Migration Guide

Migration SIMATIC S5 - SIMATIC S7

Version 1.0 - December 2007

Plant Audit — Analysis — Strategy — Review

Specification — Planning — Quotation — Migration until FAT
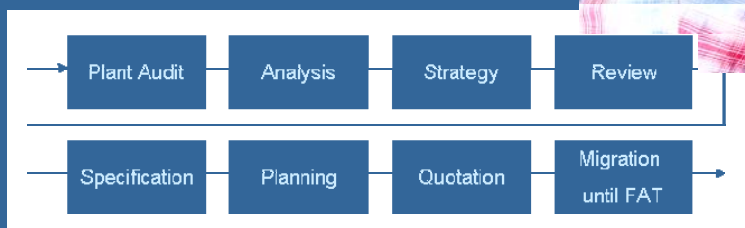
service

& SUPPORT

SIMATIC S5 to S7 Migration

SIEMENS

Foreword

This «Migration Guide» deals in particular with the «SIMATIC S5 to SIMATIC S7 Migration Concept for Siemens AG, Automation and Drives (A&D)». In particular, it describes the structured procedure for migration projects in the field of automation technology. You can refer to this guide for a coordinated procedure for migration projects. At the same time, it promotes greater understanding by shedding light on processes and their mutual relationships.

Sections 1 and 2 discuss the necessity of migration in detail, with theory backed up by the practical example of «MIGHOLZ»[1]. «MIGHOLZ» is a simple example encompassing PLC, NET and HMI components. Sections 3 to 6 present the various strategic approaches and possible courses of action, and the concept of a «fall-back strategy» is also a key issue.

Sections 7 and 8 deal with implementation. The «Siemens Solution Partner» service and partner strategy, relevant in this context, is also considered.

Throughout, particular emphasis is placed on increasing awareness of all support tools available at Siemens, (e.g. «SIMATIC Spare Part List», «CA01», «Cross Reference Tool»), of checklists, service processes and supporting organizations (e.g. Customer Support (CS), Center of Competence (CoC), Industrial Solutions and Services (I&S) and Siemens Solution Partners).

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[1] Project name of a wood-processing machine

Contents

Introduction

SIMATIC S7 was introduced in 1995. Since then, various transition strategies have been developed to enable customers to modernize their system with maximum protection for their investment.

Looking back, it is clear that modernization procedures of this kind have been successfully put into practice around the world over the last ten years. However, a great number of SIMATIC S5 systems are still installed today. Now, with final discontinuation pending (see box) and the resulting limited amount of modules in stock, it is high time to suggest concrete measures to operators of systems controlled by SIMATIC S5, and to jointly tackle the matter of their migration.
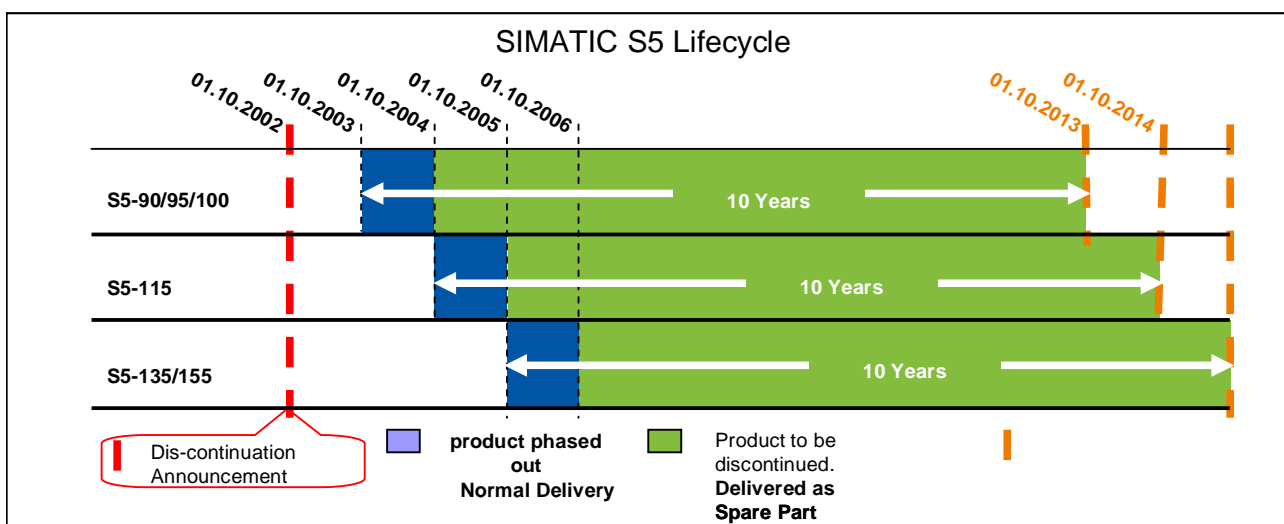
Figure 1-1: Product discontinuation of SIMATIC S5 (source: A&D AS, Nbg-M2002)

Comment on the discontinuation of the SIMATIC S5 system:

Discontinuation dates and phase-out procedure are described in detail in the following article on the Internet/intranet: Article ID:13266996 Date:2002-11-04

http://support.automation.siemens.com/ww/view/de/13266996

Operators of an in-service SIMATIC S5 controller generally understand the numerous functional improvements of the new automation family. However, this is often not sufficient to move them to take the necessary steps towards modernization. This «Migration Guide» therefore flags up further arguments in favor of migration and presents the benefits in a clear and comprehensible manner.

The customer should gradually come to the conclusion himself that modernization is necessary and should be initiated together with Siemens.

The additional arguments are set out and explained with the aid of an 8-stage model. This tried and tested guide indicates possible methods as well as available tools and strategies.

The diagram below provides an overview of the progression through the individual stages:
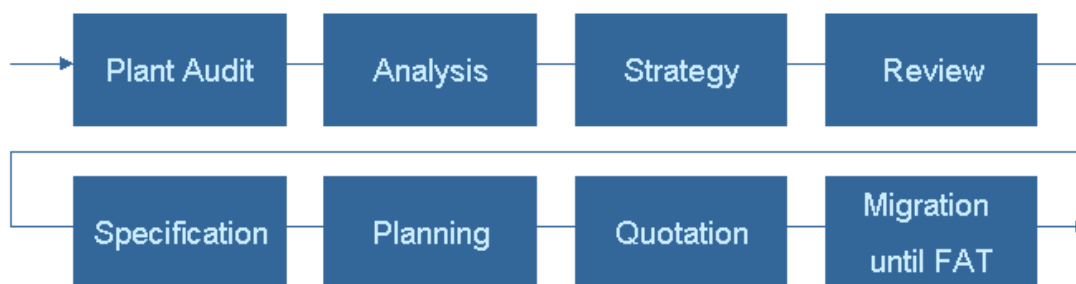
Figure 1-2: 8-stage model

The 8 stages in brief:

Stage	Designation	Description	Driver
1	Plant Audit	**Documentation of the status quo** All control and system components are covered.	**Siemens/**Customer/ Solution Partner
2	Analysis	**Analysis of the installed base** The status of all components in the product lifecycle is examined.	**Siemens/**Customer/ Solution Partner
3	Strategy	**Definition of possible courses of action** All options are considered; there is no pre-selection on the basis of supposed obstacles.	**Siemens/**Customer/ Solution Partner
4	Review	**Determination of solutions, products and standards** A decision is taken concerning the solutions, products and standards to be employed.	**Solution Partner/** Customer/Siemens
5	Specification	**Examination of specifications** All specifications for basic and additional functions are examined under the microscope.	**Solution Partner/** Customer/Siemens
6	Planning	**Drawing up the migration plan** Technical planning and setting of deadlines for the various stages of migration.	**Solution Partner/** Customer/Siemens
7	Quotation	**Drawing up a quotation** The structure and content are defined.	**Solution Partner/** Customer/Siemens
8	Migration until FAT	**Throughout the migration project** Active project support backed up by the entire service and support portfolios.	**Solution Partner/** Customer/Siemens

Table 1-1: 8-stage model

The first step, «migration kickoff»

Before Stage 1, the Plant Audit, can commence, all the important key parameters relevant to migration must be clarified. For this, an interview is recommended. The key issues and areas of discussion to cover in this interview are described below, and the subsequent analyses can assist with implementation.

A «migration kickoff» presents new opportunities and advantages, as well as the procedure and the Siemens migration offer. This phase is critical – in the end, the customer is being encouraged to make an investment, which must be shown to bring direct additional benefits. Furthermore, in the case of complete migration, another manufacturer may come under consideration. Personal, on-site contact is therefore highly recommended.

Content:

- Limitations:
    o of buildings/systems/machines
    o anticipated service/operating life

- Procedure:
    o Explain 8-stage model
    o Present partner program
    o Discuss cost aspects

- Deadlines and declaration of intent
    o Note customer's desired deadlines
    o Clear understanding of further procedure

The «Migration Guide» provides the following resources to assist you:

- Checklist for the kickoff interview   -> Annex 2
- Presentation aids   -> Enc. «Introduction Migration_xx.ppt»
- Cost guidelines for migration work   -> Annex 4

1 Stage 1: Plant audit - Examination of status quo

1.1 Basic situation and objectives

The objective of Stage 1 is the complete documentation of installed components. Since we can assume that controller and system documentation will vary in quality, this guide explains how to perform a complete actual audit of the system or machine. Available spare parts stocks are also audited. This creates a uniform base for further procedure, and brings both parties their first benefit: the thorough documentation of all system parts, controllers and modules.

1.2 Activities and procedure

Ideally, the on-site audit is performed by two employees. Reading the machine-readable product designation (MRPD), versions and dates of manufacture requires great concentration and perseverance. Controllers are sometimes installed in locations with poor access. The audit can be made even more difficult by extreme environmental conditions, such as high or low temperatures, dirt, explosive atmospheres or poorly lit areas.

During the audit, each controller is assigned a unique number. These numbers are independent from a general plant designation (AKZ).

We recommend that you attach the label in a location offering good visibility - preferably on the inside of the control cabinet, in the immediate proximity of the controller. It is not a good idea to attach labels to covers, manhole covers or individual modules, as these may be removed during general troubleshooting, and the labels lost..

Practical example:
The controller is assigned a unique number (e.g. SIM2102).

Figure 1-3:   Label

Next, all components are audited. For manual documentation, use a Component Documentation Sheet (see Figure 1-4).

Figure 1-4:   Component Documentation Sheet

Manual documentation has proven its worth in the field. The use of barcode scanners is impossible, as they can only read the MRPD on the front of the SIMATIC modules. As a rule, barcodes are affixed to the connector of the printed circuit board.

Number all the audit sheets, label them and write the controller number on them. Next, perform the electronic audit in the office. No matter which software or tool you are using for this – you must be able to export the MRPD in tabular form in preparation for the next stage. The MRPD is all that is required for the Stage 2 spare parts analysis with the aid of the «SIMATIC Spare Part List».

1.3   Helpful information, tools and checklists

We do not recommend direct, electronic documentation on-site using a PC, laptop or programming device. It is more efficient to write on paper with a suitable pad beneath. A commercially available aluminum pad with paper clamp has proven itself to be suitable for this purpose.

Enc.:

- Component Documentation Sheet   see Annex 3

Comment on the MRPD Manual:

In the MRPD Manual, you will find all relevant information about the MRPD number system in PDF format. The manual was published by the MRPD Central Working Group for the departments A&D, I&S, SV, PG, PTD and TS.

http://intra1.nbgm.siemens.de/doku_online/html_00/mlfb.htm

1.3.1   Required basic knowledge and skills

Employees who are entrusted with performing audits should

- o   have in-depth product knowledge of the SIMATIC S5 and S7
- o   be familiar with the MRPD product designation
- o   write legibly and express themselves clearly
- o   be aware of the relationships between industrial systems and controllers.

1.3.2   On-site conditions

The following conditions must be satisfied:

- o   The customer, system and machine operators and maintenance personnel have been informed about the audit.
- o   Unrestricted access to all components is assured.
- o   If necessary, systems must be made safe and/or secured so that they cannot be switched on.
- o   It must be possible to switch a system off for a brief time..

1.4 Results on completion of Stage 1

The entire control system is documented in a well-structured way with numbered controllers and parts lists. The customer now has the possibility of requesting regular checks of his installed components. Additional information and requirements have already been systematically recorded.

