

## System Requirements for dSPACE Release 2018-A

If your system meets the following requirements, you can work with RCP and HIL software (containing RTI, ConfigurationDesk, MotionDesk, ModelDesk, etc.), AutomationDesk, TargetLink, Model Compare, ControlDesk, SystemDesk, and VEOS. The system requirements of the current dSPACE Release, are also available at <http://www.dspace.com/go/sysreq>.

### Host PC Hardware

You need an x64-based personal computer as the host PC for your dSPACE software. ControlDesk can also be installed on:

- MicroAutoBox Embedded PC 3rd Gen. Intel® Core™ i7-3517UE.
- MicroAutoBox Embedded PC 6th Gen. Intel® Core™ i7-6822EQ.

### Host Processor

All dSPACE software products require at least an Intel® Core™ 2 Duo processor at 2 GHz (or equivalent). Intel® Core™ i7 (for desktop PCs) or equivalent is recommended.

### Main Memory

- All dSPACE software products require at least 8 GB RAM (recommended: 16 GB RAM or more).
- SYNECT Server requires a least 4 GB RAM (recommended: 8 GB RAM or more).

### Disk Space

- For a complete installation of the DVD set, you need up to 22 GB of free hard disk space on the program partition.
- In addition you need up to 20 GB of free disk space on the system partition, for example, for run-time software like the Microsoft .NET Framework.
- SYNECT Server: 1 GB of free disk space on the system partition required.

### Disk Drives

DVD drive for the software installation from DVD.

### Required Ports for Connecting Hardware

#### ConfigurationDesk - Configuration Version

For communication with RapidPro hardware, you need a USB port version 2.0. dSPACE does not guarantee compatibility with USB 3.0.

#### TargetLink

For processor-in-the-loop (PIL) simulation, you need a serial port (RS232) or a free USB port (depending on the type of the evaluation board).

#### ControlDesk

- To connect DCI-CAN1 and DCI-KLine1, you need a USB port version 1.1 (compatible with USB 2.0). dSPACE does not guarantee compatibility with USB 3.0.
- To connect Calibration Hub and DCI-GSI1, you need a USB port version 2.0 (compatible with USB 1.1). dSPACE does not guarantee compatibility with USB 3.0.
- To connect DCI-CAN2 and DCI-CAN/LIN1, you need a USB port version 2.0 (compatible with USB 1.1 and USB 3.0).
- To use the Steering Controller instrument, you need a USB port to connect a game controller device.
- To connect a video camera to the video capturing device, you need a USB port or an Ethernet port (depending on the camera used).
- To use the graphical user interface of the ControlDesk XIL API EESPort via the RS232 interface, your host PC needs an RS232 serial port that can run at 9,600 bit/s to connect the Failure Insertion Unit (FIU) of PHS-bus-based HIL systems. As an alternative you can use an external RS232

converter:

- USB-to-RS232 converter: Only converters with an FTDI chipset and the newest FTDI driver are supported. Refer to <http://www.ftdichip.com/FTDrivers.htm>.
- Ethernet-to-RS232 converter: The IOLAN DS1 converter from Perle is recommended by dSPACE. Refer to <http://www.dspace.com/go/eth2rs232>.
- There are limitations if you use an external RS232 converter: Software triggers and dynamic errors are not supported. Communication is also time-critical and can cause communication errors.

### Graphics Adapter and Display

- To work with dSPACE products, you need a standard graphics adapter with a minimum resolution of 1024 x 768 pixel. A standard graphics adapter with a resolution of 1280 x 800 pixels or more is recommended for ConfigurationDesk - Implementation Version.
- To work with AutomationDesk, ConfigurationDesk, ControlDesk, ECU Interface Manager, MotionDesk, ModelDesk, Model Interface Package for Simulink, RTI blocksets, SYNECT, Variable Editor you need the following Windows' display property settings:
  - Windows 7: The Windows' display property "Custom Text Size (DPI)" must be set to 100 % (default setting).
  - Windows 10: The Windows' display scaling level ("Custom sizing options") must be set to 100 %.
  - Other settings are not supported.
- To work with TargetLink and/or Model Compare, you need the following Windows' display property settings:
  - Windows 7: The Windows' display property "Custom Text Size (DPI)" must be set to 100 % (default setting) or to 125 %. Other settings are not supported.
  - Windows 10: The Windows' display scaling level ("Custom sizing options") is best set to 100 % or to 125 %.
- If you use ControlDesk in a VMware environment, 3-D support must be enabled in VMware.

