
<tr><td>Ambient noise sensor</td><td>AmbientNoiseSensorCapabilityType</td></tr>
<tr><td>Temperature sensor</td><td>TemperatureSensorCapabilityType</td></tr>
<tr><td>Humidity sensor</td><td>HumiditySensorCapabilityType</td></tr>
<tr><td>Distance sensor</td><td>DistanceSensorCapabilityType</td></tr>
<tr><td>Atmospheric pressure Sensor</td><td>AtmosphericPressureSensorCapabilityType</td></tr>
<tr><td>Position sensor</td><td>PositionSensorCapabilityType</td></tr>
<tr><td>Velocity sensor</td><td>VelocitySensorCapabilityType</td></tr>
<tr><td>Acceleration sensor</td><td>AccelerationSensorCapabilityType</td></tr>
<tr><td>Orientation sensor</td><td>OrientationSensorCapabilityType</td></tr>
<tr><td>Angular velocity sensor</td><td>AngularVelocitySensorCapabilityType</td></tr>
<tr><td>Angular acceleration sensor</td><td>AngularAccelerationSensorCapabilityType</td></tr>
</table>
</td></tr>
</table>

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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	TirePressureMonitorySystemSensorCapabilityType

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Name	*Definition*

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

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Name	*Definition*
	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

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<table>
<tr><th>Name</th><th>Definition</th></tr>
<tr><td></td><td>types.</td></tr>
<tr><td>SensorAdaptationPreferenceListType</td><td>Wrapper element type which allows multiple occurrences of user preference descriptions on sensor adaptation.</td></tr>
<tr><td>NumOfSensorAdaptationPref</td><td>This field, which is only present in the binary representation, specifies the number of SAPreference instances accommodated in the SensorAdaptationPreferenceList.</td></tr>
<tr><td>IndividualSensorAdaptationPrefType</td><td>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.
<table>
<tr><th>Term of sensor adaptation preference</th><th>Binary representation for sensor type (8 bits)</th></tr>
<tr><td>Light sensor adaptation preference</td><td>00000000</td></tr>
<tr><td>Ambient noise sensor adaptation preference</td><td>00000001</td></tr>
<tr><td>Temperature sensor adaptation preference</td><td>00000010</td></tr>
<tr><td>Humidity sensor adaptation preference</td><td>00000011</td></tr>
<tr><td>Distance sensor adaptation preference</td><td>00000100</td></tr>
<tr><td>Atmospheric pressure sensor adaptation preference</td><td>00000101</td></tr>
<tr><td>Position sensor adaptation preference</td><td>00000110</td></tr>
<tr><td>Velocity sensor adaptation preference</td><td>00000111</td></tr>
<tr><td>Acceleration sensor adaptation preference</td><td>00001000</td></tr>
<tr><td>Orientation sensor adaptation preference</td><td>00001001</td></tr>
<tr><td>Angular velocity sensor adaptation preference</td><td>00001010</td></tr>
<tr><td>Angular acceleration sensor adaptation preference</td><td>00001011</td></tr>
<tr><td>Force sensor adaptation preference</td><td>00001100</td></tr>
</table>
</td></tr>
</table>

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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>
SAPreference	Specifies single description of user preference description on sensor adaptation. The list of single sensor adaptation preferences is as follows. <table><tr><td>Term of sensor</td><td>Sensor adaptation preference type</td></tr><tr><td>Light sensor</td><td>LightAdaptationPrefType</td></tr><tr><td>Ambient noise sensor</td><td>AmbientNoiseAdaptationPrefType</td></tr><tr><td>Temperature sensor</td><td>TemperatureAdaptationPrefType</td></tr><tr><td>Humidity sensor</td><td>HumidityAdaptationPrefType</td></tr><tr><td>Distance sensor</td><td>DistanceAdaptationPrefType</td></tr><tr><td>Atmospheric pressure Sensor</td><td>AtmosphericPressureAdaptationPrefType</td></tr><tr><td>Position sensor</td><td>PositionAdaptationPrefType</td></tr><tr><td>Velocity sensor</td><td>VelocityAdaptationPrefType</td></tr><tr><td>Acceleration sensor</td><td>AccelerationAdaptationPrefType</td></tr><tr><td>Orientation sensor</td><td>OrientationAdaptationPrefType</td></tr><tr><td>Angular velocity sensor</td><td>AngularVelocityAdaptationPrefType</td></tr><tr><td>Angular acceleration sensor</td><td>AngularAccelerationAdaptationPrefType</td></tr><tr><td>Force sensor</td><td>ForceAdaptationPrefType</td></tr><tr><td>Torque sensor</td><td>TorqueAdaptationPrefType</td></tr><tr><td>Pressure sensor</td><td>PressureAdaptationPrefType</td></tr></table>

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Name	*Definition*	
	Motion sensor	MotionAdaptationPrefType
	Intelligent camera sensor	IntelligentCameraAdaptationPrefType
SensorAdaptationPreferenceBaseType	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>
```

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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>
```

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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 capabilites 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.

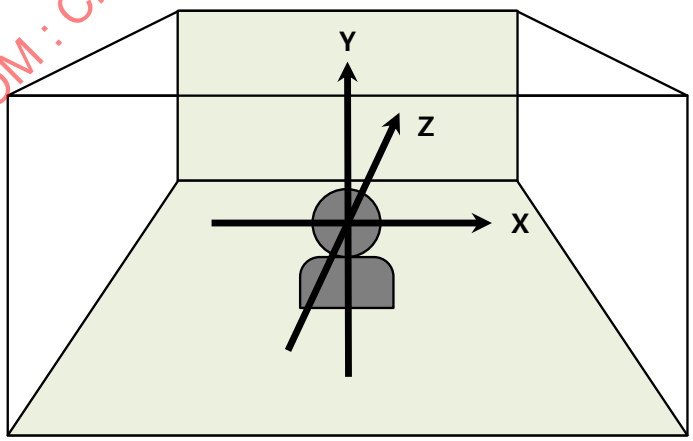

Figure 2 — Reference coordinate system for sensory devices

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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 `dia:TerminalCapabilityBaseType` 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

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

4.6.4.3 Semantics

Semantics of the `sensoryDeviceCapabilityAttributes` type:

Name	*Definition*
`sensoryDeviceCapability Attributes`	Describes a group of attributes for the sensory device capabilities.
`zerothOrderDelayTimeFlag`	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.
`firstOrderDelayTimeFlag`	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.
`locatorFlag`	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.
`zerothOrderDelayTime`	Describes required preparation time of a sensory device to be activated since it receives a command in the unit of millisecond (ms).
`firstOrderDelayTime`	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).
`locator`	Describes the position of the device from the user’s perspective according to the x-, y-, and z-axis as a reference to the `LocationCS` as defined in ISO/IEC 23005-6:—, A.2.3.

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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.

```
<cidl: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

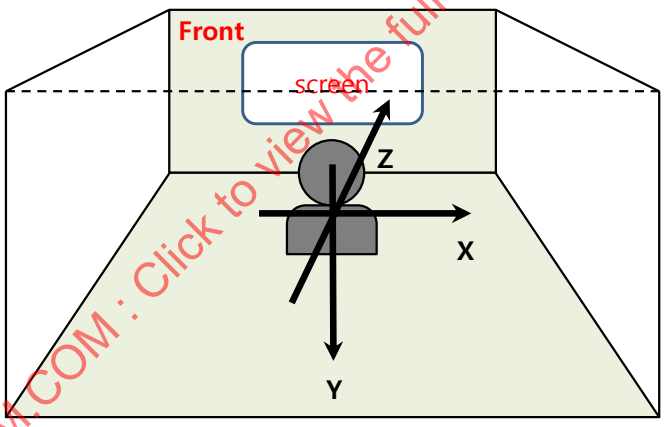

Figure 3 — Global coordinate for sensors

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="cidl:AccuracyType" minOccurs="0"/>
```

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```
            </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
}		
}		

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4.7.3.3 Semantics

Semantics of the `SensorCapabilityBaseType`:

Name	*Definition*
`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.
`AccuracyFlag`	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.
`Accuracy`	Describes the degree of closeness of a measured quantity to its actual value in `AccuracyType`.
`sensorCapabilityBase Attributes`	Describes a group of attributes for the sensor capabilities.

Semantics of the `AccuracyType`:

Name	*Definition*
`AccuracyType`	Becomes a parent type providing a choice of describing the accuracy in either relative value or absolute value.
`AccuracySelect`	This field, which is only present in the binary representation, describes which accuracy scheme shall be used. "0" means that the `PercentAccuracy` type shall be used, and "1" means that the `ValueAccuracy` type shall be used.
`PercentAccuracy`	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 `zeroToOneType` type as defined in ISO/IEC 15938-5.
`ValueAccuracy`	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.

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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
}		

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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*
`sensorCapabilityBase Attributes`	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

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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 `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1, if a unit other than the default unit specified in the semantics of the `maxValue` and `minValue` is used for the values of `maxValue` and `minValue` 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 minValue to maxValue.
`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.

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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">
```

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```
        <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

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Name	*Definition*
	sensory effect with scaled intensity according to the device capacity.
`activate`	Describes whether the effect shall be activated. A value of `true` means the effect shall be activated and `false` means the effect shall be deactivated.
`adaptationModeType`	Tool for describing the adaptation mode with enumeration set. When its value is `strict`, 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 `scalable`, 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. 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

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sensorAdaptationPrefBaseAttributes		sensorAdaptationPrefBaseAttributesType
}		

4.9.2.3 Semantics

Semantics of the `SensorAdaptationPreferenceBaseType` type:

Name	*Definition*
`SensorAdaptationPreferenceBaseType`	`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 sensor capability metadata types.
`SensorAdaptationPrefBaseAttributes`	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

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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

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sensorAdaptationPrefBaseAttributesType {	**Number of bits**	**Mnemonic**
}		

4.9.3.3 Semantics

Semantics of the `SensorAdaptatinPrefBaseAttributes` type:

Name	*Definition*
`SensorAdaptationPrefBaseAttributes`	Describes a group of common attributes for the describing adaptation preferences on sensed information.
`sensorIdRefFlag`	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.
`sensorAdaptationModeFlag`	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.
`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.
`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.
`sensorIdRef`	Refers to the ID of an individual sensor that has generated the specific sensor adaptation preferences.
`sensorAdaptationMode`	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 tothe 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.
`activate`	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.
`unit`	Describes the unit of value which the user prefers to adapt.

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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 `strict`, 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 `scalable`, 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.

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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**

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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
}		
}		

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5.3.4 Semantics

Semantics of the `LightCapabilityType` type:

Name	*Definition*
`LightCapabilityType`	Tool for describing a light capability.
`ColorFlag`	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.

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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>
```

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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
}		
}		

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5.4.4 Semantics

Semantics of the `FlashCapabilityType` type:

Name	*Definition*
`FlashCapabilityType`	Tool for describing a flash capability. It is extended from the light capability type.
`maxFrequencyFlag`	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.

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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"/>
```

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```
        </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
}		
}		

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5.5.4 Semantics

Semantics of the `HeatingCapabilityType` type:

Name	*Definition*
`HeatingCapabilityType`	Tool for describing the capability of a device which can increae 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

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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 `UnitTypeCS` 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.

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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"/>
```

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```
            <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
}		
}		

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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.

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Name	*Definition*
`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 lowest temperature that the cooling device can provide in terms of Celsius.
`minIntensity`	Describes the highest temperature that the cooling device can provide in terms of Celsius.
`unit`	Specifies the unit of the intensity, as a reference to a classification scheme term provided by `UnitTypeCS` 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.

5.6.5 Examples

This example shows the description of a heating capability with the following semantics. The heating device identifier is “cooler1”. The maximum intensity of the cooling device is 15 °C, and the minimum intensity is 30 °C. This specified device can support 30 levels in controlling the intensity. This device takes 10 ms to start and 30 ms to reach the target intensity. The location of the heating device is the right side according to the position model described in ISO/IEC 23005-3:—, Figure 3.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:CoolingCapabilityType"
id="cooler1" zerothOrderDelayTime=”10" firstOrderDelayTime="30"
maxIntensity=”15" minIntensity="30" numOfLevels="30"
locator="urn:mpeg:mpeg-v:01-SI-LocationCS-NS:right"/>
```

5.7 Wind capability type

5.7.1 General

This subclause specifies syntax and semantics of capabilities of wind generating devices.

5.7.2 XML representation syntax

```
<complexType name="WindCapabilityType">
   <complexContent>
      <extension base="cidl:SensoryDeviceCapabilityBaseType">
         <attribute name="maxWindSpeed" type="nonNegativeInteger"
            use="optional"/>
         <attribute name="unit" type="mpegvct:unitType" use="optional"/>
         <attribute name="numOfLevels" type="nonNegativeInteger"
```

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```
            use="optional"/>
        </extension>
    </complexContent>
</complexType>
```

5.7.3 Binary representation syntax

WindCapabilityType {	**Number of bits**	**Mnemonic**
maxWindSpeedFlag	1	bslbf
unitFlag	1	bslbf
numOfLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(maxWindSpeedFlag){		
maxWindSpeed	16	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.7.4 Semantics

Semantics of the `WindCapabilityType` type:

Name	*Definition*
`WindCapabilityType`	Tool for describing a wind capability.
`maxWindSpeedFlag`	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”

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Name	*Definition*
	means the attribute shall not be used.
`maxWindSpeed`	Describes the maximum wind speed that the fan can provide in terms of metre per second.
`unit`	Specifies the unit of the intensity, if a unit other than the default unit specified in the semantics of the `maxWindSpeed` is used, as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1.
`numOfLevels`	Describes the number of wind speed levels that the device can provide in between maximum and minimum speed.

5.7.5 Examples

This example shows the description of a wind device capability with the following semantics. The wind device identifier is “fan01”. The maximum wind speed of the wind device (possibly a fan) is 30 m/s. This specified device can support 5 levels in controlling the wind speed. This device takes 10 ms to start and 10 ms to reach the target intensity. The location of the heating device is the center according to the position model described in ISO/IEC 23005-3:—, Figure 3.

```
<cidl:SensoryDeviceCapability xsi:type="dcv:WindCapabilityType"
id="fan01" zerothOrderDelayTime=”10" firstOrderDelayTime=”10"
maxWindSpeed="30" numOfLevels="5" locator="urn:mpeg:mpeg-v:01-SI-
LocationCS-NS:center"/>
```

5.8 Vibration capability type

5.8.1 General

This subclause specifies syntax and semantics of capabilities of vibration generating devices.

5.8.2 XML representation syntax

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

5.8.3 Binary representation syntax

VibrationCapabilityType {	**Number of bits**	**Mnemonic**
maxIntensityFlag	1	bslbf

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unitFlag	1	bslbf
numOfLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(maxIntensityFlag){		
maxIntensity	16	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.8.4 Semantics

Semantics of the `VibrationCapabilityType` type:

Name	*Definition*
`VibrationCapabilityType`	Tool for describing a vibration capability.
`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.
`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 maximum intensity that the vibrator device can provide in terms of Hertz.
`unit`	Specifies the unit of the intensity, if a unit other than the default unit specified in the semantics of the `maxIntensity` is used, as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1.
`numOfLevels`	Describes the number of intensity levels that the device can provide in between zero and maximum intensity.

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5.8.5 Examples

This example shows the description of a vibration device capability with the following semantics. The vibration device identifier is “vib001”. The maximum intensity of the vibration device is 600 Hz. This specified device can support 4 levels in controlling the intensity. This device takes 0 ms to start and 10 ms to reach the target intensity. The location of the heating device is the center side according to the position model described in ISO/IEC 23005-3:—, Figure 3.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:VibrationCapabilityType"
id="vib001" zerothOrderDelayTime=”0" firstOrderDelayTime=”10"
maxIntensity="600" numOfLevels="4" locator="urn:mpeg:mpeg-v:01-SI-
LocationCS-NS:center"/>
```

5.9 Scent capability type

5.9.1 General

This subclause specifies syntax and semantics of capabilities of scent generating devices.

5.9.2 XML representation syntax

```
<complexType name="ScentCapabilityType">
   <complexContent>
      <extension base="cidl:SensoryDeviceCapabilityBaseType">
         <sequence>
            <element name="Scent" type="mpeg7:termReferenceType" minOccurs=”0"
               maxOccurs="unbounded"/>
         </sequence>
         <attribute name="maxIntensity" type="nonNegativeInteger"
               use="optional"/>
         <attribute name="unit" type="mpegvct:unitType" use="optional"/>
         <attribute name="numOfLevels" type="nonNegativeInteger"
               use="optional"/>
      </extension>
   </complexContent>
</complexType>
```

5.9.3 Binary representation syntax

ScentCapabilityType {	**Number of bits**	**Mnemonic**
ScentFlag	1	bslbf
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
numOfLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(ScentFlag){		
LoopScent		vluimsbf5

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for(k=0;k<LoopScent;k++){		
Scent[k]	9	blsbf
}		
}		
if(maxIntensityFlag){		
maxIntensity	16	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.9.4 Semantics

Semantics of the `ScentCapabilityType` type:

Name	*Definition*
`ScentCapabilityType`	Tool for describing a scent capability.
`ScentFlag`	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.
`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.
`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.
`LoopScent`	This field, which is only present in the binary representation, specifies the number of scent contained in the description.
`Scent`	Describes the list of scent that the perfumer can provide. The type of the scent shall be described using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6. A CS that may be used for this purpose is the

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Name	*Definition*
	`ScentCS` defined in ISO/IEC 23005-6:—, A.2.4.
`maxIntensity`	Describes the maximum intensity that the perfumer can provide in terms of ml/h.
`unit`	Specifies the unit of the intensity, if a unit other than the default unit specified in the semantics of the `maxIntensity` is used, as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6.
`numOfLevels`	Describes the number of intensity levels of the scent that the device can provide in between zero and maximum intensity.

5.9.5 Examples

This example shows the description of a scent device capability with the following semantics. The scent device identifier is "scent01". The maximum intensity of the scent amount is 5 ml/h with two levels of control. As this device takes 0 ms to start and 0 ms to reach the target intensity, it is not specified explicitly. The location of the scent device is the center side according to the position model described in ISO/IEC 23005-3:—, Figure 3. The type of scent is rose according to the ScentCS specified in ISO/IEC 23005-6:—, A.2.4.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:ScentCapabilityType"
id="scent01" maxIntensity="5" numOfLevels="2" locator="urn:mpeg:mpeg-v:01-
SI-LocationCS-NS:center">
   <dcdv:Scent>urn:mpeg:mpeg-v:01-SI-ScentCS-NS:rose</dcdv:Scent>
</cidl:SensoryDeviceCapability>
```

5.10 Fog capability type

5.10.1 General

This subclause specifies syntax and semantics of capabilities of fog generating devices.

5.10.2 XML representation syntax

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

5.10.3 Binary representation syntax

FogCapabilityType {	**Number of bits**	**Mnemonic**

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

5.10.4 Semantics

Semantics of the `FogCapabilityType` type:

Name	*Definition*
`FogCapabilityType`	Tool for describing a fog capability.
`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.
`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 maximum intensity that the fog device can provide in terms of ml/h.
`unit`	Specifies the unit of the intensity, if a unit other than the default unit specified in the semantics of the `maxIntensity` is used, as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6.

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Name	*Definition*
numOfLevels	Describes the number of intensity levels of the fog that the device can provide in between zero and maximum intensity.

5.10.5 Examples

This example shows the description of a fog device capability with the following semantics. The fog device identifier is “fog11”. The maximum intensity of the fog amount is 100 ml/h with five levels of control. This device takes 30 ms to start and 100 ms to reach the target intensity. The location of the scent device is the back side according to the position model described in ISO/IEC 23005-3:—, Figure 3.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:FogCapabilityType" id="fog11"
zerothOrderDelayTime="30" firstOrderDelayTime="100" maxIntensity="100"
numOfLevels="5" locator="urn:mpeg:mpeg-v:01-SI-LocationCS-NS:back"/>
```

5.11 Sprayer capability type

5.11.1 General

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

5.11.2 XML representation syntax

```
<complexType name="SprayerCapabilityType">
   <complexContent>
      <extension base="cidl:SensoryDeviceCapabilityBaseType">
         <attribute name="sprayingType" type="mpeg7:termReferenceType"/>
         <attribute name="maxIntensity" type="nonNegativeInteger"
            use="optional"/>
         <attribute name="unit" type="mpegvct:unitType" use="optional"/>
         <attribute name="numOfLevels" type="nonNegativeInteger"
            use="optional"/>
      </extension>
   </complexContent>
</complexType>
```

5.11.3 Binary representation syntax

SprayerCapabilityType {	**Number of bits**	**Mnemonic**
sprayingFlag	1	bslbf
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
numOfLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(sprayingFlag) {		

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SprayerCapabilityType {	**Number of bits**	**Mnemonic**
spraying	8	blsbf
}		
if(maxIntensityFlag){		
maxIntensity	16	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.11.4 Semantics

Semantics of the `SprayerCapabilityType` type:

Name	*Definition*
`SprayerCapabilityType`	Tool for describing a water sprayer capability.
`sprayingFlag`	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.
`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.
`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.
`spraying`	Describes the type of the material that the sprayer can spray as a reference to a classification scheme term. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6. A CS that may be used for this purpose is the `SprayingTypeCS` defined in ISO/IEC 23005-6, A.2.7.

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maxIntensity	Describes the maximum intensity that the water sprayer can provide in terms of ml/h.
unit	Specifies the unit of the intensity, if a unit other than the default unit specified in the semantics of the maxIntensity is used, as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.
numOfLevels	Describes the number of intensity levels of the fog that the device can provide in between zero and maximum intensity.

5.11.5 Examples

This example shows the description of a sprayer device capability with the following semantics. The sprayer device identifier is “spryr00”. The maximum intensity of the spraying amount is 10 ml/h with three levels of control. This device takes 5 ms to start and 5 ms to reach the target intensity. The location of the sprayer device is the midway side according to the position model described in ISO/IEC 23005-3:—, Figure 3.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:SprayerCapabilityType"
id="spryr00" sprayingType="urn:mpeg:mpeg-v:01-SI-SprayingTypeCS-NS:water"
zerothOrderDelayTime="5" firstOrderDelayTime="5" maxIntensity="10"
numOfLevels="3" locator="urn:mpeg:mpeg-v:01-SI-LocationCS-NS:midway"/>
```

5.12 Color correction capability type

5.12.1 General

This subclause specifies syntax and semantics of capabilities of color correction enabled devices.

5.12.2 XML representation syntax

```
<complexType name="ColorCorrectionCapabilityType">
   <complexContent>
      <extension base="cidl:SensoryDeviceCapabilityBaseType">
         <attribute name="flag" type="boolean" use="optional" default="false"/>
      </extension>
   </complexContent>
</complexType>
```

5.12.3 Binary representation syntax

ColorCorrectionCapabilityType {	**Number of bits**	**Mnemonic**
flagFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(flagFlag) {		
flag	1	bslbf

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}		
}		

5.12.4 Semantics

Semantics of the `ColorCorrectionCapabilityType` type:

Name	*Definition*
`ColorCorrectionCapabilityType`	Tool for describing if the given device has a color correction capability.
`flagFlag`	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.
`flag`	Describes the existence of the color correction capability of the given device in terms of "true" and "false".

