

ONVIF™ Imaging Service Specification

Version 2.1
June, 2011



© 2008-2011 by ONVIF: Open Network Video Interface Forum Inc.. All rights reserved.

Recipients of this document may copy, distribute, publish, or display this document so long as this copyright notice, license and disclaimer are retained with all copies of the document. No license is granted to modify this document.

THIS DOCUMENT IS PROVIDED "AS IS," AND THE CORPORATION AND ITS MEMBERS AND THEIR AFFILIATES, MAKE NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT, OR TITLE; THAT THE CONTENTS OF THIS DOCUMENT ARE SUITABLE FOR ANY PURPOSE; OR THAT THE IMPLEMENTATION OF SUCH CONTENTS WILL NOT INFRINGE ANY PATENTS, COPYRIGHTS, TRADEMARKS OR OTHER RIGHTS.

IN NO EVENT WILL THE CORPORATION OR ITS MEMBERS OR THEIR AFFILIATES BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES, ARISING OUT OF OR RELATING TO ANY USE OR DISTRIBUTION OF THIS DOCUMENT, WHETHER OR NOT (1) THE CORPORATION, MEMBERS OR THEIR AFFILIATES HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR (2) SUCH DAMAGES WERE REASONABLY FORESEEABLE, AND ARISING OUT OF OR RELATING TO ANY USE OR DISTRIBUTION OF THIS DOCUMENT. THE FOREGOING DISCLAIMER AND LIMITATION ON LIABILITY DO NOT APPLY TO, INVALIDATE, OR LIMIT REPRESENTATIONS AND WARRANTIES MADE BY THE MEMBERS AND THEIR RESPECTIVE AFFILIATES TO THE CORPORATION AND OTHER MEMBERS IN CERTAIN WRITTEN POLICIES OF THE CORPORATION.

CONTENTS

| | | |
|----------|-------------------------------------|----------|
| 1 | Scope | 4 |
| 2 | Normative references | 4 |
| 3 | Terms and Definitions | 4 |
| 3.1 | Definitions..... | 4 |
| 4 | Overview | 4 |
| 5 | Service | 5 |
| 5.1 | Imaging settings..... | 5 |
| 5.1.1 | Get imaging settings..... | 6 |
| 5.1.2 | Set imaging settings..... | 7 |
| 5.1.3 | Get options..... | 8 |
| 5.1.4 | Move..... | 8 |
| 5.1.5 | Get move options..... | 10 |
| 5.1.6 | Stop..... | 10 |
| 5.1.7 | Get imaging status..... | 11 |
| 5.1.8 | Capabilities..... | 12 |
| 5.2 | Service specific data types..... | 12 |
| 5.2.1 | ImagingStatus..... | 12 |
| 5.2.2 | FocusStatus..... | 12 |
| 5.2.3 | FocusConfiguration..... | 12 |
| 5.2.4 | ImagingSettings..... | 13 |
| 5.2.5 | Exposure..... | 13 |
| 5.2.6 | WideDynamicRange..... | 14 |
| 5.2.7 | BacklightCompensation..... | 15 |
| 5.2.8 | FocusMove..... | 15 |
| 5.2.9 | AbsoluteFocus..... | 15 |
| 5.2.10 | RelativeFocus..... | 15 |
| 5.2.11 | ContinuousFocus..... | 15 |
| 5.2.12 | MoveOptions..... | 16 |
| 5.2.13 | AbsoluteFocusOptions..... | 16 |
| 5.2.14 | RelativeFocusOptions..... | 16 |
| 5.2.15 | ContinuousFocusOptions..... | 16 |
| 5.2.16 | WhiteBalance..... | 16 |
| 5.2.17 | ImagingStatus20..... | 17 |
| 5.2.18 | FocusStatus20..... | 17 |
| 5.2.19 | ImagingSettings20..... | 17 |
| 5.2.20 | WideDynamicRange20..... | 18 |
| 5.2.21 | BacklightCompensation20..... | 18 |
| 5.2.22 | Exposure20..... | 18 |
| 5.2.23 | ImagingOptions20..... | 19 |
| 5.2.24 | WideDynamicRangeOptions20..... | 20 |
| 5.2.25 | BacklightCompensationOptions20..... | 20 |
| 5.2.26 | ExposureOptions20..... | 20 |
| 5.2.27 | MoveOptions20..... | 21 |
| 5.2.28 | RelativeFocusOptions20..... | 22 |
| 5.2.29 | WhiteBalance20..... | 22 |
| 5.2.30 | FocusConfiguration20..... | 22 |
| 5.2.31 | WhiteBalanceOptions20..... | 22 |
| 5.2.32 | FocusOptions20..... | 23 |
| 5.3 | Service specific fault codes..... | 23 |

1 Scope

2 Normative references

ONVIF Core Specification

<<http://www.onvif.org/onvif/specs/core/ONVIF-Core-Spec-v210.pdf>>

3 Terms and Definitions

3.1 Definitions

| | |
|---------------------------|--|
| Digital PTZ | Function that diminishes or crops an image to adjust the image position and ratio. |
| Imaging Service | Services for exposure time, gain and white balance parameters among others. |
| Input/Output (I/O) | Currently relay ports and Video/Audio Inputs/Outputs are handled. |
| Optical Zoom | Changes the focal length (angle of view) for the NVT by moving the zoom lens in the camera's optics. |

4 Overview

The imaging service provides configuration and control data for imaging specific properties. WSDL is part of the framework and provided in the Imaging WSDL file.

