Kollmorgen Automation Suite

30 Minutes to Motion

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Keep them for future reference.

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Because Motion Matters™

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Kollmorgen Automation Suite is based on the work of:

- Qwt project (distributed under the terms of the GNU Lesser General Public License - see also GPL terms)
- Zlib software library
- curl software library
- Mongoose software (distributed under the MIT License - see terms)
- JsonCpp software (distributed under the MIT License – see terms)
- U-Boot, a universal boot loader is used by the AKD PDMM and PCMM (distributed under the terms of the GNU General Public License). The U-Boot source files, copyright notice, and readme are available on the distribution disk that is included with the AKD PDMM and PCMM.

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1 Table of Contents

2 Key Features

Kollmorgen Automation Suite is Kollmorgen an all-in-one solution for designing, developing and maintaining automation systems. It integrates the three main functionalities of a machine:

- Interface with machine operators (HMI)
- Logic handling of the machine (IEC 61131-3 Soft PLC)
- Precise control of all moving parts (Motion control)

2.1 KAS IDE

KAS comes with a powerful Integrated Development Environment (IDE) which allows you to:

- Create new application project using KAS predefined or custom application **templates**
- Define the machine hardware architecture as well as the machine program
- Develop PLC programs using the five **IEC 61131-3** programming languages (ST, IL, FFLD, FBD and SFC) and KAS function block libraries dedicated to motion
- Centrally manage all IEC 61131-3 variables with KAS**variable dictionary** and map logical variables to physical **inputs and outputs**
- Easily set up **HMI panels** and map graphical object to IEC 61131-3 variables

2.2 Main Tools

Tool	Description
Pipe Network Editor	Graphical tool describing the mechanical System into the logical world based on an one to one translation
Cam profile Editor	Allows you to create or modify a profile definition that describes the position evolution of the cam in a 2D graphical format
Softscope	Allows to view in a two-dimensional graph one or more variables' evolution (vertical axis) across the time (horizontal axis)
Simulator	Allows you to develop your application without any hardware available

3 Installing KAS IDE

3.1 System Requirements

KAS IDE minimum system requirements:

Element	Description
Operating System	Microsoft® Windows® 7 SP1 (32 or 64-bit), Microsoft® Windows® 10 (32 or 64-bit). For optimal performance, please be sure your operating system is fully updated with the latest patches.
Processor type	Intel® Pentium® M or equivalent processor at 1.5 GHz or greater.
Memory	1 GB RAM (for 32-bit) or 2 GB RAM (for 64-bit) or greater (which is recommended for complex applications)
Storage	16 GB (for 32-bit) or 20 GB (for 64-bit) of free space on hard disk
Display	WXGA+ (1440 x 900) or higher-resolution monitor with 24-bit color. See Note #1 below.
Connectivity	1 Ethernet port, at either 100Mbits/s or 1Gbits/s. See Note #2 below.
Web Browser	A modern web browser is required to access the web server and online help. We recommend Internet Explorer (IE9 or later, see Note #3) , Mozilla FireFox , or Google Chrome .

NOTE

1. Better results are achieved with OpenGL and 3D cards.
2. A 100Mb network is required in order to allow the IDE to Runtime communication to work in all conditions. The AKDWorkBench AutoTuner and Scope both require 100Mb of bandwidth to function properly.
3. IE9 should be considered a minimum. Later versions of the browser are more compliant with web standards and afford better performance and compatibility.

↖ TIP

See the topic Connect Remotely for information about the ports used by the KAS IDE which may need to be opened to support connecting from an external network.

3.2 Download

The latest version of the Kollmorgen Automation Suite is available from KDN. Visit www.kollmorgen.com/en-us/developer-network/ to download the latest, or older versions.

NOTE

This is a restricted community to which you must be given access based on having purchased KAS. If you do not have access, please contact support.

3.3 Installation Procedure

How to proceed if you have a CD/DVD

After inserting the installation CD or DVD, a web browser automatically displays the installation start page.

> **★ TIP**
>
> If the installation start page does not automatically display, double-click on the file **Index.html** file.