### Requirements for License Handling

- Dongle licenses: To connect the dongle, you need a USB port (Version 1.1 min.).
- Floating network licenses:
  - All the PCs on which you want to run dSPACE software (dSPACE License Clients) must be able to establish a TCP/IP connection to the dSPACE License Server. A standard TCP/UDP protocol is required. The default port number is 22350 (TCP and UDP), which is an officially registered port number (IANA). If needed, you can change the port number.
  - For activating licenses, dSPACE Installation Manager needs an Internet connection to connect to dSPACE License Central (<https://licensing.dspace.de/gateways>, HTTPS, Port 443). It can work with proxy servers and can also handle proxy servers with authentication (user name, password).
  - CodeMeter Runtime Version 6.50c or later is required for handling floating network licenses on a license server

- For a host PC on which only dSPACE Installation Manager is installed or which only works as license server, the following minimum hardware is required: Intel® Core™ 2 Duo processor at 2 GHz or equivalent, 4 GB RAM main memory (or more).

### Required Slots

- You can install a modular system based on the DS1005, DS1006 or DS1007 in an expansion box. You cannot install these systems in the host PC.
- To install a DS1103, you need one free ISA slot and three adjacent brackets. The standard PCs currently available do not provide ISA slots. As an alternative, install a DS1103 in an expansion box. When installed directly in the host PC, the DS1103 cannot be used with the standard installation routines. In this case, contact dSPACE Support.
- To install a DS1104, you need one free 33 MHz/32-bit 5 V PCI slot or one PCIe slot, depending on the board variant.
- To connect your modular system (based on DS1005/DS1006), DS1103, MicroAutoBox, or dSPACE Simulator Mid-Size to the host PC via a bus connection, you need link boards in your host PC:
  - The DS815 Link Board (PC) requires one free PC card slot (type 2).
  - The DS817 Link Board (PC) requires one free 5 V PCI slot (up to DS817-03) or one free 3.3 V / 5 V Universal PCI slot (DS817-04 and later).
  - The DS819 Link Board (PC) requires one free PCI Express slot (x1 ... x32).
  - The DS821-34 mm Link Board (PC) requires one free ExpressCard/34 slot or one free ExpressCard/54 slot.
  - The DS821-54 mm Link Board (PC) requires one free ExpressCard/54 slot.
- The DS1007, MicroAutobox II, MicroLabBox and the SCALEXIO system require no link board. Host PC communication is established via your Ethernet network adapter.

## Operating System

### Operating System on Host PC

The dSPACE products support the following operating systems:

- Windows 7 Professional, Ultimate, and Enterprise with Service Pack 1 (64-bit versions). Only the listed editions are supported. The Windows 7 Home and Starter editions are not supported.
- The following editions and servicing options of Windows 10:
  - Windows 10 Professional, Education, and Enterprise (64-bit versions). The Windows 10 Home, Mobile, and Windows 10 S editions are not supported.
  - The Long-Term Servicing Branch: LTSB 2016
  - (Semi Annual Channel (formerly known as Current Branch (CB)): The compatibility statement of Microsoft applies. This means that newer versions released in this channel should be compatible with all previous versions. dSPACE used the 1709 version of the Semi Annual Channel for testing.

### Installing ControlDesk on MicroAutoBox

ControlDesk can also be installed on:

- MicroAutoBox Embedded PC 3rd Gen. Intel® Core™ i7-3517UE Processor running on Windows 7 Professional, Ultimate, and Enterprise (64-bit versions).
- MicroAutoBox Embedded PC 6th Gen. Intel® Core™ i7-6822EQ Processor running on Windows 10 IOT Enterprise, LTSB 2016, 64-bit version.

### Operating System on SYNECT Server

SYNECT Server supports the same operating systems as listed above for all dSPACE products. In addition, the 64-bit versions of Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2 and Windows Server 2016. The Windows Server Semi Annual Channel versions are not supported.