The service includes the following operations:

- Get and set imaging configurations (exposure time, gain and white balance, for example).
- Get imaging configuration options (valid ranges for imaging parameters).
- Move focus lens.
- Stop ongoing focus movement.
- Get current position and move status for focus.

WSDL for this service is specified in <http://www.onvif.org/ver20/imaging/wSDL/imaging.wsdl>.

5 Service

The imaging service provides operations used to control and configure imaging properties on a device. A device that has one or more video sources should support the imaging service as defined in [ONVIF Imaging WSDL]. The imaging settings are part of the VideoSource entity. This means that imaging parameters directly affect a specific video source.

5.1 Imaging settings

The imaging service provides operations to get or set imaging parameters and the valid ranges for those parameters. Some parameters have no effect if a specific mode is not set. Some of the parameters included in the settings require a specific imaging capability that can be requested through the GetOptions command. The following settings are available through the imaging service operations:

BacklightCompensation: Enables/disables BLC mode (on/off)

- On
 - Optional level parameter (unspecified unit).
- Off

Brightness: Adjusts the image brightness (unspecified unit).

ColorSaturation: Adjusts the color saturation in the image (unspecified unit).

Sharpness: Adjusts the sharpness in the image (unspecified unit).

Contrast: Adjusts the image contrast (unspecified unit).

Exposure:

- Auto – Enables the exposure algorithm on the device:
 - Priority – Sets the exposure priority mode (low noise/framerate).
 - Window – Rectangular exposure mask.
 - Min/MaxExposureTime – Exposure time range allowed to be used by the algorithm.
 - Min/MaxGain – The sensor gain range that is allowed to be used by the algorithm.
 - Min/MaxIris – The iris range allowed to be used by the algorithm.
- Manual – Disables the exposure algorithm on the device:
 - ExposureTime – The fixed exposure time used by the image sensor (μ s).
 - Gain – The fixed gain used by the image sensor (dB).

- Iris – The fixed attenuation of input light affected by the iris (dB). 0dB maps to a fully opened iris.

Focus:

- Auto (parameters that apply to automatic mode only):
 - Near/FarLimit – Limits for focus lens (m).
- Manual (parameters that apply to manual mode only):
 - Default speed – The default speed for focus move operation (when the speed parameter not is present). Manual control is done through the move command, see Section 5.1.4.

Ir cut filter: Toggles the Ir cut filter state between on, off and auto. The auto state lets the exposure algorithm handle when the Ir cut filter should be turned on or off.

Whitebalance:

- Auto whitebalancing mode (auto/manual).
- Manual (parameters that apply to manual mode only):
 - Rgain (unitless).
 - Bgain (unitless).

WideDynamicRange: Wide dynamic range (on/off):

- On
 - Optional level parameter (unitless).
- Off

The available imaging settings can be retrieved through the GetVideoSources command part of the media service, as specified in the ONVIF Media Service Specification. The imaging settings are part of the video source.

5.1.1 Get imaging settings

This operation requests the imaging setting for a video source on the device. A device implementing the imaging service shall support this command.

If the Video Source supports any of the imaging settings as defined by the ImagingSettings type in the [ONVIF Schema], then it should be possible to retrieve the imaging settings from the device through the GetImagingSettings command.

The imaging settings parameters are described in Section 5.1.

Table 1: GetImagingSettings command

| GetImagingSettings | | Access Class: READ_MEDIA |
|--|--|--------------------------|
| Message name | Description | |
| GetImagingSettingsRequest | <p><i>This message contains a reference to the VideoSource for which the ImagingSettings should be requested.</i></p> <p>tt:ReferenceToken VideoSourceToken[1][1]</p> | |
| GetImagingSettingsResponse | <p><i>This message contains the ImagingSettings for the VideoSource that was requested</i></p> <p>tt:ImagingSettings20ImagingSettings[1][1]</p> | |
| Fault codes | Description | |
| env:Sender ter:InvalidArgVal ter:NoSource | <p><i>The requested VideoSource does not exist.</i></p> | |
| env:Receiver ter:ActionNotSupported ter:NoImagingForSource | <p><i>The requested VideoSource does not support imaging settings.</i></p> | |

5.1.2 Set imaging settings

This operation sets the imaging settings for a video source on a device. A device implementing the imaging service shall support this command.

If the device supports any of the imaging settings as defined by the ImagingSettings type in [ONVIF Schema], then the it should be possible to configure these parameters in the device through the SetImagingSettings command.