As a result, documents can be produced, which are handed to the customer and so help to improve the quality of plant documentation. A common basis is created,
i.e. the customer, Siemens and any solution partners have the same documents about the controller in question.

1.5 Implementation of Stage 1 with «MIGHOLZ» as an example

Here, a wood-machining company is used to illustrate the audit, in the form of the «MIGHOLZ» wood-processing machine. Precut wooden battens are conveyed into the machine. Here, they are sawn, ground and then sorted and stacked at the exit. The «MIGHOLZ», manufactured in 1987, is the only system, and is the heart of the production plant. The failure of the «MIGHOLZ» would mean a complete production stoppage. The decision was therefore taken to perform an analysis of the parts used.

Figure 1-5:   Control unit of the «MIGHOLZ» wood-processing machine

Technology used for the «MIGHOLZ»:

The sorting/exit process is controlled by a SIMATIC S5-115U central unit and two ET 100U stations. For operation, an OP393III for inputting setpoints has been installed in addition to conventional buttons, switches and pilot lamps.

The result of Stage 1 is the following list of installed components::

Figure 1-6:   Result of the audit

2 Stage 2: Analysis of the installed base

2.1 Consolidation of intermediate results and objectives

A table of all MRPDs is produced on the basis of the data recorded in Stage 1. All MRPDs must be set out in one column. The numbers are prepared in order that they can be checked in the «SIMATIC Spare Part List».

The aim of Stage 2 is to check all components to see whether they are obsolescent, to be phased out or the type was discontinued (details about Product Lifecycle Management (PLM) are contained in the Introduction). You must take all substitute types into account. It is important that you analyze all data, so that a decision can be made in the subsequent stages. The more information is available, the greater the choice of possibilities and courses of action later on.

Parts list

SIMATIC Spare-Part-List

Data product phased out

Date discontinuation

Expected total discontinuation

Repair code A-D

Figure 2-1: Schematic diagram of the «SIMATIC Spare Part List»

2.2 Activities and procedure

The next step is the spare parts analysis. All the necessary information for this task can be found in the Service and Support Internet/intranet, under the header «Available spare parts».

For the analysis of SIMATIC components, we recommend that you use <u>SIMATIC Ersatzteile inkl.</u> <u>Vorgesehener Produktabkündigung</u>, referred to in the «Migration Guide» as the «SIMATIC Spare Part List».

http://support.automation.siemens.com/ww/view/en/16612315
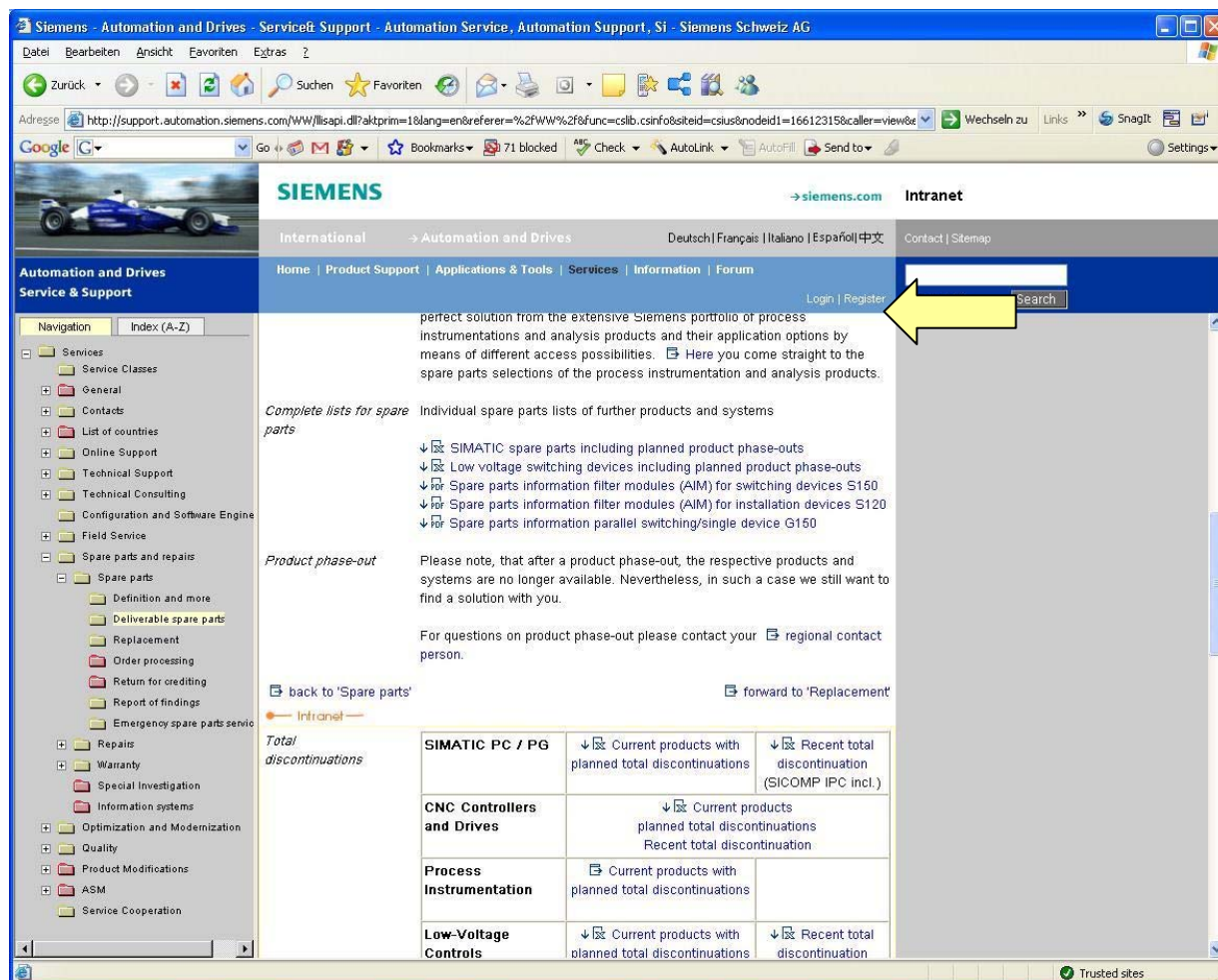
o   Figure 2-2   A&D web page "Available spare parts"

The «SIMATIC Spare Part List» provides an analysis of the following information:

- o   Repair information (classification A to D):

    - A: Repair

    - B: Repairable; no credit

    - C: Repair or credit

    - D: Repair or exchange (return of defective component obligatory)

- o   Date of obsolescence

- o   Type discontinuation

- o   Expected total discontinuation

- o   Successor product

The list is divided into two tabular sheets. In the first table, «Complete List», around 24,000 products are listed. Here, you can check individual modules in the "B" column using search functions.

«Complete List»

Figure 2-3 «SIMATIC Spare Part List»/ 1

In the second table, «Customized List», you can insert a specific component list using the «Copy/Paste» function..

«Customized List»

Figure 2-4:   «SIMATIC Spare Part List»/ 2

In order to obtain all information, carry out a new request with successor types. If successor types still appear in the analysis, repeat the procedure (see red arrow, Figure 2-4).

The available data must now be prepared as the basis for Stage 3 (Strategy). In other words, all critical modules must be recognized and marked accordingly. Critical product: A module can be classed as critical if it has the note «discontinued» in the «SIMATIC Spare Part List» and the date of discontinuation is in the past. This also applies if no successor product is listed, or only one(s) with limited compatibility. In this case action must be taken, because the customer is using a module that is either no longer available as a spare part, or can only be replaced following additional adjustments/with limitations as a result of "limited compatibility".

Examples of examined modules:

Example 1: S5-150A central unit   6ES5150-3AB12   Discontinued on 01.08.1995

If there is no successor product, very long failure times may result if a component malfunctions. For the customer, this means downtimes and therefore production stoppages.

However, it is also important to identify modules that already have «phase-out» status, with a discontinuation date within the next one or two years.

Example 2: CPU 922   6ES5922-3UA11   To be discontinued on 01.10.2010   Successor product CPU 928   ->   To be discontinued on 01.10.2017

Here, a newer product can be used as an alternative. However, this entails time and expenditure, because the products in question have only limited compatibility, and adjustments to the software will be necessary.

2.3   «SIMATIC Spare Part List»

The «SIMATIC Spare Part List» offers several advantages:
- o   Regular, automated updates
- o   Constant online availability
- o   Easy to use

«Version»
«Customized List»
«Complete List»
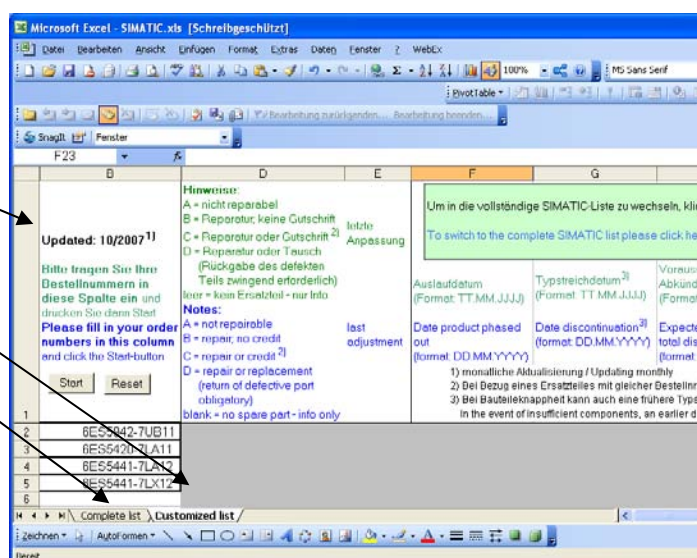
Figure 2-5:   «SIMATIC Spare Part List»/ 3

2.4 Results on completion of Stage 2

The result is a detailed list of individual components and modules. Dates of obsolescence, type discontinuations and expected total discontinuations are clear. The successor types of the individual modules are also specified.

Furthermore, this list provides information about possible repairs, availability of spare parts and replacement. Please note that for modules with status D (repair or exchange), return of the faulty part is mandatory, and the faulty module can <u>only</u> be replaced by an identical part.

2.5 Implementation of Stage 2 with «MIGHOLZ» as an example

The results of the analysis must be presented clearly and comprehensibly, so that they can be discussed with the customer. In the «MIGHOLZ» example, a manually compiled list of all the components used is available.

Item	Order No.	Designation	Date of ob-sole-scence	Type discon-tinuation	Date of ex-pected total disconti-nuation	Footnote	Successor
1.0	6ES5700-2LA12	SIMATIC S5, CR 700-2, S5-115U subrack	01.10.2004	01.10.2006	01.10.2016	No comments	None
2.0	6ES5951-7LB14	SIMATIC S5, power supply unit for 115U/H			01.10.2005	No comments	6ES5951-7LB21
2.1	6ES5951-7LB21	SIMATIC S5, power supply unit for 115U/H	01.10.2004	01.10.2005	01.10.2016	No comments	None
3.0	6ES5942-7UA12	SIMATIC S5, CPU 942			01.10.2002	No comments	6ES5942-7UB11
3.1	6ES5942-7UB11	SIMATIC S5, CPU 942	01.10.2004	01.10.2005	01.10.2016	No comments	None
4.0	6ES5375-1LA21	SIMATIC S5, 375 memory sub-module	01.10.2004	01.10.2006	01.10.2016	No comments	None
5.0	6ES5420-7LA11	SIMATIC S5, 420 digital input	01.10.2004	01.10.2005	01.10.2016	No comments	None
6.0	6ES5482-7LA11	SIMATIC S5, Dig. IN-PUT/OUTPUT	01.10.2004	01.10.2005	01.10.2016	No comments	None
7.0	6ES5441-7LA11	SIMATIC S5, 441 digital output			01.10.2005	No comments	6ES5441-7LA12
7.1	6ES5441-7LA12	SIMATIC S5, 441 digital output	01.05.1999	01.05.1999	01.05.2011	Caution! Now only available as a spare part	6ES5441-7LA13
7.2	6ES5441-7LA13	SIMATIC S5, 441 digital output	01.10.2004	01.10.2005	01.10.2016	No comments	None
8.0	6ES5393-0UA15	OP393-III operator panel	08.10.1999	01.10.2001	08.10.2011	Now only available as a spare part	None

Figure 2-6: «MIGHOLZ» analysis»

Section 2.2, «Activities and procedure», states that so-called critical products are either no longer available, or can only be replaced with additional labor and expense due to «limited compatibility».

