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TELEPERM M process control system

Migration to SIMATIC PCS 7

Brochure · July 2008

SIMATIC PCS 7

www.siemens.com/simatic-pcs7/migration

SIEMENS

Introduction

Increase your competitiveness

With Totally Integrated Automation (TIA), Siemens is the only supplier of a comprehensive range of matched products, systems and solutions for all industrial sectors, from the field level via the production control level up to interfacing to the ERP level. TIA thus permits the optimization of production sequences in all areas of a plant. This reduces the complexity, and increases productivity – along with a high level of investment security.

The result is a reduction in the Total Cost of Ownership (TCO), and thus an improvement in competitiveness: higher production throughput, significantly increased availability, higher product quality, improved efficiency for operation, extended maintenance facilities, and simultaneously a shorter time-to-market.

If a company wishes to strengthen its position on the market, it is essential to react flexibly and rapidly to new market requirements, while keeping interruptions in current operation down to a minimum. This is where the strengths of the SIMATIC PCS 7 process control system from Siemens are to be found. As a corner pillar of the Totally Integrated Automation concept, SIMATIC PCS 7 constitutes a uniform complete system which surpasses the capabilities of previous systems and satisfies the demands you place on the process control technology.

SIMATIC PCS 7 from Siemens makes a decisive contribution toward expanding your competitive advantages. This results in profits for you throughout the complete life cycle of your industrial plant. New perspectives result for you with the SIMATIC PCS 7 process control system due to increased:

- Integration
- Performance
- Scalability
- Modernization
- Security
- Innovation
- Global network of experts

Siemens has been offering a wide range of innovative migration products and solutions for its globally proven systems for many years already. The maxim of Siemens' migration strategy is to modernize the existing installed basis in steps and without completely changing the system, if possible without a plant shutdown or with minimum production downtimes. Siemens therefore supports customers' endeavors to achieve long-term safeguarding of investments together with maximization of their return on assets.

SIMATIC PCS 7 at a glance

- Scalable from small up to very large plants
- Redundancy at all levels
  (I/Os, controllers, bus systems, servers)
- Expansions/modifications possible online during operation
- Multi-user operator systems with client/server architecture
- OPC support
- Distributed access over Internet/intranet
- Wireless HMI (Human Machine Interface) with MOBIC
- Protection of plant using virus protection software
- Innovative controls with minimum scan rates of 10 ms
- Intelligent alarm management
- Time tagging at I/O module level down to minimum of 1 ms
- I/O modules for hazardous areas
- Uniform hardware platform also for process safety
- Fast Ethernet and PROFIBUS DP/PA
- Interfaces to MODBUS, AS-i and FF
- Powerful, centralized, plant-wide engineering system
- Comprehensive, efficient engineering with graphic/PCS tools
- All important configuration languages with user-specific function blocks (SFC, CFC, SCL)
- Central parameterization of field devices with SIMATIC PDM
- Software simulation and test
- Change management (version tracking, change record, etc.)
- Asset management with uniform visualization, diagnostics and maintenance of all I&C components
- Overview of complete maintenance sequence
- Complete traceability of status and maintenance orders
- Monitoring of plant performance
- Batch operation with recipes independent of equipment and units
- Hierarchical recipes in accordance with ISA S 88.01
- 21CFR Part 11, audit trail, access protection, electronic signature

Migration strategy of Siemens

Globalization and permanently increasing competition are forcing companies to continuously increase productivity and shorten product launch times. It is therefore necessary to continuously optimize engineering procedures and production processes, while simultaneously taking into account new industrial requirements, standards and statutory legislation.
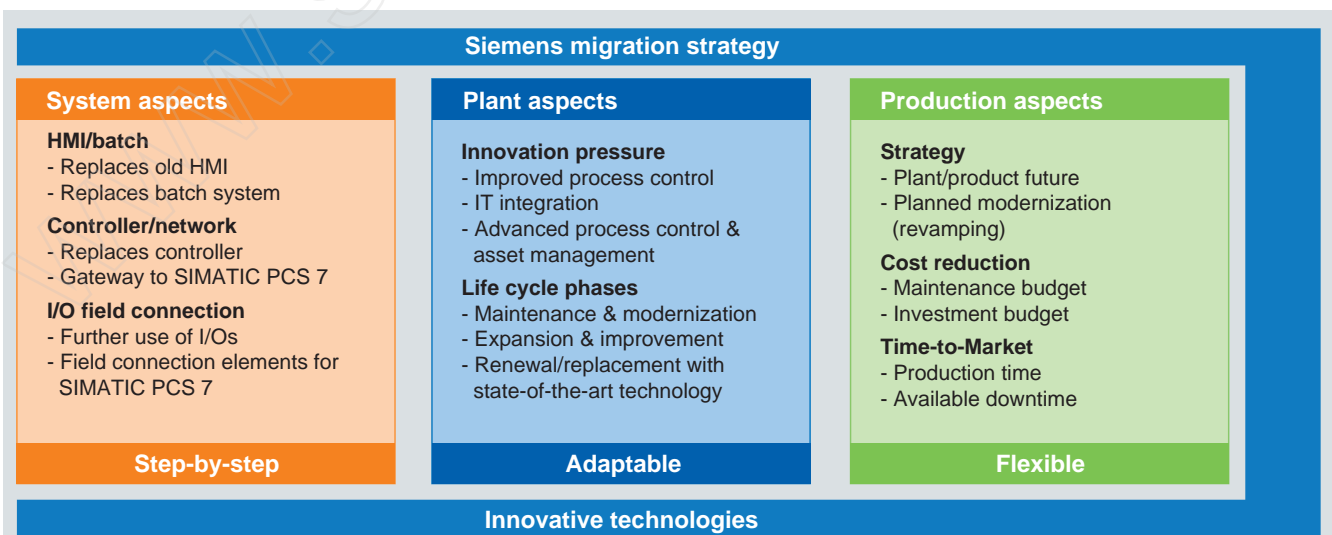
Many systems and plants have to be expanded and modernized to ensure that companies can also satisfy tomorrow's market requirements. Since the installed basis of hardware, application software and know-how of the operation and maintenance personnel represents an enormous value, investment security for plant owners is always of great importance during modernization plans.