The possible configurable imaging settings parameters are described in Section 5.1. Settings options are obtained through the command defined in Section 5.1.3

Table 2: SetImagingSettings command

| SetImagingSettings | | Access Class: ACTUATE |
|----------------------------|---|-----------------------|
| Message name | Description | |
| SetImagingSettingsRequest | <p><i>This message contains a reference to the VideoSource and ImagingSettings that should be set.</i></p> <p><i>The ForcePersistence element determines if the configuration changes shall be stored and remain after reboot. If true, changes shall be persistent. If false, changes MAY revert to previous values after reboot.</i></p> <p>tt:ReferenceToken VideoSourceToken[1][1] tt:ImagingSettings20ImagingSettings[1][1] xs:boolean ForcePersistence [0][1]</p> | |
| SetImagingSettingsResponse | <p><i>This message contains no response.</i></p> | |
| Fault codes | Description | |

| | |
|--|---|
| env:Sender ter:InvalidArgVal ter:NoSource | <i>The requested VideoSource does not exist.</i> |
| env:Receiver ter:ActionNotSupported ter:NoImagingForSource | <i>The requested VideoSource does not support imaging settings.</i> |
| env:Sender ter:InvalidArgVal ter:SettingsInvalid | <i>The requested settings are incorrect.</i> |

5.1.3 Get options

This operation gets the valid ranges for the imaging parameters that have device specific ranges. A device implementing the imaging service shall support this command. The command shall return all supported parameters and their ranges such that these can be applied to the SetImagingSettings command.

For read-only parameters which cannot be modified via the SetImagingSettings command only a single option or identical Min and Max values shall be provided.

Table 3: GetOptions command

| GetOptions | | Access Class: READ_MEDIA |
|--|---|--------------------------|
| Message name | Description | |
| GetOptionsRequest | <i>Reference to the VideoSource for which the imaging parameter options are requested.</i> tt:ReferenceToken VideoSourceToken [1][1] | |
| GetOptionsResponse | <i>This message contains the valid ranges for the imaging parameters that are categorized as device specific.</i> tt:ImagingOptions20 ImagingOptions [1][1] | |
| Fault codes | Description | |
| env:Sender ter:InvalidArgVal ter:NoSource | <i>The requested VideoSource does not exist.</i> | |
| env:Receiver ter:ActionNotSupported ter:NoImagingForSource | <i>The requested VideoSource does not support imaging settings.</i> | |

5.1.4 Move

The Move command moves the focus lens in an absolute, a relative or in a continuous manner from its current position. The speed argument is optional for absolute and relative control, but required for continuous. If no speed argument is used, the default speed is used. Focus adjustments through this operation will turn off the autofocus. A device with support for remote focus control should support absolute, relative or continuous control through the Move operation. The supported MoveOptions are signalled via the GetMoveOptions command.

At least one focus control capability is required for this operation to be functional.

The move operation contains the following commands:

Absolute – Requires position parameter and optionally takes a speed argument. A unitless type is used by default for focus positioning and speed. Optionally, if supported, the position may be requested in m^{-1} units.

Relative – Requires distance parameter and optionally takes a speed argument. Negative distance means negative direction.

Continuous – Requires a speed argument. Negative speed argument means negative direction.

Table 4: Move (focus) command

| Move | | Access Class: ACTUATE |
|--|---|-----------------------|
| Message name | Description | |
| MoveRequest | <i>Reference to the VideoSource for the requested move (focus) operation.</i> tt:ReferenceToken VideoSourceToken [1][1] tt:FocusMove Focus [1][1] | |
| MoveResponse | <i>This message is empty</i> | |
| Fault codes | Description | |
| env:Sender ter:InvalidArgVal ter:NoSource | <i>The requested VideoSource does not exist.</i> | |
| env:Receiver ter:ActionNotSupported ter:NoImagingForSource | <i>The requested VideoSource does not support imaging settings.</i> | |

5.1.5 Get move options

The GetMoveOptions command retrieves the focus lens move options to be used in the move command as defined in Section 5.1.4. A device that supports the imaging service shall support the GetMoveOptions command. The response to the command shall include all supported Move Operations. If focus move is not supported at all, the response shall be empty.

Table 5: GetMoveOptions (focus) command

| GetMoveOptions | | Access Class: READ_MEDIA |
|--|---|--------------------------|
| Message name | Description | |
| GetMoveOptionsRequest | Reference to the VideoSource for the requested move options. tt:ReferenceToken VideoSourceToken [1][1] | |
| GetMoveOptionsResponse | This message contains the valid ranges for the focus lens move options. tt:MoveOptions20 MoveOptions [1][1] | |
| Fault codes | Description | |
| env:Sender ter:InvalidArgVal ter:NoSource | The requested VideoSource does not exist. | |
| env:Receiver ter:ActionNotSupported ter:NoImagingForSource | The requested VideoSource does not support imaging settings. | |

5.1.6 Stop

The Stop command stops all ongoing focus movements of the lens. A device with support for remote focus control as signalled via the GetMoveOptions should support this command. The operation will not affect ongoing autofocus operation.