5.12.5 Examples

This example shows the description of a color correction capability with the following semantics. Since the flag is "true", the device "tv1" is equipped with a capability of color correction.

```
<cidl:SensoryDeviceCapability        xsi:type="dcdv:ColorCorrectionCapabilityType"
flag="true" id="tv1"/>
```

5.13 Tactile capability type

5.13.1 General

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

5.13.2 XML representation syntax

```
<complexType name="TactileCapabilityType">
   <complexContent>
      <extension base="cidl:SensoryDeviceCapabilityBaseType">
         <attribute name="intensityUnit" type="mpegvct:unitType"
            use="optional"/>
         <attribute name="maxValue" type="nonNegativeInteger" use="optional"/>
         <attribute name="minValue" type="nonNegativeInteger" use="optional"/>
         <attribute name="arraysizeX" type="nonNegativeInteger"/>
         <attribute name="arraysizeY" type="nonNegativeInteger"/>
         <attribute name="gapX" type="float" use="optional"/>
         <attribute name="gapY" type="float" use="optional"/>
         <attribute name="gapUnit" type="mpegvct:unitType" use="optional"/>
         <attribute name="maxUpdateRate" type="nonNegativeInteger"
            use="optional"/>
         <attribute name="updateRateUnit" type="mpegvct:unitType"
            use="optional"/>
         <attribute name="actuatorType" type="mpeg7:termReferenceType"
```

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```
            use="optional"/>
         <attribute name="numOfLevels" type="nonNegativeInteger"
            use="optional"/>
      </extension>
   </complexContent>
</complexType>
```

5.13.3 Binary representation syntax

TactileCapabilityType {	**Number of bits**	**Mnemonic**
intensityUnitFlag	1	bslbf
maxValueFlag	1	bslbf
minValueFlag	1	bslbf
arraysizeXFlag	1	bslbf
arraysizeYFlag	1	bslbf
gapXFlag	1	bslbf
gapYFlag	1	bslbf
gapUnitFlag	1	bslbf
maxUpdateRateFlag	1	bslbf
updateRateUnitFlag	1	bslbf
actuatorTypeFlag	1	bslbf
numOfLevelsFlag	1	bslbf
extendArraySizeFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(intensityUnitFlag) {		
intensityUnit	8	bslbf
}		
if(maxValueFlag){		
maxValue	16	uimsbf
}		
if(minValueFlag){		
minValue	16	uimsbf
}		

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TactileCapabilityType {	**Number of bits**	**Mnemonic**
if(arraysizeXFlag){		
if(extendArraySizeFlag){		
arraysizeX	16	uimsbf
}		
else {		
arraysizeX	8	uimsbf
}		
}		
if(arraysizeYFlag){		
if(extendArraySizeFlag){		
arraysizeY	16	uimsbf
}		
else {		
arraysizeY	8	uimsbf
}		
}		
if(gapXFlag){		
gapX	32	fsbf
}		
if(gapYFlag){		
gapY	32	fsbf
}		
if(gapUnitFlag){		
gapUnit	8	bslbf
}		
if(maxUpdateRateFlag){		
maxUpdateRate	16	uimsbf
}		
if(updateRateUnitFlag){		

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TactileCapabilityType {	**Number of bits**	**Mnemonic**
updateRateUnit	8	bslbf
}		
if(actuatorTypeFlag){		
actuatorType	3	blsbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.13.4 Semantics

Semantics of the `TactileCapabilityType`:

Name	*Definition*
`TactileCapabilityType`	Tool for describing a tactile device capability.
`intensityUnitFlag`	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.
`arraysizeXFlag`	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.
`arraysizeYFlag`	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.
`gapXFlag`	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.
`gapYFlag`	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.

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Name	*Definition*
gapUnitFlag	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.
maxUpdateRateFlag	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.
updateRateUnitFlag	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.
actuatorTypeFlag	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.
extendArraySizeFlag	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.
intensityUnit	Specifies the unit of the intensity for maxValue and minValue, as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1. There is no default unit specified as the intensityUnit may vary depending on the type of the actuator used for the tactile device. For example, when an electrotactile device is selected the unit can be mA. For a pneumatic tactile device, the unit may be either psi or Pa; for a vibrotactile device, the unit may be hz (frequency), or mm (amplitude); for a thermal display, the unit may be either Celsius or Fahrenheit.
maxValue	Describes the maximum intensity that a tactile device can drive in the unit specified by the intensityUnit attribute.
minValue	Describes the minimum intensity that a tactile device can drive in the unit specified by the intensityUnit attribute.
arraysizeX	Describes a number of actuators in X (horizontal) direction since a tactile device is formed as m-by-n array types. (integer).
arraysizeY	Describes a number of actuators in Y (vertical) direction since a tactile device is formed as m-by-n array types. (integer).
gapX	Describes the X directional gap space between actuators in a tactile device. (mm).
gapY	Describes the Y directional gap space between actuators in a tactile device. (mm).
gapUnit	Specifies the unit of the description of gapX and gapY attributes as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1, if any unit other than the default unit of mm is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.

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Name	*Definition*
maxUpdateRate	Describes a maximum update rate that a tactile device can drive.
updateRateUnit	Specifies the unit of the description of maxUpdateRate as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1, if any unit other than the default unit of Hz is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.
actuatorType	Describes a type of tactile device (e.g. vibrating motor, electrotactile device, pneumatic device, piezoelectric device, thermal device, etc.) as a reference to a classification scheme. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6. A CS that may be used for this purpose is the TactileDisplayCS defined in ISO/IEC 23005-6:—, A.2.11.
numOfLevels	Describes the number of intensity levels that a tactile device can drive.

5.13.5 Examples

The following is an example of the TactileCapabilityType to indicate that the specified device can display tactile information. This example shows the description of tactile device capabilities and its features. Among several tactile devices, a thermal device with 10-by-4 array is selected. In the array, each thermal element locates with a 5 mm gap and maximum temperature the thermal display can generate is 34° in Celsius and the minimum is 16°. Each thermal element drives 8 different levels and the temperature new temperature presented can be updated up to 10 times per second.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:TactileCapabilityType"
intensityUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:celsius" maxValue="34"
minValue="16"  arraysizeX="10" arraysizeY="4"  gapX="5" gapY="5"
maxUpdateRate="10" actuatorType="urn:mpeg:mpeg-v:01-CI-TactileDisplayCS-
NS:thermal" numOfLevels="8"/>
```

5.14 Kinesthetic capability type

5.14.1 General

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

5.14.2 XML representation syntax

```
<complexType name="KinestheticCapabilityType">
   <complexContent>
      <extension base="cidl:SensoryDeviceCapabilityBaseType">
         <sequence>
            <element name="MaximumForce" type="mpegvct:Float3DVectorType"/>
            <element name="MaximumTorque" type="mpegvct:Float3DVectorType"
               minOccurs="0"/>
            <element name="MaximumStiffness" type="mpegvct:Float3DVectorType"
               minOccurs="0"/>
            <element name="DOF" type="dcdv:DOFType"/>
            <element name="WorkSpace" type="dcdv:WorkSpaceType"/>
         </sequence>
         <attribute name="forceUnit" type="mpegvct:unitType" use="optional"/>
```

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```
            <attribute name="torqueUnit" type="mpegvct:unitType" use="optional"/>
            <attribute name="stiffnessUnit" type="mpegvct:unitType"
                use="optional"/>
            <attribute name="numOfForceLevels" type="nonNegativeInteger"
                use="optional"/>
            <attribute name="numOfTorqueLevels" type="nonNegativeInteger"
                use="optional"/>
            <attribute name="numOfStiffnessLevels" type="nonNegativeInteger"
                use="optional"/>
        </extension>
    </complexContent>
</complexType>

<complexType name="DOFType">
    <sequence>
        <element name="Tx" type="boolean"/>
        <element name="Ty" type="boolean"/>
        <element name="Tz" type="boolean"/>
        <element name="Rx" type="boolean"/>
        <element name="Ry" type="boolean"/>
        <element name="Rz" type="boolean"/>
    </sequence>
</complexType>

<complexType name="WorkSpaceType">
    <sequence>
        <element name="Width" type="float"/>
        <element name="Height" type="float"/>
        <element name="Depth" type="float"/>
        <element name="RotationX" type="float"/>
        <element name="RotationY" type="float"/>
        <element name="RotationZ" type="float"/>
    </sequence>
</complexType>
```

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5.14.3 Binary representation syntax

KinestheticCapabilityType {	**Number of bits**	**Mnemonic**
MaximumTorqueFlag	1	bslbf
MaximumStiffnessFlag	1	bslbf
forceUnitFlag	1	bslbf
torqueUnitFlag	1	bslbf
stiffnessUnitFlag	1	bslbf
numOfForceLevelsFlag	1	bslbf
numOfTorqueLevelsFlag	1	bslbf
numOfStiffnessLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
MaximumForce		Float3DVectorType

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KinestheticCapabilityType {	**Number of bits**	**Mnemonic**
if(MaximumTorqueFlag){		
MaximumTorque		Float3DVectorType
}		
if(MaximumStiffnessFlag){		
MaximumStiffness		Float3DVectorType
}		
DOF		DOFType
Workspace		WorkspaceType
if(forceUnitFlag) {		
forceUnit	8	bslbf
}		
if(torqueUnitFlag) {		
torqueUnit	8	bslbf
}		
if(stiffnessUnitFlag) {		
stiffnessUnit	8	bslbf
}		
if(numOfForceLevelsFlag) {		
numOfForceLevels	16	uimsbf
}		
if(numOfTorqueLevelsFlag) {		
numOfTorqueLevels	16	uimsbf
}		
if(numOfStiffnessLevelsFlag) {		
numOfStiffnessLevels	16	uimsbf
}		
}		
Float3DVectorType {		

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KinestheticCapabilityType {	**Number of bits**	**Mnemonic**
X	32	fsbf
Y	32	fsbf
Z	32	fsbf
}		
DOFType {		
Tx	1	bslbf
Ty	1	bslbf
Tz	1	bslbf
Rx	1	bslbf
Ry	1	bslbf
Rz	1	bslbf
}		
WorkspaceType{		
Width	32	fsbf
Height	32	fsbf
Depth	32	fsbf
RotationX	32	fsbf
RotationY	32	fsbf
RotationZ	32	fsbf
}		

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5.14.4 Semantics

Semantics of the `KinestheticCapabilityType`:

Name	*Definition*
`KinestheticCapabilityType`	Tool for describing a kinesthetic device capability.
`MaximumTorqueFlag`	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.
`MaximumStiffnessFlag`	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

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Name	*Definition*
	be used and “0” means the attribute shall not be used.
forceUnitFlag	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.
torqueUnitFlag	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.
stiffnessUnitFlag	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.
numOfForceLevelsFlag	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.
numOfTorqueLevelsFlag	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.
numOfStiffnessLevelsFlag	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.
MaximumForce	Describes the maximum force that the device can provide stably for each axis. (N).
MaximumTorque	Describes the maximum torque referring maximum rotational force that the device can generate stably for each axis. (N-mm).
MaximumStiffness	Describes the maximum stiffness (rigidity) that the device can generate stably for each axis. (N/mm).
DOF	Describes the DOF (degree of freedom) of the device.
WorkSpace	Describes the workspace of the device. [e.g. width x height x depth (mm), three angles (degree)].
forceUnit	Specifies the unit of the description of maximumForce attribute as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1, if any unit other than N (Newton) is used. 1 N refers to a force that produces an acceleration of 1 m/s^2 for 1 kg mass. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.
torqueUnit	Specifies the unit of the description of maximumTorque attribute as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1, if any unit other than N-mm (Newton-millimetre) is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.
stiffnessUnit	Specifies the unit of the description of maximumTorque attribute as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1, if any unit other than N/mm (Newton per millimetre) is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003,

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Name	*Definition*
	7.6.
numOfForceLevels	Describes the number of intensity levels of force that the kinesthetic device can drive.
numOfTorqueLevels	Describes the number of intensity levels of torque that the kinesthetic device can drive.
numOfStiffnessLevels	Describes the number of intensity levels of stiffness that the kinesthetic device can drive.

Semantics of the DOFType:

Name	*Definition*
DOFType	Defines a degree of freedom that shows a kinesthetic device provides several single (independent) movements.
Tx	A Boolean values whether a kinesthetic device allows x directional independent translation or not.
Ty	A Boolean values whether a kinesthetic device allows y directional independent translation or not.
Tz	A Boolean values whether a kinesthetic device allows z directional independent translation or not.
Rx	A Boolean values whether a kinesthetic device allows x directional independent rotation or not.
Ry	A Boolean values whether a kinesthetic device allows y directional independent rotation or not.
Rz	A Boolean values whether a kinesthetic device allows z directional independent rotation or not.

Semantics of the workspaceType:

Name	*Definition*
WorkSpaceType	Defines ranges where a kinesthetic device can translate and rotate. According to DOF (degree of freedom), three translational values (width, height, and depth) in mm (millimetre) and three rotational values (roll, pitch, and yaw) in degree are defined.
Width	Defines a maximum range in the unit of mm (millimetre) that a kinesthetic device can translate in x-axis.
Height	Defines a maximum range in the unit of mm (millimetre) that a kinesthetic device can translate in y-axis.
Depth	Defines a maximum range in the unit of mm (millimetre) that a kinesthetic device can translate in z-axis.

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Name	*Definition*
RotationX	Defines a maximum range that a kinesthetic device can rotate in x-axis, Θ (pitch).
RotationY	Defines a maximum range that a kinesthetic device can rotate in y-axis, Ψ (yaw).
RotationZ	Defines a maximum range that a kinesthetic device can rotate in z-axis, φ (roll).

5.14.5 Examples

The following is an example of the KinestheticCapabilityType to indicate that the specified kinesthetic device can display. This example shows the description of kinesthetic device capabilities. This 3DOF kinesthetic device can support maximum force, F (3.3 N, 2.1 N, 2.7 N) and maximum stiffness, K (1.45 N/mm, 2.5 N/mm, 1.07 N/mm) and its workspace is 180 mm (width), 130 mm (height), and 80 mm (depth).

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:KinestheticCapabilityType"
forceUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:Newton"
torqueUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:Nmm"
stiffnessUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:Npmm"
numOfForceLevels="100" numOfTorqueLevels="100" numOfStiffnessLevels="100">
    <dcdv:MaximumForce>
        <mpegvct:X>3.3</mpegvct:X>
        <mpegvct:Y>2.1</mpegvct:Y>
        <mpegvct:Z>2.7</mpegvct:Z>
    </dcdv:MaximumForce>
    <dcdv:MaximumTorque>
        <mpegvct:X>1.0</mpegvct:X>
        <mpegvct:Y>1.0</mpegvct:Y>
        <mpegvct:Z>-1.0</mpegvct:Z>
    </dcdv:MaximumTorque>
    <dcdv:MaximumStiffness>
        <mpegvct:X>1.0</mpegvct:X>
        <mpegvct:Y>1.0</mpegvct:Y>
        <mpegvct:Z>-1.0</mpegvct:Z>
    </dcdv:MaximumStiffness>
    <dcdv:DOF>
        <dcdv:Tx>true</dcdv:Tx>
        <dcdv:Ty>true</dcdv:Ty>
        <dcdv:Tz>true</dcdv:Tz>
        <dcdv:Rx>false</dcdv:Rx>
        <dcdv:Ry>false</dcdv:Ry>
        <dcdv:Rz>false</dcdv:Rz>
    </dcdv:DOF>
    <dcdv:WorkSpace>
        <dcdv:Width>180</dcdv:Width>
        <dcdv:Height>130</dcdv:Height>
        <dcdv:Depth>80</dcdv:Depth>
        <dcdv:RotationX>0</dcdv:RotationX>
        <dcdv:RotationY>0</dcdv:RotationY>
        <dcdv:RotationZ>0</dcdv:RotationZ>
    </dcdv:WorkSpace>
</cidl:SensoryDeviceCapability>
```

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5.15 RigidBodyMotion capability type

5.15.1 General

This subclause specifies syntax and semantics of capabilities of motion generating devices.

5.15.2 XML representation syntax

```
<complexType name="RigidBodyMotionCapabilityType">
   <complexContent>
      <extension base="cidl:SensoryDeviceCapabilityBaseType">
         <sequence>
            <element name="MoveTowardCapability"
               type="dcdv:MoveTowardCapabilityType" minOccurs="0"/>
            <element name="InclineCapability" type="dcdv:InclineCapabilityType"
               minOccurs="0"/>
         </sequence>
      </extension>
   </complexContent>
</complexType>

<complexType name="MoveTowardCapabilityType">
   <attribute name="maxXDistance" type="float" use="optional"/>
   <attribute name="maxYDistance" type="float" use="optional"/>
   <attribute name="maxZDistance" type="float" use="optional"/>
   <attribute name="distanceUnit" type="mpegvct:unitType" use="optional"/>
   <attribute name="maxXSpeed" type="float" use="optional"/>
   <attribute name="maxYSpeed" type="float" use="optional"/>
   <attribute name="maxZSpeed" type="float" use="optional"/>
   <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
   <attribute name="maxXAccel" type="float" use="optional"/>
   <attribute name="maxYAccel" type="float" use="optional"/>
   <attribute name="maxZAccel" type="float" use="optional"/>
   <attribute name="accelUnit" type="mpegvct:unitType" use="optional"/>
   <attribute name="xDistanceLevels" type="nonNegativeInteger" use="optional"/>
   <attribute name="yDistanceLevels" type="nonNegativeInteger" use="optional"/>
   <attribute name="zDistanceLevels" type="nonNegativeInteger" use="optional"/>
   <attribute name="xSpeedLevels" type="nonNegativeInteger" use="optional"/>
   <attribute name="ySpeedLevels" type="nonNegativeInteger" use="optional"/>
   <attribute name="zSpeedLevels" type="nonNegativeInteger" use="optional"/>
   <attribute name="xAccelLevels" type="nonNegativeInteger" use="optional"/>
   <attribute name="yAccelLevels" type="nonNegativeInteger" use="optional"/>
   <attribute name="zAccelLevels" type="nonNegativeInteger" use="optional"/>
</complexType>

<complexType name="InclineCapabilityType">
   <attribute name="maxPitchAngle" type="mpegvct:InclineAngleType"
use="optional"/>
   <attribute name="maxYawAngle" type="mpegvct:InclineAngleType"
use="optional"/>
   <attribute name="maxRollAngle" type="mpegvct:InclineAngleType"
use="optional"/>
   <attribute name="maxPitchSpeed" type="float" use="optional"/>
   <attribute name="maxYawSpeed" type="float" use="optional"/>
   <attribute name="maxRollSpeed" type="float" use="optional"/>
   <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
   <attribute name="maxPitchAccel" type="float" use="optional"/>
   <attribute name="maxYawAccel" type="float" use="optional"/>
   <attribute name="maxRollAccel" type="float" use="optional"/>
   <attribute name="accelUnit" type="mpegvct:unitType" use="optional"/>
   <attribute name="pitchAngleLevels" type="nonNegativeInteger" use="optional"/>
```

