

# **Differences with ISaGRAF 3**

**Software release 5.2**

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# Differences with ISaGRAF 3

The latest **ISaGRAF** version enables developing **ISaGRAF 3** configurations for use on **ISaGRAF 3** targets. Moreover, an **ISaGRAF 5** project can hold **ISaGRAF 5** and **ISaGRAF 3** configurations. In such a case, only the features relating to the individual configuration versions are available to each; many **ISaGRAF 4** and **5** features are not available to **ISaGRAF 3** configurations while many **ISaGRAF 3** features are not available to the later **ISaGRAF** versions.

In the **ISaGRAF 5** Workbench, **ISaGRAF 3** configurations are compiled using the **ISaGRAF 3** compiler. Incompatibility errors are indicated when compiling.

The following list shows the significant differences between developing **ISaGRAF 3** configurations in the different versions of the Workbench:

<b>ISaGRAF 3 Workbench</b>	<b>ISaGRAF 5 Workbench</b>
<b>Managing Projects</b>	
<b>ISaGRAF 3</b> projects are equivalent to one configuration having one resource.	For <b>ISaGRAF 3</b> configurations, these can only contain one resource. Furthermore, a Workbench project can only contain one <b>ISaGRAF 3</b> configuration.  For <b>ISaGRAF 5</b> configurations, these can contain multiple resources. A Workbench project can contain multiple <b>ISaGRAF 5</b> configurations but only one <b>ISaGRAF 3</b> configuration.
A resource definition file can be merged with the generated code and downloaded to the target PLC.	In the <b>ISaGRAF 5</b> Workbench, to retain the resource definition information created with the <b>Make&gt;Resource</b> command in the <b>ISaGRAF 3</b> environment, you need to create a text file called <b>definitions.res</b> in which you can copy the contents of the window resulting from the command. You need to place this file at the root of the resource directory.
Open multiple projects simultaneously	Open one project at a time

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<p>Password-protection is available for projects and libraries with up to 16 access levels. Elementary commands and data can be protected separately. Programs can have multiple passwords with multiple levels (0 to 15)</p>	<p>For <b>ISaGRAF 3</b> configurations, password protection and access control is not available.</p> <p>For <b>ISaGRAF 5</b> configurations, access control (Password-protection) is available for projects, libraries, resources, POUs, and targets. The Workbench does not support multiple passwords with multiple levels.</p>
<p>Project names have a maximum of eight characters</p>	<p>Projects containing <b>ISaGRAF 3</b> configurations can have names with a maximum of eight characters.</p> <p>Projects not containing <b>ISaGRAF 3</b> configurations can have names with a maximum of 128 characters.</p>
<p>A project can contain a maximum of 127 conversion tables</p>	<p>For <b>ISaGRAF 3</b> configurations, the maximum number of conversion tables is 127. Furthermore, these tables are also limited to a maximum of two points defined by the <math>Y=aX+b</math> linear function.</p> <p>For <b>ISaGRAF 5</b> configurations, conversion tables are replaced by associating I/Os with the <math>Y=aX+b</math> linear function.</p>
<p>A project can have a maximum of 128 "C" conversion functions</p>	<p>For <b>ISaGRAF 3</b> configurations, the maximum number of "C" conversion functions is 128</p> <p>For <b>ISaGRAF 5</b> configurations, these can hold any number of "C" conversion functions</p>
<p>Project groups are a list of project directories grouped together under the same root directory. These groups are identified using a name. Default project groups are "Default" and "Samples". Inserting separators enables grouping projects attached to the same application. Projects in the list having separators between them can be moved together.</p>	<p>For all configurations, projects can be grouped within directories.</p>
<p>History of modifications (one file per project). Each modification has a title, date and time.</p>	<p>In the Workbench, project descriptions can hold a history of modifications.</p>

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>Managing POUs (Programs, Functions, and Function Blocks)</b>	
<p>Programs are placed in three sections, Begin, Sequential, and End, where FC and SFC programs are located in the Sequential section uninterrupted by any other program type.</p>	<p>For <b>ISaGRAF 3</b> configurations, within the program hierarchy, FC and SFC programs must be adjacent within the hierarchy where their execution is not interrupted by non-sequential programs (IL, ST, FBD, and LD); Non-sequential programs can be placed before or after but not between sequential programs.</p> <p>For <b>ISaGRAF 5</b> configurations, within the program hierarchy, programs are placed following the order of execution while all SFC and FC programs must be adjacent. Furthermore, SFC Child or FC Sub-programs must use the same language as their parent.</p>
<p>Programs (functions, function blocks, and sub-programs) have a maximum of 32 parameters (inputs and outputs). Parameter names have a maximum of 32 characters.</p>	<p><b>ISaGRAF 3</b> POUs (programs, functions, function blocks, and sub-programs) have a maximum of 32 parameters. Parameter names have a maximum of 32 characters.</p> <p><b>ISaGRAF 5</b> POUs (functions, function blocks) have a maximum of 128 parameters (inputs and outputs). Parameter names have a maximum of 256 characters.</p>
<p>Program diary containing syntax checking output messages from compilations</p>	<p>In the Workbench, the POU description enables entering a description for each program.</p>
<p>Program names have a maximum of eight characters</p>	<p><b>ISaGRAF 3</b> POU names have a maximum of eight characters.</p> <p><b>ISaGRAF 5</b> POU names have a maximum of 128 characters</p>