Table 6: Stop (focus) command

| Stop | | Access Class: ACTUATE |
|--|--|-----------------------|
| Message name | Description | |
| StopRequest | Reference to the VideoSource where the focus movement should be stopped. tt:ReferenceToken VideoSourceToken [1][1] | |
| StopResponse | This message is empty | |
| Fault codes | Description | |
| env:Sender ter:InvalidArgVal ter:NoSource | The requested VideoSource does not exist. | |
| env:Receiver ter:ActionNotSupported ter:NoImagingForSource | The requested VideoSource does not support imaging settings. | |

5.1.7 Get imaging status

The GetStatus command requested the current imaging status from the device. A device with support for remote focus control as signalled via the GetMoveOptions shall support this command.

The imaging status contains:

- Focus position, move status and error information.
 - The focus position is represented in a unitless type.
 - Move status may be in a MOVING, IDLE or UNKNOWN state.
 - Error information provided as a string, for example a positioning error indicated by the hardware.

Table 7: GetStatus (focus) command

| GetStatus | | Access Class: READ_MEDIA |
|--|---|--------------------------|
| Message name | Description | |
| GetStatusRequest | <i>This message contains a reference to the VideoSource where the imaging status should be requested.</i> tt:VideoSourceToken VideoSourceToken [1][1] | |
| GetStatusResponse | This message contains the requested imaging status. tt:ImagingStatus20 ImagingStatus [1][1] | |
| Fault codes | Description | |
| env:Sender ter:InvalidArgVal ter:NoSource | <i>The requested VideoSource does not exist.</i> | |
| env:Receiver ter:ActionNotSupported ter:NoImagingForSource | <i>The requested VideoSource does not support imaging settings.</i> | |

5.1.8 Capabilities

The capabilities reflect optional functions and functionality of a service. The information is static and does not change during device operation. Currently there are no capabilities defined for this service.

Table 8: GetServiceCapabilities command

| GetServiceCapabilities | | Access Class: PRE_AUTH |
|--------------------------------|--|------------------------|
| Message name | Description | |
| GetServiceCapabilitiesRequest | <i>This message contains a request for device capabilities.</i> | |
| GetServiceCapabilitiesResponse | <i>The capability response message contains the requested service capabilities using a hierarchical XML capability structure.</i> timg: Capabilities Capabilities [1][1] | |
| Fault codes | Description | |
| | <i>No command specific faults!</i> | |

5.2 Service specific data types

5.2.1 ImagingStatus

```
<xs:complexType name="ImagingStatus" />
  <xs:element name="FocusStatus" type="tt:FocusStatus"/>
</xs:complexType>
```

- **FocusStatus**

5.2.2 FocusStatus

```
<xs:complexType name="FocusStatus" />
  <xs:element name="Position" type="xs:float"/>
  <xs:element name="MoveStatus" type="tt:MoveStatus"/>
  <xs:element name="Error" type="xs:string"/>
</xs:complexType>
```

- **Position**
Status of focus position.
- **MoveStatus**
Status of focus MoveStatus.
- **Error**
Error status of focus.

5.2.3 FocusConfiguration

```
<xs:complexType name="FocusConfiguration" />
  <xs:element name="AutoFocusMode" type="tt:AutoFocusMode"/>
  <xs:element name="DefaultSpeed" type="xs:float"/>
  <xs:element name="NearLimit" type="xs:float"/>
  <xs:element name="FarLimit" type="xs:float"/>
</xs:complexType>
```

- **AutoFocusMode**
- **DefaultSpeed**
- **NearLimit**
Parameter to set autofocus near limit (unit: meter).
- **FarLimit**
Parameter to set autofocus far limit (unit: meter). If set to 0.0, infinity will be used.

5.2.4 ImagingSettings

```
<xs:complexType name="ImagingSettings"/>
<xs:element name="BacklightCompensation" type="tt:BacklightCompensation
  minOccurs="0"/>
<xs:element name="Brightness" type="xs:float" minOccurs="0"/>
<xs:element name="ColorSaturation" type="xs:float" minOccurs="0"/>
<xs:element name="Contrast" type="xs:float" minOccurs="0"/>
<xs:element name="Exposure" type="tt:Exposure minOccurs="0"/>
<xs:element name="Focus" type="tt:FocusConfiguration minOccurs="0"/>
<xs:element name="IrCutFilter" type="tt:IrCutFilterMode" minOccurs="0"/>
<xs:element name="Sharpness" type="xs:float" minOccurs="0"/>
<xs:element name="WideDynamicRange" type="tt:WideDynamicRange
  minOccurs="0"/>
<xs:element name="WhiteBalance" type="tt:WhiteBalance minOccurs="0"/>
</xs:complexType>
```

- **BacklightCompensation**
Enabled/disabled BLC mode (on/off).
- **Brightness**
Image brightness (unit unspecified).
- **ColorSaturation**
Color saturation of the image (unit unspecified).
- **Contrast**
Contrast of the image (unit unspecified).
- **Exposure**
Exposure mode of the device.
- **Focus**
Focus configuration.
- **IrCutFilter**
Infrared Cutoff Filter settings.
- **Sharpness**
Sharpness of the Video image.
- **WideDynamicRange**
WDR settings.
- **WhiteBalance**
White balance settings.