Experience has shown that the success of a migration process greatly depends on a technical solution optimally matched to customer requirements and the respective plant. The objective is to minimize technical and financial risks, and to provide as high a level of security for previously made investments. The different life cycles of the system components must also be considered, which currently vary between 5 years for PC-based workstations, 15 years for controllers, and up to 25 years or more for input/output components and wiring.

Therefore Siemens does not simply consider its task to be the complete replacement of an existing system, but to work closely with customers and their system integrators to elaborate an individual, future-oriented solution on the basis of the state-of-the-art SIMATIC PCS 7 process control system, always considering the directives:

- Step-by-step
  Allows gradual introduction of new technologies at different levels of the existing system in an optimum manner for the respective plant
- Adaptable
  A procedure for maximizing the return on assets (ROA) matched to the life cycle strategy of the plant (retention and modernization, expansion and improvement, or renewal and replacement)
- Flexible
  Considers the commercial aspects of production and plant management, i.e. required increases in capacity, expansion of product range, reduction in costs, or shortening of time-to-market

And this as well for their own legacy systems as for those of 3rd party suppliers.


Siemens migration strategy		
System aspects	**Plant aspects**	**Production aspects**
HMI/batch - Replaces old HMI - Replaces batch system **Controller/network** - Replaces controller - Gateway to SIMATIC PCS 7 **I/O field connection** - Further use of I/Os - Field connection elements for SIMATIC PCS 7	**Innovation pressure** - Improved process control - IT integration - Advanced process control & asset management **Life cycle phases** - Maintenance & modernization - Expansion & improvement - Renewal/replacement with state-of-the-art technology	**Strategy** - Plant/product future - Planned modernization (revamping) **Cost reduction** - Maintenance budget - Investment budget **Time-to-Market** - Production time - Available downtime
Step-by-step	**Adaptable**	**Flexible**
Innovative technologies		

Portfolio of the migration products

At an early stage Siemens recognized the significance of migration for process automation, and has offered a wide range of innovative migration products and solutions for its globally proven systems for many years. Right from the beginning, the maxim of Siemens' migration strategy is to modernize the existing installed base in steps and without completely changing the system, if possible without a plant shutdown or with minimum production downtimes. Siemens therefore supports customers' endeavors to achieve long-term safeguarding of investments together with maximization of their return on assets.

Siemens' know-how in the migration sector has continuously grown as time has passed. The experience gained in numerous migration projects has been incorporated into new products and technologies which are even more efficient.
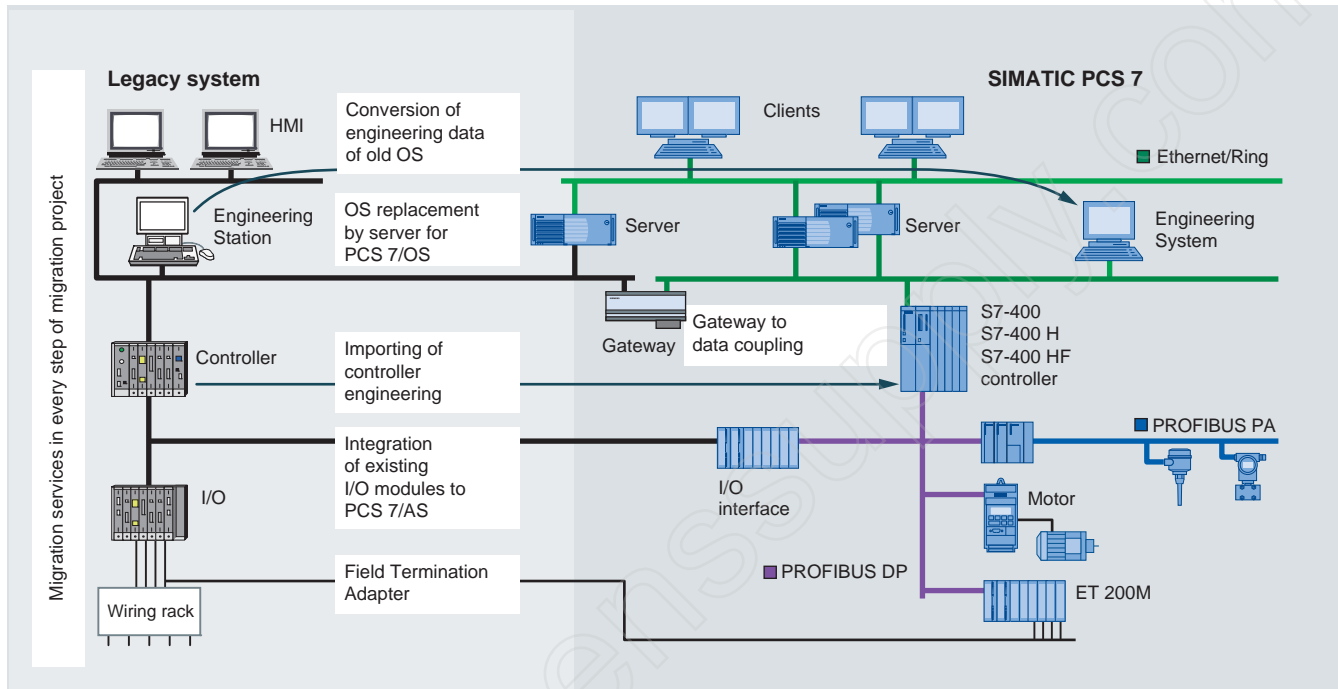
Step-by-step migration with the right products and services