### Allowing Communication via Additional Firewall Rules

Additional Windows firewall rules are installed during the installation of various dSPACE software products. For example, one rule allows communication with a dSPACE expansion box such as AutoBox and another rule allows MotionDesk to receive motion data from a network channel.

If you are running third-party firewall software on your host PC, ensure that the TCP/IP communication of dSPACE software is not blocked:

- VEOS requires the following open TCP/IP network ports: 111 (TCP and UDP), 3702 (UDP), 7214 (TCP and TCP6), 9923 (UDP), 15000 (UDP), 49152 ... 65535 (TCP, TCP6 and UDP)
- dSPACE Installation Manager and CodeMeter licensing software require the following open TCP/IP network port if communication in a LAN network is necessary: 22350 (TCP and UDP), if not changed from the default setting.
- dSPACE Help requires an open TCP/IP network port for interprocess communication between its components. The default port number is 11000. If this port number is already in use, another free port is used automatically. The related processes can be identified via the following prefixes: HelpApsLayer<xxx>, HelpInstaller<xxx>.

### Operating System on dSPACE License Server

If you purchased floating network licenses, you have to specify one of the network PCs as a license server. Every PC with CodeMeter Runtime software can be used as a license server.

- **Valid for servers without dSPACE software:** dSPACE only tests license servers with Microsoft Windows operating systems in combination with protected dSPACE software. Non-Windows operating systems, such as Ubuntu Linux, are not tested. You can use them at your own risk. dSPACE does not provide support in this case.
- **Valid for servers with dSPACE Installation Manager:** dSPACE Installation Manager supports the same operating systems as other dSPACE software products.

### Limitations for Using Windows Features

Some limitations apply when you use dSPACE software in conjunction with features of Windows:

- **Fast user switching:** The dSPACE software does not support the fast user switching feature of Windows.
- **User Account Control:** It is recommended to disable Windows' User Account Control (UAC) during the installation of dSPACE software. If you cannot disable it, you should note the following Windows behavior: If UAC is enabled, the setup programs run with the administrator account instead of the user account. Therefore it is important that the administrator account has access to the required drives, particularly to the required network drives.
- **Long path names:** dSPACE software does not support the long path name syntax of the Windows API. If a path name that exceeds 260 characters is used directly or indirectly, the behavior of the dSPACE software is not defined.

- **FIPS support:** dSPACE software was not developed for or tested against the FIPS PUB 140-2 U.S. government computer security standard (Security Requirements for Cryptographic Modules). Therefore, dSPACE products are not guaranteed to work if the respective setting is enabled in Windows. By default, the setting is disabled. For more information on FIPS, refer to <https://technet.microsoft.com/en-us/library/security/cc750357.aspx>.

## Third-Party Software

### MATLAB®

Working with various dSPACE products requires that you have installed one of the following MATLAB releases: R2016a, R2016b, R2017a, R2017b, R2018a.

Note the following exceptions:

- R2018a is not supported by TargetLink and Model Compare.
- R2018a is not supported by the RTI FPGA Programming Blockset – FPGA Interface.
- R2016a is supported only by TargetLink and Model Compare.

For system requirements of The MathWorks software, refer to <http://www.mathworks.com/support/sysreq.html>.

MATLAB Limitations for Automotive Simulation Models (ASM):

- MATLAB/Simulink Student Suite is not supported.
- ASM does not support Simulink's Rapid Accelerator Simulation Mode

### Code Generation

For code generation with RTI, RTI-MP, various RTI blocksets, ConfigurationDesk – Implementation Version (when working with Simulink models), Model Interface Package for Simulink, and for C code generation of Automotive Simulation Models (ASM), you need Simulink Coder and MATLAB Coder from The MathWorks. Make sure that the MATLAB and Simulink versions are supported by the dSPACE software you intend to install. For details refer to our Web site at <http://www.dspace.com/go/compatibility>.