In the list shown in Figure 2-6, discontinued modules are colored «red». We now go on to determine whether a successor product - or one with limited compatibility - can be found.

For items 2.0, 3.0 and 7.0, one or more searches produced the following results:

For item 2.0, item 2.1 is a compatible successor product.
For item 3.0, item 3.1 is a compatible successor product.
For item 7.0, item 7.2 is a compatible successor product.

All three items (2.1, 3.1, 7.2) were being phased out in 2004 and will be obsolete by 2016. This means that the components in items 2.0, 3.0 and 7.0 can still be replaced and repaired via the Service route, but not purchased new.

No successor type was found for item 8.0.

There is therefore a need to act for all these components; they must be replaced by up-to-date products.

3 Stage 3: Strategy - Defining possible courses of action

3.1 Consolidation of intermediate results and objectives

The critical components have been identified in Stage 2. Stage 3 entails the definition of all the possible courses of action that come into question. A possible course of action is understood to be a possible response/approach, whereby doing nothing must also be regarded as an option. The following four basic migration scenarios are possible:

1.) Cover existing requirements using spare parts, spare parts concept

2.) Partial migration

3.) Complete migration

4.) Introduce no measures, despite critical components

On completion of Stage 3, all the information required for finding the solution in Stage 4 is at hand. Numerous resources and tools are available. These are described in section 3.3.

3.2 Activities and procedure

It is vital to consider all options neutrally before coming to a decision. If factors such as cost, environmental conditions, migration time, downtime, spare parts procurement, etc. are dealt with at this stage, there is a risk of leaving a possible variant out from the very beginning.

3.2.1 Procedure for each migration scenario

Coverage of existing requirements using spare parts, spare parts concepts
Check the hardware components to find direct successor or replacement types. Successor types may not yet be discontinued, and may therefore still be available. Do this with the aid of the «SIMATIC Spare Parts List» (also see Stage 2).

Partial migration/Complete migration
In the case of partial or complete migration, check all hardware components to find their S7 substitutes. You can do this with aid of the «Cross Reference Tool», which is integrated in the CA01 (described in section 3.3).

Introduce no measures, despite critical components

The Stage 2 analysis indicates the presence of critical components, but the customer has an adequate stock of spare parts, for example.

3.2.2 Evaluation of possible courses of action for each scenario

Different possible courses of action exist for the various migration scenarios. These must be adapted to the customer's needs.

Figure 3-1 provides a schematic overview of the relationships between scenarios, possible courses of action and helpful resources..
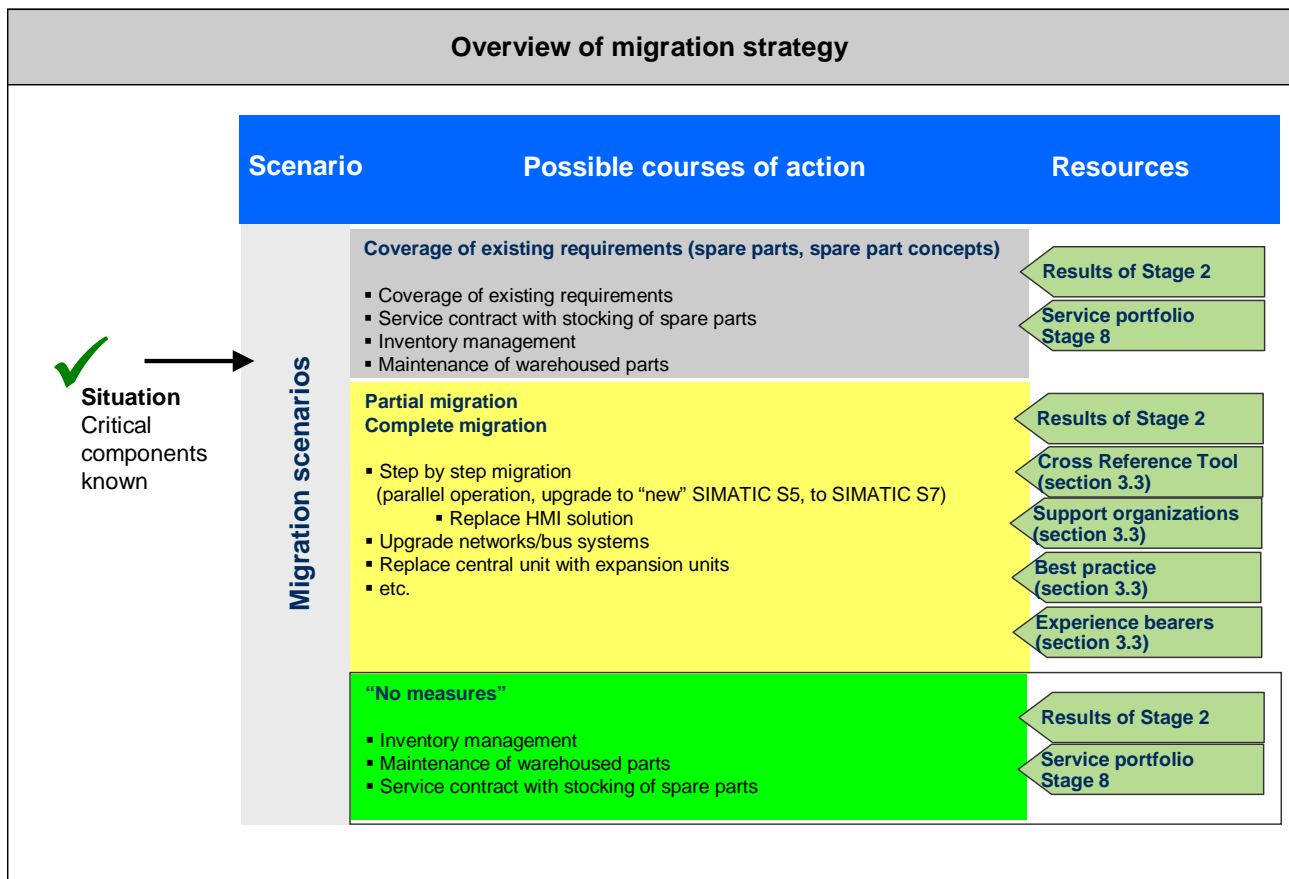
Figure 3-1   Migration scenarios, possible courses of action, helpful resources

An incomplete list of possible courses of action:

- Step by step migration, whereby individual controller components are replaced.
  o Parallel operation of SIMATIC S5 and SIMATIC S7
  o Upgrade to «newer» SIMATIC S5 components by using successor types
  o Upgrade to SIMATIC S7 components
    - Replace the HMI solution
    - Upgrade networks/bus systems
    - Replace the central unit while continuing to use expansion units
    - Spare parts concepts

Note: Following controller migration, the replaced components are available as spare parts for other controllers

Example of step by step migration:

As the first step, only the central unit is replaced, while the peripherals continue to be used. Dedicated connections for the S7-400 exist for this purpose (IM463-2). The expansion units are only migrated in the second phase. I/O adapters are employed to ensure that the connectors of the S5 can continue to be used without the new S7 connectors having to be rewired.

Typical substitution strategies for SIMATIC families
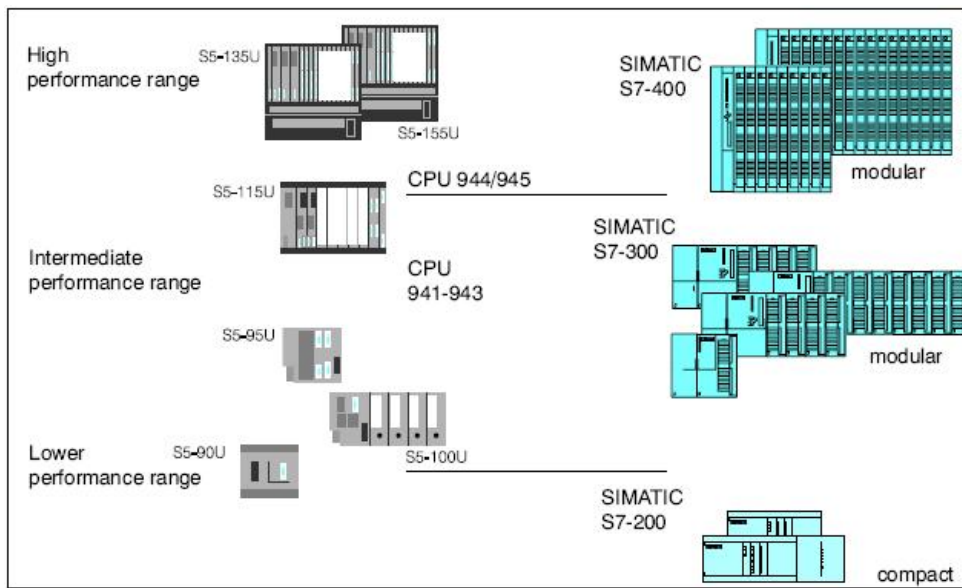
Figure 3-2   Typical substitution of S5 controllers

3.2.3   The fall-back and conversion strategy

In addition to aspects of migration pertaining to specific modules, other important factors must also be considered in Stage 3: the fall-back strategy, software conversion strategies and the migration of system documentation. We now go on to explain their importance and possible approaches to a solution.

Fall-back solution

Migration projects range in complexity from simple to extreme. Consequently, they cannot always be exactly planned, and precautions must be taken to counter the risks involved. Therefore, in each case a fall-back strategy must be defined, which you can turn to if the objectives are not achieved. This is the only way to limit this major risk – the failure of the project as a whole. If unforeseeable problems occur during migration, one – or better still, a chain – of several fall-back solutions is required.

Fall-back scenarios include:

1.) Criteria: Timelines, no return, points of no return, hardware failure
2.) Fall-back solutions: Parallel operation, provisional work-around to complete restoration of the original system

The various stages must be taken into consideration and entered in the project plan. The function of the controller or system is the primary focus.

Suggestions for software migration

Various conversion tools are available for software migration.

These are::

User software	Conversion resources
SIMATIC STEP 5	**See section 3.3** **Manual «From S5 to S7»**
ProTool	***ProTool <2.5.1 to ProTool >2.5.1*** **Possible in ProTool >2.5.1** ***ProTool >2.5.1 to WinCC flexible*** **Possible in WinCC flexible**

Table 3-1 Standard conversion tools

Presentation of documentation conversion

If plant documentation is available for the controller, this must be adapted in line with the new hardware. Ideally, software documentation exists that can be migrated. However, this is mostly not the case. This means that as a rule, the documentation must be compiled and produced from scratch. The amount of time spent on updating documentation varies depending on how well the existing system has been documented. Particular consideration must sometimes be lent to this aspect when drawing up an offer.

3.3 Helpful information, tools and checklists

Helpful tools are resources intended to simplify the individual steps of the migration process. They are used, for example, for software conversion, the selection of hardware components, and to save time on wiring. The most important tools are described below:

3.3.1 Experience reports, support organizations

SIMATIC S5-S7 Migration-Support

You will find all kinds of helpful resources under the «Migration Support» header – from the link to known FAQs to the offer of individual advice and support by the regional SIMATIC contact partner for migration from one product or product family to the next.

http://support.automation.siemens.com/WW/view/en/16612444

Applications & Tools

Here, you will find dozens of articles, applications and tools that can be used to assist you.

http://support.automation.siemens.com/WW/view/en/20208582/136000

Service & Support - Technical Forum

Exchanging advice with experts and system specialists addresses technical problems and enables the transfer of knowledge and experience.

http://www.automation.siemens.com/WW/forum/guests/Conferences.aspx?language=de

Technical Consulting

Technical Consulting provides assistance with the planning and conception of every project. Tailor-made services are offered, from detailed actual analysis and definition of objectives, through advice on product and system questions, to the elaboration of a technical solution.

http://support.automation.siemens.com/WW/view/en/16605680

3.3.2   Cross Reference Tool

The «Cross Reference Tool» is integrated in the CA01 from version 02/2008. It assists with component conversion from S5 to S7.

