

BALLUFF

Software-Description
BVS SMART *CAMERA*
BAE PD SmartVision Controller
Function Block S7-1200/1500



CONTENT

1	INTRODUCTION.....	3
1.1	General Data	3
1.2	Recommendations of FB invoke	3
2	COMMISIONING.....	4
2.1	FB parameter	4
2.2	DB parameter	4
2.3	Byte order setting	4
2.4	Device Parameter (only for SmartCamera).....	5
2.4.1	Device Parameter Slot 0	5
2.4.2	IO-Link Port parameter	6
3	FB PARAMETER DESCRIPTION.....	7
3.1	FB illustration	7
3.2	Input parameter	8
3.3	Output parameter	10
3.4	General error codes	11
3.5	FB internal error codes	11
3.6	Description of commandos.....	12
3.7	Disclaimer of Liability	13

1 INTRODUCTION

This function block is an example for the communication with a BVS SC SmartCamera. This function block allows a communication between a Balluff - *SmartCamera* **BVS SC-_*** or a Balluff SmartVision Controller **BAE PD-_*** and a Simatic® S7-1200/1500 PLC.

Please test carefully if the FB is suitable for your application!

The following commandos are supported:

Switch Application	Switches the application
Get Application ID	Gets the ID of the currently active application
Get Results	Gets the result container
Send Data	Sets the input data of the application
Get Camera Info	Gets the camera information (only for SmartCamera)
Get Date Time	Get the time stamp
Set Date Time	Sets the time stamp (only for SmartCamera)
Set Sequence Number	Sets the sequence number

Please examine, which of the given functions are supported by the camera!

For each *SmartCamera* or each camera instance of a SmartVisionController the function block has to be called with an own instance data block.

1.1 General Data

Function block name:	BVS_SC
Instance data block:	(an own instance data block has to be setup for each camera)
Invoked blocks:	TON, R_Trig, RD_Addr, DPRD_DAT, DPWD_DAT
Reserved memory bits:	none
Reserved Timers:	none
Reserved Counters:	none
I/O Range	16 - 512 Byte
Invoke:	absolute
Device compatibility:	Siemens Simatic® S7 1200/1500
Software version:	TIA Portal V13 SP1

1.2 Recommendations of FB invoke

The function block should be called only once per *SmartCamera* or *SmartVision Controller* camera instance. Multiple calls of the function block at the same time are not allowed. If the function block is conditionally called and the calling condition is false before FB sets it Ready output, the FB has to be initialized with the **“Init”** input. If the PLC restarts the **“Init”** input has to be set for one cycle. FB parameters can be assigned dynamically if necessary.

2 COMMISSIONING

2.1 FB parameter

The I/O data length of the *SmartCamera* or *SmartVision Controller* depends on the available in-/outputs on the PLC (maximum 512 bytes). The I/O addresses for the cyclic communication with the camera are determined in the function block by the hardware identifier of the SmartCamera module.

Shall a module size with more than 512 bytes be used, then the FB constants InBuSi (**I**n**B**u**S**i (**I**n**put****B**u**f**fer**S**i**z**e)) und OutBuSi (**O**u**t**bu**S**i (**O**u**t**pu**t****B**u**f**fer**S**i**z**e)) must be set according to the modul size.

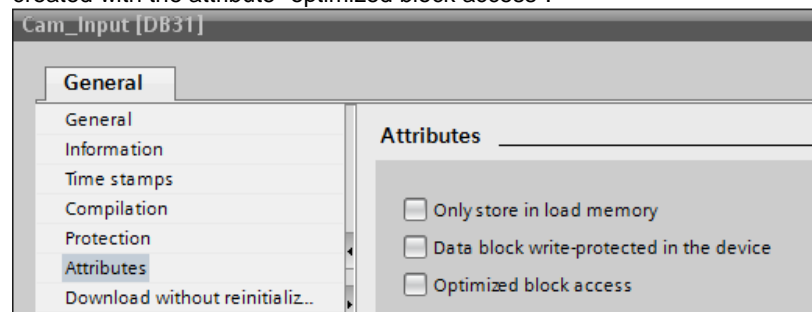
If a smaller I/O Module is used, the FB constants can be reduced accordingly.