### C/C++ Compiler for RCP and HIL Software

- For building MATLAB MEX files for the RTI CAN MultiMessage Blockset, and RTI LIN MultiMessage Blockset, you need one of the following C/C++ compilers and have to configure it as a MEX compiler in MATLAB:
  - MinGW (GNU Compiler Collection (GCC 4.9.2)): In combination with MATLAB Releases 2016b and 2017a-MinGW (GNU Compiler Collection (GCC 5.3.0)): In combination with MATLAB Release 2017b and 2018a
  - Microsoft Visual Studio 2015 Professional: In combination with MATLAB Releases 2016b, 2017a, 2017b and 2018a.
  - If you experience problems using MinGW as a MEX compiler, check the bug reports and solutions published by MathWorks.
- For MicroAutoBox, the DS1103, DS1104 and DS1005 boards, and the RapidPro Control Unit with MPC5554, you must install the Microtec PowerPC C/C++ Compiler Ver. 3.8.6. The compiler is installed automatically with the dSPACE software. If you ordered the required license, you can use the compiler.
- For the DS1006, the required dSPACE DS1006 C/C++ Compiler (Ver. 3.0, based on GNU C/C++ Compiler Ver. 4.8.3) is installed automatically together with the dSPACE software.
- For the DS1007, MicroLabBox and SCALEXIO systems,

the required QNX Compiler for dSPACE systems (Ver. 3.0, based on GNU C/C++ compiler Ver. 5.2) is installed automatically together with the dSPACE software.

- For compiling slave applications for the DS2302, DS2210, and DS2211 I/O boards, you must install TMS 320C3x/C4x Code Generation Tools Ver. 4.70 or 5.11 or TMS 320C3x/C4x Code Composer Tools Release 4.10 from Texas Instruments. Installing TMS 320C3x/C4x Code Composer Tools of Release 4.10 (containing C3x/C4x Code Generation Tools 5.11) under Windows 7 (64-bit) is not possible. For information on a workaround, refer to [http://e2e.ti.com/support/development\\_tools/code\\_compiler\\_compiler\\_studio/f/81/t/211223.aspx](http://e2e.ti.com/support/development_tools/code_compiler_compiler_studio/f/81/t/211223.aspx) or contact dSPACE Support.
- For compiling slave applications for the DS1103, you must install Texas Instruments Code Composer Studio (CCStudio) Integrated Development Environment (IDE) v3 – for F24x/C24x devices.

### C compiler for internal bypass targets used by the RTI Bypass Blockset

For compiling real-time applications for internal bypass targets, you need a C compiler depending on the target:

- HighTec GNU CC compiler for the Infineon TriCore, Freescale MPCxxx and Renesas target processor families
- GNU CC compiler for the x86 target

The compilers are part of the RCP and HIL software package and installed automatically with the dSPACE software.

### C/C++ Compiler for VEOS

You must install one of the following C/C++ compilers to build software-in-the-loop (SIL) simulation applications:

- Microsoft Visual C/C++ Compiler as in Visual Studio 2015 or Visual Studio 2012. Express editions of these versions are also supported. For using Automotive Simulation Models (ASM) with VEOS, Visual Studio 2012 is not supported. Use Visual Studio 2015 instead.
- C/C++ Compiler of the GNU Compiler Collection (GCC). The GNU GCC Ver. 5.2 is shipped with the dSPACE software and installed automatically.

### Third-Party Software for ControlDesk

- API and driver for CAN, LIN or FlexRay interfaces from Vector Informatik GmbH  
To use CAN, LIN or FlexRay interfaces from Vector Informatik GmbH with ControlDesk, you need the appropriate API and driver:
  - API: XL Driver Library 9.7.26 or later (provided by the ControlDesk installation)
  - Driver: Vector Driver Ver. 9.8 or later. You need a driver version that is compatible with the API you use. Download the driver from <http://www.vector-informatik.de>.
- Driver for CAN/LIN Interfaces from Kvaser  
To use Kvaser CAN/LIN interfaces with ControlDesk, you need the appropriate Kvaser driver: Kvaser CAN Ver. 5.17 or later, or Kvaser LIN Ver. 5.17 or later. Download it from <http://www.kvaser.com>.
- Drivers for CAN, LIN or FlexRay interfaces from Eberspächer Electronics (formerly TZM)  
To use these CAN, LIN or FlexRay interfaces with ControlDesk, you need the appropriate driver Ver. 6.4 (or later). Download it from <http://www.eberspaecher.com>.