 ->
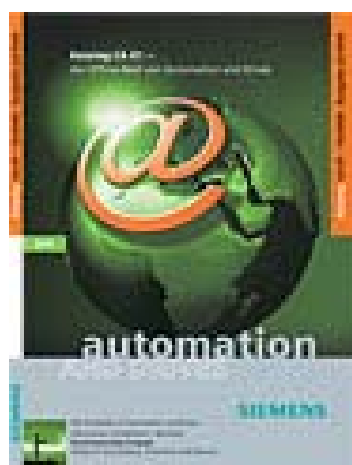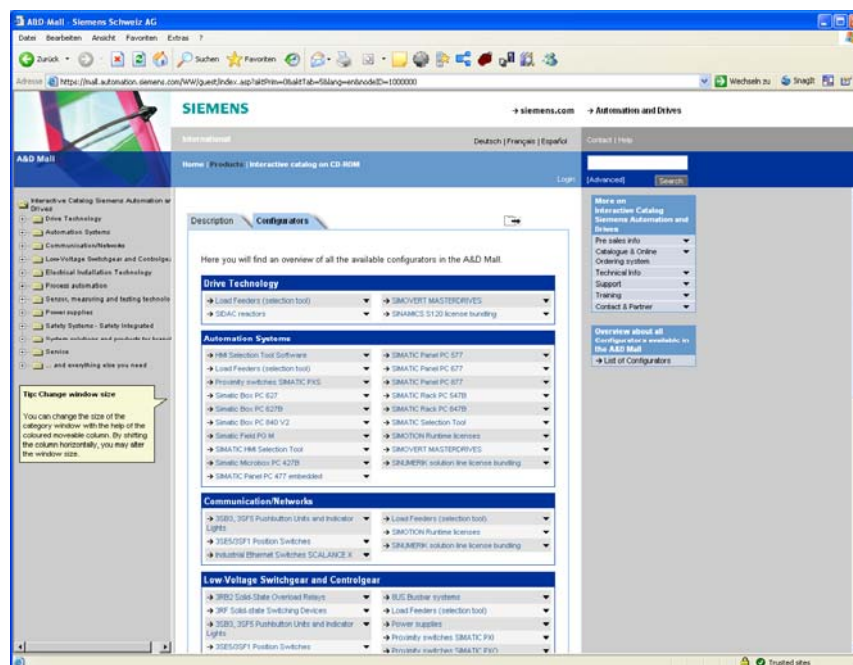
Configuration schemes available in the CA01/MALL to assist with configuration (as at 11/2007)

Conversion guide:

Step 1:   Start the S5 -> S7 Converter from the CA01 File -> Import -> SIMATIC S5
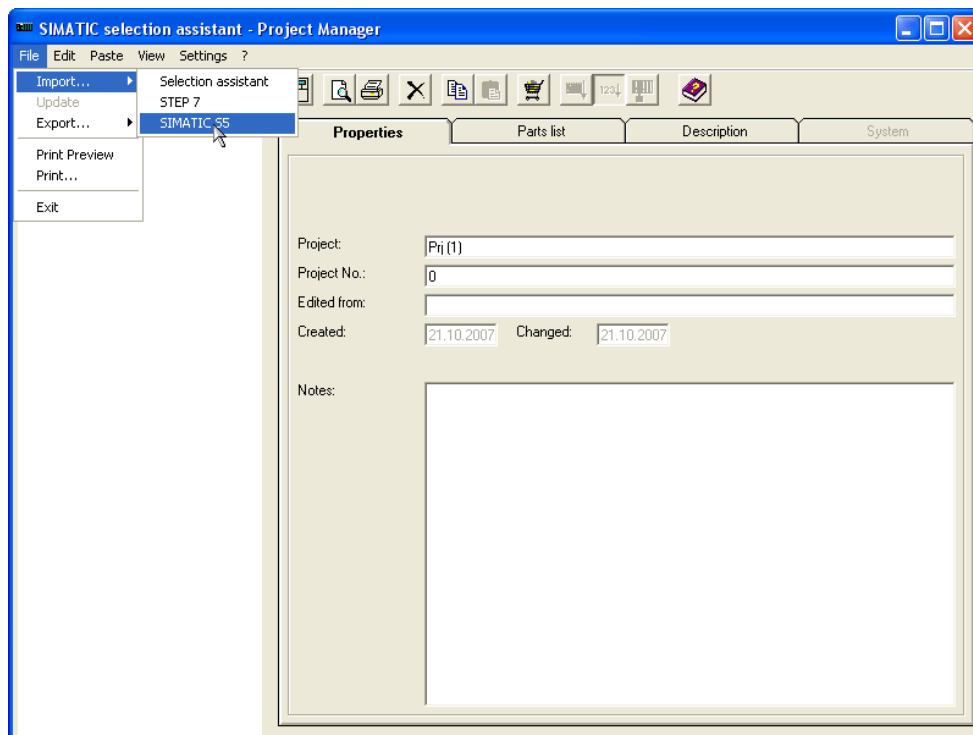
Figure 3-3   Cross Reference Tool

Step 2:   Select the file S5.csv[2] with the S5 components
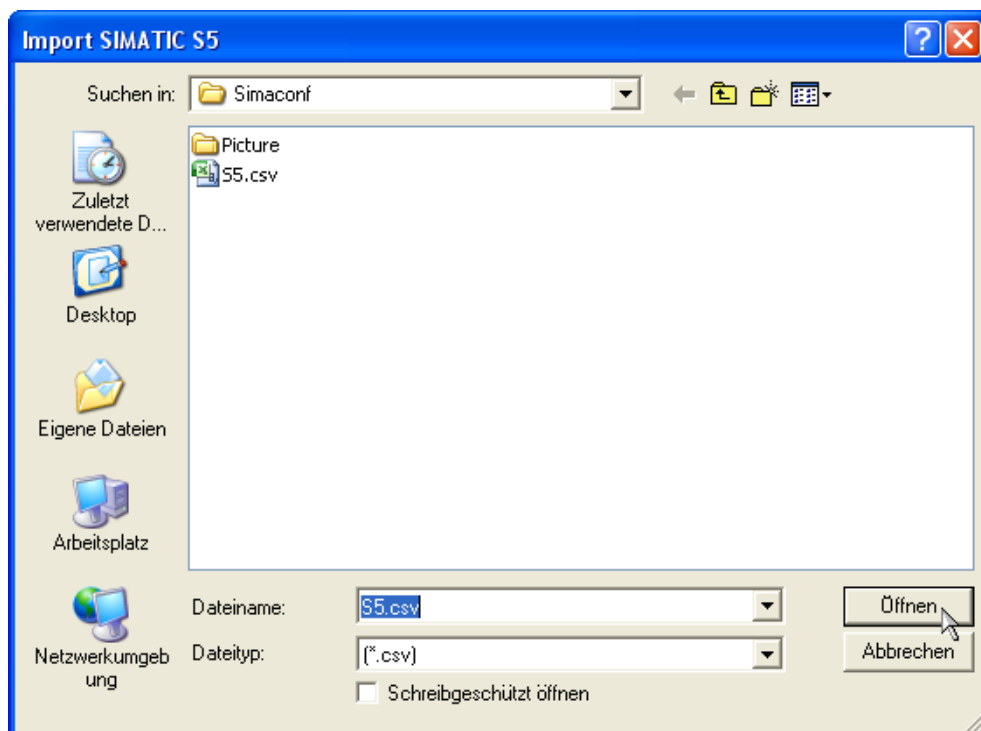
Figure 3-4   Importing the S5.csv

Step 3:   Select the S7 components with the aid of the SIMATIC Selection Assistant
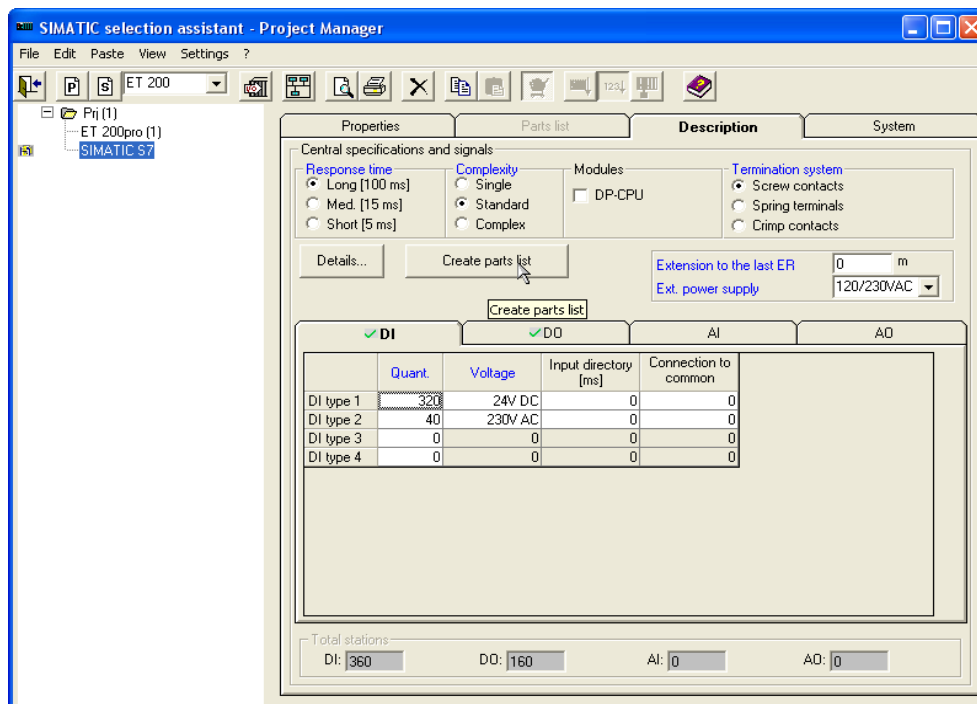
Figure 3-5   SIMATIC Selection Assistant

Step 4:   Identify possible S7 systems

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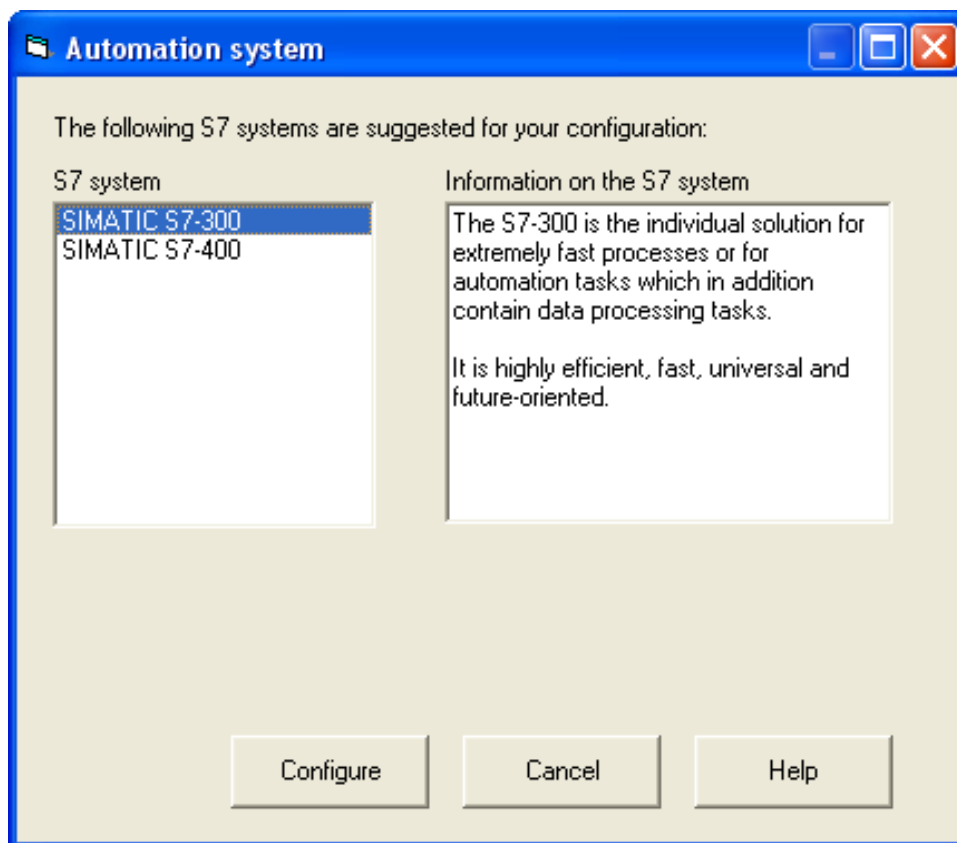
Figure 3-6   Automation System