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>IEC 61499 Programming</b>	
The IEC 61499 distribution method is not available in the <b>ISaGRAF 3</b> Workbench	Not available for <b>ISaGRAF 3</b> configurations. For other configurations, the distribution method enables the distribution of individual IEC 61499 function blocks belonging to an IEC 61499 program across multiple resources. The IEC 61499 standard function blocks are available with the IEC 61499 library. Basic and composite IEC 61499 function blocks can also be programmed.
<b>Code Generation</b>	
The <b>ISaGRAF 3</b> compiler performs compilations (makes) and syntax verifications	For <b>ISaGRAF 3</b> configurations, the <b>ISaGRAF 3</b> compiler performs compilations (makes) and syntax verifications. For <b>ISaGRAF 5</b> configurations, the <b>ISaGRAF 5</b> compiler performs syntax verifications and compilations (builds).
<b>I/O Wiring (I/O Connections)</b>	
Simple and complex devices have a maximum of 128 channels	For <b>ISaGRAF 3</b> configurations, simple and complex devices have a maximum of 128 channels. For <b>ISaGRAF 5</b> configurations, simple and complex devices have a maximum of 65536 channels.
Simple and complex devices have a maximum of 16 parameters, excluding OemKey	For <b>ISaGRAF 3</b> configurations, simple and complex devices have a maximum of 16 parameters, excluding OemKey. For <b>ISaGRAF 5</b> configurations, simple and complex devices have an unlimited number of parameters.

<b>ISaGRAF 3 Workbench</b>	<b>ISaGRAF 5 Workbench</b>
Board slots can be numbered starting from 0 to 15. Grouping of boards can be created by moving individual board slots up or down in the list and by placing empty slots between them. Note: Boards correspond to devices in <b>ISaGRAF 5</b> .	For all configurations, numbering of devices (device index) and creating grouping by moving individual devices to reorganize list of devices.
The numbering starting index for I/O channels ranges from 0 to 15. The default value is 1.	For all configurations, enables specifying number of channels, however, these channels are automatically numbered from 0.
Password-protection for individual I/O channels	For all configurations, password protection is only available for projects, libraries, resources, POU's, and targets.
For I/O connections with boards or equipment, technical notes provide information for I/O board management. These notes are written by the board or equipment supplier.	For all configurations, for I/O wiring devices, help in a Comment window is available for a device. This help is defined for the device using the Target Definition Builder.
You can only wire global variables.	For <b>ISaGRAF 3</b> configurations, you can only wire global variables. For <b>ISaGRAF 5</b> configurations, you can wire local and global variables.
Comments are available for free channels	Not available in the <b>ISaGRAF 5</b> Workbench
In debug mode, the values of free channels can be modified.	In debug mode, the values of free channels cannot be modified.
<b>Variable Bindings</b>	
Internal Bindings are not available in the <b>ISaGRAF 3</b> Workbench	Not available for <b>ISaGRAF 3</b> configurations For other configurations, Internal Bindings bind variables from resources belonging to the same project
External Bindings are not available in the <b>ISaGRAF 3</b> Workbench	Not available for <b>ISaGRAF 3</b> configurations For other configurations, External Bindings bind variables from resources belonging to different projects

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>Version Source Control</b>	
Version source control management is not available in the <b>ISaGRAF 3</b> Workbench	In the <b>ISaGRAF 5</b> Workbench, Version source control management of changing versions of Workbench elements including projects, configurations, resources, and POUs by saving them to a control database where older versions of the elements can be retrieved at a later time. Other operations include comparing current and previous versions, accessing details for a previous version, and creating a history report.
<b>Cross References</b>	
Dictionary errors are displayed in a dialog	Dictionary errors are displayed in the output window when compiling
Statistics show the number of objects and variables declared in a project	Not available in the <b>ISaGRAF 5</b> Workbench
<b>Downloads and Debugging</b>	
Downloads are performed while in debug mode	In the <b>ISaGRAF 5</b> Workbench, downloads are performed prior to launching the debug mode. You can start the target upon completion of the download. While in debug mode, on-line changes are available.
The "Show cycle timing" display option displays the allowed, current, maximum, and overflow cycle times	<p>For <b>ISaGRAF 3</b> configurations, the Timing tab of the Diagnosis window displays the programmed (allowed), current, maximum, and overflow cycle times.</p> <p>For <b>ISaGRAF 5</b> configurations, the Timing tab of the Diagnosis window displays the programmed, current, maximum, and overflow cycle times as well as the resource state and the indication of whether the code has been saved on the target system</p>

<b>ISaGRAF 3 Workbench</b>	<b>ISaGRAF 5 Workbench</b>
<p>The "Show errors" display option displays the detected run-time errors in the bottom area of the debugger window</p>	<p>For <b>ISaGRAF 3</b> configurations, run-time errors are not displayed.</p> <p>For <b>ISaGRAF 5</b> configurations, run-time errors are displayed in the events viewer.</p>
<p>Graphical monitoring of FC tokens moving through an FC chart. Graphical monitoring of blocks (operator, function, or function block) output values is not available.</p>	<p>For <b>ISaGRAF 3</b> configurations, graphical monitoring of any type is not available.</p> <p>For <b>ISaGRAF 5</b> configurations, graphical monitoring of blocks (operator, function, or function block) output values where boolean types are displayed using color while SINT, USINT, BYTE, INT, UINT, WORD, DINT, UDINT, DWORD, LINT, ULINT, LWORD, REAL, LREAL, TIME, DATE, and STRING types are displayed as a numeric or textual value in a label directly above the output. When the output is a structure type, the displayed value is the selected member.</p>

