Baumer
Passion for Sensors

Application Note

Using the CustomData feature with NI-IMAQdx in LabView
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Description
The CustomData feature provides access to the freely available data area in the flash memory of the camera. The use of CustomData with the NI-IMAQdx image-capturing software can result in considerable delays when starting the camera. This document describes the reasons and how this effect can be prevented by deactivating the CustomDataConfigurationMode.

Products
Baumer cameras: VCXG / VCXG.I / VCXG.I.XT / VCXU from release 3 or VLXT.I / VLXT.FO from release 2

Preparation
Use of firmware with VCXG / VCXU from release 3.3 or with VLXT from release 3.1 to control the write access to the flash memory via the CustomDataConfigurationMode.

Conclusion
Baumer cameras conform to the standard and operate reliably with third-party software such as NI-IMAQdx. If there are any abnormalities in the start-up behavior, especially regarding its duration, Baumer recommends checking the CustomDataConfigurationMode. Deactivating this mode (“Off”) prevents unwanted and time-consuming write access directly to the flash memory in the camera.

Contents

1 Technical background

NI-IMAQdx offers the option of storing the settings of the camera externally (on the PC) to restore the desired operation mode of the camera (automatically) the next time that it is started up.

For this purpose, all stored settings of the camera have to be rewritten to the camera each time that it is started up. Depending on the scope of the settings (e.g. the number of features) or the storage location (e.g. flash memory), this may result in a large number or time-consuming write accesses (e.g. when writing CustomData to the flash).

For this reason, users should be familiar with the function of the CustomData features to prevent rewriting of CustomData in NI-IMAQdx upon each start of the camera.

2 CustomData features

The CustomData, CustomDataSelector, and CustomDataConfigMode camera features provide access to the freely available data area in the flash memory of the camera. These features are found in the CustomDataControl category.

Category: CustomDataControl

Category that contains the custom data features.

Name	CustomDataControl
Category	Root
NameSpace	Custom
Level	Optional
Interface	ICategory
Access	Read
Unit	-
Visibility	Guru
Values	-

2.1 CustomDataConfigurationMode

The camera feature CustomDataConfigurationMode controls the write access to the flash memory. Writing to the freely accessible data area is only possible if this is activated.

Note
CustomDataConfigurationMode was introduced with release 3.3 of the VCX and release 2.1 of the VLXT.

Name	CustomDataConfigurationMode	
Category	CustomDataControl	
NameSpace	Custom	
Level	Optional	
Interface	IEnumeration	
Access	Read/Write	
Unit	-	
Visibility	Guru	
Values	Off	Deactivates the configuration mode
	On	Activates the configuration mode

2.2 CustomData and CustomDataSelector

CustomData denotes a byte array of 128 bytes, which can be indexed byte by byte via the CustomDataSelector. The values of the byte array (CustomData) are readable at all times but only writable if the CustomDataConfigurationMode is activated (“On”).

CustomDataSelector

Selects the index of the CustomData byte array.

Name	CustomDataSelector
Category	CustomDataControl
NameSpace	Custom
Level	Optional
Interface	IInteger
Access	Read/Write
Unit	-
Visibility	Guru
Values	0 - 127

CustomData

Determines a byte for user-defined CustomData.

Name	CustomData[CustomDataSelector]
Category	CustomDataControl
NameSpace	Custom
Level	Optional
Interface	IInteger
Access	Read/Write
Unit	-
Visibility	Guru
Values	0 - 255

2.3 Using CustomData features

The use of CustomData depends on whether data should be read or written.

2.3.1 Reading out data from the flash memory

Reading out CustomData is possible at all times after the desired index is set via the *CustomDataSelector*. The read access is always directly from the flash memory.

2.3.2 Writing data to the flash memory

To prevent unwanted write access to the flash memory, the camera always starts up with the *CustomDataConfigurationMode* deactivated (“Off”). In this state, CustomData can only be read (read-only).

Writing CustomData requires the activation of the *CustomDataConfigurationMode* (“On”). In this state, CustomData can be read and written (read/write).

Similar to reading out, the write access to the CustomData is always to the index that has been previously set via the *CustomDataSelector*. The write access is always directly to the flash memory.

3 Feature persistence

NI-IMAQdx uses the GenICam function to save camera settings specific to the application and the camera. This way, the operating mode of the camera can be restored the next time it is started.