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```
    <attribute name="yawAngleLevels" type="nonNegativeInteger" use="optional"/>
    <attribute name="rollAngleLevels" type="nonNegativeInteger" use="optional"/>
    <attribute name="pitchSpeedLevels" type="nonNegativeInteger" use="optional"/>
    <attribute name="yawSpeedLevels" type="nonNegativeInteger" use="optional"/>
    <attribute name="rollSpeedLevels" type="nonNegativeInteger" use="optional"/>
    <attribute name="pitchAccelLevels" type="nonNegativeInteger" use="optional"/>
    <attribute name="yawAccelLevels" type="nonNegativeInteger" use="optional"/>
    <attribute name="rollAccelLevels" type="nonNegativeInteger" use="optional"/>
</complexType>
```

5.15.3 Binary representation syntax

RigidBodyMotionCapabilityType {	**Number of bits**	**Mnemonic**
MoveTowardCapabilityFlag	1	bslbf
InclineCapabilityFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(MoveTowardCapabilityFlag){		
MoveTowardCapability		MoveTowardCapabilityType
}		
if(InclineCapabilityFlag){		
InclineCapability		InclineCapabilityType
}		
}		
MoveTowardCapabilityType {		
maxXDistanceFlag	1	bslbf
maxYDistanceFlag	1	bslbf
maxZDistanceFlag	1	bslbf
distanceUnitFlag	1	bslbf
maxXSpeedFlag	1	bslbf
maxYSpeedFlag	1	bslbf
maxZSpeedFlag	1	bslbf
speedUnitFlag	1	bslbf
maxXAccelFlag	1	bslbf
maxYAccelFlag	1	bslbf

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RigidBodyMotionCapabilityType {	**Number of bits**	**Mnemonic**
maxZAccelFlag	1	bslbf
accelUnitFlag	1	bslbf
xDistanceLevelsFlag	1	bslbf
yDistanceLevelsFlag	1	bslbf
zDistanceLevelsFlag	1	bslbf
xSpeedLevelsFlag	1	bslbf
ySpeedLevelsFlag	1	bslbf
zSpeedLevelsFlag	1	bslbf
xAccelLevelsFlag	1	bslbf
yAccelLevelsFlag	1	bslbf
zAccelLevelsFlag	1	bslbf
if(maxXDistanceFlag){		
maxXDistance	32	fsbf
}		
if(maxYDistanceFlag){		
maxYDistance	32	fsbf
}		
if(maxZDistanceFlag){		
maxZDistance	32	fsbf
}		
if(distanceUnitFlag){		
distanceUnit	8	bslbf
}		
if(maxXSpeedFlag){		
maxXSpeed	32	fsbf
}		
if(maxYSpeedFlag){		
maxYSpeed	32	fsbf
}		

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RigidBodyMotionCapabilityType {	**Number of bits**	**Mnemonic**
if(maxZSpeedFlag){		
maxZSpeed	32	fsbf
}		
if(speedUnitFlag){		
speedUnit	8	bslbf
}		
if(maxXAccelFlag){		
maxXAccel	32	fsbf
}		
if(maxYAccelFlag){		
maxYAccel	32	fsbf
}		
if(maxZAccelFlag){		
maxZAccel	32	fsbf
}		
if(accelUnitFlag){		
accelUnit	8	bslbf
}		
if(xDistanceLevelsFlag){		
xDistanceLevels	16	uimsbf
}		
if(yDistanceLevelsFlag){		
yDistanceLevels	16	uimsbf
}		
if(zDistanceLevelsFlag){		
zDistanceLevels	16	uimsbf
}		
if(xSpeedLevelsFlag){		

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RigidBodyMotionCapabilityType {	**Number of bits**	**Mnemonic**
xSpeedLevels	16	uimsbf
}		
if(ySpeedLevelsFlag){		
ySpeedLevels	16	uimsbf
}		
if(zSpeedLevelsFlag){		
zSpeedLevels	16	uimsbf
}		
if(xAccelLevelsFlag){		
xAccelLevels	16	uimsbf
}		
if(yAccelLevelsFlag){		
yAccelLevels	16	uimsbf
}		
if(zAccelLevelsFlag){		
zAccelLevels	16	uimsbf
}		
}		
InclineCapabilityType {		
maxPitchAngleFlag	1	bslbf
maxYawAngleFlag	1	bslbf
maxRollAngleFlag	1	bslbf
maxPitchSpeedFlag	1	bslbf
maxYawSpeedFlag	1	bslbf
maxRollSpeedFlag	1	bslbf
speedUnitFlag	1	bslbf
maxPitchAccelFlag	1	bslbf
maxYawAccelFlag	1	bslbf
maxRollAccelFlag	1	bslbf

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RigidBodyMotionCapabilityType {	**Number of bits**	**Mnemonic**
accelUnitFlag	1	bslbf
pitchAngleLevelsFlag	1	bslbf
yawAngleLevelsFlag	1	bslbf
rollAngleLevelsFlag	1	bslbf
pitchSpeedLevelsFlag	1	bslbf
yawSpeedLevelsFlag	1	bslbf
rollSpeedLevelsFlag	1	bslbf
pitchAccelLevelsFlag	1	bslbf
yawAccelLevelsFlag	1	bslbf
rollAccelLevelsFlag	1	bslbf
if(maxPitchAngleFlag){		
maxPitchAngle		InclineAngleType
}		
if(maxYawAngleFlag){		
maxYawAngle		InclineAngleType
}		
if(maxRollAngleFlag){		
maxRollAngle		InclineAngleType
}		
if(maxPitchSpeedFlag){		
maxPitchSpeed	32	fsbf
}		
if(maxYawSpeedFlag){		
maxYawSpeed	32	fsbf
}		
if(maxRollSpeedFlag){		
maxRollSpeed	32	fsbf
}		

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RigidBodyMotionCapabilityType {	**Number of bits**	**Mnemonic**
if(speedUnitFlag){		
speedUnit	8	bslbf
}		
if(maxPitchAccelFlag){		
maxPitchAccel	32	fsbf
}		
if(maxYawAccelFlag){		
maxYawAccel	32	fsbf
}		
if(maxRollAccelFlag){		
maxRollAccel	32	fsbf
}		
if(accelUnitFlag){		
accelUnit	8	bslbf
}		
if(pitchAngleLevelsFlag){		
pitchAngleLevels	16	uimsbf
}		
if(yawAngleLevelsFlag){		
yawAngleLevels	16	uimsbf
}		
if(rollAngleLevelsFlag){		
rollAngleLevels	16	uimsbf
}		
if(pitchSpeedLevelsFlag){		
pitchSpeedLevels	16	uimsbf
}		
if(yawSpeedLevelsFlag){		
yawSpeedLevels	16	uimsbf

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RigidBodyMotionCapabilityType {	**Number of bits**	**Mnemonic**
}		
if(rollSpeedLevelsFlag){		
rollSpeedLevels	16	uimsbf
}		
if(pitchAccelLevelsFlag){		
pitchAccelLevels	16	uimsbf
}		
if(yawAccelLevelsFlag){		
yawAccelLevels	16	uimsbf
}		
if(rollAccelLevelsFlag){		
rollAccelLevels	16	uimsbf
}		
}		

5.15.4 Semantics

Semantics of the `RigidBodyMotionCapabilityType` type:

Name	*Definition*
`RigidBodyMotionCapabilityType`	Tool for describing the capability of rigid body motion effect.
`MoveTowardCapabilityFlag`	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.
`InclineCapabilityFlag`	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.
`MoveTowardCapability`	Describes the capability for move toward motion effect.
`InclineCapability`	Describes the capability for Incline motion effect.

Semantics of the `MoveTowardCapabilityType` type:

Name	*Definition*

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Name	*Definition*
MoveTowardCapabilityType	Tool for describing a capability on move toward motion effect.
maxXDistanceFlag	This field, which is only present in the binary representation, signals the presence of the maxXDistance attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
maxYDistanceFlag	This field, which is only present in the binary representation, signals the presence of the maxYDistance attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
maxZDistanceFlag	This field, which is only present in the binary representation, signals the presence of the maxZDistance attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
distanceUnitFlag	This field, which is only present in the binary representation, signals the presence of the distanceUnit attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
maxXSpeedFlag	This field, which is only present in the binary representation, signals the presence of the maxXSpeed attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
maxYSpeedFlag	This field, which is only present in the binary representation, signals the presence of the maxYSpeed attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
maxZSpeedFlag	This field, which is only present in the binary representation, signals the presence of the maxZSpeed attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
speedUnitFlag	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.
maxXAccelFlag	This field, which is only present in the binary representation, signals the presence of the maxXAccel attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
maxYAccelFlag	This field, which is only present in the binary representation, signals the presence of the maxYAccel attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
maxZAccelFlag	This field, which is only present in the binary representation, signals the presence of the maxZAccel attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
accelUnitFlag	This field, which is only present in the binary representation, signals the presence of the accelUnit attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
xDistanceLevelsFlag	This field, which is only present in the binary representation, signals the presence of the xDistanceLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
yDistanceLevelsFlag	This field, which is only present in the binary representation, signals the presence of the yDistanceLevels attribute. A value of “1” means the

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Name	*Definition*
	attribute shall be used and “0” means the attribute shall not be used.
zDistanceLevelsFlag	This field, which is only present in the binary representation, signals the presence of the zDistanceLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
xSpeedLevelsFlag	This field, which is only present in the binary representation, signals the presence of the xSpeedLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
ySpeedLevelsFlag	This field, which is only present in the binary representation, signals the presence of the ySpeedLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
zSpeedLevelsFlag	This field, which is only present in the binary representation, signals the presence of the zSpeedLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
xAccelLevelsFlag	This field, which is only present in the binary representation, signals the presence of the xAccelLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
yAccelLevelsFlag	This field, which is only present in the binary representation, signals the presence of the yAccelLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
zAccelLevelsFlag	This field, which is only present in the binary representation, signals the presence of the zAccelLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
maxXDistance	Describes the maximum distance on x-axis that the device can provide in terms of centimetre. EXAMPLE The value “10” means the device can move maximum 10 cm on x-axis. NOTE The value “0” means the device cannot provide x-axis movement.
maxYDistance	Describes the maximum distance on y-axis that the device can provide in terms of centimetre.
maxZDistance	Describes the maximum distance on z-axis that the device can provide in terms of centimetre.
distanceUnit	Specifies the unit of the description of MaxXDistance, MaxYDistance, and MaxZDistance attributes as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1, if any unit other than cm (centimetre) is used. These three attributes shall have the same unit. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.
maxXSpeed	Describes the maximum speed on x-axis that the device can provide in terms of centimetre per second.
maxYSpeed	Describes the maximum speed on y-axis that the device can provide in terms of centimetre per second.

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Name	*Definition*
maxZSpeed	Describes the maximum speed on z-axis that the device can provide in terms of centimetre per second.
speedUnit	Specifies the unit of the description of MaxXSpeed, MaxYSpeed, and MaxZSpeed attributes as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6, A.2.1, if any unit other than cm/s (centimetre per second) is used. These three attributes shall have the same unit. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.
maxXAccel	Describes the maximum acceleration on x-axis that the device can provide in terms of centimetre per second square.
maxYAccel	Describes the maximum acceleration on y-axis that the device can provide in terms of centimetre per second square.
maxZAccel	Describes the maximum acceleration on z-axis that the device can provide in terms of centimetre per second square.
accelUnit	Specifies the unit of the description of MaxXAccel, MaxYAccel, and MaxZAccel attributes as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1, if any unit other than cm/s^2 (centimetre per second square) is used. These three attributes shall have the same unit. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.
xDistancelevels	Describes the number of distance levels that the device can provide in between maximum and minimum distance on x-axis. EXAMPLE The value “5” means the device can provide 5 steps from minimum to maximum distance in x-axis.
yDistancelevels	Describes the number of distance levels that the device can provide in between maximum and minimum distance on y-axis.
zDistancelevels	Describes the number of distance levels that the device can provide in between maximum and minimum distance on z-axis.
xSpeedLevels	Describes the number of speed levels that the device can provide in between maximum and minimum speed on x-axis.
ySpeedLevels	Describes the number of speed levels that the device can provide in between maximum and minimum speed on y-axis.
zSpeedLevels	Describes the number of speed levels that the device can provide in between maximum and minimum speed on z-axis.
xAccelLevels	Describes the number of acceleration that the device can provide in between maximum and minimum acceleration on x-axis.
yAccelLevels	Describes the number of acceleration that the device can provide in between maximum and minimum acceleration on y-axis.

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Name	*Definition*
zAccelLevels	Describes the number of acceleration that the device can provide in between maximum and minimum acceleration on z-axis.

Semantics of the InclineCapabilityType:

Name	*Definition*
InclineCapabilityType	Tool for describing a capability on motion chair incline effect.
maxPitchAngleFlag	This field, which is only present in the binary representation, signals the presence of the maxPitchAngle attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxYawAngleFlag	This field, which is only present in the binary representation, signals the presence of the maxYawAngle attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxRollAngleFlag	This field, which is only present in the binary representation, signals the presence of the maxRollAngle attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxPitchSpeedFlag	This field, which is only present in the binary representation, signals the presence of the maxPitchSpeed attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxYawSpeedFlag	This field, which is only present in the binary representation, signals the presence of the maxYawSpeed attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxRollSpeedFlag	This field, which is only present in the binary representation, signals the presence of the maxRollSpeed attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
speedUnitFlag	This field, which is only present in the binary representation, signals the presence of the speedUnit attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxPitchAccelFlag	This field, which is only present in the binary representation, signals the presence of the maxPitchAccel attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxYawAccelFlag	This field, which is only present in the binary representation, signals the presence of the maxYawAccel attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxRollAccelFlag	This field, which is only present in the binary representation, signals the presence of the maxRollAccel attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
accelUnitFlag	This field, which is only present in the binary representation, signals the presence of the accelUnit attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

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Name	*Definition*
pitchAngleLevelsFlag	This field, which is only present in the binary representation, signals the presence of the pitchAngleLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
yawAngleLevelsFlag	This field, which is only present in the binary representation, signals the presence of the yawAngleLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
rollAngleLevelsFlag	This field, which is only present in the binary representation, signals the presence of the rollAngleLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
pitchSpeedLevelsFlag	This field, which is only present in the binary representation, signals the presence of the pitchSpeedLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
yawSpeedLevelsFlag	This field, which is only present in the binary representation, signals the presence of the yawSpeedLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
rollSpeedLevelsFlag	This field, which is only present in the binary representation, signals the presence of the rollSpeedLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
pitchAccelLevelsFlag	This field, which is only present in the binary representation, signals the presence of the pitchAccelLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
yawAccelLevelsFlag	This field, which is only present in the binary representation, signals the presence of the yawAccelLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
rollAccelLevelsFlag	This field, which is only present in the binary representation, signals the presence of the rollAccelLevels attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
maxPitchAngle	Describes the maximum angle of x-axis rotation in degrees that the device can provide. NOTE The rotation angle is increased with counterclockwise.
maxYawAngle	Describes the maximum angle of y-axis rotation in degrees that the device can provide. NOTE The rotation angle is increased with counterclockwise.
maxRollAngle	Describes the maximum angle of z-axis rotation in degrees that the device can provide. NOTE The rotation angle is increased with counterclockwise.
maxPitchSpeed	Describes the maximum speed of x-axis rotation that the device can provide in terms of degree per second.
maxYawSpeed	Describes the maximum speed of y-axis rotation that the device can provide in terms of degree per second.

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Name	*Definition*
maxRollSpeed	Describes the maximum speed of z-axis rotation that the device can provide in terms of degree per second.
speedUnit	Specifies the common unit of the description of maxPitchSpeed, maxYawSpeed, and maxRollSpeed attributes as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1, if any unit other than degree per second is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.
maxPitchAccel	Describes the maximum acceleration of x-axis rotation that the device can provide in terms of degree per second square.
maxYawAccel	Describes the maximum acceleration of y-axis rotation that the device can provide in terms of degree per second square.
maxRollAccel	Describes the maximum acceleration of z-axis rotation that the device can provide in terms of degree per second square.
accelUnit	Specifies the common unit of the description of maxPitchAccel, maxYawAccel, and maxRollAccel attributes as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1, if any unit other than degree per second square is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.
pitchAngleLevels	Describes the number of rotation angle levels that the device can provide in between maximum and minimum angle of x-axis rotation. EXAMPLE The value “5” means the device can provide 5 steps from minimum to maximum rotation angle on x-axis.
yawAngleLevels	Describes the number of rotation angle levels that the device can provide in between maximum and minimum angle of y-axis rotation.
rollAngleLevels	Describes the number of rotation angle levels that the device can provide in between maximum and minimum angle of z-axis rotation.
pitchSpeedLevels	Describes the number of rotation speed levels that the device can provide in between maximum and minimum speed of x-axis rotation. EXAMPLE The value “5” means the device can provide 5 steps from minimum to maximum rotation angle on x-axis.
yawSpeedLevels	Describes the number of rotation speed levels that the device can provide in between maximum and minimum speed of y-axis rotation.
rollSpeedLevels	Describes the number of rotation speed levels that the device can provide in between maximum and minimum speed of z-axis rotation.
pitchAccelLevles	Describes the number of rotation acceleration levels that the device can provide in between maximum and minimum acceleration of x-axis rotation.
yawAccelLevles	Describes the number of rotation acceleration levels that the device can provide in between maximum and minimum acceleration of y-axis rotation.

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Name	*Definition*
`rollAccelLevles`	Describes the number of rotation acceleration levels that the device can provide in between maximum and minimum acceleration of z-axis rotation.

5.15.5 Examples

This example shows the description of a `RigidbodyMotion` capability. This device can move maximum 20 cm on x- and y-axis. The maximum moving speed of example device on x-axis, y-axis is 10 cm/s and z-axis is 0. Also, the maximum acceleration on x-axis, y-axis is 1 cm/s^2 and z-axis is 0. That is, example device can not move on z-axis. x speed level and acceleration level is “10” and “5”, y speed level and acceleration level is “5”, respectively. This device can also rotate 180° and 90° on x-axis and y-axis. The maximum rotation speed of example device on x-axis, y-axis is 10°/s and z-axis is 0. Also, the maximum acceleration on x-axis, y-axis is 2°/s^2 and z-axis is 0. That is, example device can not rotate on z-axis. x speed level and acceleration level is “1”, y speed level and acceleration level is “1”.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:RigidBodyMotionCapabilityType">
<dcdv:MoveTowardCapability    maxXAccel="1"    maxXSpeed="10"    maxXDistance="20"
maxYAccel="1"    maxYSpeed="10"  maxYDistance="20"  maxZAccel="0"  maxZSpeed="0"
maxZDistance="0"    xAccelLevels="5"    xDistanceLevels="20"    xSpeedLevels="10"
yAccelLevels="5"    yDistanceLevels="20"    ySpeedLevels="20"    zAccelLevels="0"
zDistanceLevels="0"    zSpeedLevels="0"    distanceUnit="urn:mpeg:mpeg-v:01-CI-
UnitTypeCS-NS:cm"        speedUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:cmpersec"
accelUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:cmpersecsquared"/>
<dcdv:InclineCapability maxPitchAccel="2" maxPitchAngle="180" maxPitchSpeed="10"
maxYawAccel="2"      maxYawAngle="90"      maxYawSpeed="10"      maxRollAccel="0"
maxRollAngle="0"   maxRollSpeed="0"   pitchAccelLevels="1"   pitchAngleLevels="1"
pitchSpeedLevels="1"   yawAccelLevels="1"   yawAngleLevels="1"   yawSpeedLevels="1"
rollAccelLevels="0"            rollAngleLevels="0"            rollSpeedLevels="0"
speedUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:degpersec"
accelUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:degpersecsquared"/>
</cidl:SensoryDeviceCapability>
```

5.16 Mobile device position capability type

5.16.1 General

This subclause specifies syntax and semantics of capability description including the description of the region within which a moving device can navigate.

5.16.2 XML representation syntax

```
<complexType name="MobileDevicePositionCapabilityType">
   <complexContent>
      <extension base="cidl:SensoryDeviceCapabilityBaseType">
         <sequence>
            <element name="Boundary" type="dcdv:PhysicalSpaceBoundingBoxType"/>
         </sequence>
<!-- Precision -->
         <attribute name="numOfLongitudeLevels" type="nonNegativeInteger"
use="optional"/>
         <attribute name="numOfLatitudeLevels" type="nonNegativeInteger"
use="optional"/>
         <attribute name="numOfAltitudeLevels" type="nonNegativeInteger"
use="optional"/>
      </extension>
```

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```
    </complexContent>
</complexType>

<complexType name="PhysicalSpaceBoundingBoxType">
    <sequence>
        <element name="Longitude">
            <complexType>
                <attribute name="lowerBound" use="optional" default="-180.0">
                    <simpleType>
                        <restriction base="double">
                            <minInclusive value="-180.0"/>
                            <maxInclusive value=”180.0"/>
                        </restriction>
                    </simpleType>
                </attribute>
                <attribute name="upperBound" use="optional" default=”180.0">
                    <simpleType>
                        <restriction base="double">
                            <minInclusive value="-180.0"/>
                            <maxInclusive value=”180.0"/>
                        </restriction>
                    </simpleType>
                </attribute>
            </complexType>
        </element>
        <element name="Latitude">
            <complexType>
                <attribute name="lowerBound" use="optional" default="-90.0">
                    <simpleType>
                        <restriction base="double">
                            <minInclusive value="-90.0"/>
                            <maxInclusive value="90.0"/>
                        </restriction>
                    </simpleType>
                </attribute>
                <attribute name="upperBound" use="optional" default="90.0">
                    <simpleType>
                        <restriction base="double">
                            <minInclusive value="-90.0"/>
                            <maxInclusive value="90.0"/>
                        </restriction>
                    </simpleType>
                </attribute>
            </complexType>
        </element>
        <element name="Altitude">
            <complexType>
                <attribute name="lowerBound" type="double" use="optional"
default=”0.0"/>
                <attribute name="upperBound" type="double" use="optional"/>
                <attribute name="unit" type="mpegvct:unitType" use="optional"/>
            </complexType>
        </element>
    </sequence>
</complexType>
```

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5.16.3 Binary representation syntax

MobileDevicePositionCapabilityType {	**Number of bits**	**Mnemonic**

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numOfLongitudeLevelsFlag	**1**	**bsblf**
numOfLatitudeLevelsFlag	**1**	**bsblf**
numOfAltitudeLevelsFlag	**1**	**bsblf**
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
Boundary		PhysicalSpaceBoundingBoxType
if(numOfLongitudeLevelsFlag){		
numOfLongitudeLevels	32	uimsbf
}		
if(numOfLatitudeLevelsFlag){		
numOfLatitudeLevels	32	uimsbf
}		
if(numOfAltitudeLevelsFlag){		
numOfAltitudeLevels	32	uimsbf
}		
}		
PhysicalSpaceBoundingBoxType {		
longitudeUpperBoundFlag	1	bsblf
longitudeLowerBoundFlag	1	bsblf
latitudeUpperBoundFlag	1	bsblf
latitudeLowerBoundFlag	1	bsblf
altitudeUpperBoundFlag	1	bsblf
altitudeLowerBoundFlag	1	bsblf
altitudeUnitFlag	1	bsblf
if(longitudeUpperBoundFlag) {		
longitudeUpperBound	32	fsfb
}		
if(longitudeLowerBoundFlag) {		
longitudeLowerBound	32	fsfb
}		
if(latitudeUpperBoundFlag) {		

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latitudeUpperBound	32	fsfb
}		
if(latitudeLowerBoundFlag) {		
latitudeLowerBound	32	fsfb
}		
if(altitudeUpperBoundFlag) {		
altitudeUpperBound	32	fsfb
}		
if(altitudeLowerBoundFlag) {		
altitudeLowerBound	32	fsfb
}		
if(altitudeUnitFlag) {		
altitudeUnit	8	bslbf
}		
}		

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5.16.4 Semantics

Semantics of the `MobileDevicePositionCapabilityType`:

Names	*Description*
`MobileDevicePositionCapability Type`	Tool for describing capabilities of a mobile device which can move to a destination given as a position in the global positioning system, i.e. in longitude, latitude, and altitude above sea level.
`zerothOrderDelayTime`	Describes required preparation time of the mobile device to be activated since it receives a command in the unit of millisecond (ms).
`firstOrderDelayTime`	Describes the delay time for a mobile device to reach the crusing speed since it receives a command and is activated in the unit of millisecond (ms).
`location`	Does not have any specific semantics in this description.
`Boundary`	Describes the destination position where the mobile device can reach in forms of three-dimensional bounding box, specified by using `PhysicalSpaceBoundingBoxType`.
`numOfLongitudeLevelsFlag`	This field, which is only present in the binary representation, indicates if the optional attribute of `numOfLongitudeLevels` is present in this instance of the description.

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Names	*Description*
numOfLongitudeLevels	Describes the number of longitude levels that the device can provide in between upper bound and lower bound longitude positions.
numOfLatitudeLevelsFlag	This field, which is only present in the binary representation, indicates if the optional attribute of numOfLatitudeLevels is present in this instance of the description.
numOfLatitudeLevels	Describes the number of latitude levels that the device can provide in between upper bound and lower bound latitude positions.
numOfAltitudeLevelsFlag	This field, which is only present in the binary representation, indicates if the optional attribute of numOfAltitudeLevels is present in this instance of the description.
numOfAltitudeLevels	Describes the number of altitude levels that the device can provide in between upper bound and lower bound altitude positions.
unit	Does not have any specific semantics in this description.
longitudeUpperBoundFlag	This field, which is only present in the binary representation, indicates if the optional attribute of upperBound of Longitude element is present in this instance of the description.
longitudeLowerBoundFlag	This field, which is only present in the binary representation, indicates if the optional attribute of lowerBound of Longitude element is present in this instance of the description.
latitudeUpperBoundFlag	This field, which is only present in the binary representation, indicates if the optional attribute of upperBound of Latitude element is present in this instance of the description.
latitudeLowerBoundFlag	This field, which is only present in the binary representation, indicates if the optional attribute of lowerBound of Latitude element is present in this instance of the description.
altitudeUpperBoundFlag	This field, which is only present in the binary representation, indicates if the optional attribute of upperBound of Altitude element is present in this instance of the description.
altitudeLowerBoundFlag	This field, which is only present in the binary representation, indicates if the optional attribute of lowerBound of Altitude element is present in this instance of the description.
altitudeUnitFlag	This field, which is only present in the binary representation, indicates if the optional attribute of unit of Altitude element is present in this instance of the description.
PhysicalSpaceBoundingBoxType	Describes a bounding box in a physical space using longitude, latitude, and altitude.
Longitude	Describes lower bound and upper bound of longitude for the bounding box that the mobile device can reach.
lowerBound	Lower bound of longitude given in degrees. Positive number represents eastern longitude and the negative number represents western longitude.

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Names	*Description*
upperBound	Upper bound of longitude given in degrees. Positive number represents eastern longitude and the negative number represents western longitude.
Latitude	Describes lower bound and upper bound of latitude for the bounding box that the mobile device can reach.
lowerBound	Lower bound of latitude given in degrees. Positive number represents nothern latitude and the negative number represents southern latitude.
upperBound	Upper bound of latitude given in degrees. Positive number represents nothern latitude and the negative number represents southern latitude.
Altitude	Describes lower bound and upper bound of altitude for the bounding box that the mobile device can reach.
lowerBound	Lower bound of altitude above sea level given in metres. The default is zero.
upperBound	Upper bound of altitude above sea level given in metres.
unit	Specifies the unit of the lowerBound and upperBound of altitude, if a unit other than metre is used, as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1.

5.16.5 Examples

The following example shows the capability description of a mobile device with ID “mobile1”, which can move from 127° East to 132° East in longitude, from 32° North to 45° North in latitude, and from 10 m to 1 200 m above sea level.

```
<cidl:SensoryDeviceCapability  xsi:type="dcdv:MobileDevicePositionCapabilityType"
id="mobile1">
   <dcdv:Boundary>
      <dcdv:Longitude upperBound=”132" lowerBound=”127"/>
      <dcdv:Latitude upperBound="45" lowerBound="32"/>
      <dcdv:Altitude upperBound=”1200" lowerBound=”10" unit="urn:mpeg:mpeg-v:01-
CI-UnitTypeCS-NS:meter"/>
   </dcdv:Boundary>
</cidl:SensoryDeviceCapability>
```

5.17 Bubble capability type

5.17.1 General

This subclause specifies syntax and semantics of capabilities of bubble generating devices.

5.17.2 XML representation syntax

```
<complexType name="BubbleCapabilityType">
  <complexContent>
  <extension base="cidl:SensoryDeviceCapabilityBaseType">
```

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```
  <attribute name="flag" type="boolean" use="optional" default="false"/>
    </extension>
  </complexContent>
</complexType>
```

5.17.3 Binary representation syntax

BubbleCapabilityType {	Number of Bits	Mnemonic
flagFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(flagFlag) {		
flag	1	bslbf
}		
}		

5.17.4 Semantics

Semantics of the `BubbleCapabilityType`:

Name	*Definition*
`BubbleCapabilityType`	Tool for describing if the given device has a bubble capability.
`flagFlag`	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.
`flag`	Describes the existence of the bubble capability of the given device in terms of “true” and “false”.

5.17.5 Examples

This example shows the description of a bubble capability with the following semantics. Since the flag is “true”, the device “bubble1” is equipped with a capability of bubble.

```
<cidl:SensoryDeviceCapability   xsi:type="dcdv:BubbleCapabilityType"   flag="true"
id="bubble1"/>
```

6 Sensor capability description vocabulary

6.1 General

This Clause describes syntax and semantics of the sensor capability description vocabulary which comprises the following sensors:

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— light sensor;

— ambient noise sensor;

— temperature sensor;

— humidity sensor;

— distance sensor;

— atmospheric pressure sensor;

— position sensor;

— velocity sensor;

— acceleration sensor;

— orientation sensor;

— angular velocity sensor;

— angular acceleration sensor;

— force sensor;

— torque sensor;

— pressure sensor;

— motion sensor;

— intelligent camera sensor;

— bend sensor;

— gas sensor;

— dust sensor;

— multi interaction point sensor;

— gaze tracking sensor;

— global position sensor;

— altitude sensor;

— weather sensor;

— camera sensor;

— proximity sensor;

— body weight sensor;

— engine oil temperature sensor;

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— intake air temperature sensor;

— tire pressure monitor system sensor;

— distance traveled sensor;

— speed sensor;

— vehicle speed sensor;

— mass air flow sensor;

— fuel level sensor;

— manifold absolute pressure sensor;

— EngineRPM sensor.