- Drivers for CAN interfaces from KPIT Technologies  
To use CAN interfaces from KPIT Technologies GmbH (<http://www.kpit.com/engineering/automotive/vehicle-diagnostics>) with ControlDesk, you need the appropriate driver version. Contact dSPACE or inquire at [diagnostics@kpit.com](mailto:diagnostics@kpit.com) for details.
- Driver software for K-Line interfaces  
To use K-Line interfaces from KPIT Technologies GmbH (<http://www.kpit.com/engineering/automotive/vehicle-diagnostics>) with ControlDesk, you need the appropriate driver version. Contact dSPACE or inquire at [diagnostics@kpit.com](mailto:diagnostics@kpit.com) for details.
- Driver software for video cameras  
To access video cameras from IDS (<http://www.ids-imaging.com>) with ControlDesk, you need to install and activate the appropriate driver software. ControlDesk requires the driver software to access these cameras via DirectShow. Contact dSPACE for details.

### Third-Party Software for SYNECT and SYNECT Server

- Compatible third party software for SYNECT:
  - Microsoft Office Version 2007, 2010, 2013: To import items such as test cases from Excel files.
  - MATLAB (for compatible versions refer to SYNECT documentation): To open and execute Simulink models, to import and export Simulink model files.
  - IronPython 2.7 (64-bit): To program server scripts.
  - To connect SYNECT with a configuration management (CM) system: Apache Subversion 1.7, 1.8, 1.9, or PTC Integrity 10, or Microsoft Team Foundation Server 2013, 2015
- Supported databases for SYNECT Server:
  - SQL Server 2008, 2008R2, 2012, 2014, 2016
  - SQL Server 2014 Express is provided by the dSPACE Setup and can be used for development servers.

### C Compiler for TargetLink

You must install one of the following C compilers to build MATLAB MEX files and software-in-the-loop (SIL) simulation applications:

- Microsoft Windows SDK 7.1 or Microsoft Visual C/C++ Professional 2008 (Ver. 9.0), 2010 (Ver. 10.0), 2012 (Ver. 11.0), 2013 (Ver. 12.0), 2015 (Ver. 14.0) or 2017 (Ver. 15.0)
- MinGW (GNU Compiler Collection (GCC 4.9.2)): As of MATLAB R2016a up to MATLAB R2017a
- MinGW (GNU Compiler Collection (GCC 5.3.0)): As of MATLAB R2017b

The LCC compiler cannot be used to build 64-bit MEX files, because the shipped LCC-Win64 compiler does not support building MEX files or S-functions.

For a list of supported compilers, refer to

<http://www.mathworks.com/support/compilers>.

Processor-in-the-Loop (PIL) Simulation:

- An evaluation board (EVB) has to be available (see table below)
- A target-specific compiler has to be available (see table below)
- If your target is not listed here, refer to the TargetLink PIL Support website at <http://www.dspace.com/go/tpil>



Compatible Evaluation Boards for PIL Simulation in TargetLink	Compatible TargetLink Compilers
Emerge-Engineering ARM MEDKit	Keil 5.2
Renesas EVB7058	Renesas 9.3
Renesas YRH850F1L_R7F7010354	Green Hills 2016
Infineon EasyKit XC2287	Altium TASKING C166/ST10 VX-Toolset 3.0
Infineon TriBoard TriCore 275	HighTec GNU 4.6
	Altium TASKING TriCore VX-Toolset 6.2
Infineon TriBoard TriCore 1796	Altium TASKING TriCore VX-Toolset 3.2
Infineon TriBoard TriCore 1767	Altium TASKING TriCore VX-Toolset 6.2
	Altium TASKING TriCore VX-Toolset 3.2
Infineon TriBoard TriCore 1766 20 MHz	Altium TASKING TriCore VX-Toolset 3.2
Infineon TriBoard TriCore 1766	Altium TASKING TriCore VX-Toolset 3.2
I+ME Promotion Package 166	Altium TASKING C166/ST10 Toolset 8.6
Freescale EVB9S12XEP100	Metrowerks CodeWarrior 5.1
	Cosmic 4.8
Freescale MPC5604BEVB	Green Hills 2016
	Wind River Diab 5.9
Freescale MPC5748GEVB	Green Hills 2016
	Wind River Diab 5.9
Renesas SH72513 System Development Kit	Renesas 9.4
Renesas AB_050_Fx4_70F4012	Green Hills 2016

## Expansion Box Requirements

### **Connecting an Expansion Box and Host PC via Bus Connection**

- The DS814 Link Board has to be installed in the expansion box.
- The DS815, DS817, DS819, or DS821 Link Board has to be installed in the host PC.
- You cannot connect the currently available dSPACE boards to the host PC via the DS811 or DS812 Link Board.