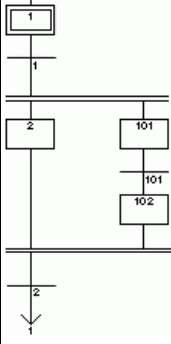
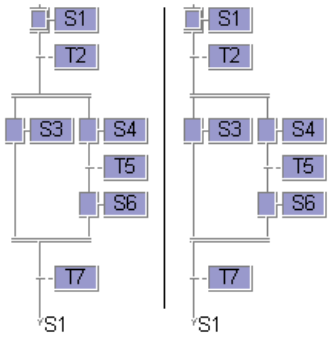
<b>ISaGRAF 3 Workbench</b>	<b>ISaGRAF 5 Workbench</b>
<p>For online modifications, only modifications to code sequences are allowed. Variable definition, application parameters and I/O connections cannot be modified.</p>	<p>For <b>ISaGRAF 3</b> configurations, only on-line modifications to code sequences are allowed. Variable definition, application parameters and I/O connections cannot be modified.</p> <p>For <b>ISaGRAF 5</b> configurations, for online modifications, modifications to code sequences and add or remove variables with some limitations. Cannot change the descriptions of I/O devices. Other limitations exist for various items of a project:</p> <p>Types, cannot add, remove, or change types definitions. When required, you could define extra types. Such extra types could then be used for future changes.</p> <p>Bindings, for some changes made to bindings, no warning message appears during compilation and modifications are not taken into account by the target at online change.</p> <p>Resource properties, for some changes made to other options, no warning message appears and the modification is not taken into account by the target at on line change.</p>

<b>ISaGRAF 3 Workbench</b>	<b>ISaGRAF 5 Workbench</b>
<p>Updating the code of a running application consists of the following operations:</p> <ol style="list-style-type: none"> <li>1. Before making changes to a running application, making a copy of the current project under another name.</li> <li>2. Before editing a program, setting the "update diary" option to ease future program maintenance.</li> <li>3. When one or more sequences have been modified (without modifying SFC structures and program hierarchy), generating the new application code on the workbench before downloading.</li> <li>4. Using the debugger, from within the old project, connecting the target PLC and performing any operation which can make the application update faster or more safely.</li> <li>5. Using the debugger, from inside the new project, connecting the target PLC. When application name is changed, the target database cannot be accessed. Users must run the "File / Update" command.</li> <li>6. Downloading the modified application by selecting the "Update later" option. This may slightly slow down the PLC during transfer.</li> <li>7. When download is complete, running the "File / Realize update" command to enable the switch at the most adequate moment. The switch will last one or two cycles.</li> </ol> <p>When the switch has been correctly performed, the programs of the modified running application are displayed. If not, the existing running application remains as is.</p>	<p>In the <b>ISaGRAF 5</b> Workbench, modifying a running resource consists of the following operations:</p> <ol style="list-style-type: none"> <li>1. Modifying the resource source code on the Workbench</li> <li>2. Generating the new resource code</li> <li>3. Downloading the new resource code using "Online change: download" command on the Debug menu (instead of "download")</li> <li>4. Switching from the old resource code to the new one in between PLC execution cycles, using the "Online change: update" command on the Debug menu</li> </ol>

<b>ISaGRAF 3 Workbench</b>	<b>ISaGRAF 5 Workbench</b>
<p>The step-by-step mode is not available in the <b>ISaGRAF 3 Workbench</b></p>	<p>Not available for <b>ISaGRAF 3</b> configurations</p> <p>For <b>ISaGRAF 5</b> configurations, the step-by-step mode for ST, IL, and LD POU's enables setting breakpoints to specific lines of code. For LD POU's, you set breakpoints to rungs. When running an application in Debug mode, the application stops when it encounters a breakpoint where depending on the state of the resource, you choose to perform various operations:</p> <ul style="list-style-type: none"> <li>- Step to the next line of code or rung</li> <li>- Step into the next line of code or rung</li> <li>- Execute one cycle</li> <li>- Switch to cycle-to-cycle mode</li> <li>- Switch to real-time mode</li> </ul> <p>A call stack window shows stepping information between POU's and called functions</p>
<p>Diagnosis tool enables working on a predefined set of variables, in order to examine and control the process. This tool provides a safe way to control the target application for final running operations or maintenance.</p>	<p>For <b>ISaGRAF 3</b> configurations, diagnostic information provides access to cycle timing and version information (only the Compiled and Running versions are valid; the Stored version is not valid). System variables, locked variables, and breakpoints are not available.</p> <p>For <b>ISaGRAF 5</b> configurations, diagnostic information provides access to cycle timing, system variables, and version information as well as a list of locked variables and a list of all breakpoints defined for ST, IL, and LD POU's of a resource</p>
<p>In the <b>ISaGRAF 3 Workbench</b>, Spotlight enables basic debugging of an application. Provides a table displaying the values of variables contained in a project.</p>	<p>In the <b>ISaGRAF 5 Workbench</b>, HiBeam enables debugging an application. All interfaces and variable definitions must be defined.</p>

