TECHNICAL GUIDE

Migrating S7-300 to S7-1500 and S7-1200: A Complete Guide and Replacement Parts

Migrating from the STEP 7 V5.x environment (Simatic Manager / Classic) to TIA Portal can be a complex process, especially for SIMATIC S7-300 systems. This article covers the migration process in detail, differences in memory architecture, the challenges of migrating low-level STL statement list code and pointers (ANY pointer, P#), and the recommended move to SCL.

How to migrate from S7-300 to S7-1500 and S7-1200

Migrating from S7-300 to S7-1500 and S7-1200 requires careful planning and preparation. Siemens defines migration from SIMATIC S7-300/S7-400 to S7-1500 as a combination of hardware and software conversion. The migration process includes several steps: software migration via TIA Portal, hardware conversion, and network modernization.

Preparing for migration: the Readiness Check Tool

Before starting migration, project readiness should be checked using the Siemens Readiness Check Tool. This tool verifies whether the hardware configuration in a STEP 7 V5.x project is ready for migration to TIA Portal. The Readiness Check can use a .cfg file exported from HW Config in STEP 7, an MLFB list in Microsoft Excel (.xls) format, or a .csv file with article numbers separated by commas without spaces.

The tool reports which software products and licenses need to be available on the programming device/PC, which firmware versions are supported in TIA Portal, and can export results to Microsoft Excel or PDF. An important limitation: components integrated via GSD or GSDML files cannot be checked by the tool and must be verified manually in the TIA Portal hardware catalog. If the required GSD/GSDML files are missing, they need to be installed.

Software migration prerequisites

Siemens specifies the following prerequisites for migrating STEP 7 V5.x to TIA Portal:

- Administrator rights on the operating system
- A compatible TIA Portal/STEP 7 Professional installation
- A consistent hardware and software project
- CPU-oriented alarm number assignment
- No access protection on the source project
- No protected blocks with a timestamp conflict
- All programs/sources compilable without errors

The block folder must contain all called blocks and must not contain uncalled blocks, particularly instance data blocks. Siemens recommends migrating unencrypted blocks, since blocks encrypted with S7-Block Privacy cannot be read or modified in TIA Portal.

The migration workflow in TIA Portal

Migrating STEP 7 V5.x projects in TIA Portal is done by opening the portal and using the "Migrate project" workflow. The migration tool converts the source project into a TIA Portal-readable file with the *.am20 extension, which is then transferred to the target system and migrated within TIA Portal. Hardware configuration can optionally be included during migration if the source hardware has a corresponding equivalent in TIA Portal.

Differences in memory architecture

S7-300 systems use absolute memory addressing (offset addressing), meaning each memory address in a data block has a fixed position (e.g. DB1.DBX0.0), and the program refers to it directly by byte and bit number. The newer generation of S7-1500 and S7-1200 systems uses Optimized Block Access by default, in which data is addressed purely symbolically — the compiler itself decides where data physically sits in memory, improving performance and safety but ruling out direct offset-based references.

In practice, this means STL code that relies on absolute addressing or on pointer operations based on byte offsets cannot be carried over unchanged. Data blocks migrated from S7-300 either have to stay in non-optimized mode (which limits some of the benefits of the new platform and isn't available for certain block types), or the logic has to be manually rewritten to reference variables by symbolic name instead of by address. This is one of the main reasons a "one-to-one" migration rarely ends with the tool-based conversion alone and typically requires a code review by a programmer.

Challenges in migrating low-level STL code

Migrating low-level STL code can be difficult due to differences in syntax and semantics between older and newer software versions. Siemens documents the migration of LAD/FBD/STL programs and notes that sources can be re-migrated as sources into TIA Portal. Rewriting the logic in SCL is recommended, as SCL is more flexible, more readable, and easier to maintain.

Pointers (ANY pointer, P#)

Pointers (ANY pointer, P#) are used in S7-300 systems to reference memory areas of variable length and type — for example, when passing data blocks to library functions. Siemens documents that in SCL and STL, memory of any kind can be transferred on block call if an ANY pointer has been programmed in the block parameter. In S7-1500 and S7-1200, the ANY/P# mechanism is still supported for compatibility, but Siemens recommends gradually moving to the Variant data type available in SCL — it is safer (compile-time type checking), more readable, and works better with optimized data block access than the older offset-based pointers.

Choosing the right system: S7-1200 or S7-1500?