Step 5:   Compile the module list
Use the list prices from the CA01

Order number	Designation	Quantity	List price	Total price
6ES7307-1BA00-0AA0	Load power supply PS 307; AC 120/230V, DC	1	98,00	98,00
6ES7313-5BF03-0AB0	Central module CPU313C (24DI, 16DO, 4AI, 2	1	791,00	791,00
6ES7321-1BH02-0AA0	Digital input, isolated, 16 DI, DC 24V	1	143,00	143,00
6ES7321-1BL00-0AA0	Digital input SM 321, isolated, 32 DI, DC 24V	9	288,00	2.592,00
6ES7321-1FF01-0AA0	Digital input SM 321, isolated, 8 DI, AC 120/2	1	111,00	111,00
6ES7321-1FH00-0AA0	Digital input module 16 DI, 120/230 V AC; isol	2	184,00	368,00
6ES7322-1BH01-0AA0	Digital output 16 DO, 24 V DC, 0.5 A; isolated	1	199,00	199,00
6ES7322-1BL00-0AA0	Digital output 32DO, DC 24V, 0.5A; isolated	4	399,00	1.596,00
6ES7360-3AA01-0AA0	Interface module IM 360 in central controller ra	1	168,30	168,30
6ES7361-3CA01-0AA0	Interface module IM 361 in expansion unit rac	2	193,00	386,00
6ES7390-1AJ30-0AA0	DIN rail 830 mm	3	42,90	128,70
6ES7392-1AJ00-0AA0	Front connector, 20-pole, with screw contact	5	21,00	105,00
6ES7392-1AM00-0AA0	Front connector, 40-pole, with screw contact	15	33,00	495,00
	Total price:			7.181,00
	Non-binding price recommendation			

Figure 3-7   Project Manager

Structure of the csv file for import in the Converter

MRPD	Qty.
6ES5942-7UA12	1
6ES5420-7LA11	2
6ES5482-7LA11	2
6ES5441-7LA11	3

Table 3-2 csv file (example)

Every MRPD number that starts with 6ES5 is interpreted as an order number, and results in a suggestion for a SIMATIC S7 module.

3.3.3   I/O adapters

The I/O adapters have been developed to enable a controller to be connected to general system peripherals quickly and at low cost for a transitional period. The I/O adapter for the SIMATIC S7-300 or SIMATIC S7-400 therefore connects the old and the new, i.e. it links tried and tested production systems and machines to state-of-the-art automation technology.

In practice, I/O adapters are simple and problem-free to use: Remove the front connector of the digital modules, replace the automation unit, plug the I/O adapter into the new I/O units and reconnect the front connector. The individual components can simply be plugged in. And as soon as the software has been updated, the S7 can go into service.

Advantages:
- The revision of wiring diagrams is reduced to a minimum.
- Signals can be reconfigured via the software by means of the assignment list.
- Machine and system downtimes are reduced to a minimum.
- A fall-back strategy is possible simply by swapping the I/O connectors.

This procedure not only saves considerable time and expense, but also greatly helps to minimize errors.

Disadvantages:

- The mounting depth of the controller is increased by the depth of the I/O adapters.
- Provisional connections result in additional contact crossovers (possible fault source).

Example: S5-135U to S7-400
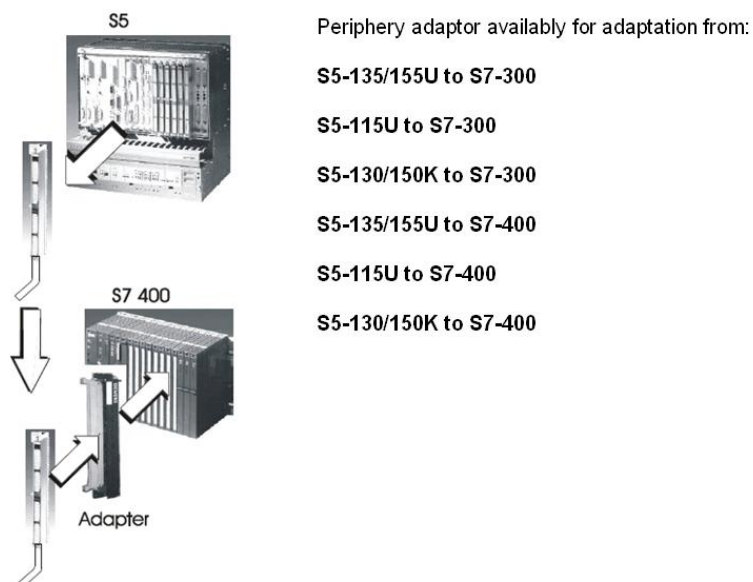
Figure 3-8   I/O adapter

3.3.4   S5 Converter

To carry out file conversion, you will require STEP 7 software. Call the S5 Converter via «Start» -> SIMATIC/STEP 7/Converting S5 Files in the Windows XP taskbar. Before you commence conversion, it is important to make sure that the S5 file that you wish to convert, the cross reference list and, if applicable, the assignment list, are in the same folder (see S5 to S7 Manual).

After it has been started, the S5/S7 Converter opens with the following entry mask:
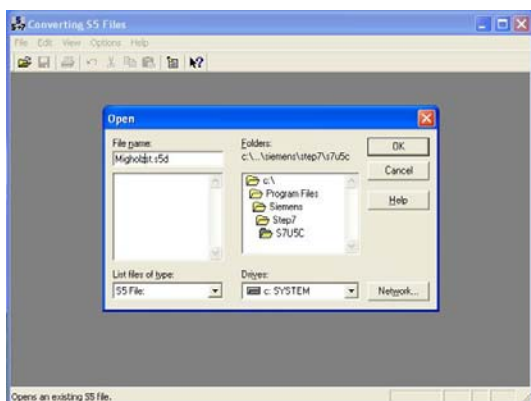
Figure 3-9   S5 Converter

3.4 Results on completion of Stage 3

The result at the end of Stage 3 is the definition of all possible courses of action. It is important not to omit any possible solution, even if a particular variant or element does not initially appear to make sense. Such variants may well produce a combination of different part solutions, which finally result in feasible, successful implementation.

Scheduling is important in this stage. During this process, you must take the discontinuations of the individual modules into account, as the various components may have different discontinuation dates. We recommend drawing up a rough schedule for the next one to two years.

In the next stage (Stage 4), the most practicable courses of action are chosen jointly with the customer from the options defined here.

3.5 Implementation of Stage 3 with «MIGHOLZ» as an example

Summary of conversion results:

The «Cross Reference Tool» suggested an S7-300 as a substitute for the S5-115U. A CPU 315 is definitely recommended for the CPU 942. As both ET 100 slaves have to be replaced, a 2DP version was the best choice. An OP77 was selected to replace the OP393III. It was possible to translate the S5 user program 100%. The OP project could not be migrated using the conversion process. Only the pages could be employed, which provided the basis for the new images in the OP77.

For the four scenarios described in this stage – Coverage of existing requirements using spare parts, Partial migration, Complete migration or No measures – the following possible courses of action have been defined:

Scenario	Possible course of action	
Coverage of existing requirements	**<u>Not applicable</u>**, as the critical components can no longer be ordered.	
Partial migration	Replace the OP393-III that can no longer be ordered or repaired with the successor OP 77, repair remaining modules on failure.	
Complete migration	Replace the controller with a SIMATIC S7-300 and the OP393III with an OP77.	
No measures	None.	

Table 3-3 Possible courses of action for «MIGHOLZ»

4 Stage 4: Review - Determination of solutions, products and standards

4.1 Consolidation of intermediate results and objectives

The objective of Stage 4 is to define the solution. This is achieved on the basis of the possible courses of action elaborated in Stage 3. Together with the customer, decisions are taken in respect of controllers, communication, the HMI solution and communication interfaces. These decisions are based on the advantages and disadvantages in terms of cost, risk, time of interruption due to implementation, additional functions and increased efficiency and productivity. These factors are assessed together with the customer.

Furthermore, the procedure is defined, i.e. a list is made specifying when what has to be done, and how. Finally, a rough time schedule with the individual key deadlines is compiled. In addition, a SIEMENS solution partner is involved in the implementation of the solution (see section 4.6, "The role of the Siemens solution partner in migration projects").

4.2 Activities and procedure

As the first step, the options elaborated in Stage 3 are reappraised on the basis of comparable criteria.

4.2.1 Establishing criteria

Possible solutions are described but not yet evaluated. With regard to the number of criteria, experience has shown that as a rule, «less is more». It is a good idea to concentrate on a few concise points. On the one hand, the amount of work increases the more criteria have to be compared; on the other hand, comparison becomes increasingly difficult.

Moreover, the following aspects must be taken into consideration when selecting your assessment criteria:

- Operationality: Assessment criteria must be accurately described and be measurable.
- Differences: Different assessment criteria must describe different features.
- Mutual independence of benefits: The satisfaction of one criterion must not depend upon the satisfaction of another.

In addition to the technical possibilities, you can also consider customer aspects in this stage:

- Cost
- Risk
- Time of interruption due to implementation

- Additional functions
- Future efficiency savings (e.g. energy) and increased productivity

4.2.2 Rating the criteria

Assessment now takes place together with the customer. How the criteria are weighted depends upon the customer's preferences.

Here, take care to ensure that «K.O. criteria»/must criteria, the satisfaction of which is essential, are evaluated separately from desired criteria, which the customer would like to be fulfilled as far as possible.

Freely scaled degrees of satisfaction and weighting factors, e.g. between 0 and 9, are typical for a simple benefit analysis.

Scaling of degrees of satisfaction: 0–2 points: «poor»

3–5 points: «average»

6–8 points: «good»

9 points: «very good»

Criteria	Degree of satisfaction	Weighting	Result / Rating
Cost of implementation		×weighting factor	
Risk		×weighting factor	
Time of interruption		×weighting factor	
Additional functions		×weighting factor	
Increased productivity		×weighting factor	
Efficiency savings		×weighting factor	
Future maintenance costs		×weighting factor	
Warranty		×weighting factor	
System value		×weighting factor	
Investment protection		×weighting factor	

Table 4-1 Benefit analysis

4.2.3 Presenting and formulating suggestions for implementation

You can present all the possibilities to the customer in a factual, neutral way on the basis of the objective descriptions of comparable criteria. Next, you can evaluate the technical options and customer-specific parameters together with the customer. After this, you must prepare suggestions for implementation.

4.3 Helpful information, tools and checklists

You can obtain helpful information via internal organizations or using internal tools, e.g. from the Center of Competence, the I&S, Customer Support, etc., see also section 3.3.1, "Experience reports and support organizations".

4.4 Results on completion of Stage 4

After the possible courses of action have been evaluated, determine the solution jointly with the customer. We recommend including an alternative scenario (second-best solution) as well. This is because if aspects arise in the next or subsequent stages that cannot be achieved with the chosen option - or only with high expenditure - it must be possible to fall back on an alternative solution. Then, it will not be necessary to go through the entire decision-making process again.

4.5 Implementation of Stage 4 with «MIGHOLZ» as an example

In practice, conditions vary from one case to another, and the customer is not always willing to un-dergo total modernization. Indeed, total modernization is not always possible, particularly in the case of larger plants with numerous expansion units and visualization systems with varying techno-logical levels and ages. In cases such as these, what counts is finding the most ideal solution for the customer.

The options set out in section 3.5 have been presented to the customer, assessed and subjected to a benefit analysis together with the customer (see section 4.2.2). In this analysis, the customer's primary concerns were:

1. Production can only be interrupted for two weeks of the year (plant closure for vacation).
2. Long-term solution, high productivity and low risk are the most important issues.