3.1 GenICam

The standard defines the streamable attribute to specify the persistence of each feature:

<Streamable> denotes that the corresponding feature is prepared to be stored to and loaded from a file via the GenApi node tree. The idea is to persist the state of a camera by storing the features marked as Streamable and restore the state by writing those features back to the node tree. [GenICam_Standard_v2_1_1.pdf, 2 GenApi Module, 2.8 Available Node Types, page 25]

As standard, this attribute is optional and not activated by default (Streamable = “No”). [GenICam_Standard_v2_1_1.pdf, 3.2 Default values of optional node elements and attributes]

Note
As Baumer cameras do not use the streamable attribute, none of the features is marked “streamable”. Therefore, the optional feature persistence according to GenICam is not supported in accordance with the standard.

3.2 NI-IMAQdx

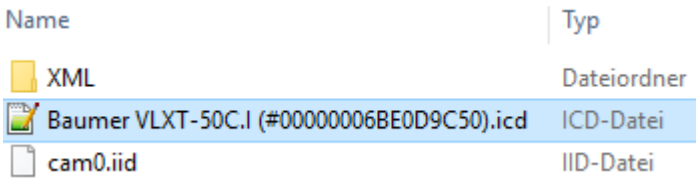
NI-IMAQdx implements both the feature persistence according to GenICam as well as a proprietary approach in order to offer this function independently of the standard.

Note
In the proprietary mode, NI-IMAQdx has no option for controlling the reading and writing of the persistent data. Therefore, the behavior of the feature persistence during the saving of the settings as well as during the restoration (start up) depends on the operating mode of the camera.

Which features NI-IMAQdx recognizes and stores as “persistent” can only be identified by analyzing the created ICD files. This data is usually found in the following folder:

```
C:\Users\Public\Documents\National Instruments\NI-IMAQdx\Data
```

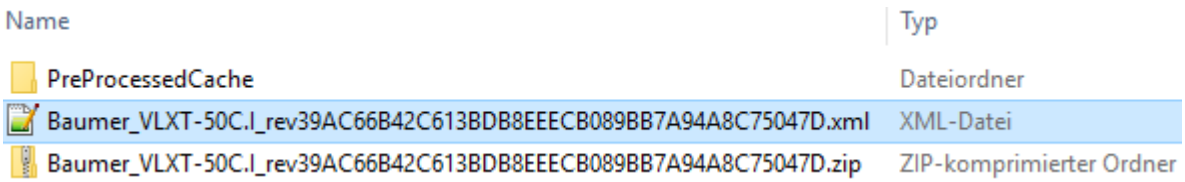
In a VLXT-50C.I, for example, the following files and folders can be found:



The IID file called “cam0” is based on the name of the camera after it is started in NI-IMAQdx.

The XML folder contains the XML file that was downloaded from the camera and that is subsequently used by NI-IMAQdx at each start of the camera (instead of downloading it from the camera).

Only when NI-IMAQdx recognizes from the name of the XML archive that a new/modified XML file is present is the XML file on the PC replaced by the one on the camera. For this purpose, the name of the XML file contains the unequivocal hash value of the file:



The ICD file is a text file that is generally structured as follows:

```
[NIIMAQ_HEADER]
Type = 2
Version = 8

[CAMERA_DATA]
..
AcquisitionAttributes::PacketSize = "8000"
..
CameraAttributes::AcquisitionControl::ExposureAuto = "Off"
CameraAttributes::AcquisitionControl::ExposureMode = "Timed"
CameraAttributes::AcquisitionControl::ExposureTime = "15"
..
CameraAttributes::DeviceControl::DeviceStreamChannelPacketSize = "8000"
..
CameraAttributes::CustomDataControl::CustomDataConfigurationMode = "Off"
CameraAttributes::CustomDataControl::CustomDataSelector = "0"
CameraAttributes::CustomDataControl::CustomData = "255"
..
CameraAttributes::CustomDataControl::CustomDataSelector = "127"
CameraAttributes::CustomDataControl::CustomData = "255"
..
```

In the section `[CAMERA_DATA]`, immediately following the header (with the type and version identifiers) the settings of the PC software (e.g. PacketSize) are found under `AcquisitionAttributes`, while the camera settings (e.g. ExposureTime or PacketSize) are found under `CameraAttributes`.

Upon analysis, it becomes clear that the features of the category *CustomDataControl* are stored as well and therefore written back to the camera when it is started. This includes both the CustomData values themselves, including the associated selectors, as well as the *CustomDataConfigurationMode*.