SmartCameraCom								
	Name	Datentyp	Defaultw..	Remanenz	Erreichb...	Sichtbar...	Einstellwert	Kommentar
1...	Constant				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1...	InBuSi	Int	512		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	maximum Size inputbuffer
1...	OutBuSi	Int	512		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	maximum Size outputbuffer

(Figure: TIA-Portal: function block BVS_SC, variable declaration)

2.2 DB parameter

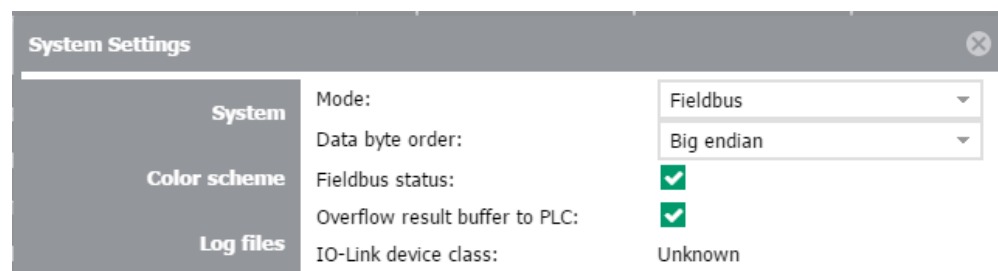
The maximum read/write length of the FB is 32.767 byte. The data blocks for send- and receive data have to setup according the FB input parameters **Offset_DBSend**, **Offset_DBReceive** and **Data_Length**. The data blocks DBSend and DBReceive may not created with the attribute "optimized block access".



(Figure: TIA-Portal: function blocks, DB properties)

2.3 Byte order setting

For using the Function block the byte order have to be set to **Big Endian** in BVS Cockpit system settings. With the setting **Big Endian** data are shown compatible to Siemens S7 byte order.



(Figure: BVS Cockpit, system settings)

2 COMMISSIONING

2.4 Device Parameter (only for SmartCamera)

2.4.1 Device Parameter Slot 0

IO-Link diagnostics

Disable	=	suppress diagnostic messages
Enable	=	permit diagnostic messages

IO-Link port function Pin 4

NO	=	Input as normally open contact
NC	=	Input as normally closed contact
Output	=	Output function
IO-Link	=	IO-Link function
Normally open after configuration	=	SIO mode an IO-Link device can be configured via IO-Link and after-ward switched over to an SIO mode in which the IO-Link port pin functions as a simple normally open switch input
Normally closed after configuration	=	SIO mode an IO-Link device can be configured via IO-Link and after-ward switched over to an SIO mode in which the IO-Link port pin functions as a simple normally closed switch input

IO-Link port function Pin 2

NO	=	Input as normally open contact
NC	=	Input as normally closed contact
Output	=	Output function
Diagnostic input	=	Cable break detection

IO-Link safe state Pin 4/2

0	=	Output off when fieldbus is off
1	=	Output on when fieldbus is off
Last value	=	Output holds last value when fieldbus is off

2 COMMISSIONING

2.4.2 IO-Link Port parameter

Validation type

No validation	=	Not activated
Compatible	=	Device ID and Vendor ID identical
Identical	=	Device ID, Vendor ID and Serial number identical

Parameter server enabling

Disable	=	Not activated
Clear	=	Parameter server data are cleared
Enable	=	Parameter server enabled