5.2.5 Exposure

```
<xs:complexType name="Exposure"/>
<xs:element name="Mode" type="tt:ExposureMode"/>
<xs:element name="Priority" type="tt:ExposurePriority"/>
<xs:element name="Window" type="tt:Rectangle/>
```

```

<xs:element name="MinExposureTime" type="xs:float"/>
<xs:element name="MaxExposureTime" type="xs:float"/>
<xs:element name="MinGain" type="xs:float"/>
<xs:element name="MaxGain" type="xs:float"/>
<xs:element name="MinIris" type="xs:float"/>
<xs:element name="MaxIris" type="xs:float"/>
<xs:element name="ExposureTime" type="xs:float"/>
<xs:element name="Gain" type="xs:float"/>
<xs:element name="Iris" type="xs:float"/>
</xs:complexType>

```

- **Mode**
Exposure Mode
 - Auto – Enabled the exposure algorithm on the NVT.
 - Manual – Disabled exposure algorithm on the NVT.
- **Priority**
The exposure priority mode (low noise/framerate).
- **Window**
Rectangular exposure mask.
- **MinExposureTime**
Minimum value of exposure time range allowed to be used by the algorithm.
- **MaxExposureTime**
Maximum value of exposure time range allowed to be used by the algorithm.
- **MinGain**
Minimum value of the sensor gain range that is allowed to be used by the algorithm.
- **MaxGain**
Maximum value of the sensor gain range that is allowed to be used by the algorithm.
- **MinIris**
Minimum value of the iris range allowed to be used by the algorithm.
- **MaxIris**
Maximum value of the iris range allowed to be used by the algorithm.
- **ExposureTime**
The fixed exposure time used by the image sensor (μ s).
- **Gain**
The fixed gain used by the image sensor (dB).
- **Iris**
The fixed attenuation of input light affected by the iris (dB). 0dB maps to a fully opened iris.

5.2.6 WideDynamicRange

```

<xs:complexType name="WideDynamicRange"/>
  <xs:element name="Mode" type="tt:WideDynamicMode"/>
  <xs:element name="Level" type="xs:float"/>
</xs:complexType>

```

- **Mode**
White dynamic range (on/off)
- **Level**
Optional level parameter (unitless)

5.2.7 BacklightCompensation

```
<xs:complexType name="BacklightCompensation"/>
  <xs:element name="Mode" type="tt:BacklightCompensationMode"/>
  <xs:element name="Level" type="xs:float"/>
</xs:complexType>
```

- **Mode**
Backlight compensation mode (on/off).
- **Level**
Optional level parameter (unit unspecified).

5.2.8 FocusMove

```
<xs:complexType name="FocusMove"/>
  <xs:element name="Absolute" type="tt:AbsoluteFocus minOccurs="0"/>
  <xs:element name="Relative" type="tt:RelativeFocus minOccurs="0"/>
  <xs:element name="Continuous" type="tt:ContinuousFocus minOccurs="0"/>
</xs:complexType>
```

- **Absolute**
Parameters for the absolute focus control.
- **Relative**
Parameters for the relative focus control.
- **Continuous**
Parameter for the continuous focus control.

5.2.9 AbsoluteFocus

```
<xs:complexType name="AbsoluteFocus"/>
  <xs:element name="Position" type="xs:float"/>
  <xs:element name="Speed" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **Position**
Position parameter for the absolute focus control.
- **Speed**
Speed parameter for the absolute focus control.

5.2.10 RelativeFocus

```
<xs:complexType name="RelativeFocus"/>
  <xs:element name="Distance" type="xs:float"/>
  <xs:element name="Speed" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **Distance**
Distance parameter for the relative focus control.
- **Speed**
Speed parameter for the relative focus control.

5.2.11 ContinuousFocus

```
<xs:complexType name="ContinuousFocus"/>
  <xs:element name="Speed" type="xs:float"/>
</xs:complexType>
```

- **Speed**
Speed parameter for the Continuous focus control.

5.2.12 MoveOptions

```
<xs:complexType name="MoveOptions"/>
<xs:element name="Absolute" type="tt:AbsoluteFocusOptions minOccurs="0"/>
  <xs:element name="Relative" type="tt:RelativeFocusOptions
    minOccurs="0"/>
  <xs:element name="Continuous" type="tt:ContinuousFocusOptions
    minOccurs="0"/>
</xs:complexType>
```

- **Absolute**
- **Relative**
- **Continuous**

5.2.13 AbsoluteFocusOptions

```
<xs:complexType name="AbsoluteFocusOptions"/>
<xs:element name="Position" type="tt:FloatRange"/>
  <xs:element name="Speed" type="tt:FloatRange minOccurs="0"/>
</xs:complexType>
```

- **Position**
Valid ranges of the position.
- **Speed**
Valid ranges of the speed.