As a result, the following approach (Table 4-2):

Scenario	Rating	
Partial migration	Replace the OP393-III that can no longer be ordered or repaired with the successor OP 77, get remaining modules repaired on failure	
Complete migration	Replace the controller with a SIMATIC S7-300 and the OP393III with an OP77	
No measures	No measures	

Table 4-2 Suggested solutions

was rated together with the customer as follows:

Partial migration			
Criteria	**Criteria**	**Criteria**	**Criteria**
Risk	5	7	35
Time of interruption	7	5	35
Additional functions	5	3	15
Productivity	6	8	48
Total			133
Complete migration			
Criteria	**Criteria**	**Criteria**	**Criteria**
Risiko	9	7	63
Time of interruption	6	5	30
Additional functions	5	3	15
Productivity	9	8	72
Total			180
No measures			
Criteria	**Criteria**	**Criteria**	**Criteria**
Risk	0	7	0
Time of interruption	9	5	45
Additional functions	0	3	0
Productivity	2	8	16
Total			61

Table 4-3 Rating the suggested solutions

On this basis, the customer decided in favor of complete migration.

4.6 The role of the Siemens Solution Partner Program «SPP» in migration projects

A&D boasts a highly qualified Solution Partner Program, in which experience and proximity to the customer are of prime importance. This partnership aims to achieve benefits for all concerned (customer, solution partner and A&D). In the matter of migration projects, it provides cooperation on the level of strategy, operations and distribution. Together with certified partners, made-to-measure solutions are achieved, thereby producing a competitive advantage in the market. The right approach for successful cooperation depends upon each partner's service portfolio and service offer. And this approach produces various possibilities with different requirements:

Description of cooperation	Role of Siemens
Partner provides service together with Siemens	Support, special areas, specialist knowledge, maintenance work
Partner provides service independently	Support on threat of shutdown, specialist knowledge, escalation support, global services and maintenance work

Table 4-4 Partner cooperation model

The responsibility for implementation grows with each implemented stage of a migration project. Since in the end, the responsibility for migration and the associated obligation must be borne by the partner executing the work, we recommend actively involving certified solution partners in implementation stages 4–8, at the latest. Also see Table 1-1 on page 7 (8-stage model).

5 Stage 5: Specification - Examination of additional specifications

5.1 Consolidation of intermediate results and objectives

In Stage 5, additional system/machine upgrades and expansions are defined on the basis of the solution selected in Stage 4. Basic requirements and additional functions are set out and specifications drawn up. These are generally documented in a performance specification.

5.2 Activities and procedure

First of all, possibilities for improvement must be identified and described, and subsequently analyzed and weighted. The bases for making a decision on further planning will only be available when the various possibilities have been addressed.

5.2.1 Evaluation of requirement specifications

New control systems are higher-powered in terms of cycle time and memory size. It is therefore generally safe to assume that controller performance will be increased.

Drive systems display marked improvements in terms of energy efficiency. Therefore, the question arises as to what effect this will have on the productivity of a controller or machine/system. You should now discuss the potential of these new possibilities (e.g. higher unit numbers, faster throughput, more precise processing, or even just a larger number of messages) with the customer.

Below is a list – not intended to be exhaustive – with technological developments, which can be used as the basis for looking at additional requirements:

Technology	Description	Potential		
PLC/controller	PC, controller, CbA, SCADA-based	Improved performance	Fewer interfaces	Soft controller
HMI	Graphics	Archive	Trend curves	Reporting system
NET/Profibus	Profibus DP	PLC/PLC link	Higher data throughput	Diagnostic capability
Safety/PROFISafe	EMERGENCY STOP	2-handed trigger	Machine directives	Standards
Ethernet/Profinet	Connection to IT network	Remote	I-WLAN	Condition monitoring

Table 5-1 Technological developments

5.2.2 Examination of requirement specifications

If upgrades/expansions are required in addition to the planned migration, you must examine whether these can be incorporated in the migration process or must be implemented on its completion. Just because something is possible, it is not necessarily sensible.

Particular attention must be paid to the surrounding systems. If the control cabinet contains further components that must be examined more closely due to their age, this should also be taken into consideration. There are also components that can now be replaced thanks to the replacement of the controller, such as replacing a hardware controller by a software version. Once you have determined the products and components, you can start to plan their integration in the existing environment. Take care to ensure that sufficient space is available for fitting new parts. Carry out measurements for this purpose. It is important to comply with the mounting specifications of new components, particularly with regard to vertical and horizontal distances. As a SIMATIC controller is to be replaced by a newer SIMATIC controller, generally speaking no further measures concerning environmental conditions have to be taken. Nevertheless, it sometimes happens that the replacement controller is not designed for the predominant temperature or humidity at the site in question. This must be taken into account before the new controller is installed, and corrected if necessary.

5.3 Helpful information, tools and checklists

An analysis of additional requirements must be conducted individually with each customer. Factors such as actual condition, desired condition, approach to a solution, benefit and risk assessment are set out in a table (see Annex 5 – Evaluation of additional requirements), evaluated and discussed.

Zusatzanforderung		
Ist-Zustand	Lösungsansatz	Nutzen
Soll-Zustand	Zusatzkosten	Risikobewertung

Table 5-2 Description of additional requirements

5.4   Results on completion of Stage 5

The result of Stage 5 is that all additional requirements for the new controller have been defined and described in a specification. On the basis of this performance specification, or description, a binding migration plan can now be produced as the next step (Stage 6).

5.5   Implementation of Stage 5 with «MIGHOLZ» as an example

The changes to be brought about by the conversion are discussed with the customer. When HMI units are used, considerably more information can generally be displayed. Here, there was a need to define whether the existing control philosophy should be retained or adapted in line with the system's new capabilities.

A graphic display would simplify operation. And part of the control panel can be dispensed with, because operation will take place using the touchscreen in future.

Zusatzanforderung	Remote maintenance: Link to teleservice		
Ist-Zustand		Lösungsansatz	Nutzen

Zusatzanforderung	HMI: More user friendly	
Ist-Zustand	Lösungsansatz	Nutzen
HMI: Text display Complex navigation	Use of functionalities in the OP Display of PLC and states	Proactive maintenance Simple, faster operation and configuration
Soll-Zustand	Zusatzkosten	Risikobewertung
HMI: Graphic display Simple navigation	12h € 1500	Small

Table 5-3 Description of additional requirements in the «MIGHOLZ» project

In this way, the customer was made aware of the additional benefits, advantages and disadvantages, risks and costs. The advantages were obvious. In addition to migration, the customer wanted the benefits of the options remote access via teleservice and simplified operator guidance.

6 Stage 6: Planning - Drawing up the migration plan

6.1 Consolidation of intermediate results and objectives

Stage 6 is aimed at planning the procedure and answering the question: what is to be done when and by whom? The time schedule is formulated and written up in a project plan. The planning of a general fall-back solution is also important in this stage. Here, you must define the point in time and project stage of the migration at which conversion will progress or be reversed.

6.2 Activities and procedure

First, draw up a list of all activities. Next, arrange these in chronological order and note probable times for implementation. Plan activities
that can be dealt with in parallel accordingly. A rough plan of activities before, during and after the actual migration is drawn up on site.

In addition, the scope of the services performed by the customer during actual implementation is clarified. If the customer is performing services himself, these must be defined and included in the project plan.

6.2.1 Drawing up a project plan

We recommend discussing the project plan with the customer in detail, and also presenting areas of expertise, escalation strategies and helpful resources. It is important to position the milestones correctly and, as already mentioned, to have an adequate fall-back solution at your disposal at all times.

Nr.		Vorgangsname	November 2006	Dezember 2006	Januar 20
1		Interview beim Kunden. Besprechen der weiteren Vorgehnesweise	SIEMENS		
2		Aufnahme vor Ort	SIEMENS		
3		Analyse	SIEMENS		
4		Ausarbeiten der Handlungsoptionen	SIEMENS		
5		Review	Solution Partner		
6		Spezifikation festlegen	Solution Partner		
7		Planung	Solution Partner		
8		Angebot erstellen	Solution Partner		
9		Projektstart	20.11.		
10		Übersetzen der Software Step5	Solution Partner		
11		Prüfen der übersetzten Software	Solution Partner		
12		SW Fehlerbehebung	Solution Partner		
13		Rückfallszenario 1	21.11.		
14		OP7 SW erstellen	Solution Partner		
15		SW Test mittels Simulation	Solution Partner		
16		Abnahme SAT	Solution Partner		
17		Abnahme SAT	27.11.		
18		Vorbereitungen vor Ort			Solution Partner
19		Ausschalten			Solution Partner
20		alte Steuerung lösen			Solution Partner
21		Rückfallszenario 2			26.12.
22		Einbau neue Steuerung			Solution Partne
23		Umverdrahten der Peripherie			Solution Partn
24		Profibus Kabel verlegen			Kunde
25		Umbau der Slaves			
26		Ersetzen des OP393III durch OP77			
27		Rückfallszenario 3			25.12.
28		Prüfen der HW-Konfiguration			
29		Verdrahtung überprüfen /Netz			
30		Signaltest	17.10.		
31		Laden der Anwender SW	17.10.		

Projekt: Projektplanung Datum: Mo 26.11.07	Vorgang		Meilenstein	◆	Externe Vorgänge	
	Unterbrechung		Sammelvorgang		Externer Meilenstein	◆
	In Arbeit		Projektsammelvorgang		Stichtag	
			Seite 1			

Figure 6-1 Project plan

6.2.2 Fall-back planning

If unforeseeable problems occur during migration, one – or better still, a chain – of several fall-back solutions is required (see section 3). The various stages must be taken into consideration and entered in the project plan.

6.3 Helpful information, tools and checklists

You can turn to internal departments and tools for support (also see 4.3). The implementation of a fall-back plan must not be allowed to restrict the functionality of the controller or system. You must discuss a fall-back solution with the customer.

The success of full or partial migration depends upon many factors. One of the most important of these is the conversion of the software (see Tools and support index in the Annex).

Once the software has been translated and is free from errors, you must check its functionality. If you are using standard modules, STEP 7 suggests the appropriate replacement types. User soft-

ware exists that can only be translated poorly or in part. (For information on conversion tools and the success quota, see bibliography in Migration Manual).

In order to make a judgment in these situations, we recommend that you contact the Technical Support Center (see Tools and support index in the Annex) and seek an expert opinion.

6.4   Results on completion of Stage 6

The result of Stage 6 is a project plan. This regulates the allocation of resources, sets out the time schedule and defines which fall-back solution should be employed at what point, should the need arise.

6.5 Implementation of Stage 6 with «MIGHOLZ» as an example

Once the conversion deadlines had been scheduled, the following procedure was defined:

#		Task	Duration	Start	Finish	Pred	Resource
1	⊞	Interview beim Kunden. Besprechen der weiteren Vorgehnesweise	2 Std.	Mo 16.10.06	Di 17.10.06		SIEMENS
2	⊞	Aufnahme vor Ort	8 Std.	Mo 23.10.06	Di 24.10.06		SIEMENS
3	⊞	Analyse	4 Std.	Di 24.10.06	Di 24.10.06	2	SIEMENS
4	⊞	Ausarbeiten der Handlungsoptionen	8 Std.	Di 24.10.06	Mi 25.10.06	3	SIEMENS
5	⊞	Review	4 Std.	Mi 25.10.06	Do 26.10.06	4	Solution Partner
6	⊞	Spezifikation festlegen	8 Std.	Do 26.10.06	Fr 27.10.06	5	Solution Partner
7	⊞	Planung	8 Std.	Fr 27.10.06	Mo 30.10.06	6	Solution Partner
8	⊞	Angebot erstellen	16 Std.	Mo 30.10.06	Mi 01.11.06	7	Solution Partner
9	⊞	Projektstart	0 Tage	Mo 20.11.06	Mo 20.11.06	8	Solution Partner
10	⊞	Übersetzen der Software Step5	2 Std.	Mo 20.11.06	Mo 20.11.06	9	Solution Partner
11	⊞	Prüfen der übersetzten Software	4 Std.	Mo 20.11.06	Mo 20.11.06	10	Solution Partner
12	⊞	SW Fehlerbehebung	8 Std.	Mo 20.11.06	Di 21.11.06	11	Solution Partner
13	⊞ 📝	Rückfallszenario 1	0 Tage	Di 21.11.06	Di 21.11.06	12	Solution Partner
14	⊞	OP7 SW erstellen	16 Std.	Di 21.11.06	Do 23.11.06	13	Solution Partner
15	⊞	SW Test mittels Simulation	8 Std.	Do 23.11.06	Fr 24.11.06	14	Solution Partner
16	⊞	Abnahme SAT	4 Std.	Fr 24.11.06	Mo 27.11.06	15	Solution Partner
17	⊞	Abnahme SAT	0 Tage	Mo 27.11.06	Mo 27.11.06	16	Solution Partner
18	⊞	Vorbereitungen vor Ort	4 Std.	Mo 25.12.06	Mo 25.12.06	17	Solution Partner
19	⊞	Ausschalten	2 Std.	Mo 25.12.06	Mo 25.12.06	18	Solution Partner
20	⊞	alte Steuerung lösen	4 Std.	Mo 25.12.06	Di 26.12.06	19	Solution Partner
21	⊞ 📝	Rückfallszenario 2	0 Tage	Di 26.12.06	Di 26.12.06	20	Solution Partner
22	⊞	Einbau neue Steuerung	4 Std.	Di 26.12.06	Di 26.12.06	21	Solution Partner
23	⊞	Umverdrahten der Peripherie	4 Std.	Di 26.12.06	Mi 27.12.06	22	Solution Partner
24	⊞	Profibus Kabel verlegen	4 Std.	Mo 25.12.06	Mo 25.12.06		Kunde
25	⊞	Umbau der Slaves	4 Std.	Mi 27.12.06	Mi 27.12.06	23	Kunde
26		Ersetzen des OP393III durch OP77	4 Std.	Mo 25.12.06	Di 26.12.06	24	Kunde
27	⊞ 📝	Rückfallszenario 3	0 Tage	Mo 25.12.06	Mo 25.12.06		Solution Partner
28	⊞	Prüfen der HW-Konfiguration	2 Std.	Mi 27.12.06	Do 28.12.06	25	Solution Partner
29	⊞	Verdrahtung überprüfen /Netz	4 Std.	Do 28.12.06	Do 28.12.06	28	Solution Partner
30	⊞	Signaltest	4 Std.	Do 28.12.06	Fr 29.12.06	29	Solution Partner/Kunde
31	⊞	Laden der Anwender SW	2 Std.	Fr 29.12.06	Fr 29.12.06	30	Solution Partner
32	⊞	Funktionen prüfen	4 Std.	Fr 29.12.06	Fr 29.12.06	31	Solution Partner/Kunde
33	⊞	Einstellen der Parameter	4 Std.	Di 02.01.07	Di 02.01.07	32	Solution Partner
34	⊞	IBN der Maschine	8 Std.	Di 02.01.07	Mi 03.01.07	33	Solution Partner
35	⊞	Betrieb der Maschine über OP77 testen	2 Std.	Mi 03.01.07	Mi 03.01.07	34	Solution Partner
36	⊞	Start Testbetrieb	0 Tage	Mi 03.01.07	Mi 03.01.07	35	Solution Partner/Kunde
37		Testbetrieb	36 Std.	Mi 03.01.07	Mi 10.01.07	36	Kunde
38	⊞	Optimierungen	4 Std.	Mi 10.01.07	Mi 10.01.07	37	Solution Partner
39	⊞	Abnahme (FAT)	0 Std.	Mi 10.01.07	Mi 10.01.07		Solution Partner/Kunde

Figure 6-2 Project plan in the «MIGHOLZ» project

7 Stage 7: Quotation – Producing the quotation with supporting tools

7.1 Consolidation of intermediate results and objectives

All information has now been dealt with, and an actual quotation can now be drawn up. The integration of the solution partner at an early stage continues to yield positive results, because he can implement the instructions with SIMATIC components himself on the one hand, and calculate lower cost approaches than Siemens on the other hand, while assuming overall responsibility.

7.2 Activities and procedure

The solution partner draws up a quotation. This is based on the points listed in section 7.2.2, plus the consolidated requirements and agreed expansions.

Siemens assumes an advisory, coordinating role, and makes tools, checklists and the procedure available.

If the migration includes more complex system parts that cannot be covered by regional support, contact with Migration Support is established (see section 3.3.1). This organization provides backup support for local migration operatives.

7.2.1 Calculating migrations

The following items must be taken into consideration when calculating migrations:

- **Hardware**
  All planned components must be included. The result from the Cross Reference Tool can be used for this purpose. In addition, the quotation must include Profibus cables, connectors, repeaters, etc. Mounting and various small materials must also be calculated.

- **Software**
  As the user software is available or can be taken from the existing controller, a cost estimate can be calculated fairly easily in the majority of cases. It is helpful to check the software for the number of warnings and errors during a conversion.

  Experience-based information for producing a cost estimate:

  The extent to which the number of errors can provide helpful information depends upon the size of the user program. The larger the program code in relation to errors that occurred during conversion, the less time will have to spent on software adjustments. Cau-

tion: Consequential errors may also occur.

Experience shows that conversion only makes sense if there is a ratio of less than 8:1. (In concrete terms, no more than 1 error should occur for 8 lines of instructions.)

Untranslatable modules must also be taken into consideration. Here, too, it may well be feasible to create completely new software rather than rewrite it.

- **Conversion**

  Sufficient time must be planned for the hardware conversion. Unlike the installation of a new system, migration entails restoration work and rewiring, requiring more time. Additional time must also be spent on the consideration of general fall-back solutions.

- **Startup**

  For startup, the number of I/O, slaves, networking and visualization are taken into account. Here, the number of information points or the number of process variables is a reliable measure**.**

- **Risk**

  Any possible risk must be assessed and taken into consideration accordingly (important factors, resources, expertise, deadlines).

- **Negotiating framework**

  The framework for a general concession in price negotiations with the customer must be established in advance.

7.2.2   Recommendation for acquisition costs and configuration expenses

Further expert analyses and project designs from Stages 1-4 are liable to a fee and must be negotiated before the quotation is produced (also see kickoff meeting on page 8). Ideally, the costs/expected costs of an expert analysis will be tied to the placing of the order as a whole. In other words, the indicated value of the expert analysis is only billed if the job does not take place.

Configuration expenses are listed in the offer as engineering services for migration. Experience in this field allows the time spent on rendering these services to be reduced, so that the customer may be offered a discount.

Moreover, the customer can be offered further services encompassing all aspects of migration. You can therefore offer the customer a warranty, for example, in the form of a standby service contract with shorter reaction and intervention times. Annual maintenance of the controller/system can

also be mentioned. In this case, you should actively promote the service portfolios of the solution partners and Siemens.

7.2.3   Information on maintenance and standby concepts

If the customer wishes for short reaction and intervention times, you can formulate a solution together with the solution partner or with Siemens local service organizations. The result may be a standby service or maintenance contract, for example.
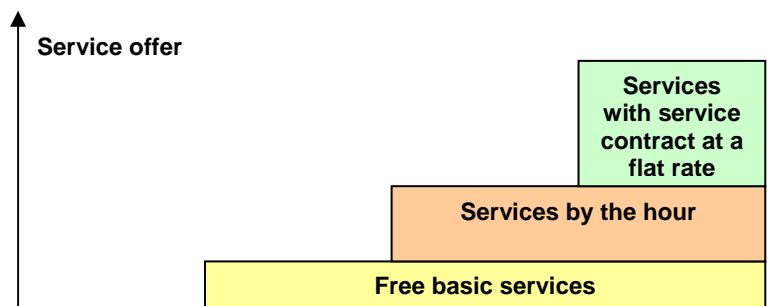

Figure 7-1 Service offer - «Basic service, by the hour, contractually agreed service » - Source: A&D AS CS4

Note on service contracts:

You will find a summary of possible service contracts (with detailed description) on the Internet/intranet, via the following link

http://support.automation.siemens.com/ww/view/de/18852040

7.3   Helpful information, tools and checklists

You can make use of the pm@siemens (PM040) process for support. As each migration is described and regarded as unique, experience is by far the most useful aid.

Terms & conditions and price recommendations can be found in Annex 4.

7.4 Results on completion of Stage 7

At the end of Stage 7, the customer has a binding quotation from the solution partner. The customer is free to obtain a comparative quote. The likelihood of this is diminished, however, due to the time spent on expert analysis, and the trust and relationship established with the partner and Siemens.

7.5 Implementation of Stage 7 with «MIGHOLZ» as an example

The quotation could be drawn up very simply. The hardware was known. 8 working hours were calculated for software migration, 20 working hours for hardware conversion and routing the new Profibus cable. A further 12 working hours were added for startup.

In total, 40 hours were calculated and the quotation written on this basis. As the software could be converted in-house, the machine only had to be shut down for less than a week. This responded to the customer's wishes, and the conversion phase could be timed to coincide with the two-week plant closure for vacation.

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		/ Version:	Datum:
		/	16.05.2006

Pos	Menge/Einheit	Bezeichnung der Lieferung/Leistung Zeitraum der Leistung	PE	Einzelpreis	Alt/Opt	Gesamtpreis CHF
		(8A/BAUGRUPPE)				
—001280 zu Pos. 001000	7 ST	6ES7392-1AJ00-0AA0				
		SIMATIC S7-300, FRONTSTECKER FUER SIGNALBAUGRUPPEN MIT SCHRAUBKONTAKTEN, 20-POLIG				
—001290 zu Pos. 001000	2 ST	6ES7392-1AM00-0AA0				
		SIMATIC S7-300, FRONTSTECKER 392 MIT SCHRAUBKONTAKTEN, 40-POLIG				
001300		Umsetzung				
—001310 zu Pos. 001000	8,00 STD	Umsetzung der Software				

Umsetzung der Software von STEP5 auf STEP7. Erstellen der Dokumentation
(Programmausdruck, Funktionen der Bausteine)

EKN:	N
AL:	N
ECCN:	N

—001320 zu Pos. 001000	14,00 STD	Umbau der Hardware vor Ort

Umbau der Hardware im Schaltschrank der Anlage, Umverdrahtung der
entsprechenden Baugruppen

EKN:	N
AL:	N
ECCN:	N

—001330 zu Pos. 001000	11,00 STD	Inbetriebsetzung vor Ort

Inbetriebsetzung der Anlage, in Zusammenarbeit mit dem Kunden.

EKN:	N
AL:	N
ECCN:	N

—001340 zu Pos. 001000	1 ST	Spesen (Übernachtung, Km)

EKN:	N
AL:	N
ECCN:	N

Netto				19.078,70
Mehrwertsteuer	7,600 %	von	19.078,70	1.449,98
Gesamt	**CHF**			**20.528,70**

Zahlungsbedingungen:
Innerhalb 30 Tagen ohne Abzug

Lieferbedingungen (INCOTERMS 2000) EXW Urdorf

Die "Allgemeinen Lieferbedingungen der Siemens Schweiz AG für kundenspezifische Anlagen - Version 01.2005" bilden einen
integrierenden Bestandteil des Vertrages. Als Gerichtsstand gilt Zürich. Wir sind jedoch berechtigt, den Besteller auch
an dessen Sitz zu belangen.

Figure 7-2 Quotation

8 Stage 8: Migration until FAT

8.1 Consolidation of intermediate results and objectives

In this final phase (Stage 8), migration takes place. The solution partner receives active support from Siemens. During the entire project phase, care must be taken to ensure that the solution partner enjoys optimum support from Siemens. If problems occur during migration, the appropriate measures must be taken to eliminate them. Ideally, this can be ensured with a support contract.

8.2 Activities and procedure

The aim of Stage 8 is to carry out migration at the site in question. The project is deemed to be completed when all functions have been tested, documentation completed and an acceptance test conducted by the customer.

8.2.1 Support services for migrations projects

Throughout the implementation phase, all A&D services are available to both the solution partner and the customer, which are available as a basic service or regulated in the contract. The list below clarifies the support offer. We recommend discussing and regulating these services in the early stages of the project.