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

6.2 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: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:scdv="urn:mpeg:mpeg-v:2016:01-SCDV-NS"
targetNamespace="urn:mpeg:mpeg-v:2016:01-SCDV-NS" elementFormDefault="qualified"
attributeFormDefault="unqualified" version="ISO/IEC 23005-2" id="MPEG-V-
SCDV.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-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>
```

6.3 Light sensor capability type

6.3.1 General

This subclause specifies syntax and semantics of light sensor capabilities.

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6.3.2 XML representation syntax

```
<complexType name="LightSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <sequence>
            <element name="Color" type="mpegvct:colorType" minOccurs="0"
               maxOccurs="unbounded"/>
            <element name="Location" type="mpegvct:Float3DVectorType"
               minOccurs="0"/>
         </sequence>
      </extension>
   </complexContent>
</complexType>
```

6.3.3 Binary representation syntax

LightSensorCapabilityType {	**Number of bits**	**Mnemonic**
ColorFlag	1	bslbf
LocationFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(ColorFlag){		
LoopColor		vluimsbf5
for(k=0;k<LoopColor;k++){		
Color[k]		ColorType
}		
}		
if(LocationFlag){		
Location		Float3DVectorType
}		
}		
Float3DVectorType {		
X	32	fsbf
Y	32	fsbf
Z	32	fsbf
}		

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6.3.4 Semantics

Semantics of the `LightSensorCapabilityType` type:

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Name	*Definition*
`LightSensorCapabilityType`	Tool for describing a light sensor capability.
`ColorFlag`	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.
`LocationFlag`	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.
`maxValue`	Describes the maximum value that the light sensor can perceive in terms of LUX.
`minValue`	Describes the minimum value that the light sensor can perceive in terms of LUX.
`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 either as a reference to a classification scheme term or as RGB value. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6. 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.
`Location`	Describes the location of the device from the global coordinate system according to the x-, y-, and z-axis in the unit of metre (m).

6.3.5 Examples

This example shows the description of a light sensing capability with the following semantics. The sensor has an ID of "LS001" and the maximum value shall be 400 (LUX) and the minimum value shall be 0 (LUX) with the resolution of 50 levels. The accuracy of the sensor is 10.0 (LUX). The offset of sensor is 1.5 (LUX). The sensor shall detect the color, #FF0000. The sensed information is received at the location of (1.00, 1.00, -1.00).

```
<cidl:SensorDeviceCapability xsi:type="scdv:LightSensorCapabilityType" id="LS001"
maxValue="400" minValue="0" numOfLevels="50" offset="1.5">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="10.0"/>
      <scdv:Color>#FF0000</scdv:Color>
      <scdv:Location>
         <mpegvct:X>1.0</mpegvct:X>
         <mpegvct:Y>1.0</mpegvct:Y>
         <mpegvct:Z>-1.0</mpegvct:Z>
      </scdv:Location>
</cidl:SensorDeviceCapability>
```

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6.4 Ambient noise sensor capability type

6.4.1 General

This subclause specifies syntax and semantics of ambient noise sensor capabilities.

6.4.2 XML representation syntax

```
<complexType name="AmbientNoiseSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <sequence>
            <element name="Location" type="mpegvct:Float3DVectorType"
               minOccurs="0"/>
         </sequence>
      </extension>
   </complexContent>
</complexType>
```

6.4.3 Binary representation syntax

AmbientNoiseSensorCapabilityType {	**Number of bits**	**Mnemonic**
LocationFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(LocationFlag){		
Location		Float3DVectorType
}		
}		

6.4.4 Semantics

Semantics of the `AmbientNoiseSensorCapabilityType` type:

Name	*Definition*
`AmbientNoiseSensorCapabilityType`	Tool for describing an ambient noise sensor capability.
`LocationFlag`	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.
`maxValue`	Describes the maximum value that the ambient noise sensor can perceive in terms of decibel (dB).
`minValue`	Describes the minimum value that the ambient noise sensor can perceive in terms of decibel (dB).

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Name	*Definition*
`Location`	Describes the location of the device from the global coordinate system according to the x-, y-, and z-axis in the unit of metre (m).

6.4.5 Examples

This example shows the description of an ambient noise sensing capability with the following semantics. The sensor has an ID of “ANS001” and the maximum value shall be 200 (dB) and the minimum value shall be -100 (dB) with the resolution of 600 levels. The accuracy of the sensor is 0.5 (dB), the offset of sensor is 0.1 (dB). The sensed information is received at the location of (1.00, 1.00, -1.00).

```
<cidl:SensorDeviceCapability     xsi:type="scdv:AmbientNoiseSensorCapabilityType"
id="ANS001" maxValue="200" minValue="-100" numOfLevels="600" offset="0.1">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.5"/>
   <scdv:Location>
      <mpegvct:X>1.0</mpegvct:X>
      <mpegvct:Y>1.0</mpegvct:Y>
      <mpegvct:Z>-1.0</mpegvct:Z>
   </scdv:Location>
</cidl:SensorDeviceCapability>
```

6.5 Temperature sensor capability type

6.5.1 General

This subclause specifies syntax and semantics of temperature sensor capabilities.

6.5.2 XML representation syntax

```
<complexType name="TemperatureSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <sequence>
            <element name="Location" type="mpegvct:Float3DVectorType"
               minOccurs="0"/>
         </sequence>
      </extension>
   </complexContent>
</complexType>
```

6.5.3 Binary representation syntax

TemperatureSensorCapabilityType {	**Number of bits**	**Mnemonic**
LocationFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(LocationFlag){		
Location		Float3DVectorType

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}		
}		

6.5.4 Semantics

Semantics of the `TemperatureSensorCapabilityType` type:

Name	*Definition*
`TemperatureSensorCapabilityType`	Tool for describing a temperature sensor capability.
`LocationFlag`	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.
`maxValue`	Describes the maximum value that the temperature sensor can perceive in the unit of Celsius (or Fahrenheit).
`minValue`	Describes the minimum value that the temperature sensor can perceive in the unit of Celsius (or Fahrenheit).
`Location`	Describes the location of the device from the global coordinate system according to the x-, y-, and z-axis in the unit of metre (m).

6.5.5 Examples

This example shows the description of a temperature sensing capability with the following semantics. The sensor has an ID of "TS001" and the maximum value shall be 120 (°C) and the minimum value shall be -20 (°C) with the resolution of 1 400 levels. The accuracy of the sensor is 0.1 (°C). The offset of sensor is 1.0 (°C). The sensed information is received at the location of (1.00, 1.00, -1.00).

```
<cidl:SensorDeviceCapability xsi:type="scdv:TemperatureSensorCapabilityType"
id="TS001" maxValue="120" minValue="-20" numOfLevels="1400" offset="1.0"
unit="celsius">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
   <scdv:Location>
      <mpegvct:X>1.0</mpegvct:X>
      <mpegvct:Y>1.0</mpegvct:Y>
      <mpegvct:Z>-1.0</mpegvct:Z>
   </scdv:Location>
</cidl:SensorDeviceCapability>
```

6.6 Humidity sensor capability type

6.6.1 General

This subclause specifies syntax and semantics of humidity sensor capabilities.

6.6.2 XML representation syntax

```
<complexType name="HumiditySensorCapabilityType">
```

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```
    <complexContent>
       <extension base="cidl:SensorCapabilityBaseType">
          <sequence>
             <element name="Location" type="mpegvct:Float3DVectorType"
                minOccurs="0"/>
          </sequence>
       </extension>
    </complexContent>
</complexType>
```

6.6.3 Binary representation syntax

HumiditySensorCapabilityType {	**Number of bits**	**Mnemonic**
LocationFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(LocationFlag){		
Location		Float3DVectorType
}		
}		

6.6.4 Semantics

Semantics of the `HumiditySensorCapabilityType` type:

Name	*Definition*
`HumiditySensorCapabilityType`	Tool for describing a humidity sensor capability.
`LocationFlag`	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.
`maxValue`	Describes the maximum value that the humidity sensor can perceive in the unit of percentage.
`minValue`	Describes the minimum value that the humidity sensor can perceive in the unit of percentage.
`Location`	Describes the location of the device from the global coordinate system according to the x-, y-, and z-axis in the unit of metre (m).

6.6.5 Examples

This example shows the description of a humidity sensing capability with the following semantics. The sensor has an ID of "HS001" and the maximum value shall be 100 (%) and the minimum value shall be 0 (%) with the resolution of 1 000 levels. The accuracy of the sensor is 0.1 (%). The offset of sensor is 1.0 (%). The sensed information is received at the location of (1.00, 1.00, -1.00).

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```
<cidl:SensorDeviceCapability          xsi:type="scdv:HumiditySensorCapabilityType"
id="HS001" maxValue="100" minValue="0" numOfLevels="1000" offset="1.0">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
   <scdv:Location>
      <mpegvct:X>1.0</mpegvct:X>
      <mpegvct:Y>1.0</mpegvct:Y>
      <mpegvct:Z>-1.0</mpegvct:Z>
   </scdv:Location>
</cidl:SensorDeviceCapability>
```

6.7 Distance sensor capability type

6.7.1 General

This subclause specifies syntax and semantics of distance sensor capabilities.

6.7.2 XML representation syntax

```
<complexType name="DistanceSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <sequence>
            <element name="Location" type="mpegvct:Float3DVectorType"
               minOccurs="0"/>
         </sequence>
      </extension>
   </complexContent>
</complexType>
```

6.7.3 Binary representation syntax

DistanceSensorCapabilityType {	**Number of bits**	**Mnemonic**
LocationFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(LocationFlag){		
Location		Float3DVectorType
}		
}		

6.7.4 Semantics

Semantics of the `DistanceSensorCapabilityType` type:

Name	*Definition*
`DistanceSensorCapabilityType`	Tool for describing a distance sensor capability.

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Name	*Definition*
LocationFlag	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.
maxValue	Describes the maximum value that the distance sensor can perceive in the unit of metre.
minValue	Describes the minimum value that the distance sensor can perceive in the unit of metre.
Location	Describes the location of the device from the global coordinate system according to the x-, y-, and z-axis in the unit of metre (m).

6.7.5 Examples

This example shows the description of a distance sensing capability with the following semantics. The sensor has an ID of “DS001” and the maximum value shall be 10 (m) and the minimum value shall be 0 (m) with the resolution of 1 000 levels. The accuracy of the sensor is 0.01 (m). The offset of sensor is 0.1 (m). The sensed information is received at the location of (1.00, 1.00, -1.00).

```
<cidl:SensorDeviceCapability          xsi:type="scdv:DistanceSensorCapabilityType"
id="DS001" maxValue=”10" minValue=”0" numOfLevels=”1000" offset=”0.1">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value=”0.01"/>
   <scdv:Location>
      <mpegvct:X>1.0</mpegvct:X>
      <mpegvct:Y>1.0</mpegvct:Y>
      <mpegvct:Z>-1.0</mpegvct:Z>
   </scdv:Location>
</cidl:SensorDeviceCapability>
```

6.8 Atmospheric pressure sensor capability type

6.8.1 General

This subclause specifies syntax and semantics of atmospheric pressure sensor capabilities.

6.8.2 XML representation syntax

```
<complexType name="AtmosphericPressureSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <sequence>
            <element name="Location" type="mpegvct:Float3DVectorType"
               minOccurs=”0"/>
         </sequence>
      </extension>
   </complexContent>
</complexType>
```

6.8.3 Binary representation syntax

AtmosphericPressureSensorCapabilityType {	**Number of bits**	**Mnemonic**
LocationFlag	1	bslbf

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SensorCapabilityBase		SensorCapabilityBaseType
if(LocationFlag){		
Location		Float3DVectorType
}		
}		

6.8.4 Semantics

Semantics of the `AtmosphericPressureSensorCapabilityType` type:

Name	*Definition*
`AtmosphericPressure SensorCapabilityType`	Tool for describing an atmospheric pressure sensor capability.
`LocationFlag`	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.
`maxValue`	Describes the maximum value that the atmospheric pressure sensor can perceive in the unit of hectopascal (hPa).
`minValue`	Describes the minimum value that the atmospheric pressure sensor can perceive in the unit of hectopascal (hPa).
`Location`	Describes the location of the device from the global coordinate system according to the x-, y-, and z-axis.

6.8.5 Examples

This example shows the description of an atmospheric pressure sensing capability with the following semantics. The sensor has an ID of “APS001” and the maximum value shall be 1 075 (hPa) and the minimum value shall be 910 (hPa) with the resolution of 1 650 levels. The accuracy of the sensor is 0.1 (hPa). The offset of sensor is 1.0 (hPa). The sensed information is received at the location of (1.00, 1.00, -1.00).

```
<cidl:SensorDeviceCapability
xsi:type="scdv:AtmosphericPressureSensorCapabilityType"                id="APS001"
maxValue="1075.0" minValue="910.0" numOfLevels="1650" offset="1.0">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
   <scdv:Location>
      <mpegvct:X>1.0</mpegvct:X>
      <mpegvct:Y>1.0</mpegvct:Y>
      <mpegvct:Z>-1.0</mpegvct:Z>
   </scdv:Location>
</cidl:SensorDeviceCapability>
```

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6.9 Position sensor capability type

6.9.1 General

This subclause specifies syntax and semantics of position sensor capabilities.

6.9.2 XML representation syntax

```
<complexType name="PositionSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <sequence>
            <element name="Range" type="scdv:RangeType"/>
         </sequence>
      </extension>
   </complexContent>
</complexType>

<complexType name="RangeType">
   <sequence>
      <element name="XminValue" type="float"/>
      <element name="XmaxValue" type="float"/>
      <element name="YminValue" type="float"/>
      <element name="YmaxValue" type="float"/>
      <element name="ZminValue" type="float"/>
      <element name="ZmaxValue" type="float"/>
   </sequence>
</complexType>
```

6.9.3 Binary representation syntax

PositionSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapabilityBase		SensorCapabilityBaseType
Range		RangeType
}		
RangeType {		
XminValue	32	fsbf
XmaxValue	32	fsbf
YminValue	32	fsbf
YmaxValue	32	fsbf
ZminValue	32	fsbf
ZmaxValue	32	fsbf
}		

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6.9.4 Semantics

Semantics of the `PositionSensorCapabilityType` type:

Name	*Definition*
`PositionSensorCapabilityType`	Tool for describing a position sensor capability.
`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 `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1, if a unit other than the default unit specified in the semantics of the `XmaxValue/YmaxValue/ZmaxValue` and `XminValue/YminValue/ZminValue` is used. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6.
`Range`	Describes the range that the position sensor can perceive in terms of RangeType in its global coordinate system. NOTE The `minValue` and the `maxValue` in the `SensorCapabilityBaseType` are not used for this sensor.
`RangeType`	Defines the range in a local coordinate system relative to the position of the sensor in idle state according to the x-, y-, and z-axis.
`XminValue`	Describes the minimum value that the position sensor can perceive along the x-axis in the unit of metre.
`XmaxValue`	Describes the maximum value that the position sensor can perceive along the x-axis in the unit of metre.
`YminValue`	Describes the minimum value that the position sensor can perceive along the y-axis in the unit of metre.
`YmaxValue`	Describes the maximum value that the position sensor can perceive along the y-axis in the unit of metre.
`ZminValue`	Describes the minimum value that the position sensor can perceive along the z-axis in the unit of metre.
`ZmaxValue`	Describes the maximum value that the position sensor can perceive along the z-axis in the unit of metre.

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6.9.5 Examples

This example shows the description of a position sensing capability with the following semantics. The sensor has an ID of "PS001" and the maximum value shall be `XmaxValue`="10.0", `YmaxValue`="10.0", and `ZmaxValue`="10.0" (m), and the minimum value shall be `XminValue`="-10.0", `YminValue`="-10.0", and `ZminValue`="-10.0" (m) with the resolution of 2 000 levels. The accuracy of the sensor is 0.01 (m). The SNR of the sensor is 0.1 (dB). The offset of sensor is 1.0 (m).

```
<cidl:SensorDeviceCapability          xsi:type="scdv:PositionSensorCapabilityType"
id="PS001" numOfLevels="2000" SNR="0.1" offset="1.0">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
   <scdv:Range xsi:type="scdv:RangeType">
```

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```
        <scdv:XminValue>-10.0</scdv:XminValue>
        <scdv:XmaxValue>10.0</scdv:XmaxValue>
        <scdv:YminValue>-10.0</scdv:YminValue>
        <scdv:YmaxValue>10.0</scdv:YmaxValue>
        <scdv:ZminValue>-10.0</scdv:ZminValue>
        <scdv:ZmaxValue>10.0</scdv:ZmaxValue>
    </scdv:Range>
</cidl:SensorDeviceCapability>
```

6.10 Velocity sensor capability type

6.10.1 General

This subclause specifies syntax and semantics of velocity sensor capabilities.

6.10.2 XML representation syntax

```
<complexType name="VelocitySensorCapabilityType">
    <complexContent>
        <extension base="cidl:SensorCapabilityBaseType"/>
    </complexContent>
</complexType>
```

6.10.3 Binary representation syntax

VelocitySensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.10.4 Semantics

Semantics of the `VelocitySensorCapabilityType` type:

Name	*Definition*
`VelocitySensorCapabilityType`	Tool for describing a velocity sensor capability.
`maxValue`	Describes the maximum value that the velocity sensor can perceive in terms of m/s for the given axis.
`minValue`	Describes the minimum value that the velocity sensor can perceive in terms of m/s for the given axis.

6.10.5 Examples

This example shows the description of a velocity sensing capability with the following semantics. The sensor has an ID of “VS001” and the maximum value shall be 50 (m/s) and the minimum value shall be 0.1 (m/s) with the resolution of 5 000 levels. The accuracy of the sensor is 0.01 (m/s). The offset of sensor is 0.5 (m/s).

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```
<cidl:SensorDeviceCapability          xsi:type="scdv:VelocitySensorCapabilityType"
id="VS001" maxValue="50.0" minValue="0.1" numOfLevels="5000" offset="0.5">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
</cidl:SensorDeviceCapability>
```

6.11 Acceleration sensor capability type

6.11.1 General

Thissubclause specifies syntax and semantics of acceleration sensor capabilities.

6.11.2 XML representation syntax

```
<complexType name="AccelerationSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType"/>
   </complexContent>
</complexType>
```

6.11.3 Binary representation syntax

AccelerationSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.11.4 Semantics

Semantics of the `AccelerationSensorCapabilityType` type:

Name	*Definition*
`AccelerationSensorCapabilityType`	Tool for describing an acceleration sensor capability.
`maxValue`	Describes the maximum value that the acceleration sensor can perceive in terms of m/s^2 for the given axis.
`minValue`	Describes the minimum value that the acceleration sensor can perceive in terms of m/s^2 for the given axis.

6.11.5 Examples

This example shows the description of an acceleration sensing capability with the following semantics. The sensor has an ID of “AS001” and the maximum value shall be 9.8 (m/s^2) and the minimum value shall be -9.8 (m/s^2) with the resolution of 1 000 levels. The accuracy of the sensor is 0.01 (m/s^2). The offset of sensor is 0.5 (m/s^2).

```
<cidl:SensorDeviceCapability      xsi:type="scdv:AccelerationSensorCapabilityType"
id="AS001" maxValue="9.8" minValue="-9.8" numOfLevels="1000" offset="0.5">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
```

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```
</cidl:SensorDeviceCapability>
```

6.12 Orientation sensor capability type

6.12.1 General

This subclause specifies syntax and semantics of orientation sensor capabilities.

6.12.2 XML representation syntax

```
<complexType name="OrientationSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <sequence>
            <element name="OrientationRange" type="scdv:OrientationRangeType"/>
         </sequence>
      </extension>
   </complexContent>
</complexType>

<complexType name="OrientationRangeType">
   <sequence>
      <element name="YawMin" type="float"/>
      <element name="YawMax" type="float"/>
      <element name="PitchMin" type="float"/>
      <element name="PitchMax" type="float"/>
      <element name="RollMin" type="float"/>
      <element name="RollMax" type="float"/>
   </sequence>
</complexType>
```

6.12.3 Binary representation syntax

OrientationSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapabilityBase		SensorCapabilityBaseType
OrientationRange		OrientationRangeType
}		
OrientationRangeType {		
YawMin	32	fsbf
YawMax	32	fsbf
PitchMin	32	fsbf
PitchMax	32	fsbf
RollMin	32	fsbf
RollMax	32	fsbf

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}		

6.12.4 Semantics

Semantics of the `OrientationSensorCapabilityType` type:

Name	*Definition*
`OrientationSensorCapabilityType`	Tool for describing an orientation sensor capability.
`OrientationRange`	Describes the range that the orientation sensor can perceive in terms of OrientationRangeType.
`OrientationRangeType`	Defines the range from the local coordinate system according to the Yaw, Pitch, and Roll.
`YawMin`	Describes the minimum value that the orientation sensor can perceive for Yaw in the unit of degree.
`YawMax`	Describes the maximum value that the orientation sensor can perceive for Yaw in the unit of degree.
`PitchMin`	Describes the minimum value that the orientation sensor can perceive for Pitch in the unit of degree.
`PitchMax`	Describes the maximum value that the orientation sensor can perceive for Pitch in the unit of degree.
`RollMin`	Describes the minimum value that the orientation sensor can perceive for Roll in the unit of degree.
`RollMax`	Describes the maximum value that the orientation sensor can perceive for Roll in the unit of degree.

NOTE 1 The local coordinate system is defined as right-handed coordinate system.

Since the sensor has multidimensional information, the `OrientationRangeType` defined in this subclause shall be used to describe the range of the possible value instead of the `minValue` and the `maxValue` in the `SensorCapabilityBaseType` for this sensor.

6.12.5 Examples

This example shows the description of an orientation sensing capability with the following semantics. The sensor has an ID of “OS001” and the maximum value shall be `YawMax`=“10.0”, `PitchMax`=“10.0” and `RollMax`=“10.0” (rad), and the minimum value shall be `YawMin`=“-10.0”, `PitchMin`=“-10.0” and `RollMin`=“-10.0” (rad) with the resolution of 1 000 levels. The accuracy of the sensor is 0.01 (rad). The SNR of the sensor is 0.1 (dB). The offset of sensor is 1.0 (rad).

```
<cidl:SensorDeviceCapability      xsi:type="scdv:OrientationSensorCapabilityType"
id="OS001" unit="radian" numOfLevels=”1000" SNR=”0.1" offset=”1.0">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value=”0.01"/>
   <scdv:OrientationRange xsi:type="scdv:OrientationRangeType">
      <scdv:YawMin>-10.0</scdv:YawMin>
      <scdv:YawMax>10.0</scdv:YawMax>
      <scdv:PitchMin>-10.0</scdv:PitchMin>
```

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```
        <scdv:PitchMax>10.0</scdv:PitchMax>
        <scdv:RollMin>-10.0</scdv:RollMin>
        <scdv:RollMax>10.0</scdv:RollMax>
    </scdv:OrientationRange>
</cidl:SensorDeviceCapability>
```

6.13 Angular velocity sensor capability type

6.13.1 General

This subclause specifies syntax and semantics of angular velocity sensor capabilities.

6.13.2 XML representation syntax

```
<complexType name="AngularVelocitySensorCapabilityType">
    <complexContent>
        <extension base="cidl:SensorCapabilityBaseType"/>
    </complexContent>
</complexType>
```

6.13.3 Binary representation syntax

AngularVelocitySensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.13.4 Semantics

Semantics of the `AngularVelocitySensorCapabilityType` type:

Name	*Definition*
`AngularVelocity SensorCapabilityType`	Tool for describing an angular velocity sensor capability.
`maxValue`	Describes the maximum value that the angular velocity sensor can perceive in terms of rad/s for each axis.
`minValue`	Describes the minimum value that the angular velocity sensor can perceive in terms of rad/s for each axis.

6.13.5 Examples

This example shows the description of an angular velocity sensing capability with the following semantics. The sensor has an ID of “AVS001” and the maximum value shall be 5.0 (rad/s) and the minimum value shall be -5.0 (rad/s) with the resolution of 1 000 levels. The accuracy of the sensor is 0.01 (rad/s). The offset of sensor is 0.01 (rad/s).

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```
<cidl:SensorDeviceCapability  xsi:type="scdv:AngularVelocitySensorCapabilityType"
id="AVS001"  unit="radpersec"  maxValue="5.0"  minValue="-5.0"  numOfLevels="1000"
offset="0.01">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
</cidl:SensorDeviceCapability>
```

6.14 Angular acceleration sensor capability type

6.14.1 General

This subclause specifies syntax and semantics of angular acceleration sensor capabilities.