Upload enabling

Disable	=	Not activated
Enable	=	Automatic parameter upload Device -> Master

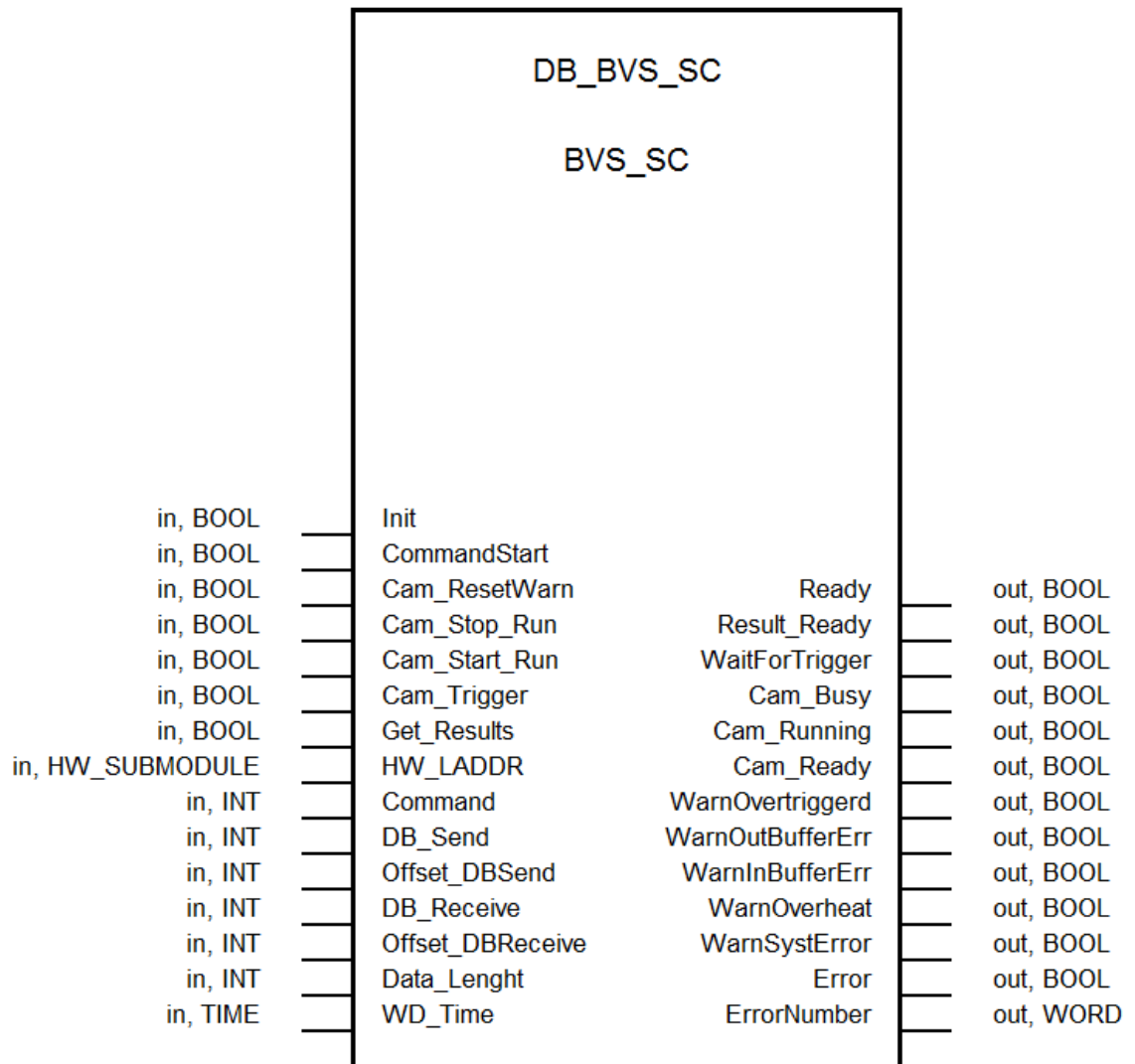
Download enabling

Disable	=	Not activated
Enable	=	Automatic parameter download Master -> Device

More information concerning the parameters is available in the BVS SC user's guide.