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>Simulator</b>	
<p>The simulator enables saving and restoring input states of named input channels. The simulator also includes a tool to build and run simulation scripts. A script is described with an easy ST like textual language and is used to automate tests with the ISaGRAF simulator.</p>	<p>For <b>ISaGRAF 3</b> configurations, the <b>ISaGRAF 3</b> simulator is launched enabling saving and restoring input states of named input channels. The simulator also enables using the cycle profiler as well as building and running scripts.</p> <p>For <b>ISaGRAF 5</b> configurations, simulating a panel of I/Os, i.e., displaying the values of inputs and outputs defined for a project, in their I/O devices. When testing a project in simulation mode, the Simulator (I/O Panel Simulation) is automatically launched. The <b>ISaGRAF 5</b> Workbench does not include a tool to build and run simulation scripts.</p>
<b>Libraries</b>	
<p>Password protection is available for individual elements in a library</p>	<p>In the <b>ISaGRAF 5</b> Workbench, access control is available for POU's, resources, configurations (targets), and projects</p>
<p>Libraries are available for use from the Library tool when these are located in the LIB directory</p>	<p>In the <b>ISaGRAF 5</b> Workbench, for all configurations, dependencies on libraries enables accessing their defined components</p>
<b>Run-time System Events</b>	
<p>Logging of run-time system events is not available in the <b>ISaGRAF 3</b> Workbench</p>	<p>For <b>ISaGRAF 3</b> configurations, logging of run-time system events is not available.</p> <p>For <b>ISaGRAF 5</b> configurations, logging of run-time system events on the Windows platform using the Events Logger and where the viewing of events is performed in the Events Viewer</p>

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>Language Editors</b>	
Macro steps representing a unique group of steps and transitions in the SFC editor	<p>For <b>ISaGRAF 3</b> configurations, macro steps are not available.</p> <p>For <b>ISaGRAF 5</b> configurations, in some designs, SFC function blocks could be used as macro steps.</p>
The SFC editor manages an SFC gallery, i.e, a collection of SFC structures to insert in SFC charts	SFC galleries are not available in the <b>ISaGRAF 5</b> Workbench
SFC steps can only be programmed in ST.	<p>For <b>ISaGRAF 3</b> configurations, SFC steps can only be programmed in ST. These steps can only have one action block.</p> <p><b>Note:</b> When using an SFC child, make sure to add the GS prefix to the step calling the SFC child. To start an SFC child, use the &lt;child_program&gt; (S) syntax and to stop the child, use the child_program&gt; (R) syntax.</p> <p>For <b>ISaGRAF 5</b> configurations, SFC steps can be programmed in ST, LD, or IL.</p>
SFC transitions can only be programmed in ST or LD.	<p>For <b>ISaGRAF 3</b> configurations, SFC transitions can only be programmed in ST or LD.</p> <p>For <b>ISaGRAF 5</b> configurations, SFC transitions can be programmed in ST or LD.</p>
SFC diagrams can have a maximum size of 20 by 20 cells	<p>For <b>ISaGRAF 3</b> configurations, SFC diagrams can have a maximum size of 20 by 20 cells.</p> <p>For <b>ISaGRAF 5</b> configurations, SFC diagrams are not limited to 20 by 20 cells.</p>

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<p>SFC diagrams are aligned from the left:</p> 	<p>For <b>ISaGRAF 3</b> configurations, SFC diagrams must be aligned from the left to enable reading by the <b>ISaGRAF 3</b> compiler. Therefore, since the <b>ISaGRAF 5</b> default aligns them by the center, these diagrams must be realigned once drawn:</p>  <p>For <b>ISaGRAF 5</b> configurations, SFC diagrams are aligned by the center.</p>
<p>Steps names must be GSx and transitions names must be GTx</p>	<p>For <b>ISaGRAF 3</b> configurations, steps names must be GSx and transitions names must be GTx.</p> <p>For <b>ISaGRAF 5</b> configurations, step names and transition names can have any name other than variable names or reserved keywords.</p>
<p>The Quick LD editor enables in-line function blocks</p>	<p>In-line function blocks are not available in the <b>ISaGRAF 5</b> Workbench</p>
<p>In FBD diagrams, adding or removing horizontal space</p>	<p>In the Workbench, moving elements adds or removes space in FBD diagrams</p>
<p>Styles (predefined) and modification tracking</p>	<p>Styles (predefined) and modification tracking is not available in the <b>ISaGRAF 5</b> Workbench</p>
<p>Tooltips are available in the Quick LD and FBD/LD editors</p>	<p>In the <b>ISaGRAF 5</b> Workbench, variable comments display various information for variables in the FBD editor</p>
<p>In the ST and IL text editor, inserting files having Ascii content</p>	<p>In the <b>ISaGRAF 5</b> Workbench, the contents of Ascii files can be copied then pasted into the ST and IL text editor.</p>

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>Basic Types</b>	
<p>BOOLEAN: logic (true or false) value  ANALOG: integer or real (floating) continuous value  TIMER: time value  MESSAGE: character string</p>	<p>For <b>ISaGRAF 3</b> configurations, only the following corresponding data types are available:  <b>BOOL</b> (replaces <b>BOOLEAN</b>): logic (true or false) value  <b>DINT</b> (replaces <b>ANALOG</b>): double integer continuous value (32 bit)  <b>REAL</b> (replaces <b>ANALOG</b>): real (floating) continuous value (32 bit)  <b>TIME</b> (replaces <b>TIMER</b>): time values less than one day; these value types cannot store dates (32 bit)  <b>STRING</b> (replaces <b>MESSAGE</b>): character string having a defined size, representing the maximum number of characters the string can contain. For example, to define MyString as a string containing 10 characters, enter MyString(10).</p>