6.14.2 XML representation syntax

```
<complexType name="AngularAccelerationSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType"/>
   </complexContent>
</complexType>
```

6.14.3 Binary representation syntax

AngularAccelerationSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.14.4 Semantics

Semantics of the `AngularAccelerationSensorCapabilityType` type:

Name	*Definition*
`AngularAccelerationSensorCapabilityType`	Tool for describing an angular acceleration sensor capability.
`maxValue`	Describes the maximum value that the angular acceleration sensor can perceive in terms of rad/s^2 for each axis.
`minValue`	Describes the minimum value that the angular acceleration sensor can perceive in terms of rad/s^2 for each axis.

6.14.5 Examples

This example shows the description of an angular acceleration sensing capability with the following semantics. The sensor has an ID of “AAS001” and the maximum value shall be 200.0 (rad/s^2) and the minimum value shall be -200.0 (rad/s^2) with the resolution of 1 000 levels. The accuracy of the sensor is 0.1 (rad/s^2). The offset of sensor is 0.5 (rad/s^2).

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```
<cidl:SensorDeviceCapability
xsi:type="scdv:AngularAccelerationSensorCapabilityType"                id="AAS001"
unit="radpersecsquared"   maxValue="200.0"   minValue="-200.0"   numOfLevels="1000"
offset="0.5">
    <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
</cidl:SensorDeviceCapability>
```

6.15 Force sensor capability type

6.15.1 General

This subclause specifies syntax and semantics of force sensor capabilities.

6.15.2 XML representation syntax

```
<complexType name="ForceSensorCapabilityType">
    <complexContent>
        <extension base="cidl:SensorCapabilityBaseType"/>
    </complexContent>
</complexType>
```

6.15.3 Binary representation syntax

ForceSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.15.4 Semantics

Semantics of the `ForceSensorCapabilityType`:

Name	*Definition*
`ForceSensorCapabilityType`	Tool for describing a force sensor capability.
`maxValue`	Describes the maximum value that the force sensor can perceive in terms of N (Newton) for each axis.
`minValue`	Describes the minimum value that the force sensor can perceive in terms of N (Newton) for each axis.

6.15.5 Examples

This example shows the description of a force sensing capability with the following semantics. The sensor has an ID of “FS001” and the maximum value shall be 5.0 (N) and the minimum value shall be 0.0 (N) with the resolution of 500 levels. The accuracy of the sensor is 0.01 (N). The offset of sensor is 0.05 (N).

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```
<cidl:SensorDeviceCapability xsi:type="scdv:ForceSensorCapabilityType" id="FS001"
maxValue="5.0" minValue="0.0" numOfLevels="500" offset="0.05">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
</cidl:SensorDeviceCapability>
```

6.16 Torque sensor capability type

6.16.1 General

This subclause specifies syntax and semantics of torque sensor capabilities.

6.16.2 XML representation syntax

```
<complexType name="TorqueSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType"/>
   </complexContent>
</complexType>
```

6.16.3 Binary representation syntax

TorqueSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.16.4 Semantics

Semantics of the `TorqueSensorCapabilityType`:

Name	*Definition*
`TorqueSensorCapabilityType`	Tool for describing a torque sensor capability.
`maxValue`	Describes the maximum value that the torque sensor can perceive in terms of N-mm (Newton millimetre) for each axis.
`minValue`	Describes the minimum value that the torque sensor can perceive in terms of N-mm (Newton millimetre) for each axis.

6.16.5 Examples

This example shows the description of a torque sensing capability with the following semantics. The sensor has an ID of “TS001” and the maximum value shall be 200.0 (N-mm) and the minimum value shall be 0.0 (N-mm) with the resolution of 20 000 levels. The accuracy of the sensor is 0.01 (N-mm). The offset of sensor is 0.05 (N-mm).

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```
<cidl:SensorDeviceCapability          xsi:type="scdv:TorqueSensorCapabilityType"
id="ToS001" maxValue="200.0" minValue="0.0" numOfLevels="20000" offset="0.05">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
</cidl:SensorDeviceCapability>
```

6.17 Pressure sensor capability type

6.17.1 General

This subclause specifies syntax and semantics of pressure sensor capabilities.

6.17.2 XML representation syntax

```
<complexType name="PressureSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType"/>
   </complexContent>
</complexType>
```

6.17.3 Binary representation syntax

PressureSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.17.4 Semantics

Semantics of the `PressureSensorCapabilityType`:

Name	*Definition*
`PressureSensor CapabilityType`	Tool for describing a pressure sensor capability.
`maxValue`	Describes the maximum value that the pressure sensor can perceive in terms of N/mm^2 (Newton/millimetre square) for each axis.
`minValue`	Describes the minimum value that the pressure sensor can perceive in terms of N/mm^2 (Newton/millimetre square) for each axis.

6.17.5 Examples

This example shows the description of a pressure sensing capability with the following semantics. The sensor has an ID of "PRS001" and the maximum value shall be 2.5 (N/mm^2) and the minimum value shall be 0.0 (N/mm^2) with the resolution of 2 500 levels. The accuracy of the sensor is 0.001 (N/mm^2). The offset of sensor is 0.05 (N/mm^2).

```
<cidl:SensorDeviceCapability          xsi:type="scdv:PressureSensorCapabilityType"
id="PRS001" maxValue="2.5" minValue="0.0" numOfLevels="2500" offset="0.05">
```

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```
    <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.001"/>
</cidl:SensorDeviceCapability>
```

6.18 Motion sensor capability type

6.18.1 General

This subclause specifies syntax and semantics of motion sensor capabilities.

6.18.2 XML representation syntax

```
<complexType name="MotionSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <sequence>
            <element name="PositionCapability"
               type="scdv:PositionSensorCapabilityType" minOccurs="0"/>
            <element name="OrientationCapability"
               type="scdv:OrientationSensorCapabilityType" minOccurs="0"/>
            <element name="VelocityCapability"
               type="scdv:VelocitySensorCapabilityType" minOccurs="0"/>
            <element name="AngularVelocityCapability"
               type="scdv:AngularVelocitySensorCapabilityType" minOccurs="0"/>
            <element name="AccelerationCapability"
               type="scdv:AccelerationSensorCapabilityType" minOccurs="0"/>
            <element name="AngularAccelerationCapability"
               type="scdv:AngularAccelerationSensorCapabilityType"
               minOccurs="0"/>
         </sequence>
      </extension>
   </complexContent>
</complexType>
```

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6.18.3 Binary representation syntax

MotionSensorCapabilityType {	**Number of bits**	**Mnemonic**
PositionCapabilityFlag	1	bslbf
OrientationCapabilityFlag	1	bslbf
VelocityCapabilityFlag	1	bslbf
AngularVelocityCapabilityFlag	1	bslbf
AccelerationCapabilityFlag	1	bslbf
AngularAccelerationCapabilityFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(PositionCapabilityFlag){		
PositionCapability		PositionSensorCapabilityType

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MotionSensorCapabilityType {	**Number of bits**	**Mnemonic**
}		
if(OrientationCapabilityFlag){		
OrientationCapability		OrientationSensorCapabilityType
}		
if(VelocityCapabilityFlag){		
VelocityCapability		VelocitySensorCapabilityType
}		
if(AngularVelocityCapabilityFlag){		
AngularVelocityCapability		AngularVelocitySensorCapabilityType
}		
if(AccelerationCapabilityFlag){		
AccelerationCapability		AccelerationSensorCapabilityType
}		
if(AngularAccelerationCapabilityFlag){		
AngularAccelerationCapability		AngularAccelerationSensorCapabilityType
}		
}		

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6.18.4 Semantics

Semantics of the `MotionSensorCapabilityType` type:

Name	*Definition*
`MotionSensorCapabilityType`	Tool for describing a motion sensor capability.
`PositionCapabilityFlag`	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.
`OrientationCapabilityFlag`	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.
`VelocityCapabilityFlag`	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.

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Name	*Definition*
AngularVelocityCapabilityFlag	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.
AccelerationCapabilityFlag	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.
AngularAccelerationCapabilityFlag	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.
PositionCapability	Describes the capability with respect to the position as defined in PositionSensorCapabilityType.
OrientationCapability	Describes the capability with respect to the orientation as defined in OrientationSensorCapabilityType.
VelocityCapability	Describes the capability with respect to the velocity as defined in VelocitySensorCapabilityType.
AngularVelocity Capability	Describes the capability with respect to the angular as defined in AngularVelocitySensorCapabilityType.
AccelerationCapability	Describes the capability with respect to the acceleration as defined in AccelerationSensorCapabilityType.
AngularAcceleration Capability	Describes the capability with respect to the angular acceleration as defined in AngularAccelerationSensorCapabilityType.

6.18.5 Examples

This example shows the description of a motion sensing capability with the following semantics. The motion sensor is with ID of "MS001". It is composed of position sensor with ID "MSPC001", orientation sensor with ID "MSOC001", velocity sensor with ID "MSVC0001", angular velocity sensor with ID "MSAVC0001", acceleration sensor with ID "MSAC0001", and angular acceleration sensor with ID "MSAAC0001".

```
<cidl:SensorDeviceCapability xsi:type="scdv:MotionSensorCapabilityType"
id="MS001">
   <scdv:PositionCapability id="MSPC001" SNR="0.1" numOfLevels="10000"
   xsi:type="scdv:PositionSensorCapabilityType">
      <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
      <scdv:Range xsi:type="scdv:RangeType">
         <scdv:XminValue>0.0</scdv:XminValue>
         <scdv:XmaxValue>3.0</scdv:XmaxValue>
         <scdv:YminValue>0.0</scdv:YminValue>
         <scdv:YmaxValue>3.0</scdv:YmaxValue>
         <scdv:ZminValue>0.0</scdv:ZminValue>
         <scdv:ZmaxValue>3.0</scdv:ZmaxValue>
      </scdv:Range>
   </scdv:PositionCapability>
   <scdv:OrientationCapability id="MSOC001" SNR="0.1" unit="radian"
   numOfLevels="10000" xsi:type="scdv:OrientationSensorCapabilityType">
      <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
      <scdv:OrientationRange>
         <scdv:YawMin>-3.14</scdv:YawMin>
```

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```
            <scdv:YawMax>3.14</scdv:YawMax>
            <scdv:PitchMin>-3.14</scdv:PitchMin>
            <scdv:PitchMax>3.14</scdv:PitchMax>
            <scdv:RollMin>-1.57</scdv:RollMin>
            <scdv:RollMax>1.57</scdv:RollMax>
        </scdv:OrientationRange>
    </scdv:OrientationCapability>
    <scdv:VelocityCapability id="MSVC0001"
    xsi:type="scdv:VelocitySensorCapabilityType" maxValue="50.0" minValue="0.1"
    numOfLevels="1000">
        <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
    </scdv:VelocityCapability>
    <scdv:AngularVelocityCapability id="MSAVC0001"
    xsi:type="scdv:AngularVelocitySensorCapabilityType" maxValue="5.0"
    minValue="-5.0">
        <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
    </scdv:AngularVelocityCapability>
    <scdv:AccelerationCapability id="MSAC0001" maxValue="9.8" minValue="-9.8"/>
    <scdv:AngularAccelerationCapability id="MSAAC0001" maxValue="1200.0"
    minValue="-200.0"/>
</cidl:SensorDeviceCapability>
```

6.19 Intelligent camera capability type

6.19.1 General

This subclause specifies syntax and semantics of intelligent camera sensor capabilities.

6.19.2 XML representation syntax

```
<complexType name="IntelligentCameraCapabilityType">
    <complexContent>
        <extension base="cidl:SensorCapabilityBaseType">
            <sequence>
                <element name="MaxBodyFeaturePoint" type="nonNegativeInteger"
                    minOccurs="0"/>
                <element name="MaxFaceFeaturePoint" type="nonNegativeInteger"
                    minOccurs="0"/>
                <element name="TrackedFeature" type="scdv:FeatureType"
                    minOccurs="0"/>
                <element name="TrackedFacialFeaturePoints"
                    type="scdv:FacialFeatureMask" minOccurs="0"/>
                <element name="TrackedBodyFeaturePoints"
                    type="scdv:BodyFeatureMask" minOccurs="0"/>
            </sequence>
            <attribute name="featureTrackingStatus" type="boolean" use="optional"
                default="false"/>
            <attribute name="facialExpressionTrackingStatus" type="boolean"
                use="optional" default="false"/>
            <attribute name="gestureTrackingStatus"  type="boolean"  use="optional"
                default="false"/>
        </extension>
    </complexContent>
</complexType>

<simpleType name="FeatureType">
    <restriction base="string">
        <enumeration value="face"/>
```

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```
        <enumeration value="body"/>
        <enumeration value="both"/>
    </restriction>
</simpleType>

<complexType name="FacialFeatureMask">
    <sequence>
        <element name="FaceFeaturePoint" type="boolean" minOccurs="60"
            maxOccurs="200"/>
    </sequence>
</complexType>

<complexType name="BodyFeatureMask">
    <sequence>
        <element name="BodyFeaturePoint" type="boolean" minOccurs="60"
            maxOccurs="200"/>
    </sequence>
</complexType>
```

6.19.3 Binary representation syntax

IntelligentCameraCapabilityType {	**Number of bits**	**Mnemonic**
MaxBodyFeaturePointFlag	1	bslbf
MaxFaceFeaturePointFlag	1	bslbf
TrackedFeatureFlag	1	bslbf
TrackedFacialFeaturePointsFlag	1	bslbf
TrackedBodyFeaturePointsFlag	1	bslbf
featureTrackingStatusFlag		
facialExpressionTrackingStatusFlag	1	bslbf
gestureTrackingStatusFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(MaxBodyFeaturePointFlag){		
MaxBodyFeaturePoint	32	uimsbf
}		
if(MaxFaceFeaturePointFlag){		
MaxFaceFeaturePoint	32	uimsbf
}		
if(TrackedFeatureFlag){		
TrackedFeature	2	bslbf

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IntelligentCameraCapabilityType {	**Number of bits**	**Mnemonic**
}		
if(TrackedFacialFeaturePointsFlag){		
TrackedFacialFeaturePoints		FacialFeatureMask
}		
if(TrackedBodyFeaturePointsFlag){		
TrackedBodyFeaturePointsFlag		BodyFeatureMask
}		
if(featureTrackingStatusFlag){		
featureTrackingStatus	1	bslbf
}		
if(facialExpressionTrackingStatusFlag){		
facialExpressionTrackingStatus	1	bslbf
}		
if(gestureTrackingStatusFlag){		
gestureTrackingStatus	1	bslbf
}		
}		
FacialFeatureMask {		
LoopFaceFeaturePoint	8	uimsbf
for(k=0;k< LoopFaceFeaturePoint;k++){		
FaceFeaturePoint[k]	1	bslbf
}		
}		
BodyFeatureMask {		
LoopBodyFeaturePoint	16	uimsbf
for(k=0;k< LoopBodyFeaturePoint;k++){		
BodyFeaturePoint[k]	1	bslbf
}		
}		

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6.19.4 Semantics

Semantics of the `IntelligentCameraCapabilityType` type:

Name	*Definition*
`IntelligentCameraCapabilityType`	Tool for describing an intelligent camera capability.
`MaxBodyFeaturePointFlag`	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.
`MaxFaceFeaturePointFlag`	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.
`TrackedFeatureFlag`	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.
`TrackedFacialFeaturePointsFlag`	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.
`TrackedBodyFeaturePointsFlag`	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.
`featureTrackingStatusFlag`	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.
`facialExpressionTrackingStatusFlag`	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.
`gestureTrackingStatusFlag`	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.
`MaxBodyFeaturePoint`	Describes the maximum number of body feature points that the intelligent camera can track.
`MaxFaceFeaturePoint`	Describes the maximum number of facial feature points that the intelligent camera can track.
`TrackedFeature`	Describes what kind of feature points can be tracked as given in `FeatureType`, e.g. body, face, or both.
`FeatureType`	Describes the types of feature to be tracked. (face, body, or both). In the binary description, the following mapping table is used. Term of FeatureType: Binary representation for feature type (2 bits)

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Name	*Definition*
	Face 00 Body 01 Both 10 Reserved 11
TrackedFacialFeature Points	Describes whether each of the facial feature points orderly listed in ISO/IEC 23005-4:2013, 5.2.7.4 is active or not, based on FacialFeatureMask.
TrackedBodyFeature Points	Describes whether each of the body feature points orderly listed in ISO/IEC 23005-4:2013, 5.2.7.6 is active or not, based on BodyFeatureMask.
featureTracking Status	Describes whether the feature tracking is capable or not.
facialExpression TrackingStatus	Describes whether the intelligent camera can extract the facial animation or not.
gestureTracking Status	Describes whether the intelligent camera can extract the body animation or not.
FacialFeatureMask	Provides a Boolean map of facial feature points in the order listed in ISO/IEC 23005-4:2013, 5.2.7.4 to identify active feature points.
BodyFeatureMask	Provides a Boolean map of body feature points in the order listed in ISO/IEC 23005-4:2013, 5.2.7.6 to identify active feature points.

6.19.5 Examples

This example shows the description of an intelligent camera sensing capability.

```
<cidl:SensorDeviceCapability      xsi:type="scdv:IntelligentCameraCapabilityType"
id="IC001" featureTrackingStatus="true"  gestureTrackingStatus="true">
   <scdv:MaxBodyFeaturePoint>69</scdv:MaxBodyFeaturePoint>
   <scdv:MaxFaceFeaturePoint>60</scdv:MaxFaceFeaturePoint>
   <scdv:TrackedFeature>both</scdv:TrackedFeature>
   <scdv:TrackedFacialFeaturePoints>
      <scdv:FaceFeaturePoint>true</scdv:FaceFeaturePoint>
      <scdv:FaceFeaturePoint>true</scdv:FaceFeaturePoint>
      <scdv:FaceFeaturePoint>true</scdv:FaceFeaturePoint>
      …
      <scdv:FaceFeaturePoint>true</scdv:FaceFeaturePoint>
      <scdv:FaceFeaturePoint>true</scdv:FaceFeaturePoint>
      <scdv:FaceFeaturePoint>true</scdv:FaceFeaturePoint>
   </scdv:TrackedFacialFeaturePoints>
   <scdv:TrackedBodyFeaturePoints>
      <scdv:BodyFeaturePoint>true</scdv:BodyFeaturePoint>
      <scdv:BodyFeaturePoint>true</scdv:BodyFeaturePoint>
      <scdv:BodyFeaturePoint>true</scdv:BodyFeaturePoint>
      …
      <scdv:BodyFeaturePoint>true</scdv:BodyFeaturePoint>
      <scdv:BodyFeaturePoint>true</scdv:BodyFeaturePoint>
      <scdv:BodyFeaturePoint>true</scdv:BodyFeaturePoint>
```

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```
    </scdv:TrackedBodyFeaturePoints>
</cidl:SensorDeviceCapability>
```

6.20 Bend sensor capability type

6.20.1 General

This subclause specifies syntax and semantics of bend sensor capabilities.

6.20.2 XML representation syntax

```
<complexType name="BendSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <sequence>
            <element name="Channels"
type="scdv:BendSensorChannelCapabilityType" minOccurs="0" maxOccurs="unbounded"/>
         </sequence>
         <attribute name="numOfChannels" type="nonNegativeInteger"
use="optional" default="1"/>
      </extension>
   </complexContent>
</complexType>

<complexType name="BendSensorChannelCapabilityType">
  <complexContent>
   <extension base="cidl:SensorCapabilityBaseType">
   <sequence>
      <element name="NumOfLocations" type="nonNegativeInteger" minOccurs="0"/>
      <element name="DistanceBtwnLocations" type="float" minOccurs="0"/>
      <element name="NumOfAxes" type="nonNegativeInteger" minOccurs="0"/>
   </sequence>
   </extension>
  </complexContent>
</complexType>
```

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6.20.3 Binary representation syntax

BendSensorCapabilityType{	**Number of bits**	**Mnemonic**
ChannelsFlag	1	bslbf
numOfChannelsFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(ChannelsFlag){		
LoopChannels		Vluimsbf5
for(k=0;k< LoopChannels;k++){		
Channels[k]		BendSensorChannelCapabilityType
}		

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}		
if(numOfChannelsFlag){		
numOfChannels	16	uimsbf
}		
}		
BendSensorChannelCapabilityType{		
NumOfLocationsFlag	1	bslbf
DistanceBtwnLocationsFlag	1	bslbf
NumOfAxesFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(NumOfLocationsFlag){		
NumOfLocations	16	uimsbf
}		
if(DistanceBtwnLocationsFlag){		
DistanceBtwnLocations	32	fsbf
}		
if(NumOfAxesFlag){		
NumOfAxes	2	uimsbf
}		
}		

6.20.4 Semantics

Semantics of the `BendSensorType`:

Name	*Definition*
`BendSensorCapabilityType`	Tool for describing a bend sensor capability.
`NumOfLocationsFlag`	This field, which is only present in the binary representation, indicates the presence of the “numOfLocations” attribute. A value of “1” implies that the attribute shall be used and a value of “0” implies that the attribute shall not be used.
`DistanceBtwnLocationsFlag`	This field, which is only present in the binary representation, indicates the presence of the “distanceBtwnLocations” attribute. A value of “1” implies that the attribute shall be used and a value of “0” implies that the attribute shall not be used.
`NumOfAxesFlag`	This field, which is only present in the binary representation, indicates the presence of the “numOfAxes” attribute. A value of “1” implies that the attribute shall be used and a value of “0” implies that the attribute shall not

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Name	*Definition*
	be used.
numOfChannelsFlag	This field, which is only present in the binary representation, indicates the presence of the "numOfChannels" attribute. A value of "1" implies that the attribute shall be used and a value of "0" implies that the attribute shall not be used.
maxValue	Describes the maximum value that the bend sensor can perceive in terms of degree.
minValue	Describes the minimum value that the bend sensor can perceive in terms of degree.
NumOfLocations	Describes the number of locations that a bend sensor can sense bend angles.
DistanceBtwnLocations	Describes the distance between the adjacent sensing locations in terms of metre.
NumOfAxes	Describes the dimension that the bend sensor can perceive the bend angles.
numOfChannels	Describes the number of channels that an array of bend sensors can perceive. The default value of the number of channels is 1.

6.20.5 Examples

This example shows the description of a bend sensing capability with the following semantics. The sensor has an ID of "BendID_01" and the number of channels is 1. The channel has its ID of "Ch1", three sensing locations with a single axis, the distance between the sensing locations of 0.03 m, and the maximum and minimum values of 90° and 0°, respectively.