Migration component	Description
OS migration products	■ Interface from SIMATIC PCS 7 OS Server/Single Station to system bus of old system ■ OS conversion tool ■ Faceplate library
Services for OS migration	Service for conversion of process images using the existing conversion tools
Services for AS migration	Tools/services for function-based conversion of AS engineering data to SIMATIC PCS 7
Gateway	Gateway between system bus of old system and SIMATIC PCS 7 (mainly for AS-AS communication)
Reuse of old system I/Os or Field Termination Assemblies (FTAs)	■ Reuse of I/Os (connection of old I/Os to SIMATIC PCS 7 automation systems) ■ Field Termination Assemblies (FTAs) for field cabling

Typical migration scenarios

A large number of different migration scenarios are possible depending on the specific technical and economical factors of each migration project. The migration products offer the modularity and flexibility required to implement such scenarios. Typical migration scenarios which can be implemented using these migration products:

Scenario 1: Replacement of existing HMI system by a SIMATIC PCS 7 operator system

If the existing HMI (Human Machine Interface) system no longer complies with current directives and standards for operator workstations, or if functional expansion is required (e.g. IT integration), it is possible to simply replace it by a SIMATIC PCS 7 operator system. The controller with application software and the process I/O are retained.

Advantages
- Minimum costs
- Reduced and understood risk
- Lengthening of service life of complete plant
- New application possibilities
- Opening of system for IT world
- Replacement possible without shutdown

Scenario 2: Plant expansion with connection to existing system

The existing plant is initially retained, and is modernized by expanding with further sections/units with SIMATIC PCS 7.

Advantages
- Simple, step-by-step increase in production capacity
- Reduced and understood risk
- Introduction of new technologies
  (e.g. PROFIBUS fieldbus, HMI)
- Opening of system for IT world
- Together with scenario 1, enables process control using a uniform operator system
- Expansion possible without shutdown

Scenario 3: Comprehensive modernization

Bottlenecks in the provision of spare parts may force comprehensive modernization of the old system using the future-oriented SIMATIC PCS 7 process control system. Conversion may also be possible during operation. Further use of the existing I/O level is supported, and the investments made for wiring, hardware components or application engineering are safeguarded.

Advantages
- Increase in performance
- Introduction of new technologies
  (e.g. PROFIBUS fieldbus, HMI)
- Opening of system for IT world
- Lengthening of service life of complete plant
- Elimination of bottlenecks

Migration from TELEPERM M to SIMATIC PCS 7

Migration solutions for TELEPERM M

The TELEPERM M process control system from Siemens has proven itself worldwide in many different industry sectors in the past 25 years. More than 15,000 installed systems have proven their performance, reliability and user-friendliness in many years of service, even under extreme operating conditions.