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
(continued)	<p>For <b>ISaGRAF 5</b> projects, the following corresponding data types are available:</p> <p><b>BOOL</b>: logic (true or false) value</p> <p><b>SINT</b>: short integer continuous value (8 bit)</p> <p><b>USINT</b>: unsigned short integer continuous value (8 bit)</p> <p><b>BYTE</b>: byte value (8 bit)</p> <p><b>INT</b>: single integer continuous value (16 bit)</p> <p><b>UINT</b>: unsigned single integer continuous value (16 bit)</p> <p><b>WORD</b>: word value (16 bit)</p> <p><b>DINT</b>: double integer continuous value (32 bit)</p> <p><b>UDINT</b>: unsigned double integer continuous value (32 bit)</p> <p><b>DWORD</b>: double word value (32 bit)</p> <p><b>LINT</b>: long integer continuous value (64 bit)</p> <p><b>ULINT</b>: unsigned long integer continuous value (64 bit)</p> <p><b>LWORD</b>: long word value (64 bit)</p> <p><b>REAL</b>: real (floating) continuous value (32 bit)</p> <p><b>LREAL</b>: long real (floating) continuous value (64 bit)</p> <p><b>TIME</b>: time values less than one day; these value types cannot store dates (32 bit)</p> <p><b>DATE</b>: date values (32 bit)</p> <p><b>STRING</b>: character string having a defined size, representing the maximum number of characters the string can contain. For example, to define MyString as a string containing 10 characters, enter MyString(10).</p>

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>User-defined Types</b>	
Arrays are an informal feature having one dimension supporting analog, real and timer (not supporting messages)	For <b>ISaGRAF 3</b> configurations, arrays of BOOL, DINT, REAL, and TIME type can have one dimension. STRING type arrays are not supported. For <b>ISaGRAF 5</b> configurations, arrays can be multi-dimensional supporting arrays, structures, and all standard IEC 61131 data types
Structures are not available in the <b>ISaGRAF 3</b> Workbench	For <b>ISaGRAF 3</b> configurations, structures are not available For <b>ISaGRAF 5</b> configurations, structures using structures, arrays, and standard IEC 61131 data types. These are composed of sub-entries called Fields. When structures are defined, variables can be created with this type.
<b>Constant Expressions</b>	
Boolean constant expressions Integer analog constant expressions Real analog constant expressions Timer constant expressions Message string constant expressions	For <b>ISaGRAF 3</b> configurations, the following constant expressions are available: Boolean Constant Expressions Double Integer Constant Expressions Real Constant Expressions Timer Constant Expressions String Constant Expressions

<b>ISaGRAF 3 Workbench</b>	<b>ISaGRAF 5 Workbench</b>
(continued)	<p>For <b>ISaGRAF 5</b> configurations, the following constant expressions are available:</p> <ul style="list-style-type: none"> <li>Boolean Constant Expressions</li> <li>Short Integer Constant Expressions</li> <li>Unsigned Short Integer and BYTE Constant Expressions</li> <li>Integer Constant Expressions</li> <li>Unsigned Integer and WORD Constant Expressions</li> <li>Double Integer Constant Expressions</li> <li>Unsigned Double Integer and Double Word Constant Expressions</li> <li>Long Integer Constant Expressions</li> <li>Unsigned Long Integer and Long Word Constant Expressions</li> <li>Real Constant Expressions</li> <li>Long Real Constant Expressions</li> <li>Timer Constant Expressions</li> <li>Date Constant Expressions</li> <li>String Constant Expressions</li> </ul>
<b>Reserved Keywords</b>	
In the <b>ISaGRAF 3</b> Workbench, reserved keywords include FEDGE, OPERATE, REDGE, TSTART, TSTOP	In the <b>ISaGRAF 5</b> Workbench, reserved keywords include SUB_DATE_DATE

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>Directly Represented Variables</b>	
<p>%IXs.c free channel of a Boolean input board            %IDs.c free channel of an integer input board            %ISs.c free channel of a message input board            %QXs.c free channel of a Boolean output board            %QDs.c free channel of an integer output board            %QSs.c free channel of a message output board</p>	<p>For <b>ISaGRAF 3</b> configurations, the following directly represented variables are available:            %IXs.c free Channel of a Boolean input I/O device            %IDs.c free Channel of a Double integer input I/O device            %ISs.c free Channel of a String input I/O device            %QXs.c free Channel of a Boolean output I/O device            %QDs.c free Channel of a Double integer output I/O device            %QSs.c free Channel of a String output I/O device</p> <p>For <b>ISaGRAF 5</b> configurations, the following directly represented variables are available:            %IXs.c free Channel of a Boolean input I/O device            %IBs.c free Channel of a Short integer, Unsigned short integer, or BYTE input I/O device            %IWs.c free Channel of an Integer, Unsigned integer, or WORD input I/O device            %IDs.c free Channel of a Double integer, Unsigned double integer, Double word, or DATE input I/O device            %ILs.c free Channel of a Long integer, Unsigned long integer, Long word, or Long real input I/O device            %IRs.c free Channel of a Real input I/O device            %ITs.c free Channel of a Time input I/O device            %ISs.c free Channel of a String input I/O device</p>

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
(continued)	<p>%QXs.c free Channel of a Boolean output I/O device</p> <p>%QBs.c free Channel of a Short Integer, Unsigned short integer, or BYTE output I/O device</p> <p>%QWs.c free Channel of an Integer, Unsigned integer, or WORD output I/O device</p> <p>%QDs.c free Channel of a Double integer, Unsigned double integer, Double word, or DATE output I/O device</p> <p>%QLs.c free Channel of a Long integer, Unsigned long integer, Long word, or Long real output I/O device</p> <p>%QRs.c free Channel of a Real output I/O device</p> <p>%QTs.c free Channel of a Time output I/O device</p> <p>%QSSs.c free Channel of a String output I/O device</p>
<p>%IXs.b.c free channel of a Boolean input board</p> <p>%IDs.b.c free channel of an integer input board</p> <p>%ISs.b.c free channel of a message input board</p> <p>%QXs.b.c free channel of a Boolean output board</p> <p>%QDs.b.c free channel of an integer output board</p> <p>%QSSs.b.c free channel of a message output board</p>	<p>For <b>ISaGRAF 3</b> configurations, the following directly represented variables are available:</p> <p>%IXs.b.c free Channel of a Boolean input I/O device</p> <p>%IDs.b.c free Channel of a Double integer input I/O device</p> <p>%ISs.b.c free Channel of a String input I/O device</p> <p>%QXs.b.c free Channel of a Boolean output I/O device</p> <p>%QDs.b.c free Channel of a Double integer output I/O device</p> <p>%QSSs.b.c free Channel of a String output I/O device</p>

