SIEMENS

SIMATIC Industrial Software

Sequential Controls with S7-GRAPH

Product Brief **Edition 06/99**

Upper Hand of Sequential Controls - with S7-GRAPH:

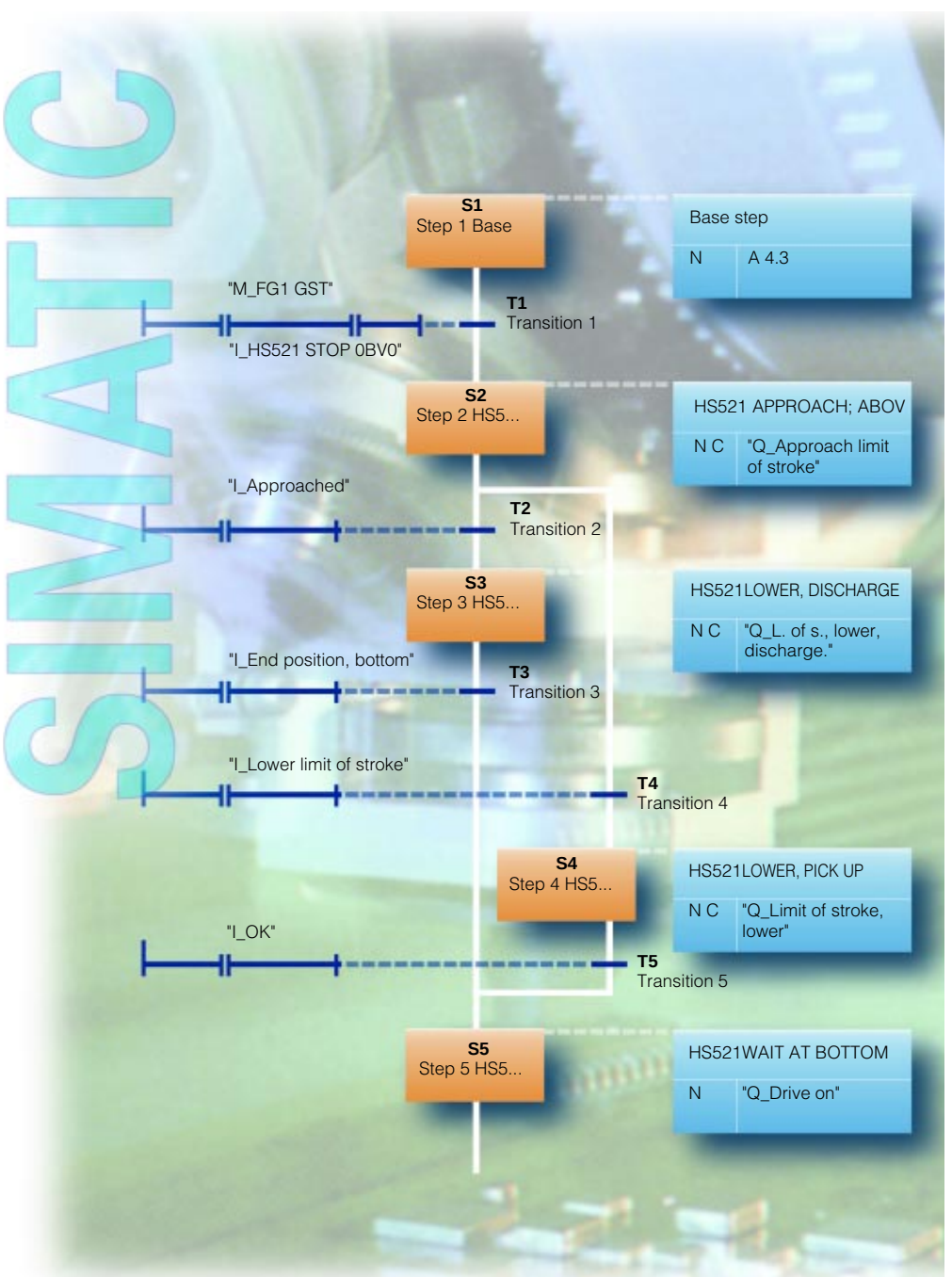
The SIMATIC software package S7-GRAPH builds on the STEP 7 programming software. It is used for execution sequences with alternative or simultaneous steps. The sequences are configured and programmed clearly and quickly in a standardized display mode (in accordance with IEC 1131-3, DIN EN 6 1131).