The installed platform of the old process control system represents an immense investment in hardware and application software as well as a wealth of valuable and complex know-how accumulated by operating and maintenance personnel.
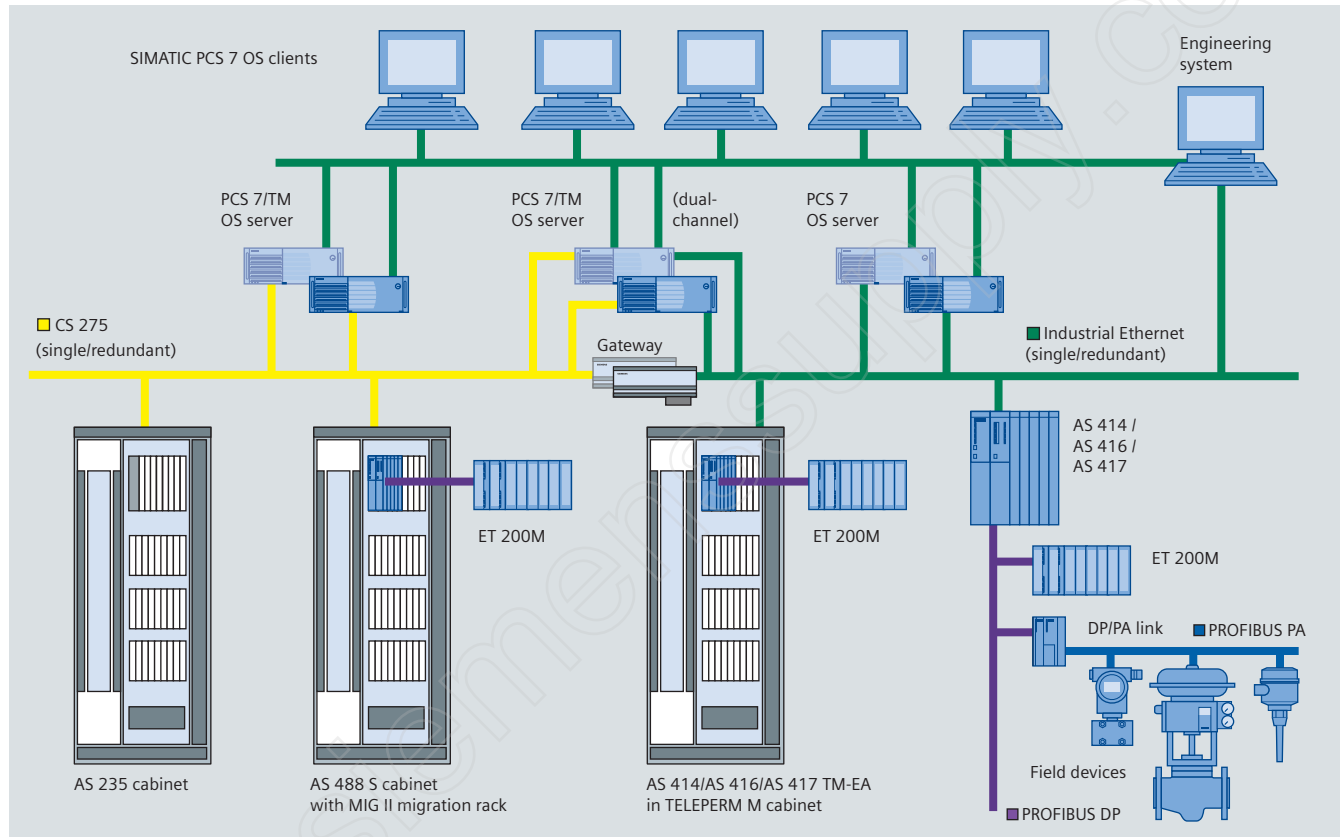
Configuration example of a typical TELEPERM M migration

For new plants and plant extensions, Siemens offers the SIMATIC PCS 7 process control system as a successor generation with an open platform for modern, future-oriented and economical automation solutions in all industrial sectors. The objective of migration is to modernize the existing installed basis without replacing the system, and to simultaneously provide a high level of security for previously made investments.

For this purpose, Siemens has been offering optimized migration solutions for the transition from TELEPERM M to SIMATIC PCS 7 for a number of years.

Thanks to our comprehensive range of migration products and services, you can follow an individual migration strategy with a time schedule matched to your specific requirements.

Important influencing factors include:

- Capital requirements
- Interruption of production
- Personnel requirements

"We do not dictate a specific strategy for you – we offer various options which you can implement step-by-step!"

Essential for a good migration strategy is a stable, future-oriented automation technology which can be effectively applied with the existing TELEPERM M systems. The state-of-the-art SIMATIC PCS 7 process control system – the central component of Totally Integrated Automation as the future-oriented system platform – sets the standard here.

The migration possibilities based on it allow you to reuse components worth retaining, with simultaneous realization of all advantages provided by SIMATIC PCS 7.

- Tool-based conversion services for the function-oriented conversion of AS engineering data to SIMATIC PCS 7

- SIMATIC PCS 7 operator stations (OS)
  With connection to the TELEPERM M automation systems in order to operate the plant with new HMI technology
- Tool-based conversion services to automatically convert the existing process graphics into corresponding images for SIMATIC PCS 7 operator stations (OS)
- SIMATIC BATCH
  Connection of a new batch system to the phase and recipe logic of the existing automation systems (AS)
- Engineering libraries for SIMATIC PCS 7 AS and OS
  Function blocks, faceplates and dynamic HMI elements in SIMATIC PCS 7 which implement equivalent TELEPERM M functionalities
- Network gateways
  For peer-to-peer communication between existing automation systems and the new SIMATIC PCS 7 automation systems
- I/O integration to SIMATIC PCS 7
  Further application of existing I/O subsystems (field devices, field terminations and I/O modules) on a new SIMATIC PCS 7 automation system
- Field Termination Adapters (FTAs)
  Retention of existing field cabling through 1:1 replacement of existing field terminations by the new, compatible FTAs (same component size and function) and standardized cabling to SIMATIC PCS 7 I/O modules