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
(continued)	<p>For <b>ISaGRAF 5</b> configurations, the following directly represented variables are available:</p> <p><b>%IXs.b.c</b> free Channel of a Boolean input I/O device</p> <p><b>%IBs.b.c</b> free Channel of a Short Integer, Unsigned short integer, or BYTE input I/O device</p> <p><b>%IWs.b.c</b> free Channel of an Integer, Unsigned integer, or WORD input I/O device</p> <p><b>%IDs.b.c</b> free Channel of a Double integer, Unsigned double integer, Double word, or DATE input I/O device</p> <p><b>%ILs.b.c</b> free Channel of a Long integer, Unsigned long integer, Long word, or Long real input I/O device</p> <p><b>%IRs.b.c</b> free Channel of an Real input I/O device</p> <p><b>%ITs.b.c</b> free Channel of a Time input I/O device</p> <p><b>%ISs.b.c</b> free Channel of a String input I/O device</p> <p><b>%QXs.b.c</b> free Channel of a Boolean output I/O device</p> <p><b>%QBs.b.c</b> free Channel of a Short Integer, Unsigned short integer, or BYTE output I/O device</p> <p><b>%QWs.b.c</b> free Channel of an Integer, Unsigned integer, or WORD output I/O device</p> <p><b>%QDs.b.c</b> free Channel of a Double integer, Unsigned double integer, Double word, or DATE output I/O device</p> <p><b>%QLs.b.c</b> free Channel of a Long integer, Unsigned long integer, Long word, or Long real output I/O device</p> <p><b>%QRs.b.c</b> free Channel of a Real output I/O device</p> <p><b>%QTs.b.c</b> free Channel of a Time output I/O device</p> <p><b>%QSs.b.c</b> free Channel of a String output I/O device</p>

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>Variables</b>	
Variable grouping is not available in the <b>ISaGRAF 3</b> Workbench	For <b>ISaGRAF 3</b> configurations, variable grouping is not available For <b>ISaGRAF 5</b> configurations, variable groups provide a method of managing variables and logically sorting them within a resource
Variable names have a maximum of 32 characters	For <b>ISaGRAF 3</b> configurations, variable names have a maximum of 32 characters For <b>ISaGRAF 5</b> configurations, variable names have a maximum of 128 characters
Quick declaration of variables in dictionary	In the <b>ISaGRAF 5</b> Workbench, duplication of variables enables a similar declaration where a sample variable is created having the required attributes then duplicated
Importing/Exporting variables data using tab, comma (CSV), semicolon, or comma and quote separators	In the <b>ISaGRAF 5</b> Workbench, importing / exporting variables data using comma-separated (CSV) or XLS format. The CSV format lines must end with a carriage return. Also, importing / exporting Workbench elements (projects, configurations, resources, and POUs) from one project to another.

<b>ISaGRAF 3 Workbench</b>	<b>ISaGRAF 5 Workbench</b>
Boolean variables Analog variables Timer variables Message String variables	For <b>ISaGRAF 3</b> configurations, the following variable types are available: Boolean Variables (BOOL) Double Integer Variables (DINT) Real Variables (REAL) Timer Variables (TIME) String Variables (STRING) For <b>ISaGRAF 5</b> configurations, the following variable types are available: Boolean Variables (BOOL) Short Integer Variables (SINT) Unsigned Short Integer (USINT) or BYTE Variables Integer Variables (INT) Unsigned Integer (UINT) or WORD Variables Double Integer Variables (DINT) Unsigned Double Integer (UDINT) or Double Word (DWORD) Variables Long Integer Variables (LINT) Unsigned Long Integer (ULINT) or Long Word (LWORD) Variables Real Variables (REAL) Long Real Variables (LREAL) Timer Variables (TIME) Date Variables (DATE) String Variables (STRING)
<b>Defined Words</b>	
Defined words have a maximum of 32 characters. These can have a common, global, or local scope.	For <b>ISaGRAF 3</b> configurations, defined words have a maximum of 32 characters. These can only have a global scope. For <b>ISaGRAF 5</b> configurations, defined words have a maximum of 128 characters. These can only have a global scope.

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>Various Differences</b>	
TSTART and TSTOP statements	For <b>ISaGRAF 5</b> configurations, the TSTART and TSTOP statements are replaced by the TON function block
Modbus SCADA addressing map	In the <b>ISaGRAF 5</b> Workbench, Modbus addressing is available using the Modbus driver
<b>Functions and Function Blocks</b>	
Maximum name length of "C" conversion functions, "C" functions, "C" function blocks, user functions, and user function blocks is eight characters. If the same function name is found in more than one library, it generates an error.	<p>For <b>ISaGRAF 3</b> configurations, the maximum name length of "C" conversion functions, "C" functions, "C" function blocks, user functions, and user function blocks is eight characters. If the same function name is found in more than one library, it generates an error</p> <p>For <b>ISaGRAF 5</b> configurations, the maximum name length of "C" conversion functions, "C" functions, "C" function blocks, user functions, and user function blocks is 128 characters.</p>
Functions and function blocks can be written in ST, IL, LD, or FBD languages.	<p>For <b>ISaGRAF 3</b> configurations, functions can be written in ST, IL, LD, or FBD and function blocks can be written in ST, LD, or FBD languages.</p> <p>For <b>ISaGRAF 5</b> configurations, functions can be written in ST, LD, FBD or IL languages. Function blocks can be written in the SFC, ST, LD, or FBD languages.</p>
Cannot assign an instance declared in the dictionary to a function or function block	<p>For <b>ISaGRAF 3</b> configurations, in the FBD and LD editors, cannot assign an instance declared in the dictionary to a function or function block</p> <p>For <b>ISaGRAF 5</b> configurations, can have automatic or declared instances of functions and function blocks</p>