5.2.14 RelativeFocusOptions

```
<xs:complexType name="RelativeFocusOptions"/>
<xs:element name="Distance" type="tt:FloatRange"/>
  <xs:element name="Speed" type="tt:FloatRange"/>
</xs:complexType>
```

- **Distance**
Valid ranges of the distance.
- **Speed**
Valid ranges of the speed.

5.2.15 ContinuousFocusOptions

```
<xs:complexType name="ContinuousFocusOptions"/>
  <xs:element name="Speed" type="tt:FloatRange"/>
</xs:complexType>
```

- **Speed**
Valid ranges of the speed.

5.2.16 WhiteBalance

```
<xs:complexType name="WhiteBalance"/>
  <xs:element name="Mode" type="tt:WhiteBalanceMode"/>
  <xs:element name="CrGain" type="xs:float"/>
  <xs:element name="CbGain" type="xs:float"/>
</xs:complexType>
```

- **Mode**
Auto whitebalancing mode (auto/manual).
- **CrGain**
Rgain (unitless).

- **CbGain**
Bgain (unitless).

5.2.17 ImagingStatus20

```
<xs:complexType name="ImagingStatus20" />
  <xs:element name="FocusStatus20" type="tt:FocusStatus20 minOccurs="0" />
</xs:complexType>
```

- **FocusStatus20**
Status of focus.

5.2.18 FocusStatus20

```
<xs:complexType name="FocusStatus20" />
  <xs:element name="Position" type="xs:float" />
  <xs:element name="MoveStatus" type="tt:MoveStatus" />
  <xs:element name="Error" type="xs:string" minOccurs="0" />
</xs:complexType>
```

- **Position**
Status of focus position.
- **MoveStatus**
Status of focus MoveStatus.
- **Error**
Error status of focus.

5.2.19 ImagingSettings20

Type describing the ImagingSettings of a VideoSource. The supported options and ranges can be obtained via the GetOptions command.

```
<xs:complexType name="ImagingSettings20" />
  <xs:element name="BacklightCompensation" type="
    tt:BacklightCompensation20 minOccurs="0" />
  <xs:element name="Brightness" type="xs:float" minOccurs="0" />
  <xs:element name="ColorSaturation" type="xs:float" minOccurs="0" />
  <xs:element name="Contrast" type="xs:float" minOccurs="0" />
  <xs:element name="Exposure" type="tt:Exposure20 minOccurs="0" />
  <xs:element name="Focus" type="tt:FocusConfiguration20 minOccurs="0" />
  <xs:element name="IrCutFilter" type="tt:IrCutFilterMode" minOccurs="0" />
  <xs:element name="Sharpness" type="xs:float" minOccurs="0" />
  <xs:element name="WideDynamicRange" type="tt:WideDynamicRange20
    minOccurs="0" />
  <xs:element name="WhiteBalance" type="tt:WhiteBalance20 minOccurs="0" />
</xs:complexType>
```

- **BacklightCompensation**
Enabled/disabled BLC mode (on/off).
- **Brightness**
Image brightness (unit unspecified).
- **ColorSaturation**
Color saturation of the image (unit unspecified).
- **Contrast**
Contrast of the image (unit unspecified).
- **Exposure**
Exposure mode of the device.

- **Focus**
Focus configuration.
- **IrCutFilter**
Infrared Cutoff Filter settings.
- **Sharpness**
Sharpness of the Video image.
- **WideDynamicRange**
WDR settings.
- **WhiteBalance**
White balance settings.

5.2.20 WideDynamicRange20

Type describing whether WDR mode is enabled or disabled (on/off).

```
<xs:complexType name="WideDynamicRange20"/>
  <xs:element name="Mode" type="tt:WideDynamicMode"/>
  <xs:element name="Level" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **Mode**
Wide dynamic range mode (on/off).
- **Level**
Optional level parameter (unit unspecified).

5.2.21 BacklightCompensation20

Type describing whether BLC mode is enabled or disabled (on/off).

```
<xs:complexType name="BacklightCompensation20"/>
  <xs:element name="Mode" type="tt:BacklightCompensationMode"/>
  <xs:element name="Level" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **Mode**
Backlight compensation mode (on/off).
- **Level**
Optional level parameter (unit unspecified).