The process is described graphically, whereby it is divided into separate steps that each comprise a clearly comprehensible functional scope. For each step, you can define actions and control their execution. Transitions control progress from one step to the next. The interlock and monitoring conditions can be specified for each step.

Interlocks contain conditions for the execution of actions whereas monitoring conditions enable recognition of operational faults.

Advantages over LAD, FBD, STL

- At the design stage, your process is clearly structured. This is a considerable advantage during the subsequent stages.
- LAD, FBD and STL are optimized for designing logic controls. The prime application of S7-GRAPH is the process sequence.
- A clear graphical representation of the process with sequences permits easy updating and adaptation of the programs.
- The integrated diagnostics functions put you on the right track immediately in the event of process faults. This minimizes expensive idle times, especially in manufacturing.



S7-GRAPH versus GRAPH 5

Due to the special characteristics of S7-GRAPH, it is able to provide better solutions for applications than GRAPH 5.

Execution mode

GRAPH 5 usually runs in continuous mode which ensures that the interlocks/ manual interventions and monitoring functions programmed in the respective zoomed steps are executed in every cycle. This results in a relatively long execution time for the sequencer that depends on the number of steps. In S7-GRAPH, the sequencer is executed selectively, i.e. only the active steps are executed. This results in a comparatively short execution time for the sequencer that does not depend on the number of steps. Other functions, for example for activating equipment such as motors and valves, must be executed continuously. This subordinate manual/ interlock level is contained in a separate function block. This subordinate block is opened by double clicking the corresponding action in the step.

In GRAPH 5, when the sequencer is executed selectively, the assignments are not canceled.
In S7-GRAPH, however, the assignments are automatically canceled. This is easier and safer for the user.

S7-GRAPH has the following additional advantages:

- When a step is deleted, the manual and interlock level is not affected.
- Different languages can be selected for the manual and interlock level (e.g. LAD, FBD, STL).
- The S7-PDIAG software tool can be used for diagnosis of the manual and interlock level independently of the status of the sequencer.

Memory requirements

S7-GRAPH and GRAPH 5 are not directly comparable in terms of the memory requirements.