To start the installation of Kollmorgen Automation Suite, click the corresponding link and confirm that you want to execute **KAS-Setup.exe**.

Follow the procedure below to proceed with the KAS IDE software installation.

> **① IMPORTANT**
>
> Installation of the KAS IDE can require you to change your firewall setting. If you do not have sufficient privileges to configure your firewall, you must stop the relevant Windows Service.

Once KAS has finished downloading, complete the following installation steps:

1. Double-click the **KAS-Setup.exe** file to run the installation Wizard.

   > **NOTE**
   >
   > A Security Warning dialog displays as a result of security certification. Do not be alarmed.

2. Click **Run** to start the installation Wizard.
3. While the setup is loading, wait for the setup splash screen to vanish after being displayed.
4. The following Welcome Wizard displays with the version and build number of the KAS IDE. Click **Next** to continue.

5. Review the License Agreement and click "I Agree" to continue the installation.

   > **NOTE**
   >
   > You must accept the agreement to install Kollmorgen Automation Suite.

6. Select the **Development Environment** installation type from the drop-down menu.

Installation type	Description
Development Environment	This kind of installation is typically used for creating and developing a new application. When you need to install the KAS IDE and the KAS Runtime Simulator, you can select Development Environment as the type of installation.
Custom	You can manually select the specific KAS components to install.

7. Click **Next** to access the destination folder.
8. Click **Browse** to specify a custom install directory or accept the recommended default location. When finished, click **Install** to continue.

   > **★ TIP**
   >
   > Kollmorgen strongly recommends accepting the default destination folder under C:\Program Files\Kollmorgen\Kollmorgen Automation Suite\Kollmorgen Automation Suite 3.01.X.X.

9. The software installation begins. Wait until the installation process is complete.
10. You are done; click **Finish.**

> **★ TIP**
>
> - Adding the **KAS IDE** application as an exception in your firewall settings is recommended to avoid security issues.

3.3.1 User Data

User-generated data such as log files, project sources, field bus configurations, function blocks, etc. are stored in the Windows User directory and are maintained between installations. This applies to files on AKD PDMMs, PCMMs, as well as Simulator files.

4 Exploring KAS Workspace

This chapter will help you become familiar with the KAS IDE.

4.1 Windows and Panels Overview

4.1.1 Main Window

The KAS IDE interface provides an all-in-one-window integrated workspace.
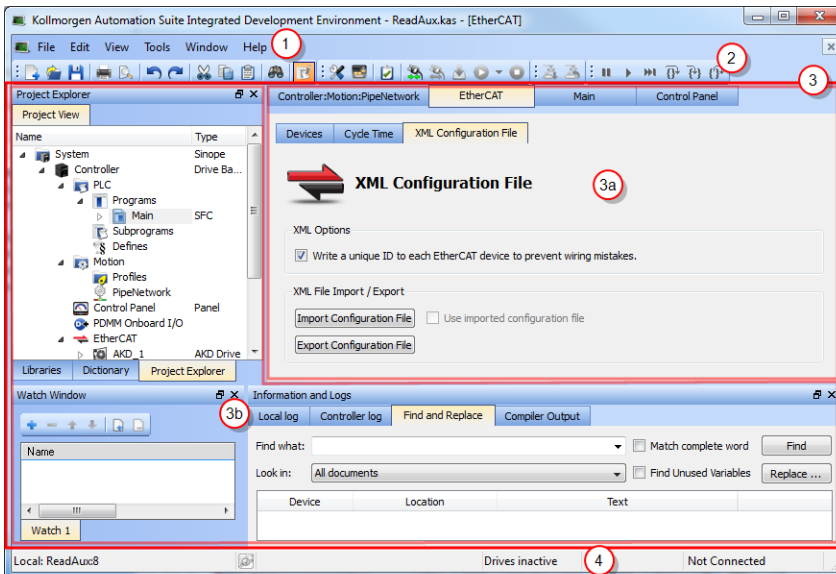
Figure 3-1: KAS IDEMain Window

The main view in the Integrated Development Environment (IDE) is a Multiple Document Interface (MDI) environment. This provides an easy-to-use and customizable view; including the capability to hide, enlarge or overlap windows in order to optimize visibility.