Summary of migration products

HMI	PCS 7/TM-OS as single-user or multi-user system with client/server architecture, optionally with faceplates in TELEPERM M and PCS 7 layout, also with: ■ Connection to TELEPERM M CS 275 plant bus ■ Double-channel functionality for simultaneous use of an OS server/single-user system on the TELEPERM M and SIMATIC PCS 7 plant buses (CS 275/Industrial Ethernet)
Communication	■ GT104CS gateway for AS-AS communication not limited to a specific plant bus segment between TELEPERM M AS on CS 275 and SIMATIC PCS 7 AS on Industrial Ethernet ■ PROFIBUS AG-AG as additional data bus parallel to the plant bus for communication between AS x88/TM themselves and with SIMATIC S7-300, S7-400, S5-95F/U, S5-115U, S5-135U and S5-155U automation systems
Automation	■ PCS7/TM-EA migration package for use of TELEPERM M AS with SIMATIC PCS 7 AS and integration of existing TELEPERM M I/Os
Process I/O	Distributed I/O on the PROFIBUS DP and DP expansions for AS 488/TM for plant expansion or for new plants, in addition to or as alternative to existing TELEPERM M I/O; on 2 physically separate DP segments of the AS 488/TM with max. 122 participants each: ■ ET 200M distributed I/O devices (main I/O range) with S7-300 I/O modules, SIWAREX M function module and CP 342-2 communications processor for connection of the AS-Interface fieldbus ■ ET 200S, ET 200iSP distributed I/O ■ PROFIBUS PA fieldbus (connection using DP/PA coupler or DP/PA link) ■ AS-Interface fieldbus (connection using DP/AS-i link) ■ SIMATIC S7-300, S7-400 or third-party systems, connection using DP/DP coupler) ■ SIMATIC S7-300 (slave connection using DP connection in the CPU module)

Possible migration paths

The most commonly applied migration paths are:

- TELEPERM M OS migration
- Plant expansion with PCS 7/combination of TELEPERM M and PCS 7
- Replacement of controller level with retention of I/Os
- Complete replacement of TELEPERM M components
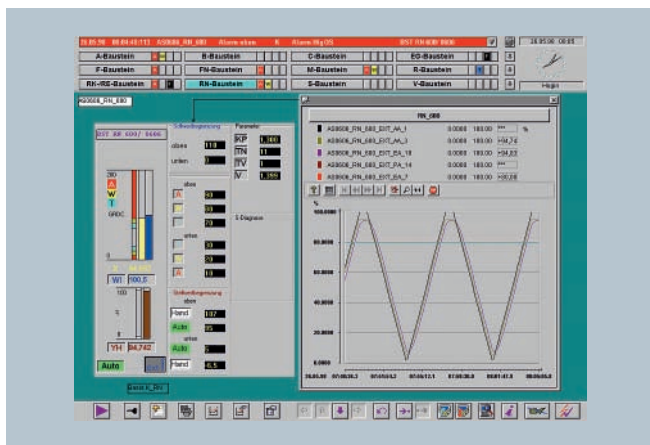
PCS 7/TM faceplate

TELEPERM M OS migration

In this case, a modern OS replaces the old OS 262, OS 265 and OS 520/525 systems. The automation system and field connection level remain unchanged. The OS configuration data can be converted using tools.
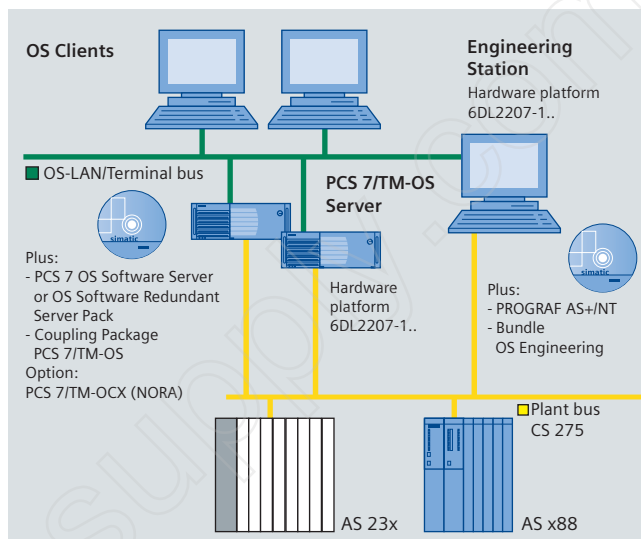
Sketch of TELEPERM M OS migration

Advantages:

- Saves time and money
- No new configuration necessary
- Degree of recognition for visualization is very high. Operators require only a short acquaintance time.