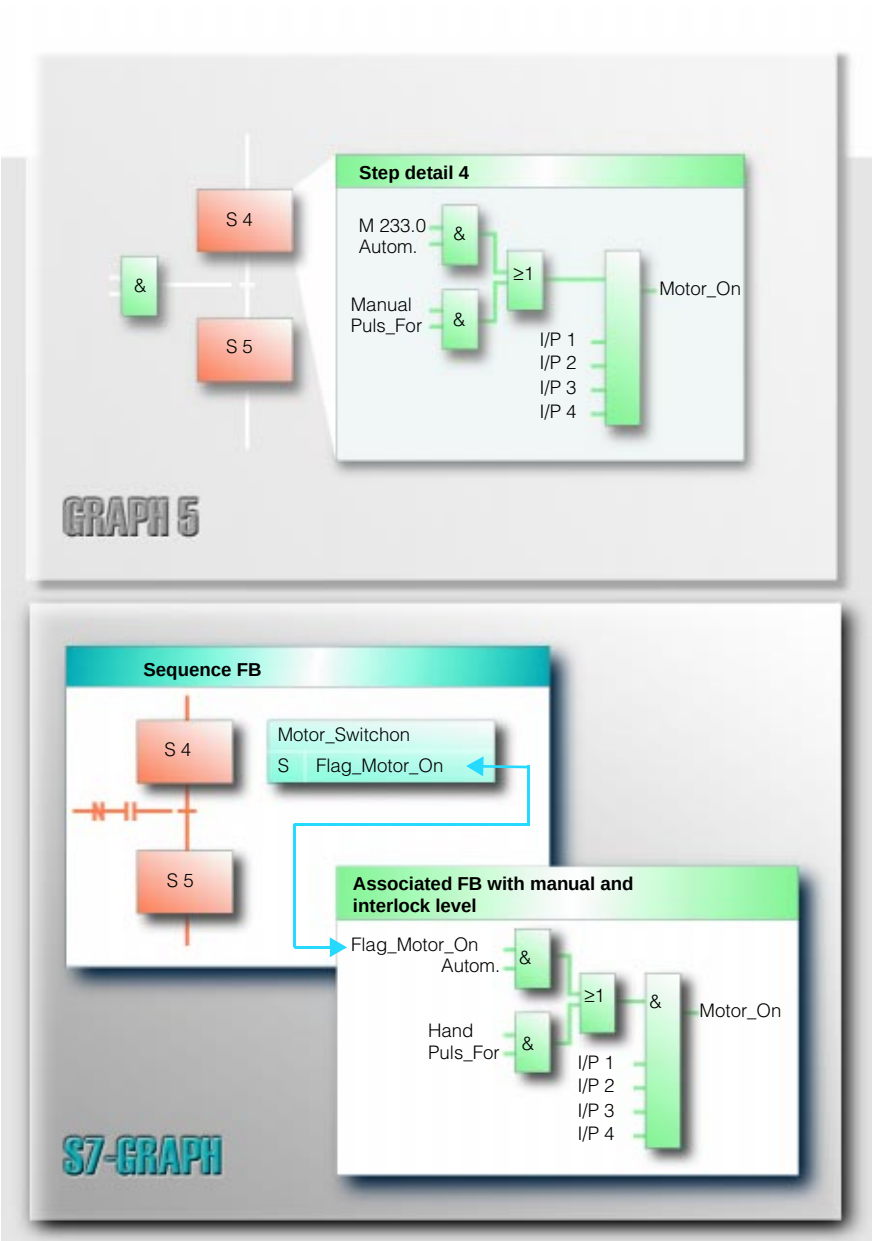


Fig. 1 Comparison of a sequential control with GRAPH 5 and S7-GRAPH

Different values apply depending on the configuration of GRAPH 5 or the version of S7-GRAPH (see table on the back page).

Qualifiers

In S7-GRAPH, ready-to-use qualifiers are provided with a low memory requirement which make programming step actions easier. The qualifiers include the following:

- Assignments (transient, set, reset)
- Time-dependent actions (time delay, time limiting)
- Actions dependent on sequencer status (step begin, step end, ...)

Fault analysis

In the case of GRAPH 5, a separate package is required for recording the signals for fault analysis. In S7-GRAPH, these signals are stored during execution and are therefore directly available for fault analysis.

S7-GRAPH:
More than just a tool for programming sequencers

Memory requirements of the header can be set as required

In order to execute, an S7-GRAPH sequencer block requires a general-purpose header.
S7-GRAPH offers various adjustable compiler options in order to link this header:

- Option "Running in stand-alone mode":
  The required general-purpose header (approx. 5 KB) is included in each function block generated by S7-GRAPH. This is the solution for small applications with only one sequencer block.
- Option "With standard FC":
  The general-purpose header is stored in a separate block. This standard block is only present once per project and is used by all S7-GRAPH sequencer blocks. The memory requirements are 8 KB or 10 KB depending on the type of standard FC selected.

Synchronization

It is possible to synchronize the sequencer with the status of the machine or installation using the programming device if it has been changed in manual mode and initialization is not appropriate. In this case, you only need to mark the step that is to be the synchronization point in the sequencer overview.

New with version 5

- Now also FBD in addition to LAD
  All transitions, interlocks and monitoring conditions can now be programmed either in LAD as previously or in FBD.
- Extended scope of commands for programming actions
  You can now directly program simple arithmetic commands (e.g. +, -) or counters/timers as actions in the step.
- More compact representation and printing
  The complete sequencer is more compact in the editor, and the print function has been improved.