```
<cidl:SensorDeviceCapability                xsi:type="scdv:BendSensorCapabilityType"
id="BendID_01" numOfChannels="1">
   <scdv:Channels id="Ch1" maxValue="90" minValue="0">
      <scdv:NumOfLocations>
         3
      </scdv:NumOfLocations>
      <scdv:DistanceBtwnLocations>
         0.03
      </scdv:DistanceBtwnLocations>
      <scdv:NumOfAxes>
         1
      </scdv:NumOfAxes>
   </scdv:Channels>
</cidl:SensorDeviceCapability>
```

6.21 Gas sensor capability type

6.21.1 General

This subclause specifies syntax and semantics of gas sensor capabilities.

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6.21.2 XML representation syntax

```
<complexType name="GasSensorCapabilityType">
   <complexContent>
     <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
          <element name="GasType" type="mpeg7:termReferenceType" minOccurs="0"/>
       </sequence>
     </extension>
   </complexContent>
</complexType>
```

6.21.3 Binary representation syntax

GasSensorCapabilityType {	**Number of bits**	**Mnemonic**
GasTypeFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(GasTypeFlag){		
GasType	16	uimsbf
}		
}		

6.21.4 Semantics

Semantics of the `GasSensorCapabilityType`:

Name	*Definition*
`GasSensorCapabilityType`	Tool for describing a gas sensor capability.
`GasTypeFlag`	This field, which is only present in the binary representation, signals the presence of the GasType element. A value of "1" means the element shall be used and "0" means the element shall not be used.
`GasType`	Describes the sensed type by the gas sensor. Tool for describing a gas type as a reference to a classification scheme term provided by `GasTypeCS` defined in ISO/IEC 23005-6:—, A.2.12.8. The details of the structure and use of classification scheme and `termReferencetype` description is defined in ISO/IEC 15938-5:2003, 7.6. EXAMPLE `urn:mpeg:mpeg-v:01-CI-GasCS-NS:oxygen` would describe oxygen gas.
`maxValue`	Describes the maximum value that the gas sensor can perceive in terms of ppm (parts per million).
`minValue`	Describes the minimum value that the gas sensor can perceive in terms of ppm (parts per million).

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6.21.5 Examples

This example shows the description of a gas sensing capability with the following semantics. The sensor has an ID of "GSID_01" and the maximum value shall be 25.0 (ppm) and the minimum value shall be 0.0 (ppm) with the resolution of 100 levels. The accuracy of the sensor is 0.001 (ppm). The offset of sensor is 0.05 (ppm).

```
<cidl:SensorDeviceCapability xsi:type="scdv:GasSensorCapabilityType" id="GSID_01"
minValue="0.0"        maxValue="25.0"        numOfLevels="100"        offset="0.05"
unit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:ppm">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.001"/>
</cidl:SensorDeviceCapability>
```

6.22 Dust sensor capability type

6.22.1 General

This subclause specifies syntax and semantics of dust sensor capabilities.

6.22.2 XML representation syntax

```
<complexType name="DustSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType"/>
   </complexContent>
</complexType>
```

6.22.3 Binary representation syntax

DustSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.22.4 Semantics

Semantics of the `DustSensorCapabilityType`:

Name	*Definition*
`DustSensorCapabilityType`	Tool for describing a dust sensor capability.
`maxValue`	Describes the maximum value that the dust sensor can perceive in terms of μg/m^3 (micrograms per cubic metre).
`minValue`	Describes the minimum value that the dust sensor can perceive in terms of μg/m^3 (micrograms per cubic metre).

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6.22.5 Examples

This example shows the description of a dust sensing capability with the following semantics. The sensor has an ID of "DTID_01" and the maximum value shall be 1 000 (μg/m³) and the minimum value shall be 1 (μg/m³) with the resolution of 1 000 levels. The accuracy of the sensor is 1 (μg/m³). The offset of sensor is 5 (μg/m³).

```
<cidl:SensorDeviceCapability                xsi:type="scdv:DustSensorCapabilityType"
id="DSID_01" minValue="1" maxValue="1000" numOfLevels="1000" offset="5" >
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="1"/>
</cidl:SensorDeviceCapability>
```

6.23 Multi interaction point sensor capability type

6.23.1 General

This subclause specifies syntax and semantics of multi interaction point sensor capabilities.

6.23.2 XML representation syntax

```
<complexType name="MultiInteractionPointSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <attribute name="numOfInteractionPoints" type="nonNegativeInteger"
use="optional" default="1"/>
      </extension>
   </complexContent>
</complexType>
```

6.23.3 Binary representation syntax

MultiInteractionPointSensorCapabilityType{	**Number of bits**	**Mnemonic**
numOfInteractionPointsFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(numOfInteractionPointsFlag){		
numOfInteractionPoints	16	uimsbf
}		
}		

6.23.4 Semantics

Semantics of the `MultiInteractionPointSensorCapabilityType`:

Name	*Definition*
`MultiInteractionPointSensorCapabilityType`	Tool for describing a multi interaction-point sensor capability.
`numOfInteractionPointsFla`	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute

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Name	*Definition*
g	shall be used and “0” means the attribute shall not be used.
numOfInteractionPoints	Describes the number of interaction points that a multi interaction point sensor includes.

6.23.5 Examples

The following is an example of the MultiInteractionPointSensorCapability to indicate the capable number of interaction points. This example shows that the given Multi Interaction Point Sensor with ID of “MIPS_ID1” has 5 interaction points to receive user’s selection.

```
<cidl:SensorDeviceCapability
xsi:type="scdv:MultiInteractionPointSensorCapabilityType" id="MIPSID_01"
numOfInteractionPoints="5"/>
```

6.24 Gaze tracking sensor capability type

6.24.1 General

This subclause specifies syntax and semantics of gaze tracking sensor capabilities.

6.24.2 XML representation syntax

```
<complexType name="GazeTrackingSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <sequence>
            <element name="PositionCapability"
type="scdv:PositionSensorCapabilityType" minOccurs="0"/>
            <element name="OrientationCapability"
type="scdv:OrientationSensorCapabilityType" minOccurs="0"/>
         </sequence>
         <attribute name="gazeTrackingOn" type="boolean" use="optional"
default="false"/>
               <attribute name="blinkTrackingOn" type="boolean" use="optional"
default="false"/>
      </extension>
   </complexContent>
</complexType>
```

6.24.3 Binary representation syntax

GazeTrackingSensorCapabilityType {	**Number of bits**	**Mnemonic**
PositionCapabilityFlag	1	bslbf
OrientationCapabilityFlag	1	bslbf
gazeTrackingOnFlag	1	bslbf
blinkTrackingOnFlag	1	bslbf

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SensorCapabilityBase		SensorCapabilityBaseType
if(PositionCapabilityFlag){		
PositionCapability		PositionSensorCapabilityType
}		
if(OrientationCapabilityFlag){		
OrientationCapability	1	OrientationSensorCapabilityType
}		
if(gazeTrackingOnFlag){		
gazeTrackingOn	1	bslbf
}		
if(blinkTrackingOnFlag){		
blinkTrackingOn	1	bslbf
}		
}		

6.24.4 Semantics

Semantics of the `GazeTrackingSensorCapabilityType`:

Name	*Definition*
`GazeTrackingSensorCapabilityType`	Tool for describing a Gaze tracking sensor capability.
`PositionCapabilityFlag`	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the element shall be used and “0” means the element shall not be used.
`OrientationCapabilityFlag`	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.
`gazeTrackingOnFlag`	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.
`blinkTrackingOnFlag`	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.
`PositionCapability`	Describes the capability with respect to the position as defined in `PositionSensorCapabilityType`.
`OrientationCapability`	Describes the capability with respect to the orientation as defined in

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Name	*Definition*
	`OrientationSensorCapabilityType`.
`gazeTrackingOn`	Indicates whether the gaze tracking sensor can track user's gazes or not. "false" means the gaze tracking sensor does not detect the gaze and "true" means the sensor does detect. In the binary description, the following mapping table is used. Binary value (1 bits) | whether detecting gaze or not 0 | Not detecting gaze 1 | Detecting gaze
`blinkTrackingOn`	Indicates whether the gaze tracking sensor can detect the user's blinking or not. "false" means the gaze tracking sensor does not detect eye's blinking and "true" means the sensor does detect. In the binary description, the following mapping table is used. Binary value (1 bits) | Whether detecting eye's blinking or not 0 | Not detecting eye's blinking 1 | Detecting eye's blinking

6.24.5 Examples

This example shows the description of a gaze tracking sensor capability with the following semantics. The sensor has an ID of "GTS001" and it can track the position and the orientation of user's gaze while it cannot sense user's blinking.

```
<cidl:SensorDeviceCapability     xsi:type="scdv:GazeTrackingSensorCapabilityType"
id="GTS001" gazeTrackingOn="true" blinkTrackingOn="false"/>
```

6.25 Global position sensor capability type

6.25.1 General

This subclause specifies syntax and semantics of global position sensor capabilities.

6.25.2 XML representation syntax

```
<complexType name="GlobalPositionSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <sequence>
            <element name="VariousAccuracy" type="scdv:VariousAccuracyType"
minOccurs="0" maxOccurs="unbounded"/>
         </sequence>
```

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```
          <attribute name="crs" type="anyURI"
default="urn:ogc:def:crs:EPSG::4326"/>
          <attribute name="latitudeOffset" type="float" use="optional"/>
          <attribute name="longitudeOffset" type="float" use="optional"/>
          <attribute name="maxOperatingTemp" type="float" use="optional"/>
          <attribute name="minOperatingTemp" type="float" use="optional"/>
       </extension>
    </complexContent>
</complexType>

<complexType name="VariousAccuracyType">
    <attribute name="accuracyType" type="mpeg7:termReferenceType"/>
    <attribute name="value" type="float" use="required"/>
    <attribute name="accuracyUnit" type="mpeg7:termReferenceType"/>
</complexType>
```

6.25.3 Binary representation syntax

GlobalPositionSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
latitudeOffsetFlag	1	bslbf
longitudeOffstFlag	1	bslbf
maxOperatingTempFlag	1	bslbf
minOperatingTempFlag	1	bslbf
VariousAccuracyCount	32	uimsbf
For (i=1;i<VariousAccuracyCount;i++) {		
accuracyType	4	AccuracyTypeCS
value	32	flbf
accuracyUnit	8	bslbf
}		
crs		UTF-8
if(latitudeOffsetFlag){		
latitudeOffset	32	fsbf
}		
if(longitudeOffsetFlag){		
longitudeOffset	32	Fsbf
}		
if(maxOperatingTempFlag){		

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GlobalPositionSensorCapabilityType {	**Number of bits**	**Mnemonic**
maxOperatingTemp	32	fsbf
}		
if(minOperatingTempFlag){		
minOperatingTemp	32	fsbf
}		
}		

6.25.4 Semantics

Semantics of the `GlobalPositionSensorCapabilityType`:

Name	*Definition*
`GlobalPositionSensorCapabilityType`	Tool for describing a GPS sensor capability.
`Accuracy`	Describes the degree of closeness of a measured quantity of longitude to its actual value in `AccuracyType`.
`LatitudeAccuracy`	Describes the degree of closeness of a measured quantity of latitude to its actual value in `AccuracyType`.
`unit`	Does not have any meaningful semantics in this description.
`maxValue`	Does not have any meaningful semantics in this description.
`minValue`	Does not have any meaningful semantics in this description.
`offset`	Describes the value added to a base value of longitude in order to get to a specific absolute value.
`VariousAccuracy`	Describes the accuracy in various points of view. Each occurrence of this element defines one type of accuracy. This element defines the accuracy by using three attriubtes defined. The `accuracyType` attribute specifies the type of the accuracy by referencing the `AccuracyTypeCS` in A.2. The `value` attribute specifies the value to denote the accuracy. The `unit` attribute specifies the unit of the value attribute by referencing the `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1.
`crs`	Specifies the URI of the coordinate reference system based on which the values of longitude, latitude and altitude are given. The default is urn:ogc:def:crs:EPSG::4326 specifying the Coordinate Reference System (CRS) with code 4326 specified in the EPSG database available at http://www.epsg.org/.
`longitudeOffset`	Describes the value added to a base value of longitude in order to get to a specific absolute value.
`latitudeOffset`	Describes the value added to a base value of latitude in order to get to a

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Name	*Definition*
	specific absolute value.
numOfLevels	Describes the number of value levels that the sensor can perceive in between maximum and minimum value of longitude. EXAMPLE The value “5” means the sensor can perceive 5 steps from minValue to maxValue.
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.
maxOperatingTemp	Describes the number of locations that a bend sensor can sense bending angles.
minOperatingTemp	Describes the distance between the adjacent sensing locations.

Semantics of the VariousAccuracyType

Name	*Definition*
VariousAccuracy	Tool for describing accuracy of the sensor in various points of view.
accuracyType	This attribute specifies the accuracy type, e.g. distance accuracy or reacquisition time, by referencing to the AccuracyTypeCS in A.2.
value	This attribute specifies the value of the accuracy.
accuracyUnit	This attribute specifies the unit of the accuracy description by referenceing to the UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1.

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6.25.5 Examples

This example shows the description of a global position sensor's sensing capability with the following semantics. The sensor has an ID of “gps01” with the maximum operating temperature of 90 °C, minimum operating temperature of -30 °C, sensitivity of 0.01°, and the position accuracy of 0.01°.

```
<cidl:SensorDeviceCapability   xsi:type="scdv:GlobalPositionSensorCapabilityType"
id="gps01"         crs="urn:ogc:def:crs:EPSG::4326"         maxOperatingTemp="90"
minOperatingTemp="-30" sensitivity="0.01">
   <scdv:VariousAccuracy       value="0.01"       accuracyType=":mpeg:mpeg-v:01-
AccuracyTypeCS-NS:PositionAccuracy"          accuracyUnit="urn:mpeg:mpeg-v:01-CI-
UnitTypeCS-NS:degree"/>
</cidl:SensorDeviceCapability>
```

6.26 Altitude sensor capability type

6.26.1 General

This subclause specifies syntax and semantics of altitude sensor capabilities.

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6.26.2 XML representation syntax

```
<complexType name="AltitudeSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <attribute name="crs" type="anyURI"
default="urn:ogc:def:crs:EPSG::4326"/>
      </extension>
   </complexContent>
</complexType>
```

6.26.3 Binary representation syntax

AltitudeSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
crs		UTF-8
}		

6.26.4 Semantics

Semantics of the `AltitudeSensorCapabilityType`:

Name	*Definition*
`AltitudeSensorCapabilityType`	Tool for describing an altitude sensor capability.
`crs`	Specifies the URI of the coordinate reference system based on which the values of longitude, latitude and altitude are given. The default is urn:ogc:def:crs:EPSG::4326 specifying the Coordinate Reference System (CRS) with code 4326 specified in the EPSG database available at http://www.epsg.org/.
`Accuracy`	Describes the degree of closeness of a measured quantity to its actual value in `AccuracyType`.
`unit`	Specifies the unit of the sensor's measuring value as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6, A.2.1, if a unit other than the default unit specified in the semantics of the `maxValue` and `minValue` is used for the values of `maxValue` and `minValue` are used. The default unit is metre.
`maxValue`	Describes the maximum altitude that the altitude sensor can perceive in metres.
`minValue`	Describes the minimum altitude that the altitude sensor can perceive in metres.
`offset`	Describes the value needed to be added to a base value in order to get to a specific absolute value.

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Name	*Definition*
numOfLevels	Describes the number of altitude levels that the sensor can perceive in between maximum and minimum value. EXAMPLE The value "5" means the sensor can perceive 5 steps from minValue to maxValue.
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.

6.26.5 Examples

This example shows the description of an altitude sensing capability with the following semantics. The sensor has an ID of "ASID_01" and the maximum value shall be 1 000 (metre) and the minimum value shall be 0 (metre) with the resolution of 2 000 levels. The accuracy of the sensor is 0.5 (metre). The offset of sensor is 5 (metre).

```
<cidl:SensorDeviceCapability          xsi:type="scdv:AltitudeSensorCapabilityType"
id="ASID_01" minValue="0" maxValue="1000" numOfLevels="2000" offset="5" >
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.5"/>
</cidl:SensorDeviceCapability>
```

6.27 Weather sensor capability type

6.27.1 General

This subclause specifies syntax and semantics of weather sensor capabilities.

6.27.2 XML representation syntax

```
<complexType name="WeatherSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
         <sequence>
            <element name="TemperatureCapability"
type="scdv:TemperatureSensorCapabilityType" minOccurs="0"/>
            <element name="PrecipitationCapability" minOccurs="0">
               <complexType>
                  <complexContent>
                     <extension base="cidl:SensorCapabilityBaseType"/>
                  </complexContent>
               </complexType>
            </element>
            <element name="SnowCapability" minOccurs="0">
               <complexType>
                  <complexContent>
                     <extension base="cidl:SensorCapabilityBaseType"/>
                  </complexContent>
               </complexType>
            </element>
            <element name="WindCapability" minOccurs="0">
               <complexType>
                  <complexContent>
```

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```
                        <extension base="cidl:SensorCapabilityBaseType"/>
                    </complexContent>
                </complexType>
            </element>
            <element name="HumidityCapability"
type="scdv:HumiditySensorCapabilityType" minOccurs="0"/>
          </sequence>
       </extension>
    </complexContent>
</complexType>
```

6.27.3 Binary representation syntax

WeatherSensorCapabilityType {	**Number of bits**	**Mnemonic**
TemperatureCapabilityFlag	1	bslbf
PrecipitationCapabilityFlag	1	bslbf
SnowCapabilityFlag	1	bslbf
WindCapabilityFlag	1	bslbf
HumidityCapabilityFlag	1	bslbf
If (TemperatureCapabilityFlag) {		
TemperatureCapability		TemperatureSensorCapabilityType
}		
If (PrecipitationCapabilityFlag) {		
PrecipitationCapability		SensorCapabilityBaseType
}		
If (SnowCapabilityFlag) {		
SnowCapability		SensorCapabilityBaseType
}		
If (WindCapabilityFlag) {		
WindCapability		SensorCapabilityBaseType
}		
If (HumidityCapabilityFlag) {		
HumidityCapability		HumiditySensorCapabilityType
}		
}		

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6.27.4 Semantics

Semantics of the `WeatherSensorCapabilityType`:

Name	*Definition*
`WeatherSensorCapabilityType`	Tool for describing capabilities of a weather sensor, which may be either a physical sensor or a virtual sensor that can produce weather information or can gather weather information in various means.
`TemperatureCapabilityFlag`	This field, which is only present in the binary representation, signals the presence of the `TemperatureCapability` element. A value of “1” means that this element is present and “0” means that this element is not present.
`PrecipitationCapabilityFlag`	This field, which is only present in the binary representation, signals the presence of the `PrecipitationCapability` element. A value of “1” means that this element is present and “0” means that this element is not present.
`SnowCapabilityFlag`	This field, which is only present in the binary representation, signals the presence of the `SnowCapability` element. A value of “1” means that this element is present and “0” means that this element is not present.
`WindCapabilityFlag`	This field, which is only present in the binary representation, signals the presence of the `WindCapability` element. A value of “1” means that this element is present and “0” means that this element is not present.
`HumidityCapabilityFlag`	This field, which is only present in the binary representation, signals the presence of the `HumidityCapability` element. A value of “1” means that this element is present and “0” means that this element is not present.
`TemperatureCapability`	Element to describe the temperature-related capability of a weather sensor. If this element is not instantiated, the given Weather sensor is unable to provide temperature information.
`PrecipitationCapability`	Element to describe the precipitation-related capability of a weather sensor. If this element is not instantiated, the given Weather sensor is unable to provide precipitation information.
`SnowCapability`	Element to describe the snow-related capability of a weather sensor. If this element is not instantiated, the given Weather sensor is unable to provide snow information.
`WindCapability`	Element to describe the wind-related capability of a weather sensor. If this element is not instantiated, the given Weather sensor is unable to provide wind information.
`HumidityCapability`	Element to describe the humidity-related capability of a weather sensor. If this element is not instantiated, the given Weather sensor is unable to provide humidity information.
`sensorCapabilityBaseAttributes`	There are `sensorCapabilityBaseAttributes` inherited from the `SensorCapabilityBaseType` at the top level of the `WeatherSensorCapabilityType` as well as at each individual capability description of temperature, precipitation, snow, wind and humidity sensor. In this capability description, the attributes defined in the `sensorCapabilityBaseAttributes` of the top level are disabled and not used except the `id` and `sensorIdRef` attributes.

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6.27.5 Examples

The following is an example of the `WeatherSensorCapabilityType` to indicate that the capability of the given sensor. This example shows that the given Weather sensor with ID of "WSC_ID1" can sense humidity, temperature, and snow. The humidity information can be provided between 5 % and 90 % with sensitivity of 1 %, the temperature information can be provided between 100 °C and -100 °C in 200 levels, and the snow information can be provided with maximum of 100 cm/min, in 200 levels.

```
<cidl:SensorDeviceCapability xsi:type="scdv:WeatherSensorCapabilityType"
id="WSC_ID1">
   <scdv:TemperatureCapability maxValue="100" minValue="-100" numOfLevels="200"
unit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:celsius"/>
   <scdv:SnowCapability maxValue="100" numOfLevels="200" unit="urn:mpeg:mpeg-
v:01-CI-UnitTypeCS-NS:centimeterperhour"/>
   <scdv:HumidityCapability maxValue="90" minValue="5" numOfLevels="90"
sensitivity="1"/>
</cidl:SensorDeviceCapability>
```

6.28 Camera sensor capability type

6.28.1 General

This subclause specifies syntax and semantics of camera sensor capabilities. This camera sensor capability supports the capapblities of the camera sensor, the spectrum camera sensor, the color camera sensor, the depth camera sensor, the stereo camera sensor, and the thermographic camera sensor specified in ISO/IEC 23005-5.

6.28.2 XML representation syntax

```
<complexType name="CameraSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="SupportedResolutions" type="scdv:ResolutionListType"
minOccurs="0"/>
       <element name="FocalLengthRange" type="scdv:ValueRangeType"
minOccurs="0"/>
       <element name="ApertureRange" type="scdv:ValueRangeType" minOccurs="0"/>
       <element name="ShutterSpeedRange" type="scdv:ValueRangeType"
minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>

<complexType name="ResolutionListType">
   <sequence>
       <element name="Resolution" type="scdv:ResolutionType"
maxOccurs="unbounded"/>
   </sequence>
</complexType>

<complexType name="ResolutionType">
   <sequence>
       <element name="Width" type="nonNegativeInteger"/>
       <element name="Height" type="nonNegativeInteger"/>
```

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```
   </sequence>
</complexType>

<complexType name="ValueRangeType">
   <sequence>
       <element name="MaxValue" type="float"/>
       <element name="MinValue" type="float"/>
   </sequence>
</complexType>
```

6.28.3 Binary representation syntax

CameraSensorCapabilityType {	**Number of bits**	**Mnemonic**
SupportedResolutionsFlag	1	bslbf
FocalLengthRangeFlag	1	bslbf
ApertureRangeFlag	1	bslbf
ShutterSpeedRangeFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(SupportedResolutionsFlag) {		
SupportedResolutions		ResolutionListType
}		
if(FocalLengthRangeFlag) {		
FocalLengthRange		ValueRangeType
}		
if(ApertureRangeFlag) {		
ApertureRange		ValueRangeType
}		
if(ShutterSpeedRangeFlag) {		
ShutterSpeedRange		ValueRangeType
}		
}		
ResolutionListType {		
LoopResolution		vluimsbf5
for(k=0;k< LoopResolution;k++) {		

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CameraSensorCapabilityType {	**Number of bits**	**Mnemonic**
Resolution[k]		ResolutionType
}		
}		
ResolutionType {		
Width	32	uimsbf
Height	32	uimsbf
}		
ValueRangeType {		
MaxValue	32	fsbf
MinValue	32	fsbf
}		

6.28.4 Semantics

Semantics of the `CameraSensorCapabilityType`:

Name	*Definition*
`CameraSensorCapabilityType`	Tool for describing a camera sensor capability.
`SupportedResolutionsFlag`	This field, which is only present in the binary representation, signals the presence of the `SupportedResolutions` element. A value of "1" means that this element is present and "0" means that this element is not present.
`SupportedResolutions`	Describes a list of resolution that the camera can support.
`ResolutionListType`	Describes a type of the resolution list which is composed of `ResolutionType` element.
`ResolutionType`	Describes a type of resolution which is composed of `Width` element and `Height` element.
`Width`	Describes a width of resolution that the camera can perceive.
`Height`	Describes a height of resolution that the camera can perceive
`FocalLengthRangeFlag`	This field, which is only present in the binary representation, signals the presence of the `FocalLengthRange` element. A value of "1"

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Name	*Definition*
	means that this element is present and “0” means that this element is not present.
FocalLengthRange	Describes the range of the focal length that the camera sensor can perceive in terms of ValueRangeType. Its default unit is millimetres (mm). NOTE The minValue and the maxValue in the SensorCapabilityBaseType are not used for this sensor.
ValueRangeType	Defines the range of the value that the sensor can perceive.
MaxValue	Describes the maximum value that the sensor can perceive.
MinValue	Describes the minimum value that the sensor can perceive.
ApertureRangeFlag	This field, which is only present in the binary representation, signals the presence of the ApertureRange element. A value of “1” means that this element is present and “0” means that this element is not present.
ApertureRange	Describes the range of the aperture that the camera sensor can perceive in terms of ValueRangeType. NOTE The minValue and the maxValue in the SensorCapabilityBaseType are not used for this sensor.
ShutterSpeedRangeFlag	This field, which is only present in the binary representation, signals the presence of the ShutterSpeedRange element. A value of “1” means that this element is present and “0” means that this element is not present.
ShutterSpeedRange	Describes the range of the shutter speed that the camera sensor can perceive in terms of ValueRangeType. Its default unit is seconds (sec). NOTE The minValue and the maxValue in the SensorCapabilityBaseType are not used for this sensor.