3 FB PARAMETER DESCRIPTION

3.1 FB illustration



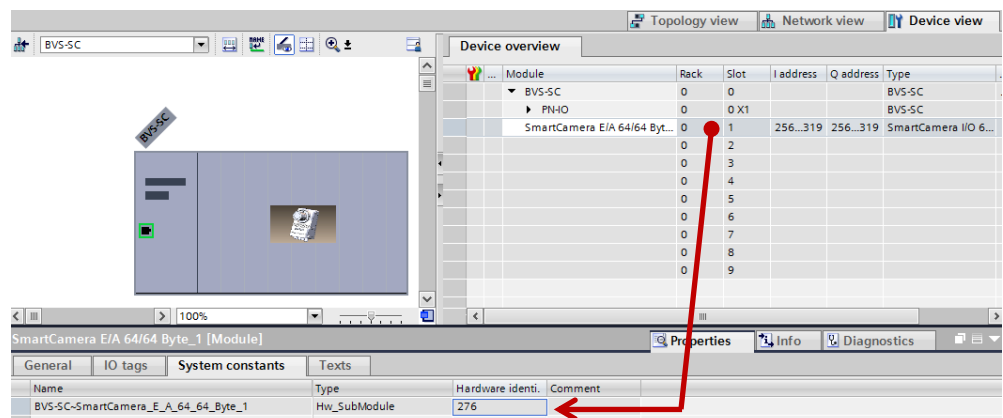
“Cam_” = Smart Camera signals

3 FB PARAMETER DESCRIPTION

3.2 Input parameter

Init	Function block initialization Must be set for one cycle each time the PLC is restarted. Static variables, control bits and upcoming commandos are reset. The function is done when Ready is set again.
CommandStart	Start commando. CommandStart = true starts a job. This signal must be set until the Ready output goes to 0. The function is done when Ready or Error is set again. The Input Get_Results can't be set to true at the same time.
Cam_ResetWarn	Reset camera warn bits
Cam_Stop_Run	It deactivates the Run mode of the camera
Cam_Start_Run	It activates the Run mode of the camera. While the signal is on true, the Run mode is restarted if Cam_Running is false.
Cam_Trigger	Initiates a trigger in the camera
Get_Results	Gets the result container from the camera if a rising edge is applied. Same command sequence than commando 03. The function is done, when Ready or Error is set again. The Input CommandStart can't be set to true at the same time.
HW_LADDR	Hardware identifier of SmartCamera module or camera instance of a SmartVisionController. The I/O area is determined by the hardware identifier . The hardware identifier is displayed in the properties of SmartCamera Modul (or in the properties of a CameraInstance). This parameter is only activated after a rising pulse at the FB Init input.

Figure for SmartCamera:

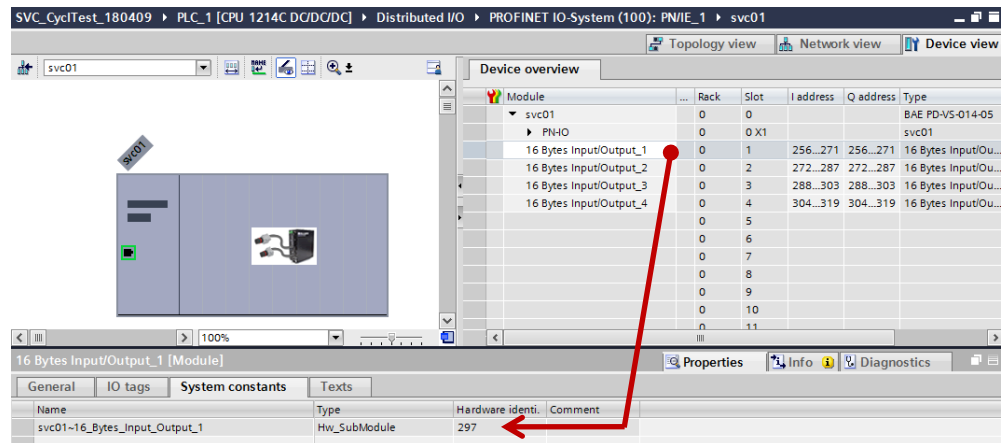


(Figure TIA-Portal: Devices & networks, properties of SmartCamera I/O module)

In this case the Hardware identifier 276 is assigned at the FB input.