New possibilities can be used:

- Improvement in process visualization through increased resolution, window technology, hierarchy model
- Saving of resources and improvement in quality through integration of a management execution system

Plant expansion – combination of TELEPERM M and SIMATIC PCS 7

Plant expansion and combination of TELEPERM M and SIMATIC PCS 7 plant components are possible using:

- Common HMI with two-channel OS (PCS 7 and TM)
- Gateway to AS-AS communication
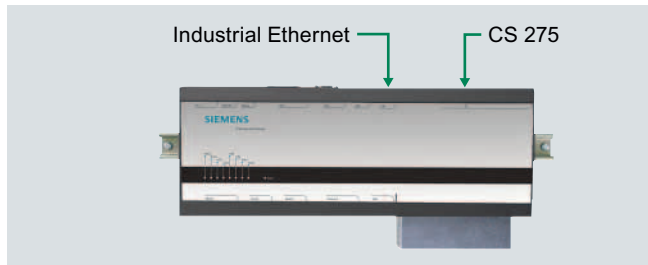
GT104CS gateway

The owner of a plant completely applies SIMATIC PCS 7 system components for modernization or expansion, with the option for further use of existing TELEPERM M I/Os.

The existing plant is expanded by further plant components, where the old system is initially retained and SIMATIC PCS 7 is installed for the expansion.

In this manner, a plant owner can use all advantages of this powerful system generation without limitation, and profit from their continuous further development.

Modern conversion tools for the existing user software permit fast and reliable conversion, where it is possible to consider both sector-specific properties and special plant solutions.

If old and new systems are combined under a common, new OS level, operators can profit from the uniform look & feel for both systems.

Engineering libraries of SIMATIC PCS 7 which simulate the functionality and response of the old systems facilitate famil-iarization for the technical personnel and the maintenance functions.

The step-by-step modernization using a new plant component permits functional expansions such as fieldbus technology, IT integration, Totally Integrated Automation and much more without having to immediately replace the complete system.
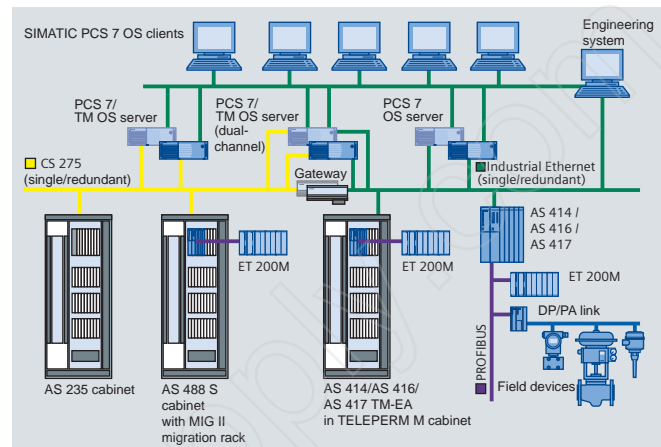
SIMATIC PCS 7 plant with integrated TELEPERM M I/Os

Advantages:

- Simple, step-by-step increase in production capacity and flexibility
- Supports trouble-free introduction of new technologies (e.g. fieldbus)
- Permits networking with ERP systems as well as improved IT integration
- Permits visualization of various automation systems on a common HMI
- Facilitates the introduction of new HMI technologies for the operating personnel

Replacement of the controller level with retention of the TELEPERM M I/Os

MIG II migration rack

The process I/Os of existing plants with their extensive wiring and routing, large stock of I/O modules, power supply units, cabinets and sometimes Ex isolating devices represent, together with the plant's documentation and the maintenance personnel's know-how, a highly valuable asset. Siemens therefore offers plant owners the possibility to preserve and use these resources for as long as possible.

They are supported in this by the PCS 7/TM-EA migration package and by the solution services which are available for the on-site conversion of the AS as well as the user's TELEPERM M automation system in a SIMATIC PCS 7 structure.

The PCS 7/TM-EA migration package combines a SIMATIC PCS 7 automation system with the components required for interfacing the TELEPERM M I/Os in an MIG II migration rack. This rack offers five additional slots for TELEPERM M I/O modules, and replaces the rack with the CPU in the TELEPERM M basic cabinet of the automation system to be migrated.

Advantages:

- Minimized assembly requirements
- Retention of field wiring
- Low test requirements
- No new signal check
- Retention of field documentation
- Minimum downtime
- No additional space requirements

The know-how incorporated in the application software represents a large part of the total investment volume.

Hence the quality of its conversion into the new system architecture is a key criterion for a migration's economic efficiency.

Our migration specialists will work with you in drawing up an optimum migration solution for your requirements and the technical conditions of your plant. In addition to the complete migration of your plant, we provide services for single phases of the migration process, e.g. AS conversion with retention of the TELEPERM M I/Os – all from one source.

And we can also provide you with fast and reliable conversion of your user software for use on the new system platform. In doing so we make allowance for sector-specific properties as well as special plant solutions. As a result of the modern tools that we developed ourselves, you are provided with software of consistent high quality and reliability. All conversion steps implemented are documented.