The main view is saved when you exit the application. This ensures that your workspace remains the same each time you open and use the KAS IDE.

The KAS IDE main window contains the following items:

- Menu bar (see call out **1**)

- Toolbar **2** A toolbar is a little bar with icons which is usually located under the menu bar of a window.

- Workspace **3** which contains:

    - A specific area dedicated to displaying the workspace children windows **3a**

    - Several toolboxes **3b** A toolbox is a child window that provides you with some functions to perform specific tasks.

- Status bar at the bottom **4** displaying the current state of the target

4.1.1.1   About toolboxes

The available toolboxes include:

- Project Explorer
- 4.1.3 Libraries
- Dictionary
- 4.1.5 Information and Logs

4.1.2 Project Explorer

The Project Explorer toolbox is a window that displays machine application information in a tree-structure representation. This window contains all the following items used to design, implement, test, and document the application.
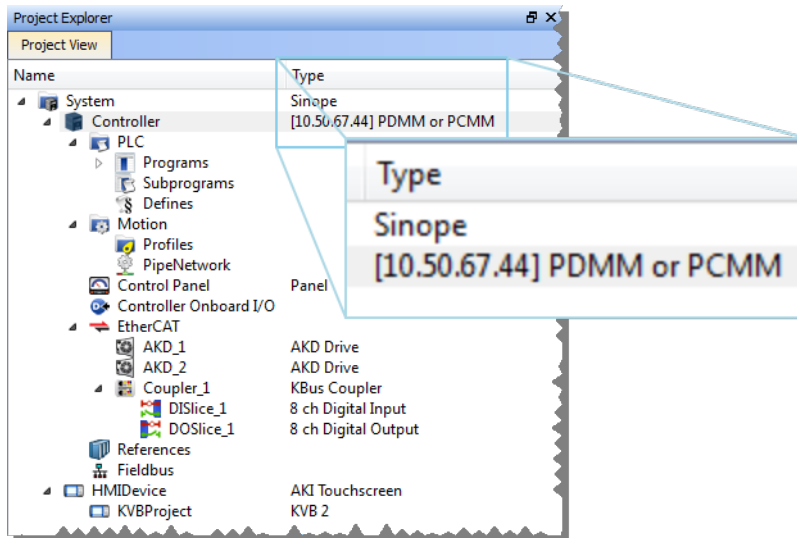
Figure 3-2: Project Explorer

4.1.3 Libraries

This toolbox contains several tabs to access all the functions of the available libraries.
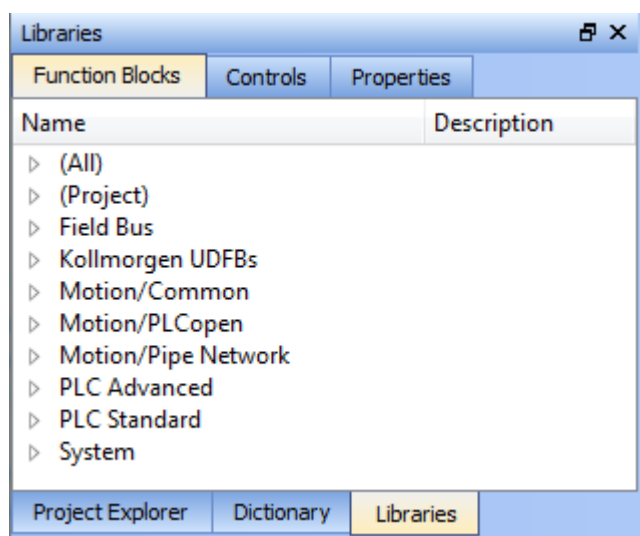
Figure 3-3: Libraries Toolbox

4.1.3.1   Function Blocks

This tab displays all the available libraries shown in a tree-structure representation and gathered by categories. You can expand a library to access all its functions. A short description of each function is also available.

- PLC Standard
- PLC Advanced
- Motion/Pipe Network
- Motion/PLCopen
- Field Bus
- System
- Kollmorgen UDFBs

4.1.3.2   Controls

This tab displays all the controls available for the HMI design.