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6.28.5 Examples

This example shows the description of a camera sensing capability with the following semantics. The camera sensor has an ID of “CSCID_001”. The sensor has a list of the supported resolutions, 1280 × 720 (width × height) and 1920 × 1080. The maximum focal length of the sensor is 100 (mm) and the minimum focal length is 5 (mm). The maximum aperture of the sensor is F1.4 and the minimum aperture is F8. The maximum shutter speed of the sensor is 1 (sec) and the minimum shutter speed is 0.001 (sec).

```
<cidl:SensorDeviceCapability           xsi:type="scdv:CameraSensorCapabilityType"
id="CSCID_001">
   <scdv:SupportedResolutions>
      <scdv:Resolution>
         <scdv:Width>1280</scdv:Width>
         <scdv:Height>720</scdv:Height>
      </scdv:Resolution>
      <scdv:Resolution>
         <scdv:Width>1920</scdv:Width>
```

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```
            <scdv:Height>1080</scdv:Height>
        </scdv:Resolution>
    </scdv:SupportedResolutions>
    <scdv:FocalLengthRange>
        <scdv:MaxValue>100</scdv:MaxValue>
        <scdv:MinValue>5</scdv:MinValue>
    </scdv:FocalLengthRange>
    <scdv:ApertureRange>
        <scdv:MaxValue>1.4</scdv:MaxValue>
        <scdv:MinValue>8</scdv:MinValue>
    </scdv:ApertureRange>
    <scdv:ShutterSpeedRange>
        <scdv:MaxValue>1</scdv:MaxValue>
        <scdv:MinValue>0.001</scdv:MinValue>
    </scdv:ShutterSpeedRange>
</cidl:SensorDeviceCapability>
```

6.29 Proximity sensor capability type

6.29.1 General

This subclause specifies syntax and semantics of proximity sensor capabilities.

6.29.2 XML representation syntax

```
<complexType name="ProximitySensorCapabilityType">
    <complexContent>
        <extension base="cidl:SensorCapabilityBaseType"/>
    </complexContent>
</complexType>
```

6.29.3 Binary representation syntax

ProximitySensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.29.4 Semantics

Semantics of the `ProximitySensorCapabilityType`:

Name	*Definition*
`ProximitySensor CapabilityType`	Tool for describing a proximity sensor capability.
`maxValue`	Describes the maximum value that the proximity sensor can perceive in the unit of metre.
`minValue`	Describes the minimum value that the proximity sensor can perceive in the unit of metre.

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6.29.5 Examples

This example shows the description of a proximity sensing capability with the following semantics. The sensor has an ID of “PXS001” and the maximum value shall be 10 (m) and the minimum value shall be 0 (m) with the resolution of 1 000 levels. The accuracy of the sensor is 0.01 (m). The offset of the sensor is 0.1 (m).

```
<cidl:SensorDeviceCapability        xsi:type="scdv:ProximitySensorCapabilityType"
id="PXS001" maxValue="10" minValue="0" numOfLevels="1000" offset="0.1">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
</cidl:SensorDeviceCapability>
```

6.30 Body weight sensor capability type

6.30.1 General

This subclause specifies syntax and semantics of body weight sensor capabilities. This type supports the capabilities of the body weight sensor and the CoM sensor specified in ISO/IEC 23005-5.

6.30.2 XML representation syntax

```
<complexType name="BodyWeightSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
      </extension>
   </complexContent>
</complexType>
```

6.30.3 Binary representation syntax

BodyWeightSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensoryCapabilityBase		SensoryCapa bilityBaseType
}		

6.30.4 Semantics

Semantics of the `BodyWeightSensorCapabilityType`:

Name	*Definition*
`BodyWeightSensorCapabilityType`	Tool for describing a body weight sensor capability.
`maxValue`	Describes the maximum value that the body weight sensor can perceive in the unit of kilograms.

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6.30.5 Examples

This example shows the description of a body weight capability with the following semantics. The sensor has an ID of "BWSC001" and the maximum value shall be 200.0 (kg) with the resolution of 2 000 levels. The accuracy of the sensor is 0.01 (kg). The offset of sensor is 0.1 (kg)

```
<cidl:SensorDeviceCapability       xsi:type="scdv:BodyWeightSensorCapabilityType"
id="BWSC001" maxValue="200.0" numOfLevels="2000" offset="0.1">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
</cidl:SensorDeviceCapability >
```

6.31 Engine oil temperature sensor capability type

6.31.1 General

This subclause specifies the capability description of the engine oil temperature sensors. The engine oil temperature sensor capability type is defined as an extension of Temperature Sensor Capability type.

6.31.2 Syntax

```
<complexType name="EngineOilTemperatureSensorCapabilityType">
   <complexContent>
      <extension base="scdv:TemperatureSensorCapabilityType"/>
   </complexContent>
</complexType>
```

6.31.3 Binary representation syntax

EngineOilTemperatureSensorCapabilityType {	**Number of bits**	**Mnemonic**
TemperatureSensorCapability		TemperatureSensorCapabilityType
}		

6.31.4 Semantics

Semantics of the `EngineOilTemperatureSensorCapabilityType`:

Name	*Definition*
`EngineOilTemperatureSensorCapabilityType`	Tool for describing capability of the engine oil temperature sensor.

6.31.5 Examples

This example shows the description of an engine oil temperature sensing capability with the following semantics. The sensor has an ID of "EOTS001" and the maximum value shall be 120 (°C) and the minimum value shall be -20 (°C) with the resolution of 1 400 levels. The accuracy of the sensor is 0.1 (°C). The offset of sensor is 1.0 (°C). The sensed information is received at the location of (1.00, 1.00, -1.00).

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```
<cidl:SensorDeviceCapability
xsi:type="scdv:EngineOilTemperatureSensorCapabilityType" id="EOTS001"
maxValue="120" minValue="-20" numOfLevels="1400" offset="1.0" unit="celsius">
    <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
    <scdv:Location>
        <mpegvct:X>1.0</mpegvct:X>
        <mpegvct:Y>1.0</mpegvct:Y>
        <mpegvct:Z>-1.0</mpegvct:Z>
    </scdv:Location>
</cidl:SensorDeviceCapability>
```

6.32 Intake air temperature sensor capability type

6.32.1 General

This subclause specifies a capability description of intake air temperature sensor. The intake air temperature sensor type is defined as an extension of Temperature Sensor type, and the intake air temperature sensor capability type is defined as an extension of temperature sensor capability type.

6.32.2 Syntax

```
<complexType name="IntakeAirTemperatureSensorCapabilityType">
    <complexContent>
        <extension base="scdv:TemperatureSensorCapabilityType"/>
    </complexContent>
</complexType>
```

6.32.3 Binary representation syntax

IntakeAirTemperatureSensorCapabilityType {	**Number of bits**	**Mnemonic**
TemperatureSensorCapability		TemperatureSensorCapabilityType
}		

6.32.4 Semantics

Semantics of the `IntakeAirTemperatureSensorCapabilityType`:

Name	*Definition*
`IntakeAirTemperatureSensorCapabilityType`	Tool for describing the intake air temperature sensor capability.

6.32.5 Examples

This example shows the description of an intake air temperature sensing capability with the following semantics. The sensor has an ID of “IATS001” and the maximum value shall be 120 (°C) and the minimum value shall be -20 (°C) with the resolution of 1 400 levels. The accuracy of the sensor is 0.1 (°C). The offset of sensor is 1.0 (°C). The sensed information is received at the location of (1.00, 1.00, -1.00).

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```
<cidl:SensorDeviceCapability
xsi:type="scdv:IntakeAirTemperatureSensorCapabilityType"
   id="IATS001" maxValue="120" minValue="-20" numOfLevels="1400" offset="1.0"
   unit="celsius">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
   <scdv:Location>
      <mpegvct:X>1.0</mpegvct:X>
      <mpegvct:Y>1.0</mpegvct:Y>
      <mpegvct:Z>-1.0</mpegvct:Z>
   </scdv:Location>
</cidl:SensorDeviceCapability>
```

6.33 Tire pressure monitor system sensor capability type

6.33.1 General

This subclause specifies a capability type of the tire pressure monitor system sensor.

6.33.2 Syntax

```
<complexType name="TirePressureMonitorSystemSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType"/>
   </complexContent>
</complexType>
```

6.33.3 Binary representation syntax

TirePressureMonitorSystemSensorCapability Type {	**Number of bits**	**Mnemonic**
SensorCapability		SensorCapabilityBaseType
}		

6.33.4 Semantics

Semantics of the `TirePressureMonitorSystemSensorCapabilityType`:

Name	*Definition*
`TirePressureMonitorSystemSensorCapabilityType`	Tool for describing capability of a tire pressure monitor system sensor.

6.33.5 Examples

This example shows the description of a tire pressure monitor system sensor capability with the following semantics. The sensor has an ID of “TPMS001” and the maximum value shall be 100 and the minimum value shall be 0 with the resolution of 200 levels. The accuracy of the sensor is 0.5, the offset of sensor is 0.

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```
<cidl:SensorDeviceCapability
xsi:type="scdv:TirePressureMonitorSystemSensorCapabilityType"          id="TPMS001"
maxValue="100" minValue="0" numOfLevels="200" offset="0.0">
    <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.5"/>
</cidl:SensorDeviceCapability>
```

6.34 Distance traveled sensor capability type

6.34.1 General

This suclause specifies a capability of the distance traveled sensor type which senses total distance traveled by the vehicle.

6.34.2 Syntax

```
<complexType name="DistanceTraveledSensorCapabilityType">
    <complexContent>
        <extension base="scdv:DistanceSensorCapabilityType"/>
    </complexContent>
</complexType>
```

6.34.3 Binary representation syntax

DistanceTraveledSensorCapabilityType {	**Number of bits**	**Mnemonic**
DistanceSensorCapability		DistanceSensorCapabilityType
}		

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6.34.4 Semantics

Semantics of the `DistanceTraveledSensorCapabilityType`:

Name	*Definition*
`DistanceTraveledSensorCapabilityType`	Tool for describing capability of the sensor sensing the total distance traveled by a vehicle.

6.34.5 Examples

This example shows the description of a distance traveled sensor capability with the following semantics. The sensor has an ID of “DTS001” and the maximum value shall be 999999 and the minimum value shall be 0 with the resolution of 99999999 levels. The accuracy of the sensor is 0.005, the offset of sensor is 0.

```
<cidl:SensorDeviceCapability xsi:type="scdv:DistanceTraveledSensorCapabilityType"
id="DTS001" maxValue="999999" minValue=”0" numOfLevels="99999999" offset=”0.0">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value=”0.005"/>
</cidl:SensorDeviceCapability>
```

6.35 Speed sensor capability type

6.35.1 General

This subclause specifies a capability of the speed sensor which senses the speed without the notion of moving direction.

6.35.2 Syntax

```
<complexType name="SpeedSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType"/>
   </complexContent>
</complexType>
```

6.35.3 Binary representation syntax

SpeedSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapability		SensorCapabilityBaseType
}		

6.35.4 Semantics

Semantics of the `SpeedSensorCapabilityType`:

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Name	*Definition*
`SpeedSensorCapabilityType`	Tool for describing capability of the speed sensor, which does not specify any moving direction, unlike a velocity sensor.

6.35.5 Examples

This example shows the description of a speed sensor capability with the following semantics. The sensor has an ID of "SS001" and the maximum value shall be 100 and the minimum value shall be 0 with the resolution of 1 000 levels. The accuracy of the sensor is 0.05, the offset of sensor is 0.

```
<cidl:SensorDeviceCapability xsi:type="scdv:SpeedSensorCapabilityType" id="SS001"
maxValue="100" minValue="0" numOfLevels="1000" offset="0.0">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.05"/>
</cidl:SensorDeviceCapability>
```

6.36 Vehicle speed sensor capability type

6.36.1 General

This subclause specifies a capability of the vehicle speed sensor. The vehicle speed sensor capability type is defined as an extension of the speed sensor capability type.

6.36.2 Syntax

```
<complexType name="VehicleSpeedSensorCapabilityType">
   <complexContent>
      <extension base="scdv:SpeedSensorCapabilityType"/>
   </complexContent>
</complexType>
```

6.36.3 Binary representation syntax

VehicleSpeedSensorCapabilityType {	**Number of bits**	**Mnemonic**
SpeedSensorCapability		SpeedSensorCapabilityType
}		

6.36.4 Semantics

Semantics of the `VehicleSpeedSensorCapabilityType`:

Name	*Definition*
`VehicleSpeedSensorCapabilityType`	Tool for describing the capability of a vehicle speed sensor.

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6.36.5 Examples

This example shows the description of a vehicle speed sensor capability with the following semantics. The sensor has an ID of "VSS001" and the maximum value shall be 300 and the minimum value shall be 0 with the resolution of 3 000 levels. The accuracy of the sensor is 0.05, the offset of sensor is 0.

```
<cidl:SensorDeviceCapability      xsi:type="scdv:VehicleSpeedSensorCapabilityType"
id="VSS001" maxValue="300" minValue="0" numOfLevels="3000" offset="0.0">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.05"/>
</cidl:SensorDeviceCapability>
```

6.37 Mass air flow sensor capability type

6.37.1 General

This subclause specifies the capability of a mass air flow sensor.

6.37.2 Syntax

```
<complexType name="MassAirFlowSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType"/>
   </complexContent>
</complexType>
```

6.37.3 Binary representation syntax

MassAirFlowSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapability		SensorCapabilityBaseType
}		

6.37.4 Semantics

Semantics of the `MassAirFlowSensorCapabilityType`:

Name	*Definition*
`MassAirFlowSensorCapabilityType`	Tool for describing capability of a mass air flow sensor.

6.37.5 Examples

This example shows the description of a mass air flow sensor capability with the following semantics. The sensor has an ID of "MAIS001" and the maximum value shall be 1 000 and the minimum value shall be 0 with the resolution of 1 000 levels. The accuracy of the sensor is 0.5, the offset of sensor is 0.

```
<cidl:SensorDeviceCapability      xsi:type="scdv:MassAirFlowSensorCapabilityType"
id="MAIS001" maxValue="1000" minValue="0" numOfLevels="1000" offset="0.0">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.5"/>
```

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```
</cidl:SensorDeviceCapability>
```

6.38 Fuel level sensor capability type

6.38.1 General

This subclause specifies the capability of a fuel level sensor.

6.38.2 Syntax

```
<complexType name="FuelLevelSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType"/>
   </complexContent>
</complexType>
```

6.38.3 Binary representation syntax

FuelLevelSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapability		SensorCapabilityBaseType
}		

6.38.4 Semantics

Semantics of the `FuelLevelSensorCapabilityType`:

Name	*Definition*
`FuelLevelSensorType`	Tool for describing the capability of a fuel level sensor, which gives vales in percentage.

6.38.5 Examples

This example shows the description of a fuel level sensor capability with the following semantics. The sensor has an ID of "FLS001" and the maximum value shall be 100 and the minimum value shall be 0 with the resolution of 100 levels. The accuracy of the sensor is 0.5, the offset of sensor is 0.

```
<cidl:SensorDeviceCapability        xsi:type="scdv:FuelLevelSensorCapabilityType"
id="FLS001" maxValue="100" minValue="0" numOfLevels="100" offset="0.0">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.5"/>
</cidl:SensorDeviceCapability>
```

6.39 Manifold absolute pressure sensor capability type

6.39.1 General

This subclause specifies the capability of a manifold absolute pressure sensor.

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6.39.2 Syntax

```
<complexType name="ManifoldAbsolutePressureSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType"/>
   </complexContent>
</complexType>
```

6.39.3 Binary representation syntax

ManifoldAbsolutePressureSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapability		SensorCapabilityBaseType
}		

6.39.4 Semantics

Semantics of the `ManifoldAbsolutePressureSensorCapabilityType`:

Name	*Definition*
`ManifoldAbsolutePressureSensorCapabilityType`	Tool for describing the capability of a manifold absolute pressure sensor.

6.39.5 Examples

This example shows the description of a manifold absolute pressure sensor capability with the following semantics. The sensor has an ID of "MAPS001" and the maximum value shall be 1 000 and the minimum value shall be 0 with the resolution of 1 000 levels. The accuracy of the sensor is 0.5, the offset of sensor is 0.

```
<cidl:SensorDeviceCapability
xsi:type="scdv:ManifoldAbsolutePressureSensorCapabilityType"          id="MAPS001"
maxValue="1000" minValue="0" numOfLevels="1000" offset="0.0">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.5"/>
</cidl:SensorDeviceCapability>
```

6.40 EngineRPM sensor capability type

6.40.1 General

This subclause specifies the capability of an engine RPM sensor.

6.40.2 Syntax

```
<complexType name="EngineRPMSensorCapabilityType">
   <complexContent>
      <extension base="cidl:SensorCapabilityBaseType"/>
   </complexContent>
</complexType>
```

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6.40.3 Binary representation syntax

EngineRPMSensorCapabilityType {	**Number of bits**	**Mnemonic**
SensorCapability		SensorCapabilityBaseType
}		

6.40.4 Semantics

Semantics of the `EngineRPMSensorCapabilityType`:

Name	*Definition*
`EngineRPMSensorCapabilityType`	Tool for describing the capability of an engine RPM sensor.

6.40.5 Examples

This example shows the description of an engine RPM sensor capability with the following semantics. The sensor has an ID of “ERPMS001” and the maximum value shall be 10 000 and the minimum value shall be 0 with the resolution of 10 000 levels. The accuracy of the sensor is 0.5, the offset of sensor is 0.

```
<cidl:SensorDeviceCapability        xsi:type="scdv:EngineRPMSensorCapabilityType"
id="ERPMS001" maxValue="10000" minValue="0" numOfLevels="10000" offset="0.0">
   <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.5"/>
</cidl:SensorDeviceCapability>
```

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7 User’s sensory preference vocabulary

7.1 General

This Clause describes syntax and semantics of the user’s sensory preference vocabulary which comprises the following effects:

— light, colored light, flash;

— heating, cooling;

— wind;

— vibration;

— scent;

— fog;

— sprayer;

— color correction;

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— tactile;

— kinesthetic;

— rigid body motion;

— bubble.

NOTE SEPV has been designed in an extensible way and additional user preferences on sensory effects can be added easily.

7.2 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:sepv="urn:mpeg:mpeg-
v:2016:01-SEPV-NS" targetNamespace="urn:mpeg:mpeg-v:2016:01-SEPV-NS"
elementFormDefault="qualified" attributeFormDefault="unqualified"
version="ISO/IEC 23005-2" id="MPEG-V-SEPV.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>
```

7.3 Light preference type

7.3.1 General

This subclause specifies syntax and semantics of user's preferences towards light or colored light effects.

7.3.2 XML representation syntax

```
<complexType name="LightPrefType">
    <complexContent>
        <extension base="cidl:UserSensoryPreferenceBaseType">
            <sequence>
                <element name="UnfavorableColor" type="mpegvct:colorType"
                    minOccurs="0" maxOccurs="unbounded"/>
            </sequence>
            <attribute name="maxIntensity" type="float" use="optional"/>
            <attribute name="unit" type="mpegvct:unitType" use="optional"/>
        </extension>
```

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```
    </complexContent>
</complexType>
```

7.3.3 Binary representation syntax

LightPrefType {	Number of bits	Mnemonic
UnfavorableColorFlag	1	bslbf
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(UnfavorableColorFlag){		
LoopUnfavorableColor		vluimsbf5
for(k=0;k< LoopUnfavorableColor;k++){		
UnfavorableColor[k]		ColorType
}		
}		
if(maxIntensityFlag){		
maxIntensity	32	fsbf
}		
if(unitFlag){		
Unit	8	bslbf
}		
}		

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7.3.4 Semantics

Semantics of the `LightPrefType` type:

Name	*Definition*
`LightPrefType`	Tool for describing a user preference on light effect.
`UnfavorableColorFlag`	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.
`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”

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Name	*Definition*
	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.
`maxIntensity`	Describes the maximum desirable intensity of the light effect in terms of illumination with respect to [10^{-5} lux, 130 klux].
`unit`	Specifies the unit of the `maxIntensity` value as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1, if a unit other than the default unit specified in the semantics of the `maxIntensity` is used. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6.
`UnfavorableColor`	Describes the list of user's detestable colors either 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. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6. EXAMPLE `urn:mpeg:mpeg-v:01-SI-ColorCS-NS:alice_blue` would describe the color Alice blue.

7.3.5 Examples

This example shows the description of a user preference on light effect with the following semantics. The light effect is desired with the maximum intensity of 300 lux. A color, which is refused by user, is "alice_blue" from the classification scheme described in ISO/IEC 23005-6, A.2.2.

```
<cidl:USPreference xsi:type="sepv:LightPrefType" activate="true"
unit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:lux" maxIntensity="300">
   <sepv:UnfavorableColor>
   urn:mpeg:mpeg-v:01-SI-ColorCS-NS:alice_blue
   </sepv:UnfavorableColor>
</cidl:USPreference>
```

7.4 Flash preference type

7.4.1 General

This subclause specifies syntax and semantics of user's preferences towards flash effects.

7.4.2 XML representation syntax

```
<complexType name="FlashPrefType">
   <complexContent>
      <extension base="sepv:LightPrefType">
         <attribute name="maxFrequency" type="float" use="optional"/>
         <attribute name="freqUnit" type="mpegvct:unitType" use="optional"/>
      </extension>
   </complexContent>
```

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```
</complexType>
```

7.4.3 Binary representation syntax

FlashPrefType {	**Number of bits**	**Mnemonic**
maxFrequencyFlag	1	bslbf
freqUnitFlag	1	bslbf
LightPref		LightPrefType
if(maxFrequencyFlag){		
maxFrequency	32	fsbf
}		
if(freqUnitFlag){		
freqUnit	8	bslbf
}		
}		

7.4.4 Semantics

Semantics of the `FlashPrefType` type:

Name	*Definition*
`FlashPrefType`	Tool for describing a user preference on flash effect. It is extended from the light type.
`maxFrequencyFlag`	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.
`freqUnitFlag`	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.
`maxFrequency`	Describes the maximum allowed number of flickering in times per second. EXAMPLE The value 10 means it will flicker 10 times for each second.
`freqUnit`	Specifies the unit of the `maxFrequency` value as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1, if a unit other than the default unit specified in the semantics of the `maxFrequency` is used. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6.

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7.4.5 Examples

This example shows the description of a user preference on flash effect with the following semantics. The flash is desired with the maximum frequency of 50 times per second.

```
<cidl:USPreference xsi:type="sepv:FlashPrefType" activate="true"
maxFrequency="50" unit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:Hz"/>
```

7.5 Heating preference type

7.5.1 General

This subclause specifies syntax and semantics of user's preferences towards temperature (i.e. heating) effects.