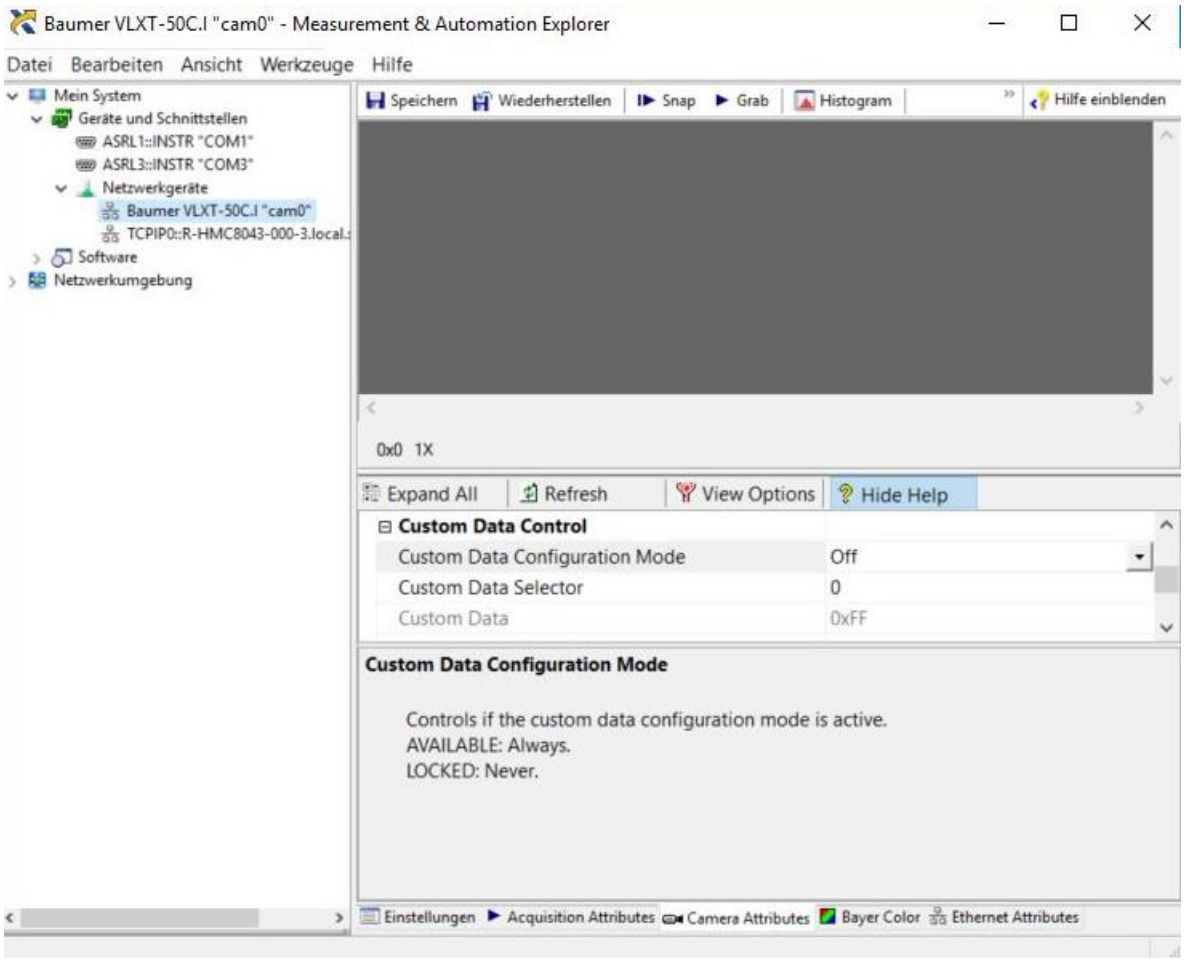
Based on the implementation of CustomData, the 128 write accesses to the CustomData ultimately result in 128 individual direct write accesses to the flash memory of the camera. Each write access lasts on average around 1.2 seconds, including reading back the data from the flash, the deletion of the concerned flash sector, and the writing of the new data of the sector to the flash. In total, this process requires around 153 seconds, which is a good 2.5 minutes.

4 Saving camera settings in NI-IMAQdx

The correct handling of the *CustomDataConfigurationMode* feature when saving the camera settings is decisive for the usability of CustomData. This must be deactivated at this time to prevent the data from being redundantly written back directly into the flash memory of the camera the next time that the camera is started.