Beitrags-ID: 27227312

Basic service	on T&M basis and with contract	only with contact	
			Online Support
X			FAQ (answers to frequently asked questions)
X			Tips & Tricks
X			Latest product information
X			SW-Updates (Service packs only)
X			Manuals
X			Approbations/test certificates/trends
	X		Support Tools
X			Newsletter
			Technical Support
X			Basic telephone consulting without agreed reaction time
	X		Priority callback within a few minutes
	X		24h availability round the clock
	X		Older Products consulting on products that can no longer be delivered
	X		Extended processing of more complex and extensive tasks
	X		Personal Contact person-to-person contact
	X		Personal Contact 24h person-to-person contact round the clock
	X		Remote telediagnostics and support
			Service on Site
	X		Service on site during normal working hours without agreed response time
		X	Service on site with agreed response time and/or extended service time
		X	Standby personnel with branch know-how
	X		Service personnel permanently on site
	X		Corrective service on time and materials basis
		X	Corrective service at a flat rate (labour only)
		X	Corrective service including spare parts at a flat rate
	X		Inspection and servicing
			Repairs and Spare Parts
	X		Standard repairs (10 working days)
	X		Express repairs (2 working days)
	X		Turnaround repairs (puck-up/return from/to customer)
X			All spare parts kept in a central store
X			Selected spare parts kept in regional stores
		X	All spare parts required kept in regional store
	X		Standard delivery from central store: EU Europe up to 2 working days
			Non-EU Europe up to 3 working days
			outside Europe up to 11 working days *)
	X		System standstill from central store: EU Europe 24 hours
			Non-EU Europe 1...2 working days
			outside Europe 2...8 working days *)
	X		System standstill from regional store **): 24 hours
		X	Agreed delivery time for spare parts
		X	System-specific spare parts stock
	X		Replacement spare parts
			*) to border without customs formalities
			**) for selected parts only
			Modernization / Optimization
	X		Hardware upgrades
	X		Software upgrades
	X		Process optimization
	X		Retrofit

Table 8-1 Support services

8.2.2 Resources on loan for simulation purposes

If you need to loan materials for simulation purposes, your local Siemens contact partner can assist you.

8.2.3 Acceptance and handover of the system

After a defined test phase, the controller is handed over to the customer with an acceptance test report. Acceptance also signifies the start of the warranty on the part of the supplier. The warranty period should be limited to 12 months whenever possible, as surrounding systems are not necessarily replaced.

8.2.4 Documentation

The documentation is handed to the customer. Its scope depends upon the agreements set out in the performance specification or quotation. Normally, existing plans are extended, adapted or new ones produced. In addition, the customer receives a hard copy of the program, the cross reference list and the list of blocks. Startup reports and specifications do not form part of this documentation, but are handed to the customer during the various project phases, as the situation arises.

8.3 Helpful information, tools and checklists

The software conversion from S5 to S7 is described in depth in the manual entitled «From S5 to S7», which is placed in the folder Siemens -> Documentation -> English during every STEP 7 installation.

We recommend that you draw up a test plan that corresponds with the project plan and incorporates all milestones. A list of information points from the SIMATIC Manager can be printed out to assist with startup.

8.4 Results on completion of Stage 8

The controller has been converted, the hardware and software tested and the system/machine is fully operational. Furthermore, any agreed functional enhancements have been implemented and tested to the customer's satisfaction.

8.5 Implementation of Stage 8 with «MIGHOLZ» as an example

Thanks to the use of this standard procedure with the 8 tried and tested stages, the «MIGHOLZ» project was completed successfully without problem.

9   Conclusion and outlook

The aim of this guide was to provide the reader with an idea about the procedure to follow during migration projects, i.e. to describe the most significant phases and the services on offer. Particular focus was placed on the questions of «when», «what» and, above all, «how».

Firstly, the procedure was described in 8 stages, which experience has shown to be especially useful. Annex 1 contains a «Blueprint» of the entire relationship model based on these 8 stages.

The model shows which input and output parameters must be available at what time, the relationship of these parameters to the subsequent phase, and how these intermediate results must be addressed so that they can be utilized efficiently and to the full in the next phase.

Based on positive experience, the following key findings are emphasized once more below as particularly attractive:

- Migration is based on the meticulous, clear documentation of all modules

- The «SIMATIC Spare Part List» is used to assess the project lifecycle

- The «Cross Reference Tool» from the CA01 is used to select compatible successor products

- System enhancements with lasting improvements to efficiency are incorporated

- Partners are involved in the solution process at an early stage

Outlook: From now on, best practice examples will be added to the installation migration platform http://support.automation.siemens.com/ww/view/en/16612444.

Positive side effect: Thanks to the modular 8-stage model, further tried and tested documents and additional solutions can be integrated at any time, and the experience and knowledge gained extended to further sectors and controller segments.

Key to abbreviations

A&D   Siemens Automation and Drives
AKZ   Plant Designation
CRM   Customer Relationship Management
ERP   Enterprise Resource Planning
FAT   Factory Acceptance Test
MRPD   Machine-Readable Product Designation
PC   Personal Computer
PG   Programming device

Tools and support index

Tool and brief description	Location
«SIMATIC Spare Part List» (SI-MATIC.xls) Brief description: For checking SIMATIC components for obsolescence, type discontinuation and expected total discontinuation	http://support.automation.siemens.com/ww/view/en/16612315
«Cross Reference Tool» Brief description: Suggests S7 modules as replacements for the S5 components in question	Available in the CA01 catalog, version 02/2008 onwards
Component Documentation Sheet Brief description: Helpful form	Annex 3
I/O adapters Brief description: Adapters for minimizing the amount of wiring	SIEMENS AG RD SDW STG I&S SCS Weissacherstr. 11 D-70499 Stuttgart
S5 Converter Brief description: Translates S5 files to S7	Part of STEP 7 Start -> SIMATIC / STEP 7 / Converting S5 Files
Benefit Analysis Brief description: For listing, analyzing and evaluating additional requirements	Annex 5
Kickoff Checklist Brief description: Questionnaire on situation overview	Annex 2
Simatic S5-S7 Migration Support Brief description: Internet platform with helpful information	http://support.automation.siemens.com/WW/view/en/16612444

Applications & Tools Brief description: Helpful articles and applications	http://support.automation.siemens.com/WW/view/en/20208582/136000
Technical Forum Brief description: Exchange with experts and system specialists	http://www.automation.siemens.com/WW/forum/guests/Conferences.aspx?language=en
Technical Consulting Brief description: Assistance with planning and conception	E-mail: simatic.sss@siemens.com Query form: http://support.automation.siemens.com/WW/view/en/16605791 http://support.automation.siemens.com/WW/view/en/16605680

Diagram index

Table index

Bibliography

STEP 7	From S5 to S7	Migration Manual Edition 03/2006 A5E00706928-01	**6ES7810-4CA08-8AW0**
STEP 7	System and Standard Functions for S7-300 and S7-400	Reference Manual Edition 03/2006 A5E00709321-01	**6ES7810-4CA08-8AW1**

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Annex 1 «Blueprint»

Blueprint: 8-stage model
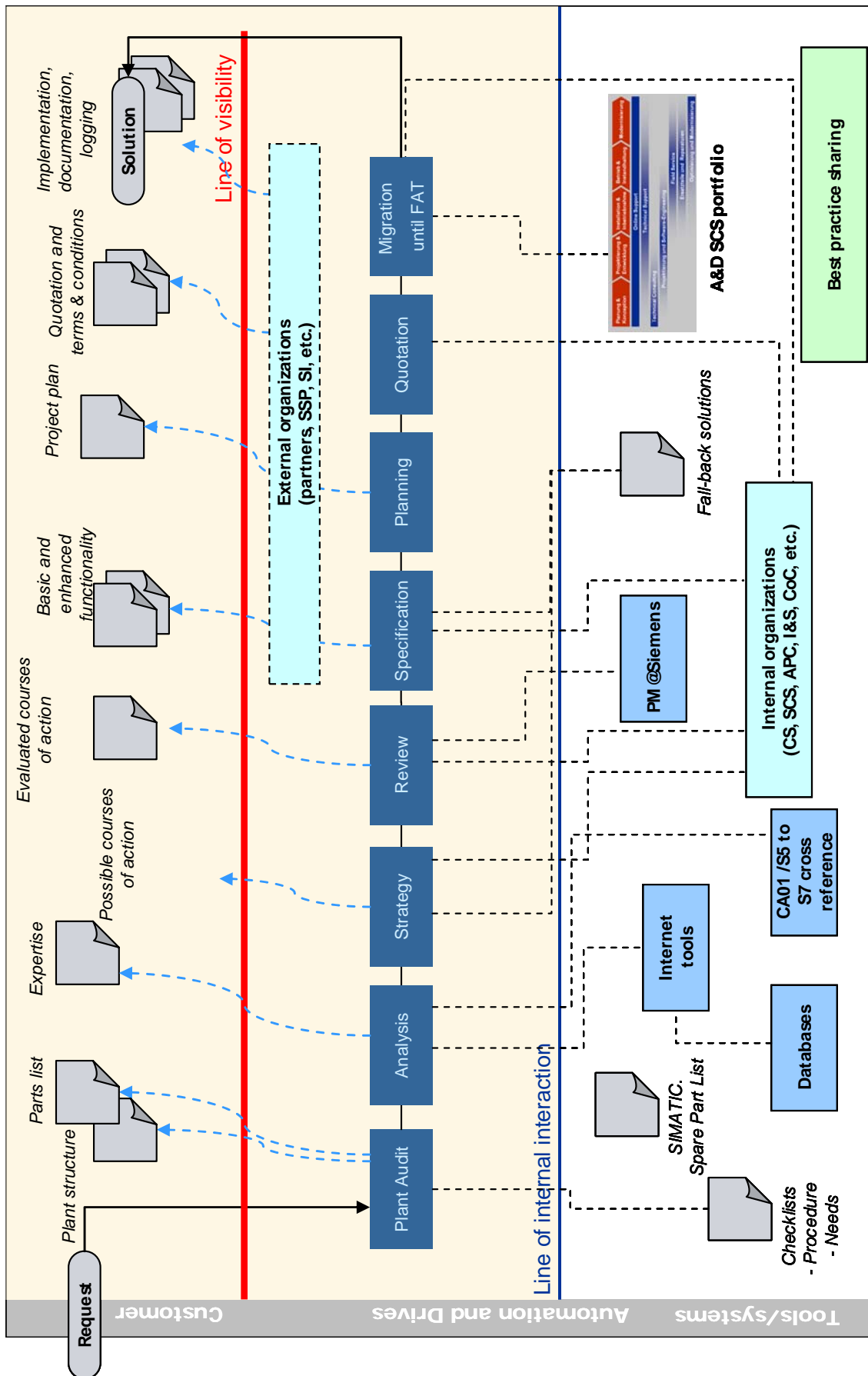
Annex 2 «Kickoff Checklist»

Question	Rating	Answer
What is the general condition of the system?		
What is the customer's main focus concerning the controller?		
How long will the controller/system be in operation?		
Are spare parts available for the controller/system?		
Will migration free up components that can then be used as replacements for other system parts?		
Does the customer's budget cover migration?		
Has the system already undergone previous migration?		
Would surrounding systems be affected by migration?		
Who is the manufacturer/supplier?		
Are original project data available?		
Is the original user software available?		
What condition is the documentation in?		
Is it a validated system?		
Are there safety regulations to be observed?		
Has the customer already obtained a quotation for migration?		

The order of these questions does not indicate their priority.

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Annex 3 «Component Documentation Sheet»

Einbauort:						Firma:	
Gerätetyp:						SIM:	
Pos.	**Anzahl**	**MLFB**				**Version**	**Bemerkung**
1							
2							
3							
4							
5							
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21							
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25							
26							

Datum:

Annex 4 «Price Sheet»

The way this sheet is set out for this sector may vary in different countries. The suggested price sheet below is based on a Central European approach:

Stage	Designation	Not subject to a fee	Subject to a fee	Negotiable	Recommendation/Approaches
	Kickoff	✘			
1	Plant Audit		✘	(✘)	*By the hour* Automation (conception, development, implementation, startup) approx. € 80/h
2	Analysis		✘	(✘)	*Flat rate per item* € 3 per item
3	Strategy		✘	(✘)	Automation (conception, development, implementation, startup) approx. € 80/h
4	Review		✘	(✘)	PLC, HMI, field bus, etc. IT solutions (conception, development, implementation, startup) approx. € 100/h
5	Specification		✘	(✘)	Databases, recipe and batch management, networking)
6	Planning		✘	(✘)	Project management approx. € 110–120/h Concept design, expert analysis, performance specification, consulting
7	Quotation		✘	(✘)	
8	Migration until FAT		✘		

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Annex 5 «Evaluation of additional requirements»

Additional requirement	Actual status	Suggested solution	Benefits
	Target status	Additional costs	Risk assessment