4.1.3.3   Properties

This tab displays all the properties of an HMI control.

4.1.4 Variables tab

The Variables tab is used to show all the variables defined within the project. All the variable details are displayed in order to show the variable types, dimensions, attributes, etc.
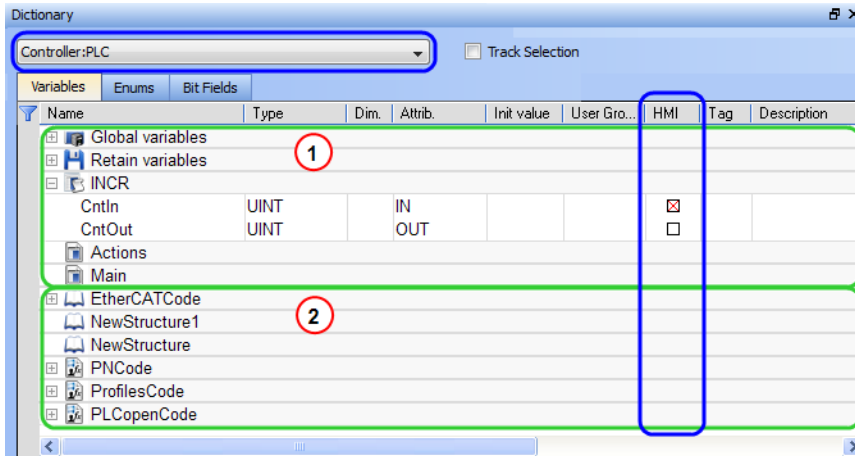
Figure 3-4: Dictionary Toolbox

The list of variables is split into two parts:

- All the Variables at the top ①
- All the Structures at the bottom ②

About the Dictionary's contextual menu.

Command	Description
Undo	Undo the last action performed on the Dictionary
Redo	Redo the last undone action
Add Variable	Add a new variable in the selected level (Global, Retain, program). This automatically creates a new variable called NewVar with type BOOL
	For a Function or UDFB, you can specify input and output parameters
Rename variables	This function can either replace a section of matching variables or append text to the variables' names.
Edit variables as text	This function will open a text editing dialog, allowing you to edit the variables found in the group as text using IEC 61131-3 syntax.
Browse variable	This function allows you to browse all instances of a variable.
Add Structure	Used to have a new complex type. A structure named NewStructure is created and variables can be dragged into it
Rename Structure	Rename the selected structure
Copy	Copy a variable
Paste	Paste the copied variable to the selected level
Delete	Delete the selected variable. A deletion can also be performed by pressing the Delete key on the keyboard
Find all	This function will find all instances of the specified variable and open the results in the Find and Replace tab.
Open UDFB	Open the selected UDFB instance

Command	Description
Plug On Channel ...	Plug the selected variable on a channel. This command opens a dialog used to configure the variable plug operation.
	This command is enabled when your application is connected and running, and if the type of variable is eligible for the softscope (i.e. BOOL, INT, SINT, DINT, LINT, UINT, USINT, UDINT, ULINT, BYTE, WORD, DWORD, LWORD, TIME and LREAL, as long as they are not in a UDFB instance).
Unplug All Channels	Unplug all plugged probes from the softscope
Variable I/O mapping	Connect a variable to an I/O.
Print Dictionary ...	Print all the variables displayed in the Dictionary and sorted by programs. The columns display the Name, Type, Dimension, Initial Value, and Attributes

```
Name                    Type              Dim   InitVal               R   E

(Global)
   TravelSpeed          LREAL               0   LREAL#0
   MasterAbsPos         LREAL               0   LREAL#0
   MasterDeltaPos       LREAL               0   LREAL#90
   MachineSpeed         LREAL               0   LREAL#0
   Axis1Status          DINT                0
   Axis2Status          DINT                0
   MachineState         DINT                0   0
   bMasterAbs           BOOL                0   FALSE
   bMasterRel           BOOL                0   FALSE
   bEStop               BOOL                0   FALSE
   bLedStatus           BOOL                4
   Profiles             ProfilesCode        0
   EtherCAT             EtherCATCode        0                         R
   PipeNetwork          PNCode              0

(Retain)
   LastAxisPos          LREAL               0

MachineLogic
   lastTravelSpeed      LREAL               0   LREAL#0
   lastMachineSpeed     LREAL               0   LREAL#0

ProfilesCode
   cmdID                DINT                0

PNCode
   cmdID                DINT                0
   MASTER               DINT                0
   GEAR1                DINT                0
   CNV1                 DINT                0
   AXIS1                DINT                0
   GEAR2                DINT                0
   CNV2                 DINT                0
   AXIS2                DINT                0
   PipeAXIS1            DINT                0
   PipeAXIS2            DINT                0
```

