MULTICAMERA SOLUTIONS WITH BVS COCKPIT
GENERAL INFORMATION

Multicamera solutions with BVS Cockpit can be achieved with:
- SmartVision Controller BAE0103 plus BVS CA Industrial Cameras
- Custom PC system plus BVS Cockpit Windows BAI000Z plus BVS CA Industrial Cameras

Both versions offer the connection of max. 4 independent industrial cameras (GigE or USB3) which can be used in max. 4 independent application instances.

MEMORY (RAM) CONSIDERATIONS FOR SMARTVISION CONTROLLER OR CUSTOMIZED CONTROLLING PC

As the BVS Cockpit System offers independent application instances the available RAM memory is fixed divided by default into 4 (25%) or 8 (12.5%) memory blocks for each instance (port 9000, 9001, 9002, …).

In these blocks all data of each inspection (inspection program, calibration data, reference images, run time data, …) is saved.

Depending on the system setup the user can assign each memory block depending on the assigned camera resolution and the size of the inspection program in the BVS System Settings:

An expansion package BAI BVS-P99N-UGY-0001-1DZ-IAZZ for max. 8 independent industrial cameras is available for existing base systems.

The software license is verified with the BVS Cockpit USB license key.

Designing a multi camera solution requires careful consideration how to plan, install and run the system. Please keep in mind that based on the configuration and the usage there are consequences on the overall performance. Key parameters are the amount of data being transferred in a dedicated time – the worst scenario is to have the same synchronized trigger timing.

This has the consequence that all image data are transferred at the same time.

Another topic is the sharing of the CPU resources on various test instances. Here the processing queue is affected the more parallel processes occur.

Finally, there is the sharing of the system memory to multiple test instances.

Additional network switching components might be needed.

Switch configurations and impacts on the application performance is in the responsibility of the integrator.

In case of a custom based controller PC the integrator is responsible of the internal networking configuration and firewall settings.

The following chapters give additional information, considerations and limitations designing multicamera solutions.

Please make sure that the total amount of the assigned memory over all instances is not exceeding 100% – due to internal structure the BVS Cockpit is not verifying the values! A wrong parameterization might lead to “Memory error messages!”

If the memory block becomes insufficient this error message will pop up in Configuration Mode of any inspection within the instance or when running the inspection in Monitor Mode:

Now action is required – as also stated in the error message – you must either enlarge the amount of assigned memory for this instance or reduce the complexity of the inspection by deleting tools.
CONTROLLER PROCESSING PERFORMANCE

The SmartVision Controller BAE0103 is equipped with CPU Q170 chipset, Core i7 with 4 kernels and 8 threads (logical processors).

A prediction regarding the cycle time increase of an inspection when adding parallel running instances on the SmartVision Controller is very difficult because of the non-transparent internal process of splitting single tasks of an inspection to the available CPU cores.

However, as a rough rule of thumb you can increase the inspection time for every additional instance by 50%.

Example:

<table>
<thead>
<tr>
<th>Number of instances</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspection time</td>
<td>100 ms</td>
<td>150 ms</td>
<td>225 ms</td>
<td>340 ms</td>
</tr>
</tbody>
</table>

Using the 8-channel license expansion will further enlarge the single inspection times.

OVERALL DATA TRAFFIC

Within an Ethernet network only a portion of bandwidth is available for camera (image) data transfer. Based on our experience in a 1 GigE network a max. bandwidth of 125 MByte/s, in 100 MBit networks 12.5 MByte/s is available for the image data.

Some additional bandwidth is needed by the communication protocol and some other non-GigE Vision related network traffic. Internal network devices and controller might include additional bandwidth bottle necks.

In applications where multiple cameras share a single network path, you must keep the bandwidth in mind.

The SmartVision Controller BAE0103 is designed like this:

Each external GigE network interface is connected via 1 Gbit/s to the CPU. On the LAN interface no industrial camera can be connected.
ADDITIONAL NETWORK SWITCHES

To cover more than 4 GigE Industrial Cameras at least one external GigE-switch must be integrated.

Depending on the design of the switch, its internal packet buffer varies. If the buffer is too small, large image data arriving at the same time can result in lost image data. With high-quality switches, it is sometimes possible to configure the packet buffer to maximum and make other related optimizations.

We implemented some features to the hardware and the driver to bypass the limitations of the used protocol. A resend buffer and a check to get information about lost packages and gain the ability to resend them. Also, an adjustable “brake” to limit the bandwidth of the imaging device.

This adjustable “break” is necessary, as soon as multiple cameras are connected via one switch (BVS Cockpit Windows or SmartVision Controller with > 4 cameras) and they may be triggered simultaneously. The amount of data sent simultaneously by the cameras can and should also be limited in the configuration of the cameras.

Rule of thumb: Divide the preset maximum bandwidth by the number of cameras on this switch and subtract then also a few percent for the bandwidth needed by the communication protocol.

Following a short explanation how to enable the bandwidth limitations (mvIMPACT Acquire > 2.25.0) with the PropView – Setting DeviceLinkThroughputLimit

- In Setting → Base → Camera → GenICam →
  Device Control → Device Link Selector set property
  Device Link Throughput Limit Mode to On
- Set the bandwidth with Device Link Throughput Limit to your desired bandwidth in Byte per second