3 FB PARAMETER DESCRIPTION

Figure for SmartVision Controller:



Slot	HW-Identifier (Example)	IQ address	Camera instance
1	297	256...271	http://<SVC name>:9000
2	298	272...287	http://<SVC name>:9001
3	299	288...303	http://<SVC name>:9002
4	300	304...319	http://<SVC name>:9003

(Figure TIA-Portal: Devices & networks, properties of SmartCamera SmartVisionController I/O module)

Each slot in the device configuration is firmly assigned to a camera instance. The function block get access to the process data by the hardware-identifier of the slot for each camera instance. For each slot is an separate instance call of the function block necessary. The hardware-identifier is assigned by TIA Portal software. The hardware-identifier is displayed in the module properties of each slot.

Command

Camera commands:

Command = 01 _{hex} :	Switch Application
Command = 02 _{hex} :	Get Application ID
Command = 03 _{hex} :	Get Results
Command = 04 _{hex} :	Send Data
Command = 05 _{hex} :	Get Camera Info (only for SmartCamera)
Command = 06 _{hex} :	Get Date Time
Command = 07 _{hex} :	Set Date Time (only for SmartCamera)
Command = 08 _{hex} :	Set Sequence Number

DB_Send

Data block for camera input data.

Offset_DBSend

Start address for camera input data in the data block.

DB_Receive

Data block for camera output data.

3 FB PARAMETER DESCRIPTION

Offset_DBReceive	Start address for camera output data in the data block.
Data_Lenght	Transmitted data length for commando 4 (Set inputs).
WatchdogTime	Monitoring time for commands. This time have to be chosen according to the maximum command execution time. After the expiration of the timer the command is aborted. Example calculation: 32k should be read from the camera. The process data length is only 16 bytes. The PLC cycle Time is 10ms. Calculated data transfer duration 145s.

3.3 Output parameter

Ready	Job completed This bit is set when the job was completed. This output will be reset by a rising edge of Start or Reset input.
Result_Ready	A result in camera is ready.
WaitForTrigger	The camera is waiting for a trigger signal.
Cam_Busy	The camera is currently busy.
Cam_Running	The camera is in running mode.
Cam_Ready	The camera has completely started and is ready. The camera running mode can be started. This output only changes to false. If a Camera reset is executed or if the camera isn't ready for use.
WarnOvertriggerd	A trigger was discarded by the camera since it was still busy with the analysis of the previous image.
WarnOutBufferErr	This bit becomes active as soon as a result container was not picked up by the controller and overwritten by a new result.
WarnInBufferErr	It is set for input container overflow (more input containers than inspections, so that one input container was discarded) or input container underflow (more inspections than input containers, so that one input container was used multiple times).
WarnOverheat	Camera temperature exceeds the limit.
WarnSystemError	Fatal system error. At least one reset is required, a part of the camera could be defective.
Error	Job completed with error This bit is set if the job was completed with an error and is reset with a rising edge at Reset or CommandStart input
ErrorNumber	If the Error bit is set, the error number will be displayed here as hex value.

ATTENTION

Warn = Camera Warn-Bits. Warning messages from the camera. For detailed diagnosis, different camera messages are shown. Not more active messages, can be reset by the FB Input **Cam_ResetWarn**. Commands may be executed, while message bits are active!

3 FB PARAMETER DESCRIPTION

3.4 General error codes

Status-code	Meaning	Effect	Remedy
10 _{hex}	NOK Error	An error occurred during the last transfer of a command	Check command string
11 _{hex}	NOK Communication Abort	Communication was canceled by the controller by resetting the Strobe bit.	Check PLC program
12 _{hex}	NOK Communication Error	A communication error occurred (e.g. handshake timeout violation)	Check PLC program
13 _{hex}	NOK Invalid Command	An invalid command code was transferred	Check program string
14 _{hex}	NOK Invalid Application ID	An invalid application ID was transferred during the last command	Transmit valid Application ID
15 _{hex}	NOK Results	Response to the command Get Results; no results present	Start Get Result after Result Ready bit is set
16 _{hex}	NOK Busy	Command could not be executed since the camera is still processing another command or is not yet ready after a restart.	Start commands when camera is ready

This error list is corresponding to the status codes in user's manual.