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>Operators</b>	
&	AND
=1	XOR
>=1	OR
l	l Gain
AND_MASK	In the <b>ISaGRAF 5</b> Workbench, is a standard function
OR_MASK	In the <b>ISaGRAF 5</b> Workbench, is a standard function
XOR_MASK	In the <b>ISaGRAF 5</b> Workbench, is a standard function
NOT_MASK	In the <b>ISaGRAF 5</b> Workbench, is a standard function
ANA	For <b>ISaGRAF 3</b> configurations, renamed to ISA3_ANA. Performs the same operation as ANY_TO_DINT. Not available for <b>ISaGRAF 5</b> configurations.
BOO	Available for <b>ISaGRAF 3</b> configurations. Performs same operation as ANY_TO_BOOL.
REAL	For <b>ISaGRAF 3</b> configurations, renamed to ISA3_REAL. Performs same operation as ANY_TO_REAL.
TMR	Available for <b>ISaGRAF 3</b> configurations. Performs same operation as ANY_TO_TIME.
MSG	Available for <b>ISaGRAF 3</b> configurations. Performs same operation as ANY_TO_STRING.
CAT	Available only for <b>ISaGRAF 3</b> configurations
SYSTEM	For <b>ISaGRAF 3</b> configurations, renamed to ISA3_SYSTEM. For <b>ISaGRAF 5</b> configurations, is a system variable accessed in the diagnostic information
OPERATE	Available only for <b>ISaGRAF 3</b> configurations

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
FEDGE	Not available in the <b>ISaGRAF 5</b> Workbench
REDGE	Not available in the <b>ISaGRAF 5</b> Workbench
Not available in the <b>ISaGRAF 3</b> Workbench	Available only for <b>ISaGRAF 5</b> configurations: ANY_TO_SINT ANY_TO_BOOL ANY_TO_REAL ANY_TO_TIME ANY_TO_STRING ANY_TO_USINT ANY_TO_BYTE ANY_TO_INT ANY_TO_UINT ANY_TO_WORD ANY_TO_DINT ANY_TO_UDINT ANY_TO_DWORD ANY_TO_LINT ANY_TO_ULINT ANY_TO_LWORD ANY_TO_LREAL ANY_TO_DATE NOT
<b>Standard Functions</b>	
ARCREATE function ARREAD function ARWRITE function	Available only for <b>ISaGRAF 3</b> configurations. For <b>ISaGRAF 5</b> configurations, arrays are declared in the Dictionary.
DAY_TIME function	Available only for <b>ISaGRAF 3</b> configurations. For <b>ISaGRAF 5</b> configurations, available as the GET_TIME_STRING function and GET_TIME_STRUCT function block.

<b>ISaGRAF 3 Workbench</b>	<b>ISaGRAF 5 Workbench</b>
F_CLOSE function F_EOF function F_ROPEN function F_WOPEN function FA_READ function FA_WRITE function FM_READ function FM_WRITE function	Available only for <b>ISaGRAF 3</b> configurations. For <b>ISaGRAF 5</b> configurations, these functions can be developed as "C" functions using the Target Definition Builder.
Not available in the <b>ISaGRAF 3</b> Workbench	Available only for <b>ISaGRAF 5</b> configurations: AS_SEND_EVENT CURRENT_ISA_DATE FAILOVER GET_TIME_STRING IOCTL LOG_MSG SET_PRIORITY SUB_DATE_DATE
<b>Optional Functions</b>	
<b>ODBC Functions</b>	
Not available in the <b>ISaGRAF 3</b> Workbench	Available only for <b>ISaGRAF 5</b> configurations: SQLAllocHandle SQLBindCol SQLBindParameter SQLBrowseConnect SQLBulkOperation SQLCancel SQLCloseCursor SQLColAttribute SQLColumnPrivileges SQLColumns SQLConnect SQLCopyDesc

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
(continued)	SQLDataSources SQLDescribeCol SQLDescribeParam SQLDisconnect SQLDriverConnect SQLDrivers SQLEndTran SQLExecDirect SQLExecute SQLExtendedFetch SQLFetch SQLFetchScroll SQLForeignKeys SQLFreeHandle SQLFreeStmt SQLGetConnectAttr SQLGetCursorName SQLGetData SQLGetDescField SQLGetDescRec SQLGetDiagField SQLGetDiagRec SQLGetEnvAttr SQLGetFunctions SQLGetInfo SQLGetStmtAttr SQLGetTypeInfo SQLMoreResults SQLNativeSql SQLNumParams SQLNumResultCols SQLParamData SQLPrepare SQLPrimaryKeys