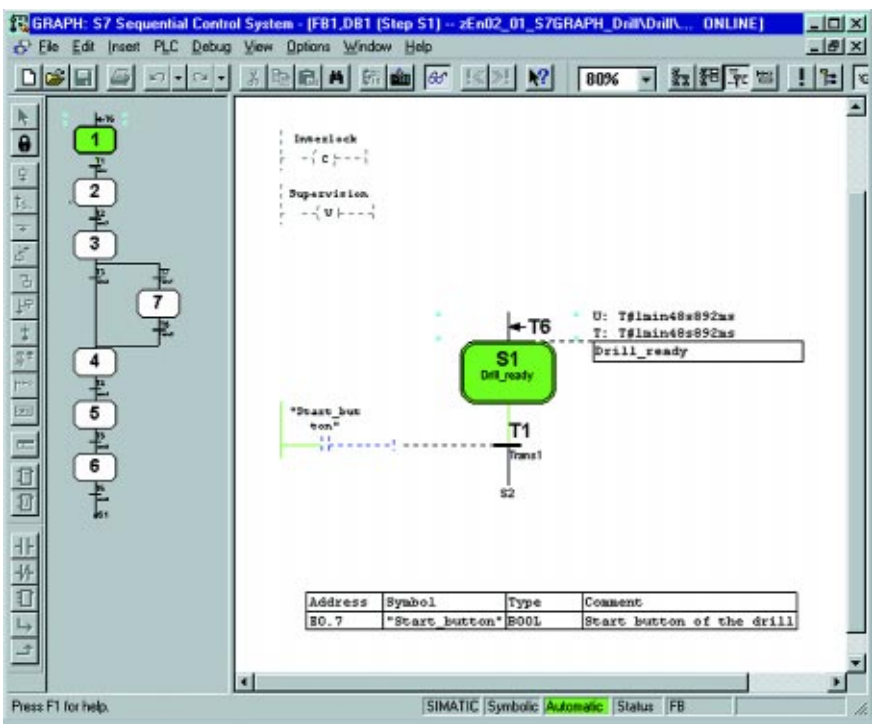


Fig. 2 S7-GRAPH in monitoring mode

- User-defined call interface
  Two possibilities can be selected for the call interface of the sequencer
- Predefined parameter sets, selectable between minimum, standard and maximum
- User-defined parameters (version 5 upwards) permit flexible adaptation to the requirements of the application

Process diagnostics

The software packages S7-GRAPH and ProAgent (from the SIMATIC HMI range) permit fast and direct process diagnostics in installations and machines with fault localization and diagnostics functions.

The software packages

- provide optimum support for the plant and machine personnel for fault localization and rectification,
- increase plant availability,
- shorten idle times.

The data relevant to diagnostics are generated automatically by S7-GRAPH. It is only necessary to activate the corresponding option in the compiler.

ProAgent efficiently utilizes the diagnostics data generated by S7-GRAPH. The display contents for diagnostics and control of the plant/machine are automatically generated by ProAgent. ProAgent is available as an option package for ProTool and WinCC:

- from ProTool V3 upwards, for OP25, OP27, OP35, OP37
- from WinCC V4 upwards, for PC FI25, PC FI45, OP47.

Technical Specifications

Additional information regarding this product can be found in the Internet under

http://www.ad.siemens.de/simatic

	GRAPH 5	S7-GRAPH	
Presentation	Character graphics	Pixel graphics	
Sequencer control/structure	Control and structure in sequence block	Control in function block, structure in data block	
Sequencers per function block	1	8	
Steps per sequence	127	250	
Simultaneous branches	8	250	
Alternative branches	8	250	
Transition	127 instructions	32 conditions	
Step	127 instructions	▪ 32 interlock conditions, ▪ 32 monitoring conditions, ▪ 100 actions with integrated system qualifiers	
Memory requirements			
Sequencer administration	Standard FB/SB with several configuration possibilities: ▪ minimum of 3 Kbytes (sequencer without simultaneous branches) ▪ maximum of 6 Kbytes (SB70 + SB71) ▪ plus 4 Kbytes (for diagnostics)	**With option "Running in stand-alone mode"** 5 Kbytes per sequencer block	**With option "With standard FC"** (shared standard FC for all sequencer blocks of a CPU) ▪ FC 70/71 approx. 8 KB (from V 4.0 upwards, only standard call interface) ▪ FC 72 approx. 10 KB (from V 5.0 upwards, required with user-defined call interface; can also be used as standard call interface)
Sequence	Depends on contents	n x 150 bytes (n = No. of steps in sequencer)	
Runtime per sequence (for average step contents)			
	Depends on the number of steps	Does not depend on the number of steps. Only the active steps will be processed.	
		With option "Running in stand-alone mode"	**With option "With standard FC"**

S5-95U	S5-155U	CPU 315	CPU 416	CPU 315	CPU 416
25 steps: 6 ms 100 steps: 9 ms	25 steps: 1 ms 100 steps: 2 ms	Sequence with 1 active step		Sequence with 1 active step	
		3 ms	0.35 ms	4 ms	0.4 ms
		Per additional active step		Per additional active step	
		0.9 ms	0.05 ms	1 ms	0.06 ms

Siemens AG
Automation & Drives Group
Industrial Automation Systems
P.O. Box 4848, D-90327 Nuremberg
Federal Republic of Germany

Siemens Aktiengesellschaft

Order No. 6ZB5310-0FJ02-0BA2
Printed in the Federal Republic of Germany
261/901380 SS 0699 1.