5.2.22 Exposure20

Type describing the exposure settings.

```
<xs:complexType name="Exposure20"/>
  <xs:element name="Mode" type="tt:ExposureMode"/>
  <xs:element name="Priority" type="tt:ExposurePriority" minOccurs="0"/>
  <xs:element name="Window" type="tt:Rectangle" minOccurs="0"/>
  <xs:element name="MinExposureTime" type="xs:float" minOccurs="0"/>
  <xs:element name="MaxExposureTime" type="xs:float" minOccurs="0"/>
  <xs:element name="MinGain" type="xs:float" minOccurs="0"/>
  <xs:element name="MaxGain" type="xs:float" minOccurs="0"/>
  <xs:element name="MinIris" type="xs:float" minOccurs="0"/>
  <xs:element name="MaxIris" type="xs:float" minOccurs="0"/>
  <xs:element name="ExposureTime" type="xs:float" minOccurs="0"/>
  <xs:element name="Gain" type="xs:float" minOccurs="0"/>
  <xs:element name="Iris" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **Mode**
Exposure Mode
 - Auto – Enabled the exposure algorithm on the device.
 - Manual – Disabled exposure algorithm on the device.
- **Priority**
The exposure priority mode (low noise/framerate).
- **Window**
Rectangular exposure mask.
- **MinExposureTime**
Minimum value of exposure time range allowed to be used by the algorithm.
- **MaxExposureTime**
Maximum value of exposure time range allowed to be used by the algorithm.
- **MinGain**
Minimum value of the sensor gain range that is allowed to be used by the algorithm.
- **MaxGain**
Maximum value of the sensor gain range that is allowed to be used by the algorithm.
- **MinIris**
Minimum value of the iris range allowed to be used by the algorithm.
- **MaxIris**
Maximum value of the iris range allowed to be used by the algorithm.
- **ExposureTime**
The fixed exposure time used by the image sensor (µs).
- **Gain**
The fixed gain used by the image sensor (dB).
- **Iris**
The fixed attenuation of input light affected by the iris (dB). 0dB maps to a fully opened iris.

5.2.23 ImagingOptions20

```
<xs:complexType name="ImagingOptions20" />
  <xs:element name="BacklightCompensation" type=
    "tt:BacklightCompensationOptions20 minOccurs="0"/>
  <xs:element name="Brightness" type= "tt:FloatRange minOccurs="0"/>
  <xs:element name="ColorSaturation" type= "tt:FloatRange minOccurs="0"/>
  <xs:element name="Contrast" type= "tt:FloatRange minOccurs="0"/>
  <xs:element name="Exposure" type= "tt:ExposureOptions20 minOccurs="0"/>
  <xs:element name="Focus" type= "tt:FocusOptions20 minOccurs="0"/>
  <xs:element name="IrCutFilterModes" type="tt:IrCutFilterMode"
    minOccurs="0" maxOccurs="unbounded"/>
  <xs:element name="Sharpness" type= "tt:FloatRange minOccurs="0"/>
  <xs:element name="WideDynamicRange" type= "tt:WideDynamicRangeOptions20
    minOccurs="0"/>
  <xs:element name="WhiteBalance" type= "tt:WhiteBalanceOptions20
    minOccurs="0"/>
</xs:complexType>
```

- **BacklightCompensation**
Valid range of Backlight Compensation.

- **Brightness**
Valid range of Brightness.
- **ColorSaturation**
Valid range of Color Saturation.
- **Contrast**
Valid range of Contrast.
- **Exposure**
Valid range of Exposure.
- **Focus**
Valid range of Focus.
- **IrCutFilterModes**
Valid range of IrCutFilterModes.
- **Sharpness**
Valid range of Sharpness.
- **WideDynamicRange**
Valid range of WideDynamicRange.
- **WhiteBalance**
Valid range of WhiteBalance.

5.2.24 WideDynamicRangeOptions20

```
<xs:complexType name="WideDynamicRangeOptions20"/>
  <xs:element name="Mode" type="tt:WideDynamicMode"
    maxOccurs="unbounded"/>
  <xs:element name="Level" type="tt:FloatRange minOccurs="0"/>
</xs:complexType>
```

- **Mode**
- **Level**

5.2.25 BacklightCompensationOptions20

```
<xs:complexType name="BacklightCompensationOptions20"/>
  <xs:element name="Mode" type="tt:BacklightCompensationMode"
    maxOccurs="unbounded"/>
  <xs:element name="Level" type="tt:FloatRange minOccurs="0"/>
</xs:complexType>
```

- **Mode**
'ON' or 'OFF'
- **Level**
Level range of BacklightCompensation.

5.2.26 ExposureOptions20

```
<xs:complexType name="ExposureOptions20"/>
  <xs:element name="Mode" type="tt:ExposureMode" maxOccurs="unbounded"/>
  <xs:element name="Priority" type="tt:ExposurePriority" minOccurs="0"
    maxOccurs="unbounded"/>
  <xs:element name="MinExposureTime" type="tt:FloatRange minOccurs="0"/>
  <xs:element name="MaxExposureTime" type="tt:FloatRange minOccurs="0"/>
  <xs:element name="MinGain" type="tt:FloatRange minOccurs="0"/>
  <xs:element name="MaxGain" type="tt:FloatRange minOccurs="0"/>
  <xs:element name="MinIris" type="tt:FloatRange minOccurs="0"/>
```

```

<xs:element name="MaxIris" type= "tt:FloatRange minOccurs="0"/>
<xs:element name="ExposureTime" type= "tt:FloatRange minOccurs="0"/>
<xs:element name="Gain" type= "tt:FloatRange minOccurs="0"/>
<xs:element name="Iris" type= "tt:FloatRange minOccurs="0"/>
</xs:complexType>

```

- **Mode**
Exposure Mode
 - Auto – Enabled the exposure algorithm on the device.
 - Manual – Disabled exposure algorithm on the device.
- **Priority**
The exposure priority mode (low noise/framerate).
- **MinExposureTime**
Valid range of the Minimum ExposureTime.
- **MaxExposureTime**
Valid range of the Maximum ExposureTime.
- **MinGain**
Valid range of the Minimum Gain.
- **MaxGain**
Valid range of the Maximum Gain.
- **MinIris**
Valid range of the Minimum Iris.
- **MaxIris**
Valid range of the Maximum Iris.
- **ExposureTime**
Valid range of the ExposureTime.
- **Gain**
Valid range of the Gain.
- **Iris**
Valid range of the Iris.

5.2.27 MoveOptions20