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
(continued)	SQLProcedureColumns SQLProcedures SQLPutData SQLRowCount SQLSetConnectAttr SQLSetCursorName SQLSetDescField SQLSetDescRec SQLSetEnvAttr SQLSetPos SQLSetStmtAttr SQLSpecialColumns SQLStatistics SQLTablePrivileges SQLTables SQLUpAndRunning
<b>Serial Communications Functions</b>	
Not available in the <b>ISaGRAF 3</b> Workbench	Available only for <b>ISaGRAF 5</b> configurations: SERIAL_CLOSE SERIAL_CONNECT SERIAL_DISCONNECT SERIAL_OPEN SERIAL_RECEIVE SERIAL_SEND SERIAL_SET SERIAL_STATUS

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>Standard Function Blocks</b>	
SEMA	Available only for <b>ISaGRAF 3</b> configurations
<b>Basic Operations Function Blocks</b>	
Not available in the <b>ISaGRAF 3</b> Workbench	Available only for <b>ISaGRAF 5</b> configurations: AS_AE CONNECT FC_GET_STAT GET_TIME_STRUCT NOW URCV_S USEND_S

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>Advanced Control Function Blocks</b>	
Not available in the <b>ISaGRAF 3</b> Workbench	Available only for <b>ISaGRAF 5</b> configurations: AnalogAlarm BatchSwitch BatchTotalizer Bias BiasCalibration Characterizer Comparator DigitalAlarm FlipFlop IPIDController LeadLagController Limiter PDController RateLimiter Ratio RatioCalibration RetentiveOnTimer Scaler Setpoint SignalSelector TrackAndHold TransferSwitch

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>Matrix Operations Function Blocks</b>	
Not available in the <b>ISaGRAF 3</b> Workbench	Available only for <b>ISaGRAF 5</b> configurations: NEW_MATRIX FREE_MATRIX GET_I_MATRIX PUT_I_MATRIX GET_F_MATRIX PUT_F_MATRIX DUP_MATRIX COPY_MATRIX COPY_ROW_MATRIX COPY_COL_MATRIX TYPE_MATRIX ROWS_MATRIX COLS_MATRIX TRANSPOSE_MATRIX INVERT_MATRIX ADD_MATRIX SUBTRACT_MATRIX MULTIPLY_MATRIX SCALAR_I_MATRIX SCALAR_F_MATRIX PRINT_MATRIX

ISaGRAF 3 Workbench	ISaGRAF 5 Workbench
<b>Optional Function Blocks</b>	
Not available in the <b>ISaGRAF 3</b> Workbench	Smart PID Function Block available only for <b>ISaGRAF 5</b> configurations.
<b>IEC 61499 Function Blocks</b>	
Not available in the <b>ISaGRAF 3</b> Workbench	Available only for <b>ISaGRAF 5</b> configurations: E_CTU E_CYCLE E_D_FF E_DELAY E_DEMUX E_F_TRIG E_MERGE E_N_TABLE E_PERMIT E_R_TRIG E_REND E_RESTART E_RS E_SELECT E_SPLIT E_SR E_SWITCH E_TABLE E_TABLE_CTRL E_TRAIN

(continued)	<p>LWORD: long word value (64 bit)</p> <p>REAL: real (floating) continuous value (32 bit)</p> <p>LREAL: long real (floating) continuous value (64 bit)</p> <p>TIME: time values less than one day; these value types cannot store dates (32 bit)</p> <p>DATE: date values (32 bit)</p> <p>STRING: character string having a defined size, representing the maximum number of characters the string can contain. For example, to define MyString as a string containing 10 characters, enter MyString(10).</p>
	<p>Unsigned double integer, Double word, or DATE output I/O device</p> <p>%QLs.c free Channel of a Long integer, Unsigned long integer, Long word, or Long real output I/O device</p> <p>%QRs.c free Channel of a Real output I/O device</p> <p>%QTs.c free Channel of a Time output I/O device</p> <p>%QSS.c free Channel of a String output I/O device</p>

(continued)	<p>%QBs.b.c free Channel of a Short Integer, Unsigned short integer, or BYTE output I/O device</p> <p>%QWs.b.c free Channel of an Integer, Unsigned integer, or WORD output I/O device</p> <p>%QDs.b.c free Channel of a Double integer, Unsigned double integer, Double word, or DATE output I/O device</p> <p>%QLs.b.c free Channel of a Long integer, Unsigned long integer, Long word, or Long real output I/O device</p> <p>%QRs.b.c free Channel of a Real output I/O device</p> <p>%QTs.b.c free Channel of a Time output I/O device</p> <p>%QSSs.b.c free Channel of a String output I/O device</p>
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<p>Not available in the <b>ISaGRAF 3</b> Workbench</p>	<p>Available only for <b>ISaGRAF 5</b> configurations:</p> <ul style="list-style-type: none"> <li>SQLAllocHandle</li> <li>SQLBindCol</li> <li>SQLBindParameter</li> <li>SQLBrowseConnect</li> <li>SQLBulkOperation</li> <li>SQLCancel</li> <li>SQLCloseCursor</li> <li>SQLColAttribute</li> <li>SQLColumnPrivileges</li> <li>SQLColumns</li> <li>SQLConnect</li> <li>SQLCopyDesc</li> <li>SQLDataSources</li> <li>SQLDescribeCol</li> <li>SQLDescribeParam</li> <li>SQLDisconnect</li> <li>SQLDriverConnect</li> <li>SQLDrivers</li> <li>SQLEndTran</li> <li>SQLExecDirect</li> <li>SQLExecute</li> <li>SQLExtendedFetch</li> <li>SQLFetch</li> <li>SQLFetchScroll</li> <li>SQLForeignKeys</li> <li>SQLFreeHandle</li> <li>SQLFreeStmt</li> <li>SQLGetConnectAttr</li> <li>SQLGetCursorName</li> <li>SQLGetData</li> </ul>
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