How do I modify parameters of a variable?

Mode	Description
One Parameter	Assuming you are in the **cell** edition mode, double-click on the parameter
All the parameters are at the same time	Assuming you are in the **row** edition mode, double-click in any parameter to open the dialog box for variable configuration as shown below.

4.1.5 Information and Logs

The Information and Log window is used to identify current state status and can be used to identify operational errors, compilation errors, and also to quickly assist you in finding areas of the workspace or program variables.

This window contains different tabs that provide:

- Log messages (Local or Controller) including Log Messages Settings
- A system search function
- A list of breakpoints
- A state report on the program compiler

5   Creating An Application

This exercise helps you become familiar with KAS application environment. The Control Panel is used to create a simulated motion on two axes.

In this exercise, you will perform the following steps:

- Create a new KAS project
- Compile the project
- Start the KAS Simulator and download the project to it
- Start the application via the Control Panels and observe the functions in the KAS Simulator

To create the simulated motion, follow this chapter step by step.

5.1   Creating a Project

Step	Description
1	To start your project, you have to add a controller, choose which motion engine your application is based on (Pipe Network or PLCopen), and set the properties of the controller
2	Add all AKD drives being part of your EtherCAT network and define all their parameters
3	Add all the IO couplers and slices being part of your EtherCAT network
4	Configure EtherCAT motion bus by mapping all the devices and setting the cycle time
5	Create programs with the five programming languages that comply with the IEC 61131-3 standard
6	Create variables, which can also be arrays or complex structures, and monitor them with the Dictionary, or the variable editor
7	Create functions and function blocks that can be called from your programs
8	Use constant definitions to ease the maintenance of your code
9	Use the functions available in the pre-defined libraries
10	Create your custom libraries containing your PLC code that you can use afterwards in different projects
11	Map digital or analog inputs and outputs, that are on the EtherCAT motion bus, to PLC variables
12	Design motion with pipe blocks in the pipe network or with PLCopen axis
13	Create Cam Profiles that you can associate to a cam pipe block
14	Define the number of cycles between successive executions of the PLC programs, and configure the programs priority
15	Add an HMI Device, design the KVB Panel, and map the variables

⚠ IMPORTANT

Each time you modify your project, you have to recompile and download the new version to save your modifications on the target.

5.1.1 Add the Controller

To add a controller to your project:

- Click the **New** command in the **File** menu tso start the Controller Creation Wizard
- Choose the motion engine option (Pipe Network or PLCopen) and select the application template
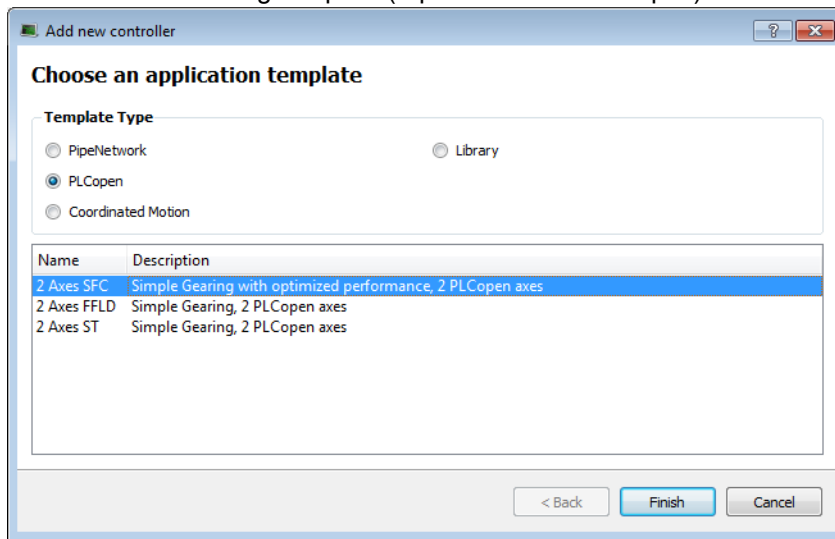
Figure 4-1: Select an Application Template