### **Connecting an Expansion Box and Host PC via Ethernet**

- A slot CPU with an integrated network adapter has to be installed in the expansion box.
- Valid for DS1007 systems: The DS1007 provides an onboard Ethernet interface to connect the system installed in the expansion box to the host PC via Ethernet.
- The host PC must have a 10BASE-T (twisted pair, 10 Mbit/s or faster) network adapter.

### **Required Slots**

- To install a DS1103, you need one free, full-size ISA slot and two additional, free, adjacent brackets.
- To install a modular system based on DS1005, DS1006, or DS1007, you need as many free slots in the box as the number of boards you want to install. Note that the DS2210 requires two adjacent brackets altogether. The DS5203 requires two adjacent brackets, if the DS5203M1 I/O modules are installed. The DS2202, DS2211, DS4003, and DS4004 each require a total of three adjacent brackets.
- Valid for DS1005 and DS1006: One free full-size ISA slot is required either by the DS814 (bus connection) or the slot CPU (Ethernet connection). Note that the slot CPU (supplied as of March 2008) requires two slots if you use it in an AutoBox with a DS1005.

- The DS1006 has special slot requirements to ensure proper cooling of the AMD Opteron™ processor:
  - In a PX20, the slot requirement depends on the board revision: Up to board revision DS1006-03, each DS1006 requires four slots (including one slot for the DS814 Link Board or the slot CPU). As of board revision DS1006-06, each DS1006 requires three slots. However, none of the slots can be used for the DS814 Link Board or the slot CPU.
  - In a PX10, the DS1006 requires either two slots (with Gigalink module) or one slot (without Gigalink module), if installed next to the box's power supply (recommended).

### **Installing a DS1006 in an Expansion Box**

- The DS1006-based modular system must be installed in a PX10 or PX20 Expansion Box. PX10 supports one, PX20 up to two DS1006 boards.
- The expansion boxes need special power supplies and connectors which meet the DS1006 requirements. For information on whether your existing expansion box meets these requirements, refer to <http://www.dspace.com/go/pxboxvers>.
- You cannot insert a DS1006 in a PX4 Expansion Box, or an AutoBox/Tandem-AutoBox.

### **Installing DS1007 in an Expansion Box**

- The DS1007-based modular system can be installed in a PX10 or PX20 Expansion Box or in an AutoBox/Tandem-AutoBox. PX10 and AutoBox support one, PX20 and Tandem-AutoBox support up to two DS1007.
- You cannot insert a DS1007 in a PX4 Expansion Box.

### **3-D Online Animation via MotionDesk**

For 3-D online animation via MotionDesk, your system has to meet additional requirements. They are also listed at <http://www.dspace.com/go/mdhwrequ>.

#### **Software Requirements**

- The latest driver for the graphics adapter must be installed. This driver must support OpenGL Ver. 2.1 and OpenGL Shading Language Ver. 1.4.

#### **Hardware Requirements**

- At least an Intel® Core™ 2 Duo processor at 2 GHz, 8 GB RAM is required. Recommended: Intel Core i7 processor, 16 GB RAM or more.
- At least 6 GB of free disk space for the initial installation.
- For a multi-PC solution with DS1005/DS1006 (not possible for DS1103 or MicroAutoBox), you need additional hardware (not required for DS1007, SCALEXIO systems, VEOS): a MotionDesk Multi-PC Interface Kit for the simulator and an Ethernet card (10 Mbit/s or faster) for each connected MotionDesk PC.
- For a Simulink simulation, the Simulation PC and each connected MotionDesk PC must have at least a 10 Mbit/s Ethernet card. If simulation and visualization run on the same PC, one 10 Mbit/s Ethernet card is sufficient for that PC.