4.1 Not saving settings after writing CustomData

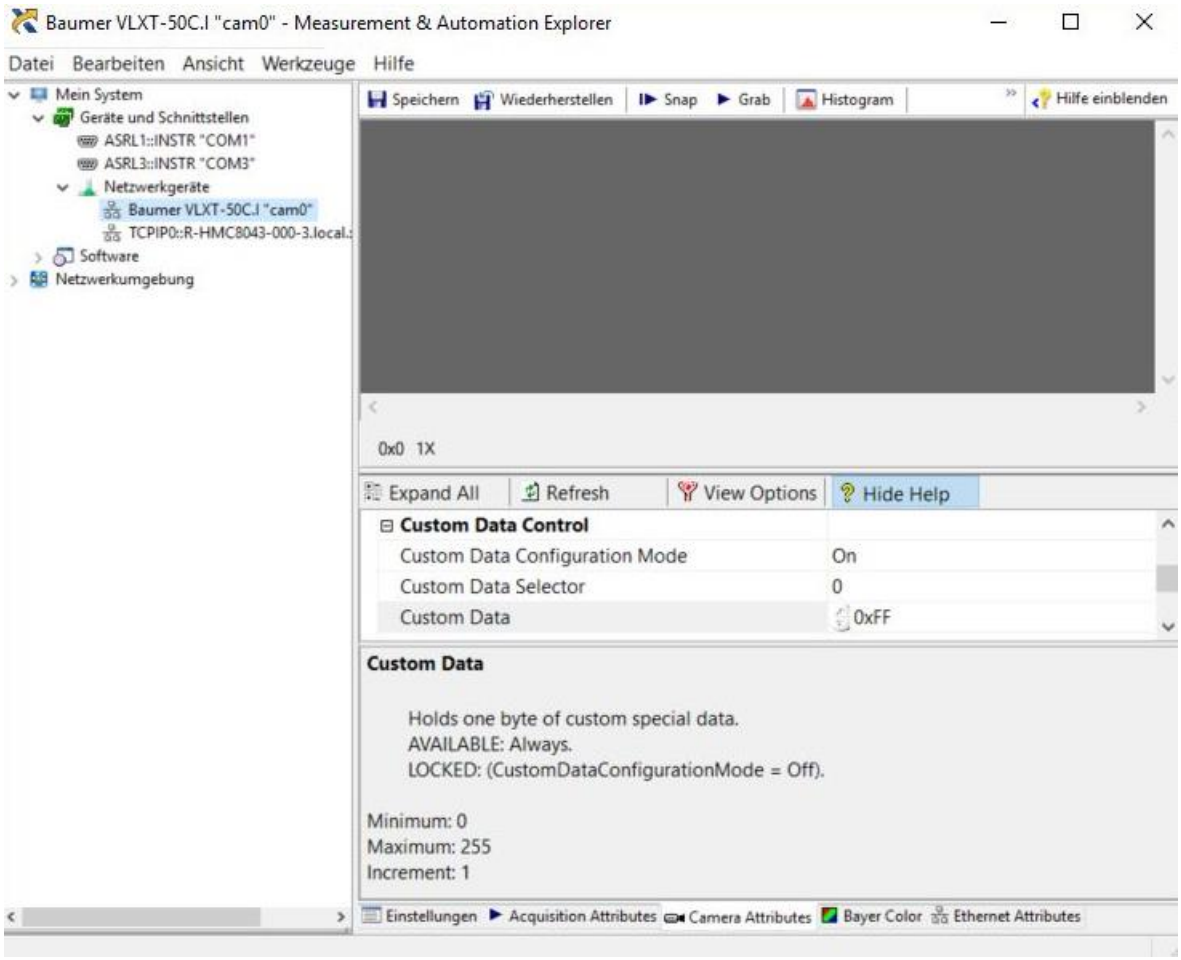
In general, all Baumer cameras start with the *CustomDataConfigurationMode* deactivated (“Off”). Therefore, NI-IMAQdx adopts these settings when the camera is operated for the first time on a PC with the software from NI. The camera is started quickly.



The status remains intact if the settings are not saved after writing CustomData.

4.2 Saving settings with CustomDataConfigurationMode “Off”

Saving the settings of the camera for the purpose of saving the contents of the modified CustomData or other modified features should be done while the *CustomDataConfigurationMode* is **deactivated** (“Off”) to prevent restoration of the otherwise writable CustomData values.



5 Support

Please contact our Technical & Application Support Center with any questions.

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6 Legal information

Baumer Group

The Baumer Group is one of the worldwide leading manufacturers of sensors, encoders, measuring instruments and components for automated image processing. Baumer combines innovative technologies and customer-oriented service into intelligent solutions for factory and process automation and offers an unrivalled wide technology and product portfolio. With around 2,700 employees and 39 subsidiaries in 19 countries, the family-owned group of companies is always close to the customer. Baumer provides clients in most diverse industries with vital benefits and measurable added value by worldwide consistent high quality standards and outstanding innovative potential. Learn more at www.baumer.com on the internet.

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