7.5.2 XML representation syntax

```
<complexType name="HeatingPrefType">
    <complexContent>
        <extension base="cidl:UserSensoryPreferenceBaseType">
            <attribute name="minIntensity" type="integer" use="optional"/>
            <attribute name="maxIntensity" type="integer" use="optional"/>
            <attribute name="unit" type="mpegvct:unitType" use="optional"/>
        </extension>
    </complexContent>
</complexType>
```

7.5.3 Binary representation syntax

HeatingPrefType {	**Number of bits**	**Mnemonic**
minIntensityFlag	1	bslbf
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(minIntensityFlag){		
minIntensity	8	uimsbf
}		
if(maxIntensityFlag){		
maxIntensity	16	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		

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}		

7.5.4 Semantics

Semantics of the `HeatingPrefType` type:

Name	*Definition*
`HeatingPrefType`	Tool for describing a user preference on heating effect.
`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.
`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.
`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.
`maxIntensity`	Describes the highest desirable temperature of the heating effect with respect to the Celsius scale (or Fahrenheit).
`minIntensity`	Describes the lowest desirable temperature of the heating effect with respect to the Celsius scale (or Fahrenheit).
`unit`	Specifies the unit of the `maxIntensity` and `minIntensity` value as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6.

7.5.5 Examples

This example shows a description of a user preference on heating effect with the following semantics. The identifier for this preference description is “heater001”. The heating is desired with the maximum intensity of up to 50 °C, and minimum intensity of 20 °C. When the given command on the heating effect is not within the range of preference or capability, it should be properly scaled.

```
<cidl:USPreference xsi:type="sepv:HeatingPrefType" id="heater001"
maxIntensity="50" minIntensity="20" adaptationMode="scalable"
activate="true"/>
```

7.6 Cooling preference type

7.6.1 General

This subclause specifies syntax and semantics of user’s preferences towards temperature (i.e. cooling) effects.

7.6.2 XML representation syntax

```
<complexType name="CoolingPrefType">
   <complexContent>
      <extension base="cidl:UserSensoryPreferenceBaseType">
```

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```
            <attribute name="minIntensity" type="integer" use="optional"/>
            <attribute name="maxIntensity" type="integer" use="optional"/>
            <attribute name="unit" type="mpegvct:unitType" use="optional"/>
        </extension>
    </complexContent>
</complexType>
```

7.6.3 Binary representation syntax

CoolingPrefType {	**Number of bits**	**Mnemonic**
minIntensityFlag	1	bslbf
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(minIntensityFlag){		
minIntensity	16	simsbf
}		
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
}		

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7.6.4 Semantics

Semantics of the `CoolingPrefType` type:

Name	*Definition*
`CoolingPrefType`	Tool for describing a user preference on cooling effect.
`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.
`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.

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Name	*Definition*
`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.
`maxIntensity`	Describes the lowest desirable temperature of the cooling effect with respect to the Celsius scale (or Fahrenheit).
`minIntensity`	Describes the highest desirable temperature of the cooling effect with respect to the Celsius scale (or Fahrenheit).
`unit`	Specifies the unit of the `maxIntensity` and `minIntensity` value as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6.

7.6.5 Examples

This example shows a description of a user preference on cooling effect with the following semantics. The identifier for this preference description is "cooling001". The cooling is desired with the maximum intensity of up to 10 °C, and minimum intensity of 30 °C. When the given command on the cooling effect is not within the range of preference or capability, it should be properly scaled.

```
<cidl:USPreference xsi:type="sepv:CoolingPrefType" id="cooling001"
maxIntensity="10" minIntensity="30" adaptationMode="scalable"
activate="true"/>
```

7.7 Wind preference type

7.7.1 General

This subclause specifies syntax and semantics of user's preferences towards wind effects.

7.7.2 XML representation syntax

```
<complexType name="WindPrefType">
   <complexContent>
      <extension base="cidl:UserSensoryPreferenceBaseType">
         <attribute name="maxIntensity" type="integer" use="optional"/>
         <attribute name="unit" type="mpegvct:unitType" use="optional"/>
      </extension>
   </complexContent>
</complexType>
```

7.7.3 Binary representation syntax

WindPrefType {	**Number of bits**	**Mnemonic**
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf

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WindPrefType {	**Number of bits**	**Mnemonic**
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
}		

7.7.4 Semantics

Semantics of the `WindPrefType` type:

Name	*Definition*
`WindPrefType`	Tool for describing a user preference on a wind effect.
`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.
`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.
`maxIntensity`	Describes the maximum desirable intensity of the wind effect in terms of strength with respect to the Beaufort scale.
`unit`	Specifies the unit of the `maxIntensity` value as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1, if a unit other than the default unit specified in the semantics of the `maxIntensity` is used. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6.

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7.7.5 Examples

This example shows a description of a user preference on wind effect with the following semantics. The identifier for this preference description is "wind01". The wind is desired with the maximum intensity of up to 4 Beaufort. When the given command on the wind effect is not within the range of preference or capability, it should be clipped.

```
<cidl:USPreference xsi:type="sepv:WindPrefType" id="wind01" maxIntensity="4"
activate="true" adaptationMode="strict"/>
```

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7.8 Vibration preference type

7.8.1 General

This subclause specifies syntax and semantics of user's preferences towards vibration effects.

7.8.2 XML representation syntax

```
<complexType name="VibrationPrefType">
   <complexContent>
      <extension base="cidl:UserSensoryPreferenceBaseType">
         <attribute name="maxIntensity" type="integer" use="optional"/>
         <attribute name="unit" type="mpegvct:unitType" use="optional"/>
      </extension>
   </complexContent>
</complexType>
```

7.8.3 Binary representation syntax

VibrationPrefType {	**Number of bits**	**Mnemonic**
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
}		

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7.8.4 Semantics

Semantics of the `VibrationPrefType` type:

Name	*Definition*
`VibrationPrefType`	Tool for describing a user preference on vibration effect.
`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.
`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"

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Name	*Definition*
	means the attribute shall not be used.
`maxIntensity`	Describes the maximum desirable intensity of the vibration effect in terms of strength with respect to Hertz.
`unit`	Specifies the unit of the `maxIntensity` value as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6, A.2.1, if a unit other than the default unit specified in the semantics of the `maxIntensity` is used. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6.

7.8.5 Examples

This example shows a description of a user preference on vibration effect with the following semantics. The identifier for this preference description is “vibe02”. The vibration is desired with the maximum intensity of up to 600 Hz. When the given command on the vibration effect is not within the range of preference or capability, it should be properly scaled with the maximum of 600 Hz, if the maximum intensity defined in the device capability is greater than 600.

```
<cidl:USPreference xsi:type="sepv:VibrationPrefType" id="vibe02"
maxIntensity="600" activate="true" adaptationMode="scalable"/>
```

7.9 Scent preference type

7.9.1 General

This subclause specifies syntax and semantics of user’s preferences towards scent effects.

7.9.2 XML representation syntax

```
<complexType name="ScentPrefType">
   <complexContent>
      <extension base="cidl:UserSensoryPreferenceBaseType">
         <sequence>
            <element name="HedonicScent" type="mpeg7:termReferenceType"
                minOccurs="0" maxOccurs="unbounded"/>
         </sequence>
         <attribute name="maxIntensity" type="integer" use="optional"/>
         <attribute name="unit" type="mpegvct:unitType" use="optional"/>
      </extension>
   </complexContent>
</complexType>
```

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7.9.3 Binary representation syntax

ScentPrefType {	Number of bits	Mnemonic
HedonicScentFlag	1	bslbf
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(HedonicScentFlag){		
LoopHedonicScent		vluimsbf5
for(k=0;k< LoopHedonicScent;k++){		
HedonicScent[k]	9	blsbf
}		
}		
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
}		

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7.9.4 Semantics

Semantics of the `ScentPrefType` type:

Name	*Definition*
`ScentPrefType`	Tool for describing a user preference on scent effect.
`HedonicScentFlag`	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.
`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.
`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.

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Name	*Definition*
LoopHedonicScent	This field, which is only present in the binary representation, specifies the number of HedonicScent contained in the description.
HedonicScent	Describes the list of user's pleasant or unpleasant scent. A CS that may be used for this purpose is the ScentCS defined in ISO/IEC 23005-6:—, A.2.4. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.
maxIntensity	Describes the maximum desirable intensity of the scent effect in terms of millilitre per hour.
unit	Specifies the unit of the maxIntensity value as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1, if a unit other than the default unit specified in the semantics of the maxIntensity is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.

7.9.5 Examples

This example shows a description of a user preference on scent effect with the following semantics. The identifier for this preference description is "scent001". The scent effect is desired with the maximum intensity of up to 4 ml/h. When the given command on the scent effect is not within the range of preference or capability, it should be properly scaled with the maximum of 4 ml/h, if the maximum intensity defined in the device capability is greater than 4. Also, it specifies that the scent of rose as defined in ScentCS of ISO/IEC 23005-6 is not desired.

```
<cidl:USPreference xsi:type="sepv:ScentPrefType" id="scent001"
maxIntensity="4" adaptationMode="scalable">
  <sepv:HedonicScent>
  urn:mpeg:mpeg-v:01-SI-ScentCS-NS:rose
  </sepv:HedonicScent>
</cidl:USPreference>
```

7.10 Fog preference type

7.10.1 General

This subclause specifies syntax and semantics of user's preferences towards fog effects.

7.10.2 XML representation syntax

```
<complexType name="FogPrefType">
   <complexContent>
      <extension base="cidl:UserSensoryPreferenceBaseType">
         <attribute name="maxIntensity" type="integer" use="optional"/>
         <attribute name="unit" type="mpegvct:unitType" use="optional"/>
      </extension>
   </complexContent>
</complexType>
```

7.10.3 Binary representation syntax

FogPrefType {	**Number of bits**	**Mnemonic**

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maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
}		

7.10.4 Semantics

Semantics of the `FogPrefType` type:

Name	*Definition*
`FogPrefType`	Tool for describing a preference on fog effect.
`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.
`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.
`maxIntensity`	Describes the maximum desirable intensity of the fog effect in terms of millilitre per hour.
`unit`	Specifies the unit of the `maxIntensity` value as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1, if a unit other than the default unit specified in the semantics of the `maxIntensity` is used. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6.

7.10.5 Examples

This example shows a description of a user preference on fog effect with the following semantics. The identifier for this preference description is "fogfog". The fog effect is desired with the maximum intensity of up to 5 ml/h. When the given command on the fog effect is not within the range of preference or capability, it should be properly scaled with the maximum of 5 ml/h, if the maximum intensity defined in the device capability is greater than 5.

```
<cidl:USPreference xsi:type="sepv:FogPrefType" id="fogfog" maxIntensity="5"
adaptationMode="scalable"/>
```

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7.11 Spraying preference type

7.11.1 General

This subclause specifies syntax and semantics of user's preferences towards sprayer effects.

7.11.2 XML representation syntax

```
<complexType name="SprayingPrefType">
   <complexContent>
      <extension base="cidl:UserSensoryPreferenceBaseType">
         <attribute name="sprayingType" type="mpeg7:termReferenceType"/>
         <attribute name="maxIntensity" type="integer" use="optional"/>
         <attribute name="unit" type="mpegvct:unitType" use="optional"/>
      </extension>
   </complexContent>
</complexType>
```

7.11.3 Binary representation syntax

SprayingPrefType{	**Number of bits**	**Mnemonic**
sprayingFlag	1	bslbf
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(sprayingFlag){		
spraying		SprayingType
}		
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
}		

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7.11.4 Semantics

Semantics of the `SprayingPrefType` type:

Name	*Definition*
`SprayingPrefType`	Tool for describing a user preference on spraying effect.
`sprayingFlag`	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.
`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.
`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.
`sprayingType`	Describes the type of the sprayed material as a reference to a classification scheme term. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6. A CS that may be used for this purpose is the `SprayingTypeCS` defined in ISO/IEC 23005-6:—, A.2.7.
`maxIntensity`	Describes the maximum desirable intensity of the spraying effect in terms of millilitre per hour.
`unit`	Specifies the unit of the `maxIntensity` value as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1, if a unit other than the default unit specified in the semantics of the `maxIntensity` is used. The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6.

7.11.5 Examples

This example shows a description of a user preference on spraying effect with the following semantics. The identifier for this preference description is “letspray”. The spraying effect is desired with the maximum intensity of up to 4 ml/h. When the given command on the spraying effect is not within the range of preference or capability, it should be properly scaled with the maximum of 4 ml/h, if the maximum intensity defined in the device capability is greater than 4. The desired material to be sprayed is purified water, as defined in the `SprayingTypeCS` defined in ISO/IEC 23005-6:—, A.2.7.

```
<cidl:USPreference xsi:type="sepv:SprayingPrefType" id="letspray"
maxIntensity="4" sprayingType="urn:mpeg:mpeg-v:01-SI-SprayingTypeCS-NS:water"/>
```

7.12 Color correction preference type

7.12.1 General

This subclause specifies syntax and semantics of user’s preferences towards color correction effects.

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7.12.2 XML representation syntax

```
<complexType name="ColorCorrectionPrefType">
   <complexContent>
      <extension base="cidl:UserSensoryPreferenceBaseType"/>
   </complexContent>
</complexType>
```

7.12.3 Binary representation syntax

ColorCorrectionPrefType {	**Number of bits**	**Mnemonic**
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
}		

7.12.4 Semantics

Semantics of the `ColorCorrectionPreferenceType` type:

Name	*Definition*
`ColorCorrectionPrefType`	Specifies whether the user prefers to use color correction functionality of the device or not by using `activate` attribute. Any information given by other attributes is ignored.

7.12.5 Examples

This example shows the description of a user preference on color correction effect with the following semantics. The color collection effect is desired by user simply by activating it “true”.

```
<cidl:USPreference xsi:type="sepv:ColorCorrectionPrefType" activate="true"/>
```

7.13 Tactile preference type

7.13.1 General

This subclause specifies syntax and semantics of user’s preferences towards tactile effects.

7.13.2 XML representation syntax

```
<complexType name="TactilePrefType">
   <complexContent>
      <extension base="cidl:UserSensoryPreferenceBaseType">
         <attribute name="maxTemperature" type="float" use="optional"/>
         <attribute name="minTemperature" type="float" use="optional"/>
         <attribute name="maxCurrent" type="float" use="optional"/>
         <attribute name="maxVibration" type="float" use="optional"/>
         <attribute name="tempUnit" type="mpegvct:unitType" use="optional"/>
         <attribute name="currentUnit" type="mpegvct:unitType" use="optional"/>
```

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```
            <attribute name="vibrationUnit" type="mpegvct:unitType"
               use="optional"/>
         </extension>
      </complexContent>
</complexType>
```

7.13.3 Binary representation syntax

TactilePrefType {	**Number of bits**	**Mnemonic**
maxTemperatureFlag	1	bslbf
minTemperatureFlag	1	bslbf
maxCurrentFlag	1	bslbf
maxVibrationFlag	1	bslbf
tempUnitFlag	1	bslbf
currentUnitFlag	1	bslbf
vibrationUnitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(maxTemperatureFlag){		
maxTemperature	32	fsbf
}		
if(minTemperatureFlag){		
minTemperature	32	fsbf
}		
if(maxCurrentFlag){		
maxCurrent	32	fsbf
}		
if(maxVibrationFlag){		
maxVibration	32	fsbf
}		
if(tempUnitFlag){		
tempUnit	8	bslbf
}		
if(currentUnitFlag){		

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TactilePrefType {	**Number of bits**	**Mnemonic**
currentUnit	8	bslbf
}		
if(vibrationUnitFlag){		
vibrationUnit	8	bslbf
}		
}		

7.13.4 Semantics

Semantics of the `TactilePrefType`:

Name	*Definition*
`TactilePrefType`	Tool for describing a user preference on tactile effect.
`maxTemperatureFlag`	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.
`minTemperatureFlag`	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.
`maxCurrentFlag`	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.
`maxVibrationFlag`	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.
`tempUnitFlag`	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.
`currentUnitFlag`	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.
`vibrationUnitFlag`	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.
`maxTemperature`	Describes the maximum desirable temperature regarding how hot the tactile effect may be achieved. (Celsius)
`minTemperature`	Describes the minimum desirable temperature regarding how cold the tactile effect may be achieved.(Celsius)
`maxCurrent`	Describes the maximum desirable electric current. (mA).

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Name	*Definition*
maxVibration	Describes the maximum desirable vibration. (mm).
tempUnit	Specifies the unit of the intensity, as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1. If the unit is not specified, the default unit is Celsius. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.
currentUnit	Specifies the unit of the intensity, as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1. If the unit is not specified, the default unit is milli-ampere. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.
vibrationUnit	Specifies the unit of the intensity, as a reference to a classification scheme term provided by UnitTypeCS defined in ISO/IEC 23005-6:—, A.2.1. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in ISO/IEC 15938-5:2003, 7.6.

7.13.5 Examples

An example of the TactilePrefType to indicate the preference of tactile sensory effect is given. For the case of thermal display maximum temperature is 45° in Celsius and minimum temperature is 10° in Celsius. Also, maximum electric current less than 30 mA is preferred and maximum vibration not exceeding 0.1 mm is preferred.

```
<cidl:USPreference xsi:type="sepv:TactilePrefType" maxTemperature="45"
minTemperature="10" maxCurrent="30" maxVibration="0.1"
tempUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:celsius"
currentUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:milliampere"
vibrationUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:mm"/>
```

7.14 Kinesthetic preference type

7.14.1 General

This subclause specifies syntax and semantics of user's preferences towards kinesthetic effects.

7.14.2 XML representation syntax

```
<complexType name="KinestheticPrefType">
   <complexContent>
      <extension base="cidl:UserSensoryPreferenceBaseType">
         <sequence>
            <element name="MaxForce" type="mpegvct:Float3DVectorType"
               minOccurs="0"/>
            <element name="MaxTorque" type="mpegvct:Float3DVectorType"
               minOccurs="0"/>
         </sequence>
         <attribute name="forceUnit" type="mpegvct:unitType" use="optional"/>
         <attribute name="torqueUnit" type="mpegvct:unitType" use="optional"/>
      </extension>
   </complexContent>
</complexType>
```

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7.14.3 Binary representation syntax

KinestheticPrefType {	**Number of bits**	**Mnemonic**
MaxForceFlag	1	bslbf
MaxTorqueFlag	1	bslbf
forceUnitFlag	1	bslbf
torqueUnitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(MaxForceFlag){		
MaxForce		Float3DVectorType
}		
if(MaxTorqueFlag){		
MaxTorque		Float3DVectorType
}		
if(forceUnitFlag) {		
forceUnit	8	bslbf
}		
if(torqueUnitFlag) {		
torqueUnit	8	bslbf
}		
}		
Float3DVectorType {		
X	32	fsbf
Y	32	fsbf
Z	32	fsbf
}		

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7.14.4 Semantics

Semantics of the `KinestheticPrefType`:

Name	*Definition*
`KinestheticPrefType`	Tool for describing a user preference on Kinesthetic effect (forcefeedback effect).
`MaxForceFlag`	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.
`MaxTorqueFlag`	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.
`forceUnitFlag`	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.
`torqueUnitFlag`	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.
`MaxForce`	Describes the maximum desirable force for each direction of three-dimensional axis (x, y and z). (N).
`MaxTorque`	Describes the maximum desirable torque for each direction of three-dimensional axis (x, y and z). (N-mm).
`forceUnit`	Specifies the unit of the intensity, as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1. If the unit is not specified, the default unit is Newton (N). The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6.
`torqueUnit`	Specifies the unit of the intensity, as a reference to a classification scheme term provided by `UnitTypeCS` defined in ISO/IEC 23005-6:—, A.2.1. If the unit is not specified, the default unit is Newton millimetre (N-mm). The reference to the classification scheme shall be done using the `mpeg7:termReferenceType` defined in ISO/IEC 15938-5:2003, 7.6.

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7.14.5 Examples

This example of the `KinestheticPrefType` indicates the preference of kinesthetic sensory effect. In this example, a maximum force is considered with values of forces on each axis (Fx=5.0N, Fy=3.0 N, Fz=3.5 N).

```
<cidl:USPreference xsi:type="sepv:KinestheticPrefType"
forceUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:Newton"
torqueUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:Nmm">
   <sepv:MaxForce>
      <mpegvct:X>5.0</mpegvct:X>
      <mpegvct:Y>3.0</mpegvct:Y>
      <mpegvct:Z>3.5</mpegvct:Z>
   </sepv:MaxForce>
</cidl:USPreference>
```

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7.15 RigidBodyMotion preference type

7.15.1 General

This subclause specifies syntax and semantics of user's preferences towards rigid body motion effects.

7.15.2 XML representation syntax

```
<complexType name="RigidBodyMotionPrefType">
   <complexContent>
      <extension base="cidl:UserSensoryPreferenceBaseType">
         <sequence maxOccurs="unbounded">
            <element name="MotionPreference"
               type="sepv:MotionPreferenceBaseType"/>
         </sequence>
      </extension>
   </complexContent>
</complexType>

<complexType name="MotionPreferenceBaseType" abstract="true">
   <attribute name="unfavor" type="boolean" use="optional" default="0"/>
</complexType>

<complexType name="MoveTowardPreferenceType">
   <complexContent>
      <extension base="sepv:MotionPreferenceBaseType">
         <attribute name="maxMoveDistance" type="unsignedInt" use="optional"/>
         <attribute name="maxMoveSpeed" type="float" use="optional"/>
         <attribute name="maxMoveAccel" type="float" use="optional"/>
         <attribute name="distanceUnit" type="mpegvct:unitType" use="optional"/>
         <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
         <attribute name="accelUnit" type="mpegvct:unitType" use="optional"/>
      </extension>
   </complexContent>
</complexType>

<complexType name="InclinePreferenceType">
   <complexContent>
      <extension base="sepv:MotionPreferenceBaseType">
         <attribute name="maxRotationAngle" type="float" use="optional"/>
         <attribute name="maxRotationSpeed" type="float" use="optional"/>
         <attribute name="maxRotationAccel" type="float" use="optional"/>
         <attribute name="angleUnit" type="mpegvct:unitType" use="optional"/>
         <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
         <attribute name="accelUnit" type="mpegvct:unitType" use="optional"/>
      </extension>
   </complexContent>
</complexType>

<complexType name="WavePreferenceType">
   <complexContent>
      <extension base="sepv:MotionPreferenceBaseType">
         <attribute name="maxWaveDistance" type="float" use="optional"/>
         <attribute name="maxWaveSpeed" type="float" use="optional"/>
         <attribute name="distanceUnit" type="mpegvct:unitType" use="optional"/>
         <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
      </extension>
   </complexContent>
```

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```
</complexType>

<complexType name="CollidePreferenceType">
    <complexContent>
        <extension base="sepv:MotionPreferenceBaseType">
            <attribute name="maxCollideSpeed" type="float" use="optional"/>
            <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
        </extension>
    </complexContent>
</complexType>

<complexType name="TurnPreferenceType">
    <complexContent>
        <extension base="sepv:MotionPreferenceBaseType">
            <attribute name="maxTurnSpeed" type="float" use="optional"/>
            <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
        </extension>
    </complexContent>
</complexType>

<complexType name="ShakePreferenceType">
    <complexContent>
        <extension base="sepv:MotionPreferenceBaseType">
            <attribute name="maxShakeDistance" type="float" use="optional"/>
            <attribute name="maxShakeSpeed" type="float" use="optional"/>
            <attribute name="distanceUnit" type="mpegvct:unitType" use="optional"/>
            <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
        </extension>
    </complexContent>
</complexType>

<complexType name="SpinPreferenceType">
    <complexContent>
        <extension base="sepv:MotionPreferenceBaseType">
            <attribute name="maxSpinSpeed" type="float" use="optional"/>
            <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
        </extension>
    </complexContent>
</complexType>
```

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7.15.3 Binary representation syntax

RigidBodyMotionPrefType {	**Number of bits**	**Mnemonic**
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
LoopMotionPreference	4	uimsbf
for(k=0;k< LoopMotionPreference;k++){		
MotionPreferenceType[k]	4	bslbf
MotionPreference[k]		MotionPreferenceBaseType
}		
}		

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