- Click the **Finish** button
- Click the **Save As** command in the **File** menu
- Define the Project Name and its Location
- Click **OK**

5.1.2 Configure the Controller

The controller is configured using the Controller Properties dialog box.

To set-up the controller:

1. In the Project Explorer, right-click on the new controller to open the contextual menu
2. Select the **Properties** command
3. Define the IP Address
4. (Optional) Choose whether the project's source code should be downloaded to the controller. This is enabled by default and your preference is saved with the project. Disabling this option means a comparison of source on the controller and in the IDE will not be available.
5. (Optional) Choose whether PLC variables may be read/written via an HTTP connection. this requires that the source be downloaded to the controller. By default this option is disabled so unauthorized changes may not be made.

⬉ TIP

Be sure to recompile the application before downloading it to the controller.
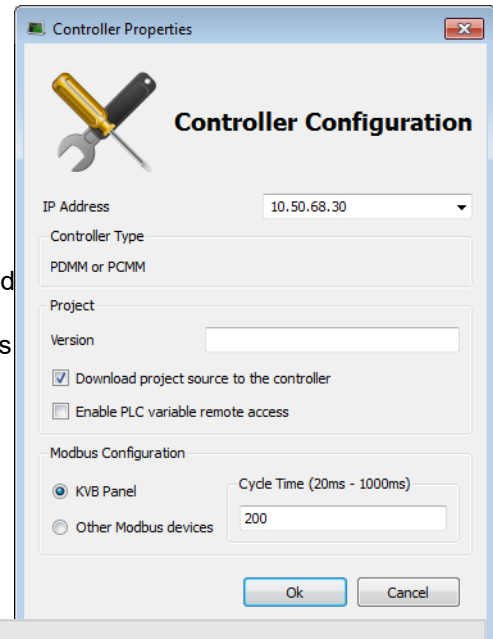
6. Select whether Modbus will go to a KVB Panel or be handled by another Modbus device, and set the **Cycle Time** (the communication update frequency).

NOTE

- If KVB Panel is selected there will be no node to add a Modbus configuration in the Fieldbus Editor.
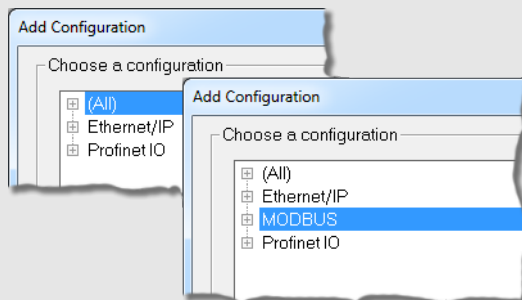
- If Other Modbus devices is selected then the KVB checkbox for Dictionary items will be hidden.. Motion configuration will need to be added from the Fieldbus Editor.

7. Click **OK**

5.2   Compile the Application

After creating all the elements of your project, you are ready to compile it.

You can compile your project with the compile icon ![icon] in the toolbar (**Ctrl+B** shortcut).

5.3   Launch KAS Simulator

If you want to simulate your application, click on the Simulator button in the toolbar.
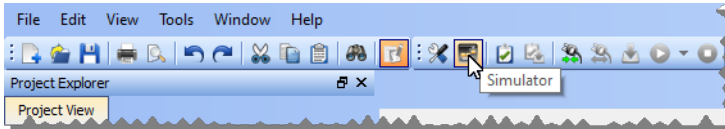
Once the program opens, you can start the simulation using the Control Panel.