The right system depends on the specific needs and requirements of the project. The S7-1200 is more compact and economical, ideal for smaller applications and systems with limited requirements. The S7-1500 offers more functionality and capability, higher performance, and greater memory capacity, making it the better choice for more complex systems. Factors to consider include memory requirements, processing speed, number of I/O points, and required security level.

Hardware migration: replacing I/O modules

Hardware migration includes replacing older SM321/SM322 cards with the newer distributed architecture built around ET 200 stations. Siemens migration material references ET 200MP / S7-1500 IO and ET 200SP as part of the migration landscape. ET 200SP, ET 200MP, and ET 200S components are integrated into TIA Portal, making them easier to configure and manage.

ET 200MP is an ideal solution for S7-1500 systems, offering a distributed I/O architecture with high flexibility and scalability. ET 200SP is an alternative for more compact applications. These modules are designed to work with S7-1500 and S7-1200 systems and offer more functionality than the older SM321/SM322 cards. The table below shows example replacement paths for the most common I/O modules:

| Legacy module (S7-300) | Replacement family | Notes |

|---|---|---|

| SM321 (DI) | ET 200MP / ET 200SP DI | Select based on the number and type of digital inputs |

| SM322 (DO) | ET 200MP / ET 200SP DO | Select based on output load capacity |

| SM331/SM332 (AI/AO) | ET 200MP / ET 200SP AI/AO | Check analog signal ranges |

Choosing the specific variant (MP vs. SP) and module depends on the number of channels, signal type, and enclosure requirements — ET 200 modules, as well as original and replacement SM321/SM322 cards, are available from Enetiv, so feel free to get in touch if you're unsure about a specific part number.

Network modernization

Network modernization is a key part of the migration process. Older S7-300 systems often use Profibus DP, while newer S7-1500 and S7-1200 systems use Profinet. Profinet is a more modern protocol offering higher throughput, better reliability, and easier integration with IT systems.

Tools offered by the manufacturer

Siemens offers several tools that make migrating from STEP 7 V5.x to TIA Portal easier — the Readiness Check Tool described above for verifying project readiness, and the Migration Tool for automatic project conversion.

Migration Tool

The Migration Tool simplifies the software migration process. It converts a STEP 7 V5.x project into a migration file with the *.am20 extension, which is then transferred to the target system and migrated in TIA Portal. The migration process includes automatic conversion of programs, data blocks, and hardware configuration.

Summary

Migrating from S7-300 to S7-1500 and S7-1200 requires careful planning and preparation. Key steps include:

- Checking project readiness with the Readiness Check Tool
- Verifying the software migration prerequisites
- Carrying out the software migration via the TIA Portal Migration Tool
- Replacing older I/O modules with ET 200MP or ET 200SP
- Modernizing the network from Profibus DP to Profinet
- Rewriting low-level STL code in SCL
- Verifying and testing the migrated project

Choosing the right system (S7-1200 or S7-1500), migrating hardware, and modernizing the network are all key elements of the migration process. Using the tools Siemens offers, such as the TIA Portal Readiness Check Tool and Migration Tool, significantly eases and speeds up migration.

FAQ

What's the difference between the S7-1200 and the S7-1500?

The S7-1200 is more compact and economical, ideal for smaller applications. The S7-1500 offers more functionality, higher performance, and greater memory capacity, making it the better choice for more complex systems.

How do you carry out a software migration?

Migrating STEP 7 V5.x software to TIA Portal is done by opening TIA Portal and using the "Migrate project" workflow. The migration tool converts the project into an *.am20 file, which is transferred to the target system and migrated in TIA Portal.

Are ANY pointers and P# still supported in the new generation of systems?

Yes, ANY pointers and P# are still supported in the new generation of S7-1500 and S7-1200 systems, though Siemens recommends gradually moving to the safer Variant type in SCL.

What tools does Siemens offer to make migration easier?

Siemens offers several tools, including the TIA Portal Readiness Check Tool for verifying project readiness and the Migration Tool for automatically converting STEP 7 V5.x projects to the TIA Portal format.

Which I/O modules should replace the older SM321/SM322 cards?

The older SM321/SM322 cards should be replaced with the newer distributed architecture built around ET 200MP or ET 200SP stations, which are integrated into TIA Portal and offer greater flexibility and capability than the older modules.

Contact

Enetiv is a distributor of Siemens systems as well as other brands (ABB, Allen-Bradley, Schneider Electric, and others), and invites you to get in touch at https://enetiv.com/kontakt for more information on migrating from S7-300 to S7-1500 and S7-1200, and for support with your automation system modernization project.