```

<xs:complexType name="MoveOptions20"/>
  <xs:element name="Absolute" type= "tt:AbsoluteFocusOptions
    minOccurs="0"/>
  <xs:element name="Relative" type= "tt:RelativeFocusOptions20
    minOccurs="0"/>
  <xs:element name="Continuous" type= "tt:ContinuousFocusOptions
    minOccurs="0"/>
</xs:complexType>

```

- **Absolute**
Valid ranges for the absolute control.
- **Relative**
Valid ranges for the relative control.
- **Continuous**
Valid ranges for the continuous control.

5.2.28 RelativeFocusOptions20

```
<xs:complexType name="RelativeFocusOptions20"/>
  <xs:element name="Distance" type="tt:FloatRange"/>
  <xs:element name="Speed" type="tt:FloatRange minOccurs="0"/>
</xs:complexType>
```

- **Distance**
Valid ranges of the distance.
- **Speed**
Valid ranges of the speed.

5.2.29 WhiteBalance20

```
<xs:complexType name="WhiteBalance20"/>
  <xs:element name="Mode" type="tt:WhiteBalanceMode"/>
  <xs:element name="CrGain" type="xs:float" minOccurs="0"/>
  <xs:element name="CbGain" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **Mode**
'AUTO' or 'MANUAL'
- **CrGain**
Rgain (unitless).
- **CbGain**
Bgain (unitless).

5.2.30 FocusConfiguration20

```
<xs:complexType name="FocusConfiguration20"/>
  <xs:element name="AutoFocusMode" type="tt:AutoFocusMode"/>
  <xs:element name="DefaultSpeed" type="xs:float" minOccurs="0"/>
  <xs:element name="NearLimit" type="xs:float" minOccurs="0"/>
  <xs:element name="FarLimit" type="xs:float" minOccurs="0"/>
</xs:complexType>
```

- **AutoFocusMode**
Mode of auto focus.
 - AUTO
 - MANUAL
- **DefaultSpeed**
- **NearLimit**
Parameter to set autofocus near limit (unit: meter).
- **FarLimit**
Parameter to set autofocus far limit (unit: meter).

5.2.31 WhiteBalanceOptions20

```
<xs:complexType name="WhiteBalanceOptions20"/>
  <xs:element name="Mode" type="tt:WhiteBalanceMode"
    minOccurs="1" maxOccurs="unbounded"/>
  <xs:element name="YrGain" type="tt:FloatRange minOccurs="0"/>
  <xs:element name="YbGain" type="tt:FloatRange minOccurs="0"/>
</xs:complexType>
```

- **Mode**
Mode of WhiteBalance.

- AUTO
- MANUAL
- **YrGain**
- **YbGain**

5.2.32 FocusOptions20

```
<xs:complexType name="FocusOptions20"/>
  <xs:element name="AutoFocusModes" type="tt:AutoFocusMode" minOccurs="0"
    maxOccurs="unbounded"/>
  <xs:element name="DefaultSpeed" type="tt:FloatRange" minOccurs="0"/>
  <xs:element name="NearLimit" type="tt:FloatRange" minOccurs="0"/>
  <xs:element name="FarLimit" type="tt:FloatRange" minOccurs="0"/>
</xs:complexType>
```

- **AutoFocusModes**
Mode of Auto Focus.
 - AUTO
 - MANUAL
- **DefaultSpeed**
Valid range of DefaultSpeed.
- **NearLimit**
Valid range of NearLimit.
- **FarLimit**
Valid range of FarLimit.

5.3 Service specific fault codes

Table 9 lists the imaging service specific fault codes. In addition each command can also generate a generic fault.

The specific faults are defined as subcode of a generic fault. The parent generic subcode is the *subcode* at the top of each row below and the specific fault *subcode* is at the bottom of the cell.

Table 9: Imaging specific fault codes

| Fault Code | Parent Subcode | Fault Reason | Description |
|--------------|------------------------|---|--|
| | Subcode | | |
| env:Receiver | ter:ActionNotSupported | VideoSource does not support imaging settings | The requested VideoSource does not support imaging settings. |
| | ter:NolmagingForSource | | |
| env:Sender | ter:InvalidArgVal | Invalid configuration | The requested settings are incorrect. |
| | ter:SettingsInvalid | | |
| env:Sender | ter:InvalidArgVal | Video source does | The requested VideoSource |

| | | | |
|--|--------------|-----------|-----------------|
| | ter:NoSource | not exist | does not exist. |
|--|--------------|-----------|-----------------|