5.4   Connect to the Controller

Figure 4-2: The Device Toolbar

NOTE

If the previous download failed (due to events such as the Ethernet being disconnected or the controller being turned off), you will not be able start your application. Additionally:

- no version information is shown in the web server or status bar
- the Start, Cold Start and Download buttons are not available on the web server
- if the AKD PDMM or PCMM tries to auto-start, an E24 error is flashed on the 7-segment display.

Review the Controller logs for more information.

Ensure the Simulated device mode is active (the icon ![icon] must be selected)

To establish the connection with the target controller, click the Connect Device icon ![icon].

5.4.1 Actions to Prevent Compatibility Issues

The software versions of the KAS IDE and the KAS Runtime have to match to avoid compatibility problems.

↖ TIP

The software versions of the KAS IDE and the KAS Runtime are also available in the local log messages (the level for this message is INFO).

When another KAS IDE is already connected to the controller, a warning is displayed and the connection is discarded to prevent any conflict.

5.5   Download the Application

- Click the *Compile and Download* button (**Ctrl + F7**) or the *Download* button.
  The application is compiled and downloaded or just downloaded to the controller.
    - If you enabled the "Download Project Source in the controller" option in the Controller Properties dialog box (see "Configure the Controller" (p. 15)) then the source code is also copied to the controller.
    - If you disabled the "Download Project Source in the controller" option and the controller has project source loaded you will be prompted with a message. The message presented will vary, based on whether your current project and the project on the controller have the same name or not.

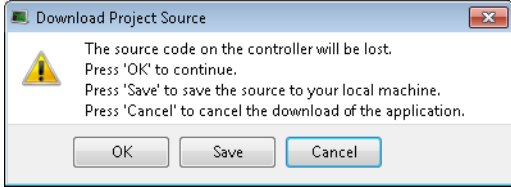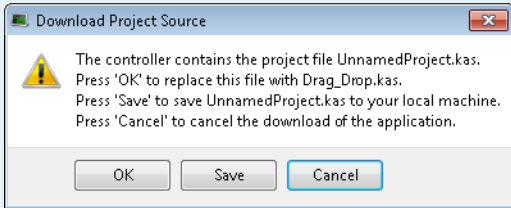| Project Names	Message	Actions
Same name	Download Project Source The source code on the controller will be lost. Press 'OK' to continue. Press 'Save' to save the source to your local machine. Press 'Cancel' to cancel the download of the application. OK Save Cancel	**OK:** Source on controller is deleted. **Save:** Source on controller is overwritten and is also saved to "My Documents". If that source file already exists in My Documents you will be prompted to rename the source file, overwrite that file or not. If you do not rename or overwrite the file then the download to the controller will be canceled. **Cancel:** Download is stopped.
Different name	Download Project Source The controller contains the project file UnnamedProject.kas. Press 'OK' to replace this file with Drag_Drop.kas. Press 'Save' to save UnnamedProject.kas to your local machine. Press 'Cancel' to cancel the download of the application. OK Save Cancel	**OK:** Source on the controller will be replaced. **Save:** Source on the controller will be saved to "My Documents" as above. **Cancel:** Download is stopped.

- You will be prompted with an alert to connect to a controller if you try to Compile and Download without being connected.
- You will be prompted with an alert if there is not sufficient space on the controller for the application. Clearing the User Data is one method to create more space on a AKD PDMM or PCMM.

TIP

The versions between the KAS IDE and the KAS Runtime must be the same if you want to be able to debug your application (for example to display the animated values in the editors).

IMPORTANT

If the IDE version differs from the runtime after compiling an application, the function blocks defined in the IDE and those implemented in the virtual machine of the runtime can possibly be different. To prevent this potential mismatch, you must compile and download your application again.

NOTE

In addition to downloading the application to the controller's flash memory, you can download the project's source code, allowing you to store the project.

5.6   Device Control

You can start / stop the device with the buttons and

5.7   Operate the Control Panel

The Example program has a default control panel built-in to make it easy to start an application.