AS migration means extensive retention of engineering functions optimized over many years:

- Tool-based conversion of engineering data by experienced migration experts using powerful software tools
- Conversion into any target libraries and standards possible
- All SIMATIC PCS 7 functions can be used

Advantages:

- Optimized engineering functions are retained as far as possible (operating concepts/process engineering know-how)
- Nevertheless, the complete scope of SIMATIC PCS 7 functions can be used

Complete replacement of TELEPERM M components including the TELEPERM M I/O modules

In order to immediately profit from all advantages of the SIMATIC PCS 7 process control system and to avoid future bottlenecks with spare parts for the TELEPERM M systems, comprehensive modernization in one step can well be meaningful.

In this case, the TELEPERM M system including the I/O modules is replaced by the modern SIMATIC PCS 7 control system, if necessary also during ongoing operation to avoid production downtimes.

With this scenario, the existing instrumentation as well as the complete cabling up to the control cabinet are retained. Tools can be used to convert the existing user software to the new SIMATIC PCS 7 system platform.

Advantages:

• Prewiring in the factory
• Functional test in the factory
• No additional space requirements
• No limitation in design
• Extension of TELEPERM M service life
• Minimization of Total Cost of Ownership through
• Further application of TELEPERM M

Other conditions:

• Handling of field cables
• TELEPERM M components must be converted
• Loop test must be carried out
• Longer conversion time on site

When replacing the TELEPERM M I/O modules, two versions are distinguished depending on the physical situation on site.

Version 1

The SIMATIC PCS 7 AS including ET 200 is installed in the existing TELEPERM M cabinet. The cabling is retained up to the connection point on the cabinet terminal block (SAE).
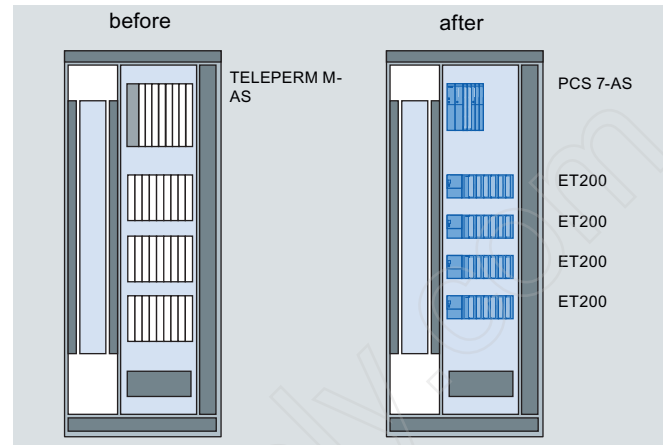
Replacement of TELEPERM M I/O modules by ET 200, version 1

Version 2: Adapter solution

Adapter solutions are available if conversion during ongoing operation is not possible, and if the downtimes nevertheless have to be very short during the conversion phase.

The PCS 7 AS including ET 200 is then installed in a new cabinet. The field cabling is retained up to the rear of the old TELEPERM M I/O rack. Routing from the old TELEPERM M I/O rack to the SAE in the new PCS 7 cabinet is via a universal adapter cable.

Version: complete additional cabinet

*   Fieldbus cables are left in the old cabinet
*   Internal connections are left in place
*   Plug connection from rack to SAE in the new cabinet

Advantages:

*   Prewiring in the factory
*   Functional test in the factory
*   Field cables are not moved
*   No limitation in design
*   Only one adapter for all types of module (1:1 wiring)
*   Short conversion time on site
*   Contains fewer plant components
*   Comprehensive investment security
*   Retention of acquainted plant structure
*   Minimized assembly requirements
*   Low test requirements
*   No new cables for field and switchgear
*   Retention of field documentation (option)
*   Minimum downtime
*   Graded concepts can be implemented
*   Plannable costs

Other conditions:

*   Space for new cabinet required
*   Intermediate routing in the new cabinet from SAE to ET 200M modules

before   after

Replacement of TELEPERM M I/O modules by ET 200, version 2
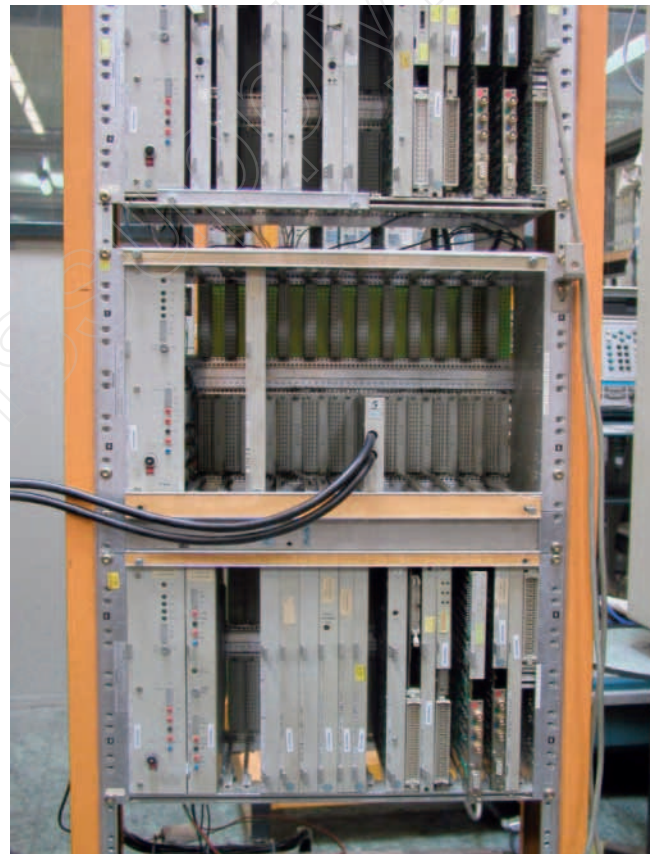
Conversion using adapter solution

Services

Combined competence for first-class solutions

Expert know-how for migration

The Siemens migration specialists are familiar with the systems technology behind TELEPERM M and SIMATIC PCS 7 and have many years of experience in engineering, commissioning and service. Siemens combines the know-how for TELEPERM M modernization in Migration Support Centers (MSC).