3.5 FB internal error codes

Status-code	Meaning	Effect	Remedy
30 _{hex}	Monitoring time expired	Camera and FB go to base state	Check programming
31 _{hex}	Undefined command	Camera and FB go to base state	Check programming
32 _{hex}	Read /Write length exceeds the limit.	Camera and FB go to base state	Check programming, Limit 32767 byte
40 _{hex}	No connection to SmartCamera Modul	Camera and FB go to base state	Check hardware configuration and Profinet - connection, initialize FB again
41 _{hex}	Data could not be read from SmartCamera Modul	Camera and FB go to base state	Check hardware configuration and Profinet-connection, initialize FB again

3 FB PARAMETER DESCRIPTION

Status-code	Meaning	Effect	Remedy
42 _{hex}	Data could not be write to SmartCamera Modul	Camera and FB go to base state	Check hardware configuration and Profinet - connection, initialize FB again
43 _{hex}	FB Internal Error	Camera and FB go to base state	Check hardware configuration and Profinet - connection, check length of DB_Send/ DB_Receive initialize FB again

3.6 Description of commandos

The commandos are selected by a hexadecimal value at the „**Command**“ input. With a rising edge at „**Start**“ input the commando is executed. After successful execution the „**Ready**“ Output is true and „**Error**“ is false.

Switch Application ID 01_{hex}:

Switches the camera application. The application ID, stored in data block „**DB_Send**“ at the byte address „**Offset_DBSend**“ is transmitted to the camera. The application ID 0 cannot be selectet by the fieldbus interface. The application may not be switched during the camera mode “Running”.

Get Appliaction ID 02_{hex}:

Gets the ID of the currently active application. The Application ID is transmitted to data block „**DB_Receive**“ at the byte address „**Offset_DBReceive**“.

Get Results 03_{hex}:

Gets the camera result container. The result container is transmitted to „**DB_Receive**“ at the byte address „**Offset_DBReceive**“.

Send Data 04_{hex}:

Sends camera application input data from PLC to camera. The input data are read from data block „**DB_Send**“ starting at the byte address „**Offset_DBSend**“ and transmitted to camera. The amount of data is assigned by the input parameter „**Data_Lenght**“. The same length as in camera application tool “Recive data” have to be used.

Get Camera Info 05_{hex}:

Gets the camera information. Camera information are transmitted to data block „**DB_Receive**“ starting at address „**Offset_DBReceive**“.

Get Date and Time 06_{hex}:

Get the time stamp from camera. The timestamp is transmitted to data block „**DB_Receive**“ at the start address „**Offset_DBReceive**“.

Set Date and Time 07_{hex}:

Sets the time stamp in the camera. The timestamp is read in „**DB_Send**“ at the byte „**Offset_DBSend**“ and transmitted to the camera. The transmitted data amount is 7 Bytes.

Set Sequence Number 08_{hex}:

Sets the sequence number. The sequence number is read from data block „**DB_Send**“ at the byte „**Offset_DBSend**“ and transmitted to camera. The transmitted data amount is 4 Bytes.

More information concerning the commandos is available in the BVS SC user’s guide.

3 FB PARAMETER DESCRIPTION

3.7 Disclaimer of Liability

This demo function block is free of charge and is a universal application example. This demo function block shall help program and configure PLC applications and shall provide possible solutions.

The user is not entitled to claim for warranty, error correction and updates. In particular there is excluded any claims against Balluff GmbH for damages that might result from the use of this demo program. Excluded from this limitation of liability shall be (a) those damages that are based on injury to life, limb or health, (b) a liability according to the Produkthaftungsgesetz (German Product Liability Law) and (c) cases of willful intent.

Please check if the function block is intended for your application before adapting it in plants and machineries.

By using the S7 sample, made available free of charge you accept the limitation of warranty and liability!

Balluff GmbH
Schurwaldstraße 9
73765 Neuhausen a.d.F.
Germany
Tel. +49 7158 173-0
Fax +49 7158 5010
balluff@balluff.de
www.balluff.com

Valid from function block version 1.2 • D18; Subject to change.