Perform the following steps to operate the control panel:

1. Double-click on **Control Panel** in the Project Explorer to open the form
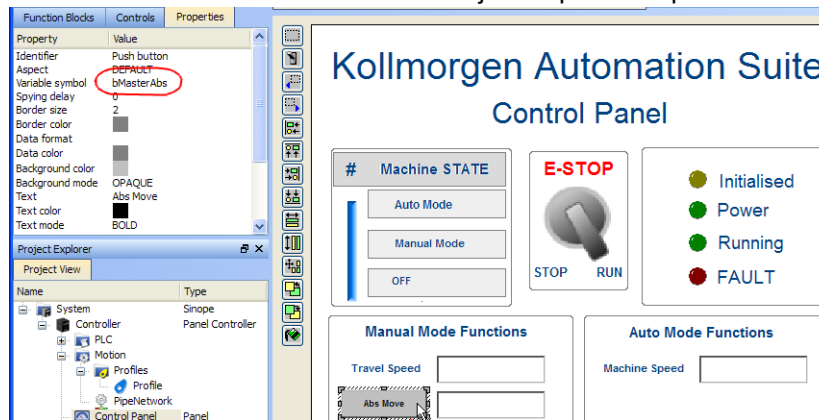
Figure 4-3: Control Panel

2. Start by moving the vertical slider bar to select the Machine STATE as **Manual Mode**
3. In the Manual Mode Functions area, double-click the text box for the Travel Speed
4. Enter the numeric value for the Travel Speed and press Enter

5.7.1 About KAS Simulator Display

The KAS Simulator displays the status and position of the axes.
It also displays the log messages.
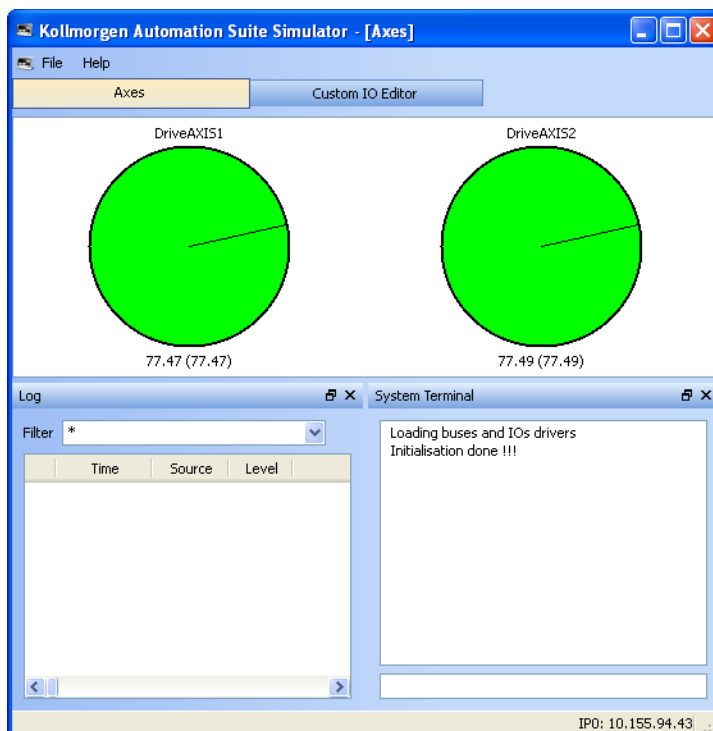
Figure 4-4: Display of KAS Simulator

You can continue to use the Control Panel to:

- Experiment with the controls and observe the simulated output
- Perform an absolute move by entering a position in the text box
- Perform a relative move

5.8   Exiting Simulation Mode

To exit Simulation mode, do as follows:

1. Click the Stop Device button 🔴
2. Click the Disconnect Device button 🦫

NOTE
For additional information about Kollmorgen Automation Suite, see the following documentation: • Getting Started   • User Manual   • Technical Reference - PLC Library   • Technical Reference - Motion Library   • Online Help

About KOLLMORGEN

Kollmorgen is a leading provider of motion systems and components for machine builders. Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions that are unmatched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.

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