The MSC specialists of Siemens offer you support from initial consulting (e.g. plant analysis) up to project handling. In addition, Siemens cooperates with competent partners in order to guarantee successful and efficient migration.

Plant owners can then be sure that they receive an optimum migration solution as a result of the efficient partnership between system integrator and Siemens. There are many reasons in favor of Siemens as your automation partner with a future.

With the innovative SIMATIC PCS 7 process control system, flexible migration solutions and services as well as sector know-how, migration experience gained over many years, and global support, Siemens offers an unbeatable mix with maximum added value for his customers.

The MSC specialists will inform you about the migration options available, analyze your plant, provide you with individual consulting and prepare a detailed migration concept on request.

They will join you in drawing up an optimum migration solution for your requirements and the technical conditions of your plant.

In addition to the complete migration of your plant, the MSC provide services for single phases of the migration process, such as AS conversion with retention of the TELEPERM M I/Os – all from one source.

And the MSC can also provide you with fast and reliable conversion of your user software for use on the new system platform. In doing so we make allowance for sector-specific properties as well as special plant solutions. As a result of the modern tools that Siemens developed himselves, you provide software of constant quality, reliability and verifiability.

Determine the right path with expert help

- Concentration of experiences gained with TELEPERM M migration in the Migration Support Center (MSC) in Karlsruhe
- Comprehensive knowledge and know-how
- Development and maintenance of powerful tools
- Migration concepts and consulting providing optimum solutions for your plant
- Estimation of costs for the corresponding migration concepts

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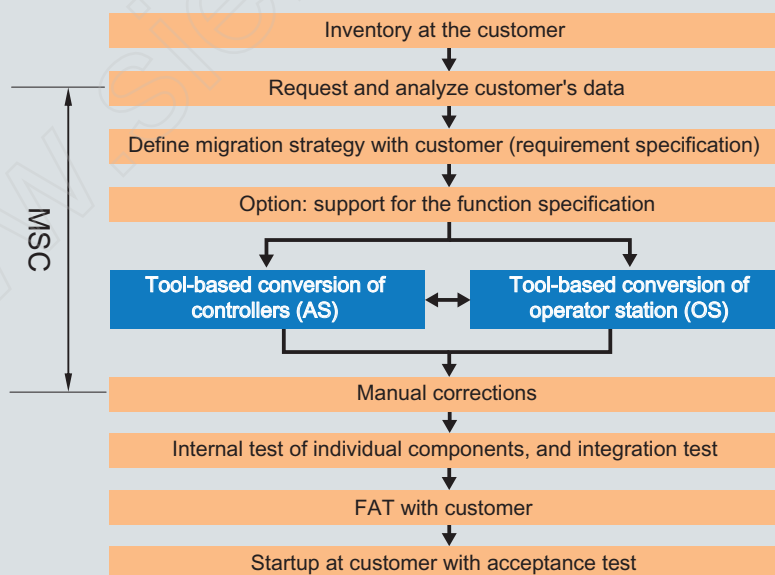
Possible execution steps with support of the MSC

References

Many migration projects have already been carried out successfully in many different industrial sectors.

Further references for TELEPERM M migrations as well as for other systems are available at:

www.siemens.com/simatic-pcs7/migration

Reference example

Customer: StatoilHydro

- 12 oil & gas rigs (No. 4 Offshore)
- 7 rigs with TELEPERM M

Oseberg Feltsenter offshore rig

- 140 km west of Bergen (North Sea)
- Daily production: 194 000 barrels of oil and 5.9 million m^3 of gas

Decision criteria in favor of Siemens

- State-of-the-art DCS based on TIA
- Homogenous integrated fail-safe technology
- Integrated "PROFIBUS" fieldbus
- Price/performance ratio
- Good experiences with Siemens over many years

PCS 7 quantity size

- 108 controllers (417F/FH) with 38 000 I/Os
- 6 redundant OS servers
- 13 standard clients
- 3 clients in hazardous area
- 3 clients with large-screen displays
- 4 engineering systems

Project specialties

- Migration in several steps:
  - Additional new HMI (PCS 7 OS)
  - Replacement of TELEPERM M OS
  - Step-by-step conversion of measuring circuits ("circuit by circuit")
- Conversion of plant during ongoing production (no shutting-down of plant)
- Tool-based conversion of application software (both for OS and AS)

Further reference projects on request.