#### **Graphics Card Specification**

- Types:
  - NVIDIA graphics accelerator (OpenGL-compliant)
  - Intel graphics accelerators as of Intel HD Graphics 530 or faster
- Supported cards: NVIDIA Quadro, Quadro FX including mobile derivatives; NVIDIA GeForce GTX family higher than GeForce GTX 285; NVIDIA GeForce GTX Ti family.
- Limited supported cards: Quadro FX, Intel graphics accelerators as of Intel HD Graphics 530 or faster, Intel HD Graphics 4600 and higher graphics accelerators (Sensor simulation is not supported on this GPU family). Limited support means comprehensive functionality is not tested and therefore not guaranteed.
- Unsupported cards: NVIDIA Quadro NVS, NVIDIA GeForce GT family, GTS family, ATI/AMD graphics accelerators (not tested), Intel graphics accelerators earlier than Intel HD Graphics 530.

- Graphics memory: At least 2 GB RAM. Recommended: at least 4 GB RAM and two output channels (one output channel to display MotionDesk, the other one to display ModelDesk, ControlDesk, or MATLAB).

#### **Additional Requirements for Notebooks**

- MotionDesk has high requirements with regard to graphic performance and driver quality. In some cases MotionDesk will not operate properly on notebooks.
- The notebook should be equipped with a supported NVIDIA graphics accelerator (see list above).
- MotionDesk requires the NVIDIA GPU to be selected as the rendering GPU. This setting can be done in the NVIDIA Control Panel (on the Manage 3D Settings page).

#### **Onboard Graphic Adapters**

dSPACE does not guarantee that MotionDesk runs on computers with onboard graphic adapters for the following reasons:

- The specialized onboard graphics processing units often behave differently from high-end graphics cards.
- Even if the technical specifications of these processing units match the formal requirements, drivers are often not stable enough to satisfy the requirements of 3-D real-time applications.

For trouble-free operation, the NVIDIA graphics accelerator must be the only active graphics accelerator.

#### **Unsupported Environments**

Because it uses OpenGL software rendering, MotionDesk does not support the following environments:

- VMware or similar products utilizing software rendering
- Remote desktop software

Using MotionDesk in one of these environments might result in false rendering.

## Resource Requirements of dSPACE Boards

dSPACE boards require different resources in the host PC and the expansion box, depending on the installation.

### Installation in the Host PC

The following table lists the required I/O address ranges together with the default addresses and the required memory of dSPACE boards, when installed in the host PC. Some dSPACE boards support plug & play, in which case they require an interrupt request line (IRQ). However, the boards operate correctly even if no free IRQ is available.

Board	Slot Type	Required I/O Address Range	Default I/O Base Address	Required Memory Range	Required IRQ
DS1104	PCI	None	None	Two 4 KB blocks (Plug & play)	1 (PCI)
DS1104 (PCIe variant)	PCIe	None	None	Two 4 KB blocks (Plug & play)	1 (PCIe)
DS815	PCMCIA	10H	Plug & play	None	1 (ISA)
DS817	PCI	10H	Plug & play	None	1 (PCI)
DS819 <sup>1)</sup>	PCI Express	10H	Plug & play	None	1 (PCI Express)
DS821 <sup>1)</sup>	Express Card	10H	Plug & play	None	1 (PCI Express)

<sup>1)</sup> Supported by the dSPACE software as of dSPACE Release 5.2.

### Installation in the Expansion Box

When installed in an expansion box, dSPACE boards require the following resources in the expansion box:

Board	Required I/O Address Range	Default I/O Base Address
DS1005	10H	300H
DS1006 up to board revision DS1006-03	10H	300H
DS1006 as of board revision DS1006-06 (multicore processor board)	40H	300H
DS1103	10H	300H
DS2302	10H	380H

The DS1007 PPC Processor Board does not need any resources in the expansion box.

### **Connection via DS815, DS817, DS819, or DS821 Link Board**

The Link Boards require the following resources in the host PC:

Required I/O Address Range	Default I/O Base Address	Required Memory Range	Required IRQ
10H	Plug & play	None	1 <ul style="list-style-type: none"> <li>• ISA for DS815</li> <li>• PCI for DS817</li> <li>• PCI Express for DS819/DS821</li> </ul>

